RADIOMODEM

RM169



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Our website www.seneca.it contains many useful information, user guides and configuration software and technical documents always update to the latest version.

If you have technical problems or cannot find the required information in the provided documents, contact our Technical Support by email at support@seneca.it or by phone +39 049 8705355 - 8705359.

Restrictions on use

SENECA PRODUCTS HAVE NOT BEEN DESIGNED, INTENDED NOR INSPECTED TO BE USED IN ANY LIFE SUPPORT RELATED DEVICE OR SYSTEM RELATED FUNCTION NOR AS A PART OF ANY OTHER CRITICAL SYSTEM INCLUDED AERONAUTICAL / AEROSPACE APPLICATION.
SENECA PRODUCTS ARE GRANTED NO FUNCTIONAL WARRANTY IF THEY ARE USED IN ANY OF THE APPLICATIONS MENTIONED.

SENECA RM169 Series radio modems have been designed to operate on frequency ranges as SRD (Short Range Device), the exact use of which differs from one region and/or country to another. The

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user of a radio modem must take care that the device is not operated without the permission of the local authorities on frequencies other than those specifically reserved and intended for use without a specific permit.

SENECA RM169 Series are allowed to be used in the following countries with E.R.P. and duty cycle limitation, either on licence free channels or on channels where the operation requires a licence. More detailed information is available at the local frequency management authority.

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Allowed use according to ERC Recommendation 70-03						
Model	**Frequency (MHz)**	**Annex (1)**	**E.R.P (2)**	**Duty Cycle (3)**	**Country allowed**	**Country with restriction of use**
310	169,400 - 169,475	1e1	≤ 500 mW	≤ 1 %	AUT-BEL-BUL-CZE-CYP-DNK-EST-FIN-F-D-HRV-GRC-HNG-ISL-IRL-I-LVA-LIE-LTU-LUX-MLT-HOL-NOR-POL-POR-ROU-SVK-SVN-E-SUI-S-G-AND-ALB-AZE-BIH-BLR-GEO-MDA-MKD-MNE-RUS-SRB-TUR-UKR	GEO-RUS-UKR
310	169,400 - 169,475	2b	≤ 500 mW	≤10 %		HOL-GEO-RUS BLR-UKR
320	433.0875 - 434.7375	f2	≤ 10 mW	≤ 10 %		GEO-RUS-UKR
340	863,000 - 870,000	1g1	≤ 25 mW	≤ 0.1 %		GRC-NOR-SVN-E-S-GEO-RUS-BLR-UKR
340	868,000 - 868,600	1g1.1	≤ 25 mW	≤ 1 %		GEO-RUS-BLR-UKR
340	868,700 - 869,200	1g1.2	≤ 25 mW	≤ 0.1 %		GEO-BLR-UKR
341	869,400 - 869,650	1g1.3	≤ 500 mW	≤ 10 %		GEO-RUS-BLR-UKR
341	869,700 - 870,000	1g1.4	≤ 5,0 mW	≤ 100 %		GEO-RUS-BLR-UKR

NOTE:
Before to install the device check always the latest version of ERC Recommendation 70-03 in order to verify any restriction and limitation in terms of E.R.P and Duty Cycle

(1) Annex 1.xxx refer to SRD (Short Range Device), Annex 2 refer to Tracking, Tracing and Data Acquisition.

(2) E.R.P. = Max Effective Radiated Power allowed from radiomodem and associated antenna takes into consideration transmitter power output, transmission line attenuation, RF connector insertion losses and antenna gain

(3) Duty Cycle is defined as the ratio, expressed as a percentage, of the maximum transmitter "on" time on one carrier frequency, relative to a one hour period

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Technical specification

Operating data		
		Value
Label	*Description*	*RM169*
$V_{S\ (EXT)}$	Power supply, voltage range	9,0 → 32 Vdc
$P_{S\ (EXT)}$	Max power	2,04W
P_{RF}	RF transmission power	200 mW
RX_{SENS}	Receiver sensitivity	≤ -110 dBm@12.5 kHz ≤ -107 dBm@25 kHz
RF_{MOD}	Modulation mode	9K00F1D o 18K0F1D
CH	Channels spacing	12,5 - 25 kHz
BR Radio	Baud Rate on radio channel	4800 bps @ 12.5 kHz 9600 bps @ 25 kHz
$Z_{I/O\ ANT}$	Antenna impedance	50 Ω
Digital Input	Digital input rating	5 - 24 Vdc | 3 - 20 Vac
$Z_{DIGITAL\ INPUT}$	Digital input impedance	2.2 kΩ
Digital Output	Digital output rating	Normalmente aperto (NO) 28VAC@0.5A - 32VDC@1A
$I_{A,B\ LINES}$	Max current out at RS-485 serial port	± 60 mA
BR DTE	Baud Rate RS-485 serial port	1.200 → 38.400 bps

WARNING

Exceed the maximum operating value below (continuous and/or temporary) can damage the device

Massimi valori operativi		
Label	*Description*	*Value*
$V_{S(EXT)}$	Max power supply voltage	32 Vdc
$V_{\ DIG-INP}$	Digital input max voltage on	24 Vdc / 20 Vac
$V_{\ DIG-OUT}$	Digital output max voltage rating	32 Vdc / 28 Vac
$V_{P\ RS-485}$	Max peak voltage at the ports A/B RS-485 (1)	± 32 Vdc
$I_{O\ DIG-OUT}$	Digital output max current	1 Adc / 500 mAac
$I_{\ A,B\ LINES}$	Max peak current at the ports A/B RS-485 (1)	± 200 mA
$T_{\ OPERATING}$	Operating temperature range	-30°C +60 °C
$T_{\ STORAGE}$	Storage temperature range	-40°C +85 °C

NOTE:

(1) Impulse time < 100 millisecond.

