

EZTest HazMon System Tester



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January 2019

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Revision Notes

First Release – October 18, 2012

Revision A01 – January 16, 2013

- Update to include version 1.02 firmware features

Revision A02 – April 2, 2015

- Rewrite the firmware from assembly language to C language, and update firmware to V2.00
- Support all test functions in Revision A01, and add function to test mCP001 and mIP001 sensors

Revision A03 – February 1, 2017

- Add the function to read mDC001 sensors
- Add the function to configure mDC001 cables
- Add the function to detect the number of DS28EA00 sensors connected on a cable

Revision A04 – June 12, 2017 – FW 2.26

- Update to include version 2.26 firmware features
- Change batter gauge function to batter voltage function
- Modify mDC001 cable configuration to configure CMC cable and OPI cable

Revision A05 – March 20, 2018 – FW 2.33

- Sensor test description for mDC002 added
- Grain cable configuration added
- Proximity data on mCP001 added
- Battery gauge modified
- Ground fault removed from testing
- mPHT001 sensor added

Revision A06 – January 31, 2019 – FW 2.33

- New overlay, logo and buttons

1. Overview

The **EZTest** HazMon System Tester provides a simple method to diagnose CMC HazMon systems.

The **EZTest** is handheld and operates off 2 AA batteries. It has an easy to read backlit LCD. A simple 4 button operator interface is provided

The **EZTest** provides a standalone good/bad test for individual sensors. In addition, the sensor's electrical interface and real-time output can be verified. All information is presented in scaled units to simplify the test results.

In addition to testing individual sensors, the **EZTest** can be connected to an active CMC Intrinsically Safe network. The **EZTest** will supply a simply good/bad indication of the networks operation. Further details of the networks electrical operating condition are also provided.

The **EZTest** can also emulate a sensor. A sensor is first attached to the **EZTest** and after the serial number is captured the **EZTest** is attached to the network. The keyboard can then be used to set any value for the sensor.

mVM001 Vibration Sensor, mTS017 Infrared Temperature Sensor, mCP001 Proximity Capacitive Sensor, mIP001 Proximity Inductive Sensor, mDC001/2 Cable Sensor and mPHT001 Pressure Humidity Temperature Sensor are configurable. The **EZTest** provides a simplified means of configuring these sensors.






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2. Description of Indicators



Figure 1 - Illustration of Indicators

There are five control pushbuttons:

- | | | |
|---|---------------|--|
|  | Power | Press to turn power on or off |
|  | Select | Select the displayed function |
|  | Back | Go back one menu level or exit this function |
|  | Down | Next menu item; Decrease value |
|  | Up | Previous menu item; Increase value |

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3. Operation

The EZTest HazMon System Tester has an easy to use menu system. To turn on the tester, press and hold the **<Power>** key until the display backlight illuminates. To turn the tester off, press and hold the **<Power>** key until the display backlight goes off. The tester automatically turns off after 5 minutes except working in “Sensor Emulator” mode:

The system will display two opening messages when power is turned on:

**CMC Industrial
Electronics**

**EZTest Ver 2.33
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The tester may display a status message before proceeding to the main menu. The status messages are as follows:





Message	Description	Required Action
Battery Low < 2.20V	The battery has discharged below 2.20 V	Check the battery level using the “Battery Voltage” function. If the voltage is less than 2.20V, replace the batteries
Program CRC Fault	The tester’s program is corrupted	Return the unit to the factory for repair
Data RAM Fault	The tester failed self-test	Return the unit to the factory for repair
Calibration Fault	The calibration parameters are corrupted	Return the unit to the factory for repair

The main menu is then displayed:

**Select Function
Sensor Test**

3.1 Using the Menu Control Pushbuttons

There are four menu control pushbuttons:

	Select	Select the displayed function
	Back	Go back one menu level or exit this function
	Down	Next menu item
	Up	Previous menu item

There are six menu selections from the main menu. These are selected using the **Up** and **Down** pushbuttons.

Sensor Test	Test an individual sensor
Bus Test	Test the CMC Intrinsically Safe network
Sensor Emulator	Emulates connected sensor
Sensor Configuration	Configure sensor parameters
Battery Voltage	Check remaining battery level
Proximity Data	Read proximity data for mCP001 Sensor
Cable Insert Test	Read number of sensors connected on the cable insertion FOR CMC INTERNAL USE ONLY

Once the function is displayed, it is executed by pressing the **<Select>** pushbutton.

3.2 Sensor Test

The sensor test will report the health of a single sensor plugged into the modular connector on the front of the unit. In addition, the sensor test will check for any fault conditions of the actual sensor and on the sensor wiring.

