QUICK START GUIDE

Cabling the Cisco uBR 3x10 RF Switch

Warning **Only trained and qualified personnel should be allowed to install, replace, or service this equipment.** Statement 1030

1 Overview

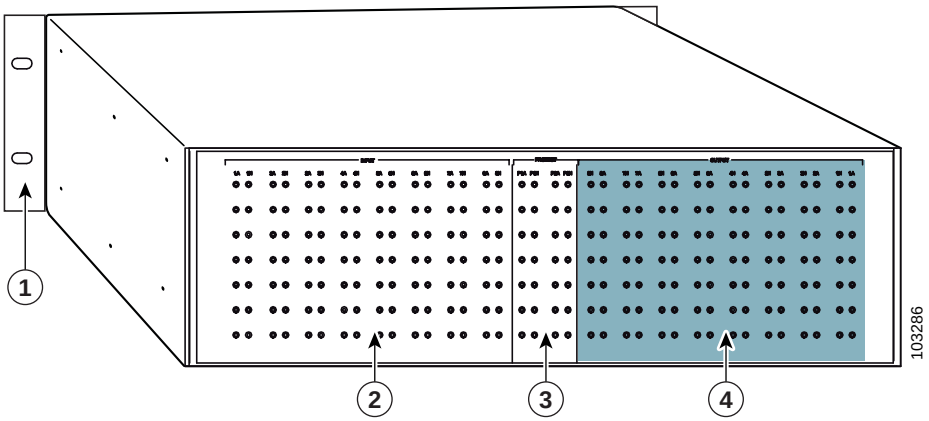
The RF switch is designed to work with both the Cisco uBR7246VXR cable modem termination system (CMTS) and the Cisco uBR10012 CMTS in a cable headend or hub to provide N+1 redundancy for applications such as Voice over IP (VoIP). The cabling scenarios presented here are designed to help you cable the cards to the RF switch and upconverter (when used). Refer to the specific card and CMTS information to help you cable the Cisco uBR 3x10 RF Switch to cable interface line cards.

The following configurations are discussed:

- Cabling the Cisco uBR 3x10 RF switch to a Cisco uBR10-LCP2-MC16*x* line card installed in a Cisco uBR10012 CMTS
- Cabling the Cisco uBR 3x10 RF switch to a Cisco uBR10-LCP2-MC28C line card installed in a Cisco uBR10012 CMTS
- Cabling the Cisco uBR 3x10 RF switch to a Cisco uBR10-MC5X20S/U/H line card installed in a Cisco uBR10012 CMTS
- Cabling the Cisco uBR 3x10 RF switch to a Cisco uBR-MC16*x* line card installed in a Cisco uBR7246VXR CMTS
- Cabling the Cisco uBR 3x10 RF switch to a Cisco uBR-MC28*x* line card installed in a Cisco uBR7246VXR CMTS

Tip The CMTS, PROTECT, and CABLE PLANT MCX connections are accessed from the rear of the RF switch chassis.

Figure 1 Rear View of the Cisco uBR-3x10 RF Switch



1	Mounting brackets	**3**	PROTECT MCX connector location
2	CMTS (working) MCX connector location	**4**	CABLE PLANT MCX connector location

Refer to the rack-mounting quick start guides for information about installing the Cisco uBR 3x10 RF Switch in a telco rack.

- See *Rack-Mounting the Cisco uBR 3x10 RF Switch with the Cisco uBR10012 CMTS*, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/cable/rfswitch/ub10swrk.htm
- See *Rack-Mounting the Cisco uBR 3x10 RF Switch with the Cisco uBR7246VXR CMTS*, at the following URL: http://www.cisco.com/univercd/cc/td/doc/product/cable/rfswitch/vxrrack.htm

For warranty information, see the *Cisco uBR 3x10 RF Switch Roadmap* documentation, at the following URL:
http://www.cisco.com/univercd/cc/td/doc/product/cable/rfswitch/rdmp310.htm

For information about the Vecima upconverter, go to the following URL:
http://www.vecimanetworks.com/

2 Cables and Equipment

The cables approved for use in this Cisco N+1 redundancy solution, are Mini Precision RG59 95 percent tinned copper braid with 100 percent foil shield. This cable is SDI rated with a 1 MHz to 3 GHz rating.

Cable Kit Part Numbers

- CAB-RFSW-3X10-10T (bundled cable kit: 10-m, RFS to HUB, MCX to F). The kit also includes 13 extra F-connectors and 2 single 10-m cables
- CAB-RFSW-3X10-T (bundled cable kit: 1.2-m, RFS to UPx, MCX to F)
- CAB-RFSW520TIMM (bundled cable kit: 1-m, MCX to MCX)
- CAB-RFSW520TMPF (bundled cable kit: 3-m, MCX to F) kit includes 28 extra F-connectors

Note We recommend that you tighten the F-connectors to a value between 10 (recommended) and 15 (maximum) inch-pounds (1.1298 and 1.7339 Nm).

- 8 RF cable kits:
  CAB-RFSW520TIMM (MC5X20S/U to RFS, dual-shielded, two 10-bundle, one 5-bundle)
  or
  CAB-RFSW520QTIMM (MC5X20S/U/H to RFS, quad-shielded, five 5-bundle)
- 30 header blocks (for the CMTS, PROTECT, CABLE PLANT sections on the RF switch)
- Flat-blade screwdriver
- T-10 Torx screwdriver for UCH cable installation

Cisco cables are color-coded for easy reference and installation. The cable color corresponds to a specific port on the card. The tables include a column for users to define ports and color definitions.

See Table 1 for a list of the cable ports and associated cable color applicable when using legacy 5-color quad-shielded cables.

See Table 2 for a list of the cable ports and associated cable color applicable when using 10-color dual/qual-shielded cables.

Table 1 MC5X20 Legacy 5-color Quad-Shielded Cable Ports and Cable Colors

Universal Cable Holder (1)			Universal Cable Holder (2)			Universal Cable Holder (3)		
Line Card Port	**Cable Color**	**RF Switch User Defined**	**Line Card Port**	**Cable Color**	**RF Switch User Defined**	**Line Card Port**	**Cable Color**	**RF Switch User Defined**
US[1]0	Red		US10	Red		DS[2]0	Red	
US1	White		US11	White		DS1	White	
US2	Blue		US12	Blue		DS2	Blue	
US3	Green		US13	Green		DS3	Green	
US4	Yellow		US14	Yellow		DS4	Yellow	
US5	Red		US15	Red		—	—	
US6	White		US16	White		—	—	
US7	Blue		US17	Blue		—	—	
US8	Green		US18	Green		—	—	
US9	Yellow		US19	Yellow		—	—	

1. US = upstream
2. DS = downstream

Table 2 MC5X20 Ten-color Dual/Quad-Shielded Cable Ports and Cable Colors

Universal Cable Holder (1)			Universal Cable Holder (2)			Universal Cable Holder (3)		
Line Card Port	Cable Color	RF Switch User Defined	Line Card Port	Cable Color	RF Switch User Defined	Line Card Port	Cable Color	RF Switch User Defined
US[1]0	Red		US10	Grey		DS[2]0	Red	
US1	White		US11	Brown		DS1	White	
US2	Blue		US12	Red		DS2	Blue	
US3	Green		US13	White		DS3	Green	
US4	Yellow		US14	Blue		DS4	Yellow	
US5	Violet		US15	Green		—	—	
US6	Orange		US16	Yellow		—	—	
US7	Black		US17	Violet		—	—	
US8	Gray		US18	Orange		—	—	
US9	Brown		US19	Black		—	—	

1. US = upstream
2. DS = downstream

Other Tools and Equipment

Custom cables or cable components such as header blocks, crimping tools, or connectors are available from custom cable fabricators such as WhiteSands Engineering (telephone: 1 800 586 7377), or at the following URL:

http://www.whitesandsengineering.com/

WhiteSands Part Numbers:

- MCXHEADERBK—Header blocks
- REMTOOL- MCX removal tool for MCX or RF switch header block
- MCXFP—MCX connectors for dual-shielded cables
- MCXFPQ MCX connectors for quad-shielded cables
- MCXF/FF—Adapters, MCX female connectors to F female connectors
- ASFP—F-connectors for dual-shielded
- ASFPQ - F connectors for quad-shielded
- ACT-483—Crimper for F-connectors and MCX connectors
- CPT-7538-125—Stripper for MCX connector
- CPT-7538Q—Stripper for F-connectors (quad-shielded)
- CPT-7538—Stripper for F connectors (dual-shielded)
- CPT-7538-200Q—Stripper for MCX connector (quad-shielded)

Upconverters and Attenuators

The Cisco uBR-MC16U cable interface line card and the Cisco uBR-MC28U cable interface line card have onboard upconverters. Upconverters are not required when these cards are used in the Cisco uBR7246VXR CMTS. However, due to a higher IF output (+42 dBmV) on other Cisco uBR-MC16 and MC28 line cards, a 10-dB attenuator may be required for UPx IF inputs.

The line cards that may require a 10-db attenuator between the DS port and the IF input on the upconverter include:

- Cisco uBR-MC16*x* (C, E, S, and X)
- Cisco uBR-MC28x (C and X)
- Cisco uBR10-LCP2-MC16*x* (C, S, and E)
- Cisco uBR10-LCP2-MC28C

Note Vecima upconverters are used in these examples. Some other upconverters may not require the use of attenuators.

3 Installing the Header Blocks on the Cisco uBR 3x10 RF Switch

The RF cables are connected to the CMTS, PROTECT, and CABLE PLANT portions of the Cisco uBR 3x10 RF Switch using the header blocks. Header blocks are installed on the RF switch at the following locations:

- CMTS—RF cables connect to working cable interface line cards and to IF-to-RF upconverters.
- PROTECT—RF cables connect to protecting cable interface line cards.
- CABLE PLANT—RF cables connect to the cable headend or hub.

Equipment

- Header blocks
- Flat-blade screwdriver

Tip The number of header blocks depends on the number of RF switches and line cards used. For example, if you are using one RF Switch and eight line cards, you will need 18 header blocks.

Step 1 With the beveled edge of the header block at the top, line up the two alignment pins on the header block with the two holes corresponding to the RF connector group under the CMTS, PROTECT, or CABLE PLANT section of the Cisco uBR 3x10 RF Switch.

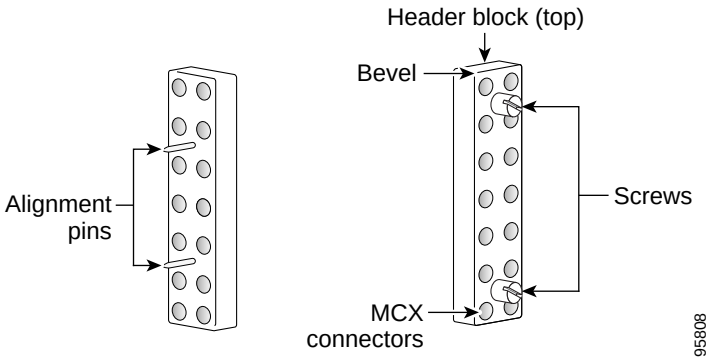
Step 2 Press the header block into place, using equal pressure on both the upper and lower portions of the header block.

Step 3 Use a flat-blade screwdriver to tighten the captive installation screws at both the top and bottom of the header block to prevent accidental disconnections.

Note Tighten the header blocks to the Cisco uBR 3x10 RF Switch only after gently pulling on the cables to be sure that they are firmly seated in the header block.

Caution Do not overtighten the captive screws. We recommend that you tighten the screws to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm)

Figure 2 Header Block Description



4 Cabling the Cisco uBR 3x10 RF Switch with the Cisco uBR10-LCP2-MC16*x* or the Cisco uBR10-LCP2-MC28C Cable Interface Line Cards in a Cisco uBR10012 CMTS

A single Cisco uBR 3x10 RF Switch is cabled to cable interface line cards installed in the Cisco uBR10012 router, providing a redundancy scheme in which one protect line card (one of the eight, usually 5/1) supports from one to seven working line cards in the same chassis. The Cisco uBR10012 router supports up to eight cable interface line cards.

- The Cisco uBR10-LCP2-MC16*x* (C, E, and S) line cards have one downstream and six upstream cable interfaces for a total of 8 downstream and 48 upstream interfaces in the chassis.
- The Cisco uBR10-LCP2-MC28C line cards have two downstream and eight upstream cable interfaces for a total of 16 downstream and 64 upstream interfaces in the chassis.

Note Keep in mind that like cards back up like cards. For example, a Cisco uBR10-LCP2-MC16C line card is required to backup Cisco uBR10-LCP2-MC16C line cards.

