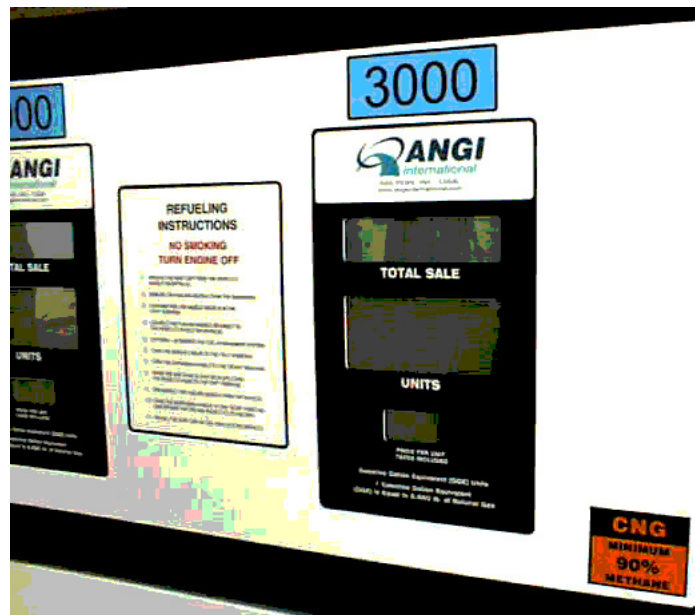
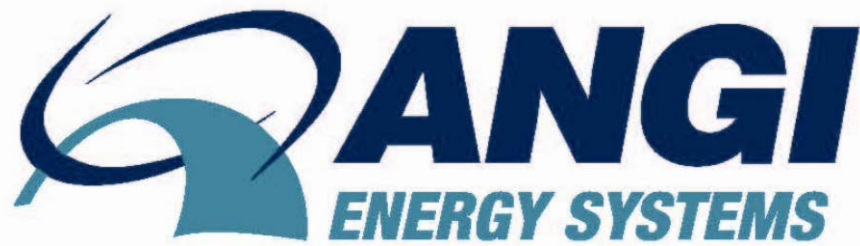




ModBus Register Mapping Manual

ANGI Series II Dispenser

Rev. 01

NOTICE

IMPORTANT SAFETY INFORMATION

Only operate this equipment in accordance with the instructions provided in this manual. Improper application or operation of this equipment may cause serious bodily injury or death. Improper application or operation of this equipment will void the warranty.

Contact ANGI Customer Service if this equipment is to be used in a different application than it was originally designed for.

This equipment must be repaired and maintained by ANGI Customer Service Personnel, or the customer's qualified service representative.

Should you detect a gas leak...

Immediately shut down the compressor and leave the compressor station. Extinguish any open flame or source of ignition. Shut off the supply valve and contact your authorized ANGI service representative and/or gas supply company.

WARRANTY

ANGI hereby warrants that the EQUIPMENT sold hereunder shall be free of defects in material and workmanship appearing within 12 months from the date the EQUIPMENT is placed into service or 18 months from the date the GOODS are available to be shipped; whichever comes first. PURCHASER must give written notice of any defect covered by this warranty to ANGI within the warranty period. For any defect covered by this warranty, ANGI shall repair or replace the EQUIPMENT. Repairs or replacement parts are warranted for 90 days from the date that the repaired or replaced EQUIPMENT OR GOODS are shipped from the factory or until termination of the original warranty, whichever is longer. This warranty does not cover labor costs and other contingent expenses for the diagnosis of defects or for removal and reinstallation of the EQUIPMENT. Such repair or replacement shall be PURCHASER's sole and exclusive remedy for ANGI's breach of this AGREEMENT.

This warranty does not extend to any GOODS or EQUIPMENT which have been (a) subject to misuse, neglect, accidents, acts of God, or causes of a similar nature; (b) repaired or altered by anyone other than ANGI, without ANGI's prior approval; (c) improperly installed by anyone other than ANGI or someone under its direction or (d) to consumable parts or materials such as filter elements, seals, belts, or fuses, or (e) damage resulting from overloading the GOODS or EQUIPMENT. This warranty does not extend to nor does ANGI provide any warranty to components such as motors and drive engines that are separately covered by a warranty issued by their respective manufacturers. ANGI shall transfer or pass through to PURCHASER any such warranties received by ANGI. This warranty is in lieu of all other warranties expressed or implied.

EXCEPT TO THE EXTENT PROHIBITED BY APPLICABLE LAW, THIS IS THE ONLY WARRANTY GIVEN FOR THE SALE OF GOODS, EQUIPMENT AND/ OR SERVICES. NO WARRANTIES OF MERCHANTABILITY AND FITNESS FOR PARTICULAR PURPOSE SHALL APPLY. IN NO EVENT SHALL ANGI BE LIABLE FOR CONSEQUENTIAL, SPECIAL, INDIRECT, PUNITIVE, OR INCIDENTAL DAMAGES RESULTING FROM THE PURCHASE OR USE OF ANGI EQUIPMENT, GOODS, AND/OR SERVICES RESULTING FROM ANY DELAYS OR FAILURE OF PERFORMANCE OF ANGI UNDER ANY AGREEMENT BETWEEN ANGI AND PURCHASER, OR RESULTING FROM ANY SERVICES FURNISHED BY ANGI.

This warranty may not be modified, amended, or otherwise changed except by a written document properly executed by ANGI.

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1. Introduction

The ANGI Series II dispenser supports the ModBus protocol on its half-duplex RS485 serial communication port COMM 5 as a slave device with dispenser program revisions 3.960 and greater. This port is found on the Series II Interface board 403-07263 TB6. It is electrically isolated from the dispenser circuitry by opto-couplers and an isolated DC-DC power converter. The port is powered from the interface board. An on-board terminating resistor/capacitor is integrated on the interface board and is brought out on the terminal strip TB6. The provided terminating resistor can be wired in to the end of the transmission cable. The ModBus protocol is enabled by turning switch SW1-8 on (up) on the dispenser interface board. The dispenser will revert to the proprietary Series II Monitor protocol if this switch is off. Switches SW1-2 through SW1-6 and a parameter establish the ModBus node ID (see section 10).

2. Supported ModBus functions

The dispenser supports these ModBus functions

- 1) Function 3: read holding registers.
- 2) Function 4: read input registers.
- 3) Function 16: write multiple registers.
- 4) Function 22: mask write single register.
- 5) Function 23: write/read multiple registers (Write before read).
- 6) Function 43: read device identification.

All other functions are not supported and, if called for, will return an error. Function 3 and 4 are identical. The terms “holding” and “input” that apply to a Modicon PLC do not apply to the Series II dispenser. Both functions are simplified to just being read-register functions. There are no “coils” defined in the Series II dispenser controller. Those coil functions are not supported.

3. ModBus addressing, Series II dispenser register set

The Series II control uses a field of 32-bit registers exclusively to hold long and floating point words. All the register words are aligned to the ModBus odd address: word at memory address 0 is at ModBus address 1. All the register words must be read or written as two consecutive ModBus integer address starting with the odd address. Registers addressed on the even ModBus address or in amounts not in sets of two integers will return an exception error. This rule does not apply to function 22 mask write single register. Function 22 will mask write the upper or lower 16 bits of the 32-bit register based on the Modbus address.

The value in the dispenser's 32-bit register can be placed in the two consecutive ModBus integers in either a big-endian or little-endian format. The desired format is selected by the parameter configuration bit “extra_configuration / use_little_endian” in the dispenser. A ‘1’ in this bit puts the ModBus communication in the little-endian format mode, a ‘0’ big-endian. With the big-endian format the odd address holds the most significant half and the even (higher) address holds the least significant half of the dispenser's 32-bit register value. The little-endian format is reversed, the odd address holds the least significant half and the even (higher) address holds the most significant half. The lower address is always sent first in the response packet. The byte order of the ModBus integer values is always big-endian: the most significant half (byte) of the

integer is sent first. In function 22 mask write register, the big or little endian format will apply to which half of the dispenser's 32-bit register is mask written. In big endian mode the odd Modbus address mask writes the most significant half of the dispenser's 32-bit register. Visa versa for little endian mode. This option exists to allow the dispenser to conform to how the host system, using the ModBus protocol, may order it's register values.

The Series II dispenser's register set is divided into blocks containing 64 long words (long word = 32 bits). Each block is dedicated to a specific dispenser function. Sets of blocks are, in turn, assembled into groups. The individual registers are ModBus addressed in a block from 1 to 128 (1 to 80 hex). The blocks are ModBus addressed in values of 128 (80 hex) added to the ModBus address. The ModBus protocol subtracts a 1 from the address and sends the values 0 to 127 to the dispenser for addressing the registers in the blocks. The dispenser will align the ModBus address to the dispenser memory point by dividing it by 2. Examples:

Input Modbus address 51 (33 hex) - 1 = 50 (32 hex) sent in the master packet. In the dispenser $50 / 128 = 0$ block, $50 / 2 = 25$, the 25th register in the dispenser is addressed in block 0.

Input Modbus address 407 (197 hex) - 1 = 406 (196 hex) sent in the master packet. In the dispenser $406 / 128 = 3$ block, $406 \text{ remainder } 128 = 22$ (17 hex) the 22th register in the dispenser is addressed in block 3.

A formulas for dispenser to ModBus addressing would be:

Block# * 128 + register# x 2 + 1 = ModBus address.

$(\text{ModBus address} - 1) / 128 = \text{block\#}$ (truncate decimal fraction)

$((\text{ModBus address} - 1) \text{ logical-and } 127) / 2 = \text{register\#}$

Addressing registers not defined in the dispenser program will not return a traditional ModBus exception error. The dispenser will return a zero if read and do nothing if written. An exception error will also not be generated by a ModBus write command if the register is write protected. The register will simply not be written.

The function 23 multiple read/write will write the registers first then read. If the same register is written and read with the register being write protected, the write will be denied and the original unmodified value will be read.

The write protect on the dispenser registers can be unlocked by writing a password number to a register. There are two password registers, one unlocks the write protect according to the protection level given to the password value and the other unlocks the write protect only during the reception of a packet. The first password register value will unlock the write protect and set-up a ten second time-out timer. The write protect will lock-up after ten seconds if another transmission from the master is not sent. The unlock timer will be reset every time the ModBus master poles the dispenser with any function. The use of second password register is not practical with the ModBus protocol since registers cannot be arbitrarily addressed but are read or written as a contiguous block. The registers are write protected at the end of processing the ModBus command reception using password #2.

The ModBus communication can be forced to be read-only be selected by the parameter configuration bit "extra_configuration / MB_read_only" set to 1 in the dispenser. Sending a valid password number will not unlock the write protect with this configuration bit set.

4. The Series II dispenser register set: block definitions

Note: GTI: Gas Technology Institute

All register values are long words, registers containing floating point values are noted as “float” in their decimal point declaration.

All control addresses are stated as “block.register” in decimal.

ModBus addresses are stated as decimal value and hex value – 1.

The item list number given to the defined registers in sequential order.

For more information on the function of these register consult the ANGI Series II Dispenser Technical Function manual.

An asterisk by the control address thus x.x* indicates the register is a set of Boolean bits.

Block 0: Directory. The register value provides a list item index to the base register in the named block. Note: the listing item number is not the control address used in the ModBus addressing.

