

Technical Note

Initial Steps and Equipment Needed

Follow these steps to monitor a Modbus Banner Engineering sensor connection and/or operation status when the sensor is connected to a MultiHop radio or a DXM Controller with an embedded MultiHop module.

Required equipment includes:

- Wireless DXM Controller master with a MultiHop radio module
- Wireless DXM Controller slaves and/or MultiHop slave radios
- Modbus sensor such as the Temperature/Humidity Modbus Sensor model M12FTH3Q, or an SDI-12 sensor
- Windows-based PC running the DXM Configuration Tool v3 (downloaded from the Banner website)

To confirm the connection between the sensor and radio, define Read Rules and Action Rules. Use two local registers to monitor each Modbus RTU sensor. Use an optional third register to monitor how long the sensor was not connected to the radio.

Note: This procedure works with the current firmware and DXM Configuration Tool as well as with version 1.0 firmware and the DXM Configuration Tool V2.

- 1. Connect to the DXM Controller master radio using serial or TCP/IP.
- 2. Define the Local Registers.
- 3. Define the Read Rule.
- 4. Define the Threshold/Action Rule.
- 5. Repeat these steps for each Modbus sensor and MultiHop slave radio you'd like to track.

Define the Local Registers

Define the local registers used to verify the connection between a Modbus sensor and a MultiHop radio.

Before beginning, you should have downloaded the DXM Configuration Tool to your computer and have launched it.

- 1. Go to the Local Registers > Local Register Configuration screen.
- 2. Define a register to hold a data point.



Figure 1. Example data point for a relative humidity (RH) Modbus sensor.

•	1001	DS2 Ave Wind Speed	Units mph		Group Weather Inform	ation	
		Display Information Units Scaling Scale value 2.2370 Sca Apply offset before scale v LCD permissions	Custom v mph Multiply v Ile offset 0.0000 \$ ralue Read v	Constant Value and Timer None Cloud Settings Cloud reporting On Cloud permissions Read V	Logging and Protocol Conve SD card logging Protocol conversion Host Timeout Parameters If the host fails to communi 0 \$ seconds, set th	Insign None	
		Register Group Group name Weather Inform	ation				

Figure 2. Example data point for a wind speed SDI-12 sensor.

If the host fails to communicate with this register for

0 🗘

0 <a>
 seconds, set the register to

3. Define a register to be used as an alarm notification register when the MultiHop radio cannot communicate with the sensor.

• 19	9	Failure to Read Garage RH		Units	; on/of		Group	Environmen	tal Parame		
		Display Information Units Sign Type Scaling LCD permissions Register Group Group name Environmental Pa	on/o unsi Non Rea	aff gned e d ters		Constant Value and Timer None Cloud Settings Cloud reporting On Cloud permissions Read	Logging and SD card log Protocol co Host Timeo If the host 0 \$	d Protocol Co gging proversion ut Parameters fails to comm seconds, se	None None None sunicate with this re at the register to	egister for	
		Figure 3.	Exa	ample	e alai	m notification register for a	relative	humidity	sensor.		
~ 19	9	Wind Speed Sensor Alarm		Units	; on/of	r	Group	Sensor Con	nection Ala		
		Display Information Units Sign Type	on/o unsi	off	•	Constant Value and Timer	Logging and SD card log Protocol co	d Protocol Co gging proversion	nversion Log 1	•	

Group name Sensor Connection Alarms

•

•

Figure 4. Example alarm notification register for a wind speed sensor.4. Define a register to be used to track how long the Modbus sensor was not communicating with the master radio.

loud Settings

Cloud reporting On

Cloud permissions Read

None

Read

•

)•)



Figure 5. Example communication register for a temperature/relative humidity sensor.

Create a Read Rule

Create a Read Rule to define how often to read the sensor register and what to do if the communication attempt fails.

1. Go to the Register Mapping > Read Rules screen.

Scaling

LCD permission

- 2. Click Add New Rule to create a Read Rule.
- 3. Name the Read Rule and define from which slave ID this register is being read, how many registers are being read, and the starting register.
- 4. Define how often to read this register (Frequency).

5. Define what value should be written to the register (Apply value) after the number of failed read attempts (read failures).



Figure 6. Example read rule for monitoring the relative humidity sensor connection...

