CAR-24A

CROSSING ALARM REPORTER

USER MANUAL

MICRO-AIDE

Rail Signal Products

MICRO-AIDE

www.micro-aide.com

RAIL SIGNAL PRODUCTS

CAR-24A
CROSSING ALARM REPORTER
USER MANUAL

TABLE OF CONTENTS

TC

TC

CHAPTER 5 – FRONT PANEL OPERATION

TC

TC

CHAPTER 1 – GENERAL DESCRIPTION

INTRODUCTION

Since 1988 MICRO-AIDE has provided the rail signal industry with a broad range of recording devices and systems that vary in capacity, size and features. MICRO-AIDE has developed a great deal of expertise in the field of railroad signal monitoring. This expertise has been used to create a new family of products referred to as Crossing Alarm Reporters (CAR). The product family consists of two devices; the CAR-14A and CAR-24A. The latter is the subject of this User Manual.

The CAR-24A is designed to be a direct replacement for MICRO-AIDE's CAR-24 Alarm Reporter. The CAR-24A includes all of the features and capabilities of the earlier Reporter. However, the CAR-24A utilizes a much faster and versatile M4-class ARM microprocessor chip. The user will quickly note the speed improvements when accessing and dumping data. The initialization cycle completes soon after power application, even when the Event Record memory is full.

The CAR-24A was designed to monitor signals at a crossing for the purpose of detecting and then reporting specific fault conditions. The most unique aspect of the CAR-24A is its ability to transmit Alarm messages to a message processing server. Alarm messages are coded in accordance with specific formatting rules. Typically, they are transmitted via a Virtual Private Network (VPN) using a variety of Internet-based protocols and methodologies.

Union Pacific defined the requirements for a CAR-based alarm generation and processing system. The CAR-24A is one component of this system. The VPN used by the Reporter is maintained and operated exclusively by Union Pacific. The message processing server is also under the control of Union Pacific. Access to the VPN is accomplished via connection to a fiber optic network or wireless modem. illustrates the basic relationship of the major system components.
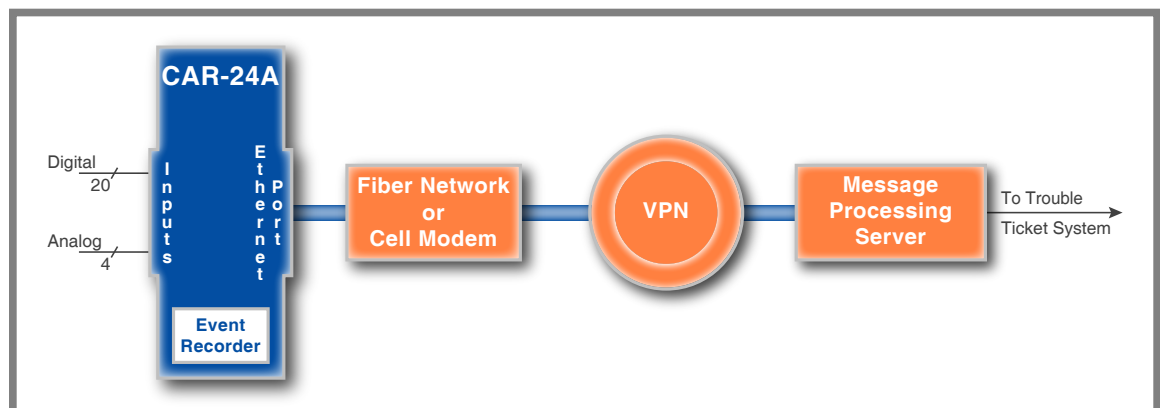
Figure 1: System Components

The CAR-24A and CAR-14A share a common set of Alarm Reporting features. Input capacities aside, the two products differ in one very important regard. The CAR-24A also includes the features and capabilities of an Event Recorder. In fact, MICRO-AIDE's CWR-24A Event Recorder provided the basis for all of the CAR-24A's recording features. In this regard, they are nearly identical.

The single-screen Alarm Configuration Table (ACT) allows the CAR-24A to report as many as 20 different crossing-related Alarms. Like an Event Recorder, the CAR-24A utilizes a Setup Database to determine

various aspects of its operation. The contents of the ACT are part of the Setup Database. The database and Event Records are saved in the non-volatile memory of the Reporter. Accordingly, power losses will not result in the loss or corruption of any database or Event Record information. The database can be saved to a PC file, reloaded and modified as required. Although the contents of the database are largely predefined by Union Pacific, the user is able to assign various site-specific parameters (e.g., location related information).

To an increasing degree, the logs and data records that are retrieved from wayside systems are being challenged in court on a new front. This data is often crucial to the case, but tends to be in the form of simple text files possibly printed on paper. Unsecured text data can be authored in any word processing application. Accordingly, the integrity of the data submitted into evidence can be easily challenged. The CAR-24A is the first reporting product that allows its user to create an Event Record report and append a unique, tamper-proof digital signature to the resultant electronic data file. The Digital Signature Report Feature (DSRF) was directly ported from MICRO-AIDE's GCS.

The CAR-24A features 20 Digital and 4 Analog Inputs. The operation of all inputs is completely non-intrusive to the signaling system. High input impedances and an isolated, internal power supply allow the Reporter to be used safely. Digital Inputs are typically wired to indications such as XR, gate down, gate up, etc. The Analog Inputs can be used to monitor both DC and AC signals such as battery levels and commercial power voltages. Unlike other systems, the use of Analog Inputs does not reduce the number of available Digital Inputs. MICRO-AIDE's Failed Lamp Detector (FLD-2) can be used in conjunction with the CAR-24A to detect burned-out signal lamps.

Sixteen programmable Virtual Inputs are used to augment the flexibility of the ACT and Event Record capabilities. Virtual Inputs allow the user to define important logical associations among various Digital, Analog and other Virtual Inputs. The Virtual Input feature can be used to detect possible fault conditions of a logical nature (e.g., one relay is up while another is down).

The flexibility of the ACT is further enhanced by the use of various timed measurements. Potential fault conditions are ignored until their duration exceeds specific requirements. A low battery voltage represents a potential fault condition. However, it does not generate an Alarm until its persistence exceeds a predefined limit value.

1

Sixteen Timer Inputs can be used to measure and report the elapsed time between any two events. As an example, the duration of a relay operation, the time between two relay events or the occurrence of an Analog Input event and a relay event can be reported. Additionally, separate High and Low Limit Values can be assigned for each timer. An event occurrence that is too fast or slow when compared to the Limit Values is identified in a Timer Input Event Record.

Maintainer Mode allows the user to temporarily suspend the reporting of Alarms. This can be useful when the maintainer is performing tests of the crossing equipment. As a safeguard, normal operation of the Reporter will occur after a predefined interval if the maintainer forgets to exit Maintainer Mode.

As a convenience to its user, the CAR-24A can copy Event Records directly to a FAT-32 formatted flash drive. The USB Host Port is a standard feature of the Reporter. Install a flash drive into the Reporter's front panel socket, press a few keypad buttons and in seconds Event Records from any time span are written as a .txt file. The .txt file can then be read, e-mailed or printed as required. At the user's option, a digital signature can be appended to the saved text file.

Every CAR-24A comes equipped with a built-in keypad and display screen located on the front panel. This allows the user to effectively operate the Reporter without additional peripheral devices. However, each Reporter will support applications that require PC-based storage of Event Records. USB Device, RS-232 and Ethernet® Ports are all standard features of the Reporter. Collectively they provide for increased flexibility when interfacing with the Reporter. The USB Device and Ethernet Ports provide high speed data transfer rates of 4.71 Mbps and 4.70 Mbps, respectively. A PC is then used to retrieve, store and review Event Record data of interest to the user.

The network interface of the CAR-24A provides for automatic and manual modes of operation. In automatic mode, the Reporter uses the Dynamic Host Configuration Protocol (DHCP) to acquire a leased IP address and other network access parameters. Alternatively, these parameters can be assigned by the

user when the CAR-24A is in manual mode. Manual mode is typically used when the Reporter is part of a LAN utilizing fixed IP addresses.

The time stamping of Alarm messages and Event Records is controlled by the Reporter's internal, real-time clock. Network-based time server(s) are accessed periodically to insure the clock is kept accurate.

Alarm and Health Check messages are sent using the HTTP-Get method. Validation and retransmission techniques are employed to insure that accurate and complete messages are delivered to the message processing server.

The serial Terminal Port of the Reporter also includes two modes of operation. In Terminal Port Mode, the port provides local access to the Reporter using a PC and a communications application (e.g., HyperTerminal® or Tera Term®). In Remote Port Mode, the Terminal Port can be connected to a secondary piece of crossing equipment. An Ethernet connection to the Reporter's Ethernet Port then allows a remote user to access the secondary piece of crossing equipment.

All MICRO-AIDE rail signal products, including the CAR-24A, are designed to be easy to use and maintain. Each design is based upon the premise that value and reliability start with attention to detail and a concern for usability rather than needless complexity. Our goal in creating the CAR-24A was to provide the rail signal industry with an instrument maintainers and signal technicians will find easy to operate long after the device has been installed and set up.

KEY FEATURES

The CAR-24A is an Alarm Reporting device with full Event Recording capabilities. Its features can be grouped into three categories as listed in the following.

ALARM REPORTING FEATURES

- XR active too long, gate not down, gate not up, low battery voltages and loss of AC power Alarms are reported automatically.

- Site-specific information such as the state, subdivision and DOT number can be assigned by the user.

- The name of an accessible Domain Name Server (DNS) can be assigned.

- Periodic Health Check messages are sent to the message processing server. This technique is used to insure that the Reporter and network are functioning normally.

EVENT RECORDING FEATURES

- The USB Host Port allows copying of Event Records to a FAT-32 formatted flash drive.

- The storage capacity is 302,084 Event Records (expandable to 1,269,572).

- Event Records can be logged for 128 distinct days.

- Event Records are stored in flash memory devices that do not require a battery power source. Records are retained even if power is removed.

- Every Event Record includes a measurement for each of four Analog Inputs.

- Excessive train speed is reported by four separately programmable Train Speed Monitors. Speed violations are reported in the form of Event Records that are saved to memory.

- The FLD-2 Failed Lamp Detector can be used at crossings to detect burned-out bulbs.

- Events satisfying the Detection Time criteria are date and time stamped to the nearest thousandth of a second.

- Event Records are reported at the start and end of each flashing sequence.

- The flashing rate of a circuit can be precisely measured. The flash rate in fpm is reported as part of the Event Record for each flash sequence.

- Exception Event Records can be created that report out-of-range flashing rates.

- Sixteen Timer Inputs can be used to measure and report intervals between any pair of events.

- Limit Values can be assigned to establish a range of acceptable and unacceptable timed intervals.

- Timer Inputs create Event Records that list the timed interval and its relationship to the programmed Limit Values.

- The internal temperature of the Reporter is measured and tested against user-assigned Limit Values.

COMMON FEATURES

- The 4.71 Mbps USB Device Port can be used in lieu of the serial Terminal Port.

- The internal Ethernet Port allows for remote LAN-based access.

- The internal Ethernet Port complies with the 10 / 100 Base-T standard at speeds of 10 and 100 Mbps.

- SNTP-Unicast is used to access primary and secondary time servers. SNTP-Multicast is also supported.

- Automatic adjustment for Daylight Saving Time (DST) can be enabled or disabled. The DST feature is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.

- The time zone setting of the Reporter can be assigned to any of seven zones used in North America.

- Setup data and Event Record data can be easily and quickly transferred to a PC file.

- Attaching the Reporter to an event generating circuit is completely non-intrusive to the circuit. This is ensured by the high impedance nature of the design.

- Each Digital Input utilizes opto-isolation technology to provide ground isolation of at least 3800 Vdc.

- Relay signals in the range from 9 to 36 Vdc can be sensed by the Digital Inputs.

- Digital Inputs can be used to sense positive and negative voltages.

- Event Detection Times for Digital Inputs can be set by the user on an input-by-input basis. Default values are provided as an aid to the user.

- Event Detection Times for Digital Inputs can be set to a thousandth of a second (.001 seconds) to capture fast, electronically generated control signals.

- Analog Inputs can range from 51.1 V (.1 V scale) to 255 V (1 V scale), DC or AC.

- Analog Inputs are tested against separate High and Low Limit Values that are assigned by the user. Crossing either Limit Value will create an Event Record or possible alarm.

- Sixteen Virtual Inputs can be programmed to create Event Records that identify alarm or fault conditions of special interest to the user.

- Installation is quite simple. Input wires are terminated in detachable, screw-down terminals. Wire sizes as large as 12 AWG can be used.

- Maximum power consumption is less than 3 W. A 9 to 36 Vdc power source can be used to power the Reporter.

- The user interface provides full cursor control when using a PC.

- Three distinct levels of password security provide protection against unauthorized access.

- Several diagnostic commands can be executed to verify important system operations.

1

- Firmware updates can be uploaded to the Reporter via any port (i.e., Terminal, USB Device or Ethernet). Additionally, new firmware can be uploaded directly via a USB flash drive.

- User access is supported by a serial Terminal Port, USB Device Port and Ethernet connections.

PRODUCT COMPARISONS

CAR-14A AND CAR-24A

The CAR-14A and CAR-24A are similar products in one very important regard. Their Crossing Alarm Reporting capabilities are identical. Both products interact with the Union Pacific VPN and message processing server in the same manner. Both are able to report crossing-related Alarm and Health Check messages. However, the CAR-14A was designed to perform as an Alarm Reporting device only. It does not provide additional features that are typically associated with an Event Recorder.

Most of the recording features of MICRO-AIDE's CWR-24A Event Recorder have been included as capabilities of the CAR-24A . This makes the CAR-24A a hybrid product. It can be used as an Alarm Reporting device as well as an Event Recorder that is ideally suited to crossing applications. The hardware design of the CAR-24A is, in fact, a specific configuration of the CWR-24A.

Table 1 on page 5 summarizes the important distinctions between the CAR-14A and CAR-24A.

Feature	CAR-14A	CAR-24A
Digital Inputs	10	20
Digital Input LEDs	10	none
USB Host Port	not available	std.
USB Device Port	not available	std.
Front panel keypad and LCD	not available	std.
Relay output	not available	1
Event Record capacity	not applicable	302,084 (std.)

Table 1: CAR-14A and CAR-24A Differences

CWR-24A AND CAR-24A

As was previously stated, most of the recording features of MICRO-AIDE's CWR-24A Event Recorder have been included as capabilities of the CAR-24A . The two products share a common hardware design and many firmware-based features. Nevertheless, there are several important distinctions. They have been highlighted in Table 2 on page 5.

Feature	CWR-24A	CAR-24A
Ethernet Port	optional	std.
GPS Receiver	optional	not available
Internal modem	optional	not available
Event Record capacity (std.)	307,123	302,084

Table 2: CWR-24A and CAR-24A Differences

FIRMWARE MODIFICATION HISTORY

Features have either been introduced or modified as the result of the following firmware modifications.

V1.00 Initial release.

V1.01 Significantly increased speed of USB Host Port data transfers. Improved integrity of data written to LCD. Added support for 128 Mb flash memories.

V1.02 The firmware checksum calculation was corrected.

V1.03   The Ethernet Port is re-initialized whenever an alteration of the Network settings is detected. The number of flash memory devices that are supported has been expanded.

V1.04   Corrected problem with Ethernet Port timeout. Query command Include Details setting is now retained with each session. Setup Database can be saved and updated via USB Host Port.

V1.05   Added Primary DNS and Secondary DNS assignments while in static IP mode.

V1.06   Corrected date error in Alarm Message format and Alarm, Flashing and Timer Event Records.

V1.07   Corrected hung state in Ethernet Port and retries of successfully delivered Alarm Messages.

V1.08   Expanded number of Virtual Inputs from 8 to 16.

V1.09   Corrected display of Virtual Input Event Records on LCD.

V1.10   Network parameters, except the MAC Address, can be changed during a Restricted access session.

V1.11   Added Terminal Port command to front panel Diagnostic command menu.

Ｓｅｔｕｐ Ｄａｔａｂａｓｅ Ｃｏｍｐａｔｉｂｉｌｉｔｙ

Occasionally, modifications to the firmware of the device will result in a new memory map of the Setup Database. When this occurs, the previously created Setup Database becomes incompatible with the new firmware. Table 3 on page 6 details the compatibility status of each firmware version. A green check mark (☑) indicates compatibility with the previous Setup Database. A red X (☒)indicates that a new Setup Database will have to be created for the firmware version listed.

Firmware Version	Compatibility
V1.00	
V1.01	☑
V1.02	☑
V1.03	☑
V1.04	☑
V1.05	☑
V1.06	☑
V1.07	☑
V1.08	☒
V1.09	☑
V1.10	☑
V1.11	☑

Table 3: Setup Database Compatibility

Earlier versions of the Setup Database can be converted for compatibility with V1.08 (and later) firmware. MICRO-AIDE has created the CAR Setup Database Converter tool for this purpose. It can installed on any Windows PC and downloaded for free at: www.micro-aide.com/support/downloads.html

Never attempt to use an incompatible Setup Database. The operation of the device can be severely impacted.

Ａｂｏｕｔ ｔｈｉｓ Ｍａｎｕａｌ

This document is intended to provide the user with comprehensive, easy-to-read instructions on how to install, set up, operate and maintain the MICRO-AIDE CAR-24A Crossing Alarm Reporter. This document

refers to version 1.11 of the CAR-24A firmware. Union Pacific is largely responsible for the creation of Setup Database files. As of this writing, the file named "c24gates2down.v201" is the currently approved Setup Database file for use with the CAR-24A on the Illinois High-Speed Rail project. The sample data and command details depicted were prepared using a version 1.11 device running the c24gates2down.v201 Setup Database. Wherever possible, step-by-step instructions have been included. In the event the user has questions about any of the described procedures the user should contact MICRO-AIDE for assistance. Additional copies of this manual are available upon request.

MICRO-AIDE CORPORATION
685 Arrow Grand Circle
Covina, CA 91722
Tel: 626-915-5502   Fax: 626-331-9484
E-mail: support@micro-aide.com

The MICRO-AIDE "Material Return" and "Limited Warranty" policies can be found on the inside back cover of this manual.

The next chapter describes how to install a CAR-24A.

1

U<small>SER</small> N<small>OTES</small>

1

CHAPTER 2 – INSTALLATION

INTRODUCTION

This chapter describes how to properly unpack and install the CAR-24A prior to operation. It is advisable to perform the Initial Check-Out Procedure before attempting to set up the Reporter.

UNPACKING

Each CAR-24A is packed in a shipping carton that is properly sized for the Reporter. Abundant packing materials are provided to minimize mechanical shock to the contents. Before opening the carton inspect it for damage. Damage to the carton should be noted. Carefully remove the Reporter. It is advisable to save all packing materials in the event the Reporter ever needs to be returned to MICRO-AIDE.

Inspect the Reporter for visual damage. It should not be scratched, dented or deformed in any way. If it appears the Reporter was damaged in shipment the responsible carrier should be notified immediately. MICRO-AIDE will assist the user in filing a claim in the event damage was sustained during shipment.

INITIAL CHECK-OUT PROCEDURE

Before the CAR-24A is installed at a crossing facility it is recommended that an operational check of the Reporter be performed. The following materials are required as a part of this procedure.

- 12 Vdc power source.

- Common hook-up wire for power and testing inputs (12 to 22 AWG).

- Wire strippers and small, flat-head screwdriver.

- PC equipped with a communications program (e.g., HyperTerminal or Tera Term) and either a USB port or serial comm port set to operate at 9600 Baud.

- Digital Voltmeter (DVM).

Perform each of the following steps in the sequence listed. If a problem arises, refer to the sections entitled "Diagnostic Testing" on page 99 and "Trouble-Shooting Guide" on page 104. Elements common to most installations are illustrated in Figure 2 on page 10 and Figure 3 on page 11.

1. With the power off, connect the power source positive and negative conductors to either pair of terminals labeled "B" and "N", respectively. They are located at the right end of the Reporter's top panel.

2. Connect the PC's serial comm port to the DE-9 male connector labeled "Terminal". Use the cable provided by MICRO-AIDE or a DE-9 to DE-9 straight-through cable. Figure 10 on page 109 illustrates the proper wiring of the cable. Alternatively, connect a USB A-B cable between the Reporter's port labeled "USB Device to PC" and any USB port available on the PC.

To use the Reporter's USB Device Port the proper drivers must be installed in the PC. Appendix D describes how to locate and install the correct drivers.

2

A	Detachable screw-down connectors (7)	**B**	80-character LCD
C	USB Host Port	**D**	LCD contrast adjustment
E	LED indicators (3)	**F**	20-positon keypad
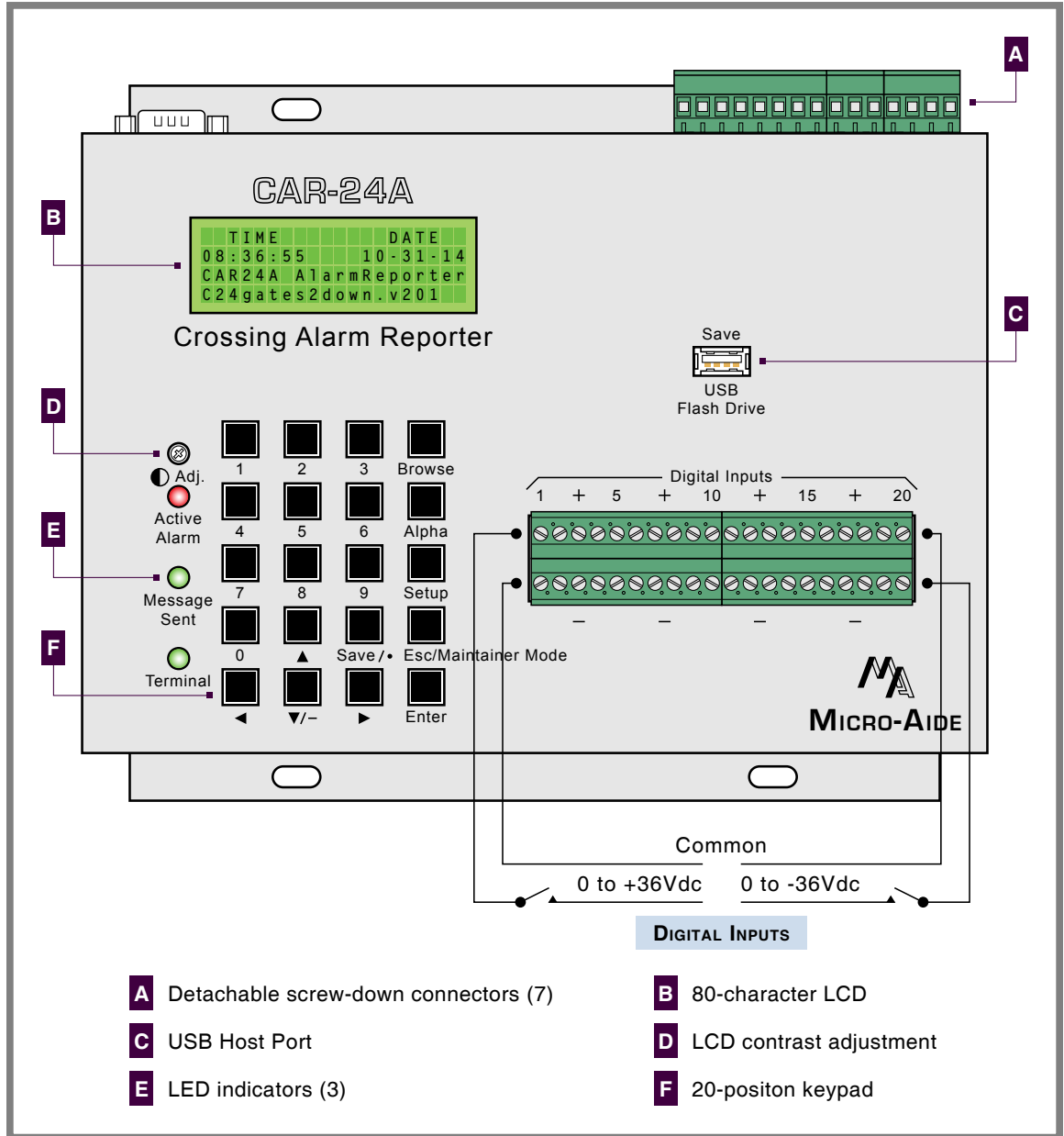
Figure 2: Typical Installation - Front Panel View

The c24gates2down.v201 Setup Database provided by Union Pacific selects a Terminal Port Baud rate of 9600. The CAR-24A requires 8 data bits, no parity, 1 stop bit (i.e., 8-N-1) and hardware flow control.

3. Set the PC to emulate an ANSI terminal. In the case of HyperTerminal, click on the File, Properties command. Select the Settings tab. Enable Terminal keys. Select ANSI from the Emulation drop-down list box.

4. Apply power to the PC. Ensure that the communications program is set for a direct connection to the appropriate communications port.
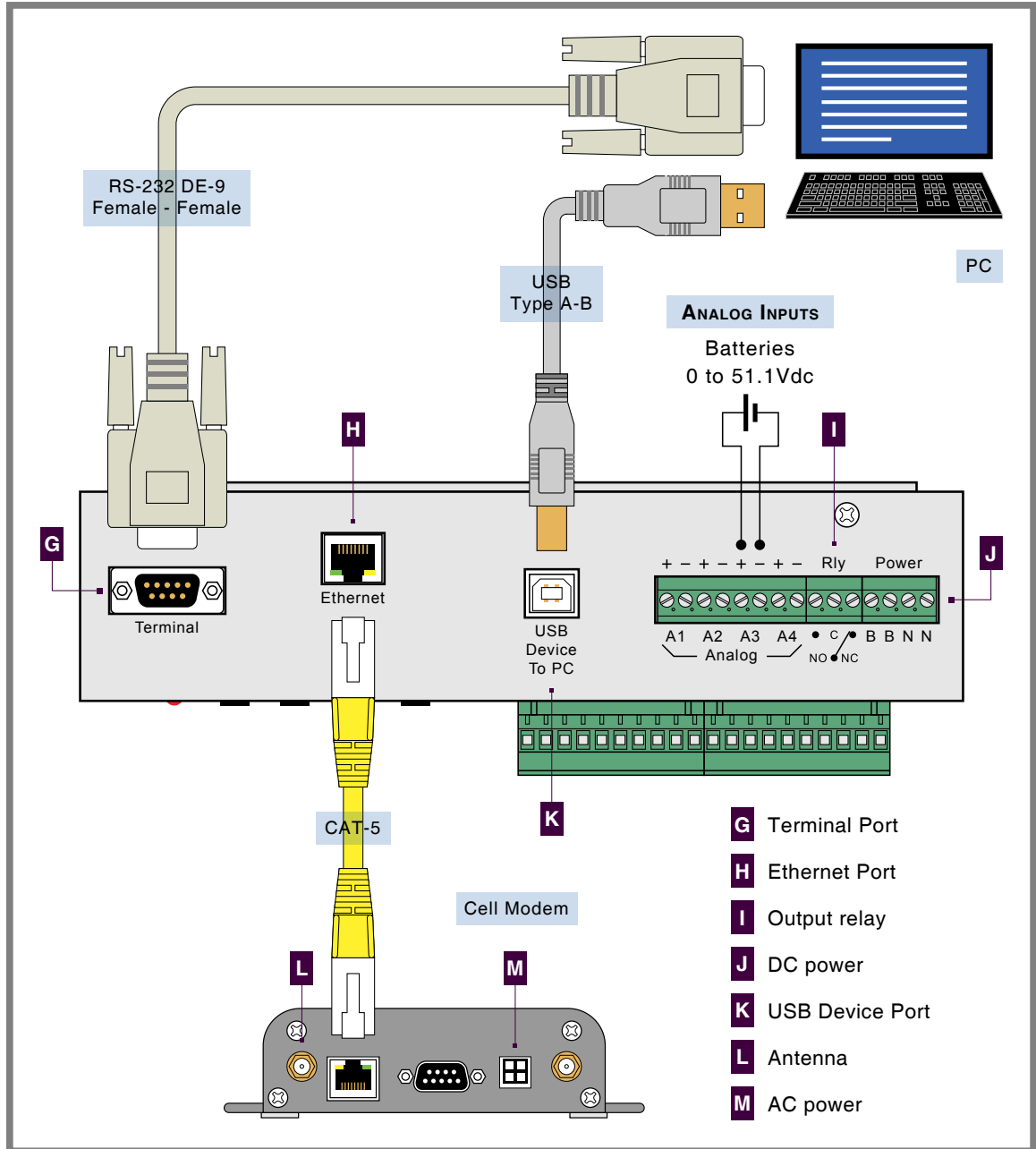
Figure 3: Typical Installation - Top Panel View

5. Apply power to the CAR-24A. The Liquid Crystal Display (LCD) panel should illuminate. The PC will display the following message (Terminal Port only).

```
Micro-Aide CWR-24a Flash Boot Loader 1.00
Press ESC for boot loader
```

The preceding boot loader message is always issued at a Baud rate of 38,400. If the Reporter is set to run at 9600 Baud, the message will appear to be garbled. Regardless, do not press the **Esc** key. The user must wait several seconds for the CAR-24A to complete its initialization process.

6. After the Reporter completes its initialization the date and time should appear on the LCD. Confirm that the LCD indicates that Maintainer Mode is enabled. The first line of text on the LCD will include the MAINT reference as shown in the following.

```
 TIME MAINT  DATE
12:38:55    10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```
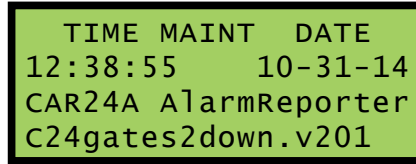
Maintainer Mode Enabled

If Maintainer Mode is not enabled, press the front panel pushbutton switch labeled "Esc / Maintainer Mode" once.

7. The date and time may need to be changed. The procedure for changing the date and time is described in the section entitled . The following password challenge will be displayed.

```
Model CAR-24A 1.11 (C) 2014 MICRO-AIDE INC.

C24gates2down.v201

Event storage capacity: 302084

Enter password:
```

Password Request

8. If the Reporter fails to display the password request, check the power and peripheral connections and Baud rate and communications settings. If the problem can be isolated to the CAR-24A contact MICRO-AIDE customer service for instructions on how to proceed.

ⓘ Repair and return policies are described on the inside back cover of this manual.

2

9. The remainder of the Initial Check-Out Procedure presumes the Reporter is configured to operate in accordance with the parameters established by the c24gates2down.v201 Setup Database. If this is not the case the user may wish to reload the c24gates2down.v201 database. Refer to the section entitled for details.

10. From the PC's keyboard type **car** in lower-case letters. This is the Union Pacific specified Restricted Password. Complete the entry by pressing the **Enter** key. The Main Menu, shown in the following, will be displayed.

```
        MICRO-AIDE CAR-24A Alarm Reporter 1.11
                  C24gates2down.v201

              F Site Specific Information
              L Live Status
              C Time/Date
              Q Query Events
              V View Events
              M Measure Flash Rate
              T Transfer Files
              D Diagnostics
              S Setup
              R Remote Port
              X Log Off
```
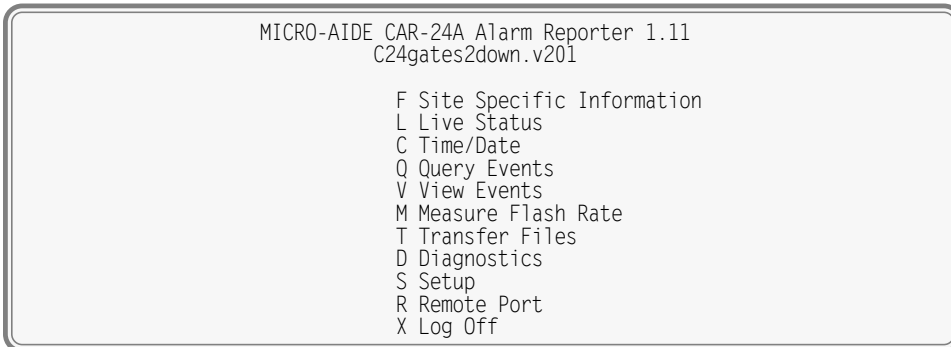
Main Menu

11. Using a short pair of stripped jumper wires place +12 Vdc and negative to Digital Input number 1. Refer to the silkscreened labels located near the input terminals. Positive voltage should be placed on the terminal to the left and negative voltage on the right. The voltage should be held for at least 1.5 seconds before proceeding.

12. Use the same procedure described in the previous paragraph to test additional Digital Inputs.

13. Perform a Query of the Event Records by pressing **Q** at the PC keyboard. Select today's date and then press **Enter**. Finally, press the **F1** function key. Alternatively, press the **Ctrl+W** keys simultaneously. Refer to the section entitled "Query Events (Q)" on page 54 for additional details.

14. Verify that an Event Record is reported for each Digital Input tested. Note any inputs not displayed and test the inputs again, being careful to hold the voltage for at least 1.5 seconds. A second Query should verify the retested inputs.

15. Press the **Esc** key once to return to the Main Menu. Press the **L** key. The CAR-24A will now display the real-time status of Digital and Analog Inputs.

16. Connect the 12 Vdc positive and negative test leads to the two inputs of Analog Input A1.

17. Verify the Analog Input reading for A1 is within .15 Vdc of the correct reading.

18. Repeat the previous two steps for the remaining three Analog Inputs.

19. Before completing the Initial Check-Out Procedure verify the LCD is providing acceptable contrast. If it needs to be improved adjust the potentiometer located at the Reporter's front panel. Refer to the section entitled "Adjusting the LCD Contrast" on page 97.

This concludes the Initial Check-Out Procedure. This procedure may be used at any time to verify that the CAR-24A is operating properly. Power can now be removed from the Reporter. Connections to the PC should also be removed.

In the event that a failure occurs during any part of this procedure a series of diagnostic tests should be performed. Refer to the sections entitled "Diagnostic Testing" on page 99 and "Trouble-Shooting Guide" on page 104. Alternatively, the user may wish to contact MICRO-AIDE customer service. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

INSTALLATION PROCEDURE

The following sections describe the recommended Installation Procedure. Elements common to most installations are illustrated in Figure 2 on page 10 and Figure 3 on page 11. The illustrations also depict the location of each connector used in the installation.

LOCATION

The location where the CAR-24A is to be installed should comply with a few simple requirements. The ambient temperature near the Reporter should be in the range from -40°C to 72°C.

MOUNTING

The CAR-24A is designed to be mounted on a flat surface such as a shelf or backboard. It is equipped with two mounting brackets suitable for this purpose. The four mounting holes are .5″ by .219″ in size. Their center lines form a rectangle 5.0″ by 7.0″.

The cell modem and PC (if used) should be mounted in accordance with the manufacturer's recommendations.

SITE PREPARATION

The equipment location must have access to a stable 9 to 36 Vdc power source. A pair of wires must be run from the power source to the location where the Reporter will be mounted. The CAR-24A wire ends must be stripped approximately 1/4″. The stripped ends will be secured by screw-down terminals located along the top panel of the Reporter. One wire must be connected to the positive voltage of the power source and the other wire must be attached to the return of the power source. The screw-down terminals will accept wire sizes as large as 12 AWG. The two wires must be properly secured to prevent damage.

It is preferable not to run the wires adjacent to electrical equipment such as motors that may generate large electrical disturbances.

The Digital and Analog Inputs also use a screw-down style of detachable connector. Each wire should be tagged with its circuit identity. Each input cable or wire bundle should be secured to prevent damage to the connections at either end.

The CAR-24A can be programmed to issue an alarm indication signal. A form C relay with normally closed and normally open contacts is available at the connector alongside where power is attached to the Reporter. The contacts are rated for 2 Adc at 24 Vdc and 1 Aac at 125 Vac. The relay can be used to control an external light or warning device.

Pₑᵣᵢₚₕₑᵣₐₗ EQᵤᵢₚₘₑₙₜ

If a PC is to be co-located with the CAR-24A an appropriate AC power source must be available. Additional connections can be made as described in the following sections.

USB Dₑᵥᵢcₑ Pₒᵣₜ

If an on-site PC is to be used MICRO-AIDE recommends that the USB Device Port be connected to a USB port of the PC. The USB Device Port will support data transfer rates of 4.71 Mbps. A standard USB Type A-B cable is used for this purpose. Table 16 on page 108 lists the bit transfer rates of each user-accessible port.

To use the Reporter's USB Device Port the proper drivers must be installed in the PC. Appendix D describes how to locate and install the correct drivers.

Tₑᵣₘᵢₙₐₗ Pₒᵣₜ

As an alternative, the PC (if used) must be connected to the Terminal Port. The Terminal Port cable should be kept to a minimum distance, preferably less than 20'. MICRO-AIDE provides, as a standard feature, an RS-232 DE-9 to DE-9 cable. The cable is suitable for use with any PC comm port or USB-to-serial adapter cable.

Each Reporter is shipped with a MICRO-AIDE manufactured RS-232 cable. The shield wire in the provided cable is not attached. Consequently, the Reporter chassis and peripheral device are electrically isolated. This further improves the isolation properties of the system.

Eₜₕₑᵣₙₑₜ Pₒᵣₜ

The Ethernet Port of the CAR-24A will generally connect to the VPN's fiber optic network via a network switch. If a cell modem is used, its Ethernet Port should be connected to the Ethernet Port of the CAR-24A. A standard CAT-5 Ethernet cable can be used in either application. The length of the cable must be limited to 200'.

CₐBₗᵢₙG

Follow the steps listed in the following to complete the cabling installation.

The power, alarm relay and input wires all terminate in connectors that are detachable. The cable installation may be performed more easily if the female connectors are first detached from their male halves that remain secured to the CAR-24A circuit board.

Pₒwₑᵣ

1. Ensure that the power is off at the power source.

2. The two wires from the power source must be secured to either pair of screw-down terminals labeled "B" and "N", respectively.

3. Connect power to the cell modem and PC (if used).

ALARM RELAY

Wire the alarm indicating device or circuit to the appropriate relay terminals labeled "C", "NO" or "NC" (i.e., common, normally open, normally closed, respectively).

INPUT CIRCUITS

Fault conditions will only be Alarmed properly if the input circuits are wired correctly to the CAR-24A. The correct polarity of Digital and Analog Inputs must be identified.

Digital Input circuits are wired to a pair of ten-position, detachable connectors. Individual pairs are wired to vertically adjacent terminals. The positive lead of the digital circuit to be monitored must be connected to the upper terminal labeled "+". The common, or return, lead of the digital circuit must be connected to the lower terminal labeled "-".

Positive and negative voltages can be monitored by a Digital Input, even if they occur from the same circuit. In such cases the circuit is wired to two inputs of the Reporter, one for each polarity. illustrates how to connect negative voltage circuits.

Analog Inputs are connected similarly to Digital Inputs. The four Analog Inputs terminate in a separate, eight-position connector located at the top panel of the Reporter.

The user may wish to verify the proper operation of each input. The should be used to identify any faulty input wiring.

Once the cabling is completed, power can be applied to the entire system. The Setup Database will likely need to be modified to reflect the requirements of the local site. This is the subject of the next chapter.

2

USER NOTES

CHAPTER 3 — SETUP

INTRODUCTION

This chapter describes how to set up the CAR-24A for use in a typical application. The Setup Procedure is described using two different methods. The first is directed towards maintainers and technicians whose set up activity will be limited to assigning site-specific information. This procedure assumes that the user needs to add site-specific information to the c24gates2down.v201 Setup Database. The second, and more comprehensive procedure, describes how to modify and/or create an entire Setup Database.

LOGGING ON

User sessions are initiated only after the log-on procedure is completed. Logging on is described in the section entitled "Initial Check-Out Procedure" on page 9. To log on the user must enter the correct password in response to the password challenge. A typical password challenge message is shown in the sample data entitled "Password Request" on page 12.

The Terminal, Ethernet and USB Device Ports of the CAR-24A incorporate two levels of password security. Each level uses a distinct password. The Restricted Access password allows a user to review all aspects of the Setup Database. Modifications to the Setup Database are limited to parameters that are considered site-specific. The Administrative Access password allows a user full access to all aspects of the Reporter. This includes the unrestricted ability to make changes to the Setup Database.

ℹ The c24gates2down.v201 Setup Database created by Union Pacific defines the Restricted Access password as **car**. For security reasons, the Administrative Access password is not listed anywhere in this document.

The Main Menu, as shown below, will be displayed after the correct password has been entered.

