



- Connects a Davis VantagePro2 or Vantage Vue to a Modbus network
- Modbus RTU over RS-485 and Modbus TCP/IP over Ethernet compatible
- Easy Modbus TCP/IP configuration via webpage, Modbus registers, or onboard switches
- Supports three simultaneous Modbus TCP masters.
- Various selectable metric and imperial unit conversions
- Compatible with new Davis firmware; provides additional weather data
- Allows weather station configuration directly

Quick View

- Complete Holding Register Listing ([Appendix A](#))
- Unit Conversions ([Page 11](#)) can be done by either writing direct to the registers or using the KTA-282 Application.
- Default Units for Readings:

Variable Type	Default Units
Temperature	°C
Pressure	mbar
Wind Speed	kph
Rain	mm

- Troubleshooting ([Page 19](#))
- Understanding the data formation for the readings of extra temperature/humidity/leaf/soil stations. ([Appendix B](#))

Notes: All temperatures are signed integers, therefore, a reading greater than 32767 represents a negative temperature.

Overview

The KTA-282 Modbus TCP Weather Station Gateway allows the easy connection of a PLC (Programmable Logic Controller), RTU (Remote Telemetry Unit) or SCADA System to a Davis Instruments Weather Station. Using the Modbus RTU (Binary), or Modbus TCP/IP (Ethernet) protocols, it enables a programmable controller to monitor and carry out actions based on wind speed, wind direction, temperature and many other weather-based variables.

The KTA-282 Modbus TCP Weather Station Gateway is a major upgrade to our popular GWY-141 Modbus-VantagePro2 Gateway. It provides all the functionality of the GWY-141, with the following improvements:

- Addition of Ethernet:
 - Allows the KTA-282 to be polled by up to three Modbus TCP/IP masters simultaneously
 - Provides a webpage whereby TCP/IP settings can be easily monitored and altered. Also shows current settings, weather data, and communications statuses.
 - Can be interrogated over HTTP to return Modbus register values in XML format
- Allows all 125 registers to be polled at once – previously limited to 30.
- Supports the new LOOP 2 command in compatible devices¹ (VantagePro 2 firmware V1.90 or later, and Vantage Vue). This provides an additional 16 packets of previously unavailable weather data.
- Provides a method to setup the weather station for first use, without the need to connect it to your PC.

Notes: 1. The Weatherlink cable can be used to update the firmware of your weather station; allowing it to respond to the loop 2 command.

Device Compatibility

The KTA-282 is compatible with the following Davis Instruments weather stations (Davis Instruments product numbers in bold):

- **6152C** Cabled VantagePro2
- **6162C** Cabled VantagePro2 Plus
- **6152** Wireless VantagePro2
- **6162** Wireless VantagePro2 Plus
- **6153** Wireless Vantage Pro 2 Fan Aspirated
- **6163** Wireless Vantage Pro 2 Plus Fan Aspirated
- **6250** Vantage Vue
- **6316** Wireless Weather Envoy
- **6316C** Cabled Weather Envoy

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Getting Started

Certain generic terms are used throughout this manual to refer to equivalent hardware.

Terminology	Refers To
“Weather station”	<ul style="list-style-type: none"> • Vantage Pro 2 console • Vantage Vue console • Envoy (wired or wireless)
“Sensors”	<p>Any weather sensors your weather station communicates with. This is commonly a bunch of sensors packaged together as an Integrated Sensor Suite (ISS) but can also include:</p> <ul style="list-style-type: none"> • ISS Plus (ISS + UV & Solar Radiation) • Wireless Temperature Sensor • Temp/Humidity Sensor • Leaf & Soil Moisture/Temp <p>Or individual sensors (not an exhaustive list):</p> <ul style="list-style-type: none"> • Leaf Wetness • Solar Radiation • UV • Anemometer • Rain Collector • Temperature
“Weatherlink”	The serial WeatherLink expansion cable. Required for weather station connection to the KTA-282. Can also be used to update the firmware of your console.
“Gateway”	The KTA-282 Modbus TCP Weather Station Gateway
“Controller”	The Modbus device you are using to poll the KTA-282.
“Weather station EEPROM”	Persistent memory held inside the weather station used to store factory calibration values, location specific data, and other configuration values. It is this memory that is set during the setup of your weather station for first use (latitude, longitude, elevation, etc).

Table 1: Davis Instruments Jargon

Weather Station Set Up

Begin by assembling your weather station and sensors, using the documentation provided by Davis. You will need to fit the **WeatherLink** in this procedure.

This is now the best time to setup your weather station for first use. Your Davis documentation will detail this process. If you have a weather station with a screen you can follow the prompts after entering “setup” mode, otherwise the setup process can be done by connection to a PC. The KTA-282 also offers a method for setting up your weather station (by directly writing to registers), however it is designed for advanced users to alter calibration values and is not recommended for first use configuration. The following values are typically set during this procedure:

- IDs, and retransmission of wireless sensors (if applicable).
- Date and time
- Latitude and longitude
- Daylight savings
- Elevation
- Wind cup size (large is standard)
- Rain collector size (US models: 0.01 in, UK models: 0.2 mm. This will typically only need to be changed if a metric adapter is fitted to a US unit)
- Rain season start
- Serial Baud Rate (ensure it is at default: 19200. No other baud rates are supported by the gateway)

Continue the set up process by connecting all necessary cabling. A generic set up is shown in the diagram below (depending on your particular product, connections may differ slightly).

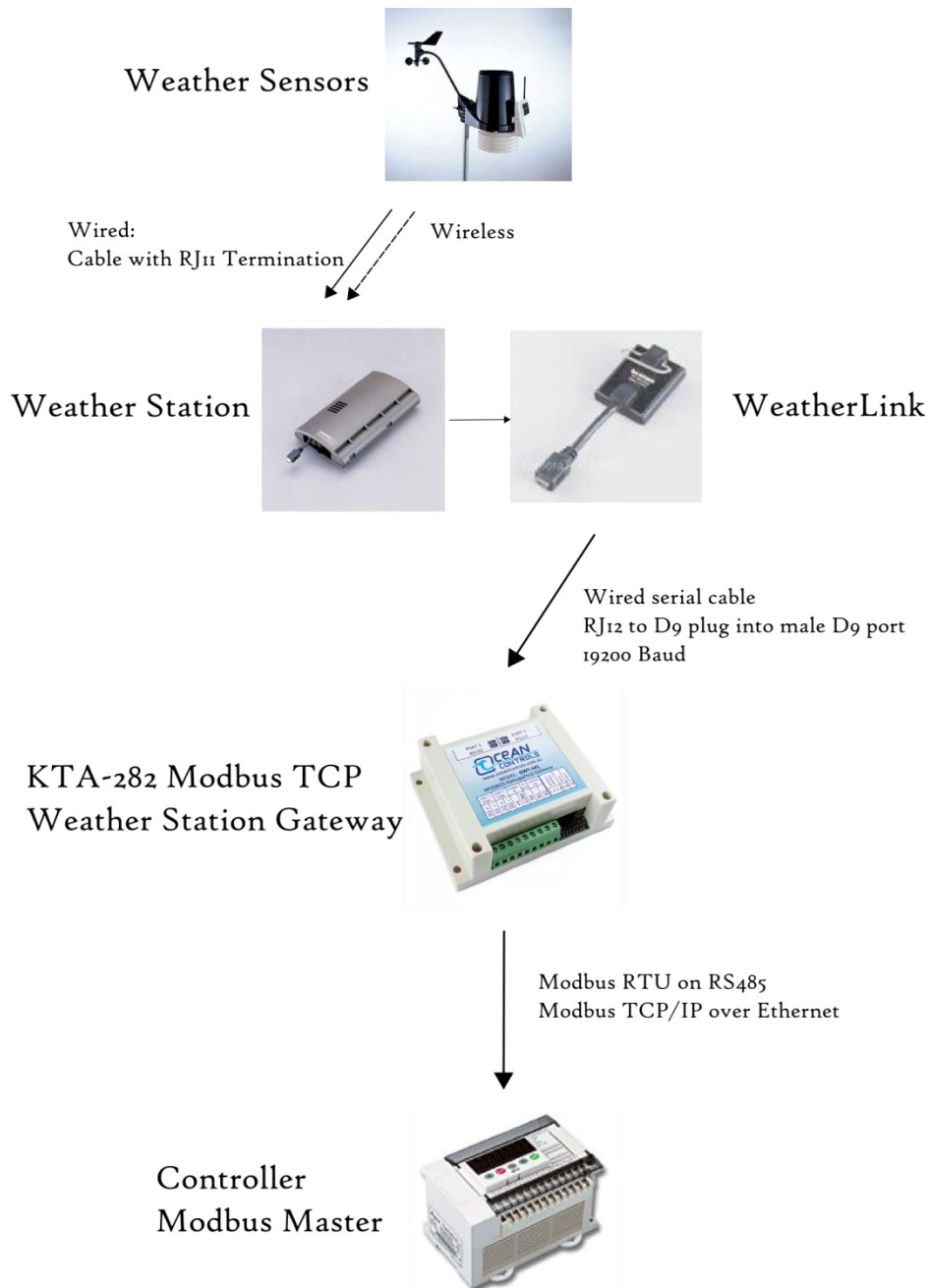


Figure 1: Typical weather station set up

Configuring the KTA-282

Connection	Description
Vs	Power Positive (8 to 28V DC; 100mW)
COM	Power Negative (Ground)
D +	RS-485 Data +
D -	RS-485 Data -
GND	Ground
Male DE-9	Serial communications (RS-232) between KTA-282 and Weather station via WeatherLink cable
RJ45 Socket	Ethernet Port
OC1	Open Collector Output 1
OC2	Open Collector Output 2

