STYLITIS-100/101

INSTALLATION GUIDE

SYMMETRON
ELECTRONIC APPLICATIONS

CONTENTS

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SYMMETRON ELECTRONIC APPLICATIONS
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Made in Greece.

REFERENCES:

- Stylitis-101 User's Manual.
- For more information refer to manuals of the individual sensors.

1. GENERAL

INPUTS:

Stylitis-101 is able to measure voltage, curent, frequency and pulses. 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 –50 ~ +50V, -20 ~ +20mA and 0 ~ 3kHz.

OUTPUTS:

The vane supply outputs (+V EXC OUT) may be used for excitation, as they are capable of supplying up to a TOTAL of 100 milliAmps with an accuracy of ±0.2%. 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 sensor 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-101 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.

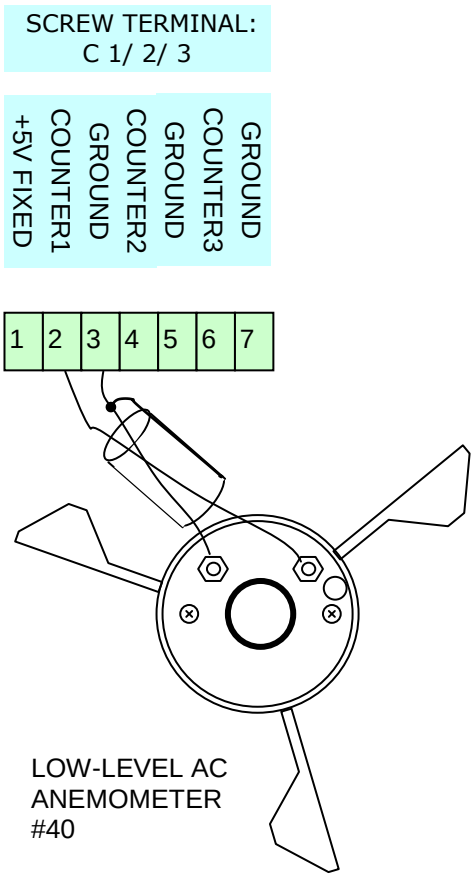
- To select a menu item use the corresponding numeric key.
- [ESC] goes one menu-level up and abandons changes.
- [ENTER] goes one menu-level up and saves changes.
- You can change parameters only when ACQUISITION is OFF.

2. LOW-LEVEL AC ANEMOMETER NRG #40.

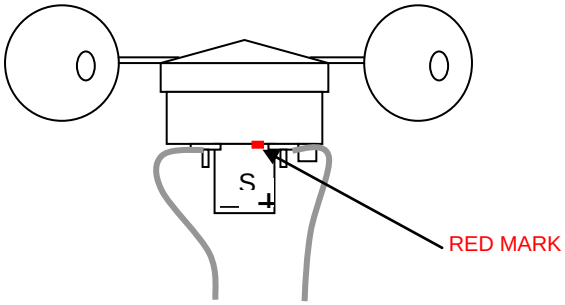
Other sinusoidal output sensors: YOUNG 05103 (for connections refer to instruction sheet).

CONNECTION:

- Connect the first anemometer to screws 2 [COUNTER1] and 3 [GROUND] on the screw terminal.
- Connect the second anemometer to screws 4 [COUNTER2] and 5 [GROUND] on the screw terminal.
- Connect the third anemometer to screws 6 [COUNTER3] and 7 [GROUND] on the 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 #40



GND C1 ~ C6

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:

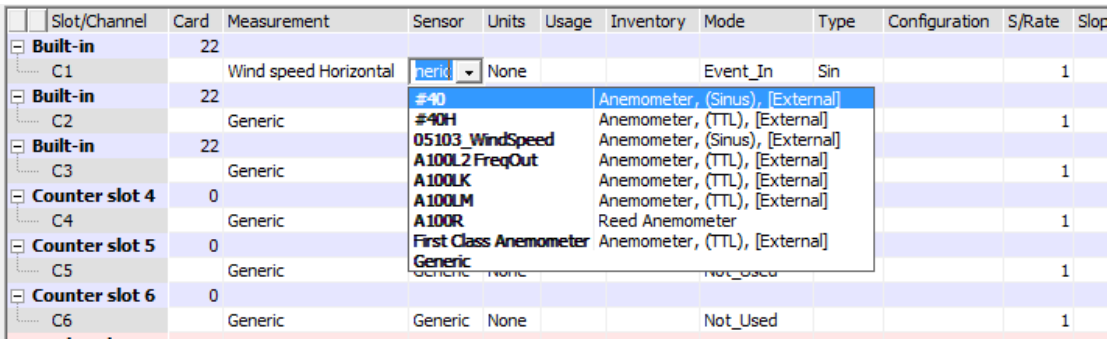
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

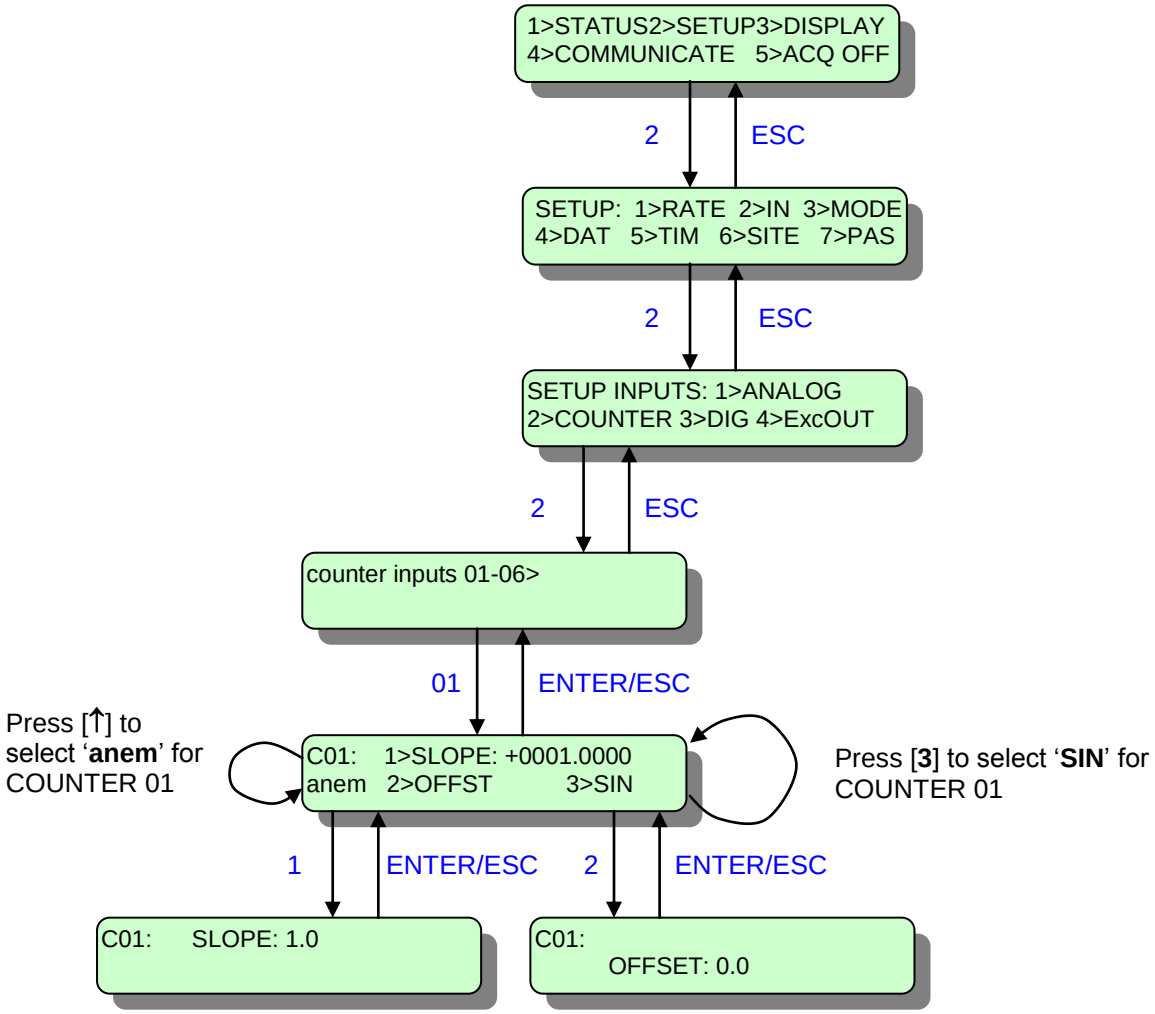
a. Via Software

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. If you wish to use one of channels C4~C6, make sure that you have plugged the suitable counter module (eg Card 22) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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

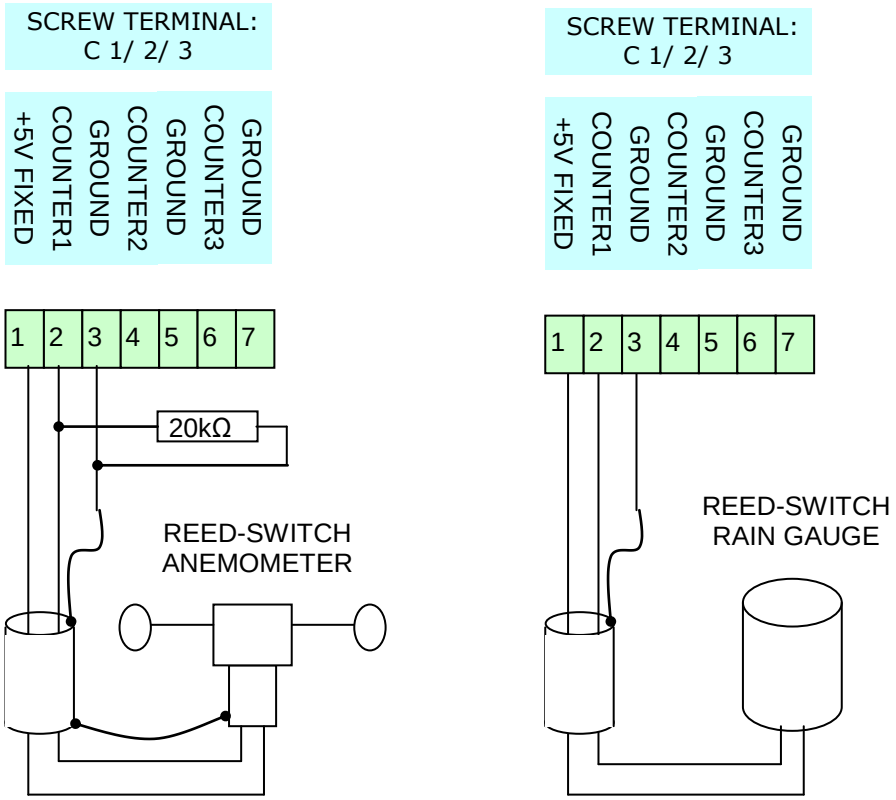
NOTE: For calibrated anemometers enter the correct SLOPE και OFFSET values.

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 [+5V FIXED] and 2 [COUNTER1] on the let screw terminal.
- Connect the second anemometer or rain gauge to screws 1 [+5V FIXED] and 4 [COUNTER2] on the screw terminal.
- Connect the third anemometer or rain gauge to screws 1 [+5V FIXED] and 6 [COUNTER3] on the 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 18~22 kΩ 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**].

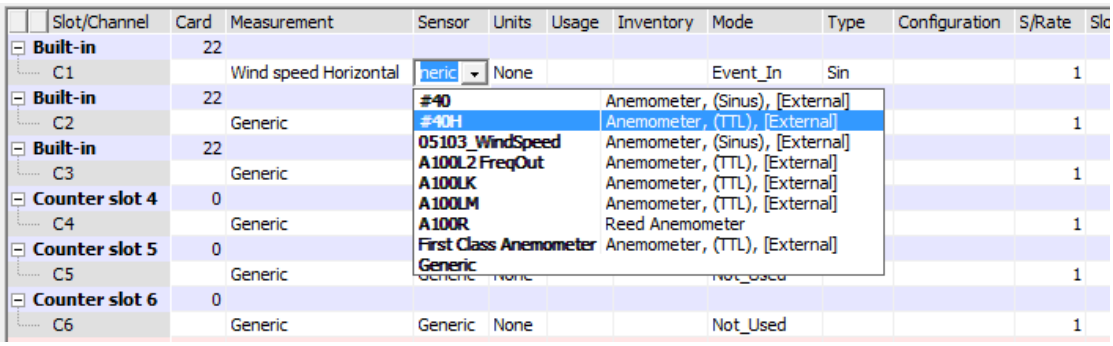
After changing setup select:
5>ACQ ON (press [**5**] and [**ENTER**]

to start acquisition (data logging).

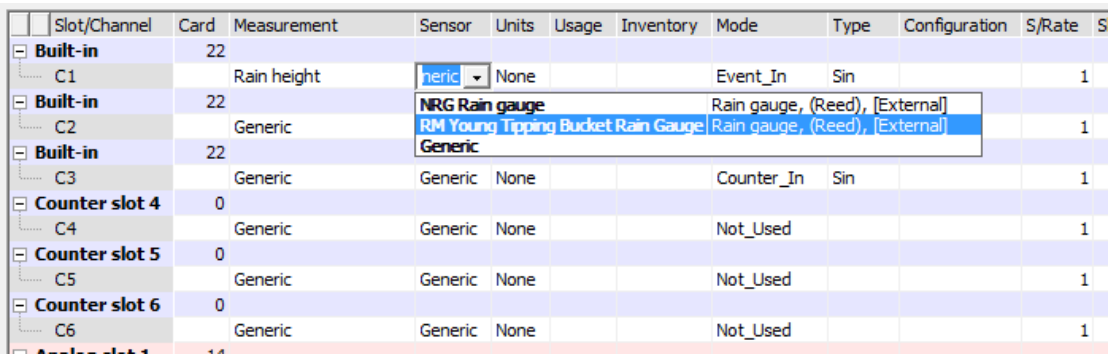
a. Via Software

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. If you wish to use one of channels C4~C6, make sure that you have plugged the suitable counter module (eg Card 22) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.



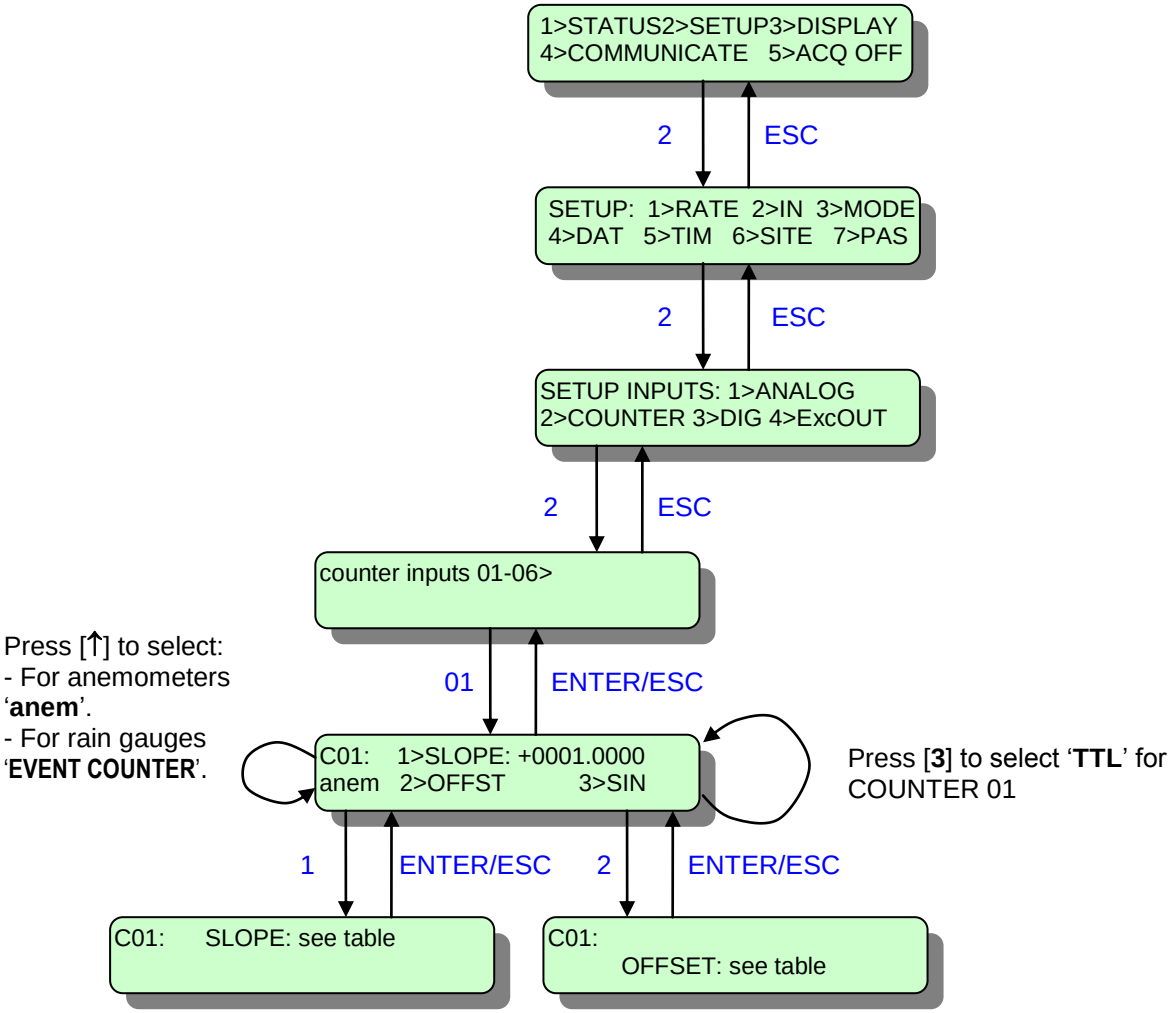
- To select an **anemometer**, click the 'Measurement' field and select 'Wind Speed Horizontal'.
- Click the 'Sensor' field and select '#40H' or 'A100R'.
- The channel type ('Type' field), along with the Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' 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), 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.
- NOTE: For calibrated anemometers you can enter the correct SLOPE και OFFSET values in retrospect.

