PRS-45
Cesium Primary Reference Source

User Guide

P/N 12713206-002-2

Revision A – April 2001

For 24-hour customer service, contact Datum, Inc.:

Address: P.O. Box 14766, Austin, Texas 78761

Shipping Address: 15811 Vision Drive, Pflugerville, Texas 78660

Phone: 512.721.4000 • Fax: 512.251.9685

Email: austinsupport@datum.com

▶ Datum

Note

The contents of any amendments may affect operation and/or maintenance of the equipment.

Introduction **1**

Product Overview **2**

Installing the PRS-45 **3**

Configuring the PRS-45 **4**

Operating the PRS-45 **5**

Maintenance and Troubleshooting **6**

Specifications **A**

Table of Contents

Contents

Contents

List of Figures

Contents

Contents

List of Tables

Contents

Contents

1

1 Introduction

This *User Guide* contains information about installing, operating, and maintaining the PRS-45 Primary Reference Source (PRS) manufactured by Datum. The PRS-45 Cesium Beam Primary Reference Source is an accurate and stable frequency reference designed for telecommunications Stratum 1 applications.

1.1 Who Should Read This User Guide

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

◆ **Systems Engineers** – Section 2 and Section 3 provide an overview of the product, options, and theory of operation. Cross references in these sections direct readers to detailed system configuration information in Section 4. Section 6 provides information about product ordering, shipping, and storage.
◆ **Installation Engineers** – Section 3 provides installation information and procedures. Section 4 and Section 5 provide specific configuration and operation information to ensure proper operation or, modify the systems configuration.
◆ **Maintenance Engineers** – Section 6 provides preventive and corrective maintenance guidelines. Section 6 also provides procedures for diagnosing and troubleshooting fault indications and alarms.

Certain sections, particularly Section 1 and Section 2, are intended for non-technical audiences. Others, such as Section 3, Section 4, Section 5, and Section 6 contain instructions which are intended to be performed by qualified personnel only.

1

1.2 About This User Guide

This *User Guide* is intended to be used as a reference for the PRS-45 Primary Reference Source. This *User Guide* has an introduction to the PRS-45 product, system and configuration specifications, and procedures for installation, power-up, operation, maintenance, and troubleshooting.

This *User Guide* contains the following sections and appendixes:

◆ Section 1 – Introduction: This section includes an overview of this *User Guide*, the intended audience, and the stylistic and typographical conventions used.
◆ Section 2 – Product Overview: This section includes a product and functional description, as well as a theory of operation of the PRS-45.
◆ Section 3 – Installing the PRS-45: This section includes environmental considerations of the PRS-45 unit, a guide to mounting the PRS-45 unit, and electrical (cable) connection procedures for the PRS-45 unit.
◆ Section 4 – Configuring the PRS-45: This section includes information on connecting the PRS-45 unit to a laptop, PC, or terminal for installing software and setting the systems configuration options.
◆ Section 5 – Operating the PRS-45: This section provides Power-on and Power-off procedures, as well as normal operating indications.
◆ Section 6 – Maintenance and Troubleshooting: This section provides information about preventive and corrective maintenance, troubleshooting, re-ordering procedures, and re-shipment of the product.
◆ Appendix A – Specifications: This section provides system specifications information.
◆ Glossary – This section contains a list of acronyms and abbreviations, and a definition of terms found in this *User Guide*.

1.3 Typographical and Other Conventions

This *User 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. In addition, the glossary defines the acronyms and abbreviations.
- ◆ **Revision Control** – The title page lists the printing date and part number of this *User Guide*. Table 1-1 describes the typographical conventions that this *User Guide* uses to distinguish between the different types of information according to how they are used.

Table 1-1.   Typographical Conventions

When Text Appears This Way …	It Means …
PRS-45 User Guide	The title of a document.
CRITICAL PORT-A J1	An operating mode, alarm state, status, or chassis label.
Press the **Enter** key. Press the **Print Scrn** key.	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.
A *re-timing* application …	A term or a word being emphasized.
Datum ***does not*** recommend …	A word or term given special emphasis so that you do not miss the idea being presented.

1

1.4   Warnings, Cautions, Recommendations, and Notes

Warnings, Cautions, Recommendations, and Notes attract attention to essential or critical information in this *User Guide*. The types of information included in each are explained as follows:

Warning …

All warnings have this symbol. *Do not* disregard warnings. They are installation, operation, or maintenance procedures, practices, or statements that if not strictly observed, may result in personal injury or loss of life.

ELECTRICAL SHOCK HAZARD …

All electrical shock hazard warnings have this symbol. To avoid serious personal injury or death, *do not* disregard electrical shock hazard warnings. They are installation, operation, or maintenance procedures, practices, or statements that if not strictly observed, may result in personal injury or loss of life.

CAUTION …

All cautions have this symbol. *Do not* disregard cautions. They are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in damage to or destruction of equipment or may cause a long-term health hazard.

CAUTION …

All Electrostatic Discharge (ESD) cautions have this symbol. They are installation, operation, or maintenance procedures, practices, conditions, or statements that if not strictly observed, may result in electrostatic discharge damage to, or destruction of, static sensitive components of the equipment.

RECOMMENDATION …

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

NOTE …

All notes have 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.

1.5   Where to Find Answers to Product and Document Questions

If you believe that this product is not performing as expected, or if you have comments about this *User Guide*, please contact your Datum representative or sales office. You may also complete and send in the *Reader Comment Form* located in the back of this *User Guide*.

We appreciate your suggestions on ways to improve this *User Guide*. Please mark or write your suggestions on a copy of the page and include it with the comment form. Thank you for providing the information.

NOTE …

Datum offers a number of applicable training courses designed to enhance product usability. Contact your Datum representative or sales office for a complete list of courses and outlines.

2

2 Product Overview

The Datum PRS-45 Cesium Beam Primary Reference Source (PRS) is a low cost, accurate and stable frequency reference designed for telecommunications Stratum 1 applications.

2.1 Functional Description

The PRS-45 Cesium Beam Primary Reference Source is a PRS with fully automatic operation by microprocessor control. The Unit provides a Stratum 1 quality signal without the need of an external reference. The PRS-45 comes in two different models:

◆ The PRS-45 developed to meet ANSI requirements and applications

◆ The PRS-45e developed to meet ETSI requirements and applications

The PRS-45 front and rear panel views are shown in Figure 2-1 and Figure 2-2. The PRS-45e front and rear panel views are shown in Figure 2-3 and Figure 2-4. Refer to Table A-1 in Appendix A for a list of the system's performance specifications.

The major function of the PRS-45 is to produce two accurate and stable DS1 (1544 Kbps) or E1 (2048 Kbps) signals for telecom network synchronization. To accomplish this, a cesium beam tube resonator is used to stabilize the output of a quartz crystal oscillator which provides the frequency source for the output generators.

2
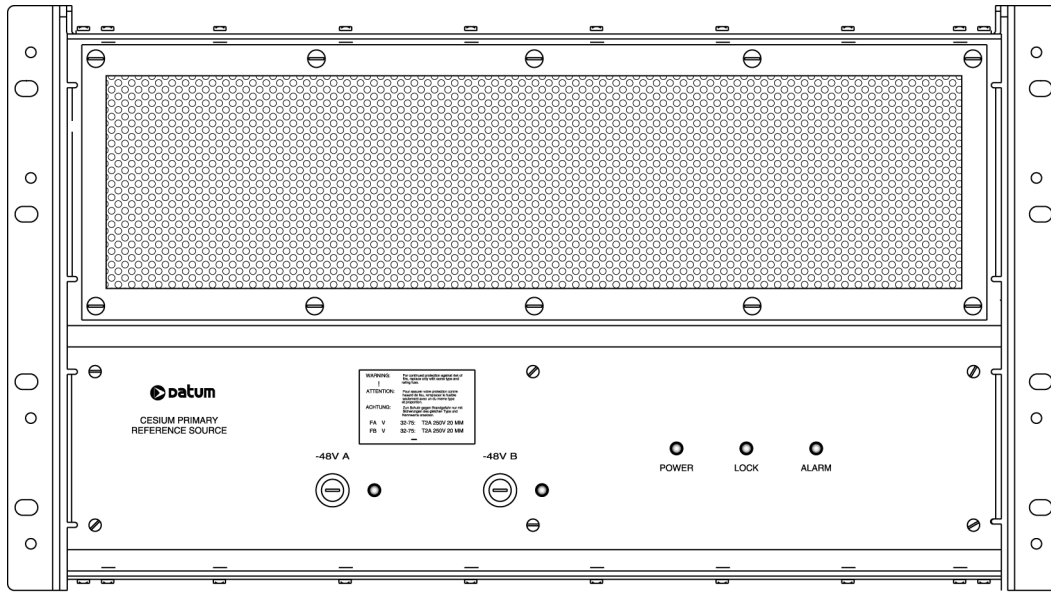
p4500019

Figure 2-1.   PRS-45 Front View
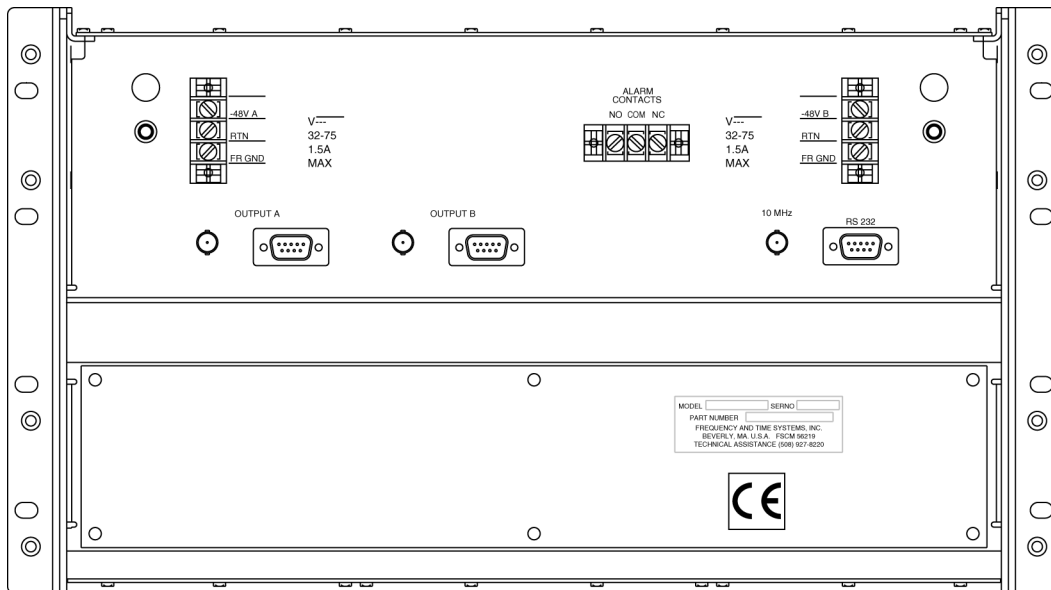
p4500018

Figure 2-2.   PRS-45 Rear View
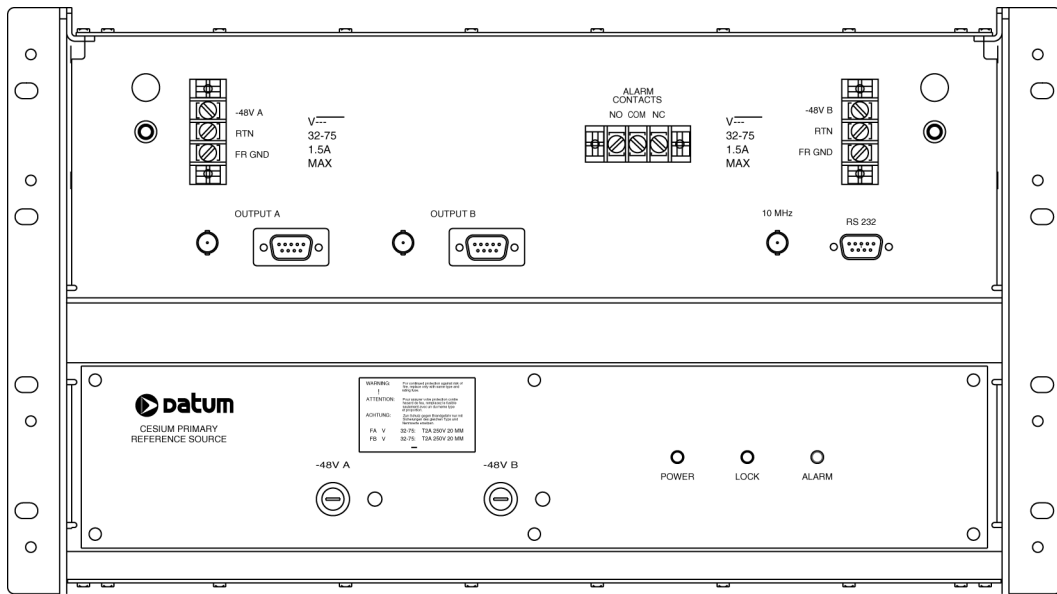
p4500020

Figure 2-3.   PRS-45e Front View
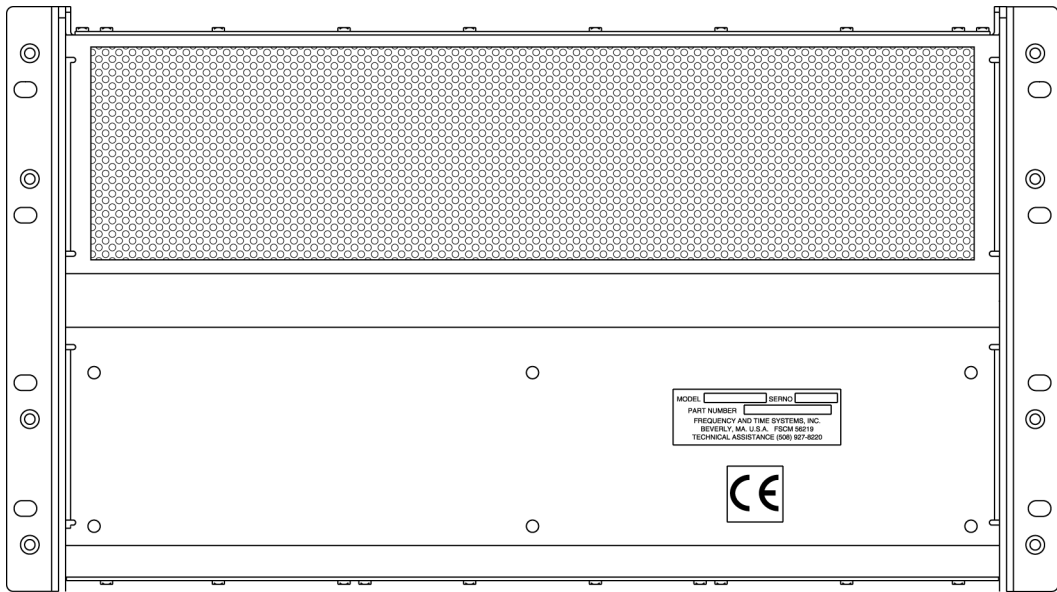
p4500021

Figure 2-4.   PRS-45e Rear View

2

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

Power – The PRS-45 is powered from a –48 Vdc source by one or two redundant connections. The input power contacts are labeled –48V A and B, RTN, and 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 PRS-45 uses an internal DC-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 may 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 in the fuse connectors on the front panel. These fuses may be used as the disconnect device in an emergency. Normally, power is removed upstream from the hard-wired connections by either a switch panel or power panel.

Connectors – All permanent electrical connections are made at the rear panel of the PRS-45 and the front panel of the PRS-45e. Refer to Figure 2-2 and Figure 2-3 for the location and contact designation for the various connectors. The RS-232 serial port may be used to control or monitor the PRS-45 through the use of a PC or laptop. The Unit's outputs are labeled Output A and Output B. These outputs have both a DB9 connector for balanced signals (T1 at 100 ohms and E1 at 120 ohms), and a BNC connector for unbalanced signals (75 ohms). The BNC connector labeled 10 MHz is a reference sinusoidal signal output (X1 at 10MHz, 0.5Vrms at 50 ohms). The PRS-45(e) is supplied with a DB9 to wire wrap connector adapter (P/N 22013085-000-0) for wire wrap applications. The adapter pins are marked to identify tip, ring and sleeve.

Alarms – The PRS-45 provides for an ALARM (operation has been or soon will be compromised). 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 2-2 and Figure 2-3. The factory default for ALARM operation is *warning mode* (non-latching operation), where, if the alarm is activated, within 30 minutes the ALARM indicator turns off and the LOCK indicator turns on, if the alarm condition has cleared. The ALARM relay is then reset and the outputs are ready to use. The user may change the alarm status from *major* mode (attention required at operator's convenience) to *critical mode* (Stratum 1 synchronization has been or soon may be compromised) where the ALARM is latching. In this mode the alarm must be reset by the user through the RS232 port, by issuing the RESET ALARM command, see Section 5.2.

Software – The PRS-45 has a number of software controllable features. **Monitor 2** is a proprietary software utility program that is designed to help configure and monitor the PRS-45 using a proprietary interface. It requires a PC or laptop running Windows NT 4, Windows 95, Windows 98, Windows ME, or Windows 2000. The software comes standard and is quickly installed and easy to use. Refer to Section 3.6, Installing the Monitor 2 Software for more information.

Event Logging – A portion of the non-volatile memory in the system is reserved for storage of event records. Event records consist of a time stamp and an event description. Any change in the system status is recorded as a new event in the log. The Event log stores two distinct time stamps and can be cleared by an external command. The first is a 6 byte calendar date and the second is a 32 bit value representing the total system power-on hours. A maximum of 128 events can be stored in the PRS-45.

2.2 Factory Configurations

The PRS-45 can be ordered with two different output configurations. Refer to Table 2-1. for output configuration and part number reference information.

