Supplementary manual

Modbus RTU module (RS485)

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Principles

Together with the CAN bus converter CAN-BC2, this module provides the link between the CAN bus from Technische Alternative and the Modbus RTU. In addition, an M-Bus interface is available to connect up to 4 M-Bus meters.

It is programmed using TAPPS2 software.

The CAN-BC2 including MD-MODB can be operated via the UVR16x2 controller, CAN-MTx2 or the C.M.I. interface.

The same minimum system requirements apply as for the CAN bus converter CAN-BC2.

This manual describes only the features that are relevant to this module. The CAN-BC2 manual contains all other relevant information for the CAN bus converter.
Installation and connection

1. Attach the 2 supplied spacers to the PCB of the CAN-BC2.

2. The module is attached to the pins provided on the PCB of the CAN-BC2. The spacers ensure the correct distance to the converter PCB. The module may only be installed when the CAN-BC2 is switched off.

3. Connect the Modbus cable, taking note of the polarity (A/+1, B/-2) and/or connection of the M-Bus cable.

Each Modbus network must be provided with a 120 Ω bus terminator at the first and last network node (termination with plug-in jumper). A Modbus network therefore always has two terminators (one at each end).

The Modbus cable must be routed in accordance with Modbus specifications. Information about the M-Bus cable can be found in the CAN-BC2 manual.
Modbus RTU 485 interface

The Modbus RTU is designed to read data from or write data to defined data areas of a device. The information about which data is located in which data area varies from device to device. In order to be able to contact the Modbus RTU, the Modbus settings must first be defined (baud rate, parity and stop bits).

This module is only suitable for communication via RS485.

Communication then proceeds using the master/slave system. Communication always begins with the master sending a request. Every slave has an address that must only be assigned once. If a slave detects that its address has been contacted by the master, it sends a response. The slaves cannot communicate with one another. They cannot initiate communication with the master either.

It is possible to transmit 64 values in each direction (Modbus ⇒ CAN and CAN ⇒ Modbus).

Programming with TAPPS2

To program a bus converter with Modbus module, the right device type must be selected.

If the module is retrofitted to the bus converter and the bus converter (without module) has already been programmed, the following procedure must be followed to continue programming (with module):

1. Open the existing program (without module).
2. Create a new drawing for the device type with the relevant auxiliary module (CAN-BC2-MODB).
3. Select (Ctrl + a) and then copy (Ctrl + c) the whole content of the existing drawing.
4. Paste (Ctrl + v) the copied drawing into the new drawing (with module).
5. Create function data (*.dat file) for the existing program (without module) (“Export”).
6. Import this function data into the new drawing (with module).

This will result in all settings from the original program being applied to the new drawing and you can then continue programming the auxiliary module.
Settings for M-Bus inputs of the module
These settings are made together with the 4 inputs of the bus converter. The entire unit can therefore read data from up to 8 M-Bus meters. The settings are described in the bus converter manual.

Device settings for Modbus
These settings can also be made in the "File / Settings / Device settings..." menu:

Master mode
Master/Slave: Select Master
Baud rate: Adjustable from 1200 to 38400 Baud
Parity: Select: Even / Odd / None
Stop bits: Select: 1 or 2

Slave mode
Master/Slave: Select Slave
Device: In slave mode, the device number (1-247) of the bus converter in the Modbus network must also be defined.

The structure of the connected Modbus network must be known to be able to make device settings.
Modbus inputs

Up to 64 Modbus inputs can be programmed. The Modbus inputs are then available as sources to the other bus outputs, the function input variables, visualisation or datalogging.

General – Type

Choose whether the value applied by the Modbus is analogue (numeric) or digital (ON/OFF).

Designation

Every Modbus input can be given its own designation. The designation can be selected from various designation groups or can be user defined.

Example:

<table>
<thead>
<tr>
<th>Designation</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Des. group</td>
<td>Temperature actual value</td>
</tr>
<tr>
<td>Des. index</td>
<td>1</td>
</tr>
</tbody>
</table>

General – information about Modbus source

Entry of the properties of a value that is to be applied by the bus converter. This requires precise knowledge of the Modbus properties of the source.

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Analogue</td>
</tr>
<tr>
<td>Device</td>
<td>1</td>
</tr>
<tr>
<td>Function</td>
<td>3 - Read holding register</td>
</tr>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Data type</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>Byte sequence</td>
<td>Big-endian</td>
</tr>
<tr>
<td>Interval time</td>
<td>00:10 [mm:ss]</td>
</tr>
<tr>
<td>Divisor</td>
<td>1</td>
</tr>
<tr>
<td>Factor</td>
<td>1</td>
</tr>
</tbody>
</table>

Device / Function / Address

**Master mode:** Details of the Modbus device (slave) from which the values are taken.

**Slave mode:** The device's own number is given in the device settings. The function is defined according to the input type selected. The address of the module is issued automatically and counts upwards irrespective of the input number and type.

