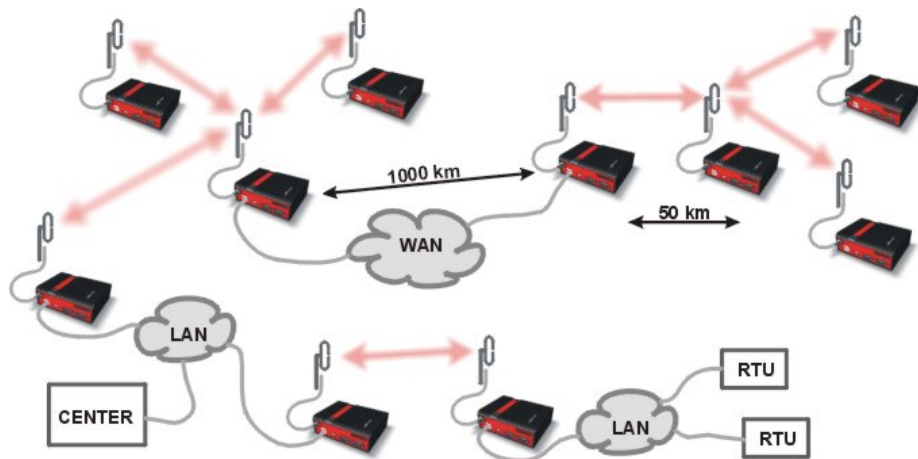


## Application notes



# RipEX Profibus

version 1.0  
11/20/2017



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## Introduction

Radio modem RipEX supports the most widely spread Profibus (Process Field Bus) type designated Profibus DP (Decentralized Periphery) type 0 (see <http://www.profibus.com/technology/profibus/>).

Profibus DP is designed for fast master–slave communication. The central master unit communicates with the remote slaves using RS485 bus. They are typically connected by twisted pair cabling. The cable length between two RS485 repeaters is limited (from 100 to 1200 m), depending on the bit rate used. The RipEX Profibus DP implementation allows for RS485 to be replaced by radio network, either partially or entirely. This significantly increases the potential distance between the individual nodes or even enables you to get rid of cable links altogether.

# 1. Bridge and Router modes

RipEX operates in two basic modes, Bridge and Router. Network topology determines which one is the more suitable for your specific application (see chapter RipEX in detail<sup>1</sup> of the manual).

Apart from network layouts designed in this manual, we also recommend using Router mode if alongside the central RipEX some PLC Slaves are also connected to the PLC Master over RS485 while others connect over the radio network.

This is because in Bridge mode RipEX would broadcast to radio channel each packet received on RS485. This could cause slower communication in some situations, and even collisions when a repeater is used. In Router mode only the packets destined for remote PLC Slaves are broadcast over the radio channel while packets sent to the PLC Slaves connected directly over RS485 are ignored.

