Geosignal ™

Datalogger XV 102A USB

Version 1.0.02

User Manual

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Introduction

Thank you for purchasing a data logger XV 102A USB (USB drive standard alone DC voltage data logger)

This is the fully comprehensive manual, the logger comes with a four page simplified manual printed on paper. Basic instructions can also be found inside the file control.txt of the logger.

XV 102A is a dual channel stand alone voltage data logger storing up to 73106 measures on its internal memory, it is implemented as generic USB disks and is designed to operate under any computer operating system capable of reading standard USB flash drives (pen drives).

Some of the features XV 102A are:
- Two analog channels with 12 bit resolution.
- Seven programmable voltage ranges from 0-1V to 0-100V
- Two point calibration for maximum precision.
- Multiple starts with separate timestamps for each sampling section.
- Text file output compatible with common software like Open Office and Excel.
- Memory erasing protected by password.
- Programmable sampling interval from one second to one week.
- 2.4V internal rechargeable NiMH battery,

XV 102A does not need any specific software for data downloading and programming, as programming is done by editing a text file "CONTROL.TXT" which is found on the disk itself.

Data is saved on a read only file named "DATALOGS.CSV"

The data logger will start to scan at the given time with the given scan rate after being detached from the USB socket.

Safety Precautions

Although this voltage data logger can measure DC voltages up to 100V it must not be used with any voltage greater than 48V as it is not insulated and contact with such voltages may cause electric shock and death.

The USB plug of this logger is connected to the 2.4V battery negative which is electrically separated from the negative black bindpost. If the negative of the logger comes in contact with any part of the measuring circuit, an incorrect measurement may result and the battery may be discharged faster than usual.

Getting Started

Initialising

- The data logger is password protected and needs to be initialised before use. Each data logger has a different password (code) which is required for erasing and initialising.
- Please keep the code in a safe place as it is always required for erasing the memory.
- Connect the data logger to a USB socket of a USB host enabled device (PC, tablet, etc) by using the USB cable which has been provided with the logger .
- The data logger will appear like a USB disk storing three files: CONTROL.TXT, CALIBRAT.TXT and DATALOGS.CSV. Open the file CONTROL.TXT with a simple text editor. If your system does not have a native text editor please install one before using the data logger. We have tested Notepad on Windows, Gedit on Ubuntu, and Ted on Android 4.0.
- Some Android devices do not immediately open USB drives and require a specific app to manage USB drives, those may also not allow for enough power for charging.
- The latest Mac versions try to write somewhat like 150 hidden files on the logger memory: The logger does not allow that and an error message is produced ("Cannot repair disk"). In this case Mac users should install a "Virtual Machine" (VirtualBox) that can be downloaded for free and run a free Linux image (or Windows) to program the device. However the logger remains fully readable by the native Mac OS: Data can be downloaded (sampling will resume once the device is unplugged).
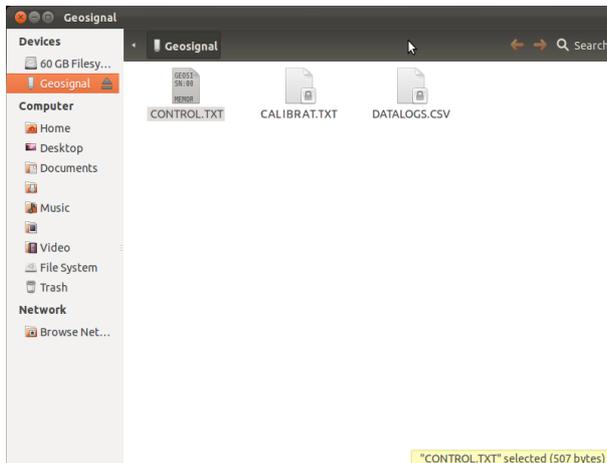
- The file CONTROL.TXT on a new XV 102A will appear as below:

```
GEOSIGNAL USB DATA LOGGER
SN:00000001

MEMORY: code?
DATE: 16Y/01M/01D Fr
TIME: 12H:00M:06S
SCAN RATE: 00s
START TIME: 01M/01D 12H:00M:30S Fr
CLOCK: +000
INPUT1: 00.090V+010Vr
INPUT2: 00.090V+010Vr
Bat 99%


Edit values & save file to program.
Don't change position/length of fields.
Detach and plug device to show actual values.
Log starts at Start Time after device is detached.
Scans: 00s 01s 10s 01m 10m 01h 01d 01w
Clock +-sec per week
Vrange 1,2,5,10,20,50,100
Input code to unlock device.
```

