ALSTOM

DataLogger

An Event Recording Utility for CenTraCode® and VPI® Systems

User's Manual
P2512E

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User's Manual
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PREFACE

NOTICE OF CONFIDENTIAL INFORMATION

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ABOUT THE MANUAL

This manual is intended to provide the basic information needed to understand how to use the DataLogger utility, an event recording utility for CenTraCode® and VPI® Systems.

The information in this manual is arranged into sections. The title and a brief description of each section follow:

Section 1 – INTRODUCTION: This section gives general information on manual intent, content, and describes DataLogger functions.

Section 2 – QUICK-START GUIDE: This section contains typical setup and usage of DataLogger.

Section 3 – EVENT SOURCES, TYPES AND LOGGING MODES: This section contains information on how event logs are identified by source and type as well has how the event logs can be recorded in a variety of ways.

Section 4 – CONFIGURATION BY THE ALSTOM CAAPE: This section provides a guide to installing DataLogger using the Alstom Computer Aided Application Programming Environment (CAAPE) software package.

Section 5 – USING DATALOGGER DIAGNOSTICS: This section describes use of DataLogger's diagnostic menus.

Section 6 – GENERIC PORT INTERFACE: This section explains how to access DataLogger remotely through the Generic Port Interface (GPI), and gives the format of messages used with DataLogger from a remote location.

Appendix A – SAMPLE NON-VITAL APPLICATION FILES: This appendix contains sample non-vital application files.

Appendix B – GLOSSARY OF TERMS: This appendix defines technical terms and abbreviations used throughout this manual.

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MANUAL SPECIAL NOTATIONS

In the Alstom manuals, there are three methods used to convey special informational notations to the reader. These notations are warnings, cautions, and notes. Both warnings and cautions are readily noticeable by boldface type two lines beneath the caption.

Warning

A warning is the most important notation to heed. A warning is used to tell the reader that special attention needs to be paid to the message because if the instructions or advice is not followed when working on the equipment then the result could be either serious harm or death. The sudden, unexpected operation of a switch machine, for example, or the technician contacting the third rail could lead to personal injury or death. An example of a typical warning notice follows:

WARNING

DISCONNECT THE MOTOR ENERGY WHENEVER WORKING ON SWITCH LAYOUT OR SWITCH MACHINE. UNEXPECTED OPERATION OF MACHINE COULD CAUSE INJURY FROM OPEN GEARS, ELECTRICAL SHOCK, OR MOVING SWITCH POINTS.

Caution

A caution statement is used when an operating or maintenance procedure, practice, condition, or statement, which if not strictly adhered to, could result in damage to or destruction of equipment. A typical caution found in a manual is as follows:

CAUTION

Turn power off before attempting to remove or insert circuit boards into a module. Boards can be damaged if power is not turned off.

Note

A note is normally used to provide minor additional information to the reader to explain the reason for a given step in a test procedure or to provide a background detail. An example of the use of a note follows:

NOTE

A capacitor may be mounted on the circuit board with a RTV adhesive. Use the same color RTV.

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1. SECTION 1 – INTRODUCTION

This manual contains the basic information needed to understand how to use the DataLogger utility, an event recording utility for CenTraCode® and VPI® Systems.

1.1. INTENDED AUDIENCE

This manual is written for signaling application engineers and others who wish to understand the operation of the DataLogger utility.

1.2. INTRODUCTION

Alstom DataLogger is an embedded event recording software utility that operates on the following non-vital processor boards:

- Alstom CenTraCode II-s
- Alstom CSEX2 (Code System Emulator Extended II)
- Alstom CSEX3 (Code System Emulator Extended III)

DataLogger is an optional component and may be included in a non-vital application at the user's discretion.

Although DataLogger is highly optimized, its inclusion, like any other module, introduces an additional load to the non-vital processor. Application designers should consider this fact when considering whether to include DataLogger in applications that employ fast communication protocols.

1.3. KEY FEATURES

- View Events Historical, Real Time
- Filter Unwanted Info
- Save Data In Nonvolatile Memory
- Timeline and Timestamp Views
- Record time-stamped events to on-board battery-backed memory
- Event capacity is typically several days
- Automatically detect a change to a large number of user-specified application parameters, and record when changes occur in real-time
- On-line help is available to assist the operator

1.4. SUPPORTED ALSTOM OPERATING ENVIRONMENTS

The DataLogger software operates on an Alstom non-vital processor board as one of several software modules dedicated to performing a specific function in the system. Although not all modules share data with each other, all have links to the non-vital processor board's System Software Executive (the board's proprietary operating system).

When included in a non-vital application, the DataLogger module provides interfaces suitable for accepting data to be logged from other installed modules, such as communication protocols. DataLogger also provides three specialized sub-modules integral to it for logging specific types of data:

- User-composed messages referred to as "User Messages"
- Non-Vital Inputs (NVI) changes
- Non-Vital Outputs (NVO) changes

1.5. REAL-TIME CLOCK

All logged data bears a time stamp resolved to one second based on the system clock on the non-vital processor board. The Alstom non-vital processor boards are each equipped with a battery-backed hardware-based Real-Time Clock (RTC).

NOTE

For proper time-stamping of events, it is imperative that the system's RTC be initialized. See the Section 5, Heading 5.3.4.2., for clockset details.

1.6. MEMORY USAGE

DataLogger battery-backed memory space is partitioned into three major areas:

1. *Scratch Pad*
2. *Directory Frames*
3. *Log Frames*

1.6.1. Scratch Pad

DataLogger reserves approximately 250 bytes of battery-backed RAM for its housekeeping activities. This secured area, referred to as the *Scratch Pad,* holds the DataLogger operating parameters and intermediate data requiring battery backup.

1.6.2. Directory Frames

A 4K-byte block of battery-supported RAM is reserved to hold 192 *Directory Frames*. A record is entered in this area upon the creation of a new directory, typically every hour.

In addition to other information, a *Directory Frame* contains the memory locations of the group of event data logs (called *Log Frames*) that occur in a given hour. *Directory Frames* facilitate locating event data for report generation, and because each *Directory Frame* contains the date and time, this reduces the size of each *Log Frame*.

Each *Directory Frame* is a fixed length structure, as detailed in Table 1–1. Note that 0xNNNN denotes a hexadecimal (base 16) value.

DataLogger stores a *Directory Frame* under the following conditions:

- System Reset: when the operating system is reset or is powered up
- Start of an Hour: when the system clock advances to a new hour
- Clock Setting: when the operator modifies the system date or time through DataLogger's password protected clock-setting utility
- Operational Change: A logging parameter is changed on-line by the user
- End of Memory: when DataLogger reaches the end of physical battery-backed memory (but only if Timed Data Protection has expired for the oldest logged data)

In each instance, the creation of a new *Directory Frame* can be inhibited by the enforcement of Timed Data Protection wherein logs are protected from being overwritten until data is older than the user-specified duration. A new *Directory Frame* is not created until after timed protection expires.

Since during normal operation, DataLogger stores a new *Directory Frame* every hour (in lieu of Timed Data Protection) and there are 192 *Directory Frames*, this sets a maximum limit of eight days of logged data. Once DataLogger's internal table of 192 *Directory Frames* becomes full, the oldest *Directory Frame* and all of its associated logged data are erased and reused when new event data occurs.

Table 1–1. Directory Frame Contents

Bytes	Directory Frame Structure Member Description
3	The creation second, minute and hour for this *Directory Frame*
2	The creation day and month for this *Directory Frame*
2	The creation year, including the millennium, for this *Directory Frame*
2	The primary status indication: • 0x5656 = this directory's data logs are valid and can therefore be accessed and time-protected • 0x5858 = this directory's data logs have expired and therefore can no longer be accessed
1	The secondary status indication: • 0x55 = closed: data can no longer be written into this directory • 0xFF = open: the directory is valid and is termed the "current" directory • 0xAA = dumped (not applicable as of DataLogger Rev. A18) • 0x58 = expired: this directory's data logs can no longer be accessed
2	The number of *Log Frames* (event data logs) associated with this directory
4	The pointer to (address of) the first (oldest) *Log Frame* associated with this directory
4	The pointer to the next available area of memory for the next *Log Frame*; except for the open (current) *Directory Frame*, this pointer contains the address of the first *Log Frame* of the next *Directory Frame*
1	The memory page that includes the first (oldest) *Log Frame* associated with this directory [added in DataLogger Rev. A18] **NOTE** This applies only to CSEX3 which has four 256K "pages" of memory (1MB total).
1	The memory page that includes the last (most recent) *Log Frame* associated with this directory [added in DataLogger Rev. A18] **NOTE** This applies only to CSEX3 which has four 256K "pages" of memory (1MB total).

1.6.3. Log Frames

The remaining battery-backed random-access memory (BBRAM) is dedicated for DataLogger to store event logs (referred to as *Log Frames*).

A *Log Frame* is composed of event and descriptive data. The descriptive portion of a *Log Frame* has a fixed length of seventeen bytes used to identify the type and source of the event data (see Table 1–2). *Log Frames* are variable in length due to the various types of data that may be logged.

Table 1–2. Log Frame Contents

Bytes	**Log Frame Structure Member Description**
4	Pointer to (address of) the start of the previous (older) *Log Frame*
4	Pointer to the start of the next (more recent) *Log Frame* or next available memory space
1	Number of the *Directory Frame* to which this log belongs
2	Type of data logged (refer to Section 3, Event Sources, Types and Logging Modes)
2	Source of the data (refer to Section 3, Event Sources, Types and Logging Modes)
1	The second this *Log Frame* was created
1	The minute this *Log Frame* was created
2	The total number of following data bytes (*n*) in this *Log Frame*
n	Data bytes; contents depends upon the type and source of the data

Events are stored in consecutive memory locations until the end of the data logging area is reached, then DataLogger restarts at the beginning of the data logging area to store subsequent event data. This causes the data stored at the beginning of memory to be overwritten. This overwrite can be inhibited by utilizing the optional Timed Data Protection mechanism provided by DataLogger. Table 1–3 summarizes the total amount of battery-backed memory available on the different hardware platforms on which DataLogger operates.

1.7. LOGGING CAPACITY

The logging capacity of DataLogger is expressed in terms of the approximate maximum number of events that can be stored before event memory becomes full. In addition, the DataLogger *Directory Frames* effect logging capacity, as discussed previously.

The following example assumes that DataLogger is configured to log only changes to User Message parameters, and that only one parameter at a time changes state. User Messages are described in Section 3, Event Sources, Types And Logging Modes. An estimate of logging capacity also depends upon the hardware platform in use, since each provides a different amount of battery-backed memory as shown in Table 1–3.

Table 1–3. Approximate Battery-Backed Memory Capacity

Hardware Platform	Total Available Battery-Backed Memory for Event Storage
CenTraCode II-s	125,000 bytes
CSEX2	250,000 bytes
CSEX3	977,000 bytes*

*This applies to DataLogger Rev. A18 (or later). Earlier revisions of DataLogger provided 250,000 bytes of CSEX3 memory.

In this example, each stored event (*Log Frame*) requires twenty bytes of memory consisting of seventeen bytes for descriptive data (summarized in Table 1–2) and three bytes of data for the single parameter that changed state. Therefore, if DataLogger is run on a CSEX2 board, approximately 12500 events (250000/20) are logged before memory becomes full. On a CSEX3 board, 48850 events (975000/20) fill the memory.

For capacity in total logging time, estimate how many events typically occur each hour. Use the previous example and assume an average of five events per minute (300 events per hour):

- CSEX2: DataLogger memory is full in about 42 hours (12500/300) – 1 day, 18 hours
- CSEX3: DataLogger memory is full in about 163 hours (48850/300) – 6 days, 19 hours

Adjust this calculation based upon the expected frequency of events.

In a given application, it may be determined that usually several parameters change state simultaneously, and is therefore logged as a single event by DataLogger. In this case, a typical *Log Frame* contains multiple parameter changes and be larger than the twenty bytes shown in the example above. Calculate the size (in total number of bytes) of a typical change message *Log Frame* as follows:

- Seventeen bytes of descriptive data as summarized in Table 1–2; plus
- One additional byte (containing the total number of changes in this *Log Frame*); plus
- Two bytes multiplied by the average number of parameters that typically change state simultaneously

For example, if a typical event contains three parameter state changes, the size of a typical *Log Frame* is 24 bytes (17+1+2*3). In this case, multiple state changes are stored in a single *Log Frame* instead of in separate *Log Frames* so that each event does not incur the overhead of separate *Log Frames*. This is a more efficient use of event memory.

1.8. DATA PROTECTION

DataLogger stores *Log Frames* in contiguous memory locations. After DataLogger uses all available battery-backed memory, it seeks to overwrite *Log Frames* that belong to the oldest *Directory Frame*. An optional Timed Data Protection mechanism exists that can be used to prevent events from being overwritten until after data has “aged” sufficiently. The minimum length of time a *Directory Frame* is saved after is it created is configurable. Refer to Section 4, Configuration By The Alstom CAAPE: Data Protection Record, for details on configuring Timed Data Protection.

NOTE

Events are not logged while DataLogger waits for Timed Data Protection to expire. The creation of *Directory Frames* because of manual clock change and hourly rollovers is also inhibited.

1.9. EVENT MEMORY RECLAMATION

DataLogger reclaims all memory formerly used to store events associated with a *Directory Frame*. Given the same log sources and types, the size of a *Directory Frame’s* event memory area varies with the number of *Log Frames* stored. Areas occupied by periods of heavy event traffic are larger than those with little or no event traffic. When DataLogger reclaims a data log area, the status indicator in the *Directory Frame* that describes the area is set to *expired*. Data in an *expired* area cannot be meaningfully interpreted.

1.10. SYSTEM OVERLOADING

The hardware platforms on which DataLogger runs primarily serve to emulate code systems and execute non-vital Boolean logic. The flexibility of these platforms has allowed them to fill a wide range of additional applications, such as event recording.

In a system operating with fast communication protocols for code system emulation, it is possible to overload the system by setting up DataLogger to record a wide range of frequently changing parameters. Application designers should limit loading to essential requirements and set up DataLogger to record only needed parameters.

Another example of how a system can be overloaded is to configure DataLogger to record all code line messages (serial controls and indications) using *Direct* mode instead of the default *Relay* mode. *Direct* mode introduces an overhead that handicaps code line systems that operate with short inter-scan delays (the time interval between messages received by a field location from a control center). For a discussion of *Direct* vs. *Relay* mode, see Heading 5.3.4.4.2., Logger > Util > Setup > System, General System Configuration.

2. SECTION 2 – QUICK START GUIDE

This section provides typical DataLogger installation and usage guidelines. DataLogger is a very versatile tool. The guidelines in this section show one typical usage of DataLogger. Subsequent sections in this manual describe various setup options in DataLogger, some of which may be appropriate for use in certain non-vital applications. The instructions that follow are not global recommendations for all applications, but are intended only to show the typical set up and usage of DataLogger.

The basic steps in setting up and using DataLogger in a non-vital application are:

1. Include DataLogger in the non-vital application, and define the type of data to be logged. Details are located in Section 4, Configuration by the Alstom CAAPE".

- To include DataLogger in the non-vital application, place the following record in the application's CSI file:

```
DATA LOGGING = ON
```

- In the application, create a DATA LOGGING SECTION and place the following records in this section:

```
LOCATION ID = 1
DATA PROTECT = 0 HOURS
DATA LOG = (DIAGNOSTICS)
MSG LOG = CHANGE DETECT
DATALOGGER NAMES = YES

APPLICATION LOG MESSAGE = LENGTH (nnn)
   1 = parameter_1
   2 = parameter_2
   3 = parameter_3
          •
          •
          •
nnn = parameter_nnn
```

These records assume the following:

- DataLogger's Time Data Protection feature is to be disabled.

- The Vital Diagnostic Protocol (VDP) is used in the application (refer to Alstom publication P2346W for details on the VDP). If the VDP is not used, omit the following record:

```
DATA LOG = (DIAGNOSTICS)
```

- User Message data is logged when changes occur, as defined by the parameters specified in the Application Log Message.

2. In the running system, use DataLogger's on-line diagnostics to perform the following initial steps:

- Set the system's Real-Time Clock to the current date and time.

- Erase all logged data so that subsequent events are properly time-stamped.

WARNING

IF TIMED DATA PROTECTION IS ENABLED AND OLD, IMPROPERLY TIME-STAMPED EVENTS ARE NOT ERASED AFTER THE CLOCK IS SET, WHEN EVENT MEMORY BECOMES FULL, NEW EVENTS MAY NOT BE LOGGED EVEN AFTER THE PROTECTION PERIOD HAS EXPIRED.

See Section 5, Using DataLogger Diagnostics, for details on setting the clock and erasing logged data.

3. In the running system, use DataLogger's on-line diagnostics to review logged event data. Again, refer to Section 5, Using DataLogger Diagnostics, for details on DataLogger report generation capabilities.

3. SECTION 3 – EVENT SOURCES, TYPES AND LOGGING MODES

3.1. SOFTWARE MODULES

DataLogger accepts event data for logging from a variety of system software modules, and three modules are integral to DataLogger. These three modules are compact and dedicated to monitor specific system events: User Message data, Non-Vital Inputs and Non-Vital Outputs. The application designer is given complete control over these and other event sources and types from which DataLogger can accept data.

3.2. EVENT SOURCES AND TYPES

DataLogger uses two descriptors, *Source* and *Type*, to identify an event log. *Source* identifies the module that submits an event. The following is a list of sources from which DataLogger can accept events:

- Port: Identifies modules that are attached to the system's serial ports. These sources are typically communication protocols, such as Alstom's DataTrain VIII protocol.
- Logger: Identifies DataLogger's own automatically stored event logs, such as saving a timestamp each hour (called an hourmark).
- User: Identifies an event log generated from a User Message. DataLogger provides a mechanism used by a designer to define a message, called a User Message, in the non-vital application. A User Message consists of a variety of parameters that exist in the application, such as selected control and indication bits or non-vital outputs, results of Boolean logic, and other parameters that the designer wishes to monitor for state changes.
- Non-Vital Inputs (NVI): A system has three classes of Non-Vital Inputs. Each class is defined by the rate that the assigned group of input terminals is debounced. The following identities are applied to NVI log data:
  - 00NVI: The source identifier for logs taken from a group of inputs debounced at 0 milliseconds (these are inputs read with no software debouncing)
  - 25NVI: Identifies logs from a group of inputs debounced at 25 milliseconds
  - 50NVI: Identifies logs from a group of inputs debounced at 50 milliseconds
- Non-Vital Outputs (NVO): The non-vital outputs generated by the system.
- General: Identifies event logs from other internal system sources.

Type further classifies events. Certain types of events are unique to some sources. The following is a discussion of event types and their associated sources:

- Port Event Types
- Logger Event Types
- General System Event Types

3.2.1. Port Event Types:

- Controls: Is the type descriptor for non-vital control messages received through serial ports from a source external to the system. Outside sources include other field and office code units.
- Indications: Describes non-vital indication data transmitted by the system to external field and office devices.
- Broadcast: Describes special protocol messages received through the serial ports.
- Poll: Describes received protocol requests (or commands) for non-vital indications or current input/output (I/O) status.
- Configuration: Is a protocol type that describes a request (or command) for a field unit's operating parameters or configuration.
- DC Message: Describes messages of DC type.
- Protocol: Describes received or transmitted serial communication messages that do not fit the descriptions of any of the preceding types.

3.2.2. Logger Event Types

DataLogger records three types of non-vital application data: User Messages, NVI and NVO. DataLogger provides three modules specialized and dedicated to monitor for these specific application events. Upon occurrence of these types of events, DataLogger evaluates their data *Type* and *Source* identifiers to determine whether the application designer has specified them as acceptable for logging.

A programmer can specify whether a source is logged periodically or dynamically as its parameters change. A source to be logged dynamically can also be selected for filtration. Filtration is a process that inhibits logging sources that change too frequently. Without this filtration process, a floating or bouncing source can generate enough data to exhaust available log memory quickly.

Event logs generated internally by DataLogger include the following types:

- Logger: Describes some built-in types that a designer cannot control
- Bouncing: Describes logs generated to note that a monitored source is generating changes too frequently
- Flagged: Describes change detect logs, but the entire message is logged
- Filtered: Describes logs taken from a properly behaved filtered source
- Periodic (Snapshot): Describes logs taken periodically at a user specified interval or automatically by DataLogger, typically at the beginning of each hour
- Clockset: Describes logs that note when the system clock is modified
- Hourmark: Describes date and time logs made at the beginning of every hour
- Change Detect: Describes logs made when one or more components of the source change, but only the changes are logged

3.2.3. General System Event Types

The events in this group do not fit under the categories of *Port* or *Logger* event types. Other system modules, such as communication protocols and operating system executives, generate logs in this category:

- Status: Describes logs passed to DataLogger by other modules describing their states
- Diagnostic: Describes logs generated by diagnostic modules, such as the optional Vital Diagnostic Protocol (VDP) – refer to Alstom publication P2346W
- Error: Describes logs generated by various error handlers in the system
- Special: Describes a broad category often unique to protocols

3.3. LOGGING MODES

Only the three non-vital application sources supported by DataLogger (User Messages, NVI and NVO) can be specified for the following four logging modes since these are the only sources DataLogger can monitor directly. Importantly, these are also the only fixed size sources for which data structures can be built. Four modes are available for the logging of non-vital application sources:

- Flagged Logging
- Periodic Logging
- Change Detect
- Filtered Logging

3.3.1. Flagged Logging

In this mode, a source is logged only when one or more of its components change. In the case of a User Message, a log is taken following the complete solution of the non-vital application equations that result in changed message bits.

In the cases of NVI and NVO, DataLogger constantly scans their RAM buffers for individual state changes. Entire groups of bits in a source are logged when changes are detected. For instance, if only bit 2 of 00NVI changes, all the bits of that debounce group are logged. This method is used for a broad perspective while analyzing logged data.

3.3.2. Periodic Logging

In this mode, a source is regularly logged at a user specified time interval. The source is never evaluated for changes, but instead is logged in its entirety – this is called a “snapshot” or a “bit map”. In addition to the other three logging modes, DataLogger can be configured to record snapshots periodically of the three non-vital application sources.

3.3.3. Change Detect

In this mode, the data bytes of a source are scanned for changes. Only the changed bytes are stored (instead of the entire source as in *Flagged Logging* mode). When a change is detected, the index (offset) of the changed byte and the new value of the byte are stored, unless the number of changed bytes exceeds 25% of the total number of bytes in the source. In the latter case, the entire source is logged.

3.3.4. Filtered Logging

This mode is similar to Change Detect mode in that logs are stored when changes occur. An application designer has the option of specifying the number of changes that may occur, in a given time interval, before the source is declared faulty or abnormal. This provision is used by a designer to limit the number of logs that are taken from a source thus preventing a rapid exhaustion of available log memory.

DataLogger accepts two values for specifying Filtered Logging mode: a time interval, and the number of samples. DataLogger adds one to the number of samples and scans the source that many times within the specified interval, counting the number of scans that result in detected changes. From the first scan, each time a change is detected, the source is logged. If the number of scans resulting in changes equals the number of scans taken in the given time interval, the last log is stored as a bouncing source. DataLogger continues regular scanning, but stops logging the source. Logging resumes when the number of detected changes falls within the specified sample count.

The maximum allowed scan frequency is 3 Hz (three samples per second). If the given number of samples and time interval result in a frequency greater than 3 Hz, DataLogger defaults to 3 Hz. As described in the preceding paragraph, for a 3 Hz filtration, samples are taken four times at equal intervals in time. If all four scans result in change detects, the fourth is logged as bouncing.

