MARTEM
KAUGJUHTIMISSÜSTEEMID
TELECONTROL SYSTEMS

RTU DIGITAL OUTPUT MODULE TELEM-DO5-T
User manual

Martem AS
2010

Preface

This document, User Manual edition 1.1 for RTU Digital Output Module TELEM-DO5-T version 1.0, provides a general technical description of the module, its configuration and use. Although we have carefully checked the contents of this publication for conformity with the hardware and software described, we cannot guarantee complete conformity since errors cannot be excluded**.** The information provided in this manual is checked at regular intervals and any corrections that might become necessary are included in the next releases. Any suggestions for improvement are welcome.

The RTU Digital Output Module TELEM-DO5T has been designed and manufactured according to the quality principles of ISO 9001.

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Contents

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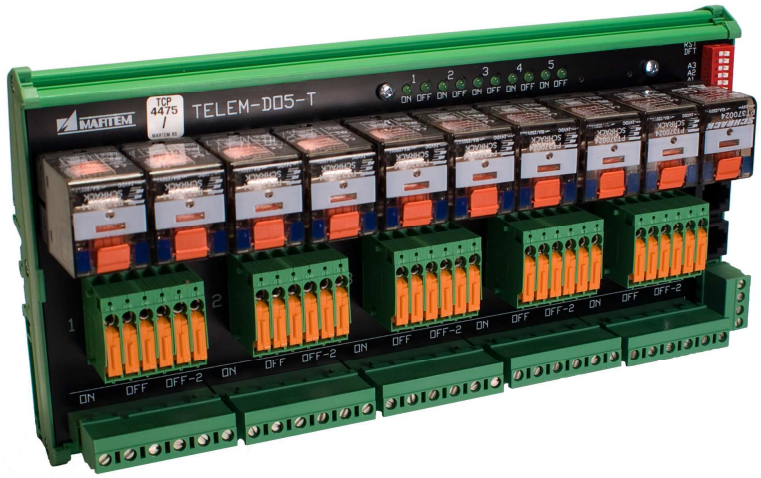
1. Application

RTU (Remote Terminal Unit) TELEM-DO5-T digital output module is used to perform OPEN and CLOSE operations. The functionality of the module allows it to be used for distributed process automation in supervision, control and data acquisition systems (SCADA) where excellent noise immunity with respect to environmental and electromagnetic influences is important. It may be used as a standalone device or in a daisy chain connection with other modules.

2. Construction

The mechanical design is based on a plastic enclosure that can be readily mounted on 35-mm rails.

The TELEM family RTU module TELEM-DO5-T with fixed or changeable relay outputs for control operation of 5 objects (+ 3 objects with external relays). The module is based on 32-bit ARM CPU. Interfaces to other equipment are RS-232 or RS-422. Data exchange protocol IEC 60870-5-1-101.



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3. Features

- Configuration / parameterization with the IEC 60870-5-101 protocol using the Configuration Tool.
- Adjustable Control pulse length 20ms …1min.
- Daisy chain master – slave connection of up to 15 same type of modules using RS- 422 interface and up to 45 different type of modules
- Self diagnostics and supervision simultaneously with data acquisition
- Operation execution control
- Relay coil impedance control before the control operation
-
- Fixed or changeable relay sockets
- Relay for ON and OFF operations has two contacts in series

4. Technical Data

Number of controllable objects	5 (+3)
Number of outputs for every objects	1 output for ON operation, 2 for OFF/TRIP operation
Output relay max. capacity	2500 VA
Indication	2 for every output, 1 for a running indication, 1 red for an alert indication
External relay coil impedance	400- 900 Ohm
External relay coil voltage	24 V DC

Power requirements

Supply voltage for main board and relays	24 V DC, 4 VA
Fuse protection	24 V 0,1A (resettable)

Installation, terminals and environment

Weight	761 g
Mounting	DIN 35
Dimensions (WxHxD)	250 x 60 x 64
Terminals for signal	GMVSTBW 2,5/6-ST
Cross section of wires for signal	Max. 2,5 mm2
Cross section of wires for power	Max. 2,5 mm2
Over voltage protection	IEC-60255-4, 5 kV pulse protection IEC-60255-5, 2 kV DC on
Disturbance	IEC-61000-3-2, 61000-6-2, 6100-6-4
Ambient temperature in operation	–20…+50℃

