

**Modbus communication module for TCX2: AEX-MOD**

**Features**

- RS485 3-wire MODBUS standard in accordance to EIA/TIA 485
- Slave type of communication
- Supports up to 127 nodes on one network
- Galvanic isolated bus connection
- LED indicators
- Selectable transmission types:
  - RTU with CRC16 checksum
  - ASCII with LRC checksum
- Baud rates: 4800, 9600, 19200, 38400
- Parity: No parity, odd or even parity
- Default: RTU with 8 data bits, 1 even parity bit, 1 stop bit. Baud rate 19200

**Communication type**

By default, RTU uses 8 data bits, 1 parity bit with even parity and 1 stop bit; ASCII mode uses 7 data bits, 1 parity bit with even parity, and 1 stop bit.

Both modes support "No Parity" mode, in these cases a 2<sup>nd</sup> stop bit is used to keep the byte length (11bit for RTU and 10 bit for ASCII, including the start and stop bits) unchanged in accordance with the Modbus specification. Other possible serial port modes like Odd Parity or baud rates other than listed ones are not supported.

**Supported Modbus commands:**

- 03 (0x03): Read multiple registers
- 06 (0x06): Write single register
- 16 (0x10): Write multiple registers

In commands 03 and 16 the allowed number of registers ranges from 1 to 32. Although Modbus specification would allow more registers to be read and written, a maximum of 32 Modbus registers are supported in one packet. One Modbus register is 16 bits wide. The Modbus slave transmits the values as signed 16 bit integers. The least significant digit of the transmitted number is always the first digit below the decimal point, and this results in the following range of numbers that the slave module is able to transmit: from -9999.9 to 9999.9

In an event of an out-of-range command addressing or an unsupported command, the Modbus slave responds with an exception message according to the Modbus specification.

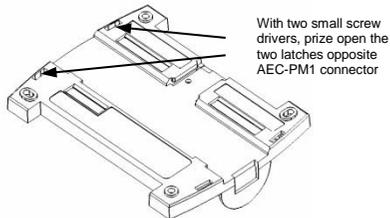
**LED indicators**

The Modbus slave features a green LED and a red LED for indication of traffic on the RS-485 bus. The green LED is lit when an incoming packet is received, and the red LED is lit when an outgoing packet is transmitted to the bus. At power-up, both LED blink twice simultaneously as a sign of the boot process being completed. A constantly lit LED serves as an indication of a fault condition in the reception or sending process.

**Assembly**

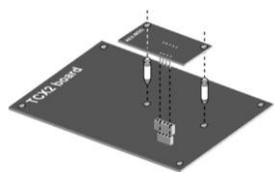
The steps outlined below are only required if the communication plug in is to be added to a standalone controller. A clean and ESD compliant working environment is required. If you are unsure about this procedure, contact your nearest dealer.

- Disconnect all wires from the controller and remove it from its mounted position
- Turn controller around:



With two small screw drivers, prize open the two latches opposite AEC-PM1 connector

- Carefully separate the lower housing from the upper housing,
- Insert the two columns first into the large holes on either corner of the AEX-MOD
- Then match the two connectors of the AEX-MOD with their counterparts of the main board.

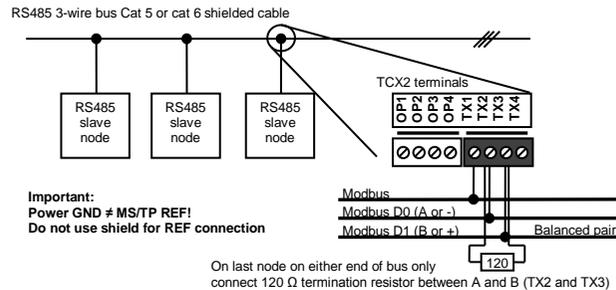


Lower the plug-in carefully until the two columns connect with their placement hole with an audible click

- Bend the two latches of the upper part slightly outwards and re-assemble the upper part with the lower part of the housing. Make sure the four latches connect save and the housing is secured.

**Technical specification**

<b>Power supply</b>	Power requirements	5 VDC ± 5%, 10 mA max.	
<b>Network</b>	Hardware interface	RS485: 3-wire Modbus over RS485 in accordance with EIA/TIA 485	
	Max nodes	127 devices may be connected on one network	
	Cabling	Twisted Shielded Pair (TSP) cable category 5 or 6. Balanced 100 to 120 Ω	
	Impedance		
	Nominal capacitance	50 pF/m 16pF/ft. or lower	
<b>Galvanic isolation</b>	Nominal velocity	65% or higher	
	Galvanic isolation	The output circuitry of the AEX-BAC module is 100% galvanic isolated, which prevents ground loops between Modbus connected nodes.	
<b>Line termination</b>	Line termination	A line termination resistance (120 ohm) shall be connected between the terminals A and B of the furthest slave (relatively from the Modbus master) node of the network	
	Line polarization	The device supports fail-safe biasing. See below for details	
<b>Terminals on TCX2</b>	Terminals on TCX2	TX1 is RS-485 Modbus common TX2 is RS-485 Modbus D0 (A or -) TX3 is RS-485 Modbus D1 (B or +) TX4 is not used	
	<b>Modbus</b>	Communication standard	Modbus (www.modbus.org)
	Default setting	19200 Baud rate, RTU 8 data bits, 1 even parity bit, 1 stop bit	
	Communication speed	4800, 9600, 19200, 38400	
<b>Protocol</b>	Protocol	RTU with CRC16 checksum ASCII with LRC checksum	
	Parity bit	no parity, even or odd parity	
<b>Environment</b>	Operation	To IEC 721-3-3	
	Climatic conditions	class 3K5	
	Temperature	0...50 °C (32...122 °F)	
	Humidity	< 95 % RH non-condensing	
	Transport & storage	To IEC 721-3-2 and IEC 721-3-1	
<b>Climatic conditions</b>	Climatic conditions	class 3K3 and class 1K3	
	Temperature	-25...70 °C (-13...158 °F)	
<b>Humidity</b>	Humidity	<95 % RH non-condensing	
	Mechanical conditions	class 2M2	
<b>Standards</b>	conformity	CE	
	EMC directive	2004/108/EC	
	Low voltage directive	2006/95/EC	



