CWR-40B
CWR-72B
EVENT RECORDER

USER MANUAL
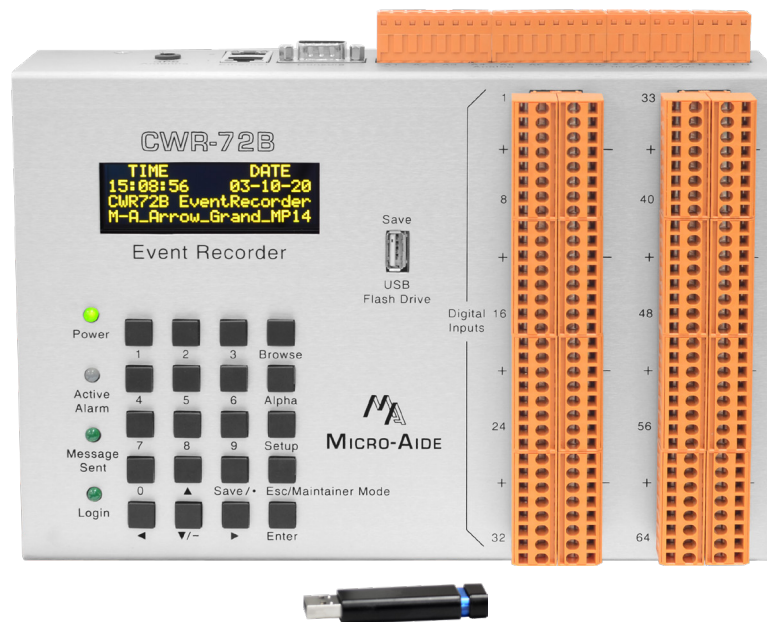
MICRO-AIDE
Rail Signal Products

EVENT RECORDERS   ALARM REPORTERS   DATA LOGGERS

CLOCK SYNCHRONIZERS   CURRENT SENSORS   VOLTAGE MONITORS

BATTERY MONITORS   LIGHT OUT DETECTORS   CUSTOM ENGINEERING

MICRO-AIDE

RAIL SIGNAL PRODUCTS

CWR-72B

TIME   DATE
15:08:56   03-10-20
CWR72B EventRecorder
M-A_Arrow_Grand_MP14

Event Recorder

Save

USB
Flash Drive

Digital
Inputs

Power

Active
Alarm

Message
Sent

Login

1   2   3   Browse
4   5   6   Alpha
7   8   9   Setup
0   ▲   Save/•   Esc/Maintainer Mode
◄   ▼/–   ►   Enter

MICRO-AIDE

CWR-40B AND CWR-72B
EVENT RECORDER
USER MANUAL

Revised: July 2, 2022

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CHAPTER 1 – GENERAL DESCRIPTION

INTRODUCTION

MICRO-AIDE's extensive line of Event Recording devices has recently taken a major step forward in their continuing evolution. The B-family of Event Recording devices has now been introduced. The A-family of devices (e.g., CWR-24A, CWR-40A, CWR-72A, etc.) rely upon the use of third-party software products known as terminal emulator applications (e.g., HyperTerminal, Tera Term, Zoc). These applications were used to establish a serial Terminal Port or modem connection, or a Telnet connection to the recorder's Ethernet Port. By way of contrast, local and remote user connections to any of the B-family products are established by use of a common browser. Briefly stated, all B-family devices are fully compatible with Firefox, Google Chrome, Microsoft Edge and Internet Explorer.

The B-family recorders are further characterized by their dual Ethernet Ports. Both ports are standard equipment items, not options. Each port operates independently of the other. This means multi-user concurrent sessions are supported. The additional port can also be used as an alternative pathway to the device in applications where redundancy is required.

MICRO-AIDE has implemented a broad set of real-time, data analytical tools for several of its A-family products. Collectively, these are known as the Crossing Alarm Reporter (CAR) features. They can be found in the CAR-14A, CAR-24A and CAR-40A devices. The entire set of CAR features and capabilities are now resident in the B-family of devices. A near limitless variety of alarm, fault or possible maintenance concerns can be detected, saved to memory and reported to a message processing server. In effect, the B-family of devices are both powerful Event Recorders and Alarm Reporting devices.

Presently, the B-family of CWR products consists of the CWR-24B, CWR-40B and CWR-72B. The subject of this User Manual is the CWR-40B and CWR-72B. The features, capabilities and physical aspects of both products are identical, with one exception. The CWR-40B includes support for 32 Digital Inputs, while the CWR-72B supports 64. In all other regards the two products are nearly indistinguishable from each other. Accordingly, this User Manual will serve to describe both recorders.

Unless specifically stated otherwise and for the remainder of this User Manual, the reference "CWR-72B" will also be used to describe the CWR-40B. In cases where a distinction exists, a descriptor such as 32 / 64 will be used. The first number or label will apply to the CWR-40B, the latter to the CWR-72B.

The single-screen Alarm Configuration Table (ACT) allows the CWR-72B to report as many as 20 different signal- or crossing-related Alarms. Like other MICRO-AIDE Event Recorders, the CWR-72B utilizes a Setup Database to determine various aspects of its operation. The contents of the ACT are part of the Setup Database. The database and Event Records are saved in the non-volatile memory of the recorder. Accordingly, power losses will not result in the loss or corruption of any database or Event Record information. The database can be saved to a PC file, reloaded and modified as required.

Alarm or fault conditions are detected in real-time by the CWR-72B. These conditions are then used to log an Event Record into memory. Simultaneously, a condition-specific Alarm Message is transmitted to a message server. Refer to Figure 1 on page 2. The figure depicts a VPN network, but more broadly any type of LAN / WAN network can be used. Additionally, the recorder can communicate by direct connection to a spare port on an Ethernet switch or via a cell modem. More simply, either Ethernet Port can be connected directly to an on-site PC.
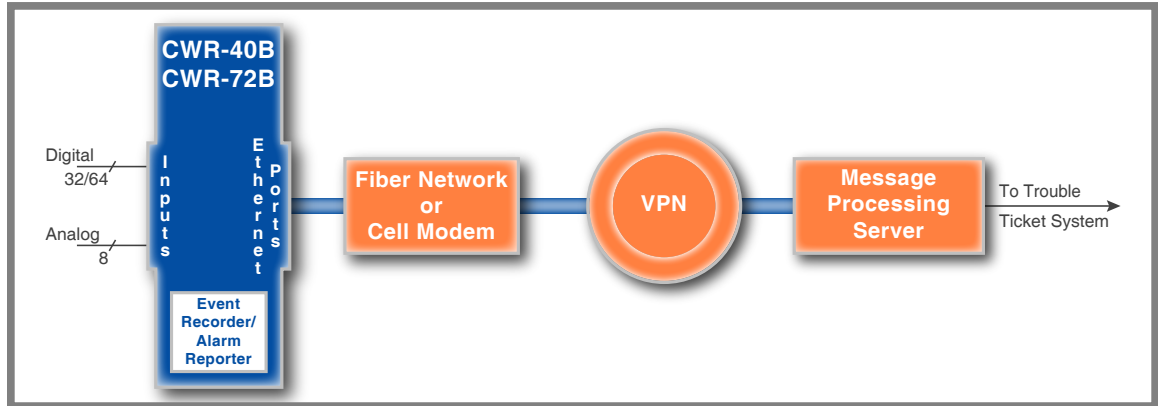
Figure 1: System Components

To an increasing degree, the logs and data records that are retrieved from wayside systems are being challenged in court on a new front. This data is often crucial to the case, but tends to be in the form of simple text files possibly printed on paper. Unsecured text data can be authored in any word processing application. Accordingly, the integrity of the data submitted into evidence can be easily challenged. To overcome this potential issue, the CWR-72B allows its user to create an Event Record report and append a unique, tamper-proof digital signature to the resultant electronic data file.

The CWR-72B features 64 (32 for CWR-40B) Digital and 8 Analog Inputs. The operation of all inputs is completely non-intrusive to the signaling system. High input impedances and an isolated, internal power supply allow the recorder to be used safely. Digital Inputs are typically wired to indications such as XR, gate down, gate up, etc. The Analog Inputs can be used to monitor both DC and AC signals such as battery levels and commercial power voltages. Unlike other systems, the use of Analog Inputs does not reduce the number of available Digital Inputs. MICRO-AIDE's Failed Lamp Detector (FLD-2) can be used in conjunction with the CWR-72B to detect burned-out signal lamps.

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

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

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

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

As a convenience to its user, the CWR-72B can copy Event Records directly to a FAT-32 formatted flash drive. The USB Host Port is a standard feature of the recorder. Install a flash drive into the recorder's front panel socket, press a few keypad buttons and in seconds Event Records from any time span are written as a .txt file. The .txt file can then be read, emailed or printed as required. At the user's option, a digital signature can be appended to the saved text file.

Every CWR-72B comes equipped with a built-in keypad and display screen located on the front panel. This allows the user to effectively operate the recorder without additional peripheral devices. The CWR-72B utilizes an OLED-based display for improved contrast and temperature stability.

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

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

The CWR-72B will also operate as a Modbus compatible server utilizing the Modbus messaging service over TCP/IP. The Ethernet Ports allows an unlimited number of concurrent Modbus clients to access live status information from Digital, Analog, Virtual and Alarm Inputs.

All MICRO-AIDE rail signal products, including the CWR-72B, 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 CWR-72B was to provide the rail signal industry with an instrument maintainers and signal technicians will find easy to operate long after the device has been installed and set up.

KEY FEATURES

The CWR-72B is an Event Recorder with extensive Alarm Reporting capabilities. Its features can be grouped into three categories as listed in the following.

EVENT RECORDING FEATURES

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

- The storage capacity is 261,632 Event Records (expandable to 3,055,104).

- Event Records can be logged for 128 distinct days.

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

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

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

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

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

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

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

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

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

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

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

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

ALARM REPORTING FEATURES

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

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

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

Common Features

- Dual internal Ethernet Ports allow for local and remote user access via commonly available browser applications.

- The primary user interface is GUI in nature in accordance with the recorder's support of browser application.

- Both Ethernet Ports comply with the 10 / 100 Base-T standard at speeds of 10 and 100 Mbps.

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

- Support of Modbus over TCP / IP allows an unlimited number of concurrent Modbus clients to acquire the real-time status of any Digital, Analog, Virtual or Alarm Input.

- 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.

- 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 3800 Vdc.

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

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

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

- Event Detect Times for Digital Inputs can be set to a hundredth of a second (.01 seconds) to capture fast, electronically generated control signals.

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

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

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

- Maximum power consumption is less than 3.1 W. A 9 to 36 Vdc power source can be used to power the recorder.

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

- The Administrative and Restricted Passwords and Passcode are encrypted for additional security.

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

- New software and Setup Database files can be uploaded to the recorder via either Ethernet Port or the USB Host Port.

SOFTWARE MODIFICATION HISTORY

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

V1.00   Initial software release.

V1.01   Corrected inconsistent behavior of OLED panel.

V1.02   Corrected leap year error in GPS algorithm.

V1.03   Both Passwords and the Passcode are now encrypted and decrypted when performing a Setup Database download and upload, respectively.

V1.04   Corrected error in handling GEAB requests for out of range dates. The USB Host Port now creates .bin record files for use with GEAB.

V1.05   Corrected failure in Daylight Saving Time feature.

SETUP DATABASE COMPATIBILITY

Occasionally, modifications to the software of the device will result in a new memory map of the Setup Database. When this occurs, the previously created Setup Database becomes incompatible with the new software. Table 1 on page 5 details the compatibility status of each software version. A green check mark (☑) indicates compatibility with the previous Setup Database. A red X (☒)indicates that a new Setup Database will have to be created for the software version listed.

CWR-40B		CWR-72B	
Software Version	**Compatibility**	**Software Version**	**Compatibility**
V1.00	Initial release	V1.00	Initial release
V1.01	☑	V1.01	☑
V1.02	☑	V1.02	☑
V1.03	☑	V1.03	☑
V1.04	☑	V1.04	☑
V1.05	☑	V1.05	☑

Table 1: Setup Database Compatibility

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

ABOUT THIS MANUAL

This document is intended to provide the user with comprehensive, easy-to-read instructions on how to install, set up, operate and maintain the MICRO-AIDE CWR-40B and CWR-72B Event Recorders. This document refers to Version 1.05 of the software for both products. The sample data and command details depicted were prepared using version 1.05 installed on a CWR-72B. 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 a CWR-72B.

1

CHAPTER 2 – INSTALLATION

INTRODUCTION

This chapter describes how to properly unpack and install the CWR-72B prior to operation. It is advisable to perform the Initial Check-Out Procedure before attempting to set up the recorder.

UNPACKING

Each CWR-72B 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

Before the CWR-72B is installed at a signal facility the user may wish to perform an operational check of the recorder. The following materials are required as a part of the recommended procedure.

- PC equipped with a browser application (e.g., Firefox, Google Chrome or Microsoft Internet Explorer or Edge)

- CAT-5 Ethernet cable

- 12 Vdc power source

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

- Wire strippers and small, flat-head screwdriver

- Digital Voltmeter (DVM)

Perform each of the following steps in the sequence listed. If a problem arises, refer to the sections entitled "Diag" on page 84 and "Trouble-Shooting Guide" on page 100. Elements common to most installations are illustrated in Figure 2 on page 8 and Figure 3 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 recorder's top panel.

2. Apply power to the recorder. The front panel LED labeled "Power" will be illuminated.

3. After approximately 20 seconds the Power LED will flash continuously to indicate that the recorder has completed its boot up and initialization procedure. The OLED display will then indicate the date and time, although these may need to be corrected. The procedure for changing the date and time is described in the section entitled "Time / Date" on page 25.
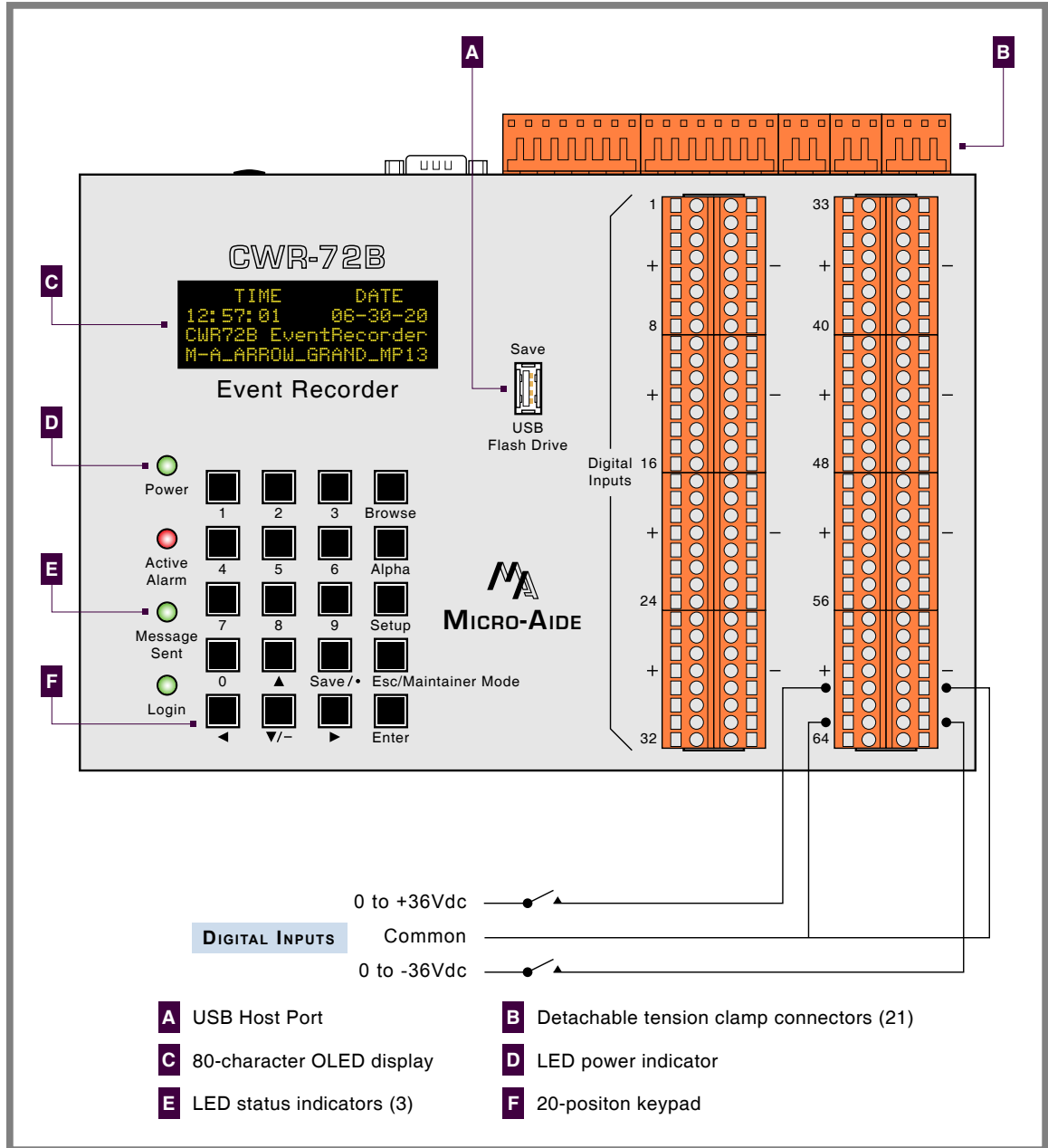
Figure 2: Typical Installation - Front Panel View

4. Confirm that the OLED display indicates that Maintainer Mode is enabled. The first line of text on the display will include the MAINT reference as shown in the following.
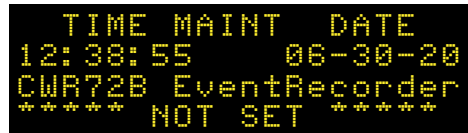
Maintainer Mode Enabled

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

5. Use the CAT-5 cable to connect the PC's Ethernet port to the Ethernet Port of the recorder that is labeled "Ethernet 1". It is located along the top panel of the recorder. Do not connect to the port labeled "Ethernet 2".
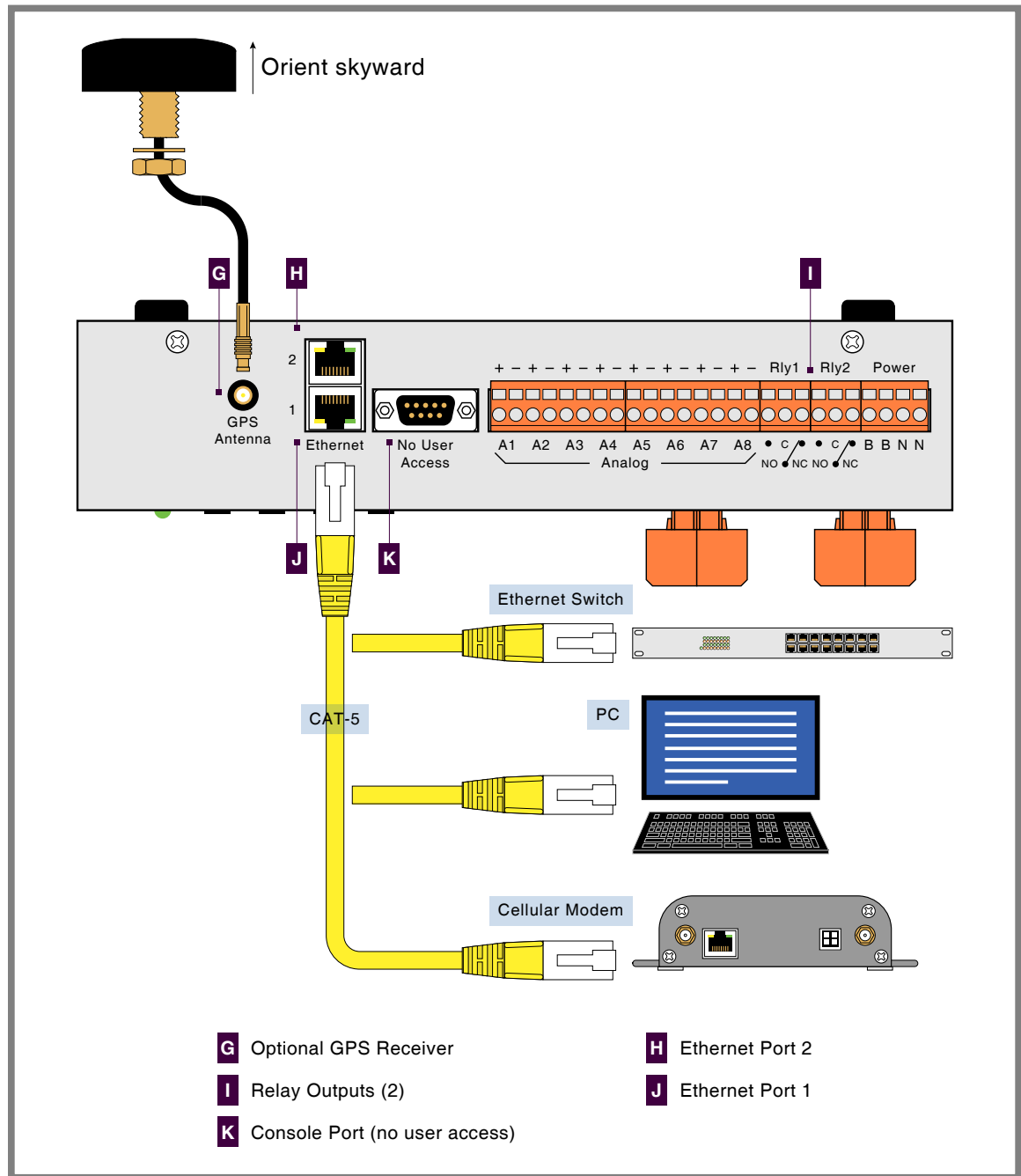
Figure 3: Typical Installation - Top Panel View

6. Apply power to the PC. Set the IP address and subnet mask of the PC's Ethernet port as shown in the screen shot entitled "PC Ethernet Port - IPV4 Settings" on page 10. This will insure that the PC and recorder are on the same subnet mask and thus able to communicate with each other. The IPV4 properties can be accessed by navigating to the Windows Control Panel under the Network and Sharing Center settings. The property settings of interest can be found within the Ethernet or Local Area Connections category.

ⓘ For the purposes of this test, the PC's subnet mask should be set to 255.255.255.000. The PC's IP address should be 192.168.1.nnn, where nnn can be 001 through 254. Do not use 000, 255 or 123. The first two are reserved and the latter has been assigned to the recorder.
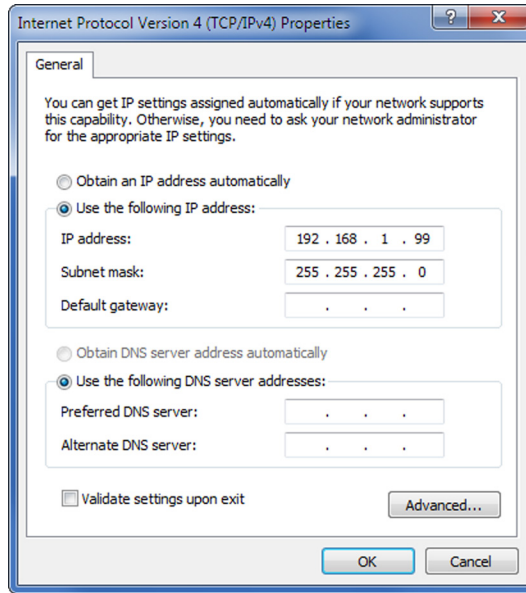
PC Ethernet Port-IPV4 Settings

7. Launch the browser. In the address bar of the browser enter the IP Address and port of the recorder as detailed in the following note.

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ⓘ The remainder of the Initial Check-Out Procedure presumes the recorder is configured to operate in accordance with the factory assigned default settings.

ⓘ The location of the browser's address bar is shown in red in the screen shot entitled "Password Request" on page 10. The correct IP Address and port number are also shown.

ⓘ The factory assigned IP Address and port of **Ethernet Port 1** is initially set to:
192.168.1.123:8080 for Firefox or Google Chrome
http://192.168.1.123:8080 if Microsoft Internet Explorer or Edge is being used.

🔧 Both Ethernet Port settings can be changed by using the Network front panel command. Refer to the section entitled "Network" on page 87 for additional details.

8. The password request, as shown in "Password Request" on page 10, should be displayed on the PC.

Password Request

9. If the recorder fails to issue the password request, check the PC's IPV4 settings, CAT-5 cable and power connections. If the problem can be isolated to the CWR-72B 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.

10. From the PC's keyboard type **PASSWORD** in upper-case letters. This is the default Administrative Password. Complete the entry by clicking the button labeled "Log In". The Main Menu, shown in the following, will be displayed.
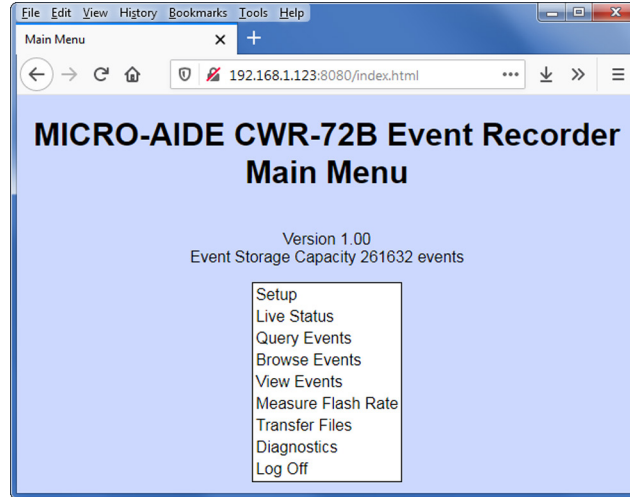
Main Menu

11. Click the Main Menu command labeled "View Events". A screen similar to the following will be displayed.
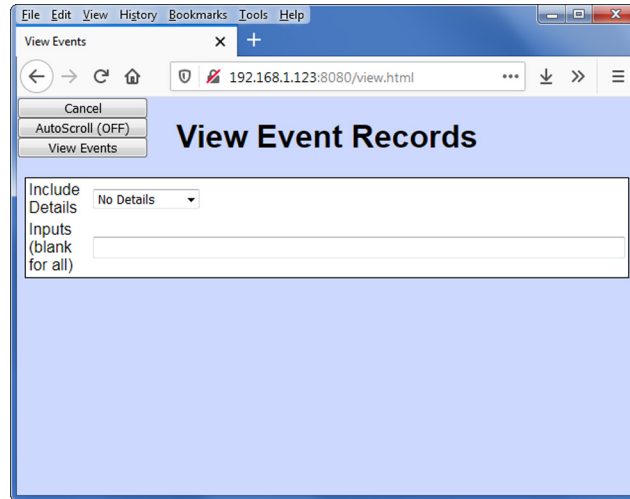
View Events - Initial Settings

12. Click the button labeled "AutoScroll (OFF)". The setting will toggle to AutoScroll (ON). Click the button labeled "View Events".

13. Using a short pair of stripped jumper wires place +12 Vdc and negative to Digital Input Number 1. Refer to the silkscreened labels located near the input terminals. Positive voltage should be placed on the terminal to the left and negative voltage on the right. The voltage should be held for at least .5 seconds before proceeding. Remove the applied voltage. An On, followed by an Off, Event Record should be displayed. They will be similar to those shown in the screen entitled "View Events - Sample Event Records" on page 12.
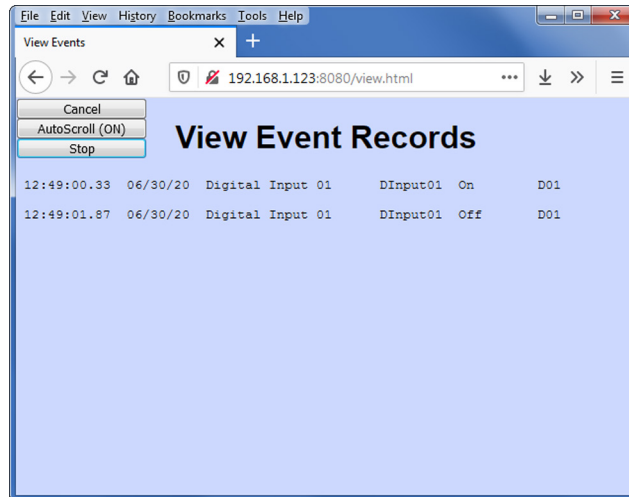
View Events - Sample Event Records

14. Use the same procedure described in the previous paragraph to test additional Digital Inputs. Verify a pair of Event Records are displayed with each application and removal of voltage.

15. Once the Digital Inputs are tested return to the Main Menu by clicking the button labeled "Cancel".

16. From the Main Menu select the command labeled "Live Status". A screen shot similar to the following will be displayed. In the interest of brevity only the upper portion of the screen is shown.
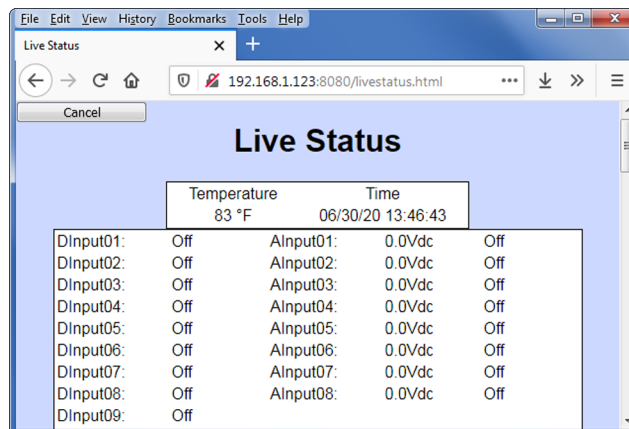
Live Status - Analog Inputs

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

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

19. Repeat the previous two steps for the remaining seven Analog Inputs.

20. Once the Analog Inputs are tested return to the Main Menu by clicking the button labeled "Cancel".

This concludes the Initial Check-Out Procedure. This procedure may be used at any time to verify that the CWR-72B 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 "Diag" on page 84 and "Trouble-Shooting Guide" on page 100. Alternatively, the user may wish to contact MICRO-AIDE customer service. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

INSTALLATION PROCEDURE

The following sections describe the recommended Installation Procedure. Elements common to most installations are illustrated in Figure 2 on page 8 and Figure 3 on page 9. The illustrations also depict the location of each connector used in the installation.

LOCATION

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

MOUNTING

The CWR-72B is designed to be mounted on a flat surface such as a shelf or backboard. It is equipped with two mounting brackets suitable for this purpose. The four mounting holes are .5″ by .219″ in size. Their center lines form a rectangle 6.0″ by 8.5″.

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

SITE PREPARATION

A large number of cables will be required to fully install the recorder. Advanced planning should be taken to properly locate and secure the power and input cables.

The equipment location must have access to a stable 9 to 36 Vdc power source. A pair of wires must be run from the power source to the location where the recorder will be mounted. The wire ends must be stripped approximately 1/4″-3/8″. Refer to Figure 4 on page 13. The stripped ends will be secured by tension clamp terminals located along the top panel of the unit. 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 tension clamp terminals will accept wire sizes as large as 12 AWG. The two wires must be properly secured to prevent damage. It is preferable not to run the wires adjacent to electrical equipment such as motors that may generate significant electrical disturbances.
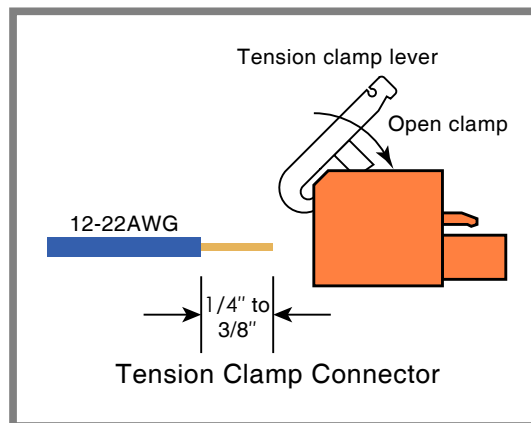
Figure 4: Tension Clamp Connectors

It is likely that the recorder will be monitoring dozens of relays. They will terminate in the Digital Inputs located at the front of the recorder. It is recommended, although not mandatory, that these wires be attached to spare contacts at each relay. The other end of each wire will also connect to tension clamp terminals associated with each Digital Input. The Digital Input connectors are detachable. The cable bundles should be neatly dressed and secured.

The Analog Input and Relay Output cables require similar treatment and planning as those for the Digital Inputs. The connectors involved are also detachable and tension clamp style.

Care should be taken to avoid excessively long service loops that might be accidentally snagged by personnel as they perform their duties in and around the recorder.