```
MICRO-AIDE CAR-24A Alarm Reporter 1.11
           C24gates2down.v201

         F Site Specific Information
         L Live Status
         C Time/Date
         Q Query Events
         V View Events
         M Measure Flash Rate
         T Transfer Files
         D Diagnostics
         S Setup
         R Remote Port
         X Log Off
```

Main Menu

USER INTERFACE CONVENTIONS

The CAR-24A user interface is designed for ease-of-use. Before proceeding further, the user should become familiar with a few simple aspects of the interface.

Fɪᴇʟᴅs ᴀɴᴅ Cᴏᴍᴍᴀɴᴅs

The CAR-24A user interface allows commands and parameter fields to be easily and quickly selected. Commands are listed vertically in a menu. Some commands direct the user to sub-menus containing additional commands (e.g., Setup command). Fields allow the user to either select or enter parameter values. A specific field is always uniquely associated with a particular command.

To select a command from a menu or a field within a command simply move the rectangular highlight to the location of the desired command or field. Pressing the appropriate arrow keys located on the PC keyboard will move the highlight. The left, right, up and down arrow keys may be used in any sequence to position the highlight.

To execute a command that has been previously selected (i.e., highlighted) simply press the **Enter** key. Alternatively, the command may be executed by pressing the single-letter code listed to the left of the command. Upper- and lower-case letters may be used. Every command listed in a menu has a distinct single-letter code that permits immediate execution of that command.

Wᴏʀᴋɪɴɢ ᴡɪᴛʜ Fɪᴇʟᴅs

The CAR-24A utilizes two types of fields. Selection Fields allow the user to select a parameter from a list of predefined values (e.g., Terminal Port Baud Rate). Edit Fields can be set to any alphanumeric value desired by the user (e.g., DOT number).

To change the value of a Selection Field simply press the **Spacebar** on the PC keyboard. The next value from a predefined list of values will be displayed each time the **Spacebar** is pressed. The first value in the list will automatically follow the last value.

Input Names, Detection Times and Limit Values are examples of parameters that are defined by Edit Fields. After the desired Edit Field is highlighted the user may type any combination of alphanumeric characters appropriate to the field. The initial value of the field is completely removed after typing the first character. Consequently, it is not necessary to delete each character that comprises the initial value. Errors in typing can be corrected by using the **Backspace** key. At any time while editing a field the user may press the **Esc** key and thereby restore the field to its previous value.

Upper- and lower-case letters may be used. Limit Values are assigned negative values by preceding the numeric entry with a minus sign. Numeric values that exceed the range of the field are automatically set to the maximum or minimum value (as appropriate) permitted by the range.

To accept the new value assigned to an Edit Field the user can either press the **Enter** key or move the highlight to a new field. The initial value of an Edit Field cannot be restored after the new value has been accepted. When all of the fields contain values suitable to the user the command may be completed.

Once a field has been accepted by pressing the **Enter** key or moving the highlight it may, depending upon the command, be programmed into the Reporter as an updated operating parameter. Accordingly, the acceptance may occur before completion of the command.

Cᴏᴍᴘʟᴇᴛɪɴɢ Cᴏᴍᴍᴀɴᴅs

Generally, commands are completed by pressing the **Esc** key. However, pressing the **Esc** key will not complete the command if the user is in the process of editing a field. Pressing the **Esc** key prior to accepting the new value will instead restore the highlighted field to its previous value. To complete a command that requires pressing the **Esc** key, first accept the contents of the last Edit Field by pressing the **Enter** key or moving the highlight to another field.

Some commands are completed by responding to a choice listed in a Selection Field (e.g., No or Yes). In these cases the command is completed by highlighting the desired choice and then pressing the **Enter** key. Pressing the **Esc** key is the equivalent of selecting the default choice (generally the No option). As a rule of thumb, executing the No option will abandon any field changes made prior to the completion.

Other commands are completed by pressing the key described in a prompt message displayed with the command. Prompts are frequently listed with commands as an aid to the user. After the command is completed the user will be returned to the menu that was previously displayed.

DATA FLOW CONTROL

A few of the setup and operational commands can generate considerable amounts of displayed data. If the user wishes to observe this data on the screen of a PC it may be helpful to temporarily pause the data stream being sent by the Reporter. The Pause and Resume commands may be used to provide the required data flow control.

To Pause the data being sent press the **Ctrl** and **S** keys simultaneously. The data flow will be stopped indefinitely. To Resume data flow press the **Ctrl** and **Q** keys simultaneously. This technique can be used to freeze the data at the PC.

Another useful command is the Abort command. At any time during a lengthy data dump the remaining data can be ignored or aborted by pressing the **Esc** key. The user can then issue another command immediately after the Abort is executed rather than wait until the lengthy data dump is completed.

SETUP PROCEDURE - SITE SPECIFIC DATA ONLY

The Setup Procedure described in this section will typically be used by maintainers and technicians. A Restricted Access session will be used to modify a limited portion of the Setup Database. Only modifications to site-specific parameters will be described. It is assumed that the user has logged onto the Reporter using the Restricted Password. The Main Menu should be displayed. Refer to the sample data entitled "Main Menu" on page 17.

Each command will be identified by its name as listed in the menu where it resides. The single-letter code that executes the command will be listed in parenthesis.

ⓘ It is assumed that the Union Pacific-defined c24gates2down.v201 Setup Database has been installed in the CAR-24A. The comm port of the PC must be set to operate at a speed of 9600 Baud with hardware flow control enabled.

Maintainer Mode should be enabled before proceeding with the Setup Procedure. This will prevent any Alarms from being sent while the Reporter is being set up. Refer to the section entitled "Maintainer Mode" on page 51. The first line of text on the LCD should include the MAINT reference as shown in the following.

```
 TIME MAINT  DATE
12:38:55    10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```
Maintainer Mode Enabled

If Maintainer Mode is not enabled, press the front panel pushbutton switch labeled "Esc / Maintainer Mode" once.

SITE SPECIFIC INFORMATION (F)

Site parameters are grouped within a single Main Menu command. To change any of the settings, start by selecting the Site Specific Information command. A collection of fields with data similar to the following will be displayed.

```
                    Site Specific Information
                    -------------------------
              State                 XX
              Subdivision           0000
              DOT number            TESTXXX
              Time Zone             CST  (UTC-6)
              Daylight Saving Time  Enabled
              DNS Name       m402555TEST.airlink.uprr.com

                      Analog Configuration
         Input   Range      Filter*   Low Limit    High Limit
         -----  ----------  ------    ---------    ----------
          A01   +/-25.5Vdc   Fast       10.4          15.6
          A02   +/-25.5Vdc   Fast       11.2          16.8
          A03   +/-25.5Vdc   Fast      -20.0          20.0
          A04   +/-25.5Vdc   Fast      -20.0          20.0

                 *Recommend "Slow" for AC
```

Site Specific information Command

The name of each field is listed to the left of each setting. Fields can be modified or skipped as required. A description of each field is provided in the following sections.

STATE

The State field can be any two-letter abbreviation (e.g., IL or CA).

SUBDIVISION

The Subdivision field can be any four-character designation that further defines the location of the site. The user may wish to consult Union Pacific as regards appropriate designators.

DOT NUMBER

The DOT Number field provides for the seven-character designation that typically forms a valid number.

TIME ZONE

The Reporter's real-time clock can be periodically synchronized to a time server. The SNTP-Unicast and SNTP-Multicast methods are employed for this purpose. However, SNTP time data is relative to UTC-0 time (previously known as GMT). To report the correct local time the Reporter must convert UTC time by applying the correct time zone adjustment.

The Time Zone setting can be assigned as one of seven different values that are commonly used in North America. Each setting is explained in .

Time Zone Code	Description	Shift from UTC (hours)
AST	Atlantic Standard Time	-4
EST	Eastern Standard Time	-5
CST	Central Standard Time	-6
MST	Mountain Standard Time	-7
PST	Pacific Standard Time	-8
AKST	Alaska Standard Time	-9
HAST	Hawaii Standard Time	-10

Table 4: Time Zone Settings

Press the **Spacebar** repeatedly until the required setting is displayed.

DAYLIGHT SAVING TIME

The real-time clock of the CAR-24A can be adjusted automatically to compensate for DST. If enabled, the real-time clock will be shifted by 1 hour on the second Sunday of March and the first Sunday of November. In both cases the clock is adjusted at 2:00 AM.

Press the **Spacebar** as required to enable or disable the DST adjustment.

The DST feature implemented by the CAR-24A is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.

DNS NAME

The DNS Name field is used to provide a network name for the CAR-24A site. More specifically, it is the network name assigned to the cell modem which controls access to the CAR-24A. The name must be unique within the network. As many as 40 alphanumeric characters can be used to create the name.

The DNS Name takes the form: modemname.domain. By way of example only, the c24gates2down.v201 Setup Database includes the name: m402555TEST.airlink.uprr.com. The user may wish to consult Union Pacific for more information regarding the creation of valid DNS Names.

ANALOG CONFIGURATION

The four Analog Inputs of the CAR-24A are used to measure and report battery and/or AC voltages and currents (optional). The user can select entries from a preset menu that best suit the intended application.

The sample data entitled "Site Specific information Command" on page 20 lists the Analog Configuration used by the c24gates2down.v201 Setup Database. It comprises five columns of data. The first column identifies the input. Analog Inputs are consistently labeled by the CAR-24A as "A01", "A02", etc. The A-prefix is always used to distinguish Analog from Digital, Virtual, Timer and System Inputs. This first column of fields is fixed and cannot be altered by the user. Four parameters can be used to characterize an Analog Input. Each parameter is described in the sections that follow. Table 5 on page 21 lists the Resolution, Filter and Limit Values applicable to each of the seven Ranges.

Range	Resolution	Filter	Low Limit	High Limit
±25.5 Vdc	.1 Vdc	Slow or Fast	-25.6 to 25.5 Vdc	-25.6 to 25.5 Vdc
+51.1 Vdc	.1 Vdc	Slow or Fast	0.0 to 51.1 Vdc	0.0 to 51.1 Vdc
±255 Vdc	1 Vdc	Slow or Fast	-256 to 255 Vdc	-256 to 255 Vdc
25.5 Vac	.1 Vac	Slow or Fast	0.0 to 25.5 Vac	0.0 to 25.5 Vac
255 Vac	1 Vac	Slow or Fast	0 to 255 Vac	0 to 255 Vac
±25.5 Adc	.1 Adc	Slow or Fast	-25.6 to 25.5 Adc	-25.6 to 25.5 Adc
25.5 Aac	.1 Aac	Slow or Fast	-25.6 to 25.5 Aac	-25.6 to 25.5 Aac

Table 5: Analog Input Parameters

RANGE

The Range setting allows the user to configure the Analog Input for DC or AC voltage or DC or AC current measurements. The Range setting also selects the span of voltages or currents that will be monitored. Lastly, the Range setting selects the resolution that will be reported by the measurement. The +51.1 Vdc range is particularly useful in monitoring batteries that may exceed 24 Vdc when charging. The 255 Vac range is useful for monitoring the AC power source connected to a battery charger. The DC and AC current ranges are intended to be used with a MICRO-AIDE external current sensor.

Each of the Ranges identified as AC utilize a true RMS method of measurement. Consequently, these settings can also be used when monitoring inputs with variable DC or pulse content.

FILTER

The Filter parameter can be set to either Fast or Slow. The Fast setting utilizes a time constant of .1 seconds. It is generally used when monitoring DC signals. The Slow setting utilizes a time constant of .64 seconds. It should be used when monitoring AC signals in order to smooth out their ripple content. If the user is unconcerned about the Filter time constant it is best to use the Slow (default) setting.

3

H**IGH AND** L**OW** L**IMITS**

Analog Inputs are constantly compared to two Limit Values. The High and Low Limit Values define ranges of acceptable and unacceptable operation. Outside the acceptable range the input is considered to be in an abnormal state. An Event Record will be created when the Analog Input transitions into or out of either range. Additionally, if this condition persists an Alarm message will be issued.

Figure 4 on page 22 illustrates the relationship of the High and Low Limit Values to the Analog Input state. Each range defines the type of Event Record that is created by transitions of the input. The figure depicts an Analog Input configured to monitor a typical 12 Vdc battery source. The figure indicates that the unacceptable range includes all voltages less than 10.4 Vdc and all voltages greater than 15.6 Vdc. The unacceptable range always consists of two portions separated by the acceptable range. If the input is within the range extending from 10.4 to 15.6 Vdc the battery voltage is considered to be acceptable.

Analog Inputs with levels greater than the Low Limit Value but less than the High Limit Value are considered to be in an Off state. They will create Event Records defined by the inactive or Off Event state. Levels found to be outside these limits are considered to be in an On state. They will create Event Records defined by the active or On Event state. On and Off states are important to the assignments included in the Alarm Configuration Table. Refer to the section entitled "Alarm Configuration (L)" on page 47 for additional details.

In the following illustration, when the signal transitions into the unacceptable range an On Event Record is created and identified with an Event Name of Batt1BAD. When the signal transitions into the acceptable range an Off Event Record is created and identified with an Event Name of Batt1_OK.
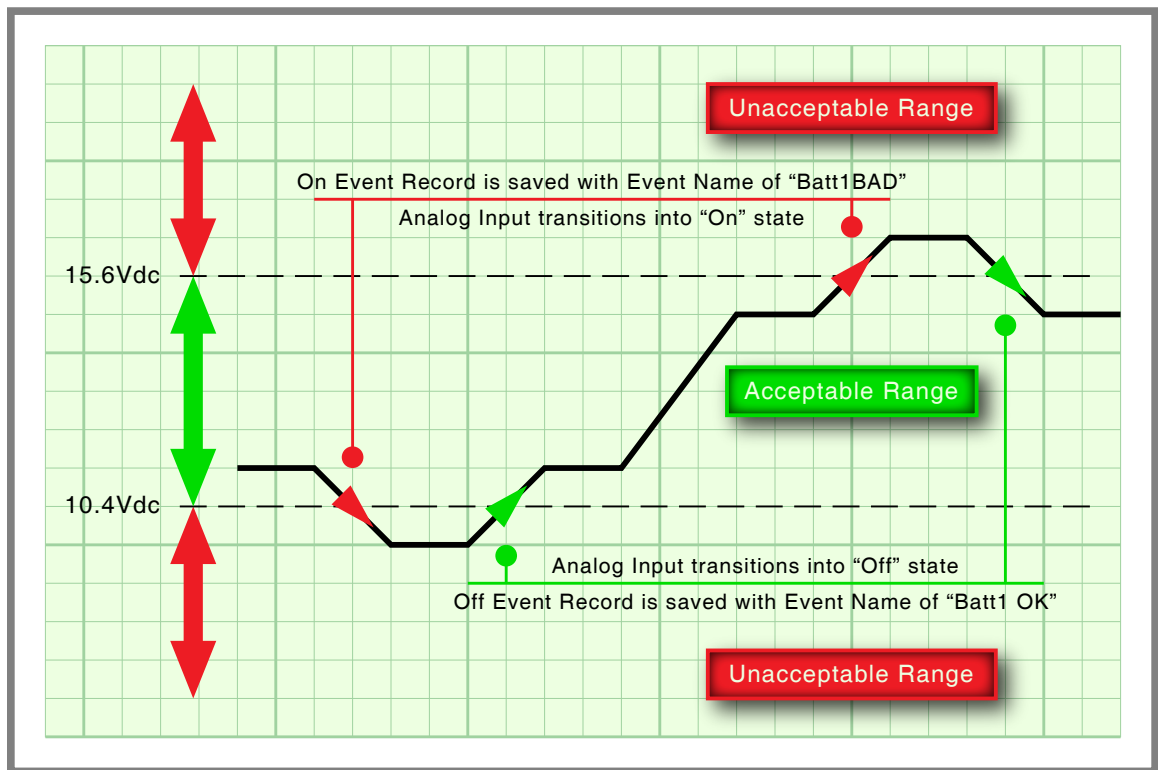
Figure 4: Analog Input Operating Ranges and Limit Values

T**IME** / D**ATE** (C)

Event Records and Alarm messages sent by the CAR-24A include a date and time stamp. The Reporter features a real-time clock circuit whose accuracy is rated at ±3 ppm (±8 seconds per month). It will automatically account for leap year. The clock will continue to keep time accurately during a power outage

lasting 30 or more days. The time zone used by the Reporter can also be selected. Refer to the section entitled "Time Zone" on page 20 for additional details.

To set the time and/or date execute the Time/Date command. The sample data listed in the following shows a typical response to the Time/Date command.

```
                            Time/Date

                              HH:MM:SS
                       Time: 10:43:30

                              MM-DD-YY
                       Date: 10-31-14 Friday


                   [F1/^W]=Request SNTP clock sync
```

Time/Date Command

The CAR-24A utilizes a military-style clock. Accordingly, 12:01:02 AM is defined as 00:01:02 and 12:59:58 PM is defined as 23:59:58. The day of week is displayed automatically as determined by the date listed.

The Time/Date command allows the user to set the real-time clock by exercising either of two methods. Both methods are described in the following.

MANUAL METHOD

Move the highlight to one of the time or date fields. Enter a new numerical value. Leading zeros are not required. Adjust additional fields as required. To complete the command, press the **Esc** key. The user can then accept or abandon the changes.

TIME SERVER METHOD

The Reporter's clock can also be set precisely by a time server at any moment the user desires. This can be useful when the Reporter becomes operational for the first time. This feature requires that the Reporter have network access to at least one time server. To use this method, press the **F1** function key. Alternatively, press the **Ctrl+W** keys simultaneously. The clock will be set immediately. A failure or confirmation message will be displayed. The latter will include the new date and time.

Using this method, the Reporter attempts to communicate with the time server(s) identified by the SNTP Server Primary and Secondary address fields. Refer to the section entitled "SNTP Server - Primary and Secondary" on page 45 for additional details. This method is also employed automatically once per day to sync the Reporter's real-time clock. At 00:05:00 (i.e., 5 minutes past midnight) the Reporter will request a time setting from either the primary or secondary time server.

PRINT SETUP DATA (P)

After the site-specific information is entered, the user may wish to review the various parameters that comprise the new Setup Database. To do so, select the Setup command from the Main Menu followed by the Print Setup Data sub-command. The following menu of sub-commands will be displayed.

```
                     Print Setup Data

              P Print All
              E Print Event Names
              I Print Input Names/Identifiers
              D Print Detect Times/Flash Enable
              V Print Virtual Inputs
              T Print Timer Configuration
              M Print Measure Speed Parameters
              N Print Network Settings
              H Print HTTP Server Settings
              L Print Alarm Parameters
              F Print Site Specific Information
              S Print System Parameters
```

Print Setup Data Command

The Print All command can be used at the end of the Setup Procedure to display the entire Setup Database. The remaining commands are used to display specific portions of the Setup Database.

The Print All command will issue a lengthy stream of data that will exceed the viewing capacity of a single terminal screen. The user may wish to temporarily pause the data for better viewing. Refer to the procedure entitled "Data Flow Control" on page 19.

T<small>RANSFER</small> F<small>ILES</small> (T)

Careful thought and time is expended creating and entering the site-specific information that becomes a part of the Setup Database. In the event of an accidental loss of data memory (e.g., a reset performed by mistake) this information will need to be re-entered. The Transfer Files command provides the user with a quick and simple data exchange alternative to re-entering the Setup Database by hand.

The Download Setup Data sub-command is used to transmit the Setup Database to a data storage system. A PC running a communications program like HyperTerminal or Tera Term makes an ideal storage system. A file containing the setup parameters can be permanently saved on the hard disk or a flash drive for later retrieval via the Upload Setup Data sub-command.

To initiate a download or upload of the Setup Database, execute the Transfer Files command from the Main Menu. The following sub-commands will be displayed. Both procedures are described in the two sections that follow.

```
                         File Transfer

          D Download Setup Data CAR to PC
          U Upload Setup Data PC to CAR
          F Firmware Upload
```
Transfer Files Command

The Setup Database can also be easily and quickly downloaded and uploaded using the USB Host Port. Refer to the sections entitled "Saving the Setup Database" on page 73 and "Update" on page 92, respectively.

D<small>OWNLOAD</small> S<small>ETUP</small> D<small>ATA</small> (D) - S<small>AVING THE</small> D<small>ATABASE</small>

Perform the following steps to save the current Setup Database.

The steps necessary to complete the download depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

If the Reporter's Terminal Port is used in the following procedure, hardware flow control must be enabled at the PC's comm port.

1. Select the Download Setup Data sub-command. The following message will be displayed.

```
Start text file capture on your PC and hit any key
```

2. With the mouse, click on the Transfer>Capture Text... command. The Capture Text dialog box will be displayed.

3. Click the button labeled Browse... to open the Select Capture File dialog box.

4. Navigate to the desired folder where the Setup Database file will be saved. In the edit box labeled "File name:", enter an appropriate name for the new file.

The saved Setup Database will be a text file with an extension of ".txt". As it will reflect the unique properties of the current location, it should not be named c24gates2down.v201.

5. Click the button labeled "Save". The Select Capture File dialog box will close. The user will be returned to the Capture Text dialog box.

6. Click the button labeled "Start". Press the **Enter** key to initiate the transfer. Data similar to the following will be displayed. The sample data lists only the first and last four lines of text. The data transfer will cease automatically after a few seconds.

```
:100000000008DC123456C0A80064FFFFFF000000A7
:10001000000088130105433134736561 72322E7616
:100020003130300000000000000000000000000003F
:1000300000000000000000000000000000000000000C0


:1004D000726C696E6B2E757072722E636F6D000098
:0C04E0000000000000000000000000000000FF11
:00000001FF
Stop file capture and press ESC to continue
```

Sample Data from Upload Command

7. Click the Transfer>Capture Text>Stop command to complete the transfer. Press the **Esc** key twice to return to the Main Menu.

UPLOAD SETUP DATA (U) - RESTORING THE DATABASE

Before the Setup Database can be restored to the Reporter it must have been previously saved. Refer to the procedure entitled "Download Setup Data (D) - Saving the Database" on page 24. Perform the following steps to restore a saved Setup Database.

The steps necessary to complete the upload depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

If the Reporter's Terminal Port is used in the following procedure, hardware flow control must be enabled at the PC's comm port.

1. Select the Upload Setup Data sub-command. The following message will be displayed.

```
Are you SURE you want to upload new Setup Data from PC to CAR?
                        No Yes
```

2. Select No to abort the upload. Select Yes to proceed. If the user elects to proceed with the upload the following message will be displayed.

```
Send hex setup file as text file now
```

A hex file is a particular type of text file. Accordingly, the saved Setup Database will likely have an extension of ".txt" or ".hex". It cannot be a binary file with an extension of ".bin" (e.g., setupdata.bin).

3. With the mouse, click on the Transfer>Send Text File... command. The Send Text File dialog box will open.

4. Navigate to the desired folder where the Setup Database file was saved. Select the appropriate file.

5. Click the button labeled "Open". The Send Text File dialog box will close.

6. Several period characters will be displayed. They are used to indicate the progress of the transfer. The data transfer will cease automatically after a few seconds. The following message will be displayed.

```
.............
Upload completed
Press ESC to continue
```

7. Press the **Esc** key twice to return to the Main Menu.

LOG OFF (X)

The Log Off command is used to terminate the current user session. If the previous user logs off of the Reporter, access can be regained only by entering the correct password. If the previous user fails to log off, a second user will be allowed access without entering a correct password.

⚠️ All sessions should be terminated by executing the Log Off command.

To log off of the Reporter, access the Main Menu and then press the **X** key. The following message will be displayed.

```
About to Log Off, are you sure?
No Yes
```

Log Off Command

If the user proceeds with the log off the current session will be immediately terminated.

This completes the site-specific portion of the Setup Procedure. Since the installation and setup of the Reporter are critical to how the CAR-24A will perform, it is advisable to review the steps taken earlier. Make any changes that may be required.

⚠️ Maintainer Mode should now be terminated. If it is on, press the front panel pushbutton switch labeled "Esc / Maintainer Mode". Refer to the section entitled "Maintainer Mode" on page 51.

The CAR-24A is ready to operate in accordance with its installed Setup Database. It is assumed that the cell modem, network and message processing server are also properly configured.

The remainder of this chapter provides additional information that concerns users with Administrative Access. It can be ignored by users with Restricted Access. The next chapter describes how to operate the CAR-24A.

SETUP PROCEDURE - ALL SETUP DATA

The Setup Procedure described in this section will typically be used by signal engineers who need to prepare a new, or perhaps make significant changes to an existing, Setup Database. Accordingly, an Administrative Password must be entered to access the Reporter. It is assumed that the user has already logged onto the Reporter. The Main Menu should be displayed. Refer to the sample data entitled "Main Menu" on page 17.

Each command will be identified by its name as listed in the menu where it resides. The single-letter code that executes the command will be listed in parenthesis.

ⓘ It is assumed that the Union Pacific-defined c24gates2down.v201 Setup Database has been installed in the CAR-24A. The comm port of the PC must be set to operate at a speed of 9600 Baud.

Maintainer Mode should be enabled before proceeding with the Setup Procedure. This will prevent any Alarms from being sent while the Reporter is being set up. Refer to the section entitled "Maintainer Mode" on page 51. The first line of text on the LCD should include the MAINT reference as shown in the following.

```
TIME MAINT  DATE
12:38:55    10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```
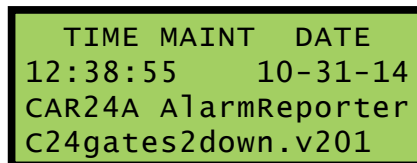
Maintainer Mode Enabled

If Maintainer Mode is not enabled, press the front panel pushbutton switch labeled "Esc / Maintainer Mode" once.

PARAMETERS PREVIOUSLY DESCRIBED

The Administrative Password provides the user with unrestricted access to the Setup Database. This includes all of the parameters described in the section entitled "Setup Procedure - Site Specific Data Only" on page 19. Refer to the following sections for a description of:

- "Site Specific Information (F)" on page 19.

- "Time / Date (C)" on page 22.

- "Print Setup Data (P)" on page 23.

- "Transfer Files (T)" on page 24.

- "Log Off (X)" on page 26.

The remaining parameters included in the Setup Database are a part of the Setup command. The Setup command is listed in the Main Menu.

SETUP (S)

The following menu of sub-commands will be displayed after executing the Setup command.

```
                         Setup Menu

             E Event Names
             I Input Names/Identifiers
             D Detect Times/Flash Enable
             G Global Detect Time
             V Virtual Inputs
             W Timer Inputs
             M Measure Speed
             N Network
             S System Parameters
             P Print Setup Data
             R Reset System
             H HTTP Server
             L Alarm Configuration
```

Setup Commands

In the sections that follow, twelve of the Setup Menu commands are described. The commands are listed in a sequence that will likely be used if the Setup Database must be changed in its entirety.

RESET SYSTEM (R)

The Reset System command can be used at any time to restore the Reporter to its factory default settings. The command can also be used to clear previously logged Event Records. This step is listed as part of the Setup Procedure since it can be useful in restoring the Reporter to a known state consistent with much of this documentation. Additionally, any programming or Event Records created as a part of the Initial Check-Out Procedure will be erased.

The following menu will be displayed after executing the Reset System command. Both command options are described in the sections that follow.

```
                         Reset System

             S Reset Setup Data
             E Reset Event Memory
             B Reset Both
```

Reset System Command

The time and date settings, along with the Network and several System Parameters, are not affected by either option of the Reset System command.

RESET SETUP DATA (S)

The CAR-24A utilizes two non-volatile memories. The first, referred to as the Setup Database, contains all of the programmed parameters established by the user. Most of these parameters can be restored to their factory default values by executing the Reset Setup Data command. The time and date settings, along with the Network and several System Parameters, are not affected by the Reset Setup Data command. Table 6 on page 28 lists the values after the reset is performed. The table also lists the values associated with the c24gates2down.v201 Setup Database defined by Union Pacific.

Parameter	Value After Reset	c24gates2down.v201 Value
State	(not assigned)	XX
Subdivision	(not assigned	0000
DOT Number	(not assigned)	TESTXXX
Time Zone	(as previously assigned)	CST (UTC-6)
Daylight Saving Time	(as previously assigned)	Enabled
DNS Name	(not assigned)	m402555TEST.airlink.uprr.com
Analog Configuration - Range	±25.5 Vdc	±25.5 Vdc
Analog Configuration - Filter	Slow	Fast
Analog Configuration - Low Limit	-25.6 Vdc	10.4, 11.2, -20.0, -20.0 Vdc
Analog Configuration - High Limit	25.5 Vdc	15.6, 16.8, 20.0, 20.0 Vdc
Time / Date	(as previously assigned)	(as previously assigned)
Measure Flash Rate - Input	(as previously assigned)	(as previously assigned)
Event Names - On	On (1-19), Violate (20)	(see sample data on page 38)
Event Names - Off	Off (1-19), Nominal (20)	(see sample data on page 38)
Input Names - Digital Inputs	Digital Input 01, 02, 03...	(see sample data on page 39)
Input Names - Analog Inputs	Analog Input 01, 02, 03...	(see sample data on page 40)
Input Names - Virtual Inputs	Virtual Input 01, 02, 03...	(see sample data on page 40)
Input Names - Timer Inputs	Timer 01, 02, 03...	(see sample data on page 40)
Identifiers - Digital Inputs	DInput01, DInput02...	(see sample data on page 39)
Identifiers - Analog Inputs	AInput01, AInput02...	(see sample data on page 40)
Identifiers - Virtual Inputs	VInput01, VInput02...	(see sample data on page 40)
Identifiers - Timer Inputs	Timer01, Timer02...	(see sample data on page 40)
Event Pairs	1, 20 for Timer Inputs	(see sample data on page 39, page 40)
Digital Inputs - Detect Time	.300 seconds	1.000 seconds
Digital Inputs - Flash Enable	No	No
Virtual Inputs - Variables	--- (not assigned)	(see sample data on page 41)
Virtual Inputs - Relay	No	No
Timer Inputs - From and To Triggers	--- (not assigned)	--- (not assigned)
Timer Inputs - From and To Events	Off	Off
Timer Inputs - Low Limit	0.0 seconds	0.0 seconds
Timer Inputs - High Limit	0.0 seconds	0.0 seconds
Measure Speed - Sensor1	--- (not assigned)	--- (not assigned)
Measure Speed - Sensor2	--- (not assigned)	--- (not assigned)
Measure Speed - Distance	0	0
Measure Speed - Units	inches	inches
Measure Speed - Threshold	0 mph	0 mph
Network - IP Address	(as previously assigned)	192.168.0.100
Network - Subnet Mask	(as previously assigned)	255.255.255.0

Table 6: Setup Database Settings

Parameter	Value After Reset	c24gates2down.v201 Value
Network - Gateway	(as previously assigned)	0.0.0.0
Network - Ethernet MAC Address	(as previously assigned)	(as previously assigned)
Network - Port	(as previously assigned)	5000
Network - Primary DNS Server	(as previously assigned)	(as previously assigned)
Network - Secondary DNS Server	(as previously assigned)	(as previously assigned)
Network - TCP / IP mode	(as previously assigned)	Telnet
Network - DHCP mode	Static IP	Automatic IP
Network - SNTP Server (primary)	(not assigned)	e.ntp.uprr.com
Network - SNTP Server (secondary)	(not assigned)	f.ntp.uprr.com
Network - DHCP IP Address	(not assigned)	0.0.0.0
Network - DHCP Subnet Mask	(not assigned)	0.0.0.0
Network - DHCP Gateway	(not assigned)	0.0.0.0
Network - DHCP DNS (primary)	(not assigned)	0.0.0.0
Network - DHCP DNS (secondary)	(not assigned)	0.0.0.0
Unit Name	***** NOT SET *****	C24gates2down.v201
Description	(not assigned)	C24gates2down.v201
Terminal Port Baud Rate	38,400	9600
Administrative Password	PASSWORD	(refer to Union Pacific)
Restricted Password	LOOKWORD	car
Passcode	12345678	(refer to Union Pacific)
Ring Count	2 (not applicable)	2 (not applicable)
Clock Sync Mode	(as previously assigned)	SNTP
High Temp Limit	257 °F	140 °F
Low Temp Limit	-67 °F	-40 °F
Maint PB Timeout	3600 seconds	5400 seconds
Health Check Interval	48 hours	48 hours
Min / Flash Rate	0 / 0 fpm	35 / 65 fpm
Default Input Filter	(not assigned)	D1-20 A1-4 L1-20 S1-20
Equipment ID	(not assigned)	C24
Recording Mode	Enabled	Enabled
HTTP - Server URL	(not assigned)	home.www.up.com
HTTP - Server Script File	(not assigned)	/xml_services/signal_equipment/ PAAMsgProcess.cfm
Alarm Configuration - SetInp	--- (not assigned)	(see sample data on page 47)
Alarm Configuration - SetState	Off	(see sample data on page 47)
Alarm Configuration - SetTime	0	(see sample data on page 47)
Alarm Configuration - SetName	(not assigned)	(see sample data on page 47)
Alarm Configuration - ClrInp	--- (not assigned)	(see sample data on page 47)
Alarm Configuration - ClrState	Off	(see sample data on page 47)
Alarm Configuration - ClrTime	0	(see sample data on page 47)
Alarm Configuration - ClrName	(not assigned)	(see sample data on page 47)
Alarm Configuration - MaintClr	No	(see sample data on page 47)

Table 6: Setup Database Settings

The following precaution will be displayed after selecting the Reset Setup Data command.

```
RESET ALL SETUP DATA TO FACTORY DEFAULTS, ARE YOU SURE?
                        No  Yes
```

3

Select No to abort the reset. Select Yes to proceed.

The Reset Setup Data command will return the Terminal Port Baud rate to its default setting of 38,400 Baud. The PC Baud rate may have to be adjusted.

RESET EVENT MEMORY (E)

The Reset Event Memory command will permanently remove from memory all Event Records that were previously logged. Records from each of 128 possible days will be deleted.

The following precaution will be displayed after selecting the Reset Event Memory command.

```
                 ERASE ALL EVENTS FROM MEMORY, ARE YOU SURE?
                                  No Yes
```

Select No to abort the reset or Yes to proceed. If a reset is performed the following precaution will be displayed.

```
              Erasing memory, do not turn power off for 60 seconds,
                            Press any key to continue
```

It is important that the user not turn off the power while the CAR-24A is clearing the Event Record memory. Failure to do so may result in corruption to the Event Record set.

RESET BOTH (B)

The Reset Both command allows the user to clear both databases simultaneously. The precaution noted in the preceding paragraph applies to this command as well.

SYSTEM PARAMETERS (S)

System Parameters are those parameters that affect the Reporter as a whole. They do not affect individual inputs or their behavior. System Parameters include, but are not limited to, the Description, passwords and Equipment ID settings. The sixteen System Parameters are defined with a single command containing multiple fields. A typical response to the System Parameters command is shown in the following. The use of each System Parameter is described in the following sections.

```
                         System Parameters
                         -----------------
                    Unit Name
C24gates2down.v201
                    Description          C24gates2down.v201
                    Terminal Port Baud Rate   9600
                    Administrative Password
                    Restricted Password
                    Passcode
                    Ring Count              2
                    Clock Sync Mode        SNTP
                    High Temp Limit        140 Degrees F
                    Low Temp Limit         -40 Degrees F
                    Maint PB Timeout        5400     Sec
                    Health Check Interval   48 Hours
                    Min/Max Flash Rate     35/65 FPM
                    Default Input Filter
D1-20 A1-4 L1-20 S1-20
                    Equipment ID           C24
                    Recording Mode        Enabled
                         Modem is NOT installed

                         GPS receiver is NOT installed
```

System Parameters Command

UNIT NAME

The Unit Name serves as a comprehensive Reporter and site ID. It is included at the top of each report and appears on the LCD. Data from several CAR-24A Reporters can be easily distinguished by providing each unit with a unique and descriptive name. A total of eighty alphanumeric characters can be used

to define the Unit Name. It is assigned using the standard Edit Field techniques described in "Working with Fields" on page 18.

At this time Union Pacific has elected to assign the Unit Name as the name of the Setup Database (e.g., c24gates2down.v201 as noted in the sample date).

The front panel LCD has a limited capacity to display information. It is limited to 4 lines of 20 characters. The content of the first 3 lines are fixed by the Reporter's firmware and cannot be changed by the user. The content of the fourth LCD line always reflects the first 20 characters of the Unit Name as depicted in the following.

```
     TIME          DATE
18:56:16      10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```

When Event Records are saved to a USB flash drive the records are contained in a folder. The folder name is created automatically by the Reporter. It is a copy of the first 20 characters of the Unit Name just as they appear on the LCD.

Guidelines and prohibitions regarding the first 20 characters of the Unit Name are detailed in the following.

- The first 20 characters must be unique to each Reporter. Doing so assures that each USB flash drive folder created by the Reporter will also be unique, thereby avoiding confusion in the resultant Event Record data files.

- The following Windows-prohibited characters (11 total) cannot be used / \ ? % * : | " < >.

- The first and last characters cannot be a space, period (.) or control character.

- If a space is required for clarity, use the underscore (_) character instead.

DESCRIPTION

The Description setting is used to identify the Setup Database that was downloaded from the Union Pacific website. It is included as a part of the Main Menu heading. Refer to the sample data entitled "Main Menu" on page 17. A total of forty alphanumeric characters can be used to define the Description. It is assigned using the standard Edit Field techniques described in "Working with Fields" on page 18.

