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Measuring signal strength values in XPRS IP radio network

The XPRS IP radio displays the RF link signal strength value in LCD and WEB user interfaces when device is powered. The RSSI (Received Signal Strength Indicator) is measured from the transmissions of the next radio device in the same radio network towards the central radio station, "root node". The measured RSSI values is kept in the memory of the device for 15 seconds by default after reception.

Radio devices configured with SATEL NETCO Design, software configuration tool, radio devices will have automatically set information, from which radio devices transmission the RSSI reading will be created from. This numbering value is the next radio link towards the central radio station, "root node". Central station will create its RSSI reading from all stations transmissions, therefore the value will fluctuate depending of the network topology.

If no communication in the radio network after the 15 second time period, radio starts to measure the background noise from the radio environment. Therefore a radio station that doesn't "hear" radio transmission from the radio that is next link towards central radio station, the RSSI in the LCD UI will displayed with red text and indicating the measured background noise (e.g.: **-127 dBm**). The LCD user interface is updated once per 30 seconds by default, therefore if no data in the system for 15 seconds before the LCD UI update, measured noise level will be displayed. In the WEB UI, the previous value can be seen in the user interface if the WEB UI is not refreshed. Historical data can be seen from the device WEB user interface.

Detector SNR (Signal to Noise Ratio) value is an indication of signal quality in SATELLAR radio routers. On the contrary to SATELLINE radio modems, in SATELLAR radio modems this is not a calculated value from the background noise level, but an actual indication of signal quality. Actual background noise signal level can be measured with an NMS ID 1.112, local radio being radio address "0" (regardless of the set RMAC number).

For automatic measurements of these and many other values, features like SNMP or Modbus NMS can be used. Please contact Technical.Support@SATEL.com for more detailed information.

See requirement tables for the RSSI and Detector SNR at the end of this document.

To measure current link health manually, a special tool in the central radio station, "root node" WEB user interface can be used:

1. Enter the WEB user interface
2. Go to Tools –tab → NMS Value
3. Enter the NMS ID value to fetch from radio:
 - o 1.149 (Combined diagnostics value, RSSI and Detector SNR)
4. Enter the RMAC address that the values are fetched from.
 - o Each radio in the network has unique RMAC address.
5. Press the "Get Values Repeatedly" and wait for at least 10 values read from the device in order to have measurement fluctuation of the environment. Stop the process by pressing "Stop NMS Value Fetching".
6. Check that the readings are in the required levels for reliable radio communication according to the tables below.

Modem Settings Modem Info Routing Diagnostics Firmware Updater NMS Import Tools Encryption Logs Administration Logout

Node 1

Status: Voltage: 23.7 V RSSI: -83 dBm
Time: 2018-01-15 15:15:16

NMS Value tool is used to show individual NMSID values from the CU or RU. Values from remote devices can also be shown.

NMSID field can also contain multiple IDs separated with whitespace (e.g. 1.111 1.650), max. 30 IDs.
Valid values for the Device field are:
0 for local RU
4096 for local CU
RMAC of the remote device for remote RU
RMAC of the remote device + 4096 for remote CU

NMSID:
Device:

Display as hexadecimal: Display only value:

