

STYLITIS-101 USER'S MANUAL



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Made in Greece.

CONVENTIONS USED IN THIS MANUAL

Symbol	Meaning
	To avoid injury of personnel and/or damage to the instrument the operator must refer to the user's manual.
	Calls attention to a procedure or condition which, if not correctly performed could result in damage to the instrument.
1>	Represents a menu item in the display.
[1]	Represents a key in the front panel



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MANUFACTURER'S DECLARATION OF CONFORMITY

I, the undersigned, hereby declare that the equipment specified conforms to the below Directives and Standards.

Standards to which Conformity is Declared

EMC Emissions: EN55022, EN61000-4-3

EMC Immunity: EN61000-4-2, EN61000-4-4, EN61000-4-5, EN61000-4-6

Safety: EN61010-1

Description of Equipment

Data recording and logging instruments.

Model

Stylitis-101

Batch of product covered

Serial numbers: from 50 to 2000

Date and Place

Pikermi, Attica, Greece, December 31, 2002.

Authorized signatory on behalf of the manufacturer

N. Hadzidakis

Name: N. E. Hadzidakis

Title: Director

N. Hadzidakis – T. Katsabakou Co.

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1. INTRODUCTION

Stylitis-101 is designed to make the collection of technical measurements easy and safe. As such, it allows you to:

- ❑ Communicate through the built-in display and keyboard.
- ❑ Connect various types of industry-standard sensors like Low-voltage bridge sensors, 4~20mA-output sensors, frequency-output sensors, anemometers, vanes, pyranometers, thermometers, etc.
- ❑ Program a time interval, over which the instrument will perform mathematical operations, including minimum, maximum, average and standard deviation. (Math mode).
- ❑ Program the sampling rate at 1,2,4,8,16 or 32Hz, individually for each input. (Time-series mode).
- ❑ Store the input data or math results in the internal buffer or in external (removable) Compact Flash memory cards.
- ❑ Use the serial interface to download buffer contents or as a substitute for the built-in display and keyboard.

The above operations are performed simultaneously without affecting the integrity of the acquired data (see block diagram, *Figure 1*).

USING STYLITIS-101

The Stylitis family of data loggers can operate in several different ways, depending on your application (refer to *Figure 2*):

1. **As a stand-alone unit.** You can leave the logger unattended for weeks or months, conditioning and recording input signals. Data are compressed and stored in the internal buffer or in removable Compact Flash

cards. If the card is not new or if it has not been used only in the specific datalogger, it induces the user to press button [1] to clear the card. Cards can be replaced without interrupting the acquisition process. Using the supplied software (Opton 4) one can read the card via a Compact Flash reader and convert compressed data to ASCII text files organized in columns for further processing.

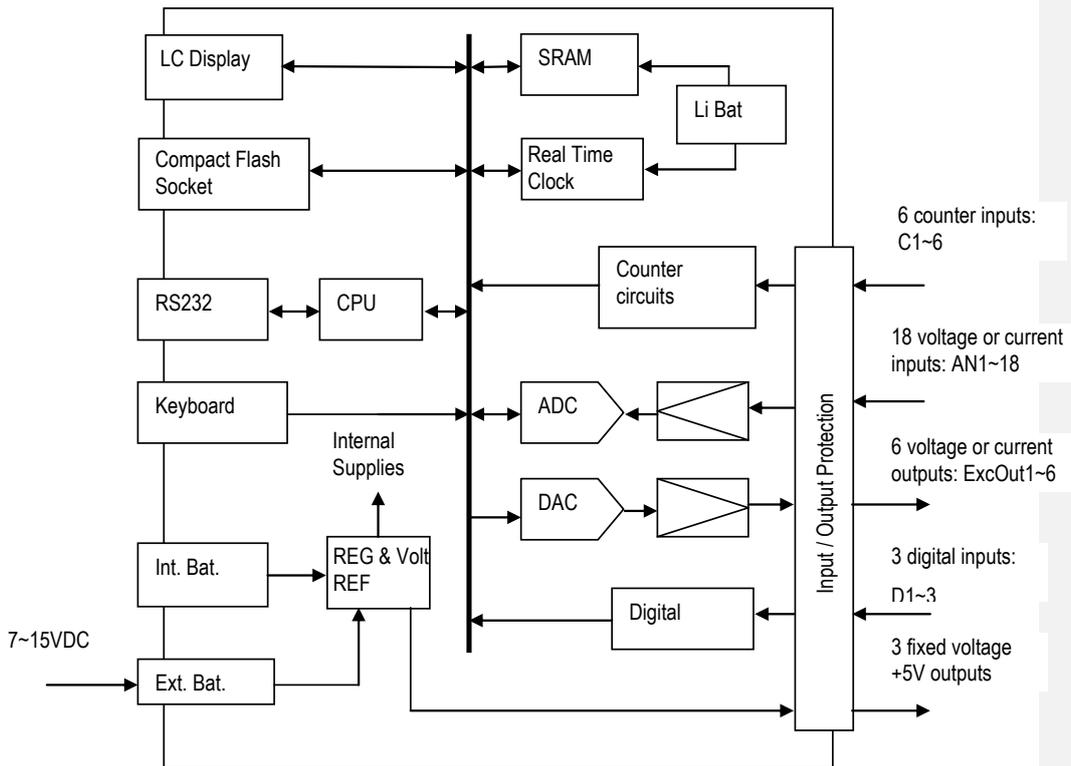
2. **As a stand-alone unit with on-line data transfer.**

Storage is done as above. Data are transferred to the PC for further processing via the serial port. Connection between the logger and the PC can be done using a serial cable, a modem (wired or wireless) or a LAN. A COM port, a modem or an Ethernet adapter, respectively, is required on the PC. The supplied Stylitis software is used for the above operations, as well as, the conversion of compressed data to ASCII text files.

3. **As an on-line front-end unit.** It conditions, samples and transfers signal measurements on-line to a computer for further processing and storage. The user's program issues a command, which is used to transfer data. Connection between the logger and the PC can be done using a serial cable, a modem (wired or wireless) or a LAN. See 4. **POWER...**

For a detailed description read the following pages. Technical support is available at (+30)-2106044084 or e-mail address info@symmetron.gr

