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**CRD-14A
COMPACT RECORDING
DEVICE**

USER MANUAL

**MICRO-AIDE
Rail Signal Products**

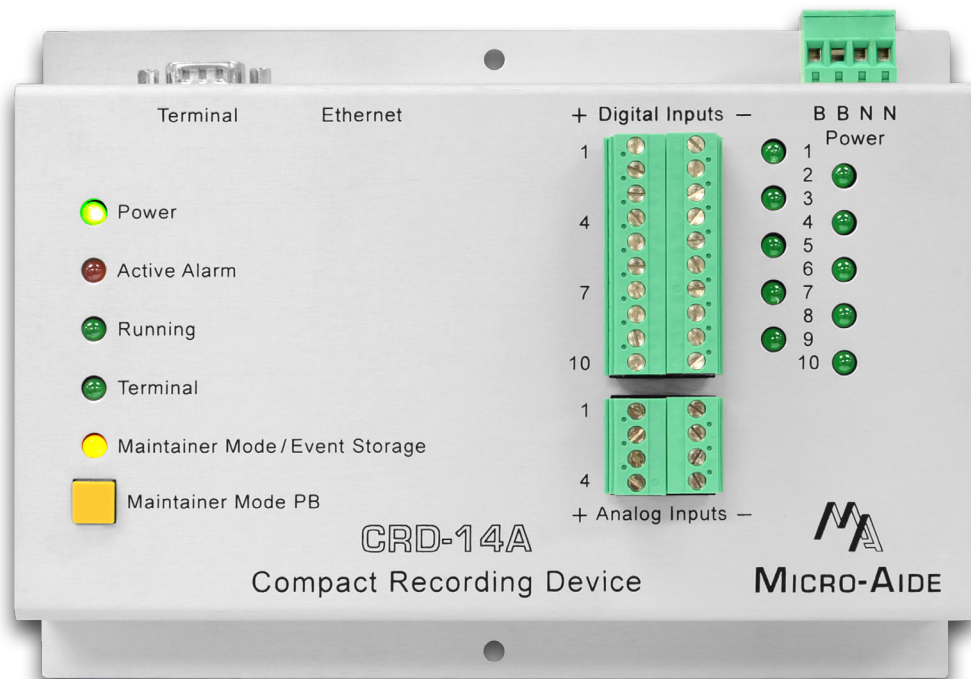
*EVENT RECORDERS ALARM REPORTERS DATA LOGGERS
CLOCK SYNCHRONIZERS CURRENT SENSORS VOLTAGE MONITORS
BATTERY MONITORS LIGHT OUT DETECTORS CUSTOM ENGINEERING*

MICRO-AIDE



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RAIL SIGNAL PRODUCTS



CRD-14A COMPACT RECORDING DEVICE USER MANUAL

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CHAPTER 1 – GENERAL DESCRIPTION

INTRODUCTION

Since 1988 MICRO-AIDE has provided the rail signal industry with a broad range of Event Recorders that vary in capacity, size and features. The CRD-14A is the first member of a new family of products referred to as Compact Recording Devices. The CRD-14A is a small, low cost and very easy-to-use recorder. It is ideally suited to crossing applications that require monitoring of only a few signals. Beyond these basic aspects, the CRD-14A is a hybrid device in the sense that it includes many of the features of MICRO-AIDE's CWR-24A Event Recorder and CAR-14A Crossing Alarm Reporter. It is in fact a companion product to both. It includes the Event Recording capabilities of the CWR-24A along with the fault detection features of the CAR-14A.

The CRD-14A is designed to be a direct replacement for MICRO-AIDE's CRD-14 Event Recorder. The CRD-14A includes all of the features and capabilities of the earlier recorder. However, the CRD-14A utilizes a much faster and versatile M4-class ARM microprocessor chip. The initialization cycle completes soon after power application, even when the Event Record memory is full.

Along with ten optically isolated Digital Inputs, the CRD-14A is equipped with four Analog Inputs. Unlike other systems, the use of Analog Inputs does not reduce the number of available Digital 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 recorder to be used safely. Front panel mounted LEDs are used to indicate the state of each Digital Input. Digital Inputs are typically wired to indications such as XR, gate down, gate up, etc. The Analog Inputs are designed specifically to monitor batteries.

A user controlled Counter is available for each of the ten Digital Inputs. The Counters increment based upon the Event transition selected by the user. Each Counter value can range from 0 to 65,535 and includes an automatic rollover feature.

Eight Virtual Inputs allow the user to create Event Records based upon a specific logical association of several Digital, Analog, Timer and other Virtual Inputs. The Virtual Input feature can be very useful in analyzing failure conditions or in creating alarm indications. Tedious and confusing site-specific profiles are not required when using the Virtual Input feature.

Eight 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.

The CRD-14A introduces a third programmable class of inputs. The L-inputs represent Alarm Inputs. Twenty different Alarm Inputs can be individually configured. Their capabilities are similar to those defined by the Alarm Configuration Table used by the CAR-14A. The Alarm reporting capabilities of the CRD-14A and CAR-14A differ according to the following description. The CRD-14A does not report Alarms to a centralized server via an Internet-based VPN. Instead it reports Alarms via time and date stamped Event Records that are saved to non-volatile memory. Alarm Inputs can be selectively reviewed and compiled into reports just like Digital, Analog, Virtual and Timer Inputs.

The flexibility of the Alarm Configuration Table is 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 Event Record until its persistence exceeds a predefined limit value.

The CRD-14A utilizes the same hardware design as the CAR-14A. This allows a CRD-14A to be upgraded to a CAR-14A easily and at very low cost. The upgrade adds the 85-0135 Ethernet Port, a change in sheetmetal and firmware. The result is that as needs evolve, a CRD-14A installation can be upgraded to provide fully automated, remote alarm reporting.

All MICRO-AIDE rail signal products, including the CRD-14A Event Recorder, 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 CRD-14A was to provide the rail signal industry with an instrument maintainers and signal technicians will find easy to operate long after the recorder has been installed and set up.

KEY FEATURES

Listed in the following are some of the features included with every CRD-14A Event Recorder.

- The Alarm Configuration Table allows persistent XR and low battery voltages to be detected and reported. Gates not up or down conditions can also be detected and reported.
- Twenty distinct Alarm Inputs can be configured to create Event Records that indicate important crossing-related fault conditions.
- Event Records from Alarm Inputs are identified by a separate L-designator.
- The storage capacity is 297,045 Event Records (expandable to 1,264,533).
- Event Records can be logged for 128 distinct days.
- Event Records are stored in a flash memory device that does not require a battery power source. Records are retained even if power is removed.
- Setup data and Event Record data can be easily and quickly transferred to a PC file.
- Attaching the recorder 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 3800Vdc.
- Relay signals in the range from 9 to 36Vdc can be sensed by the Digital Inputs.
- Both positive and negative voltages can be sensed.
- A user controlled Counter is available for each Digital Input.
- Every Event Record includes a measurement for each of four Analog Inputs.
- Analog Inputs can range from 0 to 51.1Vdc with a resolution of .1Vdc.
- 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.
- Event Detection Times 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 can be set to a thousandth of a second (.001 seconds) to capture fast, electronically generated control signals.
- Events satisfying the Detection Time criteria are date and time stamped to the nearest thousandth of a second.
- Flashing signal events are detected and can be reported either per flash or per 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.
- Eight Virtual Inputs can be programmed to create Event Records that identify alarm or fault conditions of special interest to the user.
- Eight 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 optional internal Ethernet Port allows for remote LAN-based access via an Ethernet connection.
- If the LAN includes a time server, the Ethernet Port also allows the recorder's real-time clock to be precisely controlled using the SNTP-Multicast protocol.
- 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 recorder can be assigned to any of seven zones used in North America.
- Installation is quite simple. Input wires are terminated in detachable, screw-down terminals. Wire sizes as large as 12AWG can be used.
- Typical power consumption is less than 1 W. A 9 to 36 Vdc power source can be used to power the recorder.
- The internal temperature of the recorder is measured and reported.
- The user interface provides full cursor control when using a PC.
- Two distinct levels of password security provide protection against unauthorized access.
- Several diagnostic commands can be executed to verify important system operations.
- Firmware updates can be uploaded to the recorder locally via the Terminal Port, or remotely via the optional Ethernet Port.

COMPARING THE CRD-14A AND CWR-24A

A key feature of the CRD-14A is its ability to detect and report a variety of crossing related failures. However, many of the recording features of the CWR-24A Event Recorder have been included as capabilities of the CRD-14A. The latter can be used as an Alarm reporting device as well as an Event Recorder that is ideally suited to limited capacity crossing applications. The differences between the two recorders have been highlighted in [Table 1 on page 4](#).

Feature	CRD-14A	CWR-24A
Digital Inputs	10	20
Counters	10	not available
Programmable Alarm Inputs	20	not available
Alarm Configuration Table	std.	not available
Front panel LCD and keypad	LEDs only	std.
USB Host Port	not available	std.
USB Device Port	not available	std.
Relay output	not available	std.
GPS Receiver	not available	optional
Internal modem	not available	optional
Train Speed Monitors	none	4
Abnormal flash rate reporting	not available	std.

Table 1: CRD-14A and CWR-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** The number of flash memory devices that are supported has been expanded.
- V1.02** Query command Include Details setting is now retained with each session.
- V1.03** Added a counter to each Digital Input.
- V1.04** In rare circumstances Alarms events could be improperly time stamped after an initialization.
- V1.05** Corrected date error in Flashing and Timer Event Records.

1

SETUP DATABASE COMPATIBILITY

Occasionally, modifications to the firmware of the recorder will result in a new memory map of the Setup Database. When this occurs the previously created Setup Database will be incompatible with the new firmware. [Table 2 on page 4](#) details the compatibility status of each firmware version. A green check mark (✓) in any given row 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. As noted below, Setup Databases for all versions of the CRD-14 are fully compatible with V1.05 of the CRD-14A.

Firmware Version	Compatibility
CRD-14 (all versions)	✓
V1.00	✓
V1.01	✓
V1.02	✓
V1.03	✓
V1.04	✓
V1.05	✓

Table 2: Setup Database Compatibility



When an incompatibility occurs, contact MICRO-AIDE before preparing a new Setup Database. E-mail a copy of the existing Setup Database along with the applicable firmware revision number. MICRO-AIDE will convert the database and return a file that is fully compatible with the new firmware version.



Never attempt to use an incompatible Setup Database. The operation of the recorder 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 CRD-14A Event Recorder. This document refers to Version 1.05 of the CRD-14A firmware. Specifically, the sample data and command details depicted were prepared using a Version 1.05 recorder. 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.

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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 the CRD-14A.

CHAPTER 2 – INSTALLATION

INTRODUCTION

This chapter describes how to properly unpack, check-out and install the CRD-14A prior to operation. It is advisable to perform the Initial Check-Out Procedure before attempting to set up the recorder.

UNPACKING

Each CRD-14A is packed in a shipping carton that is properly sized for the recorder. 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 recorder. It is advisable to save all packing materials in the event the recorder ever needs to be returned to MICRO-AIDE.

Inspect the recorder for visual damage. It should not be scratched, dented or deformed in any way. If it appears the recorder 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

2

Before the CRD-14A is installed at a crossing facility it is recommended that an operational check of the recorder be performed. The following materials are required as a part of this procedure.

- 12Vdc power source.
- Common hook-up wire for power and testing inputs (12 to 22AWG).
- Wire strippers and small, flat-head screwdriver.
- PC equipped with a communications program (e.g., HyperTerminal or Tera Term) and serial comm port set to operate at 9600Baud.
- 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 53 and "[Trouble-Shooting Guide](#)" on page 57. Elements common to most installations are illustrated in [Figure 1](#) on page 8 and [Figure 2](#) on page 9.

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 7](#) on page 60 illustrates the proper wiring of the cable.



The remainder of the Initial Check-Out Procedure presumes the recorder is configured to operate in accordance with the parameters established by the Union Pacific-defined `crd14setup1.v101` Setup Database. It selects a Terminal Port Baud rate of 9600. The CRD-14A requires 8 data bits, no parity, 1 stop bit (i.e., 8-N-1) and hardware flow control.

