



TimeCesium Primary Reference Source

User Guide
Revision D – November 2005
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Contents

How to Use This Guide

Purpose of This Guide	x
Who Should Read This Guide.	x
Structure of This Guide	x
Conventions Used in This Guide.	xi
Warnings, Cautions, Recommendations, and Notes	xii
Related Documents and Information.	xiii
Where to Find Answers to Product and Document Questions	xiii
What's New In This Guide.	xiii

Chapter 1 Product Overview

Functional Description.	16
Introduction	16
Software	16
Alarms and the Alarm Relay Connector	17
Power	17
Fuses	17
Connectors	20
Microprocessor	20
Outputs	21
T1–1.544 Mb/s Outputs	21
E1–2.048 Mb/s Outputs	21
Composite Clock.	21
Sinusoidal Signals.	21
Factory Configurations	22
Factory Settings	22

Chapter 2 Installing the TimeCesium

Overview	24
Unpacking Instructions	24
Environmental Considerations	25
Pre-Installation Checklist	25
Tools and Materials.	26
Installing the TimeCesium.	26
Mounting the TimeCesium	27
Making Power and Ground Connections	30
Connecting the TimeCesium to a Computer.	33
Installing the Monitor3 Software	33

Chapter 3 Operating and Configuring the TimeCesium

Starting the Monitor3 Software Application	36
Configuring the Serial Port	38
Viewing and Resetting Alarms	39
Viewing the Event Log and Setting the Time and Date.	41
Configuring Telecom Outputs	42
Changing Factory Settings	43
Changing RS-232 Settings	44

Chapter 4 Specifications

TimeCesium Specifications.	48
------------------------------------	----

Chapter 5 Maintenance and Troubleshooting

Preventive Maintenance	54
Troubleshooting	55
Disposal	56
Shipping	57
Hazardous Material (HAZMAT) Shipping Considerations.	57
Shipping Products Back to the Factory.	57
Shipping Carriers	58
Re-Ordering Information	59
Storage	59
Cesium Beam Tube Vacuum	59
Cesium Beam Tube Shelf Life	59

Figures

1-1	Front View of the TimeCesium 4500	18
1-2	Rear View of the TimeCesium 4500	18
1-3	Front View of the TimeCesium 4400	19
1-4	Rear View of the TimeCesium 4400	19
2-1	TimeCesium ANSI Shelf Rack Mounting Diagram.	28
2-2	TimeCesium ETSI Shelf Rack Mounting Diagram	29
2-3	TimeCesium Connector Locations.	31
2-4	DB9 to Wire-wrap Connector Pin Location and Pinout	31
3-1	Monitor3 Initial Start-up Screen	37
3-2	Configuring the Serial Port.	39
3-3	Alarms	40
3-4	Event Log.	41
3-5	Configuring the Telecom Outputs.	43
3-6	Factory Settings.	44
3-7	RS-232 Settings.	45
5-1	Typical Label Placement	58

Tables

1-1	Factory Configuration Options	22
1-2	Default Factory Settings.	22
2-1	Front Panel LED Indicators	32
2-2	RS-232 Port DB9 to DB25 Connector Pinout	33
2-3	RS-232 Port DB9 to DB9 Connector Pinout	33
4-1	System Specifications	48
4-2	Factory Default Settings.	50
5-1	Preventive Maintenance	54
5-2	Fault Messages	55

How to Use This Guide

This section describes the format, layout, and purpose of this guide.

In This Preface

- [Purpose of This Guide](#)
- [Who Should Read This Guide](#)
- [Structure of This Guide](#)
- [Conventions Used in This Guide](#)
- [Warnings, Cautions, Recommendations, and Notes](#)
- [Related Documents and Information](#)
- [Where to Find Answers to Product and Document Questions](#)
- [What's New In This Guide](#)

Purpose of This Guide

The *TimeCesium User's Guide* describes the procedures for unpacking, installing, using, maintaining, and troubleshooting the Symmetricom TimeCesium Primary Reference Source. It also describes the alarms and events, the languages that you use to communicate with the TimeCesium, default values, and other information.

Who Should Read This Guide

[Chapter 1, Product Overview](#), is written for non-technical audiences who need general information about the product. Subsequent chapters contain technical information about the product that describes installation and configuration instructions or details primarily intended for qualified maintenance personnel.

This *User Guide* is designed for the following categories of users:

- **Systems Engineers** – [Chapter 1](#) provides an overview of the product and its options. Cross references in this chapter direct readers to detailed configuration information in [Chapter 3, Operating and Configuring the TimeCesium](#).
- **Installation Engineers** – [Chapter 2](#) provides installation and operation information and procedures. [Chapter 3, Operating and Configuring the TimeCesium](#) provides specific configuration information to ensure proper operation.

Structure of This Guide

This guide contains the following sections:

Chapter, Title	Description
Chapter 1, Product Overview	Provides both a physical and functional description of the TimeCesium Primary Reference Source.
Chapter 2, Installing the TimeCesium	Provides environmental considerations of the TimeCesium unit, a guide to mounting, and electrical (cable) connection procedures for the TimeCesium unit. It also provides instructions on installing the Monitor3 utility program that is used to configure the TimeCesium.
Chapter 3, Operating and Configuring the TimeCesium	Provides information on connecting the TimeCesium unit to a laptop, PC, or terminal for installing software and setting the systems configuration options.

Chapter, Title	Description
Chapter 4, Specifications	Provides system specifications information.
Index	Provides references to individual topics within this guide.

Conventions Used in This Guide

This guide uses the following conventions:

- **Acronyms and Abbreviations** – Terms are spelled out the first time they appear in this User Guide. Thereafter, only the acronym or abbreviation is used.
- **Revision Control** – The title page lists the part number, issue number, and printing date of this Operating Manual.
- **Typographical Conventions** – This guide uses the typographical conventions described in the table below.

When text appears this way...	... it means:
<i>TimeCesium User's Guide</i>	The title of a document.
ALARM	An operating mode, alarm state, status, or chassis label.
Select File, Open...	Click the Open option on the File menu.
Press Enter	A named keyboard key. The key name is shown as it appears on the keyboard. An explanation of the key's acronym or function immediately follows the first reference to the key, if required.
Username:	Text in a source file or a system prompt or other text that appears on a screen.
D:\setup.exe	A command you enter at a system prompt or text you enter in response to a program prompt. You must enter commands for case-sensitive operating systems exactly as shown.
<i>do not</i>	A word or term being emphasized.
Symmetricom does not recommend...	A word or term given special emphasis.

Warnings, Cautions, Recommendations, and Notes

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this guide. The types of information included in each are explained in the following examples.



Warning: To avoid serious personal injury or death, *do not* disregard warnings. All warnings use this symbol. Warnings are installation, operation, or maintenance procedures, practices, or statements, that if not strictly observed, may result in serious personal injury or even death.



Caution: To avoid personal injury, *do not* disregard cautions. All cautions use this symbol. Cautions are installation, operation, or maintenance procedures, practices, conditions, or statements, that if not strictly observed, may result in damage to, or destruction of, the equipment. Cautions are also used to indicate a long-term health hazard.



ESD Caution: To avoid personal injury and electrostatic discharge (ESD) damage to equipment, *do not* disregard ESD cautions. All ESD cautions use this symbol. ESD cautions are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in possible personal injury, electrostatic discharge damage to, or destruction of, static-sensitive components of the equipment.



Electrical Shock Caution: To avoid electrical shock and possible personal injury, do not disregard electrical shock cautions. All electrical shock cautions use this symbol. Electrical shock cautions are practices, procedures, or statements, that if not strictly observed, may result in possible personal injury, electrical shock damage to, or destruction of components of the equipment.



Recommendation: All recommendations use this symbol. Recommendations indicate manufacturer-tested methods or known functionality. Recommendations contain installation, operation, or maintenance procedures, practices, conditions, or statements, that provide important information for optimum performance results.



Note: All notes use this symbol. Notes contain installation, operation, or maintenance procedures, practices, conditions, or statements, that alert you to important information, which may make your task easier or increase your understanding.

Related Documents and Information

See your Symmetricom representative or sales office for a complete list of available documentation.



Note: Symmetricom offers training courses designed to enhance your knowledge of the TimeCesium. Contact your local representative or sales office for a complete list of courses and outlines.

Where to Find Answers to Product and Document Questions

For additional information about the products described in this guide, please contact your Symmetricom representative or your local sales office. You can also contact us on the web at www.symmetricom.com.

What's New In This Guide

Revision D of this guide contains the following new information:

- Corrected part numbers in [Table 1-1](#)
- References to the T1 ANSI product are replaced with references to the TimeCesium 4500
- References to the E1 ETSI product are replaced with references to the TimeCesium 4400
- Removed the duplicated reference to the ANSI product on page 16
- Updated the the contact numbers on page 24

Chapter 1 Product Overview

This chapter provides both a physical and functional description of the TimeCesium Primary Reference Source.

In This Chapter

- [Functional Description](#)
- [Outputs](#)
- [Factory Configurations](#)

Functional Description

Introduction

The Symmetricom TimeCesium Primary Reference Source (PRS) is a low cost, accurate and stable frequency reference with fully automatic operation by microprocessor control. The unit provides a Stratum 1 quality signal without the need of an external reference.

The TimeCesium produces the following accurate and stable signals for telecom network synchronization:

- DS1 (1.544 Mb/s) and 1.544 MHz
- E1 (2.048 Mb/s) and 2.048 MHz
- Composite Clock (64 kHz/8 kHz BPV AMI pattern)
- Sinusoidal Outputs (X1 at 5 MHz and 10 MHz)

The signals can be configured using a cesium beam tube resonator to stabilize the output of a quartz crystal oscillator that provides the frequency source for the output generators.

The TimeCesium is available in two models:

- The TimeCesium 4500, which meets ANSI mounting and access requirements and applications
- The TimeCesium 4400, which meets ETSI mounting and access requirements and applications

The TimeCesium 4500 front and rear panel are shown in [Figure 1-1](#) and [Figure 1-2](#). The TimeCesium 4400 front and rear panel are shown in [Figure 1-3](#) and [Figure 1-4](#). Refer to [Table 4-1](#) for a list of the system's performance specifications.

Software

The TimeCesium has a number of software controllable features. The Monitor3 program delivered with the TimeCesium is a proprietary software utility program designed to help configure and monitor the TimeCesium using a proprietary interface. It requires a PC or laptop running Windows 95, Windows 98, Windows ME, Windows NT 4, Windows 2000, or Windows XP. The software is quickly installed and easy to use. Refer to [Installing the Monitor3 Software](#), on page 33, and [Starting the Monitor3 Software Application](#), on page 36, for more information.

Alarms and the Alarm Relay Connector

The TimeCesium provides alarms to indicate when any of several parameters deviates from the acceptable value. One set of form-C relay contacts, 1-Amp rating, is provided on the terminal block labeled ALARM. The alarm connection is available either as “normally open” or “normally closed” (see [Figure 1-2](#) and [Figure 1-3](#)). For connection instructions, see [Mounting the TimeCesium](#), on page 27, [Step 7](#) and for alarm fault codes, see [Troubleshooting](#), on page 55.