(Note: Above colours are not shown on the file; they are only for clarity)

- Replace the line "MEMORY: code?" with "MEMORY: xxxxx" where xxxxx is the 5 digit code specific to your data logger. For example if your code is 01234, type:
- "MEMORY: 01234"
- Save the file to activate the code: the red LED of the data logger will quickly flash for a few seconds and the data logger will restart. (The LED is located on the back right side near the USB plug).
- Close and reopen the file CONTROL.TXT. Now, if the code was correct, it will read: "Memory: 00000" indicating that the memory is blank and the device ready.

Programming

- Each time the data logger is plugged into a USB socket and CONTROL.TXT is read by the computer operating system: the data logger reads its memory, registers and input and changes the information contained in CONTROL.TXT. Please NOTE: we have found that after the data logger has been inserted into a USB socket, all the different operating systems (we have tested) read the file just ONCE.
- Open CONTROL.TXT and edit the scan rate, current time, and starting time; do not change position and length of the fields; for example: "DATE: 16Y/01M/01D Fr" must not be changed in "DATE: 16Y/1M/1D Fr"
- Possible scan rates are: 01s 10s, 01m, 10m, 01h, 01d, 01w (00s means stop)
- Save the file, the data logger LED will blink.
- If the data logger LED did not blink the file was not really saved but it is just temporarily stored in the computer cache. This behaviour depends on the operating system. Windows and Ubuntu immediately save the file but some other OS or older versions may require you to unmount the device or go through the process of "Safely remove the device".
- Please also note that the data logger internal time is programmed into the data logger in the precise moment the red LED blinks.
- Detach the data logger to start the acquisition.
- If the starting time is past the data logger will start immediately, if the weekday is incorrect the logger will wait indefinitely to start even if the starting time is past.
- If you instead only wanted to stop the data logger then you should have programmed the scan rate as: "SCAN RATE: 00s"
- At scan time the red led will blink for an instant.

Downloading Data

- Plug the data logger into any USB socket of a computer.
- Scanning will stop and will be resumed once the data logger is detached.
- Copy the file DATALOGS.CSV from the disk drive to your computer and open it with a text editor, or Open Office, or Excel, the copying process can take several seconds.
- Make sure the data has been actually copied on your computer hard disk before erasing the data logger memory.

Erasing memory

- Plug the data logger into any USB socket of a computer.
- The acquired data is protected from unauthorised erasing as the file DATALOGS.CSV cannot be directly erased.
- To erase DATALOGS.CSV open instead the file CONTROL.TXT with a text editor,
- Replace the line "MEMORY: 37435" with "Memory: ERASExxxxx" where xxxxx is the 5 digit code specific to your data logger. For example if your code is 01234, type: "Memory: ERASE01234"
- Please note: The command is case sensitive "ERASE" must be in capital letters.
- Save the file to activate the code: the red LED of the data logger will quickly flash for a few seconds and the data logger will restart.
- CLOSE and reopen the file CONTROL.TXT: Now, if the code was correct, it will read: "Memory: 00000" indicating that the memory is blank and the device ready.

