MOTOROLA

Installation Manual

DCX3501-M

High-Definition DVR

i   Safety & Regulatory Information

IMPORTANT SAFETY INSTRUCTIONS

- Read these instructions.
- Keep these instructions.
- Heed all warnings.
- Follow all instructions.
- Do not use this apparatus near water.
- Clean only with dry cloth.
- Do not block any ventilation openings. Install in accordance with the manufacturers instructions.
- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.
- Do not defeat the safety purpose of the polarized or grounding type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.
- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.
- Only use attachments/accessories specified by the manufacturer.
- Unplug this apparatus during lightning storms or when unused for long periods of time.
- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the power supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

IMPORTANT SAFETY CONSIDERATIONS

The DCX3501-M set-top requires careful handling to avoid potential damage to its internal hard disk drive or the loss of recorded data. Be sure to follow these requirements during transportation and installation.

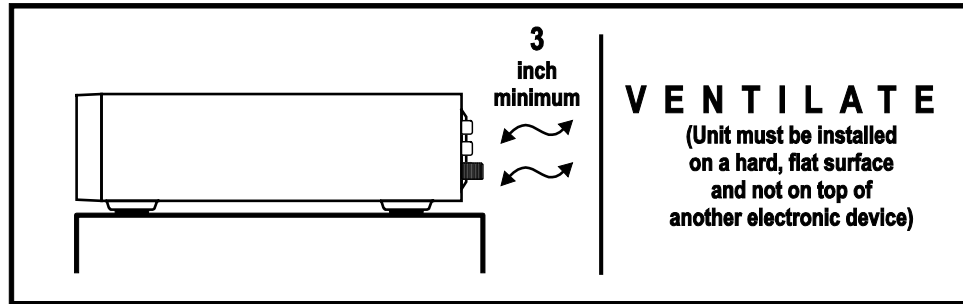The plug is the main disconnect device. It shall remain readily accessible and operable.

The apparatus shall not be exposed to dripping or splashing and no objects filled with liquids, such as vases, shall be placed on the apparatus.

During Transportation to the Subscriber Home

Transport the cable terminal in its shipping box or an equally padded container.

Do not expose the terminal to rain or moisture.

3 inch minimum

V E N T I L A T E
(Unit must be installed on a hard, flat surface and not on top of another electronic device)

During Installation

- Do not place the terminal in an enclosed area where the cooling vents are blocked or impede the flow of air through the ventilation openings.

- Install the terminal so that its position does not interfere with its proper ventilation. For example, do not place the terminal on a bed, sofa, rug, or similar surface that could block the ventilation openings.

- Install the terminal away from heat sources such as radiators, heat registers and stoves. Installation of the terminal near consumer electronics devices, such as stereo receiver/amplifiers and televisions, is permitted as long as the air surrounding the terminal does not exceed 40º C (104º F).

- Place the terminal on a flat surface not prone to vibration or impact.

- Do not install the terminal in an area where condensation occurs.

- To prevent the temporary loss of guide data and cause a temporarily non-responding terminal, do not plug the AC power cord into a switched power outlet.

- To avoid shock and vibration damage to the internal hard drive, do not move the terminal while it is plugged in.

- To allow the hard drive to spin down and park its heads, wait at least 10 seconds after disconnecting power before moving the terminal.

FCC Compliance

Note: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and set-top.

- Connect the equipment into an outlet on a circuit different from that to which the set-top is connected.

- Consult the dealer or an experienced radio/TV technician for help.

Caution: Changes or modifications not expressly approved by Motorola for compliance could void the user's authority to operate the equipment.

This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

FCC Declaration Of Conformity

Motorola Mobility, 101 Tournament Drive, Horsham, PA 19044, 1-215-323-1000, declares that the DCX 3400 set-top complies with 47 CFR Parts 2 and 15 of the FCC rules as a Class B digital device.

Canada Industry Canada (IC)

This Class B digital device complies with Canadian ICES-003.

Cet appareil numérique de la classe B est conforme à la norme NMB-003 du Canada.

Caring for the Environment by Recycling
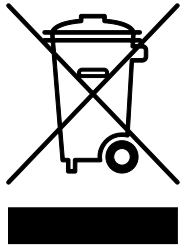
When you see this symbol on a Motorola product, do not dispose of the product with residential or commercial waste.

Recycling your Motorola Equipment

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1 Introduction

This manual provides instructions for cable operator personnel to install the Motorola DCX3501-M All-Digital High-Definition Dual Tuner DVR Cable Set-top. This unit includes a high-end processor, expanded memory, and enhanced graphics to support digital and on-demand broadcast and interactive services. It provides a full complement of interconnection options.

The DCX3501-M provides advanced capabilities, including:

- Authorization and purchase of on-demand programming
- Dual High-Definition (HDTV) decode of MPEG-2, MPEG-4 AVC (H.264), and VC-1
- HDTV output through component video (YPbPr), High-Definition Multimedia Interface™ (HDMI™), or IEEE-1394
- Surround-sound audio through a variety of digital interconnection options
- Dual-tuner DVR functionality to pause and time shift live video and seamlessly record in conjunction with the Interactive Programming Guide (IPG)
- DOCSIS 2.0+ embedded Cable Modem with support for DSG
- Ethernet and Universal Serial Bus (USB) 2.0 ports for future home networking applications
- Adaptability to various software platforms

As with all Motorola digital cable set-tops, the hardware features are enabled by core operating and third party application software.

Figure 1 – Front and rear views

Features

Tuners

- Two all-digital 1 GHz (54 to 1002 MHz) video tuners
- MPEG-2 Main Profile @ High Level (High-Definition)
- MPEG-4 H.264 (AVC) High-Definition decode
- One dedicated tuner for the DOCSIS high-speed data services channel, up to 1 GHz
- One dedicated tuner for the out-of-band (OOB) control channel

Standard Audio/Video Features

- ITU standard 64/256 QAM/FEC/enhanced adaptive equalizer
- DES based encryption/DCII (via inserted CableCARD™) access control
- Out-of-band data receiver (70-130 MHz) 2.048 Mbps
- Digital video scaling (picture in graphics)
- Accelerated 2-D and 3-D graphics support in hardware
- Macrovision® copy protection
- High-Definition video output through:
- HDMI (also compatible with DVI using an HDMI-to-DVI converter cable)
- Component video (YPbPr)
- IEEE-1394
- Standard-Definition video output through:
- S-Video
- Baseband
- RF
- Audio output through:
- S/PDIF coaxial and optical digital audio connections
- One volume-adjustable Baseband L/R stereo analog audio connection

Standard DVR Functionality

DVR functionality integrated with the IPG enables subscribers to:
- Pause, rewind, fast-forward, or record live TV
- Maintain a personal recorded program library and access it using the IPG
- Select programs to record across multiple channels and time slots
- Rewind and replay recorded programs

- Simultaneously watch two programs, switching easily between them using the swap key
- Record a program in the background while viewing another live program
- Simultaneously record programs from two channels while watching a different pre-recorded program, with the ability to switch viewing between any of the three programs

Motorola cannot guarantee the exact amount of programming that each subscriber will be able to record. The approximate time depends on the programming type and the drive size:

Table 1 – DVR recording time guidelines

| Model | Drive Size | Estimated Recording Hours For: | |
		Standard Digital Channels	HDTV Channels
DCX3501-M	500 GB	350 to 700 (MPEG-4)	100 to 160 (MPEG-4)
		175 to 350 (MPEG-2)	50 to 60 (MPEG-2)

All times are approximate. The actual hours a subscriber can record are a function of program bit rate, the IPG type, and the reserved buffer space.

Standard Data Features

- Integrated DOCSIS 2.0+ capable cable modem
- 64 MB FLASH memory
- 512 MB DRAM
- One Universal Serial Bus (USB) 2.0 port
- One eSATA (external SATA) connector, un-powered for data-only connectivity, on the rear panel
- 10/100 Mbps Ethernet Port (RJ-45) on the rear panel
- On-board real-time RF return (DOCSIS compliant)

Standard Miscellaneous Features

- Messaging capabilities
- Digital diagnostics
- Full feature access from front panel using a four-digit, seven-segment LED display

If You Need Help

If you need assistance while working with the DCX3501-M, contact the Motorola Technical Response Center (TRC):

- Inside the U.S.: 1-888-944-HELP (1-888-944-4357)

- Outside the U.S.: 1-847-725-4011

- Motorola Online: http://businessonline.motorola.com/

The TRC is on call 24 hours a day, 7 days a week. In addition, Motorola Online offers a searchable solutions database, technical documentation, and low-priority issue creation and tracking. For specific toll-free numbers when calling from outside the United States, please refer to the product manual or our web page.

Calling for Repairs

If a Motorola set-top requires repair service, please call one of the following Motorola Authorized Service Centers:

Company	From USA or Canada	Outside USA or Canada
World Wide Digital	1-800-227-0450	1-956-541-0600
Teleplan	1-800-352-5274	1-302-322-6088

To ensure efficient service, request a Return for Service Authorization (RSA) number. Be sure to display the RSA number prominently on all equipment boxes.

The Service Center will provide the shipping address of the location performing your repairs.

To ship your equipment for repair:

- Pack the unit securely, if possible in its original factory shipping carton.
- Print or display the RSA number so it is easily visible on all equipment boxes.
- Enclose a note describing the exact problem. Complete and enclose the checklist provided with the unit.
- Ship the unit *PREPAID* to the address provided by the Service Center.

Overview

2

Front Panel

The front panel controls provide functional navigation if the remote control is lost or is temporarily out of service. Certain functions, such as those requiring a numeric entry, require a remote control. Some connectors are not enabled and require the support of application software.

The DCX3501-M features new touch-sensitive buttons on the front panel. The buttons are activated when your fingertip touches the marked areas on the front panel. Note that the buttons do not physically depress like standard mechanical buttons.

Figure 2 – Front panel

1	Cursor — Menu navigation
	Select — Selects menu options
2	Power — Turns the set-top on and off (standby)
3	Menu — Displays the menu
4	Guide — Displays the program guide
5	Info — Displays current channel and program information
6	Format* — Change the video output format
7	Channel — Changes channel up or down

The availability of certain features is dependent upon application support.

Front Panel Format Button

The Format button located on the front panel of the DCX3501-M allows you to quickly change the video output format on the component video (YPbPr) and HDMI outputs of the product. The DCX3501-M is capable of providing the following video formats:

- High Definition 1080p (1920 x 1080 pixels) over HDMI **only**

- High Definition 1080i (1920 x 1080 pixels) over HDMI and YPbPr

- High Definition 720p (1280 x 720 pixels) over HDMI and YPbPr

- Enhanced Definition 480p (720 x 480 pixels) over HDMI and YPbPr

- Standard Definition 480i (720 x 480 pixels) over HDMI and YPbPr

The Format button is intended to allow you to select a video output format that is compatible with a connected display device. Some televisions may not support all five video formats listed above. The Format button provides an easy method for selecting an output format that is compatible with the television and can help you to restore video if you should lose the picture for any reason.

Operation

The Format button is intended to complement the User Settings Menu (see User Setting Status). It is not intended to replace the User Settings Menu. The User Settings Menu is the preferred method of optimizing the DCX3501-M to operate with the specific television.

If you cannot get a video display when the DCX3501-M is connected to the television via component video or HDMI cables, use the Format button to select a video output format that results in a viewable picture on the display screen. Once a viewable picture is available, please use the User Settings Menu to optimize the DCX3501-M display settings for the specific television.

Video Format Indicators (Front Panel Display)

The front panel display of the DCX3501-M is equipped with five indicators to the right hand side of the display that are used to indicate the currently-selected video output format on the component video (YPbPr) and HDMI outputs. The indicators represent 1080p, 1080i, 720p, 480p, and 480i video output formats. As the Format button is pressed, the front panel format indicators will change to illuminate the currently selected video output format in use by the DCX3501-M on these outputs. Note, however, that the component video (YPbPr) output will be set to 480i whenever the HDMI output is set to 1080p.

Note: There are some scenarios where the DCX set-top does not change the video output format if the Format button is pressed. In these instances, the DCX3501-M will flash the currently illuminated video format indicator on the front panel display. If this should occur, please use the User Settings Menu to make further changes to the video output settings of the DCX3501-M set-top.

Rear Panel

The rear panel contains a power input; connectors for video, audio, and RF cabling; data output; and modem and data interface connectors. Some connectors are not enabled and require the support of application software.
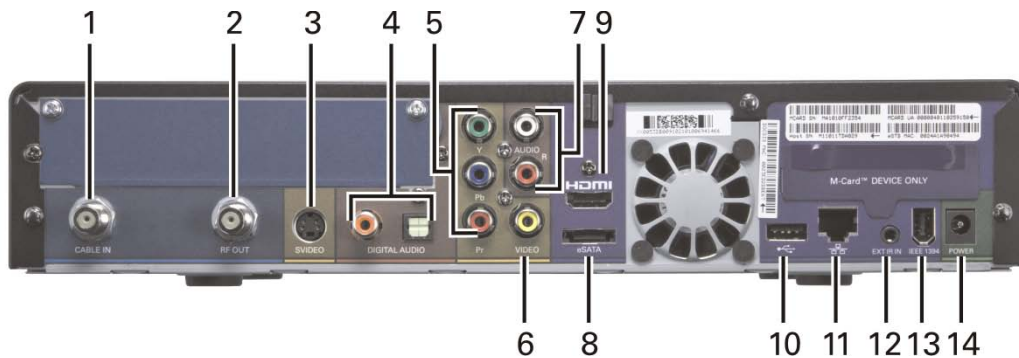
Figure 3 – Rear panel

Table 2 – Rear panel connections

1	Cable In — Connects to cable signal from the service provider
2	RF Out — Ch 3/4 modulated audio/video (SDTV) to TV or VCR
3	S-Video — Standard-Definition TV (SDTV) connector
4	Digital Audio (coaxial S/PDIF) — Provides Dolby® Digital 5.1 audio or PCM output
5	YPbPr — Component video output (HDTV)
6	Video — composite video (SDTV) output
7	Audio — Audio L/R outputs
8	eSATA* — External Serial ATA disk interface
9	HDMI — HDTV audio and video connector (Provides Dolby® Digital Plus 7.1 audio)
10	USB* 2.0 — High-Speed peripheral device connection
11	Ethernet* — Network connection
12	IR Remote Input — Connects to a remote control set-top accessory cable. Serves dual purpose as serial test connector (service personnel only).
13	IEEE-1394 — Audio and HDTV video device connection (US models only)
14	External Power Supply Connector

The availability of certain features is dependent upon application support.

M-Card™

The M-Card is required to view cable television programs, previously recorded programs on the DVR, or interactive on-demand programs. The M-Card should not be removed.

3 Installation

Before you move or change components on the subscriber's entertainment system:

- Review the installation instructions.
- Determine if you are connecting to a standard analog NTSC TV (supporting an RF input), a composite (baseband) video input, or an S-Video input) or a High-Definition TV (supporting component video input, HDMI input, or an IEEE-1394 input).
- Determine if the subscriber has other equipment to be connected to the terminal (home theater or A/V receiver, VCR, etc.).
- Verify that you have the necessary cables and other required items.
- If the terminal was previously used, clear its hard drive before installing it at a new subscriber location.

Cold Reset Procedure

This section describes the two *Front Panel Cold Reset* procedures for Motorola's DCX3501-M set-top. The front panel cold reset is generally used by operational and field personnel to accomplish the following:

- Restore the set-top to a known state.
- Clear channel maps, and application settings.
- Remove application and software objects above the platform code.
- Clear the Out of Band (OOB) Last Known Carrier (LKC) and force the units to hunt for a new OOB control channel.

Front Panel Cold Reset Method 1

1. Remove the DCX from its packaging.
2. Applying AC power to the DCX.
3. Once 8888 appears on the front panel LED, simultaneously press and hold both the power key and select keys on the front panel.
4. Once the key sequence has been executed correctly, the front panel LED will display cold for one second and then the DCX will reset.
5. The front panel LED will display hunt until it finds an RF feed and/or a valid OOB channel.
6. Once an RF feed or valid OOB channel is found, the DCX will lock to it, and the hunt display will disappear.

Front Panel Cold Reset Method 2

1. Remove the DCX from its packaging.
2. Apply AC power to the DCX.
3. Once 8888 appears on the front panel LED, press and hold the menu key on the front panel until the front panel LEDs display boot.
4. The DCX will remain in this state indefinitely, waiting for user input.
5. Press the cursor up (arrow up) key on the front panel until the front panel LED displays cold.
6. Press the select key on the front panel.
7. The front panel LED will flash '----' followed by 8888 and the DCX3501-M will reset.
8. Once the reset is finished, the front panel LED will display 'hunt' until it finds an RF feed and/or a valid OOB channel.
9. Once an RF feed or valid OOB channel is found, the DCX will lock to it, and the hunt display will disappear.

Clearing the Hard Drive

On a previously-used cable terminal, delete all recorded programs from the hard drive before installing it at a new subscriber location. This prevents the new subscriber from viewing programming they may not have purchased or may not want to see.

To prevent subscribers from accidentally deleting all of their recorded programs, a specific set of keystrokes is required to clear the hard drive. The DCX3501-M does not need to be connected to a television in order to clear the hard drive using this process.

To clear the hard drive:

1. Start the diagnostics as described in the Diagnostics section; d 01 is displayed on the front-panel display.
2. Using a remote control, within five seconds, press REPLAY, MY DVR three times, and LIVE TV. (On some remote controls, the MY DVR key may be labeled LIST.)
3. If you correctly enter this key sequence in five seconds or less, the hard drive is cleared and the front-panel displays *Clr*.
4. If *Clr* is not displayed, re-enter the key sequence in step 2.
5. If *Clr* is displayed, press any other key on the remote control to reset the terminal, turn it off, and complete the clearing process.

Video Connection Options

Use the following guidelines to determine the best video connection for the subscriber home entertainment system. To determine the available video inputs on the TV, check the manual supplied with the TV or the TV itself.

The DCX3501-M offers the following video outputs:

Component (YPbPr)	HDTV and SDTV	The YPbPr output, providing three component analog video signals to the TV, is the most widely supported HD video connection.
HDMI or IEEE-1394	HDTV and SDTV	HDMI and IEEE-1394 provide higher-quality digital HD video signals than component video signals. If the TV has an HDMI or a DVI input, use the HDMI output instead of the IEEE-1394 output. HDMI and IEEE-1394 are video and audio connections. If you use HDMI or IEEE-1394, no separate audio connection to the TV is required. HDMI is compatible with DVI. If the TV has a DVI input, you can use an HDMI-to-DVI converter cable or adapter to connect the DVI-equipped TV to the HDMI-equipped DCX3501-M. If you use the IEEE-1394 connection, the subscriber will be unable to see on-screen graphics (such as the EPG).
S-Video	SDTV only	If the TV has an S-Video input, use S-Video. S-Video is the highest-quality Standard-Definition video output on the DCX3501-M.
Video (composite)	SDTV only	If the TV does not have an S-Video input, use the composite video (video) output.
RF	SDTV only	If the TV only has a coaxial RF input, connect it to the DCX3501-M RF out connector.

Audio Connection Options

When connecting to a home theater receiver, depending on its inputs, you can use the following DCX3501-M audio outputs:

HDMI	Unlike a DVI connection, an HDMI connection is capable of carrying digital video and audio signals to the TV or a home theater receiver equipped with HDMI switching support. The HDMI connection can deliver Dolby Digital Plus, Dolby Digital, Linear PCM, and other digital audio formats to a compatible TV or home theater receiver.
Digital audio optical (S/PDIF) or digital audio coaxial (S/PDIF)	If the TV or home theater receiver supports it, use either the S/PDIF digital audio optical or S/PDIF digital audio coaxial outputs to deliver Dolby Digital and Linear PCM audio to a Dolby Digital home theater receiver. • For an HDMI or IEEE-1394 video connection, no additional audio connections to the TV are required. • For RF output, no further audio connection is required
Baseband Audio L and R	If the audio receiver does not support Dolby Digital, use the baseband AUDIO L and R outputs to connect to the audio receiver. The DCX3501-M offers two sets of Baseband Stereo L/R audio outputs. One set provides fixed volume audio while the other set provides volume-adjustable audio.