Figure 1: Block Diagram



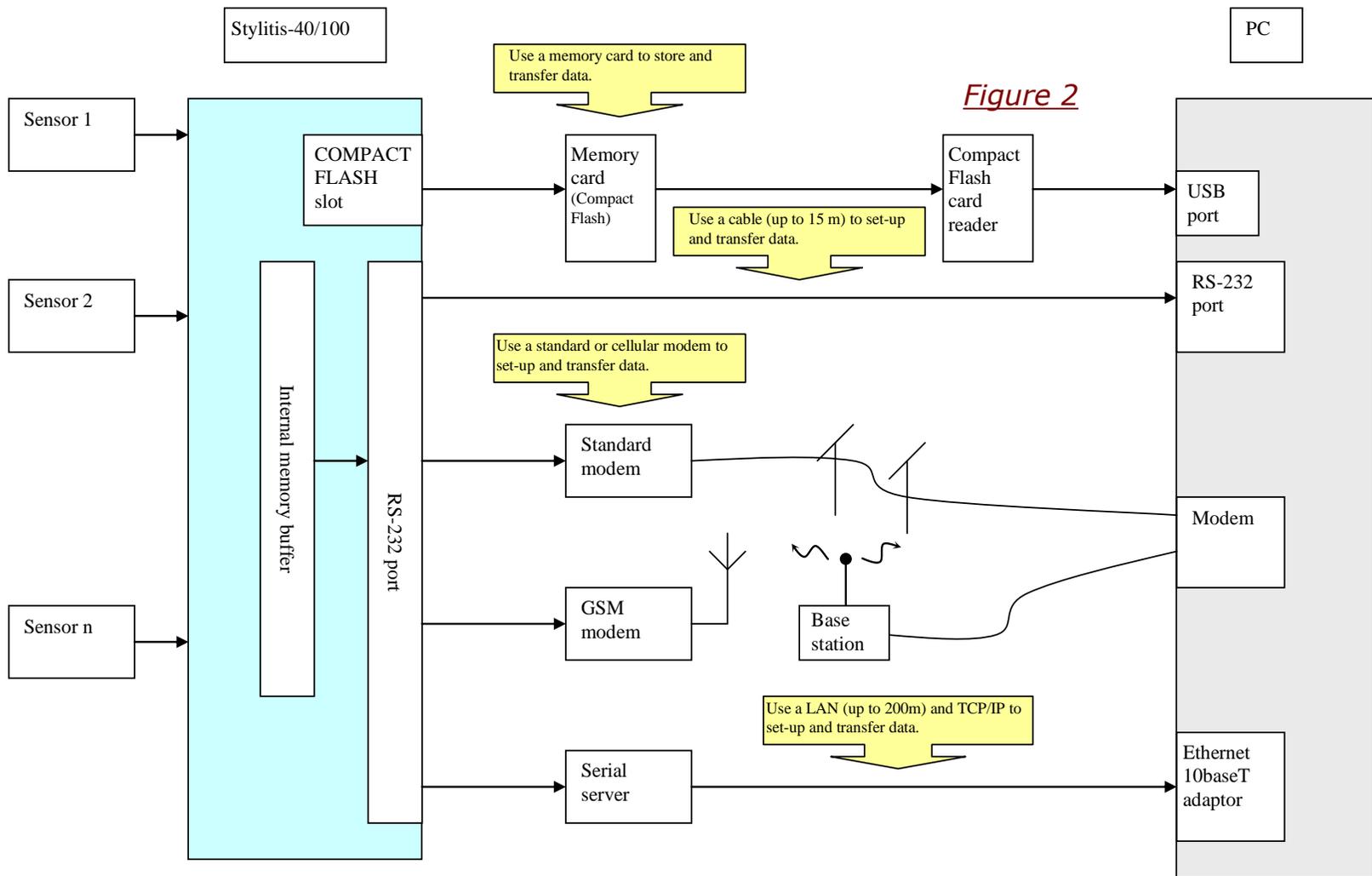


Figure 2

2. USE & SAFETY

EXTERNAL DESCRIPTION.

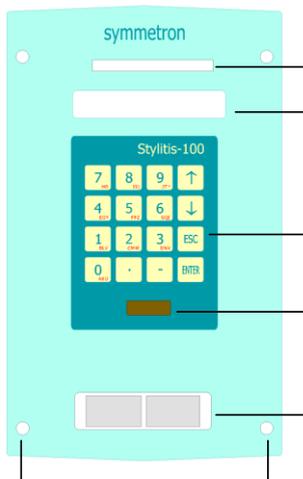


CAUTION

Do not:
- destroy
- overheat
- short-circuit
- charge dry cells.

If the instrument will not be used for a long time, remove the dry cells.

Front Panel



Compact Flash memory card slot. Push the card in with the logo on the upper side.

Liquid crystal display.

Keypad.

RS232, D9M connector for connection to a PC, modem or Ethernet adapter.

2xPP3 (9V) cell drawers. To open the drawers pull out while pushing upside. Alkaline cells are recommended.

4x front panel screws. Remove to replace the power supply fuse.

Box right-side panel

(Terminal description inside box cover)



Ground bolt. It is connected to the internal instrument shield. Usually connected to earth.



CAUTION

The fuse used must of the specified rating. Never short-circuit the fuse holder.

FUSE REPLACEMENT.

The instrument uses a 315mA power supply fuse, which must be replaced if blown (supply voltage out of limits). It can be found on the upper-left side of the main printed circuit board, after removing the 4 screws that hold the front panel in place. Make sure you have removed the external supply and dry cells before attempting the replacement.

KEY SEQUENCE



1> | 1>

1> | 2>

1> | 3>

1> | 4>

1> | 5>

2> | 1>

2> | 2>

2> | 3>

2> | 4>

2> | 5>

2> | 6>

3. USER INTERFACE & FUNCTIONS SUMMARY

(See also APPENDIX C)

Use the display/keyboard to:

- Check firmware version.
- Check battery voltage (due to a protection, diode *internally* the battery voltage measures about 0.6V less than actual value). The logger operates with *internal* voltages greater than 6.25VDC and less than 15VDC.
- Check COMPACT FLASH card status and remaining capacity. COMPACT FLASH memory cards may be used to hold large amounts of data. See 10. **DATA...**
- Check buffer status and remaining capacity. See 10. **DATA...**
- Verify system activity. This is a summary of basic settings.
- **Either** setup an averaging interval. See 8. **MATH...**
- **Or** setup sampling rates. See 9. **TIME SERIES...**
- Setup input parameters. See 7. **INPUTS**
- Setup Energy Save or Continuous logger operation mode. This menu also selects the 'PC SYNC' operation - see 4. **POWER...**
- Setup acquired data processing: Store sampled Inputs (Time Series) or perform statistics (Math).
- Display and change the internal Real Time Clock time/date (key-in new values).
- Enter the site identification in alphanumeric characters. Use the dot [.] to change the keyboard character set.

2> | 7>

3> | 1> 2> 3>

4> | 1>

4> | 2>

4> | 3>

5>

- ❑ Set/Clear the Password. Enter all zeroes to disable password. See **14. PASSWORD**
- ❑ Display the current value of an input and the minimum, maximum and average of the last interval (in math mode).
- ❑ Download measurement data via the RS232 port - see **15. COMMUNICATION**
- ❑ Check for existence of a modem. If a GSM modem is connected display network operator and signal level.
- ❑ Check a SIM card's PIN. 'READY' is displayed if SIM is ready for use, otherwise a valid SIM PIN is asked for. Then, the logger will unlock the SIM card.
- ❑ Start or Stop ACQuisition. In stopped acquisition state no data are recorded and the internal buffer is cleared. See **11. RECORDING...**

- 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 if ACQUISITION is OFF.

4. POWER MANAGEMENT

Three operating modes are available:

➤ **ENERGY SAVING MODE**

This is the default operating mode. The unit is in standby mode and is awakened once per second to measure, calculate and store results. This results in long battery life, since it is active only one 50th of the time. The LCD is off.

Depressing a key for at least one second activates the LCD display, allowing interface with the user.

Stylitis-101 automatically reverts to standby mode if there is no user activity for about 1 minute.

➤ **CONTINUOUS OPERATION MODE**

This mode holds the unit continuously activated, thus greatly reducing battery life. However it is useful if you want to continuously display an input for checking purposes.

Continuous mode is also enforced when a sampling rate faster than 1Hz is selected.

When set for continuous operation, Stylitis-101 does not automatically switch to standby mode. You will have to manually set the operation mode back to 'Energy Save'.

➤ **PC SYNC MODE**

'PC SYNC' enables on-line operation with a computer connected to the serial port. A user software can setup the logger and read measurement data in real-time. *This is done simultaneously and does not intervene with data logging.* For more information refer to application notes AN100-3 and AN100-4.

5. MEASUREMENTS

Stylitis-101 is capable of directly measuring voltage, current, resistance, frequency and events.

With suitable sensors the above electrical quantities are translated to:

- Wind speed, direction and wind-turbine power curves. Interfaces to virtually every type of anemometer and wind vane.
- Temperature, humidity, pressure.
- Solar radiation, rain height, water speed, water level, etc.

Sensors must provide an analog voltage, an analog current or a frequency signal in the range of 0~5kHz.

6. OUTPUTS

The programmable analog excitation outputs (V. EXC or EXC OUT) are capable of supplying **voltage** up to a TOTAL of 100 milliamps or **current** up to 5mA each, with an accuracy of $\pm 0.2\%$, see [APPENDIX A](#).

- In ENERGY SAVE mode, all these outputs are pulsed to conserve battery power. They are on for about 5 milliseconds every 1 second. Thus the average current drawn from the battery (in addition to the one listed in the specifications) is $1/200^{\text{th}}$ the total analog supply current
- In CONTINUOUS mode the outputs are constantly ON.

Similarly, the counter supply outputs (+5V FIXED) can supply up to a TOTAL of 10milliAmps with an accuracy of $\pm 5\%$. These outputs are not pulsed. Thus, the average current drawn from the battery is the same as the total counter supply current.

For specifications see chapter 17.

For connection examples refer to [APPENDIX B](#).

You can program the outputs using this sequence:

```
2>SETUP |
2>IN |
4>Vexc or
ExcOUT.
```

CAUTION

Do not apply an external voltage to the instrument outputs.

7. INPUTS

Inputs are set by selecting the **IN** option from the **SETUP** menu.

➤ ANALOG INPUTS

The analog section has from 0 to 18 inputs, depending on the number of analog modules installed. The resolution is 12 bits.

INPUTS 1-18. Input modules, as described in **APPENDIX A**, define the characteristics of analog inputs. The following options however are generally available on all inputs:

- ❑ **NOT USED.**

- ❑ User selectable **1>SLOPE** and **2>OFFSET** values are applied on acquired data:
Scaled input = (slope x input voltage) + (offset).
Math operations are performed on scaled inputs. These include minimum, maximum, average and standard deviation.
The input can also be set to **3>UNIPolar** or **3>BIPolar** mode for unipolar or bipolar signals. The **4>FS** (full scale) selection allows for hardware amplification of input signals from 1~1000 times. Remember, however, that the input signal **MUST NOT** exceed the **FS** selection (see **APPENDIX A**).

