



# User manual

## Phoenix G2 IDU

/ER 1.10

FW 0403\_04

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This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

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- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

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### Chapter 1: OVERVIEW

This document briefly describes the PhoeniX G2 series TDM/ASI/IP split mount system (IDU+ODU) covering the built-in management system, configuration functionality, hardware features, etc.

The Phoenix G2 is a robust and versatile dual-channel Indoor Unit designed for High Capacity point-to-point microwave networks. Two integrated modems in one Indoor Unit provide excellent ability to connect two active ODUs and aggregate or switch the traffic between two links. The device operates with SAF ODUs and allows to build wireless links in protected (hitless 1+1 HSB, SD, FD), aggregate (2+0) and "Dual End Station" configurations. Due to its design and license keys the device is fully scalable and allows a seamless upgrade of transmission capacity, unlock the additional functionality and expand with more interface ports (e.g., E1/T1 for TDM application or DVB-ASI for video broadcasting). The open device architecture is prepared for growing along with customer needs in the future.

The primary traffic interface for PhoeniX G2 split mount system is Gigabit Ethernet. As PhoeniX G2 system is capable of providing bit rate of up to 452Mbps, it is a great addition to SAF portfolio. PhoeniX G2 radio and modem performance allows achieving high system capacity by employing 1024-decision states modulation scheme by user's choice. Apart from the full system capacity of 452Mbps, it is possible to configure the radio to any of 10, 14, 20, 25, 28, 30, 40, 50, 56 and 60 MHz channels as well as to any of QPSK, 16QAM, 32QAM, 64QAM, 128QAM, 256QAM, 512QAM and 1024QAM modulations, thus providing various capacities to suit particular needs.

SAF Tehnika has employed most modern design solutions and components to create high performance split mount system with low power consumption – 43-85W per system. PhoeniX G2 system is a perfect building block for any modern future proof wireless network, including mobile service providers, fixed data service operators, enterprise customers, municipal and governmental networks among others.

### PhoeniX G2 IDU features summary

Main features:

- Split mount system solution
- 1+0, 1+1 (HSB, FD, SD) and 2+0 configuration schemes
- 1+1 Full protection split mode utilizing two IDU units
- Integrated XPIC mechanism
- Capacity: up to 452 Mbps over single channel, 904 Mbps aggregated capacity
- Channel Bandwidth ETSI and ANSI: 7/10/14/20/25/28/30/40/50/56/60 MHz
- Modulations: QPSK/16QAM/32QAM/64QAM/128QAM/256QAM/512QAM/1024QAM
- Interfaces: 10 / 100 / 1000 Eth
- Traffic: Ethernet (4xSFP, 3xLAN), E1 (up to 64E1), ASI (up to 16 ASI streams)
- TDM and ASI port extension by means of "External MUX Module (EMM)"
- Frequency bands: 2.3\* / 4 / 6 / 7 / 8 / 10 / 11 / 13 / 15 / 18 / 23 / 26 / 38 GHz
- Hitless ACM and ATPC functions
- 802.1Q VLAN support
- AES256 encryption
- SyncE, PTP 1588v2 synchronization
- Standard management access: HTTPS, SNMP v2&3, Telnet, SSH
- Two integrated wide-band modems in one indoor unit for different Point-to-Point applications
- Single USB port for local management access

\* The 2.3GHz radio unit complies with FCC part 27

For 2.3GHz radio, end-user is responsible for limiting systems E.I.R.P within allowed operational license to be in line with Tx Power plus antenna gain and minus attenuation in cabling between radio and antenna. For example, to assuming the operational license allows 2000W E.I.R.P and radio Tx power is set at 36 dBm and there is 0 dB cable loss between radio and antenna max allowed gain is 26.9 dBi.

For compliance with Canada General Population Limit the minimum safe operational distance is 5.5 meters.

### **IDU mechanical features**

- 1U high
- Power consumption <30W
- Dimensions 45x210x240 mm, weight 2.22 kg



Figure 1.1 Phoenix G2 IDU

### **ODUs mechanical features**

- Compact unit, 288x288x80mm, 3.5kg (SP/HP ODUs); 280x437x110mm, 7.5kg (VHP ODU)
- 3 handles (SP/HP ODU) and 1 handle (VHP ODU) for user convenience
- Safe and easy to use 4 side locking/tightening arrangement
- All connectors on the side of the unit, always at 45° regarding vertical axis for both V and H polarization on the SP/HP ODUs
- All the connectors downwards on the VHP ODU
- Power consumption: 13-39W (SP/HP ODUs) and 39-55W (VHP ODU)



Figure 1.2 Phoenix G2 ODUs

### **IRFU** mechanical features

- Indoor radio unit (IDU+IRFU)
- 2U high
- Power consumption: 13-39W
- Dimensions 90x430x260 mm, weight 5.8 kg.



Figure 1.3 Phoenix G2 IRFU

### Labelling

The label contains the following information (see samples in the picture below):

**Product model name** (PhoeniX G2 IDU for PhoeniX G2 Indoor Unit, CFIP-18-PhoeniX for 18GHz Outdoor Unit, etc).

**Product Number / Model Number (P/N or M/N)** (EAGXU002, S18RFU05LA): product/model number contains information about the unit. **Serial Number** (355260100007): the serial number uniquely identifies the unit.



Figure 1.4 Label of the PhoeniX G2 Indoor Unit



Figure 1.5 Label of the PhoeniX G2 ODU

P/N Translation for CFIP PhoeniX G2 ODU:

- "S" designates CFIP split mount series product;
- "18" designates Frequency range (18 GHz) of the Unit;
- "RF" designates standard power radio;
- "U" designates unified band ODU operating 7 60MHz;
- "05" designates the version number of the Unit;
- "L" designates the band side in which ODU operates (H, L);
- "A" designates the subband in which ODU operates (A, B, C).



Figure 1.6 Label of the PhoeniX G2 IRFU

P/N Translation for CFIP PhoeniX G2 IRFU:

- "S" designates CFIP split mount series product;
- "06" designates Frequency range (6 GHz) of the Unit;
- "RI" designates IRFU radio;
- "U" designates unified band radio operating 7 60MHz;
- "01" designates the version number of the Unit;
- "L" designates the band side in which ODU operates (H, L);
- "A" designates the subband in which ODU operates (A, B, C).

### IDU front panel interfaces and LEDs

Phoenix G2 IDU has following interfaces:



Figure 1.7 PhoeniX G2 IDU interfaces

### **DC port**

48V power supply connection. Input DC voltage operating range is -40.5V to -57V (max current up to 3A). 4-wire DC power connector with screw terminals included. Polarity layout indicated on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 4 pole "screw on" power connector could be used.

### **4xSFP ports**

SFP slots 1 to 4 for Gigabit Ethernet traffic. Any type of SFP modules can be used (Singlemode or Multi-mode optical fibre). SFP ports are used also for interconnecting IDUs in case of 1+1 full protection configuration, and for IDU interconnection with EMM modules. 2.5 Gbps optical fibre cable and SFP modules must be used to interconnect Phoenix G2 IDUs in 1+1 full protection mode. 1 Gbps optical fibre cable and SFP modules can be used to interconnect Phoenix G2 IDU with EMM modules.

### LAN1, LAN2 ports

10/100/1000Base-Tx Ethernet traffic ports (RJ-45)

### **MNG LAN3 port**

10/100/1000Base-Tx port, which is out-of-band management by default and provides access to the management via web GUI, Telnet or SSH communication facilities. It can be reconfigured for traffic purposes as well

### **HOST USB port**

USB port reserved for flash memory

### **MNG USB port**

USB mini port dedicated for local management access via its own IP address.

### ODU A, ODU B ports

N-type female  $50\Omega$  coaxial ports for connecting ODUs. Any type of  $50 \Omega$  coaxial cable of good quality can be used to interconnect the Phoenix G2 IDU and ODUs. The cable should be equipped with N-type male connectors on each end.

### **Grounding screw**

Grounding screw for equipment grounding

#### Phoenix G2 IDU front panel alarm LED indications:

LED name	Description
SYNC (A,B)	<b>Orange –</b> OK, synchronization of link (A and/or B) established
	Orange blinks – loss of synchronization
STATUS	<b>Orange –</b> OK, no alarms present
	Orange blinks – one or several alarms are active
SFP (1-4)	Orange – SFP port connected
	Off – SFP port not connected
Power	Green – power supply is OK

#### Ethernet RJ-45 connector LED indications:

LED color	Description
Yellow	ON – link speed is 1000Mbps/s OFF – link speed is 100Mbps/s
Green	<b>ON</b> – Ethernet link is up <b>Blinking</b> – activity on port's egress/ingress directions

### **Application Examples**

PhoeniX G2 1+0 configuration:

• Basic split-mount 1+0 system with up to 452 Mbps Ethernet



Figure 1.8 PhoeniX G2 1+0 configuration

### PhoeniX G2 1+0 Dual (repeater) configuration:

- Dual-core modem allows to use one IDU as repeater node
- Both ODUs are working to different directions (East/West)



Figure 1.9 PhoeniX G2 1+0 Repeater configuration

### PhoeniX G2 1+1 Frequency Diversity (FD):

- FD protected (1+1) configuration is used with single antenna and OMT (orthomode transducer) or a coupler at each side of the link
- Each pair of ODUs utilizes its own frequency channel (f<sub>low</sub>, f<sub>high</sub>, f'<sub>low</sub>, f'<sub>high</sub>)
- The outgoing (Tx) traffic at each site is passed to both ODUs, and both are always transmitting
- The incoming (Rx) traffic is picked from one of the ODUs
- 1+1 configuration provides hardware redundancy and mitigates multipath fading
- Both Tx and Rx switching is hitless

### PhoeniX G2 1+1 Hot Standby (HSB):

- HSB protected (1+1) configuration is used with single antenna and a coupler at each side of the link
- Both the incoming (Rx) and outgoing (Tx) traffic is switched to either one link or other, only single ODU at each side is transmitting
- Protects modem and radio from failure



Figure 1.10 PhoeniX G2 1+1 FD and HSB configuration with coupler

### PhoeniX G2 1+1 Space Diversity (SD):

- SD protected (1+1) configuration is used with two antennas at each side of the link
- Both the incoming (Rx) and outgoing (Tx) traffic is switched to either one link or other, only single ODU at each side is transmitting
- In Space Diversity mode antennas are located 10-12 meters apart hence allows avoiding frequency selective fading multipath (e.g. reflection over water, air refraction, etc.)
- Rx switching is hitless , Tx switching <50ms



Figure 1.11 PhoeniX G2 1+1 SD configuration

### PhoeniX G2 1+1 Full protection configuration:

- 1+1 HSB, FD and SD full protection is provided. SD supports only fixed hotswap role – primary or secondary
- This protection type protects the link also against IDU, power supply and interface failures
- In case of protection, when the Primary link fails, the secondary re-configures itself to the Primary role



Figure 1.12 PhoeniX G2 1+1 full protection configuration

2.5 Gbps SFP modules must be used for both IDU FO interconnection. In Design Type 511 both SFP ports work in "Forced 2G5" mode.

### PhoeniX G2 2+0/2+0 XPIC configurations:

- 2+0 configuration is used to aggregate payload traffic (capacity doubling). In this case 2 frequency channels are required
- 2+0 XPIC configuration is used to aggregate payload traffic using 1 frequency channel in both polarizations Vertical and Horizontal simultaneously

• Layer 1Link bonding is supported as aggregation technique



Figure 1.13 PhoeniX G2 2+0/2+0 XPIC configurations

### PhoeniX G2 2+2 FD/2+2 XPIC configurations:

- 2+2 FD configuration is used to aggregate payload traffic (capacity doubling) using 2 frequency pairs. HSB/SD and FD protection is provided for the aggregated links.
- 2+2 XPIC configuration is used to aggregate payload traffic using 1 frequency channel in both polarizations Vertical and Horizontal simultaneously. HSB/SD and FD protection is provided for the aggregated links.
- Layer 1Link bonding is supported as aggregation technique



```
Figure 1.14 PhoeniX G2 2+2 FD/2+2 XPIC configurations
```



Both IDUs in each side of the link are interconnected with 2 optical cables on ports SFP1 and SFP2. 2.5 GB SFP modules must be used for this interconnection. SFP3 or SFP4 ports can be used for the IDU interconnection with EMM modules.

### EMM extension modules description

### ASI EMM extension module

The ASI EMM extension module provides ASI interface extension for Phoenix G2 IDUs. The ASI EMM module multiplexes up to 4 ASI channels into the compact stream which is directed over

the fibre optic (FO) connection to/from the Phoenix G2 IDU. The ASI EMM module features 4 x ASI built-in ports (one BNC per ASI channel) and 2 x SFP 1000Base-SX ports.

The compact, simple to configure, and easily scalable design enables cascading with other EMM extension devices (e.g. ASI EMM and/or E1/T1 EMM). The configuration is performed in the web GUI of the IDU, in section  $\underline{Config} \rightarrow \underline{Ports} \rightarrow \underline{EMM}$ .

Maximum speed for single ASI channel is 216 Mbps. The actual ASI channel speed is autodetected by the system and is displayed in Config  $\rightarrow$  Ports  $\rightarrow$  MUX section.

