

# APPENDIX A – TECHNICAL DATA

## SPECIFICATIONS

### Physical

**Size** (without mounting brackets)  
**Length:** 9.5"  
**Height:** 7.2"  
**Depth:** 3.4"  
**Weight**  
2.5lb.

### 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**  
**Typical:** 2 W  
**Maximum:** 4 W (with GPS Receiver, Ethernet and Modem options)

### Isolation

**Power**  
**Minimum:** 3800 Vdc from B and N terminals to chassis and inputs  
**Digital Inputs**  
**Minimum:** 3800 Vdc to any terminal  
**Analog Inputs**  
**Minimum:** 3800 Vdc to any terminal  
**Input to Adjacent Input**  
**Digital:** minimum 3800 Vdc  
**Analog:** minimum 3200 Vdc  
**USB Host and Device Ports**  
**Minimum:** 3800 Vdc to any terminal  
**GPS Receiver and Ethernet Port (optional)**  
**Minimum:** 3800 Vdc to any terminal  
**Internal Modem (optional)**  
Designed to meet FCC part 68 standards

### Capacities

**Inputs**  
**Digital:** 20, all optically isolated  
**Analog:** 4 total, voltage or current (optional)  
**Virtual:** 8, user assigned  
**Timer:** 16, user assigned  
**Train Speed Monitor:** 4, user assigned  
**Outputs**  
**Relay:** 1, form C, rated for 2 A at 24 Vdc or 1 A at 125 Vac, maximum switching capacity of 125 VA or 60 W, service life 1 million electrical (typical)

### Event Storage

**Standard:** 307,123 records  
**Maximum:** 1,274,611 records  
**Liquid Crystal Display**  
**Characters:** 80 total on 4 lines  
**Viewing Area:** 2.8" by .8"

### Front Panel Keypad

**Quantity:** 20 keys

### Physical Inputs

**Input Impedance**  
**Digital:** minimum 10KOhms, optically isolated  
**Analog:** minimum 10MOhms  
**Range**  
**Digital Input-On:** 9 to 36 Vdc  
**Digital Input-Off:** 0 to 2 Vdc  
**Analog DC Voltage:** 3 scales,  $\pm 25.5$ ,  $+51.1$ ,  $\pm 255$   
**Analog AC Voltage:** 2 scales, 25.5, 255  
**Analog Current:** 2 scales,  $\pm 25.5$  Adc, 25.5 Aac (optional)

### Event Validation Times

**Digital:** .001 to 32.767 seconds, compatible with fixed rate flashing circuits  
**Analog:** fast and slow filter settings

### Analog Limit Values

**Voltage**  
**High and Low Limits:** in multiples of .1 V or 1 V  
**Current**  
**High and Low Limits:** in multiples of .1 A

### Analog Input Accuracy

**Typical Vdc:**  $\pm 1\%$  full scale  
**Typical Vac:**  $\pm 1.5\%$  full scale  
**Typical Current:**  $\pm 2\%$  full scale

### Virtual Inputs

**Definitions**  
Any logical association shared by 1 to 4 variables (i.e., Digital, Analog, Timer or other Virtual Inputs)  
Assigned by defining the state of the Virtual Input for each combination of variable states

### Virtual Inputs (continued)

**Reporting**  
Creates standard Event Records  
Relay can be controlled by each Virtual Input  
Modem (optional) can be enabled to dial out Event Records

### Timer Inputs

**Programming**  
Any input can be assigned as a trigger or terminating source  
On or Off events can be assigned as a trigger or terminating source

### Limit Values

**High and Low Limits:** in multiples of .1 seconds  
**Range:** 0.0 to 999.9 seconds

### Reporting

Measured Time is reported in each Timer Input Event Record  
Violation of Limit Values are also reported

### 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:** 36" to 99" or 8' to 5280'

### Limit Values

5 to 99 mph or 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

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**Ports****RS-232**

**Quantity:** 1, for use with a PC

**Terminal Emulation:** ANSI

**Baud Rates:** 300, 600, 1200, 2400, 4800, 9600, 19,200, 38,400, 57,600, 115,200

**Bit Format:** 8-N-1

**USB Host**

Compatible with any FAT-32 formatted flash drive

Can create a text file of Event Record data from any time span

Can be used to update firmware

**USB Device**

Eliminates need for serial comm port, data transfer rates of 960Kbps

**Ethernet (optional)**

**Type:** 10/100 Base-T

**Protocols:** TCP/IP, Telnet, SNMP-Unicast and -Multicast

**Concurrent Sessions:** Telnet (2)

Provides remote or local access via TCP/IP

Data transfer rates of 850Kbps

User assignable IP Address, Telnet port, sub-net mask, Unicast IP Address

**Modem (optional)**

Provides remote access, auto-answer

**GPS Receiver (optional)**

Used to provide precise, real-time clock control, latitude and longitude coordinates

