

Figure 5.56 Example of port configuration in Endpoint IDU 2

13) Save new settings by pressing **Write** button.

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



Figure 5.57 Status of 1+0 Dual FD mode in Repeater IDU

The status of the Endpoint IDU 1 is displayed in the header of the web GUI:

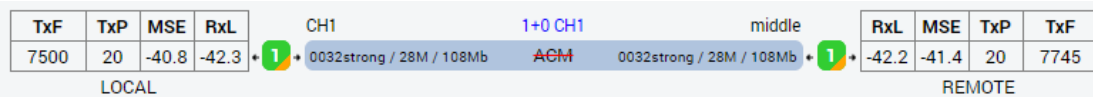


Figure 5.58 Status of 1+0 Ch1 mode in Endpoint IDU 1

The status of the Endpoint IDU 2 is displayed in the header of the web GUI:

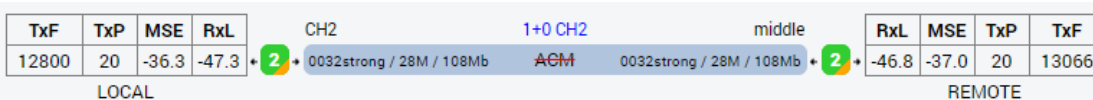


Figure 5.59 Status of 1+0 Ch2 mode in Endpoint IDU 2

Example 9 – 1+1 HSB/SD Dual-band frequency protection scheme

The 1+1 HSB/SD (Hot Standby/Space Diversity) Dual-band frequency protection mode is specific mode which supports data transmission to one direction using one frequency channel/band, and for opposite direction another frequency channel/band. This mode allows even to have frequency channels of each direction in different frequency bands (for example – 7 GHz and 13 GHz frequency bands). Each frequency channel works in Simplex mode and is protected.

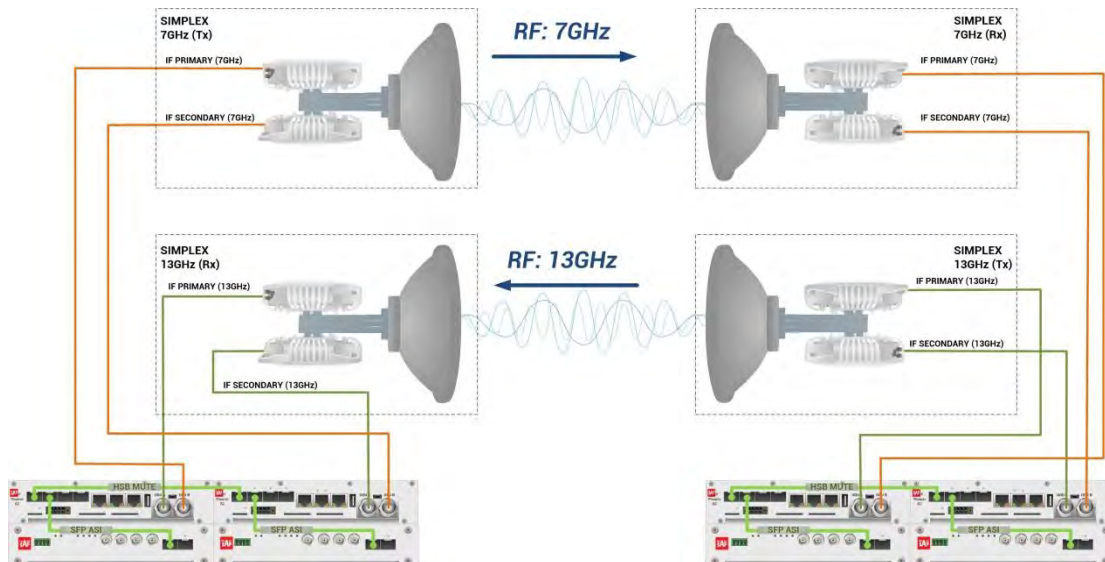


Figure 5.60 Example of 1+1 HSB/SD Dual-band frequency protection

In above mentioned scheme the ODUs and couplers can be substituted with IRFUs and IBUs combination if required by customer.

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 2+2' and Link diversity 'HSB/SD – hot standby' are selected on both link sides. One frequency channel works on Tx-only mode, but the second frequency channel works in Rx-only mode. The modulation is 32QAM in BW 60 MHz and the appropriate maximal data speed is about 227 Mbps per channel. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODUs per link.**



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

Configuration steps for 1+1 HSB/SD Dual-band frequency protection are following:

- 1) **IDU A (primary):**
 - a) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary'. As the link will use different frequency channels/bands for each direction then the Duplex Mode must be configured so that one of channels is in Tx mode, but the second channel is in Rx mode. In the example on Side A the Channel 1 is 'Tx-only' mode, and the Channel 2 is in 'Rx-only' mode.

TxF	TxP	MSE	RxL										
17800	24	0.0	-89.4	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-30.7	-36.4	muted	18810	
18100	muted	-38.3	-49.0	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-87.4	0.0	muted	19110	
17800	muted	0.0	-89.9	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-34.7	-36.5	muted	18810	
18100	muted	-34.6	-54.6	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-88.6	0.0	0	19110	

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Log out in: 3 h 59 m 19 s Write

DESIGN CONFIGURATION LOCAL (primary) ACTION

Design Type: Design 511 Apply

DESIGN MODES LOCAL (primary) ACTION

Functional Mode: Split 2+2 Apply

Link Protection Diversity: HSB/SD - Hot standby Apply

Link Aggregation Diversity: FD

Hot-Swap Startup Device Role: Fixed primary

FO peer connected - it's role will be set automatically.

RADIO MODES CHANNEL 1 CHANNEL 2 ACTION

Duplex Mode: Tx Only (Caution: manually set the RF neighbour Radio Mode to Simple Rx mode) Rx Only (Caution: manually set the RF neighbour Radio Mode to Simple Tx mode) Apply

ADMIN permissions +

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Fri, 08.02.2019
Time: 14:34:31
Uptime: 0 00:08:57
Refresh status

Figure 5.61 Example of Side A Primary IDU system configuration

- b) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters. Frequency channel/band must be different for Channel 1 and Channel 2, and correspond to 'Tx-only' and 'Rx-only' Duplex mode settings in '[Config->System->Mode](#)' page.

TxF	TxP	MSE	RxL										
17800	24	0.0	-89.2	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-31.1	-36.3	muted	18810	
18100	muted	-38.2	-48.9	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-87.1	0.0	muted	19110	
17800	muted	0.0	-89.8	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-34.7	-36.4	muted	18810	
18100	muted	-34.6	-54.5	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-88.4	0.0	0	19110	

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Log out in: 3 h 48 m 58 s Write

MODEM LOCAL REMOTE

Bandwidth: 60000_02 60000_02 60000_02 60000_02

Max RxACM Profile: 0032/strong 0032/strong 0032/strong 0032/strong

ACM Setting: * * - -

Advanced Setting: default default - -

RADIO LOCAL REMOTE

T/R Spacing: fixed fixed fixed fixed

TX Frequency [MHz]: 17800 18100 18810 19110

RX Frequency [MHz]: 18810 19110 17800 18100

TX Power Limit [dBm]: 26 26 26 26

TX Mute Config: auto auto auto auto

ATPC Function: [] [] [] []

ATPC RX Level [dBm]: -55 -55 -55 -55

Refresh Undo Apply local

ADMIN permissions +

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Fri, 08.02.2019
Time: 14:44:52
Uptime: 0 00:19:17
Refresh status

Modem Serial Number: 355260100010
License Number: 3010403010100229
License Type / Status: permanent / ok

Figure 5.62 Example of Side A Primary IDU radio configuration

- c) The ACM (Adaptive Coding and Modulation) must be disabled if Duplex modes "Tx only" and "Rx only" are used. In order to disable it, navigate to '[Config->Radio->ACM](#)' in the web GUI and set ACM function to "man p1" on both Channels. This setting disables the ACM

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	W	RxL	MSE	TxP	TxF
17800	13	0.0	-89.5	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-41.7	-28.7	muted	18810
18100	muted	-39.2	-44.1	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-87.2	0.0	13	19110
17800	muted	0.0	-89.8	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-46.0	-38.1	muted	18810
18100	muted	-37.0	-49.0	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-88.7	0.0	muted	19110

ACM SETTINGS	CHANNEL 1	CHANNEL 2	Usual value	Note
ACM function	man p1	man p1	auto	
ACM Offset	0.0	0.0	0	-3.0 ... +3.0

Figure 5.63 Example of Side A Primary IDU ACM configuration

- d) In web GUI 'Config->IP->Addresses' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	W	RxL	MSE	TxP	TxF
17800	24	0.0	-89.2	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-31.0	-36.3	muted	18810
18100	muted	-38.2	-49.0	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-87.2	0.0	muted	19110
17800	muted	0.0	-89.7	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-34.6	-36.4	muted	18810
18100	muted	-34.6	-54.5	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-88.4	0.0	0	19110

MAIN ADDRESS SETTINGS	REQUIRED	CONFIGURED
Device IP / Mask	192.168.205.13 / 24	192.168.205.13/24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS	REQUIRED	CONFIGURED
USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24	10.10.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24	10.10.10.10/24

Figure 5.64 Example of Side A Primary IDU IP configuration

- e) In web GUI 'Config->IP->Advanced' set 'WEB' option as Default NAT to remote. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

The screenshot shows the 'Config' page for IP NAT. The 'WEB' checkbox is checked and circled in red. The 'SSH' checkbox is unchecked. The 'NAT' section shows the following settings:

SETTINGS	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		1443 192.168.205.11.443 Default WEB NAT: on (https://192.168.205.13:1443/ https://192.168.205.13:2443/) Default SSH NAT: off
Radius Server		

Figure 5.65 Example of Side A Primary IDU IP NAT configuration

- f) Port group configuration must be done according to customer requirements. In this configuration when the Duplex modes "Tx-only" and "Rx-only" are used the remote management access via WAN port is not supported. That is why NAT configuration is required. In this example LAN1 port is used for the traffic, so LAN1 and WANa are grouped in the same group (Group 1). LAN2 and WANb are grouped in Group 2 and will not be used or can be intended for any other independent and separated user data traffic. LAN3 and MNG ports are grouped in Group3 for management access only via LAN3 port. Port grouping configuration is available in web GUI '[Config->Ports->EthVLAN](#)' section

The screenshot shows the 'EthVLAN' configuration page. The 'Port Group' column shows the following settings:

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Below the table is a diagram showing the port grouping:

```

graph TD
    LAN1 --- GE_switch
    LAN2 --- GE_switch
    LAN3 --- GE_switch
    WANa --- GE_switch
    WANb --- GE_switch
    MNG_CPU --- GE_switch
  
```

Figure 5.66 Example of Side A Primary IDU port grouping

- g) In web GUI '[Config->Ports->MUX](#)' specify Data channel and port speed for WAN (radio direction) port and SFP ports. In the example WANa port is connected to high priority data channel 'ETH1a' and is set on full speed limit 1000 Mbps. The SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode 'force2G5'

The screenshot displays the 'EMM' configuration page. The 'DATAFLOW CONFIGURATION' table shows settings for SFP1, SFP2, SFP3, SFP4, LAN1, LAN2, and LAN3. SFP1 and SFP2 are set to 'force2G5' mode. The 'ETH SWITCH' section shows 'Channel Select' for EMM1 and ETH1a. The 'PBPM' section shows 'Speed Limit' set to 1000. The 'Modem Speed' is 227.81 Mbps active.

Figure 5.67 Example of Side A Primary IDU port configuration

- h) In web GUI '[Config->Ports->EMM](#)' configure the ASI traffic according to customer requirements. In the example one ASI traffic stream via ASI1 port is sent from side A to side B. In this case the ASI EMM configuration will be following: 'EMM Enable' and 'EMM Protection Failover' check-boxes must be checked. Also ASI EMM module 'Enable' check-box must be checked and 'Mode' set as "Rx"


The screenshot displays the 'EMM' configuration page. The 'EMM' table shows settings for EMM#1, EMM#2, EMM#3, and EMM#4. EMM#1 is configured for 4ASI. The 'EMM Enable' and 'EMM Protection Failover' check-boxes are checked. The 'Mode' is set to 'Rx'. The 'Speed Limit (Rx) [Mbps]' is 214.

Figure 5.68 Example of Side A Primary IDU EMM configuration

- i) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

		LOCAL (primary)		LOCAL	REMOTE	LOCAL		
WARNINGS		Pri/Sec switch	CH 1	Peer (FO)	Direct RF	THRESHOLDS		DETAILS
Modem								
Modem Aggr/Prot	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem Data Sync	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem MSE Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25	-25	[dB]
Modem FER	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	10	[error_frm/10s]
Radio								
Radio RX Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-75	-75	[dBm]
Radio TX Mute	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Ports								
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem LAN2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem LAN3 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem SFP1 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem SFP2 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
Modem SFP4 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
EMM#1 -4AS1								
		Pri/Sec switch	CH 1	Peer (FO)	Direct RF	THRESHOLDS		DETAILS
EMM HW+SW	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			none
SFP2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Sync	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Idle	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Lock	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

Figure 5.69 Example of Side A Primary IDU alarm configuration

- j) Save new settings by pressing  button.
- 2) **IDU A (secondary):**
 - a) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed secondary'. As the link will use different frequency channels/bands for each direction then the Duplex Mode must be configured so that one of channels is in Tx mode, but the second channel is in Rx mode. In the example on Side A the Channel 1 is 'Tx-only' mode, and the Channel 2 is 'Rx-only' mode

TxF	TxP	MSE	RxL					RxL	MSE	TxP	TxF
17800	24	0.0	-88.8	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	-31.2	-36.2	muted	18810
18100	muted	-38.3	-48.8	W	simple RX	AGM	0032strong / 60M / 227Mb	-87.0	0.0	muted	19110
17800	muted	0.0	-89.6	W	simple RX	AGM	0032strong / 60M / 227Mb	-34.7	-36.3	muted	18810
18100	muted	-34.7	-54.4	W	simple RX	AGM	0032strong / 60M / 227Mb	-88.1	0.0	13	19110

Mode	Description	Date&Time	Advanced	ACTION
DESIGN CONFIGURATION				
Design Type	Design 511			Apply
DESIGN MODES				
Functional Mode	Split 2+2			Apply
Link Protection Diversity	HSB/SD - Hot standby			Apply
Link Aggregation Diversity	FD			Apply
Hot-Swap Startup Device Role	Fixed secondary			Apply
RADIO MODES				
CHANNEL 1		CHANNEL 2		ACTION
Duplex Mode	Tx Only	Rx Only		Apply
Caution: manually set the RF neighbour Radio Mode to Simple Rx mode		Caution: manually set the RF neighbour Radio Mode to Simple Tx mode		

Figure 5.70 Example of Side A Secondary IDU system configuration

- b) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters. Frequency channel/band must be different for Channel 1 and Channel 2, and correspond to 'Tx-only' and 'Rx-only' Duplex mode settings in '[Config->System->Mode](#)' page.

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	24	0.0	-88.8	1	0032strong / 60M / 227Mb	ACM	simple RX	-31.3	-36.3	muted	18810
18100	muted	-38.3	-48.9	2	simple RX	ACM	0032strong / 60M / 227Mb	-87.0	0.0	muted	19110
17800	muted	0.0	-89.5	1	0032strong / 60M / 227Mb	ACM	simple RX	-34.6	-36.3	muted	18810
18100	muted	-34.7	-54.4	2	simple RX	ACM	0032strong / 60M / 227Mb	-88.1	0.0	13	19110

LOCAL (secondary)		S.loc.sec_12		HSB/SD		rem.sec_10:S		REMOTE(s)	
Logout in:	16 m 36 s								

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	0032/strong	0032/strong	0032/strong	0032/strong
ACM Setting				
Advanced Setting	default	default		

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17800	18100	18810	19110
RX Frequency [MHz]	18810	19110	17800	18100
TX Power Limit [dBm]	20	13	20	13
TX Mute Config	auto	auto	auto	auto
ATPC Function				
ATPC RX Level [dBm]	-55	-55	-55	-55

Figure 5.71 Example of Side A Secondary IDU radio configuration

- c) The ACM (Adaptive Coding and Modulation) must be disabled if Duplex modes "Tx only" and "Rx only" are used. In order to disable it, navigate to '[Config->Radio->ACM](#)' in the web GUI and set ACM function to "man p1" on both Channels. This setting disables the ACM

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	13	0.0	-89.5	1	0032strong / 60M / 227Mb	ACM	simple RX	-41.7	-28.5	muted	18810
18100	muted	-39.2	-44.1	2	simple RX	ACM	0032strong / 60M / 227Mb	-87.1	0.0	-99.9	19110
17800	muted	0.0	-89.7	1	0032strong / 60M / 227Mb	ACM	simple RX	-46.0	-38.1	muted	18810
18100	muted	-36.7	-49.0	2	simple RX	ACM	0032strong / 60M / 227Mb	-88.7	0.0	muted	19110

LOCAL (secondary)		S.loc.sec_12		HSB/SD		rem.sec_10:S		REMOTE(s)	
Logout in:	19 m 38 s								

ACM SETTINGS	CHANNEL 1		CHANNEL 2		Usual value:	Note
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2		
ACM function	man p1	man p1			auto	
ACM Offset	0.0	0.0			0	-3.0 .. +3.0

Figure 5.72 Example of Side A Secondary IDU ACM configuration

- d) In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL						RxL	MSE	TxP	TxF
17800	24	0.0	-88.8	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-31.1	-36.2	muted	18810
18100	muted	-38.3	-48.7	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-87.0	0.0	muted	19110
17800	muted	0.0	-89.4	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-34.5	-36.2	muted	18810
18100	muted	-34.7	-54.4	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-88.0	0.0	13	19110

LOCAL (secondary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTE(s)

Logout in: 17 m 48 s

Addresses SNMP Advanced

MAIN ADDRESS SETTINGS

	REQUIRED	CONFIGURED
Device IP / Mask	192.168.205.12 / 24	192.168.205.12/24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS

	REQUIRED	CONFIGURED
USB IP/Mask	<input type="radio"/> 10.10.11.10/24 <input checked="" type="radio"/> 192.168.11.10/24	10.10.11.10/24
Fallback IP/Mask	<input type="radio"/> 10.10.10.10/24 <input checked="" type="radio"/> 192.168.10.10/24	10.10.10.10/24

Undo Save

Figure 5.73 Example of Side A Secondary IDU IP configuration

- e) In web GUI 'Config->IP->Advanced' set 'WEB' option as Default NAT to remote. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

TxF	TxP	MSE	RxL						RxL	MSE	TxP	TxF
17800	24	0.0	-88.8	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-31.1	-36.2	muted	18810
18100	muted	-38.3	-48.7	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-87.0	0.0	muted	19110
17800	muted	0.0	-89.4	1	0032strong / 60M / 227Mb	ACM	simple RX	1	-34.5	-36.2	muted	18810
18100	muted	-34.7	-54.4	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-88.0	0.0	13	19110

LOCAL (secondary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTE(s)

Logout in: 17 m 48 s

Addresses SNMP Advanced

STATIC ROUTES - INPUT VALUES

Routed IP/MASK

Gateway IP

Add Delete

NAT - INPUT VALUES

Local_Port Dest_IP:Port

Add Delete DelAll

Default NAT to remote WEB SSH Set

RADIUS - INPUT VALUES

IP:destport SecString timeout

Add Delete DelAll

SETTINGS

	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		Default WEB NAT: on (https://192.168.205.13:2443:1443/ https://192.168.205.13:2443:2443/) Default SSH NAT: off
Radius Server		

Save

Figure 5.74 Example of Side A Secondary IDU IP NAT configuration

- f) Port group configuration must be done according to customer requirements. In this configuration when the Duplex modes "Tx-only" and "Rx-only" are used the remote management access via WAN port is not supported. That is why NAT configuration is required. In this example LAN1 port is used for the traffic, so LAN1 and WANa are grouped in the same group (Group 1). LAN2 and WANb are grouped in Group 2 and will not be used or can be intended for any other independent and separated user data traffic. LAN3 and MNG ports are grouped in Group3 for

management access only via LAN3 port. Port grouping configuration is available in web GUI '[Config->Ports->EthVLAN](#)' section

Figure 5.75 Example of Side A Secondary IDU port grouping

- g) In web GUI '[Config->Ports->MUX](#)' specify Data channel and port speed for WAN (radio direction) port and SFP ports. In the example WANa port is connected to high priority data channel 'ETH1a' and is set on full speed limit 1000 Mbps. The SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode 'force2G5'

Figure 5.76 Example of Side A Secondary IDU port configuration

- h) In web GUI '[Config->Ports->EMM](#)' configure the ASI traffic according to customer requirements. In the example one ASI traffic stream via ASI1 port is sent from side A to side B. In this case the ASI EMM configuration will be following: 'EMM Enable' and 'EMM Protection Failover' check-boxes must be checked. Also ASI EMM module 'Enable' check-box must be checked and 'Mode' set as "Rx"

ADMIN permissions

Logout in: 14 m 59 s Write

MUX | EthVLAN | EthQOS | EMM

EMM	EMM#1	EMM#2	EMM#3	EMM#4
EMM Type	4ASI	none	none	none
EMM Enable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EMM Protection Failover	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
EMM Add/Drop ID	auto			
EMM Add/Drop Range	1..4			
EMM Mode				

EMM CARD #1	ASI 1	ASI 2	ASI 3	ASI 4
Enable	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
Link Status	loss	loss	loss	loss
PCR Lock	-	-	-	-
Mode	Rx	Rx	Rx	Rx
Data Source				
Speed Limit (Rx) [Mbps]	214	214	214	214

Undo Apply

Figure 5.77 Example of Side A Secondary IDU EMM configuration

- i) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

Major | Minor

WARNINGS	LOCAL (secondary)		LOCAL	REMOTE	LOCAL		THRESHOLDS	DETAILS
	Pri/Sec switch	CH 1	CH 2	Peer (FO)	Direct RF			
Modem								
Modem Aggr/Prot	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem Data Sync	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25	-25
Modem MSE Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		[dB]
Modem FER	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	10
Radio								
Radio RX Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-75	-75
Radio TX Mute	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		[dBm]
Ports								
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN3 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP2 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP4 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
EMM#1 - 4ASI								
EMM HW+SW	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		none
SFP2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Sync	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Idle	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 5.78 Example of Side A Secondary IDU alarm configuration

- j) Save new settings by pressing button.
- 3) **IDU B (primary):**
- a) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link

Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary'. As the link will use different frequency channels/bands for each direction then the Duplex Mode must be configured so that one of channels is in Tx mode, but the second channel is in Rx mode. In the example on Side B the Channel 1 is 'Rx-only' mode, and the Channel 2 is in 'Tx-only' mode

TxF	TxP	MSE	RxL	W	Prem.prim_11	Split 2+2	loc.prim_13:P	W	RxL	MSE	TxP	TxF
18810	muted	-36.2	-31.0	1	simple RX	ACM	0032strong / 60M / 227Mb	1	-88.9	0.0	24	17800
19110	24	0.0	-87.0	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-32.6	-20.2	muted	18100
18810	muted	-36.3	-34.7	1	simple RX	ACM	0032strong / 60M / 227Mb	1	-89.5	0.0	muted	17800
19110	muted	0.0	-88.0	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-38.3	-36.3	muted	18100

LOCAL (primary) S:rem.sec_10 HSB/SD loc.sec_12:S REMOTES

Logout in: 19 m 55 s

Mode Description Date&Time Advanced

DESIGN CONFIGURATION LOCAL (primary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (primary) ACTION

Functional Mode Split 2+2 Apply

Link Protection Diversity HSB/SD - Hot standby Apply

Link Aggregation Diversity FD FO peer connected - it's role will be set automatically.

