Installation Manual

DCT6200/DCT6208 High Definition Cable Receiver

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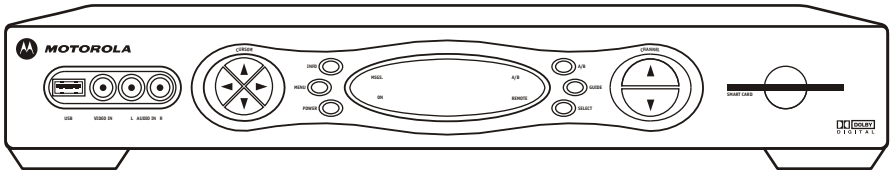
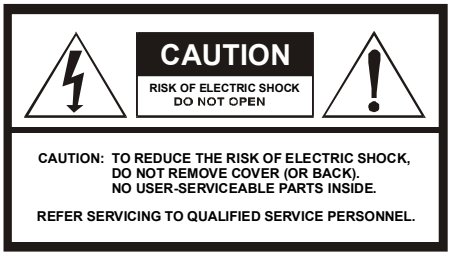
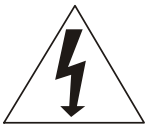




Caution

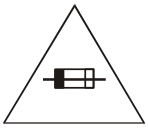
These servicing instructions are for use by qualified personnel only. To reduce the risk of electrical shock, do not perform any servicing other than that contained in the Installation and Troubleshooting Instructions unless you are qualified to do so. Refer all servicing to qualified service personnel.

Special Symbols That Might Appear on the Equipment



This symbol indicates that dangerous voltage levels are present within the equipment. These voltages are not insulated and may be of sufficient strength to cause serious bodily injury when touched. The symbol may also appear on schematics.

The exclamation point, within an equilateral triangle, is intended to alert the user to the presence of important installation, servicing, and operating instructions in the documents accompanying the equipment.



For continued protection against fire, replace all fuses only with fuses having the same electrical ratings marked at the location of the fuse.

This equipment operates over the marked Voltage and Frequency range without requiring manual setting of any selector switches. Different types of line cord sets may be used for connections to the mains supply circuit and should comply with the electrical code requirements of the country of use. The line cord provided with the equipment is acceptable for use with NEMA Style 5-15R ac receptacles supplying nominal 120 Volts.

WARNING: TO PREVENT FIRE OR SHOCK HAZARD, DO NOT EXPOSE THIS APPLIANCE TO RAIN OR MOISTURE. 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.

CAUTION: TO PREVENT ELECTRICAL SHOCK, DO NOT USE THIS (POLARIZED) PLUG WITH AN EXTENSION CORD, RECEPTACLE, OR OTHER OUTLET UNLESS THE BLADES CAN BE FULLY INSERTED TO PREVENT BLADE EXPOSURE.

CAUTION: TO ENSURE REGULATORY AND SAFETY COMPLIANCE, USE ONLY THE PROVIDED POWER CABLES.

It is recommended that the customer install an AC surge arrestor in the AC outlet to which this device is connected. This is to avoid damaging the equipment by local lightning strikes and other electrical surges.

FCC Compliance

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 when the equipment is operated in a residential environment. This equipment generates, 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. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense. Any changes or modifications not expressly approved by Motorola could void the user's authority to operate this equipment under the rules and regulations of the FCC. 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 of the following measures:

- Re-orient or relocate the receiving antenna
- Increase the separation between the equipment and receiver
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

You may find the following booklet, prepared by the Federal Communication Commission, helpful: *How to Identify and Resolve Radio-TV Interference Problems*, Stock No. 004-000-0342-4, U.S. Government Printing Office, Washington, DC 20402.

Changes or modification not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Canadian Compliance

This Class B digital apparatus meets all requirements of the Canadian Interference-Causing Equipment Regulations.
Cet appareil numérique de la classe B respects toutes les exigences du Règlement sur le matériel brouilleur du Canada.

FCC Declaration of Conformity

According to 47 CFR, Parts 2 and 15 for Class B Personal Computers and Peripherals; and/or CPU Boards and Power Supplies used with Class B Personal Computers, Motorola, Inc., 6450 Sequence Drive, San Diego, CA 92121, 1-800-225-9446 or 101 Tournament Drive, Horsham, PA 19044, 1-888-944-4357, declares under sole responsibility that the product identifies with 47 CFR Part 2 and 15 of the FCC Rules as a Class B digital device. Each product marketed is identical to the representative unit tested and founded to be compliant with the standards. Records maintained continue to reflect the equipment being produced can be expected to be within the variation accepted, due to quantity production and testing on a statistical basis as required by 47 CFR 2.909. Operation is subject to the following condition: This device must accept any interference received, including interference that may cause undesired operation. The above named party is responsible for ensuring that the equipment complies with the standards of 47 CFR, Paragraphs 15.107 to 15.109

Repairs: If repair is necessary, call the Motorola Repair Facility at 1-800-227-0450 for a Return for Service Authorization (RSA) number before sending the unit. The RSA number must be prominently displayed on all equipment cartons. Pack the unit securely, enclose a note describing the exact problem, and a copy of the invoice that verifies the warranty status. Ship the unit PRE-PAID to the following address:

Motorola, Inc.
Attn: RSA #_____
5964 E. 14th Street
Brownsville, TX 78521

NOTE TO CATV SYSTEM INSTALLER: This reminder is provided to call CATV system installer's attention to Article 820-40 of the NEC that provides guidelines for proper grounding and, in particular, specifies that the cable ground shall be connected to the grounding system of the building, as close as possible to the point of cable entry as practical.

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Section 1

Introduction

The Motorola DCT6200 series of digital set-tops targets high definition (HD) video and digital video recorder (DVR) cable services. The digital set-top family offers advanced capabilities that include a high-end microprocessor, expanded memory, and enhanced graphics.

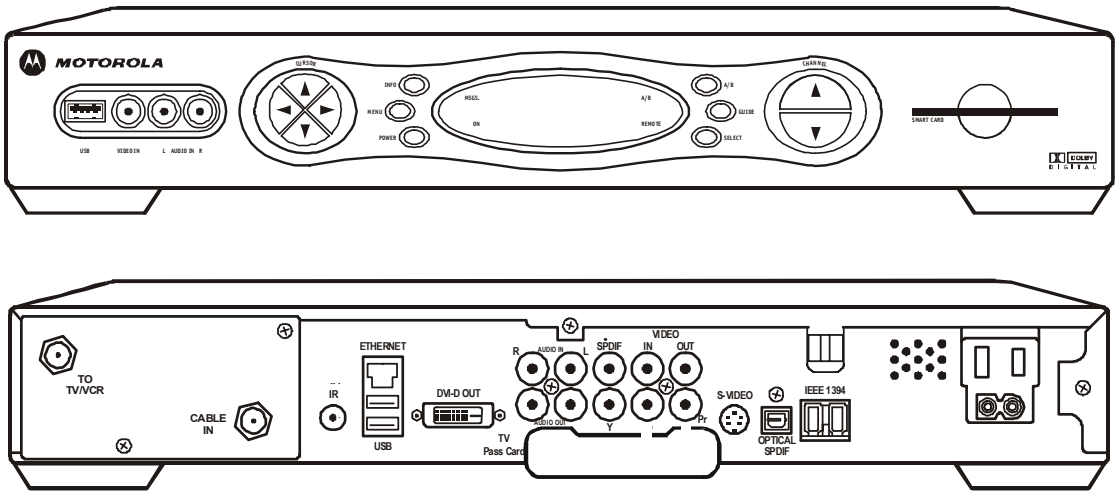
The DCT*:

- Initiates, authorizes, and facilitates the purchase of on-demand programming services
- Decodes high definition television (HDTV) video
- Outputs HDTV in multiple modes
- Enables high-quality video and surround-sound audio
- Incorporates DVR services for controlling live TV and seamless integration with EPG (DCT6208 only)
- Includes a built-in DOCSIS modem for IP services

In this Installation Manual, DCT refers to both the DCT6200 and DCT6208 High Definition Cable Receivers.*

The *DCT6200* is a high-end digital set-top with HD decode capabilities. The *DCT6208* offers the same capabilities as the DCT6200 with an added internal 80 GB hard disk drive and DVR functionality. The DVR offers the ability to pause and time shift live video and allows a seamless experience for recording from the resident electronic programming guide (EPG). As with all Motorola digital set-tops, the hardware features are enabled by core operating and third party application software.

Figure 1-1
DCT* front and rear views



Standard Features

The Motorola DCT* offers the following standard features:

- Two tuners up to 860 MHz
- ITU standard 64/256 QAM/FEC/enhanced adaptive equalizer
- Clear analog channel processor with BTSC decoder
- MPEG—2 main profile® high level video processor
- ATSC standard Dolby® AC-3® audio processor
- Triple-Tuner™ architecture supports simultaneous internet protocol (IP) connection while processing video (software enabled)
- Data Over Cable Service Interface Specification (DOCSIS) compliant integrated cable modem
- DES based encryption/DCII access control
- Out-of-band data receiver (70-130 MHz) 2.048 Mbps
- 16 MB Flash memory
- 64 MB SDRAM (128 MB optional)
- DVI connector
- IEEE 1394 connectors (dual)
- Audio/Video input ports (front and rear)
- Component Output (Y Pb Pr)
- S-Video output
- S/PDIF-Dolby AC-3 electrical or optical output — Dolby Digital audio interface
- Universal Serial Bus (USB) port (dual connector interface) — 2 rear, 1 front
- 10/100 Base-T Ethernet Port (RJ-45)
- RF and baseband (video and L/R audio) output ports
- On-board real-time RF return (DOCSIS compliant)
- Renewable security connector
- Smart Card interface for electronic commerce
- Infra-Red (IR) blaster port
- Switched accessory outlet
- Messaging capabilities
- Digital diagnostics
- 32-bit graphics
- Analog/digital video scaling (picture in graphics)
- 2-D/3-D graphics support in hardware
- Macrovision copy protection

- 4 digit, 7 segment LED display
- Full feature access from front panel

High Definition Video

Both the DCT6200 and DCT6208 offer high-definition video capabilities through multiple outputs:

- DVI
- Component Video (YPbPr)
- IEEE 1394

Digital Video Recorder (DCT6208 Only)

The DVR functionality of the DCT6208 provides subscribers with on-demand viewing control for both standard and HDTV programming.

With the DVR, subscribers can:

- Record up to 60 hours of standard TV or 7 to 10 hours of HDTV (dependent upon your transmission bit rate)
- Maintain a personal library of recorded programming, accessed by using the EPG
- Pause, rewind, and fast-forward live TV
- Rewind and replay recorded programs
- Select programs to record across several channels and time slots via integrated EPG

Hard Disk Drive (DCT6208 Only)

The DCT6208 is fully equipped with an integrated 80 GB hard drive to support DVR functionality.

The DCT6200 series also features a 1394 Firewire digital interface that will in the future enable external hard-drive expansion for increased storage or connection to future networked video devices.

Optional Features

- Expansion dynamic random access memory (128 MB DRAM)
- Expansion flash memory (32 MB)
- RF Bypass switch
- IR Blaster transmitter
- A/B Switch module

Using This Manual

This manual provides instructions to install and configure a DCT*:

Section 1	**Introduction** provides a product description, a list of related documentation, the technical helpline telephone number, and the repair/return procedure.
Section 2	**Overview** describes the DCT* and provides an overview of its use. This section also identifies the front-panel displays and switches and describes the rear-panel features.
Section 3	**Installation** provides instructions on how to install the DCT* in a subscriber location and perform operational tests.
Section 4	**Diagnostics** provides instructions on accessing and interpreting the built-in diagnostics.
Section 5	**Troubleshooting** provides information on common error conditions and their resolution.
Appendix A	**Specifications** provides the DCT*'s technical specifications and **Features** lists the features of the DCT*.
Appendix B	**Connection Record** provides a diagram for recording the connections between the DCT* and other devices.
Abbreviations and Acronyms	The **Abbreviations and Acronyms** list contains the full spelling of the short forms used in this manual.

Related Documentation

The following documentation may be helpful when operating the DCT*:

- *DCT6200/DCT6208 User Guide*
- User documentation for the remote control, audio receiver, TV, and other components

Separate instruction manuals are available for associated components.

Document Conventions

Before you begin working with this manual, familiarize yourself with the stylistic conventions used in this manual:

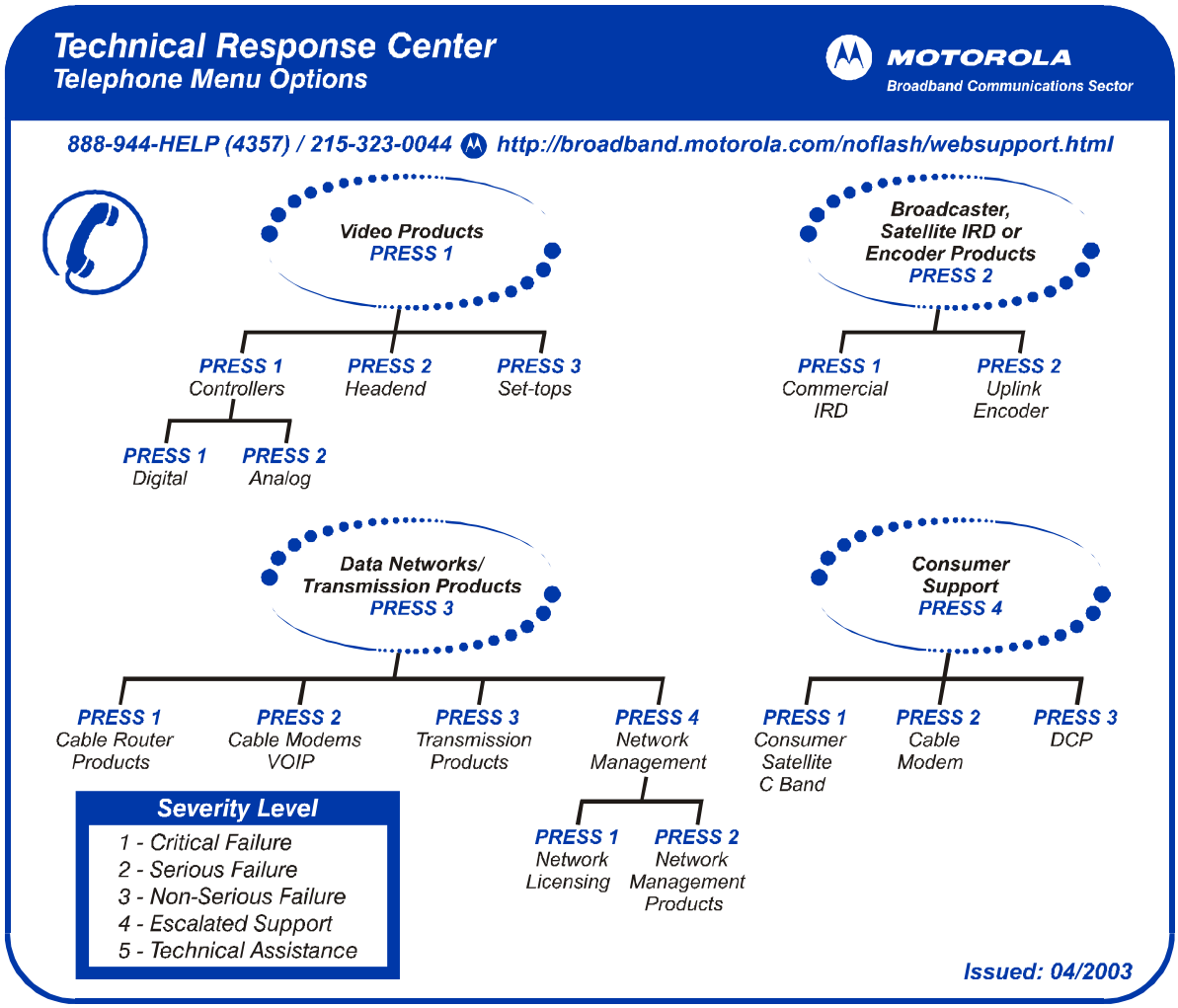
SMALL CAPS	Denotes silk screening on the equipment, typically representing front- and rear-panel controls, input/output (I/O) connections, and LEDs
*** (asterisk)**	Indicates that several versions of the same model number exist and the information applies to all models; when the information applies to a specific model, the complete model number is given
Italic type	Used for emphasis
`Courier font`	Displayed text

If You Need Help

If you need assistance while working with the DCT*, contact the Motorola Technical Response Center (TRC):

- Inside the U.S.: **1-888-944-HELP** (**1-888-944-4357**)
- Outside the U.S.: **215-323-0044**
- Online: http://broadband.motorola.com/noflash/websupport.html.