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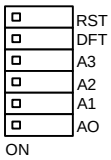
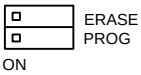
5. Mode Switches and Indication LED

5. 1 Mode Switches

Mode of operation, address of the module and the default settings are determined using switches on the board



RST - ON - reset the device
DFT - ON - restores the default setup after a reset (see 7.1 and 7.2)
A0 - A3 - determines the address of the module in binary



ERASE - ON erases the frame program **(be careful)**
PROG - ON loads a new frame program

5.2 Indication LEDs

Indication LEDs display the state of the device:

Indication LEDs display the state of the device:
ALERT – fired, error state
RUN – blinking fire/unfired 1/1, normal operation and synchronized by an internal clock,
RUN – blinking fired /unfired 1/9, normal operation and synchronized by a gateway

SIGNAL STATE – green fired, signal is activated, polarity of signal voltage normal,
SIGNAL STATE – red fired, signal is activated, polarity of signal voltage inversed

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5.3 Setting an address

A0	A1	A2	A3	Address
on	off	off	off	1
off	on	off	off	2
on	on	off	off	3
off	off	on	off	4
on	off	on	off	5
off	on	on	off	6
on	on	on	off	7
off	off	off	on	8
on	off	off	on	9
off	on	off	on	10
on	on	off	on	11
off	off	on	on	12
on	off	on	on	13
off	on	on	on	14
on	on	on	on	15
off	off	off	off	16

6. Communication

- Transmission rate — 200…38400 bit/s (default 9600 bit/s)
- Communication mode — asynchronous data bits 8, parity N, stop bits 1
- Communication interface — selectable RS232, RS422 or RS485
- Communication protocol — IEC60870-5-101 slave/master, unbalanced
- Link address length — 1 byte
- ASDU address length — 2 byte
- Object address length — 2 byte
- GPS time synchronization input — 9600 bps (RS422/485 RX),
- Time synchronization protocol — ASCII (Motorola), device TLM-
- Communication interface isolation — optically to 2,5kV RMS

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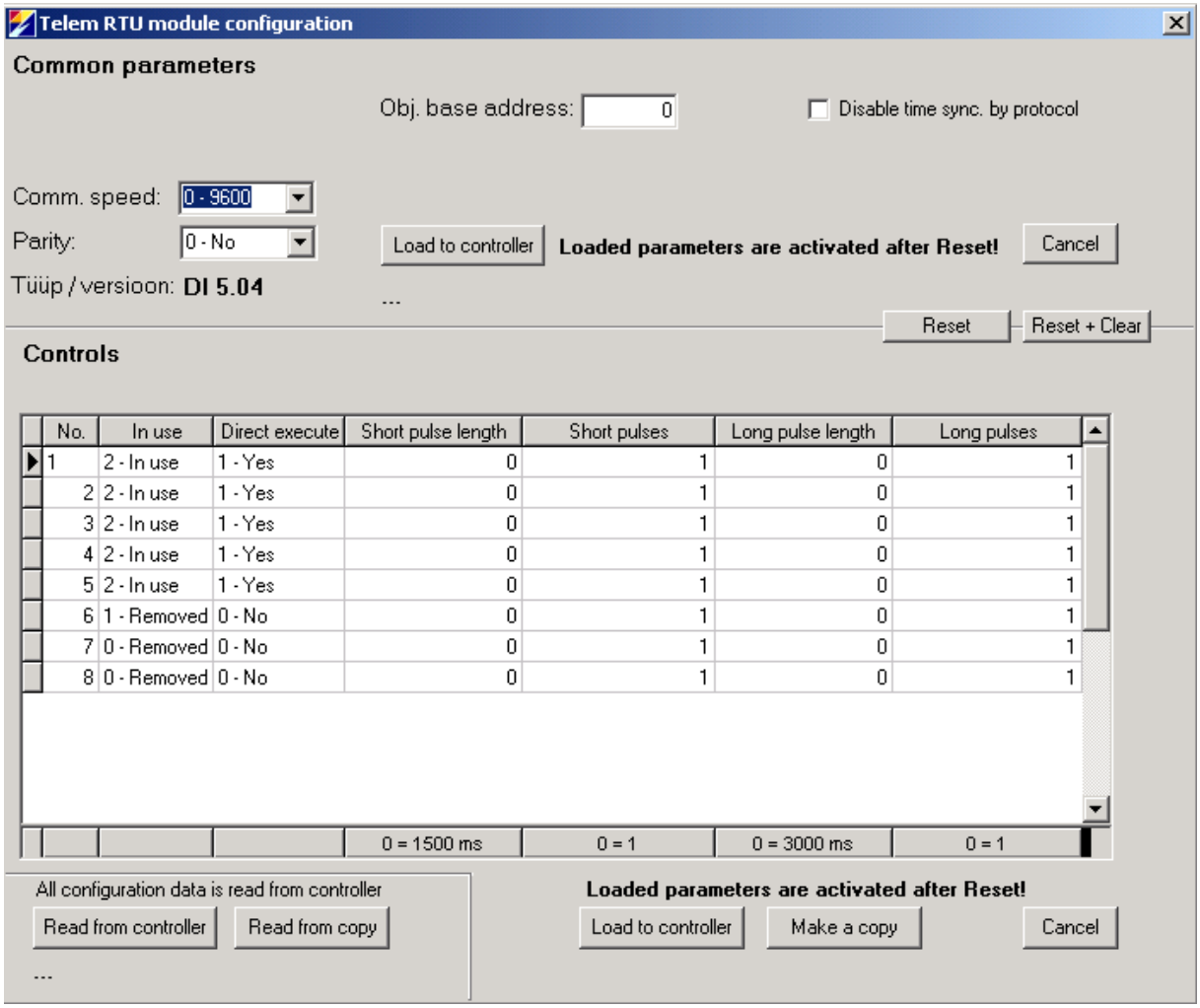
7. Configuration