Note: EZTester itself doesn't work as a tester for any type of digital grain temperature cables. Correct reading of grain cable on EZTester is not indication of good condition of the cable. Grain cable can be tested by EZTester when using together with mDC controller described below.

***** **Caution** *****

Sensors connected to a bus converter on an active network or multiple sensors connected together cannot be tested using this function. Connect a single standalone sensor into the tester's front panel connector.

If "**Sensor Test**" is selected and no sensor is connected to the modular connector, the display will indicate:

Sensor Test
No Sensor

To test a sensor, plug the sensor into the tester. When a sensor is connected to the modular jack and "**Sensor Test**" is selected, the display will first indicate:

Sensor Test
Please Wait

The following messages can be displayed:

Message	Description
Sensor Good	The sensor passed all of the tests and is operational. This test confirms the electrical interface of the sensor is working properly. Use the Down key to verify the sensor is providing the correct output.
Supply Volts Low	The sensor is drawing too high a current from the networks power supply.

Data Volts High	The sensor is loading the data line and the data high voltage is lower than required.
Data Volts Low	The sensor is loading the data line and the data line low voltage is higher than allowed.
Open Wire	For temperature sensors this message indicates that the red power wire to the sensor is open
Bad Data	The tester was unable to read a valid data packet from the sensor.
No Sensor	No sensor was detected, the sensor is defective
Serial Number	Sensor's serial number can be read if there is valid sensor connected
Measured Value	Sensor's measurement value can be read if there is valid sensor connected. When mTC002 and mDC001/2 cards are tested the values of connected cables can be read, described below.
Firmware Version	Sensor's firmware can be read if there is valid mCP001 or mIP001 sensor connected

The **<Up>** and **<Down>** keys can be used to display further information about the sensor's performance. If the display indicates "**Sensor Good**", use the **<Down>** key to verify the value being returned by the sensor. The tester displays the sensor's value in real world units for verification.

The following table describes the available display starting from the status display described above:

Key	Function	Description
Down 1	Real-time display	The sensor type and real-time value for the sensor are displayed in the units suitable for the sensor. Verify the sensor's output using this function.
Down 2	Serial number display	The sensor's serial number is displayed. The serial number should agree with the serial number printed on the sensor's label.
Down 3	Sensor Version	Sensor version is displayed. This function is only valid for mCP001 and mIP001 sensors
Up 1	Sensor Power	The sensor power voltage level is displayed. If this voltage is too low it indicates the sensor is drawing excessive power.
Up 2	Sensor Data Low	The data low voltage level on the network is displayed. If this voltage is too high, the sensor has resistance between the green data wire and the red power wire.

- Up 3** **Sensor Data High** The data high voltage level on the network is displayed. If this voltage is too low the sensor has resistance between the green data wire and the white common wire.

Sensor test on mTC002 and mDC002

To perform this test the tester must be connected to single controller card connected to the backplane and cables which should be read are connected to designated terminals. No more than one controller card can be read at the same time. The card needs to be isolated from a system if installed in one. It is enough to disconnect incoming and outgoing branches using the dip switches on backplanes.

mTC002

If the card works correctly and Real-time display menu in sensor test is selected the tester will circle between the mTC002 card status (see mTC002 manual for more information on status), ambient temperature of the board and then values of connected thermocouple sensors. It takes time for the mTC002 card to provide the data so it circles between status and ambient temperature for a while. It depends on position of thermocouple sensors how it will be displayed. If 7 thermocouple sensors are connected to the first card and first connector the sensors will be reported under numbers 1-7 as on example below:

mTC002			mTC002			mTC002		
1	23°C	73°F	2	25°C	77°F	3	24°C	75°F

The same will be read if the connector on the mTC002-TC is closed and if there is no sensor connected and the switch is open the display will show error for open wire.

mDC002

If the card works correctly and Real-time display menu in sensor test is selected the tester will circle right away between the controller card status, ambient temperature and the values from the connected sensors.

The test of the mDC002 by EZTester is more sophisticated than on the mTC002 and can help to troubleshoot the card with the sensor cables. The EZTester only reads data provided by the mDC002 card and detailed description of the data is in manual of the mDC002. Description below shows just the interpretation of the data on the EZTester.

