MARTEM
KAUGJUHTIMISSÜSTEEMID
TELECONTROL SYSTEMS

RTU digital input module TELEM-DO5-T and expansion module TELEM-DO5add-T

User Manual

Martem AS
2015

Preface

This document, User Manual for RTU (Remote Terminal Unit) RTU Digital Output Module TELEM-DO5-T provides a general technical description of the module, its configuration and use. Current version of this manual is applicable to the RTU versions marked as DO-D-xxx.

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-DO5-T has been designed and manufactured according to the quality principles of ISO 9001.

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 box 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 (+ 5 objects with external relays on e.g. TELEM-DO5add-T expansion module). TELEM-DO5-T module is based on 32-bit ARM CPU, interfaces to other equipment are RS-232 or RS-422, data exchange protocol is IEC 60870-5-1-101. TELEM-DO5add-T module is an expansion module with additional relays, has no CPU or firmware and is connected to TELEM-DO5-T with ribbon cable without protocol.

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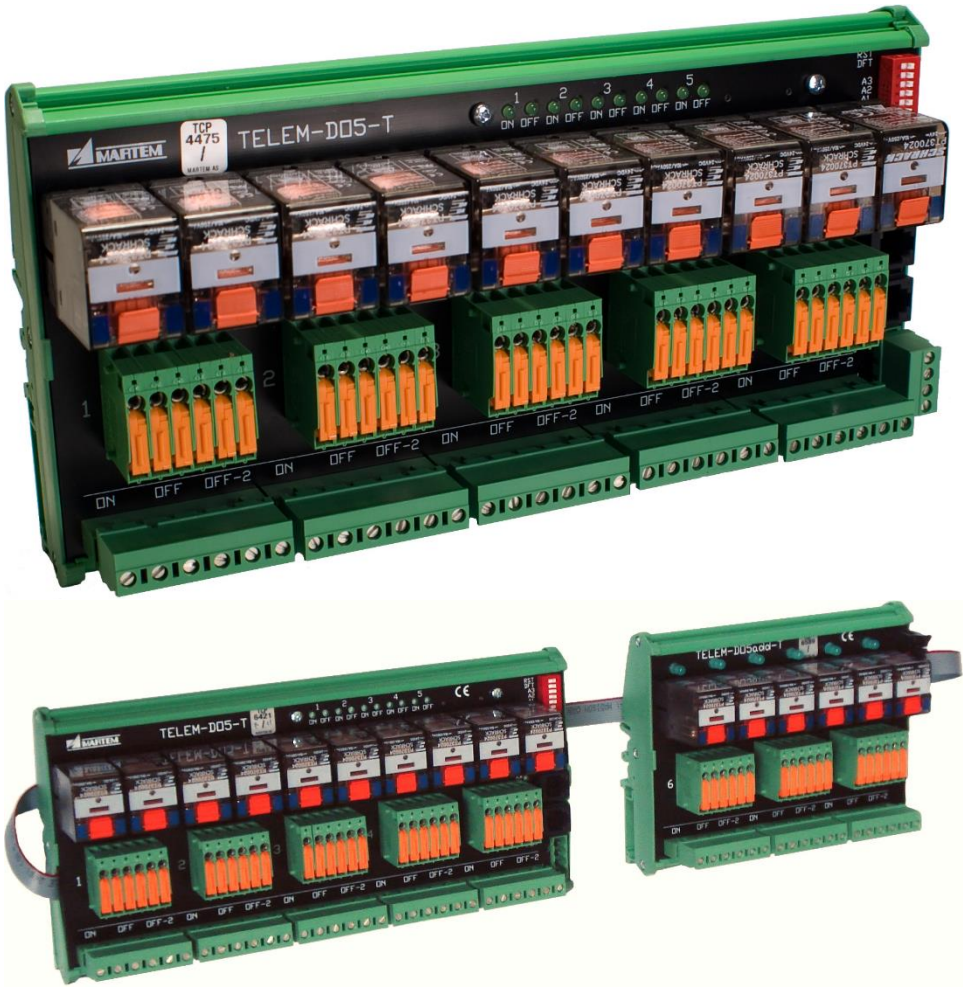


