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OVERVIEW

The Badger® Data Industrial® Model 345WT wireless Modbus/ pulse transceiver is designed to allow systems integrators the ability to communicate with remote locations while avoiding the costs associated with running low voltage wiring to multiple locations in a single or between multiple buildings. To meet these requirements, the Model 345WT provides the installer with all the tools necessary to install and configure the hardware and software with a minimum of time and investment.

Installation Checklist

A Model 345WT system installation has the following components:

Required hardware
- Two or more Model 345WT transceivers.

External hardware
- RS485 Modbus master system such as a Model 3700 or a PLC.
- Optional: RS485/Modbus slave devices such as power meters or IO modules.
- Optional: Pulse output transducers for measuring gas, electricity, water, etc. from existing meters and sensors. Make sure to obtain the pulse output scale, or multiplier for each device you will be using.

Hardware Overview

Features

Processor	60Mhz ARM7.
LED	2 x RF, 2 x RS 485, 2 x pulse, Alive, Alarm
Communications	RS485 Modbus
RF	900Mhz Frequency Hopping, ISM band, 100mw
Range up to	1500 ft indoor depending on obstructions
Power Requirement	110-120VAC
Power Supply	Included, 9VDC, class 2 transformer (included)
Pulse Inputs	2x dry contact (consumption/rate/min/max)
Size	6.5" x 4.5" x 2"

Electrical Connection
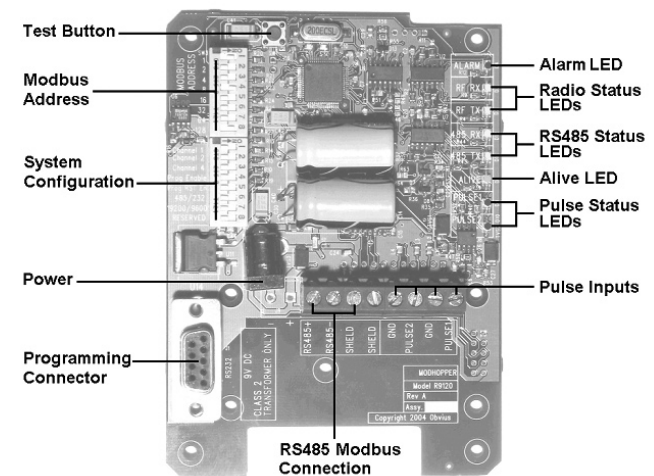
Hardware Connection

Step 1 - Unpack materials: Remove all materials from shipping box and verify all required components are available.

Step 2 - Mount the Model 345WT on the wall or other appropriate location.

Step 3 - Connect the pulse output devices.

Step 4 - Connect the RS485 Modbus terminals to your Modbus devices. This can include either the master device such as an Model 3700 or PLC, and it can include a slave device such as a power meter.

Step 5 - Attach the antenna and power connector to the Model 345WT.

Modbus Address

Before the Badger® Data Industrial® Model 345WT can be used, you must set the Modbus address. This address must be unique among all Modbus devices in the system including all devices that are connected on remote wireless links.

Select an address, and set the dipswitches to match.

The sum of the value of the switches is the address. In the example to the right, address 52 is set by placing switch 4, 16 and 32 to the on position.

Note: 4 + 16 + 32 = **52**

System Configuration

For most systems, set all of the system switches to the "off" position.

Radio channel: This option selects the channel number that can be used to isolate a group of Model 345WTs.

Programming: Set the Prog Enable and Prog RST En to Off for normal operation.

Port RS232 or RS485: Set the switch to the Off position for RS485 operation. The Model 345WT can communicate via the RS232 connection, however, most Modbus devices will need 485 terminals.

Baud Rate: This option sets the serial port speed for the Modbus devices connected to the Model 345WT. Set this option to Off for 19200. Set the switch to On for 9600 baud.

Reserved: Set this option to Off.
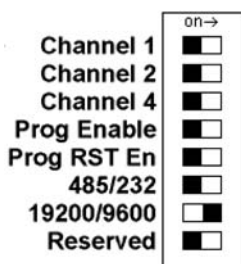
Status LEDs

The device should power up and be ready in a few seconds. The LEDs should blink in the following manner.

- The Alive LED should start to blink about once per second.
- The Alarm LED will blink when transmission errors occur.
- The RF TX/RX LEDs will blink when the radio is receiving or transmitting data.
- The RS 485 LEDs will blink for local Modbus activity.
- The Pulse input LEDs will light when the corresponding pulse input terminals are closed.

Signal Strength Test

When the Model 345WT is operating, the Test button can be used to report the signal strength received by the Model 345WT from another unit.

Press and hold the Test button. The status LEDs will light up as a bar graph display. Each LED is approximately 10% of scale. For example if PULSE 1 and 2 are on, the received strength is approximately 20% to 29%.

For useful signal reporting, it is important to turn off all but one other Model 345WT. When reporting the signal strength, the most recent wireless transmission received is displayed. If two Model 345WTs are transmitting, the display will only show the most recently received packet, and the user will not be able to determine which Model 345WT the signal strength being reported.

NOTE: The normal operation of the Model 345WT is suspended while the test button is pressed. No pulses are counted, Modbus communications and wireless transmissions are not processed.