7.1. Configuration Parameters for a Module

RTU Module is configurable by Telem configuration software or by other configuration software that supports the IEC60870-5-101 protocol. Configuration parameters are altered using the parameter setting commands of the IEC60870-5-101 protocol. Specification of parameter setting commands for this module is available on request. Telem-2000 RTU configuration software runs under Windows 95, 98, 2000, XP and NT4.0 operating systems on any standard PC, communicates via COM port interface and performs the following principal functions:

- Configuration / parameterization of Telem RTU modules
- Back up of RTU configuration data
- Diagnostics and real-time supervision simultaneously with data acquisition.



TELEM-DO5-T configuration tab card

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Parameter	Value	Default value (in cell)
1. Communication speed	200 – 38400 bps	9600
2. Link Address	1-255	1
3. ASDU address	1-255	1
4. Base address of the objects	0-65534	0
5. Communication mode	Online	Online
	Online with RTS/CTS	
	Offline with RTS/DCD	
6. GPS enabled	Yes/No	Yes
7. Buffer depth for each command		20

7.2 Configuration Parameters for Digital Outputs

Parameter	Value	Default value (in cell)
1. In use	Yes/No	No
2. Control mode (Direct execute)	Select and execute	Select and
	Execute	execute (0)
3. Short pulse duration	20-65535 ms	1500 ms (0)
4. Number of short pulses	1-256	1 (1)
5. Long pulse duration	20-65535 ms	2000 ms (0)
6. Number of long pulses	1-256	1 (1)

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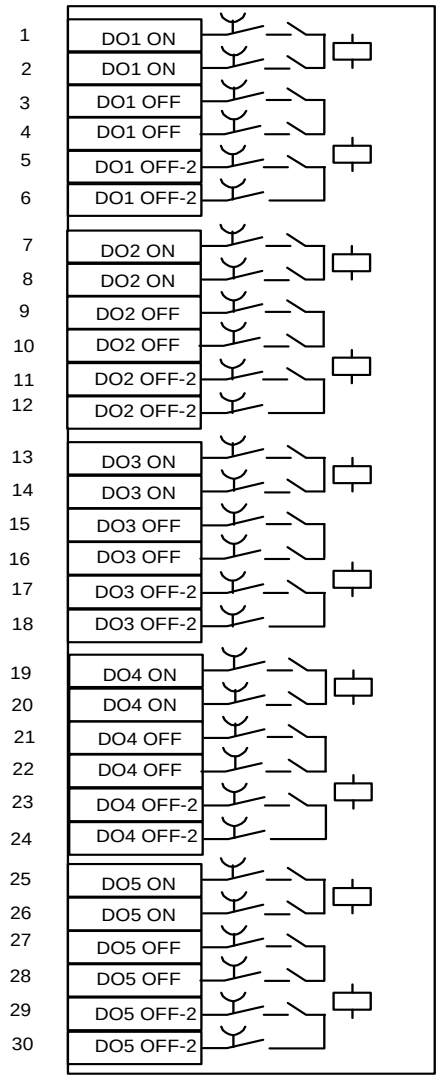
8. Connection to Output Lines