Table 2-1.   Factory Output Configuration Options

Output Configuration	Part Number
PRS-45 (ANSI Version)	P/N 13415-101
PRS-45e (ETSI Version)	P/N 13415-102

2.2.1 DS1-1544 Kbps Outputs

A PRS-45 ordered in the ANSI version provides DS1 (1544 Kbits) telecom signals in either SF (D4) or ESF format. The output format is user selectable through **Monitor 2** 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 which identifies the source as a PRS (Stratum 1) source. See Table A-1 in Appendix A for specifications. When powering the unit up the **Monitor 2** software utility program will attempt to discover 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 communications settings change. At the end of the scan, a message appears, indicating whether or not the cesium instrument was located. The communication settings are then displayed on the Real-Time Status Display. For a list of default settings, see Table 4-1.

2.2.2 E1- 2048 Kbps Outputs

A PRS-45 ordered in the ETSI version provides E1 (2048 Kbits) 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) signal. These outputs are available in either 120 Ohm balanced or 75-Ohm unbalanced form. See Table A-1 in Appendix A for output specifications. As with the factory configuration of DS1 outputs, the E1 configuration will also attempt to discover the correct settings for you upon power-up, if different from the default using the **Monitor 2** software utility program. At the end of the scan, a message appears indicating whether or not the cesium instrument was located. The communication settings are then displayed on the Real-Time Status Display. For a list of default settings, see Table 4-2.

2.3 Theory of Operation

This section provides a Theory of Operation for the PRS-45 which complements the functional description and offers a better understanding of the instrument's operation.

2.3.1 Introduction

The PRS-45 Cesium Frequency Standard (CFS) generates signals that are:

◆ Accurate

◆ Spectrally pure

◆ Stable

Accuracy is obtained by comparing the output frequency of a quartz crystal oscillator to the atomic resonance of a beam of cesium atoms. Spectral purity (absence of all frequencies in the output signal except the fundamental frequency) is obtained by using a high performance quartz crystal oscillator to create the desired output signal. Stability (maintaining the specified frequency over a specified time interval) is derived from the invariant resonant frequency of cesium atoms.

The major components of the PRS-45 are located in the Cesium Frequency Standard Module, see Figure 2-5. The CFS Module contains all the electronics to generate the required output signals, including the Telecom Synthesizer (DS1 or E1) and the TTL (10 MHz) output.
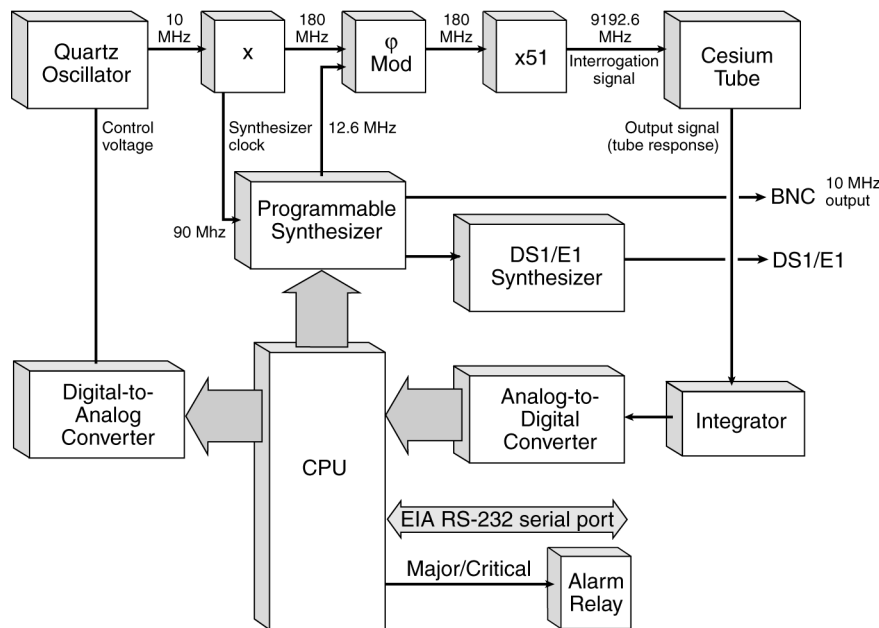
p4500014

Figure 2-5.   PRS-45 Block Diagram (A1)

2.3.2 Cesium Frequency Standard (CFS) Module

The cesium frequency module is an atomic frequency standard based on a hyper-fine transition in the ground state of the cesium 133 atom. The frequency of this transition defines the international time unit: the second. The CFS contains the following elements:

◆ A quartz oscillator whose frequency is locked to the hyper-fine transition frequency (clock transition) of the cesium atom.

◆ A cesium atomic beam resonator (cesium tube).

◆ Frequency Multiplexer Synthesis circuits, driven by the quartz oscillator frequency, delivering an interrogation signal. This signal is fed to the atomic resonator. The response of the resonator is a signal whose amplitude is maximum when the interrogation signal frequency is equal to the clock transition frequency.

◆ Servo loop circuits, fed by the tube output signal, which control the quartz oscillator frequency so that the interrogation frequency is locked to the clock transition.

◆ Power supplies.

A cesium tube can be thought of as a high Q resonator: when the frequency of the input signal scans the atomic transition, the output signal is a micro-current of variable amplitude; the tube acts as a very narrow band-pass filter coupled to an amplitude detector.

When the frequency of the microwave interrogation signal scans the clock frequency, the output signal of the cesium tube has the schematic behavior shown in Figure 2-6. A large resonance, called pedestal or Rabi resonance, is topped by interference fringes or Ramsey fringes (Ramsey pattern). The central fringe, or central line, provides the reference to which the interrogation signal frequency and, consequently, the quartz oscillator frequency are locked.

Moreover, the microwave spectrum displays six other resonances of similar structure, symmetrically disposed and regularly spaced about the central resonance. One of these is shown in Figure 2-6. The central frequency of this resonance pattern (Zeeman line) is linearly dependent on the magnetic field inside the cesium tube: by measuring this frequency it is possible to know and to stabilize the magnetic field inside the tube.

2

$f_h = 9,192,631,771.88 \, H_z$
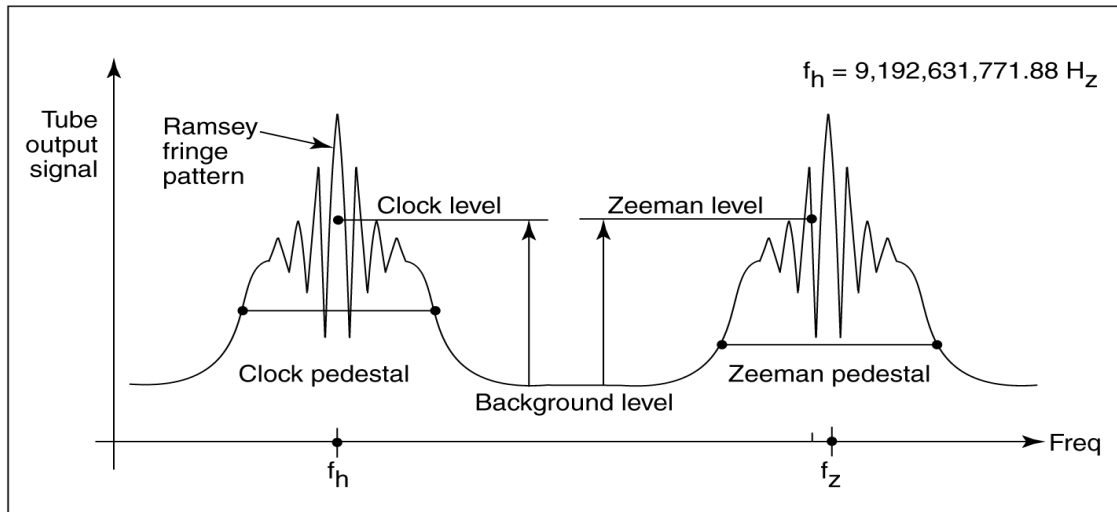
p4500013

Figure 2-6.   Cesium Tube Output Signal vs. Microwave Input Signal Frequency

A programmable frequency synthesizer, controlled by a microprocessor and with a short response time, periodically probes several characteristic points of the tube response. This probing is based on two principles:

First Principle: When two frequencies symmetrically disposed about f_h (central line) are alternately programmed, the tube output current switches between two levels; their difference is related to the offset of the quartz oscillator frequency from the resonant frequency. Digitized, this difference is processed by the central unit and then fed back to the quartz oscillator.

Second Principle: Since the servo loop time constant is much longer than the measuring cycle time, it is possible to periodically "steal" one measuring cycle which is then used to program other frequencies in order to check the different useful characteristic points of the tube response.

By using this flexible frequency synthesizing technique and the many possibilities offered by a microprocessor-driven system, the time frequency standard performs permanently and in real-time operation, the following functions:

◆ Measurement and control of the central line centering through symmetrical testing of the pedestal.

◆ Measurement and control of the central line peak value relative to background and relative to the gain required in the cesium servo.

◆ Measurement and control of the magnetically dependent transitions to provide continuous feedback to the frequency-determining C-field.

◆ Measurement and control of the microwave power applied to the tube, providing for optimum power over environment and time.

2.3.3 Telecom Synthesizer

The telecom synthesizer is integrated within the cesium module electronics. The synthesizer produces two outputs for either DS1 (1544 kbps) or E1 (2048 kbps) applications and consists of the following functional blocks:

◆ Digital phase-lock synthesizer

◆ Frame/format generator

◆ Line interface devices

Refer to the block diagram in Figure 2-7 for an illustration of the three functional blocks of the synthesizer.
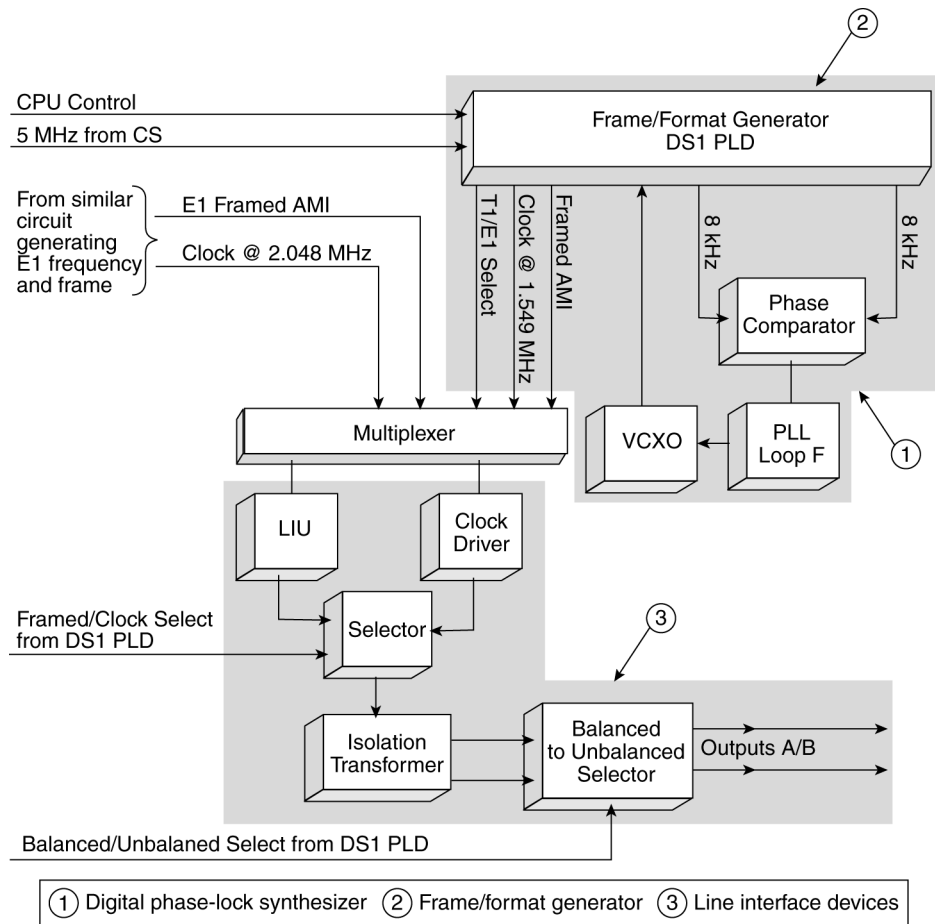
p4500024

Figure 2-7.   Synthesizer Block Diagram

2

The digital synthesizer section phase-locks a Voltage Controled Crystal Oscillator (VCXO) to a 5 MHz reference signal that is derived from the Cesium Frequency Module. Both signals are digitally divided, phase compared, and integrated to provide a control voltage to the VCXO.

The divider stage yields the clock signal which is distributed to the Format Generating Circuitry. The required formatted TTL output is provided by a Serial Receiver/Transmitter driven by the clock signal. The formatted data is applied to a Line Interface device.

The Line Interface device transforms the TTL signals (from the serial transmitter) into the appropriately shaped Alternating Mark Inverted (AMI) pulses.

The outputs are muted by the loss of the phase-lock or a loss of Cesium lock. Alarm circuitry is provided by relay contacts on the rear panel ALARM connector.

3 Installing the PRS-45

This section provides unpacking instructions and installation procedures for the PRS-45 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 Customer Service by telephone at 1-512-721-4032 during normal business hours (8 a.m. to 5 p.m. CST) or 1-512-721-4000 (after hours, on weekends, and holidays), or by E-mail at austinsupport@datum.com.

3.1 Unpacking Instructions

CAUTION

To avoid electrostatic discharge (ESD) damage to sensitive internal parts in the PRS-45, observe proper ESD handling procedures.

1. Inspect the container for signs of damage. If the container appears to be damaged, notify both the carrier and the Datum 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.

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 can be found on a label affixed to the rear panel. Contact the Datum distributor if the model or item numbers do not match.

	CAUTION
⚠	This instrument must be operated only as specified by the manufacturer. Use other than as specified may compromise the safety precautions of the system.

3.2   Environmental Considerations

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 PRS-45. 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.

3.3   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 PRS-45 front panel

◆   The proper tools and materials are available as listed in Section 3.4, Tools and Materials

3.4 Tools and Materials

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

◆ Standard tool kit

◆ VOM meter

◆ Cable ties or acceptable cable clamps

◆ # 16 AWG wire for –48V, RTN, and Frame Ground (minimum)

◆ # 22 AWG Shielded Twisted Pair Wire-Wrap Cable (Amp #640433-7 or equivalent)

◆ Wire-wrap tool

◆ Rack mounting hardware

◆ #18 AWG wire for connecting office alarms

◆ Laptop or PC with Windows NT4, Windows 95, Windows 98, Windows ME, or Windows 2000 installed

◆ Null Modem cable

3.5 Installing the PRS-45

The PRS-45 is designed to be mounted in a standard telecom equipment rack. The front panel occupies a height of 10.5 inches (25.9 mm). The PRS-45 is 10.1 inches (25.7 mm) deep and weighs approximately 36 lbs (16.4 Kg).

The PRS-45 comes equipped with removable rack mounting brackets. These brackets, which are reversible, may be positioned in different configurations to satisfy a variety of mounting requirements, including mounting in a standard 19 (48.2 mm) or 23 (58.4 mm) inch rack. See the shelf mounting diagram in Figure 3-1. The brackets may be mounted 0 or 3.625 inches (9.2 mm) behind the PRS-45 front panel.

CAUTION

To avoid damage to the PRS-45, access covers must not be removed except by trained service personnel.

WARNING

For continued protection against risk of fire, ensure that only the specified fuse type and rating are used. Fuse specifications are contained in Table A-1 and the label on the instrument's front panel.

3

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

	Caution
⚠	The PRS-45 is convection cooled. To prevent the instrument from overheating, allow for a one rack unit (1.75 in./4.44 cm) space above and below the unit for cooling.

	CAUTION
⚠	To avoid electrostatic discharge (ESD) damage to components in the PRS-45, observe the appropriate electrostatic discharge (ESD) precautions and procedures.

Mounting and Installation – Refer to for a PRS-45E), then perform the following procedures:

1. Install the rack mounting ears in the desired position on the unit with the eight (8-32) screws provided.

2. Mount the PRS-45 in the desired location in the equipment rack using the eight #10 screws, washers, and lock washers provided.