Item Numb	Control Address	ModBus Address	Description / Name
0	0.0	1 0h	Total items
1	0.1	3 2h	Common parameters (shared by both hoses)
2	0.2	5 4h	'A' Hose variables
3	0.3	7 6h	'A' Hose Flow meter variables (floating point)
4	0.4	9 8h	'A' Hose parameters
5	0.5	11 Ah	'A' Hose fill monitor variables
6	0.6	13 Ch	'A' Hose totalizer variables
7	0.7	15 Eh	'B' Hose variables
8	0.8	17 10h	'B' Hose Flow meter variables (floating point)
9	0.9	19 12h	'B' Hose parameters
10	0.10	21 14h	'B' Hose fill monitor variables
11	0.11	23 16h	'B' Hose totalizer variables
12	0.12	25 18h	Program control variables
13	0.13	27 1Ah	Analog input variables
14	0.14	29 1Ch	GTI 'A' Hose control variables
15	0.15	31 1Eh	GTI 'A' Hose signal variables (floating point)
16	0.16	33 20h	GTI 'A' Hose fill variables (floating point)
17	0.17	35 22h	GTI 'A' Hose fill monitor variables
18	0.18	37 24h	GTI 'A' Hose parameters (floating point)
19	0.19	39 26h	GTI 'A' Hose parameters
20	0.20	41 28h	GTI 'B' Hose control variables
21	0.21	43 2Ah	GTI 'B' Hose signal variables (floating point)
22	0.22	45 2Ch	GTI 'B' Hose fill variables (floating point)
23	0.23	47 2Eh	GTI 'B' Hose fill monitor variables
24	0.24	49 30h	GTI 'B' Hose parameters (floating point)
25	0.25	51 32h	GTI 'B' Hose parameters
26	0.26	53 34h	'A' Hose price
27	0.27	55 36h	'B' Hose price
28	0.28	57 38h	'A' Hose process
29	0.29	59 3Ah	'B' Hose process
30	0.30	61 3Ch	'A' Hose Gilbarco communication variables
31	0.31	63 3Eh	'B' Hose Gilbarco communication variables
32	0.32	65 40h	'A' Hose test variables
Item Numb	Control Address	ModBus Address	Description / Name

33	0.33	67	42h	'B' Hose test variables
34	0.34	69	44h	Extra parameters (see note 1)
none	0.36	73	48h	Not defined
...				
none	0.63	128	7Fh	Not defined

Block 1: Common parameters. Shared by both hoses. Write protected. Items with * write protected by switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
35	1.0	129 80h	Sdpmax	%	0.0
36	1.1	131 82h	Smmfactor	g/pls	0.0000
37	1.2	133 84h	SPcrit	Mpa	0.00
38	1.3	135 86h	STcrit	K	0.0
39	1.4	137 88h	underfill_factor	%	0
40	1.5	139 8Ah	Smax	%	0.0
41	1.6	141 8Ch	Sdelay	sec	0.00
42	1.7	143 8Eh	Stank_dwell	sec	0.00
43	1.8	145 90h	press_settle	Mpa	0.00
44	1.9*	147 92h	test_bits	#	0
45	1.10	149 94h	Smass_unit	#	0
46	1.11	151 96h	Smassconv	g / 'unit'	0.0
47	1.12	153 98h	mass_decimal	#	0
48	1.13	155 9Ah	Ssale_decimal	#	0
49	1.14	157 9Ch	pulses_per_qty	pls / 'unit'	0
50	1.15	159 9Eh	pulses_per_sale	pls / 'unit'	0
51	1.16	161 A0h	qty_frequency	Hz	0
52	1.17	163 A2h	sale_frequency	Hz	0
53	1.18	165 A4h	temperature_sim	K	0.0
54	1.19	167 A6h	tank_size	feet^3	0.000
55	1.20	169 A8h	resist_sim	Pa s^2 / g^2	0.0
56	1.21	171 AAh	low_sim	Mpa	0.00
57	1.22	173 ACh	mid_sim	Mpa	0.00
58	1.23	175 AEh	high_sim	Mpa	0.00
59	1.24	177 B0h	time_zone	#	0
60	1.25	179 B2h	serial_number*	#	0
61	1.26	181 B4h	spc_baud	#	0
62	1.27	183 B8h	Sprice_decimal	#	0
63	1.28	185 BAh	spc_com_timeout	#	0
64	1.29	187 BCh	overfill_factor	%	0
none	1.30	189 BEh	Not defined		
...					
none	1.63	128 FFh	Not defined		

Block 2: 'A' Hose variables. All write protected by password and switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
65	2.0	257	100h Astatus	#	0
66	2.1	259	102h Await	sec	0.0
67	2.2	261	104h Amass	g	0
68	2.3	263	106h Apressure	Mpa	0.00
69	2.4	265	108h Apreslow	Mpa	0.00
70	2.5	267	10Ah Aflow	g / s	0.00
71	2.6	269	10Ch Atemperature	K	0.0
72	2.7	271	10Eh Apress_stored	Mpa	0.00
73	2.8	273	110h Atemp_stored	K	0.0
74	2.9	275	112h Apmax	Mpa	0.00
75	2.10	277	114h Apmax_calc	Mpa	0.00
76	2.11	279	116h Atankpress	Mpa	0.00
77	2.12	281	118h Aflow_max	g / s	0.00
78	2.13	283	11Ah Apress_test	Mpa	0.00
79	2.14	285	11Ch Aresist	Pa s ² / g ²	0.0
80	2.15	287	11Eh Apress_mem	Mpa	0.00
81	2.16	289	120h Arestrict	Pa ⁻² s / g	0.000
82	2.17*	291	122h Aflags	#	0
83	2.18*	293	124h Acontrol_bits	#	0
84	2.19	295	126h Apchange	Mpa	0.00
85	2.20	297	128h Aflow_analog	#	0
86	2.21	299	12Ah Aabs_press	Mpa	0.00
87	2.22	301	12Ch Amax_moles	moles	0.00
88	2.23	303	12Eh Asim_press_preset	Mpa	0.00
89	2.24	305	130h Asim_dpmax	%	0.0
90	2.25	307	132h Apress_delta	Mpa	0.00
91	2.26*	309	134h Aerror_reg	#	0
92	2.27	311	136h Aerror_code	#	0
93	2.28	313	138h Apressure2_in	Mpa	0.00
94	2.29	315	13Ah Apsim	Mpa	0.00
95	2.30	317	13Ch Atemp_analog	K	0.0
96	2.31	319	14Eh Asonic_pressure	Mpa	0.00
97	2.32	321	140h Apress_display	Mpa	0.00
98	2.33	323	142h Aresist_temp	Pa s ² / g ²	0.0
99	2.34	325	144h Apress_target	Mpa	0.00
100	2.35	327	146h Amass_ran	g	0
101	2.36	329	148h Aqty_pulses	pls	0
102	2.37	331	14Ah Asale_pulses	pls	0
103	2.38	333	14Ch Aqty_pulses_sent	pls	0
104	2.39	335	14Eh Asale_pulses_sent	pls	0

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
105	2.40	337	150h Atotal_sale	\$	note 1
106	2.41	339	152h Atotal_qty	'units'	note 2
107	2.42	341	154h Aprice_per_unit	\$	note 3
108	2.43	343	156h Apmass_used	Mpa	0.00
109	2.44	345	158h Ameter_mass_flow_unit	#	0
110	2.45	347	15Ah Ameter_mass_unit	#	0
111	2.46	349	15Ch Ameter_temp_unit	#	0
112	2.47	351	15Eh Afull_mass	g	0
113	2.48	353	160h Atank_mass	g	0
114	2.49	355	162h Afinal_process_count	#	0
115	2.50	357	164h Afinal_process_mod	#	0
116	2.51	359	166h Aprocess_mod	#	0
117	2.52	361	168h Agas_temperature	K	0
118	2.53	363	16Ah Atotalizer_pulses	pls	0
119	2.54	365	16Ch Atotl_pulses_sent	pls	0
120	2.55	367	16Eh Apast_mons_page	#	0
121	2.56	369	170h Acurrent_mons_page	#	0
122	2.57	371	172h Amon_ROM_address	#	0
123	2.58*	373	174h Ameter_status	#	0

Block 3: 'A' Hose Flow meter variables. All write protected by switch 1-1. All IEEE real.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
124	3.0	385	180h Ameter_temp	C	float
125	3.1	387	182h Ameter_flow	Kg / s	float
126	3.2	389	184h Ameter_mass	Kg	float
127	3.3	391	186h Ameter_vol	Liter	float
128	3.4	392	188h Ameter_mass_inv	Kg	float
none	3.5	393	18Ah not defined		
...					
none	3.5	511	1FEh not defined		

Block 4: 'A' Hose parameters. All write protected by password. * indicates switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
129	4.0	513	200h ASlowflo	g / s	0.00
130	4.1	515	202h ASmidflo	g / s	0.00
131	4.2	517	204h Ashiflo	g / s	0.00
132	4.3	519	206h Astopflo	g / s	0.00
133	4.4	521	208h ASDrop	Mpa	0.00
134	4.5	523	20Ah ASlow	g / s	0.00
135	4.6	525	20Ch ASburst	g / s	0.00
136	4.7	527	20Eh Astartdel	s	0.00
137	4.8	529	210h ASmode	#	0
138	4.9	531	212h Aanalog_temp_cal	C	0.0
139	4.10	533	214h Adac_freeze	adc#	0
140	4.11	535	216h Ano_flow_time	s	0.00
141	4.12	537	218h Apress_dac_offset	adc#	0
142	4.13	539	21Ah Apress_dac_range	adc#	0
143	4.14	541	21Ch Aflow_dac_zero	adc#	0
144	4.14	543	21Eh Aflow_dac_max	adc#	0
145	4.16	545	220h Aflow_cal	g / s	0.00
146	4.17	547	222h Ameter_temp_cal	#	0
147	4.18	549	224h Ameter_flow_cal	#	0
148	4.19	551	226h Ameter_mass_cal	#	0
149	4.20	553	228h Apress_unit	#	0
150	4.21*	555	22Ah Asignal_config *	#	0
151	4.22	557	22Ch ASlowtarget	%	0
152	4.23	559	22Eh ASmidtargt	%	0
153	4.24	561	230h AShightarget	%	0
154	4.25	563	232h Ato_mid	Mpa	0.00
155	4.26	565	234h Ato_high	Mpa	0.00
156	4.27	567	236h Ato_full	Mpa	0.00
157	4.28	569	238h A valve_off_dwell	s	0.00
158	4.29	571	23Ah Apress2_dac_offset	adc#	0
159	4.30	573	23Ch Apress2_dac_range	adc#	0
160	4.31	575	23Eh Apress2_trip	Mpa	0.00
161	4.32	577	240h Abank_time_limit	s	0
162	4.33	579	242h Amass_calibrate	#	0.0000
163	4.34	581	244h Apressure_trip	Mpa	0.00
164	4.35	583	246h Adelay_adj_limit	Mpa	0.00
165	4.36	585	248h Apmax_fixed	Mpa	0.00
166	4.37	587	24Ah Amin_resist	Pa s ² / g ²	0.0
167	4.38	589	24Ch Ahose_mass	g	0
168	4.39	591	24Eh Apress_dip	Mpa	0.00
none	4.40	593	250h not defined		
...					
none	4.63	639	27Eh not defined		

