Application Note

Interfacing a Modbus Stick with Emerson MicroMotion 5700

OVERVIEW

The MicroMotion 5700 is an Emerson Coriolis meter used to measure and log an array of process variables such as flow volume, density, and temperature. A simple yet flexible way to send the MicroMotion's data wirelessly over the air is to read its registers through a Modbus Stick. However, this presents problems when installed as normal. This document serves to help technicians identify and fix this issue so as to allow error-free operation.

SYMPTOM

When a SignalFire network has a Modbus Stick reporting in, regardless of what Slave ID has been assigned to the Modbus Stick or what end devices it's reading, the Modbus Stick's radio address will additionally appear under Slave ID 111, even if there is no Slave ID 111 anywhere on the network.

If there are multiple Modbus Sticks, they may check-in and overwrite Slave ID 111 with its radio address. In the screenshots below, there are 3 Modbus Sticks reporting in as they should at Slave IDs 44, 54, and 64. However, there is also a nameless Modbus Stick reporting in at 111.
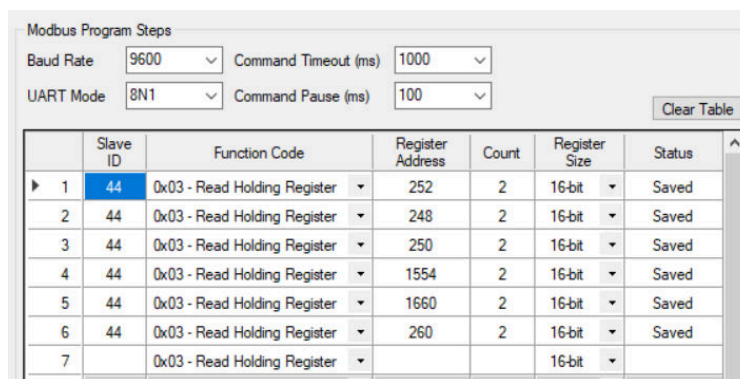
40	Sent HART	TV#13_PSI	-50	3.310	5 min
41	Sent HART	TV#13_LVL	-47	3.264	5 min
42	Sent HART	TV#13_H2O	-57	3.260	5 min
44	MB Stick	TV#13_OIL	-55	27.308	1 min
50	Sent HART	TV#14_PSI	-56	3.257	5 min
51	Sent HART	TV#14_LVL	-50	3.270	5 min
52	Sent HART	TV#14_H2O	-56	3.292	5 min
54	MB Stick	TV_14_OIL	-52	27.536	1 min
60	Sent HART	TV#15_PSI	-61	3.247	5 min
61	Sent HART	TV#15_LVL	-49	3.282	5 min
62	Sent HART	TV#15_H2O	-56	3.295	5 min
64	MB Stick	TV_15_OIL	-78	27.634	1 min
101	WIOM	CMP_#1_WIO	-43	26.787	1 min
102	WIOM	CMP_#2_WIO	-55	24.331	1 min
103	WIOM	CMP_#3_WIO	-43	26.794	1 min
104	WIOM	CMP_#4_WIO	-57	26.826	1 min
111	MB Stick		-58	27.406	5 min
224	Sent HART	Still_Temp	-59	4.567	5 min

Even if all 3 Modbus Sticks are removed from the network, Slave ID 111 will remain. Because all 3 have unique radio addresses and are conflicting with the same Slave ID, the Gateway logs the radio address change event.

