- AES key status This information line shows the status of the actual AES key, as well as CRC of entered valid key. Note that such CRC value MUST match on both local and remote respective channels.
- 8) AES function This box enables or disables AES encryption function. When enabled, the whole traffic stream from packet processor is encrypted by provided AES key. Out of band management channel is not encrypted in this mode, therefore remote access to remote IDU is possible in any way. It is required to define valid AES key(s) in order to enable the AES function.

When choosing Design type **Design 511** following additional configuration options will appear in this same section:

100 m 100	TxF	TxP	MSE	RxL	W	P.loc.prim_13	Split 1+1	rem.sec_10:S	RxL	MSE	TxP	TxF
ŠĂĔ	17800	15	-41.5	-41.5	•	0004strong / 14M / 21 Mb	ACM	0004strong / 14M / 21Mb	-89.4	0.0	18	9000
SIAF	17990	muted	-40.9	-49.7		*	ADIM	+1	+ -40.3	-41.0	15	8810
	LC	OCAL (p	rimary		W	S:loc.sec_12	HSB/SD	rem.prim_11:P		REN	NOTES	
DMIN permissions 🕒	Logou	rt in: 19	m 49 :	5							W	ite
Status	Mode	De	scripti	on	Date	Time Advanced						
Config	DESIGN	CONF	IGURA	TION			LOCAL (pr	(mary)		ACTI	M	(1)
System Access	Design	Туре					Design 5	11 👻		Арр	ly	
IP	DESIGN	MODE	s				LOCAL (pr	imary)		ACTIO	DN	(i)
Radio Ports	Functio	nal Mo	de			9	Split 1+	1 🔻		Арр	ly	
Alarms Maintenance	Link Pro	otectio	n Diver	sity	1	0 н	SB/SD - Hot :	standby 👻	FO per	App	ly lected - ir	s
Tools	Hot-Sw	ap Sta	rtup De	vice Ro	-	1	Auto (secon	dary) 👻		le will l utomat		
	Running	g Role	Swappi	ng	1	2 swap de	vice role (pri	mary/secondary)		Арр	ly	
Date: Wed, 27.02.2019	RADIO	MODES					CHANN	EL 1		ACTH	ow .	(1)
Time: 14:28:47	Duplex	Mode					Bidirectio	nal 🔻		Арр	ly	
Uptime: 0 02:47:47 Refresh status	Refre	sh									Und	0

Figure 3.25 "Config → System → Mode" page, Design 511 configuration

- Functional Mode above mentioned Radio modes in Design 511 can be combined with following Functional modes:
 - a) **Split 1+1** full protection mode which uses one physical channel on each IDU. Two IDUs must be used on each side of the link.
 - b) **Split 2+2** combination of both protection and aggregation modes. This setting requires two IDUs on each side of the link, each IDU with two radios attached.

Split 2+2 mode requires the PRT3 option in the license.

- 10) *Link Protection Diversity* modes those modes are available when choosing above mentioned **Split 1+1** or **Split 2+2** Functional modes:
 - a) **FD** frequency diversity configuration with frequency separation in both physical channels of the IDU
 - b) **SD** space diversity configuration with single Tx channel, two Rx channels and two antennas in both directions. This mode does not support Tx switch-over
 - c) **HSB/SD** hot standby configuration with single Tx channel at a time and two Rx channels in both directions. This mode will switchover the Tx in case of Primary Tx failure.
- 11) Hot-Swap Startup Device Role Hot-Swap configuration settings are following:
 - a) **Auto (primary)** auto Hot-Swap enabled, the device will be configured as 'primary' during start-up. The device will swap it's role if a protection Alarm occurs. The 'Auto (secondary)' setting MUST be set on the peer (FO) IDU. Change in this setting will not change the running device role.
 - b) Auto (secondary) auto Hot-Swap enabled, the device will be configured as 'secondary' during start-up. The device will swap it's role if a protection Alarm occurs. The 'Auto (primary)' setting MUST be set on the peer (FO) device! Change in this setting will not change the running device role.

- c) Fixed primary Hot-Swap disabled. The device role will be always 'primary'. The 'Fixed secondary' role should be set on the peer device (FO). Changing this setting will result in an immediate automatic role switch on both local devices (if interconnected).
- d) Fixed secondary Hot-Swap disabled. The device role will be always 'secondary'. The 'Fixed primary' role should be set on the peer device (FO). Changing this setting will result in an immediate automatic role switch on both local devices (if interconnected).
- 12) Running Role Swapping this option is available only when the Hot-Swap Startup Device Role is configured in the 'Auto' mode. By pressing this button, it is possible to swap running roles of local devices

When choosing Functional mode **Split 2+2** the additional header information and Duplex Mode settings for both Channels will apper. Following additional configuration options will appear in this same section:

and the second second	TxF	TxP	MSE	RxL	W	Ploc.sec_12	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
2 A #	17990	18	-41.4	-49.6	0	0004strong / 14M / 21Mb	ACM	0004strong / 14M / 21Mb + 1	-90.1	0.0	15	18810
SAL	18190	18	-41.0	-51.4	Ð	• 0004strong / 14M / 21Mb	ACM	0004strong / 14M / 21Mb + 2	-85.8	0.0	15	19110
	17800	muted	-41.6	-41.7	0	× 0004strong / 14M / 21Mb	ACM	0004strong / 14M / 21Mb + 1	+ -48.2	-41.8	18	19000
	18100	muted	-41.7	-43.3	0	× 0004strong / 14M / 21Mb	ACM	0004strong / 14M / 21Mb + 2	+ -48.9	-41.2	18	19200
	LOC	CAL (see	condar	y)	W	S:loc.prim_13	HSB/SD	rem.sec_10:S		REM	AOTES	
ADMIN permissions 🕞	Logou	nt in: 7 k	29 m	43 s								Write
Status	Mode	De	scripti	on I	Date	Time Advanced						
4 Config	DESIGN	CONF	GURA	TION			LOOAL (sec	ondary)		ACTI	ON	C
System Access	Design	Туре					Design 5	11 🔻		Арр	ly	
IP	DESIGN	MODE	s				LOCAL ISE	ondary)		ACTI		G
Radio	Functio	nal Mo	de				Split 2+	2 🕶		Арр	elv l	
Ports	Link Pr	otection	Diver	sity		F	ISB/SD - Hot	standby 🔻		Арр		
Alarms Maintenance	Link Ag	areaati	on Div	ersity	4	3		+		er conn	nected	- it's
Tools				vice Ro		5	Auto (secon	danv) 👻	1	le will utomat		
					ic .	auroa d			d	-		
	Runnin	g note :	swapp	ing		swap u	evice role (pri	mary/secondary)	-	Арр	ny	
Date: Wed, 27.02.2019	RADIO	MODES				CHANNEL	1	CHANNEL 2		ACTI		(1)
Time: 14:50:50	Duplex	Mode				Bidirectiona	1 -	Bidirectional 👻		Арр	iy	
Uptime: 0 03:09:50 Refresh status	Refre	sh									U	ndo

Figure 3.26 "Config → System → Mode" page, 2+2 mode configuration

- 13) Link Aggregation Diversity modes those modes are available when choosing Split 2+2 Functional mode:
 - a) *FD* frequency diversity configuration with frequency separation in both physical channels of the device
 - b) **XPIC** cross-polarization diversity with automatic attenuation of interfering signal from the X-polarized channel

Config \rightarrow System \rightarrow Description

It is possible to specify device information in this section.

and the second second	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A #	22600	11	-37.6	-49.8	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	+ -48.7	-36.7	11	21400
SPAP		LOC	AL						RE	MOTE	
ADMIN permissions 🖻	Logou	nt in: 31	8 m 44	5							
Status	Mode	D	escripti	on	Date&Time Advanced						
Config	USER D	EFINE	D DESC	BIPT	DN.						(1
System Access	Device	Name	1		/IW_unit						
IP	Locatio	n	1	2	ree for user input						
Radio	Custom	n Text	:	3	ree for user input						
Ports								Undo	Ann	W 8. 5	ewe
Alarms								Unuo	(APP	yas	CIVE

Figure 3.27 "Config → System → Description" page

- 1) Device Name the IDU name shown in the header/web page title
- 2) Location location of the IDU
- 3) Custom Text free field for user input

Valid characters are [a-zA-Z0-9 _!@#%*()-+=:;',.?/] (including [] and without space character in device name)

Config \rightarrow System \rightarrow Time&Date

The section with date, time, time zone and the network time protocol settings.



The date and time settings may not be available if a time limited license is in use.

 \triangle

When ntpds value is selected, the device will be used as local NTP server. The NTP synchronization is directed by the protocol itself while the rdate synchronization is initialized once per 24 hours and during the start-up of the device.

A CONTRACTOR OF	TxF	TxP	MSE	RxL N	IW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
e A e	22600	11	-37.5	-49.8 + 1 + 1	024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	-48.7	-36.7	11	21400
SPAP		LOC	AL						RE	NOTE	
DMIN permissions 🖻	Logou	t in: 30	m 37	5							
Status	Mode	De	escripti	Date&T	ime Advanced						
Config	DATEA	ND TIN	IE SET	TINGS							0
System	Date			20.04.201	8						
Access	Time			12:30:47			Fill-in PC 1	time +10:	s		
Radio				extended		•					
Ports	Time Zo	one		UTC							
Alarms	REMOT	ETIME	SERV	8		REQUIRED	00	NFIGU	RED		0
Maintenance	Server	Туре				ntp 🔹		ntp			
Tools	Server	P			80.7	9.25.111	8	0.79.25.	111		

Figure 3.28 "Config → System → Time&Date" page

$\mathsf{Config} \rightarrow \mathsf{System} \rightarrow \mathsf{Advanced}$

This section contains following advanced settings:

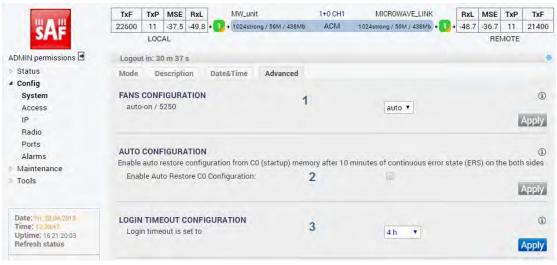


Figure 3.29 "Config → System → Advanced" page

- 1) Fand Configuration the configuration of the inbuilt fans; options are following:
 - a) on the fan always is on
 - b) off the fan always is off
 - c) auto the fan is auto-regulated by the device (default setting)



The thresholds for auto mode are following: >= 40° C to turn the fan on, <= 30° C to turn the fan off.

- 2) **Auto Configuration** when the checkbox is selected, the start-up configuration (C0) will be loaded after 10 minutes of the continuous error state. It is recommended to disable this function during initial link configuration and installation. By default it is off.
- 3) **LoginTimeout Configuration** timeout settings of the GUI auto-logout. There is continuous communication between GUI and the device while logged on.

Config \rightarrow Access \rightarrow Users

Usernames and passwords settings

and the second second	TxF	TxP	MSE	RxL	MW_unit		1+0 CH1	MICROWAVE_LINK	R	xL I	MSE	TxP	TxF
WA H	22600	11	-37.6	-49.8	• 1024stron	g / 56M / 438Mb	ACM	1024strong / 56M / 438Mb •	1 + -4	8.7 -	36.7	11	21400
SPAP	-	LOC	AL								REN	IOTE	
ADMIN permissions 🖻	Logou	t in: 3	h 55 m	14.s									
Status	Users	P	rotocol	s C	erts&Keys								
Config	BOLEN	AME	L	GIN NA	ME 15	PASSWORD (6	CONFIRM PASSWORD 7	PASSY	ORD	STRE	NGTH	1
System Access	GUEST	1		guest									
IP	USER	2		user									
Radio	ADMIN	3	1	admin									
Ports	Requ	ire sec	ure pa	ssword	3								
Alarms	4								Lin	do I	Anni	y & S	awa
Maintenance									UII	uo I	15151	100	143

Figure 3.30 "Config → Access → Users" page

- 1) GUEST user role with read-only access
- 2) USER user role with standard management access
- ADMIN ser role with enhanced management access enhanced settings, passwords, FW upgrade, etc.
- 4) Require secure passwords if checked, only secure passwords will be accepted.



Secure password is 8 or more characters long, contains lowercase, uppercase and numbers. More secure password consists of at least 13 characters and contains combination of lower/uppercase characters, numbers and symbols (! @ $\# \% * ()_{-} + = []:;', .?/$). Do not use other characters (^ & \$ { } \)

- 5) **LOGIN NAME** user name for selected level of the access The number of characters in the input field have to be in range from 4 to 12. Valid characters are [a-z, A-Z, 0-9, _]. it is not allowed to use user names which are already present in the system (for example root, daemon, username present in other access level).
- PASSWORD password for selected level of the access. The number of characters in the input field have to be in range from 0 to 19. Password for ADMIN have to be in range from 1 to 19.
- 7) **CONFIRM PASSWORD** has to be the same as PASSWORD.

Config \rightarrow Access \rightarrow Protocols

Management protocols and security configuration section.

	TxF	TxP	MSE	RxL	MW_unit		1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A "	22600	11	-37.6	-49.8 +	• 1024strong	/ 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	+ -48.7	-36.7	11	21400
3/11		LOC	AL							RE	MOTE	
ADMIN permissions 🖻	Logou	t in: 3	h 46 m	3 s								
Status	Users	P	rotocol	s Certsa	Keys							
Config	MANAG	EMEN	TACCE	SS								(1
System Access	HTTPS,	SSH			1		÷	Up	load certi	icates		
IP	HTTPS	with C	lient ce	ertificate	2			B	eset certif	icates		
Radio	HTTP				3							
Ports Alarms	TELNET				3							
Maintenance	SNMP						1	v2 & v3	30	¢.		
Tools	SSH wit	th KEY			4		14		Upload k	eys		
	SSH use	er/pas	sword	login enable	d 5		1		Reset ke	ys .		
Date: Fn. 20:04,2018 Time: 13:06:54	1									Und	do s	ave

Figure 3.31 "Config → Access → Protocols" page

- HTTPS, SSH it is always enabled, cannot be turned off. By default, self-signed server certificate (SC) is used. This causes a browser security warning. To avoid this warning you can upload your own server certificate (SC) and upload the appropriate client certificate (CC) to the user browser.
- 2) HTTPS with Client Certificate https access is possible only if the client (browser) has installed client certificate (CC). The option is available only if the device has uploaded the certification authority (CA) certificate signing CC. Reset of the CA certificate is possible only if this option is not checked.
- HTTP, TELNET, SNMP to increase the security of the device you can disable unencrypted access (http, telnet, SNMP v2) and turn on only encrypted SSH, HTTPS and SNMP v3 (SNMP can be set only on the Config/IP/SNMP page).
- 4) **SSH with KEY** You can provide SSH keys in order to log in via SSH terminal without using a password.
- SSH user/password login enabled You can switch off SSH login using username/password. You have to be sure that login without password works. Reset of the SSH key is possible only if this option is enabled.

$Config \rightarrow Access \rightarrow Certs\&Keys$

In this section is possible to import necessary certificates

and the second second	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
2 A 2	22600	11	-37.6	-49.9	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	+ -48.6	-36.7	11	21400
3/11		LOC	AL						RE	MOTE	
ADMIN permissions 🖻	Logou	nt in: 3	h 59 m	25 s							
P Status	Users	P	rotocol		Certs&Keys						
Config											
System	SERV	ER CE	RTIFIC	ATE +	PRIVATE KEY (.PEM)						(j)
Access	Izvēlē	ēties fa	ilu Na	v izvēl	lēts neviens fails		1			10	pload
IP	Loaded	certifica	ate: Subje	ect: C=0	CZ, ST=Czech Republic, O=OEM					-	
Radio			17 06:12								
Ports	SHA1 F	ingerpri	nt=9B:CE	91:E3:	22:5E:BA:E3:2A:CF6C:C7:B2:35:B3:E	B:D2:A1:20:FA					
Alarms											
Maintenance	CERT	IFICAT	TION A	UTHO	RITY CERTIFICATE (.PEM)						(i)
> Tools	Izvēlē	ēties fa	ilu Na	v izvēl	lēts neviens fails		2			10	pload
			ate: Not I	oaded			2				
	Validity	1000	pecified								
Date: Fn 20:04:2018	Unspeci	ified									
Time: 13:20:11 Uptime: 16 22:09:27											
Refresh status		and the second s			(ID_RSA.PUB)					-	1
					Nav izvēlēts neviens fails						pload
Modem Serial Number 355260100009	USER:	Izvēl	ēties fa	lu N	av izvēlēts neviens fails		3			10	pload
License Number	GUEST	E Izvē	ilēties f	ailu M	lav izvēlēts neviens fails					U	pload
3010403010100228		1.4.1.1.1.1	aded: no								
License Type / Status	User kej										
permanent / ok License Expiration	Guest k	ey is loa	ided: no								

Figure 3.32 "Config → Access → Certs&Keys" page

- Server Certificate + Private Key (.PEM) a tool for HTTPS server certificate import. There is also shown basic information of actual HTTPS certificate. By default a selfsigned certificate is loaded. It causes a browser security alert.
- 2) Certification Authority Certificate (.PEM) it is possible to secure the access by means of a personal certificate loaded in the browser. In this sub-section it is possible to import a certificate of Certification Authority who signed personal certificate. There is also shown basic information about actual authority certificate.
- 3) SSH Public RSA Keys (ID_RSA.PUB) it is possible to secure the SSH connection by means of importing customer's public SSH key. It is usually stored in home directory as "./ssh/id_rsa.pub". It is possible to load the key for each user role. Statuses are shown in this sub-section.



Important! The other file "id_rsa" (without extension) stored in the same directory is your PRIVATE key! It must not leave your home directory and/or computer!

$\mathsf{Config} \to \mathsf{IP} \to \mathsf{Addresses}$

In this section IP addresses of the IDU can be configured.

and the second second	TxF	TxP	MSE	RxL	MW_unit	1-	-0 CH1	MICRO	NAVE_LI	NK	RxL	MSE	TxP	TxF
SAF	22600	11	-37.6	-49.9	• 1024strong	/ 56M / 438Mb	ACM	1024strong / 5	6M / 438M	46 + 11	-49.0	-36.7	11	21400
SAF		LOC	AL								-	RE	MOTE	
OMIN permissions 🖻	Logou	n in: 3	h 59 m	49 s										
Status	Addres	sses	SNM	IP	Advanced									
Config	MAINA	DDRE	SS SET	TINGS	s.	REO	UIRED			C	NFIGU	RED		(
System Access	Device	IP / Ma	ask		1	192.168.2	206.1 / 2	24		192	168.206	.10/24		
IP	Default	Gatew	ay IP		2	192.16	8.206.1			19	2.168.2	06.1		
Radio	OPTION	NAL AD	DRESS	SETT	TINGS	REC	UIRED			C	NFIGU	RED		(
Ports Alarms	USB IP	/Mask			3	10.10.11.1 192.168.1				10	10.11.1	0/24		
Maintenance Tools	Fallbac	k IP/M	ask		4	10.10.10.1				10	.10.10.1	0/24		

Figure 3.33 "Config → IP → Addresses" page

1) **Device IP / Mask** – IP address assigned to port ETH0 (device local address) with the appropriate netmask specification. Netmask value is inserted in form of a decimal

number which corresponds to numbers in binary subnet mask presentation. For example, the net-mask for subnet mask 255.255.255.0 is presented as decimal number 24. Local network has its own and unique primary IP address.

 Default Gateway IP – default Gateway IP address is used by CPU when connection outside of IP range defined in system routing table is required. Such IP address must be a member of the above defined Device IP subnet.

This sib-section also shows the REQUIRED and CONFIGURED IP settings. REQUIRED



settings will be stored by the Save button. In order to activate the new settings use the

IP Init button (you will be logged out, but user traffic will not be dropped) or the settings and reboot the device.

- 3) **USB IP/Mask** it specifies IP address for USB0 management port. When default USB IP address is in collision with other network configuration it can be changed with this parameter. Factory default value is 10.10.11.10/24
- 4) **Secondary IP/Mask** it specifies secondary IP address for ETH0 management port. When default secondary IP address is in collision with other network configuration it can be changed with this parameter. Factory default value is 10.10.10.10/24

Note that configured Main IP and Gateway IP addresses are not in conflict with another internal IP addresses, especially with:

- used fallback IP address, either with default 10.10.10/24 or with optional 192.168.10.10/24
- used USB IP address, either with default 10.10.11.10/24 or with optional 192.168.11.10/24
- temporary remote1 IP address, either with default 192.168.253.243 or with optional 10.10.253.243
- temporary remote2 IP address, either with default 192.168.253.244 or with optional 10.10.253.244

$\mathsf{Config} \rightarrow \mathsf{IP} \rightarrow \mathsf{SNMP}$

In this section SNMP settings can be configured

	TxF	TxP	MSE RxL	MW_ur	nit	1+0 CH1	MICROV	AVE_LINK	RxL	MSE	TxP	TxF
SAF	22600	11	-37.6 -49.9	• 1 + 1024st	rong / 56M / 438Mb	ACM	1024strong / 56	6М / 438МБ 🛛 🚺	+ -49.0	-36.7	11	21400
SAF		LOC	AL							RE	MOTE	
DMIN permissions 🖻	Logou	tin: 3	h 59 m 49 s									
Status	Addres	sses	SNMP	Advanced								
Config	SNMP	CONFI	GURATION									6
System	SNMP B				1							
Access	SNMP	Versio	n:		2			v2 & v3 •				
IP Radio	SNMP F	Port:			3			161				
Ports	Trap Po	ort:			4			162				
Alarms	-						[192,168,2,101	-			_
Maintenance	Trap IP	Addre	ss:		5			none				
Tools								none				
	SNMP o	daemo	n status					running				
Date: Sat. 21 84 2016	COMM	UNITY	SETTINGS		R	ead only acce	55	Ré	ad write	access		G
Time: 06/32/41	Commu	inity st	tring:	6	pu	blic		priv	ate			
Uptime: 17 15:21:57 Refresh status					19	2.168.2.0/24		192	.168.2.0	/24]	
	IP Addr	ess/M	ask:	7	no	ne		nor	ie	1		
Modem Serial Number 355260100009					no	ne		nor	le			
License Number	SNMPV	13.			R	ead only acce	55	Re	ad write	access		G
3010403010100228 License Type / Status	User Na	ame:		8	pu	blic		priv	ate		1	
permanent / ok	Auth an	d Priv	acy Password	: 9								
License Expiration unlimited	Confirm	1 Pass	word:	10							1	
Firmware Version	Encrypt	tion:		11			(AES	O DES				
0401_01 Bunning Design										Lin	do 💽	2)//2

*Figure 3.34 "*Config → *IP* → *SNMP" page*

- 1) SNMP Enable enables/disables the SNMP daemon in the device
- 2) **SNMP Version** SNMP v2c & SNMP v3 or just SNMP v3 can be chosen for SNMP access to the device
- 3) **SNMP Port** the parameter specifies which port will be used for SNMP communication. The same configuration must be set also in SNMP agent station
- 4) **Trap Port** the parameter specifies the destination port on which SNMP traps will be sent to. The same configuration must be set also in SNMP agent station
- Trap IP Address up to three IP addresses can be configured as the destination for SNMP trap distribution. Trap message events are configured in the same way as the alarm setting
- 6) **Community string** the parameter specifies community string for secure SNMP v2c management access (a different setting for read-only and read/write access can be entered, valid for SNMP v2 only). The number of characters in the input field has to be in the range from 1 to 15. Valid characters are [a-z, A-Z, 0-9, _]
- 7) *IP Address/Mask* up to three IP subnets can be configured as permitted IP source for SNMP v2c management access. Please note that the Mask parameter is mandatory.
- 8) User Name username configuration for secure SNMP access with SNMP v3 protocol only (a different setting for read-only and read/write access can be entered). The number of characters in the input field has to be in the range from 4 to 15. Valid characters are [a-z, A-Z, 0-9, _]
- 9) Auth and Privacy Password password configuration for secure SNMP access with SNMP v3 protocol, the identical password must be entered into Confirm Password box (a different setting for read only and read/write access can be entered). The number of characters in the input field has to be in the range from 8 to 15. Valid characters are [az, A-Z, 0-9, _]
- 10) Confirm Password Auth and Privacy password confirmation
- 11) Encryption the encryption protocol for the SNMPv3: CFB-AES-128; CBC-DES

and the second	TxF	TxP	MSE R	xL	MW_uni	it	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
ŠĂĔ	22600	11 LOCA	37.6 -4	9.8 •	• 1024stro	ong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb +	+ -49.0	100000	11 MOTE	21400
		LUCA	-							RE	MOTE	
ADMIN permissions 🖻	Logou	t in: 3 h	59 m 59	s								1
Status	Addres	ses	SNMP	Adv	vanced							
Config	STATIC	ROUTE	S - INPU	TVALUE	ES							G
System	Routed	IP/MAS	К	1								
Access	Gateway	y IP		2		-				Add	Del	ete
Radio	NAT - TAN	IPUT V	ULIES.									(î.
Ports			IP.Port	3					Add	Delete	De	
Alarms	Default			4		WEB	SSH		1.00	Delete		Set
Maintenance	1										-	_
Tools	RADIUS				5				In case of a	D.I.A.		(
	IP.destp	ort Sec	String tir	neout	5				Add	Delete	e De	
Date: Set 21 04 2018	SETTIN	GS	6	2		REQUIRED			NFIGURE	Ð		1
Time: 07:16:21	Route		0					default via 192.168.2	06.1			
Uptime: 17 16:05:37 Refresh status	NAT							Default WEB NAT: off Default SSH NAT: off				
	Radius :	Server										
Modem Serial Number 355260100009											S	Save
License Number 3010403010100228					-							
License Type / Status	BUNNIN	IG IP CO	NFIGUR			100 100 000 1						(î
permanent / ok						192.168.206.1 de /24 dev eth0 src 1						
License Expiration unlimited	Routes					/24 dev usb0 src 16.0/24 dev eth0 s		c 10				
Firmware Version 0401_01					192.168.20	6.11 dev rfi1 src 6.11 dev rfi2 src	192.168.206.1	0 metric 100				
Running Design 505 (DXN3)	NATS											

Figure 3.35 "Config \rightarrow IP \rightarrow Advanced" page

Config \rightarrow IP \rightarrow Advanced

For a specific configuration of management access it might be necessary to add or delete

static routes. It is possible to **Delete** an already specified route by specifying it in the **Routed IP/MASK**. It is not necessary to specify the Gateway IP for route deletion.

When adding routes, the new configuration must be stored with Save button and re-

initialised with the **IP Init** button.

- 1) **Routed IP / MASK** IP address from the routed network and the appropriate network mask must be inserted. Routed network range is calculated from inserted values.
- 2) **Gateway IP** the correct IP address gateway for above-mentioned network must be inserted.

For a specific configuration of management access, it might be necessary to add or delete NAT records. This is especially required for out-band type management access.

