AWS-X GSM/GPRS weather station

User Manual V 1.2

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Product Description

The AWS-X weather station (also called AWX in this manual) is a GSM/GPRS device that works with a solar panel and rechargeable battery, that can measure the weather parameters, in the most complete version:

1- Wind speed and direction

2- Air temperature and relative humidity

3- Rain

4- Atmospheric pressure

5- Solar radiation

6- Leaf wetness

7- Soil temperature

8- Soil Moisture

These data can be sent to a server connected to the internet with a static IP address, by means of GPRS packets, at intervals programmable from 1 to 60 minutes.

Hardware description

The AWX station consists in the CPU BOX, water and dust resistant (IP56), in which the CPU board and the battery are and the sensors that acquire the various weather parameters. A solar panel will recharge the battery by means of the circuit installed in the CPU box.

All these devices are supplied in aluminum metal parts, ready to be attached to a pole (not supplied).

Setting up

To set up the station it is enough to attach it and the sensors to a pole of the correct dimension, to connect the sensors and to program the required features by means of a PC or SMS.

IMPORTANT: you must remove the PIN request from the SIM before switching on the unit, otherwise the AWX will not work and after switching up 2 times, the SIM will be locked, and you may need the PUK code to ock it. To disable the PIN request, put the SIM in a telephone and disable this request using the security menu of the phone.

How to connect Sensors

Sensors should be attached to the plugs as indicated in the PCB.

In details:

WIND: Connect here the anemometer

RAIN: Connect here the Rain Collector after ahving removed its locking stripe

TEMP: Connect here the SOIL temperature sensor

TEMP/RH: Connect here the normal AIR temperature and Relative HUmidity sensor that is in the shield below the rain collector.

SUN: Connect here the Radiation sensor

LEAF: Connect here the Leaf Wetness sensor

The Soil Moisture sensor should be connected to the connector with 2 screws.

Basic Programming

Please find below the commands most commonly used that you will need to activate the station.

#PWD password command, must be followed by 6 digits (default 123456)

#MHD Followed by the name of the station. This is usualy used as a key for the data to be stored in the server.

#APN followed by the GPRS Internet APN of your operator

#UIP followed by IP address and port where to send the UDP data.

#DSI followed by sampling interval in minutes. Better over 10.

#SLP1 to Activate Sleep Mode to save energy (recommended)

#LGG followed by interval in minutes between GPRS packets. Put it = DSI

#UDM defines the GPRS modality. Use 2 (#UDM2)

#RTC programs the real time clock. Note well: can be used ONLY after the modem is succesfully registered to the operator.

#SCT This command is very important to sync the station with the operator time, so you can see data with correct timing. Works ONLY with SMS

REAL TIME CLOCK

The station has a real Time Clock that is powered by the main lead battery. If you disconnect the battery, the clock is maintained for a few minutes by a capacitor, and then needs to be reprogrammed.

IMPORTANT: if the RTC is not programmed correctly you will not see data in the internet, because they are stored in the database in the wrong records!

Example of data sent to a server in the internet with UPD packets

AWS-X weather station has GPRS connectivity and can send data to a IP address in the internet. These data can be then stored by a local application, using a Data Base, like for example MySql, and retrieved later using PHP.

In details this is the explanation of the AWS-X data:

DATE and TIME of when data were measured

SMSC: counter of the SMS sent by the station

SI: Sampling interval. Data are measured every minute and aggregated according to the sampling interval, that can go from 1 to 60.

WAS: WInd average speed

PRESS: Atmospheric air pressure in millibar

WMINS: Wind minimum speed in the SI interval

WGUST: Wind maximum speed in the SI interval

DWGUST: Daily wind maximum speed

LEAF: wetness. From 0=wet to 15=dry

WDIR: Wind direction in SI

WDSD: Wind Direction Variability. Form 0=steady to 15=variable

SUN: Solar radiation in W/Mq

TEMP: Air temperature average in SI

DMINTEMP: Minimum Daily Temperature

DMAXTEMP: Maximum Daily Temperature

SOILT: Soil Temperature

RF: Rainfall in SI

DRF: Daily Rainfall

SOILW: Soil moisture expressed as soil tension (0 (wet) - 200 (dry) Kpa)

DP: Dew point based on simplified calculation

RH: Relative humidity

DMINRH: Daily minimum Relative Humidity

DMAXRH: Daily Maximum Relative Humidity

PWR: Type of power supply. B=Battery, E=External

VBAT: Battery Voltage

How to program the AWX

You can program the station by means of SMS sent from your mobile.

It is a safe and reliable system, because the SMS must start with a password.

You can also program the unit using a PC by means of terminal software, like Putty or Zterm.

To do so you need a level shifting cable that we may provide on request.

More details on appendix A.