Peripheral Equipment

If a PC is to be co-located with the CWR-72B an appropriate AC power source must be available. Additional connections can be made as described in the following sections.

Ethernet Ports

The Ethernet Ports of the CWR-72B will generally connect to the ports of an Ethernet Switch. However, one port may need to be connected to the Ethernet Port of a cellular modem. Standard CAT-5 Ethernet cables can be used. The length of the cables must be limited to 200'. The installer should consult the network plans for the specific location.

GPS Receiver (optional)

The GPS Receiver option is the preferred means of precisely controlling the recorder's real-time clock. The optional feature includes a bulkhead-mount antenna designed specifically for use with the receiver module. For improved reception the antenna should be mounted outside of the equipment house or cabinet, as it requires unobstructed skyward access. The antenna is designed to be moisture proof and is rated to operate over a broad temperature range.

The antenna is equipped with a 16' coaxial cable. The antenna end of the cable is non-detachable. The other end of the cable terminates in an MCX-male connector. The MCX connector must be secured to the recorder's connector labeled "GPS Antenna" located along the top panel.

Upon request, an optional magnetic-mount antenna can be supplied. Additionally, in lieu of the bulkhead-mount antenna the customer may wish to use a multi-band cellular / GPS antenna. In this case the bulkhead-mount antenna is replaced by a suitable MCX to type N cable assembly. Refer to the section entitled for ordering details.

Failed Lamp Detector (optional)

The installation may require the use of MICRO-AIDE's Failed Lamp Detector (FLD-2). The User Manual for the FLD-2 should be reviewed as it describes additional connections to the Digital Inputs of the CWR-72B.

Cabling

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

The power, Relay Outputs 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 CWR-72B 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 tension clamp terminals labeled "B" and "N", respectively.

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

Relay Outputs

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

Input Circuits

Fault conditions will only be Alarmed properly if the input circuits are wired correctly to the CWR-72B. The correct polarity of Digital and Analog Inputs must be identified.

Digital Input circuits are wired to a pair of eight-position, detachable connectors. Individual pairs are wired to vertically adjacent terminals. The positive lead of the digital circuit to be monitored must be connected to the terminal labeled "+". The common, or return, lead of the digital circuit must be connected to the 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 2 on page 8 illustrates how to connect negative voltage circuits.

Analog Inputs are connected similarly to Digital Inputs. The eight Analog Inputs terminate in a pair of separate, eight-position connectors located at the top 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.

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CHAPTER 3 – SETUP

INTRODUCTION

This chapter describes how to set up the CWR-72B for use in a typical application. The Setup Procedure is described using two different methods. The first is directed towards maintainers and technicians whose setup activity will be limited to assigning site-specific information. This procedure assumes that the user needs to add site-specific information to a customer-defined Setup Database. The second, and more comprehensive procedure, describes how to modify and/or create an entire Setup Database.

LOGGING ON

User sessions are initiated only after the log-on procedure is completed. Logging on is described in the section entitled "Initial Check-Out Procedure" on page 7. To log on the user must enter the correct password in response to the password challenge. The password challenge is shown in the sample data entitled "Password Request" on page 10.

Both Ethernet Ports of the CWR-72B incorporate two levels of password security. Each level uses a distinct password. The Restricted Access password allows a user to review all aspects of the Setup Database. Modifications to the Setup Database are limited to parameters that are considered site-specific. The Administrative Access password allows a user full access to all aspects of the recorder. This includes the unrestricted ability to make changes to the Setup Database.

The default CWR-72B Setup Database created by MICRO-AIDE defines the Restricted and Administrative Access passwords as **LOOKWORD** and **PASSWORD**, respectively.

The customer is strongly encouraged to change both passwords at the earliest opportunity.

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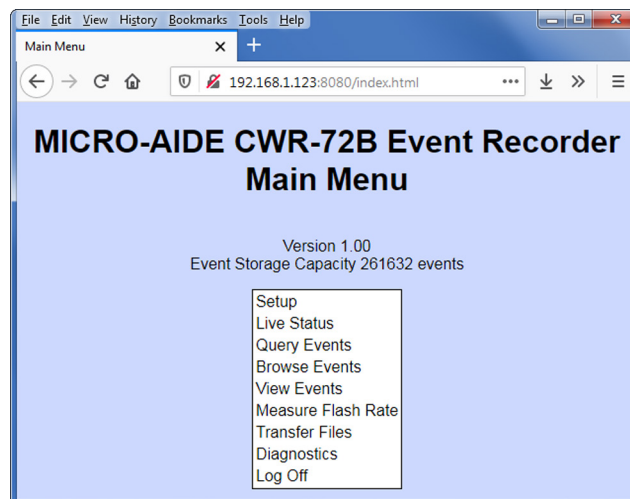
Main Menu

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A common browser is used to access the CWR-72B. No third-party terminal emulator software (e.g., Zoc, Tera Term, etc.) is required to interact with the recorder. The user interface is entirely GUI (Graphical User Interface) in nature.

To highlight a command, subcommand or parameter's setting or value simply locate the mouse icon over the object of interest. A single mouse click will select the object. Parameter values or settings can be entered or changed by interacting with the following objects.

Edit Box - Click inside the box and simply type the new value or edit the existing value (e.g., Input Names).

Drop Down List Box - Click the down arrow and select the new setting from a predefined list (e.g., Time Zone).

Check Box - Click the box to enable or disable the item (e.g., Flashing).

Viewing of, and changes to, the Setup Database are further controlled by three buttons. They are described in the following.

Save Changes - Click this button to save all of the changes as they are currently displayed. A message confirming the changes will be briefly displayed after which the user will be returned to the previous screen.

Cancel - Click this button to abandon the changes in their entirety. The user will be immediately returned to the previous screen.

Back - This button is common to all browsers and can be found on the menu bar of the browser. It appears as a left pointing arrow. Click this button to abandon the changes in their entirety. The user will be immediately returned to the previous screen.

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

Each command will be identified by its name as listed in the menu where it resides.

(i) For the remainder of this chapter, it is assumed that the recorder is configured to operate in accordance with the factory assigned default settings.

Maintainer Mode should be enabled before proceeding with the Setup Procedure. This will prevent any Alarms from being sent while the recorder is being set up. Refer to the section entitled "Maintainer Mode" on page 49. The first line of text on the OLED display panel should include the MAINT reference as shown in the following.

```
 TIME MAINT  DATE
12:38:55    06-30-20
CWR72B EventRecorder
M-A_Arrow_Grand_MP14
```
Maintainer Mode Enabled

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

SYSTEM PARAMETERS

From the Main Menu select the Setup-System Parameters command. A screen similar to the following will be displayed.

System Parameters Command - Restricted Access

The name of each parameter is listed to the left of each editable object. A description of each parameter appropriate to this procedure is provided in the following sections. Disabled parameters are described in later sections of this chapter.

UNIT NAME

The Unit Name serves as a comprehensive recorder and site ID. It is included at the top of each report and appears on the OLED display. Data from several 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.

> The initial or default setting for the Unit Name is ***** NOT SET *****.

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

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

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

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

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

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

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

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

The Time Zone setting can be assigned as one of seven different values that are commonly used in North America. Each setting is explained in Table 2 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 2: Time Zone Settings

Select the required Time Zone setting by clicking the appropriate entry from the drop down list box.

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The real-time clock of the CWR-72B can be adjusted automatically to compensate for DST. If enabled, the real-time clock will be shifted by 1 hour on the second Sunday of March and the first Sunday of November. In both cases the clock is adjusted at 2:00 AM.

Click the check box to change the setting as required.

The DST feature implemented by the CWR-72B is in full compliance with the Energy Policy Act of 2005 which took effect in 2007.

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

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

DOT NUMBER

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

DNS NAME

The DNS Name field is used to provide a network name for the CWR-72B site. It can be the name assigned to the recorder itself or the cellular modem attached to the recorder. The name must be unique within the network. As many as 40 alphanumeric characters can be used to create the name. It is included as part of each Alarm Message transmitted by the recorder.

The DNS Name takes the form: sitename.domain. The user may wish to consult with the I.T. group regarding the creation of valid DNS Names.

PRINT SETUP DATA

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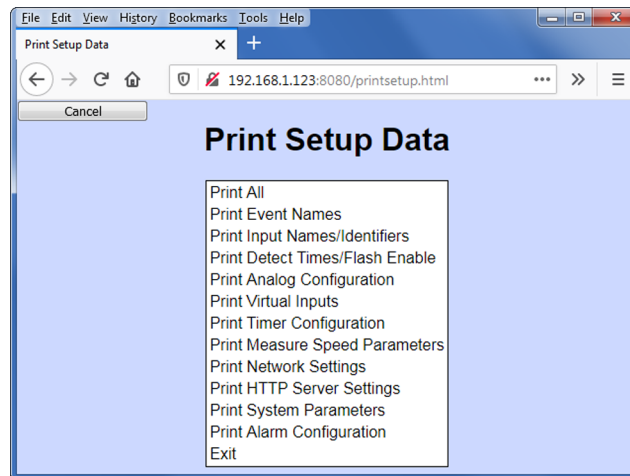
Print Setup Data Command

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.

LOG OFF

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

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

To log off of the recorder, return to the Main Menu and select the Log Off command. The current session will be immediately terminated.

This completes the site-specific portion of the Setup Procedure. Since the installation and setup of the recorder are critical to how the CWR-72B will perform, it is advisable to review the steps taken earlier. Make any changes that may be required.

⚠ Maintainer Mode should now be terminated. If it is on, press the front panel pushbutton switch labeled "Esc / Maintainer Mode". Refer to the section entitled "Maintainer Mode" on page 49.

The CWR-72B is ready to operate in accordance with its installed Setup Database. It is assumed that the network, cellular modem and message processing server are also properly configured.

The remainder of this chapter provides additional information that concerns users with Administrative Access privileges. It can be ignored by users with Restricted Access. The next chapter describes how to operate the CWR-72B.

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

ⓘ The sample data displayed in the remainder of this chapter depicts settings established by the factory default Setup Database.

Maintainer Mode should be enabled before proceeding with the Setup Procedure. This will prevent any Alarms from being sent while the recorder is being set up. Refer to the section entitled "Maintainer Mode" on page 49. The first line of text on the OLED display panel should include the MAINT reference as shown in the following.

```
TIME MAINT  DATE
12:38:55    06-30-20
CWR72B EventRecorder
***** NOT SET *****
```

Maintainer Mode Enabled

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

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The Administrative Password provides the user with unrestricted access to the Setup Database. This includes all of the parameters described in the section entitled "Setup Procedure - Site-Specific Parameters Only" on page 18. Refer to the following sections for a description of the following settings.

- "Unit Name" on page 19
- "Time Zone" on page 20
- "Daylight Saving Time" on page 20
- "State" on page 20
- "Subdivision" on page 20
- "DOT Number" on page 21
- "DNS Name" on page 21
- "Print Setup Data" on page 21
- "Log Off" on page 21

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

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From the Main Menu click the Setup command. The following menu of subcommands will be displayed.
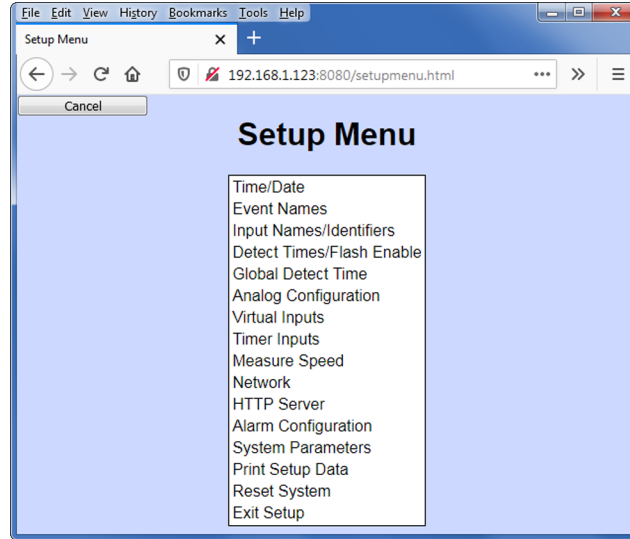
Setup Command

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

RESET SYSTEM

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. 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 much of this documentation. Additionally, any programming or Event Records created as a part of the Initial Check-Out Procedure will be erased.

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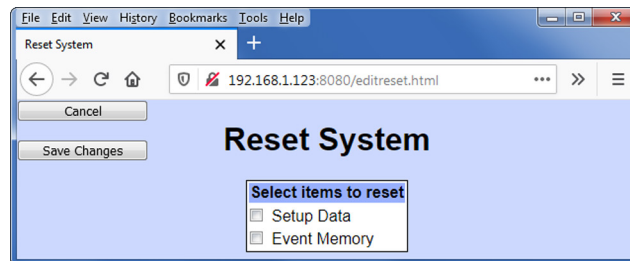
Reset System Command

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

RESET SETUP DATA

The CWR-72B 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 selecting the Setup Data for reset. The time and date settings, along with the Network and several System Parameters, are not affected by the reset. Table 3 on page 24 lists the values after the reset is performed.

To reset the Setup Database enable the check box labeled "Setup Data". Click the button labeled "Save Changes" to perform the reset.

Parameter	Value After Reset
Time / Date	(as previously assigned)
Unit Name	***** NOT SET *****
Description	(not assigned)
Administrative Password	PASSWORD
Restricted Password	LOOKWORD
Passcode	12345678
Clock Sync Mode	(as previously assigned)
SNTP Server	(as previously assigned)
Time Zone	(as previously assigned)
Daylight Saving Time	(as previously assigned)
High Temp Limit	257 °F
Low Temp Limit	-67 °F
Maint Timeout	3600 seconds
Health Check Interval	48 hours
Retry Interval	5 minutes
Retry Count	3
Min / Max Flash Rate	0 / 0 fpm
Equipment ID	(not assigned)
State	(not assigned)
Subdivision	(not assigned
DOT Number	(not assigned)
DNS Name	(not assigned)
Input Names - Digital Inputs	Digital Input 01, 02, 03...
Input Names - Analog Inputs	Analog Input 01, 02, 03...
Input Names - Virtual Inputs	Virtual Input 01, 02, 03...
Input Names - Timer Inputs	Timer 01, 02, 03...
Identifiers - Digital Inputs	DInput01, DInput02...
Identifiers - Analog Inputs	AInput01, AInput02...
Identifiers - Virtual Inputs	VInput01, VInput02...
Identifiers - Timer Inputs	Timer01, Timer02...
Event Pair Assignments	1, 20 for Timer Inputs
Event Names - On	On (1-19), Violate (20)
Event Names - Off	Off (1-19), Nominal (20)
Digital Inputs - Detect Time	.30 seconds
Digital Inputs - Flash Enable	No
Global Detect Time	Always displays 0.00
Analog Configuration - Range	±25.5 Vdc
Analog Configuration - Filter	Slow
Analog Configuration - Low Limit	-25.6 Vdc
Analog Configuration - High Limit	25.5 Vdc
Virtual Inputs - Variables	--- (not assigned)
Virtual Inputs - Relay 1 and Relay 2	Disabled
Timer Inputs - From and To Triggers	--- (not assigned)
Timer Inputs - From and To Events	Off
Timer Inputs - LowLimit	0.0 seconds

Table 3: Setup Database Settings

Parameter	Value After Reset
Timer Inputs - HighLimit	0.0 seconds
Measure Speed - Sensor 1/2	--- (not assigned)
Measure Speed - Distance	0'
Measure Speed - Threshold	0 mph
Network - IP Address 1/2	(as previously assigned)
Network - Subnet Mask 1/2	(as previously assigned)
Network - Gateway 1/2	(as previously assigned)
Network - Ethernet Port 2 Enabled	(as previously assigned)
Network - DNS 1-2	(as previously assigned)
HTTP - Server URL	(not assigned)
HTTP - Server Script File	(not assigned)
Alarm Configuration - SetInp	--- (not assigned)
Alarm Configuration - SetState	Off
Alarm Configuration - SetTime	0
Alarm Configuration - SetName	(not assigned)
Alarm Configuration - ClrInp	--- (not assigned)
Alarm Configuration - ClrState	Off
Alarm Configuration - ClrTime	0
Alarm Configuration - ClrName	(not assigned)
Alarm Configuration - MaintClr	No
Measure Flash Rate - Input	D1
Ping IP Address	(as previously assigned)

Table 3: Setup Database Settings

RESET EVENT MEMORY

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

To reset the Event Record memory enable the check box labeled "Event Memory". Click the button labeled "Save Changes" to perform the reset.

TIME / DATE

Event Records and Alarm Messages sent by the CWR-72B include a date and time stamp. The recorder features a real-time clock circuit whose accuracy is rated at ±3 ppm (±8 seconds per month). It will automatically account for leap year. The clock will continue to keep time accurately during a power outage lasting seven or more days. The time zone used by the recorder can also be selected. Refer to the section entitled "Time Zone" on page 20 for additional details.

To set the time and/or date select the Time / Date command. The sample data listed in the following shows a typical response to the Time / Date command. The CWR-72B 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.

To change the date and time change the edit boxes as required. Click the button labeled "Save Changes". The clock will be updated immediately.

As described in the previous section, the recorder's clock can be set manually at any time. Additionally, it can be automatically synchronized by accessing an available time server or by use of the optional GPS Receiver. The latter two methods are described in the section entitled "Clock Sync Mode" on page 27.
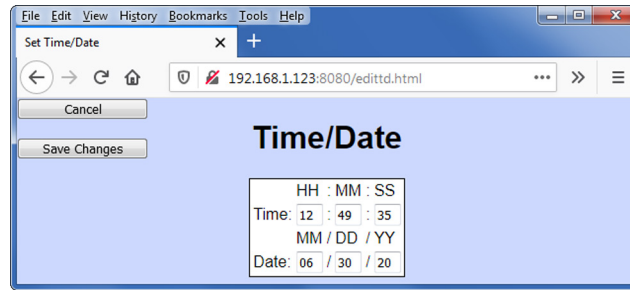
Time / Date Command

System Parameters

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 Description, passwords and Equipment ID settings. The System Parameters are defined with a single command containing multiple objects. Refer to the sample data entitled "System Parameters Command-Administrative Access" on page 27.

The use of each System Parameter, not already explained, is described in the following sections. Click the button labeled "Save Changes" when the necessary changes have been completed. The System Parameters will be immediately updated.

Description

The Description setting is used to identify the Setup Database and version number. It is defined by the customer. It is included as a part of the Main Menu heading. Refer to the sample data entitled "Main Menu" on page 17. A total of forty alphanumeric characters can be used to define the Description.

Administrative and Restricted Passwords

Access to the CWR-72B is protected by a dual level password system. Administrative Access permits unrestricted access to all recorder functions. Administrative Access allows the entire Setup Database to be altered. Accordingly, the Administrative Password should be known to a limited number of users with a genuine need to know.

Restricted Access permits only limited access to the recorder. It allows the user to review the entire Setup Database, but alter only a limited portion of the database. The Restricted Password can be shared with maintainers and technicians that are involved in the installation and setup of a CWR-72B.

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

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

The customer is strongly encouraged to change both passwords at the earliest opportunity.

Passcode

The CWR-72B can be effectively programmed and operated from its front panel. The Passcode is used to protect the recorder from unwanted access via the front panel. It must be entered when the user attempts to alter the Setup Database. The Passcode can be assigned any combination of digits not exceeding eight total. Alphabetic characters cannot be assigned to the Passcode.

System Parameters Command - Administrative Access

CLOCK SYNC MODE

The CWR-72B contains a real-time clock that allows the recorder to time stamp Event Records to the nearest hundredth of a second. With any clock a small amount of drift can be expected. However, the real-time clock of the CWR-72B can be precisely synchronized by employing either of the following methods.

● SNTP-Unicast or SNTP-Multicast (requires accessible time server)

● GPS time (requires GPS Receiver option to be installed)

The Clock Sync Mode setting controls the synchronization method. Click the drop down list box labeled "Clock Sync Mode" and select one of the following settings.

None - The real-time clock is not synchronized.

ⓘ The real-time clock of the CWR-72B (if not synchronized) features an accuracy of ±3 ppm, which is approximately ±8 seconds per month.

SNTP - If the SNTP Server address is set to 0.0.0.0 the Multicast method is employed. This setting effectively disables the Unicast method in favor of Multicast. Otherwise Unicast is selected. Refer to the section entitled "SNTP Server" on page 28 for additional details.

GPS - Every hour, on the hour, the real-time clock will be synchronized to GPS time. This occurs provided the GPS Receiver is in acquisition of a valid GPS signal.

As previously stated, the real-time clock can be synchronized automatically by means of a time server. To use this feature the following requirements must be satisfied.

● The time server must be enabled for either Unicast or Multicast operation.

- 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.

SNTP time synchronization operates as follows:

- If Unicast operation is selected, five minutes after each hour the CWR-72B will send a time request message to the time server. The latter will respond with a time and date message. The CWR-72B will receive and validate this message and update its clock accordingly.

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

A System Event Record is logged to memory whenever the real-time clock is synchronized. This occurs irrespective of the synchronization method selected. Refer to the section entitled "System Events" on page 97 for additional details.

SNTP S<small>ERVER</small>

The SNTP Server setting operates in conjunction with the Clock Sync Mode setting as follows:

- Set the SNTP Server address to the address of a suitable time server and the Clock Sync Mode to SNTP to enable Unicast operation. The SNTP Server address can be fixed or named. A named address can contain as many as 80 characters. If the address is named, the recorder will resolve the name by use of DNS Servers. Refer to the section entitled "DNS Servers" on page 42.

- Set the SNTP Server address to 0.0.0.0 and the Clock Sync Mode to SNTP to enable Multicast operation.

The I.T. group responsible for the network will be able to identify an appropriate time server address as well as configure the time server appropriately.

H<small>IGH AND</small> L<small>OW</small> T<small>EMP</small> L<small>IMITS</small>

The temperature inside the CWR-72B 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 97 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.

M<small>AINT</small> T<small>IMEOUT</small>

Maintainer Mode allows a maintainer or technician to test the crossing system without concern that unwanted Alarms will be transmitted by the CWR-72B. Refer to the section entitled "Maintainer Mode" on page 49 for additional details. Maintainer Mode is enabled or disabled by simply pressing the front panel switch labeled "Esc / Maintainer Mode". However, in the event that the maintainer forgets to disable Maintainer Mode the Maintainer PB Timeout parameter will restore the CWR-72B 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 CWR-72B to remain in Maintainer Mode with the transmission of Alarms suspended indefinitely. This can be useful if the crossing will be tested for more than 24 hours. However, in this special case the maintainer must remember to re-enable normal mode operation. This setting must be used with caution.

H<small>EALTH</small> C<small>HECK</small> I<small>NTERVAL</small>

It's quite likely that the recorder will not issue any Alarm Messages for an extended period of time. This will be the case when no failures are detected and consequently no Alarms are sent to the message processing server. However, the message processing server needs to know if the recorder is still in service

or has itself experienced a failure. A network outage represents a similar concern. The Health Check message is sent periodically to the server as a means of verifying overall system availability.

To change the setting, enter a new numeric value in the range of 0 to 255 hours. The setting defines the maximum time between messages sent by the CWR-72B. If the time measured from the last message sent to the current time exceeds the assigned interval, a Health Check message is immediately sent.

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

RETRY INTERVAL

Health Check and Alarm Messages may not be delivered to the message process server for a variety of reasons not related to the recorder. Transmission issues associated with the cellular modem or network can cause messages not to be delivered. The Retry Interval setting determines the wait time between successive retry attempts. The Retry Interval can be set in the range of 0 to 255 minutes.

RETRY COUNT

The Retry Count setting works in conjunction with the Retry Interval. It determines the maximum number of retry attempts before the transmission of Health Check and Alarm Messages are aborted. This prevents the recorder from attempting an endless number of retries in the event of a prolonged network outage. The Retry Count can be set in the range of 0 to 255.

MIN / MAX FLASH RATE

The CWR-72B will create an Event Record at the start and end of a flashing sequence. This applies to any Digital Input enabled for flash detection. Refer to the section entitled "Flash Enable" on page 33 for additional details. The Event Record from a flashing input will include the measured flash rate in fpm. The Min / Max Flash Rate parameter establishes a range of acceptable flash rates. The range is used to provide the following Event Record data.

- An Event Record for System Input S8 will be saved to memory when a flash rate outside of the range is first detected. The record will be labeled with an Input Name, Identifier and Event Name of "Flash Rate Alarm", "FlashAlm" and "On", respectively. System Events are further described in the section entitled "System Events" on page 97.

- An Event Record for System Input S8 will be saved to memory when a flash rate within the range is first detected. The record will be labeled with an Input Name, Identifier and Event Name of "Flash Rate Alarm", "FlashAlm" and "Off", respectively.

- System Input S8 Event Records are only saved to memory on the first occasion of an out-of-range or in-range flashing sequence. As an example, if the rate is out-of-range on five consecutive crossing activations and then in-range for the next three activations, only two S8 records will created. The first will occur on the first activation and the second will occur on the sixth activation. It follows that the interval between successive S8 On and Off events is the duration during which the flash rate was either too fast or too slow. Conversely, the interval between successive S8 Off and On events is the duration during which the flash rate was within range and therefore acceptable.

To change the Min or Max setting, enter a numerical value in the appropriate edit box. Settings can range from 0 to 99 fpm.

Although the Input Name for an S8 System Event Record is Flash Rate Alarm, these records do not create Alarm Messages. Alarm Messages are defined solely by the content of the Alarm Configuration Table. Refer to the section entitled "Alarm Configuration" on page 43 for details.

EQUIPMENT ID

The Equipment ID can be any three-character designation that identifies the device (e.g., 40B or 72B). The user may wish to consult the signal design staff as regards preferred codes.

INPUT NAMES / IDENTIFIERS

The CWR-72B utilizes two types of inputs. The 64 Digital (32 for CWR-40B) and 8 Analog Inputs are referred to as physical inputs because actual circuits are wired to the recorder's input connectors. The CWR-72B also includes 32 Virtual, 32 Timer, 20 Alarm and a variety of System Inputs. Contrary to physical inputs, these inputs are for the most part defined by the user for the purpose of detecting fault conditions among the physical inputs. The System Inputs provide important information regarding the recorder as a whole.

All inputs, regardless of type, share one common attribute. They are characterized by an Input Name, Input Identifier and Event Name pair. The Input Name can be any combination of alphanumeric characters not exceeding twenty total. The Input Name appears in each Event Record created by the input in question. It is the primary means by which inputs are distinguished.

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

The Event Name pairs are described in the next section. As many as twenty Event Name pairs can be defined by the user. After the pairs are defined, the Input Names / Identifiers command is used to assign Event Name pairs to inputs. To assign an Event Name pair to an input click the drop down list box for the input of interest. From the drop down list select the pair appropriate for the input.

The following screen shots show selective portions of the factory default Input Names, Identifiers and Event Name pairs for Digital, Analog, Virtual and Timer Inputs. The browser's vertical scroll bar allows the user to view any portion of the web page.
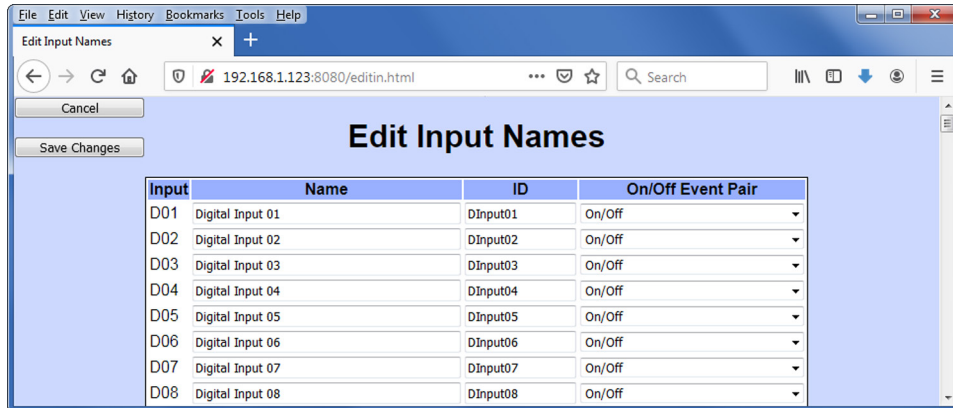
Input Names / Identifiers Command - Digital Inputs
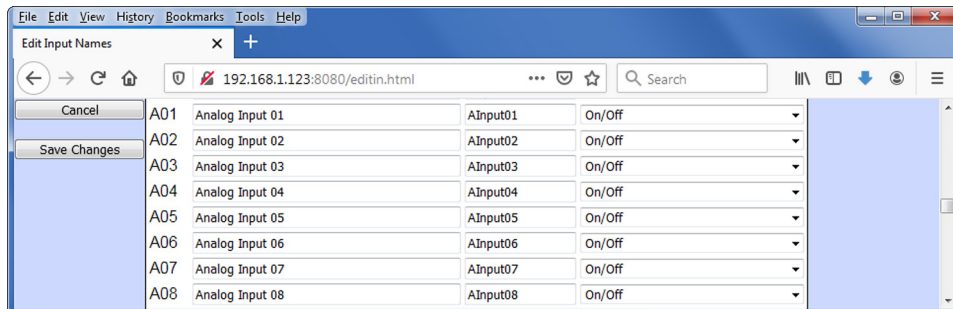
Input Names / Identifiers Command - Analog Inputs
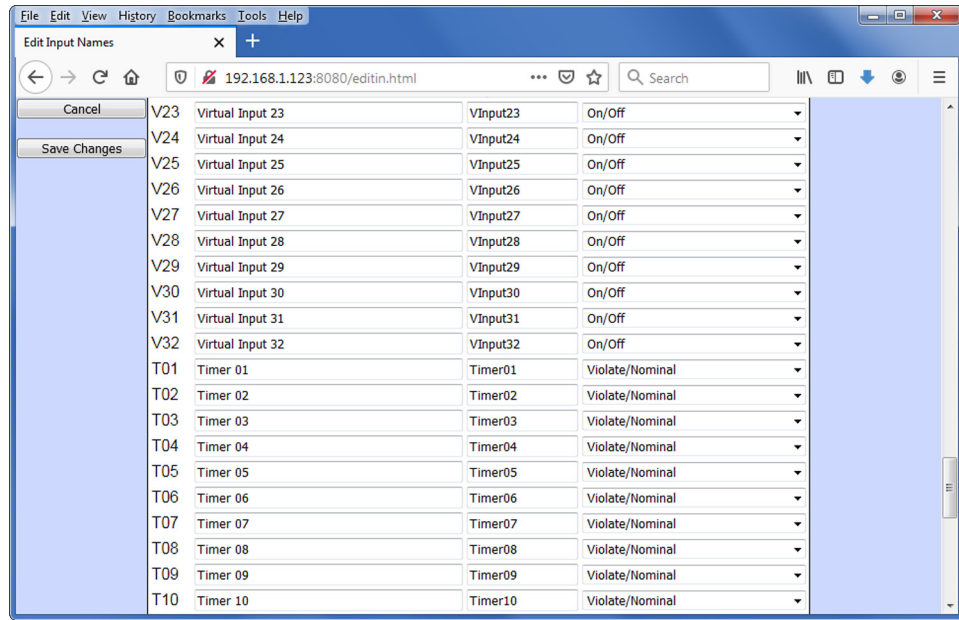
Input Names / Identifiers Command - Virtual and Timer Inputs

Click the button labeled "Save Changes" to immediately update the Setup Database.

EVENT NAMES

There are two types of Event Records. As an example, an Active Event Record is 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 Records associated with Virtual, Timer and Alarm Inputs also have active and inactive conditions.

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

As many as twenty Event Name pairs can be defined. Once the pairs are defined they can be assigned to inputs of the CWR-72B in any manner that helps the user distinguish Event Records precisely and quickly. By way of example, the Event Records for Digital Input 1 could be labeled "XR Up" and "XR Down". The Event Records for Analog Input 1 could be labeled "Batt1BAD" and "Batt1 OK". The factory default Event Names are shown in the screen shot entitled "Event Names Command" on page 32.

To define a new Event Name simply edit the contents of the appropriate Event Name. Event Names are restricted in length to eight characters. They can be formed by any combination of letters, numbers and syntax symbols. Click the button labeled "Save Changes" to immediately update the Setup Database.