- 3) LocalPort DestIP:Port the NAT record must be inserted in the following format: local_port destination_ip:port (example: '10443 192.168.1.2:443' => local port 10443 redirects to the port 443 (secure web - https) of the unit with IP 192.168.1.2)
- 4) Default NAT to remote enable or disable the automatically generated NAT records for WEB and SSH management access. These records will work only when there is active connection between this device and the targetted device.
 - a) **WEB** This will add automatic NAT record for accessing the remote device's WEB GUI. The default values are as follows (the IP portion is only example and depends on actual running IP configuration):
 - 1443 192.168.3.91:443 Remote device's GUI accessible on local port 1443 (e.g. <u>https://localIP:1443</u>)
 - 2443 192.168.3.92:443 Second Remote (in Star mode) or direct Fiber Optics (FO) neighbour (in Full/Split Protection mode) device's GUI accessible on local port 2443
 - 3443 192.168.3.93:443 Indirect Remote FO neighbour (ergo 'cross-corner' in Split Protection mode) device's GUI accessible on local port 3443
 - b) SSH This will add automatic NAT record for accessing the remote device's SSH. The default values follows (the IP portion is only example and depends on actual running IP configuration):
 - 1022 192.168.3.91:22 Remote device's GUI accessible on local port 1022
 - 2022 192.168.3.92:22 Second Remote (in Star mode) or direct FO neighbour (in Split Protection mode) device's GUI accessible on local port 2022
 - 3022 192.168.3.93:22 Indirect Remote FO neighbour (ergo 'cross-corner' in Split Protection mode) device's GUI accessible on local port 3022

Radius access configuration:

- 5) IP:destport SecString timeout the definition of remote Radius server
 - **IP** IP address of the Radius server;
 - Destport destination port. This is an optional parameter;
 - secString password of Radius Server login. The recommended length of the password is from 4 to 50 characters;
 - **timeout** connection time-out between the device and Radius Server. Recommended value is 1 – 5 second
- 6) This sub-section displays the REQUIRED and CONFIGURED Route/NAT/Radius

settings. REQUIRED settings will be stored by means of the Save button. In order to

activate the new setting use the Save and IP Init button (user will be logged out,

but data will not be dropped) or Save the IP settings and reboot the device.

7) This sub-section diaplays the IDU's active IP Route table, NAT records and Radius Server configuration. In order to populate this table with a new configuration, the IP

configuration should be re-initialised by means of **IP Init** button.

Config \rightarrow Radio \rightarrow Parameters

This section contains the most important modem and radio settings. It allows configuration of both local and remote side parameters. Note that the remote settings feature requires an active radio connection to the remote side in order to provision and apply the remote settings. Also note that any changed settings have to be stored separately in both local and remote side.

and the second	TxF	TxP	MSE	RxL	MW_unit	1+0 CH1	MICROWAVE_LIN	К	RxL	MSE	TxP	TxF
"A"	22600	11	-37.6	-49.9	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438M	•	.48.9	-36.7	11	21400
SPAP		LOC	AL							RE	MOTE	
DMIN permissions 🖻	Logou	t in: 3	h 55 m	4 s								-
Status	Param	neters	ACI	A	Advanced							
Config	Maria				LOCAL			REN	OTE			1
System	MODEN	A.			Channel 1			Char	nnel 1			
Access	Bandwi	dth			56000_02 ▼			5600	00_02			
Radio	Max Rx	ACM F	Profile	3	2 1024/strong	•		1024/s	trong •			
Ports	ACM Se	etting		1	3 default				-			
Alarms	Advanc	ed Set	ting	4	4 default				-			
Maintenance					LOCAL			FIEN.	NOTE			(i)
Tools	RADIO				Channel 1		(i)	Char	inel 1			
	T/R Spa	acing		!	5 fixed •		1	fix	ed			
Date: Set 21 04 2010	TX Freq	uency	[MHz]	1	6 22600		(i)	21	400			
Time: 08:02:47	RX Freq	quency	[MHz]		21400		(i)	22	600			
Uptime: 1716:52:03 Refresh status	TX Pow	er Lim	it [dBm]	1	3 11		(i)	1	1			
	TX Mut	e Conf	ig	1	auto 🔻			auto				
Modem Serial Number 355260100009	ATPC F	unctio	n	3	0			6	3			
License Number	ATPC R	X Leve	el (dBm)	1	-50		(i)	-1	55			
3010403010100228 License Type / Status	Refre	sh					Unc	lo Ap	ply to	local	& rem	ote

Figure 3.36 "Config → Radio → Parameters" page

- 1) **Bandwidth** the bandwidth of the transmitting modulation. The number after the underscore indicates the modulation variant.
- Max RxACM Profile This is the highest modulation available for the ACM switching or a fixed modulation when the ACM is not enabled. Each modulation can have multiple Forward Error Correction variants:
 - medium optimal FEC, medium throughput speed
 - strong strong FEC, lowest throughput speed
- ACM Setting Gear icon indicates that the ACM settings does not match the factory defaults and leads the user to the ACM settings page. If the ACM is set to defaults such information will be displayed instead.
- 4) Advanced Setting Gear icon indicates that the Advanced radio settings does not match the factory defaults and leads the user to the Advanced radio settings page. If the Advanced radio settings is set to defaults such information will be displayed instead.
- T/R Spacing TX / RX frequency distance mode. Note that available options depends on the attached radio type and it's capabilities.
- 6) **TX Frequency** Transmission frequency can be set within the frequency range noted under the respective info icon in accordance with radio sub-band specification (read

from the radio part). Such displayed range is the edge to edge flat diplexer frequency scope increased/decreased by one half of the used modulation bandwidth.

- RX Frequency If fixed T/R spacing is selected the Receive frequency will be calculated automatically. If manual T/R spacing is selected the Receive frequency has to be calculated and specified manually.
- TX Power Limit Maximum transmission power parameter defines the maximum power level which is required for optimal transmission conditions. The operating TxPower then depends on:
 - configured ATPC values (if ATPC is enabled)
 - radio part power limit (depends on the used RF band and selected modulation)
- 9) **TX Mute Config** Transmitter mute configuration. Three modes of this parameter can be selected:
 - **auto** mute mode is the standard selection for this parameter. In this mode the radio part automatically is muted when required by design or when abnormal transmission conditions are detected by the device.
 - *mute* mode for fixed radio mute configuration
 - **unmute** option is available only on remote channels when there is not Rx connection from such remote channel. When selected the unmute command is send to the remote side which, if listening, will attempt to unmute it's respective Tx part.
- 10) ATPC Function Automatic Transmit Power Control enables or disables the ATPC feature. The transmitted power is automatically adjusted to ensure that the remote side will receive signal of strength defined in its respective ATPC RxL Level settings with hysteresis of +/- 2dBm (hitless regulation).
- 11) **ATPC RX Level** Required level for Automatic Transmit Power Control. This field specifies the optimal receive level used for the ATPC function. The remote unit will adjust it's Tx power in manner to match this required level as close as possible.

$Config \rightarrow Radio \rightarrow ACM$

Adaptive Coding anad modulation (ACM) settings

101 m 101	TxF	TxP	MSE	RxL	-	/W_unit		1+0 CH1	MICROWAV		-	RxL	MSE	TxP	-
SAE	22600	11		-49.9	0	1024strong / 56M	/ 438Mb	ACM	1024strong / 56M /	438Mb •	•	-48.8	-36.7	11	2140
3/11		LOC	AL										REN	NOTE	
OMIN permissions 🖻	Logou	tin:3	h 31 m	30 s											
Status	Param	eters	ACI	M J	Advanc	ed									
Config	ACM SE	TTING	15				Channel T			Lisua	al valu	8	N	ote	
System	ACM fu			1			auto p1 🔻				uto				_
Access	ACM Of		-	2			0.0			-	0	-	0.0	+3.0	
IP	ACIMUI	Iset		4			0.0				U		-3.0	+3.0	
Radio	ACM PF		SETTI	NGS											1
Ports		3						Modem							
Alarms	ACM_r	n		en a	4	mod/fec	5	spd	6	thrLo	7		thr	Hi	8
Maintenance	ACM_0	1		1		0004/01		87.8		-9.95			-11.	20	
Tools	ACM_0	12		1		0004/02		94.1		-11.65			-12.	90	
	ACM_0	3		1		0016/01		175.5		-16.45			-17.	70	
	ACM_0	14		1		0032/01		219.4		-19.45			-20.	70	
Date: Set. 21 84 2018	ACM_0	15		1		0032/02		235.4		-21.15			-22.	40	
Ime: 08:24:23 Jptime: 17 17:13:40	ACM_0	16		1		0064/01		263.3		-22.52			-23.	77	
Refresh status	ACM_0	7		1		0064/02		282.5		-24.22			-25.	47	
	ACM_0	8		1		0128/01		307.2		-25.49			-26.	74	
Nodem Serial Number 355260100009	ACM_0	19				0128/02		329.5		-27.19			-28.	44	
icense Number	ACM_1	0		1		0256/01		351.1		-28.52			-29.	77	
3010403010100228	ACM_1	1				0256/02		376.6		-30.22			-31.	47	
icense Type / Status ermanent / ok	ACM_1	2		1		0512/01		395.0	-	-31.50			-32.	75	
icense Expiration	ACM_1	3		1		0512/02		423.7		-33.20			-34.	45	
unlimited	ACM_1	4		~		1024/01		438.8	-	-34.53		-	-35.		
Firmware Version 0401_01	ACM_1	5		1		1024/02		470.8		-36.23			-37.	48	
Running Design	ACM_1	6				1024/03		494.7		-39.28			-40.	53	
505 (DXN3)	Set to	defa	ult										Und		pply

*Figure 3.37 "*Config → *Radio* → *ACM" page*

- 1) ACM Function Adaptive Coding and Modulation. The possible modes are following:
 - **auto pX** automatic modulation switching using ACM profile number X
 - **man pX** disables the ACM function. The modulation defined in the *Max RxACM Profile* field on the *Parameters* tab will be used for transmission.
- ACM Offset The MSE offset off the pre-set thrLo and thrHi constants (see ACM profiles)
- 3) ACM_nr designation of the modulation
- 4) en enables a modulation for ACM switching
 - "I" means unlicenced modulation
 - "e" means error setting
- 5) mod/fec bandwidth/forward error correction level
- 6) *spd* maximal throughput
- 7) **thrLo** the MSE threshold value for switching from this respective modulation to a lower Rx modulation
- 8) thrHi the MSE threshold value for switching to this respective modulation

The ACM settings of local and remote devices should match.

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

$\mathsf{Config} \rightarrow \mathsf{Radio} \rightarrow \mathsf{Advanced}$

This section provides several options for advanced radio part and modem settings

and the second	TxF TxP MSE RxI	- W High	1+0 CH1	Low W Rx	MSE TxP	TxF
ŠA Ë	6620 8 -38.3 -42.	5 • 1) • 1024strong / 56M / 438Mb	ACM 1024strong / 1	56M / 438Mb • 1) • -43	0 -38.8 8 6	5960
SAF	LOCAL				REMOTE	
DMIN permissions 🗗	Logout in: 19 m 39 s				Wr	ite
Status	Parameters ACM	Advanced				
Config System	RADIO ADVANCED SETTI	VGS	CHANNEL 1		USUAL VALUE	G
Access	Radio Type	1	SAF ODU (7) 🔻		various	
IP	Radio Filter	2	auto 🔻		auto	
Radio Ports	Radio Power Supply	3	on 🔻		on	
Alarms	Radio Frequency Range	4	auto 🔻		auto	
Maintenance	MODEM ADVANCED SETT	INGS	CHANNEL T		USUAL VALUE	G
Tools	Modem IF Output	5	unmuted T		unmuted	
	Modem Signal Type	6	qam 🔻		qam	
	CW Frequency [Hz]	7	-1000006		0	
Date: Wed, 27.02.2019 Time: 15:16:14 Uptime: 6 02:24:36					Undo Appl	У

Figure 3.38 "Config → Radio → Advanced" page

- 1) **Radio Type** selection of the connected radio type. This setting is available only on supported systems
- 2) Radio Filter options are following:
 - **auto** filter is selected automatically according to the modulation BW (default)
 - narrow manual selection of narrow radio filter
 - wide manual selection of wide radio filter
- 3) Radio Power Supply options are following:
 - on enables power output to the respective radio part
 - off disables power output to the respective radio part
- 4) Radio Frequency Range options are following:
 - **auto** the unit automatically calculates the usable frequency range by subtracting/adding half of the current bandwidth from the radio frequency edges
 - hw the radio frequency limits are used. This is suitable only for special use cases
- 5) *Modem IF Output* options are following:
 - unmuted modem IF Tx is transmitting
 - muted modem IF Tx is muted
- 6) **Modem Signal Type** specification of modulation output. It is possible to replace standard modulated signal with carrier signal (CW) in this drop-down menu. The possible modes are following:
 - **qam** TxIF modulated signal is presented at IF output from the device (default)
 - **cw** Carrier signal with given frequency is presented at IF output
- 7) CW Frequency carrier signal frequency settings

Config \rightarrow Ports \rightarrow MUX

In respect of management access type, traffic modification (number of independent channels over air) and the aggregation function preference the user has to select the relevant Mode type (Refer to <u>Config \rightarrow System \rightarrow Mode settings) before starting any port settings. Each Mode uses similar but not identical port configuration scheme. By default the internal ETH switch is divided into four groups. Such setting prevents potential Ethernet loops at connected LAN ports for all Modes. The port settings consist of several configuration layers labelled leftmost of the configuration window</u>

10.00.00		Тх		MSE	RxL	MW_u	200	1+0 CH1		AVE_LINK		1 A		TxF
SAF	4	226	500 11 LOC	-37.6	-49.9	• 1024s	trong / 56M / 438M	IL ACM	1024strong / 56	M / 438Mb 🔸 🚺	• -48.9	-36.6 REM		14
			200									THE OT	0.12	
DMIN permissions 🖻		Lo	gout in: 2	h 55 m	36 s									
Status		M	UX Et	hVLAN	Eth	QOS								
Config		DAT	AFLOW C	DNFIGU	RATION									
System Access		POR	IT	1	1 10	SFP1	SFP2	SFP3	SFP4	LANT	LAN2		LAN3	
IP			Status	-	n	SFP module ot present	SFP module not present	SFP module not present	SFP module not present	LAN No LINK	LAN No LI	NK LA	No LINK	ĸ
Radio		FIG	Hot Stand	lby		off	T	off	7	off			+	
Ports	2	PORT CONFIG	Mode		a	uto1GX 🔻	auto1GX 🔻	auto1GX 🔹	auto1GX 🔻	auto 🔻	auto	• au	to 🔻	
Alarms	4	RT	MDIX			2	-	-	-	auto 🔻	auto 🔻	1	auto 🔻	
Maintenance Tools		PC	Flow Cont	trol 🔬		force	force	force	force	off	off		off	
10013			1588			off 🔻	off v	off 🔻	off *	off 🔻	off 🔻		off 🔻	
												_		
Date: Sat 21 04 2018		E								LANT	LAH2		LANS	
Time: 08.56:24 Uptime: 17 17:45:41	3	SWITCH								WANA	GETH swi		NGCPU	e l
Refresh status		ETH S								- Contract				
Modem Serial Number		Ē											CPU	
355260100009 License Number														
3010403010100228	1	SWAP	Channel S	Select		none 🔻	none 🔻	none 🔻	none 🔻	ETH1a 🔻	none	▼ RF	II RFI2	2
License Type / Status permanent / ok	-	SV	Connecte	d Port		off		none	wa	na		none		_
License Expiration unlimited	E	M	Traffic Ch	annel		PTP1		EMM1	ETH	11a		ETH1b		-
Firmware Version	5	PBPM	Speed Lin	nit (j		auto	1	0	10	00		0		
Running Design	-						-							
505 (DXN3)	6		Available	Speed			438.87 M	ops						
												Undo	Apply	у

Figure 3.39 "Config → Ports → MUX" page

- 1) **PORT** sub-section contains information about available ports:
 - a) SFP1-4 1G optical interface for user data or EMM card chain
 - b) LAN1-2 Ethernet 1G (data) interface
 - c) LAN3 Ethernet 1G (management) interface
- 2) **PORT CONFIG:**
 - a) **Status** status of the port as detected by the device (speed, duplex mode, link, administrative down status).
 - b) Hot standby automatic switch over between ports according to actual link status
 - c) *Mode* displays and defines the actual port mode (speed/duplex, administrative down)
 - d) MDIX set particular ETH cable crossing option like auto/mdi/mdx
 - e) *Flow Control* displays the actual duplex flow control mechanism settings. Flow control configuration is possible in page <u>Config → Ports → EthQOS</u>
 - f) **1588** Precision time protocol source
- ETH SWITCH illustrates the ETH switch fragmentation into groups and also their interconnection with physical LAN ports and internal WAN ports. The group configuration is available on page <u>Config → Ports → EthVLAN</u>
- 4) **SWAP**:
 - a) **Channel Select** settings of data multiplexer. By this settings it is possible to cross connect a particular Switch port with a Mux Channel.
 - b) Connected Port current settings of the SWAP block
- 5) **PBPM** (Priority Based Packet Multiplexer):
 - a) Traffic Channel shows bonding between the selected channel and port
 - **PTPx** Precision time protocol channel
 - EMMx EMM channel. Speed will be computed automatically

1

• ETHxa – high priority data channel. Speed can be limited - see field color and bubble help

Firmware version 0401_01 does not allow to assign ETHxa data channel to any of SFP ports if PTP1588 feature is not licensed. It will not pass Ethernet traffic over SFP ports in this case.

- ETHxb low priority data channel. Speed can be limited see field color and bubble help
- b) **Speed Limit** speed value for transmitting data with priority falling from left to right
- c) **Act Aggr Speed** it indicates the actual aggregated capacity in 2+0 mode. It depends on channels statuses and asymmetry. Actual aggregated capacity may be less than sum of available channels capacities.
- 6) **Available Speed** indicates the available capacity of appropriate channel. This value depends on the actual modulation scheme and license speed limits.

Config → Ports → EthVLAN

VLAN configuration is basically used for the separation of management traffic from other customer data traffics. It can be useful to configure ETH VLANs also for customer traffic and filter ingress data traffic by means of these settings in some specific applications.



Figure 3.40 "Config → Ports → EthVLAN" page

- Port mode it is possible to set-up the required VLAN mode separately for each ETH switch port. It is recommended to leave all ports in basic mode (802.1Q disabled at the port) and edit VTU (VLAN rules table: VLAN Tugged/Untagged) records first. The user has to be sure with correct VLAN configuration and has to set also his network into the similar VLAN support. VLAN Port modes are described bellow:
 - a) **basic** 802.1Q VLAN mode is disabled. Only port group rules are applied. It is a transparent mode where VLAN settings in VTU table are ignored. *Ingress policy* both untagged or tagged frames are accepted at port entry and exit only those ports of ETH switch which are members of the same group as the input port. The port default VLAN number is assigned as frame VID (VLAN ID) for next internal switch processing

Egress policy – frames are transmitted unchanged

b) access – 802.1Q VLAN mode is enabled. VTU rules in conjunction with port group rules are applied. Such port is a member of just one VLAN ID defined in VTU table whose VID is identical with the port Default VLAN number. This port is configured in VLAN VTU record as untagged.

Ingress policy – only untagged frames are accepted at entry port. Internal frame VID of such untagged frame is automatically assigned from port's Default VLAN. Frames are allowed to exit only those ports that belong to the frame's VLAN and are inside the same group as the input port.

Egress policy – frames are transmitted untagged from this port. The egressing frame's VID is checked against VTU table and if VID doesn't exist in VTU table such frame is filtered (discarded).

c) trunk – 802.1Q VLAN mode is enabled. VTU rules in conjunction with port group rules are applied. Port can be a member of more tagged VLANs according to VID extracted from VLAN tag and one untagged VLAN defined by port Default VLAN. *Ingress policy* – only such frames are accepted, whose VID assigned from VLAN tag (tagged frames) or port's Default VLAN (untagged frames) exist in VTU table, and the entry port is a member of such VLAN. Frames are allowed to exit only those ports that belong to the frame's VLAN and are inside the same group as the input port.

Egress policy – frames are transmitted untagged or tagged according to the specification in VTU record table. The egressing frame's VID is checked against VTU table and if VID doesn't exist in VTU table such frame is filtered (discarded).

- d) **hybrid** when frame's VLAN number exists in VTU table the rules for trunk port are used, when the number does not exist then the basic rules are applied.
- 2) Port Group this parameter defines a separate MAC address table domains inside the internal switch and defines also the group of ports which can communicate to each other. Only the ports from the same group can communicate with each other. The other group ports are completely isolated. It is possible that isolated networks (different groups) can use the same MAC addresses without any collision in the internal ETH switch ATU table.
- 3) Default VLAN This parameter is configured automatically depending on records in the VTU table. Default VLAN is updated for the port which is marked as untagged in the VTU record. VLAN No.1 can not be added into VTU table and it is just fictive VLAN for internal purposes. The port cannot be configured into access mode when Default VLAN of this port is 1. When Default VLAN value for the trunk port is 1, then the port accepts tagged frames only.

<u>/!</u>

When a new VLAN configuration is applied, it is required to press the button to confirm the new configuration. Otherwise, previous VLAN configuration will be restored after 120 seconds.

- ACTION it adds or removes VTU records. A VTU record can not be removed if it contains an untagged port which is configured into access mode. Just simple VLAN Nr. specification is required for VTU record eraseing.
- 5) VLAN N. The VLAN number of edited VLAN (added or removed). Please note the VLAN No. 0 & 1 are reserved by the system and can not be set; thus the valid VLAN No. are from 2 to 4095
- 6) FID defines the MAC address database table for each VTU VLAN record. When more than one VLAN is added into the same FID table then such VLANs will share the same MAC address database; thus they will not be completely isolated. Usually, it is desired that each VLAN has its unique FID. Note that the port Groups 1-4 are assigned to the MAC address databases FIDs 1-4, and thus these FIDs should not be used for VTU VLAN separation (especially for VTU VLANs 2-4) unless the MAC table sharing between such defined VLAN and a particular port Group is the desired state.

- 7) QOS PRI when VTU override mode is selected then the QOS priority value of original frame is overridden. This configuration has influence only on the internal frame processing by means of queue controller (QPRI defined by OQPRI instead of IQPRI bits), but frames are still egressed with the initial priority assignment (FPRI is without any change).
- 8) LAN 1-WAN B it defines VLAN mode for each port in configured VLAN.
 - a) **Deny** port is not a member of edited VLAN. Ports which are defined in different groups should be set into this mode.
 - b) Untag port is a member of edited VLAN as untagged.
 - c) Tag port is a member of edited VLAN as tagged.



"Tag" option is not supported for LAN3 port as this port is reserved for local management access. LAN3 port can be set in "Deny" or "Untag" modes depending on customer's VLAN configuration scenario

 Listing of actual VTU values – the list of VTU records (defined VLANs) in the ETH switch. The abbreviations in this list correspond to the first letter of the port mode definition in VTU records.

Config \rightarrow Ports \rightarrow EthQOS

This section allows configuring Flow Control and extended QOS modes which are important for a specific traffic prioritization.

The system uses four priority queues for each port where frames, with an assigned initial frame priority, an initial queue priority and an override queue priority, are mapped onto four output queues according to QPRI settings. A final frame queue priority is derived from the assigned initial queue or the override queue priority and it is used for deciding what queue will be used for frame buffering. The queue with a higher number is egressed with higher priority than the queues with lower numbers. The assigned initial frame priority is then used for replacing of frame's PRI bits in 802.3ac VLAN tag section, when the frame is egress tagged.

and the second second		TxF	TxP	MSE	RxL	MV	V_unit		1+0 CH1		MICROWAVE	LINK	RxL	MSE	TxP	TxF
"A "		22600	11	-37.6	-49.9 •	+ 10	24strong / 56M /	438N	1b ACM	1	1024strong / 56M / 4	38Mb + 🚺 +	-48.8	-36.7	11	21400
SPAP			LOC	AL										REN	NOTE	
ADMIN permissions 🖻		Logou	t in: 3	h 43 m	59 s											
Status		MUX	Eth	VLAN	EthQO	s										
Config		ETH SE	TTING	s	LANT		LAN 2		LANS		MNG	WAN	A	V	ANB	0
System		QOS Ma	odes	1	weighted	•	weighted	۲	weighted	•	weighted 🔻	weighted	•	weig	hted	•
IP		Priority	Policy	2	IPv4/6 on	ly 🔻	All		All	•	All	All	۲	All		•
Radio		Port Pri	ority	3	0 •		0 •		0 •		0 •	0 •			• 0	
Ports		Priority	Overri	ide 4	off 🔻		off 🔻		off 🔻		off 🔻	off 🔹		0	off 🔹	
Alarms Maintenance	5	FLOW C	ONTR	OL SET	TINGS		SFP 1		SFP 2		SFP 3	SEP 4		Ň	ING	G
Tools	~	Auto Ne	egotiat	ion Co	nfig		on		on		off	off			off	
10013		Flow Co	ontrol	Config		fo	rce-on 🔻	f	orce-on *		force-on *	force-on '		off	7	
		Flow Co	ontrol	Status			on		on		on	on			off	
Date: 341 21 04 2018							WAN A		WAN B		LAN T	LAN 2		L	ANS	
Time: 10.35-10		Auto Ne	egotia	tion Co	nfig		off		off		on	n/a		1	n/a	
Uptime: 17 19:24:26 Refresh status		Flow Co	ontrol	Config		fc	rce-on *	f	orce-on *		off 🔻	off	•	off		
		Flow Co	ontrol	Status			on		on		off	off			off	
Modem Serial Number 355260100009														Und	Ap	ply

Figure 3.41 "Config → Ports → EthQOS" page

- 1) QOS Modes:
 - a) **weighted** in the weighted scheme an 8, 4, 2, 1 round robin weighting is applied to the four priorities (8 frames from Q3, 4 frames from Q2, 2 frames from Q1 and 1

frame from Q0). This approach prevents the lower priority frames from being served out with only a slight delay to the higher priority frames.