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

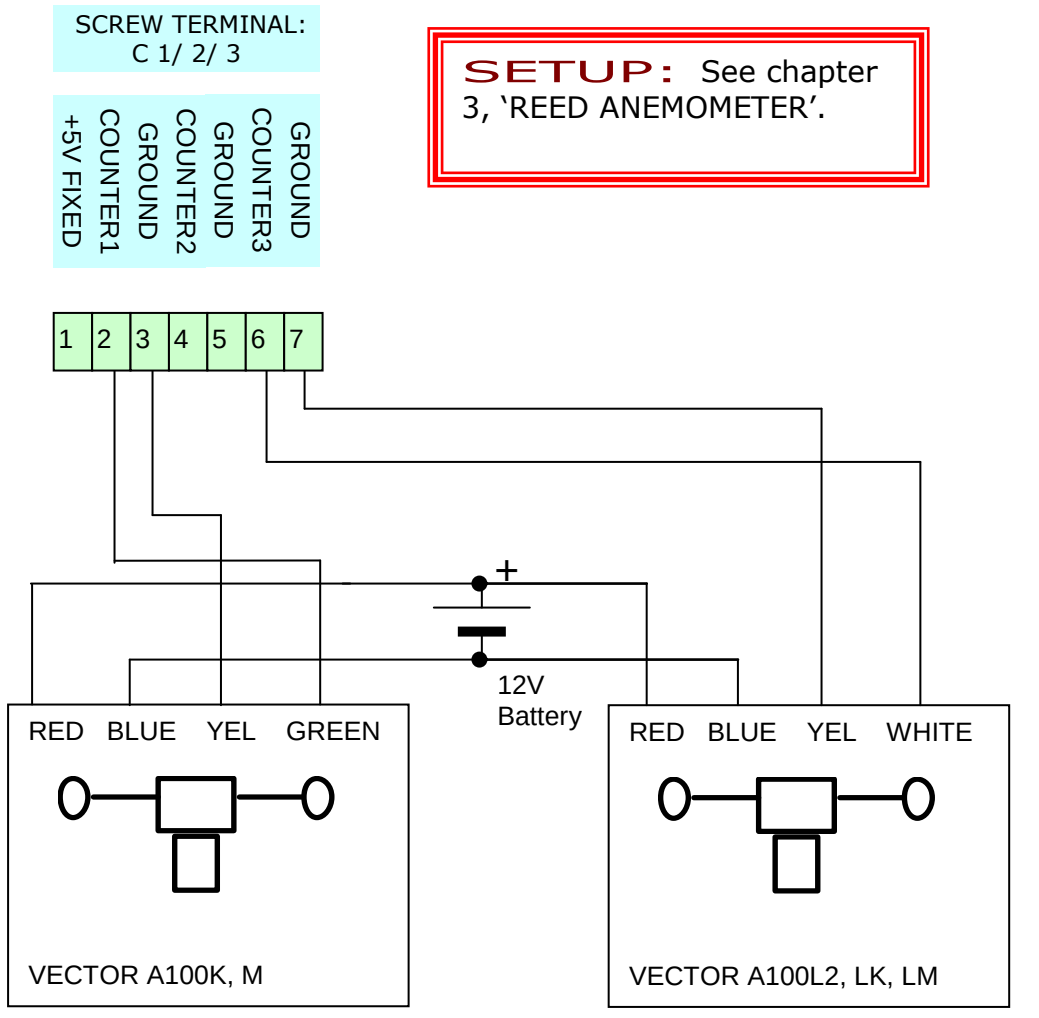
NOTES: 1.For calibrated **anemometers** enter the corrected SLOPE και OFFSET values.
2. For **rain gauges**, you can set appropriate Slope coefficients for Event counters in Stylitis Explorer | Site Properties, in the 'Calculated Columns' tab. Type the value you wish for each channel C1~C6.

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

Optical disk sensors

CONNECTION:

- Connect the first anemometer to screws 2 [COUNTER1] and 3 [GROUND] on the screw terminal.
- Connect the second anemometer to screws 4 [COUNTER2] and 5 [GROUND] on the screw terminal.
- Connect the third anemometer to screws 6 [COUNTER3] and 7 [GROUND] on the screw terminal.
- Wire polarity does matter (see drawing). Typical wire size: 4 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:

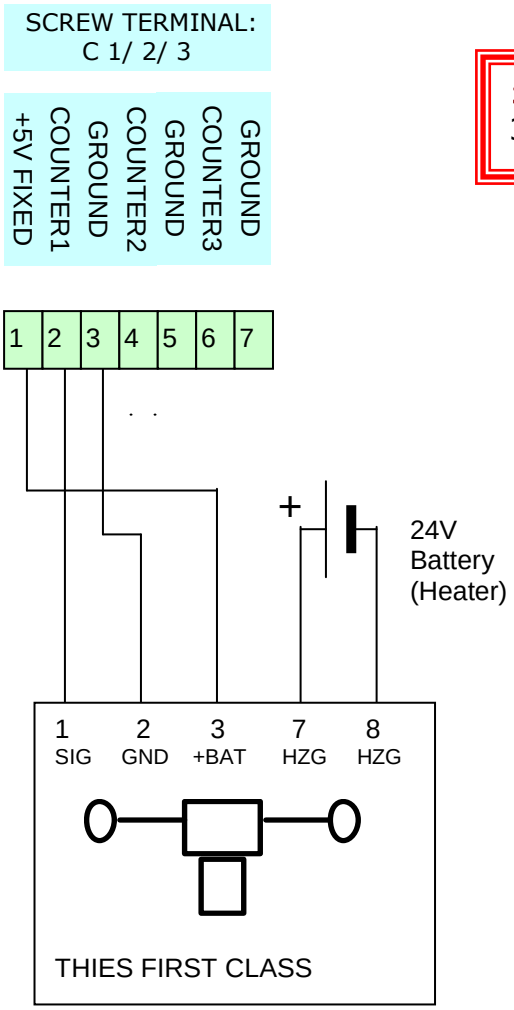
- Check that the anemometer rotates freely and that its axle is straight.
- Rotate the anemometer and measure the DC voltage between the COUNTER input and GND; it should toggle between 0 and 5 Volts (approximately).

5. THIES FIRST CLASS ANEMOMETER.

Optical disk type sensor.

CONNECTION:

- Connect the first anemometer to screws 1 [+5V FIXED], 2 [COUNTER1] and 3 [GROUND] on the screw terminal.
- Connect the second anemometer to screws 1 [+5V FIXED], 4 [COUNTER2] and 5 [GROUND] on the screw terminal.
- Connect the third anemometer to screws 1 [+5V FIXED], 6 [COUNTER3] and 7 [GROUND] on the 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:

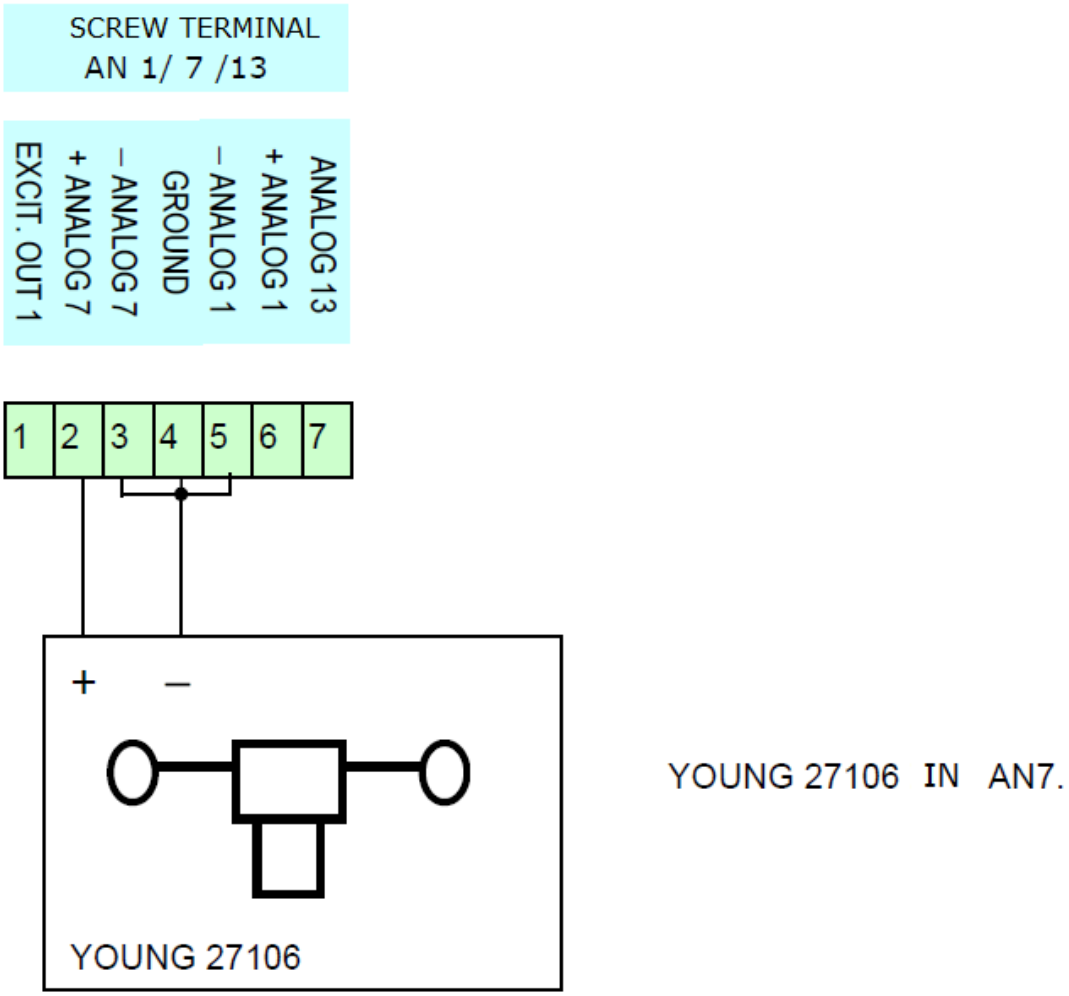
- Check that the anemometer rotates freely and that its axle is straight.
- Rotate the anemometer and measure the DC voltage between the COUNTER input and GND; it should toggle between 0 and 5 Volts (approximately).

6. YOUNG 27106 PROPELLER ANEMOMETER

Tach generator type instrument.

CONNECTION:

- Connect the first anemometer to screws 6 [+ANALOG1] and 4 [GROUND] of the screw terminal on an *analog voltage channel*.
- Connect the second anemometer to screws 2 [+ANALOG7] and 4 [GROUND] of the screw terminal on an *analog voltage channel*.
- Connect the second anemometer to screws 7 [+ANALOG13] and 4 [GROUND] of the screw terminal on an *analog voltage channel*.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- Wire polarity does matter (see drawing): Typical wire size: 2 x 0,25 mm2 (shielded cables are recommended). If a shield exists connect it to the GROUND screw and the metal body of the anemometer.



YOUNG 27106 IN AN7.

IN CASE THE ANEMOMETER DOESN'T WORK:

- Check that the anemometer rotates freely and that its axle is straight.
- Rotate the anemometer and, with a multimeter, check the DC voltage between the sensor's [+] and [-] terminals: with a wind of 4,5 m/s, it must be about 0,25 Volts.

SETUP:

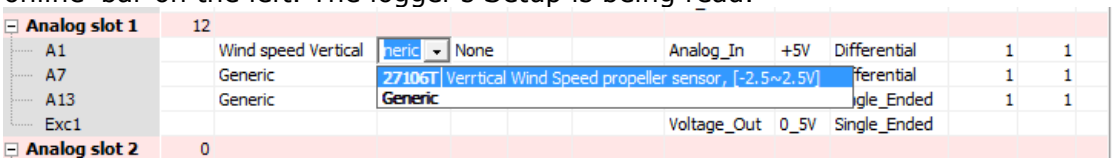
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

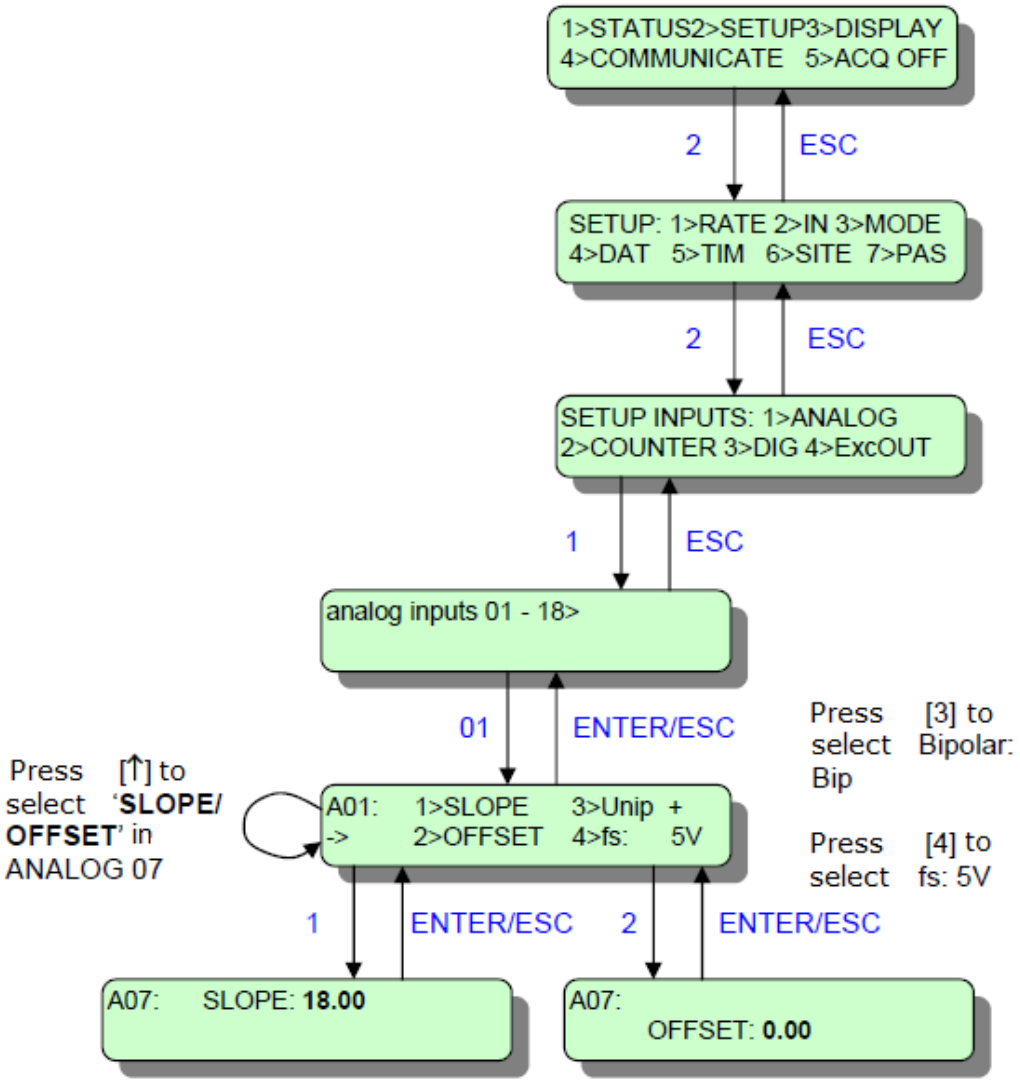
a. Via software

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. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage excitation output (eg Card 12) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- Click the 'Measurement' field and select 'Wind Speed Vertical', for the wind's vertical component.
- Click the 'Sensor' field and select '27106T'.
- The channel type ('Type' field), along with the Slope, are automatically updated.
- You can also change the units by clicking the 'Units' field. The Slope is 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.

b. Manually



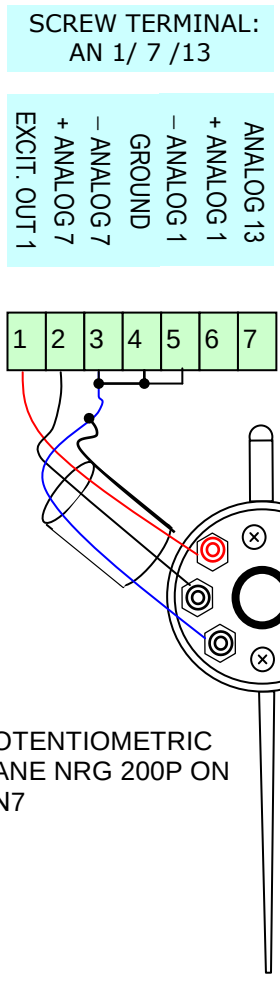
- Factors to covert to m/s.
- SLOPE: 18.00 OFFSET: 0.00
- This setup allows positive and negative wind speeds.

7. WIND VANE NRG 200P

Other potentiometer-type 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 [EXCITATION OUT], 6 [+ANALOG1] and 4 [GROUND] on the analog screw terminal.
- Connect the second wind vane to screws 1 [EXCITATION OUT], 2 [+ANALOG7] and 4 [GROUND] on the analog screw terminal.
- Connect the third wind vane to screws 1 [EXCITATION OUT], 7 [ANALOG13] and 4 [GROUND] on the analog screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- 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: 3 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 ON AN7

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 0 Ω to about 10 kΩ.