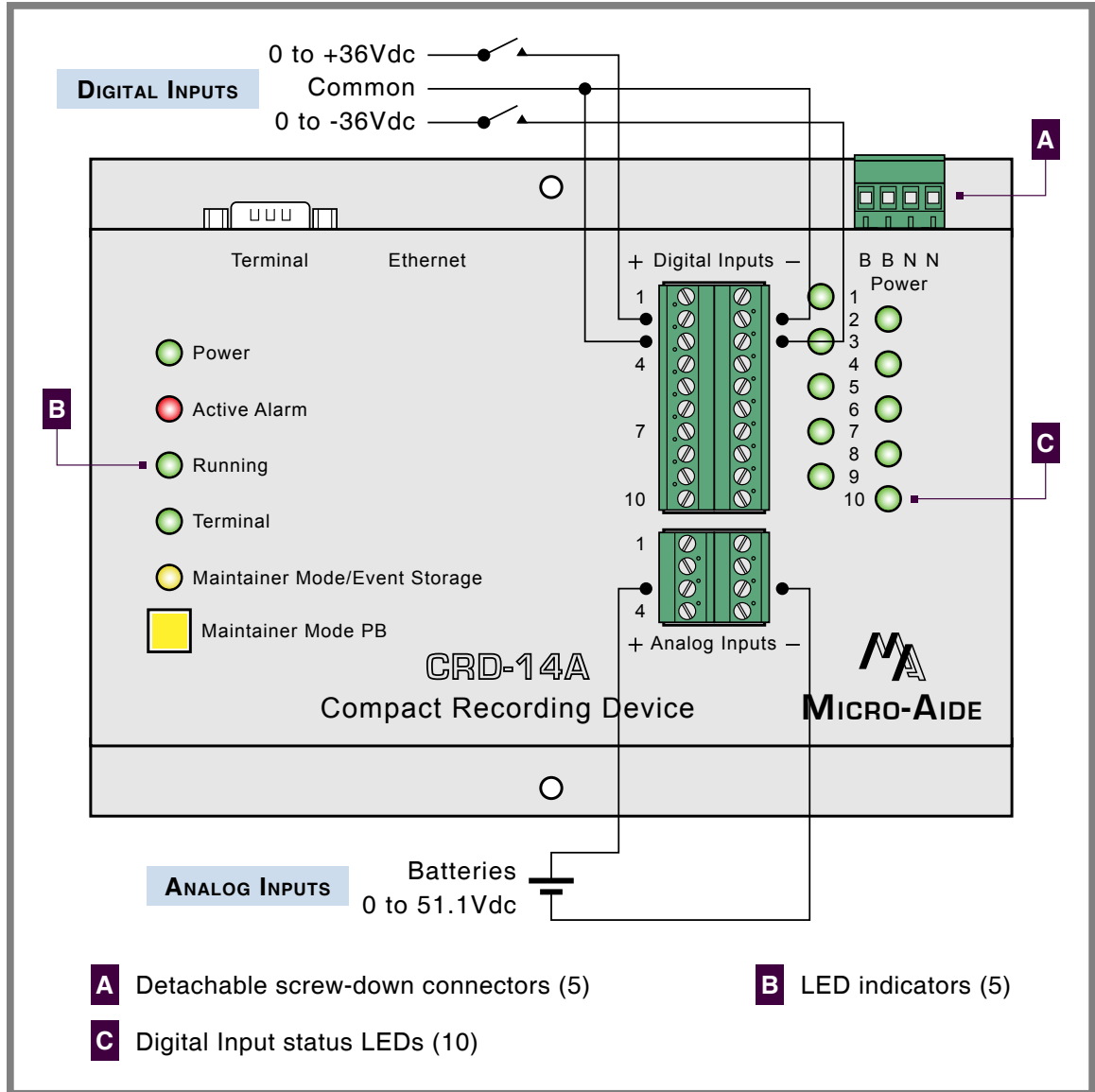


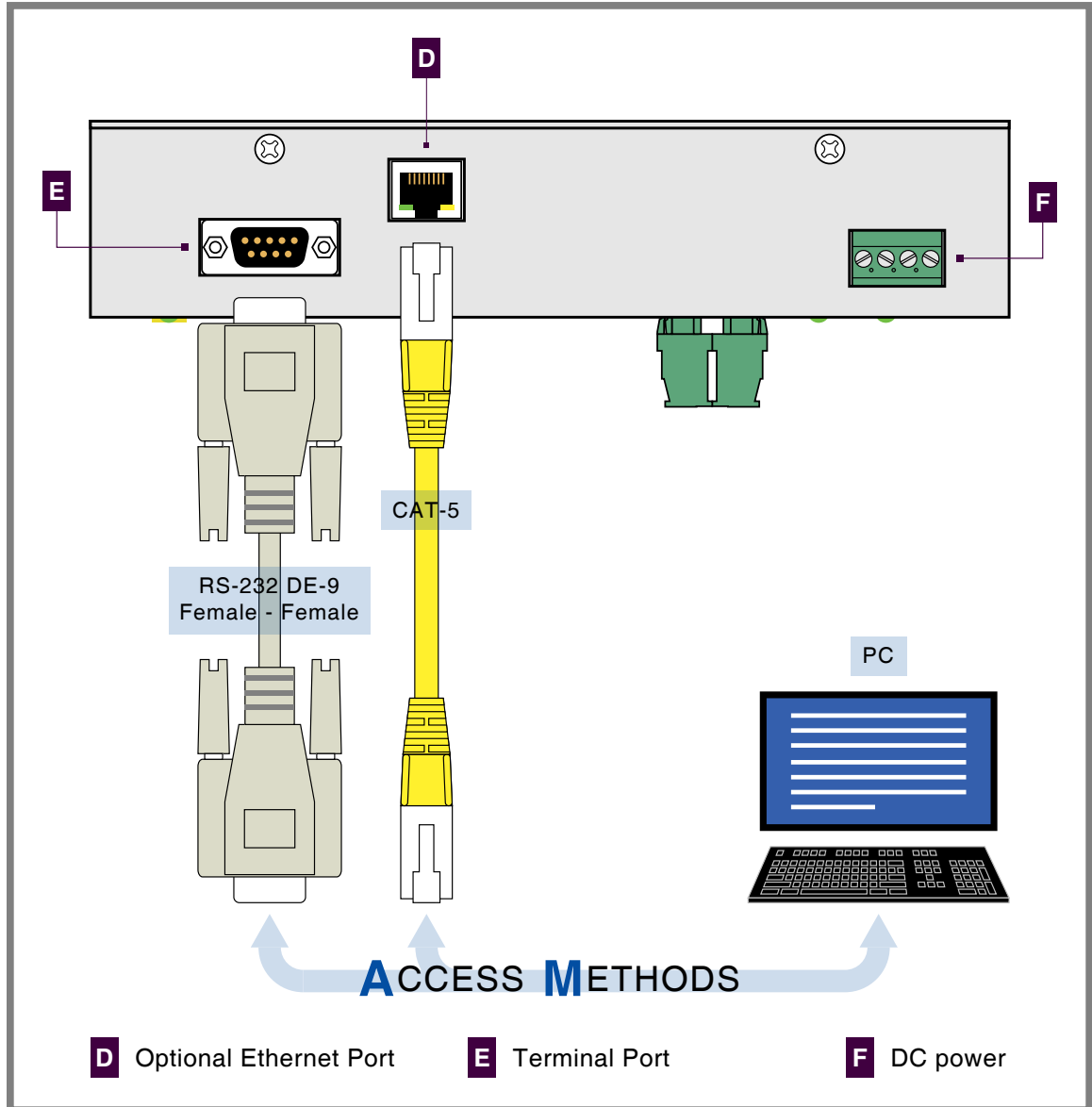
Figure 1: Typical Installation - Front Panel View

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.
5. Apply power to the CRD-14A. The PC will display the following message.

Micro-Aide Crd-14a 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 recorder is set to run at 9600Baud, the message will appear to be garbled. Regardless, do not press the **Esc** key. The user must wait a few seconds for the CRD-14A to complete its initialization process.



2

Figure 2: Typical Installation-Top Panel View

6. Verify that the front panel LED labeled "Power" is illuminated. Additionally, the LED labeled "Running" should be flashing once per second.
7. After the recorder completes its initialization, a password challenge similar to the following will be displayed.

```

Model CRD-14A Event Recorder. Ver 1.05 (C) 2014 MICRO-AIDE INC.
***** NOT SET *****
Event storage capacity: 297045
Enter password:
    
```

Password Request

8. If the recorder 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 CRD-14A contact MICRO-AIDE customer service for instructions on how to proceed.

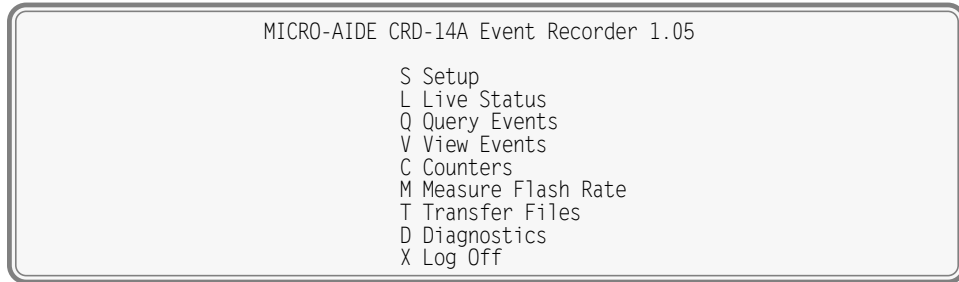


Repair and return policies are described on the inside back cover of this manual.

9. From the PC's keyboard type **crd** 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.



The password to be entered may be different if the Union Pacific Setup Database has not been installed. Enter **PASSWORD** in upper-case letters as an alternative.



Main Menu

10. Using a short pair of stripped jumper wires place +12Vdc 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 .5seconds before proceeding.
11. Verify that the LED associated with the Digital Input under test is now illuminated.
12. Use the same procedure described in the previous two paragraphs 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** key. Alternatively, press the **Ctrl+W** keys simultaneously. Refer to the section entitled "[Query Events \(Q\)](#)" on page 39 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 .5seconds. 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 CRD-14A will now display the real-time status of Digital and Analog Inputs.
16. Connect the 12Vdc positive and negative test leads to the two inputs of Analog Input A1.
17. Verify the Analog Input reading for A1 is within .15Vdc of the correct reading.
18. Use the same procedure described in the previous two paragraphs to test the remaining three Analog Inputs.

This concludes the Initial Check-Out Procedure. This procedure may be used at any time to verify that the CRD-14A is operating properly. Power can now be removed from the recorder. 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 53 and "[Trouble-Shooting Guide](#)" on page 57. 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 1 on page 8](#) and [Figure 2 on page 9](#). The illustrations also depict the location of each connector used in the installation.

LOCATION

The location where the CRD-14A is to be installed should comply with a few simple requirements. The ambient temperature near the recorder should be in the range from -40C to 72C.

MOUNTING

The CRD-14A is designed to be mounted on a flat surface such as a shelf or backboard. The front panel sheetmetal includes two mounting holes .188" in diameter. They are spaced 5.35" apart.

SITE PREPARATION

The equipment location must have access to a stable 9 to 36Vdc power source. A pair of wires must be run from the power source to the location where the recorder will be mounted. The CRD-14A 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 recorder. 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 12AWG. 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.

2

PERIPHERAL EQUIPMENT

If a PC is to be co-located with the CRD-14A an appropriate AC power source must be available. Additional connections can be made as described in the following sections.

TERMINAL PORT

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

ETHERNET PORT (OPTIONAL)

The optional Ethernet Port may be used to connect the CRD-14A to a LAN or PC. A standard CAT-5 Ethernet cable is used to connect to the LAN via a hub or switch. The length of either cable must be limited to 200'. [Table 10 on page 60](#) lists the bit transfer rates of the two user-accessible ports.

CABLING

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



The power 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 CRD-14A 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 AC power to the PC (if used).

INPUT CIRCUITS

Event Records and Alarm conditions will be logged properly only if the input circuits are wired correctly to the CRD-14A. 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 horizontally adjacent terminals. The positive lead of the digital circuit to be monitored must be connected to the left-side terminal labeled "+". The common, or return, lead of the digital circuit must be connected to the right-side 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 recorder, one for each polarity. [Figure 1 on page 8](#) illustrates how to connect negative voltage circuits.

Analog Inputs are connected identically to Digital Inputs. The four Analog Inputs terminate in separate connectors also located at the front panel of the recorder.

The user may wish to verify the proper operation of each input. The ["Initial Check-Out Procedure" on page 7](#) 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.

CHAPTER 3—SETUP

INTRODUCTION

This chapter describes how to set up the CRD-14A for use in a typical application. It is assumed that the Setup Database contains the factory default settings. However, information regarding the Union Pacific-defined crd14setup1.v101 Setup Database is provided.

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 7. 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 9.

The Terminal and optional Ethernet ports of the CRD-14A incorporate two levels of password security. Each level uses a distinct password. The Restricted Access password allows a user to review, but not alter, all aspects of the Setup Database. The Administrative Access password allows a user full access to all aspects of the recorder. This includes the unrestricted ability to make changes to the Setup Database.



The Administrative Access, factory default password is **PASSWORD** in upper-case letters. However, if the crd14setup1.v101 Setup Database is installed the Restrictive Access password is **crd** in low-case letters. Contact Union Pacific for the crd14setup1.v101-defined Administrative Access password.

3

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

```
MICRO-AIDE CRD-14A Event Recorder 1.05

S Setup
L Live Status
Q Query Events
V View Events
C Counters
M Measure Flash Rate
T Transfer Files
D Diagnostics
X Log Off
```

Main Menu

USER INTERFACE CONVENTIONS

The CRD-14A user interface is designed for ease-of-use. Before proceeding further, the user should become familiar with a few simple aspects of the interface.