- b) **strict 3xxx** strict priority for queue 3 and weighted round robin for queues 2,1 and 0. Queues 2,1,0 are served only when Q3 is empty.
- c) **strict 32xx** strict priority for queues 3,2 and weighted round robin for queues 1 and 0. Queues 1,0 are served only when Q3 and Q2 are empty.
- d) **strict 3210** strict priority for all queues. Lower priority queues are served only when higher priority queues are empty.
- Priority policy defines the initial ingress queue policy. It defines the initial rules for what output queue will be assigned to every ingress frame.
- 3) **Port Priority** the configuration of default port priority. Value 0 up to 7 can be entered (0 is default value)
- 4) Priority Override it offers the possibility to replace an initial queue priority with a new priority. The new priority is assigned to each frame whose VLAN ID is defined in the VTU table with properly configured QOS PRI value.
 - a) off QOS override is disabled
 - b) **vtu** queue priority override information (OQPRI). When this parameter is set to off state, override process is not active for appropriate VTU record, even though Priority override is enabled on the port.
- 5) Flow Controll settings allows to configure Flow control for each port:
 - a) off Flow control is disabled
 - b) auto Flow control is enabled during auto-negotiation process
 - c) force-on Flow control is active, even if connected device does not support it

Config \rightarrow Ports \rightarrow EMM

This section will appear only if the EMM module is successfully connected to any of SFP ports of the Phoenix G2 IDU and in Config \rightarrow Ports \rightarrow MUX section EMM1 or EMM2 option is chosen in *Channel Select* cell for particular SFP port where the EMM module is connected:

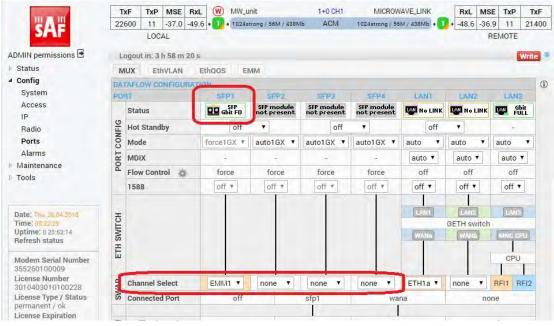


Figure 3.42 Enabling of EMM module

'Config \rightarrow Ports \rightarrow EMM' section provides monitoring and configuration of EMM modules basic functions. Following information will be displayed for ASI EMM module:

A CONTRACTOR OF	TxF	TxP	MSE	RxL	W	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
2 A #	22600	11	-37.1	-49.6 •	0	1024strong / 56M / 438	мь АСМ	1024strong / 56M / 438Mb + 1	-48.6	-36.9	11	21400
SAF		LOC	AL						-	RE	MOTE	
DMIN permissions 🖻	Logou	t in: 3	h 45 m	44 s							-	Write
Status	MUX	Eth	VLAN	Eth	205	EMM						
Config	EMM					EMM#1	EMM#2	EMM#3		EMIN	1#4	G
System	EMM Ty	/pe		1		4ASI	none	none		nor	ne	
Access	EMM Er	nable		2				3				
IP	EMM A	dd/Dro	p ID	3		auto 🔻						
Radio	EMM A	dd/Dro	p Rang	e 4		14						
Ports	EMM M	ode		5								
Maintenance	EMM C	ARD #	1			ASI T	ASI 2	ASI 3		AS)	4	(
Tools	Enable			6						6	1	
	Link Sta	atus		7		loss	loss	loss		los	s	
	PCR Lo	ck		8		lock	-	-		-		
Date: Thu 26.04.2018	Mode			9		Rx 🔻	Rx ▼	Rx 🔻		Rx	•	
Time: 09:35:05 Uptime: 1 00:04:50	Data So	ource		10								
Refresh status	Speed L	.imit(R	x) [Mb]	ps] 11		214	216	216		21	6	
Modem Serial Number 355260100009										Und	o A	pply

Figure 3.43 "Config → Ports → EMM" ASI EMM configuration page

- EMM Type displays the type of connected EMM card. The 'none' type indicates that particular position is empty, the 'RELAY-SYS' indicates that the relay IDU is connected directly to the device's SFP port (relay application) or to EMM secondary SFP port (add/drop configuration).
- EMM Enable enables generation/reception of data frames to/from Fiber Optic stream. When EMM is enabled then EMM occupies an appropriate range of traffic port channels (described below).
- 3) EMM Add/Drop ID in 'auto' mode EMM card occupies port-channel range according to its position in EMM chain. For Add/Drop application it is sometimes necessary to set different (manual) Add/Drop ID, especially when EMM card should drop port channels from specific Add/Drop range.
- 4) **EMM Add/Drop Range** displays appropriate port-channel range according to the EMM card position and EMM Add/Drop ID setting.
- 5) EMM Mode it selects the mode of connected EMM 16E1/T1 card
- Enable this checkbox selects which ASI ports are configured for DVB ASI connection. The necessary link capacity is automatically allocated according to the amount of all ASI Rx streams.
- Link Status it displays the actual status of ASI port. Status depends on chosen Rx or Tx mode:
 - a) In Rx mode:
 - ok a valid ASI signal is presented at the appropriate input port
 - **ok** a valid ASI signal is presented at the appropriate input port, but the port is not enabled for traffic application.
 - Idle ASI signal detected and successfully synchronized, but the signal does not contain user data (MPEG stream is missing).
 - Idle ASI signal detected and successfully synchronized but the signal does not contain user data (MPEG stream is missing) and the particular port is not enabled for traffic application.
 - nosync indicates that synchronization is not established for current receiving ASI signal.
 - nosync indicates that synchronization is not established for current receiving ASI signal and the port is not enabled for traffic application.
 - loss no signal detected at ASI input port.
 - **loss** no signal detected at ASI input port and the port is not enabled for traffic application.

- b) In **Tx mode**:
 - **ok** a valid inbound signal is presented and transmitted via appropriate ASI port.
 - **ok** a valid inbound signal is presented, but the port is not enabled for transmission.
 - Idle the low-level code is detected, but the MPEG code was lost in the service.
 - Idle the low-level code is detected, but the MPEG code was lost in the service, and the particular port is not enabled for traffic application.
 - **noSync** high-level MPEG code was not detected.
 - **noSync** high-level MPEG code was not detected, and the particular port is not enabled for traffic application.
- PCR Lock in Rx mode it is always 'lock', but in Tx mode following options are available:
 - **lock** PCR recovery loop is locked
 - noLock PCR interval is not guaranteed
- 9) *Mode* specifies if the particular port operates in Rx (ingress from coaxial cable) or Tx (egress to coaxial cable) mode.
- Data Source specifies the source for Tx signal. Either remote ASI port (Remote CH1-4) or one of available local ASI Rx port (Local Ch1-4) can be chosen. This setting is available in Tx mode only.
- 11) **Speed Limit** maximal data rate for inbound traffic to avoid overloading of overall link capacity. This setting is available in **Rx mode** only.

Following information will be displayed for E1/T1 EMM module:

111 111 111	TxF		MSE	RxL	W	MW_u			-	1+0 CH		0.5	1.1.1.1.1.1	VE_LIN	-	RxL	MSE		-	-
SAF	22600	11 LOCA	-37.1 L	-49.6	•••	• 10245	trong / 5	5M / 438	МЬ	ACM	1	024stro	ng / 56M	438M	6 • U	• -48.6		EMOTE	214	.01
DMIN permissions 🖻	Logou	tin:3h	59 m	3 s															Write	
Status	MUX	Eth	/LAN	Et	hoos	EN	MM													
Config	EMM					E	/IM#T			EMA	140			EMM#	2		SM	M#4		(
System	EMM Ty	ne					IASI		-	16E1				none	2	1		one		1
Access	EMM En						1			102		-		inonic	-					
IP	EMM Ad		ID			a	uto v			auto	-									
Radio	EMM Ad			0			14			17.										
Ports Alarms	EMM M		many				1			E1										
Maintenance	EMM CA	RD #1				3	SIT			ASI	12			ASI 3			A	SI 4		(
Tools	Enable									C	1						- 1			
10013	Link Sta	tus					loss			los	s			loss			k	ss		
	PCR Loc	ck				11	lock			-								÷.		
Date: Thu: 26.04.2018 Time: 11:47.09	Mode					F	Rx 🔻			Rx	۲			Rx •			R	< •		
Uptime: 0 00:04:31	Data So	urce																		
Refresh status	Speed L	imit(Rx) [Mbp	s]		B	214			21	6			216			2	16		
Modem Serial Number	EMM CA	ARD #2		đ	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	(
355260100009 License Number	Enable		12	1	0							E								
3010403010100228	Link Sta		13	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	loss	
License Type / Status	Termina	tion [Ω]	14	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	120	
permanent / ok License Expiration	LLOOP		15		8															
unlimited	RLOOP		16		E	E		D		E		E		E	0	E		E	E.	
Firmware Version 0401 01	Coax mo	ode	17																	
Running Design 505 (DXN3)																	Un	do 🔺	pply	

Figure 3.44 "Config → Ports → EMM" E1/T1 EMM configuration page

- 12) Enable select which E1/T1 ports are configured for customer traffic connection. Those ports require appropriate capacity allocation from IDU, even though customer traffic is not carried (e.g. cable is disconnected).
- 13) *Link Status* it displays the actual status of E1/T1 port or appropriate internal traffic channel.

- 14) *Termination* displays the actual impedance matching of E1/T1 port according to Coax mode setting.
- 15) **LLOOP** local loopback configuration, incoming data from the E1/T1 port to modem are sent to the modem and simultaneously looped back to the E1/t1 port. This is a debugging function.
- 16) RLOOP remote loopback configuration, incoming data from the modem to E1/T1 port are sent to this port and simultaneously looped back to the modem. This is a debugging function.
- 17) Coax Mode changes the E1/T1 mode from standard 120 Ω balanced to 75 Ω unbalanced.

In case of **Design 511** and **Split 1+1** or **Split 2+2** modes are used, additional EMM protection settings will appear in EMM configuration section:

0 muteo 0 muteo LOCAL (p LOCAL (p)LOCAL (p LOCAL (p)LOCAL (p LOCAL (p)LOCAL	d -34.6 orimary) h 34 m ivlan	-89.6 -54.6) 16 s EthQ		0032strong / 60M / 227Mb simple RX 0032strong / 60M / 227Mb simple RX Siloc.sec_12 EMM EMM/F1 4ASI	AGM AGM AGM HSB/SD EMM#2 none	simple RX + 1 0032strong / 60M / 227Mb + 2 simple RX + 1 0032strong / 60M / 227Mb + 2 rem.sec_10.5	-87.0	0.0 -36.2 0.0 REF		18810 19110 18810 19110 Write
0 muteo 0 muteo LOCAL (p LOCAL (p)LOCAL (p LOCAL (p)LOCAL (p LOCAL (p)LOCAL	d 0.0 d -34.6 orimary) h 34 m	-89.6 -54.6) 16 s EthQ	(⊗)	0032strong / 60M / 227Mb simple RX Siloc.sec_12 EMM EMM#1 4ASI	AGM AGM HSB/SD EMM#2	simple RX = 0 0032strong / 60M / 227Mb = 2 rem.sec_10.S	• -34.7	-36.2 0.0 REF	muted 0 MOTES	18810 19110 Write
0 muted LOCAL (p out in: 3 C Ell Type Enable Protecti	d -34.6 orimary) h 34 m ivlan	-54.6) (16 s EthQ	W	simple RX Siloc.sec_12 EMM EMM#1 4ASI	AGM HSB/SD EMM#2	0032strong / 60M / 227Mb • 2 rem.sec_10.S		0.0 REF	0 MOTES	19110 Write
LOCAL (p out in: 3 (Eth Type Enable Protecti	orimary) h 34 m IVLAN) (16 s EthQ(W	Siloc.sec_12 EMM EMM#3 4ASI	HSB/SD EMM#2	rem.sec_10:S	-88.2	REF	MOTES	Write
out in: 3 Eth Type Enable Protecti	h 34 m IVLAN	16 s EthQ	~	EMM EMM/73 4ASI	EMM#2	ENMINS		EMI		
Type Enable Protecti	VLAN	EthQ	DS	EMM#3 4ASI						
Type Enable Protecti			DS	EMM#3 4ASI			-		Niti 4	(
Enable Protecti	on Failo	over 18		4ASI			-		Nit 4	G
Enable Protecti	on Failo	over 18			none	none				
Protecti	on Failo	over 18		178				no	ne	
	on Failo	over 18		×						
Add		10						E	9	
Add/Dro	p ID			auto 🔻						
Add/Dro	p Rang	le		14						
Mode										
CARD #	1			ASI 1	ASI 2	ASI 3		AS	14	G
e				2		0		C	1	
Status				loss	loss	loss		lo	ss	
lock				*						
				Rx T	Rx 🔻	Rx 🔻		Rx		
Source										
d Limit (F	Rx) [Mb	ps]		214	214	214		2	14	
	le Status Lock Source	le Status Lock Source	le Status Lock	le Status Lock Source	le Status loss Lock Rx Source	le I I I I I I I I I I I I I I I I I I I	le loss loss loss loss loss Status loss loss loss Status loss loss loss Status loss loss loss loss loss loss loss lo	le loss loss loss loss loss Source	le Status loss loss loss los los los los los los	le loss loss loss loss loss loss source

Figure 3.45 "Config → Ports → EMM" ASI configuration in Split 1+1 and in Split 2+2 modes

18) EMM Protection Failover – if this option is enabled, transmitters of secondary EMM modules are muted, and receivers are in Hi-Z(E1) or usual(ASI) impedance - simple passive external splitter is needed in this case for EMM traffic protection

Config \rightarrow Alarms \rightarrow Major

This section contains possible events/alarms with direct impact on the link operability.

and a state of the	TxF	TxP	MSE R	xL N	IW_unit	1.	+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
SAF	22600	11	-37.6 -49	9.9 + 🚺 + 1	024strong / 56M	/ 438Mb	ACM 10	24strong / 56M / 438Mb 🔹 🚺	+ -48.8	-36.7	11	21400
SPAF		LOC	AL							RE	MOTE	
DMIN permissions 🖻	Logou	t in: 3	h 51 m 40	s								
Status	Major	N	linor									
Config				4	OCAL	90	AOTE	1	OCAL			Œ
System	ALARN	ns			Channel2		Channel 2		UCAL	DETA	10	C.
Access	Modem			Grianniner	Shannen	onenner 1	Constitues a	THILDHULDS		DEIM	in Log	
IP	Modem		se 1	1								
Radio	Modem	HW	2				.0			non	e	-
Ports	Modem	SW	3			0				non	e	
Alarms	Modem	Temp			1		0	-570 °C		42.3	°C	_
Maintenance	Modem	IF Lev	vel 5		11.0			-319 dBm				
Tools	Radio											
	Radio T	eleme			0.0		-0-					
	Radio H	łW	7		0.0		0			non	e	
Date: Mon. 23.04.2018	Radio T	emper		20	0.0	٠		-32.584.5 °C		48 °	С	
Uptime: 19 22:21:03	Radio II	F Cabl			0.0							
Refresh status	EMM		10									
Modem Serial Number	EMM 1			1			0					
355260100009	EMM 2			L			6					
License Number 3010403010100228	EMM 3			0			0					
License Type / Status	EMM 4			1			10					
permanent / ok License Expiration	Set a	all OK	Set def	faults						Und	o Ap	ply

Figure 3.46 "Config → Alarms → Major" page

- 1) **Modem License** this alarm will be raised when the license file is about to expire or is expired already, or contains an invalid data
- 2) Modem HW a hardware problem
- 3) *Modem SW* a software problem (for example incompatible mode selection on local and remote side)
- 4) Modem Temperature the temperature of the modem part
- 5) Modem IF Level this alarm indicates low or high level of modem input (140 MHz)
- 6) Radio Telemetry the status of communication with the radio part
- 7) Radio HW the status as reported by the radio part
- 8) *Radio Temperature* the temperature of the radio part
- 9) Radio IF Cable this alarm indicates bad radio IF input (350 MHz)
- 10) EMM 1-4 the status of bidirectional FO communication with respective EMM module

In case if **Design 511 Split 1+1** or **Split 2+2** mode is enabled, the additional Pri/Sec switch co.lumn will appear:

and an and	TxF	TxP	MSE	RxL	W	Ploc.sec_12	2	Split 2+3	2	rem.prim_11:P	RxL	MSE	TxP	TxF
GAE	17990	18	-41.0	-49.7	0	0004strong	/ 14M / 21Mb	ACM	0004stro	ng / 14M / 21Mb + 🚺	-90.1	0.0	15	18810
SPAF	18190	18	-40.9	-51.5	2	0004strong	/ 14M / 21Mb	ACM	0004stro	ng / 14M / 21Mb + 2	-85.8	0.0	15	19110
_	17800	muted	-41.5	-41.8 +	0	0004strong	/ 14M / 21Mb	ACM	0004stro	ng / 14M / 21Mb + 1	+ -48.2	-41.8	18	19000
	18100	muted	-41.8	-43.2 +	2.	0004strong	/14M / 21Mb	ACM	0004stro	ng / 14M / 21Mb + 2	+ -48.9	-41.3	18	19200
	LOC	AL (see	condary)	W	S:loc.prim_	13	HSB/SE)	rem.sec_10:S		REM	OTE(s)
OMIN permissions 🕞	Logou	t in: 1 h	1 22 m 3	37 s										Write
Status	Major	Mi	inor											
Config		-			LOC	AL (Amoond	14.4	LOCAL	TEMOTE		LOCAL			G
System Access	ALAMA			Pri/S	··	1 011	ONE	Peer (FO)	Durect RF	THRESHOLDS		DETA	ULS	
IP	Modem													
Radio Ports	Modem	Licens	e	по										
Alarms	Modem	HW		no		7	•		•			по	ne	
aintenance	Modem	SW		no		V	•					no	ne	
Tools	Modem	Tempe	rature	no			•			-570 °C		52.4	°C	
	Modem	IF Leve	el	no		20								
	Radio													
Date: Wed, 27.02.2019	Radio T	elemet	ry	no										
Time: 15:46:51	Radio H	W		no								noi	ne	
Uptime: 0.04:05:52	Radio T	empera	ature	no						-32.584.5 °C		45	°C	
Refresh status	Radio IF	F Cable		no										
Modem Serial Number	EMM													
355260100010	EMM 1			yes	6						-1			
License Number 3010403010100229	EMM 2			yes	3				-9-					
License Type / Status	EMM 3			yes	5									
permanent / ok	EMM 4			Ves										

Figure 3.47 "Config → Alarms → Major" page using Split 1+1 and Split 2+2 modes

11) Pri/Sec switch – For correct protection role switching in 1+1 mode the user have to appropriately configure the Pri/Sec switch alarms marked as "yes". Only the alarms which are enabled and listed as Pri/Sec switch will be used as criteria for protection switching. This same refers to Minor alarms in Config → Alarms → Minor section

Config \rightarrow Alarms \rightarrow Minor

This section contains possible events/alarms with partial immediate impact on the link operability.

For correct protection role switching in 1+1 mode the user have to appropriately configure all the **Pri/Sec switch** alarms. Only the alarms which are enabled and listed as **Pri/Sec switch** will be used as criteria for protection switching.

	TxF	TxP	MSE	RxL	W	MICROWAVE_LINK		1+1			MW.	_unit (W	RxL	MSE	TxP	TxF
242	21400	11	-36.6	-48.7									1+	-49.9	-37.5	11	2260
SAF	n/a	n/a	0.0	n/a	2.	1024strong / 56M / 4	138Mb	ACM	1024st	rong / 5	OM / 43	8MP *	2	n/a	0.0	n/a	n/a
	-	LOC	AL					HSB							REN	NOTE	
DMIN permissions 🖻	Logou	rt in: 1	9 m 39	S													Write
Status	Major	M	linor														
Config						LOCAL	at	MOTE					LOCA	r			0
System	WARNI	NGS		0	hannel		7	2		т	HRESI	HOLDS			DET	AILS	
Access	Modem				in an in the i	- Solitaritiesta						TOLEDO				1000	
IP	Modem	Agar/	Prot	1													
Radio	Modem			2													
Ports	Modem	MSE	Level	3	-	10				-24	1	-24	1		[c	18]	
Alarms	Modem	FER		4						5	Đ	5	(i)		lerror_f	rm/10	sl
Maintenance Tools	Badio							-						1.5			-1
10015	Radio B	XLev	el	5						-65	(i)	-65	1		[di	Bm]	_
	Radio T			6						00		00	0	-	for	ang	-
Date: Mon 28.04 2018	Ports	Ama		0			-	-						-			_
Fime: 15:45:05	Modem	LAN1	Link														_
Uptime: 19 21:57:40 Refresh status	Modem	LAN2	Link	7		86											_
netresh status	Modem	LAN3	Link	1													
Modem Serial Number	Modem	SFP1	Link														
355260100010 License Number	Modem	SFP2	Link	8		8.0											
3010403010100229	Modem	SFP3	Link						<								
License Type / Status	Modem	SFP4	Link			0											
permanent / ok License Expiration unlimited	🗆 Set a	all OK	Set	defau	lts 🔲 s	Set all									Und	o Ap	ply

Figure 3.48 "Config → Alarms → Minor" page

- Modem Aggr/Prot status of the Aggregation/Protection (displayed only if 1+1 or 2+0 modes enabled)
- Modem Data Sync this alarm indicates actual status of the packet processor (PBPS) synchronization.
- Modem MSE Level the alarm indicated if MSE threshold is trespassed. Usual MSE values can be checked in the ACM profile table under menu <u>Config → Radio → ACM</u>.
- 4) Modem FER the threshold for error frames per 10s
- 5) *Radio RX Level* the receiving level threshold
- 6) Radio TX Mute transmitting Mute status
- 7) *Modem LAN1/2/3 Link* status of the LAN port Link
- 8) Modem SFP1/2/3/4 Link status of the SFP port Link

Maintenance

Maintenance \rightarrow Configuration \rightarrow Save&Run

This section allows to store, display, export and execute the start-up configuration and IP settings.

Concernence of	TxF	TxP	MSE	RxL	W	MICROWAVE_LINK	1+1	MW_unit	W	RxL	MSE	TxP	TxF
" A "	21400	11	-36.6	-48.8			ACM		• 🔽 •	-49.9	-37.5	11	22600
SPAP	n/a	n/a	0.0	n/a	2	1024strong / 56M / 438Mb	AGM	1024strong / 56M / 438Mb	× 2	n/a	0.0	n/a	n/a
		LOC	AL		-		HSB		-		RE	MOTE	
ADMIN permissions 🖻	Logou	nt in: 7	m 22 s										Write
> Status > Config	Save8	Run	Bac	kupℜ	store	Factory default							
Maintenance	UPDA	TE, SH	HOW O	R RUN	STA	RT-UP SYSTEM CONFIG	URATION	N.					1
Configuration	Start-u	ip syst	em con	figurati	on me	emory c0 (last change 20	18-04-201	4:22)	Wr	ite S	how o	:0 R	un c0
Firmware									-			-	-
Files	RUN	OR SH	ow st			ONFIGURATION							1
Logs	11000					ange 2018-04-03 17:47)					Show	IP	P Init
Troubleshooting				and the							SHOW		e mile

Figure 3.49 "Maintenance → Configuration → Save&Run" page

Write - store the actual configuration.

Show c0 - displays the device's stored start-up configuration as list of commands. Note that the order of commands in this list is important. This configuration is not automatically updated unless this button is pressed again.

Run co - this will execute the current start-up memory content. Note that this action will cause data loss and the loss of all unsaved configuration changes.

Show IP

- shows the device IP configuration as list of commands. Note that this configuration is not automatically updated unless this button is pressed again.

IP Init - it will execute the current start-up memory IP settings content as well as reinitialization of IP interfaces. Note that this action will not cause user data loss but it will disconnect all active management sessions.

Maintenance \rightarrow Configuration \rightarrow Backup&Restore

This section allows to BACKUP the start-up configuration into the internal restart persistent memory. Only stored configuration will be backed up. Only one backup is allowed.

This backup is not automatically updated after firmware upgrade and thus it should be regenerated by the user manually.

The RESTORE button will appear if there is a configuration file stored. This file can be downloaded from this section directly.

- After pressing the RESTORE button the start-up configuration will be immediately replaced by the restored configuration.
 - Run c0 The restored configuration is not automatically activated. The button should be applied or soft reboot performed in order to activate it.
 - The RESTORE should be performed on the same FW version as it was created .

In this section it is possible to select and upload previously saved configuration file (*.afw) from external location.



Upload and execute

- After pressing the button the start-up configuration will be immediately replaced by the restored configuration.
- The restored configuration is not automatically activated. The Run c0 button should be applied or soft reboot performed in order to activate it.
- The RESTORE should be performed on the same FW version as it was created

The Party of the P	TxF	TxP	MSE	RxL	W	MICROWAVE_LINK	1+1	MW_unit	W	RxL	MSE	TxP	TxF
WA H	21400	11	-36.7	-48.7	•	•	ACM			-49.9	-37.6	11	22600
SPAF	n/a	n/a	0.0	n/a	2	1024strong / 56M / 438Mb	ACIM	1024strong / 56M / 438Mb	2	n/a	0.0	n/a	n/a
		LOC	AL				HSB				RE	MOTE	
DMIN permissions 🖻	Logou	nt in: 3	h 42 m	54 s									Write
Status	Save&	Bun	Bac	kupℜ	store	Factory default							
Config													
Maintenance	COMP	LETE	CONF	IGURA	TION	BACKUP & RESTORE -	INTERNA	AL STORAGE					(1)
Configuration	Backup	p confi	guratio	n into i	ntern	al permanent non-volatile	memory						
Firmware	III ATTI	ENTIO	N, previ	ous ba	ckup	will be rewritten !!!						Ba	ackup
Files						No config file in local	memory.						
Logs													
Troubleshooting	COMP		CONE	GURA	TION	RESTORE - EXTERNA	STORAG	F					(i)
Reboot						up file in external storage		-					
Tools						ettings will be lost !!!							
	Izvēlē	ēties fa	ilu Na	v izvēlē	ēts ne	viens fails							
Date: Mon. 23.04.2016										Lini	and a	nd av	ecute

Figure 3.50 "Maintenance → Configuration → Backup&Restore" page

Maintenance \rightarrow Configuration \rightarrow Factory default

In this section it is possible to restore the configuration of the device to its factory pre-set values including login credentials, radio and IP settings.



Figure 3.51 "Maintenance → Configuration → Factory default" page



In case of lost password or any other issues to access Phoenix G2 IDU web GUI via LAN MNG and /or USB MNG port, contact SAF technical support team at techsupport@saftehnika.com.

Maintenance \rightarrow Firmware \rightarrow Upgrade

To update the firmware, follow the upgrade wizard in this section. It will guide through the whole firmware upgrade process. If an EMM chain is used, update the EMM chain as well in the same web GUI page.

Concernant of the	TxF	TxP	MSE RxL	MW_unit	1+0 CH1	MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A #	22600	11	-37.5 -50.2	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb • 1	+ -48.9	-36.6	11	21400
SPAP		LOC	AL					RE	MOTE	
ADMIN permissions 🖻	Logou	t in: 4:	3 m 53 s							
Status	Upgra	de								
D Config										
 Maintenance 	DEVIC	EFIR	MWARE UPG	RADE						i
Configuration Firmware	Step	I: Sel	ect and impo	ort 'checkversions.afw' fi	rmware file					
Files	Cho	ose file	No file ch	nosen						
Logs										
Troubleshooting									105	nport
Reboot									-	nport
▶ Tools	Step	2: Upl	oad required	parts of firmware 0401	_01					
Date: Tue 10.04.2018	Part		Ver	sion Status						
Time: 07:38:09 Uptime: 6:16:27:25	osker			√Firmw	are is up to da	ite				
Refresh status	hwbas				are is up to da					
	hwbas				are is up to da					
Modem Serial Number 355260100009	fwbas	e.afw	040	I1_01 √Firmw	are is up to da	ate				
License Number 3010403010100228	Cho	ose file	No file ch	iosen						
License Type / Status permanent / ok									-	_
License Expiration unlimited									Ir	nport
Firmware Version 0401_01 Running Design	All fir	mwar	e parts are u	p to date, no upgrade re	quired.					
505 (DXN3)										
CFIP PhoeniX G2						© SAF Te	ehnika JSC	- <u>www</u>	saftehi	nika.com

Figure 3.52 "Maintenance → Firmware → Upgrade" page

Basically the firmware upgrade can be done in 3 steps:

- **Step 1** import the "checkversion.afw" file. This will display the frame with information about the firmware parts which are needed for the upgrade.
- **Step 2** import all required firmware parts. Once completed the firmware upgrade frame will be displayed.
- Step 3 in firmware upgrade frame initiate the upgrade by pressing
 UPGRADE MODEM or UPGRADE MODEM & EMM button. Firmware upgrade initialized in this step will cause data drop approximately one minute for the modem part plus about 30 seconds per each attached EMM card.

