EOL2020

wind data-logger

WindFarm Module

KINTECH
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CONTENTS

Version 1.0
January 2004

The *WindFarm* module is an accessory to the data logger *EOL2020.* This document is a guide to the module functions, which should be read in conjunction with the "User Guide" for the data-logger.

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1. General description of WindFarm *module*

The *WindFarm* module has been designed with the two principal objectives of making the operation of a wind farm easier and more efficient in such a critical area as the meteorological data. The module has been developed with this aim in mind. It establishes permanent contact with a meteorological tower on a wind farm, using TCP/IP communications for this data.

Some years ago, it was quite common for towers to be similar to those used for site investigation. Some towers did not even incorporate the option for remote communication. Nowadays, there is a clear tendency towards erecting more towers on wind farms, depending on the relief, wind rose, etc. Furthermore, given the importance of the meteorological data obtained, they are included within the monitoring system of the wind farm. The data-logger is very often the responsibility of the wind farm operator, assigned by the administrator/owner.

The design of the *WindFarm* module has been carried out with the following aspects in mind:

- Ease-of-use for the wind-farm operator, maintaining the classic user interface of the basic eol2020 module.
- Keeping all of the eol2020 logger functions, for remote communication, recording and downloading data files, graphs, reports, etc. In addition, as it is a comprehensive system, it will maximise data availability.
- Versatility of the communications module. It can be very rapidly adapted to different systems.

The design of the *WindFarm* module has been based on the standards of the international organisations; IEA, IEC, AWEA and WMO. During the phase of calculations and operability, various work has been considered by the Spanish energy research organisations CIEMAT, IDAE and CIRCE. In particular, suggestions in the standard IEC 61400 have been included.

It has been produced with the same philosophy of both ease-of-use and security in data acquisition which is shared by the other EOL products.

New functions have been added to support its use as a meteorological tower on a wind farm.

Basically, the new functions allow real-time data to be sent to a PC on a wind farm, usually via a fibre-optic cable. The *WindFarm* module software responds to all TCP/IP requests, providing data to other applications so, for example, the System of Communications and Data Acquisition (SCADA) of the wind farm can be integrated into the system.

2. Reliability

The *WindFarm* module for the wind-farm logger maintains the same operating structure as the rest of the EOL range of products, from which it inherits its now well-known characteristics of precision and reliability.

In order to maintain reliability, the latest features have needed new algorithms, paying particular attention to maintaining communication at all times, even in the case of total power loss to the wind farm computers.

Furthermore, the data is stored in the memory of the logger itself, so it is possible to have on the one hand, the usual data-processing system in site-investigation towers, using memory downloads with the generic *EOL2020* software, and on the other hand, the database obtained from real-time data sent to be integrated into the SCADA system on the farm.

3. Precision

The average speeds are calculated with an accuracy of sixteen bits. This means that in practice, the precision of the data downloaded only depends on the precision of the anemometer used.

The directions are calculated with an accuracy of eight bits, which implies a conversion error of 0.4%. In the other analogical inputs, the accuracy is 12 bits.

The accuracy mentioned above refers to data recorded in the memory, whose binary value is transferred during downloading.

The maximum and minimum instantaneous speeds have an accuracy of ±0.05 metres per second. The real-time data can be seen in the monitoring window or on the logger display. In the case of wind speeds, they are sent in decoded hexadecimal format with a decimal figure. These are the average for the last two seconds, the maximum and

minimum speeds of the current 10-minute interval for anemometer 1, and the average speed of the previous 10-minute interval.

For the vane reading, a number sampled every two seconds is sent, decoded in hexadecimal. The temperature is sent as a decoded value, with a decimal figure in hexadecimal format. The analogue data are sent as a number of binary values from the converter.

4. Type and number of sensors

It is possible to connect the following directly to the *EOL2020®* logger: three anemometers, two vanes, a temperature sensor, three analogue sensors, (typically atmospheric pressure, relative humidity and rainfall) and active power in the machine, and an external digital input which can be used as an instantaneous GSM call alarm.