If the customer equipment supports it, use either the optical S/PDIF or coaxial S/PDIF output instead of the AUDIO L and R outputs. The S/PDIF outputs offer better audio quality, including support for Dolby Digital 5.1 Surround Sound. The HDMI interface supports Dolby® Digital Plus (7.1) audio.

The cabling diagrams show sample audio/video (A/V) connections to an audio receiver, where the receiver functions as an A/V router. When connecting to an audio receiver, reference its installation instructions for directions on connecting to baseband and digital audio (S/PDIF) ports.

Note: The VCR and TV receive their A/V signals from the currently selected input device on the audio receiver. This is important when the subscriber has another A/V device such as a DVD player, secondary VCR, CD player, or other electronic component. Motorola recommends connecting the TV to the monitor output so on-screen menus for the receiver can be displayed. (Receivers themselves often have interactive on-screen menus.)

Installation Overview

1. Determine if you are connecting to a:

High-Definition TV or monitor	Use the component video (YPbPr), HDMI, or IEEE-1394 outputs. No other video connection supports HDTV. If the TV has a DVI input, connect a DVI-to-HDMI adapter or cable to the HDMI out connector on the DCX set-top instead of the IEEE-1394 connection and the DVI-HDTV connector on the TV.
Standard-Definition TV	Connect the S-Video connector using an S-video cable or connect the composite video connector using a composite (RCA phono) cable. If the TV only has a coaxial RF input, connect it to the DCX3501-M RF OUT connector.

2. Determine if you are connecting the audio to a home theater receiver or directly to the TV:

   o For an HDMI or IEEE-1394 video connection, no additional audio connections to the TV are required.

   o If the receiver or TV has a digital audio (S/PDIF) input, use the digital audio optical (s/pdif) or coaxial (s/pdif) outputs. Otherwise, use the baseband left and right audio out outputs.

3. Locate the cabling diagram(s) that best match the subscriber's configuration.

4. Connect the audio and video cables in a manner matching that diagram.

5. Determine if you are connecting to a data device (see Data Device Connections). For installation details, refer to the instructions included with the data device.

6. Connect the cable terminal to the coaxial cable wall outlet.

7. Perform the operational check for the remote control.

8. Optimize the High-Definition settings. See Configuring Audio, Video, and Closed Caption Settings in this section.

Connecting HDTV — Single Connection for Video/Audio

This section describes steps to connection the DCX to an HDTV using connections options that combine video and audio into a single cable.

Cable In

Connect an RF coaxial cable to the cable wall outlet and the cable in connector on the DCX set-top.

HDMI

If the TV has an HDMI input, this is for both audio and video if you are using the TV speakers. Connect a Standard HDMI cable to the TV and to the HDMI connector on the DCX set-top.

IEEE-1394

If the HDTV has an IEEE-1394 connector, you can use the IEEE-1394 for both the video and audio connection:

Connect an IEEE-1394 cable to the IEEE-1394 connector on the HDTV and DCX set-top.

Note: On-screen graphics will not be displayed when you are using the IEEE-1394 connection on the rear panel of the DCX set-top.

If there is an audio/video receiver and you are not using the TV's speakers, go to Connecting the DCX Set-top to an A/V Receiver – Audio.

Because HDMI and IEEE-1394 provide both video and audio output, no additional audio connections to the TV are required if you use either of these connections.
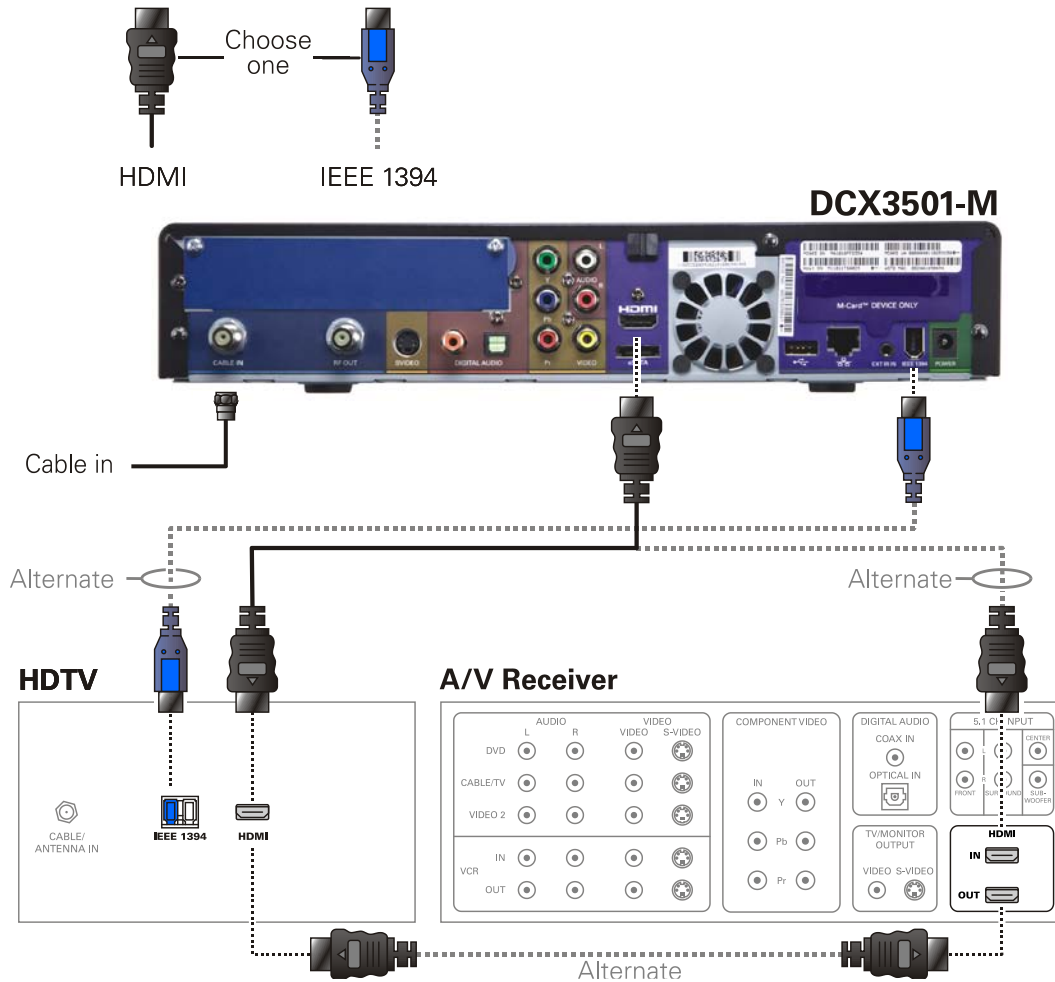
Figure 4 – Connecting the DCX to an HDTV — single connection for video/audio

Note: Only (1) HDTV video/audio connection needs to be made to an HDTV.

Note: On-screen graphics will not be displayed when using IEEE-1394 connection. Refer to Graphics Overlaying the Video for more information.

Note: Solid lines indicate optimum connections.

Note: Optional HDMI connection to A/V Receiver shown but not required.

Connecting HDTV — Separate Video/Audio Connections

Cable In

Connect an RF coaxial cable to the cable wall outlet and the cable in connector on the DCX set-top.

DVI

If the TV has a DVI input, use the DVI connection for the video:

- Connect a HDMI-to-DVI adapter or cable to the HDMI out connector on the DCX set-top and the dvi-hdtv connector on the TV.

Note: A DVI connection supports only the video connection between the DCX set-top and the HDTV. To connect your audio connections with your TV speakers, go to the Audio section below. To connect the audio connections for an A/V receiver, go to Connecting the DCX Set-top to an A/V Receiver — Audio.

Component Video (YPbPr)

Connect the component video cables to the **Y**, **Pb**, and **Pr** connectors on the HDTV and DCX set-top.

Note: This connection supports only the High-Definition video connection between the DCX set-top and the HDTV. Be sure to match up each signal to the same connection on the TV, otherwise the colors will not appear correctly on the TV.

Note: To connect your audio connections with your TV speakers, go to the Audio section below.

Audio

If the TV does not have digital audio inputs:

- Connect the stereo audio cable to the audio l and r connectors on the DCX3501-M Series set-top and the audio left and audio right connectors on the HDTV.

If the TV supports a digital audio input:

- If the equipment supports it, use the digital audio optical S/PDIF or coaxial S/PDIF outputs instead of the audio l and r outputs. S/PDIF offers better audio quality, including support for Dolby® Digital audio.

For information on configuring the DCX set-top settings, see Configuring Audio, Video, and Closed Caption Settings.
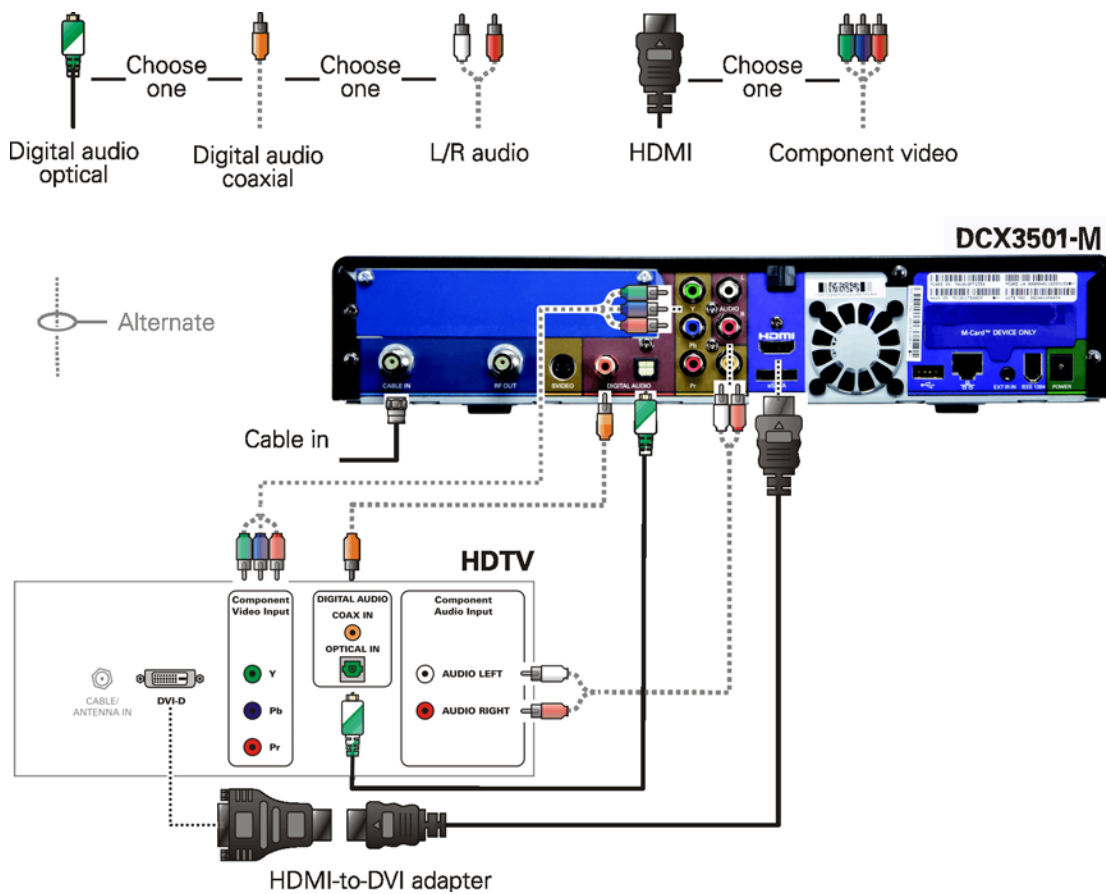
Figure 5 – Connecting the DCX to an HDTV — separate video/audio

Note: If the receiver can check the baseband and digital audio (S/PDIF) ports for appropriate channels, connect both the baseband and digital audio connections. Otherwise, do not connect both the baseband left/right composite connections and the coaxial digital connection. The baseband connections are not necessary because the digital audio port provides a single audio interface for digital channels.

Note: If the A/V receiver includes HDMI inputs and output(s), then the DCX3501-M HDMI output can be directly connected to the A/V receiver.

Connecting an A/V Receiver — Audio

There are several options available for audio connections to the A/V receiver:

- Digital audio (OPTICAL S/PDIF)

- Digital audio (COAXIAL S/PDIF)

- Stereo audio (AUDIO L and R)

If the A/V receiver supports it, the optical S/PDIF or COAXIAL S/PDIF digital audio outputs may be used in place of the stereo audio outputs (audio L and r). These outputs offer a higher level of audio quality, including support for Dolby Digital audio.

- **Digital audio optical (S/PDIF)** — Connect the optical cable to the digital audio OPTICAL connector on the DCX set-top and the optical connector on the A/V receiver.

- **Digital audio coaxial (S/PDIF)** — Connect the digital audio cable to the digital audio connector on the DCX set-top and the digital input coaxial connector on the A/V receiver.

- **Stereo audio** — Connect the stereo audio cable to the audio l and r connectors on the DCX set-top and the audio left and audio right connectors on the A/V receiver.

For information on configuring the DCX set-top settings, see Configuring the Audio, Video, and Closed Caption Settings.
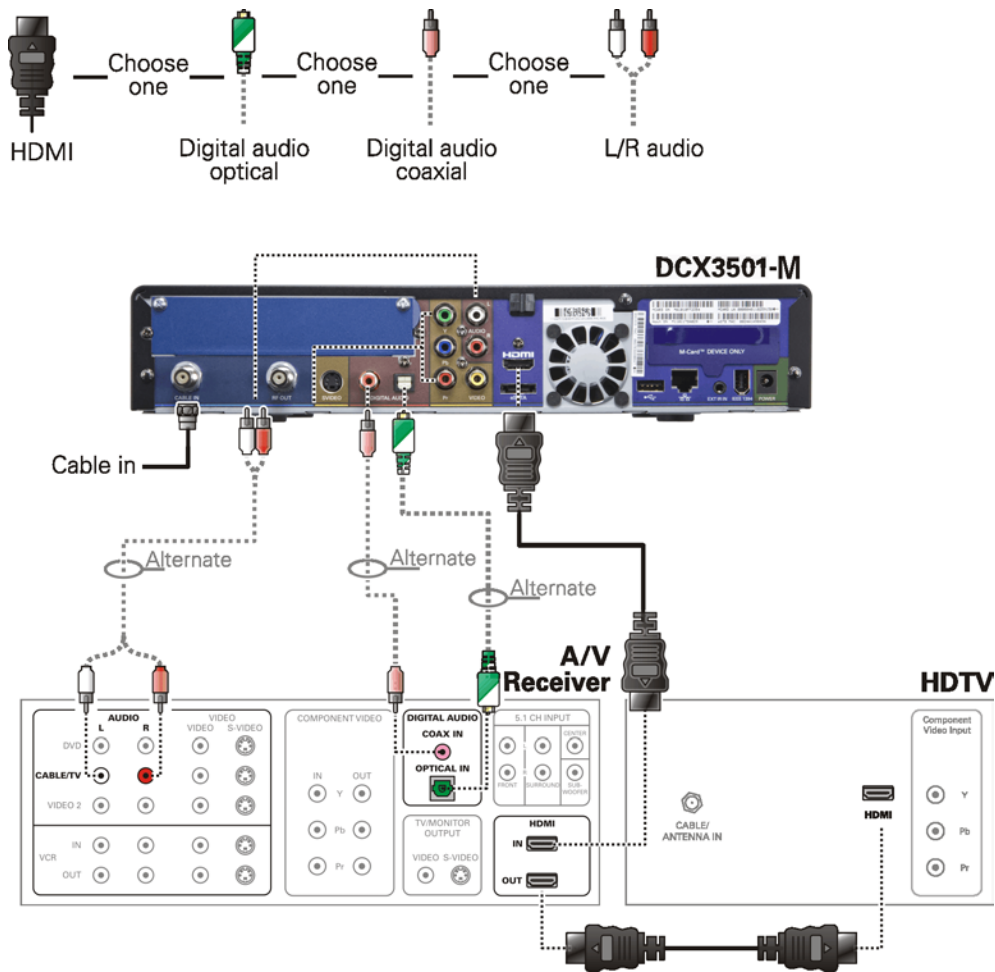
Figure 6 – Connecting the DCX to an A/V receiver — audio

Note: Because some entertainment equipment cannot simultaneously support baseband composite video and S-Video, never simultaneously connect both video inputs.

Note: This connection method does not support HDTV. For information, see Connecting HDTV — Separate Video/Audio Connections in this section.

Connecting a Standard-Definition TV (SDTV)

1. Connect the stereo audio cable to the audio l and r connectors on the DCX3501-M series set-top and the audio left and audio right connectors on the SDTV.

2. Connect a video cable to the video out connector on the DCX3501-M series set-top and the input video on the TV *or* an S-video cable to the s-video connectors on the DCX set-top and the TV.

Note: These video connection methods do not support HD video. If you have an HDTV, see Connecting HDTV — Separate Video/Audio Connections.
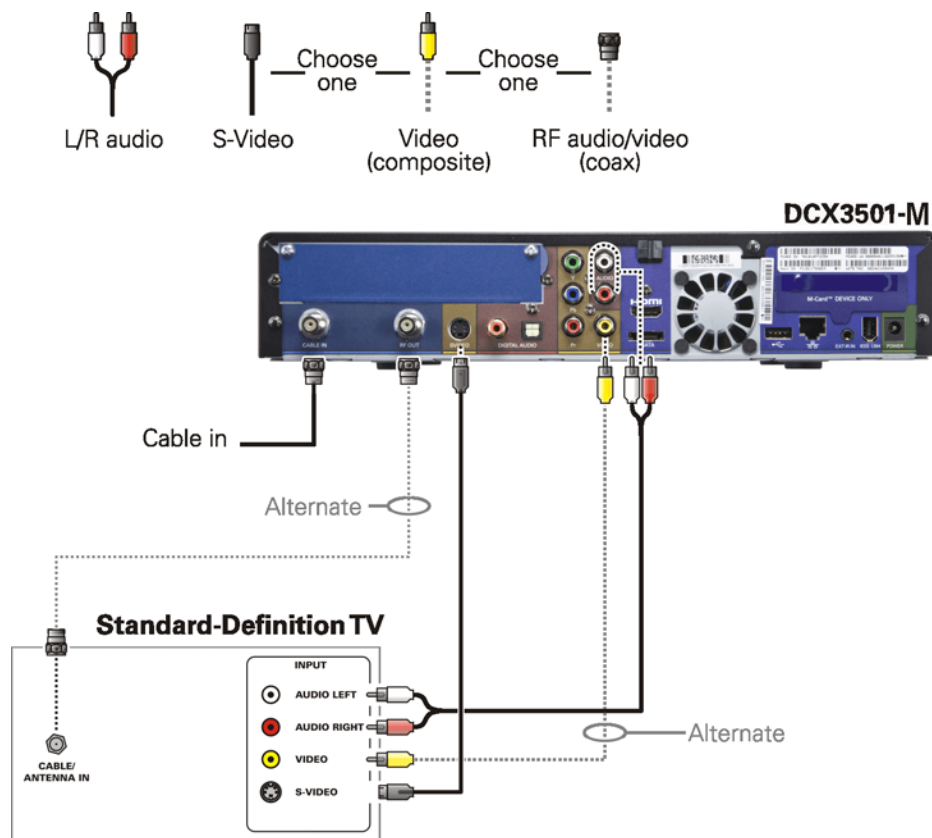
Figure 7 – Connecting the DCX to a stereo TV (SDTV)

Note: S-Video and Composite video require separate audio connections.

Note: Only (1) video connection and (1) audio connection is required.

Note: Solid lines indicate optimum connections.

Note: If the TV does not support S-Video connections, composite video connections may be used in place of S-Video.

Note: If the TV does not support S-Video or composite connections, use the RF out connector on the DCX set-top. The RF connection carries video and audio.

Connecting a Standard-Definition TV (SDTV) and VCR/DVD Recorder

1. Connect a stereo audio cable to the audio out l and r connectors on the DCX3501-M Series set-top and the input audio l and r connectors on the VCR/DVD Recorder.