Cisco uBR10-LCP2-MC16*x* Cable Interface Line Card

Figure 3 Table 2Cabling the Cisco uBR 3x10 RF Switch to the Cisco uBR10-LCP2-MC16x Line Cards in the Cisco uBR10012 CMTS

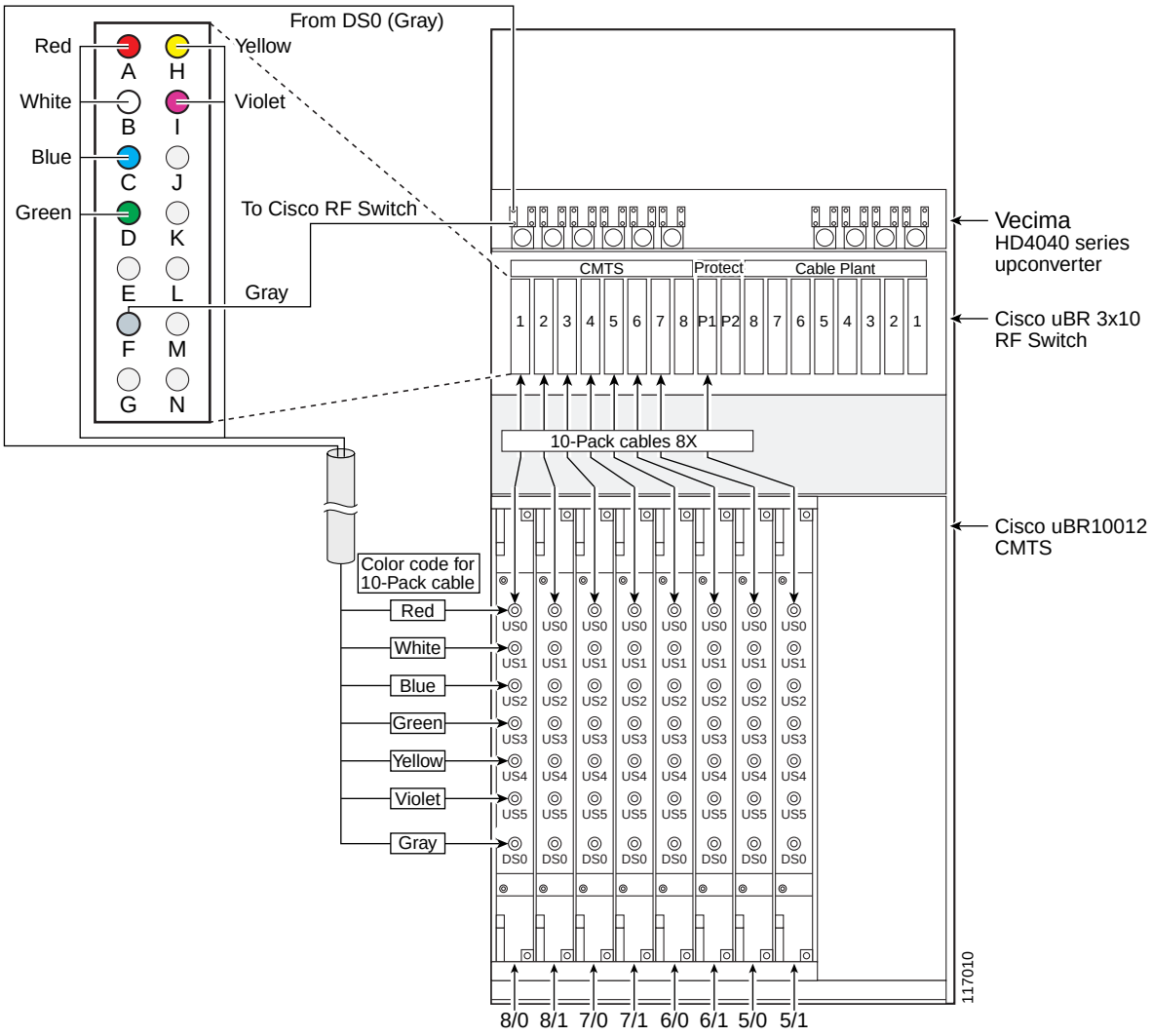


Table 3 Sample Mapping of a Cisco uBR10-LCP2-MC16x Cable Interface Line Card to the Cisco uBR 3x10 RF Switch

Connect to the Cable Interface on the CMTS	RFS[1] (Color)	RFS (Color)	Connect to the Cable Interface on the CMTS
US0	A (Red)	H (Yellow)	US4
US1	B (White)	I (Violet)	US5
US2	C (Blue)	J	(Unused upstream)
US3	D (Green)	K	(Unused upstream)
(Unused upstream)	E	L	(Unused upstream)
DS0	F (Gray)	M	(Unused downstream)
(Unused downstream)	G	N	(Not connected)

1. RFS—RF switch, MCX connector on the RF switch.

Cisco uBR10-LCP2-MC28C Cable Interface Line Card

Figure 4 Cabling the Cisco uBR 3x10 RF Switch to the Cisco uBR10-LCP2-MC28C Line Card in the Cisco uBR10012 CMTS

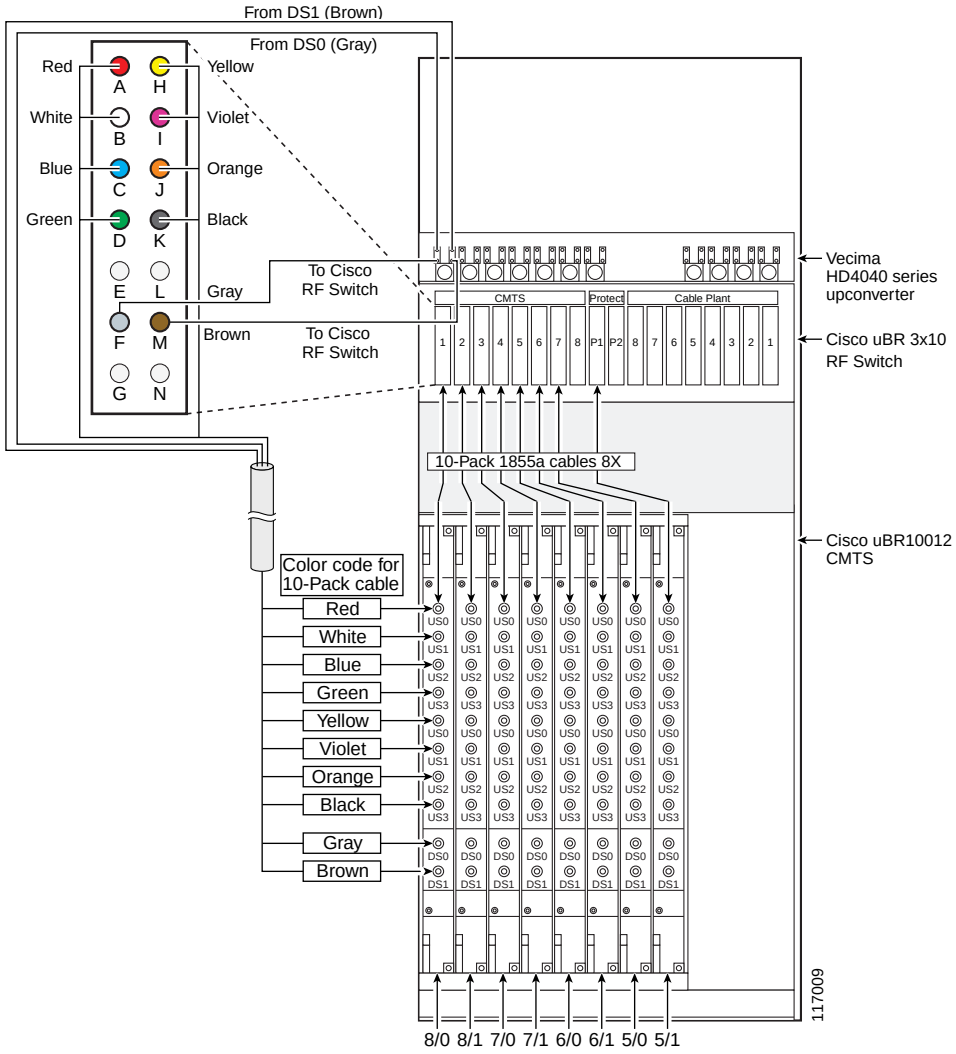


Table 4 Sample Mapping of a Cisco uBR-MC28C Line Card to the Cisco uBR 3x10 RF Switch

Connect to the Cable Interface on the CMTS	RFS[1] (Color)	RFS (Color)	Connect to the Cable Interface on the CMTS
US0 of first MAC domain	A (Red)	H (Yellow)	US0 of second MAC domain
US1 of first MAC domain	B (White)	I (Violet)	US1 of second MAC domain
US2 of first MAC domain	C (Blue)	J (Orange)	US2 of second MAC domain
US3 of first MAC domain	D (Green)	K (Black)	US3 of second MAC domain
(Unused upstream)	E	L	(Unused upstream)
DS0	F (Gray)	M (Brown)	DS1
(Unused downstream)	G	N	(Not connected)

1. RFS—RF switch, location of the MCX connection on the RF switch.

Cabling the Working and Protect Line Cards to the RF Switch

This section describes cabling the working and protect line cards to the RF switch.

Tip Use the card in slot 5/1 for the protect card. See Figure 3 on page 7 for slot number locations.

Equipment

- 8 RF cable bundle kits, CAB-RFSW-3X10-T (1.2-m, MCX to F)
- 8 header blocks (installed)
- Flat-blade screwdriver (extended length)

To cable the line card, complete the following steps:

Step 1 Connect the cables to the cable interface line card connectors (upstream and downstream). Tighten the F-connectors no more than 10 (recommended) to 15(maxium) inch-pounds (1.1298 to 1.7339 Nm).

Step 2 Run the cable bundle (behind the cable management bracket if it was installed) up to the CMTS header blocks on the RF switch.

Tip See Table 5 and Figure 5 on page 10 for cable interface MCX connection locations. The gray and brown cables have F-connectors instead of MCX connectors. These cables are used to connect to the upconverter (UPx).

Step 3 Install the cables in the CMTS header block in the order that they are mapped.

a. Push the MCX connector into the hole in the header block until you can feel it snap into place.

b. Gently wiggle the connector to make sure that the connection is secure.

Step 4 Repeat Step 1 through Step 3 for the other line cards.

Step 5 Repeat Step 1 through Step 3 for the PROTECT (P1A–P1H) header block.

Step 6 Gently pull on the cables to be sure that they are firmly seated in the header blocks.

Step 7 Use a flat-blade screwdriver to tighten the captive installation screws at both the top and the bottom of the header block to prevent accidental disconnection.

Caution Do not overtighten the captive screws. We recommend that you tighten the captive screws to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).

Caution To ensure proper installation and avoid poor connections, be sure that the cables are not positioned at too acute an angle.

Figure 5 Cisco uBR 3x10 RF Switch—MCX Connection Locations

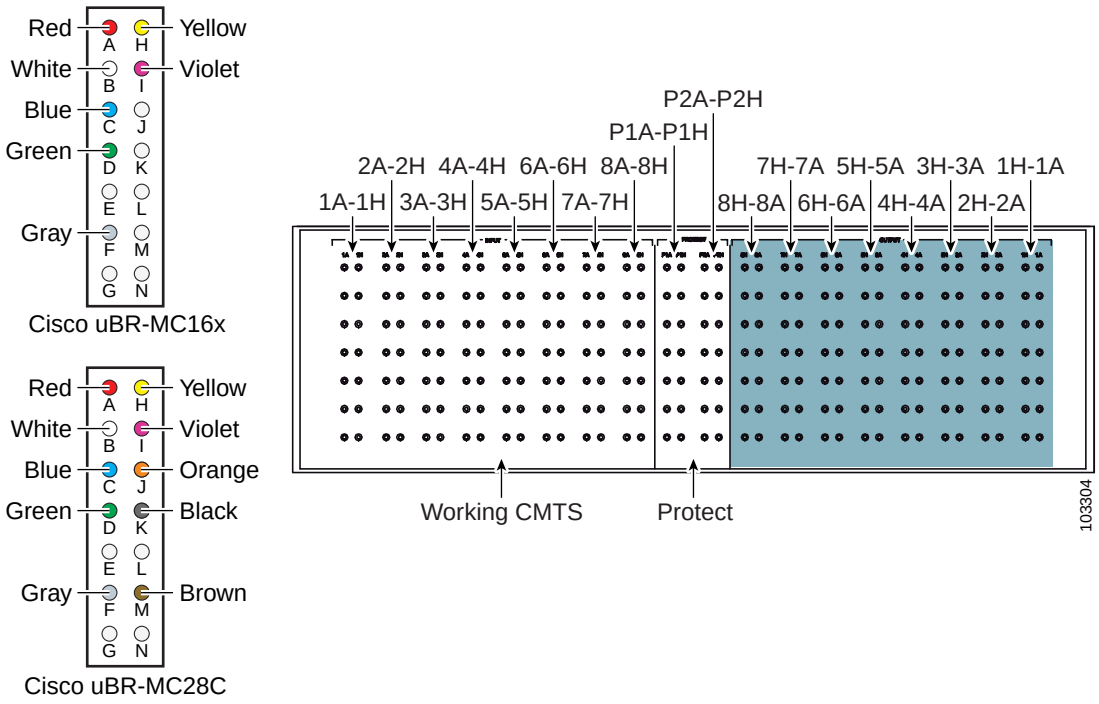


Table 5 Cabling the Cable Interface Line Card to the RF Switch

Cisco uBR10-LCP2-MC16x Line Cards			**Cisco uBR10-LCP2-MC28C Line Cards**		
LC/Slot	**RFS connection**	**a**	**LC/Slot**	**RFS connection**	**a**
LC1—8/0 working	1A-1D, 1H, 1I		LC1—8/0 working	1A-1D, 1H-IK	
LC2—8/1working	2A-2D, 2H, 2I		LC2—8/1working	2A-2D, 2H- 2K	
LC3—7/0working	3A-3D, 3H, 3I		LC3—7/0working	3A-3D, 3H-3K	
LC4—7/1working	4A-4D, 4H, 4I		LC4—7/1working	4A-4D, 4H- 4K	
LC5—6/0working	5A-5D, 5H, 5I		LC5—6/0working	5A-5D, 5H-5K	
LC6—6/1working	6A-6D, 6H, 6I		LC6—6/1working	6A-6D, 6H-6K	
LC7—5/0working	7A-7D, 7H, 7I		LC7—5/0working	7A-7D, 7H-7K	
LC8—5/1protect	P1A-P1D, P1H, P1I		LC8—5/1protect	P1A-P1D, P1H-P1K	

Cabling the DS Ports to the Input Ports on the Upconverter

Equipment

These cables are part of cable bundle kit CAB-RFSW-3X10-T.

