DCH200

Installation Manual

MOTOROLA

IMPORTANT SAFETY INSTRUCTIONS

- Read these instructions.

- Keep these instructions.

- Heed all warnings.

- Follow all instructions.

- Do not use this apparatus near water.

- 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.

- Clean only with dry cloth.

- Do not block any ventilation openings. Install in accordance with the manufacturers instructions.

- Do not install near any heat sources such as radiators, heat registers, stoves, or other apparatus (including amplifiers) that produce heat.

- Do not defeat the safety purpose of the polarized or grounding-type plug. A polarized plug has two blades with one wider than the other. A grounding type plug has two blades and a third grounding prong. The wide blade or the third prong is provided for your safety. If the provided plug does not fit into your outlet, consult an electrician for replacement of the obsolete outlet.

- Protect the power cord from being walked on or pinched particularly at plugs, convenience receptacles, and the point where they exit from the apparatus.

- Only use attachments/accessories specified by the manufacturer.

- Unplug this apparatus during lightning storms or when unused for long periods of time.

- Refer all servicing to qualified service personnel. Servicing is required when the apparatus has been damaged in any way, such as the power-supply cord or plug is damaged, liquid has been spilled or objects have fallen into the apparatus, the apparatus has been exposed to rain or moisture, does not operate normally, or has been dropped.

IMPORTANT SAFETY CONSIDERATIONS

Be sure to follow these requirements during transportation and installation.

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

During Transportation to the Subscriber Home

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

Do not expose the terminal to rain or moisture.

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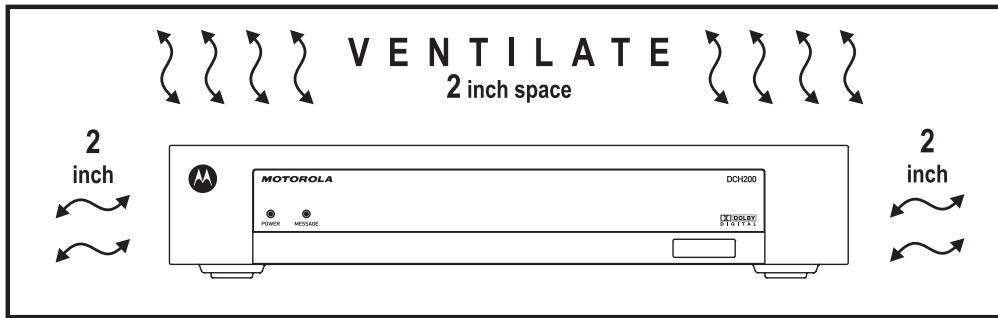
- Do not place the cable terminal in an enclosed area where the cooling vents are blocked or impede the flow of air through the ventilation openings.

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

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

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

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

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

FCC COMPLIANCE

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

- Reorient or relocate the receiving antenna.

- Increase the separation between the equipment and 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.

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

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

FCC DECLARATION OF CONFORMITY

Motorola Inc., Connected Home Solutions, 101 Tournament Drive, Horsham, PA 19044, 1-215-323-1000, declares that the DCH200 receiver complies with 47 CFR Parts 2 and 15 of the FCC rules as a Class B digital device.

Canada Industry Canada (IC)

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

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

CARING FOR THE ENVIRONMENT BY RECYCLING

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

Recycling your Motorola Equipment

Please do not dispose of this product with your residential or commercial waste. Some countries or regions, such as the European Union, have set up systems to collect and recycle electrical and electronic waste items. Contact your local authorities for information about practices established for your region. If collection systems are not available, call Motorola Customer Service for assistance.

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1 INTRODUCTION

This manual provides instructions for cable operator personnel to install the Motorola DCH200 cable receiver. This unit includes a high-end processor, expanded memory, and enhanced graphics to support digital, on-demand, and analog broadcast and interactive services.

The DCH200 provides advanced capabilities, including:

- Authorization and purchase of on-demand programming

- Surround-sound audio through a variety of analog and digital interconnection options

- Adaptability to various software platforms

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

Figure 1-1 Front and rear views
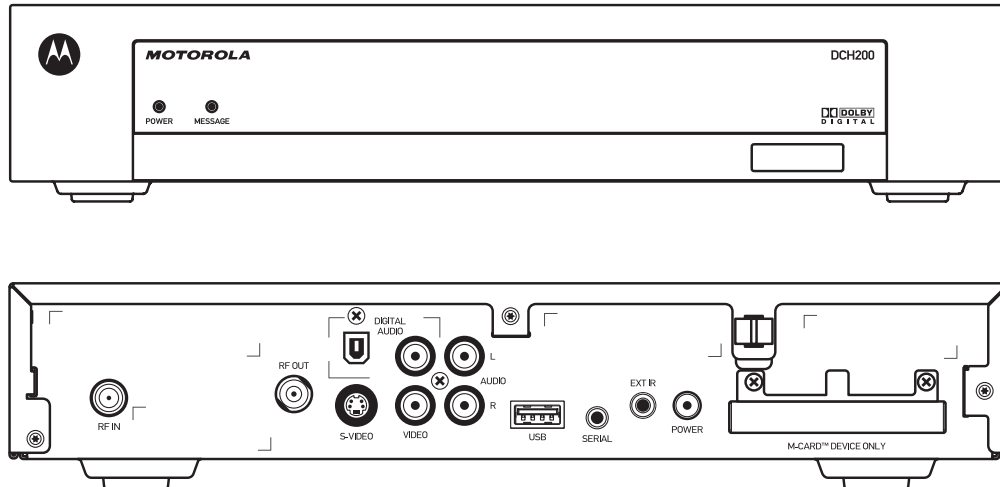
Features

Tuner

- Analog AM-VSB and digital MPEG-2 main profile main level video processor
- Provides an out-of-band (OOB) control channel

Standard Audio/Video Features

- ITU standard 64/256 QAM/FEC/enhanced adaptive equalizer
- Clear analog channel processor with BTSC decoder
- DES based encryption/DCII (via inserted CableCARD™) access control
- Out-of-band data receiver (70-130 MHz) 2.048 Mbps
- Analog/digital video scaling (picture in graphics)
- 32-bit 2D graphics support in hardware
- Macrovision® copy protection
- Standard-definition video output through:
  - S-Video
  - Baseband
  - RF
- Audio output through:
- Digital audio (S/PDIF) ATSC standard Dolby Digital® AC-3 electrical or optical
- Baseband L/R

Standard Data Features

- 32 MB flash memory
- 128 MB SDRAM
- On-board, real-time RF return

Standard Miscellaneous Features

- Messaging capabilities
- Digital diagnostics

If You Need Help

If you need assistance while working with the DCH200, contact the Motorola Technical Response Center (TRC):

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

Outside the U.S.: 1-215-323-0044

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

The TRC is on call 24 hours a day, 7 days a week. In addition, Motorola Online offers a searchable solutions database, technical documentation, and low-priority issue creation and tracking.

Calling for Repairs

If a Motorola DCH200 set-top requires repair service, please call one of the following Motorola Authorized Service Centers:

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

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

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

To ship your equipment for repair:

- Pack the unit securely, if possible in its original factory shipping carton.

- Print or display the RSA number so it is easily visible on all equipment boxes.

- Enclose a note describing the exact problem. Complete and enclose the checklist provided with the unit.

- Ship the unit PREPAID to the address provided by the Service Center.

2 OVERVIEW

Front Panel
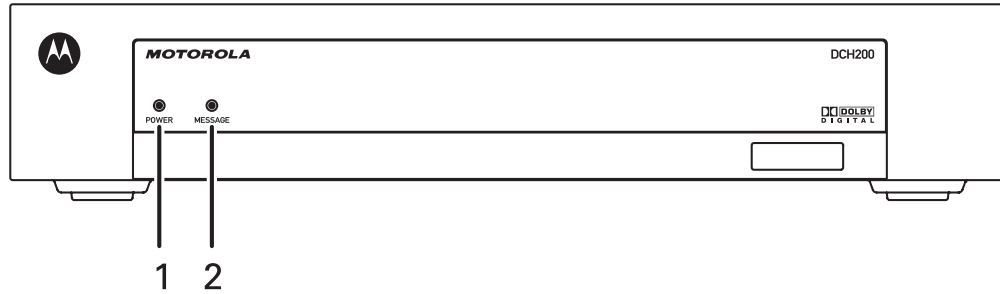
1	Power Indicator — Lit when the unit is powered ON, unlit when unit is OFF
2	Message Indicator* — Lit when a new message is waiting to be read, unlit otherwise

Availability of certain features is dependent upon application support.