Charging battery

- Please note that the battery of the logger is charged while the logger is connected to the USB port.
- Battery Life Expectancy: A <u>new</u> battery with 10% charge would allow the logger to record a full memory a few times.
- Battery voltage is checked automatically by the data logger when it is inserted into the USB socket. The charge percentage is shown as "Bat 99%" in the file CONTROL.TXT and it is worked out from the battery voltage which may not reflect the real level of charge all the times, charge the logger to 99% for 30 minutes over one month deployment, please take also in account that the battery may have an internal self discharge.
- Procedure: Make sure the data logger is stopped and it is not sampling in the next minutes, close the file CONTROL.TXT, detach the data logger from the USB socket, reattach the data logger to the USB socket, reopen the file CONTROL.TXT, read the updated battery value.
- The charge level shown can vary between 0% and 99%
- The logger use a discrete amount of power to charge its battery so if it is connected to the USB port of a battery powered device it will drain that device's battery.

Reset

- To properly reset the data logger: Insert a pin into the small hole near the LED, push and click the internal button.

Read inputs in real time

- The data logger reads its input when it is plugged into the USB socket. The current value is shown in CONTROL.TXT . The voltage shown in CONTROL.TXT is not so accurate as the voltage which is recorded into the memory, The reason of this is because that voltage is read when the logger switches from the internal battery to the USB power.

Voltage Range and Quick Calibration

- Please note: The instrument is already factory calibrated @ 5.000V (by logging reference voltage source into the memory).
- The voltage range of the instrument can be changed by editing the line :

  "`INPUT1: 00.000V+010Vr`" of CONTROL.TXT, change the range and save the file.

  For example: "`INPUT1: 00.000V+020Vr`" will change the range to 0-20V.
- PLEASE NOTE: The same procedure applies to INPUT2
- Ranges available are 0-1V, 0-2V, 0-5V, 0-10V, 0-20V, 0-50V, 0-100V
- Use the smallest range possible for the voltage being monitored In order to achieve the best accuracy.
- Please note that the 0-1V range and the one second scan rate cannot be selected together.
- Calibration and measurement units can be changed by editing CONTROL.TXT.

  For example on XV 102A it is possible to adjust the gain of the data logger.
- If the logger is out of calibration (In this example the data logger is indicating +4.950V at the reference voltage of 5.0V on input 1) this 1% error can be adjusted by editing and saving the line "`INPUT1: 00.000S+010Vr`". Change V with S (Scale) where "+010" means: "adjust the input of roughly about 1.0% in positive". The six characters preceding S (`00.000S`) are required but can be any values for the purpose of calibrating the instrument.
- The adjustment can be up to +10% (+128S) or down to -10% (-127S).
- Please refer to the next chapter 'Calibration' for further details.

Memory Structure

The memory of the data logger is flash memory and structured in the clusters and sectors of a generic detachable USB drive.
The maximum number of datapoints is 73106. Each start (when the data logger is plugged into USB and restarted, but the memory is not erased) will reduce the memory capacity of about 42 datapoints as timestamps and calibration parameters takes some room as they need to be saved on the data logger internal flash memory.

The data logger will appear as a disk storing three files: CONTROL.TXT, CALIBRAT.TXT and DATALOGS.CSV.
CONTROL.TXT is meant to control the data logger and to show its current state, memory and time.
DATALOGS.CSV contains the data. If it is empty its length is zero.
CALIBRAT.TXT is a read only file showing the calibration constants and the date of the last calibration

CONTROL.TXT once opened with a text editor like notepad will appear as follow:

```
GEOSIGNAL USB DATA LOGGER
SN:00000001


MEMORY: 00136
DATE: 16Y/01M/01D Fr
TIME: 12H:40M:48S
SCAN RATE: 10s
START TIME: 01M/01D 12H:00M:30S Fr
CLOCK: +000
INPUT1: 00.080V+010Vr
INPUT2: 00.080V+010Vr
Bat 99%


Edit values & save file to program them.
Do not change position/length of fields.
Detach and plug device to show actual programmed values.
Log starts at Start Time after device is detached from USB.
Scans: 00s 01s 10s 01m 10m 01h 01d 01w
Clock +-sec per week
Vrange 1,2,5,10,20,50,100
To erase: MEMORY: ERASE+code
```
(Note: Above colours are not shown on the file; they are only for clarification)

This file is created when the data logger is plugged into the USB socket and the operating system of the computer or tablet or host device reads the contents of the file.
It important to understand that the file is not necessarily created when the file is opened by you.