Table 2: Connections to the KTA-282

LED	Function
Red Tx LED (next to RS-485 terminal)	Indicates serial communications received on RS-485
Green Rx LED (next to RS-485 terminal)	Indicates serial communications sent (Modbus RTU) on RS-485
Green Rx LED next to DE-9 connector	Indicates serial communications received (from weather station) on the serial port
Red Tx LED next to DE-9 connector	Indicates serial communications sent on the serial port
Green LED (right side) on RJ45 socket	Link LED. Always on to indicate good status for Ethernet, flashes to indicate activity.
Yellow LED (left side) on RJ45 socket	FDX LED. On = Full duplex Ethernet Off = Half duplex Ethernet
Green Rx LED next to RJ45 socket	Flashes when packets are received on the Ethernet port.
Red Tx LED next to RJ45 socket	Flashes when packets are sent on the Ethernet port.

Table 3: KTA-282 LED Functions

Provide power to the KTA-282 via the V+ and GND screw terminals. Without anything else connected, you should see the red LED next to the DE-9 connector flash once every 5 seconds. This confirms the card is on and functional.

Continue by connecting the DE-9 cable from your weather station (via the WeatherLink) to the male D9 port of the KTA-282. You should now see an accompanying green light every time the red LED flashes. This indicates the card is successfully receiving data from the weather station.

Configuring Modbus

Modbus RTU

Serial Modbus is provided on RS-485. The communications settings for this port are set using 8 DIP switches next to the DE-9 Socket. Any changes to the switches won't take effect until the KTA-282 is power cycled.

Modbus RTU Address	Switch 1	Switch 2	Switch 3	Switch 4
1	OFF	OFF	OFF	OFF
2	ON	OFF	OFF	OFF
3	OFF	ON	OFF	OFF
4	ON	ON	OFF	OFF
5	OFF	OFF	ON	OFF
6	ON	OFF	ON	OFF
7	OFF	ON	ON	OFF
8	ON	ON	ON	OFF
9	OFF	OFF	OFF	ON
10	ON	OFF	OFF	ON
11	OFF	ON	OFF	ON
12	ON	ON	OFF	ON
13	OFF	OFF	ON	ON
14	ON	OFF	ON	ON
15	OFF	ON	ON	ON
Reserved	ON	ON	ON	ON

Table 4: Modbus RTU address switches

Baud Rate	Switch 5	Switch 6
2400	OFF	OFF
4800	ON	OFF
9600	OFF	ON
19200	ON	ON

Table 5: Modbus RTU Baud Rate switches

Parity	Switch 7	Switch 8
None	OFF	OFF
Even	ON	OFF
Odd	OFF	ON
Bootloader¹	ON	ON

Table 6: Modbus RTU Parity switches

Notes:

1. The bootloader is an advanced function that allows firmware updates to be deployed in the field.

Modbus TCP/IP & Ethernet Webserver

To communicate over a TCP/IP network, the KTA-282 needs five pieces of information:

1. The Internet Protocol (IP) address of the KTA-282 within the network. Set by the user
2. The Subnet Mask of the network. Set by the user
3. The Default Gateway of the network. Set by the user.
4. A unique MAC address. Shipped preloaded by Ocean Controls.
5. The TCP/IP port the request is being sent on. For the KTA-282, **Modbus TCP/IP is on port 502**, and the **webserver (HTTP) is on port 80**.

These settings themselves can be set by one of three available methods:

1. 8 DIP switches next to the Ethernet Connector
2. Modbus registers (using either Modbus RTU on RS485 or Modbus TCP/IP on Ethernet)
3. The webpage.

Configuration Using Switches

Switch one determines where the TCP/IP settings are loaded from when power is applied to the KTA-282. With this switch off, settings are loaded from the current values of the switches, **regardless of previous settings**. With the switch on, the settings are loaded from internal memory - saved after being previously configured via the webpage or Modbus.

Power Up Configuration	Switch 1
OFF	TCP/IP settings from switches
ON	TCP/IP settings from internal persistent memory

Table 7: TCP/IP mode switch

Switch two is the “panic switch”, returning the KTA-282 to default if the user writes incorrect values or doesn’t otherwise know what settings the card currently possesses. To use, flick the switch on, hold for one second, and turn back off again. **Don’t leave this switch on; the card will be constantly resetting and therefore unresponsive.**

Default Values

IP Address: 192.168.1.100
 Subnet Mask: 255.255.255.0
 Default Gateway: 192.168.1.1

Reset to Default	Switch 2
OFF	No action
ON	TCP/IP settings reset to default

Table 8: TCP/IP Reset Switch

Switches three and four choose between four different TCP/IP schemes commonly used in private address space.

TCP/IP Base Settings	Switch 3	Switch 4
IP Address: 192.168.1.x Subnet Mask: 255.255.255.0 Default Gateway: 192.168.1.1	OFF	OFF
IP Address: 10.0.0.x Subnet Mask: 255.0.0.0 Default Gateway: 10.0.0.1	OFF	ON
IP Address: 10.1.1.x Subnet Mask: 255.255.0.0 Default Gateway: 10.1.1.1	ON	OFF
IP Address: 172.16.0.x Subnet Mask: 255.240.0.0 Default Gateway: 172.16.0.1	ON	ON

Table 9: TCP/IP Subnet switches

The final four switches determine the last octet of the IP address.

Last Octet (IP Address)	Switch 5	Switch 6	Switch 7	Switch 8
100	OFF	OFF	OFF	OFF
101	ON	OFF	OFF	OFF
102	OFF	ON	OFF	OFF
103	ON	ON	OFF	OFF
104	OFF	OFF	ON	OFF
105	ON	OFF	ON	OFF
106	OFF	ON	ON	OFF
107	ON	ON	ON	OFF
108	OFF	OFF	OFF	ON
109	ON	OFF	OFF	ON
110	OFF	ON	OFF	ON
111	ON	ON	OFF	ON
112	OFF	OFF	ON	ON
113	ON	OFF	ON	ON
114	OFF	ON	ON	ON
115	ON	ON	ON	ON

Table 10: TCP/IP IP Address switches

Configuration Using Webpage

The KTA-282 has an inbuilt web server that can service HTTP requests on port 80. Simply point your web browser to the IP Address of the KTA-282 to retrieve this page.

Below the current weather readings is a web form with provision to set the TCP/IP settings of the KTA-282. The form fields will be populated with the Gateway's current values. These can be altered and written to the KTA-282. After writing these values, you will likely want to **change TCP switch 1 to read from memory** on the next power up, otherwise the TCP/IP configuration will read from the switches.

Configuration Using Modbus (RTU or TCP/IP)

The KTA-282 has 13 Modbus holding registers reserved for configuration. These settings can be read and written using **either** serial Modbus (RTU on RS-485) or Modbus TCP/IP.

Modbus Register	Function
80	1 st octet IP Address
81	2 nd octet IP Address
82	3 rd octet IP Address
83	4 th octet IP Address
84	1 st octet Subnet Mask
85	2 nd octet Subnet Mask
86	3 rd octet Subnet Mask
87	4 th octet Subnet Mask
88	1 st octet Default Gateway
89	2 nd octet Default Gateway
90	3 rd octet Default Gateway
91	4 th octet Default Gateway

92	Commit to Gateway (write a 1)
----	-------------------------------

Table 11: Modbus TCP/IP Configuration Registers

Each register holds one octet of the TCP/IP configuration. These can be read to view the current TCP/IP settings, or written to set the values. Once all twelve octets are manually set, the settings are committed to the gateway by writing a one to holding register 92. Make sure **all** registers are written with correct values before they are committed to the gateway.

Weather Station Data

The gateway operates as a Modbus slave. To access the holding registers in the gateway, the PLC or RTU must be configured as a Modbus Master. Using Modbus Function 3, the PLC can read the Holding Registers.

Loop 1 Data

Data returned by the loop 1 command. All supported Davis Instruments hardware will populate these fields.