Hot-Swap Startup Device Role Fixed primary

RADIO MODES CHANNEL 1 CHANNEL 2 ACTION

Duplex Mode Rx Only Tx Only Apply

Caution: manually set the RF neighbour Radio Mode to Simple Tx mode

Caution: manually set the RF neighbour Radio Mode to Simple Rx mode

Refresh Undo

Figure 5.79 Example of Side B Primary IDU system configuration

- b) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters. Frequency channel/band must be different for Channel 1 and Channel 2, and correspond to 'Tx-only' and 'Rx-only' Duplex mode settings in '[Config->System->Mode](#)' page.

TxF	TxP	MSE	RxL	W	Prem.prim_11	Split 2+2	loc.prim_13:P	W	RxL	MSE	TxP	TxF
18810	muted	-36.2	-31.1	1	simple RX	ACM	0032strong / 60M / 227Mb	1	-88.8	0.0	24	17800
19110	24	0.0	-87.0	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-32.6	-20.7	muted	18100
18810	muted	-36.3	-34.5	1	simple RX	ACM	0032strong / 60M / 227Mb	1	-89.5	0.0	muted	17800
19110	muted	0.0	-88.0	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-38.1	-35.9	muted	18100

LOCAL (primary) S:rem.sec_10 HSB/SD loc.sec_12:S REMOTES

Logout in: 19 m 26 s

Parameters ACM Advanced

MODEM LOCAL REMOTE

CHANNEL 1 CHANNEL 2 CHANNEL 1 CHANNEL 2

Bandwidth 60000_02 60000_02 60000_02 60000_02

Max RxACM Profile 0032/strong 0032/strong 0032/strong 0032/strong

ACM Setting

Advanced Setting default default - -

RADIO LOCAL REMOTE

CHANNEL 1 CHANNEL 2 CHANNEL 1 CHANNEL 2

T/R Spacing fixed fixed fixed fixed

TX Frequency [MHz] 18810 19110 17800 18100

RX Frequency [MHz] 17800 18100 18810 19110

TX Power Limit [dBm] 26 26 26 26

TX Mute Config auto auto auto auto

ATPC Function

ATPC RX Level [dBm] -55 -55 -55 -55

Refresh Undo Apply local

Figure 5.80 Example of Side B Primary IDU radio configuration

- c) The ACM (Adaptive Coding and Modulation) must be disabled if Duplex modes “Tx only” and “Rx only” are used. In order to disable it, navigate to ‘[Config->Radio->ACM](#)’ in the web GUI and set ACM function to “man p1” on both Channels. This setting disables the ACM

The screenshot shows the web GUI for Side B Primary IDU. The top section displays a table of radio parameters for two channels (18810 and 19110) in both Tx and Rx directions. Below this, the 'ACM SETTINGS' section is visible, with the 'ACM function' dropdown menu set to 'man p1' for both Channel 1 and Channel 2. The 'ACM Offset' is set to 0.0 for both channels. The 'Usual value' for ACM function is 'auto', and the 'Note' is '-3.0 ... +3.0'. The 'Write' button is visible in the top right corner.

Figure 5.81 Example of Side B Primary IDU ACM configuration

- d) In web GUI ‘[Config->IP->Addresses](#)’ set the IP address of the device. The IP address must be different for each IDU

The screenshot shows the web GUI for Side B Primary IDU. The top section displays a table of radio parameters for two channels (18810 and 19110) in both Tx and Rx directions. Below this, the 'Addresses' section is visible, with the 'Device IP / Mask' field set to '192.168.205.11 / 24'. The 'Default Gateway IP' is set to '192.168.205.1'. The 'OPTIONAL ADDRESS SETTINGS' section shows 'USB IP/Mask' and 'Fallback IP/Mask' both set to '10.10.10.10/24'. The 'Save' button is visible in the bottom right corner.

Figure 5.82 Example of Side B Primary IDU IP configuration

- e) In web GUI ‘[Config->IP->Advanced](#)’ set ‘WEB’ option as Default NAT to remote. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the remote primary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:1443>

The screenshot shows the SAF web GUI interface for IP NAT configuration. The left sidebar contains navigation options: ADMIN permissions, Status, Config (System, Access, IP, Radio, Ports, Alarms), Maintenance, and Tools. The main content area is titled 'Advanced' and includes sections for 'STATIC ROUTES - INPUT VALUES', 'NAT - INPUT VALUES', and 'RADIUS - INPUT VALUES'. The 'NAT - INPUT VALUES' section has a 'WEB' checkbox checked and circled in red. Below this is a 'SETTINGS' table with columns for 'REQUIRED' and 'CONFIGURED'.

SETTINGS	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		Default WEB NAT on (https://192.168.205.13:1443:1443/, https://192.168.205.13:1443:2443/) Default SSH NAT: off
Radius Server		

At the bottom right of the settings table is a 'Save' button.

Figure 5.83 Example of Side B Primary IDU IP NAT configuration

- f) Port group configuration must be done according to customer requirements. In this configuration when the Duplex modes “Tx-only” and “Rx-only” are used the remote management access via WAN port is not supported. That is why NAT configuration is required. In this example LAN1 port is used for the traffic, so LAN1 and WANa are grouped in the same group (Group 1). LAN2 and WANb are grouped in Group 2 and will not be used or can be intended for any other independent and separated user data traffic. LAN3 and MNG ports are grouped in Group3 for management access only via LAN3 port. Port grouping configuration is available in web GUI ‘[Config->Ports->EthVLAN](#)’ section

The screenshot shows the SAF web GUI interface for port grouping configuration. The left sidebar is the same as in Figure 5.83. The main content area is titled 'EthVLAN' and contains a table for configuring port groups. Below the table is a diagram showing the physical port connections.

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

The diagram below the table shows a 'GE switch' with ports LAN1, LAN2, LAN3, WANa, WANb, and MNG CPU connected to it.

Figure 5.84 Example of Side B Primary IDU port grouping

- g) In web GUI ‘[Config->Ports->MUX](#)’ specify Data channel and port speed for WAN (radio direction) port and SFP ports. In the example WANa port is connected to high priority data channel ‘ETH1a’ and is set on full speed limit 1000 Mbps. The SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode ‘force2G5’

Figure 5.85 Example of Side B Primary IDU port configuration

- h) In web GUI '[Config->Ports->EMM](#)' configure the ASI traffic according to customer requirements. In the example one ASI traffic stream via ASI1 port is sent from side A to side B. In this case the ASI EMM configuration will be following: 'EMM Enable' and 'EMM Protection Failover' check-boxes must be checked. Also ASI EMM module 'Enable' check-box must be checked and 'Mode' set as "Tx". The Data Source in this case must be specified as 'Remote Ch1'

Figure 5.86 Example of Side B Primary IDU EMM configuration


- i) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must

be checked in order to initiate the switch-over in case of failure of any of those interfaces

The screenshot shows the web GUI configuration for Side B Primary IDU alarm. The interface is divided into Major and Minor sections. The Major section includes Modem, Radio, and Ports. The Ports section shows various links with checkboxes and status indicators. The Minor section includes EMM#1 -4ASI and other links. A red box highlights the 'Write' button, and another red box highlights the 'Modem SFP1 Link' and 'Modem SFP2 Link' checkboxes.

		LOCAL (primary)		LOCAL	REMOTE	LOCAL		
WARNINGS		Pri/Sec switch	CH 1	CH 2	Peer (FD)	Direct RF	THRESHOLDS	DETAILS
Modem								
Modem Aggr/Prot	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem Data Sync	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem MSE Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25 ⓘ -25 ⓘ	[dB]
Modem FER	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10 ⓘ 10 ⓘ	[error_frm/10s]
Radio								
Radio RX Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-75 ⓘ -75 ⓘ	[dBm]
Radio TX Mute	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Ports								
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN3 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP2 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP4 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
		LOCAL (primary)		REMOTE	LOCAL	LOCAL		
EMM#1 -4ASI		Pri/Sec switch	CH 1	Peer (FD)	Direct RF	THRESHOLDS	DETAILS	
EMM HW+SW	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		none	
SFP2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Sync	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			
P1 Idle	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>			

Figure 5.87 Example of Side B Primary IDU alarm configuration

j) Save new settings by pressing  button.

4) IDU B (secondary):

- In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed secondary'. As the link will use different frequency channels/bands for each direction then the Duplex Mode must be configured so that one of channels is in Tx mode, but the second channel is in Rx mode. In the example on Side B the Channel 1 is 'Rx-only' mode, and the Channel 2 is in 'Tx-only' mode

ADMIN permissions

Logout in: 19 m 35 s Write

DESIGN CONFIGURATION LOCAL (secondary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (secondary) ACTION

Functional Mode Split 2+2 Apply

Link Protection Diversity HSB/SD - Hot standby Apply

Link Aggregation Diversity FD FO peer connected - it's role will be set automatically.

Hot-Swap Startup Device Role Fixed secondary

RADIO MODES CHANNEL 1 CHANNEL 2 ACTION

Duplex Mode Rx Only Tx Only Apply

Caution: manually set the RF neighbour Radio Mode to Simple Tx mode Caution: manually set the RF neighbour Radio Mode to Simple Rx mode

Modem Serial Number Refresh Undo

Date: Fri, 08.02.2019
Time: 15:26:03
Uptime: 0 00:59:20
Refresh status

TxF	TxP	MSE	RxL																	
18810	muted	-36.1	-31.0		Prem.prim_11	Split 2+2	loc.prim_13:P			RxL	MSE	TxP	TxF							
19110	24	0.0	-86.7		simple RX	ACM	0032strong / 60M / 227Mb			-88.8	0.0	24	17800							
19110	24	0.0	-86.7		0032strong / 60M / 227Mb	ACM	simple RX			-32.7	-20.8	muted	18100							
18810	muted	-36.2	-34.8		simple RX	ACM	0032strong / 60M / 227Mb			-89.5	0.0	muted	17800							
19110	muted	0.0	-88.1		0032strong / 60M / 227Mb	ACM	simple RX			-38.3	-36.3	muted	18100							
LOCAL (secondary)					S:rem.sec_10	HSB/SD	loc.sec_12:S			REMOTE(s)										

Figure 5.88 Example of Side B Secondary IDU system configuration

- b) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters. Frequency channel/band must be different for Channel 1 and Channel 2, and correspond to 'Tx-only' and 'Rx-only' Duplex mode settings in '[Config->System->Mode](#)' page

ADMIN permissions

Logout in: 19 m 24 s Write

MODEM LOCAL REMOTE ACTION

CHANNEL 1 CHANNEL 2 CHANNEL 1 CHANNEL 2

Bandwidth 60000_02 60000_02 60000_02 60000_02

Max RxACM Profile 0032/strong 0032/strong 0032/strong 0032/strong

ACM Setting - -

Advanced Setting default default - -

RADIO LOCAL REMOTE ACTION

CHANNEL 1 CHANNEL 2 CHANNEL 1 CHANNEL 2

T/R Spacing fixed fixed fixed fixed

TX Frequency [MHz] 18810 19110 17800 18100

RX Frequency [MHz] 17800 18100 18810 19110

TX Power Limit [dBm] 20 13 20 13

TX Mute Config auto auto auto auto

ATPC Function

ATPC RX Level [dBm] -55 -55 -55 -55

Refresh Undo Apply local

Date: Fri, 08.02.2019
Time: 15:27:11
Uptime: 0 01:00:28
Refresh status

Modem Serial Number 355260100011
License Number 3010403010100230
License Type / Status permanent / ok

TxF	TxP	MSE	RxL																	
18810	muted	-36.1	-30.9		Prem.prim_11	Split 2+2	loc.prim_13:P			RxL	MSE	TxP	TxF							
19110	24	0.0	-86.8		simple RX	ACM	0032strong / 60M / 227Mb			-88.8	0.0	24	17800							
19110	24	0.0	-86.8		0032strong / 60M / 227Mb	ACM	simple RX			-32.8	-20.7	muted	18100							
18810	muted	-36.2	-34.7		simple RX	ACM	0032strong / 60M / 227Mb			-89.4	0.0	muted	17800							
19110	muted	0.0	-88.2		0032strong / 60M / 227Mb	ACM	simple RX			-38.2	-36.2	muted	18100							
LOCAL (secondary)					S:rem.sec_10	HSB/SD	loc.sec_12:S			REMOTE(s)										

Figure 5.89 Example of Side B Secondary IDU radio configuration

- c) The ACM (Adaptive Coding and Modulation) must be disabled if Duplex modes "Tx only" and "Rx only" are used. In order to disable it, navigate to '[Config->Radio->ACM](#)' in the web GUI and set ACM function to "man p1" on both Channels. This setting disables the ACM

TxF	TxP	MSE	RxL										
18810	muted	-28.5	-41.7	1	Prem.prim_11	Split 2+2	loc.prim_13:P	1	RxL	MSE	TxP	TxF	
19110	13	0.0	-87.0	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-89.5	0.0	13	17800	
18810	muted	-38.1	-46.0	1	0032strong / 60M / 227Mb	ACM	simple RX	2	-44.1	-39.2	muted	18100	
19110	muted	0.0	-88.5	2	simple RX	ACM	0032strong / 60M / 227Mb	1	-89.7	0.0	muted	17800	
19110	muted	0.0	-88.5	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-48.9	-36.9	muted	18100	

ACM SETTINGS	CHANNEL 1	CHANNEL 2	Usual value	Note
ACM function	man p1	man p1	auto	
ACM Offset	0.0	0.0	0	-3.0 .. +3.0

Figure 5.90 Example of Side B Secondary IDU ACM configuration

- d) In web GUI 'Config->IP->Addresses' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL										
18810	muted	-36.1	-30.9	1	Prem.prim_11	Split 2+2	loc.prim_13:P	1	RxL	MSE	TxP	TxF	
19110	24	0.0	-86.8	2	simple RX	ACM	0032strong / 60M / 227Mb	2	-88.8	0.0	24	17800	
18810	muted	-36.2	-34.7	1	0032strong / 60M / 227Mb	ACM	simple RX	2	-32.8	-20.7	muted	18100	
19110	muted	0.0	-88.2	2	simple RX	ACM	0032strong / 60M / 227Mb	1	-89.4	0.0	muted	17800	
19110	muted	0.0	-88.2	2	0032strong / 60M / 227Mb	ACM	simple RX	2	-38.2	-36.2	muted	18100	

MAIN ADDRESS SETTINGS	REQUIRED	CONFIGURED
Device IP / Mask	192.168.205.10 / 24	192.168.205.10/24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS	REQUIRED	CONFIGURED
USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24	10.10.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24	10.10.10.10/24

Figure 5.91 Example of Side B Secondary IDU IP configuration

- e) In web GUI 'Config->IP->Advanced' set 'WEB' option as Default NAT to remote. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the remote secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:3443>

The screenshot shows the 'Advanced' configuration page for IP NAT. The 'Default NAT to remote' section has the 'WEB' checkbox checked and circled in red. Other sections include 'STATIC ROUTES - INPUT VALUES', 'NAT - INPUT VALUES', and 'RADIUS - INPUT VALUES'. A table at the bottom shows 'SETTINGS', 'REQUIRED', and 'CONFIGURED' values for Route, NAT, and Radius Server.

TxF	TxP	MSE	RxL	W	Prem.prim_11	Split 2+2	loc.prim_13:P	W	RxL	MSE	TxP	TxF
18810	muted	-36.1	-30.9	1	simple RX	AGM	0032strong / 60M / 227Mb	1	-88.8	0.0	24	17800
19110	24	0.0	-86.8	2	0032strong / 60M / 227Mb	AGM	simple RX	2	-32.8	-20.7	muted	18100
18810	muted	-36.2	-34.7	1	simple RX	AGM	0032strong / 60M / 227Mb	1	-89.4	0.0	muted	17800
19110	muted	0.0	-88.2	2	0032strong / 60M / 227Mb	AGM	simple RX	2	-38.2	-36.2	muted	18100

Figure 5.92 Example of Side B Secondary IDU IP NAT configuration

- f) Port group configuration must be done according to customer requirements. In this configuration when the Duplex modes “Tx-only” and “Rx-only” are used the remote management access via WAN port is not supported. That is why NAT configuration is required. In this example LAN1 port is used for the traffic, so LAN1 and WANa are grouped in the same group (Group 1). LAN2 and WANb are grouped in Group 2 and will not be used or can be intended for any other independent and separated user data traffic. LAN3 and MNG ports are grouped in Group3 for management access only via LAN3 port. Port grouping configuration is available in web GUI [‘Config->Ports->EthVLAN’](#) section

The screenshot shows the 'EthVLAN' configuration page. A table lists port modes for LAN 1, LAN 2, LAN 3, MNG, WAN A, and WAN B. Below the table is a diagram showing the physical ports (LAN1, LAN2, LAN3, WANa, WANb, MNG CPU) connected to a GE switch.

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Figure 5.93 Example of Side B Secondary IDU port grouping

- g) In web GUI [‘Config->Ports->MUX’](#) specify Data channel and port speed for WAN (radio direction) port and SFP ports. In the example WANa port is connected to high priority data channel ‘ETH1a’ and is set on full speed limit 1000 Mbps. The SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode ‘force2G5’

The screenshot shows the EMM configuration page in the Phoenix G2 IDU web GUI. The 'DATAFLOW CONFIGURATION' section is the primary focus, with several settings highlighted by red circles:

- SFP1 and SFP2 Status:** Both are set to 'SFP gbit FD'.
- EMM1 Mode:** Set to 'EMM1'.
- ETH1a Mode:** Set to 'ETH1a'.
- Speed Limit:** Set to '1000'.
- Avail Aggr Speed:** 227.8 Mbps ETH.
- Modem Speed:** 227.81 Mbps eth-disabled.

The left sidebar shows the navigation menu with 'Config' selected, and 'Ports' and 'EMM' sub-menus. The top navigation bar includes 'MUX', 'EthVLAN', 'EthQOS', and 'EMM'. The right side of the page shows a network diagram with various ports and modules.

Figure 5.94 Example of Side B Secondary IDU port configuration

- h) In web GUI '[Config->Ports->EMM](#)' configure the ASI traffic according to customer requirements. In the example one ASI traffic stream via ASI1 port is sent from side A to side B. In this case the ASI EMM configuration will be following: 'EMM Enable' and 'EMM Protection Failover' check-boxes must be checked. Also ASI EMM module 'Enable' check-box must be checked and 'Mode' set as "Tx". The Data Source in this case must be specified as 'Remote Ch1'

The screenshot shows the EMM configuration page in the Phoenix G2 IDU web GUI. The 'EMM' section is the primary focus, with the following settings:

- EMM Type:** 4ASI
- EMM Enable:**
- EMM Protection Failover:**
- EMM Add/Drop ID:** auto
- EMM Add/Drop Range:** 1..4
- EMM Mode:** (empty)
- EMM CARD #1 (ASI 1):** Enable Link Status: noSync PCR Lock: noLock Mode: Tx Data Source: Remote Ch1 Speed Limit (Rx) [Mbps]: 214
- EMM CARD #2 (ASI 2):** Enable Link Status: loss PCR Lock: - Mode: Rx Speed Limit (Rx) [Mbps]: 214
- EMM CARD #3 (ASI 3):** Enable Link Status: loss PCR Lock: - Mode: Rx Speed Limit (Rx) [Mbps]: 214
- EMM CARD #4 (ASI 4):** Enable Link Status: loss PCR Lock: - Mode: Rx Speed Limit (Rx) [Mbps]: 214

The left sidebar shows the navigation menu with 'Config' selected, and 'Alarms' and 'Minor' sub-menus. The top navigation bar includes 'MUX', 'EthVLAN', 'EthQOS', and 'EMM'. The right side of the page shows a network diagram with various ports and modules.

Figure 5.95 Example of Side B Secondary IDU EMM configuration

- i) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

WARNINGS	LOCAL (secondary)		LOCAL	REMOTE	LOCAL		THRESHOLDS	DETAILS
	Pri/Sec switch	CH 1	Peer (FO)	Direct RF				
Modem								
Modem Aggr/Prot	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem Data Sync	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem MSE Level	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-25	-25 [dB]
Modem FER	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	10	10 [error_fm/10s]
Radio								
Radio RX Level	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	-75	-75 [dBm]
Radio TX Mute	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Ports								
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem LAN2 Link	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem LAN3 Link	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem SFP2 Link	no	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
Modem SFP4 Link	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
EMM#1 - 4ASI								
EMM HW+SW	no	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		none
SFP2 Link	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
P1 Link	yes	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
P1 Sync	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		
P1 Idle	yes	<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>		

Figure 5.96 Example of Side B Secondary IDU alarm configuration

j) Save new settings by pressing **Write** button.

