

AWS Setup



Configurations

Version 1

Quick Guide



April 2015



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Version of edition

Version of edition: 1 Date of the edition: 2015-04-17

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1. Open the project file

The project file for a station is stored in a file with .DLX file extension. To open a project file, double click on that file and it should be opened by the **AWS Setup** program automatically. If the AWS Setup is not associated with the DLX file extension, then it is possible to open this file from the AWS Setup program.

The program is capable to open even an older file with .CBU file extension, but the changes are saved in newer DLX file.

2. Make changes

When the project file is opened you can make changes in the configuration. You can add support for a new sensor, or change something in existing configuration.

2.1 Using macros

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The macro feature of AWS Setup can simplify the creation of configuration tasks. For example if you want to add a sensor, you have to define a variable, an analog channel, calculations and events. These tasks may be confusing and error prone.

Macros simplify the configuration, because they execute these steps at once. You just have to change some parameters and the macros will do the process instead of you.

Jsed macros	 Add new 	Macro:Ethernet support Description			
Clone Move up Move down		Disabled			
Name	Description	Default IP address	192.168.145.198		
SDI-12 line		Gateway IP address			
Generic SDI-12	Temperature	Natural mask	255 255 255 0		
Generic 4-20mA	Humidity	INELWORK Mask	233.233.233.0		
Generic 4-20mA	Water height	Power mode	Ethernet only		
Ethernet support		Apply Cancel	Delete		
Network COM					

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MicroStep-MIS can create various types of macros, for example:

- support for generic or one specific type of sensor
- communication protocol
- algorithms
- network settings
- much more

If the preinstalled macros are not enough, you can contact MicroStep-MIS and we will create the requested macros. Once you have a macro for a sensor, you can add multiple sensors of the same type in the same project or use them in other projects as well.

Every macro may have parameters, which can be used to specify the details. For example this parameter may be the channel number of sensor and the variable. You can create copies of this macro and then change the channel and the variable. By doing this you have added a new sensor to configuration. The algorithm and the settings are the same, but the difference is only in the channel and the variable (more generally: in parameters).

3. Example configurations

In this chapter you can find some example methods of sensor configurations. There may be other methods, and these are just for reference. If you don't find the sensor in this chapter, you can define one from the generic way (Chapter 3.1). If you are in doubt, feel free to consult with MicroStep-MIS or see the full documentation about using AWS Setup.

3.1 Generic analog sensor

These steps are universal for any kind of analog sensors which have voltage output.

From the sensor's manual you have to know the measuring range and the corresponding value to these values.

Voltage	Quantity value	Example voltage [mV]	Example value [°C]
UL	VL	0	-40
UH	VH	1000	60

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For example voltage UL = 0 V corresponds to temperature VL= -40 $^{\circ}$ C and voltage UH = 1 V corresponds to temperature VH = 60 $^{\circ}$ C.

In analog section you have to create analog channel and select a differential channel which is not used in the project. You have to create a variable, where the result will be stored. Enter a name in variable section (unique in project, no spaces, and maximum 8 characters) then click **Create new** button.

By convention we use a prefix "a" for actual value, then capital abbreviation of the measured quantity (e.g Temperature of Air) then a number (e.g. 1) which make a difference between multiple sensors (e.g. full name of variable is **aTA1**).

You should define how often the value is measured in **Period** section. In **minimum** field use the minimal value (VL) of the measuring range of the sensor (e.g. -40 $^{\circ}$ C) and in the **maximum** field use the maximal value (VH) of the measuring range of the sensor (e.g. 60 $^{\circ}$ C)

Set the **polarity** to **unipolar** if the voltage is always positive for all measuring range and **bipolar** if the voltage has negative parts as well.

Select a gain, for which the voltage range is greater than the output range of the sensor. (E.g. **Gain 2** with range up to 1.25 V for sensor with output from 0 to 1 V)

Use calculation **Scaling**. This will convert the measured voltage to the measured quantity value. You have to define a polynomial (coefficients k_1 , k_2 , k_3 , k_4) which converts this value. To calculate the values for linear sensors use these formulas:

$$k_1 = \frac{V_H - V_L}{U_H - U_L}$$
$$k_0 = V_L - k_1 \cdot U_L$$
$$k_2 = 0$$
$$k_3 = 0$$

Please note that UH and UL are in **millivolts for ADF** (differential) channels and in **volts for A** (single ended) channels.