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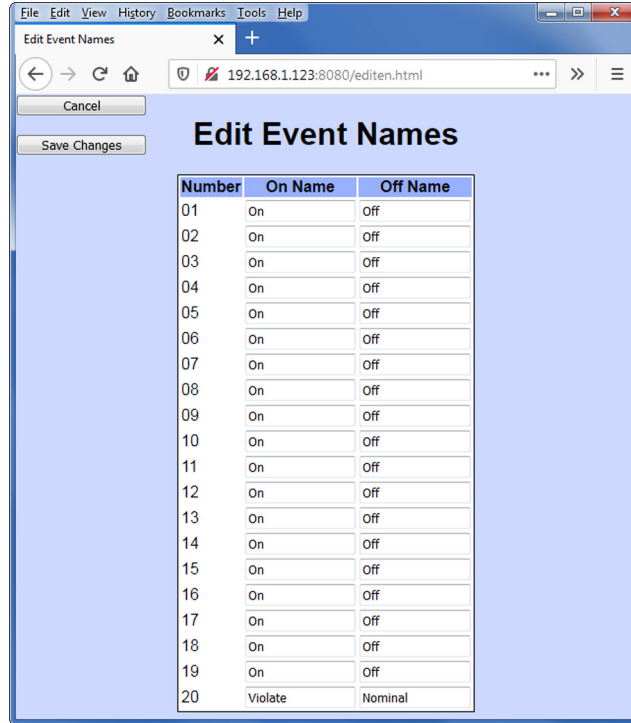
Event Names Command

D<small>ETECT</small> T<small>IMES</small> / F<small>LASH</small> E<small>NABLE</small>

The Digital Inputs of the CWR-72B 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 Detect Time feature allows the user to establish a validation time for each Digital Input. Each Digital Input can also be set to monitor a flashing circuit. The Detect Time / Flash Enable command allows the user to program each of these features.

The following screen shot shows an excerpt of settings established by the factory default Setup Database. The Detect Time and Flash Enable settings are all .30 seconds and disabled, respectively.
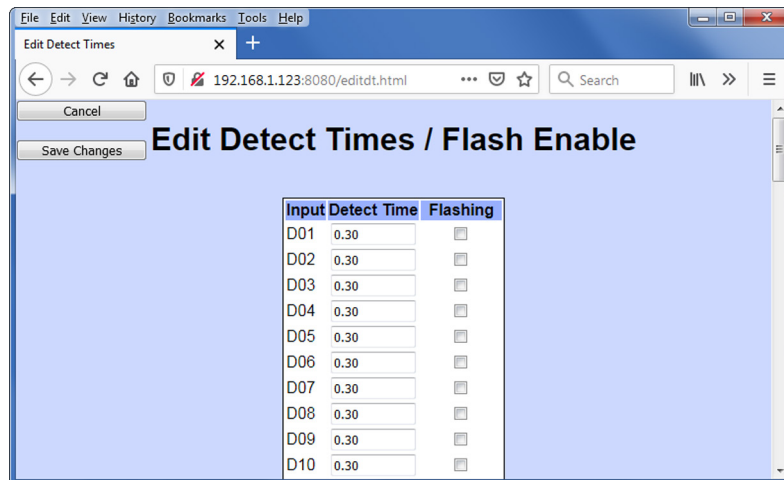
Detect Times / Flash Enable Command

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

D<small>ETECT</small> T<small>IMES</small>

The range of valid Detect Times is 0 to 327.67 seconds.

Set the Detect 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 Detect Time value to zero.

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

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

FLASH ENABLE

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

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

2. Click the edit box for the Digital Input to enable flash reporting.

Figure 5 on page 33 illustrates a flashing sequence and the events that would be created at the start and end of the sequence.

Set Detect Time to:
50% of $T_{on}+T_{off}$ **or**   30÷fpm rate

Flash Event -On-   Flash Event -Off-

9 to 36Vdc

0 to 1Vdc

T_{on} T_{off}
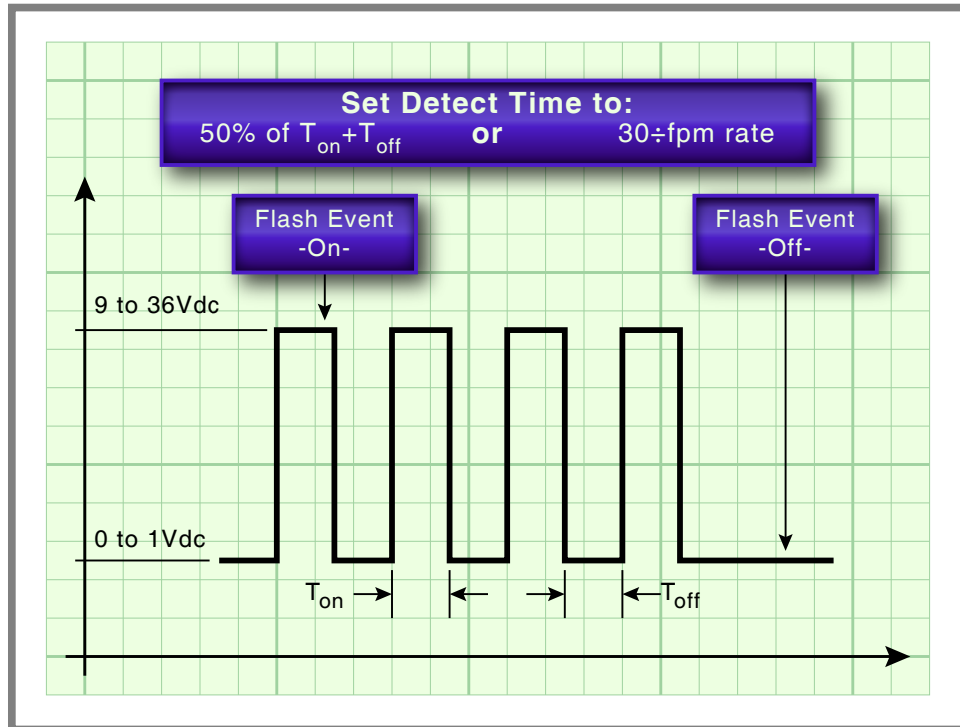
Figure 5: Typical Flashing Pulse Sequence

The Detect 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 CWR-72B 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 Detect Time. Use either of the two methods listed in the following paragraph to determine the correct Detect Time for inputs with non-varying flash rates.

The Measure Flash Rate command can be used to accurately determine the Detect Time for flashing inputs. Refer to the section entitled "Measure Flash Rate" on page 60. Alternatively, the correct Detect Time (in seconds) is equal to 30 divided by the number of flashes per minute (i.e., 30÷fpm).

GLOBAL DETECT TIME

The Detect Times / Flash Enable command allows each Digital Input to be set individually. Setting all 40 / 64 inputs to values that differ from the factory default setting can be time consuming. Alternatively, the Global Detect Time command can be used to set all inputs to a single Detect Time value.

The Global Detect Time command will display the following screen shot.
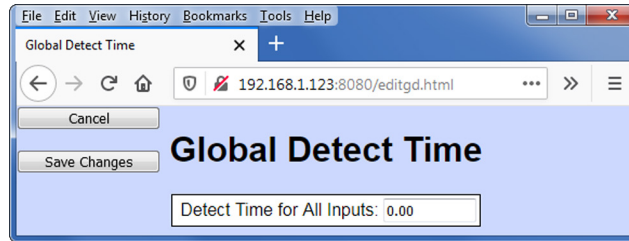
Global Detect Time Command

To set the Detect Time for each Digital Input to a common value simply enter a number in the range from .01 to 327.67. Click the button labeled "Save Changes" to update all of the Detect Time settings.

An initial value of 0.00 is always listed in the edit field. The Global Detect Time command will not alter the setting of Digital Inputs assigned as sensors for any of the Train Speed Monitors.

ANALOG CONFIGURATION

The eight Analog Inputs of the CWR-72B are used to measure and report battery and/or AC voltages and currents (optional). The user can select entries from a preset menu that best suit the intended application.

The sample data entitled "Analog Configuration Command" on page 34 shows the Analog Configuration used by the factory default Setup Database.
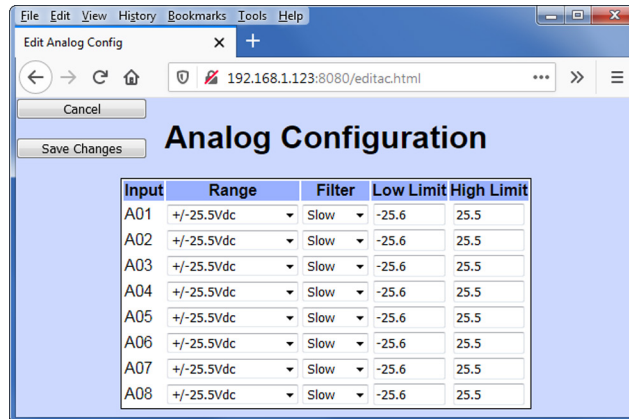
Analog Configuration Command

The left-hand column identifies the input. Analog Inputs are consistently labeled by the CWR-72B as "A01", "A02", etc. The A-prefix is always used to distinguish Analog from Digital, Virtual, Timer, Alarm and System Inputs. Four parameters can be used to characterize an Analog Input. Each parameter is described in the sections that follow. Table 4 on page 35 lists the Resolution, Filter and Limit Values applicable to each of the seven Range settings.

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

Table 4: Analog Input Parameters

RANGE

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

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

FILTER

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

HIGH AND LOW LIMITS

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

Figure 6 on page 36 illustrates the relationship of the High and Low Limit Values to the Analog Input state. Each range defines the type of Event Record that is created by transitions of the input. The figure depicts an Analog Input configured to monitor a typical 12 Vdc battery source. The figure indicates that the unacceptable range includes all voltages less than 10.4 Vdc and all voltages greater than 15.6 Vdc. The unacceptable range always consists of two portions separated by the acceptable range. If the input is within the range extending from 10.4 to 15.6 Vdc the battery voltage is considered to be acceptable.

Analog Inputs with levels greater than the Low Limit Value but less than the High Limit Value are considered to be in an Off state. They will create Event Records defined by the inactive or Off Event state. Levels found to be outside these limits are considered to be in an On state. They will create Event Records defined by the active or On Event state. On and Off states are important to the assignments included in the Alarm Configuration Table. Refer to the section entitled "Alarm Configuration" on page 43 for additional details.

In the following illustration, when the signal transitions into the unacceptable range an On Event Record is created and identified with an Event Name of Batt1BAD. When the signal transitions into the acceptable range an Off Event Record is created and identified with an Event Name of Batt1_OK.
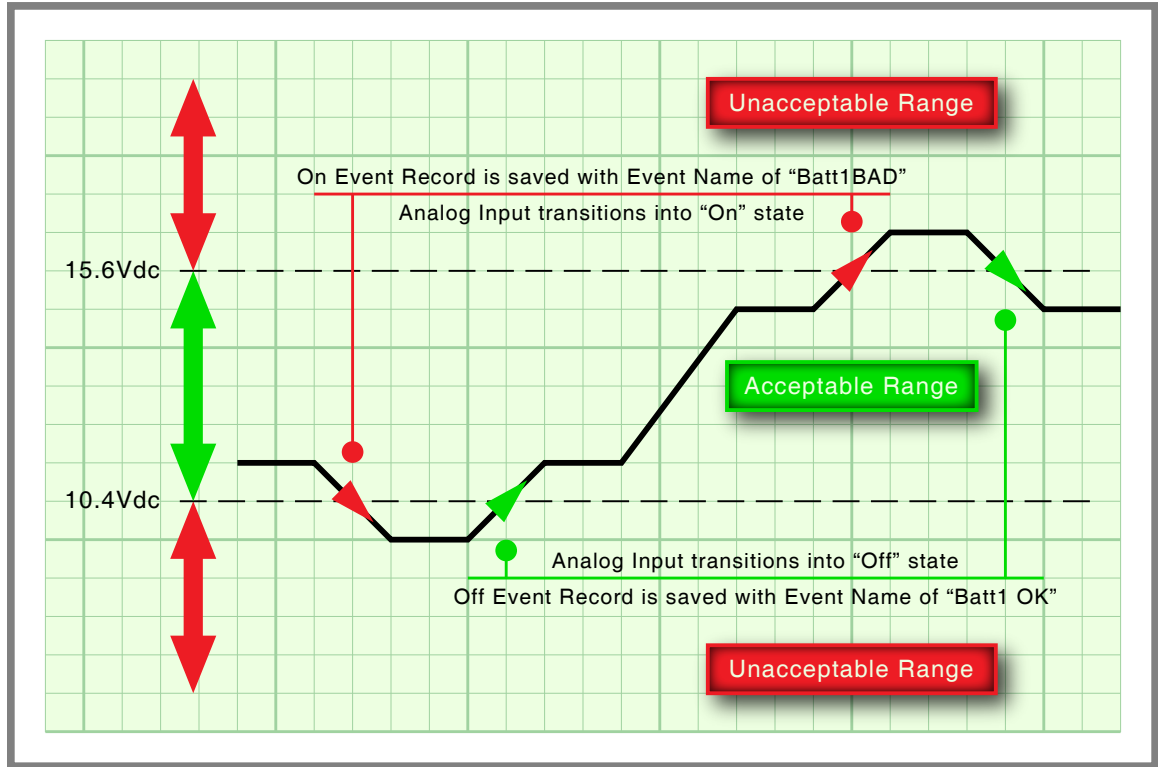
Figure 6: Analog Input Operating Ranges and Limit Values

VIRTUAL INPUTS

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

Identifying failures that occur as the result of abnormal relay states is greatly simplified by using the Virtual Input feature. In the case of the CWR-72B, Virtual Inputs have the added capability of generating and clearing Alarm states. This means that logical conditions among two or more inputs can be used to define very specific Alarm Messages. For additional details refer to the section entitled "Alarm Configuration" on page 43. The CWR-72B allows as many as 32 Virtual Inputs to be defined. They are characterized by two essential properties.

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

The second property pertains to the state of each assigned variable. A fault condition in a relay-based circuit can only be identified if the state of each variable is properly evaluated. The state of a variable is defined by the CWR-72B as either On or Off. Both states are described in the following.

On–The Digital Input voltage is in the range from 9 to 36 Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 6 on page 36. The Timer Input has measured a delay that is less than its assigned Low Limit Value or greater than its assigned High Limit Value. The state of the Alarm Input is Set. 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 Timer Input has measured a delay that is within the range of its assigned Limit Values. The state of the Alarm Input is Clear. The Virtual Input evaluates to a false logic state.

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

ASSIGNING THE VARIABLES

The following screen shot shows the first ten Virtual Inputs. Virtual Input 1 (V1) has been assigned three variables. From left to right they are D1, A1 and V32. The definition of V1 is nested since it is in part defined by V32. The fourth variable is blank as it is not required by the logical conditions being defined.
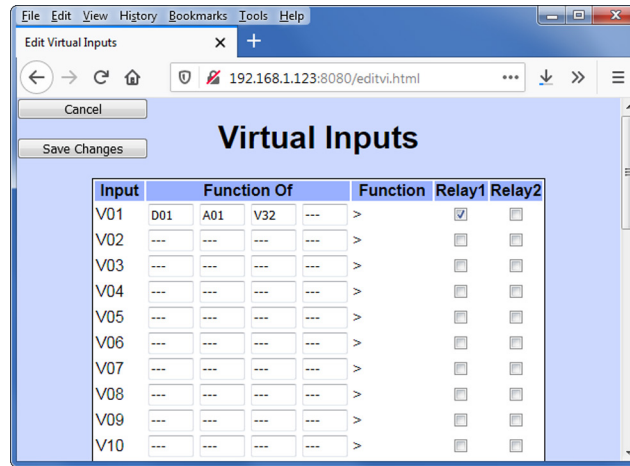
Virtual Inputs Command - Assigning the Variables

To assign variables double-click inside any of the edit boxes associated with the Virtual Input of interest. Assign a variable by entering **Dn**, **An, Tn, Ln or Vn** where n is 1 through 32 / 64 for Digital Inputs, 1 through 8 for Analog Inputs, 1 through 32 for Timer and Virtual Inputs, and 1 through 20 for Alarm Inputs. Leading zeros are not required. To remove an assignment, double-click the edit box and delete the entire entry.

Each Virtual Input can control the two Relay Outputs. To do so, click the appropriate check box. In the previous screen shot, V1 will directly control Relay Output 1 and ignore Relay Output 2. If enabled, the normally open contacts of the relay will close when the Virtual Input evaluates as true. The contacts will open when the same Virtual Input assumes a false (i.e., no longer true) state.

To complete the definition of a Virtual Input, the state of each variable must now be assigned. This Virtual Input property is referred to as its function. In the following section, the variables for V1 are once again used.

DEFINING THE FUNCTION

To create or edit the function of a Virtual Input, click the ">" character listed to the right of the fourth variable placeholder. A table of variables comprising two or more rows will be displayed. Screen shot "Virtual Inputs Command - Defining the Function" on page 38 provides a sample view of the function assignments for V1. It shows eight rows, appropriate for a Virtual Input using three variables.

Each row of the function table lists one set of states for the variables that have been assigned. The first row always applies to each variable being in the Off sate. The last row always applies to each variable being in the On state. The middle rows apply to other combination of states. One, two, three and four variables require two, four, eight and sixteen rows, respectively.

The last column of each row includes a check box. If the check box is enabled, the Virtual Input will assume an On state for that combination of variable states. If not checked, the Virtual Input will assume an Off state.
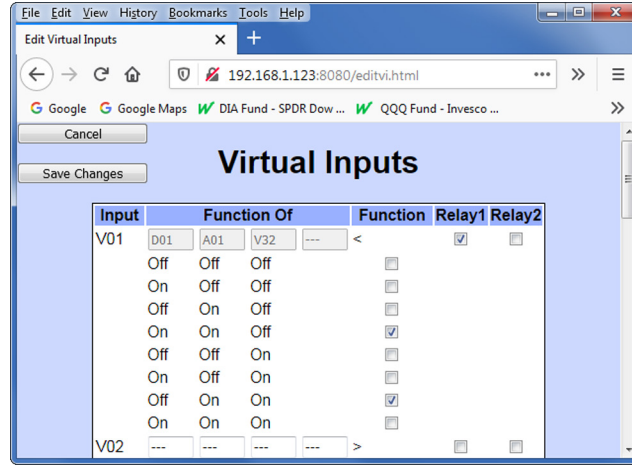
Virtual Inputs Command - Defining the Function

The logic works as follows. In any single row the variables form an **and** condition from left to right. In the sample data the first row applies to D1, A1, V32 as Off **and** Off **and** Off. The last row applies to D1, A1, V32 as On **and** On **and** On. The check boxes that form the column labeled "Function" form a series of **or** conditions. In the sample data, if D1, A1, V32 are On **and** On **and** Off **or** D1, A1, V32 are Off **and** On **and** On, Virtual Input V1 will evaluate as true and assume an On state.

TIMER INPUTS

The CWR-72B includes 32 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 .
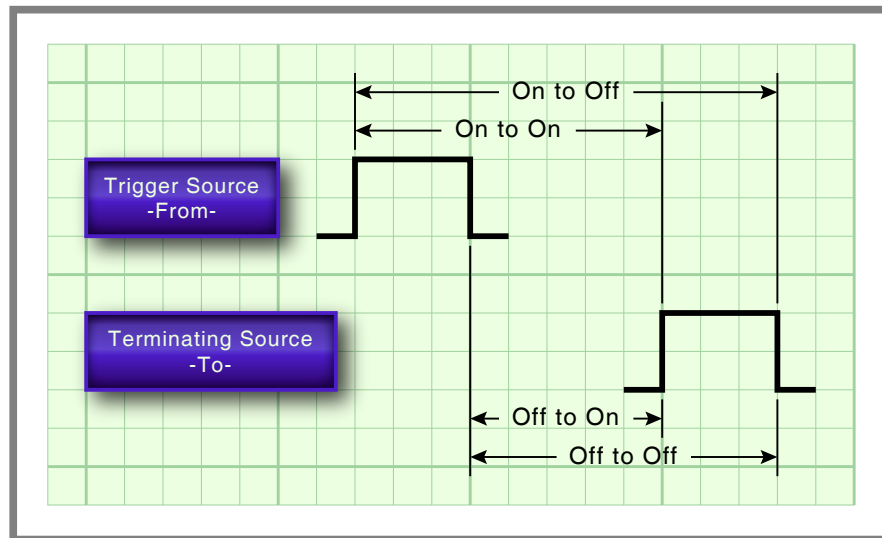
Figure 7: Timer Measurements

In the interest of brevity, the following screen shot lists only the first ten Timer Inputs. Timer Input 1 (T1) has been assigned several parameters. Its settings will be used to explain how a typical Timer Input can be created.
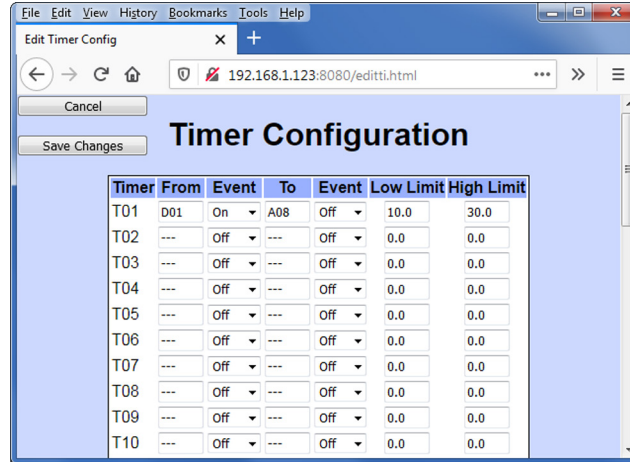
Timer Inputs Command

It may help to think of a Timer Input as a stopwatch. The stopwatch is triggered by an event, specifically pressing its button. The stopwatch ceases to measure time when a second event occurs, specifically pressing its button a second time. The measured time can then be reported as either too fast or too slow, or as expected. With this analogy in mind, a Timer Input can be created by performing the following steps.

1. Each row is associated with a single Timer Input. Identify the Timer Input and row of interest.

2. In the column labeled "From" enter an Input Number that identifies the trigger source. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 32/64 for Digital Inputs, 1 through 8 for Analog Inputs or 1 through 32 for Virtual Inputs. Leading zeros are not required.

3. In the adjacent column labeled "Event" click the arrow for the drop down list box. Select either the On or Off event option.

4. In the next column to the right labeled "To" enter an Input Number that identifies the terminating source. Assign it by entering **Dn**, **An** or **Vn** where n is 1 through 32/64 for Digital Inputs, 1 through 8 for Analog Inputs or 1 through 32 for Virtual Inputs. Leading zeros are not required.

5. In the adjacent column labeled "Event" click the arrow for the drop down list box. Select either the On or Off event option.

6. The next column to the right labeled "Low Limit" is used to establish the lower end of the acceptable range of timed measurements. Enter a value within the range of 0 to 999.9 seconds.

7. The last column labeled "High Limit" is used to establish the upper end of the acceptable range of timed measurements. Enter a value within the range of 0 to 999.9 seconds.

The Timer Input is now fully defined. Edit or create additional Timer Inputs by repeating the previous steps. Click the button labeled "Save Changes" to update the Setup Database.

In the example cited previously, the time after Digital Input 1 reaches its On state until Analog Input 8 reaches its Off state will be measured. A measured time interval of 10.0 to 30.0 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. Conversely, measured time intervals that are outside the range established by the Limit Values will generate Event Records tagged with an Event Name of Violate. Refer to the section entitled "Event Names" on page 31 for additional information.

MEASURE SPEED

The CWR-72B includes a speed measuring feature that can be used to continuously monitor train speeds and log speed violations. The use of this feature is strictly optional. It is referred to as the Train Speed Monitor feature and it is controlled by the Measure Speed command.

3

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

- There are a total of four Train Speed Monitors available in each CWR-72B. For each monitor two train sensors must be wired to two spare Digital Inputs of the recorder.

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

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

- The distance between each sensor must be in the range from 50' to 5280'.

Figure 8 on page 40 illustrates how the two train sensors, track distance and train motion relate as regards the Train Speed Monitor feature. Excessive train speed is reported in a time stamped Event Record. Refer to the section entitled "Event Record Formatting" on page 61. In the following screen shot only the fourth Train Speed Monitor has been defined. The operation of the others has been disabled.
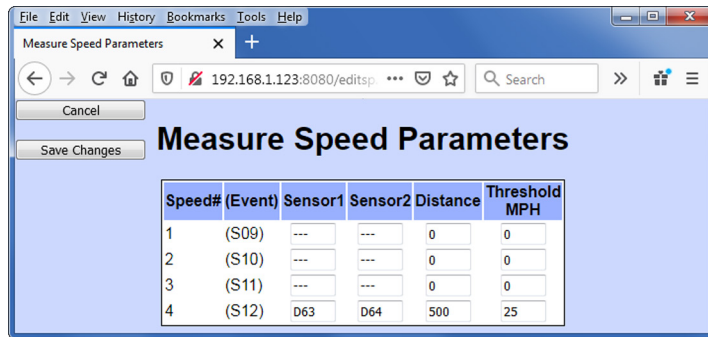
Measure Speed Command

Each row represents one Train Speed Monitor. Each row is comprised of four edit boxes that are used to define the properties of the monitor. In the sections that follow the use of each edit box is described.
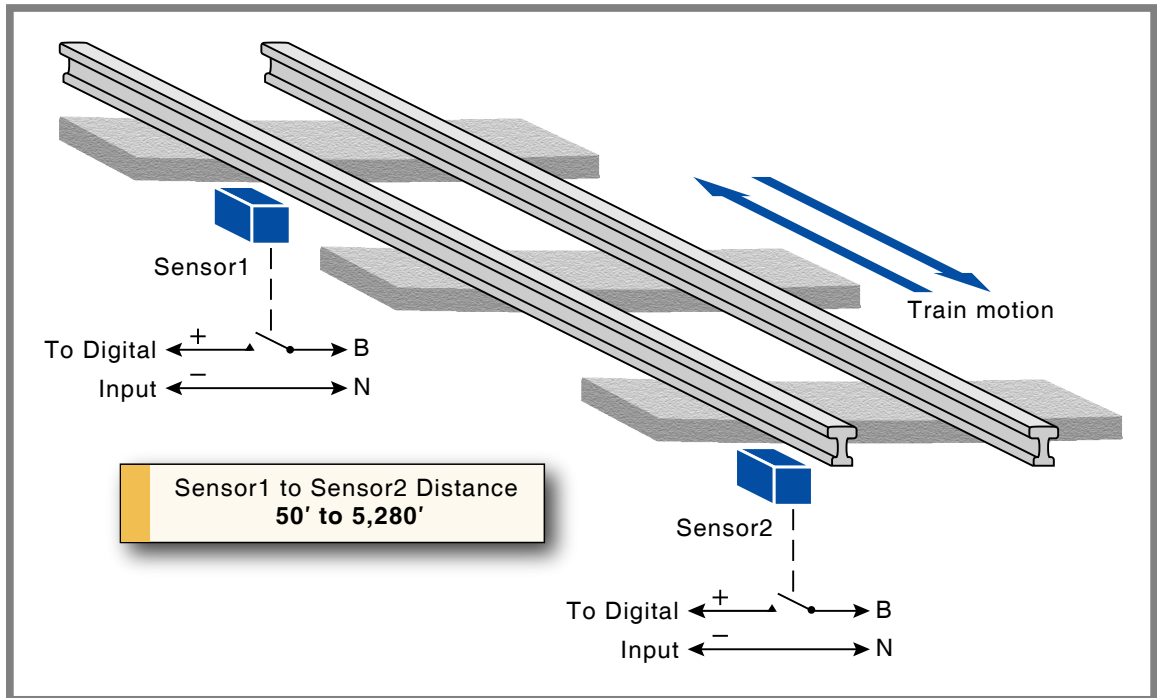
Figure 8: Typical Installation - Train Speed Monitor

SENSOR1 / SENSOR2

The Sensor1 and Sensor2 edit boxes can be assigned any valid Digital Input Number. The values can be entered as **Dn** where n is 1 through 32 / 64. Leading zeros are not required. The two sensors must use different Digital Inputs. The values can be non-consecutive or in ascending or descending order. The Train Speed Monitors report motion in either direction with a positive value.

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

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

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

- The Detect Time for each input will be automatically set to .05 seconds to de-bounce the sensor output signals.

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

To disable a Train Speed Monitor delete the existing entry in the edit box for either Sensor1 or Sensor2.

DISTANCE BETWEEN SENSORS

The distance between each sensor must be known in order to calculate the speed of the train. The value must be in the range from 50' to 5280'. The value must be entered as a whole number.

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

THRESHOLD

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

A train found to be in motion at a speed greater than the Threshold value will have its speed reported as a System Event Record. In this case the Event Name will be listed with a value of On. A train in motion with a speed less than the Threshold value will create a System Event Record with an Event Name assigned as Off. In both cases, the measured speed will be listed at the end of the Event Record.

System Events are also used to log power on and off occurrences. System Events are numbered like other inputs. They are identified with an S-prefix. The four Train Speed Monitors use System Event numbers S9 through S12. Refer to the section entitled "System Events" on page 97 for additional information.

NETWORK

The Network command is used to configure both Ethernet Ports. The ports are identified as Ethernet Port 1 and Ethernet Port 2. They are completely interchangeable. The operation of one is the same as that of the other. They operate independently of, and concurrently with, the other. Collectively the ports provide access to a total of four concurrent users. The four-user limitation is irrespective of the ports being used. As an example, Ethernet Port 1 may be used by one, two, three or four user(s). In this example, Ethernet Port 2 could be used by three, two or one concurrent user(s), respectively.

The following screen shot shows the factory default network settings. Ethernet Port 2 is always disabled and left unassigned. The following sections describe how to configure the various network settings.

Before changing any network settings the reader is advised to consult with the I.T. group responsible for the network. It is likely that they have defined various properties for the network. To avoid access problems, the Ethernet Port settings must not be in conflict with those properties.
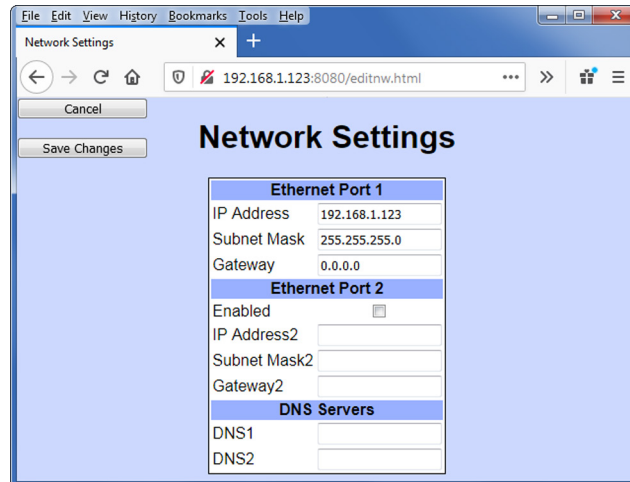
Network Command

ETHERNET PORT 1

IP Address - The CWR-72B uses fixed IP addressing. Set the IP Address to a valid IPV4 value. As they are reserved, the last three digits cannot be 000 or 255.

Subnet Mask - The Subnet Mask must be set in accordance with the requirements of the network.

Gateway - Access to and from the recorder is controlled by the Gateway address. Assuming a value of 0.0.0.0 cannot be used, the I.T. group must advise the reader of the required setting. The Gateway address must allow Ethernet Port 1 to access the DNS and SNTP time servers.

ETHERNET PORT 2

Enabled - From the factory, Ethernet Port 2 is disabled. It is not required to perform the Initial Check-out Procedure. Refer to the section entitled "Initial Check-Out Procedure" on page 7. To enable the port, click the check box.

IP Address2 - Set the IP Address to a valid IPV4 value different than the IP Address of Ethernet Port 1. As they are reserved, the last three digits cannot be 000 or 255.

Subnet Mask2 - The Subnet Mask must be set in accordance with the requirements of the network.

The Ethernet Ports of the CWR-72B must operate within different subnets. Accordingly, the IP Address and Subnet Mask settings for both ports must not violate this network rule.

Gateway2 - Access to and from the recorder is controlled by the Gateway address. Assuming a value of 0.0.0.0 cannot be used, the I.T. group must advise the reader of the required setting. The Gateway address must allow Ethernet Port 2 to access the DNS and SNTP time servers.

DNS SERVERS

The CWR-72B allows the message processing server and SNTP time server to be named. The required name resolutions are resolved by a pair of Domain Name Servers (i.e., DNS1 and DNS2).

DNS1 - A vaild IPV4 fixed address must be entered.

DNS2 - A vaild IPV4 fixed address, distinct from DNS1, must be entered.

If a user session is idle for more than ten consecutive minutes a timeout condition will occur. The timeout simply logs the user off and makes the recorder immediately available to an additional user. An idle condition is defined as the user has not clicked an object within the web page delivered by the recorder. This does not impact the viewing or saving of reports that may continue for many minutes and do not require any further user intervention once initiated.

The Ethernet Ports do not require any special configuration settings to support the Modbus interface and SNTP-Multicast feature. An unlimited number of concurrent Modbus sessions are supported. Four simultaneous user sessions are supported. Except as previously noted, Modbus, SNTP and user sessions are allowed to occur concurrently.

