Installation Manual
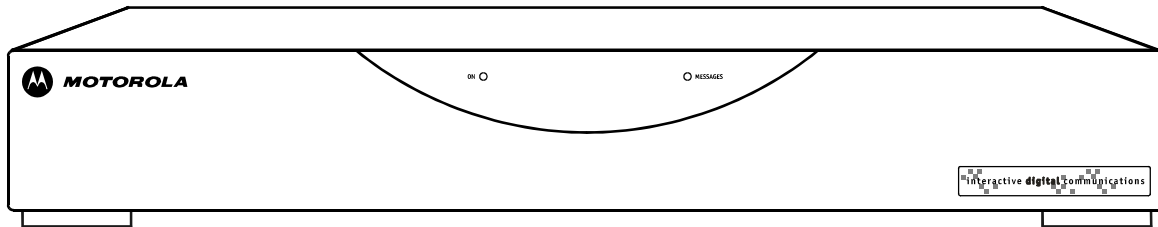
DCT1800
Digital ConsumerTerminal

MOTOROLA
intelligence everywhere™

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ON ○   ○ MESSAGES

interactive **digital** communications

CAUTION

RISK OF ELECTRIC SHOCK
DO NOT OPEN

CAUTION: TO REDUCE THE RISK OF ELECTRIC SHOCK,
DO NOT REMOVE COVER (OR BACK).
NO USER-SERVICEABLE PARTS INSIDE.

REFER SERVICING TO QUALIFIED SERVICE PERSONNEL.
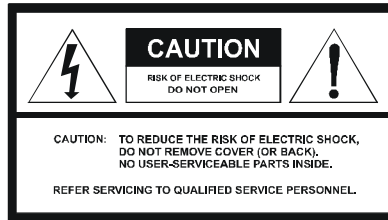
Graphical symbols and supplement warning marking locations on the bottom of the appliance.

	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.
	This symbol calls attention to a critical procedure, or means refer to the instruction manual for opening or service information. Only qualified service personnel are to install or service the equipment. The symbol may also appear in text and on schematics.

WARNING:

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

CAUTION:

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

FCC Compliance: Federal Communications Commission Radio and Television Interface Statement for a Class 'B' Device

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 the 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 the 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:

- Reorient or relocate the receiver antenna
- Increase the separation between the equipment and the affected receiver
- Connect the equipment into an outlet or on a circuit different from that to which the receiver is connected
- Consult the dealer or experienced radio/TV technician for help
- Ensure that the cover plate for the security card is secured and tight

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

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, 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 #_____
c/o Rudolph Miles and Sons
2500 Courage Boulevard
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 DCT1800 is an analog/digital set-top that supports 64 and 256 QAM digital signal formats. The DCT1800 is compatible with existing Motorola analog and digital set-top products.

The Motorola DCT1800 offers:

- 54 through 860 MHz integrated tuner
- Integrated RF return (using built-in STARVUE II® module)
- RF and baseband audio/ video ports

Figure 1-1 illustrates front and rear views of the DCT1800:

Figure 1-1
DCT1800 advanced set-top
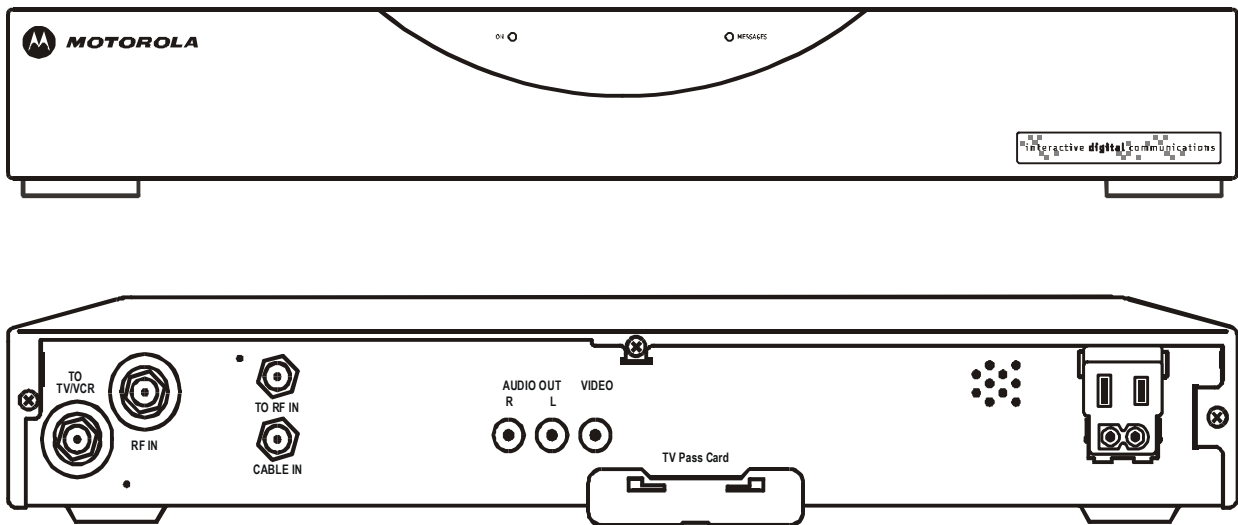
Using This Manual

This manual provides instructions to install and configure a DCT1800:

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 DCT1800 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 DCT1800 in a subscriber location and perform operational tests.
Section 4	**Troubleshooting** provides guidelines for troubleshooting the equipment.
Appendix A	**Specifications** provide the technical specifications for the DCT1800.
Appendix B	**Diagnostics** provide instructions on accessing and interpreting the built-in diagnostics.
Abbreviations and Acronyms	The **Abbreviations and Acronyms** list contains the full spelling of the short forms used in this manual.

Related Documentation

Separate instruction manuals are available for associated components. Although these may be useful, they are not necessary to install or operate the DCT1800:

▪ *DCT1800 User Guide*

Document Conventions

Before you begin working with this manual and using the DCT1800, 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 DCT1800, 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 2:00 AM 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 call **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.

Ship the unit **PREPAID** to the following address:

Motorola, Inc.
Broadband Communications Sector
Attn: RSA #_____
c/o Rudolph Miles and Sons
2500 Courage Boulevard
Brownsville, TX 78521

Overview

The DCT1800 uses digital compression technology to provide new revenue generating services. The DCT1800 can be configured to support real time reverse path communications, providing a gateway to interactive services such as Video on Demand (VOD), Internet access, e-mail, home shopping, and more.

This section provides illustrations and tables showing the DCT1800 displays and connectors. Before you begin to install the DCT1800, familiarize yourself with the various controls and displays.

Front Panel

The front panel of the DCT1800 has two LED displays: one to indicate the unit is turned on and one to indicate a message is present. Figure 2-1 illustrates the front panel:

Figure 2-1
DCT1800 front panel
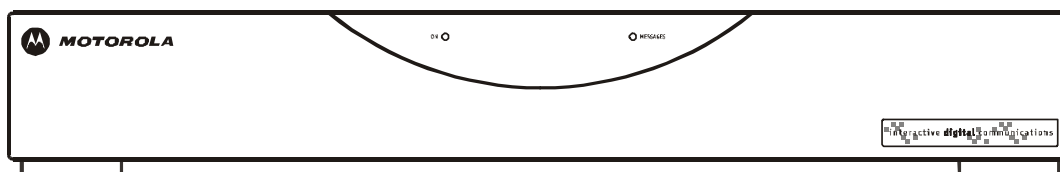
The DCT1800 is operated by using the Motorola universal remote control. See "Remote Controls" in this section for information on operating the DCT1800.