- ❑ **VANE** input, for wind direction measurements (**only for low-voltage inputs**). An input voltage between 0V and 5V corresponds to an angle of 0~360 degrees with a resolution of 1.4 degree (VANE type has 8 bit resolution). Math operations include vector minimum, maximum, average and standard deviation. Vane math is **NOT** the

To setup vane and analog input parameters:
Select an input, 01-18. Then use [↑] or [↓] to select option.

CAUTION

Do not apply a voltage exceeding the maximum permissible ($\pm 20V$) on voltage inputs. Do not apply a current exceeding the maximum permissible ($\pm 100mA$) on current inputs.

arithmetic average; a vector-averaging algorithm is used to ensure true calculation of angle averages.

The user can freely set the zero degree **offset** in degrees (0~359). This is the actual vane zero in respect to the north. 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.

- 4. **TEMPERATURE PT100**. The logger is connected to a PT100 RTD temperature sensor as shown in **APPENDIX B**. Linearization is performed internally throughout a range of -50°C~+150°C. Math is performed as above.

➤ ADVANCED APPLICATIONS OF ANALOG INPUTS.

BRIDGE CONNECTION

In the '**SLOPE & OFFSET**' menu, you can use the dash [-] to switch input type between PLAIN INPUT (A) and BRIDGE (B). A bridge connection changes a module's type to work as follows:

The first differential voltage channel (i.e. ANALOG1) is used for measuring the bridge output.

The second differential voltage channel (i.e. ANALOG7) is used as a sense connection for the excitation voltage to ensure that it has the correct value on the sensor's terminals despite the length of the connecting cables.

For many bridge-type sensors it is useful to zero the output when in steady state. Use the menu keys to display the channel used as bridge input (i.e. ANALOG1). Then push the [0] key to start the **Auto-Zero** process. This automatically adds a small current to one bridge arm in order to **balance** it's output to zero. If you want to **cancel** the Auto-Zero balance action press the dash [-] key.

See **APPENDIX B** for connection example.

To setup anemometer and counter parameters: Select an input, 1-6. Then, use [↑] or [↓] to select option.

➤ COUNTING INPUTS.

The counter section has from 3 to 6 inputs, depending on the number of analog modules installed. The resolution is 16 bits (0~65535 counts).

INPUTS 1~3. These are **built-in** counting inputs. Input threshold is selectable: low-level AC (SIN) or pulse (TTL) type. Resolution is 0.5Hz.

INPUTS/OUTPUTS 4~6. Optional plug-in modules, as described in **APPENDIX A** make these channels either **counter inputs** or **state outputs**.

The following options are available on all modules with counter inputs:

❑ **NOT USED.**

❑ **ANEM** input.

Input frequency (counts per second) is scaled with user selectable slope and offset values: Wind speed (km/h) = (slope x input frequency) + (offset).

Math operations include *minimum, maximum, average and standard deviation*.

Output (calculated) range: 0~400.0 user-defined units. Resolution is 0.1 units. Examples of units are m/sec, km/h, etc.

The anemometer's manufacturer gives slope and offset values. For instance, the NRG-Maximum #40, has a slope = 0.765 m/sec/Hz, and an offset = 0.35.

From the TYPE menu press the corresponding numeric key to change anemometer or counter input type between Low Level AC (SIN), Digital (TTL) or Switch (REED).

CAUTION

Do not apply a voltage exceeding the maximum permissible ($\pm 20V$) on counter or digital inputs.

- ❑ **FREQUENCY COUNTER.** Slope and offset are fixed at 1.0 and 0.0 respectively. Math operations include minimum, maximum, average.
- ❑ **EVENT COUNTER.** Counts events (pulses) per averaging period (1 minute through 1hour).

➤ **DIGITAL INPUTS.**

This is a group of 3 digital inputs (state inputs 1/0 corresponding to 5V and 0V). The available options are **USED** and **NOT USED**. If **USED** is chosen they are stored as a byte with bits 2:0 representing digital inputs 3, 2, 1 respectively (bits 7:3 are always zero). Math operations include minimum and maximum.

8. MATH PROCESSING

The analog and counting inputs selected are measured and temporarily stored once per second. Averaging intervals are selectable at 1, 2, 5, 10, 15 or 60 minutes.

Following the completion of an averaging interval, the math functions are performed and the results are stored in the internal buffer or the COMPACT FLASH card. See also, 7. **INPUTS...**

Math calculations include **minimum, maximum, average and standard deviation**. The standard deviation is calculated using

the formula: $SDV = \sqrt{\left(\frac{\sum x^2}{n} - AV^2\right) \frac{n}{n-1}}$, where n is the number

of the samples and AV the average of the samples in the averaging interval.

Stored data format for the various input types is:

	ANEM	FREQ	ANALOG VANE	ANALOG
Minimum	xxx.x	xxx	xxx.x	xxxx.xxx
Maximum	xxx.x	xxx	xxx.x	xxxx.xxx
Average	xxx.xx	xxx.x	xxx.x	xxxx.xxx
SDV	xxxx.xxx		xxx.x	xxxx.xxx

The stored data have are marked with a **time stamp** for extra protection. The time stamp marks the end of the statistic interval.

9. TIME SERIES OPERATION.

Input values are sampled, scaled and stored. Math is not performed. The sampling rate **for each channel** is user selectable, and takes one of the following values: 1, 2, 4 ,8, 16 or 32 Hz. Stylitis-101 is automatically switched to 'Continuous' mode for sampling rates greater than 1.

Although each channel separately can have its own sampling rate (up to 32Hz), for the datalogger's proper operation, not all channels can sample simultaneously at 32 Hz.

The channels are 25: 6 counters, 18 analog channels and 1 digital (the 3 digital ones are calculated as 1, see **7.INPUTS**)

It is recommended that the sum of the frequencies of the used channels does not exceed the number 200. E.g., if all channels are used and are sampling at 8 Hz, the sum is $8 \times 25 = 200$.

10. DATA STORAGE/RETRIEVAL

Three types of storage media can be used, each one having its own strengths.

➤ INTERNAL BUFFER.

The internal buffer's size of 512Kbytes is enough for several applications. For example, to record data using one anemometer and one vane, with a 10min-averaging interval, it will suffice for 212 days. A memory card is NOT permanently required, thus reducing operating costs. Data can be retrieved two ways:

1. By placing, for a few seconds, a compatible memory card (see below) in the slot. Data are transferred to the card and recording continues uninterrupted.

- During the acquisition in the internal buffer (with no card), you can put a card in the datalogger and clear it, if it is not clear, via the [1] button. Only after that data will be able to be recorded in the card.
- Then, the data which have already been recorded in the internal buffer will be transferred in the card almost immediately. That is, either the 'CARD ERASED ok' message will appear in the datalogger's screen, in case you clear the card, or the message indicating its size will appear, along with an 'ok'. Right next, the 'TRANSFERING DATA' message will appear. When it disappears, you can remove the card. If you do not,, the file which has been created in the card, and contains these data, will continue to be recorded.

2. By downloading buffer contents through the serial port, see [15. COMMUNICATION...](#)

- ADVANTAGES: Low Operational Costs.
- DISADVANTAGES: Restricted size.

COMPACT FLASH MEMORY CARDS

The size of the above cards is enough for virtually all applications. (E.g. for data of one anemometer and one windvane, with a 10 minute interval, a 256 Mbytes card will last for 3737 months).

Each time a new card is inserted in the datalogger, it must be cleared. The datalogger warns you with the corresponding message and induces you to do so by pressing the [1] button.

The card is recognized and initialized by inserting it into the Stylitis-41 slot. A header is put on it including a serial number, the site name and the insertion time. Therefore, if you remove the card and re-insert the same one later, it will be recognized by the datalogger and you will not need to clear it.

By inserting the card in the slot of a Compact Flash card reader, connected to a computer USB port, data are retrieved via the Opton 4 software.

- ADVANTAGES: High capacity. Low cost. No Battery.
- DISADVANTAGES: None.

When acquisition is on: No parameter change is allowed.

When acquisition is off: Parameter change is allowed.

11. RECORDING & FILING SYSTEM

- Starting (ON) acquisition means:
 1. Open a new file on a memory card (if one exists).
 2. Start recording with the set parameters.

- Stopping (OFF) acquisition means:
 1. Stop recording.
 2. Close the file on a memory card (if one exists).
 3. Clear the internal buffer.

