



# Cisco Remote PHY Line Card and Supervisor Redundancy

This document provides information about Remote PHY line card and Supervisor redundancy.

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## Hardware Compatibility Matrix for Cisco Remote PHY Device



**Note** Unless otherwise specified, the hardware components introduced in a given Cisco Remote PHY Device Software Release are supported in all subsequent releases.

**Table 1: Hardware Compatibility Matrix for the Cisco Remote PHY Device**

Cisco HFC Platform	Remote PHY Device
Cisco GS7000 Super High Output Node	Cisco 1x2 / Compact Shelf RPD Software 2.1 and Later Releases
Cisco GS7000 Super High Output Intelligent Node (iNode)	Cisco 1x2 / Compact Shelf RPD Software 4.1 and Later Releases Cisco Intelligent Remote PHY Device 1x2 <ul style="list-style-type: none"><li>• PID—iRPD-1X2=</li><li>• PID—iRPD-1X2-PKEY=</li></ul>



**Note** The -PKEY suffix in the PID indicates units that enable the SCTE-55-2 Out-of-Band protocol support.

# Information About Remote PHY Line Card and Supervisor Redundancy

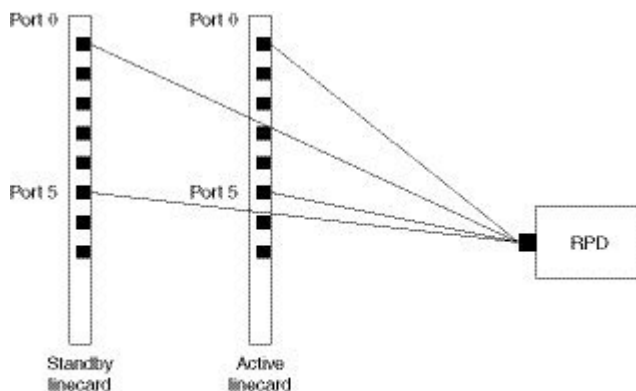
This section provides details of line card and Supervisor redundancy.

## Line Card Redundancy

In Remote PHY (R-PHY) configuration, RPDs connect to both active linecard and standby linecard, and have active connections to active linecard, standby connections to standby linecard. From RPD side, it connects to active core and standby core independently.

Each RPD has one principal core, and may have several auxiliary cores. LCHA needs to support multiple cores. These cores are on the same linecard or different linecards. The port on the standby linecard can protect all the same ports on the active linecards.

**Figure 1: Multiple cores on the same line card**

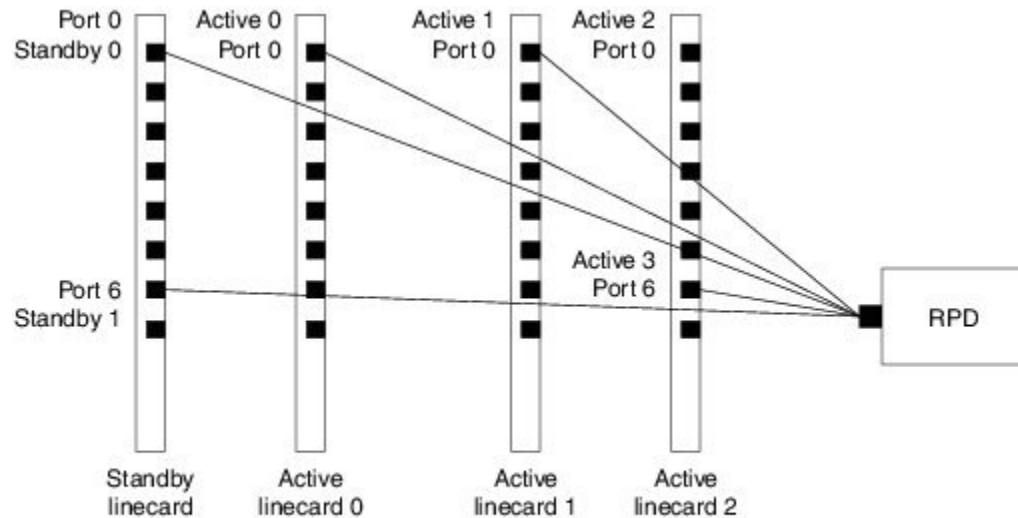


■ The Giga port

In the figure above, the RPD has multiple cores connected to the same active linecard. In order to support LCHA, RPD needs to connect to the same port on the standby linecard. In this way, RPD has several standby cores to protect the active cores. The standby core have the same resource as the active core.