Tip Alternate gray and brown cables when cabling the Cisco uBR10-LCP2-MC28*C* card.

To cable the downstream ports to the upconverter, complete the following steps.

Step 1 Connect the cables to the downstream ports (MC16*x*–DS0, MC28C–DS0, DS1) on the line cards.

Step 2 Run the cables up to the upconverter.

Step 3 Connect the cables to the input ports (top) on the upconverter. Add attenuators, if required.

See Table 6 and Figure 6 when cabling a Cisco uBR10-LCP2-MC16*x* line card.

See Table 7 and Figure 7 when cabling a Cisco uBR10-LCP2-MC28C line card.

Figure 6 Cabling the Input Ports on the Upconverter (MC16x)

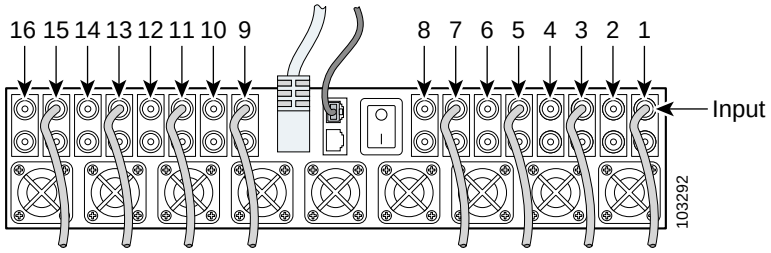


Table 6 Cabling the DS Ports to the Input Ports on the Upconverter

Color	Line Card Slot	UPx Conn	a	Color	Line Card Slot	UPx Conn	a
Gray	8/0—working	15		Gray	6/0—working	7	
Gray	8/1—working	13		Gray	6/1—working	5	
Gray	7/0—working	11		Gray	5/0—working	3	
Gray	7/1—working	9		Gray	5/1—protect	1	

Figure 7 Cabling the Input Ports on the Upconverter (MC28C)

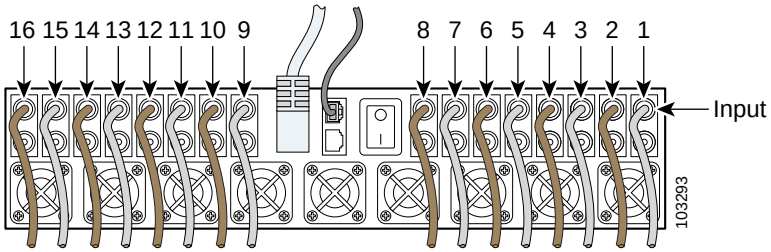


Table 7 Cabling the DS Ports to the Input Ports of the Upconverter

Color	Line Card Slot	DS Port	UPx Conn	a		Color	Line Card Slot	DS Port	UPx Conn	a
Brown	8/0—working	DS1	16			Brown	6/0—working	DS1	8	
Gray	8/0—working	DS0	15			Gray	6/0—working	DS0	7	
Brown	8/1—working	DS1	14			Brown	6/1—working	DS1	6	
Gray	8/1—working	DS0	13			Gray	6/1—working	DS0	5	
Brown	7/0—working	DS1	12			Brown	5/0—working	DS1	4	
Gray	7/0—working	DS0	11			Gray	5/0—working	DS0	3	
Brown	7/1—working	DS1	10			Brown	5/1—protect	DS1	2	
Gray	7/1—working	DS0	9			Gray	5/1—protect	DS0	1	

Cabling the Output Ports from the Upconverter to the RF Switch

Equipment

- 8 RF cables for Cisco uBR10-LCP2-MC16*x* cards (F-connector to MCX connector–gray)
- 16 RF cables for Cisco uBR10-LCP2-MC28C cards (F-connector to MCX connector–gray, brown)

To cable the output ports on the upconverter to the RF switch, complete the following steps:

Step 1 Connect the cable to the output connector (1–lower) on the upconverter.

Step 2 Connect the cable to the appropriate MCX connection on the CMTS header block.

For Cisco uBR10-LCP2-MC16*x* cards, see Table 8.

For Cisco uBR10-LCP2-MC28C cards, see Table 9.

Step 3 Repeat Step 1 through Step 3 for the remaining cables.

Figure 8 Cabling the Output Ports (UPx to RF Switch)

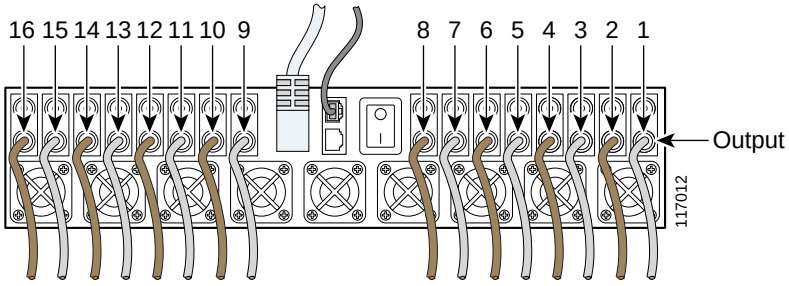


Table 8 Upconverter Output Cables to the Working Plant on the RF Switch (for MC16x Line Cards)

Color	UPx Output	RFS CMTS	LC Slot (DS0)	a	UPx Output	RFS CMTS	LC Slot (DS0)	a
Gray	15	1F	8/0–working (DS0)		7	5F	6/0–working (DS0)	
Gray	13	2F	8/1–working (DS0)		5	6F	6/1–working (DS0)	
Gray	11	3F	7/0–working (DS0)		3	7F	5/0–working (DS0)	
Gray	9	4F	7/1–working (DS0)		1	1PF	5/1–protect (DS0)	

Table 9 Upconverter Output Cables to the Working Plant on the RF Switch (for MC28C Line Cards)

Color	UPx Output	RFS CMTS	LC Slot (DS)	a	Color	UPx Output	RFS CMTS	LC Slot (DS)	a
Brown	16	1M	8/0—working(DS1)		Brown	8	5M	6/0—working (DS1)	
Gray	15	1F	8/0—working(DS0)		Gray	7	5F	6/0—working (DS0)	
Brown	14	2M	8/1—working(DS1)		Brown	6	6M	6/1—working (DS1)	
Gray	13	2F	8/1—working(DS0)		Gray	5	6F	6/1—working (DS0)	
Brown	12	3M	7/0—working(DS1)		Brown	4	7M	5/0—working (DS1)	
Gray	11	3F	7/0—working(DS0)		Gray	3	7F	5/0—working (DS0)	
Brown	10	4M	7/1—working(DS1)		Brown	2	1PM	5/1—protect (DS1)	
Gray	9	4F	7/1—working(DS0)		Gray	1	1PF	5/1—protect (DS0)	

Cabling the Output RF Switch (CABLE PLANT to HUB)

The output cables are connected to the CABLE PLANT section of the RF switch. The CABLE PLANT header blocks are cabled in the opposite sequence to the CMTS and PROTECT header blocks (see Figure 9).

Equipment

- 7 RF cable bundle kits, CAB-RFSW-3X10-10T (10-m, MCX connector to F-connector—multicolor)
- 7 header blocks (installed)

Tip For shorter cables (3m) use cable kit CAB-RFSW5X20TPMF.

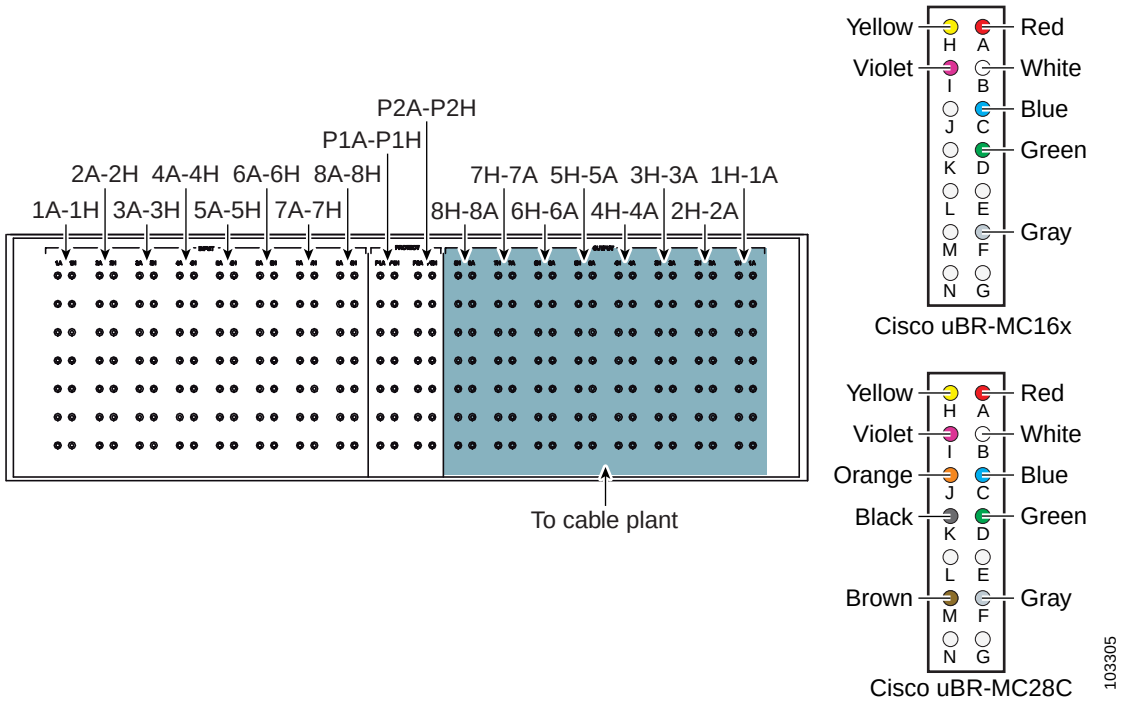
To cable the output connections, complete the following steps:

Step 1 Install the output cables in the header blocks.

Step 2 Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters

Step 3 Run the output cables (F) or (M–F) to the splitters and combiners, DS laser transmitters, or the high side of the diplex filters.