Data type / Byte sequence

Only for analogue values: Details about the data type of the device from which the value is applied.

Interval time

The readout intervals can be adjusted from 10 seconds to 30 minutes (only possible in master mode).

Divisor / Factor

Only for analogue values: Entry of a divisor or factor to adjust the applied value to the actual quantity (e.g. correct positioning of the decimal point).
Unit

<table>
<thead>
<tr>
<th>Unit</th>
<th>Temperature °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sensor correction</td>
<td>0.0 K</td>
</tr>
<tr>
<td>Start value</td>
<td>0.0 °C</td>
</tr>
</tbody>
</table>

Every Modbus input must be assigned a **unit** as the data is transmitted without dimensions. A wide range of units is available to choose from.

**Sensor correction**
The value of the Modbus input can be corrected by applying a fixed differential value.

**Start value**
Definition of a start value which is shown after the bus converter is restarted until a new value is applied by the Modbus.

**Sensor check**
The sensor check can only be activated for **analogue** Modbus inputs.
If you set the sensor check to "**Yes**", the **sensor error** of the Modbus value is available as a digital input variable for a function.
This application is only useful if **user defined** threshold and output values are specified for the sensor error.

<table>
<thead>
<tr>
<th>Sensor check</th>
<th>Yes</th>
</tr>
</thead>
</table>

**Sensor error**
This setting is only displayed if the **sensor check is active**.
**Sensor error**: Status "**No**" for a correct value **within** the threshold values and "**Yes**" for a value **outside** the thresholds. This allows the controller to react to the failure of a Modbus device, for example.

<table>
<thead>
<tr>
<th>Sensor check</th>
<th>Yes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Short circuit threshold</td>
<td>Standard</td>
</tr>
<tr>
<td>Threshold value</td>
<td></td>
</tr>
<tr>
<td>Short circuit value</td>
<td>Standard</td>
</tr>
<tr>
<td>Output value</td>
<td></td>
</tr>
<tr>
<td>Lead break threshold</td>
<td>Standard</td>
</tr>
<tr>
<td>Threshold value</td>
<td></td>
</tr>
<tr>
<td>Lead break value</td>
<td>Standard</td>
</tr>
<tr>
<td>Output value</td>
<td></td>
</tr>
</tbody>
</table>

In order to make good use of the sensor check, the short circuit and lead break thresholds should be changed from "Standard" to "**User defined**" and the required threshold values defined. The required short circuit and lead break values will subsequently also be defined by the user.

If the measurement read is **below** the defined **short circuit threshold** or **exceeds** the **lead break threshold**, the relevant **output values** will be applied instead of the measurement.

By selecting suitable thresholds and output values, a fixed value can be specified for the bus converter in the event of a measurement failure, to allow a function to continue operating in emergency mode (fixed hysteresis: 10 or 1.0 °C).

The short circuit threshold can only be defined **below** the lead break threshold.
Example: Temperature

If the measurement is below 5 °C, 20 °C will be issued; if it exceeds 40 °C, 20 °C will also be issued.

Depiction of an analogue Modbus input in **master** mode once the parameter entries have been completed by pressing **OK** in **TAPPS2**

<table>
<thead>
<tr>
<th>Input number</th>
<th>Device number of the slave</th>
<th>Function</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus Inp. 1 (5 / 3 / 0) T.heating circ. flow</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Designation</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Depiction of an analogue Modbus input in **slave** mode

<table>
<thead>
<tr>
<th>Device number of the slave</th>
<th>Function</th>
<th>Address</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus Inp. 2 (1 / 6 / 1) T.heating circ. rtn</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Device number 1 of the module was defined in the device settings. The function and address of the input are issued automatically. Input 2 is an analogue input (function 6) and is given address 1.
Modbus outputs

Up to 64 Modbus outputs can be programmed. They are defined by specifying the source in the bus converter, the type and the Modbus properties.

General – Type

Choose whether the value is analogue (numeric) or digital (ON/OFF).

Designation

Every Modbus output can be given its own designation. The designation can be selected from various designation groups or can be user defined.

Example:

<table>
<thead>
<tr>
<th>Gerät</th>
<th>Parameter</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bez.-Gruppe</td>
<td>Temperatur Istwert</td>
</tr>
<tr>
<td>Bezeichnung</td>
<td>T.Heizkreis RL</td>
</tr>
<tr>
<td>Bez.-Index</td>
<td>1</td>
</tr>
</tbody>
</table>

Input variable

After the source has been linked to the input variables in TAPPS2, the source type, source and variable will be shown.

Variable

4 different source variables can be selected for analogue values. For digital values, only the measurement (ON/OFF) and the network error are available.