Add Read Rule	Delete Last F	Rule				
- DS2 Spe	ed_Dir_Temp C	From slave ID 20 🗘 read 2 🗘 registers starting at	11101 🗘 through 11102 to local registers starting at 1001 🗘 through 1001			
Read	d Settings					
Re	Remote type Holding register		Local Registers Names			
Fre	quency	00:01:00.000 🗘 hh:mm:ss.fff	DS2 Ave Wind Speed			
Sci	aling	Scale value 0.000000 \$ Scale offset 0 \$				
Err	or condition	Apply value 150 \$ after 5 \$ read failures				
Flo	ating point	Swap words				
On	register	0 \$				

Figure 7. Example read rule for monitoring the wind speed sensor connection.

For the **relative** humidity example, local register 4 (Garage Humidity) will be populated with the value from Modbus ID 19, register 101. The DXM master radio attempts to communicate with the Modbus sensor (Slave ID 19) every 5 minutes. After five consecutive unsuccessful attempts, the value of 125 is placed in the local register 19 (Failure to Read Garage RH).

For the wind speed example, local register 1001 (DS2 Wind Speed) will be populated with the value from Modbus ID 20, register 11101 and 11102. The DXM master radio attempts to communicate with the Modbus sensor (Slave ID 20) every 1 minute. After five consecutive unsuccessful attempts, the value of 150 is placed in the local register 19 (Failure to Read DS2 Wind Sensor).

Note: You must place the SDI-12 sensor results in the 32-Bit Floating Point Register set in the DXM Controller. When using an SDI-12 sensor and an SDI-12 enabled MultiHop radio, when the DXM master or remote radios cannot communicate with the sensor, a value of 65535 is entered into the Results Register for that sensor in the Local Registers.

Select am alarm value that makes sense for the potential values of the application, but won't adversely affect graphing or charting the data point for analysis. For the RH example, the normal value for this local register is between 0 and 100. Therefore, 125 is not too excessive but is different enough to be a trigger value. For the wind speed example, 150 is a good choice.

Create a Threshold Rule

Create an action rule to define the behavior of the system when the communication fails.

- 1. Go to the **Action** Rules > Thresholds screen.
- 2. Click Add Threshold Rule.

3. Define a Threshold Rule so that when the local register Failure to Read value equals the error value (125 for relative humidity, 150 for wind speed), a value of 1 is entered into the Communication Alarm register.

▼ T/H Sensor Comms Error When register	4 (Garage Humidity) equals 125 set register 19 (Fai	iure to Read Garage RH) to 1					
Definition							
When local register 4 🗢 Garage	When local register 4 🗘 Garage Humidity = 🗨 Value 🕞 🔹 125 🗘						
When TRUE, set local register	When TRUE, set local register 19 \$ Failure to Read Garage RH to Value 1 \$						
When register 4 (Garage Humidit)	When register 4 (Garage Humidity) not equal to 125						
Set register 19 (Failure to Read	Set register 19 (Failure to Read Garage RH) to Value						
Hysteresis	On Time	Logging Options					
Hysteresis value 0 ≎ Minimum on time (hh:mm:ss) 00:00:00 ≎ Minimum off time (hh:mm:ss) 00:00:00 ≎	Record the number of minutes that the rule has been true to register 22 \$ RH Comm Alarm Time	 Save threshold events to cloud Save threshold events to event log Push when active After trigger, set source to 0 					
E-mail/SMS on State Transition							
SMS E-Mail Recipient Send R SMS Recipient 1 X E-mail SMS Recipient 2 F-mail	tecipient Send Recipient 1 🔀						
Figure 8. Example thre	eshold/action rule for a humidity sensor	communication failure.					

-	Nind Speed Sensor Alarm When register 1001 (DS2 Ave Wind Speed) equals 150 set register 19 (Wind Speed Sensor Alarm) to 1						
	Definition						
	When local register 1001 🗘 DS2 Ave Wind Speed = Value 🔹 150 🗘						
	☑ When TRUE, set local register 19						
	When register 1001 (DS2 Ave Wind Speed) not equal to 150						
	Set register 19 (Wind Speed Sensor Alarm) to Value 0 \$						
	Hysterasis On Time Longing Onlight						
	Hysteresis value 0 Minimum on time (hh:mm:ss) 00:00:00 Minimum off time (hh:mm:ss) 00:00:00						
E-mail/SMS on State Transition							
	SMS E-Mail Recipient Send SMS Recipient 1 X E-mail Recipient 1 X SMS Recipient 2 E-mail Recipient 2						

Figure 9. Example threshold/action rule for a wind speed sensor communication failure.

For the relative humidity example, when this register's value equals 1, local register 22 tracks how long this Modbus sensor was not able to be reached. The alarm is sent to the web server service, and the event is logged in the Events Log on the DXM. A message is sent to one SMS recipient and one email recipient, although you can configure it to send more messages if necessary.