3. Features

- Configuration / parameterization with the IEC 60870-5-101 protocol using the GWS Configuration Tool.
- Adjustable Control pulse length 20ms …1min.
- Daisy chain master – slave connection for up to 15 modules using RS-422 interface
- 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
- Onboard knife disconnectors for relay outputs

4. Technical Data

Number of controllable objects	5 (+5)
Number of outputs for every object	1 output for ON operation, 2 for OFF/TRIP operation
Output relay max. capacity	10A at 250 VAC, 10A at 50VDC
Indication	2 for every output, 1 for a running indication, 1 red for an alert indication
Relay coil impedance	777 Ohm
Relay coil voltage	24 V DC

Power requirements

Supply voltage for main board and relays	20-72 V DC, 2W
Fuse protection	24 V 0,1A (resettable)

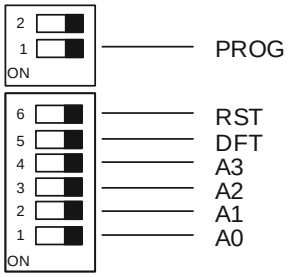
Installation, terminals and environment

Weight	761 g (+515 g)
Mounting	DIN 35
Dimensions (WxHxD)	250x60x64 (+155x60x64)
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	–30…+70°C

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



PROG – ON – load a new frame program
RST – ON – reset the device
DFT – ON – restores default setup
A0 – A3 – determines the address of the module

5.2. Indication LED

Indication LEDs display the state of the device:
ALERT – fired, error state or no connection with upper level device
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, internal power supply
SIGNAL STATE – red fired, signal is activated, external power supply

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. Loading Frame program

For loading new frame program two files:

- DO_SerialDownload_Firmware.bat
- do_xxx.bin

and a program:

- sflash

are needed.

Place those files in a folder
All of those files are provided by Martem AS, when needed.

Step 1
Modify contents of DO_SerialDownload_Firmware.bat

@echo off

*sflash.exe do_**xxx**.bin -s 16 -p 0x2800 **-c 8** -b 115200 -d*

pause

Define **do_xxx**.bin file to be used in the new progrem and set **com port** used by PC.

Step 2
Create connection between PC and Telem DO5-T

Step 3
Make neccesary dip switch changes and run **DI_SerialDownload_Firmware.bat** in following order:

1. PROG on
2. RST on
3. RST off
4. run DI_SerialDownload_Firmware.bat
5. wait until firmware update is finished
6. RST on
7. PROG off
8. RST off

7. Configuration

There can be configured up to 10 DOs (5 on TELEM-DO5-T + 5 external e.g. on TELEM-DO5add-T). RTU Module is configurable by Telem-GWS 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-GWS RTU configuration software runs under Windows NT4.0, 95, 98, 2000, XP, Vista and 7 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

Simultaneous diagnostics and real-time supervision with data acquisition is available with Telem-2000 RTU software.

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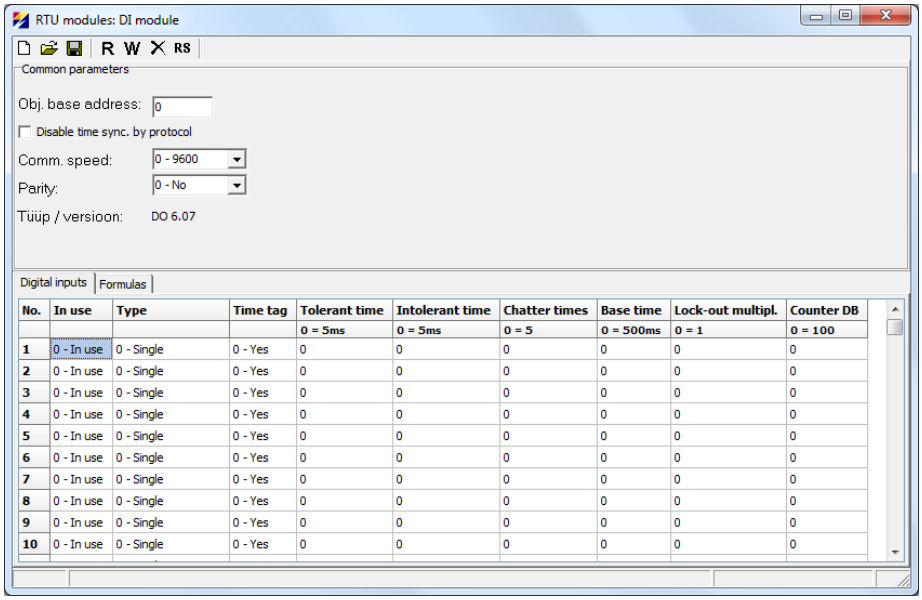
7.1. Configurable Parameters and General Settings of Communication Ports