- **Measurement** – the value captured by the sensor
- **RAS mode** – subject to the setting of the switch on the room sensor (RAS, RASPT, RAS-PLUS, RAS-F), the following analogue values will be issued:
  - Automatic 0
  - Standard 1
  - Lowered 2
  - Standby 3
- **Sensor error** – digital value; ON if a sensor error occurs
- **Network error** – digital value; ON if a timeout is active (= error).
**General – information about properties**

<table>
<thead>
<tr>
<th>General</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td>Analogue</td>
</tr>
<tr>
<td>Device</td>
<td>1</td>
</tr>
<tr>
<td>Function</td>
<td>6 - Preset single register</td>
</tr>
<tr>
<td>Address</td>
<td>1</td>
</tr>
<tr>
<td>Data type</td>
<td>16-bit signed integer</td>
</tr>
<tr>
<td>Byte sequence</td>
<td>Big-endian</td>
</tr>
<tr>
<td>Divisor</td>
<td>1</td>
</tr>
<tr>
<td>Factor</td>
<td>1</td>
</tr>
</tbody>
</table>

Entry of the properties of the **target device** which the value from the bus converter will be issued to (**Master mode**), and definition of the data type (**analogue** only). This requires precise knowledge of the Modbus properties of the target device.

**Device / Function / Address**

**Master mode**: These details relate to the target device (slave) and are therefore only available in **master** mode.

**Slave mode**: The device’s own number is given in the device settings. The function is defined according to the input type selected. The address of the module is issued automatically and counts upwards irrespective of the input number and type.

**Data type / Byte sequence**

Only for **analogue** values: Details on the data type of the value issued in the bus converter (matched to the target device)

**Divisor / Factor**

Only for **analogue** values: Entry of a divisor or factor to adjust the value issued to the target device. Only whole numbers without a unit can be issued to the Modbus. Example: “375” is issued for 37.5 °C. If only “37” is to be issued, a divisor of 10 should be entered.

**Transmission conditions**

These details apply to the conditions under which values are issued to the target device.

They are only available in **master** mode.

**Analogue values:**

<table>
<thead>
<tr>
<th>Transmission conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>If change</td>
<td>10</td>
</tr>
<tr>
<td>Blocking time</td>
<td>00:00 [mm:ss]</td>
</tr>
<tr>
<td>Send in intervals</td>
<td>Yes</td>
</tr>
<tr>
<td>Interval time</td>
<td>5 min</td>
</tr>
</tbody>
</table>

**Digital values:**

<table>
<thead>
<tr>
<th>Transmission conditions</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>If change</td>
<td>Yes</td>
</tr>
<tr>
<td>Blocking time</td>
<td>00:00 [mm:ss]</td>
</tr>
<tr>
<td>Send in intervals</td>
<td>Yes</td>
</tr>
<tr>
<td>Interval time</td>
<td>5 min</td>
</tr>
</tbody>
</table>

| If change > 10 | A new transmission will be made if the current value has changed by more than the quantity specified (1.0 K in this example) compared to the last transmitted value. In the converter, the unit of the source is applied together with the corresponding decimal place. (Minimum value: 1) |
| If change Yes/No | Transmission of the value if a status change occurs |
| Blocking time 00:10 [mm:ss] | If the value changes within 10 seconds of the last transmission by more than 1.0 K, the value is nevertheless only transmitted again after 10 seconds. (Minimum value: 1 sec) |
| Send in intervals Yes | The value is transmitted every 5 minutes even if it has not changed by more than 1.0 K since the last transmission (minimum setting: 1 minute). |
| Interval time 5 min | Setting range: 1 to 59 min |
Depiction of the digital Modbus output in **master** mode once the parameter entries have been completed by pressing **OK** in **TAPPS2**

<table>
<thead>
<tr>
<th>Device number</th>
<th>Designation</th>
<th>Source</th>
<th>Destination</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAN</td>
<td>Digital 1 (1/1)</td>
<td>Htg circ. pump</td>
<td>Modbus Outp. 1 (5/5/8801)</td>
</tr>
</tbody>
</table>

Depiction of an analogue Modbus output in **slave** mode

**Modbus Outp. 2 (1/4/2)**

T.DHW

Device number 1 of the module was defined in the device settings. The function and address of the output are issued automatically. Output 2 is an analogue output (function 4) and is given address 2.
C.M.I. menu

Modbus

Modbus settings

The structure of the connected Modbus network must be known to be able to make device settings. The CAN-BC2 can be operated in master or slave mode.

