WS2
Operator Interface

Document No. 12035 Revision A04
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Revision Notes

Initial Release - December 2016

A01 – Modbus Appendix Changed

A02 – Modbus Data structure modified

Ethernet IP Data structure added

Modification of existing interface to match the newest release

A03 – Modbus/Ethernet IP limitation of connected units added

Power disconnection description added

Ethernet IP commands added

A04 - Import setup from WS1 CMC Web Server

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1. Overview

The WS2 is an operator interface and web server that can configure, display, and data log up to 256 process sensors on a desktop PC equipped with commonly available web browsers. No additional software is required. Remote I/O to control machine running input signal can be connected. In comparison to the previous generation of CMC web server the new generation can show a real system which is set by user to fit to its needs.

Each machine in the real system can be represented by picture which will fit the real machine the best. On the picture can be assigned all necessary sensors on their real position. This allows user to see the system as real as possible. In case there is not suitable picture for some machine, user can upload own suitable picture.

Up to four alarms for each display position can be entered. The Interface has both external contact and e-mail alerts, and is provided in a din rail mount enclosure.

The Interface can service up to 8 CMCIEL mBC08x Bus Converters over an RS485 network. Each Bus Converter can process 32 CMCIEL digital sensors. Bus Converters are available for both Industrial/Commercial and Intrinsically Safe hazardous area environments. A complete line of pre-packaged process sensors is available. The wiring system is fully specified and includes field interconnect components. In addition to the web server, the Interface has a Modbus TCP/IP Slave interface for connection to remote PLC and computer systems. Web server also supports Ethernet IP Slave interface. Both, Modbus and Ethernet IP, work in bidirectional way – web server can be controlled through the interfaces. This creates limitation on number of units which can connect to the web server through the interfaces. The number of units which can be connected is limited to 1.

The new generation of web server is able to record and maintain data from all sensors for maximum of two years when system fully loaded (8 bus converters, each with 32 sensors).

Caution: This device contains electronic components that can be damaged by static discharge. Proper ESD handling procedures should be observed at all times.

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2. Description of Connections, Switches and Indicators

Figure 1 - Keypad and Indicators

ID	Label	Description of Connection
POWER SUPPLY		
A	24 VDC	Apply SELV/PELV 24 VDC (min 1.5A), see specs in section 6
B,C	GND	Ground
MODBUS 1		
D	24 VDC	Power connection for the mBC08x Bus converter
E	DATA +	Data High connection for the mBC08x Bus Converters
F	SHIELD/EARTH	Earth Ground connection for the mBC08x Bus Converters
G	DATA -	Data Low connection for the mBC08x Bus converter
H	GND	Ground connection for the mBC08x Bus converter
MODBUS 2		
I	24 VDC	Power connection for the mBC08x Bus converter
J	DATA +	Data High connection for the mBC08x Bus Converters
K	SHIELD/EARTH	Earth Ground connection for the mBC08x Bus Converters
L	DATA -	Data Low connection for the mBC08x Bus converter
M	GND	Ground connection for the mBC08x Bus converter
SWITCHES		
N	ACK	Acknowledge all alarms conditions, turns off Horn and Alarm relays and stops email alerts until a new warning, alarm, or system event occurs FOR ADDITIONAL FUNCTIONALITY SEE “BUTTONS” TABLE BELOW
O	COM	Common connection for ACK and Silence switches
P	SILENCE	Turns off Horn relay if currently active FOR ADDITIONAL FUNCTIONALITY SEE “BUTTONS” TABLE BELOW
ALARM CONTROL		
Q	NC	Normally Closed connection for the Alarm relay
R	COM	Common connection for the Alarm relay
S	NO	Normally Open connection for Alarm relay
HORN CONTROL		
T	NO	Normally Open connection for Horn relay
U	COM	Common connection for Horn relay
V	NC	Normally Closed connection for Horn relay
ETHERNET		
X	Ethernet	Ethernet connection

TERMINATION		
W	TERMINATION	Terminate mBC08x connection OFF ← • → ON Note: Each device at the end of RS485 Modbus line has to have the termination switch on.

INDICATORS

POWER	- Indicator of WS2 power
LINK	- Indicator of data flow on RS485 line (Modbus). May light continuously, depending on poll rate
STATUS	- Indicates problem on the RS485 line
MODBUS CONN.	- Red LED indicates if the Modbus output is connected. When connected LED is on

BUTTONS

Combinations of the buttons and their commands

Note: *ACK, SILENCE and ACQUIRE buttons have to be hold for at least 1s to function, all other buttons have to be hold for 5s*

B1	B2	B3	ACK	SILENCE	COMMAND
PRSD	PRSD	PRSD			POWER OFF
PRSD		PRSD			REBOOT
PRSD	PRSD				STOP
PRSD					START
	PRSD	PRSD			ACQUIRE
	PRSD				TEST ALM
		PRSD			TEST HORN
			PRSD		ACK
				PRSD	SILENCE
PRSD			PRSD	PRSD	IP DEFAULT RECOVERY

Commands functionality description:

Power Off: Turns off web server.

Reboot: Reboots web server.

Stop: Stops Modbus service and disconnects Modbus outputs.

Start: Starts Modbus service and connects Modbus outputs.

Acquire: Sends command to all connected bus converters to acquire connected sensors.

Test ALM: In case Modbus service is running the alarm relay will turn on for 5s. In case the Modbus service is off the relay will turn on and off in 1s intervals five times. For test from interface see section 4.10.5.1 Alarm and Horn Test

Test Horn: In case Modbus service is running the horn relay will turn on for 5s. In case the Modbus service is off the relay will turn on and off in 1s intervals five times. For test from interface see section 4.10.5.1 Alarm and Horn Test

ACK: Acknowledges all alarm conditions, turns off Horn and Alarm relays and stops email alerts until a new warning, alarm, or system event occurs.

SILENCE: Turns off the Horn relay if currently active

IP Recovery: Sets factory default IP address 192.168.1.111

3. External Connections

The WS2 provides connections for mBC08x bus converters, Ethernet, input switches and output alarm.

Caution: This device contains electronic components that can be damaged by static discharge. Proper ESD handling procedures should be observed at all times.

3.1 Ethernet Connection

The WS2 is connected to a single computer or a Local Area Network using standard CAT5 cable.

Figure 2 - Ethernet connection

3.2 Alarm Outputs

Two dry contact relay outputs are provided. They are configured separately and work independently. Although not limited to these uses, one is nominally intended as an alarm output for sensing by a remote system, while the other is intended to operate a horn or Sonalert®.

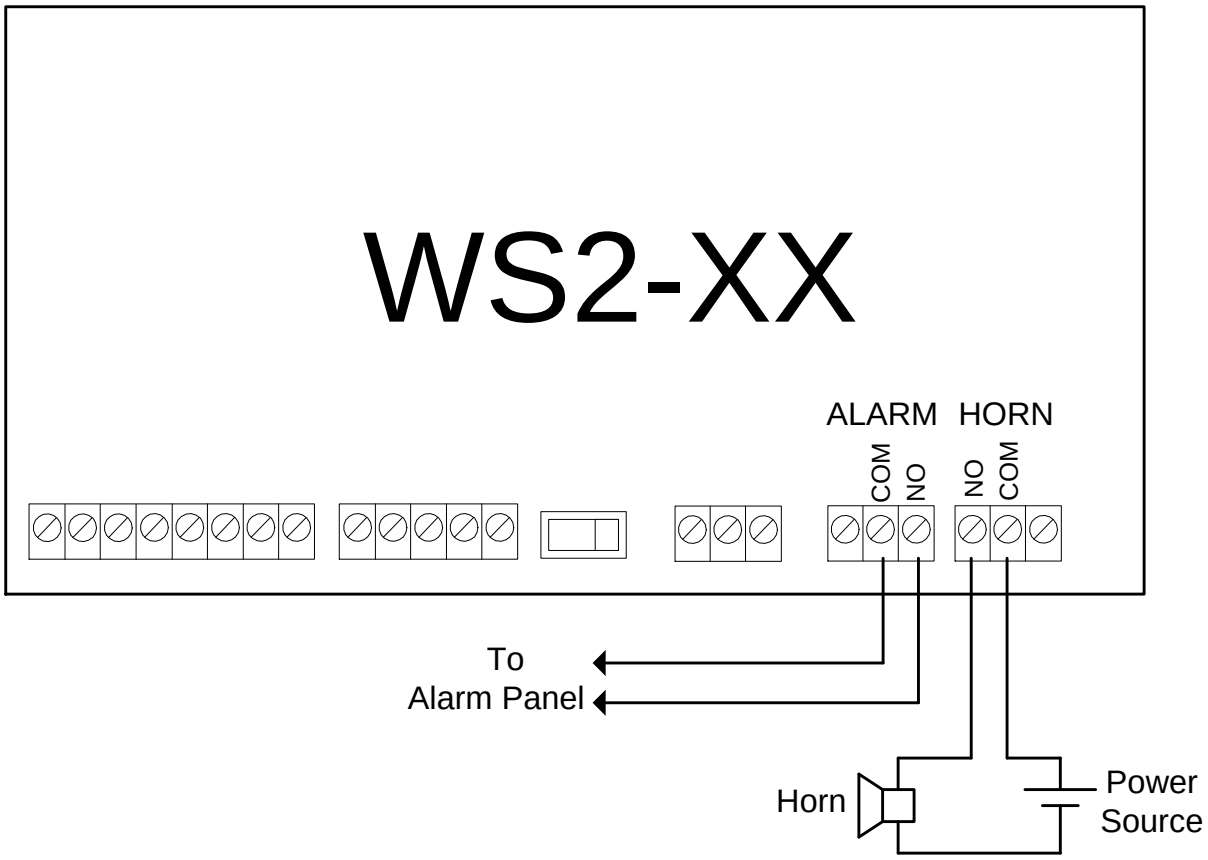


Figure 3 - Suggested Alarm Connection

3.3 Input Switches

Connections are provided to allow the user to acknowledge alarms and silence the horn remotely. The ACK (Alarm Acknowledge) input turns off both relays and suppresses email messages pertaining to any existing warnings, alarms, and system events. The SILENCE (Silence Horn) input turns off the Horn Contact relay only, and does not affect the email system.

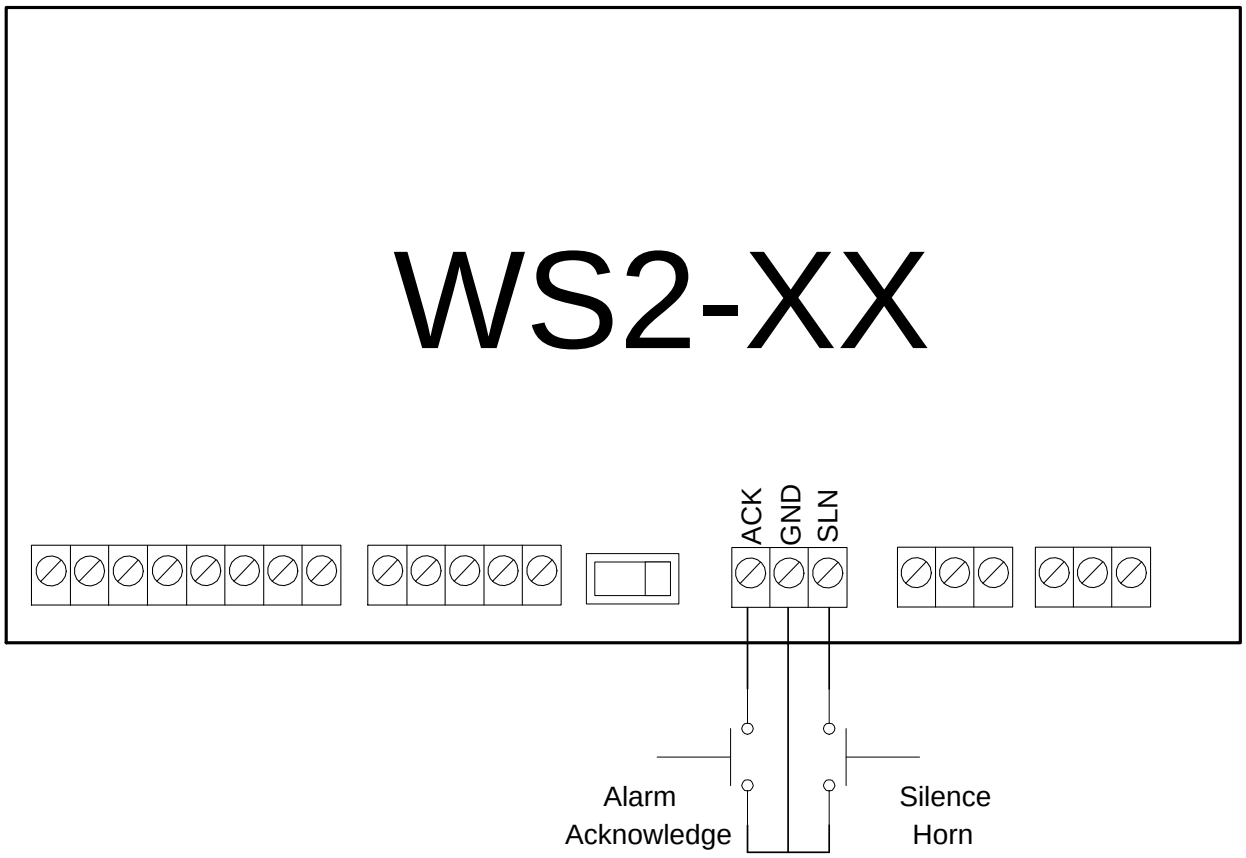
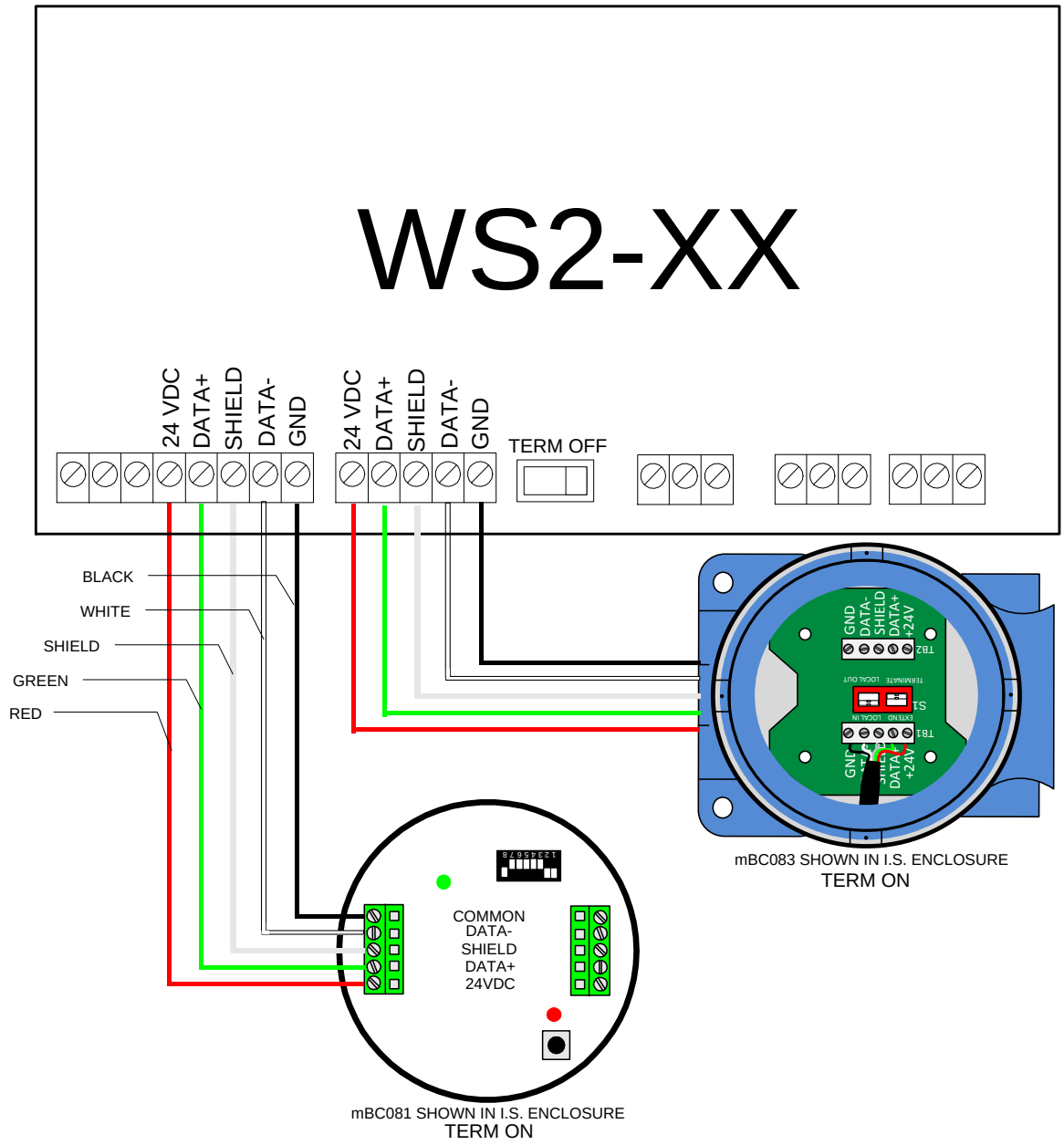


Figure 4 - User Input connections

3.4 Bus Converters

mBC08x bus converters are to be connected using two pair (4-conductors) shielded cable as shown in Figure 5. The best practice is to have one pair for data and one pair for power.



WIRE COLORS SHOWN ARE FOR BELDEN 8723 - 2 PAIR 22 AWG CABLING
USE WIRE SIZE CALCULATOR AT www.cmciel.com TO DETERMINE REQUIRED WIRE SIZE
CABLE SHIELD SHOULD BE CONNECTED TO GROUND ONLY AT THIS INTERFACE

TERMINATION SWITCH ON BUS CONVERTERS SHOULD BE ON AS THEY ARE THE LAST PHYSICAL DEVICES ON THE RS485 LINE, TERMINATION SWITCH ON WEB SERVER SHOULD BE OFF

Figure 5 - Bus Converter Connections

Note: Only Bus Converters with their address switches set to an address between 1 and 8 will be detected by the WS2.

3.5 DC Power Connection

As a power source for WS2 must be used SELV or PELV power supply with output +24 VDC to meet requirements for intrinsically safe bus converters which are powered from the web server. CMC recommends using power supply P/N *DRP-24V48W1AZ.* Always follow instructions provided by the manufacturer of the particular power supply to achieve proper installation.

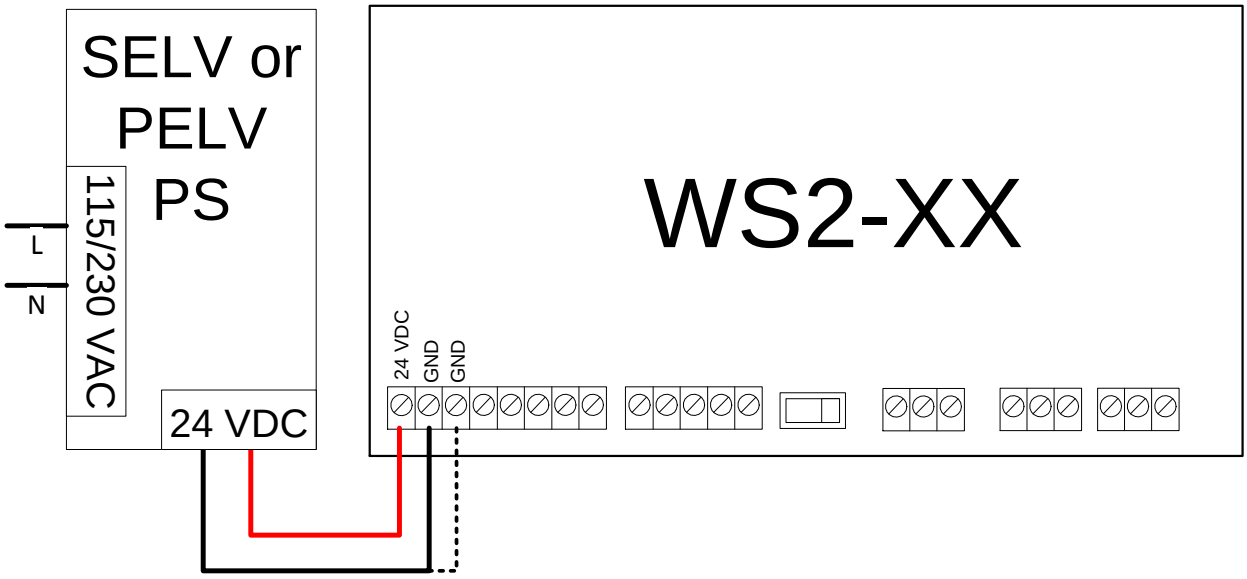


Figure 6 - DC Power Connections

3.5.1 Disconnecting power

When power is disconnected from the web server, it will maintain certain level of power for couple minutes. This is thanks to big capacitors installed on the input for the power supply. These big capacitors are also a reason for a relatively big current (around 2 A) during startup.

Reason for such a behavior is to protect the database. Web server is constantly writing data into its internal hard drive. In case there is a power outage and the web server would drop the power immediately in the middle of record saving, the database will become corrupted. The capacitors provide enough power for the web server to finish the record. Decreasing voltage on the capacitors will create an interrupt which will cause the web server to finish the last record and not to start a new one.

If the **power** is disconnected for some maintenance or installation reasons the web server **should be disconnected** from the power **for at least 5 minutes** to let the capacitors fully discharge. **Otherwise it won't start up**. Unit should be always powered down before disconnecting the power from it. To power the unit down all three buttons on the top side of the web server have to be pressed down for at least 5 seconds. For more information see chapter 2 Description of Connections, Switches and Indicators, section Buttons.

4. Web Server

The web server WS2 provides interface for the HazMon system configuration such as real time machine displaying, system monitoring, alarms configuration and logging the process values.

4.1 IP Address

The default IP address of the WS2 is 192.168.1.111. When you type 192.168.1.111 into the address bar of your Internet browser, the WS2 will display the login screen. Configuration of the Interface, including the desired IP address, is performed after logging in.

4.2 Login

There is factory default login and password for the first login:

LOGIN – cmcadmin

PASSWORD – P@ssw0rd

Administrators should change these default IDs and passwords during initial configuration of the Interface, and as often thereafter as deemed necessary. Note that login IDs and passwords are case-sensitive.

Keep the administrator ID and password in a secure location. It is not possible to reconfigure the Interface without them. Reloading the factory default settings may restore access to the Interface, but all previously entered setup data will be erased.

4.3 User Roles

5 different user roles can be chosen, each with different set of rules.

4.3.1 System Administrator

All possible rights

4.3.2 IT Administrator

Host Configuration rights, no alarm acknowledgment, no system setup, user rights and settings view

4.3.3 Configuration

Machines configuration only

4.3.4 Advanced Operator

Alarms can be acknowledged, no configuration allowed

4.3.5 Operator

Only for observation

4.4 Logging Out

All users are automatically logged out of the Interface when the browser window containing the Interface is closed or if “Logout” button on the top right corner of the screen is pressed.

4.5 Password Reset

When password was forgotten, CMC Industrial Electronics has to be contacted to provide confirmation code for password reset. MAC address of the web server has to be obtained before contacting CMC. CMC will provide confirmation code based on the provided MAC address. Customer can then generate login and password based on this confirmation code.

To obtain the MAC address, enter "/index.php" after your IP address in web browser so the whole address will look like this example: *http://192.168.1.111/index.php*; or click on "System" sign on top of any page on the web server. Following page is going to appear, Figure 8.

On this page the MAC address can be obtained. CMC will then provide the confirmation code which will be entered on the same page. After entering the confirmation code new login and password will be generated. This login and password will be used in regular login page, user will be then asked to enter current password which will be the generated password and then create a new one.

