ADVANCED MICRO INSTRUMENTS

Modbus RS485 Communication Protocol for 2010BR, 210BR, 3010BR and 4010BR

Supplemental Manual

Modbus RS485 Communication Protocol

SUPPLEMENTAL MANUAL

Special Message from Advanced Micro Instruments (AMI):

This manual provides a reference of how to read Modbus RTU Protocol over RS485 Communication.

It is important to know that RS485 Communication is disabled whenever the USB connector is plugged in at both ends.

If you have any questions, contact AMI at 714.848.5533 or **www.amio2.com**.

TABLE OF CONTENTS

Settings for User Computer

The following step must be completed first before initiating the Modbus RS485 Communication Protocol.

Manually enter the following settings in your computer that is or will be connected to the Analyzer:

- Baud Rate: 9600
- Parity: None
- Data Bits: 8
- Stop Bits: 1
- Slave ID (default): 17
- Starting Base addressing: 0

Modbus RTU Protocol over RS485 Communications

The Modbus address is entered in variable N1 for the Analyzer.

Directions for Writing to this Variable

- Open the COMMAND CENTER and initiate communication with the Analyzer
- When the COMMAND CENTER communicates with the Analyzer, go to the VARIABLES Page of the COMMAND CENTER
- Go to the User Input of the Variable Page. Click on the USER INPUT and enter 'AMI' for the password when prompted. Then, return to the USER INPUT
- In the USER INPUT, enter the following to change the address of the Modbus:

  A0WN1<Address>, where <Address> is 1-255
  Note: By default, it is set to 17.

Using the Modbus RTU command, you can read the Analyzer's Modbus register(s):
(Note: There are a total of eight bytes to send)

- Byte 0 = Address (Modbus Bus Slave addressed to be entered into variable N1)
- Byte 1 = 3
- Byte 2 = 0
- Byte 3 = Register (Register equals the Starting Register for the Modbus read)
- Byte 4 = 0
- Byte 5 = Count (Count equals the Number of Registers to be read)
- Byte 6 = CRC Bytes
- Byte 7 = CRC Bytes

IMPORTANT
It is important to know that RS485 Communication is disabled whenever the USB connector is plugged in at both ends.

Table I: Holding Registers for MODEL 2010BR, 210BR and 3010BR

Register	Writable?	Variable Name	AMI address
0	N	Reading in Percent of Range	
1	N	PPM or Percent Range	
2		Output Range	B
3		Span Factor	D
4		High Range Offset	E0
5		Sensor Factor	E1
6		High Range Gain	E2
7		Output Zero Offset	E3
8		Output Full Scale Span	E4
9		Heater Control	E5
10		Special Flags	E6
11		Alarm 1 Setpoint	F
12		Alarm 2 Setpoint	G
13		Alarm State	H
14		Alarm Hold-off Time	Z
15		Alarm 1 Delay	X
16		Alarm 2 Delay	Y
17		Pulse Time	W
18		Log Period	P7
19	N	Log Data Position	Q
20		Sequence Time	
21	N	Sensor Temperature	T0
22	N	Last Invalid Address	
23		Error Flags	I
24	N	Power Temperature	T1
25	N	Power Supply Voltage	T3
26		Seconds	P0
27		Minutes	P1
28		Hours	P2
29		Day of Week	P3
30		Day of Month	P4
31		Month	P5
32		Year	P6
33	N	Serial Number 0	L0
34	N	Serial Number 1	
35	N	Serial Number 2	
36	N	Serial Number 3	
37	N	Serial Number 4	
38	N	Serial Number 5	
39	N	Serial Number 6	
40	N	Software Revision 0	C
41	N	Software Revision 1	
42	N	Software Revision 2	
254		Modbus Address	N1

Table II: Coils

Coil	Name	Meaning if Set (1)	Meaning if Reset (0)
24	Allow writing into Analyzer	Enables writing	Disables writing

Table III: Diagnostic Functions

The diagnostic functions 0, 1, 2, 4, 10, 11, 12, 13, 14, 15, and 16 are supported.

Note that each counter will count up to 65535 but will not go any higher. They can be reset to zero with the 10 command.

Function	Command (without CRC)	Action	Notes
0	11 08 00 00	Echo Message	Return the Exact Sames Message
1	11 08 00 01	Restart Communication	Restarts from a Previous 4 Command
2	11 08 00 02	Return Error Byte	Returns Same as Holding Register 23
4	11 08 00 04	Listen Only Mode	Stops the Analyzer from Responding to Anything
10	11 08 00 0A	Clear All Diagnostic Counters	Clear Each of the Diagnostic Counters to Zero
11	11 08 00 0B	Total Message Count	Total Number of Messages Seen by the Analyzer
12	11 08 00 0C	CRC Error Count	Number of CRC Errors Seen by the Analyzer
13	11 08 00 0D	Exception Count	Number of Invalid Modbus Commands
14	11 08 00 0E	Number of Slave Messages	Number of Messages the Analyzer has Returned
15	11 08 00 0F	Number of No Responses	Number of Messages Addressed to the Analyzer that It did not Respond to
16	11 08 00 10	Number of NAK Responses	Number of Messages with Incorrect Parameters (such as Invalid Registers or Out-of-bounds Values) Seen by the Analyzer