Rear Panel

Figure 2-2 illustrates the rear panel of the DCT1800, which contains a power connection and connectors for video, audio, and RF cabling:

Figure 2-2
DCT1800 rear panel
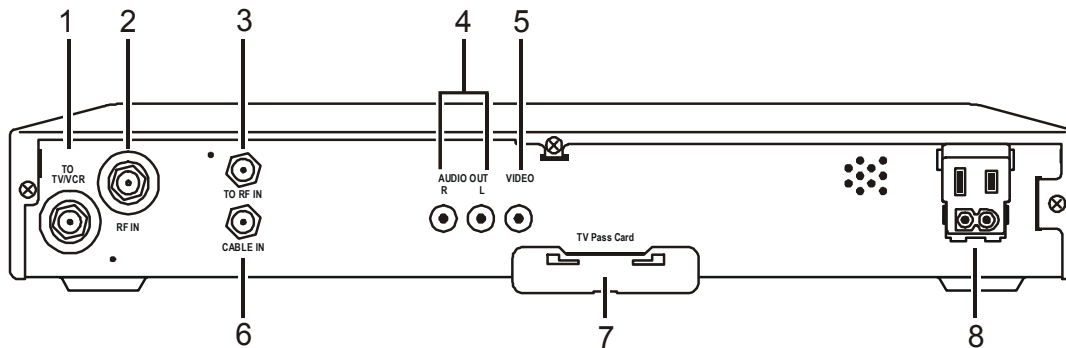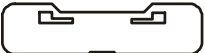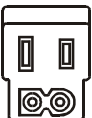
Table 2-1 describes each of the rear-panel features:

Table 2-1
Rear panel

Key	Item	Function
1	TO TV/VCR	F-type connector used to connect the DCT1800 to a standard TV or VCR
2	RF IN	F-type connector used for DCT1800 input from the TO RF IN connector
3	TO RF IN	F-type connector used to connect the TO RF IN port to the RF IN port (output from integrated RF return)
4	AUDIO OUT R L	Left and right audio RCA jacks used for stereo audio output
5	VIDEO	RCA jack used to connect the DCT1800 to a composite (baseband) video TV or a monitor; in some configurations this jack connects to a VCR
6	CABLE IN	F-type connector used for the coaxial cable input port from plant (input to integrated RF return)
7	TV Pass Card	Cover for an area reserved for future use
8		AC power outlet that can be configured as a switched or unswitched outlet

Remote Controls

The DCT1800 uses a Motorola universal remote control to operate. If your system offers optional interactive applications, such as an interactive program guide, a different remote control may be required. The application provider should supply user instructions for each interactive application.

Motorola Universal Remote Control

Figure 2-3 illustrates the remote control:

Figure 2-3
Motorola universal remote control
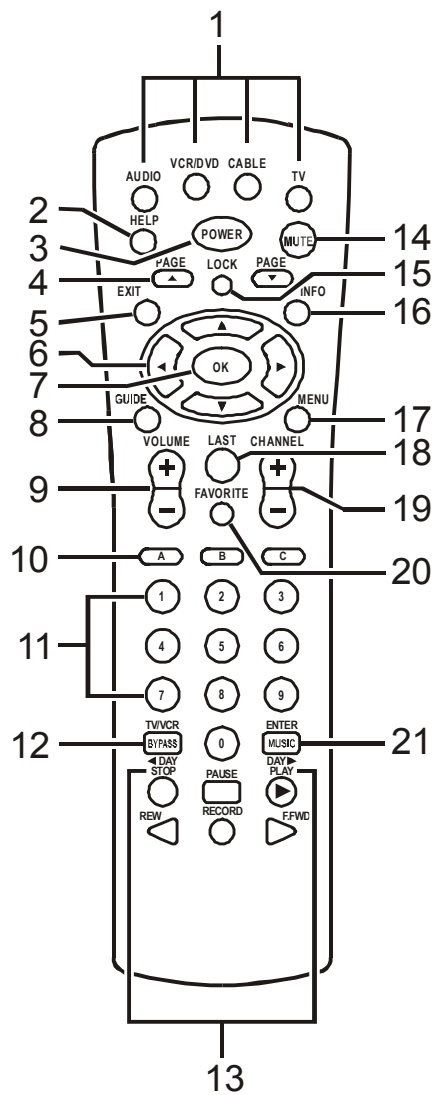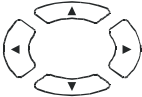
Table 2-2 describes the remote control keys:

Table 2-2
Remote control keys

Key	Item	Description
1	**AUDIO, VCR/DVD, CABLE, or TV**	Selects a desired device to control. The selected mode will remain active until you press another device key.
2	**HELP**	Displays the help screen.
3	**POWER**	Turns the selected home entertainment component on or off.
4	**PAGE ▲ or PAGE▼**	Pages through menu screens and the program guide.
5	**EXIT**	Exits a menu or program guide.
6		Moves the cursor around the program guide and menu screens.
7	**OK**	Selects menu options, Pay-Per-View events or tune programs from the program guide. Your remote may only have OK; this key still performs the same functions.
8	**GUIDE**	Displays the program guide.
9	**VOLUME + or VOLUME -**	Increases or decreases the volume of the currently selected device.
10	**A, B, or C**	Functionality is determined from services offered by the service provider.
11	**NUMBER KEYS**	Directly selects a channel.
12	**TV/VCR BYPASS**	When in VCR mode, toggles between television and VCR. Bypass is not available.
13	**◄ Day Day ▶**	Moves the program guide ahead or back 24 hours.
	STOP, PAUSE, PLAY, REW, RECORD, F.FWD	Controls the VCR.
14	**MUTE**	Toggles the sound on and off.
15	**LOCK**	Limits viewing of selected programs; and is used to view the Pay-Per-View menu. Your remote may have only LOCK; this key still performs the same functions.
16	**INFO**	Displays the current channel and program information (not supported by all applications).
17	**MENU**	Displays the main menu.
18	**LAST**	Recalls the last channel or goes back one screen in the menu.
19	**CHANNEL + or -**	Changes the channels by moving up or down.
20	**FAVORITE**	Displays preset favorite cable channels.
21	**ENTER/MUSIC**	Displays digital music channel menus. On some TV models, press to enter channels.

Installing Batteries in Remote Control

Before using the remote control, you must install two AA (1.5 V) alkaline batteries. Figure 2-4 illustrates battery access on the back of the remote control.

To install batteries in a Motorola universal remote control:

1 Press and slide the battery compartment cover off.

2 Place the batteries in the compartment; be careful to observe the correct polarity.

3 Slide the battery compartment cover back into place.

Battery installation will vary with each style of remote control. Refer to the instructions included with your remote control for installing batteries.

Figure 2-4
Back view of remote control
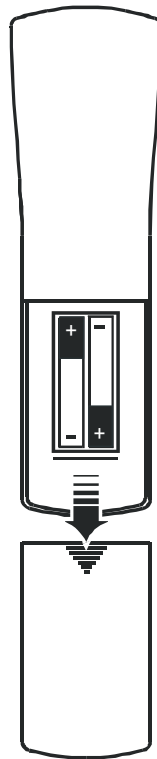
NOTE!

!	Use and dispose of batteries in accordance with all applicable laws, rules and regulations. Motorola will not be liable to anyone for the user's failure to use and/or dispose of batteries in the proper manner and in accordance with such laws, rules and regulations, or for any defect contained in batteries that may cause injury damage to persons or property.

Section 3
Installation

This section provides instructions for installing and cabling the DCT1800. To complete the installation, you must:

- Connect the cables
- Supply power to equipment
- Download configuration information and software
- Run operational check and diagnostics

This section also includes the procedure for performing a cold initialization of the DCT1800.

Before You Begin

Before you begin, review the installation instructions, gather the required items, and complete the tasks listed below:

- Verify that you have 75-ohm coaxial cables with F-type connectors and RCA baseband phono-type cables.
- Determine if you are connecting the DCT1800 to a standard TV or a composite (baseband) monitor.
- Place the DCT1800 on a smooth, flat surface and remove any obstructions that could interfere with the free flow of air over, under, or around it. Advise the subscriber not to place anything on top of the unit.

Installing the DCT1800

To install the DCT1800:

1 Determine if you are connecting the DCT1800 to a conventional TV or to a monitor. To install the video connection:

- For a conventional TV, use a 75-ohm coaxial cable with F-type connectors.
- For a monitor, use an RCA phono cable to connect the VIDEO connector to the monitor.