Block 5: 'A' Hose fill monitor variables. Read only

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
169	5.0	641	280h Alow_target	Mpa	0.00
170	5.1	643	282h Alow_tank	Mpa	0.00
171	5.2	645	284h Amid_target	Mpa	0.00
172	5.3	647	286h Amid_tank	Mpa	0.00
173	5.4	649	288h Ahigh_target	Mpa	0.00
174	5.5	651	28Ah Ahigh_tank	Mpa	0.00
175	5.6	653	28Ch Alow_adjust	%	0.00
176	5.7	655	28Eh Amid_adjust	%	0.00
177	5.8	657	290h Apress_max	Mpa	0.00
178	5.9	659	292h Asubsonic_press	Mpa	0.00
179	5.10	661	294h Ainit_flow_max	g / s	0.00
180	5.11	663	296h Ainit_ib_pressure	Mpa	0.00
181	5.12	665	298h Ainitial_resist	Pa s ² / g ²	0.0
182	5.13	667	29Ah Amid_resist	Pa s ² / g ²	0.0
183	5.14	669	29Ch Ahigh_resist	Pa s ² / g ²	0.0
184	5.15	671	29Eh Afinal_resist	Pa s ² / g ²	0.0
185	5.16	673	2A0h Ainit_tank_press	Mpa	0.00
186	5.17	675	2A2h Alow_ib_pressure	Mpa	0.00
187	5.18	677	2A4h Alow_tank_target	Mpa	0.00
188	5.19	679	2A6h Alow_time	s	0.00
189	5.20	681	2A8h Amid_ib_pressure	Mpa	0.00
190	5.21	683	2AAh Amid_tank_target	Mpa	0.00
191	5.22	685	2ACh Amid_time	s	0.00
192	5.23	687	2AEh Ahigh_ib_pressure	Mpa	0.00
193	5.24	689	2B0h Ahigh_tank_target	Mpa	0.00
194	5.25	691	2B2h Ahigh_time	s	0.00
195	5.26	693	2B4h Afinal_mass	g	0.00
196	5.27	695	2B6h Afinal_press	Mpa	0.00
197	5.28	697	2B8h ATcomp_press	Mpa	0.00
198	5.29	699	2BAh Alow_hose_mass	g	0
199	5.30	701	2BCh Amid_hose_mass	g	0
200	5.31	703	2BEh Ahigh_hose_mass	g	0
201	5.32	705	2C0h Alow_stop_flow	g / s	0.00
202	5.33	707	2C2h Amid_stop_flow	g / s	0.00
203	5.34	709	2C4h Ahigh_stop_flow	g / s	0.00
204	5.35	711	2C6h Alow_off_adj	Mpa	0.00
205	5.36	713	2C8h Amid_off_adj	Mpa	0.00
206	5.37	715	2CAh Ahigh_off_adj	Mpa	0.00
207	5.38*	717	2CCh Afinal_flags	#	0
208	5.39	719	2CEh Aspare_44	#	0
209	5.40*	721	2D0h Aaccount_1	#	0
210	5.41*	723	2D2h Aaccount_2	#	0
211	5.42*	725	2D4h Aaccount_3	#	0
212	5.43*	727	2D6h Aaccount_4	#	0
213	5.44	729	2D8h Aalgorithm_type	#	0
214	5.45	731	2DAh Atime	time	n.a.
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

215	5.46	733	2DCh	Adate	date	n.a.
216	5.47	735	2DEh	Alast_ib_pressure	Mpa	0.00
217	5.48	737	2E0h	Alast_tank_target	Mpa	0.00
218	5.49	739	2E2h	Alast_tank_pressure	Mpa	0.00
219	5.50	741	2E4h	Ainit_restrict	Pa ⁻² s / g	0.000
220	5.51	743	2E6h	Amid_restrict	Pa ⁻² s / g	0.000
221	5.52	745	2E8h	Ahigh_restrict	Pa ⁻² s / g	0.000
222	5.53	747	2EAh	Afinal_restrict	Pa ⁻² s / g	0.000
223	5.54	749	2ECh	Alow_adj_restrict	%	0.00
224	5.55	751	2EEh	Amid_adj_restrict	%	0.00
225	5.56	753	2F0h	Ahi_adj_restrict	%	0.00
none	5.57	755	2F2h	not defined		
...						
none	5.63	767	2FEh	not defined		

Block 6: 'A' Hose totalizer variables. Read only

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
226	6.0	769	300h Atotal_save_count	#	0
227	6.1	771	302h Alog_count	#	0
228	6.2	773	303h Atime_stamp	time	n.a.
229	6.3	775	306h Adate_stamp	date	n.a.
230	6.4	777	308h Ahose_id	#	0
231	6.5	779	30Ah Atotal_extend	g	note 4
232	6.6	781	30Ch Atotal_sale_tier1	\$	0
233	6.7	783	30Eh Atotal_mass_tier1	g	0
234	6.8	785	310h Atotal_sale_tier2	\$	0
235	6.9	787	312h Atotal_mass_tier2	g	0
236	6.10	789	314h Atotal_mass_ran	g	note 6
237	6.11	791	316h Atotal_sale_ran	\$	0
238	6.12	793	318h Atotal_qty_ran	'unit'	0
239	6.13	795	31Ah Aprice_ran	\$	0
240	6.14	797	31Ch Aprice_tier_ran	#	0
241	6.15	799	31Eh Asale_ran_decimal	#	0
242	6.16	801	320h Aqty_ran_decimal	#	0
243	6.17	803	322h Aprice_ran_decimal	#	0
244	6.18	805	324h Alow_cycle_total	#	0
245	6.19	807	326h Amid_cycle_total	#	0
246	6.20	809	328h Ahigh_cycle_total	#	0
247	6.21	811	32Ah Atotal_fault	#	0
248	6.22	813	32Ch Ashift_sale_tier1	\$	0
249	6.23	815	32Eh Ashift_mass_tier1	g	0
250	6.24	817	330h Ashift_sale_tier2	\$	0
251	6.25	819	332h Ashift_mass_tier2	g	0
252	6.26	821	334h Ashift_time_stamp1	time	n.a.
253	6.27	823	336h Ashift_date_stamp1	date	n.a.
254	6.28	825	338h Ashift_time_stamp2	time	n.a.
255	6.29	827	33Ah Ashift_date_stamp2	date	n.a.
256	6.30	829	33Ch Aqty_remainder	'unit'	0
257	6.31	831	33Eh Atotal_sale_spc_ran	\$	0
none	6.32	833	340h not defined		
...					
none	6.63	895	37Eh not defined		

Block 7: 'B' Hose variables. All write protected by switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
258	7.0	897	380h Bstatus	#	0
259	7.1	899	382h Bwait	sec	0.0
260	7.2	901	384h Bmass	g	0
261	7.3	903	386h Bpressure	Mpa	0.00
262	7.4	905	388h Bpreslow	Mpa	0.00
263	7.5	907	38Ah Bflow	g / s	0.00
264	7.6	909	38Ch Btemperature	K	0.0
265	7.7	911	38Eh Bpress_stored	Mpa	0.00
266	7.8	913	390h Btemp_stored	K	0.0
267	7.9	915	392h Bpmax	Mpa	0.00
268	7.10	917	394h Bpmax_calc	Mpa	0.00
269	7.11	919	396h Btankpress	Mpa	0.00
270	7.12	921	398h Bflow_max	g / s	0.00
271	7.13	923	39Ah Bpress_test	Mpa	0.00
272	7.14	925	39Ch Bresist	Pa s ² / g ²	0.0
273	7.15	927	39Eh Bpress_mem	Mpa	0.00
274	7.16	929	3A0h Brestrict	Pa ⁻² s / g	0.000
275	7.17*	931	3A2h Bflags	#	0
276	7.18*	933	3A4h Bcontrol_bits	#	0
277	7.19	935	3A6h Bpchange	Mpa	0.00
278	7.20	937	3A8h Bflow_analog	#	0
279	7.21	939	3AAh Babs_press	Mpa	0.00
280	7.22	941	3ACh Bmax_moles	moles	0.00
281	7.23	943	3AEh Bsim_press_preset	Mpa	0.00
282	7.24	945	3B0h Bsim_dpmax	%	0.0
283	7.25	947	3B2h Bpress_delta	Mpa	0.00
284	7.26	949	3B4h Berror_reg	#	0
285	7.27	951	3B6h Berror_code	#	0
286	7.28	953	3B8h Bpressure2_in	Mpa	0.00
287	7.29	955	3BAh Bpsim	Mpa	0.00
288	7.30	957	3BCh Btemp_analog	K	0.0
289	7.31	959	3BEh Bsonic_pressure	Mpa	0.00
290	7.32	961	3C0h Bpress_display	Mpa	0.00
291	7.33	963	3C2h Bresist_temp	Pa s ² / g ²	0.0
292	7.34	965	3C4h Bpress_target	Mpa	0.00
293	7.35	967	3C6h Bmass_ran	g	0
294	7.36	969	3C8h Bqty_pulses	pls	0
295	7.37	971	3CAh Bsale_pulses	pls	0
296	7.38	973	3CCh Bqty_pulses_sent	pls	0
297	7.39	975	3CEh Bsale_pulses_sent	pls	0
298	7.40	977	3D0h Btotal_sale	\$	note 1
299	7.41	979	3D2h Btotal_qty	'units'	note 2
300	7.42	981	3D4h Bprice_per_unit	\$	note 3
301	7.43	983	3D6h Bpmax_used	Mpa	0.00
302	7.44	985	3D8h Bmeter_mass_flow_unit	#	0
303	7.45	987	3DAh Bmeter_mass_unit	#	0
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

304	7.46	989	3DCh	Bmeter_temp_unit	#	0
305	7.47	991	3DEh	Bfull_mass	g	0
306	7.48	993	3E0h	Btank_mass	g	0
307	7.49	995	3E2h	Bfinal_process_count	#	0
308	7.50	997	3E4h	Bfinal_process_mod	#	0
309	7.51	999	3E6h	Bprocess_mod	#	0
310	7.52	1001	3E8h	Bgas_temperature	K	0
311	7.53	1003	3EAh	Btotalizer_pulses	pls	0
312	7.54	1005	3ECh	Btotl_pulses_sent	pls	0
313	7.55	1007	3EEh	Bpast_mons_page	#	0
314	7.56	1009	3F0h	Bcurrent_mons_page	#	0
315	7.57	1011	3F2h	Bmon_ROM_address	#	0
316	7.58*	1013	3F4h	Bmeter_status	#	0

Block 8: 'B' Hose Flow meter variables. All write protected by switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
317	8.0	1025 400h	Bmeter_temp	C	float
318	8.1	1027 402h	Bmeter_flow	Kg / s	float
319	8.2	1027 404h	Bmeter_mass	Kg	float
320	8.3	1031 406h	Bmeter_vol	Liter	float
321	8.4	1033 408h	Bmeter_mass_inv	Kg	float
none	8.5	1035 40Ah	not defined		
...					
none	8.63	1151 47Eh	not defined		

Block 9: 'B' Hose parameters. All write protected by password. * indicates switch 1-1.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
322	9.0	1153	480h BSlowflo	g / s	0.00
323	9.1	1155	482h BSmidflo	g / s	0.00
324	9.2	1157	484h Bshiflo	g / s	0.00
325	9.3	1159	486h Bstopflo	g / s	0.00
326	9.4	1161	488h BSdrop	Mpa	0.00
327	9.5	1163	48Ah BSlow	g / s	0.00
328	9.6	1165	48Ch BSburst	g / s	0.00
329	9.7	1167	48Eh BStartdel	s	0.00
330	9.8	1169	490h BSmode	#	0
331	9.9	1171	492h Banalog_temp_cal	C	0.0
332	9.10	1173	494h Bdac_freeze	adc#	0
333	9.11	1175	496h Bno_flow_time	s	0.00
334	9.12	1177	498h Bpress_dac_offset	adc#	0
335	9.13	1179	49Ah Bpress_dac_range	adc#	0
336	9.14	1181	49Ch Bflow_dac_zero	adc#	0
337	9.14	1183	49Eh Bflow_dac_max	adc#	0
338	9.16	1185	4A0h Bflow_cal	g / s	0.00
339	9.17	1187	4A2h Bmeter_temp_cal	#	0
340	9.18	1189	4A4h Bmeter_flow_cal	#	0
341	9.19	1191	4A6h Bmeter_mass_cal	#	0
342	9.20	1193	4A8h Bpress_unit	#	0
343	9.21*	1195	4AAh Bsignal_config *	#	0
344	9.22	1197	4ACh BSlowtarget	%	0
345	9.23	1199	4AEh BSmidtarget	%	0
346	9.24	1201	4B0h BShightarget	%	0
347	9.25	1203	4B2h Bto_mid	Mpa	0.00
348	9.26	1205	4B4h Bto_high	Mpa	0.00
349	9.27	1207	4B6h Bto_full	Mpa	0.00
350	9.28	1209	4B8h Bvalve_off_dwell	s	0.00
351	9.29	1211	4BAh Bpress2_dac_offset	adc#	0
352	9.30	1213	4BCh Bpress2_dac_range	adc#	0
353	9.31	1215	4BEh Bpress2_trip	Mpa	0.00
354	9.32	1217	4C0h Bbank_time_limit	s	0
355	9.33	1219	4C2h Bmass_calibrate	#	0.0000
356	9.34	1221	4C4h Bpressure_trip	Mpa	0.00
357	9.35	1223	4C6h Bdelay_adj_limit	Mpa	0.00
358	9.36	1225	4C8h Bpmax_fixed	Mpa	0.00
359	9.37	1227	4CAh Bmin_resist	Pa s ² / g ²	0.0
360	9.38	1229	4CCh Bhose_mass	g	0
361	9.39	1231	4CEh Bpress_dip	Mpa	0.00
none	9.40	1233	4D0h not defined		
...					
none	9.63	1279	4FEh not defined		