The various types of sensors that can be connected include those most commonly used, whether for anemometers, vanes or analogue sensors.

The logger accepts coil, opto-chopper and reed-contact anemometers. It is also possible to connect anemometers with analogue code, to measure vertical currents.

The vanes are usually of the potentiometer type with values of between 1KΩ and 10KΩ. It is also possible to connect absolute encoder vanes, coded in Gray.

The analogue connections should have a power output, and accept values of up to five volts. If this is not the case, it will be necessary to use signal adaptors.

5. Downloading and logger interface

The *WindFarm* module in the *EOL2020®* application will request data from the data-logger every two seconds. Information on these data can be found in the section on *Reliability*. These data received by the *EOL2020®* application are then delivered to any TCP/IP client applications so they can be used as required, normally for integration in the wind farm SCADA.

Apart from sending the data in real time, the data-logger also continues to record the statistical data every 10 minutes within its memory, with the possibility of being programmed to automatically download the data

recorded. If this is the case, the real-time data will not be available for the number of seconds that it takes to make the download. It is also possible to download the data manually by substituting the E2PROM, without interrupting the process of sending the data in real time.

6. Logger installation

If quality and cleanliness during the installation of a telemetering system are fundamental in ensuring trouble free operation on a tower for a site investigation, then, they are even more important for a tower on a wind farm where such a system is expected to operate for many years. For this reason, we strongly advise that any installation be carried out with the greatest degree of cleanliness and quality as possible.

For the power supply and connecting the sensors, refer to the general procedure for the installation set out in the “User Guide” for the EOL2020.

The volume of information generated during the communications is insignificant when considering the bandwidth available in any type of fibre-optic cable, such that the installation of this system and of the RS232 converters can be carried out using the existing fibre-optic installation on the wind farm. The procedure to follow for the installation of the RS232 converter module in a fibre-optic network is therefore the same as for any other fibre-optic installation. There are various methods commercially available for this application. However, you are welcome to consult KinTech for information.

7. Installation and configuration of server software

To install the software, follow the procedure described in the “User Guide”.

The *EOL2020®* server program continuously captures data in real time, from any data-loggers connected, normally by a fibre-optic cable to the wind farm PC. To configure the automatic continuous monitoring of a data-logger, simply mark the corresponding box in the *Monitor* file of the site required. On saving the location, it is added to the list of automatic monitoring.

On doing so, every time the software is executed, all of the locations on the list of automatic monitoring are checked by a separate new *EOL2020®*

task, which is started for this precise purpose. There will therefore be as many tasks as meteorological towers on the wind farm.

Every *EOL2020®* task functions as a server waiting for communication from the new client. With a source code, the TCP/IP client application is available to all users of *EOL2020®* to enable the task of integrating the data into SCADA. Such that, every server application launched by the *EOL2020®* software will respond to any connection requests received, in its IP host address, in its location port number specified in the corresponding file in the location window.

Although the IP address is defined by the system, each location should be given a different free port number. The client application should define the IP address of the server and the number of the remote port for the location you wish to connect to. As soon as the server application receives a request for connection, the server sends all the instantaneous monitoring data.