- Reboot all 4 IDUs after successful reconfiguration
- In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' in both Primary IDUs in order to enable protection mode

The screenshot shows the 'System' configuration page for Primary IDUs. The 'Hot-Swap Startup Device Role' is set to 'Auto (primary)', which is circled in red. The 'Design Type' is set to 'Design 511' and the 'Functional Mode' is set to 'Split 2+2'. The 'Link Protection Diversity' is set to 'HSB/SD - Hot standby' and the 'Link Aggregation Diversity' is set to 'FD'. The 'Running Role Swapping' is set to 'swap device role (primary/secondary)'. The 'Write' button is visible in the top right corner.

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF	
17800	24	0.0	-89.0	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-31.1	-36.2	muted	18810
18100	muted	-38.3	-49.0	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-87.0	0.0	muted	19110
17800	muted	0.0	-89.5	1	0032strong / 60M / 227Mb	AGM	simple RX	1	-34.6	-36.3	muted	18810
18100	muted	-34.6	-54.4	2	simple RX	AGM	0032strong / 60M / 227Mb	2	-88.1	0.0	0	19110

Figure 5.97 Example of Primary IDUs system configuration in Auto mode

- In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto secondary' in both Secondary IDUs in order to enable protection mode

ADMIN permissions

Logout in: 18 m 56 s Write

TxF	TxP	MSE	RxL										
17800	24	0.0	-88.8		Ploc.prim_13	Split 2+2	rem.prim_11:P						
18100	muted	-38.3	-48.9		0032strong / 60M / 227Mb	AGM	simple RX						
17800	muted	0.0	-89.5		0032strong / 60M / 227Mb	AGM	simple RX						
18100	muted	-34.7	-54.4		simple RX	AGM	0032strong / 60M / 227Mb						
LOCAL (secondary)					S:loc.sec_12	HSB/SD	rem.sec_10:S						REMOTE(s)

Mode Description Date&Time Advanced

DESIGN CONFIGURATION LOCAL (secondary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (secondary) ACTION

Functional Mode Split 2+2 Apply

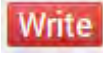
Link Protection Diversity HSB/SD - Hot standby Apply

Link Aggregation Diversity FD Apply

Hot-Swap Startup Device Role **Auto (secondary)** FO peer connected - it's role will be set automatically.

Running Role Swapping swap device role (primary/secondary) Apply

Figure 5.98 Example of Secondary IDUs system configuration in Auto mode

- 8) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):

ADMIN permissions

Logout in: 18 m 56 s Write

TxF	TxP	MSE	RxL										
17800	24	0.0	-89.4		Ploc.prim_13	Split 2+2	rem.prim_11:P						
18100	muted	-38.3	-49.0		0032strong / 60M / 227Mb	AGM	simple RX						
17800	muted	0.0	-89.9		0032strong / 60M / 227Mb	AGM	simple RX						
18100	muted	-34.6	-54.6		simple RX	AGM	0032strong / 60M / 227Mb						
LOCAL (primary)					S:loc.sec_12	HSB/SD	rem.sec_10:S						REMOTES

Figure 5.99 Status of 1+1 HSB/SD Dual-band frequency mode

Example 10 – 2+2 FD aggregation HSB/SD protection scheme

The 2+2 FD (Frequency Diversity) aggregation HSB/SD (Hot Standby/Space Diversity) protection mode is the mode supporting link aggregation which is protected using HSB/SD protection method. In this case two data Channels are used for data aggregation (Channel 1 and Channel 2). Each channel uses its own radio frequency channel (FD), and each channel is protected.

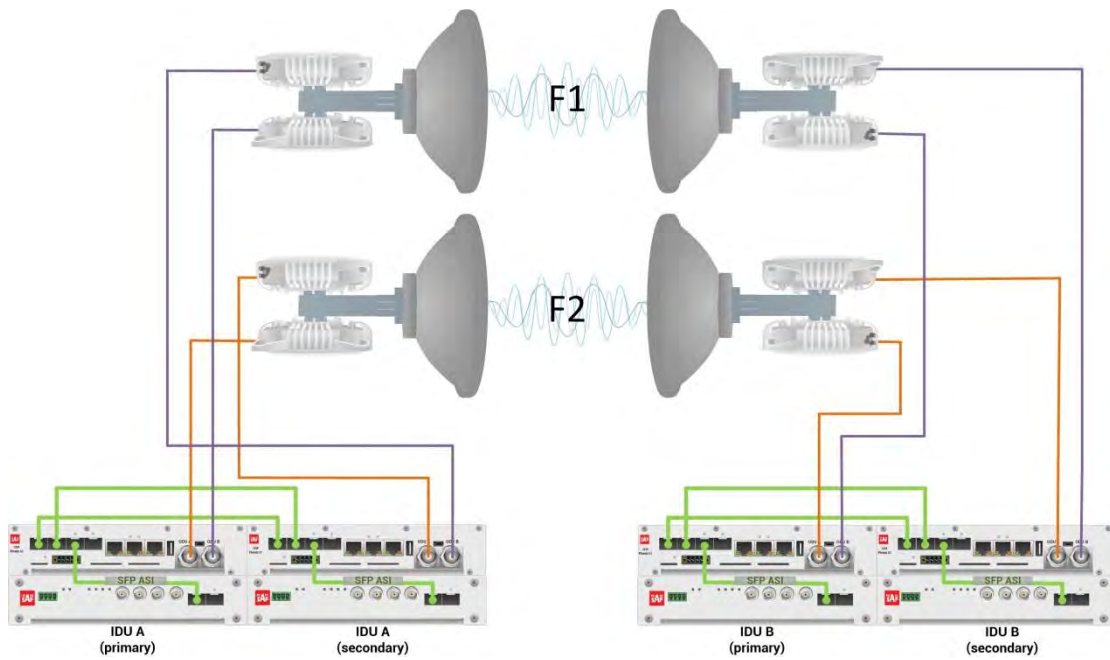


Figure 5.100a Example of 2+2 FD aggregation HSB/SD protection scheme

Figure 5.100a shows 2+2 FD aggregation HSB/SD protection scheme where IF interconnections between IDUs and ODUs provides HSB connection diagram. Two frequency channels are used in the same polarization. Couplers are used to interconnect 2 ODUs to one antenna.

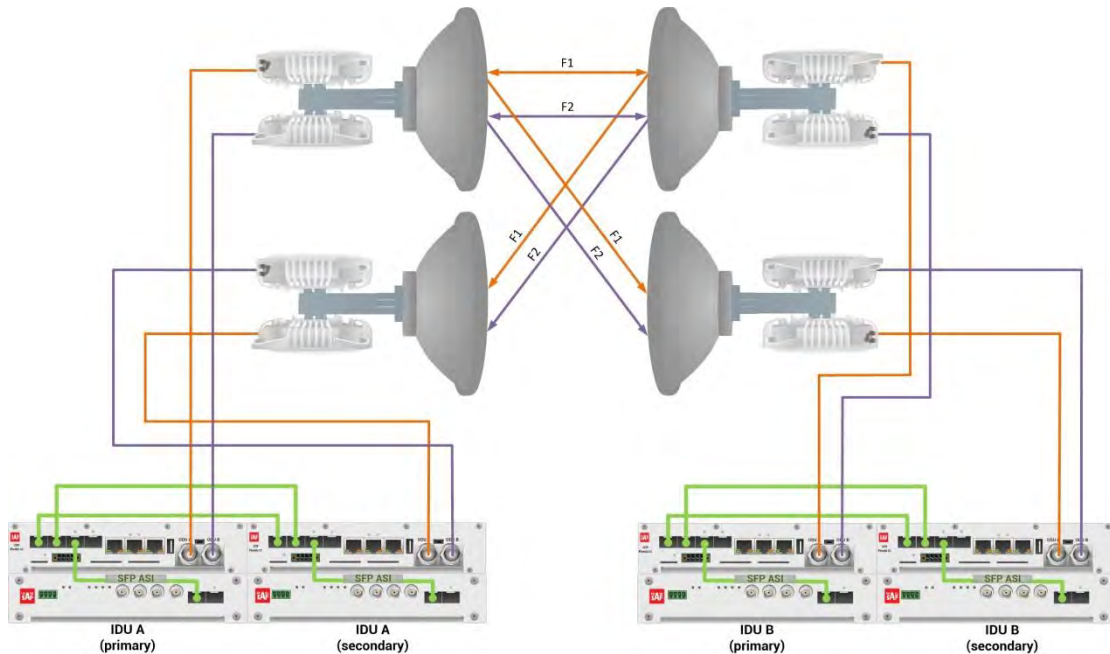


Figure 5.100b Example of 2+2 FD aggregation HSB/SD protection scheme

Figure 5.100b shows 2+2 FD aggregation HSB/SD protection scheme where IF interconnections between IDUs and ODUs provides SD connection diagram. Two frequency channels are used in the same polarization. Couplers are used to interconnect 2 ODUs to one antenna.

In both above mentioned schemes the ODUs and couplers can be substituted with IRFUs and IBUs combination if required by customer.

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 2+2', Link Aggregation Diversity 'FD' and Link Protection Diversity 'HSB/SD – hot standby' are selected on both sides of the link. The modulation is 32QAM in BW 60 MHz and the appropriate maximal data speed is about 227 Mbps per channel. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODU's per link.**



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

Configuration steps for 2+2 FD aggregation HSB/SD protection are following:

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs.

TxF	TxP	MSE	RxL					RxL	MSE	TxP	TxF	
17800	muted	-34.7	-55.9	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	1	-54.2	-36.2	muted	18810
18100	muted	-39.3	-44.1	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	2	-53.8	-34.0	13	19110
17800	6	-30.1	-61.0	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	1	-58.2	-32.4	6	18810
18100	6	-36.9	-49.7	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	2	-59.0	-30.9	muted	19110

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 15 m 52 s

Mode	Description	Date&Time	Advanced	ACTION
DESIGN CONFIGURATION LOCAL (primary)				ACTION
Design Type	Design 511			Apply
DESIGN MODES LOCAL (primary)				ACTION
Functional Mode	Split 2+2			Apply
Link Protection Diversity	HSB/SD - Hot standby			Apply
Link Aggregation Diversity	FD			Apply
Hot-Swap Startup Device Role	Fixed primary			Apply
RADIO MODES CHANNEL 1 CHANNEL 2				ACTION
Duplex Mode	Bidirectional	Bidirectional		Apply

FO peer connected - it's role will be set automatically.

Refresh Undo

Date: Thu, 14.02.2019
Time: 14:30:25
Uptime: 0 03:21:53

Figure 5.101 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Choose different frequency channels for Channel 1 and Channel 2

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	13	-34.6	-55.9	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-41.8	-38.7	muted	18810
18100	13	-39.2	-44.1	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-41.7	-38.3	13	19110
17800	muted	-30.1	-61.1	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-46.6	-38.0	6	18810
18100	muted	-36.9	-49.7	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-47.0	-37.7	muted	19110

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 17 m 22 s Write

Parameters ACM Advanced

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	0032/strong	0032/strong	0032/strong	0032/strong
ACM Setting				
Advanced Setting	default	default	-	-

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17800	18100	18810	19110
RX Frequency [MHz]	18810	19110	17800	18100
TX Power Limit [dBm]	13	13	13	13
TX Mute Config	auto	auto	auto	auto
ATPC Function				
ATPC RX Level [dBm]	-55	-55	-55	-55

Refresh Undo Apply local

Date: Thu, 14.02.2019
Time: 14:35:11
Uptime: 0 03:26:40
Refresh status

Modem Serial Number
355260100010
License Number
3010403010100229
License Type / Status
permanent / ok

Figure 5.102 Example of Radio configuration

- 3) In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	13	-34.6	-56.0	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-41.8	-38.7	muted	18810
18100	13	-39.2	-44.1	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-41.8	-38.4	13	19110
17800	muted	-30.2	-60.9	1	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-46.6	-38.0	6	18810
18100	muted	-36.9	-49.7	2	0032strong / 60M / 227Mb	ACM	0032strong / 60M / 227Mb	-47.0	-37.6	muted	19110

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 19 m 49 s Write

Addresses SNMP Advanced

MAIN ADDRESS SETTINGS	REQUIRED	CONFIGURED
	Device IP / Mask	192.168.205.13 / 24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS	REQUIRED	CONFIGURED
	USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24	10.10.10.10/24

Undo Save

Figure 5.103 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

The screenshot displays the 'Config' section of the Phoenix G2 IDU web GUI, specifically the 'IP' configuration page. The 'Default NAT to remote' section has the 'WEB' checkbox checked and circled in red. The 'NAT' section shows the following configuration:

SETTINGS	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		1443 192.168.205.11:443 Default WEB NAT: on (https://192.168.205.13:1443/ https://192.168.205.13:2443/) Default SSH NAT: off
Radius Server		

Figure 5.104 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI [Config->Ports->EthVLAN](#) section and must be done in all Phoenix G2 IDUs

The screenshot displays the 'Config' section of the Phoenix G2 IDU web GUI, specifically the 'EthVLAN' configuration page. The 'Port Group' column shows the following assignments:

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Below the table, a diagram shows the port connections: LAN1 is connected to WANa, LAN2 is connected to WANb, and LAN3 is connected to MNG CPU. The ports are grouped into three categories: LAN1, LAN2, and LAN3.

Figure 5.105 Example of port grouping

- 6) In web GUI [Config->Ports->MUX](#) specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode 'force2G5'

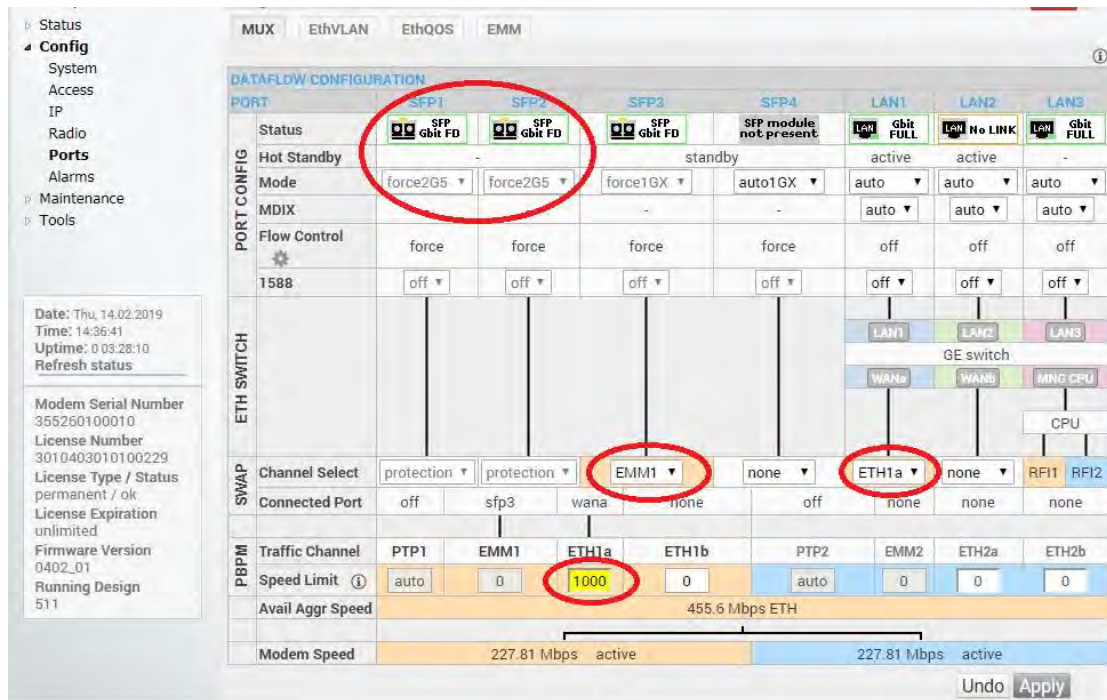


Figure 5.106 Example of port configuration

- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm checkboxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

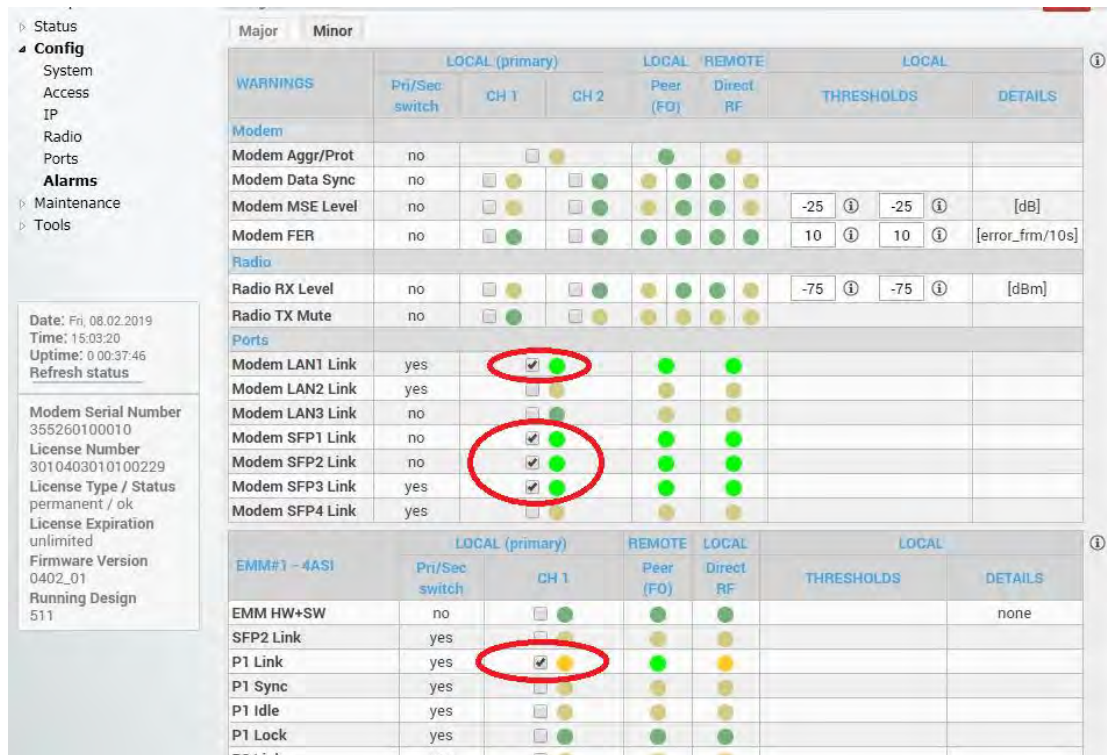

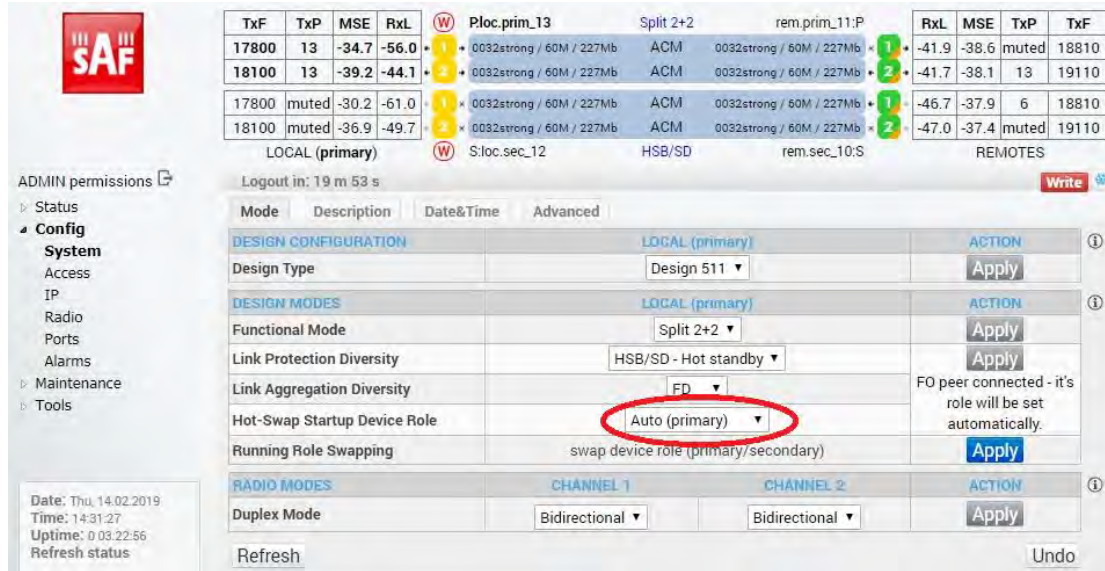



Figure 5.107 Example of alarm configuration

- 9) Save new settings by pressing  button.
- 10) Reboot all 4 IDUs after successful reconfiguration
- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs

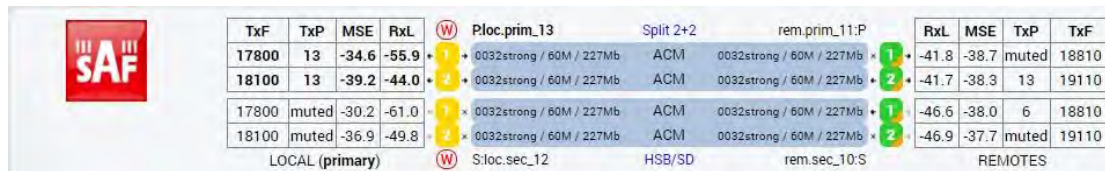


The screenshot shows the Phoenix G2 web GUI interface. At the top, there is a table displaying link status for two channels (17800 and 18100) across four IDUs. The 'LOCAL (primary)' IDU is highlighted. Below the table, the 'Config' menu is expanded to 'System' > 'Mode'. The 'Hot-Swap Startup Device Role' is set to 'Auto (primary)', which is circled in red. Other settings include 'Design Type: Design 511', 'Functional Mode: Split 2+2', 'Link Protection Diversity: HSB/SD - Hot standby', and 'Link Aggregation Diversity: FD'. A 'Write' button is visible in the top right corner.

