

DIGITAL CLOCK DISTRIBUTOR

REMOTE TRACK AND HOLD CARD USER MANUAL

(FOR INSTALLATION IN REMOTE DCD SHELVES ONLY)

CONTENTS	PAGE	Tables (Cont'd)	Page
1. GENERAL	1	D. Reference Input Signal Connections – DCD-519/523	8
2. INTRODUCTION	2	E. Startup Indications	8
3. DESCRIPTION AND SPECIFICATIONS...	2	F. RTHC Event Alarms	23
4. INSTALLATION	6	G. RT	
A. Unpacking	6	H. HC Holdover Conditions.....	25
B. Card Installation in Existing Shelf	7		
C. Input Reference Signal Connection	7		
D. Card Installation in New Shelf	7		
E. BT MON Software	8		
5. MAINTENANCE	21	1. GENERAL	
A. Troubleshooting	21	1.01 This document provides descriptions and specifications for the Remote Track and Hold Card (RTHC).	
6. TEST AND ACCEPTANCE	26	1.02 This version provides correct user switch settings on pages 4 and 29. It also contains updated contact numbers for Symmetricom Global Services (SGS) on page 6. Tables E and G are added for startup and holdover indications.	
A. Card Test	26	1.03 Symmetricom is a registered trademark of Symmetricom, Inc. DCD is a trademark of Symmetricom, Inc. All other product names, service marks, trademarks, and registered trademarks used in this document are the property of their respective owners.	
		1.04 The following abbreviations and acronyms are used in this document:	
Charts		BT MON BesTime Monitoring software	
1. BT MON Installation	8	CCK composite clock	
2. Downloading RTHC Software	20	CI Clock Input	
3. RTHC Card Replacement in Shelf	22	CLEI Common Language Equipment Identification	
4. RTHC Card Test – DCD-400/ST2 Shelves	27	CSM Core Sync Module	
5. RTHC Card Test – DCD-519/523 Shelves	28	DCD Digital Clock Distributor	
		FPGA field-programmable gate array	
		LED light emitting diode	
		RTHC Remote Track and Hold Card	
		ST2 Stratum 2 clock	
		ST3 Stratum 3 clock	
Figures			
1. RTHC Faceplate	2		
2. RTHC Block Diagram.....	3		
3. RTHC Dip Switches	4		
4. RTHC Card Switch	29		
Tables			
A. RTHC LED Indicators	3		
B. RTHC Card Specifications	5		
C. Reference Input Signal Connections – DCD-400/ST2.....	7		

2. INTRODUCTION

2.01 The DCD Remote Track and Hold Card (RTHC) is designed to provide a much higher level of robustness to input CCK faults as compared to the existing DCD Remote Shelf system, which is based on CI cards and ST3 cards. The RTHC interfaces in a CI input slot and replaces both the current CI and ST3 cards.

2.02 A key benefit is improved holdover performance maintaining sufficient CCK alignment during maintenance periods. The current base ST3 card can support holdover for only a few minutes.

2.03 The RTHC faceplate is shown in Figure 1.

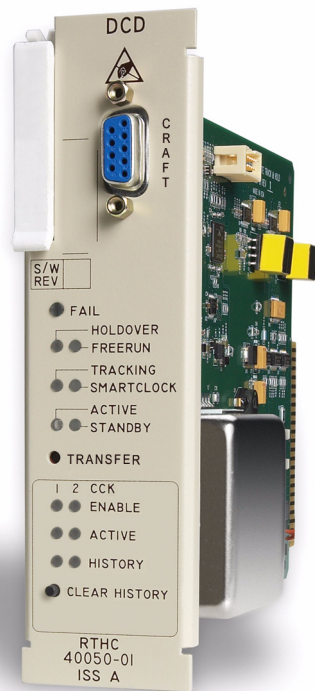


Figure 1. RTHC Faceplate

3. DESCRIPTION AND SPECIFICATIONS

3.01 The RTHC is divided into three main sections: Microprocessor, Double Oven Oscillator, and CSM. Refer to the RTHC block diagram in Figure 2.

3.02 The Microprocessor provides BT MON Craft software access, alarm log, and SmartClock algorithm. The Microprocessor also determines when the shelf alarm is to be created. The shelf alarm is contained in DCD-400, DCD-ST2, DCD-519, or DCD-523 shelves. A history function causes the history LED to light if any alarm has been detected on CCK input 1 or 2. The LED can be reset by pressing the CLEAR HISTORY button. The microprocessor program is downloadable firmware via BT MON Craft software via the faceplate RS-232 DB-9 connector.

3.03 The Double Oven Oscillator provides a stable reference during holdover conditions. The holdover stability typically allows phase movement less than 2.5 microseconds in 12 hours with SmartClock enabled.

3.04 The CSM contains a downloadable FPGA program via the BT MON software program. The CSM contains most card hardware functions. CCK1 and CCK2 are controlled by the CSM as well as the 4 kHz outputs that drive the output cards.

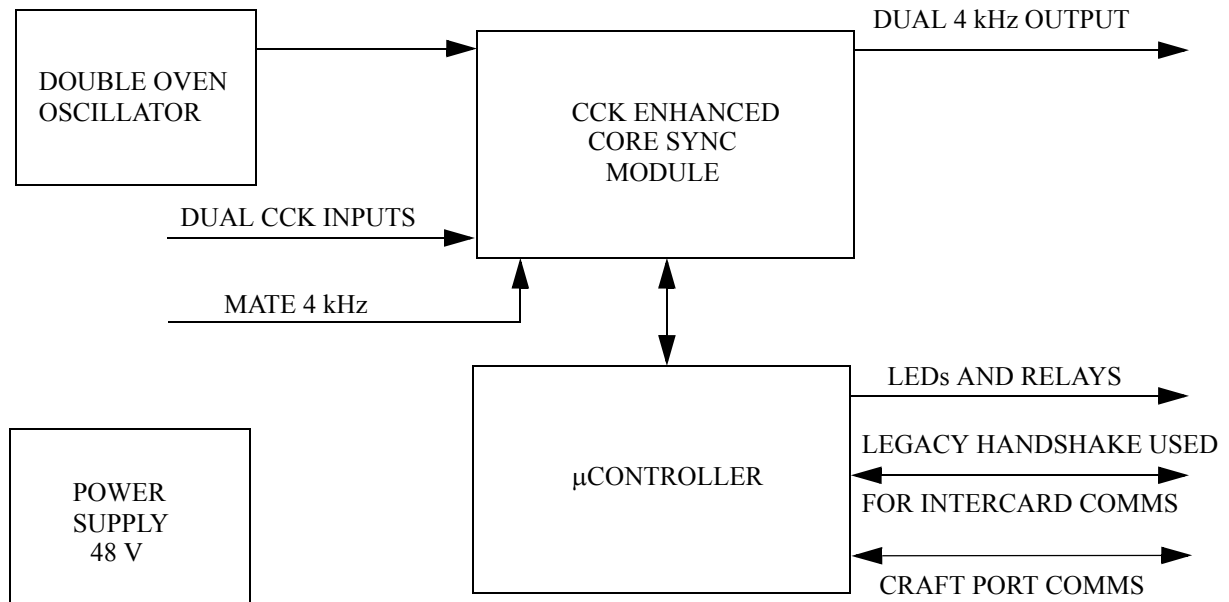


Figure 2. RTHC Block Diagram

3.05 Table A lists the RTHC LED indicators.

Table A. RTHC LED Indicators

LED	PRIMARY COLOR	DESCRIPTION
FAIL	RED	A hardware failure has been detected and RTHC card output is squelched. Failure causes a major shelf alarm.
	OFF	No hardware failure has been detected.
HOLDOVER	YELLOW for 8 hours; RED after 8 hours	A holdover condition has occurred. Holdover causes a major shelf alarm.
	OFF	No holdover condition has occurred.
FREERUN	GREEN	A freerun condition has occurred. Note: No output will be present on card. Card will be inactive.
	BLINKING GREEN	RTHC in warm-up state.
TRACKING	GREEN	The card is tracking.
	OFF	The card is not tracking.
SMARTCLOCK	GREEN	The SmartClock has predicted $\leq 2.5 \mu\text{s}$ holdover error in 8 hours.
	BLINKING GREEN	The SmartClock has predicted $\leq 4.0 \mu\text{s}$ holdover error in 8 hours.
	OFF	The SmartClock is not available.