FIELDS AND COMMANDS

The CRD-14A 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.

WORKING WITH FIELDS

The CRD-14A 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., Unit Name).

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 recorder as an updated operating parameter. Accordingly, the acceptance may occur before completion of the command.

COMPLETING COMMANDS

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 recorder. The Pause and Resume commands may be used to provide the required data flow control.

To Pause the data being sent press the **Ctrl+S** keys simultaneously. The data flow will be stopped indefinitely. To Resume data flow press the **Ctrl+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

Before the CRD-14A is ready for use the recorder must be configured to reflect the operation required by the user. The following steps should be performed in the sequence listed. It is assumed that the user intends to access the CRD-14A via a PC which is connected to the Terminal Port. The succeeding chapter describes how to access the recorder via the optional Ethernet Port. It is further assumed that the user has not previously altered any of the factory default settings.



The comm port of the PC must be set to operate at a speed of 9600Baud with hardware flow control enabled.

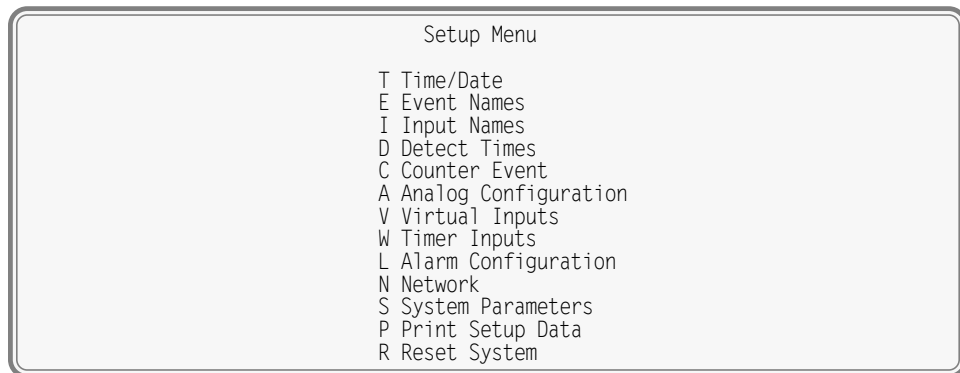
The Main Menu of commands will be displayed immediately after logging on. Refer to the sample data entitled "[Main Menu](#)" on page 13. The Setup Procedure described in this chapter will familiarize the user with the Setup, Transfer Files and Log Off commands listed in the Main Menu.

For the remainder of this chapter the Setup, Transfer Files, Log Off commands and their numerous sub-commands will be described in the sequence recommended by MICRO-AIDE for their execution as part of the Setup Procedure. 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. The Setup Procedure commences with the execution of the Setup command listed at the top of the Main Menu.

3

SETUP (S)

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



Setup Commands

TIME / DATE (T)

The CRD-14A time stamps all Event Records. Therefore, the correct time and date must be set. The recorder will automatically account for leap year. The recorder's clock circuitry will continue to keep time even if power is interrupted for a prolonged period.

To manually change the time 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: 10:36:56
      MM-DD-YY
Date: 10-31-14 Friday
    
```

Time /Date Command

The highlight may be moved to the hour, minute or second time fields or month, day or year date fields. The CRD-14A 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. The day of week is displayed automatically as determined by the date selected by the user.

To complete the command press the **Esc** key. The user can then accept or abandon the changes.



The clock of the CRD-14A can be set manually or automatically via the optional Ethernet Port. The Clock Sync Mode can be set to none or SNTP. Refer to the section entitled "[Clock Sync Mode](#)" on page 20. If the clock cannot be synchronized MICRO-AIDE recommends that the clock be manually set once per month.



A System Event Record is logged to memory whenever the real-time clock is manually set or synchronized. This occurs irrespective of the synchronization method selected. Refer to the section entitled "[System Events](#)" on page 54 for additional details.

RESET SYSTEM (R)

The Reset System command can be used at any time to restore the recorder to its factory default settings. The command can also be used to clear previously logged Event Records and Counter values. This step is listed as part of the Setup Procedure since it can be useful in restoring the recorder to a known state consistent with 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. All three command options are described in the sections that follow.

```

Reset System
      S Reset Setup Data
      E Reset Event Memory
      B Reset Both
      C Reset Counters
    
```

Reset System Command



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

RESET SETUP DATA (S)

The CRD-14A 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. [Table 3 on page 16](#) lists the values after the reset is performed. Some parameters are unchanged by the reset.

Parameter	Value After Reset	crd14setup1.v101 Value
Time/Date	(as previously assigned)	(as previously assigned)
Event Names-On	On (1-29), Violate (30)	On (1), BattBad (2), unassigned (3-30)
Event Names-Off	Off (1-29), Nominal (30)	Off (1), BattGood (2), unassigned (3-30)

Table 3: Factory Default /Reset Settings

Parameter	Value After Reset	crd14setup1.v101 Value
Input Names-Digital Inputs	Digital Inp 01, Digital Inp 02, etc.	(see sample data on page 27)
Input Names-Analog Inputs	Analog Inp 01, Analog Inp 02, etc.	(see sample data on page 27)
Input Names-Virtual Inputs	Virtual Inp 01, Virtual Inp 02, etc.	Virtual Inp 01, Virtual Inp 02, etc.
Input Names-Timer Inputs	Timer 01, Timer 02, etc.	Timer 01, Timer 02, etc.
Input Names-Alarm Inputs	Alarm Inp 01, Alarm Inp 02, etc.	(not assigned)
Event Pairs	1, 30 for Timer Inputs	1, 2 for Analog Inputs
Digital Inputs-Detect Time	.300seconds	.300seconds
Digital Inputs-Flash Enable	No	No
Counter-Event Selection	Disable	Disable
Analog Configuration-Low Limit	0Vdc	9.0Vdc for Analog Inputs 1, 2 0.0Vdc for Analog Inputs 3, 4
Analog Configuration-High Limit	51.1 Vdc	16.0Vdc
Virtual Inputs-Variables	--- (not assigned)	--- (not assigned)
Timer Inputs-From and To Triggers	--- (not assigned)	--- (not assigned)
Timer Inputs-From and To Events	Off	Off
Timer Inputs-LowLimit	0.0seconds	0.0seconds
Timer Inputs-HighLimit	0.0seconds	0.0seconds
Alarm Configuration-SetInp	--- (not assigned)	--- (not assigned)
Alarm Configuration-SetState	Off	Off
Alarm Configuration-SetTime	0	0
Alarm Configuration-ClrInp	--- (not assigned)	--- (not assigned)
Alarm Configuration-ClrState	Off	Off
Alarm Configuration-ClrTime	0	0
Alarm Configuration-MaintClr	No	No
Network-IP Address	(as previously assigned)	(as previously assigned)
Network-Subnet Mask	(as previously assigned)	(as previously assigned)
Network-Gateway	(as previously assigned)	(as previously assigned)
Network-Ethernet MAC Address	(as previously assigned)	(as previously assigned)
Network-Port	(as previously assigned)	(as previously assigned)
Network-TCP/IP Mode	(as previously assigned)	(as previously assigned)
Unit Name	***** NOT SET *****	CRD14SETUP1.v101
Terminal Port Baud Rate	38,400	9600
Administrative Password	PASSWORD	(contact Union Pacific)
Restricted Password	LOOKWORD	crd
Clock Sync Mode	(as previously assigned)	None
Time Zone	(as previously assigned)	CST (UTC-6)
Daylight Saving Time	(as previously assigned)	Enabled
High Temp Limit	257 °F	120 °F
Low Temp Limit	-67 °F	32 °F
Maint Timeout	5400seconds	30seconds
Measure Flash Rate -Input	(as previously assigned)	(as previously assigned)

Table 3: Factory Default / Reset 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

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 settings of 38,400Baud. 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 CRD-14A 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.

RESET COUNTERS (C)

The Reset Counters command will set all ten Counter values to zero. The following precaution will be displayed after selecting the Reset Counters command.

Are you SURE you want to reset all counters?
No Yes

To proceed select Yes. The following additional warning will be displayed.

OK to reset all counters to ZERO?
No Yes

To proceed select No. A final precaution will be displayed as follows.

Do you want to ABORT this operation?
No Yes

To proceed select No. The Counter values will be immediately set to zero. The Event Selection settings are not altered by the Reset Counters command. The latter is described in the section entitled "Counter Event (C)" on page 22.

SYSTEM PARAMETERS (S)

System Parameters are those parameters that affect the recorder as a whole. They do not affect individual inputs or their behavior. System Parameters include, but are not limited to, the Unit Name and passwords. The ten System Parameters are defined with a single command containing multiple fields. The System Parameters defined by crd14setup1.v101 are shown in the following. The use of each System Parameter is described in the following sections.

```

System Parameters
-----
Unit Name
CRD14SETUP1.v101
Terminal Port Baud Rate  9600
Administrative Password
Restricted Password
Clock Sync Mode          None
Time Zone                CST (UTC-6)
Daylight Saving Time     Enabled
High Temp Limit          120 Degrees F
Low Temp Limit           32 Degrees F
Maint Timeout            30 Sec

