STYLITIS-40/41

INSTALLATION GUIDE

SYMMETRON
ELECTRONIC APPLICATIONS

CONTENTS

SYMMETRON ELECTRONIC APPLICATIONS
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Made in Greece.

REFERENCES:

- Stylitis-41 User's Manual.

1. GENERAL

INPUTS:

Stylitis-41 is able to measure voltage, frequency and pulses (and current as an option). With suitable sensors it is also capable of measuring:

- Wind speed, direction and wind-turbine power curves
- Temperature, humidity, pressure.
- Solar radiation, rain height, water speed, etc.

The sensors' output must be within 0~5V and 0~3kHz.

OUTPUTS:

The vane supply outputs (+5V PULSED) may be used for excitation, as they are capable of supplying up to a TOTAL of 25milliAmps with an accuracy of ±0.1%.
One of the outputs (+VA PULSED) has selectable output voltage.
Similarly, the anemometer supply outputs (+5V FIXED) can supply up to a TOTAL of 10milliAmps with an accuracy of ±5%. These outputs are not pulsed. Thus, the average current drawn from the battery is the same as the total Anemometer supply current.

SERIAL PORT:

The Data logger comes equipped with one serial port. Communication speed fixed at 9600 baud with 8 data bits, 1 stop bit and no parity bit. The port is full duplex and may be one of the following:

RS232 (standard)
DB9 Plug (Male). PIN 2: Transmit, PIN 3 Receive, PIN 5 Ground. To connect to a standard PC serial port a "straight" type cable is required, i.e. one, which connects pin 2 of one connector to pin 2 of the other, etc. Both cable connectors must be female.

RS485 (option)
DB9 Plug (Male). PIN 2: Receive [-], PIN 7: Receive [+], PIN 3 Transmit [-], PIN 8 Transmit [+], PIN 5 Ground.

QUICK SETUP:

Make sure you have gone through all of the following steps:

1. Connect sensors to the data logger.
2. Connect power supply (alkaline cells, lead-acid cells, etc.).
3. Depressing a key for more than one second activates the display, allowing interface with the user. Stylitis-41 automatically reverts to standby mode if there is no key action for 1 minute.
4. If PASSWORD protection has been activated, you are allowed 4 attempts to enter the correct one. Otherwise the instrument will lock and you must contact Symmetron to unlock it.
5. Setup time, date, site and math interval (10 minutes typical).
6. Using the menus, select the type of sensors and setup parameters (i.e. Slope/Offset for calibrated anemometers). Do not forget to set to NOT USED all unused channels.
7. Select ENERGY SAVE MODE from the MODE menu.
8. Data are stored in a memory card if you insert one; Otherwise they are stored in the internal buffer.
9. Select ACQUISITION ON to start data logging. It is recommended to always operate the data logger in ACQUISITION ON, unless you make changes to the setup. Selecting ACQUISITION OFF you automatically **delete** any stored data from the internal buffer (data are **not deleted** from a memory card).
10. Check the available logging space in days using 1>STATUS 3>CARD or 1>STATUS 4>BUFFER.

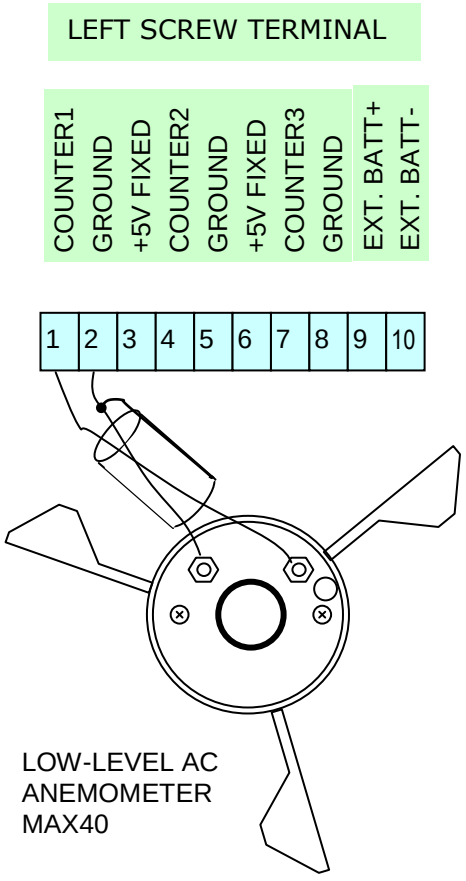
- To select a menu item use the corresponding numeric key.
- [ESC] goes one menu-level up and abandons changes.
- [ENTER] goes one menu-level up and saves changes.
- You can change parameters only when ACQUISITION is OFF.

2. LOW-LEVEL AC ANEMOMETER NRG MAX#40.

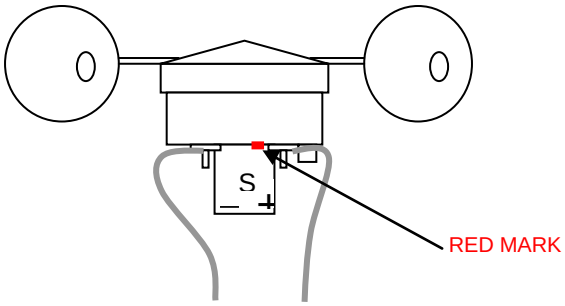
Other sinusoidal output sensors: YOUNG 05103 (for connections refer to instruction sheet).

CONNECTION (MAX#40):

- Connect the first anemometer to screws 1 [COUNTER1] and 2 [GROUND] on the left screw terminal.
- Connect the second anemometer to screws 4 [COUNTER2] and 5 [GROUND] on the left screw terminal.
- Connect the third anemometer to screws 7 [COUNTER3] and 8 [GROUND] on the left screw terminal.
- Wire polarity does matter (see drawing). Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended). Connect the shield to the GROUND screw. Do not connect the shield to the anemometer.



LOW-LEVEL AC ANEMOMETER MAX40



GND C1, C2 or C3

IN CASE IT DOESN'T WORK:

- Check that the anemometer rotates freely and that its axle is straight.
- With a multimeter check the resistance in the anemometer's terminals. It must be less than 1000Ω and greater than 400Ω.
- Rotate the anemometer and measure the AC voltage on its terminals; it should generate at least 200mV.

SETUP:

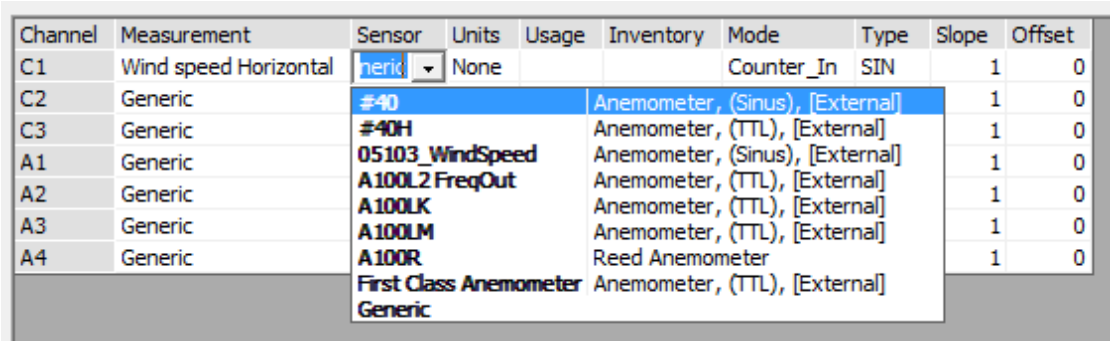
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

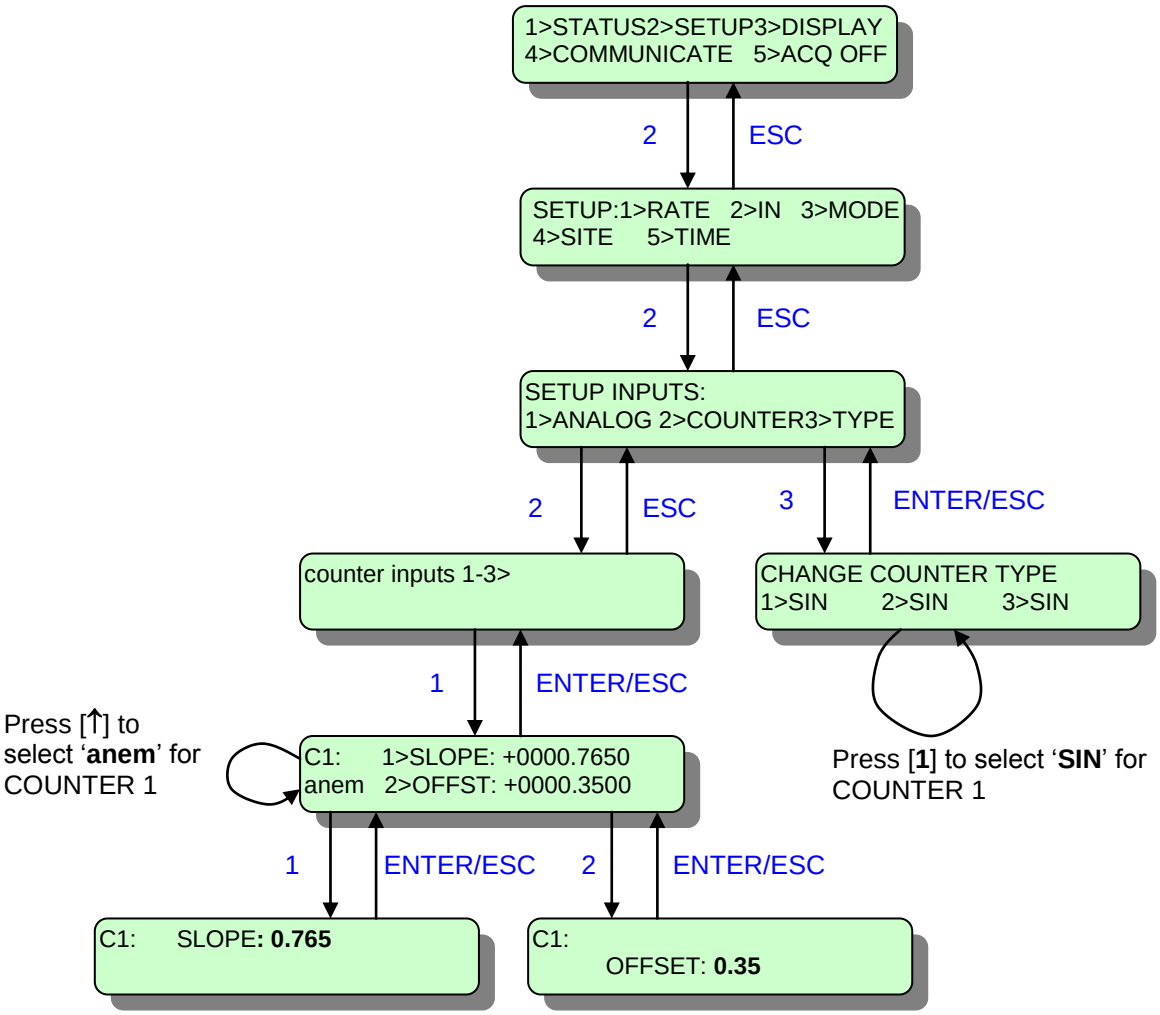
a. Via Software

- Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select a counter channel's line, eg C1.
- Click the 'Measurement' field and select 'Wind Speed Horizontal'.
- Click the 'Sensor' field and select '#40' or '05103_WindSpeed'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' field. The Slope and Offset are automatically updated again.
- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.
- NOTE: For calibrated anemometers you can enter the correct SLOPE και OFFSET values in retrospect.

b. Manually



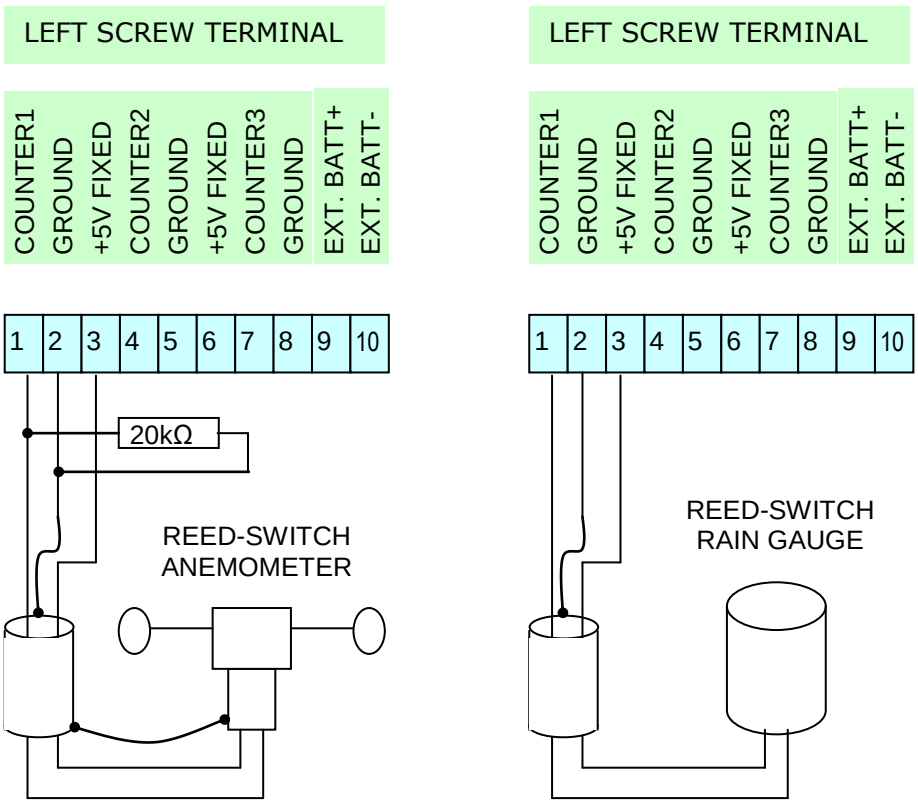
ANEMOMETER	SLOPE	OFFSET
NRG MAX#40	0.7650	0.3500
YOUNG 05103	0.0978	0.0000

3. REED ANEMOMETERS OR RAIN GAUGES.

Switch-type sensors (reed):
Anemometers: VECTOR A100R, NRG #40H.
Rain Gauges: NRG RainGage, YOUNG Tipping Bucket

CONNECTION:

- Connect the first anemometer or rain gauge to screws 1 [COUNTER1] and 3 [+5V FIXED] on the left screw terminal.
- Connect the second anemometer or rain gauge to screws 4 [COUNTER2] and 3 [+5V FIXED] on the left screw terminal.
- Connect the third anemometer or rain gauge to screws 7 [COUNTER3] and 6 [+5V FIXED] on the left screw terminal.
- Wire polarity is irrelevant. Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended). Connect the shield to the GROUND screw and the metal body of the anemometer (if plastic, leave it unconnected).
- A 20kΩ pull-down resistor must be connected between a Counter input and Ground for each anemometer. Otherwise, the cable capacitance will not allow readings above a few meters/second.



IN CASE IT DOESN'T WORK:

- Check that the anemometer or rain gauge rotates freely and that its axle is straight.
- With a multimeter check the resistance in the sensor's terminals: it should change from short circuit to open circuit while moving or rotating.

SETUP:

Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

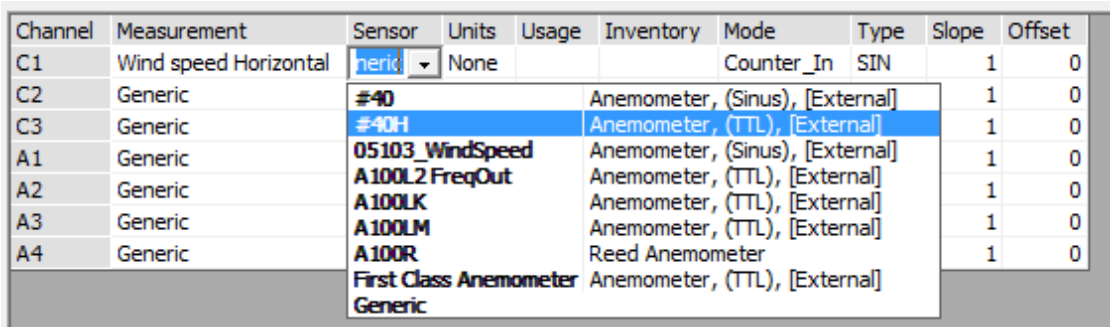
After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

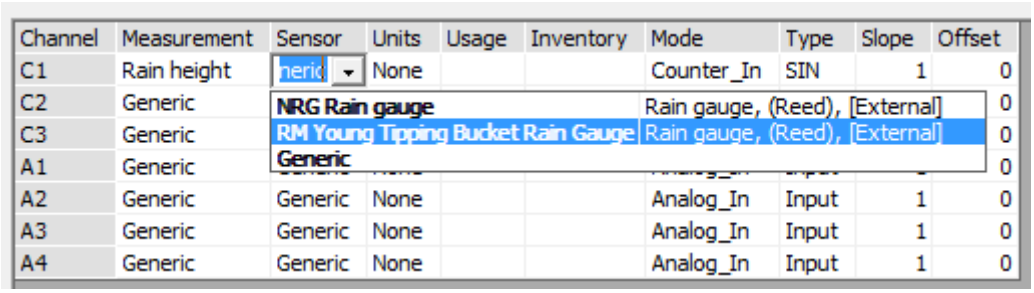
a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.