UPGRADE MODEM & EMM button will simultaneously update modem and all attached outdated EMM cards.

EXAMPLE MODEM button will update modem only. This button will be displayed if no EMM cards are present or if such cards do not require an update.



Release Notes document is always released with a new firmware describing all changes in comparison to previous releases.

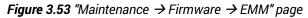


The firmware upgrade does not rewrite any customizing options. All customizing options such as customer logo are part of the license file.

$\mathsf{Maintenance} \rightarrow \mathsf{Firmware} \rightarrow \mathsf{EMM}$

This tab will appear only if any EMM module is connected to the IDU and enabled.

Concession of	TxF	TxP	MSE	RxL	Low	1+0 CH1	High	RxL	MSE	TxP	TxF
"A #	6675	8	-35.2	-43.1	• 0004strong / 80M / 111Mb	ACM	0004strong / 80M / 111Mb + 1	-43.2	-37.2	8	7015
SPAP		LOC	AL					_	RE	MOTE	
ADMIN permissions 🖻	Logo	ut in: 1	3 m 34	5							
Status	Upgra	de	EMM								
Config											
Maintenance	UPGF	RADE	EMM C	ARDS	FIRMWARE						(1)
Configuration					are from actual "fwbase" file.						
Firmware		_	ended t	o upgi	rade EMM by order number from	highest to	lowest (EMM4 => EMM1) !				
Files	EMM	1 🔻									
Logs										Up	irade
Troubleshooting										-	No. of Concession, Name



This section allows to upgrade firmware in attached EMM modules. It is recommended to update EMM modules in reverse order as follows:

EMM4->EMM3->EMM2->EMM1

During firmware upgrade there will be a data drop for about 15 seconds per one module.

Maintenance \rightarrow Files \rightarrow Exports

This section allows collect various device reports as downloadable archives for problem diagnostics/troubleshooting and backup. The selected files can be collected by means of

pressing the Generate button which will result in appropriate number of downloadable files listed in the sub-section EXPORT GENERATED FILES FROM VOLATILE MEMORY. Those files

are erased during restart of the device or by means of the Remove button.

and the second second	TxF	TxP	MSE	RxL	W	MW_unit	1+0 CH1		MICROWAVE_LINK	RxL	MSE	TxP	TxF
"A "	22600	11	-37.6	-49.9 •		• 1024strong / 56M / 438Mb	ACM	7	1024strong / 56M / 438Mb 🔸 🚺	+ -48.7	-36.7	11	21400
SPAP		LOC	AL							-	RE	MOTE	
OMIN permissions 🖻	Logour	in: 3	h 48 m	56 s									Write
Status	Export	s	Upload	1									
Config													
Maintenance	GENER	RATE	FILES	INTO V	OLA	TILE MEMORY							(i)
Configuration	Please	read I	nelp for	informa	tion	S.							
Firmware									2				
Files							erate ALL						
Logs						Generate	e Log File	0	2				
Troubleshooting						Generate License Rec	uest File	11	3				
Reboot						Generate Configur	ation File		4				
Tools												Gen	erate
	EXPOR	RT GE	NERA	TED FIL	ESI	FROM VOLATILE MEMO	DRY						
Date: Mon. 23.04.2018	Remov	e all g	enerate	ed files fi	om	temporary volatile memo	ry					Re	move

Figure 3.54 "Maintenance → Files → Exports" page

- 1) Generate ALL selects all below listed items for file generation at once.
- 2) *Generate Log File* archive of various log files for debugging purposes with link configuration and condition as plain text files.
- Generate License Request a binary file with current license status. This file is meant for extending license expiration date.
- 4) Generate Configuration File a binary file with complete configuration of the device. This file can be used for backing up the configuration or for transfer of such configuration into an another device. The configuration transfer should be done only between devices with matching firmware versions. This file can not be read by the user.

Maintenance \rightarrow Files \rightarrow Upload

In this section it is possible to upgrade firmware files manually, configuration file and the license file. In this case user should select the appropriate file and press the UPLOAD AND EXECUTE button.

and the second	TxF	TxP	MSE	RxL	W	MW_unit		1+0 CH1	MICROW	AVE_LINK	W	RxL	MSE	TxP	TxF
SA#	22600	11	-37.6	-49.9	•	1024strong / 56M	/ 438Mb	ACM	1024strong / 56	438Mb +	0.	-48.7	-36.7	11	21400
SAF		LOC	AL										RE	MOTE	
ADMIN permissions 🖻	Logou	nt în: 3	h 32 m	20 s											Write
Status	Export	ts	Upload												
Config															
Maintenance															i
Configuration	Sele	ect and	l execut	e self	extract	ing *.afw or *.af	l file (firmv	vare, patc	h, license, confi	guration,))				
Firmware	-		-		_										
Files	Izvēle	ēties fa	alu Na	v izvēl	ēts nev	iens fails									
Logs															
Troubleshooting												_			
Reboot												Upl	oad ar	nd Ex	ecute
· Table															

Figure 3.55 "Maintenance \rightarrow Files \rightarrow Upload" page

Examples of files are as follows:

Firmware (load files in the following order):

- hwbase505.afw, hwbase511.afw software for internal HW parts
- oskernel.afw operating system
- fwbase.afw application software (WEB, SNMP, commands , etc.)

Configuration:

 fwconf_OriginatingSN_Timestamp.afw (example: fwconf_3010501010100008_1702141508.afw)

License:

• licSN.afw (example: lic3010501010100008.afw)

The extension of the file is important. The device file validation is case sensitive so *.afw is not equal to *.AFW.

Maintenance → Logs

This section displays device's historical data. 3^{rd} level sections enlisted under this section do not depend on the alarm settings, thus all events are recorded. The historic span of this information depends on the link condition – a lot of events will cause quicker filling of these logs and sooner overwriting of the oldest records.

	TxF	TxP	MSE	RxL (W		-	1+0 CH		0.00	and the second s	-	xL	MSE	TxP	TxF
SAF	21400	LOC	1 1	-48.7 +	+ 1024strong	/ 56M / 438M	6 ACM	1024strong	a / 56M / 4	38ME +	• -4	9.9	-37.6 REI	11 NOTE	22600
DMIN permissions	Logo	st in 2	h 22 m	11 4											Write
Status Config Maintenance	Syste	m	Alarms 2	Court		nands 4	Access 5	SNMPd 6							(1)
Configuration Firmware Files Logs Troubleshooting Reboot Tools	l;1;Jar c;1;Ар c;1;Ар c;1;Ар c;1;Ар c;1;Ар c;1;Ар c;1;Ар	n 01 20 r 23 20	07;01:05 018;16:1- 018;16:1- 018;16:1- 018;16:1- 018;16:1- 018;16:1- 018;16:1- 018;15:4	5:21;78; L0 4:05;88; R 4:05;87; L; 4:05;87; N 4:04;96; R 4:04;96; L; 4:04;96; E; 4:51;64; R	l_otemp=47.0 ;side1;rxbl=5 ;r_otemp=48. l_otemp=47.0 ;side1;rxbl=5. ;r_otemp=48.	0;-100.0;r_r 0;-99.9;l_rxl .84e+04 ;ur 0;-100.0;r_r 0;-99.9;l_rxl .84e+04 ;un 0;-100.0;r_r	=-48.7;-99.9 icor=0 ; xl=-49.9;-99 =-48.5;-99.9 cor=87 ; xl=-49.9;-99	0.9;r_oalm=00; 9;l_oalm=00;fff prot=6.9e+10; 9.9;r_oalm=00;fff prot=6.9e+10 9.9;r_oalm=00;fff	f;l_itemp tle=1 00;r_iten f;l_itemp tle=0 00;r_iten	p=50.7;l_ ;tbe=1.7 np=43.0; p=50.5;l_ ;tbe=1.7 np=43.0;	mse=-3 5e+03 r_mse=-3 mse=-3 75e+03 r_mse=	36.6 efs= -37 36.7 ;efs -37	0;l_syr =1.72e .6;0;r_s ;0;l_syr =1.72e .5;0;r_s	n=1;0;l, +06;ers syn=26 n=1;0;l, +06;er syn=26	,7;0 Lial s=2 .7;0 Lial s=2 .7;0
Date: Tue 24.05.2016 Time: 14.2209 Uptime: 20.20-24-38 Refresh status	c;1;Ap c;1;Ap c;1;Ap c;1;Ap c;1;Ap	r 23 20 r 23 20 r 23 20 r 23 20 r 23 20 r 23 20)18,15:4)18,15:4)18,15:4)18,15:4)18,15:4	4:51;64; N 4:50;72; R 4:50;72; L; 4:50;72; E; 4:50;72; R	;side1;rxbl=5; r_otemp=48; l_otemp=48;0 side1;rxbl=5; r_otemp=48;	.831e+04;u 0;-100.0;r_r 0;-99.9;l_rxl .831e+04;u 0;-100.0;r_r	ncor=0 xl=-49.9;-99 =-48.6;-99.9 ncor=531 xl=-49.9;-99);1_oalm=00;fff prot=6.89e+1();1_oalm=00;fff ;prot=6.89e+1);9;r_oalm=00;fff);9;r_oalm=00;fff	0;tle=1 00;r_iten f;l_itemp 0;tle=0 00;r_iter	tbe=1; np=43.0; =49.0;L; tbe= np=43.0;	;efs= r_mse=- mse=- 1 ;efs r_mse=	1.73 37 36.5 =1.7 37	2e+06; .5;0;r_s ;0;l_syr ?2e+06 .5;0;r_s	ers=29 syn=26 n=1;0;L ;ers=2 syn=26	3 7;0 _ial 93 7;0
355260100010 License Number	c;1;Ap c;1;Ap	r 23 20 r 23 20)18;15:4)18;15:4)18;15:4	4:49;83; N 3:03;75; R 3:03;75; L;	side1;rxbl=5	.778e+04;u 0;-100.0;r_r	ncor=0 xl=-49.9;-99	prot=6.89e+10 9.9;r_oalm=00;);tle=1 00;r_iter	tbe=3; np=42.8;	.52e+0 r_mse	5;ef	s=1.72 .6;0;r_s syn=0;	e+06;e syn=26 0;l_ialr	rs= 7;0
3010403010100229 License Type / Status permanent / ok License Expiration unlimited Firmware Version 0401_01	с;1;Ар с;1;Ар с;1;Ар	r 19 20 r 19 20 r 19 20)18;13:4)18;13:4)18;13:4	4:14;45; R 4:14;45; L; 4:14;45; N	;r_otemp=49. l_otemp=48.0 ;side1;rxbl=5.	0;-100.0;r_r 0;-99.9;l_rxl .778e+04;u	xl=-51;-99.9 =-49.8;-99.9 ncor=0	prot=6.89e+10 0;r_oalm=00;00 0;l_oalm=00;ff prot=5.48e+10 0.9;r_oalm=00;);tle=0);r_itemp f;l_itemp);tle=1	;tbe=3. =43.0;r_ =49.9;L_ ;tbe=1	.52e+0 .mse=-(.mse=-(.efs=	37.4 36.3 1.31	;0;r_sy ;0;l_syi 7e+06;i	n=267; n=1;0;L ers=19	rs= 0;r_ _ial 1

Figure 3.56 "Maintenance → Logs" page

- 1) **System** system events (for example: license action, radio configuration changes, etc.)
- 2) Alarms the alarm log
- Counter system counter events. When an error is detected or resolved this file is appended by the actual link parameters at this moment
- 4) Commands history of performed commands
- 5) Access authentication history
- 6) **SNMPd** reports of the internal SNMP daemon

Maintenance \rightarrow Troubleshooting \rightarrow Assistant

Troubleshooting assistant displays status information about each configured channel. According to this information it is possible to point out possible issues with the equipment like misconfiguration, non-default settings and other device performance issues.

and the second	TxF	TxP	MSE	RxL	W MI	CROW	AVE_LINK	1+0 CH1		MW_unit	W	RxL	MSE	TxP	TxF
"A "	21400	11	-36.7	-48.7	• 10	24stron	ig / 56M / 438Mb	ACM	1024strong / 5	6M / 438Mb	•	-49.9	-37.6	11	22600
SAF		LOC	AL										RE	NOTE	
ADMIN permissions 🖻	Logou	nt in: 1	h 58 m	16 s										-	Write
Status	Assist	ant	Detai	I-SYS	Detai	I-IF	Detail-RF								
Config															
Maintenance	CHAN	NEL 1	RESU	LT											(i)
Configuration															
Firmware	Checki														
Files	Moden			Passa .	0d 22:10										
Logs	XPIC s			Error .	00 22.10	.08									
Troubleshooting	Checki														
Reboot	Tx1 OK	-													
Tools	Checki	ng chi	System	n:											
	Systen														
	Checki														
Date: Tue: 24.04.2018	HW ch	ecks C	к												
Time: 14/42/06															
Uptime: 20 20:54:41															
Refresh status															

Figure 3.57 "Maintenance → Troubleshooting → Assistant" page

Maintenance \rightarrow Troubleshooting \rightarrow Detail-SYS

Device status summary is displayed in this section. Additional debug information will be shown in case of error state.

	TxF	TxP	MSE	RxL	W MICROW	AVE_LINK	1+0 CH1	MW_I	Init	W	RxL	MSE	TxP	TxF
"A #	21400	11	-36.7	-48.7	• 1024stron	g / 56M / 438Mb	ACM	1024strong / 56M / 438	мь .	0	-49.8	-37.6	11	22600
SPAF	-	LOC	AL							Ξ.		RE	MOTE	
ADMIN permissions	Logou	nt in: 1	h 55 m	52 s									1	Write 🦉
▶ Status	Assist	ant	Detai	I-SYS	Detail-IF	Detail-RF								
Config														(1)
 Maintenance 	1 Alarm	s stat	OK											C
Configuration	-			OK: ra	d2 :0K; mod1 :0	K: mod2 :OK:	lan :OK: mux	OK SVS OK						
Firmware					d2 :OK; mod1 :C									
Files	1	R2 off	: disal	oled rad	lio2(4)									
Logs														
Troubleshooting														
Reboot														
> Tools														

Figure 3.58 "Maintenance → Troubleshooting → Detail-SYS" page

- 1) Alarms stat actual device alarm status. Only enabled alarms are considered.
- Drivers stat actual status of low level drivers. An eventual error suggests unsuccessful or ongoing communication between respective driver and the system driver. The system driver is responsible for interpretation of device status to front ends (CLI, GUI, SNMP).
- 3) **Settings stat** actual configuration status. An eventual error suggests that a required settings could not be set.

Maintenance \rightarrow Troubleshooting \rightarrow Detail-IF

This section provides summary of basic and advanced status details of the IF part.

and the second	TxF TxP	MSE RxL (W	MICROWAVE_LINK	1+0 CH1	MW_unit	W	RxL	MSE	TxP	TxF
₩A #	21400 11	-36.7 -48.7 + 🚺	• 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb	• 🚺	-49.9	-37.6	11	22600
SILL	LOCA	L						RE	NOTE	
ADMIN permissions 🖻	Logout in: 1 h	51 m 20 s								Write 🔹
Status	Assistant	Detail-SYS	Detail-IF Detail-RF							
Config	MODULATION	NS								(1)
Maintenance	Modulation	1: 1024_56000	02 strong							0
Configuration		2: 1024_56000								
Firmware	MODEM_CONF		#2							
Files	Functio	n : EndStat	off							
Logs	Modems Cf	g: modem	off(mut)							
and the second se	IF Outpu	at: unmuted	muted							
Troubleshooting	Signal Typ	e: qam	CWS							
Reboot	ACM Mod	le: man	man							
Tools	ACM Profil	le: p1	p1							
	ACM RxModFe	c: 1024/01	1024/01							
	ACM TxModFe	c: 1024/01	1024/01							
Date: Tue: 24.04.2018	XPI	C: off	off							
Time: 14:49:03	Bid	ir: on								
Uptime: 20 21:01:38	SignalSourc	e: ok	off							
Refresh status	Cw Fre	q: -1000011	-1000011							
	Loopbac	k: off	off							
Modem Serial Number	Baud Rate	s: 51171875	51171875							
355260100010	Modul.Spee	d: 438	438							
License Number	MSE Alleve	el: -24	-24							
3010403010100229 License Type / Status	MODEM_STAT	US								
permanent/ok	Modem Syn	ic: ok	loss							
License Expiration	Resync cour	nt: 784	25268							
unlimited	Last erro	or: none	ExtAGC							
Firmware Version	MS	E: -36.70	0.00							
0401_01	IFLevel[dBn	n]: -10.40	-40.00							
Running Design	ExtAGC	/]: 3.2855	0							
505 (DXN3)	SN	R: 0	0							
	ER	R: 0	1							
	GLOB	AL								
	PLL_Lcks(7	f): 0x1f								
	DAC Alarm(C	0): 0x0								
	ADC Mea	s: 168001768	168001768							
	DAC Mea	s: 224002358								
	SyncETH Mea	s: 224002358								
	RPT Fif	o: 0	0							

Figure 3.59 "Maintenance → Troubleshooting → Detail-IF" page

Maintenance \rightarrow Troubleshooting \rightarrow Detail-RF

This section provides summary of basic and advanced radio parameters. These values are collected directly from the ODU and reflect its actual state.

	TxF	TxP	MSE	RxL	W MICF	OWAVE_LINK	1	+0 CH1		MW_un	it (W)	RxL	MSE	TxP	TxF
SA E	21400	11	-36.7	-48.7	• 🚺 + 1024	strong / 56M / 438	Mb	ACM	1024strong	/ 56M / 438MI	• • 🚺	-49.8	-37.6	11	22600
3/11		LOC	AL										RE	MOTE	
ADMIN permissions 🖻	Logou	nt in: 1	h 47 m	151 s											Write
> Status	Assist	ant	Deta	il-sys	Detail-II	Detail-RF									
Config	RADIO		DED					LastRes	4402						(i)
Maintenance	NADIO		IXP: 1	10.0	P	AD2 comm pro									•
Configuration			set:			ADZ COMIN PIO		dbg :677							
Firmware			SSI: -			Badio	Type :								
Files				transmit	tting				ff ffffffff 1 C)					
Logs			oop: o					LastRes	p - 4403,						
			mp.: 4			D		nrespont							
Troubleshooting		ALAR	Ms: (00x0				dbg :677	3						
Reboot	(TXShi	ftFr: (0				variant :	0.0						
Tools		Orien	tat.: 4	41											
		Cable	Att.: -	4											
			TXF: 2												
Date: Tue 24.04.2018			RXF: 3												
Time: 14:52:31				21200-2	1800										
Uptime: 20 21:05:06			tep: (
Refresh status			olex : 1												
Modem Serial Number			lat.: 1												
355260100010			BW: 8	2.2											
License Number				S23GFU											
3010403010100229			SN: 3	3535601	100141										
License Type / Status		0.00000	ype: 1												
permanent / ok License Expiration		adior		, 00560	0.0										
unlimited				LastRes											
Firmware Version		Del		respon											
0401_01		Dei		dbg :151											
Running Design 505 (DXN3)				variant :											
CFIP PhoeniX G2										-		1			nika.com

Figure 3.60 "Maintenance → Troubleshooting → Detail-RF" page

Maintenance → Reboot

The second second	TxF	TxP	MSE	RxL	Low	1+0 CH1	High	RxL	MSE	TxP	TxF
SA F	6675	8	-35.1	-43.1	• 1 + 0004strong / 80M / 111	Mb ACM	0004strong / 80M / 111Mb + 1)	-43.2	-37.3	8	7015
SAF		LOC	AL						RE	MOTE	
DMIN permissions 🖻	Logo	ut in: 7	m4s								
Status	Reboo	ot									
Config											
Maintenance	REBO	OT DE	VICE								(i)
Configuration	Unit	t Rebo	ot - 30s	data d	drop						
Firmware										R	eboot
Files										-	_
Logs	RESE	TEMM	A CAR	s							1
Troubleshooting	Res	et EMI	VI cards	-15s	data drop on EMM						
Reboot										1	Reset
Tools										-	
	IP IN	т									(1)
Date: No. 02 00 0010			- no da	ta dro	p. Reloads network interfac	ces, WWW, SSH.	SNMP				U
Date: Mon, 03.09.2018 Time: 15:52:03			laemon								
Uptime: 3 00:17:11											p Init
Refresh status										-	

Figure 3.61 "Maintenance → Reboot" page

Reboot - IDU's reboot will be performed by pressing this button. This operation will cause

data drop.

Reset - this section will appear only if any of AMM modules is connected to the IDU and enabled. EMM cards will be initialized when this button will be pressed. This operation will cause data drop.

Ip Init - re-initialization of IP interfaces, SSH, WEB, SNMP and NTP daemons will be performed by pressing this button.

Tools

Tools \rightarrow Terminal

In this section built-in terminal window for accessing CLI (Command Line Interface) is available.

Execute command '?' in order to display all available commands. In order to check available sub-commands, question mark must be typed after the main command, for example command 'show ?' will print out all available 'show' sub-commands.

Sector Sector	TxF	TxP	MSE	RxL	W	MICROWAVE_LINK	1+0 CH1	MW_unit 🛞	RxL	MSE	TxP	TxF
"A "	21400	11	-36.7	-48.8	•	+ 1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	-49.9	-37.6	11	22600
SPAP		LOC	AL							RE	MOTE	
ADMIN permissions	Logout	t in: 1	h 19 m	53 s							1	Write 📽
▷ Status	Termin	al										
Config												
Maintenance	TERMI	NAL										(1)
4 Tools		You	r Com	mand:								
Terminal											No. of Concession, Name	-
IP Ping	LISTIN	IC.								Undo	APP	ny
On Anthony	LISTIN	10										

Figure 3.62 "Tools → Terminal" page

Tools \rightarrow IP Ping

Possibility to send 'ICMP ECHO_REQUEST' to network hosts by entering IP address in *Target IP address* cell.

	TxF	TxP	MSE	RxL	W	MICROWAVE_LINK	1+0 CH1	MW_unit 🛞	RxL	MSE	TxP	TxF
"A"	21400	11	-36.7	-48.8	•	1024strong / 56M / 438Mb	ACM	1024strong / 56M / 438Mb + 1	• -49.8	-37.6	11	22600
SAL		LOC	AL							RE	MOTE	
ADMIN permissions 🖻	Logou	rt în: 31	7 m 36	5							-	Write
> Status	Ping											
Config	-											
Maintenance	IP PIN	IG										(1)
Tools				Targe	t IP ad	dress						
Terminal												Ping
IP Ping												Ping
Sp. Analyser												
Constellation												

Figure 3.63 "Tools → IP Ping" page

Tools \rightarrow Sp. Analyser

This section provides integrated spectrum analyser for free channel lookup, or alternatively for detection of interference within the particular band.

The frequency scanning consists of 3 automated steps:

- a. local transmitter is muted;
- b. local Rx frequency is sequentially tuned from lowest to highest frequency
- c. the local Rx level is recorded for each frequency

	TxF TxP MSE RxL	MICROWAVE_LI	NK	1+0 CH1	MW_unit	W RxL	MSE	TxP	TxF
GAE	21400 11 -36.7 -48.7 +	 1024strong / 56M 	1 / 438Mb	ACM	1024strong / 56M / 438Mb	1 + -49.8	-37.6	11	2260
SINF	LOCAL						REN	NOTE	
ADMIN permissions 🖻	Logout in: 3 h 57 m 44 s								Write
> Status	Channel1								
Config									1.2
Maintenance	SPECTRUM ANALYSER				Channel 1			_	(
Tools	Local TX Mute Duration (sec)	1	150					M	ute
Terminal	Delay Before Start (sec)	2	0					Analy	/se
IP Ping	Auto Mute Remote Radio	3			Warning: This	action will o	ause a	data d	lrop!
Sp. Analyser	Delay status	4							
Constellation	SPECTRUM ANALYSER OUTP	UT _							
		5							
	Channel A analyze 2018.04.24. 1	5:38:43							
	Ird em								
	Proceeding analyzer - RAD1, plea	se wait							
Date: Tue: 24.04.2018	txmute done								
Time: 15:41:44	narrow filter applied								
Uptime: 20 21:54:19	ConfMode changed to 0 - hw limit	ts							
Refresh status	STARTRxF=22400000								
	ENDRxF=23000000								
Modem Serial Number	FSTEP=3500								
355260100010	22400.0:-91.7:								
License Number	22403.5:-91.7:								
3010403010100229	22407.0:-91.6:								
License Type / Status	22410.5:-91.6:								
permanent / ok	22414.0:-91.6:								
License Expiration	22417.5:-91.6:								
unlimited									
Firmware Version	22421.0:-91.7:								
0401_01	22424.5:-91.7:								
Running Design 505 (DXN3)	22428.0:-91.6:								
500 (DAN3)	22547.0:-85.9:*								
	22550.5:-83.5:***								
	22554.0:-80.6:*****								
	22557.5:-76.8:********								
	22561.0:-72.1:************								
	22564.5:-67.5:**********************								
	22568.0:-63.6:***********************************	*****							
	22571.5:-60.8:************************************	******							
	22575.0:-59.4:************************************	******							
	22578.5:-58.1:************************************	*****							
	22582.0:-57.4:************************************	******							
	22585.5:-56.9:**********************	******							
	22589.0:-56.3:************************								
	22592.5:-56.2:****************************								
	22596.0:-56.1:*****************************								
	22599.5:-56.1:**********************								
	22603.0:-56.0:**********************								
	22605.0-50.0								

Figure 3.64 "Tools → Sp. Analyser" page

- Local TX Mute Duration manual Tx mute setting for the local radio for the specified duration. During this period the frequency scan should be performed on the remote device. This will not invoke the frequency scanning.
- 2) Delay Before Start delay before frequency analysis starting (in seconds)
- 3) **Auto Mute Remote Radio** allows auto mute of remote radio if possible (this function requires synchronization with remote side)
- 4) **Delay status** a remaining delay time countdown
- 5) **SPECTRUM ANALYSER OUTPUT** the spectrum analyser output frame. It displays the analyser results collected since last device reboot. It will be displayed only after pressing

Analyse button.

The radio frequency scan can take between 30sec and 2min depending on used radio type and bandwidth. Data will be dropped during the frequency scanning.

Tools \rightarrow Constellation

This section provides actual spectrum and constellation diagram outputs.

SPECTRUM shows simplified Rx spectrum plot.

CONSTELLATION DIAGRAM is a representation of a signal modulated by the digital

modulation schemes 1024QAM, 512QAM, 256QAM, 128QAM, 64QAM, 32QAM, 16QAM or 4QAM. It displays the signal as a two-dimensional scatter diagram in the complex plane at symbol sampling instants. Measured constellation diagram can be used to recognize the type of interference and distortion in a signal.