2 Locate the cabling diagram that matches the subscriber's configuration requirement.

3 Connect the cables as illustrated in the diagram.

4 Perform the basic operational check in this section after the DCT1800 is installed.

Standard Cabling Diagram

The DCT1800 will output on either channel 3 or 4 depending on the configuration message from the control system. Figure 3-1 illustrates a standard diagram connecting the DCT1800 to a TV using RF connectors:

Figure 3-1
Standard cabling
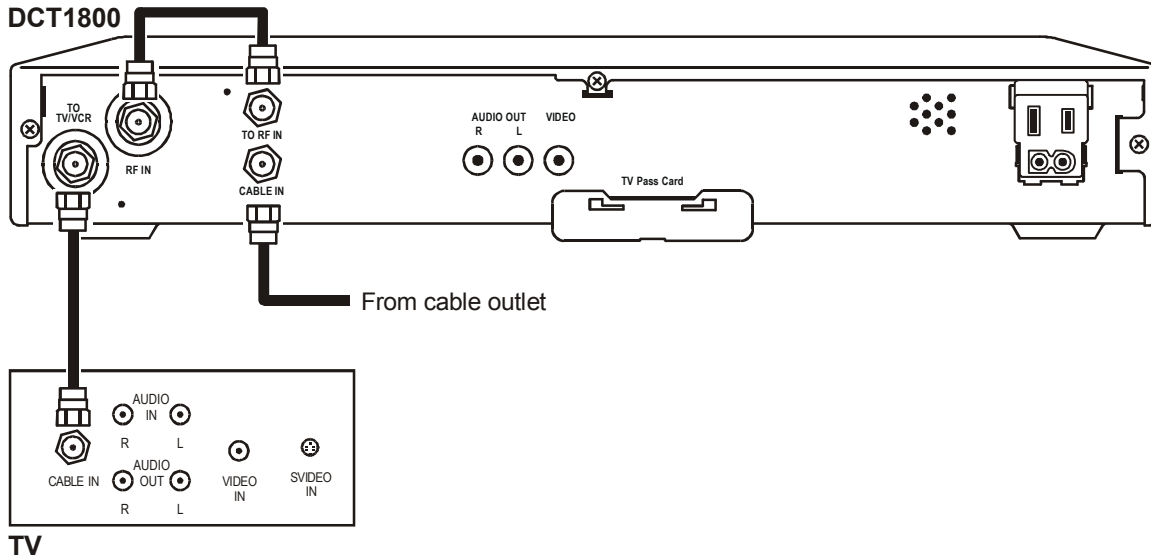
The remodulated channel, 3 or 4, does not carry stereo for digital channels. To receive stereo, connect the DCT1800 using RCA baseband connectors. These connections are illustrated later in this section.

Standard VCR Cabling Diagram

Figure 3-2 illustrates the basic cabling diagram that enables you to record the channel being viewed:

Figure 3-2
Standard VCR cabling
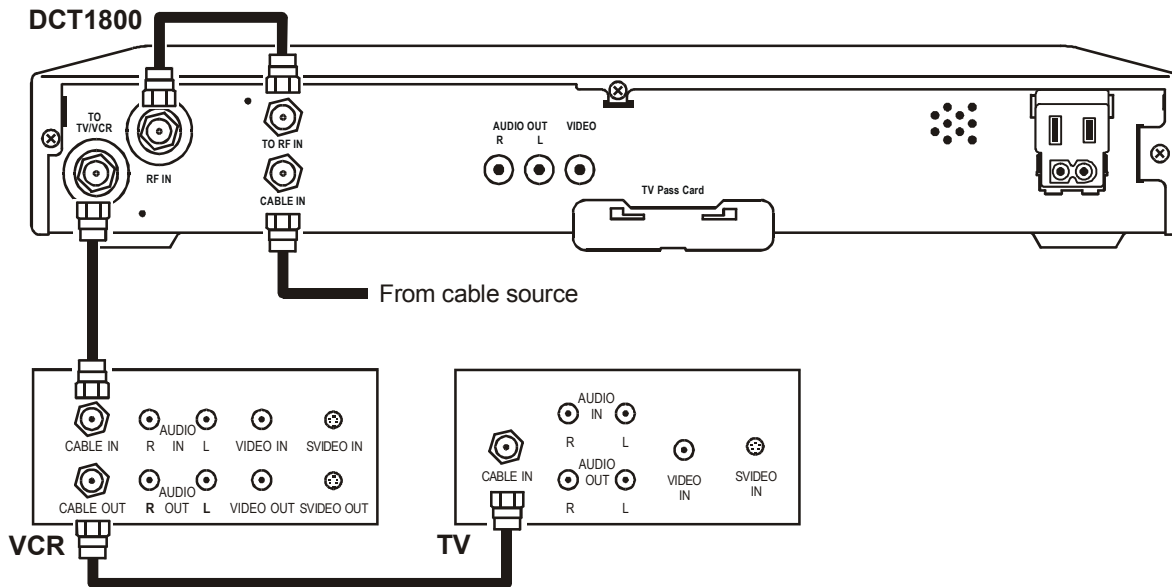
The remodulated channel, 3 or 4 does not carry stereo for digital channels. To receive stereo, connect the DCT1800 using RCA baseband connectors. These connections are illustrated later in this section.

Composite Baseband Cabling Diagrams

Connecting the DCT1800 using the baseband RCA type outputs enables the subscriber to experience stereo and Dolby Surround® sound when available on digital channels.

Figure 3-3 illustrates the standard baseband audio and video outputs of the DCT1800:

Figure 3-3
Standard baseband cabling
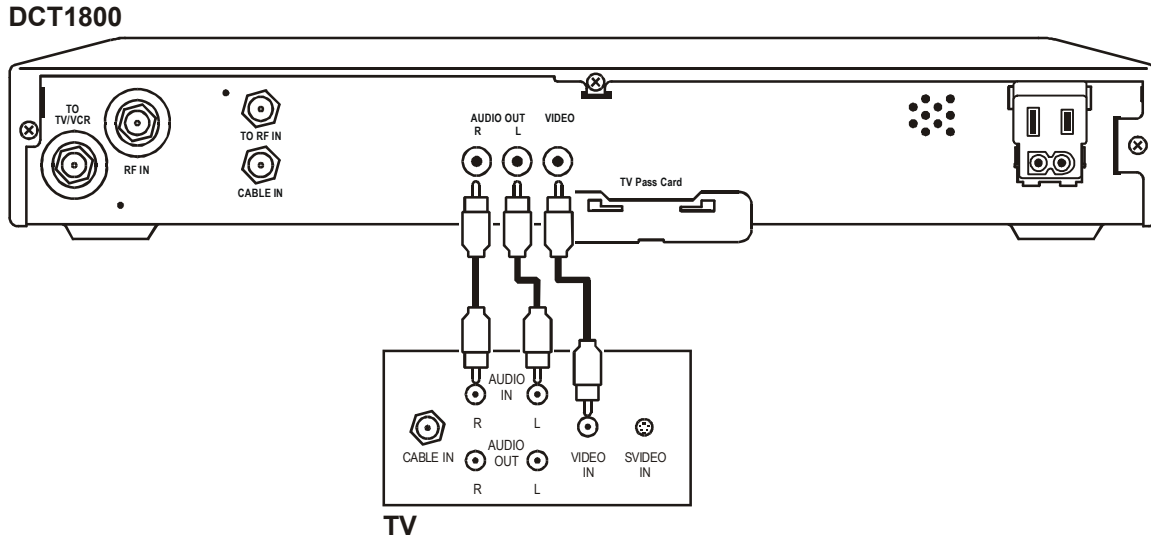
Figure 3-4 illustrates baseband audio and video connections to a VCR and TV:

Figure 3-4
Composite VCR cabling
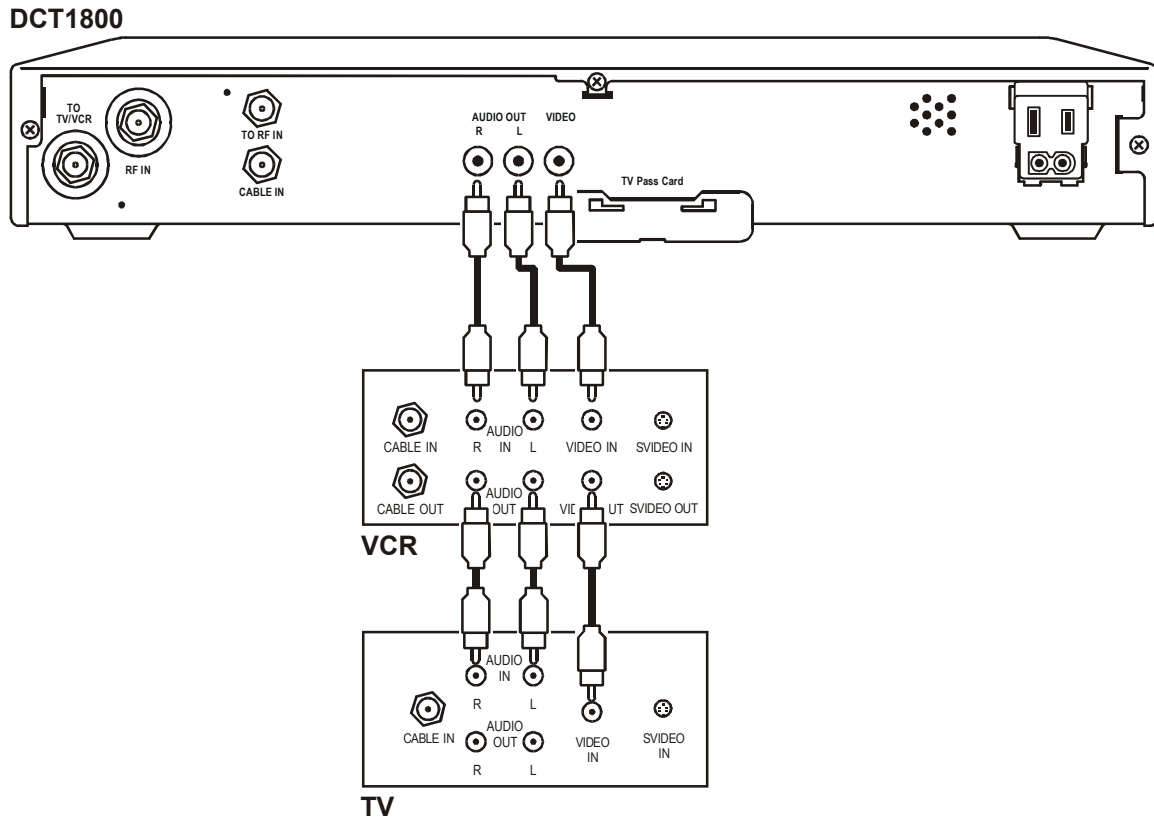
Stereo Cabling Diagram (Baseband)