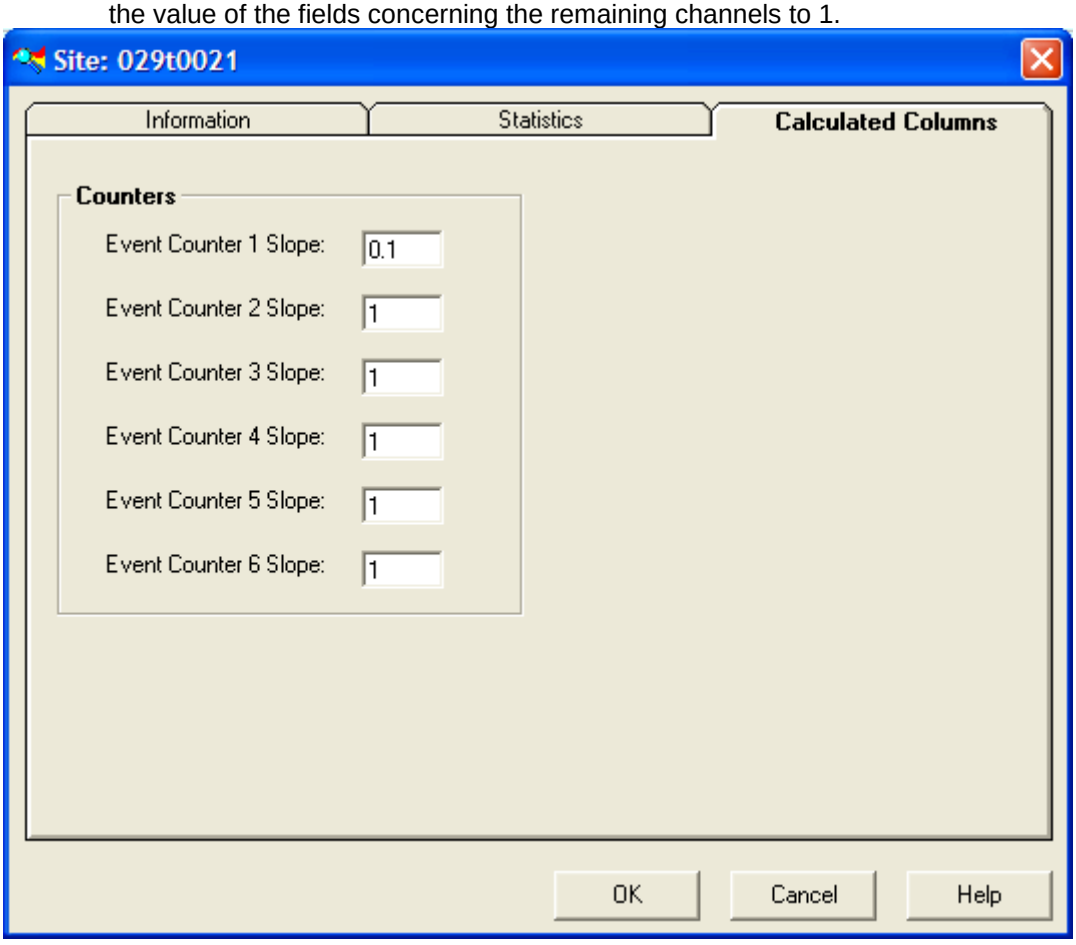
- Select a counter channel's line, eg C1..



- To select an **anemometer**, click the 'Measurement' field and select 'Wind Speed Horizontal'.
- Click the 'Sensor' field and select '#40H' or 'A100R'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' field. The Slope and Offset are automatically updated again.

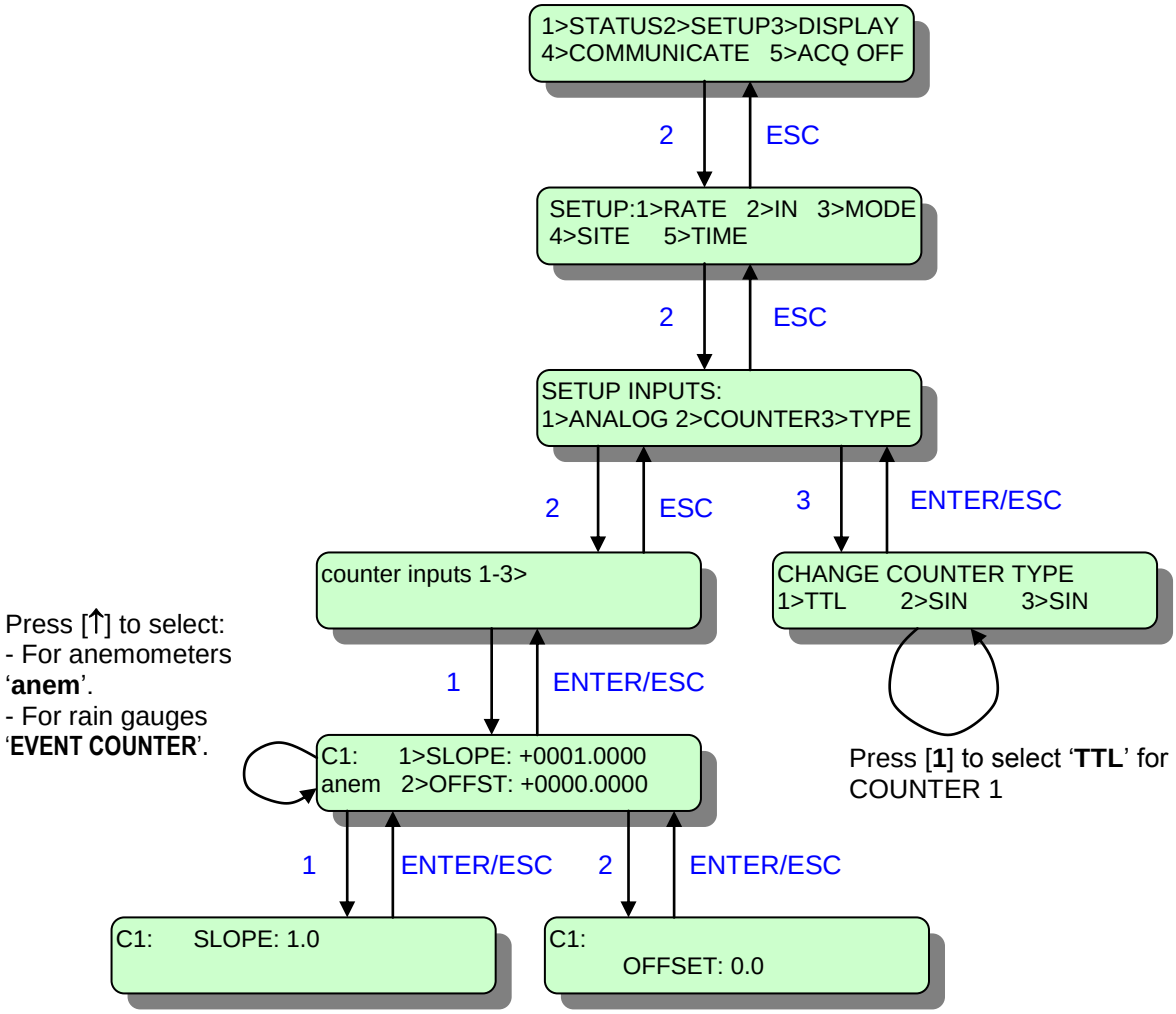


- To select a **rain gauge**, click the 'Measurement' field and select 'Rain Height'.
- Click the 'Sensor' field and select 'Rain gauge' or 'Tipping Bucket Rain Gauge'. The channel type ('Type' field), is automatically updated, but the Slope is not. As the appearing message states, since the channel is set to 'Event Counter', you have to type the Slope manually in the 'Calculated Columns' tab of Site Properties. In our example, type the 'Tipping Bucket Rain Gauge''s Slope (0.1) in the first field (for C1). Type "0.254" in the corresponding field, if you are using NRG's 'Rain gauge'. Leave the value of the fields concerning the remaining channels to 1.



- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.
- NOTE: For calibrated anemometers you can enter the correct SLOPE and OFFSET values in retrospect. In case of rain gauges, just enter the correct Slope in the fields of the tab above.

b. Manually



ANEMOMETER	SLOPE	OFFSET
RISO P2546A	0.6201	0.2700
VECTOR A100K	0.0515	0.0000
VECTOR A100M	0.1000	0.0000
VECTOR A100R	1.2500	0.0000
FRIEDRICH 4034.0000/1000	0.1000	0.0000
FRIEDRICH 4091.1000	0.3448	0.0000
NRG #40H	0.7650	0.3500
THIES FIRST CLASS	0.0500	0.0000

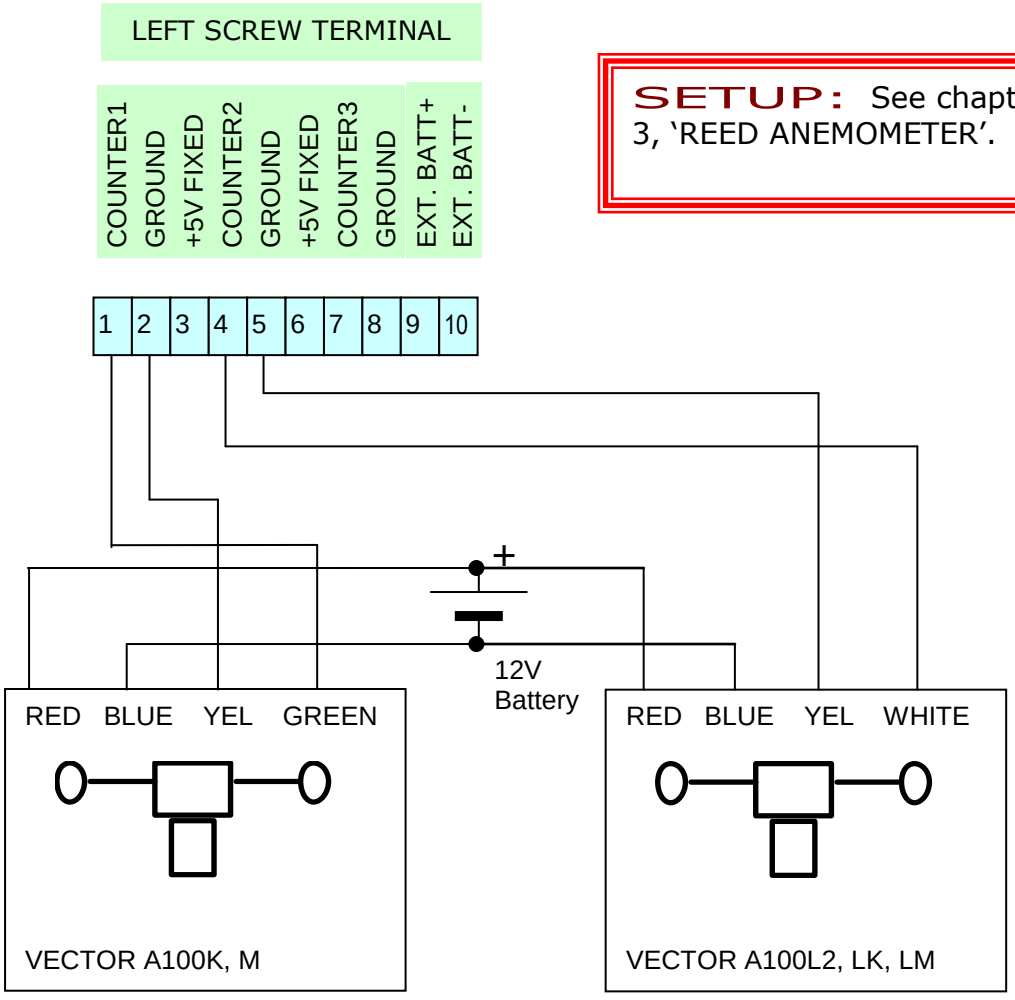
NOTES: 1.For calibrated **anemometers** enter the corrected SLOPE και OFFSET values.
2. For **rain gauges**, you can set appropriate Slope coefficients for Event counters in Stylitis Explorer | Site Properties, in the 'Calculated Columns' tab. Type the value you wish for each channel C1~C3.

4. VECTOR A100K, M, L2, LK, LM ANEMOMETER.

Optical disk sensors

CONNECTION:

- Connect the first anemometer to screws 1 [COUNTER1] and 2 [GROUND] on the left screw terminal.
- Connect the second anemometer to screws 4 [COUNTER2] and 5 [GROUND] on the left screw terminal.
- Connect the third anemometer to screws 7 [COUNTER3] and 8 [GROUND] on the left screw terminal.
- Wire polarity does matter (see drawing). Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended). Connect the shield to the GROUND screw and the metal body of the anemometer.



SETUP: See chapter 3, 'REED ANEMOMETER'.

IN CASE IT DOESN'T WORK:

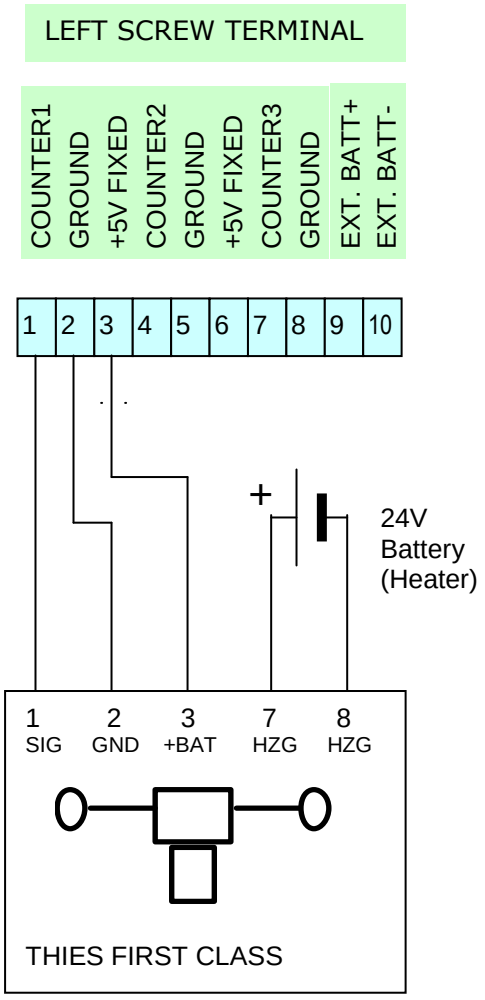
- Check that the anemometer rotates freely and that its axle is straight.
- Rotate the anemometer and measure the DC voltage between the COUNTER input and GND; it should toggle between 0 and 5 Volts (approximately).

5. THIES FIRST CLASS ANEMOMETER.

Optical disk type sensor.

CONNECTION:

- Connect the first anemometer to screws 1 [COUNTER1] and 2 [GROUND] on the left screw terminal.
- Connect the second anemometer to screws 4 [COUNTER2] and 5 [GROUND] on the left screw terminal.
- Connect the third anemometer to screws 7 [COUNTER3] and 8 [GROUND] on the left screw terminal.
- Wire polarity does matter (see drawing). Typical wire size: 3 x 0,25 mm^2 (shielded cables are recommended). Connect the shield to the GROUND screw and the metal body of the anemometer.



SETUP: See chapter 3, 'REED ANEMOMETER'.

IN CASE IT DOESN'T WORK:

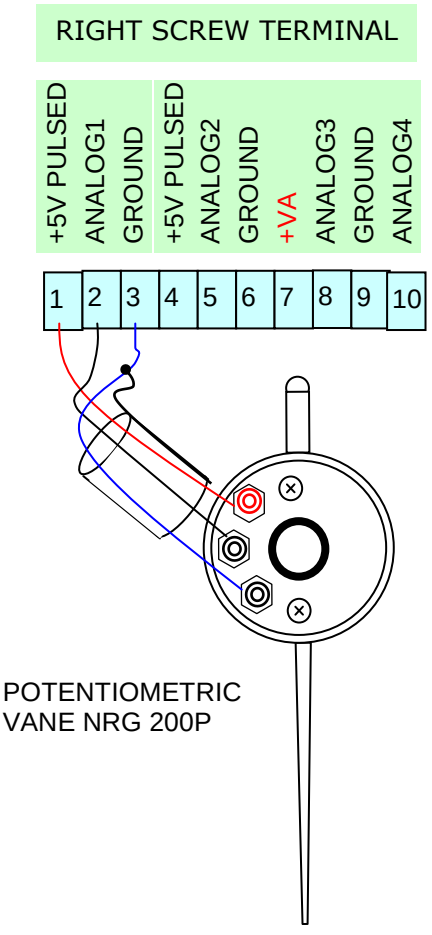
- Check that the anemometer rotates freely and that its axle is straight.
- Rotate the anemometer and measure the DC voltage between the COUNTER input and GND; it should toggle between 0 and 5 Volts (approximately).

6. WIND VANE NRG 200P

Other potentiometric sensors with resistance 1KΩ or greater: NRG #200P, Vector W200P, Young 05103, Thies First Class Wind Vane (for connections refer to data sheet).

CONNECTION:

- Connect the first wind vane to screws 1 [+5V PULSED], 2 [ANALOG1] and 3 [GROUND] on the right screw terminal.
- Connect the second wind vane to screws 4 [+5V PULSED], 5 [ANALOG2] and 6 [GROUND] on the right screw terminal.
- Connect the third wind vane to screws 7 [+VA PULSED], 8 [ANALOG3] and 9 [GROUND] on the right screw terminal. CAUTION: make sure that position 7 [+VA PULSED] generates +5V and not +12V or +18V!
- Wire polarity does matter (see drawing): The RED screw of the wind vane connects to +5V, the middle screw of the wind vane with an ANALOG position and the last screw of the wind vane to a GROUND position. Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended). If a shield exists connect it to the GROUND screw. Do not connect the shield to the wind vane.
- Be careful not to short-circuit the shield with any of the wind vane screws. Wrong connections my damage the wind vane!



POTENTIOMETRIC VANE NRG 200P

IN CASE IT DOESN'T WORK:

- Check that the wind vane rotates freely and that its axle is straight.
- With a multimeter check the resistance between the wind vane's most far-apart terminals. It must be about 10kΩ.
- Rotate the wind vane and measure the resistance from the center screw to one of the other screws; it should change from 0Ω to about 10kΩ.