10/6/2021 9:26	13852	WARNING	Slave 111 Changed	Radio Address 56540	MB Stick	Checkin Interval=5 min	RSSI=-74	BattmV=26744	PPM=19
10/6/2021 9:21	13851	WARNING	Slave 111 Changed	Radio Address 82597	MB Stick	Checkin Interval=5 min	RSSI=-53	BattmV=26613	PPM=19
10/6/2021 9:21	13850	WARNING	Slave 111 Changed	Radio Address 56540	MB Stick	Checkin Interval=5 min	RSSI=-83	BattmV=26689	PPM=16
10/6/2021 9:16	13849	WARNING	Slave 111 Changed	Radio Address 82597	MB Stick	Checkin Interval=5 min	RSSI=-53	BattmV=26559	PPM=16
10/6/2021 9:16	13848	WARNING	Slave 111 Changed	Radio Address 56540	MB Stick	Checkin Interval=5 min	RSSI=-74	BattmV=26646	PPM=12
10/6/2021 9:11	13847	WARNING	Slave 111 Changed	Radio Address 82597	MB Stick	Checkin Interval=5 min	RSSI=-53	BattmV=26505	PPM=16
10/6/2021 9:11	13846	WARNING	Slave 111 Changed	Radio Address 93880	MB Stick	Checkin Interval=5 min	RSSI=-58	BattmV=26450	PPM=16
10/6/2021 9:11	13845	WARNING	Slave 111 Changed	Radio Address 56540	MB Stick	Checkin Interval=5 min	RSSI=-74	BattmV=26602	PPM=13
10/6/2021 9:06	13844	WARNING	Slave 111 Changed	Radio Address 82597	MB Stick	Checkin Interval=5 min	RSSI=-53	BattmV=26461	PPM=13
10/6/2021 9:06	13843	WARNING	Slave 111 Changed	Radio Address 93880	MB Stick	Checkin Interval=5 min	RSSI=-52	BattmV=26353	PPM=13
10/6/2021 9:06	13842	WARNING	Slave 111 Changed	Radio Address 56540	MB Stick	Checkin Interval=5 min	RSSI=-74	BattmV=26548	PPM=20
10/6/2021 9:01	13841	WARNING	Slave 111 Changed	Radio Address 82597	MB Stick	Checkin Interval=5 min	RSSI=-51	BattmV=26385	PPM=13
10/6/2021 9:01	13840	WARNING	Slave 111 Changed	Radio Address 93880	MB Stick	Checkin Interval=5 min	RSSI=-52	BattmV=26288	PPM=13

CAUSE

The Modbus Stick is normally programmed to read a specific set of registers, example shown below for one of the units. The SignalFire network has a transparent read function, so that if the PLC tries to read a register that isn't being explicitly read by the Modbus Stick from an existing Slave ID, the Gateway will send an over-the-air read command to the Modbus Stick and retrieve the requested register if available.

The Modbus Stick will also regularly scan across all Slave IDs and report any devices it finds to the Gateway. If the PLC makes a request to a device on the network but not in the Modbus Stick's program steps, the Gateway knows to send an over-the-air request to that Modbus Stick and still retrieve the data from that register/Slave ID.

The MicroMotion 5700 can be programmed to a Slave ID within the range 1-127, except for Slave ID 111 (excerpt from MicroMotion manual below). Slave ID 111 is used as special "service port" address, and any MicroMotion 5700 device will respond to a request to Slave ID 111. When the Modbus Stick runs its scan, the MicroMotion 5700 responds at the Slave ID its programmed to, as well as Slave ID 111. The Modbus Stick then sends an empty device to the Gateway at 111, leading to a "ghost" Modbus Stick at Slave ID 111.

Tip
— If you need an address that is out of range, you can disable **Modbus ASCII Support**. When **Modbus ASCII Support** is disabled, the Modbus address can be set to 1–127, excluding 111. 111 is reserved for the service port address. However, you will not be allowed to use Modbus ASCII (7-bit) for connections to the transmitter. You must use Modbus RTU (8-bit) instead.

SOLUTION

The problem is caused by the combination of the Modbus Stick performing a scan, and the MicroMotion 5700 responding to any "ping" or request specifically on Slave ID 111.

The Modbus Stick can be programmed to not auto-scan, which will prevent the Emerson meter from responding and creating a dummy device at 111. While configuring the Modbus Stick (must be directly connected, not in remote configuration), go to Tools and open the Debug Terminal. You may also use keyboard shortcut "Ctrl+D". Type in the command `scan disable` and hit the Enter key. The setting is preserved in the Modbus Stick across reboots.

The Modbus Stick will now cease scanning across all Slave IDs to find new devices. The side effect to this is that if there is a device that needs to be transparently written to, the Modbus Stick must now explicitly have a program step that reads a register – any register, even if it fails – to make the Gateway aware that that device is available for over-the-air