Figure 5.108 Example of system configuration in Auto mode

- 12) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):



The screenshot shows the Phoenix G2 web GUI interface. At the top, there is a table displaying link status for two channels (17800 and 18100) across four IDUs. The 'LOCAL (primary)' IDU is highlighted in bold. Below the table, the 'Config' menu is expanded to 'System' > 'Mode'. The 'Hot-Swap Startup Device Role' is set to 'Auto (primary)'. Other settings include 'Design Type: Design 511', 'Functional Mode: Split 2+2', 'Link Protection Diversity: HSB/SD - Hot standby', and 'Link Aggregation Diversity: FD'. A 'Write' button is visible in the top right corner.

Figure 5.109 Status of 2+2FD aggregation HSB/SD protection mode

Example 11 – 2+2 FD aggregation FD protection scheme

The 2+2 FD (Frequency Diversity) aggregation FD (Frequency Diversity) protection mode is the mode supporting link aggregation which is protected using FD protection method. In this case two data Channels are used for data aggregation (Channel 1 and Channel 2) and two Channels are used for protection of aggregation channels. Each channel – aggregation and protection uses its own radio frequency channel (FD), in total 4 frequency channels are used.

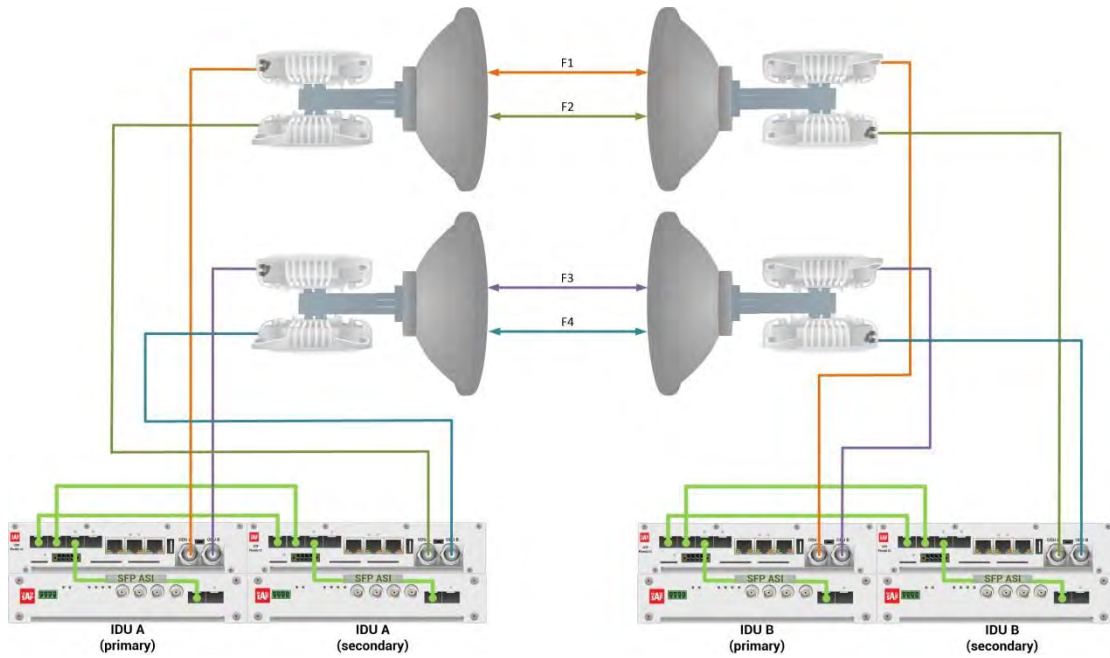


Figure 5.110a Example of 2+2 FD aggregation FD protection scheme

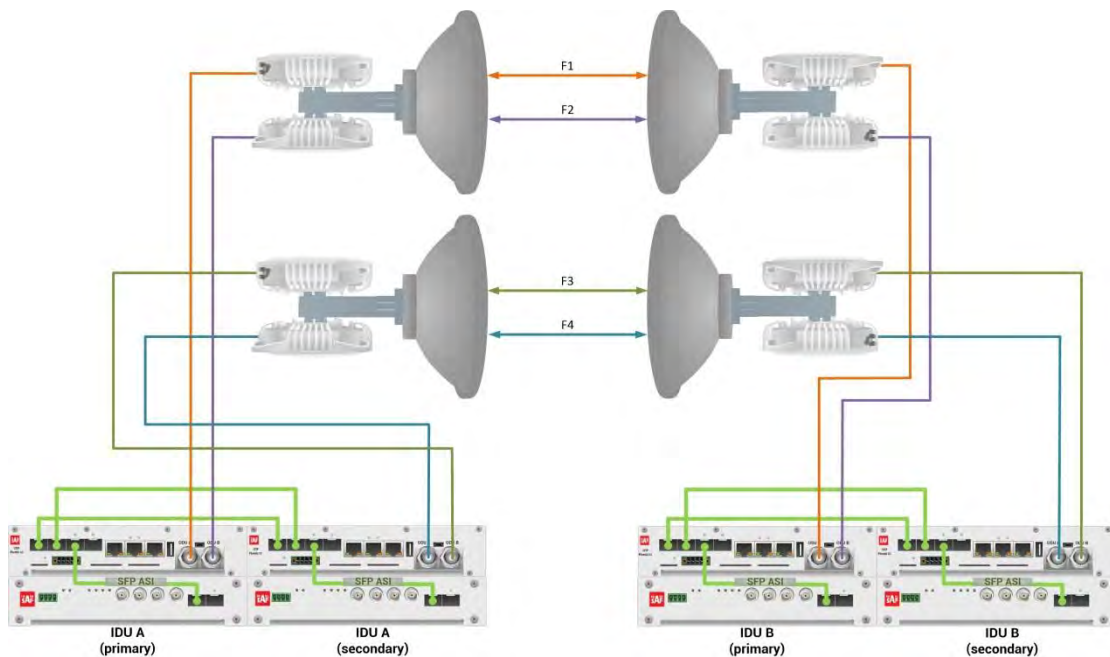


Figure 5.110b Example of 2+2 FD aggregation FD protection scheme

Figures 5.110a and 5.110b show 2+2 FD aggregation FD protection scheme where four frequency channels are used in the same polarization. Couplers are used to interconnect 2 ODU's to one antenna.

In both above mentioned schemes the ODU's and couplers can be substituted with IRFU's and IBU's combination if required by customer.

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 2+2', Link Aggregation Diversity 'FD' and Link Protection Diversity 'FD – Freq. diversity' are selected on both sides of the link. The modulation is 1024QAM in BW 60 MHz and the appropriate maximal data speed is about 455 Mbps per channel. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODU's per link.**



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

Configuration steps for 2+2 FD aggregation FD protection are following:

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'FD – Freq. diversity', Link Aggregation Diversity 'FD'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17790	15	-38.7	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.9	-38.7	15	18800
17890	15	-39.1	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.0	-38.4	15	18900
17990	18	-38.5	-48.9	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.2	-38.6	18	19000
18190	18	-36.5	-50.3	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-36.7	18	19200

LOCAL (primary) S.loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 17 m 11 s

Mode	Description	Date&Time	Advanced	ACTION
DESIGN CONFIGURATION LOCAL (primary)				
Design Type	Design 511			Apply
DESIGN MODES LOCAL (primary)				
Functional Mode	Split 2+2			Apply
Link Protection Diversity	FD - Freq. diversity			Apply
Link Aggregation Diversity	FD			Apply
Hot-Swap Startup Device Role	Fixed primary			Apply
RADIO MODES CHANNEL 1 CHANNEL 2 ACTION				
Duplex Mode	Bidirectional	Bidirectional		Apply

Refresh Undo

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
 - Maintenance
 - Tools

Date: Tue, 19.02.2019
Time: 14:53:18
Uptime: 0 00:27:07
Refresh status

Figure 5.111 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Choose different frequency channels for Channel 1 and Channel 2 in both Primary IDUs and another different frequency channels for Channel 1 and Channel 2 in both secondary IDUs

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17790	15	-38.7	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.9	-38.8	15	18800
17890	15	-39.0	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.1	-38.5	15	18900
17990	18	-38.5	-48.8	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.2	-38.4	18	19000
18190	18	-36.5	-50.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-36.8	18	19200

LOCAL (primary) S.loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 18 m 57 s

Parameters	ACM	Advanced		
MODEM LOCAL REMOTE				
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong	1024/strong	1024/strong
ACM Setting				
Advanced Setting	default	default		
RADIO LOCAL REMOTE				
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17790	17890	18800	18900
RX Frequency [MHz]	18800	18900	17790	17890
TX Power Limit [dBm]	15	15	15	15
TX Mute Config	auto	auto	auto	auto
ATPC Function				
ATPC RX Level [dBm]	-55	-55	-55	-55

Refresh Undo Apply to local & remote

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
 - Maintenance
 - Tools

Date: Tue, 19.02.2019
Time: 14:56:59
Uptime: 0 00:30:49
Refresh status

Modem Serial Number
355260100010
License Number
3010403010100229
License Type / Status

Figure 5.112 Example of Primary IDU Radio configuration

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17790	15	-38.8	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.8	-38.8	15	18800
17890	15	-39.0	-41.5	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.1	-38.5	15	18900
17990	18	-38.4	-48.8	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-38.4	18	19000
18190	18	-36.5	-50.3	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-36.8	18	19200

LOCAL (secondary) S:loc.sec_12 FD rem.sec_10:S REMOTE(s)

Logout in: 13 m 18 s

Parameters ACM Advanced

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong	1024/strong	1024/strong
ACM Setting	⚙️	⚙️	-	-
Advanced Setting	default	default	-	-

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17990	18190	19000	19200
RX Frequency [MHz]	19000	19200	17990	18190
TX Power Limit [dBm]	18	18	18	18
TX Mute Config	auto	auto	auto	auto
ATPC Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ATPC RX Level [dBm]	-55	-55	-55	-55

Refresh Undo Apply to local & remote

Date: Tue, 19.02.2019
Time: 14:57:04
Uptime: 0 00:31:15
Refresh status

Modem Serial Number: 355260100008
License Number: 3010403010100227
License Type / Status: permanent / ok

Figure 5.113 Example of Secondary IDU Radio configuration

- 3) In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17790	15	-38.8	-41.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.8	-38.8	15	18800
17890	15	-39.0	-41.3	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.1	-38.5	15	18900
17990	18	-38.4	-48.8	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.2	-38.4	18	19000
18190	18	-36.4	-50.3	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.2	-36.8	18	19200

LOCAL (primary) S:loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 19 m 49 s Write

Addresses SNMP Advanced

MAIN ADDRESS SETTINGS	REQUIRED	CONFIGURED
Device IP / Mask	192.168.205.13 / 24	192.168.205.13/24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS	REQUIRED	CONFIGURED
USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24	10.10.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24	10.10.10.10/24

Undo Save

Figure 5.114 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

The screenshot shows the 'Advanced' configuration page for IP NAT. The 'Default NAT to remote' section has the 'WEB' checkbox checked and circled in red. Other sections include 'STATIC ROUTES - INPUT VALUES', 'NAT - INPUT VALUES', 'RADIUS - INPUT VALUES', and 'SETTINGS' with 'REQUIRED' and 'CONFIGURED' columns.

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17790	15	-38.7	-41.4	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-39.8	-38.8	15	18800
17890	15	-39.1	-41.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-40.1	-38.5	15	18900
17990	18	-38.5	-48.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-47.2	-38.5	18	19000
18190	18	-36.4	-50.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-47.3	-36.8	18	19200

LOCAL (primary) S:loc.sec_12 FD rem.sec_10:S REMOTES

Log out in: 19 m 53 s

Addresses SNMP Advanced

STATIC ROUTES - INPUT VALUES

Routed IP/MASK

Gateway IP

Add Delete

NAT - INPUT VALUES

Local_Port Dest_IP:Port

Add Delete DelAll

Default NAT to remote WEB SSH Set

RADIUS - INPUT VALUES

IP:destport SecString timeout

Add Delete DelAll

SETTINGS

	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		1443 192.168.205.11:443 Default WEB NAT: on (https://192.168.205.13:1443/ .https://192.168.205.13:2443/) Default SSH NAT: off
Radius Server		

Save

Figure 5.115 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI [‘Config->Ports->EthVLAN’](#) section and must be done in all Phoenix G2 IDUs

The screenshot shows the 'EthVLAN' configuration page. The 'Port Mode' is set to 'basic' for all ports. The 'Port Group' dropdowns are set to 'group-1' for LAN1, LAN2, WANa, and WANb; 'group-2' for LAN3; and 'group-3' for MNG. The 'Default VLAN' is set to 1 for all ports.

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Diagram showing port connections: LAN1, LAN2, LAN3, WANa, WANb, MNG CPU, GE switch.

Figure 5.116 Example of port grouping

- 6) In web GUI [‘Config->Ports->MUX’](#) specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode ‘force2G5’

The screenshot displays the 'DATAFLOW CONFIGURATION' interface. Key elements include:

- PORT CONFIG:** SFP1 and SFP2 are set to 'force2G5'. SFP3 is 'force1GX' and SFP4 is 'auto1GX'. LAN ports are set to 'auto'.
- SWAP:** 'Channel Select' for SFP1 and SFP2 is 'protection'. SFP3 is 'EMM1' and SFP4 is 'none'. 'Connected Port' for SFP3 is 'sfp3', for SFP4 is 'off', for LAN1 is 'ETH1a', and for LAN2 is 'none'.
- PBPM:** 'Traffic Channel' for SFP3 is 'EMM1', for SFP4 is 'ETH1a', for LAN1 is 'ETH1a', and for LAN2 is 'ETH1b'. 'Speed Limit' for SFP3 is '0', for SFP4 is '0', for LAN1 is '1000', and for LAN2 is '0'.
- Modem Speed:** Both sides are at '455.62 Mbps active'.


Figure 5.117 Example of port configuration

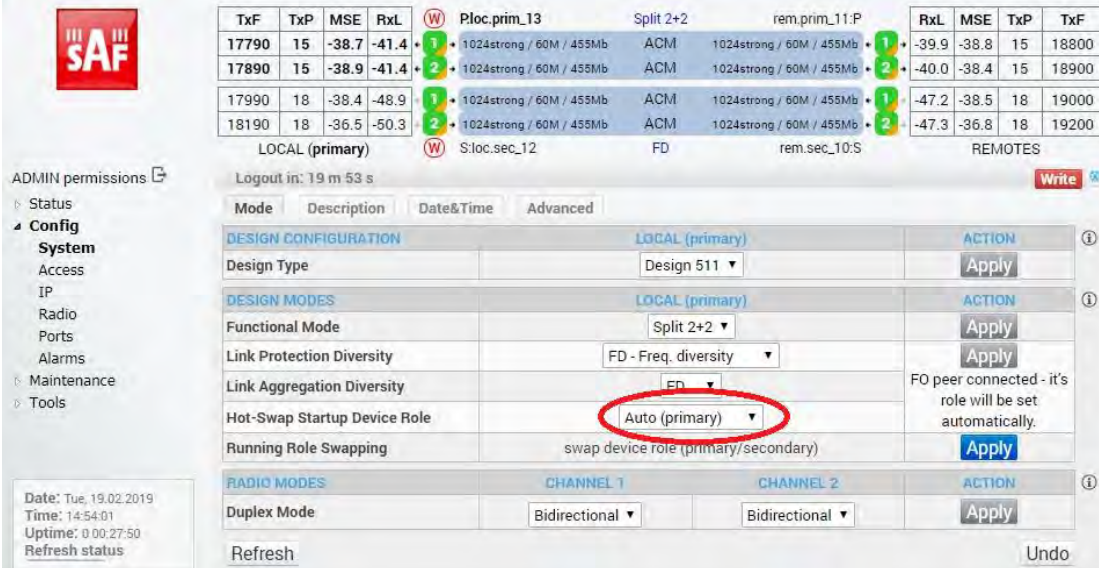
- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm checkboxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

The screenshot displays the 'Minor' alarm configuration interface. Key elements include:

- Ports Section:** Checkboxes for 'Modem LAN1 Link', 'Modem SFP1 Link', 'Modem SFP2 Link', and 'Modem SFP3 Link' are checked.
- EMM#1 - 4ASI Section:** The checkbox for 'P1 Link' is checked.


Figure 5.118 Example of alarm configuration

- 9) Save new settings by pressing  button.
- 10) Reboot all 4 IDUs after successful reconfiguration
- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs

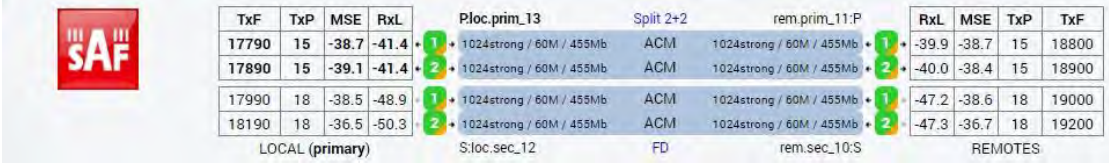


The screenshot shows the web GUI for Phoenix G2 IDU. At the top, there is a table of link statistics with columns TxP, MSE, RxL, and TxP. Below this, the 'LOCAL (primary)' status is shown. The main configuration area is titled 'DESIGN CONFIGURATION' and includes settings for Design Type (Design 511), Functional Mode (Split 2+2), Link Protection Diversity (FD - Freq. diversity), Link Aggregation Diversity (FD), and Hot-Swap Startup Device Role (Auto (primary), which is circled in red). The 'Running Role Swapping' is set to 'swap device role (primary/secondary)'. The 'RADIO MODES' section shows Duplex Mode set to Bidirectional for both channels. A 'Write' button is visible in the top right corner.

Figure 5.119 Example of system configuration in Auto mode

- 12) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):



The screenshot shows the web GUI for Phoenix G2 IDU. At the top, there is a table of link statistics with columns TxP, MSE, RxL, and TxP. Below this, the 'LOCAL (primary)' status is shown in bold. The main configuration area is titled 'DESIGN CONFIGURATION' and includes settings for Design Type (Design 511), Functional Mode (Split 2+2), Link Protection Diversity (FD - Freq. diversity), Link Aggregation Diversity (FD), and Hot-Swap Startup Device Role (Auto (primary)). The 'Running Role Swapping' is set to 'swap device role (primary/secondary)'. The 'RADIO MODES' section shows Duplex Mode set to Bidirectional for both channels. A 'Write' button is visible in the top right corner.

Figure 5.120 Status of 2+2 FD aggregation FD protection mode

Example 12 – 2+2 XPIC aggregation HSB/SD protection scheme

The 2+2 XPIC (Cross-polarization Interference Cancellation) aggregation HSB/SD (Hot-standby/Space Diversity) protection mode is the mode supporting link aggregation which is protected using HSB/SD protection method. In this case two data Channels are used for data aggregation (Channel 1 and Channel 2) and two Channels are used for protection of aggregation channels. All channels – aggregation and protection works on the same one frequency channel.

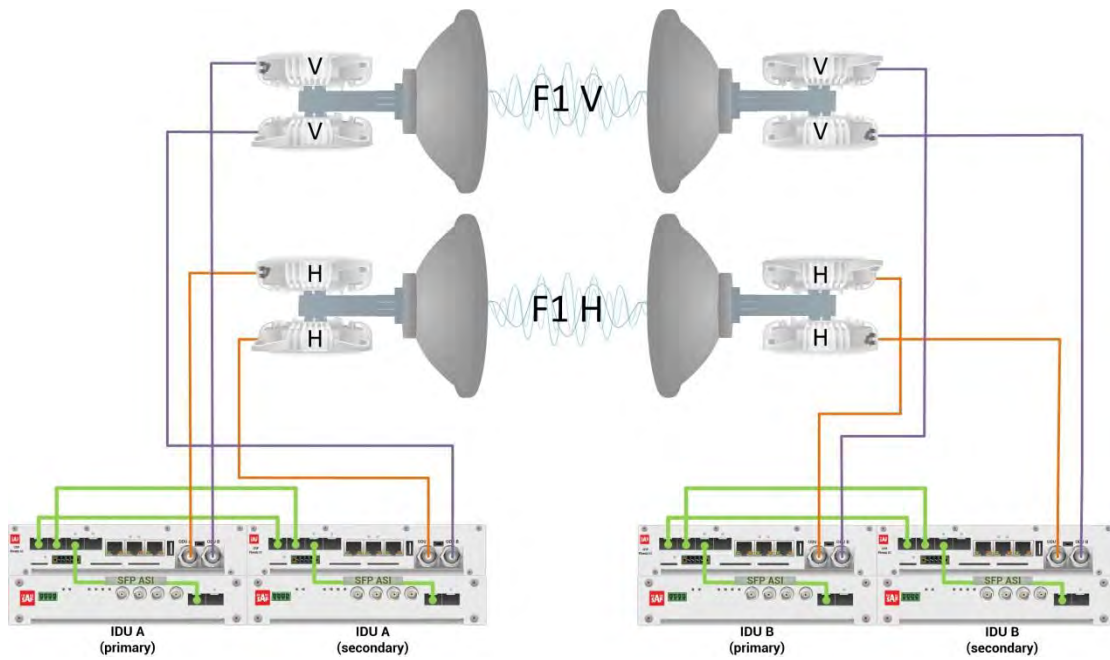


Figure 5.121a Example of 2+2 XPIC aggregation HSB/SD protection scheme

Figure 5.121a shows 2+2 XPIC aggregation HSB/SD protection scheme where IF interconnections between IDUs and ODUs provides HSB connection diagram. One frequency channel is used in both Horizontal and Vertical polarizations. Couplers are used to interconnect 2 ODUs to one antenna in this scheme. In this connection scheme the ODUs and couplers can be substituted with IRFUs and IBUs combination if required by customer.