Ethernet is NOT installed

```

System Parameters Command

UNIT NAME

The Unit Name serves as a comprehensive recorder and site ID. It is included at the top of each report. Data from several CRD-14A recorders 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 14](#).



A Unit name can be assigned by the user to suit a variety of requirements. As an example, it may include references to a district, city, milepost number, street and DOT designation.

The first 20 characters of the Unit name have special significance. Guidelines and prohibitions regarding these characters are detailed in the following.

- The first 20 characters should be unique to each recorder.
- 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.

3

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 115200bps. 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 CRD-14A.

ADMINISTRATIVE AND RESTRICTED PASSWORDS

Access to the CRD-14A via any port is protected by a dual level password system. Administrative Access permits unrestricted access to all recorder functions. Administrative Access allows the Setup Database to be altered and the Event Record memory to be cleared. 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 recorder. It allows the user to review, but not alter, the Setup Database and Event Record memories. The Restricted Password can be shared with users that only need access to Event Record data when investigating an incident or resolving a maintenance issue.

The Administrative and Restricted Passwords are defined similarly. Each may be assigned any combination of alphanumeric characters not exceeding eight total. To defeat the password security system assign one of the passwords a null value. This can be done by deleting all of the characters in the password

field and then accepting the empty field. When the password challenge is issued the user will be able to access the system by simply pressing the **Enter** key.



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.

CLOCK SYNC MODE

The CRD-14A contains a real-time clock that allows the recorder 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 CRD-14A can be precisely synchronized using the optional Ethernet Port and an accessible time server.



The real-time clock of the CRD-14A (if not synchronized) features an accuracy of ± 3 ppm, which is approximately ± 8 seconds per month.

The Clock Sync Mode setting controls the synchronization method. Press the **Spacebar** to select one of the following methods.

- **SNTP:** The recorder will automatically update its clock upon receipt of a Multicast message. The updates are under the sole control of the time server. They occur at intervals set by the time server. To use this feature the time server must be enabled for Multicast. The various switches, gateways and routers that comprise the LAN must be configured to propagate the required SNTP messaging to and from the time server and recorder.
- **None:** Time synchronization is disabled. The real-time clock can only be set manually.



A System Event Record is logged to memory whenever the real-time clock is set. This occurs irrespective of the method selected (i.e., manually or via SNTP). Refer to the section entitled "[System Events](#)" on page 54 for additional details.

3

TIME ZONE

The correct Time Zone setting must be assigned when the SNTP synchronization method is selected. SNTP time data is relative to UTC-0 time, previously known as GMT. To display the correct local time the Event Recorder must convert the reported UTC time by applying the correct time zone adjustment.

The Time Zone setting can be assigned one of seven different values that are commonly used in North America. Each setting is explained in [Table 4 on page 20](#).

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

DAYLIGHT SAVING TIME

The real-time clock of the CRD-14A can be adjusted automatically to compensate for DST. This feature operates independently of the Clock Sync Mode setting. If enabled, the real-time clock will be shifted by one hour on the second Sunday of March and the first Sunday of November. In both cases the clock is adjusted at 2:00 AM.



The DST feature implemented by the CRD-14A is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.

HIGH AND LOW TEMP LIMITS

The temperature inside the CRD-14A 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 54 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.

MAINT TIMEOUT

Maintainer Mode allows a maintainer or technician to test the crossing system without concern that unwanted Alarms will be logged to memory. Refer to the section entitled "Maintainer Mode Pushbutton" on page 37 for additional details. Maintainer Mode is enabled or disabled by simply pressing the front panel switch labeled "Maintainer Mode PB" for .5 seconds. However, in the event that the maintainer forgets to disable Maintainer Mode the Maintainer Timeout parameter will restore the CRD-14A 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 recorder is restored immediately after the timeout has expired.



A Maintainer Timeout value of 0 disables the timer. This allows the CRD-14A to remain in Maintainer Mode with the logging 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.

DETECT TIMES / FLASH ENABLE (D)

The Digital Inputs of the CRD-14A will generally be connected to relay-based control circuits. Since relay contacts typically bounce, the recorder 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. A typical response to the Detect Time / Flash Enable command is shown in the following.

3

Detect Times/Flash Enable		
Input	Detect Time	Flash
D01	0.300	No
D02	0.300	No
D03	0.300	No
D04	0.300	No
D05	0.300	No
D06	0.300	No
D07	0.300	No
D08	0.300	No
D09	0.300	No
D10	0.300	No

Detect Times / Flash Enable Command

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

DETECTION TIMES

In the sample data shown previously the Detection Times are set to the factory default value of .300 seconds. 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 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

The first-tier method employed by the CRD-14A to report flashing events is described in this section. 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 3 on page 22 illustrates a flashing sequence and the events that would be created at the start and end of the sequence.

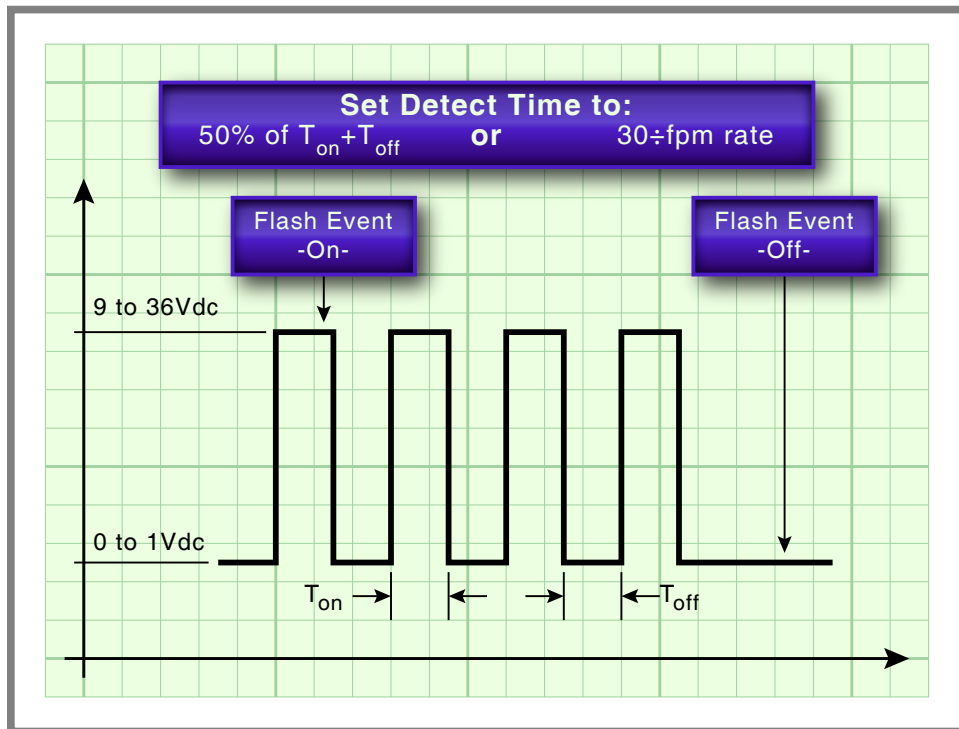


Figure 3: Typical Flashing Pulse Sequence

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 CRD-14A 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 note 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 45. Alternatively, the correct Detection Time (in seconds) is equal to 30 divided by the number of flashes per minute (i.e., $30 \div \text{fpm}$).

COUNTER EVENT (C)

The CRD-14A features a user-defined Counter per Digital Input. Counter values range from 0 to 65,535. The Counter value automatically rolls over to 0 after reaching its maximum value. Each Counter can be set to increment when its associated Digital Input transitions to an On state or an Off state. Additionally, the operation of each Counter can be individually disabled. The following section describes how the Counter behavior is controlled.

A typical response to the Counter Event command is shown in the following.

Counter Event Selection	
Input	Event
D01	Off
D02	On
D03	Disable
D04	Disable
D05	Disable
D06	Disable
D07	Disable
D08	Disable
D09	Disable
D10	Disable

Counter Event Command

To alter the Counter Event Selection setting position the highlight to the desired field and press the Spacebar key one or more times. As the Spacebar key is pressed the displayed setting will change from Disable to On to Off and then back to Disable.

ANALOG CONFIGURATION (A)

The four Analog Inputs of the CRD-14A are used to measure and report battery voltages. Analog Inputs are identified by the CRD-14A as "A1", "A2", etc. The A-prefix is always used to distinguish Analog from Digital and Virtual Inputs.

Analog Inputs must have operating ranges of 0 to 51.1 Vdc. AC and negative voltages are not measured since only batteries are monitored. The recorder is able to measure voltages to a resolution of .1 Vdc. Analog Inputs are constantly compared against 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. If this condition persists an Alarm Event Record will be created.

Figure 4 on page 24 illustrates the relationship of the High and Low Limit Values to the Analog Input state. The figure depicts an Analog Input that is monitoring a nominal 12Vdc battery. The figure indicates that the unacceptable range includes all voltages less than 10.4Vdc and all voltages greater than 15.6Vdc. 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 15.6Vdc the battery voltage is considered to be acceptable.

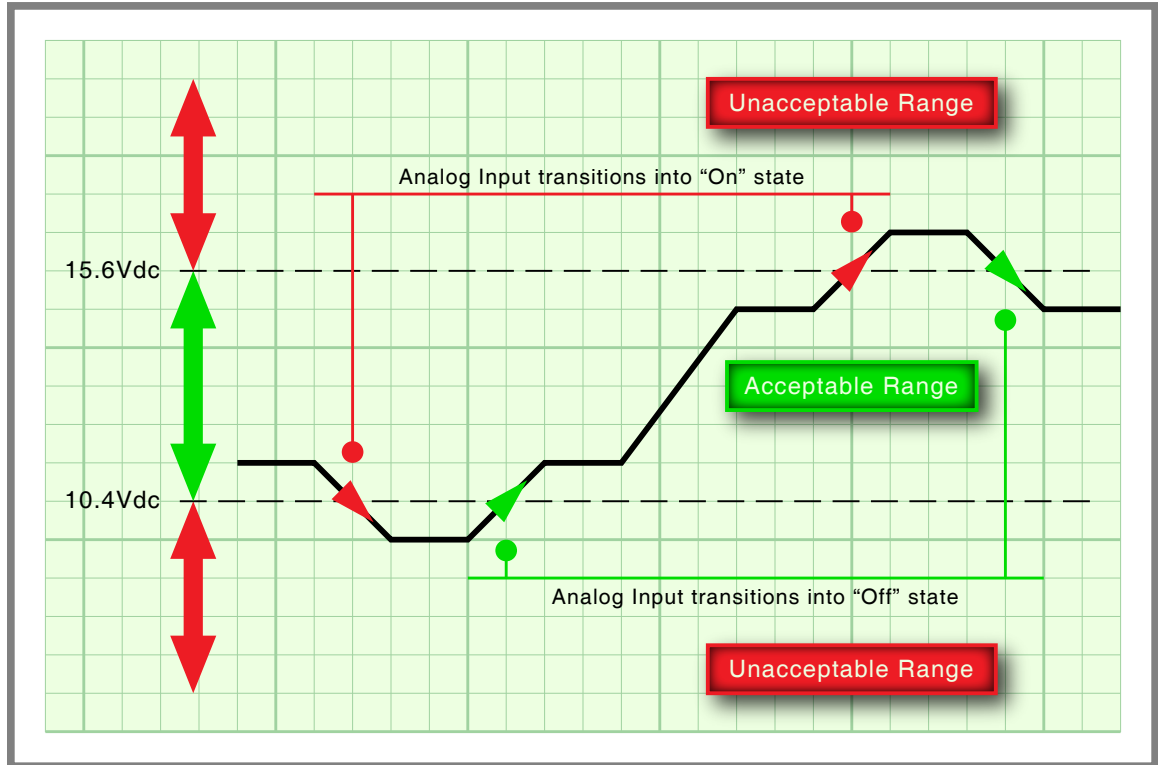


Figure 4: Analog Input Operating Ranges and Limit Values

3



Analog Inputs with levels within the acceptable range are in an Off state. Conversely, levels found to be within the unacceptable range are in an On 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 31](#) for additional details.

TIMER INPUTS (W)

The CRD-14A includes eight 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 5 on page 25](#).

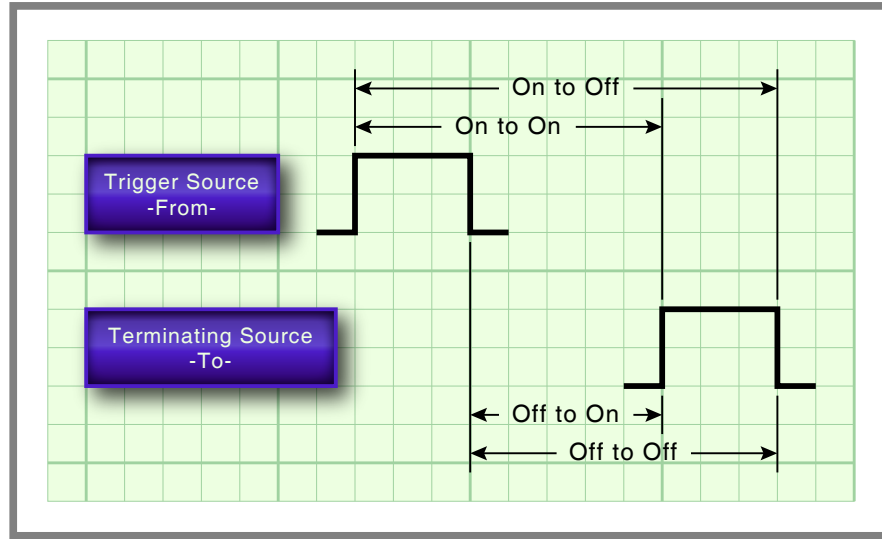


Figure 5: Timer Measurements

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	Timer Configuration					
	From	Event	To	Event	LowLimit	HighLimit
T01	D07	On	D10	Off	7.5	12.5
T02	---	Off	---	Off	0.0	0.0
T03	---	Off	---	Off	0.0	0.0

Timer Inputs Command

3

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 10 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 8 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 10 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 8 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 999.9seconds. 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 999.9seconds. 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 7 reaches its On state until Digital Input 10 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 following section entitled "Event Names (E)" on page 26 for additional information.

EVENT NAMES (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 (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 30 Event Name pairs can be defined. Once the pairs are defined they can be assigned to inputs of the CRD-14A 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_On" and "XR_Off". The Event Records for Analog Input A1 could be labeled "Bat_Norm" and "Bat_Fail".

A typical response to the Event Name command is shown in the following. In the interest of brevity only three of the 30 pairs are listed. The factory default Event Names are shown.

Event Names		
Number	ON Name	OFF Name
1	On	Off
2	On	Off
3	On	Off

[F1/^W]=Next Page [F2/^E]=Prev Page

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 30 is by default labeled "Violate" and "Nominal". Furthermore, pair 30 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.

Two data screens are required to list all 30 Event Name pairs. 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.

INPUT NAMES (I)

The CRD-14A utilizes two types of inputs. The ten Digital and four Analog Inputs are referred to as physical inputs because actual circuits are wired to the recorder's input connectors. The CRD-14A also includes eight Virtual, eight Timer and twenty Alarm Inputs. Contrary to physical inputs, Virtual, Timer and Alarm Inputs are defined by the user for the purpose of detecting failure or alarm conditions among the physical inputs.

All inputs, regardless of type, share one common programming characteristic. The user can define a unique Input Name and Event Name pair to each input. The Input Name can be any combination of alphanumeric characters not exceeding 20 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 Event Name pairs are described in the preceding section. As many as 30 Event Name pairs can be defined by the user. Each pair is identified by a number ranging from 1 to 30. After the pairs are defined the Input Names 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 first 20 Input Names/Identifiers defined by the crd14setup1.v101 Setup Database are shown in the following. Analog Inputs follow Digital Inputs. The Virtual Inputs follow the Analog Inputs. They are followed by the Timer Inputs and then Alarm Inputs.

Input	Name	Input Names OnEvent/OffEvent	Event Pair
D01	XR	On/Off	1
D02	D02	On/Off	1
D03	ISLAND1	On/Off	1
D04	ISLAND2	On/Off	1
D05	ISLAND3	On/Off	1
D06	GATEUP	On/Off	1
D07	GATEDOWN1	On/Off	1
D08	GATEDOWN2	On/Off	1
D09	D09	On/Off	1
D10	POK	On/Off	1
A01	B12X	BattBad/BattGood	2
A02	B12	BattBad/BattGood	2
A03	BATTERY3	BattBad/BattGood	2
A04	BATTERY4	BattBad/BattGood	2
V01	Virtual Inp 01	On/Off	1
V02	Virtual Inp 02	On/Off	1
V03	Virtual Inp 03	On/Off	1
V04	Virtual Inp 04	On/Off	1
V05	Virtual Inp 05	On/Off	1
V06	Virtual Inp 06	On/Off	1

[F1/^W]=Next Page [F2/^E]=Prev Page

Input Names / Identifiers Command

Three data screens are required to list all 50 physical, Virtual, Timer and Alarm 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 Event Recorders and Data Loggers. The CRD-14A is a powerful, general purpose recording device that can be used to satisfy the data logging demands of a variety of applications. An Event Recorder is frequently used to gather data on a failure condition thought to exist in a relay-based control circuit. The failure condition may occur intermittently. The need to log data over a significant period of time will often impose an additional requirement upon the recorder. The suspected failure can often 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 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. Each CRD-14A allows as many as eight Virtual Inputs to be defined. Each Virtual Input is defined by specific logical associations among particular physical inputs or other Virtual Inputs.

Virtual Inputs are defined 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 Virtual Input event is to be logged. The number of variables that define the Virtual Input can range from one to four. Variables can be Digital, Analog or 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 CRD-14A as either On or Off. Both states are described in the following.

On—The Digital Input voltage is in the range from 9 to 36Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to [Figure 4 on page 24](#). 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

An array of fields similar to the following will be displayed after selecting the Virtual Inputs command. In the example cited, only variables for Virtual Input V3 have been entered. The other fields have retained their factory default settings.