Rear Panel
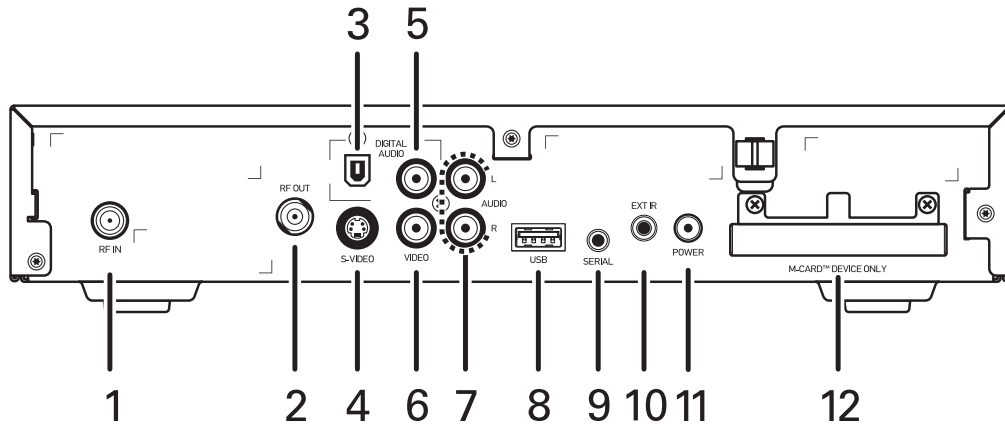
1	Cable In — Connects to cable signal from your service provider
2	RF Out — Ch 3/4 modulated audio/video (SDTV) to TV or VCR
3	Digital Audio Optical (S/PDIF) — Provides Dolby® Digital 5.1 audio or PCM output
4	S-Video — Connects to S-Video (SDTV) input of TV or VCR
5	Digital Audio Coaxial (S/PDIF) — Provides Dolby® Digital 5.1 audio or PCM output
6, 7	Video/Audio Out — Composite Video (SDTV) /Audio outputs
8	USB* 1.1 — High-Speed peripheral device connection
9	Serial — Service only
10	External IR connector
11	Power cord supply connector
12	M-Card — Inserted M-Card

Availability of certain features is dependent upon application support.

M-Card™

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

3 INSTALLATION

Before You Begin

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

- Review the installation instructions.
- Determine if you are connecting to a standard TV or a composite (baseband) monitor.
- Verify that you have the necessary cables and other required items.

Video Connection Options

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

The DCH200 offers the following video outputs:

S-Video	SDTV only	If your TV has an S-Video input, use S-Video. S-Video is the highest quality Standard-Definition video output on the DCH200.
Video (composite)	SDTV only	If your TV does not have an S-Video input, use the composite video (video) output.
RF	SDTV only	If your TV only has a coaxial RF input, connect it to the DCH200 RF out connector.

Audio Connection Options

Connect the stereo audio cable to the AUDIO L and R connectors on the DCH200 and the audio left and right connectors on the TV. If the equipment supports it, use the optical SPDIF or coaxial digital SPDIF output instead of the AUDIO L and R outputs. In most cases, these outputs offer better audio quality, including support for 5.1 Surround Sound.

When connecting to a home theater receiver, depending on its inputs, you can use the following DCH200 audio outputs:

Digital audio optical (S/PDIF) or digital audio coaxial (S/PDIF)	If the receiver supports it, use the digital audio optical (S/PDIF) or digital audio coaxial (S/PDIF) audio output to deliver Dolby AC-3 audio to a Dolby Digital home theater receiver.
Baseband Audio R and L	If the audio receiver does not support Dolby Digital, use the baseband AUDIO L and R outputs to connect to the audio receiver.

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

The VCR and TV receive their A/V signals from the currently selected input device on the audio receiver. This is important when the subscriber has another A/V device such as a DVD player, 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).

Installation Overview

1. Connect the S-Video connector using an S-video cable or connect the composite video connector using a composite (RCA phono) cable. If the TV only has a coaxial RF input, connect it to the DCH200 RF OUT connector.

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

   - If the receiver or TV has an S/PDIF input, use the digital audio optical (S/PDIF) or coaxial (S/PDIF) outputs.

   - Otherwise, use the baseband left and right audio out outputs.

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

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

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

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

7. Perform the operational check for the remote control.

Cabling to a Standard-Definition TV and an A/V Receiver

Figure 3-1 Cabling to a Standard-Definition stereo TV
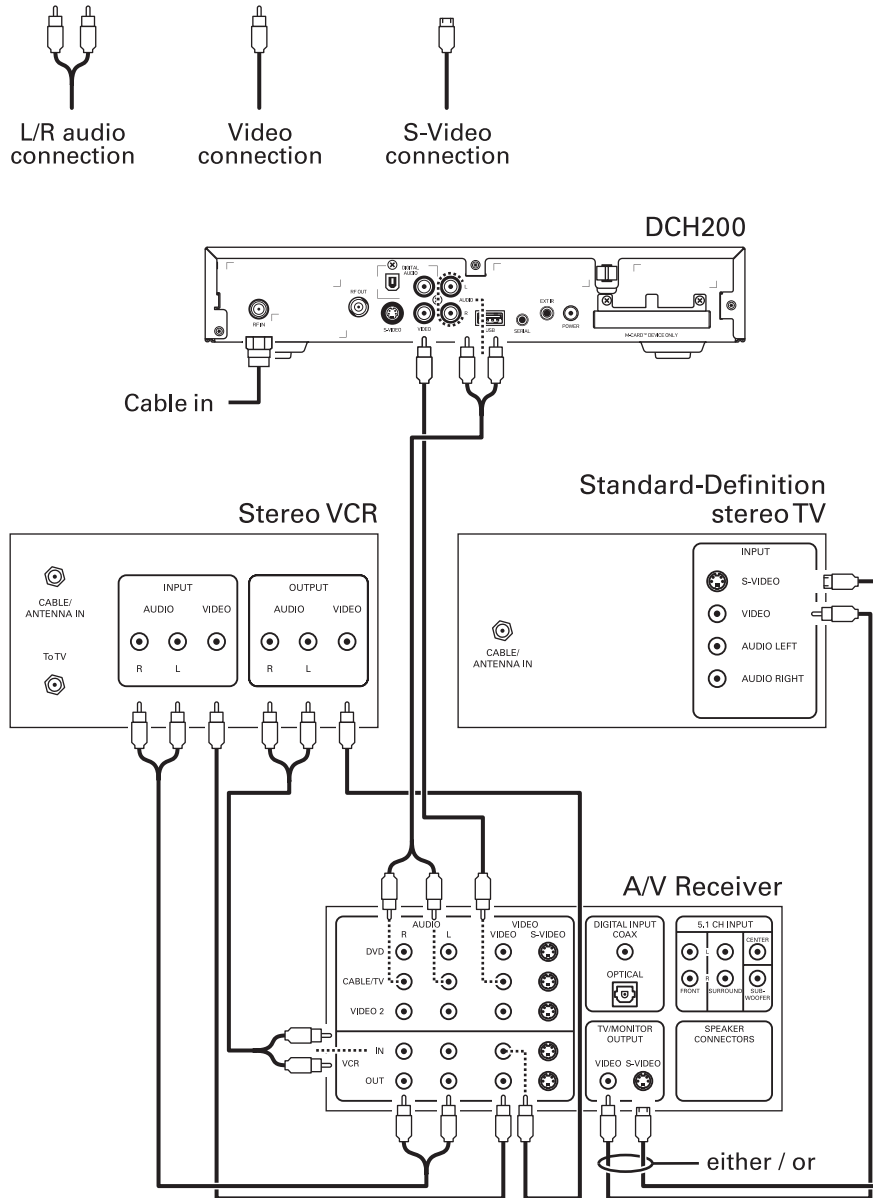
Because some entertainment equipment cannot simultaneously support baseband composite video and S-Video, never simultaneously connect both video inputs.