Each ASI channel can be independently configured into Tx or Rx mode. Following port combinations are possible:

- 4x ASI Tx (unidirectional)
- 3x ASI Tx and 1x ASI Rx (bidirectional)
- 2x ASI Tx and 2x ASI Rx (bidirectional)
- 1x ASI Tx and 3x ASI Rx (bidirectional)
- 4x ASI Rx (unidirectional)

Up to 4 EMM modules can be connected into the cascade and thus get the maximum quantity of external ports (ASI EMM and E1/T1 EMM modules combination is possible). Maximum 4 EMM modules can be cascaded and in case of ASI EMM modules the maximum count of ASI channels is 16. SFP 1000Base-SX on the left side **SFP 2 UPLINK 2** is dedicated for the modules interconnection into cascade. The configuration of all EMM modules is performed from the web GUI of the IDU.

ASI EMM extension module has following interfaces/connectors:



Figure 1.15 ASI EMM extension module interfaces

### **4xDVB ASI ports**

Four configurable Input / Output DVB-ASI ports (75 Ohm).

### **SFP 1 UPLINK 1**

Primary SFP port reserved for connection to the IDU or to primary EMM extension module in EMM extension module chain.

### SFP 2 UPLINK 2

Secondary SFP port reserved for connection to secondary / next EMM extension module in EMM module chain or for connection to relay IDU in add/drop configuration.

### DC port

48V power supply connection. Input DC voltage operating range is -20V to -72V (max current up to 3A). 2-wire DC power connector with screw terminals included. Polarity layout indicated

on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 2 pole "screw on" power connector could be used.

### **Grounding screw**

Grounding screw for equipment grounding

#### ASI EMM module front panel alarm LED indications:

LED name	Description
STATUS	<b>Orange</b> – OK, module enabled, proper communication with the IDU
	Orange blinks – WARNING, module is not enabled in the system or no
	communication with IDU, or configuration is not finished yet
	Off – ERROR, firmware is not loaded into EMM module HW
	Green – power supply is OK
TOWEN	Off – no power supply
	Orange blinks – signal detected and synchronized, valid communication
SFP 1/2 LINK	with the IDU
	Off – no correct signal detected
	ASI port in Tx mode:
ASI STATUS	Orange blinks – ASI signal is presented, sending the data
	<b>Off</b> – no data (IDLE status)
	ASI port in Rx mode:
	<b>Orange</b> – signal detected, but its status is IDLE or Nosync mode
	Orange blinks – incoming ASI signal
	Off – no ingress signal detected

Interconnection of Phoenix G2 IDU and ASI EMM module must be done using optical cable and SFP modules. For 1+0 and 2+0 configurations any of all 4 SFP ports on the IDU can be used for connection to EMM module. In 1+1 full redundancy configuration SFP ports 3 and 4 can be used to connect to EMM module. On EMM module SFP port 1 can be used to connect to Phoenix G2 IDU and SFP port 2 must be used to connect to the next cascaded EMM module.



Figure 1.16 Phoenix G2 IDU and ASI EMM module interconnection

Application of 1+0 link connection with ASI EMM modules:



Figure 1.17 1+0 link with ASI EMM modules

Application of 1+1 link connection with ASI EMM modules:



Figure 1.18 1+1 link with ASI EMM modules

0000 -0000 -.... 1 P 0000 \* CAAAAO đě, 0000 0.0000 đă.

Application of 1+1 full protection link connection with ASI EMM modules:

Figure 1.19 1+1 full protection link with ASI EMM modules



In 1+1 Full protection mode EMM modules can be connected only to SFP3 and SFP4 ports of the Phoenix G2 IDU. SFP1 port is for both Phoenix G2 IDU interconnection and SFP2 port is reserved for 2+2 modes

1+0 retranslation application with ASI EMM modules:



Figure 1.20 1+0 retranslation link with ASI EMM modules

The retranslation IDU in *Figure 1.20* is configured in 1+0 Dual mode.

1+0 retranslation application with 2xASI streams '*Drop*' in the retranslation site. Other 2xASI streams are forwarded to the end-point:



Figure 1.21 1+0 retranslation link with ASI stream Drop

1+0 retranslation application example with 2xASI streams '*Drop*' and 2xASI streams '*Add*' in the retranslation site:



Figure 1.22 1+0 retranslation link with ASI stream Add/Drop

### E1/T1 EMM extension module

The E1/T1 EMM extension module provides E1/T1 interface extension for Phoenix G2 IDUs. The E1/T1 EMM module multiplexes up to 16 E1/T1 channels into the compact stream which is directed over the fibre optic (FO) connection to/from the Phoenix G2 IDU. The E1/T1 EMM module features 16 x E1/T1 built-in ports (one RJ-45 per e1/t1 channel) and 2 x SFP 1000Base-SX ports.

The compact, simple to configure, and easily scalable design enables cascading with other EMM extension devices (e.g. E1/t1 EMM and/or ASI EMM). The configuration is performed in the web GUI of the IDU, in section Config  $\rightarrow$  Ports  $\rightarrow$  EMM.

Maximum speed for single E1 channel is 2.048 Mbps and for single T1 channel is 1.544 Mbps. The actual/total E1/T1 channels speed is auto-detected by the system and is displayed in Config  $\rightarrow$  Ports  $\rightarrow$  MUX section.

Up to 4 EMM modules can be connected into the cascade and thus get the maximum quantity of external ports (E1/T1 EMM and ASI EMM modules combination is possible). Maximum 4 EMM modules can be cascaded and in case of E1/t1 EMM modules the maximum count of E1/t1 channels is 64. SFP 1000Base-SX on the left side **SFP 2 UPLINK 2** is dedicated for the modules interconnection into cascade. The configuration of all EMM modules is performed from the web GUI of the IDU.

E1/T1 EMM extension module has following interfaces/connectors:



Figure 1.23 E1/T1 EMM extension module interfaces

### 16xE1/T1 ports

16 configurable Input / Output E1/T1 ports (120 Ohm).

### **SFP 1 UPLINK 1**

Primary SFP port reserved for connection to the IDU or to primary EMM extension module in EMM extension module chain.

### **SFP 2 UPLINK 2**

Secondary SFP port reserved for connection to secondary / next EMM extension module in EMM module chain or for connection to relay IDU in add/drop configuration.

### **DC port**

48V power supply connection. Input DC voltage operating range is -20V to -72V (max current up to 3A). 2-wire DC power connector with screw terminals included. Polarity layout indicated on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 2 pole "screw on" power connector could be used.

### **Grounding screw**

Grounding screw for equipment grounding

E1/T1 EMM module front panel alarm LED indications:

LED name	Description	
CT ATUC	<b>Orange</b> – OK, module enabled, proper communication with the IDU	
	Orange blinks – WARNING, module is not enabled in the system or no	
314103	communication with IDU, or configuration is not finished yet	
	Off – ERROR, firmware is not loaded into EMM module HW	
	Green – power supply is OK	
POWEN	Off – no power supply	
SFP 1/2 LINK	Orange blinks – signal detected and synchronized, valid communication	
	with the IDU	
	Off – no correct signal detected	
	LINK:	
	Green – E1/T1 signal detected at the port	
	Off – no link at the port	
E1/T1 STATUS		
	AIS (Alarm Indication Signal):	
	Orange – AIS signal detected	
	<b>Off</b> – no AIS on the port	

The position and indexing of 16 E1 user ports indicates the legend below:



Figure 1.24 Indexing of E1/T1 ports

The legend of e1/t1 port pins is following:

- Pin1 Rx-
- Pin2 Rx+
- Pin4 Tx-

Pin5 – Tx+

All the E1/T1 ports are protected against ESD (electrostatic discharge), CDE (Cable Discharge Events), and lightning.

In the case of connecting 16E1 balanced RJ-45 interface to customer's unbalanced BNC E1 interface ports the following cable must be used:



Figure 1.25 Cable for interconnecting to unbalanced E1/T1 CPE

#### Pinout for such cable is following:

Pin	Signal
1	Rx ring
2	Rx tip
3	GND (over resistor 0805 0R)
4	Tx ring
5	Tx tip
6	GND (over resistor 0805 0R)
7	NC
8	NC

Interconnection of Phoenix G2 IDU and E1/T1 EMM module must be done using optical cable and SFP modules. For 1+0 and 2+0 configurations any of all 4 SFP ports on the IDU can be used for connection to EMM module. In 1+1 full redundancy configuration SFP ports 3 and 4 can be used to connect to EMM module. On EMM module SFP port 1 can be used to connect to Phoenix G2 IDU and SFP port 2 must be used to connect to the next cascaded EMM module.



Figure 1.26 Phoenix G2 IDU and E1/T1 EMM module interconnection

Application of 1+0 link connection with E1/T1EMM modules:



Figure 1.27 1+0 link with E1/T1 EMM modules

Application of 1+1 link connection with E1 EMM modules:



Figure 1.28 1+1 link with E1/T1 EMM modules

Application of 1+1 full protection link connection with E1/T1 EMM modules:



Figure 1.29 1+1 full protection link with E1/T1 EMM modules

In 1+1 Full protection mode EMM modules can be connected only to SFP3 and SFP4 ports of the Phoenix G2 IDU. SFP1 port is for both Phoenix G2 IDU interconnection and SFP2 port is reserved for 2+2 modes

1+0 retranslation application with E1/T1 EMM modules:



Figure 1.30 1+0 retranslation link with E1/T1 EMM modules

The retranslation IDU in *Figure 1.30* is configured in 1+0 Dual mode.

1+0 retranslation application with E1/T1 Add/Drop in the retranslation site:



Figure 1.31 1+0 retranslation link with E1/T1 Add/Drop

### Phoenix G2 ODU and IRFU interfaces and ports

### SP/HP ODU

Phoenix G2 Standard Power (SP)/High Power (HP) ODU has following interfaces:



Figure 1.32 SP/HP ODU interfaces

### **UBR flange**

Standard UBR flange for ODU interconnection with antenna. Flange size depends on the frequency used.

### **RSSI port**

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by Phoenix G2 vs. RSSI port output voltage. The evaluated Rx level has the error +/-2 dB.



RSSI, Displayed RSL, dBm v 0 -90 -85 0,1 -80 0,2 -75 0,3 -70 0,4 -65 0,5 -60 0,6 -55 0,7 -50 0,8 -45 0,9 -40 1 -35 1,1 -30 1,2 -25 1,3 -20 1,4

Figure 1.33 Typical RSSI=f(RSL) chart

### **N-type connector**

N-type Female connector for ODU interconnection to IDU with coaxial cable

### **Grounding screw**

Grounding screws should be interconnected with grounding cable and connected to ground circuit

### SP/HP ODU with SAF2 adaptation interface

Phoenix G2 Standard Power (SP)/High Power (HP) ODU with SAF2 adaptation has following interfaces:



Figure 1.34 SP/HP ODU with SAF2 interfaces

### SAF2 adapter with UBR flange

Standard UBR flange for ODU interconnection with antenna equipped with SAF2 interface. Flange size depends on the frequency used.

### **RSSI port**

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by Phoenix G2 vs. RSSI port output voltage. The evaluated Rx level has the error +/-2 dB.



### **N-type connector**

N-type Female connector for ODU interconnection to IDU with coaxial cable

### **Grounding screw**

Grounding screws should be interconnected with grounding cable and connected to ground circuit

### VHP ODU

Phoenix G2 Very High Power (VHP) ODU has following interfaces:



Figure 1.36 VHP ODU interfaces

### **Twisted polarization flange**

VHP ODU features twisted polarization flange and resulting signal polarization is determined by interface on antenna/OMT. To change signal polarization, only the antenna interface should be rotated, as radio always remains in vertical position.

### **RSSI port**

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by Phoenix G2 vs. RSSI port output voltage. The evaluated Rx level has the error +/-2 dB.



Figure 1.37 Typical RSSI=f(RSL) chart

### N-type connector

N-type Female connector for ODU interconnection to IDU with coaxial cable

### **Power LED**

Indicates if the ODU is powered ON

### **Grounding screw**

Grounding screws should be interconnected with grounding cable and connected to ground circuit

### IRFU with built-in diplexer

Phoenix G2 IRFU with built-in diplexer has following interfaces:



### Figure 1.38 IRFU interfaces

### DC port

48V power supply connection. Input DC voltage operating range is -40.5V to -57V (max current up to 3A). 2-wire DC power connector with screw terminals included. Polarity layout indicated on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 2 pole "screw on" power connector could be used.

### **Power LED**

Indicates if the IRFU is powered ON

### **RSSI port**

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by Phoenix G2 vs. RSSI port output voltage. The evaluated Rx level has the error +/-2 dB.



Figure 1.39 Typical RSSI=f(RSL) chart

### IF port

SMA IF connector for connection to IDU

### **N-type connector**

N-type Female connector for IRFU interconnection to antenna with coaxial cable

### **Grounding screw**

Grounding screws should be interconnected with grounding cable and connected to ground circuit

### IRFU without built-in diplexer

Phoenix G2 IRFU without built-in diplexer has following interfaces:



Figure 1.40 IRFU interfaces

### **DC port**

48V power supply connection. Input DC voltage operating range is -40.5V to -57V (max current up to 3A). 2-wire DC power connector with screw terminals included. Polarity layout indicated on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 2 pole "screw on" power connector could be used.

### **Power LED**

Indicates if the IRFU is powered ON

### **RSSI port**

RSSI (Received Signal Strength Indicator) port is used to adjust the alignment of antenna for best performance (for both rough and fine adjustment); this can be done using digital multimeter which is connected to the RSSI port. The output of the RSSI port is DC voltage and varies depending on received signal level.