4. SECTION 4 – CONFIGURATION BY THE ALSTOM CAAPE

4.1. INTRODUCTION

To use DataLogger, a non-vital application with specific references must be written. This section provides a guide for installing DataLogger using Alstom's Computer Aided Application Programming Environment (CAAPE) software package. This section discusses only the CAAPE records that are used to set up DataLogger in a non-vital application. Additional information about entering records in the CAAPE is available in CAAPE's on-line help.

The CAAPE provides a means to design a non-vital application graphically. The specific input records are automatically composed by the CAAPE and placed in the application's resultant source files. This section assumes the designer enters the non-vital application's records directly.

Refer to Appendix A for an example of typical CAAPE input files. The sample application shown contains examples of CAAPE input records pertinent to DataLogger:

- DLOG.CSI: This is the master non-vital application file containing application configuration data
- DLOG.LOG: This is the DataLogger file containing records that specify the desired operation of DataLogger
- DLOG.CSS: This is the communications file containing specifications for serial port operations

All DataLogger-specific records discussed in this section apply equally to CenTraCode II-s, CSEX2 and CSEX3.

4.2. CAAPE DATALOGGER RECORDS

DataLogger offers a great deal of flexibility in terms of how and which types of data are to be logged, thus giving an application designer maximum control. The CAAPE has records for specifying permissible log sources, and records for specifying log modes and permissible event types.

4.2.1. DataLogger Switch Record

To enable data logging and to include the DataLogger module in the non-vital application, the following record must be present and placed in the application's CSI file:

```
DATA LOGGING = ON
```

4.2.2. Remote Access Interface Record

Remote access is used to transfer logged event data from DataLogger to a remote device, typically a Personal Computer running the Alstom Signaling Tracker™ utility (see Section 6, Generic Port Interface and Alstom publication P2307). Note that remote access of logged event data is optional since DataLogger provides online formatted reports of event logs.

To enable remote access of logged data:

1. Specify the interface to use for remote access to DataLogger by placing the following record in the application's CSI file:

```
TRACKER INTERFACE = PORT n, INPUT ADDRESS (adrs), OUTPUT
ADDRESS (adrs)
```

Where:

- Remote access occurs through the DataTrain VIII (DT8) protocol on serial port *n*.
- The DT8 protocol places incoming messages destined for DataLogger in the text control (input) buffer whose non-zero address is *adrs* (in binary).
- DataLogger places its outgoing messages in the text indication (output) buffer whose non-zero address is *adrs* (in binary).

Inclusion of this record instructs the CAAPE to provide the Generic Port Interface (GPI) software module with the non-vital application. During system operation, the GPI acts as a conduit between DataLogger and the DT8 protocol for exchanging data between the remote device and DataLogger.

Example：

```
TRACKER INTERFACE = PORT 2, INPUT ADDRESS (00000001), OUTPUT
ADDRESS (00000001)
```

2. In the application's SERIAL COMMUNICATIONS SECTION, assign the DataTrain VIII (DT8) protocol emulation to one of the system's serial ports and define input and output station records, as shown in DLOG.CSS in Appendix A and in the example below.

- The serial port number must match the number specified in the TRACKER INTERFACE record shown in step 1 above.

- Use the standard *Slave* mode of the DT8 protocol.

- Define token 8-byte control (destination) and indication (source) station messages with all parameters set to PERMZERO (0).

- Define separate text control and text indication station messages (buffers) to receive and transmit DataLogger commands and responses via the GPI. Each buffer's length must be at least 60 bytes, and the recommended length is 200 bytes. Any desired name may be assigned to each of these buffers.

- The total number of bits in the control, indication and text buffer addresses should not be greater than eight bits each.

- The control, indication and text buffer addresses must not be set equal to zero and must match the address specified in the TRACKER INTERFACE record shown in step 1 above.

The following example illustrates setting up serial port 4 for remotely accessing DataLogger:

```
* TRACKER/DataLogger INTERFACE PORT
SERIAL PORT 4 = TYPE (DT8 SLAVE)
DEFAULT BAUD RATE = 9600
DATA FORMAT = 8, 1, N

CONTROL = ADDRESS (00000001), LENGTH (8)
1 = PERMZERO
2 = PERMZERO
3 = PERMZERO
4 = PERMZERO
5 = PERMZERO
6 = PERMZERO
7 = PERMZERO
8 = PERMZERO

INDICATION = ADDRESS (00000001), LENGTH (8)
1 = PERMZERO
2 = PERMZERO
3 = PERMZERO
4 = PERMZERO
5 = PERMZERO
6 = PERMZERO
```

```
7 = PERMZERO
8 = PERMZERO

TEXT CONTROL = ADDRESS (00000001), LENGTH (200), NAME (DL-
IN)
TEXT INDICATION = ADDRESS (00000001), LENGTH (200), NAME
(DL-OUT)
```

4.2.3. Data Logging Section

A non-vital application can contain only one DATA LOGGING SECTION, usually placed in a separate source file with an extension of LOG. If the DATA LOGGING SECTION is in a separate file, include it in the application by placing the following statement in the application's CSI file:

```
INCLUDE filename.LOG
```

The CAAPE records described subsequently in this section must be placed in the DATA LOGGING SECTION. Refer to Appendix A (DLOG.LOG) for a typical DATA LOGGING SECTION.

4.2.4. Location ID Record

The application designer can assign a location identification (ID) number from 0 to 1024 to the non-vital application. The location ID appears in DataLogger reports.

```
LOCATION ID = id
```

Where *id* is a 4-digit decimal number, the default value is 0.

Examples:

```
LOCATION ID = 1
LOCATION ID = 50
```

4.2.5. Data Protect Record

A DataLogger system has a finite amount of memory available for logging event data. When memory becomes full, DataLogger overwrites the oldest logs with new events unless timed data protection is active. The Data Protect Record is provided to extend the life of the oldest logs. A log is not overwritten until it is retained for the length of time specified in this record. The designer specifies the data protection time in hours and minutes, up to 30,000 minutes (500 hours).

```
DATA PROTECT = hours HOURS, minutes MINUTES
```

If this record is omitted, then the timed data protection limit defaults to six hours. To disable the timed data protection feature set it to zero hours by using the following record:

```
DATA PROTECT = 0 HOURS
```

Examples:

```
DATA PROTECT = 24 HOURS
DATA PROTECT = 15 HOURS, 30 MINUTES
```

4.2.6. System Snapshot Period Record

Each time DataLogger creates a new *Directory Frame* (typically hourly), it stores an entire snapshot of the three non-vital application log sources (User Messages, NVI and NVO). In addition to these automatically stored snapshots, DataLogger can be configured to log additional snapshots of the three non-vital application log sources periodically. The System Snapshot Period Record is used to activate this function. If the period is set to zero hours or this record is omitted, this function is disabled.

```
SYSTEM SNAPSHOT PERIOD = hours HOURS, minutes MINUTES
```

Examples:

```
SYSTEM SNAPSHOT PERIOD = 10 HOURS
SYSTEM SNAPSHOT PERIOD = 1 HOURS, 30 MINUTES
SYSTEM SNAPSHOT PERIOD = 40 MINUTES
```

4.2.7. Specifying Source and Event Types

The Data Log Record specifies the permissible log sources and the types of events that are logged. One source and multiple event types from this source may be specified in each instance of this record. Only event types that are specified for a source are accepted and logged by DataLogger. Use the Data Log Record to specify acceptable event types that are generated by other system software modules, such as communication protocols. Refer to Tables 5–7 through Table 5–10 in the Section 5, Using DataLogger Diagnostics, for a complete list of the event types associated with each specific source. In this record, parentheses are required around the event list.

```
DATA LOG = PORT n (port-event-list)
DATA LOG = (general-event-list)
```

Where:

- *n* is the serial communications port number, from 1 to 5 (or 1 to 3 for CenTraCode II-s)
- *port-event-list* is a list of one or more event types to be accepted for logging from the specified serial port. Event types, separated by commas, may continue on multiple lines. The following is a list of protocol-specific event types supported by DataLogger:
  - CONTROLS: application messages received from sources external to the system
  - INDICATIONS: messages from the application bound for devices external to the system
  - BROADCAST: general alarm, recall, reset or other messages unique to a communication protocol
  - POLL: an external request for application (indication) data received or transmitted to the system
  - CONFIGURATION: requests from an external source for the protocol's operating parameters
  - PROTOCOL: general-purpose protocol-specific messages

- *general-event-list* is a list of one or more events to be accepted for logging from the operating system and from other non-protocol modules. Event types, separated by commas, may continue on multiple lines. The following is a list of the general event types supported by DataLogger:

  – INPUTS: All Non-Vital Inputs defined in the non-vital application

  – OUTPUTS: All Non-Vital Outputs defined in the non-vital application

  – STATUS: Messages which contain a module's operating status

  – DIAGNOSTICS: Messages that contain diagnostic data

  NOTE

  This includes the Vital Diagnostic Protocol (VDP) module that allows a CSEX board to access CPU/PD board vital diagnostic information. The VDP module must be installed in the non-vital application in order to log and view vital system status changes (refer to Alstom publication P2346W for more information on the VDP).

  – ERROR: Messages which contain errant events

  – SPECIAL: Messages specific to a module; if a module of interest generates special messages, its manual should specify the appropriate formats

Examples:

```
DATA LOG = PORT 1 (CONTROLS, PROTOCOL)
```

This example permits controls and protocol specific data to be logged from serial port 1.

```
DATA LOG = PORT 2 (CONTROLS, INDICATIONS, BROADCAST)
```

This example permits controls, indications and broadcast data to be logged from serial port 2.

```
DATA LOG = (DIAGNOSTICS)
```

This example permits diagnostic data to be logged from system software modules. If the VDP is included in the non-vital application, vital system status changes are logged (refer to Alstom publication P2346W).

4.2.8. Specifying the Logging Mode

An application can specify one of four logging modes for the three non-vital application sources that are directly monitored by DataLogger (User Messages, NVI and NVO). The supported logging modes for these sources are:

- Periodic (“PERIOD”)
- Flagged (“FLAGGED”)
- Filtered (“SAMPLES”)
- Change Detect (“CHANGE DETECT”)

A mode specification record states the source name followed by the required parameter(s) or a keyword that describes the logging mode. The allowable non-vital application source names are:

- “INPUT LOG” for specifying the logging mode for Non-Vital Inputs
- “OUTPUT LOG” for specifying the logging mode for Non-Vital Outputs
- “MSG LOG” for specifying the logging mode for User Messages

The general format of the mode specification record is as follows:

```
source name = PERIOD (min MINUTES, sec SECONDS)
source name = PERIOD (min MINUTES, sec SECONDS), SAMPLES
(samples)
source name = FLAGGED
source name = CHANGE DETECT
```

Where:

- *source name* is either “INPUT LOG”, “OUTPUT LOG”, or “MSG LOG”
- *min* and *sec* specify the length for periodic logging in minutes and seconds
- *samples* is used with *Filtered Logging* mode and specifies the number of changes that may occur in a given time interval (period) before data is logged from the source

Examples:

```
INPUT LOG  = PERIOD (10 MINUTES, 30 SECONDS)
INPUT LOG  = PERIOD (2 SECONDS), SAMPLES (3)
INPUT LOG  = CHANGE DETECT
OUTPUT LOG = PERIOD (5 MINUTES)
OUTPUT LOG = PERIOD (3 SECONDS), SAMPLES (4)
OUTPUT LOG = CHANGE DETECT
MSG LOG = PERIOD (7 MINUTES)
MSG LOG = PERIOD (1 SECOND), SAMPLES (3)
MSG LOG = CHANGE DETECT
```

4.2.9. Defining a User Message

An Application Log Message Record is used to define a User Message. A User Message consists of a list of non-vital application parameters that the designer wishes DataLogger to monitor in real time for changes. Any parameter defined in a non-vital application may be included in a User Message, whose length can be at most 1000 parameters. Parameters listed in a User Message may be ordered at the discretion of the designer. They may include, for example, specific non-vital inputs, outputs, communication controls or indications, the results of Boolean expressions, or the predefined constant PERMZERO. If necessary, the CAAPE expands the length of a User Message to be an even multiple of eight.

In this record, the message address is optional; DataLogger ignores the address (if any). If several Application Log Message Records are used in the non-vital application to define more than one User Message, each User Message can be assigned a unique address.

The format of the Application Log Message Record is either:

```
APPLICATION LOG MESSAGE = LENGTH (n)
1 = parameter 1 name
2 = parameter 2 name
3 = parameter 3 name
     •
     •
n = parameter n name
```

Or:

```
APPLICATION LOG MESSAGE = ADDRESS (msg_address), LENGTH (n)
1 = parameter 1 name
2 = parameter 2 name
3 = parameter 3 name
     •
     •
n = parameter n name
```

Where:

- *n* is the total number of parameters listed in the User Message
- *msg_address* is the optional message address (in binary)
- *parameter name* is the application variable name of the parameter to be logged

Example:

```
APPLICATION LOG MESSAGE = LENGTH (40)
1 = STDBY-IN1
2 = GATE-ARM0
      •
      •
38 = PERMZERO
39 = PERMZERO
40 = TRACK-SW1
```

NOTE

For the remote access of logs to Alstom Signaling Tracker utility, define only one User Message since Tracker does not support multiple User Messages.

NOTE

If more than one User Message is defined in the application, while viewing on-line reports the screen prompts for which User Message number (from 1 to n, where *n* is the total number of User Messages) to use to produce the report.

4.2.10. Specifying the Storage of Parameter Names in the Non-Vital Application

The DataLogger Names Record is placed in the application's DATA LOGGING SECTION before the definition of the User Message(s). It permits DataLogger to report logged User Message data with meaningful non-vital application parameter names (the names specified in the User Message).

```
DATALOGGER NAMES = YES
```

The parameter names listed in the User Message are stored in program memory space, after the non-vital application logic. The approximate amount of program memory space, in total bytes, required for the table of parameter names can be computed roughly using the equation *TotalNames* * (4 + *n*).

Where:

- *TotalNames* is the size of the User Message (total number of parameters)
- *n* is the average number of characters in a typical parameter name

For example, if a User Message is 200 bits long (*TotalNames*) and application parameters typically have 8 characters (*n*) in their names; 2400 bytes of PROM space are required to store the table of parameter names.

If the DataLogger Names Record is omitted or "NO" is specified, DataLogger produces only unformatted binary or hexadecimal reports of logged data, without parameter names.

Be aware that at extremely large installations where application program memory is at a premium, the application designer may decide not to save the parameter names if doing so exhausts program memory. This programming, however, makes it impossible for DataLogger to show reports of logged data with parameter names.

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5. SECTION 5 – USING DATALOGGER DIAGNOSTICS

5.1. INTRODUCTION

DataLogger has diagnostic features for retrieving and reviewing logged data. Descriptions in this section relate to menus and options relevant to the DataLogger portion of CAAPE. Details about other system and protocol menus are discussed in other Alstom Signaling publications.

A video terminal or a Personal Computer (PC) connected to the Maintenance Access (MAC) port on the non-vital processor board (see Figure 5–1) is needed to display the system's diagnostic menus. Any video terminal compatible with Digital Equipment Corporation's VT100 may be used. PC with proper terminal emulation software may also be used. Alstom recommends a battery-operated laptop PC equipped with terminal emulation software that allows capture of the serial data stream. Display modes showing logged event data can be invoked, and a PC used as a display terminal allows the capture of displayed information to disk files for analysis at a future date. Some commercially available terminal emulation software packages are HyperTerminal® (Hilgraeve), Crosstalk® (Digital Communications Associates), ProComm Plus® (Datastorm Technologies) and Smartcom® (Hayes Microcomputer Products).

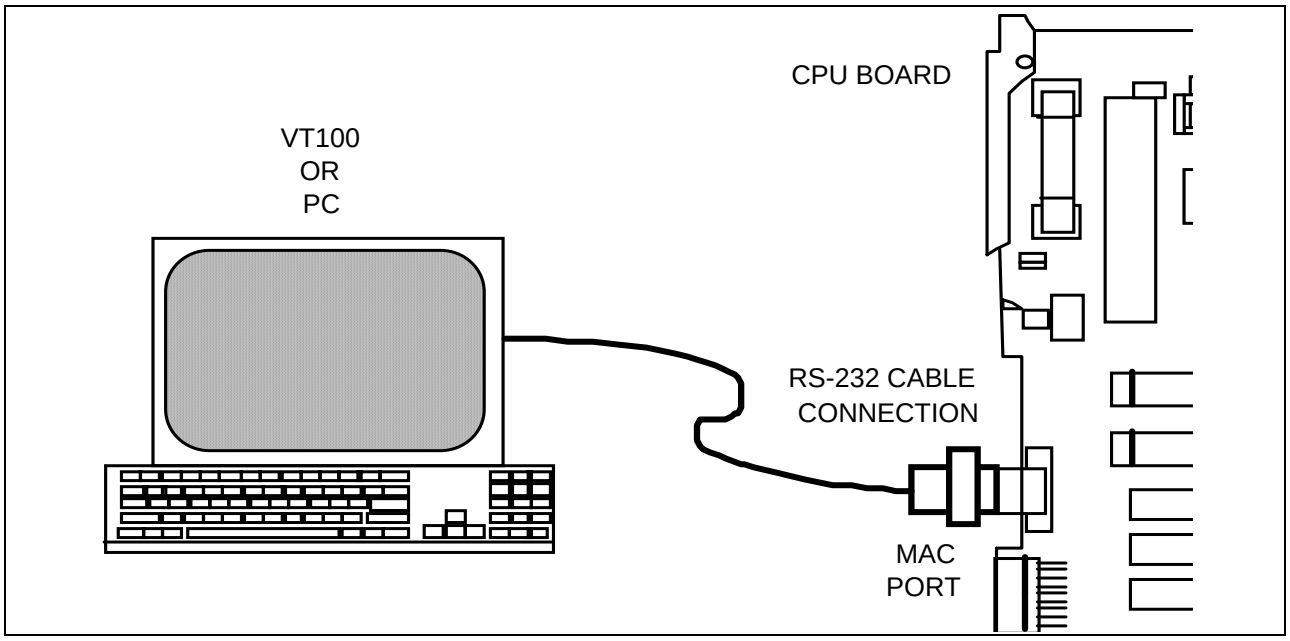

Figure 5–1. System MAC Port Connection

Connect an RS-232 cable between the computer or terminal's serial port and the MAC port, the 9-pin female connector at the front edge of the CSEX or CenTraCode II-s board. If using a CSEX3 board, confirm that switch SW1 (labeled "MAC F/B") located at the top front edge of the board is in the "F" (Front) position. Alternatively, the CSEX3 MAC port signals may be wired to the board's P3 connector through the backplane. In this case, SW1 should be in the "B" (Back) position. This switch is not on the CSEX2 board because these ports are in parallel on this board.

The following equipment is required for correct operation of the MAC port:

1. A VT100-compatible terminal (ANSI standard X3.64-1979), or a PC) running terminal emulation software configured as follows:

   - Direct connection to one of the computer's COM ports (typically COM1 or COM2)
   - VT100 terminal emulation (ANSI standard X3.64-1979)

NOTE

HyperTerminal®, available in Microsoft Windows®, must be set for "ANSI Emulation" for proper operation with the MAC port.

   - 9600 baud (this default value may be overridden in the non-vital application)
   - No parity with 8 data bits and 1 stop bit (these default values may be overridden in the non-vital application)
   - Software flow control, or no flow control
   - 24 lines by 80 columns of text

2. A serial interface cable:

   - Tables 5–1 and 5–2 show the construction of the cable between the computer and the MAC port, including the interface to most computers; consult the computer owner's manual to verify proper connections

WARNING

TO AVOID DAMAGING EQUIPMENT COMMON SHOULD NOT BE TAKEN TO EARTH GROUND. WHEN CONNECTING AN AC OR DC POWERED COMPUTER TO THE MAC PORT, BE CAREFUL TO OBSERVE WHETHER A VOLTAGE DIFFERENCE EXISTS BETWEEN THE RS-232 PORT OF THE COMPUTER (PIN 7 OF A 25-PIN CONNECTOR OR PIN 5 OF A 9-PIN CONNECTOR) AND PIN 5 OF THE MAC PORT CONNECTOR. IF A CONNECTION IS ATTEMPTED WHILE THERE IS A POTENTIAL DIFFERENCE, PERMANENT DAMAGE TO THE SERIAL INTERFACE MAY OCCUR.

WARNING

A GROUND ISOLATION PLUG (TO CONVERT 3-PRONG TO 2-PRONG) IS REQUIRED ON THE VT100 TERMINAL OR THE PC'S 120 VOLT AC CONNECTION TO PREVENT MULTIPLE PATHS TO GROUND.

Table 5–1. Current Loop MAC Port Connections (CSEX2 only)

CSEX2 9-Pin Pin/Name	B&B 232 PCL DB25P Pin	B&B 232 PCL DB25S Pin	PC/Terminal 25-Pin Pin/Name	PC/Terminal 9-Pin Pin/Name
1/RXD Loop +	14	2	2/TX	3/TX
8/RXD Loop –	19	3	3/RX	2/RX
5/TXD Loop +	25	7	7/GND	5/GND
7/TXD Loop –	23			

Refer to Table 5–2 for MAC port connections when using RS-232 operation. The CenTraCode II-s and CSEX3 MAC port is RS-232 only.

Table 5–2. RS-232 MAC Port Connections

CTC2s, CSEX2 or CSEX3 9-Pin Pin/Name	PC/Terminal 25-Pin Pin/Name	PC/Terminal 9-Pin Pin/Name
2/RX	2/TX	3/TX
3/TX	3/RX	2/RX
5/GND	7/GND	5/GND

5.2. USING MAC PORT MENUS

DataLogger diagnostics follow the tree-structured menu system shown in Figure 5–2. Diagnostic functions are selected from various MAC port menus. Any menu selection or option can be made as follows:

- Press the Right or Left Arrow key or the Space Bar to highlight the menu or option of interest and then press the Enter key.
- Press the first letter of a menu or option. The first letter is usually displayed in uppercase.
- Press ‘E’ (Exit) to exit from any menu, although certain submenus are exited by pressing ‘Q’ (Quit).
- Simultaneously press Ctrl and ‘E’ to return directly to the Main Menu from any submenu.

After a menu option is selected, additional information may be requested and the screen prompts for specific data.