Figure 7: Access to MAC Address link

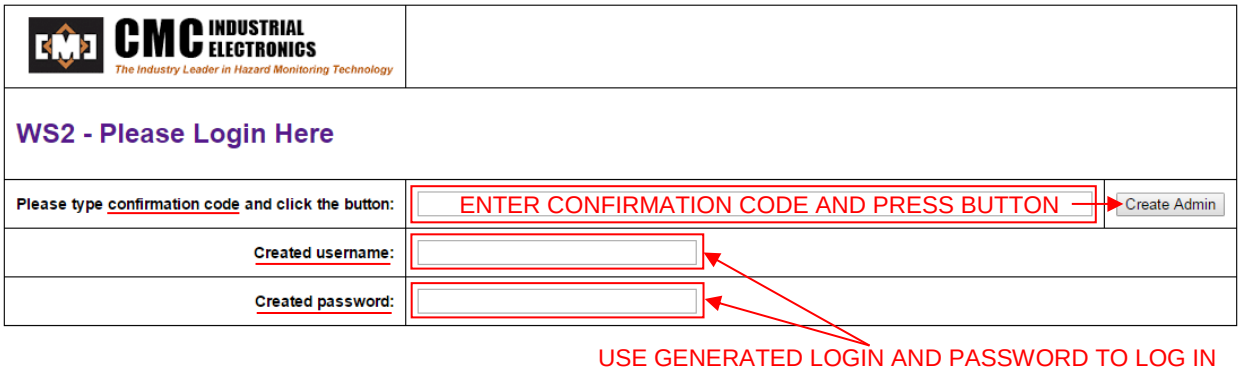


Figure 8: Forgotten Password, MAC Address, New Login and Password

4.6 Dashboard

Dashboard is a main page where all set machines and their status can be seen. Status of machines is represented by the way they are shown, see section 4.7.1. To see dashboard with all set and active machines click on Dashboard button or Machines link

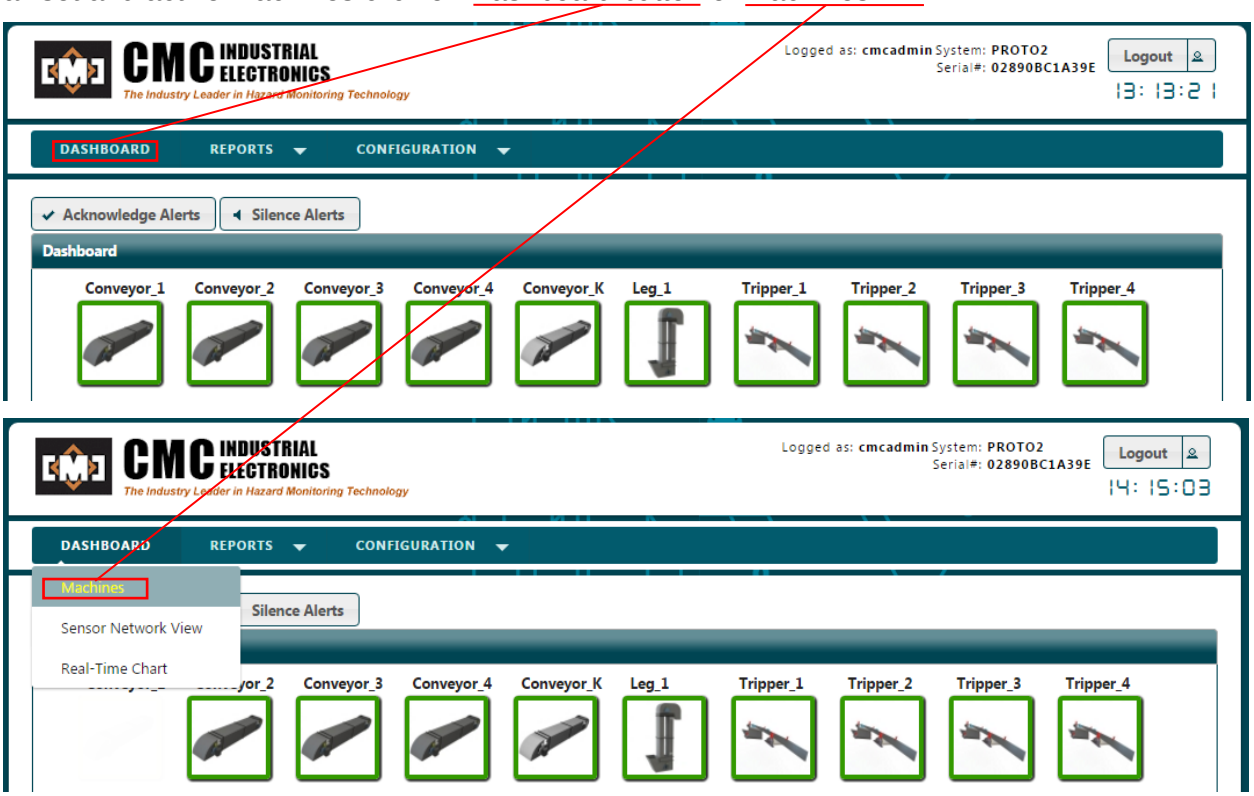


Figure 9 – Dashboard access

4.6.1 Machine Status Representation on Dashboard

Each machine is represented by a picture of machine and by colorful frame. The frame represents a status of the machine. There can be three different statuses on the machine:

- **No alarm**, **no warning**. In this case the frame is green and the picture is solid.

- **Low/High Warning**. In this case the frame is yellow and the picture is blinking

- **Low/High Alarm**. In this case the frame is red and the picture is blinking

- **Sensor fault.** In this case the frame is purple and the picture is blinking

- **No sensor on machine is active or no sensor is read.** In this case the frame and the picture is greyed out and solid

4.6.2 Recent Alert History

On the dashboard are shown all recent system events. In Recent Alert History is following information:

Machine	Position	Value	Reference	Rate of Rise	Units	Alerts	Description	Event Time
Conveyor_3	Rubber4	150.01	74.75		Deg. F		Sensor test	Jun 30, 14:15:06
Conveyor_1	Rubber2	74.07	150.01		Deg. F		Ref.Sensor test	Jun 30, 14:15:01
Conveyor_3	Rubber4	150.01	74.75	Δ 75.6	Deg. F		Rate of rise+Sensor test	Jun 30, 14:15:01
Conveyor_3	Rubber4	150.01	74.64		Deg. F		Sensor test	Jun 30, 14:09:42
Conveyor_3	Rubber4	150.01	74.75	Δ 75.94	Deg. F		Rate of rise+Sensor test	Jun 30, 14:09:29
Conveyor_1	Rubber2	73.85	150.01		Deg. F		Ref.Sensor test	Jun 30, 14:09:29
Conveyor_3	Rubber4	185	74.75	Δ 63.22	Deg. F		Rate of rise	Jun 30, 14:06:40
Conveyor_3	Rubber4	93.88	74.64	Δ 32.62	Deg. F		Rate of rise	Jun 30, 14:04:37
Conveyor_3	Rubber4	120.54	74.64	Δ 17.89	Deg. F		Rate of rise	Jun 30, 14:01:25
Conveyor_3	Rubber4	79.93	74.64	Δ 15.86	Deg. F		Rate of rise	Jun 30, 14:01:21
Conveyor_3	Rubber4	96.57	74.64	Δ 6.53	Deg. F		Rate of rise	Jun 30, 13:59:40
Conveyor_3	Rubber4	100.51	74.64	Δ 18.23	Deg. F		Rate of rise	Jun 30, 13:57:50
Conveyor_3	Rubber4	112.78	74.64	Δ 25.99	Deg. F		Rate of rise	Jun 30, 13:50:54
Conveyor_3	Rubber4	185.79	74.64	Δ 45.79	Deg. F		Rate of rise	Jun 30, 13:48:26

Figure 10: Recent Alert History Table

- Machine – Machine to which the particular sensor is assigned to
- Position – Position to which is the sensor attached on that particular type of machine
- Value – Real time data on the sensor
- Reference – Real time data on reference sensor
- Rate of Rise – Shows the absolute value of rise of sensor value if Rate of Rise alarm is enabled. Value in the table shows how much the sensor value raised compare to the last measured point which is set user or compare to last point which triggered rate of rise, delta.

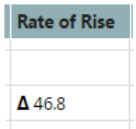


Figure 11: Rate of Rise

- Units – Units in which the sensor value is presented
- Alerts – Shows signs of alarms in present.

▲	High Alarm

	Low Alarm
	High Warning
	Low Warning
	Rate of Rise

- Description – In description column are shown events which are in present on sensor at the time when another event appeared or disappeared. On following example are recent alert on one sensor. First event on the sensor was Low alarm and then two another one occurs so there is a new record of it. Then those two new disappeared again and this is recorded as well. Basically any difference in events is recorded.

Machine	Position	Value	Reference	Rate of Rise	Units	Alerts	Description	Event Time
Conveyor_1	Bearing1	74.2	73.4		Deg. F		Low alarm	Jul 14, 10:26:01
Conveyor_1	Bearing1	74.2	150		Deg. F		Low alarm+Relative low alarm+Ref.Sensor test	Jul 14, 10:25:01
Conveyor_1	Bearing1	74.2	73.4		Deg. F		Low alarm	Jul 14, 10:24:10

Figure 12: Sensor Events Description

- Event Time – Time and date when the event occurred

Amount of shown records can be restricted by time span set in Configuration->System->Settings. It can be set from 4 to 48 hours. The number of records is also restricted by maximum number of 512 records. This doesn't restrict recorded data in database, all events are recorded.

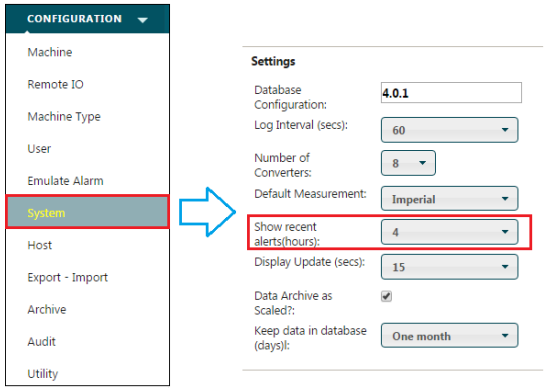


Figure 13: Recent Alert Display Span

4.6.2.1 Stop Refresh

The recent alert history is automatically updated approximately every 5 seconds. This can be disturbing in case user wants to search for certain alarm in the table and review it. In this case Stop Refresh check box should be checked to stop the automatic update of the table. This affects only alerts which are displayed, not actual record of alerts in database.

4.6.2.2 E-Mail Recent Alerts

All recent alerts can be emailed to the user which is currently logged in. To receive list of recent alerts press button E-Mail Recent Alerts

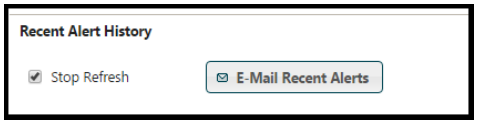


Figure 14: Stop Refresh checkbox & E-Mail Alerts button

4.6.2.3 Enable E-Mail

In case the button for E-Mail Recent Alerts is grayed out it means that this functionality was not enabled. To enable it go Configuration->System. In E-Mail section check checkbox Enabled as is on figure 11 and then press button save on the bottom of that page.

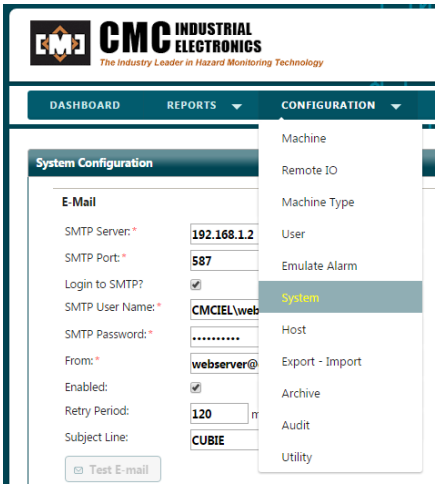


Figure 15: Enable E-Mail Alerts setup access

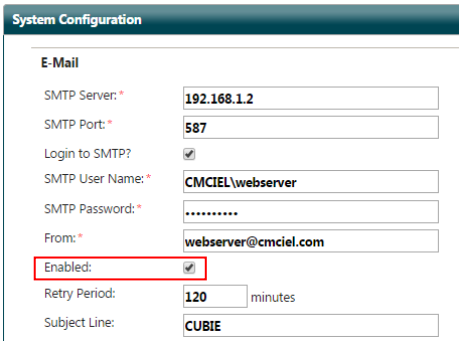


Figure 16: Enable E-Mail Alerts

4.6.3 Acknowledge Alerts

All alarms can be acknowledged by Acknowledge Alerts button on a dashboard. The Acknowledge Alert button turns off both relays and suppresses email messages pertaining to any existing warnings, alarms, and system events. The same functionality has ACK input described in section 3.3.

Alerts can be also acknowledged by setting certain command registers in Modbus or Ethernet IP protocols. For more information see Appendix 1 (Modbus) and Appendix 2 (Ethernet IP)

4.6.4 Silence Alerts

Horn can be silenced by “Silence Alerts” button on a dashboard. The “Silence Alerts” button turns off the Horn Contact relay only, and does not affect the email system. The same functionality has SILENCE input described in section 3.3.

Alerts can be also silenced by setting certain command registers in Modbus or Ethernet IP protocols. For more information see Appendix 1 (Modbus) and Appendix 2 (Ethernet IP)

4.6.5 Machine View

Each machine can be shown in detail with all assigned sensors when clicking on the machine icon (picture) on dashboard.

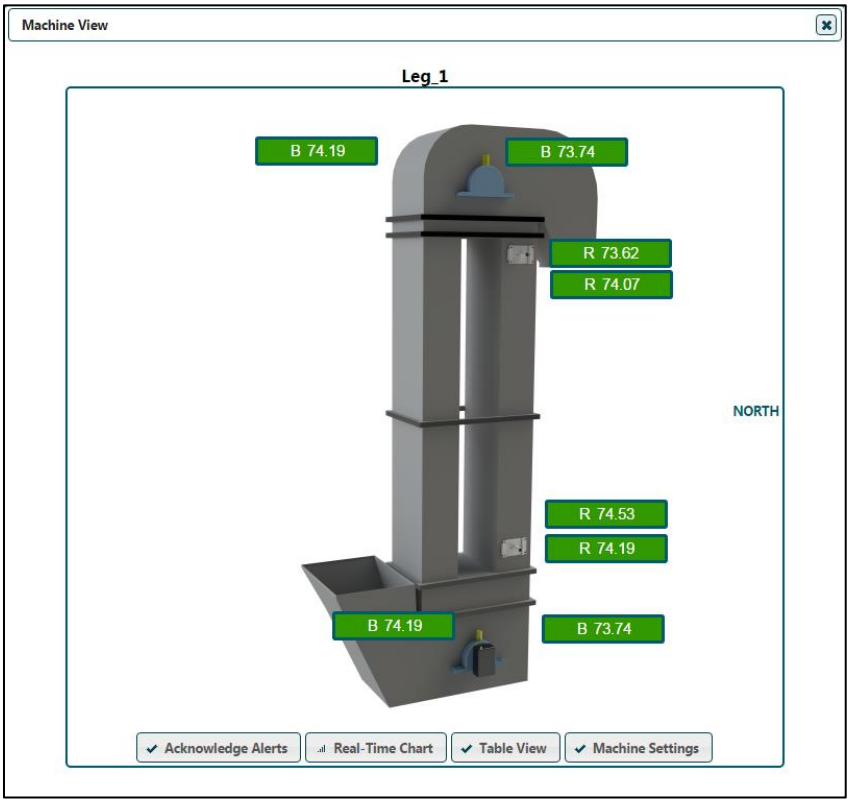


Figure 17: Machine View Example

When clicked on the machine icon on dashboard, new window “Machine View” will open. On machine are shown all assigned sensors with current values in real time. To see how to assign sensors and their types see section 4.10.1 Machine. When clicked on the rectangle with sensor value “Display Table Alerts” will open. On this screen can be seen history of data of the particular sensor. Data are presented in a table and also in a chart. History of shown data is 1.5 hour. On the screen is button to refresh the data because it is not refreshed automatically. The data can be saved as CSV file and chart can be saved as a picture. When clicked on E-Mail, picture and data will be sent to email of logged user.

Time	Value	Reference	Rate of Rise	Units	Description	Since Last Event	Remote IO Machine	Remote IO Position
2016-07-04 15:29:01	73.29			Deg. F		00:38:26		OFF
2016-07-04 15:28:02	73.29			Deg. F		00:37:27		OFF
2016-07-04 15:27:00	73.29			Deg. F		00:36:25		OFF
2016-07-04 15:26:02	73.4			Deg. F		00:35:27		OFF
2016-07-04 15:25:01	73.51			Deg. F		00:34:26		OFF
2016-07-04 15:24:01	73.51			Deg. F		00:33:26		OFF
2016-07-04 15:23:02	73.74			Deg. F		00:32:27		OFF
2016-07-04 15:22:01	73.74			Deg. F		00:31:26		OFF
2016-07-04 15:21:01	73.74			Deg. F		00:30:26		OFF
2016-07-04 15:20:02	73.85			Deg. F		00:29:27		OFF
2016-07-04 15:19:01	73.96			Deg. F		00:28:26		OFF
2016-07-04 15:18:00	73.96			Deg. F		00:27:25		OFF
2016-07-04 15:17:02	73.96			Deg. F		00:26:27		OFF
2016-07-04 15:16:01	73.96			Deg. F		00:25:26		OFF

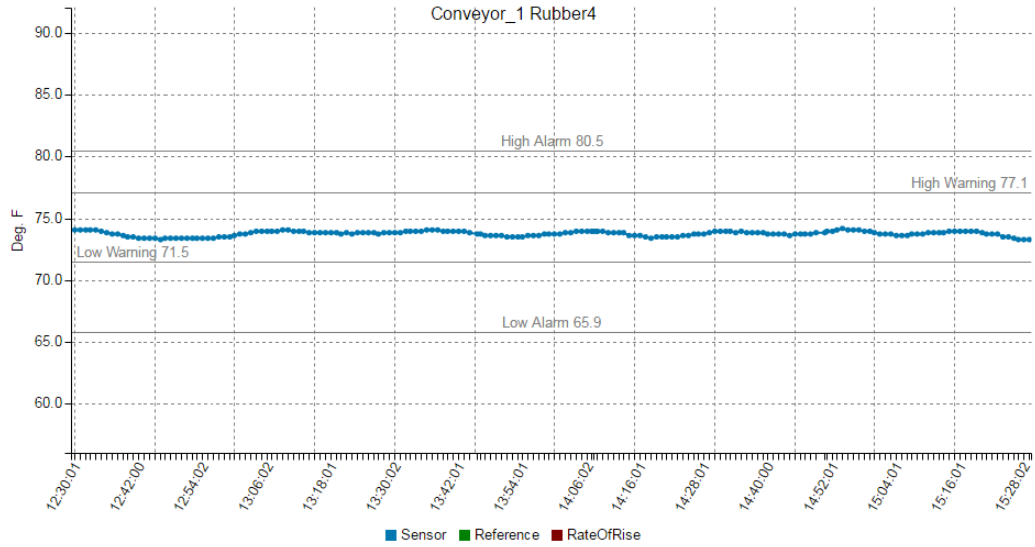


Figure 18: Display Table Alerts Example

In data table are following information:

Time: Time and date of record

Value: value of sensor at the time

Reference: value of reference sensor at the time

Rate of Rise: if rate of rise was presented at the recorded time it will be presented at this column with value which it raised for

Units: Units in which the sensor value is presented

Description: description of recent events to be acknowledged at the time

Since Last Event: measured time from last event

Remote IO Machine: if IO is assigned to the machine it will show in this column if it is on or off

Remote IO Position: if IO is assigned to a position it will show in this column if it is on or off

Acknowledge Alerts

In the “Machine View” window, acknowledgment of alerts can be done by clicking on “Acknowledge Alerts” button on the bottom of the window.

Real-Time Chart

By clicking on button “Real-Time Chart” can be shown all values on all sensors in real-time chart. This topic is described in detail in section Real-Time Chart

Table View

When clicked on button “Table View” will show another way of data on certain machine. This option shows all sensors on certain machine in table. The data can be also exported as CSV file over an email or save as a CSV file. This can be done by buttons “Save To CSV” and “E-Mail”. These buttons are on the bottom of that page.

On the page are shown following data:

- # – Type of sensor and position in order
- Position – Name of position to which the sensor is assigned to. Not Active is shown in brackets in case the sensor is not activated.
- Units – Units in which the sensor is presented
- Value – Real time data from the sensor
- Reference – Real time value from reference sensor
- Rise - Shows the absolute value of rise of sensor value if Rate of Rise alarm is enabled
- Remote IO Machine – If machine assigned to the sensor through remote IO is on or off
- Remote IO Position – If position assigned to the sensor through remote IO is on or off
- Alerts – Any alerts in present in the real time
- Since Last Event – Counting time on particular sensor from the last event on the sensor. By event is considered any alarm or warning, fault, reference alarms or faults
- Acknowledge – Shows alarms to be acknowledged
- Time – Actual time when events in present

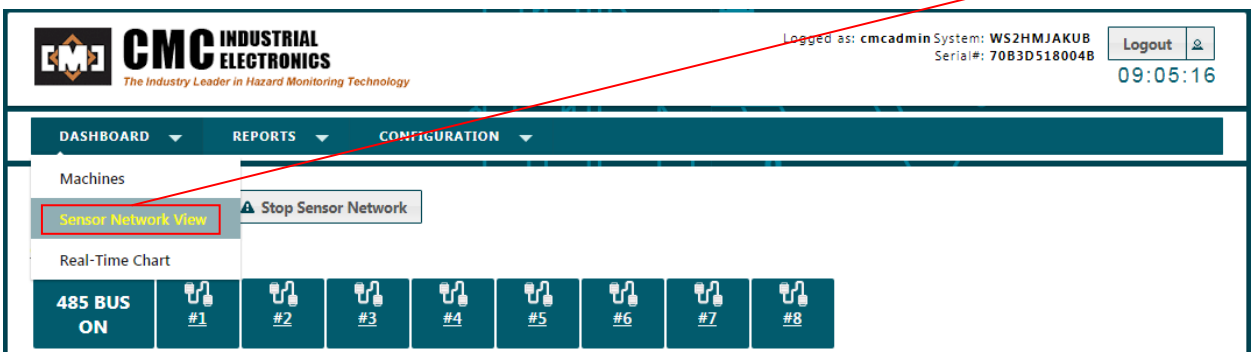
#	Position	Units	Value	Reference	Rise	Remote IO Machine	Remote IO Position	Alerts	Since Last Event	Acknowledge	Time
B (1)	Bearing1	Deg. F	**74.53**						73:12:08		15:16:30
B (2)	Bearing2	Deg. F	**75.43**						73:12:08		15:16:30
B (3)	Bearing3	Deg. F						Missing Sensor	55:10:55	Missing Sensor	15:16:30
B (4)	Bearing4	Deg. F	**73.85**	**74.41**					73:12:08		15:16:30
R (5)	Rubber1	Deg. F	**74.07**	**74.41**					73:12:08		15:16:30
R (6)	Rubber2	Deg. F	**74.07**						73:12:08		15:16:30
R (7)	Rubber3	Deg. F	**74.75**						73:12:08		15:16:30
R (8)	Rubber4	Deg. F	**236.19**	**74.75**	**86.18**			Rate of rise	00:00:02	Rate of rise+Sensor test	15:16:30
S (9)	Speed1 (Not Active)	RPM									

Figure 19: Machine Table View

Last button on the “Machine View” page is “Machine Settings”. By clicking on the button window where all machine settings can be done will be open. For more information for this setting menu see section 4.10.1 Machine Configuration

4.7 Sensor Network View

On “Sensor Network View” page is summarization of condition on whole hazard monitoring system. Status on all connected bus converters can be seen as well as all sensors connected to the network. To see “Sensor Network View” page, click on “Sensor Network View” button.



4.7.1 Modbus Network Control

As described in section 3.4, bus converters can be connected to the two sets of 5 positions connectors on the web server. Provided power for those connectors can be controlled so user can control if the bus converters connected to the web server will be powered or not (connected to the system or not) along with the whole sensor network. This can be done by buttons “Start Sensor Network” and “Stop Sensor Network” on the top of the page. Indication of active sensor network is red LED diode which is installed between those two connectors on the web server. If the sensor network is activated the red LED will be on. Indication of active sensor network on the interface is the field on the left side beside the bus converters status fields. It is blue and shows “485 BUS ON” in case the network is activated and it is grey and shows “485 BUS OFF” when the network is disabled.

4.7.2 Bus converter status

On the next section of the page are shown bus converters and their statuses. Status of bus converter is shown in real time on each bus converters icon. When there is another status than “online” the status will be written below number of bus converter and it will be blinking. On following picture (Fig 20) is shown 8 bus converters, two online (3, 8), one in fault condition (2) and 5 offline (1, 4, 5, 6, 7).

Following statuses of bus converter can be seen: *Online; Offline; Bus Data Shorted Low; Bus Data Shorted High; No Sensor Present; Bus Power Overload; Excessive Bus Error; Sensor Bus Fault; Sensor Table Overflow; Unsupported Sensor Detected; In Acquire; RAM Fault; Parameter Table Fault; Firmware Fault*. For further information see manual for mBC081/83.

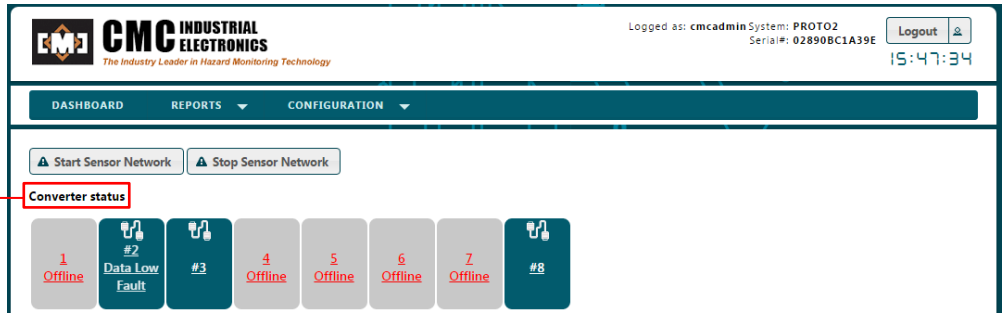


Figure 20: Bus Converters Statuses

4.7.2.1 Converter Sensor List

When clicked on the bus converter icon “Converter Sensor List” will be shown. These are all the sensors which are physically connected to certain bus converter and the bus converter acquired them. On the top of the window is field for searching sensors by serial ID. List can be saved or emailed in CSV file.

On each sensor are shown following information:

- Converter – Bus converter number to which the sensor is connected
- # – Position of sensor in bus converter table
- Time – Shows date and time when last change on sensor was done (e.g. Sensor was shifted in bus converter table)
- Serial ID – Serial number of sensors
- Machine – Machine to which is the sensor assigned to
- Position – Position on which the sensor is assigned

When clicked on “Converter status” link sensors read on all bus converters will be shown the same way as it is described above for each bus converter. This will allow user to search for physical location of sensors.

4.7.2.2 Number of Bus Converters

Each system might have different number of bus converters which will be connected to the web server. To choose the right amount of bus converters go to Configuration->System->Settings and in filed “Number of Converters” choose 1-8.

