X2-Parameter access through MODBUS

Validity
This document is valid for X2 firmware from V1.2 R7 onwards.

Static Address List
Generally we do not encourage changing parameter value through external communications. It can however be done as a work around. This application note explains how access is given and how to interpret the associated values.

With the address table below the parameter settings of the controller may be accessed. The values in the table correspond to the first parameter of each list for the addressed X2 controller. For example 3400 will point to 5U00. 3408 will point to 5U08.

Note: This address will deliver the raw unconditioned 8bit parameter value. Further information is required to interpret those values correctly. See chapter *interpretation of values based on parameter type*.

Description	1	2	3	4	5	6	7	8	9	10	11	12
User settings	2000											
Universal input	3000	3100	3200	3300	3400	3500	3600	3700	3800	3900	4000	4100
Control Loop	5000	5100	5200	5300								
Analog Output	6000	6100	6200									
Binary Output	7000	7100	7200	7300	7400	7500	7600	7700				
Fan output	8000	8100										
Alarm	9000	9100	9200	9300	9400	9500	9600	9700				
Functions	10000	10100	10200	10300	10400							
Time Schedules	11100	11200	11300	11400	11500	11600	11700	11800	11900	12000	12100	12200
Communication	13000											

Time schedule Settings
Time schedules are slightly special as they do not operate with parameters. Time schedules addresses start at address 11100. To remotely change time schedule settings, follow the table below.

Address	Module	Description of Weekly Schedules	Range	R/W
1055	General		1bit	R/W
Table+0	SCHED1	Time of time schedule event in hex format (hh mm)	16bit	R/W
Table+1	SCHED1	Active days of time schedule event (bits) Bit 0 = Day 1 (Monday) Bit 1 = Day 2 (Tuesday) Bit 2 = Day 3 (Wednesday) Bit 3 = Day 4 (Thursday) Bit 4 = Day 5 (Friday) Bit 5 = Day 6 (Saturday) Bit 6 = Day 7 (Sunday)	8bit	R/W
Table+2	SCHED1	Type of time schedule: 0 = Disabled 1 = Operation mode 2 = Control loop set point 3 = Analog output set point 4 = Fan output 5 = Binary output 6 = Holiday	4bit Right Nibble: 0x hex	R/W
		Parameter ID: Number of chosen type (example: AO**2**)	4bit Left Nibble: x0 hex	R/W
Table+3	SCHED1	For weekly schedules only: ID of time schedule: Will show only if type of schedule is not operation mode.	8bit	R/W
Table+4	SCHED1	For weekly schedules only: Set point of time schedule: If type of times schedule is operation mode (Table+2=1): 0 = OFF, 1 = Economy, 2 = ON For all other types: The value represents the set point calculate value using input range dependent limit. (see parameter range table)	8bit	R/W

Time schedule settings for annual time schedules

Annual time schedules used to define holidays have a different format than weekly time schedules. They share however the same address space. So if a time schedule is changed with Table+2 to holiday mode, the format of the other settings associated with this time schedule change as well.

Address	Module	Description	Range	R/W
1055	General	Enable time schedules	1 bit	R/W
Table+0	SCHED1	Not used	4bit Right Nibble: 0x hex	R/W
		For annual schedules only: Starting month of holiday -1 : Range 00 - 11	4bit Left Nibble: x0 hex	R/W
Table+1	SCHED1	For annual schedules only: Starting day of holiday -1: Range 00-30	8 bit	R/W
Table+2	SCHED1	Type of time schedule: 0 = Disabled 1 = Operation mode 2 = Control loop set point 3 = Analog output set point 4 = Fan output 5 = Binary output **6 = Holiday**	4bit Right Nibble: 0x hex	R/W
		Not used	4bit Left Nibble: x0 hex	R/W
Table+3	SCHED1	Not used	4bit Right Nibble: 0x hex	R/W
		For annual schedules only: Finishing month of holiday -1 : Range 00 - 11	4bit Left Nibble: x0 hex	R/W
Table+4	SCHED1	For annual schedules only: Finishing day of holiday -1: Range 00-30	8 bit	R/W

Interpretation of values based on parameter type

When reading an 8-bit parameter, the value x is within the range 0 to 255. This value needs to be conditioned in order to create a meaning full display of the value.

Description	Range	Calculation for correct display	Calculated display
Binary (on – off)	on – off	Isolate Least significant bit	00 = OFF 01 = ON
Display range value for inputs	-50...205	For non Fahrenheit value: x- 50	0 = -50 255 = 205
		For Fahrenheit value: (x*2)-58	0 = -58 255 = 401
Sensor calibration	Per input range	Non Fahrenheit: Value – 127	0 = -127 127 = 0 255 = 128
		If Fahrenheit: (Value – 127)*2	0 = -254 127 = 0 255 = 256
Time delays	00:00s...15:10h MM:SS...HH:MM	if x < 60 = x *5 if x > 59 = (x-50) * 30 if x > 159 = (x-164) * 600	0..59 = 00:00 – 04:55 60...159 = 05:00 – 59:30 160...255 = 01:00 – 15:10h
%-Range displays	0.0 – 100%	x * 200 / 255 * 0.5 (calculate in this order)	0 = 0% 255 = 100%
For input dependent span settings such as PI-Band, hysteresis etc.	Per input range	x * multiplier[1)]	0 = 0 255 = 255 (multiplier = 1) or = 1275 (multiplier = 5) or = 2550 (multiplier = 10)
For input dependent limits such as set points or alarm limits	Per input range	Non Fahrenheit values: (Value * multiplier[1)]) -500 + (display min *10)	0 = -500 255 = 2550
		Fahrenheit values: (Value *2 * multiplier[1)]) -580 + (display min *20)	0 = -580 255 = 4520

[1)] Input dependent multiplier calculation.
Multiplier depends on input range:
display max – display min = y
If y < 25 multiplier = 1
if y < 125 multiplier = 5
else multiplier = 10
Note: double multiplier each for differential inputs and/or temperature inputs in Fahrenheit mode.