The TRC is open from 8:00 AM to 7:00 PM Eastern Time, Monday through Friday and 10:00 AM to 5:00 PM Eastern Time, Saturday. When the TRC is closed, emergency service *only* is available on a call-back basis. Web Support offers a searchable solutions database, technical documentation, and low priority issue creation/tracking 24 hours per day, 7 days per week.



Calling for Repairs

If repair is necessary, call the Motorola Repair Facility at **1-800-227-0450** for a Return for Service Authorization (RSA) number before sending the unit. The RSA number must be prominently displayed on all equipment cartons. The Repair Facility is open from 8:00 AM to 5:00 PM Central Time, Monday through Friday.

When calling from outside the United States, use the appropriate international access code and then dial **956-541-0600** to contact the Repair Facility.

When shipping equipment for repair, follow these steps:

1. Pack the unit securely.
2. Enclose a note describing the exact problem. Complete and enclose the checklist provided with the unit.
3. Enclose a copy of the invoice that verifies the warranty status.
4. Ship the unit **PREPAID** to the following address:

   Motorola, Inc.
   c/o Rudolph Miles & Son, Inc.
   Attn: RSA # _____
   5964 E. 14th Street
   Brownsville, TX 78521

Section 2

Overview

This section provides an overview of DCT* features and functionality. The DCT*:

- Supports existing entertainment, analog, on-demand, and digital broadcast interactive services
- Provides high definition video output
- Supports DVR services (DCT6208 only)
- Includes two 6 MHz tuners with analog AMS-VSB, digital MPEG-2, and digital DOCSIS data-receive capability for services such as web enhanced TV (application dependent)
- Supports the S-Video and Sony Philips Digital Interface Format (SPDIF) AC-3 electrical and optical consumer electronic interfaces
- Supports Ethernet and Universal Serial Bus (USB) for home networking applications (future capability)
- Is adaptable to various software platforms

In this Installation Manual, DCT refers to both the DCT6200 and DCT6208 High Definition Cable Receivers.*

Triple Tuner

The DCT* has a unique Triple Tuner™ architecture. One tuner is dedicated to video services, another to the DOCSIS channel for high-speed data services, and the third tuner is used for the out-of-band control channel.

The DCT6208 can record one live program through a single video tuner, which allows a subscriber to record a live program while simultaneously watching a recorded program.

Front Panel

The front panel contains selection and tuning buttons, various displays, the power switch, and connectors for USB, audio and video. The front panel controls provide functional navigation of the DCT* 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.

Figure 2-1
Front panel

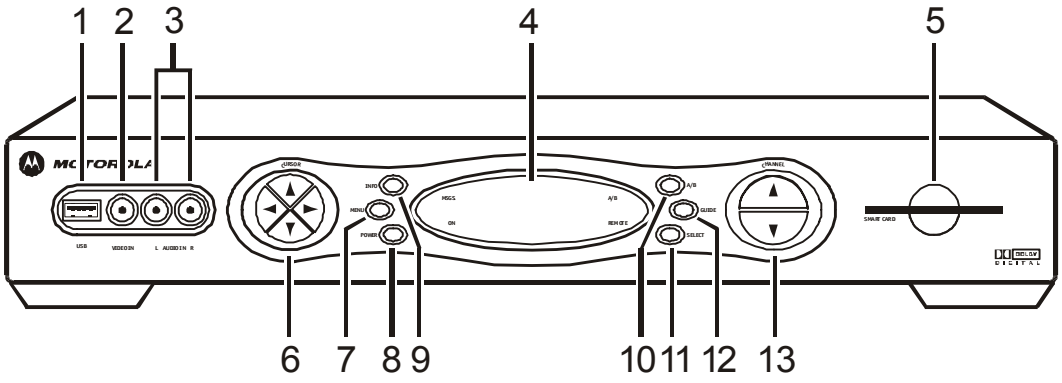


Table 2-1 describes the front-panel controls and LEDs.

Some connectors on the front panel are not enabled and require the support of the application software.

Table 2-1
Front panel

Key	Feature	Function
1*	USB	The Universal Serial Bus (USB) connector is used to support devices such as keyboards, joysticks, scanners, disk storage, PCs, printers, and digital cameras.
2*	VIDEO IN	The VIDEO IN connector accepts baseband video from a VCR, camcorder, or other video device.
3*	L AUDIO IN R	This audio input connector pair accepts audio from a VCR, camcorder, or other audio device.

Key	Feature	Function
4	**LED**	Displays the channel number or time of day. There are four indicator lights on the LED screen: MSGS. — the DCT* has received messages for you to read ON — the DCT* is powered on A/B — the RF bypass is active REMOTE — the remote control is in use
5*		This interface supports electronic commerce activity using a Smart Card.
6		Moves the cursor around the program guide and menu screens.
7		Displays the main menu.
8		Turns the device on or off.
9		Displays the current channel and program information (not supported by all applications).
10		Use to manually enable the RF bypass function.
11		Selects menu options, pay-per-view events or programs from the program guide.
12		Displays the program guide.
13		Changes the channels by moving up or down.

** These connectors are not enabled and require the support of the application software.*

Rear Panel

The rear panel contains a switched power outlet; connectors for video, audio, and RF cabling; data output; and modem and data interface connectors.

Some connectors on the rear panel are not enabled and require the support of the application software.

Figure 2-2
Rear panel

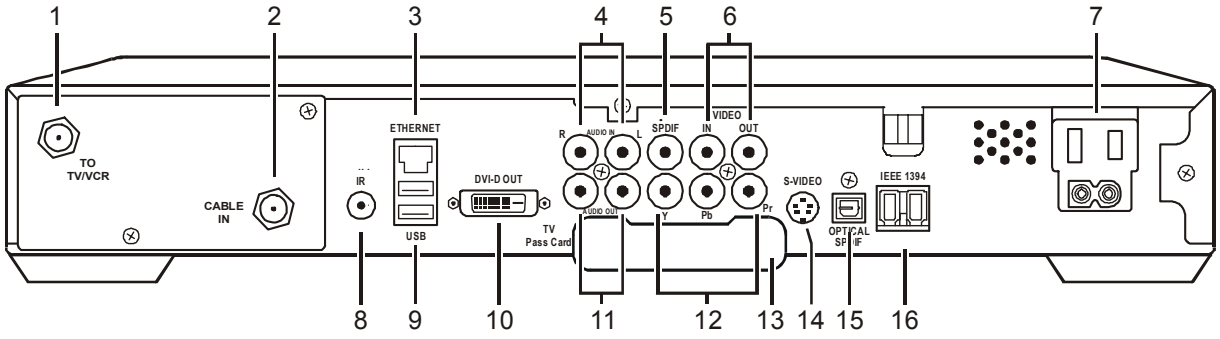
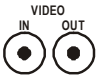
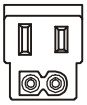
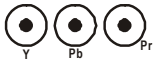
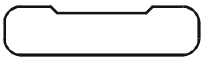


Table 2-2
Rear panel connections

Key	Item	Function
1		F-type connector used to connect the DCT* to a standard TV or VCR operating on channel 3 or 4.
2		F-type connector used for the coaxial cable input from service provider (input to integrated RF return).
3*		Ethernet 10Base-T port supports PC networking.
4*		RCA jacks for loop-through audio from audio equipment.
5		The SPDIF connector is a digital output connection that carries Dolby Digital 5.1 audio or PCM audio.
6		VIDEO IN – RCA jack connects the DCT* to a composite (baseband) video input from a TV, VCR, camcorder, or other video device. *Not enabled at this time.* VIDEO OUT – RCA jack that delivers video to a device such as a VCR or TV. Enabled.
7		AC power outlet that can be configured as a switched or unswitched outlet; and a two-pronged plug for attaching a power cord.
8		Mini phono jack enabling the DCT* to control a VCR using an optional low power IR Blaster transmitter (not all electronic program guides support this feature).
9*		The Universal Serial Bus (USB) supports such devices as keyboards, joysticks, scanners, disk storage, PCs, printers, and digital cameras.

Key	Item	Function
10		The Digital Video Interface (DVI) connector enables you to connect the DCT* to an HDTV.
11		Left and right audio RCA jacks used for stereo audio output.
12		RCA jack connectors enable you to connect the DCT* to an HDTV.
13		For future use.
14		Coaxial cable connector used to deliver high quality video to external devices that accept S-Video inputs, such as a high-end VCR or TV.
15		The OPTICAL SPDIF connector is an optical digital output connection that carries Dolby Digital 5.1 audio or PCM audio.
16		IEEE 1394 connector for connecting to audio and video devices such as a DTV.

** These connectors are not enabled and require the support of the application software.*

Section 3

Installation

This section provides instructions for cabling the DCT* and checking its operation. The cabling diagrams assist you with the installation.

In this Installation Manual, DCT refers to both the DCT6200 and DCT6208 High Definition Cable Receivers.*

Important Safety Considerations

When transporting or installing the DCT*, follow these important safety considerations:

- Handle DCT*s carefully – mishandling can damage the hard disk drive
- To avoid damage due to condensation, avoid drastic temperature changes when transporting the DCT*
- To prevent overheating, be sure to advise the subscriber to allow adequate ventilation and airflow around the DCT*:
  - Position the DCT* with at least 2 inches of space above and on all sides
  - Do not block the slots and openings in the DCT*
  - Do not place anything on top of the DCT*
  - Do not position the DCT* in an enclosed space that would restrict airflow around the unit
  - Do not position the DCT* near any external heat source that could raise the temperature around the unit

Before You Begin

Before you move or change components on the subscriber entertainment system, review the installation instructions, gather the required items, and complete the tasks listed below:

- Determine if the subscriber system requirements include an RF Bypass module or A/B switch. Installation instructions are provided with the module if purchased separately.
- Determine if you are connecting the DCT* to a standard TV, a composite (baseband) monitor, or a component monitor.
- Verify that you have the necessary audio/visual cables for the selected installation.
- Place the DCT* on a smooth, flat surface and remove any obstructions that could interfere with the free flow of air over, under, or around it.

Installation Overview

CAUTION!

Be sure to advise the subscriber that, to prevent overheating:

- Position the DCT* with at least 2 inches of space above and on all sides
- Do not block the slots and openings in the DCT*
- Do not place anything on top of the DCT*
- Do not position the DCT* in an enclosed space that would restrict airflow around the unit
- Do not position the DCT* near any external heat source that could raise the temperature around the unit

To install the DCT*:

1 If an add-on module is required and was not installed previously, install it now.

2 Determine if you are connecting the DCT* to a:

High definition TV (HDTV) or monitor	Use the component video (Y, Pb, and Pr), DVI, or IEEE 1394 outputs. *No other video connection supports HDTV.*
Standard definition TV	Connect the composite VIDEO connector using an RCA phono cable or Connect the RF TO TV/VCR connector using a 75-ohm coaxial cable with F-type connectors or Connect the S-VIDEO connector using a S-video cable

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

- If the receiver or TV supports SPDIF, use the coaxial or optical SPDIF audio outputs on the DCT*.
- Otherwise, use the baseband left and right AUDIO OUT connectors.

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

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

6 Determine if you are connecting the DCT* to a data device (see "Data Device Connections" in this section). For installation details, refer to instructions included with the data device.

7 Perform the boot cycle, including the download to the DCT*, as described in "Boot Cycle" in this section.

8 Perform the operational check for the remote control.

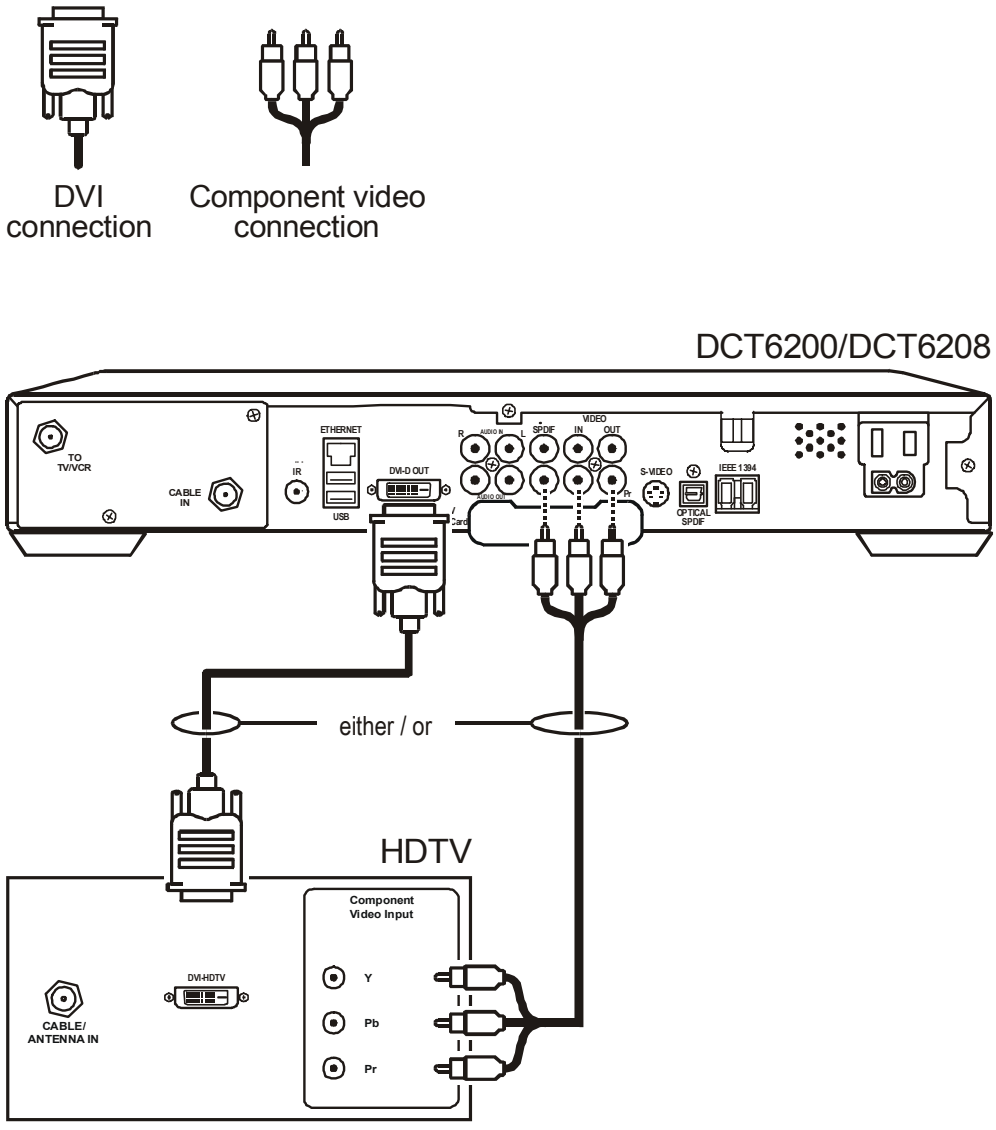
9 Optimize the high definition settings. See "Optimizing the High Definition Settings" in this section.

10 Verify that the appropriate configuration information has been downloaded using the addressable controller, such as the DAC 6000.

Cabling the DCT* to an HDTV

Figure 3-1 illustrates video cabling for an HDTV:

Figure 3-1
Cabling to an HDTV



Audio/Video Cabling

The DCT* can deliver Dolby AC-3 audio to a Dolby Digital audio receiver using the SPDIF coaxial or optical connector. When connecting to an audio receiver, depending on the capabilities of the audio receiver, you can use the left/right RCA audio outputs on the DCT*:

Baseband If the audio receiver does not support Dolby Digital, use the baseband left and right RCA audio connections to interface to the audio receiver.