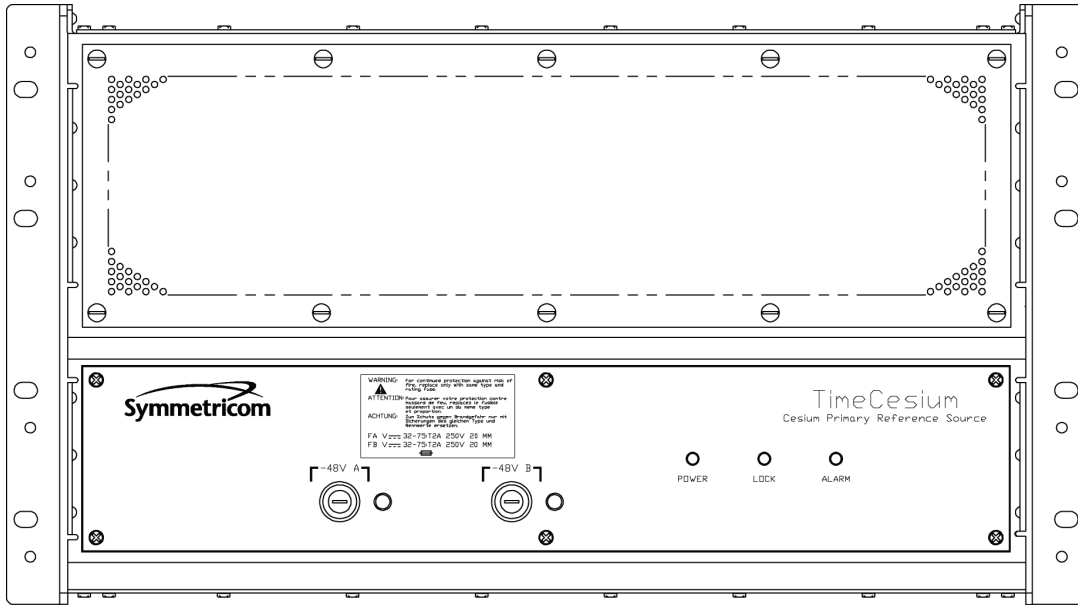
The factory default for ALARM operation is warning mode (non-latching operation). If the alarm is activated, the ALARM indicator turns on. If the alarm condition has cleared, the alarm clears. The ALARM relay is then reset and the outputs are ready to use. The user can change the alarm operation from warning mode (attention required at operator’s convenience) to critical mode (Stratum 1 synchronization has been or soon can be compromised) where the ALARM is latching. In this mode you must reset the alarm by issuing a RESET ALARM command (see [Viewing and Resetting Alarms](#), on page 39) through the RS-232 port.

Power

The TimeCesium is powered from a –48 Vdc source either by a single connection or two redundant connections. The input power contacts (see [Figure 1-2](#) and [Figure 1-3](#)) are labeled –48V A and –48V B, Return (RTN), and Frame Ground (FR GND). Grounding practices should comply with local grounding codes. RTN is the positive side of the voltage supply and is isolated from frame ground (FR GND). The TimeCesium uses an internal DC-to-DC converter to provide a wide input voltage range as well as electrical isolation between the DC input and chassis ground. Either side of the DC input can be located at chassis ground potential. The external DC inputs are protected against reverse polarity connection by series diodes.

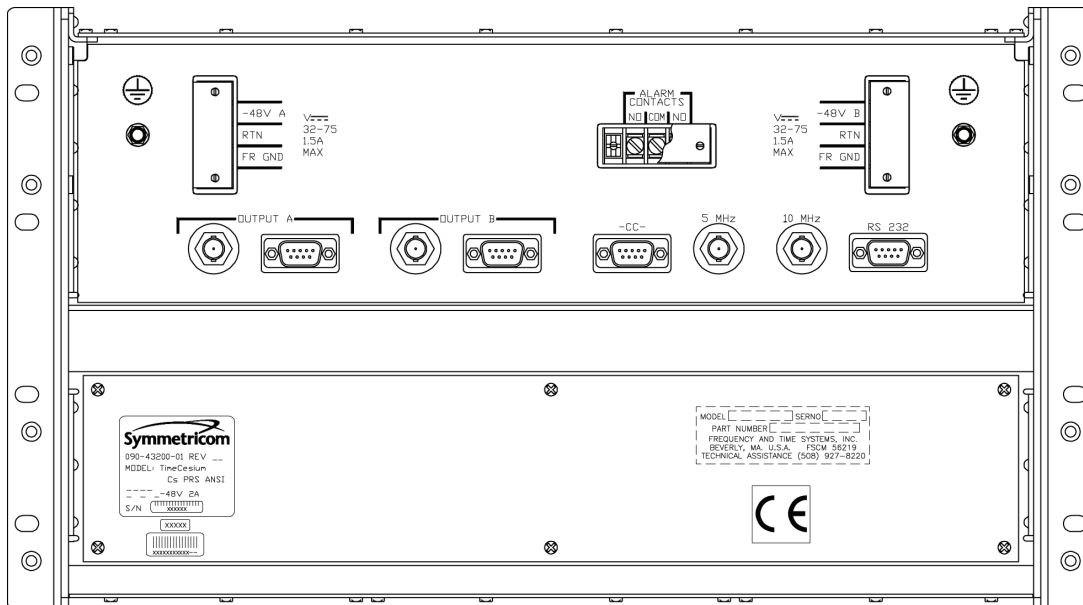
Fuses

The DC fuses are located on the front panel in the fuse holder labeled –48V A and –48V B (see [Figure 1-1](#) and [Figure 1-3](#)). In an emergency you can use the fuses as a disconnect device. Normally, you should remove power by disconnecting the hard-wired connections at either a switch panel or power panel.



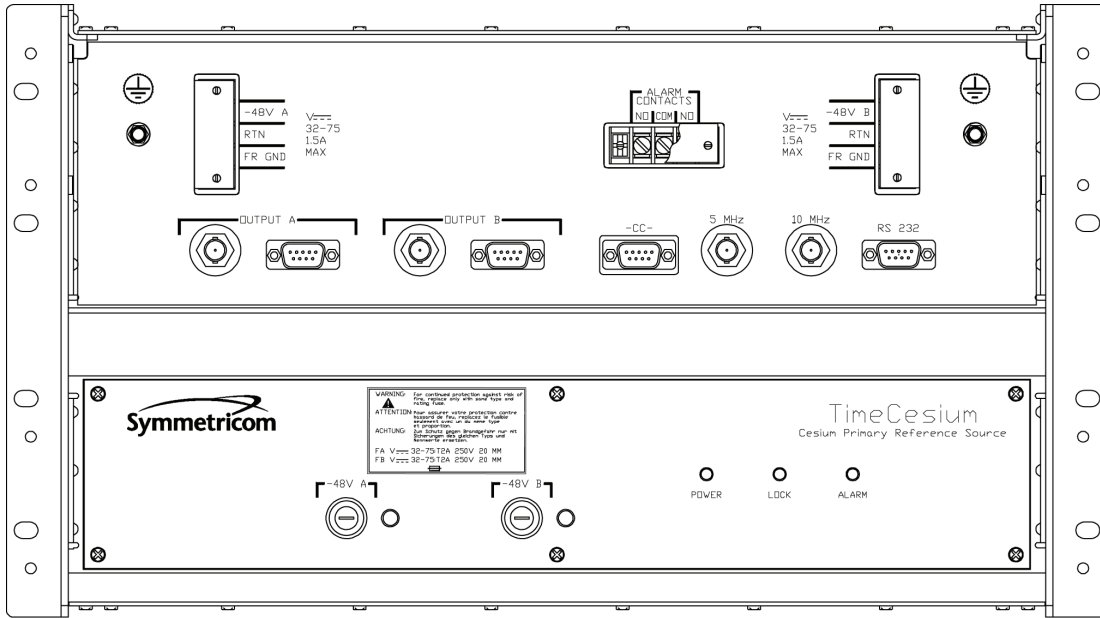
TC0003

Figure 1-1. Front View of the TimeCesium 4500



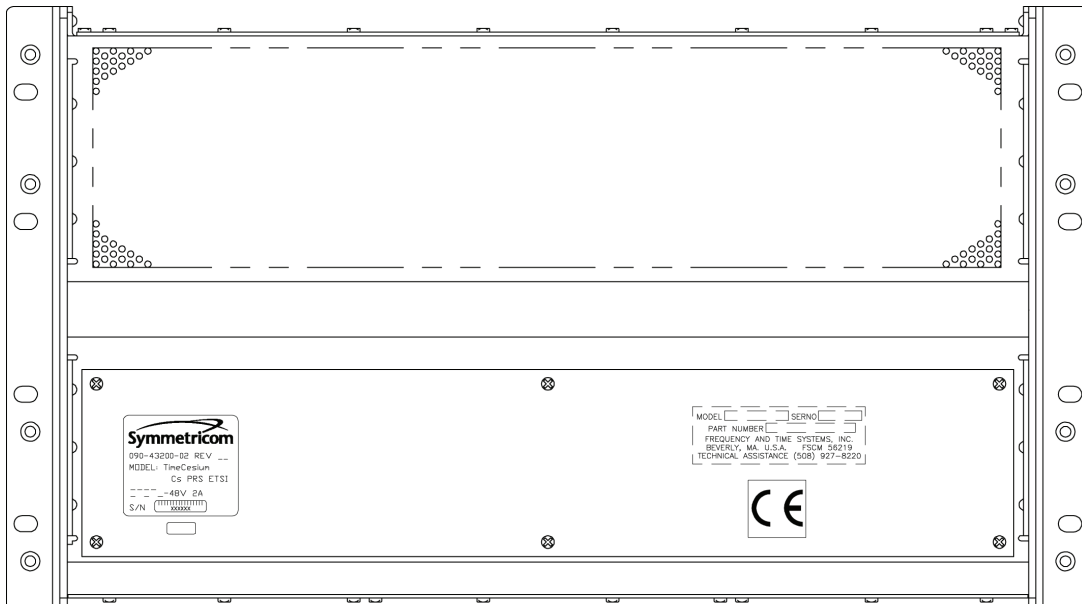
TC0004

Figure 1-2. Rear View of the TimeCesium 4500



TC0005

Figure 1-3. Front View of the TimeCesium 4400



TC0006

Figure 1-4. Rear View of the TimeCesium 4400

Connectors

All connections are made at the following locations:

- The rear panel of the TimeCesium 4500
- The front panel of the TimeCesium 4400

Refer to [Figure 1-2](#) and [Figure 1-3](#) for the location and designation for the various connectors.

RS-232 Serial Port

Connecting a PC or laptop to the RS-232 serial port with a null modem cable allows you to control and monitor the TimeCesium using the Monitor3 software application.

Synchronization Signals

The connectors labeled Output A and Output B provide both a DB9 connector for balanced signals (T1 at 100 Ω and E1 at 120 Ω), and a BNC connector for unbalanced signals (75 Ω). For wire-wrap applications the TimeCesium is supplied with a DB9 to wire-wrap connector adapter (P/N 22013085-000-0). The adapter pins are marked to identify tip, ring, and sleeve.

The DB9 connector labeled CC provides a composite clock output at a frequency of 64 kHz (AMI pattern) with bipolar violation (BPV) phase reversals every 125 microseconds corresponding to a frequency of 8 kHz.

Sinusoidal Signals

The BNC connectors labeled 5 MHz and 10 MHz provide high spectral purity sinusoidal outputs (X1 at 5 MHz and 10 MHz, 0.5 Vrms at 50 Ω).

Microprocessor

A microprocessor performs the following tasks:

- Digital demodulation and integration of the servo loop signals
- Monitoring of system parameters
- Control of adaptive servos
- Diagnostic functions to aid in troubleshooting
- Communication for monitoring and control

Outputs

T1–1.544 Mb/s Outputs

The TimeCesium provides T1 (1.544 Mb/s) telecom signals in either D4 or ESF format. The output format is user selectable through Monitor3 software settings. Line length settings are also selectable for various cable lengths up to 655 feet. In ESF operation, a Sync Status Message (SSM) is included in the output signals that identifies the source as a PRS (Stratum 1). See [Table 4-1](#) for system specifications. When you power up the unit, the Monitor3 software utility program attempts to detect the correct settings for you, if different from the default. This can take anywhere from a few seconds to several minutes. As the scan progresses, the communication settings change. At the end of the scan a message appears to indicate if the cesium instrument was located. The communication settings are then displayed on the Real-Time Status Display.