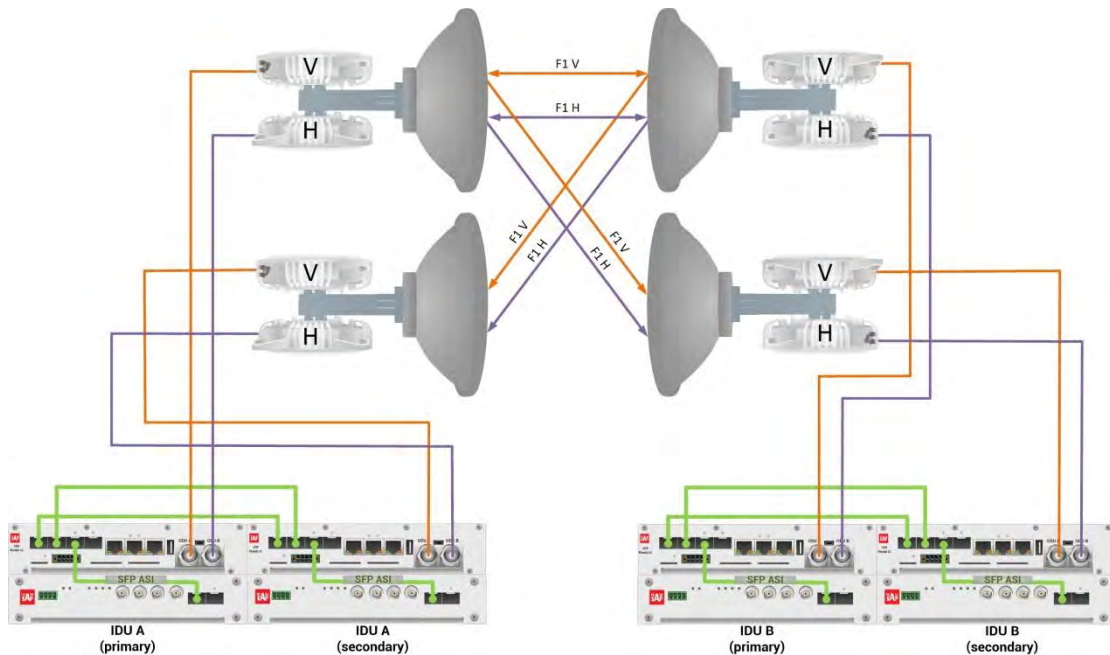


Figure 5.121b Example of 2+2 XPIC aggregation HSB/SD protection scheme

Figure 5.121b shows 2+2 XPIC aggregation HSB/SD protection scheme where IF interconnections between IDUs and ODUs provides SD connection diagram. One frequency channel is used in both Horizontal and Vertical polarizations. OMTs are used to interconnect 2 ODUs to one antenna in this scheme.

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 2+2', Link Aggregation Diversity 'XPIC' and Link Protection Diversity

'HSB/SD-Hot standby' are selected on both sides of the link. The modulation is 1024QAM in BW 60 MHz and the appropriate maximal data speed is about 455 Mbps per channel. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODUs per link.**



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

Configuration steps for 2+2 XPIC aggregation HSB/SD protection are following:

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'HSB/SD – Hot standby', Link Aggregation Diversity 'XPIC'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs

TxF	TxP	MSE	RxL					RxL	MSE	TxP	TxF	
17990	muted	-39.4	-43.0	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-42.2	-39.1	muted	19000
17990	muted	-39.4	-40.3	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-41.4	-36.4	15	19000
17990	18	-38.4	-48.5	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-47.1	-38.4	18	19000
17990	18	-37.8	-45.5	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.5	-36.6	muted	19000

LOCAL (primary) S:loc_sec_12 XPIC HSB rem_sec_10:S REMOTES

Logout in: 1 h 59 m 22 s

Mode	Description	Date&Time	Advanced	
DESIGN CONFIGURATION				
Design Type	Design 511			Apply
DESIGN MODES				
Functional Mode	Split 2+2			Apply
Link Protection Diversity	HSB/SD - Hot standby			Apply
Link Aggregation Diversity	XPIC			FO peer connected - it's role will be set automatically.
Hot-Swap Startup Device Role	Fixed primary			
RADIO MODES				
CHANNEL 1		CHANNEL 2		ACTION
Duplex Mode	Bidirectional	Bidirectional		Apply

Refresh Undo

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Wed, 20.02.2019
Time: 11:02:48
Uptime: 0 00:50:03

Figure 5.122 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Set the same one frequency channel for Channel 1 and Channel 2 in both Primary and Secondary IDUs.

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-39.4	-42.9	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.0	-38.5	muted	19000
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.4	-38.1	15	19000
17990	muted	-38.5	-48.5	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-43.9	-38.3	18	19000
17990	muted	-37.7	-45.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-44.1	-38.0	muted	19000

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong	1024/strong	1024/strong
ACM Setting				
Advanced Setting	default	default	-	-

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17990	17990	19000	19000
RX Frequency [MHz]	19000	19000	17990	17990
TX Power Limit [dBm]	15	15	15	15
TX Mute Config	auto	auto	auto	auto
ATPC Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ATPC RX Level [dBm]	-55	-55	-55	-55

Figure 5.123 Example of Radio configuration

- 3) In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-39.5	-43.1	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	muted	19000
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000
17990	muted	-38.5	-48.5	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-44.0	-38.2	18	19000
17990	muted	-37.7	-45.5	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-44.0	-38.0	muted	19000

MAIN ADDRESS SETTINGS		REQUIRED	CONFIGURED
Device IP / Mask		192.168.205.13 / 24	192.168.205.13/24
Default Gateway IP		192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS		REQUIRED	CONFIGURED
USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24		10.10.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24		10.10.10.10/24

Figure 5.124 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

TxF	TxP	MSE	RxL	Ploc.prim_13		Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-39.5	-43.1	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	muted	19000
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000
17990	muted	-38.5	-48.5	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-44.0	-38.2	18	19000
17990	muted	-37.7	-45.5	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-44.0	-38.0	muted	19000

SETTINGS	REQUIRED	CONFIGURED
Route		default via 192.168.205.1
NAT		1443 192.168.205.11-443 Default WEB NAT: on (https://192.168.205.13:1443/ https://192.168.205.13:2443/) Default SSH NAT: off
Radius Server		

Figure 5.125 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI [Config->Ports->EthVLAN](#) section and must be done in all Phoenix G2 IDUs

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Figure 5.126 Example of port grouping

- 6) In web GUI [Config->Ports->MUX](#) specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode 'force2G5'

The screenshot displays the 'DATAFLOW CONFIGURATION' interface. Key elements include:

- PORT CONFIG:** SFP1 and SFP2 are set to 'force2G5' mode. SFP3 is 'force1GX' and SFP4 is 'auto1GX'. LAN1, LAN2, and LAN3 are set to 'auto'.
- ETH SWITCH:** A diagram shows the internal network structure with LAN1, LAN2, LAN3, WAN1, WAN2, MNG CPU, and CPU.
- SWAP:** Channel Select is set to 'protection' for SFP1 and SFP2, and 'EMM1' for SFP3. Connected Port is 'off' for SFP1 and SFP2, and 'wana' for SFP3. ETH1a is selected in the SWAP dropdown.
- PBPM:** Traffic Channel is 'PTP1' for SFP1, 'EMM1' for SFP2, and 'ETH1a' for SFP3. Speed Limit is 'auto' for SFP1, '1000' for SFP2, and '0' for SFP3.
- Modem Speed:** 455.62 Mbps active.

Figure 5.127 Example of port configuration

- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm checkboxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces


The screenshot displays the 'Minor' alarm configuration page. Key elements include:

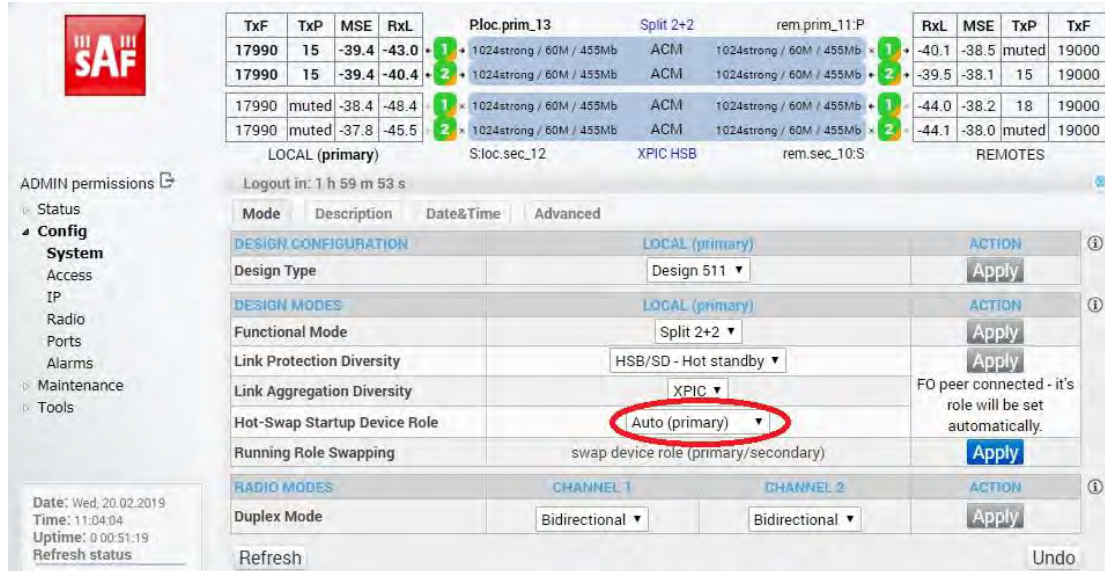
- Warnings Table:**

Warnings	Pri/Sec switch	CH 1	CH 2	Peer (FO)	Direct RF	THRESHOLDS	DETAILS
Modem							
Modem Aggr/Prot	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem Data Sync	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem MSE Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25 [dB]	
Modem FER	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10 [error_frm/10s]	
Radio							
Radio RX Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-75 [dBm]	
Radio TX Mute	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Ports							
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN3 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP2 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP4 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
- EMM#1 - 4ASI Table:**

EMM#1 - 4ASI	Pri/Sec switch	CH 1	Peer (FO)	Direct RF	THRESHOLDS	DETAILS
EMM HW+SW	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		none
SFP2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Sync	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Idle	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Lock	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 5.128 Example of alarm configuration


- 9) Save new settings by pressing  button.
- 10) Reboot all 4 IDUs after successful reconfiguration
- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs



The screenshot shows the 'System' configuration page in the Phoenix G2 web GUI. The 'Hot-Swap Startup Device Role' is set to 'Auto (primary)', which is circled in red. The 'Running Role Swapping' is set to 'swap device role (primary/secondary)'. The 'Link Protection Diversity' is set to 'HSB/SD - Hot standby'. The 'Link Aggregation Diversity' is set to 'XPIC'. The 'Functional Mode' is set to 'Split 2+2'. The 'Design Type' is set to 'Design 511'. The 'Duplex Mode' is set to 'Bidirectional' for both channels. The 'Status' section shows the system is in 'LOCAL (primary)' mode. The 'Tools' section shows the system is in 'Auto (primary)' mode.

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17990	15	-39.4	-43.0	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.1	-38.5	muted	19000
17990	15	-39.4	-40.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.5	-38.1	15	19000
17990	muted	-38.4	-48.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-44.0	-38.2	18	19000
17990	muted	-37.8	-45.5	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-44.1	-38.0	muted	19000

LOCAL (primary) S.loc.sec_12 XPIC HSB rem.sec_10:S REMOTES

ADMIN permissions 

Logout in: 1 h 59 m 53 s

Mode Description Date&Time Advanced

DESIGN CONFIGURATION LOCAL (primary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (primary) ACTION

Functional Mode Split 2+2 Apply

Link Protection Diversity HSB/SD - Hot standby Apply

Link Aggregation Diversity XPIC Apply

Hot-Swap Startup Device Role Auto (primary) Apply

Running Role Swapping swap device role (primary/secondary) Apply


RADIO MODES CHANNEL 1 CHANNEL 2 ACTION

Duplex Mode Bidirectional Bidirectional Apply

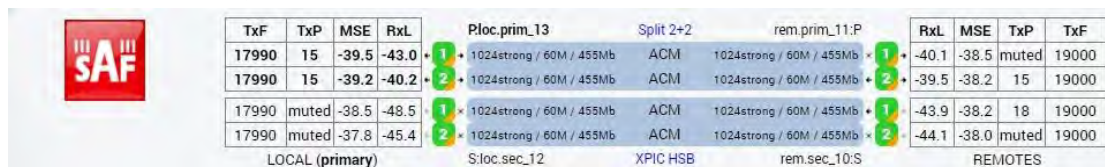
Refresh Undo

Date: Wed, 20.02.2019
Time: 11:04:04
Uptime: 0 00:51:19
Refresh status

Figure 5.129 Example of system configuration in Auto mode

- 12) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):



The screenshot shows the status of the 2+2 XPIC aggregation HSB/SD protection mode. The 'LOCAL (primary)' status is highlighted in bold. The 'Status' section shows the system is in 'LOCAL (primary)' mode. The 'Tools' section shows the system is in 'Auto (primary)' mode.

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 2+2	rem.prim_11:P	RxL	MSE	TxP	TxF
17990	15	-39.5	-43.0	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-40.1	-38.5	muted	19000
17990	15	-39.2	-40.2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.5	-38.2	15	19000
17990	muted	-38.5	-48.5	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-43.9	-38.2	18	19000
17990	muted	-37.8	-45.4	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-44.1	-38.0	muted	19000

LOCAL (primary) S.loc.sec_12 XPIC HSB rem.sec_10:S REMOTES

Figure 5.130 Status of 2+2 XPIC aggregation HSB/SD protection mode

Example 13 – 2+2 XPIC aggregation FD protection scheme

The 2+2 XPIC (Cross-polarization Interference Cancellation) aggregation FD (Frequency Diversity) protection mode is the mode supporting link aggregation which is protected using FD protection method. In this case two data Channels are used for data aggregation (Channel 1 and Channel 2) and two Channels are used for protection of aggregation channels. Both Aggregation Channels use the same one frequency channel, both Protection channels use another frequency channel for FD protection.

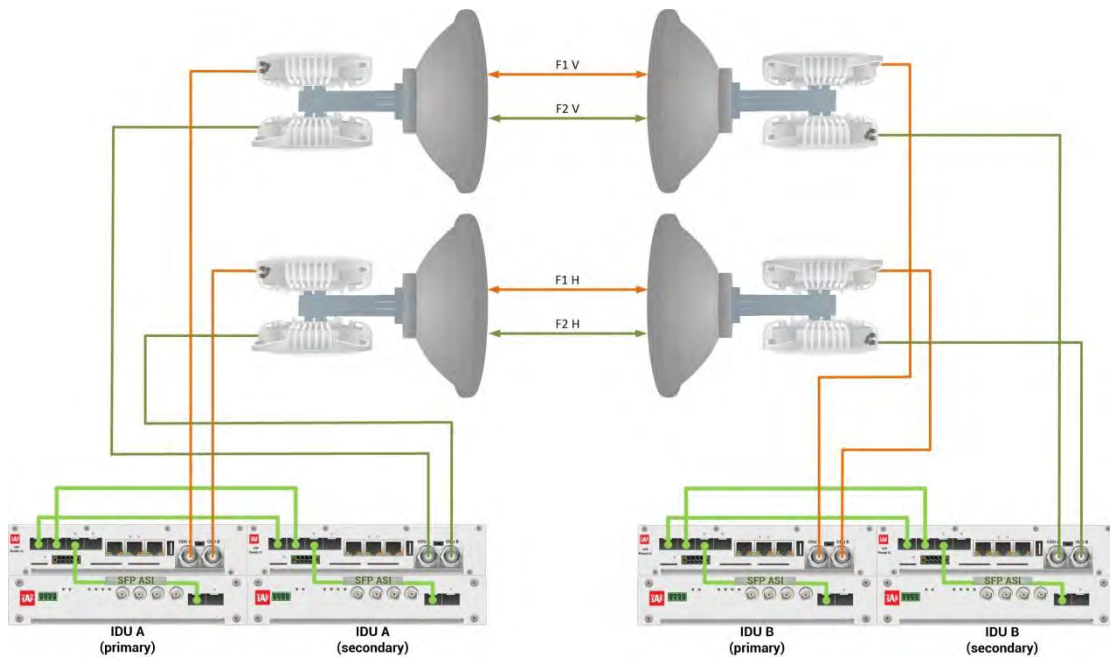


Figure 5.131a Example of 2+2 XPIC aggregation FD protection scheme

Figure 5.131a shows 2+2 XPIC aggregation FD protection scheme where one frequency channel is used in both Horizontal and Vertical polarizations for Primary IDU/ODUs, and another frequency channel is used in both polarizations for Secondary IDU/ODUs. Couplers are used to interconnect 2 ODUs to one antenna in this scheme. In this connection scheme the ODUs and couplers can be substituted with IRFUs and IBUs combination if required by customer.

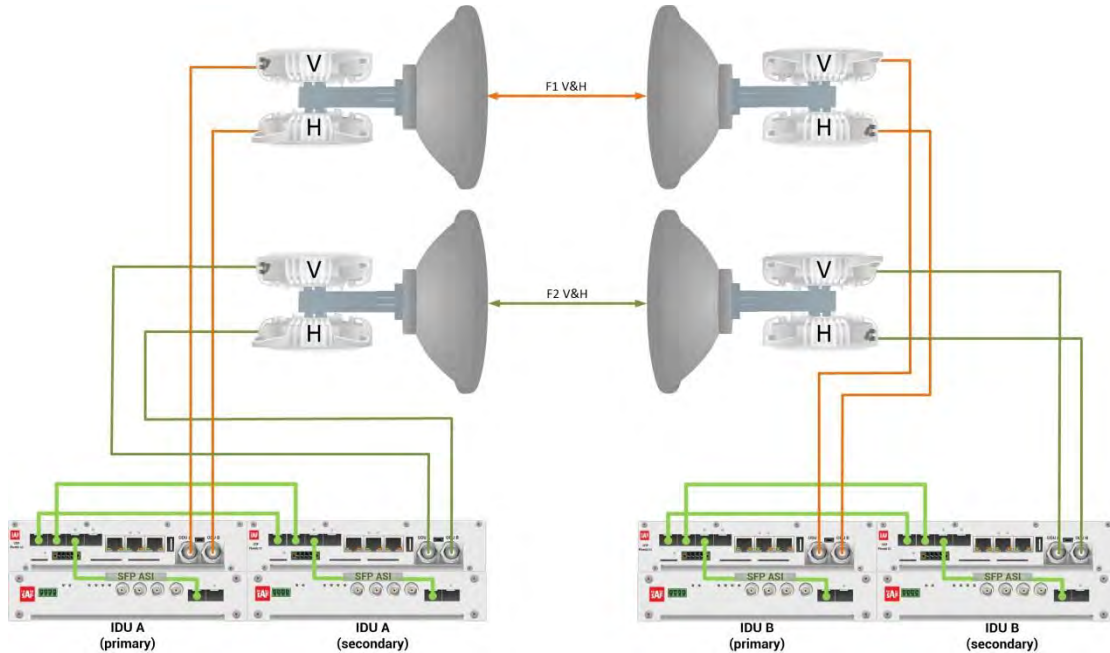


Figure 5.131b Example of 2+2 XPIC aggregation FD protection scheme

Figure 5.131b shows 2+2 XPIC aggregation FD protection scheme where one frequency channel is used in both Horizontal and Vertical polarizations for Primary IDU/ODUs, and another frequency channel is used in both polarizations for Secondary IDU/ODUs. OMTs are used to interconnect 2 ODUs to one antenna in this scheme.