Table A. RTHC LED Indicators (Cont'd)

LED	PRIMARY COLOR	DESCRIPTION
ACTIVE	GREEN	The card is providing the synchronization signal source for all output cards.
	OFF	The card is not providing the synchronization signal source for all output cards.
STANDBY	GREEN	The card is phase locked to the output of the other (active) card.
	OFF	The card is not phase locked to the output of the other (active) card.
ENABLE	GREEN	The reference is qualified.
	FLASHING GREEN	Input is 180 degrees out of phase with RTHC output, indicating CCK Tip and Ring wiring turnover on input.
	RED	The reference is not qualified. (Minor shelf alarm occurs.)
	YELLOW	A phase offset of input signal of $\geq 1.5 \mu\text{sec}$ has been detected compared to output. (This will occur on inactive inputs only.)
	OFF	The reference is not enabled. (CCK1 is always enabled.)
CCK ACTIVE	GREEN	The reference is currently active.
	OFF	The reference is not currently active.
HISTORY 1	YELLOW	An event occurred on input 1. (LED will stay lit until CLEAR HISTORY is disabled.)
	OFF	An event did not occur on input 1. (LED will stay lit until CLEAR HISTORY is disabled.)
HISTORY 2	YELLOW	An event occurred on input 2. (LED will stay lit until CLEAR HISTORY is disabled.)
	OFF	An event did not occur on input 2. (LED will stay lit until CLEAR HISTORY is disabled.)

3.06 The TRANSFER switch, located on the RTHC faceplate, transfers active status between the first RTHC and the second RTHC.

3.07 The CLEAR HISTORY button, located underneath the HISTORY LEDs, resets HISTORY 1 and HISTORY 2.

3.08 Figure 3 shows the RTHC configurable dip switches in the default positions. Switches 1 and 2 are set at the factory and cannot be changed. Switch 3 sets the security and switch 4 turns on the second input. See page 29 for more details.

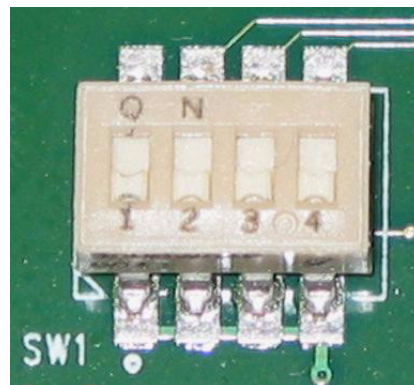


Figure 3. RTHC Dip Switches

3.09 The RTHC has the following features:

- High Performance Double Oven/ (ST2) extends holdover time from minutes to hours.
- Highly integrated reliable design based on the new Core Sync Module (CSM) platform limits aging CI and ST3 cards.
- Patent pending Cascaded Architecture provides high speed transient detection and firewall.
- Redundant Hot Standby operation.
- Dual CCK inputs.

- Capable of downloading new FPGA and microprocessor firmware via BT MON Craft PC software.
- Event log (with up to 256 log events) retrievable through BT MON via the Craft jack.
- Firmware, serial number version, and Common Language Equipment Identification (CLEI) code available via BT MON Craft software.
- Security, input statistics, alarms, sync monitor, and holdover is also available via BT MON Craft software.
- Security can be disabled with dip switch.

3.10 The RTHC card specifications are listed in Table B.

Table B. RTHC Card Specifications

ITEM	SPECIFICATION
ELECTRICAL	
Input Signals	Composite Clock: GR-378-CORE Line Code RTZ 133 Ω balanced W-W Accepts two inputs from master BITS shelf
Operating Voltage	42 Vdc to 60 Vdc
Current Drain	Warmup: 17 watts Operational: 6 watts
MANAGEMENT AND COMMUNICATION	
Com Port	1 serial RS-232 DCE
Connector	1 DB9F on faceplate
Baud Rate	Auto to 38.4 kb/s with BT MON craft software
BT MON CRAFT SCREENS	
Alarm Log	256-event alarm log
Download	Firmware and FPGA
Security	15 users with 4 security levels, must be enabled via dip switch
Inventory	Serial number, firmware version, CLEI
Input Statistics	LOS, LOA, Freq, Wander, T/R Rev, Enable, Active, Normal, Tracking Holdover, Ext. Holdover Active
Alarm Monitor	RTHC input and card alarms
Provision Inputs	Enable CCK2 for monitoring only or for monitoring and use.

Table B. RTHC Card Specifications (Cont'd)

ITEM	SPECIFICATION
Sync Monitor	Displays MTIE, TDEV, average frequency, and MDEV
Holdover Information	Daily and monthly holdover information
BT MON COMPUTER REQUIREMENTS	
Operating System	Windows 95/98/NT 4.0/2000/Me/XP
Minimum CPU	x486 or equivalent at 33 MHz 8 MB RAM Serial communications port 3-1/2 inch floppy disk drive Recommended: spreadsheet application that can accept comma-delimited (.csv) data files to process the logged files
SMARTCLOCK	
Green LED	Predicted $\leq 2.5 \mu\text{s}$ holdover error in 8 hours
Blinking Green LED	Predicted $\leq 4.0 \mu\text{s}$ holdover error in 8 hours
HOLDOVER	
Green SmartClock LED	Predicted $\leq 2.5 \mu\text{s}$ holdover error in 8 hours ($\pm 2.5 \text{ }^\circ\text{C}$)
Blinking Green SmartClock LED	Predicted $\leq 4.0 \mu\text{s}$ holdover error in 8 hours ($\pm 2.5 \text{ }^\circ\text{C}$)
GENERAL	
Operating Temperature	0 $^\circ\text{C}$ to 50 $^\circ\text{C}$
Operating Humidity	5% to 95%
Physical	Each RTHC occupies one Clock Input slot of DCD-400, DCD-ST2, DCD-519, or DCD-523 shelves

4. INSTALLATION

A. Unpacking

4.01 This section provides guidelines and instructions for unpacking equipment and returning damaged equipment.

Warning: *When handling the RTHC, use local office procedures regarding electrostatic discharge (ESD), including the following:*

- Use grounded wrist straps connected to equipment frame ground when handling cards.

- Store cards only in antistatic packaging provided by the factory.

4.02 Save packing material. All equipment returned *must be packed in the original packing material. Returned equipment not packed in original packing material voids warranty.* Contact your local Symmetricom distributor, or call Symmetricom Global Services (SGS) if additional packaging is needed at one of the following:

+44 (0) 1189 277 500 (U.K.)

+1 408 428 7907 (U.S.A.)

Note: The following toll-free number is available in some countries to access the SGS office in the U.S.A.:

+1 888 367 7966 (U.S.A.)

4.03 The RTHC is packed in its own box. Refer to the following when the RTHC card box is received.

1. Unpack the RTHC carefully.
2. Inspect the RTHC for shipping damage.
3. Notify your local Symmetricom distributor, or SGS and the carrier if the RTHC was damaged in transit.

B. Card Installation in Existing Shelf

4.04 To install the RTHC in an existing remote shelf with CI cards, do the following:

Warning: Always confirm composite clock phase alignment prior to beginning this procedure. Clock input cards will pass 180-degree phase turnover to output of system when changing active status.

Note: This procedure should be completed without interruption. CI and RTHC cards should co-exist during upgrade process only.

1. If the CI-B card is active, first push the XFR switch on the CI-B card to make the CI-A card active.
2. Install the RTHC in the CI-B card slot and allow the card to warm up and go active.
3. Wait 10 minutes to allow RTHC to warm up.
4. Push the XFR switch on the CI-A card. Confirm RTHC is now active.

5. Remove the CI-A card.
6. Install the RTHC in the CI-A slot and allow the card to warm up and go into standby mode.
7. Remove the ST3-B card (if equipped).
8. Remove the ST3-A card (if equipped).
9. Install single-wide blank panels (p/n 070-00014-01) and double-wide blank panels (p/n 070-00014-02) as follows:
 - a. DCD-400: Two single-wide panels.
 - b. DCD-519/523: One double-wide panel and two single-wide panels.
 - c. DCD-ST2: Two double-wide panels and two single-wide panels.

Note: These panels should cover the ST-A and ST-B slots.

C. Input Reference Signal Connection

4.05 Connect wire-wrap input signals to the connectors on the rear panel according to Table C (for DCD-400/ST2) and Table D (for DCD-519/523).

D. Card Installation in New Shelf

4.06 To install the RTHC in a new remote shelf, do the following:

1. Install the RTHC in the CI-A slot and allow the card to warm up and go active.
2. Install the RTHC in the CI-B slot and allow the card to warm up and go active.

Table C. Reference Input Signal Connections – DCD-400/ST2

RTHC Port	Clock Input-B	Clock Input-A
1	TB8 AUX IN (CC)	TB5 AUX IN (CC)
2	TB9 DS1 IN (BRDG)	TB6 DS1 IN (BRDG)

Table E lists the Smartclock LED actions and the BT MON events that occur after starting up the RTHC.