Programming with SMS messages

This is the most convenient way, if your SIM supports SMSs, because you can do it from everywhere and you do not need to open the box.

Every command must start with a octothorpe sign (#).

The first command of an SMS must be #PWD followed by a 6 digits valid password. The default is 123456.

Every command SMS must end with #.

You can put more than 1 command in one SMS, as long as you don't pass the limit for 1 SMS (160 characters).

The message will be received and checked every minute, and the unit will answer with OK or Err depending on the result.

The AWX can send maximum 40 messages everyday (it is a protection for your bill). This limit can be changed with the command SMC.

If you don't want to receive an answer by SMS, insert #NOA# at the end of the SMS.

TCX-OS command list

AWX can be programmed using 3 letter commands. The commands are the same, via SMS or via PC interface.

You can use lower case or upper case letters, or a mixture of the 2.

For example: PWD=pwd=Pwd.

Do not put spaces or other characters in the command string or among commands.

Remember that EVERY command must start with a octothorpe (#)

This is a list of the commands most used:

#APN: Defines the Access Point Name for GPRS

#END: Exit from programming menu (if using a PC)

#GTM: ask weather data via SMS

#INI: Initialize all parameters

#LGG: define GPRS interval for sending data

#MHD: Program the NAME of the station (max 10 characters)

#NOA: Do not send acknowledgement SMS

#PWD: Password (followed by 6 digits password)

#RTC: Program real time clock date and time

#SCT: Sync real time clock with incoming message timestamp

#SLP: Enable/Disable (1/0) Sleep mode to save power

#SMC: SMS counters and 24h maximum

#UDM: Define the control system used for UPD packets (echo etc.)

#UIP: Define IP address and port

BASIC SMS to activate the unit to send GPRS data

This is an example of the SMS that is needed to activate the unit once has been powered on.

#pwd123456

#mhdMY-AWX

#APNweb.vodafone.it

#uip192.168.135.110:999

#lgg60

#slp1

#udm2

#sct

#

It should be one complete string, no spaces, no CRs (we have put the CRs here only to improve legibility).

In details:

#pwd123456 = Password, needed at the start of any message.

#mhdMYAWX = Name of the station. Needed to identify it on the server.

#APNweb.vodafone.it = APN of your operator. Needed to send data in gprs

#uip192.168.135.110:999 = IP address and port of your server

(if you want to use our server ask us the correct IP address).

#lgg60 = gprs interval at 60 minutes (you can put a value from 01 to 60)

we recommend to use the same value as DSI.

#slp1 = sleep mode active

#udm2 = upd data sent with local check and echo check

#sct = Sync real time clock with this message timestamp

= message closure

Detailed command Description

#PWD

Password. This command must always come first. Use 6 digits as a password. The default one, when the device comes from the factory, is 123456. You may change it, using the #CAP command.

Remember that if you change it and forget it, you will have to return the device for a total reset, and this service has a cost.

In all the following examples we will use 123456 as an example of password.

#APN

Defines the Access Point Name for GPRS.

Every operator has a different APN that allows connection to the internet using mobile devices. For example web.omnitel.it or ibox.tim.it or isp.vodafone.ie are all valid APN for different operators. You should ask your operator which is the correct one for your SIM.

#END

Exit from PC programming menu. This is not an SMS command.

#GTM

Using this command it is possible to ask the station to send an SMS with the weather data of the last Sampling Interval.

This command will not work when the station has just been switched on, before at least a period corresponding to a sampling interval has elapsed.

#INI

INItialize parameters to default settings. This command will erase all the eeprom and reinitialize to factory settings.

IMPORTANT!: all your numbers and other settings will be erased!!!

Password will be reset to 123456.

After issuing this command, wait at least 2 minutes before sending other commands to the unit.

#LGG

Define the interval at which the GPRS packets will be sent.

Minimum 1 minute, maximum 60 minutes.

We suggest to keep this value at 60 minutes, not to pay too much for data traffic

Example: #LGG6

#MHD

Message HeaDer. This command allows you to program the Name of the station. and the serial number of the SMS messages (autoincremented)

Every message is sent by the unit in a format similar to the following:

TCX-0001

Where TCX is the name of the device, that can be programmed with MHD, 0001 is the serial number (continuously incremented) of the SMS and then the following text that is the real information sent with the SMS and that varies accordin gto the reason why the SMS was generated (i.e. ALARM, Command answers etc.).

With the command MHD you can program the Name and the serial number, if you want. If you program only the name, you need to use up to 10 characters and close with a #, as in the following example:

#PWD123456#MHD=my tcx#

If you want also to program the serial number, make sure you are programming the header using <u>exactly</u> 10 characters and then, after a comma, program a 4 digit serial number. For example:

#PWD123456#MHD=my-awx....,0001

<u>To check</u> what the current header and serial number is, you can send the message: #PWD123456#MHD?