Figure 9 RF Switch Cable Plant Outputs (Turquoise)

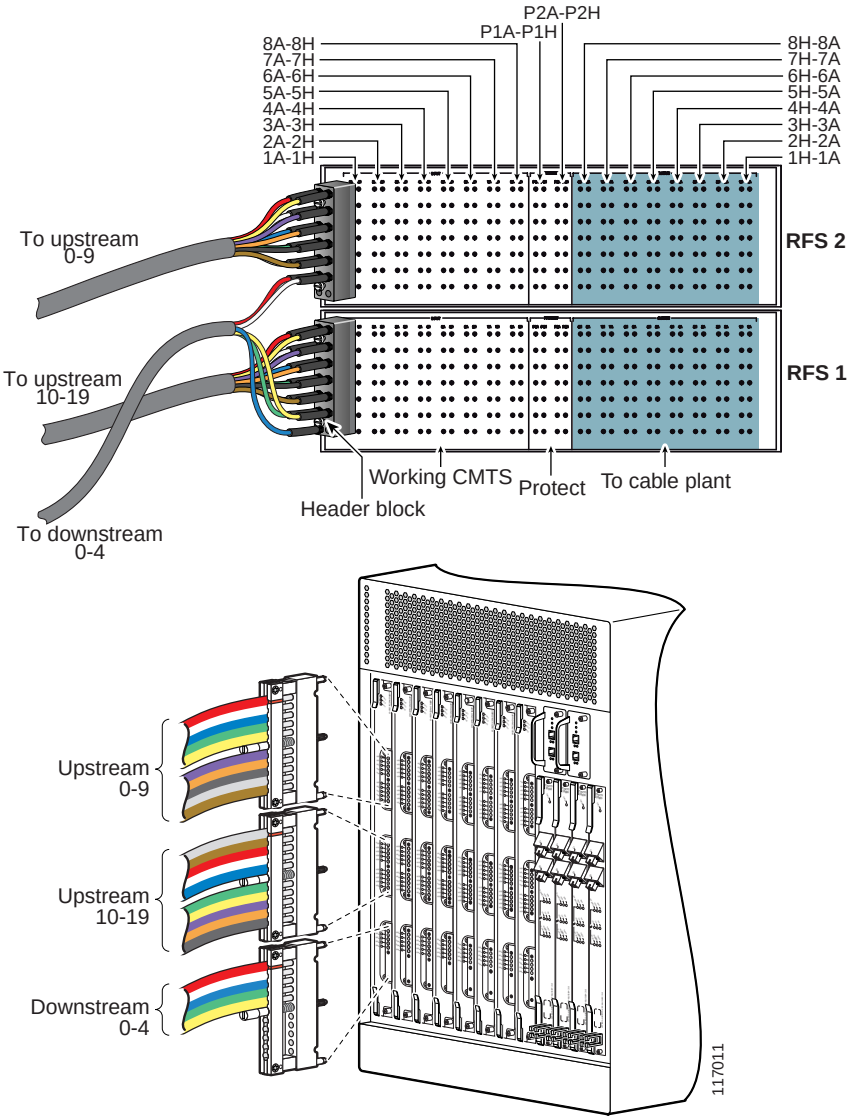


5 Cabling the Cisco uBR 3x10 RF Switch with Cisco uBR-MC5X20S/U/H Cable Interface Line Cards in the Cisco uBR10012 CMTS

The Cisco uBR10012 router supports up to eight Cisco uBR10-MC5X20S/U/H cable interface line cards, each featuring five downstream and twenty upstream cable interfaces for a total of 40 downstream and 160 upstream interfaces in the chassis. Two Cisco uBR 3x10 RF Switchs are used in this configuration, allowing you to employ a redundancy scheme in which one protect cable interface line card (one of the eight, usually 5/1) supports from one to seven working line cards in the same chassis.

Note If you are replacing a Cisco uBR10-MC5X20S or U card with a Cisco uBR10-MC5X20U or H card, you must reconfigure the card.

Figure 10 Cabling the Cisco uBR 3x10 RF Switch with the Cisco uBR10-MC5X20S/U/H in the Cisco uBR10012 CMTS



Cabling the Working and Protect Line Cards to the RF Switch

This section describes cabling the working and protect line cards to the RF switch. This procedure assumes that the RF cables are already installed in the universal cable holder 1 or 2 (UCH1 or UCH2) and mounted on the Cisco uBR-MC5X20S/U/H cable interface line card. If the cables have not been installed in the UCH1 or UCH2 and mounted on the line card, refer to the *Cisco uBR-MC5X20S/U/H Cable Interface Line Card* documentation at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/cable/ubr10k/ubr10012/frus/ubrmc520.htm

Note The UCH1 or UCH2 is supplied with the Cisco uBR10-MC5X20 S/U/H cable interface line card.

Tip You can cable the header blocks first, then mount them on the RF switch. Do not fully tighten the header blocks to the RF switch before gently pulling on the cables to be sure that they are firmly seated.

Equipment

To connect the header blocks and install the cables on the RF switch, complete the following steps:

Step 1 Install the header blocks on the RF switches. See the "Installing the Header Blocks on the Cisco uBR 3x10 RF Switch" section on page 5.

Step 2 Run the cables (behind the cable management bracket if it is installed) up to the CMTS header blocks on the RF switch.

Step 3 Insert the MCX connectors into the header blocks. See Figure 10 on page 14.

For MCX cabling locations, refer to:

Table 10 on page 15 for slot 8/0 and 8/1 working line card RF switch connections.

Table 11 on page 16 for slot 7/0 and 7/1 working line card RF switch connections.

Table 12 on page 17 for slot 6/0 and 6/1 working line card RF switch connections.

Table 13 on page 18 for slot 5/0 and 5/1 working and protect line card RF switch connections.

Step 4 Gently pull on the cables to be sure that they are firmly seated in the header blocks.

Caution To ensure proper installation and avoid poor connections, be sure that the cables are not positioned at too acute an angle.

Step 5 Use a flat-blade screwdriver to tighten the captive installation screws at both the top and bottom of the header block to prevent accidental disconnections. Do not over-tighten the captive screws.

Caution Do not overtighten the captive screws. We recommend that you tighten the captive screws to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).

Table 10 RF Switch Ports and Line Card Ports for Line Card Slots 8/0 and 8/1

Ports	Cable Color	Working Line Card Slot 8/0—Ports	RF Switch—Port	a	Working Line Card Slot 8/1—Ports	RF Switch—Port	a
To upstream 0-9	Red	US0	RFS-2–1A		US0	RFS2–2A	
	White	US1	RFS-2–1B		US1	RFS-2–2B	
	Blue	US2	RFS-2–1C		US2	RFS-2–2C	
	Green	US3	RFS-2–1D		US3	RFS-2–2D	
	Yellow	US4	RFS-2–1H		US4	RFS-2–2H	
	Violet	US5	RFS-2–1I		US5	RFS-2–2I	
	Orange	US6	RFS-2–1J		US6	RFS-2–2J	
	Black	US7	RFS-2–1K		US7	RFS-2–2K	
	Gray	US8	RFS-2–1E		US8	RFS-2–2E	
	Brown	US9	RFS-2–1L		US9	RFS-2–2L	

Table 10 RF Switch Ports and Line Card Ports for Line Card Slots 8/0 and 8/1 (continued)

Ports	Cable Color	Working Line Card Slot 8/0—Ports	RF Switch—Port	a	Working Line Card Slot 8/1—Ports	RF Switch—Port	a
To upstream 10-19	Gray	US10	RFS-1–1E		US10	RFS-1–2E	
	Brown	US11	RFS-1–1L		US11	RFS-1–2L	
	Red	US12	RFS-1–1A		US12	RFS-1–2A	
	White	US13	RFS-1–1B		US13	RFS-1–2B	
	Blue	US14	RFS-1–1C		US14	RFS-1–2C	
	Green	US15	RFS-1–1D		US15	RFS-1–2D	
	Yellow	US16	RFS-1–1H		US16	RFS-1–2H	
	Violet	US17	RFS-1–1I		US17	RFS-1–2I	
	Orange	US18	RFS-1–1J		US18	RFS-1–2J	
	Black	US19	RFS-1–1K		US19	RFS-1–2K	
To downstream 0-4	Red	DS0	RFS-2–1F		DS0	RFS-2–2F	
	White	DS1	RFS-2–1M		DS1	RFS-2–2M	
	Blue	DS2	RFS-1–1G		DS2	RFS-1–2G	
	Green	DS3	RFS-1–1F		DS3	RFS-1–2F	
	Yellow	DS4	RFS-1–1M		DS4	RFS-1–2M	

Table 11 RF Switch Ports and Line Card Ports for Line Card Slots 7/0 and 7/1

Ports	Cable Color	Working Line Card Slot 7/0—Ports	RF Switch—Port	a	Working Line Card Slot 7/1—Ports	RF Switch—Port	a
To upstream 0-9	Red	US0	RFS-2–3A		US0	RFS-2–4A	
	White	US1	RFS-2–3B		US1	RFS-2–4B	
	Blue	US2	RFS-2–3C		US2	RFS-2–4C	
	Green	US3	RFS-2–3D		US3	RFS-2–4D	
	Yellow	US4	RFS-2–3H		US4	RFS-2–4H	
	Violet	US5	RFS-2–3I		US5	RFS-2–4I	
	Orange	US6	RFS-2–3J		US6	RFS-2–4J	
	Black	US7	RFS-2–3K		US7	RFS-2–4K	
	Gray	US8	RFS-2–3E		US8	RFS-2–4E	
	Brown	US9	RFS-2–3L		US9	RFS-2–4L	

Table 11 RF Switch Ports and Line Card Ports for Line Card Slots 7/0 and 7/1 (continued)

Ports	Cable Color	Working Line Card Slot 7/0—Ports	RF Switch—Port	a	Working Line Card Slot 7/1—Ports	RF Switch—Port	a
To upstream 10-19	Gray	US10	RFS-1–3E		US10	RFS-1–4E	
	Brown	US11	RFS-1–3L		US11	RFS-1–4L	
	Red	US12	RFS-1–3A		US12	RFS-1–4A	
	White	US13	RFS-1–3B		US13	RFS-1–4B	
	Blue	US14	RFS-1–3C		US14	RFS-1–4C	
	Green	US15	RFS-1–3D		US15	RFS-1–4D	
	Yellow	US16	RFS-1–3H		US16	RFS-1–4H	
	Violet	US17	RFS-1–3I		US17	RFS-1–4I	
	Orange	US18	RFS-1–3J		US18	RFS-1–4J	
	Black	US19	RFS-1–3K		US19	RFS-1–4K	
To downstream 0-4	Red	DS0	RFS-2–3F		DS0	RFS-2–4F	
	White	DS1	RFS-2–3M		DS1	RFS-2–4M	
	Blue	DS2	RFS-1–3G		DS2	RFS-1–4G	
	Green	DS3	RFS-1–3F		DS3	RFS-1–4F	
	Yellow	DS4	RFS-1–3M		DS4	RFS-1–4M	

Table 12 RF Switch Ports and Line Card Ports for Line Card Slots 6/0 and 6/1

Ports	Cable Color	Working Line Card Slot 6/0—Ports	RF Switch—Port	a	Working Line Card Slot 6/1—Ports	RF Switch—Port	a
To upstream 0-9	Red	US0	RFS-2–5A		US0	RFS-2–6A	
	White	US1	RFS-2–5B		US1	RFS-2–6B	
	Blue	US2	RFS-2–5C		US2	RFS-2–6C	
	Green	US3	RFS-2–5D		US3	RFS-2–6D	
	Yellow	US4	RFS-2–5H		US4	RFS-2–6H	
	Violet	US5	RFS-2–5I		US5	RFS-2–6I	
	Orange	US6	RFS-2–5J		US6	RFS-2–6J	
	Black	US7	RFS-2–5K		US7	RFS-2–6K	
	Gray	US8	RFS-2–5E		US8	RFS-2–6E	
	Brown	US9	RFS-2–5L		US9	RFS-2–6L	

Table 12 RF Switch Ports and Line Card Ports for Line Card Slots 6/0 and 6/1 (continued)

Ports	Cable Color	Working Line Card Slot 6/0—Ports	RF Switch—Port	a	Working Line Card Slot 6/1—Ports	RF Switch—Port	a
To upstream 10-19	Gray	US10	RFS-1–5E		US10	RFS-1–6E	
	Brown	US11	RFS-1–5L		US11	RFS-1–6L	
	Red	US12	RFS-1–5A		US12	RFS-1–6A	
	White	US13	RFS-1–5B		US13	RFS-1–6B	
	Blue	US14	RFS-1–5C		US14	RFS-1–6C	
	Green	US15	RFS-1–5D		US15	RFS-1–6D	
	Yellow	US16	RFS-1–5H		US16	RFS-1–6H	
	Violet	US17	RFS-1–5I		US17	RFS-1–6I	
	Orange	US18	RFS-1–5J		US18	RFS-1–6J	
	Black	US19	RFS-1–5K		US19	RFS-1–6K	
To downstream 0-4	Red	DS0	RFS-2–5F		DS0	RFS-2–6F	
	White	DS1	RFS-2–5M		DS1	RFS-2–6M	
	Blue	DS2	RFS-1–5G		DS2	RFS-1–6G	
	Green	DS3	RFS-1–5F		DS3	RFS-1–6F	
	Yellow	DS4	RFS-1–5M		DS4	RFS-1–6M	

Table 13 RF Switch Ports and Line Card Ports for Line Card Slots 5/0 and 5/1

Ports	Cable Color	Working Line Card Slot 5/0—Ports	RF Switch—Port	a	Protect Line Card Slot 5/1—Ports	RF Switch—Port	a
To upstream 0-9	Red	US0	RFS-2–7A		US0	RFS-2–P1A	
	White	US1	RFS-2–7B		US1	RFS-2–P1B	
	Blue	US2	RFS-2–7C		US2	RFS-2–P1C	
	Green	US3	RFS-2–7D		US3	RFS-2–P1D	
	Yellow	US4	RFS-2–7H		US4	RFS-2–P1H	
	Violet	US5	RFS-2–7I		US5	RFS-2–P1I	
	Orange	US6	RFS-2–7J		US6	RFS-2–P1J	
	Black	US7	RFS-2–7K		US7	RFS-2–P1K	
	Gray	US8	RFS-2–7E		US8	RFS-2–P1E	
	Brown	US9	RFS-2–7L		US9	RFS-2–P1L	

Table 13 RF Switch Ports and Line Card Ports for Line Card Slots 5/0 and 5/1 (continued)

Ports	Cable Color	Working Line Card Slot 5/0—Ports	RF Switch—Port	a	Protect Line Card Slot 5/1—Ports	RF Switch—Port	a
To upstream 10-19	Gray	US10	RFS-1–7E		US10	RFS-1–P1E	
	Brown	US11	RFS-1–7L		US11	RFS-1–P1L	
	Red	US12	RFS-1–7A		US12	RFS-1–P1A	
	White	US13	RFS-1–7B		US13	RFS-1–P1B	
	Blue	US14	RFS-1–7C		US14	RFS-1–P1C	
	Green	US15	RFS-1–7D		US15	RFS-1–P1D	
	Yellow	US16	RFS-1–7H		US16	RFS-1–P1H	
	Violet	US17	RFS-1–7I		US17	RFS-1–P1I	
	Orange	US18	RFS-1–7J		US18	RFS-1–P1J	
	Black	US19	RFS-1–7K		US19	RFS-1–P1K	
To downstream 0-4	Red	DS0	RFS-2–7F		DS0	RFS-2–P1F	
	White	DS1	RFS-2–7M		DS1	RFS-2–P1M	
	Blue	DS2	RFS-1–7G		DS2	RFS-1–P1G	
	Green	DS3	RFS-1–7F		DS3	RFS-1–P1F	
	Yellow	DS4	RFS-1–7M		DS4	RFS-1–P1M	

Cabling the RF Switch Output (CABLE PLANT to HUB)

This section describes cabling the RF switch to the HUB or cable plant.