MODBUS OVERVIEW

Register Listing

offset	point	type	desc
0	40001	UINT32	pulse count 1 MSW
1	40002	UINT32	pulse count 1 LSW
2	40003	UINT32	pulse count 2 MSW
3	40004	UINT32	pulse count 2 LSW (same format as pulse count 1)
4	40005	UINT16	inst pulse 1 time (seconds)
5	40006	UINT16	inst pulse 2 time (seconds)
6	40007	UINT16	(R/W) min pulse 1 time (seconds) (write clears min/max)
7	40008	UINT16	(R/W) min pulse 2 time (seconds)
8	40009	UINT16	(R/W) max pulse 1 time (seconds)
9	40010	UINT16	(R/W) max pulse 2 time (seconds)
10	40011	UINT16	(R/W) inst pulse count size. (default 5)
100	40101	UINT16	Serial Number (bytes 1,2) (serial number)
101	40102	UINT16	Serial Number (bytes 3,4)
102	40103	UINT16	Serial Number (bytes 5,6)
103	40104	UINT16	firmware version (e.g. v1.03, high byte=major, lowbyte=minor, 0x8000 flag set for Beta)
104	40105	UINT16	boot count
105	40106	UINT32	mfg date MSW
106	40107	UINT32	mfg date LSW
107	40108	UINT16	radio group id setting (0-6)
108	40109	UINT16	alarm flags (0x01 = boot from watchdog)
109	40110	UINT16	max packet buffers used.
110	40111	UINT32	Radio up time (seconds) MSW
111	40112	UINT32	Radio up time (seconds) LSW

Register Functions
Pulse Count: The pulse count is stored as an unsigned 32bit integer. This allows for 2^32 pulses (4.2billion) to be counted before rollover. On Modbus systems that do not allow you to read 32 bit values, you can calculate the pulse count as follows:

count = (MSW * 65535) + LSW

Instantaneous Pulse Rate: The pulse rate values for instantaneous, min and max rates are calculated based on the time between arriving pulses. For example, if InstPulse1 = 30, and inst pulse count size is 5, then the average rate for the last 5 pulses is 6 seconds per pulse. To convert the register values (in seconds) to a rate value, use the following formula.

RatePerHour = (N * 60 * 60 / Inst_Register)

Where InstRegister is any of the 6 register values 4 through 9. N is the instantaneous pulse count size at offset 10.

Min/Max pulse rate: These four registers are calculated from the instantaneous pulse rate. These latching registers are updated whenever the minimum or maximum rate fields are exceeded by the instantaneous rate. These four registers may be cleared by writing a zero to the register. Writing to one min/max register clears all four min/max registers.

FIRMWARE UPDATE
From time to time, Badger Meter may release firmware updates with additional features and system changes. To find out what firmware your Badger® Data Industrial® Model 345WT has installed, read the firmware version register with a Modbus utility, or use the Advanced Configuration page in the Model 3700 setup menu.   Firmware update files may be obtained from Badger Meter Technical Support.

The firmware update process requires an RS232 serial port and a windows computer to run the firmware update utility. Before starting this process, verify your computer has a serial port available. You may need to deactivate other software such as the palm pilot utility or ups monitor software. USB connected serial ports may be used, however these are not as fast or reliable as standard computer serial ports and may fail to upgrade the firmware correctly.

To update the firmware, use the following procedure.

Step 1: Install the Philips LPC2000 software as provided by Badger Meter.
Step 2: Remove power from the Model 345WT. Attach the Model 345WT to your computer with an RS232 serial cable. The Model 345WT programming connector is the 9 pin RS232 connector to the side of the power jack.

Step 3: Set the following dip switches:
       Prog Enable = on
       ProgRstEn = on
       485/232 = on
Step 4: Power up the Model 345WT. The Green Alive LED should light up and stay on solid.
Step 5: Run the LPC2000 Flash Utility. The following screen will be displayed.
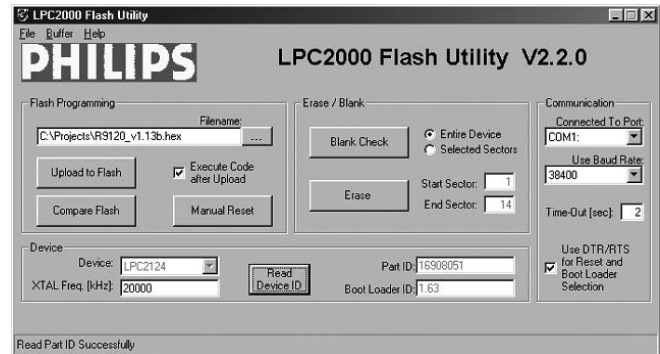
Step 6: Set the following communications options: COM1 or COM2 depending on your computer serial port.
Use baud rate: 38400 or slower.
Check Use DTR/RTS for Reset
XTAL Freq[kHz] = 20000
Step 7: Click the Read Device ID button. The PartID and BootLoaderID fields will be shown if successful. Also, the Device dropdown menu should switch to LPC2124. The bottom of the window will display Read Part ID Successfully.
Step 8: Click the Filename... button. A dialog box will appear. Locate and select the Model 345WT firmware image file. In the example above, this is named R9120_v1.13b.hex.
Step 9: Click the Upload to Flash button. The firmware update will start, and a blue progress bar will be shown acorss the bottom of the screen.
Step 10: When the update is complete, disconnect power from the Model 345WT. Remove the RS232 serial cable. Turn off the three switches noted in step 3 above.
    Prog Enable = OFF
    Prog Rst En = OFF
    485/232 = OFF
Step 11: Power up the Model 345WT. The new firmware should now operate. To confirm the new firmware is installed, use the Model 3700 device details page, click the Configure button, and then the Advanced button. The firmware version number will be displayed on the lower right side of the advanced details page.

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