Status	Message	Description
Of mDC card	OK!	No problem, everything is working good.
	F	ROM memory problem, card should be replaced
	P	Power up problem, card should be replaced
	S	Presence of short on one of the cables
	A	Ambient temperature sensor on card failure
	O	One of previously read cables is disconnected
Cables Reading	Each cable read temperature in °C and °F and is represented by a number. The number shows the position of each sensor. If the cable has 20 sensors and it is	

	plugged into the first slot it will be read as numbers 1-20. If second cable has also 20 sensors and will be plugged into second slot it will reads as 29-48 if mDC002 is used and 22-41 if mDC001 is used.						
Short	Short reports which cables on the backplane are shorted. If there is no short all the positions will be shown as dots. Each position represents one cable. If cable 1 and 7 is shorted the message will look as following: <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">mDC002</p> <p style="text-align: center;">Short : S S .</p> </div>						
Open Wire	OP_WR reports which cables on the backplane are disconnected. If all 8 cables are properly connected all the positions will be shown as dots. Each position represents one cable. If cable 2 and 8 are disconnected the message will look as following: <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">mDC002</p> <p style="text-align: center;">OP_WR : . O O</p> </div>						
Not Match	NotMch reports cables which sensors are not reporting. If cable has 20 cells and programmed to read from 20 cells but it reads data only from 19 or less, it will be reported in this part. Each position represents one cable. If cable 4 and 8 are disconnected the message will look as following: <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p style="text-align: center;">mDC002</p> <p style="text-align: center;">NotMch : . . . N . . . N</p> </div>						
Cables Information	Each cable carries information of how many sensors is in cable, what is its digital bin number and what is its location number. If cable in slot 2 has 22 sensors and it is programmed to bin number 10 and location number 5 it will look as example below. <table border="1" style="width: 100%; text-align: center; border-collapse: collapse;"> <tr> <td style="width: 33%;">Cable #2</td> <td style="width: 33%;">Cable #2</td> <td style="width: 33%;">Cable #2</td> </tr> <tr> <td>Sensor Num: 22</td> <td>Loc Num: 5</td> <td>Bin Num: 10</td> </tr> </table>	Cable #2	Cable #2	Cable #2	Sensor Num: 22	Loc Num: 5	Bin Num: 10
Cable #2	Cable #2	Cable #2					
Sensor Num: 22	Loc Num: 5	Bin Num: 10					

Note: If there is no short, no open wire, no mismatch and all cells are reading correct data that is indication of the grain cable working properly and can be considered as fully functional cable.

To do the best troubleshooting it is necessary to know the behavior of the mDC card. It matters if cable was shorted, removed or misplaced and the card was reset (power cycled) or if the card didn't go through reset. For better understanding see mDC001/2 manuals.

***** **Caution** *****

Only sensors that display the “**Sensor Good**” message and that are displaying the correct reading using the real-time display should be used.

If a sensor is connected and does not provide a valid CMC family code, the sensor may be read, but in the real-time display will show the sensor type “**Unknown**” and the units as “**raw**”. This sensor is not a valid sensor for use on a CMC network.

The following table lists the allowable tolerance set for each of the sensors permitted on the CMC network:

Model	Family Code	Power Supply Minimum	Data Low Maximum	Data High Minimum
mTS01X	40	4.75	0.25	3.85
mRS001	160	4.58	0.25	3.75
mVM001	161	4.58	0.25	3.75
mCM001	162	4.61	0.25	3.75
mRH001	163	4.66	0.25	3.75
mDI001	165	4.63	0.25	3.75
mTS017	166	4.67	0.25	3.75
mTC001	177	4.47	0.25	3.85
mAM001	178	4.61	0.25	3.75
mTC002	179	4.18	0.25	3.85
mCP001	180	4.36	0.25	3.75
mIP001	181	4.18	0.25	3.75
mDC001	182	4.18	0.25	3.75
mDC002	183	4.18	0.25	3.75
mPHT001	184	4.18	0.25	3.75

3.3 Bus Test

The “**Bus Test**” reports the health of a CMC network. Common network faults such as a partially shorted data bus or open data bus are detected. The EZTester is able to measure insulation resistance between data line and ground wires. The tester also displays the number of sensors being polled by the bus converter and the serial numbers of the sensors being polled.

***** **Caution** *****

The tester displays the sensors that are being polled by the bus converter. This display does not indicate that those sensors are present on the network or responding to the poll request, only that they are present in the bus converters polling list. Individual sensors should be verified using the “**Sensor Test**”.