When editing this file it is extremely important not to change the position and length of the fields as the data logger will refuse to program itself if data is found in the wrong position.
Also take in account that the parameters typed into the file that you are editing with the computer are transferred to the data logger only when the computer decides to. Normally this happens when you 'Save' with the text editor, but some operating systems require you to unmount the data logger (UNIX command) or to go through the process of 'Safely remove the drive' before the data is actually programmed into the data logger.
The data logger features a red LED to inform you that data has been actually stored on its memory by the Computer operating system.
The data logger will also restart when an important data change like erasing or calibration has been performed, these changes have priority over date, time, starting time and scan rate which are not programmed when a restart is processed.

When a restart or reset occurs the data logger detaches and reattaches itself to the USB. the device will update its local instance of the file CONTROL.TXT and you need to close and reopen the file to see the changes and to edit the file again.

CONTROL.TXT shows:

`SN:00000001`   (Serial number which is unique for each data logger)

`MEMORY: `<mark>`00136`</mark>   (Memory used: stored datapoints) it can also be used to erase the memory.

`DATE: `<mark>`16Y/01M/01D Fr`</mark>   (Current Date in reverse order Year/Month/Day)

`TIME: `<mark>`12H:40M:48S`</mark>   (Current Time actually when the data logger was inserted into USB)

`SCAN RATE: `<mark>`10s`</mark>   (Current Scan rate which can be: `00s`, stopped; `01s`, one second; `10s`, ten seconds; `01m`, one minute; `10m`, ten minutes; `01h`, one hour; `01d`, one day; `01w`, one week).

`START TIME: `<mark>`01M/01D 12H:00M:30S Fr`</mark>

in decreasing importance order: Month/Day Hour:Minute:Second Weekday.

The weekday (Mo Tu..) is always necessary as the logger will not start if weekday is incorrect

The starting time has to be consistent (correct weekday) even if the starting time is past and not being used.

`CLOCK: +`<mark>`000`</mark>   indicate the clock calibration in + or – seconds per week and can be changed to adjust the internal clock if it is running fast or slow.

`INPUT1: 00.496V+010Vr`   indicates the current reading and range for channel 1

The possible options are:

`INPUT1: 00.000V+`<mark>`001`</mark>`Vr`   set Range (with 7 ranges available) `001`–>0-1V

`INPUT1: 00.000V+`<mark>`002`</mark>`Vr`   set Range 0-2V

`INPUT1: 00.000V+`<mark>`005`</mark>`Vr`   set Range 0-5V

`INPUT1: 00.000V+`<mark>`010`</mark>`Vr`   set Range 0-10V

`INPUT1: 00.000V+`<mark>`020`</mark>`Vr`   set Range 0-20V

`INPUT1: 00.000V+`<mark>`050`</mark>`Vr`   set Range 0-50V (max voltage 48VDC)

`INPUT1: 000.00V+`<mark>`100`</mark>`Vr`   set Range 0-100V (max voltage 48VDC)

The default range for a new data logger is (`010`) 0+10V

`INPUT2: 00.496V+010Vr`   indicates the current reading and range for input 2

It is possible <u>to disable channel 2</u> to operate in a <u>single channel mode</u> and releasing more memory for input 1: just set <mark>`000`</mark>`Vr` on Input2 and save control.txt

The possible options are:

`INPUT2: 00.000V+`<mark>`001`</mark>`Vr`   set Range (with 7 ranges available) `001`–>0-1V