The following chart and table shows typical relationship of the received signal level (Rx level) displayed by Phoenix G2 vs. RSSI port output voltage. The evaluated Rx level has the error +/-2 dB.



#### IF port

SMA IF connector for connection to IDU

### **RX port**

SMA connector for IRFU Rx interconnection with external branching unit

### **TX port**

SMA connector for IRFU Tx interconnection with external branching unit

### **Grounding screw**

Grounding screws should be interconnected with grounding cable and connected to ground circuit

On some IRFU devices optional RJ-45 control port can be available for interconnection with IBU device which is equipped with active switch. In case if the IRFU is equipped with the Control port, additional LED indications are available on:

LED name	Description
POWER	<b>Green –</b> power supply is OK <b>Off</b> – no power supply
Control	Green – works correctly
(optional)	<b>OII</b> – not connected, cable fault

### IBU without active switch

Phoenix G2 IBU (Indoor Branching Unit) without built-in active switch has following interfaces on the front panel:



Figure 1.42 IBU front panel interfaces

### **RX1 and RX2 ports**

SMA connector for IBU interconnection with corresponding IRFU Rx port

### TX1 and TX2 ports

SMA connector for IBU interconnection with corresponding IRFU Tx port

Backpanel of the IBU:



Figure 1.43 IBU top-back panel interfaces

### Waveguide connection

Interconnection with waveguide.

The *Figure 1.43* shows the IBU P/N C06U43BSR3M with outgoing CMR137 (UER70) waveguide flange. For other options refer to the IBU product datasheet or SAF representative. Example of IRFU and IBU interconnection using the 1+1 or 2+0 application with single IDU:



Figure 1.44 IRFU and IBU interconnection using single IDU

Example of IRFU and IBU interconnection using the 1+1 full redundancy application with two IDUs:



Figure 1.45 IRFU and IBU interconnection using two IDUs
### IBU with active switch

Phoenix G2 IBU with built-in active switch has following interfaces on the front panel:



Figure 1.46 IBU with active switch front panel interfaces

#### **RX1 and RX2 ports**

SMA connector for IBU interconnection with corresponding IRFU Rx port

#### **TX1 and TX2 ports**

SMA connector for IBU interconnection with corresponding IRFU Tx port

#### **Radio 1 and Radio 2 Control ports**

RJ-45 connector for IBU interconnection with corresponding IRFU Control port

#### **DC port**

48V power supply connection. Input DC voltage operating range is -40.5V to -57V (max current up to 3A). 2-wire DC power connector with screw terminals included. Polarity layout indicated on the front panel. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 2 pole "screw on" power connector could be used.

LED name	Description
Control (Radio	Green – normal operation – control cable connected, IRFU is powered on
1/2)	Off – control cable unplugged or damaged, or IRFU is not powered on
	<b>Green</b> – Normal operation – Tx part is active or in active search during the switchover
TX (Radio 1/2)	<b>Off</b> – Tx part is in standby state, normal operation <b>Bed</b> – alarm condition – both Tx are working simultaneously faulty control
	cable or IRFU is not powered on *

Phoenix G2 IBU front panel alarm LED indications:

\* In case of 1+1 configuration the IRFU must not be powered on via DC port, that is why in this case the Red LED is acceptable

Example of IRFU and IBU interconnection using the 1+1 or 2+0 application with single IDU:



Figure 1.47 IRFU and IBU interconnection using single IDU



It is not recommended to use external PSU for powering the IRFU via DC port in 1+1 configuration, as the redundancy functionality may be lost

Example of IRFU and IBU interconnection using the 1+1 full redundancy application with two IDUs:



Figure 1.48 IRFU and IBU interconnection using two IDUs

# Chapter 2: INSTALLATION

# Getting started

The installation of Phoenix G2 IDU and ODU link involves the following steps:

Install the Phoenix G2 IDU in 19" rack: as the IDU is ½ width of the 19" inch rack position, there are two options how to install it in the rack:

**Option one: Single device installation:** attach blank panel and bracket to the IDU (all included in the package). Install the IDU in the rack using attached blank panel and rack mount bracket.



Figure 2.1 Single device installation

**Option two: Dual device installation:** interconnect two devices (IDU and EMM, or IDU with IDU) using dual device mount kit, attach brackets to each device. Brackets are included in the package of IDUs; dual device mount kit is included in EMM module package, and can be ordered as an optional accessory if two IDUs must be interconnected. Dual device mounting kit includes aluminium mounting profile (P/N EASMEX03) which must be inserted in side panel grooves of IDUs thus fastening both devices together. In order to fix it and avoiding of both IDU movements use mounting plate (P/N WAKMEXS1.001) for fixation. The mounting plate must be attached to IDUs on back-panel using already existing screws from the IDUs.

2



Insert the aluminium mounting profile in side panel grooves of IDUs, fix it using setscrew with square nut



Remove 2 existing screws from both IDUs back panel

1



**3** Attach the mounting plate to IDUs and fix it to IDUs using the same existing screws



**4** Final view of back panel of interconnected IDUs

Install both devices in the rack using attached rack mount brackets.



Figure 2.2 Dual device installation

- Ground Phoenix G2 IDU by interconnecting it's grounding screw with the grounding point of the rack
- In case if the Phoenix G2 IDU will be used in **1+0 Ch1** mode, connect ODU to the IDU's IF port **ODU A** with coaxial cable before turning on the power
- In case if the Phoenix G2 IDU will be used in **1+0 Ch2** mode, connect ODU to the IDU's IF port **ODU B** with coaxial cable before turning on the power
- In case if the Phoenix G2 IDU will be used in modes **1+1 Dual**, **2+0** or **1+1**, connect ODUs to the IDU's IF ports **ODU A** and **ODU B** with coaxial cables before turning on the power

In case of IDU tests in the lab without ODU, the IDU can be powered on without ODU connected, it will not damage the unit

# Attaching Phoenix G2 ODU to antenna

SP/HP ODU

Tools required: SAF tightening tool



In order to attach SP/HP ODU to SAF adopted antenna use two guidance pins for fixing polarization and 4 side lockings for attachment. Lockings should be tightened in diagonal sequence.



Figure 2.3 Locking of ODU with tightening tool

Pair radios in licensed frequency bands 6 - 38 GHz use same polarization for Tx/Rx channels on both ends of the link - either horizontal, or vertical.





In case of 6GHz (N-Type connectors) polarization is determined by antenna and should be same on both ends of the link.

Examples:



23GHz (horizontal polarization)



For extra protection from sun radiation it is recommended to install sun shield to cover the radio.

In order to attach the SP/HP ODU to SAF non-adapted antenna separated ODU mounting bracket (P/N S0SPKS03) and flexible waveguide/coaxial cable is required



*Figure 2.4* SP/HP ODU with mounting bracket For instructions how to connect SP/HP ODU to mounting bracket refer to "SAF mounting bracket installation V1.0" document

# VHP and SP/HP ODU with SAF2 adaptation interface

Tools required: Size 5 Allen wrench, 240mm

Level (not supplied)



Phoenix G2 VHP ODU features twisted polarization flange and resulting signal polarization is determined by Interface on antenna/OMT. To change signal polarization, please rotate only the antenna interface, as radio always remains in vertical position.

SP/HP ODU with SAF2 adaptation interface supports standard UBR flange which must match with the flange position on antenna. To change the signal polarization, please rotate the antenna interface and accordingly the ODU as well.



Examples of VHP ODU polarizations:



Example of vertical polarization interconnection



Example of horizontal polarization interconnection

#### Examples of SP/HP ODU with SAF2 adaptation interface polarizations:



Example of vertical polarization



Example of horizontal polarization

As both those ODUs have the same SAF2 interface, the steps of ODU interconnection with antenna for both are the same and are given below:



Put VHP ODU on antenna adapter flange by hooking half-turn loosened clamp at the top and leaving the completely loosened clamp at the bottom. Make sure O-ring is in place and the adapter flange fits into the VHP ODU transition flange socket.

Note! The protective sticker should be removed before attaching the VHP ODU to the antenna.





Tighten bottom fixation clamps.

1



**3** Use air level to verify that VHP ODU is properly levelled. Tighten all four fixation clamps properly.



Final view of assembled SP/HP ODU with SAF2 adapter in Horizontal polarization



Final view of assembled VHP ODU 1+0 setup.



Final view of assembled SP/HP ODU with SAF2 adapter in Vertical polarization

#### Acceptable angle of polarization tolerance of SP/HP ODU is up to 30°

If any further assistance is required please contact techsupport@saftehnika.com

6

# Cable requirements

#### IDU-ODU cable:

5

1

1

IDU-ODU cable is a 50  $\Omega$  coaxial cable intended to interconnect the Indoor Unit with the Outdoor Unit. Any type of 50  $\Omega$  cable of good quality can be used; the cable should be equipped with N-type male connectors on each end. There are two N-type male connectors included in each radio unit delivery that fit RG-213 cables or other cables with a surface diameter of 10 mm. As the attenuation of the cable is essential particularly at 350 MHz frequency, its usage is restricted, - the attenuation of the signal should not exceed 15 dB at 350 MHz.



Figure 2.6 PhoeniX G2 IDU-ODU cable

#### DC power cable:

Due to low power consumption of the PhoeniX G2 split mount system, there are no special requirements for the cable used to connect the IDU to the DC power source. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied single block 4 pole "screw on" power connector could be used. The power connector is 2 pole, type 2ESDV-04P.

#### **USB B Serial Connection:**

USB B management port must be used for management access with alternative IP address. This requires USB cable (USB A connector – computer side / USB mini B connector – IDU side).



Figure 2.7 PhoeniX G2 USB management cable

#### **RSSI BNC cable:**

To connect the digital multimeter to the PhoeniX G2 ODU RSSI port in order to adjust the antenna alignment, a coaxial cable with BNC connector on one end and appropriate termination on other end can be used.



Figure 2.8 Cable for connecting the multimeter to the PhoeniX G2 ODU RSSI port

#### **Optical cable:**

Optical cable supporting 1 Gbps must be used to interconnect PhoeniX G2 IDU and EMM (ASI or E1) modules. Either Single-mode or Multi-mode optical fiber can be used. The same type SFP modules have to be installed in both devices PhoeniX G2 IDU and EMM. In order to interconnect two Phoenix G2 IDUs for 1+1 Full redundancy configuration 2.5 Gbps optical cable and SFP modules must be used.



Figure 2.9 Optical cable and SFP modules for Phoenix G2 IDU and EMM module interconnection

# Powering Phoenix G2 IDU/ODU

Next step is to interconnect LLM IDU DC power connector with power source using power cable. In case AC/DC Power supply, 48VDC, 80W (EU - P/N I0AB4810, US – P/N I0AB4811, AUS - I0AB4818) provided by SAF Tehnika JSC is used to power up PhoeniX G2 IDU, interconnect IDU and power source through appropriate connectors. Otherwise perform the following steps to ensure that PhoeniX G2 IDU is powered up correctly:

1. It is necessary to interconnect PhoeniX G2 IDU DC power connector (located on left side of front panel) with power source. For this purpose power cable is required. Any 2 wire power cable of good quality which fits well in SAF Tehnika's supplied 4 pole "screw on" power connector could be used. The power cable connector is 4 pole, type 2ESDV-04. This connector has screw clamp terminals that accommodate 24 AWG to 12 AWG wire. The recommended wire size for construction of power cables under 3 meters in length, supplying -48 V DC, is 18 AWG. The opposite end of the power cable should have a termination appropriate for the power supply being used. The power cable should be of sufficient length to avoid tension in the cable and provide a service loop for connection, but not be of excessive length. Using the power cable connector of type 2ESDV-04, pins 1/2 (labelled '-') should be connected to the power supply terminal supplying -48 V DC, while pins 3/4 (labelled '+') should be grounded. Refer to *Figure 2.10*.



Note that pins 3/4 ('+') of the PhoeniX G2 IDU DC Power connector (*Figure 2.10*) is connected to the IDU chassis ground internal to the IDU. Use of a power supply with an inappropriate ground reference may cause damage to PhoeniX G2 IDU and/or the power supply.

- 2. Connect the power cable to the -48 V DC power supply, and place the voltmeter probes at the unconnected ends of the power cable, with the positive voltmeter probe on pin 1/2 ('-') of the cable connector and the negative probe on pin 3/4 ('+'). The connector screw terminal screw heads may be used as convenient monitor points. Refer to *Figure 2.10*.
- 3. Turn on the -48 V DC supply. Verify that the digital voltmeter reads between -36 V DC and -57 V DC when monitoring the cable points specified above. Adjust the power supply output voltage and/or change the connections of the power supply to achieve this reading.
- 4. With the negative voltmeter probe still on pins 3/4 ('+') of the power cable connector (and the power supply still on), put the positive voltmeter probe to the PhoeniX G2 IDU

chassis and verify a potential of zero volts between the IDU chassis and cable pins 3/4 ('+'). If the measured potential is not zero, the power supply may be grounded incorrectly and should not be used for PhoeniX G2 IDU powering. Note that this measurement assumes that PhoeniX G2 IDU is installed and properly grounded. If that is not the case, the same measurement can be made between cable pins 3/4 ('+') and a convenient ground (such as an AC outlet third-wire ground).

- 5. Turn the -48 V DC supply off.
- 6. Plug the power cable into PhoeniX G2 IDU front panel DC Power connector (**DC port**). Place the voltmeter probes on the cable connector screw terminal screw heads as described in step 2 above. Refer to *Figure 2.10*. Note that PhoeniX G2 IDU does not have a power on/off switch. When DC power is connected, the digital radio powers itself up and is operational. There can be up to 500 mW of RF power present at the antenna port. The antenna should be directed safely when power is applied.
- 7. Turn on the -48 V DC power supply, and verify that the reading on the digital voltmeter is as specified in step 3 above.