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Conformity declaration

English: Hereby, SENECA S.r.l. declares that this RM169 SERIES is in compliance with the essential requirements and other relevant provisions of Directive 1999/5/EC.

Finnish: SENECA S.r.l. vakuuttaa täten että RM169 SERIES tyyppinen laite on direktiivin 1999/5/EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.

Dutch: Hierbij verklaart SENECA S.r.l. dat het RM169 SERIES in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 1999/5/EG. Bij deze verklaart SENECA S.r.l. dat deze RM169 SERIES voldoet aan de essentiële eisen en aan de overige relevante bepalingen van Richtlijn 1999/5/EC.

French: Par la présente SENECA S.r.l. déclare que l'appareil RM169 SERIES est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 1999/5/CE.
Par la présente, SENECA S.r.l. déclare que ce RM169 SERIES est conforme aux exigences essentielles et aux autres dispositions de la directive 1999/5/CE qui lui sont applicables

Swedish: Härmed intygar SENECA S.r.l. att denna RM169 SERIES står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 1999/5/EG.

Danish: Undertegnede SENECA S.r.l. erklærer herved, at følgende udstyr RM169 SERIES overholder de væsentlige krav og øvrige relevante krav i direktiv 1999/5/EF

German: Hiermit SENECA S.r.l., dass sich dieses RM169 SERIES in Übereinstimmung mit den grundlegenden Anforderungen und den anderen relevanten Vorschriften der Richtlinie 1999/5/EG befindet". (BMWi). Hiermit erklärt SENECA S.r.l. die Übereinstimmung des Gerätes RM169 SERIES mit den grundlegenden Anforderungen und den anderen relevanten Festlegungen der Richtlinie 1999/5/EG. (Wien)

Greek: ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ SENECA S.r.l. ΔΗΛΩΝΕΙ RM169 SERIES ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 1999/5/ΕΚ

Italiano: Con la presente SENECA S.r.l. dichiara che RM169 SERIES è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 1999/5/CE.

Spanish: Por medio de la presente SENECA S.r.l. declara que el RM169 SERIES cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 1999/5/CE

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Declaration of Conformity

We, the undersigned,

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Address, City	Via Austria, 26 - 35127 PADOVA (PD)
Country	Italy
Phone number	+39 049 8705355 - 8705359
Fax number	+39 049 8706287

certify and declare under our sole responsibility that the following equipment:

Product description / Intended use	169 MHz, 433 MHz and 868 MHz Radiomodem for commercial and light-industrial use
EU / EFTA member states intended for use	**EU**: all members **EFTA**: all members
Member states with restrictive use	**EU**: all members **EFTA**: all members
Manufacturer	SENECA S.r.l. | I-35127 PADOVA (PD)
Brand name	SENECA
Type/Model	RM169 SERIES

is tested to and conforms with the essential requirements for protection of health and the safety of the user and any other person and Electromagnetic Compatibility, as included in following standards:

Art. of Directive	*Standard*	*Date of issue of the standard*
3.1(a) Health	EN 50401	2006 + A1(2011)
3.1(a) Safety	EN 60950-1	2006 + A11:2009 + A1:2010 +A12:2011 +AC:2011
3.1(b) EMC	EN 301 489-1	V1.9.2 (2011-09)
3.1(b) EMC	EN 301 489-3	V1.6.1 (2013-08)

and is tested to and conforms with the essential radio test suites so that it effectively uses the frequency spectrum allocated to terrestrial/space radio communication and orbital resources so to as to avoid harmful interference, as included in following standards:

Art. of Directive	*Standard*	*Date of issue of the standard*
3.2 Spectrum	*EN 300 220-2*	*V2.4.1 (2012-05)*

and therefore complies with the essential requirements and provisions of Art. 3.3 too, where applicable, of the **Directive 1999/5/EC** of the European Parliament and of the council of March 9, 1999 on Radio equipment and Telecommunications Terminal Equipment and the mutual recognition of their conformity and with the provisions of Annex II.

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CE

TCF reference nr.	RM169 SERIES Rev.0
Data	18 febbraio 2015

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Warranty - Liability of the Product

Supplier represents and warrants that products are manufactured in accordance with the applicable specifications and are free from defects in materials and workmanship. The warranty, valid for a period of 12 months of use, maximum 18 months from the date of delivery, shall not cover defects caused by accident, Buyer's negligence, improper use or maintenance or by any other reason beyond Supplier's control.

Buyer shall have 10 (ten) working days following receipt of products to inspect the products and to notify to Supplier in writing any defects or non-compliance. In the event that any shipment of products is not accepted by Buyer due to any non-conformity with the specifications, or as a result of a cause occurred prior to placement thereof with the carrier, Buyer shall, if so indicated in writing by the Supplier, promptly return some samples or the full shipment that was rejected by Buyer at Buyer's costs.

Supplier, at its own discretion, shall, within a reasonable period, considering the entity of the complaint: (i) send a replacement shipment of products conforming, or (ii) credit Buyer a sum equal to the value of the defective or non-conforming products. This warranty overwrites all legal warranties for defects and compliance and exempts Supplier from any other responsibility for the supplied products; in particular, Buyer shall not be entitled to any requests for compensation or price reductions.

If one of the products sold by the Supplier to the Buyer is defective, the Buyer will send it, at its own expense, at the headquarters of the Italian Supplier. The product will be repaired or replaced by the Supplier, at no costs to the Buyer.