If “**Bus Test**” is selected and the tester is not connected to the network using the supplied patch cable, the display will indicate:



When the tester is connected to a powered network, one of the following messages will be displayed:

Message	Description
Bus Good	No errors were detected on the bus
Please Wait	Wait while information is being collected
Power Volts Low	The network DC power is below 4.00 VDC
Data Volts Low	The network data line DC level is below 3.90 VDC
Data Stuck Low	The network data line level is stuck in the low state
Data Stuck High	The network data line level is stuck in the high state

The **Up** and **Down** keys can be used to display further information about the network’s performance. The following table describes the available display starting from the status display described above:

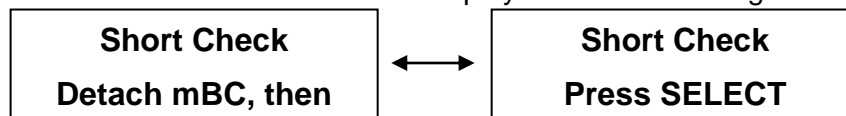
Key	Function	Description
Down 1	No. of Sensors	The number of sensors being polled by the bus converter is displayed

Down 2 -33	Serial Number Display	Displays the serial numbers of the sensors being polled by the bus converter
Up 1	Data Idle Signal Only for mBC081	The data line average voltage. The data line should be above 3.5 VDC. This measurement is irrelevant for bus converter mBC083 and to check data line condition the insulation test must be conducted, described below
Up 2	Data Low	The average value of low level data voltage. Should be below 0.25 VDC
Up 3	Power Signal	The power line average voltage. The power supply should be above 4.5 VDC.
Up 4	Short Check	Data -> Ground insulation test. Bus converter must be disconnected from the network to run this test. Tester will report resistances lower than 1 kΩ. More info below.

Data -> Ground insulation test – as mentioned above the measurement of data idle signal is relevant only for mBC081. This signal is detected by the tester and its value can tell if the data line is shorted or partially shorted to the ground. This signal is not detectable on bus converter mBC083 and the measured data idle doesn't correspond with condition of the network. For this reason there is the insulation test. When the Short Check menu is selected the bottom line will show:

Short Check
Detach mBC, then

The tester will be idle at this menu and Select button will be disabled until the bus converter is disconnected from the network. Then the display will show following:



When Select button is pressed the tester will measure the resistance between the data line and ground wires and if the resistance will be higher than 1 kΩ, which is acceptable, the display will show following:

Not Shorted
R > 1 KOhm

In case that the resistance is lower than 1 kΩ, which means that the network has some issues which should be solved, the display will show the value of the resistance:

Shorted
0-999 Ohm

The values displayed above can be used to further troubleshoot the system. If the display indicates an error, use the standard troubleshooting procedure starting at the first field interconnect box to isolate portions of the network. If the error is corrected when a branch is isolated, the problem will be in that branch. Continue to the next field interconnect box and repeat until the field interconnect box causing the error is found. The sensors in that box can then be individually tested to locate the defective sensor.

3.4 Sensor Emulator

The tester can emulate most CMC sensors. Sensors that can have multiplexed output modes such as the mTS017 and mVM001 will only be emulated as single mode devices. The mTC001 and mTC002 Thermocouple converters cannot be emulated. To emulate a sensor follow these steps:

1. Select "**Emulate Sensor**" from the main menu;
2. The display will indicate:

**Connect sensor
to emulate**

3. Once connected, the display will indicate the serial number of the sensor being emulated;

**166- 0-188- 58
230- 0- 17- 52**

4. After displaying the serial number the display will indicate;

**Connect tester
To bus**

5. Connect the tester to the bus using the supplied cable;
6. The display will now indicate the type of sensor being emulated and the value being sent to the host system;

**mTS011
0.0 C 32.0 F**

7. The **Up** and **Down** keys can be used to change the value. The range of values that can be emulated are dependent on the sensor. Negative values are permitted for some sensors. If the sensor cannot be emulated the display will show;

**Sensor cannot
be emulated**

8. EZTester allows adjusting time delay of 1 wire bus Read Bit (log 1). To enter this setup sensor needs to be emulated and then **<Select>** button needs to be hold, and then **<Up>** key has to be pressed. Display will show the current delay time. The **<Up>** and **<Down>** keys can be used to change the value. Holding **<Select>** button pressed, and then **<Up>** key will return to emulator status.

<p style="text-align: center;">Delay Time 30 us</p>

9. The **<Back>** key will terminate the emulation session.

3.5 Sensor Configuration

The tester can configure the mTS017 Infrared Temperature Sensor, the mVM001 Vibration Sensor, the mCP001 Proximity Capacitor Sensor, mPTH001 Pressure Humidity Temperature sensor and digital grain cables.

To connect digital grain cable special adapter must be used. CMC part number is 12077.