SPDIF The SPDIF port carries the audio in PCM or Dolby AC-3 format

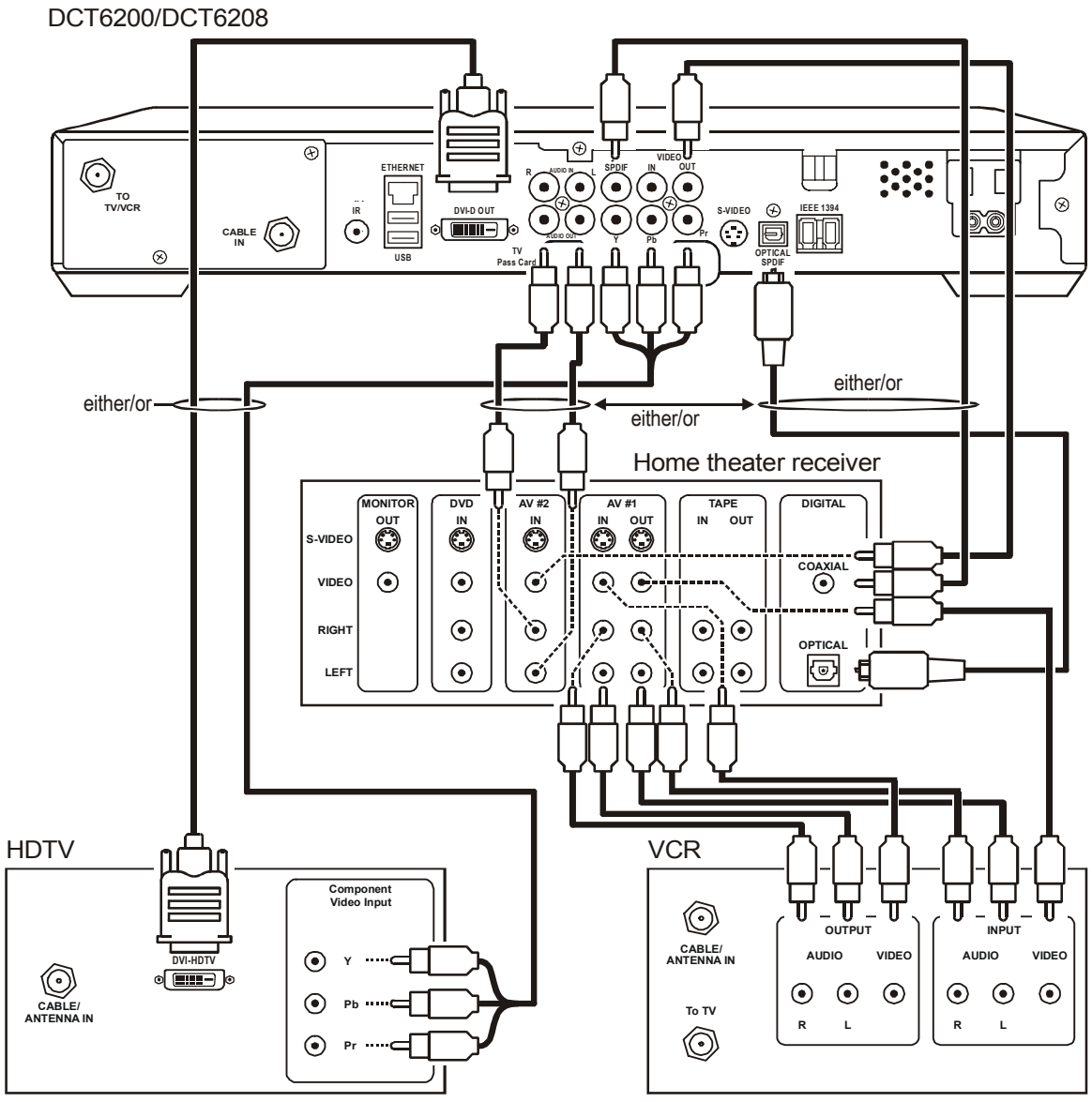
The cabling diagrams show sample audio/video connections to an audio receiver, where the receiver functions as an audio/video router. When connecting to an audio receiver, reference its installation instructions for directions on connecting to baseband and SPDIF ports.

The VCR and TV receive their audio/video signals from the currently selected input device on the audio receiver. This is important when the subscriber has another audio/video device such as a DVD player, a secondary VCR, a CD player, or other electronic component. We recommend connecting the TV to the monitor output so on-screen menus for the receiver can be displayed. (In many cases the receivers themselves have interactive on-screen menus).

Cabling the DCT* to an HDTV and Audio/Video Receiver

Figure 3-2 illustrates cabling the DCT* to an HDTV and audio/video receiver:

Figure 3-2
Cabling to an HDTV and audio/video receiver

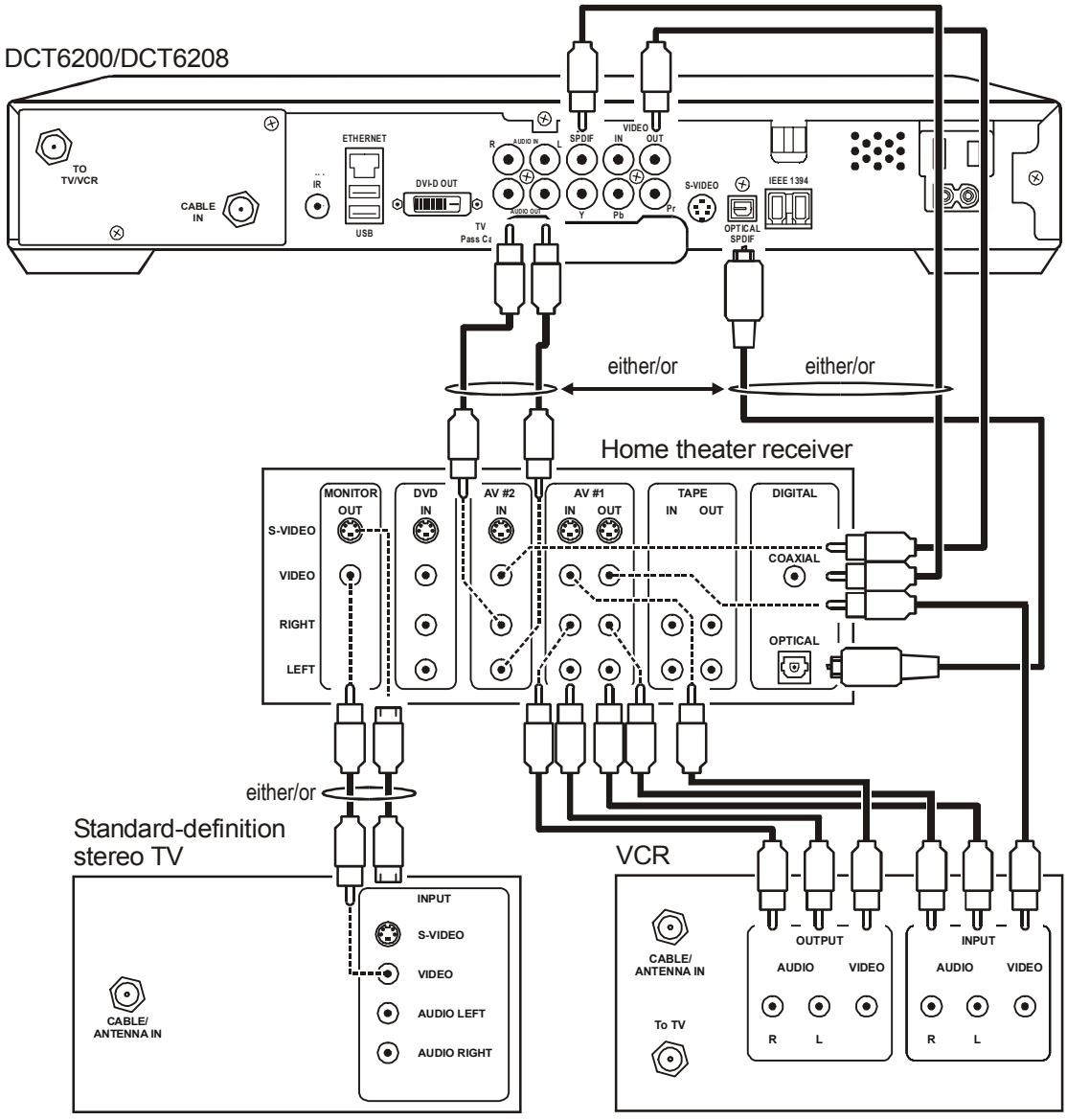


If the receiver can check the baseband and SPDIF ports for appropriate channels, connect both the baseband and SPDIF connections. Otherwise, do not connect both the baseband left/right RCA connections and the RCA SPDIF digital connection. The baseband connections are not necessary because the SPDIF port carries audio for both digital and analog channels providing for a single audio interface.

Cabling the DCT* to a Standard Definition TV and Audio/Video Receiver

Figure 3-3 illustrates video cabling for a standard-definition stereo TV:

Figure 3-3
Cabling to a standard-definition stereo TV



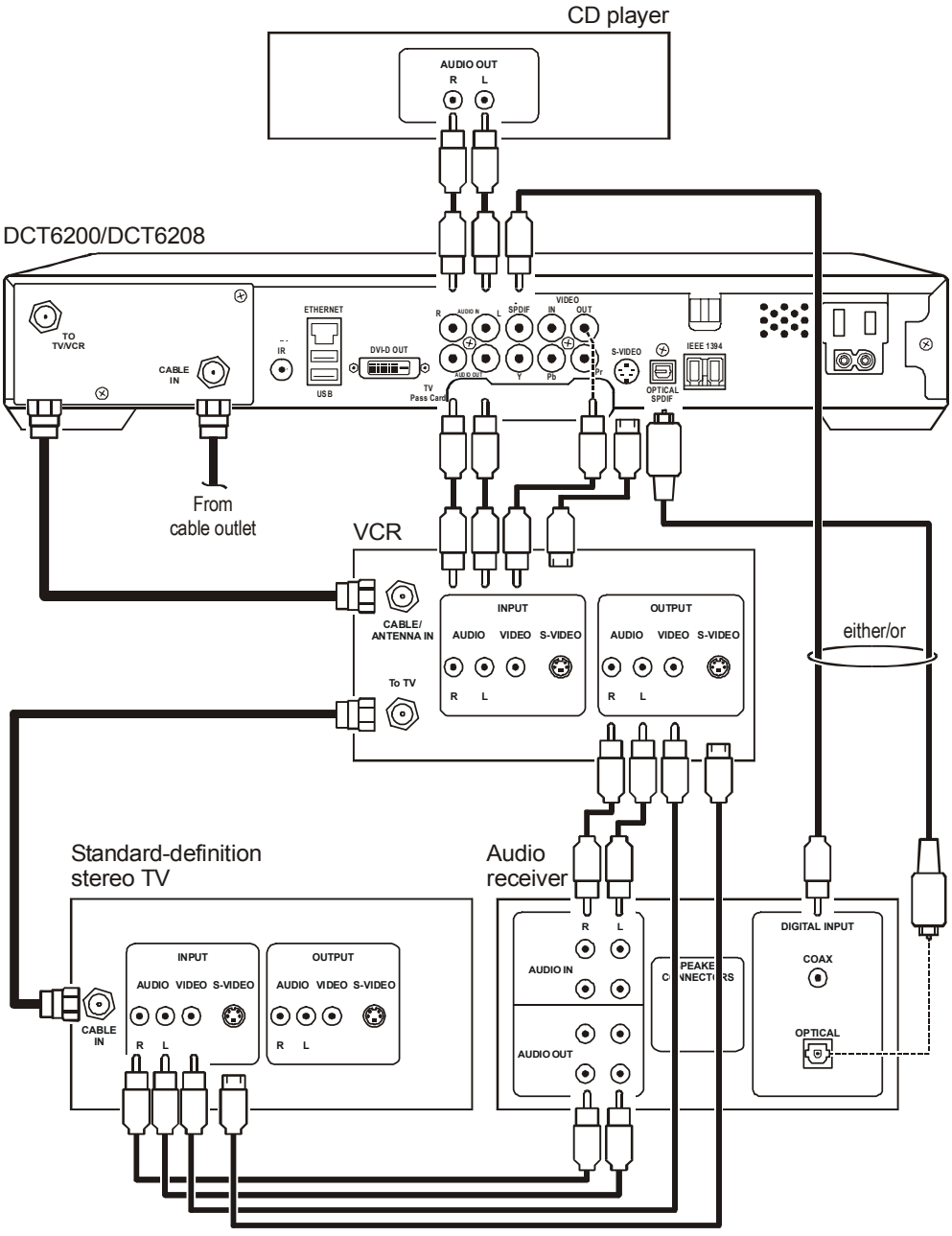
Because some entertainment equipment cannot simultaneously support baseband composite video and S-Video, never simultaneously connect both video inputs.

This connection method does not support HDTV. For more information, see "Cabling the DCT to an HDTV."*

Cabling the DCT* to a Standard Definition TV and Audio Receiver

To connect to an audio receiver, such as a home mini system, follow a daisy-chain convention. The audio/video configuration illustrated enables digital stereo recording, including Dolby Surround® sound. Use only one set of RCA input connectors on the stereo. Figure 3-4 illustrates the audio and video paths:

Figure 3-4
Cabling an audio receiver



The video connections shown in this illustration do not support HDTV. For more information, see "Cabling the DCT to an HDTV."*

Cabling the Optional RF Bypass Switch

The RF Bypass switch option supports modulated video and audio outputs for a variety of configurations that enable you to meet the needs of individual subscribers.

The RF Bypass switch is a factory option and requires specific platform support software.

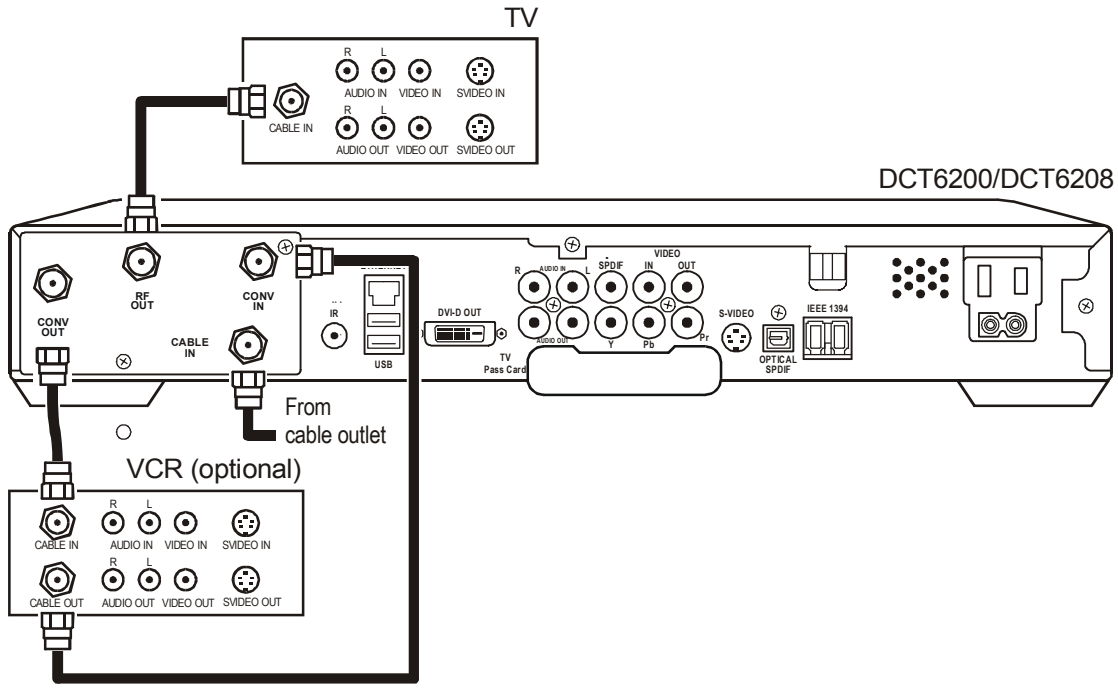
The RF Bypass switch enables the cable signal to pass directly to a cable-ready TV, bypassing the DCT*. The bypass mode is automatically initiated under one of three conditions: when the DCT* loses power, when it is turned off from the front panel, or when the user manually activates the switch by pressing the A/B key. If the DCT* loses power or is turned off, the subscriber can continue viewing the clear analog channels on the cable system. Activating bypass mode enables you to tape a tuned channel from the DCT* while watching a different clear channel that is bypassed to the TV.