E1–2.048 Mb/s Outputs

The TimeCesium provides E1 (2.048 Mb/s) telecom signals per ITU-T Reg. G.703. The outputs are framed in accordance with ITU-T Reg. G.704. The output signals contain a Sync Status Message that identifies the source as a PRS (Stratum 1). These outputs are available in either 120 Ω balanced or 75 Ω unbalanced form. See [Table 4-1](#) for system specifications. As with the factory configuration of T1 outputs, at power up the Monitor3 software also attempts to detect the correct settings for you if different from the default. At the end of the scan, a message appears to indicate if the cesium instrument was located. The communication settings are then displayed on the Real-Time Status Display.

Composite Clock

The TimeCesium provides a composite clock output at a frequency of 64 kHz (AMI pattern) with bipolar violation (BPV) phase reversals every 125 microseconds corresponding to a frequency of 8 kHz.

Sinusoidal Signals

The TimeCesium provides two (5 MHz and 10 MHz) high spectral purity sinusoidal outputs (X1 at 5 MHz and 10 MHz, 1.0 V_{rms} at 50 Ω).

Factory Configurations

The TimeCesium is available in two configurations. Refer to [Table 1-1](#) for configuration and part number reference information.

Table 1-1. Factory Configuration Options

Configuration	Part Number
TimeCesium 4500 (ANSI version)	PRS-4500
TimeCesium 4400 (ETSI version)	PRS-4400

Factory Settings

The default factory settings for the two TimeCesium configurations are shown in [Table 1-2](#).

Table 1-2. Default Factory Settings

Parameter	Setting
TimeCesium 4500	
T1 Framing Pattern Generator	
Spec	D4
Fault Strategy	Mute
Output A	
Settings Enabled (checked)	DS1, Mb/s, Balanced
Output B	
Settings Enabled (checked)	DS1, Mb/s, Balanced
TimeCesium 4400	
E1 Framing Pattern Generator	
Spec	CAS4
SSM Channel	4
Fault Strategy	Mute

Chapter 2 Installing the TimeCesium

This chapter provides TimeCesium installation information, including shelf installation, wiring and the operational procedure for power-on and power-off. It also provides information on installing the Monitor3 software application.

In This Chapter

- [Overview](#)
- [Installing the TimeCesium](#)
- [Making Power and Ground Connections](#)
- [Connecting the TimeCesium to a Computer](#)
- [Installing the Monitor3 Software](#)

Overview

This chapter provides unpacking instructions and installation procedures for the TimeCesium as well as warnings, cautions, notes, and recommendations that pertain to the procedures being performed. To prevent serious injury and/or equipment damage, do not ignore these safety, environmental, and operational messages.



Note: If you encounter problems during any of the following procedures, contact Symmetricom Global Services at:

Worldwide (Main Number): 1-408-428-7907

USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907

USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)

Europe, Middle East & Africa: 49 700 32886435

Unpacking Instructions



Caution: To avoid electrostatic discharge (ESD) damage to sensitive internal parts in the TimeCesium, observe proper ESD handling procedures.

1. Inspect the container for signs of damage. If the container is damaged, notify both the carrier and the Symmetricom distributor. Retain the shipping container and packing material for the carrier to inspect.
2. Unpack all components in the shipping container.
3. Inventory, and set aside all items and paperwork that are included in the container. The following items are included in the shipping container:

TimeCesium 4500

- TimeCesium PRS (part number PRS-4500)
- Monitor3 Software CD-ROM (part number 15534-001)
- DB9 to wire-wrap adapters (3 ea.) (part number 22013085-000-0)
- Rack mounting screws (8 ea.) (part number 125-22441-08)
- Fuses (2 ea.) (part number 143-00239-02)
- Mounting ears (2 ea.) (ANSI part number 15411-001)
- Mounting ears (2 ea.) (ETSI part number 15412-001)

TimeCesium 4400

- TimeCesium PRS (part number PRS-4400)
 - Monitor3 Software CD-ROM (part number 15534-001)
 - DB9 to wire-wrap adapters (3 ea.) (part number 22013085-000-0)
 - Rack mounting screws (8 ea.) (part number 125-22441-08)
 - Fuses (2 ea.) (part number 143-00239-02)
 - Mounting ears (2 ea.) (ETSI part number 15412-001)
 - Mounting ears (2 ea.) (ANSI part number 15411-001)
4. Verify that the model and item number shown on the shipping list agrees with the model and item number on the equipment. The item number is on a label affixed to the rear panel. Contact the Symmetricom distributor if the model or item numbers do not match.

Environmental Considerations



Caution: To avoid compromising the safety precautions of the system, this instrument must be operated only as specified by the manufacturer.

When installing the instrument, consider the standard environmental factors (temperature, humidity, vibration, etc.) and the presence of magnetic fields that might affect the accuracy of the TimeCesium. Avoid installing or using the instrument near large motors, generators, transformers, or other equipment which radiates strong AC or DC fields of 2-gauss or more.

Pre-Installation Checklist

Before installation, ensure that the following preparations are in place:

- The equipment rack is grounded and has power available
- The power supply fuses have been removed from the power input of the TimeCesium front panel
- The proper tools and materials are available as listed in the Tools and Materials section

Tools and Materials

The following is a list of recommended tools and materials NOT supplied by Symmetricom:

- Standard tool kit
- Volt-Ohm-Milliammeter
- Cable ties or acceptable cable clamps
- # 16 AWG wire for –48V, RTN, and Frame Ground (minimum)
- #18 AWG wire for connecting office alarms
- Laptop or PC with Windows 95/98/ME/2000/NT 4 installed
- Null Modem cable (F-F)

Installing the TimeCesium

The TimeCesium is designed to be mounted in a standard telecom equipment rack. The front panel occupies a height of 10.5 in. (26.7 cm). The TimeCesium is 10.1 in. (25.7 cm) deep and weighs approximately 36 lbs (16.4 kg).



Caution: Due to weight consideration, the TimeCesium must be mounted at the lowest portion of the rack.

The TimeCesium comes equipped with removable rack mounting brackets that can be positioned for mounting the unit in a standard 19-inch (48.2 cm) rack or 23-inch (58.4 cm) rack. See the shelf mounting diagram in [Figure 2-1](#). The brackets can be mounted 0 in. or 3.625 in. (9.2 cm) behind the TimeCesium front panel.



Caution: To avoid damage to the TimeCesium, only trained service personnel should remove the access covers.



Warning: For continued protection against risk of fire, use only the specified fuse type and rating. Fuse specifications are contained in [Chapter 4, Specifications](#) and on the instrument's front panel.

Mounting the TimeCesium

Refer to [Figure 2-1](#) for the TimeCesium 4500 and [Figure 2-2](#) for the TimeCesium 4400, then perform the following procedures:



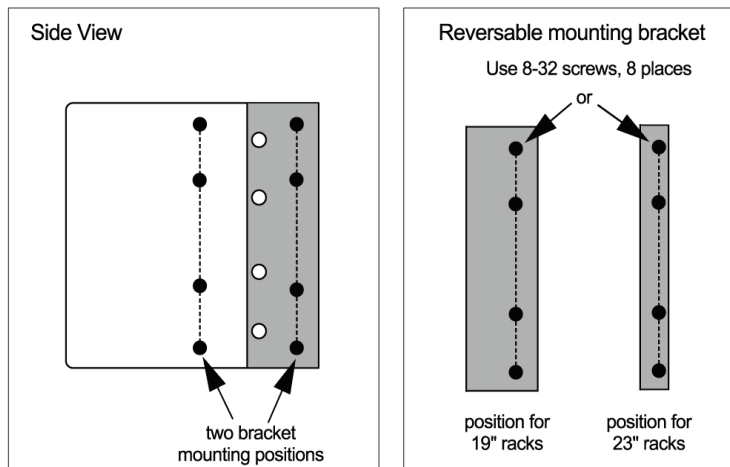
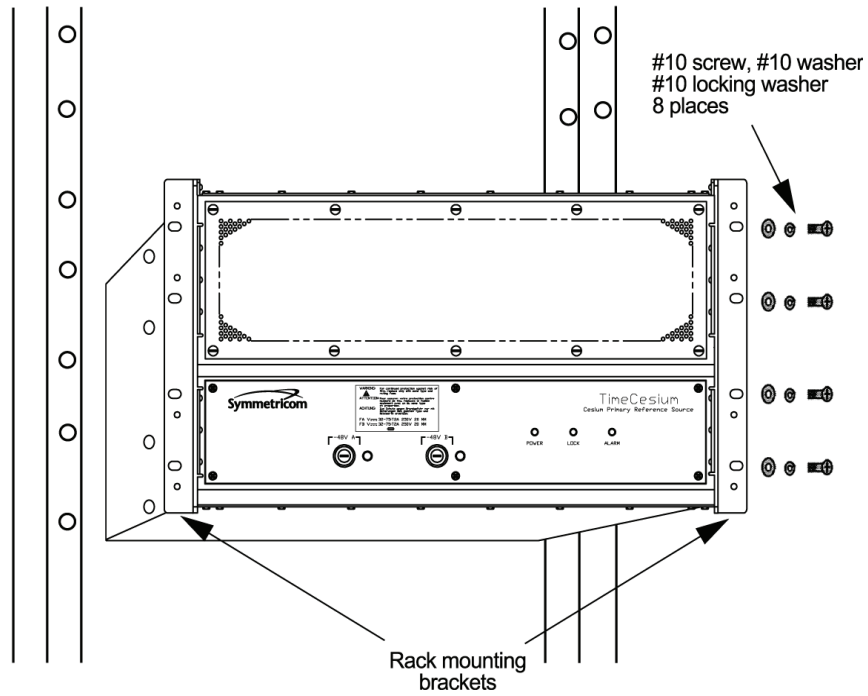
Caution: To prevent damage to the instrument during installation, ensure power is disconnected by removing both fuses from the front panel. The fuses are the emergency disconnect for the device – there is no ON/OFF switch.

The TimeCesium is convection cooled. To prevent the instrument from overheating, allow for a one rack unit (1.75 in./4.4 cm) space above and below the unit for cooling.



