CATTRON™

Messenger BLE MODBUS Slave

User Manual

9M02-7000-A201-EN

CONNECT. CONTROL. PROTECT.

Revision History

VERSION	DATE	NOTES
1.0	12/2020	Initial Release. This document originated from the “Messenger MODBUS Slave.docx” document and has been modified to match the Messenger BLE mapping.
A	12/2020	Document rebranded and contact information updated

Contents

1 Modbus Communications Parameters

The Messenger supports up to two serial ports (User Ports 1 and 2) utilizing the MODBUS RTU communications protocol. Either port can be configured as a MODBUS Slave port. Both ports support RS-485 only as the physical interface. If RS-232 is needed, an RS-485 to RS-232 adapter is required. Reference the MessengerBLE User Manual (Document Number xxxx-xxxx-xxxx) to change the serial port settings. The available MODBUS Slave port communication parameters are defined as follows:

- Mode – Slave (mode = 2)
- Baud – 1200-115200
- SlaveID – 1-227 (default = 126)
- Data – 7-8
- Stop – 1-2
- Parity – None, Even, Odd

2 Modbus Registers Defined

Notes:

1. This document always refers to registers by numbers, which start at 1 as defined in the Modbus protocol.
2. A letter ‘S’ in the bits/sign column indicates a signed value using two’s compliment arithmetic; all others are unsigned (‘U’).
3. A double number in the bits/sign column indicates a bit within a register of a specific size; e.g., 16/16 is the most significant bit and 1/16 is the least significant bit of a 16 bit register.
4. Bits within registers are numbered from 1, not 0, to avoid the confusion that would be caused if the sixteenth bit of a 16 bit register were labelled 15/16.
5. For any particular build of firmware, some registers may not be supported. Registers not supported will contain a data value that indicates “Not Avail”.
6. For values that are not available (e.g., when the engine not running), the register value will be 0xFFFF for 16-bit integer registers, 0xFFFFFFFF for 32-bit integer registers and -1.0 for 32-bit float registers.
7. Double register (32-bit) values are stored with the most significant bits in the register with the lower address.
8. For double register reads (32-bit), to get the correct value, both registers must be read in a single request.

3 Modbus Exception Codes

If the Messenger detects an error in a request, one of the following standard Modbus exception codes is returned:

Condition	Exception	Exception Code
Unsupported function code received	ILLEGAL_FUNCTION	1
Register address is out of range or the starting address plus the number of registers to read exceeds the address range of the Messenger	ILLEGAL_ADDRESS	2
Number of registers requested is too large, i.e., beyond the range of the Messenger	ILLEGAL_VALUE	3
The slave cannot respond because the response message is too large (too much data requested) or there has been a failure internal to the device	SLAVE_DEV_FAILURE	4

4 Digital Data Registers, Packed Holding (16-bit): 201-208

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.
2. Each register can contain multiple discrete values with each value occupying 2-bits.
3. A value of 3 indicates “Not Available”.

Register Number (4xxxx)	Name	Bit Values				#Bits/U-S
		00	01	10	11	BitPos/Bits
201	**System A**			**Undefined**	**Not Avail**	**16U**
	CELL	OK	Fault			1/16
	GPS	OK	Fault			7/16
	Serial Comm	OK	Fault			3/16
	CAN	OK	Fault			5/16
	Accelerometer	Normal	Fault			9/16
	BLE	Normal	Fault			11/16
	Undefined					13-16/16
202	**System B**			**Undefined**	**Not Avail**	**16U**
	User DIN 1	Off	On			1/16
	User DIN 2	Off	On			3/16
	User DIN 3	Off	On			5/16
	User DIN 4	Off	On			7/16
	User DOUT 1	Off	On			9/16
	User DOUT 2	Off	On			11/16
	User DOUT 3	Off	On			13/16
	Undefined					15-16/16
203	**Engine A**			**Undefined**	**Not Avail**	**16U**
	Run	Not Run	Run			1/16
	Shutdown	Not Active	Active			3/16
	Warning	Not Active	Active			5/16
	Malfunction Indicator Lamp	Not Active	Active			7/16
	Protect Lamp	Not Active	Active			9/16