Cabling 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 A/V configuration illustrated enables digital stereo recording, including Dolby Surround sound. Use only one set of composite input connectors on the stereo:

The figure still refers to a DCH6200 and shows a 6200 rear panel.

Figure 3-2 Cabling an audio receiver
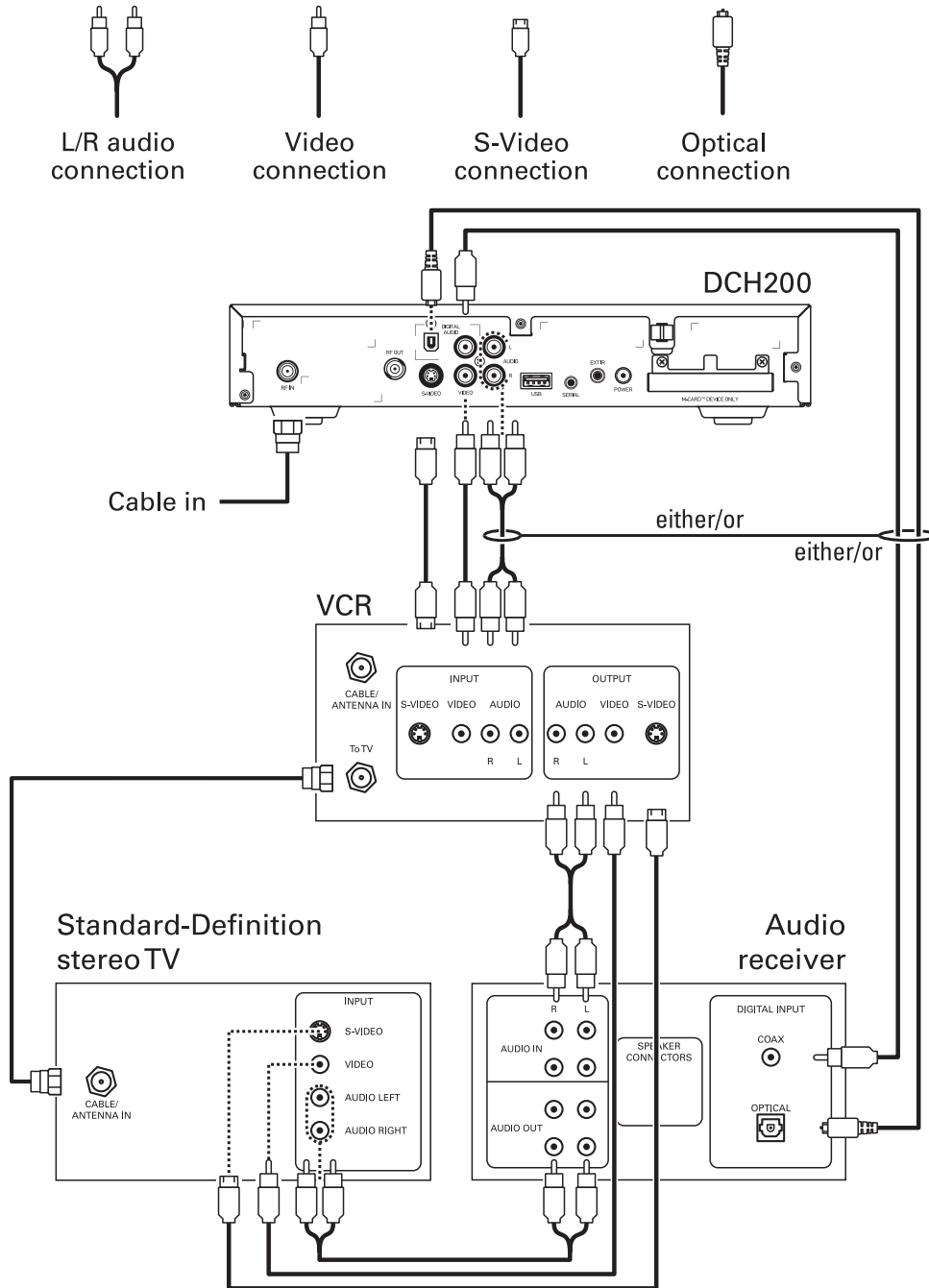
Data Device Connections

The DCH200 provides optional high-speed data services through its USB 1.1 port. The functionality requires and depends on installed application software. The USB 1.1 port can be used to daisy-chain USB devices such as printers and storage devices, or to interface with keyboards, joysticks, and other USB PC peripherals.

Figure 3-3 Sample data devices you can connect to the DCH200

DCH200

USB
devices
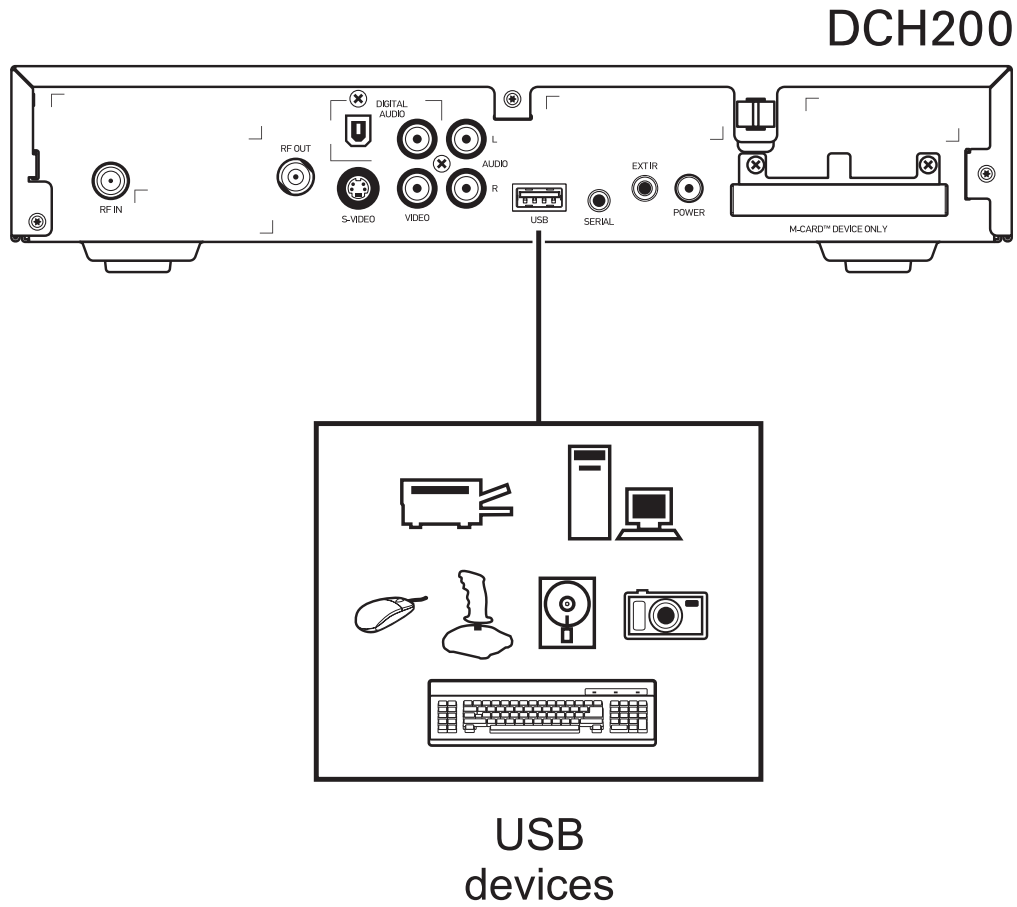
Operational Check for the Remote Control

The operational check tests communication with the remote control:

Table 3-1 Operational check procedures

Feature	Testing Procedure
Power on	Press **power** on the remote control to turn on the DCH200.
	Tune to the output 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 DCH200 does not operate properly, refer to the Troubleshooting section.