The Buyer will pay all the shipping costs for the product repaired or replaced and sent back to the Buyer.

The Buyer will bear all costs related to disassembly, assembling and transportation of the product, and any damage caused by the "machinery inactivity".

Buyer shall not make any oral or written representations which vary from the specifications, operating instructions, labels or representations given or made by Supplier with respect to the products. If any liability is incurred because of such varying representations, Buyer holds Supplier harmless with respect to any such representations.

In no event shall Supplier be liable for any indirect, incidental, exemplary or consequential damages, including without limitation any claim for damages based on lost revenues or profits, however caused.

In no event shall the Supplier be liable for any costs or damages arising from any act or omission of Buyer, including, without limitation, relating to the modification, handling, storage and marketing

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of Products by Buyer or to Buyer's failure to provide its employees, agents and customers or other third parties with adequate instruction as to the proper handling and use of Products.
In this respect we hereby confirm that our products are not designed for nuclear applications neither for aircraft/aerospace industries. For the above mentioned applications both warranty and insurance coverage do not apply.

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Warnings and safety instructions

-Read these safety instructions carefully before using the product:

-Warranty will be void, if the product is used in any way that is in contradiction with the instructions given in this manual, or if the radio modem housing has been opened or tampered with.

-The radio modem is only to be operated at frequencies allocated by local authorities, and without exceeding the given maximum allowed output power ratings and duty cycle. SENECA and its distributors are not responsible, if any products manufactured by it are used in unlawful ways.

-The devices is complies with Directive 1999/5/EC as describe in our declaration of conformity above

-The devices mentioned in this manual are to be used only according to the instructions described in this manual. Faultless and safe operation of the devices can be guaranteed only if the transport, storage, operation and handling of the devices is appropriate. This also applies to the maintenance of the products.

-Do not install the equipment close to a heat source or in damp conditions and direct sunlight is also to be avoided.

-The device must not be exposed to aggressive chemical agents or solvents likely to damage the plastic or corrode the metal parts.

-The device must not be exposed directly to dusty environment.

-Maintenance should only be carried out by qualified persons.

-For your own safety, you must ensure that the equipment is switched off before carrying out any work on it.

-Any electrical connection of the product must be equipped with a protection device against voltage spikes and short-circuits

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Disposal of waste by users in private households within the European Union



According to Directive 2012/19/EU of the European Union on waste electrical and electronic equipment (WEEE) this product must not be disposed off with your other household waste, it is your responsibility to dispose of your waste by taking it to a collection point designated for the recycling of electrical and electronic appliances.

Separate collection and recycling of your waste at the time of disposal will contribute to conserving natural resources and guarantee recycling that respects the environment and human health.

For further information concerning your nearest recycling centre, please contact your nearest local authority/town hall offices.

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General description

The RM169 Series are radiomodems with RS232 and RS485 serial connections, configurable by software, either remotely or locally, on the fly by DTE.
The devices are complete with one optically isolated digital input, and one relay output that can be used for radio transmission of signals and alarms.

RM169 Series has 4 operating modes that are software programmable: mirror point to point, point to multipoint, broadcasting, and digipeater which allows multipath data routes, to ensure data delivery.

The Low power design along with the power saving function, allows for extended battery life.

	Operating mode
	Radio modem
Radio	
Channel spacing	Yes
RF channel	Yes
Frequency Agility	Yes
Listen Before Talk	Yes
RF power	Yes
Porta Seriale	
RS485 or RS232	Configurable by software
Bit Rate	Yes
Parity bit	Yes
DTX Time	Yes
Data	
Routing Table	Standard 1, with address from DTE up to 8
Broadcasting	Yes
Address from DTE	Yes
Address to DTE	Yes
Rx address for Tx	Yes
Request of ACK	Yes
Set number of retries	Only RS232
NAK to DTE	Yes
Routing Table	Yes
Other	
Diagnostic	Yes
Power Save	Yes
Link Test	Yes

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Installation

Mechanical

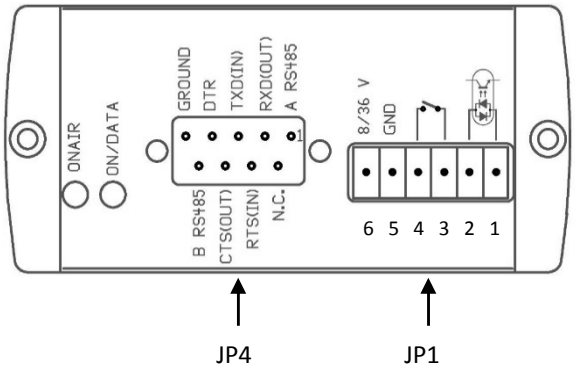
The device must be installed in a location that is sufficiently ventilated so that there is no risk of internal heating. Place the device against a flat, firm and stable surface. It is not recommendable to install the radio modem on a strongly vibrating surface. Suitable dampening and/or isolation materials should be used in cases where the installation surface will be subjected to vibration.

Electrical (wiring)

To prevent damage both the radio modem and any terminal devices must always be switched OFF before connecting or disconnecting the serial connection cable. It should be ascertained that different devices used have the same ground potential. Before connecting any power cables the output voltage of the power supply should be checked.

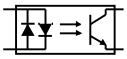
The product has no disconnecting device. An external disconnecting device must be installed. This must be close to the equipment.

To by supplied by class II (LPS) certified AC/DC adaptor.