3. Remove the fuses from the fuse holders labeled –48V A and –48V B from the front panel.

#10 screw, #10 washer,
#10 locking washer,
8 places

Rack mounting
brackets

3

Side view Model PRS-45

two bracket
mounting positions

Reversible mounting bracket

Use 8-32 screws, 8 places
or

positioned for
19" racks

posititioned for
23" racks
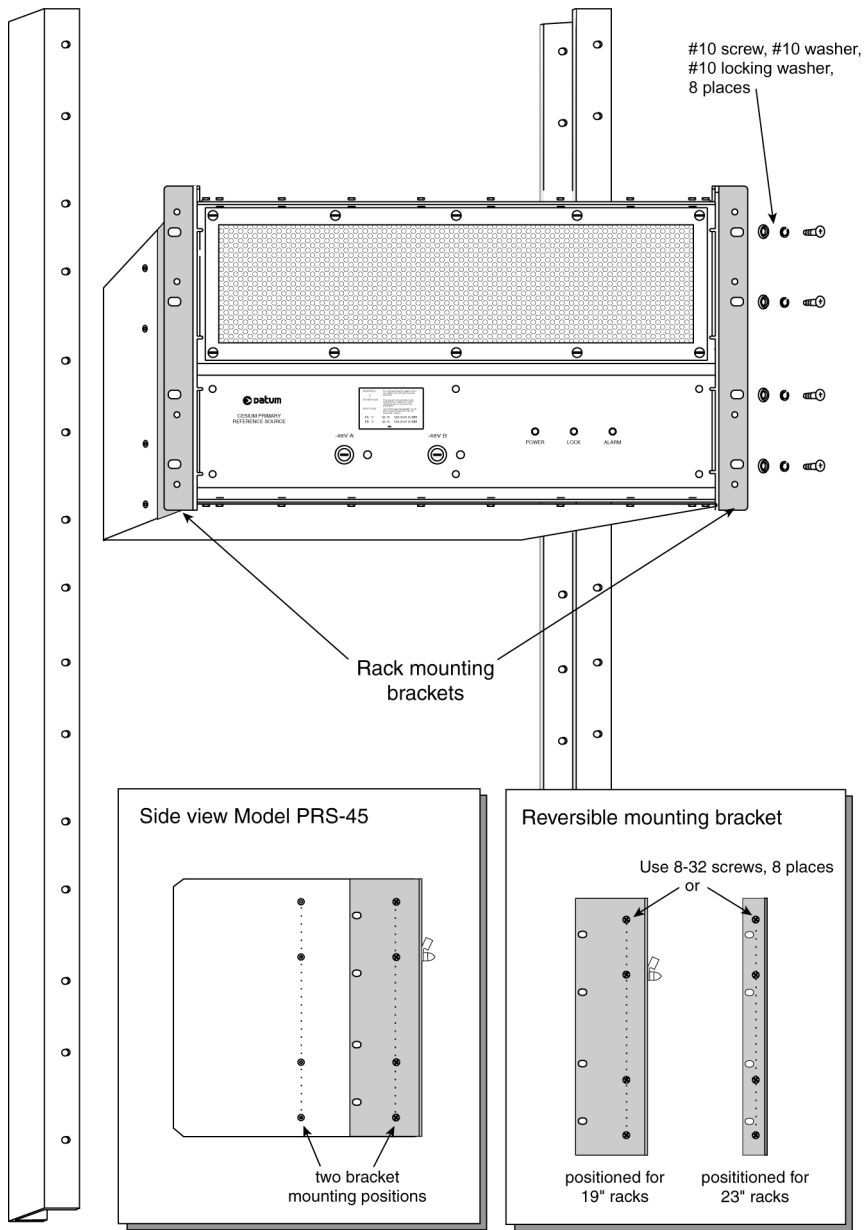
p4500022

Figure 3-1.   PRS-45 Shelf Rack Mounting Diagram

3
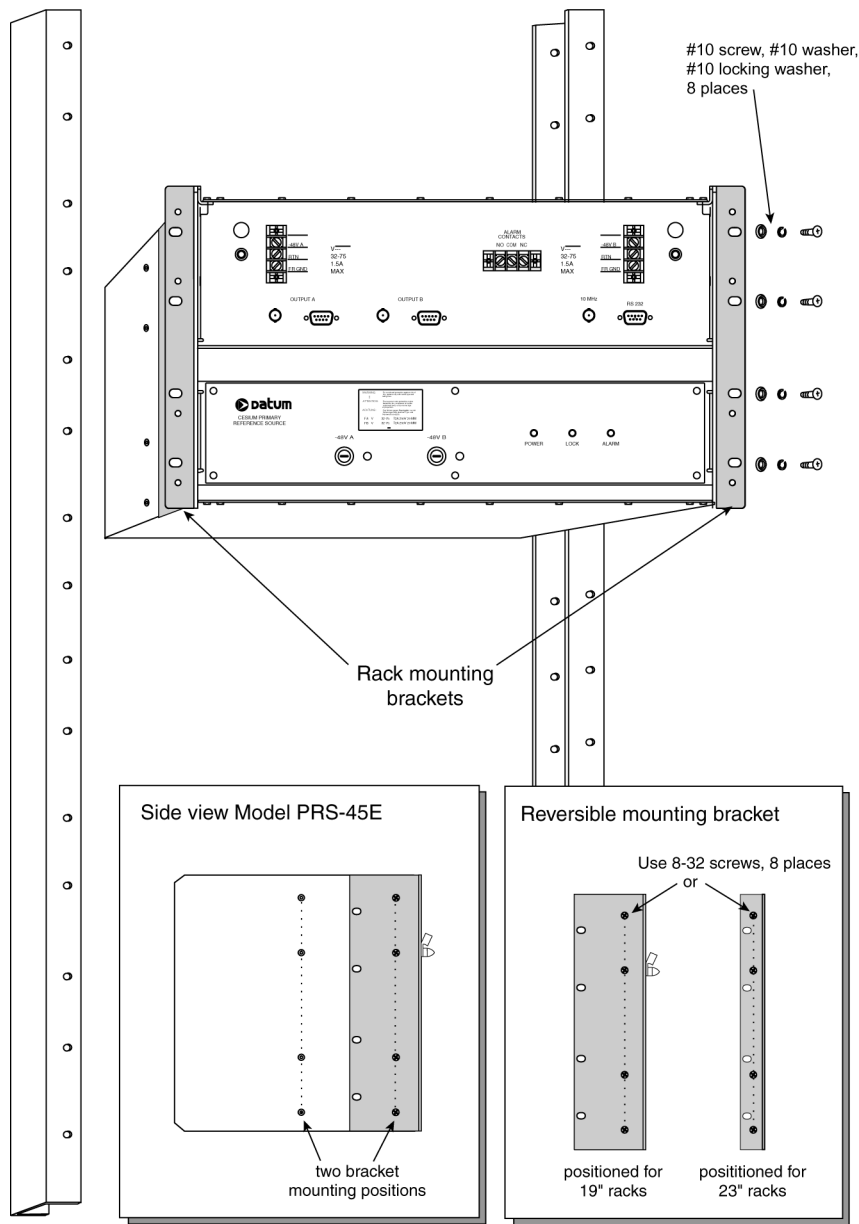
p4500023

Figure 3-2.   PRS-45e Shelf Rack Mounting Diagram

![NOTE icon]

NOTE

All permanent electrical connections are made on the rear panel of the PRS-45 and on the front panel of the PRS-45E. Refer to Figure 3-3 for the location and contact designation for the various connectors.

- Both power inputs A and B must be applied to satisfy the alarm criterion.
- The screw terminal marked "FR GND" may 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.

---

4. Connect Frame ground to lug marked "FR GND" on –48V A and –48V B terminal blocks.

5. Connect –48Vdc "Power A" from the fuse panel to lug marked "–48V A".

6. Connect –48Vdc "Power B" from the fuse panel to lug marked "–48V B".

7. Connect the return side (+) of the –48Vdc "Power A" to the terminal marked "RTN".

8. Connect the return side (+) of the –48Vdc "Power B" to the terminal marked "RTN".
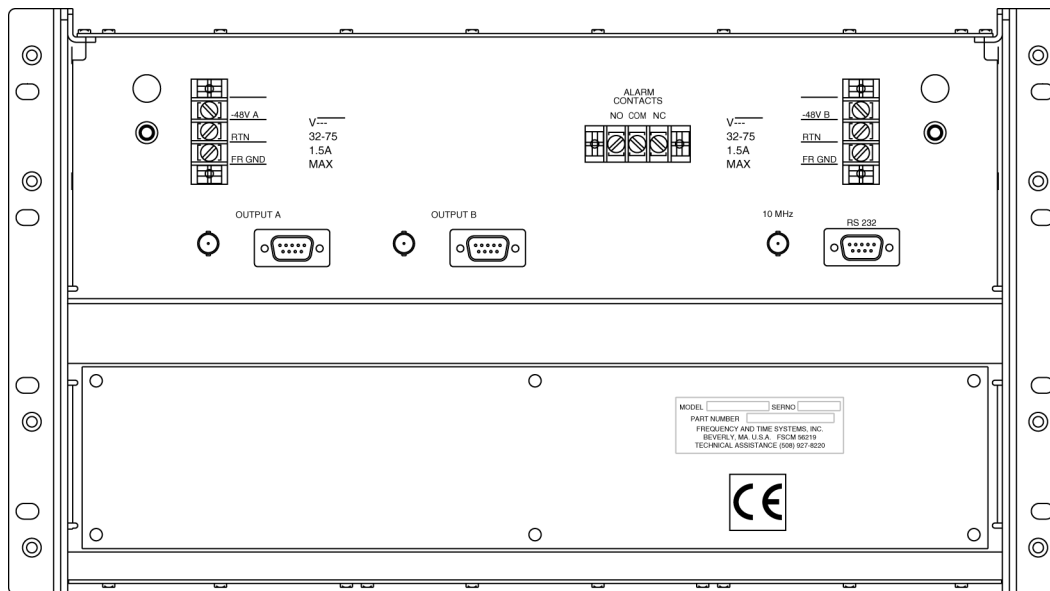
p4500018

Figure 3-3.   PRS-45 Connector Locations

---

9. Connect one end of the alarms cable to the "ALARM CONTACTS" terminals labeled "COM", and either "NO" or "NC" as required, see Figure 3-3. Connect the other end to the appropriate alarm monitoring device per local regulations.

10. Route, connect, and dress the output cable from "OUTPUT A" to the selected network element. Select either BNC, DB9, or wire-wrap connection, see Table 3-1 for pinout information if using the DB9 connector. If using the wire-wrap adapter the pins are clearly marked.

11. Route, connect, and dress the output cable from "OUTPUT B" to the selected network element. Select either BNC, DB9, or wire-wrap connection, see Table 3-1 for pinout information if using the DB9 connector. If using the wire-wrap adapter the pins are clearly marked.

Table 3-1.   Outputs A and B DB9 Connector Pinout

Function	Pin
Tip	6
Ring	2
Sleeve	1

12. Install the proper fuses into the fuse holders labeled –48V A and –48V B on the front panel. (Refer to Table A-1 and the label on the instrument's front panel.)

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 not active.

13. Observe that the POWER and ALARM indicators are illuminated.

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

15. Wait for the unit to stabilize the frequency control loop. This may 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.

Refer to Table 3-2 for a description of all the front panel indicators.

Table 3-2.   Front Panel 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

3

3.6   Installing the Monitor 2 Software

The PRS-45 has a number of software controllable features. **Monitor 2** is a software utility program that will help you configure your Cesium instrument. It requires a PC or laptop operating with Windows NT 4, Windows 95, Windows 98, Windows ME, or Windows 2000.

3.6.1   Connecting the Serial Cable

Connect one end of an RS-232 cable to the serial communications port on your computer and the other end to the connector labeled RS 232 on the PRS-45. Use a NULL Modem cable with pins connected as shown in the following tables.

If you have a DB25 connector on your computer refer to Table 3-3 for connector pinout information.

Table 3-3. 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)

If you have a DB9 connector on your computer refer to Table 3-4 for connector pinout information.

Table 3-4. RS 232 Port DB9 to DB9 Connector Pin out

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

3.6.2 Loading the Monitor 2 Software

1. Locate the **Monitor 2** software floppy disk provided in the shipping container. If unable to locate the disk, contact Customer Service at 1-512-721-4032 during normal business hours (8 a.m. to 5 p.m. CST) or 1-512-721-4000 (after hours, on weekends, and holidays) for a replacement disk.

2. Install the floppy disk into the computer.

3. Run the program **m2setup.exe** located on the disk by clicking the Start button, selecting Run, and from the command line typing *A:\m2setup.exe,* then press Enter.

4. This installs the **Monitor 2** application files onto your hard disk. A folder is added to your Start menu containing icons for Monitor2 and its documentation. An uninstall icon is also added so that you can easily remove the program in the future. All the necessary files will be copied to your Program Files directory.

3.7   Establishing Communications

Monitor 2 will initially attempt to communicate with the PRS-45 using the default settings of the communications port 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; Monitor 2 will remember any changes you make. Refer to Section 4.2, Configuring the Serial Port, to perform this operation.

1.   Click the Start button, select **Programs**, **Monitor 2**, and the program icon **Monitor 2**. The **Monitor 2** interface appears.

2.   Verify that the PRS-45 is operational and responding. To do this, select **View** from the menu and click **Monitors**. This will open a large window showing the complete real-time status of the cesium instrument, as shown in Figure 3-4.

3.   Select **View** from the menu and click **Monitors** again to hide the window.

4.   If the window opens and closes, the unit is operational.

5.   At this time close the program by selecting **File** and **Exit**. To configure the PRS-45, refer to Section 4, Configuring the PRS-45.
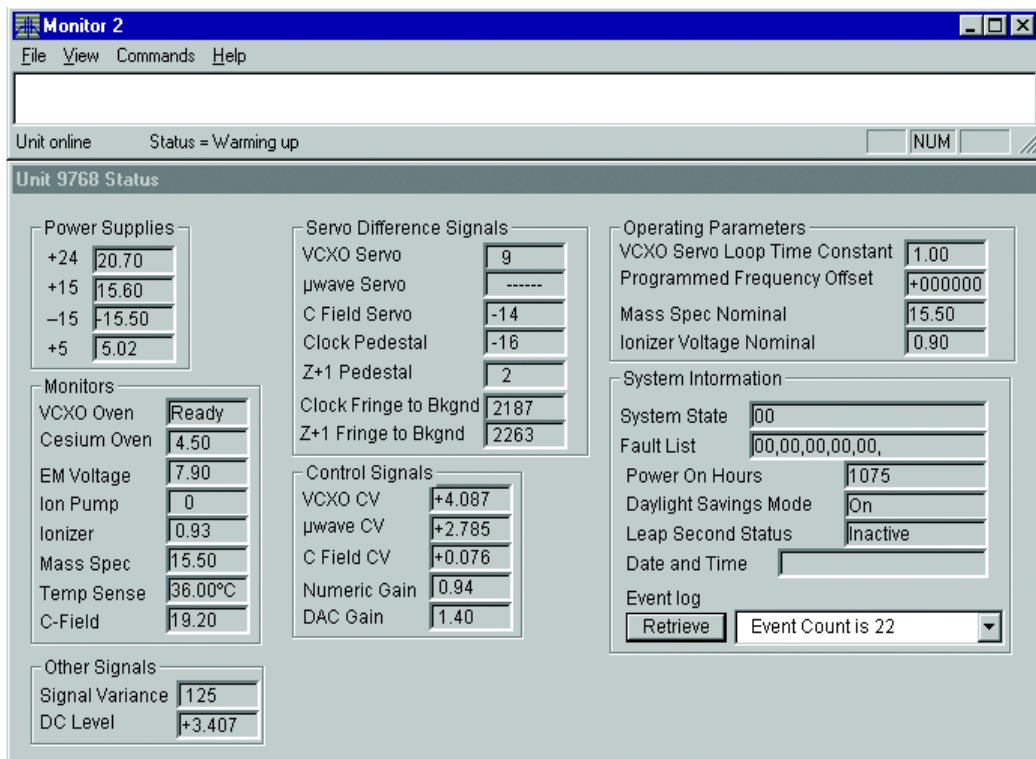
Figure 3-4.   Monitor 2 Initial Start-up Screen

3

4   Configuring the PRS-45

Before beginning the configuration procedures outlined in this section, ensure that the installation procedures in Section 3, Installing the PRS-45 have been performed.

NOTE

If you encounter problems during any of the following procedures, contact Customer Service by telephone at 1-512-721-4032 during normal business hours (8 a.m. to 5 p.m. CST) or 1-512-721-4000 (after hours, on weekends, and holidays), or by E-mail at austinsupport@datum.com.

4

4.1 Preliminary Procedures

CAUTION

To avoid electrostatic discharge (ESD) damage to components in the PRS-45, observe the appropriate electrostatic discharge (ESD) precautions and procedures.

1. Connect a serial cable from the computer to the RS 232 serial port as described in Section 3.6.

WARNING

For continued protection against risk of fire, ensure that only the specified fuse type and rating are used. Fuse specifications are contained in Table A-1 and on the label on the instrument's front panel.

2. Insert the proper fuses into the two fuse slots (–48V A and –48V B) of the front panel to apply power to the PRS-45. The green POWER LED should be illuminated. Disregard other LED indications at this time.

3. Start the **Monitor 2** interface program. Click the Start button, select **Programs**, **Monitor 2**, and click on the program icon **Monitor 2**. The Monitor 2 interface should look similar to the one shown in Figure 4-1. The programs screen size and shape can be adjusted. Adjust the screen according to the user's preference.