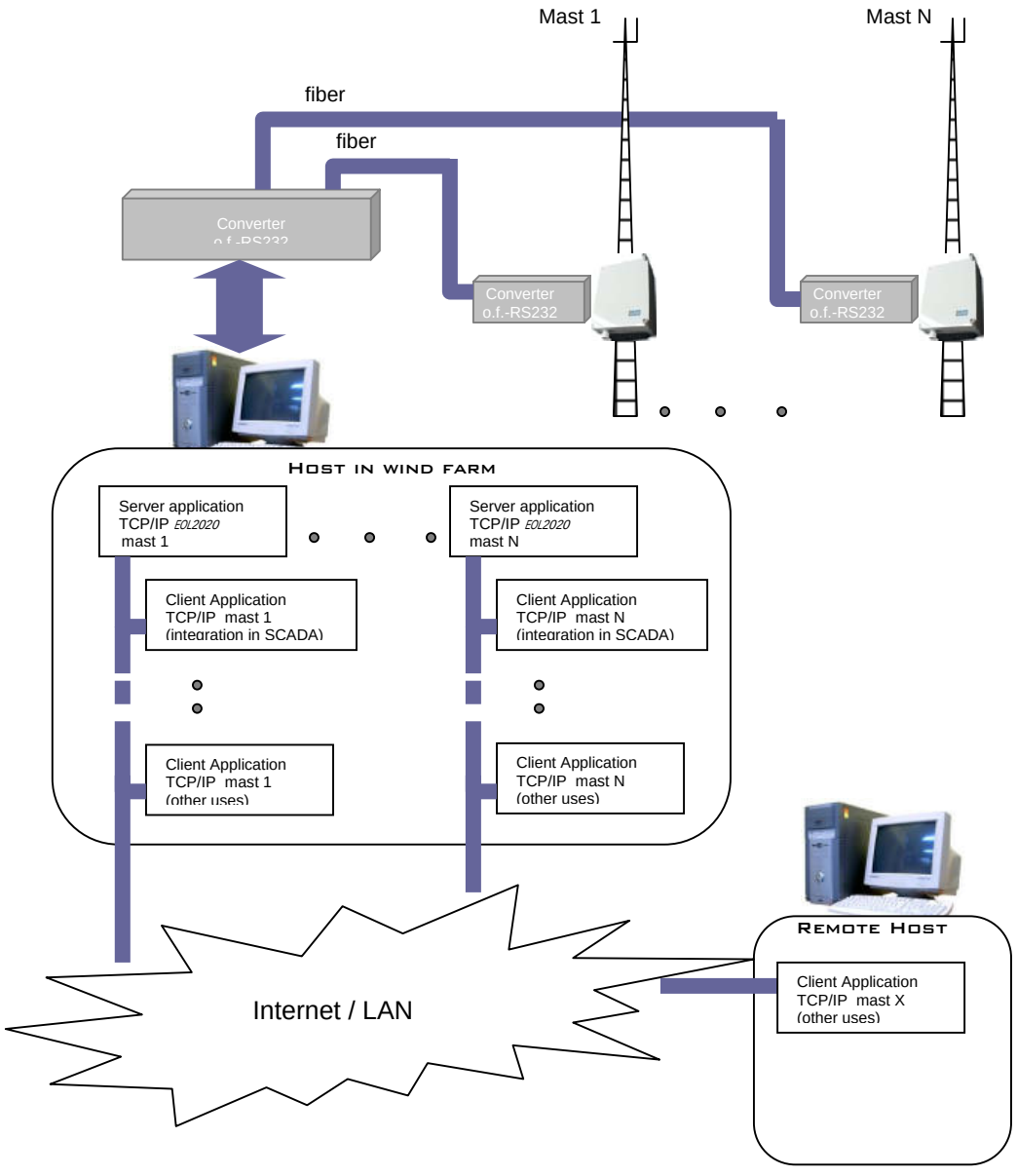
The software has been optimised to minimise the loading on the system.

There is no limit to the number of clients per logger that the server can respond to, so other clients, in addition to the application entering the data into SCADA, may access the instantaneous data from the meteorological tower.

If there is an error in the communication between a PC host and a logger, the software re-starts communication automatically.

8. Installation diagram

The installation should follow the connection diagram below:


Mast 1
Mast N
fiber
fiber
Converter
Converter o.f.-RS232
Converter o.f.-RS232
HOST IN WIND FARM
Server application TCP/IP EOL2020 mast 1
Server application TCP/IP EOL2020 mast N
Client Application TCP/IP mast 1 (integration in SCADA)
Client Application TCP/IP mast N (integration in SCADA)
Client Application TCP/IP mast 1 (other uses)
Client Application TCP/IP mast N (other uses)
Internet / LAN
REMOTE HOST
Client Application TCP/IP mast X (other uses)