TERMINAL PORT BAUD RATE

The Terminal Port Baud rate may be assigned one of ten values. Valid settings are: 300, 600, 1200, 2400, 4800, 9600, 19200, 38400, 57600 and 115200 bps. Press the **Spacebar** to select a Baud rate.

The following message will be displayed if the Baud rate was changed.

```
        Change baud rate now, then
        Press any key to continue
```

The user must change the Baud rate of the PC to match the new setting assigned to the CAR-24A.

ADMINISTRATIVE AND RESTRICTED PASSWORDS

Access to the CAR-24A via any port is protected by a dual level password system. Administrative Access permits unrestricted access to all Reporter functions. Administrative Access allows the entire Setup Database to be altered. Accordingly, the Administrative Password should be known to a limited number of users with a genuine need to know.

Restricted Access permits only limited access to the Reporter. It allows the user to review the entire Setup Database, but alter only a limited portion of the database. The Restricted Password can be shared with maintainers and technicians that are involved in the installation and setup of a CAR-24A.

The Administrative and Restricted Passwords are defined similarly. Each may be assigned any combination of alphanumeric characters not exceeding eight total.

⚠️ Care should be exercised in assigning and saving the Administrative Password. If it is lost or forgotten it will be necessary to contact MICRO-AIDE for assistance.

Pᴀꜱꜱᴄᴏᴅᴇ

The CAR-24A can be effectively programmed and operated from its front panel. The Passcode is used to protect the Reporter from unwanted access via the front panel. It must be entered when the user attempts to alter the Setup Database. The Passcode can be assigned any combination of digits not exceeding eight total. Alphabetic characters cannot be assigned to the Passcode.

Rɪɴɢ Cᴏᴜɴᴛ

This parameter applies exclusively to the internal Modem. However, at the present time the CAR-24A does not provide hardware support for the internal Modem. Accordingly, this parameter should be ignored.

Cʟᴏᴄᴋ Sʏɴᴄ Mᴏᴅᴇ

The CAR-24A contains a real-time clock that allows the Reporter to time stamp Event Records to the nearest thousandth of a second. With any clock a small amount of drift can be expected. However, the real-time clock of the CAR-24A can be precisely synchronized by means of a timer server. Support for SNTP-Unicast and SNTP-Multicast is provided.

The Clock Sync Mode setting controls the synchronization method; however, the setting must always be assigned as SNTP.

⚠️ Union Pacific's use of the CAR-24A requires that the Clock Sync Mode parameter always be set to SNTP. Do not alter this setting as it will cause the real-time clock to run un-synchronized.

ℹ️ The real-time clock of the CAR-24A (when not synchronized) features an accuracy of ±3 ppm, which is approximately ±8 seconds per month.

SNTP time synchronization operates as follows:

- Once every day and precisely at five minutes after midnight (i.e., 00:05:00) the Reporter will send a Unicast time request message to the primary and/or secondary time server(s). The latter will respond with a time and date message. The Reporter will receive and validate this message and update its clock accordingly. The targeted time server(s) are defined by the SNTP Server (primary) and SNTP Server (secondary) parameters. Refer to the section entitled "SNTP Server - Primary and Secondary" on page 45 for additional details.

- The Reporter will automatically update its clock upon receipt of a Multicast message. In this case, the updates are under the sole control of the time server. They occur at intervals set by the time server.

ℹ️ A System Event Record is logged to memory whenever the real-time clock is synchronized. This occurs irrespective of the synchronization method employed. Refer to the section entitled "System Events" on page 102 for additional details.

Hɪɢʜ ᴀɴᴅ Lᴏᴡ Tᴇᴍᴘ Lɪᴍɪᴛꜱ

The temperature inside the CAR-24A can be measured and reported. If the temperature reaches an extreme value a System Event will be declared and logged to memory. Refer to the section entitled "System Events" on page 102 for additional information. The High and Low Temp Limits are used to define the range of acceptable operation. The settings must range from -67°F to 257°F.

Mᴀɪɴᴛ PB Tɪᴍᴇᴏᴜᴛ

Maintainer Mode allows a maintainer or technician to test the crossing system without concern that unwanted Alarms will be transmitted by the CAR-24A. Refer to the section entitled "Maintainer Mode"

for additional details. Maintainer Mode is enabled or disabled by simply pressing the front panel switch labeled "Esc / Maintainer Mode". However, in the event that the maintainer forgets to disable Maintainer Mode the Maintainer PB Timeout parameter will restore the CAR-24A to normal operation.

To change the setting, enter a new numeric value in the range of 0 to 99,999 seconds. Normal operation of the Reporter is restored immediately after the timeout has expired.

A Maintainer Timeout value of 0 disables the timer. This allows the CAR-24A to remain in Maintainer Mode with the transmission of Alarms suspended indefinitely. This can be useful if the crossing will be tested for more than 24 hours. However, in this special case the maintainer must remember to re-enable normal mode operation. This setting must be used with caution.

HEALTH CHECK INTERVAL

It's quite likely that the Reporter will not issue any Alarm messages for an extended period of time. This will be the case when no failures are detected and consequently no Alarms are sent to the message processing server. However, the message processing server needs to know if the Reporter is still in service or has itself experienced a failure. A network outage represents a similar concern. The Health Check message is sent periodically to the server as a means of verifying overall system availability.

To change the setting, enter a new numeric value in the range of 0 to 255 hours. The setting defines the maximum time between messages sent by the CAR-24A. If the time measured from the last message sent to the current time exceeds the assigned interval, a Health Check message is immediately sent.

A Health Check Interval value of 0 disables the issuance of Health Check messages. This setting must be used with caution.

MIN / MAX FLASH RATE

The CAR-24A will create an Event Record at the start and end of a flashing sequence. This applies to any Digital Input enabled for flash detection. Refer to the section entitled "Flash Enable" on page 35 for additional details. The Event Record from a flashing input will include the measured flash rate in fpm. The Min / Max Flash Rate parameter establishes a range of acceptable flash rates. The range is used to provide the following Event Record data.

- An Event Record for System Input S08 will be saved to memory when a flash rate outside of the range is first detected. The record will be labeled with an Input Name, Identifier and Event Name of "Flash Rate Alarm", "FlashAlm" and "On", respectively. System Events are further described in the section entitled "System Events" on page 102.

- An Event Record for System Input S08 will be saved to memory when a flash rate within the range is first detected. The record will be labeled with an Input Name, Identifier and Event Name of "Flash Rate Alarm", "FlashAlm" and "Off", respectively.

- System Input S08 Event Records are only saved to memory on the first occasion of an out-of-range or in-range flashing sequence. As an example, if the rate is out-of-range on five consecutive crossing activations and then in-range for the next three activations, only two S08 records will created. The first will occur on the first activation and the second will occur on the sixth activation. It follows that the interval between successive S08 On and Off events is the duration during which the flash rate was either too fast or too slow. Conversely, the interval between successive S08 Off and On events is the duration during which the flash rate was within range and therefore acceptable.

To change the Min or Max setting, move the highlight to either field. Settings can range from 0 to 99 fpm.

Although the Input Name for an S08 System Event Record is Flash Rate Alarm, these records do not create Alarm messages. Alarm messages are defined solely by the content of the Alarm Configuration Table. Refer to the section entitled "Alarm Configuration (L)" on page 47 for details.

DEFAULT INPUT FILTER

Event Records are saved to memory from several types of inputs, which include Digital, Analog, Virtual, Timer, Alarm and System sources. These input sources are designated by a single-letter prefix, which is D, A, V, T, L and S, respectively. Inputs within a specific type are identified by an appropriate prefix and a one- or two-digit number. Table 7 on page 34 summarizes the use of input prefixes and number designations. Leading zeros are not required.

Type of Input	Letter Prefix	Number Designation	Example
Digital	D	1-20	D15 (Digital Input 15)
Analog	A	1-4	A4 (Analog Input 04)
Virtual	V	1-16	V16 (Virtual Input 16)
Timer	T	1-16	T06 (Timer 06)
Alarm	L	1-20	L9 (Alarm 09)
System	S	1-12	S01 (System Input 01)

Table 7: Input Types and Designations

The Reporter's Query Events, View Events and front panel Browse commands are used to inspect Event Record data. Each command includes an Inputs field. The Inputs field allows the user to inspect Event Records from a specific set of inputs. The Default Input Filter setting presets this field to a preferred collection of inputs. The c24gates2down.v201 Setup Database includes a setting of D1-20 A1-4 L1-20 S1-20. This setting can be used to report events from all Digital, Analog, Alarm and System Inputs.

The Inputs field setting is discussed in greater detail in the section entitled "Inputs" on page 56.

EQUIPMENT ID

The Equipment ID can be any three-character designation that identifies the CAR device (e.g., C14 or C24). The user may wish to consult Union Pacific as regards preferred codes.

RECORDING MODE

The CAR-24A is a hybrid device that includes extensive Event Recording and Alarm Reporting features. The Recording Mode setting allows the user to selectively enable or disable the logging of Event Records. To change the setting simply press the **Spacebar** key.

A Recording Mode setting of Disabled will immediately curtail the recording of events. However, previously logged records will be retained in memory. There is no timeout setting that will automatically restore the Event Recording feature. Recording can only be restored with Recording Mode set to Enabled.

DETECT TIMES / FLASH ENABLE (D)

The Digital Inputs of the CAR-24A will generally be connected to relay-based control circuits. Since relay contacts typically bounce, the Reporter must have the ability to de-bounce these inputs. The Detection Time feature allows the user to establish a validation time for each Digital Input.

Each Digital Input can also be set to monitor a flashing circuit. The Detect Time / Flash Enable command allows the user to program each of these features. The response to the Detect Time / Flash Enable command is shown in the following. The sample data is from the c24gates2down.v201 Setup Database.

```
                    Detect Times/Flash Enable
                             Detect
                      Input Time Flash
                      ----- ---- -----
                       D01  1.000  No
                       D02  1.000  No
                       D03  1.000  No
                       D04  1.000  No
                       D05  1.000  No
                       D06  1.000  No
                       D07  1.000  No
                       D08  1.000  No
                       D09  1.000  No
                       D10  1.000  No
                       D11  1.000  No
                       D12  1.000  No
                       D13  1.000  No
                       D14  1.000  No
                       D15  1.000  No
                       D16  1.000  No
                       D17  1.000  No
                       D18  1.000  No
                       D19  1.000  No
                       D20  1.000  No
```

Detect Times/Flash Enable Command

The procedure for programming both parameters is described in the following sections.

DETECTION TIMES

The range of valid Detection Times is 0 to 32.767 seconds. Use the decimal point key to enter fractional values.

Set the Detection Times to values slightly greater than the longest expected bounce time of the relay contacts. This will insure that noise or transient induced voltage changes are not recorded and that legitimate short duration events will be logged. To prevent a Digital Input from logging events, set its Detection Time value to zero.

The Detection Time of Digital Inputs assigned as sensors in the Train Speed Monitor feature cannot be altered. They are set to a fixed value of .05 seconds.

The Detection Time assigned to a Digital Input enabled for flashing operation represents a special case requiring additional explanation. The correct programming procedure is described in the following.

FLASH ENABLE

A typical flashing event is created by the operation of a crossing light or approach signal. Each time the light flashes a new pulse is seen at the Digital Input. The user may wish to log events only at the start and end of the sequence, not an event for each pulse. When the sequence terminates, an Event Record will then list the measured flash rate in fpm. This feature can be enabled by performing the following steps.

1. Assign the proper Detection Time to the Digital Input.

2. Highlight the Flash setting for the Digital Input.

3. Select the Yes setting by pressing the **Spacebar** once.

Figure 5 on page 36 illustrates a flashing sequence and the events that would be created at the start and end of the sequence.

3
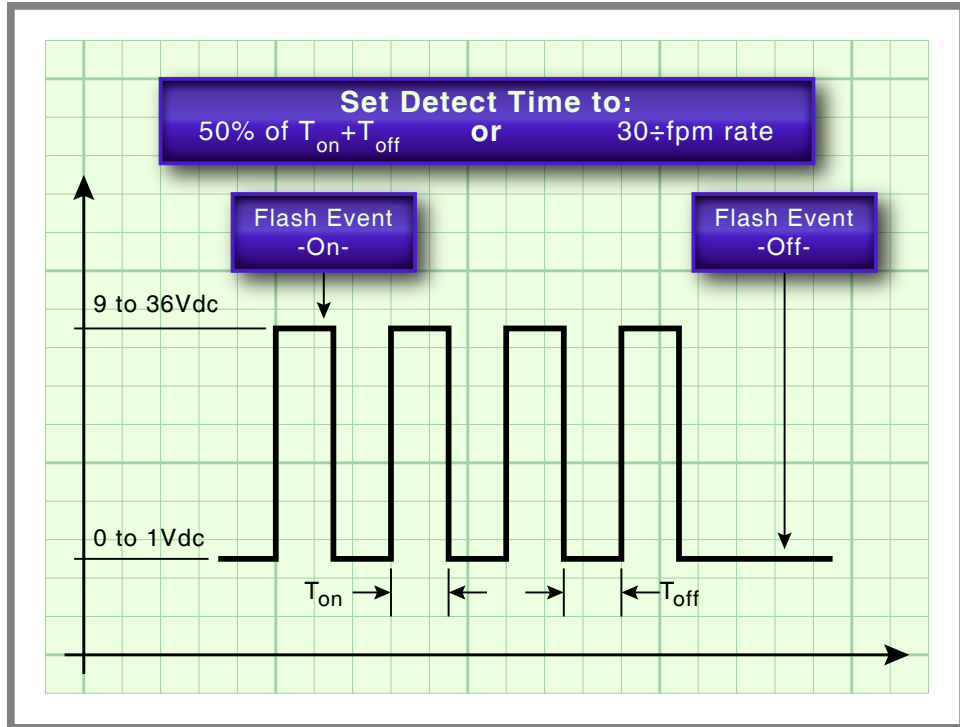
Figure 5: Typical Flashing Pulse Sequence

The Detection Time must be set to the nominal duration of a flash pulse. Pulses are expected to be on and off for the same duration. However, the CAR-24A is designed to allow for some variation in the duration of each pulse. Each on and off pulse must have a duration in the range from 75% to 125% of the assigned Detection Time. Use either of the two methods listed in the following paragraph to determine the correct Detection Time for inputs with non-varying flash rates.

The Measure Flash Rate command can be used to accurately determine the Detection Time for flashing inputs. Refer to the section entitled "Measure Flash Rate (M)" on page 59. Alternatively, the correct Detection Time (in seconds) is equal to 30 divided by the number of flashes per minute (i.e., 30÷fpm).

GLOBAL DETECT TIME (G)

The Detect Times / Flash Enable command allows each Digital Input to be set individually. Setting all twenty inputs to values that differ from the factory default setting can be time consuming. Alternatively, the Global Detect Time command can be used to set all inputs to a single Detection Time value.

The following edit field will be displayed in response to the Global Detect Time command.

```
                     Global Detect Time

           Detect Time for All Inputs:  0.000
```

Global Detect Time Command

To set the Detection Time for each Digital Input simply enter a number in the range from .001 to 32.767. To complete the entry press **Enter**.

An initial value of 0.000 is always listed in the edit field. The Global Detect Time command will not alter the setting of Digital Inputs assigned as sensors for any of the Train Speed Monitors.

TIMER INPUTS (W)

The CAR-24A includes sixteen general purpose Timer Inputs. Each timer can be programmed individually. A Timer Input can be used to measure the elapsed time between any two events. As an example, the

time between two relay events can be measured. The time a single relay is energized or un-energized can be measured. The interval between the loss of adequate BN voltage and a relay operation can be measured. Additionally, the user can assign Limit Values to each Timer Input. In this way, time delays that are unacceptably short or long can be reported. Finally, Timer Inputs will generate distinguishable Event Records like any other input. Included in each record is the measured time value.

The relationship shared by the From trigger source, the To terminating source and various event transitions is depicted in Figure 6 on page 37.
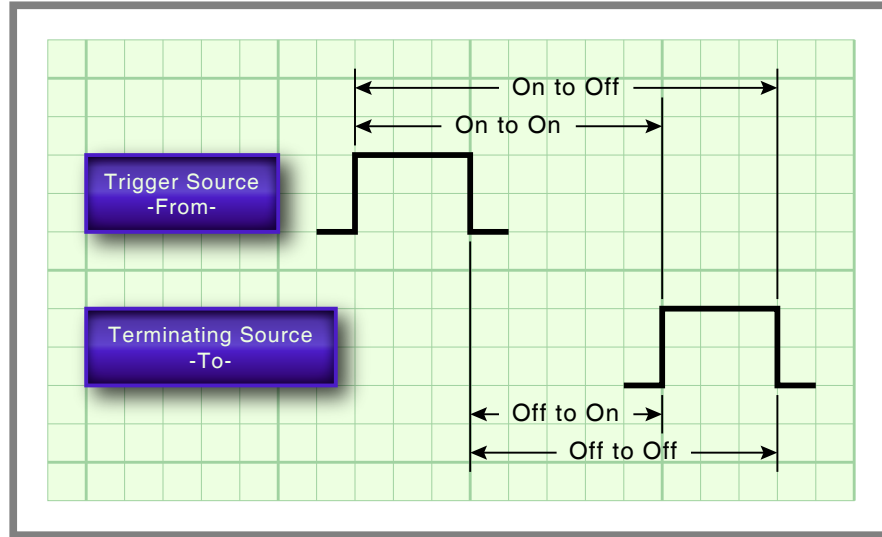
Figure 6: Timer Measurements

An array of fields similar to the following will be displayed after selecting the Timer Input command. In the example cited, parameters for the first Timer Input have been entered. The other fields have retained their factory default settings. Only the first three Timer Inputs are listed.

```
                      Timer Configuration
      Timer  From  Event   To   Event  LowLimit  HighLimit
      -----  ----  -----  ----  -----  --------  ---------
      T01    D19     On    D20    Off      7.5       12.5
      T02    ---    Off    ---    Off      0.0        0.0
      T03    ---    Off    ---    Off      0.0        0.0
```

Timer Inputs Command

To program a Timer Input follow the steps listed in the following.

1. Position the highlight anywhere in the row identified by the Timer Input to be programmed (e.g., T01).

2. Move the highlight into the column labeled "From". The From input is used to trigger the timer. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 20 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 16 for Virtual Inputs. Leading zeros are not required.

3. Move the highlight to the right into the first column labeled "Event". Assign the trigger event by pressing the **Spacebar** as required to select the On or Off setting.

4. Move the highlight to the right into the column labeled "To". The To input is used to terminate the timer. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 20 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 16 for Virtual Inputs. Leading zeros are not required.

5. Move the highlight to the right into the second column labeled "Event". Assign the terminating event by pressing the **Spacebar** as required to select the On or Off setting.

6. Move the highlight to the right into the column labeled "LowLimit". Enter a value within the range of 0 to 999.9 seconds. Any measured time interval that is less than this value will generate an Event Record tagged with an Event Name of Violate.

7. Move the highlight to the right into the column labeled "HighLimit". Enter a value within the range of 0 to 999.9 seconds. Any measured time interval that is greater than this value will also generate an Event Record tagged with an Event Name of Violate.

8. Move the highlight to another row to program an additional Timer Input.

9. After each of the required Timer Inputs are programmed press the **Esc** key to complete the command.

In the example cited previously, the time after Digital Input 19 reaches its On state until Digital Input 20 reaches its Off state will be measured. A measured time interval of 7.5 to 12.5 seconds is considered acceptable. Measured time intervals that are within the range established by the Limit Values will generate Event Records tagged with an Event Name of Nominal. Refer to the section entitled "Event Names (E)" on page 38 for additional information.

E<small>VENT</small> N<small>AMES</small> (E)

There are two types of Event Records. Active Event Records are created when a Digital Input is found to have sufficient input voltage (greater than 9 Vdc) or when an Analog Input transitions into its unacceptable range as defined by its Limit Values. Conversely, inactive Event Records are created when a Digital Input has less than 1 Vdc or an Analog Input is within its acceptable range of operation.

Event Names allow the user to distinguish Event Records from each other in a quick and unambiguous manner. They should not be confused with Input Names and Input Identifiers (see next section). Event Names always occur in pairs. The On Event and Off Event names form the pair. They in turn distinguish the active and inactive Event Records, respectively.

As many as twenty Event Name pairs can be defined. Once the pairs are defined they can be assigned to inputs of the CAR-24A in any manner that helps the user distinguish Event Records precisely and quickly. By way of example, the Event Records for Digital Input 1 could be labeled "XR Up" and "XR Down". The Event Records for Analog Input 1 could be labeled "Batt1BAD" and "Batt1 OK".

The Event Names used by the c24gates2down.v201 Setup Database are shown in the following.

```
                         Event Names

             Number  ON Name   OFF Name
             ------  --------  --------
                1    On        Off
                2    XR Up     XR Down
                3    FXR Up    FXR Down
                4    I1 Up     I1 Down
                5    I2 Up     I2 Down
                6    I3 Up     I3 Down
                7    I4 Up     I4 Down
                8    I5 Up     I5 Down
                9    I6 Up     I6 Down
               10    POR Up    POR Down
               11    Batt1BAD  Batt1 OK
               12    Batt2BAD  Batt2 OK
               13    Batt3BAD  Batt3 OK
               14    Batt4BAD  Batt4 OK
               15
               16
               17
               18
               19
               20    Violate   Nominal
```

Event Names Command

To define a new Event Name simply position the highlight to the desired field and type the new name. Event Names are restricted in length to eight characters. They can be formed by any combination of letters, numbers and syntax symbols.

As an aid to the user Event Name pair 20 is by default labeled "Violate" and "Nominal". Furthermore, pair 20 is by default assigned as the Event Name pair to all Timer Inputs. The pair assignment and names can, however, be changed by the user to better suit the intended application.

INPUT NAMES/IDENTIFIERS (I)

The CAR-24A utilizes two types of inputs. The twenty Digital and four Analog Inputs are referred to as physical inputs because actual circuits are wired to the Reporter's input connectors. The CAR-24A also includes sixteen Virtual and sixteen Timer Inputs. Contrary to physical inputs, Virtual and Timer Inputs are defined by the user for the purpose of detecting fault conditions among the physical inputs. Refer to the section entitled "Virtual Inputs (V)" on page 40.

All inputs, regardless of type, share one common programming characteristic. The user can define a unique Input Name, Input Identifier and Event Name pair to each input. The Input Name can be any combination of alphanumeric characters not exceeding twenty total. The Input Name appears in each Event Record created by the input in question. It is the primary means by which inputs are distinguished.

The Input Identifier can be thought of as an abbreviated name. It is limited in length to eight alphanumeric characters. It too appears in the Event Record. It is primarily used to distinguish Event Records displayed on the LCD panel of the Reporter. Several of the setup commands use the Input Identifier rather than the lengthier Input Name to reference inputs.

The Event Name pairs are described in the preceding section. As many as twenty Event Name pairs can be defined by the user. Each pair is identified by a number ranging from one to twenty. After the pairs are defined the Input Names/Identifiers command is used to assign Event Name pairs to inputs. The Event Name pair can be assigned by using either of two methods. The **Spacebar** can be repeatedly pressed when the highlight is located within the OnEvent/OffEvent field until the desired pair is listed. Alternatively, the number of the required Event Name pair can be entered in the last column.

The following sample data lists the Input Names, Identifiers and Event Name pairs for Digital Inputs assigned by the c24gates2down.v201 Setup Database. The next sample data lists the assignments for the Analog and Virtual Inputs.

```
                  Input Names/Identifiers
    Input         Name           ID      OnEvent/OffEvent  Event Pair
    ----- -------------------- -------- ------------------ ----------
    D01 XR                     XR          XR Up/XR Down       2
    D02 D2                     D2             On/Off           1
    D03 Island 1               Island 1    I1 Up/I1 Down       4
    D04 Island 2               Island 2    I2 Up/I2 Down       5
    D05 Island 3               Island 3    I3 Up/I3 Down       6
    D06 Gate Up Ind            GateUp         On/Off           1
    D07 Gate Down Ind1         GateDn1        On/Off           1
    D08 Gate Down Ind2         GateDn2        On/Off           1
    D09 D9                     D9             On/Off           1
    D10 Power Off Relay        POR         POR Up/POR Down     10
    D11 Island 4               Island 4    I4 Up/I4 Down       7
    D12 Island 5               Island 5    I5 Up/I5 Down       8
    D13 Island 6               Island 6    I6 Up/I6 Down       9
    D14 D14                    D14            On/Off           1
    D15 D15                    D15            On/Off           1
    D16 D16                    D16            On/Off           1
    D17 D17                    D17            On/Off           1
    D18 D18                    D18            On/Off           1
    D19 D19                    D19            On/Off           1
    D20 D20                    D20            On/Off           1
    [F1/^W]=Next Page [F2/^E]=Prev Page
```

Input Names/Identifiers Command - First Screen

```
                   Input Names/Identifiers
    Input          Name             ID     OnEvent/OffEvent Event Pair
    -----  -------------------  --------  ----------------- ----------
    A01 BatteryBank1            BB1       Batt1BAD/Batt1 OK      11
    A02 BatteryBank2            BB2       Batt2BAD/Batt2 OK      12
    A03 BatteryBank3            BB3       Batt3BAD/Batt3 OK      13
    A04 BatteryBank4            BB4       Batt4BAD/Batt4 OK      14
    V01 Virtual Gate Not Up     VGateNUp      On/Off            1
    V02 Virtual Gate Up         VGateUp       On/Off            1
    V03 Virtual Gate Not Dn     VGateNDn      On/Off            1
    V04 Virtual Gate Dn         VGateDn       On/Off            1
    V05 V5                      V5            On/Off            1
    V06 V6                      V6            On/Off            1
    V07 V7                      V7            On/Off            1
    V08 V8                      V8            On/Off            1
    V09 Virtual Input 09        VInput09      On/Off            1
    V10 Virtual Input 10        VInput10      On/Off            1
    V11 Virtual Input 11        VInput11      On/Off            1
    V12 Virtual Input 12        VInput12      On/Off            1
    V13 Virtual Input 13        VInput13      On/Off            1
    V14 Virtual Input 14        VInput14      On/Off            1
    V15 Virtual Input 15        VInput15      On/Off            1
    V16 Virtual Input 16        VInput16      On/Off            1
    [F1/^W]=Next Page [F2/^E]=Prev Page
```

Input Names/Identifiers Command - Second Screen

Three data screens are required to list all 56 physical, Virtual and Timer Inputs. To advance to the next screen press the **F1** function key. To return to the previous screen press the **F2** function key. Alternatively, the **Ctrl+W** and **Ctrl+E** keys can be pressed simultaneously, respectively.

VIRTUAL INPUTS (V)

Virtual Inputs are a unique feature only found in MICRO-AIDE's family of signal monitoring products. These products are frequently used to gather data on a failure condition thought to exist in a relay-based control circuit. On occasion, the suspected failure can be defined as the abnormal occurrence of two or more relay states. The normal operation of the circuit predicts that only certain relay states can occur. It follows that any deviation from these normal states suggests a potential failure that should be flagged and carefully examined.

Identifying failures that occur as the result of abnormal relay states is greatly simplified by using the Virtual Input feature. In the case of a CAR device, Virtual Inputs have the added capability of generating and clearing Alarm states. This means that logical conditions among two or more inputs can be used to define very specific Alarm messages. For additional details refer to the section entitled "Alarm Configuration (L)" on page 47. The CAR-24A allows as many as sixteen Virtual Inputs to be defined. They are characterized by two essential properties.

The first property concerns the selection of variables. Variables are merely the inputs (physical or virtual) that will be checked to determine if a specific logical condition is valid. The number of variables that define the Virtual Input can range from one to four. Variables can be Digital, Analog and other Virtual Inputs. Assigning a Virtual Input as a variable to another Virtual Input is referred to as nesting. Nesting allows the user to create a higher level Virtual Input that evaluates more than four variables.

The second property pertains to the state of each assigned variable. A fault condition in a relay-based circuit can only be identified if the state of each variable is properly evaluated. The state of a variable is defined by the CAR-24A as either On or Off. Both states are described in the following.

On—The Digital Input voltage is in the range from 9 to 36 Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 4 on page 22. The Virtual Input evaluates to a true logic state.

Off—The Digital Input voltage is less than 1 Vdc. The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Virtual Input evaluates to a false logic state.

The procedure used to define Virtual Inputs is described in the following two sections.

ASSIGNING VARIABLES

For the c24gates2down.v201 Setup Database, the following fields will be displayed after selecting the Virtual Inputs command. Variables for Virtual Inputs V1 through V4 have been assigned.

```
                  Virtual Input Parameters
            Input  Function of:   Relay
            -----  --- --- --- ---  -----
             V01   D01 D06 --- ---    No
             V02   D01 D06 --- ---    No
             V03   D01 D07 D08 ---    No
             V04   D01 D07 D08 ---    No
             V05   --- --- --- ---    No
             V06   --- --- --- ---    No
             V07   --- --- --- ---    No
             V08   --- --- --- ---    No
             V09   --- --- --- ---    No
             V10   --- --- --- ---    No
             V11   --- --- --- ---    No
             V12   --- --- --- ---    No
             V13   --- --- --- ---    No
             V14   --- --- --- ---    No
             V15   --- --- --- ---    No
             V16   --- --- --- ---    No

            [F1/^W] to edit virtual output function
```

Virtual Inputs Command

To assign variables perform the following steps in the order described.

1. Position the highlight anywhere in the row identified by the Virtual Input to be programmed (e.g., V1). Then move the highlight within the row to the extreme left-most column.

2. Assign the first variable by entering **Dn**, **An or Vn** where n is 1 through 20 for Digital Inputs, 1 through 4 for Analog Inputs and 1 through 16 for Virtual Inputs. Leading zeros are not required.

3. Move the highlight to the right. Assign the remaining variables using the previous step. Not all fields need to be assigned a variable. To remove a variable press the **0** key or simply delete all of the characters in the field.

4. Press the **F1** function key to proceed to the next step. Alternatively, press the **Ctrl+W** keys simultaneously.

To complete the definition of a Virtual Input, the state of each variable must now be assigned. The c24gates2down.v201 assignment for V3 is shown in the following.

```
                 Virtual Output Function
        Inputs:                            Output:
          D01      D07      D08      ---      V03
          XR     GateDn1  GateDn2           VGateNDn
        -------- -------- -------- -------- --------
        XR Down    Off      Off                On
        XR Up      Off      Off                Off
        XR Down    On       Off                On
        XR Up      On       Off                Off
        XR Down    Off      On                 On
        XR Up      Off      On                 Off
        XR Down    On       On                 Off
        XR Up      On       On                 Off
```

Assigning States to Virtual Inputs

SELECTING STATES

Before proceeding further the table of state selection fields must be understood. Each Virtual Input will have its own data table. However, the basic structure of each table will remain the same. Refer to the sample data entitled "Assigning States to Virtual Inputs" on page 41. Each row lists, from left to right, the Input Numbers that are assigned to each variable (e.g., labeled "D01", "D07" and "D08"). Unassigned variables are labeled "---". The last column of the third line lists the Input Number of the Virtual Input being defined (e.g., labeled "V03"). Directly below the Input Numbers on the fourth line of

text is listed the Identifier for the variable. For the sample data shown the Identifiers are labeled "XR", "GateDn1" and "GateDn2". The Virtual Input has been assigned an Identifier of "VGateNDn".

The remaining lines of text will vary with the number of assigned variables. One variable will list two lines of text. Two variables will list four lines of text. Three variables will list eight lines of text. Four variables will list sixteen lines of text. Each line will specify a state for each of the assigned variables (i.e., inputs). Each state is identified by its user-defined Event Name. The sample data includes three variables, so eight lines of text lists all of the possible variable states.

The last column of data in each line includes a selection field. The field can be set, line by line, to an On or Off state. The user decides which state to assign to the Virtual Input for each combination of variable states. For the sample data shown, the Virtual Input is assigned to an On state when the XR input is in the XR Down state and either of the GateDn1 or GateDn2 inputs is in an Off state. Any time this combination of states is found to exist among inputs variables, Virtual Input V3 will be evaluated as true and then assume an On state. When this logical condition no longer exists, Virtual Input V3 will assume an Off state.

Perform the following steps to complete the Virtual Input programming procedure.

1. Move the highlight to the first line of text that lists the input states.

2. Press the **Spacebar** to select the appropriate state for that combination of inputs.

3. Move the highlight to the next line and repeat the preceding step.

4. When the Virtual Input state is correctly defined for each line, press the **Esc** key and return to the variable assignment table.

5. Press the **Esc** key to exit the command or reposition the highlight and select the next Virtual Input. Repeat both of the previously described procedures as required.

MEASURE SPEED (M)

The CAR-24A includes a speed measuring feature that can be used to continuously monitor train speeds and log speed violations. The use of this feature is strictly optional. It is referred to as the Train Speed Monitor feature and it is controlled by the Measure Speed command.

The Reporter must be properly configured before the Train Speed Monitor can be used. Regardless of other variations in the configuration the following list of requirements must be satisfied.

- There are a total of four Train Speed Monitors available in each CAR-24A. For each monitor two train sensors must be wired to two spare Digital Inputs of the Reporter.

- Each train sensor must reliably indicate the presence of a train.

- The sensor outputs must be either open (no train) or closed to positive battery (nearby train).

- The distance between each sensor must be in the range from 36" to 99" or 8' to 5280'.

An array of fields similar to the following will be displayed after selecting the command.

```
                    Measure Speed Parameters
        Speed# (Event)  Sensor1  Sensor2  Distance Units  Threshold
        ------ -------  -------  -------  -------- -----  ---------
           1    (S09)     ---      ---          0 inches    0 MPH
           2    (S10)     ---      ---          0 inches    0 MPH
           3    (S11)     ---      ---          0 inches    0 MPH
           4    (S12)     ---      ---          0 inches    0 MPH


             To disable measure speed feature:
             set sensor inputs(s) to none (---),
             or distance or speed limit to zero.
```

Measure Speed Command

The use of each field is described in the following four sections.

The four Train Speed Monitors are always disabled within the c24gates2down.v201 Setup Database.

Excessive train speed is reported in a time stamped Event Record. Refer to the section entitled "Event Record Formatting" on page 62. Figure 7 on page 43 illustrates a typical Train Speed Monitor installation.
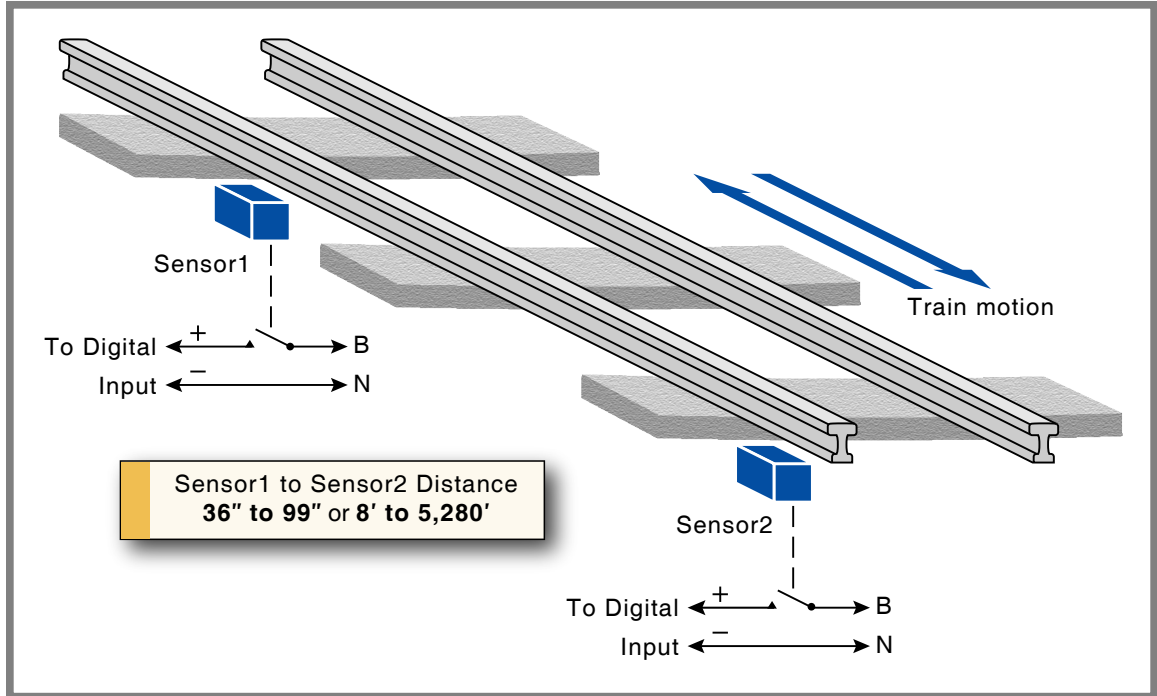

Figure 7: Typical Installation - Train Speed Monitor

FIRST / SECOND SENSOR INPUT

The First and Second Sensor Input fields can be assigned any valid Digital Input number. Leading zeros are not required. The values can be non-consecutive or in ascending or descending order. The Train Speed Monitors report motion in either direction with a positive value.

The two Digital Inputs assigned to the train sensors are subject to the following treatment.

- Previously enabled Flashing Input and Measure Flash Rate settings will be automatically disabled.

- Contact closures from either sensor will not result in Event Records being logged to memory.

- The Detection Time for each input will be automatically set to .005 seconds to de-bounce the sensor output signals.

- The user will not be able to alter the Flashing Input, Measure Flash Rate and Detection Time settings. To regain control of these settings the Train Speed Monitor must first be disabled.

To disable a Train Speed Monitor enter a zero value in the Sensor1 or Sensor2 field.

DISTANCE BETWEEN SENSORS

The distance between each sensor must be known in order to calculate the speed of the train. The value must be in the range from 36 to 99 (Units set to inches) or 8 to 5280 (Units set to feet). The value must be entered as a whole number.

Greater values of distance (e.g., 500' instead of 50') will result in improved speed accuracy.

UNITS

Press the **Spacebar** key to select a Units setting of either inches or feet.

THRESHOLD

The Threshold setting establishes a Limit Value which, if exceeded, will result in an Event Record being created. The Threshold setting must be entered as a whole number, in miles per hour. It must be in the range from 5 to 99 mph (Units set to inches) or 5 to 180 mph (Units set to feet).

A train found to be in motion at a rate greater than the Threshold value will have its speed reported as a System Event Record. System Events are also used to log power on and off occurrences. System Events are numbered like other inputs. They are identified with an S-prefix. The System Event number is listed in parenthesis to the right of the Train Speed Monitor number. Refer to the section entitled "System Events" on page 102 for additional information.