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 2+2', Link Aggregation Diversity 'XPIC' and Link Protection Diversity 'FD – Freq. diversity' are selected on both sides of the link. The modulation is 1024QAM in BW 60 MHz and the appropriate maximal data speed is about 455 Mbps per channel. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODU's per link.**



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

Configuration steps for 2+2 XPIC aggregation FD protection are following:

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 2+2', Link Protection Diversity 'FD – Freq. diversity', Link Aggregation Diversity 'XPIC'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.7	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.0	-38.5	15	19000
17990	15	-39.3	-40.3	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.6	-38.1	15	19000
18100	18	-37.7	-49.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.8	-38.3	18	19110
18100	18	-36.5	-48.9	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.6	-36.8	18	19110

LOCAL (primary) S:loc.sec_12 XPIC rem.sec_10:S REMOTES

Logout in: 19 m 31 s

Mode Description Date&Time Advanced

DESIGN CONFIGURATION LOCAL (primary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (primary) ACTION

Functional Mode Split 2+2 Apply

Link Protection Diversity FD - Freq. diversity Apply

Link Aggregation Diversity XPIC Apply

Hot-Swap Startup Device Role Fixed primary Apply

RADIO MODES CHANNEL 1 CHANNEL 2 ACTION

Duplex Mode Bidirectional Bidirectional Apply

Refresh Undo

ADMIN permissions

Status

Config

System

Access

IP

Radio

Ports

Alarms

Maintenance

Tools

Date: Wed, 20.02.2019
Time: 11:21:08
Uptime: 0 01:08:23

Figure 5.132 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Set the same one frequency channel for Channel 1 and Channel 2 in both the Primary IDUs and another frequency channel for Channel 1 and Channel 2 in the Secondary IDUs

TxF	TxP	MSE	RxL		Ploc.prim_13		Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.6	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.4	15	19000	
17990	15	-39.3	-40.3	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000	
18100	18	-37.8	-49.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.8	-38.2	18	19110	
18100	18	-36.5	-48.9	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.4	-36.9	18	19110	

LOCAL (primary) S:loc.sec_12 XPIC rem.sec_10:S REMOTES

Logout in: 18 m 36 s

Parameters ACM Advanced

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong	1024/strong	1024/strong
ACM Setting	» ⚙	» ⚙	-	-
Advanced Setting	default	default	-	-

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	17990	17990	19000	19000
RX Frequency [MHz]	19000	19000	17990	17990
TX Power Limit [dBm]	15	15	15	15
TX Mute Config	auto	auto	auto	auto
ATPC Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ATPC RX Level [dBm]	-55	-55	-55	-55

Refresh Undo Apply to local & remote

Figure 5.133 Example of Primary IDU Radio configuration

TxF	TxP	MSE	RxL		Ploc.prim_13		Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.7	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.0	-38.5	15	19000	
17990	15	-39.3	-40.2	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000	
18100	18	-37.7	-49.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.7	-38.3	18	19110	
18100	18	-36.4	-48.9	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.5	-36.8	18	19110	

LOCAL (secondary) S:loc.sec_12 XPIC rem.sec_10:S REMOTES(s)

Logout in: 16 m 19 s

Parameters ACM Advanced

MODEM	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
Bandwidth	60000_02	60000_02	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong	1024/strong	1024/strong
ACM Setting	» ⚙	» ⚙	-	-
Advanced Setting	default	default	-	-

RADIO	LOCAL		REMOTE	
	CHANNEL 1	CHANNEL 2	CHANNEL 1	CHANNEL 2
T/R Spacing	fixed	fixed	fixed	fixed
TX Frequency [MHz]	18100	18100	19110	19110
RX Frequency [MHz]	19110	19110	18100	18100
TX Power Limit [dBm]	18	18	18	18
TX Mute Config	auto	auto	auto	auto
ATPC Function	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
ATPC RX Level [dBm]	-55	-55	-55	-55

Refresh Undo Apply to local & remote

Figure 5.134 Example of Secondary IDU Radio configuration

- In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.6	-40.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	15	19000
17990	15	-39.2	-40.3	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000
18100	18	-37.7	-49.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.9	-38.3	18	19110
18100	18	-36.6	-49.0	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.6	-36.9	18	19110

LOCAL (primary)		S:loc.sec_12	XPIC	rem.sec_10:S	REOTES
Device IP / Mask	192.168.205.13 / 24			192.168.205.13/24	
Default Gateway IP	192.168.205.1			192.168.205.1	

OPTIONAL ADDRESS SETTINGS		REQUIRED	CONFIGURED
USB IP/Mask	<input type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24		10.10.11.10/24
Fallback IP/Mask	<input type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24		10.10.10.10/24

Figure 5.135 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.6	-40.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	15	19000
17990	15	-39.2	-40.3	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000
18100	18	-37.7	-49.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.9	-38.3	18	19110
18100	18	-36.6	-49.0	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.6	-36.9	18	19110

LOCAL (primary)		S:loc.sec_12	XPIC	rem.sec_10:S	REOTES
Local_Port	Dest_IP:Port				
Default NAT to remote		<input checked="" type="checkbox"/> WEB	SSH		

SETTINGS		REQUIRED	CONFIGURED
Route			default via 192.168.205.1
NAT			1443 192.168.205.11:443 Default WEB NAT: on (https://192.168.205.13:1443/ https://192.168.205.13:2443/) Default SSH NAT: off
Radius Server			

Figure 5.136 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN

ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI '[Config->Ports->EthVLAN](#)' section and must be done in all Phoenix G2 IDUs

TxF	TxP	MSE	RxL										
17990	15	-38.7	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	15	19000	
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.6	-38.0	15	19000	
18100	18	-37.7	-49.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.9	-38.3	18	19110	
18100	18	-36.6	-48.8	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.6	-36.8	18	19110	

Figure 5.137 Example of port grouping

- 6) In web GUI '[Config->Ports->MUX](#)' specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 and SFP2 ports must be automatically indicated as connected in Mode 'force2G5'

Figure 5.138 Example of port configuration

- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP2, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

Major	Minor	LOCAL (primary)	LOCAL	REMOTE	LOCAL	THRESHOLDS	DETAILS
WARNINGS							
Modem							
Modem Aggr/Prot	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem Data Sync	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem MSE Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-25	-25 [dB]
Modem FER	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10	10 [error_frm/10s]
Radio							
Radio RX Level	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	-75	-75 [dBm]
Radio TX Mute	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Ports							
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem LAN3 Link	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP2 Link	no	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
Modem SFP4 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
EMM#1 - 4AS1							
EMM HW+SW	no	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		none
SFP2 Link	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Link	yes	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Sync	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Idle	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		
P1 Lock	yes	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>		

Figure 5.139 Example of alarm configuration

- 9) Save new settings by pressing **Write** button.
- 10) Reboot all 4 IDUs after successful reconfiguration
- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs

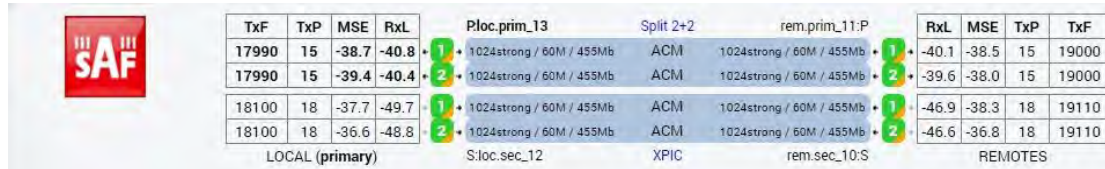
TxF	TxP	MSE	RxL					RxL	MSE	TxP	TxF	
17990	15	-38.6	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	15	19000
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.5	-38.0	15	19000
18100	18	-37.7	-49.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.8	-38.3	18	19110
18100	18	-36.5	-48.9	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.5	-36.8	18	19110

Mode	Description	Date&Time	Advanced	ACTION
DESIGN CONFIGURATION				
Design Type	Design 511			Apply
DESIGN MODES				
Functional Mode	Split 2+2			Apply
Link Protection Diversity	FD - Freq. diversity			Apply
Link Aggregation Diversity	XPIC			Apply
Hot-Swap Startup Device Role	Auto (primary)			Apply
Running Role Swapping	swap device role (primary/secondary)			Apply
RADIO MODES				
Duplex Mode	Bidirectional			Apply

Figure 5.140 Example of system configuration in Auto mode

- 12) Save new settings by pressing **Write** button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):



TxF	TxP	MSE	RxL		Ploc.prim_13	Split 2+2	rem.prim_11:P		RxL	MSE	TxP	TxF
17990	15	-38.7	-40.8	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-40.1	-38.5	15	19000
17990	15	-39.4	-40.4	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-39.6	-38.0	15	19000
18100	18	-37.7	-49.7	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-46.9	-38.3	18	19110
18100	18	-36.6	-48.8	2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	2	-46.6	-36.8	18	19110

LOCAL (primary) S.loc.sec_12 XPIC rem.sec_10:S REMOTES

Figure 5.141 Status of 2+2 XPIC aggregation FD protection mode

Example 14 – 1+1 HSB/SD Full protection scheme

The 1+1 HSB/SD (Hot Standby/Space Diversity) full protection mode besides the ODU, IDU-ODU cable and modem failure protection adds protection also against HW failures such as IDU power failure, ETH port failure, Primary-EMM and Secondary interconnection failure and EMM failure. When any of these events occurs the Secondary IDU is automatically reconfigured to become Primary IDU and its data ports are automatically enabled for traffic while the original primary, now the secondary, is simultaneously set so the Tx direction is still working but received data from EMM ports are dropped out.

The usage of an external ETH switch with automatic ARP table flushing is required for proper LAN and SFP2 data switch-over. To avoid an unnecessary data drop the new Primary unit will remain in its Primary role even when the original reason for switching has disappeared. Note that the LAN3 port is intended for management connection and it cannot be protected (automatically enabled/disabled) like other ports

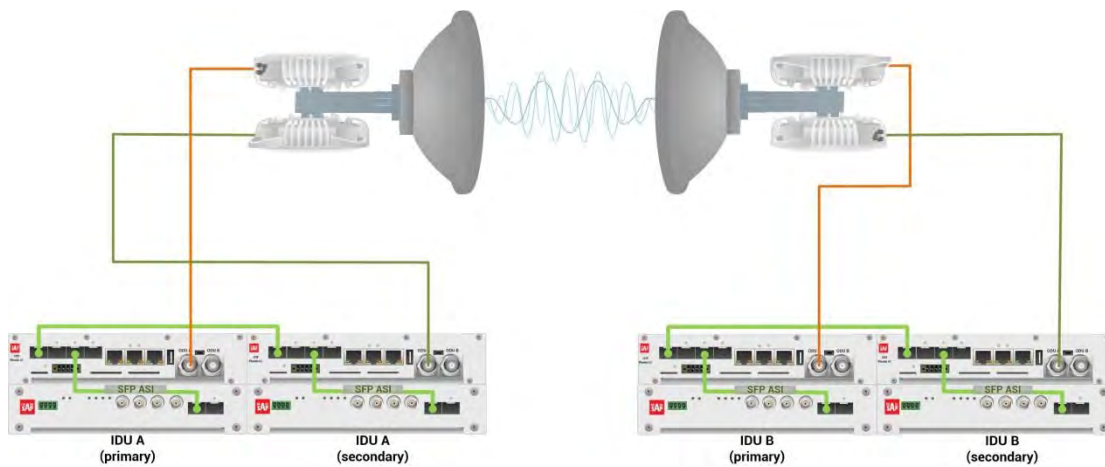


Figure 5.142a Example of 1+1 HSB full protection scheme

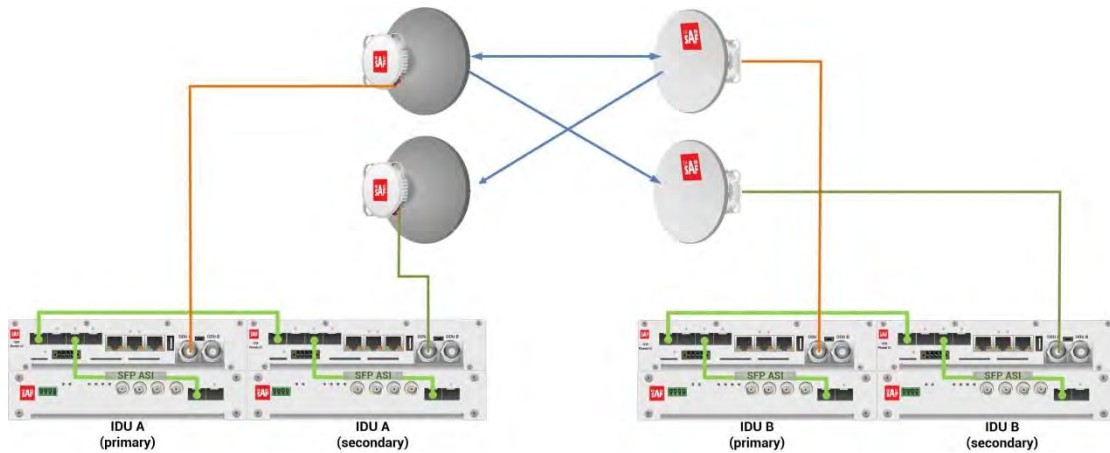


Figure 5.142b Example of 1+1 SD full protection scheme

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 1+1', Link Protection Diversity 'HSB/SD – Hot standby' are selected on both sides of the link. The modulation is 1024QAM in BW 60 MHz and the appropriate maximal data speed is about 455 Mbps. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODUs per link.**



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

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

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 1+1', Link Protection Diversity 'HSB/SD – Hot standby'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs

TxF	TxP	MSE	RxL	W	P.loc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.8	-41.2	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.7	-38.8	15	18810
17800	muted	-38.2	-46.8	2				-43.6	-38.4	muted	18810

LOCAL (primary) S.loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 19 m 51 s Write

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Thu, 21.02.2019
Time: 13:55:35
Uptime: 0 03:11:26

Refresh Undo

DESIGN CONFIGURATION LOCAL (primary) ACTION

Design Type Design 511 Apply

DESIGN MODES LOCAL (primary) ACTION

Functional Mode Split 1+1 Apply

Link Protection Diversity HSB/SD - Hot standby Apply

Hot-Swap Startup Device Role Fixed primary Apply

FO peer connected - it's role will be set automatically.

RADIO MODES CHANNEL 1 ACTION

Duplex Mode Bidirectional Apply

Figure 5.143 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Set the same one frequency channel in all Phoenix G2 IDUs

ADMIN permissions

Status

Config

- System
- Access
- IP
- Radio**
- Ports
- Alarms

Maintenance

Tools

Date: Thu, 21.02.2019
Time: 14:01:20
Uptime: 0 03:17:11
Refresh status

Modem Serial Number
355260100010
License Number
3010403010100229
License Type / Status

TxF	TxP	MSE	RxL	Ploc.prim_13			Split 1+1	rem.prim_11:P			
17800	15	-38.8	-41.2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb		RxL	MSE	TxP	TxF
17800	muted	-38.2	-46.7					-39.6	-38.7	15	18810
								-43.6	-38.3	muted	18810

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 17 m 51 s

Parameters | ACM | Advanced

MODEM	LOCAL		REMOTE	
	CHANNEL 1		CHANNEL 1	
Bandwidth	60000_02		60000_02	
Max RxACM Profile	1024/strong		1024/strong	
ACM Setting	default		-	
Advanced Setting	default		-	

RADIO	LOCAL		REMOTE	
	CHANNEL 1		CHANNEL 1	
T/R Spacing	fixed		fixed	
TX Frequency [MHz]	17800		18810	
RX Frequency [MHz]	18810		17800	
TX Power Limit [dBm]	15		15	
TX Mute Config	auto		auto	
ATPC Function	<input type="checkbox"/>		<input type="checkbox"/>	
ATPC RX Level [dBm]	-55		-55	

Refresh Undo Apply to local & remote

Figure 5.144 Example of Radio configuration

- 3) In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

ADMIN permissions

Status

Config

- System
- Access
- IP
- Radio
- Ports
- Alarms

Maintenance

Tools

Date: Thu, 21.02.2019
Time: 14:01:20
Uptime: 0 03:17:11
Refresh status

Modem Serial Number
355260100010
License Number
3010403010100229
License Type / Status

TxF	TxP	MSE	RxL	Ploc.prim_13			Split 1+1	rem.prim_11:P			
17800	15	-38.8	-41.2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb		RxL	MSE	TxP	TxF
17800	muted	-38.2	-46.7					-39.7	-38.7	15	18810
								-43.5	-38.4	muted	18810

LOCAL (primary) S:loc.sec_12 HSB/SD rem.sec_10:S REMOTES

Logout in: 19 m 40 s

Addresses | SNMP | Advanced

MAIN ADDRESS SETTINGS	REQUIRED		CONFIGURED	
	Device IP / Mask	192.168.205.13 / 24		192.168.205.13/24
Default Gateway IP	192.168.205.1		192.168.205.1	

OPTIONAL ADDRESS SETTINGS	REQUIRED		CONFIGURED	
	USB IP/Mask	<input checked="" type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24		10.10.11.10/24
Fallback IP/Mask	<input checked="" type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24		10.10.10.10/24	

Undo Save

Figure 5.145 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

The screenshot displays the web GUI for IP NAT configuration. At the top, there are performance metrics for TxP, MSE, RxL, and TxP. Below this, the configuration is divided into several sections: 'STATIC ROUTES - INPUT VALUES', 'NAT - INPUT VALUES', 'RADIUS - INPUT VALUES', and 'SETTINGS'. In the 'NAT - INPUT VALUES' section, the 'WEB' checkbox is checked and highlighted with a red circle. The 'SETTINGS' section shows the 'Route' as 'default via 192.168.205.1' and the 'NAT' configuration as '1443 192.168.205.11:443 Default WEB NAT on (https://192.168.205.13:1443/ https://192.168.205.13:2443/) Default SSH NAT: off'. A 'Save' button is located at the bottom right of the settings section.

Figure 5.146 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI '[Config->Ports->EthVLAN](#)' section and must be done in all Phoenix G2 IDUs

The screenshot displays the web GUI for port grouping configuration. The 'EthVLAN' section shows a table with columns for LAN 1, LAN 2, LAN 3, MNG, WAN A, and WAN B. The 'Port Group' column shows 'group-1' for LAN 1 and WAN A, 'group-2' for LAN 2 and WAN B, and 'group-3' for LAN 3 and MNG. Below the table is a diagram showing the physical ports (LAN1, LAN2, LAN3, WANa, WANb, MNG CPU) connected to a GE switch. The 'VTU SETTINGS' section shows a table with columns for ACTION, VLAN N, FID, QOS PRI, LAN 1, LAN 2, LAN 3, MNG, WAN A, and WAN B. The 'ACTION' column shows 'add' and the 'QOS PRI' column shows 'off'. The 'LAN 1', 'LAN 2', 'LAN 3', 'MNG', 'WAN A', and 'WAN B' columns show 'Deny'.

Figure 5.147 Example of port grouping

- 6) In web GUI '[Config->Ports->MUX](#)' specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 port must be automatically indicated as connected in Mode 'force2G5'

The screenshot displays the 'DATAFLOW CONFIGURATION' interface. Key elements include:

- PORT CONFIG:** A table with columns for SFP1, SFP2, SFP3, SFP4, LAN1, LAN2, and LAN3. The 'Mode' row shows 'force2G5' for SFP1, 'force2G5' for SFP2, 'force1GX' for SFP3, and 'auto1GX' for SFP4. 'Flow Control' is set to 'force' for SFP ports and 'off' for LAN ports.
- ETH SWITCH:** A diagram showing connections between LAN1, LAN2, LAN3, WANa, WANb, MNG CPU, and CPU.
- SWAP:** 'Channel Select' is set to 'EMM1' and 'Connected Port' is set to 'ETH1a'.
- PBPMM:** 'Traffic Channel' is 'PTP1', 'Speed Limit' is '1000', and 'Available Speed' is '455.62 Mbps'.


Figure 5.148 Example of port configuration

- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switchover in case of failure of any of those interfaces

The screenshot displays the 'Minor' alarm configuration interface. Key elements include:

- Modem:** Settings for 'Modem Aggr/Prot', 'Modem Data Sync', 'Modem MSE Level', and 'Modem FER'.
- Radio:** Settings for 'Radio RX Level' and 'Radio TX Mute'.
- Ports:** A table with columns for 'LOCAL (primary)', 'LOCAL', 'REMOTE', and 'LOCAL'. The 'Modem LAN1 Link', 'Modem SFP1 Link', and 'Modem SFP3 Link' rows have their checkboxes checked and highlighted with red circles.

Figure 5.149 Example of alarm configuration


- 9) Save new settings by pressing  button.
- 10) Reboot all 4 IDUs after successful reconfiguration

- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs

The screenshot shows the web GUI for Phoenix G2 IDU. At the top, there are performance metrics for TxP, MSE, and RxL for both Primary and Secondary IDUs. Below this, the system configuration is displayed. The 'Hot-Swap Startup Device Role' is highlighted with a red circle and set to 'Auto (primary)'. Other settings include 'Design Type' (Design 511), 'Functional Mode' (Split 1+1), and 'Link Protection Diversity' (HSB/SD - Hot standby). A 'Write' button is visible in the top right corner.

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.7	-41.2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.7	-38.7	15	18810
17800	muted	-38.2	-46.7	S:loc.sec_12	HSB/SD	rem.sec_10:S	-43.6	-38.4	muted	18810

Figure 5.150 Example of system configuration in Auto mode

- 12) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):

The screenshot shows the web GUI for Phoenix G2 IDU. At the top, there are performance metrics for TxP, MSE, and RxL for both Primary and Secondary IDUs. Below this, the system configuration is displayed. The 'Hot-Swap Startup Device Role' is set to 'Auto (primary)'. Other settings include 'Design Type' (Design 511), 'Functional Mode' (Split 1+1), and 'Link Protection Diversity' (HSB/SD - Hot standby). A 'Write' button is visible in the top right corner.

TxF	TxP	MSE	RxL	Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.8	-41.2	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.7	-38.7	15	18810
17800	muted	-38.3	-46.7	S:loc.sec_12	HSB/SD	rem.sec_10:S	-43.6	-38.4	muted	18810

Figure 5.151 Status of 1+1 HSB/SD protection mode

Example 15 – 1+1 FD Full protection scheme

The 1+1 FD (Frequency Diversity) full protection mode besides the ODU, IDU-ODU cable and modem failure protection adds protection also against HW failures such as IDU power failure, ETH port failure, Primary-EMM and Secondary interconnection failure and EMM failure. When any of these events occurs the Secondary IDU is automatically reconfigured to become Primary IDU and its data ports are automatically enabled for traffic while the original primary, now the secondary, is simultaneously set so the Tx direction is still working but received data from EMM ports are dropped out.