Table D. Reference Input Signal Connections – DCD-519/523

Reference Input Connections	TB12 RTHC Input Ports	TB13 RTHC Input Ports
Rear Panel Wire-wrap Pins TB12 = Ref. A TB13 = Ref. B	RTHC (CI-A) (Place SW4 in BRDG Up position)	RTHC (CI-B) (Place SW5 in BRDG Up position)
Row 4	Port 2	Port 2
Row CCK	Port 1	Port 1

Table E. Startup Indications

Time Since Startup (minimum) H	SmartClock LED	Learning State Event in BT MON
0	Off	none
8	Blinking	Degraded Smartclock available
16	On	Smartclock available

E. BT MON Software

4.07 BT MON (BesTime Monitoring) is a Windows 95/98/NT 4.0/2000/Me/XP compatible craft software program which provides system configuration, alarms, and diagnostics. BT MON resides on a user-provided PC, and interfaces to the RTHC via the local (Craft) RJ-45 or remote (Remote) RS-232 communication port.

Note: BT MON is not required for card installation. BT MON is used for firmware download and troubleshooting.

4.8 Chart 1 describes the procedure for installing BT MON on a user-provided PC.

Chart 1. BT MON Installation

STEP	PROCEDURE
Use this procedure to install BT MON on a user-provided PC.	
1	Insert the BT MON CD-ROM disk into the PC CD-ROM drive.
2	Double-click the My Computer icon to display the My Computer contents. Double-click the designated CD-ROM drive to display the BT MON disk contents.
3	Double-click SETUP.EXE to install BT MON on the PC.
4	Ensure that a serial communications cable (DB-9 to DB-9 male to female cable) is connected between the RTHC craft connector and a serial communications port on the PC. <i>Note:</i> This cable is not supplied with RTHC.

Chart 1. BT MON Installation (Cont'd)

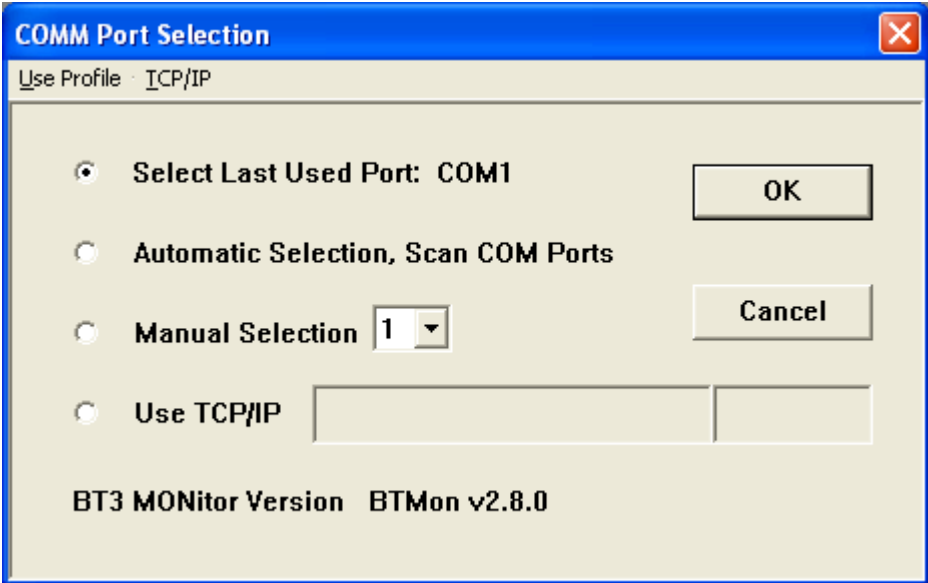
STEP	PROCEDURE
5	<p>Open the BT MON application. The COMM Port Selection screen appears.</p> 
6	<p>Choose a communications port by clicking one of the following:</p> <ul style="list-style-type: none"> • Select Last Used Port: COMx: This selection will use the named serial communications port, which BT MON identifies as the one used in the previous session, when the OK button is clicked. • Automatic Selection, Scan COM Ports: This selection will scan the serial communications ports on the host PC for the communications port connected to the remote shelf when the OK button is clicked. • Manual Selection: This selection allows the user to enter or choose the host PC communication port that is connected to the remote shelf. • Use TCP/IP: This selection lets the user enter a TCP/IP connection to select the serial communications port. <p><i>Note:</i> The user must supply external terminal service in order to use the Use TCP/IP option.</p>

Chart 1. BT MON Installation (Cont'd)

STEP	PROCEDURE
7	<p>Click OK. Verify a User Login screen appears (shown below).</p> <div> </div> <p>Note: If a dialog box appears stating, “Failed to Open COM Port” instead of the User Login screen, verify that the remote shelf is powered, and the serial communications are connected. Then click OK, and repeat Steps 5 and 6.</p> <p>Note: Switch 1 position 3 must be ON to enable security.</p> <p>Enter the user name and password for this installation, then click the OK button. The following screen appears showing the version number, copyright date, and the serial port that communicates with the remote shelf.</p> <p>Notes:</p> <ol style="list-style-type: none"> 1. The user name, “default1”, is set at the factory, and the password, “RTHC4U!”, is set at the factory. Be sure to enter the entire password in all capital letters, including the exclamation point. 2. The user name and password are case-sensitive. 3. If an incorrect user name and password are entered three consecutive times, the BT MON application exits and ends the attempted session. If this happens, re-open the application, and enter the correct user name and password.

Chart 1. BT MON Installation (Cont'd)

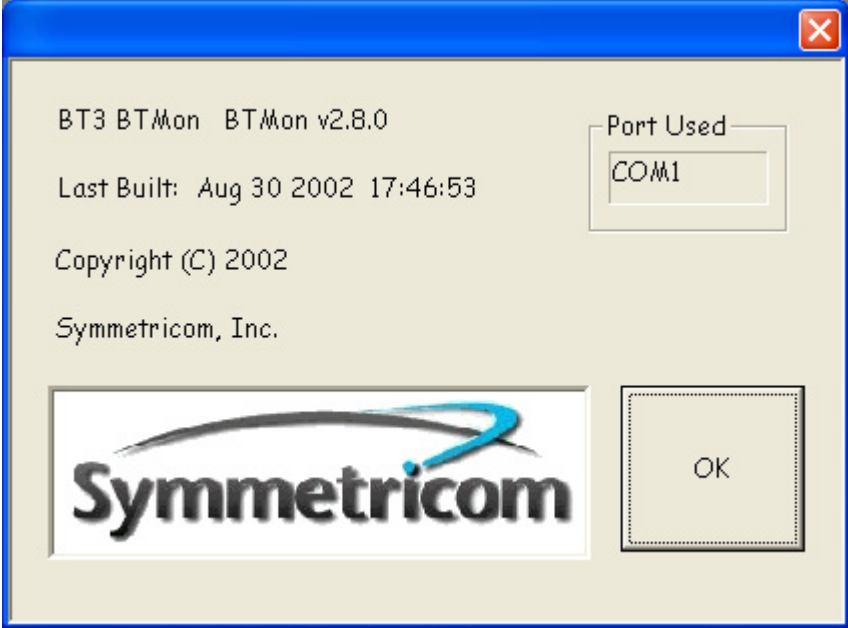
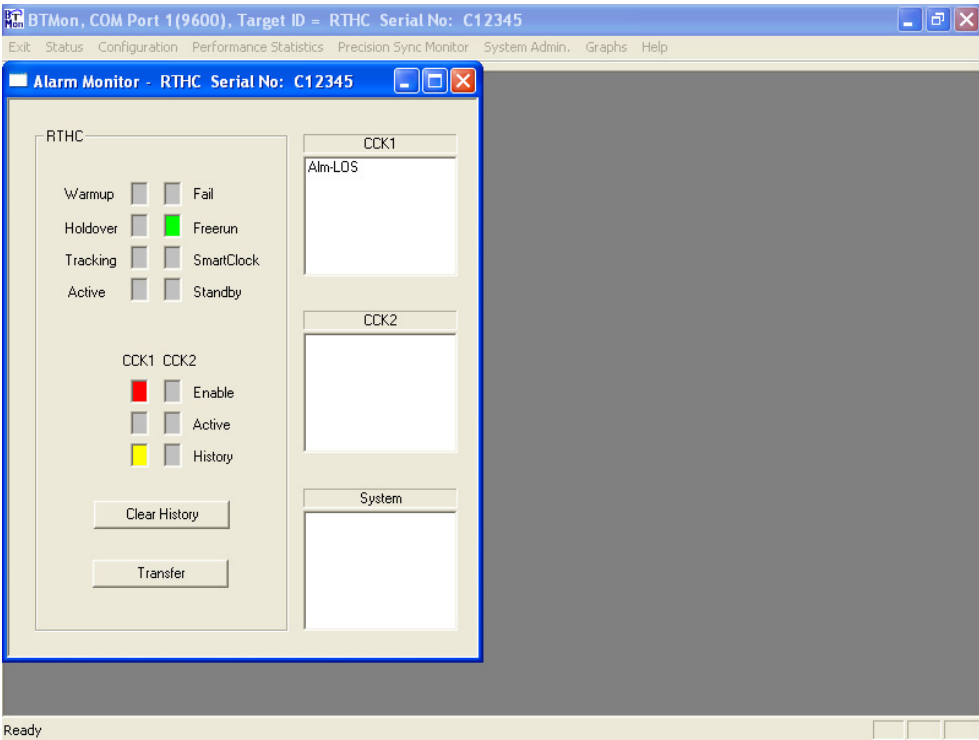
STEP	PROCEDURE
8	<p>Click the OK button. The following screen appears showing the version number, copyright date, and the serial port that communicates with the remote shelf.</p> 
9	<p>Click the OK button. The following BT MON main screen appears.</p> 
10	<p>Select Configuration from the main screen, then select Installation.</p>