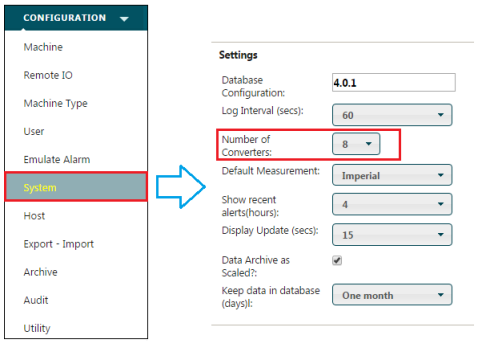


Figure 21: Number of Bus Converters in System

4.7.3 Assigned Sensor List

Assigned Sensor list is divided into five sections:

- Sensor Command
- Converter IO Binds
- Faulted Sensors
- List of Sensors
- Industrial Output Map

4.7.3.1 Sensor Commands

To be able to read all sensors which are connected to a bus converter the sensors have to be acquired by the system. For this purpose is button "Sensor Command" in window "Assigned Sensor list".

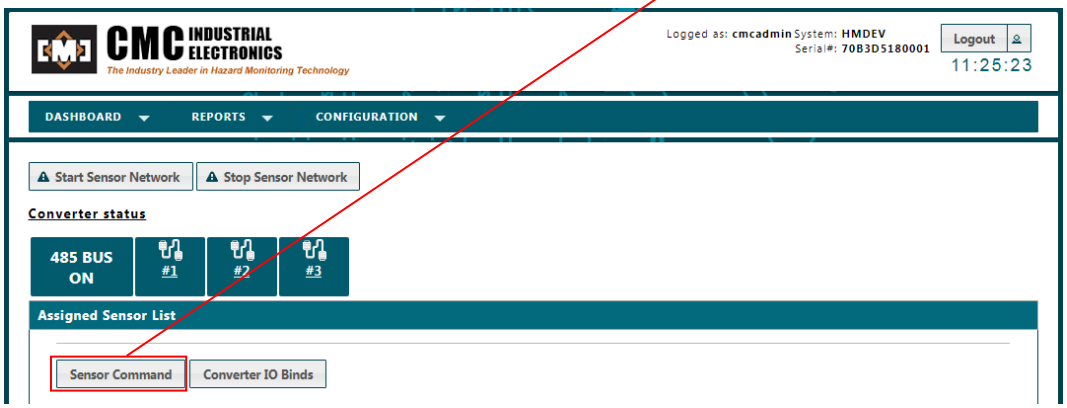


Figure 22: Sensor Command Button

When clicked on the button, message with warning will appear. The reason for the message is that there may be interruption on bus converters which are not acquired when there is heavy data stream. This may cause some alarms to go off. For that reason is better to do acquisition as less as possible.

After closing the message buttons for commands for bus converters will appear. There are three commands which can be executed on each bus converter separately. Bus converter, on which the command will be executed, is chosen by converter number from dropdown menu.

- Acquire Sensors – scan sensor bus on chosen bus converter and save the sensors into bus converter table. When "Acquire Sensors" button is hit it will discover and add all new sensors on the bus into the table. In case there are less than 32 sensors, the bus converter will keep the record of the old sensors. This makes the acquisition process faster. In case there are 32 new sensors connected, the whole table will be replaced.

  Note: Current system supports one channel sensors only. This apply on vibration and IR sensors only as they can read multiple values (PEAK and RMS for vibration; AMBIENT and OBJECT for IR)

- Reset Converter – Soft reset of converter is an equivalent to power cycle. Can be used when changing address switch on bus converter.
- Clear Converter – Clears out table of sensor in bus converter. There will be no record of any sensor.

By the button “Acquire All Sensors” will be acquired all sensors which are connected to the web server.

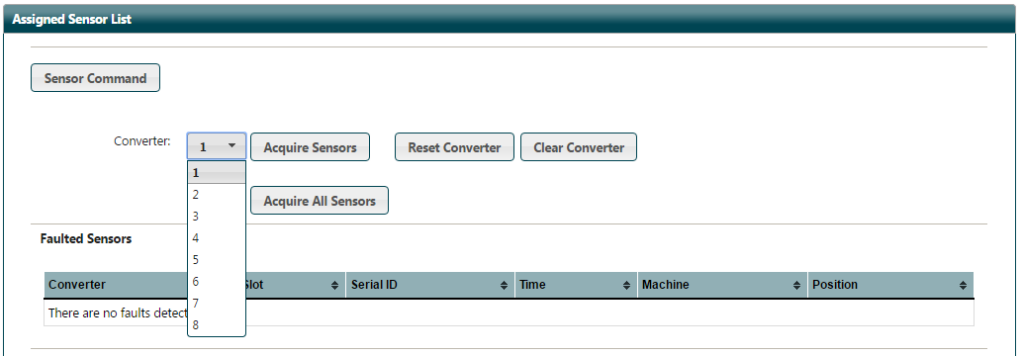


Figure 23: Bus Converters Commands

4.7.3.2 Converter IO Binds

When the grain elevator system uses pieces of equipment which can be either on or off during normal operation, as tripper for example is, it is desirable that no alarms are triggered. Trippers usually use generators to power up the HazMon system. So the bus converter and all sensors connected to it will be offline when tripper is not running. In normal conditions this will create alarms but in this case it would be false alarms. For this situation there is the function of binding the bus converter which is on such equipment, to the Remote IO input. This Remote IO input monitors the power for the particular equipment. If bus converter bonded to certain Remote IO will go offline and Remote IO will also indicate that the equipment is offline no alarms will be generated. Description of the setup is described below.

When clicked on the “Converter IO Binds” button window on Figure 24 will open. In the window are two sections, one for creating of a new binding and second one is a list of existing binds and for possible updates of them.

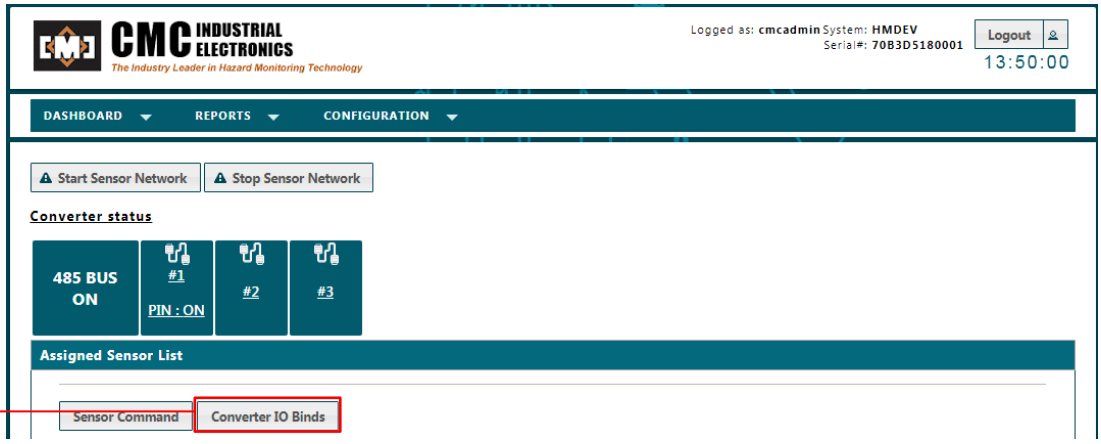


Figure 24: Converter IO Binds

4.7.3.2.1 New Binding

Converter – To make a new binding, bus converter which will be bonded to the Remote IO input has to be selected from the converter dropdown menu.

Enabled? – The binding can be enabled immediately by checking the “Enabled?” check box.

Is Invert? – By “Is Invert?” check box can be selected if the bus converter alarms will be suppressed by reading of logical 1 or 0.

Remote IO – From the “Remote IO” dropdown menu can be selected which Remote IO will be used to bind to the selected bus converter. If there is none to select, the Remote IO wasn’t set yet. To set Remote IO se section 4.10.2 Remote IO.

Input# – Input number will select which pin from the selected Remote IO will be bonded to the selected bus converter

Delay On (secs) – Delay to which the system will react when the input will be activated, in seconds

When all inputs are entered or selected “Save” button has to be pressed to apply all the setting.

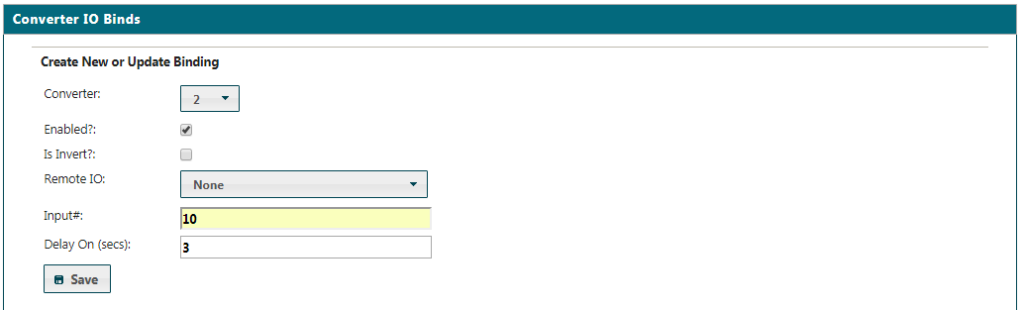


Figure 25: New Converter IO Binding

4.7.3.2.2 Update of existing Binding

Existing binding can be enabled/disabled by “Enabled” check box and selected if it will work on logical 1 or 0 as described above. When changes are done “Update” button has to be pressed to apply all the changes in the system.

To delete the binding “Delete” button has to be pressed.

Figure 26: Update of Existing Converter IO Binding

4.7.3.3 Faulted Sensors

In case there is an assigned sensor, which becomes faulted, it will be listed in the Faulted Sensors list. The list contains following information, see picture below:

- Converter – on which bus converter the faulty sensor is
- Serial ID – what is the serial number of the sensor
- Time – what time did the fault appeared
- Machine – on which machine this sensor is assign to
- Position – what is the position of the sensor on the machine

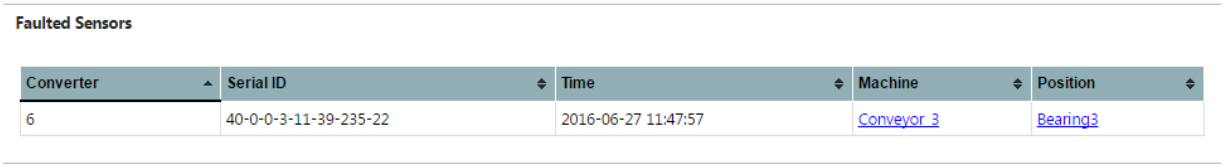


Figure 27: Faulted Sensor Report

4.7.3.4 Sensors List

All sensors which are assigned to machine and position can be seen in the list on “Sensor Network View” page, below “Faulted Sensors” list. By checking check box “Show Active Only” it can be chosen if all sensors should be shown or only active ones. Sensor list can be emailed or saved as CSV file.

Another function on Sensors list is “**Check Missing Sensors**”. To fully understand this function please see Acquire Sensors section above. In case some sensor is removed from working network, this sensor will be reported in “Faulted Sensors” as described in section 4.8.3.2. The second case is when sensor is assigned to a machine but there is no record of the sensor in bus converter table. This problem will be reported eventually during repeated automatic checks as on picture below. This check can take up to 90 seconds, for that reason is there “Check Missing Sensors” button which will make this discovery immediately.

Figure 28: Missing Sensor

For each sensor in the list is shown:

- Machine – Machine to which the sensor is assigned to
- Position Name – Position to which the sensor is assigned to on machine view
- Serial ID – Serial number of sensor
- Reference ID – Serial number of reference sensor
- Active – If sensor is active or not
- Note – system messages about sensor (missing sensor)

- PLC – CMC web server can communicate with PLC using the Modbus/TCP protocol. The configuration of the memory with 16 bit registers is described in appendix 3. For sensors is allocated 512 of these registers. For each sensor two. One for value and one for status of each sensor. This make in total maximum of 256 positions for sensors which can be connected to the system. To be able to access the data and read it by PLC using the Modbus/TCP protocol, each sensor has to be allocated to one of those positions. To do so PLC register has to be chosen for each sensor to be able to access it from PLC. For this purpose is there PLC register number.

  When this number is set to 1, the sensor will be read on registers 40001 for value and 40002 for status. For further information on this topic see appendix 3.

4.8 Real-Time Chart

In the Real-Time Chart is option to select a machine from which all sensors will be displayed. This selection is presented by dropdown menu where machine can be picked.

Right below the selection is shown if the remote I/O, which is bond to the selected machine is on or off. In case there is no input bonded to this machine there will be no sign of it. See following picture.

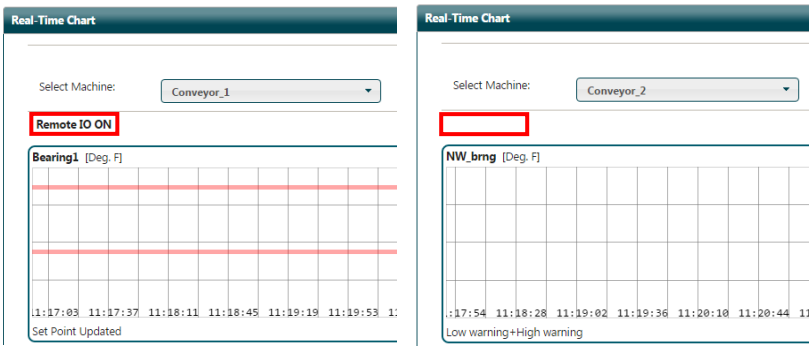
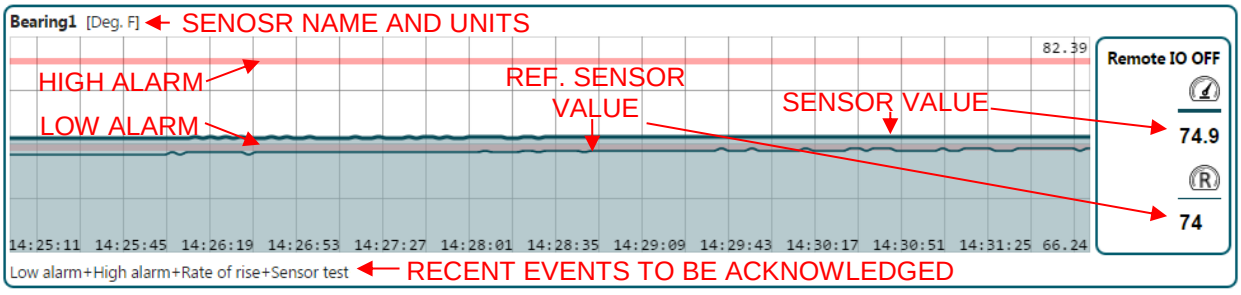


Figure 29: Real-Time Chart Remote I/O presentation

On the Real-Time Chart can be observed each machine with all assigned sensors in real time.

In the main widow of the graph is shown value of the sensor which continuously shows new values with time. The time range of the window is about 6 minutes. Vertical scale is dynamically changed to fit all sensor values in the 6 minutes time range. If there is a threshold of low or high alarm within the displayed range it will show as a red line.



On the right side of the graph is field with sensor values and statuses. Following can be displayed:

- Sensor value at the moment 

- Reference sensor value at the moment 

- Remote IO status. Can be On or Off, in case no input is bond to sensor nothing will be displayed 

- Rate of Rise 
- High Alarm 

- High Warning
- Low Alarm
- Low Warning
- In case of sensor fault no value is shown

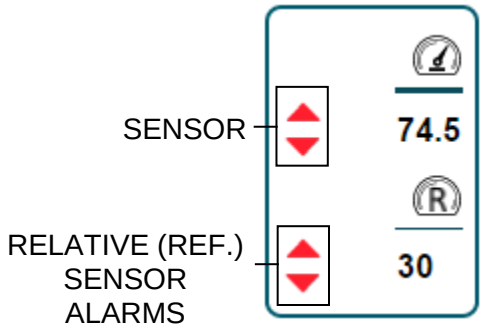


Figure 30: Real-Time Chart Relative and Regular Alarm display

4.9 Reports

There are three options of reports which can be shown:

- Display charts
- Display tables
- Display events

As mentioned in the overview the web server is able to keep record of data for all sensors up to 2 years. These records are created in SQL format and are not that easily accessible. It can take up to couple hours to download 2 years database records. For this reason are here these reports which gives user the opportunity to access recent data quicker and easier.

4.9.1 Display Chart

On Display Chart window can be easily picked up to 5 sensors which will be shown in chart. Sensors can be picked only from one machine at the time.

To access display chart menu click Report -> Display Chart as on following picture.

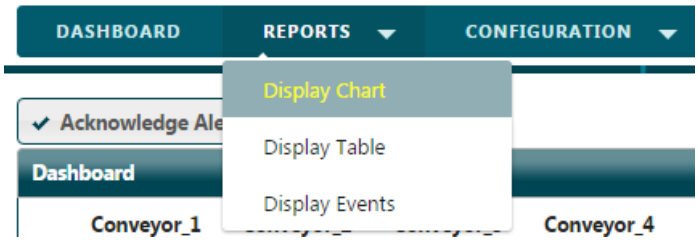


Figure 31: Display Chart Access

First machine from which the sensors will be selected has to be picked. This can be done through “Select Machine” drop down menu.

When machine is selected the time frame has to be chosen. As mentioned, in the window maximum time frame can be 72 hours. Most of the time the interval can be bigger but can’t exceed 15000 records, which is approximately 72 hours. When selecting the time frame always choose first the “Time From” and then the “Time To”. The reason for this is that always when you choose “Time From”, it automatically fills out the “Time To” by adding one extra hour from “Time From”. The reason for this is to avoid time frames larger than the mentioned 72 hours.

When time frame is selected in drop down menu “Select Positions (up to 5):” can be picked 5 sensors which can be drawn on the graph. Each sensor will be represented in order by customized colors on the right hand side. First selected sensor in order in the dropdown menu will have color picked in “Line Color 1:” and so on.

When sensors, time frame and machine are selected “Draw” button can be pressed to draw graph from selected items. When the button was pressed graph should be drawn as it is on the example graph below. In case nothing will appear on the graph it means that there is no data to show or that the time frame was exceeded. In case the time frame was exceeded the window will have to be refreshed to make it work again.

In the graph is enabled option to use a zoom by scroll wheel on mouse. When going with mouse over the graph it will be showing time at that position and value at that position on all shown sensors.

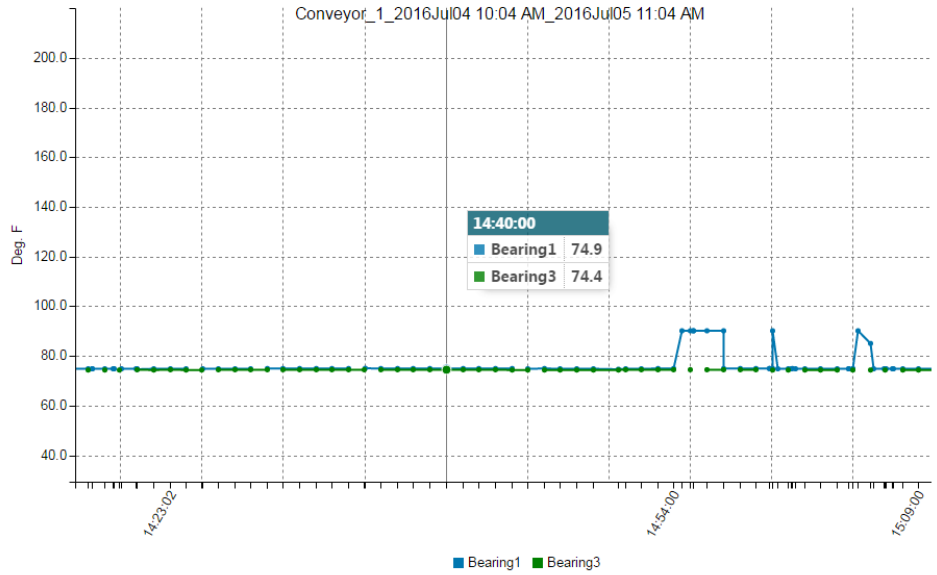


Figure 32: Chart Display Example

Below the drop down menu for sensors which should be drawn can be chosen threshold of one sensor which can be also shown in the graph. On the following picture can be seen set values of thresholds for chosen sensor.

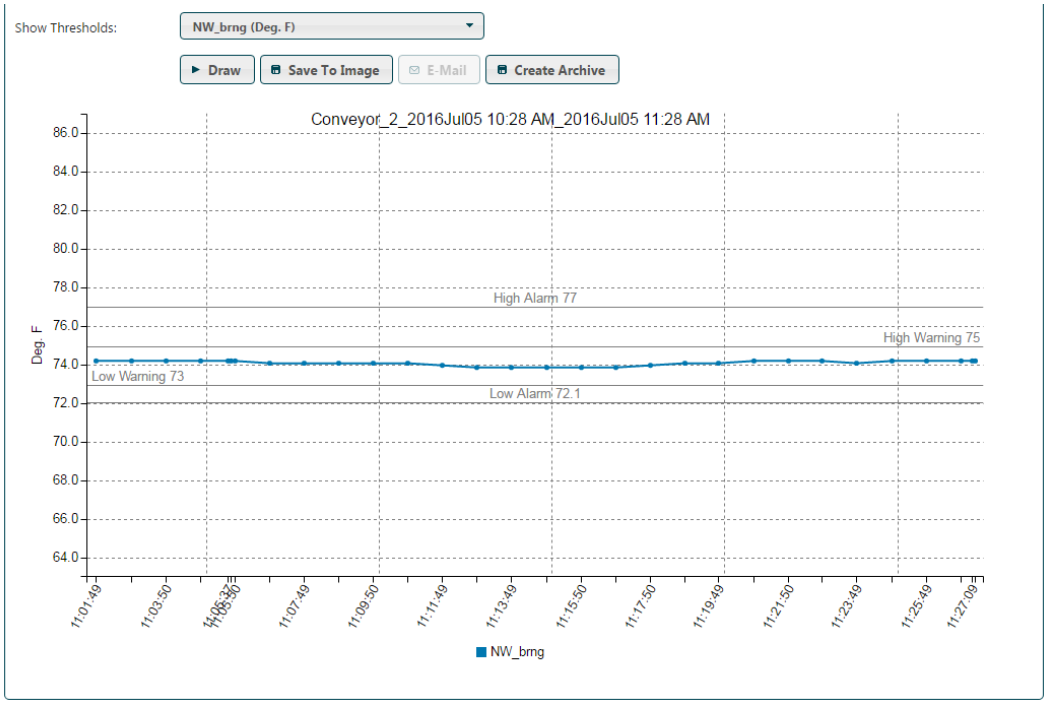


Figure 33: Chart sensor example with thresholds

Each shown graph can be saved as png format picture by clicking on “Save To Image” button.

Graph can also be emailed by clicking on button “E-mail”. In case the button is not active, the email will have to be enabled. To enable it see section Enable E-Mail.

Last 24 hours record of all sensors on selected machine can be downloaded by clicking on button “Create Archive”. When clicked on the button gzip file will be downloaded. To open this file right click on the file and choose 7-zip and in the opened menu choose “Extract to ’File Name’ ”. Then there will be txt file which can easily be opened by Microsoft Excel. Content of the file is described below.

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T
1	machine_id	machine_name	utc_time	local_time	position_1	position_2	position_3	position_4	position_5	position_(	position_7	position_8	state_1	state_2	state_3	state_4	state_5	state_6	state_7	state_8
2	4	Conveyor_1	04/07/2016 18:02	04/07/2016 11:02	74.9	73.96	74.41	73.85	73.85	73.96	73.74	73.85	0	0	0	0	0	4096	0	0
3	4	Conveyor_1	04/07/2016 18:03	04/07/2016 11:03	74.8	73.96	74.41	73.85	73.85	73.96	73.74	73.74	0	0	0	0	0	4096	0	0
4	4	Conveyor_1	04/07/2016 18:04	04/07/2016 11:04	185	73.96	74.41	73.85	73.85	73.96	73.62	73.74	8200	0	0	0	0	4096	0	0
5	4	Conveyor_1	04/07/2016 18:05	04/07/2016 11:05		73.96	74.3	73.85			73.74			0	0	0			0	
6	4	Conveyor_1	04/07/2016 18:05	04/07/2016 11:05	74.8				73.85	73.85		73.74	0				0	4096		0
7	4	Conveyor_1	04/07/2016 18:06	04/07/2016 11:06	74.8	73.96	74.41	73.85	73.85	73.85	73.74	73.74	0	0	0	0	0	4096	0	0
8	4	Conveyor_1	04/07/2016 18:07	04/07/2016 11:07	74.8	73.96	74.41	73.85	73.85	73.96	73.85	73.74	0	0	0	0	0	4096	0	0
9	4	Conveyor_1	04/07/2016 18:07	04/07/2016 11:07		73.96	74.41	73.96			73.85			0	0	0			0	
10	4	Conveyor_1	04/07/2016 18:08	04/07/2016 11:08	74.9				73.85	73.96		73.74	0				0	4096		0
11	4	Conveyor_1	04/07/2016 18:09	04/07/2016 11:09		74.07	74.41	73.96			73.96			0	0	0			0	
12	4	Conveyor_1	04/07/2016 18:09	04/07/2016 11:09	74.9				73.85	73.96		73.85	0				0	4096		0
13	4	Conveyor_1	04/07/2016 18:09	04/07/2016 11:09		74.07	74.41	73.96			73.96			0	0	0			0	
14	4	Conveyor_1	04/07/2016 18:10	04/07/2016 11:10	74.9				73.85	74.07		73.85	0				0	4096		0
15	4	Conveyor_1	04/07/2016 18:11	04/07/2016 11:11	74.9	74.07	74.53	74.07	73.96	74.07	73.96	73.96	0	0	0	0	0	4096	0	0
16	4	Conveyor_1	04/07/2016 18:11	04/07/2016 11:11		74.07	74.53	74.07			74.07			0	0	0			0	
17	4	Conveyor_1	04/07/2016 18:12	04/07/2016 11:12	75				73.96	74.07		73.96	0				0	4096		0
18	4	Conveyor_1	04/07/2016 18:13	04/07/2016 11:13	75	74.19	74.53	74.07	74.07	74.19	74.07	74.07	0	0	0	0	0	4096	0	0
19	4	Conveyor_1	04/07/2016 18:13	04/07/2016 11:13		74.19	74.53	74.19			74.07			0	0	0			0	
20	4	Conveyor_1	04/07/2016 18:14	04/07/2016 11:14	75				74.07	74.3		74.07	0				0	4096		0
21	4	Conveyor_1	04/07/2016 18:15	04/07/2016 11:15	75	74.19	74.53	74.19	74.07	74.3	74.19	74.19	0	0	0	0	0	4096	0	0
22	4	Conveyor_1	04/07/2016 18:16	04/07/2016 11:16	75	74.19	74.53	74.19	74.19	74.3	74.19	74.19	0	0	0	0	0	4096	0	0
23	4	Conveyor_1	04/07/2016 18:16	04/07/2016 11:16		74.3	74.64	74.19			74.19			0	0	0			0	
24	4	Conveyor_1	04/07/2016 18:17	04/07/2016 11:17	75				74.19	74.3		74.19	0				0	4096		0

Figure 34: Display Chart archive

machine_id – machine_id is unique number which is assigned to each machine when created. It can’t be changed by user and user can’t see the number except in this type of reports. The purpose of this number is for easy filtration of data from separate machines.

machine_name – machine_name is name of the machine which was set by user.

utc_time – coordinated universal time

local_time – time set on the web server by user

position_X – value of sensor assigned to the certain position at the time. Positions can be reviewed on Configuration -> Machine -> Positions

state_X – state of each sensor at the time.