This audio configuration does not provide for a TV playing through the stereo. Figure 3-5 illustrates how to connect the DCT1800 to a stereo using the audio connectors on the VCR:

Figure 3-5
Audio through the VCR
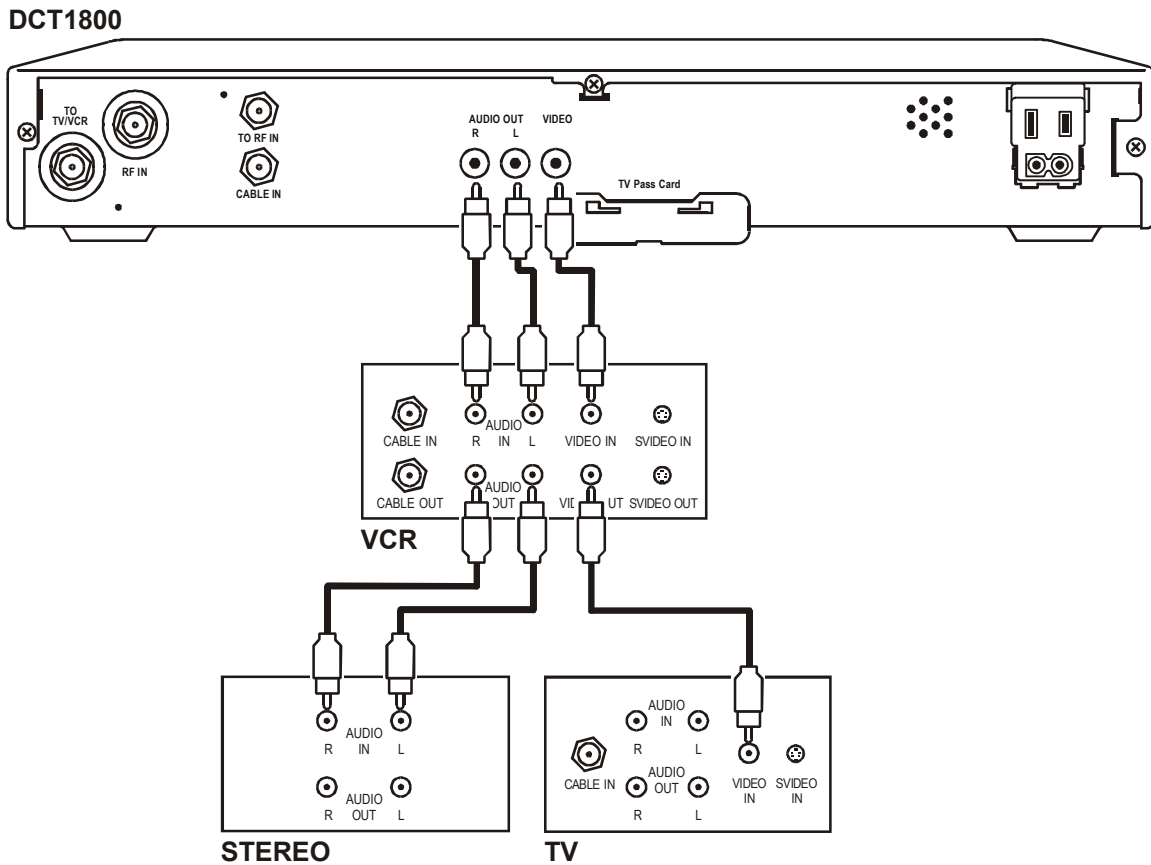
This audio configuration enables the TV to play through the stereo. Figure 3-6 shows how to connect the DCT1800 to a stereo using the audio loop-through connectors on the VCR and the audio output ports on the TV monitor:

Figure 3-6
Audio through VCR/audio output on TV
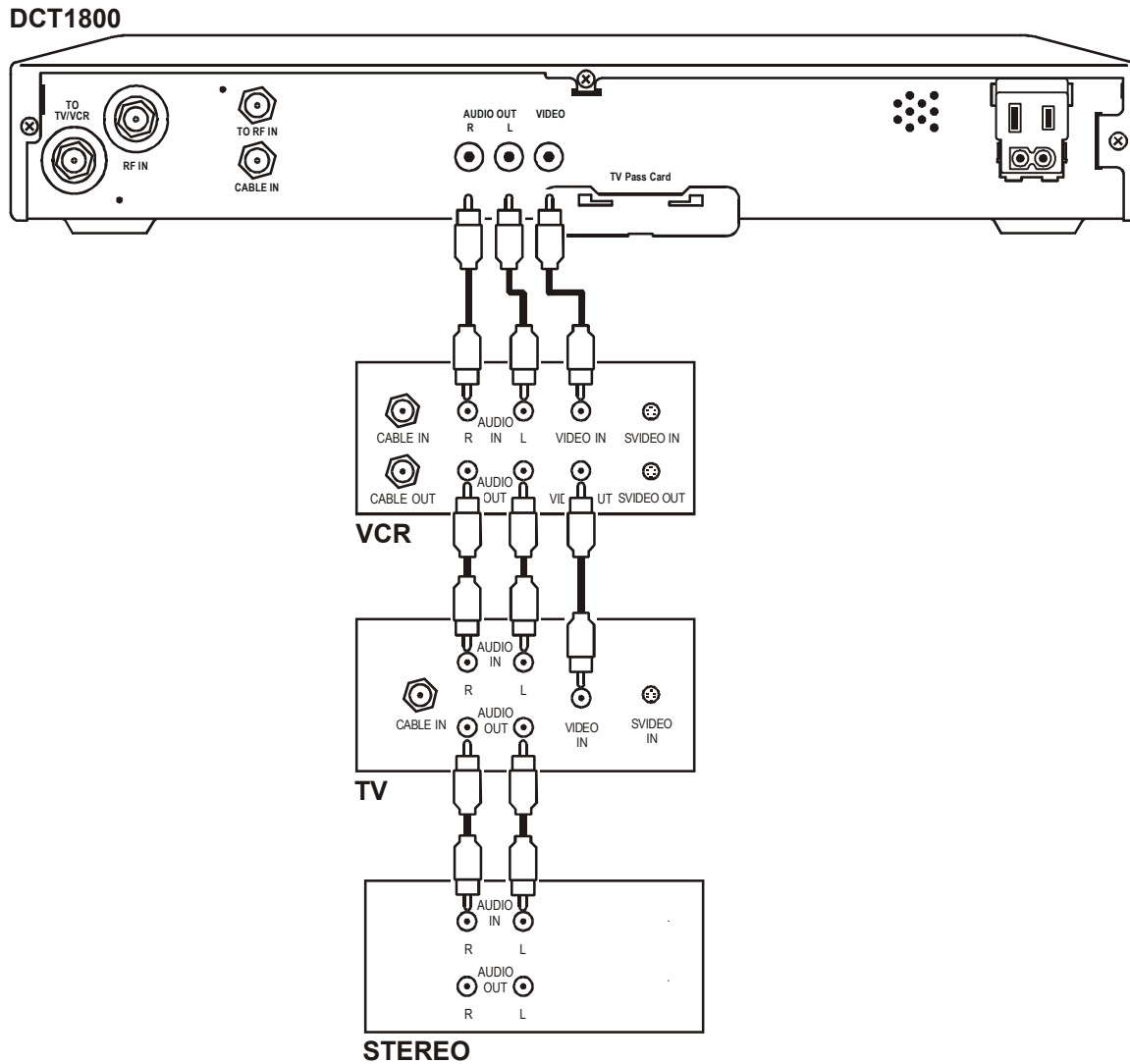
A/V Receiver Cabling Diagrams