- When using memory cards keep in mind the following tips:
 1. Multiple files (acquisition sessions) can exist on the same card. If you stop the current acquisition and start a new one, a new file is created with a new number and a new start date and time.
 2. Full cards are replaced without loss of data and without turning OFF the acquisition. In the meantime, data are kept in the buffer.
 3. Accidentally removing and reinserting a card does not result in data loss. The system recognizes it is the same card and (provided there is space) continues storing data in a new file.
 - Only the lastly inserted card is recognized by the system. You can withdraw and reinsert the same memory card as many times as you wish. But changing the Compact Flash card means that recognition and initialization of a card is done only if the card is new and not used. Otherwise, the datalogger induces you to clear it by pressing the [1] button (refer to: **10. DATA STORAGE...**).

12. DATA POST PROCESSING

A card's recorded data are transferred to a PC for processing when you insert the card to the slot of a Compact Flash card reader, connected to a computer USB. To save space, data are stored compressed.

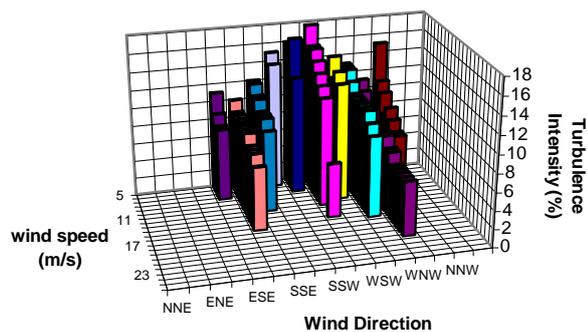
Moreover, the data can be retrieved directly from the datalogger, via its serial port, either locally or via modem (see [15. COMMUNICATION VIA THE SERIAL PORT](#)). Via Opton 4 software, you can download data either from the internal buffer or from the card (if there is one).

- When you download data from the **internal buffer**, (with no card), with acquisition ON, after the download, Opton 4 asks you if you wish to clear it or not. In the second case, the recording will be continued, by incrementing the size of the internal buffer's data file. The 'BUFFER REMAINS' message will appear in the datalogger's screen.
- When you download data from the **card**, there are two options:
 1. To download a previous file, by typing its number in the Opton 4's window. In this case, if the acquisition is ON, then the recording in the current file continues uninterrupted (it is not affected by the download).
 2. To download the Compact Flash (files) Directory. Afterwards, you may mark specific files from the directory to download. Again, if the acquisition is ON, then the recording in the current file continues uninterrupted (it is not affected by the download).
 3. To download the most recent file ('*Most recent file*' option). In this case, if the acquisition is ON, the file closes before it is downloaded and then it is downloaded. After it has closed, a next file opens (is created), in which the acquisition continues.

Data records are decompressed to columns using **Stylitis**, a PC program that comes with the unit. Further data manipulation and processing is possible using standard available software like Excel, Axum, etc.

'Windrose', an optional software suitable for Wind/Meteorological analysis is also available. It accepts the decompressed output and produces graphs, tables, etc. in industry-standard format. Please contact Symmetron for details.

Windrose graph



13. DATA SAFETY

To ensure correct data acquisition and protect stored data and settings the **Power Supply** is continuously checked. If battery voltage is found to be less than 6.25V then acquisition stops. The acquisition restarts when battery voltage rises above 6.75V. If battery voltage falls below 5.15V the system shuts down and stops responding to external stimuli.

14. PASSWORD

Stylitis-101 allows you to set a password in order to permit access to it from qualified persons only. Using the **SETUP>PASSWORD** menu enter an alphanumeric word of up to 8 characters long (press [.] to enter alpha characters).

Password protection starts after the password is set and Stylitis enters Energy-Save mode. Any attempt to wake-up the data logger will result in asking for the password. If the correct password is not supplied within 4 tries, the logger will lock-up and can only be unlocked by Symmetron (either locally or remotely).

To disable the password protection you must enter 8 dashes [-] or zeroes [0].

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.

15. COMMUNICATION VIA THE SERIAL PORT

The RS-232 serial port comes as standard with Stylitis-101. It allows local or remote set-up and buffer data retrieval (it also allows Logger-to-PC on-line operation, see [4. POWER...](#)). The user interface, as appears on the PC screen is identical to that on the data logger.

The connector is a DB9Male with the following pin assignment:

- PIN 2 Transmit
- PIN 3 Receive
- PIN 5 Ground

Communication speed is fixed at 9600 baud with 8 data bits, 1 stop bit and no parity bit.

For the communication of Stylitis and the PC, connect the datalogger's serial port to a computer COM port via a DB9F to DB9F (female-female) straight cable. Next, run the Opton 4 software, by creating a local connection via the specific COM port to communicate with the datalogger.

You can also use a modem, by connecting it to the serial port via a NULL MODEM cable for remote communication with Stylitis (see [APPENDIX E](#)). Furthermore, you can use Symmetron's **Sym-o-net**, by connecting the datalogger's serial port to the DEVICE 1 port of the Sym-o-net, via a NULL MODEM DB9F to DB9M (female-female) cable. In this case, create a Diameson (GPRS client) connection via Opton 4.

For further information about the Sym-o-net and its settings and capabilities, please refer to its [User Guide](#).

16. SOFTWARE INSTALLATION

For software installation and using instructions refer to the README.TXT file on the 1st diskette or CD supplied with the unit.

17. TECHNICAL SPECIFICATIONS

INPUTS

Each individually selectable:

- *ANALOG plug-in (A1~A12)*: 12 differential inputs, 12bit each.
For input specifications see [Appendix A](#).
- *ANALOG plug-in (A13~A18)*: 6 single-ended inputs, 12bit each.
For input specifications see [Appendix A](#).
- *COUNTING built-in (C1~C3)*: 3 inputs, 16 bit each. Resolution 0.5Hz (2 counts per period). Accuracy ± 1 count. Input range: 0~5kHz. Input impedance: 1M Ω . Sensitivity: 100mV (SIN), 2V (TTL). **Maximum continuous input: $\pm 20V$**
- *COUNTING/OUTPUT plug-in (C4~C6)*: 3 inputs, 16 bit each.
For input specifications see [Appendix A](#).
- *DIGITAL built-in*: 3 TTL inputs, 1 bit each. Selectable as a group. Input impedance: 100k Ω . Sensitivity: 2V. **Maximum continuous input: $\pm 20V$**

OUTPUTS (SENSOR SUPPLY)

- *3 built-in*, fixed 5V. Maximum total output current: 10mA. Accuracy $\pm 5\%$. **Maximum continuous time, short-circuit to Ground: indefinite.**
- Pulsed 0~6 depending on analog *plug-ins*. For specifications see [Appendix A](#).

PROTECTION

- All inputs/outputs are protected from transient overvoltages with spark gap arrestors and high-speed diodes.

SENSOR EXAMPLES

- Voltage, current, frequency, anemometers, vanes, pyranometers, thermometers, rain level, water speed, barometric pressure, pulse counting, etc,

DATA STORAGE

- *INTERNAL BUFFER*: 512Kbyte). Typical capacity (1 analog and 1 counting input, 10 min averaging): 212 days.
- *Compact Flash MEMORY CARDS*: up to 2Gbytes, FAT16 formatted.

DATA PROCESSING

- Math mode: Individually programmable slope and offset for each input. Sampling @ 1 Hz. Calculation and storage of Minimum, Maximum, Average and Standard Deviation selectable @ 1, 2, 5, 10, 15 or 60 minute intervals.
- Time series mode: Individually programmable slope and offset for each input. Individually programmable Sampling rate @ 1, 2, 4, 8, 16, 32 Hz.
- Real Time Clock with automatic lap year correction. Accuracy: ± 1 minute/ month.

SERIAL PORT

- *PROGRAMMING AND DATA TRANSFER*: RS232C port. 9600 baud, 8 bits, no parity, 1 stop bit. Socket is DB9M. Supports modems and Ethernet (LAN) adapters.