A Modbus connection is initiated by a Modbus client. The CWR-72B will complete the connection immediately. The connection will only terminate if ten or more seconds have elapsed between data requests from the client device. In effect, each data request also serves as a keep alive command. If a session timeout occurs the client device must launch a new connection.

ALARM CONFIGURATION

The Alarm Configuration command is used to display and edit the Alarm Configuration Table (ACT). The ACT allows the user to establish criteria for twenty separate Alarms. The ACT is organized as twenty rows with multiple columns. Each row contains the settings for a single Alarm. A total of nine editable objects are used to enter the settings for each Alarm. A sample ACT is shown in the screen shot entitled "Alarm Configuration Command" on page 44.

Alarm Messages use a specific data structure and syntax. Both are described in Appendix D.

Alarm Messages are only issued when specific conditions are detected by the recorder. Before attempting to edit an existing Alarm (or assign 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.

- Alarms are identified by an Ln designation, where n is in the range from 1 to 20. The left-most column of the ACT lists the Alarm Number. This reference cannot be altered.

- An Alarm is defined by two primary conditions. Digital, Analog and Virtual Inputs are continuously evaluated as one primary condition. These inputs define the logical conditions that determine the Alarm's Set and Cleared state.

- The other primary condition involves persistence. The Input used to define the Alarm's Set or Cleared condition is used to initiate the persistence 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's Set or Cleared condition are satisfied and an Alarm Message is sent.

- 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 persistence check.

- Alarms are Set and Cleared by similar, but separate, processes. At the moment an Alarm is Set an appropriate message is sent to the server. Similarly, at the moment an Alarm is Cleared a related, but nevertheless distinct, message is sent.

In the screen shot entitled "Alarm Configuration Command" on page 44 Alarm L20 has been created. Its logical Set and Clear conditions are defined by Virtual Inputs 1 and 2 (i.e., V1 and V2), respectively. When true (i.e., On), V1 verifies that the XR relay is active, all gates are confirmed as down and flashing is On. When true (i.e., On), V2 verifies that the XR is no longer active, all gates are confirmed as up and flashing is off. These sample settings will be used in the descriptions that follow.

The content of the ACT should only be changed with the concurrence of the signal design staff. Alarms are defined by very specific criteria. Changing the criteria changes the meaning of an Alarm. Furthermore, Alarms can be assigned that the message handling file will not be able to process.
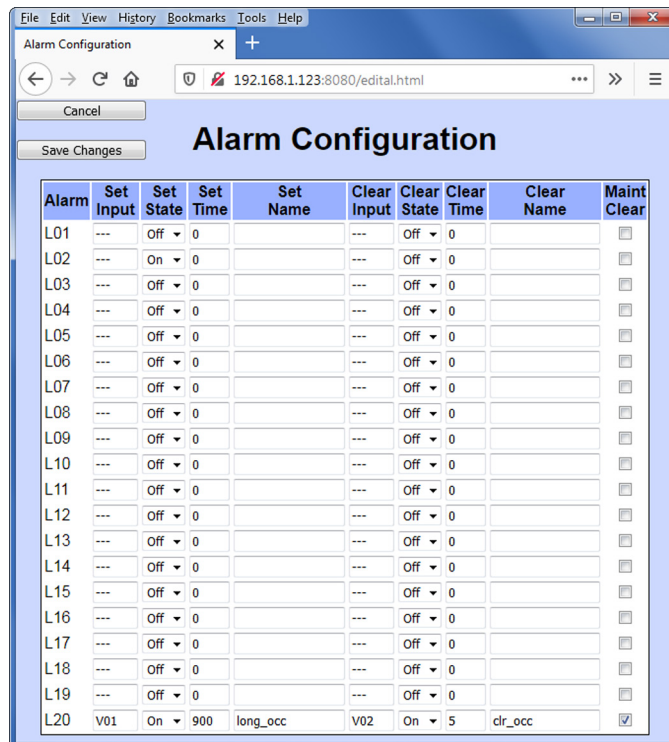
Alarm Configuration Command

SETINP

The SetInp object 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 32 / 64 for Digital Inputs, 1 through 8 for Analog Inputs and 1 through 32 for Virtual Inputs. Leading zeros are not required. In the sample data, the SetInp for Alarm L20 is set to V1.

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

SETSTATE

The SetState object allows the On or Off state of the input to be used to Set the Alarm. Click the arrow to select the correct setting from the drop down list box. 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 6 on page 36. 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 object establishes the persistence criterion used to Set the Alarm. This feature prevents transient conditions from creating unwarranted Alarm Messages. SetTime is always measured in seconds and must be in the range of 0 to 99,999. Fractional values are not accepted. In the sample data the persistence value is set to 900 seconds to indicate a long crossing occupancy.

SETNAME

The SetName parameter can be any eight-character mnemonic that serves as an identification for an Alarm that has been Set. In the sample data, the SetName has been labeled as "long_occ" to indicate a long occupancy.

⚠️ SetNames must be assigned with caution. The message processing server will be programmed to only accept Alarm Messages with valid SetName or ClrName values. The signal design staff must be consulted before creating a new SetName.

CLRINP

The ClrInp object 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 32/64 for Digital Inputs, 1 through 8 for Analog Inputs and 1 through 32 for Virtual Inputs. Leading zeros are not required. In the sample data, the ClrInp for Alarm L20 is set to V2.

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

CLRSTATE

The ClrState object allows the On or Off state of the input to be used to Clear the Alarm. Click the arrow to select the correct setting from the drop down list box. 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 6 on page 36. 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 object establishes the persistence criterion used to Clear the Alarm. This feature prevents transient conditions from creating unwarranted Alarm Messages. ClrTime is always measured in seconds and must be in the range of 0 to 99,999. Fractional values are not accepted. In the sample data the persistence value is set to 5 seconds to indicate that the long occupancy condition has been terminated.

CLRNAME

The ClrName parameter can be any eight-character mnemonic that serves as an identification for an Alarm that has been Cleared. In the sample data, the ClrName has been labeled as "clr_occ" to indicate that the long occupancy has been cleared.

⚠️ ClrNames must be assigned with caution. The message processing server will be programmed to only accept Alarm Messages with valid SetName or ClrName values. The signal design staff must be consulted before creating a new ClrName.

MAINTCLR

The user can, at any time, place the recorder in Maintainer Mode. Refer to the section entitled "Maintainer Mode" on page 49 for additional details. While in Maintainer Mode the recorder will not transmit any new Alarm Messages to the server. However, the MaintClr setting can be used to Clear an Alarm that is currently Set. The sample data shows that Alarm L20, if Set, will be Cleared if Maintainer Mode becomes active. If appropriate, the Clear Alarm Message will be sent immediately after Maintainer Mode become active.

HTTP SERVER

The HTTP Server command is used to identify the message processing server and the file it will execute to process each Alarm Message. The correct settings will be known by the I.T. group. The following screen shot depicts two sample settings. Both settings are described in the following sections.
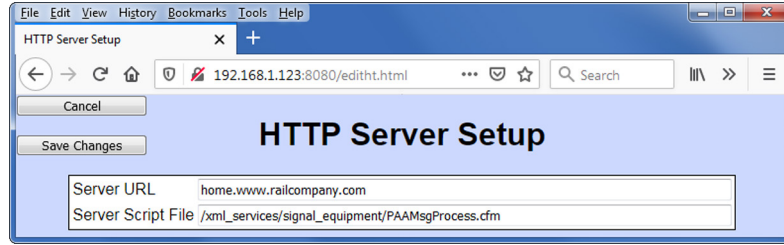
HTTP Server Command

Sᴇʀᴠᴇʀ URL

The edit box labeled "Server URL" must be set to the address of the message processing server. The setting can contain a maximum of 80 alphanumeric characters. The recorder's assigned DNS servers will be used to resolve the URL address.

Sᴇʀᴠᴇʀ Sᴄʀɪᴘᴛ Fɪʟᴇ

The CWR-72B uses the HTTP-Get method for transmitting Alarm Message content. Alarm Messages are handled by an executable file that runs on the message processing server. The appropriate file must be known to the recorder. The edit box labeled "Server Script File" is used to enter the file specification of the appropriate file. The sample data uses a setting of /xml_services/signal_equipment/PAAMsgProcess. cfm.

⚠ Neither of the HTTP Server settings should be changed without the prior approval of the I.T. group.

This completes the Setup Procedure. The installation and setup are critical to how the CWR-72B will perform. It is advisable to review the steps taken earlier. Make any changes that may be required.

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

Tʀᴀɴsꜰᴇʀ Fɪʟᴇs

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 command is used to transmit the Setup Database as a file to be saved on the PC. Once the file is saved, the Upload Setup Database command can be used to restore the entire Setup Database.

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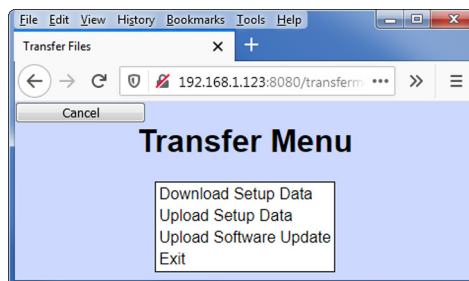
Transfer Files Command

The Setup Database used by the recorder can be saved as a file typically named setup.txt (the user can assign a different name). As a text file the setup.txt file can be viewed in any text editor application (e.g., Notepad).The setup.txt file contains both Passwords and the Passcode. As a security measure, all three settings are encrypted into 36-character values whenever a download operation is performed. An upload operation automatically decrypts the three settings before saving them for use by the recorder.

The Setup Database can also be easily and quickly downloaded and uploaded using the USB Host Port. Refer to the sections entitled "Saving the Setup Database" on page 69 and "Update" on page 88 respectively.

DOWNLOAD SETUP DATA - SAVING THE DATABASE

Perform the following steps to save the current Setup Database.

MICRO-AIDE recommends that the browser be set to save downloaded files to the PC desktop.

1. Click the Download Setup Data. The following screen shot will be displayed.
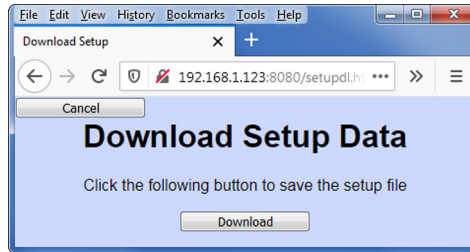
2. Click the button labeled "Download". A dialog box similar to the following screen shot will be displayed. The dialog box shown is for a current version of Firefox. Google Chrome, Edge and Internet Explorer will display a somewhat different screen. In either case, the file will by default be named "setup.txt". The option to save the file should be selected.
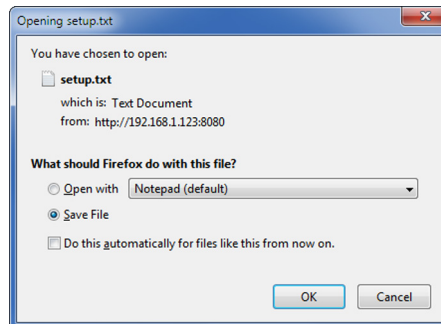
3. Click the button labeled "OK". The setup.txt file will be saved to the location specified by the browser for downloads.

This completes the download procedure. Like any other text file, the setup.txt file can be renamed, viewed, copied and relocated at any time.

UPLOAD SETUP DATA - 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 - Saving the Database" on page 47. Perform the following steps to restore a saved Setup Database.

1. Click the Upload Setup Data. The following screen shot will be displayed.
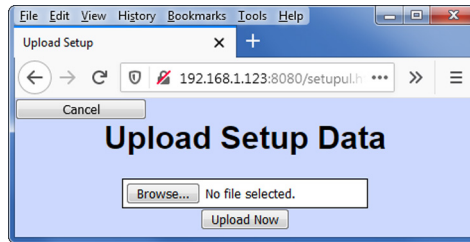
Upload Setup Data Command

2. Click the button labeled "Browse...". A file selection dialog box similar to the following will be displayed.
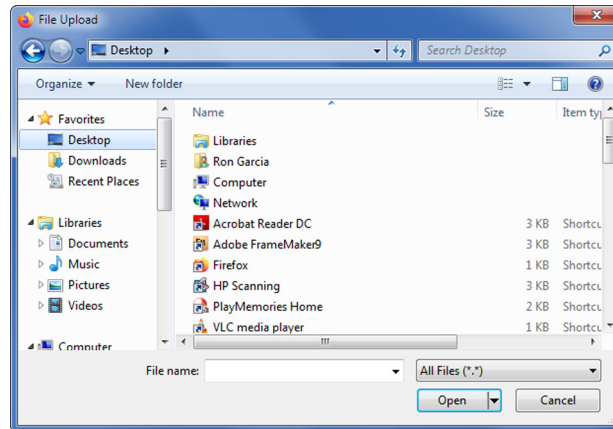
3. Navigate to the location of the saved Setup Database file. Select the file and then click the button labeled "Open".

4. The screen shot entitled will once again be displayed. Verify the edit box containing the button labeled "Browse..." now lists the correct Setup Database file.

5. Click the button labeled "Update Now". The Setup Database used by the recorder will be immediately updated.

The CWR-72B is ready to operate in accordance with its installed Setup Database. It is assumed that the cellular modem, network and message processing server are also properly configured.

The next chapter describes how to operate the CWR-72B.

CHAPTER 4 — OPERATION

INTRODUCTION

Except as noted in the following section, the operation of the CWR-72B is completely automatic once an appropriate Setup Database is loaded and the recorder is installed. The recorder is designed to operate autonomously without any need for user intervention. It will monitor the signal facility and, if so enabled, transmit Alarm and Health Check messages as the need arises.

Eventually the user will need to create an Event Record report pertaining to an incident or maintenance issue. With this in mind, this chapter describes how to operate the CWR-72B using a common browser application. It should be noted that local as well as remote access of the recorder involves the same procedures. The recorder's operation is indistinguishable when the user is located locally or remotely relative to the recorder. Before the recorder can be operated it must be properly installed and set up. A user must be logged into the recorder. The use of the OLED display panel and keypad are described in the next chapter.

MAINTAINER MODE

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

Maintainer Mode Disabled

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

Conversely, on occasion the signaling equipment will need to be tested or perhaps repaired. While under test or repair, it is likely that the CWR-72B will transmit Alarm Messages that do not reflect failures of any equipment. Placing the recorder in Maintainer Mode temporarily halts the transmission of Alarm Messages. To place the recorder in Maintainer Mode, press the pushbutton switch labeled "Esc / Maintainer Mode". Confirm that the OLED display panel indicates that Maintainer Mode is enabled. The first line of text on the display will include the "MAINT" label as shown in the following.

Maintainer Mode Enabled

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

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

- If left unattended, a fail safe mechanism will automatically restore normal operation. The Maint Timeout setting controls the duration of Maintainer Mode. If the duration is exceeded, normal operation is restored immediately. This timeout feature is fully described in the section entitled "Maint Timeout" on page 28. The factory default Setup Database includes a Maint Timeout value of 3600 seconds.

(i) A System Event Record for input S7 is saved to memory each time Maintainer Mode is enabled and disabled. System Events are described in the section entitled "System Events" on page 97. While enabled, Maintainer Mode does not impact the detection or saving of any Event Records.

(i) The transmission of Health Check messages is not affected by the state of Maintainer Mode.

FRONT PANEL FEATURES

The front panel of the CWR-72B provides many ease-of-use features. They are described in the following sections. Figure 2 on page 8 provides an illustration of the recorder's front panel.

OLED DISPLAY PANEL / KEYPAD

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

LED INDICATORS

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

Power–The green LED will illuminate immediately after power is applied. It will start to flash at a fixed rate only after the recorder's initialization sequence has been completed. It will then continue to flash to indicate that the recorder is running.

Active Alarm–The red LED illuminates whenever one or more Alarms are active. As an example, if a battery voltage is found to be insufficient for a defined duration, an Alarm will be Set. The Active Alarm LED will illuminate while the Alarm is Set and turn off only after all Alarms are Cleared. Alarm Set and Clear definitions are described in the section entitled "Alarm Configuration" on page 43.

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

Login–The green LED illuminates when there are one or more users who have logged onto the recorder.

USB HOST PORT

The USB Host Port can be used to save selected Event Record data directly to a FAT-32 formatted flash drive. Refer to the section entitled "Saving Records to a Flash Drive" on page 66 for details. Additionally, it can be used to update the recorder's software. Refer to the section entitled "Update" on page 88. The USB Host Port also allows the recorder's Setup Database to be saved and restored.

MULTI-USER OPERATION

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

OPERATIONAL COMMANDS

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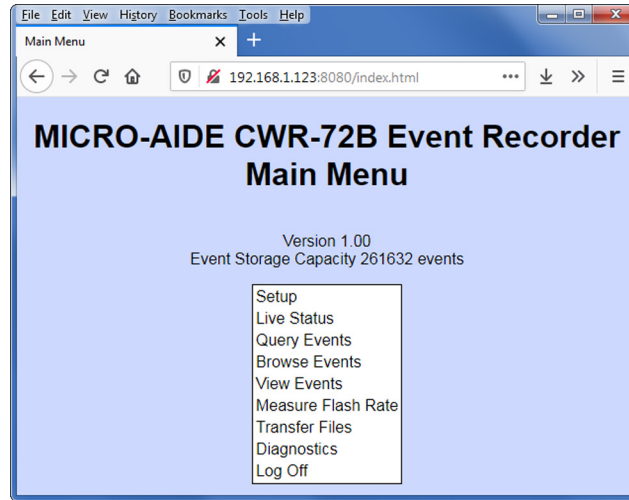
Main Menu

QUERY EVENTS

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 screen shot shows a typical response to the Query Events command.
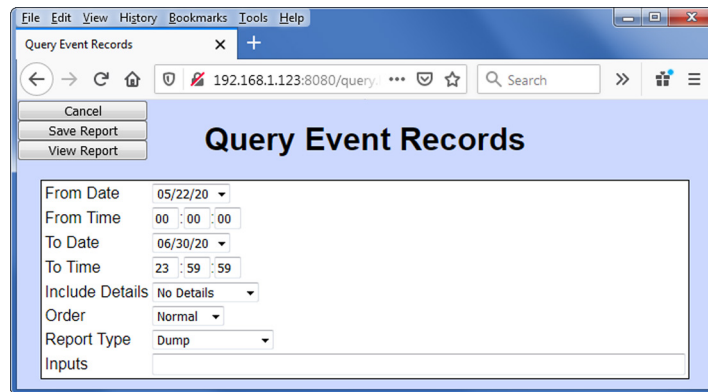
Query Events Command

Creating a Query Events report is a two-step process. The first step is to define the report's content. The second step is to execute the report. Both steps are described in the following.

DEFINING THE REPORT CONTENT

To define the report's content, the user establishes settings among a collection of eight edit and drop down list boxes. From top-to-bottom each are described in the following sections.

FROM DATE

Click the down arrow to view the contents of the drop down list box. It will contain one or more dates listed in MM/DD/YY format (e.g., 05/22/20 in the sample data). Initially the drop down list box will indicate

the date of the oldest Event Record in memory. As many as 128 dates may be listed. For each date at least one Event Record was saved to memory. Select the date that represents the first date of the required report.

The CWR-72B utilizes a rotating memory. Records from the 129th day will automatically over-write records from the first day. Similarly, if the memory is full, each new event will automatically over-write the oldest event.

Fʀᴏᴍ Tɪᴍᴇ

The From Time setting controls the report's first record. Specifically, the first record will be the oldest record in memory past the selected From Date and From Time settings. Initially the From Time setting will be 00:00:00 (i.e., midnight). Change the edit box contents to reflect the From Time required by the report. The CWR-72B 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.

Tᴏ Dᴀᴛᴇ

Click the down arrow to view the contents of the drop down list box. It will contain one or more dates listed in MM/DD/YY format (e.g., 05/22/20 in the sample data). Initially the drop down list box will indicate the date of the oldest Event Record in memory. As many as 128 dates may be listed. For each date at least one Event Record was saved to memory. Select the date that represents the last date of the required report.

Tᴏ Tɪᴍᴇ

The To Time setting controls the report's last record. Specifically, the last record will be the most recent record in memory before the selected To Date and To Time settings. Initially the To Time setting will be 23:59:59 (i.e., just before midnight). Change the edit box contents to reflect the To Time required by the report. The CWR-72B 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.

Iɴᴄʟᴜᴅᴇ Dᴇᴛᴀɪʟs

The CWR-72B can format Event Record reports in five different ways. Click the down arrow of the Include Details drop down list box. Select one of the five formatting options. The initial selection will be No Details.

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 61. The numbers included in each of the headings listed in the following specify the number of lines of text each formatting option will create.

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

Digital Details (2)–The status of each Digital Input is listed along with data concerning the input that created the record.

Analog Details (2)–The level of each Analog Input is listed along with data concerning the input that created the record.

Virtual Details (2)–The status of each Virtual Input is listed along with data concerning the input that created the record.

All Details (4)–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.

Oʀᴅᴇʀ

The Order setting can be either Normal (initial setting) or Reverse. The Normal setting will result in the oldest records being listed first. They will be followed by newer records. Conversely, the Reverse 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 (initial setting) or Dump+Signature. This setting further controls the content of the report. The proper selection depends upon the user's requirement. Both options are described in the following sections.

Dump—The Dump option will stream the Event Record set for the selected range of times and dates. The records will be displayed on the PC screen or they can be captured to a text file for saving and later review. Refer to the section entitled "Save Report" on page 54. The streaming of records will cease automatically after the last record is issued.

Dump+Signature—This setting is similar to the Dump setting in that it produces a streamed report from start to end. However, a digitally encrypted signature is appended to the end of the report. The signature can be used to determine if the content of the report has been tampered with and therefore no longer reflects the actual data as logged by the recorder. Refer to Appendix E for additional details.

> A report using the Dump or Dump+Signature option will yield identical Event Record data. The only difference is that the Dump+Signature report will include a single-line marker before the first record and a multi-line Digital Signature after the last record in the set.

INPUTS

The Inputs edit box acts as a filter allowing the user to inspect Event Records from specific inputs. To select specific inputs a valid Input Number must be entered. Digital Inputs are entered as **Dn**, where n is 1 through 32/64. Analog Inputs are entered as **An**, where n is 1 through 8. Virtual Inputs are entered as **Vn**, where n is 1 through 32. Timer Inputs are entered as **Tn**, where n is 1 through 32. Alarms are entered as **Ln**, where n is 1 through 20. System Event Inputs are entered as **Sn**, where n is 1 through 11. Leading zeros are not required. Records from all inputs will be issued if the edit box is left blank.

> System Event Inputs are another type of non-physical input that can create Event Records. System Event Records are used to report the status of the recorder at a specific moment in time. Refer to the section entitled "System Events" on page 97 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 input type designator can be entered as an upper- or lower-case letter. Input Numbers can be entered without regard to sequence.

The following screen shot provides several examples of how to select a single input as well as a contiguous range of inputs.

Query Events Command - Inputs

EXECUTING THE REPORT

Once the report content is fully defined, the report can be executed. The user can select from either of two execution options. Both are described in the following.

View Report

To simply view the report on the PC screen, click the button labeled "View Report". All of the Event Records meeting the criteria established by the report's definition will be streamed to the PC and appear in chronological order. The Event Record stream will terminate automatically. The completion of the report will be noted by a record count and a line of text that reads "End of report". As the report may extend vertically beyond the bounds of a typical window, use the vertical scroll bar to inspect records that are not presently in view. To return to the Query Event Records web page, click the browser's back button.

If the report was created with the Digital + Signature option, the last lines of text will include the Digital Signature.

Save Report

In many cases the report will need to be saved as a text file on the PC. As a file, it can then be copied, shared and printed as the need arises. To save the report, complete the following steps.

1. Click the button labeled "Save Report". A dialog box similar to the following will be displayed.

The Firefox browser was used in the following example. The procedure for Google Chrome and Microsoft Edge and IE will be similar.
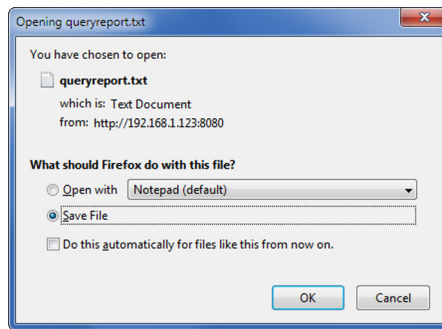
Save Report - Firefox

2. Click the button labeled "OK". A dialog box similar to the following will be displayed.
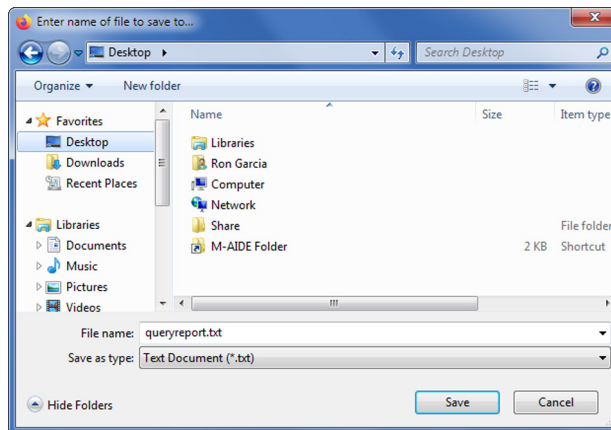
Save Report - Save File As Dialog Box

3. As listed in the edit box named "File name:", the saved file will initially be named "queryreport.txt". Change the filename as required.

4. Make sure the drop down list box labeled "Save as type:" is set to the option labeled "*.txt".

5. At the left is the folder pane. Navigate to and select the folder where the report file will be saved.

6. Click the button labeled "Save" to complete the process.

The dialog boxes will close automatically and the saved file will be available to the user. The user will be returned to the Query Event Records web page.

A digitally signed report that has been saved is unique in that it cannot be altered without the alteration being detectable. Appendix E describes how to verify that a signed report has not been altered.

As an alternative to this procedure, reports can also be saved directly to a USB Flash Drive. The procedure is described in the section entitled "Saving Records to a Flash Drive" on page 66. Reports saved to a flash drive can also be made secure by including a Digital Signature.

The section entitled "Event Record Formatting" on page 61 provides a complete description of the information contained in each Event Record. Several records with various levels of detail are used as examples.

BROWSE EVENTS

The Browse Events command provides another means of reviewing Event Record data. Like the Query and View Events commands the user can select a starting time and date for the records of interest. The events can also be filtered by level of detail, type and number. The difference is how the Event Record data is displayed.

A screen shot similar to the following will be displayed after clicking the Browse Events command.
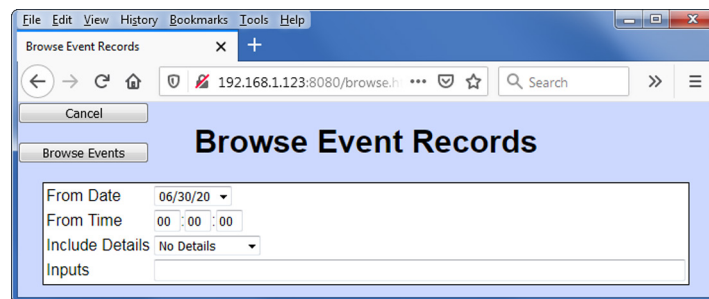
Browse Events Command

Creating a Browse Events report is a two-step process. The first step is to define the report's content. The second step is to execute the report. Both steps are described in the following.

DEFINING THE REPORT CONTENT

To define the report's content, the user establishes settings among a collection of four edit and drop down list boxes. From top-to-bottom each are described in the following sections.

FROM DATE

Click the down arrow to view the contents of the drop down list box. It will contain one or more dates listed in MM/DD/YY format (e.g., 06/30/20 in the sample data). Initially the drop down list box will indicate the date of the oldest Event Record in memory. As many as 128 dates may be listed. For each date at least one Event Record was saved to memory. Select the date that represents the first date of the required report.

FROM TIME

The From Time setting controls the report's first record. Specifically, the first record will be the oldest record in memory past the selected From Date and From Time settings. Initially the From Time setting will be 00:00:00 (i.e., midnight). Change the edit box contents to reflect the From Time required by the report. The CWR-72B 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.

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 "Include Details" on page 52.

Inputs

The Inputs edit box allows the user to review records from specific inputs. This setting is described in the section entitled "Inputs" on page 53.

Executing the Report

Once the report content is fully defined, the report can be executed. To view the report click the button labeled "Browse Events". As depicted in the following screen shot, each report will include a group of ten Event Records. In the sample data, the various Input Names, Identifiers and Event Names reflect the factory default settings.

Several controls allow the user to view different sets of Event Records. Each control is described in the following sections.
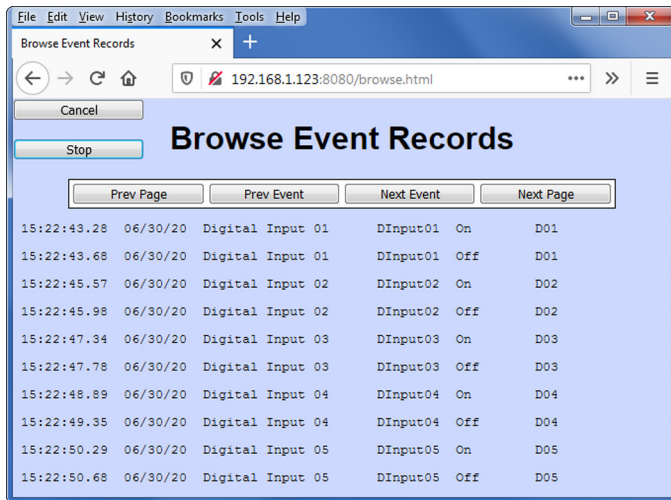
Browse Events - Sample Report

Prev Page

Irrespective of the Include Details setting, each view will consist of one page of Event Records. A page is always comprised of ten records. To view the ten records prior to the present set of records, click the button labeled "Prev Page".

Prev Event

To view the previous record in the chronological sequence, click the button labeled "Prev Event". The new Event Record will appear at the top of the view.

Next Event

To view the next record in the chronological sequence, click the button labeled "Next Event". The new Event Record will appear at the bottom of the view.

Next Page

Irrespective of the Include Details setting, each view will consist of one page of Event Records. A page is always comprised of ten records. To view the ten records immediately after the present set of records, click the button labeled "Next Page".

Stop

To view an entirely different range of Event Records, click the button labeled "Stop". The user will be returned to the Browse Event Records command menu.

CANCEL

To exit, click the button labeled "Cancel". The user will be returned to the Main Menu.

The section entitled "Event Record Formatting" on page 61 provides a complete description of the information contained in each Event Record. Several records with various levels of detail are used as examples.

VIEW EVENTS

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 available for viewing. 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 connected.

The following screen shot will be displayed after the command has been selected.
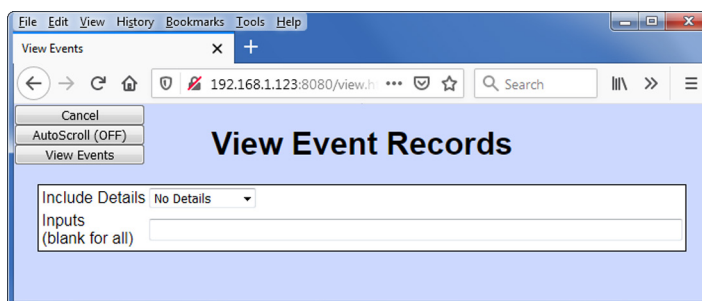
View Events Command

Creating a View Event Records report is a two-step process. The first step is to define the report's content. The second step is to execute the report. Both steps are described in the following.

DEFINING THE REPORT CONTENT

The Event Records of interest to the user can be qualified by two settings. They are 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 "Include Details" on page 52.

INPUTS

The Inputs edit box allows the user to review records from specific inputs. This setting is described in the section entitled "Inputs" on page 53.

EXECUTING THE REPORT

Once the report content is fully defined, the report can be prepared for execution. The user can select from either of two window control options. Both are described in the following.

AUTOSCROLL

The button labeled "AutoScroll" toggles from an "(OFF)" to an "(On)" and then back to an "(OFF)" setting each time it is clicked. The settings are described in the following.

Off–Eventually the window will fill with Event Record data. When it does, the "OFF" setting will not automatically display new Event Record data as it occurs. In this case, the user will have to manually scroll up and down to view the new record data.

On–With the "ON" setting, new data will be automatically and continuously displayed at the bottom of the window. The oldest data will be vacated from the top of the window. In this case, the user will have to manually scroll up and down to view old record data.

View Events

Once the report definition and window control options are selected the report can be executed. The button labeled "View Events" will toggle to a "Stop" and then back to a "View Events" setting each time it is clicked. By clicking this button the user can start and stop the report at any time.