2. Connect a video cable to the video out connector on the DCX3501-M Series set-top and the input video connector on the VCR/DVD Recorder.

3. Connect a stereo audio cable to the output audio l and r connectors on the VCR/DVD Recorder and the input audio left and right connectors on the SDTV.

4. Connect a video cable to the output video connector on the VCR/DVD Recorder and the input video connector on the SDTV.

Note: You can also connect using the S-Video connectors, if supported by the VCR/DVD Recorder.

Note: These video connection methods do not support HD video. If there is an HDTV, see Connecting HDTV — Separate Video/Audio Connections.

L/R audio

Video
(composite)

DCX 3501-M

Cable in

VCR/DVD Recorder

Standard-Definition TV

CABLE/
ANTENNA IN

To TV

INPUT

AUDIO   VIDEO

L   R

OUTPUT

AUDIO   VIDEO

L   R

CABLE/
ANTENNA IN

INPUT

AUDIO LEFT

AUDIO RIGHT

VIDEO

S-VIDEO
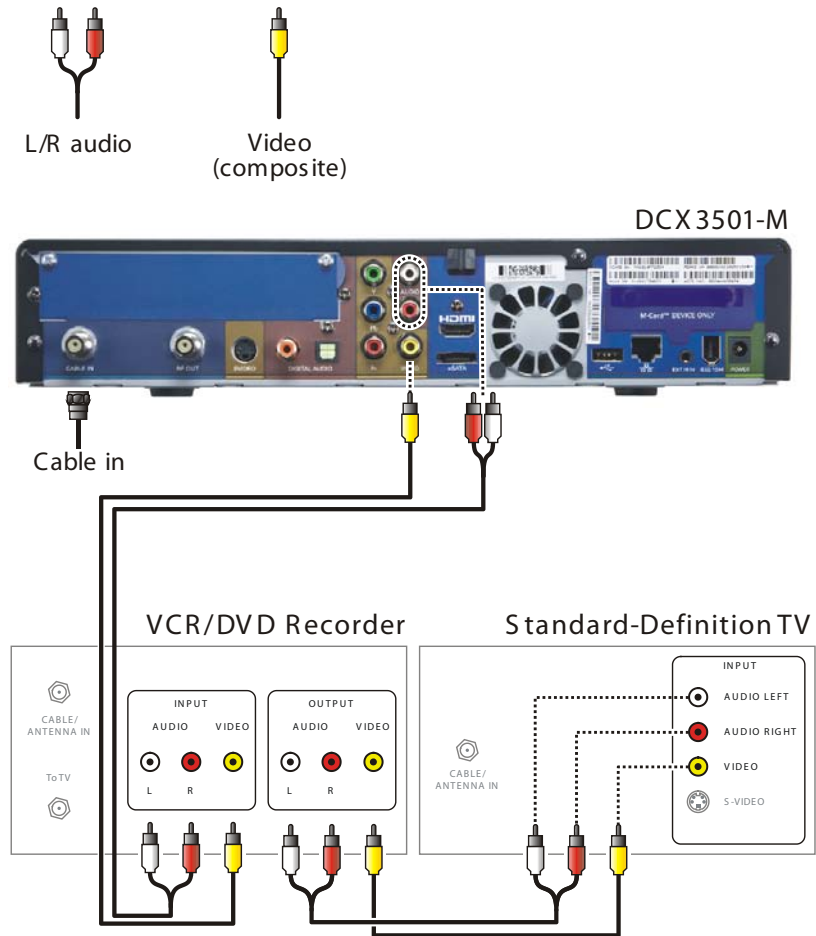
Figure 8 – Connecting the DCX to a standard-definition TV (SDTV) and VCR/DVD recorder

Connecting an A/V Receiver, SDTV, and VCR

1. Connect a stereo audio cable to the AUDIO OUT L/R connectors on the DCX3501-M series set-top and the INPUT L/R connectors on the A/V receiver.

2. Connect an S-Video cable to the S-Video out connector on the DCX3501-M series set-top and the S-Video connector on the A/V receiver.

Note: If your A/V Receiver does not support S-Video connections, Composite video connections may be used in place of the S-Video connection.

3. Connect a stereo audio cable to the VCR AUDIO OUT L/R connectors on the A/V receiver and the INPUT AUDIO L/R connectors on the stereo VCR.

4. Connect a stereo audio cable to the OUTPUT AUDIO OUT L/R connectors on the stereo VCR and the VCR AUDIO IN L/R connectors on the A/V receiver.

5. Connect a composite video cable to the input video connector on the stereo VCR and the video VCR OUT connector on the A/V receiver.

6. Connect a composite video cable to the output video connector on the stereo VCR and the video VCR IN connector on the A/V receiver.

7. Connect an S-Video cable to the input S-Video connector on the Standard-Definition TV (SDTV) and the TV/monitor output S-Video connector on the A/V receiver.

Note: If your TV or A/V receiver does not support S-Video connections, Composite connections may be used in place of the S-Video connections.

Note: The digital audio optical (OPTICAL S/PDIF) or digital audio (COAXIAL S/PDIF) audio outputs may be used in place of the stereo audio outputs (AUDIO L/R). These outputs offer a higher level of audio quality, including support for Dolby Digital audio.

Note: These video connection methods do not support HD video. If there is an HDTV, see Connecting HDTV — Single Connection for Video/Audio.
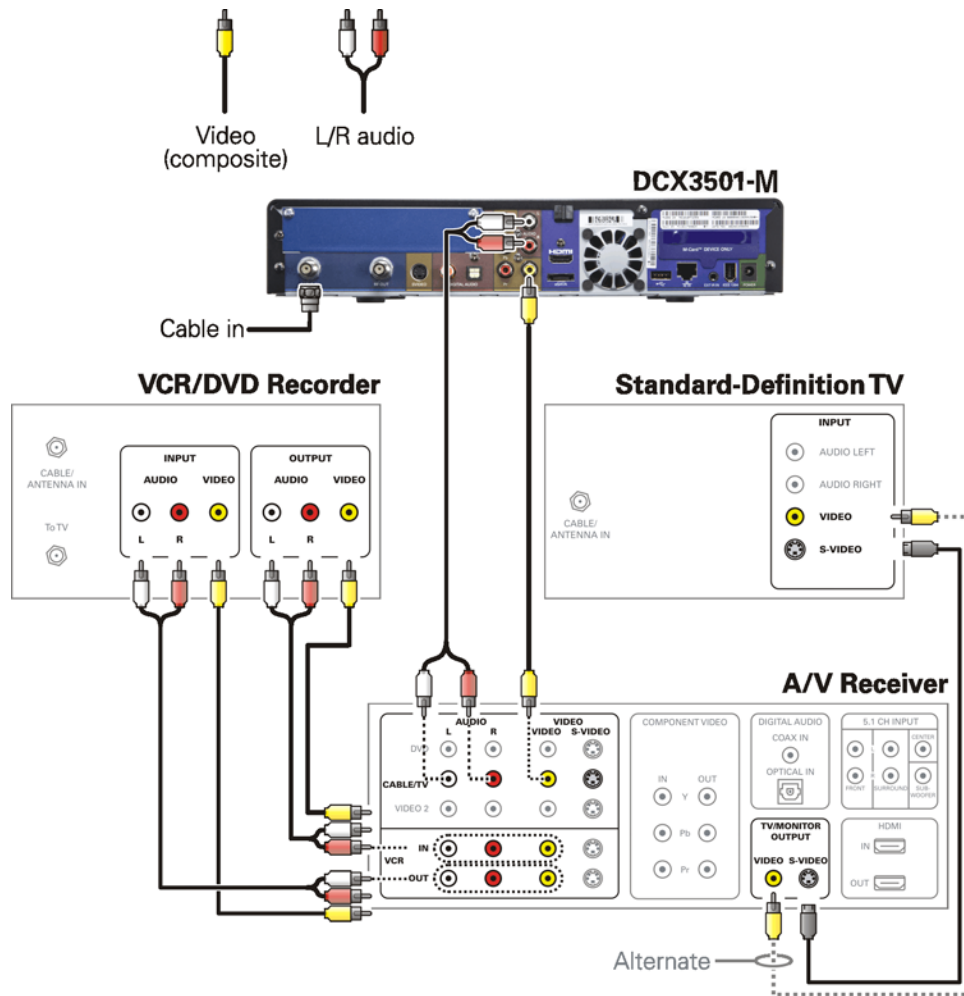
Figure 9 – Connecting the DCX to an A/V Receiver, stereo TV (SDTV), stereo VCR

Note: Solid lines indicate optimum connections.

Note: Consult your A/V receiver manual for additional wiring options or constraints when including a VCR/DVD Recorder in your configuration.

Data Device Connections
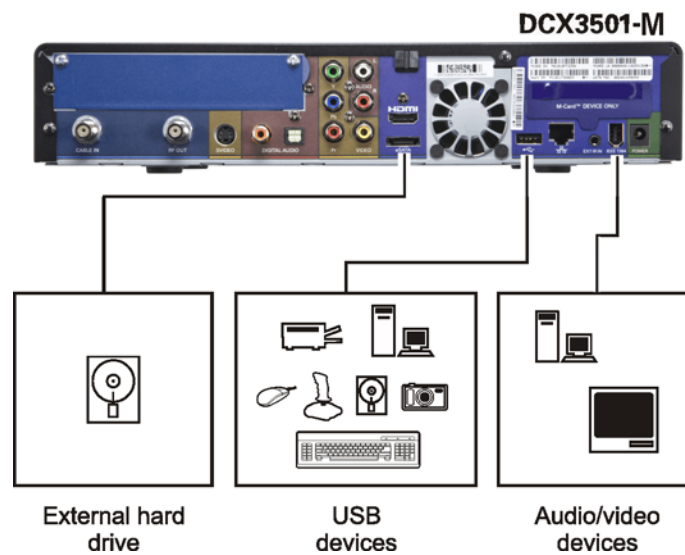
Figure 10 – Sample data devices you can connect to the DCX3501-M

Do not attempt to connect data devices without contacting your service provider. Advanced data features require the proper application and network infrastructure to operate.

Data Features

In addition to high-quality audio and video, the DCX3501-M can deliver high-speed data services such as Internet access, e-mail, IP telephony, e-commerce, and home banking.

Note: Your DCX may be equipped with the interface connections illustrated, but their functionality depends on the services offered by your service provider.

Operational Check for the Remote Control

The operational check tests communication with the remote control:

Table 3 – Operational check procedures

Feature	Testing Procedure
Power on	Press power on the remote control to turn on the DCX3501-M. Tune to the output channel (3 or 4), if using the RF output.
Channel selection	Scan through the channels using the channel + or - keys. Tune to several channels by entering the channel number using the numeric keys.
Volume control	Press volume + or - on the remote control to increase the volume to its upper limit, lowest level, and to a comfortable level. Press mute to turn the sound off. Press mute again to restore the sound.

If the DCX3501-M does not operate properly, refer to the Troubleshooting section.

<table>
<tr><td>**4**</td><td># Configuring the Audio, Video, and Closed Caption Settings</td></tr>
</table>

The following describes how to configure the audio (for HDMI connections), SD and HD video settings, and closed caption settings for the DCX3501-M.

Before you adjust the output settings:

- Connect the DCX3501-M to other home entertainment devices.

- Plug the DCX3501-M into an AC power outlet.

- Initialize the DCX3501-M and authorize services.

- Turn the TV on.

Note: When using an HDMI connection between the DCX3501-M and the television, be sure to have the cable connected and the TV powered on before adjusting the video settings. Motorola recommends using HDMI cables less than 20 meters (65') long.

User Settings Menu Main Screen

To configure the DCX3501-M settings on the main User Settings menu screen, first power off the DCX3501-M using either the remote control or the Power button and then press the MENU key on the remote control . If the TV is on, the on-screen User Settings menu lists the DCX3501-M settings that can be adjusted.

If no HDMI device is connected to the DCX3501-M, the default User Settings menu appears as follows:
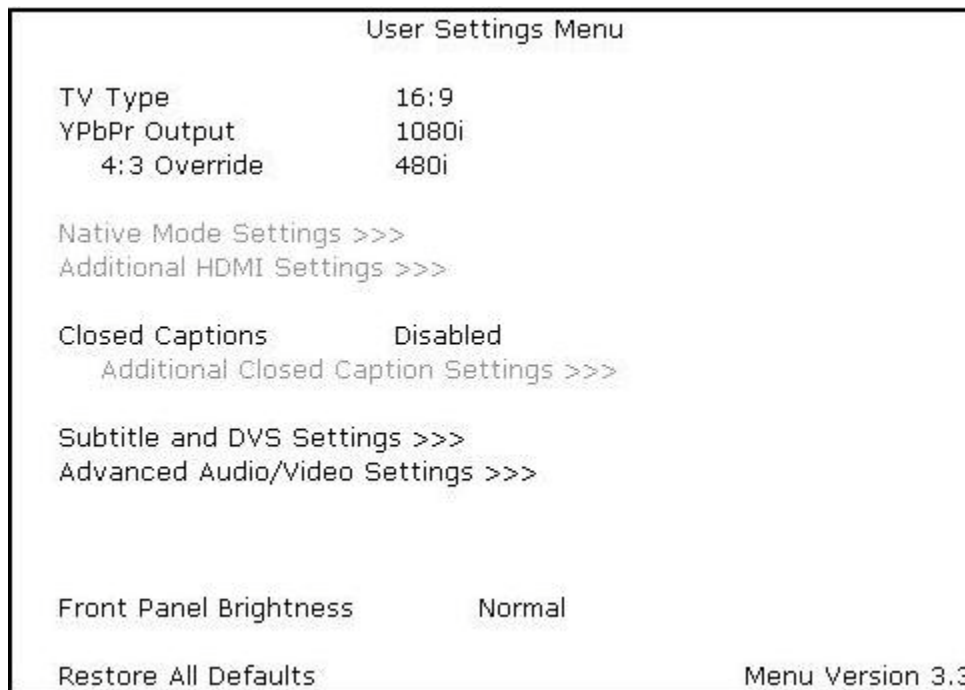
Figure 11 – Default User Settings Menu when no HDMI connection is in place

If the DCX3501-M is connected via HDMI to a display device such as a television, the default User Settings menu is updated to reflect this information. The YPbPr Output menu option is replaced with the HDMI/YPbPr Output menu option as shown below.
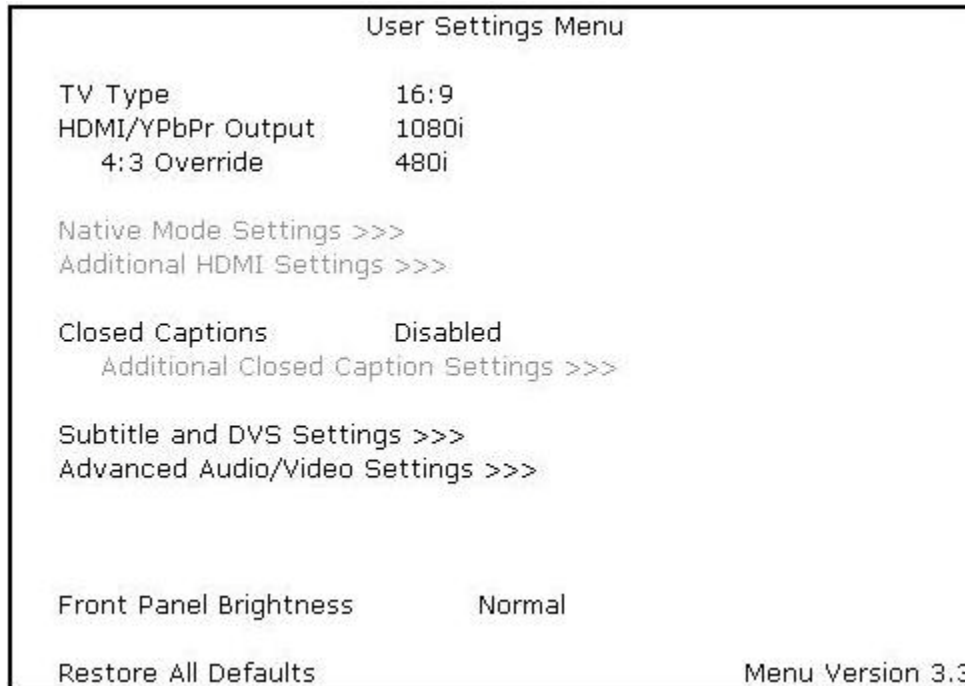
Figure 12 – Default User Settings Menu when an HDMI connection is in place

Use the remote control cursor keys to navigate the on-screen menus as follows:

● Press the ▲ and ▼ keys to highlight the setting you wish to change.

● Press the ► key to select an option.

● To exit the setting and move to another setting, press the ▲ or ▼ key.

The User Settings menu options available from the main screen are illustrated and defined below.
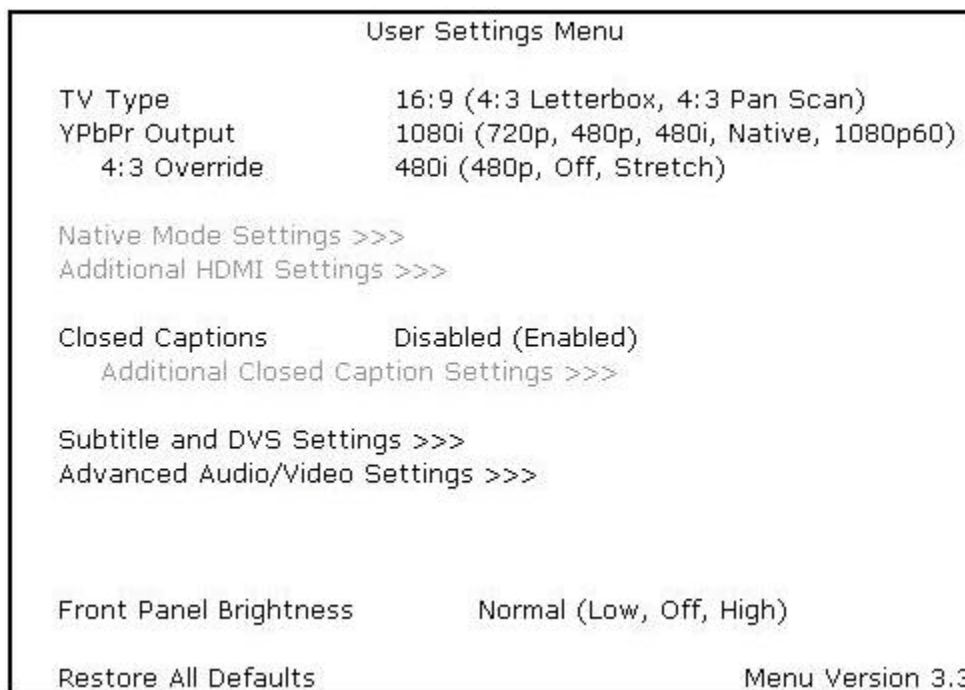
Figure 13 – User Settings Menu – Main Menu Screen