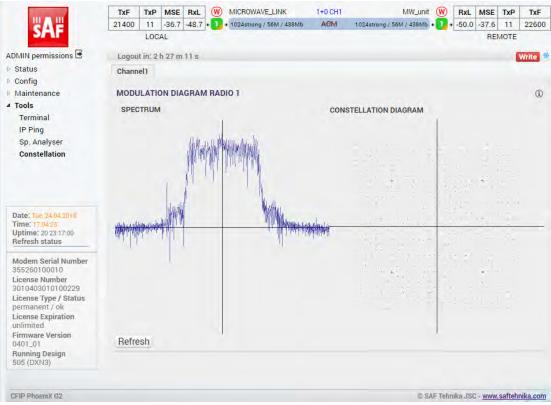
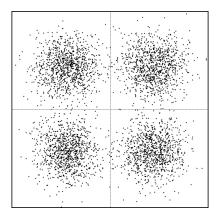


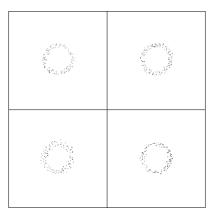
Figure 3.65 "Tools → Constellation" page

For the purpose of analysing the received signal quality, some types of corruption are evident in the constellation diagram. For example:

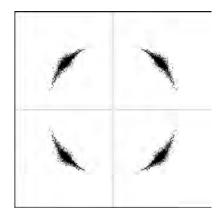
1) Gaussian noise is displayed as fuzzy constellation points:



2) Non-coherent single frequency interference is displayed as circular constellation points:



3) Phase noise is displayed as rotationally spreading constellation points:



Chapter 4: COMMAND LINE INTERFACE

Command line interface (CLI) is available via 3 individual interfaces:

- Secure Shell (SSH);
- Telnet;
- Web GUI (Tools→Terminal, partial functionality)

Telnet and SSH terminal is available via Ethernet management port. CLI is also available in web GUI in Tools \rightarrow Terminal page.

Command line management interface offers the same configuration and monitoring functionality as it is in web GUI.



Default username for SSH and Telnet connections is **admin** and password - **secret** To end Telnet and/or SSH session enter command "quit". Opening the session again, the prompt will appear to enter username and password.

The basic command structure and output description is following:

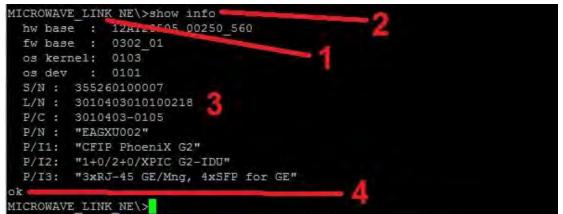


Figure 4.1 CLI command structure

1 Name and informative prompt of the device

- a) "MICROWAVE_LINK" the name of the device, can be changed by user (command **set descr name <new_name>**)
- b) "_NE\>" informative prompt, following meaning are provided:
- "xxx_XXY>" > prompt in reading mode
- "xxx_XXY#" # prompt in enable mode
- "xxx_XX|Z" | prompt indicates unsaved changes (write w0 is needed)
- "xxx_XX\Z" \ prompt indicates no unsaved changes (no write w0 needed)
- "xxx_NXYZ" N indicates that device is in ok state (command to check alarms sh alarm all)
- "xxx_EXYZ" E indicates that device is in alarm state (command to check alarms sh alarm all)
- "xxx_XNYZ" N indicates that device was not in alarm state since last alarm validation
- "xxx_XEYZ" E indicates that device as in alarm state since last alarm validation (command to check sh history alarm)

2 Executed command

Command executed by user

3 Output field of the command

Output of the executed command

4 The exit status of the command

Possible return values are following:

- **ok** the command was executed successfully
- not valid at pos:1 the numeric value represents position of unrecognised argument of the latest command. Such command was not executed
- no access configuration changing action without 'enable' mode
- locked another active administrative session already in 'enable' mode

In order to change any settings in command line 'enable' mode must be acquired. This mechanism ensures that only one login session (CLI, SNMP or WEB) is allowed to change the settings. This step is not necessary in the built-in WEB GUI Terminal as the administrative login in the WEB GUI acquires 'enable' mode automatically.

The 'enable' mode can be activated by means of command **enable** and deactivated by command **exit**. It is also possible to forcefully takeover the enable mode by means of command **kill enable**.

An example of using 'enable' mode is shown in the example below:

device_name_NN\>set descr name my_device	// try to change device's name
no access	// not in enable mode; command was not executed
device_name_NN\>enable	// try to acquire the enable mode
locked	// an another session already in the enable mode
device_name_NN\>kill enable	// takeover the enable mode
ok	// success
device_name_NN\#set descr name my_device	// try to change the device's name
ok	// success; note the changed name
my_device_NE #write w0	// commit the current settings
stage 0 ok	
ok	// success
my_device_NE\#exit	// exit the enable mode
ok	// success
my_device_NE\>	// non administrative prompt

Figure 4.2 'Enable' mode examples

The CLI offers inbuilt online help accessible by means of '?' question mark.

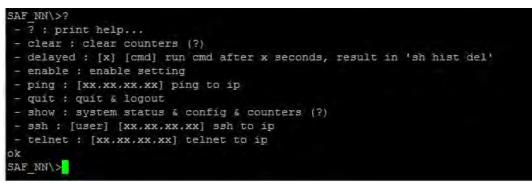


Figure 4.3 CLI online help

Syntax used in online help [] required parameters • {} optional parameters (?) the parameter contains nested parameters. Type '?' at end of the command to see possible values and syntax Some commands allow using the online help also for their sub-parameters. Refer to the example in Figure 4.4 Most of commands can be entered in their shortened form. For example: enable = en, show = sh, write = wr, etc. SAF NE\#set rad1 2 - analyzer : [my] start spectrum analyzer (option my means fine analysis around - atpc : radio atpc parameters (?) - down : power-off radio part up : power-on radio part filter : radio filter parameters (?) - mute : mute RF output from power amplifier - unmute : enable RF output from power amplifier rxfreq : [number] set radio Rx frequency (MHz), valid only for some radio typ 28 - tr : [low/high] Tx-Rx frequency distance, valid only for some radio types txfreq : [number] set radio Tx frequency (MHz), ? for valid range (?) txpower : [number] set radio Tx power (dBm), ? for valid range (?) οk SAF NE\#set rad1 atpc ? - off : atpc off on : atpc on rxlevel : min rx level [-74 - 0]

Figure 4.4 CLI online help

Connecting to SSH

SSH connection to Phoenix G2 IDU is carried out using Ethernet management connection. Please refer to Chapter <u>Ethernet management connection configuration</u> for Ethernet management port connection details.

You can use any SSH client. Below are connection steps with <u>*PuTTY*</u> - Windows freeware software.

1. Open *PuTTY*, choose "Connection Type": "SSH", enter IP address and make sure that correct port number is used ("22" by default):

tegory: ⊟- Session	Denis antiana farman D.	TTV
Logging Terminal Keyboard Bell Features Window Appearance Behaviour Translation Selection Colours Connection Data Proxy Telnet Rlogin SSH SSH Serial	Basic options for your Pu Specify the destination you want to Host <u>Name (or IP address)</u> 10.10.10.10 Connection type: Raw <u>I</u> elnet Rlogin Load, save or delete a stored sessi Saved Sessions	e connect to Port 22 © SSH © Segal
	Default Settings Close window on exit:	Load Save Delete

Figure 4.5 PuTTY configuration

2. Press "Open", enter login credentials (default user name is *admin* and password - *secret*). After successful login following prompt should appear:



Figure 4.6 PuTTY SSH prompt

Connecting to Telnet

Telnet connection to Phoenix G2 IDU is carried out using Ethernet management connection. Please refer to Chapter <u>Ethernet management connection configuration</u> for Ethernet management port connection details.

You can use any Telnet client. Below are connection steps with <u>PuTTY</u> - Windows freeware software.

1. Open *PuTTY*, choose "Connection Type": "Telnet", enter IP address and make sure that correct port number is used ("23" by default):

ategory:		
Session	Basic options for your Pu	TTY session
Logging En Terminal	Specify the destination you want to	
Keyboard Bell	Host <u>N</u> ame (or IP address) 10.10.10.10	23
	Connection type: Raw <u>I</u> elnet Rlogin Load, save or delete a stored sessi Sav <u>e</u> d Sessions	
	Default Settings	Load Sa <u>v</u> e Delete
⊞ SSH Serial	Close window on exit:	nly on clean exit

Figure 4.7 PuTTY confguration

2. Press "Open", enter login credentials (default user name is *admin* and password - *secret*). After successful login following prompt should appear:



Figure 4.8 PuTTY Telnet prompt

Chapter 5: EXAMPLES

Example 1 – Configuration of SFP ports for GE traffic transmission

There are two ways of SFP port configuration to transmit Gigabit Ethernet traffic:

- 1) SFP port interconnected with built-in switch
- 2) SFP port directly interconnected with data channel, bypassing built-in switch

The option when SFP port is interconnected with built-in switch can be used in cases if:

- It is needed to access management of the IDU via SFP port
- It is needed to apply VLAN or QoS rules on the SFP stream

In this case the SFP port will be connected to one of WAN ports and it automatically consumes one of two WAN ports, and in case if for example two separated LAN traffics are needed, this option can not be used.

Configuration steps of this option are following:

1) In web GUI '<u>Config->Ports->EthVLAN</u>' page configure port grouping so that WANA and WANB ports are in the same group.

MUX EthV	LAN EthQOS	EMM					
VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B	i
Port Mode	basic 🔻	basic 🔻	basic 🔻	basic 🔻	basic 🔻	basic 🔻	
Port Group	group-1 🔻	group-2 🔻	group-1 🔻	group-1 🔻	group-1 🔻	group-1 🔻	
Default VLAN	1	1	1	1	1	1	
		LAN1	LAN2	LAN3			
			GETH switch	1			
		WANa	WANb	MNG CPU			

Figure 5.1 Example of group configuration for WANA and WANB ports

 In web GUI page '<u>Config->Ports->MUX</u>' for particlular SFP port select one of WAN ports in the 'Channel Select' row thus interconnecting this SFP port with the WAN port of the built-in switch.

POI	BT	SEPT	SFP2	SFP3	SFP4	LANI	LAN2	LANS
	Status	SFP module not present	SFP module not present	SFP module not present	Gbit FD	LAN No LINK	Gbit FULL	LAN Gbit FULL
CONFIG	Hot Standby	off	•	off	•	off		-
CO	Mode	force1GX •	auto1GX 🔻	auto1GX 🔻	force1GX *	auto 🔹	auto 🔻	auto 🔻
PORT	MDIX		-	-	÷	auto 🔻	auto 🔻	auto 🔻
Å	Flow Control 🎄	force	force	force	force	off	off	off
	1588	off *	off 🔻	off 🔻	off *	off 🔻	off *	off •
-						LAVI	LA/12	LANS
SWITCH							GETH switch	1
						WANa	WAND	MNEGPU
HL								CPU
AP	Channel Select	WANA 🔻	none 🔻	none 🔻	EMM1 •	SFP1 •	ETH1a •	REI1 REI
SWAP	Connected Port	off		sfp4	wa	nb	no	one

Figure 5.2 Example of SFP port and WAN port interconnection

3) In the same web GUI page for the second WAN port (the one which is not interconnected with SFP port) choose option ETH1a in 'Channel Select' drop-down thus interconnecting the second WAN port with data channel over the RF (refer to *Figure 5.3*). In order to have remote MNG access the MNG port must be in the same group with both WAN ports (refer to *Figure 5.1*).

un.	TAFLOW CONFIGURA	HON									
PO	BT	SEPT		SFP2	SFP3	S	FP4	LANT	L	AN2	LANS
	Status	SFP mod not pres	ule ent	SFP module not present	SFP module not present	00	SFP Gbit FD	LAN No LINK			LAN Gbit FULL
FIG	Hot Standby	(off	•	off	•		off	•		-
CONFIG	Mode	force1G>	× •	auto1GX 🔻	auto1GX 🔻	force	elGX 🔻	auto 🔹	auto	•	auto
PORT	MDIX	-		-	-		+	auto 🔻	au	to 🔻	auto 🔻
P	Flow Control 🎄	force		force	force	force		off		off	off
	1588	off •		off 🔻	off *	C	off *	off 🔻	0	ff *	off *
								147/1	E	Ari2	LANS
SWITCH								P	. 4000	I switch	Calculation
H SWI								LV6NS		AND	MING CPU
HLI									_		CPU
AP	Channel Select	WANA	•	none 🔻	none 🔻	EM	IM1 V	SFP1 T	ETH	- -11a ▼	REI1 REI
SWAP	Connected Port		off		sfp4		wa	hb	~		one

Figure 5.3 Example of WAN port and data channel interconnection

 Configure the same settings also in the remote Phoenix G2 IDU. Save new settings by pressing Write button.

The option when **SFP port directly is interconnected with data channel, bypassing built-in switch** can be used in cases if:

- It is needed to simply pass SFP traffic transparently over the link
- It is needed to have jumbo packet support
- It is need to have SFP traffic separated from the other data
- There is no need for any of the built-in switch capabilities

Configuration steps of this option are following:

1) In page '<u>Config->Ports->MUX</u>' for particlular SFP port select ETH1a option to interconnect it directly with data channel.

POI	RT	SFE	21	5	FP2	SFP	3	3	FP4	LA	NT	U	AN2	. 14	EN1
	Status	SFP mo	odule esent	SFP	module present	SFP mod not pres	lule ent	00	SFP Gbit FD	LAN N	o LINK	LAN	Gbit FULL	LAN	Gbit FULL
FIG	Hot Standby		off	۲			off	۲		off auto 🔻				-	
PORT CONFIG	Mode	force1	GX 🔻	auto	IGX V	auto1G>	•	force	e1GX *			auto 🔻		auto	
DRT	MDIX	-			-	-			-	aut	o •	au	to 🔻	auto	
P	Flow Control 🎄	fore	ce	f	orce	force	2	f	orce	0	ff		off	C	off
	1588	off	•	c	off T	off 1		Q	off *		F W	of	f =	off 🔻	
															_
H											-	1.000	AMPE	-	EM
Ĕ										_		GETH	switch	1	
ETH SWITCH										V7	ika	[\\	AND	_	PU
		-	-											T	
SWAP	Channel Select	ETH1	a 🔹	no	ne 🔻	none	•	EM	M1 •	ETH	1b 🔻	non	e 🔻	RFI1	RFI2
SW	Connected Port	-	OIT	-		sfp4			sfp	n1			Wa	ana	

Figure 5.4 Example of SFP port and data channel interconnection

 In the same page interconnect one of WAN ports with ETH1b data channel by choosing it in ' Channel Select' drop-down thus enabling remote MNG access (refer to *Figure 5.5*). Note that MNG port must be in the same group as chosen WAN port

PO	RT	SFP1	SFP2	SFP3	SFP4	LANT	LAN2	LANS	
	Status	SFP module not present	SFP module not present	SFP module not present	Gbit FD	LAN No LINK	Gbit FULL	Gbit FULL	
CONFIG	Hot Standby	off	T	off	T	off	T	-	
CON	Mode	force1GX 🔻	auto1GX 🔻	auto1GX 🔻	force1GX *	auto 🔻	auto 🔻	auto 🔻	
PORT	MDIX	-	-	-	-	auto 🔻	auto 🔻	auto 🔻	
P	Flow Control 🎄	force	force	force	force	off	off	off	
	1588	off 🔻	off •	off 🔻	off T	off *	off *	off 🔻	
H						LANI	LANZ	LANS	
E							GETH switch	1	
ETH SWITCH						WANa	WAND	MINE GPU	
E								CPU	
SWAP	Channel Select	ETH1a 🔻	none 🔻	none 🔻	EMM1 T	ETH1b •	none 🔻	RFI1 RFI2	
SW	Connected Port	off		sfp4	sfp		Wa	ana	

Figure 5.5 Example of WAN port and data channel interconnection

3) In the same page set speed limits for both ETH1a and ETH1b channels. Note that ETH1a channel is high priority channel and if the maximum allowable speed will be set for this port, the ETH1b (low priority data channel) speed will be left as 0 Mbps and MNG traffic will not be possible over the link

M	Traffic Channel	PTP1	EMM1	ETH1a	ETH1b
PBPM	Speed Limit (j)	auto	0	90	10
			r		
	Available Speed	11	1.89 Mbps		

Figure 5.6 Example of data channel speed limit configuration

4) Configure the same settings also in the remote IDU. Save new settings by pressing

Write button.

Example 2 – Basic 1+1 HSB/SD protection scheme

The basic 1+1 HSB/SD (Hot Standby/Space Diversity) protection schemes ensure the correct data transmission over the microwave link in case of specific HW block (ODU, IDU-ODU cable, modem) failure or receive conditions degradation.(multipath fading, ..). This scheme requires one Phoenix G2 IDU with connected two ODUs per site.

1+1 HSB/SD protection scheme can be enabled by software in web GUI of the IDU in '<u>Config-System->Mode</u>' page. Physically 1+1 HSB or 1+1 SD mode is determined by antenna usage in sites – for 1+1 HSB one antenna and coupler can be used per each site with two ODUs connected to the coupler, while 1+1 SD requires two antennas in each site with one ODU connected to each antenna.

In 1+1 HSB/SD mode one transmitter is active (second one is automatically muted), while two receivers receive the identical signal and the IDU decides what stream will be used for final data de-multiplexing. The equipment provides hitless switchover in case of ODU Rx failure, and short data drop in switchover in case of ODU Tx failure.

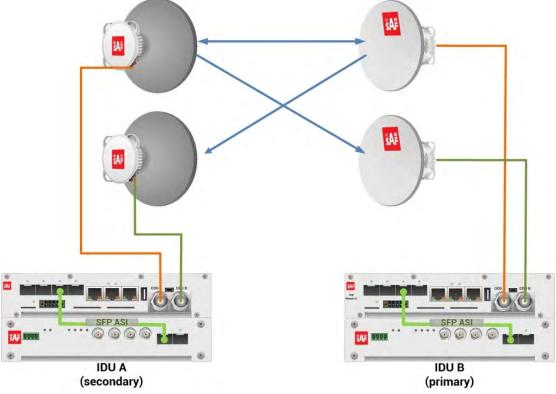


Figure 5.7 Example of 1+1 SD mode

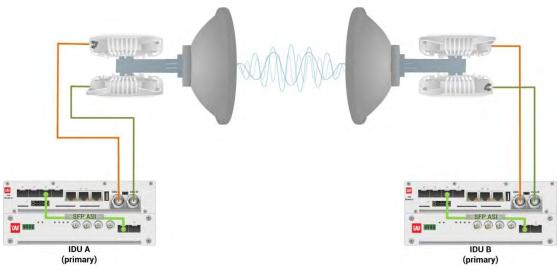


Figure 5.8 Example of 1+1 HSB mode

This concrete example describes an application where the Design Type 'Design 505', Functional mode '1+1' and Link diversity 'HSB/SD – hot standby' are selected on both link sides, modulation is 32QAM in BW 60 MHz and the appropriate maximal data speed is about 227 Mbps. The management access is In-Band management described in section 'Management channel configuration options'.

Configuration steps for basic 1+1 HSB/SD protection scheme are following:

1) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+1' and Link Diverity 'HSB/SD – hot standby' in both Phoenix G2 IDUs:

	TxF	TxP	MSE	RxL	Low	1+1	High	RxL	MSE	TxP	TxF
SAF	19000	8	-32.8	-57.9	1 • 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1	-59.3	-33.2	8	17992
SAF	19000	muted	-35.5	-52.0	2 × 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb × 2	-51.8	-36.3	muted	17992
		LOCA	AL.			HSB/SD			RE	MOTE	
ADMIN permissions 🕞	Logot	nt in: 3 h	25 m	23 s							4
Status	Mode	De	scripti	n	Date&Time Advanced						
Config System	DESIGN	CONFI	GURA	NON		LOCA	AL		ACT	ION	(
Access	Design	Туре				Design	505 🔻		Арр	oly	
IP	DESIG	MODE	S			LOC	AL		ACT	ION	(
Radio Ports	Functio	nal Mo	de			1+1	•		Арр	ply	
Alarms	Link Di	versity			H	SB/SD - hot	standby V		Ар		

Figure 5.9 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use the same frequency channel for both ODU pairs:

Sector Start	TxF	TxP	MSE	RxL	Lov	N			1+1			High	RxL	MSE	TxP	TxF
"A #	19000	8	-32.8	-58.0	1 + 003	32strong	/ 60M / 2	227Mb	ACM	00326	trong / 60M / 1	227Mb + 1	-59.3	-33.2	8	17993
SPAP	19000	muted	-35.5	-52.1	2 × 003	32strong	/ 60M / 2	227Mb	ACM	00326	trong / 60M / :	227Mb × 2	+ -51.9	-36.4	muted	17992
		LOCA	AL		-				HSB/SD					RE	MOTE	-
MIN permissions 🕞	Logou	nt in: 3 h	1 57 m	33 s												
Status	Param	neters	AC	M	dvanced											
Config	-						LOCA					DI	EMOTE			0
System	MODEN	A			CHAN	NEL 1	LOUA		ANNEL 2		CHAN		ENTOTE	CHÂN	JEI 2.	
Access IP	Bandwi	idth			60000	_			00_02 ▼	II	6000		-	60000		
Radio		ACM PI	afile	-	1			120					0		-	
Ports Alarms Maintenance Tools			ome	-	0032/st			-	/strong		0032/st	rong •			rong •	-
	ACM Se	-		_	» defa				» 🏰 lefault	_				-		_
	Advand	ed Sett	ing		dera	un			ierauit					-		_
	BADIO	BADIO					LOCA						EMOTE			(
					CHANNEL	LT	1	CHAN	NEL 2	(i)	CHAN	NEL 1		CHAN	VEL 2	
	T/R Sp	acing			fixed	•	(i)	fixed	•	i	fix	ed		fixe	ed	
Deter T - Dr. co. Door	TX Free	uency	[MHz]		19000		(i)	190	00	(i)	179	992		179	92	
Date: Tue, 06.11.2018 Time: 14:07:13	RX Free	quency	[MHz]		17992		(i)	179	92	i	190	000		190	00	
Uptime: 3 23:19:45 Refresh status	TX Pow	er Limit	t [dBm]		8		(i)	9	P.	(i)	8	3		9		
	TX Mut	e Confi	g		auto			mute	d 🔻		auto	•		auto		
Modem Serial Number 355260100009	ATPC F	unction	i -					C	1		E	0	6		1	
License Number	ATPC P	X Level	[dBm]		-50		(i)	-5	0	(i)	-5	5		-5	5	
icense Type / Status ermanent / ok	Refre	sh										Undo /	pply to	local	& rem	ote

Figure 5.10 Example of basic Radio parameters configuration

3) Port group configuration must be done according to customer requirements. The requirement in this example is to have In-band management which means that the management is accessible via the same ports where user traffic is passed through. In this case management port must be allocated in the same group with traffic ports (LAN and WAN ports). In the example Management port (MNG) and traffic ports (LAN1, LAN3 and WANa) are grouped into Group 1. Other ports – LAN2 and WANb are grouped in the Group 2 and will not be used or can be intended for any other independent and separated user data traffic. Port grouping configuration is available in web GUI 'Config->Ports->EthVLAN' and must be done in both Phoenix G2 IDUs.

and the second second	TxF	TxP	MSE	RxL		Low		1+1		÷	ligh	RxL	MSE	TxP	TxF
"A#	19000	8	-32.8	-58.0		0032strong / 60M /	227Mb	ACM	0032strong	/ 60M / 227	Mb • 1	-59.2	-33.2	8	17992
SPAP	19000	muted	-35.5	-52.0 + 2		0032strong / 60M /	227Mb	ACM	0032strong	/ 60M / 227	мв × 2 -	-52.0	-36.4	muted	17992
		LOCA	AL					HSB/SD					RE	MOTE	
ADMIN permissions 🕞	Logou	t in: 3 h	1 38 m	27 5											\$
Status	MUX	Eth	VLAN	EthQO	s										
 Config System 	VLANN	IODE		LANT		LAN 2		LAN 3	MEN	G	WAN	A		WAN B	(i
Access	Port Mo	de	bas	sic 🔹		basic 🔹	bas	ic 🔻	basic	•	basic	•	bas	sic	•
IP	Port Gro	oup	gr	oup-1 🔻		group-2 🔻	gr	oup-1 🔻	group	1 .	group-		gr	oup-2	
Radio Ports	Default	VLAN		1		1		1	1		1			1	
Alarms						LANT		LAN2		LANS					
Maintenance								GE switch							
> Tools						WAPta		WAND		MG CPU					

Figure 5.11 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speed for WAN (radio direction) port in both Phoenix G2 IDUs. In the example WANa port is connected to high priority data channel 'ETH1a' and is set on full speed limit 1000 Mbps.

Contraction of the local division of the loc	Т	xF T	TxP 1	ASE	RxL		Low			1+1		High	RxL	MSE	TxP	TxF
2 A 2	19	000	8 -	32.9	-58.0		0032strong	/ 60M / 22	27Mb	ACM	0032strong / 60M /	227Mb • 1 -	-59.2	-33.2	8	1799
SAF	19	000 m	uted -	35.5	-52.0	2	0032strong	/ 60M / 23	27мБ	ACM	0032strong / 60M /	227Mb × 2 +	-51.9	-36.4	muted	1799
	-	1	LOCAL		-				H	SB/SD				REI	OTE	
OMIN permissions 🕞	L	ogout in	n: 3 h 3	9 m	54 5											
Status	M	UX	EthV	AN	Eth	oos										
Config																
System	DA	TAFLOW	V CON	agui	BATION											
Access	PO			1001	SFE		SFP2		SFP3		SFP4	LANT	1.6	AN2	L	ANS
IP Radio		Status			SFP mo	dule	SFP mod	ule	SFP mod	ule		LAN No LINK	LAN	No LINK	LAN	Gbit FULL
Ports	0	Hot St	andby		and the second	off	•			off	•	off	-			-
Alarms	ONF	Mode		T	force1	GX V	auto1GX		auto1GX	•	force1GX •	auto 🔻	auto	•	auto	•
Maintenance Tools	TC	MDIX			-		-		-	-	-	auto 🔻	au	to 🔻	aut	to 🔻
Tools	PORT CONFIG	Flow C	Control		fore	e	force		force		force	off		off	c	off
		1588			off	7	off *		off *	1	off 🔻	off 🔻	0	ff 🔻	of	fr
Date: Tue: 06.11.2018					1		1	-						I		T
Time: 14:48:13	-											LANT		AN2		ANS
Uptime: 4 00:00:46 Refresh status	E												GE	switch	-	
	SW											WANa		AND	MNO	G OPU
Modem Serial Number 355260100009	ETH SWITCH															
License Number	-														C	PU
3010403010100228 License Type / Status	۵.	Chann	ol Sole	et	none	•	none	•	none	•	none 🔻	ETH1a V	nor		BEI1	BEI
permanent / ok	SWAP	Conne			off	-	none	-		none	off	\sim				
License Expiration unlimited		Conne	cted P	on	011		none	wan	a	none	011	none		one	no	one
Firmware Version	×	Traffic	Chan	nel	PTP1		EMM1	ETHI	a	ЕТНІВ	PTP2	EMM2	E	H2a	ET	H2b
0401_09 Running Design 505 (DXN3)	PBPM	Speed (i)	Limit		auto		0	100		0	auto	0	1	000		0
000 (07010)								1								
		Availal	ble Sp	eed			227	.81 Mbp	s			227.81	Mbp	3		

Figure 5.12 Example of port configuration

- 5) In case if EMM module is used, configure it according to EMM configuration description described in section <u>'Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing write button.