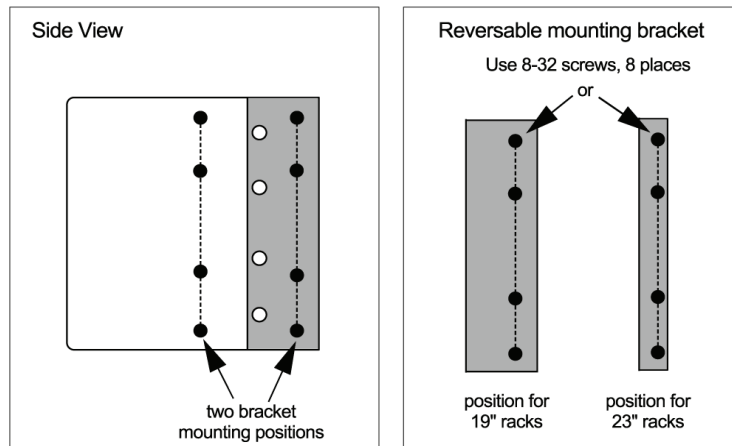
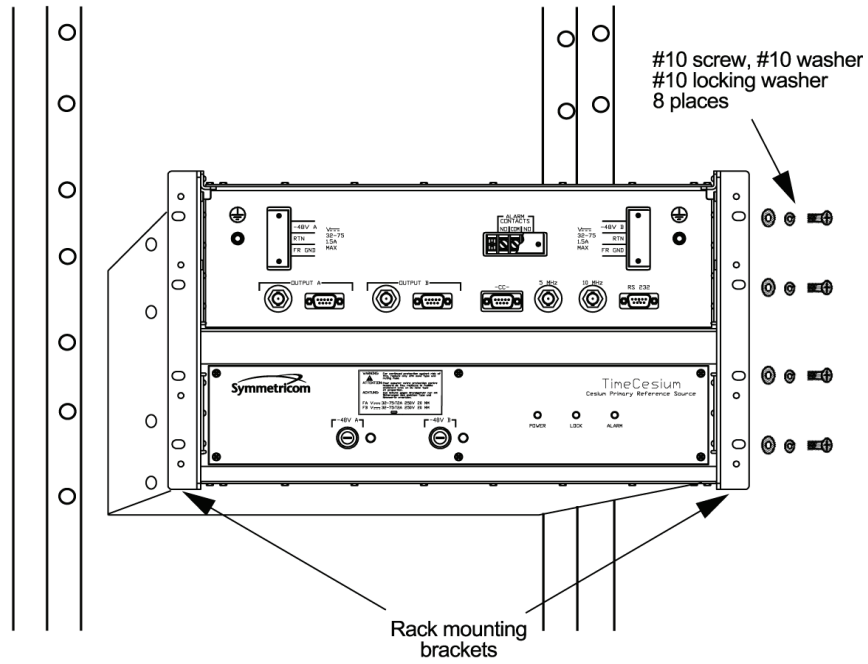
Caution: To avoid electrostatic discharge (ESD) damage to components in the TimeCesium, observe the appropriate ESD precautions and procedures.

1. Install the rack mounting ears in the desired position on the unit with the eight (8-32) screws provided.
2. Mount the TimeCesium in the lowest portion of the equipment rack using the eight #10 screws, washers, and lock washers provided.



TC0007

Figure 2-1. TimeCesium ANSI Shelf Rack Mounting Diagram



TC0008

Figure 2-2. TimeCesium ETSI Shelf Rack Mounting Diagram

Making Power and Ground Connections

- Both power inputs A and B must be used to satisfy the alarm criteria.
- The screw terminal marked “FR GND” can be connected to the frame ground in accordance with local grounding regulations, but must be isolated from the DC returns.
- The external DC inputs are protected against reverse polarity connection by series diodes.



Note: All permanent electrical connections are made on the rear panel of the TimeCesium 4500 and on the front panel of the TimeCesium 4400. Refer to [Figure 2-3](#) for the location and contact designation for the various connectors.

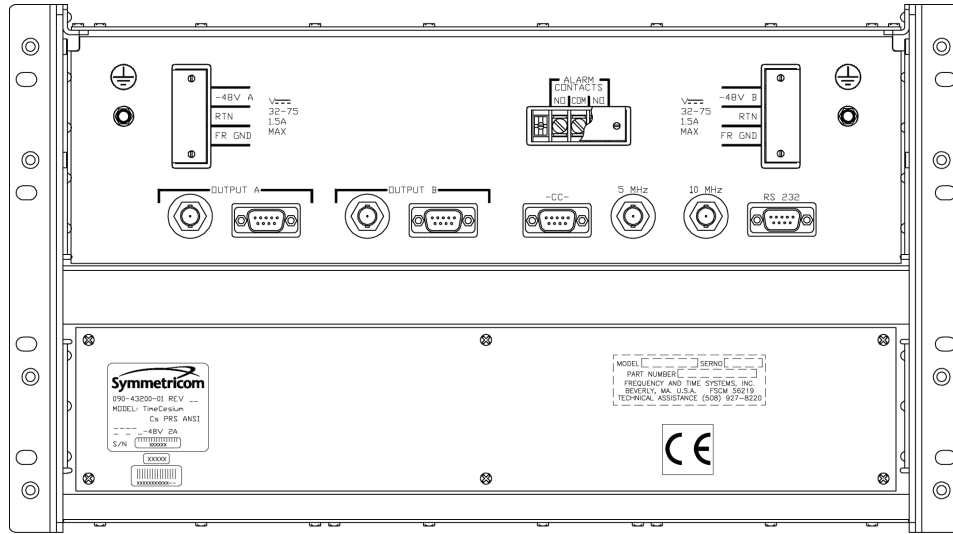


Note: To turn off the TimeCesium, disconnect the hard-wired connections at either a switch panel or power panel. In an emergency you can turn the unit off by removing the fuses labeled –48V A and –48V B on the TimeCesium front panel.



Warning: For continued protection against risk of fire, ensure that only the specified fuse type and rating are used. Fuse specifications are contained in the Specifications chapter and on the instrument's front panel.

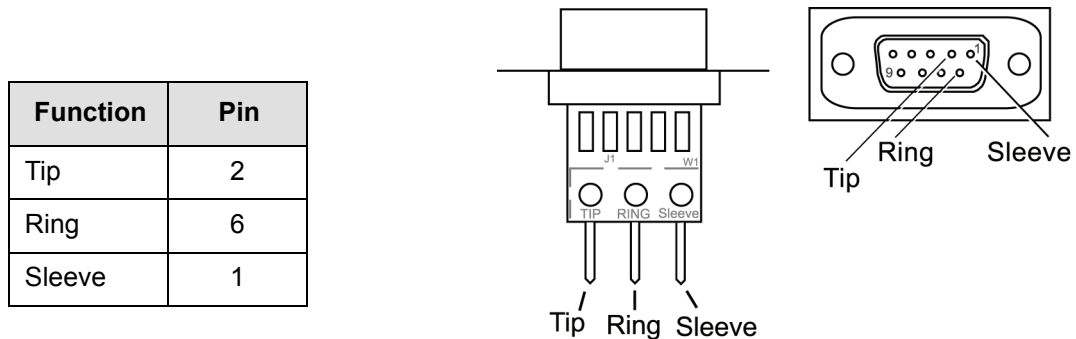
1. Do not remove the fuses from the fuse holders labeled –48V A and –48V B from the front panel.
2. Connect Frame ground to the lug marked "FR GND" on –48V A and –48V B terminal blocks.
3. Connect –48Vdc "Power A" from the fuse panel to the lug marked "–48V A".
4. Connect –48Vdc "Power B" from the fuse panel to the lug marked "–48V B".
5. Connect the return side (+) of –48Vdc "Power A" to the terminal marked "RTN".
6. Connect the return side (+) of –48Vdc "Power B" to the terminal marked "RTN".
7. Connect one end of the alarms cable to the "ALARM CONTACTS" terminals labeled "COM", and either "NO" or "NC" as required (see [Figure 2-3](#)). Connect the other end to the appropriate alarm monitoring device per local regulations.



TC0004

Figure 2-3. TimeCesium Connector Locations

8. Route, connect, and dress the output cable from "OUTPUT A" to the selected network element. Select either BNC, DB9, or DB9 to wire-wrap connection; see Figure 2-4 for pinout information if you are using the DB9 connector. If you are using the DB9 to wire-wrap adapter (part number 22013085-000-0), refer to Figure 2-4 for pinout information.
9. Route, connect, and dress the output cable from "OUTPUT B" to the selected network element. Select either BNC, DB9, or DB9 to wire-wrap connection. If you are using the DB9 to wire-wrap adapter (part number 22013085-000-0), refer to Figure 2-4 for pinout information.



TC0009

Figure 2-4. DB9 to Wire-wrap Connector Pin Location and Pinout

10. Ensure the proper fuses are installed in the –48V A and –48V B mounting rack fuse panel and ensure that power is applied to the TimeCesium –48V A and –48V B power inputs.



Note: Applying DC power initiates the warm-up and automatic lock acquisition sequence. During this time, the ALARM relay is activated and the signal outputs are ready for use.

To turn off the TimeCesium, disconnect the hard-wired connections at either a switch panel or power panel. In an emergency you can turn the unit off by removing the fuses labeled –48V A and –48V B on the TimeCesium front panel.

11. Observe that the TimeCesium POWER and ALARM indicators are illuminated.

12. Ensure that neither of the –48 VDC Power Fault indicators are illuminated.

13. Wait for the unit to stabilize the frequency control loop. This can take up to 30 minutes. When stabilized, the ALARM indicator turns off and the LOCK indicator illuminates. The ALARM relay is also reset. At this time the signal outputs are ready for use.



Note: The factory default alarm operation is “warning mode” (non-latching operation), but you can change the operation to “critical mode” (latching operation). In critical mode, you must reset the alarm from the RS-232 port by issuing the Reset Unit Alarms command.

Refer to [Table 2-1](#) for a description of all the front panel LED indicators.

Table 2-1. Front Panel LED Indicators

Indicator Name	Description
POWER	Turns green when DC power is present.
LOCK	Turns green when the frequency control loop is stable. Indicates normal operation. Outputs are active.
ALARM	Turns red when the unit is initialized and when a minor or critical alarm is present (alarm relay is activated).
–48 Vdc Power A Fault	Turns red when fuse is blown.
–48 Vdc Power B Fault	Turns red when fuse is blown.

Connecting the TimeCesium to a Computer

Connect one end of a null modem RS-232 cable to the serial communications port on your computer and the other end to the connector labeled RS 232 on the TimeCesium. Refer to [Table 2-2](#) for a DB9 to DB25 connection and [Table 2-3](#) for a DB9 to DB9 connection.



Note: Perform this step only if it is necessary to monitor or communicate with the unit.

Table 2-2. RS-232 Port DB9 to DB25 Connector Pinout

DB9-F	DB25-F	Function
3	3	RX (Receive Data)
2	2	TX (Transmit Data)
5	7	GND (Signal Ground)

Table 2-3. RS-232 Port DB9 to DB9 Connector Pinout

DB9-F	DB9-F	Function
3	2	RX (Receive Data)
2	3	TX (Transmit Data)
5	5	GND (Signal Ground)

Installing the Monitor3 Software

The TimeCesium has a number of software controllable features. The Monitor3 software is a utility program that can help you configure the TimeCesium instrument. It requires a PC or laptop operating with Windows 95, Windows 98, Windows ME, Windows NT 4, Windows 2000, or Windows XP.

1. Locate the Monitor3 software CD-ROM provided in the shipping container.
2. Install the CD-ROM into the computer.

3. Run the program `setup.exe` located on the disk by clicking **Start**, selecting **Run**, and at the command line typing `D:\setup.exe`, then pressing **Enter**.
4. This installs the Monitor3 application files onto the hard disk in the `c:\Program Files\Symmetricom` directory. A folder labeled Symmetricom is added to the Start, Programs menu and contains an icon for the software. The installation also creates a desktop shortcut icon for Monitor3 For details on software operation, see [Chapter 3, Operating and Configuring the TimeCesium](#).



Note: To uninstall the Monitor3 software, use the Windows Add/Remove Programs in the control panel.

Chapter 3 Operating and Configuring the TimeCesium

This chapter provides information on how to use the Monitor3 application from a laptop, computer, or terminal connected to a TimeCesium serial port.

In This Chapter

- Starting the Monitor3 Software Application
- Configuring the Serial Port
- Viewing and Resetting Alarms
- Viewing the Event Log and Setting the Time and Date
- Configuring Telecom Outputs
- Changing Factory Settings
- Changing RS-232 Settings

Starting the Monitor3 Software Application

Before beginning the procedures in this section, ensure that the installation procedures in [Chapter 2, Installing the TimeCesium](#) have been performed.