JP4 Connector		
PIN	*Label*	*Description*
1	A RS485	RS-485 (line A)
2	RXD (OUT)	Data output
3	TXD (IN)	Data input
4	DTR	Data Terminal Ready
5	GROUND	Ground (GND)
6	N.C.	Not connected
7	RTS	Request To Send
8	CTS	Clear To Send
9	A RS485	RS-485 (line B)

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JP1 Connector		
PIN	*Label*	*Description*
1 2		Optoisolated digital input
3 4		Digital output normally open (NO)
5		Ground (GND)
6	9-32V 0,5A	Power supply (9 - 32 VDC, 0.5A)

Antenna

The device's antenna must be free and at least 10 cm away from any conducting material. When the antenna is installed outside, it is essential to connect the cable screen to the building's earth. We recommend using lightning protection. The protection kit chosen must permit the coaxial cable to be earthed (eg: coaxial lightning arrester with earthing of the cable at different places on the antenna at the base of pylons and at the entry, or just before entering the premises).

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Configuration

Download from SENECA web site (www.seneca.it) the latest version of configuration software.
The configuration must be done through a RS485 interface.

System Requirements

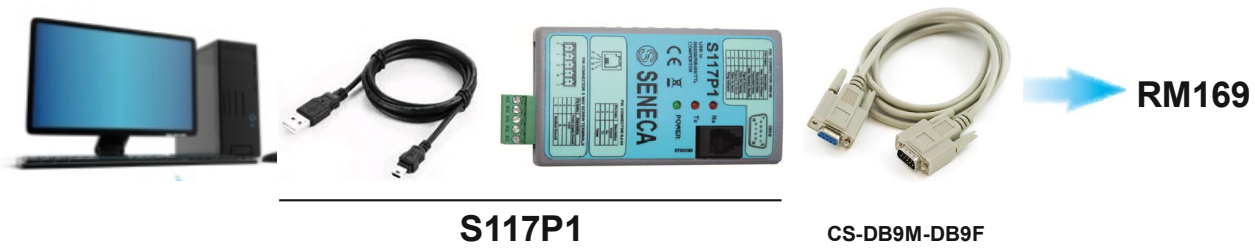
Operative System: Windows 98 SE, Windows ME, Windows2000, Windows XP, Windows Vista, Windows 7
Minimum screen resolution : 800 x 600 dpi.

Configuration via RS232 serial port

1) Connect the serial port of the radio modem to the computer communication port with a **NO Null Modem cable** and open the configuration utility.
2) In **Options** Menu select the appropriate computer Communication Port.
3) Connect, with the proper polarity, a power supply source to the radio modem.
4) Press the "**Turn ON**" button on the configuration program. On the radiomodem the entering into configuration state is confirmed by a led color change from off to orange. On the configurator this change it is confirmed by a variation in the text of the button from "**Turn ON**" to "**Turn OFF**" and by the activation of the Read and Write buttons. If, when "Turn ON" is pressed, the button blink green, wait the end of the blink before proceding with normal operation.

Configuration via USB port

1) **Install the appropriate driver** as explained in the user manual of the S117P1 interface.
2) Connect the interface S117P1 to a personal computer by a USB cable with type A connector (PC side) and microUSB connector(interface side).
3) Go into the options menu of the Configuration (Options) and **select the serial port** (Serial port selector).
4) Using a cable with a DB9 connector on one side, connect the radio modem to the interface board according to the diagram (see the figure below).



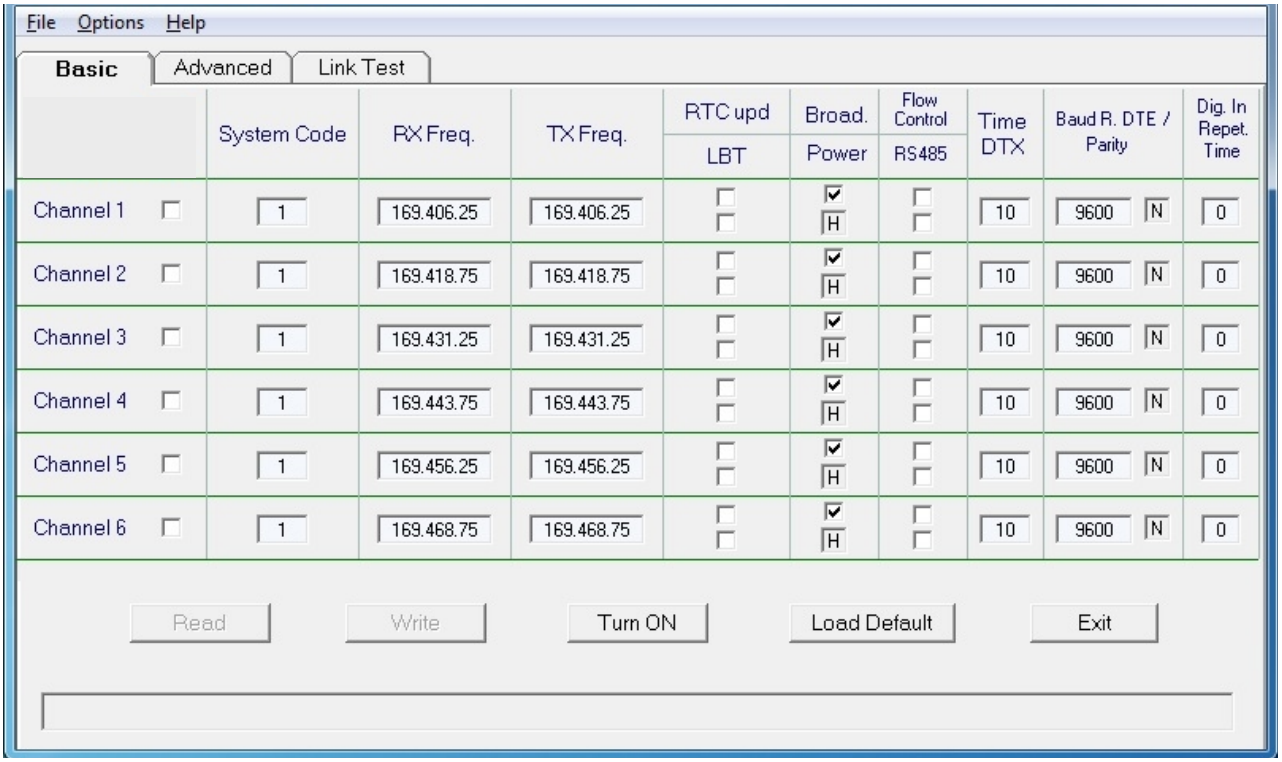
5) Power up the radio modem.
6) To enter in configuration mode you must follow this step: turn off the radio modem, click on the "**Turn On**" button of the configurator and turn on the radio modem within 4 seconds from the push of the "Turn On" button (while the button is flashing green). On the radiomodem, the entry in the configuration state is signaled by the change in color of the LED that changes from green (fast pulse)