Figure 2.10 Phoenix G2 IDU DC Power Cable Connector of type 2ESDV-04

Depending on the ODU type and supported frequency the power consumption of one Phoenix G2 IDU and 2xODUs can be up to 180 W. So this should be taken in account when choosing power adaptor.

# Powering External Multiplexer Modules (EMM)

The External Multiplexer Module (ASI, E1/T1) unit (if used) must be connected to the power supply separately, with a nominal voltage of -48 VDC and GND must be connected to the positive pole. Connector type 2-pin MC 1,5/ 2-STF-3,81 is supported. Its power consumption is <9 W.

# Powering Phoenix G2 IRFU

PhoeniX G2 IRFU (if used) can be powered via coaxial IF cable or using separate power supply, providing at least 60W load power.



Note that pin 2 ('+') of the PhoeniX G2 IRFU DC Power connector is connected to the IDU's internal chassis ground. Use of a power supply with an inappropriate ground reference may cause damage to PhoeniX G2 IRFU and/or the power supply.

# Chapter 3: WEB GUI

# Initial configuration

### System requirements

To access PhoeniX G2 IDU Web GUI you will need a PC with the following system requirements:

Operating system

- Microsoft Windows XP / Vista / 7 / 8/10;
- Linux

Web browser

- Google Chrome;
- Mozilla Firefox;
- Internet Explorer 8 (or above)



### Ethernet management connection configuration

Before proceeding with initial link setup in Web GUI, you must adjust IPv4 settings of your LAN adapter to 10.10.10.0 subnet. IP address should be other than default IP address (10.10.10.10).

automatically if your network supports eed to ask your network administrator
natically
s:
10 . 10 . 10 . 20
255 . 255 . 255 . 0
a v v
automatically
er addresses:
a a a
at 4 4
Advanced

#### Figure 3.1 TCP/IPv4 Properties

After applying these settings you are ready to connect to Web GUI or establish SSH/Telnet connection.

## USB Management connection configuration

In case MNG USB B serial port is used for Web GUI access, following steps can be taken:

- Interconnect PC with USB B port of the IDU using USB/USB mini B cable (USB A connector computer side / USB mini B connector IDU side). USB cable is shown in *Figure 2.6*
- If the connection is done for the first time, wait while device driver software will be installed automatically. If it does not happen automatically, contact SAF Technical support.
- If driver is successfully installed, in PC's Network Connection panel new network adapter will appear:



Local Area Connection 3 Identifying...

USB Ethernet/RNDIS Gadget

Figure 3.2 PC IP USB setup – USB network adapter

• Adjust IPv4 settings of USB Ethernet network adapter to 10.10.11.0 subnet. IP address should be other than default IP address (10.10.11.10).

tically sk yo 10 255	, 1/ , 1/ , 25	youn netv	11 255	twor adm	k supp iinistra 20
10 255	, 1/ . 25	0. 15.	11 255	. 2 i. 1	20
10 255	, 1) . 25	0. 15.	11 255	• 2 i. 1	20
10 255	, 1) . 25	D,	11 255	. 2 i. 1	20
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	x	4	<u> </u>	a:	
			I	Ac	lvance
		, , ,			AC

Figure 3.3 TCP/IPv4 Properties

After applying these settings you are ready to connect to Web GUI.

# Accessing PhoeniX G2 IDU Web GUI

- 1. Connect your PC to MNG LAN 3 port on PhoeniX G2 IDU with Ethernet patch cable.
- 2. Launch your Web browser and in address field enter PhoeniX G2 IDU IP address. Default IP address is 10.10.10.10.

Another management access options are following:

- LAN 3 port IP Address 10.10.10.10, Netmask 255.255.255.0 factory default
- LAN 3 port IP Address 192.168.10.10, Netmask 255.255.255.0 configurable alternative
- MNG USB port IP Address 10.10.11.10, Netmask 255.255.255.0 factory default
- MNG USB port IP Address 192.168.11.10, Netmask 255.255.255.0 configurable alternative



Depending on your WEB Browser you may be warned that the device has a self-signed certificate and thus it is not secure to connect to it. To avoid this message you have to either setup device certificates or allow an exception for the target IP. This exception needs to be set up once per each IP address and WEB browser.

- 3. Press "Enter" key.
- 4. Login screen will appear.
- 5. Enter username and password. Default credentials are as follows:
  - Username: admin
  - Password: secret

JAF	
CFIP PhoeniX G2	
Login:	
Password:	
Login	
	CFIP PhoeniX G2

Figure 3.4 Login screen

6. Press Login button.

The WEB GUI interface requires enabled JavaScript in your browser.

	here are three access levels available. Default access details for each level are following:											
~	ACCESS level	LOGIN name	Password									
	Administrator	admin	secret									
	User	user	test									
	Guest	guest	no password									

## Web GUI description

The WEB GUI is designed as a standalone web application which receives status updates from the device. This communication is done asynchronously; thus it may take a while until the change is reflected in the GUI. WEB interface consists of five parts, those parts are following:

and the second second	TxF	TxF TxP MSE			MW_unit		1+0 CH1	MICROWAVE_L	WAVE_LINK RxL MSE T				TxF		
ŠAË	22600	11	-37.7 -	49.3 📲	• 1024strong / 56M	/ / 438Mb	ACM	1024strong / 56M / 43	Mb + 🚺	• -48.1	-36.8	11	21400		
37 11		LOCAL										REMOTE			
ADMIN permissions 🖻	Logou	t in: 15	m 41 s			1									
Status	Overvi	Overview Ports System License 3													
General	muarra		10			LOCAL REMOTE									
Events Z	SYSTER	M STAT	us			CI	HANNEL I		C	HANNE	LI				
Tranda	Device	IP				192	168.206.10		192	168.20	06.11		_		
Inventory	Data en	cryption	n		5	no	encryption		no	encryp	tion				
Config	Data sy	nc					sync			sync			_		
Maintenance	Data TL	E [sec]					2999			2877					
Tools					4	LOCAL TR	AFFIC STAT	INSTICS							
	Tx8	Eth1		Γ					RxEth1						
Date: Thu 22 03 2016 Time: 13:54:51			10	00Mbps					1000Mb	ps					
Uptime: 0.00:58:17 Refresh status	00:58:17 atus		7	50Mbps					750Mbp	750Mbps					
Modem Serial Number 355260100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration 4 unlimited	Display	500Mbps ay: Ethla							500Mbps Display.						
	☐ TxE ✓ TxE	th1b th1	2	50Mbps					250Mbp	s .					
Firmware Version 0401_01T09 Running Design 505 (DXN3)		DMbps 14:50:00 14:51:00 14:51:30 14:52:00 14:53:00 14:53:30													

Figure 3.5 PhoeniX G2 web GUI

Web GUI is divided into 5 sections:

#### **1** Header and status bar

The header displays the actual link condition. The RF path diagram varies depending on the used Design and Mode setting. In the Split 511 design, the actual Local Primary unit is displayed in the first header row, the Local Secondary on the second row. Bold font highlights the actually managed unit. The physically linked RF units are always in the same row. The displayed speed is average maximal throughput per last second. Meaning of the used graphics is described in the following picture:



Figure 3.6 PhoeniX G2 web GUI header and status bar

### 2 Two level menu and Login/Logout box

Allows navigating between main pages and sub-pages. The user can expand the menu tree structure either by using the arrows on the left or using double-click on the desired section. The menu tree structure is sorted in the following manner to allow successive configuration and monitoring: :

- Status informational section designed for link performance monitoring
- **Config** configuration section. The user can perform configuration of all necessary parameters from top to bottom as some options may override consecutive settings, for example, the Design and Mode change invokes a preset load and changes page layout of the Ports section. It is highly recommended to save and reboot the device once the first complete configuration is done.
- **Maintenance** a device management section which houses tools for device configuration backups, FW/License upgrade, log files and troubleshooting sections, and reboot.
- **Tools** set of various tools for advanced debugging tasks such as Ping, Terminal, Constellation and Spectrum analysis.

### **3** Third level menu

Allows navigating between 3rd level pages of each subpage

#### **4** Side bar frames

The Side Bar located on the left side of the GUI shows the summary of important device information:

• Date - system date

- **Time** system time
- **Uptime** time since startup
- **Refresh status** indicates the amount of time until the next GUI refresh. The bar changes its colour to red if the GUI auto-refresh is frozen through the solution. The refresh interval of information shown in the GUI is automatically calculated by the device depending on actual transmission speed between the WEB browser and the device. The minimum refresh interval is 2 seconds, the maximal then 30 seconds.
- **Modem Serial Number** device Serial Number. It is shown only when it differs from the License Number
- License Number the license number
- License Type / Status shows if the license is permanent or time-limited and its status
- License Expiration shows the remaining time until the license expires.
- Firmware Version version of the device firmware.
- **Running Design** active design type.

#### **5** Information field

Shows monitoring and configuration pages chosen in menu.

### Button conversion and configuration box description

There are multiple buttons available across the GUI interface. Buttons have distinctive colors depending on the effect on the system: pressing the red button may cause immediate data drop or direct overwriting of start-up parameters in flash memory; pressing the grey button has not effect; pressing the blue button alters the running configuration but such configuration needs to be stored by means of the WRITE button else it will not persist through the device reboot; and the white button has only data refreshing option, but such action does not alter the running or stored configuration. Most common button types used in the WEB GUI are following:

Button	Function
(1)	Opens Help/information page
Write	Shown in the status bar when there are unsaved changes on a connected device in the link. Using this button, you update the startup configuration by actually running configuration on all linked units.
Save	Shown when a value is modified directly in flash memory but command activation requires either parameter initialization or system reboot, for example, IP settings.
IP Init	Shown when there are pending changes in the IP settings. By pressing this button, the device performs a network interfaces reset. Note, this action does not cause the user data outage, but it disconnects all active management sessions (GUI, CLI, SNMP).
Apply	Apply all the changes at current GUI page or in a respective frame.
Undo	Revert all unconfirmed changes in a respective frame.
Refresh	Shown only on pages which contain values which are not automatically refreshed. It pulls

	information from the device and renders it on the screen.
--	---

The colour of configuration value entered in a setting box indicates the status of the following value:

- **black** unmodified value
- **blue** modified but non-applied value
- red entered value does not match the allowed range
- purple the actual configuration does not match the required modem settings.

Setting input boxes may change its border colour to red if the entered value is not applicable, for example, invalid IP address or a character in an integer-type field. In such event, the

button is hidden until the problem is fixed.

### Configuration of basic system parameters

In order to establish the link, following main configuration steps should be performed:

- Step 1 in web GUI navigate to "<u>Config → System → Mode</u>" and specify *Design Type*, *Duplex mode* and *Functional Mode*. With those settings user defines the basic configuration of the equipment:
  - a) 1+0 single channel configuration,
  - b) 1+0 dual channel configuration,
  - c) 1+1 (HSB, FD, SD, XPIC) standard redundancy configuration,
  - d) 1+1 (HSB, FD, SD) full redundancy configuration,
  - e) 2+0 FD aggregation configuration,
  - f) 2+0 XPIC aggregation configuration
  - g) Bidirectional transmission
  - h) Unidirectional transmission

THE R. P. LEWIS	TxF	TxP	MSE	RxL	W	) MW_unit		1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF				
"A "	22600	11	-37.2	49.1	1	+ 1024strong / 56M /	438Mb	ACM	1024strong / 56M / 438Mb • 🚺	• -48.2	-36.7	11	21400				
SAL		LOCAL										REMOTE					
ADMIN permissions 🖻	Logou	it in: 7	m 46 s									-	Write 🔮				
▷ Status	Mode	D	escriptio	n	Dat	e&Time Advan	ced										
▲ Config	DESIGN	I CON	FIGURAT	ION				LOC	AL	1	DN.	1					
System	Design	Туре					Design 505 ¥										
IP	DESIGN	MOD	ES				LOCAL						i				
Radio	Duplex	Duplex Mode					Bidirectional 🔻										
Ports	Functio	Functional Mode					1+0 Ch1 🔻					Apply					
Alarms	Link Di	versity					none										
> Tools	OATA E	NORY	PTION				Channel )						i				
	AES ke	y lengt	h				128  256										
	AES ke	vinnut					Please	enter 32 hex dig	its to AES key chanç		Ann	in a					
Date: Fri. 06.04.2018	ALONE	ALS REY INPUT					Generate random keys										
Time: (3.02:22	AES key status																
Refresh status	AES fui	nction					in on										

Figure 3.7 Design and modes configuration

 Step 2 - in web GUI "<u>Config → IP → Addresses</u>" configure *IP address/subnet mask* and *Gateway IP* address of the IDU.