#NOA

NO Acknowledgement. Use this command if you don't want the device to answer to your SMS command with another SMS.

#RTC

Real Time Clock. Use this command to program a specific date and time in the real time clock of the device. You will need to have it programmed well if you want to use the feature WHO in a useful way. See also #SCT.
The command is as follows:
#PWD123456#RTC09/12/05,11:58:01
and to check you can use
#PWD123456#RTC?
RTC=09/12/05,11:58:01

#SCT

Synchronize Clock with SMS TimeStamp. This command provides a easy way to set your device clock without needing to send the longer RTC command.
Simply send: #PWD123456#RTC and your clock will be automatically synchronized with the network. This is expecially useful during Summer or Winter time changes

#SLP

Sleep the Station. This command is very usefull for power saving and should always be used. The station will enter power save, but still measure parameters, and will wake up every minute to check incoming SMS etc.
Example: #SLP1

#UDM

UDP mode.

The AWX can send UDP packets in 3 modes, defined by UDM.

0= Data are sent with no control.

1= data are send checking that the GSM Modem hasn't received an error from the network or has no signal.

2- In addition to 1, the unit waits for an echo of the same packet, coming from the server

We suggest to use #UDM2

#UIP

Define IP address and port

This command is used to tell the AWX where to send the data.

You should enter here the static IP address of the server you are using and the port. Make sure this port is not filtered by a firewall.

Example: #UIP127.127.0.1:999

Most common problems and solutions

I have inserted the SIM but the unit doesn't work:

Check to have removed the PIN request from the SIM. If you didn't do it and you have switched-on the unit more than 3 times, you may need to use the PUK. Check with SIM instructions for details

Weather data don't arrive to the Server

Check that the UPD port you are using is not filtered by a firewall.

Make sure you have programmed the correct name of the station with command MHD.

Make sure you have synced the real time clock of the station with command SCT.

Contact us for more information

APPENDIX A

Programming with PC

It is possible to program this device with a PC, using the special level shifting cable that we can supply on request.

Setup the communication software of your PC or MAC (Putty or Zterm work well) to communicate at 9600 baud, 8 bit, no parity, 2 stop bits.

When you switch on the AWX it will output [hello] through the serial port and the status led will blink very fast for a few seconds.

During this time you can enter the programming menu by typing [menu] on the keyboard (only menu, no square brackets). Press Enter.

NOTE: at this stage, the modem is not registered to the network, so you cannot program RTC.

Once the modem is registered, you need to wait one minute, until the unit stops clicking (you hear a ticking every second, normally, when this stops momentarily, press ENTER.

Press ENTER on your keyboard.

The screen (after a few seconds) will show [hello]

Type [menu] and press ENTER.

The unit will enter the programming menu as follows:

>

hello!

>menu

PASSWORD?

>123456

TCX OS v9.0, (c)1999-2009 DPS-Promatic srl

Device name: AWX

>

As you can see after having typed [menu] the device has requested to enter the password. Type 123456 if you have not changed it.

At this point you can enter the commands directly without needing to type the password anymore.

For example, to check the LGG value

> *>#LGG?*
>
> *LGG=60*

To change it to 2

> *>#LGG02*
>
> *LGG-OK:02*
>
> *>*

Once you have fnished this programming session, just give command #END to exit.

> *>#END*
>
> *EXITING MENU...BYE BYE*
>
> *>*

Maintenance

AWX station needs to be checked at least every year, to make sure it is efficiently working. In details:

Rain collector cleaning

The rain collector tends to fill with dirt and leaves. Should be checked to maintain it efficient.

Solar radiation sensor cleaning

The solar radiation sensor should be cleaned every year using a cloth with liquid soap and water.

Leaf wetness sensor cleaning

The leaf wetness sensor should be cleaned every year using a cloth with liquid soap and water.

Anemometer check

The anemometer should be checked every year with a compass and a reference anemometer. Anemometer should be aimed at NORTH.

Temperature and Humidity calibration

These sensors cannot be calibrated and should be checked with a reference instrument.

Barometric pressure check

You can check the functionality of this sensor by means of a reference instrument.

Cleaning solar panel

Solar panel should be aimed at south and should have no shadows coming from trees. Clean it using a cloth with liquid soap and water.

Lead Accumulator

The average life of the accumulator is 6 years.

You can check its charge looking at the data sent in the internet.

If it will go below 11 V, the station will stop working and will enter power save mode.

Important note: electronic devices may pollute the environment.

Act according to your local laws when disposing this unit.

The PCB1041 and PCB1045 electronic boards comply with EMC regulation.

The Quectel M95 GSM engine complies with EMC regulation

This device contains a GSM modem.

Do not keep it near you and observe precautions that should be

normally observed with any mobile phone.