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to **orange**. On the configurator this change it is confirmed by a variation in the text of the button from "**Turn ON**" to "**Turn OFF**" and by the activation of the "Read" and "Write" buttons.

Note:
Use **TAB** key and **Up**, **Down**,**Left** and **Right Arrows** to move into the desired fields. A function may be activated choosing the relative box.

Basic configuration



Fields explanation:
Square brackets [ ] it indicates the range of allowed values or conditions ON (on) or OFF (disabled). Between parentheses ( ) it indicates the unit of measure for the selected field.

Channel selection: The box in the fields of the channel numbers allowing the choice of single channel and / or use of the Agility function. If none of the channels is selected, the channel selection is made by the **hardware criteria** (CH0, CH1, CH2). When one channel is selected, the radio modem is operating only on the selected channel and the **hardware criteria** (CH0, CH1, CH2) **are excluded**. If selected more than one channel (**max 3**), the radio modem transmit always on less disturbed channel (between selected active channels) and again the hardware criteria are not used. If you use more than one channel you must configure the same active channels in all the units of the network. In case of more than one channel active, it should be noted that all the configuration value, even on the Advanced tab, are identical to those of the first channel in numerical order as evidenced by the

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lack of boxes of different fields of other channels, so only the parameters of the first active channel (numerical order) are selectable.

System Code [1....255]: Define the identification code of a group of radiomodems. Obviously all radiomodems of a specified group may have the same System Code.

RxFreq. (MHz): Operating frequency of the receiver section.The step synthesis is 12.5 kHz or 25 kHz depending on the selected canalization

TxFreq. (MHz): Operating frequency of the transmitter section. All previous considerations are valid for TxFreq.
Note: The insertion format of operating frequencies contains both integer and decimal.
For example, if the frequency is 169.40625 MHz the displayed format is 169.406.25.
Function keys F5 and F6 respectively decrease/increase this value by a step of 12.5 kHz or 25 KHz depending on the selected canalization.

RTC Upd [ON/OFF]: it is an option only present on firmware version that implement it. The purpose of the function is to allow time synchronization between the Master unit and the Slave units in the network

LBT [ON/OFF]: When the function Listen Before Talking is ON, the packet is transmitted only if the channel is free. If the channel is busy, the radio modem expect the channel to become free before transmitting. We recommend the use of this feature in conjunction with Agility function (see Channel selection).

Broadcasting [ON/OFF]: Available only if both ACK and Echo functions are disabled. When selected all transmitted packet are received by all radiomodems having the same System Code independently by their target addresses.(See Advanced Help for more information).

Power select [L,M,H]: It allows adjustment of output power between three levels: **Low**, **Mid**, **High** (if applicable).

Flow Control [ON/OFF]: When selected the RTS (Ready To Send) and CTS (Clear to Send) criteria of RS232 serial port controls the data flow from DTE. When using flow control you must use the same serial port speed on the used radio modems. If disabled, it is a DTE task to assure the correct timings between groups of data sent.

RS485 [ON/OFF]: When it is turned off, the radio modem uses the RS232 interface for communication; vice versa if it is enabled the radio modem uses the RS485 interface.

TimeDtx [0....255] (msec): Define the waiting time between the stop of data flow on the communication port and the sending of packet by radio. If the data to be send presents one ore more long pauses may be useful increase this time to masks this pause.

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Baud Rate DTE[1200/2400/4800/9600/19200/38400] (bps): Communication Port Speed in bit per second.

Parity [N,E,O]: N = no parity ; E = parity Even ; O = parity Odd.

Digital Input Repetition Time [0....60]: It is the time interval (minutes) between the transmissions of the digital input state. When the value is zero this functionality is disabled.

Read Push-button: when pressed read data from all channels.

Write Push-button: when pressed load the inserted data in all channels.

Exit Push-button: Quit to desktop.

Toolbar:
The Toolbar on upper side of the screen contains the **File**, **Options** and **Help** Menu.
Each menu can be opened as a normal Windows menu using both mouse or keys.

FILE Menu:

- **Open** (path/filename): Load an existing file in the configurator utility.
- **Save** (path/filename): Update an existing file after a change in the parameters.
- **Save As** (path/filename): Create a new file containing all configuration data. The user can be select an adequate filename and choose the destination folder. The default destination folder is the same which contains the software.
- **Exit**: Quit to desktop

Options Menu:

- **Mode** **Local**: Configure the radiomodem linked up communication port.
  Remote: Configure a remote unit by the unit linked up communication port.

