Tune-up procedure

The tune-up procedure is described in the User Manual in chapter 7.3.2 Radio. Some parameters are variable dependent on higher level settings (e.g. modulation rate in accordance with channel spacing and mode).

7.3.2. Radio

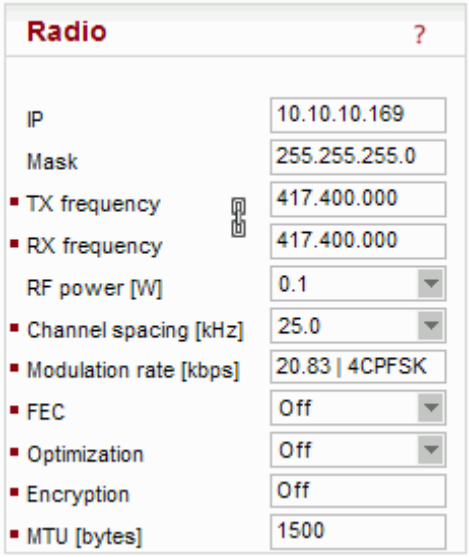

Fig. 7.5: Menu Radio

Notes for following items:
* Active only when in Router mode
** These items have to be set in accordance with the license issued by the respective radio regulatory authority

IP*

Default = 10.10.10.169
IP address of Radio interface

Mask*

Default = 255.255.255.0
Network Mask of Radio interface

TX frequency**

Transmitting frequency. Format MHz.kHz.Hz. Step 5 (for 25 kHz channel spacing) or 6.25 kHz (for 12.5 or 6.25 kHz channel spacing).

The value entered must be within the frequency tuning range of the product as follows:
RIPEX-135: 135–154 MHz
RIPEX-154: 154–174 MHz
RIPEX-215: 215–240 MHz
RIPEX-300: 300–320 MHz
RIPEX-320: 320–340 MHz
RIPEX-340: 340–360 MHz
RIPEX-368: 368–400 MHz

RIPEX-400: 400–432 MHz
RIPEX-432: 432–470 MHz
RIPEX-470: 470–512 MHz
RIPEX-928: 928–960 MHz

RX frequency**

Receiving frequency, the same format and rules apply.
Note: By default, the TX and RX frequencies are locked together and change in one field is mirrored in the other. If clicked, the lock is removed and different TX and RX frequencies can be entered.

Channel spacing [kHz]**

List box: possible values
Default = 25 kHz
The wider the channel the higher the posible Modulation rate.

Note: The 50 kHz channel spacing is available only for HW versions of Radio board higher than 1.1.90.0 or 1.2.50.0. See Status/Radio/HW version.

Modulation rate [kbps]**

• **Mode**
RipEX allows multiple settings of modulation parameters for every channel spacing to enable meeting the different regulations which apply in different countries. Naturally different limits on transmitted signal parameters result in different Modulation rates. The "Mode" menu conveniently groups the settings optimal for common internationally recognized standards. The detailed technical parameters for each setting can be found in the RipEX User manual.
List box: possible values
Default = CE

○ **CE**
Settings optimized for ETSI standards and similar

○ **FCC**
Settings suitable for countries which follow the U.S. government group of standards.
Note: CPFSK modulations have approx. 20% higher frequency deviation compared to CE, so the receiver sensitivity for the same modulation (data rate) is approx. 1-2 dB better.

○ **Narrow**
Special settings for extra-restrictive regulations.
Note: In the 25 kHz channel spacing, the RipEX transmitted signal 16kHz bandwidth contains 99% of the total integrated power for transmitted spectrum according to ITU-R SM328 . This setting is required for 25 kHz channel spacing by authorities in Czech Republic.

○ **Unlimited**
Full channel width used to achieve the maximum possible data rate.

• **Modulation rate [kbps]**
List box: possible values
Default = 20.83 | 4CPFSK

Possible values in list box are dependent on the Mode setting. The two highest rates for 25 and 50 kHz channel spacing are available only when the corresponding SW feature key is active (Either the 166/83 kbps key or the Master key).
Higher Modulation rates provide higher data speeds but they also result in poorer receiver sensitivity, i.e. reduced coverage range. Reliability of communication over a radio channel is always higher with lower Modulation rates.