Holding Register Address 40,000+	No. of Registers	Description	Multiplier	Units	Notes
1	1	Indicates the current 3-hour barometer trend.			1
2	1	Packet Type, always 0			
3	1	Location in the archive memory where the next data packet will be written. This can be monitored to detect when a new record is created.			
4	1	Barometer	0.1	mbar	
5	1	Inside Temperature	0.1	°C	
6	1	Inside Humidity	1	%	
7	1	Outside Temperature	0.1	°C	
8	1	Wind Speed	1	kph	
9	1	10Min Average Wind Speed	1	kph	
10	1	Wind Direction	1	degrees	
11	4	7 Extra Temperatures	1	°C	
15	2	4 Soil Temperatures	1	°C	
17	2	4 Leaf Temperatures	1	°C	
19	1	Outside Humidity	1	%	
20	4	7 Extra Humidity Stations	1	%	
24	1	Rain Rate	0.1	mm/hour	2
25	1	UV Index	0.1		
26	1	Solar Radiation	1	W/m ²	
27	1	Storm Rain	0.1	mm	2
28	1	Current Date Of Storm Rain	1		3
29	1	Day Rain	0.1	mm	2
30	1	Month Rain	0.1	mm	2
31	1	Year Rain	0.1	mm	2
32	1	Day ET	0.1	mm	2
33	1	Month ET	1	mm	2
34	1	Year ET	1	mm	2
35	2	4 Soil Moistures	1	centibar	
37	2	4 Leaf Wetness, 0 to 15, 0 = Very Dry, 15 = Very Wet	1		
39	1	Inside Alarms	1		
40	1	Rain Alarms	1		
41	1	Outside Alarms	1		
42	4	Extra Temp Hum alarms	1		
46	2	Soil and Leaf Alarms	1		
48	1	Transmitter Battery Status	1		
49	1	Console Battery Voltage	1	Volts	

50	1	Forecast Icons	1		
51	1	Forecast Rule Number	1		
52	1	Time of Sunrise	1	HHMM	
53	1	Time of Sunset	1	HHMM	
54	1	Wet Bulb	0.1	°C	5
60	1	Comms Status (1=OK, 0=Fault)	1		4

Table 12: Loop 1 Modbus Register Listing

Notes:

- The three hour barometer trend will show one of the following:

Value	Meaning
-60 (196 as an unsigned byte)	Falling Rapidly
-20 (236 as an unsigned byte)	Falling Slowly
0	Steady
20	Rising Slowly
60	Rising Rapidly
80 (ASCII 'P')	Rev A firmware; no trend info is available. The WeatherLink cable can be used to update the weather station to the latest firmware
Any other value	The weather station doesn't have the 3 hours of barometer data required to calculate trend data

Table 13: Three hour barometer trend description

- The start date of current storm is represented as follows, bit 15 to bit 12 is the month, bit 11 to bit 7 is the day and bit 6 to bit 0 is the year offset by 2000.
- Holding Register 60 contains the communications status, which indicates if the Gateway is receiving data from the Weather Station.
- Wet bulb is not NOAA accurated, but rather an estimation based on temperature and dewpoint. Use as an indication only.

Loop 2 Data

Only recent Davis Instruments hardware (Vantage Pro 2 firmware V1.9 or later, Vantage Vue) will return the loop 2 command with valid data. Older hardware will either not respond or respond with rubbish values. The WeatherLink cable can be used to update an older weather station with this recent firmware.

Holding Register Address 40,000+	No. of Registers	Description	Multiplier	Units	Notes
61	1	2Min Wind Speed	0.1	kph	
62	1	10Min Wind Gust	0.1	kph	
63	1	Wind Direction for 10Min Gust	1	degrees	
64	1	Dew Point	1	°C	
65	1	Heat Index	1	°C	
66	1	Wind Chill	1	°C	
67	1	THSW Index	1	°C	
68	1	Last 15Min Rain	0.1	mm	2
69	1	Last Hour Rain	0.1	mm	2
70	1	Last 24 Hours Rain	0.1	mm	2
71	1	Barometric Reduction Method			5
72	1	User Entered Barometric Offset	0.1	mbar	
73	1	Barometric Calibration Number	0.1	mbar	
74	1	Barometric Sensor Raw Reading	0.1	mbar	
75	1	Absolute Barometric Pressure	0.1	mbar	
76	1	Altimeter Setting	0.1	mbar	
77	1	Index to Minute Within the Hour			6
78	1	Loop 2 Comms Status			7

Table 14: Loop 2 Modbus Register Listing

Notes:

- The barometric reduction method applies corrections to the barometer to get a more accurate reading. The raw pressure is affected by other weather events such as temperature, humidity, and elevation. The options are:

Reading	Barometric Reduction Method
0	User offset
1	Altimeter Setting
2	NOAA Bar Reduction (for Vantage Pro 2 this is the default and cannot be changed)

Table 15: Barometric Reduction Method Description

6. Index to the minute within the hour holds the current progress of the hour used for rain rate calculations – from 0 to 59.
7. Holding register 78 contains the status of the loop 2 command. If 1, loop 2 is being successfully received. To obtain the loop 2 data, the hardware must be either a Vantage Pro2 (Firmware revision 1.90 or later) or a Vantage Vue.

Functionality

Unit Conversions

NOTE: if your temperature displays incorrectly below 0°C, update to the latest firmware at oceancontrols.com.au

The units of the readings can be changed by writing to the Modbus holding registers shown in table 16. The following table shows the multiplier and unit. For example, if a 1 was written to holding register 106 then the atmospheric pressure readings would be in mmHg and have to be multiplied by 0.1.

Holding Register	Variable Type	Conversion ¹	Registers Affected
105	Temperature	0 = 0.1 °F 1 = 0.1 °C	5, 7
105	Extra Temperatures ²	0 = 1 °F + 90 1 = 1 °C + 50	11, 12, 13, 14, 15, 16, 17, 18
106	Pressure	0 = 0.001 inHg 1 = 0.1 mmHg 2 = 0.1 mb 3 = 0.001 atm	4
107	Wind Speed	0 = 1 mph 1 = 1 kph 2 = 1 knots 3 = 1 m/s 4 = 1 ft/s	8, 9
108	Rain ³	0 = 0.01 in 1 = 0.1 mm	24, 27, 29, 30, 31, 32, 33, 34

Table 16: Unit Conversion Modbus Register Listing

Notes:

1. The units used by the gateway:

Symbol	Unit
°F	Fahrenheit
°C	Centigrade or Celsius
inHg	Inches of Mercury
mmHg	Millimetres of Mercury
mbar	Millibar
atm	Atmospheres
mph	Miles per Hour
kph	Kilometres per Hour
knots	Knots (Nautical Miles per Hour)
m/s	Metres per Second
ft/s	Feet per second
in	Inch
mm	millimetre

Table 17: Gateway Units Listing

2. The Extra Temperatures apply to the 7 extra, 4 Leaf and 4 soil temperatures from loop 1. For Fahrenheit readings, Extra Temperatures need to have 90 subtracted from them. For Centigrade readings, Extra Temperatures need to have 50 subtracted from them.
3. The readings for Register 33, 34 will be in 0.01in or 1mm. Register 32 is reduced by a factor of 10; the readings returned will be 0.0001 in or 0.1 mm.

Weather Station Polling Period

By default, the gateway asks for data from the weather station every 2.5 seconds (as this is the same interval used by the weather station to read its sensors). This ensures that the latest weather data is made available to your controller. In between requests, the weather station sleeps to conserve power.

The polling period can be changed by writing to Modbus register 109. Enter your preferred polling period as a number in tenths of seconds (i.e. for 2.5 seconds enter 25). A longer polling period reduces the weather station's power consumption; extending battery life.

Weather Station EEPROM Write (Advanced users)

Beware that some configuration values are set by Davis in the factory and should not be changed. The KTA-282 does not guard against ill-advised use of the EEPROM write command.

The configuration registers of the weather station can be directly altered by the KTA-282. The EEPROM of the weather station is written using either the EEWR command or BAR= command depending on which EEPROM register requires manipulation (see Vantage Serial Protocol Docs on the Ocean Controls website). Each argument of these commands is coupled to a Modbus register. Any weather station EEPROM can therefore be written using Modbus communications.

The BAR command is of the following format:

BAR= <barometer calibration (in Hg * 1000)> <weather station elevation (in feet)>

The EEWR command is of the following format:

EEWR <address in hexadecimal> <value in hexadecimal>

Sending this string to the weather station will write the byte held in data to the EEPROM location specified by address. For registers of length 2 bytes, two EEWR commands are required.