Note: If problems are encountered during any of the following procedures, contact the Customer Assistance Center at:

Worldwide (Main Number): 1-408-428-7907

USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907

USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)

Europe, Middle East & Africa: 49 700 32886435

Use the following procedure to start the Monitor3 application.

1. Ensure the Monitor3 software is installed (see [Chapter 2, Installing the TimeCesium](#)).
2. Ensure a null modem serial cable is connected from the computer to the RS-232 serial port as described in [Connecting the TimeCesium to a Computer](#), on page 33.
3. Ensure the proper fuses are inserted into the two fuse slots (–48V A and –48V B) of the front panel and that power is applied to the TimeCesium; the green POWER LED should illuminate. Disregard other LED indications at this time.

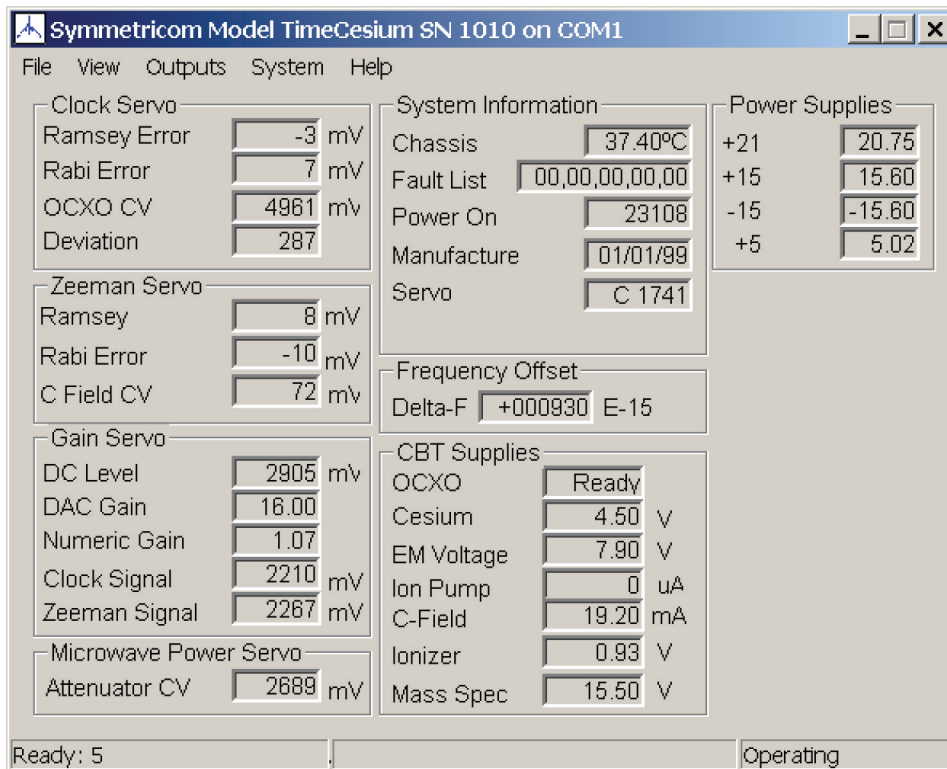


Warning: For continued protection against risk of fire, ensure that only the specified fuse type with the specified rating is used. Fuse specifications are provided in [Table 4-1](#) and on the instrument's front panel.

4. To start the Monitor3 interface program, click **Start** and select **Programs, Symmetricom, Monitor3**. The TimeCesium start up screen appears as shown in [Figure 3-1](#).

[Figure 3-1](#) shows the Monitor3 main status window under normal operating conditions. The title bar of the main window shows the TimeCesium model, serial number, and PC communications port. The status bar at the bottom of the main window indicates RS232 communications activity and polling rate count-down on the left and instrument status (Warming Up, Operating, Minor Fault, or Major Fault) on the right. By default, the displayed data updates every 10 seconds.

If you cannot establish communications, a “Unit Not Responding” message appears at the bottom left of the main window. Check the cabling and power to the TimeCesium and ensure that no other programs are running that use the selected communications port on your computer.



TC0010

Figure 3-1. Monitor3 Initial Start-up Screen

Monitor3 initially attempts to communicate with the TimeCesium using the default settings:

- Com 1
- 9600 baud
- odd parity
- 7 data bits
- 2 stop bits

If you wish to use Com 2, Com 3, or Com 4 on your PC, you must change this setup. This only needs to be done once; Monitor3 stores any changes you make. Refer to [Configuring the Serial Port](#), on page 38 to perform this operation.



Note: Valid COM ports can be 1 through 8; however, only the available COM ports are displayed in the option list. Ports that are being used and uninstalled ports are not shown.

5. To close the program, click **File** and select **Exit**.

Configuring the Serial Port

Monitor3 default settings are Com 1, 9600 baud, odd parity, 7 data bits, 2 stop bits. Use the following procedure to change the serial port configuration:

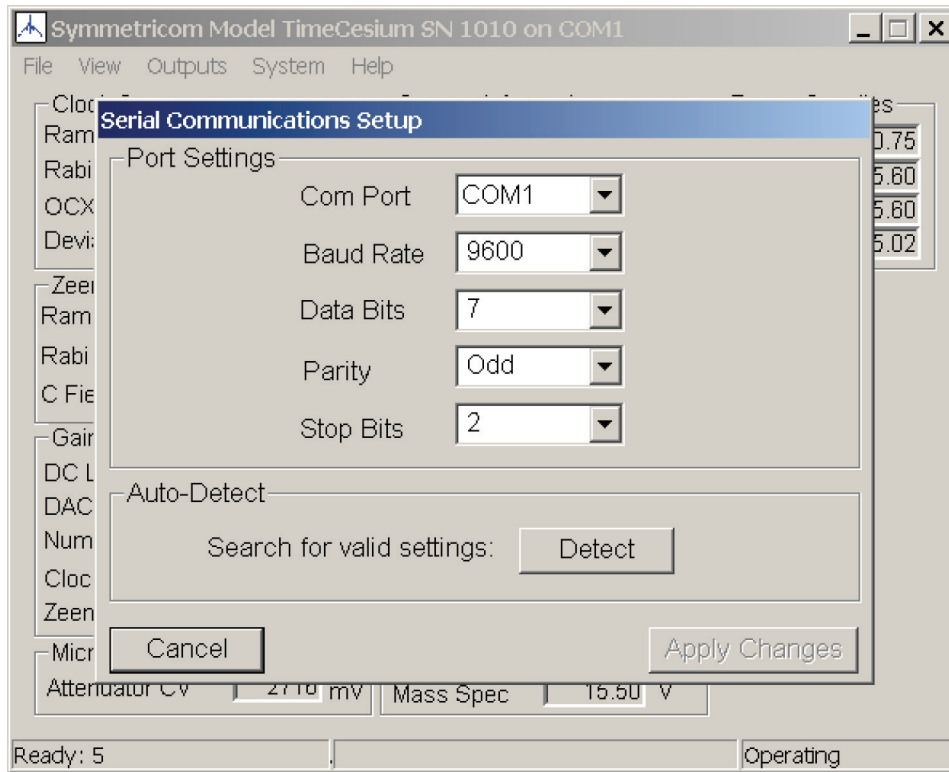
1. Click **File** and select **Configure Serial Port** to open the Serial Communications Setup window (see [Figure 3-2](#)).
2. To automatically configure the port, use [Step a](#) through [Step c](#). To manually configure the port, go to [Step 3](#).
 - a. Click **Detect** in the Auto-Detect section.
 - b. Allow the unit to scan and automatically detect the correct settings. This can take anywhere from a few seconds to several minutes.



Note: If the appropriate configuration is not detected, the scan process continues to cycle through all possible settings. If you click **Cancel** to stop the process, communications will not be established and a message appears stating the Cesium instrument was not detected. Refer to [Connecting the TimeCesium to a Computer](#), on page 33 for proper cable connections.

- c. Click **OK** to select the detected settings.
3. Select the COM port where the TimeCesium is connected to the PC.
 4. Select the baud rate, data bits, parity, and stop bits.
 5. When you complete the setup, click **Apply Changes** to close the Serial Communications Setup window and save the setup, or click **Cancel** to close the window without saving the changes. The main window indicates if the unit is online and shows system status.

If you cannot establish communications, a “Unit Not Responding” message appears at the bottom left of the main window. At 10 second intervals, Monitor3 re-initializes the communications port and attempts to establish communications. If you cannot establish communications, check cabling, power to the cesium instrument, and ensure that no other programs are running that use the communications port on your computer.



TC0011

Figure 3-2. Configuring the Serial Port

Viewing and Resetting Alarms

The TimeCesium monitors the system power supplies, signal quality, and numerous physics package (cesium tube) operating parameters as indicated on the Monitor3 main panel. Alarms are generated when any of several parameters deviates from the acceptable value. Alarms are classified into two types:

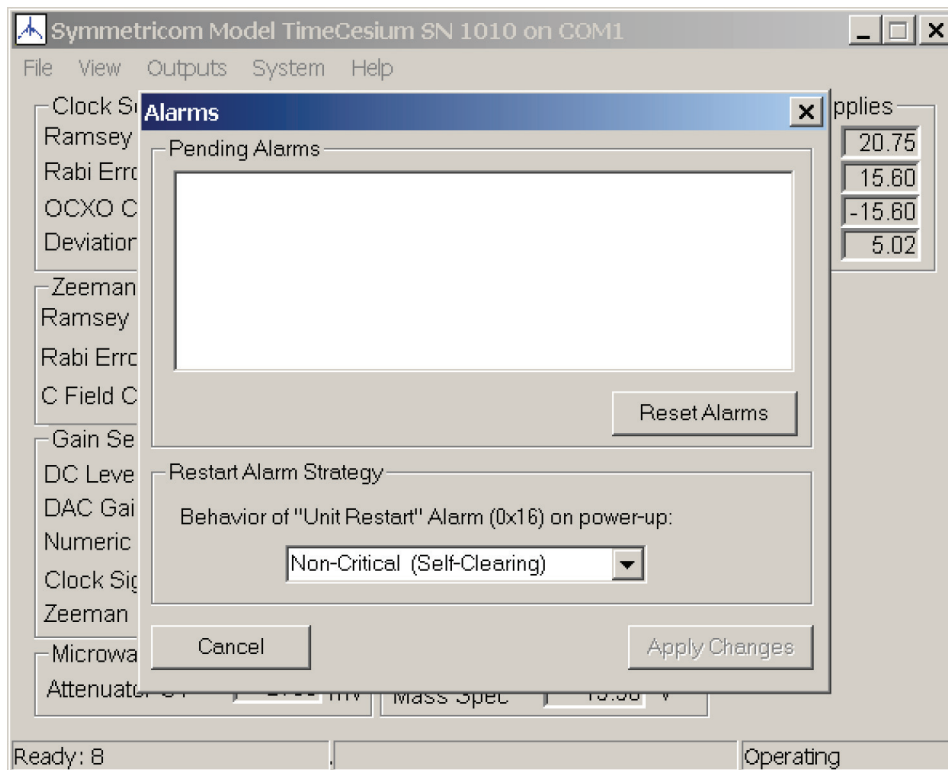
Minor Alarm – indicates out of nominal specification that should be noted but is not expected to impact instrument performance.

Major Alarm – indicates detection of a fault which will cause the instrument to fail to meet specification.