- **Serial port selector** [COM1/2]: Open the serial port selection box.

- **Model**: allows a choice between the models of radio modems RM169.

- **Sub-band selector**: it allows the selection of the operating sub-band. The DL169 model has only one sub-band.

- **Canalization** **12.5 KHz**: the width of the radio channel is 12.5 KHz and the speed of radio data is 4800 bps
  25 KHz: the width of the radio channel is 25 KHz and the speed of radio data is 9600 bps

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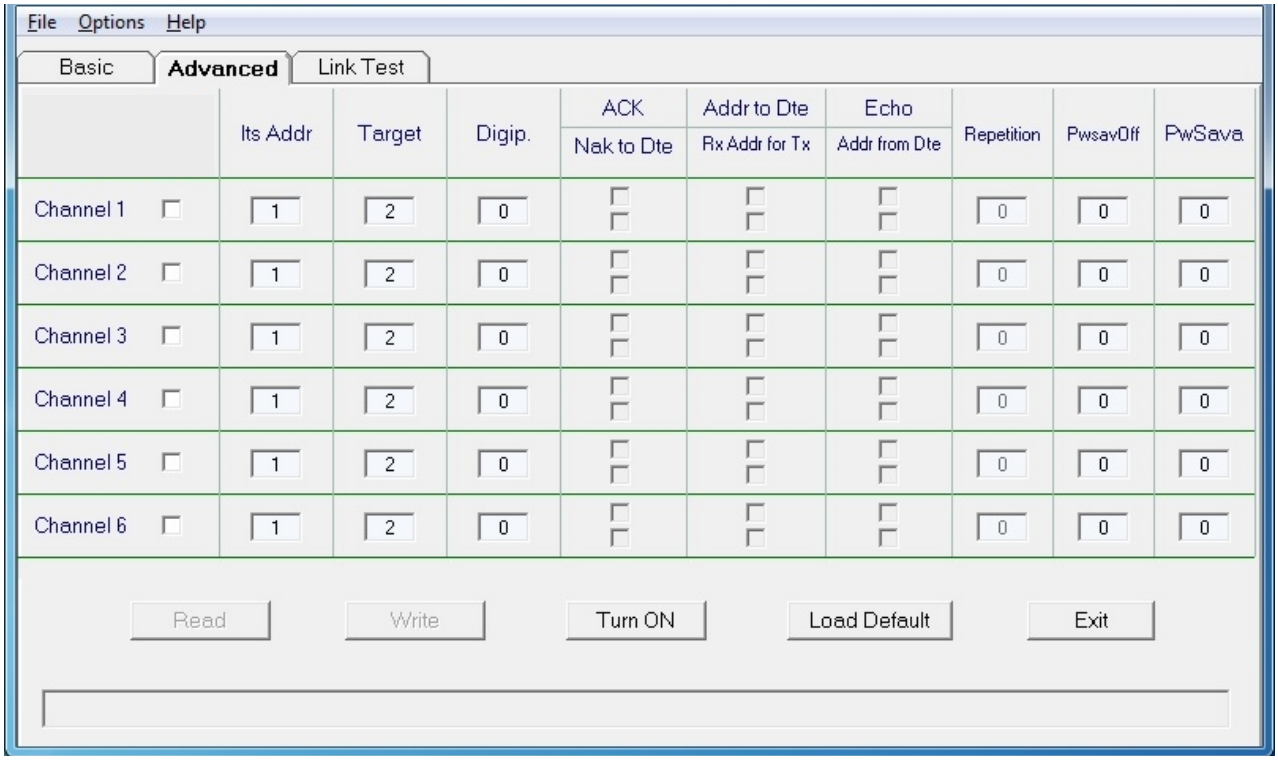
Help Menu:

- **Index** F1: Open this Help file permitting the Italian/English language choose.
- **About:** Display the information about the configuration software.

Channel Copy:
Its possible copy all the parameters of a channel in an other by positioning the cursor over the channel to be copied, pushing the right button of the mouse to open the dialog box and choosing Copy. Now move the cursor over the channel to be updated push the right button of the mouse to open the dialog box and choose Paste. Press Paste to all channels to copy the data in all the other channels.

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Advanced configuration



Its Addr [1....255]: Define own address, **each radio modem must have an univocal address**. In a point- multipoint network the master's address must be **1**.

Target [1....255]: Define the addres of remote unit destination of the message.

Digip. [0....255]: Define the digipeater's addres. The value 0 indicate the absence of any digipeaters.

ACK [ON/OFF]: Available only if Echo and Broadcasting functions are inactive. When active the transmitting modem wait an acknowledge from the remote unit. If this don't come in an adequate time interval the source modem repeats the last packet until specified in the Repetition field.

NAK to DTE [ON/OFF]: Available only with ACK active. When selected the modem send to DTE a NAK character (ASCII 21) at the expiry of Repetition cycle if no ACK have been received

Addr to DTE [ON/OFF]: If selected data send to remote DTE will be preceded by transmitting unit address so that shall be possible to identify the message source unit.

Rx Addr for TX [ON/OFF]: Available only if Addr from DTE function is inactive. If selected the target radiomodem save the address, complete of digipeaters if presents, of the source unit and use this to send the answer of its DTE.

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Echo [ON/OFF]: Available only if ACK and Broadcasting functions are inactive. It's useful to verify the radio link, digipeaters included. When a modem receive an "Echo" packet don't send it to its communication port but repeat it to source modem that send this packet to its DTE.