Register Number (4xxxx)	Name	Bit Values				#Bits/U-S
		00	01	10	11	BitPos/Bits
	Undefined					11-16/16
204	**Engine B**			**Undefined**	**Not Avail**	**16U**
	Undefined					1-16/16
205	**OEM A**			**Undefined**	**Not Avail**	**16U**
	Auto Start 1	Off	On			3/16
	Auto Start 2	Off	On			5/16
	Auto Start Enable	Not Enabled	Enabled			1/16
	Undefined					7-16/16
206	**OEM B**			**Undefined**	**Not Avail**	**16U**
	Undefined					1-16/16
207	**Tier 4 A**			**Undefined**	**Not Avail**	**16U**
	DPF Passive Regen Status	Not active	Active			1/16
	DPF Active Regen Status	Not active	Active			3/16
	DPF Active Regen Inhibit Status	Not inhibited	Inhibited			5/16
	DPF Active Regen Inhibit Swx	Not inhibited	Inhibited			7/16
	DPF Active Regen Inhibit Temporary Lockout	Not inhibited	Inhibited			9/16
	DPF Active Regen Inhibit Permanent Lockout	Not inhibited	Inhibited			11/16
	DPF Auto Active Regen Config	Not enabled	Enabled			13/16
	DPF1 Condition Not Met For Regen	DPF regen not inhibited	DPF regen inhibited			15/16
208	**Tier 4 B**			**Undefined**	**Not Avail**	**16U**
	Undefined					1-16/16

5 Time Registers (16-bit): 251-255

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.

Register Number (4xxxx)	Name	Minimum Value	Maximum Value	#Bits/U-S BitPos/Bits
251	Daylight Savings/Time Zone			16U
	Time Zone[a]	0	7	1-8/16
	Daylight Savings	0	1	9-16/16
252	Hour	0	23	16U
253	Minute/Second			16U
	Second	0	59	1-8/16
	Minute	0	59	9-16/16
254	Day	1	31	16U
255	Month/Year			16U
	Year	00	99	1-8/16
	Month	1	12	9-16/16

[a] Time Zones

Types	Description
0	GMT
1	Atlantic
2	Eastern
3	Central
4	Mountain
5	Pacific
6	Alaska
7	Hawaii
8-65535	Not Defined

6 Analog Data Registers (32-bit): 301-452

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.
2. All values are type FLOAT and occupy two consecutive registers (32-bit).
3. A value of -1.0 is used as an indication of “Not Available”.

Register Number (4xxxx)	Name	Units	Range
301	Fuel Level	Pct	
303	Engine Speed	RPM	
305	Auxiliary IO Chan 1		
307	Auxiliary IO Chan 2		
309	Coolant Temperature	°F	
311	Battery Potential (switched)	Volts	
313	Electrical Potential (unswitched)	Volts	
315	Oil Pressure	PSI	
317	Engine Control Command	n/a	0 = override to stop 1 = override to start 2 = undefined 3 = return control to panel
319	User Analog Input 1	Definable	
321	User Analog Input 2	Definable	
323	User Analog Input 3	Definable	
325	System Power	Volts	
327	Supercap Charge Level`	Volts	
329	Board Temp	°F	
331	Service Timer, Oil	Hours	
333	Service Timer, Oil Filter	Hours	
335	Service Timer, Fuel Filter	Hours	
337	Service Timer, Air Filter	Hours	
339	Service Timer, Battery	Hours	
341	Service Timer, Belts	Hours	
343	Service Timer, Coolant	Hours	
345	Service Timer, Major	Hours	
347	Service Timer, Pump	Hours	

Register Number (4xxxx)	Name	Units	Range
349	Service Timer, 10	Hours	
351	Service Timer, 11	Hours	
353	Service Timer, 12	Hours	
355	Service Timer, 13	Hours	
357	Service Timer, 14	Hours	
359	Service Timer, 15	Hours	
361	Service Timer, 16	Hours	
363	Fuel Rate	Gals/Sec	
365	Engine Starts	counts	
367	Idle, Time	Mins	
369	Idle, Fuel	Gals	
371	Work, Time	Mins	
373	Work, Fuel	Gals	
375	Idle, Daily Time	Mins	
377	Idle, Daily Fuel	Gals	
379	Work, Daily Time	Mins	
381	Work, Daily Fuel	Gals	
383	Oil Level	Pct	
385	Oil Temperature	°F	
387	Coolant Level	Pct	
389	Fuel Economy, Average		
391	Fuel Economy, Instantaneous		
393	Throttle Position	Pct	
395	Vehicle Speed	MPH	
397	Barometric Pressure	PSI	
399	Cabin Temperature	°F	
401	Ambient Temperature	°F	
403	Accel Pedal Position	Pct	
405	Air Filter Diff Pressure	PSI	
407	Engine Load	Pct	
409	Engine Torque	Pct	
411	Engine Fuel Temperature	°F	
413	Fan Speed	Pct	