Setting	Description
TV Type	The **TV Type** setting allows you to specify the style of television connected to the DCX3501-M. Options include **16:9**, **4:3 Letterbox**, and **4:3 Pan Scan**. By default, the 16:9 option is selected. The options are used as follows: • **16:9** indicates that a widescreen television is connected to the DCX3501-M. • **4:3 Letterbox** indicates that a standard-screen television is connected to the DCX3501-M and that widescreen programs should be scaled to fit the screen with black bars above and below the picture. • **4:3 Pan Scan** indicates that a standard-screen television is connected to the DCX3501-M and that widescreen programs should be cropped so that the picture fills the entire screen.
HDMI/YPbPr Output	The **HDMI/YPbPr Output** setting allows you to select the video format of the HDMI and/or Component Video (YPbPr) outputs: • For ALL programs when the **4:3 Override** setting is set to either **Off** or **Stretch**. • For ONLY widescreen programs when the **4:3 Override** is set to either **480i** or **480p**. Available options for the **HDMI/YPbPr Output** setting include **1080i**, **720p**, **480p**, **480i**, and **Native**. By default, the 1080i option is selected. The options are used as follows: • **1080p60**—Presents programs in the High-Definition 1080p60 format (1920 x 1080 pixels with progressive scanning at 60 frames per second). • **1080i**—Presents programs in the High-Definition 1080i format (1920 x 1080 pixels with interlaced scanning at 30 frames per second). • **720p**—Presents programs in the High-Definition 720p format (1280 x 720 pixels with progressive scanning at 60 frames per second). • **480p**—Presents programs in the Enhanced-Definition 480p format (720 x 480 pixels with progressive scanning at 60 frames per second). • **480i**—Presents programs in the Standard-Definition 480i format (720 x 480 pixels with interlaced scanning at 30 frames per second). • **Native**—Presents programs in the format that most closely matches their native format according to the list of compatible formats selected from the Native Mode Settings menu screen. *Note 1: Not all televisions will support all of the available video formats. Please consult the television's user manual for more information on video format compatibility.* *Note 2: The DCX3501-M can detect when the HDMI connection is in use. If you are not using the HDMI connection on the DCX3501-M, the* **HDMI/YPbPr Output** *setting will display as* **YPbPr Output** *in the User Settings Menu.* *Note 3: Most new HDTVs have at least one HDMI input and can support the 1080p60 format. The DCX3501-M is designed to provide excellent video quality when converting any program to the 1080p60 video format. If your television supports 1080p60 video input, it is highly recommended to adjust the* **HDMI/YPbPr Output** *setting to the* **1080p60** *setting.*

Setting	Description
4:3 Override	The **4:3 Override** setting allows you to select the video output format of the DCX3501-M when it is tuned to a Standard-Definition program or playing back a Standard- Definition program from the DVR. Options include **480i**, **480p**, **Stretch**, and **Off**. By default, the 480i option is selected. The options are used as follows: • **480i**—Presents Standard-Definition programs in the Standard-Definition 480i format (720 x 480 pixels). • **480p**—Presents Standard-Definition programs in the Enhanced-Definition 480p format (720 x 480 pixels). • **Stretch**—Stretches all Standard-Definition programs to a widescreen (16:9) aspect ratio and present the video in the format designated by the **HDMI/YPbPr Output** setting. Note that the **Stretch** option is only available when the **TV Type** setting is **16:9**. • **Off**—Creates a widescreen version of a Standard-Definition program by adding black bars to the left and the right of the picture (pillarbox) and present the video in the format designated by the **HDMI/YPbPr Output** setting. *Note 1: Not all televisions will support all of the available video formats. Please consult your television's user manual for more information on format compatibility.* *Note 2: If the **HDMI/YPbPr Output** setting is set to either **480i** or **Native**, the **4:3 Override** feature is disabled and no longer selectable in the menu. The **4:3 Override** feature is available when the **HDMI/YPbPr Output** setting is **1080i**, **720p**, or **480p**.*
Native Mode Settings	The **Native Mode Settings** option allows you to customize the Native Mode feature of the DCX3501-M by selecting the video formats supported by your television. Selecting the **Native Mode Settings** option will present a new menu screen with settings specific to Native Mode operation. These settings are discussed in more detail below. The **Native Mode Settings** option is only available when the **HDMI/YPbPr Output** setting is set to **Native**. Otherwise, the **Native Mode Settings** option is disabled and no longer selectable in the menu.
Additional HDMI Settings	The **Additional HDMI Settings** option is available whenever an HDMI device is connected to the DCX3501-M. Selecting the **Additional HDMI Settings** option will present a new menu screen with settings specific to the HDMI connection. These settings are discussed in more detail below. If no HDMI device is connected to the DCX3501-M, the **Additional HDMI Settings** option is disabled and no longer selectable in the menu.
Closed Captions	The **Closed Captions** setting turns closed captions off or on. When this option is set to **Disabled**, the DCX3501-M does not render (draw) closed captions on any video output. When this option is set to **Enabled**, the DCX3501-M will render (draw) closed captions on all video outputs if closed captions are included within the program. By default, the **Disabled** option is selected.

Setting	Description
Additional Closed Caption Settings	The **Additional Closed Caption Settings** option allows you to customize the style and appearance of closed captions. Selecting this option will present a new menu screen with settings specific to closed captions, including font style, color, and size. These settings are discussed in more detail below. The **Additional Closed Caption Settings** option is only available when the **Closed Captions** setting is set to **Enabled**. Otherwise, the **Additional Closed Caption Settings** option is disabled and no longer selectable in the menu.
Subtitle and DVS Settings	The **Subtitle and DVS Settings** option allows you to customize the operation of the subtitle and descriptive video service features. Selecting the **Subtitle and DVS Settings** option will present a new menu screen with settings specific to subtitle and descriptive video service operation. These settings are discussed in more detail below.
Advanced Audio/Video Settings	The **Advanced Audio/Video Settings** option allows you to customize several advanced audio and video features of the DCX3501-M. Selecting this option will present a new menu screen with settings specific to closed captions, including font style, color, and size. These settings are discussed in more detail below
Front Panel Brightness	The **Front Panel Brightness** settings allows you to adjust the brightness level of the front panel display (clock/channel number and indicator icons) of the DCX3501-M. The options are used as follows: • **High**—Displays at its brightest level. This setting is most useful when using the DCX3501-M in very brightly lit rooms • **Normal**—Displays at its default brightness level. • **Low**—Displays at its lowest (visible) brightness level. This setting is most useful when using the DCX3501-M in dim or dark rooms. • **Off**—Display is turned off completely, including the clock/channel number and all indicator icons. However, the blue backlighting of the front panel Power button will remain illuminated even if the **Off** option has been selected.
Restore All Defaults	To reset ALL of the DCX3501-M User Settings to their default values, including options stored on other menu screens, move the cursor to this option and press the ► key.

Native Mode Settings Screen

The Native Mode Settings menu is used to configure the operation of the native mode feature on the DCX3501-M. The DCX3501-M is capable of receiving and decoding a number of different digital video formats. When operating in native mode, the DCX3501-M will generate a video output format that most closely matches the broadcast video format .

For example, if the DCX3501-M is configured to operate in native mode, a channel broadcast in the 720p format will be output to the television in the 720p format, while a channel broadcast in the 1080i format will be output to the television in the 1080i format.

When using the native mode feature of the DCX3501-M, please exercise caution when selecting the formats from the checklist. If a format is selected that is not compatible with the television, there may be a loss of video whenever the DCX3501-M is tuned to a channel which is broadcast in that format.

If the television is connected to the DCX3501-M using an HDMI cable, the DCX3501-M will automatically customize the checklist of supported formats as reported to it by the television. If the television is connected to the DCX3501-M using Component Video (YPbPr) cables, the checklist will need to be customized manually. *Note that at least one of the [1080p - 1080i – 720p – 480p – 480i] formats must be selected from the checklist for the DCX3501-M to operate properly in native mode.*

The Native Mode Settings menu screen is illustrated and defined below.

```
                     Native Mode Settings

   NOTE:    Selecting formats in the list below that
            are not supported by your HDTV may
            result in a loss of video.

   My TV Supports the Following Formats:
      [   ] 1080p60
      [   ] 1080p30
      [   ] 1080p24
      [ X ] 1080i
      [   ] 720p
      [   ] 480p
      [ X ] 480i




   Return to Main Menu >>>

   Restore Default Native Settings
```
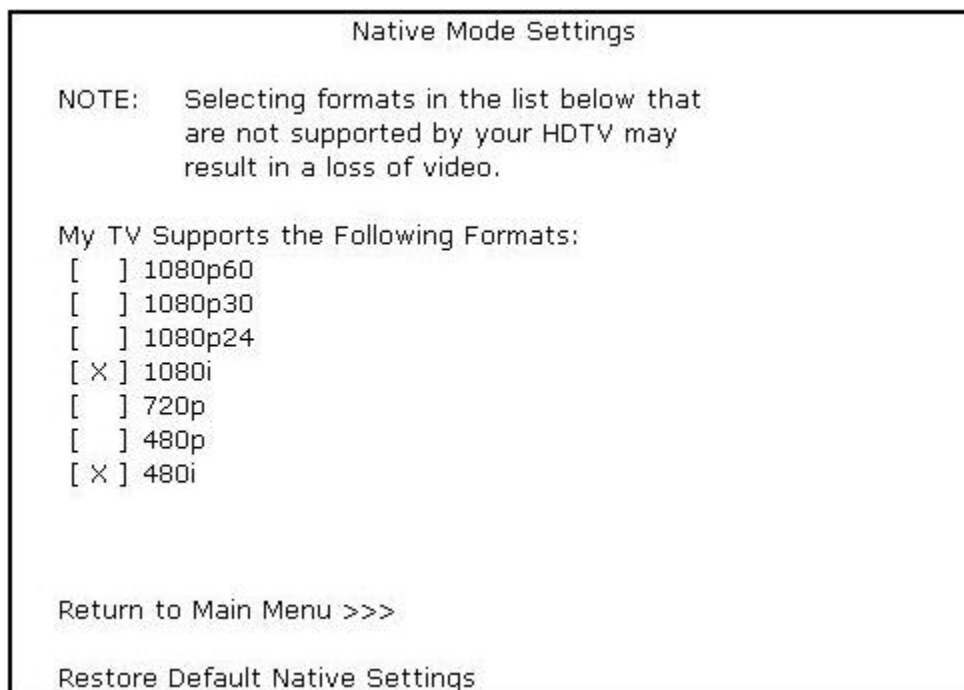
Figure 14 – Native Mode Settings menu screen

Setting	Description
1080p60 **(High Definition)**	Generates 1080p60 video on the HDMI output if the program is broadcast in 1080p60 format. The DCX3501-M can also convert any other broadcast format to the 1080p60 video format. 1080p60 is a high-definition video image with 1920 x 1080 pixels, progressive scanning, and a frame rate of 60 frames per second. This option is only available if the DCX3501-M is connected to an HDMI display device. If no HDMI connection is detected, this option is disabled and no longer selectable in the menu. *Note: The Component Video (YPbPr) output delivers 480i video whenever the HDMI output is delivering 1080p60 video.*
1080p30 **(High Definition)**	Generates 1080p30 video on the HDMI output if the program is broadcast in 1080p30 format. The DCX3501-M cannot convert any other broadcast format to the 1080p30 video format. 1080p30 is a high-definition video image with 1920 x 1080 pixels, progressive scanning, and a frame rate of 30 frames per second. This option is only available if the DCX3501-M is connected to an HDMI display device. If no HDMI connection is detected, this option is disabled and no longer selectable in the menu. *Note: The Component Video (YPbPr) output delivers 480i video whenever the HDMI output is delivering 1080p30 video.*
1080p24 **(High Definition)**	Generates 1080p24 video on the HDMI output if the program is broadcast in 1080p24 format. The DCX3501-M cannot convert any other broadcast format to the 1080p24 video format. 1080p24 is a high-definition video image with 1920 x 1080 pixels, progressive scanning, and a frame rate of 24 frames per second. This option is only available if the DCX3501-M is connected to an HDMI display device. If no HDMI connection is detected, this option is disabled and no longer selectable in the menu. *Note: The Component Video (YPbPr) output delivers 480i video whenever the HDMI output is delivering 1080p24 video.*
1080i **(High Definition)**	Generates 1080i video on both the HDMI and Component Video (YPbPr) outputs if the program is broadcast in 1080i format. The DCX3501-M can also convert any other broadcast format to the 1080i video format. 1080i is a high-definition video image with 1920 x 1080 pixels, interlaced scanning, and a frame rate of 30 frames per second.
720p **(High Definition)**	Generates 720p video on both the HDMI and Component Video (YPbPr) outputs if the program is broadcast in 720p format. The DCX3501-M can also convert any other broadcast format to the 720p video format. 720p is a high-definition video image with 1280 x 720 pixels, progressive scanning, and a frame rate of 60 frames per second.
480p **(Enhanced Definition)**	Generates 480p video on both the HDMI and Component Video (YPbPr) outputs if the program is broadcast in 480p format. The DCX3501-M can also convert any other broadcast format to the 480p video format.

Setting	Description
	480p is an enhanced-definition video image with 720 x 480 pixels, progressive scanning, and a frame rate of 60 frames per second.
480i (Standard Definition)	Generates 480i video on both the HDMI and Component Video (YPbPr) outputs if the program is broadcast in 480i format. The DCX3501-M can also convert any other broadcast format to the 480i video format.
	480i is a standard-definition video image with 720 x 480 pixels, interlaced scanning, and a frame rate of 30 frames per second.
Restore Default Native Settings	Selecting this option will restore the checklist of video formats to its default configuration. Use this option if audio and/or video has been lost after adjusting these settings from their default values.
	If you are the HDMI connection to your television, the checklist will be automatically customized according to the supported formats reported by the television.
	If you are using the Component Video (YPbPr) connection to your television, the checklist will have only the **1080i** and **480i** formats selected.
Return to Main Menu	Selecting this option will return you to the User Settings Menu main screen.

Additional HDMI Settings Screen

The Additional HDMI Settings menu is used to configure advanced options that affect the operation of the DCX3501-M with other HDMI and DVI display devices. Adjustable options include display mode, color space, audio output mode, and audio lip sync delay.

The Additional HDMI Settings menu screen is illustrated and defined below.


```
                    Additional HDMI Settings

      NOTE:     Changing these values may result in
                loss of audio and/or video.

      HDMI/DVI Mode          HDMI (DVI)
      Color Space            YCC 4:4:4 (RGB)
      Audio Output           Auto (L-PCM, Pass Through)
      Lip Sync               Auto (Off, Manual)
         Lip Sync Delay      0 (50, 100, 150, ..., 500) msec




      Return to Main Menu >>>

      Restore Default HDMI Settings
```
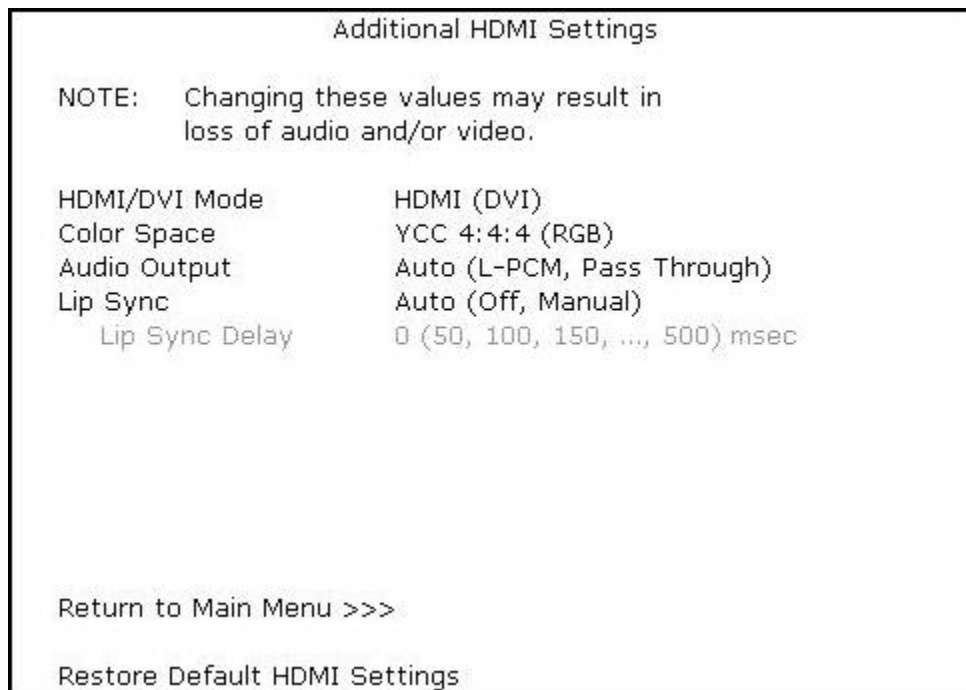
Figure 15 – Additional HDMI Settings screen

Setting	Description
HDMI/DVI Mode	The **HDMI/DVI Mode** setting allows you to optimize the HDMI output to work with both DVI-equipped televisions and HDMI-equipped televisions. By default, this option is set to HDMI. The options are used as follows: • **HDMI**—Optimized to work with an HDMI television or home theater receiver. • **DVI**—Optimized to work with a DVI television or display device (connected via an HDMI-to-DVI adapter).
Color Space	The **Color Space** setting allows you to adjust the color space used by the DCX3501-M to generate the video signals on the HDMI output. By default, this option is set to **YCC 4:4:4**. The options are used as follows: • **YCC 4:4:4**—Generates video signals within the YCC color space. • **RGB**—Generates video signals within the RGB color space. *Note: Adjusting these settings could result in a loss of video. Only a professional installer or someone with a good working knowledge of the color spaces supported by the TV should change this setting.*
Audio Output	The **Audio Output** setting allows you to specify the digital audio format delivered over the HDMI output by the DCX3501-M. Options include **Auto**, **L-PCM**, and **Pass Through**. By default, the Auto option is selected. The options are used as follows: • **Auto**—Provides the digital audio format specified by the connected device (TV or home theater receiver) when that device was first connected to the DCX3501-M. • **L-PCM**—Provides all audio in the Linear Pulse Code Modulation digital audio format. The L-PCM format is widely supported by most HDMI televisions and home theater receivers. • **Pass Through**—Provides the same digital audio format on the HDMI output as is provided with the program being viewed at that time. For example, if the program has a Dolby Digital soundtrack, the DCX3501-M will pass the Dolby Digital audio to the HDMI output. This option is most useful when connecting the DCX3501-M to a home theater receiver that has HDMI switching capability. *Note: Adjusting these settings could result in a loss of audio. Only a professional installer or someone with a good working knowledge of the digital audio formats supported by the TV and/or home theater receiver should change this setting*
Lip Sync	The **Lip Sync** setting allows you to adjust the amount of time the audio signal is delayed with respect to the video signal on the HDMI output. Some HDMI televisions and home theater receivers add an extra delay to the video signal during processing which can produce an effect where the audio noticeably "leads" the video. By default, this option is set to **Auto**. The options are used as follows: • **Auto**—Automatically delays the audio signal on the HDMI output by the amount of time requested by the connected HDMI device. • **Manual**—Delays the audio signal on the HDMI output by the amount of time selected for the **Lip Sync Delay** setting. • **Off**—Does not delay the audio signal on the HDMI output.

Setting	Description
Lip Sync Delay	The **Lip Sync Delay** setting is only available when the **Lip Sync** option has been set to **Manual**. The **Lip Sync Delay** setting can be adjust between **0** milliseconds (msec) and **500** milliseconds in **50** millisecond increments. If the **Lip Sync** option has been set to either **Auto** or **Off**, this option is disabled and no longer selectable in the menu. Use this option to adjust the HDMI audio delay if you notice that the video image routinely seems to be "behind" the audio soundtrack when using your HDMI device.
Return To Main Menu	Selecting this option will return you to the User Settings Menu main screen.
Restore Default HDMI Settings	Selecting this option will restore all of the settings on this screen (**HDMI/DVI Mode**, **Color Space**, **Audio Output,** and **Lip Sync**) to their default value. Use this option if audio and/or video has been lost after adjusting these settings from their default values.

Additional Closed Caption Settings Screen

The Additional Closed Caption Settings menu is used to adjust the various display options for closed caption legibility. Customizable options include font size, font style, font color, and font opacity. You may also select to view different closed caption services if these are included within the broadcast program.