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Example: $U_L = 0mV$ $V_L = -40^{\circ}C$ $U_H = 1000mV$ $V_H = +60^{\circ}C$ $k_1 = \frac{V_H - V_L}{U_H - U_L} = \frac{60 - (-40)}{1000 - 0} = \frac{100}{1000} = 0.1$ $k_0 = V_L - k_1 \cdot U_L = -40 - 0.1 \cdot 0 = -40$ $k_2 = 0$ $k_3 = 0$

3.2 Temperature

3.2.1. Pt100

Temperature is measured using Pt100 thermometers. The data logger supports measuring the resistance, then convert this resistance to temperature using the **Temperature** calculation.



Connect the Pt100 to a free differential channel ADF.



Analog:ADF0 -				
Туре	Differential 24-bit ×			
Channel	0			
Description	Air temperature			
Variable	aTA1 Y Create new			
Period	1 Minutes			
Minimum	-40			
Maximum	60			
Polarity	Unipolar	Ŷ		
Gain	16 (Range: 156.25 mV) ×			
Calculation	Temperature v			
Apply	Revert Delete			

Use **Gain 16** to ensure that voltage will remain in measurement range for temperatures in required range. Use **Calculation Temperature**. Save the measured value to **variable** aTA1 (actual Temperature of **A**ir no. **1**)

If you choose in range ADF0 – ADF6, include a measurement of channel UR0 into configuration. For higher channels include channel UR1.

This is required for measuring the electric current over the reference resistor. Save that voltage for example to **variable** TTREF (temperature reference) every minute.

Analog:UR0 —				
Туре	Differential 24-bit Y			
Channel	URO			
Description	TTREF			
Variable	TTREF Y	Create new		
Period	1 Minutes			
Minimum	0			
Maximum	160			
Polarity	Unipolar	~		
Gain	16 (Range: 156.25 mV)			
Calculation	None	Ý		
Apply	Revert	Delete		

3.2.2. Analog output

The temperature channel for sensors with analog output was described in chapter 3.1 (Generic analog sensor).

3.3 Relative Humidity

3.3.1. Analog sensor

For analog sensors set the connected analog channel according to sensors' parameters. For example if your analog humidity sensor has an output range 0-1 V which means 0-100 %RH, adjust the measured value by calculation **Scaling**. This is a polynomial adjustment. Change the coefficient **k1** (gain) to **100** for single ended analog channels or **0.1** for differential channels. The reason for discrepancy is that single ended values are measured in volts and differential channels in millivolts.

Set channel **minimum** to 0 and **maximum** to 100. If a value is out of this range, the value becomes invalid, which may be represented differently in messages. See messages for details.

3.3.2. Sdi-12 digital sensor

Sdi-12 digital bus is located on serial line **COM5**. To create a measurement, create an **event** with **action Send** (requestRH1) and an **event** with **action Receive** (responseRH1). For send event set the **interval** to desired sample interval and for receive event set the **validity** to sample interval + 1 second, which ensures that the measurement will not expire if the response is delayed. The measurement will expire if the sensor is not responding or the value cannot be parsed.

requestRH1

Set the output message with text for example "1M! r1D0! r" which means the following: start measurement in device with address 1, then get the result from the device with address 1.

responseRH1

The device returns "1+34.45+24.14\r\n" for this command. Data logger combines the command with the response and from the serial line COM5 is returned: "1D0!1+34.45+24.14\r\n"

This result is parsed in an input message (of event responseRH1), which has to be defined for example with start "1D0!1" and end " $r\n$ ".

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Between these strings is the response from the sensor. To parse these values create a message in Cells section, where you can assign the values to variables. Create two cells:

- variable aRH1 with format %f to store +34.45
- variable aTA1 with format %f to store +24.14

3.4 Wind direction

3.4.1. Analog

Example sensor: Thies Wind direction sensor

Voltage	Direction value
0 V	0 °
5 V	359 °

Connect the sensor to a **Single ended** analog channel.

Set variable to **aWD1** and click Create new button.

Set the minimum value to 0 and maximum to 359.