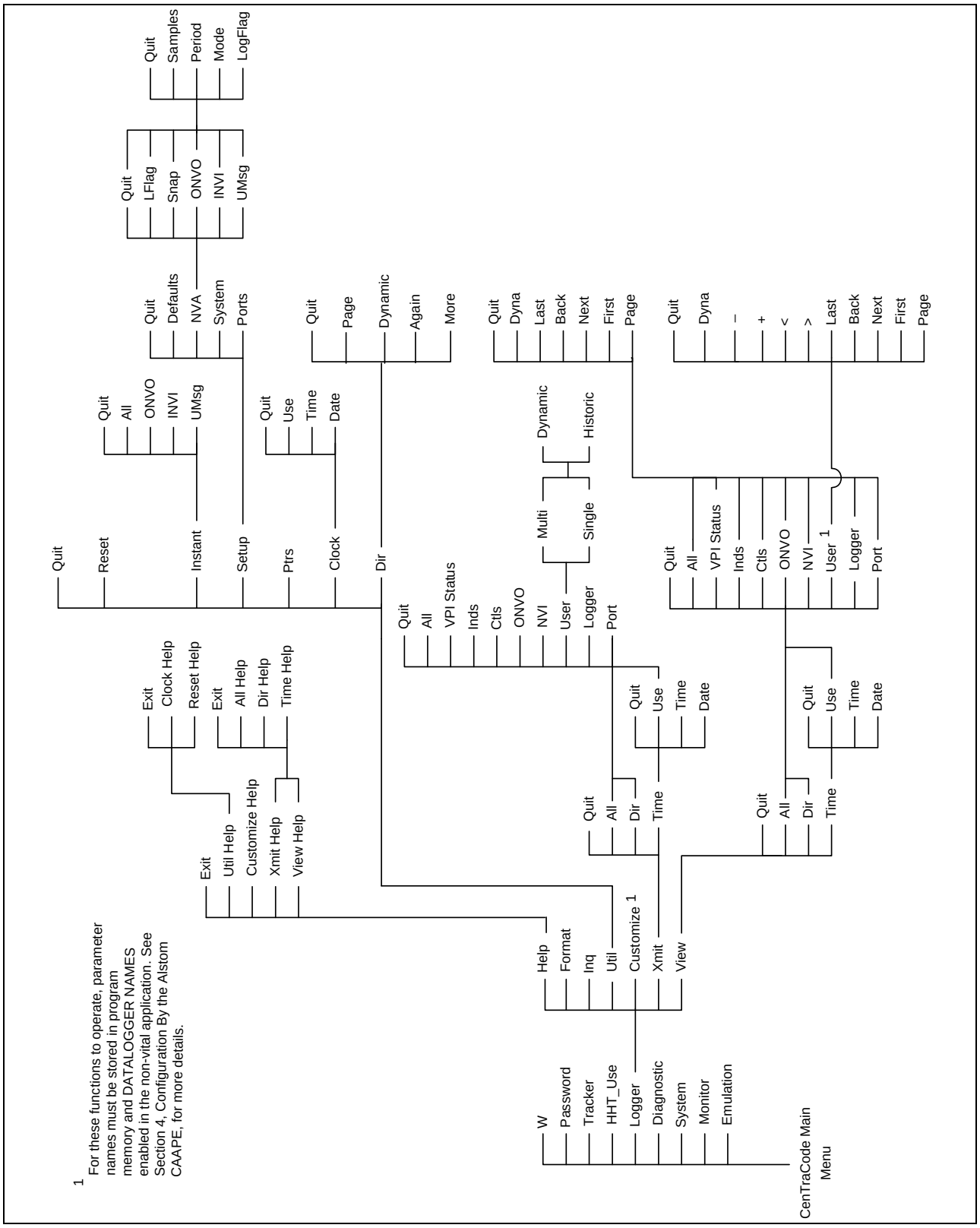

Figure 5–2. Menu Tree

5.3. SYSTEM MAIN MENU

When the system is powered up or reset, the Main Menu is displayed on the terminal screen connected to the MAC port (see Figure 5–3).

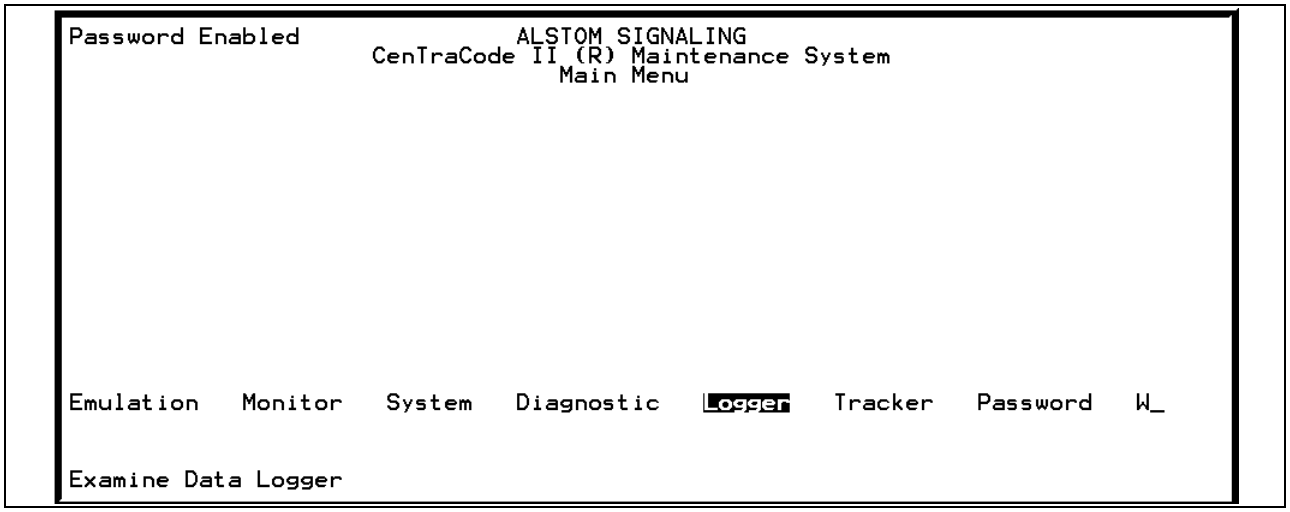

Figure 5–3. System Main Menu

If any board resets have occurred since the last time the system was turned on, this information appears above the Main Menu. This error log is cleared whenever system power is turned off. Table 5–3 lists the system error messages. In addition, the CSEX3 and CenTraCode II-s boards contain a 2-digit diagnostic display. Normally this display reads “00” upon system turn on, unless an error occurs during this process.

Table 5–3. System Errors

Code	Displayed Error Message	Possible Cause(s)
00	*none*	No errors detected (normal operation)
11	Memory Shortage on port *n*	Insufficient system RAM for application requirements
12	No protocol on port *n*	No valid communication protocol is installed on this serial port
13	Protocol init on port *n*	Protocol emulation initialization failure (see System Error 1a)
14	Tasking on port *n*	Failure in loading a port's task
15	Ring on port *n*	Failure in RAM allocation for a port's serial ring buffers
16	Port on port *n*	Failure in RAM allocation for a port's internal data structures
17	CAA Indication Flag on port *n*	Invalid value for a RAM indication buffer flag
18	CAA Control Flag on port *n*	Invalid value for a RAM control buffer flag
19	CAA Spcl Msg Flag on port *n*	Invalid value for a RAM special buffer flag
1a	Protocol Error *n*	Error code for protocol emulation initialization (error 13) or other failure
1b	Unknown reset TCB *nn* Active	Reset due to unknown cause: Momentary power loss Reset button manually pressed Miscellaneous hardware or software failure
1c	Watchdog caused reset TCB *nn* Active	The main task loop has stalled – the system performs an automatic reset
1d	Software reset called	Operator-induced software reset caused by: Diagnostic input switch (CenTraCode II-s & CSEX3 only) MAC port diagnostics – Reset option PROM or RAM failure (automatic system reset)

Table 5–3. System Errors (Cont.)

Code	Displayed Error Message	Possible Cause(s)
1e	PROM error at *n*	Test of RAM or PROM failed – the system performs an automatic reset with the diagnostic display showing Error 1d n Meaning 1 System's startup RAM test failed 2 System's startup PROM checksum verification failed 3 Not assigned (future) 4 System's periodic PROM checksum test failed
1f	Reset due to stack crash, task number *nn*	A task's stack or its local memory area is corrupted, or the diagnostic test of a serial port's local memory area failed – the system performs an automatic reset
20	CRC error in port *n* local memory	Diagnostic test of a serial port's local memory area failed – the system performs an automatic reset
22	Application is not running	The application logic is no longer running – the system performs an automatic reset
23 (22)	Flag error – Pointer *nnnn*	Application buffer flag locked "in use" and the application logic is no longer running – the system performs an automatic reset; since the condition triggers the events that generate an Error 22, diagnostic display shows 22
24	CS:IP error–last TCB active *nn*	Executing code from RAM (invalid) – the system performs an automatic reset

The following Main Menu choices are relevant to DataLogger:

- Password: The *Password* option is used to enter a password specified by the application designer in the non-vital application. After the password is entered correctly, “Password Enabled” is displayed at the upper left of the screen. Enabling the password grants access to sensitive areas of the system’s diagnostics. Password protection is provided only if the application designer defined a password in the non-vital application.

  DataLogger’s diagnostics offer utilities for modifying its operating parameters. These utilities are password protected to prevent inadvertent or unauthorized changes. To access these utilities, first select the *Password* option from the Main Menu and type in the correct password.

- Logger: Select the *Logger* option from the Main Menu to display DataLogger’s Main Diagnostic Menu (see Figure 5–4).

5.3.1. Logger, DataLogger's Main Diagnostic Menu

DataLogger's Main Diagnostic Menu (Figure 5–4) appears when the *Logger* option is selected from the Main Menu.

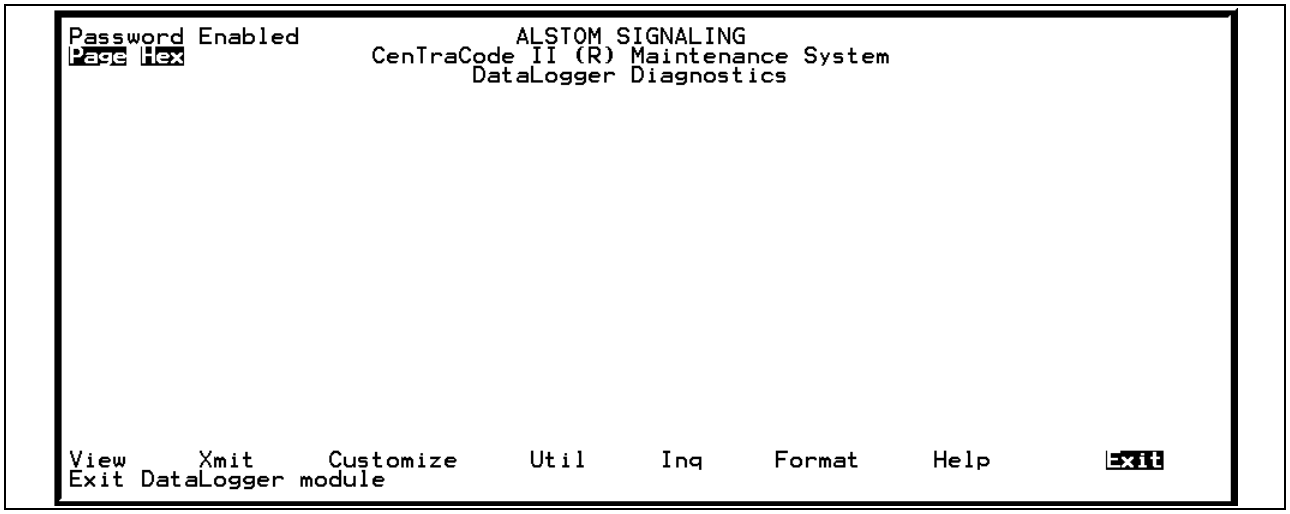

Figure 5–4. DataLogger's Main Diagnostic Menu

Table 5–4 summarizes the DataLogger's Main Diagnostic Menu Options.

NOTE

As this section discusses the available options available under *Logger*, topic Headings include the path to get there. For example, to get to DataLogger help the path is Logger > Help.

Table 5–4. DataLogger's Main Diagnostic Menu Options

Option	Description
View	The *View* option provides an on-line review of recorded event data (logs). Select the *View* option, pick the range and source of data from the Log Range Menu and the Log Source Menu (see Figure 5–5 and Figure 5–7). Next, select the report type: the Unformatted Report of Logged Data (Figure 5–8), the User Message Report (Figure 5–9) or the Vital Status Change Report. These on screen reports provide the ability to move ahead and back through logged data. However, to review data, a range and the source of logs to examine must be specified, as discussed later. On-line review of logs is provided for a casual quick use. Extensive examination of logs can be performed off-line at a PC using Alstom Signaling's Tracker™ utility (see Alstom publication P2307).
Xmit	The *Xmit* (Transmit) option provides a means of downloading a report of logged data to an off-system device. This is similar to the *View* option except that it does not provide interactive report screens and menus. DataLogger downloads the logged data after the desired range and log source are selected. Transmission of data continues until the end of the selected range is reached, or any key is pressed to abort the download.
Customize	The *Customize* option applies to User Message data only. Typically, a User Message is composed of several dozen, or even hundreds, of parameters. This option is used to select only those parameters of interest. The names assigned to the parameters in a User Message can be viewed, from 1 to 16 names can be selected to show exclusively in the report of User Message data. In this way, the data parameters of interest can be selected so that the report shows state changes to only these parameters, filtering out changes to all other parameters. Doing so does not affect the data recorded by DataLogger in any way. It only affects how the data is presented in the on-line reports.
Util	The *Util* (Utility) option provides access to a set of password protected DataLogger utilities via the Utility Menu shown in Figure 5–11.

Table 5–4. DataLogger's Main Diagnostic Menu Options (Cont.)

Option	Description
Inq	The *Inq* (Inquiry) option leads to the Inquiry Menu shown in Figure 5–20. This option provides run-time information such as the current time, password status, the DataLogger's software version and general operating status. This menu is provided primarily for remote computer access to DataLogger, typically for Alstom Signaling's Tracker™ utility, and is not intended for user operation.
Format	The *Format* option provides the ability to view logged data in the unformatted DataLogger reports in either hexadecimal or binary format. The data format currently being used (hexadecimal by default) is displayed in the upper left portion of the screen.
Help	The *Help* option displays instructions on commonly used DataLogger functions.
Exit	The *Exit* option returns to the system Main Menu screen (see Figure 5–3).

5.3.1.1. Logger > View, Logger > Xmit

The *View* and *Xmit* (Transmit) options in DataLogger's Main Diagnostic Menu produce similar results. The *View* option displays logged data so that the operator can examine and scroll back and forth through it on the screen, whereas the *Xmit* option is used to download and store logged data to a computer for analysis later. Due to their similarities, these options are discussed together.

Menu selections for the *Xmit* option are the same as for the *View* option when choosing the log range and the log source. However, before the downloaded report begins (the *Xmit* option), a prompt is displayed indicating "Prepare to capture data...Press any key to begin". At this point, prepare the PC communication software to capture incoming data to disk by launching a commercially available communication software package such as ProComm™ Plus.

The Log Range Menu (Figure 5–5) appears after the *View* option (to view logged data) or the *Xmit* option (to download logged data) is selected. This menu is used to select a range of logs to examine. The range is specified by time (the *Time* option), an individual directory (the *Dir* option), or all logs currently stored (the *All* option).

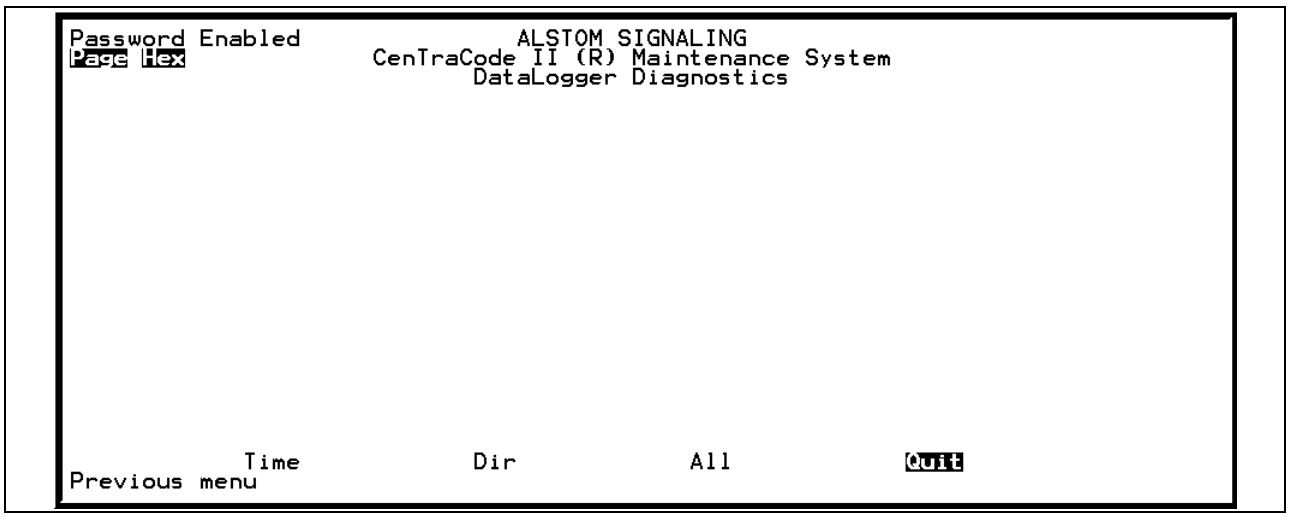

Figure 5–5. Log Range Menu

5.3.1.1.1. Logger > View or Xmit > Time, Specify a Time Range

The *Time* option in the Log Range Menu is used to enter a specific start and end date/time range to view or download logged data. Upon selection of the *Time* option, the Time Range Selection Menu (Figure 5–6) is presented.

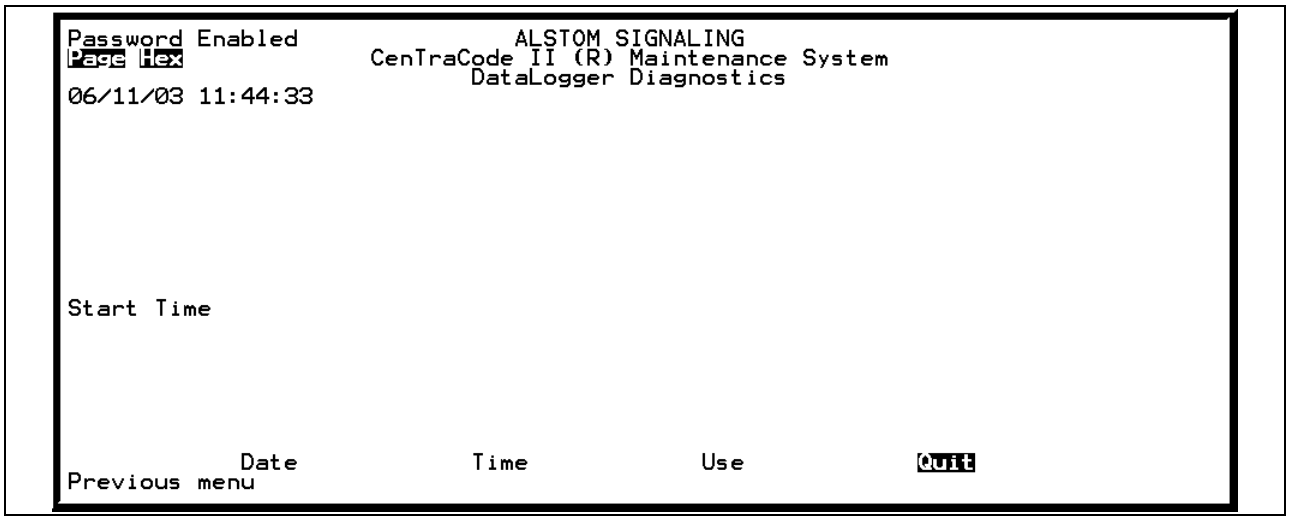

Figure 5–6. Time Range Selection Menu

The current date and time are shown at the top left of the screen, and the message “Start Time” is shown at the far left of the screen. Follow these steps to enter a time range:

1. If some date other than the current date is of interest, select the Date option from the Time Range Selection Menu, type in the desired start date, and then press the Enter key. Dates must be entered in the form MM/DD/YYYY with leading zeroes.

Where:

- MM is the month expressed as a 2-digit number from 01 to 12
- DD is the day expressed as a 2-digit number from 01 to 28-31 (based on the month)
- YYYY is the year expressed as a 4-digit number from 0000 to 9999

For example, 01/02/1998 and 03 04 2000 are both valid dates. Note that any character, not just “/”, may be used as a separator. The dates 08/16/98 and 3 04 2000 are both invalid and are not accepted due to an incorrect number of digits.

2. Select the Time option from the menu, type in the desired start time and then press the Enter key. Note that DataLogger automatically truncates the start time to the nearest hour. Times must be entered in the form HH:MM:SS with leading zeroes.

Where:

- HH is the hour expressed as a 2-digit number from 00 to 23
- MM and SS are the minute and second each expressed as a 2-digit number from 00 to 59

For example, 00:00:00 and 19:00:00 are both valid times, whereas 23:0:0 and 19:00 are invalid times and are not accepted due to an incorrect number of digits. Note that any character, not just ":", may be used as a separator.

3. Submit the start date/time by selecting the *Use* option. DataLogger may require several seconds to validate the start date/time, after which the message "End Time" is displayed at the far right of the screen, and a prompt appears requesting the end time.

4. Repeat steps 1-3 to enter the desired end date and time for the data range.

NOTE

It is not necessary to enter both the date and time when using the Time Range Selection Menu. DataLogger always begins by using the current date and time as default values. If the desired start or end date is the current date, only the time must be entered.

The entered date and/or time information is not validated until the *Use* option is selected. If either the date or time is invalid, a warning beep sounds and the message "Invalid" is displayed. A date/time range is considered invalid if either no data is logged within this time window or the start date/time is later than the end date/time.

5.3.1.1.2. Logger > View or Xmit > Dir, Specify a Directory

The *Dir* option in the Log Range Menu is used to examine or download logged data based on a specific directory. A list of valid directories is displayed, and the desired directory number is input (in hexadecimal).

DataLogger stores event data organized in blocks of numbered directories. Typically, a new directory is created at the start of each hour. If, for example, the system is powered up at 6:00pm, the first directory (numbered 0) contains data recorded between 6:00pm and 7:00pm. At 7:00pm, a new directory (numbered 1) is automatically created by DataLogger for event logs recorded between 7:00pm and 8:00pm. This process is repeated each hour.

Four other circumstances cause the creation of directories. A new directory is created whenever the system is reset (or powered up), the real-time clock is reprogrammed, a logging parameter is changed on-line by the user, or DataLogger reaches the absolute end of event storage memory. In each case, directories are numbered sequentially.

5.3.1.1.3. Logger > View or Xmit > All, View or Download All Logged Data

The *All* option in the Log Range Menu is used to view or download all currently logged data. Selecting this option launches the Log Source Menu.

5.3.1.2. Logger > View or Xmit > Time, Dir, or All >, Review or Download Logged Data

The Log Source Menu (Figure 5–7) appears after the *View* option (to view logged data) or the *Xmit* option (to download logged data) is selected and a log range is selected.

DataLogger accepts event logs from a variety of sources, described in detail in Section 3, Event Sources, Types And Logging Modes. This menu is used to select the specific type of logged data to view or download.