NOTE

Monitor 2 initially attempts to communicate with the PRS-45 using the default settings of 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, see Section 4.2. This only needs to be done once. Monitor 2 stores any changes you make.
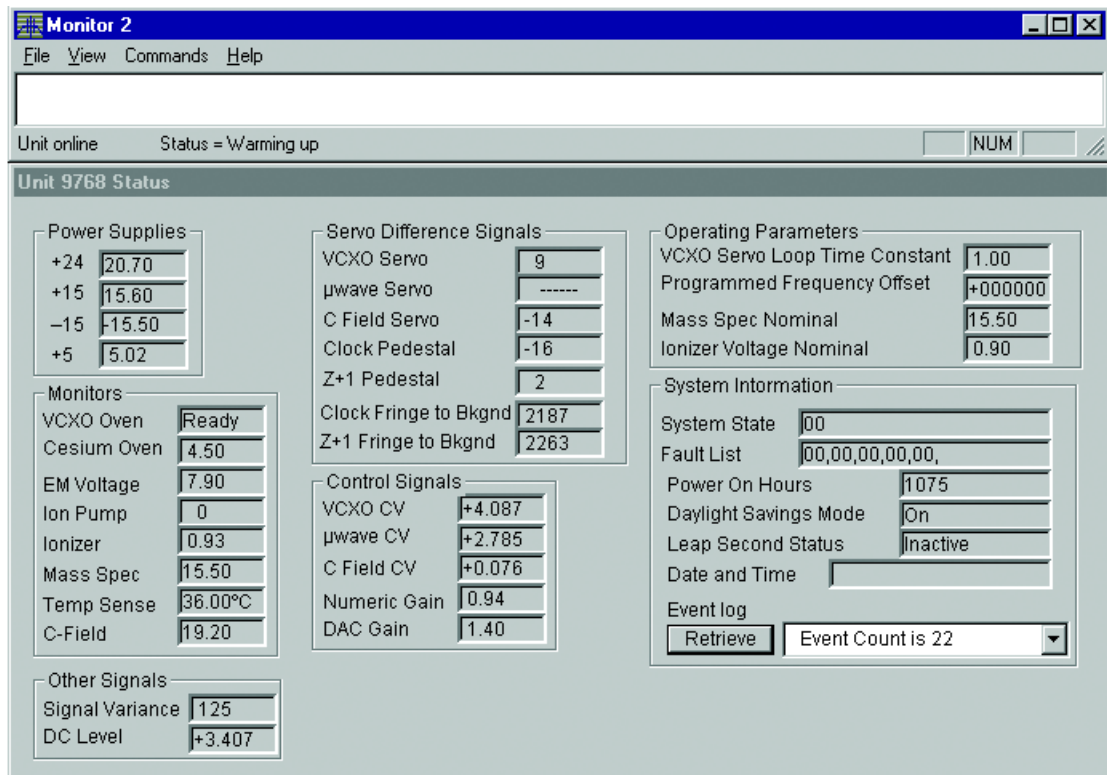
Figure 4-1.   Monitor 2 Start-up Screen

4.2 Configuring the Serial Port

1. Select **File** from the menu and **Configure Serial Port** from the menu option. A dialog box appears as shown in Figure 4-2.
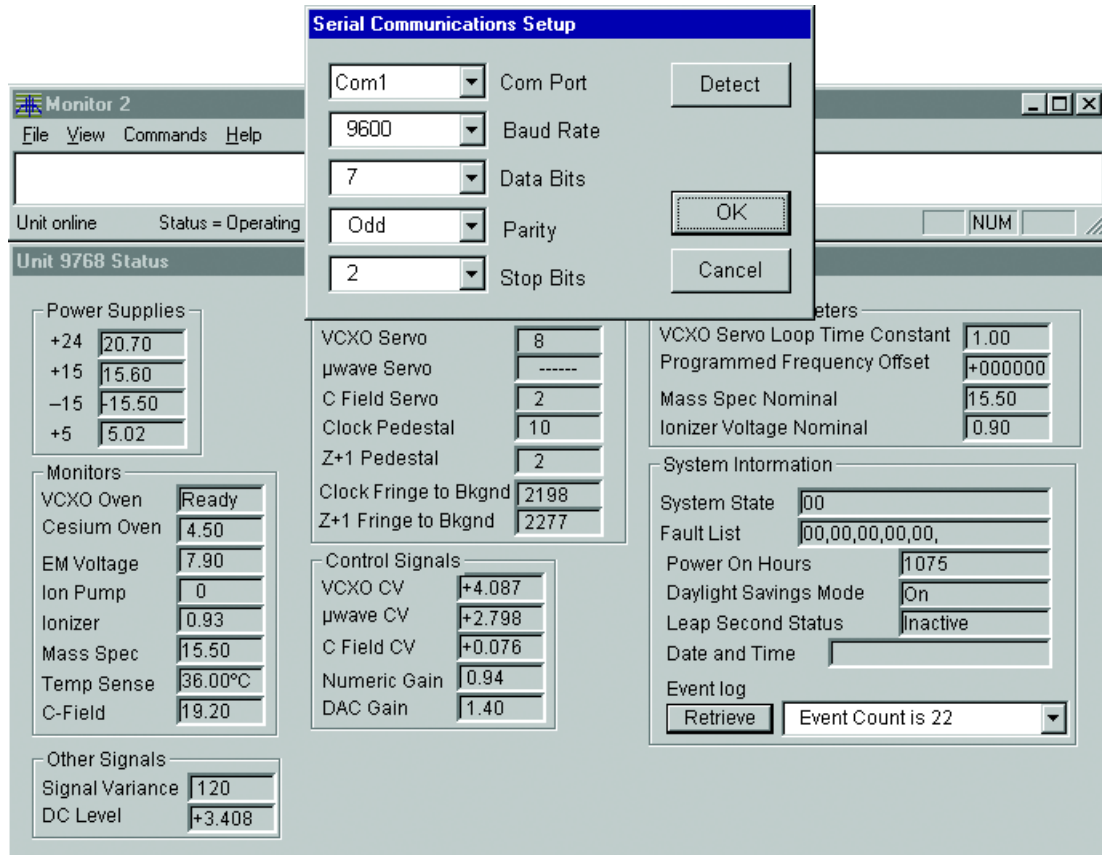
Figure 4-2.   Configuring the Serial Port

NOTE

If you do not know what the correct settings are, click the **Detect** button in the dialog box and **Monitor 2** will attempt to discover the correct settings for you. This can take anywhere from a few seconds to several minutes. As the scan progresses, the communications settings change. At the end of the scan, a message appears, indicating whether or not the cesium instrument was located. If you click Cancel to stop the process, communications will not be established.

2.   Set the serial port and parameters to the appropriate settings.

3.   If communications cannot be established, check cabling, power to the cesium instrument, and make sure that no other programs are running which use the communications port on your computer.

4.   Once communications are established, close the serial port communications setup dialog window by clicking **OK**. The main window now indicates that the unit is online and show you the status of the cesium instrument.

4

4.3 Polling Options

1. Select **File** from the menu and **Configure Unit Monitoring** from the menu option. This opens a dialog box as shown in Figure 4-3.
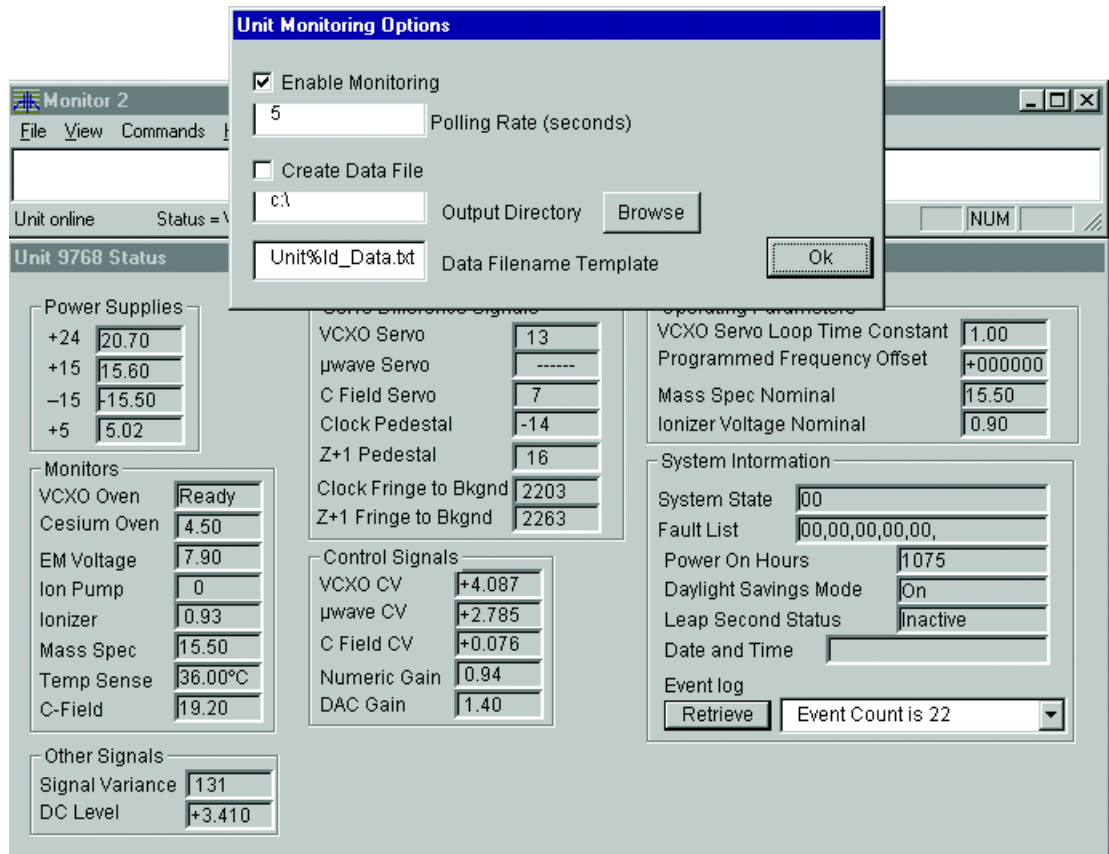
p4500008

Figure 4-3.   Selecting a Polling Rate

2. Ensure that **Enable Monitoring** is checked, then select a polling rate that is appropriate.

3. Click OK to close the Unit Monitoring Options setup dialog box.

4.4   Displaying Real-Time Status

1.   Select **View** from the menu and click **Monitors** from the menu option. This will open a large window showing the complete real-time status of the cesium instrument, see Figure 4-4.

2.   Select **View** from the menu and click **Monitors** again to hide the window.

NOTE

The real-time display window is a status window only. The operating parameters cannot be changed from this window.

Unit 9768 Status

Power Supplies
+24   20.70
+15   15.60
−15   -15.50
+5   5.02

Monitors
VCXO Oven   Ready
Cesium Oven   4.50
EM Voltage   7.90
Ion Pump   0
Ionizer   0.93
Mass Spec   15.50
Temp Sense   36.00°C
C-Field   19.20

Other Signals
Signal Variance   125
DC Level   +3.407

Servo Difference Signals
VCXO Servo   9
μwave Servo   ------
C Field Servo   -14
Clock Pedestal   -16
Z+1 Pedestal   2
Clock Fringe to Bkgnd   2187
Z+1 Fringe to Bkgnd   2263

Control Signals
VCXO CV   +4.087
μwave CV   +2.785
C Field CV   +0.076
Numeric Gain   0.94
DAC Gain   1.40

Operating Parameters
VCXO Servo Loop Time Constant   1.00
Programmed Frequency Offset   +000000
Mass Spec Nominal   15.50
Ionizer Voltage Nominal   0.90

System Information
System State   00
Fault List   00,00,00,00,00,
Power On Hours   1075
Daylight Savings Mode   On
Leap Second Status   Inactive
Date and Time
Event log
Retrieve   Event Count is 22

p4500015

Figure 4-4.   Real-Time Status Display

4.5 Reset Unit Alarms

1. Select **Commands** from the menu and click **Reset Unit Alarms** from the menu option. This opens a dialog box as shown in Figure 4-5. This will reset the alarm LED and alarm contacts.

2. Verify that the alarm has been cleared by observing that the Alarm LED is not lit.
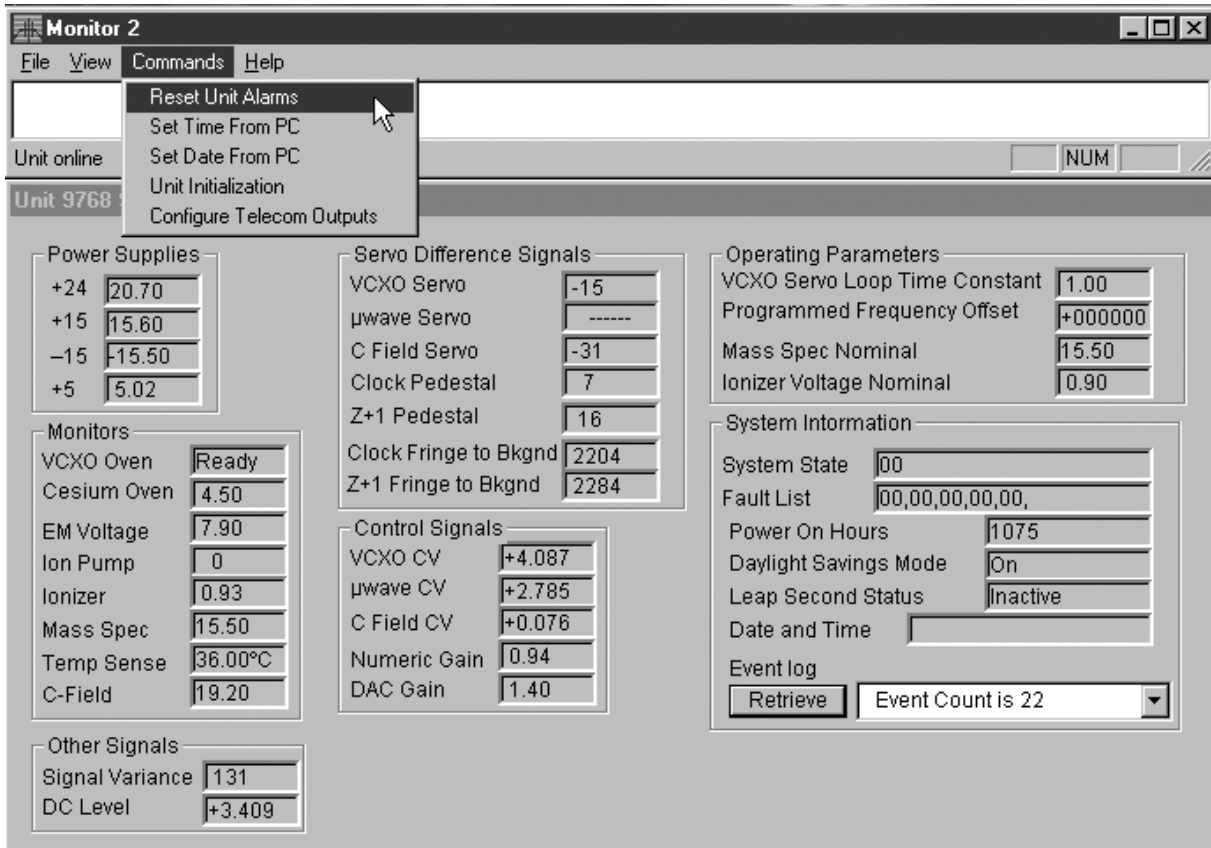
p4500002

Figure 4-5. Selecting Reset Unit Alarms

4.6   Setting the Time from a PC

Select **Commands** from the menu and click **Set Time From PC** from the menu option. This opens a dialog box as shown in Figure 4-6. The time is automatically set from the current time of the computer.
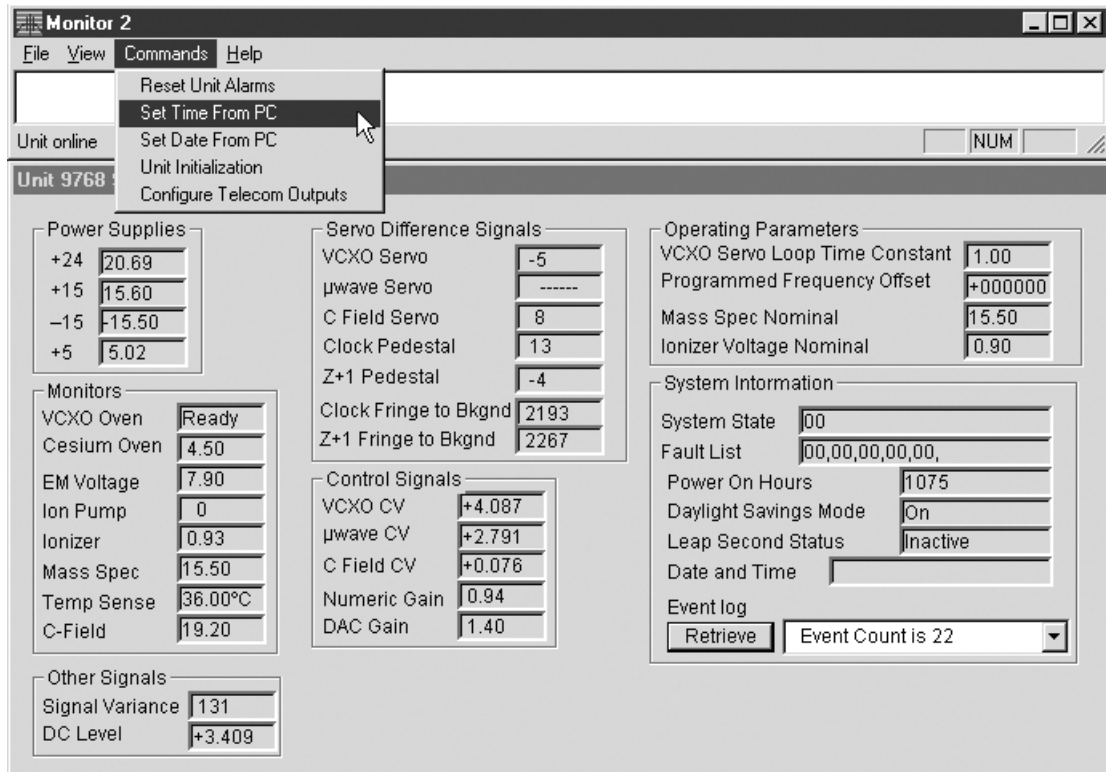
p4500010