Proper RF Bypass operation requires:

- Special configuration data from the addressable controller
- Proper user interface settings in the Electronic Program Guide (EPG).

Figure 3-5 illustrates RF cabling to an optional VCR using the RF Bypass switch. When a VCR is not present, install the supplied jumper cable from the **CONV OUT** to **CONV IN** on the RF Bypass switch.

Figure 3-5
RF Bypass switch



The DCT RF output does not carry stereo for digital channels. All VCR recordings made using this connection will be in mono for digital channels.*

The video connections shown in this illustration do not support HDTV. For more information, see "Cabling the DCT to an HDTV."*

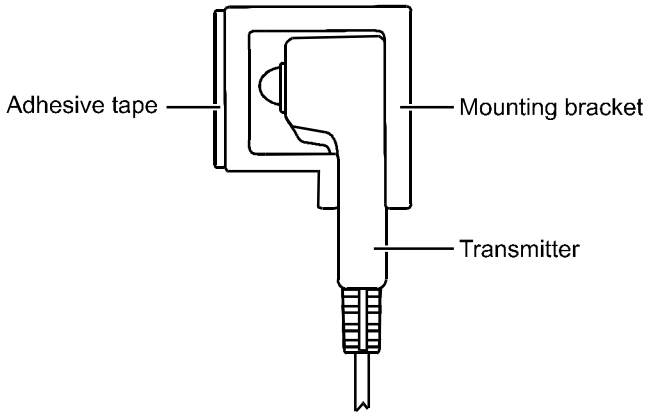
Installing the Optional IR Blaster

The optional IR Blaster provides control of the subscriber VCR from the DCT*. It consists of a low-power infrared transmitter attached to a six-foot cord and a mounting bracket. The mounting bracket is a clear plastic holder that has a pad of adhesive tape that enables you to install the IR Blaster near the VCR IR receiver. A mini-pin connector at the end of the cord connects the IR Blaster to the DCT*. The IR Blaster is sold separately as an accessory item.

The availability and functionality of the IR Blaster depends on the installed application software. Some EPGs may not support the IR Blaster.

Figure 3-6 illustrates the IR transmitter installed in the mounting bracket:

Figure 3-6
IR transmitter installed in mounting bracket



Once installed, the IR Blaster is activated automatically through the electronic program guide. Individual VCR codes are broadcast through the out-of-band data channel and are updated periodically as new codes are added.

The procedure for installing the IR Blaster is described in the following paragraphs.

Locating the IR Receiver on the VCR

The IR receiver area is not visible on some VCRs. To locate it:

- Obtain a piece of opaque material, such as a 3- by 5-inch index card.
- Use the card to block off areas of the VCR where the IR receiver might be located. Try to turn the VCR on and off with the remote control pointed directly at it, and close enough to reduce the possibility that the receiver will see IR reflections.
- Note the blocked area where the VCR is unresponsive to the remote control. This region contains the sensor and can be marked by loosely taping the index card to the area.

Because the IR Blaster radiates in an area approximately 40 degrees wide, you do not need to be precisely on target with the receiver. You may prefer to offset the location of the IR Blaster transmitter so that it is less likely to interfere with operation of the VCR remote control.

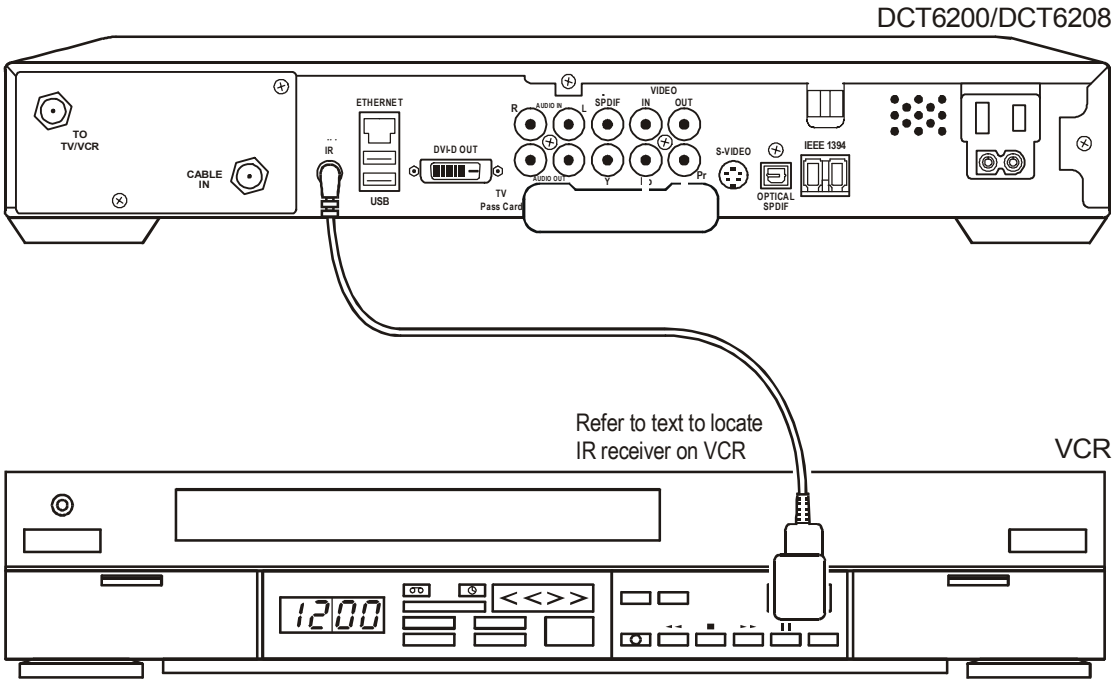
Connecting the IR Blaster

To connect the IR Blaster:

1 Fit the transmitter into the mounting bracket (refer to Figure 3-6).

2 Plug the mini-pin connector into the IR jack on the rear panel of the DCT* rear panel as illustrated in Figure 3-7:

Figure 3-7
IR Blaster installed



3 Remove the adhesive tape cover from the mounting bracket.

4 Position and press firmly to attach the mounting bracket to the IR receiver on the VCR. Be careful to route the wire so that it does not prevent loading tapes.

Checking the IR Blaster

The IR Blaster is now located near the receiver and the VCR can be controlled through the DCT*. As a final check, operate the VCR using the remote control from various positions in the room. If the IR Blaster is obstructing the IR receiver on the VCR, move it slightly.

Data Device Connections

The DCT* provides optional high-speed data services such as Internet access, USB, Ethernet, and more. *The functionality of each data device port requires, and depends on, installed application software.*

The DCT* rear panel provides:

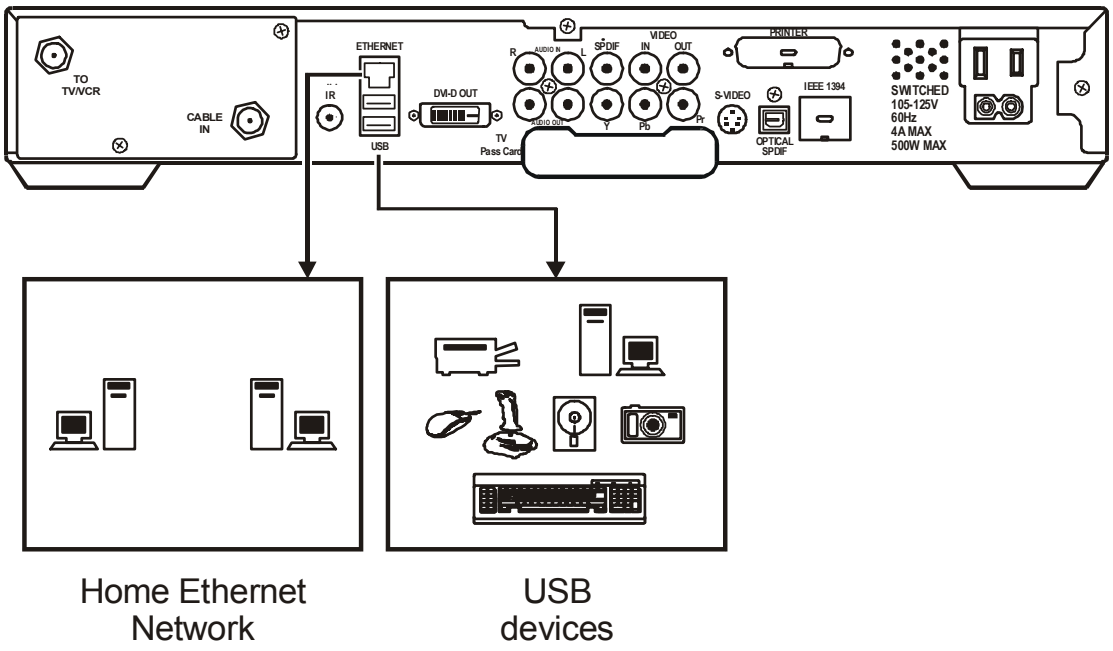
Two USB ports	Can be used to daisy-chain USB devices such as printers and storage devices, or to interface with USB keyboards, joysticks, and other USB peripherals used for PCs. An additional USB port is available on the front panel.
Ethernet 10Base-T	This RJ-45 port can be used to connect the DCT* to a home network.

The DCT* front panel provides:

USB port	Can be used in the same manner as the USB ports on the rear panel.
ISO 7816 Smart Card interface	Can be used for electronic commerce.

Figure 3-8 illustrates sample data devices that you can interface through the DCT*:

Figure 3-8
Sample data devices you can connect to the DCT*



Boot Cycle

After connecting the proper cabling to the DCT*, plug the power cord into the DCT* and electrical wall outlet. Begin performing the boot cycle procedure:

- After a few moments, the LED displays **HUNT** and then **FR 1**.
- The DCT* searches for the headend out of band (OOB) frequency carrier. If the OOB frequency is not set to 75.25 MHz, the LED flashes **FR 1** and then flashes **FR 2**. This searching process repeats until the correct OOB frequency is found and the required message for the set-top model is acquired.

  Table 3-1 illustrates the LED displays and OOB frequencies:

Table 3-1
LED displays OOB frequencies

Display	Frequency	Description
| dl	**N/A**	OOB network download in progress
EF	**N/A**	Erasing Flash memory
FP	**N/A**	Flash memory is being programmed
____	**N/A**	Network download complete
Hunt	**N/A**	Hunting for OOB frequency
FR 1	**75.25 MHz**	Attempting to lock on frequency 1
FR 2	**104.20 MHz**	Attempting to lock on frequency 2
FR 3	**72.75 MHz**	Attempting to lock on frequency 3
FR 4	**92.25 MHz**	Attempting to lock on frequency 4
FR 5	**98.25 MHz**	Attempting to lock on frequency 5
FR 6	**103.75 MHz**	Attempting to lock on frequency 6
FR 7	**107.25 MHz**	Attempting to lock on frequency 7
FR 8	**107.40 MHz**	Attempting to lock on frequency 8
FR 9	**110.25 MHz**	Attempting to lock on frequency 9
FR 10	**116.25 MHz**	Attempting to lock on frequency 10
Au	**N/A**	Authenticating code object (displays only after download)

- When the correct OOB frequency is acquired, the LED flashes **FR number.**
- When multiple OOB frequencies are used, the DCT* pauses 40 seconds on each valid frequency. The LED displays **dl** and a progress indicator, which identifies a software object download. The progress indicator, or crawling ant, moves one position around the dl display for each segment of download received. If the dl stops moving up and down on the LED for an extended period of time, contact the headend operator.

  The progress indicator usually moves at a consistent rate as segment downloads are received. If all the segments are retrieved in the first pass, the **EF**, **AU** and **FP** messages are displayed on the LED. If segments are dropped, the progress indicator appears to stall and then inch forward after the dropped segments are retired.

The software download may take up to 45 minutes (or longer if the system is experiencing high demand). As long as the progress indicator is spinning, the download is progressing.

When the progress indicator alternates between rapid and sluggish movement, this may indicate that the stream is spinning too fast for existing plant conditions.

- When the software object download is complete, the LED displays:

  EF For up to 60 seconds during flash erasure

  FP For up to 60 seconds during flash programming

- When the LED display is blank, the DCT* is ready for initialization and service authorization using the addressable controller. Verify that the DCT* is powered up or reset within two minutes of a completed download.

Boot Cycle Error Codes

If hardware or software problems occur, the DCT* displays error codes on the LED display. Table 3-2 lists error codes that can occur during boot cycle startup:

Table 3-2
Boot cycle error codes

Code	Description	When Error Occurs	Action Required
Eb 01	Object failed validation	After the LED displays `dl`, indicating validation check failed	Contact headend operator
Eb 02	Download time-out	After cycling twice through the OOB frequencies	None
Eb 03	Flash erase failed	After software object download complete and `EF` is displayed	Replace DCT*
Eb 04	Flash programming failed	After software object download complete and `FP` is displayed	Contact headend operator
Eb 05	Invalid DLC frequency	After the LED displays `dl`, indicating validation check failed	Contact headend operator
Eb 06	Hardware initialization failed	After plugging the DCT* into an electrical outlet to begin the boot cycle	Replace DCT*
Eb 07	Object failed validation	After software object download complete and `FP` is displayed	Contact headend operator
		After a successful software object download and DCT* is reset	No action required because DCT* repeats software object download process
Eb 08	Reserved		None
Eb 09	Check failed	Reset within two minutes of a complete software object download	No action required because DCT* repeats software object download process
Eb 10	SUDB recreation	After plugging the DCT* into an electrical outlet to begin the boot cycle	None

Code	Description	When Error Occurs	Action Required
Eb 11	Failed to lock OOB frequency	After cycling twice through the OOB frequencies (LED then displays `Eb 02` indicating the software object download was unsuccessful)	Ensure proper cable connections
Eb 12	No COAC message received	After cycling twice through the OOB frequencies (LED then displays `Eb 02` indicating the software object download was unsuccessful)	Contact headend operator
Eb 13	No DLC message received	After cycling twice through the OOB frequencies (LED then displays `Eb 02` indicating the software object download was unsuccessful)	Contact headend operator
Eb 14	Bad object type or class	After the LED displays `dl`, indicating failed during attempted download	Contact headend operator
Eb15	No matching Platform ID found	After cycling twice through the OOB frequencies (LED then displays `Eb 02` indicating the software object download was unsuccessful)	Contact headend operator
Eb18	Object size mismatch	After the LED displays `dl`, indicating failed during attempted download	Contact headend operator
Eb19	Object size failed range check	After the LED displays `dl`, indicating failed during attempted download	Contact headend operator
Eb20	Invalid SUDB pointer	After plugging the DCT* into an electrical outlet to begin the boot cycle	None

Operational Check for the Remote Control

The operational check tests the communication link between the remote control and the DCT*. Table 3-3 lists the operational check procedures:

Table 3-3
Operational check

Feature	Testing Procedure
Power on	Press **POWER** to turn on the DCT*.
	Tune to the output channel of the DCT* (channel 3 or 4).
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 DCT* does not operate properly, refer to Section 5, “Troubleshooting”.