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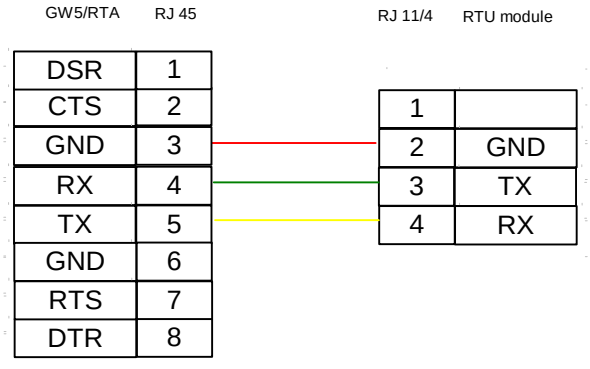
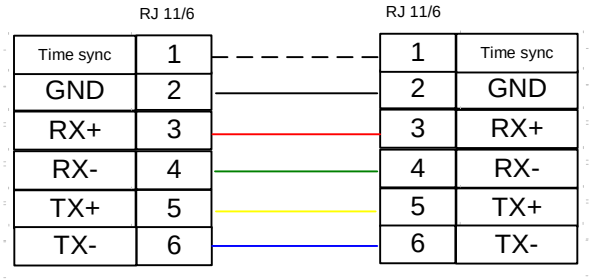
9. Communication Cables

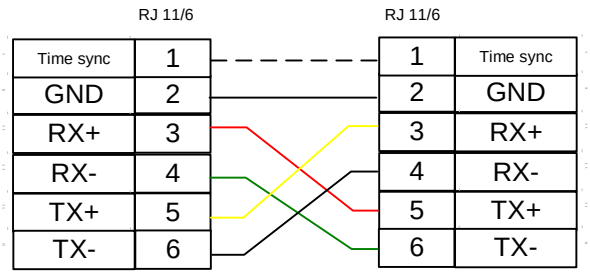
Data contcentrator-RTU module connection



RTU module RS-422 Slave-Slave connection



RTU module RS-422 Master-Slave connection



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10. Loading Frame Program

10.1 Erase Flash from the Controller

1) switch ERASE to ON state
2) wait 2 seconds
3) switch RST to ON state
4) switch ERASE to OFF state
5) switch PROG to ON state
6) switch RST to OFF state
7) wait 5 seconds
8) switch RST to ON state
9) switch PROG to OFF state
10) switch RST to OFF state

10.2 To Load a New Frame Program

1) Download the SAM-BA.exe host program (AT91 In-system Programmer). The program can be downloaded from: http://www.atmel.com/dyn/products/tools_card.asp?tool_id=3883
2) Install "AT91 In-system Programmer" running "Install AT91-ISP v.13.exe"
3) Specify paths to SAM-BA and bin files in "rtu_5_programming.bat" file. For instance:

```
echo Setting path to SAM-BA
  path="C:\Program Files\ATMEL Corporation\AT91-ISP v1.13\sam-ba v   2.9";%path%
   echo Setting path to user files
  path="D:\Projects\RTU_ARM\RTU-T Firmware\V5";%path%
```

4) Specify the COM port, location of the SAM-BA core files and the "rtu_arm_di_501.bin" file. For instance if using COM 5 port:

```
set COMIF=COM5
```

5) Run "rtu_5_do_programming.bat"(Switches ERASE and PROG have to be in OFF state)
6) Waite until loading completing green colored message appears
7) Set default settings by switching.:
   switch DFT ON state
   switch RST ON/OFF state
   switch DFT OFF state

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