Figure 4-6.   Setting the Time from a PC

4.7 Setting the Date from a PC

Select **Commands** from the menu and click **Set Date From PC** from the File menu. This opens a dialog box as shown in Figure 4-7. The date is automatically set from the current date of the computer.
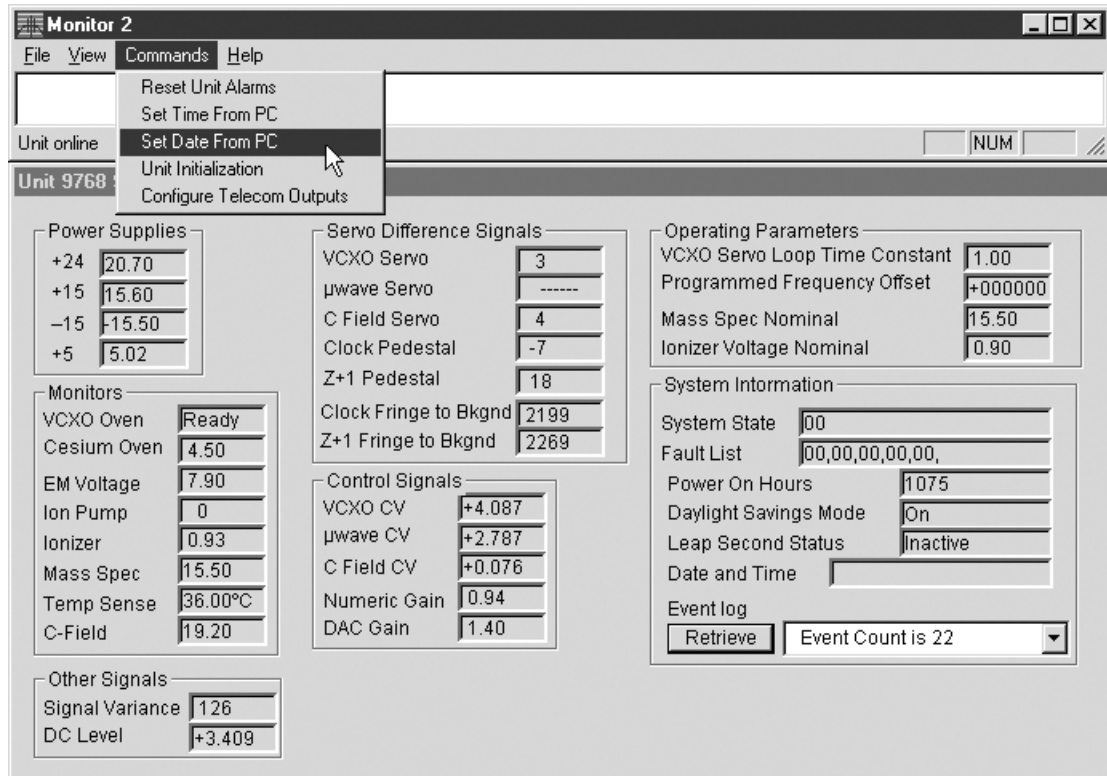
p4500011

Figure 4-7.   Setting the Date from a PC

4.8 Unit Initialization Options

1. Select **Commands** from the menu and click **Unit Initialization** from the menu option. This opens a dialog box as shown in Figure 4-8.
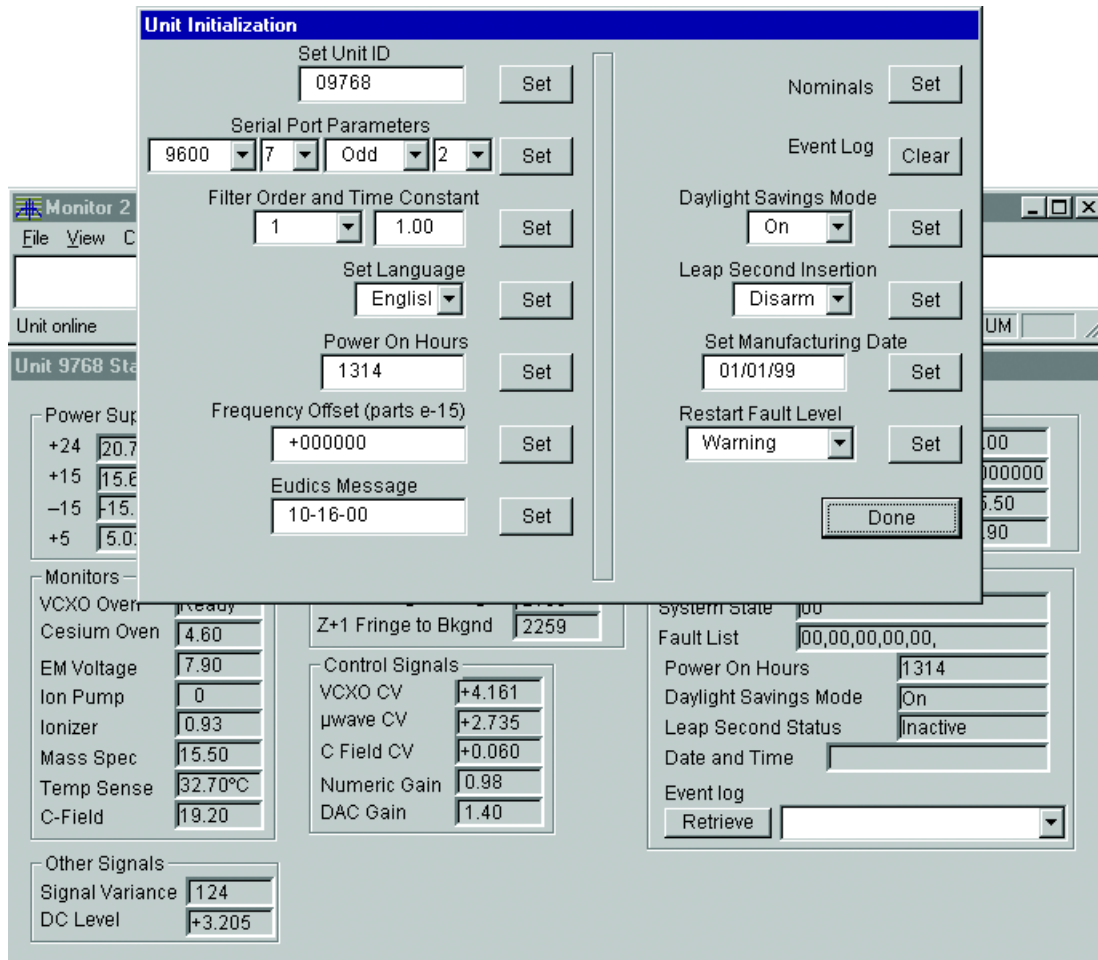
p4500016

Figure 4-8. Selecting Unit Initialization Options

NOTE

The Unit Initialization dialog allows you to set various parameters. Refer to Figure 4-8 and Table 4-1 for the appropriate settings for the PRS-45, or Figure 4-8 and Table 4-2 for the PRS-45e .

CAUTION

Changing the serial communications parameters can cause your unit to stop responding. If this happens, refer to *Establishing Communications between Monitor 2* and the PRS-45 and the appropriate default configuration settings in Table 4-1 for the PRS-45, or Table 4-2 for the PRS-45e.

NOTE

The Unit is factory configured with the Restart Fault Level in the *Warning* mode. In this mode the Alarm Relay is automatically cleared if the unit is restarted (power removed and restored). However, it will set the fault code (16), which will be displayed in the Unit Initialization dialog box. If the Restart Fault Level is changed to **Critical** mode, the operator will have to issue the Clear Unit Alarms command from the Command menu in the **Monitor 2** program to clear the alarm after the unit is restarted.

4

2.   Set the parameters to your system's requirements.

3.   Click Set after each parameter that is changed.

4.   Click Done when complete**.**

4.9 Configuring Telecom Outputs

The PRS-45 has two Telecommunications outputs, each of which can be driven by a T1 or E1 signal. The output channels are configured separately from the signal generators as shown in Figure 4-9. Each output can be a simple Clocked signal, or can be a fully detailed PRS Framed signal.

1. Select **Commands** from the menu and click **Configure Telecom Outputs** from the menu option. This opens a dialog box as shown in Figure 4-9.
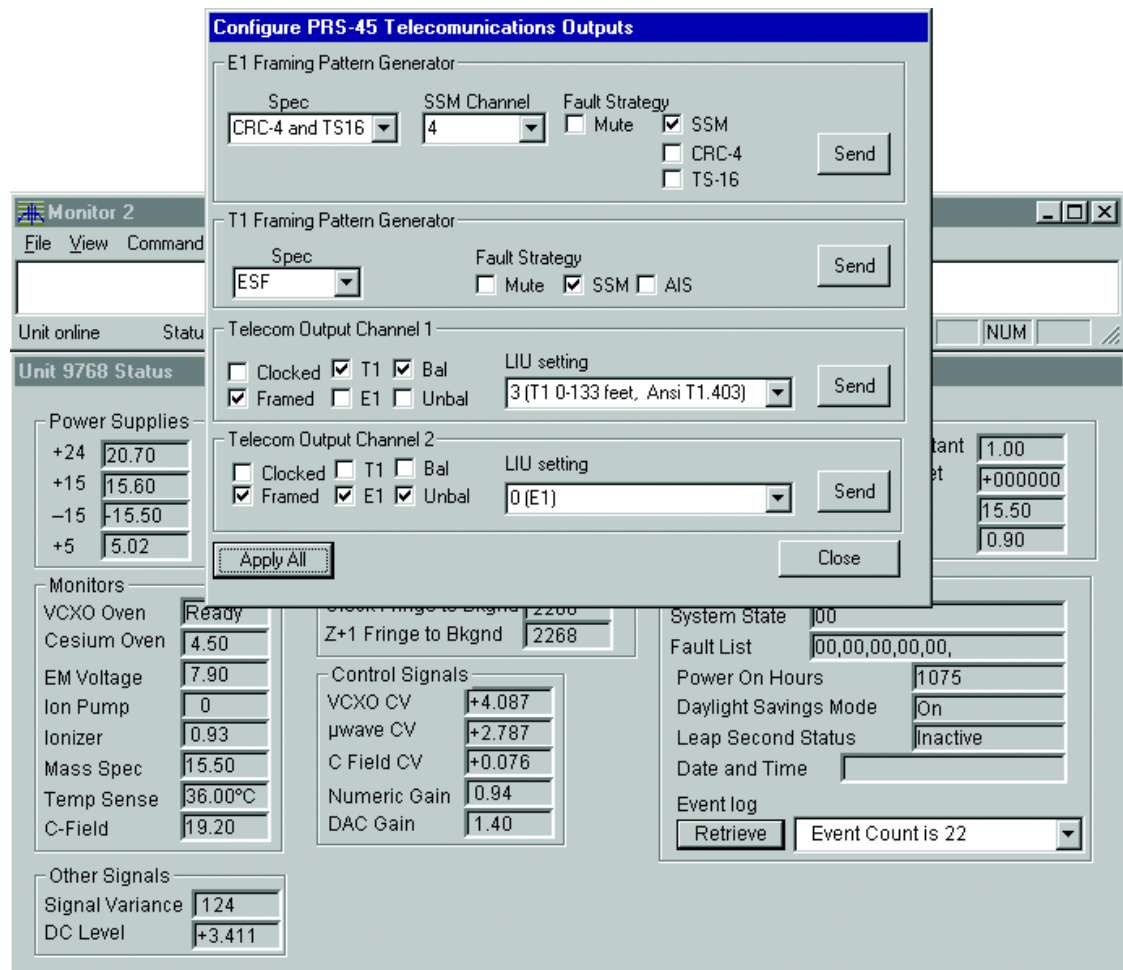
Figure 4-9.   Configuring the Telecom Outputs

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. For E1 there is only one LIU setting. For T1, there are several LIU settings. See relevant Bell Core documentation for details. Click **Send** to apply your configuration.

6. When all settings are complete, click **Apply All** and click close.

4

4.10　Factory Default Settings

The PRS-45 and PRS-45e are shipped from the factory with default configuration settings. Refer to Table 4-1 (PRS-45) and Table 4-2 (PRS-45e) for a list of the factory default settings.

Table 4-1.　PRS-45 Default Configuration 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	5
Data File Output Directory	C:\
Data File Name Template	Unit%ID_Data.txt
Unit ID	(Unit Serial #)
Filter Order	1
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

4

Table 4-1. **PRS-45 Default Configuration Settings**

Parameter	Setting
T1 Framing Pattern Generator	
Spec	ESF
Fault Strategy	Mute
Output A, Channel 1	
Settings Enabled (checked)	Framed, T1, Bal.
LIU Setting	3 (T1 0-133 feet, ANSI T1.403
Output A, Channel 2	
Settings Enabled (checked)	Framed, T1, Bal.
LIU Setting	3 (T1 0-133 feet, ANSI T1.403

4

Table 4-2. **PRS-45e Default Configuration 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	5
Data File Output Directory	C:\
Data File Name Template	Unit%ID_Data.txt
Unit ID	(Unit Serial #)
Filter Order	1
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
Fault Strategy	Mute

4

Table 4-2.   PRS-45e Default Configuration Settings

Parameter	Setting
Output A, Channel 1	
Settings Enabled (checked)	Framed, E1, Unbal.
LIU Setting	0 (E1)
Output A, Channel 2	
Settings Enabled (checked)	Framed, E1, Unbal.
LIU Setting	0 (E1)

4

5   Operating the PRS-45

This section describes the operational procedures for power-on and monitoring, and power-off of the PRS-45 Cesium Primary Reference Source.

NOTE

If you encounter problems during any of the following procedures, contact Customer Service by telephone at 1-512-721-4032 during normal business hours (8 a.m. to 5 p.m. CST) or 1-512-721-4000 (after hours, on weekends, and holidays), or by mail at austinsupport@datum.com.

5.1   Power-On

Except for the application of power, no specific user actions are required to turn on the Datum PRS-45 and obtain the specified output signals. Application of DC power initiates the warm-up and automatic lock acquisition sequence. However, if monitoring and communicating with the unit is necessary, all of the following steps must be performed.

WARNING

For continued protection against risk of fire, ensure that only the specified fuse type and rating are used. Fuse specifications are contained in Table A-1 and on the label on the instrument's front panel.

---

1.   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 PRS-45. (Perform this step only if it is necessary to monitor or communicate with the unit.)

2.   Activate power to the PRS-45 by installing the correct fuses in the –48Vdc Power A and B slots on the front panel.

---

3. Observe that the POWER and ALARM indicators are illuminated and that neither of the –48 VDC Power Fault indicators are illuminated, see Table 3-2.

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

5. Click the Start button, then select **Programs**, **Monitor 2**, and the program icon **Monitor 2**. The **Monitor 2** interface appears. Monitor 2 attempts to communicate with the PRS-45 using the default settings (Com 1, 9600 baud, odd parity, 7 data bits, 2 stop bits) or the settings last saved in non-volatile memory. To change the serial port settings, refer to Section 4.2, Configuring the Serial Port. The unit is now operational.

NOTE

The factory default for alarm operation is "warning mode," (non-latching operation). The user may change operation to "critical mode" (latching operation). In critical mode the alarm is latching and must be reset by the user from the RS232 port by issuing the Reset Unit Alarms command.

5.2 Power-Off and Restart

1. De-activate power to the PRS-45 by removing the fuses labeled –48V A and –48V B on the front panel.

2. To restart the instrument, re-connect the power to the PRS-45 by installing the fuses labeled –48V A and –48V B on the front panel and wait for the LOCK indicator to illuminate.

5

6   Maintenance and Troubleshooting

This section provides information about preventive maintenance, re-ordering parts, accessories, and re-shipment of the product.

Caution

To avoid electrostatic discharge (ESD) damage to components in the PRS-45, observe the appropriate electrostatic discharge (ESD) precautions and procedures.

Caution

To avoid damage, under no circumstances should the interior of the PRS-45 unit be allowed to come in contact with water.

CAUTION

To avoid electromagnetic discharge and damage to the circuitry, never attempt to clean the PRS-45 with a vacuum.

6

NOTE

If you encounter problems during any of the following procedures, contact Customer Service by telephone at 1-512-721-4032 during normal business hours (8 a.m. to 5 p.m. CST) or 1-512-721-4000 (after hours, on weekends, and holidays), or by E-mail at austinsupport@datum.com.

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 Customer Service department for assistance.

6.1 Preventive Maintenance

The PRS-45 unit 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, the exterior chassis may be wiped off using a soft cloth dampened with mild soapy water.

Table 6-1 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 6-1.

Table 6-1.   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
Input Power Fuses	Inspect for loose or damaged fuse holders	If loose or damaged contact Datum Service Support	Periodically
Unit Case Screws	Inspect for loose or missing screws or hardware on shelf	If loose, tighten securely, replace missing hardware	Periodically

6

6.2 Troubleshooting

If the alarm activates and the ALARM LED remains lit indicating a failure of the PRS-45, call Datum Customer Service for instructions.

Table 6-2 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 Datum Customer Service for further instructions.

Table 6-2. 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	
16	Unit Restarted	
17	Module configuration not set	
18	Digital Gain at lower limit	= 1
26	Fuse A open	
27	Fuse B open	

Table 6-2. Fault Messages (Continued)

Fault Code	Description	Comment
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	>±0.16 V of nominal
F4	Ion Pump current	>175 uA
F5	+24 V Supply	<17 or >24 V

6.3   Shipping

To turn off the Datum PRS-45 prior to shipment, remove 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.

6.3.1   Hazardous Material (HAZMAT) Shipping Considerations

Datum 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 Datum PRS-45 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 case as well as its labeling.

The initial shipment of every Datum cesium standard complies with HAZMAT regulations by using a shipping case which has been tested and certified. This case has been designed to prevent damage to the unit during shipment and to meet current hazardous-material shipping regulations. The case can be used repeatedly and should be retained for any future shipping requirements of the instrument. In addition, the following required labels have been placed on the case:

◆ FRAGILE
◆ DANGEROUS WHEN WET
◆ DANGER – NO PASSENGER AIRCRAFT
◆ CESIUM UN 1407

6

6.3.2   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 Section 6.3.1, Hazardous Material (HAZMAT) Shipping Considerations. 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 the factory or local representative for repair:

1.   Call Customer Service at 1-512-721-4000 to obtain a return material authorization (RMA) number before returning the product for service.

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

3.   Provide the return shipping information (customer field contact, address, telephone number, and so forth).

4.   Pack all items into the original shipping container.

5.   Ensure the container is properly marked as described in Section 6.3.3.

6.   Ship the product to Datum, transportation prepaid and insured, with the RMA number and serial numbers clearly marked on the outside of the container to:

   Datum, Inc.
   15811 Vision Drive
   Pflugerville, TX   78660
   Attention: Service Department

6.3.3   Shipping Carriers

The shipper is responsible for the overall condition of the Hazardous Material shipping case; such as latches locked (if applicable), no visible damage to case and the proper placement of all labels on the case. Figure 6-1 illustrates the proper placement of labels. Make sure an address label, proper HAZMAT labels, and packing slip (if necessary) are affixed to the shipping case and are clearly visible.