```

Virtual Input Parameters
Input Function of:
-----
V01 --- --- --- ---
V02 --- --- --- ---
V03 D10 D07 A04 ---
V04 --- --- --- ---
V05 --- --- --- ---
V06 --- --- --- ---
V07 --- --- --- ---
V08 --- --- --- ---

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

Virtual Inputs Command

3

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., V3). 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 10 for Digital Inputs, 1 through 4 for Analog Inputs or 1 through 8 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, the **Ctrl+W** keys can be pressed simultaneously.

A sample response listing three variables is shown in the following. To complete the definition of the Virtual Input the state of each variable must now be assigned.

```

Inputs:                                Virtual Output Function                                Output:
D10                                     D07                                     A04                                     ---                                     V03
POK                                     GATEDOWN1                               BATTERY4                               ---                                     Virtual Inp 03
-----
Off                                     Off                                     Off                                     ---                                     Off
On                                      Off                                     Off                                     ---                                     Off
Off                                     On                                      Off                                     ---                                     Off
On                                      On                                      Off                                     ---                                     Off
Off                                     Off                                     On                                      ---                                     Off
On                                      Off                                     On                                      ---                                     Off
Off                                     On                                      On                                      ---                                     Off
On                                      On                                      On                                      ---                                     On
    
```

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 28. Each row lists, from left to right, the Input Numbers that are assigned to each variable (e.g., labeled “D10”, “D07” and “A04”). 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 first fourteen characters of the Input Name for the variable. For the sample data shown the Input Names are the default names labeled “Digital Inp 10”, “Digital Inp 07” and “Analog Inp 04”. The Virtual Input has retained its default Input Name as well. It is labeled “Virtual Inp 03”.

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. For the sample data shown, all of the Event Names have retained their default values of “On” and “Off”. 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 active or inactive 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 its active state (labeled “On”) when the variable’s states are also “On”, “On” and “On”. Anytime this combination of states is found to exist among inputs D10, D7 and A4, respectively, an active Event Record for Virtual Input V3 will be created and stored in memory. An additional, inactive Event Record will be created when the variable states no longer satisfy these requirements.

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 correct Event Name for that combination of input states.
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.

3

NETWORK (N)

The Network command is used to configure the optional Ethernet Port. A set of six user-assigned fields with data similar to the following will be displayed after the command is selected.

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
TCP/IP mode	Raw TCP/IP

Network Command

A description of each field follows.

IP ADDRESS

The IP Address must be set in accordance with the requirements of the LAN or the same as the address used by the TCP/IP connection of the PC. The initial setting is typically 192.168.0.100.

SUBNET MASK

The Subnet Mask must also be set in accordance with the requirements of the LAN. A value of 255.255.255.0 should be acceptable for a directly connected PC. The initial setting is typically 255.255.255.0.

GATEWAY

If a Gateway is being used by the LAN it too must be set in accordance with the LAN requirements. A setting of 0.0.0.0 is acceptable for a directly connected PC or a LAN when communications through a Gateway are not required. The initial setting is typically 0.0.0.0.

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 CRD-14A. The remaining three numbers must not be shared by any other Ethernet device on the LAN. The initial setting is 00-08-DC-aa-bb-cc, where aa-bb-cc is the serial number assigned by MICRO-AIDE to the recorder. By way of example, a CRD-14A 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.



Use extreme caution in modifying the recorder's MAC Address. Serious LAN conflicts will be created if duplicate MAC Addresses are allowed to exist. Also, restoring a Setup Database will alter the MAC Address if the saved database includes a different MAC Address.

PORT

The Port assignment must also be selected in accordance with the requirements of the LAN. For a directly connected PC any value greater than 1024 is acceptable. The initial setting is typically 5000.

TCP/IP Mode

A Selection Field is used to assign the TCP/IP Mode setting. Press the **Spacebar** to select either Raw TCP/IP or Telnet. In the case of the CRD-14A, either setting is acceptable.

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.

Network settings changed, restart network now?
No Yes



The six fields that comprise the Ethernet Port settings can only be altered by use of the Network command or by uploading a different Setup Database. The Reset System command will not change any of the Network settings.



If an Ethernet connection is idle for more than five minutes a timeout condition will occur. The timeout will result in a forced disconnection at the CRD-14A end. The user will then have to initiate a new connection procedure to re-establish communications with the recorder. The timeout duration and forced disconnection is performed so that in the event of a connection failure anywhere in the network, the recorder will be prepared to complete a subsequent connection attempt. However, to be successful the subsequent connection attempt must occur no sooner than five minutes after the communications disruption. The recorder will automatically recover from communication failures of less than five minutes duration provided the user end does not perform a disconnect.

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 20 separate Alarms. The ACT is organized as 20 rows. Each row includes eight fields, seven of which can be edited. Each field includes a numeric or alphanumeric setting that is used to define the Alarm.

The following data sample displays a typical ACT. It has defined ten Alarm conditions.

Alarm Configuration							
	SetInp	SetState	SetTime	ClrInp	ClrState	ClrTime	MaintClr
L01	A01	On	600	A01	Off	300	No
L02	A02	On	600	A02	Off	300	No
L03	A03	On	600	A03	Off	300	No
L04	A04	On	600	A04	Off	300	No
L05	D10	Off	1800	D10	On	300	No
L06	D10	Off	7200	D10	On	300	No
L07	D03	On	5	D03	Off	5	No
L08	D04	On	5	D04	Off	5	No
L09	D05	On	5	D05	Off	5	No
L10	D01	Off	1800	D01	On	10	Yes
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-related Event Records are only created when specific conditions are detected by the recorder. Before attempting to modify an existing Alarm (or define a new Alarm) the processes used by the recorder should first be fully understood. Irrespective of type, every Alarm is subject to the following conditions and processes.

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- 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 Event Record is created and logged to memory. When an Alarm is Cleared a related, but nevertheless distinct, record is also created.
- Set and Cleared Alarm Event Records include an On Event Name and Off Event Name, respectively. Refer to the section entitled "Event Names (E)" on page 26 for additional details.
- 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 acts 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 Event Record is created.
- The state of every recorder 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 seven fields of the ACT define the specific criteria for each Alarm. The settings for these fields are described in the following sections.

SETINP

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 10 for Digital

Inputs, 1 through 4 for Analog Inputs and 1 through 8 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.

SETSTATE

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 24](#). 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.

SETTIME

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

CLRINP

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 10 for Digital Inputs, 1 through 4 for Analog Inputs and 1 through 8 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.

CLRSTATE

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 24](#). 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 Alarms. ClrTime is always measured in seconds and must be in the range of 0 to 99,999. Fractional values are not accepted.

MAINTCLR

The user can, at any time, place the recorder in Maintainer Mode. Refer to the section entitled ["Maintainer Mode Pushbutton" on page 37](#) for additional details. While in Maintainer Mode the recorder will not log Alarm records to memory. The MaintClr setting can be used to reset an Alarm that is currently Set. In the sample ACT, Alarm Input L10 (XR down for 30minutes) is cleared 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 On state of Digital Input D9 will be used to Set the Alarm. The Off state of Digital Input D10 will be used to Clear the Alarm.

- Durations of 10 minutes and 5 minutes will be used to validate the Set and Clear Alarm conditions, respectively.
- Maintainer Mode is allowed to clear an active Alarm condition.

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	ClrInp	ClrState	ClrTime	MaintClr	

L20	D09	On	600	D10	Off	300	Yes

Sample Alarm Definition

PRINT SETUP DATA (P)

The Print Setup Data command can be used to display the setup parameters assigned by the user. The following menu of sub-commands is displayed after selecting the Print Setup Data command.

Print Setup Data	
P	Print All
E	Print Event Names
I	Print Input Names
D	Print Detect Times/Flash Enable
C	Print Counter Events
A	Print Analog Configuration
V	Print Virtual Inputs
T	Print Timer Configuration
L	Print Alarm Parameters
N	Print Network Settings
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 14.

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TRANSFER FILES (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 CRD to PC
U	Upload Setup Data PC to CRD
F	Firmware Upload

Transfer Files Command

DOWNLOAD SETUP DATA (D) - SAVING THE DATABASE

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 recorder'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.



As the saved Setup Database file will be a text file, it should be assigned a file extension of ".txt" or ".hex".

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.

```
:100000000008DC012345C0A80064FFFFFF000000DA
:100010000000881300072A2A2A2A204E4F54203B
:10002000534554202A2A2A2A00FFFFFFFFFFFFF8
:10003000FFFFFFFFFFFFFFFFFFFFFFFFFFFFFD0

:1008B00000000000FF00FF00000000000000003A
:1008C000FF00FF000000000000000000FF00FF002C
: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 recorder it must have been previously saved. Refer to the procedure entitled "Download Setup Data (D) - Saving the Database" on page 34. 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 recorder'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 CRD?
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. Provided the saved Setup Database file was not renamed, it will have a file extension of ".txt" or ".hex".

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 Administrative and Restricted Access sessions. If the previous user logs off of the recorder, 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 recorder, 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 Setup Procedure for the CRD-14A Event Recorder. The recorder is now prepared to log events in accordance with the setup performed by the user. Since the installation and setup of the recorder are critical to how the CRD-14A will perform, it is advisable to review the steps taken earlier.

The next chapter describes how to operate the CRD-14A.

CHAPTER 4 – OPERATION

INTRODUCTION

Except as noted in the following sections, the operation of the CRD-14A is completely automatic once an appropriate Setup Database is loaded and the unit is installed. It will monitor the crossing and log Event Records to memory without the need for user intervention. However, if and when an incident or maintenance issue arises the user will need to interact with the recorder in order to review and acquire pertinent Event Record data. This chapter describes various techniques for gathering this data.

The user's operational interaction with the recorder is facilitated by several features. The features can be broadly grouped into three main categories.

FRONT PANEL FEATURES

The status of several important recorder features are continuously updated by the use of LED indicators.

STATUS INDICATORS

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

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Power– The green LED illuminates when power is applied. Power must be in the range of 9 to 36 Vdc.

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 predefined 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 31. The current status of all 20 Alarms is also reported using the Live Status command. Refer to the section entitled "[Live Status \(L\)](#)" on page 43 for additional details.

Running– The green LED will flash once per second to indicate the CRD-14A is operational.

Terminal– The green LED will flash momentarily while data is being sent or received via the serial Terminal Port.

Maintainer Mode/Event Storage– If Maintainer Mode is inactive, the yellow LED will illuminate momentarily when an Event Record is saved to memory. It will blink off when Maintainer Mode is active.

MAINTAINER MODE PUSHBUTTON

On occasion the crossing will need to be tested or perhaps repaired. While under test or repair, it is likely that the CRD-14A will log Alarm records that do not reflect failures of any crossing equipment. Placing the recorder in Maintainer Mode indefinitely halts the saving of all Alarm-related records.

To place the recorder in Maintainer Mode, press the switch labeled "Maintainer Mode PB" for .5 seconds. The yellow LED labeled "Maintainer Mode/Event Storage" will illuminate to confirm the action. The logging of all Alarm Event Records will be halted immediately. Previously saved Event Records will be retained in memory.

The recorder's normal mode of operation can be restored by either of two actions. They are described in the following.

- Press the Maintainer Mode PB switch for .5seconds.
- If left unattended, a fail safe mechanism will automatically restore normal operation. The Maint Timeout setting controls the duration of Maintainer Mode. If the duration is exceeded, normal operation is restored immediately. The action will be confirmed by the Maintainer Mode / Event Storage LED. This timeout feature is fully described in the section entitled "[Maint Timeout](#)" on page 21. The default setting for the timeout parameter is 90minutes.

A System Event Record is saved to memory each time Maintainer Mode is enabled or disabled. System Event Records are described in the section entitled "[System Events](#)" on page 54.

DIGITAL INPUT INDICATORS

Each of the ten Digital Inputs are linked to an individual LED indicator. A green LED will illuminate when its associated Digital Input is in an On state. Digital Inputs assume an On state when their voltage is in the range of 9 to 36Vdc and the voltage persists in this range for a duration greater than the input's assigned Detection Time. Refer to the section entitled "[Detect Times / Flash Enable \(D\)](#)" on page 21 for additional details.

ETHERNET PORT OPTION

The previous chapters described accessing the user interface of the CRD-14A via its serial Terminal Port. However, the recorder can also be accessed via its optional Ethernet Port. This option provides two important network-based features.

ACCESS VIA ETHERNET

4

The first of these features provides the ability to remotely access the recorder via a LAN-based 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 recorder. The section entitled "[Network \(N\)](#)" on page 29 describes these settings.

The following points describe important aspects of Ethernet connections as they apply to the CRD-14A.

- 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 19.
- Identical sets of commands, sub-commands and menus are available to the Ethernet and Terminal Port interfaces.
- The data throughput rate using a LAN-based Ethernet connection will be greatly superior to that of a Terminal Port connection. [Table 10 on page 60 12](#) lists typical data transfer rates for both user-accessible ports.
- Ethernet sessions will automatically terminate after 5minutes of no activity. No activity is defined as data is neither being sent nor received via the Ethernet Port's connection. This action provides automatic recovery from network outages. Anytime after waiting 5minutes, a new Ethernet connection can be established.

Perform the steps listed in the following to establish an Ethernet connection. The procedure assumes that the user will access the recorder via a LAN.

1. Assign an IP Address and Port Number to the recorder's Ethernet Port in accordance with the requirements of the LAN.
2. Connect the CRD-14A to either a switch or hub device using a CAT-5 cable.
3. Configure the communications application (e.g., HyperTerminal) to connect using TCP/IP (Winsoc).

4. Within the communications application enter the recorder's IP Address and Port Number as the target IP Address and associated Port Number. HyperTerminal refers to the target device as a host.
5. Click the appropriate icon that initiates the connection.
6. A successful connection is indicated by a log-on password request regardless of the interconnection method employed. A password request similar to the following will be displayed.