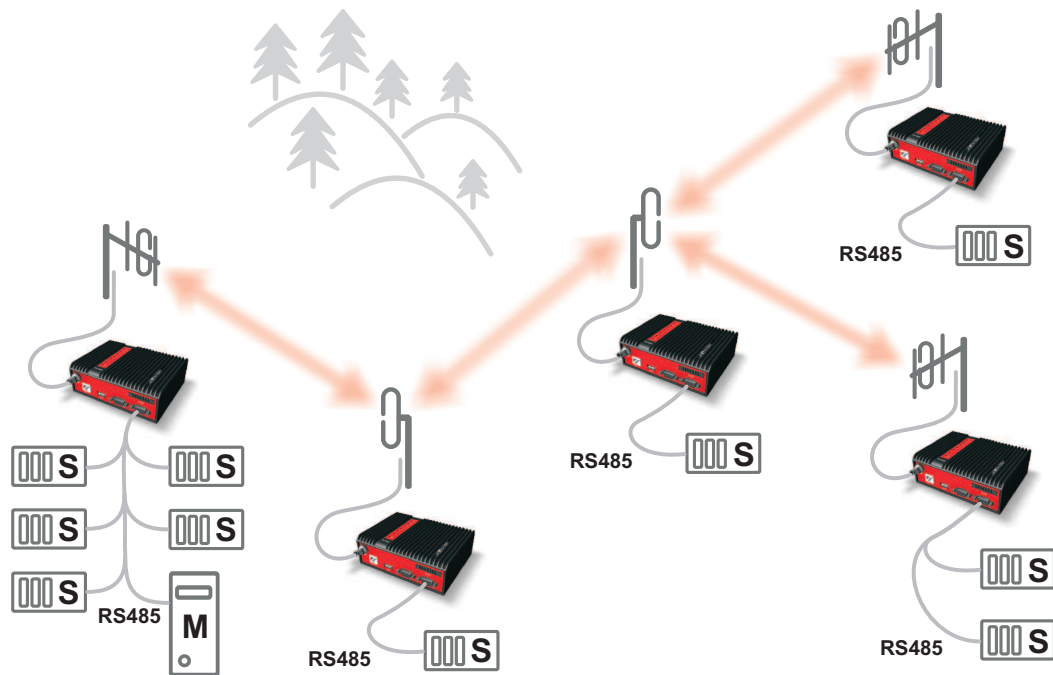


Fig. 1.1: RS485 and Radio network

<sup>1</sup> <http://www.racom.eu/eng/products/m/ripex/ripex-detail.html>

## 2. Profibus settings

We will only be looking at the basic communication parameters of the protocol – other parameters correspond to the standard Profibus DPV0. Profibus protocol is very sensitive to DP Slave response times. Delays are common in radio networks; this should be taken into account when setting up Profibus communication parameters.

**Recommended default Profibus settings** for data transfer using RipEX radio modems:

Tslot_Init:	16 383 t_bit
Max. Tsdr:	50 t_bit
Min. Tsdr:	11 t_bit
Tset:	1 t_bit
Tqui:	0 t_bit

Explanation of acronyms:

**Tslot\_init (Slot-time):** This indicates how long a DP Master should wait for a response from a DP Slave before it repeats a packet or sends another. The maximum value is 16 383.

**Max. Tsdr (Maximum Station Delay of Responders):** Sets the maximum DP Slave response time. This value is the same for all DP Slaves and is distributed from the DP Master at the beginning of their communication. This value must be lower than Tslot\_init (Slot-time).

**Min. Tsdr:** Sets the minimum DP Slave response time. 11 to 255 bit values are permitted. This value is the same for all DP Slaves and is distributed from the DP Master at the beginning of their communication. This value must be lower than Max. Tsdr.

**Tset:** Sets delay. This is used to postpone broadcasting of the next packet. This parameter enables you to create space for other communication on RipEX network.

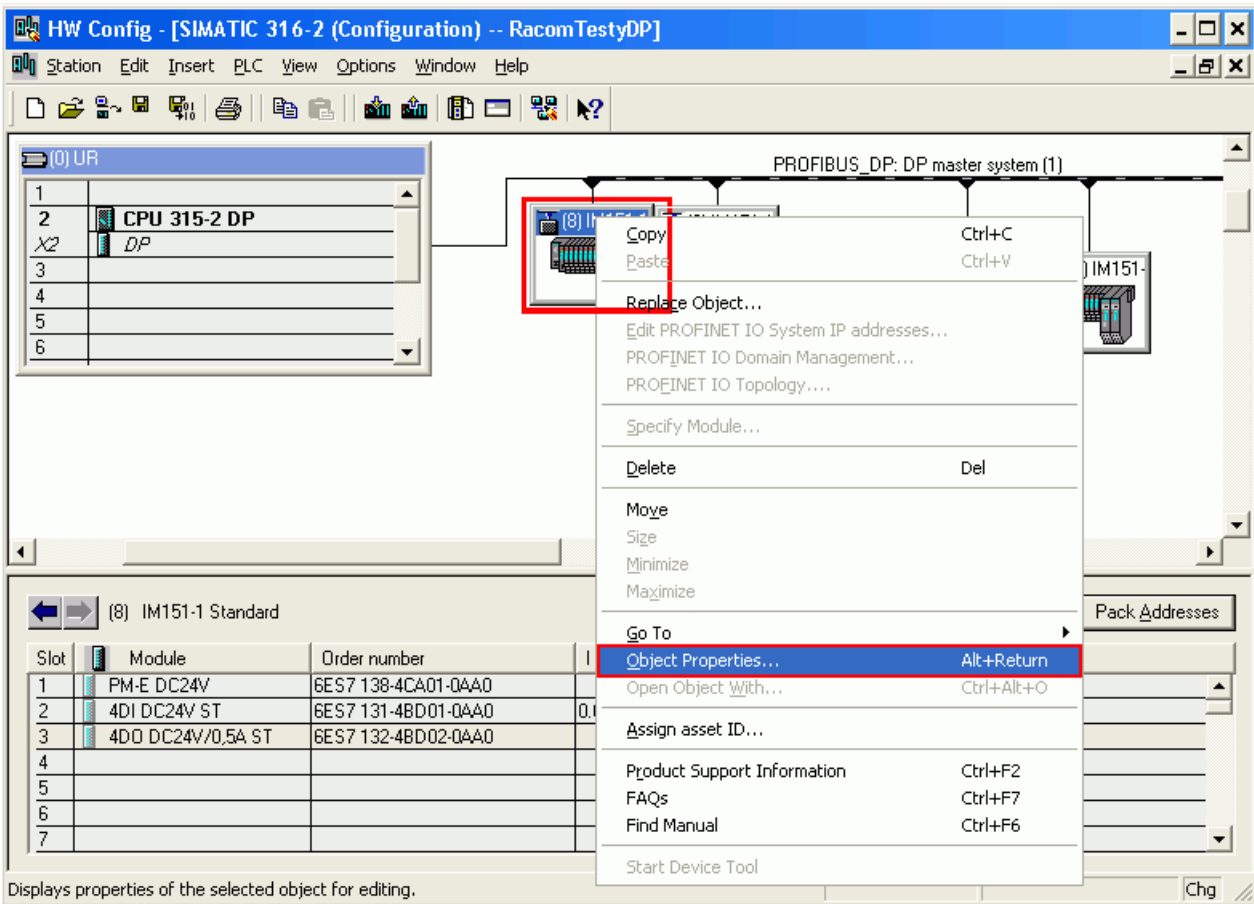
**Tqui (Quit time):** Sets the switching time between reception and broadcasting. This must be lower than Min. Tsdr.