The Additional Closed Caption Settings menu screen is illustrated and defined below.

```
              Additional Closed Caption Settings

    Service Selection
        Analog                CC1
        Digital               Primary Language

    Font Size                 Auto
    Font Style                Auto
    Font Color                Auto
    Font Opacity              Auto
    Font Edge Type            Auto
    Font Edge Color           Auto
    Background Color          Auto
    Background Opacity        Auto
    Settings                  Auto


    Return to Main Menu >>>

    Restore Default CC Settings
```
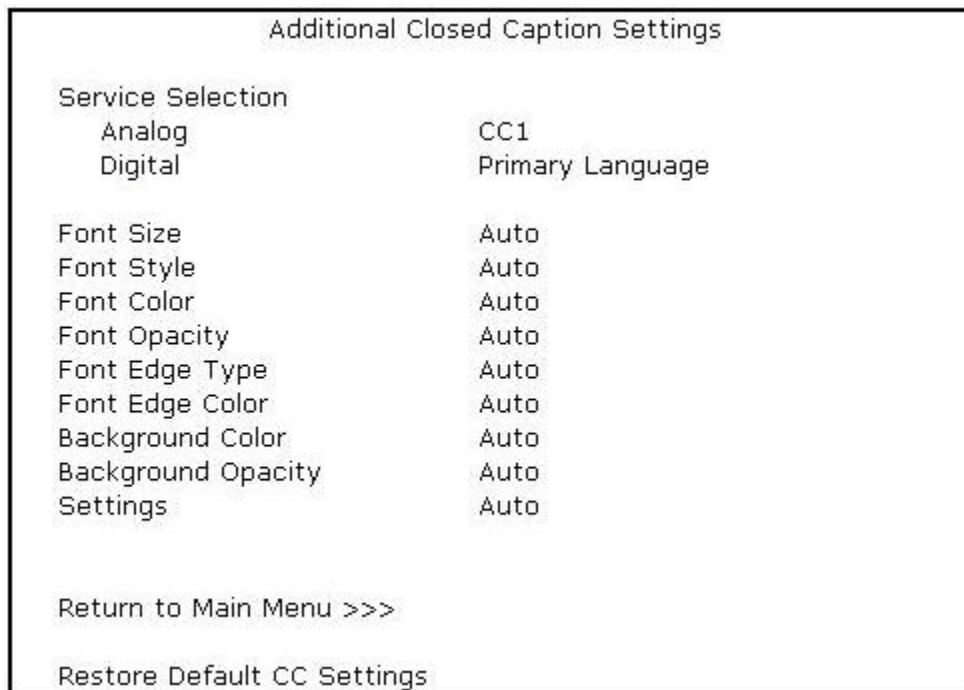
Figure 16 – Additional Closed Caption Settings menu screen

Setting	Description
Service Selection	Sets the service used by the DCX3501-M to render (draw) the closed captions: • **Analog**—This setting affects closed captions for analog and digital standard definition services. Available options are: **CC1**, **CC2**, **CC3**, **CC4**, **T1**, **T2**, **T3**, or **T4**. The default setting is **CC1**. • **Digital**—This setting affects closed captions for digital enhanced definition and high definition services. Available options are: **Primary Language**, **Secondary Language**, **3**, **4**, **5**, or **6**. The default setting is **Primary Language**.
Font Size	Sets the font size used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, Standard, Large,** or **Small**.
Font Style	Sets the font style used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, Mono Serif, Proportion Serif, Mono No Serif, Proportion No Serif, Casual, Cursive,** or **Small Capitals**.
Font Color	Sets the font color used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, White, Black, Red, Green, Blue, Yellow, Magenta,** or **Cyan**.
Font Opacity	Sets the opacity used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, Transparent, Translucent, Solid,** or **Flashing**.
Font Edge Type	Sets the edge appearance used for rendering (drawing) closed captions. Available options include: **Auto, None, Raised, Depressed, Uniform, Left Shadowed,** or **Right Shadowed**. The default setting is **Auto**.
Font Edge Color	Sets the edge color used for rendering (drawing) closed captions. Available options include: **Auto, White, Black, Red, Green, Blue, Yellow, Magenta,** or **Cyan**. The default setting is **Auto**.
Background Color	Sets the background color used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, White, Black, Red, Green, Blue, Yellow, Magenta,** or **Cyan**.
Background Opacity	Sets the background opacity used for rendering (drawing) closed captions. The default setting is **Auto**. Available options include: **Auto, Transparent, Translucent, Solid,** or **Flashing**.
Settings	Sets the default settings for closed captions (**Auto**) or restores the settings you had previously configured (**User**) allowing you to easily change the closed caption settings between their default settings and your customized settings. The default setting is **Auto**. Available options include: **Auto** or **User**.
Return To Main Menu	Selecting this option will return you to the User Settings Menu main screen.
Restore Default CC Settings	To reset all of the Additional Closed Caption settings to their default values, navigate to this option and press the ▶ key.

Subtitle and DVS Settings Screen

The Subtitle and DVS Settings menu is used to customize the language and appearance of subtitles and to turn the descriptive video service feature on and off on the DCX3501-M. Subtitles allow a viewer to watch television programs and movies which contain dialogue that is not in the viewer's native language. Subtitles are not included within many television programs (unlike closed captions).

A descriptive video service (DVS) is a special secondary audio track which is included within many television programs and is intended to assist the visually impaired. The DVS audio track provides a verbal description of each scene along with the program's normal dialogue.

The Subtitle and DVS Settings menu screen is illustrated and defined below.

```
                    Subtitle and DVS Settings

    NOTE:      Descriptive video service is
               a secondary audio track that
               provides a description of the
               scene for the visually impaired.


    Subtitles                  Off (On)
        Language               English (Spanish, French, Portuguese)

    Descriptive Video Service  Off (On)




    Return to Main Menu >>>

    Restore Default Subt/DVS Settings
```
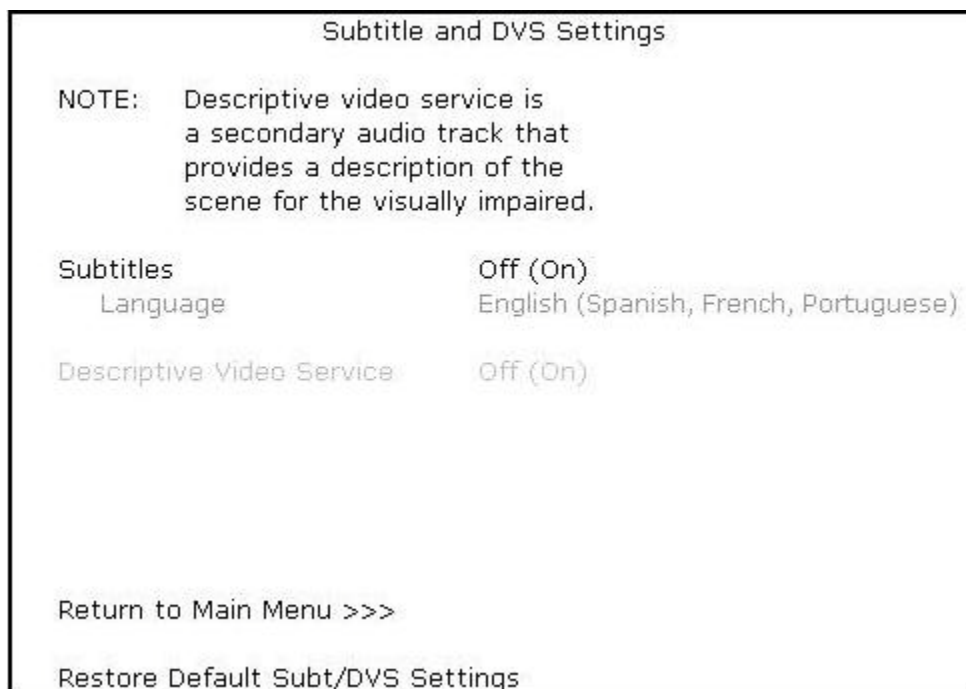
Figure 17 – Subtitle and DVS Settings Menu Screen

Setting	Description
Subtitles	The **Subtitles** default setting is **Off**. The options are used as follows: • **Off**—Subtitles are not rendered (drawn) by the DCX3501-M. • **On**—Subtitles are rendered (drawn) by the DCX3501-M if they are included within the program and in the language specified by the **Language** setting. When the **Subtitles** option is set to **On**, the **Language** selection option becomes selectable from the menu.
Language	The **Language** setting is only available when the **Subtitles** option is set to **On**. Otherwise, this setting is disabled and no longer selectable in the menu. The default language selection is **English**. The options are used as follows: • **English**—Renders (draws) subtitles in the English language if they are included within the program. • **Spanish**—Renders (draws) subtitles in the Spanish language if they are included within the program. • **French**—Renders (draws) subtitles in the French language if they are included within the program. • **Portuguese**—Renders (draws) subtitles in the Portuguese language if they are included within the program. *Note: The DCX3501-M is not capable of translating subtitles from one language into another language. For example, if French subtitles are included with the program, the DCX3501-M cannot translate them to into Portuguese if the Language option has been set to Portuguese. The DCX3501-M can only display subtitles in the language(s) that have been included within the program.*
Descriptive Video Service	The **Descriptive Video Service** default setting is **Off**. The options are used as follows: • **Off**—The DVS audio track is not played by the DCX3501-M. • **On**—The DVS audio track is played by the DCX3501-M if it is included within the program. *Note: If the DVS setting is disabled and not selectable from the menu, the software installed on the DCX3501-M is not capable of supporting the DVS feature.*
Return To Main Menu	Selecting this option will return you to the User Settings Menu main screen.
Restore Default Subt/DVS Settings	To reset all of the Subtitle and DVS settings to their default values, navigate to this option and press the ▶ key.

Advanced Audio/Video Settings Screen

The Advanced Audio/Video Settings menu is used to customize several advanced audio and video features of the DCX3501-M, most notably the Dolby Volume feature and the Video Sharpness feature.

The Dolby Volume feature provides volume normalization across channels, programs, and commercials. Normalization is a process where the different volume levels across channels, programs, and commercials are adjusted to the same approximate output volume. As a result, sudden volume changes are reduced and the overall volume output of the DCX3501-M is more consistent.

The Video Sharpness feature is used to soften or sharpen Standard Definition (SD) programs when viewed on either the HDMI or Component Video (YPbPr) outputs. When SD programs are viewed on a large screen television, picture quality can suffer because noise and other imperfections in the picture can be magnified on the large display. The Video Sharpness feature can be used to soften the picture and reduce the appearance of these imperfections.

The Advanced Audio/Video Settings menu screen is illustrated and defined below.

```
               Advanced Audio/Video Settings

Dolby Volume                    Off (On)



Video Sharpness           1     2    [ 3 ]    4     5










Return to Main Menu >>>

Restore Default A/V Settings
```
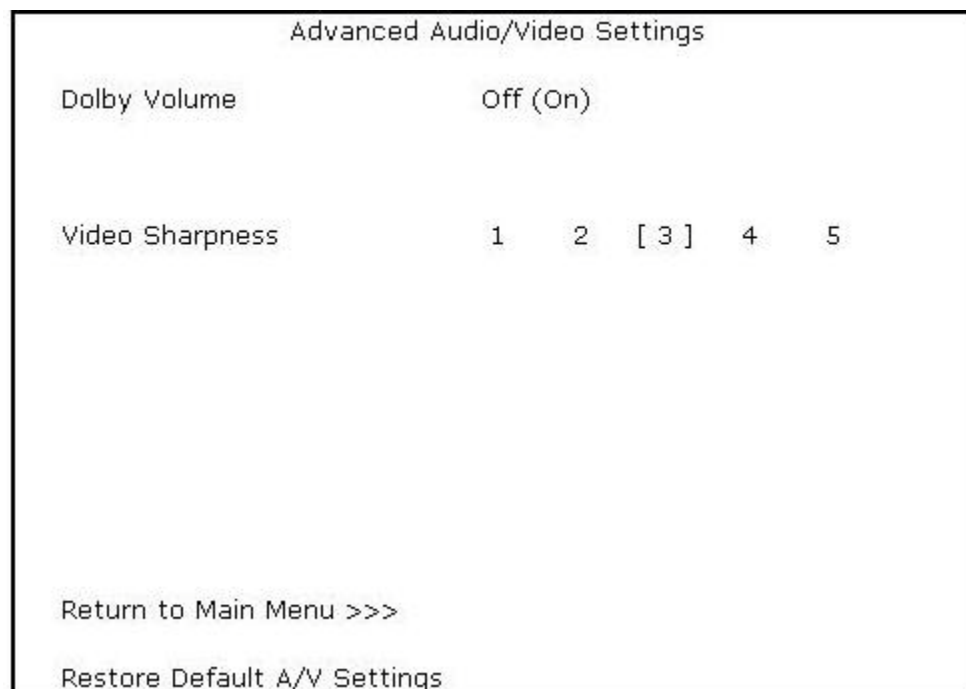
Figure 18 – Advanced Audio/Video Settings Menu Screen

Setting	Description
Dolby Volume	The **Dolby Volume** default setting is **Off**. The options are used as follows: • **Off**—The output volume may fluctuate during commercials or when changing channels. • **On**—The DCX3501-M maintains a more consistent output volume regardless of the channel or program being viewed.
Video Sharpness	The **Video Sharpness** setting allows you to adjust the picture sharpness when viewing a standard definition (SD) program on the DCX3501-M. The **Video Sharpness** setting affects the HDMI and Component Video (YPbPr) outputs. By default, the sharpness level of **3** is selected. The DCX3501-M supports five distinct levels of analog video picture sharpness. A value of **1** corresponds to a "softer" picture while a value of **5** corresponds to a "sharper" picture. The best sharpness setting depends upon the video connection being used, the display quality of the TV, and your own personal preference.
Return To Main Menu	Selecting this option will return you to the User Settings Menu main screen.
Restore Default A/V Settings	To reset all of the Advanced Audio/Video settings to their default values, navigate to this option and press the ▶ key.

Graphics Overlaying the Video

The DCX3501-M can generate graphics that overlay the video programming or fill the entire television screen. Common examples include on-screen menus (such as the User Setting menu), closed captions, and IPG. The DCX3501-M overlays these graphics whenever you open a menu, enable closed captions, or scroll through a program grid.

On-screen graphics are available for all DCX3501-M video outputs except IEEE-1394.

5   Diagnostics

Diagnostics are displayed on the on-screen display (OSD) and front-panel display. They confirm proper installation, including:

- Checking error states and signal integrity
- Identifying the cable terminal on the network
- Verifying communications with the headend

For the diagnostics described in this section:

- All indicators are in decimal notation, unless otherwise noted.
- All signal-level and quality indicators use a 1% to 100% scale, unless otherwise noted.
- All sample displays are illustrative; actual data may differ from the examples.

Using the Diagnostics

To use the diagnostics:

1. Ensure that the DCX3501-M is installed with the Thin Client software and that it is connected to an AC outlet.
2. Ensure the set-top is powered on.
3. Press power to put the set-top in stand-by mode. Within two (2) seconds, press select to enable the diagnostic mode.
4. The Diagnostics main menu is displayed on the OSD, and d01 is displayed on the front panel:

You can use the following keys to navigate the diagnostics menus:

- Press channel ▲, channel ▼, cursor ▲, or cursor ▼ to select d01 through E.
- Press cursor ◄, cursor ►, select or enter to execute the selected diagnostic.
- Select E from the main menu or press power to exit.

General Status

This diagnostic displays system status information on the OSD and front panel. The information is updated each time the diagnostic is displayed.


```
                    DIAGNOSTICS
> d01    GENERAL STATUS
  d02    PURCHASE/POLL STATUS
  d03    OOB STATUS
  d04    INBAND STATUS
  d05    UNIT ADDRESS/SECURITY
  d06    CURRENT CHANNEL STATUS
  d07    UPSTREAM STATUS
  d08    CODE MODULES
  d09    MEMORY CONFIG
  d10    AUDIO/VIDEO STATUS
  d11    INTERFACE/PORT STATUS
  d12    USER SETTING STATUS
  d13    DVR/HDD STATUS
  d14    DOCSIS STATUS
  d15    APPLICATION SPECIFIC INFORMATION
  d16    INTERACTIVE STATUS
  d17    CONNECTED HOME
  d18    KEYPAD/LED
  E      EXIT
```

```
                    GENERAL STATUS

ERROR:              EP00   CONNECTED    DES

PLATFORM ID:        0x0812
MAPPED PLATFORMID:  0x0812
FAMILY ID:          0x001D
MODEL ID:           0xEC04
REMOD CHANNEL:      03
SETTOP LOCAL TIME:  Nov 04 2010 14:20:15
DST ACTIVE:         NO
TIME ZONE:          GMT-05:00
DST ENTRY TIME:     Apr 03 2011 07:00:00 GMT
DST EXIT TIME:      Oct 30 2011 06:00:00 GMT
CURRENT GPS TIME:   Nov 04 2010 19:20:15
COUNTRY CODE:       USA, 1, UNITED STATES
TOTAL RUN TIME:     4H 50M
STANDBY TIME %:     1%
LOW POWER TIME %:   0%
```

Figure 19 – Example General Status display (no error)

```
EP00
```

Environment code   Error code

The General Status fields are.

Field	Description
Error	Error codes display on the LED and OSD when an error occurs. If multiple errors occur, the last recorded error is displayed:

	Error Code	Description
	EP00	No error
	EP01	Not connected
	EP03	DRAM error
	EP04	SRAM error
	EP07	ROM verification failure
	EP08	RAM test failure
	EP09	Battery test failure
	EP11	Invalid unit address
	EP12	Power on self test failure
	EP14	GITV startup failure
	EP15	TSI structure corrupt
	EP18	Driver initialization failure

Field	Description
Connected State	A DCX-operations connect or disconnect message determines whether the DCX3501-M is CONNECTED or DISCONNECTED.
Platform ID	A unique 16-bit hexadecimal number that identifies the platform image (also called the ROM ID).
Family ID	The manufacturer and product family, in hexadecimal.
Model ID	The model, in hexadecimal.
Remod Chan	The interface to the subscriber TV; channel 3 or 4 in the USA.
Set-top Local Time	The current time setting on set-top.
DST Active	Daylight Saving Time. Yes indicates the DST is active. No indicates the DST is disabled.

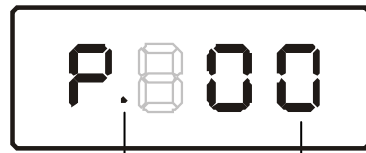| Field	Description
Time Zone	Time Zone is selected on the set-top.
DST Entry Time	The Date and Time the set-top will begin Daylight Savings Time.
DST Exit Time	The Date and Time the set-top will end Daylight Savings Time.
Current GPS Time	The current OOB time displayed in global positioning system (GPS) seconds from Jan 6, 1980. It is displayed in Greenwich Mean Time (GMT).
Country Code	Country code, if configured by the controller
Total Run Time	Total Run time in hours and minutes since last reset or power cycle
Standby Time %	Percent of time the set-top is in standby mode
Low Power Time %	Percent of time the set-top is in Low Power mode, if power saving mode is enabled.

Purchase Status

This diagnostic displays the status of subscriber event purchases on the OSD and front panel. The OSD and front panel displays are updated each time this diagnostic is viewed:

Figure 20 – Front panel display for Purchase Status diagnostic

Purchase Indicator

On when IPPV is enabled | Number of unsent purchases

The Purchase Status fields are:

Field	Description
Unsent	The number of purchases in the DCX3501-M remaining to be polled. It can be an integer from 0 to 63.
Unack	The number of reports that have not been acknowledged by the controller. It is an integer.
Last Seq Num	The last acknowledged sequence number of a purchase sent by the controller. It is a 16-bit, unsigned hexadecimal number.
Last RB Time	The last time the DCX3501-M attempted to report back purchases to the controller, in GPS seconds.
IPPV Status	If IPPV is enabled, the IPPV status indicator is on. If IPPV is disabled, the IPPV status indicator is off.
Prep CMD	"Last Prepare for Poll Command" sequence number and time of the last prepare for poll request command that was sent by the controller. Note that each requesting process maintains an independent sequence of poll requests to uniquely identify the poll responses.
Prep ACK	"Last Prepare for Poll Acknowledge" sequence number and time of the last Report Purchase request sent by the controller.
Poll Request	Sequence number and time of the last send poll buffer command that was sent by the controller.
Poll Acknowledge	Sequence number and time of the last Poll Acknowledge message sent by the controller.
Stack Unit	Unit used in purchase processing.
Show Count	Count used in purchase processing.
Credit Total	Credit used for purchase processing.
Debit Total	Debit used for purchase processing.