SETUP:

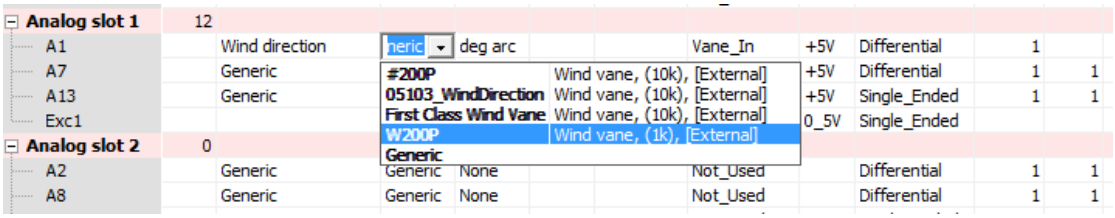
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

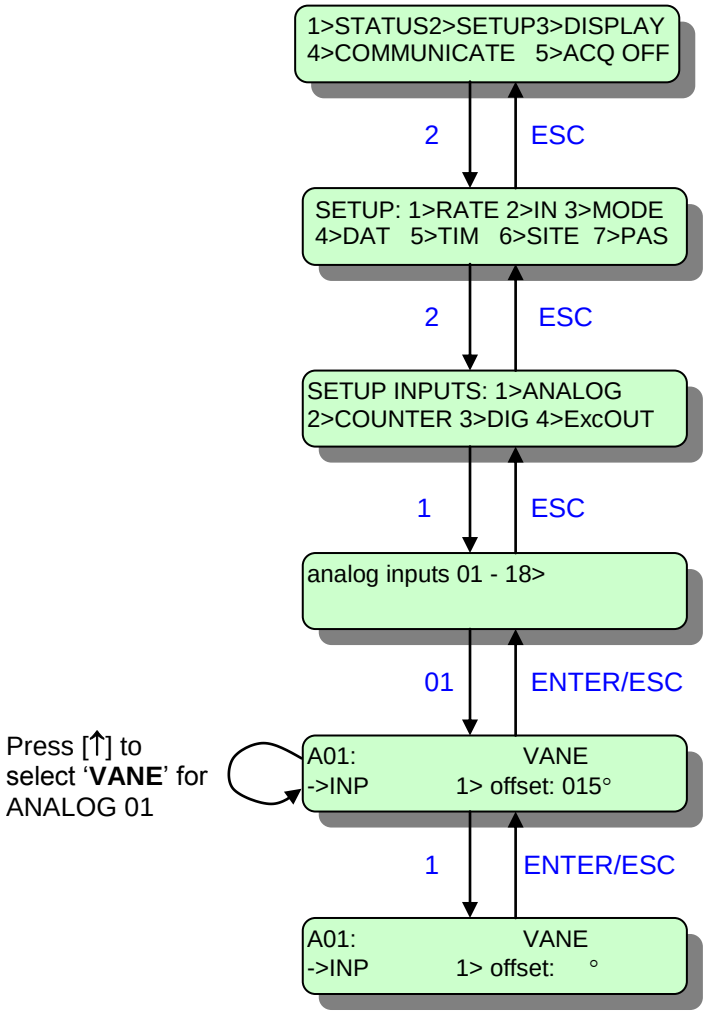
a. Via Software

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. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage excitation output and voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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), along with the Excitation Output (Exc1, in our case, set to 5V) are 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



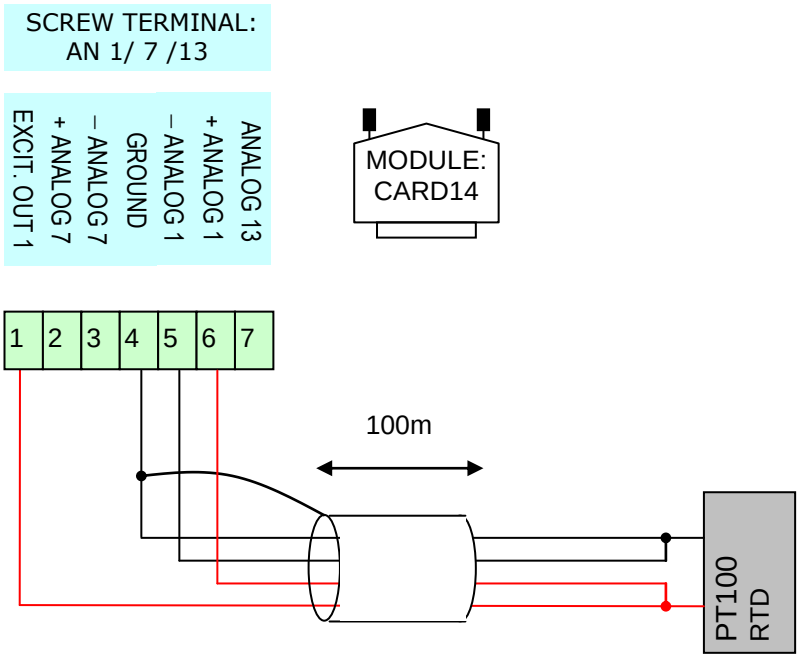
Enter the vane offset for direction measurement in degrees (0~359). For instance, if the vane "zero" mark is placed 30 east then you enter 30 as offset; if it is placed 30 West you enter 330 (=360-30) as offset.

8. TEMPERATURE PT100: 4-wire, current excitation

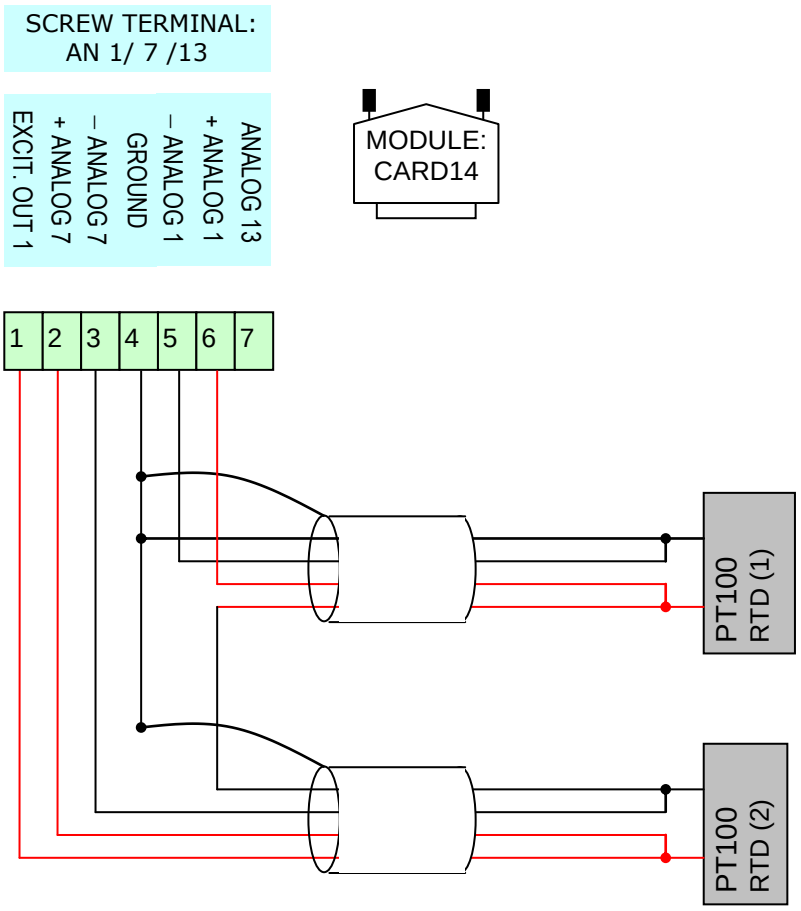
Platinum sensors (RTD), 100Ω resistance at 0°C: VECTOR T351, etc.
Temperature range: –50°C ~ +55°C.
NOTE: Recommended connection for best accuracy. Uses current output module (Card14) and corresponding differential input channels. Suitable for long distances between sensor and data logger.

CONNECTION:

- Connect a PT100 sensor to 6 [+ANALOG1] and 5 [-ANALOG1] on the screw terminal as shown in the drawing.
- Alternatively, you can connect the PT100 sensor to 2 [+ANALOG1] and 3 [-ANALOG1].
- You can connect two PT100 sensors to one Card 14 module as shown in the diagram in next page.
- Wire polarity is irrelevant. Typical wire size: 4 x 0,25 mm^2 (shielded cables are recommended). If a shield exists connect it to the GROUND screw.



CONNECTING 2 PT100 SENSORS.



IN CASE IT DOESN'T WORK:

- The data logger should 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:

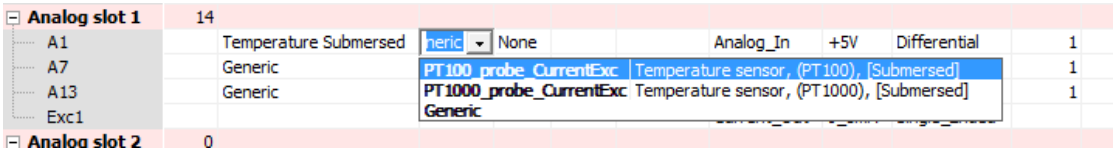
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

a. Via Software

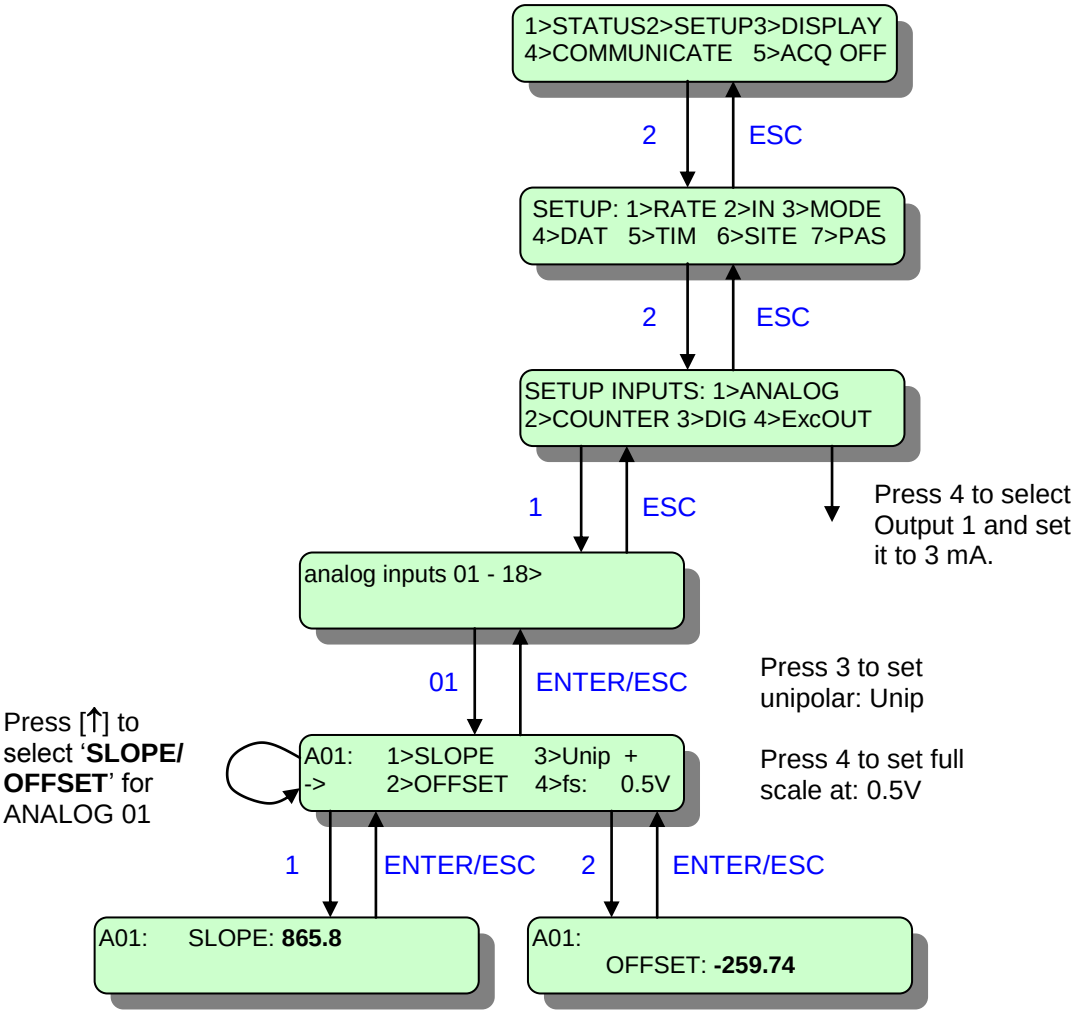
Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with current excitation output and voltage sensor output (eg Card 14) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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 current excitation PT100 sensor. Eg, if you have selected 'Temperature Submersed' before, click the Sensor field and select 'PT100_probe_CurrentExc'. For this connection, select one combination from the ones in the table below.
- The channel type ('Type' field), along with the Excitation Output (Exc1, in our example, set to 3mA), Slope, Offset are automatically updated.
- You can also change the units by clicking the 'Units' field. You can also change the Excitation output value (valid values are from 0.5 to 5mA) In both cases, 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.

MEASUREMENT	SENSOR
Temperature External	Thermos_PT100_CurrentExc OR Thermos_PT1000_CurrentExc, OR Thygro_Temperature Sensor(PT1000)_CurrentExc, etc
Temperature Internal	PT100_ element _CurrentExc
Temperature Submersed	PT100_probe_CurrentExc
Temperature Surface	PT100_patch_CurrentExc

b. Manually



- Coefficients for Celsius degrees:
  SLOPE: 865.8, OFFSET: -259.74

9. TEMPERATURE PT100: 2-wire, voltage excitation

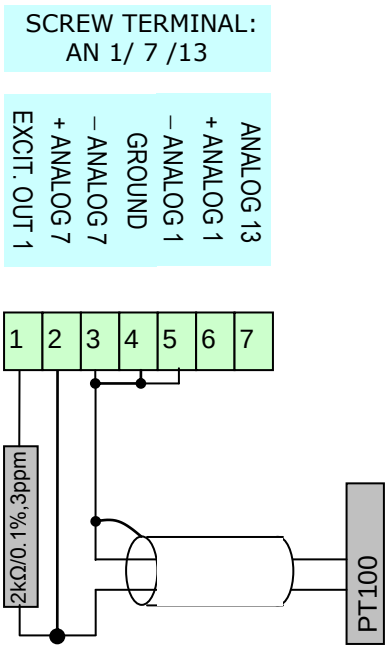
Platinum sensors (RTD), 100Ω resistance at 0°C: VECTOR T351, etc.
Temperature range: –50°C ~ +55°C.
NOTE: Simplest connection with minimum number of wires. Suitable for short distances between sensor and data logger. Long wires must be proportionally thicker.

CONNECTION:

- Connect the first PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor, to screws 1 [EXC OUT], 6 [+ANALOG1] and 4 [GROUND] on the screw terminal (see drawing).
- Connect the second PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor, to screws 1 [EXC OUT], 2 [ANALOG7] and 4 [GROUND] on the screw terminal.
- Connect the third PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor, to screws 1 [EXC OUT], 7 [ANALOG13] and 4 [GROUND] on the screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- If a PT1000 sensor is used replace the external resistor with a 20 kΩ, 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 should 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:

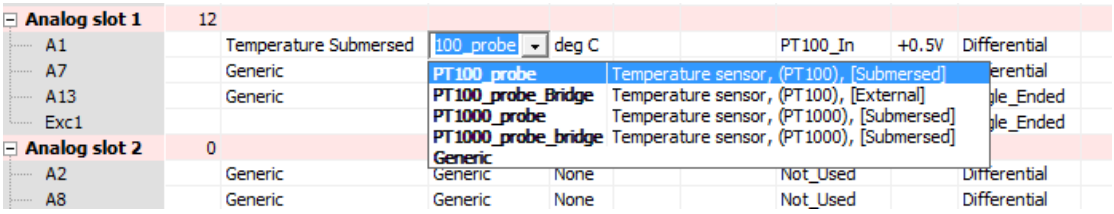
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

a. Via Software

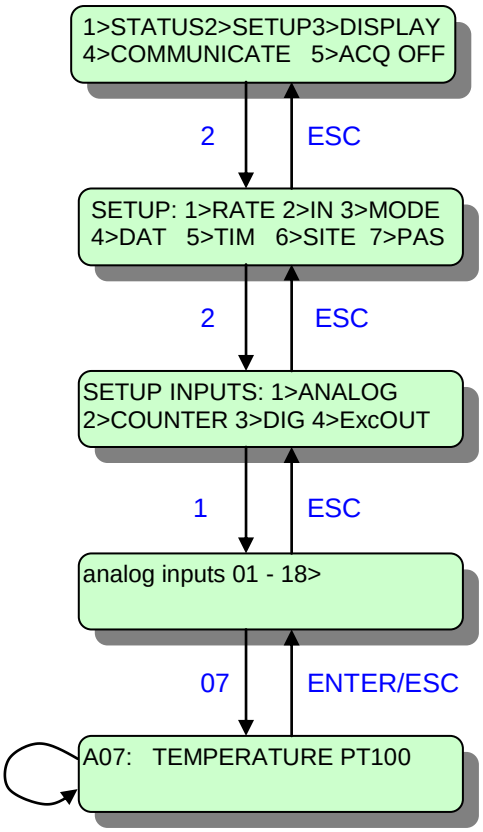
Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output and a voltage excitation output (eg Card 12) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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 voltage excitation PT100 sensor. Eg, if you have selected 'Temperature Submersed' before, click the Sensor field and select 'PT100_probe'. For this connection, select one combination from the ones in the table below.
- The channel type ('Type' field), along with the Excitation Output (Exc1, in our example, set to 5V) 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.