Note: All times are given in bits.  $1 \text{ t\_bit} = 1 / \text{Baud rate [seconds]}$

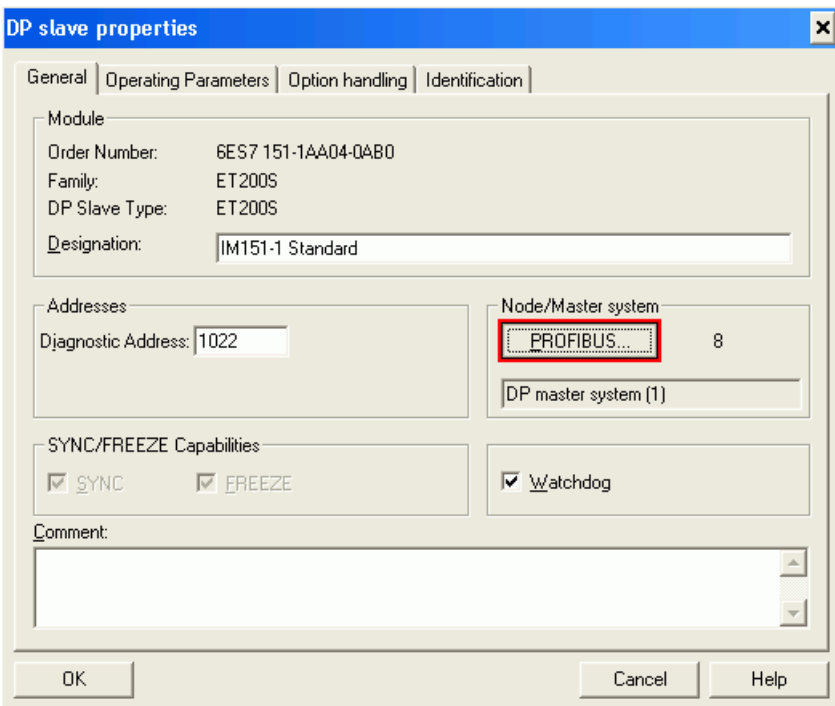
A single bit time	Baud rate – data transfer speed
104.2 $\mu\text{s}$	9600 bps
52.1 $\mu\text{s}$	19200 bps

### Example of Profibus DP settings in STEP 7

Under network layout click the right mouse button to open Object Properties:

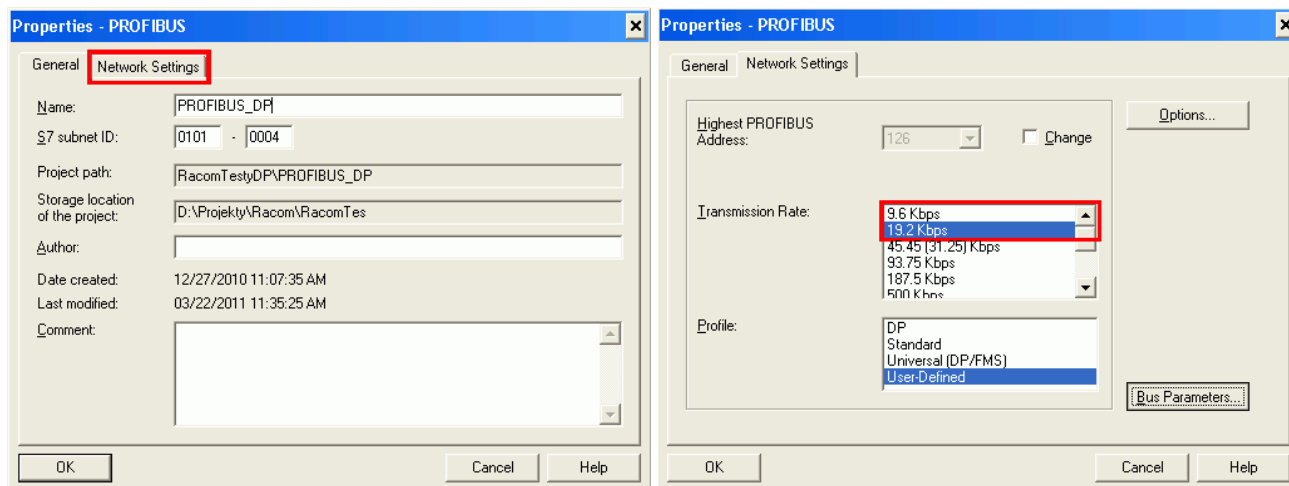


DP slave properties window opens. Click on the PROFIBUS button:

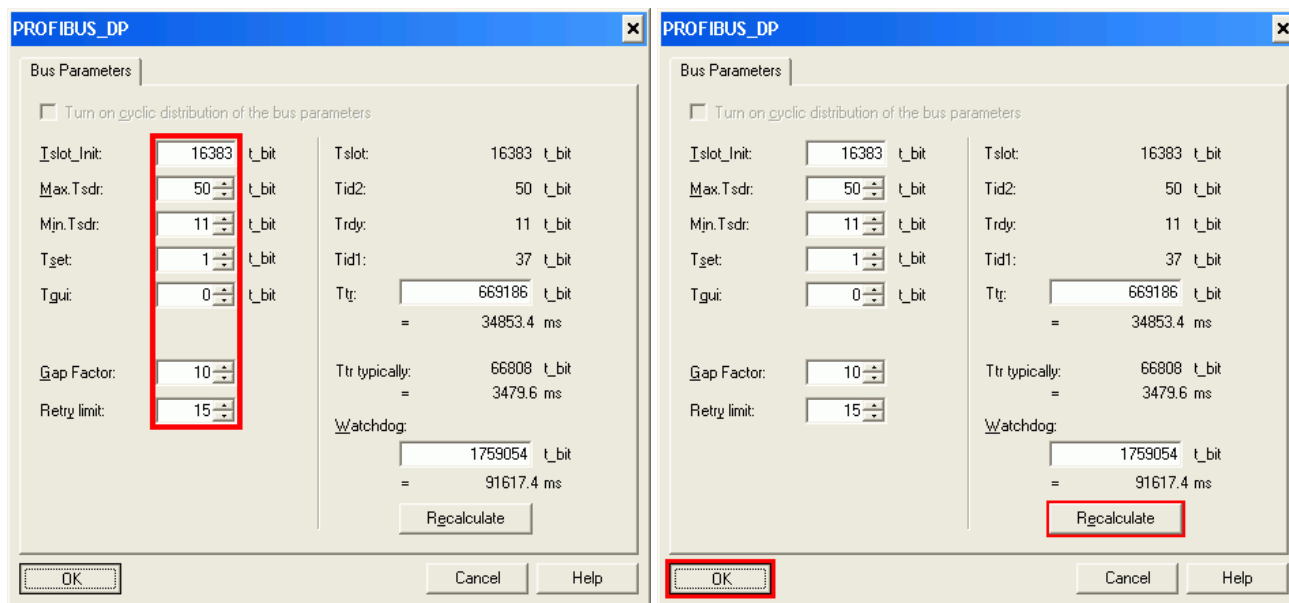


Properties – PROFIBUS window opens. Select the Transmission Rate (19.2 Kbps or 9.6 Kbps) under the Network Settings tab. The recommended value is 19.2 Kbps. Under Profile select User Defined and click Bus Parameters.