When a Minor Alarm occurs, the front panel ALARM LED illuminates, in addition to the POWER and LOCK LEDs. All outputs remain active and the ALARM LED remains illuminated for as long as the alarm condition persists. When a Major Alarm occurs, the LOCK LED turns off and the ALARM LED illuminates. All outputs are disabled, including RF, 1 PPS, and optional auxiliary outputs, if installed. If the alarm condition ceases, the instrument restarts from its initial power-on condition. The current list of alarms is indicated by hexadecimal code in the alarm list on the Monitor3 main panel.

To see an annotated list of alarms, to reset alarms, or to set the priority of the restart alarm, perform the following steps.

1. Click **View** and select **Alarms**. This opens a dialog box as shown in [Figure 3-3](#)
2. Click **Reset Alarms** to clear the alarm and reset the alarm LED and alarm contacts.
3. Verify that the alarm has cleared by ensuring that the Alarm LED is not lit.
4. In the Restart Alarm Strategy drop down box select **Non-Critical (Self-Clearing)** or **Critical (Manual Reset)**.
 - Non-Critical (Default) – After system restart, the 0x16 alarm flag is set, outputs are muted during re-acquisition and restored upon successful lock. The 0x16 alarm flag remains set until cleared by the user.
 - Critical – After system restart, the 0x16 flag is set, outputs are muted during re-acquisition and remain muted thereafter until the 0x16 alarm flag is cleared by the user.
5. Click **Apply Changes** to close the window and set the modified alarm strategy, or click **Cancel** to close the window without saving the changes.



TC0013

Figure 3-3. Alarms

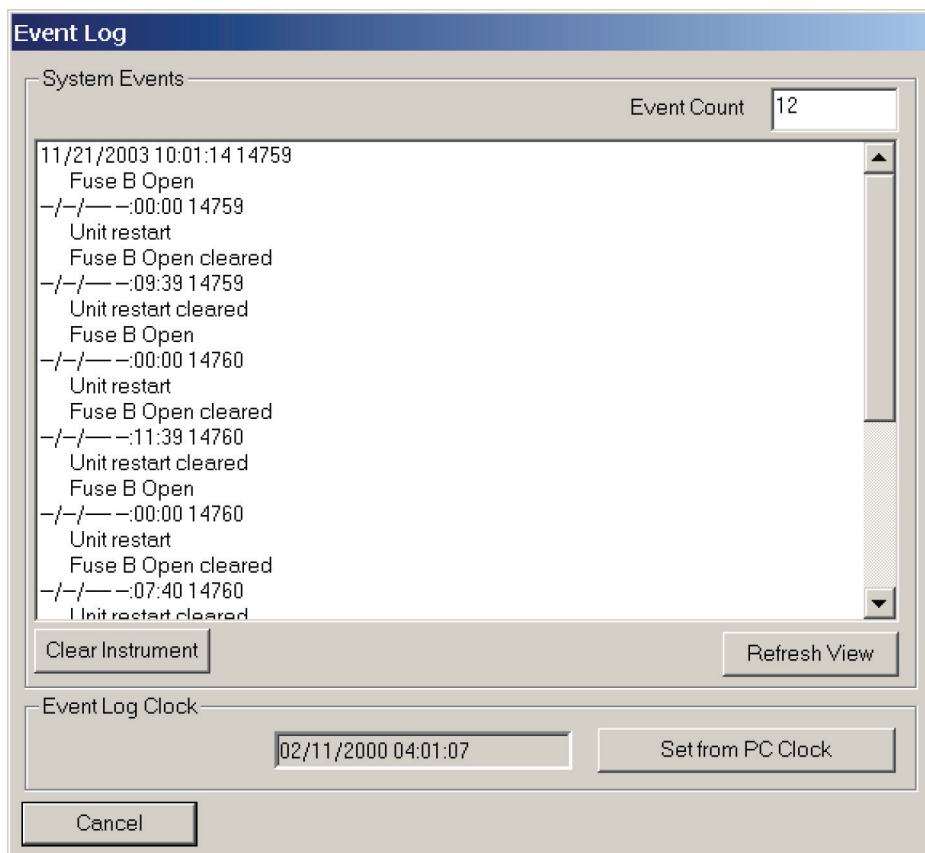
Viewing the Event Log and Setting the Time and Date

Changes in the system status are recorded as new events in the log and each event has a time stamp. To clear the list of displayed events or to set the time and date, perform the following steps.

1. Click **View** and select **Event Log** to open the dialog box as shown in [Figure 3-4](#).
2. Click **Clear Instrument** to clear the event log.
3. Click **Refresh View** to display new events.
4. Click **Set From PC Clock** to set the time and date from the computer's current time and date, or click **Cancel** to close the window without saving the changes.



Note: The Event Count window displays the current number of system events listed.



TC0014

Figure 3-4. Event Log

Configuring Telecom Outputs

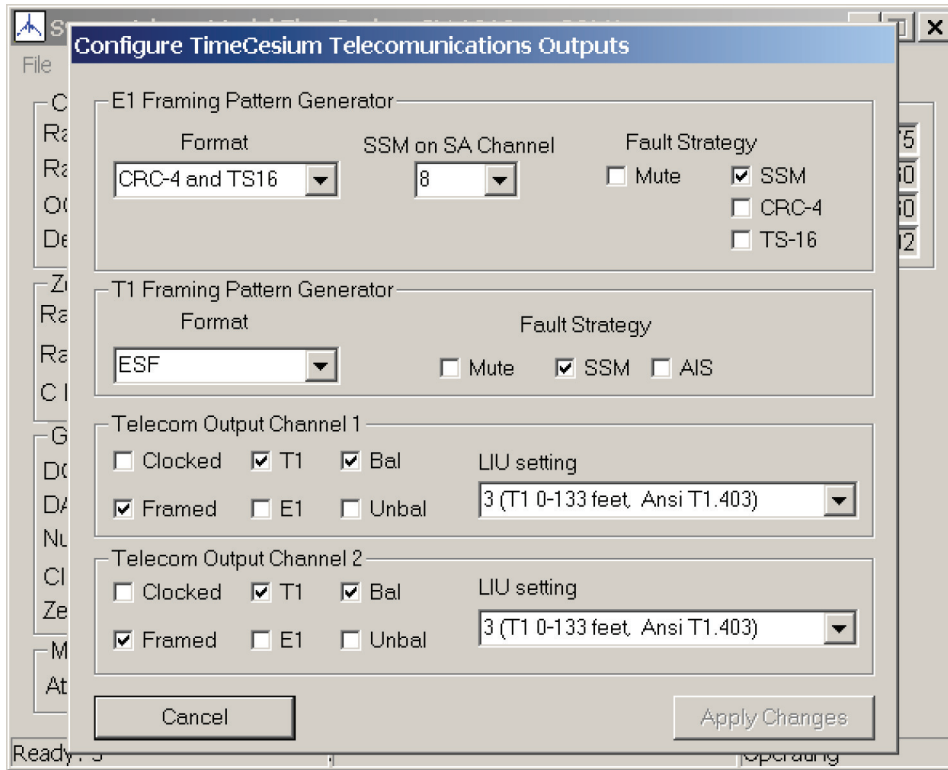
The TimeCesium has two Telecommunications outputs and each can be driven by a T1 or E1 signal. The output channels are configured separately from the signal generators as shown in [Figure 3-5](#). Each output can be a simple Clocked signal, or it can be a fully detailed PRS Framed signal. Use the following procedure to configure the telecom outputs.

1. Click **Outputs** and select **Configure Telecom Outputs** from the menu option. This opens a dialog box as shown in [Figure 3-5](#).
2. Configure the E1 signal generator by selecting options according to the needs of your installation. See ITU specification G.703 for details. Click **Send** to apply your configuration.
3. Configure the T1 signal generator by selecting options according to the needs of your installation. See relevant Bell Core documentation for details. Click **Send** to apply your configuration.
4. Configure Output Channel 1 and Output Channel 2 by selecting options according to the needs of your installation. Output drive can be either balanced or unbalanced. You cannot have both enabled simultaneously on a single channel.
5. Ensure the LIU setting matches the type of signal being produced by this channel.



Note: For E1 there is only one LIU setting. For T1, there are several LIU settings. See relevant Bell Core documentation for details.

6. When all settings are complete, click **Apply Changes** to close the window and save the settings, or click **Cancel** to close the window without saving the changes.



TC0016

Figure 3-5. Configuring the Telecom Outputs

Changing Factory Settings

Use the following procedure to change the factory settings:



Note: Generally, factory settings should only be modified by trained personnel, but are included in the Monitor3 interface to accommodate particular applications.

1. Click **System** and select **Factory Settings** to open the Factory Settings window (see [Figure 3-2](#)).
2. To change the Unit ID, enter a new five-digit value in the edit field and click the associated **Send** button.

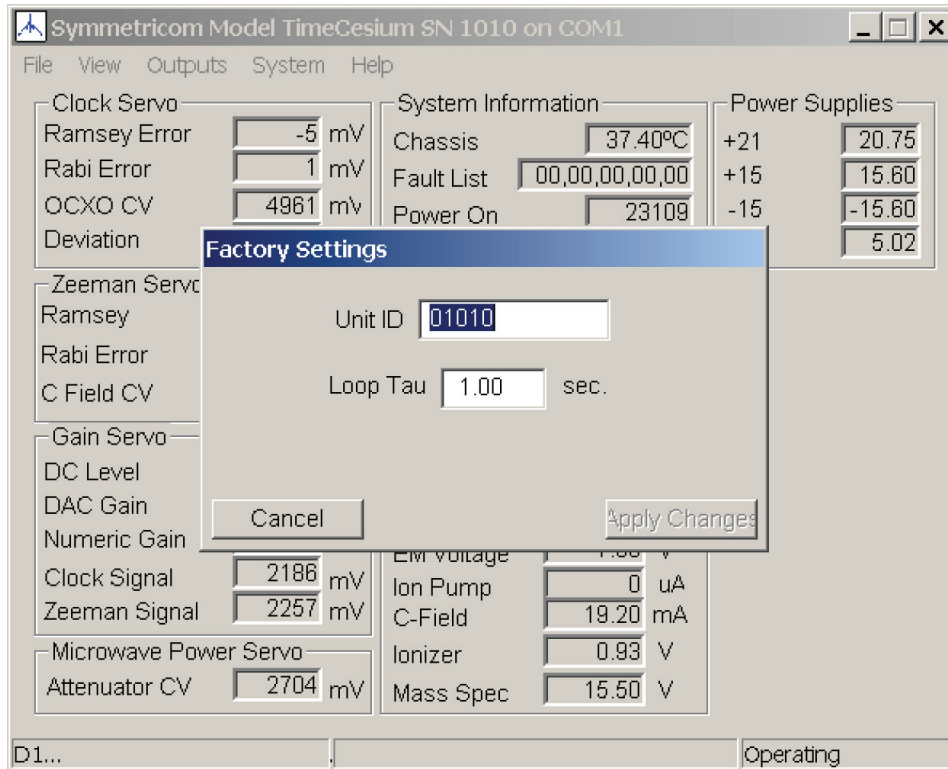


Note: The UnitID is a 5-digit number set in the factory to reflect the last five digits of the serial number of the instrument, as printed on the back panel label.

3. To change the Loop Tau, enter a new value, between 0.1 and 99.9 seconds, in the edit field and click the associated **Send** button.



Note: The Loop Tau is the fundamental time constant of the OCXO servo. The factory default value of $t = 1.0$ second is appropriate for most applications and operation at other values of t may compromise instrument performance. Only knowledgeable personnel should change this value.