Chart 1. BT MON Installation (Cont'd)

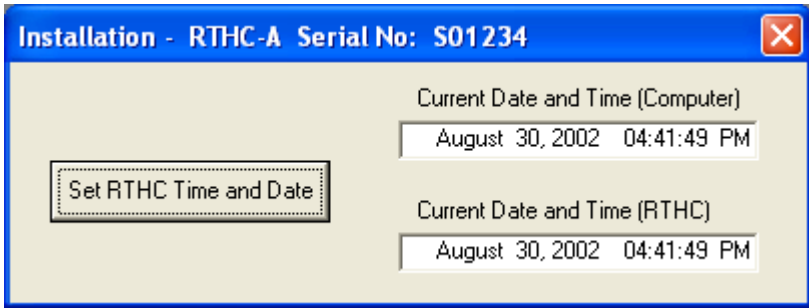
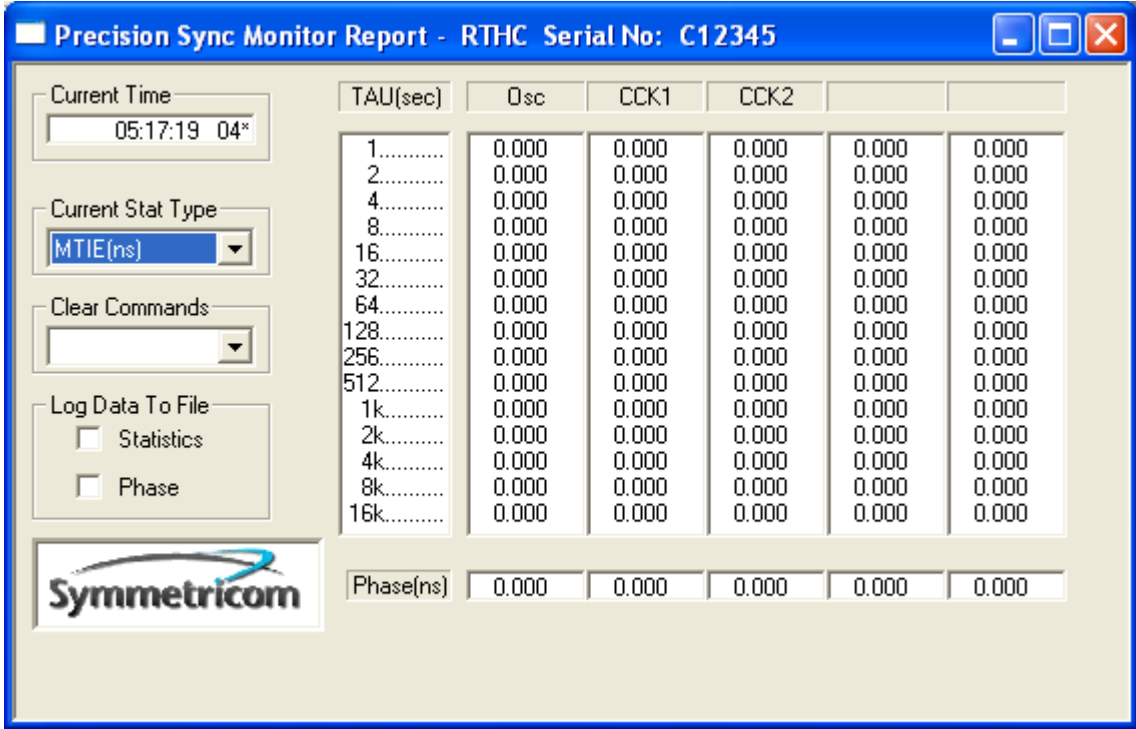
STEP	PROCEDURE																																																																																																																
11	<p>The following BT MON installation screen is displayed.</p>  <p>To complete BT MON installation, do the following:</p> <ul style="list-style-type: none"> • Verify that Current Date and Time (Computer) is correct. • If Current Date and Time (Computer) is correct, click the Set RTHC Time and Date button. • If Current Date and Time (Computer) is NOT correct, use the Date/Time function located in the Control Panel of the PC's Windows operating system to select correct time. 																																																																																																																
12	<p>Once BT MON is installed, the program can be used to check the status of various RTHC functions. These functions are shown in the following steps.</p>																																																																																																																
13	<p>View the RTHC Precision Sync Monitor Report by using the following screen:</p>  <table border="1"> <thead> <tr> <th></th> <th>TAU(sec)</th> <th>Osc</th> <th>CCK1</th> <th>CCK2</th> <th></th> <th></th> </tr> </thead> <tbody> <tr><td>1.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>2.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>4.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>8.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>16.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>32.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>64.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>128.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>256.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>512.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>1k.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>2k.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>4k.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>8k.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> <tr><td>16k.....</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td><td>0.000</td></tr> </tbody> </table> <p>Phase(ns) 0.000 0.000 0.000 0.000 0.000</p>		TAU(sec)	Osc	CCK1	CCK2			1.....	0.000	0.000	0.000	0.000	0.000	0.000	2.....	0.000	0.000	0.000	0.000	0.000	0.000	4.....	0.000	0.000	0.000	0.000	0.000	0.000	8.....	0.000	0.000	0.000	0.000	0.000	0.000	16.....	0.000	0.000	0.000	0.000	0.000	0.000	32.....	0.000	0.000	0.000	0.000	0.000	0.000	64.....	0.000	0.000	0.000	0.000	0.000	0.000	128.....	0.000	0.000	0.000	0.000	0.000	0.000	256.....	0.000	0.000	0.000	0.000	0.000	0.000	512.....	0.000	0.000	0.000	0.000	0.000	0.000	1k.....	0.000	0.000	0.000	0.000	0.000	0.000	2k.....	0.000	0.000	0.000	0.000	0.000	0.000	4k.....	0.000	0.000	0.000	0.000	0.000	0.000	8k.....	0.000	0.000	0.000	0.000	0.000	0.000	16k.....	0.000	0.000	0.000	0.000	0.000	0.000
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Chart 1. BT MON Installation (Cont'd)

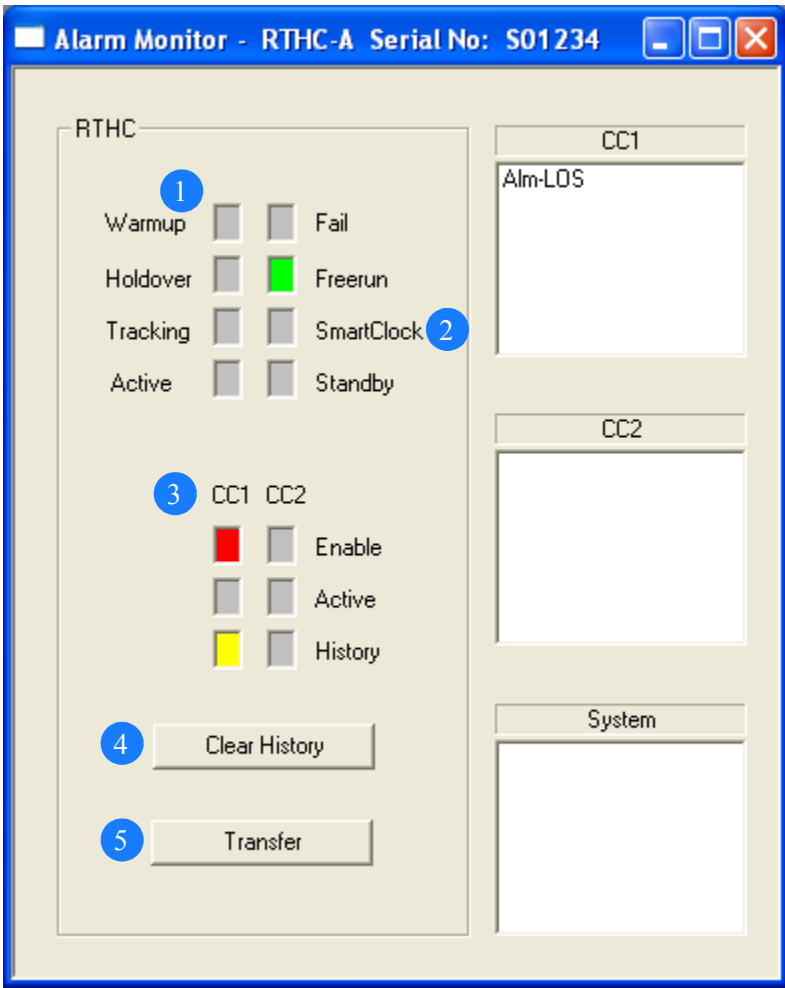
STEP	PROCEDURE
14	<p>View the RTHC Alarm Monitor by using the following screen.</p>  <p>Screen items description:</p> <ol style="list-style-type: none"> 1 Faceplate shows solid green for warmup state. 2 Blue display indicates degraded SmartClock. 3 Blue display for Enable indicates Tip and Ring reversal. 4 Clicking this button will clear History LED(s) on RTHC faceplate. 5 Clicking this button will cause transfer of active status between RTHC cards.