RF power [W]**

List box: possible values
Default = 5 W
The range of values in the list box is limited to 2 W for high Modulation rates. 10 W is available only for lower Modulation rates (CPFSK) and only when the corresponding SW feature key is active.
Note: Max. RF power for RipEX-470 is 8 W. (Even if there was 10W in list box for fw ver. 1.3.x.x and older)

FEC

List box: possible values
Default = Off
FEC (Forward Error Correction) is a very effective method to minimize radio channel impairments. Basically the sender inserts some redundant data into its messages. This redundancy allows the receiver to detect and correct errors (to some extent). The improvement comes at the expense of the user data rate. The lower the FEC ratio, the better the capability of error correction and the lower the user data rate. The User data rate = Modulation rate x FEC ratio.

Optimization*

List box: On, Off
Default = Off
Optimization is applicable in Router mode for packets directed to Radio channel. It watches packets on individual radio links and optimizes both the traffic to the counterpart of a link and the sharing of the Radio channel capacity among the links.
On an individual link the optimizer supervises the traffic and it tries to join short packets when opportunity comes. However in case of heavy load on one link (e.g. FTP download) it splits the continuous stream of packets and creates a window for the other links. To minimize the actual load, Zlib compression (with LZ77 decimation and Huffman coding) and other sophisticated methods are used.
There is also a "stream" compression, which is very effective for data streams consisting of similar packets. E.g. when there are many remotes behind a single repeater, packets on the most loaded hop between the repeater and the central unit get very efficiently compressed. Note: when there is only one direction traffic, there should be also routing for ETH IP addresses set in RipEX routing tables to make stream compression effective.
In addition a special TCP optimiser is used for TCP/IP connections. It supervises every TCP session and eliminates redundant packets. It also compresses TCP headers in a very efficient way. The overall effect of the Optimization depends on many factors (data content, packet lengths, network layout etc.), the total increase of network throughput can be anything from 0 to 200%, or even more in special cases.

Note: Apart from this Optimization, there is an independent compression on the Radio channel, which
works in both Operating modes, Bridge and Router. This compression is always On.

Encryption

AES 256 (Advanced Encryption Standard) can be used to protect your data from an intrusion on Radio channel. When AES 256 is On, control block of 16 Bytes length is attached to each frame on Radio channel. AES requires an encryption key. The length of key is 256 bits (32 Bytes, 64 hexa chars). The same key must be stored in all units within the network.
List box: Off, AES 256
Default = Off

When AES 256

Key mode
List box: Pass Phrase, Manual
Default = Pass Phrase

- **Pass phrase**
It is not necessary to fill in 32 Bytes of hexa chars in order to set the encryption key. The key can be automatically generated based on a Pass phrase. Fill in your Pass phrase (any printable ASCII character, min. 1 char., max. 128 char.). The same Pass phrase must be set in all units within the
network

- **Manual**
The key can be configured manually (fill in 32 Bytes of 64 hexa chars) or it can be randomly generated using Generate button. The same key must be in all units within the network, i.e. it has to be generated only in one unit and copied to the others.

MTU [bytes]*

Default = 1500 Bytes [70 - 1500] (max. packet size)
When a packet to be transmitted from the Radio interface is longer than the MTU (Maximum Transmission Unit) set, the RipEX router performs standard IP fragmentation. A packet longer than the configured size is split into the needed number of fragments, which are then independently transmitted - the first packet(s) is (are) transmitted fragment-size long, the last packet contains the remaining bytes. The reassembly of the fragments into the original packet normally takes place in the unit at the end of the path. Reducing the maximum length of a frame on a Radio link may improve its performance under unfavourable conditions (interference, multi-path propagation effects). However the recommended place to determine the packet size is the actual user interface, e.g. a COM port. Note that the IP fragmenting is possible in the Router mode only.