Optimizing the High-Definition Settings

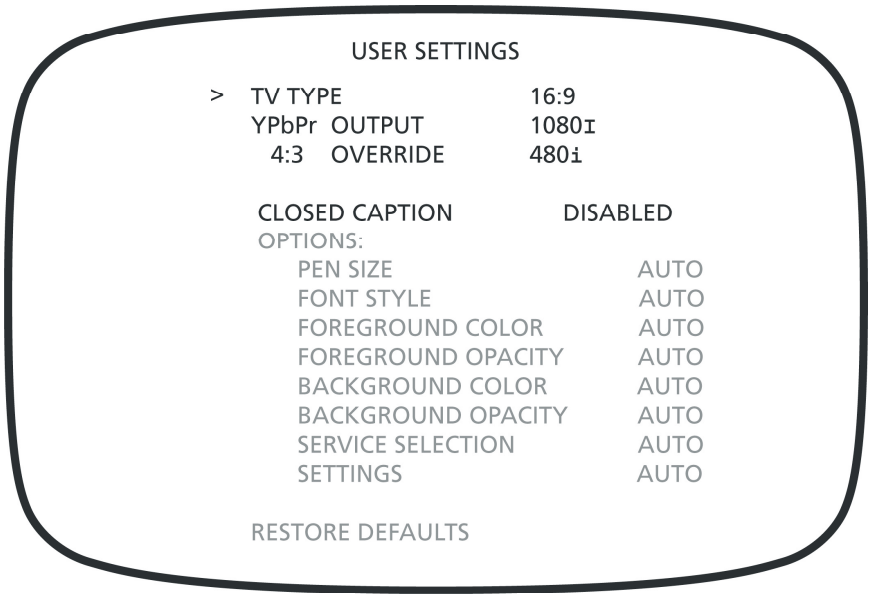
The DCT* delivers high-quality component video for high definition TVs using the YPbPr (component) and DVI-D video connectors. This subsection describes how to use the on-screen menu to optimize standard- and high-definition video based on subscriber preferences and configure the high definition settings.

Before you optimize the DCT* output settings:

- Connect the DCT* to other home entertainment devices
- Plug the DCT* into a power outlet
- Perform the boot cycle
- Initialize the DCT* and authorize services
- Turn the DCT* off
- Turn the TV on

To optimize the DCT* output settings using the on-screen display:

1 Power off the DCT* and then immediately press the **MENU** key on the front panel. If the TV is on, the on-screen menu lists the settings you can configure:



2 Use the remote control or the cursor keys on the front panel to navigate the on-screen menus:

- 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.

If the on-screen menu does not display on the HDTV screen, the TV may be off or it may not support the default video output setting. Use the DCT front panel LED to view and change the settings.*

The high-definition settings are:

Setting	Description
TV Type	Sets the aspect ratio. The LED panel displays the type you select. Defaults to 16:9. Options are 16:9 for wide screen TVs or 4:3 LETTERBOX or 4:3 PAN/SCAN for standard TVs: ▪ 4:3 LETTERBOX fits high-definition programming on the screen by placing black bars at the top and bottom. ▪ 4:3 PAN/SCAN fills the screen by cropping the left and right edges of high-definition programming.
DVI/YPbPr Output	Sets the video display format for the component video outputs. The LED panel displays the format you select. Defaults to 1080i. Options are 1080i, 720p, 480p, or 480i. Some TVs only support certain display formats. Check your TV user manual for more information. If you are not using an HDTV, selecting a format other than 480i causes the on-screen display to go blank. If this occurs, you can view the settings on the LED panel to change the format back to 480i. If you are not using the DVI video connection, the DVI/YPbPr OUTPUT setting displays as YPbPr OUTPUT.
4:3 Override	Sets the display format for 4:3 standard-definition programming. If the YPrPb Output is set to 1080i, 720p, or 480p, this setting defaults to 480i. If the YPrPb Output is set to 480i, this setting defaults to OFF and cannot be changed. Options are: ▪ **OFF** displays non-high-definition programs having a 4:3 aspect ratio in wide screen format. On an HDTV, black bars display on the left and right of the picture. Selecting OFF for a 4:3 TV may result in a small picture with black bars around it. ▪ **480i** displays non-high-definition programs in their original 480i format. Some TVs cannot display 480i format on their component video inputs (YPbPr). Check the TV user manual for more information. Graphics overlaying the video are displayed. ▪ **480p** converts non-high-definition TV programs to a higher-quality 480p format. Some TVs cannot display 480p format on their component video inputs (YPbPr). Check the TV user manual for more information. Graphics overlaying the video are not displayed.
Closed Caption	Turns closed captions off or on. The LED panel displays the status of the closed captions. Defaults to DISABLED. Options are ENABLED or DISABLED.
Pen Size	Sets the font size for closed captions. Defaults to AUTO. Options are AUTO, STANDARD, LARGE, or SMALL.
Font Style	Sets the font style for closed captions. Defaults to AUTO. Options are AUTO, MONO SERIF, PROPORTION SERIF, MONO NO SERIF, PROPORTION NO SERIF, CASUAL, CURSIVE, or SMALL.
Foreground Color	Sets the foreground color for closed captions. Defaults to AUTO. Options are AUTO, WHITE, BLACK, RED, GREEN, BLUE, YELLOW, MAGENTA, or CYAN.
Foreground Opacity	Sets the opacity of the closed captions foreground. Defaults to AUTO. Options are AUTO, TRANSPARENT, TRANSLUCENT, SOLID, or FLASHING.
Background Color	Sets the background color for closed captions. Defaults to AUTO. Options are AUTO, WHITE, BLACK, RED, GREEN, BLUE, YELLOW, MAGENTA, or CYAN.
Background Opacity	Sets the background opacity for closed captions. Defaults to AUTO. Options are AUTO, TRANSPARENT, TRANSLUCENT, SOLID, or FLASHING.
Service Selection	Sets the service for closed captions. Defaults to AUTO. Options are AUTO, PRIMARY LANGUAGE, SECONDARY LANGUAGE, 3, 4, 5, or 6.

Setting	Description
Settings	Sets the default settings for closed captions (AUTO) or the settings you have configured (USER). Defaults to AUTO. Options are AUTO or USER.
Restore Defaults	Resets the on-screen display options to their default settings.

3 To exit the menu and save your settings, press the **POWER** or **MENU** key.

Graphics Overlaying the Video

The DCT* 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 interactive program guides. The DCT* overlays these graphics whenever the subscriber opens a menu, enables closed captions, or scrolls through a program grid.

Overlaying graphics are not available on all DCT video output and mode combinations.* Table 3-1 summarizes the availability of overlaying graphics for each DCT* video output combination:

Table 3-4
Modes supporting graphics overlay

DVI or YPrPb Output Mode	DCT* Primary Video Output (DVI or YPrPb)	DCT* Secondary Video Output		
		S-Video Out	Composite Out	RF Out
1080i	Graphics overlay supported	Video *only*	Video *only*	Video *only*
720p	Graphics overlay supported	Video *only*	Video *only*	Video *only*
480p	Graphics overlay supported	Video *only*	Video *only*	Video *only*
480i	Graphics overlay supported	Graphics overlay supported	Graphics overlay supported	Graphics overlay supported

The 4:3 Override feature enables you to specify a different Output Mode for high-definition (DVI or YPrPb) programming and standard-definition (4:3) programming. If the 4:3 Override is set to 480i and the subscriber tunes to a 4:3 standard channel, the DCT* displays graphics overlays on all outputs even if the DVI or YPrPb Output Mode is 1080i, 720p, or 480p.

Section 4

Diagnostics

This section describes the diagnostics that confirm proper installation of the DCT*, including:

- Checking error states and signal integrity
- Identifying the DCT* on the network
- Verify communications with the headend

The diagnostic information is displayed on the front-panel LEDs and the on-screen display (OSD).

For diagnostics provided in this section:

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

In this Installation Manual, DCT refers to both the DCT6200 and DCT6208 High Definition Cable Receivers.*

Accessing Diagnostics

You can run the base platform software or Thin Client software to access the DCT* diagnostics.

To access diagnostics:

1. Ensure the DCT* is installed with the base platform or Thin Client software and that it is connected to an ac outlet.
2. Press **POWER** and then immediately press **SELECT**.

   The DIAGNOSTICS main menu is displayed on the OSD and d01 is displayed on the front-panel LED. The DCT* is now in diagnostic mode.

Use the following keys to navigate 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 to exit.
- Pressing **POWER** also exits diagnostic mode.

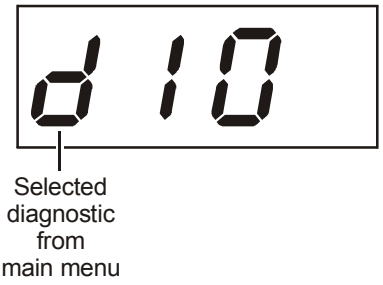
Table 4-1 illustrates the OSD of the diagnostic main menu. Note, d15 INTERACTIVE INFO will only be displayed when Thin Client is running in the DCT*.

Table 4-1
Main menu - OSD

DIAGNOSTICS	
d01	GENERAL STATUS
d02	PURCHASE STATUS
d03	OOB STATUS
d04	IN BAND STATUS
d05	UNIT ADDRESS
d06	CURRENT CHANNEL STATUS
d07	UPSTREAM MODEM
d08	CODE MODULES
d09	MEMORY CONFIG
d10	KEYPAD/LED
d11	INTERFACE STATUS
d12	USER SETTING STATUS
d13	PVR STATUS
d14	HDD STATUS
d15	INTERACTIVE INFO
E	EXIT

Figure 4-1 is an example of the LED for the main menu selected diagnostic:

Figure 4-1
Main menu diagnostic - LED



d01 General Status

This diagnostic provides system status information that displays on the OSD and LED. The information is updated each time the diagnostic is accessed.

Table 4-2
GENERAL STATUS - OSD

GENERAL STATUS		
ERROR:	E 00	DISCONNECTED
PLATFORM ID:	0256	
FAMILY ID:	0000	
MODEL ID:	0087	
REMOD CHANNEL:	3	
SETTOP TIME:	xxxxxxxxxx GPS	

Figure 4-2 is an example of a GENERAL STATUS diagnostic LED:

Figure 4-2
General status - LED

Error Codes

Error codes are displayed on the LED when an error occurs. If multiple errors occur, the last recorded error is displayed.

Table 4-3 defines the hardware error codes displayed on the LED:

Table 4-3
Fatal hardware initialization errors - LED

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

Connected State

The state of the DCT* is either connected or disconnected. The connected state of the box is set by a DCT-operations connect or disconnect message. The OSD displays DISCONNECTED when the DCT* is in the disconnected state and CONNECTED when it is in the connected state.

PLATFORM ID

The PLATFORM ID is a 16-bit parameter used to differentiate between unique digital platform images in the field. It is displayed in hexadecimal format. The PLATFORM ID is also referred to as the ROM ID.

FAMILY ID

The FAMILY ID indicates DCT*'s manufacturer and product family. It is displayed in hexadecimal format.

MODEL ID

The MODEL ID is the model of the set-top terminal. It is displayed in hexadecimal format.

REMOD CHANNEL

The REMOD CHANNEL number can be either 3 or 4 (USA systems). The output port configuration displays the configuration of the DCT* output or re-modulated (remod) port. The output port/remod port is the interface from the DCT* to the subscriber's television set.

SETTOP TIME

The SETTOP TIME is current OOB set-top time displayed in Global Positioning System (GPS) seconds from Jan 6, 1980. SETTOP TIME is an integer value ranging from 0 to 4294967295.

d02 Purchase Status

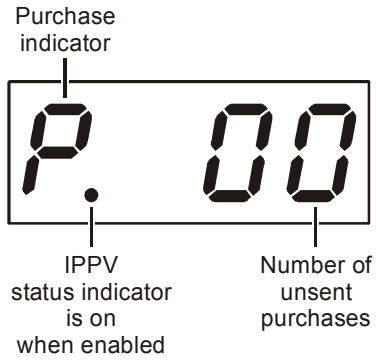
This diagnostic displays the status of subscriber event purchases on the OSD and LED. The OSD and LED information displays are updated each time this diagnostic is accessed.

Table 4-4
PURCHASE STATUS - OSD

PURCHASE STATUS	
PURCHASES	
UNSENT:	xx
UNACK:	xx
LAST SEQ NUM:	xxxx
LAST RB TIME:	xxxxxxxxxx
IPPV Status:	Enabled

Figure 4-3 is the front-panel LED display for the PURCHASE STATUS diagnostic:

Figure 4-3
PURCHASE STATUS - LED



UNSENT

Indicates the number of purchases in the DCT* remaining to be polled. The number of purchases can range from 0 to 63 decimal.

UNACK

Indicates the number of reports that have not been acknowledged by the controller. The number is displayed in decimal format.

LAST SEQ NUM

Displays the last acknowledged sequence number of a purchase sent by the controller. The sequence number is a 16 bit unsigned that is displayed in hexadecimal format.

LAST RB TIME

Indicates the last time the DCT* attempted to reportback purchases to the controller. The time of the last purchase reportback is displayed in GPS seconds.

IPPV Status

The IPPV Status of Enabled or Disabled is displayed on the OSD. The LED IPPV Status indicator is on when IPPV status is enabled.

Table 4-5 lists the IPPV Status indicators for OSD and LED:

Table 4-5
IPPV status indicators – OSD and LED

OSD Display	LED Indicator	Definition
ENABLED	on	IPPV Enabled
DISABLED	off	IPPV Disabled

d03 Out-Of-Band (OOB) Diagnostic

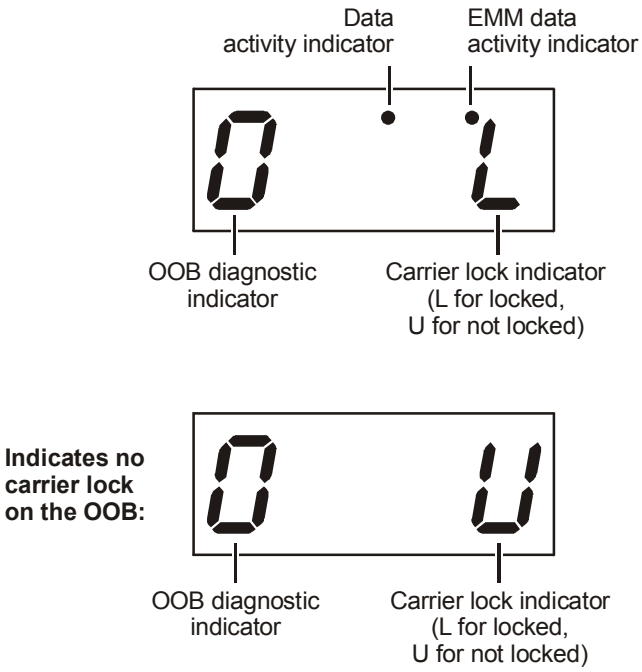
This diagnostic indicates the status of the out-of-band control channel. The information is updated every 5 seconds while viewing the diagnostic.

Table 4-6
OOB status - OSD

OOB DIAGNOSTIC			
OOB FREQUENCY:		075.25	MHz
CARRIER LOCK:		YES	
DATA:		YES	
EMM DATA:		YES	
SNR:	22.1 dB	GOOD	
AGC:	23 %	FAIR	
EMM PROVIDER ID:		0x0400	
EMM PID:		0x0403	
NETWORK PID:		0x0003	

Figure 4-4 illustrates the OOB Status display on the LED:

Figure 4-4
OOB status - LED



OOB FREQUENCY

Displays the center frequency of the DCT* OOB tuner. The frequency range is 70 to 130 MHz.

OOB CARRIER LOCK

Indicates if the OOB receiver is locked to the carrier:

Table 4-7
CARRIER LOCK indicators – OSD and LED

OSD Display	LED Display	Definition
YES	L	Carrier locked
NO	U	Carrier unlocked

OOB DATA

Indicates if data is being carried by the OOB and EMM traffic, which is tracked separately:

Table 4-8
DATA indicators – OSD and LED

OSD Indicator	LED Indicator	Definition
YES	on	OOB data detected within last 5 seconds
NO	off	OOB data not detected within last 5 seconds

OOB EMM DATA

The EMM indicators are on when EMM data is being carried on the OOB stream.