The EEPROM write function works as follows:

Modbus Holding Register	Name	Description
110	EEPROM address	Address of the EEPROM register in the weather station memory
111	EEPROM Payload	Value to be committed to the memory at the address specified in Holding Register 110
112	Commit to EEPROM	Write a 1 to this register to activate the EEPROM write command
113	Barometer Value	Value to be written to BAR_CAL (Barometer argument)
114	Elevation	Value to be written to ELEVATION (Elevation argument)
115	Send BAR Command	Write a 1 to this register to activate the BAR write command
116	Write success	Upon successful EEPROM write, this register will be written to a 1

Table 18: EEPROM Write Modbus Register Listing

The weather station must be power cycled for the new EEPROM values to take effect. If your console takes batteries in addition to a plug pack, make sure both the plug pack **and** the batteries are removed. Wait ten seconds before reapplying power to ensure the weather station has in fact powered down.

Example (BAR= command):

The user has an external barometer that currently reads 1013.25 mbar (29.9 inHg), and the weather station is mounted 204 metres (670 feet) above sea level.

The weather station requires the pressure to be in thousandths of an inch mercury. Therefore 1013.25 mbar becomes 29.9 inHg; 29900 mInHg. The elevation must be in feet; 204 metres becomes 670 feet.

Write 29900 to Modbus register 115, and 670 to register 116. Commit the values to the weather station by writing register 117 to 1.

Note: the BAR= command must send both arguments to the weather station. If one of elevation or barometer calibration does not need to be written, you must manually write that register to zero before sending the BAR=

command.

Example (EEWR command):

The user desires the latitude to be set for Melbourne, Australia. The calculation is as follows: Melbourne lies at 37.7° South. Southern latitudes are represented in Davis weather stations' as negative tenths of a degree (-377). As an unsigned number in 2's compliment this is 65159 or FE87 in hexadecimal. To write this figure to the weather station, two commands will have to be used – one for each byte. The latitude is held in EEPROM location 0B in the weather station and is two bytes long. Values are *little endian (least significant byte first)*, therefore the following two commands must be sent:

**EEWR 0B 87
EEWR 0C FE**

This is done with the Modbus interface as:

Write 0B [or decimal 11] to register 111 and 87 [decimal 135] to register 112. To send the command, write a 1 to register 113. To confirm the EEPROM write as a success, read register 114. Success will be represented with a 1. To write the second command, first write register 114 to zero (so that success can be confirmed on the next write). Follow the same procedure as before: 0C [decimal 12] (the next address in the weather station's EEPROM) to register 111, FE [decimal 254] to register 112, and a 1 to register 113. Register 114 will again change to a 1 upon EEPROM write success.

This completes setting the latitude of the Davis weather station.

Note: consult the *EEPROM configuration settings* section of "Vantage Serial Protocol Docs" on the Ocean Controls website for detailed information on the EEPROM.

Modbus TCP Manual Socket Severing

Some users have experienced some problems with their Modbus TCP connection failing after prolonged use (between days and months). If this is a problem for you, it may help to enable manual socket severing by **writing a one to Modbus Holding Register 125**.

Modbus Holding Register	Name	Description
125	Modbus Socket Sever	<p>1 = Automatically severs a Modbus TCP connection after 90 seconds of inactivity.</p> <p>0 = Normal Modbus behaviour (socket remains open for the duration of the connection).</p>

The issue is caused by the Modbus Master mishandling the Modbus connection. In this situation, the Master opens a socket to the KTA-282 and begins communicating over Modbus TCP. At some point, the Master stops communicating on that socket, and tries to open another socket, **without properly closing the first connection**. Communications continue on the second socket. Again, the Master stops communicating on the second socket, and opens a third. The KTA-282 supports up to three simultaneous Modbus TCP connections, so at this point all comms are OK. But when it happens again, the KTA-282 will refuse the connection, because all sockets are occupied. The only way to recover is to power cycle either the KTA-282 or the Modbus Master, and manually sever the sockets.

By writing a one to Holding Register 125, you are enabling manual socket severing. The KTA-282 monitors all open connections, and if there is no actual traffic on a socket for 90 seconds, that connection is artificially forced to close.

Webpage

In addition to providing an interface to read and write the TCP/IP configuration values, the webpage also provides the user with a view of the current status of the KTA-282.

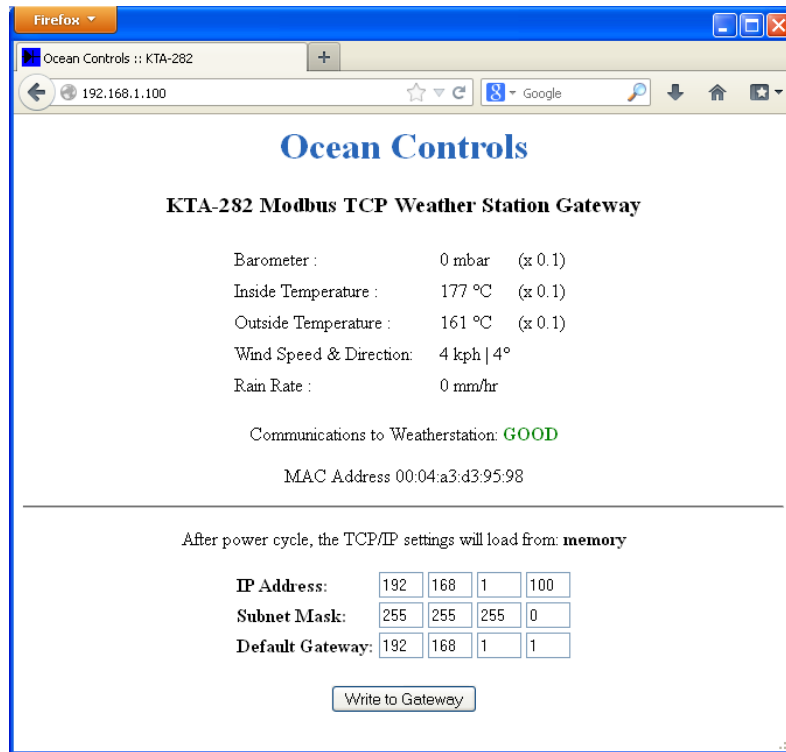


Figure 2: KTA-282 Webpage

Some common current weather values are displayed, along with their corresponding unit and multiplier. The unit and multiplier are displayed dynamically; that is, they change if conversions change. This is therefore a good way to view the current conversion settings of the KTA-282.

Below these readings is an indication of the current communication status between the gateway and weather station, either “GOOD” or “BAD”.

Directly above the horizontal line reads the MAC address for the KTA-282. This identifier is globally unique.

Directly below the horizontal line is the configuration fields for the gateway, and a line of text reading: “After power cycle, the TCP/IP settings will load from: <dynamic value>”. This text will read either “switches” or “memory” based on the status of TCP switch 1. It is important to realise that the TCP/IP settings **may still be read from the switches on power up**, despite changing them using Modbus or the webpage.

XML Request

In addition to Modbus TCP/IP, the gateway can also return the status of the holding registers via an XML file over HTTP (port 80). To trigger this request; send a HTTP GET query to the KTA-282’s IP Address with the register number appended after a forward slash. Alternatively, the entire register listing can be returned by using the same query with a “registers.xml” termination. The XML file structure is shown in the screenshots. This format is consistent.

Single Register

<IP Address> / <holding register number>

Using a web browser - with the gateway at its default address – requesting register 60:
192.168.1.100/60

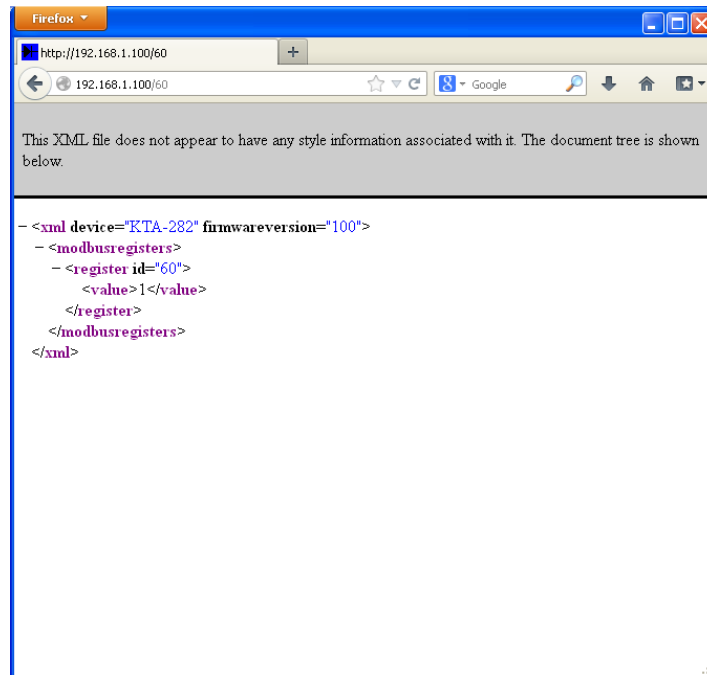


Figure 3: Single register HTTP query using browser

All Registers

<IP Address>/registers.xml

Using a web browser – with the gateway at its default address:
192.168.1.100/registers.xml

