- Connects Davis VantagePro2 Weather Station to Modbus Network
- Modbus RS232 or RS485 Selectable
- Selectable Modbus Address 1-16
- 2400, 4800, 9600 and 19200 Baud Rates Supported
- None, Odd and Even Parity Supported
- 10sec Weather Parameter Update Interval
- Transmit and Receive Indicator LEDs
- Comms OK Modbus Register
- VantagePro2 Requires Weatherlink Serial Module
- Imperial or Metric Unit Selectable

The GWY-141 Modbus VantagePro2 Gateway allows the easy connection of a PLC (Programmable Logic Controller), RTU (remote telemetry unit) or SCADA System to a Davis Instruments Vantage Pro2 Weather Station. Using the Modbus RTU (Binary) protocol 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 gateway is linked to the weather stations RS232 serial connection, the gateway then polls the weather station for its readings every 10 seconds. These readings are stored in the Modbus holding registers of the Gateway. A PLC or RTU acting as a Modbus master is able to use Modbus Function 3 to read the contents of the Gateway's holding registers, which will contain the latest weather readings.

Device Compatibility
The GWY-141 is compatible with the following Davis Instruments Products provided they have a 6510SER Serial Weatherlink installed. Note: Part numbers quoted are Davis Instruments part numbers.

• 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	• 6316 Wireless Weather Envoy (with 6322 Wireless ISS or 6327 Wireless ISS Plus or 6323 Wireless ISS Solar, Fan Aspirated or 6328 Wireless ISS Plus Solar Fan Aspirated) • 6316C Cabled Weather Envoy (with 6322C Cabled ISS or 6327C Cabled ISS Plus or 6323C Cabled ISS Solar Fan Aspirated or 6328C Cabled ISS Plus Solar Fan Aspirated)

Connections

Table 1: Connections

D1+	Port 1 RS485 Data+	**+V**	Power In + (8-28VDC)
D1-	Port 1 RS485 Data-	**COM**	Power In -
D2+	Port 2 RS485 Data+ (Unused)	**5V**	5VDC Output
D2-	Port 2 RS485 Data- (Unused)	**B1**	Digital IO 1 (Unused)
		B2	Digital IO 2 (Unused)

Modbus Description
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 1 to 60. Please note - the PLC or RTU can not read more than 30 registers at one time. To interrogate the full 60 holding registers two separate reads must be used.

Table 2: Variables and Holding Register Addresses with default units and multipliers

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	0.001	inHg
5	1	Inside Temperature	0.1	°F
6	1	Inside Humidity	1	%
7	1	Outside Temperature	0.1	°F
8	1	Wind Speed	1	mph
9	1	10Min Average Wind Speed	1	mph
10	1	Wind Direction	1	degrees
11	4	7 Extra Temperatures	1	°F
15	2	4 Soil Temperatures	1	°F
17	2	4 Leaf Temperatures	1	°F
19	1	Outside Humidity	1	%
20	4	7 Extra Humidities	1	%
24	1	Rain Rate	0.01	In/Hr
25	1	UV Index	1	
26	1	Solar Radiation	1	W/m^2
27	1	Storm Rain	.01	inches
28	1	Current Date Of Storm Rain	1	
29	1	Day Rain	.01	inches
30	1	Month Rain	.01	inches
31	1	Year Rain	.01	inches
32	1	Day ET	.01	inches
33	1	Month ET	.01	inches
34	1	Year ET	.01	inches
35	2	4 Soil Moistures	1	centibar
37	2	4 Leaf Wetnesses, 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
60	1	Comms Status (1=OK, 0=Fault)	1	

Holding Register 60 contains the communications status, which indicates if the Gateway is receiving data from the Weather Station

For more detail see the document "Vantage Serial Protocol Docs v2.1.0.pdf", section IX, 1 LOOP data format - Contents of LOOP packet, Forecast Icons in LOOP packet, Forecast Icon Values, Currently active alarms in the LOOP packet. The document can be seen by downloading the serial communications reference from: http://www.davisnet.com/support/weather/software_dllsdk.asp

Unit Conversions (V5.4 and Later)

The units of the readings can be changed by writing to the holding registers shown in Table 3. The following table shows the multiplier and unit. For example if a 1 was written to holding register 112 then the atmospheric pressure readings would be in mmHg and have to be multiplied by 0.1.