Table 4-9
EMM DATA indicators – OSD and LED

OSD Indicator	LED Indicator	Definition
YES	on	EMM data detected within last 5 seconds
NO	off	EMM data not detected within last 5 seconds

OOB Signal-to-Noise Ratio (SNR)

Displays an estimate of the carrier signal-to-noise ratio in dB with an explanation:

Table 4-10
SNR indicators - OSD

Indicator	Meaning
GOOD	Good value
FAIR	Marginal signal level, check the signal
POOR	Unusable signal
INVALID	SNR value not valid

This field is only valid when carrier lock has been established.

OOB Automatic Gain Control (AGC)

Displays an estimate of the AGC in percentage and an explanation for the value.

Table 4-11
AGC indicators

Indicator	Meaning
GOOD	Good value
FAIR	Marginal signal level, check the signal
POOR	Unusable signal
INVALID	AGC value not valid

This field is valid only when carrier lock has been established.

EMM PROVIDER ID

Specifies the conditional access stream for the DCT* and is displayed in hexadecimal format.

EMM PID

Displays the PID stream the DCT* tunes to for EMM data. This value is displayed in hexadecimal format.

NETWORK PID

The DCT* is tuned to the NETWORK PID to receive network messages. This value is displayed in hexadecimal format.

d04 In-Band (IB) Diagnostic

The IN-BAND DIAGNOSTIC displays for the last attempted tuned channel. If a digital carrier is not present, this diagnostic indicates the carrier is not locked.

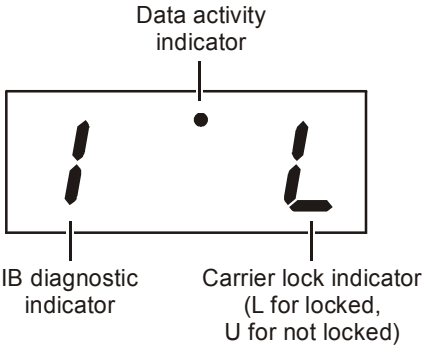
Table 4-12
IN-BAND DIAGNOSTIC - OSD

IN-BAND DIAGNOSTIC		
MODE:		64 QAM
CARRIER LOCK:		YES
DATA:		YES
SNR	32.0 dB	GOOD
AGC:	23 %	FAIR
5 SECOND ERROR COUNTS:		
UNCORRECTABLE:		1234
CORRECTABLE:		5678

The display information is updated every 5 seconds when viewing the diagnostic.

Figure 4-5 illustrates the LED display:

Figure 4-5
IN-BAND DIAGNOSTIC - LED



MODE

The values for the MODE display on the OSD are:

Table 4-13
MODE values - OSD

Value	Description
ANALOG IB	Contains an Analog channel
64 QAM IB	Contains a Digital channel with a modulation mode of 64 QAM
256 QAM IB	Contains a Digital channel with a modulation mode of 256 QAM

CARRIER LOCK

Indicates if the IB receiver is locked to the carrier:

Table 4-14
In-Band CARRIER LOCK - OSD and LED

OSD Display	LED Display	Definition
YES	L	Carrier locked
NO	U	Carrier unlocked

DATA

The IB data indicates if data is being carried on the IB stream. The indicators cover all packet processors regardless of which stream they are monitoring.

Table 4-15
In-Band DATA indicators – OSD and LED

OSD Display	LED Indicator	Definition
YES	on	IB Data detected within last 5 seconds
NO	off	IB Data not detected within last 5 seconds

Signal-to-Noise Ratio (SNR)

The IB SNR displays on the OSD as an estimate of the carrier signal-to-noise ratio in dB with an explanation for the value:

Table 4-16
In-Band SNR - OSD

Value	Description
GOOD	Good value
FAIR	Marginal signal level, check the signal
POOR	Unusable signal
INVALID	SNR value not valid

This display is only valid when carrier lock has been established.

Automatic Gain Control (AGC)

An estimate of the AGC displays in percentage and an explanation for the value displays on the OSD.

Table 4-17
In-Band AGC values - OSD

Value	Description
GOOD	Good value
FAIR	Marginal signal level, check the signal
POOR	Unusable signal
INVALID	AGC value not valid

This display is only valid when carrier lock has been established.

5 SECOND ERROR COUNTS

Indicates the number of correctable and uncorrectable errors in the digital multiplex. The display is updated every 5 seconds and is reset each time the DCT* is power cycled or another digital multiplex is tuned. The count is shown in decimal format and the maximum value is 9999. The maximum value displayed is 9999 even if the number of errors exceeds 9999.

d05 Unit Address

This diagnostic displays the unit address of the DCT*.

Table 4-18
UNIT ADDRESS - OSD

UNIT ADDRESS
TVPC INSTALLED NO
UNIT ADDRESS:
123-45678-90123-456
OOB ADDRESSES:
NETWORK: 123-45678-90123-456
MULTICAST 16 ADDRESS FOR: nnnn
0x0000 0x0000
0x0000 0x0000
MAC ADDRESSES:
DOCSIS: xx xx xx xx xx xx
Ethernet: xx xx xx xx xx xx
1394: xx xx xx xx xx xx
USB: xx xx xx xx xx xx
Settop: xx xx xx xx xx xx

The value *nnnn* represents the following datastreams:

- DATA
- POLL
- NET
- EMM
- SCC
- DWLD

The information on the OSD and LED updates every 5 seconds while the diagnostic displays. After each OSD update, the six datastreams cycle and a different datastream (*nnnn*) value with Multicast 16 Addresses is displayed.

TVPC INSTALLED

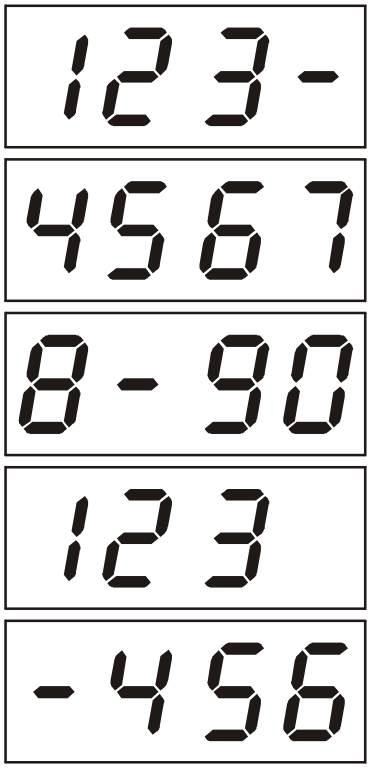
TVPC is a type of renewable security system. This diagnostic indicates if the renewable security system is installed and the type. The OSD displays YES if the TvPC is installed and NO if the TvPC is not installed.

UNIT ADDRESS

Indicates the unit address or physical address of the DCT* set-top terminal. The UNIT ADDRESS is unique and displayed in decimal format.

Figure 4-6 illustrates the LED display of a unit address:

Figure 4-6
UNIT ADDRESS - LED



OOB ADDRESSES

The NETWORK ADDRESS is the terminal's network address displayed in decimal format.

The MULTICAST 16 ADDRESS specifies the stream to which the OOB multicast 16 addresses are assigned.

The valid stream types and descriptions displayed on OSD are:

Table 4-19
MULTICAST 16 ADDRESS streams - OSD

nnnn **OSD Display**	**Description**
Net	Network
EMM	EMM
SCC	SCC_ECM
DnId	Download
Data	Data
PolI	Polling PID

The stream type and multicast 16 addresses cycle on the OSD display every 5 seconds.

Multicast 16 Addresses

This display is of the 16-bit multicast address in a 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.

MAC ADDRESSES

The MAC addresses are stored in Protected Flash and displayed in hexadecimal format. MAC addresses are assigned to the DOCSIS, Ethernet, 1394, USB, and set-top.

d06 Current Channel Status

This diagnostic displays a status of the last attempted tuned channel on the IB stream. The channel type determines the status display. Examples of analog and digital Current Channel Status OSDs are shown below:

Table 4-20
Analog CURRENT CHANNEL STATUS - OSD

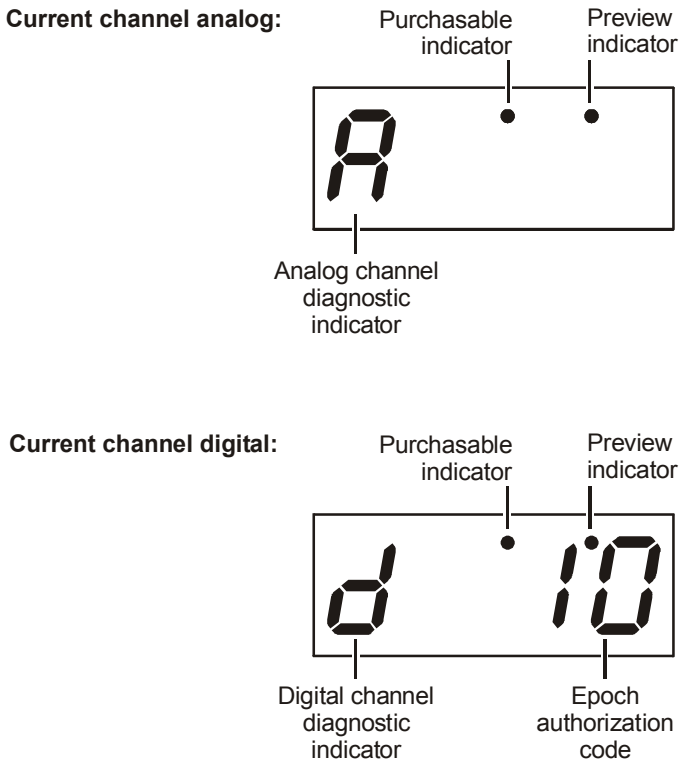
CURRENT CHANNEL STATUS	
TYPE:	ANALOG aaa
PICTURE CARRIER	077.2500 MHz
AUTHORIZED:	YES
PURCHASABLE:	YES
PURCHASED:	YES
PREVIEW:	YES

Table 4-21
Digital CURRENT CHANNEL STATUS - OSD

CURRENT CHANNEL STATUS	
TYPE:	DIGITAL aaa 0xbb
INBAND FREQUENCY:	199.2500 MHz
AUTHORIZED:	
PURCHASABLE:	YES
PURCHASED:	YES
PREVIEW:	YES
MPEG VIDEO LOCK	YES
MPEG AUDIO LOCK	YES
PCR LOCK	YES

Figure 4-7 illustrates the LEDs for the analog and digital current channel status:

Figure 4-7
CURRENT CHANNEL STATUS - LED



TYPE

Indicates if the channel is analog or digital. There are separate OSD and LED displays for analog and digital channels.

Table 4-22
Current channel TYPE – OSD and LED

OSD Display	LED Display	Definition
ANALOG	A	Current Channel Type is Analog
DIGITAL	d	Current Channel Type is Digital

The variable description codes used in the current channel status OSD are:

Table 4-23
Variable descriptions - OSD

OSD Variables	State
aaa	For analog:
	SCR – scrambled
	CLR – Clear
	For digital :
	ENC – encrypted
	UNE – unencrypted
	CLR – Clear
bb	current epoch authorization reason

The current channel encryption mode is displayed next to the channel type and is indicated with the *aaa* variable on the OSD. The analog encryption mode value of *aaa* is replaced with SCR indicating scrambled or CLR indicating a clear analog signal. The information is displayed on the OSD and LED updating every 5 seconds.

The digital encryption mode value aaa is replaced with ENC indicating encrypted, UNE for unencrypted, or CLR for a clear digital signal. The value of *bb* is replaced with a hexadecimal number for the epoch authorization reason code.

AUTHORIZATION Reason Code

The reason code is for digital channels only and is displayed on the OSD and LED as an 0xbb variable.

PICTURE CARRIER or In-Band Frequency

The analog frequency is displayed as the picture carrier. The in-band frequency is a center RF carrier frequency tuned for the digital service. The frequency is displayed in MHz and ranges from 54 to 860 MHz.

AUTHORIZED

Displays a parameter indicating if the DCT* is authorized for the currently tuned service.

Table 4-24
AUTHORIZED values

Values	Description
YES	Current channel is authorized
NO	Current channel is not authorized

PURCHASABLE

Indicates whether the current program can be purchased for viewing.

Table 4-25
Purchase indicators – OSD and LED

OSD Display	LED Indicator	Definition
YES	on	Current channel is purchasable.
NO	off	Current channel is not purchasable.

PREVIEW

Indicates if the current program is in preview mode.

Table 4-26
PREVIEW mode indicators – OSD and LED

OSD Display	LED Indicator	Definition
YES	on	Channel is in preview
NO	off	Channel is not in preview

MPEG VIDEO LOCK

Indicates if the video stream is locked.

Table 4-27
MPEG VIDEO LOCK

Values	Definition
YES	Video Processor is locked to the video stream
NO	Video Processor is not locked to the video stream

MPEG AUDIO LOCK

Indicates whether the audio stream is locked.

Table 4-28
MPEG AUDIO LOCK values

Values	Definition
YES	Audio Processor is locked to the audio stream
NO	Audio Processor is not locked to the audio stream

PCR LOCK

Indicates if the in-band receiver is locked to the current program clock reference.

Table 4-29
PCR LOCK values

Values	Definition
YES	Channel is PCR locked
NO	Channel is not PCR locked

d07 RF Modem (Upstream)

This diagnostic displays the appropriate modem information based on the module installed in the DCT*.

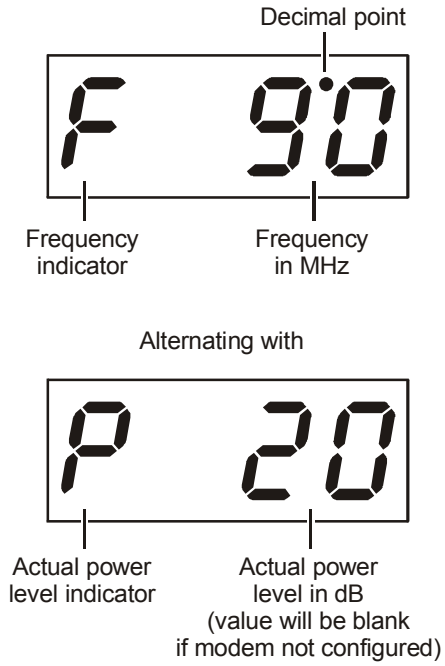
Table 4-30
RF upstream modem

RF MODEM	
STATUS:	NOT CONFIGURED
CENTER FREQUENCY:	9.0000 MHz
REQUESTED POWER LEVEL:	23 dB
ACTUAL POWER LEVEL:	20 dB
REPORTBACK ADDRESS:	xx xx xx xx
LAST RB ATTEMPT TIME:	xxxxxxxxxx

The information on the OSD and LED is updated each time this diagnostic is accessed.

Figure 4-8 illustrates the LED for the RF upstream modem:

Figure 4-8
RF upstream modem - LED



RF Modem STATUS

Displays CONFIGURED or NOT CONFIGURED, depending on the state of the modem.

CENTER FREQUENCY

The RF modem CENTER FREQUENCY is displayed on the OSD and LED in MHz.

REQUESTED POWER LEVEL

Displays the value assigned to the DCT* during the RF leveling process. This level is displayed in dB or is blank if not configured.

ACTUAL POWER LEVEL

The ACTUAL POWER LEVEL is displayed on the OSD and LED in dB or is left blank if the power level has not been set.

REPORTBACK ADDRESS

The REPORTBACK ADDRESS is displayed in 4-byte hexadecimal format, if configured.