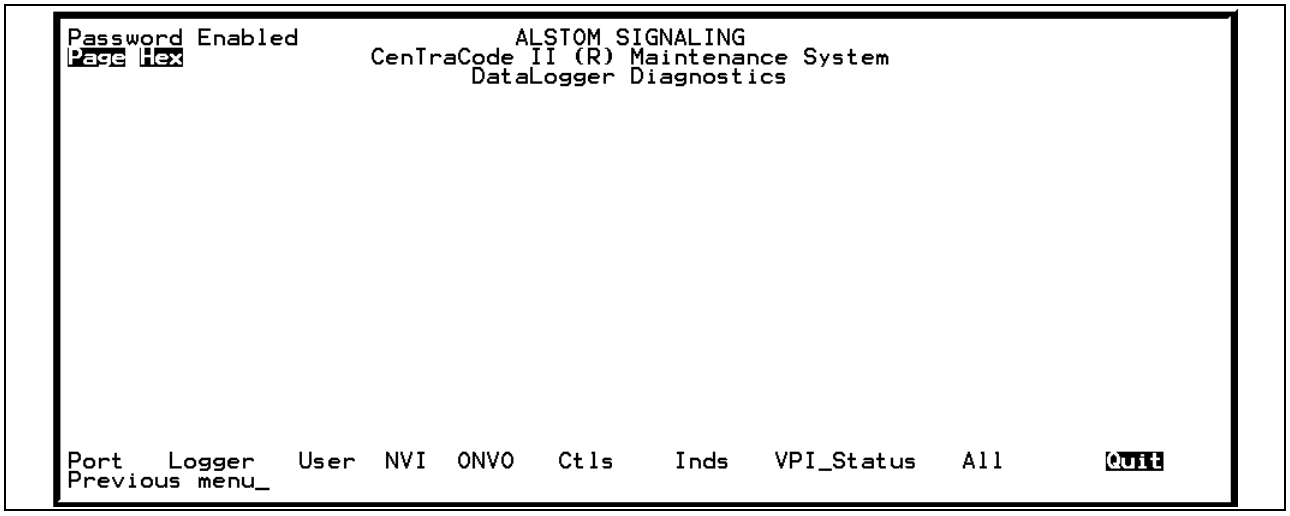

Figure 5–7. Log Source Menu

The options summarized in Table 5–5 are available in this menu:

Table 5–5. Log Source Menu Options

Option	Description
Port	This option specifies all logs accepted from the system's serial ports. Typically, DC code systems and serial communication protocols supply these logs.
Logger	This option specifies logs originated internally and automatically by DataLogger.
User	This option specifies logs taken from User Messages. This type of logged data is presented in a fully formatted User Message Report described later in this section.
NVI	This option specifies logs taken from the Non-Vital Input buffers. All NVI logs are shown when this option is selected. However, NVI bits are grouped according to their non-vital application debounce assignments into separate logs.
ONVO	This option specifies logs taken from Non-Vital Output buffers.
Ctls	This option specifies logs of serial control messages submitted by a port protocol. In a *Slave* mode protocol, these are control messages received from a master station. In *Peer* mode, these are control messages originated from the local field site.
Inds	This option specifies logs of serial indication messages submitted by a port protocol. It is important to note that these logs are not taken from the non-vital application. DataLogger does not sample the non-vital application's control and indication messages.
VPI_Status	This option specifies logs of vital system status changes from the CPU/PD board. These logs are stored only if the Vital Diagnostic Protocol (VDP) is included in the non-vital application (see Alstom publication P2346W). This type of logged data is presented in a Vital Status Change Report described later in this section.
All	This option instructs DataLogger to report logs from all sources.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

5.3.1.2.1. DataLogger Reports

After a range (time, directory or all) and a log source from the Log Source Menu are selected, one of the following reports is presented:

- Unformatted Report of Logged Data (Figure 5–8).
- User Message Report (Figure 5–9).
- Vital Status Change Report.

5.3.1.2.1.1. Unformatted Report Of Logged Data

This report is displayed for many types of logged data. It shows event data in unformatted hexadecimal or binary notation (see Figure 5–8).

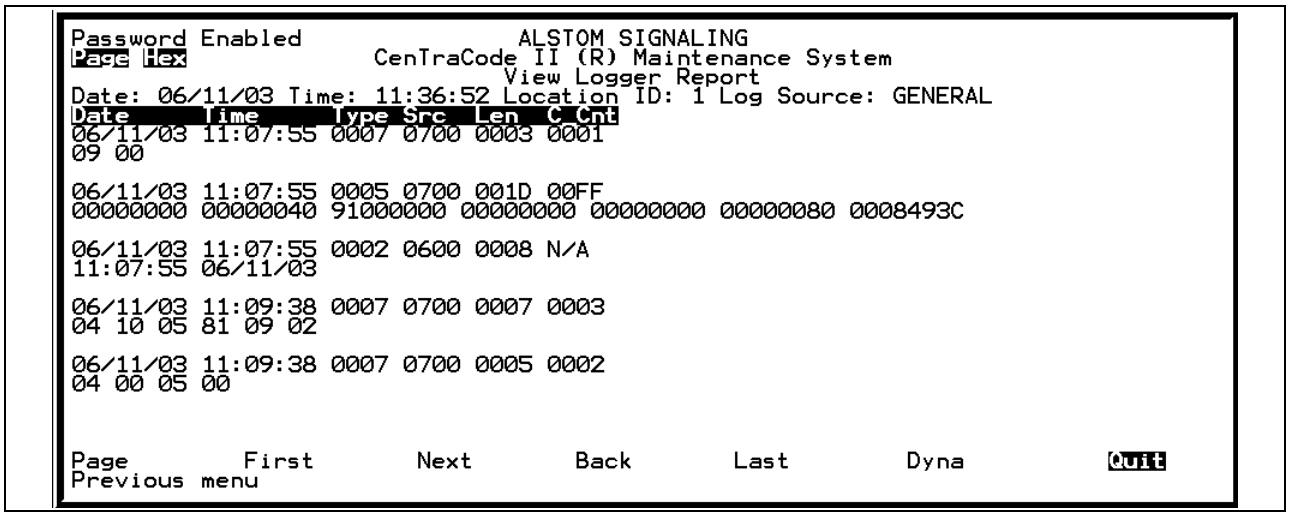

Figure 5–8. Unformatted Report of Logged Data

NOTE

DataLogger presents the following types of logged data in easy-to-read, formatted reports, shown later in this section:

- User Message data (if stored with parameter names): the User option in the Log Source Menu
- Vital System Status Change data: the VPI_Status option in the Log Source Menu

Table 5–6 shows the options available when viewing the Unformatted Report of Logged Data.

Table 5–6. Unformatted Report Options

Option	Description
Page	This option alternates between showing a single log at a time, and showing a full screen of logs on the display. A status indicator at the upper left of the screen shows whether the display is in *Line* or *Page* mode.
First	This option displays logs beginning with the first one that occurred in the selected range. In *Page* mode, a full screen of data is displayed beginning with the first log.
Next	Use this option to view logs that occurred later in time.
Back	Use this option to view logs that occurred earlier in time.
Last	Use this option to view logs starting from the end of the selected range.
Dyna	This option invokes *Dynamic* mode where events of the selected source are displayed at the time they are recorded (in real time). Once active, press any key to exit *Dynamic* mode.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

A typical Unformatted Report of Logged Data is shown in Figure 5–8. The heading "View Logger Report" is centered above the report, under which is the date and time of the report, the Location ID and the log source for which the report is issued. Column headings are shown on the next line, with logged event data on subsequent lines. The components of an event log (a *Log Frame*) are reported in the following order:

1. Date: The day the event was recorded.

2. Time: The time the event was recorded.

3. Type: A 4-digit hexadecimal number that identifies the type of data contained in each *Log Frame* (see Table 5–7 through Table 5–10).

4. Src (Source): A 4-digit hexadecimal number that uniquely identifies the source of the event data (see Table 5–7 through Table 5–10). The first two digits of the source number, listed in the tables below, define the main source of the data, and the last two digits define the data's secondary source (or index). For example, an application that defines three User Messages produces reports that show source descriptors 0700, 0701 and 0702. The secondary sources, the sequence of numbers 00, 01 and 02, refer to the User Message to which the data applies – 00 for the first User Message, 01 for the second, and 02 for the third.

Table 5–7. General System Sources and Associated Event Types

Source	Source Number	Associated Event Type	Event Type Number
General	0C	Status	0000
		Diagnostics*	0001
		Error	0002
		Special	0003

*This is the source (General) and type (Diagnostics) used to identify logs recorded by Alstom's Vital Diagnostic Protocol (VDP). Refer to Alstom publication P2346W for more information on the VDP

Table 5–8. DataLogger's Internal Event Types

Source	Source Number	Associated Event Type	Event Type Number
Logger	06	Logger	0000
		Hourmark**	0002

**This is the source (Logger) and type (Hourmark) that identifies the hourly timestamp logged by DataLogger

Table 5–9. Non-Vital Application Sources and Associated Event Types

Source	Source Number	Associated Event Type	Event Type Number
User Message	07	Bouncing	0001
00NVI	08	Flagged	0003
25NVI	09	Filtered	0004
50NVI	0A	Periodic Snapshot	0005
NVO	0B	Change Detect	0007

Table 5–10. Serial Ports and Associated Event Types

Source	Source Number	Associated Event Type	Event Type Number
Port 1	00	Controls	0000
Port 2	01	Indications	0001
Port 3	02	Broadcast	0002
Port 4	03	Poll	0003
Port 5*	04	Configuration	0004
Port 6**	05	Reserved	0005
		Status	0006
		Diagnostics	0007
		Error	0008
		Special	0009
		DC Message	000A
		Clockset***	000B
		Protocol	000C

*Serial port 5 is not available in CenTraCode II-s.
**Serial port 6 is not available in CenTraCode II-s
***This is the type used by DataLogger to identify the log stored when the system's real time clock is reprogrammed. The log source is the system's MAC port number, either 4 (CenTraCode II-s) or 6 (CSEX2 or CSEX3).

5. Len (Length): The total number of data bytes (in hexadecimal) in the *Log Frame*.

6. C_Cnt (Change Count): The first byte of data in the *Log Frame*, shown in hexadecimal with two leading zeros. In the case of non-vital application sources (NVI, NVO and User Messages), the displayed value is the number of changes that occurred in the source since the previous log. If a full log (a snapshot) of the source was taken, the value displayed is 00FF. If the number of changes in the source was less than 25% of the source's length, the displayed value is the actual number of changes. For example, if there were 11 changes and this was less than 25% of the source's full length, the displayed number is 000B.

7. Event Data: The format of this information depends upon the type of event. Interpretation of non-vital application event data requires knowledge of the meaning of each parameter being recorded in the User Message, NVO or NVI data. Non-vital application event data is stored in one of two ways:

   – Snapshot: A full, bit-map representation of the state of all parameters at the time the *Log Frame* was generated. In this case, the first byte of data is the hexadecimal value 0xFF – indicating that all parameter states were logged – therefore the change count (C_Cnt) is 00FF. A snapshot is recorded when certain system conditions occur (such as power-up, hourly directory creation) or when more than 25% of the total message parameters have changed. In *Flagged* and *Periodic* modes, the change count is *always* 00FF because DataLogger always stores the entire message in these cases.

   – Changes Only: If fewer than 25% of the parameters change, the *Log Frame* contains only information for those parameters that changed state. In this case, the first data byte in the *Log Frame* specifies the number of changes recorded in the log. The second byte of event data (and every other byte thereafter) is a zero-based index of the changed byte in the non-vital application message. The third (and every other byte thereafter) is the new value for the changed byte.

The different types of data that can be displayed are as follows:

   – Events that contain a date and time are displayed in decimal with appropriate delimiters. This includes Clockset data stored when the system's clock is reprogrammed. In this case, an event log is recorded containing the former clock setting followed by the new user-entered date and time, and displayed as the current (previous) date and time, followed by the new date and time.

   – Data that is binary in nature is always shown in binary format.

   – User Message and Non-Vital Input (NVI) data is displayed in either binary or hexadecimal format. Select the display format using the Format option in DataLogger's Main Diagnostic Menu (see Figure 5–4).

     When data bytes of these types are shown in binary, they are displayed with the least significant bit first. When displayed in hexadecimal, the most significant byte is displayed first. User Message and NVI data are bit-mapped such that the low numbered bits are in the least significant positions of a byte. Displaying bytes least significant bit first provides a visual continuity for tracing the bits left to right from the first byte to the last.

   – Non-Vital Output (NVO) event data is *not* bit mapped. Each NVO is represented as a 2-digit hexadecimal number. An NVO can be set to any one of sixteen states described in Table 5–11 DataLogger reports each state using the corresponding hexadecimal number from the first column of this table.

Table 5–11. CenTraCode NVO States

NVO State # (Hex)	NVO State Description	NVO State # (Hex)	NVO State Description
00	Off	08	Flashing, Rate 1: Sinking, Phase A
01	On: Sinking	09	Flashing, Rate 2: Sinking, Phase A
02	Unused	0A	Flashing, Rate 1: Sourcing, Phase A
03	On: Sourcing	0B	Flashing, Rate 2: Sourcing, Phase A
04	Pulsing, Rate 1: Sinking	0C	Flashing, Rate 1: Sinking, Phase B
05	Pulsing, Rate 2: Sinking	0D	Flashing, Rate 2: Sinking, Phase B
06	Pulsing, Rate 1: Sourcing	0E	Flashing, Rate 1: Sourcing, Phase B
07	Pulsing, Rate 2: Sourcing	0F	Flashing, Rate 2: Sourcing, Phase B

5.3.1.2.1.2. A Detailed Look at a Sample Unformatted Report of Logged Data

The following is a detailed analysis of sample event logs as shown in the unformatted report:

User Messages Data

Two types of User Message data can appear in the report: snapshots and change messages. A snapshot is a bitmap representation of all application parameters contained in the User Message, and a change message contains only new values for bytes containing parameters that have changed state. For example:

```
Date        Time         Type       Src        Len        C_Cnt
01/02/01    15:17:28     0005       0700       001A       00FF
00000000    00000000     00000000   00000004   00000000
00000000    00

01/02/01  15:25:48  0007       0700       0003       0001
00 01
```

The first of the two event logs shown above is a User Message snapshot:

1. The *Date* and *Time* of the event was January 2, 2001 at 15:17:28.

2. The event *Type* (0005) indicates that the User Message was logged routinely on a periodic basis (see Table 5–9).

3. The log source (*Src*) (0700) is made up of two components:

   – 07 indicates that the log came from a User Message

   – 00 indicates that the log came from the first (and typically only) User Message defined in the application.

   Use Table 5–9 as a cross-reference.

4. The length (*Len*) (001A hexadecimal or 26 decimal) is the total number of data bytes logged in this User Message event –for example 26.

5. The Change Count (*C_Cnt*) is 00FF indicating that all parameters in the User Message were logged (a snapshot was taken).

6. The actual event data (25 hexadecimal bytes in the example) are shown on the next line of the report. Each hexadecimal byte contains the states, ON (TRUE) or OFF (FALSE), of eight bits (parameters) in the User Message. The application designer defines the meaning of each parameter in the User Message. The numbers in this sample *Log Frame* show that bits 0 through 121 are all OFF, bit 122 is ON, and the remaining bits are all OFF.

Be aware:

- when data is shown in hexadecimal, bits within a byte are swapped (listed most significant first)
- when data is in binary, bits are listed least significant first

In the example, the selected display format is hexadecimal. The term **Hex** is displayed at the upper left of the screen whenever hexadecimal format is displayed. To display data in binary, before viewing the report, select the *Format* option from DataLogger's Main Diagnostic Menu (see Figure 5–4).

The second event log in the previous example is a User Message change log:

1. The *Date* and *Time* of the event was January 2, 2001 at 15:25:48.

2. The event *Type* (0007) indicates that the User Message contains one or more parameter changes only (see Table 5–9).

3. The log source (*Src*) (0700) is a User Message.

4. The total number of data bytes in the *Log Frame* is three.

5. The number of changes is one.

6. The first byte of the User Message (byte 0) changed value, and the first (least significant) bit (bit 0) of this byte changed from 0 (FALSE) to 1 (TRUE). Note that each byte of a User Message contains data for eight application parameters.

Non-Vital Input Messages

Non-vital input events are similar to the User Message logs describe above, with the exception that there are no secondary sources (the last two digits of an NVI source are always 00). Three distinct NVI sources are classified according to the debounce groups of 0, 25 and 50ms (refer to Table 5–9).

Non-Vital Output Messages

Non-vital output event data are shown similar to User Message data; although NVO event data are always displayed as 2-digit hexadecimal numbers (see Table 5–11).

```
Date      Time        Type       Src       Len      C_Cnt
01/02/01  10:22:02    0005       0B00      0011     00FF
01010101  01010101    01010101   01010101
01/02/01  10:22:03    0007       0B00      0005     0002
05 03 07 01
```

In this example, both event logs shown are of the same NVO group. The last two digits of the NVO source (00) indicate the board on which the non-vital outputs physically reside. In the example, the secondary source of 00 indicates a log of outputs that reside on the first output board.

The first of the two NVO logs shown above is a periodic snapshot (the type is 0005), and the second log was taken due to changes (the type is 0007). The data length of the first sample log is 0011 hexadecimal (17 decimal) bytes. The C_Cnt (Change Count) of the periodic snapshot is 00FF, indicating that all elements of the NVO group were logged. The second example log shown, a change log, indicates that two elements of the NVO changed. The index of the first element that changed is 05 and its new value is 03; the index of the second element that changed is 07 and its new value is 01. Refer to Table 5–11 to interpret these NVO values.

Vital System Status Messages

To log this type of data, a properly configured Vital Diagnostic Protocol (VDP) must be installed in the non-vital application (refer to Alstom publication P2346W).

A vital status change message contains the date and time a CPU/PD board's status changed, along with the new vital system status (e.g. ERROR ALERT). This status is stored in the event log as a series of hexadecimal ASCII characters. The source is general (0C00) and the type is diagnostics (0001) – refer to Table 5–7. This type of log is shown in the unformatted report as follows:

```
Date       Time       Type      Src       Len       C_Cnt
01/02/01   15:25:48   0001      0C00      000A      N/A
53595354   454D204F   4B00
```

Other Event Types

Events that contain date and time data are displayed in decimal with appropriate delimiters. For instance, the third *Log Frame* shown in Figure 5–8 is a DataLogger hourmark, hence the type is 0002 and its source is 0600 (see Table 5–8). DataLogger automatically takes an hourmark at the start of each hour, when the system is reset, and when the system is powered up.

5.3.1.3. Logger > View or Xmit > Time, Dir, or All > VPI_Status, VPI Status Change Report

If the Vital Diagnostics Protocol (VDP) is included in the non-vital application (refer to Alstom publication P2346W), select *VPI_Status* from the Log Source Menu (Figure 5–7) to display or download a report of all VPI status change messages.

NOTE

This report is available in DataLogger Revision A15 and later.

The Vital Status Change Report presents the date and time the vital CPU/PD board changed state between SYSTEM OK, SYSTEM WARNING and ERROR ALERT. An UNKNOWN state exists only when communication between the non-vital CSEX and the vital CPU/PD circuit boards is interrupted for several seconds.

```
 EVENT DATE/TIME          VITAL STATUS
06/17/03 14:23:45         SYSTEM OK
06/19/03 22:16:18         ERROR ALERT
```

The menu options for the displayed report (*Page*, *First*, *Next*, *Back*, *Last* and *Dyna*) are the same as for the Unformatted Report of Logged Data described earlier in this section.

5.3.1.4. Logger > View > Time, Dir Or All > User, User Message Report

User Message data with pre-assigned names for each parameter (bit) is reported in the format shown in Figure 5–9.

NOTE

This report is available in DataLogger Revision A11 and later. It is only accessible if parameter names are made available to DataLogger in the non-vital application. Refer to Heading 4.2.10., Specifying the Storage of Parameter Names in the Non-Vital Application.

In this report, logged User Message data is shown in time-stamped TRUE/FALSE notation with parameter names. Names are automatically shown with the event data.

NOTE

A custom list of up to 16 parameter names is selected. These parameters are filtered from the data and displayed in this report. See Heading 5.3.3., Logger > Customize, Customize Selected Parameters, for a discussion of customization of selected parameters.

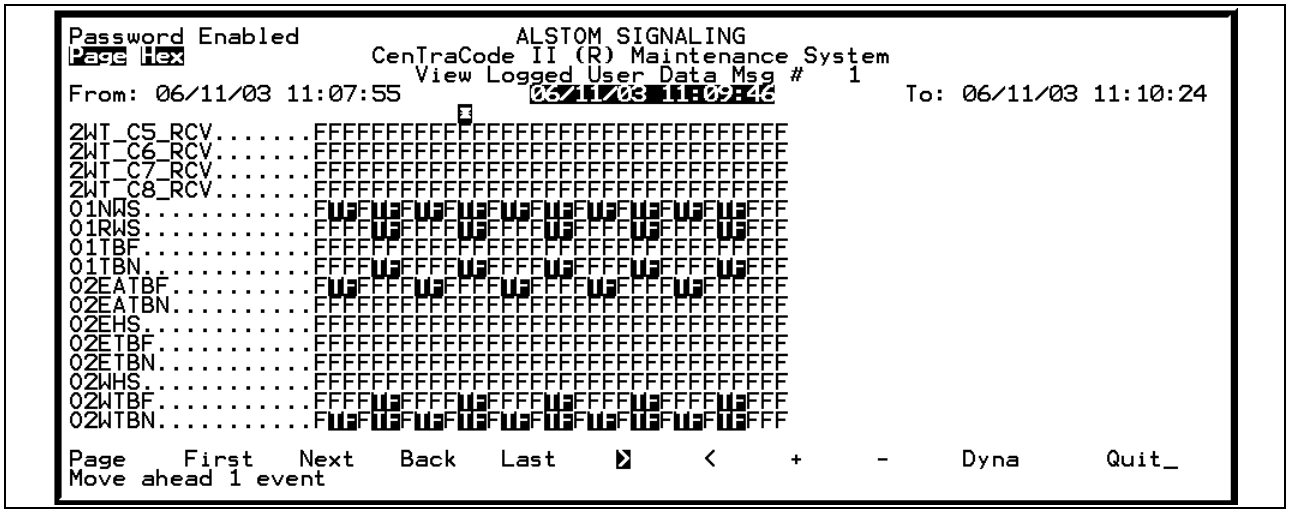

Figure 5–9. User Message Report

To view the report of logged User Message data with parameter names, make the following selections starting from DataLogger's Main Diagnostic Menu (see Figure 5–4):

1. *View*.

2. *Time*, *Dir* or *All*: select a time range (*Time*), a specific directory (*Dir*) for this report, or view all recorded User Message data (*All*) – as explained under Headings 5.3.1.1.1., 5.3.1.1.1.1. , 5.3.1.1.1.2. and 5.3.1.1.1.3.

3. *User*: the log source must be User Message data for this report.

This report shows logged User Message data for up to 16 bits (parameters) at a time with the name assigned to each parameter. Data for up to 62 logged events are shown from left (the earliest) to right (more recent) on a single screen. As shown in Figure 5–9, data for the first event is presented in the first vertical column of TRUE/FALSE states.

A parameter in the OFF state is represented by a single letter F (for FALSE) and a parameter in the ON state is represented by a single letter T (for TRUE). A state change between event data is illustrated by use of reverse video.

The "From" and "To" times displayed above the report are the log times of the first and last events. The time centered above the report is the date and time of occurrence of the single event pointed to by an asterisk (*) directly above its column of data. In Figure 5–9, this is the leftmost (first) event.

The menu for the User Message Report contains the options listed in Table 5–12.

Table 5–12. User Message Report Options

Option	Description
Page	This option affects the operation of the + and – menu choices. In *Page* mode (the default), a full screen of 16 names appear with each press of the + and – keys, whereas in *Line* mode, only one new name appears (with its data) when + or – are pressed. A status indicator at the upper left of the screen shows whether the display is in *Line* or *Page* mode.
First	This option displays logs beginning with the first one that occurred in the selected range.
Next	Use this option to view logs that occurred later in time. Up to 62 more recent events are shown.
Back	Use this option to view logs that occurred earlier in time. Up to 62 prior events are shown.
Last	Use this option to view logs starting from the end of the selected range.
>	Moves the event pointer (the asterisk) to the right one column and displays the time that event occurred.
<	Moves the event pointer (the asterisk) to the left one column and displays the time that event occurred.
+	Replaces the data shown with data for the next 16 (*Page* mode) or one (*Line* mode) parameter(s) in the User Message.
–	Replaces the data shown with data for the previous 16 (*Page* mode) or one (*Line* mode) parameter(s) in the User Message.
Dyna	This option enters *Dynamic* mode where User Message events are displayed at the time they occur (in real time). When invoked, all historic data currently displayed is erased from the screen and a snapshot of the current state of the parameters is displayed in the first column. Thereafter, as new events occur, their data is shown in the next available column. The time of occurrence of the most recent event is shown centered above the report. Press any key to exit *Dynamic* mode.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

5.3.2. Logger > Xmit > Time, Dir, or All > User, Download Logged User Message Data

Logged User Message data can be downloaded with parameter names in a format suitable for capturing to a file on a PC.

NOTE

This report is available in DataLogger Revision A11 and later. It is accessible only if parameter names have been made available to DataLogger in the non-vital application (refer to Heading 4.2.10., Specifying the Storage of Parameter Names in the Non-Vital Application).