TC0017

Figure 3-6. Factory Settings

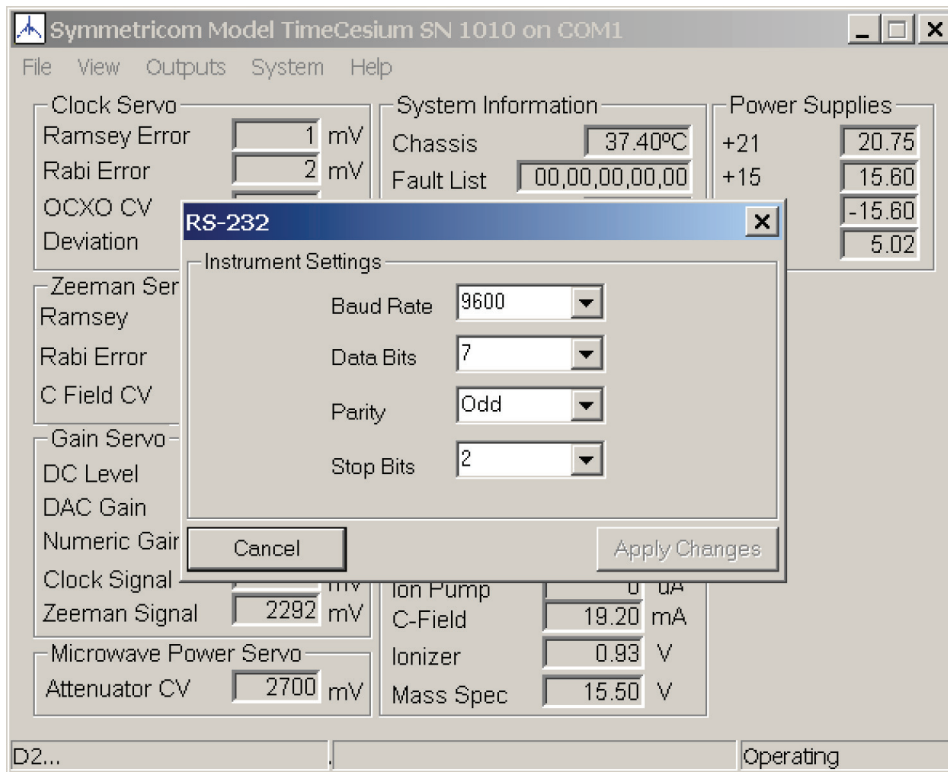
Changing RS-232 Settings

Use the following procedure to change the TimeCesium's communication settings. To change the Monitor3 communications settings, see [Configuring the Serial Port](#), on page 38.



Note: The Monitor3 application automatically changes its settings to match the TimeCesium RS-232 settings and maintains communications after the change.

1. Click **System** and select **RS-232** to open the RS-232 window (see [Figure 3-7](#)).
2. Select the baud rate.
3. Select the number of data bits.
4. Select parity.
5. Select the number of stop bits.
6. Click **Apply Changes** to close the RS-232 window and save the changes, or click **Cancel** to close the window without saving the changes.



TC0018

Figure 3-7. RS-232 Settings

Chapter 4 Specifications

This chapter provides the specifications for the TimeCesium.

In This Chapter

- [TimeCesium Specifications](#)

TimeCesium Specifications



Note: All specifications are performed at 25° C unless otherwise specified.

Table 4-1. System Specifications

Category	Specification
Performance	
Accuracy, Calibrated to	$\leq \pm 1 \times 10^{-12}$
Accuracy (over environment)	$\leq \pm 1 \times 10^{-12}$
Retrace (reproducibility)	$\leq \pm 1.2 \times 10^{-12}$
Stability sg(t)	
Averaging Time	
1s	1.2×10^{-11}
10 s	8.5×10^{-12}
100 s	2.7×10^{-12}
1,000 s	8.5×10^{-13}
10,000 s	2.7×10^{-13}
Warm-up Time (typical)	30 minutes
Outputs	
Telecom Signals	Two channels: one input/output channel, either framed or clock, configurable by the Monitor3 software interface through the RS-232 port
Framed (AMI) – 1.544 Mbps	ANSI T1.102 DS1 selectable framing: D4 or ESF, with Stratum 1 Sync Status Message (SSM)
Format	Framed all ones, B8ZS
Framed (AMI) – 2.048 Mbps	ITU-I Rec. G.703/9 (E1) with G.704 framing and with Stratum 1 Sync Status Message (SSM)
Format	Framed all ones, HDB3
Clock – 1.544 MHz	Same as G.703/13
Clock – 2.048 MHz	G.703.13

Table 4-1. System Specifications (Continued)

Category	Specification
Composite Clock	64 KHz / 8 KHz BPV, AMI, Balanced 100 Ω
Connectors	DB9 for balanced signals T1 at 100 Ω E1 at 120 Ω BNC for unbalanced signals, 75 Ω DB9 to wire-wrap adapter for balanced signals (P/N 22013085-000-0)
Sinusoidal Signals	x1 at 10 MHz, 1V rms/50 Ω , BNC x1 at 5 MHz, 1V rms/50 Ω , BNC
General	
Power Requirements	Dual redundant dc inputs
Operating Voltage	-48 V DC nominal (-36 to -62 V DC)
Power (operating)	40 W
Power (warm-up)	55 W
Interface Connections	
External DC inputs, A and B	#6 screw terminal block
RS-232	9 pin male connector (mate: DA9S, ITT Cannon or equal)
Chassis ground, A and B	#6 screw terminal block
Alarm - Critical and Minor	#6 screw terminal block
Fuses	
External DC Input	2 A, 250 V, slow acting (5 x 20 mm)
Dimensions	
Width	18.2 in (64.0 cm)
Depth	10.1 in (25.7 cm)
Height	10.5 in (26.67 cm)
Weight	36.5 lb. (16.6 kg)
Mounting	Mounting ears provided for 19 in or 23 in racks
Environment	
Temperature, Operating	0 to 50 $^{\circ}$ C

Table 4-1. System Specifications (Continued)

Category	Specification
Temperature, Non-operating	-40 to +75 °C
Humidity	95%, non-condensing
Magnetic field	0 to 2 gauss @ DC, 50, 60 or 400 Hz

Table 4-2. Factory Default Settings

Parameter	Setting
RS 232 Serial Port	
Comm Port	1
Baud Rate	9600
Data Bits	7
Parity	Odd
Stop Bits	2
Unit Monitoring	
Polling Rate	10 seconds
Data File Name Template	Unit%ID_Data.txt
Unit ID	(Unit Serial #)
Time Constant	1.00
Language	English
Daylight Savings Time	On
Leap Second Insertion	Disarm
Restart Fault Level	Warning
Telecom Outputs	
E1 Framing Pattern Generator	
Spec	CRC4 and TS16
SSM Channel	4
Fault Strategy	Mute
T1 Framing Pattern Generator	
Spec	ESF

Table 4-2. Factory Default Settings (Continued)

Parameter	Setting
Fault Strategy	Mute
Output A, Channel 1	
Settings Enabled (checked)	Framed, T1, Bal.
LIU Setting	3 (T1 0 to 133 feet, ANSI T1.403)
Output A, Channel 2	
Settings Enabled (checked)	Framed, T1, Bal.
LIU Setting	3 (T1 0 to 133 feet, ANSI T1.403)

Chapter 5 Maintenance and Troubleshooting

This chapter provides information about preventive maintenance, troubleshooting alarm fault codes, and re-shipment of the product.

In This Chapter

- [Preventive Maintenance](#)
- [Troubleshooting](#)
- [Disposal](#)
- [Shipping](#)
- [Storage](#)

Preventive Maintenance



Caution: To avoid electrostatic discharge (ESD) damage to components in the TimeCesium, observe the appropriate electrostatic discharge (ESD) precautions and procedures.



Caution: To avoid damage, under no circumstances should the interior of the TimeCesium unit be allowed to come in contact with water.



Caution: To avoid electromagnetic discharge and damage to the circuitry, never attempt to clean the TimeCesium with a vacuum.



Note: Please retain the original packaging of the unit for re-shipping the product as needed. If the original packaging has been discarded, contact the Symmetricom Global Services (SGS) for assistance (see [Shipping Products Back to the Factory](#), on page 57).

The TimeCesium requires minimum preventive maintenance. Care should be taken to insure the unit is not exposed to hazards such as direct sunlight, open windows, or extreme heat. Should the unit require cleaning, wipe the exterior chassis with a soft cloth dampened with mild soapy water.

[Table 5-1](#) lists suggested preventive maintenance measures to be performed at the user's discretion, as time permits. These procedures are *not required* to be performed. Do not disassemble components solely for the purpose of inspection. During a component disconnection procedure, such as a cable removal or replacement, inspect components according to the inspection procedures listed in the [Table 5-1](#).

Table 5-1. Preventive Maintenance

Item	Inspection	Corrective Action	Interval
Unit Case	Inspect for dirt or foreign material	Clean the exterior of shelf with a soft dry cloth	Periodically
Cables	Inspect for pinched, worn or damaged cable	Replace pinched, worn or damaged cable at the first opportunity	Periodically
Connectors	Inspect for loose or damaged connectors and jacks, bent or missing connector pins	Tighten loose connectors. If damaged, replace the connector and/or cable at the first opportunity	Periodically

Table 5-1. Preventive Maintenance (Continued)

Item	Inspection	Corrective Action	Interval
Input Power Fuses	Inspect for loose or damaged fuse holders	If loose or damaged contact Symmetricom Global Services	Periodically
Unit Case Screws	Inspect for loose or missing screws or hardware on shelf	If loose, tighten securely, replace missing hardware	Periodically

Troubleshooting

If the alarm activates and the ALARM LED remains lit indicating a failure of the TimeCesium, contact Symmetricom Global Services for instructions.

Table 5-2 lists the two-digit numeric fault codes, a description of each, and any comments associated with the specific code. If any of the following fault codes are observed, refer to the comment in the Comments column. If unable to resolve the cause of the fault, contact Symmetricom Global Services for further instructions.

Table 5-2. Fault Messages

Fault Code	Description	Comment
01	Clock Peak to Background	<1320 or >3080 mV
02	Clock Pedestal Symmetry	>50 mV
03	Zeeman Pedestal Symmetry	>160 mV
04	Mass Spectrometer	>5% of nominal (± 0.7 V)
05	C-field Current	< 16.0 or >22.0 V
06	Electron Multiplier Supply	< 7.0 or >13 V
07	ADC	
08	VCXO Control Voltage	<10% or >90% (± 4000 mV)
09	Case Temperature	>80°C
10	not used	
11	not used	
12	+5 V Supply	<4.75 or >5.25 V
13	+15 V Supply	<13.5 or >16.5 V
14	-15 V Supply	>-13.5 or <-16.5 V
15	not used	

Table 5-2. Fault Messages (Continued)

Fault Code	Description	Comment
16	Unit Restarted	
17	Module configuration not set	
18	Digital Gain at lower limit	= 1
26	Fuse A open	
27	Fuse B open	
80	Software Failure	
81	Event Log Invalid	
F1	Cesium Oven Warm-up	>10.0 V (after warm-up)
F2	OCXO Oven Warm-up	>2.5 V after initial warm-up
F3	Ionizer Filament	> \pm 0.16 V of nominal
F4	Ion Pump current	>175 μ A
F5	+24 V Supply	<17 or >24 V

Disposal

The cesium beam contained in the TimeCesium Primary Reference Source is classified as hazardous and should be disposed of in accordance with local, state, and federal guidelines. Symmetricom provides a disposal service. For current information and prices, contact Symmetricom Global Services.

