Technote 65 – AcquiLite EMB A7810 Register Map

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This document details the registers available to poll via ModbusTCP on the A7810.

Pulse Mode:

count: the number of pulses counted on the input port. In standard mode, the pulse is counted on the closure of the contact. If the KYZ option is enabled, both the closure and opening of the pulse are counted. The maximum pulse rate to be able to count is 10 Hz. Expect pulse width to be minimum of 20ms. The pulse count starts at zero (factory default) and always increments as pulses are counted. Rollover at 2^32 (approx 4.3 billion). Count is stored in non-volatile memory. The pulse count can not be reset to zero.

rate-inst: The instantaneous rate of pulses received on the input, calculated based on the time the last N pulses were received. For example, if the pulse rate is 2hz, and N is 5, then 5 pulses will be received in 10 seconds, and the rate-inst value will return 10. N is user selectable from 2 to 20. Note: as the value of rate-inst increases, the pulse rate it represents decreases. thus, a value of 20(seconds) represents a pulse rate that is 1/2 of a 10s value. If the pulse rate is very fast such that rate-inst < N the value of rate-inst will be poor to unusable due to the granularity of the measurement. This should be handled as off-scale-high by the Modbus master system. The rate-inst register will report 65535 when off-scale-low. When reading large values from rate-inst, it is advisable to handle numbers as off-scale-low when the number of seconds exceeds the data logging interval.

rate-min: The minimum rate value as measured in rate-inst. Note: the minimum rate is actually the largest count of seconds seen in rate-inst.

rate-max: The maximum rate value as measured in rate-inst. Note: the maximum rate is actually the smallest count of seconds seen in rate-inst.

*** clear min/max** (register 41021): The Modbus registers for rate-inst, rate-min and rate-max may be cleared by writing to a Modbus register. It is assumed that these three fields will be cleared at the beginning of each new logging period by the Modbus master device. In pulse mode, clearing the inst register does not clear the pulse count history. The fields for inst/min/max will be valid after only one pulse value is received.

*** average rate** (not an arm7/io datapoint): The AcquiSuite will compute an average rate for the pulse count input. The calculation will be performed at the end of each logging cycle by subtracting the count at the start and end of the interval and dividing by the interval length. (DV/DT). This will provide the average rate over the log interval. If the unit of measure is power related, (kwh, kvarh, kvah, etc) the average rate will be called "demand" as it is the effective block demand value for the input. Because the rate value is not a Modbus register, external Modbus/TCP clients must use the “count” register and compute the average rate value.

Status Mode:

count: the number of pulses counted on the input port. In standard mode, the pulse is counted on the closure of the contact. If the KYZ option is enabled, both the closure and opening of the pulse are counted. The maximum pulse rate to be able to count is 10 hz. Expect pulse width to be minimum of 20ms.

on-time: the cumulative number of seconds the contacts have been closed. The pulse count starts at zero (factory default) and always increments as pulses are counted. Rollover at 2^32 (over 130 years). Count is stored in nv memory. This value has 1 second granularity, rounding is performed by sampling the input once per second and accumulating 1 second if the contact is closed at that time. For practical applications, the pulse width should be a minimum of 1 second.

dutycycle: The ratio of of time the contact is closed vs open. For example, if the contact is closed for 10 seconds and open
for 30, the dutycycle register will report 25%. The register value returned must be divided by 1000 to convert it to a
percentage with three decimal places.

status: returns 1 if the contact is presently closed, 0 if the contact is presently open.

*** clear min/max** (register 41021): the only value cleared in status mode is the dutycycle field. The data logger will clear this field at the beginning of each log period. The dutycycle register will be used to calculate the dutycycle for one log period only.

Register Map:

offset	point	type	desc		
offset	point	type	desc modes-->	Pulse	Status
0	40001	UINT32	input 1 value MSW	(count/NV,	count/NV)
1	40002	UINT32	input 1 value LSW		
2	40003	UINT32	input 2 value MSW	(count/NV,	count/NV)
3	40004	UINT32	input 2 value LSW		
4	40005	UINT32	input 3 value MSW	(count/NV,	count/NV)
5	40006	UINT32	input 3 value LSW		
6	40007	UINT32	input 4 value MSW	(count/NV,	count/NV)
7	40008	UINT32	input 4 value LSW		
			modes-->	Pulse	Status
16	40017	UINT32	input 1 ave MSW	(rate-inst,	on-time/NV)
17	40018	UINT32	input 1 ave LSW		
18	40019	UINT32	input 2 ave MSW	(rate-inst,	on-time/NV)
19	40020	UINT32	input 2 ave LSW		
20	40021	UINT32	input 3 ave MSW	(rate-inst,	on-time/NV)
21	40022	UINT32	input 3 ave LSW		
22	40023	UINT32	input 4 ave MSW	(rate-inst,	on-time/NV)
23	40024	UINT32	input 4 ave LSW		
			modes-->	Pulse	Status
32	40033	UINT32	input 1 min MSW	(rate-min,	dutycycle)
33	40034	UINT32	input 1 min LSW		
34	40035	UINT32	input 2 min MSW	(rate-min,	dutycycle)
35	40036	UINT32	input 2 min LSW		
36	40037	UINT32	input 3 min MSW	(rate-min,	dutycycle)
37	40038	UINT32	input 3 min LSW		
38	40039	UINT32	input 4 min MSW	(rate-min,	dutycycle)
39	40040	UINT32	input 4 min LSW		