To download the report of logged User Message data with parameter names, make the following selections starting from DataLogger's Main Diagnostic Menu (see Figure 5–4)

1. *Xmit*.

2. *Time*, *Dir* or *All*: select a time range (*Time*), a specific directory (*Dir*) for this report, or download all recorded User Message data (*All*) – as explained under Headings 5.3.1.1.1., 5.3.1.1.1.1. , 5.3.1.1.1.2., and 5.3.1.1.1.3.

3. *User*: the log source must be User Message data for this report.

For this report, select from the following options:

1. User Message data is downloadable in one of two formats: Single-line or Multiple-line:

- *Single-line* (short) format is a more concise report with up to three parameters on a line.

- *Multiple-line* (long) format presents only one parameter per line, which can be better suited for later import and analysis by some PC database management software packages. Each line of the report contains four columns of information: event date, event time, parameter name and parameter value (T for TRUE and F for FALSE). If several parameters change state in the same event, the data for this event is output on multiple lines with one parameter per line.

2. *Historic* vs. *Dynamic* data. The *Historic* option reports existing already logged data, whereas the *Dynamic* option transmits a report showing state changes as they occur in real-time.

3. Show initial snapshot (applies only to the *Historic* option). When this option is selected, the report begins with a snapshot showing the starting values of all parameters in the report.

Before the report begins, the prompt “Prepare to capture data...Press any key to begin” appears. At this point, prepare the PC communication software to capture incoming data to disk, by using commercially available communication software, such as ProComm™ Plus. Press any key and the report begins. While downloading historic (already logged) event data, it is displayed. New logs are displayed dynamically as they occur in real time. Press any key again to stop dynamic reporting or to abort the historic report prematurely.

A downloaded report contains only printable ASCII characters, with each line ending with a CR/LF sequence. When the report is finished, the message “Report Done…Press any key to continue” is displayed. Instruct the PC communication software to stop capturing incoming data to disk, and then press any key to return to DataLogger’s Main Diagnostic Menu (Figure 5–4).

Sample Single-Line Download Report

```
Start of Log Report
Report Format: Short
Show Initial Snapshot: No
Location ID:    1

 6/06/2003  9:31:13     O1NWS T     O2EATBF T    O2WTBN T
                       2EATBF T    2STOP-NV T
 6/06/2003  9:31:14     O1NWS F     O2EATBF F    O2WTBN F
                       2EATBN F     P2EATBK F
 6/06/2003  9:31:15  2STOP-NV F
 6/06/2003  9:31:15     O1NWS T       O1RWS T     O1TBN T
                       O2WTBF T      O2WTBN T  2STOP-NV T
 6/06/2003  9:31:15     O1NWS F       O1RWS F     O1TBN F
                       O2WTBF F      O2WTBN F
 6/06/2003  9:31:17  2STOP-NV F

Log Report Complete
```

Sample Multiple-Line Download Report

```
Start of Log Report
Report Format: Long
Show Initial Snapshot: No
Location ID:    1

 6/06/2003  9:31:13          O1NWS T
 6/06/2003  9:31:13        O2EATBF T
 6/06/2003  9:31:13         O2WTBN T
 6/06/2003  9:31:13          2EATBF T
 6/06/2003  9:31:13        2STOP-NV T
 6/06/2003  9:31:14          O1NWS F
 6/06/2003  9:31:14        O2EATBF F
 6/06/2003  9:31:14         O2WTBN F
 6/06/2003  9:31:14          2EATBN F
 6/06/2003  9:31:14         P2EATBK F
 6/06/2003  9:31:15        2STOP-NV F
 6/06/2003  9:31:15          O1NWS T
 6/06/2003  9:31:15          O1RWS T
 6/06/2003  9:31:15          O1TBN T
 6/06/2003  9:31:15         O2WTBF T
 6/06/2003  9:31:15         O2WTBN T
 6/06/2003  9:31:15        2STOP-NV T
 6/06/2003  9:31:15          O1NWS F
 6/06/2003  9:31:15          O1RWS F
 6/06/2003  9:31:15          O1TBN F
 6/06/2003  9:31:15         O2WTBF F
 6/06/2003  9:31:15         O2WTBN F
 6/06/2003  9:31:17        2STOP-NV F

Log Report Complete
```

5.3.3. Logger > Customize, Customize Selected Parameters

Typically, a User Message consists of several dozen, or even hundreds, of parameters. At a given time, data recorded for selected parameters is shown in the User Message Report (see Figure 5–9) or in the custom downloaded report of User Message data. To access this feature, select *Customize* from DataLogger's Main Diagnostic Menu (Figure 5–4).

NOTE

This feature is available in DataLogger Revision A11 and later.

The names assigned to the bits of a User Message can be displayed. From this list, 1 to 16 parameters of interest are selected to be viewed or downloaded in the User Message Report. The report then only shows state changes to these parameters, filtering out changes to all other parameters. Doing so does not affect previously recorded data; it only affects the manner the data is presented.

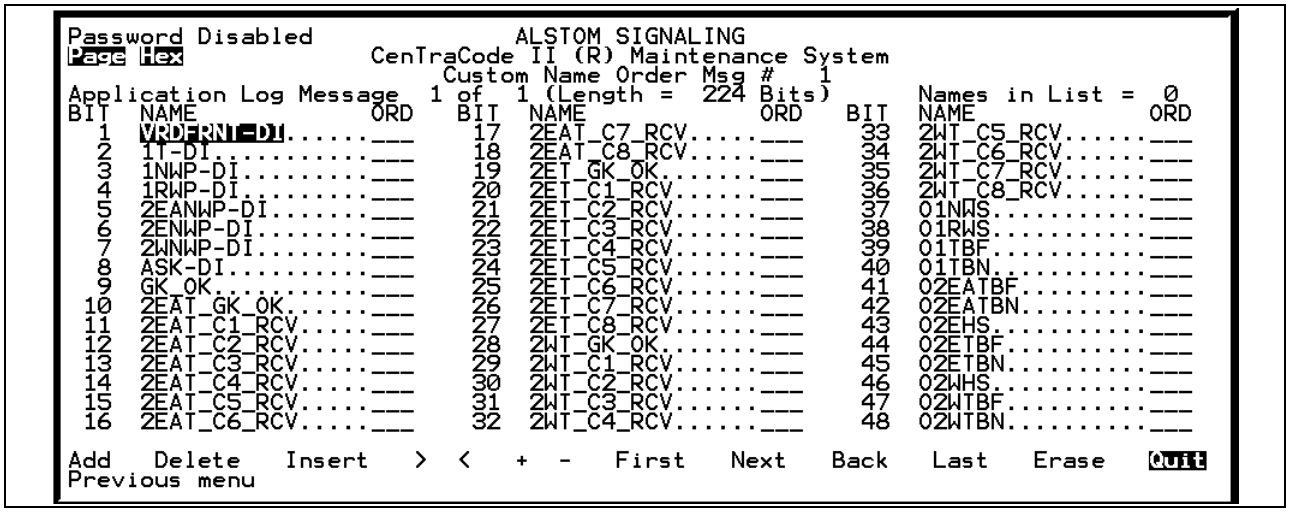

Figure 5–10. Selection of Custom List of Names

Initially, no names have been selected from the customize screen. In this case, the viewed or downloaded report of User Message data contains data for all User Message parameters in the same order as defined in the non-vital application. Since initially no custom list of names exists, the *ORD* (order) column is blank (underlines) and the total "Names in List" (shown above the table) is zero.

To move around in the table of parameter names and to highlight a desired name press

- >, the greater than symbol
- <, the less than symbol
- +, the addition symbol
- -, the subtraction symbol

Press the *Add* or *Insert* option to place a name in the custom list of ordered names. When a name is placed in the list, it is automatically assigned the next sequential number from 1 to 16. Names may be placed in any order in the custom list.

Press the *First, Next, Back* and *Last* menu options to display additional names (if any) in the User Message. At most 48 names, in three columns of 16 each, are shown on a single screen.

To remove an already-selected name from the ordered list, highlight the previously numbered name and then select the *Delete* option; other names formerly selected are renumbered accordingly.

Press the *Erase* option to erase the entire custom list of ordered names. This restores the *ORD* column to blanks and the total names in the list to zero. A verification prompt prevents the accidental erasing of the list of names.

5.3.4. Logger > Util, Utility Menu

DataLogger's Utility Menu is password protected and provides access to DataLogger's operating parameters. The *Password* option is discussed on page 5–9.

Enter the password (if necessary) and then select the *Logger* option in the System Main Menu (Figure 5–3) followed by the *Util* option in DataLogger's Main Diagnostic Menu (Figure 5–4) to display the Utility Menu (Figure 5–11).

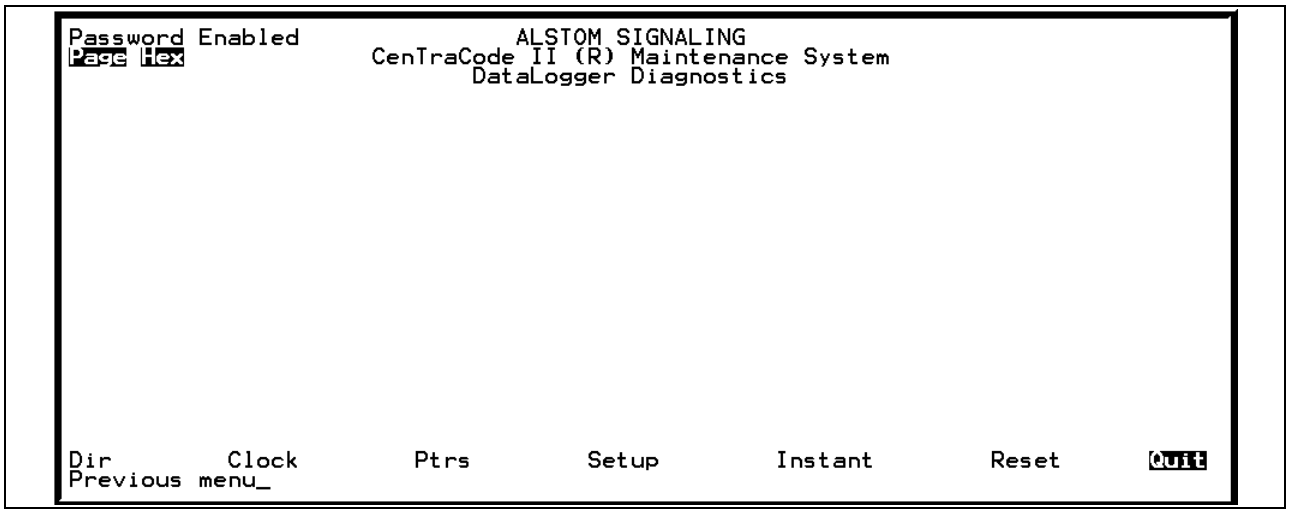

Figure 5–11. Utility Menu

The following options, each described in detail next, are available in the Utility Menu:

Table 5–13. Utility Menu Options

Option	Description
Dir	Use this option to produce a listing of valid *Directory Frames* as shown in the menu in Figure 5–12.
Clock	Use this option to modify the system's Real Time Clock (RTC) used to timestamp logged event data (Figure 5–13).
Ptrs	This option displays the addresses of DataLogger's working internal data structures (Figure 5–14). The information displayed is intended for Alstom technical personnel only.
Setup	This option provides review/edit access to DataLogger's configurable items (Figure 5–15).
Instant	This option provides a means of taking a snapshot of all of the non-vital application defined sources, such as User Message data (Figure 5–19).
Reset	This option restores all of DataLogger's operating parameters to default values and deletes all directories and previously logged data. The result is that previous logs and directories cannot be accessed; logging resumes as though it were an entirely new system. **CAUTION** Use the *Reset* option carefully since it erases all logged data.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

5.3.4.1. Logger > Util > Dir, Directory Menu

Select the *Dir* option from DataLogger's Utility Menu (Figure 5–11) to produce a list of valid *Directory Frames*, an example is shown in Figure 5–12. Up to fifteen *Directory Frames* can be displayed at a time.

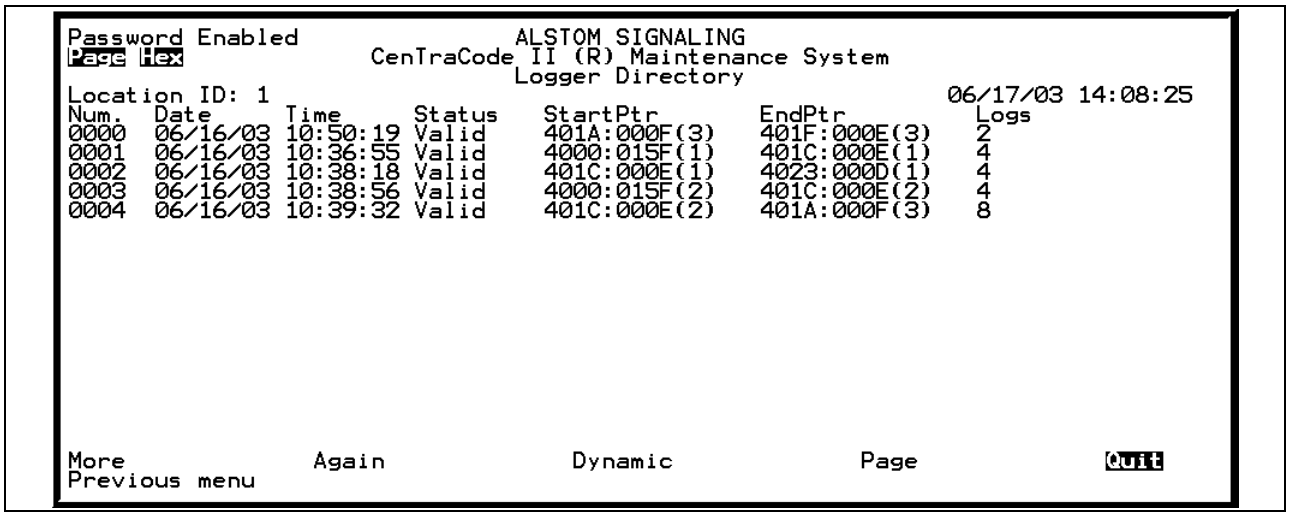

Figure 5–12. Directory Menu

The value in parenthesis after the start and end pointers is the battery-backed memory page (for DataLogger Rev. A18 or later). Earlier revisions of DataLogger provided only one 256K page of CSEX3 memory. CSEX3 has four 256K memory pages, numbered 0 – 3, whereas all other supported hardware platforms have only one memory page, numbered 0, that is either 128K in size (CenTraCode II-s) or 256K in size (CSEX2).

The following options are available in the Directory Menu:

Table 5–14. Directory Menu Options

Option	Description
More	This option displays additional valid directory records. When in *Page* mode, the *More* option displays up to fifteen additional *Directory Frames*, whereas in *Line* mode, one additional *Directory Frame* is shown.
Again	This option redisplays the directory listing beginning with first *Directory Frame*.
Dynamic	This option causes the displayed time as well as the *Dnepr* (End Pointer) and the *Logs* count (total number of events) of the current directory to be updated in real time (as this information changes).
Page	This option switches the display between *Page* and *Line* modes, and effects the operation of the *More* option. The status indicator at the upper left of the screen shows whether the display is in *Page* or *Line* mode.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

The following is a discussion of the sample DataLogger directory listing shown in Figure 5–12. The *Location ID* is a number from 0 to 1024 that uniquely identifies a given application (or site). It is designated using the optional Location ID Record in the non-vital application.

Information on each *Directory Frame* is presented in the following columns:

1. Num (Number): This is the number assigned to a *Directory Frame*, ranging from 0 to 191 (0x00BF in hexadecimal). Unless the system's operating clock or the system is reset, *Directory Frame* numbers correspond to hour rollovers since DataLogger automatically logs a new Directory Frame every hour.

2. Date: The Directory Frame was generated on this day.

3. Time: The *Directory Frame* was generated at this time.

4. Status: This is the *Directory Frame's* current status, either:

   - Valid – indicates that the logs (events) included in this *Directory Frame* are accessible.

   - Expired – indicates the logs included in this *Directory Frame* are overwritten and can no longer be accessed.

5. StartPtr (Start Pointer): This is the starting location (address) of the memory area; it holds the logs included in this *Directory Frame*.

6. EndPtr (End Pointer): This is the location in memory (address) of the next log entry to be stored.

7. Logs: This is the total number of *Log Frames* (events) included in this *Directory Frame*. This count is shown in decimal.

5.3.4.2. Logger > Util > Clock, Clockset Menu

When the *Clock* option is selected from DataLogger's Utility Menu (Figure 5–11), a screen for entering a new date and time is presented (Figure 5–13).

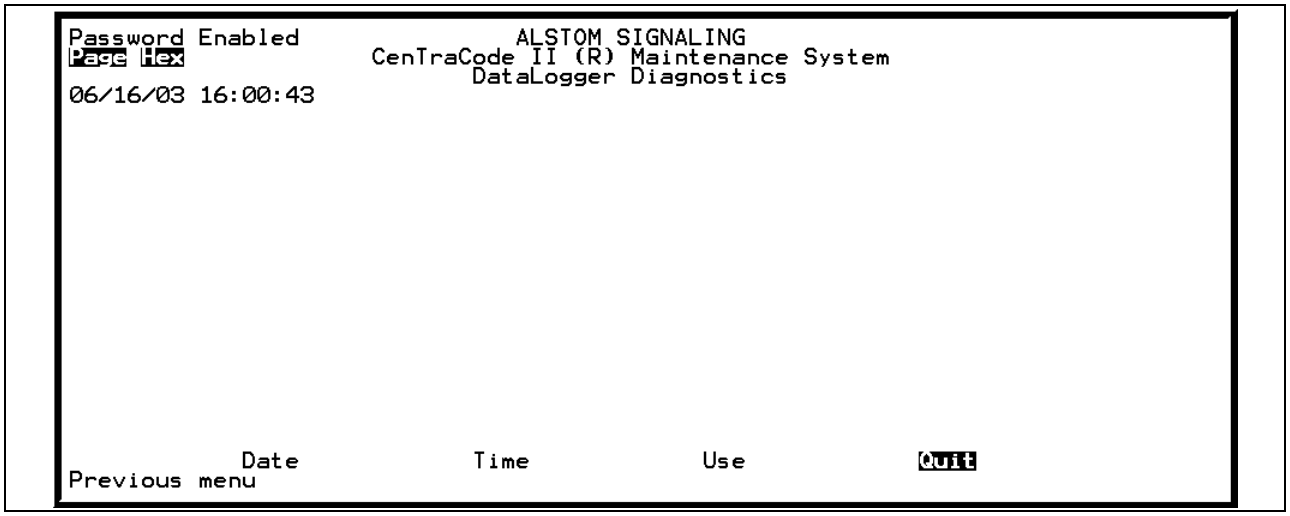

Figure 5–13. Clockset Menu

NOTE

For proper time stamping of events, it is imperative that the system's Real-Time Clock is initialized from the Clockset Menu.

The current date and time are shown at the top left of the screen. Follow these steps to enter a new date and time, and set the system's Real-Time Clock:

1. If some date other than the current date is desired, select the Date option, type in the desired date and then press the Enter key. The date must be entered in the form MM/DD/YYYY with leading zeroes.

Where:

- MM is the month expressed as a 2-digit number from 01 to 12
- DD is the day expressed as a 2-digit number from 01 to 28-31 (based on the month)
- YYYY is the year expressed as a 4-digit number from 0000 to 9999

For example, 01/02/1998 and 03 04 2000 are both valid dates. Note that any character, not just "/", may be used as a separator. The dates 08/16/98 and 3 04 2000 are both invalid and are not accepted due to an incorrect number of digits.

2. Select the Time option from the menu, type in the desired time and then press the Enter key. The time must be entered in the form HH:MM:SS with leading zeroes.

Where:

- HH is the hour expressed as a 2-digit number from 00 to 23
- MM and SS are the minute and second each expressed as a 2-digit number from 00 to 59

For example, 00:00:00 and 19:00:00 are both valid times, whereas 23:0:0 and 19:00 are invalid times and are not accepted due to an incorrect number of digits. Note that any character, not just ":", may be used as a separator.

3. Select the *Use* option to submit the new date and time. DataLogger reprograms the system's clock and save a new *Directory Frame*, unless inhibited by Timed Data Protection.

5.3.4.3. Logger > Util > Ptrs, Internal Structure Pointers

Select the *Ptrs* (Pointers) option from DataLogger's Utility Menu (Figure 5–11) to display DataLogger's "Static RAM" and "Battery RAM" internal structure pointers (Figure 5–14). This option is intended for Alstom technical personnel only.

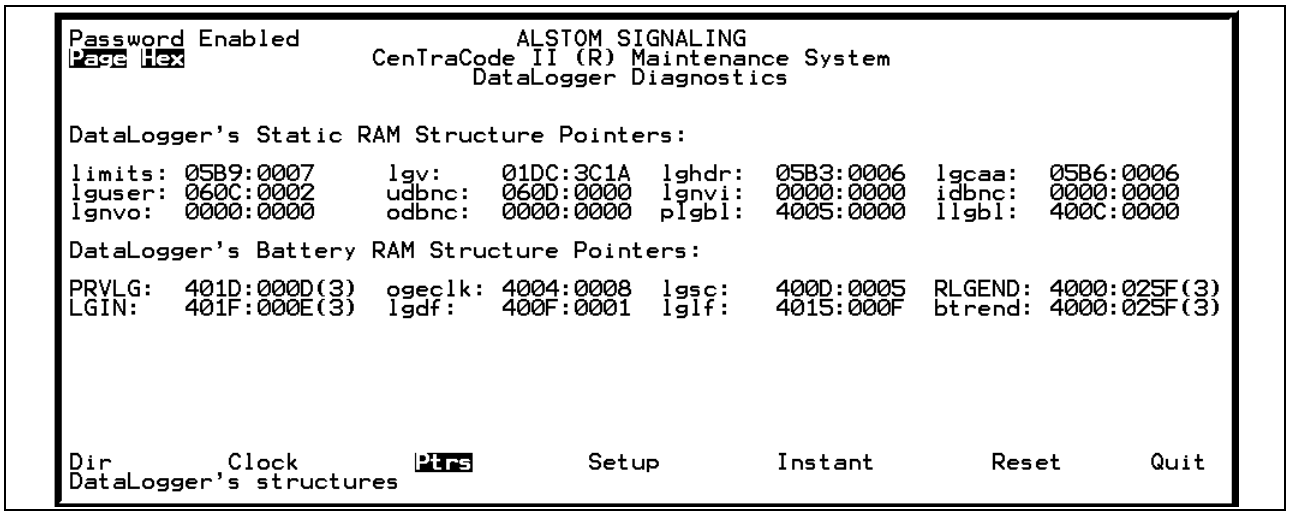

Figure 5–14. Display of DataLogger's Internal Structure Pointers

5.3.4.4. Logger > Util > Setup, DataLogger's Setup (Configuration) Menu

Select the *Setup* option from DataLogger's Utility Menu (Figure 5–11) to access the Setup (configuration) Menu (Figure 5–15). The Setup Menu provides access to DataLogger's configurable operating parameters. Parameters can be reviewed and optionally modified. Default operating parameters are preset in the non-vital application and are stored in program memory. DataLogger maintains a copy of the parameters in battery supported RAM for its own use, retained even after power failure or system restart.

Parameters discussed here are directly related to log sources, modes and logged events. See Table 5–7 through Table 5–10 for details on the parameters themselves.

Initially, the captions "PORT EVENTS" and "GENERAL SYSTEM EVENTS" are displayed as shown in Figure 5–15, but no parameter values appear.