Block 10: 'B' Hose fill monitor variables. Read only

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
362	10.0	1281	500h Blow_target	Mpa	0.00
363	10.1	1283	502h Blow_tank	Mpa	0.00
364	10.2	1285	504h Bmid_target	Mpa	0.00
365	10.3	1287	506h Bmid_tank	Mpa	0.00
366	10.4	1289	508h Bhigh_target	Mpa	0.00
367	10.5	1291	50Ah Bhigh_tank	Mpa	0.00
368	10.6	1293	50Ch Blow_adjust	%	0.00
369	10.7	1295	50Eh Bmid_adjust	%	0.00
370	10.8	1297	510h Bpress_max	Mpa	0.00
371	10.9	1299	512h Bsubsonic_press	Mpa	0.00
372	10.10	1301	514h Binit_flow_max	g / s	0.00
373	10.11	1303	516h Binit_ib_pressure	Mpa	0.00
374	10.12	1305	518h Binitial_resist	Pa s ² / g ²	0.0
375	10.13	1307	51Ah Bmid_resist	Pa s ² / g ²	0.0
376	10.14	1309	51Ch Bhigh_resist	Pa s ² / g ²	0.0
377	10.15	1311	51Eh Bfinal_resist	Pa s ² / g ²	0.0
378	10.16	1313	520h Binit_tank_press	Mpa	0.00
379	10.17	1315	522h Blow_ib_pressure	Mpa	0.00
380	10.18	1317	524h Blow_tank_target	Mpa	0.00
381	10.19	1319	526h Blow_time	s	0.00
382	10.20	1321	528h Bmid_ib_pressure	Mpa	0.00
383	10.21	1323	52Ah Bmid_tank_target	Mpa	0.00
384	10.22	1325	52Ch Bmid_time	s	0.00
385	10.23	1327	52Eh Bhigh_ib_pressure	Mpa	0.00
386	10.24	1329	530h Bhigh_tank_target	Mpa	0.00
387	10.25	1331	532h Bhigh_time	s	0.00
388	10.26	1333	534h Bfinal_mass	g	0
389	10.27	1335	536h Bfinal_press	Mpa	0.00
390	10.28	1337	538h BTcomp_press	Mpa	0.00
391	10.29	1339	53Ah Blow_hose_mass	g	0
392	10.30	1341	53Ch Bmid_hose_mass	g	0
393	10.31	1343	53Eh Bhigh_hose_mass	g	0
394	10.32	1345	540h Blow_stop_flow	g / s	0.00
395	10.33	1347	542h Bmid_stop_flow	g / s	0.00
396	10.34	1349	544h Bhigh_stop_flow	g / s	0.00
397	10.35	1351	546h Blow_off_adj	Mpa	0.00
398	10.36	1353	548h Bmid_off_adj	Mpa	0.00
399	10.37	1355	54Ah Bhigh_off_adj	Mpa	0.00
400	10.38*	1357	54Ch Bfinal_flags	#	0
401	10.39	1359	54Eh Bspare_44	#	0
402	10.40*	1361	550h Baccount_1	#	0
403	10.41*	1363	552h Baccount_2	#	0
404	10.42*	1365	554h Baccount_3	#	0
405	10.43*	1367	556h Baccount_4	#	0
406	10.44	1369	558h Balgorithm_type	#	0
407	10.45	1371	55Ah Btime	time	n.a.
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

408	10.46	1373	55Ch	Bdate	date	n.a.
409	10.47	1375	55Eh	Blast_ib_pressure	Mpa	0.00
410	10.48	1377	560h	Blast_tank_target	Mpa	0.00
411	10.49	1379	562h	Blast_tank_pressure	Mpa	0.00
412	10.50	1381	564h	Binit_restrict	Pa ⁻² s / g	0.000
413	10.51	1383	566h	Bmid_restrict	Pa ⁻² s / g	0.000
414	10.52	1385	568h	Bhigh_restrict	Pa ⁻² s / g	0.000
415	10.53	1387	56Ah	Bfinal_restrict	Pa ⁻² s / g	0.000
416	10.54	1389	56Ch	Blow_adj_restrict	%	0.00
417	10.55	1391	56Eh	Bmid_adj_restrict	%	0.00
418	10.56	1393	570h	Bhi_adj_restrict	%	0.00
none	10.57	1395	572h	not defined		
...						
none	10.63	1407	57Eh	not defined		

Block 11: 'B' Hose totalizer variables. Read only

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
419	11.0	1409	580h Btotal_save_count	#	0
420	11.1	1411	582h Blog_count	#	0
421	11.2	1413	583h Btime_stamp	time	n.a.
422	11.3	1415	586h Bdate_stamp	date	n.a.
423	11.4	1417	588h Bhose_id	#	0
424	11.5	1419	58Ah Btotal_extend	g	note 4
425	11.6	1421	58Ch Btotal_sale_tier1	\$	0
426	11.7	1423	58Eh Btotal_mass_tier1	g	0
427	11.8	1425	590h Btotal_sale_tier2	\$	0
428	11.9	1427	592h Btotal_mass_tier2	g	0
429	11.10	1429	594h Btotal_mass_ran	g	0
430	11.11	1431	596h Btotal_sale_ran	\$	0
431	11.12	1433	598h Btotal_qty_ran	'unit'	0
432	11.13	1435	59Ah Bprice_ran	\$	0
433	11.14	1437	59Ch Bprice_tier_ran	#	0
434	11.15	1439	59Eh Bsale_ran_decimal	#	0
435	11.16	1441	5A0h Bqty_ran_decimal	#	0
436	11.17	1443	5A2h Bprice_ran_decimal	#	0
437	11.18	1445	5A4h Blow_cycle_total	#	0
438	11.19	1447	5A6h Bmid_cycle_total	#	0
439	11.20	1449	5A8h Bhhigh_cycle_total	#	0
440	11.21	1451	5AAh Btotal_fault	#	0
441	11.22	1453	5A4h Bshift_sale_tier1	\$	0
442	11.23	1455	5AEh Bshift_mass_tier1	g	0
443	11.24	1457	5B0h Bshift_sale_tier2	\$	0
444	11.25	1459	5B2h Bshift_mass_tier2	g	0
445	11.26	1461	5B4h Bshift_time_stamp1	time	n.a.
446	11.27	1463	5B6h Bshift_date_stamp1	date	n.a.
447	11.28	1465	5B8h Bshift_time_stamp2	time	n.a.
448	11.29	1467	5BAh Bshift_date_stamp2	date	n.a.
449	11.30	1469	5BCh Bqty_remainder	'unit'	0
450	11.31	1471	5BEh Btotal_sale_spc_ran	\$	0
none	11.32	1473	5C0h not defined		
...					
none	11.63	1535	5FEh not defined		

Block 12: Program control variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
451	12.0	1537	600h action_command	#	0
452	12.1	1539	602h action_commanded	#	0
453	12.2*	1541	604h io_inputs	#	0
454	12.3*	1543	606h io_outputs	#	0
455	12.4	1545	608h force_out_off	#	0
456	12.5	1547	60Ah force_out_on	#	0
457	12.6	1549	60Ch keyset_0	#	0
458	12.7	1551	60Eh keyset_1	#	0
459	12.8*	1553	610h main_loop_boolean	#	0
460	12.9	1555	612h keyset_2	#	0
461	12.10	1557	614h keyset_3	#	0
462	12.11	1559	616h RTC_time	time	n.a.
463	12.12	1561	618h RTC_date	date	n.a.
464	12.13	1563	61Ah time_control	#	0
465	12.14	1565	61Ch average_scan	usec	0
466	12.15	1567	61Eh maximum_scan	usec	0
467	12.16	1569	620h minimum_scan	usec	0
468	12.17	1571	622h key_mode	#	0
469	12.18	1573	624h revision	#	0.000
470	12.19	1575	626h totals_page	#	0
471	12.20	1577	628h totals_ROM	#	0
472	12.21	1579	62Ah rom_save_addr	#	0
473	12.22	1581	62Ch key_pad	#	0
474	12.23	1583	62Eh key_set	#	0
475	12.24	1585	630h audit_find	#	0
476	12.25	1587	632h trail_list_base	#	0
477	12.26	1589	634h data_trail_base	#	0
478	12.27	1591	636h pass_number_1	#	0
479	12.28	1593	638h pass_number_2	#	0
480	12.29	1595	63Ah access_level	#	0
481	12.30	1597	63Ch backup_ROM	#	0
none	11.31	1599	63Eh not defined		
...					
none	11.63	1663	67Eh not defined		

Block 13: Analog input variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
482	13.0	1665	680h AN_0	adc#	0
483	13.1	1667	682h AN_1	adc#	0
484	13.2	1669	684h AN_2	adc#	0
485	13.3	1671	686h AN_3	adc#	0
486	13.4	1673	688h AN_4	adc#	0
487	13.5	1675	68Ah AN_5	adc#	0
488	13.6	1677	68Ch AN_6	adc#	0
489	13.7	1679	68Eh AN_7	adc#	0
none	13.8	1681	690h not defined		
...					
none	13.63	1791	6FEh not defined		

Block 14: GTI 'A' Hose control variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
490	14.0	1793	700h AGTI_page	#	0
491	14.1	1795	702h AGTI_step	#	0
492	14.2*	1797	704h AGTI_flags	#	0
493	14.3*	1799	706h AGTI_flags2	#	0
494	14.4	1801	708h AGTI_wait	s	0.000
495	14.5	1803	70Ah AGTI_mass_ran	g	0
496	14.6*	1805	70Ch AGTI_error_reg	#	0
497	14.7	1807	70Eh AGTI_meter_status	#	0
498	14.8	1809	710h AGTI_init_hose_press	PSI	0
499	14.9	1811	712h AGTI_hose_press_theory	PSI	0
none	14.10	1813	714h not defined		
...					
none	14.63	1919	77Eh not defined		

Block 15: GTI 'A' Hose signal variables (floating point)

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
500	15.0	1921	780h Aflow	lbs / min	float
501	15.1	1923	782h Apr	PSI	float
502	15.2	1925	784h Ats	F	float
503	15.3	1927	786h Asum_ps0	PSI	float
504	15.4	1929	788h Asum_ts0	F	float
505	15.5	1931	78Ah Apsm	PSI	float
506	15.6	1933	78Ch Atsm	F	float
507	15.7	1935	78Eh Asim_tank_mass	g	float
508	15.8	1937	790h Atank_psim_f	PSI	float
509	15.9	1939	792h Adelmr	lbs	float
510	15.10	1941	794h Arhorat	lbs / ft^3	float
511	15.11	1941	794h Arhorat36	lbs / ft^3	float
none	15.12	1943	796h not defined		
...					
none	15.63	2047	7FEh not defined		

Block 16: GTI 'A' Hose fill variables (floating point).