To exit the View Event Records report, click the button labeled "Cancel". The user will be returned to the Main Menu.

ⓘ The section entitled "Event Record Formatting" on page 61 provides a complete description of the information contained in each Event Record. Several records with various levels of detail are used as examples.

Live Status

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 Detect Times are set in accordance with the characteristics of the monitored circuits. It provides a single-screen snapshot of the present state of 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 labels each input by the use of its user-assigned Input Identifier and Event Name. The latter are described in the sections entitled "Input Names / Identifiers" on page 30 and "Event Names" on page 31, respectively.

To view the status information, select the Live Status command from the Main Menu. Data similar to the following will be displayed.

ⓘ The following screen shot shows a left and right section. The Live Status command actually displays a single screen view of all inputs. The normal display was split in half so all of the data could be shown on a single page. The right section would normally appear directly below the left section.

At the top of the report is the header. The header includes the current internal temperature of the recorder and the date and time. The latter is updated each second. The remainder of the screen is organized into two major groups. The first group includes two columns of data. It lists the status of all 32 / 64 Digital Inputs. The second group includes three columns of data. It lists the status of the Analog, Virtual and Alarm Inputs.

In the following sections the status data for each input group is described from top-to-bottom and then left-to-right.

Digital Input Status

The Identifier assigned to each Digital Input is listed in the left-most column (e.g., Isld_1T, DInput02, etc.). The current status of each Digital Input is reported in the column to the right. At any given moment a Digital Input is either On or Off. However, its status can be more fully described by its user-assigned Event Name pair. In the sample data, the status of Digital Input 1, with an Identifier label of Isld_1T, is Tk_Dwn. In the Setup Database Tk_Dwn corresponds to an Off condition.

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

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

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

Live Status

Temperature	Time
90 °F	06/30/20 19:14:07

Isld-1T:	Tk_Dwn	B12-N12:	9.1Vdc	Batt_Low
DInput02:	Off	AInput02:	0.1Vdc	Off
DInput03:	Off	AInput03:	0.0Vdc	Off
DInput04:	Off	AInput04:	0.0Vdc	Off
DInput05:	Off	AInput05:	0.0Vdc	Off
DInput06:	Off	AInput06:	0.0Vdc	Off
DInput07:	Off	AInput07:	0.0Vdc	Off
DInput08:	Off	Ac_Pwr:	0Vac	Pwr_Off
DInput09:	Off			
DInput10:	Off	VInput01:	Off	
DInput11:	Off	VInput02:	Off	
DInput12:	Off	VInput03:	Off	
DInput13:	Off	VInput04:	Off	
DInput14:	Off	VInput05:	Off	
DInput15:	Off	VInput06:	Off	
DInput16:	Off	VInput07:	Off	
DInput17:	Off	VInput08:	Off	
DInput18:	Off	VInput09:	Off	
DInput19:	Off	VInput10:	Off	
DInput20:	Off	VInput11:	Off	
DInput21:	Off	VInput12:	Off	
DInput22:	Off	VInput13:	Off	
DInput23:	Off	VInput14:	Off	
DInput24:	Off	VInput15:	Off	
DInput25:	Off	VInput16:	Off	
DInput26:	Off	VInput17:	Off	
DInput27:	Off	VInput18:	Off	
DInput28:	Off	VInput19:	Off	
DInput29:	Off	VInput20:	Off	
DInput30:	Off	VInput21:	Off	

		VInput21:	Off
DInput31:	Off	VInput22:	Off
DInput32:	Off	VInput23:	Off
DInput33:	On	VInput24:	Off
DInput34:	On	VInput25:	Off
DInput35:	On	VInput26:	Off
DInput36:	On	VInput27:	Off
DInput37:	On	VInput28:	Off
DInput38:	On	VInput29:	Off
DInput39:	On	VInput30:	Off
DInput40:	On	VInput31:	Off
DInput41:	On	VInput32:	Off
DInput42:	On		
DInput43:	On	Maint:	Off
DInput44:	On		
DInput45:	On	L01:	On
DInput46:	On	L02:	Off
DInput47:	On	L03:	Off
DInput48:	On	L04:	Off
DInput49:	On	L05:	Off
DInput50:	On	L06:	Off
DInput51:	On	L07:	Off
DInput52:	On	L08:	Off
DInput53:	On	L09:	Off
DInput54:	On	L10:	Off
DInput55:	On	L11:	Off
DInput56:	On	L12:	Off
DInput57:	On	L13:	Off
DInput58:	On	L14:	Off
DInput59:	On	L15:	Off
DInput60:	On	L16:	Off
DInput61:	On	L17:	Off
DInput62:	On	L18:	Off
DInput63:	On	L19:	Off
DInput64:	On	L20:	On	Long_Occ

Live Status Command

ANALOG INPUT STATUS

The status of all eight Analog Inputs is reported at the top of the next group. The Identifier assigned to each Analog Input is listed in the first column (e.g., B12-N12, AInput02, etc.). To the right is the present measured level of the input. In the last column the appropriate Event Name is reported. In the sample data Analog Inputs 1 and 8 have been assigned Identifiers of B12-N12 and Ac_Pwr, respectively. Their respective measured levels are 9.1 Vdc and 0 Vac. Their measured levels correspond to Event Names of Batt_Low and Pwr_Off. From the data it can be determined that the battery has been significantly discharged because AC power has been lost to the battery charger.

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

On–The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 6 on page 36.

Off–The Analog Input level is within the acceptable range as defined by the region between the Limit Values.

VIRTUAL INPUT STATUS

The status of all 32 Virtual Inputs is also reported in the second group immediately below the Analog Inputs. The Identifier assigned to each Virtual Input is listed in the first column (e.g., VInput01, VInput02, etc.). To the right is the status of the Virtual Input per its user-assigned Event Name pair. At any given moment a Virtual Input is either On or Off. However, its status is more fully described by the Event Name that is listed.

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

On–The Virtual Input evaluates to a true logic state.

Off – The Virtual Input evaluates to a false logic state.

Maintainer Mode

Directly below the status of Virtual Input 32 is listed the status of Maintainer Mode. Either On or Off will be indicated. Refer to the section entitled "Maintainer Mode" on page 49 for additional details.

Alarm Input Status

At the bottom of the second group is listed the status of all 20 Alarm Inputs. They are labeled by their preassigned Identifiers (e.g., "L01", "L02", etc.). The adjacent column to the right lists the current On or Off status of the Alarm Input. The column furthest to the right lists the status of the Alarm Input by either its SetName (e.g., Long_Occ) or ClrName as determined by its On or Off status.

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

On – The Alarm Input is currently detecting an Alarm condition. The user-assigned SetName will be used to identify the Alarm.

Off – The Alarm Input is not currently detecting an Alarm condition. The user-assigned ClrName will be used to identify the Alarm.

Measure Flash Rate

Typical railroad operating procedures require that the flashing rate of crossing signals be periodically measured and reported. The Measure Flash Rate command allows the CWR-72B user to precisely determine the flashing rate of a circuit.

Using the Measure Flash Rate feature imposes two pre-conditions upon the Setup Database of the recorder. The circuit to be measured must be connected to a Digital Input that is enabled for flash detection. Secondly, the selected Digital Input will be temporarily assigned a Detect Time of .1 seconds. This will insure that the flashing pulses will not be filtered out by the de-bounce properties of the Detect Time feature. Refer to the section entitled "Detect Times / Flash Enable" on page 32.

The CWR-72B will automatically adjust the Digital Input's Detect 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.

A screen shot similar to the following will be displayed after the Measure Flash Rate command is selected.
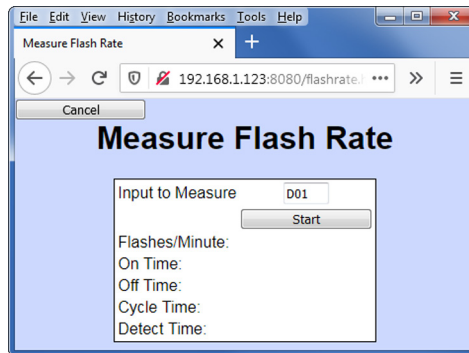
Measure Flash Rate Command

The user must enter a valid Digital Input Number in the Input to Measure edit box. The entry must take the form **Dn**, where n is 1 through 32 / 64. Leading zeros are not required. Click the button labeled "Start" to accept the Input Number and initiate the measurement. A screen shot similar to the following will be displayed.
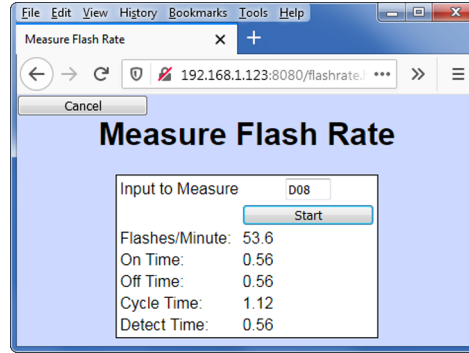
Measure Flash Rate Report

In the sample data the flash rate of Digital Input 8 is being measured. The lower five lines of text reflect the Measure Flash Rate information. The first line indicates the number of flashes per minute (e.g., 53.6). 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 a single pulse on/off sequence. It is the sum of the On Time and Off Time durations. Finally, the fifth line specifies the optimum Detect Time to be assigned to inputs using the reported flash rate (e.g., .56 seconds).

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 click the button labeled "Cancel". The Digital Input can then be connected to another circuit. The original Detect Time setting will be restored and the user will be returned to the Main Menu.

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. Five different formatting methods are employed by the CWR-72B. The five formatting options create one-, two- and four-line records. All five formatting options are available in the Query, Browse and View Events commands. In the sections that follow, each of these formatting options are described in order of increasing detail.

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 or other signal facility. The data is illustrative and only for the purposes of explanation. The Query Events command was used to gather the data.

NO DETAILS

The one-line form is used to provide event information from a single input. Analog Input levels, Digital and Virtual Input status information is not listed in this format. Ten sample records are shown in the following screen shot. Each record is comprised of six or seven data fields. From left-to-right each data field is described.

Time – The time the event was detected is indicated in military-style hh:mm:ss.dd format. The time is identified to the nearest hundredth of a second.

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

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

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

```
File  Edit  View  History  Bookmarks  Tools  Help

192.168.1.123:8080/postqu.html    ✕    +

←  →  C  ⌂        🛡  🖉  192.168.1.123:8080/postqu.html        ▤  •••    »    ≡

Dump from 06-02-20 00:00:00.00 to 06-02-20 23:59:59.99
M-A_Arrow_Grand_MP14
Total 56 events in 1 days

11:52:20.01  06/02/20  System Power        Power     OFF       S01
11:52:43.00  06/02/20  System Power        Power     ON        S01
12:00:00.40  06/02/20  GPS Clock Record    GPS Rec   OFF       S06    0.07SEC
12:38:40.00  06/02/20  Gate_Up_Ind         Gate_Up   Off       D06
12:39:03.53  06/02/20  Alarm Input L06     Alarm06   PK        L06
12:39:27.20  06/02/20  Island_Track_1      Island_1  On        D03
12:40:32.65  06/02/20  Gate_Delay          Timer16   Violate   T16    22.6s
12:42:54.46  06/02/20  EOR                 EOR       Off       D20    52.6FPM
12:46:01.54  06/02/20  Speed Monitor 4     SpeedLim  ON        S12    26MPH
13:19:43.32  06/02/20  Maintainer Mode     Maint     ON        S07

Number of records = 10
End of report
```

Event Records - No Details

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 "Violate" listed in the seventh Event Record clearly indicates to the user that a timing violation was recorded.

Input Number—The Input Number is frequently, but not always, the last data field listed. The record may be from a Digital (D1 through D32/64), Analog (A1 through A8), Virtual (V1 through V32), Timer (T1 through T32), Alarm (L1 through L20) or System Event Input (S1 through S12).

Measured Time, Flash Rate or Speed—Some Event Records will include a data field after the Input Number. System Event Records associated with the GPS Clock Sync feature will, once an hour, report the amount of clock correction that occurred (e.g., .07 seconds). Timer Inputs will include a measured duration (e.g., 22.6 seconds). The Off Event Record associated with a flashing input will list the flash rate (e.g., 52.6 fpm). System Event Records created by the Train Speed Monitor feature will report a measured speed (26 mph).

The first two sample records are from System Input 1. They indicate when power was lost and then restored to the recorder. During the 23-second-long interval no Alarms or events could be detected or reported. The last record indicates that the Maintainer Mode was turned on at 13:19:43.32.

ⓘ A sample Event Record is listed in each of the four sections that follow. In each case the sample record used is a copy of the sixth record included in the No Details description. In the interest of brevity, the report header and browser chrome has been removed.

VIRTUAL DETAILS

The Virtual Details format also uses two lines of text. The first line is formatted identically to that used by the No Details option. The formatting convention is described in the section entitled "No Details" on

. The second line of text include a sequence of 32 characters that indicate the state of each Virtual Input at the time the event was logged to memory. A pattern of X, x and . (period) characters are shown in the following sample record. The left-most character indicates the state of Virtual Input 1. The right-most character indicates the state of Virtual Input 32. There are four symbols used to indicate the state of Digital and Virtual Inputs. They are described in the section entitled "Symbol Legend" on page 64. In the sample record Virtual Input 31 was in an On state at the time the Event Record for Digital Input 3 was created.

```
12:39:27.20  06/02/20  Island_Track_1        Island_1  On        D03
.......... .......... .......... X.
```

Event Records - Virtual Details

DIGITAL DETAILS

The Digital Details format uses two lines of text. The first line is formatted identically to that used by the No Details option. The formatting convention is described in the section entitled "No Details" on page 61. The second line of text is used to indicate the state of each Digital Input at the time the event was recorded. The left-most character indicates the state of Digital Input 1. The right-most character indicates the state of Digital Input 32/64. A pattern of X, x and . (period) characters are shown in the following sample record. There are four symbols used to indicate the state of Digital and Virtual Inputs. They are described in the section entitled "Symbol Legend" on page 64. In the sample record Digital Inputs 3, 11, 30 and 64 were in an On state at the time the Event Record for Digital Input 3 was created.

```
12:39:27.20  06/02/20  Island_Track_1        Island_1  On        D03
..X....... x.......... .........x .......... .......... .......... ...x
```

Event Records - Digital Details

ANALOG DETAILS

The Analog Details format uses two lines of text. The first line is formatted identically to that used by the No Details option. The formatting convention is described in the section entitled "No Details" on page 61. The second line of text lists the measured levels of each Analog Input. From left to right, A1 through A8 are reported. The units of measurement are always displayed to the right of the measured level (e.g., Vdc and Vac). To the right of the units of measurement data is a single-character indicator. It is used to indicate the state of the Analog Input relative to the user-defined Limit Values. There are four symbols used to indicate the state of Analog Inputs. They are described in the section entitled "Symbol Legend" on page 64. In the sample record the voltages measured by Analog Inputs 1 and 8 were 13.1 Vdc and 90 Vac, respectively, at the time the Event Record for Digital Input 3 was created. The voltage at Analog Input 8 was outside of its acceptable range of operation.

```
12:39:27.20  06/02/20  Island_Track_1        Island_1  On        D03
 13.1Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    90Vac!
```

Event Records - Analog Details

ALL DETAILS

The All Details format incorporates all of the detail content defined in the Digital, Analog and Virtual Details options. It requires four lines of text. From top to bottom the details include Virtual Input states, Digital Input states and Analog Input measured levels. The following data shows the sample record from the previous sections formatted with the All Details option.

```
12:39:27.20  06/02/20  Island_Track_1        Island_1  On        D03
.......... .......... .......... X.
..X....... x.......... .........x .......... .......... .......... ...x
 13.1Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    0.0Vdc    90Vac!
```

Event Records - All Details

S**YMBOL** L**EGEND**

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" on page 31 and "High and Low Limits" on page 35, respectively.

This concludes the chapter on how to operate the CWR-72B. Terminate the current session by using the Log Off command. Refer to the section entitled "Log Off" on page 21.

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

4

CHAPTER 5 – FRONT PANEL OPERATION

INTRODUCTION

The CWR-72B is designed to provide its user with the greatest degree of versatility and functionality. Towards this end, it is equipped with a front panel mounted OLED display panel and keypad. Together these features allow the user to perform all of the setup and operational procedures required to effectively use the recorder. The advantage to the user is that a PC, although helpful, is not required to operate the recorder while on-site.

Setup and operation of the CWR-72B from the front panel is somewhat different than operation via a PC. The tasks to be performed and the end results are identical but the methods employed are different. This chapter describes the methods that are unique to front panel operation. Figure 2 on page 8 provides an illustration of the display panel and keypad.

FRONT PANEL DESCRIPTION

OLED DISPLAY PANEL

The display panel consists of a viewing area approximately 2.8″ by .8″ in size. It is configured to present four lines of data. Each line can contain twenty alphanumeric characters and symbols. The characters are large and can be viewed easily from several feet away. The OLED design provides improved contrast and temperature stability. There are no backlight, contrast or illumination adjustments that are required.

KEYPAD

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

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

LED INDICATORS

The front panel of the CWR-72B also includes four LED indicators. Their use is described in the section entitled "LED Indicators" on page 50.

USB HOST PORT

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

HOW TO USE THE USB HOST PORT

Every CWR-72B is equipped with a USB Host Port designed for use with a FAT-32 formatted flash drive. The port can be used to save copies of selected Event Records to a compact, portable memory. Once saved, the resultant text records can be read and reviewed on any PC. They can also be copied or moved to a PC file on a hard drive. The user has the option of copying selected records with an appended digital signature, as if the Query Events command with Dump+Signature option had been used. Refer to the section entitled for additional information.

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

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

The USB Host Port can also be used to download and upload the Setup Database. The procedures for doing so are described in the sections entitled and , respectively.

Finally, the USB Host Port can be used to update the recorder's software. This procedure is described in the section entitled .

SAVING RECORDS TO A FLASH DRIVE

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

SAVING EVENT RECORDS FROM A COMPLETE DAY

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

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

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

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

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

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

```
062320  062420  062520
062620  062720  062820
062920  063020
```

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

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

```
Digital Signature?

Yes   No
```

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

```
Writing events.txt
Writing events.bin
Writing setup.txt
OK, Remove USB drive
```

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

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

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

SAVING EVENT RECORDS FROM A RANGE OF TIMES AND DATES

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

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

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

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

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

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

```
062320  062420  062520
062620  062720  062820
062920  063020
```

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

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

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

7. To accept the 00:00:00 midnight setting as the start time, press the *Esc* key. To modify the start time, move the highlight to the hours, minutes or seconds position. Press the *Enter* key. Press the number keys as required to create a new value. The CWR-72B utilizes a military-style clock. Accordingly, 12:01:02 AM is defined as 00:01:02 and 12:59:58 PM is defined as 23:59:58. Leading zeros are not required. To accept the new value, press the *Esc* key. Using the same technique, adjust the other values as required. When the start time is correct, press the *Esc* key.

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

```
062320  062420  062520
062620  062720  062820
062920  063020
```

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

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

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

```
Digital Signature?

    Yes   No
```

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

```
Writing events.txt
Writing events.bin
Writing setup.txt
OK, Remove USB drive
```

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

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

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

FILES WRITTEN TO THE FLASH DRIVE

The first time Event Records are saved via the USB Host Port a folder is automatically written to the flash drive. The name of the folder is taken from the first twenty characters of the Unit Name. Certain restrictions apply to the creation of the Unit Name. Refer to the section entitled "Unit Name" on page 19 for additional details.

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

EVENTS TEXT FILE

The first file written is the text version of the Event Records. The file is assigned a filename formatted as follows: MM-DD-YY@hhmmss-mmddyy.txt. As a text file, this file can be read by any word processing application (e.g., Notepad or Word). Table 7 on page 69 provides a complete description and example of the filename format.

EVENTS BINARY FILE

The selected Event Records are also written to the flash drive as a highly compressed binary file. The filename is formatted similarly to the text file; however, the file extension is changed to .bin. The binary version of the record file is used exclusively by GEAB for viewing and plotting of the Event Records.

Text and Binary Filename Definition	Description
MM-DD-YY	The date of the first record saved to the flash drive.
hhmmss	The time the records were saved to the flash drive.
mmddyy	The date the records were saved to the flash drive.
.txt	Denotes the file as a text file readable by any word processor.
.bin	Denotes the file as a binary file readable only by GEAB.
Example: 06-23-20@120127-063020.txt	The first record is from 06-23-20. They were saved to the flash drive at 12:01:27 pm on 06-30-20.

Table 7: Flash Drive Filenames

SETUP DATABASE TEXT FILE

In order for GEAB to view and plot the saved records, a copy of the recorder's Setup Database must be available. The recorder's database file is always named setup.txt. This file is automatically overwritten each time a record file is written to the flash drive.

SAVING THE SETUP DATABASE

The Setup Database can be downloaded or saved directly to a USB flash drive. The following steps describe the applicable procedure.

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

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

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

Save Command

4. Press the *Enter* key after highlighting the option labeled "Setup Data".

5. The Setup Database will be immediately saved. The following message will be displayed briefly at the completion of the save operation.

6. The flash drive can now be removed from the USB Host Port.

HOW TO USE THE KEYPAD

After power is applied, the CWR-72B will perform a software boot-up procedure. The OLED display panel will remain blank for approximately 20 seconds while the recorder is booting. The following message will be briefly displayed at the completion of the boot-up procedure.

```
    MICRO-AIDE
  Model CWR-72B
  Event Recorder
   Version 1.05
```

The reference to software version 1.05 may vary. The software version number should be recorded and saved in the event service ever needs to be performed on the unit. After the boot-up procedure is completed the recorder will automatically enter Idle Mode. There are three operational modes. Each is described in the following sections.

IDLE MODE

Except as noted in the following, the real-time clock and Unit Name are displayed during Idle Mode. It is the at rest condition of the recorder. An example of the real-time clock display is shown in the following. The first twenty characters of the Unit Name are listed in the fourth row. Refer to the section entitled "UName" on page 78 for additional information.

ⓘ Throughout the remainder of this chapter, the characters shown with a yellow background indicate the initial position of the highlight and therefore, the presently selected command or option.

🔧 The following screen indicates that the CWR-72B is in Maintainer Mode. Maintainer Mode is always enabled when power is first applied or restored to the recorder. Press the front panel pushbutton switch labeled "Esc / Maintainer Mode" to initiate normal operation. Refer to the section entitled "Maintainer Mode" on page 49 for additional information.

```
TIME  MAINT  DATE
12:38:55    06-30-20
CWR72B EventRecorder
M-A_Arrow_grand_MP14
```
OLED Display During Idle Mode

The CWR-72B utilizes the 24-hour, military time convention (e.g., 7:00 PM is shown as 19:00:00). The date and time display is altered once every minute for five seconds. Alternating messages referring to the Setup and Browse Modes are displayed during this period.

The real-time clock display is also interrupted in Idle Mode when new Event Records are logged. Each new event will be displayed only briefly. This process is useful in verifying that the recorder is continuing to detect events. The Event Record format used by the OLED display panel is described in the following section.

EVENT RECORD FORMAT

Event Records consist of four lines of text. Sample records for several input types are shown in the following.

```
12:39:27.20 06-02-20
D03       1..x.......
Island_Track_1
Island_1    On
```
Event Record - Digital Input

```
13:47:56.69 06-02-20
A02   8.9Vdc.x......
Signal_Battery_1
SB_1        Batt1BAD
```
Event Record - Analog Input

```
13:55:44.67 06-02-20
V02        1.x......
Virtual_Gate_Up
VGateUp      On
```

Event Record - Virtual Input

```
12:39:03.53 06-02-20
L06
Alarm Input L06
Alarm06      PK
```

Event Record - Alarm Input

The first line of text always specifies the time and date the event was logged to memory. The date is listed in MM-DD-YY format.

The second line of text lists the Input Number. In the case of Digital, Analog and Virtual Input records, it is followed by a sequence of x and . (period) characters. An x indicates an input with an active or On Event state. A . (period) indicates an input with an inactive or Off Event state. In the case of Analog Inputs the state indicators are preceded by the measured Analog Input level (e.g., 8.9 Vdc in the second sample record). In the case of Digital Input records all 32/64 Digital Input states cannot be depicted in the second line of text. Only a group of ten are shown. The one- or two-digit number that precedes the state field is the Input Number of the first state indicator. For Analog Inputs the state indicators, from left to right, pertain to A1 through A8.

The third line always lists the twenty characters of the assigned Input Name (e.g., Signal_Battery_1 in the second sample record).

Finally, the eight characters of the assigned Input Identifier and Event Name are listed in the fourth line from left to right, respectively. Input Identifiers and Event Names are described in "Input Names/Identifiers" on page 30 on page 73 and "Event Names" on page 31, respectively.

BROWSE MODE

Browse Mode is most commonly used to view Event Records via the OLED panel. Event Records may be viewed in either forward or reverse chronological order. Events are selected by date and time and optionally by Input Number. However, two additional features allow the user to inspect the current status of an input or to measure the flash rate of a flashing circuit.

To access any of the Browse options press the *Browse* key. The following message will appear.

```
      Browse:
  Event Records
  Input Status
  Flash Rate
```

Browse Command

Each of the three options are described in the sections that follow.

EVENT RECORDS

After selecting the option labeled "Event Records", a table of dates similar to the following will be displayed.

```
062320  062420  062520
062620  062720  062820
062920  063020
```

Browse Command - Event Records Option

At least one Event Record will be logged for each date listed. Dates are listed in the MMDDYY format. The Event Records option may list as many as 128 dates. Only eight dates are listed in the example cited previously. The up and down arrow keys can be used to scroll quickly through a large collection of dates. Press the *Enter* key after highlighting a date. The display will then specify a start time as shown in the following.

```
Browse Start Time:
Enter=edit, Esc=OK
        00:00:00
```

Press the *Esc* key if records starting from midnight are to be inspected. To inspect records starting later in the day perform the following steps.

1. Using the left and right arrow keys position the highlight in the hour, minute or second field.

2. Press the *Enter* key to select the highlighted field.

3. Enter the required hours, minutes or seconds by pressing the appropriate numeric keys. Leading zeros are not required.

4. Press the *Enter* key to complete the entry.

5. Repeat the previous steps to adjust the remaining fields.

After the correct starting time is specified the *Esc* key should be pressed. The following message describing the use of the arrow keys will be briefly displayed.

```
Use <>^v to scroll,
Browse to select
input to query
```

Provided the *Browse* key has not been pressed, the first Event Record meeting the specified date and time will be displayed. The record format used by the OLED is described in the section entitled "Event Record Format" on page 70. The left and right arrow keys can be used to review Event Records in forward or reverse chronological order.

Holding down an arrow key allows the user to search through the record set very quickly.

The limits of the record set will be indicated by a message stating either Start of Data or End of Data. To exit Browse Mode and return to Idle Mode, press the *Esc* key.

Press the *Browse* key any time after the start time is specified to inspect records for a particular input. This procedure is referred to as Query by Input Number.

Qᴜᴇʀʏ ʙʏ Iɴᴘᴜᴛ Nᴜᴍʙᴇʀ

To inspect Event Records for a specific input press, the *Browse* key after the starting time is specified. The following message will be displayed.

```
Input to query,
(--- uses default)
        ---
```

A flashing highlight will be positioned in the Input Number field located in the third row of text. To specify an input follow the steps listed in the following.

1. Press the *Alpha* key repeatedly until the desired input type (i.e., D, A, V, T, S or L) is displayed. If this setting is not modified, records from all inputs types will be displayed.

2. Press the appropriate number keys to enter the Input Number. Leading zeros are not required.

3. Press the *Enter* key to display the first Event Record satisfying the date, time and Input Number criteria. Several seconds may be required to locate the first record.

4. Use the arrow keys to inspect additional records for the specified input.

The *Browse* key can be pressed again at any time if a different input is to be inspected. Press the *Esc* key to exit the Query by Input Number procedure and return to Idle Mode.

The CWR-72B will log an Event Record to memory when the power is turned off as well as on. Additionally, a record will be logged if the measured temperature is outside the Temp Limits assigned by the user. These records are referred to as System Records and are associated with S-type inputs. Refer to the section entitled "System Events" on page 97 for additional details.

INPUT STATUS

The Input Status option allows the user to inspect the current state of each input. The status of Digital, Analog and Virtual Inputs is indicated by their assigned Event Names. Voltage measurements are reported for Analog Inputs. The Input Status feature can be of great use when setting up the recorder. Without a peripheral device the user can verify that inputs are assigned proper Input Identifiers and Event Names. Each input can be checked to verify that it will report a change of state. Additionally, the command provides a DVM-like function for each Analog Input.

After selecting the Input Status option the following message will be displayed briefly.

```
Use <>^v to scroll,
Browse=select input
```

Browse Command-Input Status Option

The arrow keys can be used to scroll from one input to the next. Digital Inputs are followed by Analog Inputs. They are followed by Virtual Inputs. Rather than use the arrow keys to scroll sequentially through each input the user can jump to a specific input by pressing the *Browse* key. Select the input using the procedure described in "Query by Input Number" on page 72.

Sample status data for each input type is listed in the following.

```
D03
Island_Track_1
Island_1     On
```

Input Status-Digital Input

```
A02
Signal_Battery_1
SB_1          Batt1_OK
                 13.6Vdc
```

Input Status-Analog Input

```
V02
Virtual_Gate_Up
VGateUp      On
```

Input Status-Virtual Input

The Input Number and Input Name are listed in the first and second rows, respectively. The Input Identifier and Event Name are listed in the third row. The fourth row is used to report analog levels. The data listed is updated automatically and in real-time. Without the aid of a PC the user can check the sequence

of events at a crossing or while a control function is being exercised. Press the *Esc* key to exit the Input Status feature and return to Idle Mode.

Fʟᴀꜱʜ Rᴀᴛᴇ

The third option included with the Browse command allows the user to measure the flash rate of a circuit. The following request for a Digital Input Number will be displayed after selecting the Flash Rate option.

```
Measure Input:D08
```

Browse Command - Flash Rate Option

The user must enter the number of the flashing input (1-32 / 64). Leading zeros are not required. Press the *Enter* key to complete the entry. Flash rate data similar to the following will be displayed.

```
Measure Input:D08
Flashes/Min:   53.6
On/Off:  0.56/  0.56
Cycle Time:   1.12
```

Measured Flash Rate

The Input Number and flash rate, measured in flashes per minute, are listed in the first two rows. The average on and off intervals of each flash pulse, measured in seconds, are listed in the third row. The lesser value is the optimum value to be assigned as the Detect Time for inputs using the reported flash rate. The sum of the average on and off intervals is reported as the cycle time in the fourth row.

Press the *Esc* key to exit the Flash Rate command and return to Idle Mode.

5 Sᴇᴛᴜᴘ Mᴏᴅᴇ

Setup Mode allows the user to set up the CWR-72B to a specific set of application requirements. The various commands that can be executed from the keypad form a subset of those performed via a peripheral device. Only a few commands are not applicable to the keypad (e.g., Transfer Files). The results from any keypad-performed command are indistinguishable from those performed from a peripheral device. Accordingly, the setup descriptions that are a part of Chapter 3 may be used to provide a more detailed explanation of their keypad counterparts.

To enter Setup Mode from Idle Mode, press the *Setup* key. The following message will be displayed. The user must enter the correct Passcode before any setup command can be executed.

```
Enter the passcode:
_
```

Passcode Request

ⓘ The factory default Passcode is *12345678*.

Passcodes are assigned numeric values only. Press the *Enter* key to complete the entry. If the user fails to enter the correct Passcode an error message will be displayed.

Assuming the correct Passcode is entered the following message will be briefly displayed.

```
Use <>^v to select
items and then ENTER
```

The Setup Menu of front-panel-accessible commands will then be displayed as shown in the following.

```
Clock TimZone CSMode
DTimes GDTime   UName
ENames INames  Analog
Virtual Timer TLimit
```

Setup Commands - Screen 1

Moving the highlight beyond the limits of the first menu will display the following additional commands.

```
PCode   Speed    Diag
Network Update RESET
```

Setup Commands - Screen 2

The Setup Menu consists of eighteen commands. Table 8 on page 75 provides a brief explanation of each command. To select a command, advance the highlight to the desired command and press the *Enter* key. The use of each command is explained in the final sections of this chapter.