MEASUREMENT	SENSOR
Temperature External	Thermos_PT100 OR Thermos_PT1000, OR Thygro_Temperature Sensor(PT1000), etc
Temperature Internal	PT100_ element
Temperature Submersed	PT100_probe
Temperature Surface	PT100_patch

b. Manually



Press [↑] to select '**TEMPERATURE**' for ANALOG 07 (°C)

10. TEMPERATURE PT100: 4-wire voltage excitation

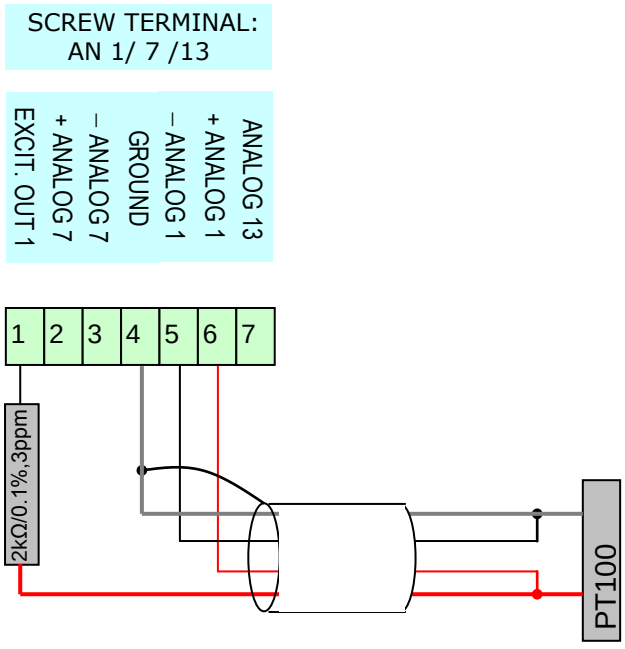
Platinum sensors (RTD), 100Ω resistance at 0°C: VECTOR T351, etc.
Temperature range: −50°C ~ +55°C.
NOTE: Better accuracy than 2-wire voltage excitation but with 4 wires. Suitable for short distances between sensor and data logger. Long wires must be proportionally thicker.

CONNECTION:

- Connect the first PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor, to screws 1 [EXC OUT], 6 [+ANALOG1] and 5 [-ANALOG1] on the screw terminal (see drawing).
- Connect the second PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor, to screws 1 [EXC OUT], 2 [+ANALOG7] and 3 [-ANALOG7] on the screw terminal.
- If a PT1000 sensor is used replace the external resistor with a 20 kΩ, 0.1%, 3ppm type. Wire sizes in the following table can then be reduced to one tenth (1/10).
- Wire polarity is irrelevant. Diagram has THICK wires and THIN wires. Wire size of THICK wires according to connection distance can be found in following table (shielded cables are recommended). Typical wire size of THIN wires is 0,25 mm^2.

CABLE LENGTH meters	WIRE SIZE OF THICK WIRES mm^2 (PT100)
Up to 1	2x0,25
Up to 2	2x0,35
Up to 3	2x0,50
Up to 4	2x0,75
Up to 5	2x1
Up to 10	2x1,5
Up to 20	2x2,5

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



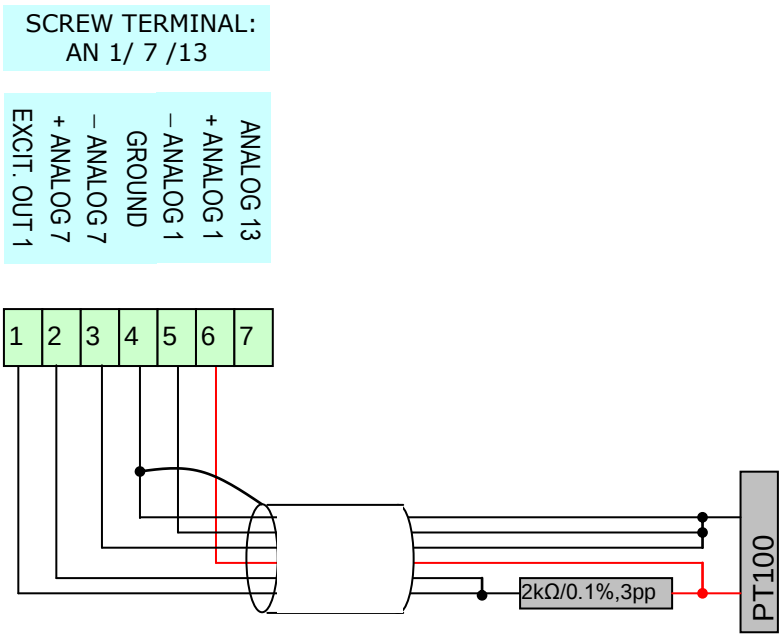
SETUP: See Chapter: 'TEMPERATURE PT100: 2-wire, voltage excitation'.

11. TEMPERATURE PT100: 6-wire voltage excitation

Platinum sensors (RTD), 100Ω resistance at 0°C: VECTOR T351, etc.
Temperature range: −50°C ~ +55°C.
NOTE: Best accuracy of voltage excitation methods, but needs 6 wires and 2 differential inputs to eliminate errors due to resistance of long wires. Suitable for long distances between sensor and data logger.

CONNECTION:

- On the same screw terminal, use 2 differential voltage analog inputs and a voltage output [EXC OUT] set to 5V (check from Menu: Setup>In>).
- Although you use both channel 1 and 7, only the first channel (1) will be set up (see next page).
- You can you use up to 6 channel pairs (up to 6 PT100s) in this configuration: 1/7, 2/8, 3/9, 4/10, 5/11 and 6/12.
- Connect the PT100 sensor and a 2kΩ / 0.1%, 3ppm resistor as shown in the diagram.
- If a PT1000 sensor is used replace the external resistor with a 20 kΩ, 0.1%, 3ppm type.
- Wire polarity is irrelevant. Typical wire size: 6 x 0,25 mm^2 (shielded cables are recommended).



IN CASE IT DOESN'T WORK:

- The data logger should 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:

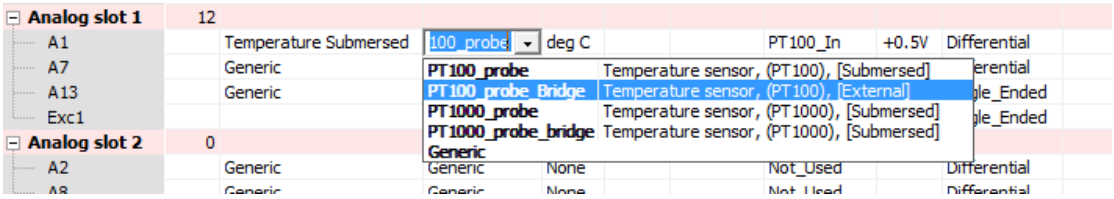
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

a. Via Software

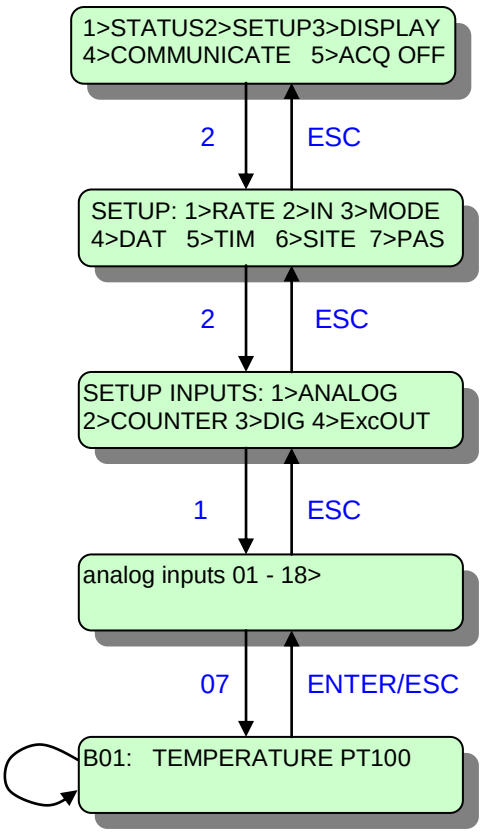
Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output and voltage excitation output (eg Card 12) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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 in bridge connection. Eg, if you have selected 'Temperature Submersed' before, click the Sensor field and select 'PT100_probe_bridge'. For this connection, select one combination from the ones in the table below.
- The channel type ('Type' field), along with the 'Mode' and 'Configuration' field 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.

MEASUREMENT	SENSOR
Temperature External	Thermos_PT100_Bridge OR Thermos_PT1000_Bridge, OR Thygro_Temperature Sensor(PT1000)_Bridge, etc
Temperature Internal	PT100_ element_bridge
Temperature Submersed	PT100_probe_bridge
Temperature Surface	PT100_patch_bridge

b. Manually



Press [↑] to select '**TEMPERATURE**' for ANALOG 01

Press [-] to select bridge **(B01)** configuration for ANALOG 01

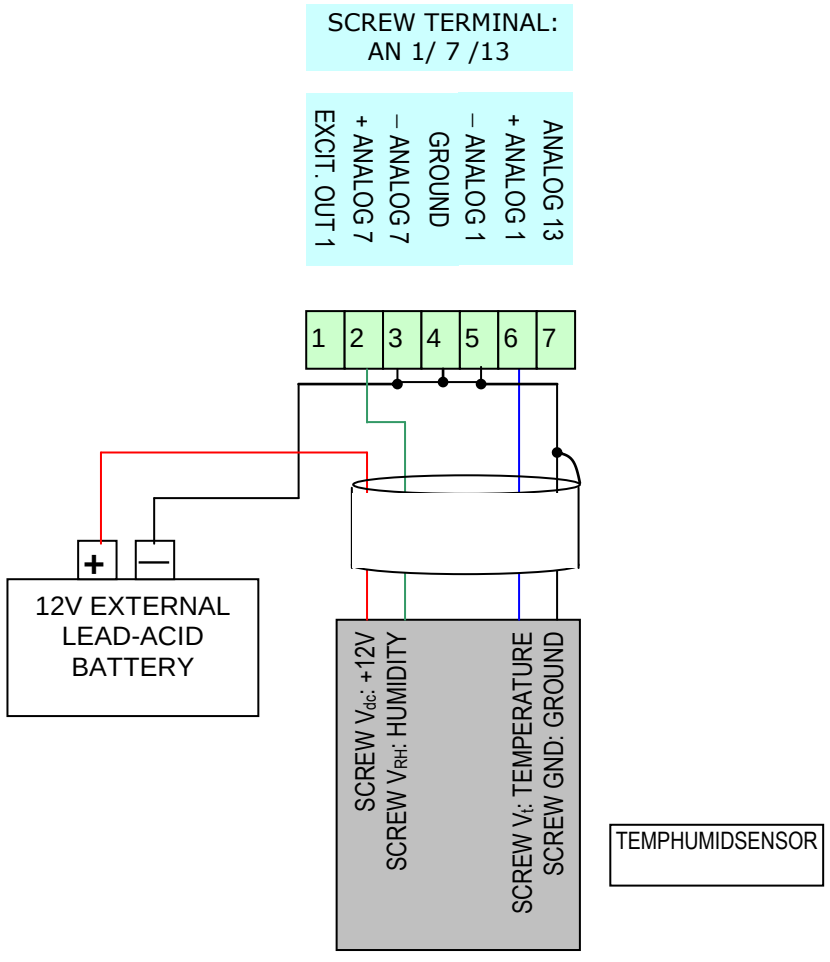
Conversion to Celsius degrees

12. 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:

- Make sure that you are using a voltage analog input.
- Connect the sensor to screws 6 [+ANALOG1], 2 [+ANALOG7] and 4 [GROUND] on the screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- 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 BAT] pin (12V)	Temperature sensor wire at +ANALOG pin (eg [+ANALOG1])	Humidity sensor wire at +ANALOG pin (eg [+ANALOG7])	Wire at -ANALOG pin (eg [-ANALOG7]), if differential, and [GROUND] pin
HD900TR	DeltaOhm	Red	Green	Blue	Black
P6312	Ammonit	Green	Black	Brown	Yellow
HMP50	Vaisala	Brown	Black	White	Blue

SETUP:

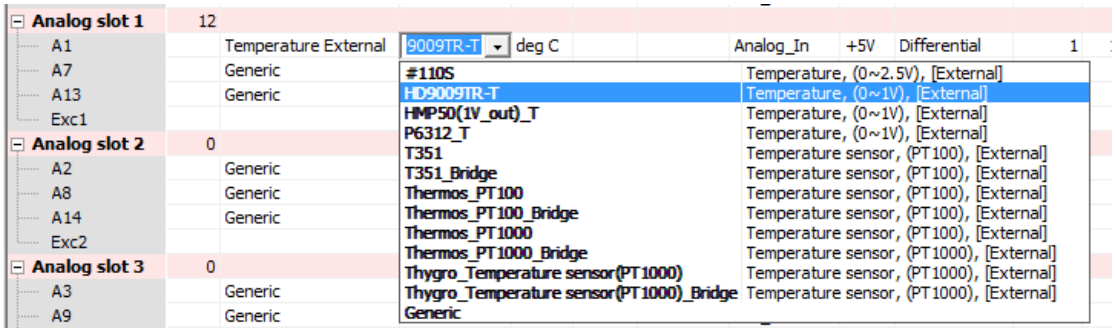
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

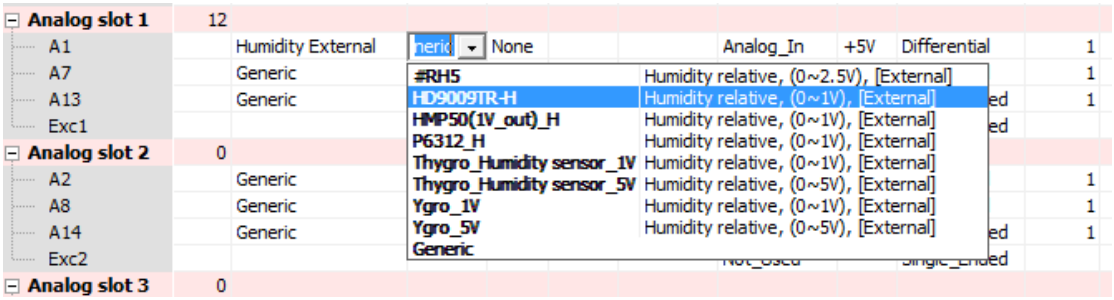
to start acquisition (data logging).

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. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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.

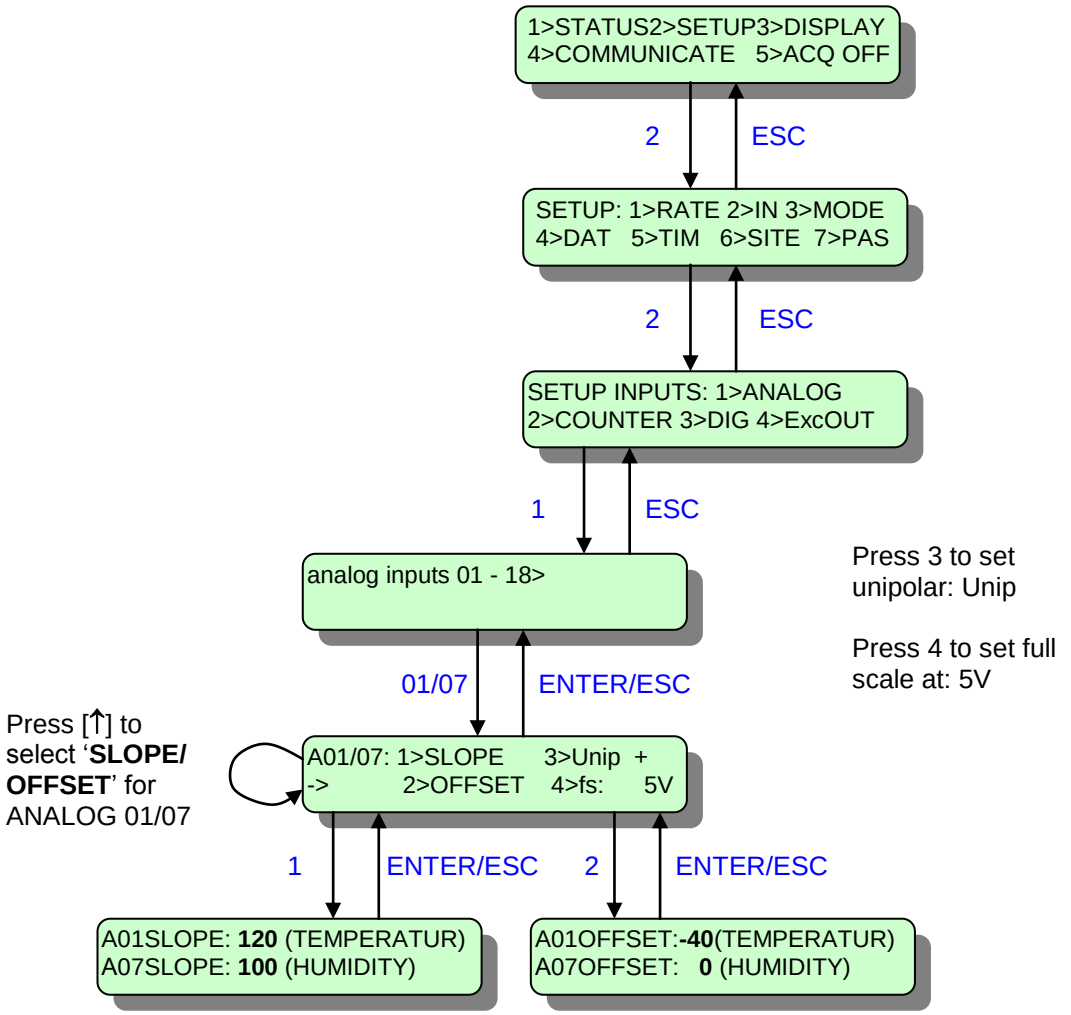


- For the **humidity** sensor , select an analog channel's line, eg A7. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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