			modes-->	Pulse	Status
48	40049	UINT32	input 1 max MSW	(rate-max,	status max)
49	40050	UINT32	input 1 max LSW		
50	40051	UINT32	input 2 max MSW	(rate-max,	status max)
51	40052	UINT32	input 2 max LSW		
52	40053	UINT32	input 3 max MSW	(rate-max,	status max)
53	40054	UINT32	input 3 max LSW		
54	40055	UINT32	input 4 max MSW	(rate-max,	status max)
55	40056	UINT32	input 4 max LSW		
Mode setting options.			see below for value details.		
64	40065	UINT16	input 1 mode (NV/r/w)		
65	40066	UINT16	input 2 mode (NV/r/w)		
66	40067	UINT16	input 3 mode (NV/r/w)		
67	40068	UINT16	input 4 mode (NV/r/w)		
--- system settings and information ---					
999	41000	UINT16	contact closure threshold (NV/r/w) in ohms, default 1000 = 1kohm. (minimum value 100 ohms, maximum value 5000 ohms)		
1001	41002	UINT16	number of pulses for inst rate (NV/r/w) default 5. limit 2 to 20.		
1002	41003	UINT16	serial number bytes 1,2 - (ro) Also A8812 / MAC address.		
1003	41004	UINT16	serial number bytes 3,4 (ro)		
1004	41005	UINT16	serial number bytes 5,6 (ro)		
1005	41006	UINT16	firmware version (major)		
1006	41007	UINT16	firmware version (minor)		
1020	41021	UINT16	clear min/max/ave (r/w) read returns 0, write any value to clear min/max/ave for all channels.		

Register Formatting

Pulse Count: The pulse count is stored as an unsigned 32bit integer. This allows for 2^32 pulses (4.2billion) to be counted before rollover. On Modbus systems that do not allow you to read 32bit values, you can calculate the pulse count as follows:

count = (MSW * 65536) + LSW

or

count = (MSW << 16) | LSW [bit shift high order word by 16 bits and xor against low order word]

Pulse count registers accumulate a total number of pulses received on each pulse input. The pulse count totals always increment and can not be cleared or set to an arbitrary value to prevent tampering. All pulse count totals are stored in nonvolatile memory to preserve counts during power failure. The unsigned 32 bit counter values can accumulate up to 4.29 billion (2^32) pulses before rollover.

All 32 bit data point values are encoded in 2 Modbus registers (16bits each). Modbus master systems should always query the A8332-8F2D using a single query to read an entire block of registers. Never use two queries to read one register and then combine the two results into a single 32 bit value. Doing so will allow the pulse count to increment in the middle of the two Modbus queries, and will cause intermittent data readings that are incorrect.

For example, a pulse input has a count of 65534. This is represented as a 32 bit hex number 0x0000FFFE. The first 4 digits are the MSW register, the second 4 digits are the LSW register. The Modbus Master reads the first (MSW) register and gets 0x0000. In between the two readings, the pulse input counts 2 more pulses, making the total 65536 or 0x00010000 in hex. Next the Master reads the second (LSW) register and gets 0x0000. When the two

registers are combined, the result is 0x00000000. The proper way to handle this situation is to simply read both registers in a single Modbus query.

Instantaneous Pulse Rate: The pulse rate values for instantaneous, min and max rates are calculated based on the time between arriving pulses. For example, if InstPulse1 = 30, and inst pulse count size is 5, then the average rate for the last 5 pulses is 6 seconds per pulse. To convert the register values (in seconds) to a rate value, use the following formula.

RatePerHour = (N * 60 * 60 / Inst_Register)

Where InstRegister is any of the 6 register values 4 through 9. N is the instantaneous pulse count size at offset 10.

Min/Max pulse rate: These registers are calculated from the instantaneous pulse rate. These latching registers are updated whenever the minimum or maximum rate fields are exceeded by the instantaneous rate.