Note CABLE PLANT slots on the Cisco uBR 3x10 RF Switch are numbered in reverse sequence to the CMTS and PROTECT slots. Slot number one is on the far right. Refer to Figure 11 on page 20 for header block and cable designations as viewed from the cable side of the header blocks.

Equipment

- 7 RF cable bundle kits, CAB-RFSW520TPMF (3-m, RFS to cable plant, MCX to F, two 10-bundle, one 5-bundle)
- 14 header blocks provided with input cable kits (installed)

To cable the output connections, complete the following steps. See Figure 11.

Step 1 Install the output cables in the header blocks. Refer to the "Equipment" section on page 15 for MCX connector installation instructions.

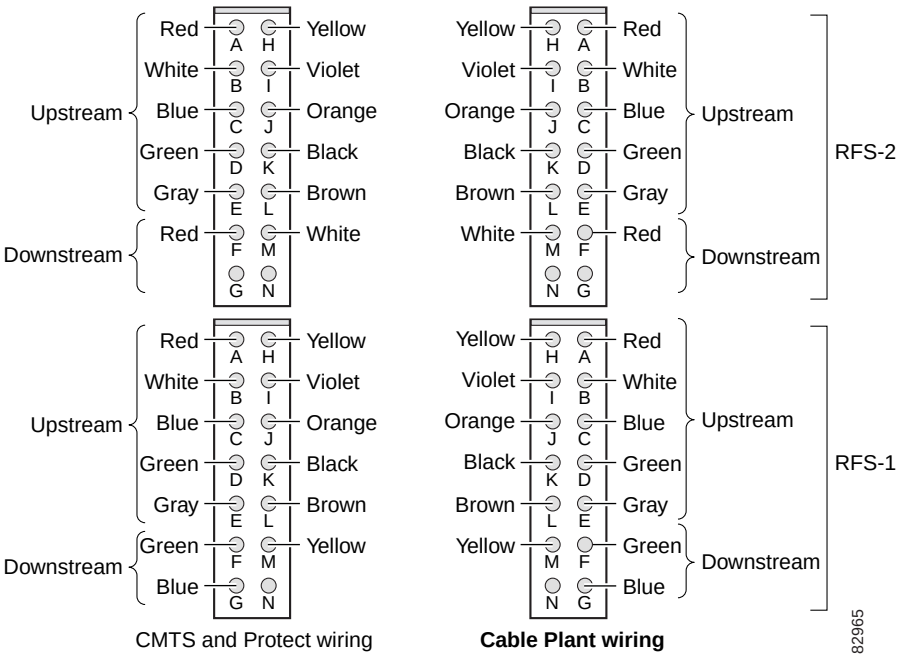
Note The output cables (CABLE PLANT) on the Cisco uBR 3x10 RF Switches are cabled in the reverse order of the input cables (CMTS).

Step 2 Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters.

Step 3 Run the output cables (M, F, G) to the splitters and combiners, DS laser transmitters, or the high side of the diplex filters.

Note N is not used.

Figure 11 Cabling the Cable Plant Headers (CMTS/Protect Headers Shown for Comparison)

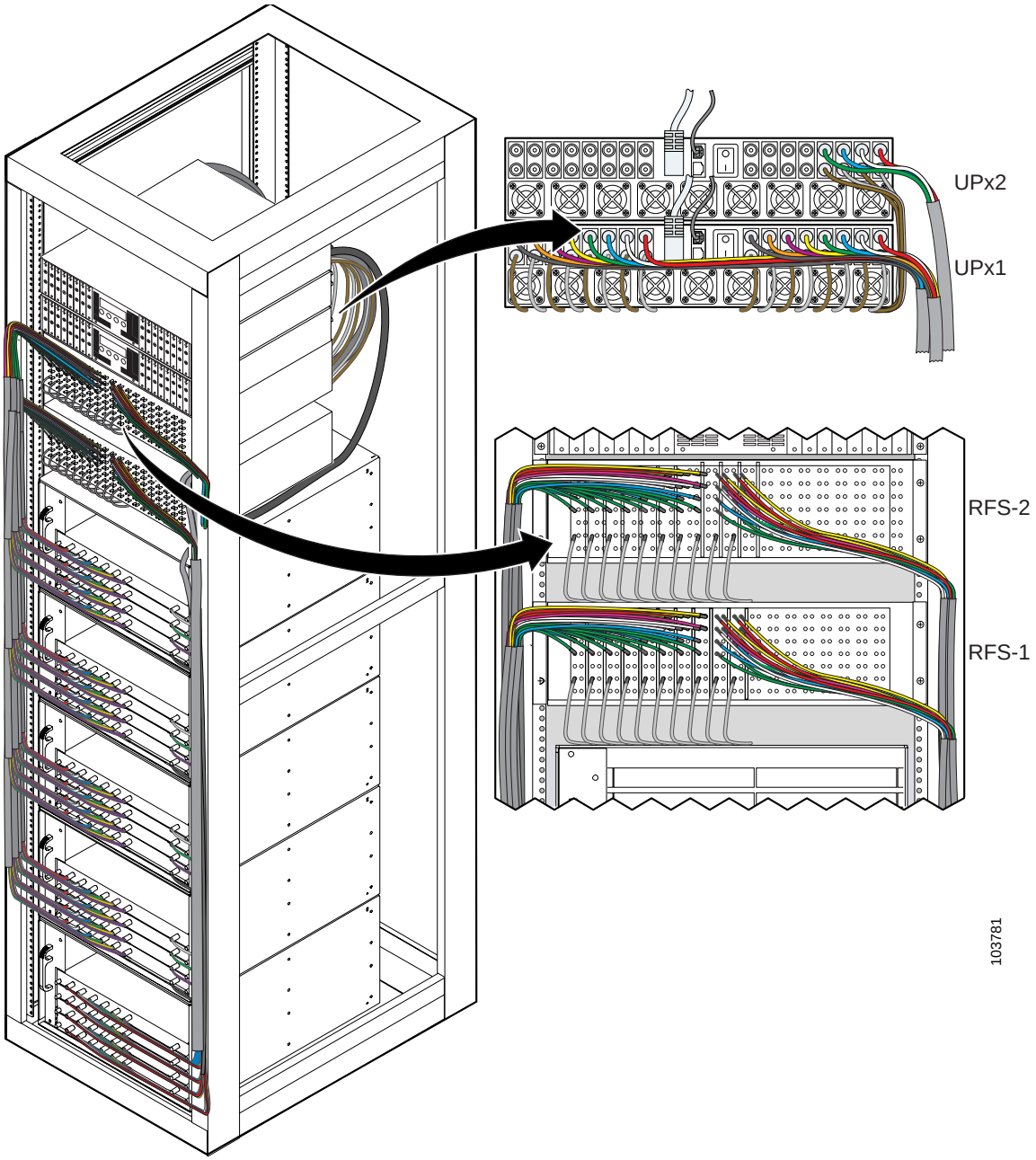


6 Cabling the Cisco uBR 3x10 RF Switch with Cisco uBR-MC16*x* Cable Interface Line Cards in the Cisco uBR7246VXR CMTS

The Cisco uBR7246VXR CMTS using five Cisco uBR7246VXR chassis, supports up to 20 Cisco uBR-MC16*x* (C, E, S, X or U) line cards. Each line card has one downstream and six upstream cable interfaces for a total of 20 downstream and 120 upstream interfaces for the CMTS. Two Cisco uBR 3x10 RF Switches are connected to the five Cisco uBR7246 routers, allowing you to employ a redundancy scheme in which one protect line card (in the protect router) supports from one to four working line cards in one of the four working chassis. Two upconverters are required for this configuration.

Note Cisco uBR-MC16U line cards have onboard upconverters and don't require the use of external upconverters. A Vecima upconverter is used in this sample configuration.

Figure 12 Cisco uBR7246VXR CMTS with Cisco uBR-MC16x Cable Interface Line Cards



Cabling the Working Line Card (VXR1–VXR4)

This section describes cabling two Cisco uBR 3x10 RF switches with five Cisco uBR7246VXR routers (with Cisco uBR-MC16*x* line cards installed) and two Vecima upconverters. See Figure 12 on page 21.

Note Keep in mind that like cards back up like cards (for example, a Cisco uBR-MC16C line card is required to back up Cisco uBR-MC16C line cards).

Tip Cable the line card to the RF switch header block one card at a time.

Equipment

- 16 cable bundle kits (4 per router), CAB-RFSW-3X10-T (1.2-m, F-connector to MCX connector)
- 16 header blocks (installed)

To cable the working line cards, complete the following steps. Refer to Table 14, Table 15, Table 16, and Table 17.

Step 1 Connect the cables to the upstream connectors (US0–US5) on the line cards in VXR1.

Note We recommend that you tighten the F-connectors to a value between 10 (recommended) and 15 (maximum) inch-pounds (1.1298 Nm and 1.7339 Nm).

Step 2 Secure the cables with cable wrap, as necessary, and run the cable bundles up the left side of the equipment rack.

Step 3 Install the cables in the CMTS header block in the order that they were mapped.

a. Push the MCX connector into the hole in the header block until you can feel it snap into place.

b. Gently wiggle the connector to make sure that the connection is secure.

Step 4 Repeat Step 1 through Step 3 for each line card in each Cisco uBR7246VXR (VXR2 through VXR4).

Note One cable bundle is used for the US ports on each card. DS ports use a different cable bundle.