Out-Of-Band (OOB) Status

This diagnostic indicates the out-of-band control channel status. The information is updated every five seconds.

```
                    OOB STATUS

    OOB FREQUENCY:      075.25 MHz
    CARRIER LOCK:       YES
    DATA:               YES
    EMM DATA:           NO

    SNR:                21.1 dB     GOOD
    AGC:                23 %        GOOD

    EMM PROVIDER ID:    0x0001
    EMM PID:            0x1503
    NETWORK PID:        0x0777

    HUNT MODE:          Hunted
    LKC:                075.25 MHz
```

Figure 21 – Front panel display for the OOB diagnostic
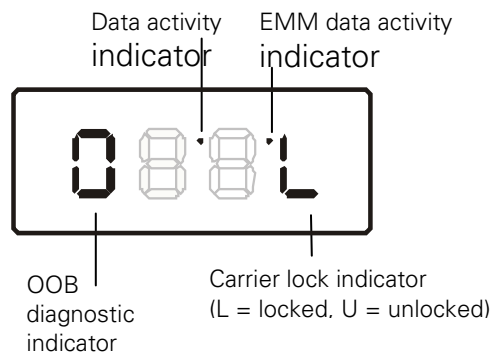
The Out-of-Band Status fields are:

Field	Description
OOB Frequency	Indicates the OOB tuner center frequency, from 70 to 130 MHz.
Carrier Lock	Indicates whether the OOB receiver is locked to the carrier:

	OSD	Front panel	Description
	YES	L	Carrier locked
	NO	U	Carrier unlocked

Field	Description
Data	Indicates whether data is being carried by the OOB and EMM traffic, which is tracked separately:

	OSD	Front panel	Description
	YES	On	OOB data detected within the last 5 seconds
	NO	Off	OOB data not detected within the last 5 seconds

Field	Description
EMM Data	Indicates whether EMM data is being carried on the OOB stream:

	OSD	Front panel	Description
	YES	On	EMM data detected within the last 5 seconds
	NO	Off	EMM data not detected within the last 5 seconds

Field	Description
SNR	When carrier lock has been established, displays an estimate of the carrier signal-to-noise ratio in dB, with an explanation: GOOD — Good value FAIR — Marginal signal level, check the signal POOR — Unusable signal INVALID — Invalid AGC value
AGC	When carrier lock has been established, displays an estimate of the AGC as a percentage, with an explanation: GOOD — Good value FAIR — Marginal signal level, check the signal POOR — Unusable signal INVALID — Invalid AGC value
EMM Provider ID	Displays the conditional access stream for the DCX3501-M, in hexadecimal.
EMM PID	Displays the packet identifier (PID) stream the DCX3501-M tunes to for EMM data, in hexadecimal.

Field	Description
Network PID	Displays the network PID to which the DCX3501-M is tuned to receive network messages, in hexadecimal.
Hunt Mode	The hunt mode includes Hunted, None, Round Robin (RR), Search (SRCH), Fixed Frequency (FIX), or EMM Provider ID (EMM).
LKC	The last known carrier is the last valid OOB frequency displayed in MHz and ranges from 70 to 130 MHz, with the specific values of: 75.25, 104.20, 72.75, 92.25, 98.25, 107.25, 107.40, 110.25, 116.25, and 103.75.
	LKC will remain blank during hunting if a valid carrier has not been found, and will be populated once a valid OOB is found.

Agile OOB Tuner Hunting

An OOB frequency can be selected manually by pressing the Menu button while in the OOB Status diagnostics screen. To exit this mode, press the Menu button a second time, or press the Power button.

If the set-top is in the process of hunting for an OOB frequency, control of frequency selection is suspended, i.e. it is not possible to press the Menu button on the OOB status screen and display MAN FREQ when the set-top is hunting.

Summary of Manual Selection of the OOB Frequency

The manual override frequency capability is only displayed if the box is not currently hunting and the operator presses the MENU key while OOB OSD diagnostics are displayed. The MAN Freq displays the LKC and allows the operator to select (via scroll up/down) a specific frequency to check if a valid OOB is on that specific frequency. The MAN Freq parameter is the OOB frequency selected in the frequency selection mode and displayed in MHz, with the specific values of 75.25, 104.20, 72.75, 92.25, 98.25, 107.25, 107.40, 110.25, 116.25, and 103.75.

1. When in the OOB Receiver Status Diagnostic, press the MENU button to enter the frequency selection mode. The Front Panel displays the frequency of the last known carrier. The OSD displays a new "MAN FREQ" line at the bottom of the screen, which indicates the last known carrier frequency. At this point, if desired, the frequency change mode can be exited by pressing the MENU key a second time.

2. Use the UP/DOWN channel or cursor keys to scroll through all 10 frequencies until the desired new OOB frequency is found. The new frequency selections will appear on the Front Panel and on the MAN FREQ line of the OSD. When the last known frequency is selected, a dot will appear in the middle-upper part of the Front Panel.

3. When the desired new frequency has been selected, press the SELECT key to start the search. The manual frequency search will last up to 40 seconds. As the DCX3501-M searches, the frequency being searched for will flash on the Front Panel. On the OSD, the MAN FREQ line of text will be cleared, the HUNT MODE will display FIX to indicate a search on a fixed frequency, and the OOB FREQ field will change to the frequency being searched for.

4. If the frequency is found with the proper EMM Provider ID, then the Front Panel will display the normal OOB receiver status. The OSD LKC field will change to display the new frequency.

5. If after 40 seconds the frequency search is not successful, the product will perform a warm reset.

6. To abort a search without waiting the 40 seconds, the POWER key can be pressed to cause an immediate warm reset.

Note: The Front Panel will display hunt after a cold reset from the front panel. This indicates that the product is in a Round Robin Hunt Mode. Hunt will continue to be displayed until the proper stream is detected.

In-Band Status

This diagnostic displays the in-band status for the last attempted tuned channel. The information is updated every five seconds.


```
                    IN-BAND STATUS

    IN-BAND TUNER 1
    MODE:                    256 QAM
    CARRIER LOCK:            YES
    PCR LOCK:               NO
    DATA:                   YES
    FREQUENCY:              0651.000 MHz
    SNR:                    33.2 dB     GOOD
    5 SECOND ERROR COUNTS:
    UNCORRECTABLE:  0000     CORRECTABLE:  0000

    IN-BAND TUNER 2
    MODE:                    256 QAM
    CARRIER LOCK:            YES
    PCR LOCK:               NO
    DATA:                   YES
    FREQUENCY:              0567.000 MHz
    SNR:                    38.0 dB     GOOD
    5 SECOND ERROR COUNTS:
    UNCORRECTABLE:  0000     CORRECTABLE:  0000
```

Figure 22 – Front panel display for in band diagnostic

Data activity indicator

IB diagnostic indicator

Carrier lock indicator (L = locked, U = unlocked)

The In-Band Status fields are:

Field	Description
Mode	The values displayed on the OSD are: 64 QAM — 64 QAM digital channel 256 QAM — 256 QAM digital channel
Carrier Lock	Indicates whether the in-band receiver is locked to the carrier. If a digital carrier is not present, it indicates the carrier is not locked:

OSD	Front panel	Description
YES	L	Carrier locked
NO	U	Carrier not locked

Field	Description
PCR Lock	Indicates whether the in-band receiver is locked to the current program clock reference for a digital video service on the specified tuner. If a digital carrier is not present, it indicates the PCR is not locked.
Data	Indicates whether data is being carried on the in-band stream. The indicators cover all packet processors regardless of the stream they are monitoring:

OSD	Front panel	Description
YES	On	In-band data detected within the last 5 seconds
NO	Off	In-band data not detected within the last 5 seconds

Field	Description
Frequency	The in-band frequency is center RF carrier frequency tuned for the digital service on the specified tuner. The frequency is displayed in MHz in xxxx.xxx format and ranges from 54 to 860 MHz.
SNR	When carrier lock has been established, SNR displays an estimate of the carrier signal-to-noise ratio in dB, with an explanation: GOOD — Good value FAIR — Marginal signal level, check the signal POOR — Unusable signal INVALID — Invalid SNR value
5 Second Error Counts	Indicates the number of correctable and uncorrectable digital multiplex errors, up to 9999. It is updated every five seconds and reset each time the DCX3501-M is power cycled or another digital multiplex is tuned. The maximum value displayed is 9999, even if there were more than 9999 errors.

Unit Address

This diagnostic displays the unit address of the CableCARD if inserted:

Figure 23 – Front panel display of a unit address
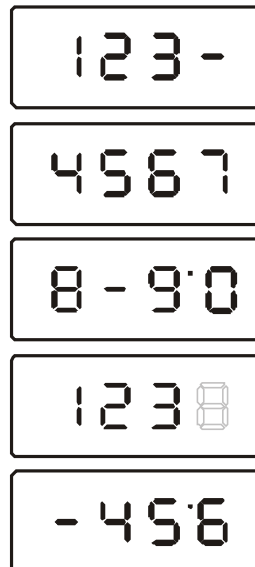
The Unit Address fields are:

Field	Description
TvPC Installed	Indicates whether the TvPC renewable security system is installed: NO — TvPC is not installed (Note: the DCX3501-M does not include a TvPC slot).
CableCARD Inserted	YES — CableCARD is inserted. NO — CableCARD is not inserted.
Unit Address	A unique decimal number that indicates the unit address or physical address.
OOB Addresses	
Network	The DCX3501-M network address displayed in decimal format.
Multicast 16 Address	Specifies the stream to which the OOB multicast 16 addresses are assigned. The stream type and multicast 16 addresses cycle on the OSD every five seconds. The valid stream types nnnn are: Net — Network EMM — EMM SCC — SCC_ECM Dnld — Download Data — Data Poll — Polling packet identifier (PID) The 16-bit multicast address is displayed in 4-byte hexadecimal format. The multicast 16 addressed messages filter on a 16-bit multicast address. The user processor can define up to four multicast addresses in hardware, and any message matching one of the four is processed. Messages not matching the multicast address are discarded.
Serial Number	The Host Serial Number is displayed on the Unit Address diagnostic screen.
MAC Addresses	The MAC addresses are stored in protected flash and displayed in hexadecimal.

Separable Security

This diagnostic displays information on the inserted M-CARD and CableCARD Interface with the DCX.

```
Separable Security      ^^^ Scroll Up ^^^

CARD Interface: GOOD
CableCARD ID:      000-045-272-214-3
Host ID:           044-026-972-168-2
Data ID:           274-297-661-92
Validation:        VALID

Pairing Rpt Method:MMI
MSO Phone Number:   UNKNOWN

CableCARD
    Object Name:     MCblCard
    Object Ver:      05.23
    Manufacturer:    0x0000
    HW Version:      0537971002
    Boot Version:    03.25
    2nd Version:     03.31
    Serial Number:   MA1038FAG326
    MAC Address:     3C 75 4A D0 48 8D
Page 2 of 2
```

Field	Description
CARD Interface	CableCARD Interface is a status indication of the interface between the Host and CableCARD. It will indicate "Good" if no errors are detected, "Error" if there is an error establishing the CableCARD interface, or "Unsupported CARD" if the inserted CableCARD is not an M-CARD.
CableCARD ID	The unique identifier provided by the CableCARD.
Host ID	The unique identifier in the Host Device Certificate.
Data ID	A value generated by the CableCARD for the Pairing report.
Validation	• UKNOWN if a Validation message was not received by the product. • VALID or INVALID as set by the Host Validation Message received from the headend. • BINDING if the CableCARD is busy with the binding authentication process. • NOT BOUND if Card validation status is not bound for CableCARD reasons. • HOST CERTIFICATE INVALID if the status is not bound because the Host Certificate was invalid. • HOST SIGN FAILED if status is not bound because of failure to verify Host's SIGN. • AUTH KEY FAILED if status is not bound because of failure to match AuthKey from the Host Device. • FAILED if binding failed for other reasons.
Pairing Rpt Method	Set to MMI or Reportback as received by a message from the headend, or set to Unknown if the headend message was not received.
MSO Phone Number	MSO Phone Number as configured at the headend.
CableCARD	
Object Name	Code object name executing on the CableCARD.
Object Ver.	Code object version executing on the CableCARD.
Manufacturer	CableCARD manufacturer.
HW Version	Version number provided by the CableCARD.
Boot Version	Version number provided by the CableCARD.
2nd Version	Version number provided by the CableCARD.
Serial Number	Serial number fo the CableCARD
MAC Address	MAC Address of the CableCARD.

Current Channel Status

This diagnostic displays a status of the last attempted channel you attempted to tune on the in-band stream. The channel type determines the status display.

```
              CURRENT CHANNEL STATUS
PRIMARY A/V SOURCE:        N/A
IB TUNER 1
 TYPE: DIGITAL                      CLR
 STATUS:     Acquired Not playing
PREVIEW:              NO
PURCHASABLE:          NO
PURCHASED:            NO
EPOCH Num:            000
Auth Reason:          0x00
Service: 0     Status:  0     ID:0x000000
CH:      800   Tuned Frequency:   651.0000 MHz
VCT ID:              1        SOC: DISABLED
CCI:  0x00  APS:  0x00  RC Flag: 0x00
CIT:  0x00  DRM:  0x00  RS:      FOREVER



Page 1 of 2          vvv Scroll Down vvv
```

```
                          ^^^ Scroll Up ^^^
     CURRENT CHANNEL STATUS
IB TUNER 2
 TYPE: DIGITAL                      ENC
 STATUS:     Acquired Not playing
PREVIEW:              NO
PURCHASABLE:          NO
PURCHASED:            NO
EPOCH Num:            026
Auth Reason:          0x07
Service: 0     Status:  1     ID:0x020000
CH:      381   Tuned Frequency:   567.0000 MHz
VCT ID:              1
CCI:  0x02  APS:  0x00  RC Flag: 0x00
CIT:  0x00  DRM:  0x00  RS:      FOREVER



Page 2 of 2
```

```
                  ^^^ Scroll Up ^^^
SDV Client Status
Status:        UnInited
Pri Svr:       0.0.0.0/0
Sec Svr:       0.0.0.0/0
Dsc Srv:       0.0.0.0/0
Mode:          OB-OB
MotoCar:       xxxxx Cnt=ddddd
Config:        Ver=255,MRS=9999
Channels:      Sw=0      ACL=0
Carousel:      Ver=255,MRS=9999
Last Err:      11 4 2010 19:24:18
Last Err:      RES(03E0)
Service Group:  0

Frq TSID    SG    Tunes/Fail/Fail
                       Short Long


Page 3 of  3
```

Figure 24 – Current channel status front panel displays

Digital channel: Purchasable indicator   Preview indicator

Digital channel indicator   Epoch authorization code
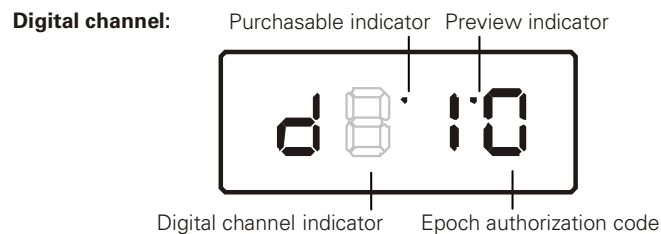
The Current Channel status fields are:

Field	Description		
Type	Indicates whether the channel is analog or digital.		
	OSD	**Front panel**	**Description**
	DIGITAL	d	Digital
Status	Indicates the current status of channel acquisition.		
	OSD	**Front panel**	**Description**
	Acquired		Service has been acquired and is playing, but stream components may not be locked yet if the service is digital. For an analog service, there are no stream components to lock, so this is the final status.
	Acquiring		Service is being reacquired.
	Not Acquired		Service has not been acquired due to a failure.
	Acquired and Locked		Digital service has been acquired, and all relevant stream components for the service are locked. If the service is purchasable, the stream components will not be locked until the service is purchased.
	Acquired Not Playing		Service has been partially acquired, but is not playing. For MPEG-2 services, this means that no components are selected.
Preview	Indicates whether the current program is in preview mode.		
Purchasable	Indicates whether the current program can be purchased for viewing.		
Purchased	Indicates whether the current program has been purchased.		
EPOCH Num	Number of authorization requests originating from DCX3501-M.		
Auth Reason	The current epoch authorization reason is displayed in the hexadecimal format 0xbb on the OSD and front panel.		
Service	Service number from the secure processor. It is a decimal value from 0 to 3.		
Status	Service status from the secure processor. It is a decimal value from 0 to 3.		
ID	Service ID from the secure processor. It is a hexadecimal value. First 2 bytes indicate a MPEG service number, and the last byte indicates another unique identifier.		
CH	Current Channel to which the set-top is tuned.		
Tuned	(Digital channels only) The center RF carrier frequency for the digital service. It can be		

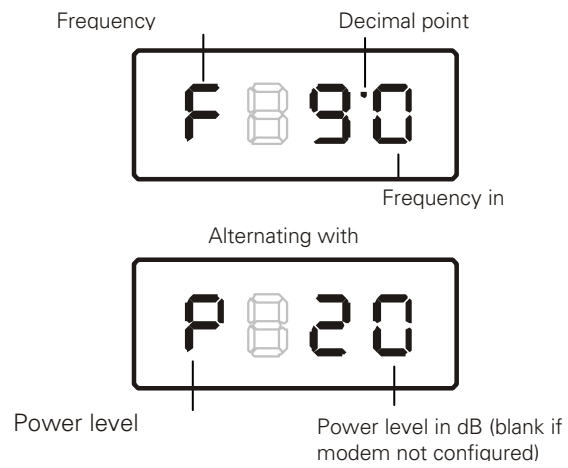| Field	Description
Frequency	From 54 to 860 MHz.
VCT ID	Virtual Channel Table ID
SOC	The Selectable Output control is enabled or disabled.
CCI	The copy control information:
	00 — copy free
	01 — no more copies
	10 — copy once
	11 — never copy
	N/A — the value is invalid or cannot be retrieved
APS	The Analog Protection System; for example, Macrovision:
	00 — no Macrovision
	11 — Type 3 Macrovision
	N/A — the value is invalid or cannot be retrieved
RC Flag	Displays whether the broadcast flag is present:
	0 — no flag/not defined
	1 — the flag is present/enabled
	N/A — the value is invalid or cannot be retrieved
CIT	The constrained image trigger, as delivered in the PRK or the Set DRM API:
	1 — set
	0 — not set
	N/A — the value is invalid or cannot be retrieved
DRM	The digital rights management valid flag bit:
	1 — set
	0 — not set
	N/A—the value is invalid or cannot be retrieved
RS	The retention state:
	Forever, 1 week, 2 days, 1 day, 12 hours, 6 hours, 3 hours, 90 minutes, or Not Defined
	N/A —value is invalid or cannot be retrieved
SDV Client Status	If Switched digital video is available, the following information is related to the SDV Client:
	• Status of client
	• IP Address of primary switched video manager (SVM) server
	• IP Address of secondary switched video manager (SVM) server
	• IP Address of Auto Discovery server
	• SDV Mode
	• MotoCar configuration and message count

Field	Description
	• Version number of the SDV configuration message and number of minutes since the version was last seen by the client
	• Configured switched channels (SW) followed by the number of channels in the Active Channel List (ACL).
	• Version number of the Mini Carousel message and the time it was last seen
	• Time and date of the last error recorded by the Client
	• Last error code
	• Service Group ID
	• SDV QAM diagnostic parameter table consisting of entries for attempted and successful SDV tunes and QAMs listed in the Auto Discover list. Table includes the QAM frequency, the TSID, ("*" if a TSID mismatch exists), Auto Discovery Indicator, if QAM is included in the Auto Discover List, Service group ID, count of successful tunes to switched services, count of short term tune failures over the last 24 hours, count of long term tune failures.

RF Modem (Upstream)

This diagnostic displays the RF modem status, if an RF modem is installed in the DCX3501-M. The information is updated each time the DCX3501-M displays this diagnostic.

```
                    RF  MODEM

STATUS:              CONFIGURED

CENTER  FREQUENCY:           0008.096 MHz

REQUESTED  POWER  LEVEL:     060 dB

ACTUAL  POWER  LEVEL:        INVALID

REPORT  BACK  ADDRESS:       0x000005
```

Figure 25 – RF upstream modem front panel display

Frequency   Decimal point

F 9.0

Frequency in

Alternating with

P 20

Power level   Power level in dB (blank if
modem not configured)

The RF Modem fields are:

Field	Description
Status	CONFIGURED or NOT CONFIGURED.
Center Frequency	The RF modem center frequency is displayed on the OSD and front panel in MHz.
Requested Power Level	The value in dB assigned to the DCX3501-M during RF leveling (which is blank if it is not configured).
Actual Power Level	The power level is displayed in dB on the OSD and front panel or is blank if the power level has not been set.
Report Back Address	Displayed in 4-byte hexadecimal format, if configured.