`INPUT2: 00.000V+`<mark>`002`</mark>`Vr`   set Range 0-2V

`INPUT2: 00.000V+`<mark>`005`</mark>`Vr`   set Range 0-5V

`INPUT2: 00.000V+`<mark>`010`</mark>`Vr`   set Range 0-10V

`INPUT2: 00.000V+`<mark>`020`</mark>`Vr`   set Range 0-20V

`INPUT2: 00.000V+`<mark>`050`</mark>`Vr`   set Range 0-50V (max voltage 48VDC)

`INPUT2: 000.00V+`<mark>`100`</mark>`Vr`   set Range 0-100V (max voltage 48VDC)

`INPUT2: 000.00V+`<mark>`000`</mark>`Vr`   <u>Channel 2 has been disabled</u>

The default range for a new data logger is (`010`) 0+10V

<mark>`Bat 10%`</mark> shows the battery level of charge (10% in this case).

<u>WARNING: do no connect the logger to voltages greater than 48V as it is not insulated and that may electrocute you</u>

`00.000`<mark>`O–010`</mark>`Vr`   (<mark>`O`</mark> for offset) compensates "zero calibration" by subtracting 1% of the range to the measures (+/- 0.1% per point): <mark>`–010`</mark> corresponds in this case at -1%; for example: if the range is 10V this will add 1% x 10 = 100mV.

`INPUT1: 000.00`<mark>`S`</mark>`+001Vr` sets the "scale calibration": add input x "scale calibration" x 0.00085 (basically this allows you to increase of decrease the gain on the input up to +10% (`00.000S+127Vr`) or down to -10% (`00.000S–128Vr`) in order to compensate for any gain errors. Please see the chapter Calibration for further details.

Data File Structure
The stored data is accessible by opening a text file in csv format (comma separated values).
Formerly: comma separated vector.
The format of the file can be as following:

```
2016/05/01,14:39:29, 4.9960,V Ch1
2016/05/01,14:39:30, 4.9985,V Ch1
2016/05/01,14:39:31, 4.9985,V Ch1



2016/05/04,22:42:38, 00.047,V Ch1  , 09.422,V Ch2
2016/05/04,22:42:39, 00.052,V Ch1  , 09.425,V Ch2
2016/05/04,22:42:40, 00.050,V Ch1  , 09.425,V Ch2
2016/05/04,22:42:41, 00.047,V Ch1  , 09.440,V Ch2
2016/05/04,22:42:42, 00.047,V Ch1  , 09.440,V Ch2
```

The date is in reverse order: year/month/day. Time is in 24h format (0-23). The voltage datum takes a 6 character field. The last field marks the measurement units, V (Volt) in this case.
All fields are separated by a comma and the period marks the decimal point.
If the logger is used in a country where comma is used for the decimal point please adjust the file import options of the software you are using.
The format of date and time can be changed after importing.
A variable number of spaces (up to 3 disk sectors) separate different acquisitions indicating that the logger was stopped and later restarted.
When a restart occurs some sectors of the disk are used to store the restart information and spaces are printed in the data file to show that.

Calibration

The data logger allows calibration for the voltage input and a 'seconds per week' calibration of the internal quartz clock.

Calibration is done by editing and saving the parameters INPUT1, INPUT2 or CLOCK of the file CONTROL.TXT

`CLOCK: +012`   for example will add approx 12 seconds per week on a slow clock, it is possible to add up to 127 seconds or to detract -128.

XV 102A will show and can be programmed with the following:
`INPUT1: 0.0000O+010Vr` compensate zero by adding 10 millivolt x range to measures.
`INPUT1: 0.0000V+001Vr` set Range (7 ranges available) `001->`0-1V
`INPUT1: 0.0000V+002Vr` set Range 0-2V
`INPUT1: 0.0000V+005Vr` set Range 0-5V
`INPUT1: 00.000V+010Vr` set Range 0-10V
`INPUT1: 00.000V+020Vr` set Range 0-20V
`INPUT1: 00.000V+050Vr` set Range 0-50V
`INPUT1: 000.00V+100Vr` set Range 0-100V
`INPUT1: 00.000S+001Vr` set the scale calibration: add (voltage input) x scale (001) x 0.0085
(basically this allows you to increase of decrease the gain on the sensor up to +10%
(`000.00S+127`) or down to -10% (`000.00S-128`) in order to compensate for any gain errors.