```

Model CRD-14A Event Recorder. Ver 1.05 (C) 2014 MICRO-AIDE INC.
CRD14SETUP1.v101
Event storage capacity: 297045
Enter password:

```

Password Request

7. From the host system type **crd** in lower-case letters. This is the Union Pacific specified Restricted Password. Complete the entry by pressing the **Enter** key.



The password to be entered may be different if the Union Pacific Setup Database has not been installed. Enter **PASSWORD** in upper-case letters as an alternative.

8. The host system is given three attempts to enter the correct password. A third error will result in a disconnect by the recorder. This procedure prevents unwanted users from accessing the recorder. After the password is entered the user will be able to operate the recorder in a manner identical to that specified by local operation. Accordingly, the CRD-14A will display the Main Menu of commands. Refer to the sample data entitled "[Main Menu](#)" on page 39.

CLOCK SYNC

The second important feature the optional Ethernet Port introduces concerns synchronizing the recorder's real-time clock. This feature requires an SNTP-Multicast enabled time server be connected to one node of the LAN. Refer to the section entitled "[Clock Sync Mode](#)" on page 20 for additional information.

4

OPERATIONAL COMMANDS

An explanation of each operational command is included in the remaining sections of this chapter. Operational commands may be executed in any sequence. The user may wish to perform operations in one sequence and then, depending upon the observed data, perform a different sequence of commands. Each command is listed by its name (as it appears in the Main Menu) followed by its command code contained within parenthesis.

```

MICRO-AIDE CRD-14A Event Recorder 1.05

S Setup
L Live Status
Q Query Events
V View Events
C Counters
M Measure Flash Rate
T Transfer Files
D Diagnostics
X Log Off

```

Main Menu

QUERY EVENTS (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 11-03-12

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 CRD-14A can store Event Records for 128 different dates provided the event storage capacity is not exceeded.



The CRD-14A 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.

4

SELECTING A SINGLE DATE

1. Using the appropriate arrow keys highlight the single date of interest.
2. Press the **Enter** key.

SELECTING A RANGE OF DATES

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.

QUERY REPORT MENU

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: (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 CRD-14A can format Event Records in two different ways. Press the **Spacebar** to select one of the formatting options 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 45. 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), 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 49. 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 14.

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 49. 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 47.



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.

INPUTS

The Inputs field allows the user to inspect Event Records from specific inputs. The default setting (Inputs field is blank) will issue records from all inputs. To select specific inputs a valid Input Number must be entered. Digital Inputs are entered as **Dn**, where n is 1 through 10. Analog Inputs are entered as **An**, where n is 1 through 4. Virtual Inputs are entered as **Vn**, where n is 1 through 8. Timer Inputs are entered as **Tn**, where n is 1 through 8. Alarm Inputs are entered as **Ln**, where n is 1 through 20. System Event Inputs are entered as **Sn**, where n is 1 through 6.



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 recorder at a specific moment in time. Refer to the section entitled “[System Events](#)” on page 54 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 illustrates a typical Inputs field entry.

```
Inputs: d2 D5-8 a3 d10 v7 A1-2
(blank=all)
```

As the example indicates, the input type designator can be entered as an upper- or lower-case letter. Input Numbers can be entered without regard to sequence. Event Records for Digital Inputs D2, D5, D6, D7, D8, D10, Analog Inputs A1, A2, A3 and Virtual Input V7 will be issued.

After the inputs are selected the user must press the **F1** 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 or Comma. After the last Event Record a message similar to the following will be displayed.

```
Number of records = 24 Checksum = 93F4
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.

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 or Ethernet). This command can be very useful in tracking events that are occurring while the user is online with the recorder. 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 49.

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

View Events Report

Include Details: Yes

Inputs:
(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 45 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 42.

After the selection fields are assigned press the **F1** key to start the report. Alternatively, press the **Ctrl+W** keys simultaneously. The recorder will continue to issue records as they occur in real-time. Press the **Esc** key to terminate 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 various recorder inputs (i.e., Digital, Analog, Virtual and Alarm). 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 Name and Event Name. The latter are described in the sections entitled "[Input Names \(I\)](#)" on page 26 on page 17 and "[Event Names \(E\)](#)" on page 26, respectively.



To properly view the Live Status report the PC must be configured to emulate an ANSI terminal.

```
[ESC]=exit                               Live Status                               12:11:51 10-31-14
XR : Off Alarm_Batt1 : Off
D02 : Off Alarm_Batt2 : Off
ISLAND1 : Off Alarm_Batt3 : Off
ISLAND2 : Off Alarm_Batt4 : Off
ISLAND3 : Off Alarm_Power_30min : Off
GATEUP : Off Alarm_Power_2hr : Off
GATEDOWN1 : Off Alarm_Power_AC_5sec : Off
GATEDOWN2 : Off Alarm_Hi_Temp : Off
D09 : Off Alarm_Gate_Problem : Off
POK : On Alarm_Xing_Occupied : Off
B12X : 13.1Vdc BattGood Alarm_Inp 11 : Off
B12 : 13.9Vdc BattGood Alarm_Inp 12 : Off
BATTERY3 : 0.0Vdc BattBad Alarm_Inp 13 : Off
BATTERY4 : 0.0Vdc BattBad Alarm_Inp 14 : Off
Virtual Inp 01 : Off Alarm_Inp 15 : Off
Virtual Inp 02 : Off Alarm_Inp 16 : Off
Virtual Inp 03 : Off Alarm_Inp 17 : Off
Virtual Inp 04 : Off Alarm_Inp 18 : Off
Virtual Inp 05 : Off Alarm_Inp 19 : Off
Virtual Inp 06 : Off Alarm_Inp 20 : Off
Virtual Inp 07 : Off
Virtual Inp 08 : Off
```

Live Status Report - Digital and Analog Inputs

The Live Status report includes a header that lists the present time and date. Digital Inputs, with their corresponding Input Names, are listed in the top section of the first column. To the immediate right of the Input Name is the Event Name that identifies the input's present state. The next section lists the Input Names, measured values and corresponding Event Names for each of the four Analog Inputs. The eight Virtual Inputs are listed below the Analog Inputs.

The right side of the Live Status report lists the 20 Alarm Inputs and their respective states. In the sample data all of the alarm conditions are Off.

4

COUNTERS (C)

The Counters command provides an immediate snapshot of all ten Counter values. The report is not live, but rather reflects the Counters at the moment the command was executed.

Data similar to the following will be displayed after the command is selected. The second line of text lists the installed Setup Database. Each Counter is easily identified by its Digital Input number. The counting range is 0 to 65,535 and automatically rolls over to 0 once the maximum count is reached.

```
Report printed on 07-11-17
CRD14SETUP1.v101
Counter Report
Counter for D01 = 1017
Counter for D02 = 37
Counter for D03 = 20484
Counter for D04 = 65535
Counter for D05 = 0
Counter for D06 = 0
Counter for D07 = 0
Counter for D08 = 0
Counter for D09 = 0
Counter for D10 = 0
Report Done
hit any key to continue
```

Counters Command

The Counter values are saved in the recorder's flash memory making them completely non-volatile. Individual Counter values will remain unchanged if the Counter Event Selection is set to Disable. Refer to the section entitled "[Counter Event \(C\)](#)" on page 22. The Reset Counters command can be used to reset all Counter values to zero. Refer to the section entitled "[Reset Counters \(C\)](#)" on page 18.

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 CRD-14A user to precisely determine the flashing rate of a circuit.

Enabling the Measure Flash Rate feature imposes several temporary pre-conditions upon the Setup Database of the recorder. The circuit to be measured must be connected to a Digital Input. The selected 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 21.



The CRD-14A 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 10. Leading zeros are not required. Press the **Enter** key to accept the Input Number. Finally, press the **F1** 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: 45.2
On Time:      0.664 Sec
Off Time:     0.664 Sec
Cycle Time:   1.328 Sec
Detect Time:  0.664 Sec
    
```

Measure Flash Rate Report

The lower five lines of text reflect the Measure Flash Rate data. The first line indicates the number of flashes per minute (e.g., 45.2). The second and third lines report the On Time and Off Time durations, respectively. 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 setting will be automatically restored.

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 CRD-14A. 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. Eight sample records are shown in the following.

02:01:05.000	10/31/14	System Power	OFF	S01	
02:01:37.028	10/31/14	System Power	ON	S01	
08:05:55.175	10/31/14	Gate Up Ind	On	D06	
10:12:01.330	10/31/14	Island 1	I1 Down	D03	
00:05:00.169	11/01/14	Sntp Clock Sync	OFF	S04	
07:31:47.105	11/01/14	Alarm Inp 01	BattLow	L01	
10:00:55.433	11/01/14	Gate Delay	Violate	T08	31.1s
11:08:48.297	11/01/14	EOR	Off	D10	48.2FPM

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 20-character Input Name identifies the input. An Input Name of Gate Up Ind is listed in the third 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 fourth 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 D10), Analog (A01 through A04), Virtual (V01 through V08), Timer (T01 through T08), Alarm Input (L01 through L20) or System Event (S01 through S04).

Measured Time or Flash Rate—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. The last two sample records include a measured value.

The first two sample records are from System Input 1 (i.e., S1). The records indicate when power was lost and then restored to the recorder. During the 32-second-long interval no events could be detected or recorded.

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 "No Details" on page 46. The following sample record is the third Event Record from the previous section.

08:05:55.175	03/10/14	Gate Up Ind	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

indicates the state of Digital Input D10. There are four symbols used to indicate the state of Digital Inputs. They are described in the section entitled "[Symbol Legend](#)" on page 47.

The middle section of the second line of text includes a sequence of eight 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 eight, indicates the state of Virtual Input V1. The right-most character indicates the state of Virtual Input V8. There are four symbols used to indicate the state of Virtual Inputs. They are described in the section entitled "[Symbol Legend](#)" on page 47.

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). 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 47.

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 5: 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 6: Symbol Legend-Analog Inputs

Event Names and Analog Limit Values are described in the sections entitled "[Event Names \(E\)](#)" on page 26 and "[Analog Configuration \(A\)](#)" on page 23, 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
"CRD14SETUP1,v101"
0,0,0,0,0,0,0,0,1,0,0,0,0,1,0,0,0,0,0,0,1
02:01:05.000,03/10/14,"System Power","OFF",.49
02:01:37.028,03/10/14,"System Power","ON",.49
08:05:55.175,03/10/14,"Gate Up Ind","ON",.6
10:12:01.330,03/10/14,"Island 1","OFF",.3
```

Comma Separated Value Report

Each report includes a three-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 10 are represented. In the sample data previously cited, Digital Inputs 10 is On. The other Digital Inputs are Off. The following four digits specify the state of each Analog Input. Finally, the last eight digits represent the state of each Virtual Input. All of the Analog Inputs are in their acceptable range of operation. Virtual Inputs 1 and 8 are 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 or flash enabled Digital Input a sixth field that lists the measured time or flash rate is included, respectively.