Graphics Overlaying the Video

The DCH200 can generate graphics that overlay the video programming or fill the entire television screen. Common examples include on-screen menus (such as the On-Screen Diagnostics) and EPG. The DCH200 overlays these graphics whenever you open a menu or scroll through a program grid.

On-screen graphics are available for all DCH200 video outputs.

4 DIAGNOSTICS

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

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

For the diagnostics described in this section:

- All indicators are in decimal notation, unless otherwise noted.
- All signal-level and quality indicators use a 0 to 100% scale, unless otherwise noted.
- All sample displays are illustrative; actual data may differ from the examples.
- All screens self-refresh at a minimum rate of once every five seconds.

You can use the diagnostics when running the Base Platform software.

Using the Diagnostics

To operate the set-top, use the Motorola universal remote control.

To access and navigate the diagnostic mode:

1. Ensure that the DCH200 is installed with the Base Platform software and that it is connected to an AC outlet.
2. Press POWER on the remote control to turn on the set-top.
3. Wait five seconds and then press POWER again to turn off the set-top.

To enable diagnostic mode, press SELECT/OK on the remote control within two seconds after powering off. The DIAGNOSTICS main menu is displayed on the OSD.

```
DIAGNOSTICS

>>01 General Status
  02 OOB Status
  03 In Band Status
  04 Audio/Video Status
  05 Unit Address
  06 Firmware Version
  07 Current Channel Status
  08 Renewable Security
  09 Upstream Modem
  10 App Code Modules
  11 Memory Config
  12 Interactive Info
  13 MAC Frequency Table
  14 Control Channels
  15 Message Types
  16 In Band PAT
  17 In Band PMT
  18 Task Status
  19 USB Status
  20 IB MCA Status
  21 Connected Home Status
  22 Keyboard/LED
```

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

- Press channel ▲, channel ▼, cursor ▲, or cursor ▼ to select d01 through d22.
- Press cursor ◄, cursor ►, SELECT or ENTER to execute the selected diagnostic.
- To exit the diagnostic mode, press POWER on the remote control. The set-top exits the diagnostic mode and powers off.

General Status

This diagnostic displays the error code and description, purchase count, and other information.

The General Status fields are:

Field	Description		
Error	Error codes display on the OSD when an error occurs. If multiple errors occur, the last recorded error is displayed:		
Error Code	**Description**	**Cause**	**Remedy**
E 00	NO ERROR	Indicates normal condition after initialization	None
E 01	NOT CONNECTED	The set-top did not receive a connect message	Restore out-of-band signal. Send a connect message
E 02	PWR CYCLE	Init Error	The set-top needs a power cycle to recover
E 03	DRAM	DRAM error	Not used
E 04	DPSRAM	DP-SRAM error	Not used
E 07	ROM	ROM verification failure	Power cycle the set-top; if repetitive, return for repair
E 08	RAM	Faulty RAM, ROM, EEPROM, or POST failure (this is a	Return the set-top for repair

4 DIAGNOSTICS

Field	Description		
E 09	BATTERY	Dead battery or memory has not been initialized; occurs if battery fails to keep the RAM alive during power-down; disconnects the set-top	Return the set-top for repair; requires factory initialization message
E 10	SERIALNO	Invalid serial number	Not used
E 11	INVALID UNIT ADDRESS	Invalid unit address	Return the set-top for repair; requires a unit creation message
E 12	POST ERROR	POST failed	Not used
E 13	BOOT	Sys_boot initialization failure	Power cycle the set-top; if repetitive, return for repair
E 14	STARTUP	System startup failure	Power cycle the set-top; if repetitive, return for repair
E 15	TSI INVALID	TSI Structure is corrupted	Power cycle the set-top; if repetitive, return for repair
E 16	FLASH BAD NUMBER	Bad flash number specified for Initiate Flash Platform	Error logged, ignore
E 17	BAD PLATVAL	Bad platform validation step number	Error logged, ignore
Purchases	Indicates the number of unreported subscriber event purchases stored on the product.		
Platform ID	A unique 16-bit hexadecimal number that identifies the platform image (also called the ROM ID).		
Mapped Platform ID	A unique 16-bit hexadecimal number that identifies the platform image (also called the ROM ID), used in place of the Platform ID for certain third party applications.		
Family ID	The manufacturer and product family, in hexadecimal		
Model ID	The model, in hexadecimal		
Remod Channel	The interface to the subscriber TV; channel 3 or 4 in the USA		
Time Zone	The time zone offset (in minutes) relative to GMT		
DST Entry Time	The daylight savings entry time.		
DST Exit Time	The daylight savings exit time.		
Current GPS Time	The current time.		

Out-Of-Band (OOB) Status

This diagnostic indicates the status of the out-of-band control channel.

```
OOB DIAGNOSTIC
DATA              *    SNR 20 dB   GOOD
EMM DATA          *
CARRIER LOCK YES   COUNT           8
HUNT MODE     NONE
CUR FREQ      75.25MHz
LKC           75.25MHz
EMM PRVDR ID 0x0001
```

The Out-Of-Band Status fields are:

Field	Description	
Data	Indicates whether data is being carried by the OOB (the indicators cover all packet processors regardless of which stream they are monitoring and are cleared when you enter the diagnostic).	
	OSD	**Description**
	"*"	OOB data detected within last 5 seconds
	blank	OOB data not detected within last 5 seconds
SNR	When carrier lock has been established, displays an estimate of the carrier signal-to-noise ratio in dB, with an explanation: GOOD — Good value FAIR — Marginal signal level, check the signal POOR — Unusable signal INVALID — Invalid SNR value	
EMM Data	Indicates whether the set-top is receiving a message on the EMM Stream	
	OSD	**Description**
	"*"	EMM data detected within last 5 seconds
	blank	EMM data not detected within last 5 seconds
Carrier Lock	The CARRIER LOCK is reset to "1" after an initialization from the headend or a power cycle. Each time the set-top detects a drop in OOB connectivity, the counter increments.	
	OSD	**Description**
	YES	Carrier locked
	NO	Carrier unlocked

Field	Description	
Hunt Mode	The state of OOB stream acquisition.	
	OSD	**Description**
	None	The set-top is locked to an OOB carrier
	RR (Round Robin)	The set-top is searching OOB frequencies trying to find an EMM Provider of 0 or 1.
	EMM	The set-top received a Provider ID change and is searching OOB frequencies for a new ID.
	FIX	The set-top has been commanded to attempt to lock onto a frequency
	SRCH	The set-top at some point had a valid Provider ID on the OOB frequency and is attempting to re-acquire it.
Cur Freq	The current out-of-band frequency	
LKC	The last known carrier (OOB frequency that had correct Provider ID)	
EMM Provider ID	The ID of the provider of the Entitlement Management Message (EMM)	

Agile OOB Tuner Hunting

Manual control for selecting an OOB frequency can be made while in the OOB Status diagnostics screen by pressing the Menu button. To exit this mode, press the Menu button a second time, or press the Power button.

If the set-top is in the process of hunting for an OOB frequency, control of frequency selection is suspended, i.e. pressing Menu button on OOB status screen to display MANUAL FREQ is not available when the set-top is hunting.

Summary of Operator Selection of the OOB Frequency (OSD Frequency Override in Hunted Mode)

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

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

2. The operator can use the UP/DOWN channel or cursor keys to scroll through all 10 frequencies until the desired new OOB frequency is found. The new frequency selections will appear on the "MANUAL FREQ" line of the OSD.

3. When the desired new frequency has been selected the operator will press the SELECT key to start the search. The manual frequency search will last up to 40 seconds. On the OSD the "MANUAL FREQ" line of text will be cleared, the "HUNT MODE" will display "FIX" to indicate a search on a fixed frequency, and the "CUR FREQ" field will change to the frequency being searched for.

4. If the frequency is found with the proper EMM Provider ID then the OSD "LKC" field will change to display the new frequency.

5. If after 40 seconds the frequency search is not successful the product will perform a warm reset and return to the last known carrier frequency.