• Transmission rate	200…38400 bit/s (default 9600 bit/s)
• Communication mode	asynchronous data bits 8, parity N, stop bits 1
• Communication interface	RS232, selectable RS422
• 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 RX)
• Time synchronization	IEC60870-5-101 protocol,
• 1 second synchronization pulse	
• Communication interface isolation	optically to 2,5kV RMS

7.2. Configuration Parameters for Digital Outputs

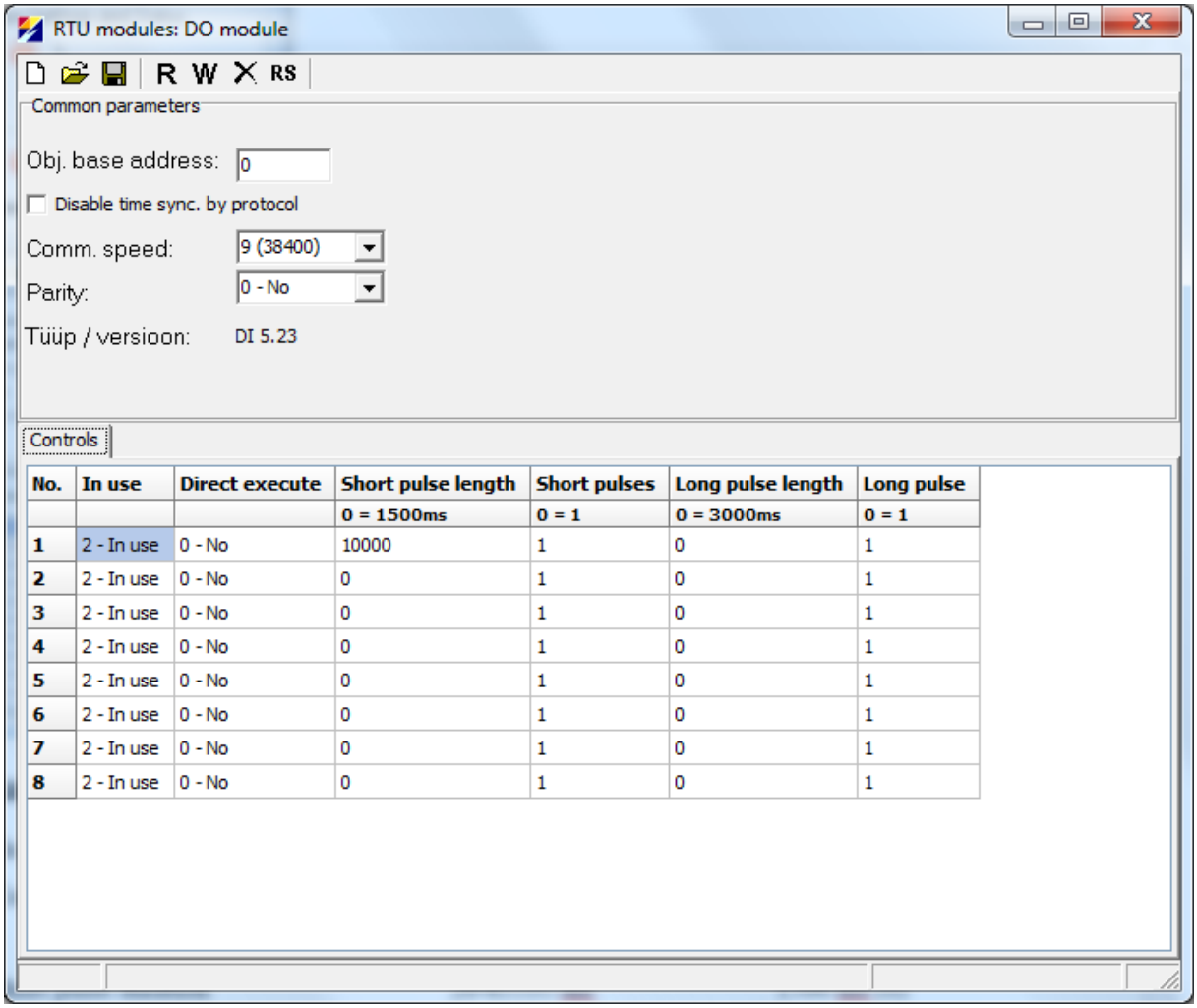
TELEM DO5-T module is configurable by **configuration tool TELEM-GWS** or by other configuration software using the data exchange protocol IEC60870-5-101. Telem-2000 RTU configuration software runs under Windows 95 or later operating systems on any standard PC, communicates via COM interface and performs the following principal functions:

- Configuration / parameterization of RTU
- Back up of RTU configuration data



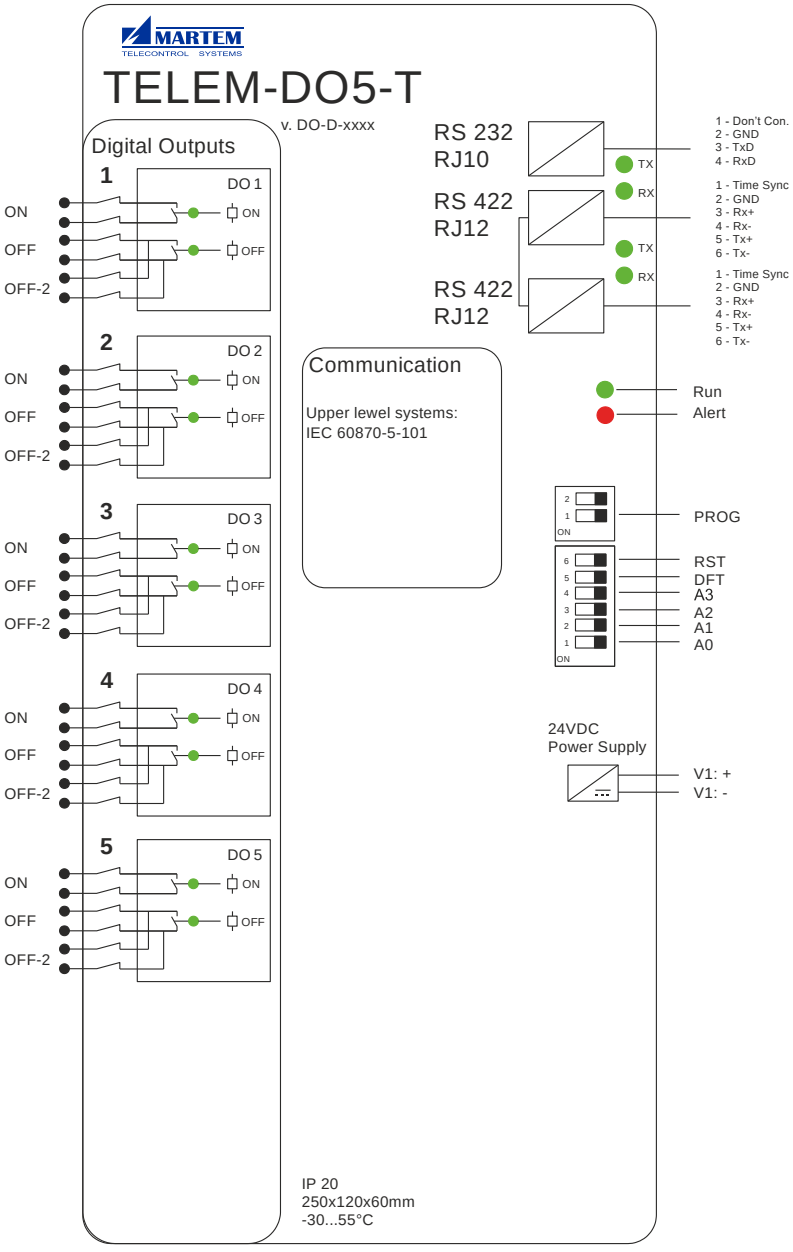
No.	In use	Type	Time tag	Tolerant time	Intolerant time	Chatter times	Base time	Lock-out multipl.	Counter DB
				0 = 5ms	0 = 5ms	0 = 5	0 = 500ms	0 = 1	0 = 100
1	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
2	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
3	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
4	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
5	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
6	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
7	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
8	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
9	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0
10	0 - In use	0 - Single	0 - Yes	0	0	0	0	0	0