4



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 7 on page 48](#) 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 54.

Event Record Category	Input Number	CSV Input
Digital	D1 - D10	1 - 10
Analog	A1 - A4	11 - 14
Virtual	V1 - V8	15 - 22
Timer	T1 - T8	23 - 30
Alarm	L1 - L20	31 - 50
System Power	S1	51
High Temperature	S2	52
Low Temperature	S3	53
SNTP Clock Sync	S4	54
Manual Clock Set	S5	55
Maintainer Mode	S6	56

Table 7: CSV Input Numbers

CAPTURING EVENT RECORDS TO A PC FILE

The Query (with the Report Type set to Dump 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** key (alternatively, the **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 recorder 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 42. In the case of the View command the record stream will cease only when the user presses the **Esc** key.
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.

This concludes the chapter on how to operate the CRD-14A from either of its two peripheral ports. Terminate the current session by using the Log Off command. Refer to the section entitled "[Log Off \(X\)](#)" on page 35.

The next chapter describes general maintenance techniques that may benefit the user in case a problem symptom is ever encountered.

CHAPTER 5 – MAINTENANCE

INTRODUCTION

The primary purpose of this chapter is to describe the recommended trouble-shooting methods to be used with the CRD-14A. It should be referred to if ever a questionable symptom arises during the operation of the recorder.

The CRD-14A 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 recorder should remain clean indefinitely. Additionally, MICRO-AIDE printed circuit boards (PCBs) are sealed with a moisture and fungus resistant conformal coating.

WORKING INSIDE THE RECORDER

The user may have occasion to work inside the unit to add an optional equipment item. The following sections describe tasks involving work that may be performed inside the recorder. Observe the steps listed in the following before attempting any task. Refer to [Figure 1 on page 8](#) and [Figure 2 on page 9](#). They illustrate the front and top sides of the recorder, respectively.

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1. Remove power from the recorder by detaching the connector labeled "Power" located along the top side of the recorder.
2. Remove all of the Analog and Digital Input connectors and peripheral cables.
3. Remove the recorder from the shelf or backboard.
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 recorder can then be completely separated.

The task can now be performed safely. After the work is completed reassemble the recorder 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 recorder it is recommended that the user wear a wrist grounding strap.

REPLACING THE FUSE

There is a fuse mounted on the Processor PCB. The fuse is designed to protect the input power source. It is rated at 1 A and conforms to the 2AG size standard. Before replacing a fuse the cause of the blown fuse should be ascertained and cleared if possible. The fuse is illustrated in [Figure 6 on page 52](#).

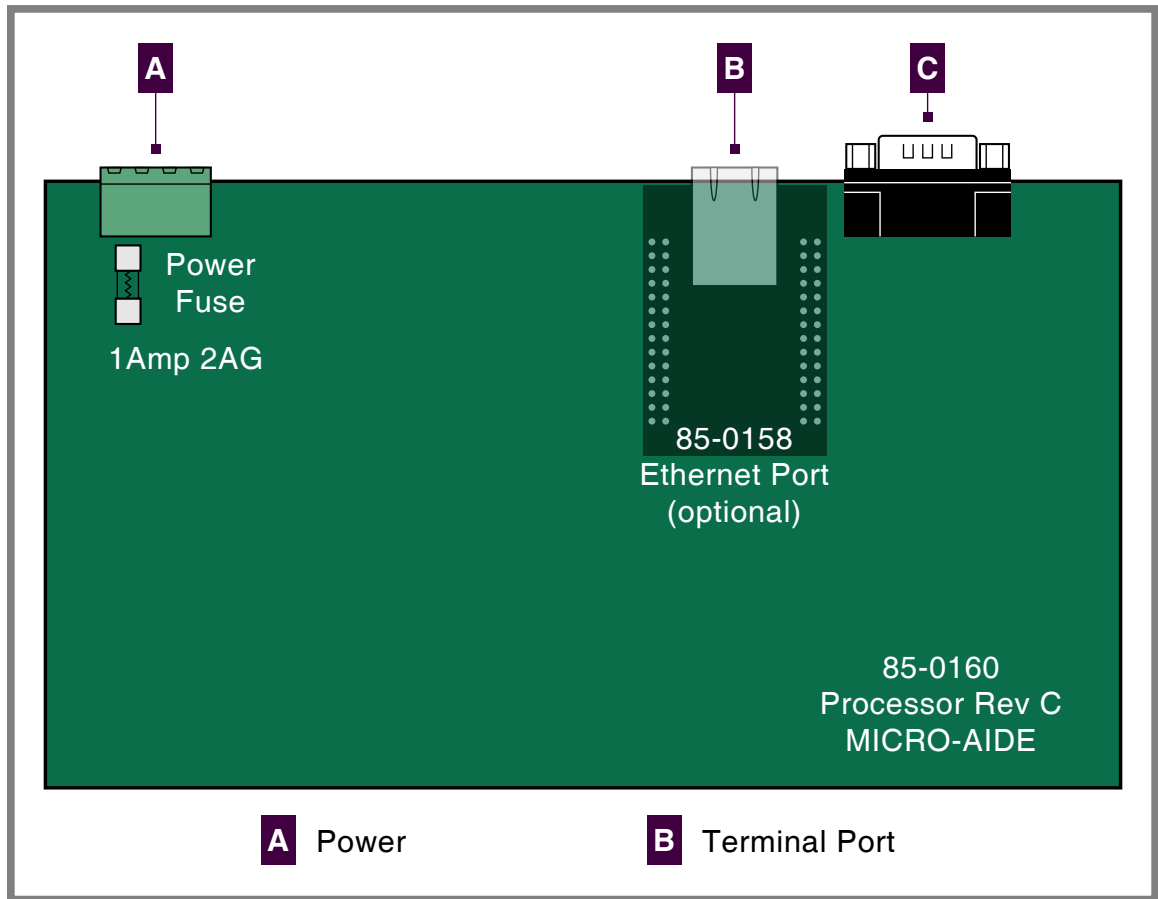


Figure 6: Processor PCB

5

INSTALLING THE OPTIONAL ETHERNET PORT

The CRD-14A can be equipped with a 10/100 Base-T Ethernet Port. The optional Ethernet Port allows high speed local or remote access to the recorder via a TCP/IP-based Local Area Network (LAN) connection. It uses the internal power of the CRD-14A rather than commercial AC power. [Table 10 on page 60](#) lists the bit transfer rates of both user-accessible ports.

Generally, the Ethernet Port is ordered at the time the recorder is purchased and is pre-installed at the factory. If the port was not previously ordered the user may wish to install it after delivery of the recorder. To install the Ethernet Port follow the steps listed below.

1. Completely remove the recorder's front panel assembly in accordance with the procedure entitled "[Working Inside the Recorder](#)" on page 51.
2. Remove and discard the protective plate that covers the Ethernet Port opening located at the top panel. A 6-32 1/4" nut secures the protective plate.
3. Locate the 56-pin female socket labeled "U6" along the upper edge of the Processor PCB. The socket is illustrated in [Figure 6 on page 52](#).
4. Carefully align all of the pins on the Ethernet Port module with their socket counterparts. Press firmly on the module to insure it is seated properly and fully into the socket.
5. Reassemble the recorder.

After power is reapplied to the recorder and the firmware is initialized, the Ethernet Port must be properly configured. Refer to the procedure entitled "[Network \(N\)](#)" on page 29.

DIAGNOSTIC TESTING

The Main Menu of commands for the CRD-14A includes the Diagnostics command. Refer to the sample data entitled "Main Menu" on page 39. The Diagnostics command can be used to quickly verify the operational integrity of several hardware elements of the CRD-14A. Each of the five tests can be performed at any time. They are non-destructive and therefore will not alter the contents of the Setup Database or Event Record memories.

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
E Ethernet Test
T Temperature
L Light LEDs
  
```

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=8351
                                GOOD

Test Complete
Press any key to continue
  
```

Program Memory Test

The checksum takes only a few seconds to be calculated. The checksum value of 8351 in the previous example will vary with the version of the firmware installed in the recorder.

FLASH MEMORY TEST (F)

The Flash Memory Test is performed on the memory chip used to store Event Records. The test verifies that the microprocessor can access the Event Record 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

If the recorder has been equipped with larger amounts of Flash Memory the 4096K reference will be replaced by the references 8192K or 16384K. A failure has been detected if 0K is reported. The readings should be compared to the known memory capacity of the recorder.

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 displayed.

```

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 LAN communications. For this reason, MICRO-AIDE recommends that a ping test also be performed.

TEMPERATURE (T)

The Temperature Test simply reports the temperature inside the recorder.

A typical response to the Temperature Test command is listed in the following. The temperature is always reported in degrees Fahrenheit.

```

Unit Temperature  77 Degrees F

Test Complete
Press any key to continue
    
```

Temperature Test



The measured temperature inside the CRD-14A will generally be 5°F to 10°F warmer than the surrounding ambient temperature. Temperature readings should never exceed 180°F.

LIGHT LEDs (L)

5

The CRD-14A includes ten LEDs that are used to indicate the status of each Digital Input. The LEDs are further described in the section entitled "[Digital Input Indicators](#)" on page 38. Select the Light LEDs command to test the indicators. The LEDs will be illuminated for 5 seconds. The test will complete automatically.



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. Examples of exceptions to this rule concern the cycling of power to the recorder and variations in the recorder's measured temperature.

Each time power to the CRD-14A 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 an event will also be logged. Each time the optional SNTP Clock Sync feature sets the recorder's real-time clock an Event Record is logged. Additionally, manually setting the real-time clock and enabling or disabling Maintainer Mode creates appropriate Event Records. 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 and Event Name fields within the record are uniquely labeled. They cannot be changed by the user. [Table 8 on page 55](#) lists the various fields used by each System Event Record.

Input Number	Input Name	Event Name Pair
S01	System Power	ON/OFF
S02	High Temperature	ON/OFF
S03	Low Temperature	ON/OFF
S04	Sntp Clock Sync	OFF/OFF
S05	Clock Set	OFF/ON
S06	Maintainer Mode	ON/OFF

Table 8: System Event Records - Assigned Labels

System Events can be reviewed using either of two formatting options. Record formats are described in the section entitled "Event Record Formatting" on page 45. Listed in the following are eight sample Event Records as they would appear at the PC. In the interest of simplicity only the single-line form is shown.

05:18:27.000	10/31/14	System Power	OFF	S01
05:18:59.244	10/31/14	System Power	ON	S01
14:11:51.000	10/31/14	High Temperature	ON	S02
15:00:09.000	10/31/14	High Temperature	OFF	S02
17:50:40.390	10/31/14	Clock Set	OFF	S05
17:50:45.000	10/31/14	Clock Set	ON	S05
03:02:32.800	11/01/14	Maintainer Mode	ON	S06
04:32:32.800	11/01/14	Maintainer Mode	OFF	S06

Sample System Event Records

The first two records indicate that power was off to the recorder for approximately 32seconds. Later in the same day the measured temperature was found to be excessive for 48minutes. The fifth record indicates that the real-time clock was manually changed at 17:50:40.390. The next record indicates that the new time was set to 17:50:45. Finally, the last two records indicate that Maintainer Mode was enabled and disabled for 90minutes.

5



With the Clock Sync Mode set to SNTP the user will never have to manually set the clock.

System Events can be Queried and Browsed just like other Event Records. Instead of selecting a D, A, V, T 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 CRD-14A 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 CRD-14A 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 CRD-14A. Consequently, there is no need to open the unit to gain access to the Processor PCB.

The firmware update procedure, described in this section, must be performed via a PC connected to the Terminal Port or optional Ethernet Port (provided the latter is installed).



Occasionally a new firmware release will be incompatible with the recorder'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 2 on page 4](#). 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 recorder'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 recorder and the Main Menu should be displayed. Refer to the sample data entitled "[Main Menu](#)" on page 39.
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 CRD to PC
U Upload Setup Data PC to CRD
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., CRD-14A V105.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 (at 9600Baud). The following message will indicate a successful file transfer.