Code Modules

This diagnostic includes information about the firmware loaded in flash memory and all non-volatile code versions that are installed on the DCX3501-M. When the native suite is running, the diagnostics of the application operating system and all associated objects should be accessible.
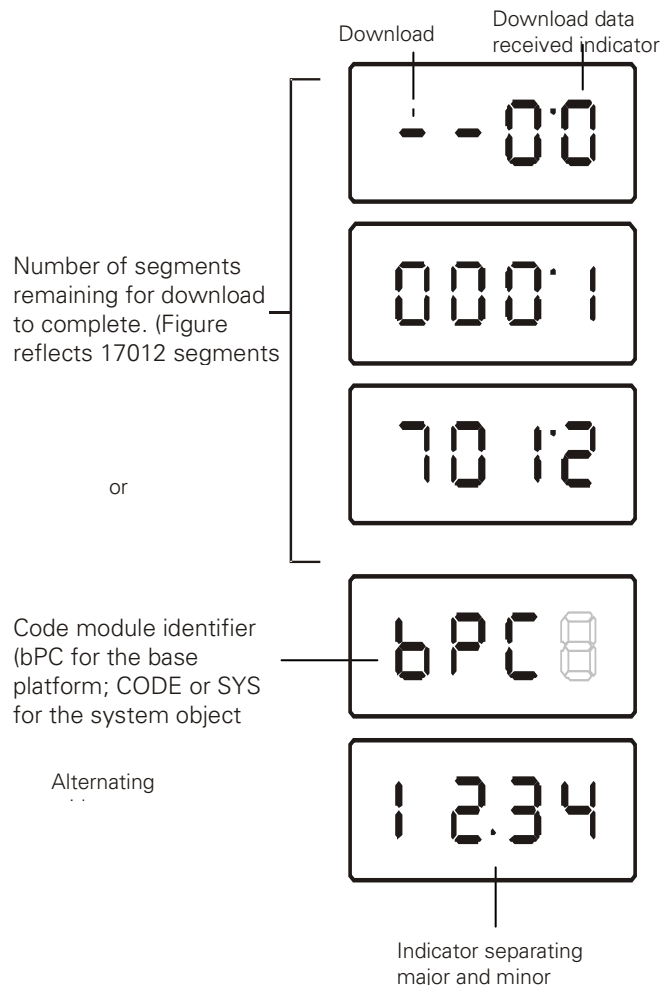

Figure 26 – Front Panel Display for code modules

Download   Download data
received indicator

- - 0 0

Number of segments
remaining for download
to complete. (Figure
reflects 17012 segments

0 0 0 1

7 0 1 2

or

Code module identifier
(bPC for the base
platform; CODE or SYS
for the system object

bPC 8

Alternating

1 2.34

Indicator separating
maior and minor

The Code Modules fields are:

Field	Description
Boot Code	The boot code version in ASCII format.
Platform Built	The date platform software was built.
Version	The firmware version and build date in ASCII format.
Processor	The digital secure processor version in ASCII format.
Analog Secure Processor	The analog secure processor version in ASCII format.
Downloadable Object Information Table	Lists all objects loaded, or being loaded, onto the DCX3501-M in ASCII format. The information displayed for each object depends on the running environment. If a download is not in progress, the front panel displays the currently running environment and version number, as shown in Figure 4-9. On the front panel, bPC represents Thin Client code.
Object	The object name.
Ver	The object version.
Status	The object status, updated on the OSD and front panel every five seconds while you display the diagnostic:

	OSD	Status	Description
	MEM ALLOC	Allocated	Memory for the object is allocated.
	LOADING	Loading	The Object is being loaded.
	STARTING	Enabling	The Object is being started (the constructor is running).
	ENABLED	Enabled	The Object is running.
	ENA-NOT RUN	Enabled_Not_ Runnable	The Object is enabled, but cannot run.
	STOPPING	Disabling	The Object is being stopped (the destructor is running).
	DISABLED	Disabled	The Object has been disabled.
	DIS-NOT RUN	Disabled_Not_ Runnable	The Object is disabled and cannot run.
	DELETING	Deleting	The Object is being deleted.

Field	Description		
	POSTPONED	Postponed	The Object cannot run on the current system; it will be enabled during the next boot.
	CONNECTED	Connect	Connected to download PID — awaiting data.
	PEND CONNECT	TryingToConnect	Trying to connect.
ID	The object identifier.		
LO	The Local Origination states whether the object is located locally on the set-top.		

Memory Configuration

This diagnostic displays the DCX3501-M memory configuration. The information is updated when you display the diagnostic.

```
          MEMORY CONFIGURATION

SYSTEM RAM:        768 MB
FLASH:              64 MB
NVRAM:             N/A
```

There is no front panel display for this diagnostic.

The Memory Configuration fields are:

Field	Description
System RAM	The allocated system RAM in MB.
Flash	The allocated flash memory in MB.
NVRAM	The allocated NVRAM in KB.

Audio/Video Status

Audio/Video Status diagnostics display information regarding audio and video content and settings configured for the set-top.

```
              AUDIO / VIDEO STATUS
SPDIF:DOLBY DIGITAL 3/2        LFE:     1
Dolby Volume: OFF
Audio Mute:    ON
Video Mute:    MUTED
Captions Detected:        N/A
N/A                       Primary Lang
Digital Subtitles Status
   Enabled:      NO        ISO Lang:      eng
   Enhanced:     NO        Rendered:      NO
PiP Focus:     N/A
OUTPUT FORMAT:            N/A
INPUT SOURCE:            IB TUNER 1
ADP LOCK:               YES
AUDIO MODE:             STEREO
VP LOCK:                YES
INPUT FORMAT:           4:3 704x480i 30
```

Field	Description		
S/PDIF Output	Indicates S/PDIF Mode as set by application software.		
	OSD Display	**Description**	
	N/A	Audio S/PDIF mode is not applicable.	
	IEC958PCM	PCM audio selected.	
	Dolby Digital	Dolby Digital uses the following speaker selections:	
	1/0	Right front or left front	
	2/0	Right front and left front	
	3/0	Right front and left front and center	
	2/1	Right front and left front and (right rear or left rear)	
	3/1	Right front and left front and center and (right rear or left rear)	
	2/2	Right front and left front and right rear and left rear	
	3/2	Right front and left front and center and right rear and left rear	
LFE: Low Frequency Effect	The LFE indicates if the nomenclature low frequency effects are available in the Dolby Digital audio stream, as indicated if the "0.1" is present in the Dolby Digital 5.1 nomenclature (for example, "Dolby Digital 5.1 surround"). Valid values include:		
	OSD Display	**Description**	
	0	LFE is not available	
	1	LFE is available (i.e. "Dolby Digital 5.1 surround").	
Dolby Volume	Indicates if Dolby Volume is turned on or off		
Audio / Video Mute	The Audio and Video Mute Status indicates if the audio and/or video have been muted by the software. The audio mute is either On or Off. The Video Mute describes the MPEG muting method selected by the software and indicates if the output video is in the mute state by displaying On or Off, followed by the mute method. Methods include:		
	OSD Display	**Description**	
	UNMUTED	Displayed if the mute method is not selected.	
	MUTE to STILL	Displayed if the mute method includes stopping video and presenting a still frame, similar to a pause function.	
	MUTE to BLACK	Displayed if mute method presents a black screen.	
Captions	The captions mode displays captions present on the service.		
	Note: The caption options are set via the User Setting Menu, where the subscriber can enable closed captions and select options.		

Field	Description
1st Caption Row: Caption Detected:	

	OSD Display	Description
	708	EIA-708 captions detected.
	608	EIA-608 captions detected.
	608 and 708	Both EIA-608 and EIA-708 captions detected.
	None	No captions detected.

2nd Caption Row: Caption Options Set, followed by Service Selected:

	OSD Display	Description
	708 Set	EIA-708 captions enabled, with options set by user.
	708 Default	EIA-708 captions enabled, with no options set by user.
	608 Set	EIA-608 captions enabled, with options set by user.
	608 Default	EIA-608 captions enabled, with no options set by user.
	None Set	Captions detected but not enabled.

	OSD Display	Definition
	CC 1	Closed Caption service CC 1 (default)
	CC 2	Closed Caption service CC 2
	CC 3	Closed Caption service CC 3
	CC 4	Closed Caption service CC 4
	T 1	Closed Caption service T 1
	T 2	Closed Caption service T 2
	T 3	Closed Caption service T 3
	T 4	Closed Caption service T 4

	OSD Display	Description
	Primary Lang	Primary language set by the provider (default, Service 1).
	Second Lang	Secondary language set by the provider (Service 2).
	Service 3	Set by the provider Service 3.
	Service 4	Set by the provider Service 4.
	Service 5	Set by the provider Service 5.

Field	Description
Service 6	Set by the provider Service 6.
Digital Subtitle Status	The subtitle parameter indicates if subtitles are enabled and, if enabled, what language is selected and if the subtitle is being rendered. The language is displayed as the 3-character ISO639.2/B language code. • Enabled is indicated with Yes or No. • The language is displayed as the 3-character ISO639.2 language code. • Enhanced mode is indicated with Yes or No. • Rendered status is indicated with Yes or No.
PiP Focus	The Picture in Picture focus indicates N/A and is not a standard supported DCX feature (dependent upon application software).
Output Format	Standard used for the output format if available, ie. NTSC video standard
Input Sources	The input source list information on ADP Lock, Audio Mode, VP lock, and Input Format. The ADP Lock indicates whether the audio stream is locked. Valid values are: • YES: Audio Processor is locked to the audio stream. • NO: Audio Processor is not locked to the audio stream. Audio Mode indicates the audio Mode of in incoming digital service. Valid values include: • N/A: The audio mode is not applicable to the currently tuned stream. • Mono: The audio mode is monophonic. • Stereo: The audio mode is stereo. • Surround: The audio mode is surround sound. • 5.1: The audio mode is Dolby® Digital 5.1 Surround Sound. VP Lock indicates whether the video stream is locked. Valid values are: • YES: Video Processor is locked to the video stream. • NO: Video Processor is not locked to the video stream. The input format includes the aspect ratio (4:3 or 16:9), the screen pixel size (nnnnXnnnn), pixel display ('i' for interlaced, 'p' for progressive), and frames per second (24, 25, 30, or 60).

Interface Status

The Interface Status diagnostic displays when running in Thin Client. There is no LED display. The information on the OSD is updated when you display the diagnostic.

```
                INTERFACE / PORT STATUS

                    ENABLED      ACTIVE
DOCSIS                YES          NO
1394                  YES          NO
DVI/HDMI              YES          YES
ETHERNET              YES          NO
IR XMIT               YES          YES
SMART CARD            NO           NO
SPDIF                 YES          NO
RF BYPASS             NO           NO
USB                   YES          NO
HMA AUTHORIZED        YES          YES
MoCA AUTHORIZED       NO           NO
   Internal           YES          NO
   External           YES          YES


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```

```
                        ^^^ Scroll Up ^^^
               INTERFACE / PORT STATUS
DVI/HDMI
MODE:   HDMI PORT   COLOR SPACE:        YCC
 DEVICE CONNECTED:        YES
 REPEATER:                NO
 VIDEO XMISSION:        ACTIVE
 HDCP ENABLED:            YES
 OUTPUT FORMAT:        720x480P
 ASPECT RATIO:            4:3
EDID DATA          TV Support
   1920x1080I   16:9                    YES
   1280x720P    16:9*                   YES
   720x480P     16:9                    YES
   720x480P     4:3                     YES
   720x480I     4:3                     NO
   1920x1080P_24 16:9                   YES
   1920x1080P_30 16:9                   YES
   1920x1080P_60 16:9                   YES
 AUDIO: DOLBY       RATE:     48KHz
Page 2 of 4              vvv Scroll Down vvv
```

```
                        ^^^ Scroll Up ^^^
               INTERFACE / PORT STATUS
1394
   ACTIVE PORTS:       0
   DATA XMISSION:      NOT ACTIVE
   5C IMPLEMENTATION:  NO
   COPY CONTROL:       Copy Free
   CYCLE MASTER NODE:  YES
   IRM NODE:           YES
   ROOT NODE:          YES
   LOOP DETECTED :     NO
   EUI-64:         0x3C754A00FEADD400
CONNECTED DEVICES: 01
        DEVICE ID
        0x3C754A00FEADD400
        N/A
        N/A
   MPEG4 PASSTHROUGH:   Enable

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```

```
                        ^^^ Scroll Up ^^^
               INTERFACE / PORT STATUS


USB DEVICES
   NO DEVICES




Page 4 of 4
```

The Interface Status fields are:

Field	Description
DOCSIS Tuner & Xmitter	Indicates if enabled; indicates if active.
1394 I/O Device	Indicates if enabled; indicates if active.
USB I/O Device	Indicates if enabled; indicates if active.
Ethernet Device	Indicates if enabled; indicates if active.
Parallel Port	Indicates if enabled; indicates if active.
IR Xmit	Indicates if enabled; indicates if active.
Hard Drive Status	Indicates if enabled; indicates if active.
Smart Card	Indicates if enabled; indicates if active.

HDMI Port	If a device is connected to the HDMI port only, the following diagnostics display to help troubleshoot the HDMI interface. They all display "N/A" if no device is connected to the HDMI port, or if the value is invalid or cannot be retrieved.
	
	• Device Connected — Indicates whether a device is connected to the HDMI port— Yes or No.
	• Repeater — Indicates whether the connected device is a repeater — Yes or No.
	• Video Xmission (transmission) — Indicates whether the DCX3501-M is transmitting video over the HDMI port — Not Active or Active.
	• HDCP Enabled — Indicates whether the DCX3501-M is using HDCP to encrypt video transmitted over the HDMI link — Yes or No. If the Video Xmission status is Not Active, the HDCP Enabled status is No.
	• Output Format — Indicates the timing format of the video sent through HDMI:
	  • 1920 x 1080i — 1920 pixels wide by 1080 pixels high, interlaced
	  • 1280 x 720p — 1280 pixels wide by 720 pixels high, progressive
	  • 720 x 480p — 720 pixels wide by 480 pixels high, progressive
	  • 720 x 480i — 720 pixels wide by 480 pixels high, interlaced
	  • 640 x 480p — 640 pixels wide by 480 pixels high, progressive
	Aspect Ratio — Indicates the aspect ratio of the video sent through HDMI — 4:3 or 16:9.

EDID Data	Indicates the video timing formats that were read from the Extended Display Identification Data (EDID) register for the connected device, in particular the detailed timing description blocks. The list displays all of the formats that the DCX3501-M could read, up to a maximum of 12 formats. If the DCX3501-M cannot read any formats, EDID Data is blank. An asterisk (*) after the aspect ratio means the DCX3501-M supports the format. If more than twelve video timing formats are discovered, the supported formats only are listed first, followed by up to twelve remaining formats.
1394 Information	If a connection is made to a 1394 device, the screen indicates: • Active Ports – number of active ports detected • Data XMission – if data flow is detected through the port • 5C implementation – indicates the level 5C DTCP authentication currently employed on the 1394 interface

Field	Description
	• Copy Control - level of copy control in the 1394 content. Valid values include: 'Copy Free', 'Copy Once', 'No Copies', 'Copy Never'.
	• Nodes - indicates if the set-top terminal is the cycle master node, the IRM node, and/or the root node on the 1394 bus.
	• Loop Detected - indicates if a loop exists on the 1394 bus.
	• EUI – device identifier
	• Number of connected devices and associated device Identifier
	• MPEG4 Passthrough – indicated if MPEG4 content is passed through to the 1394 device. The user can enable or disable MPEG4 Passthrough by pressing the MENU key while on the 1394 Status OSD diagnostics screen (selection mode is indicated by '>>>'), then pressing SELECT key to toggle between Enable and Disable.

DVR/Hard Drive Status

This three-page diagnostic displays the DVR and hard-drive status.

```
                    DVR / Hard Drive Status

        DVR Status:
          Enabled:                True
          Stream Indexer Ver:     133
          Content Record Ver:     7

        Encoder
        Number       Type         Quality
        ENCODER NOT INSTALLED


        Drive            Record Capacity Remaining
        IDE0                  485056577536 B
        IDE1                  487984201728 B



                       vvv Scroll Down vvv
```

```
                              ^^^ Scroll Up ^^^
               Hard Drive Status
    Number of Installed Drives:   2

    Drive:    1    INTERNAL
    Model Number: ST3500414CS
    Device ID:    P
    Type:         IDE
    Total Size:   500 GB          Used
      System                    441344 B
      GPFS                      1484800 B
      DVR Content            3007418368 B
      DVR Index               15239168 B

    State:    Active
    Temp:     108F  42C    Max Temp: 108F 42.2C
    Over Temp:   No        Count:       0
```

```
                              ^^^ Scroll Up ^^^
               Hard Drive Status
    Number of Installed Drives:   2

    Drive:    2    EXTERNAL
    Model Number: ST3500321CS
    Device ID:    P
    Type:         IDE
    Total Size:   500 GB          Used
      System                    379904 B
      GPFS                      239616 B
      DVR Content            15794176 B
      DVR Index               231424 B

    State:    Active
    Temp:     108F  42C    Max Temp: 108F
    Over Temp:   No        Count:       0
```

The DVR/Hard Drive Status fields are:

Field	Description
Enabled	Indicates whether the DVR is enabled, based on the DCX3501-M Connected State (CONNECTED or DISCONNECTED) and resource availability (resource authorized; hard disk installed and functional):

	OSD	Front panel	Description
	True	En	DVR enabled

	Front Panel	OSD	Description
	False	Un	DVR disabled

Field	Description
Stream Indexer Ver.	The stream indexer version number, without leading zeros; for example, version 0000000065 is displayed as 65.
Content Record Ver.	The content record version number, displayed without leading zeros.
Encoder	Encoder Not Installed
Number	Encoder Not Installed
Type	Encoder Not Installed
Quality	Encoder Not Installed
Drive	The drive type — IDE or NOT AVAILABLE (neither enabled nor configured).
Record Capacity Remaining	The remaining recording capacity, in bytes.
Number of Installed Drives	The number of internal and external hard drives, up to a maximum of 9.
Drive	The identification number sequentially assigned to each installed drive and whether the drive is Internal or External.
Model Number	The drive model number assigned at the factory.
Device ID	A text string of up to 20 characters that identifies the disk drive; N/A is displayed if the value is invalid or cannot be retrieved.
Type	The drive type — IDE, 1394, USB, or Unknown.
Total Size	The drive size in decimal GB. (1 decimal GB = 1 x 109 bytes. For example, 120 decimal GB = 120 x 109 bytes.)
System, GPFS, DVR Content, and DVR Index	The space used and allocated in MB for each of the internal hard drive's partitions — System, GPFS, DVR Content, and DVR Index (1 binary MB = 220 bytes). N/A displays if the value is invalid or cannot be retrieved.

Field	Description
State	The hard drive state: • Standby — The hard drive is working normally, but is at rest (the State returns to Active any time disc access is necessary). • Active — The hard drive is accessing data. • Failed — The hard drive hardware has failed.
Temp (F)	For an internal hard drive only, its temperature in degrees F.
Max Temp	For an internal hard drive only, its maximum temperature in degrees F.
Over Temp	Indicates whether the drive is excessively hot: • Yes — The internal drive temperature exceeds 140º F (60º C). The LED Over-Temp Indicator is on and remains lit until the next over-temp sample is taken (at least once an hour). • No — There is no over temp problem.
Count	The cumulative number of times that the hard drive temperature has been measured over 60º C, with the temperature checked at least once an hour.