Display Table

On Display Table window user can easily choose one sensor from the system and show its recorded values in a table. Only one sensor table can be shown at the time.

To access display chart menu click Report -> Display Table as on following picture.

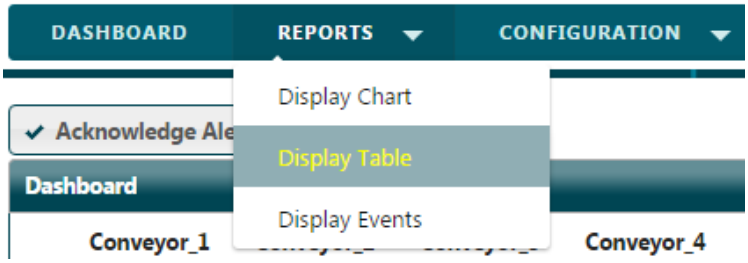


Figure 35: Display Table Access

First machine from which the sensor will be selected has to be picked. This can be done through “Select Machine:” drop down menu.

When machine is selected in next drop down menu “Select Position:” can be picked sensor which data table will be built.

When machine and sensor are selected the time frame has to be chosen. Same rule as for Display Chart works for Display Table as well. The maximum time frame can be 72 hours. Most of the time the interval can be bigger but can’t exceed 15000 records, which is approximately 72 hours. When selecting the time frame always choose first the “Time From” and then the “Time To”. The reason for this is that always when you choose “Time From”, it automatically fills out the “Time To” by adding one extra hour from “Time From”. The reason for this is to avoid time frames larger than the mentioned 72 hours.

When sensors, time frame and machine are selected “Build Table” button can be pressed to build the data table from selected items.

When table is built it can be emailed or saved as CSV file by clicking on “Save To CSV” or “E-Mail”.

Amount of data can be reduced when “Show Only Alerts” checkbox is checked. In that case alerts record will be showing only. When it is not checked it is showing logged data. Frequency of data log can be set, please see section 4.10.6.3 System Backup, Recent Alerts and Archive Settings

In built data table are following information:

Time: Time and date of record

Value: value of sensor at the time

Reference: value of reference sensor at the time

Rate of Rise: if rate of rise was presented at the recorded time it will be presented at this column with value which it raised for

Units: Units in which the sensor value is presented

Description: description of recent events to be acknowledged at the time

Since Last Event: measured time from last event

Remote IO Machine: if IO is assigned to the machine it will show in this column if it is on or off

Remote IO Position: if IO is assigned to a position it will show in this column if it is on or off

Time	Value	Reference	Rate of Rise	Units	Description	Since Last Event	Remote IO Machine	Remote IO Positior
2016-07-05 14:20:50	74.5	73.7		Deg. F	Low alarm+High alarm	02:52:26		
2016-07-05 14:19:49	74.5	73.7		Deg. F	Low alarm+High alarm	02:51:25		
2016-07-05 14:18:51	74.5	73.7		Deg. F	Low alarm+High alarm	02:50:27		
2016-07-05 14:17:50	74.5	73.7		Deg. F	Low alarm+High alarm	02:49:26		
2016-07-05 14:16:49	74.5	73.7		Deg. F	Low alarm+High alarm	02:48:25		
2016-07-05 14:15:50	74.5	73.7		Deg. F	Low alarm+High alarm	02:47:26		
2016-07-05 14:14:50	74.4	73.7		Deg. F	Low alarm+High alarm	02:46:26		
2016-07-05 14:13:50	74.5	73.7		Deg. F	Low alarm+High alarm	02:45:26		
2016-07-05 14:12:49	74.4	73.7		Deg. F	Low alarm+High alarm	02:44:25		
2016-07-05 14:11:50	74.4	73.7		Deg. F	Low alarm+High alarm	02:43:26		
2016-07-05 14:10:49	74.4	73.7		Deg. F	Low alarm+High alarm	02:42:25		
2016-07-05 14:09:49	74.4	73.7		Deg. F	Low alarm+High alarm	02:41:25		
2016-07-05 14:08:50	74.4	73.6		Deg. F	Low alarm+High alarm	02:40:26		

Figure 36: Display Table Example

4.9.2 Display Events

On Display Events window user can easily choose one sensor from the system and show all events in chosen time frame. Only one sensor table can be shown at the time.

To access display chart menu click Report -> Display Events as on following picture.

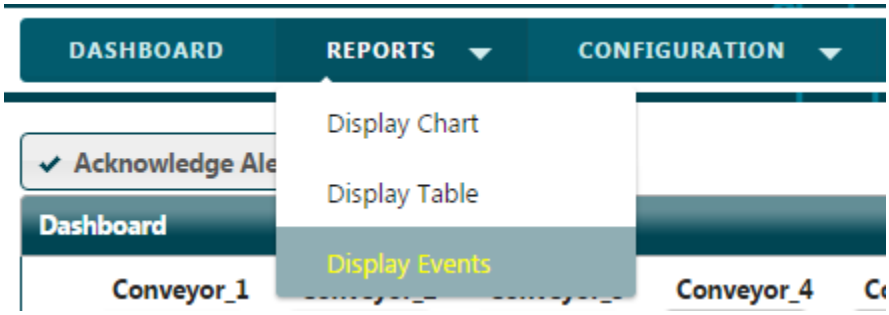


Figure 37: Display Events Access

First machine from which the sensor will be selected has to be picked. This can be done through “Select Machine:” drop down menu.

When machine is selected in next drop down menu “Select Position:” can be picked sensor which the data table will be built from.

When machine and sensor are selected the time frame has to be chosen. Same rule as for Display Chart and Table works for Display Events as well. The maximum time frame can be 72 hours. Most of the time the interval can be bigger but can’t exceed 15000 records, which is approximately 72 hours. When selecting the time frame always choose first the “Time From” and then the “Time To”. The reason for this is that always when you choose “Time From”, it automatically fills out the “Time To” by adding one extra hour from “Time From”. The reason for this is to avoid time frames larger than the mentioned 72 hours.

When sensors, time frame and machine are defined Events which are going to be shown has to be selected. These events can be chosen from the drop down menu “Select Event(s):”. When the events are selected “Build Table” button can be pressed to build the data table from selected items. In the built table are shown sensors which had the selected events only. In case no events and no sensors were selected table will be built from all sensors with any events in selected time frame.

When table is built it can be emailed or saved as CSV file by clicking on “Save To CSV” or “E-Mail”.

This table doesn’t show all events which happened in certain times. The table shows all types of events which happened within one hour. In case there was same type of event repeatedly it will be shown only once. Reason behind this is that there can be huge amount of data which wouldn’t be easy to access. This report simplifies the record and gives simple overview of what is happening on the network in range of hours.

In built data table are following information:

Time: time span when events recorded

Machine: machine to which the recorded sensor is assigned to

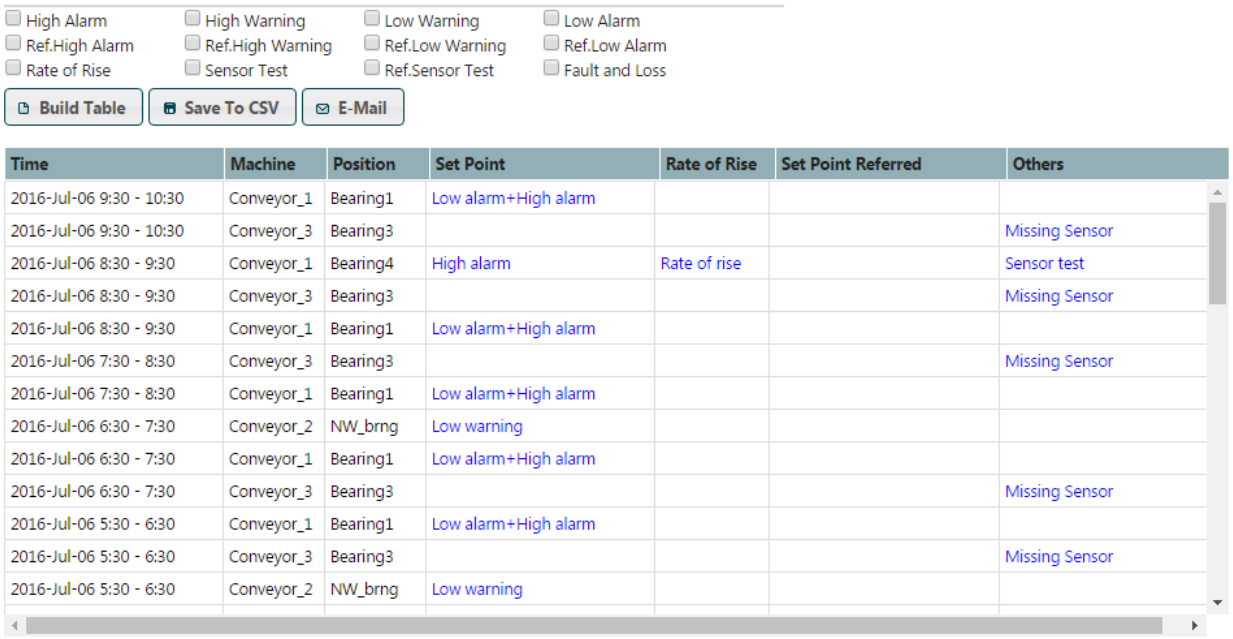
Position: position on machine to which the sensor is assigned to

Set Point: record of any High/Low alarms and High/Low Warnings in the timeframe, see table below

Rate of Rise: record of any Rate of Rise in the timeframe, see table below

Set Point Referred: record of any referred High/Low alarms and referred High/Low Warnings in the timeframe

Others: Any other event recorded on the sensor in the timeframe



Time	Machine	Position	Set Point	Rate of Rise	Set Point Referred	Others
2016-Jul-06 9:30 - 10:30	Conveyor_1	Bearing1	Low alarm+High alarm			
2016-Jul-06 9:30 - 10:30	Conveyor_3	Bearing3				Missing Sensor
2016-Jul-06 8:30 - 9:30	Conveyor_1	Bearing4	High alarm	Rate of rise		Sensor test
2016-Jul-06 8:30 - 9:30	Conveyor_3	Bearing3				Missing Sensor
2016-Jul-06 8:30 - 9:30	Conveyor_1	Bearing1	Low alarm+High alarm			
2016-Jul-06 7:30 - 8:30	Conveyor_3	Bearing3				Missing Sensor
2016-Jul-06 7:30 - 8:30	Conveyor_1	Bearing1	Low alarm+High alarm			
2016-Jul-06 6:30 - 7:30	Conveyor_2	NW_brng	Low warning			
2016-Jul-06 6:30 - 7:30	Conveyor_1	Bearing1	Low alarm+High alarm			
2016-Jul-06 6:30 - 7:30	Conveyor_3	Bearing3				Missing Sensor
2016-Jul-06 5:30 - 6:30	Conveyor_1	Bearing1	Low alarm+High alarm			
2016-Jul-06 5:30 - 6:30	Conveyor_3	Bearing3				Missing Sensor
2016-Jul-06 5:30 - 6:30	Conveyor_2	NW_brng	Low warning			

Figure 38: Display Events Example

4.10 Configuration

Configuration menu allows user to access any type of configuration which can be done on the system if the user has sufficient rights. Some of the configuration options are also accessible through dashboard but all those are covered in configuration as well.

4.10.1 Machine

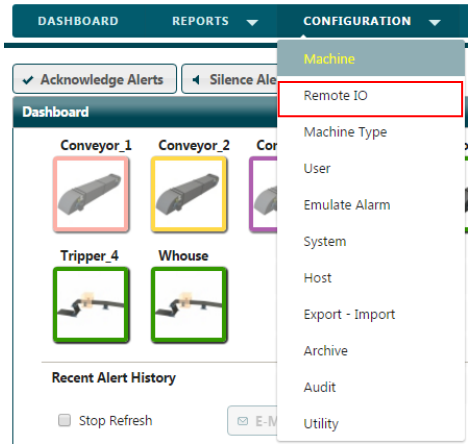


Figure 39: Machine Configuration Access

To access Machine Configuration click Configuration->Machine, Machine List will be shown in the window. Above Machine list are two buttons which allow user to email sensor list and position list. In case these two buttons are greyed out the email is not enabled. To enable email see section Enable E-mail.

On new device where no machine was set yet the “Machine List” is empty and new machine has to be added, see section below. Otherwise, list of machines is listed first. In Machine List is five fields:

- Name – Shows name of machine with picture of machine, this field is active and by clicking on it “Machine Configuration” window will open. Explained below
- Type Name – Type name shows what type of machine is for the machine
- Running Input – Shows if Remote IO input is connected. Shows name of the device and input number which is assigned to the machine
- Active – Shows if the machine is active or not. This is also explained below in “Machine Configuration”
- Delete – When click on the Delete button whole machine will be deleted

Before any machine can be configured it has to be created first. From this reason this manual will be focused first on the machine adding.

4.10.1.1 Add New Machine

When clicked on "+ Add New" button "Select Machine Type" window will open. Here can user choose desired type of machine which he wants to add to the system and configure. User can choose from list of default machine types. This list of machine types can be updated and extended by basically unlimited amount of machine types, see section 4.10.3 Machine Type. When machine type has been picked, "Machine Configuration" window with blank machine will open.

Machine

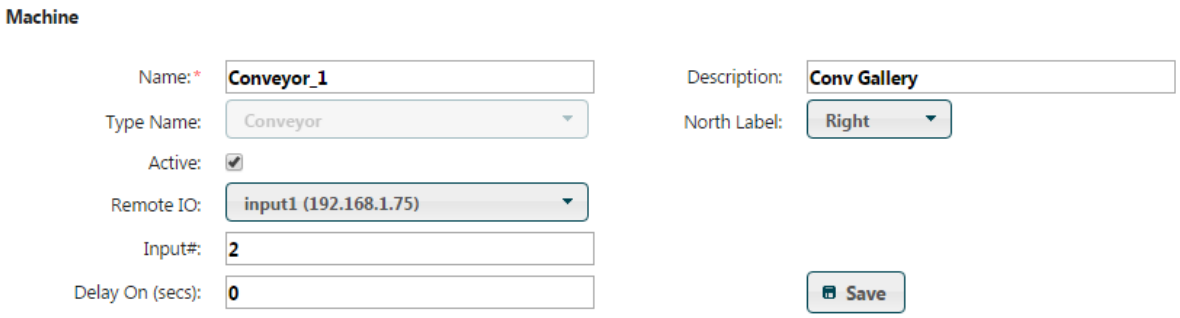


Figure 40: Machine Configuration – Part Machine

- Name – Fill out name of the machine. This is the only one field which must be filled out, otherwise all of them are optional.
- Type Name – This field can't be changed, it is chosen when Machine type is picked
- Active – If this check mark is checked the machine will be shown on dashboard
- Remote IO – If there is an active Remote IO (Activation described in section 4.10.2.2 Remote IO Devices List) device it can be picked from drop down menu to choose input which may be bond as input relay signaling running machine. The Remote IO has to be added before it can be used, see section 4.10.2.1 Add New Remote IO Device. In case Remote IO is chosen and input is set the all alarms on the machine will depend on the Remote IO input activation/deactivation as it is set in 4.10.2.2 Remote IO Devices List.
- Input# – Input number of the Remote IO input which will be bond to the machine
- Delay On – All actions which will depend on the activated/deactivated input will not happen for this period of time. Time is set in seconds.
- Description – Optional description of machine
- North Label – By the drop down menu can be chosen where the "North" label will be applied. On the screen will be shown capital "N".

Everything has to be saved by "Save" button.

Positions

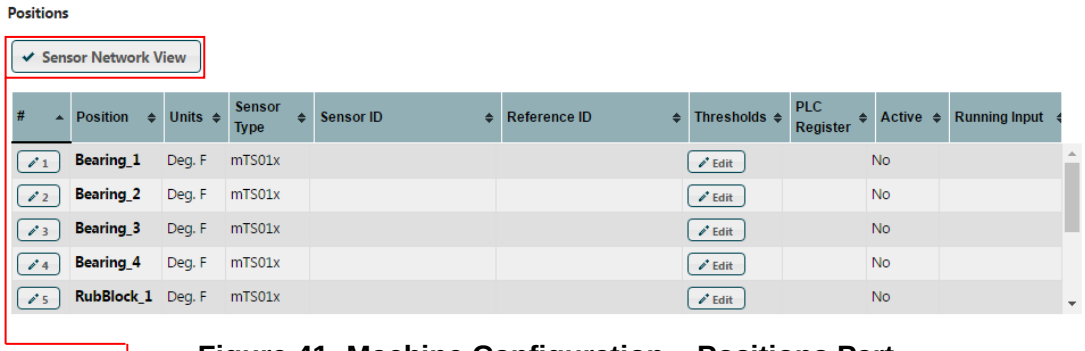


Figure 41: Machine Configuration – Positions Part

The purpose of "Sensor Network View" button in position section is to have a quick access to sensor acquisition commands and also for testing purposes. When assigning sensors to certain positions the sensor which should be assigned may be missing. The reason for that might be that this sensor is new and wasn't acquired yet. By the "Sensor Network View" button this can be done very quickly.
Another reason for "Sensor Network View" button is the ability to see if the assigned sensor is read correctly and is not in "Faulted Sensors" list. So this can verify the right functionality right away. The same thing applies also for Missing Sensors check. If there is an assigned sensor on the machine but this sensor is not read on any bus converter it can be verified in sensor list. For further information on Missing Sensor check see section 4.7.3.3. Sensors List.

As it was already mentioned new type of machine can be created to fit exact needs of the user. In this case when Conveyor was chosen, on the machine are 4 bearing sensors, 4 rub block sensors and 1 speed sensor by default.

Following information is in the table:

- # – Sensor order number on the machine. On each newly created machine type, the order can be different based on user's needs. Each order number also works as sensor setup button, description below in section # Sensor Order Number
- Position – Position shows where on the machine the sensors are placed. This position can be changed when creating new machine type.
- Units – Units in which the sensor is presented
- Sensor Type – Defines which type of sensor from the whole scale of CMC sensors is presented on that position
- Sensor ID – Serial number of presented sensor on this position
- Reference ID – Serial number of reference senor bonded to the sensor presented on that position
- Threshold – In this column is active button for Threshold setup on the particular sensor. Description of this function is described in section Alert Threshold Configuration
- PLC Register – CMC web server can communicate with PLC using the Modbus/TCP protocol. The configuration of the memory with 16 bit registers is described in appendix 1. For sensors is allocated 512 of these registers. For each sensor two. One for value and one for status of each sensor. This make in total maximum of 256 positions for

sensors which can be connected to the system. To be able to access the data and read it by PLC using the Modbus/TCP protocol, each sensor has to be allocated to one of those positions. To do so, PLC register has to be chosen for each sensor to be able to access it from PLC. For this purpose is there PLC register number.

When this number is set to 1, the sensor will be read on registers 40001 for value and 40002 for status and so on. For further information on this topic see appendix 1

- Active – This column displays if the sensor is active or inactive, active sensors will be displayed on the machine views
- Running Input – If there is a Remote IO connected, one of the inputs can be assigned to each sensor (can also be assigned to whole machine) as a running input. The main purpose for this functionality is that some of the alarms on certain sensors or machines can be suppressed in case that machine is not running (running input is not on).

4.10.1.2 # Sensor Order Number (Position Configuration)

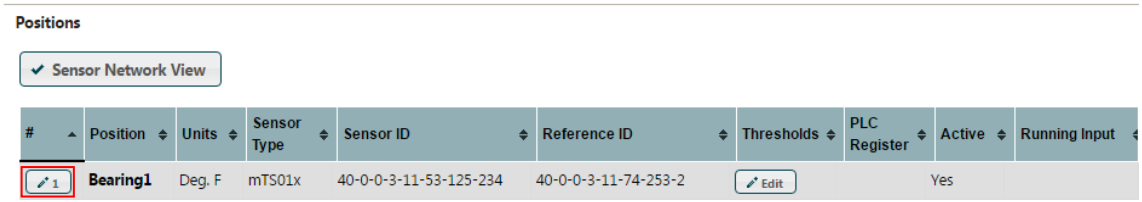


Figure 42: Sensor Order Number (Position Configuration) button

When clicked on “Sensor Order Number” button “Position Configuration” window will open. This window is divided into 4 sections:

1. Position

Figure 43: Position Configuration – Position

In position section are following fields:

- Name – here is assigned name for particular sensor position which will be shown on the particular machine.
- Description – any custom description for the sensor.
- Active – this checkbox will define if the sensor will be shown on dashboard.
- PLC register – PLC register will define on which register the sensor can be read from on another device using the Modbus/TCP protocol, see PLC register description above.
- Log – by this checkbox is defined if data on the sensor will be logged for further presentation in graphs and reports described above. This doesn’t affect data which are recorded in data base.

2. Sensors

In Sensors section are following fields:

- Sensor Type – type of sensor which was assigned to this position when Machine Type was created
- Search – Serial number can be searched in the list of unassigned sensors
- Serial ID – If clicked on the drop down Serial ID menu all sensors which are not assigned to any position will appear. I case all sensors were used there will be shown none.
- Reference – Reference checkbox has to be checked in case user wants to have the reference sensor activated. This field assign the reference sensor only and do not set any thresholds to compare the sensor and reference sensors value, this is set in the "Threshold" section.
- Search – Serial numbers can be searched in the list of all connected sensors
- Reference ID – ID of sensors which will be taken as a reference for the sensor chosen in "Serial ID" field

3. IO Terminal Bind

In IO Terminal Bind are following fields:

- Remote IO – Same thing as on the whole machine can be done for each sensor. To each sensor can be bond one input from the remote IO. This function will mostly be used to disable alarms on the sensor in case that particular input is off. For example no alarm on rotation sensor is triggered in case that machine is not running.
- Input# – Number of input which will be bonded to the sensor

4. Measurement Unit and Conversion

For each type (family code) of sensor are set default values for span and offset. In case default units are chosen no modification of span and offset is not necessary. Each provides reading of raw data. The raw data is automatically modified to be read in proper units, this is all done automatically when default units for each type of sensor are chosen. In case customer requires modification of data, custom units can be chosen and span and offset can be adjusted to meet the desired needs. To see the default span and offset for each type of sensor see section 4.10.3 Machine Type. For further understanding read the following sections.

- Units – Units in which the sensor value will be presented. For each sensor type can be chosen defaults units. For example for temperature sensor can be as default chosen F (Fahrenheit) and C (Celsius).
- Custom Unit – When user chooses to use custom units in "Units" part, here is where the desired units can be assigned. Note that if custom units are chosen Span and Offset has to be set.
- Span – Span is basically number which defines conversion between raw value which is read from sensor and value which will be displayed on the screen. Raw value is multiplied by the span number.

Temperature Sensor Span Example

For value displayed in **°C** the span has to be **0.0625**

For value displayed in **°F** the span has to be **0.1125**

- Offset – Offset is a number which is added to the raw value to set it to the right position.