```

Done!
Press ESC to continue
    
```

12. Press the **Esc** key as instructed. The following message will be displayed.

Do you want to restart the CRD-14A event recorder now?
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 16.

TROUBLE-SHOOTING GUIDE

The following guide is provided to assist the user in resolving problems that may occur with the operation of the CRD-14A. It can be especially helpful when attempting to operate the recorder 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. Corrective actions to be performed inside the CRD-14A must be carried out in accordance with the procedure entitled "Working Inside the Recorder" on page 51.

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 does not display data when connected to the Terminal Port.	Check cable connection to Terminal Port. Verify cable is wired per Figure 7 on page 60 . Check Baud rate setting. Check if Terminal LED on front panel illuminates.
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 optional Ethernet Port when directly connected.	Verify recorder's IP Address and Port Number are correctly assigned. 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.
SNTP fails to provide accurate clock control.	Verify Clock Sync Mode is set to SNTP. Verify time server is transmitting SNTP-Multicast.
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.

Table 9: Guide to Trouble-Shooting Techniques

Symptom or Problem	Resolution
Initial Check-Out Procedure fails on all Digital 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.
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.
Counters are not incrementing properly.	Check that Event Selection is not set to Disable. Verify Event Selection setting is either On or Off as preferred by the user.
Flashing inputs create multiple Event Records.	Enable flashing status for inputs. Set Detection Time, in seconds, to value of $30 \div \text{fpm rate}$.
Negative Analog Input voltage is not reported, measures 0.	Only positive voltages are reported in the range of 0 to +51.1 Vdc.
AC analog readings are incorrect.	Only DC voltages are measured.
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.
Event Records from Alarm Inputs are not being created on some inputs.	Verify proper settings in Alarm Configuration Table. Reload Setup Database.
Front panel LED labeled "Active Alarm" is always illuminated.	Use the Live Status command to identify the active alarm(s). Refer to the section entitled " Live Status (L) " on page 43. If necessary, verify the Alarm Input definition in the Alarm Configuration Table.
Upload/Download of Setup Database fails.	Verify text file transfer protocol is being used.

Table 9: Guide to Trouble-Shooting Techniques

This completes the User Manual for the CRD-14A Event Recorder. As an aid to the user three appendices have been provided. The first two include detailed specifications and options applicable to the CRD-14A. The third provides a functional description of a typical Alarm Configuration Table.

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.

APPENDIX A – TECHNICAL DATA

SPECIFICATIONS

Physical

Size
Length: 8.2"
Height: 5.9"
Depth: 2.6"

Weight
1.3lb.

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

Construction

Chassis
Fully enclosed, anodized aluminum
Externally accessible LEDs and connectors

Electrical

All components mounted on conformal coated, internal PCB

Power

Voltage
Range: 9 to 36 Vdc

Consumption
Maximum: 1.8W

Isolation

Power Terminals, Digital and Analog Inputs, Ethernet Port (optional)
Minimum: 3800 Vdc to chassis and any terminal

Capacities

Inputs
Digital: 10, all optically isolated
Analog: 4, DC voltage only
Virtual: 8, user-assigned
Timer: 8, user-assigned
Alarm: 20, user-assigned

Event Storage

Standard: 297,045 records
Maximum: 1,264,533 records

Physical Inputs

Input Impedance
Digital: minimum 10KOhms, optically isolated
Analog: minimum 10MOhms

Physical Inputs (continued)

Range
Digital Input-On: 9 to 36 Vdc
Digital Input-Off: 0 to 1 Vdc
Analog Voltage: 1 scale, 0 to +51.1 Vdc

Event Validation Times

Digital: .001 to 32.767 seconds, compatible with fixed rate flashing circuits
Analog: fast filter setting

Analog Limit Values

High and Low Limits: 0 to 51.1 Vdc, in multiples of .1 Vdc

Analog Input Accuracy

Typical: ±.15 Vdc

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

Reporting

Creates standard Event Records

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

Alarm Inputs

Usage
On/Off state changes create Event Records that are logged to memory
Designed for a broad range of crossing and signal monitoring applications

Definitions

User-assigned inputs and input states qualify each Alarm
User-assigned time durations validate each Alarm
All definitions are included in a single Alarm Configuration Table

Event Validation Time

0 to 99,999 seconds

Counters

Quantity: 1 per Digital Input with disable feature
Range: 0 to 65,535 with auto-rollover
Increment: advances with On or Off Event transition as selected by user

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

Ethernet (optional)

Type: 10/100 Base-T
Protocols: TCP/IP, Telnet, SNMP-Multicast
Concurrent Sessions: Telnet (1)
Provides remote or local access via TCP/IP connection
Data transfer rates of 4.7Mbps
User-assignable IP Address, port, sub-net mask

Indicators and Controls

System Status LEDs (5)

Power: green
Active Alarm: red, illuminates when one of more Alarm Inputs are On
Running: green, flashes once per second to indicate processor is running
Terminal: green, flashes with send and receive data
Maintainer Mode/Event Storage: yellow, on when Maintainer Mode is active; blinks momentarily when an Event Record is logged to memory

Input Status LEDs (10)

Digital Inputs 1-10: green, illuminates when input is On

Ethernet Port LEDs (2 optional)

Green: link established
Yellow: data activity

Maintainer Mode Pushbutton

Enables and disables Maintainer Mode

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

Analog Inputs

Detachable, screw-down, 8-position, 12 to 22 AWG

Terminal Port

DE-9 male, configured as modified DCE

Ethernet Port (optional)

RJ-45 female

Internal Clock

Accuracy

Typical: ±8 seconds per month (3ppm) when not synchronized

Volatility: maintains accuracy for minimum of 30 days with loss of power

Resolution: .001 seconds for all Event Records

Sync Interval

SNTP-Multicast: per time server schedule (requires Ethernet Port option)

Operation

Time Zones: selectable from 7 different North American settings

Daylight Saving Time: enable or disable automatic adjustment

Leap Year: automatically adjusted

Temperature Sensing

Usage: measures and reports internal temperature of recorder

High and Low Limits: -67°F to 257°F

Password Protection

Administrative Level

Access: unrestricted to all functions

Length: 8 characters

Restricted Level

Access: Event Record and Setup Database viewing only

Length: 8 characters

MICRO-AIDE reserves the right to make changes, at its sole discretion, to any specification listed herein.

TRANSFER RATES

Table 10 on page 60 lists typical bit transfer rates for both of the CRD-14A's user-accessible ports. In each case the same 20,000 Event Records with no-detail formatting were either dumped to a PC file. The times listed are normalized relative to 1,000 Event Records. If speed is a concern, using the optional Ethernet 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
Ethernet Port (optional)	.2	4,704,075	122.5 times faster

Table 10: Bit Transfer Rates by Port

A

TERMINAL PORT CABLE

The following cable is included with every CRD-14A.

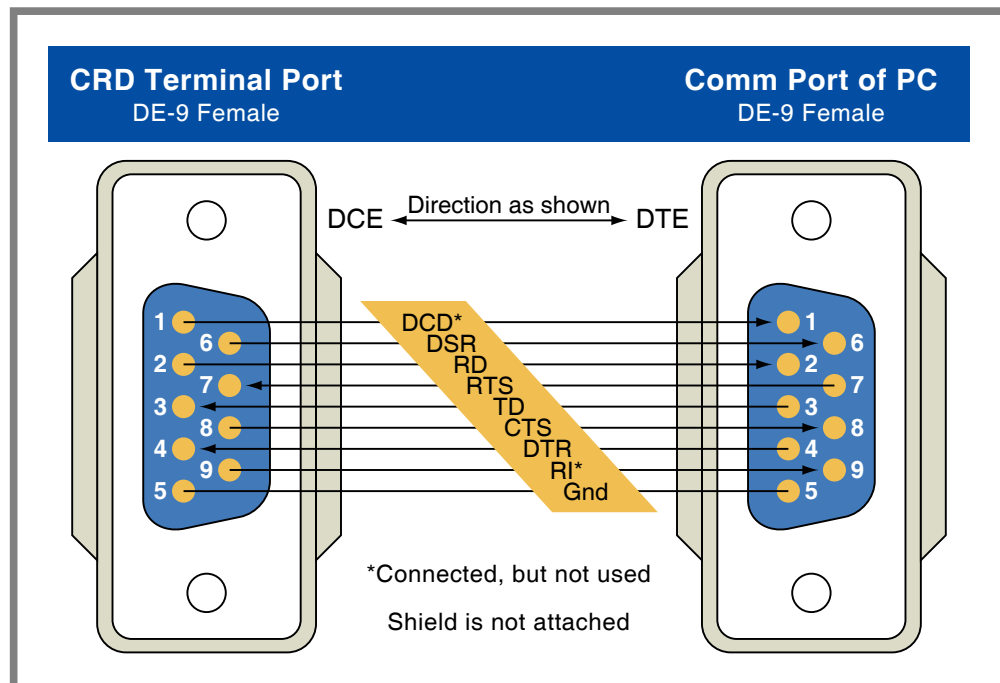


Figure 7: Terminal Port Cable - Wiring Diagram

APPENDIX B – OPTIONS AND ACCESSORIES

OPTIONS

Memory Expansion

40-0416

619,541 Event Records

40-0816

1,264,533 Event Records

Ethernet Port

85-0158

10/100 Base-T, 100Mbps; TCP/IP, Telnet and SNMP-Multicast compatible

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

Cables

DE-9 to DE-9 (included)

B

Contact MICRO-AIDE when ordering any options or accessories
Purchase orders should list part numbers as listed above

APPENDIX C – ALARM CONFIGURATION TABLE

INTRODUCTION

An important feature of the CRD-14A is its ability to detect and report signal anomalies. These anomalies can include crossing gate failures, occupancy violations and low battery voltages. In this regard the CRD-14A and CAR-14A are identical. Each device allows the user to define 20 distinct Alarm conditions. Both devices utilize nearly identical Alarm Configuration Tables (ACT) for defining each Alarm. The processing of Alarms by the CRD-14A and CAR-14A differ in one significant regard. The CAR-14A uses an Internet-based VPN to report Alarm messages in near real-time to a server. By contrast, the CRD-14A allows its user to define similar Alarms, but they are reported as Event Records logged to the memory of the recorder. The 20 possible Alarm conditions are uniquely identified by their assigned Alarm Input Name and number.

SAMPLE ALARM DEFINITIONS

The following data is derived from the ACT included in the c14sear2.v100 Setup Database prepared by Union Pacific for its CAR-14A Reporters. The data shows how a functionally equivalent ACT would appear in the CRD-14A. The section entitled "[Alarm Configuration \(L\)](#)" on page 31 provides a detailed description of how to prepare the ACT.

C

Alarm Configuration							
	SetInp	SetState	SetTime	ClrInp	ClrState	ClrTime	MaintClr
L01	A01	On	600	A01	Off	300	No
L02	A02	On	600	A02	Off	300	No
L03	A03	On	600	A03	Off	300	No
L04	A04	On	600	A04	Off	300	No
L05	D10	Off	1800	D10	On	300	No
L06	D10	Off	7200	D10	On	300	No
L07	D03	On	5	D03	Off	5	No
L08	D04	On	5	D04	Off	5	No
L09	D05	On	5	D05	Off	5	No
L10	D01	Off	1800	D01	On	10	Yes
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 sample ACT defines ten Alarms. They are identified as L01 through L10. A description of each Alarm is provided in [Table 11 on page 64](#). 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	Default Input Name	ID	State	Description
Battery	Alarm Inp 01	L01	On	Alarm is On when Analog Input 01 voltage is below 10.4Vdc or above 15.6Vdc for 10minutes.
			Off	Alarm is Off when Analog Input 01 voltage is between 10.4Vdc and 15.6Vdc for 5minutes.
Battery	Alarm Inp 02	L02	On	Alarm is On when Analog Input 02 voltage is below 11.2Vdc or above 16.8Vdc for 10minutes.
			Off	Alarm is Off when Analog Input 02 voltage is between 11.2Vdc and 16.8Vdc for 5minutes.
Battery	Alarm Inp 03	L03	On	Alarm is On when Analog Input 03 voltage is above 20.0Vdc for 10minutes.
			Off	Alarm is Off when Analog Input 03 voltage is below 20.0Vdc for 5 minutes.
Battery	Alarm Inp 04	L04	On	Alarm is On when Analog Input 04 voltage is above 20.0Vdc for 10minutes.
			Off	Alarm is Off when Analog Input 04 voltage is below 20.0Vdc for 5 minutes.
Power out (short duration)	Alarm Inp 05	L05	On	Alarm is On when POR (Digital Input 10) is Off for 30minutes.
			Off	Alarm is Off when POR (Digital Input 10) is On for 5minutes.
Power out (long duration)	Alarm Inp 06	L06	On	Alarm is On when POR (Digital Input 10) is Off for 2hours.
			Off	Alarm is Off when POR (Digital Input 10) is On for 5minutes.
AC failure	Alarm Inp 07	L07	On	Alarm is On when AnaFail (Digital Input 03) is On for 5seconds.
			Off	Alarm is Off when AnaFail (Digital Input 03) is Off for 5seconds.
Excessive temperature	Alarm Inp 08	L08	On	Alarm is On when HiTemp (Digital Input 04) is On for 5seconds.
			Off	Alarm is Off when HiTemp (Digital Input 04) is Off for 5seconds.
Gate problem	Alarm Inp 09	L09	On	Alarm is On when GateProb (Digital Input 05) is On for 5seconds.
			Off	Alarm is Off when GateProb (Digital Input 05) is Off for 5seconds.
Crossing active too long	Alarm Inp 10	L10	On	Alarm is On when XR (Digital Input 01) is Off for 30minutes.
			Off	Alarm is Off when XR (Digital Input 01) is On for 10seconds.

Table 11: Alarm Descriptions

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.

MICRO-AIDE CORPORATION

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Covina, CA 91722

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