When multiple cores connect to different active linecards, if they connect to different ports of the linecard, there will have different standby cores. If active core connects to the same port on different linecard, they share one standby core.

Figure 2: Multiple cores on different line cards



### ■ The Giga port

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In the figure above, RPD have two standby cores. One standby core connects to port 6 of the standby linecard, it can protect the active core which connects to port 6 of the active linecard 2. The other standby core connects to port 0 of the standby linecard, it can protect the active cores connect to port 0 of linecard 0 and linecard 1. So for the standby core 0, it contains the resource for both active core 0 and active core 1.

When active linecard 0 fails over to standby linecard, the standby core 1 will be deleted, the standby core 0 will bring the resource of active core 0 to active. When linecard 2 fails over to standby linecard, the standby core 0 will be deleted, and standby core 1 will become active for active core 3.

For more information about Line Card Redundancy, see [Line Card Redundancy](#).

## Supervisor Redundancy

Compared to the SUP high availability recover process in iCMTS configuration, the Remote PHY SUP high availability recover process has RPD status change as shown in the example below:

```
show cable rpd 0004.9f00.0625 lcha-cores
MAC Address      IP Address      I/F      State      Role  HA   Name
0004.9f00.0625  120.105.6.10  Te0/1/1  recovering  Pri  Act  node1
0004.9f00.0625  120.105.6.10  Te9/1/1  recovering  NA   Sby  node1

show cable rpd 0004.9f00.0625 lcha-cores
MAC Address      IP Address      I/F      State      Role  HA   Name
0004.9f00.0625  120.105.6.10  Te0/1/1  init(l2tp)  Pri  Act  node1
0004.9f00.0625  120.105.6.10  Te9/1/1  init(l2tp)  NA   Sby  node1

show cable rpd 0004.9f00.0625 lcha-cores
MAC Address      IP Address      I/F      State      Role  HA   Name
0004.9f00.0625  120.105.6.10  Te0/1/1  online      Pri  Act  node1
0004.9f00.0625  120.105.6.10  Te9/1/1  online      NA   Sby  node1
```

The status of the RPD changes from recovering to online, indicating that the SUP redundancy is working in the Remote PHY configuration.

For more information about SUP redundancy, see [Supervisor Redundancy](#).

## DPIC Link Redundancy

The Cisco cBR Series Remote PHY Digital Physical Interface Card (DPIC) provides the Ethernet network connection between the CCAP core and Remote PHY devices.

You can enable or disable RPHY link redundancy feature for a chassis. The redundancy state of a link is described using the link *mode* and *role*.

The redundancy mode is the term that is used for the configured or administered designation of a link, and is determined during the link configuration. The redundancy mode does not change during a switchover. There are two redundancy modes:

- **Primary mode:** This is the default working link of a core interface. The primary link is fixed to port 0, 2, 4, 6 when the link high availability is enabled.
- **Secondary mode:** This mode provides protection to the primary link. The secondary link is fixed to port 1, 3, 5, 7 when the link high availability is enabled.

The redundancy role is a dynamic entity that indicates the runtime or operational status of a port. The role changes only during a link switchover. The entity has two states:

- **Active role:** This link carries the RPHY data stream of the core interface. When the primary link is switched over to the secondary link, the secondary link becomes the active link of the core interface.
- **Standby role:** This link does not run any RPHY data traffic, but gets prepared to become active when the current active link has failed. According to the physical state of the standby link, the standby link can be further distinguished into a standby-hot link and standby-cold link. A standby-hot retains the link in the UP state. The 10-Gigabit Ethernet transceiver and TX power are enabled in this case, and the 10-Gigabit Ethernet port state is UP in the directly connected switch or router. The link of standby port is shut down, the TX power turned off and the 10-Gigabit Ethernet port state in the directly connected switch or router is down.

cBR supports both standby-hot and standby-cold redundancy modes.