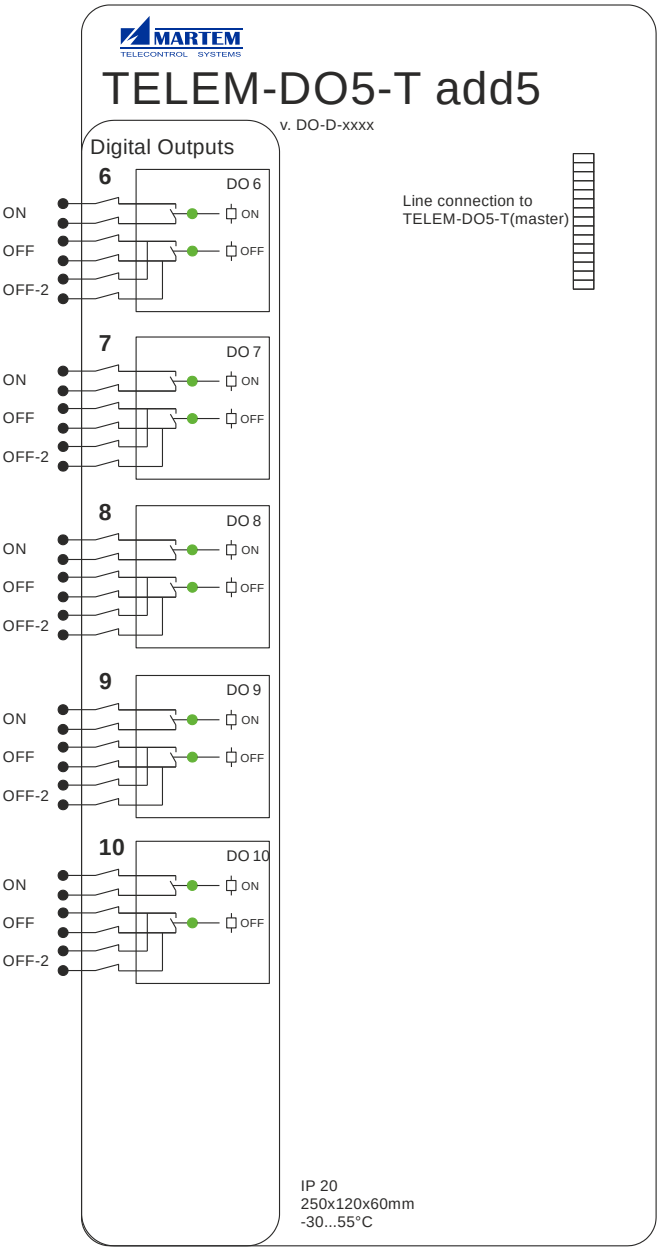
Parameter	**Value**	**Default value (in cell)**
1. In use	Yes/No	No
2. Control mode (Direct execute)	Select and execute Execute	Select and execute (0)
3. Short pulse duration	20-65535 ms	1500 ms (0)
4. Number of short pulses	1-256	1 (1)
5. Long pulse duration	20-65535 ms	2000 ms (0)
6. Number of long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