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
512	16.0	2049	800h Aprim	PSI	float
513	16.1	2051	802h Atrim	F	float
514	16.2	2053	804h Adelmrle250	lbs	float
515	16.3	2055	806h Aps1	PSI	float
516	16.4	2057	808h Ats1	F	float
517	16.5	2059	80Ah Adelmr1m_1	lbs	float
518	16.6	2061	80Ch Apr1m_1	PSI	float
519	16.7	2063	80Eh Avr1e	ft^3	float
520	16.8	2065	810h Adelmr1m	lbs	float
521	16.9	2067	812h Apr1m	PSI	float
522	16.10	2069	814h Avr1water	ft^3	float
523	16.11	2071	816h Amrie1	lbs	float
524	16.12	2073	818h Amrrat1	lbs	float
525	16.13	2075	81Ah Adelmrto90	lbs	float
526	16.14	2077	81Ch Avrwater500	ft^3	float
527	16.15	2079	81Eh Amrie500	lbs	float
528	16.16	2081	820h Amrrat500	lbs	float
529	16.17	2083	822h Adelmrto90500	lbs	float
530	16.18	2085	824h Adelmrout500	lbs	float
531	16.19	2087	826h Apr2e	PSI	float
532	16.20	2089	828h Adelmr2e	lbs	float
533	16.21	2091	82Ah Aps2	PSI	float
534	16.22	2093	82Ch Ats2	F	float
535	16.23	2095	82Eh Adelmr2m	lbs	float
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

536	16.24	2097	830h	Apr2m	PSI	float
537	16.25	2099	832h	Avr2water	ft^3	float
538	16.26	2101	834h	Amrie2	lbs	float
539	16.27	2103	836h	Amrrat2	lbs	float
540	16.28	2105	838h	Apr3e	PSI	float
541	16.29	2107	83Ah	Adelmr3e	lbs	float
542	16.30	2109	83Ch	Adelmr3m	lbs	float
543	16.31	2111	83Eh	Aslope3	#	float
544	16.32	2113	840h	Arhorim	lbs / ft^3	float
545	16.33	2115	842h	Adadj	lbs	float
546	16.34	2117	844h	Arho_ratio	%	float
none	16.35	2119	846h	not defined		
...						
none	16.63	2175	87Eh	not defined		

Block 17: GTI 'A' Hose fill monitor variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal	
547	17.0*	2177	880h	AGTI_final_flag1	#	0
548	17.1*	2179	882h	AGTI_final_flag2	#	0
549	17.2*	2181	884h	AGTI_account1	#	0
550	17.3*	2183	886h	AGTI_account2	#	0
551	17.4*	2185	888h	AGTI_account3	#	0
552	17.5*	2187	88Ah	AGTI_account4	#	0
none	17.6	2189	88Ch	not defined		
...						
none	17.63	2559	9FEh	not defined		

Block 18: GTI 'A' Hose parameters (floating point).

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
553	18.0	2177	A00h Aprat	PSI	float
554	18.1	2179	A02h Aprlim	PSI	float
555	18.2	2181	A04h Arhostd	lbs / ft^3	float
556	18.3	2183	A06h Apr36	PSI	float
557	18.4	2185	A08h Atr36	F	float
558	18.5	2187	A0Ah Adelmr250	lbs	float
559	18.6	2189	A0Ch Astep3_delay	sec	float
560	18.7	2191	A0Eh Astep8_delay	sec	float
561	18.8	2193	A10h AGTI_drop_timeout	sec	float
562	18.9	2195	A12h AGTI_drop_threshold	PSI	float
563	18.10	2197	A14h AGTI_temp_offset	#	float
564	18.11	2199	A16h AGTI_temp_cal	#	float
565	18.12	2201	A18h AGTI_mass_cal	#	float
566	18.13	2203	A1Ah AGTI_press_cal	#	float
567	18.14	2205	A1Ch AGTI_flow_cal	#	float
568	18.15	2207	A1Eh Apr_settle	PSI	float
569	18.16	2209	A20h AGTI_low_flow	lbs / min	float
570	18.17	2211	A22h AGTI_burst_flow	lbs / min	float
571	18.18	2213	A24h Alow_flow_change	lbs / min	float
572	18.19	2215	A26h Amid_flow_change	lbs / min	float
573	18.20	2217	A28h Ahigh_flow_change	lbs / min	float
574	18.21	2219	A2Ah AGTI_hose_mass	lbs	float
none	18.22	2221	A2Ch not defined		
...					
none	18.63	2559	A7Eh not defined		

Block 19: GTI 'A' Hose parameters

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
575	19.0*	2561	A80h AGTI_signal_config	#	0
576	19.1	2563	A82h Amin_vrnew	ft^3	0
577	19.2	2565	A84h AGTI_spare2_pl	#	0
578	19.3	2567	A86h AGTI_spare3_pl	#	0
579	19.5	2569	A88h AGTI_spare4_pl	#	0
none	19.6	2571	A8Ah not defined		
...					
none	19.63	2815	AFEh not defined		

Block 20: GTI 'B' Hose control variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
580	20.0	2817	B00h BGTI_page	#	0
581	20.1	2810	B02h BGTI_step	#	0
582	20.2*	2821	B04h BGTI_flags	#	0
583	20.3*	2823	B06h BGTI_flags2	#	0
584	20.4	2825	B08h BGTI_wait	s	0.000
585	20.5	2827	B0Ah BGTI_mass_ran	g	0
586	20.6	2829	B0Ch BGTI_error_reg	#	0
587	20.7	2831	B0Eh BGTI_meter_status	#	0
588	20.8	2833	B10h BGTI_init_hose_press	PSI	0
589	20.9	2835	B12h BGTI_hose_press_theory	PSI	0
none	20.10	2837	B14h not defined		
...					
none	20.63	2943	B7Eh not defined		

Block 21: GTI 'B' Hose signal variables (floating point)

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
590	21.0	2945	B80h Bflow	lbs / min	float
591	21.1	2947	B82h Bpr	PSI	float
592	21.2	2949	B84h Bts	F	float
593	21.3	2951	B86h Bsum_ps0	PSI	float
594	21.4	2953	B88h Bsum_ts0	F	float
595	21.5	2955	B8Ah Bpsm	PSI	float
596	21.6	2957	B8Ch Btsm	F	float
597	21.7	2959	B8Eh Bsim_tank_mass	g	float
598	21.8	2961	B30h Btank_psim_f	PSI	float
599	21.9	2963	B32h Bdelmr	lbs	float
600	21.10	2965	B34h Brhorat	lbs / ft^3	float
601	21.11	2967	B36h Brhorat36	lbs / ft^3	float
none	21.12	2969	B38h not defined		
...					
none	21.63	3071	BFEh not defined		

Block 22: GTI 'B' Hose fill variables (floating point).

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
602	22.0	3073	C00h Bprim	PSI	float
603	22.1	3075	C02h Btrim	F	float
604	22.2	3077	C04h Bdelmrle250	lbs	float
605	22.3	3079	C06h Bps1	PSI	float
606	22.4	3081	C08h Bts1	F	float
607	22.5	3083	C0Ah Bdelmr1m_1	lbs	float
608	22.6	3085	C0Ch Bpr1m_1	PSI	float
609	22.7	3087	C0Eh Bvr1e	ft^3	float
610	22.8	3089	C10h Bdelmr1m	lbs	float
611	22.9	3091	C12h Bpr1m	PSI	float
612	22.10	3091	C14h Bvr1water	ft^3	float
613	22.11	3091	C16h Bmrie1	lbs	float
614	22.12	3091	C18h Bmrrat1	lbs	float
615	22.13	3091	C1Ah Bdelmrto90	lbs	float
616	22.14	3101	C1Ch Bvrwater500	ft^3	float
617	22.15	3101	C1Eh Bmrie500	lbs	float
618	22.16	3101	C20h Bmrrat500	lbs	float
619	22.17	3101	C22h Bdelmrto90500	lbs	float
620	22.18	3101	C24h Bdelmrout500	lbs	float
621	22.19	3111	C26h Bpr2e	PSI	float
622	22.20	3111	C28h Bdelmr2e	lbs	float
623	22.21	3111	C2Ah Bps2	PSI	float
624	22.22	3111	C2Ch Bts2	F	float
625	22.23	3111	C2Eh Bdelmr2m	lbs	float
626	22.24	3121	C30h Bpr2m	PSI	float
627	22.25	3121	C32h Bvr2water	ft^3	float
628	22.26	3121	C34h Bmrie2	lbs	float
629	22.27	3121	C36h Bmrrat2	lbs	float
630	22.28	3121	C38h Bpr3e	PSI	float
631	22.29	3131	C3Ah Bdelmr3e	lbs	float
632	22.30	3131	C3Ch Bdelmr3m	lbs	float
633	22.31	3131	C3Eh Bslope3	#	float
634	22.32	3131	C40h Brhorim	lbs / ft^3	float
635	22.33	3131	C42h Bdadj	lbs	float
636	22.34	3141	C44h Brho_ratio	%	float
none	22.35	3143	C46h not defined		
...					
none	22.63	3199	C7Eh not defined		

Block 23: GTI 'B' Hose fill monitor variables.

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
637	23.0*	3201	C80h BGTI_final_flag1	#	0
638	23.1*	3203	C82h BGTI_final_flag2	#	0
639	23.2*	3205	C84h BGTI_account1	#	0
640	23.3*	3207	C86h BGTI_account2	#	0
641	23.4*	3209	C88h BGTI_account3	#	0
642	23.5*	3211	C8Ah BGTI_account4	#	0
none	23.6	3213	C8Ch not defined		
...					
none	23.63	3327	CFEh not defined		

Block 24: GTI 'B' Hose parameters (floating point).

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
643	24.0	3329	D00h Bprat	PSI	float
644	24.1	3331	D02h Bprlim	PSI	float
645	24.2	3333	D04h Brhostd	lbs / ft^3	float
646	24.3	3335	D06h Bpr36	PSI	float
647	24.4	3337	D08h Btr36	F	float
648	24.5	3339	D0Ah Bdelmr250	lbs	float
649	24.6	3341	D0Ch Bstep3_delay	sec	float
650	24.7	3343	D0Eh Bstep8_delay	sec	float
651	24.8	3345	D10h BGTI_drop_timeout	sec	float
652	24.9	3347	D12h BGTI_drop_threshold	PSI	float
653	24.10	3349	D14h BGTI_temp_offset	#	float
654	24.11	3351	D16h BGTI_temp_cal	#	float
655	24.12	3353	D18h BGTI_mass_cal	#	float
656	24.13	3355	D1Ah BGTI_press_cal	#	float
657	24.14	3357	D1Ch BGTI_flow_cal	#	float
658	24.15	3359	D1Eh Bpr_settle	PSI	float
659	24.16	3361	D20h BGTI_low_flow	lbs / min	float
660	24.17	3363	D22h BGTI_burst_flow	lbs / min	float
661	24.18	3365	D24h Blow_flow_change	lbs / min	float
662	24.19	3367	D26h Bmid_flow_change	lbs / min	float
663	24.20	3369	D28h Bhigh_flow_change	lbs / min	float
664	24.21	3371	D2Ah BGTI_hose_mass	lbs	float
none	24.22	3373	D2Ch not defined		
...					
none	24.63	3455	D7Eh not defined		

Block 25: GTI 'B' Hose parameters

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
665	25.0*	3713	E80h BGTI_signal_config	#	0
666	25.1	3715	E82h Bmin_vrnew	ft^3	0
667	25.2	3717	E84h BGTI_spare2_pl	#	0
668	25.3	3719	E86h BGTI_spare3_pl	#	0
669	25.5	3721	E88h BGTI_spare4_pl	#	0
none	25.6	3723	E8Ah not defined		
...					
none	25.63	3839	EFEh not defined		

Block 26: 'A' Hose price

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
670	26.0	3841	F00h Aprice_per_unit_t1	\$	note 5
671	26.1	3843	F00h Aprice_per_unit_t2	\$	note 5
672	26.2	3845	F00h Aprice_decimal_t1	#	0
673	26.3	3847	F00h Aprice_decimal_t2	#	0
674	26.4	3849	F00h Atier_select_mem	#	0
none	26.5	3851	E8Ah not defined		
...					
none	26.63	3839	EFEh not defined		

Block 27: 'B' Hose price

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
675	27.0	4097	1000h Bprice_per_unit_t1	\$	note 5
676	27.1	4099	1002h Bprice_per_unit_t2	\$	note 5
677	27.2	4101	1004h Bprice_decimal_t1	#	0
678	27.3	4102	1006h Bprice_decimal_t2	#	0
679	27.4	4103	1008h Btier_select_mem	#	0
none	27.5	4104	100Ah not defined		
...					
none	27.63	4223	107Eh not defined		