No. of Concession, Name	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF	
"A "	22600	11	-37.5	-49.7	1024strong / 56M / 488Mb	ACM	1024strong / 56M / 438Mb + 1	-48.7	-36.6	11	21400	
SAF	-	LOC	AL		-				RE	MOTE	-	
ADMIN permissions	Logou	nt in: 1	h 29 m	47 s								
Status	Addres	sses	SNM	4N	Advanced							
▲ Config	MAINA	DDRE	SS SET	TINGS		REQUIRED	CONFIGURED					
System	Device IP / Mask				92.10	58.206.10 /	24 192	192.168.206.10/24				
Access IP	Default Gateway IP				192	2.168.206.1	15	192.168.206.1				
Radio	OPTION	IAL AD	DRESS	SETT	NGS	REQUIRED	CC	CONFIGURED				
Ports Alarms	USB IP/Mask				<ul> <li>10.10</li> <li>192.1</li> </ul>	.11.10/24 68.11.10/24	10	10.10.11.10/24				
<ul> <li>Maintenance</li> <li>Tools</li> </ul>	Fallback IP/Mask				<ul> <li>10.10</li> <li>192.1</li> </ul>	<ul> <li>10.10.10/24</li> <li>192.168.10.10/24</li> </ul>						

Figure 3.8 IP address configuration

 Step 3 – in web GUI "<u>Config → Radio → Parameters</u>" set *Bandwidth* and Max *RxACM Profile* settings for modem, and *Tx Frequency*, *Tx Power Limit* and *Tx Mute Config* settings for radio

	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF		
"A"	22600	11	-37.6	-49.7	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	+ -48.7	-36.6	11	21400		
SINT		LOC	AL						RE	MOTE			
ADMIN permissions 🖻	Logou	nt în: 1	h 29 m	48 s									
Status	Param	neters	AC	M	Advanced								
Config	-				LOCAL		RE	MOTE			0		
System	MODEN	MODEM			Channel 1	_	Ch	annel T					
Access	Bandwidth Max RxACM Profile				56000_02 ▼		56	56000_02					
Radio					1024/strong		1024	strong	•				
Ports	ACM Se	etting			default								
Alarms	Advanc	ed Set	ting		default			-					
Maintenance	and the second s				LOCAL		RE	MOTE			G		
Tools	MADIO				Channel 1	(	1) Ch	annel 1					
	T/R Spa	T/R Spacing			fixed 🔻	D	fixed						
Data la constante	TX Freq	uency	[MHz]		22600	(	1) 2	1400					
Time: 11-18.89	RX Free	quency	[MHz]	1	21400	(	(1) 22600						
Uptime: 5 20:07:26 Befresh status	TX Pow	er Lim	it [dBm	1	11	(	Ð	11					
The free of the fr	TX Mut	e Conf	ig		auto 🔻		aut	. •					
Modem Serial Number	ATPC F	unctio	n										
License Number	ATPC R	X Leve	el [dBm]		-50	(	1	-55					
3010403010100228 License Type / Status	Refre	Refresh Undo Apply to local & remote											

Figure 3.9 Modem and Radio parameters configuration

 Step 4 - in web GUI "<u>Config → Ports → EthVLAN</u>" specify port grouping to enable required type of management access and port groups.

Second Second	TxF TxF	MSE	RxL (W	) MW_unit		1+0 CH1	MICROWAVE_	INK	RxL	MSE	TxP	TxF
"A "	22600 11	-37.6	-49.8 +1	+ 1024strong / 56M	// 438Mb	ACM	1024strong / 56M / 43	амь 🚛	+ -48.8	-36.6	11	21400
5/4/	LO	CAL								REI	NOTE	
ADMIN permissions	Logout in:	19 m 29	S								1	Write
▶ Status	MUX E	thVLAN	EthQO	s								
▲ Config	VLAN MODE		LAN 1	LAN 2		LAN 3	MING	WAN	A	N	ANB	(1)
System	Port Mode	ł	asic T	basic 🔻	b	asic 🔻	basic .	basic		ba	sic 🔻	
IP	Port Group	g	iroup-1 🔻	group-2 🔻	gr	oup-1 🔻	group-1 🔻	group	1 •	gro	up-2 🔻	
Radio	Default VLA	N	1	1		1	1	1			1	
Ports				0.000		LETTER .	LIANZ					
Alarms				(LANCE)		SETH swite	h					
Maintenance				WANTE		WANE	UNIC COL					
▶ Tools				(LUCCO)		Buttering	[millerer.e]					-

Figure 3.10 Port group configuration

5) **Step 5** – save configuration by pressing Write button.

### Management channel configuration options

There are several options for accessing the remote side management from or via local device:

- In-Band management
  - User data and management data share the common link capacity and are separated by a VLAN
- Out-of-Band management
  - Using internal management channel (NAT) through separate management channel
  - Management alone in a separate traffic channel

#### **In-Band Management**

In-Band management configuration with management traffic separation by means of VLAN is a preferred scheme when just one ETH connection (management & data traffic) into microwave link is accomplished. Communication with the remote side is ensured by sharing the capacity for data and management traffics through internal ETH switch. The management data together with the user data are brought via the common Gigabit cable from the external Ethernet switch to the device, and the same VLAN is then used in the whole management network for management traffic separation. For Port group and VLAN configuration refer to Config  $\rightarrow$  Ports  $\rightarrow$  MUX and Config  $\rightarrow$  Ports  $\rightarrow$  EthVLAN

The advantages of such option are following:

- Fast management access to local and remote device
- Just one Ethernet cable is required for data and management traffic connection

The disadvantages of such option are following:

- Management traffic shares capacity with the data traffic
- It is required to know what is the type of customer traffic, especially VLAN configuration at provider and customer side

#### **Out-Band Management**

1) Using Internal Management Channel (NAT):

Out-Band management configuration with NAT is a preferred scheme when just one link is supervised and management access is originated from provider side of the link. Management and data traffic must be separated at provider side in this mode. Communication with the remote side is ensured through fixed internal management channel. Management traffic is routed through management CPU inside the device. The device has an option to auto-configure the NAT setting under section <u>Config  $\rightarrow$  IP  $\rightarrow$  Advanced.</u>

For the NAT auto-configuration it is possible to enable one or both of these options:

a) **WEB** – this option will add automatic NAT records for accessing the remote device's WEB GUI. The default values are as follows (the IP portion is only an example and depends on actual running IP configuration):

	5 5 /
1443 192.168.3.91:443	Remote IDU's GUI accessible on local port 1443
2443 192.168.3.92:443	Second remote (in 505 1+0 dual mode with two separate remotes) or direct FO neighbor (in Split Protection mode) IDU's GUI accessible on local port 2443
3443 192.168.3.93:443	Indirect remote FO neighbor (ergo 'cross-corner' in split protection mode) IDU's GUI accessible on local port 3443

 b) SSH – this option will add automatic NAT record for accessing the remote IDU's SSH. The default values are as follows (the IP portion is only an example and depends on actual running IP configuration):

1022 192.168.3.91:22	Remote IDU's GUI accessible on local port 1022
2022 192.168.3.92:22	Second remote (in 505 1+0 dual mode with two separate remotes) or direct FO neighbor (in Split Protection mode) IDU's GUI accessible on local port 2022
3022 192.168.3.93:22	Indirect Remote FO neighbor (ergo 'cross-corner' in split protection mode) device's GUI accessible on local port 3022

#### Example:

The local device has IP address of 192.168.3.90 and remote 192.168.3.91, the NAT records of local device for accessing the remote will be these:

- 1443 192.168.3.91:443
- 1022 192.168.3.91:22

To access the remote device's GUI, it is required to open a new page in WEB browser and navigate to address 192.168.3.90:1443. Note this is the address of the local device plus port which is then redirected according to the appropriate NAT record to the remote side. The SSH access is realized in the same manner.

The advantage of such option is following:

• Separate management channel for local and remote device access. The whole system capacity is available for data traffic

The disadvantage of such option is following:

• The management traffic uses dedicated slower channel; therefore, management responses are little longer in comparison to the In-Band management scheme

#### 2) Management in a Separate Channel:

Out-Band management configuration in a separate channel is a preferred scheme when more links in series are managed, and the management access is originated from any device in such link or from provider's management node. The communication with the remote side is ensured by means of a configurable separated traffic channel. Management and data traffic are separated at provider side, and they are then kept separated by a reserved standalone channel through radio links. Management access is available also from opposite side (customer side) by a similar configuration of the channel separation.

This configuration can be achieved on the section <u>Config  $\rightarrow$  Ports  $\rightarrow$  EthVLAN</u> where user have to put the MNG, the dedicated management LAN3 port and one WAN channel into the same group. Simultaneously user needs to put the remaining WAN port, and user data LAN port into a different group than the management ports are in. Finally, on the section <u>Config  $\rightarrow$  Ports  $\rightarrow$  MUX, user has to configure the speed limit for both management and data. It is recommended to assign 2Mbits for the management channel. The management channel should have the highest priority. Note that the port priority is falling from left to right.</u>

The advantages of such option are following:

- Easy configuration
- Allows ICMP packet transfer (ping)

The disadvantages of such option are following:

- One whole traffic channel has to be dedicated to such management
- The management and data have to be separated in the switch before the device
- A network loop risk when link operates within a single network

# Status

# Status $\rightarrow$ General $\rightarrow$ Overview

It indicates overall system status.

111	00600	11	07.0	10.0		and service of the		ACHI	100.4	-		10.0	06.7	11	01400
SAF	22600	11	-37.6	-49.8	••••	<ul> <li>1024strong / 56M</li> </ul>	/ 438Mb	ACM	1024strong	/ 56M / 438M	••••	+ -48.6	-36.7	11	2140
		LOC	AL										RE	MOTE	
DMIN permissions 🗄	Logou	t in: T	7 m 30	s											Write
Status	Overvi	iew	Ports	s	ystem	1 License									
General								LOCAL				REMOT	E		0
Events	SVSIE	NSIA	nus				121	ANNEL T			C	HANNE	1 T		
Counters	Device	IP			1		192	168.206.10			192	168.20	06.11		
Trends	Data en	crypti	on		2		no	encryption			no	encryp	tion		
Config	Data sy	nc			3			sync				sync			
Maintananaa	Data TL	E [sec			4			616688				50403	б		
Tools						I	OCAL TR	AFFIC STAT	ISTICS	5					
	Txi	Eth1			Γ								RxEt	h1	
Date: Tio, 19 94 2018 Time: 09 35 53 Uptime: 15 18:25:09 Refresh status			1	000Mbp 750Mbp	05						1000Mb 750Mbp	ips is			
Modem Serial Number 355260100009 License Number 3010403010100228 License Type / Status permanent / ok	Display	/: th1a th1b		500Mbp 250Mbp	25						500Мbр 250Мbр	D D	isplay RxEti RxEti	n1a n1b	
License Expiration unlimited Firmware Version 0401_01 Running Design 505 (DXN3)	₩ TxE	th1		ОМbp	11	:30:301:31:001:31:	301:32:00	1:32:301:33:00	01:33:301:34:0	01:34:30	0Mbps		RxEt	1	

Figure 3.11 Status → General → Overview screen

- 1) Device IP IP addresses of devices in the link;
- 2) Data encryption encryption status;
- 3) Data sync modem synchronization status;
- 4) Data TLE [sec] time since last error occurrence;
- 5) *Local Traffic Statistics* an interactive graph depicting the link throughput since login.

# Status $\rightarrow$ General $\rightarrow$ Ports

This section provides a summary status of all physical IO ports of the device.

and the second	TxF	TxP	MSE	RxL	W	MW_unit		1+0 CH1	MICROV	VAVE_LINK	RxL	MSE	TxP	TxF
2 A #	22600	11	-37.6	-49.8	•	1024stron	g / 56M / 438Mb	ACM	1024strong / 56	5M / 438Mb + 🚺	+ -48.6	-36.7	11 3	21400
3/11	-	LOC	AL		6							RE	MOTE	
ADMIN permissions 🗄	Logou	it in: 5	m 19 s										W	rite 🔮
▲ Status	Overvi	ew	Ports	S	/stem	Lice	nse.							
General	PORTS	TATUS	8	-		SEP 1	SEP 2	SEP 3	SEP 4	LANT	LAN 7		LAN 3	0
Events	Link Sta	atus (a	ctual)	1	SFI	module	SFP module not present	SFP module not present	SFP module not present	LAN No LINK	LAN No L	INK I	LAN No LIN	к
Trends	Mode			2	1	auto_x	auto_x	auto_x	auto_x	auto	auto		auto	
Inventory	Flow Co	ontrol		3	fe	orce on	force on	force on	force on	off	off		off	
Config	VLAN g	roup		4		-	-	-		GRP1	GRP2		GRP1	
<ul> <li>Maintenance</li> <li>Tools</li> </ul>														

Figure 3.12a Status → General → Ports screen

- Link Status (actual) actual status of a port as detected by the device (speed, duplex mode, link, administrative down status);
- 2) Mode actual port settings (speed/duplex, administrative down);
- 3) Flow Control actual duplex flow control mechanism settings;
- 4) VLAN group actual port separation.

It is possible to change those settings in <u>Config  $\rightarrow$  Ports page</u>.