The same procedure applies to INPUT2
`INPUT2: 0.0000V+002Vr` set Range 0-2V on channel 2

The "zero offset calibration" can be used in particular situations like compensating for a sensor not outputting zero volt at rest or for the logger not reading zero when the input is zero volt (input shorted).
If the value recorded by the data logger differs by some millivolt from the expected value then correct this value by updating the `INPUT1: 00.000O-000Vr` line accordingly.
For example if the range is 1V: `INPUT1: 00.000O-008Vr` will detract 0.8% of the range (1V x 0.008 = 8mV) to any measurements. If instead the range is 0-10V that will detract 0.080V.
On the other hand inputting `00.000O+008Vr` will add instead 0.8% of the range to the measurements.
If the instrument gets overcompensated it will not record or show negative values but it will record or show zero (00.000).

The "scale calibration" constant can be modified as described below.
The difference between the readings can be compensated by increasing or decreasing the gain of 0.00085 multiplied by the scale calibration value.
The value of 0.00085 allows adjusting ±10% within the range of ± 127 scale-calibration units.

The instrument holds 7 separate scale-offset-calibration constants for each input: one for each range. Calibrate the instrument for each range first select the range, calibrate the zero offset then the scale offset after that proceed with the next range. Use the records not the value shown in CONTROL.TXT to calibrate the instrument.

If the instrument is not showing zero in CONTROL.TXT the command "N" can be used to further compensate from the noise created by the USB connection (this calibration constant will not affect the recordings will modify the value shown by CONTROL.TXT only).
Use this command in the same way as the Offset compensation: `INPUT1: 00.000N-008Vr` will detract 0.8% of the range (1V x 0.008 = 8mV) to the value shown in CONTROL:TXT, repeat this procedure for each range.
If something goes wrong with the calibration and the instrument does not longer show accurate values the commands `00.000N-000Vr ;   00.000O-000Vr ;  00.000S-00Vr` will reset the instrument to the pre-calibration status.

Automatic Calibration

The data logger hosts a procedure for automatic zero and scale calibration.
Each input can be separately calibrated on zero (shorted inputs) and on a 5V reference.
Copy the old file CALIBRAT.TXT on a safe place, that can be used as reference for comparing new calibration values with old ones and eventually manually adjusting them by the standard calibration commands O and S.

Proceed with zero 'Z' first and then with the 5V voltage reference 'R'.

Short the inputs with a short wire then edit and save the file CONTROL.TXT
`INPUT1: 0.0000Z+010Vr`

The logger will reset and restart in automatic calibration mode showing:
`INPUT1: 0.0000VZ010Vr`

Set the scan rate (need to save control.txt) on 1 second or 10 seconds, also set a close or past START TIME.
`SCAN RATE: 01s`
Detach the logger, it will flash the LED 7 times at 1 second rate (or 10 seconds) after that it will stop.

Replug the logger, the logger will resume in normal mode and the file CALIBRAT.TXT will show the updated values and the new date for the calibration.

Repeat the operation for Input 2:
`INPUT2: 0.0000Z+010Vr`

After Calibrating the zero it is possible to calibrate the reference the procedure is similar to the above one:
Connect the logger inputs to a 5.000V precise reference output then edit and save the file CONTROL.TXT
`INPUT1: 0.0000R+010Vr`
The logger will reset and restart showing:
`INPUT1: 0.0000VR010Vr`

Set the scan rate on 1 second or 10 seconds, also set a close or past START TIME.
`SCAN RATE: 01s`
Detach the logger, it will flash the LED 7 times at 1 second scan (or 10 seconds).