Block 28: 'A' Hose process

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
680	28.0	4225	1080h Aprocess_1	#	0
681	28.1	4227	1082h Aprocess_2	#	0
682	28.2	4229	1084h Aprocess_3	#	0
683	28.3	4231	1086h Aprocess_4	#	0
684	28.4	4233	1088h Aprocess_5	#	0
685	28.5	4235	108Ah Aprocess_6	#	0
686	28.6	4237	108Ch Aprocess_7	#	0
687	28.7	4239	108Eh Aprocess_8	#	0
688	28.8	4241	1090h Aprocess_9	#	0
689	28.9	4243	1092h Aprocess_10	#	0
none	28.10	4245	1094h not defined		
...					
none	28.63	4223	10FEh not defined		

Block 29: 'B' Hose process

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
690	29.0	4225	1100h Bprocess_1	#	0
691	29.1	4227	1102h Bprocess_2	#	0
692	29.2	4229	1104h Bprocess_3	#	0
693	29.3	4231	1106h Bprocess_4	#	0
694	29.4	4233	1108h Bprocess_5	#	0
695	29.5	4235	110Ah Bprocess_6	#	0
696	29.6	4237	110Ch Bprocess_7	#	0
697	29.7	4239	110Eh Bprocess_8	#	0
698	29.8	4241	1110h Bprocess_9	#	0
699	29.9	4243	1112h Bprocess_10	#	0
none	29.10	4245	1114h not defined		
...					
none	29.63	4479	117Eh not defined		

Block 30: 'A' Hose Gilbarco communication variables

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
700	30.0	4481	1180h Apump_node	#	0
701	30.1	4483	1182h Apump_status	#	0
702	30.2*	4485	1184h Aspc_ident	#	0
703	30.3	4487	1186h Aspc_error	#	0
704	30.4	4489	1188h Aspc_grade	#	0
705	30.5	4491	118Ah Aspc_price1_g1	\$	0.000
706	30.6	4493	118Ch Aspc_price2_g1	\$	0.000
707	30.7	4495	118Eh Aspc_tier_g1	#	0
708	30.8	4497	1190h Aspc_price_g1	\$	0.000
709	30.9	4499	1192h Aspc_vol_g1	'units'	0.000
710	30.10	4501	1194h Aspc_money_g1	\$	0.00
711	30.11	4503	1196h Aspc_vol_total_g1	'units'	0.000
712	30.12	4505	1198h Aspc_mon_total_g1	\$	0.00
713	30.13	4507	119Ah Aspc_price1_g2	\$	0.000
714	30.14	4509	119Ch Aspc_price2_g2	\$	0.000
715	30.15	4511	119Eh Aspc_tier_g2	#	0
716	30.16	4513	11A0h Aspc_price_g2	\$	0.000
717	30.17	4515	11A2h Aspc_vol_g2	'units'	0.000
718	30.18	4517	11A4h Aspc_money_g2	\$	0.00
719	30.19	4519	11A6h Aspc_vol_total_g2	'units'	0.000
720	30.20	4521	11A8h Aspc_mon_total_g2	\$	0.00
721	30.21	4523	11Aah Aspc_price1_g3	\$	0.000
722	30.22	4525	11Ach Aspc_price2_g3	\$	0.000
723	30.23	4527	11Aeh Aspc_tier_g3	#	0
724	30.24	4529	11B0h Aspc_price_g3	\$	0.000
725	30.25	4531	11B2h Aspc_vol_g3	'units'	0.000
726	30.26	4533	11B4h Aspc_money_g3	\$	0.00
727	30.27	4535	11B6h Aspc_vol_total_g3	'units'	0.000
728	30.28	4537	11B8h Aspc_mon_total_g3	\$	0.00
729	30.29	4539	11Bah Aspc_price1_g4	\$	0.000
730	30.30	4541	11BCh Aspc_price2_g4	\$	0.000
731	30.31	4543	11BEh Aspc_tier_g4	#	0
732	30.32	4545	11C0h Aspc_price_g4	\$	0.000
733	30.33	4547	11C2h Aspc_vol_g4	'units'	0.000
734	30.34	4549	11C4h Aspc_money_g4	\$	0.00
735	30.35	4551	11C6h Aspc_vol_total_g4	'units'	0.000
736	30.36	4553	11C8h Aspc_mon_total_g4	\$	0.00
737	30.37	4555	11CAh Aspc_price1_g5	\$	0.000
738	30.38	4557	11CCh Aspc_price2_g5	\$	0.000
739	30.39	4559	11CEh Aspc_tier_g5	#	0
740	30.40	4561	11D0h Aspc_price_g5	\$	0.000
741	30.41	4563	11D2h Aspc_vol_g5	'units'	0.000
742	30.42	4565	11D4h Aspc_money_g5	\$	0.00
743	30.43	4567	11D6h Aspc_vol_total_g5	'units'	0.000
744	30.44	4569	11D8h Aspc_mon_total_g5	\$	0.00
745	30.45	4571	11DAh Aspc_price1_g6	\$	0.000
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

746	30.46	4573	11DCh Aspc_price2_g6	\$	0.000
747	30.47	4575	11DEh Aspc_tier_g6	#	0
748	30.48	4577	11E0h Aspc_price_g6	\$	0.000
749	30.49	4579	11E2h Aspc_vol_g6	'units'	0.000
750	30.50	4581	11E4h Aspc_money_g6	\$	0.00
751	30.51	4583	11E6h Aspc_vol_total_g6	'units'	0.000
752	30.52	4585	11E8h Aspc_mon_total_g6	\$	0.00
753	30.53*	4587	11EAh pumps_scanned	#	0
none	30.54	4589	11ECh not defined		
...					
none	30.63	4607	11FEh not defined		

Block 31: 'B' Hose Gilbarco communication variables

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
754	31.0	4609	1200h Bpump_node	#	0
755	31.1	4611	1202h Bpump_status	#	0
756	31.2*	4613	1204h Bspc_ident	#	0
757	31.3	4615	1206h Bspc_error	#	0
758	31.4	4617	1208h Bspc_grade	#	0
759	31.5	4619	120Ah Bspc_price1_g1	\$	0.000
760	31.6	4621	120Ch Bspc_price2_g1	\$	0.000
761	31.7	4623	120Eh Bspc_tier_g1	#	0
762	31.8	4625	1210h Bspc_price_g1	\$	0.000
763	31.9	4627	1212h Bspc_vol_g1	'units'	0.000
764	31.10	4629	1214h Bspc_money_g1	\$	0.00
765	31.11	4631	1216h Bspc_vol_total_g1	'units'	0.000
766	31.12	4633	1218h Bspc_mon_total_g1	\$	0.00
767	31.13	4635	121Ah Bspc_price1_g2	\$	0.000
768	31.14	4637	121Ch Bspc_price2_g2	\$	0.000
769	31.15	4639	121Eh Bspc_tier_g2	#	0
770	31.16	4641	1220h Bspc_price_g2	\$	0.000
771	31.17	4643	1222h Bspc_vol_g2	'units'	0.000
772	31.18	4645	1224h Bspc_money_g2	\$	0.00
773	31.19	4647	1226h Bspc_vol_total_g2	'units'	0.000
774	31.20	4649	1228h Bspc_mon_total_g2	\$	0.00
775	31.21	4651	122Ah Bspc_price1_g3	\$	0.000
776	31.22	4653	122Ch Bspc_price2_g3	\$	0.000
777	31.23	4655	122Eh Bspc_tier_g3	#	0
778	31.24	4657	1230h Bspc_price_g3	\$	0.000
779	31.25	4659	1232h Bspc_vol_g3	'units'	0.000
780	31.26	4661	1234h Bspc_money_g3	\$	0.00
781	31.27	4663	1236h Bspc_vol_total_g3	'units'	0.000
782	31.28	4665	1238h Bspc_mon_total_g3	\$	0.00
783	31.29	4667	123Ah Bspc_price1_g4	\$	0.000
784	31.30	4669	123Ch Bspc_price2_g4	\$	0.000
785	31.31	4671	123Eh Bspc_tier_g4	#	0
786	31.32	4673	1240h Bspc_price_g4	\$	0.000
787	31.33	4675	1240h Bspc_vol_g4	'units'	0.000
788	31.34	4677	1242h Bspc_money_g4	\$	0.00
789	31.35	4679	1244h Bspc_vol_total_g4	'units'	0.000
790	31.36	4681	1246h Bspc_mon_total_g4	\$	0.00
791	31.37	4683	1248h Bspc_price1_g5	\$	0.000
792	31.38	4685	124Ah Bspc_price2_g5	\$	0.000
793	31.39	4687	124Ch Bspc_tier_g5	#	0
794	31.40	4689	124Eh Bspc_price_g5	\$	0.000
795	31.41	4691	1250h Bspc_vol_g5	'units'	0.000
796	31.42	4693	1252h Bspc_money_g5	\$	0.00
797	31.43	4695	1254h Bspc_vol_total_g5	'units'	0.000
798	31.44	4697	1256h Bspc_mon_total_g5	\$	0.00
799	31.45	4699	1258h Bspc_price1_g6	\$	0.000
List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal

800	31.46	4701	125Ah Bspc_price2_g6	\$	0.000
801	31.47	4703	125Ch Bspc_tier_g6	#	0
802	31.48	4705	125Eh Bspc_price_g6	\$	0.000
803	31.49	4707	1260h Bspc_vol_g6	'units'	0.000
804	31.50	4709	1262h Bspc_money_g6	\$	0.00
805	31.51	4711	1264h Bspc_vol_total_g6	'units'	0.000
806	31.52	4713	1266h Bspc_mon_total_g6	\$	0.00
807	31.53*	4715	1268h pumps_scanned	#	0
none	31.54	4717	126Ah not defined		
...					
none	31.63	4735	127Eh not defined		

Block 32: 'A' Hose test variables

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
808	32.0	4737	1280h Ap_ave	Mpa	0.000
809	32.1	4739	1282h Af_dip	g / s	0.0
810	32.2	4741	1284h Af_dip_prev	g / s	0.0
811	32.3	4743	1286h Ap_derivative	Mpa	0.00
812	32.4	4745	1288h Ap_dip_rate	Mpa	0.00
813	32.5	4747	128Ah Ap_dip_sim	Mpa	0.00
814	32.6	4749	128Ch Aset_dip_rate	#	0
815	32.7*	4751	128Eh Amisc-bits	#	0
816	32.8	4753	1290h Asale_preset	\$	0.00
817	32.9	4755	1292h Asale_stop	#	0
818	32.10	4757	1294h Acoast_mass	g	0
819	32.11	4759	1296h Astop_mass	g	0
820	32.12	4761	1298h Aactual_mass	g	0
821	32.13	4763	129Ah Adtest_spare13	#	0
822	32.14	4765	129Ch Amin_restrict	Pa ⁻² s / g	0.000
823	32.15	4767	129Eh Amax_restrict	Pa ⁻² s / g	0.000
none	32.16	4769	12A0h not defined		
...					
none	32.63	4863	12FEh not defined		

Block 33: 'B' Hose test variables

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
824	33.0	4865	1300h Bp_ave	Mpa	0.000
825	33.1	4867	1302h Bf_dip	g / s	0.0
826	33.2	4869	1304h Bf_dip_prev	g / s	0.0
827	33.3	4871	1306h Bp_derivative	Mpa	0.00
828	33.4	4873	1308h Bp_dip_rate	Mpa	0.00
829	33.5	4875	130Ah Bp_dip_sim	Mpa	0.00
830	33.6	4877	130Ch Bset_dip_rate	#	0
831	33.7*	4979	130Eh Bmisc-bits	#	0
832	33.8	4981	1310h Bsale_preset	\$	0.00
833	33.9	4983	1312h Bsale_stop	#	0
834	33.10	4985	1314h Bcoast_mass	g	0
835	33.11	4987	1316h Bstop_mass	g	0
836	33.12	4989	1318h Bactual_mass	g	0
837	33.13	4991	131Ah Bdtest_spare13	#	0
838	33.14	4993	131Ch Bmin_restrict	Pa ⁻² s / g	0.000
839	33.15	4995	131Eh Bmax_restrict	Pa ⁻² s / g	0.000
none	33.16	4997	1320h not defined		
...					
none	33.63	4991	137Eh not defined		