6

Side view
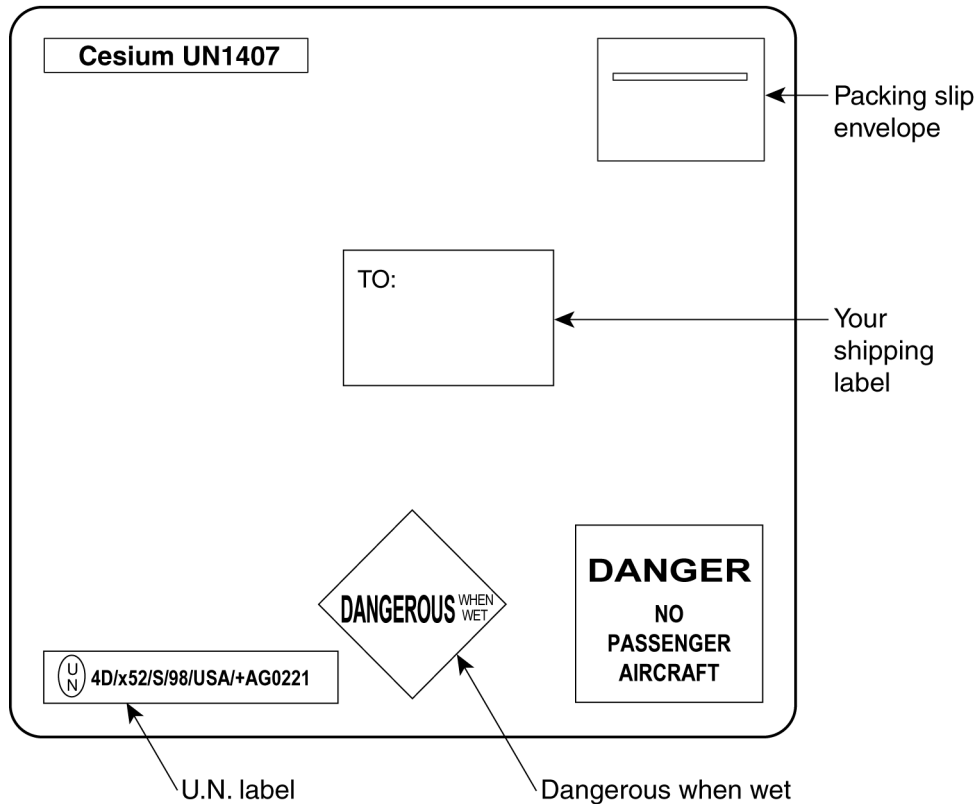
Figure 6-1.   Typical Label Placement

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. If you need additional help, call Datum Technical Service at 512-721-4000.

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 Fibreboard Box x5 Grams
Packing Instructions:	412

6

6.3.4   Re-Ordering Information

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

6.4   Storage

During storage of the PRS-45, there are two factors to consider: cesium beam tube vacuum and shelf life.

6.4.1   Cesium Beam Tube Vacuum

If the PRS-45 is stored for extended periods of time (>6 months), periodic storage-mode operation cycles of 30 minutes should be performed in order to maintain the tube vacuum. The PRS-45 must be turned-on and operated for a minimum of 30 minutes on or before the six month storage interval. Refer to Section 2 for the turn-on procedure.

6.4.2   Cesium Beam Tube Shelf Life

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

6

6

APPENDIX A   Specifications

NOTE

All specifications are performed at 25 ^{o}C unless otherwise specified.

Table A-1.   System Specifications

Category	Specification
PERFORMANCE	
Accuracy, Calibrated to	$\leq \pm 1 \times 10^{-12}$
Accuracy (25°C ± 5°C)	$\leq \pm 2 \times 10^{-12}$
Accuracy (over environment)	$\leq \pm 3 \times 10^{-12}$
Retrace (reproducibility)	$\leq \pm 1.2 \times 10^{-12}$
Stability $\sigma_y(\tau)$	
Averaging time	
1 s	3.0×10^{-11}
10 s	1.3×10^{-11}
100 s	3.0×10^{-12}
1,000 s	9.5×10^{-13}
10,000 s	3.0×10^{-13}
Warm-up Time (typical)	30 minutes

A

Table A-1.   System Specifications (Continued)

Category		Specification
OUTPUTS		
Telecom Signals		Two channels: one output/channel, either framed or clock, configurable by the Monitor 2 interface through the RS232 port
Framed (AMI)	1544 kbps	ANSI T1.102 DS1 selectable framing: SF(D4) or ESF, with Stratum 1 Sync Status Message (SSM)
	Format	Framed all ones, B8ZS
	2048 kbps	ITU-T Rec. G.703/9 (E1) with G.704 framing and with Stratum 1 Sync Status Message (SSM)
	Format	Framed all ones, HDB3
Clock	1544 kHz	same as G.703/13
	2048 kHz	G.703/13
Connectors		DB9 for balanced signal, Pins 1 and 2; Tip-Pin 6, Ring-Pin 2, Sleeve (chassis ground) Pin 1 T1 at 100 ohms E1 at 120 ohms BNC for unbalanced signals, 75 ohms
Sinusoidal Signals		x1 at 10 MHz, 0.5 V rms/50 ohms, 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
RS232		9 pin male D-connector (mate: DA9S, ITT Cannon or equal)

A

Table A-1. **System Specifications** (Continued)

Category	Specification
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"(64.0 cm)
Depth	10.1"(25.7 cm)
Height	10.5"(26.67 cm)
Weight	36.5 lb(16.6 kg)
Mounting	Mounting ears provided for 19" or 23" racks
ENVIROMENT	
Temperature, Operating	0 to 50°C
Temperature, Non-operating	–40 to +75°C
Humidity	95%, non-condensing
Magnetic field	0 to 2 gauss @ DC, 50, 60 or 400 Hz

A

Glossary

Glossary

1 PPS
One pulse per second, which equates to approximately 86,400 times per day.

10Base-T
Ethernet local area network (LAN) using twisted pair wiring, the most commonly installed LAN.

A/D
Acronym: Analog-to-Digital, or Analog to Digital Converter

abort
Operator request to discontinue a procedure. Abort does not stop the operation the controller is currently running. An aborted procedure cannot be RETRY(ed).

absolute time
A specific date and time of day. Absolute time is entered and displayed using the HH:MM:SS DD-MMM-YYYY format.START and END Times may be entered as absolute times.

Access Identifier (AID)
A Part of the TL1 protocol which Identifies the shelf, module, and port within the SSU-2000. The AID is used in the message display area of the **LMT:SSU-2000** window to display SSU-2000 event and alarm messages, and in the Local Management Terminal for Windows (LMT) dialog box titles and labels to identify the SSU-2000 system main and expansion shelves, modules, and module ports.

accumulator
A register or other memory location that temporarily holds the result of a calculation or logic operation.

ACQ
Abbreviation: Acquire

acquire
The act of gaining control of a piece of equipment needed in a receiver.

acquire set
A list of unit point tags that a receiver references during execution. The unit points in the acquire set depend on which units are available when the receiver executes.

Glossary

ACS
Acronym: Advanced Control Solutions

ACT
Abbreviation: Active

activity
A named procedure that the control system activates during one or more named batch cycles. For example, if batch cycle BATCH 1 activates procedure PRODUCT A, PRODUCT A is an activity of that batch cycle.

activity point
A console point that provides a structure for running receivers and for communicating with the operator. Activity points schedule and monitor procedures.

adaptive control
A control technique that involves automatic change of control parameter values to improve the performance of the control system.

adaptive gain
A type of primary control algorithm which allows the proportional gain to change based on the value of an analog signal, a discrete signal, the process variable, the implied valve position, or the process error. (The process error is the difference between the PV and SP values.)

A characteristic of a controller in which one or more of its tuning parameters are automatically adjusted to compensate for process non-linearities. The parameters may be adjusted based on predictable changes in operating conditions (gain scheduling) or in response to unpredictable process changes (continuous adaptation).

adaptive learning rate
A learning rate that is adapted at each epoch to achieve fast learning.

address
A number used by the computer operating system and software to identify a storage location in memory or on a storage device such as a disk. Also, a unique address value associated with a given device on the data highway or on an Ethernet circuit.

ADSL
Acronym: Asymmetric Digital Subscriber Line.

advanced user interface (AUI)
A feature of some graphics drivers that allows the display of pull-menus, icon menus, and dialogue boxes in AutoCAD applications.

Glossary

AID
Acronym: TL1 protocol Access Identifier

AIS
Acronym: Alarm Indication Signal.

AIS
Alarm Indication Signal - A code transmitted downstream in a digital network that shows that an upstream failure has been detected and alarmed.

AIX
Acronym: Advanced Interactive eXecutive The IBM version of the UNIX operating system on an RS/6000 computer.

Alarm Indication Signal (AIS)
Signal transmitted downstream to inform that an upstream failure has been detected. Replaces normal traffic signal when a maintenance alarm indication is activated.

Alternate Mark Inversion (AMI)
Signaling protocol in which ones are indicated by either a positive or a negative pulse, and zeros by no pulse. The ones alternate between positive going and negative going.

American National Standards Institute (ANSI)
Standards-setting, non-government organization that develops and publishes standards for transmission codes, protocols, and high-level languages for *voluntary* use in the United States.

American Standard Code for Information Interchange (ASCII)
A standard digital encoding scheme for data: a 7-bit binary code represents numbers, letters, symbols, and control codes.

AMI
Acronym: Alternate Mark Inversion.

AMP
Abbreviation. Ampere.

Ampere
The unit of measurement of electric current or the flow of electrons, mathematically equal to watts divided by volts.

ANSI
Acronym: American National Standards Institute.

NETSYNCPLUS®

| **APPLICATION** |

Glossary

application
(1) The system, problem, or use to which a computer is applied. (2) A program that performs a task specific to a particular end-user's needs; generally a program that is not part of a basic operating system. (3) Software that is unique to a specific system or installation, rather than a general purpose or broad use.

ASCII
Acronym: American Standard Code for Information Interchange.

aspect ratio
The ratio of an image's height to its width.

assembler code
An early programming language. Later languages are more convenient than assembler for developing sophisticated software. Assembler still is important for some applications, primarily since this language permits direct manipulation of the system hardware. Assembler is normally used where speed or timing is critical.

assembler language
See assembler code

Asymmetric Digital Subscriber Line (ADSL)
High-speed transmission technology developed by Telcordia and standardized by ANSI as T1.413. ADSL uses existing UTP copper wires from a telecommunications central office to the subscriber premises and involves ADSL modems at both ends to send high speed digital signals asymmetrically (that is, send more information in one direction).

Asynchronous Transfer Mode (ATM)
Very high speed transmission technology using high bandwidth, low-delay, connection-oriented, packet-like switching and multiplexing techniques in which each 53-byte fixed-size cell is presented to the network on a start-stop basis (asynchronously).

ATM
Acronym: Asynchronous Transfer Mode.

attributes data
Qualitative data counted for recording and analysis. This data comes from yes/no or pass/fail determinations of whether the unit conforms to acceptable standards.

audit trail
A record of changes made to a database and to the system where the database resides. The record includes the type of change, when the change was made and who made it.

B8ZS
Acronym: Bipolar with 8 Zero Substitution.

Backdoor Logon
A logon which provides a way of getting into a password-protected system without an assigned password.

Balun
Balanced/unbalanced, refers to an impedance-matching device used to connect balanced twisted-pair cabling with unbalanced coaxial cable.

Bellcore
See *Telcordia Technologies*.

Binary with 8 Zero Substitution (B8ZS)
Zero suppression scheme associated with DS1.

Bipolar
In digital transmission, an electrical line-signaling method in which the mark value alternates between positive and negative polarities.

Bipolar Violation (BPV)
In the digital line coding system that inverts the polarity of alternate one bits, a bipolar violation (BPV) indicates the presence on the carrier line of two consecutive "one" bits of the same polarity.

B-ISDN
Acronym: Broadband Integrated Services Digital Network. Also BISDN.

BITS
Acronym: Building Integrated Timing Supply.

Bits Clock
See *Building Integrated Timing Supply*.

BPV
Acronym: Bipolar Violation - In AMI signaling, occurs when two consecutive ones are indicated with the same polarity.

Broadband
Used in Wide Area Network (WAN) terminology to indicate a transmission facility providing bandwidth that is greater than 45 Mbit/s (T3), generally fiber optic systems, and contrasted with narrowband and wideband.

Broadband Integrated Services Digital Network (B-ISDN or BISDN)
Broadband ISDN. Loosely defined term that refers to circuits capable of transmitting more than one basic rate ISDN.

| **BUILDING INTEGRATED TIMING SUPPLY (BITS)** |

Building Integrated Timing Supply (BITS)

As defined in T1.101, the BITS is the master timing supply for an entire building, which is a master clock and its ancillary equipment. This is the most accurate and stable clock in the building, (i.e., the lowest stratum number of the clocks in the building.) The BITS supplies synchronization sources to all other clocks and timing sources in that building. The BITS therefore is realized by the main TSG, the PRS (if deployed), and any sub-tending TSGs within a building or Central Office. Sub-tending TSGs are slave or expansion TSGs operated from the main or master TSG.

CAS/CCS

Acronym: Channel Associated Signaling/Common Channel Signaling.

CBR

Acronym: Constant Bit Rate.

CCPI

Acronym. Computer Communication Protocol Interface.

CDMA

Acronym: Code Division Multiple Access.

Central Office

In telephony, the Local Exchange Carrier (LEC) switching facility. Also called Local Exchange or wire center. Refers to Class 5 switching office, at which subscribers' local loops terminate; handles a specific geographic area, identified by the first three digits of the local telephone number.

CEV

Controlled Environment Vault - A temperature- and humidity-controlled housing for electronic or optical equipment.

Channel Associated Signaling/Common Channel Signaling (CAS/CCS)

Framing modes associated with E1 signaling.

Clock

Internal timing device that creates a signal, generated by an oscillator. The oscillator creates a uniform electrical frequency from which digital pulses can be created. The clock signal provides a timing reference or base for sampling of signal elements in a transmission link; creates signals to be used in a transmission system to control the timing of certain functions; generate periodic, precisely spaced signals that can be used for timing, relating processor operations, or generating interrupts. The clock may be locked to an external reference signal.

Clock accuracy

The level of agreement of the frequency of a clock with the ideal frequency, specified as the magnitude of the fractional frequency offset from the ideal frequency. The fractional frequency offset is defined as the difference between the actual and ideal frequency divided by the ideal frequency. The frequency in this definition is generally the frequency averaged over a sufficiently long observation time (typically on the order of one hour to one day) to adequately determine the frequency.

Glossary (sidebar)

Glossary

Clock Module
A module that provides the "clock" functions defined for **Clock accuracy** (above). Usually, two clock modules are deployed in a TSG or SSU.

Clock signal
Uniform electrical frequency from which digital pulses can be created to provide a reference for transmission signal elements and for timing functions.

Clocking
In synchronous communication, a periodic signal used to synchronize transmission and reception of data and control characters.

CO
Acronym: Central Office.

Coaxial Cable
A copper-wire cable consisting of a central wire conductor surrounded by dielectric insulator and encased in a wire mesh. Coaxial cable provides excellent high frequency (hf) and very high frequency (vhf) transmission and data rates to hundreds of Mb/s. Commonly used as CATV transmission cable, 56kb/s data cables and ethernet LAN connections.

Code Division Multiple Access (CDMA)
New form of digital cellular phone service. CDMA is a spread spectrum technology that combines the original information signal with a correlating code, resulting in a signal which occupies a much greater bandwidth than the original but allows several simultaneous conversations to share the same frequency allocation.

CODEC
COder/DECoder - Device that converts analog signals to digital signals for transmission on digital lines. It also reconverts (digital to analog).

Communications Module (COMM)
A module within an SSU or TSG that supports user interaction with an SSU or TSG by means of information equipment such as a PC.

Computer Communication Protocol Interface (CCPI)
Binary interface developed by Datum to provide a common binary interface to Datum equipment, and used to download software or PLD images to the unit.

Computer Communication Protocol Interface.
A binary interface developed at Austron to provide for a common binary interface to Austron equipment. A subset of this is used by the SSU-2000 to download software or PLD images to the unit.

| CONFIGURATION |

Glossary

Configuration
The arrangement of modules and parameter settings within a decice.

Connector
Device for electrically connecting wires or fibers in cable to equipment or other wires or fibers.

Constant Bit Rate (CBR)
Data service in which bits are conveyed regularly in time and at a constant rate, carefully timed between source or transmitter and sink or receiver. The data transfer rates established by a timing source or clock.

Controller
SPI interface controller. The Controller is one of the modules that can be Master, typically either a Clock or Comm module.

CRC
Acronym: Cyclic Redundancy Checking.

CRC4
Cyclic Redundancy Checking protocol used with E1 signaling.

CRC6
Cyclic Redundancy Checking protocol used with DS1 signaling.

Critical Alarm
A critical alarm is a message that calls attention to an alarm condition that is potentially traffic-affecting, and may require immediate corrective action. Alarm message that signifies that the output reference is invalid or that the output modules have no clock source. A critical alarm activates the major alarm relays and the CRITICAL LED.

CSU
Channel Service Unit - A customer premises equipment (CPE) device used to terminate a DS1 or DS0 [56/64 Kbit/s] digital circuit. The CSU must comply with FCC rules and store error information provided by the Extended Super Frame (ESF). The CSU also performs line-conditioning, protection, loop-back and timing functions.

Cyclic Redundancy Checking (CRC)
A data validation process in which a CRC character, whose value depends on the hexadecimal value of the number of ones in the data block, is added to the data block at the end of a transmission by the transmitting device. The receiving device makes a similar calculation and compares the results to determine if there was a mistake in the transmission.

D4
In DS1 digital transmission technology, D4 is the fourth-generation channel bank or interface between the T1 transmission system and an analog premises device. D4 and ESF are the framing modes associated with DS1 signaling. D4 utilizes superframes for information transfer; ESF uses extended superframes. D4 framing is also called *SF.*

Glossary

Data Communications Equipment
As defined in the RS-232 specification, equipment to which DTE (Data Terminal Equipment) is connected, often to enable access to network facilities.