Chart 1. BT MON Installation (Cont'd)

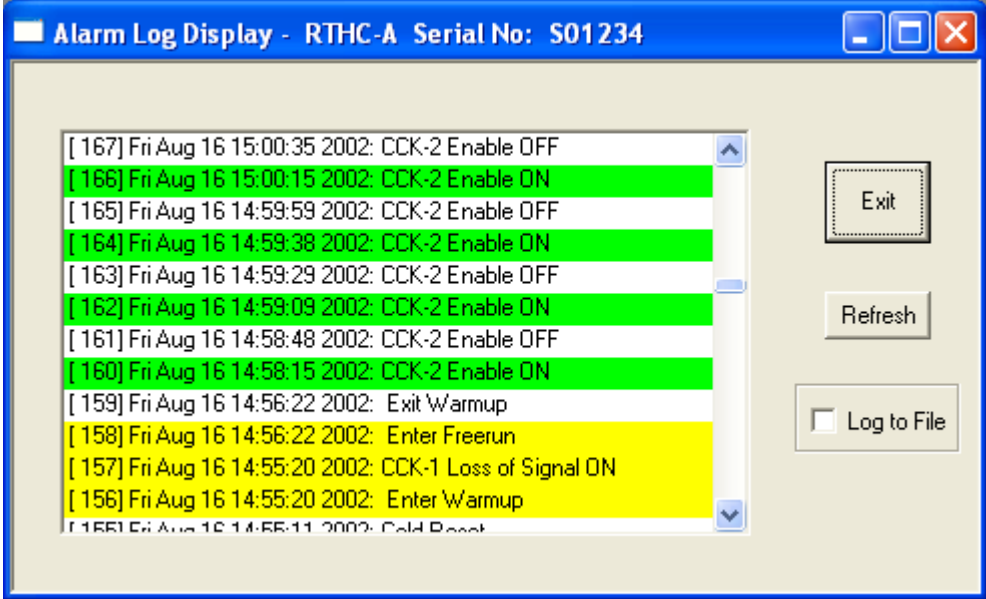
STEP	PROCEDURE
15	<p>View the RTHC Alarm Log by using the following screen (available from the Status pull-down menu).</p> <p><i>Note:</i> The RTHC Alarm Log uses the following color scheme to describe the operational states:</p> <ul style="list-style-type: none"> • Green – moving into normal state • Yellow – moving into abnormal state • Red – moving into more severe abnormal state 

Chart 1. BT MON Installation (Cont'd)

STEP	PROCEDURE
16	<p>RTHC firmware build information, including slot number and serial number, is shown in the following screen (available from the Help pull-down menu).</p> <div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: fit-content;"> </div> <p><i>Note:</i> Application Release Date, Application Release version, Boot Release Date, and Boot Release version shown for reference only.</p>

Chart 1. BT MON Installation (Cont'd)


STEP	PROCEDURE
17	<p>RTHC provisioning information is displayed in the following screen (available from the Configuration pull-down menu).</p> <div style="border: 2px solid blue; padding: 10px;"><p style="text-align: center; background-color: #0056b3; color: white; margin: 0; padding: 5px;">Provision Input & Ensembling Sources - RTHC-A Serial ...</p><div style="text-align: center; margin: 10px 0;"><input checked="" type="radio"/> Disable CC2 <input type="radio"/> Enable CC2 for Monitoring <input type="radio"/> Enable CC2 for Monitoring and Use</div><div style="display: flex; justify-content: space-between; align-items: center; margin-top: 10px;"><div style="display: flex; gap: 20px;"><div style="border: 1px dashed gray; padding: 5px 15px;">OK</div><div style="border: 1px solid gray; padding: 5px 15px;">Cancel</div></div></div></div>

Chart 1. BT MON Installation (Cont'd)

STEP	PROCEDURE
18	<p>RTHC holdover information (daily and monthly) is shown in the following screens (available from the System Admin. pull-down menu).</p> <div> </div> <div> </div>

Chart 1. BT MON Installation (Cont'd)

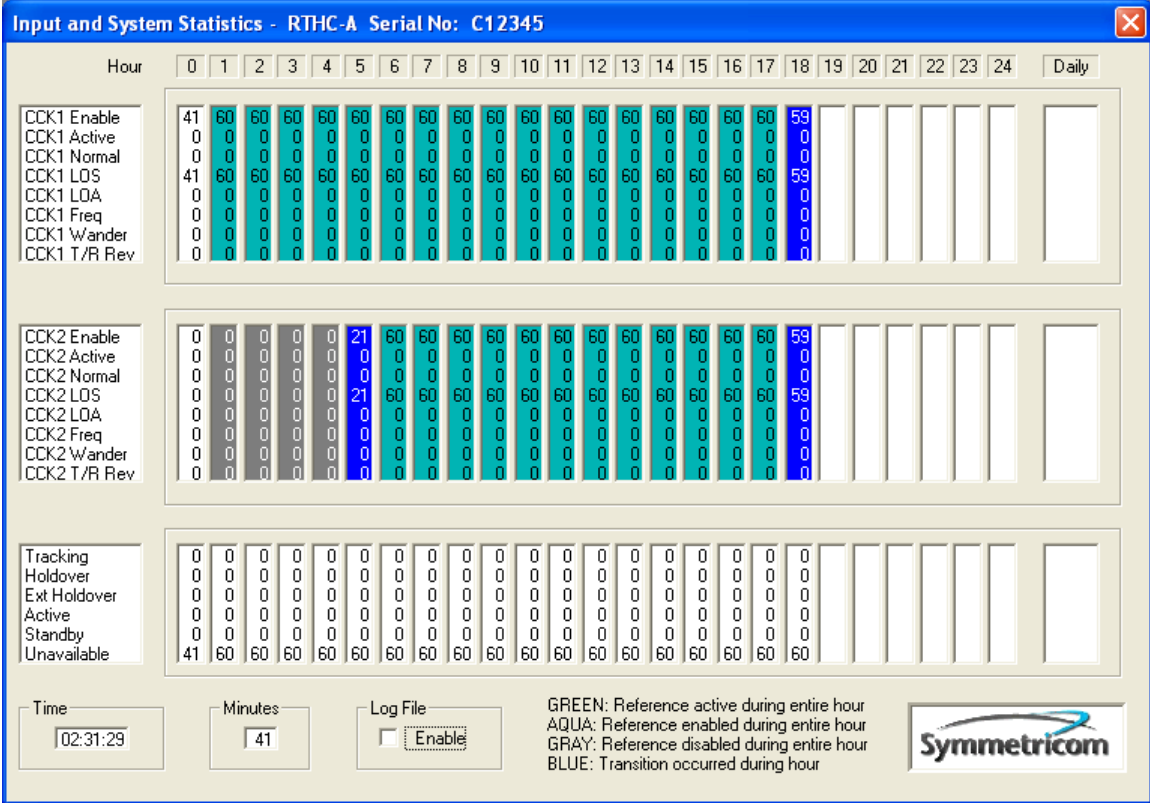
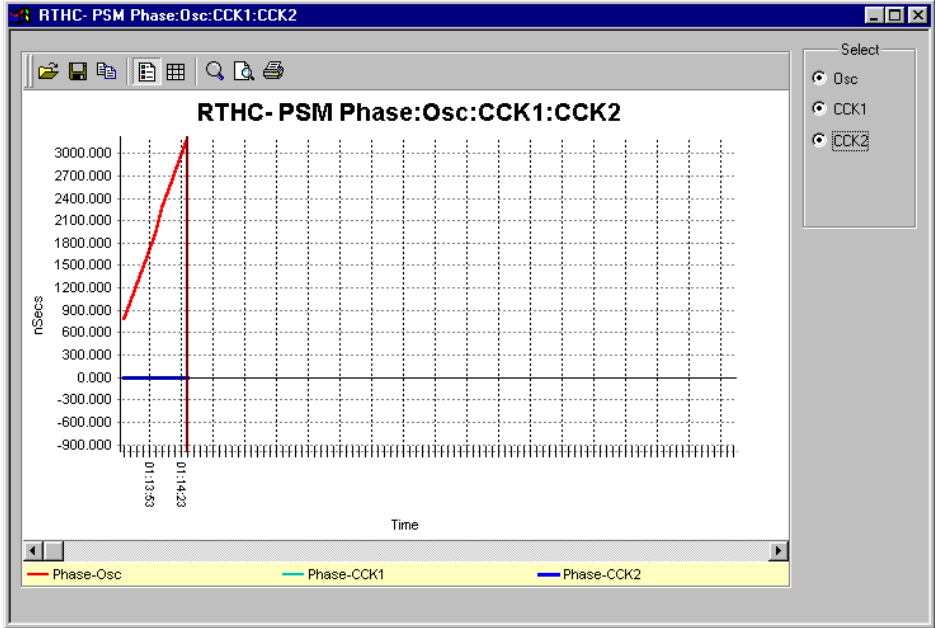
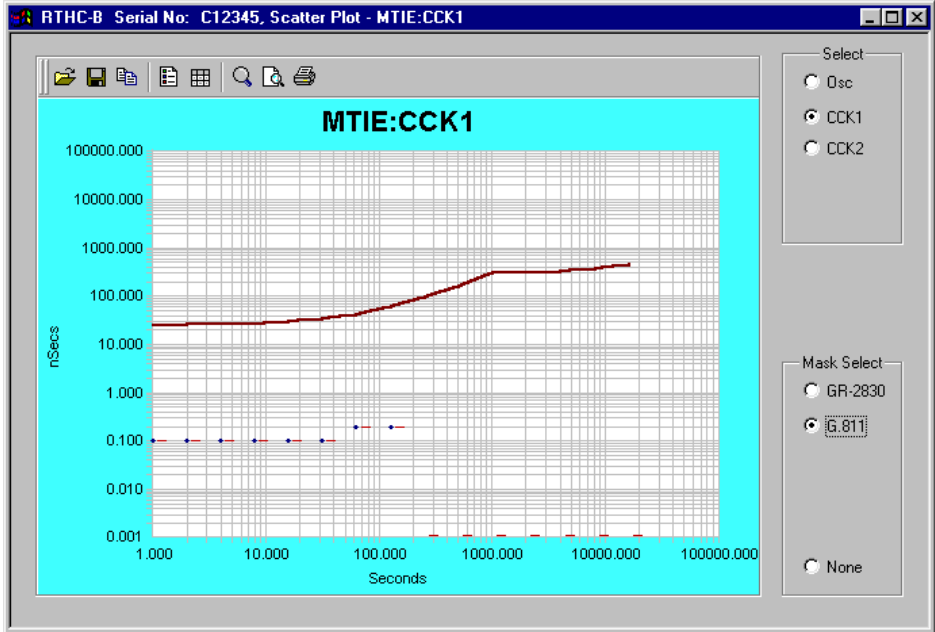
STEP	PROCEDURE
19	<p>RTHC input and system statistics are shown in the following screen (available from the Performance Statistics pull-down menu.</p>  <p>Screen items description:</p> <p>CCK 1 or 2 Enable – Input has been enabled in minutes. CCK 1 or 2 Active – Input has been active in minutes. CCK 1 or 2 Normal – Input does not have LOS, LOA, Freq, Wander, or T/R Rev in minutes. CCK 1 or 2 Freq – Input is outside the pull-in range specified for ST3 clock per GR-1244-CORE. CCK 1 or 2 Wander – Input is outside the expected wander range or delay variation from master shelf input in minutes. CCK 1 or 2 LOS – Loss of signal has occurred in minutes. CCK 1 or 2 LOA – Input phase is out of alignment compared to output phase of active RTHC in minutes. (LOA occurs on inactive RTHC only) CCK 1 or 2 T/R Rev – T/R Reversal has occurred on input compared to RTHC output in minutes.</p> <p>Tracking – The card is tracking input reference in minutes. Holdover – The card is in holdover mode in minutes. Ext Holdover – The card is in extended holdover in minutes. Extended holdover is a condition where the holdover is past the SmartClock limit. Active – The card is active in minutes. Standby – The card is in standby in minutes. Unavailable – The card is not producing a 4 kHz output in minutes.</p>