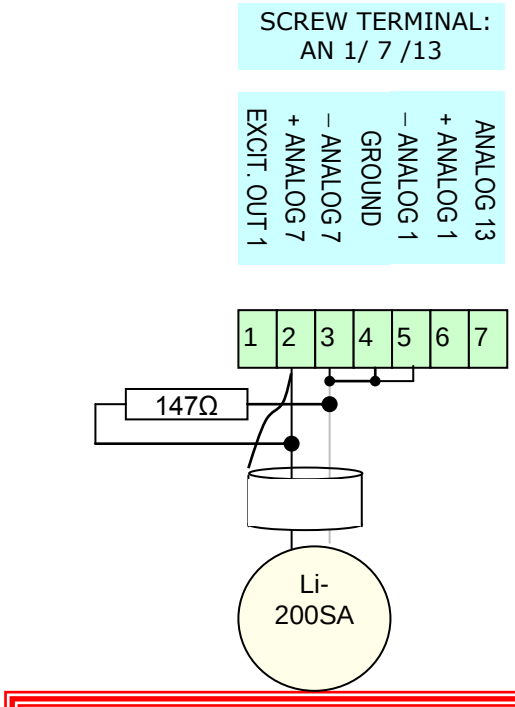
SENSOR	**Temperature sensor SLOPE**	**Temperature sensor OFFSET**	**Humidity sensor SLOPE**	**Humidity sensor OFFSET**
HD900TR	120	-40	100	0
P6312	100	-30	100	0
HMP50	100	-40	100	0

13. PYRANOMETER LiCor LI-200SZ

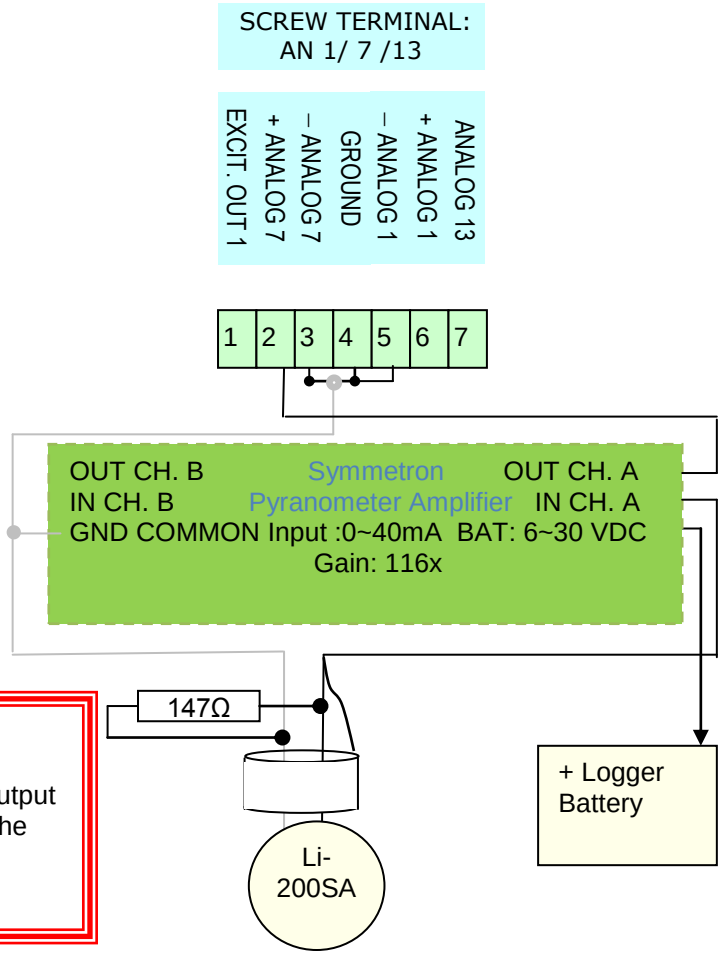
CONNECTION:

- Make sure that you are using a voltage analog input.
- Connect the first sensor to screws 6 [+ANALOG1] and 4 [GROUND] on the screw terminal. Connect to the same screws the resistor that comes with the sensor (usually 147-Ohm).
- Connect the second sensor to screws 2 [+ANALOG7] and 4 [GROUND] on the screw terminal. Connect to the same screws the resistor that comes with the sensor (usually 147-Ohm).
- Connect the third sensor to screws 7 [ANALOG13] and 4 [GROUND] on the screw terminal. Connect to the same screws the resistor that comes with the sensor (usually 147-Ohm).
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- 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.
- 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 [+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 12mV/1000W/m^2. In the dark it should display less than 1W.

SETUP:

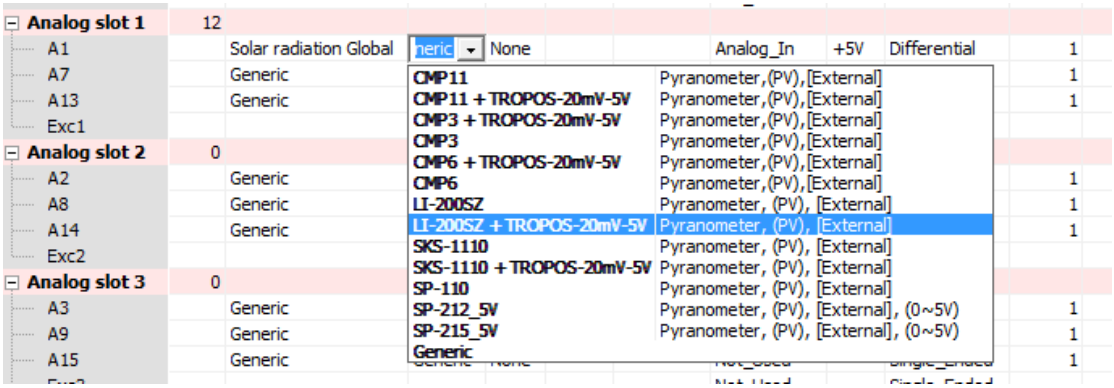
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

a. Via Software

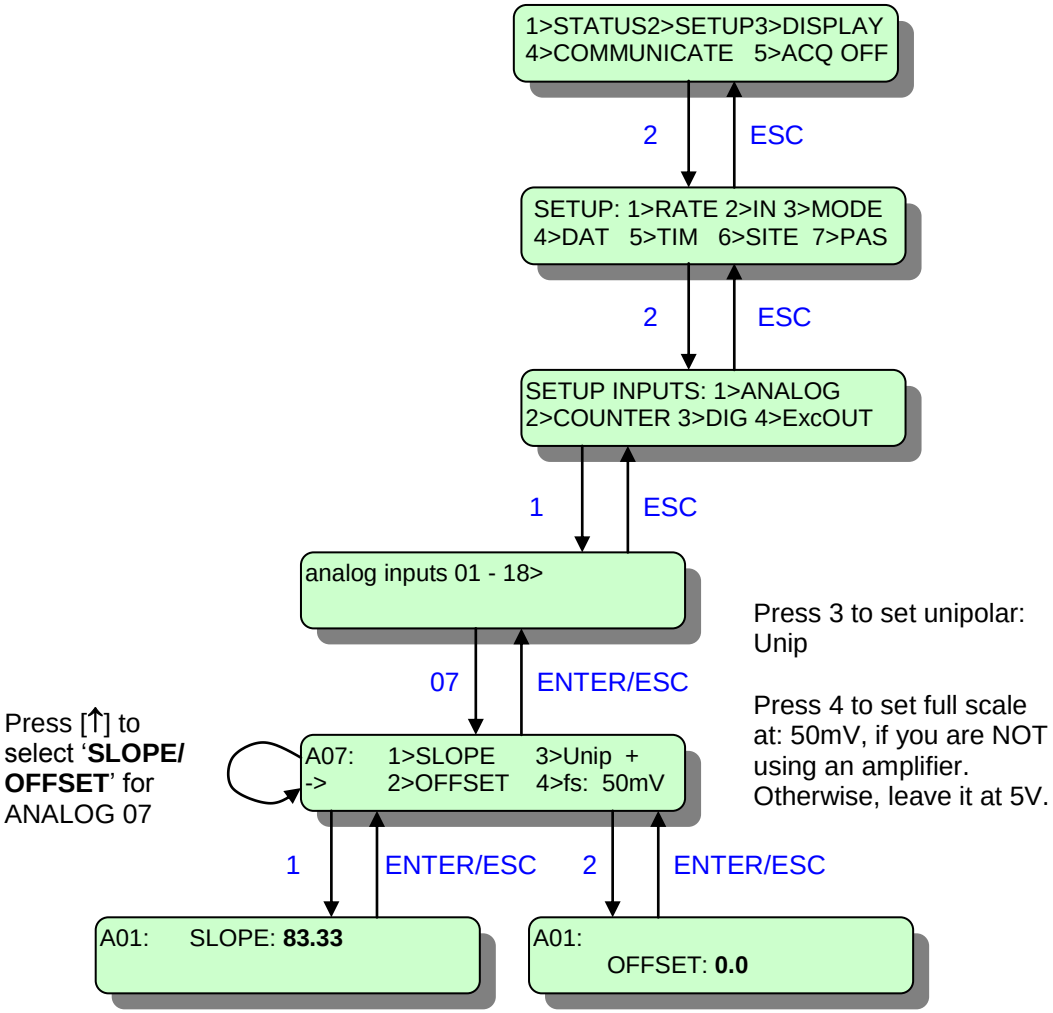
Open Opton 4 and click 'Read Inputs Setup' in the 'Setup' tab, in the 'Data logger online' bar on the left. The logger's Setup is being read.



- Select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- 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-200SZ', if you are using the sensor without an amplifier or 'LI-200SZ+TROPOS-20mV-5V', if you are using it with an amplifier.
- 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 **kW/m^2** .

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

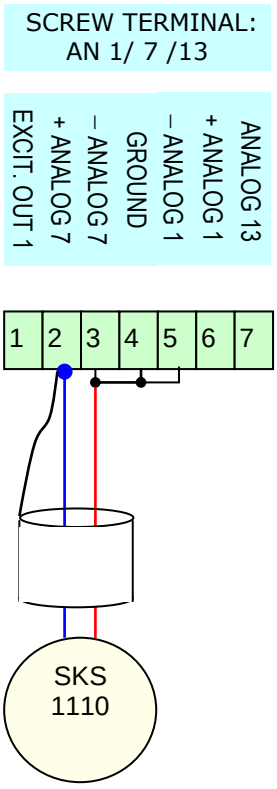
SENSOR	SLOPE WITHOUT AMPLIFIER	OFFSET WITHOUT AMPLIFIER	SLOPE WITH AMPLIFIER	OFFSET WITH AMPLIFIER
LI-200SA	83.33	0	0.7184	0
SKS-1110	100	0	0.8621	0
CMP3	80	0	0.6897	0
CMP6	80	0	0.6897	0
CMP11	95.2381	0	0.821	0
SP-110	5	0	NOT USED	NOT USED
SP-212_5V	0.25	0	NOT USED	NOT USED
SP-215_5V	0.25	0	NOT USED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

14. PYRANOMETER SKYE SKS-1110

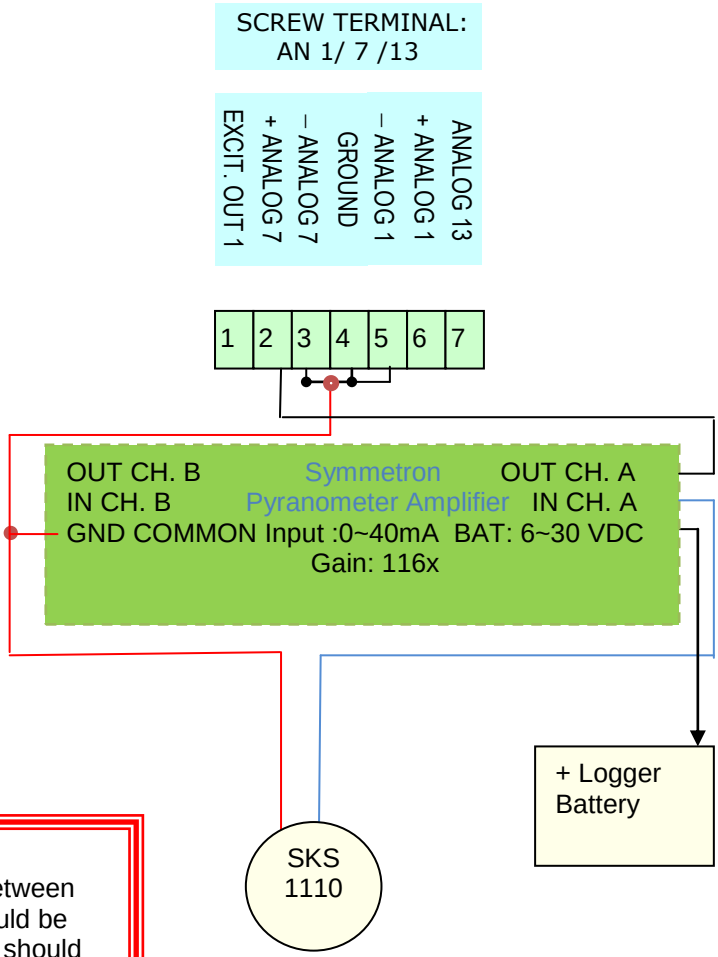
CONNECTION:

- Make sure that you are using a voltage analog input.
- Connect the first sensor to screws 6 [+ANALOG1] and 4 [GROUND] on the screw terminal.
- Connect the second sensor to screws 2 [+ANALOG7] and 4 [GROUND] on the screw terminal.
- Connect the third sensor to screws 7 [ANALOG13] and 4 [GROUND] on the screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- 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:

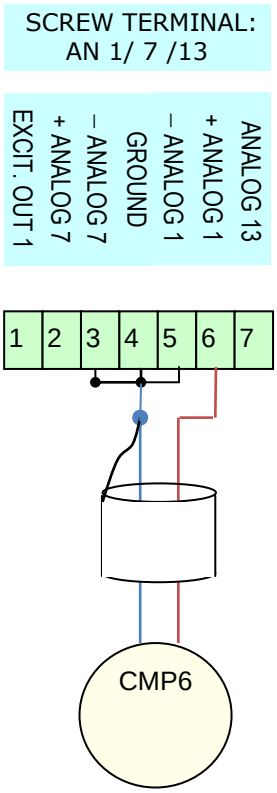
- With a multimeter check the voltage between screws 8 and 9: the sensor output should be about 100mV/1000W/m^2. In the dark it should display less than 1W.

SETUP:

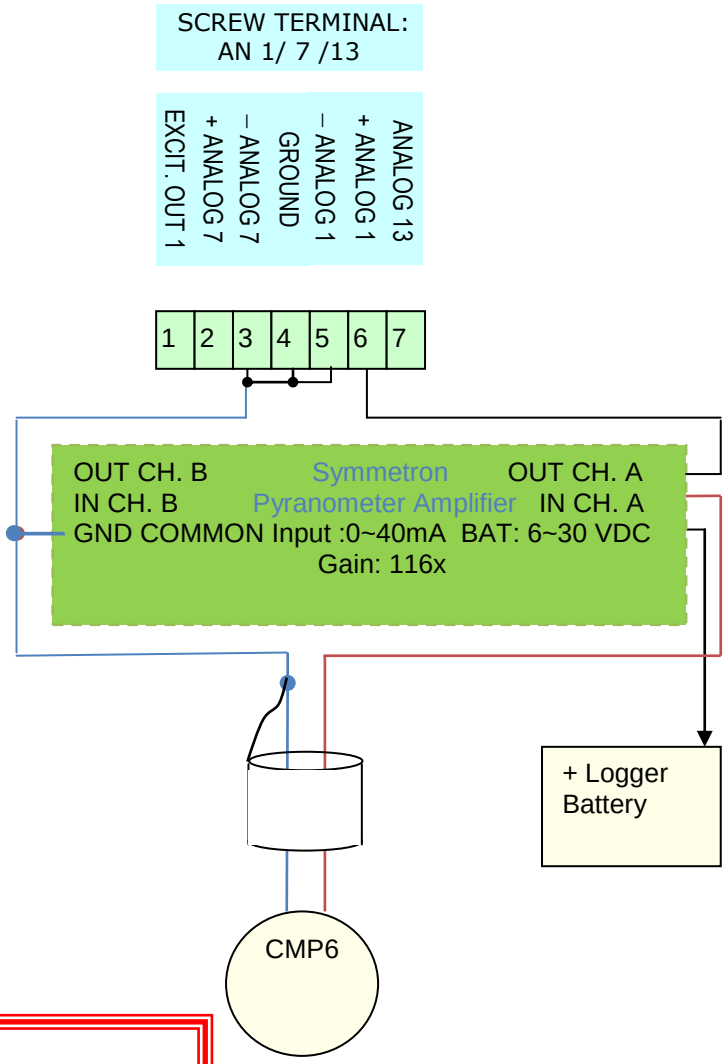
Similarly to the previous chapter's sensor. The only difference is that, **via software**, in the 'Sensor' field, select 'SKS-1110' or 'SKS-1110+Pyranometer Amp'. For **manual** Setup, refer to the table of the previous chapter for Slope and Offset

15. CONNECTION AND SETUP OF OTHER USED PYRANOMETERS

WITHOUT APMLIFIER



WITH AMPLIFIER



IN CASE IT DOESN'T WORK:

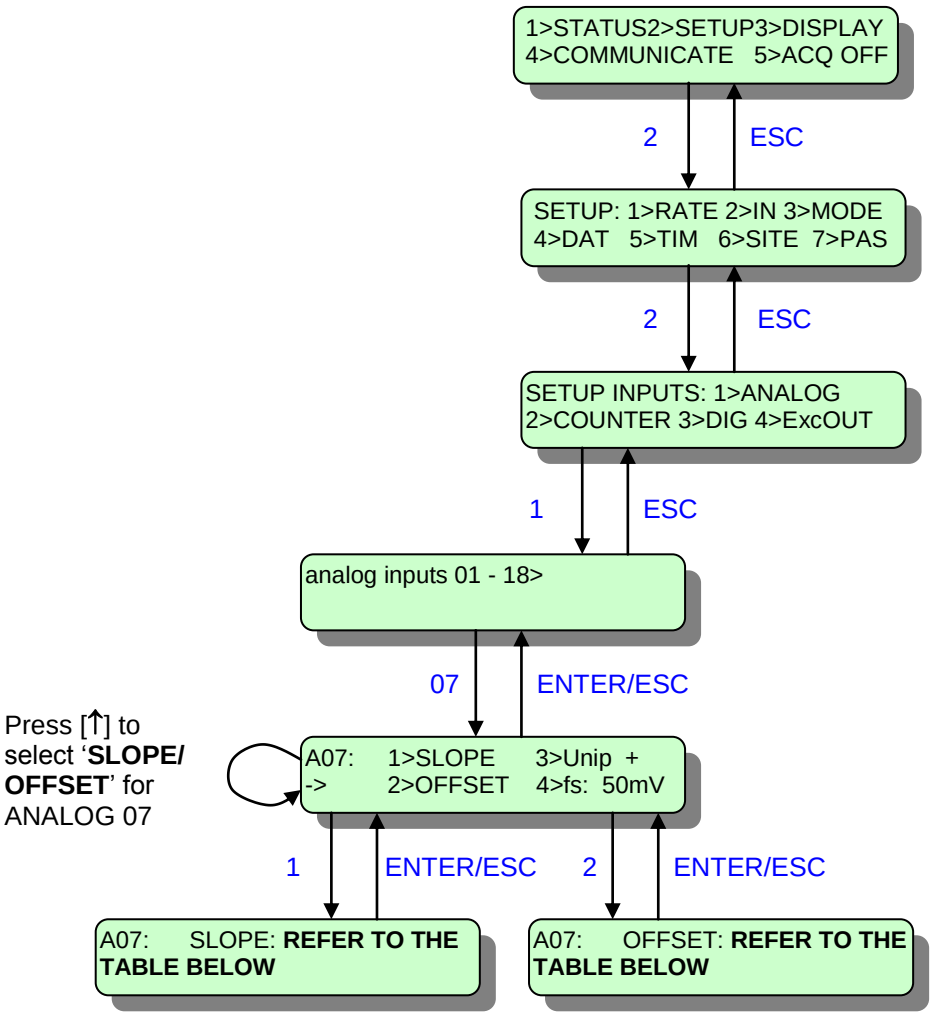
With a multimeter check the voltage between screws 8 and 9: the sensor output should be about 100mV/1000W/m^2. In the dark it should display less than 1W.

SETUP:

a. Via Software

SELECTION IN THE 'MEASUREMENT' FIELD	SELECTION IN THE 'SENSOR' FIELD	MANUFACTU-RER	Wire at +ANALOG pin (eg [+ANALOG1])	Wire at -ANALOG, if differential (eg [-ANALOG1]) and [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



Coefficients shown are for indication in **kW/m^2** .

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:

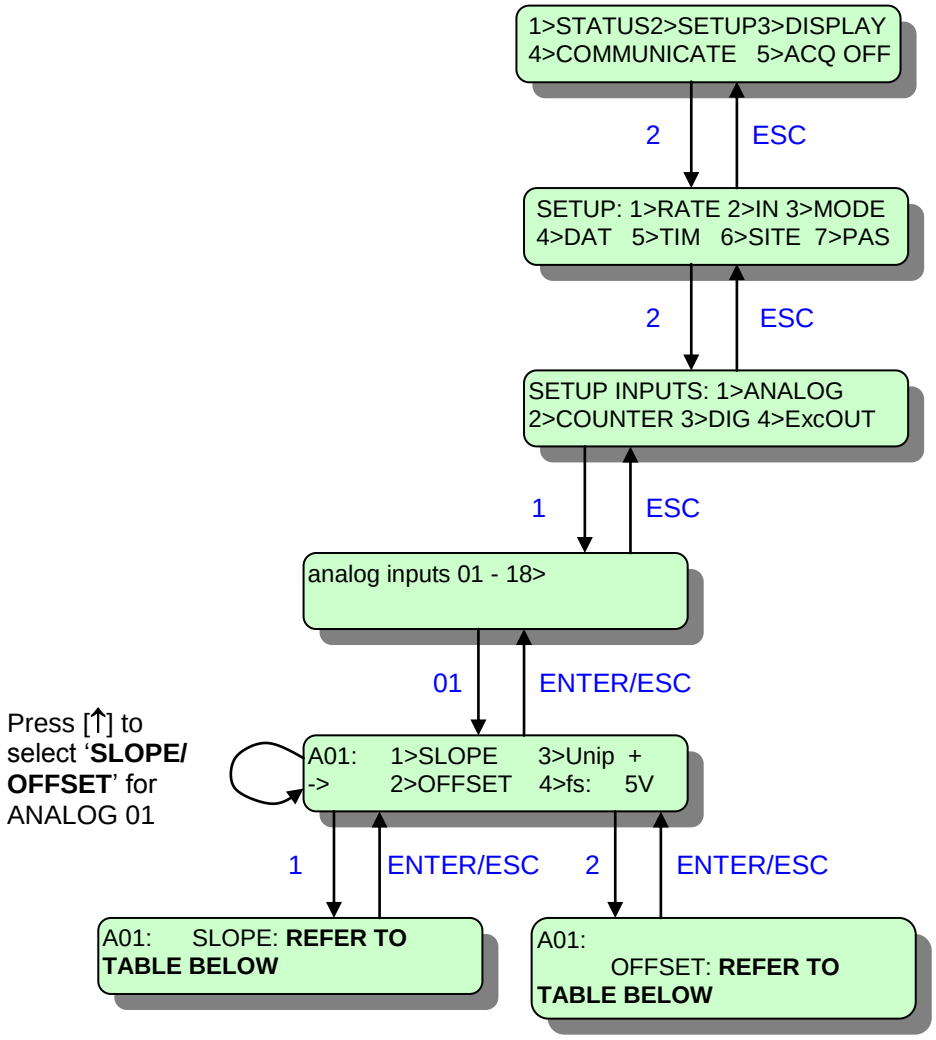
- The first three sensors can be used with an amplifier, as well, as you can see in the diagram above.
- The last 3 sensors do not require a signal amplification, because the SP-110's output signal is of around a few hundred mV, while the output signal of the SP-212_5V and the SP-215_5V is 0~5V. Therefore, 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.

16. 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

17. 4~20mA TRANSMITTERS

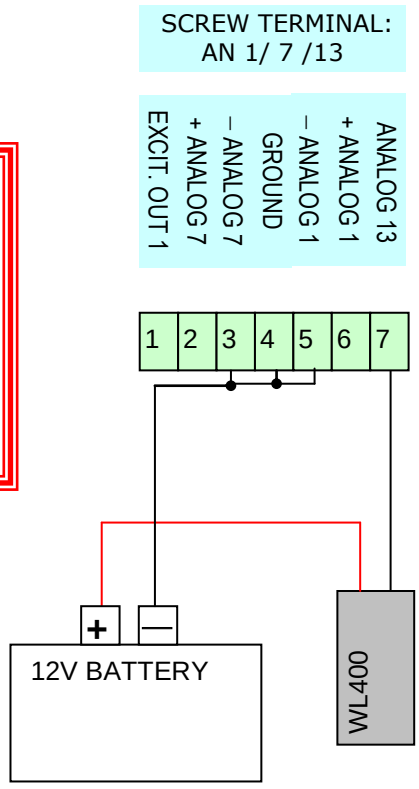
Depth Sensors: Global Water WL400, WL450, etc..
pH Sensors: WQ201 της Global Water, etc.

CONNECTION:

- Make sure that you are using a current analog input and that you have plugged the appropriate analog input module (Card 13) to the datalogger's corresponding slot.
- Connect the first sensor to screws 6 [+ANALOG1] and 4 [GROUND] on the screw terminal.
- Connect the second sensor to screws 2 [+ANALOG7] and 4 [GROUND] on the screw terminal.
- Connect the third sensor to screws 7 [ANALOG13] and 4 [GROUND] on the screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- Wire polarity does matter (see drawing): The red wire of the sensor connects to battery. The black wire of the sensor connects to [+ANALOG].

IN CASE IT DOESN'T WORK:

- Make sure that the ANALOG input is a current input.
- With the sensor connected to the logger, select from the main menu: SETUP>MODE>CONTINUOUS>[ENTER]
- With a multimeter check the current in series with one of the sensor's wires: it should be 4mA or greater.



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).

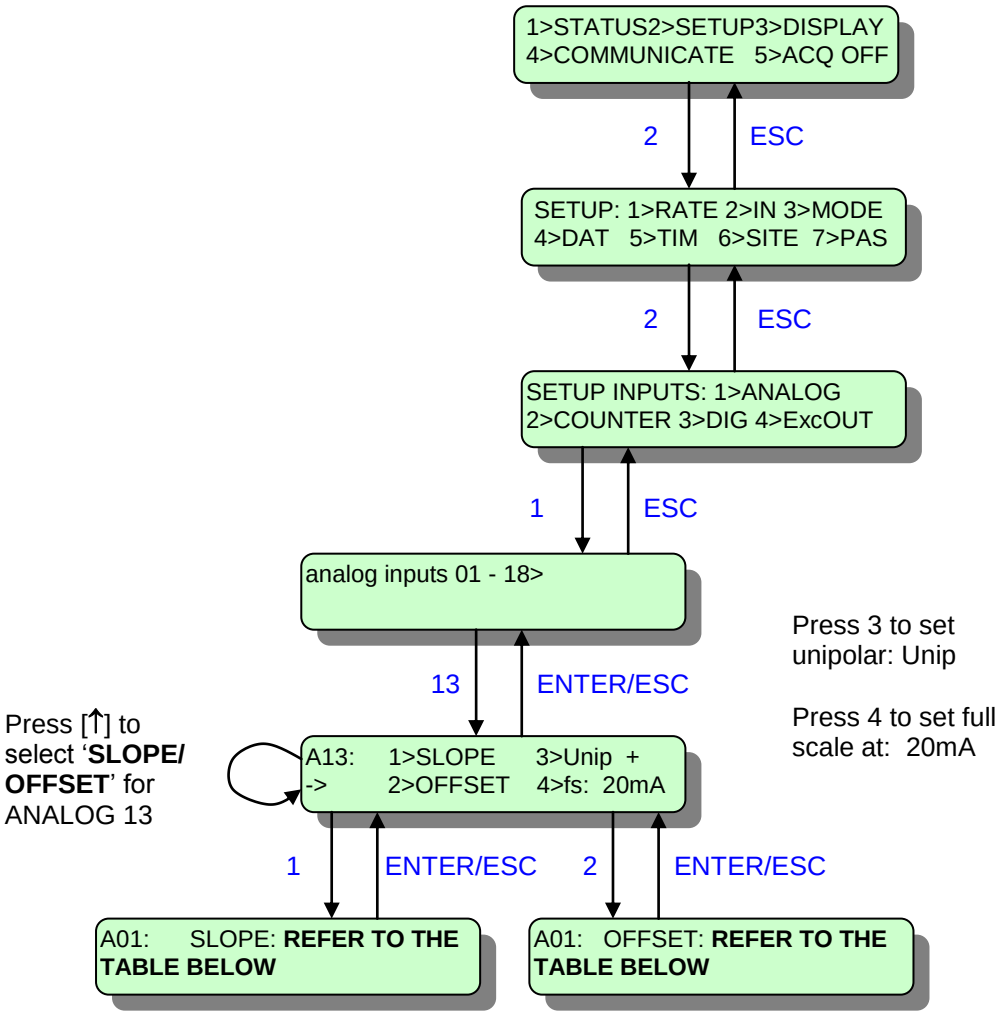
a. Via Software

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.

SELECTION IN THE 'MEASURE-MENT' FIELD	SELECTION IN THE 'SENSOR' FIELD	MANUFA-CTURER	Wire @ [+EXT BAT]	Wire at +ANALOG pin (eg [+ANALOG1])	Wire at -ANALOG, if differential, (eg [-ANALOG1]) and [GROUND] pin
PH	WQ201	Global Water	Red	White	Black
Water Depth	WL400_30ft	Global Water	Red	Black	-
Water Depth	WL450_30ft	Global Water	Black	White	-

- 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



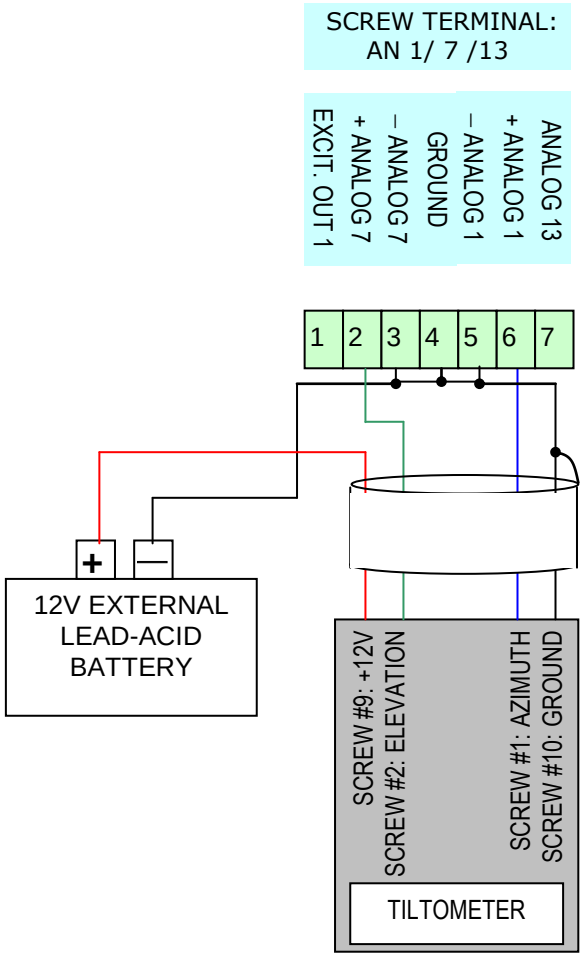
For calibrated sensors enter the correct SLOPE και OFFSET values.

SENSOR	SLOPE	OFFSET
WQ201	0.875	-3.5
WL400_30ft	0.5715	-2.286
WL450_30ft	0.5715	-2.286

18. SYMMETRON TILTOMETER

CONNECTION:

- Make sure that you are using a voltage analog input.
- Connect the sensor to screws 6 [+ANALOG1], 2 [+ANALOG7] and 4 [GROUND] on the screw terminal.
- CAUTION: short-circuit all three screws 3, 4 and 5 on the screw terminal, as shown in the diagram (i.e. convert inputs to single-ended).
- 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 order to have the Azimuth display 0 degrees when the mast tilts North, fasten the Tiltometer such, that in vertical position the box label 'looks' South.

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:

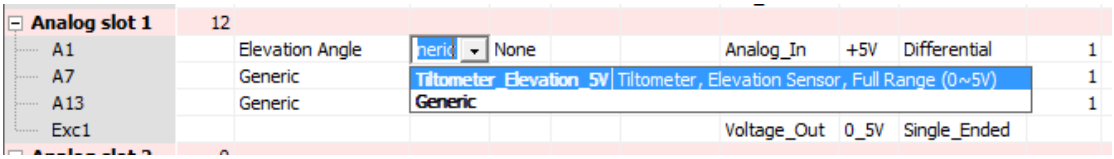
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

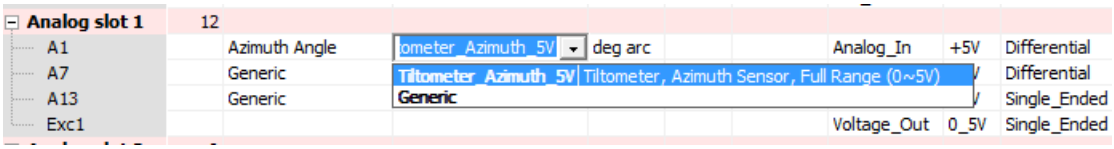
to start acquisition (data logging).

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.