Data Communications Equipment (DCE)
Protocol which resolves interface issues between DTE and network. As defined in the RS-232 specification equipment to which DTE is connected, often to enable access to network facilities.

Data File
For the LMT, the fixed file name Comma Separated Value (.csv) file name extension in which the configuration settings are stored.

Data terminal equipment (DTE)
Generally end-user devices, such as terminals and computers, that connect to DCE, which either generates or receives the data carried by the network. The RS-232, V.35 and X.21 connections are common DCE to DTE interfaces.

Data Terminal Equipment (DTE)
In the RS-232 standard specification, the RS-232-C is connected between the Data Communications Equipment (DCE) and a DTE. The major difference between a DCE and a DTE is that pins two and three are reversed.

DCE
Acronym: Data Communications Equipment.

DCS
Acronym: Digital Cross-Connect System. Also DACS (Digital Automatic Cross-Connect System).

DCS
Acronym: Digital Cross-Connect System. *Also DACS (Digital Automatic Cross-Connect System).*

DDS
Acronym: Direct Digital Synthesis.

Dense Wavelength Division Multiplexing (DWDM)
Higher-capacity version of Wavelength Division Multiplexing (WDM), a means of increasing capacity of fiber-optic data transmission systems by multiplexing multiple wavelengths of light onto the same optical fiber.

Digital Cross Connect (DCS) System
Specialized type of high-speed data channel switch. Standard voice switches switch transmission paths in response to dialing instructions. DCD systems depend on separate, specific instructions, from an operator at a console or from a program, that are given independently of system calls, and that direct the connection of one line to another line.

Glossary

Digital Service, Level 1 (DS1)
A 1.544 Mb/s digital signal consisting of 24 DS0s and a framing bit (193 bits per frame, transmitted 8000 frames per second. May be carried on a T1 facility of other transmission medium.

Digital Service, Level 3
A 44.736 Mbit/s signal, which may consist of 28 DS1 signals multiplexed together.

Digital Subscriber Line Access Multiplexer (DSLAM)
Technology which concentrates traffic in ADSL implementations through Time Division Multiplexing (TDM) at the central office or remote line shelf.

DLCP
DownLoad Communication Protocol. A subset of the Austron Computer Communication Protocol (CCPI) that is used when downloading new program/ PLD images to the unit.

Download
Receive data into a computer or ROM from another computer, as for example, receiving updated software from a host computer into Flash ROM.

DS1
Acronym: Digital Service, Level 1.

DS3
Acronym: Digital Service, Level 3.

DSLAM
Acronym: Digital Subscriber Line Access Multiplexer.

DTE
Acronym: Data Terminal Equipment.

DTE/DCE Switch
2PDT slide switch located on the back panel of SSU-200 which allows user to select either DTE (default, connection to PC) or DCE (connection to modem) type serial port connections.

DWDM
Acronym: Dense Wavelength Division Multiplexing.

E1
A digital circuit with standardized characteristics that operates at 2.048 Mbit/s. This standard is widely used in Europe as the rough equivalent of a DS1 (E1 provides thirty 64 Kbit/s channels, six more than a DSS1).

Glossary

E3
A digital circuit with standardized characteristics that operates at 34 Maps. this standard is widely used in Europe for inter-carrier communications as the rough equivalent of a DS3.

Earth Ground
The connection of an electrical system to earth. This connection is necessary to provide lightning and static protection and to establish the zero-voltage reference for the system.

EIA
Electronic Industries Association - A standards organization that developed the RS-232 and other interfaces.

EIA-232
See *RS-232*.

Electromagnetic compatibility (EMC)
The ability of equipment or systems to be used in their intended environments within designed efficiency levels without causing or receiving degradation due to unintentional EMI (electromagnetic interference). EMI can be reduced by using proper shielding techniques and grounding.

Electromagnetic Interference (EMI)
Occurs when one device emits unwanted electrical noise, adversely affecting the operation of another device. EMI is reduced by copper shielding.

Electromagnetic Interference (EMI)
Electromagnetic interference. Radiation leakage outside of a transmission medium that results (mainly) for the use of high-frequency wave energy. May be reduced by shielding.

EMC
Acronym: **E**lectro**M**agnetic **C**ompatibility.

EMI
Acronym: **El**ectro**M**agnetic ✋interference.

ESD
Acronym: **E**lectro**S**tatic **D**ischarge

ESF
Acronym: **E**xtended **S**uper**F**rame format.

Glossary

Ethernet
A LAN and baseband protocol based on a packet frame that operates at 10 Mbit/s over coaxial cable and allow terminals, concentrators, workstations, and hosts to communicate.

Ethernet Address
12 hexadecimal numbers, unique to the system, which identifies a device.

ETSI
Acronym: European Telecommunications Standards Institute - European counterpart to the American National Standards Institute (ANSI), founded in 1988 as a result of an initiative of the European Commission, established to produce telecommunications standards for users, manufacturers, suppliers, administrations, and Post Telephone and Telegraph (PTT) administrations.

European Telecommunications Standards Institute (ETSI)
European counterpart to the American National Standards Institute (ANSI), founded in 1988 as a result of an initiative of the European Commission, established to produce telecommunications standards for users, manufacturers, suppliers, administrations, and Post Telephone and Telegraph (PTT) administrations.

Event History
Historical records of activities for a device, usually comprised of event messages indicating a change in the physical or logical state of the device and a timestamp.

Extended SuperFrame Format (ESF)
A modification of the Superframe (sometimes called D4) framing scheme for DS1. ESF extends the framing pattern from 12 frames to 24 frames. A frame is 192 data bits and one frame bit. The 24 frame bits are a unique pattern of 1s and 0s that allows for terminal alignment, frame count, CRC bits, and a 2 Kbit/s data channel. Framing allows receiving equipment to identify the start and sequence of data in the binary 1.544 million bits per second DS1 stream.

Facilities Data Link (FDL)
ESF allows 4 Kbit/s to be used for a facilities data link which supports the communication of various types of monitoring or diagnostic network information used for provisioning and maintenance. Series-21 units use FDL for PQL settings.

Fault
Hard failure or performance degradation serious enough to threaten network function.

FDL
Acronym: Facilities Data Link.

FG
Acronym: Frame Ground.

Glossary

FlashROM
Flash Read Only Memory - contains software known as firmware. FlashROM can be erased and reprogrammed but persists when power to the device is turned off. FlashROM can be updated by downloading new firmware into the FlashROM (also called Flash Memory).

FLL
Acronym: Frequency Lock Loop.

Frame Generator
Frame generators use certain input timing signals to generate a digital signal having a specific frame format, such as DS1 (ESF or SF). They also accept input PQL from the reference input and convert it to the appropriate sync status message (SSM) for output.

Frame Ground (FG)
Connected to the equipment chassis to provides protective grounding.

Framing
A specified pattern of bits which can be used by the receiver to identify the time slots allocated to each sub-channel in multiplexed digital channels. Framing bits may also carry alarm signals and other overhead information.

Framing Error
Error which occurs when a receiver does not interpret frame bits correctly.

Frequency
Rate at which waveform alternates. Frequency measurements are calculated from phase measurements over time.

Frequency Lock Loop (FLL)
Mechanism whereby a generated signal is locked to a precise frequency relationship with a reference clock signal. See also *Phase Lock Loop (PLL)*.

FTP
File Transfer Protocol. An application level data communications program that transfers files. Files are identified, located, segmented, tagged with a header and passed to the next protocol level for transmission. The name comes from TCP but the function is a typical application level program.

Gbit/s
Acronym: Gigabits per second.

Generic Requirement (GR)
A document providing criteria to telecommunication technology, equipment, and operation. A prevalent example is a Telcordia (formerly Bellcore) document type that replaces Framework Technical Advisory (FA), Technical Advisory

Glossary

(TA), and Technical Reference (TR) document types. The GR is a living document representing Telcordia Technologies' current view of a technology.

GHz
Unit of frequency equal to one billion Hertz or one thousand mega Hertz or cycles per second.

Global Positioning System (GPS)
System of satellites, that transmits its position and time (derived from on-board celestial navigation equipment and atomic clocks), and a pseudo random noise (PRN) code.

GPS
Acronym: Global Positioning System.

GR
Acronym: Generic Requirement.

Graphical User Interface (GUI)
A communication method between a computer and users that depends on graphical objects such as windows, menus, and icons. Users access software functions by manipulating the graphical objects using a pointing device or keyboard commands.

GUI
Acronym: Graphical User Interface.

HDB3
Acronym: High-Density Bipolar of Order 3.

Hertz (Hz)
A unit of frequency equal to one cycle per second (cps). One kilohertz equals 1000 cps; one megahertz equals 1 million cps; one gigahertz equals 1 billion cps.

High-Density Bipolar of Order 3
Zero suppression scheme associated with E1. It does not allow more than three consecutive zeros.

Holdover Mode
Mode of operation in which an internal clock provides the synchronization reference in the event that the internal reference is lost and another suitable reference is not available.

I/O
Acronym: Input/Output

Glossary

ICA
Acronym: International Communications Association. A major trade organization for large communications users based in Dallas, Texas.

ICS
Acronym: Interactive Command Set.

IEEE
Acronym: Institute of Electrical and Electronics Engineers.

IEEE
Acronym: Institute of Electrical and Electronics Engineers.

IEEE 802.3
The standard for Carrier Sense Multiple Access with Collision Detection is one of the most used LAN protocols.

IEEE 802.3
The standard for Carrier Sense Multiple Access with Collision Detection is one of the most used LAN protocols.

Impedance
The opposition to an electrical wave based on frequency, resistance, inductance, and capacitance. Measured in ohms. Impedance is said to be matched when all components of a communications channel present the same (normally standardized) average impedance to the communications signal.

IMTC
Acronym: International Multimedia Teleconferencing Consortium.

Input Channel
TBD

Input Module
TBD

Input Port
TBD

Institute of Electrical and Electronics Engineers (IEEE)
Professional society whose goal is to advance "the theory and practice of electrical, electronics, and computer engineering and computer science," and a significant standards-making body for telecommunications and computing.

| INTERACTIVE ASCII MODE |

Interactive ASCII Mode

Command set for interaction with telecommunications interfaces via an ASCII terminal (or other serial or network device), and composed of the commands, parameters, responses, and events that are typed at the system prompt or displayed in the user interface.

Interactive Command Set (ICS)

A set of commands, responses, and events forming an interface with an SSU or TSG or other equipment with which users can interact by means of a computer or terminal that is connected by a serial cable to the equipment.

International Multimedia Teleconferencing Consortium (IMTC)

Non-profit corporation whose goal is to facilitate the development and implementation of interoperable multimedia teleconferencing solutions based on international standards.

International Standards Organization.

Paris-based standard organization that define communications and computing standards. Example standards are ISO 7776 High-Level Data Link Control Procedures X.25, and ISO 9001, a rigorous quality assurance standard

International Telecommunications Union (ITU)

United Nation agency responsible for establishing standardized communications procedures and practices, particularly known for allocation of radio frequencies, including those used by satellites.

International Telecommunications Union, Telecommunications Services Sector (ITU-T)

Permanent organ of the ITU, responsible for studying technical, operating, and tariff questions, and for issuing recommendations of each with a view to standardizing telecommunications on a worldwide basis.

Internet Protocol (IP)

The Internet Protocol (IP) address, internally represented as a 32-bit unsigned value, unique to the network, and consisting of three parts: IP address, internet gateway address, and network mask. All parts take the same form as that of the IP address. The network mask is the specification as to which bits are to be interpreted as the network address, and is a 32-bit value with ones in all bit positions that are to be interpreted as the network position.

The IP Address consists of three parts: IP address, gateway address, and network mask.

n The IP address is Internet protocol address internally represented as a 32-bit unsigned value. For example, the IP dotted address 192.168.70.224 is internally represented as IP address 0xC0A846E0.

n The gateway address is the Internet gateway address. The format is the same as described for the IP address. The network mask is the specification as to which bits are to be interpreted as the network address.

n The network mask is a 32-bit value with ones in all bit position that are to be interpreted as the network position. For example, the network dotted mask 255.255.255.0 represented as network mask as 0xFFFFFF00. The IP address must be unique in the network.

IP

Acronym: Internet Protocol.

Glossary

IP Address
The IP Address consists of three parts: IP address, gateway address, and network mask. The IP address is Internet protocol address internally represented as a 32-bit unsigned value. For example, the IP dotted address 192.168.70.224 is internally represented as IP address 0xC0A846E0. The gateway address is the Internet gateway address. The format is the same as described for the IP address. The network mask is the specification as to which bits are to be interpreted as the network address. The network mask is a 32-bit value with ones in all bit position that are to be interpreted as the network position. For example, the network dotted mask 255.255.255.0 represented as network mask as 0xFFFFFF00. The IP address must be unique in the network.

ISO
Acronym: Organization for Standardization.
See also International Standards Organization.

ITU
Acronym: International Telecommunications Union.

ITU-T
Acronym: International Telecommunications Union, Telecommunications Services Sector.

IXC
Acronym: IntereXchange Carrier.

IXC
Acronym: IntereXchange Carrier.

Jumper
Strictly speaking, a wire connection between equipment and cable on a distribution frame. This term has come to be used for the adapters located on a chassis, to which standard connections are made to the internal logic and circuits.

kHz
Abbreviation: Kilohertz.

Kilohertz
Refers to a unit of frequency equal to 1,000 Hertz.

LAN
Acronym: Local Area Network.

LED
Acronym: Light Emitting Diode.

| LG |

Glossary

LG
Logic Ground

Light Emitting Diode (LED)
A semiconductor device that emits incoherent light formed by the P-N function. Light intensity is roughly proportional to electrical current flow. A principal light source for optical-fiber transmission used mainly with multi-mode fiber. Also used for visual identification.

LIU
Acronym: Line Interface Units

LMT
Acronym: Local Management Terminal.

LNA
Low Noise Amplifier

LO
Acronym: Local Oscillator.

Local Area Network (LAN)
A user-owned, user-operated, high-volume data transmission facility connecting servers within a confined area. Run by software such as NetWare or Appletalk. Physical transfer is performed by the access method (Ethernet, etc.).

Local Oscillator (LO)
The internal oscillator.

Local Terminal (LT)
Computer, laptop, or ASCII terminal which is connected to a network element by a direct serial connection.

Locked Mode
Operational mode in which the processor controls DDS on the clock input signals in order to maintain the output frequency with respect to the input reference. The processor measures the phase of each input and adjusts the control value based on the phase changes of the reference. The processor also monitors all input signals for MTIE, frequency, and input signal errors such as Loss of Signal (LOS) or Out of Frame (OOF).

LOF
Acronym: Loss of Frame.

Log On
Process by which users identify and authenticate themselves to a network system or interface. Users typically enter their username and password.

LOS
Acronym: Loss of Signal.

Loss of Frame (LOF)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOS is a condition that indicates that a valid framing pattern could not be obtained.

Loss of Signal(LOS)
Generic term which is used specifically in different signal domains. For example, in the SONET domain, LOS is a loss of signal condition which is detected physically at the receiver

LT
Acronym: Local Terminal.

MAJOR Alarm
Alarm message that indicates a failure or malfunction of important circuits and requires immediate attention. As an example, it is an alarm message which signifies that the output signals are not synchronized to an input signal.

Master
SPI interface master. The master is the only module that originates the SPI transfer.

Maximum Time Interval (MTIE)
A peak-to-peak measure of the longer-term phase-time variations of the significant instants of a signal.

Mbit/s
Acronym: Megabits per second.

MCU
Acronym: Micro controller Unit. See *Microprocessor Unit (MPU)*.

Mega Hertz
Refers to a frequency equal to one million Hertz, or cycles per second.

MHz
Abbreviation: Mega Hertz.

Micro controller Unit (MCU)
See *Microprocessor Unit (MPU)*.

| MICROPROCESSOR UNIT (MPU) |

Microprocessor Unit (MPU)
An electronic integrated circuit, typically a single-chip package, capable of receiving and executing coded instructions (e.g., INTEL 80286, 80386, Motorola 68000 are popular microprocessors).

MINOR Alarm
Alarm message which signifies a condition that is not fatal to synchronization, but which could lead to more significant problems.

Modem
Modulator/Demodulator - An electronic device used to allow a computer to send and receive data.

Moving Pictures Experts Group (MPEG)
Joint committee of ISO and International Electrotechnical Commission (EG).

MPEG
Acronym: Moving Pictures Experts Group.

MPU
Acronym: Microprocessor Unit.

ms
Abbreviation: milliseconds.

MTIE
Acronym: Maximum Time Interval Error.

NE
Acronym: Network Element.

Network Element (NE)
Processor controlled entities of the telecommunications network that primarily provide switching and transport network functions and contain network operations functions.

Network Time Protocol (NTP)
NTP is a 64-bit protocol quantifying the absolute time (time of day). The reference scale is Universal Time Coordinated (UTC). It counts the seconds since the year 1900 with a resolution of 232 picoseconds.

NFOEC
Acronym: National Fiber Optic Engineers Conference.

Non-Volatile Random Access Memory (NVRAM)
RAM that does not lose its memory when power to it is turned off, and typically used to store software configuration settings.

NTP
Acronym: Network Time Protocol.

NVRAM
Acronym: Nonvolatile Random Access Memory.

OAM&P
Acronym: Operation, Administration, Maintenance, and Provisioning.

OC-12
Acronym: Optical Carrier, Level 12.

OC-192
Acronym: Optical Carrier, Level 192.

OC-3
Acronym: Optical Carrier, Level 3.

OC-48
Acronym: Optical Carrier, Level 48.

OC-48
Acronym: Optical Carrier, Level 48.

OC-N
Acronym: Optical Carrier, Level N.

OOF
Acronym: Out of Frame.