Show Value Get Values Repeatedly Stop NMS Value Fetching Value fetching in progress...

```
1.1 ACK "ACKTYPE_OK" (1) for GETVAL (7)
1.1 ACK "ACKTYPE_SENT" (2) for GETVAL (7)
0.2 VALUE "Link-specific signal level" (4245):4 bytes:
"Device: 1, RSSI: -85, SNR: 31"
1.1 ACK "ACKTYPE_OK" (1) for GETVAL (7)
1.1 ACK "ACKTYPE_SENT" (2) for GETVAL (7)
0.2 VALUE "Link-specific signal level" (4245):4 bytes:
"Device: 1, RSSI: -84, SNR: 31"
1.1 ACK "ACKTYPE_OK" (1) for GETVAL (7)
1.1 ACK "ACKTYPE_SENT" (2) for GETVAL (7)
0.2 VALUE "Link-specific signal level" (4245):4 bytes:
"Device: 1, RSSI: -85, SNR: 31"
1.1 ACK "ACKTYPE_OK" (1) for GETVAL (7)
1.1 ACK "ACKTYPE_SENT" (2) for GETVAL (7)
0.2 VALUE "Link-specific signal level" (4245):4 bytes:
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0.2 VALUE "Link-specific signal level" (4245):4 bytes:
"Device: 1, RSSI: -85, SNR: 31"
1.1 ACK "ACKTYPE_OK" (1) for GETVAL (7)
1.1 ACK "ACKTYPE_SENT" (2) for GETVAL (7)
0.2 VALUE "Link-specific signal level" (4245):4 bytes:
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Value fetching ongoing, RSSI and SNR values fetched remotely from RMAC 2 via root node WEB UI.

"Device 1" meaning that the RSSI was created from the TX of RMAC 1



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SATELLAR XT 5RC, QAM model, UHF (Trellis Coding ON)

Radio modulation	Air rate (bps) @ 12,5kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR level (min.)
2-QAM	10080	-118dBm	-116dBm	11dBm
4-QAM	20160	-115dBm	-113dBm	14dBm
8-QAM	30240	-113dBm	-109dBm	17dBm
16-QAM	40320	-110dBm	-106dBm	20dBm
32-QAM	50400	-107dBm	-103dBm	23dBm
64-QAM	60480	-104dBm	-100dBm	27dBm
Radio modulation	Air rate (bps) @ 25kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR level (min.)
2-QAM	20160	-117dBm	-114dBm	11dBm
4-QAM	40320	-114dBm	-111dBm	14dBm
8-QAM	60480	-111dBm	-108dBm	17dBm
16-QAM	80640	-108dBm	-105dBm	20dBm
32-QAM	100800	-105dBm	-102dBm	23dBm
64-QAM	120960	-101dBm	-98dBm	27dBm

SATELLAR XT 5RC, QAM model, VHF (Trellis Coding ON)

Radio modulation	Air rate (bps) @ 12,5kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR rate (min.)
4-QAM	20160	-115dBm	-113dBm	14dBm
8-QAM	30240	-113dBm	-109dBm	17dBm
16-QAM	40320	-110dBm	-106dBm	20dBm
32-QAM	50400	-107dBm	-103dBm	23dBm
64-QAM	60480	-103dBm	-99dBm	27dBm
Radio modulation	Air rate (bps) @ 25kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR rate (min.)
4-QAM	40320	-113dBm	-110dBm	14dBm
8-QAM	60480	-110dBm	-108dBm	17dBm
16-QAM	80640	-107dBm	-104dBm	20dBm
32-QAM	100800	-104dBm	-101dBm	23dBm
64-QAM	120960	-101dBm	-98dBm	27dBm

SATELLAR XT 5RC, FSK model (FEC OFF)

Radio modulation	Air rate bps @ 12,5kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR rate (min.)
4- FSK	9600	-119dBm	-114dBm	20dBm
8- FSK	14400	-112dBm	-105dBm	26dBm
16- FSK	19200	-104dBm	-97dBm	32dBm
Radio Modulation	Air rate bps @ 25kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR rate (min.)
4- FSK	19200	-116dBm	-108dBm	20dBm
8- FSK	28800	-108dBm	-102dBm	26dBm
16- FSK	38400	-102dBm	-94dBm	32dBm
Radio Modulation	Air rate bps @ 150kHz	Sensitivity (BER 10E-3)	Sensitivity (BER 10E-6)	Required SNR rate (min.)
4- FSK	115200	-104dBm	-97dBm	20dBm
8- FSK	172800	-96dBm	-89dBm	26dBm
16- FSK	230400	-88dBm	-82dBm	32dBm

NOTE! At least 15dB fading margin ("radio link budget") is recommended in RSSI from the given receiver maximum sensitivity values in order to maintain reliable and steady radio link in all conditions.