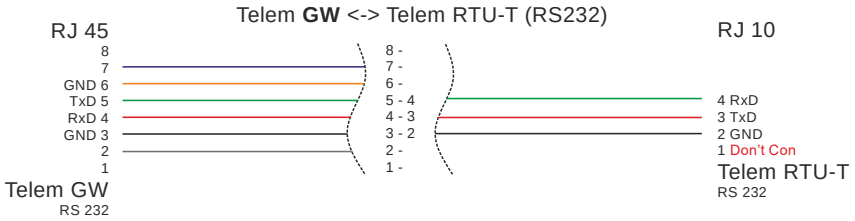
No.	In use	Direct execute	Short pulse length	Short pulses	Long pulse length	Long pulse
			0 = 1500ms	0 = 1	0 = 3000ms	0 = 1
1	2 - In use	0 - No	10000	1	0	1
2	2 - In use	0 - No	0	1	0	1
3	2 - In use	0 - No	0	1	0	1
4	2 - In use	0 - No	0	1	0	1
5	2 - In use	0 - No	0	1	0	1
6	2 - In use	0 - No	0	1	0	1
7	2 - In use	0 - No	0	1	0	1
8	2 - In use	0 - No	0	1	0	1

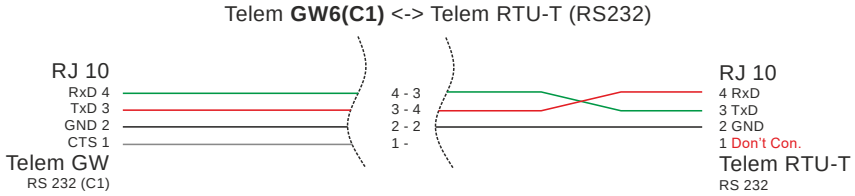
8. Connection to Signal Lines

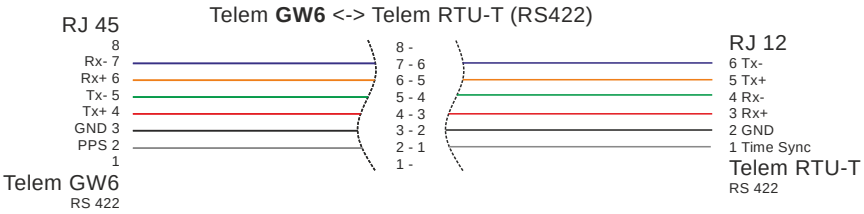


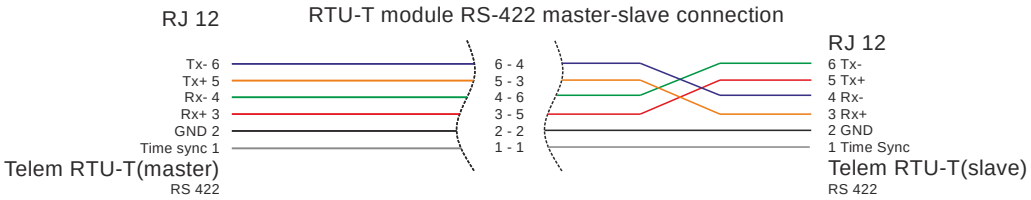

MARTEM
TELECONTROL SYSTEMS
TELEM-DO5-T add5
v. DO-D-xxxx
Digital Outputs
6
DO 6
7
DO 7
8
DO 8
9
DO 9
10
DO 10
ON
OFF
OFF-2
Line connection to
TELEM-DO5-T(master)
IP 20
250x120x60mm
-30...55°C

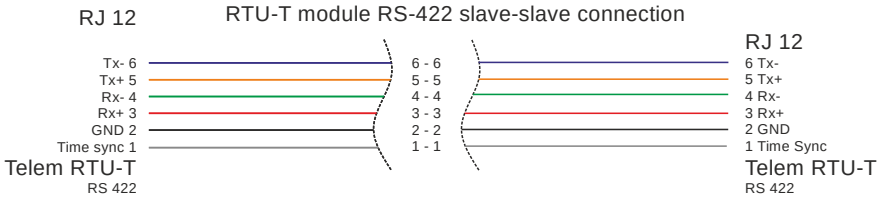
9. Communication Cables











10. Revision History

Rev 5/2015 Manual for TELEM-DO5-T (version DO-D-xxxx)