In 1+1 core link redundancy configuration, the secondary link is the backup link for the primary link. At any given time, only one link (the active link) carries the RPHY control and data traffic for a core interface. The standby link provides protection for only one primary link. Current 8x10G DPIC has eight 10G ports on front panel and 4x10G XFI ports to Cylons-R 40G. Each 10G XFI port provides two core interfaces sharing the total 10G bandwidth. For an 8-port DPIC card, you can provide four 1+1 redundant groups.

When link high availability is enabled in the chassis, the secondary card supports link HA as do the other linecards. Each linecard makes its link switchover decisions that is independently based on the physical link state.

## How to Configure Remote PHY Line Card Redundancy

This section describes how to configure Remote PHY (R-PHY) Line Card Redundancy on Cisco cBR-8.

## Configuring DPIC Ports

The Remote PHY LCHA, typically has separate paths for primary and secondary interfaces on the RPD. Hence, you should configure separate VRFs for DPIC interfaces on the secondary LC.



**Note** Sub-interfaces are not supported for DPIC interfaces on linecards in slots 0-3 and 6-9.

The following example shows how to configure DPIC port to support Remote PHY Line Card Redundancy:

```
Router# configure terminal
Router(config)# interface TenGigabitEthernet8/1/0
Router(config-if)# vrf forwarding te80
Router(config-if)# ip address 80.6.16.166 255.255.255.0
Router(config-if)# exit
Router(config)# interface TenGigabitEthernet8/1/1
Router(config-if)# vrf forwarding te81
Router(config-if)# ip address 80.6.16.167 255.255.255.0
Router(config-if)# exit
Router(config)# interface TenGigabitEthernet6/1/0
Router(config-if)# vrf forwarding te60
Router(config-if)# ip address 80.6.16.186 255.255.255.0
Router(config-if)# exit
Router(config)# interface TenGigabitEthernet6/1/1
Router(config-if)# vrf forwarding te61
Router(config-if)# ip address 80.6.16.187 255.255.255.0
```

## Configuring RPD

The following example shows how to configure RPD to support Remote PHY Line Card Redundancy:

```
Router# configure terminal
Router(config)# cable rpd node1
Router(config-rpd)# identifier 0004.9f03.0055
Router(config-rpd)# core-interface te8/1/0
Router(config-rpd-core)# principal
Router(config-rpd-core)# rpd-ds 0 downstream-cable 8/1/0 profile 0
Router(config-rpd-core)# rpd-us 0 upstream-cable 8/1/0 profile 0
Router(config-rpd-core)# exit
Router(config-rpd)# core-interface te8/1/1
Router(config-rpd-core)# rpd-ds 0 downstream-cable 8/1/1 profile 0
Router(config-rpd-core)# rpd-us 0 upstream-cable 8/1/1 profile 0
Router(config-rpd-core)# exit
Router(config-rpd)# exit
Router(config)# cable rpd node2
Router(config-rpd)# identifier 0004.9f03.0163
Router(config-rpd)# core-interface te8/1/2
Router(config-rpd-core)# principal
Router(config-rpd-core)# rpd-ds 0 downstream-cable 8/0/1 profile 1
Router(config-rpd-core)# rpd-us 0 upstream-cable 8/0/2 profile 2
```

## Configuring Remote PHY Line Card Redundancy

The following example shows how to configure Remote PHY Line Card Redundancy:

```
Router# configure terminal
Router(config)# redundancy
Router(config-red)# mode sso
```

```
Router(config-red)# linecard-group 0 internal-switch
Router(config-red-lc)# class 1:N
Router(config-red-lc)# member slot 8 primary
Router(config-red-lc)# member slot 6 secondary
Router(config-red-lc)# no revertive
```

## Verifying Remote PHY Line Card Redundancy Configuration

To verify the Remote PHY line card redundancy configuration, use the example below:

```
Router# show redundancy linecard all
```