SETUP:

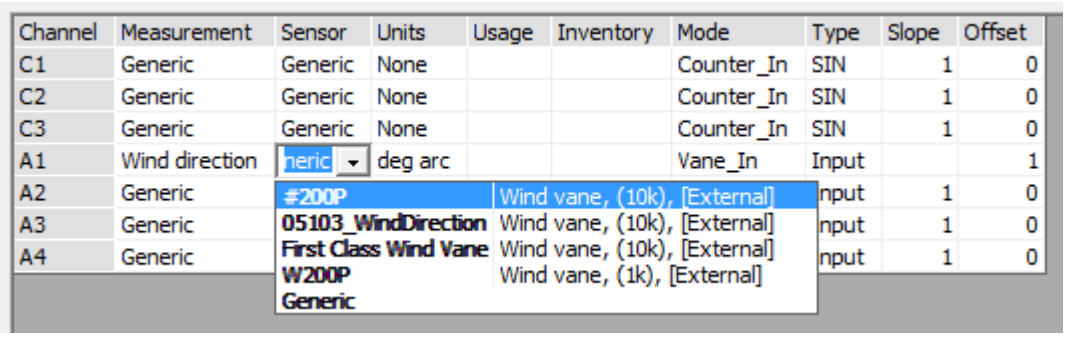
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

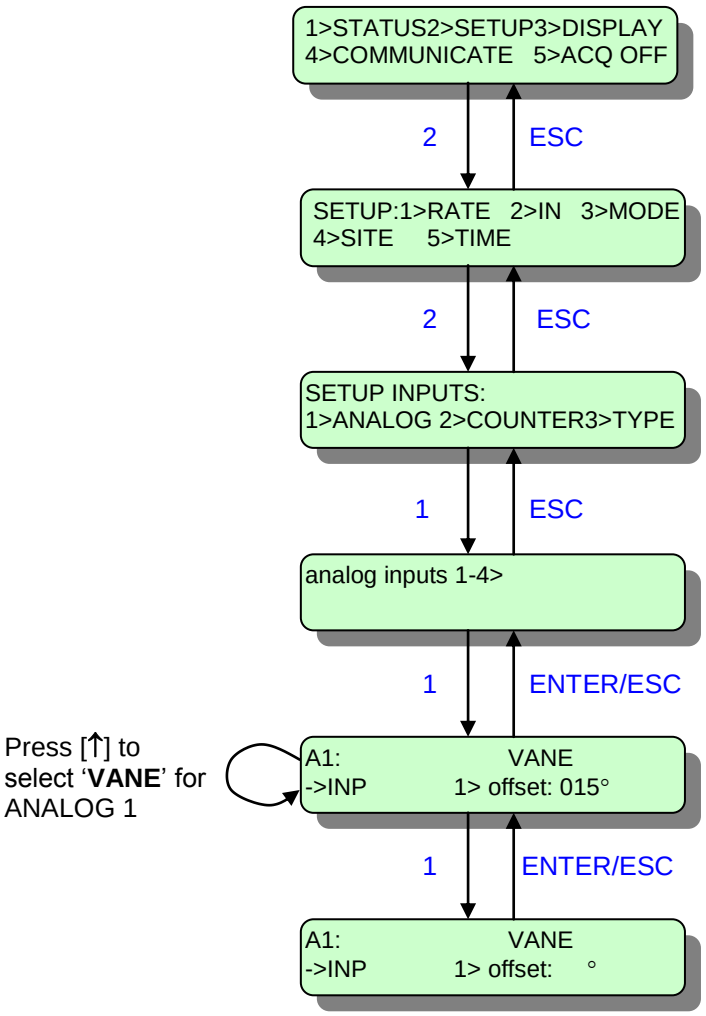
a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1.
- Click the 'Measurement' field and select 'Wind Direction'.
- Click the 'Sensor' field and select '#200P', W200P', '05103_WindDirection' or 'First Class Wind Vane'.
- The channel type ('Type' field), is automatically updated, while the default offset is set to 0.
- Change the Offset in retrospect, according to where you wish for the vane "zero" mark to be. For more details, see the note below.
- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.
- NOTE: Enter the vane offset for direction measurement in degrees (0~359). For instance, if the vane "zero" mark is placed 30 east then you enter 30 as offset; if it is placed 30 West you enter 330 (=360-30) as offset.

b. Manually



Press [↑] to select '**VANE**' for ANALOG 1

Enter the vane offset for direction measurement in degrees (0~359). For instance, if the vane "zero" mark is placed 30 east then you enter 30 as offset; if it is placed 30 West you enter 330 (=360-30) as offset.

7. TEMPERATURE PT100.

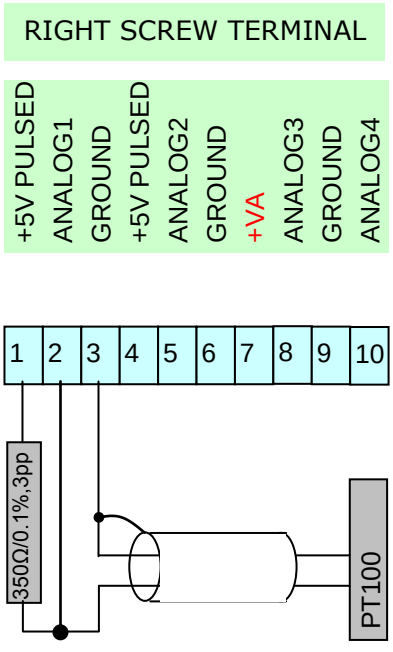
Platinum sensors (RTD), 100Ω resistance at 0°C: VECTOR T351, etc.
Temperature range: –50°C ~ +55°C.

CONNECTION:

- Connect the first PT100 sensor and a 350Ω / 0.1%, 3ppm resistor, to screws 1 [+5V PULSED], 2 [ANALOG1] and 3 [GROUND] on the right screw terminal (see drawing).
- Connect the second PT100 sensor and a 350Ω / 0.1%, 3ppm resistor, to screws 4 [+5V PULSED], 5 [ANALOG2] and 6 [GROUND] on the right screw terminal.
- Connect the third PT100 sensor and a 350Ω / 0.1%, 3ppm resistor, to screws 7 [+VA PULSED], 8 [ANALOG3] and 9 [GROUND] on the right screw terminal. CAUTION: make sure that position 7 [+VA PULSED] generates +5V and not +12V or +18V!
- If a PT1000 sensor is used replace the external resistor with a 3.5kΩ, 0.1%, 3ppm type. Wire sizes in the following table can then be reduced to one tenth (1/10).
- Wire polarity is irrelevant. Wire size according to connection distance (shielded cables are recommended):

CABLE LENGTH meters	WIRE SIZE mm^2 (PT100)
Up to 1	2x0,35
Up to 2	2x0,50
Up to 3	2x0,75
Up to 4	2x1
Up to 5	2x1,5
Up to 10	2x2,5
Up to 20	2x4

If a shield exists connect it to the GROUND screw. Do not connect the shield to the PT100 sensor.



IN CASE IT DOESN'T WORK:

- The data logger must be in 'ENERGY SAVE' mode. Otherwise, the sensor will heat-up and measure a little higher than correct.
- With the sensor disconnected from the logger, use a multimeter to check the resistance between the sensor's terminals. At ambient temperature (23°C) it should be about 110Ω.

SETUP:

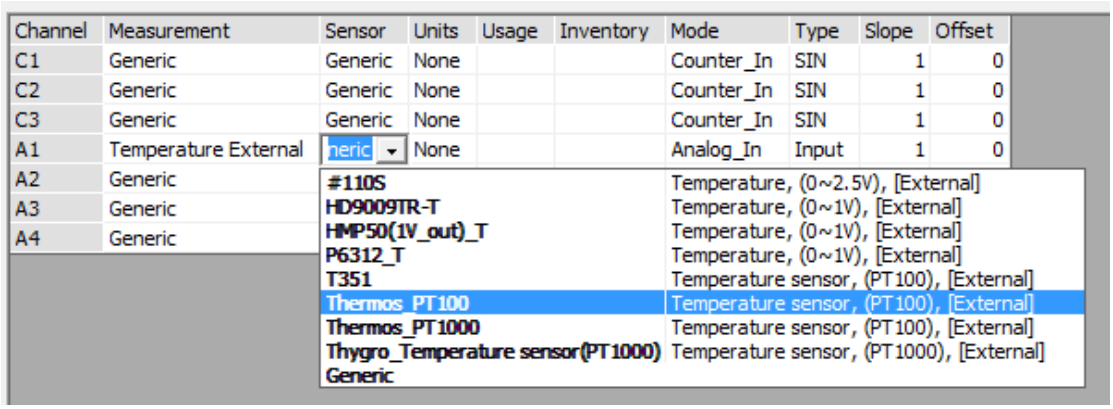
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

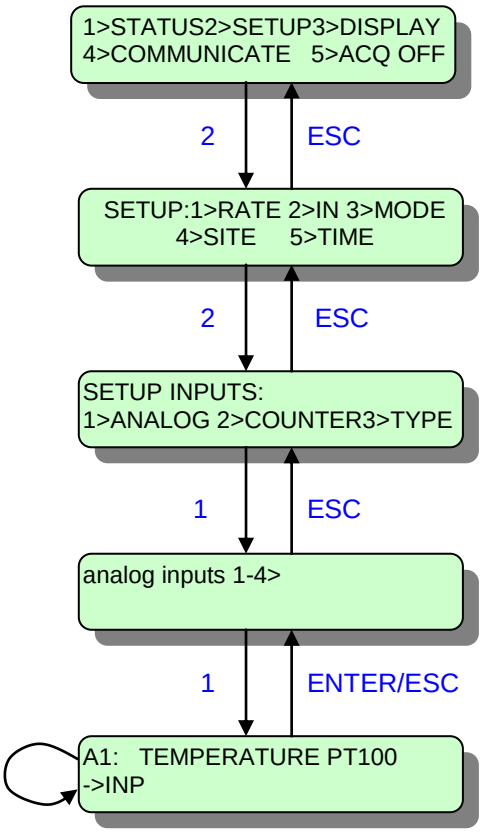
a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1.
- Click the 'Measurement' field and select 'Temperature External' 'Temperature Internal', 'Temperature Submersed' or 'Temperature Surface', according to if the temperature measurement will be internal, external, etc.
- Each measurement type affords the corresponding PT100 sensor. Eg, if you have selected 'Temperature Submersed' before, click the Sensor field and select 'PT100_probe'. The channel type ('Type' field) is automatically updated.
- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.

b. Manually



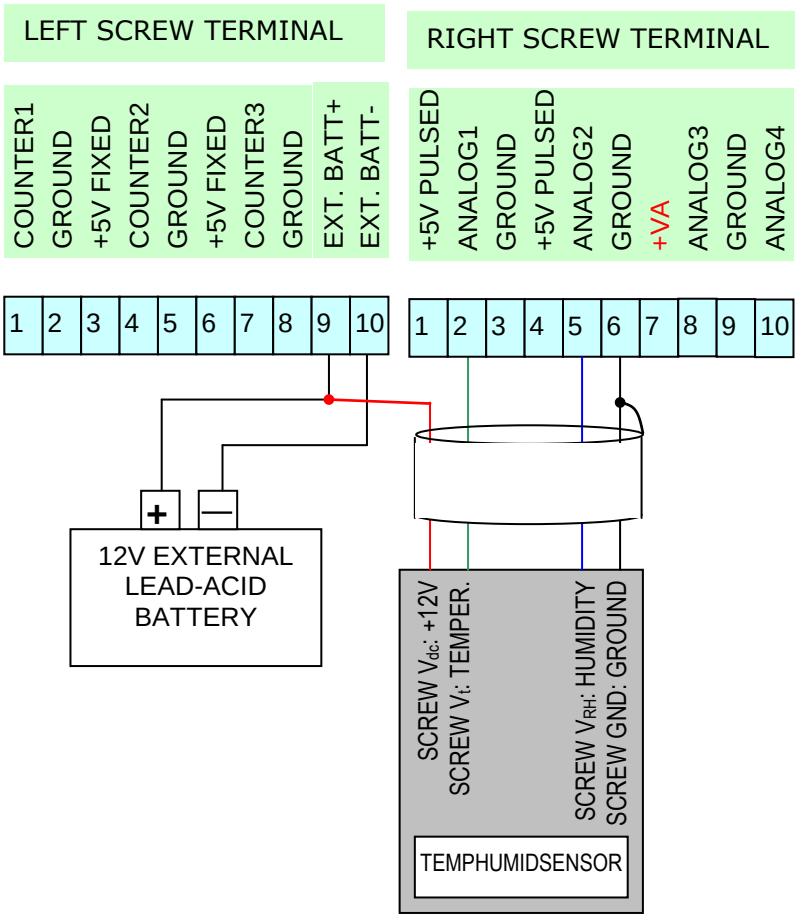
Press [↑] to select '**TEMPERATURE**' for ANALOG 1

8. TEMPERATURE-HUMIDITY DeltaOhm HD9009TR

Other Temperature-Humidity sensors: Ammonit P6312, Vaisala HMP50 (sensor output: 0~1V). See the table below for wire coloring of these sensors' connection.

CONNECTION:

- Connect the first sensor to screws 2 [ANALOG1], 5 [ANALOG2] and 3 [GROUND] on the right screw terminal.
- Connect the second sensor to screws 8 [ANALOG3], 10 [ANALOG4] και 9 [GROUND] on the right screw terminal.
- Wire polarity does matter (see drawing): The sensor connects to an external +7V ~ +30VDC power source (typically a 12V lead-acid battery). The sensor GROUND together with the cable shield connects to a logger GROUND position. Typical wire size: 4 x 0,25 mm^2 (shielded cables are recommended).



IN CASE IT DOESN'T WORK:

- Connect the sensor to the battery.
- With a multimeter check the voltage between TEMPERATURE and GROUND: At ambient temperature 20 °C it should be about 0.5V.
- With a multimeter check the voltage between HUMIDITY and GROUND: At an ambient humidity 70% it should be about 0.7V.

SENSOR	MANUFA-CTURER	Wire at [EXT BATT+] pin (12V)	Temperature sensor wire at ANALOG pin (eg [ANALOG1])	Humidity sensor wire at ANALOG pin (eg [ANALOG2])	Wire at [GROUND] pin
HD900TR	DeltaOhm	Red	Green	Blue	Black
P6312	Ammonit	Green	Black	Brown	Yellow
HMP50	Vaisala	Brown	Black	White	Blue

SETUP:

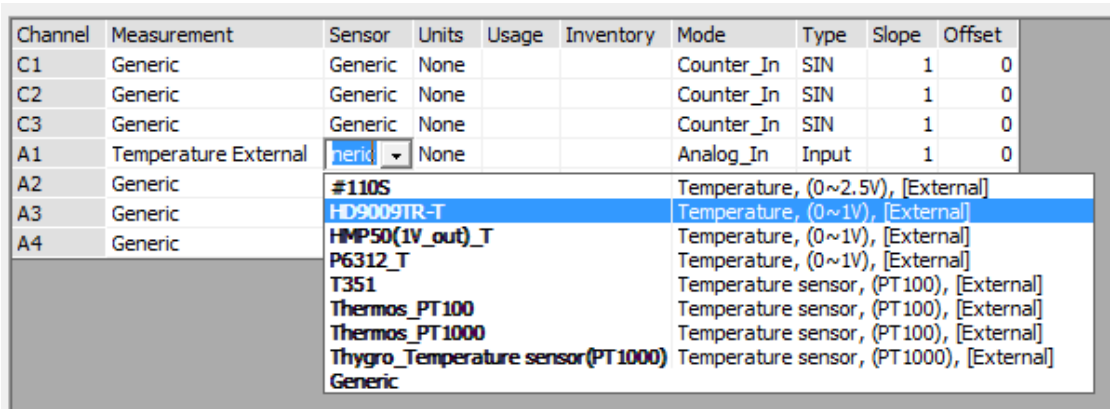
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

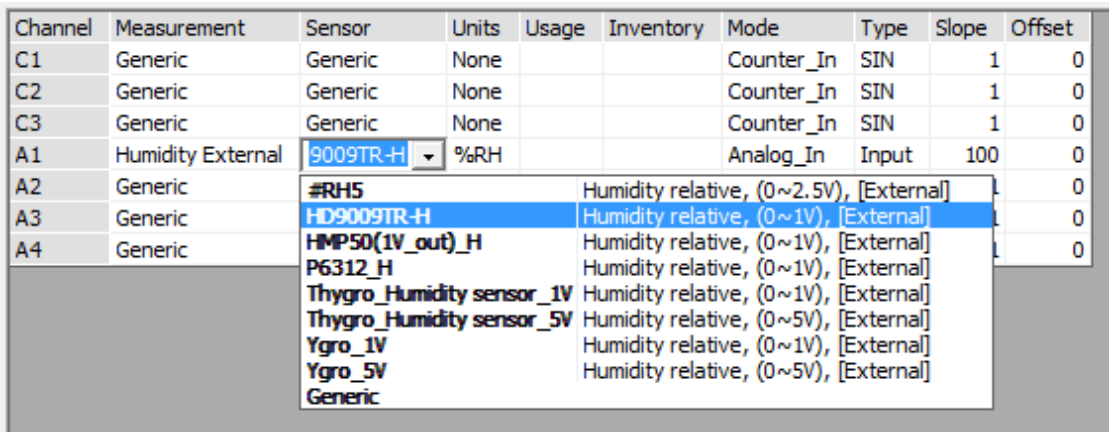
to start acquisition (data logging).