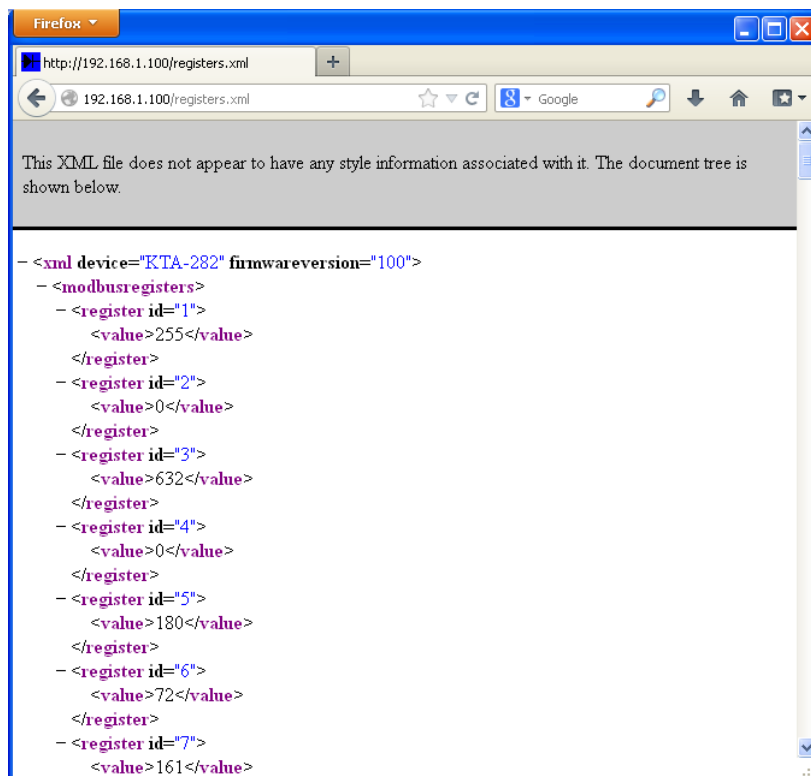


Figure 4: Complete register listing HTTP request using browser

Error Request

If the GET request is of the wrong format or otherwise unrecognised by the KTA-282, a **bad request** XML is returned.

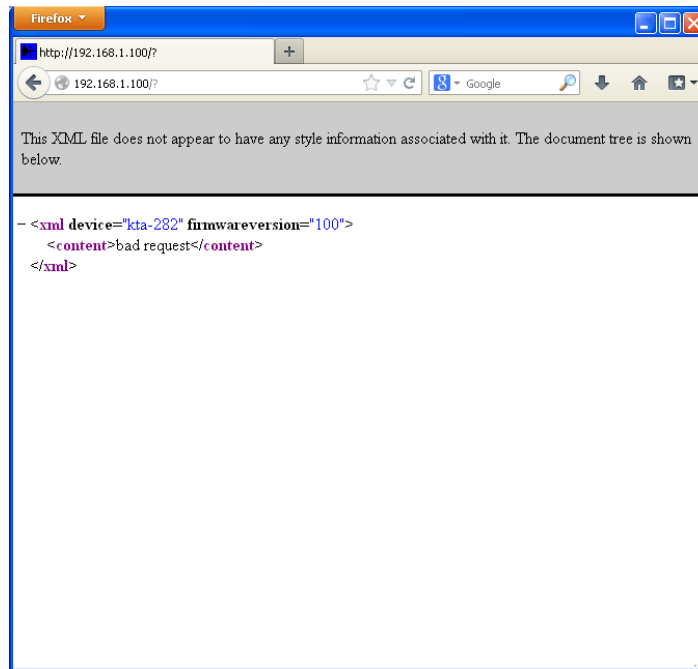


Figure 5: “Bad Request” XML file

Open Collector Outputs (PCB Rev 5 and later)

The KTA-282 is equipped with two open collector outputs able to sink up to 300mA. These can be user configured to switch on/off at a given threshold of any weather data point. They are therefore useful as alarms, or for basic control operations.

Set up is via six (6) Modbus registers:

Holding Register	Open Collector	Name	Function
117	1	Register	Sets the Holding Register containing the weather variable to be monitored
118	1	Set Point	Sets the threshold at which the open collector will turn On or Off
119	1	Direction	Sets the direction of the switching behaviour. 0 = output active below setpoint. 1 = output active above set point
120	2	Register	Sets the Holding Register containing the weather variable to be monitored
121	2	Set Point	Sets the threshold at which the open collector will turn On or Off
122	2	Direction	Sets the direction of the switching behaviour. 0 = output active below setpoint. 1 = output active above set point

Example:

Wind speed is held in register 23. I am on a farm where the roof of my tin shed will blow off above 70 km/h gusts. At 50km/h I want a buzzer to sound as a warning.

I write 23 into register 117, 50 into register 118, and 1 into register 119. The output will turn **on** the buzzer if the windspeed goes above 50 km/h.

KTA-282 PC Application

The KTA-282 can be configured using a purpose built PC application for windows (XP, Vista, 7, 8). This program is available for free download off the Ocean Controls website. Simply unzip the compressed archive and run the installer “setup”.

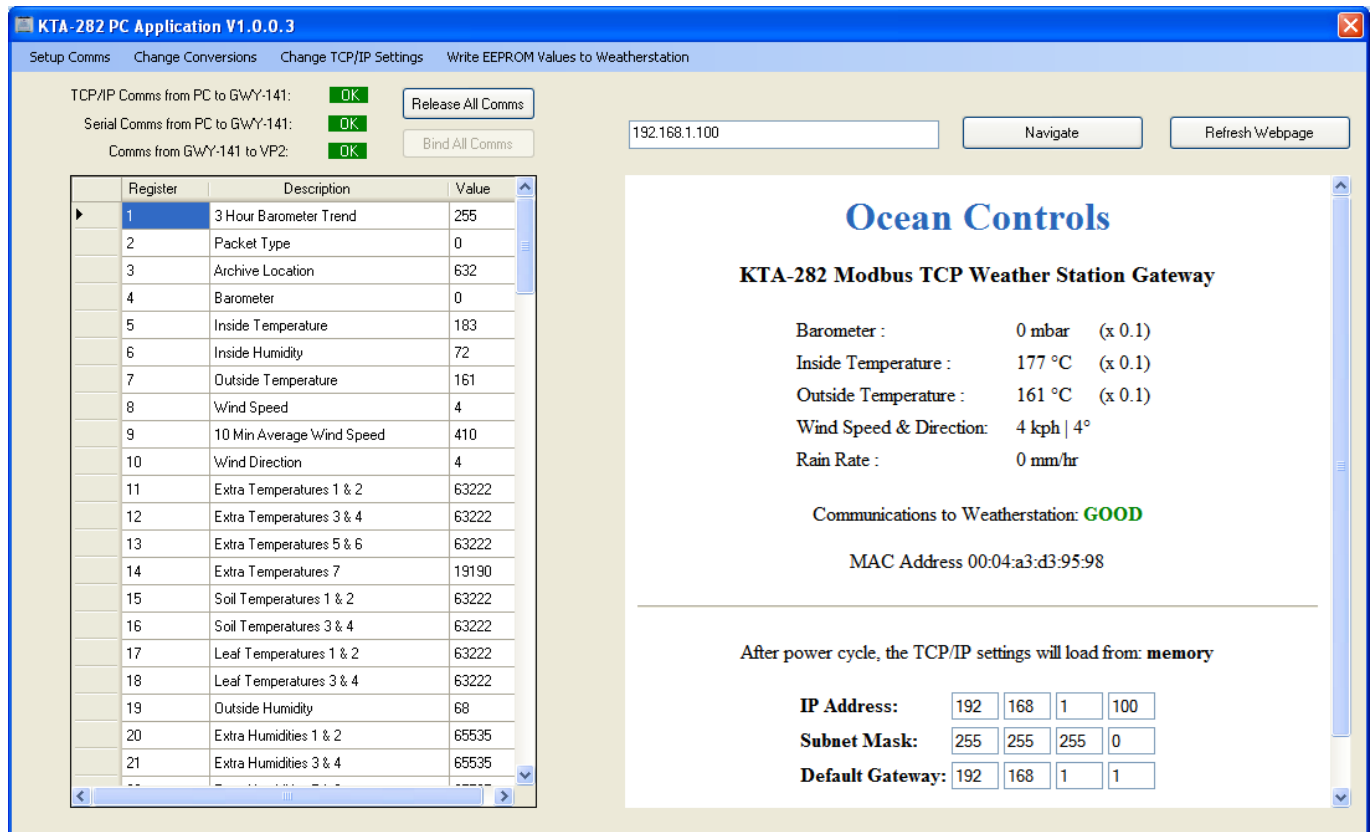


Figure 6: PC Application main screen

The main page of the application features:

- A grid displaying the values of the holding registers, and their descriptions.
- A web browser with URL textbox and refresh button
- A dynamic notifier of the communications statuses:
 - Modbus RTU over RS485
 - Modbus TCP/IP
 - Communications with the weather station
- Two buttons – named “bind all comms” and “release all comms.” These controls are designed mainly for internal use; they allow all three communications channels (Modbus RTU, Modbus TCP/IP, and the weather station simulator) to be batch killed or established. Note that the communications settings must have been previously established (see configuring communications) to use these controls effectively.
- A number of additional controls in the menu bar

Configuring Communications

Communications can be setup by clicking “Setup comms” on the menu bar. This presents you with a configuration screen.