Chart 1. BT MON Installation (Cont'd)

STEP	PROCEDURE
20	<p>RTHC PSM scatter plots are shown in the following screens (available from the Graph pull-down menu in the main screen).</p>  <p>Note: Use the Clear command in the Precision Sync Monitor Report to reset the phase to zero. All phase information is in relation to the RTHC output.</p> 
21	This procedure is completed.

4.9 Chart 2 describes the process for downloading software for the RTHC.

Chart 2. Downloading RTHC Software


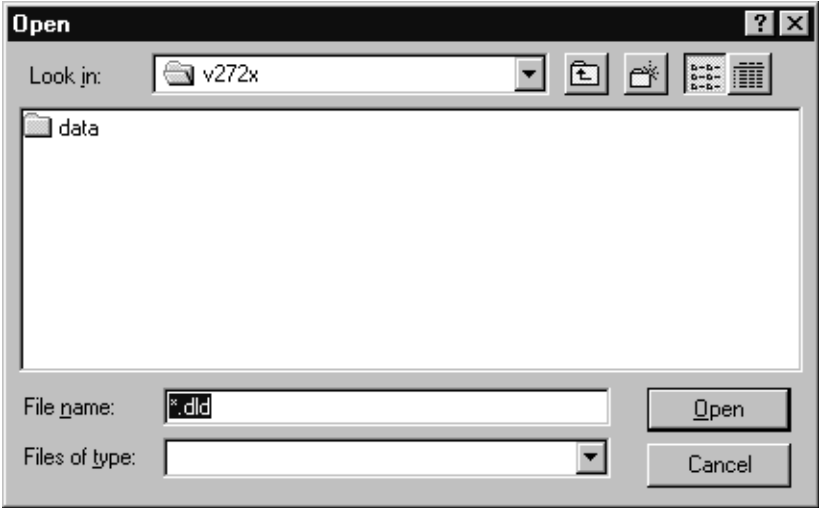
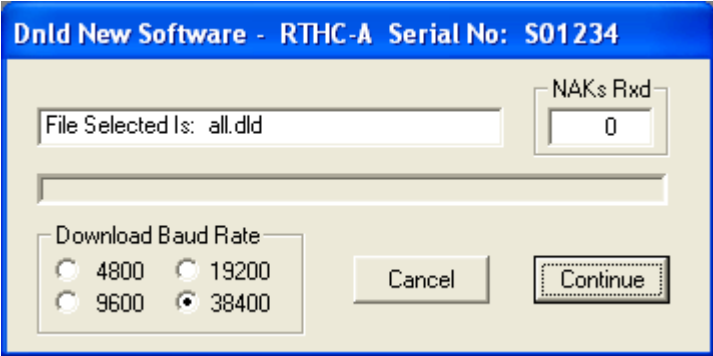

STEP	PROCEDURE
	<p>Use this procedure to download software into the RTHC.</p> <p>Warning: Download should be attempted on inactive cards only. The output can be affected on non-redundant RTHC cards.</p>
1	<p>Insert the BT MON CD-ROM disk into the PC CD-ROM drive.</p>
2	<p>In BT MON, select the Dnld New Software option from the System Admin. menu.</p> 
3	<p>An Open dialog box similar to the following appears. Navigate to find the download file (file has a .dld extension).</p> 

Chart 2. Downloading RTHC Software (Cont'd)

STEP	PROCEDURE
4	<p>Select the file. A Dnld New Software screen similar to the following appears. Click the Continue button to download the file.</p> <p><i>Note:</i> The Download Baud Rate of 38400 is the default baud rate.</p> 
5	<p>The software download process completes in a few minutes.</p>
6	<p>The RTHC card must be reset to start the new firmware. Use the System Admin. menu, click on Reset, and select Cold Start as shown in the following screen.</p> <p><i>Warning: Download should be attempted on inactive cards only. The output can be affected on non-redundant RTHC cards.</i></p> 
7	<p>This procedure is completed.</p>

5. MAINTENANCE

A. Troubleshooting

5.01 Before taking any action on the RTHC, first consider

the following guidelines for troubleshooting:

- DO** write down any alarm and normal lamp conditions. These will help you to determine where to look for the cause of the condition.