  Temperature Sensors Span Example

  For value displayed in **°C** the span has to be **0**

  For value displayed in **°F** the span has to be **-32**

- Decimals – Number of digits after the decimal point which should be displayed

4.10.1.3 Alert Threshold Configuration

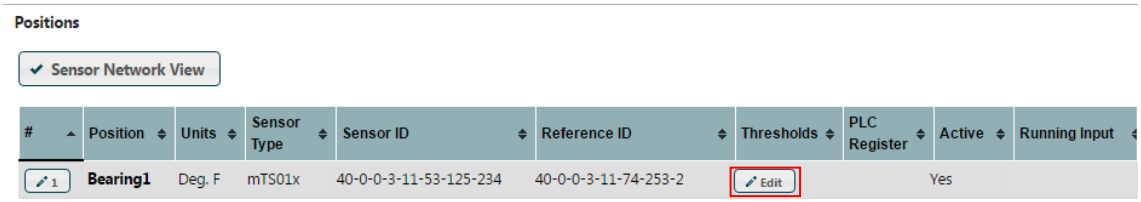


Figure 44: Alert Threshold Configuration button

When clicked on “Edit” button “Alert Threshold Configuration” window will open. This window is divided into 2 sections:

1. Information

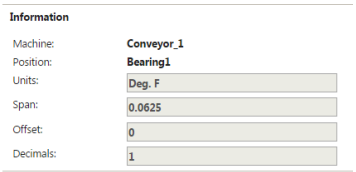


Figure 45: Alert Threshold Configuration – Information Section

In the Information section in “Alert Threshold Configuration” window is information about chosen sensor configuration. All these fields are described in the section # Sensor Order Number (Position Configuration)

2. Thresholds

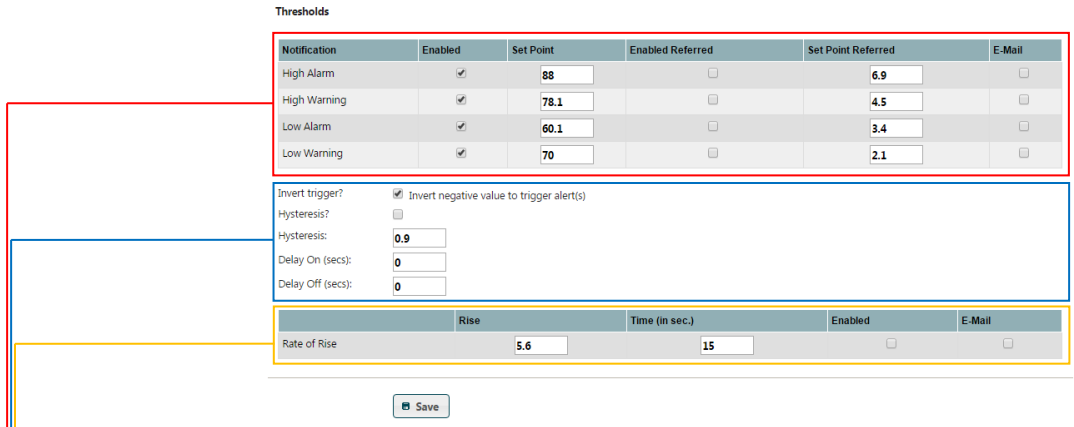


Figure 46: Position Configuration – Position

In threshold section are following fields:

Alarms and Warnings:

- Notification – Type of alarm/warning.
- Enabled – Any type of alarm/warning can be enabled/disabled by checkbox in this column.
- Set Point – For each type of alarm/warning on each sensor can be set a threshold. When this threshold value is reached the alarms will be triggered. For high alarm and high warning the value needs to be same or higher than threshold to trigger the alarm/warning. For low alarm and low warning the value needs to be lower than the threshold. Value in this filed is in units which are assigned in information section. The section above.
- Enable Referred – In case referred sensor is assigned to the selected sensor, referred alarms and warnings can be enabled/disabled by the check box in this column. When referred alarms/warnings are enabled they will be triggered in case that the difference between the sensor and referred sensor will exceed the value set in “Set Point Referred” field. In case Referred high alarm is enabled, it will be triggered when the value of the selected sensor will be higher by “Set Point Referred” value.
- Set Point Referred – As is described above the “Set Point Referred” sets when referred alarm will be triggered. The referred alarms/warnings are set when difference between selected and referenced sensor is equal or exceed the value in “Set Point Referred” field. For high alarm and warning the selected sensor value has to be higher that the reference sensor value. For the low alarm and warning the selected sensor value has to be lower than reference sensor value.
- E-mail – In case E-mail checkbox is checked for certain alarm email about this alarm will be sent to the user whose email is set in the 4.10.4.1 User Configuration

Trigger Invert/Hysteresis/Delay

- Invert Trigger – This function is related to the alarms and will be explained on example: On selected sensor is High alarm set to 50 RPM and Low alarm is set to 30 RPM. “Invert trigger” is activated/checked. The machine is running in opposite direction and the read value will be -45 RPM, no alarm will be triggered. Then the read value changes to -25

RPM, Low alarm will be triggered. If the value went to -55 High alarm would be activated. In case “Invert trigger” was not activated/checked Low alarm would be activated for any of those read values.

This function is related only to the primary sensors and doesn’t have any effect on reference sensors. Reference sensors are always related to the actual value of the primary and reference sensor.

- Hysteresis – Hysteresis check box enables hysteresis for the primary sensor. If threshold value is crossed it has to go further by the hysteresis value to make the alarm to be triggered. The same is applied for the opposite direction. When alarm is triggered and read value crosses the threshold it won’t cancel the alarm. The value has to go below the threshold by the hysteresis value to be canceled.

  This function is related to the primary sensor only and doesn’t affect the reference sensor.

- Delay On/Off – Each alarm and warning can be delayed. If the read value of the sensor crosses the threshold the alarm/warning will be delayed by the value in “Delay On” filed, in seconds. The same will be for the opposite direction threshold crossing and time in “Delay Off” filed will be applied.

Rate of Rise:

- Rate of Rise is functionality which allows user to monitor quick changes of sensor values. Two parameters can be set on each sensor to monitor it. First is Rise value and the second one is Time.

  For example: Rise = 20; Time =10 s.

  In case that value of sensor rises by 21 in 10 or less seconds the alarm will be triggered.

- Enable – By enable check box this function can be enable/disable on each sensor
- E-mail – In case E-mail checkbox is checked for certain alarm email about this alarm will be sent to the user whose email is set 4.10.4.1 User Configuration

4.10.2 Remote IO

In section remote IO is described how to setup and use Remote IO modules as well as how to understand the Real-Time Monitor. Remote IO which can be used with CMC web server must have such features that it can be connected to computer network. IP address is required.

To access Remote IO configuration and monitor click Configuration -> Remote IO

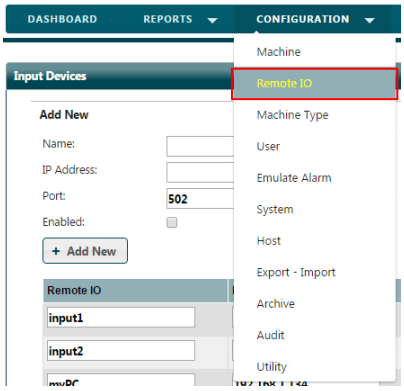


Figure 47: Remote IO Configuration and Monitor Access

"Input Devices" window will open. The first section is dedicated to adding new Remote IO device.

4.10.2.1 Add New Remote IO Device

Figure 48: Add new Remote IO

When adding new Remote IO device following fields need to be filled out:

- Name – user can assign any desired name to the Remote IO device
- IP Address – IP address of the connected Remote IO has to be entered
- Port – For devices which communicate through Modbus TCP/IP is usually set port 502. In case customer needs to set another port for the communication, it is possible through the Port field.
- Active – Active checkbox can be checked in case the device should be activate right after it's added
- Add New – Button has to be pressed to proceed with the Remote IO device process

4.10.2.2 Remote IO Devices List

Below the section for adding new Remote IO device is list of all inserted Remote IO devices, below are described all columns in this section:

- Remote IO – Name of each Remote IO assigned by used
- IP Address – IP address of each Remote IO device
- Port – Port for network communication assigned by user
- Active – By Active checkbox each Remote IO can be enabled/disabled
- Invert – If the checkbox is checked the Remote IO will be inverted in the system. On the Input Real-Time Monitor is always as it is in on actual unit.
- Save – After all changes on the Remote IO all changes will be applied when “Save” button is pressed
- Delete – By pressing “Delete” button the remote IO will be deleted

4.10.2.3 Input Real-Time Monitor (Raw Values)

By pressing “Show Connections” button will be shown/hide machines or sensors to which the inputs are assigned to. By “Raw Values” is meant that this shows the inputs are physically on or off, logic in the system may be inverted.

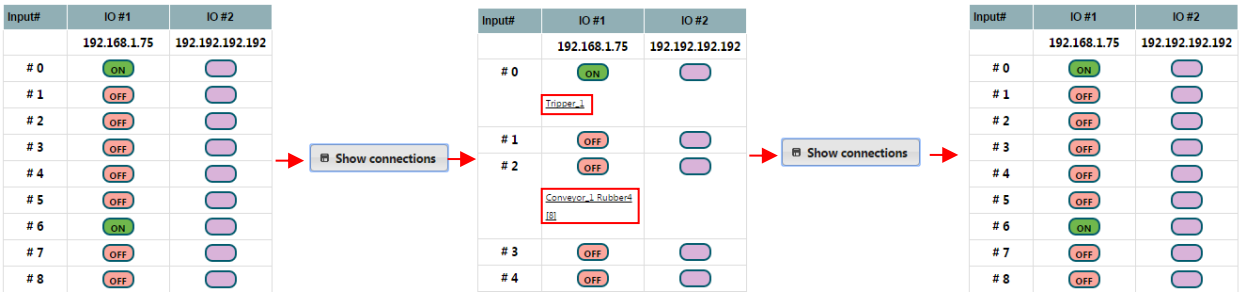


Figure 49: Remote IO Assigned Connections

Up to 8 Remote IO can be connected to the web server. All of them are visible on the Real-Time Monitor table. On the following picture is example of the table with two assigned Remote IOs.

Each Remote IO can have up to 32 inputs which can be monitored and used to control system.

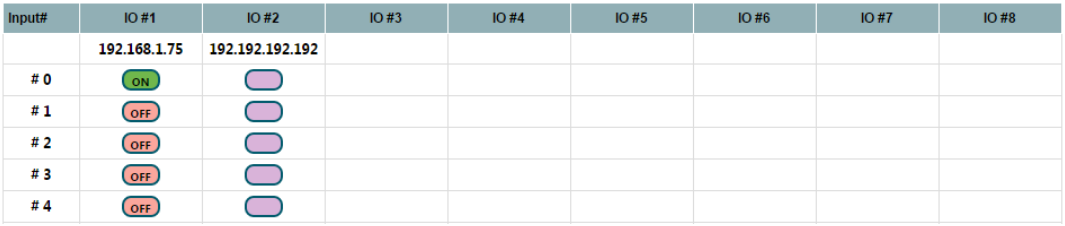


Figure 50: Remote IOs Table

As is shown on figure 46 each input can have three states:

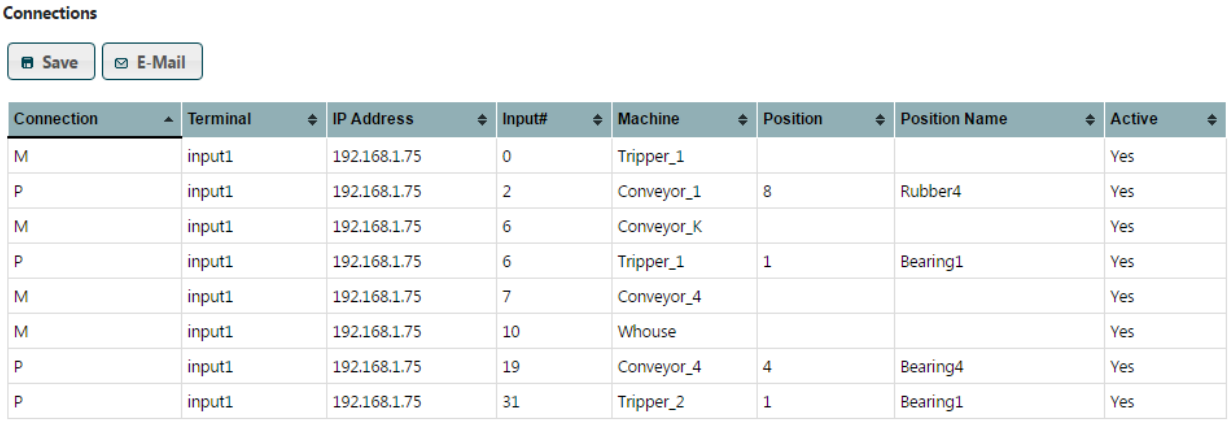
When input is activated

When input is deactivated


When input can't be read

4.10.2.4 Connections

Last section in Remote IO is "Connections". In this section can be viewed all machines and sensors which are assigned to each input.



Connection	Terminal	IP Address	Input#	Machine	Position	Position Name	Active
M	input1	192.168.1.75	0	Tripper_1			Yes
P	input1	192.168.1.75	2	Conveyor_1	8	Rubber4	Yes
M	input1	192.168.1.75	6	Conveyor_K			Yes
P	input1	192.168.1.75	6	Tripper_1	1	Bearing1	Yes
M	input1	192.168.1.75	7	Conveyor_4			Yes
M	input1	192.168.1.75	10	Whouse			Yes
P	input1	192.168.1.75	19	Conveyor_4	4	Bearing4	Yes
P	input1	192.168.1.75	31	Tripper_2	1	Bearing1	Yes

Figure 51: Remote IO Connections List

In the Connection table are following information:

- Connection – Indicates if the input is assigned to a machine "M" or to a sensor/position "P"
- Terminal – Name of the remote IO
- IP Address – IP address of the Remote IO
- Input# – Input number to which is the machine or sensor assigned to
- Machine – This column shows machine which is assigned to the particular input, or in case that sensor/position is assigned the machine where that sensor belongs to
- Position – Number of position of the sensor assigned to the input. Number refers to the section Positions in chapter 4.10.1 Machine
- Position Name – Position name is a name which is assigned to position in Machine type, refers to the section 4.10.3 Machine Type
- Active – Indicates if the Remote IO, which contains this particular input, is activated

4.10.3 Machine Type

When assigning a machine to the system (section 4.10.1 Machine), Machine Type has to be selected as a first step. By CMC was created list of default machine types (Conveyor, Tripper, Elevator, Drag, Gravity Conveyor, Fan, Motor_A-D). Each of the machine type which is already created can be modified in the Machine Type as well as new machine type can be created.

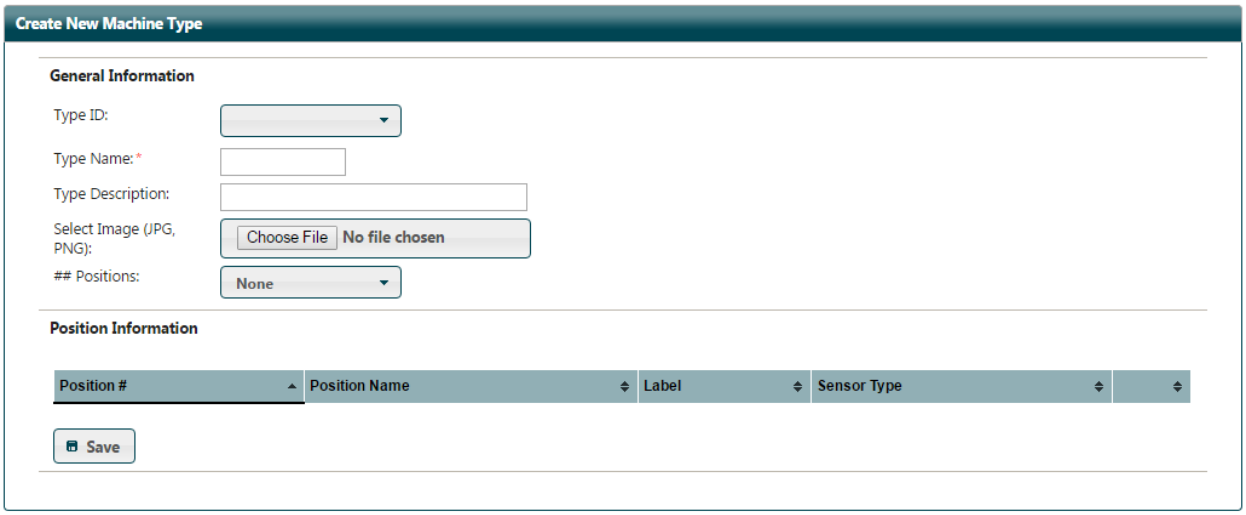
To access Machine Type click on Configuration -> Machine Type, "Machine Types" window will open.

On the top of the window are two buttons:

Figure 52: Create New Type & Import Existing

4.10.3.1 Create New Type

When clicked on "Create New Type" button "Create New Machine Type" window will open:



"Create New Machine Type" is divided into two sections:

A. General Information contains following fields

- Type ID – There are two groups of ID numbers. Numbers from 1-255 are reserved for machines defined by CMC and 256-512 available for customers. Each customer has the option to create up to 256 custom machine types.
- Type Name – Field for custom machine name.
- Type Description – Enter any desired description of the machine
- Select Image – User can upload any picture which will be suitable for the machine. Picture cannot be larger in size than 8MB. Preferable is to have square picture.
- ## Positions – Up to 32 sensors can be assigned to each machine. The number of positions is chosen in this field.

B. Position Information

When "## Positions" is defined all positions will appear below in "Position Information" section.

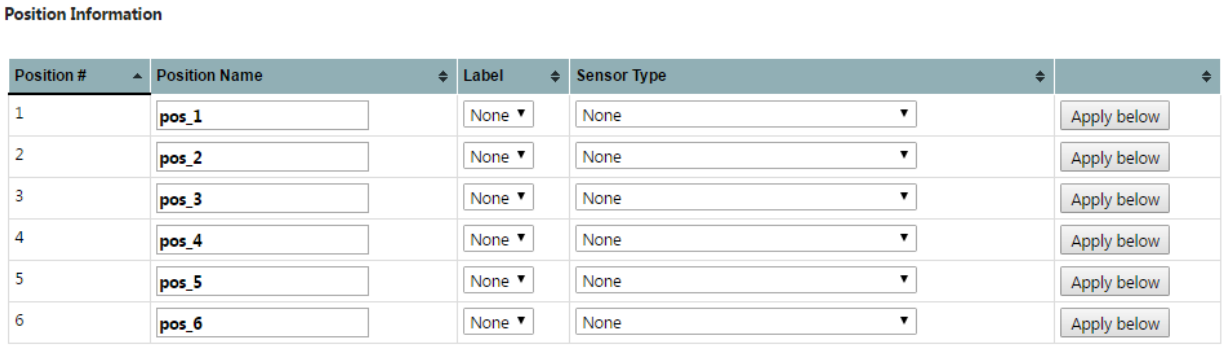


Figure 53: Position Information

Columns description follows:

- Position # – This number states the order of each sensor position
- Position Name – This field is for position name on certain machine type. Default machines created by CMC have for example position names like "Bearing_1", "Bearing_2", "Speed_1" and so on.
- Label – In label can be assigned any letter which will represent type of sensor on the machine screen on dashboard. "S" can be used for speed sensor, "R" for rub block and so on.
- Sensor Type – In sensor type is chosen what type of sensor will be assigned to that position.
- In last column is button "Apply Below". When this button is pressed all fields below will have the same "Label" and "Sensor Type". This helps to make the setting faster.

When all positions on new machine type are set "Save" button has to be pressed to be able to use that machine type.

4.10.3.2 Available Machine Types

Available Machine Types

	Type Name	Type ID	Type Description	Image	Enabled		
Select	Bucket_JP	256	Bucket Elevator JP		☐	Delete	Export
Select	Conveyor	10	General Conveyor		☑		Export
Select	Drag	40	Drag		☑		Export
Select	Elevator	30	Bucket Elevator		☑		Export
Select	Fan	60	Fan General		☑		Export
Select	GravConv	50	Gravity Conveyor		☑		Export
Select	Motor_A	70	Motor Drive A		☑		Export
Select	Motor_B	71	Motor Drive B		☑		Export
Select	Motor_C	72	Motor Drive C		☑		Export
Select	Motor_D	73	Motor Drive D		☑		Export
Select	Tripper	20	General Tripper		☑		Export

Figure 54: Available Machine Types List

Each machine type which is available on certain web server will be listed in “Available Machine Types” list. Machine types are sorted alphabetically based on “Type Name”. Description of all columns follows:

- “Select” button selects machine type which is going to be displayed in the window below “Available Machine Types” list. On the picture will be presented all positions which will represent the sensor on the dashboard. Position of all sensors can be adjusted based on customer needs. Each position is represented by rectangle with position name and 4 arrows.

Figure 55: Position Rectangle

By clicking on the arrows the rectangle will be moving in the arrow direction. Size of the moving step is defined by “Move Step” dropdown menu below the picture of the machine.

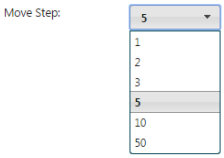


Figure 56: Move Step Dropdown Menu

Positions of sensor can be moved on all available machine types and it is automatically saved. In case there are instances of that machine type already used in the system and those changes should be applied on those machines as well, the “Update Layout Existing Machines” button has to be pressed. Then all machines which are “built” from that particular machine type will have the same setup as the machine type.

Figure 57: Update Layout Existing Machines Button

4.10.3.3 Type Machine Sensor Positions

As it was mentioned earlier on machine types can be assigned any type of sensor which is supported by CMC web server and network. To have easy view of all those sensors there is a list of them when clicked on “Supported Sensors” button.

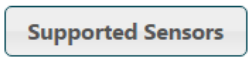
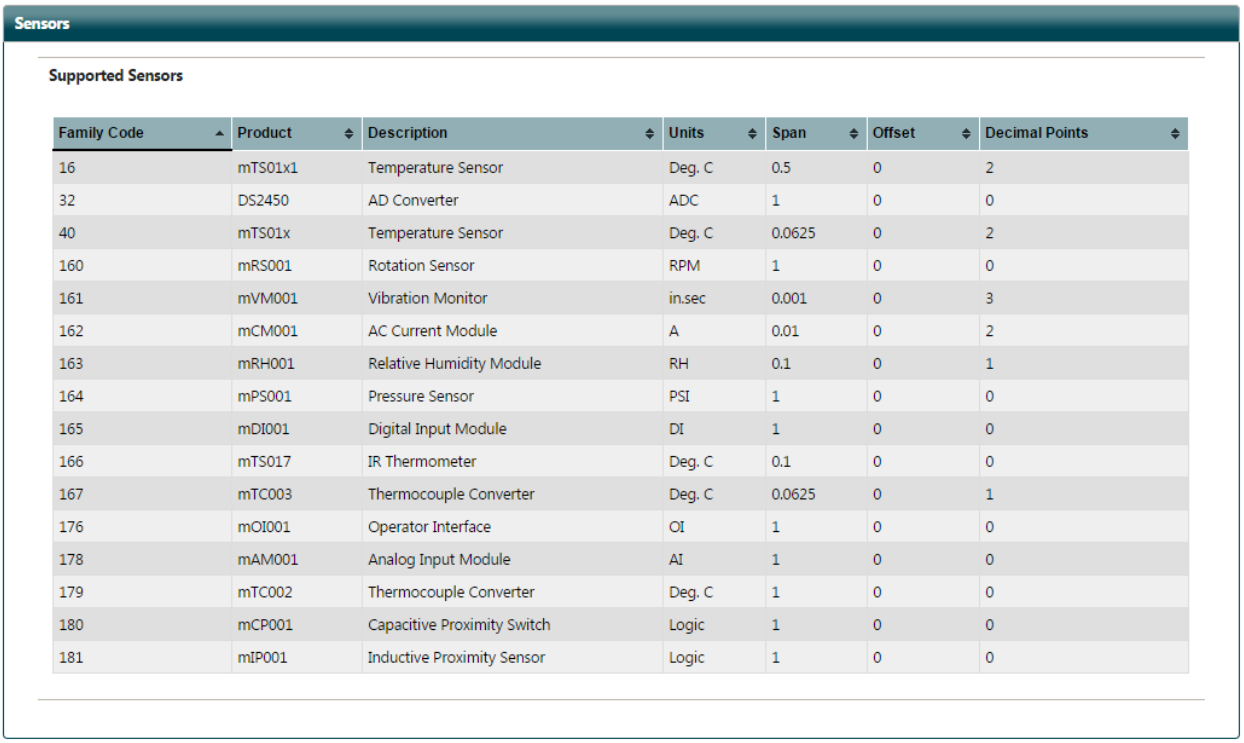


Figure 58: Supported Sensors Button

When clicked on that button table as on following picture will appear.



Family Code	Product	Description	Units	Span	Offset	Decimal Points
16	mTS01x1	Temperature Sensor	Deg. C	0.5	0	2
32	DS2450	AD Converter	ADC	1	0	0
40	mTS01x	Temperature Sensor	Deg. C	0.0625	0	2
160	mRS001	Rotation Sensor	RPM	1	0	0
161	mVM001	Vibration Monitor	in.sec	0.001	0	3
162	mCM001	AC Current Module	A	0.01	0	2
163	mRH001	Relative Humidity Module	RH	0.1	0	1
164	mPS001	Pressure Sensor	PSI	1	0	0
165	mDI001	Digital Input Module	DI	1	0	0
166	mTS017	IR Thermometer	Deg. C	0.1	0	0
167	mTC003	Thermocouple Converter	Deg. C	0.0625	0	1
176	mOI001	Operator Interface	OI	1	0	0
178	mAM001	Analog Input Module	AI	1	0	0
179	mTC002	Thermocouple Converter	Deg. C	1	0	0
180	mCP001	Capacitive Proximity Switch	Logic	1	0	0
181	mIP001	Inductive Proximity Sensor	Logic	1	0	0

Figure 59: Supported Sensors Table

In the table are following information:

- Family code – It is first number of serial number of each CMC sensor. By this number can be identified what type of sensor it is.
- Product – It is a marketing name for different types of CMC sensors
- Description – Description of the sensor type
- Units – Units in which the web server will show data if default setting is used
- Span – Default span for certain sensor
- Offset – Default Offset for certain sensor
- Decimal Points – How many decimal points will the presented value have. For example if the number is 152 and it has 2 decimal points it will show 1.52.

After returning to the Type Machine Sensor Position machine which can be configured can be selected by pressing “Select” button on the list of machines shown on Figure 51. Assigned sensors to that particular machine will be presented in list of sensors as shown on Figure 57.

On this step is possible to change position of the assigned sensors on selected machines only. No type of sensor or number of sensors can be modified at this point. This operations need to be done when a Machine Type is created, see section 4.10.3.1.

In this step each sensor can be chosen by clicking on position number highlighted below. Position of sensor can be changed by X Y coordinates. When chosen sensor is set to desired position it needs to be saved. To save the new coordinates of sensor “Save” button needs to be pressed, highlighted below.