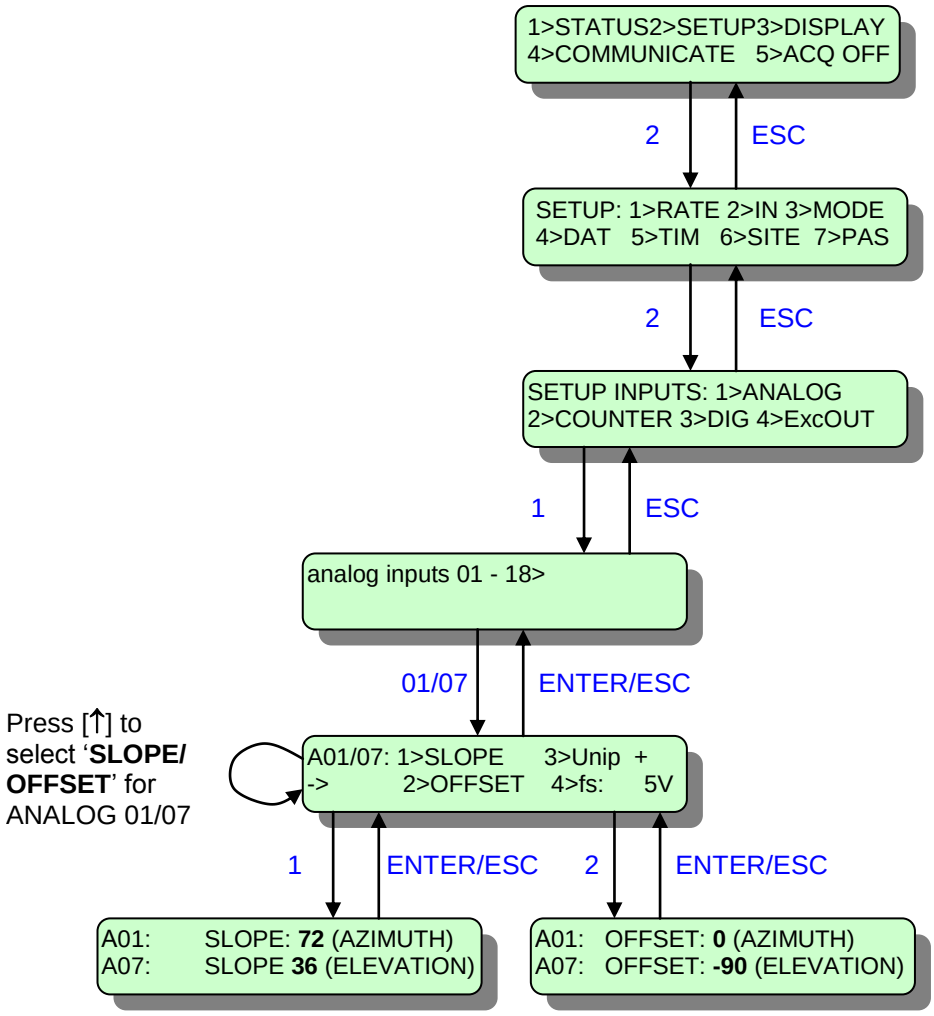
- For the **elevation** sensor , select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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.



- For the **azimuth** sensor , select an analog channel's line, eg A7. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module with voltage sensor output (eg Card 12) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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

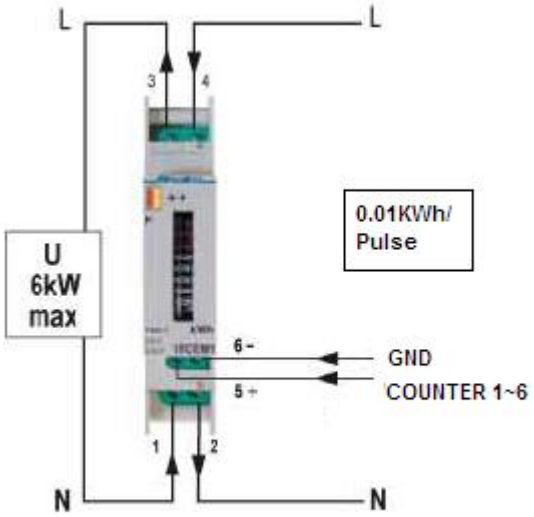
19. OPEN COLLECTOR SENSORS (ENERGY METERS)

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

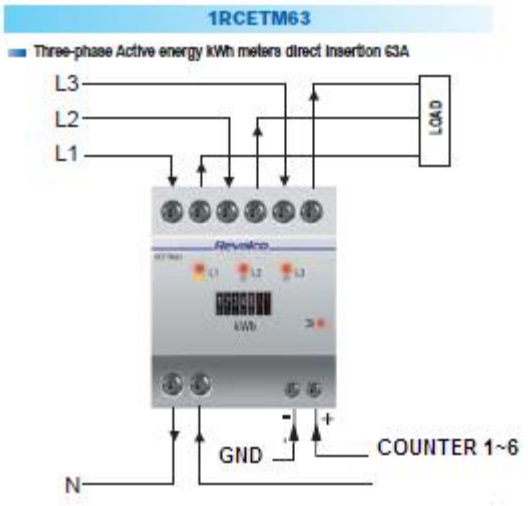
CONNECTION:

- Use a counter screw terminal (C1, C2, C3).
- Connect the first sensor's open collector output to screws 2 [COUNTER1] (+) and 3 [GROUND] (-) on this screw terminal.
- Connect the second sensor's open collector output to screws 4 [COUNTER2] (+) and 5 [GRPUND] (-) on this screw terminal, etc.
- 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:

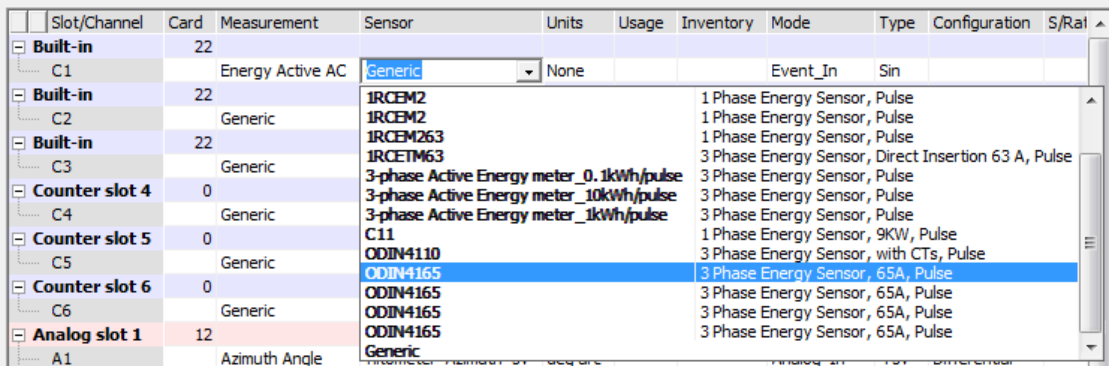
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

to start acquisition (data logging).

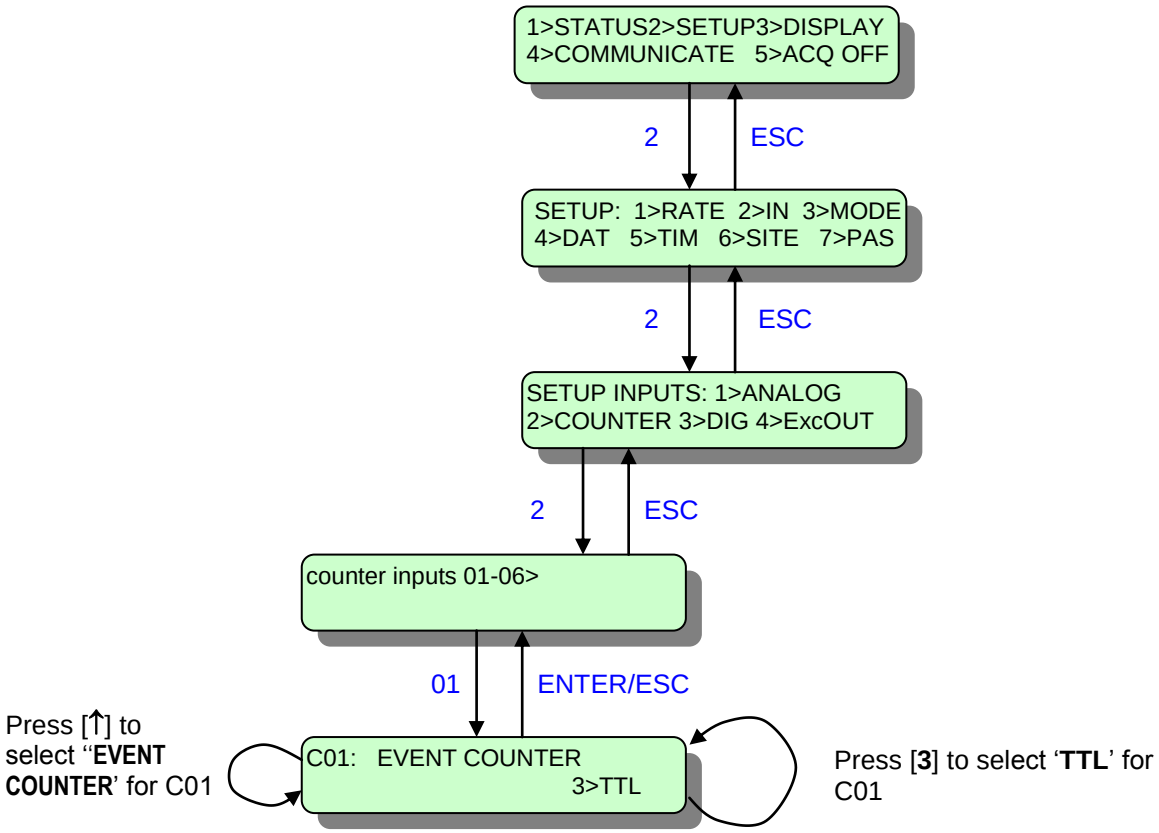
a. Via Software

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. If you wish to use one of channels C4~C6, make sure that you have plugged the suitable counter module (eg Card 22) in the corresponding datalogger slot. When the setup is read, it will be recognized and appear in the corresponding 'Card' field.
- Click the 'Measurement' field and select 'Electrical Energy'.
- Click the 'Sensor' field and select one f the three first 1-phase sensors or one of the two last 3-phase sensors.
- 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.

b. Manually


1>STATUS2>SETUP3>DISPLAY
4>COMMUNICATE 5>ACQ OFF
2
ESC
SETUP: 1>RATE 2>IN 3>MODE
4>DAT 5>TIM 6>SITE 7>PAS
2
ESC
SETUP INPUTS: 1>ANALOG
2>COUNTER 3>DIG 4>ExcOUT
2
ESC
counter inputs 01-06>
01
ENTER/ESC
Press [↑] to select "EVENT COUNTER" for C01
C01: EVENT COUNTER
3>TTL
Press [3] to select 'TTL' for C01

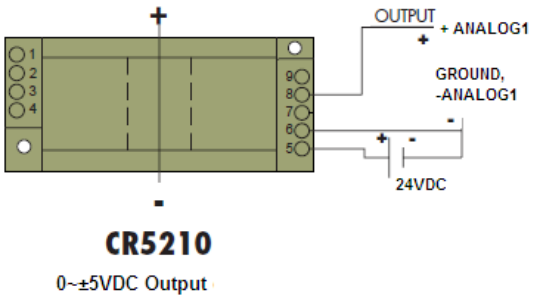
20. VOLTAGE AND CURRENT SENSORS

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

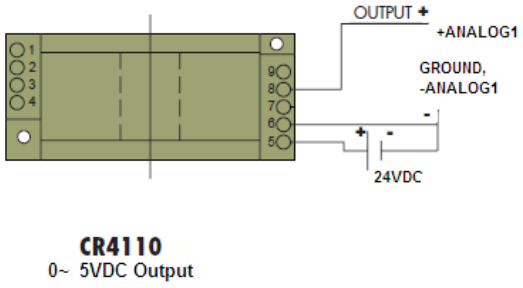
CONNECTION:

- All sensors are available in 0~±5V output (CR4510, CR5310, CR4110(s), CR5210(s)) or 4~20mA output (CR4520, CR5320, CR4120(s), CR5220(s)).
- Make sure that you have plugged the corresponding analog input module to the datalogger. If you are using voltage output sensors, use, eg, Card 12, while if you are using current output sensors, use, eg, Card 13.
- The negative voltage output is produced only by DC Voltage and Current sensors (CR5310 and CR5210(s)), indicating the direction of the current flow or the voltage polarity.
- Specifically, for DC current sensors (CR5210(s)), the positive measured current flows from the (+) to the (-) end of the sensor. For DC Voltage sensors (CR5310), the voltage will be measured positive if you connect the (+) end to pin 1 and the (-) end to pin 3. (see the corresponding figures below).
- Connect the sensor's output to the '+' end of an analog channel, if it is differential (eg +ANALOG1), or to a single ended one (eg ANALOG 13).
- Connect pin 6 to the datalogger's GROUND pin and to the '-' end of the analog channel you are using, if it is differential(eg -ANALOG1).
- 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.

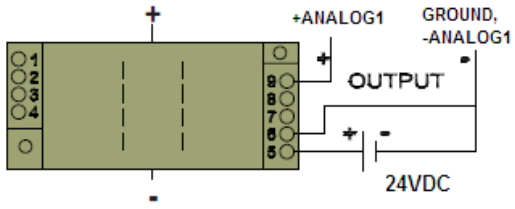
DC Current sensor(0~±5V out)



AC Current sensor (0~5V out)

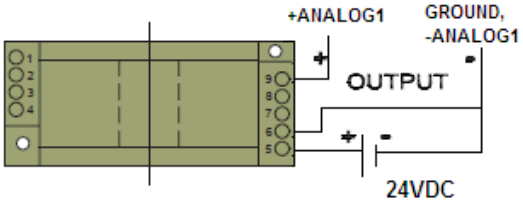


DC Current sensor(4~20mA out)



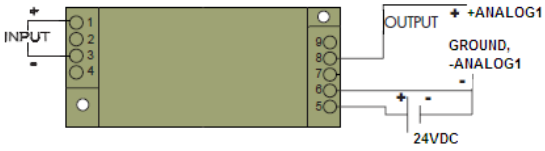
CR5220
4 - 20 mADC Output

AC Current sensor (4~20mA out)



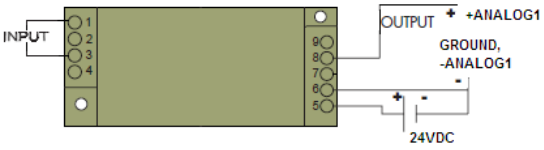
CR4120 One Element 4 - 20 mADC Output

DC Voltage sensor (0~±5V out)



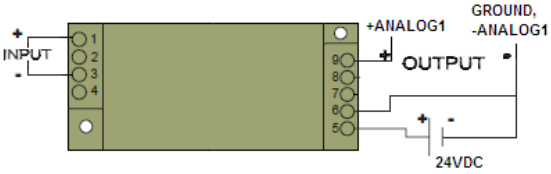
CR5310
0~±5VDC Output

AC Voltage sensor (0~5V out)



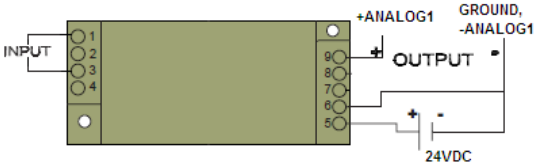
CR4510
0~ 5VDC Output

DC Voltage sensor (4~20mA out)



CR5320
4 - 20 mADC Output

AC Voltage sensor (4~20mA out)



CR4520
4 - 20 mADC Output

SETUP:

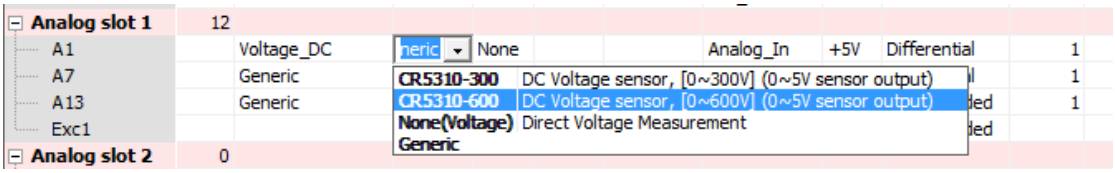
Before changing the logger's setup select:
5> ACQ OFF (press [**5**] and [**ENTER**].

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

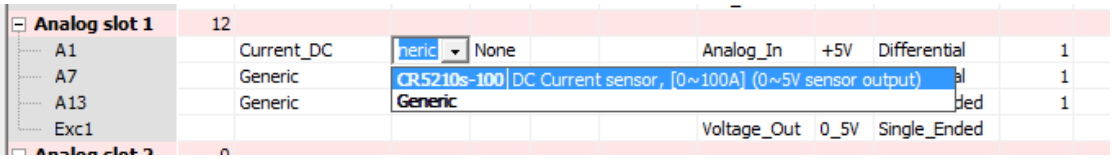
to start acquisition (data logging).

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.