The status of 1+1 configuration is displayed in the header of the web GUI:

and the street	TxF	TxP	MSE	RxL	Low	1+1	High	RxL	MSE	TxP	TxF
2 A#	19000	8	-32.8	-58.0	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1	-59.3	-33.2	8	17992
SAF	19000	muted	-35.5	-52.1	+ 2 × 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb × 2 +	-51.8	-36.3	muted	17992
		LOCA	AL			HSB/SD		-	RE	MOTE	

Figure 5.13 Status of 1+1 HSB/SD mode

Example 3 – Basic 1+1 FD protection scheme

The basic 1+1 FD (Frequency Diversity) protection scheme ensure the correct data transmission over the microwave link in case of specific HW block (ODU, IDU-ODU cable, modem) failure or receive conditions degradation, like multipath fading. Two frequency channels are used in this mode – one frequency channel for the Primary ODU pair and another frequency channel for the Secondary ODU pair. **This scheme requires one Phoenix G2 IDU** with connected two ODUs per site.

1+1 FD protection scheme can be enabled by software in web GUI of the IDU in '<u>Config-</u> <u>>System->Mode</u>' page. 1+1 FD mode can be used with one antenna and coupler (or OMT adapter) per site, two ODUs are connected to the coupler. Also two separated antennas per site can be used.

In 1+1 FD mode two transmitters are active, and two receivers receive the identical signal and the IDU decides what stream will be used for final data de-multiplexing. The equipment provides hitless switchover.

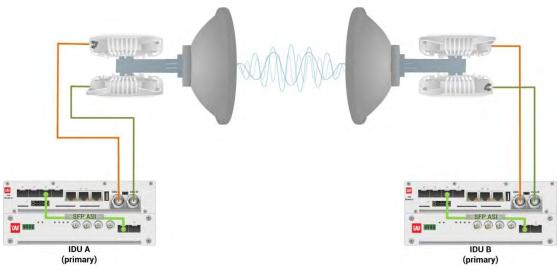


Figure 5.14 Example of 1+1 FD mode

This concrete example describes an application where the Design Type 'Design 505', Functional mode '1+1' and Link diversity 'FD – freq diversity' are selected on both link sides, modulation is 32QAM in BW 60 MHz and the appropriate maximal data speed is about 227 Mbps. The management access is Out-Band management described in section '<u>Management</u> <u>channel configuration options: Management in Separate Channel</u>'.

Configuration steps for basic 1+1 FD protection scheme are following:

1) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+1' and Link Diverity 'FD – freq diversity' in both Phoenix G2 IDUs:

and the second second	TxF	TxP	MSE	RxL	W	Low	1+1	High W	Rx	L MSE	TxP	TxF
WA H	19000	8	-32.7	-58.0	•	0032strong / 60M / 227M	b ACM	0032strong / 60M / 227Mb • 1	59	.1 -33.	2 8	17992
SPAP	18908	9	-37.7	-44.7	2	0032strong / 60M / 227M	6 ACM	0032strong / 60M / 227Mb + 2	44	3 -38.	9	17900
	-	LOC	AL				FD			R	EMOTE	
MIN permissions 🕞	Logou	t in: 2	h 3 m 5	5 s								Write
Status	Mode	De	escripti	on	Date	Time Advanced						
Config System	DESIGN	CONF	IGURA	TION			LOC	AL	1	ACT	ION	(
Access	Design	Туре					Design	505 🔻		Ар	ply	
IP	DESIGN	MODE	s				LOC	AL		ACT	ION	G
Radio	Functio	nal Mo	de				1+1	•	T	-	ply	-
Ports Alarms	Link Div					-	FD - freg dive	rsitv v		_	ply	

Figure 5.15 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use different frequency channels for each ODU pair:

The Composition of	TxF	TxP	MSE	RxL	W	Low			1+1		High	W	RxL	MSE	TxP	TxF
SA F	19000	8	-32.8	-58.1	-	+ 0032stro	ong / 60M /	/ 227Mb	ACM	00	032strong / 60M / 227Mb		-59.2	-33.2	8	17992
SPAF	18908	9	-37.7	-44.8	• 2	+ 0032stro	ong / 60M ;	227Mb	ACM	00	32strong / 60M / 227Mb	• 2 •	-44.4	-38.9	9	17900
	-	LOC	AL						FD			-		RE	IOTE	-
MIN permissions 🗗	Logou	t in: 1	h 59 m	33 s												Write
Status	Param	eters	AC	M	Adva	nced										
Config							LOC	AI.				REM	OTE			G
System Access	MODEN	n			Ó	HANNEL			ANNEL		CHANNEL 1	110011		HANN	EL 2	
IP	Bandwi	dth			60	0000_02	•	60	000_02		60000_02			60000	_02	
Radio	Max Rx	ACM F	rofile		003	2/strong		003	2/strong	•	0032/strong	-	00	32/str	ong 🔻	
Ports	ACM Se	etting				* Å			» 🔅		-			-		
Alarms Maintenance	Advanc	ed Set	ting			default			default		-					
Tools							LOC	CAL				REM	OTE			G
	BADIO				CHA	NNEL 1	(i)	CHAN	INEL 2	1	CHANNEL 1			HANN	EL 2	
	T/R Spa	acing			fixe	d 🔻	(i)	fixed	•	1	fixed			fixe	d	
Date: Wed. 07 11 2018	TX Freq	uency	[MHz]		19	0000	(i)	18	908	(i)	17992			1790	0	
fime: 10:50:50	RX Free	quency	[MHz]		17	7992	(i)	17	900	(i)	19000			1890	8	
Jptime: 0 18:55:58 Refresh status	TX Pow	er Lim	it [dBm	1		8	i	0	9	(i)	8			9		
	TX Mut	e Conf	ig		aut	• •		auto			auto 🔻			auto	•	
Nodem Serial Number	ATPC F	unctio	n					0	1							
icense Number	ATPC R	X Leve	el [dBm]			-50	(i)		50	(j)	-55			-55		
010403010100228 icense Type / Status ermanent / ok	Refre	sh									Undo	Ар	piy to	local (& rem	ote

Figure 5.16 Example of basic Radio parameters configuration

3) Port group configuration must be done according to customer requirements. The requirement in this example is to have Out-band management which means that the management is accessible via separated LAN port from traffic ports. In this case management port and traffic ports must be in different groups. In the example Management port (MNG) will be available only via LAN3 port. In this case those both ports and one of WAN ports (WANa) will be grouped together in the same one group - in Group 1. Other ports which will be used for traffic – LAN1, LAN2 and the second WAN port (WANb) will be grouped in the separated group - Group 2. Port grouping configuration is available in web GUI '<u>Config->Ports->EthVLAN</u>' and must be done in both Phoenix G2 IDUs.

and the second	TxF	TxP	MSE	RxL	W	Low		1+1			High (W	RxL	MSE	TxP	TxF
SAF	19000	8	-32.8	-58.1		• 0032strong	60M / 227Mb	ACM	0032strong	/ 60M /	227Mb +	1 -	-59.1	-33.2	8	17992
SPAP	18908	9	-37.7	-44.8 •	2	+ 0032strong	/ 60M / 227Mb	ACM	0032strong	/ 60M /	227Mb +	2 +	-44.3	-38.9	9	17900
		LOC	AL					FD						RE	OTE	
ADMIN permissions 🕞	Logou	t in: 1	h 59 m	6 s												Write
D Status	MUX	Eth	VLAN	Eth	oos											
Config	VLANN	ODE		LANT		LAN	7	LANS	MIN	G	W	ANA		.W	ANE	G
System	Port Mo			sic	•	basic		isic •	basic		basi		•	basi		•
Access			Da	SIC					1		Dasi	6			-	
IP	Port Gro	oup	g	roup-2		group-2	2 • 0	roup-1 🔻	group	1 7	gro	up-1	•	gro	up-2	
Radio Ports	Default	VLAN		1		1		1	1			1			1	
Alarms						LA	1	LAN2		LAN3						
Maintenance								GE switch								
▷ Tools						WA	la	WAND	K	ONG CPL						

Figure 5.17 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speeds for WAN (radio direction) ports in both Phoenix G2 IDUs. In the example WANa (management) port is connected to high priority data channel 'ETH1a' and is set on speed limit 2 Mbps; WANb (traffic) port is connected to low priority data channel 'ETH1b'and is set on speed limit 300 Mbps.

and the second	T	xF TxF	MSE	RxL	W	Low			1+1		High W	RxL	MSE	TxP	TxF
WA H	19	000 8	-32.7	-58.0	1.	0032strong	/ 60M / 2	27Mb	ACM	0032strong / 60M	1 / 227Mb 🔹 🚺	-59.1	-33.2	8	1799
SAF	18	908 9	-37.7	-44.8 •	2.+	0032strong	/ 60M / 2	27Mb	ACM	0032strong / 60M	1/227Mb + 2	+ -44.4	-38.8	9	1790
	-	LO	CAL						FD			-	RE	IOTE	1
DMIN permissions 🕞	L	ogout in:	1 h 31 n	165											Write
Status	N	IUX E	thVLAN	Eth	oos										-
Config	-				444										
System	DA	TAFLOW C	ONEIGI	BATION											
Access	PO		april list	SFE		SEP	2	SF	P3	SFP4	LANT	1	AN2	11	EMA
IP Radio		Status		SFP mo	dule	SFP mod	lule	SFP m	odule		LAN No LI	10	No LINK		Gbit FULL
Ports	0	Hot Stan	dbu	nocpre	off	T T T	enc.	nocpi	off	T GDR TO	of		1	12	FULL
Alarms	PORT CONFIG	Mode	luby	force10	1.7.7	auto1G)		auto1	1	force1GX •	1.7.1	• aut	0 7	auto	
Maintenance	3	10 - 17 P		Torcert	5A +	autoro				TOICETOX +					-
Tools	RT	MDIX		-		-	_	-			auto 🔻	a	uto 🔻	au	to •
	P	Flow Cor	ntrol	ford	ce	force	9	for	ce	force	off		off	0	off
		1588		off	7	off 1		off	7	off 🔻	off 🔻	0	off 🔻	of	ft
Date: Wed, 07.11.2018						T	-						T		
Time: 11:30:48	I										LANT		AN2		ANIS
Uptime: 0 19:35:55 Refresh status	E											GE	switch		_
	SW										WANa		VANE	MIN	G CPU
Modem Serial Number 355260100009	ETH SWITCH													-	
License Number	-											_		C	PU
3010403010100228		Channel	Colost	none	•	Inone	•	none	•	none 🔻	ETH1a		H1b V	BEI1	RFI2
License Type / Status permanent / ok	SWAP					none		none						1	1.000
License Expiration	S	Connect	ed Port	off		none	wai	na	wanb	of	non	e	ione	n	one
unlimited Firmware Version	-	Traffic C	hannel	PTP1	1	EMM1	ETH	la	ETHID	PTP	2 EMM	2 F	TH2a	FT	H2b
0401_09	PBPM	Speed Li					-	_		-				-	
Running Design 505 (DXN3)	P	(i)		auto		0	2		300	aut	0 0		2	3	00
ona found							-								
							7.81 Mb								

Figure 5.18 Example of port configuration

- 5) In case if EMM module is used, configure it according to EMM configuration description described in section <u>'Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing Write button.

The status of 1+1 configuration is displayed in the header of the web GUI:

and the second second	TxF	TxP	MSE	RxL	Low	1+1	High	RxL	MSE	TxP	TxF
# A#	19000	8	-32.8	-57.9	1 • 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1	-59.1	-33.2	8	17992
SPAP	18908	9	-37.7	-44.8	2 • 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 2 +	-44.4	-38.8	9	17900
	_	LOC	AL			FD			RE	MOTE	

Figure 5.19 Status of 1+1 FD mode

Example 4 – Basic 2+0 FD traffic aggregation

The basic 2+0 FD (Frequency Diversity) aggregation mode allows to increase / double Ethernet traffic capacity over the microwave link using two ODU pairs. Each ODU pair uses its own frequency channel. Provided aggregation is Layer 1 capacity aggregation which internally combines the capacity of both physical channels, therefore aggregation doesn't depend on the MAC addresses of the aggregated frames. This scheme requires one Phoenix G2 IDU with connected two ODUs per site.

2+0 FD mode can be used with one antenna and OMT adapter per site, two ODUs are connected to the OMT adapter. Two separated antennas per site can be used as well.

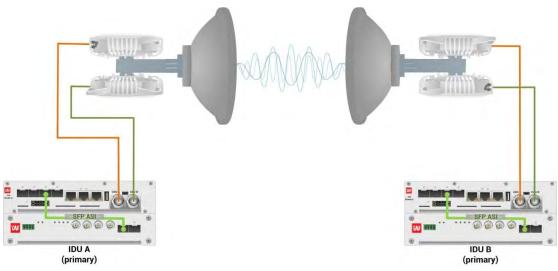


Figure 5.20 Example of 2+0 FD mode

This concrete example describes an application where the Design Type 'Design 505', Functional mode '2+0' and Link diversity 'FD – freq diversity' are selected on both link sides, modulation is 32QAM in BW 60 MHz. The appropriate maximal data speed per one ODU pair is about 227 Mbps. Total aggregated throughput is about 455 Mbps. The management access is In-Band management described in section '<u>Management channel configuration options</u>'.

Configuration steps for basic 2+0 FD protection scheme are following:

 In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '2+0' and Link Diverity 'FD – freq diversity' in both Phoenix G2 IDUs:

The second	TxF	TxP	MSE	RxL	W	Low		2+0			High (W)	RxL	MSE	TxP	TxF
HAH H	19000	8	-32.7	-58.1	٠D	• 0032strong / 60M	/ 227Mb	ACM	0032strong	/ 60M / 2	27Mb +	1.	-59.2	-33.1	8	17992
SAF	18908	9	-37.7	-44.9	• 2	+ 0032strong / 60M	/ 227Mb	ACM	0032strong	/ 60M / 2	27Mb +	2.+	-44.5	-38.8	9	17900
		LOC	AL					FD						RE	NOTE	
DMIN permissions 🕞	Logou	it in: 19	9 m 43	S												Write
Status	Mode	D	escripti	on	Date	&Time Adva	inced									
Config System	DESIGN	CONF	IGURA	TION				LOOA	AL.					ACTI	N	(i
Access	Design	Туре						Design 8	505 🔻					Арр	ly	
IP	DESIGN	MOD	ES.					LDC	AL					ACTI	DN	(j
Radio Ports	Functio	nal Mo	de					2+0	•					Арр	ly	
Alarms	Link Div	versity					FD -	freq dive	rsity 🔻					Арр		

Figure 5.21 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use different frequency channels for each ODU pair:

and the second	TxF	TxP	MSE	RxL	W	Low			2+0			High	W	RxL	MSE	TxP	TxF
SAF	19000	8	-32.8	-58.1		0032stron	g / 60M /	227Mb	ACM	003	2strong / 60M /	227Mb		-59.1	-33.1	8	1799
SFAF	18908	9	-37.6	-44.8	2	0032stron	g / 60M /	227Mb	ACM	0033	2strong / 60M /	227Mb	• 2 •	-44.3	-38.8	9	1790
		LOC	AL						FD						REI	MOTE	
DMIN permissions 🕒	Logou	t in: 1	7 m 46	s													Write
Status	Param	eters	AC	M	Advar	nced											
Config System							LOC	AL					BEM	OTE			(
Access	MODEN				01	ANNEL T		CH	ANNEL	2	CHAN	NEL 1		1	HANN	EL 2	
IP	Bandwi	dth			60	000_02 •		600	000_02		6000	0_02			60000	_02	
Radio	Max Rx		rofile		003	2/strong	•	0032	2/strong	•	0032/st	rong •	•	00)32/str	ong 🔻	
Ports Alarms	ACM Setting					ׇ			» &						-		
Maintenance	Advanced Setting					default			default						-		
Tools	BADIO						LOC	AL					REM	OTE			
	HADIO				CHAI	INEL 1	(i)	CHAN	NEL 2	(i)	CHAN	NEL I		4	CHANN	EL 2	
	T/R Spa	acing			fixed	t 🔹	(i)	fixed	•	1	fix	ed			fixe	d	
Date: Wed. 07.11.2018	TX Freq	uency	[MHz]		19	000	í	189	908	(i)	179	992			1790	00	
Time: 14:06:39	RX Freq	uency	[MHz]		17	992	(1)	179	900	1	190	000			1890	08	
Uptime: 0.22:11:47 Refresh status	TX Pow	er Lim	it (dBm	Ľ		8	(i)	9	9	(j)	8	3			9		
	TX Mut	e Conf	ig		aut	• •		auto	•		auto				auto	•	
Modem Serial Number 355260100009	ATPC F	unctio	n					li.)		E	1					
License Number	ATPC R	X Leve	el (dBm)		-	50	(i)	-8	i0	1	-5	5			-55	i.	
3010403010100228 License Type / Status	Refre	sh										Undo	Ap	ply to	local	& rem	ote

Figure 5.22 Example of basic Radio parameters configuration

3) Port group configuration must be done according to customer requirements. The requirement in this example is to have In-band management which means that the management is accessible via the same ports where user traffic is passed through. In this case management port must be allocated in the same group with traffic ports (LAN and WAN ports). In the example Management port (MNG) and traffic ports (LAN1, LAN2, LAN3 and WANa) are grouped into Group 1. WANb port is left disconnected and will not be used, so it is assigned to another group which is Group 2 in this case. Port grouping configuration is available in web GUI '<u>Config->Ports->EthVLAN</u>' and must be done in both Phoenix G2 IDUs.

A REAL PROPERTY.	TxF	TxP	MSE	RxL	W	Low		2+0		High W	RxL	MSE	TxP	TxF
"A #	19000	8	-32.7	-58.0		0032strong /	60M / 227Mb	ACM	0032strong / 60M	/ 227Mb + 1	-59.2	-33.1	8	17992
SAF	18908	9	-37.6	-44.8	2	0032strong /	60M / 227Mb	ACM	0032strong / 60M	/ 227Mb + 2	-44.4	-38.8	9	17900
		LOC	AL					FD				RE	MOTE	
DMIN permissions 🕞	Logou	t in: 3	h 59 m	53 s										Write 🚳
Status	MUX	Eth	VLAN	Eth	qos									
Config System	VLANM	ODE		LAN T		LAN 2		LANS	MNG	WAN	A	N	ANE	(i)
Access	Port Mo	de	ba	sic	•	basic	• ba	isic 🔻	basic 🔻	basic		basi	ic	•
IP	Port Gro	oup	g	roup-1	•	group-1	• g	roup-1 🔻	group-1 🔻	group-1	*	gro	up-2	
Radio Ports	Default	VLAN		1		1		1	1	1			1	
Alarms						LANT		LANE	LANS					
Maintenance								GE switch						
Tools						WAN		WAND	MING CR	U)				

Figure 5.23 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speed for WAN (radio direction) port in both Phoenix G2 IDUs. In the example WANa port is connected to high priority data channel 'ETH1a' and is set on full speed limit 1000 Mbps.

A CONTRACTOR OF	T	xF T	P MSE	RxL	W I	_ow		2+0		High	W	RxL MSE	TxP	TxF
WA H	19	000 8	3 -32.7	-58.0 +	1.	0032strong / I	50M / 227M	ACM	0032strong / 60M	/ 227Mb	1.	59.1 -33.1	8	1799
SAF	18	908 9	-37.6	-44.9 +	2 +	0032strong / I	50M / 227M	ACM	0032strong / 60M	227Mb	2 + -	44.4 -38.9	9	1790
		U	OCAL					FD				RE	NOTE	
MIN permissions 🕞	L	ogout in	3 h 56 m	28 s									1	Write
Status	N	IUX	EthVLAN	Eth	oos									
Config														1
System	DA	TAFLOW	CONFIGU	RATION										
Access IP	PO	RT		SFI	T	SFP2		SFP3	SPP4	4	ANT	LAN2	11	ANS
Radio		Status		SFP mo	odule	SFP mode	ent n	FP module ot present	GD Gbit FD	LAN	No LINK	LAN No LIN	K LAN	Gbit FULL
Ports	0	Hot Sta	indby		off	•		of	f v		off			-
Alarms	ONF	Mode		force1	GX V	auto1GX	▼ a	uto1GX V	force1GX	aut	• •	auto	aut	0
Maintenance Tools	TC	MDIX		-	-	-		-	-	a	uto 🔻	auto 🔻	a	uto 🔻
10013	PORT CONFIG	Flow Co	ontrol	for	cé	force		force	force		off	off		off
		1588		off	v	off *		off T	off T	0	off 🔻	off •	0	off 🔻
Date: Wed, 07.11.2018														
Time: 14:17:49 Uptime: 0 22:22:57	Ŧ										LANT	LAN2	E	LANS
Refresh status	UTC									-		GE switch	1.000	
	ETH SWITCH										VANE	WAND	3.0	IG CPU
Modem Serial Number 355260100009	Ē													CPU
License Number													T	CFU
3010403010100228 License Type / Status	d	Channe	Select	none	•	none	-	none 🔻	none 🔻	ET	H1a 🔻	none •	REF	1 REI
permanent / ok License Expiration	SWAP	Соппес	ted Port	off	I	none	wana	nor	ne of	ff	none	none	r	none
unlimited Firmware Version	Z	Traffic	Channel	PTP1	1	EMM1	ETHIa	ETH	1b PT	P2	EMM2	ETH2a	E	TH2b
0401_09	PBPM		Limit ①	auto		0	1000	0			0	0		0
Running Design 505 (DXN3)	-		ggr Speed	1					455.6 Mbps ETH		0			U
	-	Avail A	adi obeen	-					ioo.o mops citti					
							-				_			

Figure 5.24 Example of port configuration

- 5) In case if EMM module is used, configure it according to EMM configuration description described in section '<u>Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing Write button.

The status of 2+0 configuration is displayed in the header of the web GUI:

	TxF	TxP	MSE	RxL		Low	2+0	High	RxL	MSE	TxP	TxF
24	19000	8	-32.7	-58.0	•	+ 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1.				
SAF	18908	9	-37.6	-44.8	• 2	• 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 2 +	-44.5	-38.9	9	17900
		100	AL				ED			BE	MOTE	

Figure 5.25 Status of 2+0 FD mode

Example 5 – Basic 2+0 XPIC traffic aggregation

The basic 2+0 XPIC (Cross-polar Interference Cancellation) aggregation mode allows to increase / double Ethernet traffic capacity over the microwave link using two ODU pairs. Both ODU pairs use the same frequency channel in different polarization – one ODU pair works in Horizontal polarization, the second ODU pair works in Vertical polarization. Provided aggregation is Layer 1 capacity aggregation which internally combines the capacity of both physical channels, therefore aggregation doesn't depend on the MAC addresses of the aggregated frames. This scheme requires one Phoenix G2 IDU with connected two ODUs per site.

2+0 XPIC mode can be used with one antenna and OMT adapter per site, two ODUs are connected to the OMT adapter.

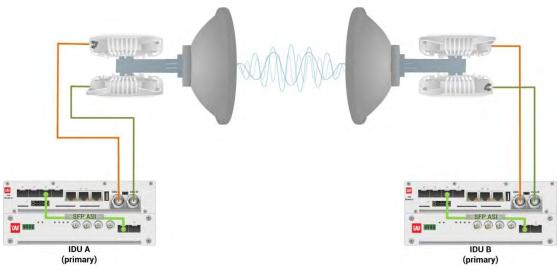


Figure 5.26 Example of 2+0 XPIC mode

This concrete example describes an application where the Design Type 'Design 505', Functional mode '2+0' and Link diversity 'XPIC' are selected on both link sides, modulation is 32QAM in BW 60 MHz. The appropriate maximal data speed per one ODU pair is about 227 Mbps. Total aggregated throughput is about 455 Mbps. The management access is In-Band management described in section '<u>Management channel configuration options</u>'.

Configuration steps for basic 2+0 XPIC protection scheme are following:

 In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '2+0' and Link Diverity 'XPIC' in both Phoenix G2 IDUs:

Contraction of the	TxF	TxP	MSE	RxL	W	Low		2-	+0		High	W	RxL	MSE	TxP	TxF
SAF	19000	15	-36.2	-50.8	•	0032strong	60M / 227M	b AC	CM c	032strong / 60M /	227Mb	· 🖸 ·	-52.0	-36.7	15	17992
3/1F	19000	9	-37.4	-44.9	• 2	• 0032strong	60M / 227M	ь АС	CM d	032strong / 60M /	227Mb	• 2 •	-44.5	-38.2	9	17992
		LOC	AL					XF	PIC					REI	MOTE	
ADMIN permissions 🕞	Logou	nt in: 3	h 19 m	22 s												Write
Status	Mode	D	escripti	on	Date	&Time	Advanced									
 Config System 	DESIGN	CONF	IGURA	TION					LOCAL					ACTIO	DN	(
Access	Design	Туре						De	esign 50	5 🔻				Арр	ly	
IP	DESIGN	MOD	ES						LOCAL					ACTI	DN	0
Radio Ports	Functio	nal Mo	ode					2	2+0	۲				Арр	iy	
Alarms	Link Div	versity						XPIC						Арр		
Maintenance	RADIO	MODE	s				CHANNE	ELT		CHANNE	12			ACTIO		0
> Tools	Duplex	Mode					Bidirectio	nal V		Bidirection	alv			Арр	iv	

Figure 5.27 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use the same frequency channel for both ODU pairs:

State of the second	TxF TxP MSE F	RxL W Low		2+0		High 🛞	RxL MSE TxP	TxF
ŠA Ë	19000 15 -36.2 -5	50.0 + 1 + 0032stro	ng / 60M /	227МЬ АСМ	003	2strong / 60M / 227Mb • 1	+ -52.2 -36.9 15	1799
SPAF	19000 9 -37.4 -4	14.9 • 2 • 0032stro	ng / 60M /	227Mb ACM	003	2strong / 60M / 227Mb + 2	+ -44.4 -38.6 9	1799
	LOCAL			XPIC			REMOTE	
OMIN permissions 🕒	Logout in: 3 h 13 m 2	3 s						Vrite
Status	Parameters ACM	Advanced						
Config			LOC	AL		BE	NOTE	(
System Access	MODEM	CHANNEL	1	CHANNEL	2	CHANNEL 1	CHANNEL 2	
IP	Bandwidth	60000_02	•	60000_02	•	60000_02	60000_02	
Radio	Max RxACM Profile	0032/strong		0032/stron	g 🔻	0032/strong •	0032/strong •	
Ports Alarms	ACM Setting	» 🌣		» 夺		-		
Maintenance	Advanced Setting	default		default			-	
Tools			LOO	AL		REI	MOTE	(
	RADIO	CHANNEL 1	(i)	CHANNEL 2	(i)	CHANNEL T	CHANNEL 2	
	T/R Spacing	fixed v	í	fixed 🔻	i	fixed	fixed	
Date: Wed. 07.11.2018	TX Frequency [MHz]	19000	(1)	19000	(1)	17992	17992	
ime: 15:28:01	RX Frequency [MHz]	17992	(j)	17992	í	19000	19000	
Jptime: 0 00:54:07 Refresh status	TX Power Limit [dBm]	15	1	9	i	15	9	
	TX Mute Config	auto 🔻		auto 🔻		auto 🔻	auto 🔻	
Nodem Serial Number	ATPC Function							
icense Number	ATPC RX Level [dBm]	-50	(i)	-50	i	-55	-55	
010403010100228 icense Type / Status	Refresh					Undo A	pply to local & remo	ote

Figure 5.28 Example of basic Radio parameters configuration

3) Port group configuration must be done according to customer requirements. The requirement in this example is to have In-band management which means that the management is accessible via the same ports where user traffic is passed through. In this case management port must be allocated in the same group with traffic ports (LAN and WAN ports). In the example Management port (MNG) and all traffic ports (LAN1, LAN2, LAN3, WANa and WANb) are grouped into Group 1. Port grouping configuration is available in web GUI '<u>Config->Ports->EthVLAN</u>' and must be done in both Phoenix G2 IDUs.