LAST RB ATTEMPT TIME

Displays the last attempted reportback made by the DCT* in GPS seconds.

d08 Code Modules

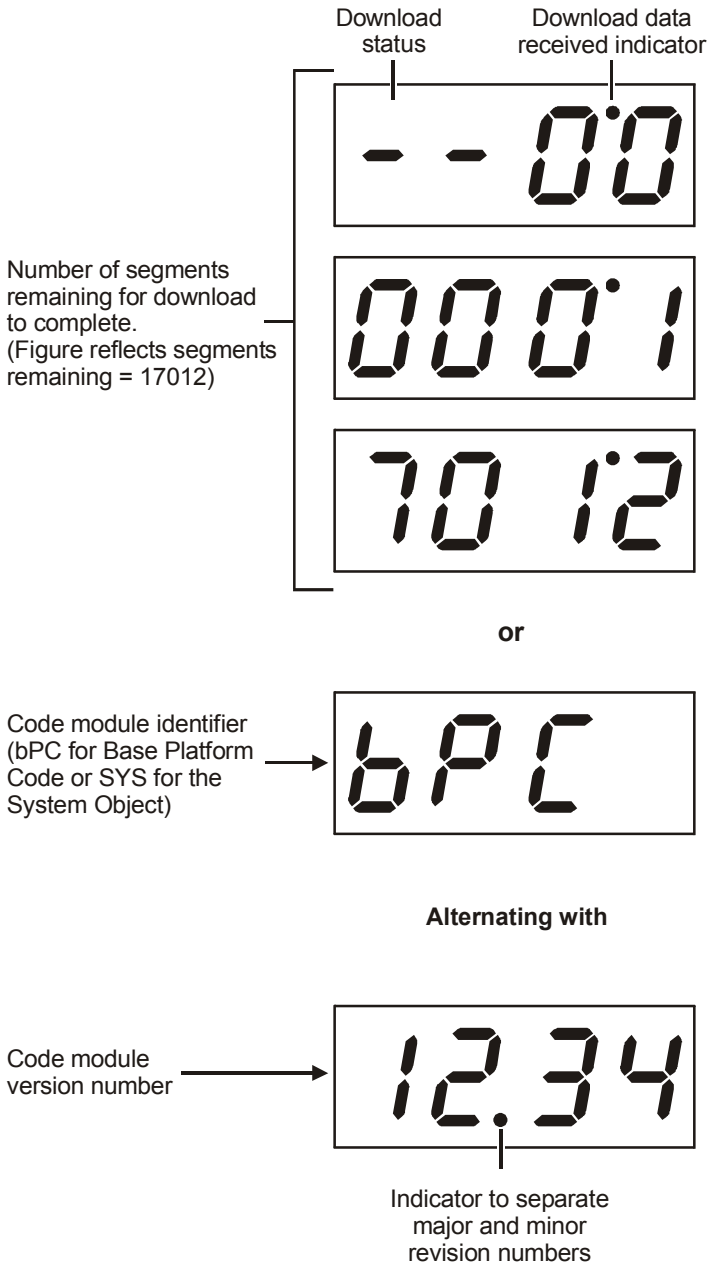
This diagnostic includes information about the firmware loaded into flash memory and all versions of non-volatile code that are installed in the DCT*. When the Native Suite is running, the diagnostics of the application operating system and all associated objects should be accessible.

Table 4-31
CODE MODULES - OSD

CODE MODULES			
BOOTLOADER:		xx.xx	
FIRMWARE:		xx.xx	
DIGITAL SECURE PROCESSOR:			x.1
ANALOG SECURE PROCESSOR:			8404
OBJECT NAME	/ VER	STATUS	SEGS/TIME
BASEPF	01.11	nnnnnnnnnnn	xxxxxxxxxx

Figure 4-9 illustrates the code module LED display:

Figure 4-9
CODE MODULES - LED



BOOTLOADER

Displays the BOOTLOADER version in ASCII format and includes major and minor revision numbers.

FIRMWARE

Displays the FIRMWARE version in ASCII format.

DIGITAL SECURE PROCESSOR

Displays the DIGITAL SECURE PROCESSOR version in ASCII format.

ANALOG SECURE PROCESSOR

Displays the ANALOG SECURE PROCESSOR version in ASCII format.

Downloadable Object Information Table

This table is displayed at the bottom of the OSD screen. It includes the object name, version number, status of object and segments remaining in download process or total time of completed download. The information displayed for each object depends on the running environment.

OBJECT NAME / VERSION

The OBJECT NAME and VERSION columns contain the names and versions of all objects loaded, or in the process of being loaded into the DCT*. The OBJECT NAME and VERSION are displayed in ASCII format. If a download is not in progress, the LED displays the environment currently running and version number as shown in Figure 5-9. On the LED display, `bPC` is displayed to represent base platform or Thin Client code.

STATUS

Displays the status of each object. The status value of *nnnnnnnnnnnn* is replaced with the status of the object. The information on the OSD and LED is updated every 5 seconds while the diagnostic is displayed.

Table 4-32 lists the object status values:

Table 4-32
Object STATUS

OSD Display	Status	Description
MEM ALLOC	Allocated	Memory for object has been allocated.
LOADING	Loading	Object is currently being loaded.
STARTING	Enabling	Object is in the process of being started (the constructor is running).
ENABLED	Enabled	Object is running.
ENA–NOT RUN	Enabled_Not_Runnable	Object has been enabled, but it is not runnable.
STOPPING	Disabling	Object is in the process of being stopped (the destructor is running).
DISABLED	Disabled	Object has been disabled.
DIS-NOT RUN	Disabled_Not_Runnable	Object has been disabled, and it is not runnable.
DELETING	Deleting	Object is in the process of being deleted.
POSTPONED	Postponed	Object is not runnable in the current system; will be enabled on next boot.
CONNECTED	Connect	Connected to download PID – awaiting data.
PEND CONNECT	TryingToConnect	Trying to connect.

SEGS / TIME

Each object is displayed on the OSD and LED segments that remain for the object download in progress. The time (in GPS seconds) is displayed on the OSD when the download is complete.

d09 Memory Configuration

This diagnostic displays the memory configuration of the DCT*. The AppOS may supplement the memory configuration with memory allocation per application in the future.

Table 4-33
MEMORY CONFIGURATION - OSD

MEMORY CONFIGURATION		
SYSTEM RAM:	32	MB
FLASH:	16	MB
NVRAM:	256	KB

An LED display is not available for this diagnostic. The information on the OSD is updated upon entry to this diagnostic.

MEMORY CONFIGURATION

The amount of allocated memory for the SYSTEM RAM and FLASH are displayed in MB. The amount of allocated memory for NVRAM is displayed in KB.

d10 Keypad - LED

This diagnostics is used to verify the functionality of the LEDs and front-panel keypad of the DCT*.

Front-Panel Keypad Diagnostic

This diagnostic verifies the functionality of the LEDs and front-panel keypad. Each LED segment that is lit corresponds with a front-panel key press.

The OSD displays characters in the format shown in Figure 4-10:

Figure 4-10
Character format display - OSD

<	>	U	D	Î	M	P	B	G	S	+	-

A character on the OSD is highlighted when the corresponding front-panel key is depressed.

d11 Interface Status

Table 4-34 illustrates the INTERFACE STATUS diagnostic OSD display when running in base platform or Thin Client:

Table 4-34
INTERFACE STATUS – OSD – Pages 1 and 2

INTERFACE STATUS	
DOCSIS TUNER & XMITTER:	INST
1394 I/O DEVICE:	NOT INST
USB I/O DEVICE:	NOT INST
10BT ETHERNET DEVICE:	NOT INST
PARALLEL PORT:	NOT INST
IR BLASTER:	NOT INST
HARD DRIVE STATUS:	NOT INST
SMART CARD:	NOT INST

DVI PORT	
DEVICE CONNECTED:	YES/NO
REPEATER:	YES/NO
VIDEO XMISSION:	ACTIVE/NOT ACTIVE
HDCP ENABLED:	YES/NO
VIDEO CONSTRAINED	YES/NO
OUTPUT FORMAT	*XXXX* x *XXXX*
ASPECT RATIO:	*XX:X*
EDID DATA	

The LED display is not available for INTERFACE STATUS diagnostics. The information on the OSD is updated upon entry to this diagnostic selection.

INTERFACE STATUS

This diagnostic displays the status of the following standard and optional interfaces as INST for installed or NOT INST for not installed:

- DOCSIS TUNER & XMITTER
- 1394 I/O DEVICE
- USB I/O DEVICE
- 10bT ETHERNET DEVICE
- PARALLEL PORT
- IR BLASTER
- HARD DRIVE
- SMART CARD

DVI PORT

This diagnostic displays information to be used when troubleshooting the DVI port:

- DEVICE CONNECTED
- REPEATER
- VIDEO XMISSION
- HDCP ENABLED
- VIDEO CONSTRAINED
- OUTPUT FORMAT
- ASPECT RATIO
- EDID DATA

The DVI PORT diagnostic information only displays when the DVI port is installed.

d12 User Setting Status

This section displays the user settings. The actual format for the display may vary. The information on the OSD and LED is updated upon entry to the diagnostic OSD.

Table 4-35 illustrates an example of the USER SETTING STATUS OSD:

Table 4-35
USER SETTING STATUS – OSD

USER SETTING STATUS	
TV TYPE	16:9
YPbPr OUTPUT	1080I
4:3 OVERRIDE	480i
CLOSED CAPTION	ENABLED
PEN SIZE	STANDARD
FONT STYLE	MONO SERIF
FOREGROUND COLOR	BLACK
FOREGROUND OPACITY	AUTO
BACKGROUND COLOR	WHITE
BACKGROUND OPACITY	AUTO
SERVICE SELECTION	PRIMARY LANGUAGE
SETTINGS	USER
RESTORE DEFAULTS	

TV TYPE

TV TYPE sets the aspect ratio. Defaults to 16:9. Options are 16:9 for wide screen TVs or 4:3 LETTERBOX or 4:3 PAN/SCAN for standard TVs:

- 4:3 LETTERBOX fits high-definition programming on the screen by placing black bars at the top and bottom
- 4:3 PAN/SCAN fills the screen by cropping the left and right edges of high-definition programming

YPbPr OUTPUT

YPbPr Output sets the video display format for the component video outputs. Defaults to 1080i. Options are 1080i, 720p, 480p, or 480i.

Some TVs only support certain display formats. Check the TV user manual for more information. If you are not using an HDTV, selecting a format other than 480i causes the on-screen display to go blank. If this occurs, view the settings on the LED panel to change the format back to 480i.

If you are not using the DVI video connection, the DVI/YPbPr OUTPUT setting displays as YPbPr OUTPUT.

4:3 OVERRIDE

4:3 Override Sets the display format for 4:3 standard-definition programming. If the YPrPb Output is set to 1080i, 720p, or 480p, this setting defaults to 480i. If the YPrPb Output is set to 480i, this setting defaults to OFF and cannot be changed. Options are:

- **OFF** displays non-high-definition programs having a 4:3 aspect ratio in wide screen format. On an HDTV, black bars display on the left and right of the picture. Selecting OFF for a 4:3 TV may result in a small picture with black bars around it.
- **480i** displays non-high-definition programs in their original 480i format. Some TVs cannot display 480i format on their component video inputs (YPbPr). Check the TV user manual for more information. Graphics overlaying the video are displayed.
- **480p** converts non-high-definition TV programs to a higher-quality 480p format. Some TVs cannot display 480p format on their component video inputs (YPbPr). Check the TV user manual for more information.

  Graphics overlaying the video are not displayed when 4:3 OVERRIDE is set to 480p.

CLOSED CAPTION

Displays the closed caption rendering state selected by the user:

OSD Display	Definition
ENABLED	Closed Caption rendering enabled.
DISABLED	Closed Caption rendering disabled.

PEN SIZE

Displays the pen size selected by the user:

OSD Display	Definition
AUTO	Pen Size is controlled by the Closed Caption stream.
STANDARD	Standard Pen Size.
LARGE	Large Pen Size.
SMALL	Small Pen Size.

FONT STYLE

Displays the font style selected by the user:

OSD Display	Definition
AUTO	Font Style is controlled by the Closed Caption stream.
MONO SERIF	Monospaced with serifs.
PROPORTION SERIF	Proportionally spaced with serifs.
MONO NO SERIF	Monospaced without serifs.
PROPORTION NO SERIF	Proportionally spaced without serifs.
CASUAL	Casual font type.
CURSIVE	Cursive font type.
SMALL	Small capitals.

FOREGROUND COLOR

Displays the foreground color option selected by the user:

OSD Display	Definition
AUTO	Foreground Color is controlled by the Closed Caption stream.
WHITE	White Foreground.
BLACK	Black Foreground.
RED	Red Foreground.
GREEN	Green Foreground.
BLUE	Blue Foreground.
YELLOW	Yellow Foreground.
MAGENTA	Magenta Foreground.
CYAN	Cyan Foreground.

FOREGROUND OPACITY

Displays the foreground opacity option selected by the user:

OSD Display	Definition
AUTO	Foreground Color is controlled by the Closed Caption stream.
TRANSPARENT	Transparent Foreground Opacity.
TRANSLUCENT	Translucent Foreground Opacity.
SOLID	Solid Foreground Opacity.
FLASHING	Flashing Foreground Opacity.

BACKGROUND COLOR

Displays the background color option selected by the user:

OSD Display	Definition
AUTO	Background Color is controlled by the Closed Caption stream.
WHITE	White Background.
BLACK	Black Background.
RED	Red Background.
GREEN	Green Background.
BLUE	Blue Background.
YELLOW	Yellow Background.
MAGENTA	Magenta Background.
CYAN	Cyan Background.

BACKGROUND OPACITY

Displays the background opacity option selected by the user:

OSD Display	Definition
AUTO	Background Color is controlled by the Closed Caption stream.
TRANSPARENT	Transparent Background Opacity.
TRANSLUCENT	Translucent Background Opacity.
SOLID	Solid Background Opacity.
FLASHING	Flashing Background Opacity.

SERVICE SELECTION

Displays the service selection selected by the user:

OSD Display	Definition
AUTO	Service Selection is controlled by the Closed Caption stream.
PRIMARY LANGUAGE	Primary language established by the provider.
SECONDARY LANGUAGE	Secondary language established by the provider.
3	Set by the provider.
4	Set by the provider.
5	Set by the provider.
6	Set by the provider.

SETTINGS

Displays the setting selected by the user:

OSD Display	Definition
AUTO	Closed Caption settings are determined by the closed caption stream regardless of user modification.
USER	Closed Caption user settings are used as configured by the user.

RESTORE DEFAULTS

Resets the User Settings to their default settings.

d13 PVR Status

This diagnostic indicates the status of the DVR resident in the DCT*.

Table 4-36
PVR STATUS - OSD

PVR STATUS		
PVR ENABLED:	TRUE	
STREAM INDEXER VERSION:	131	
CONTENT RECORD VERSION:	2	
ENCODER #	ENCODER TYPE	RECORD QUALITY
1	MPEG2	HIGH2
DISK DRIVE	RECORD CAPACITY REMAINING	
IDE0	*xxxxxxxxxxxxxxxxxxx*	

PVR ENABLED

This diagnostic indicates if the DVR is enabled (TRUE) or disabled (FALSE), based on the DCT*s configuration (connect/disconnect state) and resource availability (resource authorized; hard disk installed and functional).

The LED displays `En` for enabled or `Un` for disabled.

STREAM INDEXER VERSION

This diagnostic indicates the stream indexer version number. The value is displayed without leading zeros; for example, version number 0000000065 is displayed `65`.

CONTENT RECORD VERSION

This diagnostic indicates the content record version number. The value is displayed without leading zeros; for example, version number 0000000001 is displayed `1`.

Encoder Information Table

The Encoder Information Table includes the encoder number, type, and record quality for each analog encoder. The analog encoder is necessary for transmitting content to the IEEE 1394 output and to record analog content.

If the encoder is not enabled or configured, `NOT AVAILABLE` is displayed in the Encoder Information Table.

ENCODER NUMBER

Currently, only one encoder is supported. The value displayed in this diagnostic is `1`.

ENCODER TYPE

This diagnostic indicates the encoder type:

OSD	Description
Not Inst	Not Installed
MPEG2	MPEG2
Other	Other
Unknown	Unknown

RECORD QUALITY

This diagnostic indicates the current quality setting for the encoder. This setting may change at any time via software. RECORD QUALITY is only valid for the encoding of analog services.

OSD	Description
LOW1	Video bit rate of 1 Mbps
LOW2	Video bit rate of 2 Mbps
MEDIUM1	Video bit rate of 3 Mbps
MEDIUM2	Video bit rate of 4 Mbps
HIGH1	Video bit rate of 5 Mbps
HIGH2	Video bit rate of 6 Mbps

DVR Enabled Disk Drive Information Table

This diagnostic displays the recording capacity remaining for each disk drive. Currently, only one IDE disk drive is supported.