NETWORK (N)

The Network command is used primarily to configure the Ethernet Port. A collection of user-assigned fields will be displayed after the command is selected. The following data sample lists settings assigned by the c24gates2down.v201 Setup Database.

```
                    Network Setup
                    -------------
            IP Address              192.168.  0.100
            Subnet Mask             255.255.255.  0
            Gateway                   0.  0.  0.  0
            Ethernet MAC Address    00-08-DC-12-34-56
            Port                             5000
            Primary DNS server        0.  0.  0.  0
            Secondary DNS server      0.  0.  0.  0
            TCP/IP mode             Telnet
            DHCP mode               Automatic IP
            SNTP Server (primary)
e.ntp.uprr.com
            SNTP Server (secondary)
f.ntp.uprr.com

            DHCP IP Address         0.0.0.0
            DHCP Subnet Mask        0.0.0.0
            DHCP Gateway            0.0.0.0
            DHCP DNS (primary)      0.0.0.0
            DHCP DNS (secondary)    0.0.0.0
```

Network Command - c24gates2down.v201 Settings

A description of each field follows.

IP ADDRESS

The IP Address has significance only when the DHCP Mode is set to Static IP. In this case, the IP Address becomes the fixed address of the Reporter's Ethernet Port. Ignore the setting when the DHCP Mode is set to Automatic IP.

SUBNET MASK

The Subnet Mask has significance only when the DHCP Mode is set to Static IP. In this case, the Subnet Mask must be set in accordance with the requirements of the LAN. A setting of 255.255.255.0 will generally prove to be acceptable. Ignore the setting when the DHCP Mode is set to Automatic IP.

GATEWAY

The Gateway Address has significance only when the DHCP Mode is set to Static IP. In this case, the Gateway Address must be set in accordance with the requirements of the LAN. If a gateway device is not used, a setting of 0.0.0.0 will generally prove to be acceptable. Ignore the setting when the DHCP Mode is set to Automatic IP.

ETHERNET MAC ADDRESS

The first three numbers that comprise the MAC Address must be 00-08-DC. They must not be changed as they are uniquely associated with the Ethernet module used by the CAR-24A. The remaining three

numbers must not be shared by any other Ethernet device on the network. The initial setting is 00-08-DC-aa-bb-cc, where aa-bb-cc is the serial number assigned by MICRO-AIDE to the Reporter. By way of example, a CAR-24A with a serial number of 12345 will have a factory assigned MAC Address of 00-08-DC-01-23-45. This address is guaranteed to be unique.

The MAC Address is not saved as part of the Setup Database. Accordingly, restoring a previously saved Setup Database will not alter the current MAC Address setting. It can only be changed by direct user intervention.

Use extreme caution in modifying the Reporter's MAC Address. Serious network conflicts will be created if duplicate MAC Addresses are allowed to exist.

PORT

The Port setting identifies the port that will be used for remote access to the Reporter. A remote HyperTerminal or Tera Term user can access the CAR-24A user interface just like a local user. The former will launch an Ethernet connection. The latter will use a serial comm connection. VPN users must access the Reporter via the cell modem by selecting the modem's DNS name along with the assigned Port number. The DNS Name is described in the section entitled "DNS Name" on page 21.

If an Ethernet connection is idle for more than 5 minutes a timeout condition will occur. The timeout will result in a forced disconnection at the CAR-24A end. The user will then have to initiate a new connection procedure to re-establish communications with the Reporter. The forced disconnection is performed so that in the event of a connection failure anywhere in the network the Reporter will be prepared to complete a subsequent connection attempt. However, to be successful the subsequent connection attempt must occur no sooner than 5 minutes after the communications disruption. The Reporter will automatically recover from communication failures of less than 5 minutes duration provided the user end does not perform a disconnect.

PRIMARY DNS SERVER AND SECONDARY DNS SERVER

These settings are only used if the DHCP mode is set to Static IP. Refer to the section entitled "DHCP Mode" on page 45. In fixed IP networks a DHCP server will not be available. Regardless, a DNS server must be directly accessible so that the Server URL, SNTP Server (primary) and SNTP Server (secondary) named assignments can be resolved. This feature allows the Reporter to identify a primary and secondary DNS server in applications of this type. Refer to the sections entitled "Server URL" on page 46 and "SNTP Server - Primary and Secondary" on page 45 for additional details.

TCP / IP MODE

Press the **Spacebar** to select either the Raw TCP / IP or Telnet setting. Either setting can be used by a Telnet user.

DHCP MODE

Press the **Spacebar** to select either the Automatic IP or Static IP setting. The Union Pacific c24gates-2down.v201 Setup Database uses the automatic setting. It must be used in all cases where a DHCP server will be used to establish the correct network settings of the Reporter's Ethernet Port.

Use the Static IP setting in those cases where only fixed addresses will be used by the CAR-24A.

SNTP SERVER - PRIMARY AND SECONDARY

The real-time clock used by the CAR-24A has a rated accuracy of ±3 ppm (±8 seconds per month). Nevertheless, if left uncorrected the Reporter's clock will drift an appreciable amount over time. To counter this potential problem, the CAR-24A employs the SNTP-Unicast method to synchronize the Reporter's real-time clock.

The SNTP Server Primary and Secondary settings are used to identify the first choice and alternate choice time servers, respectively. Both fields will accept a URL designation or IP Address. The secondary setting can be left blank if an alternate time server is not available. The Time / Date command includes a method that allows the user to immediately synchronize the real-time clock from an available time server.

This method is described in the section entitled "Time Server Method" on page 23. The time server(s) accessed by this method are defined by the SNTP Server field(s).

The SNTP-Unicast method is employed automatically once per day to sync the Reporter's real-time clock. At 00:05:00 (i.e., 5 minutes past midnight) the Reporter will request a time setting from either the primary or secondary time server.

A<small>DDITIONAL</small> **DHCP**-R<small>ELATED</small> S<small>ETTINGS</small>

Provided the Reporter is operating in Automatic IP mode, the Network command will provide some additional Internet address information. In this case, the Network command will list five additional address fields at the bottom of its display. Refer to the sample data entitled "Network Command - c24gates-2down.v201 Settings" on page 44.

Initially the addresses will all be listed as 0.0.0.0. However, once the Reporter receives its response from a DHCP server, the fields will be filled appropriately. This address data listed is strictly informational in nature. It cannot be altered by the user.

Press the **Esc** key after all of the fields are properly defined. The following message will be displayed if the MAC Address was altered.

```
CHANGE MAC ADDRESS (normally 00-08-DC-xx-xx-xx), are you SURE?
                              No Yes
```

Select Yes to proceed. Finally, the following message will confirm the change(s) to be made to any other Network-related settings.

```
Network settings changed, restart network now?
                    No Yes
```

HTTP S<small>ERVER</small> (H)

The HTTP Server command is used to identify the Union Pacific message processing server. Data similar to the following will be displayed after executing the command.

```
                       HTTP Server Setup
                       -----------------
Server URL:
home.www.up.com

Server Script File:
/xml_services/signal_equipment/PAAMsgProcess.cfm
```

HTTP Server Command

The command provides for the setting of two important fields. Both are described in the following sections.

S<small>ERVER</small> **URL**

The HTTP Server field must be set to the URL or IP Address of the Union Pacific message processing server. The setting can contain a maximum of 80 alphanumeric characters. The Union Pacific c24gates2down. v201 Setup Database includes a setting of home.www.up.com.

The Server URL setting of home.www.up.com should only be changed with the concurrence of Union Pacific. Alarm messages will not be properly delivered if the message processing server is misidentified.

S<small>ERVER</small> S<small>CRIPT</small> F<small>ILE</small>

The CAR-24A uses the HTTP-Get method for transmitting Alarm message content. Alarm messages are handled by a script file that runs on the message processing server. The appropriate script file must be known to the Reporter. The Server Script File field is used to identify the script. The c24gates2down.v201 Setup Database includes a setting of /xml_services/signal_equipment/PAAMsgProcess.cfm.

The Server Script File setting of /xml_services/signal_equipment/PAAMsgProcess.cfm should only be changed with the concurrence of Union Pacific. Alarm messages will not be properly delivered if the script is misidentified.

ALARM CONFIGURATION (L)

The Alarm Configuration command is used to display the Alarm Configuration Table (ACT). The ACT allows the user to establish criteria for twenty separate Alarms. The ACT is organized as twenty rows. Each row includes ten fields, nine of which can be edited. Each field includes a numeric or alphanumeric setting that is used to define the Alarm.

At the present time, the c24gates2down.v201 Setup Database defines only nine Alarms. Appendix C provides a detailed explanation of the ACT used by the c24gates2down.v201 Setup Database.

The following data sample displays the ACT established by the c24gates2down.v201 Setup Database.

```
                              Alarm Configuration
          SetInp SetState SetTime SetName ClrInp ClrState ClrTime ClrName MaintClr
          ------ -------- ------- ------- ------ -------- ------- ------- --------
    L01   A01      On       600     B1     A01     Off      300     1B      No
    L02   A02      On       600     B2     A02     Off      300     2B      No
    L03   A03      On       600     B3     A03     Off      300     3B      No
    L04   A04      On       600     B4     A04     Off      300     4B      No
    L05   D10      Off     1800     IP     D10     On       300     PR      No
    L06   D10      Off     7200     PK     D10     On       300     PR      No
    L07   V01      On       180     GU     V02     On         2     GC      Yes
    L08   V03      On        45     GD     V04     On         2     GC      Yes
    L09   D01      Off     1800     LA     D01     On        10     CL      Yes
    L10   ---      Off        0            ---     Off        0             No
    L11   ---      Off        0            ---     Off        0             No
    L12   ---      Off        0            ---     Off        0             No
    L13   ---      Off        0            ---     Off        0             No
    L14   ---      Off        0            ---     Off        0             No
    L15   ---      Off        0            ---     Off        0             No
    L16   ---      Off        0            ---     Off        0             No
    L17   ---      Off        0            ---     Off        0             No
    L18   ---      Off        0            ---     Off        0             No
    L19   ---      Off        0            ---     Off        0             No
    L20   ---      Off        0            ---     Off        0             No
```

Alarm Configuration Command

Alarm messages are only issued when specific conditions are detected by the Reporter. Before attempting to modify an existing Alarm (or define a new Alarm) the processes used by the Reporter should first be fully understood. Irrespective of type, every Alarm is subject to the following conditions and processes.

● Alarms are identified by an Lnn designation, where nn is in the range from 01 to 20. The left-most column of the ACT lists the Alarm Number. It cannot be altered.

● Alarms are Set and Cleared by similar, but separate, processes. The parameters used by both processes are fully definable. When an Alarm is Set an appropriate message is sent to the server. When an Alarm is Cleared a related, but nevertheless distinct, message is also sent.

● An Alarm is defined by two primary conditions. Digital, Analog and Virtual Inputs are continuously evaluated as one primary condition. The other primary condition involves duration.

● The Input used to define the Alarm can be thought of as a trigger that is used to initiate a duration check. In this regard, the Input can be thought of as starting a stopwatch. If the elapsed time on the stopwatch exceeds a specified time, the conditions that define the Alarm are satisfied and an Alarm message is sent.

● The state of every Reporter Input is binary in nature. An input is either On or Off. Inputs can transition from Off to On or On to Off. Either transition can be selected as the trigger for the duration check.

The remaining nine fields of the ACT define the specific criteria for each Alarm. The settings for these fields are described in the following sections.

⚠ The content of the ACT should only be changed with the concurrence of Union Pacific. Alarms are defined by very specific criteria. Changing the criteria changes the meaning of an Alarm. Furthermore, Alarms can be defined that the script file will not be able to process. Proceed with caution.

S<small>ET</small>I<small>NP</small>

The SetInp parameter establishes the input criterion used to Set the Alarm. Its setting must be a valid Digital, Analog or Virtual Input. Entries must be in the form **Dn**, **An or Vn** where n is 1 through 20 for Digital Inputs, 1 through 4 for Analog Inputs and 1 through 16 for Virtual Inputs. Leading zeros are not required.

Although not necessary, in many cases the SetInp parameter will be the same input used to define the ClrInp parameter.

S<small>ET</small>S<small>TATE</small>

The SetState parameter allows the On or Off state of the input to be used to Set the Alarm. Press the **Spacebar** key to select the required state. On and Off states are defined as follows:

On–The Digital Input voltage is in the range from 9 to 36 Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 4 on page 22. The Virtual Input evaluates to a true logic state.

Off–The Digital Input voltage is less than 1 Vdc. The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Virtual Input evaluates to a false logic state.

S<small>ET</small>T<small>IME</small>

The SetTime parameter establishes the duration criterion used to Set the Alarm. This feature prevents transient conditions from creating unwarranted Alarm messages. SetTime is always measured in seconds and must be in the range of 0 to 99,999. Fractional values are not accepted.

S<small>ET</small>N<small>AME</small>

The SetName parameter is always a two-character mnemonic that serves as an identification for an Alarm that has been Set.

⚠ SetNames must be assigned with caution. The Union Pacific message processing server is programmed to only accept Alarm messages with valid SetName or ClrName parameters. Union Pacific must be consulted before creating a new SetName.

C<small>LR</small>I<small>NP</small>

The ClrInp parameter establishes the input criterion used to Clear the Alarm. Its setting must be a valid Digital, Analog or Virtual Input. Entries must be in the form **Dn**, **An or Vn** where n is 1 through 20 for Digital Inputs, 1 through 4 for Analog Inputs and 1 through 16 for Virtual Inputs. Leading zeros are not required.

Although not necessary, in many cases the ClrInp parameter will be the same input used to define the SetInp parameter.

C<small>LR</small>S<small>TATE</small>

The ClrState parameter allows the On or Off state of the input to be used to Clear the Alarm. Press the **Spacebar** key to select the required state. On and Off states are defined as follows:

On–The Digital Input voltage is in the range from 9 to 36 Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 4 on page 22. The Virtual Input evaluates to a true logic state.

Off–The Digital Input voltage is less than 1 Vdc. The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Virtual Input evaluates to a false logic state.

CLRTIME

The ClrTime parameter establishes the duration criterion used to Clear the Alarm. This feature prevents transient conditions from creating unwarranted Alarm messages. ClrTime is always measured in seconds and must be in the range of 0 to 99,999. Fractional values are not accepted.

CLRNAME

The ClrName parameter is always a two-character mnemonic that serves as an identification for an Alarm that has been Cleared.

ClrNames must be assigned with caution. The Union Pacific message processing server is programmed to only accept Alarm messages with valid SetName or ClrName parameters. Union Pacific must be consulted before creating a new ClrName.

MAINTCLR

The user can, at any time, place the Reporter in Maintainer Mode. Refer to the section entitled "Maintainer Mode" on page 51 for additional details. While in Maintainer Mode the Reporter will not transmit Alarm messages to the server. The MaintClr setting can be used to reset an Alarm that is currently Set. As an example, the c24gates2down.v201 Setup Database allows the LA Alarm (XR down for 30 minutes) to be reset by Maintainer Mode.

Press the **Spacebar** key to select a setting of either Yes or No.

SAMPLE ALARM DEFINITION

To further explain the ACT parameters previously described, the following Alarm definition is presented. The sample Alarm will be defined as follows:

- Alarm Number L20 will be defined.

- The Set Alarm will be referred to as NA. Its companion Cleared Alarm will be referred to as CA.

- The On state of Digital Input D19 will be used to Set the Alarm. The Off state of Digital Input D20 will be used to Clear the Alarm.

- Durations of 10 minutes and 5 minutes will be used to validate the NA and CA Alarms, respectively.

- Maintainer Mode will be allowed to Clear a pending NA Alarm.

The following sample data lists the Alarm parameters previously described. For the sake of brevity, Alarms L01 through L19 have not been listed.

```
                         Alarm Configuration
         SetInp SetState SetTime SetName ClrInp ClrState ClrTime ClrName MaintClr
         ------ -------- ------- ------- ------ -------- ------- ------- --------
           .       .        .       .       .      .        .       .       .
           .       .        .       .       .      .        .       .       .
           .       .        .       .       .      .        .       .       .
    L20   D19      On      600      NA     D20    Off      300      CA     Yes
```

Sample Alarm Definition

This completes the Setup Procedure. The installation and setup are critical to how the CAR-24A will perform. It is advisable to review the steps taken earlier. Make any changes that may be required.

Maintainer Mode should now be terminated. If it is on, press the front panel pushbutton switch labeled "Esc / Maintainer Mode". Refer to the section entitled "Maintainer Mode" on page 51.

The CAR-24A is ready to operate in accordance with its installed Setup Database. It is assumed that the cell modem, network and message processing server are also properly configured.

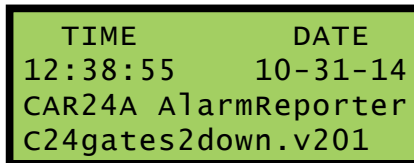The next chapter describes how to operate the CAR-24A.

USER NOTES

3

INTRODUCTION

Except as noted in the following section, the operation of the CAR-24A is completely automatic once an appropriate Setup Database is loaded and the unit is installed. The Reporter is designed to operate autonomously without any need for user intervention. It will monitor the crossing and transmit Alarm and Health Check messages as the need arises.

Eventually the user will need to create an Event Record report pertaining to an incident or maintenance issue. With this in mind, this chapter describes how to operate the CAR-24A from a PC running a suitable communications program. Local (i.e., on-site) as well as remote methods of operating the Reporter are described. Before the Reporter can be operated it must be properly installed and set up. A PC must be online with the Reporter. The use of the LCD panel and keypad are described in the next chapter.

MAINTAINER MODE

Normal operation can only occur when the Reporter is not in Maintainer Mode. Confirm that the LCD indicates that Maintainer Mode is disabled. The first line of text on the LCD will exclude the "MAINT" label as shown in the following.
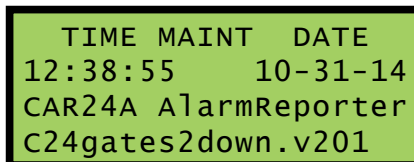
4

```
   TIME        DATE
12:38:55     10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```
Maintainer Mode Disabled

If Maintainer Mode is enabled, press the front panel pushbutton switch labeled "Esc / Maintainer Mode" once.

Conversely, on occasion the crossing will need to be tested or perhaps repaired. While under test or repair, it is likely that the CAR-24A will transmit Alarm messages that do not reflect failures of any crossing equipment. Placing the Reporter in Maintainer Mode indefinitely halts the transmission of Alarm messages. To place the Reporter in Maintainer Mode, press the pushbutton switch labeled "Esc / Maintainer Mode". Confirm that the LCD indicates that Maintainer Mode is enabled. The first line of text on the LCD will include the "MAINT" label as shown in the following.

```
  TIME MAINT   DATE
12:38:55     10-31-14
CAR24A AlarmReporter
C24gates2down.v201
```
Maintainer Mode Enabled

The transmission of Set, Clear and Health Check messages will be halted immediately. The Reporter's normal mode of operation can be restored by either of two actions. They are described in the following.

● Press the pushbutton switch labeled "Esc / Maintainer Mode".

● If left unattended, a fail safe mechanism will automatically restore normal operation. The Maint PB Timeout setting controls the duration of Maintainer Mode. If the duration is exceeded, normal operation is restored immediately. This timeout feature is fully described in the section entitled "Maint PB Timeout" on page 32. The c24gates2down.v201 Setup Database includes a Maintainer Mode timeout value of 90 minutes.

ⓘ A System Event Record for input S7 is saved to memory each time Maintainer Mode is enabled and disabled. System Events are described in the section entitled "System Events" on page 102. While enabled, Maintainer Mode does not impact the detection or saving of any Event Records.

FRONT PANEL FEATURES

The front panel of the CAR-24A provides many ease-of-use features. They are described in the following sections. Figure 2 on page 10 provides an illustration of the Reporter's front panel.

LCD / KEYPAD

The front panel keypad and LCD combination provide the user with many operational features. They are fully described in Chapter 5.

LCD CONTRAST ADJUSTMENT

The contrast level of the LCD panel may occasionally need to be adjusted to compensate for extreme variations in ambient temperature or viewing angle. To change the contrast level simply adjust the potentiometer labeled "Adj".

LED INDICATORS

The front panel of the Reporter includes a group of three LEDs aligned vertically along the left side of the unit. Each are described in the following.

Active Alarm – The red LED illuminates whenever one or more Alarms are active. As an example, if a battery voltage is found to be insufficient for a defined duration, an Alarm will be Set. The Active Alarm LED will illuminate while the Alarm is Set and turn off only after all Alarms are Cleared. Alarm Set and Clear definitions are described in the section entitled "Alarm Configuration (L)" on page 47.

Message Sent – The green LED will illuminate for 5 seconds when an Alarm is transmitted to the alarm processing server. The LED will flash for all types of Alarm messages (i.e., Set, Clear and Health Check).

Terminal – The green LED will flash momentarily while data is being sent or received via the serial Terminal Port. The Terminal Port will be active when a user is logged on to the Reporter via the port or when the port is operating in Remote Port Mode. Refer to the section entitled "Remote Port (R)" on page 60 for additional details.

USB HOST PORT

The USB Host Port can be used to save selected Event Record data directly to a FAT-32 formatted flash drive. Refer to the section entitled "Saving Records to a Flash Drive" on page 70 for details. It can also be used to update the Reporter's firmware. Refer to the section entitled "Update" on page 92 for additional information.

MULTI-USER OPERATION

A unique feature of all MICRO-AIDE signal monitoring products is their ability to handle simultaneous operation from multiple users via the Terminal Port, Ethernet Port, front panel keypad or USB Device Port. This multi-user capability eliminates the annoying practice in some systems of one user effectively locking-out a second or third user.

CONNECTING REMOTELY

The previous chapters described accessing the user interface of the CAR-24A via its serial Terminal and USB Device Ports. The Reporter is also equipped with an Ethernet Port. Its design provides a variety of network-based features. Among these features is the ability to remotely access the Reporter via an Ethernet connection. To utilize this feature a remote user simply needs to launch an Ethernet session directed to the IP Address and Port assigned to the Reporter. The section entitled "Network (N)" on page 44 describes these settings.

The following points describe important aspects of Ethernet connections as they apply to the CAR-24A.

- Ethernet sessions utilize the same socket of the Ethernet Port that is required when sending Alarm messages to the alarm processing server. Accordingly, Alarm messages will be placed in a first-in-first-out (FIFO) queue while the Ethernet session is active. Queued Alarms will be immediately transmitted when the session is terminated.

To avoid lengthy delays in the dispatch of Alarm messages, the duration of each Ethernet session should be kept to a minimum.

- Ethernet sessions will automatically terminate after 5 minutes of no activity. No activity is defined as data is neither being sent nor received via the Ethernet Port. This action provides automatic recovery from network outages. Anytime after waiting 5 minutes, a new Ethernet connection can be established.

- Access is controlled and determined by the Password used to log on. Access levels are described in the section entitled "Administrative and Restricted Passwords" on page 31.

- The data throughput rate using an Ethernet connection will generally be superior to that of a Terminal Port connection. However, network conditions can severely impact the quality of Ethernet connections.

- Ethernet sessions are fully supported by the Union Pacific VPN.

- Identical sets of commands, sub-commands and menus are available to the Ethernet and Terminal Port interfaces. However, since Remote Port Mode alters the use of the Terminal Port it is best to control its status while in an Ethernet session. Refer to the section entitled "Remote Port (R)" on page 60 for additional details.

OPERATIONAL COMMANDS

The Reporter's Main Menu includes five commands that can be used to access additional operational features. To execute these commands the user needs to log on. The Main Menu should be displayed as shown in the following.

```
           MICRO-AIDE CAR-24A Alarm Reporter 1.11
                     C24gates2down.v201

                F Site Specific Information
                L Live Status
                C Time/Date
                Q Query Events
                V View Events
                M Measure Flash Rate
                T Transfer Files
                D Diagnostics
                S Setup
                R Remote Port
                X Log Off
```

Main Menu

Qᴜᴇʀʏ Eᴠᴇɴᴛꜱ (Q)

The Query Events command provides the principal means by which Event Records are inspected. It allows the user to inspect events for a particular time frame and/or specific set of inputs. Additionally, the Query Events command includes several data output options that can be selectively employed depending upon the user's data display requirements.

The following sample data shows a typical response to the Query Events command.

```
                          Select Range of Dates

10-03-14  10-04-14  10-05-14  10-06-14  10-07-14  10-08-14  10-09-14  10-10-14
10-11-14  10-13-14  10-14-14  10-15-14  10-16-14  10-17-14  10-18-14  10-19-14
10-20-14  10-21-14  10-22-14  10-23-14  10-24-14  10-25-14  10-26-14  10-27-14
10-28-14  10-29-14  10-30-14  10-31-14  11-01-14  11-02-14  11-03-14




      Use arrow keys to move, Space=start selection, Enter=accept, ESC=cancel
```

Query Events Command - Table of Dates

The data array forms a table of dates in MM-DD-YY format. The table indicates that at least one Event Record was logged in memory for each day listed. Days where no records were logged will not be included in the table (e.g., 10-12-14). The CAR-24A can store Event Records for 128 different dates provided the event storage capacity is not exceeded.

The CAR-24A utilizes a rotating memory. Records from the 129th day will automatically over-write records from the first day regardless of how many records are stored in memory.

The first step in using the Query Events command is to select the date or range of dates that the user wishes to inspect. Slightly different procedures are used to select a single date or range of dates. Both procedures are described in the following.

Sᴇʟᴇᴄᴛɪɴɢ ᴀ Sɪɴɢʟᴇ Dᴀᴛᴇ

1. Using the appropriate arrow keys highlight the single date of interest.

2. Press the **Enter** key.

Sᴇʟᴇᴄᴛɪɴɢ ᴀ Rᴀɴɢᴇ ᴏꜰ Dᴀᴛᴇꜱ

1. Using the appropriate arrow keys highlight the first date in the range.

2. Press the **Spacebar** to anchor one end of the range to be highlighted.

3. Press the appropriate arrow keys until each date in the desired range is highlighted.

4. Press the **Enter** key to accept the highlighted range of dates.

The **Esc** key can be pressed at any time to cancel the selection. The user will then be returned to the Main Menu.

Qᴜᴇʀʏ Rᴇᴘᴏʀᴛ Mᴇɴᴜ

After the date(s) is selected an array of Selection and Edit Fields entitled "Query Report" will be displayed. The following sample data shows a typical Query Report.

```
                              Query Report

                    Start Date:         10-31-14
                    Start Time:         00:00:00

                    End Date:           10-31-14
                    End Time:           23:59:59

                    Include Details:         Yes

                    Reverse order:            No
                    Report Type:            Dump
    Inputs: D1-20 A1-4 L1-20 S1-20
    (blank=all)

                       [F1/^W]=Execute Report, ESC=cancel
```

Query Report Menu

The Event Records of interest to the user can be further qualified by the six fields listed in the Query Report menu. The use of each field is described in the sections that follow.

START TIME

Event Records that are time stamped after the assigned Start Time (for the day selected as the Start Date) will be issued by the Query Command. The Start Time can be assigned any value from 00:00:00 to 23:59:59. The default setting is always 00:00:00. The Start Time must be entered in military format.

END TIME

Event Records that are time stamped before the assigned End Time (for the day selected as the End Date) will be issued by the Query Command. The End Time can be assigned any value from 00:00:00 to 23:59:59. The default setting is always 23:59:59. The End Time must be entered in military format.

INCLUDE DETAILS

The CAR-24A can format Event Records in two different ways. Press the **Spacebar** to select either formatting option described in the following.

A complete explanation of Event Record formats is included at the end of this chapter. Refer to the section entitled "Event Record Formatting" on page 62. The numbers included in each of the headings listed in the following specify the number of lines of text each formatting option will create.

Yes (2)–The status of each Digital Input, the level of each Analog Input and the status of each Virtual Input is listed with data concerning the input that created the record.

No (1)–Only information concerning the input that created the record is listed.

REVERSE ORDER

The Reverse Order option can be set to either No (default setting) or Yes. The default setting will result in the oldest records being issued first. They will be followed by newer records. If enabled, the Reverse Order option will issue the most recent records first. In either case, Event Records are always issued in chronological sequence.

REPORT TYPE

The Report Type field can be set to Dump (default setting), Dump+S, Browse or Comma. The proper selection depends upon the user's requirement. Each option is described in the following sections.

Dump–The Dump option is used if a large number of records are to be inspected or captured to a PC file. Refer to the section entitled "Capturing Event Records to a PC File" on page 66. The Dump option will issue Event Records in a continuous stream. The streaming of records will only cease when the last record is issued or the user executes a Pause or Abort command. Refer to the section entitled "Data Flow Control" on page 19.

Dump+S–This setting is similar to the Dump setting in that it produces a streamed report from start to end. However, a digitally encrypted signature is appended to the end of the report. The signature can be used to determine if the content of the report has been tampered with and therefore no longer reflects the actual data as logged by the Reporter. Refer to the section entitled "Creating Secure Reports" on page 67 for additional details.

Browse–The Browse option allows the user to inspect a set of records one screen at a time. It will typically display eleven one-line records or seven two-line records. The same set of records will be displayed indefinitely until the user presses an arrow key to review additional records. The Browse option is most useful when a limited number of records in a narrow time frame need to be reviewed.

A completely new screen of records can be displayed by pressing the up and down arrow keys. The next record in the chronological sequence can be added to the display set by pressing the left and right arrow keys. The last line of text in each screen explains the use of the arrow keys.

Comma–The Comma option formats the Event Record data so that it can be easily imported to a spreadsheet or database application such as Excel® or Access®, respectively. However, the records in question must first be written to a PC file. Refer to the section entitled "Capturing Event Records to a PC File" on page 66. This option takes the various data fields that comprise a record and separates them with a comma. Intervening spaces are eliminated. The processing application will place the record fields into cells or fields that satisfy its own processing requirements. This formatting technique is frequently referred to as Comma Separated Values (CSV). The Comma report option is described in detail in the section entitled "CSV Report Type" on page 65.

ⓘ When the Report Type is set to Comma the Include Details setting is ignored. All Event Records for the selected time period will be issued and similarly formatted.

Iɴᴘᴜᴛꜱ

The Inputs field allows the user to inspect Event Records from specific inputs. To select specific inputs a valid Input Number must be entered. Digital Inputs are entered as **Dn**, where n is 1 through 20. Analog Inputs are entered as **An**, where n is 1 through 4. Virtual Inputs are entered as **Vn**, where n is 1 through 16. Timer Inputs are entered as **Tn**, where n is 1 through 16. Alarms are entered as **Ln**, where n is 1 through 20. System Event Inputs are entered as **Sn**, where n is 1 through 12. Leading zeros are not required. Records from all inputs will be issued if the field is left blank.

ⓘ System Event Inputs are another type of non-physical input that can create Event Records. System Event Records are used to report the status of the Reporter at a specific moment in time. Refer to the section entitled "System Events" on page 102 for additional details.

Multiple inputs can be selected by using the following methods. Separate two Input Numbers by a single space character. Select a contiguous range of inputs by including a - (hyphen) between two n numbers. The contiguous range option can be applied to all input types.

The set of Input Numbers must be terminated by pressing the **Enter** key. The following example is preset by the c24gates2down.v201 Setup Database.

```
Inputs: D1-20 A1-4 L1-20 S1-20
(blank=all)
```

The input type designator can be entered as an upper- or lower-case letter. Input Numbers can be entered without regard to sequence. The c24gates2down.v201 Setup Database preselects all Digital, Analog, Alarm and System events. It can be altered by both Administrative and Restricted users.

After the inputs are selected the user must press the **F1** function key to complete the command. Alternatively, press the **Ctrl+W** keys simultaneously. Event Records will then be issued in accordance with all of the settings selected by the user. Event Records will automatically cease being issued when the Report Type is set to Dump, Dump+S or Comma. After the last Event Record a message similar to the following will be displayed.

```
Number of records = 137   Checksum = 9219
End of report
Hit any key to continue
```

Record Count and Checksum

The exact number of records included in the report is always specified. A checksum is also included. The checksum is calculated from the first character of the first record through the last character of the last record. Any report that issues the same set of records will always list the same checksum value regardless of when the report was generated. Accordingly, alteration of the record data can be detected provided the original data and checksum are known.

To create a secure report use the Dump+S option. Refer to the section entitled "Creating Secure Reports" on page 67 for additional details.

VIEW EVENTS (V)

The View Events command allows the user to display Event Records in real-time. Immediately after an event is detected its corresponding Event Record will be issued to the active user port (i.e., Terminal, Ethernet or USB Device). This command can be very useful in tracking events that are occurring while the user is online with the Reporter. It can also be used effectively during the Initial Check-Out Procedure to verify that each input is properly cabled. The records can simultaneously be written to a text file. Refer to the section entitled "Capturing Event Records to a PC File" on page 66.

The following message will be issued after the command has been selected.

```
                        View Events Report

                Include Details:         Yes

Inputs: D1-20 A1-4 L1-20 S1-20
(blank=all)

                        [F1/^W]=Execute Report, ESC=cancel
```

View Events Command

The Event Records of interest to the user can be qualified by the two fields listed in the View Events Report. The use of each of these fields is described in the following sections.

INCLUDE DETAILS

This setting allows the user to select the level of detail to be included in each Event Record. Refer to the section entitled "Event Record Formatting" on page 62 for additional information regarding the use of this field.

INPUTS

The use of the Inputs field allows the user to review records from specific inputs. The use of this field is described in the section entitled "Inputs" on page 56.

After the selection fields are assigned press the **F1** function key to start the report. Alternatively, press the **Ctrl+W** keys simultaneously. The Reporter will continue to issue records as they occur in real-time. Press the **Esc** key to stop the report.

LIVE STATUS (L)

The Live Status command can be very useful in verifying that inputs are wired and labeled correctly. Additionally, it can be used to determine if the inputs are operating properly and if the assigned Detection Times are set in accordance with the characteristics of the monitored circuits. It provides a single-screen snapshot of the present state of Alarms and various Reporter inputs (i.e., Digital, Analog and Virtual). The state or measured value of each input is continuously and automatically updated. The Live Status report indicates the state of each input by the use of its user-assigned Input Identifier and

Event Name. The latter are described in the sections entitled "Input Names / Identifiers (I)" on page 39 and "Event Names (E)" on page 38, respectively.

To view the status information, select the Live Status command from the Main Menu. Data similar to the following will be displayed. Union Pacific's c24gates2down.v201 Setup Database was used to provide the sample data.

```
[ESC]=exit                      Live Status                 17:56:22 10-31-14
      L01: Off 1B   XR      : XR Down     BB1   :  13.1Vdc Batt1 OK
      L02: Off 2B   D2      : Off         BB2   :  13.9Vdc Batt2 OK
      L03: Off 3B   Island 1: I1 Down     BB3   :   0.0Vdc Batt3 OK
      L04: Off 4B   Island 2: I2 Down     BB4   :   0.0Vdc Batt4 OK
      L05: Off PR   Island 3: I3 Down
      L06: Off PR   GateUp  : On          VGateNUp: Off
      L07: Off GC   GateDn1 : On          VGateUp : Off
      L08: Off GC   GateDn2 : On          VGateNDn: Off
      L09: On  LA   D9      : Off         VGateDn : Off
      L10: Off      POR     : POR Down    V5      : Off
      L11: Off      Island 4: I4 Down     V6      : Off
      L12: Off      Island 5: I5 Down     V7      : Off
      L13: Off      Island 6: I6 Down     V8      : Off
      L14: Off      D14     : Off         V9      : Off
      L15: Off      D15     : Off         V10     : Off
      L16: Off      D16     : Off         V11     : Off
      L17: Off      D17     : Off         V12     : Off
      L18: Off      D18     : Off         V13     : Off
      L19: Off      D19     : Off         V14     : Off
      L20: Off      D20     : Off         V15     : Off
                                          V16     : Off
```

Live Status Command

The first row always includes the name of the report and the current time. The latter is updated each second. The remainder of the screen is organized into three groups of information. Each group includes two or three columns of data. A description of each group and column is provided in the following sections.

Aʟᴀʀᴍ Sᴛᴀᴛᴜs

Alarm status comprises the first three columns of data. The first column lists the two-letter Alarm identification (i.e., L01 through L20). The second column reports the current status of the Alarm as either On or Off. The third column also reports the current Alarm status. It reports the status by listing the appropriate SetName or ClrName. In the sample data, Alarm L09 is On. Accordingly, its status is also reported as LA. Alarm identifications, SetName and ClrName are described in the section entitled "Alarm Configuration (L)" on page 47.

Dɪɢɪᴛᴀʟ Iɴᴩᴜᴛ Sᴛᴀᴛᴜs

The Identifier assigned to each Digital Input is listed in the fourth column (e.g., XR). The current applicable On or Off Event Name of each Digital Input is reported in the fifth column. In the sample data, the XR has been in the XR Down state sufficiently long to cause the L09 Alarm to go On.

Digital Inputs are considered to be On or Off in accordance with the following definitions.

On–The Digital Input voltage is in the range from 9 to 36 Vdc.

Off–The Digital Input voltage is less than 1 Vdc.

Aɴᴀʟᴏɢ ᴀɴᴅ Vɪʀᴛᴜᴀʟ Iɴᴩᴜᴛ Sᴛᴀᴛᴜs

The status of Analog and Virtual Inputs is reported in the last three columns. The sixth column lists the assigned Identifier (e.g., BB1 and VGateNUp). The seventh column reports the voltage of each Analog Input. The current applicable On or Off Event Name of each Virtual Input is reported below the voltage measurements. Finally, the eighth column reports the appropriate On or Off Event Name of each Analog Input.

Analog and Virtual Inputs are considered to be On or Off in accordance with the following definitions.

On–The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 4 on page 22. The Virtual Input evaluates to a true logic state.

Off–The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Virtual Input evaluates to a false logic state.

MEASURE FLASH RATE (M)

Typical railroad operating procedures require that the flashing rate of crossing signals be periodically measured and reported. The Measure Flash Rate command allows the CAR-24A user to precisely deter-mine the flashing rate of a circuit.

Enabling the Measure Flash Rate feature imposes several temporary pre-conditions upon the Setup Database of the Reporter. The circuit to be measured must be connected to a Digital Input. The se-lected Digital Input will be assigned a Detection Time of .1 seconds. This will insure that the flashing pulses will not be filtered out by the de-bounce properties of the Detection Time feature. Refer to the section entitled "Detect Times / Flash Enable (D)" on page 34.

The CAR-24A will automatically adjust the Digital Input's Detection Time setting to .1 seconds when the Measure Flash Rate command is executed. The original setting will be automatically restored to its prior value when the measurement is concluded.

The following Edit Fields will be displayed after the Measure Flash Rate command is selected.

```
                 Measure Flash Rate

              Input to Measure: ---

           [F1/^W] to measure, [ESC] to quit
```

Measure Flash Rate Command

The user must enter a valid Digital Input number in the Input to Measure field. The entry must take the form **Dn**, where n is 1 through 20. Leading zeros are not required. Press the **Enter** key to accept the Input Number. Finally, press the **F1** function key to initiate the measuring process. Alternatively, press the **Ctrl+W** keys simultaneously. A data screen similar to the following will be displayed.