If any of EMM modules are connected to the IDU and enabled, additional EMM information will appear in this section:

and a start of the	TxF	TxP	MSE R	xL		Low				1+0 (	H1				High	_	RxL	MSE	TxP	T	٢F
"A #	6675	8	-35.2 -43	2.9	۰ ،	0004st	rong /	80M / 11	1Mb	AC	M	0004s	trong /	BOM / 1	11Mb •	0.	-43.1	-37.2	8	70	15
SAL		LOCA	AL.															RE	MOTE	8	
ADMIN permissions 🖻	Logou	t in: 15	m 47 s																		1
Status	Overvie	ew	Ports	S	ystem	Li	cens	e.													
General	PORT S	TATUS			3	SEP T		SFP 2		SFP	3	SF	P.4	. 1	AN T		LAN	2	LAN	3	C
Events	Link Sta	atus (ad	ctual)		SFP	modul	e : nt n	SFP mod	ule ent	SFP ma	dule		SFP Sbit FD	LAN	No LIN	ĸĘ	G G	bit LL	LAN	Gbit ULL	
Trends	Mode				f	orce_x		auto_)	¢	auto	_x	for	ce_x	3	auto		auto		aut	0	
Inventory	Flow Co	ntrol			fo	rce on		force o	n	force	on	ford	e on		off		off		of	f	
Config	VLAN g	roup				~		-					-	(	GRP1		GRP	2	GR	21	
Maintenance					-								LOC	AL							Œ
> Tools	ENIM	ODULE	STATUS		5			EMM	t.		E	AM 2			EMM	з		E	VIM 4		
	EMM SFP status							ok / lo	SS		not co	onnect	ed	no	t conn	ected		not co	onnect	ed	
	PORT	STATUS	6	PT	P2	P3	P4	P5	P6	P7	P8:	P9	PID	P11	P12	P13	'P14	P15	P16	(i	
a distant and the	EMM1	1	6EITI		loss	loss	loss	s loss	los	s loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	
Date: Fn, 31.08.2018	EMM2	n	one																		
Uptime: 2 03 39:53	EMM3	n	one																		
Refresh status	EMM4	n	one																		

Figure 3.12b Status → General → Ports screen

- 5) EMM module status shows summary status of all attached EMM cards;
- 6) EMM RX port status shows detailed status of all ports of each attached EMM. For detailed description of all possible values, please refer to page Config → Ports → EMM

## Status $\rightarrow$ General $\rightarrow$ System

This section displays modem unit status, RF/IF unit status, telemetry status and running IP configuration.

The second s	TxF	TxP	MSE	Rx	LW	MW_	unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
242	22600	11	-37.6	-49	.8 + 1	• 1024	strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb • 1	+ -48.7	-36.7	11	21400
SPAP	-	LOC	AL							-	RE	MOTE	
ADMIN permissions	Logou	nt in: 3	6 m 56	s								-	Write 🐨
▲ Status	Overvi	ew	Ports		Syster	n	License						
General	la contra de la co								LOCAL				(i)
Events	MODEN	N UNIT	STATI	IS					CHANNEL 1				
Counters	Fan Fu	nction	[status	/rpm	1	1	1		auto-on / 4865			_	
Trends	Modem	Unit T	remp [°	C]		2			43				
Inventory	IF Rx L	evel @	140 MH	Iz [d	Bm]	3			-12.1				
<ul> <li>Config</li> <li>Maintenance</li> </ul>	DC Pov	ver Sup	oply For	r RF		4			on				
Tools	DE TIM	TSTAT	nue.						LOCAL				(i)
	THE DIST	1.311	102						CHANNEL T				
	Modern	-RF U	nit Con	nmur	nication	5			ok				
	RF Unit	Temp	[°C]			6			49				
Date: Thu 19 04 2018	IF Tx Le	evel @:	350 MH	Iz [dl	Bm]	7			ok				
Time: 11:07:04	BUNN	NGIP	CONFIG	JURA	TION								(i)
Refresh status	Device	IP Add	Ir			8	192.168.206.10/2	24					
	Fallbac	k IP A	ldr			9	10.10.10.10/24						
Modem Serial Number	USB IP	Addr				10	10.10.11.10/24						
License Number	Default	Gatew	/ay			11	192.168.206.1						
3010403010100228	SNMP	daemo	n statu	IS		12	running						
License Type / Status permanent / ok	NTP se	rver				13	ntp / 80.79.25.11	1					
Common Printentian													

**Figure 3.13** Status  $\rightarrow$  General  $\rightarrow$  System screen

- 1) **Fan Function** shows the actual fan configuration status and actual spinning speed;
- 2) *Modem Unit Temp* temperature of the modem part;
- 3) IF Rx Level @140 Mhz the IF signal strength detected on thecable input of the modem part;
- 4) **DC Power Supply For RF** the actual status of power supply for the radio part;
- 5) Modem-RF Unit Communication status of telemetry communication between the device and radio part;
- 6) *RF Unit Temp –* temperature read from the radio part;
- 7) IF Tx Level @350 MHz the IF signal strength detected on the cable input of the radio part;
- 8) Device IP Addr the IP address of this IDU;
- 9) Fallback IP Addr the fallback IP address of this IDU:
- 10) USB IP Addr the fallback USB IP address of this IDU;
- 11) **Default Gateway** the default gateway IP address of this IDU;
- 12) SNMP daemon status the status of the inbuilt SNMP daemon;
- 13) **NTP server** the time synchronization server configuration.

### Status $\rightarrow$ General $\rightarrow$ License

This section displays the content and status of the currently used license with available modulation schemes and options as well as remaining license time when a time-limited license is in use.

Generate license request button, a License Request By pressing the (licreq\_SN\_timestamp.afw) file will be generated and downloaded. It will be required for extending of time-limited License. It can be downloaded from Maintenance  $\rightarrow$  Files  $\rightarrow$  Exports page.

No. of Concession, Name	TxF	TxP	MS	E Rx	dL W	) MI	V_unit		1+0 CH1	MICROV	VAVE_LINK	RxL	MSE	TxP	TxF
ŠĀĒ	22600	11	-37.	6 -49	.9 • 1	+ 10	24strong / 56M / 4	138Mb	ACM	1024strong / 5	6M / 438Mb 🔸	• -48.6	-36.6	11	21400
		LOC	AL										RE	MOTE	
ADMIN permissions	Logou	rt in: 1	7 m 4	S											Write
▲ Status	Overvi	iew	Por	ts	System	m	License								
General															
Events	LICEN	ISE													1
Counters	act.da	te : 19	.4.201	8											10
Trends	motod	ays:0	(/4)												
Inventory	status	: ok	nent												
Config	IDU L/	N : 301	10403	01010	00228										
Maintenance	LICEN	SE FIL	E												
Tools	S_N=3	01040	3010	10022	8										
	DEFAU	JLT_M:	=0004	2800	00_02										
	DEDIA			TION											
	DESIG	N=DXI	V3	TION	-1										- 61
Date: Thu, 19,04,2016	DESIG	N=511													
Uptime: 15 20:14:15	OPTIO	N=STS	SR												
Refresh status	OPTIO OPTIO	N=ESE	SM												
Modem Serial Number	OPTIO	N=PR	T1												
355260100009	OPTIO	N=AG	R1												
License Number	OPTIO	N=FEC	CS												
License Type / Status	OPTIO	N=XPI	C												
permanent / ok	OPTIO	N=AES	51												
License Expiration	MODS	CH=_0	004_	0016_	0032_0	064_0	0128_0256_051	2_1024							
Firmware Version	MODB	W=_20	_0000	25000	_28000	_300	00_40000_5000	00_560	00_60000_	<u>-</u>					
0401_01	MODV	PD=15	500												
Running Design	MODI	1 110	N=00	04 07	000 00	•									
202 (DXN3)	Ger	nerate	e lice	nse r	reques	st									
CCID DhoaniV C2											@ SAE	Tehnika 19		eaftab	niles ann

Figure 3.14 Status → General → License screen

# Status $\rightarrow$ Events $\rightarrow$ Actual

This section contains the list of alarms which are active at the current moment. It should be empty when the equipment works properly and without alarms.

	TxF	TxP	MSE	RxL	W	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A"	22600	11	-37.5	-49.9	•	+ 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb • 1	-48.6	-36.7	11	21400
SAF		LOC	AL							RE	MOTE	
ADMIN permissions 🖻	Logou	t in: 8	m 47 s									Write 🍩
▲ Status	Actual	F	listoric	al	All							
General												
Events	ACTU	AL EV	ENTS									<b>(i)</b>
Counters												
Trends												
Inventory												
Config												
Maintenance												
> Tools												

Figure 3.15 "Status → Events → Actual" page

## Status $\rightarrow$ Events $\rightarrow$ Historical

This section contains the list of alarms which occurred in the past, but which are no longer

active. By pressing Alarm History Validation button the alarms are manually acknowledged and the status of the device will be evaluated only from alarms which occurred after the manual validation.

The second	TxF	TxP	MSE RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A "	22600	11	-37.6 -49.9	1024strong / 56M / 438	мь АСМ	1024strong / 56M / 438Mb + 1	+ -48.7	-36.7	11	21400
SIAF		LOC	AL					RE	MOTE	
ADMIN permissions 🖻	Logou	rt in: 17	7 m 15 s							
<ul> <li>Status</li> <li>General</li> </ul>	Actual	н	listorical A	AII						
Events	HISTO	RICA	L NON-VALID	ATED EVENTS						(1)
Counters	0;Apr 1	7 2018	8;10:05:39;69;1	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				
Trends	0;Apr 1	7 2018	8;10:05:38;60;	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
Inventory	0;Apr 1	1 2018	8;09:20:24;67;	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				
h Config	0;Apr 1	1 2018	8;09:20:23;77;1	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
e comig	0;Apr 1	1 2018	8;05:43:20;87;1	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				
Maintenance	0;Apr 1	1 2018	8;05:43:19;95;1	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
D Tools	0;Apr 1	0 2018	3;13:43:43;61;1	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				
	0;Apr 1	0 2018	3;13:43:42;70;1	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
	0;Apr 1	0 2018	8;08:18:16;95;1	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				
	0;Apr 1	0 2018	8;08:18:15;05;	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
Date: Thu 19.04.2018	0;Apr 1	0 2018	5,07:05:45,75,	N,01.0.18,192.168.206.10	Mod DataSyn	o(18)				
Time: 11:40:22	0;Apr 1	0 2010	5,07.05.44,80,1	E,01.0.18,192.108.200.10	.Woul_DataSyn	C(18)				
Uptime: 15 20:29:39	0;Apr 1	0 2010	5,07.05.34,70,1	N,01.0.18,192.108.200.10	Mod1 DataSyn	o(10)				
Retresh status	0:Apr (	0 2010	2-15-22-40-04-	N-01 0 18-192 168 206 10	Mod1_DataSyn	c(18)				
Modem Seriel Number	0:Apr 0	0 2010	215-22-49-12	E-01 0 18-192 168 206 10	Mod1 DataSyn	c(18)				
355260100009	0:Apr 0	9 2019	8.08.37.08.14	N:01 0 18:192 168 206 10	Mod1_DataSyn	c(18)				
License Number	0:Apr (	9 2018	8.08.37.07.22	F:01 0 18:192 168 206 10	Mod1 DataSyn	c(18)				
3010403010100228	0:Apr (	9 2018	8.08.24.07.46	N:01 0 18:192 168 206 10	Mod1 DataSyn	c(18)				
License Type / Status	0:Apr 0	9 2018	3:08:24:06:55:1	E:01.0.18:192.168.206.10	:Mod1 DataSyn	c(18)				
permanent / ok	0:Apr 0	9 2018	8:08:23:53:71:	N:01.0.18:192.168.206.10	Mod1_DataSyn	ic(18)				
unlimited	0;Apr 0	9 2018	3:08:23:52:82:1	E:01.0.18:192.168.206.10	:Mod1_DataSyn	c(18)				
Firmware Version	0;Apr 0	9 2018	3:08:23:51:89:1	N;01.0.18;192.168.206.10	Mod1_DataSyn	ic(18)				
0401_01	0;Apr 0	9 2018	8;08:23:50;97;1	E;01.0.18;192.168.206.10	;Mod1_DataSyn	c(18)				
Running Design	0;Apr 0	9 2018	8;08:23:32;59;	N;01.0.18;192.168.206.10	;Mod1_DataSyn	ic(18)				-
505 (DXN3)	Refre	esh 🖊	Alarm Histor	y Validation						
		_								
CFIP PhoeniX G2						© SAF Te	hnika JS(	- <u>www</u>	safteh	nika.com

Figure 3.16 "Status → Events → Historical" page

# $\mathsf{Status} \rightarrow \mathsf{Events} \rightarrow \mathsf{All}$

This section contains the conjunction of both Actual and Historical alarms.