Using this configuration, the audio/video signals are passed through the digital receiver to enable the VCR record and playback features. Figure 3-7 illustrates audio/video connections for an A/V receiver:

Figure 3-7
Audio through A/V Receiver
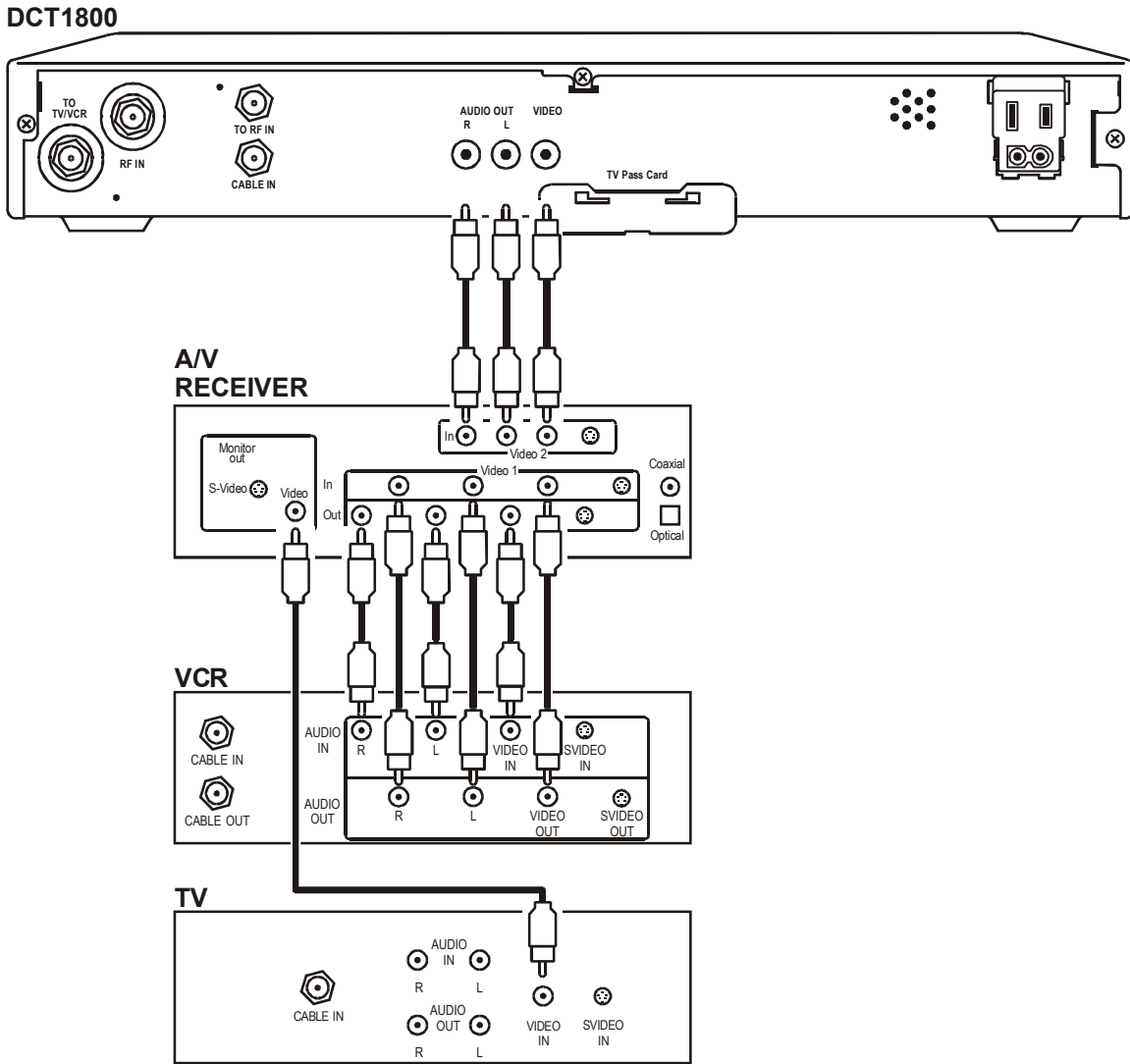
Operational Check

The operational check tests the communication link between the remote control and the DCT1800. The procedures verify the DCT1800 response to remote control commands. Table 3-1 lists the operational check procedures:

Table 3-1
Operational check

Feature	Testing Procedure
Power on	▪ Press POWER to turn on the DCT1800.
	▪ Turn on the TV and tune it to the output channel of the DCT1800 (channel 3 or 4).
Channel Selection	Tune to several channels by entering the channel number with the numeric keys on the remote control.

If the DCT1800 does not operate properly, refer to Section 4, "Troubleshooting".

Cold Initialization

The DCT1800 has no front panel buttons. To perform a cold initialization, or *reset*, use the remote control.

To execute a cold initialization:

1 Hold down any key on the remote control while disconnecting and reconnecting AC power to the DCT1800.

After booting up, the POWER LED on the DCT1800 front panel will flash.

2 Within 3 seconds, press the **3** key on the remote control.

The POWER LED on the DCT1800 front panel flashes at a decreased rate.

3 Within 3 seconds, press the **2** key on the remote control.

The POWER LED on the DCT1800 front panel flashes at an increased rate.

4 Within 3 seconds, press the **8** key on the remote control to initiate the cold reset.

During the cold initialization procedure, if the appropriate remote control key is not pressed within the three-second time period, the procedure terminates and the DCT1800 resumes normal operation.

Section 4
Troubleshooting

This section provides information to assist you in quickly detecting, isolating, and resolving error conditions that might occur when using the DCT1800. If you need assistance, call the Motorola Technical Resource Center (TRC):

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

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

Table 4-1 is a list of possible problems and solutions:

Table 4-1
Troubleshooting guidelines

Problem	Possible Solution
No power to the DCT1800	Check the power outlet for AC power.
	Be sure the TV is tuned to the output channel of the DCT1800 (channel 3 or 4).
	Verify that cable connections are correct from the TV set or monitor to the DCT1800.
	Check that the power cord is properly plugged into the outlet and DCT1800.
Remote control is not responding	Check for an obstruction between the remote control and the DCT1800. Aim the remote control directly at the DCT1800, not the TV or VCR.
	Be sure you firmly and deliberately press and release operation keys one at a time.
	Check that the DCT1800 has been initialized correctly; refer to Diagnostics.
The DCT1800 is not receiving a cable signal	Check the cable connections and hand-tighten if necessary.
	Verify that the cable connections are correct.
	Verify the TV is working and has a clear picture.
Guide has no data	Unplug the power to the DCT1800 and plug in the unit again. Wait for the DCT1800 to collect the data.

Appendix A
Specifications

Input frequency	54 - 860 MHz (excluding data carrier frequency)
HRC/IRC frequency assignments	Downloadable
Number of channels:	136 carriers per cable
Analog	1 channel per carrier
Digital	More than 1 channel per carrier, content dependent
Input analog video level	0 dBmV – +15 dBmV
Input analog sound level	–17 dBmV – +2 dBmV
Average digital input level	–10 dBmV – +5 dBmV
Data carrier:	QPSK-modulated carrier
Frequency	Agile
Bandwidth	1.5 MHz
Level	–10 dBmV – +5 dBmV
Video s/n	49 dB @ 0 dBmV input level
Output frequency accuracy	±150 kHz
Return loss:	
Input	6 dB minimum
Output	8 dB minimum
Spurious output	–57 dBc maximum, in band
Cross-modulation distortion	–56 dB (136 channels, each @ +15 dBmV)
Composite second order distortion	–57 dB (136 channels, each @ +15 dBmV)
Second order distortion	–60 dB (136 channels, each @ +15 dBmV)
Composite triple beat distortion	–57 dB (136 channels, each @ +15 dBmV)
Set-top input beats (with all input signals)	–25 dB (136 channels, each @ +15 dBmV)
Hum modulation distortion	3 IRE
Output level	10 - 15 dBmV
Isolation (input/output)	70 dB minimum
Differential phase	10 degrees (maximum)
On-screen display (OSD):	
Screen size	352 x 480 pixels (configuration dependent)
Message/barker capacity	Up to 40 pages (configuration dependent)
Mechanical security	Standard: security screws, unichassis construction
Operating environment range:	
Temperature	0° - 40°C (32° through 104°F)
Humidity	5 - 95% (noncondensing)

ac voltage	105 – 125, 60 Hz
Power dissipation	16 W at 115 Vac
Surge protection	Provided on power supply and RF ports
Size	17.13 $\times$ 13.25 $\times$ 2.75 inches
Weight	8.6 pounds

Diagnostics

This section describes the diagnostics to confirm proper DCT1800 installation, including:

- Checking error states and signal integrity
- Identifying the set-top on the network
- Verifying communications with the headend

The diagnostic information is displayed on the on-screen display (OSD).

