



TraceTek® TTDM-128 System Integration using the Modbus Protocol

The TraceTek TTDM-128 Network Master Module provides communication capability to a host system (personal computer, building management system or other automation system) using the MODBUS¹ protocol over an RS-232 or RS-485 serial connection. This document describes briefly the most common system integration method used with a TTDM-128 based leak detection system.

We assume the reader is an experienced Systems Integrator who already understands the MODBUS protocol itself, and that the physical connection (RS-232 or RS-485) between the host system and that the TTDM has already been made. Refer to the TTDM-128 installation instructions for information on making the host communication connections.

There are many possible leak detection network arrangements using one or more TTDM-128s and/or TraceTek TTSIM Sensor Interface Modules. The TTDM-128 User Manual illustrates most of these possibilities. This document assumes that you will be communicating with a single TTDM-128 and that it is connected to a network of one or more Sensor Interface Modules (SIMs or TTSIMs). The TTDM-128 itself incorporates a sensor interface module which is usually set to address 1. Additional external sensor interface modules (TTSIM units) are typically addressed from 2 to 127. Refer to the appropriate TraceTek module documentation for further information.

For most system integration applications using the TTDM-128, it is only necessary for the host system to scan each leak detection circuit (SIM) for status and leak location information. For each leak detection circuit in the TraceTek network, the TTDM stores all of the SIM information in an array of 16 Modbus registers. The first of these registers contains the status bits for the SIM. The second register contains the location of the leak in sensor cable resistance units. The Modbus register numbers for these values can be calculated as follows:

$$\text{Status Register Number (STATUS)} = 30101 + 16 * \text{SIM\#}$$

$$\text{Leak Location Register (RLOC)} = 30102 + 16 * \text{SIM\#}$$

A complete table of register numbers is included in Appendix 1.

The status register contains details of the operating condition of the sensor cable and the SIM unit. These details are bit mapped into the register value. The following table is a list of the status bits and how they are to be interpreted.

¹ See www.modbus.org for details on the MODBUS protocol

Status Register Bit Mapping

Bit # (value)	Meaning	Interpretation
1 (1)	Leak indication	0 = no leak, 1 = leak
2 (2)	Sensor contamination	0 = cable is clean, 1 = contamination (if no leak indication) or leak
3 (4)	Sensor loop intact	0 = sensor OK, 1 = sensor cable break
4 (8)	Sensor loop balance	0 = sensor OK, 1 = cable loop imbalance
5 (16)	SIM unit program status	If any of these bits = 1, there is a problem with the SIM unit itself.
6 (32)		
7 (64)		

The higher order bits (bits 8 to 16) provide other information about the SIM itself, however these first seven are all that is required to determine the integrity of the leak detection circuit.

Each SIM should be scanned and tested as follows:

1. read the status register (STATUS)
2. test STATUS value for leak indication:
 LEAK if (STATUS bitand 1)=1 *...i.e., bit 1 is set*
 - a. if LEAK, read the location register (RLOC) and calculate the leak location:
 LOCATION = RLOC / 3.900 *... location in feet from start of sensor*
 -or-
 LOCATION =RLOC / 12.796 *... location in meters from start of sensor*
3. test STATUS value for cable and SIM integrity:
 FAULT if (STATUS bitand 124) <> 0 *... i.e., any one of bits 3~7 is set*

If desired additional details can be displayed on the host system by testing the status bits individually and providing appropriate responses. It is usually sufficient for the host system to detect an alarm in the event of a leak or a system fault. A service technician can then go to the TTDM to determine the exact nature of the problem.



SIM# (address)	Status Register (STATUS)	Leak Location Register (RLOC)
1	30117	30118
2	30133	30134
3	30149	30150
4	30165	30166
5	30181	30182
6	30197	30198
7	30213	30214
8	30229	30230
9	30245	30246
10	30261	30262
11	30277	30278
12	30293	30294
13	30309	30310
14	30325	30326
15	30341	30342
16	30357	30358
17	30373	30374
18	30389	30390
19	30405	30406
20	30421	30422
21	30437	30438
22	30453	30454
23	30469	30470
24	30485	30486
25	30501	30502
26	30517	30518
27	30533	30534
28	30549	30550
29	30565	30566
30	30581	30582
31	30597	30598
32	30613	30614
33	30629	30630
34	30645	30646
35	30661	30662
36	30677	30678
37	30693	30694
38	30709	30710
39	30725	30726
40	30741	30742
41	30757	30758
42	30773	30774
43	30789	30790



Appendix 1: SIM register list

SIM# (address)	Status Register (STATUS)	Leak Location Register (RLOC)
44	30805	30806
45	30821	30822
46	30837	30838
47	30853	30854
48	30869	30870
49	30885	30886
50	30901	30902
51	30917	30918
52	30933	30934
53	30949	30950
54	30965	30966
55	30981	30982
56	30997	30998
57	31013	31014
58	31029	31030
59	31045	31046
60	31061	31062
61	31077	31078
62	31093	31094
63	31109	31110
64	31125	31126
65	31141	31142
66	31157	31158
67	31173	31174
68	31189	31190
69	31205	31206
70	31221	31222
71	31237	31238
72	31253	31254
73	31269	31270
74	31285	31286
75	31301	31302
76	31317	31318
77	31333	31334
78	31349	31350
79	31365	31366
80	31381	31382
81	31397	31398
82	31413	31414
83	31429	31430
84	31445	31446
85	31461	31462
86	31477	31478



Appendix 1: SIM register list

SIM# (address)	Status Register (STATUS)	Leak Location Register (RLOC)
87	31493	31494
88	31509	31510
89	31525	31526
90	31541	31542
91	31557	31558
92	31573	31574
93	31589	31590
94	31605	31606
95	31621	31622
96	31637	31638
97	31653	31654
98	31669	31670
99	31685	31686
100	31701	31702
101	31717	31718
102	31733	31734
103	31749	31750
104	31765	31766
105	31781	31782
106	31797	31798
107	31813	31814
108	31829	31830
109	31845	31846
110	31861	31862
111	31877	31878
112	31893	31894
113	31909	31910
114	31925	31926
115	31941	31942
116	31957	31958
117	31973	31974
118	31989	31990
119	32005	32006
120	32021	32022
121	32037	32038
122	32053	32054
123	32069	32070
124	32085	32086
125	32101	32102
126	32117	32118
127	32133	32134