3.5.1 Configuration of mTS017, mVM001, mCP001 and mPTH001

1. Select “**Sensor Config**” from the main menu;
2. The display will indicate:

**Connect sensor
to configure**

3. Once connected, the display will indicate;

**Wait getting
Serial number**

4. Once the serial number has been retrieved the display will momentarily indicate;

**166- 0-188- 58
230- 0- 17- 52**

5. After displaying the serial number the display will indicate;

Getting config
> > > > > > > > >

6. Once the current configuration of the sensor has been read the display will show the values for the sensors configuration parameters. Use the **<Up>** and **<Down>** keys to select the sensor parameter;
7. To change a sensor parameter, first select the parameter using the **<Up>** and **<Down>** keys and then press the **Select** key. A left and right arrow will appear on the display indicating it is in change mode. Use the **<Up>** and **<Down>** keys to set the value and then press the **<Select>** key to confirm the value. The arrows will disappear when the value is confirmed;
8. To save the values to the sensor, use the **<Down>** key until the display indicates;

**Save
Press Select**

9. Press the **<Select>** key to save the new values to the sensor. The display will indicate;

**Saving config
Please Wait**

10. Once the configuration has been saved the display will indicate;

**Configuration
Saved**

11. Press the **<Back>** key to exit sensor configuration.
12. To verify if the configured parameters written correctly, exit menu to top level, and run the function from step 1, and read the parameters out, and check its value.

The parameters that can be configured are fully described in the Technical Manuals for the individual sensors. If “Config to Recalibrate” is selected for mCP001, the sensor will be recalibrated after “Configuration Saved” is pressed, and the other parameters will not be affected by the calibration. It is very important not to press any buttons when the calibration is confirmed and wait till both red and green LED will go off. Calibrated proximity data, and calibrated temperature can be review in this configuration menu for the mCP001 sensor.

3.5.2 Configuration of digital grain cable

To connect the grain cable special cable adapter must be used, CMC part number of that adapter is 12077.

1. Select “**Sensor Config**” from the main menu;
2. The display will indicate:

**Connect sensor
to configure**

3. Once connected, the display will indicate;

**Wait getting
Sensor info**

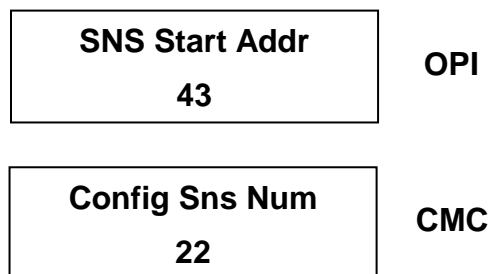
4. Once the information was read the tester will show number of sensors on the cable and manufacturer of the cable as shown;

**22 Sensors
On CMC Cable**

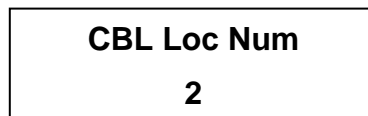
5. When **<Down>** key is pressed configured format will be shown, for example if OPI cable is used and it is configured to work in OPI system the format will be OPI Format but OPI cable can be configured to be in CMC format as well. If CMC cable is used it will show CMC Format. In case the cable was not configured properly it will show Not Configured;



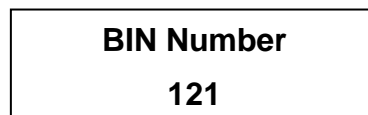
6. When **<Down>** key is pressed number and OPI cable is connected it will show the starting sensor address which might be 1, 22, 43, 64, 85, 106, 127 or 148 and can be configured by pressing **<Select>** key and then change the value and confirm it by **<Select>** again. In case the CMC cable is connected the number of sensors configured in the cable will be presented. For OPI format cable is this irrelevant value;



7. When **<Down>** key is pressed cable location number will be shown. For OPI format cable is this irrelevant value. This value can be changed by pressing **<Select>** key and change it to value from 1 to 36. 36 is the maximum number of cables in one bin. The number is confirmed by pressing **<Select>** key again.



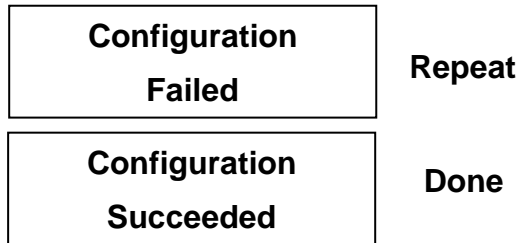
8. When **<Down>** key is pressed Bin Digital number will be shown. For OPI format cable is this irrelevant value. This value can be changed by pressing **<Select>** key and change it to value from 0 to 255. The number is confirmed by pressing **<Select>** key again.