a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



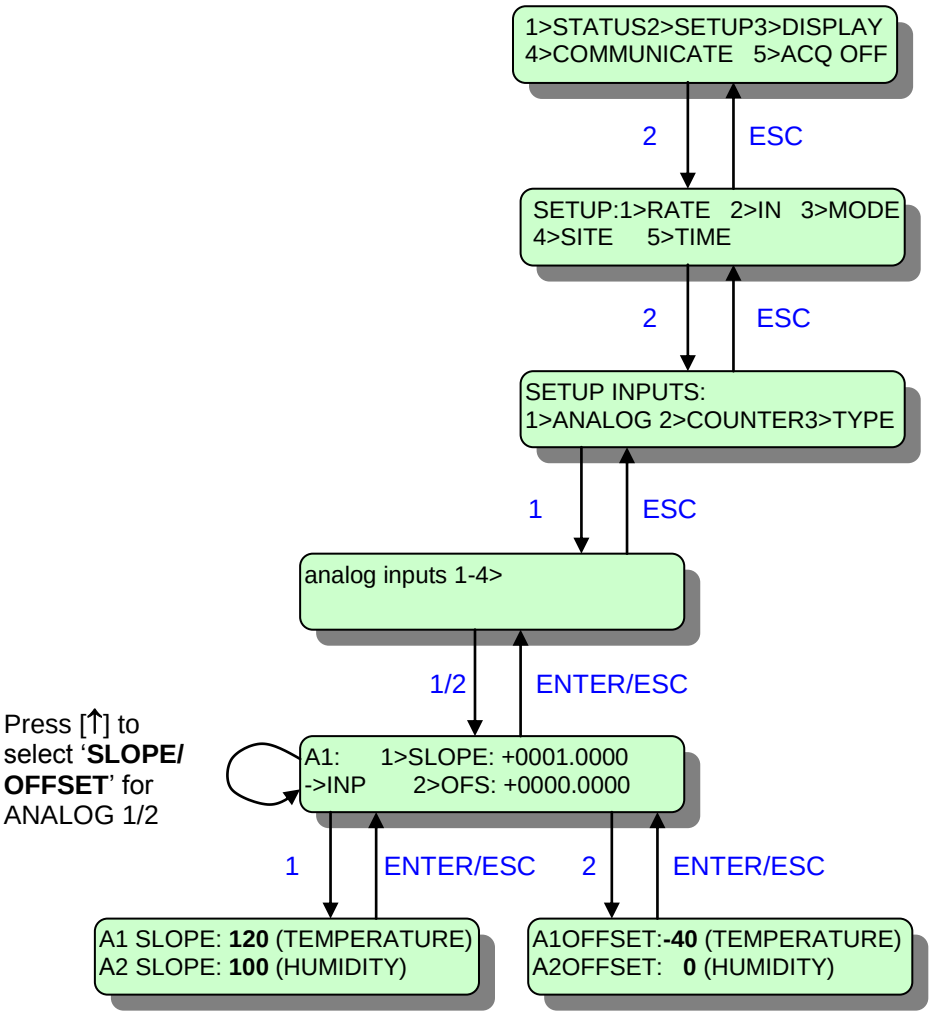
- For the **temperature** sensor , select an analog channel's line, eg A1. Click the 'Measurement' field and select 'Temperature External'.
- Click the 'Sensor' field and select 'HD9009TR'_T', 'P6312_T' or 'HMP50(1V_out)_T'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' field. The Slope and Offset are automatically updated again.
- NOTE: For calibrated sensors, you can enter the correct SLOPE και OFFSET values in retrospect.



- For the **humidity** sensor , select an analog channel's line, eg A2.
- Click the 'Measurement' field and select 'Humidity External'.
- Click the 'Sensor' field and select 'HD9009TR'_H', 'P6312_H' or 'HMP50(1V_out)_H'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- NOTE: For calibrated sensors, you can enter the correct SLOPE και OFFSET values in retrospect.

- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.

b. Manually



Coefficients for display in:
TEMPERATURE: -40 ~ +80 °C
HUMIDITY: 0 ~ 100 %

NOTE: Refer to the table below for Slope and Offset of other temperature humidity sensors

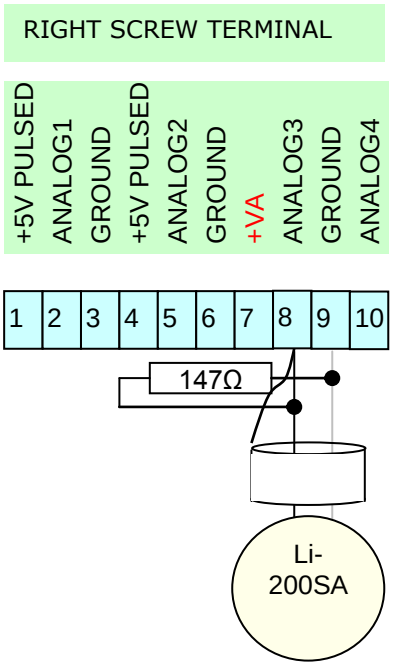
SENSOR	Temperature sensor SLOPE	Temperature sensor OFFSET	Humidity sensor SLOPE	Humidity sensor OFFSET
HD900TR	120	-40	100	0
P6312	100	-30	100	0
HMP50	100	-40	100	0

9. PYRANOMETER LiCor LI-200SZ

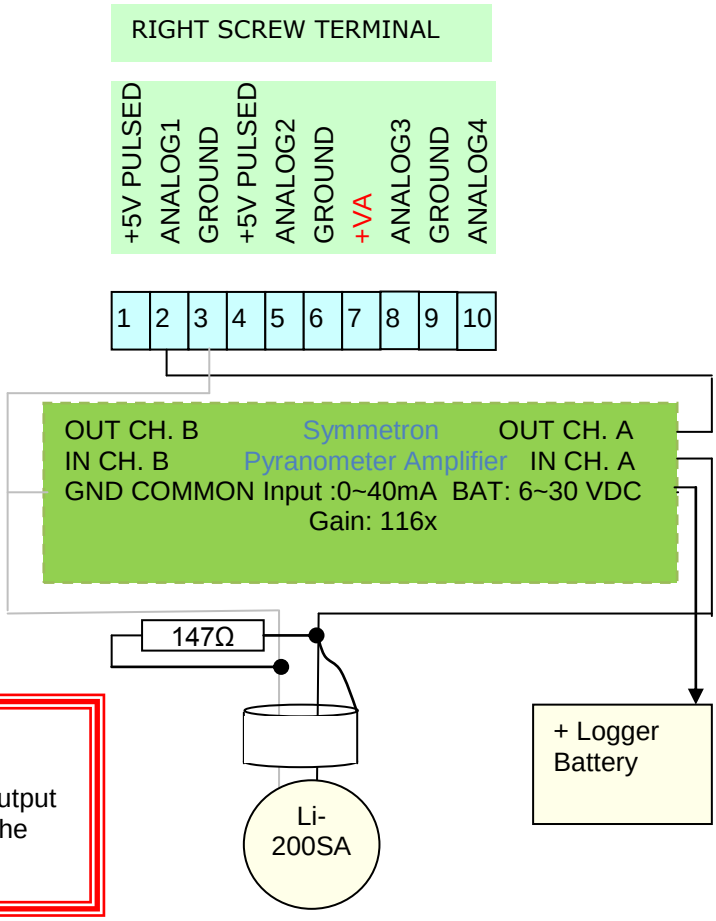
CONNECTION:

- Remove the data logger's front panel and make sure that the following resistors are in place (set A3 input gain)[(1)]:
  - Resistor R65=115K, 0.1%
  - Resistor R66=1K, 0.1%
- Alternatively, you can interfere a low-noise voltage amplifier (see connection on the right), with amplification factor 116, so that the output signal (on the ends of the resistor) is amplified from a few mV to a full-scale signal of 2.5V. The amplifier can amplify the output signal of up to 2 pyranometers. This way, you do not need to use only analog channels with gain (A3 and A4), defined by the resistors above, but all analog channels.
- Connect a 147-Ohm, 0.1% resistor to terminals 8 [ANALOG3] and 9 [GROUND] in the right-hand terminal block, i.e. terminate A3 for correct current-to-voltage conversion.
- Connect the sensor to terminals 8 [ANALOG3] and 9 [GROUND] in the right-hand terminal block.
- Wire polarity does matter (see drawing): The clear wire of the sensor connects to screw 9 [GROUND]. The pyranometer's shield together with the cable's shield is connected to [ANALOG3].
- Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended).

WITHOUT AMPLIFIER



WITH AMPLIFIER



IN CASE IT DOESN'T WORK:

- With a multimeter check the voltage between screws 8 and 9: the sensor output should be about 12mV/1000W/m^2. In the dark it should display less than 1W.

SETUP:

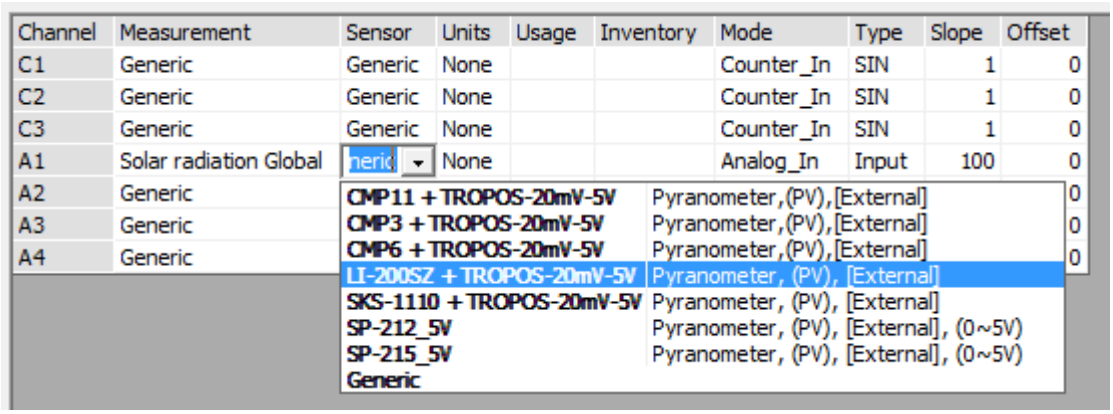
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

a. Via Software

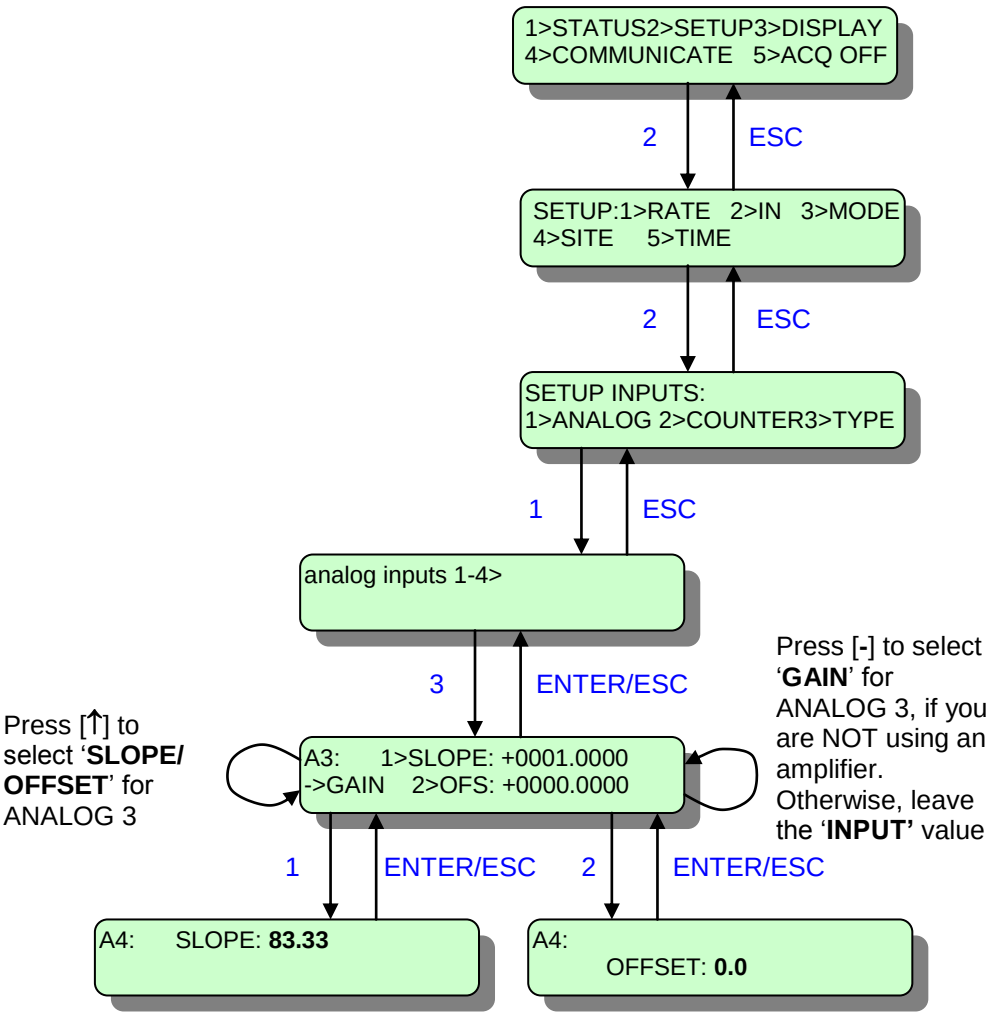
Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1. NOTE: Use only A3 or A4 if you are using the sensor without Amplifier (with GAIN).
- Click the 'Measurement' field and select 'Solar Radiation Direct beam', 'Solar Radiation Global' or ' Solar Radiation Diffused', according to the type of solar radiation you are measuring.
- Click the 'Sensor' field and select 'LI-200SA', if you are using the sensor without an amplifier or 'LI-200SA+Pyranometer Amp', if you are using it with an amplifier. As you can see in the example above, in A1 and A2, the first option is not available, as stated above.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' field. The Slope and Offset are automatically updated again.

- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.
- NOTE: For calibrated sensors, you can enter the correct SLOPE και OFFSET values in retrospect.

b. Manually



Set Slope=83.33, if you are NOT using an amplifier. Otherwise, set Slope=0.7184

Coefficients shown are for indication in **W/m²** with a typical sensitivity of 80µA/1000W/m^2. If the pyranometer is calibrated calculate the coefficients as shown above.

NOTE: Refer to the table below for Slope and Offset of other pyranometers

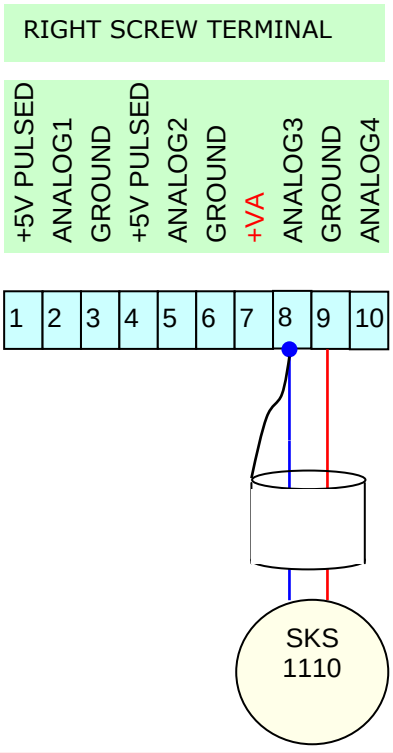
SENSOR	SLOPE WITHOUT AMPLIFIER	OFFSET WITHOUT AMPLIFIER	SLOPE WITH AMPLIFIER	OFFSET WITH AMPLIFIER
LI-200SA	83.33	0	0.7184	0
SKS-1110	100	0	0.8621	0
CMP3	80	0	0.6897	0
CMP6	80	0	0.6897	0
CMP11	95.2381	0	0.821	0
SP-110	5	0	NOT USED	NOT USED
SP-212_5V	0.25	0	NOT USED	NOT USED
SP-215_5V	0.25	0	NOT USED	NOT USED

10. PYRANOMETER SKYE SKS-1110

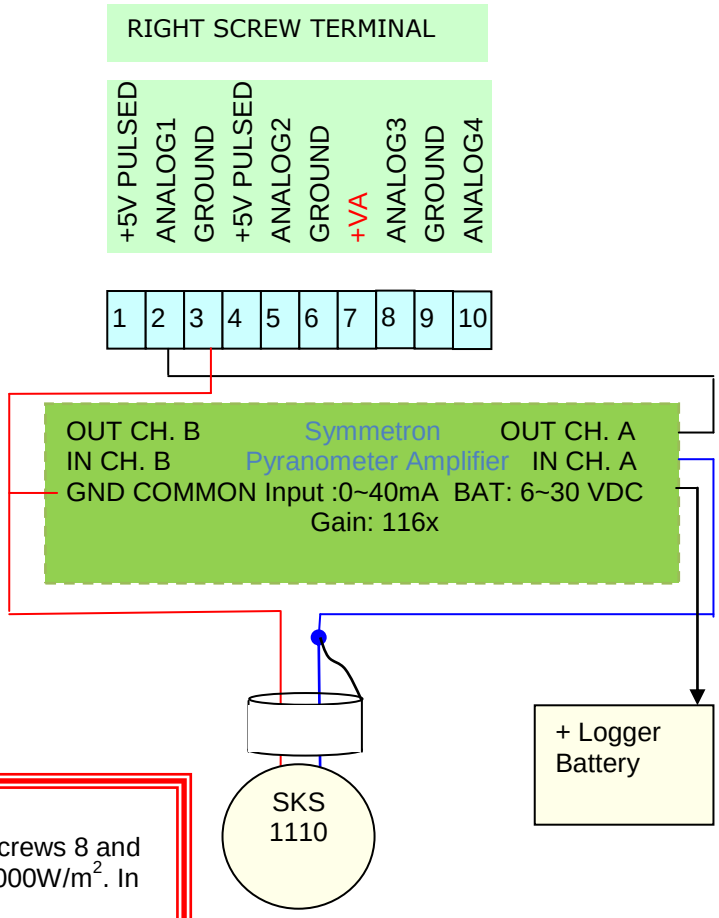
CONNECTION:

- Remove the data logger's front panel and make sure that the following resistors are in place (set A3 input gain):
  - Resistor R65=115K, 0.1%
  - Resistor R66=1K, 0.1%
- Alternatively, you can interfere a low-noise voltage amplifier (see connection on the right), with amplification factor 116, so that the output signal (on the ends of the resistor) is amplified from a few mV to a full-scale signal of 2.5V. The amplifier can amplify the output signal of up to 2 pyranometers. This way, you do not need to use only analog channels with gain (A3 and A4), defined by the resistors above, but all analog channels.
- Connect the sensor to terminals 8 [ANALOG3] and 9 [GROUND] in the right-hand terminal block.
- Remove the connector (if any) from the wire end. Wire polarity does matter (see drawing): The red wire of the sensor connect to [GROUND]. The shield together with the blue wire of the sensor is connected to [ANALOG].
- Typical wire size: 2 x 0,25 mm^2 (shielded cables are recommended).