Addr from DTE [ON/OFF]: Available only if Rx Addr for Tx function is inactive. If selected is a specific duty of DTE provide to the correct addressing of each packet. The addressing is made by some additional bytes preceding the message in the following order:
One System Code Byte [1...255].
One Flag byte with the bit having the following scope: **bit0 (lsb) = Broadcasting**
bit1 = ECHO
bit2 = ACK request
bit3 = Diagnostic
One Unit Number Byte [1...9] which contains both target and all the digipeaters if present.
A maximum of 8 Digipeaters Addresses Bytes in the correct sequence of use.
One Target Address Byte and then the message to be send (**maximum 448 bytes**).

Repetition [0....255]: Available only if ACK function is active. Define the number of repetition of the last message packet when no acknowledge by target modem is received.

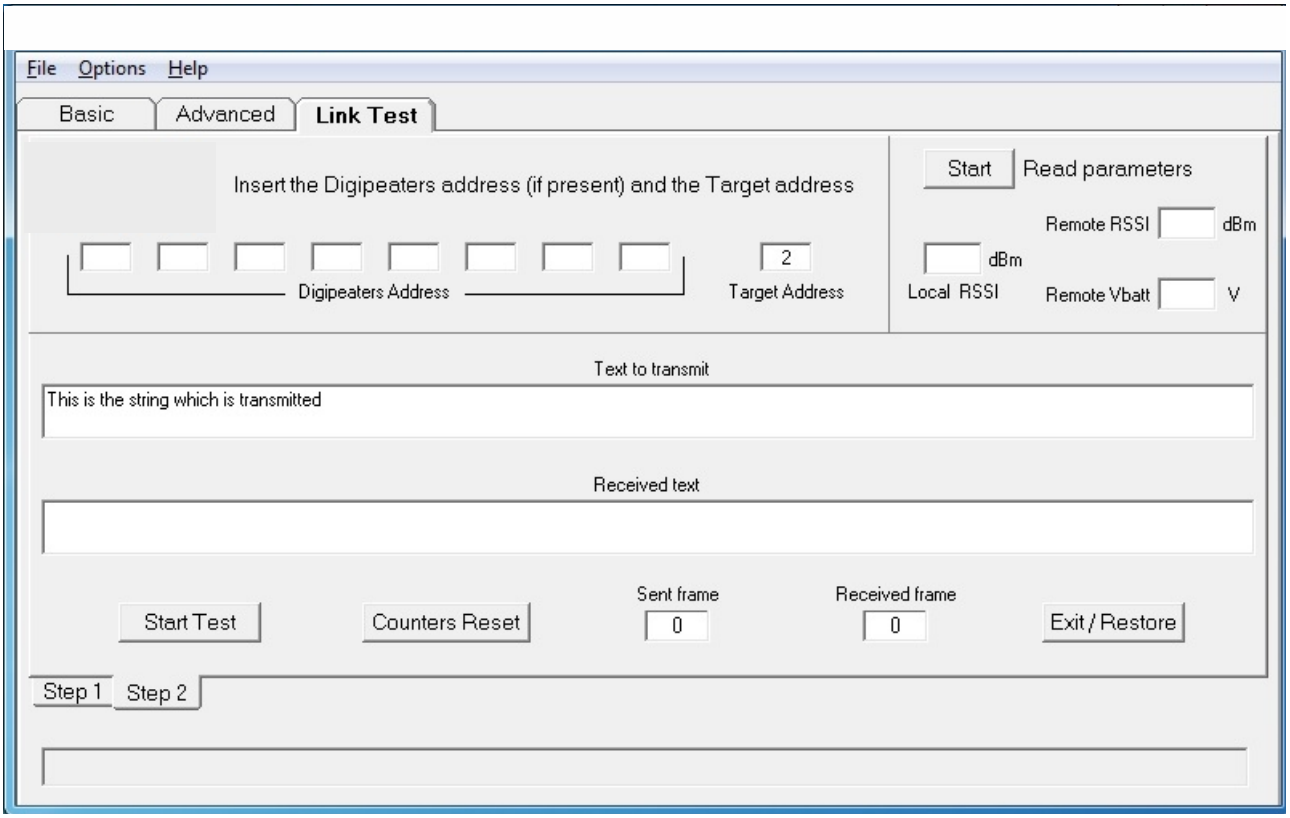
PwsavOff [0....240] (x 10 msec): Define the OFF-Time in the Power Saving cycle. The 0 value keeps countinuously turned-on the unit. This time is used to calculate the preamble length and all units of a network must have the same PwsavOff time.

PwSava [0....255] (x 100 msec): Define the waiting time before starting the Power Saving cycle after any operation. This time must be the same for any unit in the network. Maximum settable value is 254 while **255** is a **reserved** value that define unit as the **Master** of a point multi-point network where the master is continuously turned-on but the preamble length is defined by the PwsavOff time. As for PwsavOff time the 0 value blanks the Power Saving cycle.

Channel change from DTE: the change of the channel between the (six or three) configured channels can be made using the dedicated criteria (CH0, CH1, CH2) or through a specific frame sent by the DTE, the feature is enabled only if **Addr from DTE** is active.
(Possible even in Broacasting mode but with the constraints below specefied).
SEND 3 BYTES (only 3) in the sequence: **00h** - **10h** - **'New_Channel_Number'**, where the values of 'New_Channel_Number' (from 1 to 3 or 6) represent the equivalently configured channels. A value of 0 on 'New_Channel_Number' restores the selection through Dip Switches; also the reset of the radiomodem restores the selection through Dip Switches. After any channel change command it is essential to wait at least **2 mSec** before proceeding with normal activity.
In Broadcasting, because of **Addr from DTE** enabled, the DTE will have to precede to each data frame sent to the Master radiomodem the following four bytes: **System Code** - **01h** - **01h** - **01h**.