Slot	Subslot	LC Group	My State	Peer State	Peer Slot	Peer Subslot	Role	Mode
8	-	0	Active	Stdby Warm	6	-	Active	Primary
6	-	0	-	-	Multiple	None	Standby	Secondary

```
Router# show cable rpd lcha-cores
```

MAC Address	IP Address	I/F	State	Core Role	HA Role
0004.9f03.0055	80.6.16.15	Te6/1/0	online	Principal	Standby
0004.9f03.0055	80.6.16.15	Te8/1/0	online	Principal	Active
0004.9f03.0163	80.6.16.16	Te6/1/1	online	Principal	Standby
0004.9f03.0163	80.6.16.16	Te8/1/1	online	Principal	Active

```
Router# show cable rpd
```

MAC Address	IP Address	I/F	State	Core Role	HA Role
0004.9f03.0055	80.6.16.15	Te6/1/0	online	Principal	Active
0004.9f03.0163	80.6.16.16	Te6/1/1	online	Principal	Active

## How to Configure DPIC Link Redundancy

This section describes how to configure DPIC Link Redundancy on Cisco cBR-8.

### Configuring DPIC Link Redundancy

The link redundancy is disabled by default. You need to enable the link redundancy feature manually.

- To set the DPIC link in the UP state, use the **cable rphy link redundancy hot** command.
- To set the DPIC link in the standby-down state, use the **cable rphy link redundancy cold** command.  
For example:

```
Router# cable rphy link redundancy cold
```

```
RPHY Link HA: Cold mode enabled
```

Core Interface	Port	Mode	Role	Status
Te 2/1/0	0	Primary	Active	Up
Te 2/1/0	1	Secondary	Standby	Ready
Te 2/1/2	2	Primary	Active	Up
Te 2/1/2	3	Secondary	Standby	Ready
Te 2/1/4	4	Primary	Active	Up
Te 2/1/4	5	Secondary	Standby	Ready
Te 2/1/6	6	Primary	Active	Up
Te 2/1/6	7	Secondary	Standby	Ready

- To disable the link redundancy, run the **no cable rphy link redundancy** command.

## Verifying DPIC Link Redundancy

To verify the DPIC link redundancy, go through the following steps:

- To check the link redundancy of any of the DPIC slots, run the **show redundancy digi-pic slot <0-9>** command. See the following example:

```
Router# show redundancy digi-pic slot 0:
```

```
RPHY Link HA: Hot mode enabled
Core Interface Port Mode          Role      Status
-----
Te 0/1/0          0    Primary    Active    Up
Te 0/1/0          1    Secondary  Standby   Up ("Ready" in standby-cold mode)
Te 0/1/2          2    Primary    Active    Up
Te 0/1/2          3    Secondary  Standby   Down
Te 0/1/4          4    Primary    Standby   Up ("Ready" in standby-cold mode)
Te 0/1/4          5    Secondary  Active    Up
Te 0/1/6          6    Primary    Active    Down
Te 0/1/6          7    Secondary  Standby   Down
```

- To view the DPIC history, use the **show redundancy digi-pic history slot <0-9>** command. See the following example:

```
Router# show redundancy digi-pic history slot 2
```

```
Jun 25 2018 14:41:14 - 2/1/0: Auto switchover from port:1 link:down to port:0 link up,
  success.
Jun 25 2018 14:40:54 - 2/1/0: Auto switchover from port:0 link:down to port:1 link up,
  success.
Jun 25 2018 14:39:20 - 2/1/0: Enable LINKHA success.
Jun 25 2018 14:39:20 - 2/1/2: Enable LINKHA success.
Jun 25 2018 14:39:20 - 2/1/4: Enable LINKHA success.
Jun 25 2018 14:39:20 - 2/1/6: Enable LINKHA success.
Jun 25 2018 14:38:56 - 2/1/0: Disable LINKHA success.
Jun 25 2018 14:38:56 - 2/1/2: Disable LINKHA success.
Jun 25 2018 14:38:56 - 2/1/4: Disable LINKHA success.
Jun 25 2018 14:38:56 - 2/1/6: Disable LINKHA success.
Jun 25 2018 14:37:20 - 2/1/0: Manual switchover from port:1 to port:0, success.
Jun 25 2018 14:37:16 - 2/1/0: Manual switchover from port:0 to port:1, success.
Jun 25 2018 14:36:31 - 2/1/0: Enable LINKHA success.
Jun 25 2018 14:36:31 - 2/1/2: Enable LINKHA success.
Jun 25 2018 14:36:31 - 2/1/4: Enable LINKHA success.
Jun 25 2018 14:36:31 - 2/1/6: Enable LINKHA success.
```