```
                 Measure Flash Rate

              Input to Measure: D01

                 Measuring... [ESC] to quit

           Flashes/Minute:  49.1
           On Time:        0.612 Sec
           Off Time:       0.609 Sec
           Cycle Time:     1.221 Sec

           Detect Time:    0.610 Sec
```

Measure Flash Rate Report

The lower five lines of text reflect the Measure Flash Rate data. The first line indicates the number of flash-es per minute (e.g., 49.1). The second and third lines report the On Time and Off Time durations, respec-tively. The data listed in the fourth line (referred to as Cycle Time) is the duration of one on / off sequence. It is the sum of the On Time and Off Time durations. Finally, the fifth line specifies the optimum Detection Time to be assigned to inputs using the reported flash rate.

The data listed in the Measure Flash Rate report is updated continuously and automatically. For typical flash rates the data will be updated every several seconds. To stop the measuring process simply press the **Esc** key. The Digital Input can then be connected to another circuit. The original Detection Time set-ting will be automatically restored.

4

REMOTE PORT (R)

In many cases the Terminal Port of the CAR-24A will be used to provide a connection for a local PC user. This is referred to as Terminal Port Mode. However, the Terminal Port can also be connected to an alternate device co-located with the Reporter. This connection scheme and the feature that it supports is referred to as Remote Port Mode. A typical connection is illustrated in Figure 8 on page 61.

Remote Port Mode allows a user to access the user interface of the alternate device. The user must first launch an Ethernet connection. Remote Port Mode can be enabled or disabled in an Administrative or Restricted Access session.

The detection of Alarm conditions is not affected by Remote Port Mode. However, remote Ethernet connections temporarily suspend the transmission of Alarm messages as described in "Connecting Remotely" on page 53.

CONNECTING THE ALTERNATE DEVICE TO THE TERMINAL PORT

Before connecting the ports the following conditions must be met.

- The Terminal Port of the CAR-24A is configured as DCE. If the port of the alternate device is DTE, use a one-to-one cable without an adapter. If the port of the alternate device is DCE, use a one-to-one cable with a null modem adapter. MICRO-AIDE provides a one-to-one cable with every CAR-24A. The cable's wiring is illustrated in Figure 10 on page 109.

- The port of the alternate device must use 8-N-1 bit formatting.

- The port of the alternate device must support an ASCII data exchange consistent with the use of HyperTerminal or Tera Term.

The Reporter's Terminal Port utilizes a male DE-9 connector.

Once the physical connection to the alternate device is in place, the user can enable Remote Port Mode. Control of Remote Port Mode requires familiarity with three basic procedures. Each are described in the following sections.

ENABLE REMOTE PORT MODE

The remote user must perform each of the following steps in the order listed.

1. Establish an Ethernet connection with the Reporter using HyperTerminal or Tera Term. Refer to the section entitled "Connecting Remotely" on page 53.

2. Log on to the Reporter. From the Main Menu select the Remote Port command. The following menu will be displayed.

```
                    Remote Menu

              S Setup Remote Port
              A Access Remote Port
```
Remote Port Command

3. Select the Setup Remote Port command. The following menu will be displayed.

```
                    Remote Port
                    -----------
        Terminal Port Baud Rate   9600
        Terminal Port Mode      Terminal
```
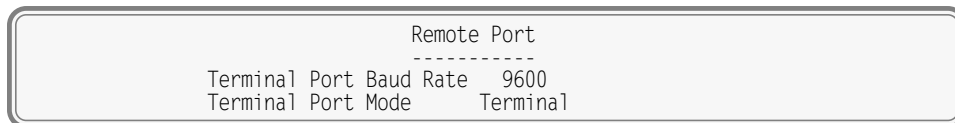
4. Highlight the Terminal Port Baud Rate field. Press the **Spacebar** key one or more times until the Baud rate of the alternate device is displayed.
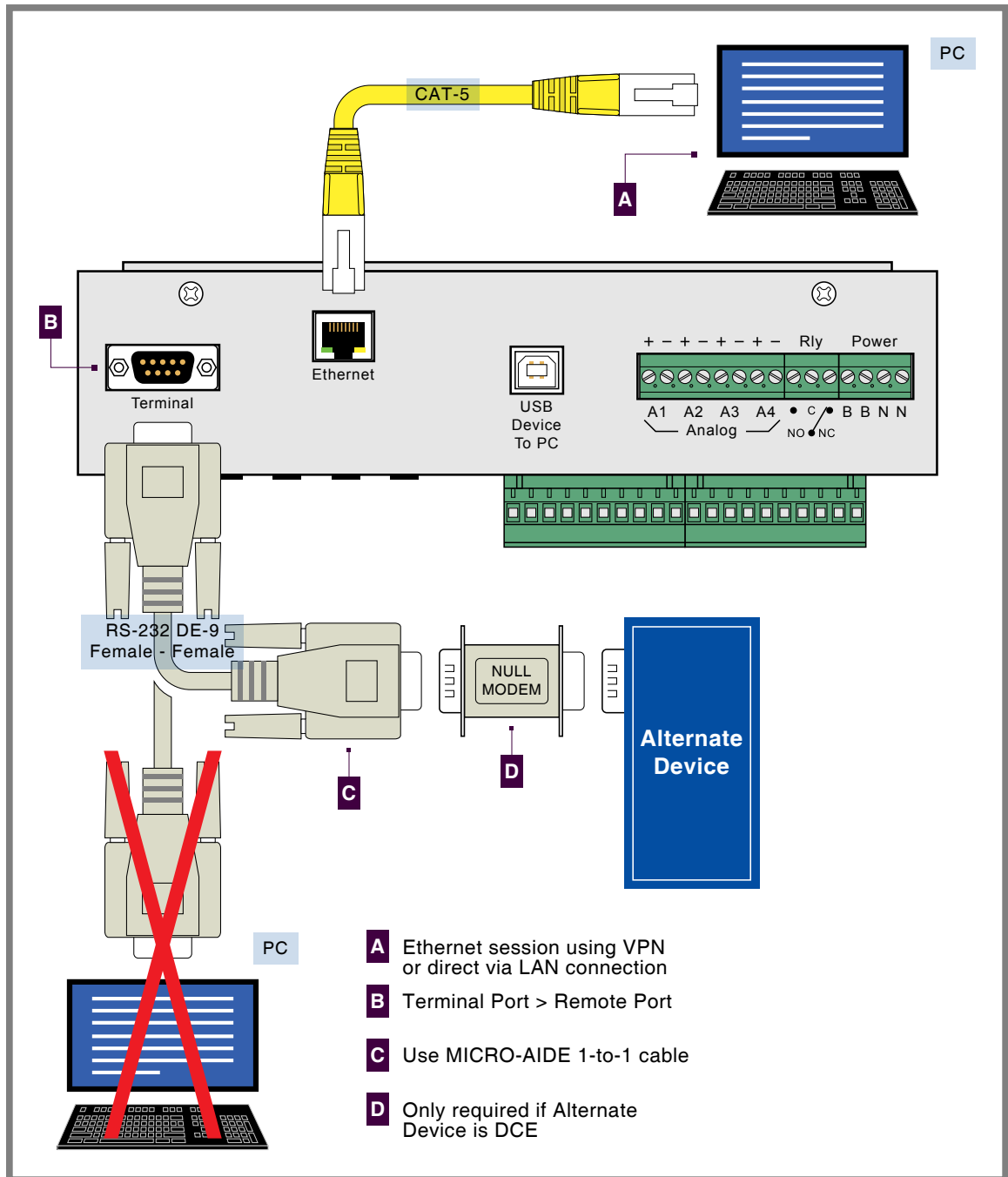
Figure 8: Remote Port Connection

5. Move the highlight to the Terminal Port Mode field. Press the **Spacebar** once. The setting will change to Remote.

6. Press the **Esc** key to return to the Remote Menu. Highlight the Access Remote Port command and press the **Enter** key. Remote Port Mode is now enabled. The following message confirms the change.

```
Beginning Remote Port access (exit with !!!)
```

7. The user is now connected to the alternate device. In general, keystrokes and commands issued by the user will be ignored by the Reporter and acted upon solely by the alternate device. This action will continue indefinitely until such time as the user terminates the session with the alternate device.

TERMINATE ALTERNATE DEVICE SESSION

To terminate the current alternate device session, perform either of the following actions.

- To terminate the alternate device session and Ethernet connection simultaneously, perform a disconnect from within HyperTerminal or Tera Term. To once again dialog with the Reporter, an Ethernet connection must be re-established.

- To terminate the alternate device session but retain the Ethernet connection, press the **!** key three times in succession. Wait 1 second between each keystroke. The remote user will now dialog directly with the Reporter. The menu for the Remote Port Command will be displayed.

Using either method, Remote Port Mode will still be enabled. To launch a new session with the alternate device, select the Access Remote Port command described in step 6 of the previous section.

DISABLE REMOTE PORT MODE

To restore Terminal Port Mode, the remote user must disable Remote Port Mode. To do so, perform each of the following steps in the order listed.

1. Establish an Ethernet connection with the Reporter using HyperTerminal or Tera Term. Refer to the section entitled "Connecting Remotely" on page 53.

2. Log on to the Reporter. From the Main Menu select the Remote Port command. The following menu will be displayed.

```
                    Remote Menu

                S Setup Remote Port
                A Access Remote Port
```
Remote Port Command

3. Select the Setup Remote Port command. The following menu will be displayed.

```
                    Remote Port
                    -----------
        Terminal Port Baud Rate   9600
        Terminal Port Mode        Remote
```
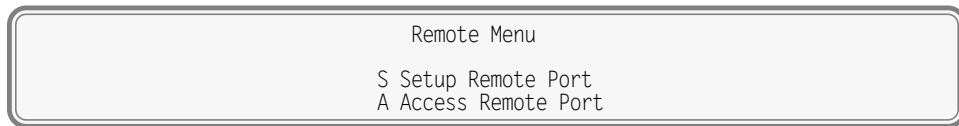
4. Move the highlight to the Terminal Port Mode field. Press the **Spacebar** once. The setting will change to Terminal. Remote Port Mode is now disabled and Terminal Port Mode resumes.

If no further alternate device sessions are required, the user may wish to disconnect the cable between the Terminal Port and alternate device. The port will again be available to a local PC user.

Remote Port Mode can be enabled and disabled locally by establishing a USB Device Port connection or by using the TPMode command from the front panel. Refer to the section entitled "TPMode" on page 92 for additional information.

EVENT RECORD FORMATTING

Event Records provide the user with information about the status of each input at a specified moment in time. Event Records consist of printable ASCII characters. Two different formatting methods are employed by the CAR-24A. They create one- and two-line records. The formatting options are referred to as No Details and Include Details. They correspond to the No and Yes settings of the Record Details and Include Details fields which are features of the Query Events and View Events commands, respectively.

The following sample Event Records do not reflect actual signal activity. Accordingly, the data should not be taken too literally. The sequence of events would not normally occur at a crossing. The data is illustrative only for the purposes of explanation.

NO DETAILS

The one-line form is used to provide event information from a single input. Analog Input levels, Digital and Virtual Input status information is not listed in this format. Ten sample records are shown in the following.

```
02:01:05.000  10/31/14  System Power        Power     OFF      S01

02:01:37.028  10/31/14  System Power        Power     ON       S01

02:02:36.300  10/31/14  Maintainer Mode     Maint     OFF      S07

08:05:55.175  10/31/14  Gate Up Ind         GateUp    On       D06

10:12:01.330  10/31/14  Island 1            Island 1  I1 Down  D03

13:01:08.006  10/31/14  Alarm Input L06     Alarm     PK       L06

00:05:00.169  11/01/14  Sntp Clock Sync     SntpSync  OFF      S04

10:00:55.433  11/01/14  Gate Delay          Timer16   Violate  T16  31.1s

11:08:48.297  11/01/14  EOR                 EOR       Off      D20  48.2FPM

12:11:26.249  11/01/14  Speed Monitor 4     SpeedLim  ON       S12  22MPH
```

Event Records with No Details

Time–The time the event was detected is indicated in military-style HH:MM:SS format. The time is identified to the nearest thousandth of a second.

Date–The date the event was detected is indicated in MM/DD/YY format.

Input Name–The twenty-character Input Name identifies the input. An Input Name of Gate Up Ind is listed in the fourth sample record.

Input Identifier–The eight-character Input Identifier further identifies the input. The Identifier GateUp is listed in the fourth sample record.

Event Name–The Event Name identifies the type of event detected at the input. The Event Name listed will always be a member of the Event Name pair assigned to the input. The Event Name I1 Down listed in the fifth Event Record clearly indicates to the user the type of event that was recorded.

Input Number–The Input Number is frequently, but not always, the last data field listed. The record may be from a Digital (D01 through D20), Analog (A01 through A04), Virtual (V01 through V16), Timer (T01 through T16), Alarm (L01 through L20) or System Event Input (S01 through S12).

Measured Time, Flash Rate or Speed–Some Event Records will include a data field after the Input Number. Timer Inputs will include a measured duration. The Off Event Record associated with a flashing input will list the flash rate in fpm. System Event Records created by the Train Speed Monitor feature will report a measured speed in mp. The last three sample records include a measured value.

The first three sample records are from System Inputs (i.e., S1 and S7). The first two records indicate when power was lost and then restored to the Reporter. During the 32-second-long interval no Alarms or events could be detected or reported. The third record indicates that the Maintainer Mode was turned off shortly after power was restored.

INCLUDE DETAILS

The two-line form is used to provide additional input information. The first line is formatted identically to that used by the No Details option. Refer to the section entitled . The following sample record is the fourth Event Record from the previous section.

```
08:05:55.175  07/04/12  Gate Up Ind         GateUp    On       D06
x....X.... .......... ..x.............  12.9Vdc  13.4Vdc   0.0Vdc   0.0Vdc
```

Event Records with All Details

The left end of the second line of text is used to indicate the state of each Digital Input at the time the event was recorded. A pattern of x and . (period) characters are shown in the sample record. The left-most character, in the first group of ten, indicates the state of Digital Input D1. The right-most character, in the second group of ten, indicates the state of Digital Input D20. There are four symbols used to indicate the state of Digital Inputs. They are described in the section entitled "Symbol Legend" on page 64.

The middle section of the second line of text includes a sequence of sixteen characters that indicate the state of each Virtual Input at the time the event was recorded. A pattern of x and . (period) characters are shown in the sample record. The left-most character, in the group of sixteen, indicates the state of Virtual Input V1. The right-most character indicates the state of Virtual Input V16. There are four symbols used to indicate the state of Virtual Inputs. They are described in the section entitled "Symbol Legend" on page 64.

Finally, the second line of text also lists the measured levels of each Analog Input. From left to right, A1 through A4 are reported. The units of measurement are always displayed to the right of the measured level (e.g., Vdc and Vac). To the right of the units of measurement data is a single-character indicator. It is used to indicate the state of the Analog Input relative to the user-defined Limit Values. There are four symbols used to indicate the state of Analog Inputs. They are described in the section entitled "Symbol Legend" on page 64.

SYMBOL LEGEND

The four symbols used to indicate the state of Digital and Virtual Inputs are described in the following table.

Symbol		Definition
X	Upper-case X	The input has transitioned into its On state. The referenced input is the source of the Event Record. The assigned On Event Name is listed as the Event Name.
x	Lower-case x	The input remains in its On state. The referenced input is not the source of the Event Record.
:	Colon	The input has transitioned into its Off state. The referenced input is the source of the Event Record. The assigned Off Event Name is listed as the Event Name.
.	Period	The input remains in its Off state. The referenced input is not the source of the Event Record.

Table 8: Symbol Legend - Digital and Virtual Inputs

The four symbols used to indicate the state of an Analog Input are described in the following table.

Symbol		Definition
*	Asterisk	The input has transitioned into its unacceptable range of operation. The referenced input is the source of the Event Record. The assigned On Event Name is listed as the Event Name.
!	Exclamation mark	The input remains in its unacceptable range of operation. The referenced input is not the source of the Event Record.
=	Equal sign	The input has transitioned into its acceptable range of operation. The referenced input is the source of the Event Record. The assigned Off Event Name is listed as the Event Name.
	(blank)	The input remains in its acceptable range of operation. The referenced input is not the source of the Event Record.

Table 9: Symbol Legend - Analog Inputs

Event Names and Analog Limit Values are described in the sections entitled "Event Names (E)" on page 38 and "High and Low Limits" on page 22, respectively.

CSV REPORT TYPE

The Query Events command provides an additional formatting option that can be selected by setting the Report Type to Comma. This section includes a description of a typical Comma Separated Value (CSV) report.

CSV SAMPLE REPORT

Listed in the following is a typical response to the Query Events command when the Report Type is set to Comma. Several of the sample records from the previous section have been used in the following.

```
22:39:46,10/31/14
"C24gates2down.v201"
0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,0,0,0,0,1,0,0,0,0,0,1,0,0,0,0,0,0,0
0,0,0,0,0,0,0,0,1
02:01:05.000,10/31/14,"System Power","OFF",49
02:01:37.028,10/31/14,"System Power","ON",49
02:02:36.300,10/31/14,"Maintainer Mode","OFF",55
08:05:55.175,10/31/14,"Gate Up Ind","ON",6
10:12:01.330,10/31/14,"Island 1","OFF",3
13:01:08.006,10/31/14,"Alarm Input L06","ON",66
```

Comma Separated Value Report

Each report includes a four-line header. The content of the header is fully described in the following.

Line 1–Lists the time and date the report was generated.

Line 2–Lists the user-assigned Unit Name.

Line 3–Contains a bit map that indicates the state of each Digital Input at the moment just prior to the first Event Record listed. From left to right Digital Inputs 1 through 20 are represented. In the sample data previously cited, Digital Inputs 10 and 20 are On. The other Digital Inputs are Off. The following four digits specify the state of each Analog Input. All of the Analog Inputs are in their acceptable range of operation. Finally, the last eight digits represent the state of Virtual Inputs 1 through 8. Virtual Input 1 is On.

Line 4–Contains a bit map that indicates the state of the remaining Virtual Inputs. From left to right Virtual Inputs 9 through 16 are represented. In the sample data previously cited, Virtual Input 16 is On.

Event Records that satisfy the user selected date and time criteria are listed after the header. Records include five or six data fields separated by a single comma. From left to right the fields always include the time, date, Input Name, status and CSV Input Number. The input status is always listed as either ON or OFF. If the record is from a Timer Input, flash enabled Digital Input or one of the Train Speed Monitors a sixth field that lists the measured time, flash rate or train speed value is included, respectively.

ⓘ By convention, CSVs that contain a comma character will be enclosed by a pair of quotation marks. A name that contains a quotation mark will be indicated by an additional quotation mark.

CSV INPUT NUMBERS

The Input Number listed in a CSV record does not include the normal single-letter prefix (i.e., D, A, V, T, L and S). Instead they are assigned purely numerical values in sequential order. Table 10 on page 66 cross references Input Numbers and CSV inputs. The S-prefix is used to refer to System Events. They are described in the section entitled "System Events" on page 102.

Event Record Category	Input Number	CSV Input
Digital	D1 - D20	1 - 20
Analog	A1 - A4	21 - 24
Virtual	V1 - V16	25 - 40
Timer	T1 - T16	41 - 56
System Power	S1	57
High Temperature	S2	58
Low Temperature	S3	59
SNTP Clock Sync	S4	60
GPS Clock Sync - correction > 5 seconds	S5	61
GPS Clock Sync - periodic interval	S6	62
Maintainer Mode	S7	63
Flash Rate Alarm	S8	64
Train Speed Monitor 1	S9	65
Train Speed Monitor 2	S10	66
Train Speed Monitor 3	S11	67
Train Speed Monitor 4	S12	68
Alarm	L1 - L20	69 - 88

Table 10: CSV Input Numbers

CAPTURING EVENT RECORDS TO A PC FILE

The Query (with the Report Type set to Dump, Dump + S or Comma) and View commands will automatically stream Event Records to the active user port. A PC running HyperTerminal can be used to capture these records as a text file. The .txt file that is created can then be read using any commonly available word processing application (e.g., Notepad® or Word®). The steps necessary to capture the Event Records as a .txt file are listed in the following. HyperTerminal and Windows 7® were used in the following procedure. Later versions of these programs may be slightly different. However, the fundamental approach will remain valid.

1. Configure the various fields of the Query or View command as desired.

⚠ Perform steps 2 through 5 IMMEDIATELY BEFORE pressing the **F1** function key or **Ctrl+W** keys simultaneously.

2. With the mouse, click on the Transfers command, then the Capture Text... command. The Capture Text dialog box will open.

3. Click the Browse button. The Select Capture File dialog box will be displayed.

4. Navigate to or create the desired folder that will contain the .txt file. Enter a filename (e.g., 10-31-14 0915AM). The three-character .txt file extension will be appended automatically. Click the Save button. The user will be returned to the Capture Text dialog box.

5. Verify that the file specification box lists the correct folder and filename. Click the Start button to open the .txt file.

6. Press the **F1** function key to initiate the data transfer. Alternatively, press the **Ctrl+W** keys simultaneously. The Reporter will proceed to stream Event Records to the newly created .txt file.

7. In the case of the Query command the record stream will cease automatically when the last record is displayed. A record count and checksum will note the end of the data. Refer to the sample data entitled "Record Count and Checksum" on page 57. In the case of the View command the record stream will cease only when the user presses the **Esc** key.

⚠ The Query with Dump+S option requires that the user wait until the digital signature is written before proceeding to the next step. The delay required to calculate the signature can be significant (more than one minute) if hundreds or thousands of records have been Dumped.

8. With the mouse, click on the Transfers command, then the Capture Text... command. Click the Stop option that is displayed.

The .txt file is now closed and available for viewing. To read the file, navigate to the folder. With the mouse, double-click the filename (e.g., 10-31-14 0915AM.txt). The file will open in the default word processing application.

CREATING SECURE REPORTS

The procedure described in the section entitled "Capturing Event Records to a PC File" on page 66 is also used to save a secure Event Record file to a local or remote PC. To create a tamper-proof, digitally signed report do the following.

1. Set the Report Type field to Dump+S. Perform steps 1 through 7 as described in the previous procedure.

2. Immediately after the record count and checksum values are reported, the following message will be displayed.

```
<<END DATA>>
Generating digital signature...
```

The <<END DATA>> marker serves to indicate that only data prior to this point will be used to calculate digital signature. Accordingly, text data from this point forward is ignored as a part of this process. The calculation of the digital signature may take a few seconds or a few minutes in the case of thousands of dumped Event Records.

ⓘ Although the process may be lengthy, while the digital signature is being calculated all other Reporter functions are being performed.

3. A message similar to the following will be displayed at the conclusion of the calculation.

```
SIGNATURE:7045c52d64a556d7d1f29e05bc57e3f7ffc2ec332bab0e345fb9d7559fddb6cb
PUBLICKEY:d98daf62ff50e08c41021d15cbbd549f03018e2e1b7307688eeb7bc97722cd7b
Hit any key to continue
```

256-Bit Digital Signature

4. With the mouse, click on the Transfers command, then the Capture Text... command. Click the Stop option that is displayed.

The .txt file is now closed and available for viewing. To read the file, navigate to the folder. With the mouse, double-click the filename (e.g., 10-31-14 0915AM.txt). The file will open in the default word processing application. The introduction of the digital signature makes the resultant data file incorruptible.

ⓘ The signature process does not encrypt or alter in any way the original report data. The latter remains readable as it was in its unsecured state.

Alterations to the file can be easily detected by using MICRO-AIDE's RSA Validator software. RSA Validator is a small footprint application that can be installed and run on any Windows PC. It can be downloaded by users from the MICRO-AIDE website without restriction or charge. Appendix E describes how to install and use the RSA Validator software.

This concludes the chapter on how to operate the CAR-24A. Terminate the current session by using the Log Off command. Refer to the section entitled "Log Off (X)" on page 26.

The next chapter describes the use of the USB Host Port, front panel keypad and LCD.

4

CHAPTER 5 – FRONT PANEL OPERATION

INTRODUCTION

The CAR-24A is designed to provide its user with the greatest degree of versatility and functionality. Towards this end, it is equipped with a front panel mounted Liquid Crystal Display (LCD) and keypad. Together these features allow the user to perform all of the setup and operational procedures required to effectively use the Reporter. The advantage to the user is that a PC, although helpful, is not required to operate the Reporter while on-site.

Setup and operation of the CAR-24A from the front panel is somewhat different than operation via a PC. The tasks to be performed and the end results are identical but the methods employed are different. This chapter describes the methods that are unique to front panel operation. provides an illustration of the LCD panel and keypad.

FRONT PANEL DESCRIPTION

LIQUID CRYSTAL DISPLAY

The LCD panel consists of a display approximately 3″ by 1″ in size. It is configured to present four lines of data. Each line can contain twenty alphanumeric characters and symbols. The LCD characters are large and can be viewed easily from several feet away. The super-twist design of the LCD panel provides a viewing angle of ±20° from the level of the display. The contrast level of the display may be adjusted. This can be helpful when the Reporter is exposed to very hot or cold temperatures. The single-turn potentiometer that controls the contrast level is accessible through a small hole in the front panel of the Reporter. It is labeled "Adj". Use a small flat-head screwdriver to adjust the setting.

KEYPAD

The keypad contains twenty individual keys. Each key consists of a pushbutton switch. They are clearly labeled as to their various functions. The keys are spaced .65″ apart to minimize double hits. A special editing technique allows alphabetic characters to be entered via the keypad. The directional (▲, ▼, ◄, ►) and *Enter* keys also provide for quick menu item selection. Except while selecting a command or performing the special editing procedure, the left arrow key may be used to backspace over characters when an incorrect number has been entered.

> Unless otherwise stated, characters shown in italics are used to refer to specific keys on the keypad (e.g., *Browse*). This convention is used throughout the remainder of this chapter.

LED INDICATORS

The front panel of the CAR-24A also includes three LED indicators. Their use is described in the section entitled "LED Indicators" on page 52.

USB HOST PORT

A multi-use USB Host Port is also located on the front panel of the Reporter. It provides several very useful features as described in the next section.

HOW TO USE THE USB HOST PORT

Every CAR-24A is equipped with a USB Host Port designed for use with a FAT-32 formatted flash drive. The port can be used to save copies of selected Event Records to a compact, portable memory. Once saved, the resultant text records can be read and reviewed on any PC. They can also be copied or moved to a PC file on a hard drive. The user has the option of copying selected records with an appended digital signature, as if the Query Events command with Dump+S option had been used. Refer to the section entitled "Creating Secure Reports" on page 67 for additional information.

ⓘ Saving records to a flash drive is completely non-destructive to the original records. Records can be saved as many times as desired by the user.

ⓘ In the following illustrations the characters shown with a dark background indicate the initial position of the highlight and therefore, the presently selected command or option.

The USB Host Port can also be used to download and upload the Setup Database. The procedures for doing so are described in the sections entitled "Saving the Setup Database" on page 73 and "Update" on page 92, respectively.

Finally, the USB Host Port can be used to update the Reporter's firmware. This procedure is described in the section entitled "Update" on page 92.

SAVING RECORDS TO A FLASH DRIVE

Either of two simple procedures can be used to save Event Records to a flash drive. Typically only a few front panel keystrokes are required. A PC is not required. Both procedures are described in the following.

SAVING EVENT RECORDS FROM A COMPLETE DAY

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

2. Insert the USB flash drive into the connector of the USB Host Port.

3. Press the *Save/.* key. The following message will be displayed.

```
Save to flash drive:
Records for one day
Records for a range
Setup Data
```
Save Command

4. Press the *Enter* key after highlighting the Records for one day option.

5. A table of dates similar to the following will be displayed.

```
102414 102514 102614
102714 102814 102914
103014 103114
```

At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates.

6. Press the *Enter* key after highlighting a date. The following message will be displayed.

```
Digital Signature?

     Yes    No
```

7. Press the *Enter* key after highlighting the desired option. The following message will be displayed briefly after the delay required to create the text file.

```
Writing events.txt
Writing events.bin
Writing setupdata
       Success!
```

(i) If the digital signature option is selected, the completion of the events.txt file will be delayed significantly (more than one minute) if hundreds or thousands of records are being saved.

8. Records from additional complete days can be saved by repeating this procedure starting at step 2.

9. Remove the flash drive from the USB Host Port after all the required records have been saved.

SAVING EVENT RECORDS FROM A RANGE OF TIMES AND DATES

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

2. Insert the USB flash drive into the connector of the USB Host Port.

3. Press the *Save /.* key. The following message will be displayed.

```
Save to flash drive:
 Records for one day
 Records for a range
 Setup Data
```
Save Command

4. Press the *Enter* key after highlighting the Records for a range option.

5. A table of dates similar to the following will be displayed. The dates represent the available start date of the range.

```
102414 102514 102614
102714 102814 102914
103014 103114
```

At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates.

6. Press the *Enter* key after highlighting a date. The following message will be displayed.

```
Start time:
Enter=edit, Esc=OK
      00:00:00
```

7. To accept the 00:00:00 midnight setting as the start time, press the *Esc* key. To modify the start time move the highlight to the hours, minutes or seconds position. Press the *Enter* key. Press the number

keys as required to create a new value. The CAR-24A utilizes a military-style clock. Accordingly, 12:01:02 AM is defined as 00:01:02 and 12:59:58 PM is defined as 23:59:58. Leading zeros are not required. To accept the new value, press the *Esc* key. Using the same technique, adjust the other values as required. When the start time is correct, press the *Esc* key.

8. A table of dates similar to the following will be displayed. The dates represent the available end date of the range.

```
102414 102514 102614
102714 102814 102914
103014 103114
```

9. Press the *Enter* key after highlighting a date. The following message will be displayed.

```
End time:
Enter=edit, Esc=OK
        23:59:59
```

10. To accept the 23:59:59 setting as the end time, press the *Esc* key. To modify the end time use the procedure described in step 6. When the end time is correct, press the *Esc* key. The following message will be displayed.

```
Digital Signature?

    Yes   No
```

11. Press the *Enter* key after highlighting the desired option. The following message will be displayed briefly after the delay required to create the text file.

```
Writing events.txt
Writing events.bin
Writing setupdata
       Success!
```

ⓘ If the digital signature option is selected, the completion of the events.txt file will be delayed significantly (more than one minute) if hundreds or thousands of records are being saved.

12. Records from other times and dates can be saved by repeating this procedure starting at step 2.

13. Remove the flash drive from the USB Host Port after all the required records have been saved.

FILES WRITTEN TO THE FLASH DRIVE

The first time Event Records are saved via the USB Host Port a folder is automatically written to the flash drive. The name of the folder is taken from the first twenty characters of the Unit Name. Certain restrictions apply to the creation of the Unit Name. Refer to the section entitled "Unit Name" on page 30 for additional details.

After the folder is created, three files are written within the folder. A description of each file is listed in the following sections. All of the record files from a specific Reporter will be written to the same folder. Provided the first twenty characters of the assigned Unit Name are not changed, a new folder is never created regardless of how many record files are saved from the Reporter.

EVENTS TEXT FILE

The first file written is the text version of the Event Records. The file is assigned a filename formatted as follows: MM-DD-YY@hhmmss-mmddyy.txt. As a text file, this file can be read by any word processing application (e.g., Notepad or Word). Table 11 on page 73 provides a complete description and example of the filename format.

Text and Binary Filename Definition	Description
MM-DD-YY	The date of the first record saved to the flash drive.
hhmmss	The time the records were saved to the flash drive.
mmddyy	The date the records were saved to the flash drive.
.txt	Denotes the file as a text file readable by any word processor.
.bin	Denotes the file as a binary file readable only by GEA.
Example: 10-24-14@120127-103114.txt	The first record is from 10-24-14. They were saved to the flash drive at 12:01:27 pm on 10-31-14.

Table 11: Flash Drive Filenames

EVENTS BINARY FILE

The selected Event Records are also written to the flash drive as a highly compressed binary file. The filename is formatted similarly to the text file; however, the file extension is changed to .bin. The binary version of the record file is used exclusively by GEA for viewing and plotting of the Event Records.

SETUP DATABASE BINARY FILE

In order for GEA to view and plot the saved records a copy of the Reporter's Setup Database must be available. The Reporter's database file is always named setupdata.bin. This file is automatically overwritten each time a record file is written to the flash drive.

(i) At the present time, the .bin versions of the Event Record and Setup Database files are not supported by GEA. This may change at some point in the future at the direction of Union Pacific.

5

SAVING THE SETUP DATABASE

The Setup Database can be downloaded or saved directly to a USB flash drive. The following steps describe the applicable procedure.

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

2. Insert the USB flash drive into the connector of the USB Host Port.

3. Press the *Save /.* key. The following message will be displayed.

```
Save to flash drive:
Records for one day
Records for a range
Setup Data
```
Save Command

4. Press the *Enter* key after highlighting the Setup Data option.

5. The Setup Database will be immediately saved. The following message will be displayed briefly at the completion of the save operation.

```
Writing setupdata
     Success!
```

6.   The flash drive can now be removed from the USB Host Port.

Although the saved file will always be named SETUPDATA.BIN, it reflects the unique properties of the current location. As a binary file, it cannot be used in the procedure referred to in the section entitled "Upload Setup Data (U) - Restoring the Database" on page 25.

How to Use the Keypad

After power is applied, the CAR-24A will perform a firmware boot-up procedure. The LCD will remain blank for 10 to 15 seconds while the Reporter is booting. The following message will be briefly displayed at the completion of the boot-up procedure.

```
   MICRO-AIDE
  Model CAR-24A
  Alarm Reporter
  Version 1.11
```
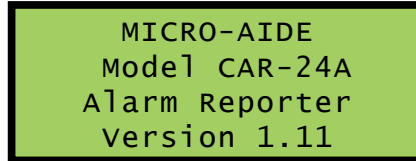
The reference to firmware version 1.11 may vary. The firmware version number should be recorded and saved in the event service ever needs to be performed on the unit. After the boot-up procedure is completed the Reporter will automatically enter Idle Mode. There are three operational modes, each is described in the following sections.

Idle Mode

Except as noted in the following, the real-time clock and Unit Name are displayed during Idle Mode. It is the at rest condition of the Reporter. An example of the real-time clock display is shown in the following. The first twenty characters of the Unit Name are listed in the fourth row. Refer to the section entitled "Unit Name" on page 30 for additional information.

Throughout the remainder of this chapter, the characters shown with a dark background indicate the initial position of the highlight and therefore, the presently selected command or option.

The following screen indicates that the CAR-24A is in Maintainer Mode. Maintainer mode is always enabled when power is first applied or restored to the Reporter. Press the front panel pushbutton switch labeled "Esc / Maintainer Mode" to initiate normal operation. Refer to the section entitled "Maintainer Mode" on page 51 for additional information.
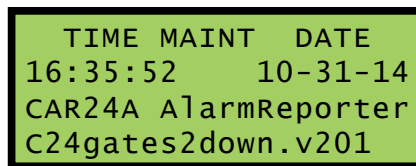
```
  TIME MAINT  DATE
 16:35:52    10-31-14
 CAR24A AlarmReporter
 C24gates2down.v201
```
LCD During Idle Mode

The CAR-24A utilizes the 24-hour, military time convention (e.g., 7:00 PM is shown as 19:00:00). The date and time display is altered once every minute for five seconds. Alternating messages referring to the Setup and Browse Modes are displayed during this period.

The real-time clock display is also interrupted in Idle Mode when new Event Records are logged. Each new event will be displayed only briefly. This process is useful in verifying that the Reporter is continuing to detect events. The Event Record format used by the LCD is described in the following section.

Event Record Format

Event Records consist of four lines of text. Sample records for several input types are shown in the following.

```
08:05:55.17 10-31-14
D06       1x....x....
Gate Up Ind
GateUp        On
```
LCD Event Record - Digital Input

```
09:47:56.69 10-31-14
A01  10.1Vdc x...
BatteryBank1
BB1          Batt1BAD
```
LCD Event Record - Analog Input

```
19:55:44.67 10-31-14
V02       1.x........
Virtual Gate Up
VGateUp      On
```
LCD Event Record - Virtual Input

```
20:24:26.70 10-31-14
L08
Alarm Input L08
Alarm        GD
```
LCD Event Record - Alarm Input

The first line of text always specifies the time and date the event was logged to memory. The date is listed in MM-DD-YY format.

The second line of text lists the Input Number. In the case of Digital, Analog and Virtual Input records it is followed by a sequence of x and . (period) characters. An x indicates an input with an active or On Event state. A . (period) indicates an input with an inactive or Off Event state. In the case of Analog Inputs the state indicators are preceded by the measured Analog Input level (e.g., 10.1 Vdc in the second sample record). In the case of Digital and Virtual Input records all twenty Digital and sixteen Virtual Input states cannot be depicted in the second line of text. Only a group of ten are shown. The one- or two-digit number that precedes the state field is the Input Number of the first state indicator. For Analog Inputs the state indicators, from left to right, pertain to A1 through A4.

The third line always lists the twenty characters of the assigned Input Name (e.g., BatteryBank1 in the second sample record).

Finally, the eight characters of the assigned Input Identifier and Event Name are listed in the fourth line from left to right, respectively. Input Identifiers and Event Names are described in "Input Names / Identifiers (I)" on page 39 and "Event Names (E)" on page 38, respectively.

BROWSE MODE

Browse Mode is most commonly used to view Event Records via the LCD panel. Event Records may be viewed in either forward or reverse chronological order. Events are selected by date and time and optionally by Input Number. However, two additional features allow the user to inspect the current status of an input or to measure the flash rate of a flashing circuit.

To access any of the Browse options press the *Browse* key. The following message will appear.

```
        Browse:
     Event Records
     Input Status
     Flash Rate
```

Browse Command

Each of the three options are described in the sections that follow.

EVENT RECORDS

After selecting the Event Records option a table of dates similar to the following will be displayed.

```
102414 102514 102614
102714 102814 102914
103014 103114
```

Browse Command-Event Records Option

At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates. Press the *Enter* key after highlighting a date. The display will then specify a start time as shown in the following.

```
Browse Start Time:
Enter=edit, Esc=OK
      00:00:00
```

Press the *Esc* key if records starting from midnight are to be inspected. To inspect records starting later in the day perform the following steps.

1. Using the left and right arrow keys position the highlight in the hour, minute or second field.

2. Press the *Enter* key to select the highlighted field.

3. Enter the required hours, minutes or seconds by pressing the appropriate numeric keys. Leading zeros are not required.

4. Press the *Enter* key to complete the entry.

5. Repeat the previous steps to adjust the remaining fields.

After the correct starting time is specified the *Esc* key should be pressed. The following message describing the use of the arrow keys will be briefly displayed.

```
Use ←→↑↓ to scroll,
Browse to select
input to query
```

Provided the *Browse* key has not been pressed, the first Event Record meeting the specified date and time will be displayed. Additionally, only records from inputs satisfying the Default Input Filter criterion will be displayed. Refer to the section entitled "Default Input Filter" on page 34 for additional information. The record format used by the LCD is described in the section entitled "Event Record Format" on page 74. The left and right arrow keys can be used to review Event Records in forward or reverse chronological order.

Holding down an arrow key allows the user to search through the record set very quickly.

The c24gates2down.v201 Setup Database provides a Default Input Filter setting of D1-20 A1-4 L1-20 S1-20. This setting provides for the display of all Digital, Analog, Alarm and System events. This setting does not provide for the display of Event Records from Virtual and Timer Inputs.

The limits of the record set will be indicated by a message stating either Start of Data or End of Data. To exit Browse Mode and return to Idle Mode press the *Esc* key.

Press the *Browse* key any time after the start time is specified to inspect records for a particular input. This procedure is referred to as Query by Input Number.

QUERY BY INPUT NUMBER

To inspect Event Records for a specific input press the *Browse* key after the starting time is specified. The following message will be displayed.