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

In-Band Status

This diagnostic displays the in-band status for the last attempted channel tune. If a digital carrier is not present, the diagnostics indicate the carrier lock is analog. When the carrier lock is analog, all fields for digital (other than a carrier lock channel) are blank.

```
IN BAND DIAGNOSTIC

DATA                          *
EMM DATA
CARRIER LOCK                  YES
PCR LOCK                      YES
SNR           35 dB           GOOD
MODULATION MODE               QAM 64
SHORT TERM ERROR COUNT        00000
LONG TERM ERROR COUNT         09850
TUNED FREQ                    219.000
```

```
IN BAND DIAGNOSTIC

DATA                          *
EMM DATA
CARRIER LOCK                  YES
PCR LOCK                      YES
SNR           39 dB           GOOD
MODULATION MODE               QAM 256
SHORT TERM ERROR COUNT        00000
LONG TERM ERROR COUNT         10945
TUNED FREQ                    525.000
```

The In-Band Status fields are:

Field	Description	
Data	Indicates whether data is being received on the in-band stream. The indicators cover all packet processors regardless of the stream they are monitoring:	
	OSD	**Description**
	"*"	In-band data received
	blank	No In-band data received
EMM Data	Indicates whether data is being received on the EMM stream. The indicator is clear when entering this diagnostic.	
	OSD	**Description**
	"*"	Data received
	blank	No data received
Carrier Lock	Indicates whether the digital in-band receiver is locked to the carrier.	
	OSD	**Description**
	YES	Carrier locked
	NO	Carrier unocked
	Analog	Analog channel
PCR Lock	Indicates whether the in-band receiver is locked to the current program clock reference for a digital service.	
	OSD	**Description**
	YES	Carrier locked
	NO	Carrier unlocked

4 DIAGNOSTICS

Field	Description
SNR	When carrier lock has been established, displays an estimate of the carrier signal-to-noise ratio in dB, with an explanation. This estimate is based on the QAM cluster variance, which is proportional to the SNR. GOOD — Good value FAIR — Marginal signal level, check the signal POOR — Unusable signal
Modulation Mode	The values displayed on the OSD are: ANALOG — analog channel 64 QAM — 64 QAM digital channel 256 QAM — 256 QAM digital channel
Short Term Error Count	The FEC errors (maximum count of 65535) at 5-second intervals. The Short Term Error Count is cleared after polling.
Long Term Error Count	The accumulation of the Short Term Error Count (maximum count of 65535). The Long Term Error Count is cleared every 24 hours.
Tuned Freq	The actual frequency the tuner is programmed (Carrier Definition Frequency + 1.75 MHz).

Audio/Video Status

This diagnostic displays the audio and video status for the tuned channel.

Field	Description	
ADP Lock	The ADP Lock indicates the audio processor locked status	
	OSD	**Description**
	YES	Audio Processor is locked to the audio stream
	NO	Audio Processor is not locked to the audio stream
Audio Mode	Audio Mode indicates the audio Mode of in incoming digital service.	

4 DIAGNOSTICS

Field	Description	
	OSD	**Description**
	N/A	The audio mode is not applicable to the currently tuned stream
	Mono	The audio mode is monophonic
	Stereo	The audio mode is stereo
	Surround	The audio mode is surround sound
AUDIO SPDIF	Indicates SPDIF Mode as set by application software.	
	OSD	**Description**
	N/A	Audio SPDIF mode is not applicable
	IEC958PCM	For analog channels, the SPDIF output is in IEC958PCM format
	Dolby	For digital channels, the possible Dolby Digital modes are:
	1+1	Left is channel 1, right is channel 2
	1/0	Center
	2/0	Left, right
	2/1	Left, center, right
	3/1	Left, right, surround
	2/2	Left, right, left surround, right surround
	3/2	Left, center, right, left surround, right surround
	LFE 0	Low frequency effects (subwoofer) channel not available
	LFE 1	Low frequency effects (subwoofer) channel available
VP Lock	VP Lock indicates the Video Processor locked status	
	OSD Display	**Description**
	YES	Video Processor is locked to the video stream
	NO	Video Processor is locked to the video stream
MPEG Method	The MPEG Method selected	
	OSD Display	**Description**
	UNMUTED	Is displayed if mute method is not selected
	MUTE STILL	Is displayed if the mute method includes stopping video and presenting a still frame, similar to a pause function
	MUTE BLACK	Is displayed if mute method presents a black screen.
Subtitle Status	The subtitle parameter indicates if subtitles are enabled and, if enabled, what language is selected and if the subtitle is being rendered. The language is displayed as the 3-character ISO639.2/B language code. • Enabled is indicated with Yes or No. • The language is displayed as the 3-character ISO639.2 language code.	

Field	Description
	• Enhanced mode is indicated with Yes or No. • Rendered status is indicated with Yes or No.

Unit Address

This diagnostic displays the 16-digit (40-bit) unit address of the set-top.

```
Unit Address:
    000-02989-92654-217

Network Address:
    000-00000-00001-026

TVPC:
    000-00000-00000-000

CableCARD Inserted: Yes

Multicast 16 Address:
    000.000   000.000
    000.000   000.000
    VCN 3500
    000.008   032.011
    064.182   138.144
Seed Health   0xFF

Serial#: 00000000000000000000000000

MAC ADDRESS
MAC-Address1: 00 19 A6 5B 41 C6
MAC-Address2: 00 19 A6 5B 41 C7

           vvv Scroll Down vvv
```

4 DIAGNOSTICS

The Unit Address fields are:

Field	Description
Unit Address	A unique decimal number that indicates the unit address or physical address (13 address digits and three check digits).
Network Address	The network address in decimal format (13 address digits and three check digits)
TVPC	The TV Passcard Address in decimal format (13 address digits and three check digits)
CableCARD Inserted	YES — CableCARD is inserted NO — CableCARD is not inserted
Multicast 16 Address For	The Multicast 16 address numbers change to display the values for each data stream in TCP/IP decimal byte form. The valid stream types are: Net — Network EMM — EMM SCC — SCC_ECM DWLD — Download DATA — Data POLL — Polling packet identifier (PID)
Seed Health	This value represents the health of the set-top and should be 0xFF. If it is not 0xFF, see the "Troubleshooting" section for more information.
Serial Number	The Host Serial Number is displayed on the Unit Address diagnostic screen.
MAC Addresses	The USB and DCH200 MAC addresses are stored in protected flash and displayed in hexadecimal.

Separable Security

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

Field	Description
CARD Interface	CableCARD Interface is a status indication of the interface between the Host and CableCARD. It will indicate 'Good' if a Native/Legacy resource is established between the host and card, 'Error' if an error has occurred when establishing the Native/Legacy resource, or 'Unsupported CARD' if the inserted CableCARD is not a Motorola M-CARD in M-Mode.
CableCARD ID	The unique identifier provided by the CableCARD.
Host ID	The unique identifier in the Host Device Certificate.
Data ID	A value generated by the CableCARD for the Pairing report.
Validation	• UKNOWN if a Validation message was not received by the product. • VALID or INVALID as set by the Host Validation Message received from the headend. • BINDING if the CableCARD is busy with the binding authentication process. • NOT BOUND if Card validation status in not bound for CableCARD reasons. • HOST CERTIFICATE INVALID if the status is not bound because the Host Certificate was invalid. • HOST SIGN FAILED if status is not bound because of failure to verify Host's SIGN. • AUTH KEY FAILED if status in not bound because of failure to match AuthKey from the Host Device. • FAILED if binding failed for other reasons.

Field	Description
Pairing Rpt Method	Set to 'MMI' or 'Reportback' as received by a message from the headed, or set to 'Unknown' if the headend message was not received.
MSO Phone Number	MSO Phone Number as configured at the headend.
CableCARD	
Object Name	Code object name executing on the CableCARD.
Object Ver.	Code object version executing on the CableCARD.
Manufacturer	CableCARD manufacturer.
HW Version	Version number provided by the CableCARD.