Figure 13 Cabling the Working Line Cards (VXR1)

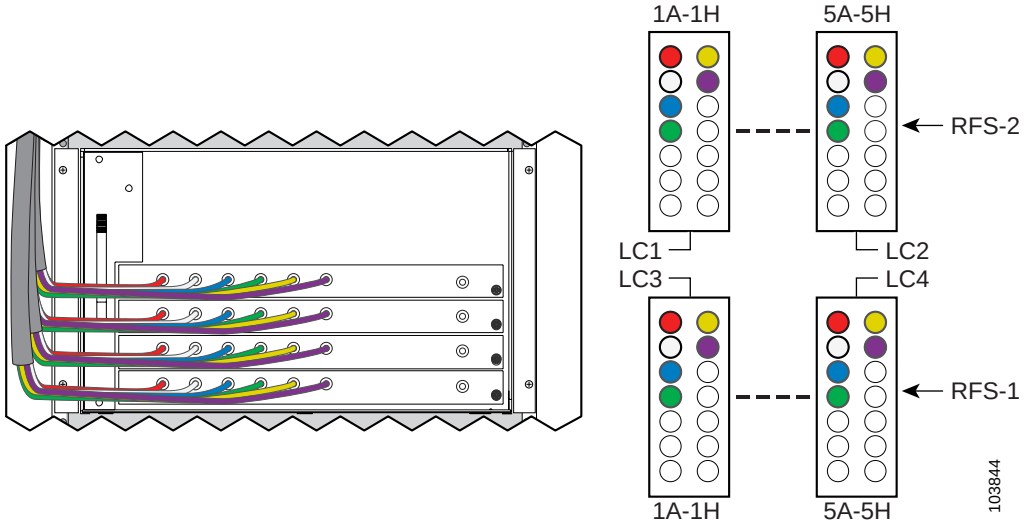


Table 14 Cable Bundle Colors Used for US—MCX Connections VXR1 to RFS

Cable Color	LC US Ports	LC1 to RFS–2	a	LC2 to RFS–2	a	LC3 to RFS–1	a	LC4 to RFS–1	a
Red	US0	RFS-2—1A		RFS-2—5A		RFS-1—1A		RFS-1—5A	
White	US1	RFS-2—1B		RFS-2—5B		RFS-1—1B		RFS-1—5B	
Blue	US2	RFS-2—1C		RFS-2—5C		RFS-1—1C		RFS-1—5C	
Green	US3	RFS-2—1D		RFS-2—5D		RFS-1—1D		RFS-1—5D	
Yellow	US4	RFS-2—1H		RFS-2—5H		RFS-1—1H		RFS-1—5H	
Violet	US5	RFS-2—1I		RFS-2—5I		RFS-1—1I		RFS-1—5I	

Table 15 Cable Bundle Colors Used for US—MCX Connections VXR2 to RFS

Cable Color	LC US Ports	LC1 to RFS–2	a	LC2 to RFS–2	a	LC3 to RFS–1	a	LC4 to RFS–1	a
Red	US0	RFS-2—2A		RFS-2—6A		RFS-1—2A		RFS-1—6A	
White	US1	RFS-2—2B		RFS-2—6B		RFS-1—2B		RFS-1—6B	
Blue	US2	RFS-2—2C		RFS-2—6C		RFS-1—2C		RFS-1—6C	
Green	US3	RFS-2—2D		RFS-2—6D		RFS-1—2D		RFS-1—6D	
Yellow	US4	RFS-2—2H		RFS-2—6H		RFS-1—2H		RFS-1—6H	
Violet	US5	RFS-2—2I		RFS-2—6I		RFS-1—2I		RFS-1—6I	

Table 16 Cable Bundle Colors Used for US—MCX Connections VXR3 to RFS

Cable Color	LC US Ports	LC1 to RFS–2	a	LC2 to RFS–2	a	LC3 to RFS–1	a	LC4 to RFS–1	a
Red	US0	RFS-2—3A		RFS-2—7A		RFS-1—3A		RFS-1—7A	
White	US1	RFS-2—3B		RFS-2—7B		RFS-1—3B		RFS-1—7B	
Blue	US2	RFS-2—3C		RFS-2—7C		RFS-1—3C		RFS-1—7C	
Green	US3	RFS-2—3D		RFS-2—7D		RFS-1—3D		RFS-1—7D	
Yellow	US4	RFS-2—3H		RFS-2—7H		RFS-1—3H		RFS-1—7H	
Violet	US5	RFS-2—3I		RFS-2—7I		RFS-1—3I		RFS-1—7I	

Table 17 Cable Bundle Colors Used for US—MCX Connections VXR4 to RFS

Cable Color	LC US Ports	LC1 to RFS–2	a	LC2 to RFS–2	a	LC3 to RFS–1	a	LC4 to RFS–1	a
Red	US0	RFS-2—4A		RFS-2—8A		RFS-1—4A		RFS-1—8A	
White	US1	RFS-2—4B		RFS-2—8B		RFS-1—4B		RFS-1—8B	
Blue	US2	RFS-2—4C		RFS-2—8C		RFS-1—4C		RFS-1—8C	
Green	US3	RFS-2—4D		RFS-2—8D		RFS-1—4D		RFS-1—8D	
Yellow	US4	RFS-2—4H		RFS-2—8H		RFS-1—4H		RFS-1—8H	
Violet	US5	RFS-2—4I		RFS-2—8I		RFS-1—4I		RFS-1—8I	

Cabling the Protect Line Cards (VXR 5)

This section describes cabling the protect cards to the RF switch.

Equipment

- 4 cable bundle kits (4 per router), CAB-RFSW-3X10-T (1.2-m, F-connector to MCX connector)
- 4 header blocks (installed)

To cable the protect line cards, complete the following steps. Refer to Table 18 and to Figure 14.

Step 1 Connect the cables to the upstream connectors (US0–US5) on line card–LC1) on router 5.

Step 2 Secure the cables with cable wrap, as necessary, and run the cable bundles up the right side of the equipment rack.

Step 3 Install the cables in the PROTECT header block in the order that they were mapped. See Figure 14.

Step 4 Repeat Step 1 through Step 3 for all the line cards in VXR5 (PROTECT).

Figure 14 Cabling the Protect Line Cards (MC16x)

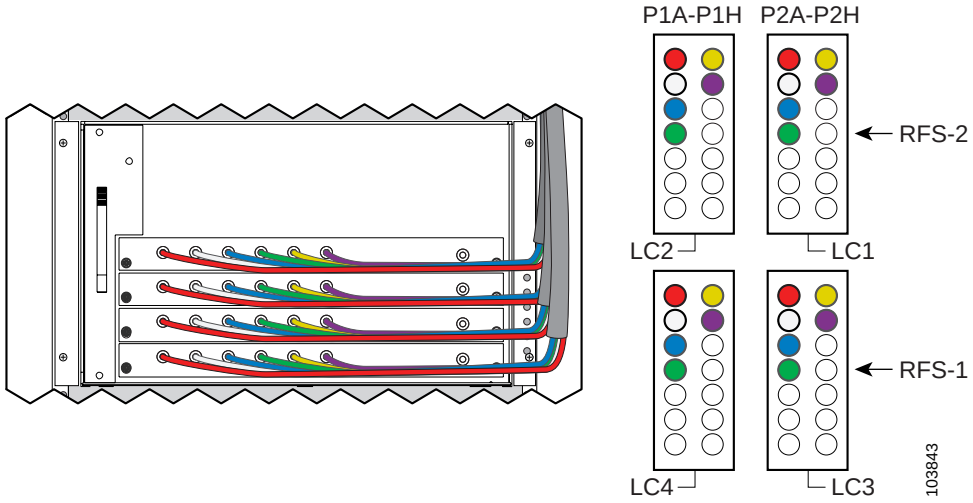


Table 18 RF Switch Slots for the PROTECT Cards

VXR5–LC	US Ports	RFS–1—PROTECT Slot	a	VXR5–LC	US Ports	RFS–2—PROTECT Slot	a
LC1	US0–US3 US4–US5	RFS-2—P2 (A–D) RFS-2—P2 (H1–I)		LC3	US0–US3 US4–US5	RFS-1—P2 (A–D) RFS-1—P2 (H–I)	
LC2	US0–US3 US4–US5	RFS-2—P1 (A–D) RFS-2—P1 (H–I)		LC4	US0–US3 US4–US5	RFS-1—P1 (A–D) RFS-1—P1 (H–I)	

Cabling DS Ports to the Input Ports on the Upconverter

This section describes cabling the DS ports to the input ports on the upconverter.

Note Cisco uBR-MC16U line cards have onboard upconverters. Cable the DS ports directly to the F ports on the RF switch.

Equipment

- 3 cable bundle kits (4 per router), F-connector to F-connector

To cable the DS ports, complete the following steps. Refer to Table 19 and Figure 15.

Step 1 Connect the cables to the downstream (DS) connectors on the line cards (LC1—LC4).

Step 2 Secure the cables with cable wrap, and run the cable bundles up the right side of the equipment rack.

Step 3 Pull the cable bundle through the space between the VXR1 router and the RF switch.

Step 4 Connect the cables to the input ports (top) on the upconverter. Add attenuators, if required.

Step 5 Repeat Step 1 through Step 4 for each DS port (VXR2 through VXR5).

Figure 15 Cabling the Upconverter (MC16x Downstream Ports to UPx1)

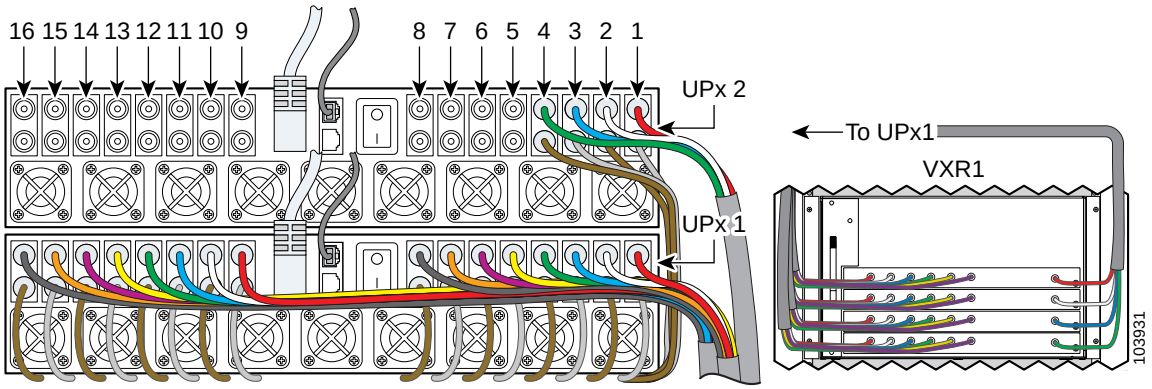


Table 19 DS Cables from VXRs to Upconverter Ports (by router)

Color	VXR1/VXR2	UPx1 Input	a	VXR3/VXR4	UPx1 Input	a	VXR5	UPx2 Input	a
Red	LC1–DS	1		LC1–DS	9		LC1–DS	1	
White	LC2–DS	2		LC2–DS	10		LC2–DS	2	
Blue	LC3–DS	3		LC3–DS	11		LC3–DS	3	
Green	LC4–DS	4		LC4–DS	12		LC4–DS	4	
Yellow	LC1–DS	5		LC1–DS	13		—	—	
Purple	LC2–DS	6		LC2–DS	14		—	—	
Orange	LC3–DS	7		LC3–DS	15		—	—	
Black	LC4–DS	8		LC4–DS	16		—	—	

Cabling the Output Ports (Upconverter to RF Switch)

This section describes cabling the output cables on the upconverter to the RF switch.

Equipment

- 20 RF cables (F-connector to MCX connector—gray and brown)

To cable the output ports on the upconverter, complete the following steps. Refer to Table 20 and Figure 16.

Step 1 Connect the cable to the output connector (1–lower) on the upconverter.

Step 2 Run the cable under the RF switch to the rear of the chassis.

Step 3 Connect the cable to the 1F port on RFS-2.

Step 4 Repeat Step 1 through Step 3 for the remaining cables.

Figure 16 Output Cables (Gray and Brown)

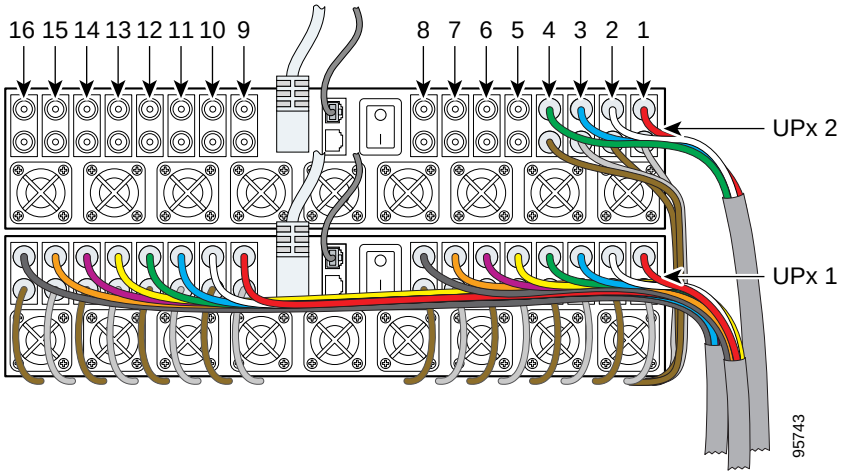


Table 20 Upconverter Output Cables (UPx1 and UPx2) to RF Switches (RFS-1 and RFS-2)

Color	UPx	RFS Ports	Supports	a	UPx	RFS Ports	Supports	a	UPx	RFS Ports	Supports	a
Gray	1[1]	RFS-2–1F	VXR1–LC 1		9	RFS-2–3F	VXR3–LC 1		1[2]	RFS-2–P2F	VXR5–LC1	
Brown	2	RFS-2–5F	VXR1–LC 2		10	RFS-2–7F	VXR3–LC 2		2	RFS-2–P1F	VXR5–LC2	
Gray	3	RFS-1–1F	VXR1–LC 3		11	RFS-1–3F	VXR3–LC 3		3	RFS-1–P2F	VXR5–LC3	
Brown	4	RFS-1–5F	VXR1–LC 4		12	RFS-1–7F	VXR3–LC 4		4	RFS-1–P1F	VXR5–LC4	
Gray	5	RFS-2–2F	VXR2–LC 1		13	RFS-2–4F	VXR4–LC 1		—	—	—	
Brown	6	RFS-2–6F	VXR2–LC 2		14	RFS-2–8F	VXR4–LC 2		—	—	—	
Gray	7	RFS-1–2F	VXR2–LC 3		15	RFS-1–4F	VXR4–LC 3		—	—	—	
Brown	8	RFS-1–6F	VXR2–LC 4		16	RFS-1–8F	VXR4–LC 4		—	—	—	

1. Working 1 through 16 are located on UPx1
2. Protect 1 through 4 are located on UPx2

Cabling the RF Switch Output (CABLE PLANT to HUB)

This section describes cabling the output cables on the RF switch to the cable plant.