Name	Description
Clock	Set date and time
TimZone	Select Time Zone and enable / disable Daylight Saving Time
CSMode	Select Clock Sync Mode
DTimes	Assign Detect Times and enable / disable Flashing
GDTime	Assign Detect Time to all Digital Inputs
UName	Assign Unit Name
ENames	Assign Event Name pairs
INames	Assign Input Names, Identifiers and Event Name pair number
Analog	Configure Analog Inputs
Virtual	Configure Virtual Inputs
Timer	Configure Timer Inputs
TLimit	Assign High and Low Temperature Limits
PCode	Assign Passcode
Speed	Configure Train Speed Monitors
Diag	Perform system diagnostics
Network	Assign Network parameters
Update	Update Setup Database and software from USB Host Port
RESET	Erase all Event Records Restore Setup Database to factory default values

Table 8: List of Front Panel Setup Commands

Before proceeding the user should note that several of the commands require alphabetic characters to be used in the creation of a name or label (e.g., Input Name). The keypad, however, contains only numeric and function keys. A special Alphanumeric Editing Procedure which is a feature of the CWR-72B allows the user to create names and labels from an extensive set of characters. This procedure is described in the following.

ALPHANUMERIC EDITING PROCEDURE

The first step in the Alphanumeric Editing Procedure is to select the parameter that is to be edited (e.g., Input Name or Input Identifier). A flashing highlight is used to indicate a specific parameter. To select the highlighted parameter, press the *Enter* key. A blank field of characters will be displayed. An underscore (i.e., _) will be positioned in the first character location. The underscore character is used as a cursor in the Alphanumeric Editing Procedure. The left and right arrow keys can be used at any time to position the cursor as required. To create an alphanumeric name perform the following steps.

1. Press the *Alpha* key. The following list of characters will be displayed.

Alphanumeric Characters

2. Using the arrow keys reposition the highlight until the desired character is highlighted. A total of eighty characters plus ten numbers are available for selection.

3. Press the *Enter* key to select the highlighted character. The selected character is placed into the name at the present location of the cursor. The cursor is then automatically moved one position to the right.

4. To enter a number into the name, press the appropriate number key. To correct an error, reposition the cursor under the character in error and overwrite it with a new character. To insert a space, as-suming no characters have been inserted to the right, simply move the cursor to the right. The space character follows the upper-case Z in the character set.

5. Repeat the previous steps until the name is completed.

6. Press the *Enter* key to accept the newly defined name. Alternatively, press the *Esc* key to retain the previously assigned name or to start again by ignoring all of the character entries.

Cʟᴏᴄᴋ

The Clock command is used to change the date or time. The time is always listed in 24-hour, military-style format (e.g., 7:00 PM is listed as 19:00:00). In accordance with this convention the user must enter the time by using the same format. The date is always listed in MM-DD-YY format as shown in the following.

Clock Command

To change the date or time, position the highlight in one of the numeric fields. Press the *Enter* key. Enter a valid one- or two-digit number (leading zeros are not required). Press the *Enter* key to accept the new value. Adjust the other fields as required. The day of week is automatically calculated by the CWR-72B based upon the day, month and year selected by the user.

Press the *Esc* key after the changes have been made. The following message will be displayed.

To complete the command, select the desired option and then press the *Enter* key.

The clock of the CWR-72B can be precisely synchronized by a VPN or LAN accessible time server. The Clock Sync Mode must be set to SNTP. The recorder supports SNTP-Unicast and SNTP-Multicast time syncing. Refer to the section entitled "CSMode" on page 77. If the clock cannot be synchronized MICRO-AIDE recommends that the clock be manually set once per month.

Tɪᴍ Zᴏɴᴇ

The TimZone command is used to assign the Time Zone and control the Daylight Saving Time (DST) setting. A message similar to the following will be displayed after selecting the TimZone command.

```
TimZone:PST (UTC-8)
Daylight Saving Time
Enabled
```

Time Zone Command

The highlight will initially be placed in the TimZone field (e.g., PST (UTC-8) in the example cited previously). To select a new Time Zone setting press the *Enter* key repeatedly until the correct setting is displayed. There are seven Time Zone settings. They are listed in Table 2 on page 20.

To enable or disable the automatic adjustment for DST, position the highlight in the third row. Press the *Enter* key to change the current setting.

Press the *Esc* key to accept the current settings and complete the command.

CSMODE

Four different methods can be used to control the recorder's real-time clock. The Clock Sync Mode command allows the user to select manual, SNTP or GPS methods. The following message will be displayed after selecting the CSMode command.

```
CLock Sync Mode:
None
SNTP
GPS
```

Clock Sync Mode Command

Listed in the following are usage instructions regarding the four options.

NONE

The recorder's clock is not synchronized. MICRO-AIDE recommends that the clock be manually set once per month. The clock can be expected to drift approximately ±8 seconds per month.

SNTP

SNTP-Unicast – The Clock Sync Mode must be set to SNTP. A time server on the network must be accessible to the recorder via one of its Ethernet Ports. The time server must be enabled for SNTP-Unicast operation. The SNTP Server parameter must be set to the IP address of the time server. The SNTP Server IP address is assigned by the System Parameters command. Refer to the section entitled "SNTP Server" on page 28 for additional details.

SNTP-Multicast – The Clock Sync Mode must be set to SNTP. A time server on the network must be accessible to the recorder via one of its Ethernet Ports. The time server must be enabled for SNTP-Multicast operation. The SNTP Server parameter must be set to 0.0.0.0. The SNTP Server IP address is assigned by the System Parameters command. Refer to the section entitled "SNTP Server" on page 28 for additional details.

> ⓘ Setting the SNTP Server IP address to 0.0.0.0 automatically disables Unicast operation in favor of Multicast. Conversely, a non-zero IP address disables Multicast operation in favor of Unicast. However, for proper operation all of the other conditions described previously must be met.

GPS

The optional GPS Receiver must be installed and it must acquire a valid GPS signal. Provided these conditions are met, the GPS signal becomes the synchronizing source. Once an hour the clock is synchronized.

DTIMES

The Detect Time feature of the CWR-72B is used to prevent relay contact bounce from logging false Event Records. The Detect Time can be set to any value in the range from .00 to 327.67 seconds. A value of zero prevents the input from detecting events. The DTimes command is used to establish a unique

Detect Time for each Digital Input. The command is also used to enable an input as a Flashing Input. Refer to the section entitled "Detect Times / Flash Enable" on page 32.

Data similar to the following will be displayed after selecting the DTimes command.

```
Inp DetTime Flashing
D01    0.30    No
D02    0.30    No
D03    0.30    No
```

Detect Time Command

The factory default settings are displayed in the sample data cited previously. The Digital Input Number is listed at the start of each line. Press the up or down arrow keys repeatedly to select a different input. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input. To change the Detect Time for the selected input, press the *Enter* key while the existing value is highlighted. A blank field with a cursor in the left-most position will be displayed. Enter a value by pressing the appropriate number keys. Use the decimal point (labeled "Save / .") to enter a fractional value. Leading zeros are not required. Press the *Enter* key to accept the new value.

To set an input as a Flashing Input position the highlight in the Flashing field. Press the *Enter* key to change the existing setting. Yes enables the input as flashing. No disables the input.

After all of the new settings have been assigned press the *Esc* key to complete the command.

GDTɪᴍᴇ

Use the Global Detect Time command to assign a common Detect Time value to all Digital Inputs. Data similar to the following will be displayed after selecting the GDTime command.

```
        GLOBAL
Detect Time:    0.00
```

Global Detect Time Command

To change the Detect Time for all inputs, press the *Enter* key. A blank field with a cursor in the left-most position will be displayed. Enter a value by pressing the appropriate number keys. Use the decimal point (labeled "Save / .") to enter a fractional value. Leading zeros are not required. Press the *Enter* key to accept the new value. Press the *Esc* key to complete the command.

ⓘ The Detect Time of Digital Inputs assigned as sensors for the Train Speed Monitor feature cannot be altered by the DTimes or GDTime commands.

UNᴀᴍᴇ

The UName command can be used to assign a unique name to each CWR-72B. The first twenty characters of the Unit Name must be assigned in accordance with various rules. These are described in the section entitled "Unit Name" on page 19. A message similar to the following will be displayed after selecting the UName command.

```
Unit name:
***** NOT SET *****
```

Unit Name Command

The first twenty characters of the existing Unit Name are displayed in the second line of text. The factory default setting is displayed in the sample data cited previously. To change the name, press the *Enter* key. Assign a new name or modify the existing name by using the "Alphanumeric Editing Procedure" on page 75. Press the *Esc* key to complete the command.

(i) Due to restrictions in the size of the OLED display panel, the UName command can be used to assign a Unit Name limited in length to twenty characters. Lengthier Unit Names (up to eighty characters) must be assigned by using the System Parameters command.

ENAMES

Event Names are created by the user to uniquely identify Event Records. By way of example, the state of an input can be labeled as "FXR_Up" or "FXR_Down" or "POR_Up" or "POR_Down". Event Names add clarity to Event Records that would otherwise not be possible if input states were only labeled as "On" or "Off". Event Names are always assigned in pairs to identify the active and inactive state of an input. As many as twenty Event Name pairs can be assigned. Refer to the section entitled "Event Names" on page 31 for additional details.

Data similar to the following will be displayed after selecting the ENames command.

```
Event ON        OFF
01 On           Off
02 XR_Up        XR_Down
03 FXR_Up       FXR_Down
```
Event Names Command

Three Event Name pairs are displayed at one time. The number (i.e., 1 to 20) of the pair is listed at the start of each row. It is followed by the currently assigned active or On Event Name (e.g., XR_Up) and the existing inactive or Off Event Name (e.g., XR_Down). To create a new name or modify an existing name, select the Event Name pair by pressing the up or down arrow keys to advance through the list of twenty pairs. Use the left and right arrow keys to select either the on or off field. Press the *Enter* key. A blank field with a cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 75 to create a new name. Use the same procedure to modify additional names.

After all of the Event Name pairs are defined press the *Esc* key to complete the command.

INAMES

The INames command is a multi-purpose command that allows the user to assign Input Identifiers, Input Names and Event Name pairs to each input of the recorder. Input Identifiers and Input Names allow the user to interpret Event Records more precisely by referring to inputs with labels that are unambiguous (e.g., Power_Off_Relay vs. Digital Input 10). Refer to the section entitled "Input Names/Identifiers" on page 30 for additional details.

Data similar to the following will be displayed after selecting the INames command.

```
D01      ID: XR
Crossing_Relay
Event ON/OFF pair:
02 XR_Up      XR_Down
```
Input Names Command

The Input Number is always displayed in the upper left-most corner. To select a different input, press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Press the *Alpha* key repeatedly until the desired input type is displayed (i.e., D, A, V or T). Enter an Input Number by pressing the appropriate number keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input.

The field labeled "ID" will initially be highlighted. Move the highlight to the second row to select the Input Name. Press the *Enter* key to modify the highlighted assignment. A blank field with a cursor in the left-most position will be displayed. Use the "Alphanumeric Editing Procedure" on page 75 to create a new Input Identifier or Input Name.

To assign an Event Name pair to a specific Input Number move, the highlight to the fourth row. Press the *Enter* key repeatedly until the desired Event Name pair (i.e., 1 to 20) is displayed. Each time the *Enter*

key is pressed the fourth line of text will be automatically updated to reflect the contents of the selected Event Name pair. Pressing the *Enter* key while pair number twenty is displayed will return the user to pair number one. After all of the names and pairs are assigned press the *Esc* key to complete the command.

In the following example the Input Name and Identifier have been assigned as AC_Power and POK, respectively. Event Name pair number 01 states that an Event Name of Pwr_On will indicate an On Event. An Event Name of Pwr_Off will indicate an Off Event.

Input Name Command - Example

Aɴᴀʟᴏɢ

The Analog command is used to configure the eight Analog Inputs of the CWR-72B. Each Analog Input can be used to monitor AC or DC voltages. Like a DVM, the CWR-72B can report its measurements using several different scales and resolutions. Analog Inputs that vary beyond an acceptable range of operation can be reported by setting appropriate Limit Values. Refer to the section entitled "High and Low Limits" on page 35 for additional details.

Data similar to the following will be displayed after selecting the Analog command.

Analog Command

The Analog Input Number is displayed in the upper left-hand corner. To select a different Analog Input press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input. The first row also indicates the Range setting. The Filter setting and High and Low Limit Values are listed in the remaining rows.

To change the Range setting, highlight the existing setting and press the *Enter* key until the desired Range is displayed. The sequence of possible Range settings is ±25.5 Vdc, +51.1 Vdc, ±255 Vdc, 25.5 Vac and 255 Vac.

The Filter setting controls the amount of smoothing the measured signal is subjected to. AC signals require the Slow setting to remove their ripple content. DC signals can generally use either the Slow or Fast setting. To toggle the existing setting simply press the *Enter* key.

All AC voltage measurements are reported in RMS units.

The Limit Values can be set separately. They cannot exceed the bounds of the Range setting. To change an existing setting highlight the value and press *Enter*. Use the number keys to enter the new value. Enter fractional and negative values by using the decimal and minus keys, respectively.

After the new settings have been assigned press the *Esc* key to complete the command.

Vɪʀᴛᴜᴀʟ

Virtual Inputs allow the CWR-72B to identify and report a variety of signal conditions that may be of interest to the user. Generally, these conditions will refer to possible anomalies in the state of several relay circuits. High or low analog levels may also be of special concern to the user. The eight Virtual Inputs of the CWR-72B are configured by use of the Virtual command. Refer to the section entitled "Virtual Inputs" on page 36 for additional information.

Data similar to the following will be displayed after selecting the Virtual command.

```
V01 (SETUP=function)
Uses: ---  ---  ---  ---
Relays:  1=No  2=No
```

Virtual Command

In the sample data cited previously, Virtual Input Number 1 is assigned its factory default settings. The Virtual Input Number is displayed in the upper left-most corner. To select a different Virtual Input press the up or down arrow keys repeatedly. Alternatively, press the *Browse* key to jump to a different input. Specify the Input Number by pressing the appropriate numeric keys. Leading zeros are not required. Press the *Enter* key to jump directly to the selected input.

The second line of text includes four place holders for variables. Variables are Digital, Analog, other Virtual or Timer Inputs. The procedure for assigning variables is described in the following section.

Each Virtual Input can selectively operate the Relay Outputs of the CWR-72B. Press the *Enter* key to toggle the existing relay setting from No to Yes or vice versa.

ASSIGNING THE VARIABLES

A variable can be any valid Digital, Analog, other Virtual or Timer Input. To assign variables complete the steps listed in the following.

1. Press the left and right arrow keys to locate the highlight in a place holder field.

2. Press the *Enter* key.

3. Press the *Alpha* key until the desired input type designator appears (i.e., D, A, V or T).

4. Enter the desired Input Number by pressing the appropriate number keys.

5. Accept the new entry by pressing the *Enter* key.

6. Repeat the preceding steps if additional variables are required.

To complete the definition of a Virtual Input, the state of each variable must now be assigned. This Virtual Input property is referred to as its function.

DEFINING THE FUNCTION

A Virtual Input can be thought of as a logical relationship shared by one to four inputs. Accordingly, the state a Virtual Input assumes is dependent upon the state of each assigned variable. It follows that a Virtual Input dependent upon one variable is defined by a combination of two states. Two variables yield a combination of four states. Three variables yield eight states. Four variables yield sixteen states. Selecting states involves the assignment of a Virtual Input state for each combination of variable states.

Press the *Setup* key after all of the variables have been assigned. Data similar to the following will be displayed.

```
Virtual Output Funct
-----Inputs----- V01
D01 A01 V32 ---
Off Off Off     Off
```

Virtual Command - Assigning States

For the sample data cited previously, three of four possible variables have been assigned to Virtual Input 1. The third line of text lists the assigned variables by Input Number. The fourth line of text lists a specific combination of states for the assigned variables. The right-most field indicates the state the Virtual Input assumes for the combination of variable states listed.

Variables (i.e., Digital, Analog, other Virtual and Timer Inputs) always assume either of two states. Each state is described in the following.

On–The Digital Input voltage is in the range from 9 to 36Vdc. The Analog Input level is outside the acceptable range as defined by the region between the Limit Values. Refer to Figure 6 on page 36. The Timer Input has measured a delay that is less than its assigned Low Limit Value or greater than its assigned High Limit Value. The state of the Alarm Input is Set. The Virtual Input evaluates to a true logic state.

Off–The Digital Input voltage is less than 1Vdc. The Analog Input level is within the acceptable range as defined by the region between the Limit Values. The Timer Input has measured a delay that is within the range of its assigned Limit Values. The state of the Alarm Input is Clear. The Virtual Input evaluates to a false logic state.

The Virtual Input will assume the state defined by the setting in the lower right-hand corner. The label "Off" is used to identify the Off state. The label "On" is used to identify the On state. Press the *Enter* key to toggle the state of the Virtual Input from Off to On or vice versa. This setting will apply only to the combination of variable states displayed in the fourth line. Press the down arrow key to define the Virtual Input state for the next combination of variables.

Listed in the following are the four variable state combinations associated with the Virtual Input described previously. Each combination can be selected in the sequence listed by pressing the up or down arrow keys.

```
D01 A01 V32 --- V03
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      Off
```

In the sample data cited previously, the state of the Virtual Input is set in all cases to its initial value of Off. Change the state of the Virtual Input as required by the remaining variable states. Press the *Esc* key to accept the new settings and complete the command.

TIMER

The CWR-72B is equipped with 32 general purpose Timer Inputs. Refer to the section entitled "Timer Inputs" on page 38 for additional information. To configure a Timer Input via the front panel, select the Timer command. Data similar to the following will be displayed.

```
T01 Frm:---   Evt:Off
    To:---    Evt:Off
  LowLim:   0.0
 HighLim:   0.0
```

Timer Command

The presently selected Timer Input is always displayed in the upper-left corner (e.g., T01). To change the input press the up or down arrow keys repeatedly. Alternatively, jump to a specific input by pressing the *Browse* key and then the appropriate number keys. Complete the entry by pressing the *Enter* key.

To select the From and To Inputs, move the highlight to the appropriate field and press the *Enter* key. Press the *Alpha* key repeatedly until the desired input type designator appears (i.e., D, A or V). Press the appropriate number keys. Complete the entry by pressing the *Enter* key.

Select the desired event setting by moving the highlight to the correct field and then pressing the *Enter* key. The current setting will be toggled between On and Off. Assign the High and Low Limit Values by locating the highlight as needed and pressing the *Enter* key. Press the appropriate number and/or decimal keys to assign a value. Complete the entry by pressing the *Enter* key.

The Limit Values can be assigned in the range from 0.0 to 999.9 seconds.

Select another Timer Input and repeat the preceding steps as necessary. After all of the required Timer Inputs are configured terminate the command by pressing the *Esc* key.

TLIMIT

The TLimit command allows the user to assign a High and Low Limit against which the internal temperature of the recorder is compared. If the temperature is found to be outside the acceptable limits of operation, a System Event Record will be logged to memory. A second record will be logged when the temperature recovers to a normal level.

Data similar to the following will be displayed after selecting the TLimits command.

Temperature Limits Command

The factory default Limit Values are listed in the sample data. To change a Limit Value, move the highlight to the appropriate field and press the *Enter* key. Enter a number using the number keys. Negative values can be entered. Limit Values can range from -67 °F to 257 °F. Accept the new value by pressing the *Enter* key.

The internal temperature and Limit Values are reported in degrees Fahrenheit.

PCODE

The Passcode feature prevents unauthorized users from altering the Setup Database via the front panel. Passcodes can contain any combination of numeric values not exceeding eight total. A message similar to the following will be displayed after selecting the PCode command.

Passcode Command

In the sample data cited previously the Passcode is set to its factory default value. To change the Passcode press the *Enter* key. A blank field with the cursor in the left-most position will be displayed. Assign a new Passcode by pressing the appropriate number keys. To assign a null Passcode press the *Enter* key instead. This will effectively disable the Passcode protection feature. Access to the recorder will be permitted by simply pressing the *Enter* key when the request for Passcode message is displayed.

Accept the new Passcode by pressing *Enter*. Press the *Esc* key to complete the command.

If the user forgets the assigned Passcode the System Parameters command should be executed. Provided the user has administrative access to the recorder, the current Passcode assignment will be displayed. Refer to the section entitled "Passcode" on page 26.

SPEED

The Speed command is used to configure the four Train Speed Monitors. Once parameters that comprise the feature are set the recorder will report train speeds and instances of excessive speed. Refer to the section entitled "Measure Speed" on page 39 for additional information regarding these parameters. Train speeds are reported via System Event Records that are logged to memory.

Data similar to the following will be displayed after selecting the Speed command.

```
01:  Sensor1:    ---
      Sensor2:    ---
Distance:     0 feet
Threshold:    0 MPH
```
Speed Command

There are four distinct parameters that must be assigned per monitor. The selected monitor (1 through 4) is always displayed in the upper-left corner. To change the selected monitor, press the up or down arrow keys repeatedly. Alternatively, jump to a specific input by pressing the *Browse* key and then the appropriate number keys. Complete the entry by pressing the *Enter* key.

Both sensors must be assigned a valid Digital Input Number. To assign a Digital Input, highlight the appropriate field. Press the *Enter* key followed by the *Alpha* key. Enter a numeric value from 1 to 32/64. Leading zeros are not required. Complete the input assignment by pressing the *Enter* key.

The separation between the two sensors is used to set the Distance parameter. It can be set to any value in the range from 50' to 5280'.

Trains with monitored speeds in excess of the Speed Limit Value will be identified by a unique Event Record. The Speed Limit Value (labeled "Threshold") must be in the range from 5 to 180 mph. Setting either the Distance or Speed Limit parameters to zero will disable the selected Train Speed Monitor. Complete the command by pressing the *Esc* key.

DIAG

The Diag command can be used to test seven important recorder functions. Included are tests of the Ethernet Ports, keypad, GPS Receiver and Alarm Message delivery service. Each test can be performed at any time and is completely non-destructive. The contents of the Setup Database and Event Record memories will remain unmodified.

The following menu will be displayed after selecting the Diag command.

```
Select test:  LED
Keypad       Relay
GPS Rcvr     HealthChk
Temperature  Pins
```
Diagnostics Command

The highlight will initially be positioned over the LED menu item. To select a different test, position the highlight in the desired field. Press the *Enter* key to perform the test. Each test is described in the sections that follow.

LED TEST

The LED test will illuminate the four front panel LEDs. After five seconds each LED will automatically resume its previous on, off or flashing state. The following message will then be displayed.

```
LED test finished

Hit any key...
```
LED Test

Press any key to return to the Diagnostics command menu.

KEYPAD TEST

The following message will be displayed after selecting the Keypad test.

```
Press keys to test
Pause to stop test
```

Keypad Test

Each key press will display a character unique to that key. To terminate the test, refrain from pressing a key for a few seconds. The following message will be displayed. After the pause press any key to return to the Diagnostics command menu.

```
Press keys to test
Keypad test stopped

Hit any key...
```

RELAY TEST

The following message will be displayed after the Relay test is selected.

```
Relay 1: 1=ON, 2=OFF
Relay 2: 4=ON, 5=OFF
Press ESC to exit
```

Relay Test

Press the *1* or *4* key to energize the selected Relay Output. Press the *2* or *5* key to un-energize the selected relay. The selected relay and any circuitry attached to the relay contacts will be tested. Press the *Esc* key to complete the test. Each Relay Output will immediately reassume its previous state when the *Esc* key is pressed. Press any key to terminate the test and return to the Diagnostics command menu.

GPS RCVR TEST

The GPS Rcvr test will check for the presence and operability of the optional GPS Receiver. A typical test result is displayed in the following.

```
GPS Rcvr Test: Okay
21:17:57.093 Valid
34.1044,-117.8784
Hit any key...
```

GPS Receiver Test

At the end of the first line either Okay or NONE will be reported. Okay indicates that the GPS Receiver is installed and the microprocessor is communicating with the receiver. NONE indicates that the receiver is either not installed or has experienced a severe failure.

At the end of the second line either Valid or Invalid will be reported. Valid indicates that the GPS Receiver has achieved a signal lock with at least one satellite and that an accurate UTC-0 time is being reported. Invalid indicates that a satellite lock has not been achieved.

The third line will list the latitude and longitude coordinates if they are available. In order to report latitude and longitude the GPS Receiver must achieve a signal lock with a minimum of four satellites. Depending upon the location of the GPS antenna this may not be possible. In such cases coordinates of 0.0000,0.0000 will be listed.

Irrespective of the reported latitude and longitude coordinates, if the test reports Valid the GPS Receiver option is reporting accurate date and time data.

HEALTHCHK TEST

The Health test allows the user to check if the recorder can deliver messages to the message processing server. The following message indicates that a Health Check message was successfully sent.

```
Sending Healthcheck:
Success

Hit any key...
```
Health Check Test - Success

The following message will be displayed if the recorder is unable to connect to the message processing server. This result suggests a network problem is preventing access to the message processing server.

```
Sending Healthcheck:
Can't connect

Hit any key...
```
Health Check Test - Can't connect

The following message indicates that the Health Check message was sent, but the message processing server failed to reply.

```
Sending Health Check
No reply

Hit any key...
```
Health Check Test - No reply

ⓘ The transmission of Health Check messages is not affected by the state of Maintainer Mode.

Tᴇᴍᴘᴇʀᴀᴛᴜʀᴇ Tᴇꜱᴛ

The Temperature test reports the temperature inside the recorder. A typical response follows.

```
Temp  88 Degrees F


Hit any key...
```
Temperature Test

The temperature is always reported in degrees Fahrenheit.

⚠ The temperature reading should never exceed 180°F. The temperature inside the CWR-72B will generally be about 5°F to 10°F warmer than the surrounding ambient temperature.

Pɪɴɢ Tᴇꜱᴛ

The following message will be displayed after selecting the Ping command.

```
Ping Test
IP:

      Go
```
Ping Test

🔧 The Ping test can be used to verify access to any device on the network. These include the message processing server and SNTP time server. A successful test verifies that various IP, subnet mask and gateway addresses have been properly assigned.

The highlight will be positioned on the current IP address to ping. The address may be blank or contain a value. To alter the address press the *Enter* key. Use the numbered keys and key labeled "Save / ." to enter a different IP address (e.g., 192.168.1.99). Leading zeros are not required. Press the *Enter* key to save the address. Move the highlight to the Go option and press the *Enter* key once again.

If the Ping test succeeds a message similar to the following will be displayed.

```
Ping Test
IP:   192.168.1.99
      Go
Pinging...Success
```

Ping Test - Success

A message similar to the following will be displayed if the Ping test fails.

```
Ping Test
IP:   192.168.1.100
      Go
Pinging...Fail
```

Ping Test - Failure

Press the *Esc* key to terminate the test. Press the *ESC* key again to return to the Diagnostics command menu.

(i) The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

NETWORK

The Network command allows the user to assign all of the network-related settings used by the recorder. Refer to the section entitled "Network" on page 41 for additional details. Data similar to the following will be displayed after selecting the Network command.

```
Network Settings
IP   192.168.1.123
Mask 255.255.255.0
Gate 192.168.1.200
```

Network Command - Menu 1

Additional network settings are accessed by pressing the up and down arrow keys. The additional settings are depicted in the following sample displays. A total of nine settings can be viewed or altered.

```
Network Settings
Ether Port2 Enabled
IP2  217.047.240.123
Msk2 255.255.128.0
```

Network Command - Menu 2

```
Network Settings
Gat2 217.047.200.0
DNS1 103.155.201.59
DNS2 217.131.101.142
```

Network Command - Menu 3

⚠ Before changing any network settings the reader is advised to consult with the I.T. group responsible for the network. It is likely that they have defined various properties for the network. To avoid access problems, the Ethernet Port settings must not be in conflict with those properties.

For the most part the Network settings take the form of an IPV4 address. These settings can be altered by locating the highlight on the item of interest and then pressing the *Enter* key. Use the numbered keys and the key labeled "Save/." to enter a new setting. Leading zeros are not required. To save the new setting press the *Enter* key again. Once all of the settings are properly assigned press the *Esc* key to exit the command.

In the following section each of the Network settings is described. The abbreviated labels that are listed are the same as they appear in the Network command menu.

IP The IPV4 address assigned to Ethernet Port 1.

Mask The subnet mask used by Ethernet Port 1.

Gate The gateway address used by Ethernet Port 1.

Ether Port2 Press the *Enter* key to enable or disable Ethernet Port 2.

IP2 The IPV4 address assigned to Ethernet Port 2.

Msk2 The subnet mask used by Ethernet Port 2.

Gat2 The gateway address used by Ethernet Port 2.

DNS1 The IPV4 address of the primary Domain Name Server.

DNS2 The IPV4 address of the secondary Domain Name Server.

Uᴘᴅᴀᴛᴇ

The USB Host Port can be used to save a copy of selected Event Records in an easy to read text format. Refer to the section entitled "Saving Records to a Flash Drive" on page 66. The port can also be used to update the Setup Database and software used by the CWR-72B. Both procedures are described in the following sections.

Sᴇᴛᴜᴘ Dᴀᴛᴀʙᴀsᴇ

Before the current Setup Database can be updated a valid database file must be saved to the USB flash drive. MICRO-AIDE recommends that the file be named setup.txt. The file must have a file extension of .txt and it must be saved to the folder named for the targeted recorder.

The USB Host Port cannot be used with NTFS formatted flash drives.

To update the Setup Database follow the steps listed in the following.

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

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

3. Select the Update command. The following message will be displayed.

```
Item to Update
Setup Data
Software
```

Update Command

4. Select the Setup Data option to proceed. The following message will be displayed.

```
Insert flash drive
with setup file and
select OK
CANCEL     OK
```

5. Select the OK option to proceed. The display will indicate that the new Setup Database file is being transferred. A single-line progress bar is used to indicate transfer activity. After a few seconds the transfer will automatically terminate and the following message will be displayed.

5

```
setup updated
Remove USB drive now
Press any key...
```
Successful Update

6. Press the *Esc* key to complete the transfer. The recorder will immediately operate in accordance with the new Setup Database.

SOFTWARE

MICRO-AIDE will periodically make available to its customers new software that either expands or improves upon the capabilities of its products. The new software will be available for downloading from our website. Visit: www.micro-aide.com/support/downloads.html.

Once the appropriate software file is downloaded, it should be saved to the root of the flash drive. It can then be used to update the recorder's software. The correct file will include an extension of .tar.gz.

The USB Host Port cannot be used with NTFS formatted flash drives.

The USB Host Port operates in strict accordance with various Microsoft standards that apply to filenames and folders. Accordingly, the software filename must not be altered to include several illegal characters. Additionally, the file extension of .tar.gz must not be altered. All files downloaded from the MICRO-AIDE website are guaranteed to be compliant with applicable Microsoft and USB Host Port standards.

Occasionally a new software 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 1 on page 5. It should always be reviewed before proceeding with an update.

To update the software perform the steps listed in the following.

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

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

3. Select the Update command. The following message will be displayed.

```
Item to Update
Setup Data
Software
```
Update Command

4. Select the Software option to proceed. The following message will be displayed.

```
Update Software
From USB Flash Drive
Yes   No
```

5. Select the Yes option to proceed. The following message will be displayed.

```
Insert flash drive
with tar.gz file and
select OK
CANCEL    OK
```

6. Select the OK option to proceed. Information similar to the following will be displayed.

```
Select .tar.gz file:
cwr-72b_v105.tar.gz
CWR-24A V109.hex
CWR-72A V107.hex
```

File Selection

7. The Update command allows the user to select a file from a list of 99. The first group of three are de-picted in the example. To navigate to another group, press the up or down arrow keys.

8. Once the correct file is highlighted, select it by pressing the *Enter* key. The following message will be displayed for several seconds.

```
Installing Software
```

Installing Update

9. At the conclusion of the update, the recorder will automatically reboot. The display will assume its Idle Mode of operation.

10. Remove the flash drive. No further user intervention is required.

RESET

The Reset command should be used with caution. It allows the user to selectively restore the entire Setup Database to its factory default values or to clear the Event Record memory. Refer to the section entitled "Reset System" on page 23 for additional information.

The following message will be displayed after the Reset command is selected.

```
Select Item to Erase

Set Factory Defaults
Erase Event Memory
```

Reset Command

To restore the entire Setup Database to its default settings, highlight the Set Factory Defaults field and press the *Enter* key. Select Yes to perform the reset or No to ignore the reset.

To completely erase all of the Event Records from the event memory, highlight the Erase Event Memory field and press *Enter*. Select Yes to perform the reset or No to ignore the reset.

Resetting the Setup Database will significantly alter the operation of the recorder. All Event Record data will be permanently lost if the Event Record memory is erased. **Proceed with extreme caution!**

This concludes the chapter on how to operate the recorder from the front panel. Since the setup of the recorder is critical to how the CWR-72B will perform, it is advisable to review any changes that may have been made to the Setup Database.

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

CHAPTER 6 – MAINTENANCE

INTRODUCTION

The primary purpose of this chapter is to describe the recommended trouble-shooting methods to be used with the CWR-72B. It should be referred to if ever a questionable symptom arises during the operation of the recorder.

