TTDM-128 MODBUS

CONNECT AND PROTECT

nVent RAYCHEM TraceTek TTDM-128 System Integration using the MODBUS Protocol

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The nVent RAYCHEM TraceTek TTDM-128 Network Master Module provides communication capability to a host system (personal computer, building management system or other automation system) using the MODBUS 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 H57341 for information on making the host communication connections.

The factory default communication parameters are:

Baud Rate: 9600 (adjustable 600 – 38400)

Parity: None

Stop bits : 1

Data bits: 8

There are many possible leak detection network arrangements using one or more TTDM-128s and/or nVent RAYCHEM TraceTek TTSIM Sensor Interface Modules. The TTDM-128 User Manual H56853 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 nVent RAYCHEM 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 nVent RAYCHEM 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 value can be calculated as follows:

Status Register Number (STATUS) = 30101 + 16 * SIM#

Leak Location Register (RLOC) = 30102 + 16 * SIM#

A complete table of register numbers is included in Table 2.

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.

TABLE 1. 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) 6 (32) 7 (64)	SIM unit program status	If any of these bits = 1, there is a problem with the SIM unit itself.

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-128 to determine the exact nature of the problem.

TABLE 2. TTDM-128 MODBUS REGISTERS FOR EACH SIM

SIM# (address)	Function Code	Status Register (STATUS)	Leak Location Register (RLOC)
1	4	0117	0118
2	4	0133	0134
3	4	0149	0150
4	4	0165	0166
5	4	0181	0182
6	4	0197	0198
7	4	0213	0214
8	4	0229	0230
9	4	0245	0246
10	4	0261	0262
11	4	0277	0278
12	4	0293	0294
13	4	0309	0310
14	4	0325	0326
15	4	0341	0342
16	4	0357	0358
17	4	0373	0374
18	4	0389	0390
19	4	0405	0406
20	4	0421	0422
21	4	0437	0438
22	4	0453	0454

SIM# (address)	Function Code	Status Register (STATUS)	Leak Location Register (RLOC)
23	4	0469	0470
24	4	0485	0486
25	4	0501	0502
26	4	0517	0518
27	4	0533	0534
28	4	0549	0550
29	4	0565	0566
30	4	0581	0582
31	4	0597	0598
32	4	0613	0614
33	4	0629	0630
34	4	0645	0646
35	4	0661	0662
36	4	0677	0678
37	4	0693	0694
38	4	0709	0710
39	4	0725	0726
40	4	0741	0742
41	4	0757	0758
42	4	0773	0774
43	4	0789	0790
44	4	0805	0806

SIM# (address)	Function Code	Status Register (STATUS)	Leak Location Register (RLOC)
45	4	0821	0822
46	4	0837	0838
47	4	0853	0854
48	4	0869	0870
49	4	0885	0886
50	4	0901	0902
51	4	0917	0918
52	4	0933	0934
53	4	0949	0950
54	4	0965	0966
55	4	0981	0982
56	4	0997	0998
57	4	1013	1014
58	4	1029	1030
59	4	1045	1046
60	4	1061	1062
61	4	1077	1078
62	4	1093	1094
63	4	1109	1110
64	4	1125	1126
65	4	1141	1142
66	4	1157	1158
67	4	1173	1174
68	4	1189	1190
69	4	1205	1206
70	4	1221	1222
71	4	1237	1238
72	4	1253	1254
73	4	1269	1270
74	4	1285	1286
75	4	1301	1302
76	4	1317	1318
77	4	1333	1334
78	4	1349	1350
79	4	1365	1366
80	4	1381	1382
81	4	1397	1398
82	4	1413	1414
83	4	1429	1430
84	4	1445	1446
85	4	1461	1462
86	4	1477	1478

SIM# (address)	Function Code	Status Register (STATUS)	Leak Location Register (RLOC)
87	4	1493	1494
88	4	1509	1510
89	4	1525	1526
90	4	1541	1542
91	4	1557	1558
92	4	1573	1574
93	4	1589	1590
94	4	1605	1606
95	4	1621	1622
96	4	1637	1638
97	4	1653	1654
98	4	1669	1670
99	4	1685	1686
100	4	1701	1702
101	4	1717	1718
102	4	1733	1734
103	4	1749	1750
104	4	1765	1766
105	4	1781	1782
106	4	1797	1798
107	4	1813	1814
108	4	1829	1830
109	4	1845	1846
110	4	1861	1862
111	4	1877	1878
112	4	1893	1894
113	4	1909	1910
114	4	1925	1926
115	4	1941	1942
116	4	1957	1958
117	4	1973	1974
118	4	1989	1990
119	4	2005	2006
120	4	2021	2022
121	4	2037	2038
122	4	2053	2054
123	4	2069	2070
124	4	2085	2086
125	4	2101	2102
126	4	2117	2118
127	4	2133	2134

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