The Extra Temperatures apply to the 7 extra, 4 Leaf and 4 soil temperatures listed in Table 2. For Fahrenheit readings, Extra Temperatures need to have 90 subtracted from them. For Centigrade readings, Extra Temperatures need to have 50 subtracted from them.

Table 3: Variable Unit Conversions and Holding Registers

Holding Register Address 40,000+	Variable Type	Register Value and Units					Registers Affected
		0	**1**	**2**	**3**	**4**	
107	Temperature	0.1 °F	0.1 °C				5, 7
	Extra Temperature	1 °F +90	0.5 °C +50				11, 12, 13, 14, 15, 16, 17, 18
108	Pressure	0.001 inHg	0.1 mmHg	0.1 mbar	0.001 atm		4
109	Wind Speed	1 mph	1 kph	1 knots	1 m/sec	1 ft/sec	8, 9
110	Rain & Rain Rate	0.01 in	1 mm				24, 27, 28, 29, 30, 31, 32, 33, 34

Weather Station Setup

The Davis Instruments Weather Station must be fitted with an RS232 Serial Interface.

Ensure that the Serial Baud rate on the Weather Station is set to 19200 Baud.

Connect the Weather Station to the Port 2 RS232 Connection.

Please note the Weather Station must have batteries or power supply fitted into its console. If power is lost to the Weather Station it will not respond to data requests from the gateway.

Gateway Setup

Connect 8 to 28VDC to the screw terminals V+ and COM.

If RS232 is used to communicate with the Modbus Master then connect the cable to the Port 1 RS232 connection, if RS485 is to be used then connect the D+ line to D1+ and the D- line to D1-.

Set the DIP Switches on the Gateway to match the Modbus Address, BaudRate and Parity of your system.

*** **Please note if DIP Switches are altered while power is on then no change will take effect until power is re-applied**.

Table 4a: DIP Switches - Modbus Address

Modbus 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
16	ON	ON	ON	ON

Table 4b: DIP Switches - Baud Rate

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

Table 4c: DIP Switches - Parity

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

Please note if DIP Switches are altered while power is on then no change will take effect until power is re-applied.

Troubleshooting

LED's are provided to assist in troubleshooting.

RX1 is Green and is located next to the Port 1 RS232 Connection. It will light up briefly when data at the correct Baud and Parity is detected on the Modbus Port (either RS232 or RS485).
TX1 is Red and is also located next to the Port 1 RS232 Connection. It will light up briefly when the gateway is sending Modbus responses out (either RS232 or RS485).

RX2 is Green and is located next to the Port 2 RS232 Connection. It will light up briefly when data is received from the Weather Station.
TX2 is Red and is also located next to the Port 2 RS232 Connection. It will light up briefly when the gateway is sending a request to the Weather Station.

TX2 and RX2 should flash once every 10 seconds to indicate communications to the Weather Station is good.

If TX2 is not flashing, check
1.12VDC is applied to V+ and COM terminals

If RX2 is not flashing, check
1.The serial baud rate on the weather station is set to 19200
2.The cable to the weather station is connected to the Port 2 RS232 connection

RX1 and TX1 LEDs indicate communications to the PLC or RTU Modbus Master.

If RX1 is not flashing check
1.Baud Rate and Parity DIP switches match Baud Rate and Parity of Modbus Master (if these are changed cycle power)
2.Connection to Modbus Master is on Port 1 either RS232 or RS485

If Tx1 is not flashing check
1.Modbus Address DIP switches are correct
2.Baud Rate and Parity DIP switches match Baud Rate and Parity of Modbus Master