2. **DO** determine if any network elements (NE) being timed from the DCD System are in alarm, or reporting slips.
 3. **DO** use the RTHC manual and available job aids to assist you.
 4. **DO** take your time. An operating error can affect ALL network elements in the office.
 5. **DO** contact your supervisor, technical support and/or Symmetricon if you are not sure what to do.
 6. **DO NOT** remove an RTHC card from the shelf, unless you are certain it is the cause of the condition. This is especially true if the clock card is in the Holdover mode (its HOLDOVER lamp is lit). Removal of both RTHC cards in this condition will cause total loss of all outputs from the shelf and/or system.
 7. **DO NOT** touch the shelf until you have analyzed the condition and know the possible result of any planned corrective actions.
 8. **DO NOT PANIC!** Both major and minor alarms in the shelf require immediate attention. But, very few alarms in the DCD System are service affecting. IMPROPER corrective actions could be service affecting.
 9. **DO NOT** touch the shelf until you have been properly grounded.
 10. Always follow proper electrostatic discharge (ESD) precautions when handling DCD Shelf cards. This includes, but is not limited to:
 - Wearing a properly grounded and tested wrist strap when handling cards.
 - Storing RTHC only in antistatic packaging provided by the factory.
- 5.02** When a system alarm is generated, the office audible alarm is activated. Press the alarm cutoff (ACO) pushbutton on the activated SAI or MIS card to silence the office audible alarm. The ACO does not deactivate the office visual alarm or any remote alarms. The ACO automatically resets when the alarm condition is cleared or when another type of alarm is generated. For example, if a MINOR alarm was previously acknowledged (ACO pressed) and a new MAJOR alarm is generated, then the ACO resets (the ACO lamp goes off) and the office audible alarm sounds again.
- 5.03** Before replacing cards, write down all abnormal and normal lamp conditions for the shelf with the alarm lamp lit on its FA, SAI, AI, or MIS card. This assists in isolating the cause of the condition.
- 5.04** If it is necessary to replace an RTHC, refer to Chart 3 for the appropriate replacement procedures.
- 5.05** Use Table F for troubleshooting the BT MON Alarm Log.

Chart 3. RTHC Card Replacement in Shelf

STEP	PROCEDURE
Use this procedure to replace an RTHC card in a shelf. <i>Note:</i> Use this chart whether or not the card's FAIL lamp is lit.	
1	If the shelf is in alarm, press the ACO pushbutton to silence the office audible alarm.
2	Depress the transfer button on the RTHC card being replaced. The card LED should indicate standby mode and should illuminate. (If card has failed, this may not occur.)
3	Remove the RTHC card from the shelf, using the eject lever on the faceplate. <i>Caution: If there is no redundant RTHC card, service will be affected.</i>
4	Set the option switches on the replacement card to the same positions as the switches on the removed card and insert the replacement card into the same slot as the card that was removed.
5	For a failed RTHC card, unplug the replacement card and check that the SW1 switch is provisioned the same as the failed card. Re-insert the replacement card in the shelf.
6	This procedure is completed.

5.06 Table F describes the RTHC Event Alarms viewable by BT MON software.

Table F. RTHC Event Alarms

Event Alarm	Description
Notes: 1. Day of week, month, time of day, year precedes each alarm log message. For example: Tue Sep 24 08:40:21 2002: CCK-1/CCK-2 Active ON 2. For further explanation of faceplate LEDs, see Table A. 3. Shelf alarms are identified as part of Event Log message.	
CCK-2 Enable ON/OFF	Enable of input is on or off for CCK-2 (CCK-1 is always enabled) (Enable means input has been manually enabled.)
CCK-1/CCK-2 Active ON/OFF	Active status is on or off for CCK-1 or CCK-2 (Active status refers to input that RTHC is using for a timing reference.)
CCK-1/CCK-2 Normal ON/OFF	Normal status is on or off for CCK-1 or CCK-2 (Normal means no LOS, LOA, excessive frequency, excessive wander, or Tip Ring Reversal.)
CCK-1/CCK-2 Loss of Signal ON/OFF	Loss of signal on or off for CCK-1 or CCK-2
CCK-1/CCK-2 Loss of Alignment ON/OFF	Loss of alignment on or off for CCK-1 or CCK-2 (LOA means greater than 1.5 μ second phase difference between RTHC input and output will occur on inactive RTHC card.)
CCK-1/CCK-2 Excessive Frequency ON/OFF	Excessive frequency on or off for CCK-1 or CCK-2 (Excessive frequency means inputs are outside the pull-in range specified for ST3 clocks by GR-1244-CORE.)
CCK-1/CCK-2 Excessive Wander ON/OFF	Excessive wander on or off for CCK-1 or CCK-2 (Excessive wander means input is outside the expected wander range or delay variation from master shelf input.)
CCK-1/CCK-2 Tip-Ring Reversal ON/OFF	Tip-Ring Reversal on or off for CCK-1 or CCK-2 (Tip-Ring Reversal means that a tip ring reversal has been detected between RTHC input and output.)
CCK-2 Monitor ON/OFF	Monitor has been disabled or enabled for CCK-2 (CCK-1 is always monitored and enabled; monitor means input is monitored for all parameters.)
SYNC Active ON/OFF	Sync is active or not active (SYNC is alternate input from the other RTHC that controls the standby LED.)
SYNC Normal ON/OFF	Sync does not have a LOS, excessive frequency, or excessive wander (SYNC is alternate input from the other RTHC that controls the standby LED.)
SYNC Loss of Signal ON/OFF	Sync has LOS on or off (SYNC is alternate input from the other RTHC that controls the standby LED.)
SYNC Excessive Frequency ON/OFF	Sync has excessive frequency movement (SYNC is alternate input from the other RTHC that controls the standby LED.)
SYNC Excessive Wander ON/OFF	Sync has excessive wander (SYNC is alternate input from the other RTHC that controls the standby LED.)
Enter/Exit Warmup	RTHC has entered or exited Warmup (Warmup is when RTHC is first powered up.)

Table F. RTHC Event Alarms (Cont'd)

Event Alarm	Description
Enter/Exit Freerun	RTHC has entered or exited Freerun condition (Freerun condition is entered when no inputs have been applied to the RTHC and the output is not active.)
Enter/Exit Tracking	RTHC has entered or exited Tracking mode (Tracking is declared when RTHC is tracking an input.)
Enter/Exit Holdover	RTHC has entered or exited Holdover (Holdover is declared when tracked references have been applied to RTHC, then removed or declared invalid.)
Enter/Exit Smart Holdover	RTHC has entered or exited Smart Holdover (Smart Holdover is a condition where RTHC has entered holdover after the SmartClock LED is on solid. Smart Holdover is indicated by yellow LED.)
Enter/Exit Extended Holdover	RTHC has entered or exited Extended Holdover (Extended Holdover is a condition when RTHC has passed Smart Holdover period. This is after 8 hours if SmartClock LED is lit solid and 4 hours if SmartClock LED is flashing. Extended Holdover is indicated by a red holdover LED.)
SmartClock Available/Unavailable	SmartClock is available after predicted holdover error is less than or equal to 2.5 μ seconds in 8 hours (This requires a minimum of 16 hours.)
Degraded SmartClock Available/Unavailable	Degraded SmartClock is available after predicted holdover error is less than or equal to 4.0 μ seconds in 8 hours (This requires a minimum of 8 hours.)
Enter/Exit RTHC Active	RTHC has entered or exited active status (Active status means RTHC is timing the 4 kHz bus which is timing output cards.)
Enter/Exit RTHC Standby	RTHC has entered or exited standby mode (Standby means RTHC is locked to the other RTHC and is ready to go active.)
Enter/Exit RTHC Unavailable	RTHC has entered or exited Unavailable mode (Unavailable means RTHC has no output.)
Major Alarm Active/Cleared	Major alarm is active or cleared (Major alarm will cause major shelf alarm on MIS, AI, SAI, or FA DCD shelf alarm cards.)
Minor Alarm Active/Cleared	Minor alarm is active or cleared (Minor alarm will cause major shelf alarm on MIS, AI, SAI, or FA DCD shelf alarm cards.)
Warm Reset	RTHC has been reset without affecting the database (Database stores security and alarm log information is non-volatile memory.) Note: Warm Reset affects microprocessor only.
Cold Reset	RTHC has been reset without affecting the database (Database stores security and alarm log information is non-volatile memory.) Note: Cold Reset affects microprocessor and FPGA.
Normal/Extended Lock	RTHC has locked (normal) within 1.0 μ seconds of output (Extended Lock means RTHC is temporarily outside normal lock because of transience.)