Position	Position Name	Measurement	Sensor	Sensor Description	Image X	Image Y	
1	Bearing_1	Temperature	mTS01x	Temperature Sensor	74	268	Save
2	Bearing_2	Temperature	mTS01x	Temperature Sensor	4	214	Save
3	Bearing_3	Temperature	mTS01x	Temperature Sensor	409	267	Save
4	Bearing_4	Temperature	mTS01x	Temperature Sensor	470	206	Save
5	Speed_1	Rotation	mRS001	Rotation Sensor	490	337	Save

Figure 60: Type Machine Sensor Position

4.10.3.4 Type Machine Image

Each machine can have its own picture to allow customer to have the best suitable interface. The picture can be changed on each available Machine Type. To choose a picture click on “Choose File” button, highlighted on Figure 58. Through opened dialog choose a desired picture. Then click on “Upload” button to upload chosen picture, highlighted on Figure 58. If the “Upload” button is inactive, machine to which the picture will be assign to needs to be selected.

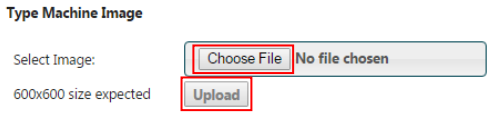


Figure 61: Type Machine Image

4.10.4 User

To open User Configuration click on Configuration -> User. Only System and IT Administrator have rights to enter this menu. Window with list of users will open, see Fig 59. When logged in for the first time the only user which will be listed is cmcadmin, as it is on Fig 59.

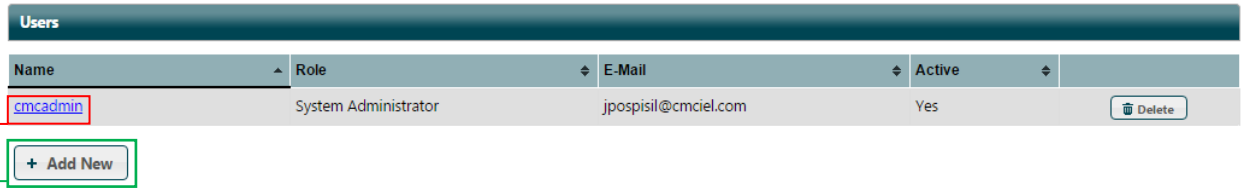


Figure 62: List of Users

In the list of users are following information:

- Name – Name of a user. Default name is cmcadmin, see section 4.2
- Role – User role which each user has assigned, see section 4.3
- E-Mail – email to which all set notification will be sent
- Active – indicates if the user is active or not
- Delete – Users can be deleted only by System Administrator

When clicked on user name link User Configuration window will open, see Fig 60.

4.10.4.1 User Configuration

Only System Administrator has rights to change user's configuration. IT Administrator has rights to view user's configuration. Logged in System Administrator can't change its own role, this is disabled to avoid situation when no user has System Administrator rights.

When existing user is configured, the name of that user can't be changed. The field for name is grayed out as inactive, see Fig 60.

Description of fields which can be configured follows:

- **E-Mail** – Email of the user where all set notification and alerts will be sent (must be filled in).
- **Phone Number** – Phone number of the user, additional information only.
- **Role** – Role which defines right which the user will have, for more information see section 4.3 User Roles.
- **Notify (E-Mail) For** – Here can be chosen which notification should be sent to the user by e-mail. The user can be notified with Alerts, Acknowledgments and Configuration Changes as is visible on Fig 60.
- **Active** – The user can be activated or deactivated by this checkbox. In case the user is not activated he/she will not be able to login.
- **Password** – Password is described in section 4.10.4.3 Changing a Password

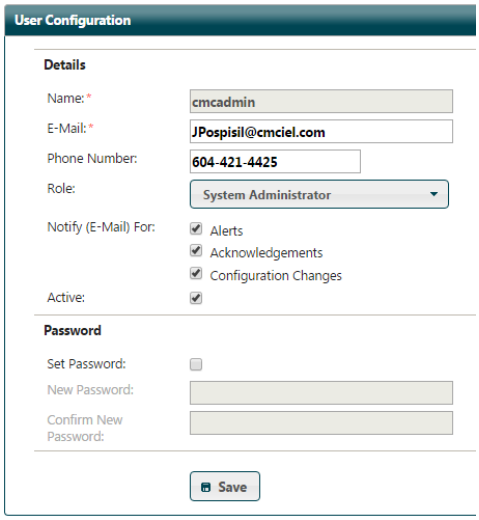


Figure 63: User Configuration

4.10.4.2 Adding/Creating a New User

To create a new user click on "+ Add New" button below the list of users, window on Fig 61 will open.

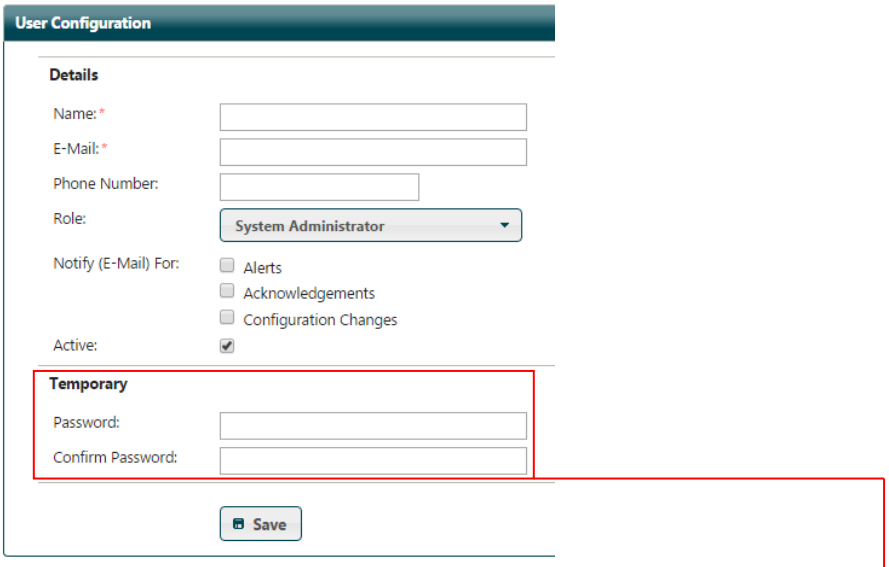


Figure 64: Adding a New User

For the new user needs to be filled in the same information as in User Configuration Section 4.10.4.1. In addition to that Name of the user has to be filled in as well.

Each user must have a password which he/she will use to log into the web server. Temporary password is set by System Administrator when he/she creates a new user. The temporary password is filled in at the bottom of the window shown on Fig 61.

When the new user is created, he/she will receive e-mail with the temporary password. When the new user logs in, he/she will be asked to set a new password as it is on Fig 62.

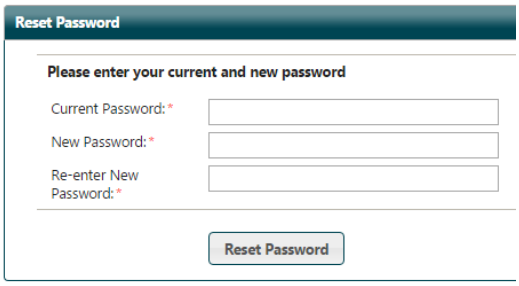


Figure 65: Password Reset

4.10.4.3 Changing a Password

To access user password settings click on Configuration -> User then click on name of user whose password should be changed.

Only System Administrator has rights to change password of each user and create temporary password. The temporary password is sent to the user by email. When user logs in for the first time after the password was changed, he/she will be asked to create its own password. To create a new password window on Fig 62 will be shown.

When System Administrator is changing its own password no temporary password will be created. The password which the System Administrator will set is the password which will be used.

The difference between changing another user password and System Administrator own password is in label for the password changing part of the User Configuration. When System Administrator is changing password for another user the window on Fig 61 will be shown. If the System Administrator is changing its own password window on Fig 63 will be shown.

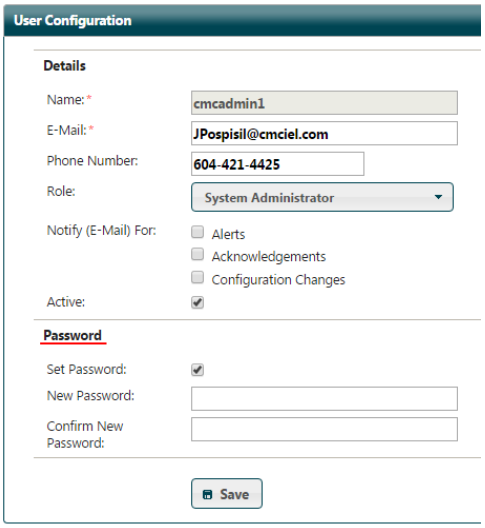


Figure 66: System Administrator User Configuration

4.10.5 Emulate Alarm

This feature serves to verify configuration of the system. User can simulate any desired value on any sensor which has been assigned to a machine. By this feature user can check if alarms which supposed to be triggered by certain values on certain sensors will be triggered.

To access Emulate Alarm feature click on Configuration -> Emulate Alarm, window on Fig 64 will appear.

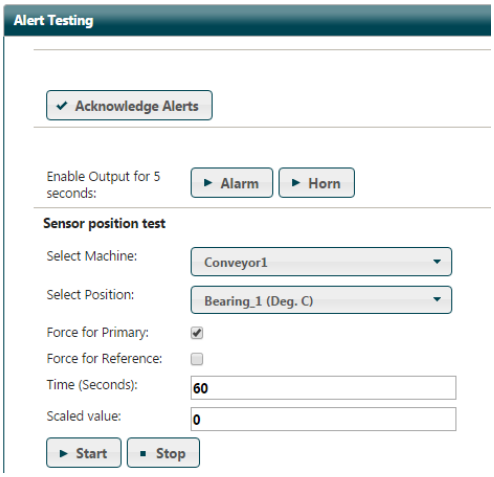


Figure 67: Alert Testing Window

4.10.5.1 Alarm and Horn Test

As it was mentioned in section 3.2 the web server has two dry contacts. One is for Alarm signal and second one for Horn. By the Alarm and Horn test the right functionality of the system can be checked. This can also be checked by buttons, see section 2 Description of Connections, Switches and Indicators in part for Buttons.

Note: The Alarm and Horn contact test from the interface can be done only if the sensor network is on.

4.10.5.2 Sensor Position Test

On each sensor which is assigned to a machine can be simulated any value. By this feature can be easily tested functionality of a system like alarms, output control, etc.

To select which sensor should be simulated, following steps needs to be done. From “Select Machine” dropdown menu choose machine to which the sensor is assigned to and from “Select Position” choose sensor which should be simulated, Fig 64.

The simulated value can be forced into the sensor itself or to the reference sensor which is assigned to the selected sensor or on both. This can be chosen by checkboxes “Force for Primary” and “Force for Reference”.

The last two fields on the Sensor position test are for the desired value which should be forced to the selected sensor and time for how long this value should be on that sensor for.

When the sensor is selected and value is set, start button can be pressed to start the simulation. When the simulation starts the progress of this test will be shown in the Test Progress list shown on Fig 65. In the list will be shown on which machine and what position the simulated sensor is, what value is forced to the sensor and what is the reference sensor.

Another thing which will be presented is list of the alarms/alerts which were triggered by the set value including the note that it is a Sensor test.

Test Progress

Machine	Position	Value	Reference	Acknowledge
Conveyor1	Bearing_1	0		Low alarm+Sensor test

Figure 68: Alarm Emulation Test Progress

The number of tests running at the same time is unlimited. The system is able to simulate values on all assigned sensors at the same time. It is not possible to stop certain test by the stop button. When the stop button is pressed it will terminate all simulations which are in progress at that time.

Acknowledge Alerts button is placed on top of the window so after each test all alarms can be acknowledged without the need of leaving the Emulate Alarm page.

4.10.6 System

To access System Configuration click Configuration -> System. In System Configuration is setup of E-mail Server configuration, setup of system backup and configuration of Industrial Network.

4.10.6.1 SMTP (Outgoing e-mail) Server Setup

First part of System Configuration is for e-mail setup. Example of the SMTP server setting is on Fig 66. In the example is private CMC SMTP server. Each customer has to have their own SMTP server to allow them to have all e-mail notifications working properly.

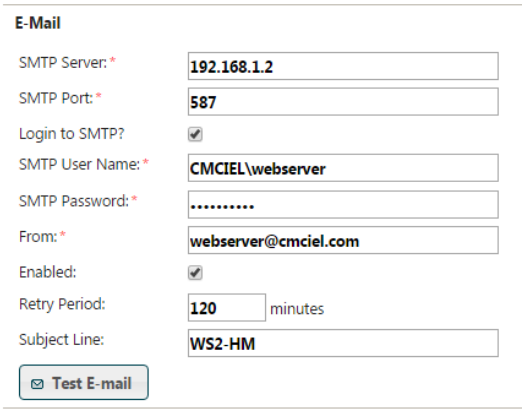


Figure 69: Example of SMTP Server Setup

To setup the SMTP server properly following information need to be provided:

- **SMTP Server** – IP address of accessible SMTP Server
- **SMTP Port** – To have correct e-mail notification functionality 587 port should be used as it requires outgoing emails only
- **Login to SMTP?** – Check for SMTP server user authentication, usually required
- **SMTP User Name** – User name for SMTP server authentication
- **SMTP Password** – Password for SMTP server authentication
- **From** – E-mail from which the e-mails will be received
- **Enabled** – Checkmark for e-mail notification enabling
- **Retry Period** – Time period in which another e-mail will be resent in case a sent e-mail was not confirmed as delivered
- **Subject Line** – Subject in sent e-mail

4.10.6.2 System Backup

Second part of System Configuration is System Backup. System Backup saves all data about the system with records of all data on each sensor for up to 2 years. To create a backup file click on “Create Complete Backup” button, see Fig 67. It may take a while till the backup file is created, depends on how much data is being proceed. If the backup file is done and “Refresh” button is pressed the backup file will be listed in the list of backup files as it is

shown on Fig 67. The backup file is special compressed MySQL file which requires special application to decode the recorded data.

Blank backup file can be created as a template to set or create the application which will work with the recorded MySQL data. The blank backup file can be created by clicking on "Create Blank Backup" button.

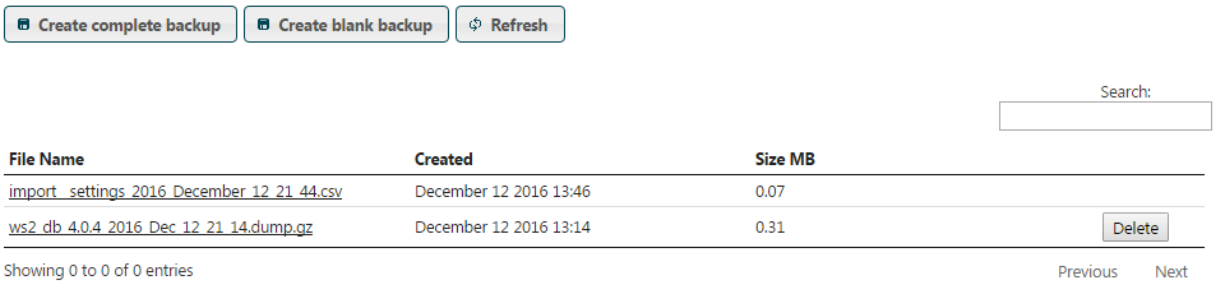


Figure 70: System Backup

4.10.6.3 System Backup, Recent Alerts and Archive Settings

Third part of the System Configuration contains fields where customer can configure the way how the data of backup file and archive file will be recorded.

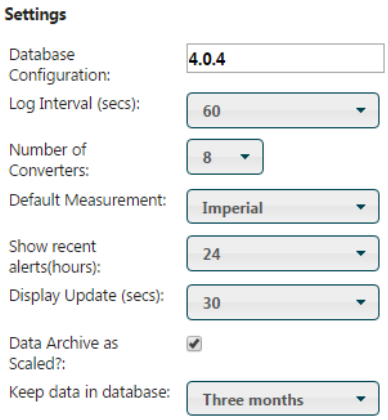


Figure 71: Backup, Recent Alerts and Archive Settings

This section has following fields:

- **Database Configuration** (Backup) – The first release of WS2 has version 4.0.4, this field can't be configured
- **Log Interval (secs)** (Backup) – in this field is set how often will be recorded data of each sensor. Here is very important to mention that this interval is applied if no alarms or warnings appear. This interval is applied only if condition of sensor will stay the same. In case some event which triggers alarm or warning the record will happen immediately regardless to the interval settings. It is important to set the interval in optimal way so there will be no huge amount of useless data created
- **Number of Converters** (Backup) – Number of converters which will be recorded. Here is also important to mention that the number of bus converters which will be

recorded shouldn't be more than number of bus converters which are actually used to avoid creating of unnecessary data.

- **Default Measurement** (Backup) – Here is assigned in which way backup data will be recorded, Imperial or SI
- **Show Recent Alerts (hours)** (Recent Alerts) – This setting affects Recent Alerts list which is described in section 4.6.2 Recent Alert History. In this field can be set how long the recent alerts should be shown. If set for 24, alerts older than 24 hours won't be listed.
- **Display Update (secs)** (Recent Alerts) – This field will set how often the recent alert list will be updated
- **Data Archived as Scaled?** (Archive) – By this checkmark user can choose if the archived data will be scaled or not
- **Keep Data in Database** (Archive) – By the drop down menu user can choose from how long time data for archive should be created.

After any changes in the setting in this section "Save" button has to be pressed to activate the changes.

4.10.6.4 Industrial Automation Setting

The last part of System Configuration is Industrial Automation Setting. In this section user can choose a protocol by which the webserver will be providing data for further use for industrial purposes as is for connected PLC and so on.

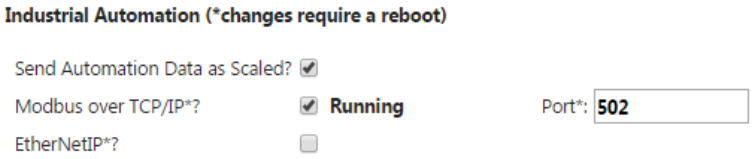


Figure 72: Industrial Automation Setting

Following options are available:

- **Send Automation Data as Scaled** – By this checkmark can be chosen if the data from sensor bus for further use should be scaled or if raw data will be provided only.
- **Modbus over TCP/IP** – By this checkmark is chosen that the protocol used to provide sensor network data will be Modbus TCP/IP protocol using port which is defined in the "Port*" field. Besides the checkmark on the right side will be shown label "Running" in case this protocol was chosen and it is running at the moment, see Fig 69. When the protocol is chosen "Save" button has to be pressed to confirm the setting plus in this case the web server needs to be rebooted.
- **EtherNetIP** – By this checkmark is chosen that the protocol used to provide sensor network data will be EtherNetIP. Besides the checkmark on the right side will be shown label "Running" in case this protocol was chosen and it is running at the moment, see Fig 69. When the protocol is chosen "Save" button has to be pressed to confirm the setting plus in this case the web server needs to be rebooted.

4.10.7 Host Configuration

To access host configuration click Configuration -> Host. In the host settings can be controlled the RS485 which connects the bus converters; The system can be rebooted; All network information is set in this section; Time and date can be set; Share folders can be set; Information about the web server performance is presented.

4.10.7.1 Reboot System and Sensor Network Control

On the top of Host Configuration window are three buttons. By the first “Reboot System” button the web server can be rebooted. Rebooting of the system is necessary for example when Industrial Automation communication protocol is changed or if some IP Network Setting changes are done.

By the second “Start Sensor Network” and third “Stop Sensor Network” buttons can be controlled the Modbus RS485 line where bus converters are connected. This function is mostly used for power cycling the bus converters along with the whole sensor network.

Figure 73: Reboot System and Sensor Network Control Buttons

4.10.7.2 IP Network Settings

In IP Network Setting section are set all necessary network information for correct functionality of web server in a network. If any changes are done on the IP Network Settings the system needs to be rebooted. For this reason the “Reboot System” button is placed above the Host Configuration window.

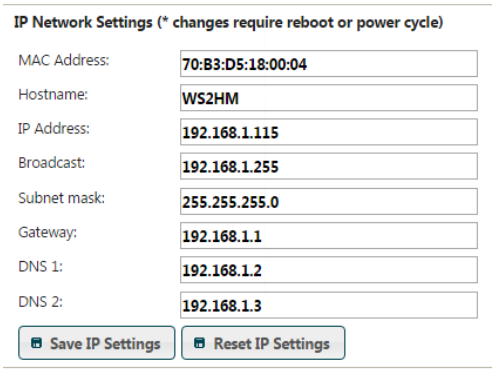


Figure 74: IP Network Settings

In the IP Network Settings are following fields:

- **MAC Address** – MAC address of the web server
- **Hostname** – Assigned hostname of the web server
- **IP Address** – IP address of the web server
- **Broadcast** – Broadcast IP address of the web server
- **Subnet mask** – Subnet mask of the web server
- **Gateway** – Gateway IP address

- **DNS 1** – DNS 1 server IP address
- **DNS 2** – DNS 2 server IP address

To save the set IP Network Settings press “Save IP Settings” button. If default IP settings should be set press “Reset IP Settings” and all IP Network Settings will be set to default values.

4.10.7.3 Date and Time Settings

In this section is set time and date of the web server. It can be synchronized from Internet or it can be set manually.

In the first part is current time and current time zone which is set on the web server, see Fig 72.

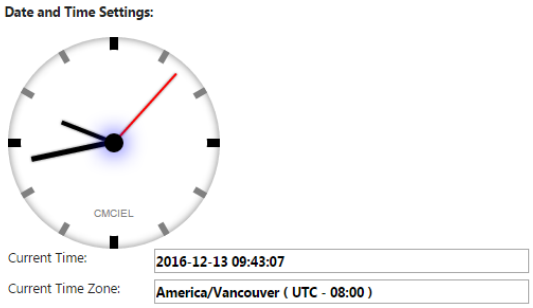


Figure 75: Host Current Time and Time Zone

In the second section are filed which are set in case the time and date should be set manually. The desired time and date is set and then “Set Host Time Manually” is pressed, this will set the time and date chosen by user.

In case the time should be set from the internet the “Set Time From Internet” button has to be pressed.

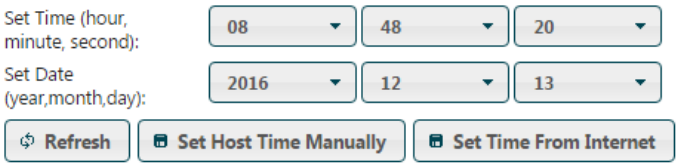


Figure 76: Host Time and Date Setup

In the last part is a field to choose a time zone which the web server should be se to. User can set the desired time zone and then press the “Set Zone” button to set it.

Figure 77: Host Time Zone Setup

4.10.7.4 Share Folders

To have easier access to files which are on web server there is an option to have shared folder which can be access from computer without the need of using web browser. For example from windows these files can be accessed from windows explorer.

To create the access to the folders which are listed below User Name and Password for those has to be created. This is done in the Share Folder(s) section. The User Name is "ws2share" by default and can't be modified. Password can be chosen. When the password is set the "Save" button needs to be pressed.

Figure 78: Share folders User Name and Password

When the password is saved user can go for example to windows explorer as is on Fig 76 and type in IP address of the web server in this format \\192.168.1.115. Dialog for login will open. Saved user name and password has to be entered to access the folder shown on the Fig 76.

User with rights to configure a host can change the password to access the shared folder and save them. However the newly set password will be used when computer where the first log into the share folders was done will be rebooted or different user will be logged into the computer. Otherwise the old password will be working and no login dialog for login will be opening.

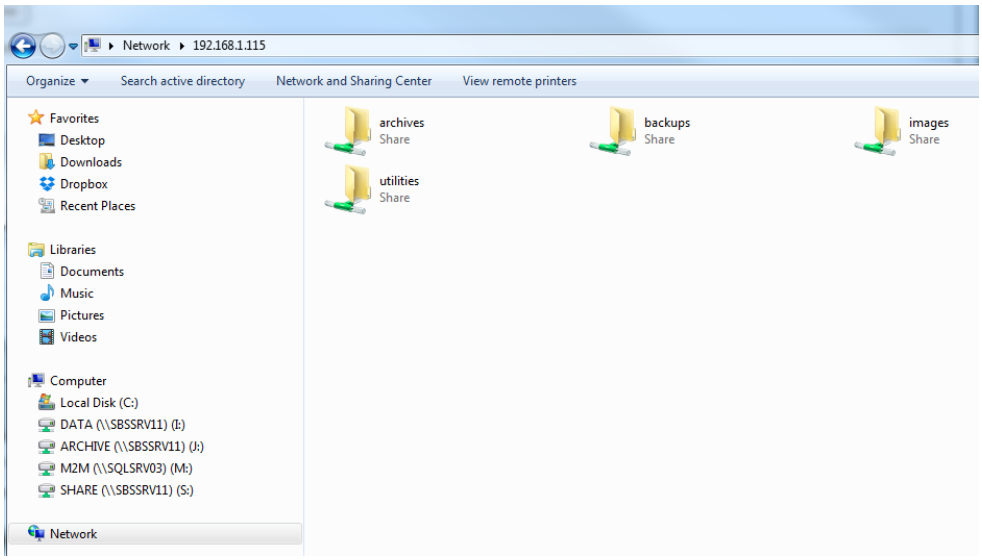


Figure 79: Shared Folders Accessed from Windows Explorer

As it was mentioned this feature allows customer to access certain files without need of using web browser. As it is visible on Fig 76 the shared folders contain *archives, backups, images* and *utilities*. Regards to the archives, backups and utilities the same file scan be accessed from web browser and this feature may make it easier to access from the windows explorer.