The CWR-72B 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

At the direction of MICRO-AIDE technicians, the user may have occasion to work inside the unit to replace a failed item. Observe the steps listed in the following before attempting any task that involves opening the unit. Refer to and . They illustrate the front and top sides of the recorder, respectively.

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 backboard or equipment rack.

4. Remove the four 6-32 1/4" screws from the top and bottom sides of the front assembly. The front and back portions of the 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 FUSES

There are three fuses mounted on the Processor PCB. The fuses are designed to protect the input power source and the contacts of the Relay Outputs. Each are rated at 1 A and conform to the 2AG size standard. Before replacing a fuse the cause of the blown fuse should be ascertained and cleared if possible. The fuses are illustrated in .

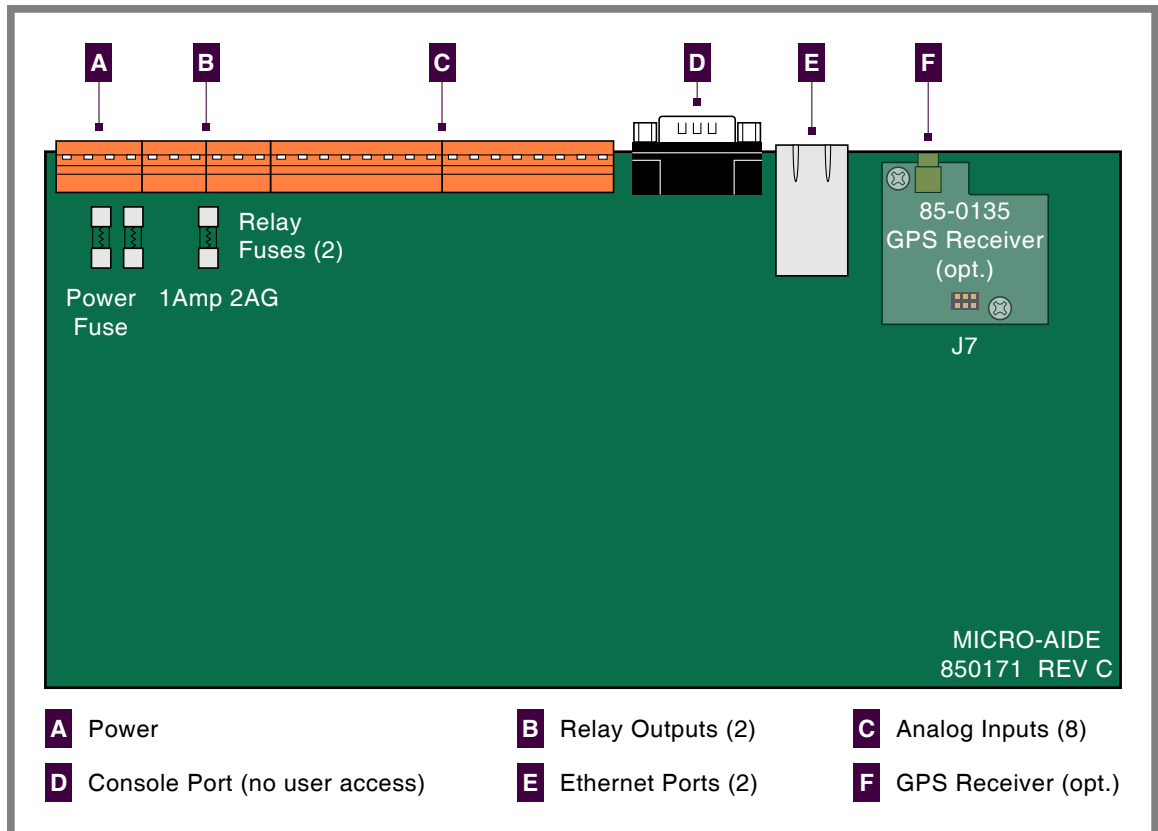| A | Power | B | Relay Outputs (2) | C | Analog Inputs (8) |
| D | Console Port (no user access) | E | Ethernet Ports (2) | F | GPS Receiver (opt.) |

Figure 9: Processor PCB

Installing the Optional GPS Receiver

The CWR-72B can be equipped with a GPS Receiver that is used to provide a 100% accurate, drift-free clock. Once installed and enabled the operation of the receiver is completely automatic. The GPS Receiver option is comprised of a small L-shaped PCB, plastic grommet and antenna (85-0135 option) or antenna cable assembly (85-0175 option).

Generally, the GPS Receiver is ordered at the time the recorder is purchased and is pre-installed at the factory. However, if the receiver was not previously ordered, it can be installed by the user. To install the receiver follow the steps listed in the following. The GPS Receiver PCB is illustrated in Figure 9 on page 92.

1. Completely remove the unit's front panel assembly in accordance with the procedure entitled "Working Inside the Recorder" on page 91.

2. The hole in the unit's top panel labeled "GPS Antenna" is capped with a plastic plug. Using a small screwdriver, carefully pry the plug off. Replace it with the grommet that was shipped along with the GPS Receiver PCB. The new grommet includes a hole and serves as an insulator.

3. Locate the 6-pin female socket labeled "J7" near the top edge of the Processor PCB. The socket is illustrated in Figure 9 on page 92.

4. Carefully align the MCX connector with the top panel hole and the six pins on the GPS Receiver PCB with their socket counterparts. Press lightly on the edges of the PCB to insure it is seated properly and fully into the socket.

Do not, under any circumstances, press down on the center of the GPS Receiver PCB. Located in the center of the PCB is a metal encased component. The metal, if bent, can damage the electronic circuitry it protects. When installing the PCB snap it into place by pressing lightly and only along its edges.

5.   Secure the GPS Receiver PCB with the pair of 4-40 screws and split washers provided.

5. Reassemble the unit.

6. If the 85-0135 option was ordered, the GPS antenna will be included. The MICRO-AIDE provided GPS antenna is housed inside a watertight enclosure at the end of a 16' long coax cable. Snap the cable end into the mating MCX socket located at the unit's top panel. If the 85-0175 option was ordered, the GPS antenna will be provided by the user and in its place a 15' long coax cable assembly will be included. The MCX end of the cable assembly should be snapped into its mating socket located at the top panel of the recorder. The N-type connector end of the cable will attach directly to the user-provided antenna or to a high voltage arrester.

7. For improved reception it is best to locate the antenna outdoors and pointed skyward.

After power is reapplied to the unit and the software is initialized, the Clock Sync Mode must be set to GPS. Refer to the section entitled "Clock Sync Mode" on page 27.

DIAGNOSTIC TESTING

The Main Menu of commands for the CWR-72B includes the Diagnostics command. Refer to the sample data entitled "Main Menu" on page 17. The Diagnostics command can be used to quickly verify the operational integrity of several hardware elements of the recorder. Each of the five tests can be performed at any time. They are non-destructive and will not alter the contents of the Setup Database or Event Record memory.

The following menu of commands will be displayed in response to selecting the Diagnostics command.
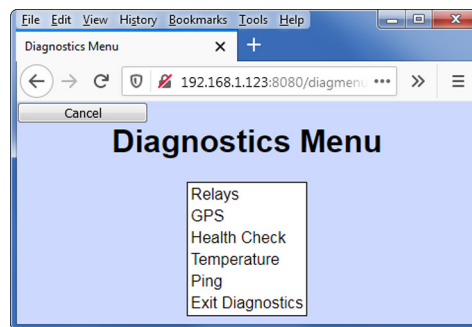

Diagnostics Command

Each command performs a specific test. The tests are described in the following sections.

RELAY TEST

The Relay Test allows the user to verify the operation of the Relay Outputs and any alarm or indication circuitry connected to the contacts of the relays.

The following message will be displayed in response to the Relays command. Press the appropriate numeric key to change the state of a Relay Output. To energize the relay select the Relay ON option. To un-energize the relay select the Relay OFF option.
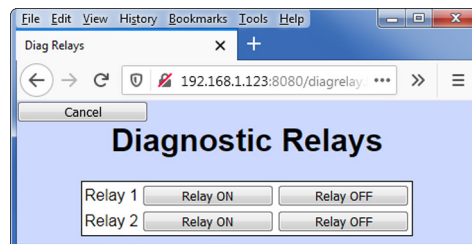

Relay Test

To terminate the test, click the button labeled "Cancel". The relays will automatically reassume their pre-test state.

GPS Rᴇᴄᴇɪᴠᴇʀ Tᴇsᴛ

The GPS Receiver Test will check for, and report, the presence and operability of the optional GPS Receiver. Several different messages will be displayed depending upon the state of the receiver.

Provided the GPS Receiver has achieved a signal lock with at least four satellites, valid UTC-0 time and latitude and longitude coordinates similar to the following will be reported.
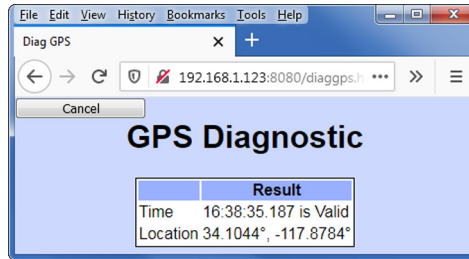
GPS Receiver Test - Valid

ⓘ A signal lock with one to three satellites allows the GPS Receiver to report a valid UTC-0 time. In such cases latitude and longitude coordinates of 0.0000° will be reported. Irrespective of the reported coordinates, if the reported time is labeled as "Valid" the GPS Receiver option is providing an accurate UTC-0 time. Under these conditions the recorder's clock is accurately synchronized.

ⓘ The Time Zone setting will automatically adjust the UTC-0 time so that accurate local time is used by the recorder.

The following screen shot will be displayed if the GPS Receiver is installed but has not as yet achieved, or is unable to achieve, a signal lock with any satellite.
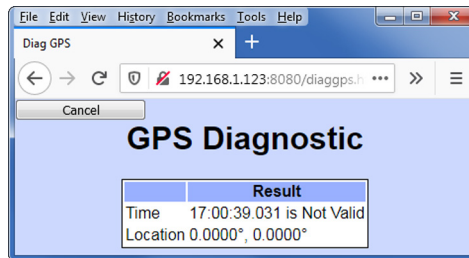
GPS Receiver Test - Not Valid

If the GPS Receiver has failed completely or is not installed, the following screen shot will be displayed.
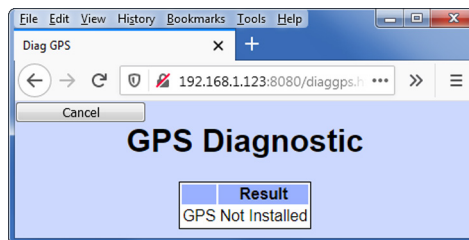

GPS Receiver Test - Not Installed

To terminate the test, click the button labeled "Cancel".
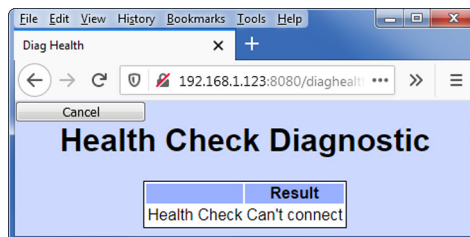
HEALTH CHECK TEST

The Health Check test allows the user to check if the recorder can deliver messages to the message processing server. Successful deliveries and failures are indicated by messages displayed in the following sections. Responses are reported shortly after the test is initiated.

The following screen shot depicts a Health Check Test that was successfully delivered to, and acknowledged by, the message processing server.
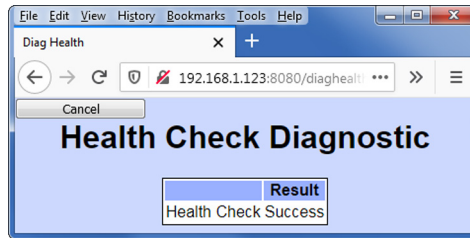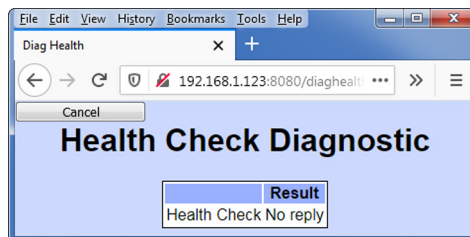

Health Check Test - Success

If the recorder is unable to connect to the message processing server the following screen shot will be displayed. This result suggests a network problem is preventing access to the message processing server.

Health Check Test - Can't connect

The following screen shot will be displayed if the message processing server fails to reply to the Health Check message.

Health Check Test - No reply

To terminate the test, click the button labeled "Cancel".

ⓘ The transmission of Health Check messages is not affected by the state of Maintainer Mode.

TEMPERATURE TEST

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.
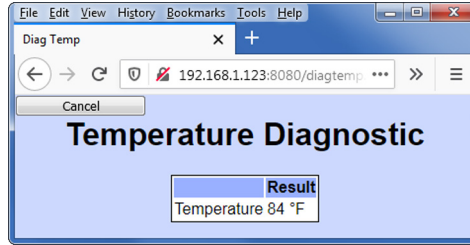
Temperature Test

⚠ The measured temperature inside the CWR-72B will generally be 5°F to 10°F warmer than the surrounding ambient temperature. Temperature readings should never exceed 180°F.
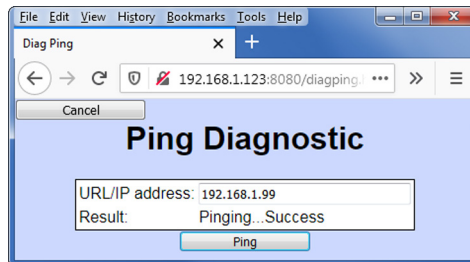
PING TEST

The Ping Test can be performed at any time. It is not affected by the state of Maintainer Mode. A screen shot similar to the following will be displayed after selected the Ping Test.
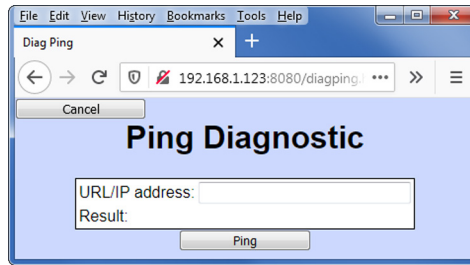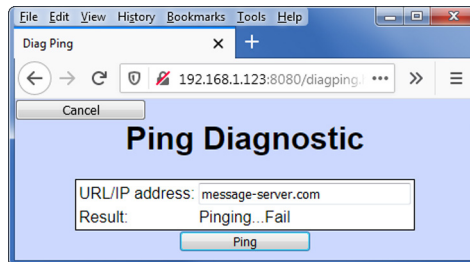

Ping Test

In the edit box labeled "URL/Ip address:" enter the address of the device to be pinged. The address can be a named URL (e.g., www.micro-aide.com) or an IPV4 value (e.g., 192.168.1.99). Click the button labeled "Ping" to initiate the test. The following screen shot depicts a successful test.

Ping Test-Success

If the Ping Test fails a screen shot similar to the following will be displayed.

Ping Test-Failure

To terminate the test, click the button labeled "Cancel".

The Ping test can be used to verify access to any device on the network. These include the message processing server and SNTP time server. A successful test verifies that various IP, subnet mask and gateway addresses have been properly assigned.

The user may wish to contact MICRO-AIDE customer service if a failure occurs as the result of any diagnostic testing. Instructions on how to proceed will be offered. The MICRO-AIDE "Material Return" and "Limited Warranty" policies are described on the inside back cover of this manual.

SYSTEM EVENTS

Event Records are normally created by a change in state of an input. Exceptions to this rule concern the cycling of power to the recorder, variations in the measured temperature and events related to the Train Speed Monitor feature. The latter feature is described in the section entitled "Measure Speed" on page 39.

Each time power to the CWR-72B is turned on or off an event will be logged into memory. If the temperature transitions into or out of the acceptable range of operation or the speed of a train is reported, an event will also be logged. Additionally, each time the SNTP Clock Sync feature sets the recorder's real-time clock an Event Record is logged. These events are classified as System Events. To distinguish them, the Input Number always includes an S-prefix (e.g., S1). Additionally, the Input Name, Identifier and Event Name fields within the record are uniquely labeled. They cannot be changed by the user. Table 9 on page 97 lists the various fields used by each System Event Record.

Input Number	Input Name	Identifier	Event Name Pair
S01	System Power	Power	ON / OFF
S02	High Temperature	HighTemp	ON / OFF
S03	Low Temperature	LowTemp	ON / OFF
S04	Sntp Clock Sync	SntpSync	OFF / OFF
S05	GPS 5 Sec Correction	GPS 5Sec	OFF / OFF
S06	GPS Clock Record	GPS Rec	OFF / OFF
S07	Maintainer Mode	Maint	ON / OFF
S08	Flash Rate Alarm	FlashAlm	ON / OFF
S09	Speed Monitor 1	SpeedLim	ON / OFF
S10	Speed Monitor 2	SpeedLim	ON / OFF
S11	Speed Monitor 3	SpeedLim	ON / OFF
S12	Speed Monitor 4	SpeedLim	ON / OFF

Table 9: System Event Records - Assigned Labels

System Events can be reviewed using any of the five formatting options. Record formats are described in the section entitled "Event Record Formatting" on page 61. Listed in the following are several sample Event Records as they would appear at the PC. In the interest of simplicity the No Details, single-line form is shown.

Sample System Event Records

The first two records indicate that power was off to the recorder for 24 seconds. A train speed violation of 23 mph occurred at 13:38:40.56. Later in the same hour the internal temperature of the recorder was found to be excessive for approximately three minutes. At 14:00:00.15 the GPS Receiver synchronized the recorder's clock. The clock was corrected by .01 seconds.

The GPS Clock Sync record listed previously is shown in the following as it would appear at the OLED display panel.

Sample System Event Record

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 SOFTWARE

Like any microprocessor-based product, the CWR-72B executes a stored memory program. The software program is saved in nonvolatile memory. The software can 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 CWR-72B. Consequently, there is no need to open the unit to gain access to the Processor PCB.

In this section the software update procedure assumes the user will perform the update by means of a PC connected to either of the Ethernet Ports. A software update can also be performed very easily by using the USB Host Port. The instructions for doing so are described in the section entitled "Update" on page 88.

Occasionally a new software 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 1 on page 5. It should always be reviewed before proceeding with an update.

Start the update procedure by launching a browser application, target the IP address of the recorder and perform a login. These steps are described in Chapter 2.

1. The Main Menu should be displayed. Refer to the sample data entitled "Main Menu" on page 17.

2. From the Main Menu select the Transfer Files command. The following sub-menu of commands will be displayed.
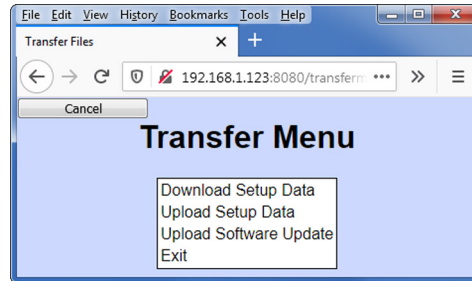
Transfer Files Command

3. Click the command labeled "Upload Software Update". The following screen shot will be displayed.
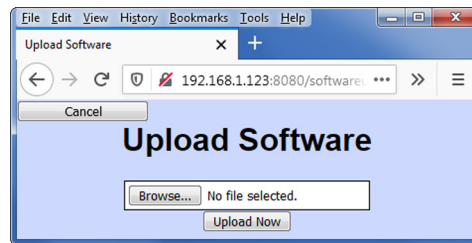
Upload Software Command

4. Click the button labeled "Browse...". A file selection dialog box similar to the following will be displayed.
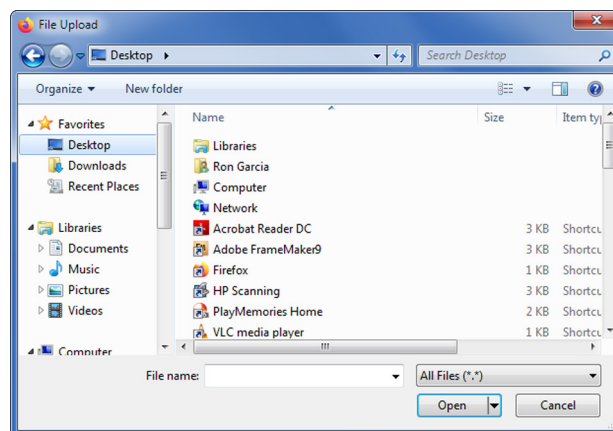
5. Navigate to the location of the saved software file. Select the file and then click the button labeled "Open".

6. The screen shot entitled "Upload Software Command" on page 99 will once again be displayed. Verify the edit box containing the button labeled "Browse..." now lists the correct software file.

⚠️ Software files for the CWR-72B must include a file extension named ".tar.gz" (e.g. cwr-72b_v105.tar.gz).

7. Click the button labeled "Update Now". The software used by the recorder will be immediately updated. The recorder will automatically perform a reboot and start executing the new program file.

After completing the software 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" on page 23.

TROUBLE-SHOOTING GUIDE

The following guide is provided to assist the user in resolving problems that may occur with the operation of the CWR-72B. 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.

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.	Front panel LED labeled "Power" should be either on or flashing. Clock on OLED display panel should be running. Verify 9 to 36 Vdc at B and N power terminals. Inspect fuse on Processor PCB.
Cannot login to recorder.	Verify Ethernet Port 1 is being used. If login screen is not being displayed the targeted IP address may not be correct. Factory default IP Address for Ethernet Port 1 is: **192.168.1.123:8080** (Firefox and Google Chrome), and **http//:192.168.1.123:8080** (for Microsoft IE or Edge). If Ethernet Port 2 is being used, verify Ethernet Port 2 is enabled. Refer to "Ethernet Port 2" on page 42. Verify recorder's Subnet and Gateway Addresses are properly assigned. Verify PC's IP address is on the same subnet as the recorder. Ping the recorder and check response.
Login screen appears, but access is denied.	Use factory default passwords of **PASSWORD** and **LOOKWORD** (case sensitive) Passwords may have been changed. Check with signal design staff for current passwords. Contact MICRO-AIDE for assistance.
SNTP fails to provide accurate clock control.	Verify time server supports SNTP-Unicast and SNTP Server address is valid. Refer to section entitled "SNTP Server" on page 28. Perform a ping from the recorder directed at the time server. Refer to section entitled "Ping Test" on page 96. If ping fails, check all Network assignments and IP address of the time server.

Table 10: Guide to Trouble-Shooting Techniques

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Symptom or Problem	Resolution
Real-time clock is incorrect by one or more hours even when SNTP clock syncing is functional.	Verify correct Daylight Saving Time and Time Zone settings.
Cannot save Event Record files to flash drive.	Verify the USB flash drive is formatted FAT-32, not NTFS. Verify flash drive is fully seated into USB Host Port. LED on flash drive should flash as files are being saved. Test integrity of flash drive by plugging it directly into a PC and copying files from the PC. Try another flash drive.
Unable to update firmware using USB Host Port.	Verify the USB flash drive is formatted FAT-32, not NTFS. Verify flash drive is fully seated into USB Host Port. Verify software file is located at root of drive, not in a sub-folder. Verify software filename ends in .tar.gz. Verify firmware filename does not include illegal characters. Verify length of firmware filename does not exceed 20 characters.
Initial Check-Out Procedure fails on all inputs.	Verify polarity of test voltage is applied correctly. Verify Detect Times are not set to zero or too long. Check inputs using View Events command.
Alarms and/or Event Records are not being created on some inputs.	Check wiring, especially polarity. Set Detect Time to shorter value. Verify Detect Times are not set to zero. Verify proper settings in Alarm Configuration Table. Reload Setup Database.
Flashing inputs create multiple Event Records.	Enable flashing status for inputs. Set Detect Time, in seconds, to value of 30÷fpm rate.
Analog Input AC source measures 0.	Analog Input is configured for DC, change to AC.
Analog Input DC source measures correctly but reports AC units.	Analog Input is configured for AC, change to DC.
Negative Analog Input voltage is not reported, measures 0.	Analog Input Range is set to +51.1 Vdc, change to ±25.5 Vdc or ±255 Vdc setting.
AC analog readings are not stable.	Reassign the analog Filter setting to Slow.
DC analog readings are not tracking voltage changes.	Reassign the analog Filter setting to Fast.
Timer Input is not reporting an Event Record.	Verify valid inputs are assigned in the From and To fields. Verify the assigned inputs are each generating state changes.
Relay Outputs will not operate.	Perform Relay Test command. Verify relay is enabled by Virtual Input. Disconnect the external circuit attached to the relay contacts, test again.

Table 10: Guide to Trouble-Shooting Techniques

6

Symptom or Problem	Resolution
Alarm and Health Check messages are not being sent successfully.	Check Network settings.
	Verify cell modem (if used) is using a correct template.
	Perform a ping from the recorder directed at the message processing server. Refer to section entitled "Ping Test" on page 96. If ping fails, check all Network assignments and IP address of the server.
	Check recorder's HTTP Server assignments. Refer to section entitled "HTTP Server" on page 45.

Table 10: Guide to Trouble-Shooting Techniques

This completes the User Manual for the CWR-40B and CWR-72B. As an aid to the user seven appendices have been provided. The first two appendices list detailed specifications of, and options applicable to, the CWR-40B and CWR-72B. The third appendix provides a functional description of a sample Alarm Configuration Table. The Alarm and Health Check Message content is fully described in Appendix D. The installation and use of MICRO-AIDE's RSA Validator software is the subject of Appendix E. Appendix F describes the Modbus implementation.

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.

6

SPECIFICATIONS

Physical
Size (without mounting brackets)
Length: 10.4″
Height: 7.6″
Depth: 3.4″
Weight
2.6 lb. / 2.9 lb.

Environmental
Storage
Temperature: -50 °C to 85 °C
Humidity: 0 to 95 %, non-condensing
Operating
Temperature: -40 °C to 72 °C
Humidity: 0 to 95 %, non-condensing

Mounting
Shelf or backboard, includes mounting brackets

Construction
Chassis
Fully enclosed, anodized aluminum
Externally accessible keypad, LEDs and connectors
Electrical
All components mounted on conformal coated, internal PCBs

Power
Voltage
Range: 9 to 36 Vdc
Consumption
Maximum: 3.1 W (with GPS option)

Isolation
Power
Minimum: 3800 Vdc from B and N terminals to chassis and inputs
Digital Inputs (32/64)
Minimum: 3800 Vdc to any terminal
Analog Inputs (8)
Minimum: 3800 Vdc to any terminal
Input to Adjacent Input
Digital: minimum 3800 Vdc
Analog: minimum 3200 Vdc
Ethernet Ports (2)
Minimum: 3800 Vdc to any terminal
USB Host Port
Minimum: 3800 Vdc to any terminal

Alarms
Quantity: 20 total, appropriate for crossing applications, user-assigned
Types: Set, Cleared and periodic Health Check

Alarms (continued)
Definitions
User-assigned inputs, input states and durations qualify each Alarm
Transmission
Sent to message processing server via Ethernet Port 1 or 2 as assigned
Operating Modes
Automatic: messages sent via VPN or LAN/WAN using DNS name resolution
Maintainer Mode: disables Alarm transmission while crossing is being tested or repaired
Validation Time
As defined by Alarm Configuration Table, 0 to 99,999 seconds

Capacities
Inputs
Digital: 32/64, all optically isolated
Analog: 8, voltage or current (optional)
Virtual: 32, user-assigned
Timer: 32, user-assigned
Alarm: 20 user-assigned
System: various for reporting power on/off, abnormal temp., clock sync, train speed, etc.
Outputs
Relays: 2, form C, rated for 2 A at 24 Vdc or 1 A at 125 Vac, maximum switching capacity of 125 VA or 60 W, service life 1 million electrical (typical)
Event Storage
Standard: 261,632 records
Maximum: 3,055,104 records
OLED Panel
Characters: 80 total on 4 lines
Viewing Area: 2.8″ by .8″
Front Panel Keypad
Quantity: 20 keys

Physical Inputs
Input Impedance
Digital: minimum 10 KOhms, optically isolated
Analog: minimum 10 MOhms
Range
Digital Input - On: 9 to 36 Vdc
Digital Input - Off: 0 to 1 Vdc
Analog DC Voltage: 3 scales, ±25.5 Vdc, +51.1 Vdc, ±255 Vdc
Analog AC Voltage: 2 scales, 25.5 Vac, 255 Vac
Analog Current: 2 scales, ±25.5 Adc, 25.5 Aac
Event Validation Times
Digital: .01 to 327.67 seconds, compatible with fixed rate flashing circuits
Analog: fast and slow filter settings

Analog Limit Values
Voltage
High and Low Limits: in multiples of .1 V or 1 V
Current
High and Low Limits: in multiples of .1 A

Analog Input Accuracy
Typical Voltage: ±.15 V or ±1.5 V
Typical Current: ±.2 A

Virtual Inputs
Definitions
Any logical association shared by 1 to 4 variables (i.e., Digital, Analog, Alarm or other Virtual Inputs)
Assigned by defining the state of the Virtual Input for each combination of variable states
Alarm Usage
Can be used to Set or Clear an Alarm as defined within the Alarm Configuration Table
Recording Usage
Creates standard Event Records
Relay Output Control
Can be used to control the state of each relay

Timer Inputs
Programming
Any input can be assigned as a trigger or terminating source
On or Off events can be assigned as a trigger or terminating source
Limit Values
High and Low Limits: in multiples of .1 seconds
Range: 0.0 to 999.9 seconds
Reporting
Measured time is reported in each Timer Input Event Record
Violation of Limit Values are also reported

Temperature Sensing
Usage: measures and reports internal temperature of recorder
High and Low Limits: -67 °F to 257 °F

Train Speed Monitor
Operation
Reports excessive train speed
Logs standard Event Record
Sensors
Digital Inputs: 2 required
Distance: 50′ to 5280′
Limit Values
5 to 180 mph

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 (with wear leveling)

Ports

Ethernet (2)
Usage: Provides remote or local access via browser-based interface

Browser Support: Chrome, Firefox, Edge, IE

Port Interaction: both ports operate concurrently and independently

Data Transfer Rates: 3,600 Event Records per second, 2.1 Mbps typical

Concurrent Sessions: users 4, Modbus unlimited

Assignable Addresses: IP, gateway, sub-net mask and DNS server (all dual)

Time Server Address: user-assigned

Type: 10 / 100 Base-T

Protocols: HTTP Get, Modbus, TCP/IP, SNTP-Unicast and -Multicast

USB Host
Compatible with any FAT-32 formatted flash drive

Can create a text file of Event Record data from any time span

Can be used to update software and save and restore Setup Database

GPS Receiver (optional)
Used to provide precise real-time clock control, latitude and longitude coordinates

Console
Factory use only (no user-access)

Connectors

Power
Detachable, tension clamp, 4-position, 12 to 22 AWG

Dual B and N terminals

Digital Inputs (32 / 64)
Detachable, tension clamp, 8-position, 12 to 22 AWG

Analog Inputs (8)
Detachable, tension clamp, 8-position, 12 to 22 AWG

Connectors (continued)

Relay Outputs (2)
Detachable, tension clamp, 3-position, 12 to 22 AWG

Normally open, normally closed and common terminals

Ethernet Port (2)
RJ-45 female

USB Host Port
USB Type A female

GPS Receiver (optional)
MCX female

Console Port
DE-9 male (no user-access)

Indicators

Display Panel
OLED design provides enhanced visibility and temperature stability

Displays numerous command menus for configuring the recorder and retrieving data

Front Panel LEDs (4)
Power: green, flashes while running

Active Alarm: red, illuminates when one or more Alarms are active

Message Sent: green, illuminates for 5 seconds when message is sent

Login: green, illuminates when one or more users are logged in

Ethernet Port LEDs (2 pair)
Green: link established

Yellow: data activity

Keypad
Located on front panel, below OLED panel

Keys: 0-9, Browse, Alpha, Setup, Esc / Maintainer Mode, Enter, Save / ., left, right, up, down / -

Internal Clock

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

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

Resolution: .01 seconds for all Event Records

Sync
SNTP-Unicast: via primary or secondary time servers, once per day at 00:05:00

SNTP-Multicast: per time server schedule

GPS: once per hour at 00:00 (with GPS option)

Internal Clock (continued)

Operation
Time Zones: selectable from 7 different North American settings

Daylight Saving Time: enable or disable automatic adjustment

Leap Year: automatically adjusted

GPS Receiver (optional)
Includes PCB and external antenna

PCB
Plugs into mating connector inside recorder

Antenna
Size: diameter 1.8″, height .6″ (not including mounting screw)

Weight: 2 oz. (less cable)

Operating Temperature: -40 °C to 85 °C

Mounting: bulkhead mountable to any surface less than 3/8″ thick

Location: unobstructed skyward orientation, for use outdoors

Password Protection

Administrative Level
Access: unrestricted to all functions

Length: 8 characters

Restricted Level
Access: modifications restricted to site-specific parameters of Setup Database, unrestricted viewing of all data and Setup Database parameters

Length: 8 characters

Passcode
Access: unrestricted to most functions

Length: 8 digits

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

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lists typical bit transfer rates for each of the CWR-72B's user-accessible ports. In each case the same 20,000 Event Records were either dumped to a PC file or saved directly to a flash drive. The single-line record format was selected. The reports did not include a Digital Signature. The times listed are normalized relative to 1,000 Event Records.