Set calculation to Scaling. Use the following scaling coefficients:

k ₀	0
k ₁	71.8
k ₂	0
k ₃	0

3.4.2. Thies first class

Connect the Data pin of the sensor to data loggers' DIN11 pin and the Clock pin of the sensor to DOUT3. In AWS Setup create a **digital** on pin D11 with **Calculation Serial synchronous**.



Digital: D11 —				
Variable	rWD1 ×	Create new		
Period	5	Seconds 👻		
Calculation	Serial synchronous			
Description	rWD1			
Maximum o	f 250 ms samples			
D11 D10 D9 D8		D3 D2 D1 D0		
Apply	Revert	Delete		

3.4.3. Gray code

Connect the sensor to free digital inputs which are side by side. (e.g. D2, D3, D4, D5, D6, D7)

Connect the lowest bit to the lower bit number in the data logger. (E.g. sensor's G0 to data logger's D2, then sensor's G1 to data logger's D3 etc.)

In AWS Setup add a digital and select the connected pins. Use **Calculation Gray code**.

Digital: D0D1D2D3D4D5				
Variable	rWD1 ~	Create new		
Period	2	Seconds 💙		
Calculation	Gray code	~		
Description	rWD1			
Maximum o	f 250 ms samples			
D11 D10 D9 D8	D7 D6 D5 D4 I	D3 D2 D1 D0		
Apply	Revert	Delete		

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3.5 Precipitation

Create a **digital** measurement, which will count pulses on digital pin.

Digital: D6					
Variable	rPR1 ×	Create new			
Period	10	Seconds ~			
Calculation	Counter	~			
Description	Reading precipita	taion 1			
Maximum of 250 ms samples					
D11 D10 D9 D8	D7 D6 D5 D4 D Revert	03 D2 D1 D0			

Add an event, which runs a calculation in the same interval as the digital is sampled. From this event create a calculation which will adjust the measured count value to mm units.

Event: rePR1			Calculation: raPR	1	
Name	rePR1	Rename	Name	raPR1	Rename
Description	Run calculation raPR	1	Description	Reading to actu	al PR1
Synchronous Run Run - Log Log One time even	Asyna O Send O Ri O Send - Receive O Ri O Ri	Asynchronous Out Receive Receive - Send Receive - Run		Output variable aPR1 v Cr Expression: aPR1= (rPR1 * 0.2)	
Time interval	10	Seconds ×	Operations	~	Insert operation
Calculation	raPR1	Create new	Messages	·	Insert variable
Use locations:			Events	v	Insert event
None			Use locations Events rePR1 Variables rPR1		
Apply	Revert Delete		Apply	Revert	Delete

3.6 Solar radiation

Example sensor: Kipp & Zonen CM11

This sensor has a sensitivity coefficient, which differs from sensor to sensor. That's why we have to define 3 variables:

rSR1 - Solar Radiation reading in millivolts

aSR1 – actual Solar Radiation in W/m²

cSR1Sens – Solar Radiation sensitivity constant in mV/(W/m²)

The sensitivity constant has to be **non-volatile** to store the value even after disconnected power.

		Analog:ADF4			Variable: rSR1		
		Туре	Differential 24-bit 🔹		Name	rSR1 Rename	
		Channel	ADF4	•	Туре	Float	•
		Description	rSR1		Non volatile		
		Variable	rSR1 -	Create new	Length	0	
Variable: cSR1	lSens	Period 🕜	10	Seconds 🔻	Description	Solar radiatio	n - reading
Name	cSR1Sens Rename	Period variable	•	Create new	Display		
Туре	Float 🔻	Measuremen	nt details		Name		
Non volatile	v	Polarity	Unipolar	•	Unit		
Length	0	Gain	128 (Range: 19	9.53125 mV) 🔻	Settable		
Description	CM11 sensitivity constant	Volt. low limit	0	2	On display		
Display		Low band	0	2	Precision	0	
Name	CM11 Sensitivity	Volt. high limit	0	2			
Unit	mV/W2	High band	0	2	Related locat	ions:	
Settable	V	Calculation	None	•	ADF4		
On display		Minimum	0	2	Calculations raSR1		
Precision	0	Maximum	20	2			
	-	Power on ch.	None	•			
Related locat	ions:	Pow. before [s]	0				
Calculations raSR1		✓ Preset					
Apply	Cancel Delete	Apply	Cancel	Delete	Apply	Cancel	Delete

The voltage is sampled directly into variable rSR1 without calculation.