Regards to the images, these pictures can't be easily accessed from the web browser and it is most likely the only possible way how to obtain the images of machines, either the default ones or the custom ones. To obtain the machine images may be needed if user needs to create a same configuration with the same types of machines on another web server.

4.10.7.5 Host Information

When clicked on "Show Host Info" button information about the web server unit will be shown. In the presented data can be seen CPU usage, CPU temperature, hard drive temperature and so on. Example of these data can be seen on Fig 77.

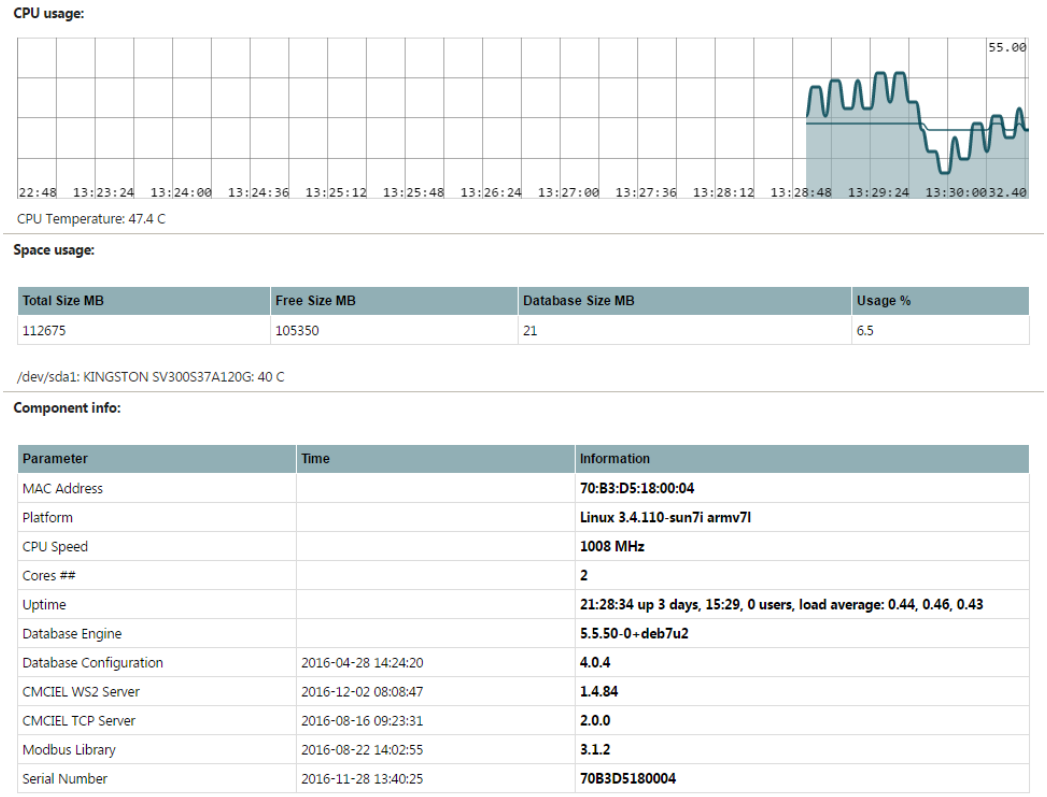


Figure 80: Example of Host Information

4.10.8 Export Import

Web server machine settings can be exported into csv format file which can be used as a back-up file for the same web server or as a copy of the existing web server setup to be uploaded to another web server.

Differently than on previous generation of CMC (mOI215) web server the host data is not exported. The only data exported are data about the machines and their sensors, remote IO setting, users and the system setup.

Web server can import data from the previous generation of CMC web server.

4.10.8.1 Export Settings

To export machine data from the web server go to Configuration -> Export – Import and then click on the “Export Settings” button marked in red frame on Fig 81. The file can be sent directly to the user’s email by clicking on “E-Mail” in the blue frame on Fig 81. The structure of the file is described in section TBD

Figure 81: Exporting of Machine Setting from WS2

4.10.8.2 Import Settings

Import setting is in the same menu as export settings. In case imported data file is from WS2, click on the “Choose File” button marked red on Fig 82. Dialog to select the file will open. Select the desired file to be uploaded and click “Open”.

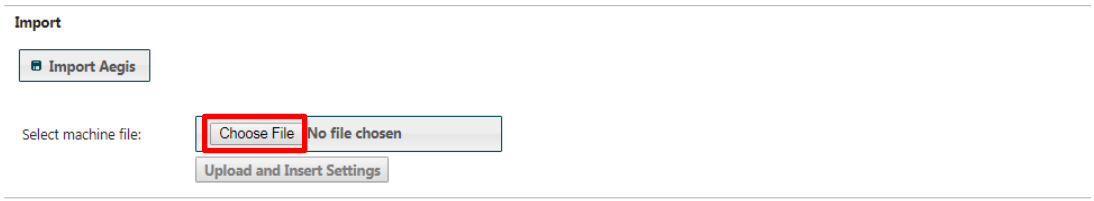
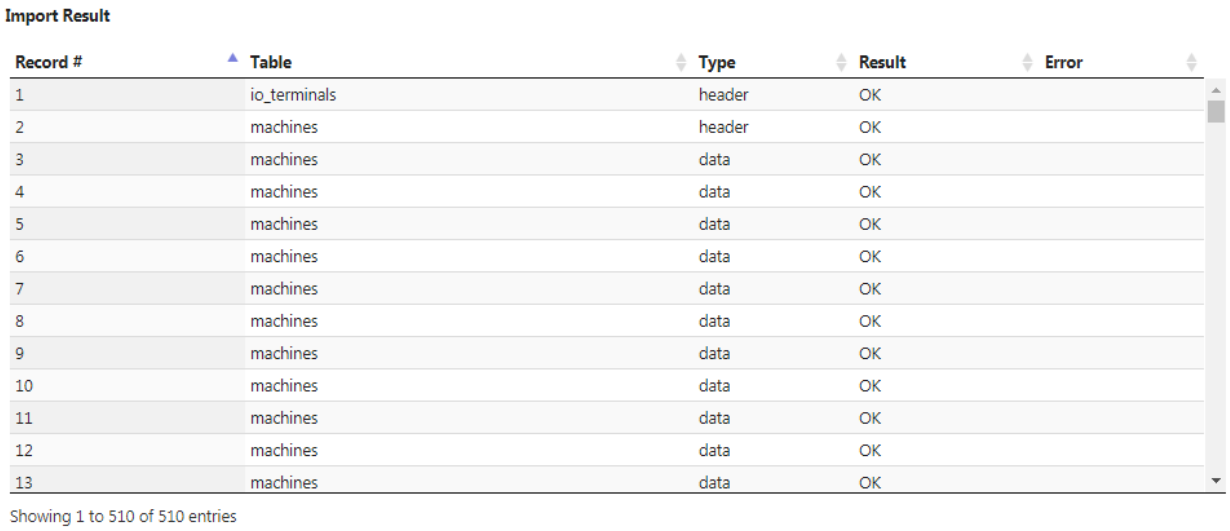


Figure 82: Selecting Machine File to be Uploaded

When file is selected “Upload and Insert Settings” button will become active and name of the selected file will be beside the “Chose File” button as is on the Fig 83.

Figure 83: Selected Machine File to be Uploaded

When clicked on the “Upload and Insert Settings” button, the web server will take couple moments to do the upload. When it is done the “Upload and Insert Settings” button will become inactive again and import results will be listed below as is on Fig 84. The import result will show all setting steps (entries) which were done and in case some steps weren’t done properly (which will be shown in update from WS1), it will be marked red in the report.



Import Result

Record #	Table	Type	Result	Error
1	io_terminals	header	OK	
2	machines	header	OK	
3	machines	data	OK	
4	machines	data	OK	
5	machines	data	OK	
6	machines	data	OK	
7	machines	data	OK	
8	machines	data	OK	
9	machines	data	OK	
10	machines	data	OK	
11	machines	data	OK	
12	machines	data	OK	
13	machines	data	OK	

Showing 1 to 510 of 510 entries

Figure 84: Successful Import Results

4.10.8.3 Import from WS1 (mOI215)

As previously mentioned the WS2 web server can accommodate data from the previous generation of CMC web server mOI215. The fashion of these two webservers is very different and the way how WS2 will interpret the data from the WS1 was determined as follows. The WS1 has 8 groups (tabs) where sensors can be assigned. The WS2 assumes that each group represents one machine even though it is not necessarily always the truth but it was the only way which the structure could be drawn upon. The WS1 can have sensors from one machine assigned to all 8 groups, it is completely flexible and it always depends on the user how the structure will be done. For this reason this feature should be use with caution and the right setup on the WS2 should be verified.

On following example was used setup which had used all 8 tabs called M1-M8, see Fig 85. Each tab had certain number of sensors and some sensors were assigned to multiple positions. The machine M1 has assigned 13 positions using 9 sensors. Position TEMP1, 10 and 32 have the same senor 40-0-0-3-1-24-19-46 assigned, TEMP2 and 31 has the same sensor 40-0-0-6-21-126-36-211 assigned and TEMP3, 30 has the same sensor 40-0-0-6-21-131-159-102 assigned.

The tabs M2-M8 has random sensors assigned and this document will not focus on the sensors from those groups.

Setup from the WS1 was acquired by using AegisX.jar application which created csv file which can be uploaded into the WS2 web server.

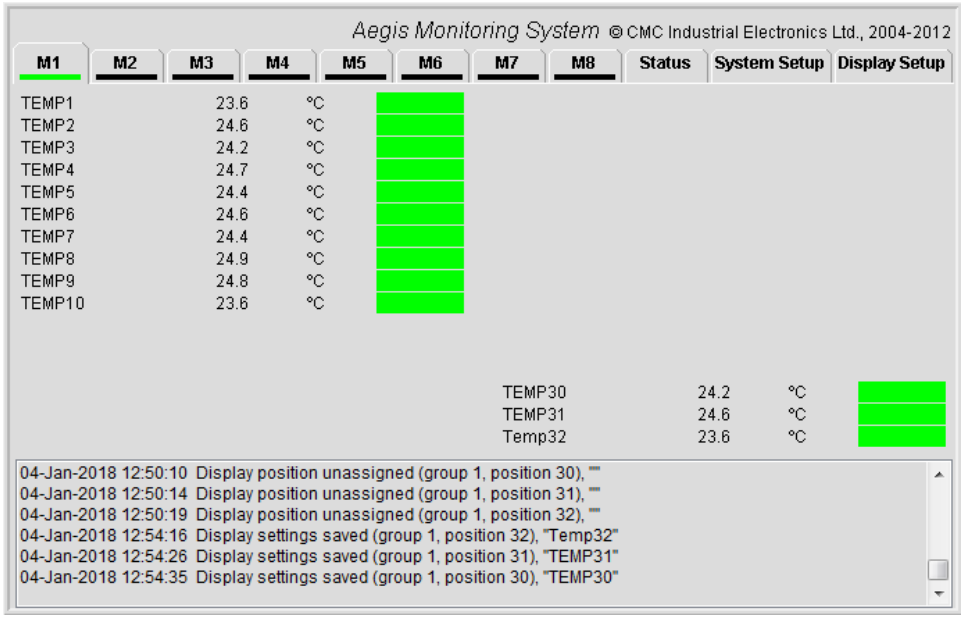


Figure 85: Example of WS1 Setup

Import setting from WS1 is in the same menu as regular import settings. In section Import click on “Import Aegis” button which is marked red on Fig 86. After clicking on that button the menu will slightly change to the one on Fig 87.

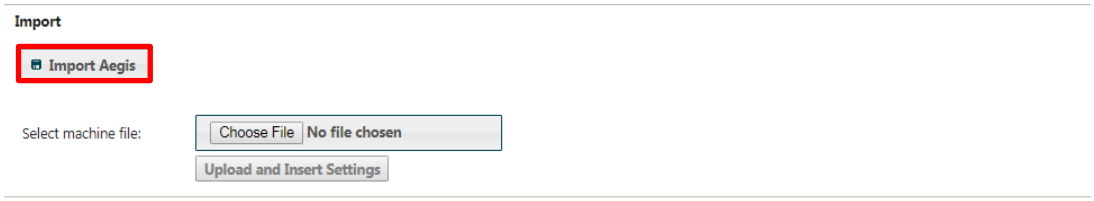


Figure 86: Select to Import File from WS1

Figure 87: Selecting Machine File to be Uploaded from WS1

Click on the “Choose File” button marked red on Fig 87. Dialog to select the file will open. Select the desired file to be uploaded and click “Open”. When file is selected “Upload and Insert Settings” button will become active and name of the selected file will be beside the “Chose File” button as is on the Fig 83.

Figure 88: Selected Machine File to be Uploaded from WS1

When clicked on the “Upload and Insert Settings” button, the web server will take couple moments to do the upload. When it is done the “Upload and Insert Settings” button will become inactive again and import results will be listed below as is on Fig 89. The import result will show all setting steps (entries) which were. As it is shown on Fig 89 there were sensors which were assigned to more than one position which is restricted on the new web server. For this reason some of the sensors are crossed out and marked red and no serial number was assigned to that position. In the report is shown that machine name is M1 and assigned positions are 1-13. But the PLC registers assigned are 1-10 and then 30-32 to match the register setup in WS1.

Step 2. Review transform result

Group #	Machine Name	Position #	Position Name	Serial ID	PLC	Units	Span	Offset
1	M1	1	TEMP1	~~40-0-0-3-11-24-19-46~~	1	Deg. C	0.0625	0
1	M1	2	TEMP2	~~40-0-0-6-21-126-36-211~~	2	Deg. C	0.0625	0
1	M1	3	TEMP3	~~40-0-0-6-21-131-159-102~~	3	Deg. C	0.0625	0
1	M1	4	TEMP4	40-0-0-6-21-161-105-221	4	Deg. C	0.0625	0
1	M1	5	TEMP5	40-0-0-6-193-120-165-157	5	Deg. C	0.0625	0
1	M1	6	TEMP6	40-0-0-9-64-128-24-65	6	Deg. C	0.0625	0
1	M1	7	TEMP7	40-0-0-9-65-30-192-190	7	Deg. C	0.0625	0
1	M1	8	TEMP8	40-0-0-9-66-3-95-51	8	Deg. C	0.0625	0
1	M1	9	TEMP9	40-0-0-9-71-133-46-74	9	Deg. C	0.0625	0
1	M1	10	TEMP10	~~40-0-0-3-11-24-19-46~~	10	Deg. C	0.0625	0
1	M1	11	TEMP30	40-0-0-6-21-131-159-102	30	Deg. C	0.0625	0
1	M1	12	TEMP31	40-0-0-6-21-126-36-211	31	Deg. C	0.0625	0
1	M1	13	Temp32	40-0-0-3-11-24-19-46	32	Deg. C	0.0625	0

Showing 1 to 74 of 74 entries

Figure 89: Import Results after Importing File Generated by WS1

On dashboard of the web server will then be the new machines M1-M8 plus all machines which already existed on the web server before as is shown on Fig 90.

Figure 90: Dashboard with Imported Machines from WS1

On Fig 91 is shown how the machine configuration will look like. All positions are named exactly as it was on WS1 with their serial numbers. Positions of sensors on the picture are in rows and columns by default and can be changed by dragging them by edge to desired position. Default picture is CMC logo and that picture can be also changed.

Positions

Sensor Network View

#	Position	Units	Sensor Type	Sensor ID	Reference ID	SetPoints	PLC Register	Active | Log	Running Input
1	TEMP1	Deg. C	mTS01x	-	-	Edit	1	Yes | No	
2	TEMP2	Deg. C	mTS01x	-	-	Edit	2	Yes | No	
3	TEMP3	Deg. C	mTS01x	-	-	Edit	3	Yes | No	
4	TEMP4	Deg. C	mTS01x	40-0-0-6-21-161-105-221	-	Edit	4	Yes | No	
5	TEMP5	Deg. C	mTS01x	40-0-0-6-193-120-165-157	-	Edit	5	Yes | No	
6	TEMP6	Deg. C	mTS01x	40-0-0-9-64-128-24-65	-	Edit	6	Yes | No	
7	TEMP7	Deg. C	mTS01x	40-0-0-9-65-30-192-190	-	Edit	7	Yes | No	
8	TEMP8	Deg. C	mTS01x	40-0-0-9-66-3-95-51	-	Edit	8	Yes | No	
9	TEMP9	Deg. C	mTS01x	40-0-0-9-71-133-46-74	-	Edit	9	Yes | No	
10	TEMP10	Deg. C	mTS01x	-	-	Edit	10	Yes | No	
11	TEMP30	Deg. C	mTS01x	40-0-0-6-21-131-159-102	-	Edit	30	Yes | No	
12	TEMP31	Deg. C	mTS01x	40-0-0-6-21-126-36-211	-	Edit	31	Yes | No	
13	Temp32	Deg. C	mTS01x	40-0-0-3-11-24-19-46	-	Edit	32	Yes | No	

Figure 91: Machine Configuration of Machine Imported from WS1

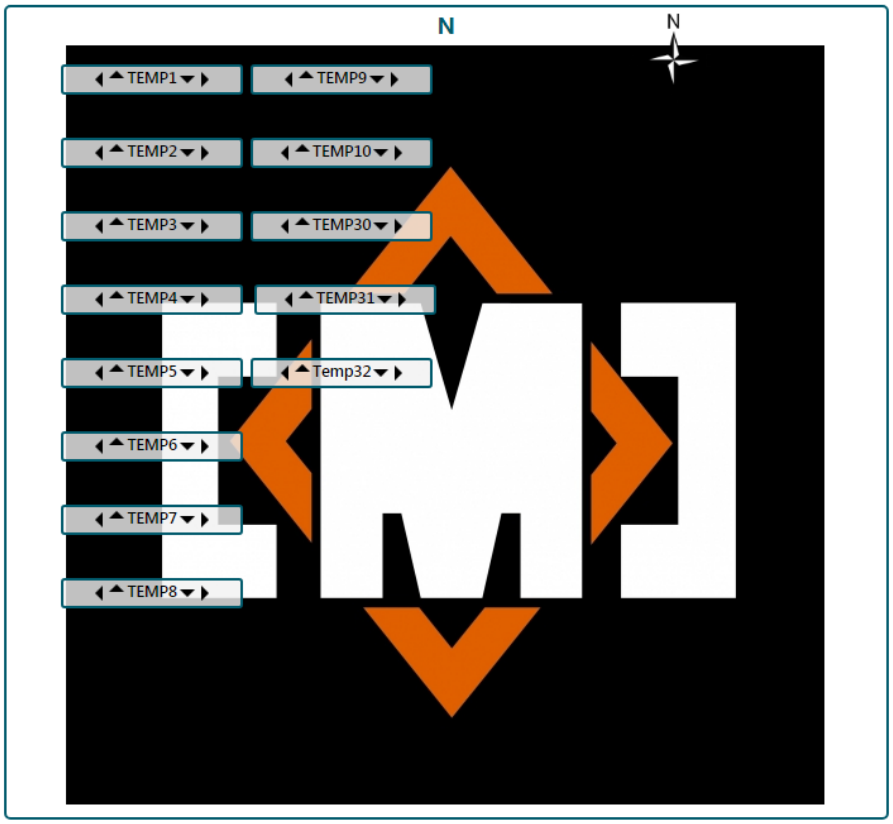


Figure 92: Picture of Machine Imported from WS1

5. Troubleshooting

This section describes solutions to various problems you may have with setup or operation of the interface.

5.1 Unable to see the WS2 on the Local Area Network

Possible Cause	Solution
AC power not present	Confirm outlet is powered and wiring is correct between transformer and WS2 circuit board.
Ethernet cable connection problem	If a previously unused Ethernet jack is being used for the WS2, confirm the jack is connected to the LAN. Check the cable is OK.
IP address conflict	Confirm the IP address chosen for the WS2 does not conflict with other IP addresses on the network.
Router's MAC address table is not automatically updated	Consult the router's user manual and rebuild its address table as recommended.

5.2 Bus Converters Are Not Detected

Possible Cause	Solution
Bus Converter address not in the range 1-8	Change the Bus Converter address switches to an address between 1 and 8

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6. Specifications

Description	Characteristics
Power Supply	
Voltage	24 VDC SELV/PELV
Current	Peak 2 A (48 VA) Avg. 0.4 A (12 VA)
Ethernet	
10BaseT	RJ-45 jack
Bus Converter Communication	
Standard	RS485 differential
Distance	500 m (1640 ft.)
Termination	120 Ω balanced line
Environment	
Temperature	0 to 60 °C (32 to 140 °F)
Relative Humidity	0 to 70% non-condensing
Dimensions	
Depth	76.2 cm (3.0 in)
Width	17.9 cm (7.05 in.)
Height	10.0 cm (3.93 in)
Industrial Interfaces	
Modbus	
Ethernet/IP	

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7. Appendix 1 - Modbus Communications

The WS2 communicates with a host computer or PLC using the Modbus/TCP protocol. The Modbus slave address for the WS2 is 1. The memory has been configured to simulate a PLC with 16 bit registers. These registers are allocated as follows:

Modbus SENSORS REGISTERS		
Register	**PLC Reg. Type**	**Description**
40001-40511 Odd addr	1-256 R	Sensor Readings. Registers are selected by user by PLC register in setting for each sensor
40002-40512 Even addr	N/A R	Flags for each position (1 through 256). A list of the bits and their description follows: 0 High Alarm — High alarm threshold has been crossed 1 Low Alarm — Low alarm threshold has been crossed 2 High Warning — High warning threshold has been crossed 3 Low Warning — Low warning threshold has been crossed 4 Ref High Alarm — Difference between primary and reference sensor crossed the set threshold $T_P>T_R$ 5 Ref Low Alarm — Difference between primary and reference sensor crossed the set threshold $T_P<T_R$ 6 Ref High Warning — Difference between primary and reference sensor crossed the set threshold $T_P>T_R$ 7 Ref Low Warning — Difference between primary and reference sensor crossed the set threshold $T_P<T_R$ 8 Rate of Rise — Temperature and Time thresholds have been crossed 9 Machine Pin — Remote IO pin assigned to machine is on 10 Position Pin — Remote IO pin assigned to position is on 11 Reference Fault — A fault exists on the reference sensor

Modbus SENSORS REGISTERS		
Register	**PLC Reg. Type**	**Description**
		12 Sensor Fault — A fault exists for this sensor 13 Fault Suppress — Alarms on the sensor are suppressed due to bus converter binding 14 Sensor Active — Active box checked 15 Sensor Assigned — Sensor to the position is assigned
44001	R	Following 51 registers show all possible setting on each sensor. On registers 44001-51 is data for sensor assigned to PLC register # 1. For sensor assigned to PLC register #2 the data is on registers 44052-102 and so on for all 255 sensors. 0 Enable Low Alarm — Low alarm enabled 1 Enable Low Warning — Low warning enabled 2 Enable High Warning — High warning enabled 3 Enable High Alarm — High alarm enabled 4 Enable Ref Low Alarm — Reference sensor low alarm enabled 5 Enable Ref Low Warning — Reference sensor low warning enabled 6 Enable Ref High Warning — Reference sensor high warning enabled 7 Enable Ref High Alarm — Reference sensor high alarm enabled 8 Enable Rate of Rise — Rate of rise alarm enabled 9 Enable Low Alarm Email — Low Alarm email notification enabled 10 Enable Low Warning Email — Low Warning email notification enabled 11 Enable High Warning Email — High Warning email notification enabled 12 Enable High Alarm Email — High Alarm email notification enabled

Modbus SENSORS REGISTERS				
Register	**PLC Reg. Type**	**Description**		
		13	Enable Rate of Rise Email	Rate of rise email notification enabled
		14	Not Used	
		15	Valid Data	Indication of valid data in all sensor registers assigned to certain PLC register
44002	R	0	Machine Active	Machine on which the sensor is assigned to is active
		1	Machine Position Active	Machine position on which the sensor is assigned to is active
		2	Enable Log	Logging on the sensor is enabled
		3	Enable Reference	Reference sensor is enabled
		4	Enable Hysteresis	Hysteresis on the sensor is enabled
		5	Invert Trigger Enabled	Reading of absolute value on sensor is enabled
		6	Machine Remote IO Inversion Enabled	Reading of Remote IO pin related to the machine is inverted
		7	Position Remote IO Inversion Enabled	Reading of Remote IO pin related to the position is inverted
		8-15	Not Used	
44003	R	Value of set low alarm threshold (recalculated using set span and offset)		
44004	R	Value of set low warning threshold (recalculated using set span and offset)		
44005	R	Value of set high warning threshold (recalculated using set span and offset)		
44006	R	Value of set high alarm threshold (recalculated using set span and offset)		
44007	R	Value of set low alarm threshold for reference sensor (recalculated using set span and offset)		
44008	R	Value of set low warning threshold for reference sensor (recalculated using set span and offset)		
44009	R	Value of set high warning threshold for reference sensor		

Modbus SENSORS REGISTERS		
Register	**PLC Reg. Type**	**Description**
		(recalculated using set span and offset)
44010	R	Value of set high alarm threshold for reference sensor (recalculated using set span and offset)
44011	R	Value of set hysteresis (recalculated using set span and offset)
44012	R	Value of set rate of rise (recalculated using set span and offset)
44013	R	Value of set rate of rise time (in sec)
44014	R	Value of time delay for all alarms to turn on (in sec, max 255)
44015	R	Value of time delay for all alarms to turn off (in sec, max 255)
44016	R	Sensor serial ID (7. 8.)
44017	R	Sensor serial ID (5. 6.)
44018	R	Sensor serial ID (3. 4.)
44019	R	Sensor serial ID (1. 2.)
44020	R	Reference sensor serial ID (7. 8.)
44021	R	Reference sensor serial ID (5. 6.)
44022	R	Reference sensor serial ID (3. 4.)
44023	R	Reference sensor serial ID (1. 2.)
44024	R	Sensor units ID: 13 in/sec 19 cm/sec 23 AI 43 DI 55 RPM 63 RH 73 PSI 79 KPA 83 A 93 Deg. F 99 Deg. C 100 ADC 113 OI 123 Logic

Modbus SENSORS REGISTERS		
Register	**PLC Reg. Type**	**Description**
44025	R	Low byte of span (float)
44026	R	High byte of span (float)
44027	R	Offset
44028-31	R	Sensor value unit name (ASCII)
44032	R	Decimal point value
44033	R	Machine name (2. 1. sign in ASCII)
44034	R	Machine name (4. 3. sign in ASCII)
44035	R	Machine name (6. 5. sign in ASCII)
44036	R	Machine name (8. 7. sign in ASCII)
44037	R	Machine name (10. 9. sign in ASCII)
44038	R	Position name (2. 1. sign in ASCII)
44039	R	Position name (4. 3. sign in ASCII)
44040	R	Position name (6. 5. sign in ASCII)
44041	R	Position name (8. 7. sign in ASCII)
44042	R	Position name (10. 9. sign in ASCII)
44043	R	Machine Remote IO set pin number
44044	R	Machine position Remote IO set pin number
44045	R	Machine Remote IO delay
44046	R	Machine Remote IO IP address low byte
44047	R	Machine Remote IO IP address high byte
44048	R	Machine Remote IO port number
44049	R	Machine Position Remote IO IP address low byte
44050	R	Machine Position Remote IO IP address high byte
44051	R	Machine Position Remote IO port number

Modbus BUS CONVERTERS NETWORK REGISTERS		
Register	**Type**	**Description**
40513	R	Modbus Network Status Register A list of and their function follows: 0 S/N Acquisition — Serial Number acquisition in progress 1-2 Not Used 3 S/N Retrieval — Serial Number retrieval in progress 4-7 Not Used 8 Bus Converter #1 offline 9 Bus Converter #2 offline 10 Bus Converter #3 offline 11 Bus Converter #4 offline 12 Bus Converter #5 offline 13 Bus Converter #6 offline 14 Bus Converter #7 offline 15 Bus Converter #8 offline
40514	N/A	Not Used
40515-40522	R	Bus Converter Status Registers for Converters 1 - 8 This register indicates the internal status of the converter and the sensor bus. A set bit indicates a fault. The fault assigned to each bit is as follows: 0 Bus data shorted low — The sensor bus data wire is shorted to the common wire. 1 Bus data shorted high — The data wire is shorted to the 5VDC wire. 2 No Sensors present — No sensors are present on the sensor bus, or the sensor bus data wire is open. 3 Bus power overload — The 5VDC wire is shorted to the common wire. 4 Excessive bus errors — During a serial number acquisition, the converter detected excessive bus errors. This condition would indicate faulty sensor bus cabling, or excessive electrical interference on the sensor data bus.