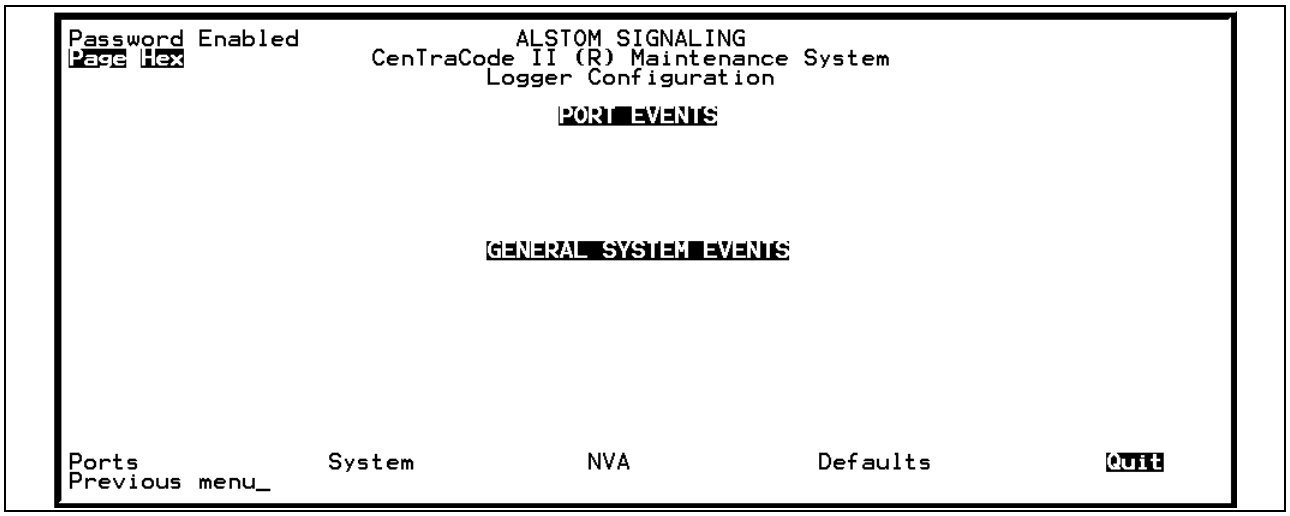

Figure 5–15. Setup Menu

The *Defaults* option restores all of DataLogger's configurable operating parameters to PROM-based default values. It is possible to modify specific operating parameters temporarily; the *Defaults* option provides a means of setting all parameters back to their default (initial) settings.

Before discussing other options in the Setup Menu, the following describes selecting and changing the DataLogger setup parameters. Note that "UDF" means that a parameter is reserved or is undefined.

To select a parameter:

1. Select the desired category of DataLogger parameters from the Setup Menu: *Ports*, *System* or *NVA*. For the *Ports* option, the desired serial port number must also be entered. For the *NVA* (non-vital application) option, a new menu appears. From this menu, select the desired non-vital application source: *Umsg* for User Messages, *INVI* for Non-Vital Inputs, *ONVO* for Non-Vital Outputs, *Snap* for I/O snapshot or *Lflag* for logger events.

2. Highlight a specific parameter by moving the highlight with the Spacebar or the Right, Left, Up or Down Arrow keys.

To change a parameter's value:

1. Toggled Parameters: Most parameters are toggled ON or OFF by pressing the letter T. Toggling a parameter informs DataLogger to either reject or accept logs of the event type.

NOTE

An event whose setup parameter is turned OFF is *not* logged.

2. Numeric Parameters: Two parameters (*Period* and *Protection*) require input of numeric values. After highlighting the parameter, type the letter T to erase the current value on the screen, and then enter a valid number for the parameter.

3. Multiple Choice Parameters: For parameters that display multiple values (e.g. *Comm-Mode*), after highlighting the parameter, repeatedly press the letter T until the desired choice appears.

5.3.4.4.1. Logger > Util > Setup > Ports, Port Selection

The *Ports* option in the Setup Menu (Figure 5–15) provides access to configurable parameters for all event types associated with communication ports. Select this option and then enter a serial port number from 1 to 6 (or 4 if CenTraCode II-s) corresponding to the port of interest.

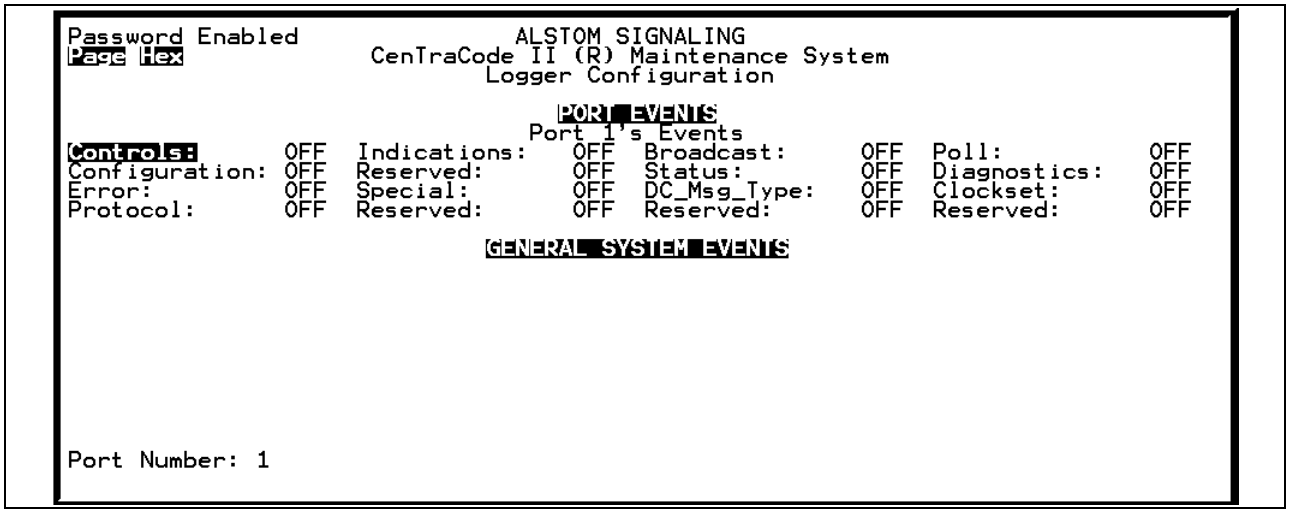

Figure 5–16. Ports Configuration Screen

Type the letter Q (*Quit*) to return to the Setup Menu (Figure 5–15).

NOTE

Turning a port event parameter ON does not ensure that port events are logged when they occur. DataLogger does not generate port event logs. An installed port software module such as a communication protocol (e.g. DataTrain VIII) must generate these logs. If an event's parameter is ON, the installed port module must generate logs before they are placed in DataLogger's memory.

5.3.4.4.2. Logger > Util > Setup > System, General System Configuration

Select the *System* option in the Setup Menu (Figure 5–15) to access DataLogger's General System Configuration Screen.

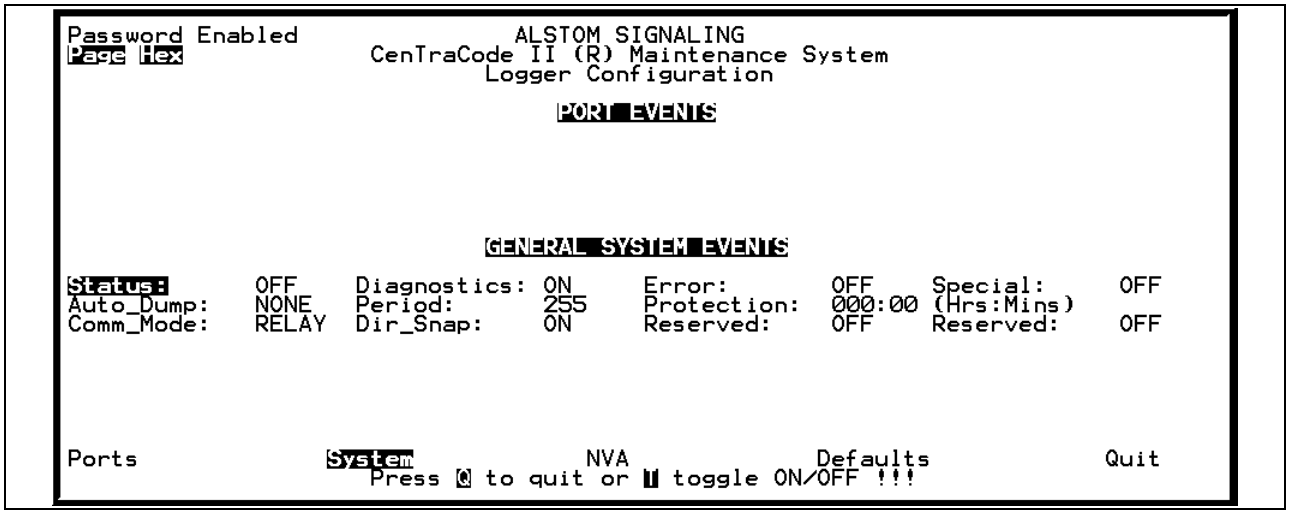

Figure 5–17. General System Configuration Screen

Some parameters accessible from this screen determine whether event types are accepted from the system, while others control the behavior of DataLogger:

1. Status**,** Diagnostics**,** Error and Special**:** DataLogger accepts these event types from the system only if their status is ON, otherwise these event types are not logged.

2. Auto_Dump and Period: As of DataLogger Revision A18, these parameters are obsolete and have no effect on the operation of DataLogger.

3. Protection: This parameter, expressed in hours and minutes, determines how old the oldest log must be before it is overwritten by the Timed Data Protection feature. To change the value, type the letter T followed by the desired age in hours and minutes. The time must be entered in the format HHH:MM, where HHH represents a 3-digit decimal number of hours and MM represents a 2-digit number of minutes. For example, 060:10 sets the time protection to sixty hours and ten minutes. If an improper number of digits are entered for the protection time, unexpected results may occur.

4. Comm_Mode: This parameter determines how DataLogger accepts logs from communication protocol modules. It can be set to any of three values: DIRECT, RELAY or NONE. If this parameter is set to NONE, all logs submitted by communication protocol modules are rejected.

- *Direct* Mode – In this mode, DataLogger clears a direct path to event memory for communication modules. This mode of logging provides the guarantee that all messages passed to DataLogger are accepted, inhibited only by the availability of event memory space. However, it has the drawback of imposing additional operating overhead on protocol modules. This increase in overhead has two negative results:

  – It considerably distracts protocols from their primary mission of maintaining steady, timely delivery of information to and from control centers. Application designers must experiment with increasing inter-scan delays to ensure that all code line messages are processed properly. Inter-scan delay is the time interval between consecutive messages sent from a control center to field locations. Increasing this interval may improve performance.

  – Stack memory availability is limited. Communication protocols are composed of tasks. A fixed amount of memory is assigned to each task for its stack activities. Early versions of protocol emulations were somewhat conservative with memory allocation. These may not allocate sufficient memory for performing the computations required to conduct logging in *Direct* mode. The use of a protocol with insufficient stack memory results in frequent system resets.

- *Relay* Mode – In this default mode of operation, data logs are placed in a limited capacity temporary buffer. Subsequent logs are rejected if this buffer becomes full. When convenient, DataLogger removes the log from the temporary buffer and stores it in permanent battery-backed memory. *Relay* mode has the advantage of not using the protocol emulation's stack to perform computations. However, it must be noted that the same amount of real time is required to accept a given log in both *Direct* and *Relay* modes. Although *Relay* mode does allow a protocol to quickly deposit a log and resume its other functions, it does not allow a bombardment of logs. Once the temporary buffer becomes full, new logs cannot be accepted.

5. Dir_Snap: This parameter determines if DataLogger takes a full snapshot of all user defined data events, such as User Messages, each time a new directory is created. This initial complete data event provides a baseline for the reports of logged data.

CAUTION

When Dir_Snap is set to OFF, many of the *View* and *Xmit* reports do not operate correctly, since these reports require an initial snapshot. Therefore, it is recommended that Dir_Snap always be set to ON.

5.3.4.4.3. Logger > Util > Setup > NVA, Non-Vital Application Configuration

The *NVA* (non-vital application) option in the Setup Menu (Figure 5–15) leads to the Non-Vital Application Sources Menu shown in Figure 5–18. This menu provides access and configuration of the three non-vital application sources (User Messages, non-vital inputs and non-vital outputs), and the I/O snapshot feature.

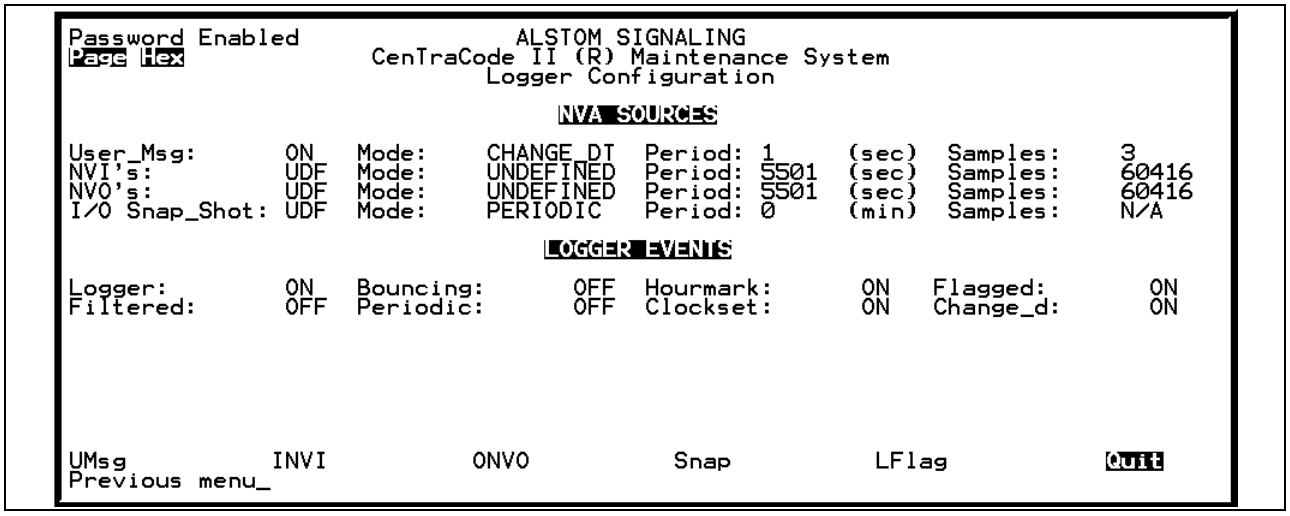

Figure 5–18. Non-Vital Application Sources Menu

The options listed in Table 5–15 are available in the Non-Vital Application Sources Menu (Figure 5–18).

Table 5–15. Non-Vital Application Sources Menu Options

Option	Description
UMsg INVI ONVO Snap	Select one of these options for a new menu used to modify a specific log source's parameters: 1. *LogFlag*: This ON/OFF switch enables or disables DataLogger's non-vital application monitor modules for the recording of User Messages, Non-Vital Inputs, Non-Vital Outputs and I/O Snapshots. For instance, the module that monitors User Messages does not log User Message data if its log flag is turned off. Select the *LogFlag* option to switch the log flag of a source ON or OFF. If a non-vital application does not include a particular monitor module, its log flag is set to UDF (undefined). See Section 4, Configuration By The Alstom CAAPE, for details on how to configure DataLogger in an application. 2. *Mode*: This parameter specifies how each non-vital application monitor module operates. The log mode can be set to one of the following states: – FLAGGED: the non-vital application module generates a log when components of the source change value. The entire source message is logged, not just the changed components. – CHANGE_DT: the non-vital application module generates a log when components of the source change value. Only the changed components are logged, unless the number of changed components exceeds 25% of its size, then the entire source is logged. – FILTERED: the non-vital application module generates logs on a change detect basis while verifying that the number of changes remains within specified limits. – PERIODIC: the non-vital application module generates logs at specified time intervals regardless of a change in the source. If any source (including I/O snapshot) is set for *Periodic* logging, then another source set to a different mode may be changed to *Periodic* logging. Changing to a mode other than *Periodic* may only be done in the non-vital application, which must then be recompiled (not from this screen). Installing the I/O snapshot feature or specifying any source for *Periodic* logging causes DataLogger to install the one universal periodic process. With this process installed, use the *Mode* option to toggle between the original (the default) mode and *Periodic* mode for the selected source. Note that the log interval time is specified in seconds and must be adjusted to a desired value. Changing the log mode does not change the timing units. UNDEFINED: represents an unknown logging mode. This can result only if there is an error in the data generated by the CAA compiler/linker or if the non-vital application module is not included in the application.

Table 5–15. Non-Vital Application Sources Menu Options (Cont.)

Option	Description
UMsg INVI ONVO Snap (Cont.)	3. *Period*: This menu option is used to change a log source's period, This data is irrelevant if a source is set for *Change Detect* logging mode. In this case, changing the period does not effect how and when the source is logged. In *Filtered* logging mode, the value of "Period" is combined with the value of "Samples" to determine the permissible maximum number of logs that may be taken from the source within one second. In the case of *Periodic* logging mode, the value of "Period" alone determines how often the source is logged. A change in this value does not cause DataLogger to immediately change its timing. For example, if the period is currently 10 minutes and 2 minutes after the most recent log is stored the period is changed to 3 minutes, then the original 10-minute period first has to expire and a new log taken before the new 3-minute interval becomes effective. 4. *Samples*: This value is irrelevant if a source is configured for *Change Detect* or *Periodic* logging mode. In either case, changing the value of "Samples" does not alter how and when a source is logged. In *Filtered* logging mode, the value of "Samples" is combined with the value of "Period" to determine the permissible maximum number of logs that may be taken from the source within one second. When the *Samples* option is selected, a prompt appears to enter a decimal number to be used in Filtered logging calculations.
LFlag	This option accesses DataLogger's event type parameters and is toggled ON or OFF. Its status is shown under the heading "LOGGER EVENTS" in Figure 5–18. If a parameter is turned OFF, its corresponding event is not logged when the event occurs. Turning a parameter OFF does not prevent a log from being generated when its event occurs, but only prevents the log from being stored.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

5.3.4.5. Logger > Util > Instant, Instantaneous Snapshot Logging

The *Instant* option in DataLogger's Utility Menu (Figure 5–11) provides a means of taking an instantaneous log of the non-vital application sources. Select the *Instant* option to view the Instantaneous Snapshot Menu (Figure 5–19). This menu is used to instantly log a snapshot of one or all three of the non-vital application sources by selecting *UMsg*, *INVI*, *ONVO* or *All*.

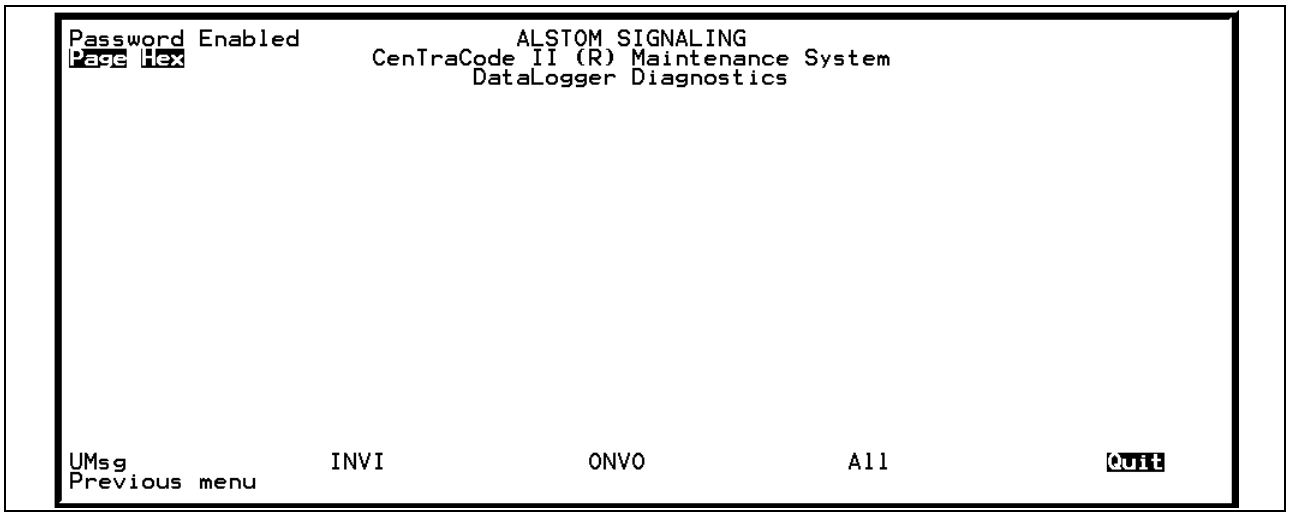

Figure 5–19. Instantaneous Snapshot Menu

These menu options instruct the DataLogger to instantly generate a log for the chosen source(s). To ensure that the instantaneous snapshot log is stored:

- The log mode for the source(s) must be set to *Periodic*.
- The log flag must be ON.
- DataLogger must have sufficient available memory space to store the log.

5.3.5. Logger > Inq, Inquiry Menu

The *Inq* option in DataLogger's Main Diagnostic Menu (Figure 5–4) leads to the Inquiry Menu shown in Figure 5–20. This option allows a remote computer access to DataLogger (e.g. from Alstom's Tracker utility) and is not intended for actual user operation.

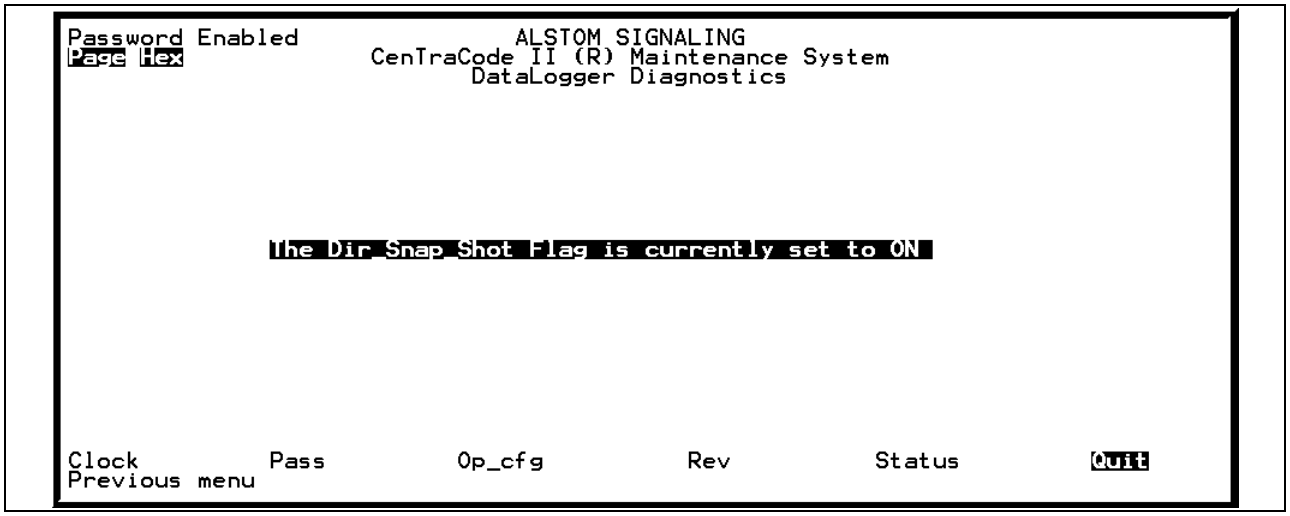

Figure 5–20. Inquiry Menu

See Table 5–16 for descriptions of the Inquiry Menu options.