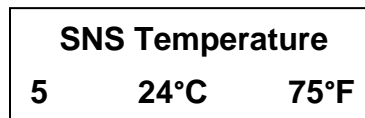
9. When **<Down>** key is pressed menu for cable format configuration will be shown. If different than CMC cable is connected the format can be changed. If CMC cable is connected this can be only CMC format and can't be changed;



10. When **<Down>** key is pressed menu for saving of all setting is shown. In case the configuration is done press the **<Select>** key and wait for confirmation message. If the message will say that configuration failed save it again till you will get message that the configuration succeeded.



11. There is one last part of the menu when **<Down>** key is pressed. This menu can read temperatures on the actual sensors. When **<Select>** key is pressed the number of the sensor can be changed and its temperature will be presented. OPI cable has opposite structure of the sensors than CMC cable. To see what are the positions of the sensors in certain cables see appendix 1.



***** **Caution** *****

This menu doesn't serve as digital grain cable test. Correct reading of temperatures using the EZTester is not indication of 100% healthy cable.

3.6 Battery Gauge

The battery gauge function displays current battery voltage in volt.

<p>Battery Voltage 2.90V</p>
--

The tester uses 2 AA batteries that are located in a battery compartment in the rear of the tester. The tester will remain active even if the battery indicator 2.20V. The sensor reading may not be accurate if the batteries are further discharged. Replace the batteries at 2.20V to ensure you have adequate battery power when the tester is needed.

3.7 Proximity Data

The Proximity Data function displays real time proximity data and temperature for mCP001 sensor.

1. Select “**Proximity Data**” from the main menu;
2. The display will indicate:

**Connect sensor
to Read**

3. Once the serial number has been retrieved the display will momentarily indicate;

**180- 0- 0- 6
193-100- 54-124**

4. After displaying the serial number the real time Proximity Data and Temperature display will indicate.

**Proximity Data
18560 23C**

3.8 Cable Insert Test CMC internal use only

The Cable Insert Test function detects how many DS28EA00 sensors connected on the cable.

1. Prepare a mDC001 hardware board installed the mDC001F firmware.
2. Connect the cable tested to the first cable connector.
3. Connect mDT001 Easy Tester with the mDC001 board.
4. Turn on mDT001 Easy Tester, and choose “Cable Insert Test function”
5. Press **<Select>** button, and wait for a while, it will show the number of sensors connected on the cable.