```
Input to query,
(--- uses default)
         ---
```
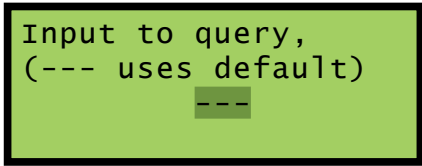
A flashing highlight will be positioned in the Input Number field located in the third row of text. To specify an input follow the steps listed in the following.

1. Press the *Alpha* key repeatedly until the desired input type (i.e., D, A, V, T, S or L) is displayed. If this setting is not modified the Default Input Filter setting will be used.

2. Press the appropriate number keys to enter the Input Number. Leading zeros are not required.

3. Press the *Enter* key to display the first Event Record satisfying the date, time and Input Number criteria. Several seconds may be required to locate the first record.

4. Use the arrow keys to inspect additional records for the specified input.

The *Browse* key can be pressed again at any time if a different input is to be inspected. Press the *Esc* key to exit the Query by Input Number procedure and return to Idle Mode.

The CAR-24A will log an Event Record to memory when the power is turned off as well as on. Additionally, a record will be logged if the measured temperature is outside the Temp Limits assigned by the user. These records are referred to as System Records and are associated with S-type inputs. Refer to the section entitled "System Events" on page 102 for additional details.

INPUT STATUS

The Input Status option allows the user to inspect the current state of each input. The status of Digital, Analog and Virtual Inputs is indicated by their assigned Event Names. Voltage measurements are reported for Analog Inputs. The Input Status feature can be of great use when setting up the Reporter. Without a peripheral device the user can verify that inputs are assigned proper Input Identifiers and Event Names. Each input can be checked to verify that it will report a change of state. Additionally, the command provides a DVM-like function for each Analog Input.

After selecting the Input Status option the following message will be displayed briefly.

```
Use ←→↑↓ to scroll,
Browse=select input
```
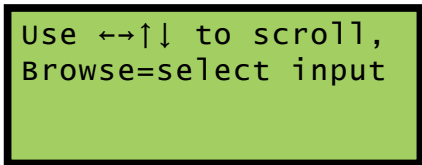
Browse Command - Input Status Option

The arrow keys can be used to scroll from one input to the next. Digital Inputs are followed by Analog Inputs. They are followed by Virtual Inputs. Rather than use the arrow keys to scroll sequentially through each input the user can jump to a specific input by pressing the *Browse* key. Select the input using the procedure described in "Query by Input Number" on page 77.

Sample status data for each input type is listed in the following.

```
D06
Gate Up Ind
GateUp       Up
```

LCD Input Status - Digital Input

```
A01
BatteryBank1
BB1        Batt1 OK
              13.6Vdc
```

LCD Input Status - Analog Input

```
V02
Virtual Gate Up
VgateUp      On
```

LCD Input Status - Virtual Input

The Input Number and Input Name are listed in the first and second rows, respectively. The Input Identifier and Event Name are listed in the third row. The fourth row is used to report analog levels. The data listed is updated automatically and in real-time. Without the aid of a PC the user can check the sequence of events at a crossing or while a control function is being exercised. Press the *Esc* key to exit the Input Status feature and return to Idle Mode.

F**LASH** R**ATE**

The third option included with the Browse command allows the user to measure the flash rate of a circuit. The following request for a Digital Input number will be displayed after selecting the Flash Rate option.

```
Measure Input:D20
```

Browse Command - Flash Rate Option

The user must enter the number of the flashing input (1-20). Leading zeros are not required. Press the *Enter* key to complete the entry. Flash rate data similar to the following will be displayed.

```
Measure Input:D20
Flashes/Min:  49.9
On/Off: 0.603/ 0.601
Cycle Time:  1.204
```

Measured Flash Rate

The Input Number and flash rate, measured in flashes per minute, are listed in the first two rows. The average on and off intervals of each flash pulse, measured in seconds, are listed in the third row. The lesser value is the optimum value to be assigned as the Detection Time for inputs using the reported flash rate. The sum of the average on and off intervals is reported as the cycle time in the fourth row.

Press the *Esc* key to exit the Flash Rate command and return to Idle Mode.

SETUP MODE

Setup Mode allows the user to set up the CAR-24A to a specific set of application requirements. The various commands that can be executed from the keypad form a subset of those performed via a peripheral device. Only a few commands are not applicable to the keypad (e.g., Transfer Files, Network). The results from any keypad-performed command are indistinguishable from those performed from a peripheral device. Accordingly, the setup descriptions that are a part of Chapter 3 may be used to provide a more detailed explanation of their keypad counterparts.

To enter Setup Mode from Idle Mode press the *Setup* key. The following message will be displayed. The user must enter the correct Passcode before any setup command can be executed.

```
Enter the passcode:



```
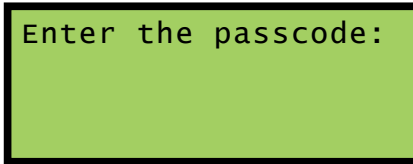
Passcode Request

The factory default Passcode is *12345678*.

Passcodes are assigned numeric values only. Press the *Enter* key to complete the entry. If the user fails to enter the correct Passcode an error message will be displayed.

Assuming the correct Passcode is entered the following message will be briefly displayed.

```
Use ←→↑↓ to select
items and then ENTER


```
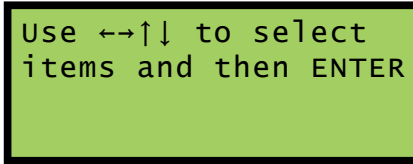
The Setup Menu of front-panel-accessible commands will then be displayed as shown in the following.

```
Clock TimZone CSMode
DTimes GDTime  UName
ENames INames Analog
Virtual Timer TLimit
```
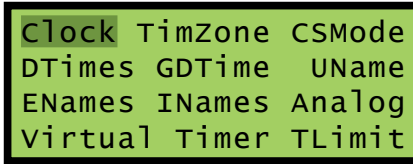
LCD Setup Commands‑Screen 1

Moving the highlight beyond the limits of the first menu will display the following additional commands.

```
PCode   Modem   Baud
Speed   Diag    TPMode
Update  RESET
```
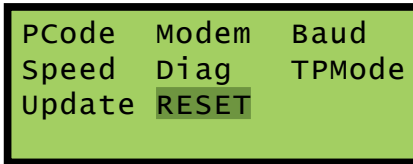
LCD Setup Commands‑Screen 2

The Setup Menu consists of 20 commands. Table 12 on page 79 provides a brief explanation of each command. To select a command advance the highlight to the desired command and press the *Enter* key. The use of each command is explained in the final sections of this chapter.

Name	Description
Clock	Set date and time
TimZone	Select Time Zone and enable / disable Daylight Saving Time
CSMode	Select Clock Sync Mode
DTimes	Assign Detection Times and enable / disable Flashing

Table 12: List of LCD Setup Commands

Name	Description
GDTime	Assign Detection Time to all Digital Inputs
UName	Assign Unit Name
ENames	Assign Event Name pairs
INames	Assign Input Names, Identifiers and Event Name pair number
Analog	Configure Analog Inputs
Virtual	Configure Virtual Inputs
Timer	Configure Timer Inputs
TLimit	Assign High and Low Temperature Limits
PCode	Assign Passcode
Modem	Assign Ring Count and Dial Numbers (not used)
Baud	Select Terminal Port Baud rate
Speed	Configure Train Speed Monitors
Diag	Perform system diagnostics
TPMode	Enable / disable Remote Port Mode
Update	Update Setup Database and firmware from USB Host Port
RESET	Erase all Event Records Restore Setup Database to factory default values

Table 12: List of LCD Setup Commands

Before proceeding the user should note that several of the commands require alphabetic characters to be used in the creation of a name or label (e.g., Input Name). The keypad, however, contains only numeric and function keys. A special Alphanumeric Editing Procedure which is a feature of the CAR-24A allows the user to create names and labels from an extensive set of characters. This procedure is described in the following.

ALPHANUMERIC EDITING PROCEDURE

The first step in the Alphanumeric Editing Procedure is to select the parameter that is to be edited (e.g., Input Name or Input Identifier). A flashing highlight is used to indicate a specific parameter. To select the highlighted parameter press the *Enter* key. A blank field of characters will be displayed. An underscore (i.e., _) will be positioned in the first character location. The underscore character is used as a cursor in the Alphanumeric Editing Procedure. The left and right arrow keys can be used at any time to position the cursor as required. To create an alphanumeric name perform the following steps.

1. Press the *Alpha* key. The following list of characters will be displayed.
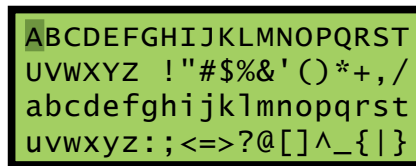
```
ABCDEFGHIJKLMNOPQRST
UVWXYZ !"#$%&'()*+,/
abcdefghijklmnopqrst
uvwxyz:;<=>?@[]^_{|}
```
Alphanumeric Characters

2. Using the arrow keys reposition the highlight until the desired character is highlighted. A total of eighty characters plus ten numbers are available for selection.

3. Press the *Enter* key to select the highlighted character. The selected character is placed into the name at the present location of the cursor. The cursor is then automatically moved one position to the right.

4. To enter a number into the name press the appropriate number key. To correct an error reposition the cursor under the character in error and overwrite it with a new character. To insert a space, assuming no characters have been inserted to the right, simply move the cursor to the right. The space characters follow the upper-case Z in the character set.

5. Repeat the previous steps until the name is completed.

6. Press the *Enter* key to accept the newly defined name. Alternatively, press the *Esc* key to retain the previously assigned name or to start again by ignoring all of the character entries.

CLOCK

The Clock command is used to change the date or time. The time is always listed in 24-hour, military-style format (e.g., 7:00 PM is listed as 19:00:00). In accordance with this convention the user must enter the time by using the same format. The date is always listed in MM-DD-YY format as shown in the following.

```
Time: 16:07:09
       MM-DD-YY
Date: 10-31-14
       Friday
```

Clock Command

To change the date or time position the highlight in one of the numeric fields. Press the *Enter* key. Enter a valid one- or two-digit number (leading zeros are not required). Press the *Enter* key to accept the new value. Adjust the other fields as required. The day of week is automatically calculated by the CAR-24A based upon the day, month and year selected by the user.

Press the *Esc* key after the changes have been made. The following message will be displayed.

```
Change the clock now

    Yes   No
```

To complete the command, select the desired option and then press the *Enter* key.

The clock of the CAR-24A can be precisely synchronized by a VPN or LAN accessible time server. The Clock Sync Mode must be set to SNTP. The Reporter supports SNTP-Unicast and SNTP-Multicast time syncing. Refer to the section entitled "CSMode" on page 81. If the clock cannot be synchronized MICRO-AIDE recommends that the clock be manually set once per month.

TIMZONE

The TimZone command is used to assign the Time Zone and control the Daylight Saving Time (DST) setting. A message similar to the following will be displayed after selecting the TimZone command.

```
TimZone:CST (UTC-6)
Daylight Saving Time
Enabled
```

Time Zone Command

The highlight will initially be placed in the TimZone field (e.g., CST (UTC-6) in the example cited previously). To select a new Time Zone setting press the *Enter* key repeatedly until the correct setting is displayed. There are seven Time Zone settings. They are listed in Table 4 on page 20.

To enable or disable the automatic adjustment for DST, position the highlight in the third row. Press the *Enter* key to change the current setting.

Press the *Esc* key to accept the current settings and complete the command.

CSMODE

This command provides three different methods of synchronizing the Reporter's real-time clock. However, Union Pacific requires that CSMode be set to SNTP as shown in the following display.

```
Clock Sync Mode:
None
SNTP
GPS
```
Clock Sync Mode Command

🚫 Do not alter the CSMode setting from SNTP.

Listed in the following is a description of the SNTP conventions used to synchronize the Reporter's clock.

SNTP-Unicast–A time server(s) on the LAN must be accessible to the Reporter via its Ethernet Port. The time server must support SNTP-Unicast. The IP Address of a primary and, optionally, a secondary time server must be assigned within the CAR-24A. Refer to the section entitled "SNTP Server - Primary and Secondary" on page 45. At 00:05:00 (i.e., five minutes past midnight) the Reporter will initiate a time sync with time server(s).

SNTP-Multicast–A time server on the LAN must be accessible to the Reporter via its Ethernet Port. The time server must be enabled for SNTP-Multicast operation. The time server's schedule determines when the Reporter's clock is synchronized.

DTɪᴍᴇꜱ

The Detection Time feature of the CAR-24A is used to prevent relay contact bounce from logging false Event Records. The Detection Time can be set to any value in the range from .000 to 32.767 seconds. A value of zero prevents the input from detecting events. The DTimes command is used to establish a unique Detection Time for each Digital Input. The command is also used to enable an input as a Flashing Input. Refer to the section entitled "Detect Times/Flash Enable (D)" on page 34.

Data similar to the following will be displayed after selecting the DTimes command.

```
Inp DetTime Flashing
D01   1.000    No
D02   1.000    No
D03   1.000    No
```
Detect Time Command

The c24gates2down.v201 settings are displayed in the sample data cited previously. The Digital Input number is listed at the start of each line. Press the up or down arrow keys repeatedly to select a different input. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input. To change the Detection Time for the selected input press the *Enter* key while the existing value is highlighted. A blank field with a cursor in the left-most position will be displayed. Enter a value by pressing the appropriate number keys. Use the decimal point (labeled "Save/.") to enter a fractional value. Leading zeros are not required. Press the *Enter* key to accept the new value.

To set an input as a Flashing Input position the highlight in the Flashing field. Press the *Enter* key to change the existing setting. Yes enables the input as flashing. No disables the input.

After all of the new settings have been assigned press the *Esc* key to complete the command.

GDTɪᴍᴇ

Use the Global Detect Time command to assign a common Detection Time value to all Digital Inputs. Data similar to the following will be displayed after selecting the GDTime command.

```
            GLOBAL
Detect Time: 0.000
```

Global Detect Time Command

To change the Detection Time for all inputs press the *Enter* key. A blank field with a cursor in the left-most position will be displayed. Enter a value by pressing the appropriate number keys. Use the decimal point (labeled "Save/.") to enter a fractional value. Leading zeros are not required. Press the *Enter* key to accept the new value. Press the *Esc* key to complete the command.

ⓘ The Detection Time of Digital Inputs assigned as sensors for the Train Speed Monitor feature cannot be altered by the DTimes or GDTime commands.

UNAME

The UName command can be used to assign a unique name to each CAR-24A. The first twenty characters of the Unit Name must be assigned in accordance with various rules. These are described in the section entitled "Unit Name" on page 30. A message similar to the following will be displayed after selecting the UName command.

```
Unit name:
C24gates2down.v201
```

Unit Name Command

The first twenty characters of the existing Unit Name are displayed in the second line of text. The c24gates2down.v201 Setup Database setting is displayed in the sample data cited previously. To change the name press the *Enter* key. Assign a new name or modify the existing name by using the "Alphanumeric Editing Procedure" on page 80. Press the *Esc* key to complete the command.

ⓘ Due to restrictions in the size of the LCD panel the UName command can be used to assign a Unit Name limited in length to twenty characters. Lengthier Unit Names (up to eighty characters) must be assigned by using the System Parameters command.

ENAMES

Event Names are created by the user to uniquely identify Event Records. By way of example, the state of an input can be labeled as "FXR Up" or "FXR Down" or "POR Up" or "POR Down". Event Names add clarity to Event Records that would otherwise not be possible if input states were only labeled as "On" or "Off". Event Names are always assigned in pairs to identify the active and inactive state of an input. As many as twenty Event Name pairs can be assigned. Refer to the section entitled "Event Names (E)" on page 38 for additional details.

Data similar to the following will be displayed after selecting the ENames command.

```
Event ON        OFF
01 On          Off
02 XR Up       XR Down
03 FXR Up      FXR Down
```

Event Names Command

Three Event Name pairs are displayed at one time. The number (i.e., 1 to 20) of the pair is listed at the start of each row. It is followed by the currently assigned active or On Event Name (e.g., On) and the existing inactive or Off Event Name (e.g., Off). To create a new name or modify an existing name select the Event Name pair by pressing the up or down arrow keys to advance through the list of twenty pairs. Use the left and right arrow keys to select either the on or off field. Press the *Enter* key. A blank field with a

cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 80 to create a new name. Use the same procedure to modify additional names.

After all of the Event Name pairs are defined press the *Esc* key to complete the command.

IN<small>AMES</small>

The INames command is a multi-purpose command that allows the user to assign Input Identifiers, Input Names and Event Name pairs to each input of the Reporter. Input Identifiers and Input Names allow the user to interpret Event Records more precisely by referring to inputs with labels that are unambiguous (e.g., Power Off Relay vs. Digital Input 10). Refer to the section entitled "Input Names/Identifiers (I)" on page 39 for additional details.

Data similar to the following will be displayed after selecting the INames command. In all cases the c24gates2down.v201 values are assigned.

```
D01      ID: XR
XR
Event ON/OFF pair:
02 XR Up    XR Down
```
Input Names Command

The Input Number is always displayed in the upper left-most corner. To select a different input press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Press the *Alpha* key repeatedly until the desired input type is displayed (i.e., D, A, V or T). Enter an Input Number by pressing the appropriate number keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input.

The field labeled "ID" will initially be highlighted. Move the highlight to the second row to select the Input Name. Press the *Enter* key to modify the highlighted assignment. A blank field with a cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 80 to create a new Input Identifier or Input Name.

To assign an Event Name pair to a specific Input Number move the highlight to the fourth row. Press the *Enter* key repeatedly until the desired Event Name pair (i.e., 1 to 20) is displayed. Each time the *Enter* key is pressed the fourth line of text will be automatically updated to reflect the contents of the selected Event Name pair. Pressing the *Enter* key while pair number twenty is displayed will return the user to pair number one. After all of the names and pairs are assigned press the *Esc* key to complete the command.

In the following example the Input Name and Identifier have been assigned as Power Off Relay and POR, respectively. Event Name pair number 10 states that an Event Name of POR Up will indicate an On Event. An Event Name of POR Down will indicate an Off Event.

```
D10      ID: POR
Power Off Relay
Event ON/OFF pair:
10 POR Up   POR Down
```
Input Name Command-Example

A<small>NALOG</small>

The Analog command is used to configure the four Analog Inputs of the CAR-24A. Each Analog Input can be used to monitor AC or DC voltages. Like a DVM, the CAR-24A can report its measurements using several different scales and resolutions. Analog Inputs that vary beyond an acceptable range of operation can be reported by setting appropriate Limit Values. Refer to the section entitled "High and Low Limits" on page 22 for additional details.

Data similar to the following will be displayed after selecting the Analog command.

```
A01 Range:+/-25.5Vdc
Filter:         Fast
High Limit:     15.6
Low Limit:      10.4
```

Analog Command

The Analog Input number is displayed in the upper left-hand corner. To select a different Analog Input press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input. The first row also indicates the Range setting. The Filter setting and High and Low Limit Values are listed in the remaining rows.

To change the Range setting, highlight the existing setting and press the *Enter* key until the desired Range is displayed. The sequence of possible Range settings is ±25.5 Vdc, +51.1 Vdc, ±255 Vdc, 25.5 Vac, 255 Vac, ±25.5 Adc and 25.5 Aac.

The Filter setting controls the amount of smoothing the measured signal is subjected to. AC signals require the Slow setting to remove their ripple content. DC signals can generally use either the Slow or Fast setting. To toggle the existing setting simply press the *Enter* key.

ⓘ All AC voltage and current measurements are reported in RMS units.

The Limit Values can be set separately. They cannot exceed the bounds of the Range setting. To change an existing setting highlight the value and press *Enter*. Use the number keys to enter the new value. Enter fractional and negative values by using the decimal and minus keys, respectively.

After the new settings have been assigned press the *Esc* key to complete the command.

VIRTUAL

Virtual Inputs allow the CAR-24A to identify and report a variety of signal conditions that may be of interest to the user. Generally, these conditions will refer to possible anomalies in the state of several relay circuits. High or low analog levels may also be of special concern to the user. The sixteen Virtual Inputs of the CAR-24A are configured by use of the Virtual command. Refer to the section entitled "Virtual Inputs (V)" on page 40 for additional information.

Data similar to the following will be displayed after selecting the Virtual command.

```
V01 (SETUP=function)
D01 D06 --- ---
Relay:     No
```

Virtual Command

In the sample data cited previously, Virtual Input number 1 was assigned per the c24gates2down.v201 Setup Database. The Virtual Input number is displayed in the upper left-most corner. To select a different Virtual Input press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input.

The second line of text includes four place holders for variables. Variables are Digital, Analog, other Virtual or Timer Inputs. The procedure for assigning variables is described in the following section.

Each Virtual Input can selectively operate the internal relay of the CAR-24A. Press the *Enter* key to toggle the existing Relay setting from No to Yes or vice versa.

ASSIGNING VARIABLES

A variable can be any valid Digital, Analog, other Virtual or Timer Input. To assign variables complete the steps listed in the following.

1. Press the left and right arrow keys to locate the highlight in a place holder field.

2. Press the *Enter* key.

3. Press the *Alpha* key until the desired input type designator appears (i.e., D, A, V or T).

4. Enter the desired Input Number by pressing the appropriate number keys.

5. Accept the new entry by pressing the *Enter* key.

6. Repeat the preceding steps if additional variables are required.

The final step is to select the states that each variable assumes in defining a Virtual Input.

Sᴇʟᴇᴄᴛɪɴɢ Sᴛᴀᴛᴇꜱ

A Virtual Input can be thought of as a logical relationship shared by one to four inputs. Accordingly, the state a Virtual Input assumes is dependent upon the state of each assigned variable. It follows that a Virtual Input dependent upon one variable is defined by a combination of two states. Two variables yield a combination of four states. Three variables yield eight states. Four variables yield sixteen states. Selecting states involves the assignment of a Virtual Input state for each combination of variable states.

Press the *Setup* key after all of the variables have been assigned. Data similar to the following will be displayed.

```
Virtual Output Funct
-----Inputs----- V01
D01 D06 --- ---
Off Off          Off
```
Virtual Command - Assigning States

For the sample data cited previously, two of four possible variables have been assigned to Virtual Input V1. The third line of text lists the assigned variables by Input Number. The fourth line of text lists a specific combination of states for the assigned variables. The right-most field indicates the state the Virtual Input assumes for the combination of variable states listed.

Variables (i.e., Digital, Analog, other Virtual and Timer Inputs) always assume either of two states. Each state is described in the following.

On–The Digital Input voltage is in the range from 9 to 36 Vdc. The Analog Input level is outside its acceptable range as defined by its assigned Limit Values. Refer to Figure 4 on page 22. The Virtual Input evaluates to a true logic state. The Timer Input has measured a delay that is less than its assigned Low Limit Value or greater than its assigned High Limit Value.

Off–The Digital Input voltage is less than 1 Vdc. The Analog Input level is within its acceptable range as defined by its assigned Limit Values. The Virtual Input evaluates to a false logic state. The Timer Input has measured a delay that is within the range of its assigned Limit Values.

The Virtual Input will assume the state defined by the setting in the lower right-hand corner. The label "Off" is used to identify the Off state. The label "On" is used to identify the On state. Press the *Enter* key to toggle the state of the Virtual Input from Off to On or vice versa. This setting will apply only to the combination of variable states displayed in the fourth line. Press the down arrow key to define the Virtual Input state for the next combination of variables.

Listed in the following are the four variable state combinations associated with the Virtual Input described previously. Each combination can be selected in the sequence listed by pressing the up or down arrow keys.

```
                           V01
D01  D06   ---    ---
off  off          off
On   off          On
off  On           off
On   On           off
```

In the sample data cited previously, the state of the Virtual Input is set to On only in the case when the XR (Digital Input 1) is in the XR Up state and the GateUp is in the Off state. Change the state of the Virtual Input as required by the remaining variable states. Press the *Esc* key to accept the new settings and complete the command.

TIMER

The CAR-24A is equipped with sixteen general purpose Timer Inputs. Refer to the section entitled "Timer Inputs (W)" on page 36 for additional information. To configure a Timer Input via the front panel select the Timer LCD command. Data similar to the following will be displayed.

```
T01 Frm:---   Evt:Off
        To:---   Evt:Off
  LowLim:  0.0
HighLim:  0.0
```

Timer Command

The presently selected Timer Input is always displayed in the upper-left corner (e.g., T01). To change the input press the up or down arrow keys repeatedly. Alternatively, jump to a specific input by pressing the *Browse* key and then the appropriate number keys. Complete the entry by pressing the *Enter* key.

To select the From and To Inputs move the highlight to the appropriate field and press the *Enter* key. Press the *Alpha* key repeatedly until the desired input type designator appears (i.e., D, A, V or T). Press the appropriate number keys. Complete the entry by pressing the *Enter* key.

Timer Inputs can be assigned as the From Input. This allows a Timer Input to trigger another Timer Input. However, a Timer Input cannot be assigned as the To Input.

Select the desired event setting by moving the highlight to the correct field and then pressing the *Enter* key. The current setting will be toggled between On and Off. Assign the High and Low Limit Values by locating the highlight as needed and pressing the *Enter* key. Press the appropriate number and/or decimal keys to assign a value. Complete the entry by pressing the *Enter* key.

The Limit Values can be assigned in the range from 0.0 to 999.9 seconds.

Select another Timer Input and repeat the preceding steps as necessary. After all of the required Timer Inputs are configured terminate the command by pressing the *Esc* key.

TLIMIT

The TLimit command allows the user to assign a High and Low Limit against which the internal temperature of the Reporter is compared. If the temperature is found to be outside the acceptable limits of operation, a System Event Record will be logged to memory. A second record will be logged when the temperature recovers to a normal level.

Data similar to the following will be displayed after selecting the TLimits command.

```
Temperature Limits:
High Limit:       140
Low Limit:        -40
```

Temperature Limits Command

The c24gates2down.v201 Limit Values are listed in the sample data. To change a Limit Value move the highlight to the appropriate field and press the *Enter* key. Enter a number using the number keys. Negative values can be entered. Limit Values can range from -67°F to 257°F. Accept the new value by pressing the *Enter* key.

The internal temperature and Limit Values are reported in degrees Fahrenheit.

PCODE

The Passcode feature prevents unauthorized users from altering the Setup Database via the front panel. Passcodes can contain any combination of numeric values not exceeding eight total. A message similar to the following will be displayed after selecting the PCode command.

```
Passcode: 12345678
```

Passcode Command

In the sample data cited previously the Passcode is set to its c24gates2down.v201 value. To change the Passcode press the *Enter* key. A blank field with the cursor in the left-most position will be displayed. Assign a new Passcode by pressing the appropriate number keys. To assign a null Passcode press the *Enter* key instead. This will effectively disable the Passcode protection feature. Access to the Reporter will be permitted by simply pressing the *Enter* key when the request for Passcode message is displayed.

Accept the new Passcode by pressing *Enter*. Press the *Esc* key to complete the command.

If the user forgets the assigned Passcode the System Parameters command should be executed. It will display the current Passcode assignment. Refer to the section entitled "Passcode" on page 32.

MODEM

This command applies exclusively to the internal Modem. However, at the present time the CAR-24A does not provide hardware support for the internal Modem. Accordingly, this command should be ignored.

BAUD

The Baud command allows the user to change the Baud rate assigned to the Terminal Port. The following array of Baud rates will be displayed after the Baud command is selected.

```
Term baud rate:   300
   600   1200   2400
  4800   9600  19200
 38400  57600 115200
```

List of Terminal Port Baud Rates

It is likely that the 9600 setting will be highlighted. It is the c24gates2down.v201 setting used by the Reporter. To assign a new Baud rate move the highlight to the desired setting by pressing the arrow keys. Press the *Enter* key to accept the new selection. The Baud rate of the peripheral device attached to the Terminal Port must be changed to match the new setting.

SPEED

The Speed command is used to configure the four Train Speed Monitors. Once parameters that comprise the feature are set the Reporter will report train speeds and instances of excessive speed. Refer to the section entitled "Measure Speed (M)" on page 42 for additional information regarding these parameters. Train speeds are reported via Event Records that are logged to memory.

Data similar to the following will be displayed after selecting the Speed command.

```
01: Sensor1: ---
    Sensor2: ---
Distance:   0 inch
Threshold:  0 MPH
```
Speed Command

There are five distinct parameters that must be assigned per monitor. The selected monitor (1 through 4) is always displayed in the upper-left corner. To change the selected monitor press the up or down arrow keys repeatedly. Alternatively, jump to a specific input by pressing the *Browse* key and then the appropriate number keys. Complete the entry by pressing the *Enter* key.

Both sensors must be assigned a valid Digital Input number. To assign a Digital Input highlight the appropriate field. Press the *Enter* key followed by the *Alpha* key. Enter a numeric value from 1 to 20. Leading zeros are not required. Complete the input assignment by pressing the *Enter* key.

The separation between the two sensors is used to set the Distance parameter. It can be set to any value in the range from 36 to 99 or 8 to 5280, assuming inch or feet is selected as the unit of measurement, respectively.

The unit of measurement can be set to inch or feet. Press the *Enter* key to toggle the setting.

Trains with monitored speeds in excess of the Speed Limit Value will be identified by a unique Event Record. The Speed Limit Value (labeled "Threshold") must be in the range from 5 to 180 mph. Setting either the Distance or Speed Limit parameters to zero will disable the selected Train Speed Monitor. Complete the command by pressing the *Esc* key.

5

DIAG

The Diag command can be used to test nine critical Reporter functions. Included are tests of the program memory, Event Record memory, internal relay, internal temperature and Ethernet Port. Each test can be performed at any time and is completely non-destructive. The contents of the Setup Database and Event Record memories will remain unmodified.

The following data will be displayed after selecting the Diag command.

```
Select test: ProgMem
FlashMem     GPS Rcvr
Ethernet       Modem
Health  Relay   Temp
```
Diagnostics Command - First Screen

```
Select test:Terminal
```
Diagnostics Command - Second Screen

The highlight will initially be positioned over the ProgMem field in the first screen. To select a different test, position the highlight in the desired field. Press the *Enter* key to perform the test. Each test is described in the sections that follow.

PROGMEM

A checksum of the entire program memory will be calculated and displayed after a few seconds. The following example shows the results of a typical ProgMem test.

```
Program Memory
Checksum=41c9 (GOOD)

Hit any key...
```
Program Memory Test

The labels GOOD or BAD will indicate the success of the test.

The reported checksum value will vary depending upon the version of the installed firmware.

FLASHMEM

The results of a typical FlashMem test are listed in the following.

```
Flash Mem
4096K

Hit any key...
```
Flash Memory Test

The test verifies that the microprocessor can properly access the Event Record memory. The reference to 4096K, 8192K or 16384K indicates the size in bytes of the memory device. A value of 0K indicates that a failure has been detected.

GPS RCVR

At the present time the CAR-24A does not provide hardware support for the GPS Receiver. Accordingly, the results of this test will always be as shown in the following.

```
GPS Rcvr Test: NONE

Hit any key...
```
GPS Receiver Test

ETHERNET

The Ethernet test will verify that the microprocessor is able to communicate with the Ethernet Port. A typical test result is displayed in the following.

```
Ethernet Test: Okay

Hit any key...
```
Ethernet Test

If the Reporter's microprocessor is able to communicate with the Ethernet Port, Okay will be reported. Otherwise, NONE will be reported.

The Ethernet test does not test for LAN communications. For this reason, MICRO-AIDE recommends that a ping test also be performed.

MODEM

At the present time the CAR-24A does not provide hardware support for the internal Modem. Accordingly, the results of this test will always be as shown in the following.

```
Modem Test...
Modem found:NONE

Hit any key...
```
Modem Test

HEALTH

The Health test allows the user to check if the Reporter can deliver messages to the message processing server. The following message indicates that a Health Check message was successfully sent.

```
Sending Health Check
Delivered OK
```

A failure is indicated by the following message. The time listed is the time left before the next retry (e.g., 01:59). The "failure" label is replaced by "no connect" if the Reporter is unable to establish a connection with the message processing server.

```
Sending Health Check
01:59 (failure)
```

The following message indicates that the Health Check message could not be sent because the Reporter is in Maintainer Mode.

```
Sending Health Check
Maint (Health)
```

If the Health Check message cannot be sent because of a pending alarm, the following message is displayed.

```
Delivery is busy
```

RELAY

The following message will be displayed after the Relay test is selected.

```
Relay: 1=ON, 2=OFF
Press ESC to exit
```
Relay Test

Press the *1* key to energize the relay. Press the *2* key to un-energize the relay. The relay and any circuitry attached to the relay contacts will be tested. Press the *Esc* key to complete the test. The relay will immediately reassume its previous state when the *Esc* key is pressed. Press any key to exit the test.

TEMP

The Temperature test reports the temperature inside the Reporter. A typical response follows.

```
Temp  88 Degrees F


Hit any key...
```
Temperature Test

The temperature is always reported in degrees Fahrenheit.

The temperature reading should never exceed 180°F. The temperature inside the CAR-24A will generally be about 5°F to 10°F warmer than the surrounding ambient temperature.

The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

Tᴇʀᴍɪɴᴀʟ

The Terminal option allows the user to display the status of the Terminal Port. A successful and active connection to the Terminal Port will always display the following status.

```
Terminal Port Status
IN:  DTR=ON   RTS=ON
Out: DSR=ON   CTS=ON
ESC to quit
```
Terminal Port Test

The Reporter automatically asserts the DSR and CTS output control signals as On. The user's connection must assert the DTR and RTS input signals as On. The status of the control signals is updated in real-time. If the connection is lost the DTR and RTS signals will be reported as Off.

If a Terminal Port connection cannot be made to the Reporter, the Terminal test should be performed to check the status of the DTR and RTS signals. An incorrect cable or configuration problem with the USB-to-serial adapter will likely be the cause of the failure.

TPMᴏᴅᴇ

The Terminal Port Mode command allows the user to enable or disable Remote Port Mode. Refer to the section entitled "Remote Port (R)" on page 60 for additional information. The following selection menu will be displayed after selecting the command.

```
Terminal Port Mode:
Terminal
Remote
```
Terminal Port Mode Command

Highlight either option, then press the *Enter* key to complete the change in mode. The Setup Menu of commands will be displayed.

If Remote Port Mode is enabled the Terminal Port will no longer be accessible to a locally connected PC. The port should then be connected to the alternate device.

Uᴘᴅᴀᴛᴇ

The USB Host Port can be used to save a copy of selected Event Records in an easy to read text format. Refer to the section entitled "Saving Records to a Flash Drive" on page 70. The port can also be used to update the Setup Database and firmware used by the CAR-24A. Both procedures are described in the following sections.

SETUP DATABASE

Before the current Setup Database can be updated a valid database file must be saved to the USB flash drive. Refer to the section entitled "Saving the Setup Database" on page 73. The file must be named SETUPDATA.BIN. It must be a binary file and it must be saved to the folder named for the targeted Reporter. Since it is a .txt file, the file c24gates2down.v201 cannot be used in this procedure.

The USB Host Port cannot be used with NTFS formatted flash drives.

To update the Setup Database follow the steps listed in the following.

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

2. Insert the flash drive into the USB Host Port.

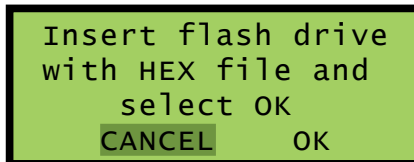3. Select the Update command. The following message will be displayed.

```
Item to Update
Setup Data
Firmware
```
Update Command

4. Select the Setup Data option to proceed. The following message will be displayed.

```
Insert flash drive
with setup file and
    select OK
CANCEL      OK
```

5. Select the OK option to proceed. The LCD will indicate that the new Setup Database file is being transferred. A single-line progress bar is used to indicate transfer activity. After a few seconds the transfer will automatically terminate and the following message will be displayed.

```
Updating SetupDat...
Success

Press any key...
```
Successful Update

6. Press the *Esc* key to complete the transfer. The Reporter will immediately operate in accordance with the new Setup Database.

FIRMWARE

MICRO-AIDE will periodically make available to its customers new firmware that either expands or improves upon the capabilities of its products. The new firmware will be available for downloading from our website. Visit: www.micro-aide.com/support/downloads.html.

Once the appropriate firmware file is downloaded and unzipped it will yield a .hex file. This file can be saved to a flash drive and then later used to update the Reporter's firmware.

The USB Host Port cannot be used with NTFS formatted flash drives.

The USB Host Port operates in strict accordance with various Microsoft standards that apply to filenames and folders. Accordingly, the .hex file name must not be altered to include several illegal characters. All .hex files downloaded from the MICRO-AIDE website are, after they are unzipped, guaranteed to be compliant with applicable Microsoft and USB Host Port standards.

Occasionally a new firmware release will be incompatible with the Reporter's existing Setup Database. When this happens the existing database will have to be erased and a new one created. Incompatibilities, if any, are listed in Table 3 on page 6. It should always be reviewed before proceeding with an update.

To update the firmware follow the steps listed in the following.

1. Verify the USB flash drive is formatted FAT-32, not NTFS.

2. Insert the flash drive into the USB Host Port.

3. Select the Update command. The following message will be displayed.
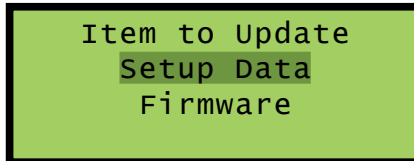
```
Item to Update
Setup Data
Firmware
```
Update Command

4. Select the Firmware option to proceed. The following message will be displayed.

```
Update Firmware
From USB Flash Drive
Yes   No
```
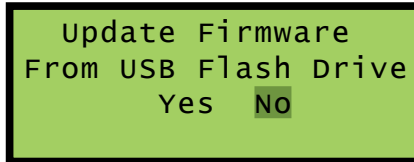
5. Select the Yes option to proceed. The following message will be displayed.