**Fail-safe biasing:**  
The device supports fail-safe biasing (line polarization), 680 Ω per wire, maximum 1 set per RS485 segment.  
- One pull-up resistor to a 5V Voltage on D1 circuit,  
- One pull-down resistor to the common circuit on D0 circuit. This should be done only once at the master only. The value of those resistors must be between 450 Ω and 680 Ω. 680 Ω resistors value may allow a higher number of devices on the serial line bus.  
**Shield connection:**  
The shield of the wire must not be used to connect to the REF terminal. Connect all the shields together and ground in one single point on the network. Make sure the shields do not accidentally touch the ground.  
Multiple ground connections induce noise and affect communication.

**Configuration of AEX-MOD**

The communication parameters may be set via TCX2-OP controllers or OPA2 terminals once the device is plugged in the TCX2 base. Login to the controller as follows:

1. Press UP/DOWN buttons simultaneously for three seconds. The display will show firmware version and revision number. Press the OPTION button to start login.
2. CODE is shown in small display.
3. Select 241 using UP/DOWN buttons.
4. Press OPTION after selecting the correct code.
5. Once logged in with 241 control modules are displayed (Lp1, Lp2, 1u, 2u, etc.) – select with UP/DOWN the communication parameters CO and open with OPTION. As soon as the module is open its parameters are displayed.
6. Select the parameters with the UP/DOWN buttons. Change a parameter by pressing the OPTION button. Three arrows are displayed to indicate that the parameter may be modified. Use UP/DOWN buttons to adjust the value.
7. After you are done, press OPTION to save the new value and return to the selection level (arrows disappear when selection is saved). Pressing left hand POWER button without pressing OPTION will discard the value and return without saving. For control parameters press POWER again to leave parameter selection and return to control module selection.
8. Press the POWER to leave the menu. The unit will return to normal operation if no button is pressed for more than 5 minutes.

**COM parameters**

Parameter	Description	Range	Default
CO 00	Bus plug-in id (read only)	0...255	1
CO 01	Bus plug-in software version (read only)	0...255	-
CO 02	Bus plug-in software revision ( read only)	0...255	-
CO 03	Communication address (must be unique in network)	1...127	1
CO 04	Baud rate: 0 = 19200 1 = 4800 2 = 9600 3 = 19200 4 = 38400	0...255	0
CO 05	Parity mode 0 = NO parity 1 = EVEN parity 2 = ODD parity	0...255	1
CO 06	Mode of communication 0 = RTU 1 = ASCII	0...255	0
CO 07	Allow changing of static settings through communication 0 = Not allowed 1 = Allowed	0...255	1
CO 08	Modbus address base mode 0 = Modbus addresses are "Base 0" 1 = Modbus addresses are "Base 1" (PLC style)	0...255	0
CO 09	User definable data storage address 00	0...255	255
CO 10	User definable data storage address 01	0...255	255
CO 11	User definable data storage address 02	0...255	255
CO 12	User definable data storage address 03	0...255	255
CO 13	Not used	0...255	255
CO 14	Not used	0...255	255
CO 15	Automatic address increase. If enabled the address will automatically increase when parameters are automatically loaded at power up using AEC-PM1 in auto load mode. This is useful when setting up controllers for a large network. This way the installer will not have to login manually and set the network address for each controller. 0 = Auto increment function is disabled 1 = Auto increment function is enabled	0, 1	0

- ➔ **Automatic address increase function:**  
When this function is enabled and an automatic AEC-M1 parameter load is executed at power up of the controller, the communication address on CO 03 is incremented and written back to the AEC-PM1 unit.  
It is incremented only if the value is not already set to 127.
- ➔ **Changing address register through broadcast message:**  
It is not possible to change network address register through broadcast message.

**Product Documentation**

Download the latest product documentation including description of objects as well as dynamic and static values online:  
English International: [www.vectorcontrols.com/download/AEX/70-00-0290\\_AEX-MOD\\_V1-2.pdf](http://www.vectorcontrols.com/download/AEX/70-00-0290_AEX-MOD_V1-2.pdf)