No. of Concession, Name	TxF	TxP	MSE	RxL	W	Low		2+0			High (R	xL	MSE	TxP	TxF
"A"	19000	15	-35.8	-50.8	1	+ 0032strong / 601	M/157Mb	ACM	0032strong	60M / 1	42Mb +	+ -5	2.0	-37.0	15	17992
SPAP	19000	9	-37.1	-44.8	2	• 0032strong / 60	M / 181Mb	ACM	0032strong	/ 60M / 1	52Mb +	2 + -4	4.3	-38.6	9	17992
		LOC	AL					XPIC						RE	NOTE	
ADMIN permissions 🗗	Logout	în: 2	h 59 m	50 s												Write
Status	MUX	Eth	VLAN	Eth	QOS											
 Config System 	VLAN M	ODE		LANT		LAN 2		AN 3	MNG	3	W	AN A		M	AN B	0
Access	Port Mo	de	ba	sic	•	basic	• bas	ic 🔻	basic	۲	basic	•		basi	с	•
IP	Port Gro	up	g	roup-1	•	group-1 *	gro	oup-1 🔻	group-1		grou	ip-1 🔻		gro	up-1	
Radio Ports	Default	VLAN		1		1		1	1			1			1	
Alarms						LAWI		LAN2		LANS						
Maintenance								GE switch			-					
> Tools						WANE		WANE	M	NG CPU						

Figure 5.29 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speed for WAN (radio direction) port in both Phoenix G2 IDUs. In the example WANa port is connected to high priority data channel 'ETH1a' and is set on full speed limit 1000 Mbps.

The second second	Т	xF	TxP	MSE	RxL	W	Low			2+0				High	W	RxL	MSE	TxP	TxF
WA#	19	000	15	-36.2	-50.9 •	D -I	0032strong	/ 60M / 22	27Mb	ACM	1	0032strong	/ 60M / 22	7Mb +	1.	52.0 ·	-36.9	15	17993
SAL	19	000	9	-37.5	-44.8 •	2.1	0032strong	/ 60M / 22	27Mb	ACM	1	0032strong	/ 60M / 22	7Mb +	2 + -	44.5 ·	-38.4	9	17992
			LOCA	L						XPIC	2						REM	IOTE	
DMIN permissions 🕞	b	ogout	in: 2 h	54 m	36 s														Write
Status	M	IUX	Eth	VLAN	Eth	QOS													
Config																			0
System Access	DA	TAFLO	W COI	IFIGU	RATION														
IP	PO	RT			SF		SFP			FP3		SFI		1	ANT	U	AN2	L	ANS
Radio		Statu	IS		SFP m not pr	odule esent	SFP mo not pre	dule	SFP	module	Ł	DD GI	SFP it FD	LAN	No LINK	LAN	No LINK	LAN	Gbit FULL
Ports	9	Hot S	standb	ý		off	•			0	off	•			off				-
Alarms Maintenance	INO	Mode			force1	GX 🔻	auto1G	X V	auto	IGX •	1	force1	GX 🔻	auto	•	auto	•	auto	• •
Tools	PORT CONFIG	MDIX	6				-			-				au	to 🔻	au	to 🔻	au	ito 🔻
	POF	Flow	Contro	ol	for	ce	forc	e	fe	orce		for	ce		off		off		off
		1588			off	Ψ.	off	7	o	ff v		off	τ	0	ff 🔻	of	ff 🔻	0	ff 🔻
Date: Wed, 07.11.2018										T									1
Time: 15:46:17 Uptime: 0.01:12:23	Ŧ														ANT	0.0	AN2		ANS
Refresh status	VITO													-		_	switch	-	
Modem Serial Number	ETH SWITCH														ANE	W	AND	MP	IC CPU
355260100009	Ē																	0	CPU
License Number 3010403010100228														-				T	
License Type / Status	d	Chan	nel Se	lect	none		none	•	nor	ie v		none	•	ETH	la v	non	e v	REIT	RF12
permanent / ok	SWAP	Conn	ected	Port	off		none	wa	na	no	one		off	-	none	n	one	n	ione
License Expiration unlimited						-												-	
Firmware Version	W	Traffi	ic Cha	nnel	PTP1	1	EMM1	ETH	l]a	ET	H1b		PTP2		EMM2	ET	H2a	E	TH2b
0401_09 Running Design	PBPM	Spee	d Limi	t (i)	auto		0	(10	00		0	_	auto		0		0		0
505 (DXN3)	-	Avail	Aggr	Speed				~	\sim	-	455.	6 Mbps E	ГН				-		
			-					-	_	_					-				
		Mode	em Spe	eed			227.81	Mbps	active	2				227	81 Mbj	os a	ctive		
																		AP	OFT THE

Figure 5.30 Example of port configuration

- In case if EMM module is used, configure it according to EMM configuration description described in section <u>'Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing Write button.

The status of 2+0 configuration is displayed in the header of the web GUI:

and the second	TxF	TxP	MSE	RxL	Low		2+0	High	RxL	MSE	TxP	TxF
"A #	19000	15	-36.2	-50.7	1 + 003	2strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1	-51.4	-34.3	15	17992
SAF	19000	9	-37.5	-44.7	2 + 003	2strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 2	-44.4	-38.6	9	17992
		LOC	AL				XPIC			RE	MOTE	

Figure 5.31 Status of 2+0 XPIC mode

Example 6 – 1+0 Dual FD connection scheme for link capacity increasing

The 1+0 Dual FD (Frequency Diversity) mode is advanced 1+0 mode which allows increasing Ethernet traffic capacity of the link by passing two independent Ethernet data streams over two separated independent physical data channels using two ODU pairs. Each ODU pair uses its own frequency channel. This configuration can be used for two independent network data passing through the link, internal aggregation is not provided in this configuration. If required, external aggregation can be performed in external network devices. **This scheme requires one Phoenix G2 IDU with connected two ODUs per site**.

In case of link capacity increasing the 1+0 Dual FD mode can be used with one antenna and OMT adapter per site, two ODUs are connected to the OMT adapter. Two separated antennas per site can be used as well.

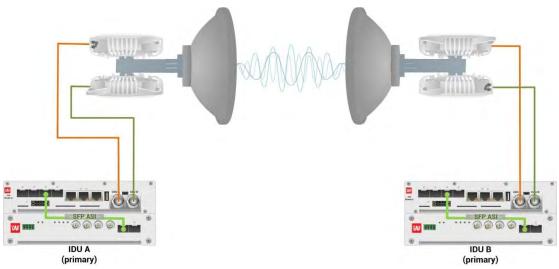


Figure 5.32 Example of 1+0 Dual FD mode for link capacity increasing

This concrete example describes an application where the Design Type 'Design 505', Functional mode '1+0 Dual' and Link diversity 'FD – freq diversity' are selected on both link sides, modulation is 32QAM in BW 60 MHz. The appropriate maximal data speed per each physical data channel (per one ODU pair) is about 227 Mbps. Total throughput over the link is about 227Mbps + 227Mbps = 454 Mbps. The management access is In-Band management described in section '<u>Management channel configuration options</u>'.

Configuration steps for this 1+0 Dual FD mode are following:

1) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+0 Dual' and Link Diversity 'FD – freq diversity' in both Phoenix G2 IDUs:

and an and a second second	TxF	TxP	MSE	RxL	W Lor	N	1+0 DUAL		High (R	LN	ISE	TxP	TxF
SAF	19000	15	-36.4	-50.6	+ 1 + 00	32strong / 60M / 223	мь асм	0032strong / 60M / 2	227Mb +	+ -5	.9 -3	7.1	15	17992
SPAF	18908	9	-37.7	-44.8	• 2 + 00	32strong / 60M / 227	мь АСМ	0032strong / 60M / 3	27Mb +	• -4	.3 -3	8.8	9	17900
		LOC	AL				FD					REN	OTE	
DMIN permissions 🕞	Logou	t in: 3	h 15 m	51 s										Write
Status	Mode	D	escripti	on	Date&Tir	ne Advance	d i							
Config System	DESIGN	CONF	IGURA	TION			LOC	AL			A	CTIO	N	(
Access	Design	Туре					Design	505 🔻			L	Appl	у	
IP	DESIGN	MOD	ES				LDC	AL.			A	CTIO	N	G
Radio Ports	Functio	nal Mo	ode				1+0 Du	ual 🔻			L	Appl	у	
Alarms	Link Div	/ersity					FD - freq dive	ersity 🔻			L	Appl	у	
Maintenance	BADIO	MODE	s.			CHAN	NELI	CHANNEL	2		A	CTIO	N	G
Tools	Duplex	Mode				Bidirect	ional T	Bidirectiona	al 🔻			Appl	y	

Figure 5.33 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use different frequency channels for each ODU pair:

Contraction of the	TxF	TxP	MSE	RxL	W	Low			1+0 DUA	L	Hi	igh W	RxL	MSE	TxP	TxF
SAF	19000	15	-36.4	-50.4	•	• 0032str	ong / 60M /	227Mb	ACM	0	032strong / 60M / 2271	ив + 🚺	.51.9	-37.1	15	1799
SPAF	18908	9	-37.7	-44.7	• 2	+ 0032str	ong / 60M /	227Mb	ACM	0	032strong / 60M / 2271	vib + 2	.44.3	-38.9	9	17900
	-	LOC	AL			-			FD				-	RE	MOTE	
MIN permissions 🕞	Logou	t in: 3	h 13 m	11 s												Write
Status	Param	eters	AC	M	Adva	nced										
Config							100	AL				BEN	OTE			0
System Access	MODEN				C	HANNEL	1	1	HANNEL	2	CHANNEL	.1		CHANN	EL 2	
IP	Bandwi	dth			6	0000_02	•	e	0000_02		60000_0	2		60000	_02	
Radio	Max Rx	ACM F	rofile		003	32/stron	g 🔻	00	32/strong	•	0032/stron	g 🔻	0	032/str	ong 🔻	
Ports	ACM Se	etting			-	» 🅸			» ġ					-	-	-
Alarms Maintenance	Advanc	ed Set	ting			default			default		+			÷		
Tools							Loo	AL				REN	OTE			(
	RADIO				ĊHA	NNEL 1	(j)	CH	NNEL 2	(j)	CHANNEL	.1		CHANN	EL 2	
	T/R Spa	acing			fixe	d 🔻	í	fix	ed 🔻	i	fixed			fixe	d	
anti-rest in second	TX Freq	uency	[MHz]		1	9000	í	1	8908	1	17992			1790	00	
Date: Thu, 08.11.2018 Time: 11:11:35	RX Freq	uency	[MHz]		1	7992	(i)	1	7900	(i)	19000	1		1890	08	
Jptime: 0 19:01:45 Refresh status	TX Pow	er Lim	it (dBm	1		15	í		9	(i)	15			9		
	TX Mute	e Conf	ig		aut	to 🔻		au	to 🔻		auto	•		auto	•	
Aodem Serial Number	ATPC F	unctio	n			0					0					
icense Number 8010403010100228	ATPC R	X Leve	el (dBm)			-50	١		-50	(j)	-55			-55		
icense Type / Status	Refre	sh									Un	do Ap	ply to	local	& rem	ote

Figure 5.34 Example of basic Radio parameters configuration

3) Port group configuration must be done according to the customer requirements. The requirement in this example is to have In-band management which means that the management is accessible via the same port where user traffic is passed through. In this 1+0 Dual FD configuration two separated data streams are used which means that also LAN ports must be separated for user traffic by assigning them into different groups. In this case management port must be allocated in the group with one of both traffic ports (LAN and WAN ports). In the example the first Ethernet data stream will use LAN1 and WANa ports and will be grouped in Group 1, but the second Ethernet data stream will use LAN2 and WANb ports and will be grouped in Group 2. Management port (MNG) will be accessible via LAN3 port and will be added to Group 1 in order to have remote access.

Adding both Ethernet data stream ports (LAN and WAN) in the same one group will create Ethernet loop.

Out-band management is available only for local management access by assigning MNG port and management LAN port (LAN3) to the third group which differs from both traffic port groups. Both WAN ports are assigned to traffic port groups. That is why management in this case will not be available remotely.

Port grouping configuration is available in web GUI 'Config->Ports->EthVLAN' and must be done in both Phoenix G2 IDUs.

The Control of Control	TxF 1	TxP	MSE	RxL	W	Low		1+0 DUAL		ł	ligh 🛞	RxL	MSE	TxP	TxF
"A "	19000	15	-36.4	-50.6		0032strong / 60M	/ 227Mb	ACM	0032strong / I	60M / 227	Mb + 1	• -52.0	-37.1	15	17992
SAF	18908	9	-37.7	-44.7	2	0032strong / 60M	/ 227Mb	ACM	0032strong /	50M / 221	мь + 2	+ -44.3	-38.8	9	17900
	5	LOCA	L					FD				-	RE	MOTE	
ADMIN permissions 🗗	Logouti	n: 3 h	7 m 33	25											Write
> Status	MUX	Eth	VLAN	Eth	QOS										
 Config System 	VLAN MO	ΦE		LAN T		LAN 2		LAN 3	MNG		WAN	A	V	VANB	1
Access	Port Mode	e	bas	sic	•	basic 🔹	ba	sic 🔻	basic	•	basic	•	bas	ic	•
IP	Port Grou	р	gr	oup-1	•	group-2 V	gi	oup-1 🔻	group-1	•	group	1 🔻	gro	oup-2 •	
Radio Ports	Default VI	LAN		1		1		1	1		1			1	
Alarms						LANI		LAN2	Ē	AN3					
Maintenance								GE switch							
Tools						WANa		WAND	MN	G CFU					

Figure 5.35 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speed for WAN (radio direction) port in both Phoenix G2 IDUs. In the example WANa port is connected to high priority data channel 'ETH1a' of the first independent data channel and is set on full speed limit 1000 Mbps, but the WANb port is connected to high priority data channel 'ETH2a' of the second independent data channel and is set on full speed limit 1000 Mbps.

Concession of the	T	xF TxP	MSE	RxL	W	Low		1+0 DUAL		High W	RxL MSE	TxP TxF
"A"	19	000 15	-36.3	-50.7 +	۰.	0032strong / 60	M / 227Mb	ACM	0032strong / 60M	/ 227Mb + 🚺 +	-51.9 -37.1	15 1799
3/11	18	908 9	-37.7	-44.7 •	2.	0032strong / 60	M / 227Mb	ACM	0032strong / 60M	/ 227Mb • 2 •	-44.3 -38.9	9 1790
		LOCA	L					FD			REI	IOTE
DMIN permissions 🕞	D	ogout in: 2 h	39 m	5 s								Write
Status Config System	M	IUX Eth	VLAN	Etho	os							
Access		TAFLOW CO	NFIGL									
IP	PO	AT		SFP		SFP2		FP3	SFP4	LANT	LAN2	LANS
Radio		Status		SFP mot not pre	sent	SFP module not present	SFP r	nodule	Gbit FD	LAN No LINK	LAN No LINK	Gbit FULL
Ports	9	Hot Standb	y		off	•		off	•	off	•	-
Alarms Maintenance	INO	Mode		force1G	X V	auto1GX •	auto	IGX •	force1GX •	auto 🔻	auto 🔻	auto 🔻
Tools	PORT CONFIG	MDIX		-				-	-	auto 🔻	auto 🔻	auto 🔻
	POF	Flow Contro	ol	force	e	force	fo	orce	force	off	off	off
		1588		off	Ŧ	off *	0	ff T	off T	off •	off •	off 🔻
Date: Thu, 08.11.2018												
Time: 11:53:29	I									LANI	LANZ	LANS
Uptime: 0 19:43:39 Refresh status	E										GE switch	-
	MS									WANB	WANG	MNG CPU
Modem Serial Number 355260100009 License Number	ETH SWITCH											CPU
3010403010100228 License Type / Status	SWAP	Channel Se	lect	none	T	none 🔻	nor	e v	none 🔻	ETH1a V	ETH2a 🔻	REI1 REI2
permanent / ok License Expiration unlimited	MS	Connected	Port	off		none	wana	none	off	none	wanb	none
Firmware Version	-	Traffic Cha	nnel	PTP1		EMM1	ETHIa	ETH1b	PTP	2 EMM2	ETH2a	ETH2b
0401_09 Running Design	PBPM	Speed Limi	t	auto		0 (1000	0	auto	0	1000	0
505 (DXN3)		C.			-		-			1	~	
		Available S	hood			227.81	Mhoe			227.91	Mbps	

Figure 5.36 Example of port configuration

- 5) In case if EMM module is used, configure it according to EMM configuration description described in section '<u>Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing write button.

The status of 1+0 Dual FD configuration is displayed in the header of the web GUI:

	TxF	TxP	MSE	RxL	Low	1+0 DUAL	High	RxL	MSE	TxP	TxF
WA H	19000	15	-36.3	-50.6	1 • 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 1 +	-51.9	-37.1	15	17992
SAF	18908	9	-37.7	-44.7	2 + 0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb + 2 +	-44.3	-38.8	9	17900
		LOC	AL			FD		-	RE	MOTE	1.1.1.1

Figure 5.37 Status of 1+0 Dual FD mode

Example 7 – 1+0 Dual XPIC connection scheme for link capacity increasing

The 1+0 Dual XPIC (Cross-polar Interference Cancellation) mode is advanced 1+0 mode which allows increasing Ethernet traffic capacity of the link by passing two independent Ethernet data streams over two separated independent physical data channels using two ODU pairs. Both ODU pairs use the same frequency channel in different polarization— one ODU pair works in

Horizontal polarization, the second ODU pair works in Vertical polarization. This configuration can be used for two independent network data passing through the link, internal aggregation is not provided in this configuration. If required, external aggregation can be performed in external network devices. This scheme requires one Phoenix G2 IDU with connected two ODUs per site.

In case of link capacity increasing the 1+0 Dual XPIC mode can be used with one antenna and OMT adapter per site, two ODUs are connected to the OMT adapter. Two separated antennas per site can be used as well.

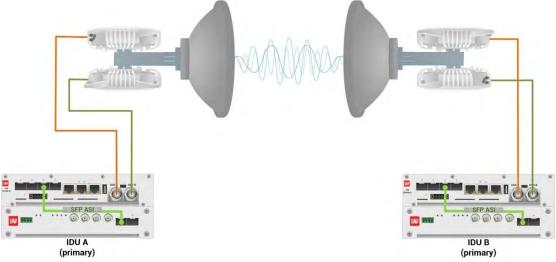


Figure 5.38 Example of 1+0 Dual XPIC mode for link capacity increasing

This concrete example describes an application where the Design Type 'Design 505', Functional mode '1+0 Dual' and Link diversity 'XPIC' are selected on both link sides, modulation is 32QAM in BW 60 MHz. The appropriate maximal data speed per each physical data channel (per one ODU pair) is about 227 Mbps. Total throughput over the link is about 227Mbps + 227Mbps = 454 Mbps. The management access is In-Band management described in section 'Management channel configuration options'.

Configuration steps for this 1+0 Dual XPIC mode are following:

1) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+0 Dual' and Link Diversity 'XPIC' in both Phoenix G2 IDUs:

and the second second	TxF	TxP	MSE	RxL	W Low		1+0 DUAL		High	W	RxL	MSE	TxP	TxF
ŠAF	19000	15	-36.3	-50.5	• 1 • 0032strong	/ 60M / 227Mb	ACM	0032strong / 60	M / 227Mb	· 🚺 ·	-51.8	-37.0	15	17992
SAF	19000	9	-37.5	-44.7	• 2 • 0032strong	/ 60M / 227Mb	ACM	0032strong / 60	м / 227Мb	. 2 .	-44.3	-38.6	9	17992
		LOC	AL				XPIC					RE	MOTE	
ADMIN permissions 🕞	Logou	t in: 3	h 46 m	38 5										Write
Status	Mode	D	escripti	on	Date&Time	Advanced								
Config System	DESIGN	CONF	IGURA	TION			LOCA	AL.				ACTIO	DN	(
Access	Design	Туре					Design (505 🔻				Арр	ly	
IP	DESIGN	MOD	ES				LOC	AL				ACTI	DN	0
Radio Ports	Functio	nal Mo	ode				1+0 Du	ial 🔻				Арр	ly	
Alarms	Link Div	/ersity				XF	PIC	•				Арр	ly	
Maintenance Tools	RADIO	VIDE	s			CHANNEL 1		CHAN	NEL 2			ACTIO	DN	0
> TOOIS	Duplex	Mode				Bidirectional	•	Bidirect	ional 🔻			Арр	iy	

Figure 5.39 Example of System configuration

2) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters in both Phoenix G2 IDUs. Use the same frequency channel for both ODU pairs:

Contraction of the	TxF	TxP	MSE	RxL	W	Low			1+0 DUA	L		Hi	gh 🛞	RxL	MSE	TxP	TxF
ŠA Ë	19000	15	-36.2	-50.5	•	0032stron	g / 60M /	227Mb	ACM	0	032strong / I	60M / 227N	иь • 🚺	+ -51.8	-36.0	15	17992
SPAF	19000	9	-37.4	-44.7	+ 2 -	0032stron	g / 60M /	227Mb	ACM	0	032strong / I	50M / 227M	/b + 2	+ -44.3	-37.5	9	17992
		LOC	AL						XPIC					-	REI	MOTE	
MIN permissions 🕞	Logou	nt in: 3	h 34 m	29 5												1	Write
Status	Param	eters	AC	M	Advan	ced											
Config	The second						LOC	AL					RE	IOTE			G
System Access	MODEN	n.			CH	ANNEL 1		C	HANNEL	2	.0	HANNEL	1		CHANN	EL 2	
IP	Bandwi	dth			60	000_02 •		6	0000_02	•		60000_0	2		60000	_02	
Radio	Max Rx	ACM	Profile		003	2/strong	•	003	32/strong	•	00	32/stron	g v	0)32/str	ong 🔻	
Ports	ACM Se	etting				»#			* 10			4			-	-	
Alarms Maintenance	Advanc	ed Set	ting			default			default			-			-		
Tools							LOD	AL.					RET	OTE			(i
	RADIO				CHAN	INEL 1	(i)	CHA	NNEL 2	(1)) 0	HANNEL	.1		CHANN	EL 2	
	T/R Spa	acing			fixed	•	(i)	fixe	d 🔻	1	>	fixed			fixe	d	
and distant	TX Freq	uency	[MHz]		19	000	(i)	1	0000	(1)		17992			1799	2	
ate: Thu, 08.11.2018 ime: 15:26:19	RX Free	quency	[MHz]		17	992	(1)	1	7992	(1)		19000			1900	00	
Jptime: 0 23:16:29 Refresh status	TX Pow	er Lim	it (dBm		-	15	(i)		9	()	15]		9		
	TX Mut	e Conf	ïg		auto	•		aut	• •		1	auto	•		auto	•	
Nodem Serial Number 55260100009	ATPC F	unctio	n		1	1											
icense Number	ATPC R	X Leve	el (dBm)		-	50	(i)		-50	(1		-55			-55		
010403010100228 icense Type / Status ermanent / ok	Refre	sh										Un	do Ap	ply to	local	& rem	ote

Figure 5.40 Example of basic Radio parameters configuration

3) Port group configuration must be done according to the customer requirements. The requirement in this example is to have In-band management which means that the management is accessible via the same port where user traffic is passed through. In this 1+0 Dual XPIC configuration two separated data streams are used which means that also LAN ports must be separated for user traffic by assigning them into different groups. In this case management port must be allocated in the group with one of both traffic ports (LAN and WAN ports). In the example the first Ethernet data stream will use LAN1 and WANa ports and will be grouped in Group 1, but the second Ethernet data stream will use LAN2 and WANb ports and will be grouped in Group 2. Management port (MNG) will be accessible via LAN3 port and will be added to Group 1 in order to have remote access.



Adding both Ethernet data stream ports (LAN and WAN) in the same one group will create Ethernet loop.

Out-band management is available only for local management access by assigning MNG port and management LAN port (LAN3) to the third group which differs from both traffic port groups. Both WAN ports are assigned to traffic port groups. That is why management in this case will not be available remotely.

Port grouping configuration is available in web GUI '<u>Config->Ports->EthVLAN</u>' and must be done in both Phoenix G2 IDUs.

and the second second	TxF	TxP	MSE	RxL	W	Low		1+0 DUAL		н	igh 🛞	RxL	MSE	TxP	TxF
242	19000	15	-36.2	-50.6		0032strong	/ 60M / 227Mb	ACM	0032strong	60M / 227	Mb + 1	+ -51.9	-36.9	15	17992
SAF	19000	9	-37.5	-44.8	2	0032strong	/ 60M / 227Mb	ACM	0032strong	60M / 227	Mb + 2	+ -44.2	-38.6	9	17992
		LOC	AL					XPIC					RE	MOTE	
ADMIN permissions 🕞	Logou	t in: 3	h 28 m	44 s											Write
Status	MUX	Eth	VLAN	Eth	qos										
Config	VLANN	IOOE		LANT		LAN	2	LAN 3	MNG	į.	WA	NA	V	VAN B	G
System Access	Port Mo	de	ba	sic	۲	basic	• ba	sic 🔻	basic	T	basic	•	bas	ic	•
IP	Port Gr	oup	g	roup-1	•	group-	2 v g	roup-1 🔻	group-1		group)-1 ▼	gro	oup-2	
Radio	Default	VLAN		1		1		1	1		1			1	
Ports Alarms						LA		LAN2		LAN3					
Maintenance						LA		GE switch		LAMS	-				
Tools						WA	7.	WAND	E.	IG CPU	-				

Figure 5.41 Example of port grouping

4) In web GUI '<u>Config->Ports->MUX</u>' specify Data channel and port speed for WAN (radio direction) port in both Phoenix G2 IDUs. In the example WANa port is connected to high priority data channel 'ETH1a' of the first independent data channel and is set on full speed limit 1000 Mbps, but the WANb port is connected to high priority data channel 'ETH2a' of the second independent data channel and is set on full speed limit 1000 Mbps.