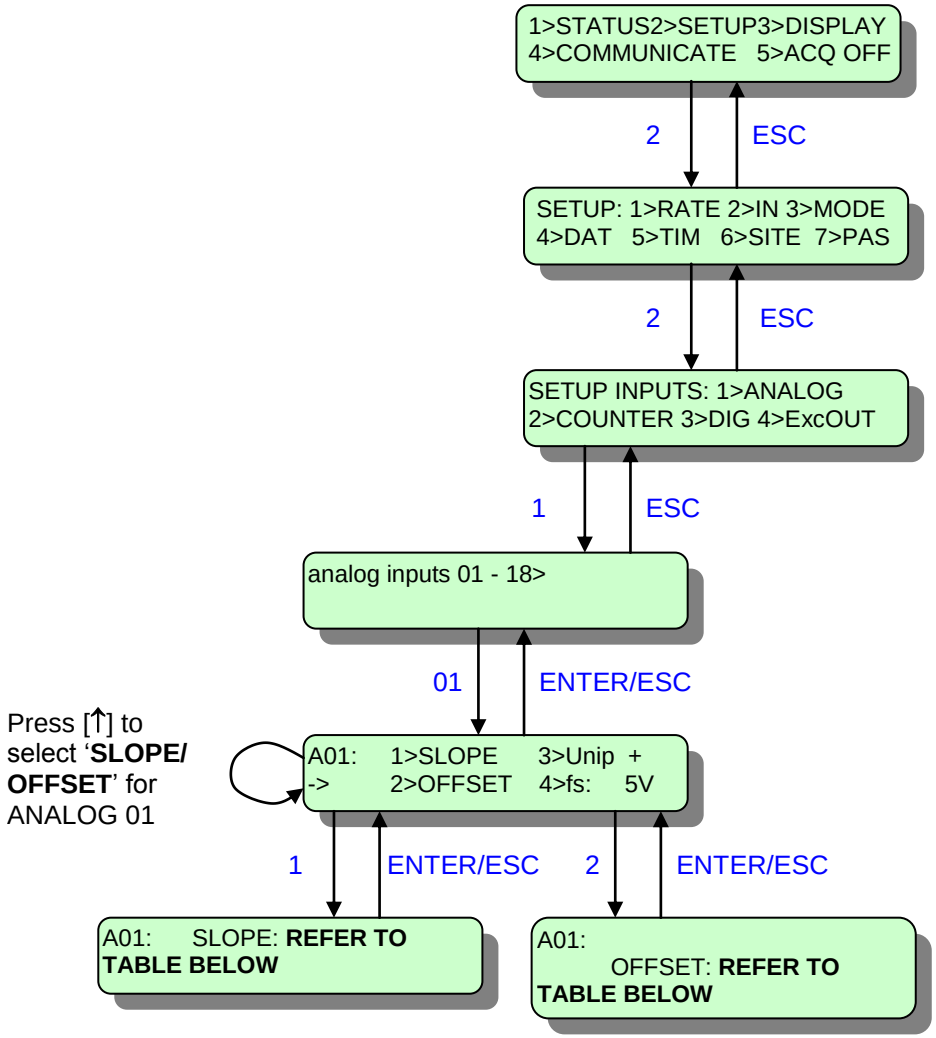


- For a **voltage** sensor , select an analog channel's line, eg A1. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module suitable for voltage sensor output (eg Card 12), or for current sensor output (eg Card 13) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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 plugged a Card 13 in the datalogger's slot, and 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). For each combination of analog module (Card12/13) and measurement (Voltage_DC/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. For each 3 channels you wish to use (A1-A7-A13, A2-A8-A14, etc), make sure that you have plugged the suitable analog module suitable for voltage sensor output (eg Card 12), or for current sensor output (eg Card 13) in the corresponding datalogger slot. When the setup is read,it will be recognized and appear in the corresponding 'Card' field.
- 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 plugged a Card 13 in the datalogger's slot, and you have selected 'Current_DC' before, click the 'Sensor' field and select 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). For each combination of analog module (Card12/13) and measurement (Current_DC/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.

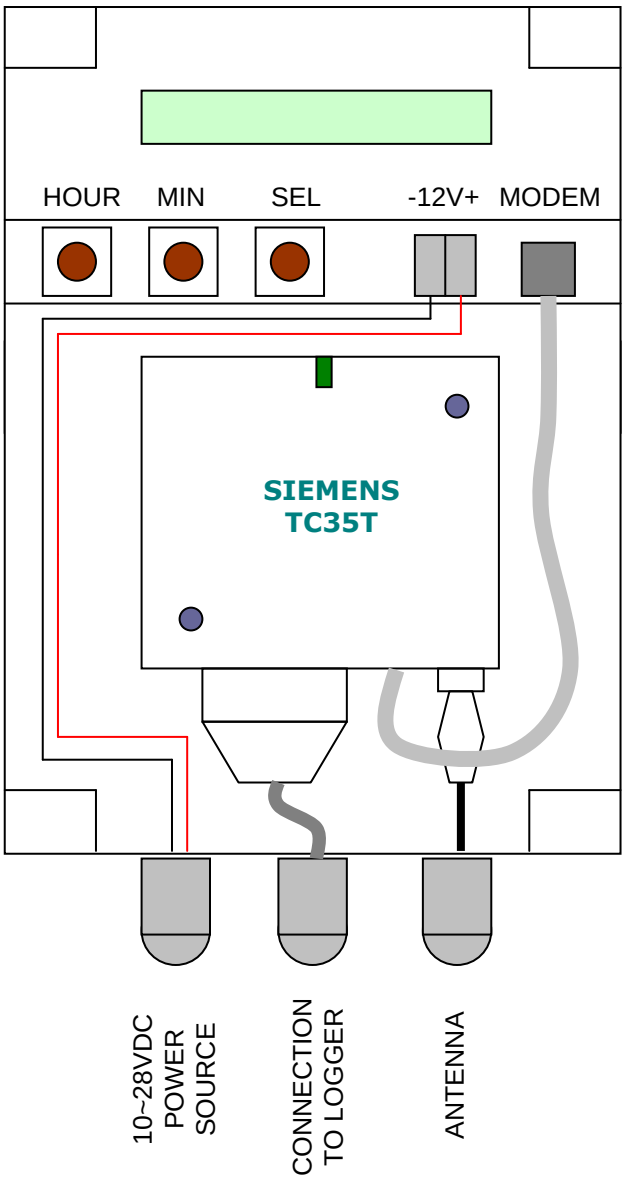
b. Manually



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

21. SYMMETRON TIMER FOR TC/MC35T MODEM

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



TIMER SETUP

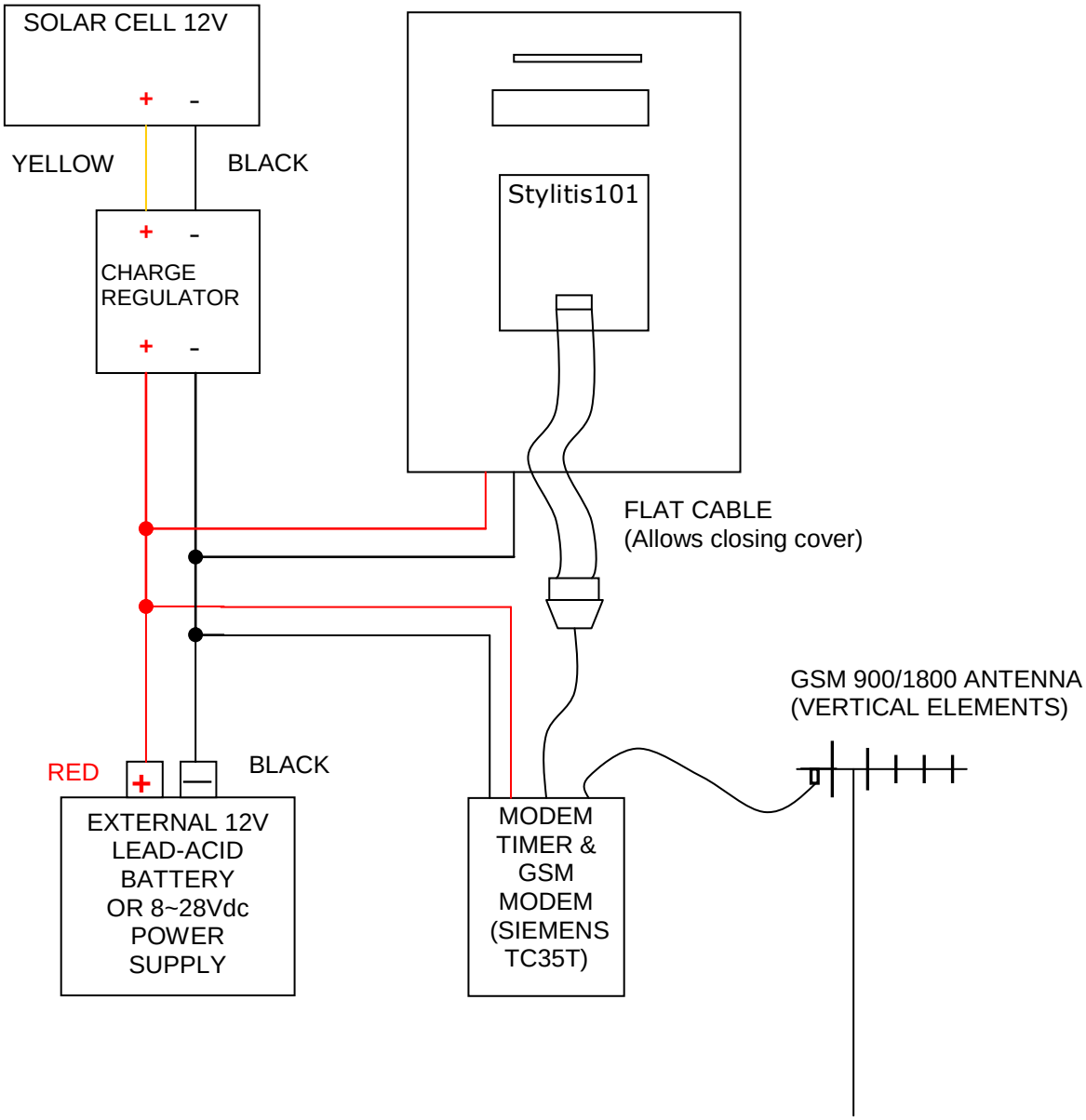
1. Includes a back-up cell to keep setup and time for at least 3 years. Without an external power supply the modem and the display are always off. Protected from reverse supply connection. Power supply: 10~ 28VDC, 2mA. Enclosure: IP65, 20x12x7cm (includes modem). Operation temperature: –30 ~ +70°C.

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.

22. BATTERY, SOLAR CELL AND TIMER

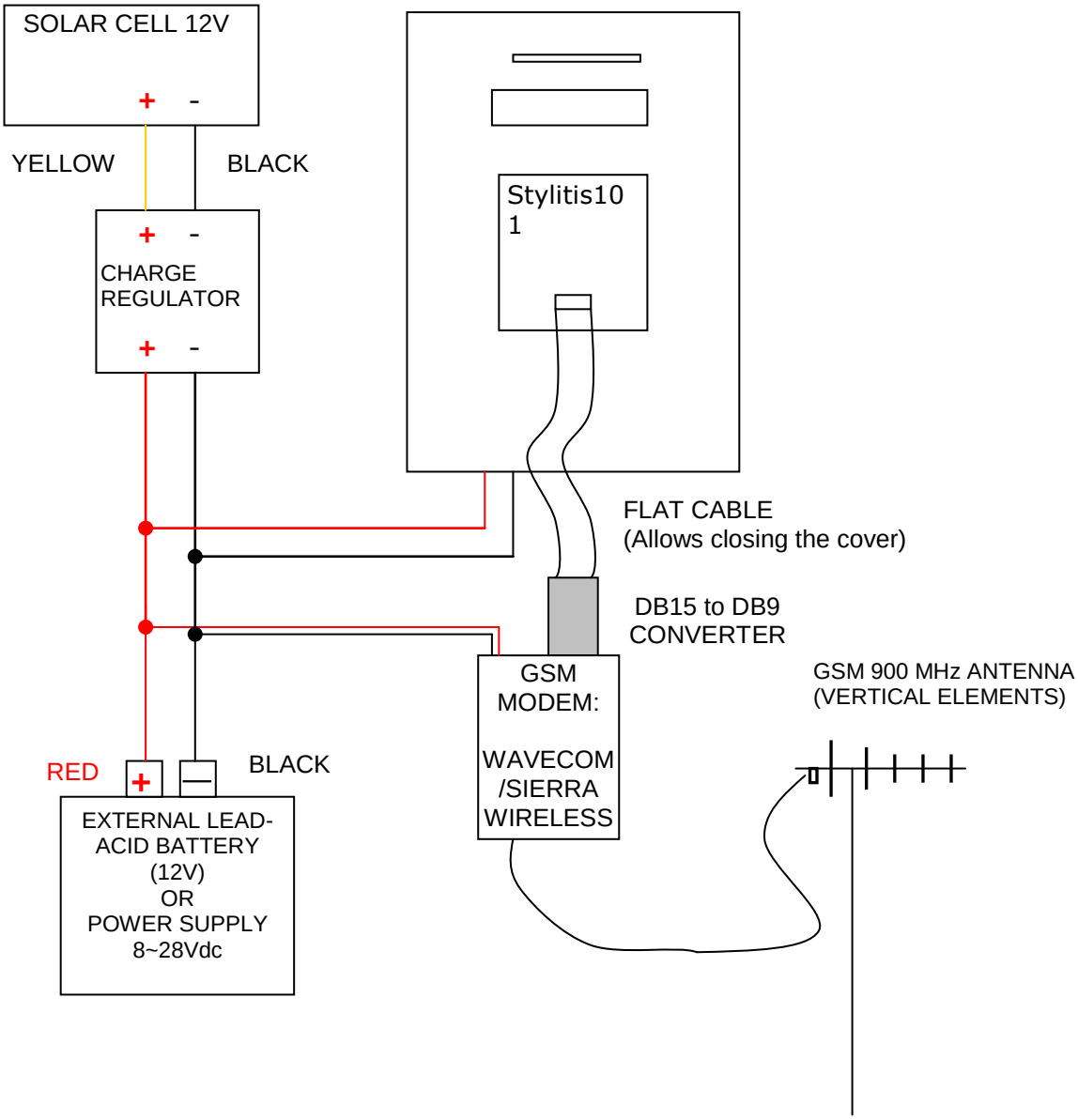
CONNECTION SIEMENS TC/MC35T:



SIEMENS TC35T/MC35T 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 WAVECOM/SIERRA WIRELESS FASTRACK:

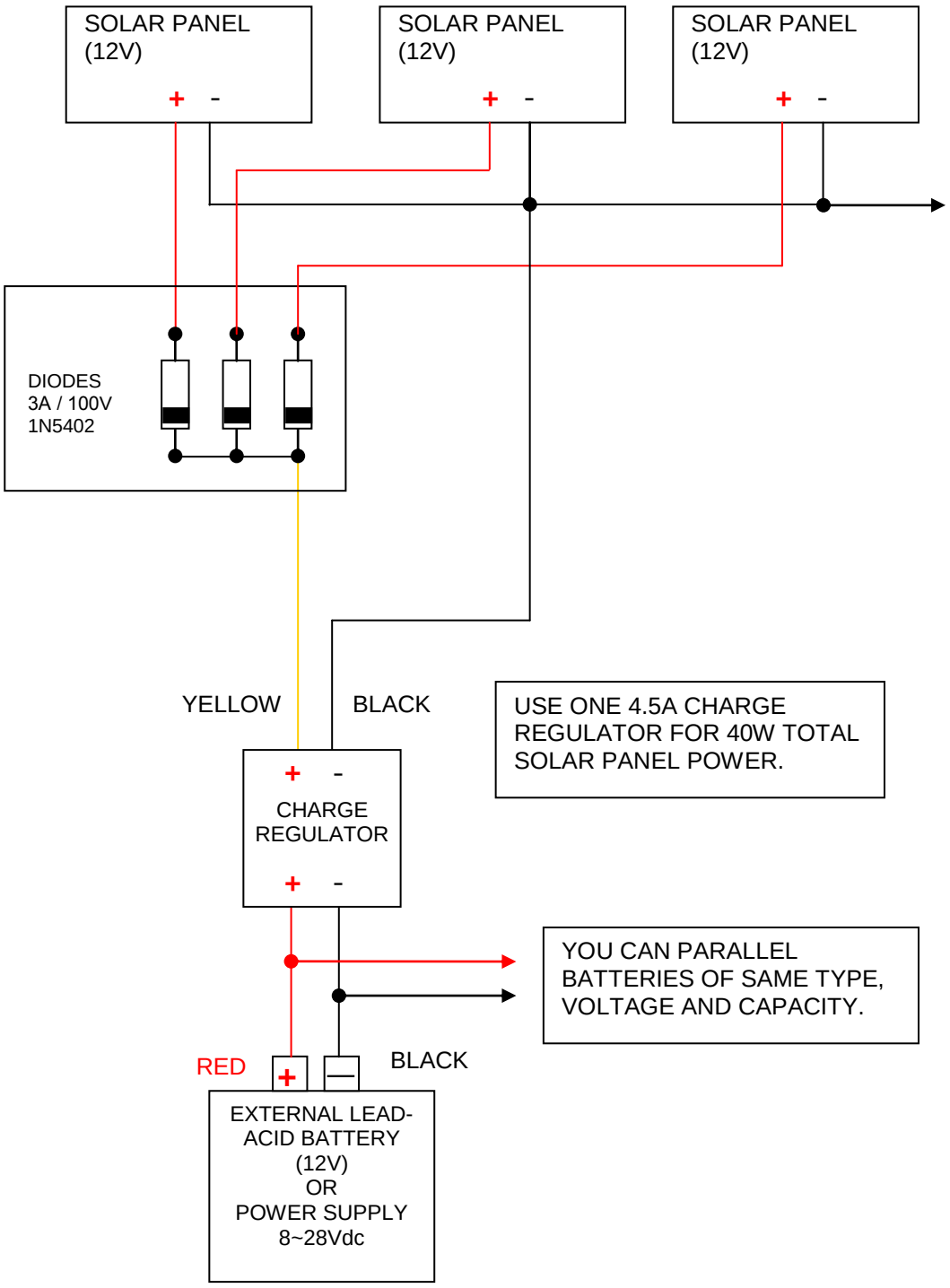


WAVECOM/SIERRA WIRELESS FASTRACK MODEM SETUP

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:



23. 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 or select 1>STATUS, 3>CARD, and finally press (-) to fix the error.
CF 1 GB OK TRANSFERING DATA…	When a Compact Flash card is inserted and ACQ is ON, the buffer's data are being transfered.
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.

24. 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 [EXCITATION OUT] outputs on the screw terminal.
- Correct measured value is +5V.

2. ANALOG INPUT CHECK

- From the main menu select: SETUP>IN>ANALOG and set all inputs (A01~A18) to SLOPE=1.0 and OFFSET=0.0
- Connect an [EXCITATION OUT] output to the analog input you want to test.
- From the main menu select: DISPL>ANALOG
- Correct value is 5V.
- Do not connect an [EXCITATION OUT] output to an analog current input.

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 (C01~C06) with SLOPE=1.0, OFFSET=0.0 and 'TTL'.
- From the main menu select: SETUP>MODE>ENERGY SAVE>[ENTER]
- Connect an [EXCITATION OUT] output to the counter input you want to test.
- From the main menu select: DISPL>COUNTER
- Correct measured value is '1.0'.

25. CONNECTION EXAMPLE