The usage of an external ETH switch with automatic ARP table flushing is required for proper LAN and SFP2 data switch-over. To avoid an unnecessary data drop the new Primary unit will remain in its Primary role even when the original reason for switching has disappeared. Note that the LAN3 port is intended for management connection and it cannot be protected (automatically enabled/disabled) like other ports

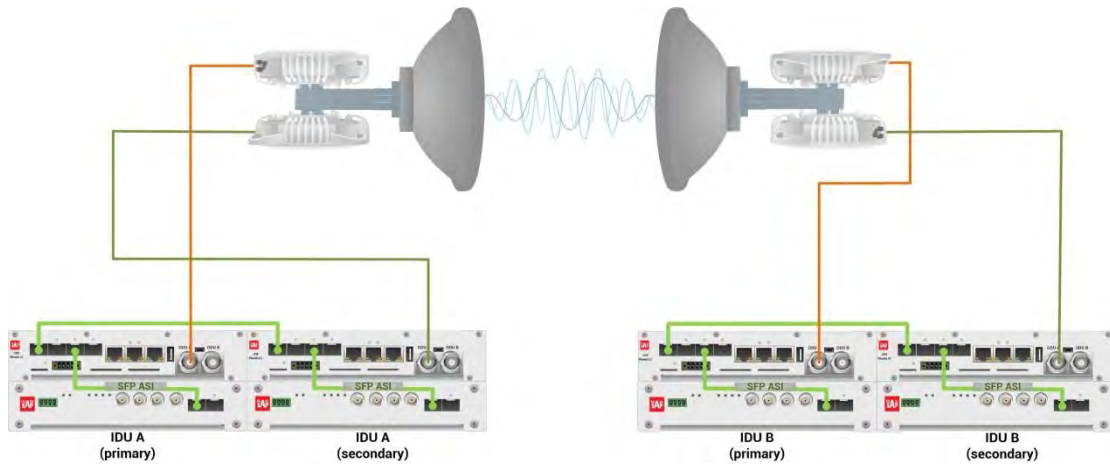


Figure 5.152 Example of 1+1 FD full protection scheme

This concrete example describes an application where the Design Type 'Design 511', Functional mode 'Split 1+1', Link Protection Diversity 'FD – Freq. diversity' are selected on both sides of the link. The modulation is 1024QAM in BW 60 MHz and the appropriate maximal data speed is about 455 Mbps. ASI traffic is passed through the link. **This scheme requires four Phoenix G2 IDUs and eight ODUs per link.**



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

Configuration steps for 1+1 FD full protection are following:

- 1) In web GUI '[Config->System->Mode](#)' choose design type 'Design 511', Functional mode 'Split 1+1', Link Protection Diversity 'FD – Freq. diversity'. The setting Hot-Swap Startup device Role during the configuration must be set as 'Fixed primary' on both Primary IDUs and as 'Fixed secondary' on both Secondary IDUs. The Duplex Mode must be set to 'Bidirectional' for both channels on all Phoenix G2 IDUs

Figure 5.153 Example of System configuration

- 2) In web GUI '[Config->Radio->Parameters](#)' configure basic radio and modem parameters in all Phoenix G2 IDUs. Set one frequency channel on the Primary link and another frequency channel for the Secondary link (FD) in all Phoenix G2 IDUs

SAF

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.8	-41.3	+	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.7	-38.8	15	18810
18000	18	-38.3	-49.0	+	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-38.5	18	19010

LOCAL (primary) S:loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 18 m 42 s Write

Parameters ACM Advanced

MODEM LOCAL REMOTE CHANNEL 1 CHANNEL 1

Bandwidth	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong
ACM Setting		
Advanced Setting	default	

RADIO LOCAL REMOTE CHANNEL 1 CHANNEL 1

T/R Spacing	fixed	fixed
TX Frequency [MHz]	17800	18810
RX Frequency [MHz]	18810	17800
TX Power Limit [dBm]	15	15
TX Mute Config	auto	auto
ATPC Function		
ATPC RX Level [dBm]	-55	-55

Refresh Undo Apply to local & remote

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Thu, 21.02.2019
Time: 14:15:55
Uptime: 0 03:31:47
Refresh status

Modem Serial Number
355260100010
License Number
3010403010100229
License Type / Status
permanent / ok

Figure 5.154 Example of Primary Radio configuration

SAF

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.8	-41.4	+	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.7	-38.7	15	18810
18000	18	-38.3	-49.1	+	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.3	-38.5	18	19010

LOCAL (secondary) S:loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 16 m 9 s Write

Parameters ACM Advanced

MODEM LOCAL REMOTE CHANNEL 1 CHANNEL 1

Bandwidth	60000_02	60000_02
Max RxACM Profile	1024/strong	1024/strong
ACM Setting		
Advanced Setting	default	

RADIO LOCAL REMOTE CHANNEL 1 CHANNEL 1

T/R Spacing	fixed	fixed
TX Frequency [MHz]	18000	19010
RX Frequency [MHz]	19010	18000
TX Power Limit [dBm]	18	18
TX Mute Config	auto	auto
ATPC Function		
ATPC RX Level [dBm]	-55	-55

Refresh Undo Apply to local & remote

ADMIN permissions

- Status
- Config
 - System
 - Access
 - IP
 - Radio
 - Ports
 - Alarms
- Maintenance
- Tools

Date: Thu, 21.02.2019
Time: 14:16:04
Uptime: 0 03:32:20
Refresh status

Modem Serial Number
355260100008
License Number
3010403010100227
License Type / Status
permanent / ok

Figure 5.155 Example of Secondary Radio configuration

- In web GUI '[Config->IP->Addresses](#)' set the IP address of the device. The IP address must be different for each IDU

TxF	TxP	MSE	RxL		Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF
17800	15	-38.7	-41.4	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-39.8	-38.7	15	18810
18000	18	-38.3	-49.1	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	-47.2	-38.5	18	19010

MAIN ADDRESS SETTINGS	REQUIRED	CONFIGURED
Device IP / Mask	192.168.205.13 / 24	192.168.205.13/24
Default Gateway IP	192.168.205.1	192.168.205.1

OPTIONAL ADDRESS SETTINGS	REQUIRED	CONFIGURED
USB IP/Mask	<input type="radio"/> 10.10.11.10/24 <input type="radio"/> 192.168.11.10/24	10.10.11.10/24
Fallback IP/Mask	<input type="radio"/> 10.10.10.10/24 <input type="radio"/> 192.168.10.10/24	10.10.10.10/24

Figure 5.156 Example of IP configuration

- 4) In web GUI '[Config->IP->Advanced](#)' set 'WEB' option as Default NAT to remote in all Phoenix G2 IDUs. This will enable management access to other IDUs in the link via NAT.



With NAT configured it is possible to access other IDUs management in the link via IP address of one of IDUs and default NAT ports. Following default NAT ports are possible: 2443 (for local secondary IDU), 1443 (for remote primary IDU), 3443 (for remote secondary IDU). The example of accessing the local secondary IDU via the local primary IDU IP address in this case is: <https://192.168.205.13:2443>

STATIC ROUTES - INPUT VALUES	REQUIRED	CONFIGURED
Routed IP/MASK		default via 192.168.205.1
Gateway IP		1443 192.168.205.11:443
		Default WEB NAT: on
		(https://192.168.205.13:1443/
		https://192.168.205.13:2443/)
		Default SSH NAT: off

Figure 5.157 Example of IP NAT configuration

- 5) Port group configuration must be done according to customer requirements. The requirement in this example is to have one LAN port for Ethernet traffic. In this case LAN1 port will be used for the Ethernet traffic – it must be allocated in one group with one of WAN ports, in this case it is WANa port (Group1). LAN3 port will be used for management access, it is allocated in one group with MNG port (Group3). As the NAT is used for remote management access, it is not necessary to add management access ports to any of WAN ports. LAN2 and WANb ports will not be used in this example and will be allocated in Group2. Port grouping configuration is available in web GUI '[Config->Ports->EthVLAN](#)' section and must be done in all Phoenix G2 IDUs

TxF	TxP	MSE	RxL	W	Ploc.prim_13	Split 1+1	rem.prim_11:P	RxL	MSE	TxP	TxF	
17800	15	-38.8	-41.3	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-39.8	-38.7	15	18810
18000	18	-38.3	-49.2	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-47.2	-38.5	18	19010

LOCAL (primary) S:loc.sec_12 FD rem.sec_10:S REMOTES

Logout in: 17 m 34 s

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-2	group-3	group-3	group-1	group-2
Default VLAN	1	1	1	1	1	1

Figure 5.158 Example of port grouping

- 6) In web GUI '[Config->Ports->MUX](#)' specify Data channel and port speed for WAN (radio direction) port and SFP ports in all 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 SFP3 port is connected to EMM channel. If both IDUs (Primary and Secondary) are interconnected successfully, the SFP1 port must be automatically indicated as connected in Mode 'force2G5'


PORT	SFP1	SFP2	SFP3	SFP4	LAN1	LAN2	LAN3
Status	SFP gbit FD	SFP module not present	SFP gbit FD	SFP module not present	LAN gbit FULL	LAN No LINK	LAN gbit FULL
Hot Standby	standby	standby	standby	standby	active	active	-
Mode	force2G5	force2G5	force1GX	auto1GX	auto	auto	auto
MDIX	-	-	-	-	auto	auto	auto
Flow Control	force	force	force	force	off	off	off
1588	off	off	off	off	off	off	off
ETH SWITCH							
SWAP Channel Select	protection	reserved	EMM1	none	ETH1a	none	RFI1 RFI2
Connected Port	off	sfp3	wana	none	none	none	none
PBPM Traffic Channel	PTP1	EMM1	ETH1a	ETH1b	ETH1b	ETH1b	ETH1b
Speed Limit	auto	0	1000	0	0	0	0
Available Speed	456.62 Mbps						

Figure 5.159 Example of port configuration

- 7) Configure EMM according to customer requirements and basing on EMM configuration description described in section '[Config->Ports->EMM](#)' in all Phoenix G2 IDUs.
- 8) In web GUI '[Config->Alarms->Minor](#)' configure interface (LAN, SFP, ASI port) alarms which will be used for protection switchover in all Phoenix G2 IDUs. In the example LAN1, SFP1, SFP3 and ASI Port 1 are used. Those interface port alarm check-boxes must be checked in order to initiate the switch-over in case of failure of any of those interfaces

		LOCAL (primary)		LOCAL	REMOTE	LOCAL	
WARNINGS		Pri/Sec switch	CH 1	Peer (FO)	Direct RF	THRESHOLDS	DETAILS
Modem							
Modem Aggr/Prot	no	<input type="checkbox"/>	●	●	●		
Modem Data Sync	no	<input type="checkbox"/>	●	●	●		
Modem MSE Level	no	<input type="checkbox"/>	●	●	●	-25 ⓘ	[dB]
Modem FER	no	<input type="checkbox"/>	●	●	●	10 ⓘ	[error_frm/10s]
Radio							
Radio RX Level	no	<input type="checkbox"/>	●	●	●	-75 ⓘ	[dBm]
Radio TX Mute	no	<input type="checkbox"/>	●	●	●		
Ports							
Modem LAN1 Link	yes	<input checked="" type="checkbox"/>	●	●	●		
Modem LAN2 Link	yes	<input type="checkbox"/>	●	●	●		
Modem LAN3 Link	no	<input type="checkbox"/>	●	●	●		
Modem SFP1 Link	no	<input checked="" type="checkbox"/>	●	●	●		
Modem SFP2 Link	no	<input type="checkbox"/>	●	●	●		
Modem SFP3 Link	yes	<input checked="" type="checkbox"/>	●	●	●		
Modem SFP4 Link	yes	<input type="checkbox"/>	●	●	●		
		LOCAL (primary)		REMOTE	LOCAL	LOCAL	
EMM#1 - 4ASI		Pri/Sec switch	CH 1	Peer (FO)	Direct RF	THRESHOLDS	DETAILS
EMM HW+SW	no	<input type="checkbox"/>	●	●	●		nActivated
SFP2 Link	yes	<input type="checkbox"/>	●	●	●		
P1 Link	yes	<input type="checkbox"/>	●	●	●		
P1 Sync	yes	<input type="checkbox"/>	●	●	●		

Figure 5.160 Example of alarm configuration

- 9) Save new settings by pressing  button.
- 10) Reboot all 4 IDUs after successful reconfiguration
- 11) In web GUI '[Config->System->Mode](#)' set Hot-Swap Startup device Role to 'Auto primary' for both Primary IDUs and to 'Auto Secondary' for both Secondary IDUs in order to enable protection mode on all Phoenix G2 IDUs

TxF	TxP	MSE	RxL	Ploc.prim_13		Split 1+1	rem.prim_11:P	RxL		MSE	TxP	TxF		
17800	15	-38.8	-41.3	●	●	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	●	●	-39.7	-38.8	15	18810
18000	18	-38.3	-49.2	●	●	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	●	●	-47.3	-38.5	18	19010


LOCAL (primary) ⓘ S:loc.sec_12 FD rem.sec_10:S ⓘ REMOTES

Logout in: 19 m 53 s Write ⓘ


Mode	Description	Date&Time	Advanced	ACTION
DESIGN CONFIGURATION LOCAL (primary) ⓘ				
Design Type	Design 511			Apply
DESIGN MODES LOCAL (primary) ⓘ				
Functional Mode	Split 1+1			Apply
Link Protection Diversity	FD - Freq. diversity			Apply
Hot-Swap Startup Device Role	Auto (primary)			Apply
Running Role Swapping	swap device role (primary/secondary)			Apply
RADIO MODES CHANNEL 1 ⓘ				
Duplex Mode	Bidirectional			Apply

Refresh Undo

Figure 5.161 Example of system configuration in Auto mode

- 1) Save new settings by pressing  button.

The status of the link and its configuration is displayed in the header of the web GUI. The status of the IDU which currently is monitored is displayed in Bold and is indicated as LOCAL (primary) or LOCAL (secondary):



TxF	TxP	MSE	RxL		Ploc.prim_13	Split 1+1	rem.prim_11:P		RxL	MSE	TxP	TxF
17800	15	-38.8	-41.3	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-39.8	-38.7	15	18810
18000	18	-38.3	-49.2	1	1024strong / 60M / 455Mb	ACM	1024strong / 60M / 455Mb	1	-47.2	-38.5	18	19010

LOCAL (primary) S:loc.sec_12 FD rem.sec_10:S REMOTES

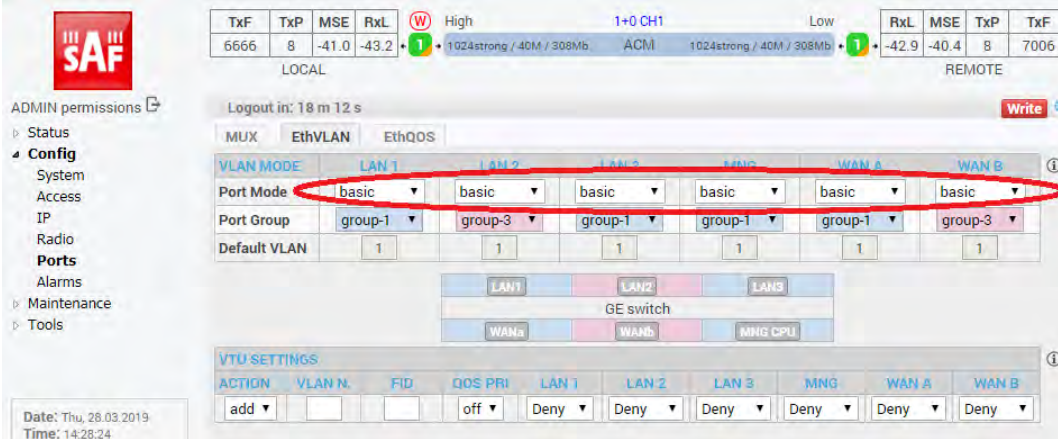
Figure 5.162 Status of 1+1 FD protection mode

Example 16 – VLAN configuration

The example will describe the VLAN configuration in Phoenix G2 IDUs. In this case the VLAN requirement is following: VLAN ID 100 will be user traffic via LAN1 port and trunked through the link; VLAN ID 200 will be used for Phoenix G2 management (MNG port) access via LAN1 port. WANa port will be used for radio/remote side access. All mentioned ports are grouped in Group 1. The same VLAN configuration must be applied on both side IDUs.

Configuration steps are following:

- 1) In web GUI [Config->System->EthVLAN](#) the 'Port Mode' for all ports must be set to "basic" option – this is transparent mode and VLAN mode is disabled:



ADMIN permissions

Logout in: 18 m 12 s Write

MUX EthVLAN EthQOS


VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-3	group-1	group-1	group-1	group-3
Default VLAN	1	1	1	1	1	1

VTU SETTINGS

ACTION	VLAN N.	FID	QOS PRI	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
add			off	Deny	Deny	Deny	Deny	Deny	Deny

Date: Thu, 26.03.2019
Time: 14:28:24

Figure 5.163 Port mode configuration before VLAN ID configuration

- 2) In the same web page in VTU Settings add user traffic VLAN ID 100 tag for LAN1 and WANa ports by choosing option "Tag" in appropriate dropdowns and press  button:

SAF

TxF TxP MSE RxL High 1+0 CH1 Low RxL MSE TxP TxP
6666 8 -40.9 -43.2 1024strong / 40M / 308Mb ACM 1024strong / 40M / 308Mb -42.9 -40.5 8 7006

LOCAL REMOTE

Logout in: 8 m 58 s Write

MUX EthVLAN EthQOS

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-3	group-1	group-1	group-1	group-3
Default VLAN	1	1	1	1	1	1

LAN1 LAN2 LAN3
GE switch
WANa WANb MNG CPU

ACTION	VLAN N.	FID	QOS PRI	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
add	100	100	off	Tag	Deny	Deny	Deny	Tag	Deny

VTU SETTINGS

Listing of actual VTU values

PORTBAS.	LAN1	LAN2	LAN3	MNG	WANA	WANB
GROUP :	1	3	1	1	1	3
MODE :	basic	basic	basic	basic	basic	basic
DEFAULT:	1	1	1	1	1	1

VTU TABLE

VLAN	FID	L1	L2	L3	MN	WA	WB	PRI
ok								

Undo Apply

Date: Thu, 28.03.2019
Time: 14:37:38
Uptime: 9 03:56:25
Refresh status

Modem Serial Number
357790100001
License Number
3010403010100268
License Type / Status
permanent / ok
License Expiration
unlimited
Firmware Version

Figure 5.164 Traffic VLAN configuration

- 3) The new applied VLAN ID will be indicated in VTU table:

VTU SETTINGS

ACTION	VLAN N.	FID	QOS PRI	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
add	100	100	off	Tag	Deny	Deny	Deny	Tag	Deny

Listing of actual VTU values

PORTBAS.	LAN1	LAN2	LAN3	MNG	WANA	WANB
GROUP :	1	3	1	1	1	3
MODE :	basic	basic	basic	basic	basic	basic
DEFAULT:	1	1	1	1	1	1

VTU TABLE

VLAN	FID	L1	L2	L3	MN	WA	WB	PRI
100	100	T	D	D	D	T	D	-

ok

Undo Apply

Date: Thu, 28.03.2019
Time: 14:42:07
Uptime: 9 03:59:54
Refresh status

Modem Serial Number
357790100001
License Number
3010403010100268
License Type / Status
permanent / ok
License Expiration
unlimited
Firmware Version
0403_01T01

Figure 5.165 Traffic VLAN configuration

- 4) Add management VLAN ID 200 tag for LAN1 and WANa ports by choosing option "Tag" in appropriate dropdowns. Choose "Untag" in MNG port dropdown. Press **Apply** button. The new configured VLAN ID will be indicated in VTU table and VLAN ID 200 will be indicated as default VLAN for MNG port:

SAF

LOCAL: TxP 8, MSE -40.9, RxL -43.2, High, 1+0 CH1, Low, RxL -42.9, MSE -40.5, TxP 8, TxP 7006

REMOTE: RxL -42.9, MSE -40.5, TxP 8, TxP 7006

Logout in: 3 h 54 m 22 s

MUX: EthVLAN, EthQOS

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	basic	basic	basic	basic	basic	basic
Port Group	group-1	group-3	group-1	group-1	group-1	group-3
Default VLAN	1	1	1	200	1	1

VTU SETTINGS

ACTION	VLAN N.	FID	OOS PRI	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
add	200	200	off	Tag	Deny	Deny	Untag	Tag	Deny

LISTING OF ACTUAL VTU VALUES

```

PORTBAS. | LAN1 | LAN2 | LAN3 | MNG | WANA | WANB
GROUP : 1 3 1 1 1 3
MODE : basic basic basic basic basic basic
DEFAULT: 1 1 1 200 1 1
VTU TABLE
VLAN | FID | L1 | L2 | L3 | MN | WA | WB | PRI
100 100 T D D D T D -
200 200 T D D U T D -
ok

```

Undo Apply

Figure 5.166 Management VLAN configuration

- 5) After configuring VLAN IDs, in the same page enable VLAN mode by setting "Port Mode" for each involved port: set "trunk" mode for LAN1 and WANa port, set "access" mode for MNG port and press **Apply** button:

SAF

LOCAL: TxP 8, MSE -41.0, RxL -43.3, High, 1+0 CH1, Low, RxL -42.9, MSE -40.4, TxP 8, TxP 7006

REMOTE: RxL -42.9, MSE -40.4, TxP 8, TxP 7006

Logout in: 3 h 50 m 29 s

MUX: EthVLAN, EthQOS

VLAN MODE	LAN 1	LAN 2	LAN 3	MNG	WAN A	WAN B
Port Mode	trunk	basic	basic	access	trunk	basic
Port Group	group-1	group-3	group-1	group-1	group-1	group-3
Default VLAN	1	1	1	200	1	1

Apply

Figure 5.167 VLAN mode enabling

- 6) After applying those settings the management connection between the IDU and computer will be lost, reconnect to the IDU via external switch with appropriate VLAN configuration (VLAN ID 200 for management access)
- 7) After successful VLAN configuration save new settings by pressing **Write** button.