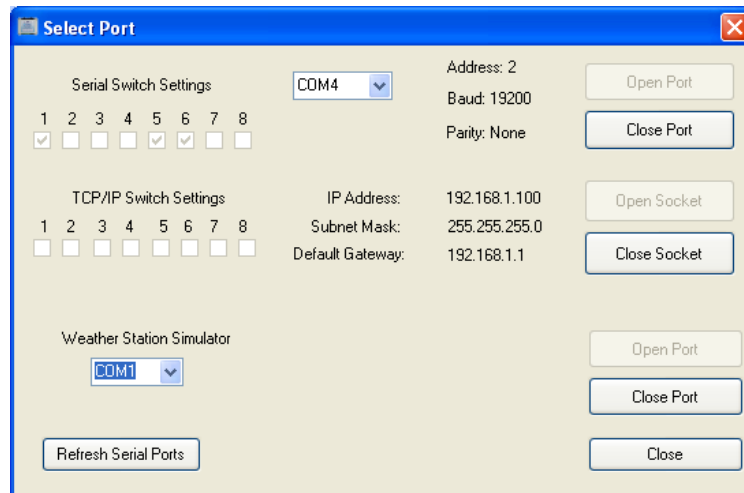


Figure 5: Communications configuration screen

Serial Switch Settings

Modbus RTU can be configured by selecting a row of eight tick boxes – corresponding to the switches on the gateway (the ones near the D9 connector). Available comm ports are shown in a dropdown box. Choose your serial port and click “open port” to establish a connection. If the correct serial port is not shown, try clicking “refresh serial ports” to update the dropdown list with the current available serial ports.

TCP/IP Switch Settings

Modbus TCP/IP is setup using a similar procedure using the other eight DIP switches (near the Ethernet Socket). Click “open socket” to establish the connection.

Weather Station Simulator

The application also features a weather station simulator. This software mimics the behaviour of the Davis Instruments weather stations, providing dummy/random weather data to the gateway. Connect a D9 serial cable to the gateway, and open the corresponding port using the dropdown box. This establishes a simulation at 19200 baud (the default for Davis hardware). Provided there is also successful Modbus communications, the grid on the main page will be populated with random data that will intermittently change.

Other Menu Items

Change Conversions

Displays a screen whereby the units’ conversions of the gateway can be set. Choose your required units using the dropdown boxes and commit the selections to the gateway using the “Write to KTA-282” button. *Writes holding registers 105 to 108.*

Change TCP/IP Settings

Displays a screen that allows the TCP/IP settings of the gateway to be altered. Fill out the relevant fields and click “write to gateway” to set. If any fields are empty or contain invalid data, they will turn yellow and the write will fail. “Clear cells” empties all cells and returns them to white. If the write is successful, notification text will be displayed: “Configuration Written to Gateway”. *Writes holding registers 80 to 92.*

Write EEPROM Values to Weather Station

Provides an interface to write the EEPROM of the weather station using the method described in “Weather station EEPROM Write”. The EEPROM command is set using the “address” and “payload” textboxes, and committed to the weather station using “Write EEPROM”. Similarly, the BAR command is sent using the barometer and elevation textboxes and committed to memory with the “Write elev + barom” button. If any fields are empty or contain invalid data, they will turn yellow and the write will fail. “Clear cells” empties all cells and returns them to white. A successful write can be checked by clicking “Check Success Register”. This notification should be cleared using “Clear Success Register” so that success can be confirmed after every attempted write. A failed write will cause the KTA-282 to reset (power off and back on). *Writes holding registers 110 to 112 (EEPROM), 113 to 115 (BAR), and 116 (Success register).*

Troubleshooting

A number of LED's have been provided to assist with troubleshooting, should you run into problems with the KTA-282.

Power Connected

Without any connections made except power, the Tx LED next to the DE-9 port should flash red once roughly every 5 seconds. This confirms the gateway is on and operational.

Weather station Comms

If the Gateway is receiving messages from the weather station, the green Rx LED should flash in response to the red Tx LED roughly every 10 seconds.

Ethernet

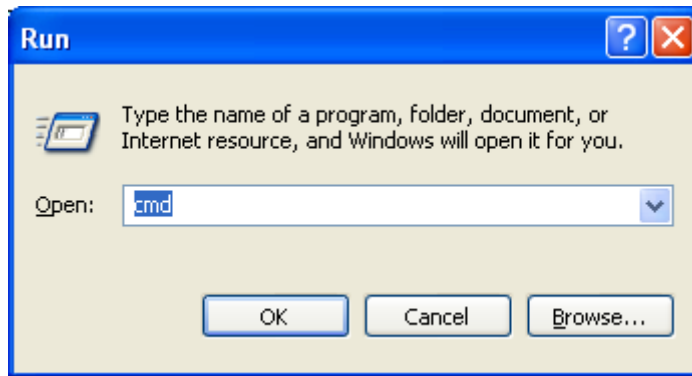
If a valid connection is made on Ethernet cable between another controller, network card, or Ethernet switch, at least one LED on the Ethernet socket will be illuminated – regardless of TCP/IP settings. If not, there is a problem with the network equipment.

RS-485

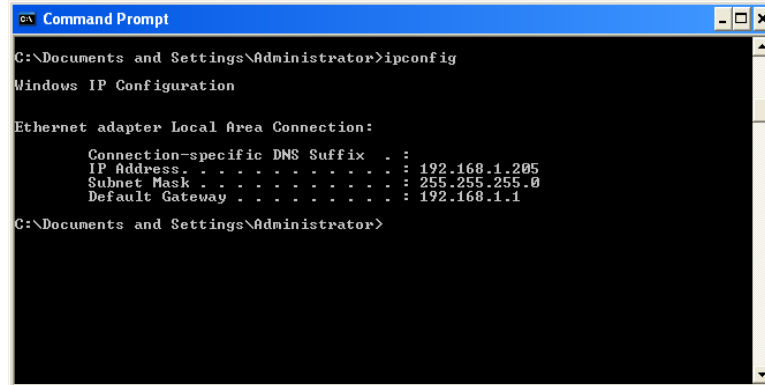
If any type of serial data is sent over RS-485, the Rx LED will flash. If the serial data is a valid Modbus command at the correct address, baud rate, and parity, the gateway will send a response. This will cause the green Tx LED to flash.

Troubleshooting Procedure

1. Begin with the Gateway disconnected from all cabling and all DIP switches in the off position.
2. Apply 8 to 28 volts to the power terminals. Check the Tx LED next to the DE-9 port. It should flash red roughly once every 5 seconds. If so, move to step 3. If not:
 1. Check the wires of the power supply are the correct way around.
 2. Probe the power terminals with a multimeter to ensure you are receiving the required DC voltage.
3. Plug the weather station into the KTA-282 using the DE-9 connector. Check the Rx LED next to the DE-9 connector. It should now flash green in combination with the red LED. If so, move to step 4. If not:
 1. Check that the weather station is powered.
 2. Check the WeatherLink is correctly installed.
 3. Check the cabling from the weather station to the gateway.
4. Plug an Ethernet cable from the gateway to a controller (either directly or via an Ethernet switch). After a moment, the lights on the Ethernet socket should illuminate/flash. If so, go to step 4. If not, there is a problem with the network hardware. Try:
 1. Making a direct connection between the KTA-282 and a PC.
5. Use the switches to set the TCP/IP settings. Using a machine in the same subnet, browse to the IP address of the gateway. If you see the KTA-282 webpage, you have successful Ethernet communications. The gateway can be polled by a Modbus TCP/IP master on this address. If not:
 1. Check your network settings to make sure the gateway is in the same subnet as your other network hardware. On windows:
 1. Press: windows + R to open the run dialogue box.
 2. Type "cmd" to open the command prompt