Block 34: Extra parameters

List Numb	Control Address	ModBus Address	Description / Name	Units	Decimal
840	34.0	4993	1380h Spc_grade	#	0
841	34.1	4995	1382h Force_tier	#	0
842	34.2	4997	1384h Spc_money_mode	#	0
843	34.3	4999	1386h Hose_A_number	#	0
844	34.4	5001	1388h Hose_B_number	#	0
845	34.5	5003	138Ah ModBus_node_base	#	0
846	34.6*	5005	138Ch extra_configuration	#	0
847	34.7	5007	138Eh extra_param_7	#	0
848	34.8	5008	1390h extra_param_8	#	0
849	34.9	5009	1392h extra_param_9	#	0
850	34.10	5011	1394h A_coast_factor	sec	0.00
851	34.11	5013	1396h A_coast_adder	g	0
852	34.12	5015	1398h A_stop_qty	'units'	0.000
853	34.13	5017	139Ah A_Compression_pressure	MPa	0.00
854	34.14	5019	139Ch A_extra_spare14	#	0
855	34.15	5021	139Eh A_extra_spare15	#	0
856	34.16	5023	13A0h A_extra_spare16	#	0
857	34.17	5025	13A2h A_extra_spare17	#	0
858	34.18	5027	13A4h A_extra_spare18	#	0
859	34.19	5029	13A6h A_extra_spare19	#	0
860	34.20	5031	13A8h B_coast_factor	sec	0.00
861	34.21	5033	13AAh B_coast_adder	g	0
862	34.22	5035	13ACh B_stop_qty	'units'	0.000
863	34.23	5037	13AEh B_Compression_pressure	MPa	0.00
864	34.24	5023	13B0h B_extra_spare24	#	0
865	34.25	5023	13B2h B_extra_spare25	#	0
866	34.26	5023	13B4h B_extra_spare26	#	0
867	34.27	5023	13B6h B_extra_spare27	#	0
868	34.28	5023	13B8h B_extra_spare28	#	0
869	34.29	5023	13BAh B_extra_spare29	#	0
870	34.30	5023	13BCh A_meter_history	#	0
871	34.31	5023	13BEh B_meter_history	#	0
none	33.32	4997	13C0h not defined		
...					
none	33.63	4991	13FEh not defined		

Note 1: decimal point is set by the value of parameter Ssale_decimal.

Note 2: decimal point is set by the value of parameter mass_decimal.

Note 3: decimal point is set by the value of parameter Sprice_decimal.

Note 4: Holds 4 bytes that extend the totalizers beyond 32-bit values. Decimal not applicable.

Note 5: decimal point is set by with the value of parameters

'Hose'price_decimal_t'tier#'

5. Decimal point and engineering unit look-up registers.

Accompanying the variable and parameter register set is a range of ModBus addresses that hold code values for the engineering unit and decimal point that go with the variable and parameter register values. This register range from 8193 to 16286 (2000h to 3FFFh) and is read only. These registers are laid out in matching order to the variable and parameter range. Addresses for the registers are obtained by adding 8192 (2000 hex) to the ModBus address for the variable or parameter. The value returned would be a 32-bit value with the decimal point number in the LSW and the engineering unit code in the MSW.

Example:

To get the decimal point and engineering unit for the 'A' hose pressure from the sensor below

68	2.3	263	106h	Apressure	Mpa	0.00
----	-----	-----	------	-----------	-----	------

add 8192 to 263 (2000h to 106h) for a ModBus address of 8297 (2106h). A read of this register will return 1966082 (001E0002 hex). The LSW of 0002 hex is the placement of 2 decimal points and the MSW of 1E hex is engineering unit code of 30 for MPa (MegaPascals).

A read if the 'A' hose pressure register at 263 (106 hex) of 2069 with the above information means this value is 20.69 Mpa. This converts to 3000 PSI (145 PSI / Mpa).

6. Engineering unit code table

Engineering units of variables and parameters used in the dispenser control and their number code read from the decimal point and engineering unit address range.

#	0	unitless number	displayed as decimal
#	1	unitless number	displayed as hex
#	2	unitless number	displayed as ASCII characters
sec or s	10	time	seconds
g	20	mass	grams
lbs	21	mass	pounds mass (slugs)
Kg	22	mass	Kilograms
EGal	23	mass	equivalent gallons of gasoline
ELiter	24	mass	equivalent liters of gasoline
SCM	25	mass	standard cubic meters at 68F 14.5 PSI
MPa	30	pressure	MegaPascals
Bar	31	pressure	Barometric
PSI	32	pressure	Pounds force per square inch
g / sec or g / s	40	mass flow	grams per second
Lbs / min	41	mass flow	pounds mass per minute
SCFM	42	mass flow	standard cubic feet per minute
K	50	temperature	Kelvin
C	51	temperature	Celsius
F	52	temperature	Fahrenheit
Pa_s^2 / g^2	60	hose resistance	Pascals per mass-flow squared metric
Bar_s^2 / g^2	61	hose resistance	Bars per mass-flow squared metric
PSI_s^2 / lbs^2	62	hose resistance	PSI per mass-flow squared imperial
moles	80	mass	
adc#	90	number	analog to digital conversion 0-1023
grams / pls	100	mass count	mass per meter pulse
lbs / pls	101	mass count	mass per meter pulse
Hz	110	frequency	Hertz
Kg / sec	120	mass flow	Kilograms per second (meter use)
Lbs / min	121	mass flow	Pounds mass per second (meter use)
nd	130	not defined	
\$	140	money	Dollars or other
%	150	percent	
pls	160	pulses	Any: mass, penny, liters, etc.
mol / l	170	density	moles per liter
g / unit	180	conversion	grams per custom mass unit
g / lbs	181	conversion	grams per pound mass
g / Kg	182	conversion	grams per Kilogram
g / EGal	183	conversion	grams per Equivalent Gallon
g / ELiter	184	conversion	grams per Equivalent liter
g / SCM	185	conversion	grams per standard cubic meters
ppu	190	pulses	pulses per unit
liter	200	volume	liter
feet^3	201	volume	cubic feet
in^3	202	volume	cubic inches
Kg / liter	210	density	Kilograms per liter
Lbs / feet3	211	density	pound mass per cubic feet

Engineering unit code table (continued)

time	220	clock time	hours, minute, second
date	230	calendar date	day-of-week, month, day, year
passw	240	number	password
error	250	number	
Pa ⁻² s / g	260	hose restrictance	square root Pascals per mass-flow metric

7. Audit trail register range.

The range of registers from 16287 to 24576 (4000 hex to 5FFF hex) is the sorted audit trail log of parameter changes through the life of the dispenser. The dispenser records any new parameter value with a time and date stamp and change counter. Each of these fields is a 32-bit long word so each change record item is four 32-bit words: count-address, new value, time, and date. The audit trail contains 1024 possible records. The audit trail is kept in the dispenser's nonvolatile flash memory for permanent storage. A sorting routine reads the trail, orders the records according to their control addresses, and put the sorted result in the dispenser's volatile memory. This sorted result is mapped to these ModBus addresses and are read only.

Each record is placed in this range in groups of four 32-bit words starting at address 16287 (4000 hex) and taking up 8 ModBus addresses so the first record lies in addresses 16287 to 16294 (4000 hex to 4007 hex). The next record starts at the next ModBus address 16295 (4008 hex), the next 8 at 16303 (4010h), and so on (A reminder: hex values shown are official ModBus addresses minus one). A read of 8 addresses for the first record would return:

16287 94000h): control address word
16289 (4002h): new parameter value
16291 (4004h): time stamp
16293 (4006h): date stamp

The first 32-bit word is encoded with the change count and control address. The audit change count is stored in the MSW (upper 16-bits) and the parameter control address is stored in the LSW (lower 16-bits) of this 32-bit word. The LSW is further encoded: this word is divided into two sections: bits 0 – 13 are the dispenser control address or flow-meter address, bits 14 and 15 are indicators for a meter parameter change. Bit 14 = 1 indicates a parameter change on the 'A' hose meter. Bit 15 = 1 indicates a parameter change on the 'B' hose meter. If the parameter change was a meter value change through the dispenser controller, bits 0 – 13 holds the ModBus address of the MicroMotion meter parameter. Bits 14 and 15 can never be 1 at the same time. With bit bits 14 and 15 = 0, bits 0 – 13 holds the dispenser control address for the dispenser parameter. Bits 0 – 13 are, in turn, divided into 2 sections, bits 8 – 13 hold the block address and bits 0 – 7 hold the control register number ranging 0-63 for that block.

The time word is encoded as value = seconds + minutes * 100 + hours * 10000 where the hours are military 24 hours The date word is encoded as value = year + day * 100 + month * 10000 + day-of-week * 1000000. The year is 0-99. The day-of-week is 0 - 6 for Sunday through Saturday respectively. Example:

The fifth change to parameter Apm_{max}_fixed at control address 4.36 (ModBus address 585 248h) to 26.20 MPa made at 1:47:35pm on a Thursday the 15th of March 2007 would be recorded as:

control address word = 328740 (00050424 hex) -> 5th change, 4th block, 36th word (24 hex)
new parameter value = 2620
time stamp = 134735 (20E4F hex) -> 13th hour, 47 minutes, 35 seconds
date stamp = 4031507 (3D8413 hex) -> 4 = Thursday, 03 = March, 15th day, year = 2007.

8. Monitor fill result history log range.

The ranges 24577 to 40959 (6000 hex to 9FFF hex) and 40961 to 57344 (A000 hex to DFFF hex) are 128 blocks of 64 fill result register for the 'A' and 'B' hose respectively. The monitor fill result variable blocks 5 and 10 ('A' and 'B' hose respectively) are copied to flash memory in a circular buffer at the end of a fill. This buffer is addressed in these ranges. The variables are laid out in the same order in each 64 32-bit registers as the variable block. Each block spans 128 ModBus addresses.

Example:

A read of ModBus address 24581 (6002 hex) will return a recording of the variable Amid_target at control address 5.2. A read of ModBus address 24709 (6082 hex) will return a recording of the variable Amid_target of another fill.

The variables 2.56 Acurrent_mons_page and 7.56 Bcurrent_mons_page points to the latest block recorded for their respective hoses. The ModBus address for the latest record for the 'A' hose would be: ModBus address = Acurrent_mons_page * 128 + 24577.

9. Dispenser interface terminal connections

The RS485 communication is connected to the dispenser interface board 403-07263 by a low capacitance shielded cable to the terminal strip TB6. An on board terminating resistor-capacitor network is provided for the end termination of the cable. Jumper terminals 56 to 54 and 55 to 53 on the last dispenser. Dispensers daisy-changed in the midst of the cable do not get jumpered to the terminating network

Signal	Terminal
Shield	57
RS484-A (+)	56
RS484-B (-)	55
RS484-A (+) Terminating RC	54
RS484-B (-) Terminating RC	53

10. ModBus node set-up

The ModBus node number is set by 5 DIP switches on the dispenser interface board SW1-2 through SW1-6 for with a binary value of 0 to 31 and a parameter ModBus_node_base 34.5. The ModBus node value is the sum of the switch value and the parameter value. The valid range for a ModBus node number ID is 1 – 255, ID 0 is a master broadcast to all slaves. Slaves do not send a response to a node 0 command. The ModBus communication will be disabled if the sum of the switch and parameter values are out of the valid node range. The switch "weight" values for the SW1-2 through SW1-6 is SW1-2 = 1, SW1-3 = 2, SW1-4 = 4, SW1-5 = 8, and SW1-6 = 16.