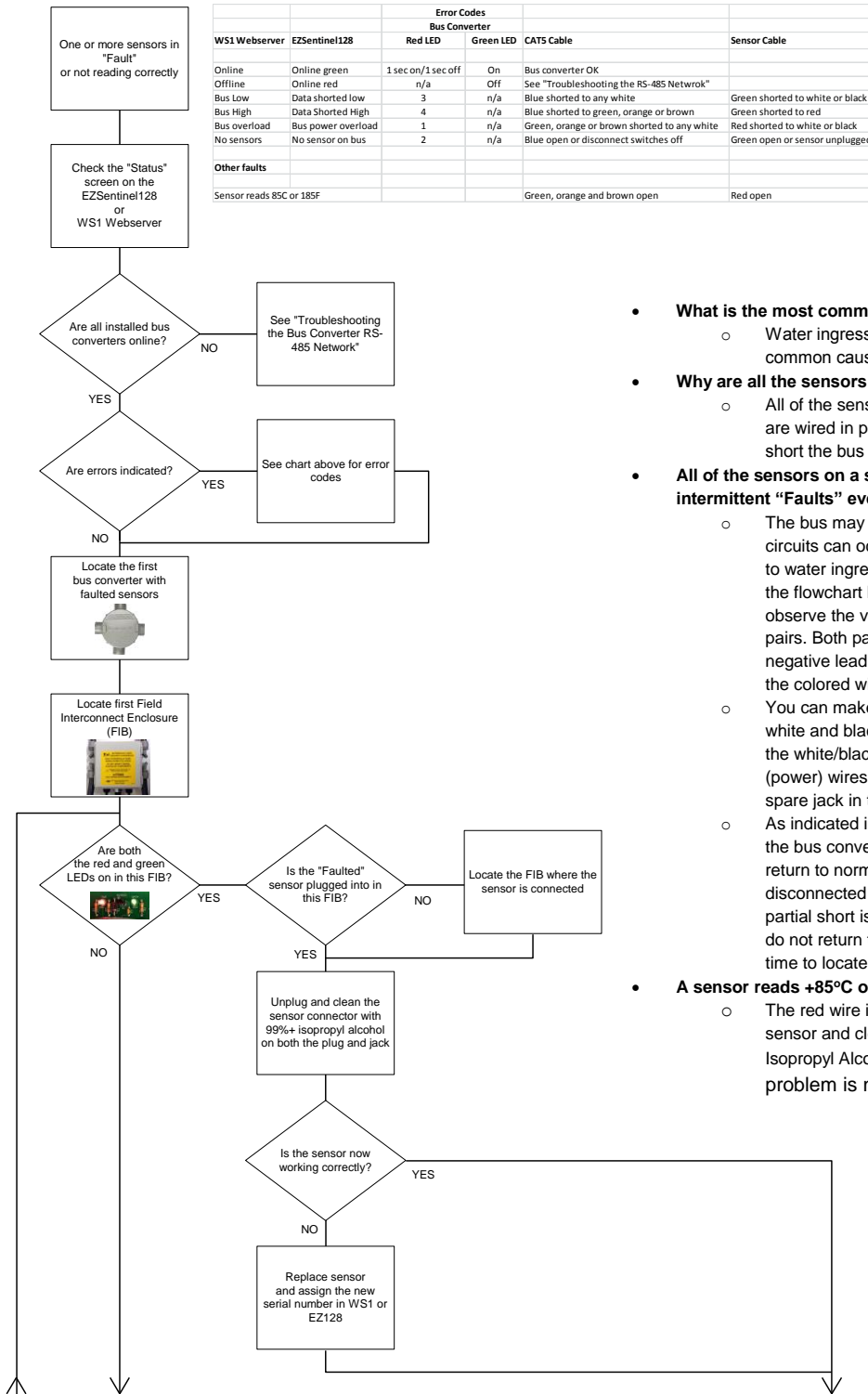
4. Troubleshooting Tips

The tester can only locate sensors that are faulted when they are connected to the tester. Sensors that are intermittent can be more difficult to locate. Here are some tips to assist you in locating problems:

1. Use the tester as soon as a fault occurs, as it is more likely the fault will be present when you connect the tester.
2. In most cases, you do not need to use the tester to locate a bad sensor or wiring on the network. The basic branch isolation technique is the easiest and fastest way to locate the fault. The sensor test "**Bus Test**" can be deployed when a partially faulted sensor is disrupting the network intermittently. The "**Bus Test**" measures the signal levels on the cable system and reports if a sensor is loading the system. The traditional isolation techniques can then be used to locate the sensor that is loading the system. The sensor can then be verified using the "**Sensor Test**" function to confirm it is defective.
3. The "**Sensor Test**" function can also be used to verify sensors during the installation. It is especially useful for speed sensors where the sensors reading can be immediately compared to a handheld tachometer at the source.
4. The "**Bus Test**" function can also be used to verify that the expected serial numbers are being polled by a bus converter. Once a system is commissioned and the sensor located using the acquire function, the "**Bus Test**" function will display the sensors being polled by the bus converter. If a sensor is being polled but is not responding then the wiring to the sensor and the sensor itself should be verified.