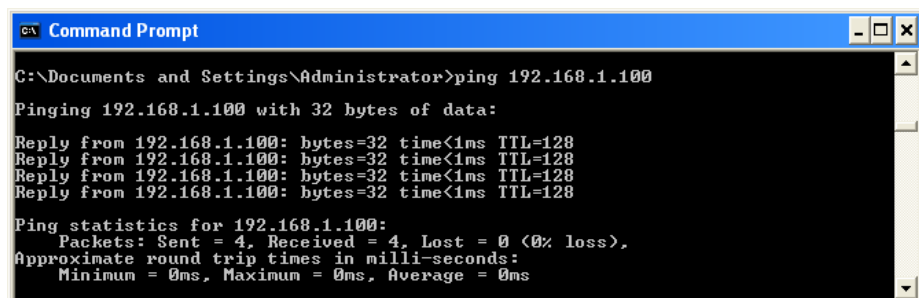
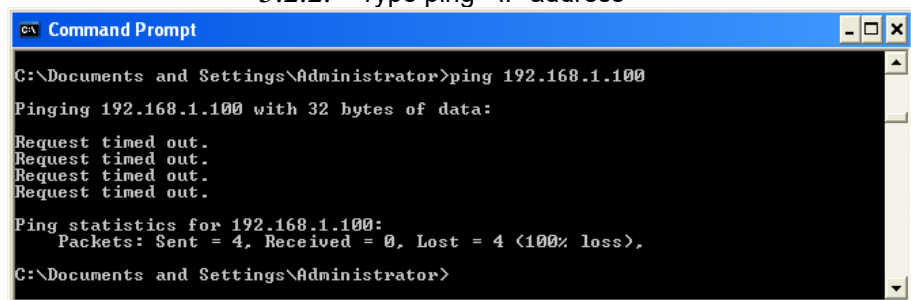
3. Type ipconfig. This will return the current PC's network adapter settings.



4. Ensure these settings are in the same subnet as the gateway. In this example, the PC would be able to contact the PC at default subnet (192.168.1.x), but not on 10.1.1.x.
2. Check your network to ensure the KTA-282 has a unique IP address within the subnet. The best way to do this is via your router (if applicable). Otherwise you could power off the gateway, and then send a ping request to that IP address. If that address is already taken, you **will** get returned packets.

5.2.1. Open the command prompt as above (on windows).

5.2.2. Type ping <IP address>

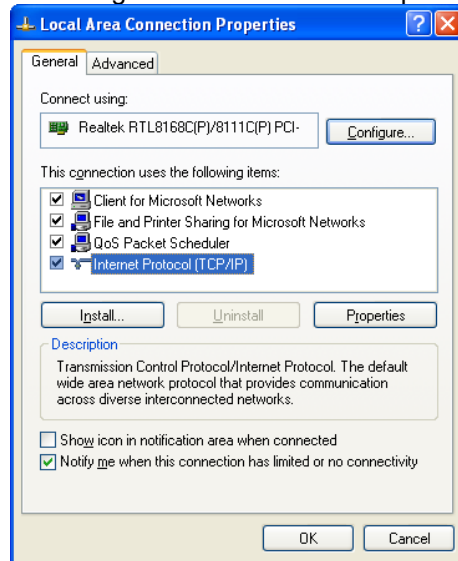


3. Make a direct connection to your PC using an Ethernet cable, and manually configure the PC to be on that subnet. On windows:

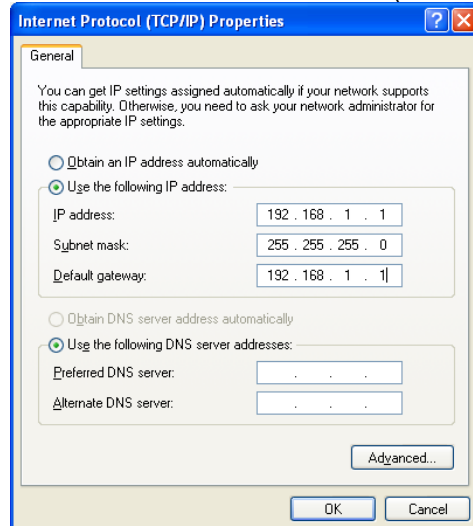
5.3.1. Set the TCP/IP settings of the gateway to default.

5.3.2. Open the Control Panel and go to network connections.

5.3.3. Right click on the LAN adapter and go to properties.



5.3.4. Click on Internet Protocol (TCP/IP) and go to properties



5.3.5. Click on “use the following IP address” and set the values to:

IP Address: 192.168.1.1
Subnet Mask: 255.255.255.0
Default Gateway: 192.168.1.1

5.3.6. Use a ping request to 192.168.1.100. You should get returned packets.

5.3.7. Point your web browser to the IP address. A webpage should be displayed.

Appendix A

Complete Holding Register Listing

Holding Register Address 40,000+	No. of Registers	Description	Multiplier	Units
1	1	Indicates the current 3-hour barometer trend.		
2	1	Packet Type, always 0		
3	1	Location in the archive memory where the next data packet will be written. This can be monitored to detect when a new record is created.		
4	1	Barometer	0.1	mbar
5	1	Inside Temperature	0.1	°C
6	1	Inside Humidity	1	%
7	1	Outside Temperature	0.1	°C
8	1	Wind Speed	1	kph
9	1	10Min Average Wind Speed	1	kph
10	1	Wind Direction	1	degrees
11	4	7 Extra Temperatures	1	°C
15	2	4 Soil Temperatures	1	°C
17	2	4 Leaf Temperatures	1	°C
19	1	Outside Humidity	1	%
20	4	7 Extra Humidity Stations	1	%
24	1	Rain Rate	0.1	mm/hour
25	1	UV Index	0.1	
26	1	Solar Radiation	1	W/m ²
27	1	Storm Rain	0.1	mm
28	1	Current Date Of Storm Rain	1	
29	1	Day Rain	0.1	mm
30	1	Month Rain	0.1	mm
31	1	Year Rain	0.1	mm
32	1	Day ET	0.1	mm
33	1	Month ET	1	mm
34	1	Year ET	1	mm
35	2	4 Soil Moistures	1	centibar
37	2	4 Leaf Wetness, 0 to 15, 0 = Very Dry, 15 = Very Wet	1	
39	1	Inside Alarms	1	
40	1	Rain Alarms	1	
41	1	Outside Alarms	1	
42	4	Extra Temp Hum alarms	1	
46	2	Soil and Leaf Alarms	1	
48	1	Transmitter Battery Status	1	
49	1	Console Battery Voltage	0.01	Volts
50	1	Forecast Icons	1	
51	1	Forecast Rule Number	1	
52	1	Time of Sunrise	1	HHMM
53	1	Time of Sunset	1	HHMM
54	1	Wet Bulb	0.1	°C
55	1	Unused		
56	1	Unused		
57	1	Unused		
58	1	Unused		
59	1	Unused		
60	1	Comms status between KTA-282 and weather station (1=OK,	1	

		0=Fault)		
61	1	2Min Wind Speed	0.1	kph
62	1	10Min Wind Gust	0.1	kph
63	1	Wind Direction for 10Min Gust	1	degrees
64	1	Dew Point	1	°C
65	1	Heat Index	1	°C
66	1	Wind Chill	1	°C
67	1	THSW Index	1	°C
68	1	Last 15Min Rain	0.1	mm
69	1	Last Hour Rain	0.1	mm
70	1	Last 24 Hours Rain	0.1	mm
71	1	Barometric Reduction Method		
72	1	User Entered Barometric Offset	0.1	mbar
73	1	Barometric Calibration Number	0.1	mbar
74	1	Barometric Sensor Raw Reading	0.1	mbar
75	1	Absolute Barometric Pressure	0.1	mbar
76	1	Altimeter Setting	0.1	mbar
77	1	Index to Minute Within the Hour		
78	1	Loop 2 Comms Status		
79	1	Unused		
80	1	IP Address 1 st octet	Note	
81	1	IP Address 2 nd octet	Note	
82	1	IP Address 3 rd octet	Note	
83	1	IP Address 4 th octet	Note	
84	1	Subnet Mask 1 st octet	Note	
85	1	Subnet Mask 2 nd octet	Note	
86	1	Subnet Mask 3 rd octet	Note	
87	1	Subnet Mask 4 th octet	Note	
88	1	Default Gateway 1 st octet	Note	
89	1	Default Gateway 2 nd octet	Note	
90	1	Default Gateway 3 rd octet	Note	
91	1	Default Gateway 4 th octet	Note	
92	1	Commit IP values to Gateway (write a 1 to send values)		
93	1	Unused		
94	1	Unused		
95	1	Unused		
96	1	Unused		
97	1	Unused		
98	1	Unused		
99	1	Unused		
100	1	Product Code		
101	1	Firmware Version		
102	1	Modbus RTU address		
103	1	Modbus RTU baud rate		
104	1	Modbus RTU parity: 0 = None 2 = Even 3 = Odd		
105	1	Temperature Conversion setting		
106	1	Pressure Conversion setting		
107	1	Wind speed conversion		
108	1	Rain and rain rate conversion		
109	1	Weather station polling period (default: 25 = 2.5 seconds)	0.1	Seconds
110	1	Weather station EEPROM write: address		
111	1	Weather station EEPROM write: payload		
112	1	Weather station EEPROM write: send (write to 1 to send EEPROM write command)		

113	1	Weather station elevation & barometer write: barometer argument		
114	1	Weather station elevation & barometer write: elevation argument		
115	1	Weather station elevation & barometer write: send (write to 1 to send elevation and barometer write command)		
116	1	Weather station memory write success (will be written to a 1 if either weather station memory write command is successful)		
117	1	Open Collector 1 register to monitor		
118	1	Open Collector 1 threshold		
119	1	Open Collector 1 Direction. 0 = down, 1 = up		
120	1	Open Collector 2 register to monitor		
121	1	Open Collector 2 threshold		
122	1	Open Collector 2 Direction. 0 = down, 1 = up		
123	1	Unused		
124	1	Unused		
125	1	Modbus Manually Sever Sockets		

Note: These values are the TCP/IP configuration currently loaded into memory. If TCP/IP switch 1 is set to load from switches, the KTA-282 will be on a different IP address to what is displayed.