```
Insert flash drive
with HEX file and
select OK
CANCEL     OK
```
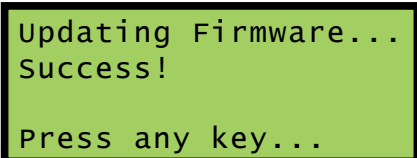
6. Select the OK option to proceed. Information similar to the following will be displayed.
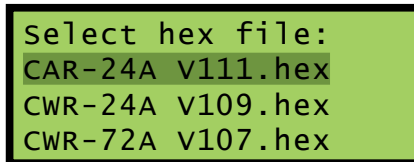
```
Select hex file:
CAR-24A V111.hex
CWR-24A V109.hex
CWR-72A V107.hex
```
File Selection
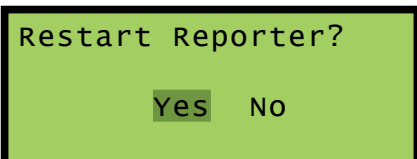
7. The Update command allows the user to select a file from a list of nine. The first group of three are depicted in the example. To navigate to the second or third group, press the up or down arrow keys.

8. Once the correct file is highlighted, select it by pressing the *Enter* key.

9. The LCD will indicate that the new firmware file is being transferred. A single-line progress bar is used to indicate transfer activity. After approximately 30 seconds the transfer will automatically terminate and the following message will be displayed.

```
Updating Firmware...
Success!

Press any key...
```
Successful Update

10. Press the *Esc* key to proceed. Finally, the following message allows the user to run or ignore the new firmware. Refer to the closing note. Select the Yes option to execute the new firmware by restarting the Reporter. The Update procedure has been completed.
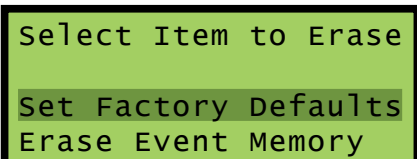
```
Restart Reporter?

     Yes   No
```
Restart Option

(i) At the completion of the transfer, the new firmware is saved in the non-volatile memory of the Reporter. However, the new firmware is not executed until such time as a restart is performed. A restart can also be performed by simply cycling power to the Reporter.

RESET

The Reset command should be used with caution. It allows the user to selectively restore the entire Setup Database to its factory default values or to clear the Event Record memory. Refer to the section entitled for additional information.

The following message will be displayed after the Reset command is selected.

```
Select Item to Erase

Set Factory Defaults
Erase Event Memory
```
Reset Command

To restore the entire Setup Database to its default settings highlight the Set Factory Defaults field and press the *Enter* key. Select Yes to perform the reset or No to ignore the reset.

To completely erase all of the Event Records from the event memory highlight the Erase Event Memory field and press *Enter*. Select Yes to perform the reset or No to ignore the reset.

⚠ It is important that the user not turn off power to the CAR-24A for 60 seconds after initiating a reset of the Event Record memory.

This concludes the chapter on how to operate the Reporter from the front panel. Since the setup of the Reporter is critical to how the CAR-24A will perform, it is advisable to review any changes that may have been made to the Setup Database.

The next chapter describes general maintenance techniques that may benefit the user in case a problem symptom is ever encountered.

USER NOTES

5

MICRO-**A**IDE

Chapter 6 – Maintenance

Introduction

The primary purpose of this chapter is to describe the recommended trouble-shooting methods to be used with the CAR-24A. It should be referred to if ever a questionable symptom arises during the operation of the Reporter.

The CAR-24A is designed to provide its user with many years of trouble-free operation. There are no user serviceable parts inside the unit. There are no consumable items or supplies that need to be replaced or replenished. The user may occasionally need to wipe dust away from the external surfaces of the unit. This should be done with a clean, dry cloth. The mechanical design of the chassis provides the internal electronic assemblies with a nearly sealed environment. Due to the low power consumption of the unit, ventilation holes are not required. The inside of the Reporter should remain clean indefinitely. Additionally, MICRO-AIDE printed circuit boards (PCBs) are sealed with a moisture and fungus resistant conformal coating.

Adjusting the LCD Contrast

The contrast level of the LCD panel may occasionally need to be adjusted to compensate for extreme variations in ambient temperature or viewing angle. To change the contrast level simply adjust the potentiometer labeled "Adj". It is accessible through a small hole in the front panel.

Working Inside the Reporter

At the direction of MICRO-AIDE technicians, the user may have occasion to work inside the unit to replace a failed item. Observe the steps listed in the following before attempting any task that involves opening the unit. Refer to Figure 2 on page 10 and Figure 3 on page 11. They illustrate the front and top sides of the Reporter, respectively.

1. Remove power from the Reporter by detaching the connector labeled "Power" located along the top side of the Reporter.

2. Remove all of the Analog and Digital Input connectors and peripheral cables.

3. Remove the Reporter from the backboard or equipment rack.

4. Remove the four 6-32 1/4" screws from the top and bottom sides of the front assembly. The front and back portions of the Reporter can then be completely separated.

The task can now be performed safely. After the work is completed reassemble the Reporter by reversing the steps listed previously.

The Processor PCB is equipped with two potentiometers that are set and sealed at the factory. Do not attempt to alter these settings. Electrostatic discharges can cause serious damage to electronic components. When handling circuitry inside the Reporter it is recommended that the user wear a wrist grounding strap.

REPLACING THE FUSES

There are two fuses mounted on the Processor PCB. The fuses are designed to protect the input power source and the contacts of the output relay. Each are rated at 1 A and conform to the 2AG size standard. Before replacing a fuse the cause of the blown fuse should be ascertained and cleared if possible. The fuses are illustrated in Figure 9 on page 98.
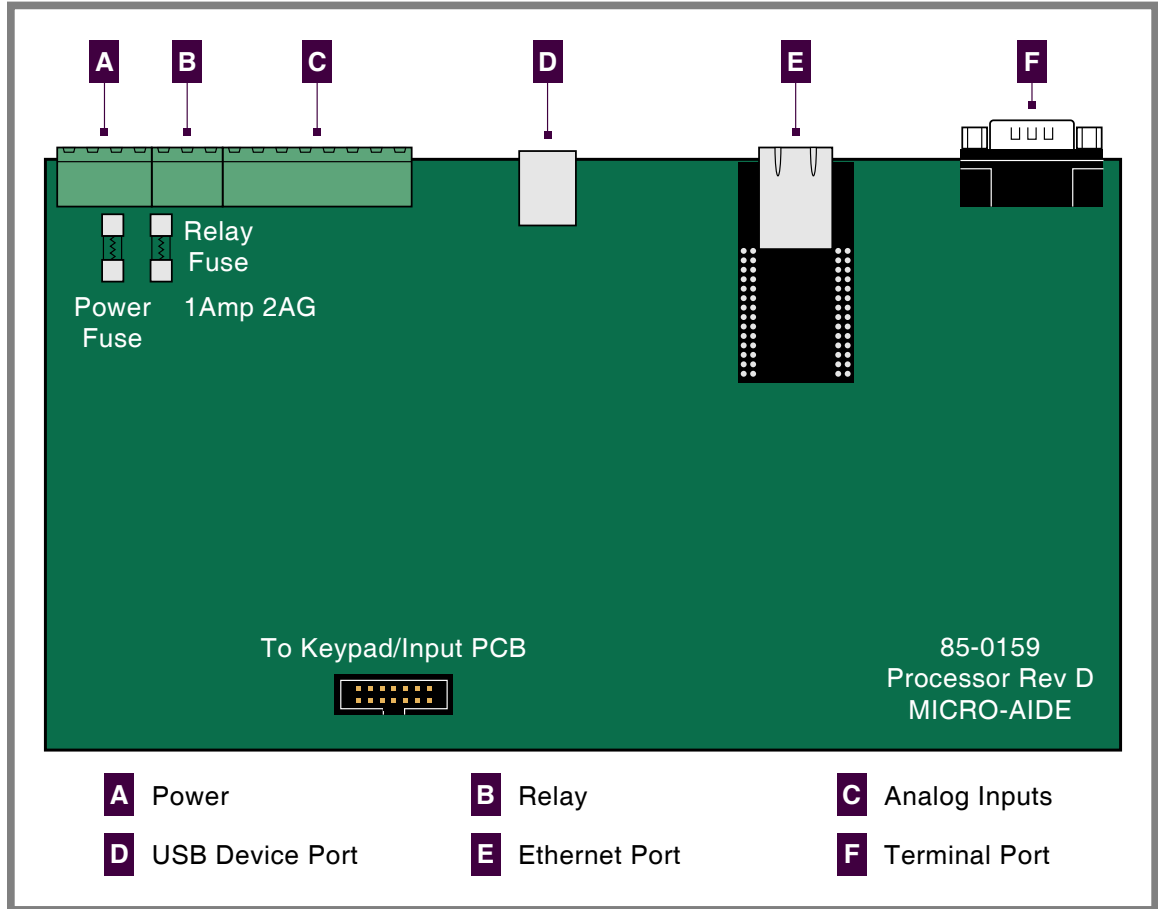

A Power	**B** Relay	**C** Analog Inputs
D USB Device Port	**E** Ethernet Port	**F** Terminal Port

Figure 9: Processor PCB

RECONNECTING THE INTERNAL CABLES

There are two ribbon cables inside the CAR-24A. A fourteen-conductor cable is used to connect the Keypad/Input PCB to the Processor PCB. To reconnect the cable simply seat its end into its respective connector. The connector end of the cable is keyed. Do not force the connector end into place. It should fit snugly but easily.

The second ribbon cable connects the Keypad/Input PCB to the LCD panel. It is easily damaged if improperly removed. Unless otherwise instructed by MICRO-AIDE service personnel, this cable should never be disconnected.

MEMORY EXPANSION

The amount of non-volatile flash memory used for storing Event Records is optionally expandable. The amount can vary considerably. However, the memory components required by any given expansion cannot be installed by the user. If the memory needs to be expanded, the Reporter will have to be returned to MICRO-AIDE. Memory expansion options are listed in section entitled "Options" on page 111.

DIAGNOSTIC TESTING

The Main Menu of commands for the CAR-24A includes the Diagnostics command. Refer to the sample data entitled "Main Menu" on page 53. The Diagnostics command can be used to quickly verify the operational integrity of several hardware elements of the Reporter. Each of the nine tests can be performed at any time. They are non-destructive and therefore will not alter the contents of the Setup Database.

The following menu of commands will be displayed in response to selecting the Diagnostics command.

```
                    System Diagnostics

            C Checksum Test Program Memory
            F Flash Memory Test
            G GPS Receiver Test
            E Ethernet Test
            H Send Health Check Message
            M Modem Test
            K Keypad Test
            R Relay Test
            T Temperature
```

Diagnostics Command

Each command performs a specific test. The tests are described in the following sections.

CHECKSUM TEST PROGRAM MEMORY (C)

The Program Memory Test reads every memory address location used to store the program code. As part of the reading process a checksum is calculated and displayed at the completion of the test. The same checksum must be calculated each time the test is performed. Either GOOD or BAD will be reported at the completion of the test.

A typical response to the Program Memory Test is listed in the following.

```
            Program Memory Checksum=41c9
                                GOOD

                     Test Complete
               Press any key to continue
```

Program Memory Test

The checksum takes only a moment to calculate. The checksum value of 41c9 in the previous example will vary with the version of the firmware installed in the Reporter.

FLASH MEMORY TEST (F)

The Flash Memory Test is performed on the non-volatile memory used to store the Setup Database. The test verifies that the microprocessor can properly access the memory.

A typical response to the Flash Memory Test command is listed in the following.

```
            Flash Memory1: 4096K


                     Test Complete
               Press any key to continue
```

Flash Memory Test

The test should report a memory size of either 4096K, 8192K or 16384K. A failure has been detected if 0K is reported. The readings should be compared to the known memory capacity of the Reporter.

GPS RECEIVER TEST (G)

At the present time the CAR-24A does not provide hardware support for the GPS Receiver. Accordingly, the results of this test will always be as shown in the following.

```
                    GPS Receiver not installed


                          Test Complete
                      Press any key to continue
```

GPS Receiver Test

ETHERNET TEST (E)

The Ethernet Test can be performed at any time to verify that the microprocessor can communicate properly with the Ethernet Port. The test can be performed while the port is active or idle.

Assuming the Ethernet Port is operating properly, the following message will be reported.

```
                          Ethernet Okay


                          Test Complete
                      Press any key to continue
```

Ethernet Test

Okay is used to indicate a successful test. Not installed is used to indicate a failure.

The Ethernet Test does not test for VPN or LAN communications. For this reason, MICRO-AIDE recommends that a ping test also be performed.

SEND HEALTH CHECK MESSAGE (H)

The Send Health Check Message test allows the user to check if the Reporter can deliver messages to the message processing server. Successful deliveries and failures are indicated by messages displayed in the following sections. Message responses are reported shortly after the test is initiated.

```
                    Sending Health Check message
                        Message delivered OK
```

Send Health Check Message Command - Success

Automatically issued or user-initiated, Health Check messages are sent once if they succeed in being delivered. If the message fails, four additional attempts are made. Each successive attempt is delayed 2 minutes. A maximum of five attempts are made before a failure is declared.

If the message is able to be sent, but fails, the following response will be displayed.

```
                    Sending Health Check message
                        Message delivery failed
```

Send Health Check Message Command - Failure

Health Check messages will not be sent while Maintainer Mode is active. The following response is displayed to indicate this condition.

```
                    Sending Health Check message
                    Maintainer Mode (Health Check Pending)
```

Alarms messages that are pending delivery will also block the transmission of Health Check messages. This condition is noted by the following response.

```
                Cannot send, alarm delivery in progress


                          Test Complete
                      Press any key to continue
```

Health Check messages that cannot be sent while the 2-minute delay is in effect are noted by the following response. The displayed timer value will count down each second.

```
                     Sending Health Check message
                     Waiting 01:53, last attempt no connect
```

MODEM TEST (M)

At the present time the CAR-24A does not provide hardware support for the internal Modem. Accordingly, the results of this test will always be as shown in the following.

```
                          Modem Test in progress...
                          Modem found: NONE

                              Test Complete
                          Press any key to continue
```

Modem Test

KEYPAD TEST (K)

Each of the twenty keys that comprise the front panel keypad can be checked by using the Keypad Test. The following instructions are displayed after selecting the command.

```
Keypad test, press ESC to cancel
```

Keypad Test

A single unique character is displayed in response to pressing a key. The correspondence between non-numeric keys and displayed characters is listed in Table 13 on page 101.

Key	Browse	Alpha	Setup	Esc	Enter	Save / .	▲	▼ / -	◄	►
Displayed	B	A	S	E	N	.	^	v	<	>

Table 13: Keypad Test Characters

To exit the test, press the **Esc** key located at the keyboard of the peripheral device that is communicating with the CAR-24A.

RELAY TEST (R)

The Relay Test allows the user to verify the operation of the internal relay and any alarm or indication circuitry connected to the contacts of the relay.

The following message will be displayed in response to the Relay Test command. Press the appropriate numeric key to change the state of the relay. To energize the relay select the Relay ON option. To un-energize the relay select the Relay OFF option.

```
                               Relay Test

                              1 Relay ON
                              2 Relay OFF
```

Relay Test

TEMPERATURE (T)

The Temperature Test simply reports the temperature inside the Reporter.

A typical response to the Temperature Test command is listed in the following. The temperature is always reported in degrees Fahrenheit.

```
                      Unit Temperature  78 Degrees F

                              Test Complete
                          Press any key to continue
```

Temperature Test

⚠ The measured temperature inside the CAR-24A will generally be 5°F to 10°F warmer than the surrounding ambient temperature. Temperature readings should never exceed 180°F.

ⓘ The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. The MICRO-AIDE "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

SYSTEM EVENTS

Event Records are normally created by a change in state of an input. Exceptions to this rule concern the cycling of power to the Reporter, variations in the measured temperature and events related to the Train Speed Monitor feature. The latter feature is described in the section entitled "Measure Speed (M)" on page 42.

Each time power to the CAR-24A is turned on or off an event will be logged into memory. If the temperature transitions into or out of the acceptable range of operation or the speed of a train is reported, an event will also be logged. Additionally, each time the SNTP Clock Sync feature sets the Reporter's real-time clock an Event Record is logged. These events are classified as System Events. To distinguish them, the Input Number always includes an S-prefix (e.g., S01). Additionally, the Input Name, Identifier and Event Name fields within the record are uniquely labeled. They cannot be changed by the user. Table 14 on page 102 lists the various fields used by each System Event Record.

Input Number	Input Name	Identifier	Event Name Pair
S01	System Power	Power	ON / OFF
S02	High Temperature	HighTemp	ON / OFF
S03	Low Temperature	LowTemp	ON / OFF
S04	Sntp Clock Sync	SntpSync	OFF / OFF
S05	GPS 5 Sec Correction	GPS 5Sec	OFF / OFF
S06	GPS Clock Record	GPS Rec	OFF / OFF
S07	Maintainer Mode	Maint	ON / OFF
S08	Flash Rate Alarm	FlashAlm	ON / OFF
S09	Speed Monitor 1	SpeedLim	ON / OFF
S10	Speed Monitor 2	SpeedLim	ON / OFF
S11	Speed Monitor 3	SpeedLim	ON / OFF
S12	Speed Monitor 4	SpeedLim	ON / OFF

Table 14: System Event Records-Assigned Labels

System Events can be reviewed using either of the two formatting options. Record formats are described in the section entitled "Event Record Formatting" on page 62. Listed in the following are six sample Event Records as they would appear at the PC. In the interest of simplicity the No Details, single-line form is shown.

```
05:18:27.000  10/31/14  System Power       Power    OFF   S01
05:18:59.244  10/31/14  System Power       Power    ON    S01
14:11:51.000  10/31/14  High Temperature   HighTemp ON    S02
15:00:09.000  10/31/14  High Temperature   HighTemp OFF   S02
15:31:04.371  10/31/14  Speed Monitor 1    SpeedLim ON    S09   16MPH
16:00:00.643  10/31/14  Sntp Clock Sync    SntpSync OFF   S04
```

Sample System Event Records

The first two records indicate that power was off to the Reporter for approximately 32 seconds. Later in the same day the measured temperature was found to be excessive for 48 minutes. A train speed

violation of 16 mph occurred at 15:31:04.371. At 16:00:00.643 the time server synchronized the Reporter's clock.

The Sntp Clock Sync record listed previously is shown in the following as it would appear at the front panel LCD.

```
16:00:00.64 10-31-14
S04
Sntp Clock Sync
SntpSync    OFF
```

LCD System Event Record

System Events can be Queried and Browsed just like other Event Records. Instead of selecting a D, A, V, T, F or L input type designator, select the S-type.

System Events are always logged to memory in chronological sequence. The power on event will immediately follow the power off event. The time between the two Event Records indicates the period during which no logging was possible. All of the Analog Input measurements for S1 records will be reported with a zero value. This is done to eliminate erroneous readings.

UPDATING THE FIRMWARE

Like any microprocessor-based product, the CAR-24A executes a stored memory program. The program, referred to as firmware, is saved in a Flash Memory chip. Flash Memory chips are uniquely characterized by their permanent storage and multiple write properties. Their use allows the CAR-24A firmware to be updated to a newer version by simply uploading a new program file. The once common practice of shipping and replacing a Programmable Read Only Memory (PROM) chip does not apply to the CAR-24A. Consequently, there is no need to open the unit to gain access to the Processor PCB.

It is preferable to perform the firmware update procedure, described in this section, via a PC connected to the Terminal Port or USB Device Port. A firmware update can also be performed very easily by using the USB Host Port. The instructions for doing so are described in the section entitled "Update" on page 92.

6

Occasionally a new firmware release will be incompatible with the Reporter's existing Setup Database. When this happens the existing database will have to be erased and a new one created. Incompatibilities, if any, are listed in Table 3 on page 6. It should always be reviewed before proceeding with an update.

The steps necessary to complete the firmware update depend upon which communications application is being used. The following example describes the HyperTerminal method. HyperTerminal 7.0 was used in the following procedure. Other versions of this program may be slightly different. However, the fundamental approach will remain valid.

If the Reporter's Terminal Port is used in the following procedure, hardware flow control must be enabled at the PC's comm port.

1. The user must be online with the Reporter and the Main Menu should be displayed. Refer to the sample data entitled "Main Menu" on page 53.

2. From the Main Menu select the Transfer Files command. The following sub-menu of commands will be displayed.

```
               File Transfer

    D Download Setup Data CAR to PC
    U Upload Setup Data PC to CAR
    F Firmware Upload
```

Transfer Files Command

3. Select the Firmware Upload command. The following warning will be displayed.

```
Are you SURE you want to upload new Firmware?
                    No Yes
```

4. To proceed select Yes. The following additional warning will be displayed.

```
OK to erase Firmware and upload new Firmware in Intel HEX format?
                            No Yes
```

5. To proceed select Yes. A final precaution will be displayed as follows.

```
Do you want to ABORT this operation
                No Yes
```

6. To proceed select No. After a short delay the following message will be displayed.

```
Please send Intel HEX file now.
```

7. Within the HyperTerminal window, click on the Transfers command, then the Send Text File... command. The Send Text File dialog box will open.

8. In the drop down list box select All files (*.*) as the type of file to display.

9. Select the correct disk drive, folder and filename (e.g., CAR-24A V111.hex). If the various settings are correct click on the Open button.

10. The progress of the upload will be indicated by a sequence of period (.) characters.

11. The update will terminate automatically after a few minutes. The following message will indicate a successful file transfer.

```
Done!
Press ESC to continue
```

6

12. Press the **Esc** key as instructed. The following message will be displayed.

```
Do you want to restart the CAR-24A Alarm Reporter
                        No Yes
```

13. Select Yes to initialize the new firmware. At the conclusion of the initialization the user will be asked to log on.

After completing the firmware update procedure it may be necessary to execute the Reset System command. A reset should be performed only if recommended by MICRO-AIDE customer service technicians. Refer to the section entitled "Reset System (R)" on page 27.

TROUBLE-SHOOTING GUIDE

The following guide is provided to assist the user in resolving problems that may occur with the operation of the CAR-24A. It can be especially helpful when attempting to operate the Reporter for the first time. Procedures for resolving both local and remote problems are listed. Where multiple steps are indicated it is recommended that they be performed in the order listed.

If the user is unable to resolve the problem, MICRO-AIDE customer service technicians should be contacted. The user will be asked to state the problem, related symptoms, and indicate any operations or conditions that have a bearing on the problem. If available, the results of any diagnostic tests should be reported.

Symptom or Problem	Resolution
No indication of power.	Verify 9 to 36 Vdc at B and N power terminals.
	Inspect fuse on Processor PCB.
PC will not connect via USB Device Port.	Verify USB Type A-B cable is being used.
	Verify correct USB device driver is installed. Refer to Appendix D.
PC does not display data when connected to the Terminal Port.	Check cable connection to Terminal Port.
	Verify cable is assembled per Figure 10 on page 109.
	Check Baud rate setting.
	Check if Terminal LED on front panel illuminates.
	Perform Terminal Diagnostic test. Refer to "Terminal" on page 92.
Terminal Port data at PC is garbled.	Check Baud rate setting.
	Verify following settings: 8 data bits, no parity, 1 stop bit, hardware flow control is enabled.
Highlight cannot be moved using PC arrow keys.	Set PC for ANSI emulation.
PC does not communicate via Ethernet Port when directly connected.	Verify Reporter's IP Address and Port Number are correctly assigned and properly targeted by the PC.
	Verify PC's Ethernet Port is configured properly.
	Verify PC's communications application is set up for TCP/IP protocol.
	Verify CAT-5 cable is being used.
Setup Database transfer fails via Ethernet Port connection.	Verify text file transfer protocol is being used.
	Initiate an Ethernet session to test Ethernet Port connection.
SNTP fails to provide accurate clock control.	Verify time server supports SNTP-Unicast and SNTP Server address is valid.
Real-time clock is incorrect by one or more hours even when SNTP clock syncing is functional.	Verify correct Daylight Saving Time and Time Zone settings.
Cannot save Event Record files to flash drive.	Verify the USB flash drive is formatted FAT-32, not NTFS.
	Verify flash drive is fully seated into USB Host Port.
	LED on flash drive should flash as files are being saved.
	Test integrity of flash drive by plugging it directly into a PC and copying files from the PC.
	Try another flash drive.
Unable to update firmware using USB Host Port.	Verify the USB flash drive is formatted FAT-32, not NTFS.
	Verify flash drive is fully seated into USB Host Port.
	Verify flash drive contains an unzipped firmware file.
	Verify firmware filename ends in .hex.
	Verify firmware filename does not include illegal characters.
	Verify length of firmware filename does not exceed 20 characters.

Table 15: Guide to Trouble-Shooting Techniques

Symptom or Problem	Resolution
Initial Check-Out Procedure fails on all inputs.	Verify polarity of test voltage is applied correctly. Verify Detection Times are not set to zero or too long. Check inputs using View Events command.
Alarms and/or Event Records are not being created on some inputs.	Check wiring, especially polarity. Set Detection Time to shorter value. Verify Detection Times are not set to zero. Verify proper settings in Alarm Configuration Table. Reload Setup Database.
Flashing inputs create multiple Event Records.	Enable flashing status for inputs. Set Detection Time, in seconds, to value of 30÷fpm rate.
Analog Input AC source measures 0.	Analog Input is configured for DC, change to AC.
Analog Input DC source measures correctly but reports AC units.	Analog Input is configured for AC, change to DC.
Negative Analog Input voltage is not reported, measures 0.	Analog Input Range is set to +51.1 Vdc, change to ±25.5 Vdc or ±255 Vdc setting.
AC analog readings are not stable.	Reassign the analog Filter setting to Slow.
DC analog readings are not tracking voltage changes.	Reassign the analog Filter setting to Fast.
Timer Input is not reporting an Event Record.	Verify valid inputs are assigned in the From and To fields. Verify the assigned inputs are each generating state changes.
Upload/Download of Setup Database fails.	Verify text file transfer protocol is being used.
Internal relay will not operate.	Perform Relay Test command. Verify relay is enabled by Virtual Input. Disconnect the external circuit attached to the relay contacts, test again.
Visibility of LCD characters is poor.	Adjust LCD contrast.
Alarm and Health Check messages are not being sent successfully.	Check Network settings. If used, verify cell modem is using a correct template. Perform a ping test of the Reporter's Ethernet Port.

Table 15: Guide to Trouble-Shooting Techniques

This completes the User Manual for the CAR-24A. As an aid to the user five appendices have been provided. The first two appendices list detailed specifications and options applicable to the CAR-24A. The third appendix provides a functional description of the Alarm Configuration Table that is a part of the c24gates2down.v201 Setup Database. Instructions on how to install the Windows drivers that support the USB Device Port feature are included in Appendix D. The installation and use of MICRO-AIDE's RSA Validator software is the subject of Appendix E.

Any comments the reader may have on how to improve this manual are welcomed. Comments should be forwarded to the Director of Marketing, MICRO-AIDE Corporation.

SPECIFICATIONS

Physical
Size (with mounting brackets)
Length: 9.5″
Height: 7.7″
Depth: 3.2″
Weight
2.6 lb.

Environmental
Storage
Temperature: -50 °C to 85 °C
Humidity: 0 to 95 %, non-condensing
Operating
Temperature: -40 °C to 72 °C
Humidity: 0 to 95 %, non-condensing

Mounting
Shelf or backboard, includes mounting brackets

Construction
Chassis
Fully enclosed, anodized aluminum
Externally accessible keypad, LEDs and connectors
Electrical
All components mounted on conformal coated, internal PCBs

Power
Voltage
Range: 9 to 36 Vdc
Consumption
Maximum: 3 W

Isolation
Power
Minimum: 3800 Vdc from B and N terminals to chassis and inputs
Digital Inputs
Minimum: 3800 Vdc to any terminal
Analog Inputs
Minimum: 3800 Vdc to any terminal
Input to Adjacent Input
Digital: minimum 3800 Vdc
Analog: minimum 3200 Vdc
Ethernet Port
Minimum: 3800 Vdc to any terminal
USB Host and Device Ports
Minimum: 3800 Vdc to any terminal

Alarms
Quantity: 20 total, appropriate for crossing applications, user-defined
Types: Set, Cleared and periodic Health Check

Alarms (continued)
Definitions
User-assigned inputs and input states qualify each Alarm
Transmission
Sent to Union Pacific message processing server via Union Pacific VPN or LAN
Operating Modes
Automatic: messages sent via VPN or LAN using DNS or fixed IP Addressing
Maintainer Mode: disables Alarm transmission while crossing is being tested or repaired
Validation Time
As defined by Alarm Configuration Table, 0 to 99,999 seconds

Capacities
Inputs
Digital: 20, all optically isolated
Analog: 4, voltage or current (optional)
Virtual: 16, user-assigned
Timer: 16, user-assigned
Train Speed Monitor: 4, user-assigned
Outputs
Relay: 1, form C, rated for 2 A at 24 Vdc or 1 A at 125 Vac, maximum switching capacity of 125 VA or 60 W, service life 1 million electrical (typical)
Event Storage
Standard: 302,084 records
Maximum: 1,269,572 records
Liquid Crystal Display
Characters: 80 total on 4 lines
Viewing Area: 2.8″ by .8″
Front Panel Keypad
Quantity: 20 keys

Physical Inputs
Input Impedance
Digital: minimum 10 KOhms, optically isolated
Analog: minimum 10 MOhms
Range
Digital Input - On: 9 to 36 Vdc
Digital Input - Off: 0 to 1 Vdc
Analog DC Voltage: 3 scales, ±25.5 Vdc, +51.1 Vdc, ±255 Vdc
Analog AC Voltage: 2 scales, 25.5 Vac, 255 Vac
Analog Current: 2 scales, ±25.5 Adc, 25.5 Aac
Event Validation Times
Digital: .001 to 32.767 seconds, compatible with fixed rate flashing circuits
Analog: fast and slow filter settings

Analog Limit Values
Voltage
High and Low Limits: in multiples of .1 V or 1 V
Current
High and Low Limits: in multiples of .1 A

Analog Input Accuracy
Typical Voltage: ±.15 V or ±1.5 V
Typical Current: ±.2 A

Virtual Inputs
Definitions
Any logical association shared by 1 to 4 variables (i.e., Digital, Analog or other Virtual Inputs)
Assigned by defining the state of the Virtual Input for each combination of variable states
Alarm Usage
Can be used to Set or Clear an Alarm as defined within the Alarm Configuration Table
Recording Usage
Creates standard Event Records
Relay can be controlled by each Virtual Input

Timer Inputs
Programming
Any input can be assigned as a trigger or terminating source
On or Off events can be assigned as a trigger or terminating source
Limit Values
High and Low Limits: in multiples of .1 seconds
Range: 0.0 to 999.9 seconds
Reporting
Measured Time is reported in each Timer Input Event Record
Violation of Limit Values are also reported

Temperature Sensing
Usage: measures and reports internal temperature of Reporter
High and Low Limits: -67 °F to 257 °F

Train Speed Monitor
Operation
Reports excessive train speed
Logs standard Event Record
Sensors
Digital Inputs: 2 required
Distance: 36″ to 99″ or 8′ to 5280′
Limit Values
5 to 99 mph or 5 to 180 mph

A

Memory

Type
Non-volatile, Event Records and Setup Database are stored in flash memory chip

Newest data over-writes oldest data, 129th day over-writes first day

Storage Longevity
Infinite with power off

Rated for 100,000 write operations

Ports

RS-232
Quantity: 1, for use with a PC

Terminal Emulation: ANSI

Baud Rates: 300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200

Bit Format: 8-N-1

USB Host
Compatible with any FAT-32 formatted flash drive

Can create a text file of Event Record data from any time span

Can be used to update firmware

USB Device
Eliminates need for serial comm port

Data transfer rates of 4.71 Mbps

Ethernet
Type: 10/100 Base-T, typically connected to cellular modem or directly to LAN

Protocols: HTTP-Get, TCP/IP, Telnet, SNTP-Unicast, SNTP-Multicast

User Interface: provides remote or local access via TCP/IP connection

Settings: user-assignable IP Address, port, subnet mask, dual IP Addresses for time server

Connectors

Power
Detachable, screw-down, 4-position, 12 to 22 AWG

Dual B and N terminals

Digital Inputs
Detachable, screw-down, 10-position, 12 to 22 AWG

Connectors (continued)

Analog Inputs
Detachable, screw-down, 8-position, 12 to 22 AWG

Relay
Detachable, screw-down, 3-position, 12 to 22 AWG

Normally open, normally closed and common terminals

Terminal Port
DE-9 male, configured as modified DCE

Can also serve as Terminal Port to alternate device

USB Host Port
USB Type A female

USB Device Port
USB Type B female

Ethernet Port
RJ-45 female

Indicators

LCD Panel
Includes LED back lighting for enhanced visibility

Displays numerous command menus for configuring the Reporter and retrieving data

Front Panel LEDs (3)
Active Alarm: red, illuminates when one or more Alarms are active

Message Sent: green, illuminates for 5 seconds when message is sent

Terminal: green, flashes with send and receive data

Ethernet Port LEDs (2)
Green: link established

Yellow: data activity

Controls

Keypad
Located on front panel, below LCD

Keys: 0-9, Browse, Alpha, Setup, Esc/Maintainer Mode, Enter, Save/., left, right, up, down/-

LCD Contrast Adjust
Single-turn pot., accessible from front panel

Internal Clock

Accuracy
Typical: ±8 seconds per month (3 ppm) when not synchronized

Volatility: maintains accuracy for minimum of 30 days with loss of power

Resolution: .001 seconds for all Event Records

Sync
SNTP-Unicast: via primary or secondary time servers, once per day at 00:05:00

SNTP-Multicast: per time server schedule

Operation
Time Zones: selectable from 7 different North American settings

Daylight Saving Time: enable or disable automatic adjustment

Leap Year: automatically adjusted

Password Protection

Administrative Level
Access: unrestricted to all functions

Length: 8 characters

Restricted Level
Access: modifications restricted to site-specific parameters of Setup Database, unrestricted viewing of all data and Setup Database parameters

Length: 8 characters

Passcode
Access: limited modifications to Setup Database via front panel

Length: 8 digits

MICRO-AIDE reserves the right to make changes, at its sole discretion, to any specification listed herein.

TRANSFER RATES

lists typical bit transfer rates for each of the CAR-24A's user-accessible ports. In each case the same 20,000 Event Records with no-detail formatting were either dumped to a PC file or saved directly to a flash drive. The times listed are normalized relative to 1,000 Event Records. If speed is a concern, using the USB Device Port is highly recommended.

Port	Time to transfer 1,000 Event Records (sec)	Actual transfer rate (bps)	Relative speed compared to 38,400
Terminal Port (38,400)	19.0	38,396	Used as reference
Terminal Port (115,200)	6.4	114,845	3.0 times faster
USB Host	2.8	n/a	6.7 times faster
Ethernet Port	.2	4,704,075	122.5 times faster
USB Device Port	.2	4,714,063	122.8 times faster

Table 16: Bit Transfer Rates by Port

TERMINAL PORT CABLE

The following cable is included with every CAR-24A.

CAR Terminal Port
DE-9 Female

Comm Port of PC
DE-9 Female

DCE ← Direction as shown → DTE

DCD*
DSR
RD
RTS
TD
CTS
DTR
RI*
Gnd

*Connected, but not used

Shield is not attached
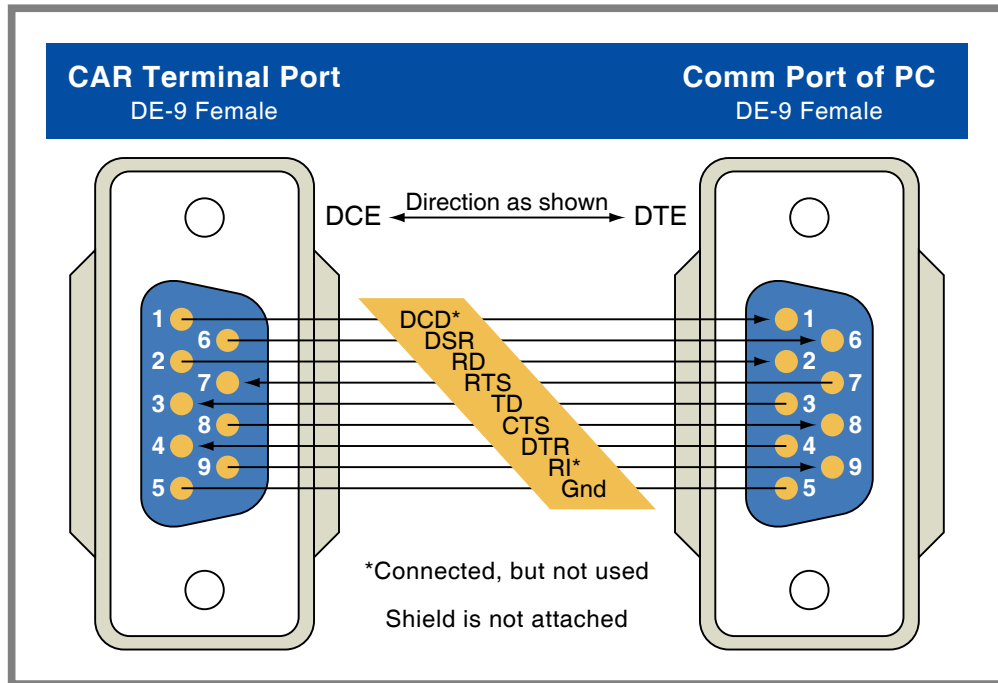
Figure 10: Terminal Port Cable - Wiring Diagram

A

U~SER~ N~OTES~

A

OPTIONS

Memory Expansion

40-0416
624,580 Event Records

40-0816
1,269,572 Event Records

ACCESSORIES

Current Sensor

HCS-4
High Current Sensor, 4 inputs, 1 to 20 Adc or Aac

Battery Charger Monitor

CSI-1
Charge Status Indicator, single input, monitors voltage and current

Voltage Detector

FVD-2
Failed Voltage Detector, 2 inputs, .5 to 48 Vdc, .5 to 36 Vac, high and low limit values, selectable timing

Light Out Detector

FLD-2
Failed Lamp Detector for incandescent, halogen or LED lamps, 2 lamp circuits, DC or AC lamp current

Mounting

31-0002
23″ rack mounting brackets

Cables
DE-9 to DE-9 (included)

USB A-B cable (for use with USB Device Port)

B

Contact MICRO-AIDE when ordering any options or accessories
Purchase orders should list part numbers as listed above

USER NOTES

B

MICRO-AIDE

INTRODUCTION

The Alarm Configuration Table (ACT) establishes many of the operational aspects of the CAR-24A. It is used to decide which crossing faults or conditions will be reported as Alarm messages. It follows that the ACT is a key aspect of the Setup Database. This Appendix provides a detailed description of the ACT as it is defined in Union Pacific's c24gates2down.v201 Setup Database.

ALARM DEFINITIONS

The following sample data is from the ACT included in the c24gates2down.v201 Setup Database. The section entitled "Alarm Configuration (L)" on page 47 provides a detailed description of how to prepare the ACT.