The value of aSR1 is updated in a calculation raSR1 (reading to actual **SR1**). This calculation contains the following equation:

rSR1 / cSR1Sens

and stores the value into variable **aSR1**. The calculation is started by a synchronous event with the same running **time interval** as the sample time of analog channel. The **time shift** is 1 second, to ensure that the analog voltage value rSR1 is sampled.



Event: reSR1			Calculation: raSR	1	
Name	reSR1	Rename	Name	raSR1	Rename
Description			Description	reading to ac	tual SR1
Synchronous Run Sen Run - Log Sen Log One-time event	As d - Receive	ynchronous Receive Receive - Send Receive - Run Call only event	Output variable Expression: aSR1	aSR1	Create new
Time interval	10	Seconds	rSR1 / cSR1S	ens	
Calculation	raSR1	Create new	Operations	•	Insert operation
Related locations: None			Variables Messages Events	•	Insert variable Insert message Insert event
Apply Cance	el Delete		Related location: Events reSR1 Variables rSR1 cSR1Sens Apply	s: Cancel	Delete

Add a row into the **Configuration actions** section on tab **Project**. Use the sensitivity constant's name in **variable** column and check the **Station specific** checkbox. This will ensure that after configuration in AWS Service, the user will be prompted to enter the sensitivity according to the used sensor. Set a default **value** to 0.014 for setting an approximate value as a default. $(14 \ \mu V/(W/m^2) = 0.014 \ mV/(W/m^2))$

				Import Settings	
Variable	Туре	Value	Station specific	Display name	Help
cSR1Sens 🔹 🖡	Float	0.014		CM11 sensitivity [mV/(W/m2)]	[mV]=[µV] / 1000



4. Compile the configuration

After changes in the configuration don't forget to change the revision number, so you can easily identify which revision is your configuration. Usually the revision is stored in **REV** variable. The value is set in **cREVset** calculation. You can increment the number by one, to indicate that the revision is newer than the previous.

- Calculation: cRE	Vset *	
Name	cREVset	Rename
Description		
Output variable	REV	Create new
Expression: REV	=	
Open on tab	3 C	5
2		_
Operations	•	Insert operation
Variables	•	Insert variable
Messages	•	Insert message
Events	•	Insert event
Related location	ns:	
Events eREVset		
Apply	Cancel	Delete

It is also possible to enter a comment in the **Project** tab. This **Version comment** will be shown in AWS Service.

	File	Output	Edi
Project	Configuration		
Identific	ation variable	LOGID -	6
Version comment		REV2: Added support for Global radiation	
Auxiliaŋ	y files	sensor.	
		Add	-

When you finished the changes, click on **Compile compressed** button on the toolbar. This will generate a TGZ file next to the DLX file. If the TGZ file already exists, it will overwrite it with newly generated version.

Project Pr	eset Help	
New Open Save	Check Compile Compile compressed	Apply all Cancel all changes
File	Output	Editor





5. Configure data logger

Use **AWS Service** program to write configuration to the data logger. Double click on the created TGZ file. If you have the AWS Service installed, it will begin the configuration process. If the AWS Service is installed, but another program opens the TGZ file, then probably you have changed the association of TGZ file extension. In this case select the file and open its properties in Windows. Then select the AWS Service as the default program for opening this TGZ file extension.

AWS Service can maintain multiple versions of configurations for each station. This helps to prevent confusion between configurations and stations. When you have tested that the changes you made are working correctly (e.g. the newly connected sensor works), then you can add that configuration version to Station List of the AWS Service.

Open **AWS Service** and select the **Station List** icon. Click on **Edit**, then **edit types** button. In this list find the configuration type, for which you changed the configuration. Then click **Add version** button. Click on the rectangle and select the newly created TGZ configuration file. Click **Add version** button to add the configuration to the list of configuration versions for the selected configuration type.

Once the configuration is added to AWS Service, you can go to the stations with that AWS Service, or connect to them remotely and change the configuration of the stations. Don't forget to make backups before updating the configuration.

See the AWS Service User's Guide for more details.

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