Appendix A: TECHNICAL SPECIFICATION

		Phoenix G2
General		
Concept / form factor	Split Mount	
Frequency bands	2/2.3*GHz, 4GHz, U4GHz, L6GHz, U6GHz 7GHz, 8GHz, 11GHz, 13GHz, 18GHz, 23GHz, 38GHz	
Capacity	Up to 900 Mbps in 2+0 configuration	
	452 Mbps at 60 MHz 1024QAM 1+0	
Max modulation	1024QAM	
Configurations	1+0, 1+1 HSB/SD/FD, 2+0 (Layer 1 aggregation), 2+0 XPIC, 2+2 (with two IDUs), 1+1 HSB/SD/FD Full redundancy (with two IDUs)	
ACM and ATPC	Yes	
Channel bandwidth	ETSI: from 7 MHz, up to 56 MHz FCC: from 10 MHz, up to 60 MHz	
Ports		
Ethernet traffic	3x RJ-45	10/100/1000Base-T
	4x SFP	1000BaseSX/LX 2x SFP ports also work as Extension/Protection ports
Ethernet Management Access	1x 10/100/1000Base-T, RJ-45	
Serial port for configuration	USB B (alternative IP port)	
Flash memory port	USB A	
ODU port	2x N-Type Female	
DC power port	Single block 4 pole	
Ethernet		
Switch type	Managed Gigabit Ethernet Layer 2	
Max frame size	64 to 2048 bytes, up to 10240 bytes for Jumbo mode	
MAC table	8192 entries; automatic learning and aging	
Packet buffer	125KB, non-blocking store&forward	
Flow Control	802.3x	
VLAN support	802.1Q, up to 4096 VLANs	
QinQ (Double Tagging)	Yes	
QoS	64 level DiffServ (DSCP) or 8 level 802.1p mapped in 4 prioritization queues with VLAN support, IPv6 Traffic Class	
Synchronization	PTP 1588v2	
Management features		
Protocols	via WEB GUI (HTTP/HTTPS), CLI (Telnet/SSH), NMS (SNMP v2c/v3), Serial interface (USB IP port)	
Access	In-band (via VLAN) Out-of-band (115 kbps)	

Phoenix G2	
SNMP	Yes, SNMP traps, MIB, SNMP v2c/3
Element Management System (EMS)	Web based, HTTP/HTTPS
Mechanical & Electrical	
Temperature Range / Humidity	-5 °C to +45 °C / 23 °F to 113 °F / 0% to 95%
Dimensions: HxWxD	½ width 1U (44 x 220 x 240 mm) / (1.73 x 8.66x 9.45 in)
Weight	2.2 kg / 4.9 lb
Max. power consumption	IDU only: <30W IDU + 2xODU: <180W
IDU-ODU connection	Maximum permissible IF cable attenuation = 15dB, N-Type connectors
DC port	-40.5V to -57V DC
IDU compliance	
Operation	ETSI EN 300 019, Part 1-3, Class 3.2
Storage	ETSI EN 300 019, Part 1-1, Class 1.2
Transportation	ETSI EN 300 019, Part 1-2, Class 2.3
Power	EN 300 132-2
Radio frequency IDU+ODU	EN 302 217-2-2
EMC	EN 301 489-1, EN 301 489-3
Safety	IEC 60950-1/EN 60950-1

*2.3GHz radio unit complies with FCC part 27

Maximum Tx Power [dBm] for Phoenix G2*:

Modulation	2/2.3 GHz**	4/U4 GHz	L6/U6 GHz	7 GHz	8 GHz	11 GHz	13 GHz	18 GHz	23 GHz	38 GHz
4 QAM	+35	+33	+19/+27/ +33	+19/+27/ +32	+19/+27/ +31	+19/+25/ +29	+19/+25/ +28	+19/+ 26	+19	+17
16 QAM	+34	+32	+18/+26/ +32	+18/+26/ +31	+18/+26/ +30	+18/+24/ +28	+18/+24/ +27	+18/+ 25	+18	+16
32 QAM	+33	+31	+17/+25/ +31	+17/+25/ +30	+17/+25/ +29	+17/+23/ +27	+17/+23/ +26	+17/+ 24	+17	+15
64 QAM	+32	+30	+16/+24/ +30	+16/+24/ +29	+16/+24/ +28	+16/+22/ +26	+16/+22/ +25	+16/+ 23	+16	+14
128 QAM	+32	+30	+16/+24/ +30	+16/+24/ +29	+16/+24/ +28	+16/+22/ +26	+16/+22/ +25	+16/+ 23	+16	+14
256 QAM	+31	+29	+15/+23/ +29	+15/+23/ +28	+15/+23/ +27	+15/+21/ +25	+15/+21/ +24	+15/+ 22	+15	+13
512 QAM	+30	+28	+14/+22/ +28	+14/+22/ +27	+14/+22/ +26	+14/+20/ +24	+14/+20/ +23	+14/+ 21	+14	+12
1024 QAM	+27	+25	+11/+19/ +25	+11/+19/ +24	+11/+19/ +23	+11/+17/ +21	+11/+17/ +20	+11/+ 18	+11	+9

* Preliminary data

** 2.3GHz radio unit complies with FCC part 27

Phoenix G2 RSL Thresholds and Capacity for ETSI channels*

Bandwidth, MHz	Modulation	2/2.3	U4GHz	L6GHz	U6GHz	7GHz	11GHz	13GHz	18GHz	23GHz	Capacity, Mbps
		GHz**									
		Guaranteed RSL Threshold, dBm									
7	4QAM StrongFEC	-91	-92	-92	-89,5	-90,5	-87,5	-88,5	-91	-89	10
	16QAM StrongFEC	-85	-86	-86	-83	-84	-82	-82,5	-85	-82,5	20
	32QAM StrongFEC	-82	-83	-83	-80	-81,5	-79	-79	-81,5	-79	25
	64QAM StrongFEC	-79	-80	-80	-76,5	-78	-76	-76	-78,5	-76	30
	128QAM StrongFEC	-75.5	-76,5	-76,5	-72,5	-74,5	-73,5	-73	-74,5	-72,5	35
14	4QAM StrongFEC	-88	-89	-89	-87	-87,5	-85	-87	-89	-87	21
	16QAM StrongFEC	-81.5	-82,5	-82,5	-81	-81	-80	-80	-82	-80	42
	32QAM StrongFEC	-78.5	-79,5	-79,5	-77,5	-78	-76,5	-77	-79	-77,5	53
	64QAM StrongFEC	-75.5	-76,5	-76,5	-75	-75,5	-74	-74	-76	-74,5	63
	128QAM StrongFEC	-72.5	-73,5	-73,5	-72	-72,5	-71	-71,5	-73	-71,5	74
	256QAM StrongFEC	-69.5	-70,5	-70,5	-68,5	-69,5	-68,5	-68	-70	-68,5	85
20	4QAM StrongFEC	-86.5	-87,5	-87,5	-86	-86	-84	-85,5	-87,5	-85	30
	16QAM StrongFEC	-80.5	-81,5	-81,5	-79	-79,5	-79	-79	-81,5	-78,5	61
	32QAM StrongFEC	-77.5	-78,5	-78,5	-76	-77	-75,5	-76	-78	-75,5	76
	64QAM StrongFEC	-74.5	-75,5	-75,5	-73	-74	-72,5	-73	-75	-72,5	91
	128QAM StrongFEC	-71	-72	-72	-70	-71	-69,5	-69,5	-72	-69,5	107
	256QAM StrongFEC	-68	-69	-69	-67,5	-68,5	-66,5	-66,5	-69	-67	122
	512QAM StrongFEC	-65	-66	-66	-64,5	-65	-63,5	-64	-66	-63,5	137
	1024QAM StrongFEC	-62	-63	-63	-60,5	-61	-61	-60	-62	-59,5	152
28	4QAM StrongFEC	-85	-86	-86	-84	-84,5	-83,5	-84	-86,5	-83,5	43
	16QAM StrongFEC	-78.5	-79,5	-79,5	-77,5	-78	-78	-77,5	-79,5	-77,5	86
	32QAM StrongFEC	-75.5	-76,5	-76,5	-74,5	-75,5	-75	-74,5	-76	-74,5	108
	64QAM StrongFEC	-73	-74	-74	-71,5	-72,5	-72	-71,5	-73	-71,5	129
	128QAM StrongFEC	-69.5	-70,5	-70,5	-68,5	-69,5	-69	-68,5	-70,5	-68,5	151
	256QAM StrongFEC	-67	-68	-68	-66	-66,5	-66	-65,5	-67	-65,5	172
	512QAM StrongFEC	-63.5	-64,5	-64,5	-62,5	-63,5	-62,5	-63	-63,5	-62	194
	1024QAM StrongFEC	-61	-62	-62	-59,5	-60	-59,5	-59	-61	-59	216
40	4QAM StrongFEC	-83.5	-84,5	-84,5	-83	-83	-82	-82	-84	-82	61
	16QAM StrongFEC	-77	-78	-78	-76	-76,5	-76	-75,5	-77	-75,5	122
	32QAM StrongFEC	-74.5	-75,5	-75,5	-73	-73,5	-73	-72,5	-74,5	-72,5	152
	64QAM StrongFEC	-71.5	-72,5	-72,5	-70	-71	-70	-69,5	-71	-69,5	183
	128QAM StrongFEC	-68.5	-69,5	-69,5	-67	-68	-67	-66,5	-68,5	-66,5	214
	256QAM StrongFEC	-65.5	-66,5	-66,5	-64	-65	-64,5	-63,5	-65	-63,5	244
	512QAM StrongFEC	-62.5	-63,5	-63,5	-61,5	-62	-60,5	-60,5	-62	-60,5	275
	1024QAM StrongFEC	-59.5	-60,5	-60,5	-58,5	-58	-58	-57,5	-58,5	-57	305
56	4QAM StrongFEC	-82	-83	-83	-80,5	-81,5	-81	-81	-82	-80,5	87
	16QAM StrongFEC	-75.5	-76,5	-76,5	-74	-75	-74,5	-74,5	-75,5	-74	174
	32QAM StrongFEC	-73	-74	-74	-71,5	-72	-71,5	-71,5	-72,5	-71	217
	64QAM StrongFEC	-70	-71	-71	-68,5	-69	-68,5	-68	-69,5	-68,5	261
	128QAM StrongFEC	-67	-68	-68	-65,5	-66,5	-65,5	-65,5	-67	-65	304
	256QAM StrongFEC	-64	-65	-65	-62	-63,5	-63	-62	-63,5	-61,5	348
	512QAM StrongFEC	-60.5	-61,5	-61,5	-59,5	-60,5	-59,5	-59	-60,5	-58,5	392
	1024QAM StrongFEC	-57.5	-58,5	-58,5	-56	-56,5	-56,5	-56	-56,5	-55,5	435

* Preliminary data

** 2.3GHz radio unit complies with FCC part 27

Phoenix G2 RSL Thresholds and Capacity for FCC channels*

Bandwidth, MHz	Modulation	2GHz**	U4GHz	L6GHz	U6GHz	7GHz	11GHz	13GHz	18GHz	23GHz	Capacity, Mbps
		Guaranteed RSL Threshold, dBm									
10	4QAM StrongFEC	-89.5	-90.5	-88.5	-88.5	-87	-88	-90	-88	-89	15
	16QAM StrongFEC	-83.5	-84.5	-82	-82.5	-81	-81.5	-83.5	-82.5	-82.5	30
	32QAM StrongFEC	-80	-81	-79	-79.5	-78.5	-78.5	-80	-79	-79.5	38
	64QAM StrongFEC	-77.5	-78.5	-76	-76.5	-75.5	-75.5	-77	-76	-76.5	45
	128QAM StrongFEC	-74.5	-75.5	-73.5	-73.5	-73	-72.5	-73.5	-72.5	-74	53
20	4QAM StrongFEC	-86.5	-87.5	-86	-86	-84	-85.5	-87.5	-85	-86	30
	16QAM StrongFEC	-80.5	-81.5	-79	-79.5	-79	-79	-81.5	-78.5	-79.5	61
	32QAM StrongFEC	-77.5	-78.5	-76	-77	-75.5	-76	-78	-75.5	-76.5	76
	64QAM StrongFEC	-74.5	-75.5	-73	-74	-72.5	-73	-75	-72.5	-73	91
	128QAM StrongFEC	-71	-72	-70	-71	-69.5	-69.5	-72	-69.5	-69.5	107
	256QAM StrongFEC	-68	-69	-67.5	-68.5	-66.5	-66.5	-69	-67	-67	122
	1024QAM StrongFEC	-65	-66	-64.5	-65	-63.5	-64	-66	-63.5	-63.5	137
25	4QAM StrongFEC	-85.5	-86.5	-84.5	-85	-83.5	-85	-87.5	-84	-84.5	37
	16QAM StrongFEC	-79.5	-80.5	-78	-79	-78	-78	-81	-78	-78	74
	32QAM StrongFEC	-76.5	-77.5	-75	-75.5	-75	-75.5	-78	-75	-75	93
	64QAM StrongFEC	-73.5	-74.5	-72	-73	-72	-72	-75	-71.5	-72	111
	128QAM StrongFEC	-70.5	-71.5	-69	-70	-69.5	-69	-72	-69	-69.5	130
	256QAM StrongFEC	-67.5	-68.5	-66.5	-67	-66.5	-66	-68.5	-66	-66.5	148
	1024QAM StrongFEC	-64.5	-65.5	-63.5	-64	-63	-63	-65.5	-63	-63.5	167
30	4QAM StrongFEC	-84.5	-85.5	-83.5	-84	-82.5	-83	-85	-83.5	-84.5	45
	16QAM StrongFEC	-78.5	-79.5	-77	-78	-77.5	-76.5	-78	-77	-77.5	91
	32QAM StrongFEC	-75.5	-76.5	-74	-75	-74	-74	-75	-74.5	-74.5	114
	64QAM StrongFEC	-72.5	-73.5	-71	-72	-71.5	-70.5	-73	-70.5	-71.5	137
	128QAM StrongFEC	-69.5	-70.5	-68.5	-69.5	-68.5	-68	-70	-68	-69	160
	256QAM StrongFEC	-66.5	-67.5	-65.5	-66	-66	-64.5	-66.5	-64.5	-66	183
	512QAM StrongFEC	-63.5	-64.5	-62.5	-63	-61.5	-61.5	-63.5	-61.5	-62.5	206
	1024QAM StrongFEC	-60.5	-61.5	-59	-59.5	-59.5	-58.5	-60	-59	-58.5	229
40	4QAM StrongFEC	-83.5	-84.5	-83	-83	-82	-82	-84	-82	-83	61
	16QAM StrongFEC	-77	-78	-76	-76.5	-76	-75.5	-77	-75.5	-76.5	122
	32QAM StrongFEC	-74.5	-75.5	-73	-73.5	-73	-72.5	-74.5	-72.5	-73	152
	64QAM StrongFEC	-71.5	-72.5	-70	-71	-70	-69.5	-71	-69.5	-70.5	183
	128QAM StrongFEC	-68.5	-69.5	-67	-68	-67	-66.5	-68.5	-66.5	-68	214
	256QAM StrongFEC	-65.5	-66.5	-64	-65	-64.5	-63.5	-65	-63.5	-64.5	244
	512QAM StrongFEC	-62.5	-63.5	-61.5	-62	-60.5	-60.5	-62	-60.5	-61	275
	1024QAM StrongFEC	-59.5	-60.5	-58.5	-58	-58	-57.5	-58.5	-57	-57.5	305
50	4QAM StrongFEC	-82.5	-83.5	-81.5	-82	-81.5	-81	-83	-81	-82	75
	16QAM StrongFEC	-76.5	-77.5	-75	-75.5	-75	-74.5	-76.5	-74.5	-75	151
	32QAM StrongFEC	-73.5	-74.5	-72	-73	-72	-71.5	-73.5	-71.5	-72.5	189
	64QAM StrongFEC	-70.5	-71.5	-69	-70	-69	-68.5	-71	-68.5	-69	227
	128QAM StrongFEC	-67.5	-68.5	-66	-67	-66	-65.5	-68	-65.5	-67	265
	256QAM StrongFEC	-64.5	-65.5	-63	-64	-63.5	-62.5	-64.5	-62.5	-63.5	303
	512QAM StrongFEC	-61.5	-62.5	-60.5	-61	-60	-60	-61.5	-59.5	-60.5	341
	1024QAM StrongFEC	-58.5	-59.5	-57	-57	-56.5	-56.5	-58	-56.5	-57.5	379
60	4QAM StrongFEC	-81.5	-82.5	-81	-81	-80.5	-81	-80.5	-80.5	-81	90
	16QAM StrongFEC	-75.5	-76.5	-74	-74	-74	-74.5	-74	-73.5	-74.5	180
	32QAM StrongFEC	-72.5	-73.5	-71	-71.5	-71	-71.5	-70.5	-70.5	-72	226
	64QAM StrongFEC	-69.5	-70.5	-68.5	-68.5	-68	-67.5	-68.5	-68	-69	271
	128QAM StrongFEC	-66.5	-67.5	-65.5	-63.5	-65	-64.5	-65.5	-65	-66	316
	256QAM StrongFEC	-64	-65	-62.5	-62.5	-62.5	-62	-62.5	-61.5	-63	361
	1024QAM StrongFEC	-60.5	-61.5	-59.5	-59.5	-59	-59	-59.5	-58.5	-59.5	407
	1024QAM StrongFEC	-57.5	-58.5	-56.5	-56.5	-56	-55.5	-56	-55.5	-56	452

* Preliminary data

** 2.3GHz radio unit complies with FCC part 27

Appendix B: ASI EMM TECHNICAL SPECIFICATION

CFIP-ASI-EXT	
EAGMEXA4	External ASI module for Phoenix G2 IDU, 4x BNC, 2x SFP ports
ASI	Unbalanced, 75 ohm
Scalability	Cascading up to four external modules
Ports	
IDU connection	1x SFP port 1000Base-SX (proprietary GigE protocol)
Connection to next External module	1x SFP port 1000Base-SX (proprietary GigE protocol)
ASI ports	4x BNC
DC port	Industrial power connector
Mechanical & Electrical	
Dimensions: HxWxD	½ width 1U (45 x 210 x 240 mm) / (1.77 x 8.27 x 9.45 in)
Weight	1.3 kg / 2.87 lb
Max. power consumption	IDU: <9 W
DC port	-20V to -60V DC

Appendix C: E1/T1 EMM TECHNICAL SPECIFICATION

CFIP-16E1/T1-EXT	
EAGMEX16	16E1/T1 external module for Phoenix G2 IDU, 16xRJ-45, 2xSFP ports
16xE1/T1	G.703-E1 balanced 120ohm for E1 mode G.703-E1 unbalanced 75 ohm for E1 mode T1.102-T1/100 ohm for T1 mode
Scalability	Cascading up to four external modules
Ports	
IDU connection	1x SFP port 1000Base-SX (proprietary GigE protocol)
Connection to next External module	1x SFP port 1000Base-SX (proprietary GigE protocol)
E1 ports	16x RJ-45
DC port	Industrial power connector
Mechanical & Electrical	
Dimensions: HxWxD	½ width 1U (45 x 210 x 240 mm) / (1.77 x 8.27 x 9.45 in)
Weight	1.3 kg / 2.87 lb
Max. power consumption	IDU: <9 W
DC port	-20V to -60V DC

Appendix D: IRFU TECHNICAL SPECIFICATION

Ports	
Antenna	A) N-Type or flange B) SMA Tx and Rx ports
IF to IDU	SMA
RSSI	2-port for multi-meter
Power	2-pin power port (alternative to IF port)
Mechanical & Electrical	
Operational use	Conforms to ETSI EN 300 019 Class 3.1E, IP20, NEMA 1
Temperature Range	-33°C to +55°C
Dimensions: HxWxD / weight	19" 2U rack 90x430x260 / 5.8 kg
IF port surge protection	Conforms to ETSI EN 301 489-1; EN 61000-4-5; IEC 61000-4-5
Input DC voltage	-40.5V to -57V DC (conforms to ETSI EN 300 132-2)
Max. power consumption	SP: 13-27 W; HP: 21-39 W; VHP: 39-55W

ABBREVIATIONS

ACM	– Adaptive Coding and Modulation
AES	– Advanced Encryption Standard
ANSI	– American National Standards Institute
ASI	– Asynchronous Serial Interface
ATPC	– Automatic Transmit Power Control
AWG	– American Wire Gauge
BER	– Bit-Error Ratio
BNC	– Bayonet Neill-Concelman connector
CDE	– Cable Discharge Events
CLI	– Command-Line Interface
CPE	– Customer-premises equipment
CRC	– Cyclic Redundancy Check
CW	– Continuous Wave
DC	– Direct Current
DSCP	– Differentiated Services Code Point
DVB	– Digital Video Broadcasting
EMM	– External Multiplexer Module
ESD	– Electrostatic Discharge
ETH	– Ethernet
ETSI	– European Telecommunications Standards Institute
FCC	– The Federal Communications Commission
FD	– Frequency Diversity
FEC	– Forward Error Correction
FER	– Frame Errors
FO	– Fiber Optics
GND	– Grounding
GUI	– Graphical User Interface
HP	– High Power
HSB	– Hot Standby
HTTPS	– Hypertext Transfer Protocol Secure
HW	– Hardware
IDU	– Indoor Unit
IF	– Intermediate Frequency
IRFU	– Indoor Radio Frequency Unit
ITU-T	– International Telecommunication Union – Telecommunication Standardization Sector
JSC	– Joint Stock Company
LAN	– Local Area Network
LED	– Light-Emitting Diode
MAC	– Media Access Control
MDI/MDX	– Medium Dependent Interface / Medium Dependent Interface Crossover
MIB	– Management Information Base
M/N	– Model Number
MNG	– Management
MPEG	– Moving Picture Experts Group

MSE – Mean Square Error
MUX – Multiplexer
NAT – Network Address Translation
NTP – Network Time Protocol
ODU – Outdoor Unit
OQPRI – Queue Priority override
PBPM – Priority Based Packet Multiplexer
PC – Personal Computer
P/N – Part Number
PRI – Priority
Pri/Sec – Primary/Secondary
PTP – Precision Time Protocol
RF – Radio Frequency
RSL – Received Signal Level
RSS – Radio Standards Specification
RSSI – Received Signal Strength Indicator
Rx – Receive
SD – Space Diversity
SFP – Small Form-factor Pluggable
SMA – SubMiniature version A connector
SNMP - Simple Network Management Protocol
S/N – Serial Number
SP – Standard Power
SSH – Secure Shell
SW – Software
SyncE – Synchronous Ethernet
QAM - Quadrature amplitude modulation
QoS – Quality of Service
QPRI – Queue Priority
QPSK – Quadrature Phase-shift Keying
TCP/IP – Internet Protocol Suite (Transmission Control Protocol / Internet Protocol)
TDM – Time-Division Multiplexing
Tx – Transmit
TV – Television
USB – Universal Serial Bus
VHP – Very High Power
VLAN – Virtual Local Area Network
VTU – VLAN rules table: VLAN Tagged/Untagged
XPIC – Cross-polar Interference Cancellation



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