PROFIBUS\_DP is the most important settings window; fill in settings as shown below, click Recalculate and confirm by clicking OK. Confirm the values in all open windows and click the icon Download to Module. Tslot\_Init is a value which fundamentally influences operation of the entire device. 16 383 t\_bit is the maximum value which helps test radio transmission. We recommend setting as described in chapter "Advanced Settings – Calculation of minimum slot time".



## 3. RipEX settings

### 3.1. Operating mode

See chapter Advanced configuration<sup>1</sup> of the manual.

If there is no more than a single repeater on your network, we recommend using Bridge mode. Profibus DP is always a master–slave type network in which there is no danger of radio channel collisions.

Router mode should only be used where network topology does not allow for Bridge mode to be used (see page YY of the manual). If you choose to use Router mode we recommend switching off acknowledgement on the radio channel. This speeds up packet transmission on the radio channel. Repetition of undelivered packets is ensured through the application layer of the DP Master.

Fig. 3.1: ACK Off

### 3.2. COM 2

Profibus DP utilises RS485 interface. This interface can only be set to COM2 in RipEX. COM2 functionality is conditioned by using the appropriate software key, see chapter Maintenance<sup>2</sup> of the manual.

COM2 settings must correspond to PLC device settings. We recommend setting port speed to 9600 for complex networks or 19200 bps for networks without re-translation (the timing is derived from the length of a single bit).

Idle state can be reduced to as little as 1.

In Router mode, set Protocol to Profibus.

For explanation of the individual parameters refer to on-line help in the web interface or chapter Settings<sup>3</sup> of the manual.

**Note:** If Profibus IP's do not correspond to RipEX IP's (e.g. several PLC Slaves are connected to a RipEX over a single bus), addresses must be **translated using a table**.

<sup>1</sup> <http://www.racom.eu/eng/products/m/ripex/h-menu.html>

<sup>2</sup> <http://www.racom.eu/eng/products/m/ripex/h-menu.html>

<sup>3</sup> <http://www.racom.eu/eng/products/m/ripex/h-menu.html>

## 4. Advanced settings

### 4.1. Calculation of minimum slot time

Setting the appropriate (minimum) Tslot\_Init value for a given network may significantly shorten the total DP Slave polling cycle. If one of the DP Slaves is out of order or if its response is lost, the DP Master will only wait for a set minimum time before sending another query. The value should be set to maximum to prevent problems.

The calculator on <http://www.racom.eu/eng/products/radio-modem-ripex.html#calculation> enables you to calculate the RTT (round trip time).

Set the PLC Master to Ethernet interface in the calculator (Profibus protocol timing is based on the last sent byte; time on Master's RS485 does not figure in this calculation).

RTT for Bridge mode can be used directly; for Router mode the resulting average RTT needs to be multiplied by constant 1.25 to receive the maximum achieved RTT.

Calculate the recommended Tslot\_Init as follows:

$$\text{Tslot\_Init} = \text{RTT} * (\text{Port speed in bps}) / 1000$$

### 4.2. Router mode - timing

Router mode web based settings may cause time problems in more complex networks. CLI lets you adjust radio channel access parameters and set up repetition taking into account the number of re-translations in your radio network.

If you only use the Profibus protocol with RipEX and no other broadcast interferes with your network, you can configure certain parameters to shorten the access time to channel using CLI. If you want to use packet acknowledgement on the radio channel, you can shorten the repetition timeout if ACK is turned off.

#### Set up using CLI:

cli\_cnf\_set\_device\_mode:

-ack n	Turns on ACK
-retries 2	Number of retries 2
-rto-prog f	Turns off progressive retries
-rto-fix 10	Shortens the retry timeout to the minimum value of 10 Bytes
-rto-var 10	Shortens the variable retry timeout to the minimum value of 10 Bytes
-slots-rx 0	Will receive immediately after request – random channel access is not used
-slots-tx 0	Will transmit immediately after request – random channel access is not used

Same settings should be used for all devices.

To find out more about CLI, see RipEX manual chapter CLI Configuration<sup>1</sup>.

<sup>1</sup> <http://www.racom.eu/eng/products/m/ripex/cli-conf.html>

**Set the following in Profibus parameters:**

Tslot\_Init 16383

**Note:** This setting is only appropriate for certain types of networks; changes should only be made by experienced users!

**Connecting RS 485**

Connector layout of RipEX COM 2 for RS 485 and the corresponding PIN's on Siemens Simatic S7.



*Fig. 4.1: RS485 connection*

## Appendix A. Revision History

Revision 1.0	2017-11-20
First issue	