For the diagnostics provided here:

- All indicators are in decimal notation unless otherwise noted.
- All signal-level and quality indicators are based on a 0 to 100% scale, unless otherwise noted.
- All screens self-refresh at a minimum rate of once every five seconds.
- All sample displays are illustrative; actual data will differ from the examples.
- The screens are available for V7.72 code and higher.

Accessing Diagnostics

Use the Motorola universal remote control to operate the DCT1800.

To access and navigate the diagnostic mode:

1 Press **POWER** on the remote control to turn on the set-top.

2 Wait five seconds and then press **POWER** again to turn off the set-top.

3 Press **SELECT /OK** on the remote control within two seconds after powering off. The DIAGNOSTICS main menu (Figure B-1) is displayed on the OSD. The set-top is now in diagnostic mode.

4 Use the **CHANNEL** keys on the remote control to select the desired diagnostic.

5 Press **CURSOR <**, **CURSOR >**, **SELECT**, or **ENTER** to execute the selected diagnostic.

6 To exit the diagnostic mode, press **POWER** on the remote control. The set-top exits the diagnostic mode and powers off.

Navigating the Diagnostics

Figure B-1 illustrates the DIAGNOSTICS main menu:

Figure B-1
DIAGNOSTICS Main Menu

```
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      MESSAGE TYPES

15      IN BAND PAT

16      IN BAND PMT

17      TASK STATUS

18      IB MCA STATUS

19      KEYBOARD / LED
```

Table B-1
Operational keys using the diagnostics main menu or submenus

Key	Key function using the diagnostics main menu	Key function using a diagnostic
POWER	Exits diagnostic mode and enters OFF state	Exits diagnostic mode and enters OFF state
CH/CUR +, CURSOR UP	Moves the cursor up	Displays the DIAGNOSTICS main menu
CH/CUR - , CURSOR DOWN	Moves the cursor down	Displays the DIAGNOSTICS main menu
CURSOR RIGHT, CURSOR LEFT, SELECT, ENTER	Runs the selected diagnostic	Displays the DIAGNOSTICS main menu
GUIDE	No function	No function
MENU	No function	No function
INFO	No function	No function

d 01: General Status

The general status diagnostic displays the error code, a short description of the error, the purchase count, and specific model information:

Figure B-2
DCT1800 Status

```
01   DCT1800 STATUS


     ERROR            :  E 00


     NO ERROR


     PURCHASES        :  0


     Platform ID:     :  0x0060

     Family ID        :  0x0000

     Model ID         :  0x008F


     TUNER            :  V860DL


     Remod Channel    :  3

     Time Zone

     (hhhhhhhh)          MMMM min


     DS Entry Time

     1/1/1999            00:00 GMT


     DS Exit Time

     1/1/1999            00:00 GMT


     Current GPS
     Time
     1/1/1999            00:00 GMT
```

Table B-2
Diagnostic Main Menu Fields

Field	Description
Error Codes	A sequence of LED flashes communicates errors when they occur. The Error Code field displays the code for the active error when appropriate.
Connected State	The state of the set-top is connected or disconnected. The connected state of the set-top is set by a DCT-operations connect or disconnect message. The OSD displays DISCONNECTED when the set-top is in the disconnected state and CONNECTED when it is in the connected state.
Platform ID	A 16-bit hexadecimal number used to differentiate between digital platform images in the field. It is also called the ROM ID.
Family ID	A hexadecimal number that indicates the set-top manufacturer and product family.
Model ID	A hexadecimal number that indicates the set-top model.
Remod Channel	The Remod Channel number can be 3 or 4 (NA systems). The output port configuration displays the configuration of the set-top output or re-modulated (remod) port. The output port/remod port is the interface from the set-top to the subscriber TV.
Time Zone	Indicates the time zone offset (in minutes) relative to GMT.
DS Entry Time	Indicates the daylight savings entry time.
DS Exit Time	Indicates the daylight savings exit time.
Current GPS Time	Indicates the current time.

Error Codes

A sequence of LED flashes communicates errors when errors occur. Table B-3 lists the error codes, associated flash sequences, causes, and remedies:

Table B-3
Error codes

Initialization Status Errors

Code	Flash Sequence	Cause	Remedy
E 00	None; no error condition exists	Indicates normal condition after initialization	Not applicable
E 01	MSG LED flashes on and off	The set-top did not receive a connect message	Restore out-of-band signal Send a connect message
E 02	Repeating series of two MSG LED flashes, separated by a pause	Init Error	The set-top needs a power cycle to recover
E 03	Repeating series of three MSG LED flashes, separated by a pause	DRAM error	Not used at this time
E 04	Repeating series of four MSG LED flashes, separated by a pause	DP-SRAM error	Not used at this time

Initialization Status Errors

Code	Flash Sequence	Cause	Remedy
E 07	Repeating series of seven MSG LED flashes, separated by a pause	ROM verification failure	Power cycle the set-top; if repetitive, return for repair
E 08	Repeating series of eight MSG LED flashes, separated by a pause	Faulty RAM, ROM, EEPROM, or POST failure (this is a hardware failure)	Return the set-top for repair
E 09	Repeating series of nine MSG LED flashes, separated by a pause	Dead battery or the memory has not been initialized; occurs if the battery fails to keep the RAM alive during power-down; causes set-top to be disconnected	Return the set-top for repair; requires factory initialization message
E 10	POWER LED flashes on and off; MSG LED remains off	Invalid serial number	Not used at this time
E 11	POWER LED flashes once; MSG LED flashes once	Invalid unit address	Return the set-top for repair; requires a unit creation message
E 12	POWER LED flashes once; MSG LED flashes twice	POST failed	Not used at this time
E 13	POWER LED flashes once; MSG LED flashes three times	Sys_boot initialization failure	Power cycle the set-top; if repetitive, return for repair
E 14	POWER LED flashes once; MSG LED flashes four times	System startup failure	Power cycle the set-top; if repetitive, return for repair
E 15	POWER LED flashes once; MSG LED flashes five times	TSI structure is corrupted	Power cycle the set-top; if repetitive, return for repair
E 16	POWER LED flashes once; MSG LED flashes six times	Bad flash number specified for Initiate Flash Platform	Error logged, ignore
E 17	POWER LED flashes once; MSG LED flashes seven times	Bad platform validation step number	Error logged, ignore

Only the V860DL AND ACD2204 tuner appear on the on-screen display.

d 02: Out-of-Band (OOB) Status

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

Figure B-3
OOB Diagnostic

```
02   OOB DIAGNOSTIC

     DATA                *       SNR   23 dB GOOD

     EMM DATA            *

     CARRIER LOCK      YES       COUNT           1

     HUNT MODE         None

     CUR FREQ

     LKC

     EMM PRVDR ID      0x0001
```

Table B-4
OOB Diagnostic Fields

Field	Description
Data	The OSD indicates with a "*" that data has been received. The indicators cover all packet processors regardless of which stream they are monitoring and are cleared when you enter the diagnostic.
EMM Data	Indicates whether the set-top is receiving a message on the EMM stream with the following variables:
	Blank No data received
	∗ Data received
	The set-top can receive only six PIDs at once. Data on PIDs can be present on the out-of-band multiplex that the set-top is not receiving.
Carrier Lock	The CARRIER LOCK is reset to "1" after an initialization from the **DAC 6000** or a power cycle. Each time the *set-top* detects a drop in OOB connectivity, the counter increments. The following Carrier Lock variables can display:
	YES Carrier locked
	NO Carrier unlocked
Hunt Mode	Indicates the state of OOB stream acquisition. The Hunt Mode can be:
	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 the 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.