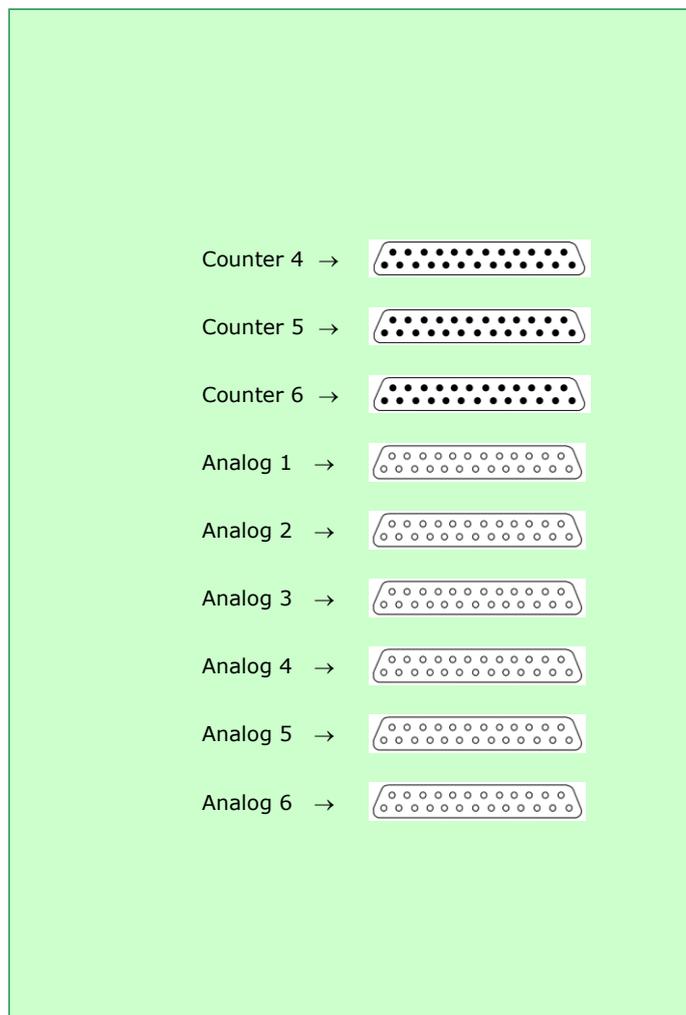
POWER SUPPLY

- *INTERNAL BATTERY*: 2x9V alkaline- typical life 2 weeks (Math mode, 10-min intervals).
- *EXTERNAL*: 6~15V, DC/AC typical consumption 1.5mA (LCD off) or 50mA (LCD on).
- **Maximum continuous power supply voltage: 18V**
- *OPTIONAL*: PV panel and internal rechargeable battery.

VARIOUS

- *ENCLOSURE*: IP65 sealed.
- *DIMENSIONS*: 31x21.5x17.5cm. *WEIGHT*: 4kg.
- *CONNECTORS*: Removable screw terminal strips on side.
- *OPERATING/STORAGE TEMPERATURE*: -30°C~ +70°C
- *LCD OPERATING TEMPERATURE*: 0-50°C

Module position on motherboard



A.1 COUNTER INPUTS.

A plug-in module conditions 1 counter input or output.

CARD-21. Color: [Blue](#)

A 'CARD21' counter **input** module is compatible with slots C4, C5 and C6. It features:

- ❑ Counter length 16 bits. Resolution 1Hz. Accuracy ± 1 count.
- ❑ Input range: 0~5kHz (TTL), 0~50Hz (REED). Input impedance: 100k Ω . Sensitivity: 2V.
- ❑ **Maximum continuous input: $\pm 20V$**

CARD-22. Color: [Brown](#)

A 'CARD22' counter **input** module is compatible with slots C4, C5 and C6. It features:

- ❑ Counter length 16 bits. Resolution 1Hz. Accuracy ± 1 count.
- ❑ Input range: 0~5kHz. Input impedance: 1M Ω . Sensitivity: 100mV (SIN), 2V (TTL).
- ❑ **Maximum continuous input: $\pm 20V$**

CARD-25. Color: [Black](#)

A 'CARD25' **output** module is compatible with slots C4, C5 and C6. It features:

- ❑ 'Open collector' output. Output resistance <0.5 Ω
- ❑ Maximum sink current 200mA with internal resettable fuse.
- ❑ **Maximum output voltage: 30V (transzorb protected).**

A.2 ANALOG INPUTS.

A plug-in module conditions 3 analog inputs. The 1st analog input has a channel number equal to the slot number. The 2nd input's channel number is equal to the 1st plus 6. The 3rd input's channel number is equal to the 2nd plus 6. For example a module plugged in Slot A2 has channel numbers of 2, 8 and 14.

The following table shows the channel configuration for all analog slots:

LOCATION Of module in motherboard:	CHANNELS 1~6 Set as 'A': Differential Set as 'B': Bridge	CHANNELS 7~12 Dependent on left column setting	CHANNELS 13~18 Independent
SLOT A1	CH1 A: differential input	CH7: differential input	CH13: Single-ended
	CH1 B: bridge input	CH7: bridge sense	
SLOT A2	CH2 A: differential input	CH8: differential input	CH14: Single-ended
	CH2 B: bridge input	CH8: bridge sense	
SLOT A3	CH3 A: differential input	CH9: differential input	CH15: Single-ended
	CH3 B: bridge input	CH9: bridge sense	
SLOT A4	CH4 A: differential input	CH10: differential input	CH16: Single-ended
	CH4 B: bridge input	CH10: bridge sense	
SLOT A5	CH5 A: differential input	CH11: differential input	CH17: Single-ended
	CH5 B: bridge input	CH11: bridge sense	
SLOT A6	CH6 A: differential input	CH12: differential input	CH18: Single-ended
	CH6 B: bridge input	CH12: bridge sense	

To select A or B type: go to one of the first 6 channels setup menu and use the [-] key.

Outputs are numbered according to the module number i.e. ExcOUT3 corresponds to a module in slot A3.

CARD-11. Color: Red

A 'CARD-11' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 differential voltage inputs. Differential input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ **Maximum continuous voltage input: ±20V**
- ❑ 1 single-ended current input. Input impedance 35Ω.
- ❑ **Maximum continuous current input: ±100mA**
- ❑ 1 programmable voltage-excitation output (referenced to common ground). Range: 0~5V. Resolution 0.1V. Accuracy: (±0.2% of setting)+(±5mV). Maximum total current output (all V-Excitation outputs): 100mA. In 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

For bridge (6-wire) connection the second voltage channel is used as a voltage sense input for the excitation output (see connections in **APPENDIX B**). This ensures correct voltage on bridge terminals.

Possible input ranges are shown in the following tables:

TYPE A: DIFFERENTIAL VOLTAGE. Voltage inputs AN1~AN12 used independently.					
TYPE B: VOLTAGE BRIDGE. Voltage inputs AN1~AN6 used together with inputs AN7~AN12 in 6-wire bridge connection.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.15 + 0.04
10	0~+0.5V	122µV	±0.5V	244µV	0.2 + 0.04
100	0~+0.05V	12.2µV	±0.05V	24.4µV	0.2 + 0.4
1000	0~+0.005V	1.22µV	±0.005V	2.44µV	0.2 + 2

SINGLE-ENDED CURRENT: Current inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
10	0~+20mA	4.88µA	±20mA	9.76µA	0.0 + 0.4
100	0~+2mA	488nA	±2mA	976nA	0.0 + 2
1000	0~+0.2mA	48.8nA	±0.2mA	97.6nA	0.0 + 20

CARD-12. Color: Green

A 'CARD-12' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 differential voltage inputs. Differential input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ 1 single-ended voltage input. Input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ **Maximum continuous voltage input: ±20V**
- ❑ 1 programmable voltage-excitation output (referenced to common ground). Range: 0~5V. Resolution 0.1V. Accuracy: (±0.2% of setting)+(±5mV). Maximum total current output (all V-Excitation outputs): 100mA. When in 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

For bridge (6-wire) connection the second voltage channel is used as a voltage sense input for the excitation output (see connections in **APPENDIX B**). This ensures correct voltage on bridge terminals.

Possible input ranges are shown in the following tables:

TYPE A: DIFFERENTIAL VOLTAGE. Voltage inputs AN1~AN12 used independently.					
TYPE B: VOLTAGE BRIDGE. Voltage inputs AN1~AN6 used together with inputs AN7~AN12 in 6-wire bridge connection.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.15 + 0.04
10	0~+0.5V	122µV	±0.5V	244µV	0.2 + 0.04
100	0~+0.05V	12.2µV	±0.05V	24.4µV	0.2 + 0.4
1000	0~+0.005V	1.22µV	±0.005V	2.44µV	0.2 + 2

SINGLE-ENDED VOLTAGE: Voltage inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.2 + 0.04
10	0~+0.5V	122µV	±0.5V	244µV	0.2 + 0.1
100	0~+0.05V	12.2µV	±0.05V	24.4µV	0.2 + 1
1000	0~+0.005V	1.22µV	±0.005V	2.44µV	0.2 + 10

CARD-13. Color: Grey

A 'CARD-13' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 differential current inputs. Input impedance 35Ω. Resolution: 4.88nA~4.88μA. Accuracy: ±0.2%.
- ❑ 1 single-ended current input. Input impedance 35Ω. Resolution: 4.88nA~4.88μA. Accuracy: ±0.2%.
- ❑ **Maximum continuous current input: ±100mA**
- ❑ 1 programmable voltage-excitation output (referenced to common ground). Range: 0~5V. Resolution 0.1V. Accuracy: (±0.2% of setting)+(±5mV). Maximum total current output (all V-Excitation outputs): 100mA. When in 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