Firmware Version

This diagnostic displays the following:

Field	Description
Dena firmware version or revision number	Firmware version number currently executing on the set-top
Build date and time	Build data and time of the Dena firmware version
BOOT	Lowest firmware code level that can be used on this set-top.
TSODA firmware version number	Firmware version number of the TSODA
CAMEL (CMLBK) firmware version number	Always 0000

Current Channel Status

This diagnostic displays the status of the last attempted tune on the in-band tuner. It shows channel type (analog/digital), acquisition state, purchasable indicator, preview indicator, parental control status, and mute status. The channel type determines the status display.

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4 DIAGNOSTICS

The Current Channel status fields are:

Field	Description		
Connected State	A connect or disconnect message determines whether the set-top is CONNECTED or DISCONNECTED.		
Type	Indicates whether the channel is analog or digital:		
	OSD	**Description**	
	ANALOG	Analog	
	DIGITAL	Digital	
aaa	Displays the encryption mode for the channel on the OSD. For an analog channel it is blank. For a digital channel, it can be: ENC — encrypted UNE — unencrypted		
bb	(Digital channels only) The current epoch authorization reason is displayed in the hexadecimal format 0xbb on the OSD.		
Status	Indicates the status of the currently tuned channel		
	OSD	**Description**	
	INIT	Initialized State	
	CONFI	Configured	
	ACQUI	Acquiring the program	
	AUTH	Authorized for the program	
	Not A	Not authorized for the program	
Preview	Indicates whether the program is in the free preview state		
	OSD	**Description**	
	YES	The program is in the free preview state	
	NO	The program is not in the free preview state	
Purchasable	Indicates whether the current program can be purchased for viewing:		
	OSD	**Description**	
	YES	Can be purchased	
	NO	Cannot be purchased	
Purchased	Indicates whether the current or next program has been purchased		
	OSD	**Description**	
	YES	Purchased	
	NO	Not purchased	
CH	Indicates the channel currently tuned when the OSD appeared		
Tuned Frequency	The actual programmed tuner frequency (Carrier Definition Frequency + 1.75 MHz)		

The EPOCH Number and Type, Authorization, Service Status, and ID are for Motorola use *only*.
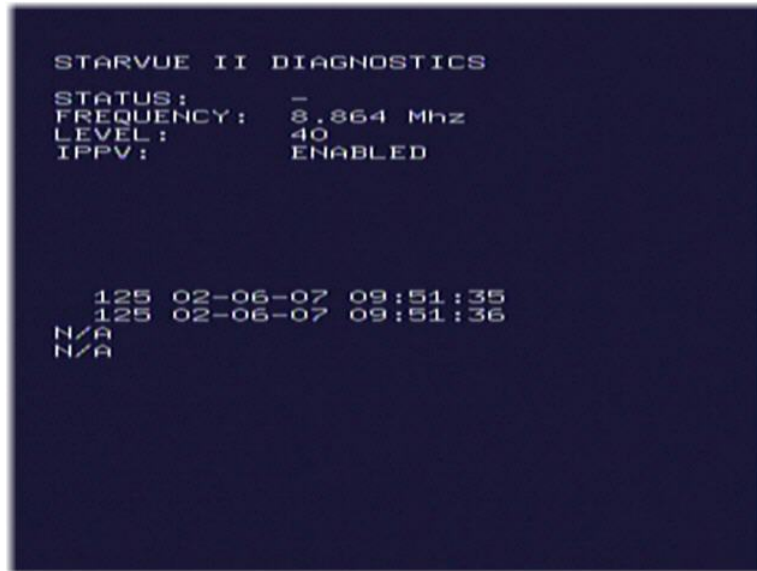
Renewable Security

RENEWABLE SECURITY

TVPC NOT REQUIRED

CRYPTO   NOT MATED
STATUS   OO
VERSION   OO
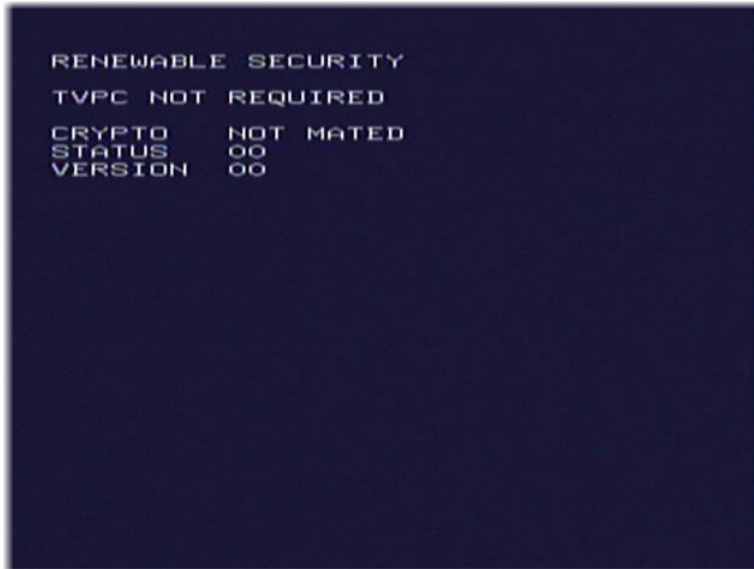
The renewable security system includes a TVPC card that returns the security status to current.

Field	Description	
TVPC Required / Not Required	Indicates whether further operation of the set-top requires the TVPC	
Crypto	Lists the current mode as displayed on the CRYPTO OSD (Stand Alone, Support, or Not Mated)	
Status	Indicates the TVPC status with the following variables	
	OSD	**Description**
	00	OK
	01	TVPC communication problem
	02	TVPC required
	03	Validator does not match between GK and TVPC
	04	Invalid unit key number
	05	Old TVPC unit address
	0a	TVPC not mated
	0b	TVPC/base module unit address mismatch
	0c	New TVPC, but wrong version number
	0d	TVPC unit address mismatch
Version	Indicates the version of renewable security being used	

Upstream Modem

This diagnostic displays the upstream status and operating parameters.

The RF Modem fields are:
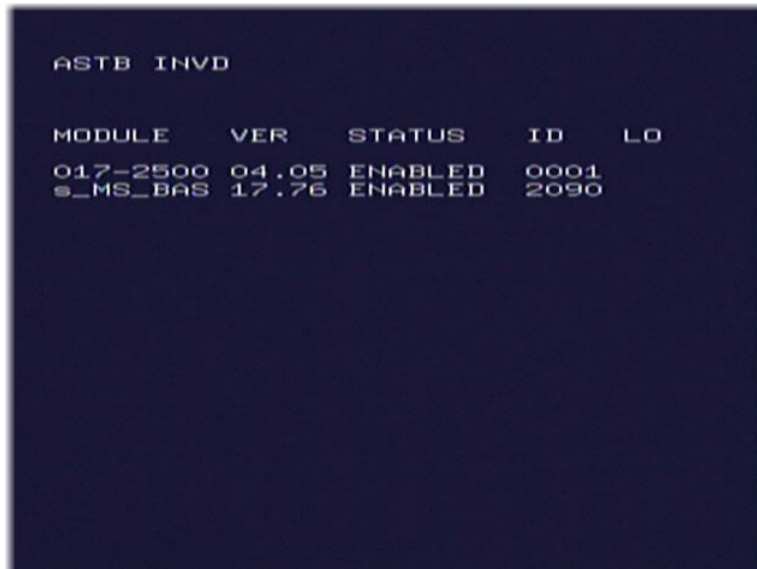
Field	Description	
Status	Indicates the transmitter status with the following variables	
	OSD	**Description**
	-	Idle
	t	Transmitting
Frequency	The transmitting frequency	
Level	The approximate power value of the STARVUE II transmitter in dBmV. The difference between the power value on the diagnostic screen and the actual power of the STARVUE II module may be +/- 5 dBmV.	
IPPV	Indicates the Interactive Pay-Per-View status with the following variables	
	OSD	**Description**
	Enabled	IPPV Enabled
	Unsent - ##	The set-top contains unsent IPPV transactions. *The variable -## is the number of unsent transactions.*
	Disabled	IPPV disabled
Last Poll Req.	Indicates the sequence number of the last poll request received by the set-top. The time stamp of the last poll request is also displayed. • If the set-top has received no poll request, the sequence number and time stamp fields display N/A • If the set-top has received a poll request but its system time has not yet been initialized, the time stamp field displays NOT AVAILABLE.	