Field	Description
CUR Freq	Indicates the current out-of-band frequency.
LKC	Indicates 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).

Selecting the OOB Frequency

To select the OOB frequency:

1 From the OOB 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, indicating the LKC frequency.

2 Press the **MENU** key a second time to exit the frequency change mode.

Or

Press the **UP/DOWN** channel or cursor keys to scroll through the frequencies to locate the desired OOB frequency. The frequency selection appears on the MANUAL FREQ line of the OSD.

The first frequency to display is 75.25. The system scrolls through each frequency until it reaches the last, 103.75, and then scrolls back to the beginning. This diagnostic scrolls through the OOB frequencies in the following order:

- 75.25 MHz
- 104.20 MHz
- 72.75 MHz
- 92.25 MHz
- 98.25 MHz
- 107.25 MHz
- 107.40 MHz
- 110.25 MHz
- 116.25 MHz
- 103.75 MHz

3 Press **SELECT** to begin searching for the OOB frequency.

On the OSD the MANUAL FREQ line of text clears, the HUNT MODE displays FIX to indicate the fixed frequency search, and the CUR FREQ field changes to the frequency selected to search.

If the frequency is found with the proper EMM Provider ID, the OSD LKC field changes to display the new frequency.

If after 40 seconds the frequency search is not successful, the set-top performs a warm reset and returns to the last known carrier frequency.

4 To abort a search without waiting the 40 seconds, press POWER to cause a warm reset.

d 03: In-band Status

The in-band diagnostics display 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.

Figure B-4
In-band Diagnostic

```
03     IN BAND DIAGNOSTIC

       DATA                                    *

       EMM DATA                                *

       CARRIER LOCK                          YES

       PCR LOCK                              YES

       SNR                         36 dB     ssss

       MODULATION MODE                      QAM 64

       SHORT TERM ERROR COUNT               0000

       LONG TERM ERROR COUNT                9999

       TUNED FREQ                          543.000
```

Table B-5
In-band Diagnostic Fields

Field	Description
Data Activity Indicator	Lights when the set-top is receiving data on the in-band channels. The indicator covers all packet processors regardless of which stream they are monitoring. The following variables can display:
	Blank No data received
	∗ Data received
EMM Data Indicator	Lights when the set-top is receiving a message on the EMM stream. The indicator is clear when entering this diagnostic. The following variables can display:
	Blank No data received
	∗ Data received
Carrier Lock	Indicates that the digital in-band receiver is locked to the carrier with the following variables:
	YES Carrier locked
	NO Carrier unlocked
	Analog Analog channel
PCR Lock	Indicates a program-clock-reference lock with the current digital data stream.

Field	Description
SNR	Displays an estimate of the carrier signal-to-noise ratio. The SNR displayed is a measure of the QAM cluster variance, which is proportional to the SNR.
	Analog channels display `analog` for carrier lock. The SNR displays a number for the numeric value and blank for the ssss value.
	The following variables can display:

	Blank	The digital section is still in the initial state. If this occurs, check diagnostic d07.
	GOOD	Good value
	FAIR	Marginal signal level − check the signal
	POOR	Unusable signal

Field	Description
Modulation Mode	Indicates the modulation modes for analog and digital channels with the following variables:

	Channels	Modulation Mode
	Analog channels	Analog
	Digital channels	QAM 64
		QAM 256

Field	Description
Short Term Error Count	Indicates the FEC errors (maximum count of 65535) at 5-second intervals. The Short Term Error Count is cleared after polling.
Long Term Error Count	Indicates the accumulation of the Short Term Error Count (maximum count of 65535). The Long Term Error Count is cleared every 24 hours.
Tuned Frequency	Indicates the actual frequency the tuner is programmed (Carrier Definition Frequency + 1.75 MHz).

d 04: Audio/Video Status

This diagnostic displays the audio and video information for the current tuned channel.

Figure B-5
Audio/Video Status

```
04   AUDIO/VIDEO STATUS

     ADP Lock            YES

     Audio Mode          STEREO

     Audio SPDIF         N/A


     VP Lock             YES

     MPEG Method         MUTE BLACK
```

Table B-6
Audio Video Status fields

Status	Description
ADP Lock	The Audio Processor locked status: YES or NO
Audio Mode	The audio modes are: ▪ N/A ▪ Mono ▪ Stereo ▪ Surround
VP Lock	The Video Processor locked status: YES or NO
MPEG Method	The MPEG Method selected. The MPEG Methods are: ▪ Unmuted ▪ Mute Still ▪ Mute Black

d 05: Unit Address

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

On the unit address OSD, the unit, network, and TV PassCard (TVPC) addresses are in decimal form (13 address digits and three check digits). The multicast 16-bit address is in TCP/IP decimal byte form.

Figure B-6
Unit Address

```
05   DCT1800 UNIT ADDRESS:
     000-02831-99902-038


     Network Address:
     085-14316-55765-159


     TVPC:
     000-00000-00000-000


     Multicast 16 Address:
     085.085  102.102
     119.119   136.136
     DATA
     068.068   051.051
     034.034   017.017


     Seed Health    0xFF
```

Table B-7
 Unit Address Fields

Field	Description
DCT1800 Unit Address	Indicates the unit address
Network Address	Indicates the network address
TVPC	Indicates the TV Passcard Address.

Field	Description
Multicast 16 Address	The Multicast 16 address numbers change to display the values for each data stream. The following is a list of Multicast 16 addresses:

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

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.

d 06: Firmware Version

The FIRMWARE VERSION diagnostic displays the:

- Dena firmware version or revision number

- Build date and time

- TSODA firmware version number

- CAMEL (CMLBK) firmware version number (always 0000)

The BOOT is the lowest level of firmware code that can be used on the DCT1800.

Figure B-7
Firmware Version

```
06   FIRMWARE VERSION

     07.72                    BOOT 07.71

     Sep 13, 2002

     10:40:21



     TSODA t16



     CMLBK 0000
```

d 07: Current Channel Status

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

Figure B-8
Current Channel Status

```
07    CURRENT CHANNEL STATUS


      TYPE  DIGITAL            aaa  bb
      STATUS                   ccccc
      CONNECTED                dddd
      PREVIEW                  NO


                              CURR         NEXT
      PURCHASABLE             NO           --
      PURCHASED              NO           --
      EPOCH NUM              0X0          1
      EPOCH TYPE            0x0          0x0
      AUTH                  0X0          0X0


      SERVICE 0   STATUS  1 ID  0X0004 0X00
      CH 204      TUNED FREQ   543.000
```

Table B-8
Current Channel Status Fields

Field	Description
Type	Indicates whether the current channel is analog or digital.
Status	Indicates the channel type with the following variables: • Authorized • Unauthorized • Encrypted • Unencrypted
Connected	Indicates whether the set-top is connected or disconnected. If the value is connected, the program is viewable.
Preview	Indicates whether the program is in the free preview state (YES or NO).
Purchasable	Indicates whether the current or next program can be purchased (YES or NO).
Purchased	Indicates whether the current or next program has been bought (YES or NO).
EPOCH Number	For Motorola use only.
EPOCH Type	For Motorola use only.
Authorization	For Motorola use only.
Service	For Motorola use only.
Status	For Motorola use only.
ID	For Motorola use only.
CH	Indicates the channel currently tuned when the OSD appeared.
Tuned Frequency	Indicates the actual frequency the tuner is programmed (Carrier Definition Frequency + 1.75 MHz).

Current Channel Variables

Table B-9 lists the CURRENT CHANNEL STATUS variables:

Table B-9
Current Channel Status Variables

OSD Variable	State
aaa	Analog – blank
	For digital only:
	ENC – encrypted
	UNE – unencrypted
bb	Current epoch authorization reason in the current_epoch_auth_reason field. This is displayed in hex:

00	missing program re-key
01	missing working key epoch message
02	missing event blackout message
03	missing category rekey
04	old category sequence in program, rekey message
10	program bought
11	program bought without taping
12	subscribed with taping
13	subscribed without taping
14	subscribed with taping purchasable
15	IPPV with taping
16	IPPV without taping
20	bad seed checksum
21	bad debit buffer checksum
30	IPPV not enabled
31	insufficient credit to purchase
32	show count limit exceeded
33	debit register will overflow
34	no AFP records available
36	maximum package cost exceeded
37	no IPPV overlay in message
40	not subscribed
41	regional blackout
42	event blackout

OSD Variable	State
ccccc	INIT – Initialized state
	CONFI – Configured
	ACQUI – Acquiring the program
	AUTH – Authorized for the program
	Not A – Not authorized for the program
ddd	blank – Connected
	NOT – Not connected

d 08: Renewable Security System

The renewable security system includes a TVPC card that returns the security status to current.