Repeat the operation for Input 2:
`INPUT2: 0.0000R+010Vr`

NOTE:
If you want to abort the calibration process, the automatic calibration mode can be cancelled by saving the control.txt file with the command 'C':
`INPUT1: 0.0000CZ010Vr`

Sensor Connection Example

A 0-10V 10 bar pressure sensor is connected to the data logger:
the data logger shows 00.050V at zero bar
set `INPUT1: 00.000O-050` and save the file.
After that the data logger shows 09.900V at 10Bar pressure.
`1-(9.9/10) = 0.01`
`0.01/0.00085 = 11.76` → `approx 12 scale calibration units`
set `INPUT1: 00.000S+012` and save the file.
At this point the zero calibration may have changed and the new value needs to be recalculated:
0.030V times `0.00085` times `12 = 0.000306V`
the value is below the sensitivity of the instrument and can be ignored.

Troubleshooting

Datalogger does not connect to PC

- Battery flat: Charge battery by leaving connected to USB port
- Perform a reset.

Inconsistent date and time or keep showing "pgm" without starting.

- Reprogram date and time unplug and re-plug the data logger.
- Perform a reset.

Datalogger stops logging after a few hours of operation.
- Recharge the logger battery, if it stops again replace battery.

Datalogger does not program scan rate or date and time:

- <u>After saving CONTROL.TXT make sure device is unmounted or "Safely removed"</u>

Datalogger is connected but an error is produced when downloading data file:
- Erase memory

Measures downloaded are inconsistent:

- Change the operating range to one more appropriate.

Datalogger does not store data:
- Scan rate was not programmed or mistake in setting the starting date and time. Always check twice for the correct start time before saving CONTROL.TXT.
- Out of Memory: Erase memory

Technical specifications

Please note that specifications may change without notice.

Voltage Data Logger

Model	XV 102A USB	
Analog channels	2	4095 subdivisions of FS
Ranges	V	0-1V, 0-2V, 0-5V, 0-10V, 0-20V, 0-50V 0-100V
AD Converter	1	12 bit
Input Impedance	OHM	375 KOHM
Calibrated Accuracy	V	0.2% (0-5V range)
Power supply	1	2.4V NiMH Battery 1000 mA/h
On time of 2.4V output at sampling	Sec	Approx 0.7 sec (2V range) Approx 1.2sec (1V range)
Current absorption	µA	30 on standby mode 50mA while connected to USB
Communications	1	USB
Internal Timer	Yes	100 year calendar with leap year
Sampling interval		1 sec, 10 sec, 1 min, 10 min, 1 hour, 1 day, 1 week 1 sec rate is not available when 0-1V range is selected
Software	No	Not required
Operating Temp.	°C	-40 + 85 °C (excluding battery)
Dimensions (maximum)	mm	150 x 76 x 14 mm
Protection Grade		IP50

Appendix

Schematic view of the inputs of XV102A

1. Black Bindpost AGND V– Input (2.4 V- out)
2. Red Bindpost V+ Input 1
3. Yellow Bindpost V+ Input 2
4. Small connector 2.4 V+ out

Notes:
- Output 4 is energised with +2.4V at sampling time and can be used to switch on sensors or other devices. Voltage depends on battery level of charge and ranges from 2.4 to 2.7V
- The small connector of output 4 can accept and hold a rigid conductor of 0.6 mm diameter like a standard pin or a terminator of an electronic component or a small tinned wire.
- Please take the maximum care in connecting output 4 as this input is not protected from over voltages and a mistaken connection may damage the data logger.
- The USB shield is connected to battery negative (GND) and it is disconnected from AGND between scans. GND can be used as return of power for external sensors but any connections between AGND and GND will drain battery power when the data logger is supposed to be at rest (between scans).

Order Code

Order codes
XV102A: 4111

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