Last Poll Ack.	Indicates the sequence number of the last poll acknowledge received by the set-top. The time stamp of the last poll acknowledge is also displayed.
	• If the set-top has received no poll acknowledge, the sequence number and time stamp fields display N/A
	• If the set-top has received a poll acknowledge but its system time has not yet been initialized, the time stamp field displays NOT AVAILABLE.
Last Purchase Report Req.	Indicates the sequence number of the last purchase report request received by the set-top. The time stamp of the last purchase report request is also displayed.
	• If the set-top has received no purchase report request, the sequence number and time stamp fields display N/A
	• If the set-top has received a purchase report request but its system time has not yet been initialized, the time stamp field displays NOT AVAILABLE.
Last Purchase Report Ack.	Indicates the sequence number of the last purchase report acknowledge received by the set-top. The time stamp of the last purchase report acknowledge is also displayed.
	• If the set-top has received no purchase report acknowledge, the sequence number and time stamp fields display N/A
	• If the set-top has received a purchase report acknowledge but its system time has not yet been initialized, the time stamp field displays NOT AVAILABLE.

App Code Modules

This diagnostic displays the downloaded code modules. This can be a multi-page display. Press SELECT to display additional pages.

4 DIAGNOSTICS

The Code Modules fields are:

Field	Description
Module	The object name
Version	The object version
Status	The object status modes available are: • LOADING • DELETED • ENABLING • ENABLED • DSABLNG • DISABLD • DELETNG • POSTPND • ENNORUN • DISNORUN
ID	The object AppID

Memory Configuration

This diagnostic displays the memory status. The format depends on the installed memory types.

The Memory Configuration fields are:

Field	Description
EEPROM Ver No.	The EEPROM version (never used, should always be 00.00)
NVMEM	The allocated system NVMEM in KB.
DRAM Code/Data	The allocated DRAM memory in KB.
FLASH	The allocated Flash memory in KB.

Interactive Status

This diagnostic tool gathers data about your system.

The Interactive Status fields are:

Field	Description
IP	The set-top IP address assigned by the NC 1500, in dotted-decimal format;for example *xxx.xxx.xxx.xxx* where each *xxx* ranges from 000 to 255. 0.0.0.0 is displayed if the IP address is not configured or unknown.
UPM	The upstream modem address. This UPM value is the same as the terminal ID assigned by the DAC 6000. It is a unique, system-generated, eight-digit integer between 1 and 16777215. 00000000 is displayed when the UPM is not configured or unknown.
Upstream ID	The set-top transmission parameter assigned by the DAC 6000. It is a four-digit decimal value from 0000 to 9999. 0000 is displayed if the Upstream ID is not configured or unknown.
Downstream ID	The set-top transmission parameter assigned by the DAC 6000. It is a four-digit decimal value from 0000 to 9999. 0000 is displayed if the Downstream ID is not configured or unknown.
State	The interactive status of the set-top:

	OSD	Description
	UNCONFIG	The set-top is not configured for the interactive system and platform should run as pre-interactive.
	MAC_CONNECT	The set-top is waiting to establish connection to MAC PID Stream.
	INIT_WAIT_DC_OR_C	The set-top is in the interactive initialization state and waiting for the default configuration or the contention channel list messages.
	WAIT_LM_ACK	The set-top is in the interactive initialization state and waiting for Link Management Response ACK for Local Address Message.

Field	Description	
	WAIT_SO_ACK	The set-top is in the interactive initialization state and waiting for a Sign On acknowledgement.
	WAIT_LA_OR_SO	The set-top is in the interactive initialization state and waiting for Logical Address or Sign On with verification Frequency message.
	INIT_STOPPED	The set-top is in the interactive initialization state and the TransMode has stopped.
	RUN_WAIT_DC_OR_C	The set-top is in the interactive state and waiting for the default configuration or the contention channel list messages.
	RUNNING	Interactive state is running, sending idle messages, and waiting for any prepare for poll or MAC messages.
	RUN_STOPPED	The interactive run state has stopped and the set-top is waiting for status or transmission control message.
	INVALID	The interactive state is unknown or invalid.
MAC Abort Cntr	This counter increments every time the MAC layer reaches the cell abort count limit. It is reset by the successful upstream transmission of a cell, for example, when an ACK is received by the set-top. If the counter reaches the MAC abort count limit, the DCH200 assumes the MAC layer is unavailable due to noise, congestion, or some other problem. The DCH200 stops transmitting data upstream, reports an error to the calling function, and attempts to re-enter the network using the initialization process. 0000 is displayed as default or if the MAC Abort CNTR is not configured or unknown.	
Socket Port State	The socket mode and activity: • UNUSED — The socket is not being used. • OPENED — The socket is open. • READY — The socket is ready to send or receive. • RECVING — The socket is receiving data from the application server. • SENDING — The socket is sending data to the application server.	

MAC Frequency Table

The set-top uses a range of frequencies set by the host for upstream communications. The MAC Frequency Table displays your frequency and signal power.

```
MAC  FREQUENCY  TABLE

FREQ        POWER
08864000    42
```

Field	Description
Frequency	The frequency, in Hz, for an upstream channel
Power	The power level, in dBmV, used on a particular upstream channel to send data to the RPD

Control Channels

This diagnostic lists channels, band types, PIDs, and counts.

```
CONTROL  CHANNEL  INFO

CHN  BAND   PID     Cnt    Ovfl  Error
*    0    INB    0000     897       0      0
*    1    INB    00A9    4430       0      0
     2    INB    0000       0       0      0
     3    INB    0000       0       0      0
     4    INB    0000       0       0      0
     5    INB    0000       0       0      0
     6    OOB    0001       1       0      0
*    7    OOB    1503   19784       0      0
*    8    OOB    0777   55378       0      0
*    9    OOB    1503   19785       0      0
*   10    OOB    1C09     627       0      0
*   11    OOB    1C0B   39847       0      0
    12    OOB    0000       0       0      0
    13    OOB    0000       0       0      0
    14    OOB    0000       0       0      0
    15    OOB    0000       0       0      0
    16    OOB    0000       0       0      0
    17    OOB    0000       0       0      0
```

Message Types

This diagnostic lists message types, IDs, and counts.

```
MESSAGE  TYPES  (hex  data)

Msg  Id  Cnt   Msg  Id  Cnt
  0   -  169    C3  1A   71
  1   -   60    C4   A  241
  2   3   51    C5   9   40
 80  10  250    D8  11    0
 81   B    0
 82  12    4
 83   C    2
 85  1E  147
 86  1D    0
 8C  18    0
 8D   8    0
 8E   F    0
 8F  19  177
 90  17    6
 91   D    0
 92  1C    0
 95  14    8
 9A   E    0
 A0  15    0
 A4  16    0
 B0   -   63
 C0  13   62
 C1   7   87
 C2  1B  253
```

Field	Description
Msg	The message type
Id	The low order byte of the Connection ID
Cnt	The number of messages received

In-band Program Association Table (PAT)

This diagnostic displays the Program Association Table Information (For Motorola use only).

```
INBAND  PAT  (hex  data)

PAT    SN    PID
001   0001  0029
002   0002  0069
003   0003  00A9
004   0004  00E9
005   0005  0129
006   0006  0169
007   0007  01A9
008   0009  0269
009   000B  02E9
00A   000C  0329
00B   000D  0369
00C   000E  03A9
00D   FFFC  0FEF
00E   0000  0FFE
```

In-band Program Map Table (PMT)

This diagnostic displays the Program Map Table information (For Motorola use only).

```
INBAND PMT (hex data)

PMT  TYPE  PID
001  0080  0090            PCR  0090
002  0081  0091            ECM  00A9
003  0086  00A3
```