Register Number (4xxxx)	Name	Units	Range
415	Transmission Oil Temperature	°F	
417	Fuel Used, Daily	Gals	
419	Distance Traveled, Daily	Miles	
421	Undefined		
423	Undefined		
425	Undefined		
427	Undefined		
429	Undefined		
431	Undefined		
433	Undefined		
435	Undefined		
437	Undefined		
439	Undefined		
441	Undefined		
443	Undefined		
445	Undefined		
447	Undefined		
449	Undefined		
451	Engine Run Time	Hours	
453	Odometer1	Miles	
455	Volume, Daily	Definable	
457	Volume, Running	Definable	
459	GPS, Latitude	n/a	+/- 90.00000 Deg
461	GPS, Longitude	n/a	+/- 180.00000 Deg
463	Exhaust Temperature	°F	
465	Requested Engine Speed	RPM	
467	Requested Engine Torque	Pct	

7 Tier 4 Analog Data Registers (32-bit): 601-660

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.
2. All values are type FLOAT and occupy two consecutive registers (32-bit).
3. A value of -1.0 is used to indicate “Not Available”. There may also be an alternate value to indicate “Not Avail”.

Register Number (4xxxx)	Name	Units	Range
601	DPF1, Soot Load	Pct	
603	DPF1, Ash Load	Pct	
605	DPF1, ET Regen	secs	
607	AT1 DPF Regen Threshold	Pct	
609	DPF2, Soot Load	Pct	
611	DPF2, Ash Load	Pct	
613	DPF2, ET Regen	secs	
615	AT2 DPF Regen Threshold	Pct	
617	DPF, Lamp Cmd	n/a	
	0 = off		
	1 = on (solid)		
	2,3 = reserved		
	4 = on (fast blink)		
	5,6 = reserved		
	7 = not avail		
619	DPF, Status	n/a	
	0 = regeneration not needed		
	1 = regen needed, lowest level		
	2 = regen needed, moderate level		
	3 = regen needed, highest level		
	4-6 = reserved		
	7 = not avail		
621	Exhaust High Temp Lamp Cmd	n/a	
	0 = off		
	1 = on (solid)		
	2-6 = reserved		

Register Number (4xxxx)	Name	Units	Range
	7 = not avail		
623	Engine Trip Fuel	Gals	
625	Engine Total Fuel	Gals	
627	AT1 DEF Tank Level 1	Pct	
629	AT1 DEF Tank Level 2	Pct	
631	AT Catalytic Reduction Active		
	0 = off (adequate DEF level)		
	1 = on (solid – low DEF level)		
	2-3 = reserved		
	4 = on (fast blink – lower DEF level)		
	5-6 = reserved		
	7 = not avail		
633	Eng Wait Start Lamp	n/a	
	0 = off		
	1 = on		
	2 = error		
	3 = not available		
635	Eng Protection Shutdown	n/a	
	0 = no		
	1 = yes		
	2 = error		
	3 = not available		
637	Eng Protection Near Shutdown	n/a	
	0 = not approaching		
	1 = approaching		
	2 = error		
	3 = not available		
639	Eng Protection Cool Lvl Status	n/a	
	0 = disabled		
	1 = enabled		
	2 = reserved		
	3 = not available		

Register Number (4xxxx)	Name	Units	Range
641	Curr Node Chan 0	mA	
643	Curr Node Chan 1	mA	
645	Curr Node Chan 2	mA	
647	Curr Node Chan 3	mA	
649	Curr Node Chan 4	mA	
651	Curr Node Chan 5	mA	
653	Curr Node Chan 6	mA	
655	Curr Node Chan 7	mA	
657	Pulse Counter, Chan 0	Counts	
659	Pulse Counter, Chan 1	Counts	
661	Transducer 2		
663	Transducer 3		
665	Transducer 4		
667	Transducer 5		
669	Transducer 6		
671	AuxInput 1		
673	AuxInput 2		
675	AuxInput 3		
677	AuxInput 4		
679	AuxInput 5		
681	AuxInput 6		
683	AuxOutput 1		
685	AuxOutput 2		
687	AuxOutput 3		
689	AuxOutput 4		

8 Diagnostic Data Registers (32-bit): 801-864

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.