WITHOUT AMPLIFIER



WITH AMPLIFIER



IN CASE IT DOESN'T WORK:

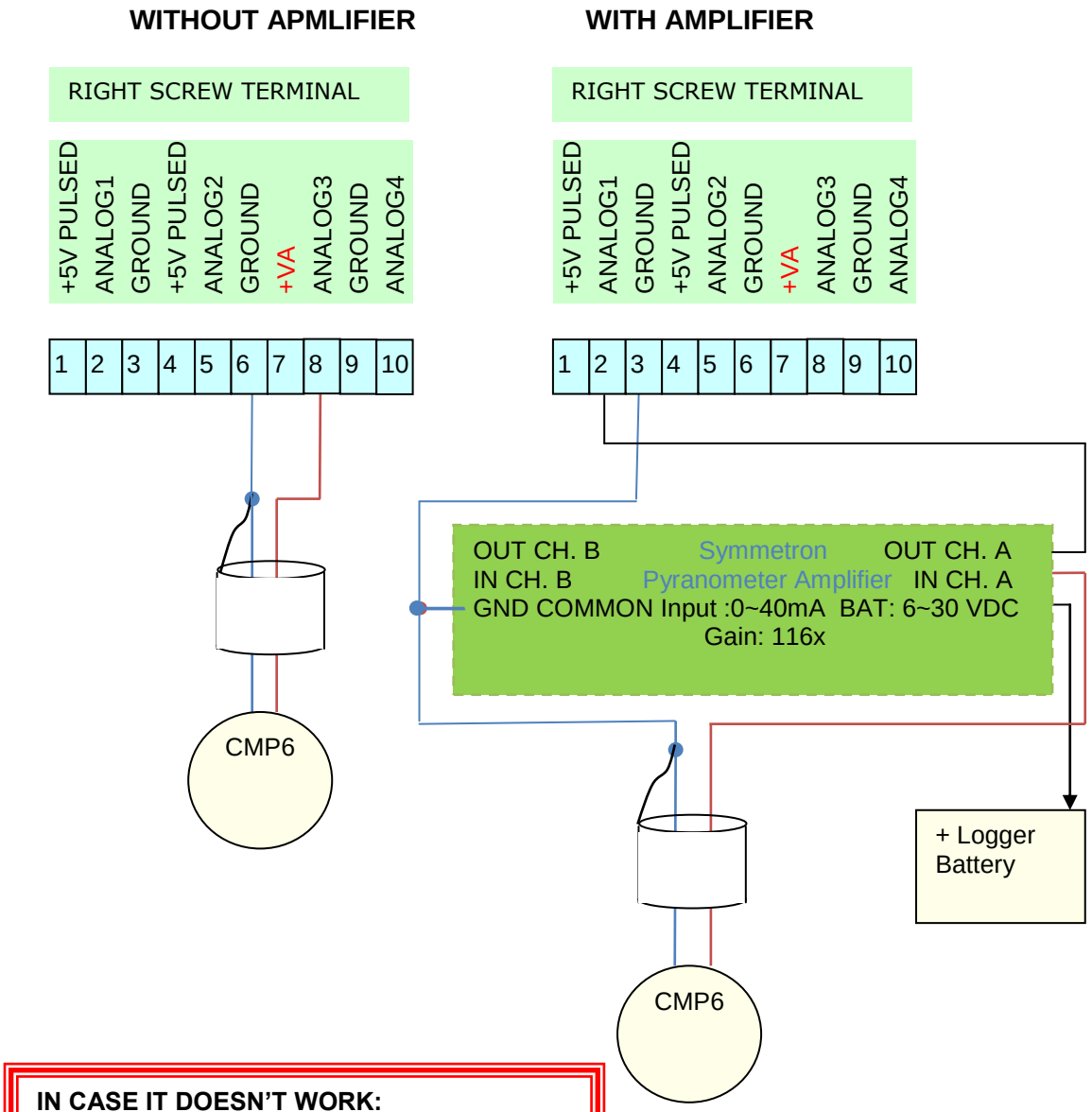
- With a multimeter check the voltage between screws 8 and 9: the sensor output should be about 100mV/1000W/m^2. In the dark it should display less than 1W

SETUP:

Similarly to the previous chapter's sensor. The only difference is that, **via software**, in the 'Sensor' field, select 'SKS-1110' or 'SKS-1110+Pyranometer Amp'. For **manual** Setup, refer to the table of the previous chapter for Slope and Offset

11. CONNECTION AND SETUP OF OTHER USED PYRANOMETERS

CONNECTION:



IN CASE IT DOESN'T WORK:

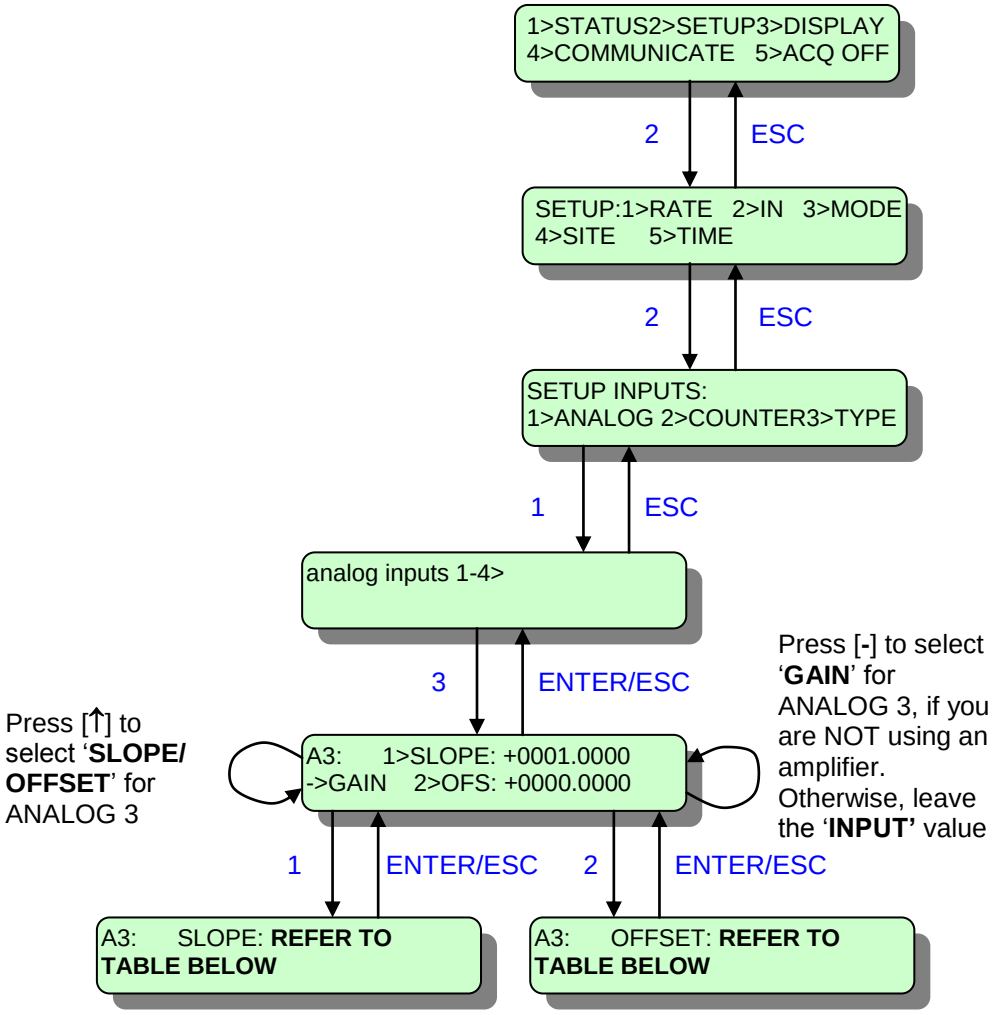
With a multimeter check the voltage between screws 8 and 9: the sensor output should be about 100mV/1000W/m^2. In the dark it should display less than 1W.

SETUP:

a. Via Software

SELECTION IN THE 'MEASUREMENT' FIELD	SELECTION IN THE 'SENSOR' FIELD	MANUFACTU -RER	Wire at ANALOG pin (eg [ANALOG3])	Wire at [GROUND] pin
'Solar Radiation Global' or 'Solar Radiation Diffused' or 'Solar Radiation Direct beam'	CMP3	Kipp & Zonen	Red or White	Blue or Black +Shield
	CMP6	Kipp & Zonen	Red	Blue +Shield
	CMP11	Kipp & Zonen	Red	Blue +Shield
	SP-110	Apogee	Red	Black+ White
	SP-212_5V	Apogee	Green	White+Gray
	SP-215_5V	Apogee	Green	White+Gray

b. Manually



SENSOR	SLOPE	OFFSET
CMP3	80	0
CMP3 + TROPOS-20mV-5V	0.32	0
CMP6	80	0
CMP3 + TROPOS-20mV-5V	0.32	0
CMP11	95.2381	0
CMP3 + TROPOS-20mV-5V	0.381	0
SP-110	5	0
SP-212_5V	0.25	0
SP-215_5V	0.25	0

NOTES:

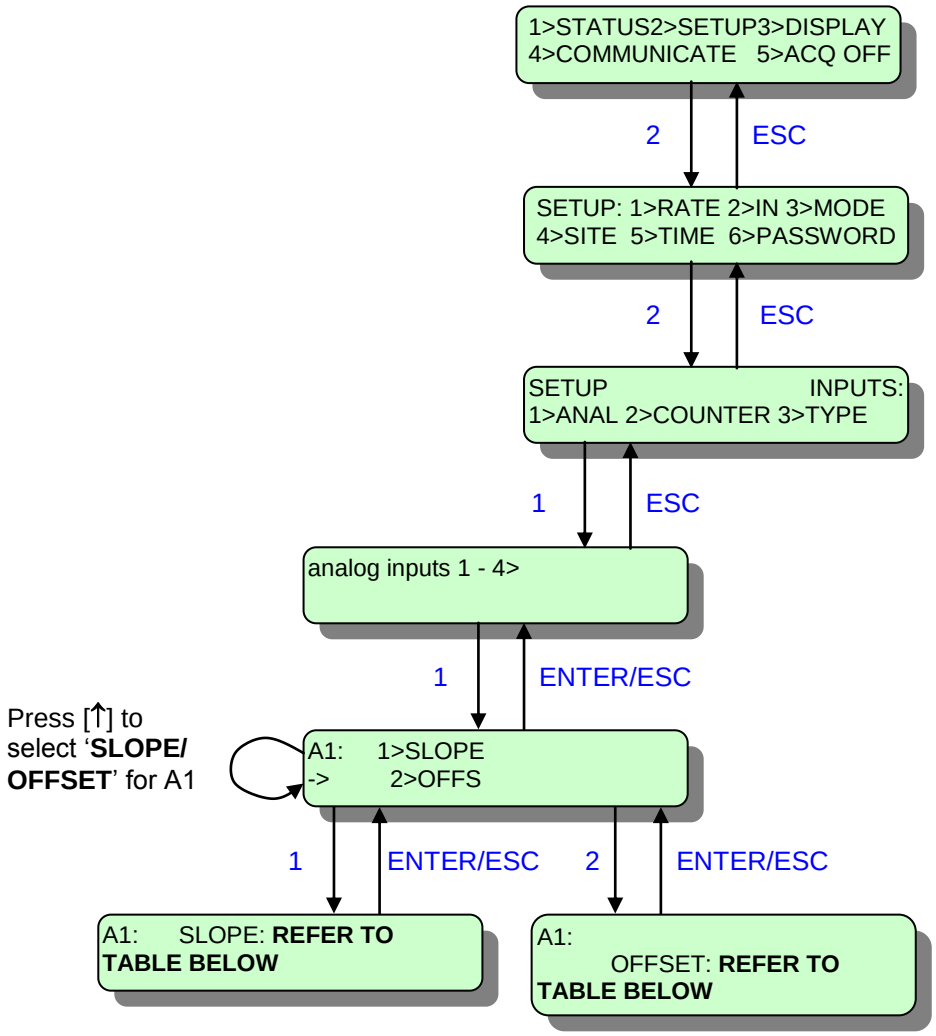
- The first three sensors can be used with an amplifier, as well, as you can see in the diagram above.
- The last 3 sensors do not require a signal amplification, because the SP-110's output signal is of around a few hundred mV, while the output signal of the SP-212_5V and the SP-215_5V is 0~5V. Therefore, do not use the connection on the right for these sesors.
- The Slope, Offset are automatically updated, but for calibrated sensors, you can change them in retrospect.

12. OTHER USED ANALOG SENSORS

CONNECTION AND SETUP VIA SOFTWARE:

SELECTION IN THE 'MEASURE-MENT' FIELD	SELECTION IN THE 'SENSOR' FIELD	MANUFA-CTURER	[EXT BATT+] pin (12V)	Analog pin (eg [ANALOG1])	[GROUND]
Humidity External	YGRO	SYMMETRON	Red Wire	White Wire	Black Wire
Humidity External	THYGRO (humidity sensor)	SYMMETRON	Red Wire	White Wire	Black Wire
Temperature External	110S	NRG	Red Wire	White Wire	Black Wire+Shield
Barometric Pressure External	BARON	SYMMETRON	Red Wire	White Wire	Black Wire
Humidity External	RH5	NRG	Red Wire	White Wire	Black Wire+Shield
Barometric Pressure External	BP20	NRG	Red Wire	White Wire	Black Wire+Shield
Barometric Pressure External	PTB100A/PTB100B/ PTB101B/PTB101C	Vaisala	SUPPLY pin	VOUT pin	GND + AGND pins
Barometric Pressure External	PTB2102/PTB2103	Vaisala	Pink Wire	White Wire	Blue + Brown Wire
Barometric Pressure External	CS105	Vaisala	Red Wire @SUPPLY pin	Blue Wire @VOUT pin	Black Wire @GND pin + Yellow Wire @AGND pin

MANUAL SETUP:

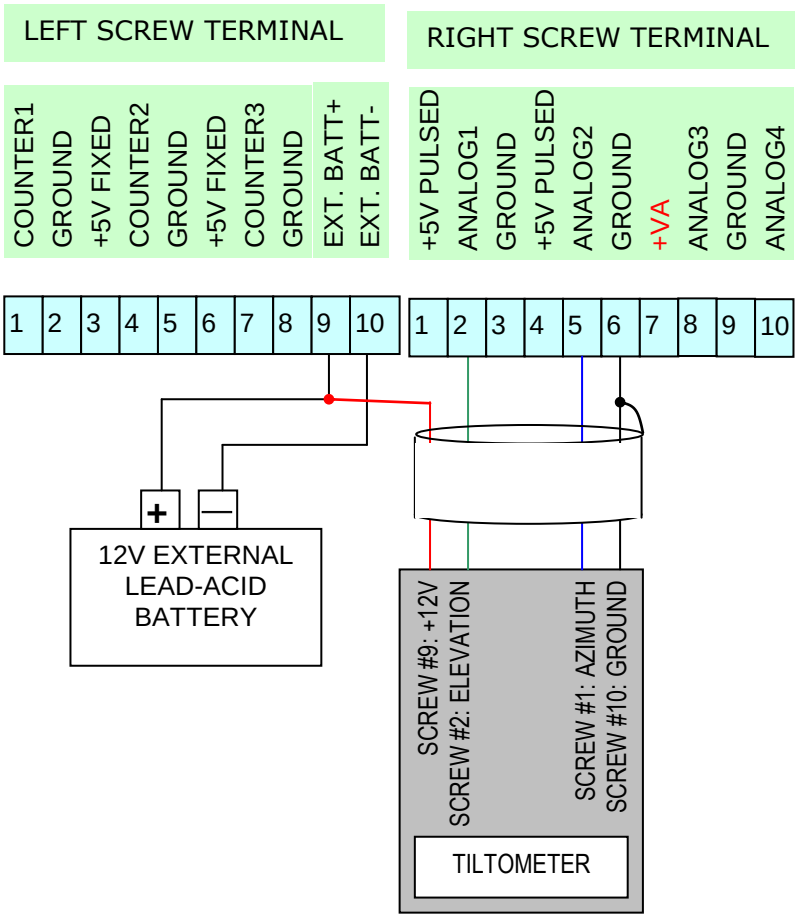


MEASUREMENT	UNIT	SENSOR	SLOPE	OFFSET
Temperature External	Deg C	110S	55.55	- 86.38
Humidity External	%RH	RH5	20	0
Humidity External	%RH	YGRO (0~5V)	20	0
Humidity External	%RH	THYGRO (0~5V)	20	0
Barometric Pressure External	mbar	BARON (0~5V)	21.79	10.55
Barometric Pressure External	mbar	BP20	217.9	105.5
Barometric Pressure External	mbar	PTB100A	52	800
Barometric Pressure External	mbar	PTB100B	92	600
Barometric Pressure External	mbar	PTB101B	184	600
Barometric Pressure External	mbar	PTB101C	80	900
Barometric Pressure External	mbar	PTB2102 (0~5V out)	92	600
Barometric Pressure External	mbar	PTB2103 (0~5V out)	160	500
Barometric Pressure External	mbar	CS105	184	600
Barometric Pressure External	mbar	SB-100	218	114
Barometric Pressure External	mbar	Setra_276	100	590
Barometric Pressure External	mbar	Setra_276sw	208.333	579.16

13. SYMMETRON TILTOMETER

CONNECTION:

- Connect the first sensor to screws 2 [ANALOG1], 5 [ANALOG2] and 3 [GROUND] on the right screw terminal.
- Connect the second sensor to screws 8 [ANALOG3], 10 [ANALOG4] και 9 [GROUND] on the right screw terminal.
- If you have only one input free, connect just the Elevation.
- Wire polarity does matter (see drawing): The Tiltometer connects to an external +6V ~ +15VDC power source (typically a 12V lead-acid battery). The sensor GROUND together with the cable shield connects to a logger GROUND position. Typical wire size: 4 x 0,25 mm^2 (shielded cables are recommended).