**Connectors****Power**

Detachable, tension clamp, 4-position, 12 to 22 AWG

Dual B and N terminals

**Digital Inputs**

Detachable, tension clamp, 10-position, 12 to 22 AWG

**Analog Inputs**

Detachable, tension clamp, 8-position, 12 to 22 AWG

**Relay**

Detachable, tension clamp, 3-position, 12 to 22 AWG

Normally open, normally closed and common terminals per relay

**Terminal Port**

DE-9 male, configured as modified DCE

**USB Host Port**

USB Type A female

**USB Device Port**

USB Type B female

**Telephone Line**

RJ-11 female

**Ethernet Port (optional)**

RJ-45 female

**GPS Receiver (optional)**

MCX female

**Indicators****LCD Panel**

Includes LED back lighting for enhanced visibility

Displays numerous command menus for configuring the recorder and retrieving data

**Front Panel LEDs (3)**

**Power:** green

**Terminal:** green, flashes with send and receive data

**Modem:** green, flashes with send and receive data and ringing

**Ethernet Port LEDs (2 optional)**

**Green:** link established

**Yellow:** data activity

**Controls****Keypad**

Located on front panel, below LCD

**Keys:** 0-9, Browse, Alpha, Setup, Esc, Enter, Save/., left, right, up, down/-

**LCD Contrast Adjust**

Single-turn pot., accessible from front panel

**Internal Clock****Accuracy**

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

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

**Resolution:** .001 seconds for all Event Records

**Sync Interval**

**SNTP-Unicast:** via time server, 5 minutes past each hour (requires Ethernet Port option)

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

**GPS:** once per hour (requires GPS Receiver option)

**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:** Event Record and Setup Database viewing only

**Length:** 8 characters

**Passcode**

**Access:** limited modifications to Setup Database via front panel

**Length:** 8 digits

**Internal Modem (optional)****Type**

V.34, 33,600Baud, data compression and error correction

**Usage**

Remote access via auto-answer operation

Allows dial-out alarm reporting of Virtual Input records

**Compliance**

Designed to meet FCC part 68 standards

**Dial-out Alarms (optional)****Calling Method**

Primary and secondary dial numbers, multiple attempts

Tone or pulse dialing

**Data**

Issues Virtual Input Event Records if enabled by Virtual Input definition

# TRANSFER RATES

Table 14 on page 93 lists typical bit transfer rates for each of the CWR-24E's user-accessible ports. In each case the same 20,000 Event Records with no-detail formatting were either dumped to a PC file or saved directly to a flash drive. The times listed are normalized relative to 1,000 Event Records. If speed is a concern, using the USB Device Port is highly recommended.

Port	Time to transfer 1,000 Event Records (sec)	Actual transfer rate (bps)	Relative speed compared to 38,400
Terminal Port (38,400)	18.78	38,352	Used as reference
Internal modem	14.48	50,638	1.3 times faster
Terminal Port (115,200)	6.28	114,569	3.0 times faster
USB Host	5.83	123,607	3.2 times faster
Ethernet Port	.84	853,851	22.3 times faster
USB Device Port	.75	960,103	25.0 times faster

Table 14: Bit Transfer Rates by Port

# TERMINAL PORT CABLE

The following cable is included with every CWR-24E.

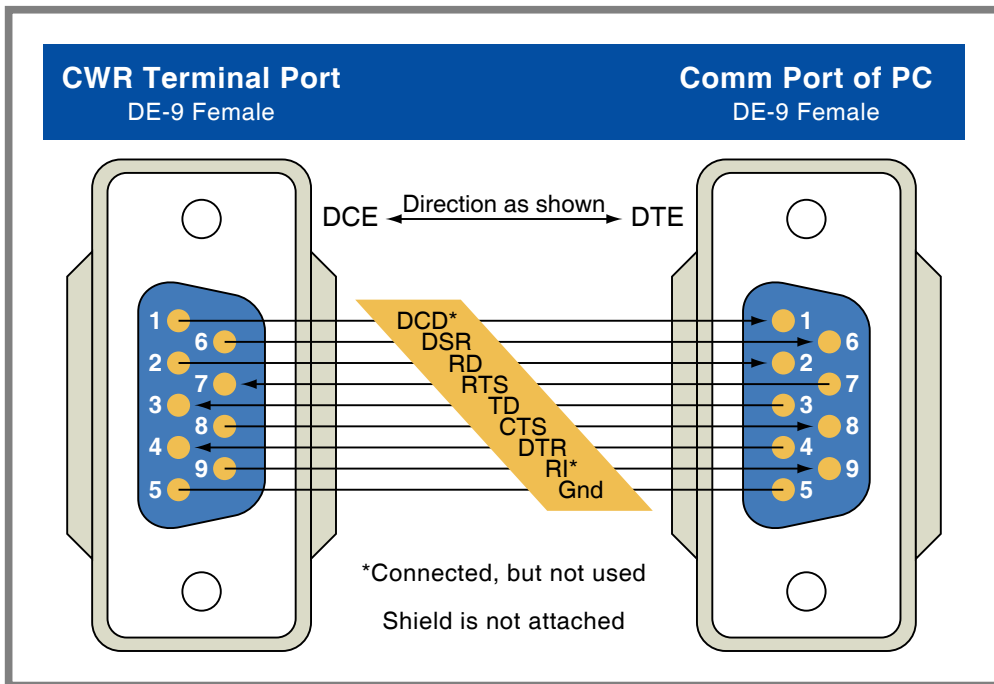


Figure 8: Terminal Port Cable - Wiring Diagram

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