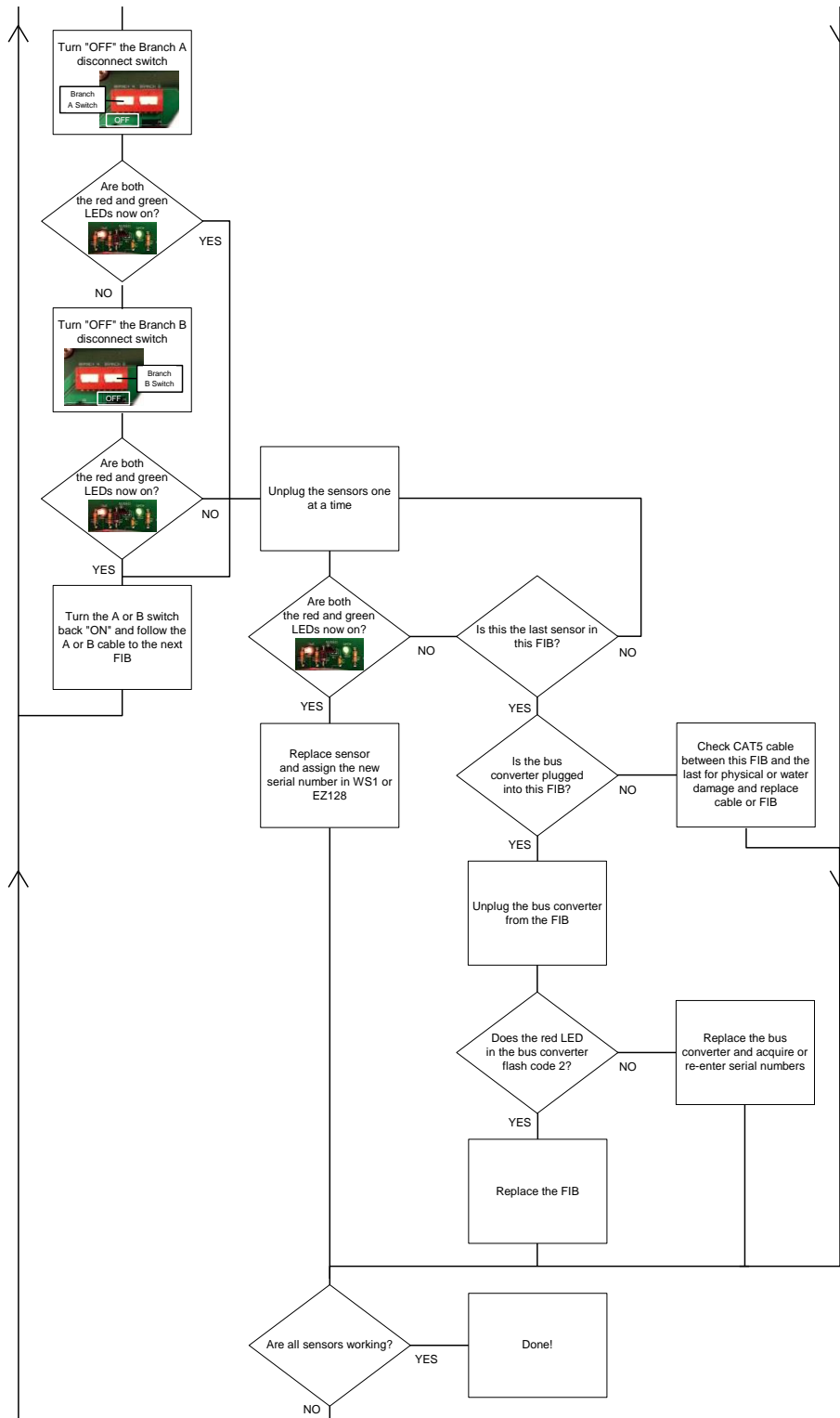
A copy of the standard network troubleshooting guide is included with this manual. A full sized laminated version is available from our sales office on request.

5. Troubleshooting charts



FAQ's

- **What is the most common cause of "Faults"?**
 - Water ingress into the wiring or FIB's is the most common cause of "Faults".
- **Why are all the sensors on a bus converter "Faulted"?**
 - All of the sensors on a CMC Intrinsically Safe network are wired in parallel. A short circuit on one sensor can short the bus and "Fault" all of the sensors.
- **All of the sensors on a single bus converter are indicating intermittent "Faults" every once in a while?**
 - The bus may have a partial short circuit. Partial short circuits can occur after severe electrical storms or due to water ingress in the wiring. Follow the procedure in the flowchart but instead of observing the LED's, observe the voltage on the blue/white and green/white pairs. Both pairs should have 4-5VDC present, with the negative lead on the white wire and the positive lead on the colored wire.
 - You can make a test cable from an old sensor. Join the white and black wires together and measure between the white/black wires and the green (data) and red (power) wires. The test cable can be plugged into a spare jack in the FIB for testing.
 - As indicated in the flow chart, start at the first FIB after the bus converter and work outwards. If the voltages return to normal when the outbound cable(s) is disconnected using the disconnect switches, then the partial short is further down the network. If the voltages do not return to normal, disconnect the sensors one a time to locate the partial short.
- **A sensor reads +85°C or +185°F, what is wrong?**
 - The red wire in the sensor cable is open. Unplug the sensor and clean both the plug and jack with 99% Isopropyl Alcohol. Replace the sensor if the problem is not resolved.



6. Specifications

Description	Characteristic
Sensor bus Voltage Current Communications	5 VDC 5.0 mA max CMC Intrinsically Safe Bus
Power Supply Battery	2 x AA
Environment Temperature Relative Humidity	-20 to 50°C (-5 to 120°F) 5 to 95% non-condensing
Dimensions Length Width Depth 10°	140mm (5.5in) 80mm (3.3in) 25mm (1.0in)

Appendix 1 – Position of #1 sensor while reading by EZTest