- To check the link redundancy of the TenGigabitEthernet 0/1/4, use the **show redundancy digi-pic interface TenGigabitEthernet 0/1/4** command. See the following example:

```
Router# show redundancy digi-pic interface TenGigabitEthernet 0/1/4
```

```
Link HA      : Hot mode enabled
HA State     : In Failover
Reason       : Manual Switchover
```

```
Port Mode          Role      Status
-----
  4 Primary          Standby   Up ("Ready" in standby-cold mode)
  5 Secondary        Active    Up
```

You can view the DPIC history of the TenGigabitEthernet using the **show redundancy digi-pic history interface TenGigabitEthernet <0-9>/1/<0, 2, 4, 6>** command. See the following example:

```

Router# show redundancy digi-pic history interface TenGigabitEthernet 2/1/0

Jun 25 2018 14:41:14 - 2/1/0: Auto switchover from port:1 link:down to port:0 link up,
success.
Jun 25 2018 14:40:54 - 2/1/0: Auto switchover from port:0 link:down to port:1 link up,
success.
Jun 25 2018 14:39:20 - 2/1/0: Enable LINKHA success.
Jun 25 2018 14:38:56 - 2/1/0: Disable LINKHA success.
Jun 25 2018 14:37:20 - 2/1/0: Manual switchover from port:1 to port:0, success.
Jun 25 2018 14:37:16 - 2/1/0: Manual switchover from port:0 to port:1, success.
Jun 25 2018 14:36:31 - 2/1/0: Enable LINKHA success.
Jun 25 2018 14:36:02 - 2/1/0: Disable LINKHA success.
Jun 22 2018 00:01:24 - 2/1/0: Enable LINKHA success.
Jun 22 2018 00:00:12 - 2/1/0: Enable LINKHA success.
Jun 22 2018 00:00:08 - 2/1/0: Disable LINKHA success.
Jun 21 2018 23:59:21 - 2/1/0: Enable LINKHA success.
Jun 21 2018 23:52:21 - 2/1/0: Enable LINKHA success.
Jun 21 2018 23:50:21 - 2/1/0: Enable LINKHA success.
Jun 21 2018 23:50:17 - 2/1/0: Disable LINKHA success.
Jun 21 2018 23:43:30 - 2/1/0: Enable LINKHA success.
Jun 21 2018 23:42:02 - 2/1/0: Enable LINKHA success.
Jun 21 2018 23:41:53 - 2/1/0: Disable LINKHA success.
Jun 21 2018 20:43:05 - 2/1/0: Enable LINKHA success.

```

## Feature Information for Remote PHY Redundancy

Use Cisco Feature Navigator to find information about the platform support and software image support. Cisco Feature Navigator enables you to determine which software images support a specific software release, feature set, or platform. To access Cisco Feature Navigator, go to the [www.cisco.com/go/cfn](http://www.cisco.com/go/cfn) link. An account on the Cisco.com page is not required.



**Note** The following table lists the software release in which a given feature is introduced. Unless noted otherwise, subsequent releases of that software release train also support that feature.

**Table 2: Feature Information for Remote PHY Redundancy**

Feature Name	Releases	Feature Information
Remote PHY LCHA	Cisco 1x2 / Compact Shelf RPD Software 3.1	This feature was integrated into the Cisco Remote PHY Device.
Remote PHY SUPHA	Cisco 1x2 / Compact Shelf RPD Software 3.1	This feature was integrated into the Cisco Remote PHY Device.
DPIC Link Redundancy	Cisco 1x2 / Compact Shelf RPD Software 5.1	This feature was integrated into the Cisco Remote PHY Device.