Port	Time to transfer 1,000 Event Records (sec)	Actual transfer rate (bps)
USB Host	.16	n/a
Ethernet Ports	.28	2.1 Mbps

Table 11: Bit Transfer Rates by Port

OPTIONS

GPS Receiver

85-0135
  Provides precise, non-drift control of recorder's real-time clock, includes bulkhead-mount antenna with 16′ of cable

L 56237-5/00
  Replaces bulkhead-mount antenna with magnetic-mount antenna

85-0175
  Provides precise, non-drift control of recorder's real-time clock, includes 15′ MCX to type N cable assembly to be used with customer provided GPS antenna

Memory Expansion

40-0416
  436,224 Event Records

40-0616
  610,816 Event Records

40-0816
  785,408 Event Records

40-1016
  960,000 Event Records

40-1216
  1,134,592 Event Records

40-1416
  1,309,184 Event Records

40-1616
  1,483,776 Event Records

40-1816
  1,658,368 Event Records

40-2016
  1,832,960 Event Records

40-2216
  2,007,552 Event Records

40-2416
  2,182,144 Event Records

40-2616
  2,356,736 Event Records

40-2816
  2,531,328 Event Records

40-3016
  2,705,920 Event Records

40-3216
  2,880,512 Event Records

40-3416
  3,055,104 Event Records

ACCESSORIES

Current Sensor

HCS-4
  High Current Sensor, 4 inputs, 1 to 20 Adc or Aac

Battery Charger Monitor

CSI-1
  Charge Status Indicator, single input, monitors voltage and current

Voltage Detector

FVD-2
  Failed Voltage Detector, 2 inputs, .5 to 48 Vdc, .5 to 36 Vac, high and low limit values, selectable timing

Light Out Detector

FLD-2
  Failed Lamp Detector for incandescent, halogen or LED lamps, 2 lamp circuits, DC or AC lamp current

Mounting

31-0002
  23″ rack mounting brackets

B

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

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

B

M<small>ICRO</small>-**A**<small>IDE</small>

INTRODUCTION

The Alarm Configuration Table (ACT) can be used to establish the automated Alarm reporting aspects of the CWR-72B. Specifically, it is used to decide which crossing faults or conditions will be reported as Alarm Messages. It follows that the ACT can be a key aspect of the Setup Database. This Appendix provides a description of a sample ACT used by a major freight railroad.

ALARM DEFINITIONS

The following data is from the ACT included in a sample Setup Database. The section entitled "Alarm Configuration" on page 43 provides a detailed description of how to prepare an ACT.

Alarm Configuration

Alarm	Set Input	Set State	Set Time	Set Name	Clear Input	Clear State	Clear Time	Clear Name	Maint Clear
L01	A01	On	600	B1	A01	Off	300	1B	☐
L02	A02	On	600	B2	A02	Off	300	2B	☐
L03	A03	On	600	B3	A03	Off	300	3B	☐
L04	A04	On	600	B4	A04	Off	300	4B	☐
L05	D10	Off	1800	IP	D10	On	300	PR	☐
L06	D10	Off	7200	PK	D10	On	300	PR	☐
L07	V01	On	180	GU	V02	On	2	GC	☑
L08	V03	On	45	GD	V04	On	2	GC	☑
L09	D01	Off	1800	LA	D01	On	10	CL	☑
L10	---	Off	0		---	Off	0		☐
L11	---	Off	0		---	Off	0		☐
L12	---	Off	0		---	Off	0		☐
L13	---	Off	0		---	Off	0		☐
L14	---	Off	0		---	Off	0		☐
L15	---	Off	0		---	Off	0		☐
L16	---	Off	0		---	Off	0		☐
L17	---	Off	0		---	Off	0		☐
L18	---	Off	0		---	Off	0		☐
L19	---	Off	0		---	Off	0		☐
L20	---	Off	0		---	Off	0		☐

Sample Alarm Configuration Table

The sample Setup Database defines nine Alarms. They are labeled as "L01" through "L09". A description of each Alarm is provided in Table 12 on page 108. 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.

Issue	ID	Type	Name	Description
Battery	L01	Set	B1	Sets B1 Alarm when Analog Input 01 voltage is below 10.4 Vdc or above 15.6 Vdc for 10 minutes.
		Clear	1B	Clears B1 Alarm when Analog Input 01 voltage is between 10.4 Vdc and 15.6 Vdc for 5 minutes.
Battery	L02	Set	B2	Sets B2 Alarm when Analog Input 02 voltage is below 11.2 Vdc or above 16.8 Vdc for 10 minutes.
		Clear	2B	Clears B2 Alarm when Analog Input 02 voltage is between 11.2 Vdc and 16.8 Vdc for 5 minutes.
Battery	L03	Set	B3	Sets B3 Alarm when Analog Input 03 voltage is above 20.0 Vdc for 10 minutes.
		Clear	3B	Clears B3 Alarm when Analog Input 03 voltage is below 20.0 Vdc for 5 minutes.
Battery	L04	Set	B4	Sets B4 Alarm when Analog Input 04 voltage is above 20.0 Vdc for 10 minutes.
		Clear	4B	Clears B4 Alarm when Analog Input 04 voltage is below 20.0 Vdc for 5 minutes.
Power out (short duration)	L05	Set	IP	Sets IP Alarm when POR (Digital Input 10) is Off for 30 minutes.
		Clear	PR	Clears IP Alarm when POR (Digital Input 10) is On for 5 minutes.
Power out (long duration)	L06	Set	PK	Sets PK Alarm when POR (Digital Input 10) is Off for 2 hours.
		Clear	PR	Clears PK Alarm when POR (Digital Input 10) is On for 5 minutes.
Gates Not Up	L07	Set	GU	Sets GU Alarm when Virtual Gate Not Up (Virtual Input 01) is On for 3 minutes.
		Clear	GC	Clears GU Alarm when Virtual Gate Up (Virtual Input 02) is On for 2 seconds.
Gates Not Down	L08	Set	GD	Sets GD Alarm when Virtual Gate Not Dn (Virtual Input 03) is On for 45 seconds.
		Clear	GC	Clears GD Alarm when Virtual Gate Dn (Virtual Input 04) is On for 2 seconds.
Crossing active too long	L09	Set	LA	Sets LA Alarm when XR (Digital Input 01) is Off for 30 minutes.
		Clear	CL	Clears LA Alarm when XR (Digital Input 01) is On for 10 seconds.

Table 12: Alarm Descriptions

Virtual Inputs 1 through 4 are defined as follows.

● Virtual Input 1 is On when the XR (Digital Input D1) is Off **AND** the Gate Up Ind (Digital Input D6) is Off.

● Virtual Input 02 is On when the XR (Digital Input D1) is Off **AND** the Gate Up Ind (Digital Input D6) is On.

● Virtual Input 3 is On when the XR (Digital Input D1) is Off **AND** the Gate Down Ind1 (Digital Input D7) is Off **OR** the Gate Down Ind2 (Digital Input D8) is Off, **OR BOTH** are Off.

● Virtual Input 3 is On when the XR (Digital Input D1) is Off **AND** the Gate Down Ind1 (Digital Input D7) is On **AND** the Gate Down Ind2 (Digital Input D8) is On.

INTRODUCTION

The CWR-72B uses the HTTP GET method to transmit Alarm Messages to the message processing server. The GET portion of the HTTP request includes all of the Alarm details. GET provides for the passing of a series of values to the server script that is being requested. The following section describes the structure of the GET data as it pertains to the recorder's Alarm Messages.

ALARM MESSAGE CONTENT

In Figure 10 on page 109 three Alarm Messages are shown. From top-to-bottom they are:

- A Set Alarm Message named "long_occ".

- A Cleared Alarm Message named "clr_occ". This Alarm clears the previous Alarm.

- A typical Health Check message.

Set and Cleared Alarm conditions are described in the section entitled "Alarm Configuration" on page 43. Health Check messages are described in "Health Check Interval" on page 28.

D


```
       1     2     3        4                5                    6               7
MSG=CA;LAC;72B;747321X;arrow_grand_mp14;0630133311;long_occ

MSG=CA;LAC;72B;747321X;arrow_grand_mp14;0630133945;clr_occ

MSG=CA;LAC;72B;747321X;arrow_grand_mp14;0630162705;OK
```

Figure 10: Sample Alarm Messages - GET Content

In the sample messages the black text is fixed. Specifically the "MSG=" and ";" characters will not change from message to message. The ";" character is used as a delimiter that separates each value. The orange text represents the values passed to the script. This content will vary from recorder to recorder and from message to message.

Every GET message begins with "MSG=". The remaining content is a series of values. In the following sections, each value is described using the numerical reference listed in the sample messages.

1 This value is the two-character State assignment. Refer to "State" on page 20 for additional details.

2 This value is the assignment for Subdivision. Subdivision is described in the section entitled "Subdivision" on page 20.

3 The assigned Equipment ID is the third value. It is described in "Equipment ID" on page 29.

4 The assigned DOT Number is next. The DOT Number is described in "DOT Number" on page 21.

5 The fifth value is the assigned DNS Name. It is described in "DNS Name" on page 21.

6 The date / time stamp of the Alarm is next. This value is coded as MMDDhhmmss using 24-hour format. The time stamp indicates the moment the Alarm was asserted as either Set or Cleared.

7 The final value is the Alarm's assigned name. The name will indicate the Set or Cleared condition of the Alarm. Alarm names are described in "SetName" on page 44 and "ClrName" on page 45. Health Check messages always use a name of "OK".

By convention, the GET content is terminated by the following character string " HTTP/1.0" (inclusive of the leading space character) followed by a single line feed character. The terminating string is not shown in the sample data.

ALARM MESSAGE HANDLING

Alarm Messages, irrespective of type, require a reply from the message processing server. A reply can take either of two forms. An Alarm Message that is received properly must be acknowledged by a "good" text string. A malformed Alarm Message requires a "bad" text string be returned. The content of each string is case-insensitive. An Alarm Message that includes a SetName or ClrName not acceptable to the message processing server requires that the "bad" string be sent. In this way an Alarm Configuration Table (ACT) that includes non-standard names will be brought to the attention of the signal design staff.

If the Event Recorder receives a "good" reply the message handling sequence has been successfully completed. If a "bad" string is received the original Alarm Message, with the same GET content, is immediately resent. The Retry Count setting imposes an upper limit on the number of retry attempts. Past this limit there are likely problems with the content of the ACT. Refer to the section entitled "Retry Count" on page 29 for additional details.

If the transmission media fails to deliver an Alarm Message, or its reply, a timeout feature will be invoked. The original Alarm Message will be resent after a delay equal to the Retry Interval setting. Refer to the section entitled "Retry Interval" on page 29. In this case as well, the Retry Count setting imposes an upper limit on the total number of retry attempts.

Health Check messages require a reply. Accordingly, a simple end-to-end test of the Alarm Message handling system can be performed by using the Health Check command found in the Diagnostics menu. Refer to the section entitled "Health Check Test" on page 95.

Appendix E – RSA Validator

Introduction

The Query Events command with Dump+S option provides for the creation of a secure electronic data file. This appendix describes how that file can be verified as unaltered. MICRO-AIDE's RSA Validator software is used for this purpose. The proper use of RSA Validator involves several simple steps. Each step is described in the following sections.

The following procedure requires access to several files. The correct files are available for downloading from the MICRO-AIDE website at: www.micro-aide.com/support/downloads.html

Installing the Required Software

The RSA Validator software is available to all MICRO-AIDE users. It can be downloaded, installed and used without restriction or charge. It is available at the MICRO-AIDE website as noted in the previous paragraph.

The downloaded software consists of two files that have been zipped together. The zipped file should be saved to a temporary location and unzipped from there. The decompressed files are named "SetupRSAValidator.exe" and "SetupQt4Lib.exe". The former is the RSA Validator application, the latter includes all of the runtime support library files that are required by the RSA Validator software. The procedures for installing the required files are described in the following two sections.

Installing RSA Validator

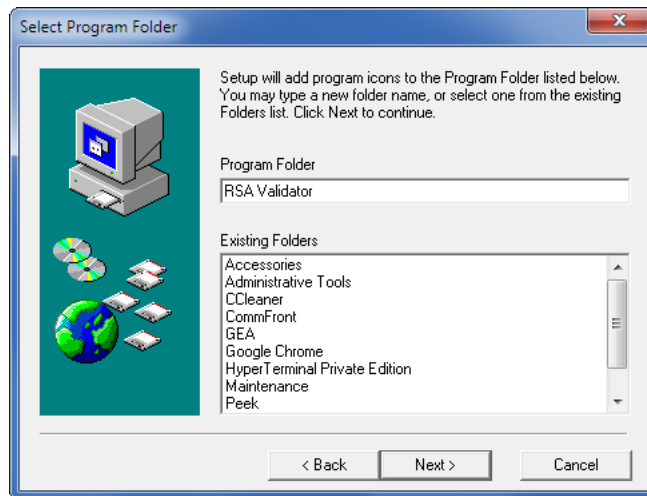Install the RSA Validator software by performing the following steps.

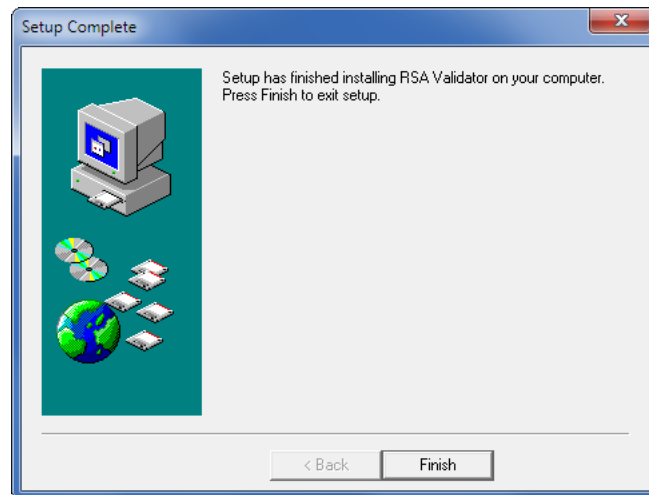1. Double-click the SetupRSAValidator.exe file. The following dialog box will be displayed.
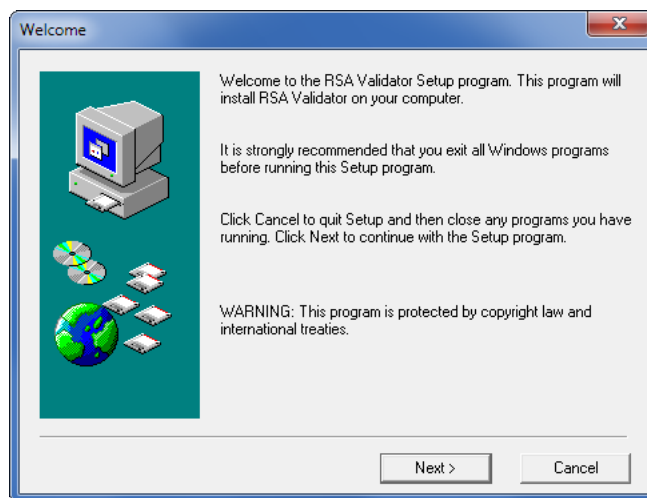
2. Click the button labeled "Next >". The following dialog box will be displayed.
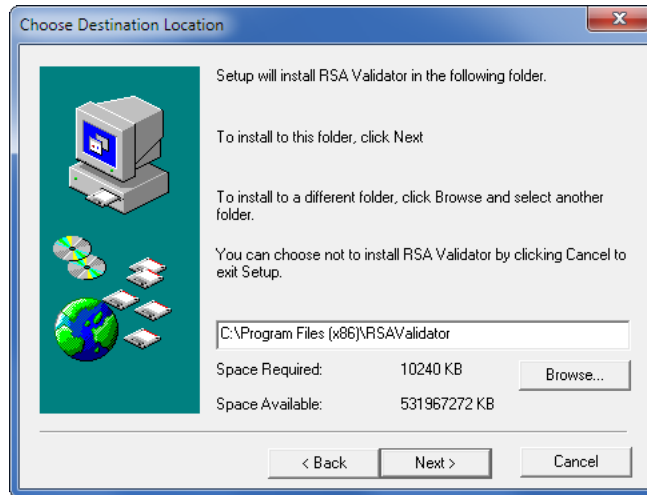
3. Accept the default location by clicking the button labeled "Next >". The following dialog box will be displayed.

4. Accept the default folder name by clicking the button labeled "Next >". Click the button labeled "Next >" in the succeeding dialog box labeled "Start Copying Files".

5. Several files will then be installed. The installation process will end automatically after several seconds as noted by the following dialog box.
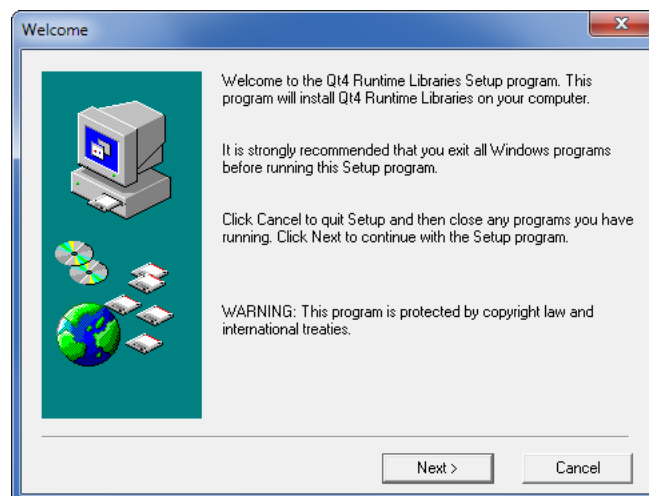
6. Complete the installation of RSA Validator by clicking the button labeled "Finish" and the "OK" button in the succeeding and final dialog box.

INSTALLING THE RUNTIME LIBRARIES

Like all applications, various runtime files are required to support RSA Validator. Perform the steps listed in the following to install the runtime support library files.
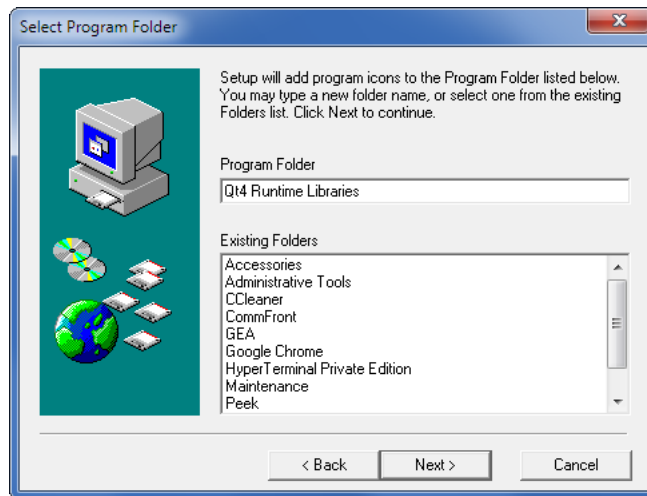
1. Double-click the SetupQt4Lib.exe file. The following dialog box will be displayed.

2. Click the button labeled "Next >". The following dialog box will be displayed.
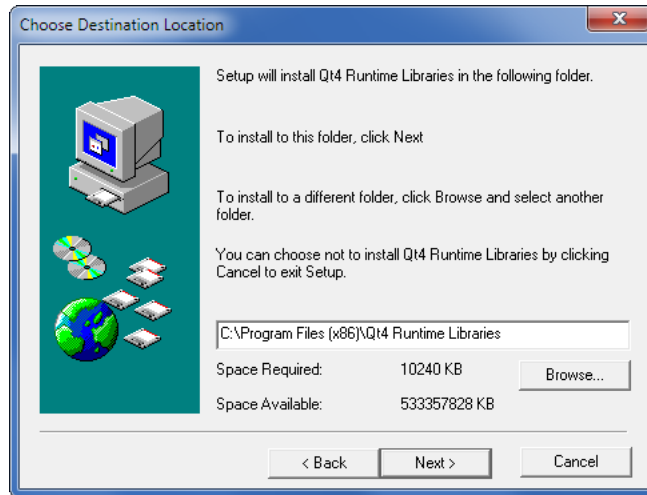
3. Accept the default location by clicking the button labeled "Next >". The following dialog box will be displayed.

4. Accept the default folder name by clicking the button labeled "Next >". Click the "Next >" button in the succeeding dialog box labeled "Start Copying Files".

5. Several files will then be installed. The installation process will end automatically after several seconds as noted by the following dialog box.
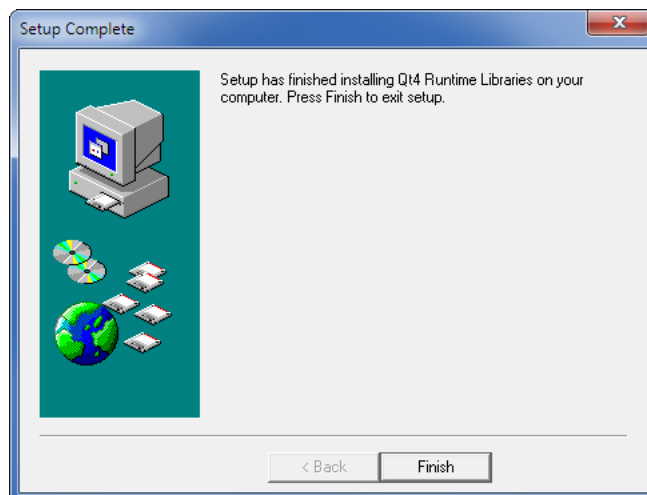
6. Complete the installation of the runtime support files by clicking the "Finish" button and the "OK" button in the succeeding and final dialog box.

RSA Validator can now be launched and used as described in the next section.

USING RSA VALIDATOR

VALIDATING A FILE

RSA Validator can be launched from the Windows Start Menu or a desktop icon. The following dialog box will be displayed after it is launched.
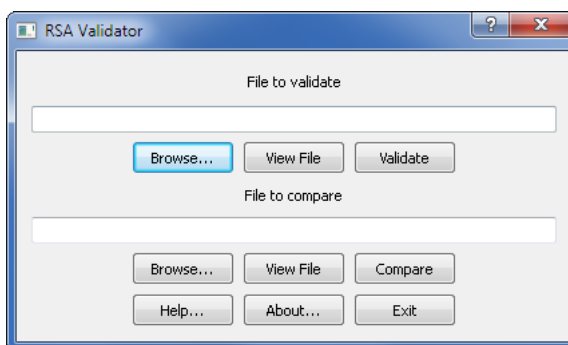

A previously created or copied electronic data file can be verified as unaltered by performing the following steps.
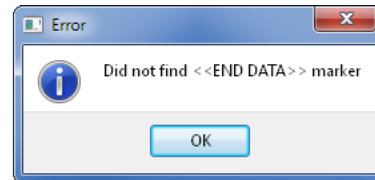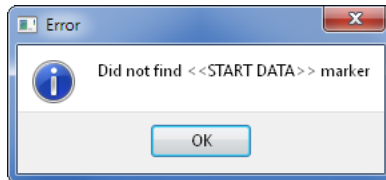
1. In the File to validate section, click the button labeled "Browse...".

2. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

3. To view the file in Notepad as simple text, click the button labeled "View File".

4. To validate the file click the "Validate" button. The following dialog box will confirm that the file has not been altered.

Info

Digital signature validated successfully

OK
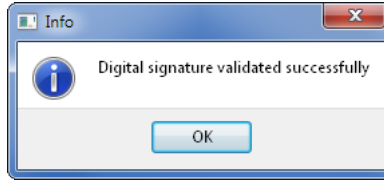
If the data content of the file has been altered, even if by a single bit, the following dialog box will instead be displayed.

Error

Digital Signature is INVALID!

OK
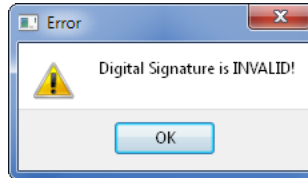
Finally, if the Start Data or End Data markers are corrupted or not found within the file, either of the following messages will be displayed.

Error

Did not find <<START DATA>> marker
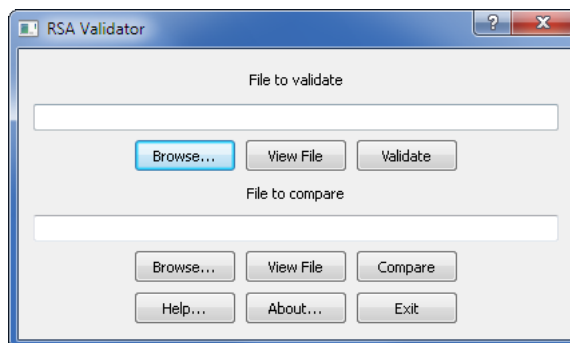
OK

Error

Did not find <<END DATA>> marker

OK

COMPARING FILES

In many cases the electronic data file will need to be shared among various parties. In a hearing or court proceeding, the file may need to be passed to the plaintiff's counsel. In such circumstances it is important that both parties are reviewing the same data file. The file compare feature of the RSA Validator software allows a comparison to be made as described in the following steps.

1. RSA Validator can be launched from the Windows Start Menu or a desktop icon. The following dialog box will be displayed after it is launched.

RSA Validator

File to validate

Browse...   View File   Validate

File to compare

Browse...   View File   Compare

Help...   About...   Exit

2. In the File to validate section, click the button labeled "Browse...".

3. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the first electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

4. To view the first file in Notepad as simple text, click the button labeled "View File".

5. In the File to compare section, click the button labeled "Browse...".

6. In the succeeding dialog box labeled "Open Digitally Signed Capture File", navigate to the location where the second electronic data file of interest is located. Click the button labeled "Open" once the proper file is selected.

7. To view the second file in Notepad as simple text, click the button labeled "View File".

8. Finally, click the button labeled "Compare". If the two files are identical, the following dialog box will be displayed.
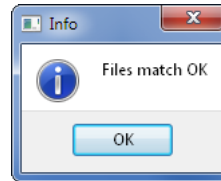
If the two files differ, even slightly, the following message will indicate a mismatch.
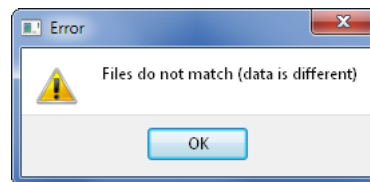
Using these techniques, Event Record data files created with the Dump + S option of the Query Events command can be validated and compared any number of times.

E

USER NOTES

E

APPENDIX F — MODBUS

INTRODUCTION

Modbus is a communications protocol originally developed by Schneider Automation. It has been in use for many years and has now become a commonly accepted method of facilitating communications among various devices and systems. In the rail signal industry it is frequently used by PLC systems. Although Modbus includes many capabilities, it is primarily designed to support the exchange of status-related data. The real-time status of inputs and registers can be determined using Modbus. The status of various inputs and registers can also be controlled using Modbus. Modbus defines two basic types of system entities. A Modbus Client requests status data or issues input and/or register data to a Modbus Server. The Modbus Server responds to these requests in accordance with the protocol standards.

The CWR-72B is designed to operate as a Modbus Server. More specifically, Modbus over TCP/IP has been implemented.

USAGE

Modbus can be used to exchange a variety of data between compliant devices. However, many of these data types do not apply to an Event Recorder. Accordingly, the CWR-72B has been designed to support only those aspects of the Modbus protocol that are appropriate to an Event Recorder application.

The CWR-72B includes Digital, Analog, Virtual and Alarm Inputs. The status of an individual Digital, Virtual or Alarm Input is binary in nature. At any given moment these inputs are either On or Off. The same can be said of an Analog Input when its measured level is compared to its High and Low Limit Values. The Analog Input is either within its acceptable range of operation or it is not. Analog Limit Values are described in the section entitled "High and Low Limits" on page 35.

There are a total of 92/124 Digital, Analog, Virtual and Alarm Inputs. As described previously, the instantaneous status of each of these inputs can be indicated as either a 1 or a 0. For Digital Inputs the input is either On (1) or Off (0). For Analog Inputs the input is either outside its normal limits of operation (1) or it is within its normal limits (0). For Virtual Inputs the input evaluates to a true (1) or false (0) condition. Similarly, an Alarm input is either Set (1) or Cleared (0). It follows that at any given instant the state of all inputs can be specified by 92/124 individual bits.

Function Codes are used by a Modbus Client to request data from a Modbus Server. The CWR-72B software supports two of these Function Codes. The first is referred to as Read Discrete Input (RDI). A Modbus Client can issue an RDI code for any or all of the 92/124 inputs of the CWR-72B. The Event Recorder will validate the received data message and respond with the requested status information. The operation is such that any Modbus Client with network access is free to issue RDI requests at will. In essence, the RDI can be used to provide a snapshot of various input states.

The response to an RDI Function Code is an array of data bits that represent the instantaneous status of selected inputs. The response does not provide information pertaining to when an input assumed its reported status. Only the Event Records saved in the memory of the recorder contain precise date- and time-stamped information. The Modbus protocol cannot be used for this purpose.

The second Function Code supported by the CWR-72B is referred to as Read Input Register (RIR). The RIR code allows a Modbus Server to respond with a 16-bit register value. In the case of the CWR-72B the measured level of an Analog Input is reported as a sign extended 16-bit register value. A Modbus Client can query the measured value of all eight Analog Inputs at once. The value of each register is interpreted as a whole number multiple of the Analog Input's resolution setting. As an example, if the resolution setting is .1 Vdc then a register value of 00FE (hexadecimal) is 254 times .1 Vdc or 25.4 Vdc. Refer to the section entitled "Analog Configuration" on page 34 for additional details regarding the resolution setting of Analog Inputs.

The CWR-72B will honor all valid Modbus Client queries. It is assumed, however, that approximately five times per second a Modbus Client will request status or register data from the recorder. Provided the rate of queries does not significantly exceed this level the Event Recorder will remain responsive to each request.

It is important to also note that the Modbus Server feature available in the CWR-72B implements a purely machine-oriented interface. As such, the user has no access to any of its operational, performance or configuration aspects. It cannot be controlled or altered in any way by the user.

If the Modbus over TCP/IP connection is idle (i.e., no data is being received or transmitted) for more than ten seconds, a timeout condition will occur. The timeout will result in a forced disconnection at the CWR-72B end. The Modbus Client will then have to initiate a new connection procedure to re-establish communications with the recorder. The short 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 promptly complete a subsequent connection attempt.

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The Modbus Server implementation within the CWR-72B is predicated upon several important factors. A summary of these factors is provided in the following.

- Modbus over TCP/IP has been implemented. Neither the RTU nor ASCII versions of Modbus are supported.

- The Modbus Client must access the Event Recorder at its preassigned IP Address. Refer to the section entitled "Network" on page 41 for additional details regarding the Ethernet Port.

- By Modbus convention, each query and response must occur over Port 502.

- The RDI and RIR Function Codes are fully supported by the Event Recorder.

- Function Codes applicable to the control of coils and registers have not been implemented.

- The measured value of an Analog Input is encoded within the Event Recorder as a signed 9-bit integer. This value is translated into a sign extended 16-bit value when it is reported as a Modbus compliant register value. As an example, -25.6 Vdc is reported with a register value of FF00 (hexadecimal).

- Digital, Analog, Virtual and Alarm Inputs are numbered as Discrete Inputs as follows:

Input Type	CWR-40B		CWR-72B	
	Recorder Numbering	RDI Numbering	Recorder Numbering	RDI Numbering
Digital	D1 to D32	0 to 31	D1 to D64	0 to 63
Analog	A1 to A8	32 to 39	A1 to A8	64 to 71
Virtual	V1 to V32	40 to 71	V1 to V32	72 to 103
Alarm	L1 to L20	72 to 91	L1 to L20	104 to 123

Table 13: RDI Numbering

- Analog Inputs A1 to A8 are numbered as registers 0 to 7.

The Modbus-IDA is a regulatory committee responsible for all the technical aspects of the Modbus protocol. A PDF document that details the Modbus over TCP / IP standard can be found at the following Internet address. The CWR-72B Server feature has been designed to be compliant with the standards as set forth in the referenced document.

www.modbus.org/docs/Modbus_Messaging_Implementation_Guide_V1_0a.pdf

F

USER NOTES

F

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.