```
                          Alarm Configuration
        SetInp SetState SetTime SetName ClrInp ClrState ClrTime ClrName MaintClr
        ------ -------- ------- ------- ------ -------- ------- ------- --------
   L01   A01      On      600     B1     A01     Off      300     1B      No
   L02   A02      On      600     B2     A02     Off      300     2B      No
   L03   A03      On      600     B3     A03     Off      300     3B      No
   L04   A04      On      600     B4     A04     Off      300     4B      No
   L05   D10     Off     1800     IP     D10     On       300     PR      No
   L06   D10     Off     7200     PK     D10     On       300     PR      No
   L07   V01      On      180     GU     V02     On         2     GC      Yes
   L08   V03      On       45     GD     V04     On         2     GC      Yes
   L09   D01     Off     1800     LA     D01     On        10     CL      Yes
   L10   ---     Off        0            ---     Off        0             No
   L11   ---     Off        0            ---     Off        0             No
   L12   ---     Off        0            ---     Off        0             No
   L13   ---     Off        0            ---     Off        0             No
   L14   ---     Off        0            ---     Off        0             No
   L15   ---     Off        0            ---     Off        0             No
   L16   ---     Off        0            ---     Off        0             No
   L17   ---     Off        0            ---     Off        0             No
   L18   ---     Off        0            ---     Off        0             No
   L19   ---     Off        0            ---     Off        0             No
   L20   ---     Off        0            ---     Off        0             No
```

Alarm Configuration Table

The c24gates2down.v201 Setup Database defines nine Alarms. They are identified as L01 through L09. A description of each Alarm is provided in Table 17 on page 114. The table lists Digital Input states as either On or Off. These states are defined as follows.

On–The Digital Input voltage is in the range from 9 to 36 Vdc for a duration greater than 1 second.

Off–The Digital Input voltage is less than 1 Vdc for a duration greater than 1 second.

C

Issue	ID	Type	Name	Description
Battery	L01	Set	B1	Sets B1 Alarm when Analog Input 01 voltage is below 10.4 Vdc or above 15.6 Vdc for 10 minutes.
		Clear	1B	Clears B1 Alarm when Analog Input 01 voltage is between 10.4 Vdc and 15.6 Vdc for 5 minutes.
Battery	L02	Set	B2	Sets B2 Alarm when Analog Input 02 voltage is below 11.2 Vdc or above 16.8 Vdc for 10 minutes.
		Clear	2B	Clears B2 Alarm when Analog Input 02 voltage is between 11.2 Vdc and 16.8 Vdc for 5 minutes.
Battery	L03	Set	B3	Sets B3 Alarm when Analog Input 03 voltage is above 20.0 Vdc for 10 minutes.
		Clear	3B	Clears B3 Alarm when Analog Input 03 voltage is below 20.0 Vdc for 5 minutes.
Battery	L04	Set	B4	Sets B4 Alarm when Analog Input 04 voltage is above 20.0 Vdc for 10 minutes.
		Clear	4B	Clears B4 Alarm when Analog Input 04 voltage is below 20.0 Vdc for 5 minutes.
Power out (short duration)	L05	Set	IP	Sets IP Alarm when POR (Digital Input 10) is Down for 30 minutes.
		Clear	PR	Clears IP Alarm when POR (Digital Input 10) is Up for 5 minutes.
Power out (long duration)	L06	Set	PK	Sets PK Alarm when POR (Digital Input 10) is Down for 2 hours.
		Clear	PR	Clears PK Alarm when POR (Digital Input 10) is Up for 5 minutes.
Gates Not Up	L07	Set	GU	Sets GU Alarm when Virtual Gate Not Up (Virtual Input 01) is On for 3 minutes.
		Clear	GC	Clears GU Alarm when Virtual Gate Up (Virtual Input 02) is On for 2 seconds.
Gates Not Down	L08	Set	GD	Sets GD Alarm when Virtual Gate Not Dn (Virtual Input 03) is On for 45 seconds.
		Clear	GC	Clears GD Alarm when Virtual Gate Dn (Virtual Input 04) is On for 2 seconds.
Crossing active too long	L09	Set	LA	Sets LA Alarm when XR (Digital Input 01) is Down for 30 minutes.
		Clear	CL	Clears LA Alarm when XR (Digital Input 01) is Up for 10 seconds.

Table 17: Alarm Descriptions

Virtual Inputs 01 through 04 are defined as follows.

- Virtual Input 01 is On when the XR (Digital Input D01) is Up **AND** the Gate Up Ind (Digital Input D06) is Off.
- Virtual Input 02 is On when the XR (Digital Input D01) is Up **AND** the Gate Up Ind (Digital Input D06) is On.
- Virtual Input 03 is On when the XR (Digital Input D01) is Down **AND** the Gate Down Ind1 (Digital Input D07) is Off **OR** the Gate Down Ind2 (Digital Input D08) is Off, **OR BOTH** are Off.
- Virtual Input 04 is On when the XR (Digital Input D01) is Down **AND** the Gate Down Ind1 (Digital Input D07) is On **AND** the Gate Down Ind2 (Digital Input D08) is On.

APPENDIX D – USB DEVICE DRIVERS

INTRODUCTION

Every CAR-24A is equipped with a USB Device Port. The device port can be used to directly connect the Reporter to a PC that does not include a serial comm port. The port also provides a substantially higher speed connection. Bit transfer rates of 4.71 Mbps can be achieved. Table 16 on page 108 lists the bit transfer rates of each user-accessible port.

This appendix provides a detailed description of how to select and install the proper drivers for the USB Device Port. Separate procedures for Windows XP® and Windows 7 are listed in the sections that follow.

The following procedure requires access to several files. The correct files are available for downloading from the MICRO-AIDE website at: www.micro-aide.com/support/downloads.html

Do not attempt to install driver files from any source other than the MICRO-AIDE website.

The correct files to be used are contained in a zip file named "stm_device_drivers.zip". Do not use the zip file named "usb_device_drivers.zip".

PREPARATION

The following pre-installation steps must be completed before the driver installation procedure can be started.

- Download the file named "stm_device_drivers.zip" from the MICRO-AIDE website. Unzip the downloaded file. The two extracted files must then be saved to a known location (e.g., to a new folder located at the PC desktop).

- The extraction will yield two files named "STM32_V1.3.1_Setup.exe" and "STM64_V1.3.1_Setup.exe". The first is intended for use in 32-bit Windows systems. The latter is for 64-bit systems.

- A USB Type A-B cable is required.

- Apply power to the Reporter and insure that it has completed its initialization cycle.

INSTALLING THE DRIVERS

WINDOWS XP PROCEDURE

The following procedure applies to Windows XP computers. Complete the following steps in the order listed.

1. Launch the 32-bit installer by double-clicking the STM32_V1.3.1_Setup.exe file. A screen similar to the following will be displayed.
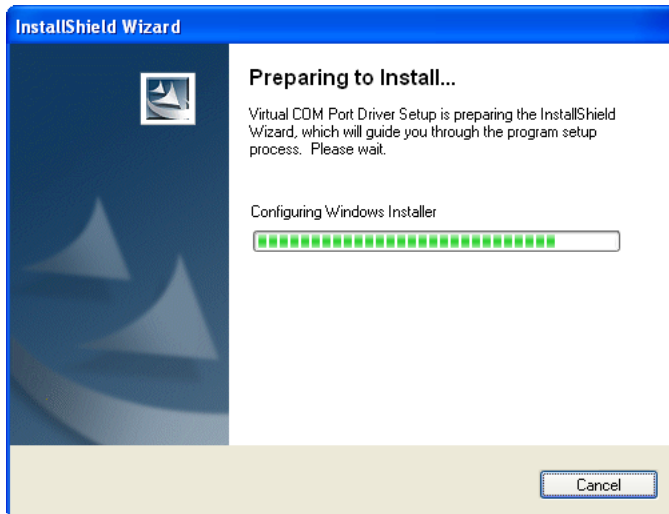
2. After a few seconds the previous screen will close automatically. After several more seconds the following screen will be displayed.
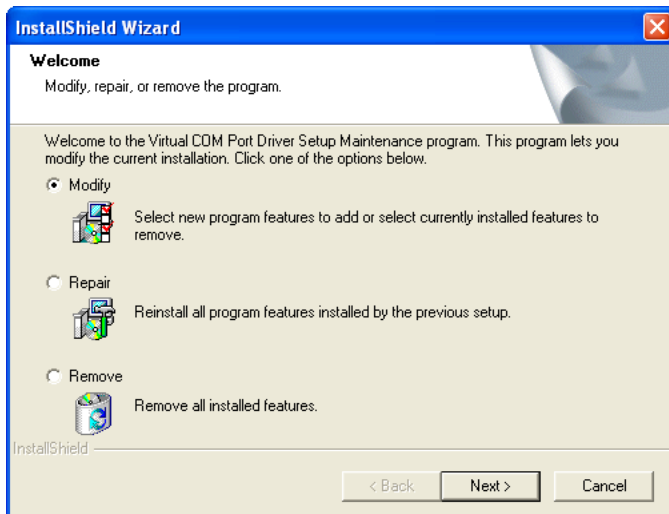
3. Click the button labeled "Next>". The following screen will be displayed.
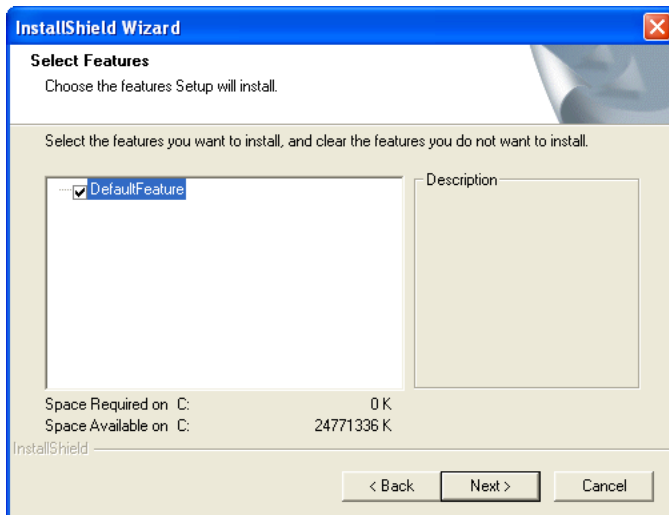
4. Click the button labeled "Next>". The following screen will be displayed briefly.

D

MICRO-AIDE
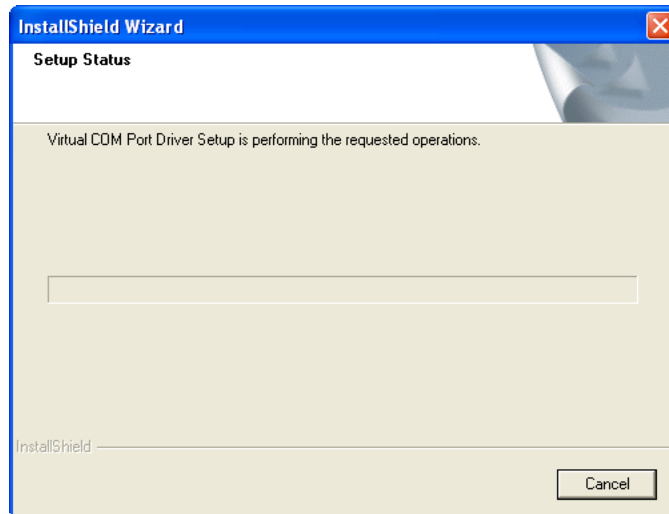
5. The previous screen will close automatically. The following screen will be displayed.
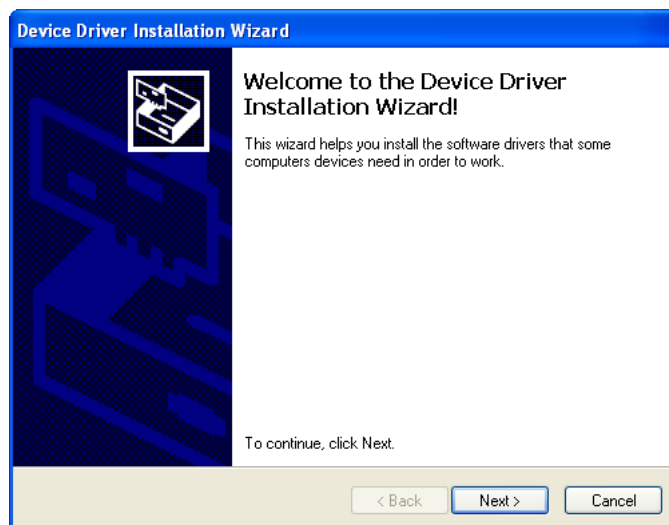
6. Click the button labeled "Next>". The following screen will be displayed briefly.
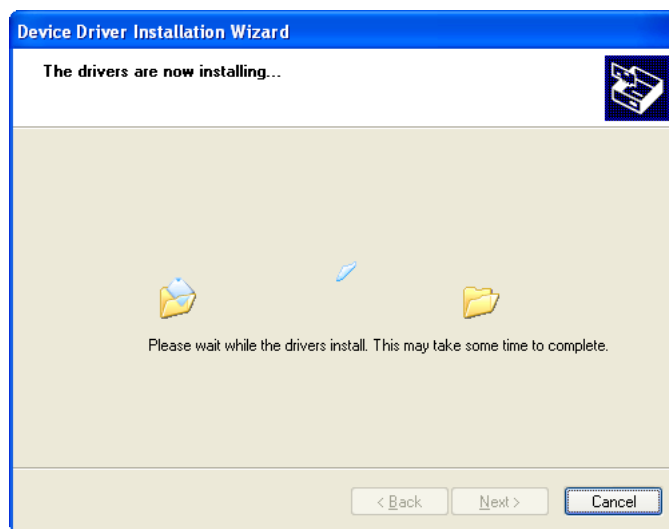
7. The previous screen will close automatically. The following screen will be displayed.
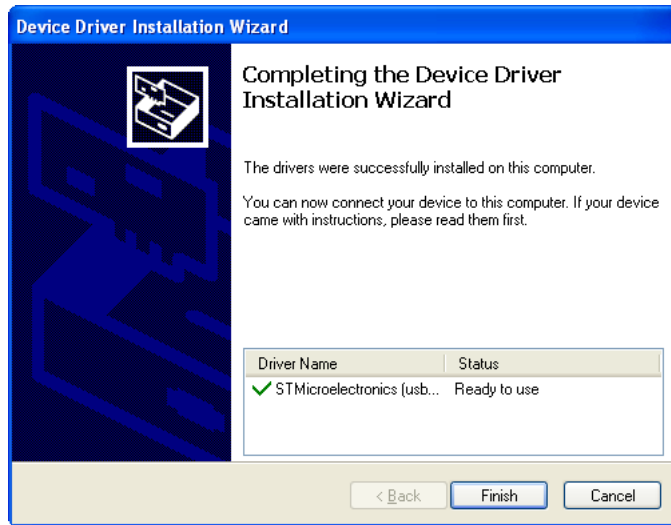
8. Click the button labeled "Finish". The required drivers are now installed. A new HyperTerminal connection can now be created. Follow the procedure entitled "Making a USB Device Port Connection" on page 121.

WINDOWS 7 PROCEDURE

The following procedure applies to Windows 7 computers. Complete the following steps in the order listed.

1. Launch the 64-bit installer by double-clicking the STM64_V1.3.1_Setup.exe file. A screen similar to the following will be displayed.
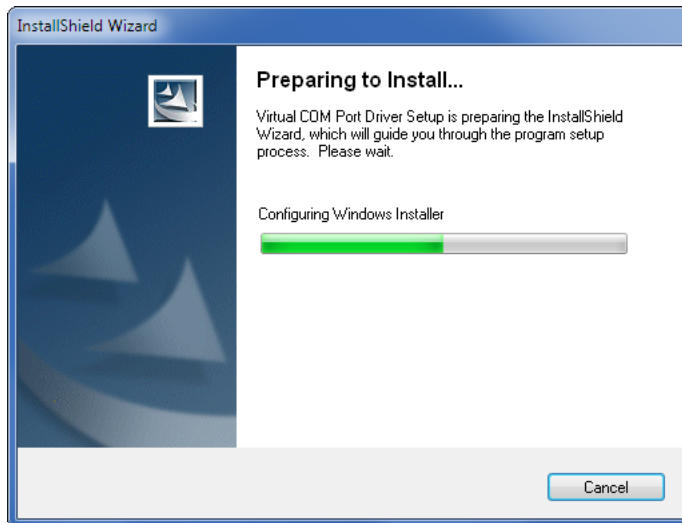
2. After a few seconds the previous screen will close automatically. After several more seconds the following screen will be displayed.
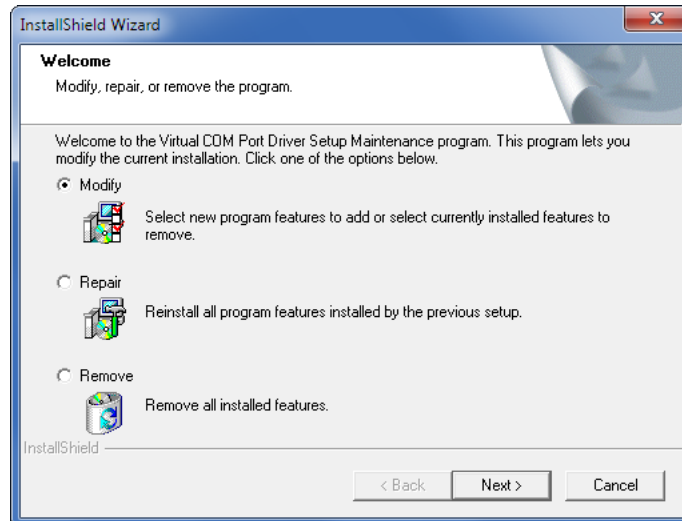
3. Click the button labeled "Next>". The following screen will be displayed.
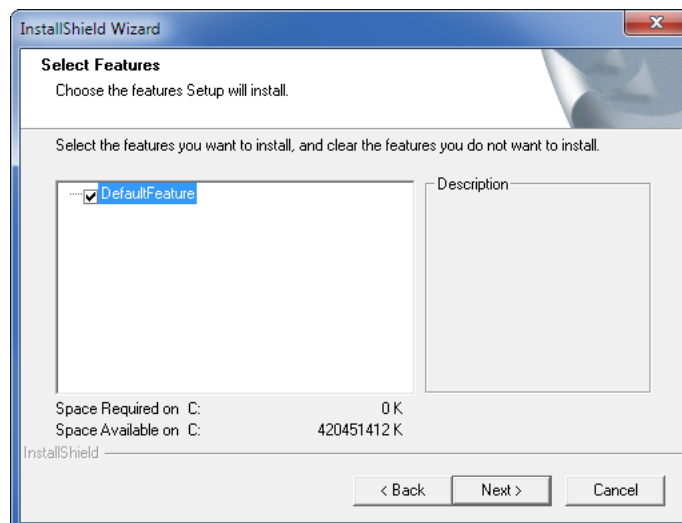
4. Click the button labeled "Next>". The following screen will be displayed briefly.

5. The previous screen will close automatically. The following screen will be displayed.
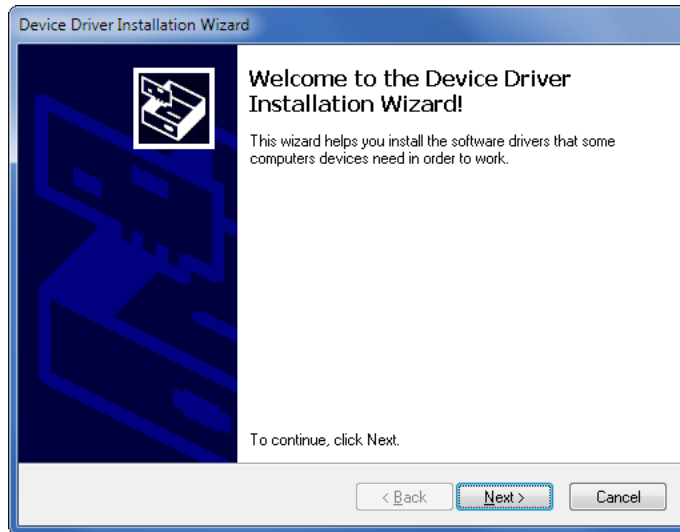
D

6. Click the button labeled "Next>". The following screen will be displayed briefly.

7. The previous screen will close automatically. The following screen will be displayed.

8. Click the button labeled "Finish". The required drivers are now installed. A new HyperTerminal connection can now be created as described in the next section.

MAKING A USB DEVICE PORT CONNECTION

After the PC has restarted per the preceding instructions, the user should test the USB device connection by performing the following steps. This procedure applies to both Windows XP and Windows 7.

1. Connect the USB Type A-B cable to the Reporter's USB Device Port and an available USB port at the PC.

2. Launch HyperTerminal. A dialog box named "Connection Description" will be displayed. Assign the new connection a descriptive name like "USB Device Port" as shown in the following. Click the button labeled "OK".

D
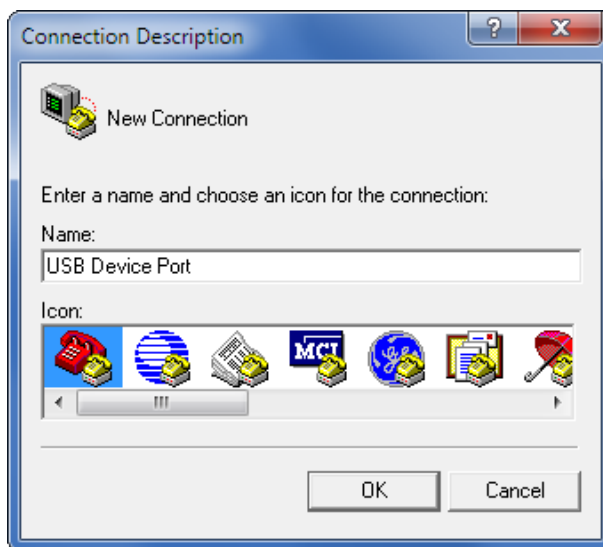
3. A dialog box named "Connect To" will be displayed. Click the down arrow to the right of the drop down list box named "Connect using:". Select the virtual comm port that was recently created (e.g., COM15). Click the button labeled "OK".
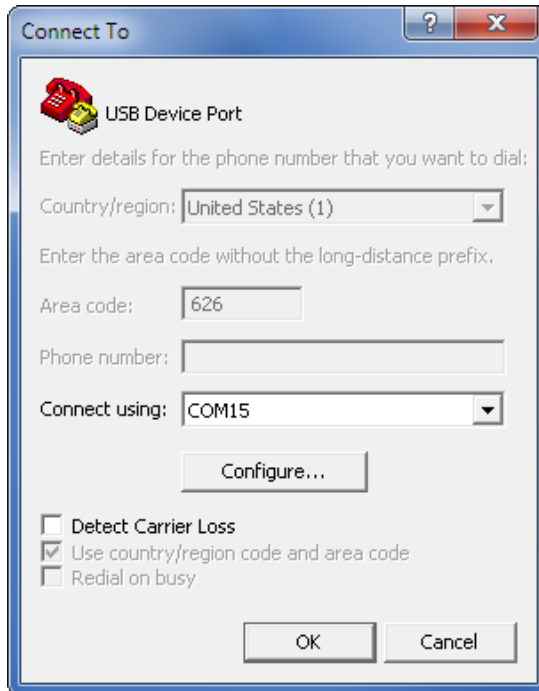
4. A dialog box labeled "COM15 Properties" will be displayed. The reference to COM15 will be replaced by the port number selected in step 3. Close the dialog box by clicking the button labeled "Cancel".

D

The COM15 Properties dialog box referenced in the previous step can be ignored. Baud rate and bit format settings do not apply to USB connections of this type.

5. A blank HyperTerminal Window will be displayed. In the lower left-hand corner of the screen, the word Connected should appear.

6. Verify that the connection is active by pressing the **Enter** key at the PC keyboard. The password challenge will be displayed. The user is now able to access the Reporter in accordance with the password that is entered. Refer to the section entitled "Administrative and Restricted Passwords" on page 31 for details regarding the use of passwords.

7. Finally, save the new connection. Within the HyperTerminal window, click on the File command, then the Save As... command. The Save As dialog box will open. Save the new connection to a convenient location such as the desktop. For the example cited herein, the new connection will appear as a new desktop icon labeled "STM Device Port.ht".

INTRODUCTION

The Query Events command with Dump+S option provides for the creation of a secure electronic data file. This appendix describes how that file can be verified as unaltered. MICRO-AIDE's RSA Validator software is used for this purpose. The proper use of RSA Validator involves several simple steps. Each step is described in the following sections.

The following procedure requires access to several files. The correct files are available for downloading from the MICRO-AIDE website at: www.micro-aide.com/support/downloads.html

INSTALLING THE REQUIRED SOFTWARE

The RSA Validator software is available to all MICRO-AIDE users. It can be downloaded, installed and used without restriction or charge. It is available at the MICRO-AIDE website as noted in the previous paragraph.

The downloaded software consists of two files that have been zipped together. The zipped file should be saved to a temporary location and unzipped from there. The decompressed files are named "SetupRSAValidator.exe" and "SetupQt4Lib.exe". The former is the RSA Validator application, the latter includes all of the runtime support library files that are required by the RSA Validator software. The procedures for installing the required files are described in the following two sections.

E

INSTALLING RSA VALIDATOR

Install the RSA Validator software by performing the following steps.

1. Double-click the SetupRSAValidator.exe file. The following dialog box will be displayed.
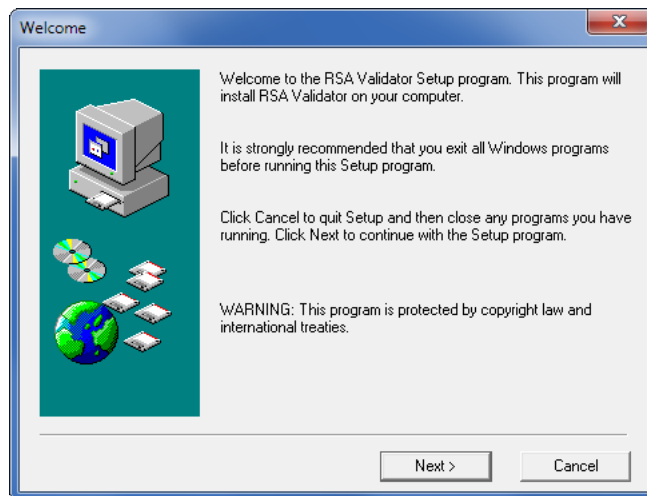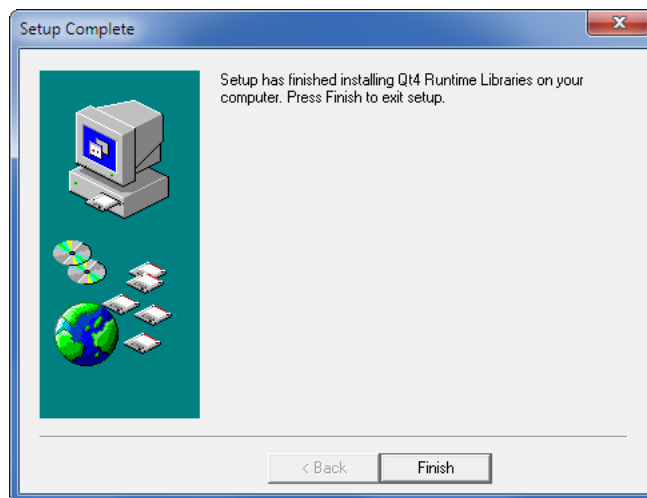

2. Click the button labeled "Next >". The following dialog box will be displayed.
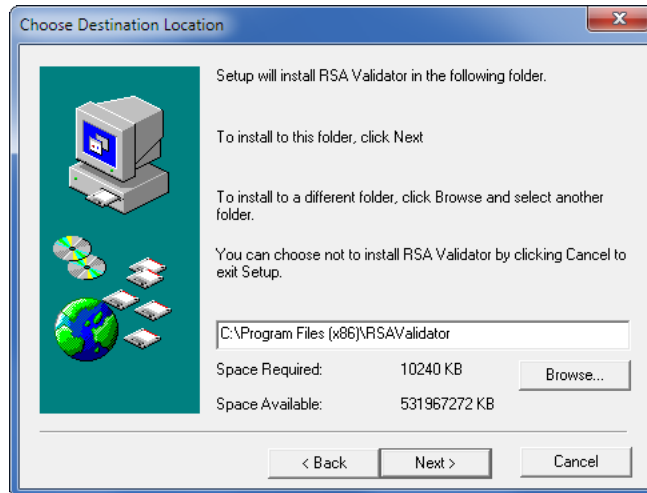
3. Accept the default location by clicking the button labeled "Next >". The following dialog box will be displayed.
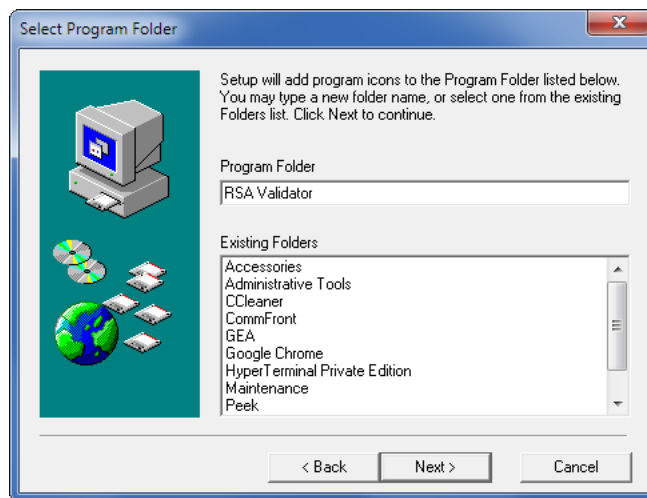
4. Accept the default folder name by clicking the button labeled "Next >". Click the button labeled "Next >" in the succeeding dialog box labeled "Start Copying Files".

5. Several files will then be installed. The installation process will end automatically after several seconds as noted by the following dialog box.
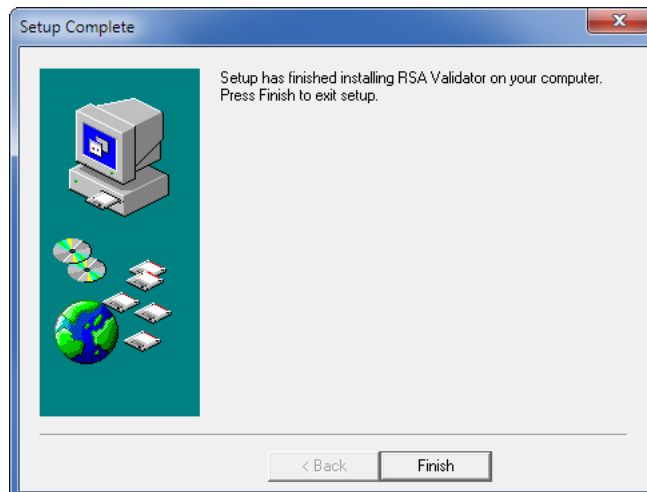
6. Complete the installation of RSA Validator by clicking the button labeled "Finish" and the "OK" button in the succeeding and final dialog box.

INSTALLING THE RUNTIME LIBRARIES

Like all applications, various runtime files are required to support RSA Validator. Perform the steps listed in the following to install the runtime support library files.

1. Double-click the SetupQt4Lib.exe file. The following dialog box will be displayed.

2. Click the button labeled "Next >". The following dialog box will be displayed.

3. Accept the default location by clicking the button labeled "Next >". The following dialog box will be displayed.

E
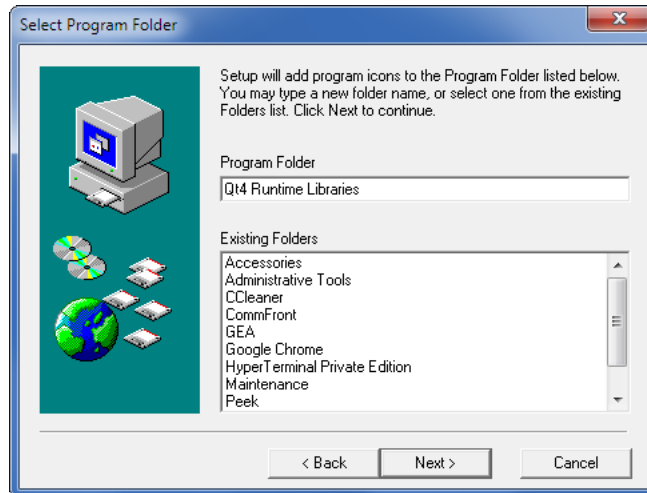
4. Accept the default folder name by clicking the button labeled "Next >". Click the "Next >" button in the succeeding dialog box labeled "Start Copying Files".

5. Several files will then be installed. The installation process will end automatically after several seconds as noted by the following dialog box.

6. Complete the installation of the runtime support files by clicking the "Finish" button and the "OK" button in the succeeding and final dialog box.

RSA Validator can now be launched and used as described in the next section.

USING RSA VALIDATOR

VALIDATING A FILE

RSA Validator can be launched from the Windows Start Menu or a desktop icon. The following dialog box will be displayed after it is launched.
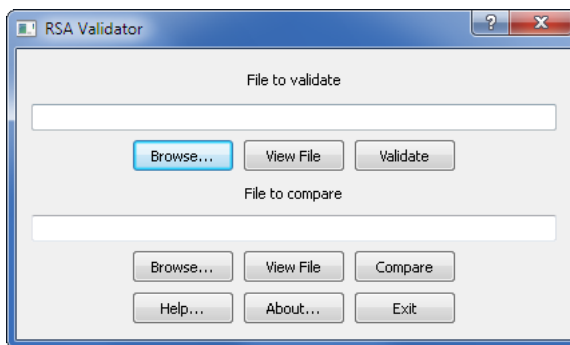
A previously created or copied electronic data file can be verified as unaltered by performing the following steps.
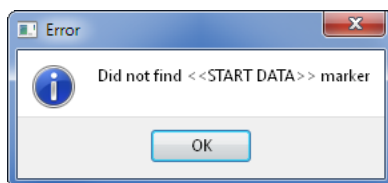
1. In the File to validate section, click the button labeled "Browse...".

2. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

3. To view the file in Notepad as simple text, click the button labeled "View File".

4. To validate the file click the "Validate" button. The following dialog box will confirm that the file has not been altered.
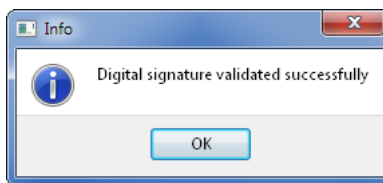
If the data content of the file has been altered, even if by a single bit, the following dialog box will instead be displayed.
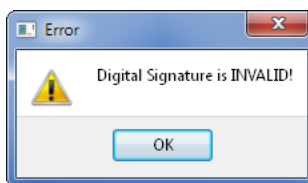

Finally, if the Start Data or End Data markers are corrupted or not found within the file, either of the following messages will be displayed.
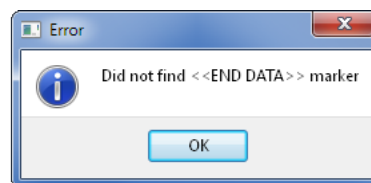

COMPARING FILES

In many cases the electronic data file will need to be shared among various parties. In a hearing or court proceeding, the file may need to be passed to the plaintiff's counsel. In such circumstances it is important that both parties are reviewing the same data file. The file compare feature of the RSA Validator software allows a comparison to be made as described in the following steps.

1. RSA Validator can be launched from the Windows Start Menu or a desktop icon. The following dialog box will be displayed after it is launched.
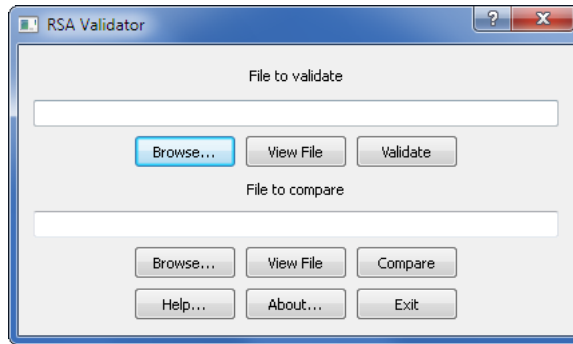
2. In the File to validate section, click the button labeled "Browse...".

3. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the first electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

4. To view the first file in Notepad as simple text, click the button labeled "View File".

5. In the File to compare section, click the button labeled "Browse...".

6. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the second electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

7. To view the second file in Notepad as simple text, click the button labeled "View File".

8. Finally, click the button labeled "Compare". If the two files are identical, the following dialog box will be displayed.
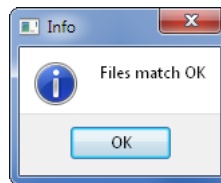
If the two files differ, even slightly, the following message will indicate a mismatch.
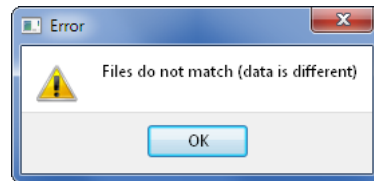
Using these techniques, Event Record data files created with the Dump+S option of the Query Events command can be validated and compared any number of times.

Material Return

In the event the customer identifies a malfunction in any product, call or write MICRO-AIDE and obtain a Return Material Authorization (RMA) number from the customer service department. Return the product to MICRO-AIDE, freight prepaid, with a note (in-warranty repair) or a purchase order (out-of-warranty) for the repair listing the following information:

- RMA number issued by MICRO-AIDE

- Return shipment address

- Name and e-mail address or telephone number of person familiar with the problem

- Brief description of the problem (include any printouts that may have a bearing on the problem)

- Method of payment for repair costs (out-of-warranty)

- Send product to the following address:

MICRO-AIDE CORPORATION
685 Arrow Grand Circle
Covina, CA 91722
Tel: 626-915-5502   Fax: 626-331-9484
E-mail: support@micro-aide.com

Limited Warranty

MICRO-AIDE warrants its products to be free from defects in material and workmanship for a period of five (5) years from the date of shipment. This warranty is in lieu of any other warranty, expressed or implied. In no event shall MICRO-AIDE be held liable for incidental or consequential damage resulting from (1) the use of any of its products, or (2) any alleged breach of this warranty provision. MICRO-AIDE's liability shall be limited to repairing or replacing, at its sole discretion, any defective product which is returned in accordance with the MICRO-AIDE Material Return Policy.

Product that has been subjected to abuse, misuse, alteration, accident, lightning damage, neglect or unauthorized installation or repair shall not be covered by this warranty. MICRO-AIDE reserves the right to make a final decision as to the existence of any failures and the cause of such failures. No warranty is made with respect to custom equipment or products produced to buyer's specifications except as mutually agreed upon in writing.

Any additional or different warranty provisions proposed by the buyer in any purchase order or other document are rejected by MICRO-AIDE and notice of objection to them is hereby given. Any such proposed warranty provisions shall be void and the conditions herein shall constitute the complete and exclusive statement of the warranty contract between MICRO-AIDE and the buyer. Neither MICRO-AIDE's acknowledgment of a purchase order nor MICRO-AIDE's failure to object to conflicting, different, or additional warranty provisions in a purchase order shall be deemed an acceptance of such warranty provisions or a waiver of the conditions hereof.