Modbus BUS CONVERTERS NETWORK REGISTERS		
Register	**Type**	**Description**
		5-7 Not Used 8 Sensor bus fault — A sensor bus fault is present as indicated by bits 0 – 4. 9 Sensor table overflow — More than 32 sensors were detected during a sensor serial number acquisition. 10 Unsupported Sensor detected — A sensor was detected on the sensor bus that is not supported by this converter. 11 In acquire — A sensor acquisition is in progress. 12-15 Not Used
40523 - 24	R	Sensor Status Bus Converter 1 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40523 represents sensor 1 and Bit 31 of register 40524 represents sensor 32. It corresponds with the Converter Sensor List.
40525 – 26	R	Sensor Status Bus Converter 2 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40525 represents sensor 1 and Bit 31 of register 40526 represents sensor 32. It corresponds with the Converter Sensor List.
40527 – 28	R	Sensor Status Bus Converter 3 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40527 represents sensor 1 and Bit 31 of register 40528 represents sensor 32. It corresponds with the Converter Sensor List.
40529 - 30	R	Sensor Status Bus Converter 4 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40529 represents sensor 1 and Bit 31 of register 40530 represents sensor 32. It corresponds with the Converter Sensor List.
40531 - 32	R	Sensor Status Bus Converter 5 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40531 represents sensor 1 and Bit 31 of register 40532 represents sensor 32. It corresponds with the Converter Sensor List.
40533 - 34	R	Sensor Status Bus Converter 6 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is

Modbus BUS CONVERTERS NETWORK REGISTERS		
Register	**Type**	**Description**
		online. Bit 0 of register 40533 represents sensor 1 and Bit 31 of register 40534 represents sensor 32. It corresponds with the Converter Sensor List.
40535 - 36	R	Sensor Status Bus Converter 7 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40535 represents sensor 1 and Bit 31 of register 40536 represents sensor 32. It corresponds with the Converter Sensor List.
40537 - 38	R	Sensor Status Bus Converter 8 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 40537 represents sensor 1 and Bit 31 of register 40538 represents sensor 32. It corresponds with the Converter Sensor List.
40539	R	WatchDog counter. This counter increments continuously at one second intervals to a maximum value of 65535, and then rolls over to 0.
40601-608	R	Sensor serial number set to the PLC register 1 601 – Family Code 602-7 – Digits 2 to 7 608 – CRC (CRC is part of each serial number)
40609-616	R	Sensor serial number set to the PLC register 2. The same pattern is repeated for all 255 sensors possibly assigned to the system.
42641-648	R	Temperature sensor serial number set to the PLC register 256

Modbus Web Server Setting Registers		
Register	**Type**	**Description**
43000-1	R	Web Server Firmware Version
43002	R	Display Update Interval (sec)
43003	R	Email Re-send Interval (sec)
43044-59	R	SMTP Server IP Address in ASCII code
43060-75	R	SMTP User Name in ASCII code
43076-91	R	Email from Address in ASCII code
43092-99	R	Web Server Serial Number in ASCII code
43201-208	R	Web Server IP address in ASCII code
43209-216	R	Web Server Subnet Mask in ASCII code
43217-224	R	Web Server Gateway IP Address in ASCII code

Modbus Web Server Setting Registers		
Register	**Type**	**Description**
43225-232	R	DNS Server 1 IP address in ASCII code
43233-240	R	DNS Server 2 IP address in ASCII code
40601-608	R	Temperature sensor serial number set to the PLC register 1 601 – Family Code 602-7 – Digits 2 to 7 608 – CRC (CRC is part of each serial number)
40609-616	R	Temperature sensor serial number set to the PLC register 2. The same pattern is repeated for all 255 sensors possibly assigned to the system.
42641-648	R	Temperature sensor serial number set to the PLC register 256

Modbus Web Server Command Register		
Register	**Type**	**Description**
42991	W	Bits in command register are used to control the webserver through Modbus. Each bit can be set to trigger actions described below. 0 Not Used 1 Silent — Silence the horn 2 Not Used 3 Acquire — All connected bus converters will run acquisition of connected sensors 4 Reset — Reset the web server 5 Acknowledge — Acknowledgment of alarms and silence horn 6 Not Used 7 Test Horn — Command to test horn output 8 Test Alarm — Command to test alarm output 9-15 Not Used
Web server allows changing of serial numbers of sensors assigned to PLC registers, or assign sensor serial number to empty PLC register through Modbus commands. So there is no need to that through the web interface. Registers 43004-43008 need to be set to change/set primary sensor. Example will be used to simplify the explanation: Set sensor 40-0-0-18-71-31-175-80 on PLC register 35		
43004	W	Select which PLC register the sensor will be change/set into From the example this register will be set to 35

Modbus Web Server Command Register		
Register	**Type**	**Description**
43005	W	7. and 8. digit of the sensor serial number From the example the number will be AF50h (175-80)
43006	W	5. and 6. digit of the sensor serial number From the example the number will be 471Fh (71-31)
43007	W	3. and 4. digit of the sensor serial number From the example the number will be 0012h (0-18)
43008	W	1. and 2. digit of the sensor serial number From the example the number will be 2800h (40-0)

8. Appendix 2 – Ethernet IP Communications

Most of the data in Ethernet IP is in Little Endian form. All following data is assumed to be in that format unless otherwise specified.

Overview of the whole structure:

#	Assembly (Buffer)	Type	Assembly ID	Buffer Size	Description	Note
1.	DATA on Demand	R	104*d*; 0x0068*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains any of 105-114 buffer (default is 105)	
2.	INPUT	W	101*d*; 0X0065*H*	32 (Bytes); 16 (int16); 8 (int32)	Used for commands	
3.	DATA Part 1	R	105*d*; 0x0069*H*	404 (Bytes); 202 (int16); 101 (int32)	Sensor [1-100] data and state	
4.	DATA Part 2	R	106*d*; 0x006A*H*	404 (Bytes); 202 (int16); 101 (int32)	Sensor [101-200] data and state	
5.	DATA Part 3 + Converter States	R	107*d*; 0x006B*H*	404 (Bytes); 202 (int16); 101 (int32)	Sensor [201-256] data and state	Size not fully used
6.	Serial ID Part 1	R	108*d*; 0x006C*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains first [1-50] sensor serial IDs	
7.	Serial ID Part 2	R	109*d*; 0x006D*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains next [51-100] sensor serial IDs	
8.	Serial ID Part 3	R	110*d*; 0x006E*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains next [101-150] sensor serial IDs	
9.	Serial ID Part 4	R	111*d*; 0x006F*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains next [151-200] sensor serial IDs	
10.	Serial ID Part 5	R	112*d*; 0x0070*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains next [201-250] sensor serial IDs	
11.	Serial ID Part 6	R	113*d*; 0x0071*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains last [251-256] sensor serial IDs	Size not fully used
12.	**Position sets**	R	114*d*; 0x0072*H*	404 (Bytes); 202 (int16); 101 (int32)	Contains settings for a selected position	
13.	**Settings**	R	103*d*; 0x0067*H*	404 (Bytes); 202 (int16); 101 (int32)	General WS2 sets	
14.	Configuration		102*d*; 0x0066*H*	16 (Bytes); 8 (int16); 4 (int32)	Reserved (not implemented)	

Each data section and command section are described below with corresponding example

Data Part 1

EIP SENSORS REGISTERS			
Byte Index	Description		Data Type
0, 1	Assembly ID (**0x0069H**)		Unsigned Integer
2, 3	Not used		N/A
4, 5	Value of sensor assigned to PLC register #1		2s complement
6, 7	Status of sensor assigned to PLC register #1 Flags for each position (1 through 256). A list of the bits and their description follows (0 – LSB, 15 – MSB):		N/A
	7	Ref Low Warning	Difference between primary and reference sensor crossed the set threshold $T_P<T_R$
	6	Ref High Warning	Difference between primary and reference sensor crossed the set threshold $T_P>T_R$
	5	Ref Low Alarm	Difference between primary and reference sensor crossed the set threshold $T_P<T_R$
	4	Ref High Alarm	Difference between primary and reference sensor crossed the set threshold $T_P>T_R$
	3	Low Warning	Low warning threshold has been crossed
	2	High Warning	High warning threshold has been crossed
	1	Low Alarm	Low alarm threshold has been crossed
	0	High Alarm	High alarm threshold has been crossed
	15	Sensor Assigned	Sensor to the position is assigned
	14	Sensor Active	Active box checked
	13	Fault Suppress	Alarms on the sensor are suppressed due to bus converter binding
	12	Sensor Fault	A fault exists for this sensor
	11	Reference Fault	A fault exists on the reference sensor
	10	Position Pin	Remote IO pin assigned to position is on

	9 Machine Pin — Remote IO pin assigned to machine is on 8 Rate of Rise — Temperature and Time thresholds have been crossed	
8, 9	Value of sensor assigned to PLC register #2 and it continues in the same pattern till PLC register #100.	2s complement
10, 11	Status of sensor assigned to PLC register #2 and it continues in the same pattern till PLC register #100. Flags are the same as for PLC register #1	N/A
400, 401	Value of sensor assigned to PLC register #100.	2s complement
402, 403	Status of sensor assigned to PLC register #100 Flags are the same as for PLC register #1	N/A

Data Part 2

EIP SENSORS REGISTERS

Byte Index	Description	Data Type
0, 1	Assembly ID (**0x006AH**)	Unsigned Integer
2, 3	Not used	N/A
4, 5	Value of sensor assigned to PLC register #101	2s complement
6, 7	Status of sensor assigned to PLC register #101 Flags for each position (1 through 256). A list of the bits and their description follows (0 – LSB, 15 – MSB): 7 Ref Low Warning — Difference between primary and reference sensor crossed the set threshold $T_P<T_R$ 6 Ref High Warning — Difference between primary and reference sensor crossed the set threshold $T_P>T_R$	N/A

	5	Ref Low Alarm	Difference between primary and reference sensor crossed the set threshold $T_P<T_R$
	4	Ref High Alarm	Difference between primary and reference sensor crossed the set threshold $T_P>T_R$
	3	Low Warning	Low warning threshold has been crossed
	2	High Warning	High warning threshold has been crossed
	1	Low Alarm	Low alarm threshold has been crossed
	0	High Alarm	High alarm threshold has been crossed
	15	Sensor Assigned	Sensor to the position is assigned
	14	Sensor Active	Active box checked
	13	Fault Suppress	Alarms on the sensor are suppressed due to bus converter binding
	12	Sensor Fault	A fault exists for this sensor
	11	Reference Fault	A fault exists on the reference sensor
	10	Position Pin	Remote IO pin assigned to position is on
	9	Machine Pin	Remote IO pin assigned to machine is on
	8	Rate of Rise	Temperature and Time thresholds have been crossed
8, 9	Value of sensor assigned to PLC register #102 and it continues in the same pattern till PLC register #200.		2s complement
10, 11	Status of sensor assigned to PLC register #102 and it continues in the same pattern till PLC register #200. Flags are the same as for PLC register #101		N/A
400, 401	Value of sensor assigned to PLC register #200.		2s complement
402, 403	Status of sensor assigned to PLC register #200 Flags are the same as for PLC register #101		N/A

Data Part 3

EIP SENSORS REGISTERS			
Byte Index	Description		Data Type
0, 1	Assembly ID (**0x006BH**)		Unsigned Integer
2, 3	Not used		N/A
4, 5	Value of sensor assigned to PLC register #201		2s compl.
6, 7	Status of sensor assigned to PLC register #201 Flags for each position (1 through 256). A list of the bits and their description follows (0 – LSB, 15 – MSB):		N/A
	7	Ref Low Warning	Difference between primary and reference sensor crossed the set threshold $T_P<T_R$
	6	Ref High Warning	Difference between primary and reference sensor crossed the set threshold $T_P>T_R$
		Ref Low Alarm	Difference between primary and reference sensor crossed the set threshold $T_P<T_R$
	4	Ref High Alarm	Difference between primary and reference sensor crossed the set threshold $T_P>T_R$
	3	Low Warning	Low warning threshold has been crossed
	2	High Warning	High warning threshold has been crossed
	1	Low Alarm	Low alarm threshold has been crossed
	0	High Alarm	High alarm threshold has been crossed
	15	Sensor Assigned	Sensor to the position is assigned
	14	Sensor Active	Active box checked
	13	Fault Suppress	Alarms on the sensor are suppressed due to bus converter binding
	12	Sensor Fault	A fault exists for this sensor
	11	Reference Fault	A fault exists on the reference sensor
	10	Position Pin	Remote IO pin assigned to position is on

	9 Machine Pin — Remote IO pin assigned to machine is on 8 Rate of Rise — Temperature and Time thresholds have been crossed	
8, 9	Value of sensor assigned to PLC register #202 and it continues in the same pattern till PLC register #256.	2s complement
10, 11	Status of sensor assigned to PLC register #202 and it continues in the same pattern till PLC register #256. Flags are the same as for PLC register #201	N/A
224, 225	Value of sensor assigned to PLC register #256.	2s complement
226, 227	Status of sensor assigned to PLC register #256 Flags are the same as for PLC register #201	N/A
EIP BUS CONVERTER NETWORK REGISTERS		
Byte Index	Description	Data Type
228, 229	4-7 Not Used 3 S/N Retrieval — Serial Number retrieval in progress 1-2 Not Used 0 S/N Acquisition — Serial Number acquisition in progress 15 Bus Converter #8 offline 14 Bus Converter #7 offline 13 Bus Converter #6 offline 12 Bus Converter #5 offline 11 Bus Converter #4 offline	N/A

	10 Bus Converter #3 offline 9 Bus Converter #2 offline 8 Bus Converter #1 offline	
232, 233	Bus Converter Status Registers for Bus Converter #1 This register indicates the internal status of the converter and the sensor bus. A set bit indicates a fault. The fault assigned to each bit is as follows: 5-7 Not Used 4 Excessive bus errors — During a serial number acquisition, the converter detected excessive bus errors. This condition would indicate faulty sensor bus cabling, or excessive electrical interference on the sensor data bus. 3 Bus power overload — The 5VDC wire is shorted to the common wire. 2 No Sensors present — No sensors are present on the sensor bus, or the sensor bus data wire is open. 1 Bus data shorted high — The data wire is shorted to the 5VDC wire. 0 Bus data shorted low — The sensor bus data wire is shorted to the common wire. 12-15 Not Used 11 In acquire — A sensor acquisition is in progress. 10 Unsupported Sensor detected — A sensor was detected on the sensor bus that is not supported by this converter. 9 Sensor table overflow — More than 32 sensors were detected during a sensor serial number acquisition. 8 Sensor bus fault — A sensor bus fault is present as indicated by bits 0 – 4.	N/A
234-247	Bus Converter Status Registers for Bus Converters 2-8 The structure of the data is the same as for bus converter #1 described in registers 232 and 233.	N/A
248-251	Sensor Status Bus Converter 1 Each bit of these registers represents a single sensor. If the bit is set the sensor is faulted and not available. If the bit is clear sensor is online. Bit 0 of register 248 represents 1st sensor and Bit 7 of register 251 represents 32nd sensor 32. It corresponds with the Converter Sensor List.	N/A

<table>
<tr><td></td><td>
<table>
<tr><td colspan="8">Register 248</td><td colspan="8">Register 249</td></tr>
<tr><td>8.</td><td>7.</td><td>6.</td><td>5.</td><td>4.</td><td>3.</td><td>2.</td><td>1.</td><td>16.</td><td>15.</td><td>14.</td><td>13.</td><td>12.</td><td>11.</td><td>10.</td><td>9.</td></tr>
<tr><td colspan="8">Register 250</td><td colspan="8">Register 251</td></tr>
<tr><td>24.</td><td>23.</td><td>22.</td><td>21.</td><td>20.</td><td>19.</td><td>18.</td><td>17.</td><td>32.</td><td>31.</td><td>30.</td><td>29.</td><td>28.</td><td>27.</td><td>26.</td><td>25.</td></tr>
</table>
</td><td></td></tr>
<tr><td>252-279</td><td>Sensor Status Bus Converters 2-8
The structure of the data is the same as for bus converter #1 described in registers 248 and 251.</td><td></td></tr>
<tr><td>280, 281</td><td>WatchDog counter.
This counter increments continuously at one second intervals to a maximum value of 65535, and then rolls over to 0.</td><td>Unsigned Integer</td></tr>
</table>

Serial ID Part 1

EIP BUS CONVERTER NETWORK REGISTERS (Continue)		
Byte Index	Description	Data Type
0, 1	Assembly ID (**0x006C*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #1 Example of sensor with S/N 40-0-0-3-101-107-15-174: Reg. 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 S/N 174 | 15 | 107 | 101 | 3 | 0 | 0 | 40	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #2 Data structure is the same as for PLC reg. #1 described above	Unsigned Integer
396-403	Serial ID of sensor assigned to PLC reg. #50 This pattern is the same for sensors assigned to PLC reg. 1-50	Unsigned Integer

Serial ID Part 2

EIP BUS CONVERTER NETWORK REGISTERS (Continue)		
Byte Index	Description	Data Type
0, 1	Assembly ID (**0x006D*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #51 Example of sensor with S/N 40-0-0-3-101-107-15-174: Reg. 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 S/N 174 | 15 | 107 | 101 | 3 | 0 | 0 | 40	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #52 Data structure is the same as for PLC reg. #51 described above	Unsigned Integer
396-403	Serial ID of sensor assigned to PLC reg. #100 This pattern is the same for sensors assigned to PLC reg. 51-100	Unsigned Integer

Serial ID Part 3

EIP BUS CONVERTER NETWORK REGISTERS (Continue)

Byte Index	Description	Data Type
0, 1	Assembly ID (**0x006E*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #101 Example of sensor with S/N 40-0-0-3-101-107-15-174:	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #102 Data structure is the same as for PLC reg. #101 described above	Unsigned Integer
396-403	Serial ID of sensor assigned to PLC reg. #150 This pattern is the same for sensors assigned to PLC reg. 100-150	Unsigned Integer

Reg.	4	5	6	7	8	9	10	11
S/N	174	15	107	101	3	0	0	40

Serial ID Part 4

EIP BUS CONVERTER NETWORK REGISTERS (Continue)

Byte Index	Description	Data Type
0, 1	Assembly ID (**0x006F*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #151 Example of sensor with S/N 40-0-0-3-101-107-15-174:	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #152 Data structure is the same as for PLC reg. #151 described above	Unsigned Integer
396-403	Serial ID of sensor assigned to PLC register #200 This pattern is the same for sensors assigned to PLC reg. 151-200	Unsigned Integer

Reg.	4	5	6	7	8	9	10	11
S/N	174	15	107	101	3	0	0	40

Serial ID Part 5

EIP BUS CONVERTER NETWORK REGISTERS (Continue)		
Byte Index	Description	Data Type
0, 1	Assembly ID (**0x0070*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #201 Example of sensor with S/N 40-0-0-3-101-107-15-174:	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #202 Data structure is the same as for PLC reg. #201 described above	Unsigned Integer
396-403	Serial ID of sensor assigned to PLC register #250 This pattern is the same for sensors assigned to PLC reg. 201-250	Unsigned Integer

Reg.	4	5	6	7	8	9	10	11
S/N	174	15	107	101	3	0	0	40

Serial ID Part 6

EIP BUS CONVERTER NETWORK REGISTERS (Continue)		
Byte Index	Description	Data Type
0, 1	Assembly ID (**0x0071*H***)	Unsigned Integer
2, 3	Not used	N/A
4-11	Serial ID of sensor assigned to PLC reg. #251 Example of sensor with S/N 40-0-0-3-101-107-15-174:	Unsigned Integer
12-19	Serial ID of sensor assigned to PLC reg. #252 Data structure is the same as for PLC reg. #251 described above	Unsigned Integer
44-51	Serial ID of sensor assigned to PLC register #256 This pattern is the same for sensors assigned to PLC reg. 201-250	Unsigned Integer

Reg.	4	5	6	7	8	9	10	11
S/N	174	15	107	101	3	0	0	40

<table>
<tr><th colspan="3">EIP Web Server Setting Registers</th></tr>
<tr><th>Byte Index</th><th>Description</th><th>Data Type</th></tr>
<tr><td>0, 1</td><td>Assembly ID (0x0067H)</td><td>Unsigned Integer</td></tr>
<tr><td>2-5</td><td>Web server FW Version
Example of version 5.0.1
<table>
<tr><td>Reg.</td><td>2</td><td>3</td><td>4</td><td>5</td></tr>
<tr><td>FW version</td><td>1</td><td>0</td><td>5</td><td>0</td></tr>
</table></td><td>Unsigned Integer</td></tr>
<tr><td>6, 7</td><td>Display update interval
Example of 15 seconds interval
<table>
<tr><td>Reg.</td><td>6</td><td>7</td></tr>
<tr><td>Interval [s]</td><td>15</td><td>0</td></tr>
</table></td><td>Unsigned Integer</td></tr>
<tr><td>8, 9</td><td>Email re-send interval
Example of 120 (7200s) minutes interval
<table>
<tr><td>Reg.</td><td>8</td><td>9</td></tr>
<tr><td>Interval [s]</td><td>32</td><td>28</td></tr>
</table></td><td>Unsigned Integer</td></tr>
<tr><td>44-51</td><td>Serial ID of sensor assigned to PLC register #256
This pattern is the same for sensors assigned to PLC reg. 201-250</td><td>Unsigned Integer</td></tr>
</table>

EIP Web Server Commands		
Byte Index	Description	Data Type
0, 1	Assembly ID (**0x0065*H***)	Unsigned Integer
2-28	N/A	Unsigned Integer
29	Must be set to **0x03H** to indicate that the data in Bytes 30 and 31 are commands for the web server	Unsigned Integer
30, 31	0x02H – Silent 0x08H – Acquire 0x10H – Reboot 0x20H – ACK 0x80H – Horn Test 0x100H – Alarm Test	Unsigned Integer
Web server allows changing of serial numbers of sensors assigned to PLC registers, or assign sensor serial number to empty PLC register through Modbus commands. So there is no need to that through the web interface. Bytes 0-7 need to be set to change/set primary sensor and bytes 8-9 need to be set to change/set reference sensor. Example will be used to simplify the explanation: Set primary sensor 40-0-0-18-71-31-175-80 and reference sensor 40-0-0-18-65-85-100-53 on PLC register 35		
Assembly ID (**0x0072H**)		
0, 1	Primary sensor addr 4 – from example AF50H (175-80)	Unsigned Integer
2, 3	Primary sensor addr 3 – from example 471FH (71-31)	Unsigned Integer
4, 5	Primary sensor addr 2 – from example 0012H (0-18)	Unsigned Integer
6, 7	Primary sensor addr 1 – from example 2800H (40-0)	Unsigned Integer
8, 9	Reference sensor addr 4 – from example 6435H (100-53)	Unsigned Integer
10, 11	Reference sensor addr 3 – from example 4155H (65-85)	Unsigned Integer
12,	Reference sensor addr 2 – from example 0012H (0-18)	Unsigned

13		Integer
14, 15	Reference sensor addr 1 – from example 2800H (40-0)	Unsigned Integer
16-29	N/A	
30	PLC register on which the sensor will be changed	Unsigned Integer