	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
ŠĂË	22600	11	-37.5	-49.9 +	1 + 1024strong / 56M / 438N	Ib ACM	1024strong / 56M / 438Mb +	+ -48.7	-36.6	11 MOTE	21400
		200	~-						, inc	MOTE	
ADMIN permissions 🖻	Logo	ut in: 16	5 m 11 :	s							
<ul> <li>Status</li> <li>General</li> </ul>	Actua	н	istorica	al All							
Events	ALL E	VENTS	S								i
Counters	0;Apr	19 2018	3;11:43	17;06; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				-
Trends	0;Apr	19 2018	3;11:43	:15;25; N;	01.0.08;192.168.206.10	Mod1_IF_Leve	l(08)				
Inventory	0;Apr	19 2018	3;11:43	:14;33; E;	01.0.08;192.168.206.10 ;	Mod1_IF_Level	(08)				
Config	0;Apr	19 2018	3;11:43	:13;42; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	ic(18)				
Maintenance	0;Apr	19 2018	5,11:43	12,52, N	01.0.18,192.168.206.10	Mod1_DataSyr	10(18)				
> Tools	0;Apr	19 2018	3:11:43	10:69 F	01 0 18 192 168 206 10	Mod1_DataSyr	n(00) nc(18)				
	0;Apr	19 2018	3:11:43	:10:69; E;	01.0.08;192.168.206.10;	Mod1_IF_Level	(08)				
	0;Apr	19 2018	3;11:43	:08;87; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				
	0;Apr	19 2018	8;11:43	:04;23; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				1.00
Dete: The second	0;Apr	19 2018	3;11:43	:02;40; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				
Time: 11:46:16	0;Apr	19 2018	3;11:42	:56;94; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				
Uptime: 15 20:35:33	0;Apr	19 2018	3;11:42	:29;64; V;	00.0.00;192.168.206.10;	ALARMS VALI	DATED				
Refresh status	0;Apr	17 2018	3;10:05	:39;69; N;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				
Modem Serial Number	0:Apr	11 2018	2.00.20	-24:67: N	01.0.18,192.168.206.10	Mod1_DataSyr	nc(18)				
355260100009	0.Apr	11 2018	3:09:20	:23:77 F	01 0 18 192 168 206 10	Mod1 DataSyr	nc(18)				
License Number	0;Apr	11 2018	3;05:43	:20;87; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				
3010403010100228	0;Apr	11 2018	3;05:43	:19;95; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				
License Type / Status	0;Apr	10 2018	3;13:43	:43;61; N;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				
License Expiration	0;Apr	10 2018	3;13:43	:42;70; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	nc(18)				
unlimited	0;Apr	10 2018	3;08:18	:16;95; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				
Firmware Version	0;Apr	10 2018	3;08:18	:15;05; E;	01.0.18;192.168.206.10;	Mod1_DataSyr	ic(18)				
0401_01 Rupping Decign	0;Apr	10 2018	3;07:05	:45;75; N;	01.0.18;192.168.206.10	Mod1_DataSyr	nc(18)				
505 (DXN3)	0,Apr	10 2018	5,07:05	.44,80; E;	01.0.18,192.168.206.10;	woor_DataSyr	10(10)				
Concession of the second s	Refr	esh									
CFIP PhoeniX G2							© SAF T	ehnika JS	C - WWW	safteh	nika.com

*Figure 3.17 "*Status → *Events* → *All" page* 

# Status $\rightarrow$ Counters $\rightarrow$ Modem

This section displays basic modem performance counters and built-in Bit Error Rate (BER) counters. For BER counter only unassigned capacity will be used (Refer to  $Config \rightarrow Ports \rightarrow MUX$  section)

100 000 000	TxF	TxP I	ASE	RxL	MW_unit		1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
ŠĂË	22600	11 -	37.6	49.9 •	1 + 1024strong / 56/	и / 438Мb	ACM	1024strong / 56M / 438Mb + 1	-48.8	-36.6	11	21400
		LOCAL								RE	NOTE	
ADMIN permissions 🖻	Logout	n: 10 n	118 s									
Status	Modem	Tr	affic	Mar	agement							
General	MODEM	COUNT	ERS					CHANNEL 1				Œ
Events	FEC RX B	locks				1		3.41712e+11				
Counters	FEC Corre	ected B	locks			2		2.30435e+10				_
Trends	FEC Unco	rrected	Erro	rs		3		10449				
Inventory	Uncorrect	ted - La	ist Se	cond		4		0				
Config	FEC Globa	al Rate	(sinc	e Clear)		5		3.0578366e-8	3			
Maintenance	FEC Actua	al Rate	(last	sec)		6		0				
Tools	Uncorrect	ted TLE	[sec]			7		530				
	Uncorrect	ted TBI	sec	1		8		1				
	Uncorrect	ted EFS	sisec			9		1.37e+6				
	Uncorrect	ted ER	S [sec	1		10		116				_
Time: 11.52.09 Uptime: 15.20:41:26 Refresh status	Clear	Clear	All	ORATE	BARYBROUND B	R		CHANNER				G
And an Paris State	Ctetus	112.00		ANTIMITES	and the second s	44	-	SVDC				
D. A CAPTER S. CAPTER D. LA DETAILS AND						10		sylic				
355260100009	Act Ty St	Al bood	thnel			1.1		210.7				
355260100009 License Number	Act. Tx Sp	peed [N	tbps]			12		219.7 random				
Above Serial Number 355260100009 License Number 3010403010100228	Act. Tx Sp TX Patter	n n	(bps]			12 13		219.7 random				
355260100009 License Number 3010403010100228 License Type / Status permanent / ok	Act. Tx Sp TX Patter RX Patter Bx Bit Co	n n n n unt Ibit	tbps]			12 13 14 15		219.7 random random 3.00701e+14				
biodem Serial Number 355260100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration	Act. Tx Sp TX Patter RX Patter Rx Bit Co Bx Err Co	peed (N n n unt (bit unt (bit	1bps] ] ]			12 13 14 15		219.7 random random 3.00701e+14 18886	L			
Abdem Serial Number 35526010009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited	Act. Tx Sp TX Patter RX Patter Rx Bit Co Rx Err Co Rx Sync C	n n n unt (bit unt (bit Count	tbps] ] ]			12 13 14 15 16 17		219.7 random random 3.00701e+14 18886 234	ł			
Abdem Serial Number 35526010009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01	Act. Tx Sp TX Patter RX Patter Rx Bit Co Rx Err Co Rx Sync C BER	n n unt (bit unt (bit Count	1bps] ] ]			12 13 14 15 16 17 18		219.7 random random 3.00701e+14 18886 234 6.280658e-11				
Abdem Serial Number 35526110009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01 Running Design	Act. Tx Sp TX Patter RX Patter Rx Bit Con Rx Err Con Rx Sync C BER TLE [sec]	peed (N n n unt (bit unt (bit Count	1bps] ] ]			12 13 14 15 16 17 18 19		219.7 random random 3.00701e+14 18886 234 6.280658e-11 530	i 			
Abovent Serial Number 35526010009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01 Running Design 505 (DXN3)	Act. Tx Sp TX Patter RX Patter Rx Bit Con Rx Err Con Rx Sync C BER TLE [sec] TBE [sec]	oeed [N n n unt [bit unt [bit Count	1bps] ] ]			12 13 14 15 16 17 18 19 20		219.7 random random 3.00701e+14 18886 234 6.280658e-11 530 0	1			
Abdeen Serial Number 35526100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01 Running Design 505 (DXN3)	Act. Tx Sg TX Patter RX Patter Rx Bit Coo Rx Sync C BER TLE [sec] TBE [sec] EFS [sec]	n n n unt [bit unt [bit Count	1bps] ] ]			12 13 14 15 16 17 18 19 20 21		219.7 random random 3.00701e+14 18886 234 6.280658e-11 530 0 1.37e+6				
Abdem Serial Number 35526100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01 Running Design 505 (DXIN3)	Act. Tx Sg TX Patter RX Patter Rx Bit Cor Rx Err Cor Rx Err Cor BER TLE [sec] TBE [sec] EFS [sec] ERS [sec]	n n unt [bit Count	1bps] ] ]			12 13 14 15 16 17 18 19 20 21 22		219.7 random random 3.00701e+14 18886 234 6.280658e-11 530 0 1.37e+6 110	1			
Abdem Serial Number 35526100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01 Running Design 505 (DXIN3)	Act. Tx Sj TX Patter RX Patter Rx Bit Col Rx Err Col Rx Sync C BER TLE [sec] TBE [sec] EFS [sec] ERS [sec]	oeed [N n n unt [bit unt [bit Count	1bps]			12 13 14 15 16 17 18 19 20 21 22		219.7 random random 3.00701e+14 18886 234 6.280658e-11 530 0 1.37e+6 110				

*Figure 3.18 "*Status → Counters → Modem" page

- 1) FEC RX Blocks the overall number of received airframes
- 2) **FEC Corrected Blocks** the number of air-frames which were repaired by FEC (Forward Error Correction). This number represents a fragment of the FEC RX Blocks
- 3) **FEC Uncorrected Errors** the number of air-frames which could not be repaired by FEC. This number represents a fragment of the FEC RX Blocks
- 4) **Uncorrected Last Second** the number of air-frames which could not be repaired during the last second
- 5) FEC Global Rate the ratio of FEC Uncorrected Errors / FEC RX Blocks
- 6) FEC Actual Rate same as above but for latest second only
- 7) Uncorrected TLE time since last error; a number of seconds from the last error

occurrence. It should correspond to the time since pressing the Liean button

- 8) Uncorrected TBE time between last two error events
- 9) Uncorrected EFS error free seconds; it should correspond to time since pressing the Clear button
- 10) Uncorrected ERS error seconds; number of seconds during which errors occurred
- 11) **Status** BER tester synchronization status (sync|nosync) or n/a when there is no active link to the remote side or free capacity left for the BER tester

- 12) Actual Tx Speed shows reserved transmission speed for BER tester. This value roughly equals to half of the unassigned capacity which is used for the BER tester
- 13) TX Pattern shows transmission pattern for BER tester frames
- 14) RX Pattern shows receiving pattern of BER tester frames
- 15) Rx Bit Count shows number of received bits (BER)
- 16) **RX Err Count** shows number of received error bits (BER)
- 17) Rx Sync Count number of synchronizations of the BER tester
- 18) BER ratio of Rx Bit Count and Rx Err Count
- 19) TLE time since last BER error; a number of seconds from the last error occurrence. It should correspond to time since pressing the Clear button
- 20) TBE time between the last two BER error events
- 21) **EFS** error free seconds of the BER tester; it should correspond to time since pressing the Clear button
- 22) ERS error seconds; number of seconds during which a BER error occurred

Clear button, the values of counters will be cleared. By pressing the By pressing the Clear All button, the values of counters on all Counter pages will be cleared.

Insert Error button, one error will be inserted into data streams of both By pressing the modems.

# Status $\rightarrow$ Counters $\rightarrow$ Traffic

This section provides a detailed overview of data frames flow. The section consists of the LAN COUNTERS which are captured by the IDU's switch and the FPGA COUNTERS which are captured by the modem.

Clear button, the values of counters will be cleared. By pressing the By pressing the

Clear All button, the values of counters on all Counter pages will be cleared.

		-			-	-				and the second second second			1.41	IX
SAF	22600	11	-37.5	-49.9	• 🕛 •	1024strong /	56M / 438Mb	ACN	1 1024strong	) / 56M / 438Mb	-48.8	3 -36.7	11	2140
		LUC	AL									RE	MOTE	
MIN permissions 🖻	Logou	t în: 3	h 49 m	бs										
Status	Moden	n	Traffic	M	anage	ment								
General														
Events	LAN C	OUNT	ERS											(
Counters	S	WITCH	COUN	Т		LAN1	LAN2		LAN3	MNG	WA	NA	)	WAN B
Trends		GO	odOcti	o Hi		0	0	2	0992082	040152893	4/9/10	0		0
Inventory	1	Ba	dOctet	S		0	0		0	0		0		0
Overfie	0		FCSe	rr at		0	0		21107	500158	257	0		0
Config	ò		Deffere	d		ŏ	ŏ		21107	09108	201	0		ő
Maintenance	I.	Br	oadcas	st		0	0		178	7752	27	345		0
Tools	10	N	luiticas	st		0	0		158	264004	267	419		0
	10	12	70c.fr	n		0	0		2583	54034	54	703		0
	iõ	25	5oc.fr	'n		ŏ	õ		647	13135	13	313		õ
	10	51	1oc.fr	n		0	0		901	22081	22	520		0
	10	102	30C.fr	n		0	0		2139	23090	24	253		0
Date: Thu, 19.04.2018	õ	C	OctetsL	0		õ	ŏ	1	0807485	42383931	661967	555		ŏ
Time: 12:13:59	0	(	Octets	łi		0	0		0	0	633	0		0
Uptime: 15 21:03:16	0		Jnicast	S		0	0		12258	252735	522	(13		0
Refresh status	ő	N N	lulticas	st		0	0		ő	8577	-	160		ő
	0	Br	oadcas	st		0	0		48	27523	7	930		0
Modem Serial Number	0		Sing	e		0	0		0	0		0		0
355260100009	Ŷ	P	ause G	0		0	0		0	0		4		0
License Number	Ó		Multipl	e		õ	Ő		ŏ	Ő		0		ŏ
3010403010100228	1	U	ndersiz	e		0	0		0	0		0		0
License Type / Status		Fra	agment	S		0	0		0	0		0		0
permanent / ok	i i		Jabbe	er		0	ő		ŏ	ő		ő		ő
License Expiration	î î		RxE	rr		0	0		Ō	0		0		0
Lineswere Version	1		FCSe	rr		0	0		0	0		0		0
0401_01	0		Lat	n e		0	0		0	0		0		0
Running Decign	ĭ	(	Discard	s		ŏ	õ		ŏ	ŏ		ŏ		ŏ
505 (DXN3)	10		Filtere	d		0	0		0	0		0		0
	FPO	GA COL	JNT	TX fra	mes	RX Frames	TX Discar	ded	Flowcontroll	Aggr.Align I	oss Tx B	ytes/s	Rx By	ytes/s
		EI	H2a	230	0	293214	)	0	4		0	41970		2107
		ETI	H1b		õ	C	)	Õ	Ő		0	õ		0
		ETI	H2b		0	C	)	0	0		0	0		0
	FPG	A MUX	COUN	T	RX	bytes	TX bytes	RX	CRC frm	Rx sync				
			rfi	2	08149	0	114399270		0 0	000				
	-								-					

Figure 3.19 "Status → Counters → Traffic" page

Status  $\rightarrow$  Counters  $\rightarrow$  Management

This section displays IP statistics of IDU's interfaces.