Table F. RTHC Event Alarms (Cont'd)

Event Alarm	Description
Synthesizer Fault	RTHC synthesizer has failed; fail light will be illuminated and card should be replaced
Tuning Limit Fault	RTHC has exceeded tuning limit; fail light will be illuminated and card should be replaced
4 kHz Bus Fault	RTHC has output 4 kHz bus fault; fail light will be illuminated and card should be replaced
Warmup Time-Out Fault	RTHC Oscillator has not warmed up in allotted time; fail light will be illuminated and card should be replaced
Power Supply Fault	RTHC has detected an internal power supply fault; fail light will be illuminated and card should be replaced
Microprocessor Fault	RTHC has detected an internal fault in microprocessor; fail light will be illuminated and card should be replaced

5.07 Use Table F to troubleshoot the RTHC when it goes into holdover..

Table G. RTHC Holdover Conditions

SmartClock LED	Time in Holdover	Holdover LED	Smart Holdover Event in BT MON
Off	0	Yellow	Enter Smart Holdover
	10 min	Yellow to Red	Exit Smart Holdover; Enter Extended Holdover
	4 h	Red	Nond
	12 h	Red	None
	>12 h	Red	None
	Enter Tracking	off	Exit Extended Holdover, Enter Tracking
Blinking	0	Yellow	Enter Smart Holdover
	10 min	Yellow	None
	>4 h	Yellow to Red	Exit Smart Holdover; Enter Extended Holdover
	12 h	Red	None
	>12 h	Red	None
	Enter Tracking	off	Exit Extended Holdover, Enter Tracking

Table G. RTHC Holdover Conditions (Cont'd)

SmartClock LED	Time in Holdover	Holdover LED	Smart Holdover Event in BT MON
On	0	Yellow	Enter Smart Holdover
	10 min	Yellow	None
	4 h	Yellow	None
	12 h	Yellow	None
	>12 h	Red	Exit Smart Holdover; Enter Extended Holdover
	Enter Tracking	off	Exit Extended Holdover, Enter Tracking

6. TEST AND ACCEPTANCE

A. Card Test

Warning: *When handling cards, use local office procedures regarding electrostatic discharge (ESD), including the following:*

- Use grounded wrist straps connected to equipment frame ground when handling cards.
- Store cards only in antistatic packaging provided by the factory.

6.01 System circuit cards are keyed, making it virtually impossible to fully insert a card into the wrong slot. If a card does not seat fully, make sure the card is sliding into the proper slot. Labels printed along the top lip of the shelves identify each slot. Use the following instructions whenever installing a card into a slot:

1. Hold the card by the locking lever on the faceplate with one hand, and support the card by the bottom edge of the printed circuit board with the other hand. Carefully align card with the shelf card edge guides. Gently seat the card in the connector on the shelf backplane.

Note: Always use two hands to install cards.

2. Secure the card into place by lowering the locking lever.

6.02 If a BT MON product is used in the Test and Acceptance process, whenever a procedure refers to the User Guide or Operations section, use the appropriate action in the BT MON product.

6.03 The procedure for the Test and Acceptance of the RTHC card is described in Chart 4 for the DCD-400/ST2 shelves and in Chart 5 for the DCD-519/523 shelves.

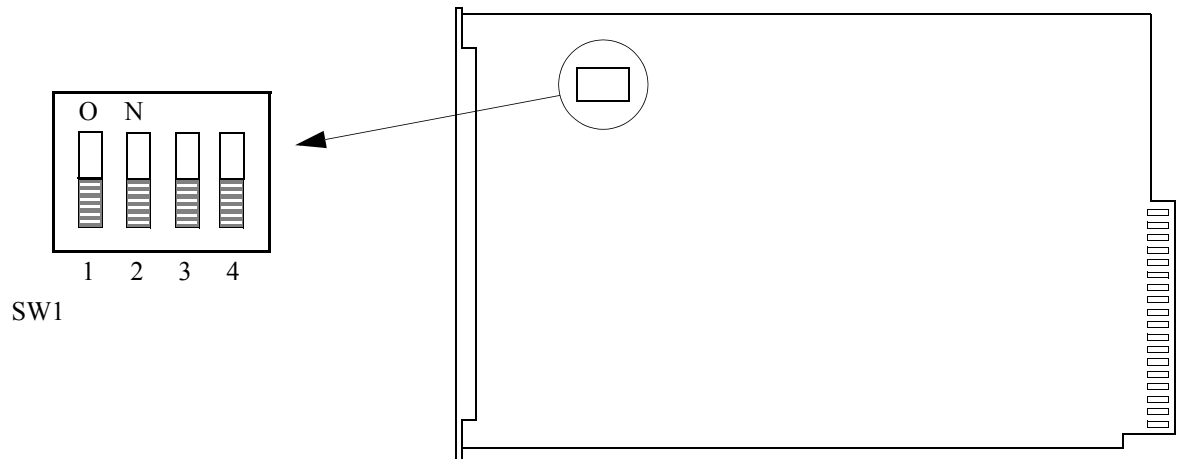
6.04 Figure 4 shows the RTHC card switch.

Chart 4. RTHC Card Test – DCD-400/ST2 Shelves

STEP	PROCEDURE
	<p>Use this procedure to verify the operation of the RTHC card. This procedure assumes the input reference signals have been connected. This procedure also assumes that the composite clock is present on CCK1 and/or CCK2.</p> <p><i>Note:</i> See Table A for LED definitions. <i>Test Equipment:</i> None</p>
1	<p>If the CI-A slot is not equipped with an RTHC card, insert an RTHC card into the CI-A slot. The following occurs once the card is installed:</p> <ul style="list-style-type: none"> • The Lamp test sequence occurs for approximately 30 seconds. • The FAIL lamp goes off after approximately 10 seconds. • The FREERUN lamp flashes green for approximately 1 to 3 minutes. • The ENABLE lamp is green (ON). • The ACTIVE lamp lights green on the active card. • The STANDBY lamp lights green on the standby RTHC card. • The TRACKING lamp turns on. • The CCK ACTIVE lamp turns on.
2	<p>If the CI-B slot is not equipped with a RTHC card, insert a RTHC card into the CI-B slot. The following occurs once the card is installed:</p> <ul style="list-style-type: none"> • The Lamp test sequence occurs for approximately 30 seconds. • The FAIL lamp goes off after approximately 10 seconds. • The FREERUN lamp flashes green for approximately 1 to 3 minutes. • The ENABLE lamp is green (ON). • The ACTIVE lamp lights green on the active card. • The STANDBY lamp lights green on the standby RTHC card. • The TRACKING lamp turns on. • The CCK ACTIVE lamp turns on.
3	<p>Press the TRANSFER pushbutton on one of the RTHC cards.</p> <p><i>Requirement:</i> The lit ACTIVE and STANDBY lamp indications transfer to the other RTHC card.</p>
4	<p>Press the TRANSFER pushbutton on the other RTHC card.</p> <p><i>Requirement:</i> The lit ACTIVE and STANDBY lamp indications transfer to the original RTHC card.</p>
5	<p>The RTHC Card Test is complete.</p>

Chart 5. RTHC Card Test – DCD-519/523 Shelves

STEP	PROCEDURE
	<p>Use this procedure to verify the operation of the RTHC card. This procedure assumes the input reference signals have been connected. This procedure also assumes that a valid composite clock is present on CCK1 and/or CCK2.</p> <p>Note: See Table A for LED definitions. Test Equipment: None</p>
1	<p>On the master shelf rear panel, set the ST2/ST3 switch to the ST3 position for this test, regardless of the type of clock card to be installed.</p>
2	<p>If the CI-A slot is not equipped with a RTHC card, insert a RTHC card into the CI-A slot. The following occurs once the card is installed:</p> <ul style="list-style-type: none"> • The Lamp test sequence occurs for approximately 30 seconds. • The FAIL lamp goes off after approximately 10 seconds. • The FREERUN lamp flashes green for approximately 1 to 3 minutes. • The ENABLE lamp is green (ON). • The ACTIVE lamp lights green on the active card. • The STANDBY lamp lights green on the standby RTHC card. • The TRACKING lamp turns on. • The CCK ACTIVE lamp turns on.
3	<p>If the CI-B slot is not equipped with a RTHC card, insert a RTHC card into the CI-B slot. The following occurs once the card is installed:</p> <ul style="list-style-type: none"> • The Lamp test sequence occurs for approximately 30 seconds. • The FAIL lamp goes off after approximately 10 seconds. • The FREERUN lamp flashes green for approximately 1 to 3 minutes. • The ENABLE lamp is green (ON). • The ACTIVE lamp lights green on the active card. • The STANDBY lamp lights green on the standby RTHC card. • The TRACKING lamp turns on. • The CCK ACTIVE lamp turns on.
4	<p>Press the TRANSFER pushbutton on one of the RTHC cards.</p> <p>Requirement: The lit ACTIVE and STANDBY lamp indications transfer to the other RTHC card.</p>
5	<p>Press the TRANSFER pushbutton on the other RTHC card.</p> <p>Requirement: The lit ACTIVE and STANDBY lamp indications transfer to the original RTHC card.</p>
6	<p>Leave the ST2/ST3 switch (SW1) on the backplane set to the ST3 position.</p> <p>Requirement: If SW1 is set to the ST2 position, the ACTIVE lamps on both RTHC cards are lit. The transfer function between the RTHC cards is disabled.</p>
7	<p>The RTHC Card Test is complete.</p>



Notes:

1. All switches are shown in the factory-set position.
2. Switch 3 and 4 are the only switches that are customer configurable. Switches 1 and 2 are set by the factory and cannot be changed.

SW1 Settings

Section	Position	Meaning	Factory Setting
1	ON	Set by factory	—
	OFF	Set by factory	X
2	ON	Set by factory	—
	OFF	Set by factory	X
3	ON	Security is enabled	—
	OFF	Security is disabled	X
4	ON	CCK2 is enabled	—
	OFF	CCK2 is not enabled	X

Figure 4. RTHC Card Switch