11. Bit definitions for registers with Booleans

Bits definitions Aflags 2.17 and Bflags 7.17

Bit	Name
0	drop_flag
1	lost_authorize
2	quit_flag
3	burstcd
4	no_zero_flow
5	flowing
6	lowb4full
7	p3high
8	mass_changing
9	p3ibhigh
10	press_error
11	filling
12	rate_low
13	rate_mid
14	rate_high
15	pressure_dip
16	authorized
17	p1high
18	p2high
19	abort_fill
20	drop_time_out
21	temperror
22	handl_inhb
23	power_loss
24	display_updated
25	fill_request
26	lowbank_flag
27	midbank_flag
28	highbank_flag
29	fill_done
30	sonic_flow
31	meter_updated

Bits definitions Acontrol_bits 2.18 and Bcontrol_bits 7.18

Bit	Name
0	force_mass_freq
1	force_sale_freq
2	force_comp_bit
3	force_screen_bit
4	blank_screen_bit
5	simulate_fill
6	sim_preset
7	first_resist_bit
8	error_bit
9	sim_handle
10	wait_enable
11	flow_settled_bit
12	handles_off
13	resist_calculated
14	other_Left
15	other_Right
16	handleL_fill
17	handleR_fill
18	send_authorize
19	burst
20	fill_data_recvd
21	power_on_dwel_bit
22	comm_authorize
23	tank_measured_bit
24	choke_bit
25	pressure_broken
26	pressure2_broken
27	save_log
28	fill_acknowlage
29	qty_enable
30	pressure_short
31	pressure2_short

Bits definitions Aerror_reg 2.26 and Berror_reg 7.26

Bit	Name
0	Change_on_flow
1	Press_over_trip
2	Press_over_Smax
3	Tank_over_target_press
4	Abort_fill
5	Lost_authorize
6	Hose_burst_flow
7	Flow_valve_off
8	Nozzle_open_timeout
9	Meter_busy
10	Switch_1_up
11	Flow_when_idle
12	Temp_out_range
13	Press_signal_loss
14	Meter_Comm_loss
15	Display_Comm_loss
16	Press_conflict
17	Comm_overrun
18	Comm_parity
19	Comm_framing
20	Comm_checksum
21	Comm_data_length
22	Comm_bad_command
23	Comm_invalid_grade
24	Parameter_changed
25	Wrong_flow_unit
26	Wrong_mass_unit
27	Press2_sig_loss
28	Press2_sig_short
29	Press_sig_short
30	Gilbarco_off_line
31	Fill_press_dip

Bits definitions Ameter_status 2.58 and Bmeter_status 7.58

Bit	Name
0	not defined
1	not defined
2	not defined
3	not defined
4	not defined
5	not defined
6	not defined
7	not defined
8	not defined
9	not defined
10	checksum_fail
11	RAM_fail
12	sensor_fail
13	temp_sensor_fail
14	input_ouerrange
15	pulse_saturated
16	not_configured
17	interrupt_fail
18	primary_saturated
19	secondary_saturated
20	primary_fixed
21	secondary_fixed
22	density_ouerrange
23	zero_fail
24	zero_to_low
25	zero_to_high
26	electronics_fail
27	zeroing
28	slug_flow
29	power_reset
30	config_changed
31	initializing

Bits definitions Asignal_config 4.21 and Bsignal_config 9.21

Bit	Name
0	use_meter_mass_flow
1	use_meter_vol_flow
2	use_analog_mass_flow
3	use_meter_vol_total
4	use_meter_mass_total
6	use_meter_temperature
7	use_analog_temperature
8	use_right_handle
9	use_left_handle
10	use_dual_display
11	use_total_pushbutton
12	use_auth1_input
13	use_auth2_input
14	use_auth3_input
15	use_tier_input
16	use_pmax_fixed
17	use_price_decimal
18	spc_com_enable
19	use_ored_authorize
20	use_redundant_pressure
21	use_early_check
22	use_resist_ave
23	use_comm_authorize
24	limit_pmax
25	disable_flow_max
26	use_restrict
27	share_display
28	use_totalizer
29	use_remote_valves
30	single_bank_valve
31	meter_9739_type

Bits definitions io_inputs 12.2

Bit	Name
0	A_handle_left
1	A_handle_right
2	A_handle_hose_seated
3	A_spare_input
4	B_handle_left
5	B_handle_right
6	B_handle_hose_seated
7	B_spare_input
8	A_authorization_1
9	A_authorization_2
10	A_authorization_3
11	A_tier_2
12	B_authorization_1
13	B_authorization_2
14	B_authorization_3
15	B_tier_2
16	SW1_1
17	SW1_2
18	SW1_3
19	SW1_4
20	SW1_5
21	SW1_6
22	SW1_7
23	SW1_8
24	spare_24
25	spare_25
26	spare_26
27	spare_27
28	spare_28
29	spare_29
30	spare_30
31	spare_31

Bits definitions io_outputs 12.3, force_out_off 12.4, and force_out_on 12.5

Bit	Name
0	not_defined_0
1	not_defined_1
2	not_defined_2
3	not_defined_3
4	not_defined_4
5	not_defined_5
6	not_defined_6
7	not_defined_7
8	ESD_Active
9	ESD_Active
10	A_lowbank_valve
11	A_midbank_valve
12	A_highbank_valve
13	B_lowbank_valve
14	B_midbank_valve
15	B_highbank_valve
16	A_choke
17	A_demand
18	A_filling
19	A_authorize
20	A_complete
21	A_error
22	B_choke
23	B_demand
24	B_filling
25	B_authorized
26	B_complete
27	B_error
28	A_sale_pulse_output
29	A_mass_pulse_output
30	B_sale_pulse_output
31	B_mass_pulse_output

Bits definitions main_loop_boolean 12.8

Bit	Name
0	comm0_connected
1	not_writing_flash
2	one_sec_os
3	use_modbus5
4	single_meter
5	calibrate_enable
6	sw1_1_on
7	mon_override
8	display_0_ok
9	display_1_ok
10	audit_sorted
11	single_step
12	supply_above_22v
13	supply_below_21v
14	supply_was_ok
15	supply_loss
16	supply_loss_ack
17	param_changed
18	param_scanned
19	quick_scan
20	fill_A_right
21	fill_A_left
22	fill_B_right
23	fill_B_left
24	display_2_ok
25	display_3_ok
26	totals_ready
27	simulating_fill
28	display_totals_bit
29	comm_connected
30	meter_data_force
31	tier_display_bit

Bits definitions extra_configuration 34.6

Bit	Name
0	MB_little_endian
1	MB_read_only
2	extra_config2
3	extra_config3
4	extra_config4
5	extra_config5
6	extra_config6
7	extra_config7
8	extra_config8
9	extra_config9
10	extra_config10
11	extra_config11
12	extra_config12
13	extra_config13
14	extra_config14
15	extra_config15
16	extra_config16
17	extra_config17
18	extra_config18
19	extra_config19
20	extra_config20
21	extra_config21
22	extra_config22
23	extra_config23
24	extra_config24
25	extra_config25
26	extra_config26
27	extra_config27
28	extra_config28
29	extra_config29
30	extra_config30
31	extra_config31

Bits definitions Aaccount_1 5.40 and Baccount_1 10.40

Bit	Status#	Description
0	27	process_started Right
1	27	process_started left
2	26	pressure_drop_detected
3	26	no_pressure_drop
4	24	waiting_short_delay
5	24	low_bank_on
6	24	waiting_motor_delay
7	24	motor_delay_time_out_bank_off
8	24	high_flow_flag_bank_off
9	22	high_bank_on_for_hose_check
10	22	high_bank_off_above_hose_mass
11	22	hose_check_time_out
12	22	abort_during_hose_check
13	22	lost_authorize_during_hose_check
14	21	pressure_and_flow_settled_after_hose_check
15	21	mass_>_hose_mass_go_record_pressure
16	21	mass_<_hose_mass_wait_for_hose_drop
17	21	spare
18	20	waiting_for_hose_drop
19	20	abort_time_out_start_delay
20	20	detected pressure drop
21	20	pressure_and_flow_settled_after_hose_drop
22	19	waiting_for_pressure_and_flow_settle
23	19	pressure_settled
24	19	flow settled
25	19	flow_not_settled_10_sec_time_out_abort
26	19	initial_pressure_and_temperature_measured
27	19	spare
28	18	calculating_target mode 0
29	18	calculating_target mode 2
30	18	calculating_target mode 4
31	18	temperature compensation off

Bits definitions Aaccount_2 5.41 and Baccount_2 10.41

Bit	Status#	Description
0	18	using calculated pressure target
1	18	using fixed pressure target
2	18	spare
3	18	spare
4	18	target_pressure_exceeds_absolute
5	18	using given target
6	18	tank_already_>_95%_full_abort
7	18	spare
8	16	resist_measure
9	16	flow_maximum_during_resist_measure
10	16	pressure_differnce_sonic
11	16	pressure_differnce_subsonic
12	16	resistance_within_range
13	16	resistance_exceeds_maximum
14	16	resistance_below_minimum
15	6	spare
16	9	low bank fill all banks off
17	9	low bank fill flow_settled
18	9	low bank fill low bank on
19	9	low bank fill resistance_increased
20	9	low bank fill resistance_decreased
21	9	low bank fill waiting_Sdelay
22	9	low bank fill in process
23	9	low bank fill abort interbank_pressure_high
24	9	low bank fill change on pressure limit
25	9	low bank fill change on pressure target
26	9	low bank fill abort on pressure high
27	9	low bank fill change on low flow
28	9	low bank fill time out
29	9	low bank spare 1
30	9	low bank spare 2
31	8	mid bank fill all banks off

Bits definitions Aaccount_3 5.42 and Baccount_2 10.42

Bit	Status# - Description
0	8 mid bank fill flow_settled
1	8 mid bank fill mid bank on
2	8 mid bank fill resistance_increased
3	8 mid bank fill resistance_decreased
4	8 mid bank fill waiting_Sdelay
5	8 mid bank fill in process
6	8 mid bank fill abort interbank_pressure_high
7	8 mid bank fill change on pressure limit
8	8 mid bank fill change on pressure target
9	8 mid bank fill abort on pressure high
10	8 mid bank fill change on low flow
11	8 mid bank fill time out
12	8 mid bank spare 1
13	8 mid bank spare 2
14	7 high bank fill all banks off
15	7 high bank fill flow_settled
16	7 high bank fill high bank on
17	7 high bank fill resistance_increased
18	7 high bank fill resistance_decreased
19	7 high bank fill waiting_Sdelay
20	7 high bank fill in process
21	7 high bank fill abort interbank_pressure_high
22	7 high bank fill change on pressure limit
23	7 high bank fill change on pressure target
24	7 high bank fill abort on pressure high
25	7 high bank fill change on low flow
26	7 high bank fill time out
27	7 high bank spare 1
28	7 high bank spare 2
29	4 fill_complete wait for settle
30	4 fill_complete
31	2 abnormal shutdown

Bits definitions Aaccount_4 5.43 and Baccount_2 10.43

Bit	Status#	Description
0	1	data_recorded wait for handle off
1		spare98
2	0	spare99
3	0	fill denied temperature error
4	0	drop flag time out
5		spare102
6		spare103
7	9	low bank burst_detect
8	8	mid bank burst_detect
9	7	high bank burst_detect
10		spare107
11		spare108
12		spare109
13		low bank pressure exceeds Smax
14		mid bank pressure exceeds Smax
15		high bank pressure exceeds Smax
16		low bank pressure exceeds absolute
17		mid bank pressure exceeds absolute
18		high bank pressure exceeds absolute
19		handle_shut_off_during_fill
20		redundant pressure error abort
21		lost authorize during fill
22		spare 119
23		spare 120
24		spare 121
25		spare 122
26		spare 123
27		spare 124
28		spare 125
29		spare 126
30		spare 127
31		spare 128

12. Document Revision History

Rev. 0: original release 7-28-2010