Possible input ranges are shown in the following tables:

TYPE A: DIFFERENTIAL CURRENT. Current inputs used independently.					
TYPE B: VOLTAGE BRIDGE. NOT APPLICABLE					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
10	0~+20mA	4.88μA	±20mA	9.76μA	0.2 + 0.1
100	0~+2mA	488nA	±2mA	976nA	0.2 + 1
1000	0~+0.2mA	48.8nA	±0.2mA	97.6nA	0.2 + 10

SINGLE-ENDED CURRENT. Current inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
10	0~+20mA	4.88μA	±20mA	9.76μA	0.0 + 0.4
100	0~+2mA	488nA	±2mA	976nA	0.0 + 2
1000	0~+0.2mA	48.8nA	±0.2mA	97.6nA	0.0 + 20

CARD-14. Color: [Blue](#)

A 'CARD-14' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 differential voltage inputs. Differential input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ 1 single-ended voltage input. Input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ **Maximum continuous voltage input: ±20V**
- ❑ 1 programmable current-excitation output (referenced to common ground). Range: 0~5mA. Resolution 0.1mA. Accuracy: (±0.2% of setting)+(±5μA). When in 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

Possible input ranges are shown in the following tables:

TYPE A: DIFFERENTIAL VOLTAGE. Voltage inputs AN1~AN12 used independently.					
TYPE B: VOLTAGE BRIDGE. NOT APPLICABLE					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.15 + 0.04
10	0~+0.5V	122μV	±0.5V	244μV	0.2 + 0.04
100	0~+0.05V	12.2μV	±0.05V	24.4μV	0.2 + 0.4
1000	0~+0.005V	1.22μV	±0.005V	2.44μV	0.2 + 2

SINGLE-ENDED VOLTAGE: Voltage inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.2 + 0.04
10	0~+0.5V	122μV	±0.5V	244μV	0.2 + 0.1
100	0~+0.05V	12.2μV	±0.05V	24.4μV	0.2 + 1
1000	0~+0.005V	1.22μV	±0.005V	2.44μV	0.2 + 10

CARD-15. Color: Red

A 'CARD-15' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 single-ended voltage inputs. Input impedance: >10MΩ.
- ❑ 1 single-ended voltage input. Input impedance: >10MΩ. Vane resolution: ±1.4 degrees.
- ❑ **Maximum continuous voltage input: ±20V**
- ❑ 1 programmable voltage-excitation output (referenced to common ground). Range: 0~5V. Resolution 0.1V. Accuracy: (±0.2% of setting)+(±5mV). Maximum total current output (all V-Excitation outputs): 100mA. When in 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

Possible input ranges are shown in the following tables:

TYPE A: LOW VOLTAGE.			
Voltage inputs AN1~AN12 used independently.			
NOTE: Accuracies are guaranteed when Card15 is used with the data logger that was calibrated.			
	UNIPOLAR		ACCURACY
GAIN	ΠΕΡΙΟΧΗ ΕΙΣΟΔΟΥ	ΑΝΑΛΥΣΗ	± (% Of reading + % Of range)
1	0~+25mV	6.1μV	0.1 + 0.025
10	0~+2.5mV	0.61μV	0.1 + 0.8
100	0~+250μV	61nV	-
1000	0~+25μV	6.1nV	-

SINGLE-ENDED VOLTAGE: Voltage inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
1	0~+5V	1.22mV	±5V	2.44mV	0.2 + 0.04
10	0~+0.5V	122μV	±0.5V	244μV	0.2 + 0.1
100	0~+0.05V	12.2μV	±0.05V	24.4μV	0.2 + 1
1000	0~+0.005V	1.22μV	±0.005V	2.44μV	0.2 + 10

CARD-16. Color: Yellow

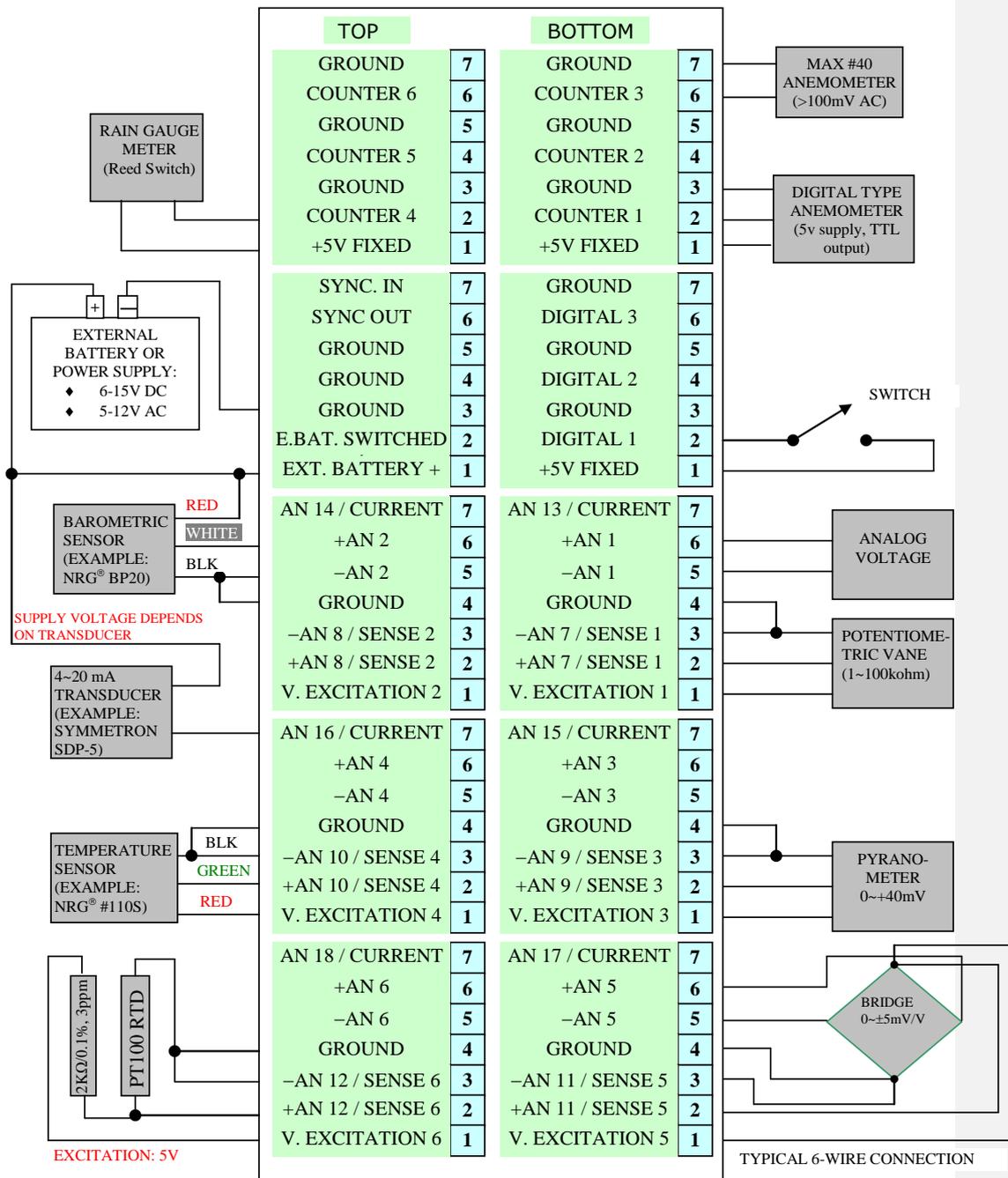
A 'CARD-16' analog input module is compatible with slots A1~A6. It features:

- ❑ 2 differential voltage inputs. Differential input impedance: >10MΩ. Common mode input impedance: 110KΩ.
- ❑ 1 single-ended voltage input. Input impedance: 110KΩ.
- ❑ **Maximum continuous voltage input: ±20V**
- ❑ 1 programmable voltage-excitation output (referenced to common ground). Range: 0~5V. Resolution 0.1V. Accuracy: (±0.2% of setting)+(±5mV). Maximum total current output (all V-Excitation outputs): 100mA. When in 'Energy Save' mode the output is on for about 5 milliseconds every 1 second. It is continuously on in 'Continuous' mode.
- ❑ **Maximum continuous time, short-circuit to Ground: indefinite.**

Possible input ranges are shown in the following tables:

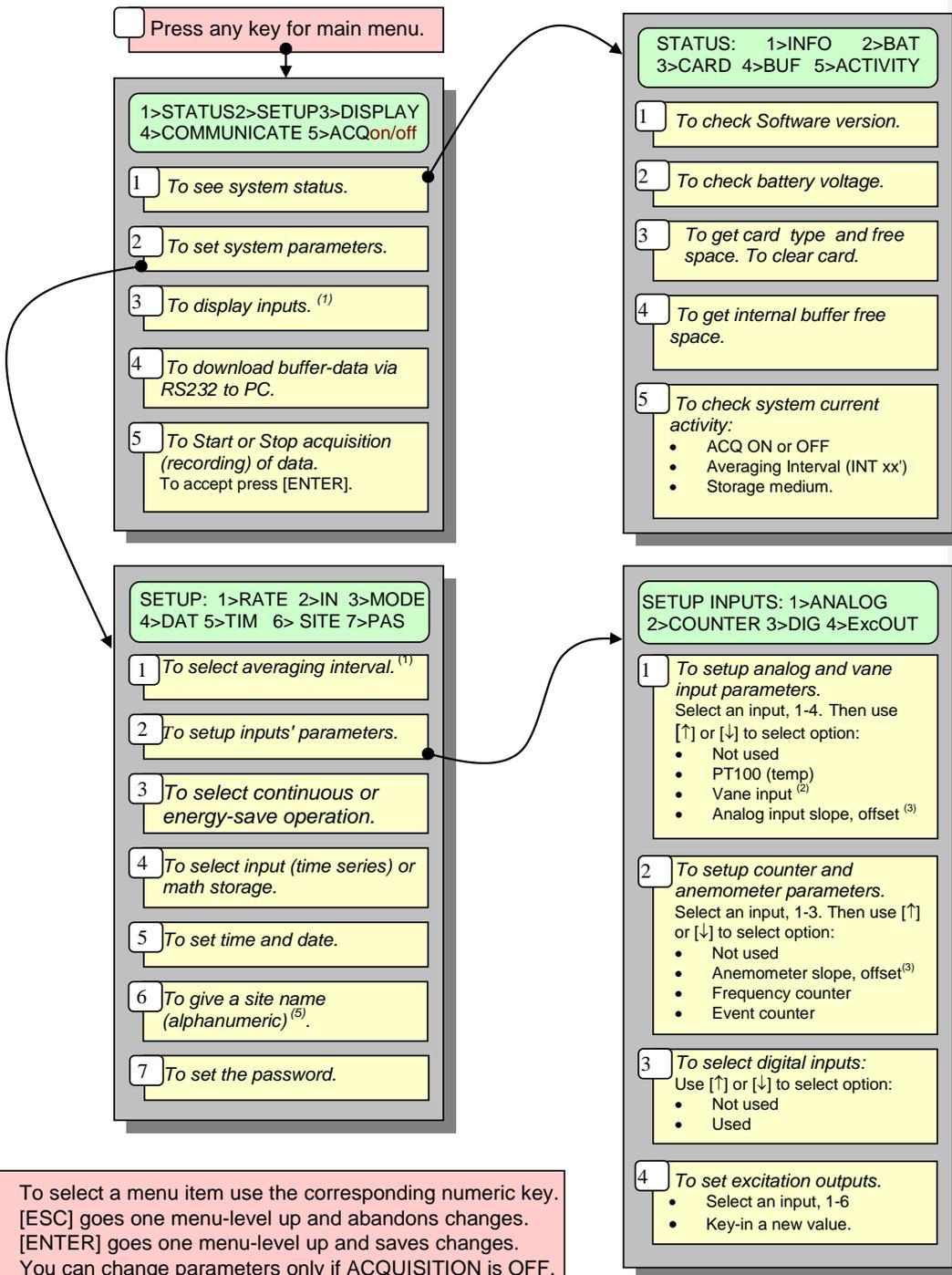
TYPE A: DIFFERENTIAL VOLTAGE. Voltage inputs AN1~AN12 used independently.					
TYPE B: VOLTAGE BRIDGE. NOT APPLICABLE					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
10	0~+50V	122μV	±50V	244μV	0.5 + 0.04
100	0~+5V	12.2μV	±5V	24.4μV	0.5 + 0.4
1000	0~+0.5V	1.22μV	±0.5V	2.44μV	0.5 + 2

SINGLE-ENDED VOLTAGE: Voltage inputs AN13~AN18 used independently.					
	UNIPOLAR		BIPOLAR		ACCURACY
GAIN	INPUT RANGE	RESOLUTION	INPUT RANGE	RESOLUTION	± (% of reading + % of range)
10	0~+50V	122μV	±50V	244μV	0.5 + 0.2
100	0~+5V	12.2μV	±5V	24.4μV	0.5 + 1
1000	0~+0.5V	1.22μV	±0.5V	2.44μV	0.5 + 10