Figure B-9
Renewable Security

```
08    RENEWABLE SECURITY


      TVPC NOT REQUIRED
      CRYPTO      NOT MATED
      STATUS      00
      VERSION     00
```

Table B-10
Renewable Security Fields

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:
	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.

d 09: Upstream Modem (STARVUE II Diagnostics)

This diagnostic shows the status and operating parameters for the STARVUE II RF return.

Figure B-10
STARVUE II Diagnostic

```
09    STARVUE II DIAGNOSTICS
      STATUS:                 DISABLED
      FREQUENCY:              23.000 MHz
      LEVEL:                  39
      IPPV:                   DISABLED


      LAST POLL REQ:          170
      6-15-2001  20:49:33
      LAST POLL ACK:          170
      6-15-2001  20:49:33
```

Table B-11
STARVUE II Transmitter Fields

Field	Description
Status	Indicates the transmitter status with the following variables:
	- Idle
	t Transmitting
Frequency	Indicates the transmitting frequency.
Level	Indicates 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:
	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 displayed under LAST POLL REQ:
	▪ 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 set-top 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 displayed under LAST POLL ACK.
	▪ 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.

d 10: Application (APP) Code Modules

This diagnostic displays the currently downloaded code modules. This can be a multi-page display. Press **SELECT** to display additional pages. Figure B-11
 is an example of an OSD screen for a set-top that contains ROM:

Figure B-11
APP Code Modules

```
10      APP CODE MODULES


        MODULE          VER         STATUS     ID


        0-8-0772        07.72       ENABLED    0001
        Appl_____      02.00       DOWNLD     07DA
```

Table B-12
APP Code Modules Fields

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

d 11: Memory Status

This diagnostic displays the DCT1800 memory status. The format of the OSD depends on the installed memory types.

Figure B-12
Memory Status

```
11   MEMORY STATUS


     EEPROM VER.NO.                                  00.00


                     PLATFORM              APPLICATION
     NVMEM           236k                  20k
     DRAM            512k                  1.5M
     FLASH           768k                  1.25M
     ROM             n/a                   n/a


     SYSTEM HEAP
       PgSz    PgCnt   Alloc   Used   Fail
        256      594     n/a    237      0
          8        1      32      0      0
         16        1      16      5      0
         32        3      24      9      0
         64       76     304    289      0
        128       13      26     20      0
```

Table B-13
Memory Status Fields

Field	Description
EEPROM Version Number	Indicates the EEPROM version (never used, should always be 00.00).
Platform	Indicates sizes of memory types allocated to platform code.
Application	Indicates sizes of memory types allocated to application code.
System Heap	Indicates breakdown of DRAM allocations.

d 12: Interactive Info

The INTERACTIVE INFO menu is a diagnostic tool used to gather data about your system:

Figure B-13
Interactive Info

```
12   INTERACTIVE INFO


   IP                 :   0.0.0.0

   UPM                :   0X000021

   UPSTREAM ID        :   0X0000

   DOWNSTREAM ID      :   0X0000

   STATE              :   UNCONFIG

   MAC ABORT CNTR     :   0000


   GOOD PACKETS:

   ERROR PACKETS:


   SOCKET PORT STATE

   0            UNUSED

   1            UNUSED

   2            UNUSED

   3            UNUSED

   4            UNUSED

   5            UNUSED
```

Table B-14
Interactive Info Fields

Field	Description
IP	Indicates 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.
UPM	Indicates the upstream modem address. This UPM value 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 displayed in hexadecimal format.
Upstream ID	Indicates the set-top transmission parameter assigned by the DAC 6000 for the interactive set-top. The Upstream ID is a four-digit value ranging from 0000 to 9999 displayed in hexadecimal format.
Downstream ID	Indicates the set-top transmission parameter assigned by the DAC 6000 for the interactive set-top. The Downstream ID is a four-digit decimal value ranging from 0000 to 9999 displayed in hexadecimal format**.**

Field	Description
State	The state modes are:

- MAC CONNECT
- UNCONFIG
- INIT_WAIT_DC_OR_
- WAIT_LM_ACK
- WAIT_SO_ACK
- WAIT_LA_OR_SO
- INIT_STOPPED
- RUN_WAIT-DC-OR-C
- RUNNING
- RUN_STOPPED
- INVALID

Field	Description
MAC Abort Cntr	The MAC Abort Counter increments every time the MAC layer reaches the Cell Abort Count limit. The MAC Abort Counter is reset by the successful upstream transmission of a cell, for example, when an ACK is received by the set-top**.**
Good Packets	Not implemented.
Error Packets	Not implemented.
Socket Port State	The different Socket Port State modes available are:

- UNUSED
- OPENED
- READY
- RECVING
- SENDING

d 13: MAC Frequency Table

The set-top uses a range of frequencies set by the host for upstream communications. **Error! Reference source not found.** is an example of the MAC FREQUENCY TABLE that displays your frequency and signal power:

Figure B-14
MAC Frequency Table

```
13   MAC FREQUENCY TABLE


     FREQ          POWER
```

Table B-15
MAC Frequency Table Fields

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

d 14: Message Types

This diagnostic displays a listing of PIDs and counts. In addition the message types with IDs and counts are shown:

Figure B-15
Message Types

```
14   MESSAGE TYPES (hex data)


   OOB:             INB:
    PID        Cnt    PID   Cnt    Lost   DRAM
   0000       0      0000   4      0      0
   0000       0      0000   2      0      0

   ___              ___
   Msg        Id     Cnt    Msg    Id     Cnt
   0          -      216    9A     E      0
   1          2      89     A0     15     0
```

Table B-16
Message Types Fields

Field	Description
OOB PID	Indicates out-of-band PID.
OOB Cnt	Indicates the number of messages received.
INB PID	Indicates the in-band PID.
INB Cnt	Indicates the number of messages received.
INB Lost	Indicates the number of messages lost due to errors.
DRAM	Indicates the count of in-band ring buffer overflows.
MSG	Indicates the message type.
ID	Indicates the low order byte of the Connection ID.
Cnt	Indicates the number of messages received.

d 15: In-band Program Association Table (PAT)

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

Figure B-16
In-band PAT

```
15   IN BAND PAT (hex data)


         PAT      SN      PID
         001     0001    0029


```

d 16: In-band Program Map Table (PMT)

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

Figure B-17
In-band PMT

```
16   IN BAND PMT (hex data)


         PMT     TYPE     PID
         001     0080    0210


```

d 17: Task Status

This diagnostic displays a listing of tasks. (For Motorola use only.)

Figure B-18
Task Status

```
17   TASK STATUS (hex data)


     TID     RID   PRI  STARTS  RUNTIME  STK%
      64     00     2   21553    47441    26
      63

      ...

       0
```

d 18: In-band Multicast Address Filter

This diagnostic displays in-band multicast filter information:

Figure B-19
In-band Multicast Address Filter

```
18   IN BAND MULTICAST ADDRESS FILTER
Filter Table:
          DMCA    MCA  PQ     RQ      APP    CID
     NA   0000   0000   -01    -01   0000   0000 0000
     NA   0000   0000   -01    -01   0000   0000 0000
     NA   0000   0000   -01    -01   0000   0000 0000
     NA   0000   0000   -01    -01   0000   0000 0000


REGISTER VALUES:
             MCA    PID
            0000   0000
            0000   0000
            0000   0000
            0000   0000
```

Table B-17
In-Band Multicast Address Filter Fields

Field	Description
Filter Table	
DMCA	Indicates the default multicast 16 address.
MCA	Indicates the current multicast 16 address.
PQ	Indicates the preemption notification queue ID.
RQ	Indicates the response queue ID.
APP	Indicates the application ID.
CID	Indicates the connection ID.
Register Values	
MCA	Indicates Multicast 16 filter register contents.
PID	Indicates PID filter register contents.

d 19: Keyboard / LED Diagnostics

This diagnostic does not apply to the DCT1800:

Figure B-20
Keyboard / LED Diagnostics

19	KEYBOARD / LED DIAGNOSTICS										
G	<	>	V	^	Î	M	S	B	-	+	P

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