DOCSIS Status

This three-screen diagnostic displays status information for the embedded cable modem (eCM):

```
DOCSIS STATUS
DOCSIS Enabled:                           NO
Acquire DS Channel:                       N/A
Obtain US Parameters:                     N/A
Establish IP Connectivity:                N/A
Obtain Configuration File:                N/A
eCM Registered:                           N/A
Network Access:                           N/A
Initialize BPI:                           N/A
System UP Time:
    000 Days 00 Hours
     00 Mins 00 Seconds

IP Addresses
  Cable Modem:              000.000.000.000
  Set-top Box:             000.000.000.000

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```

```
DOCSIS              ^^^ Scroll Up ^^^
MAC addresses
  Cable Modem:          00:00:00:00:00:00
  Set-top Box:          00:00:00:00:00:00
Downstream Channel
   Carrier Lock:        N/A
   Frequency:           N/A
   LKC:                 N/A
   Mode:                N/A
   Power Level:         000 dBmV
   SNR:                 00.0 dB
Upstream Channel
   Frequency:           N/A
   Mode:                N/A
   Channel ID:          N/A
   Power Level:         000 dBmV
   Symbol Rate:         0.000 MSym/sec

Page 2 of 3   vvv Scroll Down vvv
```

```
DOCSIS              ^^^ Scroll Up ^^^
Known MAC Addresses






Page 3 of 3
```

The fields are:

Field	Description
DOCSIS Enabled	For a DOCSIS-enabled set-top, YES. Otherwise, NO.
Acquire DS Channel	The DOCSIS downstream channel acquisition status: • YES — The downstream channel is acquired. • NO — The set-top is acquiring the downstream channel. • N/A — The value is invalid, cannot be retrieved, or DOCSIS is not enabled.
Obtain US Parameters	The DOCSIS upstream channel descriptor (UCD) acquisition status: • YES — The UCD is acquired. • NO — The set-top is acquiring the UCD or the downstream channel. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.

Field	Description
Establish IP Connectivity	Displays whether the cable modem has acquired its IP address, typically from a Dynamic Host Configuration Protocol (DHCP) server: • YES — The IP address is acquired. • NO — The set-top is acquiring its IP address. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.
Obtain Configuration File	Displays whether the cable modem has downloaded its DOCSIS cable modem configuration file from the TFTP server: • YES — The cable modem configuration file has been successfully downloaded. • NO — The set-top is downloading its cable modem configuration file. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.
eCM Registered	Displays whether the embedded cable modem has registered with the cable modem termination system (CMTS): • YES — DOCSIS registration is complete. • NO — DOCSIS registration is in progress, or the set-top could not register. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.
Network Access	Displays whether the cable modem has been granted access to the DOCSIS network: • YES — The cable modem was granted DOCSIS network access. • NO — The set-top is obtaining DOCSIS network access. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.
Initialize BPI	The Baseline Privacy Interface (BPI) status: • YES — BPI has been successfully initialized for the cable modem. • NO — BPI initialization is in progress, has failed, or was not requested by the network. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.
System Up Time	The Days, Hours, Mins (minutes), and Seconds the DOCSIS system has been operational. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, each field displays zeros.
IP Addresses	The Cable Modem and Set-Top IP addresses in dotted-decimal format xxx.xxx.xxx.xxx. Each byte value is padded with zeros when necessary. For example, 10.0.1.10 is displayed as 010.000.001.010. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, 000.000.000.000 is displayed.
MAC Addresses	The Cable Modem and Set-Top MAC address in hexadecimal format xx:xx:xx:xx:xx:xx. Each byte value xx ranges from 00 to FF and is padded with zeros when necessary. For example,0:0:2D:1:F1:D is displayed as 00:00:2D:01:F1:0D. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, 00:00:00:00:00:00 is displayed.
Downstream Channel (carries data from the headend to the set-top)	
Carrier Lock	• YES — The cable modem is locked to a DOCSIS downstream channel. • NO — The cable modem is not locked to a downstream channel. • N/A — The value is invalid or cannot be retrieved, or DOCSIS is not enabled.

Field	Description
Frequency	The center frequency of the channel to which the DOCSIS downstream channel receiver is tuned. It can be 54 to 860 MHz. If the value is invalid or cannot be retrieved, downstream Carrier Lock is No; if DOCSIS is not enabled, N/A is displayed.
LKC	The last known carrier (LKC); the frequency of the last tuned downstream channel used if the embedded cable modem enters hunt mode. It can be 54 to 860 MHz. If the value is invalid or cannot be retrieved, Carrier Lock is No; if DOCSIS is not enabled, N/A is displayed.
Mode	The DOCSIS downstream channel modulation: QAM 64 or QAM 256. If the value is invalid or cannot be retrieved, Carrier Lock is No; if DOCSIS is not enabled, 000 is displayed.
Power Level	The downstream channel power level in dBmV. If the value is invalid or cannot be retrieved, Carrier Lock is No; if DOCSIS is not enabled, 000 is displayed.
SNR	The estimated downstream channel carrier signal-to-noise ratio in the format xx.x dB. It is the value reported as SNR in the MIB. If the value is invalid or cannot be retrieved, Carrier Lock is No; if DOCSIS is not enabled, 00.0 is displayed.
Upstream Channel (carries data from the set-top to the headend)	
Frequency	The center frequency of the channel to which the DOCSIS upstream channel receiver is tuned. It can be 5 to 42 MHz. If the value is invalid or cannot be retrieved, Carrier Lock is No; if DOCSIS is not enabled, N/A is displayed.
Mode	The DOCSIS upstream channel modulation: QPSK, QAM 8, QAM 16, QAM 32, QAM 64, or QAM 128. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, N/A is displayed.
Channel ID	The upstream channel identifier 0 to 255. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, N/A is displayed.
Power Level	The upstream channel power level in dBmV. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, 000 is displayed.
Symbol Rate	The upstream channel symbol rate in mega-symbols per second. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, 0.000 is displayed.
Known MAC Addresses	Displays up to 32 MAC addresses learned by the DCX3501-M cable modem, including the Set-Top MAC and future MAC addresses assigned by DSG, in hexadecimal format xx:xx:xx:xx:xx:xx on two screens if necessary. If the value is invalid or cannot be retrieved, or if DOCSIS is not enabled, no values are displayed.

Application Specific Information

This diagnostic displays information about application servers:

```
          APPLICATION SPECIFIC INFORMATION

     NO ADDITIONAL INFORMATION

        SERVER 1 NAME:
        SRV 1 IP ADDR:

        SERVER 2 NAME:
        SRV 2 IP ADDR:

        SERVER 3 NAME:
        SRV 3 IP ADDR:

        SERVER 4 NAME:
        SRV 4 IP ADDR:

        SERVER 5 NAME:
        SRV 5 IP ADDR:
```

The fields are:

Field	Description
Server# Name	The application server name of up to 14 alphanumeric characters. It is blank if the value is invalid or no value can be retrieved.
Srvr # IP Addr	The application server's IP address in dotted-decimal format xxx.xxx.xxx.xxx; the range of each xxx is from 0 to 255. It is blank if the value is invalid or no value can be retrieved.

Interactive Status

This diagnostic describes the interactive information that is displayed only when the Thin Client platform is running. The information on the OSD and front panel is updated at least once every five seconds while the diagnostic is displayed. This is an example of a code module display with status descriptions:

```
                    INTERACTIVE STATUS

IP ADDRESS:          000.000.000.000
UPM:                 00000017
UPSTREAM ID:         0000
DOWNSTREAM ID:       0000
STATE:               UNCONFIG
MAC ABORT CNTR:      0000

SOCKET PORT STATE:
00       UNUSED      08       UNUSED
01       UNUSED      09       UNUSED
02       UNUSED      10       UNUSED
03       UNUSED      11       UNUSED
04       UNUSED      12       UNUSED
05       UNUSED      13       UNUSED
06       UNUSED      14       UNUSED
07       UNUSED
```

Figure 27 – Interactive status front panel display

The Interactive Status fields are:

Field	Description
IP Address	The IP address in dotted-decimal format xxx.xxx.xxx.xxx assigned by the NC 1500 to the DCX3501-M. 0.0.0.0 is displayed if the IP address is not configured or unknown.
UPM	The upstream modem address value is the same as the terminal ID assigned by the DAC 6000. It is a unique, system-generated, eight-digit integer between 1 and 16777215. 00000000 is displayed when the UPM is not configured or if it is unknown.
Upstream ID	A four-digit decimal value from 0000 to 9999 assigned by the DAC 6000 to the DCX3501-M. 0000 is displayed if the Upstream ID is not configured or if it is unknown.
Downstream ID	A four-digit decimal value from 0000 to 9999 assigned by the DAC 6000 to the DCX3501-M. 0000 is displayed if the Downstream ID is not configured or if it is unknown.
State	The interactive status of the DCX3501-M:

	Front Panel	OSD	Description
	U	UNCONFIG	The DCX3501-M is not configured for the interactive system, and the platform should run as pre-interactive.
	C	MAC_CONNECT	The DCX3501-M is waiting to establish a connection to the MAC PID Stream.
	Front Panel	**OSD**	**Description**
	I dc	INIT_WAIT_DC_OR_C	The DCX3501-M is in the interactive initialization state and waiting for the default configuration or the contention channel list messages.
	I L	WAIT_LM_ACK	The DCX3501-M is in the interactive initialization state and waiting for Link Management Response ACK for Local Address Message.
	I SO	WAIT_SO_ACK	The DCX3501-M is in the interactive initialization state and waiting for a Sign On acknowledgement.
	I LA	WAIT_LA_OR_SO	The DCX3501-M is in the interactive initialization state and waiting for Logical Address or Sign On with verification Frequency message.
	S I	INIT_STOPPED	The DCX3501-M is in the interactive initialization state and the TransMode has stopped.

Field	Description		
	r dc	RUN_WAIT_DC_OR_C	The DCX3501-M is in the interactive state and waiting for the default configuration or the contention channel list messages.
	r	RUNNING	Interactive state is running, sending idle messages, and waiting for any prepare for poll or MAC messages.
	S	RUN_STOPPED	The interactive run state has stopped and DCX3501-M is waiting for status or a transmission control message.
	00	INVALID	The interactive state is unknown or invalid.
MAC Abort Cntr	This counter increments every time the MAC layer reaches the cell abort count limit. It is reset by the successful upstream transmission of a cell: for example, when the DCX3501-M receives an ACK. If the counter reaches the MAC abort count limit, the DCX3501-M assumes the MAC layer is unavailable due to noise, congestion, or some other problem. The DCX3501-M stops transmitting data upstream, reports an error to the calling function, and attempts to re-enter the network using the initialization process. 0000 is displayed as the default or the MAC Abort CNTR is unconfigured or unknown.		
Socket Port State	The socket mode and activity: • UNUSED — The socket is not being used. • OPENED — The socket is open. • READY — The socket is ready to send or receive. • RECEIVING — The socket is receiving data from the application server. • SENDING — The socket is sending data to the application server. • UNKNOWN — The socket state is invalid or unknown.		

Connected Home

This diagnostic displays the connectivity and status of the Connect Home Network.

```
                         ^^^ Scroll Up ^^^
Connected Home Status
RF Freq:    N/A         MoCA:   N/A
RF Password:
 Nodes   Dev(#Ses)/Ver          MAC/IP






Page 1 of 5              vvv Scroll Down vvv
```

```
                         ^^^ Scroll Up ^^^
Connected Home Status
RF Freq:    N/A         MoCA:   N/A
RF Password:
 Nodes   Dev(#Ses)/Ver          MAC/IP






Page 2 of 5              vvv Scroll Down vvv
```

```
                         ^^^ Scroll Up ^^^
Connected Home Status
RF Freq:    N/A         MoCA:   N/A
RF Password:
 Nodes   Dev(#Ses)/Ver          MAC/IP






Page 3 of 5              vvv Scroll Down vvv
```

```
                           ^^^ Scroll Up ^^^
Connected Home Link Status
Tx Data Rate Between Nodes (Mbps)
Collecting Data: N/A
      To Node:  0    1    2    3    4
        From
        Node:
          0    ***  N/A  N/A  N/A  N/A
          1    N/A  ***  N/A  N/A  N/A
          2    N/A  N/A  ***  N/A  N/A
          3    N/A  N/A  N/A  ***  N/A
          4    N/A  N/A  N/A  N/A  ***
          5    N/A  N/A  N/A  N/A  N/A
          6    N/A  N/A  N/A  N/A  N/A
          7    N/A  N/A  N/A  N/A  N/A

Page 4 of 5              vvv Scroll Down vvv
```

```
                         ^^^ Scroll Up ^^^
Connected Home Link Status
Tx Data Rate Between Nodes (Mbps)
Collecting Data: N/A
      To Node:  5    6    7
        From
        Node:
          0    N/A  N/A  N/A
          1    N/A  N/A  N/A
          2    N/A  N/A  N/A
          3    N/A  N/A  N/A
          4    N/A  N/A  N/A
          5    ***  N/A  N/A
          6    N/A  ***  N/A
          7    N/A  N/A  ***


Page 5 of 5              vvv Scroll Down vvv
```

Field	Description
RF Freq	Frequency on which the Connected Home network is communicating.
MoCA	MoCA network status.
RF Password	RF Password is used when the MoCA network has privacy enabled.
Nodes	Node number for each member of network.
Dev(#Ses)/Ver	Number of active content sessions running on each member of network.
MAC/IP	Hardware and Network addresses for each member of the network.
Collecting Data	Displays whether data collecting is taking place on the network.
To Node	Nodes currently sending data over the network.
From Node	Nodes currently receiving data over the network.

Keypad — Front Panel Indicators

This diagnostic verifies the functionality of the front panel indicators and the front-panel keypad. Each highlighted character corresponds with a front-panel key press.

```
        KEY PAD / LED TEST


   <  >  U  D  I  M  P  F  G  S  +  -
```
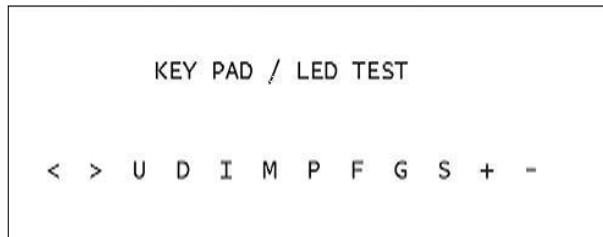
6   Troubleshooting

Troubleshooting guidelines follow. If problems still occur after performing the diagnostics, call the TRC for assistance as described in the Introduction.

Problem	Possible Solution
The DCX3501-M will not power on	The DCX3501-M may have received a software update and may not power on while the new software is being installed. Try again in a few minutes.
	• Verify that the AC power cord is connected to the DCX3501-M and an AC outlet. Unplug the DCX3501-M from the AC outlet, plug it back in, and then press the POWER button. • If the DCX3501-M is connected to a switched outlet on another unit, verify that that unit is powered on. Unplug the power cord from the DCX3501-M's AC outlet, plug it back it in, and then press the POWER button. It is recommended to use an unswitched outlet, if possible. • Press the POWER button on the DCX3501-M's front panel instead of the remote
The remote control does not work	Verify that the remote control is in Cable mode.
	Verify that there are no obstructions between the remote control and the DCX3501-M. Aim the remote control directly at the DCX3501-M front panel, not the TV or VCR.
	The angle between the remote control and the DCX3501-M may be too large. Stand in front of the DCX3501-M and not too far to either side.
	• Press and release operation keys one at a time, firmly and deliberately. • Try changing channels using the buttons on the DCX3501-M front panel. • Check the batteries in the remote control. Install new batteries if needed.
There is no audio when viewing cable channels	Verify that the mute button on the DCX3501-M or the remote control has not been pressed. Press mute on the remote control to restore sound.
	• If the DCX3501-M audio output is connected to the TV, verify that the mute button on the TV has not been pressed. • If the DCX3501-M audio output is connected to a home theater receiver, verify that the receiver is set to the appropriate input source and the mute button on the receiver has not been pressed. • Verify that you have the correct cables for the audio connections. • Verify that the audio cables are firmly connected between the DCX3501-M and the audio playback device (TV, receiver, DVD player, etc.).
There is no audio from the center and/or surround speakers of a home theater receiver connected to the DCX3501-M	Not all programs feature full Dolby Digital [5.1] or Dolby Digital Plus [7.1] surround sound. In some cases, the programs may only contain left and right stereo audio.
	• Verify that the S/PDIF cable (coaxial or optical) is firmly connected to the DCX3501-M and the home theater receiver. • Verify that the home theater receiver is set to a surround sound audio mode (Dolby Pro Logic®, Dolby Pro Logic II®, Dolby Pro Logic IIx®). • Verify that the receiver is properly configured to work with all connected speakers.

There is no video on the TV screen	Verify that the TV is powered on and set to the appropriate input source for the DCX3501-M.
	Verify that the DCX3501-M is powered on and tuned to an authorized cable channel.
	Verify that all video cables between the DCX3501-M and the TV are firmly connected.
	Verify that the coaxial cable feed is firmly connected to the DCX3501-M and the wall jack.
	• If the DCX3501-M video output is connected to a home theater unit, verify that the home theater unit is powered on and set to the appropriate input source.
	• If the DCX3501-M video output is connected to a TV through an HDMI connection, power off the TV and then power off the DCX3501-M. Wait one second and then power on the devices.
	Not all HDTVs can display every output format (1080i, 720p, 480p, or 480i) available on the DCX3501-M. To select a different format:
	1. Ensure that your DCX3501-M is plugged into a power outlet and is turned off.
	2. Press the MENU key on the front panel. Your settings are displayed on the DCX3501-M front panel display.
	3. Press the ▲ and ▼ keys to display the HDMI/YPbPr OUTPUT setting.
	4. Press the ► key to cycle through the available output formats until a picture displays on the TV.
No graphics or program guides appear on the screen	If you use the IEEE-1394 connection, on screen graphics, including closed captions and program guides, are not displayed by the DCX3501-M. On-screen graphics and captions may still be overlaid by your TV, if enabled. Alternatively, use HDMI or component video instead.
No closed captions display	Verify on the User Settings menu that closed captions are enabled on the DCX3501-M.
	Verify that closed captions are enabled on the TV.
	Note: Closed captioning may not be available on the current program.
There are black bars to the right and left of the picture	Widescreen TVs display 4:3 programs in this format unless set to Stretch. Turn on the 4:3 OVERRIDE feature in the User Settings menu. This enables most widescreen TVs to stretch the video to fill the screen (see the TV manual for information about stretching 4:3 video).
	• If the DCX3501-M is connected to a widescreen TV, verify that the TV TYPE is set to 16:9 in the User Settings menu.
	Many HD programs are broadcast in pillar-box format with black bars to the left and right of the picture. These programs are broadcast in 16:9 HD formats, even though the video is not 16:9.
There are black bars above and below the picture	All 4:3 HDTVs display HD programs in letterbox format (black bars above and below the picture) because of the shape of the display screen.
	• Turn on the 4:3 OVERRIDE feature in the User Settings menu. This enables most standard-screen TVs to display a full screen picture when the DCX3501-M is tuned to a 4:3 program.
	• Set the TV TYPE to 4:3 Pan-Scan. This enables the DCX3501-M to remove the black bars above and below the picture when possible.
	Some SD programs are broadcast in the letterbox format with black bars above and below the picture. Some widescreen TVs offer a zoom feature that may be

able to remove the black bars (see the TV manual for information about zooming 4:3 video).

There are black bars on all four sides of the picture	This may occur on a 4:3 TV if the 4:3 OVERRIDE setting is OFF. To set 4:3 SD programming to fill the screen, depending on the capabilities of the TV, set 4:3 OVERRIDE to 480i or 480p.
	This may occur on a 16:9 TV if the active video for an SD broadcast is in letterbox format. To confirm, wait for a commercial or look for a graphic, such as a network logo. If the commercial fills the screen from top to bottom, or the graphic appears below the active video, the program is being letterboxed by the broadcaster. You can minimize this by activating the zoom feature on the TV.
	A broadcast may include black bars on either side of a widescreen broadcast. This is called a hybrid aspect ratio and results in a black border around the video on a 4:3 TV. Because this is part of the broadcast, the DCX3501-M cannot correct the video. You may be able to minimize the border using the zoom feature on the TV.
Colors do not appear correctly	Be sure to match up each signal to the same YPbPr connection on the TV. Otherwise, colors will not appear correctly on the TV.
The DCX3501-M is making a humming noise.	The DCX3501-M includes an integrated hard drive and a fan for cooling. During normal operation, the DCX3501-M emits a low humming noise, similar to a personal computer. The noise varies in volume occasionally when the speed of the internal fan adjusts to changes in the temperature around the DCX3501-M. Please note the hard drive will stay on even when the DCX3501-M is turned off (standby).

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