Master mode

<table>
<thead>
<tr>
<th>Modbus settings</th>
<th>Master/Slave</th>
<th>Master</th>
</tr>
</thead>
<tbody>
<tr>
<td>Baud rate</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>Even</td>
<td></td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Baud rate: Adjustable from 1200 to 19,200 Bd
Parity: Select: Even / Odd / None
Stop bits: Select: 1 or 2

Slave mode

<table>
<thead>
<tr>
<th>Modbus settings</th>
<th>Master/Slave</th>
<th>Slave</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Baud rate</td>
<td>1200</td>
<td></td>
</tr>
<tr>
<td>Parity</td>
<td>Even</td>
<td></td>
</tr>
<tr>
<td>Stop bits</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>

Device: In slave mode, the device number (1-247) of the bus converter in the Modbus network must also be defined.
Modbus input in master mode

The setting options are described in chapter "Programming with TAPPS2".

**Exception Code**
Fault code for retrieval problems with the slave device. The code is not renewed until the interval time has expired.

**Exception code displays**

**OK**
The value was successfully retrieved from the slave device

**No respond**
No response from the slave device. Causes: Modbus settings do not match the slave device, incorrect slave device number, incorrect wiring or termination

**Other displays**
Slave device fault messages
Modbus output in master mode

The setting options are described in chapter "Programming with TAPPS2".

Exception Code
Fault code for retrieval problems with the slave device. The code is not renewed until the interval time has expired.
Exception code displays

OK
The value was successfully retrieved from the slave device

No respond
No response from the slave device. Causes: Modbus settings do not match the slave device, incorrect slave device number, incorrect wiring or termination

Other displays
Slave device fault messages

Special case: If "Acknowledge" is displayed, the slave device needs more time to process the value but is showing that value has been received. This display is therefore not really a fault message.

Modbus input and output in slave mode
Apart from the exception code and the device setting options, the displays in slave mode are identical to those in master mode.
EU Declaration of Conformity

Document number / Date: TA17067 / 23/03/2017
Manufacturer: Technische Alternative RT GmbH
Address: A-3872 Amaliendorf, Langestrasse 124

The manufacturer bears sole responsibility for issuing this Declaration of Conformity.

Product designation: MD-MODB
Brand names: Technische Alternative RT GmbH
Product description: Modbus module for CAN bus converter

The item described above complies with the following directives:
2014/35/EU Low Voltage Directive
2014/30/EU Electromagnetic compatibility
2011/65/EU RoHS directive on restricting the use of certain hazardous substances

The following harmonised standards have been applied:
EN 60730-1: 2011 Automatic electrical controls for household and similar use. Part 1: General requirements
   +A1: 2011 Emission standard for residential, commercial and light-industrial environments
   + AC2012
EN 61000-6-2: 2005 Electromagnetic compatibility (EMC) – Part 6-2:
   + AC2005 Generic standards – Noise immunity for industrial environments
EN 50581: 2012 Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances

Attachment of CE label: On packaging, operating instructions and type plate

Issued by: Technische Alternative RT GmbH
A-3872 Amaliendorf, Langestrasse 124

Authorised signature

Dipl.-Ing. Andreas Schneider, Managing Director,
23/03/2017

This declaration certifies conformity with the listed directives, but does not guarantee any properties. The safety instructions in the product documents supplied must be observed.
Guarantee conditions

Note: The following guarantee conditions do not limit statutory rights to a warranty, but rather expand your consumer rights.

1. Technische Alternative RT GmbH provides a two-year guarantee from the date of purchase to the end user for all devices and parts it sells. Defects must be reported immediately upon detection and within the guarantee period. Technical support can supply the correct solution no matter what the issue. In this respect, contacting us immediately will help to avoid unnecessary expense and effort in troubleshooting.

2. The guarantee includes free repair (but not the cost of on-site fault finding, removal, refitting and shipping) due to processing and material defects which impair operation. Goods will be replaced in the event that a repair is uneconomical in the opinion of Technische Alternative for reasons of cost.

3. Excluded are losses resulting from the effects of a voltage surge or abnormal ambient conditions. Likewise, no liability can be accepted if the device defect is due to: transport damage for which we are not responsible, incorrect assembly and installation, incorrect use, failure to observe the operating and installation instructions or incorrect maintenance.

4. The guarantee will become void if repairs or actions are carried out by people who are not authorised to perform them or have not been so authorised by us, or if our devices are operated with spare parts, auxiliary parts or accessories that are not considered to be original parts.

5. Faulty parts must be returned to our factory with a copy of the proof of purchase and a precise fault description. Processing is accelerated if an RMA number is requested via our homepage www.ta.co.at. The defect must be clarified with our technical support beforehand.

6. Services provided under guarantee result neither in an extension of the guarantee period nor in a commencement of a new guarantee period. The guarantee period for fitted parts ends with the guarantee period of the whole device.

7. Further or other claims, especially those for compensation for losses other than to the device itself, insofar as such liability is not required by statute, are excluded.

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Technische Alternative RT GmbH
A-3872 Amaliendorf Langestrasse 124, Austria
Tel ++43 (0)2862 53635 Fax ++43 (0)2862 53635 7
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