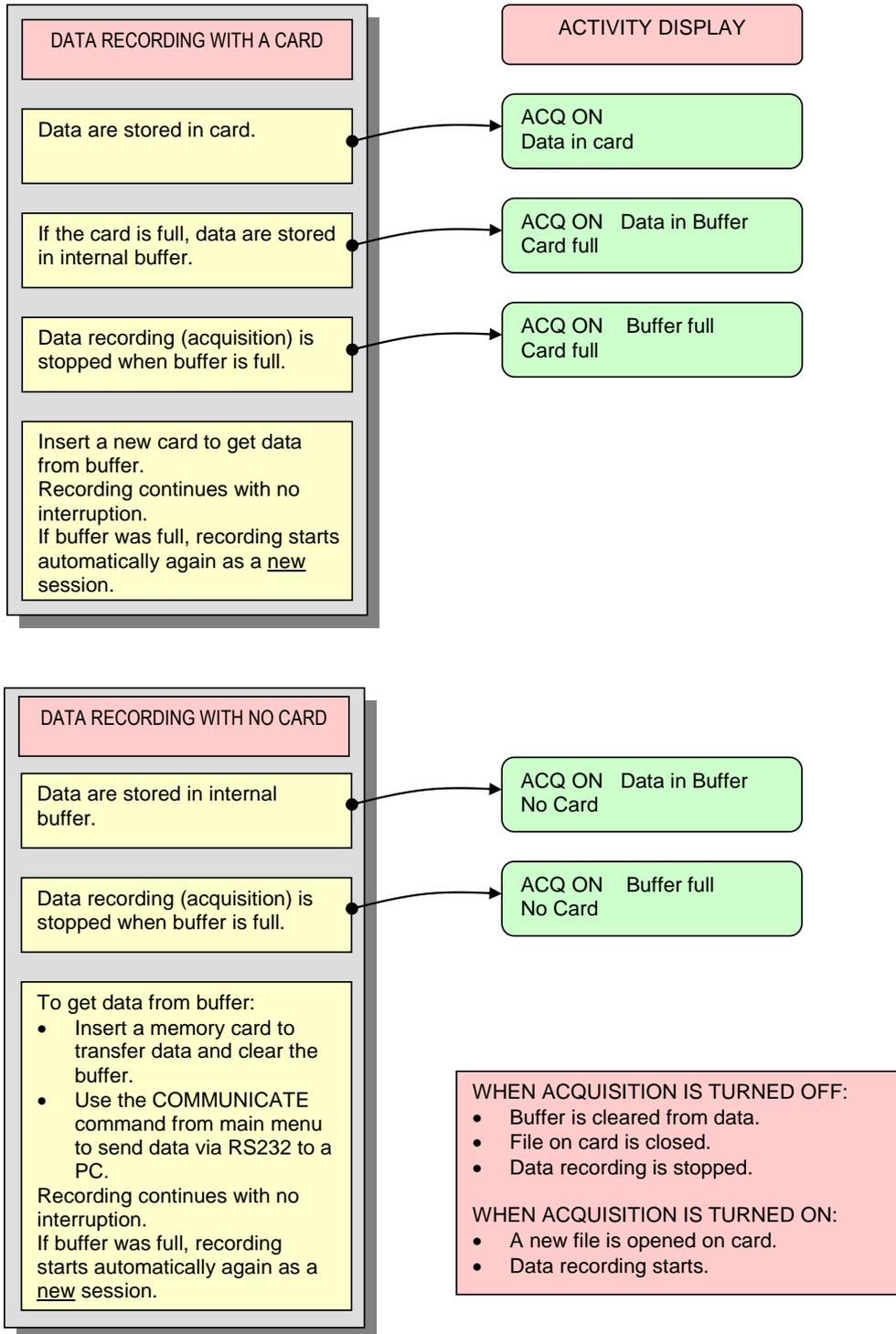
APPENDIX C

STYLITIS-101 MENU TREE

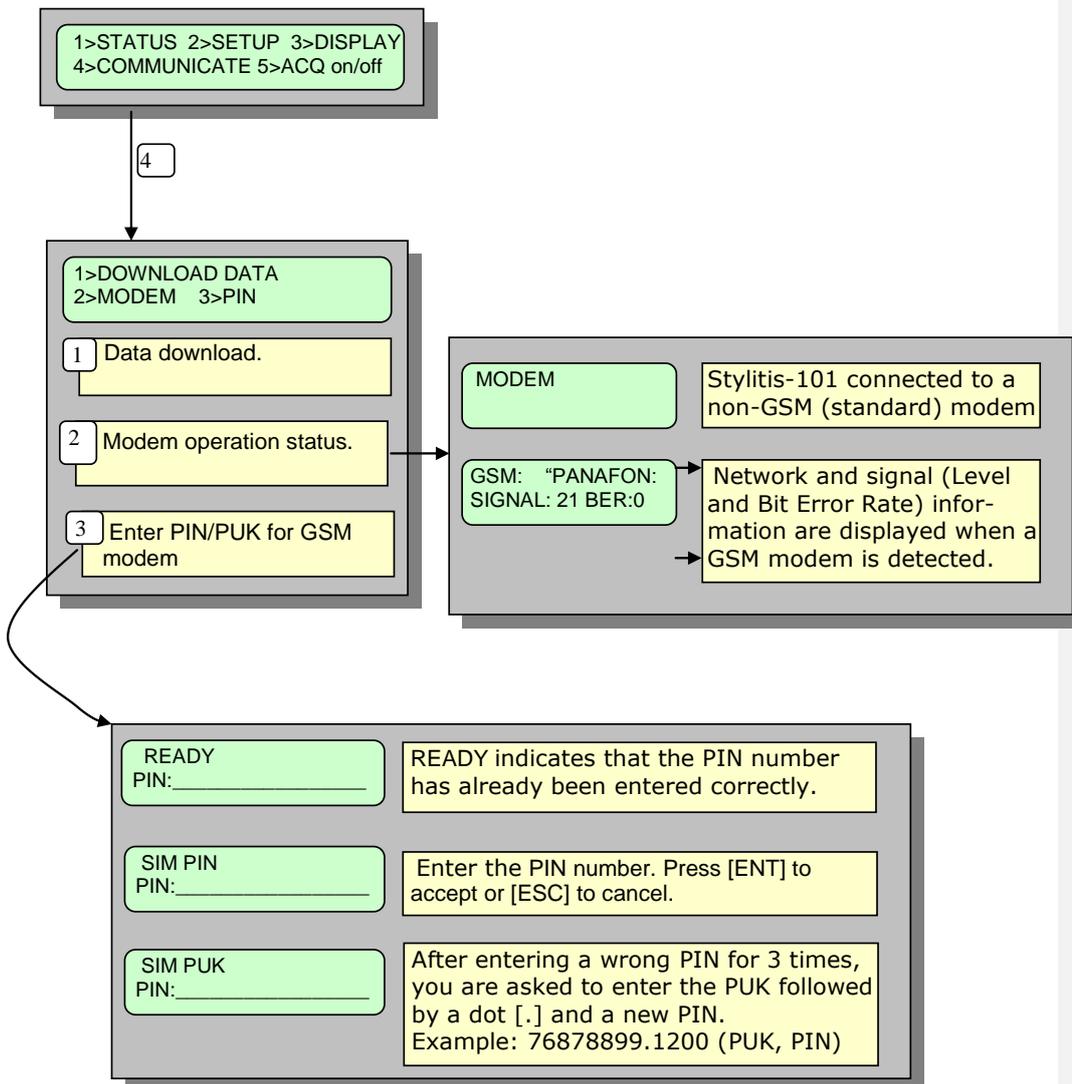


NOTES:

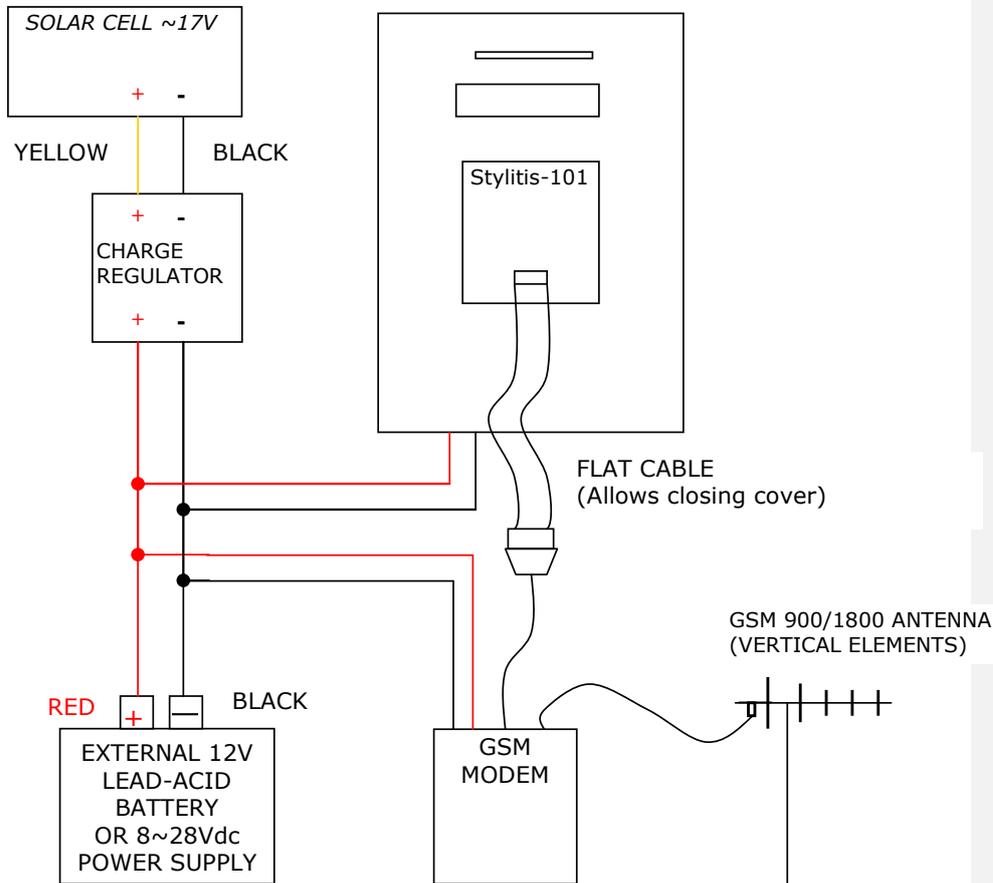
- ⁽¹⁾ Use [↑] or [↓] to select.
- ⁽²⁾ Use [—] to select vane zero point.
- ⁽³⁾ Use [1] or [2] to select fields.
- ⁽⁴⁾ Press corresponding numeric key to change anem or counter type between Low Level AC (SIN) and Digital (TTL).
- ⁽⁵⁾ Press [,] to use numerals as letters.



Using the SIEMENS TC35T MODEM Stylitis-101 is capable of supporting remote communication over the cellular (GSM) network. Using the Stylitis operation program all of the data logger's functions are available without moving from your office. A data-service subscription to a GSM900/1800 network operator is also required. In this case, the logger's menu includes the following options:



CONNECTIONS OF STYLITIS-101 WITH GSM MODEM AND BATTERY.



MODEM TYPES AND SETUP

1. TC35T MODEM

Disconnect the modem from the power supply. Press the yellow button on modem's side, take out the drawer and place the SIM card (after unlocking it via a standard cellular phone). Connect the power supply to the modem. The green light should start blinking rapidly and after a few seconds, it should start blinking slowly. Finally, go to the COMMUNICATE>MODEM menu ([4]>[1]): the network operator's name and the signal strength (SIGNAL) should appear in the display. BER shows errors (0 or 99 is OK).

2. M20T MODEM

Follow the same setup instructions with the TC35T MODEM.

3. WAVECOM M1206/1306 MODEM

Follow the same setup instructions with the TC35T MODEM, with the following differences: The button on modem's side is black, while the modem's light is red instead of green.

4. SYMMETRON TRIPLEX MODEM

Disconnect the modem from the power supply and place the SIM card (after unlocking it via a standard cellular phone). Connect the power supply to the modem. In the beginning, all 4 red LEDs will flash continuously, while the green LED (MODEM STATUS) should blink rapidly. After half a minute or so (with default settings), the MODEM and DEVICE1 LEDs will flash continuously, while the green LED should blink slowly. Finally, connect the datalogger to the DEVICE 1 serial port and go to the COMMUNICATE>MODEM menu ([4]>[1]): the network operator's name and the signal strength (SIGNAL) should appear in the display. BER shows errors (0 or 99 is OK).