DISK DRIVE types are `IDE` (internal), `1394` or `USB` (external).

RECORD CAPACITY REMAINING indicates the remaining recording capacity in bytes.

If the disk drive is not enabled or configured, `NOT AVAILABLE` is displayed in the DVR Enabled Disk Drive Information Table.

d14 Hard Disk Drive Status

This diagnostic displays information about the DCT*'s internal and external hard drives, as applicable.

Table 4-37
HARD DISK DRIVE STATUS – OSD

HARD DISK DRIVE STATUS	
NUMBER OF INSTALLED DRIVES:	1
DRIVE NUMBER:	1
MODEL NUMBER:	ST380012ACE
LOCATION:	INTERNAL
TYPE:	IDE
TOTAL SIZE:	80 GB

NUMBER OF INSTALLED DRIVES

Indicates the number of internal and external hard drives (as applicable), up to a maximum of 9.

DRIVE NUMBER

Indicates the identification number of the drive. Each installed drive is assigned a number sequentially.

MODEL NUMBER

The model number for the drive is assigned at the factory.

LOCATION

Indicates whether the drive displayed is INTERNAL or EXTERNAL.

TYPE

Indicates the support for the drive:

OSD	Description
IDE	IDE: Current type supported
1394	1394
USB	USB: Possible future support
Unkn	Unknown

TOTAL SIZE

Displays the size of the drive in GB.

d15 Interactive Info

This diagnostic describes the interactive information that is displayed only when Thin Client platform is running. The information on the OSD and LED is updated at least once every 5 seconds while the diagnostic is displayed.

Table 4-38 illustrates an example a code module display with status descriptions:

Table 4-38
INTERACTIVE INFO - OSD

INTERACTIVE INFO	
IP ADDRESS:	0.0.0.0
UPM:	00000021
UPSTREAM ID:	0000
DOWNSTREAM ID:	0000
STATE:	UNCONFIG
MAC ABORT CNTR:	0000
SOCKET PORT STATE:	
0	UNUSED
1	UNUSED
2	UNUSED
3	UNUSED
4	UNUSED

Figure 4-11 illustrates the code module LED display:

Figure 4-11
Sample INTERACTIVE INFO LED

IP ADDRESS

The NC 1500 assigns the IP ADDRESS to the DCT*. It is displayed in dotted-decimal format *xxx.xxx.xxx.xxx*.

`0.0.0.0` is displayed when the IP address is not configured or unknown.

UPM

The UPM is the upstream modem address. The value used for the UPM is the same as the terminal ID assigned by the DAC 6000. The UPM is a unique, system-generated, eight-digit integer between 1 and 16777215.

`00000000` is displayed when the UPM is not configured or unknown.

UPSTREAM ID

The UPSTREAM ID is a DCT* transmission parameter assigned by the DAC 6000 for the interactive DCT*. The UPSTREAM ID is a four-digit decimal value ranging from 0000 to 9999.

`0000` is displayed if the UPSTREAM ID is not configured or unknown.

DOWNSTREAM ID

The DOWNSTREAM ID is a DCT* transmission parameter assigned by the DAC 6000 for the interactive DCT*. The DOWNSTREAM ID is a four-digit decimal value ranging from 0000 to 9999.

`0000` is displayed if the DOWNSTREAM ID is not configured or unknown.

STATE

Indicates the interactive status of the DCT*:

LED	OSD	State Description
U	**UNCONFIG**	DCT* is not configured for the interactive system and platform should run as Pre-Interactive.
C	**MAC_CONNECT**	DCT* is waiting to establish connection to MAC Pid Stream.
I dc	**INIT_WAIT_DC_OR_C**	DCT* is running in the interactive initialization state and waiting for the default configuration or the contention channel list messages.
I L	**WAIT_LM_ACK**	DCT* is running in the interactive initialization state and waiting for Link Management Response ACK for Local Address Message.
I SO	**WAIT_SO_ACK**	DCT* is running in the interactive initialization state and waiting for a Sign On acknowledgement.
I LA	**WAIT_LA_OR_SO**	DCT* is running in the interactive initialization state and waiting for Logical Address or Sign On with verification Frequency message.
S I	**INIT_STOPPED**	DCT* is in the interactive initialization state and the TransMode has stopped.
r dc	**RUN_WAIT_DC_OR_C**	DCT* is running in the interactive state and waiting for the default configuration or the contention channel list messages.
r	**RUNNING**	DCT* interactive state is running, sending idle messages, and waiting for any Prepare for Poll or MAC messages.
S	**RUN_STOPPED**	DCT* interactive run state has stopped and DCT* is waiting for status or transmission control message.
00	**INVALID**	Set-top interactive state is unknown or invalid.

MAC ABORT COUNTER

The MAC ABORT CNTR increments every time the MAC layer reaches the Cell Abort Count limit. The MAC ABORT CNTR is reset by the successful upstream transmission of a cell, for example, when an ACK is received by the DCT*.

If the MAC ABORT CNTR reaches the MAC Abort Count limit, the DCT* assumes the MAC layer is unavailable due to noise, congestion, or some other problem. The DCT* will stop transmitting data upstream, report an error to the calling function, and attempt to re-enter the network using the initialization process.

`0000` is displayed as default or if the MAC ABORT CNTR is not configured or unknown.

SOCKET PORT STATE

Indicates socket mode and activity:

OSD Value	Description
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.

Section 5

Troubleshooting

This section provides troubleshooting guidelines. If problems still occur after performing the diagnostics, call the TRC for assistance as described in Section 1, "Introduction."

In this Installation Manual, DCT refers to both the DCT6200 and DCT6208 High Definition Cable Receivers.*

Problem	Possible Solutions
The DCT* will not power on.	Verify that the AC power cord is connected to the DCT* and an AC outlet. If the DCT* is connected to a switched outlet on another unit, verify that that unit is powered on. Press the **POWER** button on the DCT* front panel instead of the remote control. The batteries in the remote control may be depleted. The DCT* may have received a software update and may not power on while the new software is being installed. Try again in a few minutes.
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 DCT*. Aim the remote control directly at the DCT* front panel, not the TV or VCR. The angle between the remote control and the DCT* may be too large. Stand in front of the DCT* 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 DCT* 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 DCT* or the remote control has not been pressed. Press **MUTE** on the remote control to restore sound. If the DCT* audio output is connected to the TV, verify that the Mute button on the TV has not been pressed. If the DCT* 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 ports. Verify that the audio cables are firmly connected between the DCT* and the audio playback device (TV, receiver, etc.).
There is no audio from the center and/or surround speakers of a home theater receiver connected to the DCT*.	Not all Dolby Digital programs feature full 5.1 surround sound. In some cases, the programs may only contain left and right stereo audio. Verify that the SPDIF cable (coaxial or optical) is firmly connected to the DCT* and the home theater receiver. Verify that the home theater receiver is set to a surround sound audio mode (Dolby Digital, Dolby Pro Logic II, Dolby Pro Logic). Verify that the receiver is properly configured to work with all connected speakers.

Problem	Possible Solutions
There is no video on the TV screen.	Verify that the TV is powered on and set to the appropriate input source for the DCT*. Verify that the DCT* is powered on and tuned to an authorized cable channel. Verify that the coaxial cable feed is firmly connected to the DCT* and the wall jack. The DCT* DVI output may not yet be enabled. Use the component video (Y Pb Pr) output instead. If the DCT* 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. Not all HDTVs can display every output format (1080i, 720p, 480p, or 480i) available on the DCT*. Enter the User Settings menu and cycle through the available output formats until a picture displays on the TV. Verify that all video cables between the DCT* and the TV are firmly connected.
There are no graphics, closed captions, or program guides appearing on the TV screen.	The DCT* cannot generate graphics on all video outputs at all times. If the DCT* is set to 1080i, 720p, or 480p output format, graphics are only available on the high definition video outputs (DVI and component video). If the DCT* is set to 480i, graphics are available on all video outputs. For more information, see “Graphics Overlaying the Video” in Section 3, “Installation.” If the DCT* is connected to a standard definition (SD) TV, verify that the DCT* is configured to use the 480i output mode. Verify that closed captions on the DCT* have been enabled in the User Settings menu.
There are black bars to the right and left of the picture.	Wide screen 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 wide screen TVs to stretch the video to fill the screen (see the TV manual for information about stretching 4:3 video). If the DCT* is connected to a wide screen 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 DCT* is tuned to a 4:3 program. Set the TV TYPE to 4:3 Pan-Scan. This enables the DCT* 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 wide screens 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).

Problem	Possible Solutions
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 cause 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 broadcaster may include black bars on either side of a wide screen broadcast. This is called a “hybrid” aspect ratio and results in a black border surrounding the video on a 4:3 TV. Because this is part of the broadcast, the DCT* cannot correct the video. You may be able to minimize the border using the zoom feature on the TV.

Appendix A

Specifications and Features

Specifications

Input frequency	
Video	54 MHz through 860 MHz
DOCSIS	Up to 860 MHz
HRC/IRC frequency assignments	Downloadable
Number of channels	136 carriers per cable, 1 or 2 cables
Analog	1 channel per carrier
Digital	More than 1 channel per carrier, content dependent
Input analog video level	0 dBmV through +15 dBmV
Input digital average level	64 QAM: –18 dBmV through +5 dBmV
	256 QAM: –12 dBmV through +5 dBmV
Data carrier	QPSK-modulated carrier
Frequency	Agile Receiver 70 – 130 MHz
Bandwidth	1.5 MHz
Level	–15 dBmV through +5 dBmV
Mechanical security	Standard: security screws, unichassis construction
Operating environment range	
Temperature	15° through 40°C (32° through 104°F)
Humidity	5% through 95% (noncondensing)
ac voltage	105 through 125, 60 Hz
Power dissipation	30 W nominal at 115 Vac; 38 W (DCT6208)
Size	17.13 in. × 12.75 in. × 2.75 in.
Weight	9.5 pounds (DCT6200)
	11.5 pounds (DCT6208)
Hard Disk (DCT6208 only)	80 GB capacity

Features List

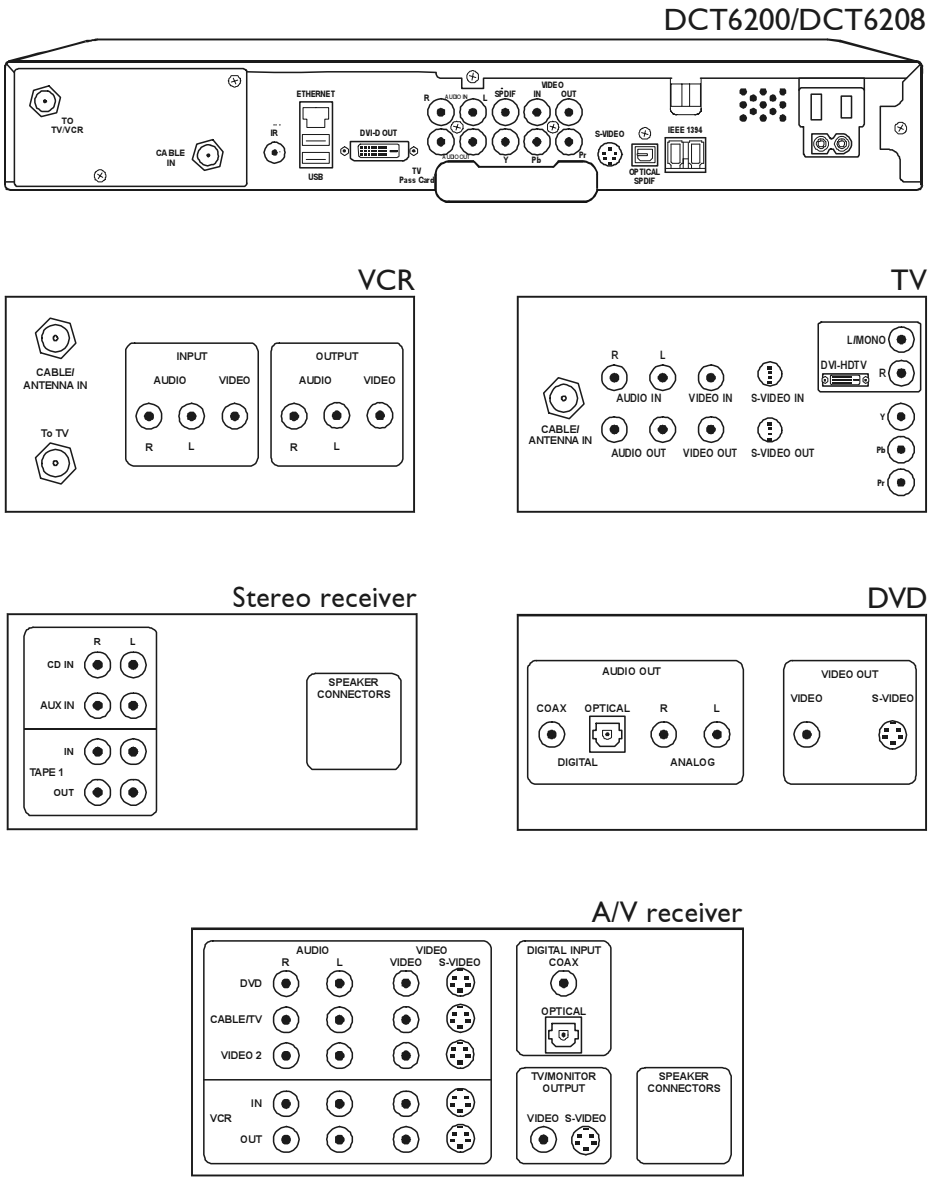
	Standard	Option
Triple Tuner:		
Video/Audio/Data	●	
DOCSIS	●	
Out of Band	●	
DOCSIS Modem	●	
Clear Analog tuning	●	
BTSC Decode	●	
RF Return	●	
IR	●	
AC Convenience outlet	●	
A/B Cable module		●
RF Bypass module		●
USB (3 ports)	●	
Ethernet 10Base-T	●	
Audio line-in/loop-through	●	
Video input (2)	●	
Smart Card reader	●	
S-Video output	●	
Audio SPDIF output (optical and coaxial)	●	
IR Blaster port	●	
Renewable security slot	●	
Component video (Y Pb Pr)	●	
DVI connection	●	
IEEE 1394 (Dual)	●	
128 MB SDRAM		●
80 GB hard disk drive (DCT6208 only)	●	

Appendix B

Connection Record

To ease reconnection if equipment is moved or added to the system, you can use a copy of this or a similar diagram to record the connections between components for the subscriber:

Figure B-1
Connection record



Before connecting or changing cable connections, disconnect the power from the set-top. Do not place another component or object on top of the set-top.

Abbreviations and Acronyms

AGC	automatic gain control
ASTB	Advanced Set-top Box
CRC	cyclic redundancy check
CSR	Customer Service Representative
DAC 6000	Digital Addressable Controller 6000
DOCSIS	Data Over Cable Service Interface Specification
DRAM	dynamic random access memory
DVI	Digital Video Interface
DVR	Digital Video Recorder
EMM	entitlement management message(s)
FLASH	A type of nonvolatile memory
GPS	global positioning system
HDTV	high-definition television
HRC	harmonically related carriers
IPG	interactive program guide
IPPV	impulse pay-per-view
IR Blaster	Infrared Blaster
IRC	incrementally related carriers
ITU	International Telecommunication Union
MPAA	Motion Picture Advisory Association
MPEG-2	Motion Picture Experts Group-2 compression standard for digital audio and video encoding
NVOD	near video on demand
NVRAM	non-volatile random-access memory
OSD	on-screen display
PCR	program clock reference
PID	packet identifier
PPV	pay-per-view
QAM	Quadrature Amplitude Modulation
QPSK	Quadrature Phase Shift Keying
RSA	Return for Service Authorization
SD	standard definition
SNR	signal-to-noise ratio
SPDIF	Sony Philips Digital Interface Format
TCP/IP	Transmission Control Protocol/Internet Protocol
TRC	Technical Response Center
TvPC	TV PassCard

USB	Universal Serial Bus
VOD	video on demand
Y Pb Pr	component video connectors

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