Table IV: Holding Registers for BARRACUDA MODEL 4010BR

Register	Number of Registers Used	Variable Name	Name	Type	Comment
0	16	A0RA0	Reading String	String	
141	2	A0RZ2	PPM Value	Two 16-bit Unsigned Integers	v7.0 Firmware or Above
143	1	A0RZ3	LBS x 100 Value	16-bit Unsigned Integer	v7.0 Firmware or Above
16	1	A0RA1	2F Baseline	16-bit Unsigned Integer	
17	1	A0RA2	2F H Peak Value	16-bit Unsigned Integer	
18	1	A0RA3	2F H Peak Index	16-bit Unsigned Integer	
19	1	A0RA4	2F C Peak Value	16-bit Unsigned Integer	
20	1	A0RA5	2F C Peak Index	16-bit Unsigned Integer	
21	1	A0RA7	Output in Pounds Flag	16-bit Unsigned Integer	
22	1	A0RB0	Output Range	16-bit Unsigned Integer	
23	1	A0RB1	Frequency Code (1)	16-bit Unsigned Integer	
24	1	A0RB2	Phase Code (2)	16-bit Unsigned Integer	
25	1	A0RB3	Bandwidth Code (3)	16-bit Unsigned Integer	
26	1	A0RB4	Scan Period (4)	16-bit Unsigned Integer	
27	1	A0RB5	Laser Enable (5)	16-bit Unsigned Integer	
28	1	A0RB6	Two F Offset (7)	16-bit Unsigned Integer	
29	1	A0RB7	Amplitude (8)	16-bit Unsigned Integer	
30	1	A0RB8	Null Width Storage (11)	16-bit Unsigned Integer	
31	1	A0RB9	Ramp Coefficient 1 (12)	16-bit Unsigned Integer	
32	1	A0RB10	Ramp Coefficient 2 (13)	16-bit Unsigned Integer	
33	1	A0RB11	Ramp Coefficient 3 (14)	16-bit Unsigned Integer	
34	1	A0RB12	Low Pass Gain (MSW) (22)	16-bit Unsigned Integer	
35	1	A0RB13	Low Pass Gain (LSW) (23)	16-bit Unsigned Integer	
36	1	A0RB14	TEC Set Point (Disabled)	16-bit Unsigned Integer	
37	1	A0RB15	TEC Enable	16-bit Unsigned Integer	
38	8	A0RC0	Software Version	String	
46	1	A0RC2	Loop Count	16-bit Unsigned Integer	
47	1	A0RD0	Cal Factor	16-bit Unsigned Integer	
48	1	A0RD1	Samples Per Scan	16-bit Unsigned Integer	
49	1	A0RD8	ADC TEC Raw Value 4	16-bit Unsigned Integer	
50	1	A0RE3	Analog Zero Offset	16-bit Unsigned Integer	
51	1	A0RE4	Analog Full Scale	16-bit Unsigned Integer	
52	1	A0RE6	E6 Config Variable	16-bit Unsigned Integer	
53	1	A0RF0	Alarm 1 Setpoint	16-bit Unsigned Integer	
54	1	A0RG0	Alarm 2 Setpoint	16-bit Unsigned Integer	
55	1	A0RH0	Alarm Configuration	16-bit Unsigned Integer	
56	1	A0RH1	Unused	16-bit Unsigned Integer	
57	1	A0RI0	Error Register 0	16-bit Unsigned Integer	
58	1	A0RI1	Error Register 1	16-bit Unsigned Integer	
59	1	A0RI2	Error Register 2	16-bit Unsigned Integer	
60	1	A0RI3	Error Register 3	16-bit Unsigned Integer	
61	8	A0RJ0	Analyzer Type	String	

Table IV: Holding Registers for BARRACUDA MODEL 4010BR (continued)

Register	Number of Registers Used	Variable Name	Name	Type	Comment
69	1	A0RJ1	Analyzer Configuration	16-bit Unsigned Integer	
70	8	A0RL0	Analyzer Serial Number	String	
78	8	A0RL0	Analyzer Tracking Number	String	
86	8	A0RL2	Analyzer User ID	String	
94	8	A0RL3	Analyzer Laser S/N	String	
102	10	A0RM0	Latest Startup Info	String	
112	2	A0RN0	Write Com ID	String	
114	1	A0RN1	Modbus ID	16-bit Unsigned Integer	
115	10	A0RO0	Low Power Event	String	
125	1	A0RP0	RTC Seconds	16-bit Unsigned Integer	
126	1	A0RP1	RTC Minutes	16-bit Unsigned Integer	
127	1	A0RP2	RTC Hours	16-bit Unsigned Integer	
128	1	A0RP3	RTC DOW	16-bit Unsigned Integer	
129	1	A0RP4	RTC DOM	16-bit Unsigned Integer	
130	1	A0RP5	RTC Month	16-bit Unsigned Integer	
131	1	A0RP6	RTC Year	16-bit Unsigned Integer	
132	1	A0RP7	Log Interval	16-bit Unsigned Integer	
133	1	A0RT0	Block Temperature +26	16-bit Unsigned Integer	
134	1	A0RT2	Pressure x 10000 (bar)	16-bit Unsigned Integer	
135	1	A0RT3	Power Voltage x 100	16-bit Unsigned Integer	
136	1	A0RU0	Hours of Operations	16-bit Unsigned Integer	
137	1	A0RW0	Alarm Pulse Time	16-bit Unsigned Integer	
138	1	A0RX0	Delay on for Alarm 1	16-bit Unsigned Integer	
139	1	A0RY0	Delay on for Alarm 2	16-bit Unsigned Integer	
140	1	A0RZ0	Alarm Hold of Time	16-bit Unsigned Integer	

ADVANCED MICRO INSTRUMENTS

HIGH PERFORMANCE **RELIABILITY** **INTUITIVE DESIGN**

www.***amio2***.com

Tel 714.848.5533
Fax 714.848.4545

OM-300-019 Rev B
04/12/2023

ADDRESS:

Advanced Micro Instruments, Inc.
225 Paularino Avenue
Costa Mesa, CA 92626