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Link test configuration



In this page of the configurator it is possible to test the communication of the radiomodem and see the quality of the radio signal in the used units.
This feature is obtained by sending via radio an echo request packet. The receiving radio modem, when the reception of a packet is finished, re-transmits the received packet to the origin unit. To use this feature it is necessary to change the configuration parameters of the radio modem connected to the computer that is using the configuration program.

The parameter change is automatic: the current configuration of the radiomodem is read and saved into a file; then it is written into the radiomodem a temporary configuration required to operate the link test.

At the end of the test it is necessary to use the automatic restore of the previous parameters into the radio modem using the "Exit/Restore" button. If this procedure is not executed, in the radiomodem will remain the configuration values used for the link test other than those for normal use; this may cause undesired behaviour.

Operations:
With the radio modem powered up and connected to the serial port of your computer, in the "**Basic**" page of the configurator, click the "**Turn On**" button.
Verify correct operation by reading the configuration of the radio modem pushing the "**Read**" button. Go to "**Link Test**" configurator page and press the "**OK**" button. In the displayed screen (page

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Link Test - Step 2) **enter the destination address value of the radiomodem** and, if used, enter the addresses values of the digipeaters in the exact sequence order.

To begin the test of the radio link press the "**Start Test**" button: the characters in the box "text to transmit" are sent. If the reception is right, the box "**Received Text**" displays the same sent string or an error message if there is an error. Each frame sent will increment the "**Sent Frame**" counter. The "**Received Frame**" counter it is incremented only if the packet is received without any error. By clicking the "**Reset Counter**" you can reset the counts.

In the same configuration page (page Link Test - Step 2) it is possible to check the strength of the received radio signal (RSSI) for the remote unit and for the local unit. The RSSI value it is expressed in dBm. To start this function press the "**Start**" button (top right). Another box displays the value of the supply voltage of the integrated RF circuit.

The RSSI provides a correct measure in the range from -100 to -50 dBm. Values lower than -100 dBm (example -105, -110 dBm) can create communication problems. The saturation of the RSSI meter limits the maximum indicated value to about -47 dBm ± 3dBm ; signals of greater intensity displays the same indication.

Note: If one or more digipeaters are present in the radio link, the level of RSSI always refers to the last received signal in each direction of the transmission sequence.

Example: with four units in the network (Master A, first digipeater B, second digipeater C, slave D) the RSSI read from the slave D is referred to the reception of the digipeater C, while the RSSI read from the master is referred to the reception of the digipeater B.

If you want to use the diagnostic function (reading of RSSI and VBatt) outside the configurator program you need to configure the radio modem in "**Address from DTE**" mode and send the following string **HEX**:

- System Code (one byte)
- Options flag (one byte of 0x08 value)
- Number of addressees (one byte)
- Digipeater addresses (0 to 8 bytes)
- Target address (one byte)
- One character (one byte)

Example: **0x01, 0x08 , 0x01 , 0x01 , 0x55**. This example uses the system code 1 with only one address: the target (1). The last byte (0x55 in the example) can assume any value.
The radio modem returns a string composed of three bytes: Remote RSSI (one byte), remote VBatt (one byte), Local RSSI (one byte).
The formula used for deriving the value of RSSI in dBm is the following: **RSSI_value / 2 -130**.
The formula used for deriving the supply voltage of the RF chip in volts is as follows: **VBatt_value / 21.1**.
The diagnostic request (bit 3 of byte flags = set) disables the normal data exchange.

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Remote configuration

To enable this feature the radio modems must be "writed" (configured) locally at least once.

The Configuration software may be used for programming a remote unit by a radiomodem linked up a communication port of a personal computer.

To start the procedure is necessary connect the computer's communication port to the local unit, force it into Configuration Mode as explained in the Online Help of the software, know the operative frequencies then in the **Basic** window of the configurator utility must be **unselected** both **Broad.** and **Flow Control** functions as shown in the following image.
Insert **255** in **TimeDTX** field and **9600** in **Baud Rate DTE**.



Open the **Advanced** window and insert **255** in **Its Addr** field, **unselect ACK and Echo** functions, **select Addr to Dte and Addr from Dte** then insert the **same values** for **PwsavOff and PwSava** used in the remote unit. The following image is an example of the Advanced configuration



Prepare for the local unit in operation mode (exit configuration mode) and set the channel on which it was made the above configuration, connect the antenna to the radio modem

In the **Options** Menu of the configuration software choose **Remote**.

Push the Read button to show all the parameters of the remote unit.

A new dialog box must be shown on the screen and into this box the following remote unit parameters must be inserted:
- **System Code**
- **Digipeaters Addresses** in the exact sequence of use (if one or more digipeaters are presents)
- **Target Address**
- **PwsavOff** time value.

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Push the **OK** button to send the reading request and in a few seconds the reader values shall be shown in the configurator windows. At the end of this process the dialog box will be closed.

To write the new parameters in the remote unit push the **Write** button to open a dialog box, insert the requested parameters then push **OK**.
The new parameters shall be transmitted to the remote unit and after few seconds the remote unit will send back the update acknowledge.

It is important to remember that any update shall be saved in the remote unit after 30 seconds since the end of programming process. **We recommend a** "**Read, Modify and Write**" procedure to avoid mistakes in the programming of the remote units.

Remember that a change in the operative frequencies of remote unit involve a new setting of local unit if the waiting time before saving is expired. Notice: If the remote unit is characterized with Addr from DTE function active the value to be inserted in System Code field must be 0 only if no one message was be send otherwise must be the same used in the communication network, normally the value sent by DTE in normal operation.

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