Open Systems Interconnection (OSI)
Standard protocol model developed by the Organization for Standardization for communication between systems created by different vendors, the goal of which is to create an open systems networking environment in which any system can share date with any other system on that or a linked network. The model organizes the communications process into seven categories and places the categories in a layered sequence based on the relation of each to the user. In this model, layers 7 through 4 treat the end to end communications between the message source and the message destination; layers 3 through 1 treat network access.

| ORGANIZATION FOR STANDARDIZATION (ISO, IOS) |

Glossary

Organization for Standardization (ISO, IOS)
Often called International Standards Organization, this voluntary, non-treaty, non-governmental organization located in Geneva was chartered by the United Nations to define and publish international standards for all fields other than electrical and electronic engineering.

Oscillator
An electronic device used to produce repeating signals of a given amplitude or frequency.

OSI
Acronym: Open Systems Interconnection.

Out of Frame Error (OOF)
Designates an error condition in framing bits, declared when two of four or two of five framing bits are missed.

Output Module
Provides output sources from the SSU or TSG, or similar equipment.

Output Port
An output port is a point of access for signals to be transmitted from equipment. In the case of Synchronization Equipment (SE), an output port provides synchronization signals of a specific format. There are typically multiple output ports per output module. (See *Port*.)

Password
Word or string of characters which a user or system administrator associates with a username, and which is entered by the user during the login in process to authenticate the username login to the network.

PBX
Acronym: Private Branch eXchange.

Phase Lock Loop (PLL)
Mechanism whereby a generated clock signal is locked to a precise phase relationship to a reference clock signal. A signal that is phase locked is also frequency locked. In some equipment, the receiver uses a PLL to derive timing signal information by locking the local clock source to the external timing signal. See also *Frequency Lock Loop (FLL)*.

Phase Measurement
Phase measurements determine the difference in phase between the input signals and the reference clock.

PLD
Acronym: Programmable Logic Device (also called LCA or FPGA.)

Glossary

PLL

Acronym: Phase Lock Loop.

Port

A point of access into a computer, an network, or other electronic device. The physical or logical interface through which one gains access.

PPS

Acronym: Pulses Per Second. See *1 PPS*.

PQL

Acronym: Priority Quality Level.

PRC

Acronym: Primary Reference Clock.

Primary Reference Clock (PRC)

Any device that provides a PRS quality output signal. PRC is the ETSI and ITU name for a PRS.

Primary Reference Receiver (PRR)

A radio receiver that provides a PRS quality output signal.

Primary Reference Source (PRS)

Timing signal with ANSI Stratum 1, or ITU and ETSI PRC accuracy and stability.

Master clocking source in a system or network from which other distributed devices derive their clocking and which enables the system or network to maintain synchronization.

Priority Quality Level (PQL)

Used internally in to represent the Synchronization Quality Level. See SPI interface document (12613087-000-2).

Priority Quality Level (PQL)

PQL settings provide an internal representation of traceability of signal presented at the input ports. The PQL settings can be managed by means of an editable translation table in which PQLs are assigned for provisioning Synchronization Status Messages. PQL information is carried in the FDL of the ESF.

PRN

Acronym: Pseudo Random Noise. See *Global Positioning System*.

PRR

Acronym: Primary Reference Receiver.

| PRS |

Glossary

PRS
Acronym: Primary Reference Source

Rack
Aluminum or steel rack onto which equipment is mounted. The telecommunication industry standard rack size is 19 inches (48.26 cm) or 23" inches (58.42 cm) wide at the front. Telecommunication equipment is mounted on the rack and cables are laid in and fastened to the rack.

Rack mounting ears
Adjustable brackets which attach to the sides of the equipment chassis to allow a 19-inch (48.26 cm) chassis to be mounted in a standard 23-inch (58.42) rack.

Rb oscillator
Rubidium oscillator, typically used in Stratum 2 or Stratum 2E clock modules.

RJ-45
The 9-pin connector used for data transmission over flat or twisted standard telephone wire. Flat wire is used for serial data communications up to 19.2 Kbps to PBXs, modems, printers, or printer buffers. Twisted wire is used for connecting to a 10Base-T local area network. Connectors are keyed or non-keyed. Keyed male connectors have a *key* or small square bump on the end; keyed female connectors are shaped to accommodate the key.

RS-232
Also known as EIA/TIA-232-E. A set of standards specifying electrical, functional, and mechanical interfaces for communicating serially between computers, terminals, and modems. The interface established by EIA to specify functions of interchange circuits, electrical characteristics, and connectors.

RS-232-C
The industry standard for a 25-pin interface that connects computers with various forms of peripheral equipment; i.e., modems, printers, etc.

RS-232-D
An EIA-specified physical interface, with associated electrical signaling, between data circuit-terminating equipment (DCE) and data terminal equipment (DTE); the most commonly employed interface between computers and modems.

S/A
Selective Availability. Refers to the ability of the Department of Defense (DOD) to purposely degrade the accuracy of GPS coarse acquisition codes to an accuracy of about 100 meters. Series-21 units use software PLL with a dynamic loop tau to minimize the effects of S/A from the GPS satellite-derived PRS signal and environmental effects of the unit.

SDH
Acronym: Synchronous Digital Hierarchy.

SDU
Synchronization Distribution Unit

SE
Acronym: Synchronization Element.

SEM
Acronym: Synchronization Element Manager.

SPI
A hardware and software interface that is used to communicate to any devices connected to a Telecom or network unit.

Serial Transmission
The sequential transmission of the bits constituting an entity of data over a data circuit.

SF
See *D4*.

Shielding
Protective enclosure surrounding a transmission medium, such as coaxial cable, designated to minimize electromagnetic leakage.

Sine wave
Analog wave which varies continuously in terms of amplitude and frequency.

Slave Clock
A clock which is normally locked to a reference timing signal.

Software Configurable
Hardware options which operators can set by entering software commands via a communications interface.

Software Configurable Hardware
Hardware options that operators can set by means of a software interface.

SONET
Acronym: Synchronous Optical NETwork.

| SPI |

SPI
Acronym: Serial Peripheral Interface.

Square wave
Digital signal which is binary in nature (in contrast to an analog sine wave which varies continuously in terms of amplitude and frequency)

SSM
Acronym: Synchronization Status Message.

SSP-IDCS
Acronym: Software Switching Platform Integrating DCS.

SSU
Acronym: Synchronization Supply Unit.

ST2E Rb Clock
Stratum 2E Rubidium clock module. Uses the Rubidium oscillator and meets or exceeds the performance requirements for ANSI and Telcordia Technologies (Bellcore) Stratum 2, ITU Type II and ETSI clocks.

Stratum 1
Stratum 1 is the highest quality or performance level in terms of accuracy and stability of a frequency source specified in T1.101, and refers to a Primary Reference Source.

Stratum Levels
Standard T1.101 defines levels of performance of clocks in a synchronized network in terms of accuracy and stability. Stratum 1 is the highest level of performance and stratum 4 is the lowest.

Synchronization
Timing of network transmissions by a master clock.

Synchronization Element Manager (SEM)
Software interface for managing performance, configuration, security, fault, alarm, and event reporting for synchronization elements.

Synchronization Status Message (SSM)
Sync Status Messages - Defined bits used to transmit the traceability of the sync reference signal and the quality of the clock being used to sync the outputs.

Synchronization Status Message (SSM)
Method by which synchronization network elements can communicate the traceability of their synchronization quality levels. SSMs take the form of identifiers embedded within the reference signals, and are used as

synchronization sources for Timing Signal Generators (TSGs) and other network elements (NEs). The identifiers carry information about the quality of the synchronization source to which the particular synchronization signal is traceable. Identifiers also indicate whether the signal is available for use as a synchronization source. SSMs are especially useful in avoiding timing loops, while allowing the TSG or NE to autonomously reconfigure to the most suitable synchronization source available.

Synchronization Supply Unit (SSU)
Equipment that performs the function of reference timing signal selection, processing, and distribution that provides the frequency characteristics of slave clocks for telecommunications synchronization.

Synchronous Digital Hierarchy (SDH)
The ITU-T standard for synchronous data transport on optical interfaces, similar to the SONET standard.

System
A collection of component that perform a defined function, as in a transmission system or a computer system.

T1
A Digital transmission system that carries a DS1 signal at a rate of 1.544 Mbit/s, and operates on twisted copper pairs with a repeater spacing of about 1 mile.

T1 Committee
A standards committee accredited by ANSI and sponsored by the Alliance for Telecommunication Industry Solutions (ATIS) to establish U.S. standards for digital telephony.

T1X1
Technical subcommittee to T1 responsible for standards relating to digital hierarchy and synchronization.

T3
The planned name of a digital transmission system that carries a DS3 signal at a rate of 44.736 Mbit/s. The DS3 signal is now generally multiplexed and transported on other facilities.

TBNC/BNO Connector
TBD

Tbit/s
Acronym: TeraBits per Second.

TCP/IP
Acronym: Transmission Control Protocol/Internet Protocol.

Glossary

| TDEV |

Glossary

TDEV
Acronym: Time Deviation.

TDM
Acronym: Time Division Multiplex.

Telcordia Technologies
Current name of the organization that was formerly Bellcore.

Time Deviation (TDEV)
A measure of the longer-term expected phase-time variations (wander) of a signal as a function of integration time. TDEV also provides information on the spectral content of the phase-time noise of a signal.

Time Division Multiplex (TDM)
Technology for sharing communication path between multiple sources, accomplished by transmitting a number of separate data, voice, or video signals simultaneously over one communications medium by sampling data, quickly interleaving sample (pieces of each signal), transmitting samples one after another, and reconstructing at the end. The goal is to pack more conversations of all data types onto fewer phone lines, in effect, substituting electronic capability for more copper line.

Time of Day (TOD)
Time and date information.

Timing Signal Generator (TSG)
Device which generates and distributes network synchronization signals, generally in a variety of waveforms.

Timing Signal Generator (TSG)
Device which generates and distributes network synchronization signals, generally in a variety of waveforms.

Tip and Ring
Two wires, positive and negative, needed for a connection.

TL1
Acronym: Transaction Language One.

TOD
Acronym: Time of Day.

Transaction Language One (TL1)
A Telcordia interface standard used in the telecommunications industry for O, A, M, & P functionality.

Glossary

Transmission Control Protocol/Internet Protocol (TCP/IP)
Two of the protocols from a suite of networking standards developed by the U.S. Department of Defense in the 1970s to support a global system of interconnected networks.

TSG
Acronym: Timing Signal Generator.

Turn up
Power up or on.

Twisted Pair
A cable composed of two small insulated conductors twisted together, usually without a common cover. The two conductors are usually substantially insulated so that the combination is a special case of the cord. Telephone signals are the most common use of twisted pair technology.

Universal Time Coordinated (UTC)
Time scale maintained by cooperating international agencies including the US Naval observatory, the Bureau International des Poids et Mesures, and the International Earth Rotation Service. UTC is the standard official time and forms the basis of a coordinated dissemination of standard frequencies and time signal.

Unshielded Twisted Pair
Transmission medium consisting of a pair of electrically balanced copper conductors, each of which is separately insulated to prevent *shorting*. The conductors are twisted around each other at routine intervals to confine the electromagnetic field within the conductors, thereby maximizing signal strength over a distance and minimizing interference between adjacent pairs in multi-pair cables.

User Interface
Software-defined boundary mediating between machine and user.

Username
The name by which each user is known in the network administration. Each user must enter a username when logging in to identify the user to the network. Each username is also associated with a password, which validates the username, and an access level which determines the degree of access granted to the user.

UTC
Acronym: Universal Time Coordinated.

UTP
Acronym: Unshielded Twisted Pair.

| UTP |

Glossary

UTP
Unshielded Twisted Pair - Transmission medium in which a pair of copper conductors, twisted around each other at intervals, are separately insulated, generally with plastic, to prevent shorting.

VCXO
A crystal oscillator whose clock frequency is determined by the magnitude of the voltage presented at its input. Such oscillators are typically a component of a hardware PLL or FLL.

VCXO
Acronym: Voltage Controlled Crystal Oscillator.

vDC
Acronym: Volts Direct Current.

Voice/Video over Internet Protocol (VoIP)
The VoIP Forum was established in 1996 by Cisco Systems as a working group of the International Multimedia Teleconferencing Consortium (IMTC).

VoIP
Acronym: Voice/Video over Internet Protocol.

VoIP SynCBR
Acronym: Voice/Video over IP Sync Constant Bit Rate.

Volt
A unit of measurement of electromotive force. A voltage is always expressed as the potential difference in available energy between two points. One volt is the force required to produce a current of one ampere through a resistance or impedance of one ohm. See *Direct Current*.

Watchdog Timer
Mechanism used to trigger an event or an escape from a process unless a timer is periodically reset. For example, a time may indicate the maximum period of time that a network connection will remain open before expiring.

Index

Numerics

10MHz output 2-4
1544 Kbits output version 2-5
1544 Kbps signals 2-1
2 gauss, fields of interference 3-2
2048 Kbits output version 2-5
2048 Kbps signals 2-1
25 degrees Centigrade, specifications A-1
5 MHz reference signal 2-10

A

abbreviations 1-3
AC/ DC
    interference 3-2
accuracy 1-1
acronyms 1-3
address, shipping 6-5
Alarm
    contacts 2-4
    critical mode 2-4
    factory configuration 2-4
    type 2-4
    warning mode 2-4
alarm activation 6-3
alarms, Reset Unit Alarms 5-2
AMI pulse signal 2-10

B

beam, cesium 1-1

C

cable
    null modem 5-1
cable connection, RS 232 3-9
cable type, RS 232 3-9

carriers, return shipping 6-5
cautions, defined 1-4
cautions, ESD, defined 1-4
cesium 133 6-4
cesium beam tube 1-1
Cesium Beam Tube Vacuum maintenance 6-7
Cesium Frequency Standard module
    components 2-6
    definition 2-7
    elements of 2-7
    signal quality 2-6
cesium isotope, shipping 6-4
Cesium lock 2-10
CFS 2-6
checklists
    pre-installation 3-2
cleaning caution 6-1
comment form 7
comments, questions 1-5
communications
    default settings 3-11
    establishing 3-11
configuration
    serial port 4-4
    system, factory 4-15
    telecom outputs 4-13
    unit initialization 4-11
    unit monitoring 4-6
connections
    power 3-7
connector types
    adapter, DB9 to wire wrap 2-4
    DB25 3-9
    DB9 2-4, 3-10
    RS-232 2-4
convection cooling space 3-4
conventions
    typographical and other 1-3
critical mode, explained 4-12
customer service
    E-mail address 3-1
    phone number 3-1

D

D4 format 2-5

Index

| E—M |

Index

Index

NETSYNCPLUS®

| T—W |

T

U

V

W

Index

Index

| W—W |

Index

Reader Comment Form

Company:

Name: Title and Department:

Telephone: email:

Job Responsibility:

Please indicate your evaluation of this manual. Attach additional sheets with comments as needed.

1. How and when do you use this manual?

- ☐ Read entire manual before attempting task
- ☐ Read selected sections before attempting task
- ☐ Read while attempting task
- ☐ Attempt task first
- ☐ Read as last resort

2. How well is the manual's content *organized*? Please explain.

- ☐ **Excellent** — parallels product's operation, very usable
- ☐ **Good** — representative of the product's operation, usable
- ☐ **Average** — usable but can be improved
- ☐ **Fair** — not very usable, must be improved
- ☐ **Poor** — not usable, must be improved

Understandable   **Applicable**

3. Is the manual's content *understandable* and *applicable* to the product's operation? Please

- ☐ ☐ **Excellent** — very easy to understand, very applicable
- ☐ ☐ **Good** — easy to understand, applicable
- ☐ ☐ **Average** — applicable but some sections not easy to understand
- ☐ ☐ **Fair** — not very understandable or applicable, must be improved
- ☐ ☐ **Poor** — not understandable or applicable, must be improved
- ☐ ☐ **No Opinion**

4. How well do the manual's *illustrations* convey product information? Please explain on a separate

- ☐ **Excellent** — very easy to understand, extremely usable
- ☐ **Good** — easy to understand, very usable
- ☐ **Average** — fairly easy to understand, usable
- ☐ **Fair** — not easy to understand, should be improved, not very usable
- ☐ **Poor** — cannot understand, must be improved, totally unusable
- ☐ **No Opinion**

5. Describe the *amount* of usable information in this manual

☐ **Too much information** — not all required to perform task
☐ **Proper amount provided** — not too much or too little
☐ **Too little information** — needed additional information to perform task
☐ **No Opinion**

Sections ⟶   ⟵ **Index**

6. How well is information *cross-referenced* in the manual's individual section and index? Please explain.

☐ ☐ **Excellent** — very easy to locate information, extremely usable
☐ ☐ **Good** — easy to locate information, very usable
☐ ☐ **Average** — fairly easy to locate information, usable
☐ ☐ **Fair** — not easy to locate information, should be improved, not very usable
☐ ☐ **Poor** — cannot locate information, must be improved, totally unusable
☐ ☐ **Did Not Use**
☐ ☐ **No Opinion**

7. How *useful* is the Glossary?

☐ **Useful**
☐ **Useful but not complete or accurate**
☐ **Not Useful**
☐ **Did Not Use**
☐ **No Opinion**

8. What is your *overall impression* of this manual? Please explain.

☐ **Excellent** — met all needs, extremely usable
☐ **Good** — met most of my needs, very usable
☐ **Average** — usable
☐ **Fair** — should be revised, not very usable
☐ **Poor** — must be revised, totally unusable
☐ **No Opinion**

Please fax or mail this form to:
Fax Number: (512) 251-9685
Attention: Technical Documentation Editor

Datum, Inc.
Attention: Technical Documentation Editor
P.O. Box 14766
Austin, TX   78761

For 24-hour customer service, contact Datum, Inc.:

Address: P.O. Box 14766, Austin, Texas 78761

Shipping Address: 15811 Vision Drive, Pflugerville, Texas 78660

Phone: 512.721.4000 • Fax: 512.251.9685

Email: austinsupport@datum.com

Datum