Register Number (4xxxx)	Name	Bits/Sign
801	Diagnostic Code 1[a]	32 U
803	Diagnostic Code 2	32 U
805	Diagnostic Code 3	32 U
807	Diagnostic Code 4	32 U
809	Diagnostic Code 5	32 U
811	Diagnostic Code 6	32 U
813	Diagnostic Code 7	32 U
815	Diagnostic Code 8	32 U
817	Diagnostic Code 9	32 U
819	Diagnostic Code 10	32 U
821	Diagnostic Code 11	32 U
823	Diagnostic Code 12	32 U
825	Diagnostic Code 13	32 U
827	Diagnostic Code 14	32 U
829	Diagnostic Code 15	32 U
831	Diagnostic Code 16	32 U
833	Diagnostic Code 17	32 U
835	Diagnostic Code 18	32 U
837	Diagnostic Code 19	32 U
839	Diagnostic Code 20	32 U
841	Diagnostic Code 21	32 U
843	Diagnostic Code 22	32 U
845	Diagnostic Code 23	32 U
847	Diagnostic Code 24	32 U
849	Diagnostic Code 25	32 U
851	Diagnostic Code 26	32 U
853	Diagnostic Code 27	32 U
855	Diagnostic Code 28	32 U

Register Number (4xxxx)	Name	Bits/Sign
857	Diagnostic Code 29	32 U
859	Diagnostic Code 30	32 U
861	Diagnostic Code 31	32 U
863	Diagnostic Code 32	32 U

[a] Format, Diagnostic Codes

Types	Description	Range
i	Status	0 = not active 1 = active
c	Occurrence count (OC)	0-127
f	Failure mode indicator (FMI)	0-32
s	Suspect Parameter Number (SPN)	0-524287

32								24							16								8							1
i	c	c	c	c	c	c	c	f	f	f	f	f	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s	s

9 User Channel Data Registers (32-bit): 1001-1199

Notes:

1. These are read-only 4x registers and are accessed via Function Code 3, Read Holding.
2. All values are type FLOAT and occupy 2 consecutive registers (32-bit).
3. A value of -1.0 is used as an indication of “Not Available”.
4. If the User channel is configured as a digital type, the register will contain a FLOAT value of 1.0 or 0.0.
5. NOTE: !!!!! These Registers have not yet been implemented !!!!

Register Number (4xxxx)	Name	Units	Range
1001	User Channel 1		
1003	User Channel 2		
1005	User Channel 3		
1007	User Channel 4		
1009	User Channel 5		
1011	User Channel 6		
1013	User Channel 7		
1015	User Channel 8		
1017	User Channel 9		
1019	User Channel 10		
…	…		
1197	User Channel 99		
1199	User Channel 100		

10 MODBUS Slave Write Data Registers (16-bit): 5000-5100

Notes:

1. These are write 4x registers and are accessed via Function Code 6 (Write Holding) or Function Code 16 (Write Multiple Holding).
2. All register values are of type 32-bit FLOAT.
3. If the value read is -1.0, this indicates the register has not yet been written to, i.e., “Not Available”.
4. If a write is attempted outside this range, an Illegal Address exception code is returned.
5. By configuring a Messenger Modbus channel with a slave address of 0, a register number in this slave pool range, and a function code of either Read Holding (3) or Write Holding (6), an external master can write to that register and it will be picked up by that Modbus channel. Using the scaling parameters of the channel, the register value is converted to an engineering value for alarming or reporting to a host server.
6. When a Slave serial port is setup on the Messenger, reads/writes from the Master must occur at periodic intervals or the Messenger will generate a Modbus Slave Comm fail. The max update interval is set to 60 seconds.
7. NOTE: !!!!! These Registers have not yet been implemented !!!!

Register Number (4xxxx)	Name	Units	Range
5001	Slave Register 1		
5002			
5003			
5004			
5005			
5006			
5007			
5008			
5009			
5010			
…	…		
5099			
5100	Slave Register 100		

11 Technical Support

For remote and communication control systems support, parts and repair, or technical support, visit us online at: www.cattron.com/contact.

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Cattron North America Inc., 655 N River Rd NW, Suite A, Warren, OH 44483

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