Equipment

- 16 cable bundles (MCX connector to F-connector—multicolor)
- 16 header blocks (installed)

To cable the RF switch output cables, complete the following steps. Refer to Figure 17.

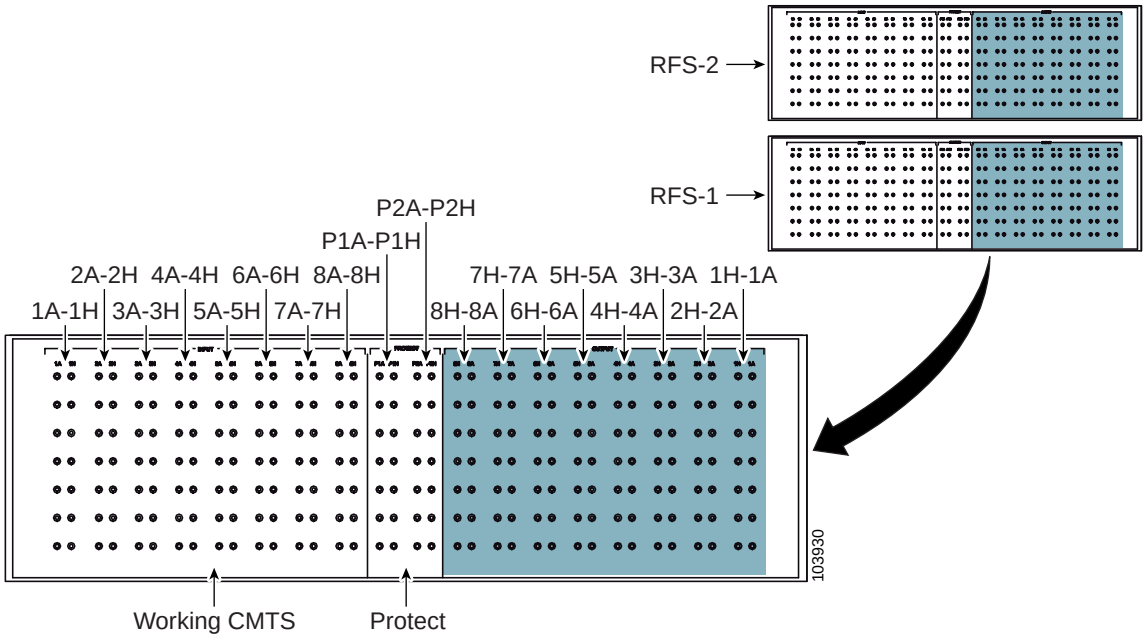
Step 1 Install the output cables in the header blocks.

Note The output cables (CABLE PLANT) on the Cisco uBR 3x10 RF Switch are cabled in the reverse order of the input cables (CMTS).

Step 2 Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters

Step 3 Run the output cables (F) to the splitters and combiners, DS laser transmitters, or the high side of the diplex filters.

Figure 17 RF Switch Cable Plant Outputs (Turquoise)

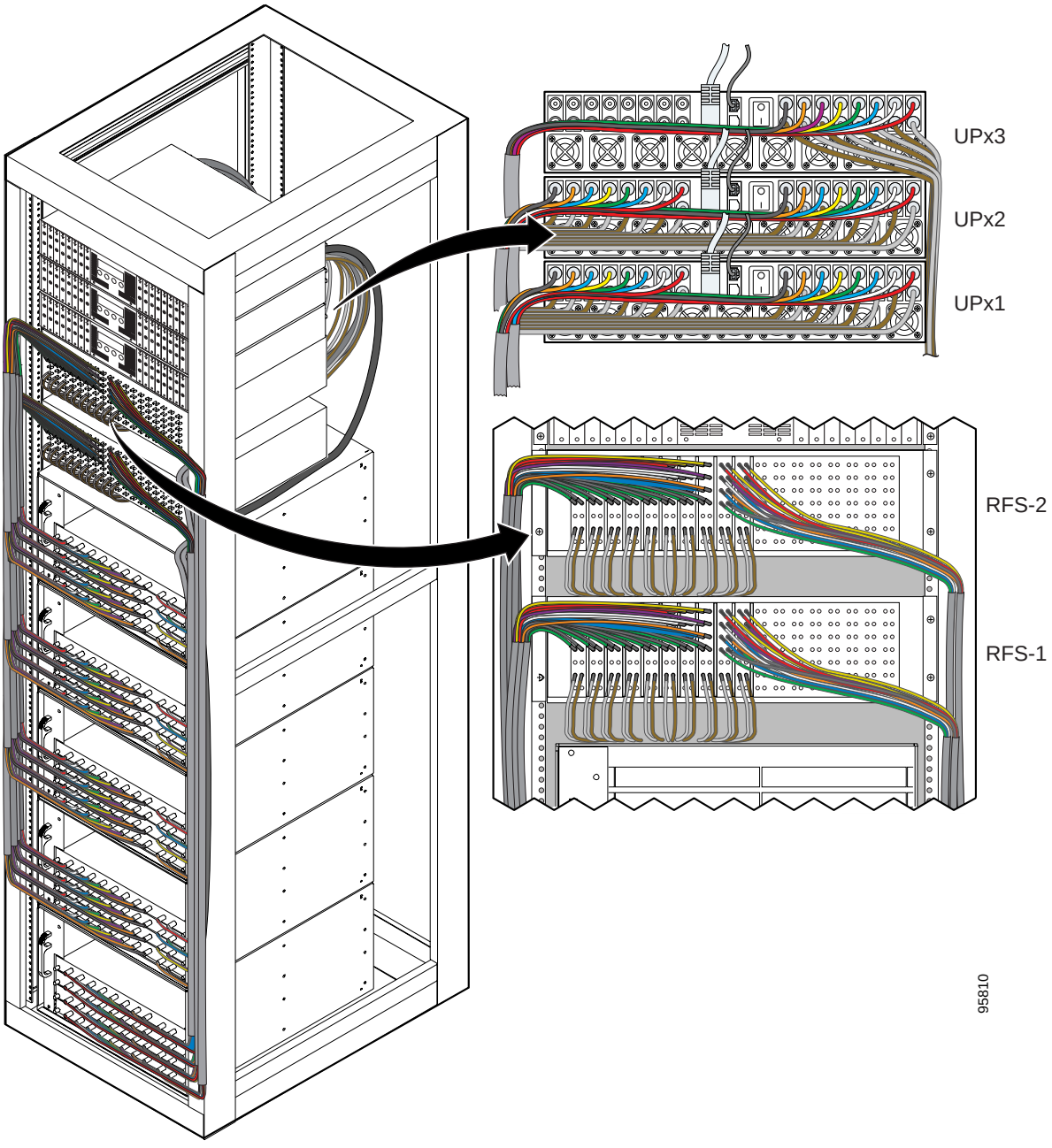


7 Cabling the Cisco uBR 3x10 RF Switch with Cisco uBR-MC28*x* Cable Interface Line Cards in the Cisco uBR7246VXR CMTS

The Cisco uBR7246VXR CMTS using five Cisco uBR7246VXR chassis, supports up to 20 Cisco uBR-MC28*x* (C, X, and U) line cards. Each line card has two downstream and eight upstream cable interfaces for a total of 40 downstream and 160 upstream interfaces for the CMTS. Two Cisco uBR 3x10 RF Switch are connected to the five Cisco uBR7246 routers, allowing you to employ a redundancy scheme in which one protect line card (in the protect router) supports from one to four working line cards in one of the four working chassis. Three upconverters are required for this configuration.

Note Cisco uBR-MC28U line cards have onboard upconverters and don't require the use of external upconverters. A Vecima upconverter is used in this sample configuration.

Figure 18 Cisco uBR7246VXR CMTS with Cisco uBR-MC28x Cable Interface Line Cards



Cabling the Working Line Card (VXR1–VXR4) to the RF Switch

This section describes cabling the working line cards to the RF switch.

Note Keep in mind that like cards back up like cards. For example, Cisco uBR-MC28C line cards require a Cisco uBR-MC28C line card for backup.

Equipment

- 16 RF cable bundle kits (4 per router), one per card (F-connector to MCX connector—multicolor)
- 16 header blocks (installed)

To cable the working line cards, complete the following steps. Refer to Table 21 for the color scheme.

Step 1 Connect the cables to the upstream ports (US0–US3, US0–US3) on the line cards in VXR1.

Note We recommend that you tighten the F-connectors to a value between 10 (recommended) and 15 (maximum) inch-pounds (1.1298 Nm and 1.7339 Nm).

Step 2 Secure the cables with cable wrap, and run the cable bundles up the left side of the equipment rack.

The line cards alternate between RF switch 1 and RF switch 2. Refer to the tables to see where each card is cabled. Table 21 shows the color of cable used for each connection.

Step 3 Install the cables in the CMTS header blocks, one card at a time. LC1 cables and LC2 cables go to RF switch 2,and LC3 cables and LC4 cables go to RF switch 1. See and Table 22 and Table 23 on page 32.

a. Push the MCX connector into the hole in the header block until you can feel it snap into place.

b. Gently wiggle the connector to make sure that the connection is secure.

Step 4 Repeat Step 1 through Step 3 for each line card in each Cisco uBR7246VXR (VXR2 through VXR4).

Figure 19 Cabling the Cisco uBR-MC28x Line Card in VXR1 to the RF Switches

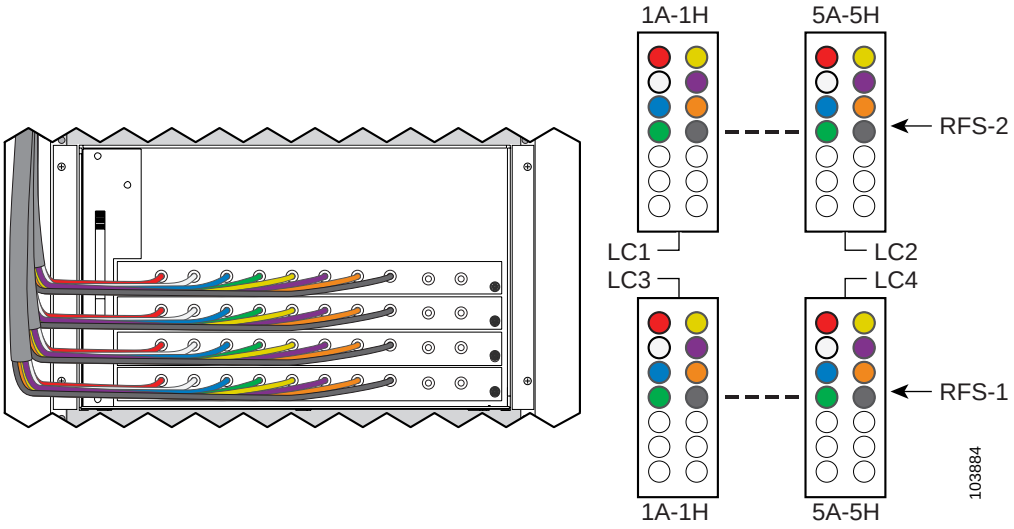
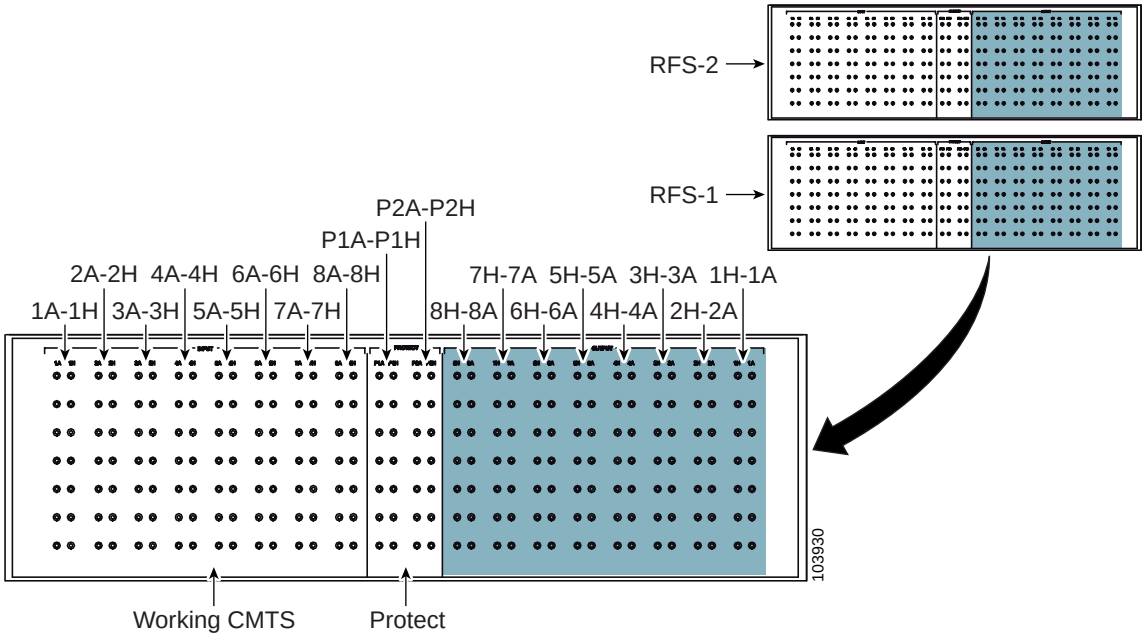