Customer Assistance Center contact information

Worldwide (Main Number): 1-408-428-7907

USA, Canada, Latin America including Caribbean, Pacific Rim including Asia, Australia and New Zealand: 1-408-428-7907

USA toll-free: 1-888-367-7966 (1-888-FOR-SYMM)

Europe, Middle East & Africa: 49 700 32886435

on the web at:

http://www.symmetricom.com/Contact/Customer_Assistance_Centers/

via e-mail:

support@symmetricom.com (Americas, Asia, Pacific Rim)

emeasupport@symmetricom.com (Europe, Middle East, Africa)

Shipping

Turn off the TimeCesium by removing the external DC power. Remove all external connections and remove the unit from the rack or cabinet. Place the unit in the HAZMAT shipping container.

Hazardous Material (HAZMAT) Shipping Considerations

Symmetricon Cesium standards contain a small amount of cesium metal. The cesium isotope used (cesium 133) is non-radioactive. However, because of its reactive chemical properties, cesium is classified as a hazardous material by the U.S. Department of Transportation (USDOT) and the International Air Transport Association (IATA). During normal handling the TimeCesium presents no danger since the cesium is encased within a vacuum-sealed metal enclosure. Hazardous materials, depending upon their specific nature, are subject to certain shipping regulations of the USDOT and the IATA. These regulations govern the shipping container as well as its labeling.



Note: If you have questions about shipping the TimeCesium, contact Symmetricon Global Services (see [Customer Assistance Center contact information](#), on page 56). You can also find information on current hazardous material shipping requirements at the Department of Transportation (DOT) web site.

The initial shipment of every Symmetricon cesium standard complies with HAZMAT regulations by using a shipping container that has been tested and certified. This container has been designed to prevent damage to the unit during shipment and to meet current hazardous-material shipping regulations. The container can be used repeatedly and should be retained for any future shipping requirements of the instrument.

Shipping Products Back to the Factory

Return all units in the original packaging. After the standard packing procedure to protect the equipment, Cesium products being returned for repair require special preparation for shipment as described in [Hazardous Material \(HAZMAT\) Shipping Considerations](#), on page 57. Connectors should be protected with connector covers or the equipment should be wrapped in plastic before packaging. Take special care to protect the front and rear panels.

To return equipment to Symmetricon for repair, contact Symmetricon Global Services to obtain a return material authorization number (RMA) before returning the product for service. Retain this RMA number for future reference (see [Customer Assistance Center contact information](#), on page 56).

1. Provide a description of the problem, product item number, serial number, and warranty expiration date.

2. Provide the return shipping information (customer field contact, address, telephone number, and so forth.)
3. Ship the product to Symmetricom, transportation prepaid and insured, with the Return Material Authorization (RMA) number and item numbers or part numbers clearly marked on the outside of the container. For the shipping address, contact Symmetricom global Services (see [Customer Assistance Center contact information](#), on page 56).

Repaired equipment is returned to you with shipping costs prepaid by Symmetricom.

Shipping Carriers

The shipper is responsible for the overall condition of the Hazardous Material shipping container; such as latches locked (if applicable), no visible damage to container and the proper placement of all labels on the container. [Figure 5-1](#) illustrates the proper placement of labels. Make sure an address label, proper HAZMAT labels, and packing slip (if necessary) are affixed to the shipping container and are clearly visible.

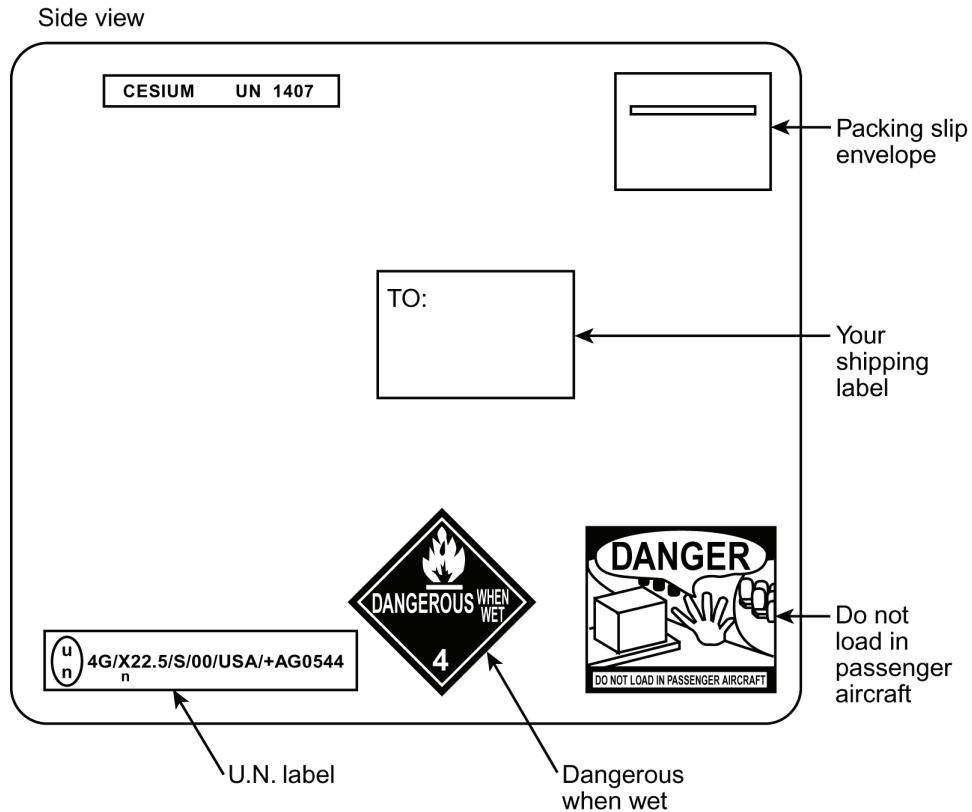


Figure 5-1. Typical Label Placement

Several United States and international shipping companies can accommodate properly packaged hazardous materials. United Parcel Service and Federal Express are examples for the United States. Intercontinental (617-569-4400) provides international shipping services. Contact one of these shipping companies for assistance.

The following information is typically requested by the carrier:

Proper Shipping Name:	Caesium (Cesium) Dangerous When Wet
Class Or Division:	4.3
UN or ID No.:	UN1407
Type Of Packing:	One Fiberboard Box x5 Grams
Packing Instructions:	412

Re-Ordering Information

Contact your local sales office to re-order any subassembly or accessory or to obtain a current list of subassemblies, accessories, and part numbers. When you know which items you are ordering, supply the subassembly or accessory name and its part number along with the purchase order number to our sales office.

Storage

During storage of the TimeCesium, there are two factors to consider: cesium beam tube vacuum and shelf life.

Cesium Beam Tube Vacuum

If the TimeCesium is stored for extended periods of time (longer than 6 months), periodic storage-mode operation cycles of 30 minutes should be performed in order to maintain the tube vacuum. The TimeCesium must be turned-on and operated for a minimum of 30 minutes on or before the six month storage interval. Refer to [Mounting the TimeCesium](#), on page 27 for the turn-on procedure.

Cesium Beam Tube Shelf Life

Extended high temperature storage (>50 °C) reduces the expected operating life of the cesium beam tube. The reduction in tube life expectancy for each year at 70 °C is approximately 4 months.

Index

A

adaptor, DB-9 to wire-wrap 31
alarm
 activation 55
 code list 55
 connecting 30
 critical 40
 critical mode 17
 form-C relay contacts 17
 major 39
 minor 39
 non-critical 40
 resetting 40
 strategy 40
 viewing 40
 warning mode 17
auto-detect, communications port 38

C

cable, null modem 33
carriers, return shipping 58
cautions defined xii
CC output overview 21
cesium 133 57
Cesium Beam Tube Vacuum maintenance 59
cesium isotope, shipping 57
checklist, installation 25
cleaning caution 54
command
 reset alarm 17
 reset unit alarms 32
communications port
 auto-detect 38
 changing settings 44
 configuring 38
 connecting 33
 default settings 37
computer, connecting 33
configuring the serial port 38
connecting a computer 33
connecting alarm contacts 30
connecting outputs 31
connecting power and ground 30

connectors
 locations 31
 serial 20
 signal 20
critical alarm 40
critical mode 17

D

date and time, setting 41
default factory settings 22
default port settings 37
default settings
 communications port 38

E

E1 output
 configuring 42
 overview 21
environmental considerations, installation 25
event log, viewing 41

F

factory settings 22
 changing 43
fault messages 55
 Unit Not Responding 38
Federal Express, shipping 59
form-C relay contacts 17
fuses 17

G

Global Services telephone/address 58
Global Services, contacting 24
ground connections 30

H

hazardous materials shipping 57
HAZMAT shipping 57

I

installation
 environmental 25
 Monitor3 software 33
 rack mounting 26–29
 tools and materials 26

installation checklist [25](#)
 International Air Transport Association [57](#)

L

LED indicators [32](#)
 loop tau value, setting [44](#)

M

major alarm [39](#)
 messages, fault [55](#)
 minor alarm [39](#)
 Monitor3
 changing RS-232 settings [44](#)
 configuring the serial port [38](#)
 default comm settings [38](#)
 event log [41](#)
 installing [33](#)
 overview [16](#)
 reset alarms [40](#)
 starting [36](#)
 start-up screen [37](#)
 view alarms [40](#)

N

non-critical alarm [40](#)
 notes defined [xii](#)
 null modem cable [33](#)

O

output
 CC, overview [21](#)
 configuring [42](#)
 connectors [20](#)
 E1, overview [21](#)
 making connections [31](#)
 sine, overview [21](#)
 specifications [48](#)
 T1, overview [21](#)
 wire-wrap adaptor [31](#)
 outputs
 disabled on alarm [39](#)

P

power
 connecting [30](#)
 overview [17](#)
 power and ground connections [30](#)
 preventive maintenance [54](#)
 purpose of this guide [x](#)

R

rack mounting [26–29](#)
 recommendations defined [xii](#)
 relay contacts, form-C [17](#)
 re-ordering [59](#)
 reset alarm command [17](#)
 reset unit alarms command [32](#)
 resetting alarms [40](#)
 return material authorization [57](#)
 return shipping [57](#)
 RMA. see return material authorization
 RS-232 connections [33](#)

S

serial port, configuring [38](#)
 setting time and date [41](#)
 settings, communications port [37](#)
 shelf life, storage [59](#)
 shipping address, repair [58](#)
 shipping carriers, [58](#)
 shipping, Federal Express [59](#)
 shipping, HAZMAT [57](#)
 shipping, procedure [57](#)
 shipping, United Parcel Service [59](#)
 sine output, overview [21](#)
 software, Monitor3 [16](#)
 specifications [48–51](#)
 storage, TimeCesium [59](#)
 storage-mode operation, periodic [59](#)
 structure of this guide [x](#)
 Symmetricom
 Global Services address [58](#)
 Symmetricom, contacting [24](#)

T

T1 output
 configuring [42](#)
 overview [21](#)
 tau value, setting [44](#)
 telephone contact numbers [58](#)
 telephone number, Symmetricom Global Services [24](#)
 time and date, setting [41](#)
 TimeCesium
 storage [59](#)
 troubleshooting [55](#)
 toll-free telephone number [24](#)

tools and materials [26](#)
troubleshooting
 alarm [55](#)
 communications port [38](#)

U

U.S. Department of Transportation, shipping [57](#)
unit ID, setting [43](#)
Unit Not Responding error message [38](#)
unit placement and exposure [54](#)
United Parcel Service, shipping [59](#)

unpacking instructions [24](#)

V

viewing alarms [40](#)

W

warning mode [17](#)
warnings defined [xii](#)
web address [xiii](#)
wire-wrap adaptor [31](#)

W—W