Table 5–16. Inquiry Menu Options

Option	Description
Clock	Transmits the current system date and time to the Generic Port Interface (GPI) port. Refer to the next section for a discussion of the GPI.
Pass	Indicates whether the password protected features are enabled, disabled or absent (no password is defined) to the GPI port.
Op_cfg	Transmits the current operating parameters of DataLogger to the GPI port.
Rev	Transmits the current revision and version of the DataLogger software to the GPI port.
Status	Transmits the present status of DataLogger to the GPI port. This status indicates whether DataLogger is actually recording data or whether it has run out of available memory and is waiting for Timed Data Protection to expire before overwriting old data with new data.
Quit	This option exits to DataLogger's Main Diagnostic Menu.

5.3.6. Logger > Help, Help Menu

The *Help* option in DataLogger's Main Diagnostic Menu (Figure 5–4) accesses DataLogger's Main Help Menu (Figure 5–21). This menu provides access to textual on-line help for DataLogger's most common features.

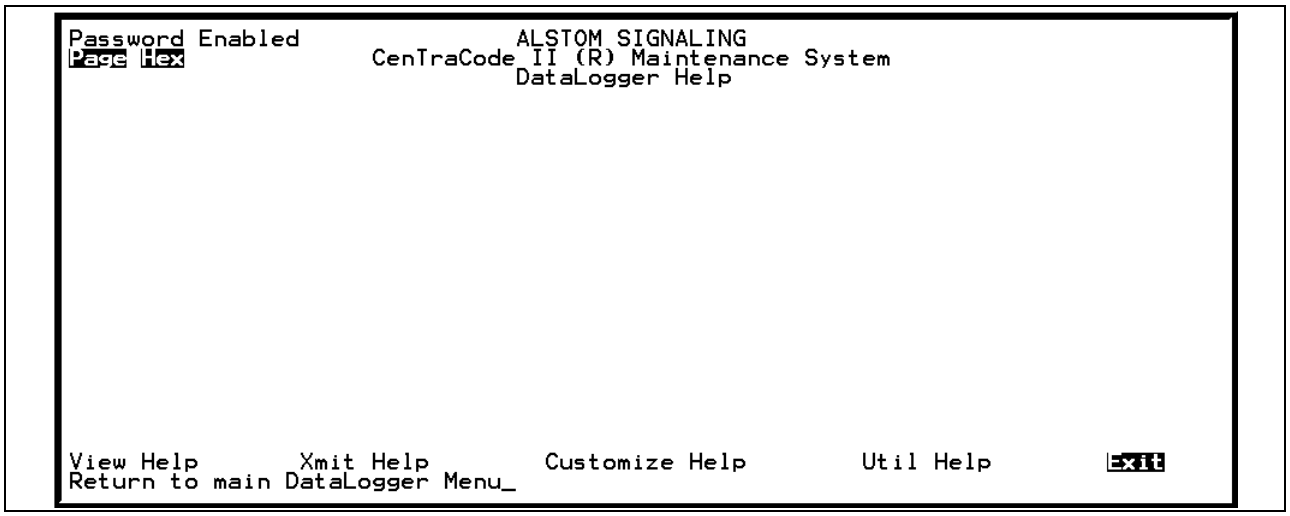

Figure 5–21. Main Help Menu

The following on-line help is available (in DataLogger Revision A15 and later):

1. *View Help*: Select the *View Help* option for a brief description of DataLogger's View function, and to display the menu shown in Figure 5–22.

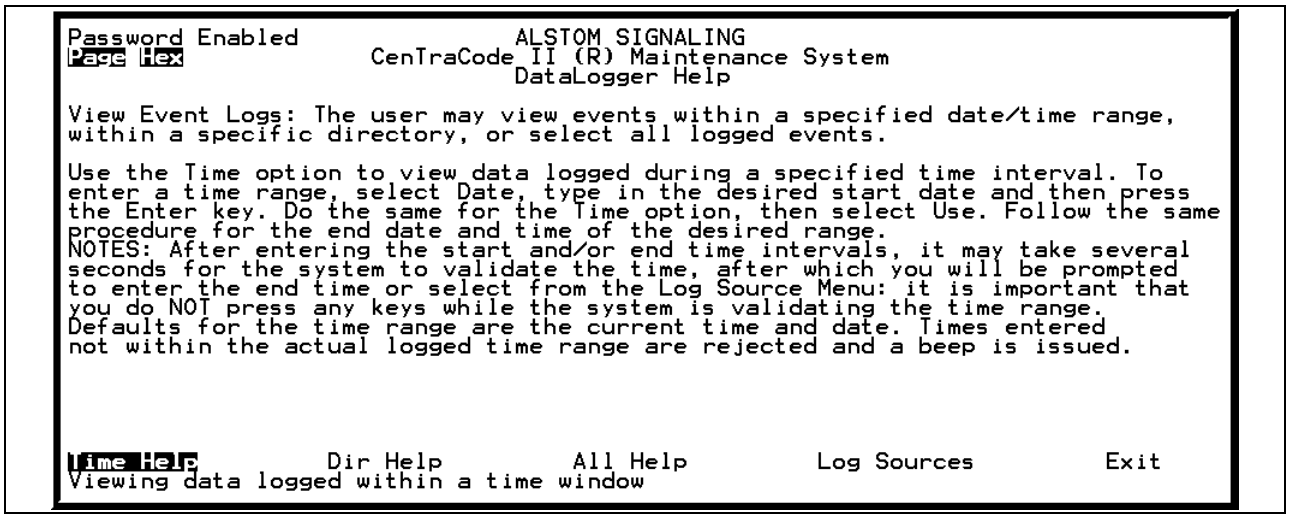

Figure 5–22. View Help Menu

The options in the View Help Menu display briefly describe the operation and usage of the log source and the three range selection choices (Time, Directory, All):

2. *Xmit Help*: Describes the data download capability of DataLogger. For an explanation of the log range and log source choices, refer to the *View Help* option.

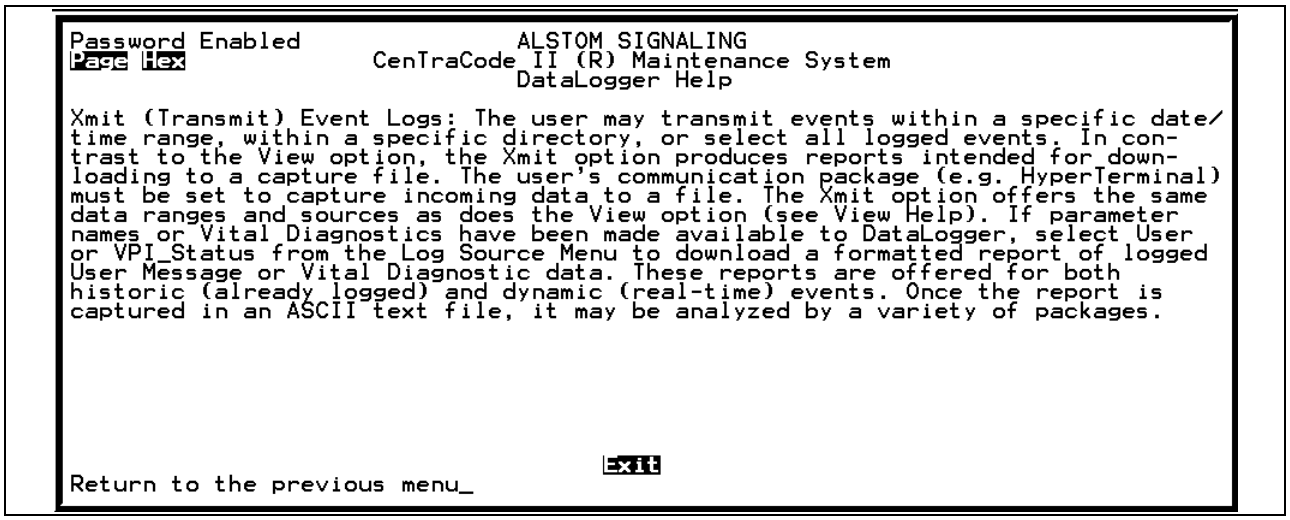

Figure 5–23. Xmit Help Menu

3. *Customize Help*: Briefly describes DataLogger's customize feature.

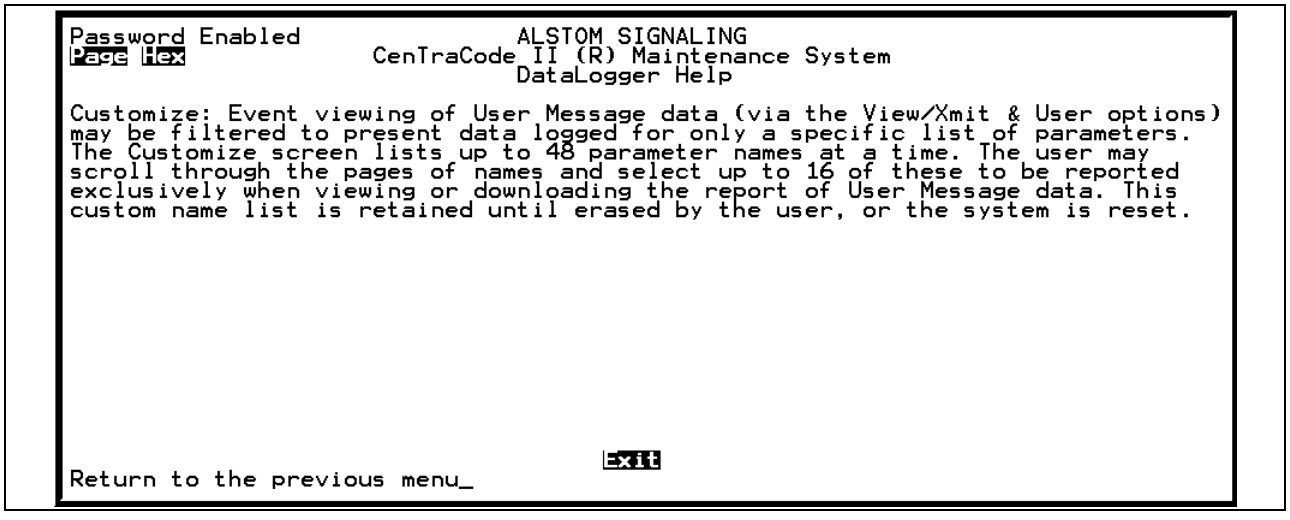

Figure 5–24. Customize Help Menu

4. *Utility Help*: Provides an overview of DataLogger's configurable parameters that are of primary interest to users: clock setting and erasure of logged data.

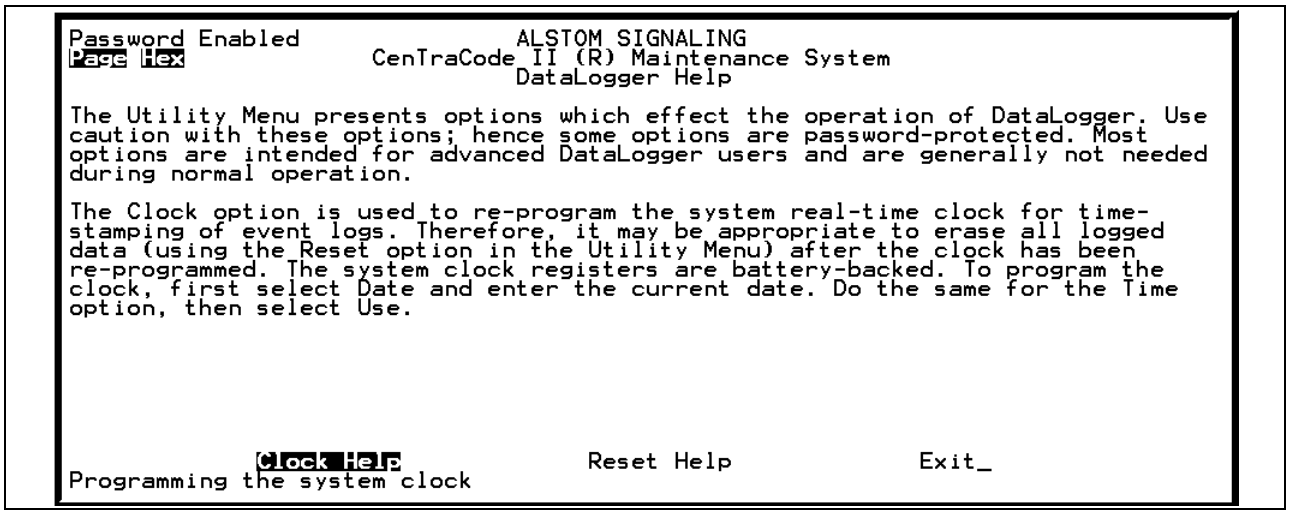

Figure 5–25. Utility Help Menu

6. SECTION 6 – GENERIC PORT INTERFACE

Generic Port Interface (GPI) is an optional system software module that sends and receives diagnostic information to/from a system serial port specified in the non-vital application.

6.1. OVERVIEW OF GENERIC PORT INTERFACE (GPI)

GPI receives diagnostic commands through this port, and passes them to the appropriate system module, such as DataLogger, for processing. Like other system modules, GPI can be optionally included in an application. GPI works in tandem with DataLogger to off-load logged data to a remote device for analysis. This device is typically a PC running the Alstom Signaling Tracker™ utility (see Alstom publication P2307).

GPI requires that a communication protocol conduct the actual data transmission. Alstom Signaling's DataTrain VIII is an Alstom communication protocol suitable for operation with GPI. To use GPI, a serial port in the system must be designated to operate the DataTrain VIII protocol. DataTrain VIII with a text interface must be installed in the application and assigned to the serial port. A port so designated is referred to as a "GPI port." See Heading 4.2.2., Configuration by the Alstom CAAPE: Remote Access Interface Record, for details on including and designating a GPI port in a non-vital application.

A GPI port shares the same system resources as the Maintenance Access (MAC) port, and both ports have the same priority level. Activating one port while the other is busy disengages the busy one giving priority to the recently activated port. The disengaged port is never re-engaged unless data is sent to it. It is recommended that re-engagements always begin with a return to the System Main Menu (Figure 5–3) via the Ctrl and 'E' command.

6.2. GPI DATA TYPES

GPI can transmit both binary (non-printable) and text (printable) data types. The nature of transmitted data is solely dependent on its source. For instance, some DataLogger messages contain printable ASCII text while others contain binary data. Received data can also be either binary or text format. However, since GPI uses the standard system diagnostic menus to process commands, nearly all of the received data must be text format.

NOTE

The prefix 0x is used to denote a numeric value in hexadecimal (base 16) notation (for example 0x1C is the hexadecimal byte 1C).

6.3. COMMUNICATION PROTOCOL

By design, GPI operates with any protocol that possesses a general-purpose message type. The text interface inherent in the Alstom DataTrain VIII protocol is suitable for this since it handles both binary and text data types.

Data encryption and transmission is conducted by the DataTrain protocol. DataTrain VIII frames the outbound message data with a header, a destination address, and a CRC16 checksum. It also validates received messages, including verifying the CRC16. Before delivering a received message to GPI, DataTrain VIII removes all protocol-specific data such as the message type, the header, the station address and the CRC16. Conversely, all data transmitted by GPI is first formatted for DataTrain VIII.

When a remote device uses the DataTrain VIII protocol for sending GPI commands and receiving DataLogger responses, there is a typical communication sequence between the remote device and the DataLogger system. The remote device can expect to receive a DataTrain VIII acknowledge message (0xAA) in reply to a GPI command. The remote device then sends a DataTrain VIII poll message (x0AB) and receives either another acknowledge or DataLogger's response. The receipt of acknowledgements is normal due to the time it takes DataLogger to formulate its response.

Refer to Alstom Signaling Publication P2346E for details on the operation of the DataTrain VIII protocol.

6.4. DATALOGGER'S USE OF GPI

DataLogger uses GPI as a fast, secure avenue for transmitting logs to a device external to the system. All data to be passed to DataLogger through GPI must be printable text format. As a matter of efficiency, except in a few instances, all transmitted data are in binary format.

DataLogger's support of GPI is limited to a set of the essential commands and responses listed herein. These commands are used to download logged data and to indicate current operational status.

6.5. DATALOGGER'S GPI MESSAGES

Commands and responses sent through a GPI port are the same as those typed in when using the system's diagnostic menus through the MAC port. However, only commands and responses stated in this section are supported. Issuing commands other than those discussed here may cause undesirable results.

Each DataLogger GPI command is composed of a series of ASCII printable characters, terminated with the ASCII non-printable ETX (end-of-text) character (Control/C or hexadecimal 0x03). Each command should be preceded by the ASCII non-printable ENQ character (Control/E or hexadecimal 0x05), the "request for Main Menu" command.

The communication protocol for transferring DataLogger commands to the GPI is the text mode of the DataTrain VIII protocol. All commands must therefore be packaged in DataTrain VIII format:

- Begin with the text message type identifier (0xAF)
- Followed by the station address
- Terminated with a 2-byte checksum (CRC16) and the end-of-message character (0xA9)

This format is illustrated in Figure 6–1 with a station address of three used for example purposes only.

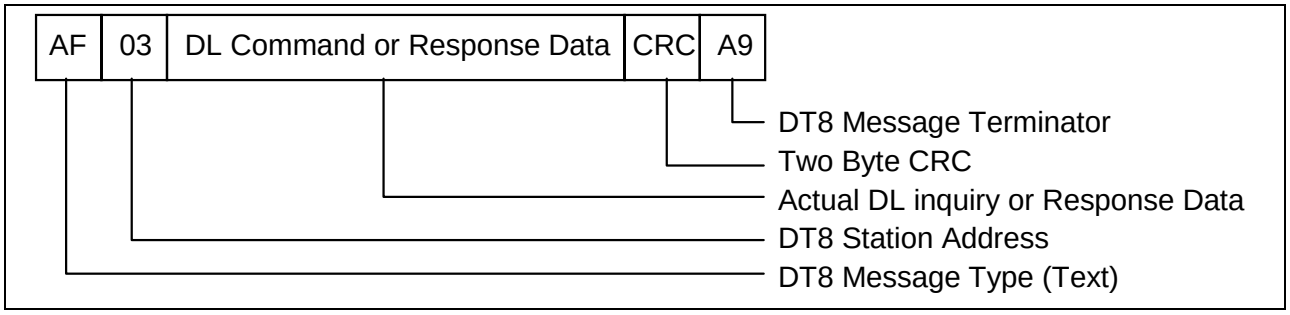

Figure 6–1. DataTrain VIII Message Format

6.6. GPI COMMAND FORMAT CONVENTIONS

Unless noted otherwise, the following describes the GPI command conventions:

1. A colon (:) (ASCII 0x3A) is used as a delimiter, although any character may be used in its place.

2. Where capital (upper case) letters are used, the message must contain the letters exactly as shown. For example, the portion of a message such as "…LUD…" must be transmitted as the printable ASCII characters L (0x4C), U (0x55) and D (0x44).

3. Where small (lower case) letters appear, a variable parameter must be sent in its ASCII printable form. The number of small letters of the same type represents the number of digits required for the parameter. For example, "yyyy" in a date parameter requires that four digits for the year must be sent as part of the command. The year "1998" must be sent as the ASCII characters 1 (0x31), 9 (0x39), 9 (0x39) and 8 (0x38).

4. Where a combination of capital and small letters are used, as in Sp, Cr, Etx and Enq, an ASCII non-printable character must be sent, as shown in Table 6–1.

Table 6–1. Non-Printable Characters in GPI Commands

For This:	**Send This:**
Etx	0x03 (Ctrl/C)
Enq	0x05 (Ctrl/E)
Cr	0x0D (Ctrl/M)
Sp	0x20 (Space)

6.7. DATALOGGER'S RESPONSE CONVENTIONS

In the DataLogger response messages shown below, lower case letter combinations are used to represent non-printable values (binary). The number of times each combination appears together represents the number of bytes that make up that value. For example, ln represents the message length, a single-byte value; yy is a 2-byte representation of the year and cdcdcdcd is a 4-byte representation of a pointer (memory address).

Where capital (upper case) letters are used, the message contains the letters exactly as shown. For example, "STX" is a 3-character representation of the start of a message and is always transmitted as the printable ASCII characters S (0x53), T (0x54) and X (0x58).

6.8. DIRECTORY FRAME COMMAND

The *Directory Frame* command instructs DataLogger to transmit a complete list of the current valid directories. Upon receipt of this command, DataLogger transmits a report header followed by all currently valid *Directory Frames* and then an end of transmission message.

The following command elicits a list of valid directories:

```
Enq LUDL Etx
```

DataLogger's Response

1. Report Header:

ln STX d m yy Sp s m h Sp id ETX

Where:

- d m yy is day, month and year of the report
- s m h is second, minute and hour of the report
- id is Location ID number (low byte only) of DataLogger station issuing the report

2. *Directory Frame* Transmission (one for each valid *Directory Frame*):

ln STX dn s m h d m yy fsfs ds lclc cdcdcdcd ndndndnd ETX

Where:

- dn is directory's reference number (from 0 to 191)
- s m h is second, minute and hour when the directory was created

- d m yy is day, month and year when the directory was created
- fsfs is directory's status: expired (0x5858) or valid (0x5656)
- ds is directory's secondary status indicator: closed (0x55), open (0xff) or expired (0x58)
- lclc is total number of *Log Frames* associated with this directory
- cdcdcdcd is directory's battery-backed memory start pointer (in Intel 32-bit format)
- ndndndnd is directory's battery-backed memory end pointer (in Intel 32-bit format)

3. End Of Transmission Message:

ln EOT

6.9. LOG FRAME COMMANDS

Each *Log Frame* command causes DataLogger to send a report header followed by a series of log entries extracted from a selected time or directory and source range. Three categories of *Log Frame* commands exist, each containing nine individual commands. Each category corresponds to the three available methods of specifying a range for data to be retrieved. The nine commands in each category correspond to the available log sources and types.

Time Range:

```
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UP Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UL Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UU Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UN Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UO Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UC Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UI  Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UV Etx
Enq LXTD mm/dd/yyyy Cr T hh:mm:ss Cr UD mm/dd/yyyy Cr T
hh:mm:ss Cr UA Etx
```

In these Time Range commands, two date/time parameters are included. These represent the start and end date/times that define the time range of interest. The first

pair of “mm/dd/yyyy” and “hh:mm:ss” represents the start date and time whereas the second pair represents the end date and time. Ten characters are required for the date, and eight characters are required for the time.

The source/type specification differentiates the Time Range commands:

- P is for logs taken from all communication ports
- L is for logs generated internally by DataLogger, such as Hourmarks
- U is for User Message logs
- N is for logs of Non-Vital Inputs
- O is for logs of Non-Vital Outputs
- C is for logs of protocol control messages
- I is for logs of protocol indication messages
- V is for Vital Diagnostic Change Message logs
- A is for logs taken from <u>all</u> enabled sources, including those just described

Directory Range:

```
Enq LXD nn Cr P {D} Etx
Enq LXD nn Cr L {D} Etx
Enq LXD nn Cr U {D} Etx
Enq LXD nn Cr N {D} Etx
Enq LXD nn Cr O {D} Etx
Enq LXD nn Cr C {D} Etx
Enq LXD nn Cr I {D} Etx
Enq LXD nn Cr V {D} Etx
Enq LXD nn Cr A {D} Etx
```

In these Directory Range commands:

- “nn” represents a 2-digit ASCII printable number of the *Directory Frame* from which logs are to be extracted. The number must be entered in hexadecimal and be that of a valid directory.
- As in the Time Range commands, the source/type specification differentiates the Directory Range commands.
- The single letter ‘D’ following the source/type specification is optional, as indicated by the curly braces. When used, DataLogger’s response includes a *Directory Frame* transmission prior to the transmission of *Log Frames*.

NOTE

The optional parameter ‘D’ is valid for DataLogger Revision A18 and later.

All Logged Data:

```
Enq LXAP Etx
Enq LXAL Etx
Enq LXAU Etx
Enq LXAN Etx
Enq LXAO Etx
Enq LXAC Etx
Enq LXAI Etx
Enq LXAV Etx
Enq LXAA Etx
```

DataLogger transmits all currently logged data. As in the Time Range commands, the source/type specification differentiates the All Logged Data commands.