IN CASE IT DOESN'T WORK:

- Connect the sensor to the battery.
- With a multimeter check the voltage between ELEVATION and GROUND: When the Tiltometer is placed flat horizontally it should be about 2.5V.
- With a multimeter check the voltage between AZIMUTH and GROUND: When the Tiltometer is placed horizontally and is rotated around its longest axis it should vary from 0 to 5V.

SETUP:

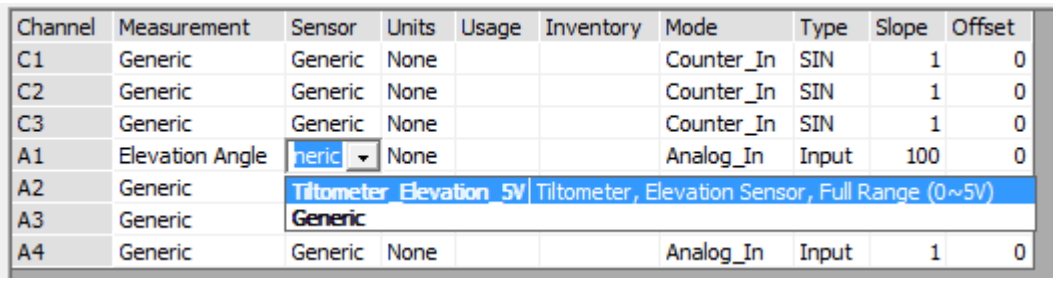
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

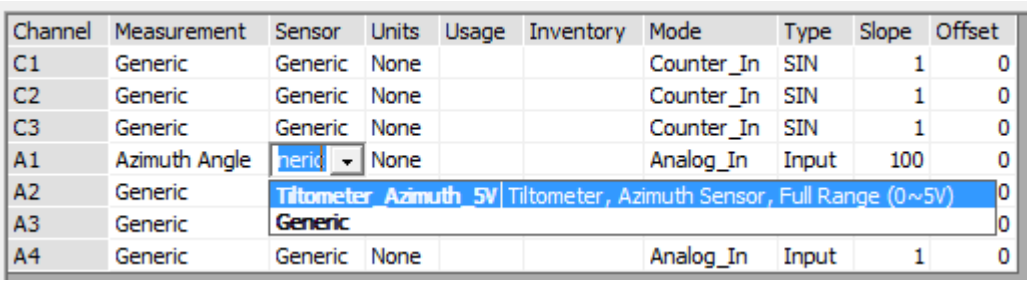
a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



Channel	Measurement	Sensor	Units	Usage	Inventory	Mode	Type	Slope	Offset
C1	Generic	Generic	None			Counter_In	SIN	1	0
C2	Generic	Generic	None			Counter_In	SIN	1	0
C3	Generic	Generic	None			Counter_In	SIN	1	0
A1	Elevation Angle	neric	None			Analog_In	Input	100	0
A2	Generic	Tiltometer_Elevation_5V	Tiltometer, Elevation Sensor, Full Range (0~5V)						
A3	Generic	Generic							
A4	Generic	Generic	None			Analog_In	Input	1	0

- For the **elevation** sensor , select an analog channel's line, eg A1.
- Click the 'Measurement' field and select 'Elevation Angle'.
- Click the 'Sensor' field and select 'Tiltometer_Elevation_5V'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.

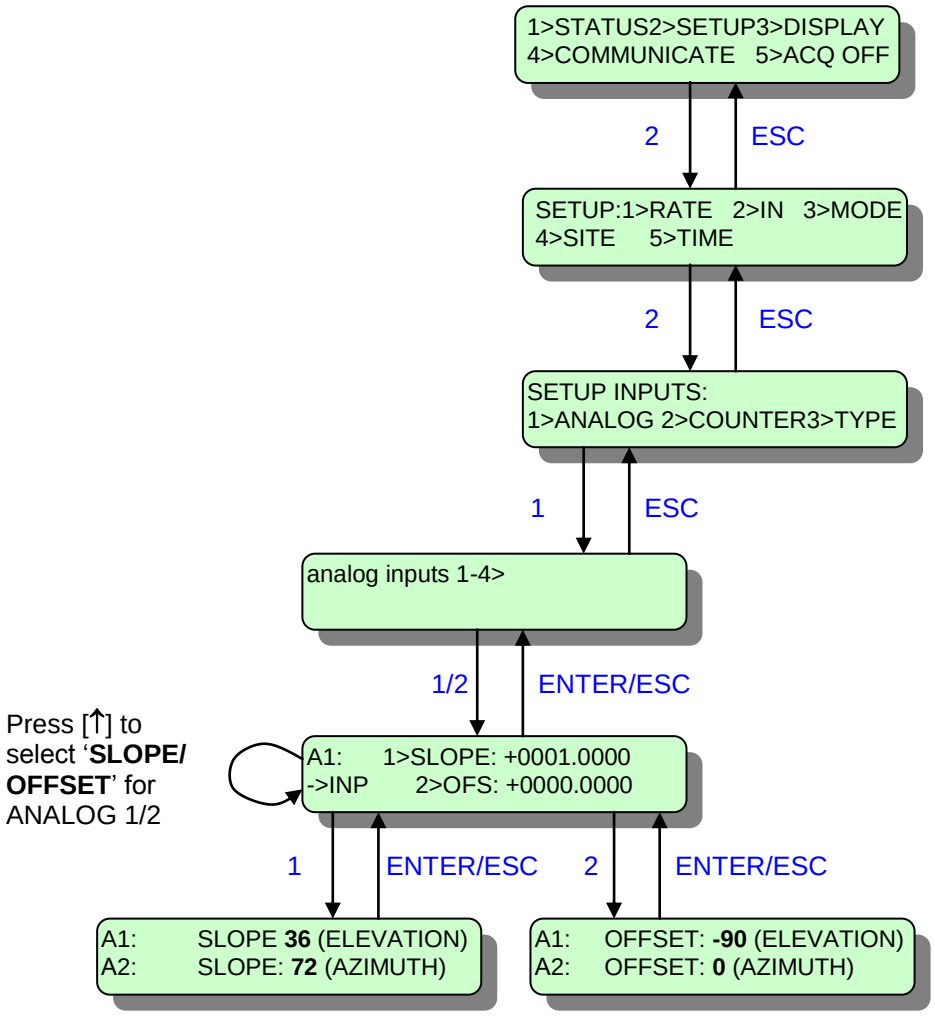


Channel	Measurement	Sensor	Units	Usage	Inventory	Mode	Type	Slope	Offset
C1	Generic	Generic	None			Counter_In	SIN	1	0
C2	Generic	Generic	None			Counter_In	SIN	1	0
C3	Generic	Generic	None			Counter_In	SIN	1	0
A1	Azimuth Angle	neric	None			Analog_In	Input	100	0
A2	Generic	Tiltometer_Azimuth_5V	Tiltometer, Azimuth Sensor, Full Range (0~5V)						0
A3	Generic	Generic							0
A4	Generic	Generic	None			Analog_In	Input	1	0

- For the **azimuth** sensor , select an analog channel's line, eg A2.
- Click the 'Measurement' field and select 'Azimuth Angle'.
- Click the 'Sensor' field and select 'Tiltometer_Azimuth_5V'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.

- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.

b. Manually



Coefficients for display in degrees:
ELEVATION: +90 ~ -90
AZIMUTH: 0 ~ 360

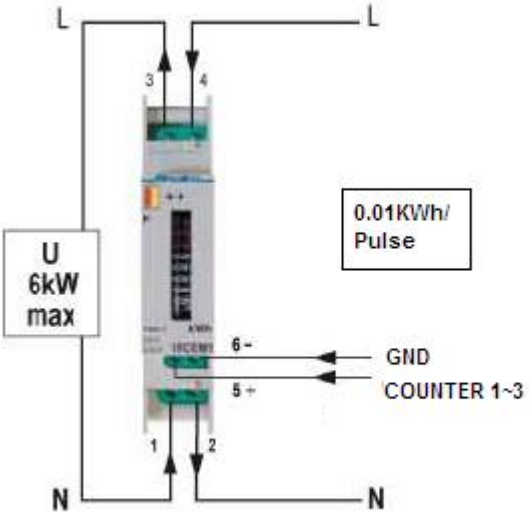
14. OPEN COLLECTOR SENSORS (ENERGY METERS)

1-Phase Energy meters: Revalco's 1RCEM1, 1RCEM2, 1RCEM263, etc.
3-Phase Energy meters: ABB's ODIN4165, Revalco's 1RCETM63, etc.

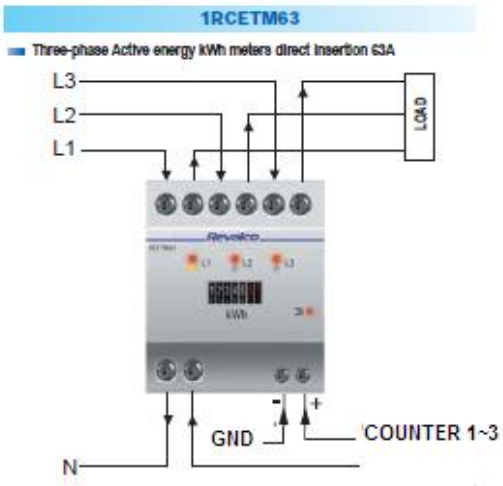
CONNECTION:

- Connect the first sensor to screws 1 [COUNTER1] and 2 [GROUND] on the left screw terminal.
- Connect the second sensor to screws 4 [COUNTER2] and 5 [GROUND] on the left screw terminal.
- Connect the third sensor to screws 7 [COUNTER3] and 8 [GROUND] on the left screw terminal.
- Wire polarity does matter. See the diagrams on the side of each sensor. Below, you can see connection examples of a 1-phase sensor and a 3-phase one.

1-PHASE EXAMPLE (1RCEM1)



3-PHASE EXAMPLE (1RCETM63)



SETUP:

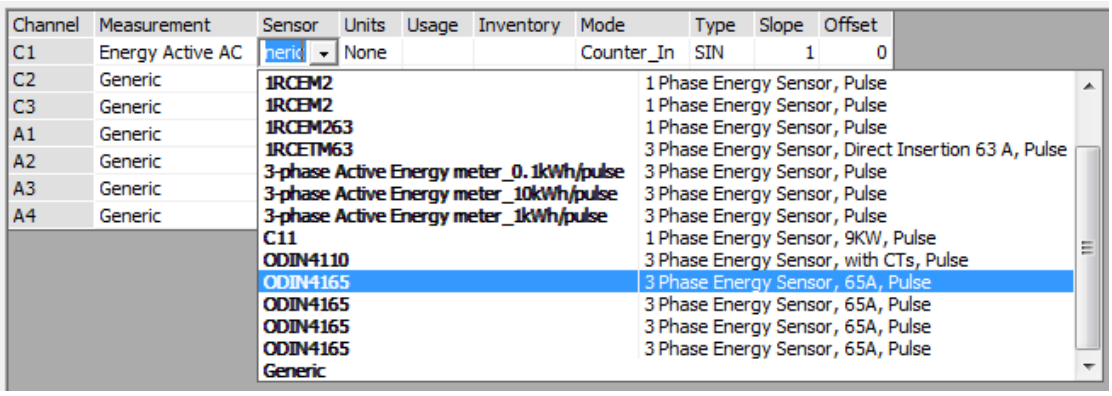
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

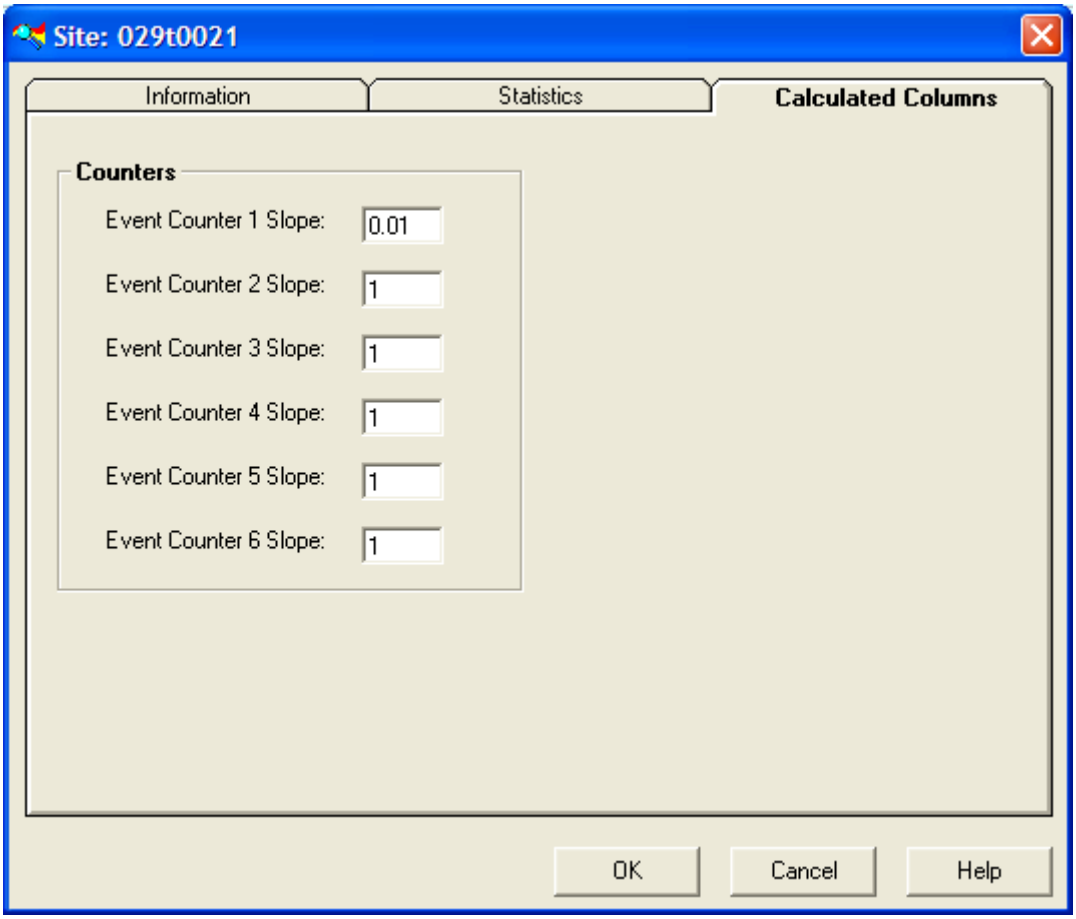
to start acquisition (data logging).

a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.

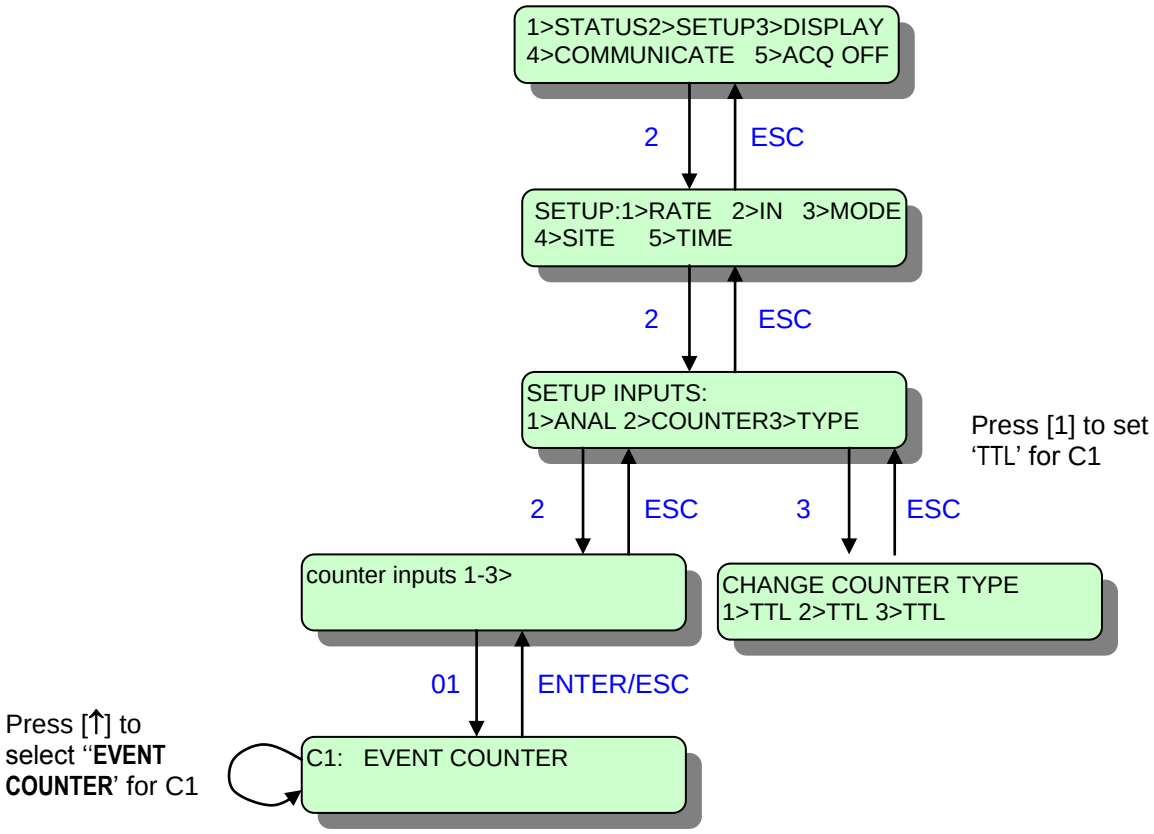


- Select a counter channel's line, eg C1.
- Click the 'Measurement' field and select 'Electrical Energy'.
- Click the 'Sensor' field and select a 1-phase sensor or a 3-phase sensor.
- The channel type ('Type' field), The channel type ('Type' field), is automatically updated, but the Slope is not. As the appearing message states, since the channel is set to 'Event Counter', you have to type the Slope manually in the 'Calculated Columns' tab of 'Site Properties. For all the sensors above, the Slope is 0.01, therefore type it in the first field (for C1), or the corresponding field for the counter channel you are using.



- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.

b. Manually



NOTE: You can set appropriate Slope coefficients for Event counters in Opton4's Site Properties, in the 'Calculated Columns' tab. Type the value you wish for each channel C1~C3.

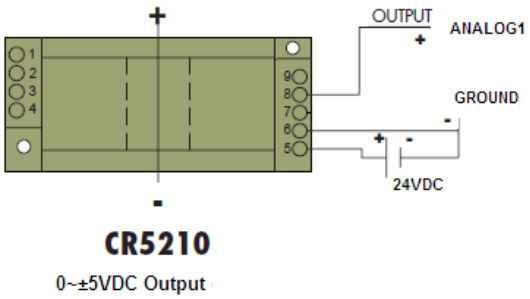
15. VOLTAGE AND CURRENT SENSORS

AC Voltage sensors: CR Magnetics' CR4510, CR4520 series
DC Voltage sensors: CR Magnetics' CR5310, CR5320 series
AC Current sensors: CR Magnetics' CR4110, CR4120 series
DC Current sensors: CR Magnetics' CR5210, CR5220 series

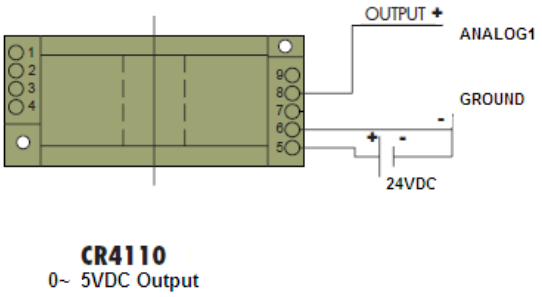
CONNECTION:

- All sensors are available in 0~±5V output (CR4510, CR5310, CR4110(s), CR5210(s)) or 4~20mA output (CR4520, CR5320, CR4120(s), CR5220(s)).
- The 4~20mA output sensors are not suitable for Stylitis-41 (a Stylitis-42 is required).
- The negative voltage output is produced only by DC Voltage and Current sensors (CR5310 and CR5210(s)), which is also not readable and recordable by Stylitis-41.
- Therefore, the wire polarity does matter, when using these sensors. For DC current sensors (CR5210(s)), the current must flow from the (+) to the (-) end of the sensor. For DC Voltage sensors (CR5310), connect the (+) end to pin 1 and the (-) end to pin 3. (see the corresponding figures below).
- Connect the sensor's output to an ANALOG pin (eg ANALOG1).
- Connect pin 6 to the datalogger's GROUND pin.
- The 's' at the end of the prefix of a current sensor indicates split core design, while the suffix indicates the input range. For instance, the 'CR5210s-100' is a DC current sensor, with split core design, with an input of 0~100ADC and an output of 0~5VDC.

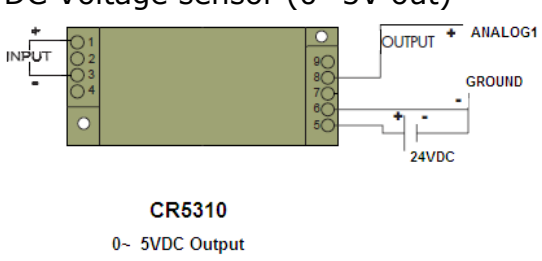
DC Current sensor(0~5V out)



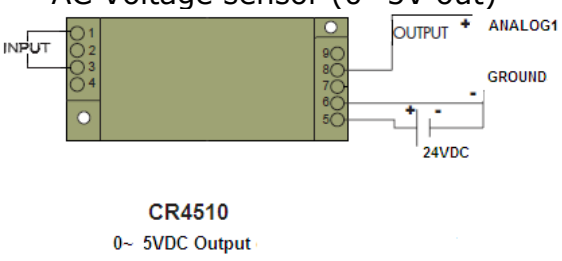
AC Current sensor (0~5V out)



DC Voltage sensor (0~5V out)



AC Voltage sensor (0~5V out)



SETUP:

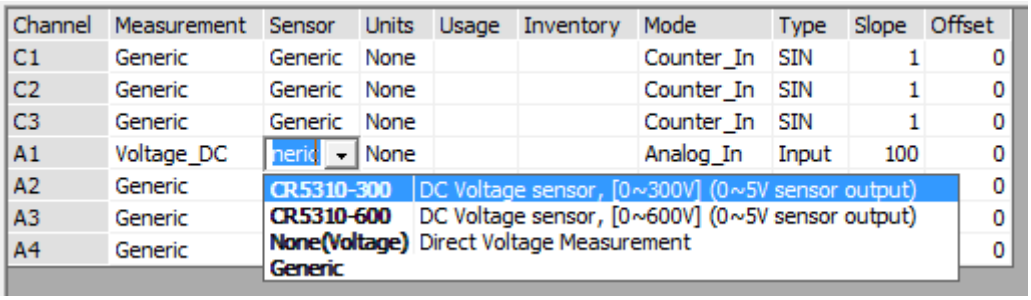
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

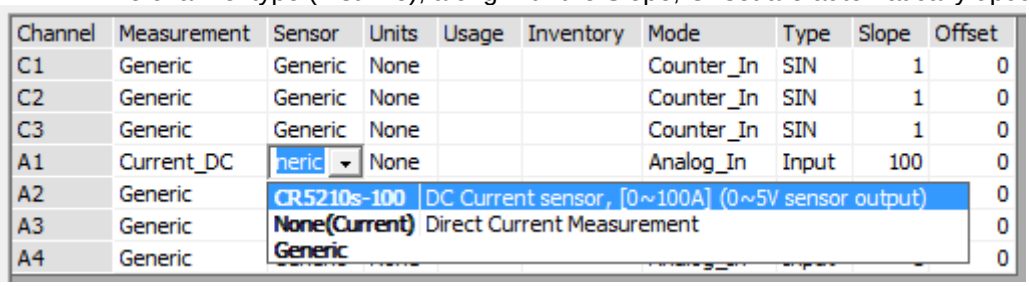
to start acquisition (data logging).

a. Via Software

Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



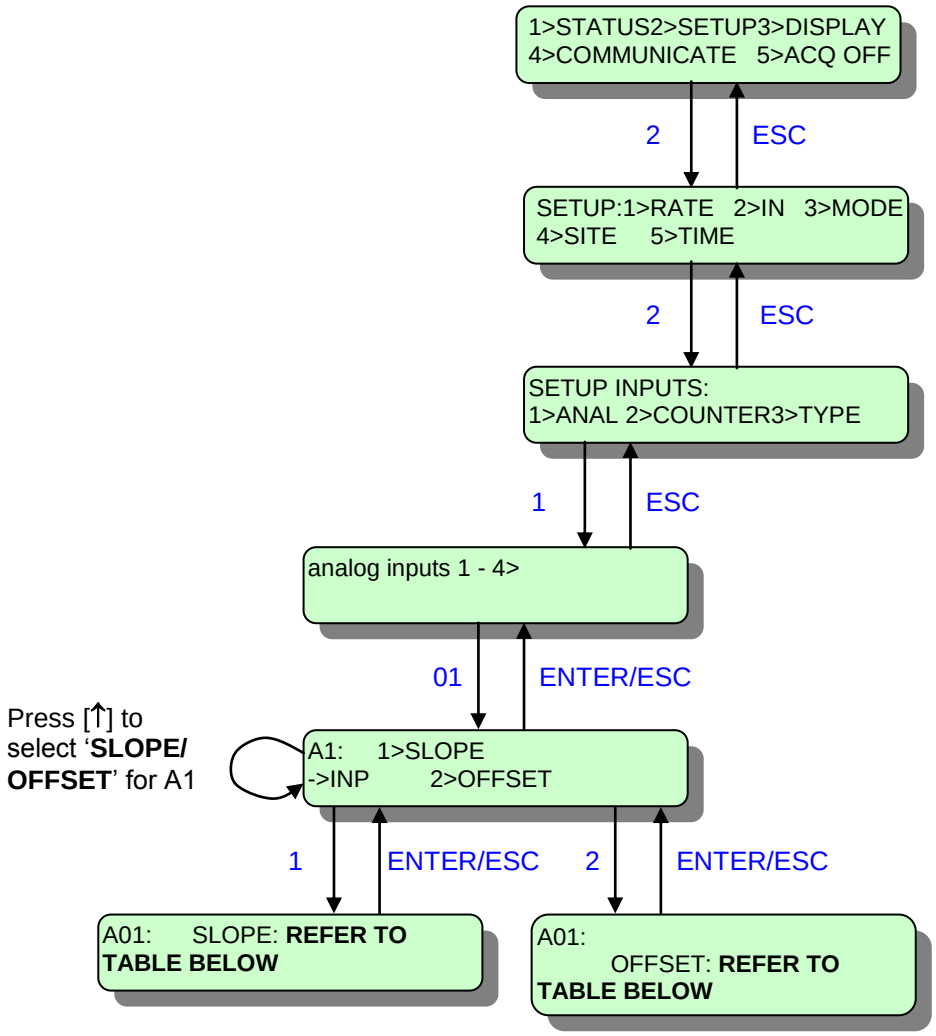
- For a **voltage** sensor , select an analog channel's line, eg A1.
- Click the 'Measurement' field line and select 'Voltage_DC', for a DC Voltage sensor or 'Voltage_AC' for an AC Voltage sensor.
- If you have selected 'Voltage_DC' before, click the 'Sensor' field and select a sensor shown in the screen shot above (which have a 0~5V output), except for the 'None' one, each one of which is suitable for a specific measurement and has a specific output (as you can see in their description). If you have selected 'Voltage_AC', the corresponding sensors will appear.
- The channel type (first line), along with the Slope, Offset are automatically updated.



- For a **current** sensor , select an analog channel's line, eg A1.
- Click the 'Measurement' field line and select 'Current_DC', for a DC Current sensor or 'Current_AC' for an AC Current sensor.
- If you have selected 'Current_DC' before, click the 'Sensor' field and select a sensor a sensor shown in the screen shot above, (which has a 0~5V output), which is suitable for a specific measurement and has a specific output (as you can see in their description). If you have selected 'Current_AC', the corresponding sensors will appear.
- The channel type (first line), along with the Slope, Offset are automatically updated.

- In order to save the changes, click 'Write Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. If you wish to change the setup of multiple channels, one 'Write Setup' in the end is enough.

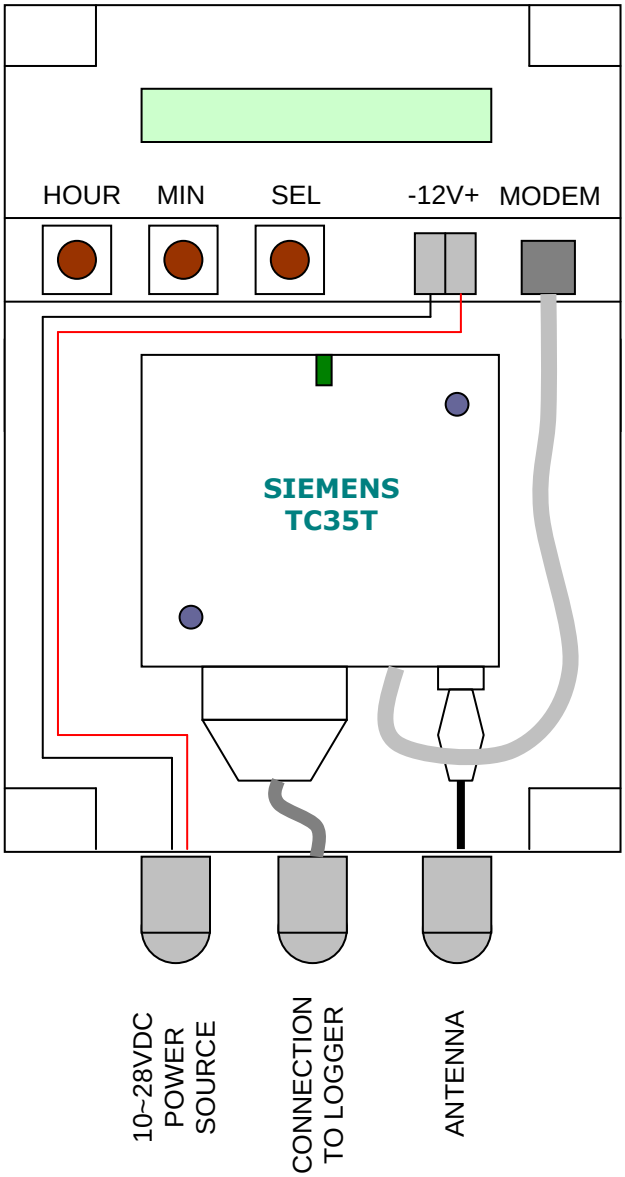
b. Manually



MEASUREMENT	ANALOG MODULE	SENSOR	SLOPE	OFFSET
AC Voltage	Card12	CR4510-500	100	0
AC Voltage	Card13	CR4520-500	31.25	-125
DC Voltage	Card12	CR5310-300	60	0
DC Voltage	Card12	CR5310-600	120	0
DC Voltage	Card13	CR5320-300	56.25	-450
DC Voltage	Card13	CR5320-600	75	-900
AC Current	Card12	CR4110s-100	20	0
AC Current	Card13	CR4120s-100	0.5715	6.25
DC Current	Card12	CR5210s-100	20	0
DC Current	Card13	CR5220s-100	12.5	-150

16. SYMMETRON TIMER FOR TC35T GSM MODEM

Switches ON and OFF the modem according to a daily program. Conserves battery power and resets the modem.



TIMER SETUP

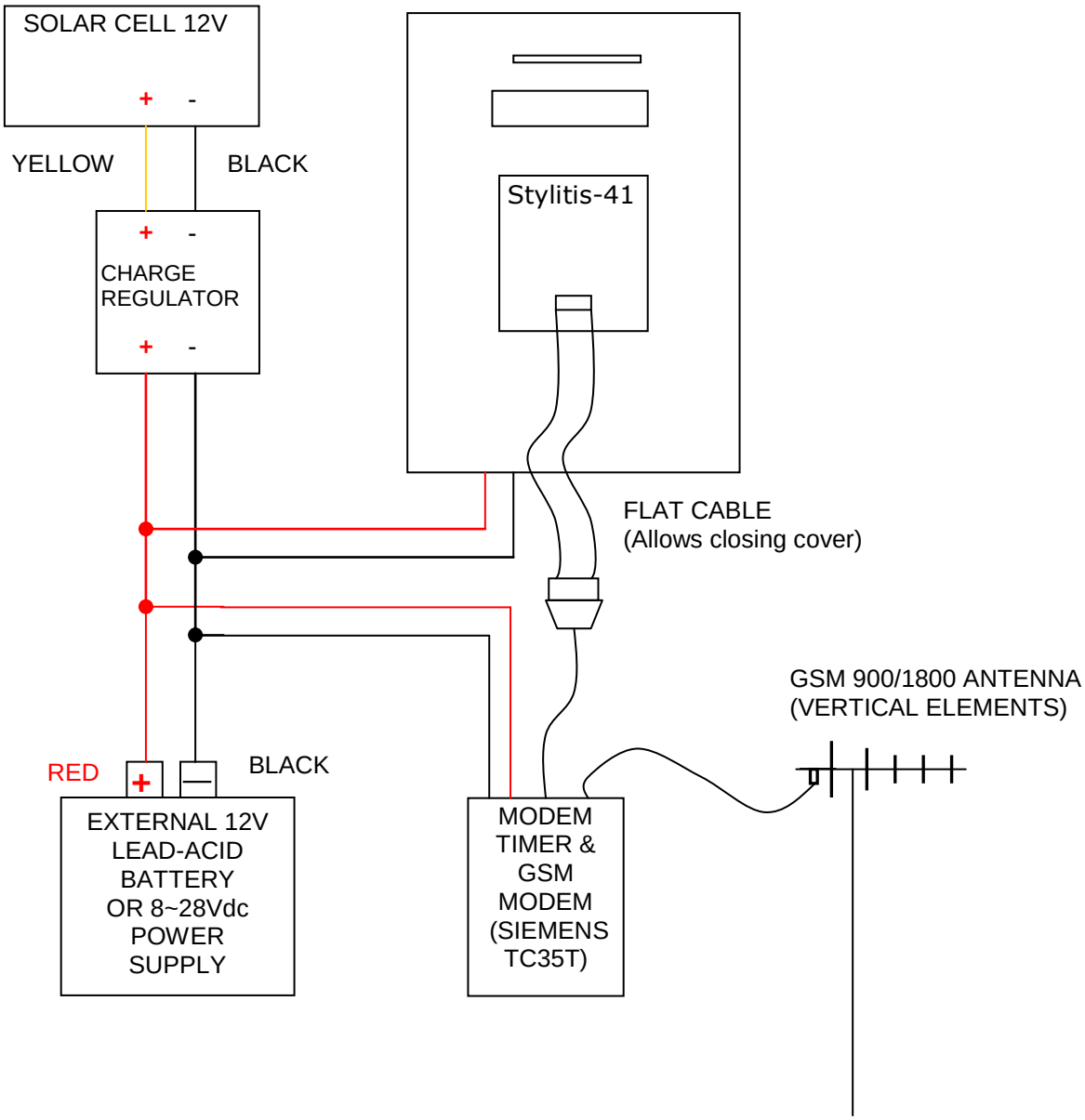
1. Includes a back-up cell to keep setup and time for at least 3 years. Without an external power supply the modem and the display are always off. Protected from reverse supply connection. Power supply: 10~ 28VDC, 2mA. Enclosure: IP65, 20x12x7cm (includes modem). Operation temperature: –30 ~ +70°C.