Appendix B

If there is a communication problem, the sensor is unplugged, or the sensor is failed, you would see a 255 for the extra temperature/soil/leaf station.

Extra Temperature Stations (Register 11-14)

This field supports seven extra temperature stations. The temperature readings of each station would be stored in one byte (8 bits) in a whole °F (°C) with an offset of 90°F (50°C).

All the registers are 16-bit integers, so each register would represent two temperature stations.

Here is an example:

11	Extra Temperatures 1 & 2	20555
12	Extra Temperatures 3 & 4	12624
13	Extra Temperatures 5 & 6	-1
14	Extra Temperatures 7	255

Holding Register Address 40,000+	Description	Value
11	Extra Temperature 1 & 2	19275 (16 bit signed) = 0x504B (in HEX) <ul style="list-style-type: none"> • 0x50 is the reading for sensor 2, 0x50 is 80 in decimal, and there is an offset of 50°C, therefore the actual temperature reading is 80-50 = 30°C • 0x4B is the reading for sensor 1, 0x4B is 75 in decimal, and there is an offset of 50°C, therefore the actual temperature reading is 75-50 = 25°C
12	Extra Temperature 3 & 4	Similarly, 12624 = 0x3150 (in HEX) <ul style="list-style-type: none"> • Sensor 4: 0x31 = 49, 49-50 = -1°C • Sensor 3: 0x50 = 80, 80-50 = 30°C
13	Extra Temperature 5 & 6	-1 = 0xFFFF <ul style="list-style-type: none"> • Sensor 6: 0xFF = 255, sensor is not connected, sensor is failed or communication issue • Sensor 5: 0xFF = 255, sensor is not connected, sensor is failed or communication issue
14	Extra Temperature 7	Sensor 7: 255, sensor is not connected, sensor is failed or communication issue

Leaf/Soil Stations (Register 15-18, Register 35-38)

Leaf/Soil temperatures (register 15-18) would have the same format as the Extra Temperature Stations (register 11-14).

Soil Moistures and Leaf Wetness are stored in one byte as well, where the leaf wetness of each leaf station is a scale number from 0-15.

Description	16-bit signed value (value you see in register 37 or 38)	In HEX	Explanation
Both sensors (wet and dry) connected	15	0x000F	<ul style="list-style-type: none"> • 0x00 is 0, this means sensor 2 is connected and very dry • 0x0F is 15, this means sensor 1 is connected and very wet
Left (wet) sensor disconnected; the right (dry) connected	255	0x00FF	<ul style="list-style-type: none"> • 0x00 is 0, this means sensor 2 is connected and very dry • 0xFF is 255, this means sensor 1 is not connected, an error value is shown
Right dry disconnected, left wet connected	-241	0xFF0F	<ul style="list-style-type: none"> • 0xFF is 255, error, sensor 2 is not connected • 0x0F is 15, sensor 1 is connected and very wet
Both sensors disconnected	-1	0xFFFF	<ul style="list-style-type: none"> • 0xFF is 255, error, sensor 2 is not connected • 0xFF is 255, error, sensor 1 is not connected
Both connected and both wet	3855	0x0F0F	<ul style="list-style-type: none"> • 0x0F is 15, sensor 2 is connected and very wet • 0x0F is 15, sensor 1 is connected and very wet

Extra Humidity Stations (Register 20-23)

This field supports seven extra humidity stations. The humidity readings of each station would be one byte in length in %.

20	Extra Humidities 1 & 2	2650
21	Extra Humidities 3 & 4	0

Holding Register Address 40,000+	Description	Value
20	Extra Humidity Stations 1 & 2	2650 (16 bit signed) = 0x0A5A (in HEX) <ul style="list-style-type: none"> • Sensor 2: 10%RH • Sensor 1: 90%RH

Forecast Icon (Register 50)

Forecast Icon is a one-byte value, and the bit maps for it are on the table below.

Field	Bit #
Rain	0
Cloud	1
Partly Cloudy	2
Sun	3
Snow	4

Here are some possible Forecast Icon Values:

Decimal Value	Hex Value	Segments Shown	Forecast
2	0x02	Cloud	Mostly Cloudy
3	0x03	Cloud + Rain	Mostly Cloudy, Rain within 12 hours
6	0x06	Partial Sun + Cloud	Partly Cloudy
7	0x07	Partial Sun + Cloud + Rain	Partly Cloudy, Rain within 12 hours
8	0x08	Sun	Mostly Clear
18	0x12	Cloud + Snow	Mostly Cloudy, Snow within 12 hours
19	0x13	Cloud + Rain + Snow	Mostly Cloudy, Rain or Snow within 12 hours
22	0x16	Partial Sun + Cloud + Snow	Partly Cloudy, Snow within 12 hours
23	0x17	Partial Sun + Cloud + Rain + Snow	Partly Cloudy, Rain or Snow within 12 hours

Forecast Rule Number (Register 51)

See **Forecast Rule Number.pdf** (can be downloaded from https://oceancontrols.com.au/KTA-282.html#product-details-tab-Downloads_1)



Shenzhen SEM.Test Technology Co., Ltd.

1/F, Building A, Hongwei Industrial Park, Liuxian 2nd Road,

Bao'an District, Shenzhen, P.R.C. (518101)

CERTIFICATE OF CONFORMITY

Certificate No.: SEM13090897

The following product has been tested by Shenzhen SEM.Test Technology Co., Ltd. with the listing standards and found in conformity with the **EC Council Directive of 2004/108/EC**. It is possible to use CE marking to demonstrate the conformity with this **EMC Directive**.

Report No. : STR13098325E

Applicant : Ocean Controls
Address : Factory 3 / 24 Wise Ave Seaford Victoria Australia

Manufacturer : Ocean Controls
Address : Factory 3 / 24 Wise Ave Seaford Victoria Australia

Description of Product : Modbus TCP weather station Gateway
Model No. : KTA-282, v6
Trade Name : Ocean Controls

Test Standards : EN 61000-6-1:2007
EN 61000-6-3:2007+A1:2011

The referred test report(s) show that the product complies with the essential requirements in the above listed standards. The applicant is authorized to use this certificate in connection with the EC declaration of conformity according to Annex 1 of the Directive.



Test Laboratory



This certificate of conformity is based on a single evaluation of the submitted sample(s) of the above mentioned product. It does not imply an assessment of the whole production and other relevant Directives have to be observed.

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E-mail: sem@semtest.com.cn

Website: www.semtest.com.cn

VERIFICATION OF CONFORMITY

According to FCC Part 15B

Certificate No.: SEM13092599

Responsible Party's Name : Ocean Controls
Address : Factory 3 / 24 Wise Ave Seaford Victoria Australia

Manufacturer : Ocean Controls
Address : Factory 3 / 24 Wise Ave Seaford Victoria Australia

Description of Product : Modbus TCP weather station Gateway
Model No. : KTA-282, v6
Trade Name : Ocean Controls

Report No. : STR13098326E-3

Compliance With Part 15B of FCC Rules.

This device complies with Part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) This device must accept any interference received, including interference that may cause undesired operation.

Responsible Party:

Tested By:



Shenzhen SEM.Test Technology Co., Ltd.
1/F, Building A, Hongwei Industrial Park, Liuxian
2nd Road, Bao'an District, Shenzhen, P.R.C.

Responsible Signature: _____

Issued By: _____

Name / Title: _____

Name / Title: Jandy So / ISO Manager

Date: _____

Date of Issue: Apr 28, 2014



The Certification of Verification shows that the tested sample technically compliances with the FCC Part 15. The certification applies to the tested sample above mentioned only and should not implied an assessment of the whole.

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