DataLogger’s Response

DataLogger’s response begins with a report header and ends with an end of transmission message. Following the report header, DataLogger transmits logs from the selected range for the requested source and type.

1. Report Header:

ln STX d m yy Sp s m h Sp id ETX

Where:

- d m yy is day, month and year of the report
- s m h is second, minute and hour of the report
- id is location ID number (low byte only) of DataLogger station issuing the report

2. *Directory Frame* Transmission (one for each valid *Directory Frame*):

ln STX dn s m h d m yy fsfs ds lclc cdcdcdcd ndndndnd ETX

Where:

- dn is directory's reference number (from 0 to 191)
- s m h is second, minute and hour when the directory was created
- d m yy is day, month and year when the directory was created
- fsfs is directory's status: expired (0x5858) or valid (0x5656)
- ds is directory's secondary status indicator: closed (0x55), open (0xff) or expired (0x58)
- lclc is total number of *Log Frames* associated with this directory
- cdcdcdcd is directory's battery-backed memory start pointer (in Intel 32-bit format)
- ndndndnd is directory's battery-backed memory end pointer (in Intel 32-bit format)

3. *Log Frame* Transmission:

ln STX pdpdpdpd ndndndnd d tptp srsr s m mlml d...d ETX

Where:

- pdpdpdpd is memory address of the *Log Frame* preceding this one (in Intel 32-bit format)
- ndndndnd is memory address of the *Log Frame* following this one (in Intel 32-bit format)
- d is number of the *Directory Frame* that includes this *Log Frame*
- tptp is this log's type descriptor (see Table 5–7 through Table 5–10)
- srsr is this log's source descriptor (see Table 5–7 through Table 5–10)
- s is second in the minute this log was recorded
- m is minute in the hour this log was recorded
- mlml is length (in bytes) of this log entry, starting with the address of the preceding *Log Frame* (pdpdpdpd above) and ending with the last byte of actual log data

- d is actual logged data (the number of data bytes is variable in length)

A *Log Frame* may be too long for the text message buffer defined in the non-vital application. In this case, GPI divides it into multiple pieces. In this case, the first piece is transmitted, preceded with an “STX”. The middle pieces (if any) are transmitted next, followed by the final piece terminated with an “ETX”. As always, each piece is formatted as a DataTrain VIII packet.

4. End Of Transmission Message:

```
ln EOT
```

6.10. PASSWORD STATUS COMMAND

This command is used to determine whether the system’s password is enabled:

```
Enq LIP Etx
```

DataLogger’s Response

- ln STX Password Enabled ETX
- ln STX Password Disabled ETX
- ln STX Password Absent ETX

The response contains one of the following printable ASCII text strings: “Password Enabled”, “Password Disabled” or “Password Absent.” DataLogger responds with “Password Enabled” if the password had been previously received and the password time (30 minutes) has not yet expired. DataLogger responds with “Password Disabled” if the password was entered incorrectly or if its time has expired. DataLogger responds with “Password Absent” if there is no diagnostic password defined in the application.

6.11. SET PASSWORD COMMAND

This command is used to enter the system password:

```
Enq P password Cr Etx
```

In this command, *password* is the password defined in the non-vital application’s Diagnostic Password Record. Be aware that the password is case sensitive.

6.12. CURRENT DATE AND TIME COMMAND

The current date and time may be obtained from the system by sending the following command:

```
Enq LIC Etx
```

DataLogger's Response

ln STX s m h d m yy fl ETX

Where:

- d m yy is the current date (day, month and year)
- s m h is the current time (seconds, minutes and hours)
- fl is a date validation flag: the clock buffer was read while being updated (0xff), or the clock buffer was read after it being updated (0x55)

6.13. CLOCKSET COMMAND

A clockset command is available to modify the system clock. The system's password must be enabled for this instruction to be accepted by the system:

```
Enq LUCD mm:dd:yyyy Cr T hh:mm:ss Cr U Etx
```

DataLogger's Response

ln STX s m h d m yy fl ETX

Where:

- d m yy is the current date (day, month and year)
- s m h is the current time (seconds, minutes and hours)
- fl is a date validation flag: the clock buffer was read while being updated (0xff), or the clock buffer was read after it being updated (0x55)

6.14. REVISION INFORMATION COMMAND

This command is used to determine DataLogger's software revision information:

```
Enq LIR Etx
```

DataLogger's Response

ln STX 51612-012-nnn Rev xxx DataLogger mmm dd yyyy at hh:mm:ss ETX

This response contains a printable text string containing the current software part number, revision number and date and time.

A. APPENDIX A – SAMPLE NON-VITAL APPLICATION FILES

The following are source files from an excerpt of a sample non-vital application referenced in the Section 4, Configuration by the Alstom CAAPE.

DLOG.CSI:

```
*****************************************************************
*****
* FILE: DLOG.CSI
    *
*
    *
* This is a typical include file for use with a non-vital
application*
*****************************************************************
*****

CSEX 1 SYSTEM SOFTWARE = 51615-408
CSEX 1 PROGRAM NUMBER  = 51607-041
CONTRACT NUMBER = 70-12345
CONTRACT NAME = CSEX QUALIFICATION TESTING
CUSTOMER NAME = Alstom SIGNALING
EQUIPMENT LOCATION = ROCHESTER, NY
DESIGNER = ENGINEERING
CHECKER  = ENGINEERING
CSEX 1 ID = DLOG

* DIAGNOSTIC TERMINAL (MAC PORT) RECORDS:
DIAGNOSTIC PASSWORD = Alstom
DIAGNOSTIC TERMINAL TYPE = MAC
DIAGNOSTIC TERMINAL BAUD RATE = 9600
DIAGNOSTIC TERMINAL DATA FORMAT = 8, 1, N

* DATA LOGGING RECORDS:
DATA LOGGING = ON
TRACKER INTERFACE = PORT 4,INPUT ADDRESS (00000001),OUTPUT
ADDRESS (00000001)

* FILES INCLUDED IN THE NON-VITAL APPLICATION:
* HARDWARE DESCRIPTION FILE
INCLUDE DLOG.HDW
* DATA LOGGING FILE
INCLUDE DLOG.LOG
* CSEX SERIAL COMMUNICATIONS FILE
INCLUDE DLOG.CSS
* NON-VITAL PARAMETERS AND NON-VITAL LOGIC FILE
INCLUDE DLOG.NV
```

DLOG.LOG:

```
*****************************************************************
*****
* FILE: DLOG.LOG
    *
*
    *
* This file shows typical data logging requirements in a non-
vital   *
* application
    *
*****************************************************************
*****

DATA LOGGING SECTION

LOCATION ID = 1
DATA PROTECT = 8 HOURS
MSG LOG = CHANGE DETECT
DATALOGGER NAMES = YES

APPLICATION LOG MESSAGE = LENGTH (248)
  1 = VRDFRNT-DI
  2 = M4TX002
  3 = MANUAL
  4 = AUTO
  5 = REMMLNP
  6 = M4TX009
  7 = M4TX010
  8 = SERIAL_TEST_OUT
  9 = M4TX012
 10 = M4TX013
 11 = M4TX014
 12 = M4TX015
 13 = M4TX016
 14 = 192RGP
 15 = 194RGP
 16 = 196RGP
 17 = 198RGP
 18 = 192VS
      •
      •
      •
240 = 196NVP-DI
241 = 198NVP-DI
242 = 196RVP-DI
243 = 198RVP-DI
244 = 192RVP-DI
245 = 194RVP-DI
246 = 192VPB-DI
247 = 194VPB-DI
248 = PERMZERO
```

DLOG.CSS:

```
************************************************************************
*****
* FILE: DLOG.CSS
    *
*
    *
* This file shows how to set up a GPI port for DataLogger.
    *
* Note that a typical non-vital application CSS file defines
    *
* additional serial ports to be used for code systems.
    *
************************************************************************
*****

SERIAL COMMUNICATIONS SECTION

* THIS PORT IS USED BY THE DataLogger FOR REMOTE SYSTEM ACCESS
SERIAL PORT 4 = TYPE (DT8 SLAVE)
DEFAULT BAUD RATE = 9600
DATA FORMAT = 8, 1, N

CONTROL = ADDRESS (00000001), LENGTH (8)
1 = PERMZERO
2 = PERMZERO
3 = PERMZERO
4 = PERMZERO
5 = PERMZERO
6 = PERMZERO
7 = PERMZERO
8 = PERMZERO

INDICATION = ADDRESS (00000001), LENGTH (8)
1 = PERMZERO
2 = PERMZERO
3 = PERMZERO
4 = PERMZERO
5 = PERMZERO
6 = PERMZERO
7 = PERMZERO
8 = PERMZERO

TEXT CONTROL    = ADDRESS (00000001), LENGTH (200), NAME (DL-IN)
TEXT INDICATION = ADDRESS (00000001), LENGTH (200), NAME (DL-OUT)
```

B. APPENDIX B – GLOSSARY OF TERMS

The following is a list of terms and abbreviations used in this manual.

Acknowledge – To reply in a predetermined manner to the reception of a valid message, usually used in reference to a communication protocol.

Address – A unique numeric identifier for a station in a communication network. Also, a specific location in RAM.

ANSI – Abbreviation for American National Standards Institute, an organization whose purpose is to set voluntary industry standards.

Application (Program or Logic) – A set of Boolean and conditional program code expressions (or instructions) that manipulate communication data and system inputs and outputs at a specific location in a communication network.

Assert – To set a signal to its TRUE or ON state.

Asynchronous – Transmission of data in which character synchronization is established by framing a unit of data with start and stop bits. The time between characters can be variable.

Backplane – Wiring connections made to the back of a CenTraCode II circuit board.

Baud (Rate) – A unit of signaling speed equal to the number of discrete conditions or signal events per second.

BBRAM – Abbreviation for Battery-Backed Random Access Memory, memory that is preserved by an on-board battery in the event of external power loss.

Binary – A number base containing only two digits, 0 and 1, and commonly used to express data as stored internally by a computer.

Bit – The smallest unit in a computer's memory whose value is either zero or one. Stands for binary digit.

Bit Map – A complete mapping of all bits in a control or an indication message. The value of each bit (or parameter) is either TRUE (1) or FALSE (0).

Broadcast (Message) – A message sent by a communication protocol intended for all remote stations, none of which should reply. Typically, a broadcast message uses a station address of zero.

Buffer – A block of RAM locations holding a related set of information.

Byte – A sequence of adjacent binary digits (usually eight) operated on as a unit.

CAAPE – Alstom's Computer Aided Application Programming Environment software package.

CenTraCode II – Alstom's non-vital communications processor boards.

CenTraCode II-s – Alstom's stand-alone non-vital communications processor board. Abbreviated CTC2s.

Checksum – A value mathematically computed for (and appended after) a packet of data, and regenerated and verified by the receiver to more likely ensure correct message transmission. Sometimes called a checkword.

Clear – To assign a FALSE value (zero) to one or more parameters or flags.

Clock Signal – In synchronous communication, a square-wave signal of a fixed frequency used to time each bit of transmitted and received messages.

Code – A series of software instructions executed by the CPU. Synonymous with **Program**.

Code-line – A communication link over that controls and indications are exchanged.

Code Unit – A device primary purpose is the efficient transfer and processing of serial communication data (controls and indications).

Compile – In reference to Alstom's CAAPE software package, a user-initiated process where the CAAPE evaluates logic statements in a non-vital application and produces machine-readable code for programming into an EPROM for execution by the CPU.

Component – In reference to Alstom's CAAPE software package, a separate, distinct unit that comprises a portion of a non-vital application. Also, a portion of hardware on a circuit board.

Configuration – A specific combination of user-defined settings.

Control – Any message received at a communication protocol's serial port (an incoming message). Contrast with **Indication**.

Corruption – The mutilation or perturbation of data caused by a hardware or software failure.

Counter – An upwards-counting value, often maintained by a protocol emulation, used to report the number of times an event occurred, such as reception of a certain message type.

CPU – Abbreviation for Central Processing Unit, the computer section that handles the actual processing of computer instructions.

CPU/PD– Abbreviation for Central Processing Unit/Polynomial Divider board, a board that handles the actual processing of computer instructions and includes an integrated polynomial divider that consists of a 32-bit shift register that uses feedback taps for data compression testing and parameter testing during the Vital program execution.

CRC – Abbreviation for Cyclic Redundancy Check, an error checking technique used to ensure the accuracy of transmitted serial data over a communication channel.

CSEX – Abbreviation for Code System Emulator Extended, a group of Alstom non-vital communications processor boards, part of the CenTraCode II-v family of circuit boards. Includes CSEX1, CSEX2 and CSEX3.

CTC2 – Abbreviation for CenTraCode II system hardware or software.

CTC2s – Abbreviation for CenTraCode II-s.

CTS – Clear To Send, a hardware control signal used by DCE to indicate it is ready to accept data from DTE. Typically paired with **RTS**.

Current Loop – A means of communicating serial data via the presence or absence of current in a 2-wire cable.

Data – The value of one or more bits of information.

Data Communications Equipment (DCE) – Interface equipment (e.g. a modem) used to couple Data Terminal Equipment (DTE) into a transmission channel.

Data Logging – The recording of selected data in the processor's battery-backed memory (BBRAM), usually based on change of state to one or more application parameters, for later evaluation by the user.

Data Terminal Equipment (DTE) – Typically a computer (specifically CenTraCode II) or a terminal connected to Data Communications Equipment (DCE).

De-assert – To set a signal to its FALSE or OFF state.

Decimal – A number base containing ten digits, 0 through 9.

Destination – The recipient of a serial message. Contrast with **Source**.

Digit – A single numeric character.

Directory Frame – A data structure that specifies the memory locations of a group of **Log Frames** in battery-backed memory.

Disable – To disallow, turn off or otherwise deactivate.

DPRAM – Abbreviation for Dual Port Random Access Memory, a memory device having bi-directional data and address connections suitable for low-level communications.

DUART – Abbreviation for Dual Universal Asynchronous Receiver/Transmitter, a device containing two asynchronous-only serial communication ports.

Duplex – See **Full Duplex** or **Half Duplex**.

DUSART – Abbreviation for Dual Synchronous-Asynchronous Receiver/Transmitter, a device containing two serial communication ports settable for synchronous or asynchronous operation.

Dynamic – To update information as it occurs (in real time).

EEPROM – A device containing Electrically Erasable Programmable Read-Only Memory that holds its contents without power.

Embedded – Software contained within a sub-component of a processor board, usually stored on a programmable memory device such as a PROM and containing code executed by the CPU.

Emulation (Software) – A computer program that mimics existing hardware or another software module to assure compatibility between two or more naturally different pieces of equipment, usually used in reference to a software implementation of a communication protocol.

Emulator – A device designed to perform the function of another.

Enable – To allow, turn on or otherwise activate for use.

EPROM – Abbreviation for Erasable/Programmable Read-Only Memory, a device that holds its contents without power and typically contains firmware.

Event – A notable occurrence, usually the result of a change to a system parameter.

Execute – To perform the instructions in a software program.

FCU – Field Code Unit.

Field Location – A set of equipment (e.g. CenTraCode II) controlled from the office and located along a railroad, whose purpose is to operate a specific section of the railroad.

Firmware – Computer instructions stored on a programmable memory device, such as an EPROM.

Flag – A location in a computer's memory used to pass information between two software programs, such as the protocol emulation and the non-vital application logic.

Flags are also used to indicate the current status of a system buffer (such as “buffer in use”).

Frame – Information bracketed around a unit of data to signal its start and end. In asynchronous transmission, a frame consists of a start bit, data bits, an optional parity bit and one or more stop bits.

Flash Device – A memory device whose contents (code and data) can be modified by the CPU by following a well-defined and secure series of steps, and are retained without power.

Full Duplex – A serial communication mode in which networked devices can send data to each other at the same time.

Half Duplex – A serial communication mode in which only a single networked device can send data at a given time.

Handshaking – The use of hardware electrical signals (typically Request To Send, RTS, and Clear To Send, CTS) to control the flow of serial data, typically through a modem.

Hardware – Any of the machinery the makes up a digital computer installation; also, the circuit boards therein.

Header – A hardware component containing multiple pins (wires) onto which jumpers may be placed for board configuration.

Hexadecimal – A number base containing sixteen digits, 0 through 9 and A (10) through F (15), commonly used to represent bytes of data stored in a computer.

HHT – Abbreviation for Hand Held Terminal, a small video display device that provides limited system diagnostics.

Indication – Any message sent out a communication protocol’s serial port (an outgoing message). Contrast with **Control**.

Initialization – A process, usually performed at startup, that resets all of a system’s operating parameters to preset default values.

Input/Output (I/O) – The process of transmitting information from an external source such as counters, switches and addresses to a system, or from a system to an external source.

Install – The act of assigning a communication protocol to a specific CenTraCode II serial port, usually done as part of the design of a non-vital application.

Intel-Hex Address Notation – A specific format (ssss:oooo) for entering a system memory address, wherein the address is expressed in two parts: the segment (ssss)

and the offset (oooo). For example, the physical hexadecimal address C045A is entered as C045:000A.

Interface – The equipment that enables one kind of hardware to be recognized and processed by another kind of hardware.

Interrupt – A computer instruction that causes the computer to stop the current process and perform a time-sensitive task before resuming the interrupted process.

Inter-scan Delay – The time interval between consecutive messages sent from a control center to field locations.

Invoke – To activate a function, process, program or routine.

Jumper – A device that closes a circuit, specifically a short length of wire or a plastic covered metal block that is pushed onto two pins to complete the circuit.

Latched – A mode of operation for a circuit in which an output, even a momentary one, is maintained “on”.

Log – To record an event in system memory, often with a time-stamp.

Log Frame – A data structure in battery-backed memory containing time-stamped logged event data.

LPC File – A Local Port Configuration File containing user-defined settings for a communication protocol assigned to a serial port on a CenTraCode II board.

MAC – Abbreviation for Maintenance Access, and refers to the MAC port connector on the CenTraCode II processor boards.

Master – A central device in a communication network responsible for controlling one or more slaves.

Menu – A set of user options offered on a single CenTraCode II diagnostics screen.

Menu Selection – A choice made by the user from one of several menu options.

Message –- A group of data referred to as a single unit, especially with reference to a control or an indication.

Microprocessor – See **CPU**.

Modem – A device that modulates and demodulates signals transmitted over data-communication facilities (e.g. telephone lines).

Modulus – The integer remainder of the division of two integer values. The percent sign (%) is used to represent the modulus operator.

Monitor – The act of observing message traffic, or a device used for this purpose.

Multi-Drop – A communication network in which a single master controls multiple uniquely addressed slaves.

Multi-Tasking – The running of two or more programs (tasks) by one computer seemingly at the same time. Usually each task relinquishes control of the computer after some short period to allow the next task to run, or each task is run for a given time slice and is then automatically suspended.

Noise – An unexpected and undesirable signal on a communication port's data line.

Non-vital – A process whose function does not affect the safety of train operation. Contrast with **Vital**.

OCU – Office Code Unit.

Office – The control center for one or more field locations along a railroad.

Operating Mode – A protocol setting that determines its behavior with respect to transmitted and received messages. For example, Master/Slave Mode or Peer Mode.

Parameter- In reference to Alstom's CAAPE software package, an application-specific entity whose value can vary over time depending upon the current state of related variables.

Parity – The use of a check bit, appended to each frame of asynchronous data, for error checking purposes.

PC – Personal Computer.

Pending – Waiting to be processed, especially in reference to a change to an indication data parameter resulting in the transmission of an indication message.

Poll – To query a remote station for current information, usually used in reference to a communication protocol.

Port – A portion of a processor board used for the transfer of digital data (messages) in a serial manner. In addition, an access point for a device where energy may be applied or withdrawn, or where the device may be observed or measured.

Post – The act of presenting a message (usually a control or an indication) to either the non-vital application logic or the protocol emulation for processing by the recipient.

Processor – See **CPU**.

Program – A series of software instructions for the computer (CPU) to follow. Synonymous with **Code**.

PROM – Abbreviation for Programmable Read-Only Memory, an integrated memory device that can be programmed with computer instructions or data.

Protocol – Rules that define how two or more communication devices “talk” to each other. A formal set of conventions governing the format and relative timing of message exchange between two communication devices.

Queue – A buffer in the system’s memory (RAM) used to hold multiple messages of the same type chronologically (for example, an indication queue).

RAM – Abbreviation for Random Access Memory, and used by a computer for storing data that may change. RAM may be written to or read by the computer.

Real-Time – In a communication system, the processing and use of data at time of occurrence and within a given timeframe.

Record – In reference to Alstom’s CAAPE software package, an input statement with a specific format and options.

Reset – To change a bit’s value to zero or an output to an inactive (OFF) condition (see also **Clear**). Also, to restart a process, as in restarting a processor board.

Round-Robin Task Loop – A multi-tasking technique wherein each task is sequentially processed and purposely relinquishes control of the CPU after some short (and typically variable) period.

RS-232 – An industry standard for either a 9-pin or a 25-pin communication interface that connects computers and various forms of peripheral equipment.

RS-422, RS-423 or RS-485 – Standards for serial transmission that extends distance and speed beyond the RS-232 standard.

RTC – A battery-packed hardware-based Real Time Clock.

RTS – Request To Send, a hardware control signal used by DTE to control the flow of serial data through a communication port. Typically paired with **CTS**.

Scratch Pad – A memory area used by software as a temporary working section for holding intermediate results.

Serial Interface – A data channel (usually a serial port) that transfers digital data one bit after another.

Set – To assign a TRUE value (one) to one or more parameters or flags.

Site-Specific – A set of instructions or operating parameters appropriate for a certain field location.

Slave – A field device in a communication network that replies only when addressed by the master.

Slot – A position in a CenTraCode II card carriage in which a circuit board is placed.

Software – Programs used in operating a digital computer.

Source – The originator of a serial message. Contrast with **Destination**.

SRAM – Abbreviation for Static Random Access Memory.

Stack – An area of system memory (RAM) used by a subroutine for the temporary storage of information.

State – The current TRUE or FALSE value of an application parameter or device.

Static – A diagnostic display that is not updated in real-time.

Station – A uniquely addressed location in a communication network, containing a set of site-specific controls and indications.

Subroutine- A portion of a computer program that carries out a specific operation or processing function.

Switch Block – A hardware component containing multiple user-settable switches for board configuration.

Synchronous – Transmission of serial data in which clocking information is transmitted along with the data. Data are sent at a defined rate controlled by a timing source at the transmitter.

System Software – The full set of embedded operating code on a CenTraCode II processor board.

Task – A computer program that is run as an independent unit (see **Multi-Tasking**).

Terminal – A video display device (see **VT100 Terminal**).

Timer – A specific fixed time constant (often user selectable) used by the CenTraCode II System Software or the protocol emulation to time an event, such as the assertion of RTS.

Traffic – Transmit and receive activity (messages) occurring on a communication port over a period.

UART – Abbreviation for Universal Asynchronous Receiver/Transmitter, a device containing one asynchronous-only serial communication port.

Unlatched – A mode of operation for a circuit in which an output remains “on” for only a moment.

USART – Abbreviation for Universal Synchronous-Asynchronous Receiver/Transmitter, a device containing one serial communication port settable for synchronous or asynchronous operation.

Vital – A process whose function affects the safety of train operation. Contrast with **Non-vital**.

VPI – Abbreviation for Vital Processor Interlocking, Alstom’s family of vital and non-vital circuit boards.

VT100 Terminal – A video display device that employs a standard set of instructions (ANSI escape sequences) for displaying information.

Watchdog Timer – An internal timer, usually a hardware device, used to detect a possible malfunction of the software and to initiate an automatic restart of the system.

Word – A pair of adjacent bytes.

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