Task Status

This diagnostic lists tasks (For Motorola use only).

```
TASK STATUS

TID RID PRI STARTS   RUNTIME STK%
255 --
254 --
253 --
252 --
251 --
250 --
249 --
248 --
247 --
246 --
245 --
244 --
243 --
242 --
241 --
240 --
239 --
238 --
237 --
236 --
235 --
234 --
233 --
232 --
```
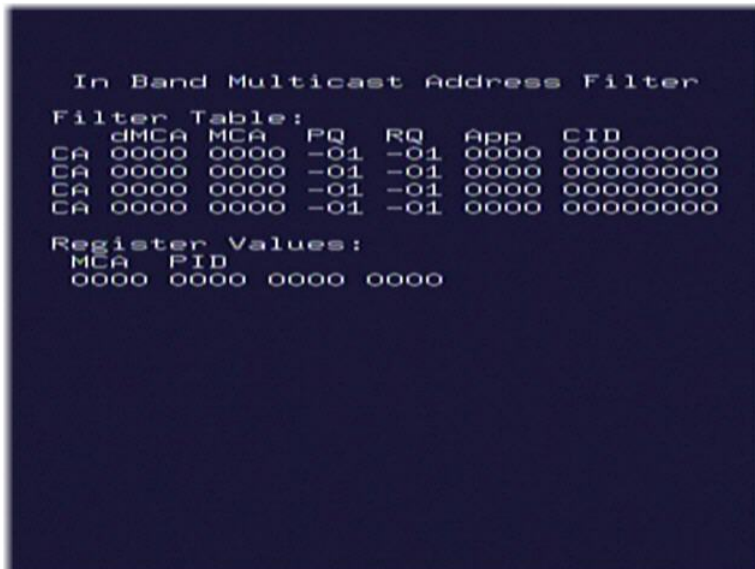
USB Diagnostic

This diagnostic is used to verify the functionality of the USB port (For Motorola use only).

In-band Multicast Address Filter

This diagnostic displays in-band multicast filter information.

Field	Description
Filter Table:	
DMCA	The default multicast 16 address
MCA	The current multicast 16 address

Field	Description
PQ	The preemption notification queue ID
RQ	The response queue ID
APP	The application ID
CID	The connection ID
Register Values:	
MCA	Multicast 16 filter register contents
PID	PID filter register contents

Connected Home Status

This diagnostic displays information related to the Home Network of which the set-top is a part.

Field	Description
RF Freq	RF frequency of the MoCA network as a numerical value in the range of 0 to 1500 inclusive representing MHz. Displays "N/A" if the MoCA network is NOT established.
MoCA	The Network and Local MoCA version IDs in the format NN/LL, where NN is the 2 digit Network MoCA version and LL is the 2 digit Local MoCA node version. Displays "N/A" if the MoCA network is NOT established.
RF Password	The MoCA RF Password for the MoCA network as a 12 to 17 decimal digit value if privacy is enabled in the MoCA network. Displays "N/A" if the MoCA network is NOT established.
Connected Home Table	The Connected Home Table contains information related to each device connected to the set-top through the Home Network. The fields included in the Connected Home Table are:

4 DIAGNOSTICS

Field		Description
	Nodes	The MoCA Node ID and Settop MR-DVR Node ID values of each device in the Home Network in format MM/SS, where MM equals the decimal digit MoCA Node ID within the range of 0-15 and SS equals the decimal digit Settop MR-DVR Node ID within the range 1-8. Displays a single dash "-"for the device if this information is not available.
		Displays an asterisk "*" in the row of the device that is the Local Device displaying diagnostics.
		Displays an "N" in the row for the device that is the Network Coordinator for the Home Network. Displays an "M" in the row of the device that is the MR-DVR Set-top Master device
		Displays "da" in the row of any device that is in the Home Network but is de-authorized for MR-DVR services
		Displays "inact" in the row of any device that is inactive in the MR-DVR network
	Dev	Displays the device type of the device:listed:
		• NIM
		• EHub
		• ETerm Hub
		• Term
		• N/A
	#Ses	The total number of MR-DVR playback and record sessions currently being supported by the device listed
	Ver	Displays the software version of the Entropic chipset in xx.yy format of the device listed
	Mac	The MAC address of the device listed in 8-byte colon-hex format (xx:xx:xx:xx:xx:xx:xx:xx)
	IP	The IP address of the device listed in 4-byte dotted decimal format (xxx.xxx.xxx.xxx).Displays "0.0.0.0" if the IP address of the device is not configured or unknown.
Connected Home Link Status Table		The Connected Home Link Status Table contains information related to the transmit phy rate between each device in the Home Network and may display warning indications under fault conditions. The warning status fields are in format "aabbcc" preceding the "From Node" row heading. These fields are blank if no fault condition exists, or display the following under the defined conditions:
	aa	Displays "Bw" in the "aa" portion to indicate a minimum bandwidth available warning
	bb	Displays "Fr" in the "bb" portion to indicate a packet error warning
	cc	Displays "Pw" in the "cc" portion to indicate a power level warning
Collecting Data		Displays "In Progress when the set-top is in the process of collecting the required data and populating the Connected Home Link Status Table.
		Displays "Complete" when the set-top has completed collecting the required data and has populated the Connected Home Link Status Table.
		Displays "N/A" when the data it has collected is invalid or unable to retrieve the data.

Keyboard / LED

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

5 TROUBLESHOOTING

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

Problem	Possible Solution
The DCH receiver will not power on	The DCH receiver may have received a software update and may not power on while the new software is being installed. Try again in a few minutes. • Verify that the AC power cord is connected to the DCH receiver and an AC outlet. Unplug the DCH receiver from the AC outlet, plug it back in, and then press the POWER button. • If the DCH receiver is connected to a switched outlet on another unit, verify that that unit is powered on. Unplug the power cord from the DCH receiver's AC outlet, plug it back it in, and then press the POWER button. It is recommended to use an unswitched outlet, if possible. • Check the batteries in the remote control. The batteries in the remote control may be depleted. Install new batteries if needed.
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 DCH receiver. Aim the remote control directly at the DCH receiver front panel, not the TV or VCR. • If using an external IR senor connected to the EXT IR input on the rear panel, ensure the cable is properly connected to the rear panel input and that there is a clear line-of-sight from the remote to the sensor. The angle between the remote control and the DCH receiver may be too large. Stand in front of the DCH receiver and not too far to either side. • Press and release operation keys one at a time, firmly and deliberately. • Check the batteries in the remote control. The batteries in the remote control may be depleted. Install new batteries if needed.
There is no audio when viewing cable channels	• Verify that the mute button on the DCH receiver or the remote control has not been pressed. Press mute on the remote control to restore sound. • If the DCH receiver audio output is connected to the TV, verify that the mute button on the TV has not been pressed. • If the DCH receiver audio output is connected to a home theater receiver, verify that the receiver is set to the appropriate input source and the mute button on the receiver has not been pressed. • Verify that you have the correct cables for the audio connections. • Verify that the audio cables are firmly connected between the DCH receiver and the audio playback device (TV, receiver, DVD player, etc.).
There is no audio from the center and/or surround speakers of a home theater receiver connected to the DCH receiver	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 S/PDIF cable (coaxial or optical) is firmly connected to the DCH receiver 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.

5 TROUBLESHOOTING

Problem	Possible Solution
There is no video on the TV screen	• Verify that the TV is powered on and set to the appropriate input source for the DCH receiver. • Verify that the DCH receiver is powered on and tuned to an authorized cable channel. • Verify that all video cables between the DCH receiver and the TV are firmly connected. • Verify that the coaxial cable feed is firmly connected to the DCH receiver and the wall jack. • If the DCH receiver 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.
No closed captions display	• Verify that closed captions are enabled on the TV. Note: Closed captioning may not be available on the current program.
There are black bars to the right and left of the picture	Wide screen TVs display 4:3 programs in this format unless set to Stretch (see your TV manual for information about stretching 4:3 video).
There are black bars above and below the picture	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 your TV manual for information about zooming 4:3 video).
There are black bars on all four sides of the picture	This may occur on a 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 DCH200 cannot correct the video. You may be able to minimize the border using the zoom feature on the TV.

MOTOROLA