Concession of the local division of the loca	T	xF TxP	MSE	RxL	W	Low		1+0 DUAL		High (W)	RxL MSE	TxP TxF
	19	000 15	-36.2	-50.5 +		0032strong / 60M	197Mb	ACM	0032strong / 60M /	197Mb • 🚺 •	-51.7 -34.7	15 1799
SPAF	19	000 9	-37.4	-44.7 •	2	0032strong / 60M	221Mb	ACM	0032strong / 60M /	221Mb + 2 +	-44.2 -36.1	9 1799
	-	LO	CAL			-		XPIC			REI	OTE
DMIN permissions 🕒	L	ogout in: 3	h 25 m	52 s								Write
Status	M	IUX E	hVLAN	Eth	qos							
Config												
System	DA	TAFLOW C	ONFIGL	RATION								
Access IP	PO	RT		SFP	1	SFP2	SI	FP3	SFP4	LANT	LAN2	LANG
Radio		Status		SFP mo	dule	SFP module not present	SFP n	nodule resent		LAN No LINK	LAN No LINK	LAN Gbit FULL
Ports	9	Hot Stan	dby		off	•		off		off	•	-
Alarms	ONF	Mode		force10	sx •	auto1GX 🔻	auto1	GX V	force1GX *	auto 🔻	auto 🔻	auto 🔻
Maintenance Tools	PORT CONFIG	MDIX		-				-	÷	auto 🔻	auto 🔻	auto 🔻
	POR	Flow Con	trol	forc	e	force	fo	irce	force	off	off	off
		1588		off		off *	of	fτ	off *	off •	off 🔻	off •
Date: Thu. 08.11.2018								T				
Time: 15:34:56	Ŧ									LANT	LAN2	LANS
Uptime: 0 23:25:06 Refresh status	DI										GE switch	
	ETH SWITCH									WANB	WAND	MING CPU
Modem Serial Number 355260100009	E											CPU
License Number											_	CPU
3010403010100228 License Type / Status	4	Channel	Select	none	•	none 🔻	non	e v	none 🔻	ETH1a V	ETH2a	REII REI2
permanent / ok	SWAP	Connecte		off	T		ana	none	off	none	wanb	none
License Expiration unlimited	-				-	notice in						Home
Firmware Version	2	Traffic Cl	nannel	PTP1		EMM1 ET	Hla	ETH1b	PTP2	EMM2	ETH2a	ETH2b
0401_09 Running Design 505 (DXN3)	PBPM	Speed Lin	nit	auto		0 (1	000	0	auto	0	1000	0
opo (primo)						1				1		

Figure 5.42 Example of port configuration

- 5) In case if EMM module is used, configure it according to EMM configuration description described in section <u>'Config->Ports->EMM</u>' in both Phoenix G2 IDUs.
- 6) Save new settings by pressing Write button.

The status of 1+0 Dual XPIC configuration is displayed in the header of the web GUI:

and the second second	TxF	TxP			Low	1+0 DUAL	High		RxL	MSE	TxP	TxF
#A #	19000	15	-36.2	-50.6	• 1 • 0032strong / 60M / 2	27Mb ACM	0032strong / 60M / 227Mb	• 🗖 •	-51.8	-37.0	15	17992
SAF	19000	9	-37.5	-44.7	+ 2 + 0032strong / 60M / 2	27Mb ACM	0032strong / 60M / 227Mb	• 2 •	-44.3	-38.6	9	17992
_		LOC	AL		-	XPIC			-	RE	MOTE	

Figure 5.43 Status of 1+0 Dual XPIC mode

Example 8 – 1+0 Dual FD repeater connection scheme

The 1+0 Dual FD (Frequency Diversity) mode is advanced 1+0 mode which allows IDU to operate as active repeater. Two ODUs are connected to modems of the single IDU and operates to two different directions.

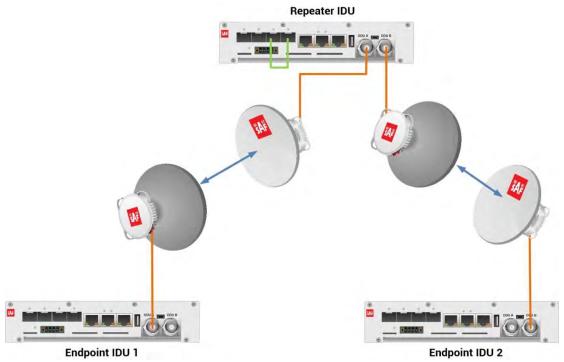


Figure 5.44 Example of 1+0 Dual FD repeater configuration

As the 1+0 Dual mode uses two independent physical data channels, the following physical data channel interconnection rule must be observed between Repeater IDU and both Endpoint IDUs: the modem output of the Repeater IDU must be linked only with the same modem output on the remote Endpoint IDUs. In the example the modem output ODU 1 of the Repeater IDU is interconnected with the modem output ODU 1 on the Endpoint IDU 1 (Channel 1), while modem output ODU 2 is interconnected with modem output ODU 2 on the Endpoint IDU 2 (Channel 2).



The 1+0 Dual repeater configuration does not support ASI/E1 EMM traffic.

This concrete example describes an application where the Design Type 'Design 505', Functional mode '1+0 Dual' and Link diversity 'FD – freq diversity' are selected on Repeater IDU; Functional mode '1+0 Ch1' is selected on Endpoint IDU 1; Functional mode '1+0 Ch2' is selected on Endpoint IDU 2. Modulation is 32QAM in BW 28 MHz on all three IDUs. Two independent Ethernet data streams in one physical data channel are passed through the link (between Endpoint IDU1 and Endpoint IDU2), each configured on 20 Mbps.



In the Repeater IDU both Ethernet data streams must be interconnected between physical data channels (Channel 1 between Endpoint IDU 1 and Repeater IDU, Channel 2 between Repeater IDU and Endpoint IDU 2) in order to get Ethernet streams passing from the Endpoint IDU 1 to the Endpoint IDU 2 and back. One Ethernet data stream will be interconnected via built-in switch using both WAN ports which are configured in the same port group, but the second Ethernet data stream will be interconnected via SFP ports which are physically interconnected with optical cable.

The management access is In-Band management described in section '<u>Management channel</u> configuration options'.

Configuration steps for this 1+0 Dual FD mode are following:

1) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+0 Dual' and Link Diversity 'FD – freq diversity' in Repeater IDU:

TxF	TxP	MSE	RxL		middle		1+0 DUAL		CH1	RxL	MSE	TxP	TxF
7745	20	-41.4	-42.1	· 🚺 ·	0032strong	/ 28M / 108Mb	ACM	0032strong / 2	EM / 108Mb + 🗻	+ -42.3	-40.9	20	7500
13066	20	-37.0	-46.9	. 2.	0032strong	/ 28M / 108Mb	ACM	0032strong / 2	28M / 108Mb + 2	+ -47.2	-36.3	20	12800
	LOC	AL					FD		CH2		REN	IOTES	
Logou	t in: 19	9 m 47	s										9
Mode	D	escripti	on	Date	Time	Advanced							
DESIGN	CONF	IGURA	TION				LOCA	iL.			ACTI	2M	(
Design	Туре						Design 8	i05 *			Арр	ly	
DESIGN	MOD	ËS					LOCA	ALC:			ACTI	MC	(
Functio	nal Mo	ode					1+0 Du	al 🔻			Арр	ly	
Link Div	versity						FD - freq dive	sity 🔻			Арр	iy	
RADIO	MODE	S				CHANNEL	1	CHAI	NNEL 2		ACTI	ON	(1
Duplex	Mode					Bidirection	v le	Bidirec	tional •		Арр	lv	

Figure 5.45 Example of System configuration of Repeater IDU

2) In web GUI '<u>Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+0 Ch1' in Endpoint IDU 1:

TxF	TxP	MSE	RxL	CH1		1+0 CH1		middle	RxL	MSE	TxP	TxF
7500	20	-40.8	-42.2	• 1 • 0032stro	ng / 28M / 108Mb	ACM	0032strong / 1	28M / 108Mb + 🚺	+ -42.2	-41.4	20	7745
	LOC	AL							-	RE	NOTE	
Logour	t in: 19	9 m 43	5									
Mode	D	escripti	on	Date&Time	Advanced							
DESIGN	CONF	IGURA	TION			LOC	AL.			ACTI	DN	0
Design	Туре					Design	505 🔻			App	ly	
DESIGN	MODE	ES				LOC	AL			ACTI	IN	0
Function	nal Mo	de				1+0 Ch	1 🔻			Арр	ly	
Link Div	ersity				n	one	Y					
RADIO	NODES	\$				CHAN	EL 1			ACTI	N	0
Duplex I	Mode				Bi	directional	•			Арр	ly	

Figure 5.46 Example of System configuration of Endpoint IDU 1

 In web GUI <u>'Config->System->Mode</u>' choose design type 'Design 505', Functional mode '1+0 Ch2' in Endpoint IDU 2:

TxF	TxP	MSE	RxL	CH2	1+0 CH2		middle	RxL	MSE	TxP	TxF
12800	20	-36.2	-47.3	2 + 0032strang / 28M / 108M	ACM	0032strong / 28M	/ 108Mb + 2	-46.9	-37.0	20	13066
	LOC	AL							REI	MOTE	
Logou	t in: 6	m 29 s									4
Mode	De	escripti	on	Date&Time Advanced							
DESIGN	CONF	IGURA	TION		LOCA	AL			ACTIO	DN	(i
Design	Туре				Design (505 🔻			Арр	ly	
DESIGN	MODE	ES-			LOC	AL.			ACTIO	ON	(
Functio	nal Mo	de			1+0 Ch	2 🔻			Арр	ly	
Link Div	rsity				none	٠					
RADIO	MODES	5.			CHANN	IEL 2			ACTIO	N	(1
Duplex	Mode				Bidirectional				Арр	ly	

Figure 5.47 Example of System configuration of Endpoint IDU 2

4) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters of the Repeater IDU:

TxF	TxP	MSE	RxL	mid	dle		1+	0 DUAL		CH1	RxL	MSE	TxP	TxF		
7745	20	-41.5	-42.1	• 1 • 003	2strong	/ 28M / 108	змь	ACM	0032	strong / 28M / 108Mb 🔸 🚺	+ -42.2	-40.8	20	7500		
13066	20	-37.0	-46.9	+ 2 + 003	2strong	/ 281/ / 108	Mb	ACM	0032	strong / 28M / 108Mb + 2	• -47.3	-36.3	20	12800		
	LOC	AL						FD		CH2		REN	IOTES			
Logou	t in: 19	9 m 31	S													
Param	eters	AC	M	Advanced												
MODEN						LOCAL				RE	NOTE			(
MODEN	n			CHAN	NEL 1		CHAN	INEL 2		CHANNEL 1		CHANN	EL 2			
Bandwi	dth			28000	02 ▼		28000	0_02 ▼		28000_02		28000	_02			
Max Rx.		rofile		0032/st	rong •		0032/s	trong •		0032/strong 🔻	0)32/str	ong 🔻			
ACM Se	etting			» -	*		*	*		-	-					
Advance	ed Set	ting		defa	ult		def	fault		+		-				
-						LOCAL				RE	TOTE			(
RADIO				CHANNEL	1	1	CHANNE	EL 2	1	CHANNEL T		CHANN	EL 2			
T/R Spa	acing			fixed	•	(i)	fixed	•	(i)	fixed		fixe	d			
TX Freq	uency	[MHz]		7745		(i)	1306	5	1	7500		1280	00			
RX Freq	uency	[MHz]		7500		(i)	12800	0	(i)	7745		1300	66			
TX Pow	er Lim	it (dBm	1	20		(1)	20		(i)	20		20				
TX Mute	Mute Config auto 🔻				•		auto	•		auto 🔻		auto	•			
ATPC F	PC Function															
ATPC R	X Leve	dBm		-55		()	-55		(i)	-55		-55	j			
Refree		a lapur		-00		U	-00		U	Undo A	oply to	1	_			

Figure 5.48 Example of basic Radio parameters configuration of the Repeater IDU

5) In web GUI '<u>Config->Radio->Parameters</u>' configure basic radio and modem parameters of the Endpoint IDU 1:

TxF	TxP	MSE	RxL	CH1		1+0 CH1		middle	RxL	MSE	TxP	TxF
7500	20	-40.8	-42.4	• 10 + 0032st	rong / 28M / 108Mb	ACM	0032strong / 28M	/ 108Mb +	+ -42.1	-41.4	20	7745
	LOC	AL								RE	MOTE	
Logou	t in: 19	m 15	S									
Param	eters	AC	M	Advanced								
MODEN					LOCAL			RI	MOTE			(
MODEN	n.				CHANNEL 1			CH	INNEL T			
Bandwi	dth				28000_02 ▼			28	000_02			
Max Rx	ACM P	rofile			0032/strong			0032	strong			
ACM Se	etting				» 🌣				-			
Advanc	ed Set	ting			default				÷			
-					LOCAL			R	MDTE			0
RADIO					CHANNEL T		(i)	CH	NNEL 1			
T/R Spa	acing				fixed 🔻		(i)		ixed			
TX Freq	uency	[MHz]			7500		1		7745			
RX Free	uency	[MHz]			7745		(i)		7500			
TX Pow	er Lim	it (dBm	1		20		()		20			
TX Mut	e Confi	ig			auto 🔻			au	• •			
ATPC F	unctio	n										
ATPC R	X Leve	dBm]			-55		(i)		-55			
Refre	ob							Undo /	line in -			-

Figure 5.48 Example of basic Radio parameters configuration of the Endpoint IDU 1

6) In web GUI <u>'Config->Radio->Parameters</u>' configure basic radio and modem parameters of the Endpoint IDU 2:

TxF	TxP	MSE	RxL	CH2	1+0 CH2	middle	RxL	MSE	TxP	TxF
12800	20	-36.3	-47.3	• 2 • 0032strong / 28M / 108Mb	ACM	0032strong / 28M / 108Mb + 2	-46.8	-36.9	20	13066
	LOC	AL						RE	MOTE	
Logou	t în: 6	m9s								3
Param	eters	AC	M	Advanced						
MODEN	-			LOCAL		REA	OTE			C
WIGDEN				CHANNEL 2		CHAP	INEL 2			
Bandwi	dth			28000_02 ▼		2800	00_02			
Max Rx.	ACM P	rofile		0032/strong		0032/s	trong •			
ACM Se	tting			» 🕸			-			
Advance	ed Set	ting		default			+			
-				LOCAL		REN	OTE			(i
RADIO				CHANNEL 2	(1) CHAN	INEL 2			
T/R Spa	icing			fixed *	(i) fi	ed			
TX Freq	uency	[MHz]		12800	(i) 13	066			
RX Freq	uency	[MHz]		13066	(i) 12	800			
TX Pow	er Lim	it [dBm		20	()	20			
TX Mute	e Confi	ig		auto 🔻		auto	•			
ATPC F	unctio	n				[1			
ATDO D	XLeve	dBm		-55	(1)	55			

Figure 5.49 Example of basic Radio parameters configuration of the Endpoint IDU 2

7) In the repeater IDU, port grouping must be configured in order to fill customer requirement about in-band management and to interconnect one Ethernet data stream between physical channels (Channel 1 and Channel 2). In this case both WAN ports must be grouped in the same one group; also the management (MNG) port and at least one of LAN ports must be connected to the same group in order to have local and remote management access. Other LAN ports also may be added to the same group. In this example all above mentioned ports are added to the Group 1. Port grouping configuration is available in web GUI 'Config->Ports->EthVLAN':

TxF	TxP	MSE	RxL]	middle		1+0 DUAL	-		CH1	RxL	MSE	ТхР	TxF
7745	20	-41.4	-42.3	• 🔽 •	0032strong / 28M / 1	08Mb	ACM		0032strong / 28M / 10	овмь + 🚺 +	-42.3	-40.8	20	7500
13066	20	-37.0	-46.9	+ 2 +	0032strong / 28M / 1	08Mb	ACM		0032strong / 28M / 10	овмь • 2 •	-47.2	-36.3	20	12800
	LOC	4L					FD			CH2		REN	IOTES	
Logout	t in: 19	m 17	S											۲
MUX	Eth	VLAN	Et	hQOS										
VLAN M	IODE		LAN 1		LAN 2		LAN 3		MNG	WAN A	λ	W	AN B	i
Port Mo	de	ba	sic	•	basic 🔻	bas	sic 🔻		basic 🔻	basic	•	basi	с	•
Port Gro	oup	g	roup-1	•	group-1 🔻	gr	oup-1 🔻		group-1 🔻	group-1	•	gro	up-1 🔻	'
Default	VLAN		1		1		1		1	1			1	
					LAN1		LAN2		LAN3					
							GE switch	h						
					WANa		WANb		MNG CPU					

Figure 5.50 Example of port grouping in the Repeater IDU



Only one Ethernet data stream can be interconnected between physical data channels in the built-in switch using WAN port grouping. The second Ethernet data stream will be linked between physical data channels via SFP ports outside built-in switch.

8) In the Endpoint IDU 1, port grouping must be configured in order to have in-band management and two separated Ethernet data streams. In the example the first Ethernet data stream will use LAN1 and WANa ports and will be grouped in Group 1, but the second Ethernet data stream will use LAN2 and WANb ports and will be grouped in Group 2. Management port (MNG) will be accessible via LAN3 port and will be added to Group 1 in order to have remote access:

TxF	TxP	MSE	RxL		CH1	1+0 CH		middle	RxL	MSE	TxP	TxF
7500	20	-40.9	-42.2 •	•	0032strong / 28M / 1	озмь АСМ	0032strong / 28M	I / 108Mb + 🚺 +	-42.2	-41.5	20	7745
	LOC	AL								REI	NOTE	
Logou MUX		8 m 49		QOS								
LAN N	ODE		LAN 1		LAN 2	LAN 3	MNG	WAN	X	M	ANB	G
Port Mo	de	ba	sic	•	basic •	basic •	basic •	basic		basi	ic '	•
Port Gro	oup	g	roup-1	•	group-2 *	group-1 🔻	group-1 🔻	group-1		gro	up-2 🔻	
Default	VLAN		1		1	1	1	1			1	
					LANT	LANZ	LANS	1				
					12001	GE swite						
					WANa	WAND	MNG C					

Figure 5.51 Example of port grouping in the Endpoint IDU 1

9) In the Endpoint IDU 2, port grouping must be also configured in order to have in-band management and two separated Ethernet data streams. In the example the first Ethernet data stream will use LAN1 and WANa ports and will be grouped in Group 1, but the second Ethernet data stream will use LAN2 and WANb ports and will be grouped in Group 2. Management port (MNG) will be accessible via LAN3 port and will be added to Group 1 in order to have remote access:

TxF	TxP	MSE	RxL	CH2	1+0 CH2	m	niddle	RxL	MSE	TxP	TxF
12800	20	-36.3	-47.4 • 2	+ 0032strong / 28M / 1	108МЬ АСМ	0032strong / 28M / 10	озмь + 🔁 +	-46.9	-37.0	20	13066
	LOC	AL							REI	MOTE	
Logout	in: 5	m 53 s									
MUX	Eth	VLAN	Ethoo	S							
VLAN M	DDE		LAN 1	LAN 2	LAN 3	MNG	WANA	k.	W	AN B	(
Port Mod	de	ba	sic 🔹	basic 🔹	basic •	basic 🔻	basic		basi	ic	•
Port Gro	ир	g	roup-1 🔻	group-2 🔻	group-1 🔻	group-1 🔻	group-1	•	gro	up-2	
Default \	/LAN		1	1	1	1	1		[1	
				LAMI	LAN2	LANS					
					GE switch						
				WANE	WANE	MING CPU					

Figure 5.52 Example of port grouping in the Endpoint IDU 2

- 10) In the Repeater IDU, in web GUI '<u>Config->Ports->MUX</u>' configure both Ethernet data stream interconnections between physical data channels (Channel 1 and Channel 2) and port speeds:
 - a) The first Ethernet data stream will be set as high priority Ethernet channel (ETH1a from Endpoint IDU1, and ETH2a from Endpoint IDU2). In the example in "Channel Select" drop-down the high priority data channel 'ETH1a' is connected to WANa port and is set on Speed limit 20 Mbps, and 'ETH2a' is connected to the WANb port and also is set on Speed limit 20 Mbps. As both WAN ports are already allocated in the same port group thus the first Ethernet data stream has been interconnected between Channel 1 and Channel 2.

T	KF TXP	MSE	E RxL		middle			1-	O DUAL			CH1	= 1	RxL MSE		TxP	TxF	
77	45 20	-41.4	-42.3 •	۰,	0032st	rong / 3	28M / 108	Mb	ACM	0032strong	/ 28M /	108Mb +	D •	-42.3	-40.9	20	7500	
13	066 20	-37.0	-46.9 •	2 +	0032st	rong / 1	28M / 108	мь	ACM	0032strong	/ 28M /	108Mb +	2.	-47.1	-36.2	20	12800	
L	LOCA ogout in: 19								FD			CH2			REM	IOTES		
		VLAN		qos													0	
	AFLOW CO	NEIGU																
POP	ar .		SFP ma			SFP2 modu	321	SFP		SFR		LA			A192		M3	
	Status		not pre	esent	not	prese	nt	DD Gbi	FD		FD	LAN N	o LINK	LAN	No LINK	LAN	lo LINK	
9	Hot Standby		off		•			off		•		off						
PORT CONFIG	Mode		auto1G	X V	auto	1GX	•	auto1G	< •	auto1G)	K	auto		auto	•	auto		
E	MDIX		-		-			-		-		auto	•	au	to 🔻	aut	• •	
POR	Flow Control		force		force			force		force		of	off		off		off	
	1588		off	off 🔻		off * of		off	off 1		r	off 🔻		off 🔻		off 🔻		
÷												LA	ND		AN2	E	N3	
ETH SWITCH												WA	Na	1	AME	-	CPU	
	Channel Se	last		•	1		78	ETH1b	-	ETH2b	•	ETHI		(CT)	12a 🔻	CI DEFI1	PU RFI2	
SWAP			none	-	no	inc.		1		EIHZD	-	C IIII	d		-			
S	Connected	Port	off		none	2	wana		sfp3		off	1	none	W	anb	sf	p4	
Z	Traffic Cha	nnel	PTP1	T	EMM	1	ETHI	a	ЕТНІВ		PTP2	E	MM2	ET	H2a	ET	12b	
PBPM	Speed Limi	t	auto		0	1 (20	>	20	I	auto		0		20		0	
-	Available S	peed	_			108	88 Mbp	DS					108.88 Mbps					

Figure 5.53 Example of port configuration in Repeater IDU

b) The second Ethernet data stream will be set as low priority Ethernet channel (ETH1b from Endpoint IDU1, and ETH2b from Endpoint IDU2). In the example in the "Channel Select" drop-down the low priority data channel 'ETH1b' is connected to SFP3 port and is set on Speed limit 20 Mbps, and 'ETH2b' is connected to the SFP4 port and also is set on Speed limit 20 Mbps. In this case in order to interconnect the second Ethernet data stream between Channel 1 and Channel 2 both SFP ports must be interconnected with optical cable externally

T	KF TXP	MSE	RxL		middle		1+	0 DUAL		CH1					TxF	
77	45 20	-41.4	-42.3 •		0032strong	/ 28M / 10	ISMb	ACM	0032strong / 28M /	108Mb +	0.	-42.3	-40.9	20	7500	
130	066 20	-37.0	-46.9 •	2 +	0032strong	/ 28M / 10	вмь	ACM	0032strong / 28M /	108Mb +	2.	-47.1	-36.2	20	12800	
L	LOC/ ogout in: 19			9				FD		CH2			REM	IOTES		
M	UX Eth	VLAN	Eth	QOS											0	
DAT	TAFLOW CO	NFIGU	BATION	1												
PQI	RT .		SFF		SFP		SFP3		SFP4	LA	M	L	AN2	LA	N3	
	Status	SFP module not present		SFP module not present			FD	Gbit FD	LAN No LINK		LAN No LINK		LAN No LINK			
9	Hot Stand	by	off		f 🔹		off		•	off		•		-		
PORT CONFIG	Mode		auto1GX •		auto1GX 🔻		auto1GX 🔻		auto1GX 🔻	auto	۲	auto	•	auto	Ŧ	
E	MDIX		-				-		-	auto	auto 🔻		auto 🔻		auto 🔻	
POF	Flow Contr	rol	force		force		force		force	o	off		off		off	
	1588		off	Ψ.	off 1		off T		off 🔻	off	•	0	ff 🔻	of	f 🔻	
										-		_		-		
S										LA	N1		ati2 switch		N3	
TIM										- WA	ela l	-	AND	LANK	CPU	
ETH SWITCH										BALL		- Bad	I	1 prove	(and a grade of the second se	
Ξ														C	PU	
_						_	-	-	1			-				
SWAP	Channel S	elect	none	•	none	. (ETH1b	·)	ETH2b V	ETH	la ▼	ETH	l2a ▼	RFI1	RFI2	
โก	Connected	Port	off		none	wan	a	sfp3	off	1	none	W	anb	sf	p4	
2	Traffic Cha	annel	PTP1		EMM1	ETHI	la	ЕТНІВ	PTP2	E	MM2	ET	H2a	ET	H2b	
PBPM	Speed Limit au		auto	auto 0 20			20 auto			Ó		20	C	20		
						1				1						
	Available \$	Speed			10	3.88 Mbp	0S			108.88 Mbps						

Figure 5.54 Example of port configuration in Repeater IDU

11) In the Endpoint IDU 1, in web GUI '<u>Config->Ports->MUX</u>' specify data channels and ports speeds. In the example the first Ethernet data stream ETH1a (high priority) is connected to WANa port and is set on speed limit 20 Mbps. The second Ethernet data stream ETH1b (low priority) is connected to WANb port and is set on speed limit 20 Mbps

T	F TX	P MS	E	RxL		CH1			1+0 CH1			midd	lle	Rx	L MSI	E TxP	TXF
75	00 2	0 -40	.8	42.3	•	• 0032st	rong /	28M / 108	ACM	0032	strong / 28	M / 108M	16 + 🚺	+ -42	.2 -41.	4 20	774
	ogout in:	OCAL 18 m 2 EthVLA			hQOS										R	EMOTE	
	TÁFLOW							SFP2	SEPS	s	EP4	LAI	MT.	LA	N2	LANS	
Status			SFP module not present		SFP module not present		SFP module not present	SFP module not present		LAN No LINK		Gbit FULL		LAN No LINK			
PORT CONFIG	Hot Standby				off		•		off	•		off		•		-	
CON	Mode			auto1	GX 🔻	aut	o1GX 🔻	auto1GX 🔻	auto	1GX ▼	auto	•	auto	•	auto	۲	
ORT	MDIX						-		+	÷		auto 🔻		auto 🔻		auto 🔻	
ĕ	Flow Control 👙				force		force		force	force		off		off		off	
	1588			off *		off T		off v	Ō	off 🔻		off 🔻		•	off 🔻		
н												LA	u]	LA		LANS	1
ETH SWITCH												WA	1/a	GE SV		MNG CE	
THS																I	
ш																CPU	
SWAP	Channe	l Selec	t		none	T	no	one 🔻	none 🔻	nor	ne 🔻 🄇	ETH1	a 🔻	ETHI	b 🔻	RFI1 B	FI2
NS	Connected Port				off			none wa			na			wanb			
W	Traffic Channel			-	PTP1				EMM1	ETH		la		ET		ГНТВ	
PBPM	Speed I	Limit (Ð		auto				0	0		20			20	20	
	Availab	lo Spac	d		108.88 Mbps										-	-	

Figure 5.55 Example of port configuration in Endpoint IDU 1

12) In the Endpoint IDU 2, in web GUI '<u>Config->Ports->MUX</u>' specify data channels and ports speeds. In the example the first Ethernet data stream ETH2a (high priority) is connected to WANa port and is set on speed limit 20 Mbps. The second Ethernet data stream ETH2b (low priority) is connected to WANb port and is set on speed limit 20 Mbps