and the second second	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
2.4 2	22600	11 .	37.5 -4	19.9 +	+ 1024strong / 56M / 438Mi	ACM	1024strong / 56M / 438Mb + 1	-48.8	-36.7	11	21400
SPAR		LOCA	L						RE	MOTE	
ADMIN permissions 🗄	Logou	tin: 3 h	46 m 2	15							
<ul> <li>Status</li> <li>General</li> </ul>	Moden	ni) i Ti	affic	Mana	gement						
Events	IP STA	TISTIC	S								(1)
Counters Trends Inventory Config Maintenance		1	eth0	: Eth ine UP RX TX RX : UN ine RX	t addr:192.168.206.10 Bk BROADCAST RUNNING I packets:281690 errors:0 packets:519801 errors:0 bytes:36255680 (34.5 M SPEC HWaddr 00-00-00- t addr:192.168.206.10 P- packets:1370071 errors:	81:58:24 ast:192.168.2 MULTICAST M dropped:0 ove dropped:0 ove B) TX bytes:0 00-00-00-00-0 t-P192.168.20 0 dropped:1 o	206.255 Mask:255.255.255.0 ITU:1500 Metric:1 erruns:0 carrier.0 47445559 (617.4 MiB) -00-00-00-00-00-00-00 16.11 Mask:255.255.255 255.255				
Date: The 19.0=2018 Time: 12.16.44 Uptime: 15.21.06:01 Refresh status		2	rfi2	TX RX : UN ine	packets:1370382 errors: bytes:1174124985 (1.0 c SPEC HWaddr 00-00-00- t addr:192.168.206.10 P-	0 dropped:0 ov iB) TX bytes: 00-00-00-00-00 t-P:192.168.25	verruns:0 carrier.0 1167512859 (1.0 GiB) 0-00-00-00-00-00-00-00 33.244 Mask:255.255.255.255				
Modem Serial Number 355260100009 License Number 3010403010100228 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401.01		3	usb0	RX TX RX Eth ine UP RX TX RX	packets:0 errors:0 dropp packets:17 errors:0 dropp bytes:0 (0.0 B) TX bytes ernet HWaddr AA:66:9C: t addr:10.10.11.10 Bcast BROADCAST MULTICAS packets:0 errors:0 dropp packets:0 errors:0 dropp bytes:0 (0.0 B) TX bytes	ed:0 overruns ed:0 overruns 14847 (14.4 k 92:D7:68 10.10.11.255 TMTU:1500 l ed:0 overruns: ed:0 overruns: 0 (0.0 B)	0 frame:0 5:0 carrier0 (iB) Mask:255.255.255.0 Metric:1 0 frame:0 0 carrier.0				

*Figure 3.20 "*Status → Counters → Management" page

- eth0 Ethernet port of MNG CPU with its own MAC address and all the standard features of Ethernet interface. Device/Fallback addresses and appropriate subnet masks are assigned to this interface.
- Rfi1/2 ppp (point-to-point protocol) type of interface which interconnects local MNG CPU with the remote side MNG CPU accessible through the separate channel inside air-frame
- 3) usb0 an onboard service USB port which is dedicated to local service IP access

# Status $\rightarrow$ Trends $\rightarrow$ Actual

The graph in this section displays the selected values in dependence on time. If the connection with remote side is established, the values from the remote unit also will be displayed. The graph is dynamic and is updated with the latest values at each GUI auto-refresh. It is possible to decrease the pooling period to 1/2 of normal refresh interval by means of the

**faster refresh** button. It can take up to several seconds before the faster refresh is activated. Also, note that every such refresh will cause zoom reset. The normal refresh interval is calculated dynamically from server response time. The actual interval is displayed in the browser console.

For depiction it is possible to choose from the following options:

- TxPower depicts the transmitter signal output level
- RxL/MSE received signal level/quality of the received signal
- Temperature displays the temperature of modem and radio

The resolution of the displayed data will be lower for older records and higher for the newest. This time segmentation is 10 minutes, 1 minute and 1 second.

1



Figure 3.21 "Status → Trends → Actual" page

# Status $\rightarrow$ Trends $\rightarrow$ Historical

The graph in this section displays the selected values in dependence on time. If the connection with remote side is established, the values from the remote unit are will be displayed.

For depiction it is possible to choose from following options:

- TxPower depicts the transmitter signal output level
- RxL/MSE received signal level/quality of the received signal
- Temperature displays the temperature of modem and radio
- ETH\_Count displays the transmission capacity for the transmission and admission on the selected ports of the IDU
- **Sync/Modul** value MLOCK = 1 displays modem synchronization, value MLOCK = 0 shows that there was no synchronization. If ACM is active, the most appropriate modulation for signal transmission or admission is found. Individual modulations are indicated by their amount of states.

It is possible to zoom the graph by means of mouse selection of the interested range; and

reset the zoom by pressing the zoom out button.



The resolution of the displayed data will be lower for older records and higher for the newest. This time segmentation is 10 minutes, 1 minute and 1 second.



Figure 3.22 "Status → Trends → Historical" page

# Status $\rightarrow$ Inventory

This section shows the device hardware/software information as well as radio part information.

Second Second	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
<b>2</b> A <b>2</b>	22600	11	-37.6	-49.8	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	+ -48.5	-36.7	11	21400
SPAP		LOC	AL		-				RE	MOTE	
ADMIN permissions 🖻	Logou	nt in: 2	h 34 m	5 s							
4 Status	Invent	ory									
General	SYSTE	MINFO	x		MODEM UNIT		RF UMIT 1	RF			1
Events	Serial N	lumbe	r		355260100009	3	53550100142				
Counters	Produc	t Num	ber		EAGXC002	S	23GFU02HA				
Trends	Produc	t Code			3010403-0105						
Inventory	FW Bas	se			0401_01		2.24				
Config	HW Bas	se			12AT20505_0030A_778						
Maintenance	OS Ker	nel			0204						
▶ Iools	Produc	t Info	1		CFIP PhoeniX G2						
	Produc	t Info 3	2		1+0/2+0/XPIC G2-IDU						
	Produc	t Info 3	3	3	xRJ-45 GE/Mng, 4xSFP for GE						

*Figure 3.23a "*Status → *Inventory" page* 

If any of EMM modules are connected to the IDU and enabled, additional EMM information will appear in this section:

No. of Concession, Name	TxF	TxP	MSE	RxL	Low	1+0 CH1	High	RxL	MSE	TxP	TxF	1	
HAH H	6675	8	-35.3	42.9 +	1 + 0004strong / 80M / 11	1МЬ АСМ	0004strong / 80M / 111Mb	•1]• -43.1	-37.2	8	7015		
5/11	LOCAL REMOTE												
DMIN permissions 🖻	Logou	nt in: 18	m 17 s									è	
Status	Inventory												
General	SYSTE	MINFO			MODEM UNIT		RF UNIT 1	RF	UNIT 2		(	)	
Events	Serial N	lumber			355260100009		353260100535						
Counters	Produc	t Numb	er		EAGXC002		S06GPU02LB						
Trends	Produc	t Code			3010403-0105								
Inventory	FW Base				0401_04		2.23						
> Contig	HW Base			1	12AT20505_0031D_79	4							
<ul> <li>Maintenance</li> </ul>	OS Kerr	nel			0204								
> 100IS	Produc	t Info 1			CFIP PhoeniX G2								
	Product Info 2				1+0/2+0/XPIC G2-IDU	E							
	Produc	t Info 3		3xR	J-45 GE/Mng, 4xSFP fo	or GE							
Date: Fri, 31.08.2018 Time: 13:13:18	EMM INFO				EMM#1	EMM#2	EMM#3		EMM#4 n/c		G	)	
	Serial N	Serial Number		3020101010100037		n/c	n/c						
Uptime: 2 04:49:27 Befrech status	Produc	t Numb	er	E	MM-16E1T1	n/c	n/c		n/c				
inencon status	Produc	t Code		11-3	3020101-0101	n/c	n/c		n/c				
Modern Serial Number	Firmwa	re (FW	Base)		01_02	n/c	n/c		n/c				
355260100009 License Number	HW Bas	se		12AT20	0481_04_03(user)	n/c	n/c		n/c				

Figure 3.23b "Status → Inventory" page

# Config

# $\mathsf{Config} \rightarrow \mathsf{System} \rightarrow \mathsf{Mode}$

In this section the user can select specific Design Type which specifies the main function of the system/link.

and the second second	TxF	TxP	MSE	RxL	Low		1+0 CH1	High	RxL	MSE	ТхР	TxF		
"A "	6675	8	-34.6	-42.8	+ 🚺 + 0004	strong / 80M / 111Mb	ACM	0004strong / 80M / 111Mb + 1	+ -43.0	-37.0	8	7015		
SIL		LOC	AL							REMOTE				
ADMIN permissions 🖻	Logou	rt in: 1	9 m 35	s										
Status	Mode Description Date&Time Advanced													
Config	DESIGN	CON	IGURA	TION			LOCAL			ACTION				
System	Design Type				1	1 Design 505 V					Apply			
IP	DESIGN	MOD	ES				LOC		G					
Radio	Functio	Functional Mode			2		1+0 Ch1 🔻			Apply				
Ports	Link Di	versity			3		none .7							
Alarms Maintenance	RADIO	MODE	S.				CHANNEL T				ACTION			
> Tools	Duplex	Duplex Mode					Bidirectional 🔻				Apply			
	DATA	NCRY	PTION				CHAN	NEL 1		ACTI	DN	G		
Date: Fn, 31-08-2018 Time: 15:21:50 Uptime: 0:00:01:05 Refresh status	AES ke	AES key length					128 256							
	AFS ke	AES key input			6	Plea	Please enter 32 hex digits to AES key chang				fv			
	ALGRE				0	Generate random keys					Apply			
	AES ke	key status 7 Customer 128bit key en				tered CRC: A5229D0A								
Modern Serial Number	AES fui	nction			8		Oon (	off		Арр	iy			

Figure 3.24 "Config → System → Mode" page, Design 505 configuration

- 1) Design Type following two design types are supported (depending on the license):
  - a) Design 505 a single IDU on each side of the link. Available modes are 1+0 (ch1, ch2, dual FD and dual XPIC), 1+1 (FD, HSB, SD, XPIC) and 2+0 (FD, XPIC). This design supports AES encryption if licensed.
  - b) Design 511 two or more IDUs on each side of the link. This design type should be selected for application where full protection is required. Two or more interconnected IDUs are used on each side of a link in this configuration. At the moment there is only Split 1+1 (FD, HSB, SD) mode available. Note that the AES encryption is not available in this design.



The design change will load a configuration pre-sets for the given design. That means the device should be re-configured by the user after each design type change. It is recommended to reboot the device after such re-configuration.



It may happen that The link to the remote side will be lost after design type change. In this case local access to all devices must be ensured before design type change. The remote side IDU/ODU has to be configured separately.

#### Following configuration fields will appear when Design type **Design 505** will be chosen:

- 2) *Functional Mode* above mentioned Radio modes in *Design 505* can be combined with following Functional modes:
  - a) 1+0 Ch1/2 simple one channel end station which uses physical channel Nr.1/2
  - b) **1+0 Dual** advanced 1+0 mode which separately uses both physical channels. Can be used also as repeater configuration.
  - c) **2+0** capacity aggregation mode which combines the capacity of both physical channels.
  - d) **1+1** protection mode which combines the capacity of both physical channels.
- Link Diversity modes those modes are available when choosing above mentioned 1+1 or 2+0 Functional modes:
  - a) *FD* frequency diversity configuration with frequency separation in both physical channels of the system. Supported by **2+0** and **1+1** functional modes
  - b) SD space diversity configuration with single Tx channel, two Rx channels and two antennas in both directions. Supported by 1+1 functional mode. This mode does not support Tx switch-over.
  - c) HSB/SD hot standby/space diversity configuration with single Tx channel at a time and two Rx channels in both directions. Supported by 1+1 functional mode. This mode will switchover the Tx in case of Primary Tx failure



It is recommended not to use ACM when 1+1 SD or 1+1 HSB/SD modes are used with separated antennas in each side of the link. In some circumstances the ACM in combination with 1+1 SD mode might not work properly. For more details please refer to SAF technical support at techsupport@saftehnika.com

d) **XPIC** – cross-polarization diversity with automatic attenuation of interfering signal from the X-polarized channel. Supported by **2+0** and **1+1** functional modes



The following AES settings will be available if they are included in the license. Those settings may be available for one or two channels depending on the configuration of the Functional Mode.

- Duplex Mode this setting determinates duplex/simplex function of the configured link and has an essential influence on whole system function:
  - a) **Rx Only** half-duplex/simplex link with only Rx channel. In this case the automatic ACM function should be set to the manual profile by the user.
  - b) **Tx Only** half-duplex/simplex link with Tx only channel. In this case the automatic ACM function should be set to the manual profile by the user.



The simplex configuration considerably limits the functionality of the system. The ACM function will not work as well as remote side monitoring from Tx only side, etc.

- c) Bidirectional full duplex link with Tx and Rx channels
- 5) AES key length One of two ASI key lengths can be selected for the AES encryption: 32 hex digits key (128 bits) or 64 hex digit key (256 bits). If there is no specific requirement of 128-bit key usage, the 256-bit key is recommended.
- 6) **AES key input** A 32 hex digit key (128 bits) or 2x 32 hex digit keys (256 bits) must be entered for each channel in order to properly initialize the AES function. The same key have to be entered on local and remote channels. It is possible to use the

Generate random keys button to generate a random key(s).