2. Place the modem in the box and connect it as shown in the diagram. Connect power; the display should come up. Use the *SEL* button to select:
Auto. The default display. Shows current time. ON is displayed when on.
SetClok. Use the *HOUR*, *MIN* buttons to set current time.
SetON. Use the *HOUR*, *MIN* buttons to set the ON time.
SetOFF. Use the *HOUR*, *MIN* buttons to set the OFF time.
AlwaysON. The timer is continuously ON.
AlwaysOFF. The timer is continuously OFF.

3. The timer program works when Auto, SetClok, SetON or SetOFF is displayed.

17. BATTERY, SOLAR CELL AND TIMER

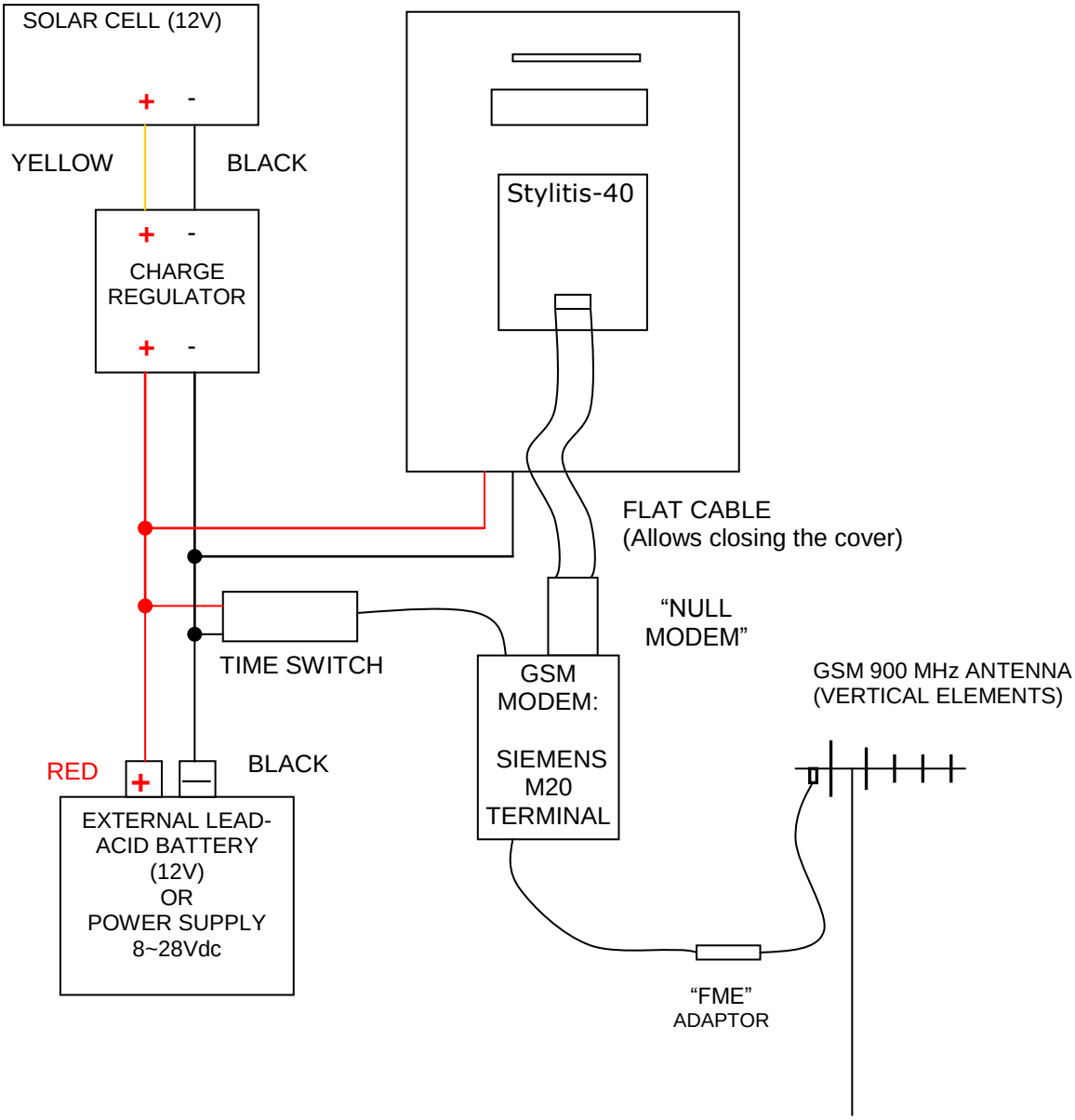
CONNECTION TC35T:



TC35T MODEM SETUP

1. **Disconnect the modem from the power supply.**.
2. Press the yellow button on modem's side, take out the drawer and place the SIM card. (You can un-lock the SIM card (using a standard cellular phone) to avoid re-entering the PIN number each time the modem power supply is removed). Push the drawer back in place.
3. Connect the power supply to the modem. The green light should start blinking rapidly. Enter the PIN code (see above).
4. Wait a few seconds; the green light should start blinking slowly.
5. Go to the COMMUNICATE>MODEM menu: the network operator's name and the signal strength (SIGNAL) should appear in the display. BER shows errors (0 or 99 is OK).
6. In case you are using a directional antenna, turn it around to maximize the "SIGNAL". A value of at least "14" is recommended.

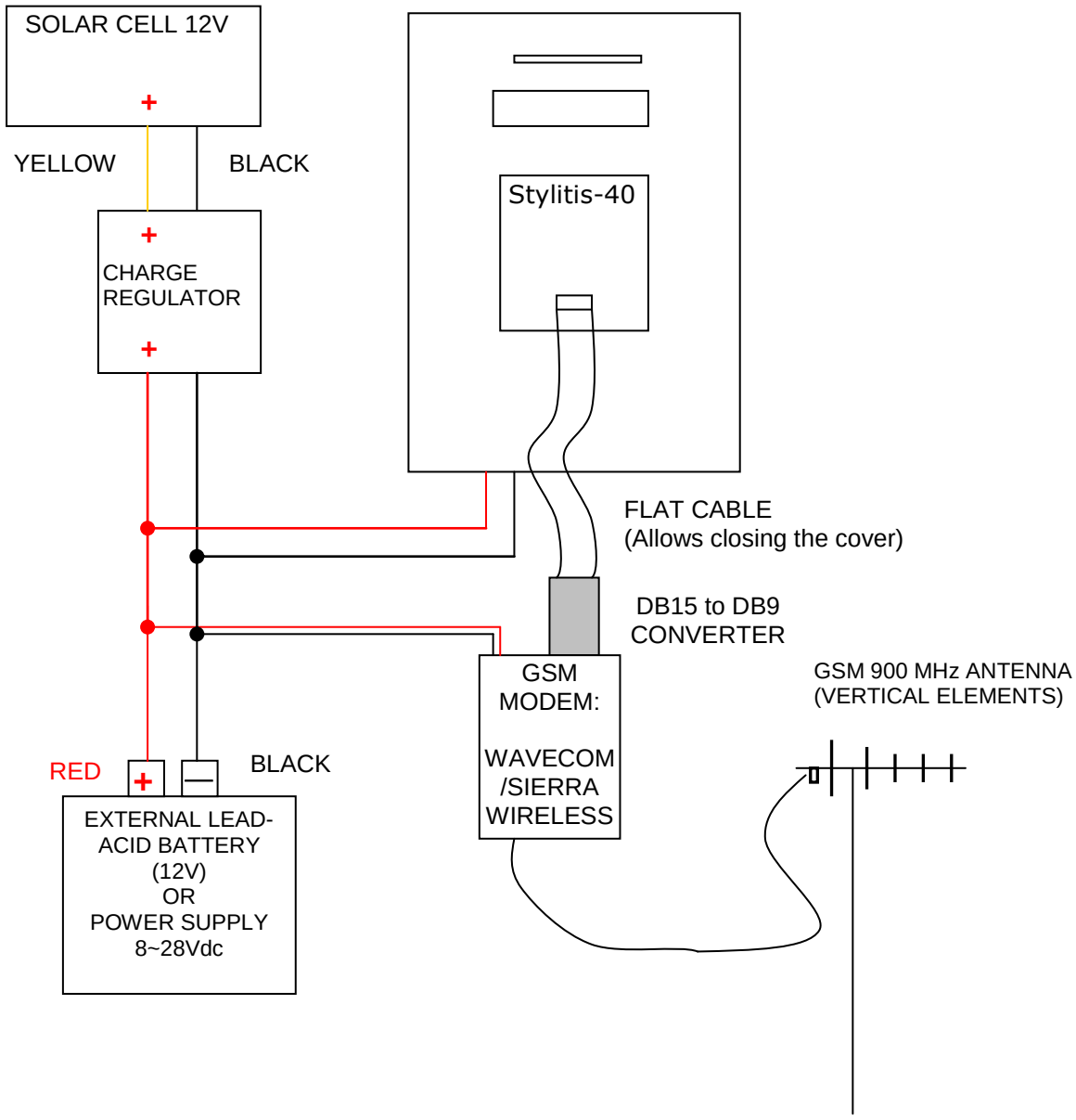
CONNECTION M20T:



M20T MODEM SETUP

1. Disconnect the modem from the power supply.
2. Press the yellow button on modem's side, take out the drawer and place the SIM card. Push the drawer back in place.
3. Connect the power supply to the modem. The green light should start blinking.
4. Enter the PIN code (see above).
5. Go to the "Modem" menu (see above). Wait a few seconds; the green light should stop blinking and the network operator's name should appear in the display.
6. In case you are using a directional antenna, turn it around to maximize the "SIGNAL". A value of at least "14" is recommended.
7. You can un-lock the SIM card (using a standard cellular phone) to avoid re-entering the PIN number each time the modem power supply is removed.

CONNECTION WAVECOM/ SIERRA WIRELESS FASTRACK :

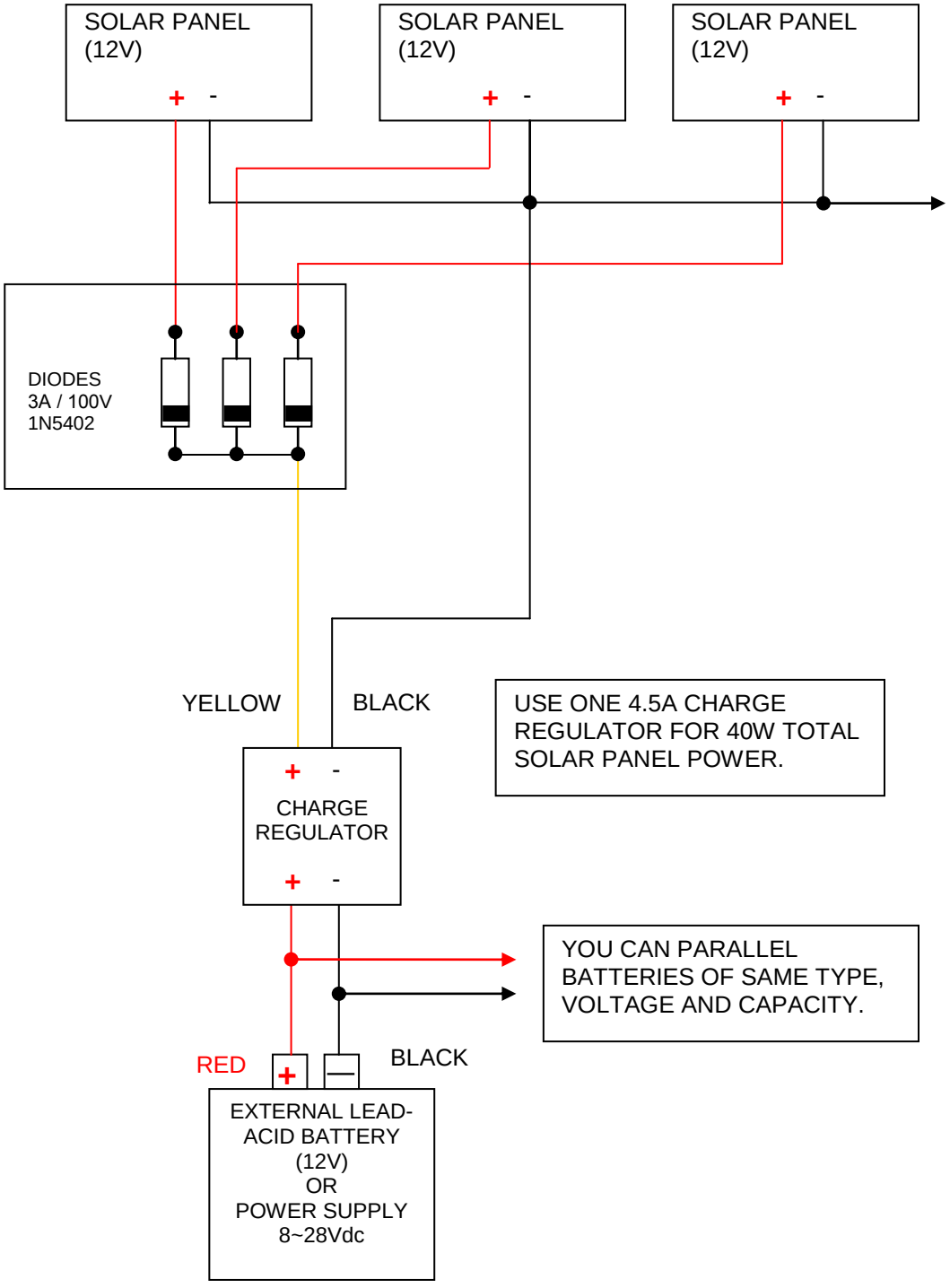


MODEM WAVECOM/SIERRA WIRELESS FASTRACK SETUP

1. Disconnect the modem from the power supply.
2. Press the black button on modem's side, take out the drawer and place the SIM card. Push the drawer back in place.
3. Connect the power supply to the modem. The red light should light up.
4. Enter the PIN code (see above).
5. Wait a few seconds; the red light should start blinking **slowly**.
6. Go to the COMMUNICATE>MODEM menu: the network operator's name and the signal strength (SIGNAL) should appear in the display. BER shows errors (0 or 99 is OK).
7. In case you are using a directional antenna, turn it around to maximize the "SIGNAL". A value of at least "14" is recommended.

SOLAR PANEL CONNECTION:

If more than one solar panel are connected to a system it is recommended that each one is connected to the Charge Regulator via a diode:



18. DATA LOGGER MESSAGES

FULL CARD - REMOVE	Full memory card. Replace with an empty one (latest firmware allows card erasure in-site). Data are stored in buffer.
CARD ERROR - REMOVE	Card is bad. Replace.
LOW CARD BATTERY- REMOVE	ONLY FOR SRAM CARDS: Card is not acceptable. Card's battery needs replacement.
PRESS <ESC> TO LEAVE <ENTER> TO CLEAR CARD	Press [ENTER] to erase card contents. Press ESC] to quit.
NOT ERASED [1>CLEAR] [- REMOVE]	Flash Card is not acceptable because it has been used in a different logger. Depending on version: press 1 to erase **or** use an erased card.
INVALID CARD - REMOVE	Card is not acceptable because the logger does not recognize it. Use another card.
BUFFER FULL	Logger's buffer is full and data logging has stopped.
LOW BATTERY -CANNOT START ACQUISITION	Acquisition cannot be started because battery voltage is less than 5.75V.
ACQ ON Data in card	Data are stored in memory card.
ACQ ON Data in Buffer Card full	Memory card is full and data are stored in the internal memory (buffer).
ACQ ON Buffer full Card full	Acquisition stops when the memory card and the internal buffer are full. Replace with an erased card to retrieve buffer data.
ACQ ON Data in Buffer No Card	Data are stored in buffer. There is no memory card.
ACQ ON Buffer full No Card	Acquisition stops when internal buffer is full. There is no memory card.
STOP ACQUISITION & CLEAR BUFFER DATA?	WHEN CHOOSING ACQUISITION OFF: • Internal buffer data are cleared. • The open card file is closed. • Data recording stops.
START ACQUISITION?	WHEN CHOOSING ACQUISITION ON: • A new file is opened on the memory card. • Data recording starts.

19. LOGGER QUICK CHECK

The checks described below are not a substitute for a standard lab check. However they can be exercised to gain 'correct operation' confidence with a probability high enough.
NOTE: Measured values depend on the accuracy of the multimeter used.

1. ANALOG OUTPUT CHECK

- From the main menu select: SETUP>MODE>CONTINUOUS>[ENTER]
- With a multimeter measure the +5V PULSED outputs on the right screw terminal.
- Correct measured value is +5V.
- With a multimeter measure the +VA PULSED output on the right screw terminal.
- Correct measured value is +5V (or +12V or +18V for Stylitis-42).

2. ANALOG INPUT CHECK

- From the main menu select: SETUP>IN>ANALOG and set all inputs (A1~A4) to SLOPE=1.0 and OFFSET=0.0
- Connect a +5V PULSED output to the analog input you want to test.
- From the main menu select: DISPL>ANALOG
- Correct value is 5V.
- For Stylitis-42, the 0~20mA current inputs (A4 and A3) must have the GAIN option enabled (see: 8. DEPTH SENSOR SDP-5).

3. FIXED OUTPUT CHECK

- With a multimeter measure the +5V FIXED output on the left screw terminal.
- Correct measured value is about +5V.

4. COUNTER INPUT CHECK

- From the main menu select: SETUP>IN>COUNTER and set all inputs (C1~C3) with SLOPE=1.0 and OFFSET=0.0
- From the main menu select: SETUP>IN>TYPE and set all inputs for 'TTL'.
- From the main menu select: SETUP>MODE>ENERGY SAVE>[ENTER]
- Connect a +5V PULSED output to the counter input you want to test.
- From the main menu select: DISPL>COUNTER
- Correct measured value is '1.0'.

20. CONNECTION EXAMPLE