Table 21 Cable Colors Used for Upstream Connections, Cisco uBR-MC28Cx US Ports (VXR) to RFS-1 and RFS-2

Cable Color	US Ports	a	Cable Color	US Ports	a
Red	US0		Yellow	US0	
White	US1		Purple	US1	
Blue	US2		Orange	US2	
Green	US3		Black	US3	

Figure 20 Cabling the Cisco uBR 3x10 RF Switch



RF Switch 1

Table 22 Cable Bundle Sequence for the Cisco uBR 3x10 RF Switch 1

VXR1–LC	US Ports	RFS–1 Slot (Header Block)	a	VXR3	US Ports	RFS–1 Slot (Header Block)	a
LC3	US0–US3 US0–US3	RFS-1 Slot 1 (1A–1D) RFS-1 Slot 1 (1H–1K)		LC3	US0–US3 US0–US3	RFS-1 Slot 3 (3A–3D) RFS-1 Slot 3 (3H–3K)	
LC4	US0–US3 US0–US3	RFS-1 Slot 5 (5A–5D) RFS-1 Slot 5 (5H–5K)		LC4	US0–US3 US0–US3	RFS-1 Slot 7 (7A–7D) RFS-1 Slot 7 (7H–7K)	
VXR2–LC	**US Ports**	**RFS–1 Slot (Header Block)**		**VXR4–LC**	**US Ports**	**RFS–1 Slot (Header Block)**	
LC3	US0–US3 US0–US3	RFS-1 Slot 2 (2A–2D) RFS-1 Slot 2 (2H–2K)		LC3	US0–US3 US0–US3	RFS-1 Slot 4 (4A–4D) RFS-1 Slot 4 (4H–4K)	
LC4	US0–US3 US0–US3	RFS-1 Slot 6 (6A–6D) RFS-1 Slot 6 (6H–6K)		LC4	US0–US3 US0–US3	RFS-1 Slot 8 (8A–8D) RFS-1 Slot 8 (8H–8K)	

RF Switch 2

Table 23 Cable Bundle Sequence for the Cisco uBR 3x10 RF Switch 2

VXR1–LC	US Ports	RFS–2 Slot (Header Block)	a	VXR3–LC	US Ports	RFS–2 Slot (Header Block)	a
LC1	US0–US3 US0–US3	RFS-2 Slot 1 (1A–1D) RFS-2 Slot 1 (1H–1K)		LC1	US0–US3 US0–US3	RFS-2 Slot 3 (3A–3D) RFS-2 Slot 3 (3H–3K)	
LC2	US0–US3 US0–US3	RFS-2 Slot 5 (5A–5D) RFS-2 Slot 5 (5H–5K)		LC2	US0–US3 US0–US3	RFS-2 Slot 7 (7A–7D) RFS-2 Slot 7 (7H–7K)	
VXR2–LC	**US Ports**	**RFS–2 Slot (Header Block)**		**VXR4–LC**	**US Ports**	**RFS–2 Slot (Header Block)**	
LC1	US0–US3 US0–US3	RFS-2 Slot 2 (2A–2D) RFS-2 Slot 2 (2H–2K)		LC1	US0–US3 US0–US3	RFS-2 Slot 4 (4A–4D) RFS-2 Slot 4 (4H–4K)	
LC2	US0–US3 US0–US3	RFS-2 Slot 6 (6A–6D) RFS-2 Slot 6 (6H–6K)		LC2	US0–US3 US0–US3	RFS-2 Slot 8 (8A–8D) RFS-2 Slot 8 (8H–8K)	

Cabling the Protect Line Cards (VXR 5)

This section describes cabling the protect line cards to the RF switch.

Equipment

- 4 cable bundles—one per router (F-connector to MCX connector—multicolor)
- 4 header blocks (installed)

To cable the protect line cards, complete the following steps. Refer to Table 24 and Figure 21.

Step 1 Connect the cables to the upstream connectors (US0–US5) on line card–LC1 on router 5.

Step 2 Secure the cables with cable wrap, as necessary, and run the cable bundles up the right side of the equipment rack.

Step 3 Install the cables in the PROTECT header block in the order that they were mapped.

Step 4 Repeat Step 1 through Step 3 for all the line cards in VXR5 (PROTECT).

Figure 21 Cabling the Protect Line Cards (Cisco MC28x to RFS-1 and RFS-2)

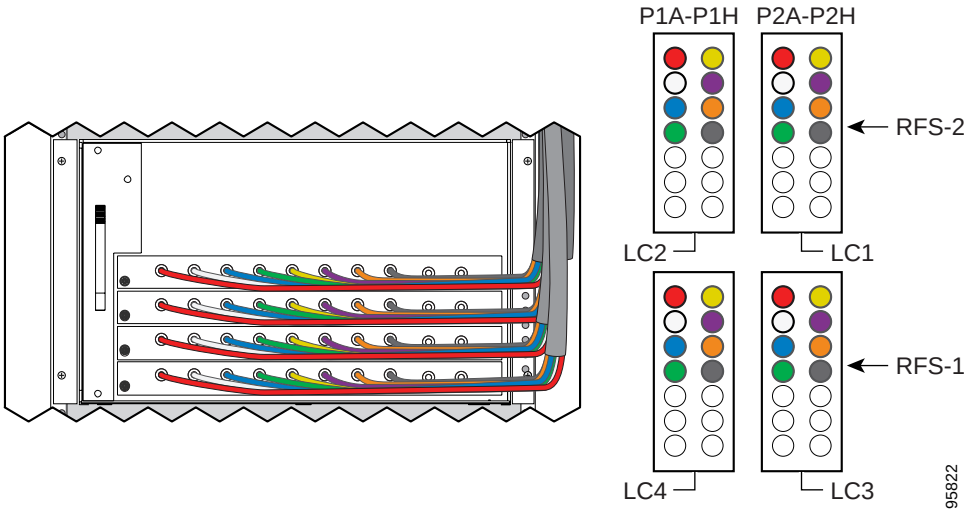


Table 24 RF Switch Slots for the PROTECT Cards

VXR5–LC	US Ports	RFS–2—PROTECT Slot	a	VXR5–LC	US Ports	RFS–1—PROTECT Slot	a
LC1	US0–US3 US0–US3	RFS-2—P2 (A–D) RFS-2—P2 (H–K)		LC3	US0–US3 US0–US3	RFS-1—P2 (A–D) RFS-1—P2 (H–K)	
LC2	US0–US3 US0–US3	RFS-2—P1 (A–D) RFS-2—P1 (H–K)		LC4	US0–US3 US0–US3	RFS-1—P1 (A–D) RFS-1—P1 (H–K)	

Cabling DS Ports to the Input Ports on the Upconverter

This section describes cabling the DS ports to the input ports on the upconverter.

Note The Cisco uBR-MC28U line cards have onboard upconverters. Cable the DS ports directly to F and M ports on the RF switch.

Equipment

- 5 cable bundle kits, CAB-RFSW-3X10-T, (F-connector to F-connector, MCX connector replaced with F-connector)

To cable the DS ports to the upconverter, complete the following steps. Refer to Figure 22, and Table 25, Table 26, and Table 27.

Step 1 Connect the cables to the downstream connectors (DS0, DS1) on the line cards (LC1—LC4).

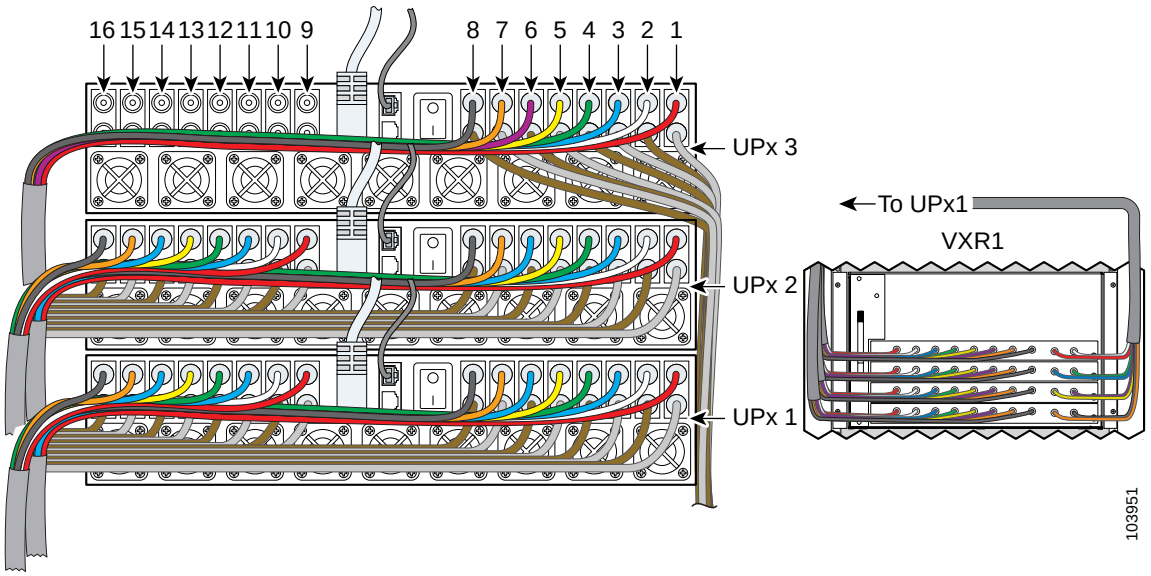
Step 2 Secure the cables with cable wrap, and run the cable bundles up the right side of the equipment rack.

Step 3 Pull the cable bundle through the space between the VXR1 router and the RF switch.

Step 4 Connect the cables to the input ports (top) on the upconverter. Add attenuators, if required.

Step 5 Repeat Step 1 through Step 4 for each DS0 and DS1 port on the Cisco uBR7246VXR routers (VXR2 through VXR5).

Figure 22 Cabling the Upconverter (MC28x Downstream Ports to the Upconverter)



UPx1

Table 25 DS Cables from VXRs to UPx1 Ports (by Router)

Color	VXR1	UPx1 Input	a	VXR2	UPx1 Input	a
Red	LC1—DS0	1		LC1—DS0	9	
White	LC1—DS1	2		LC1—DS1	10	
Blue	LC2—DS0	3		LC2—DS0	11	
Green	LC2—DS1	4		LC2—DS1	12	
Yellow	LC3—DS0	5		LC3—DS0	13	
Purple	LC3—DS1	6		LC3—DS1	14	
Orange	LC4—DS0	7		LC4—DS0	15	
Black	LC4—DS1	8		LC4—DS1	16	

UPx2

Table 26 DS Cables from VXRs to UPx2 Ports (by Router)

Color	VXR3	UPx2 Input	a	VXR4	UPx2 Input	a
Red	LC1—DS0	1		LC1—DS0	9	
White	LC1—DS1	2		LC1—DS1	10	
Blue	LC2—DS0	3		LC2—DS0	11	
Green	LC2—DS1	4		LC2—DS1	12	
Yellow	LC3—DS0	5		LC3—DS0	13	
Purple	LC3—DS1	6		LC3—DS1	14	
Orange	LC4—DS0	7		LC4—DS0	15	
Black	LC4—DS1	8		LC4—DS1	16	

UPx3

Table 27 DS Cables from VXR5 (Protect Cards) to UPx3

Color	VXR5	UPx3 Input	a
Red	LC1—DS0	1	
White	LC1—DS1	2	
Blue	LC2—DS0	3	
Green	LC2—DS1	4	
Yellow	LC3—DS0	5	
Purple	LC3—DS1	6	
Orange	LC4—DS0	7	
Black	LC4—DS1	8	

Cabling the Output Ports (Upconverter to RF Switch)

This section describes cabling the output ports on the upconverter to the RF switch.

Equipment

- 40 RF cables (F-connector to MCX connector—gray and brown)

To cable the upconverter to the RF switch, complete the following steps. Refer to Table 28 and Figure 23.

Step 1 Connect the cable to the output connector (1–lower) on the upconverter.

Step 2 Run the cable under the RF switch to the rear of the chassis.

Step 3 Connect the cable to the F1 port on the header block.

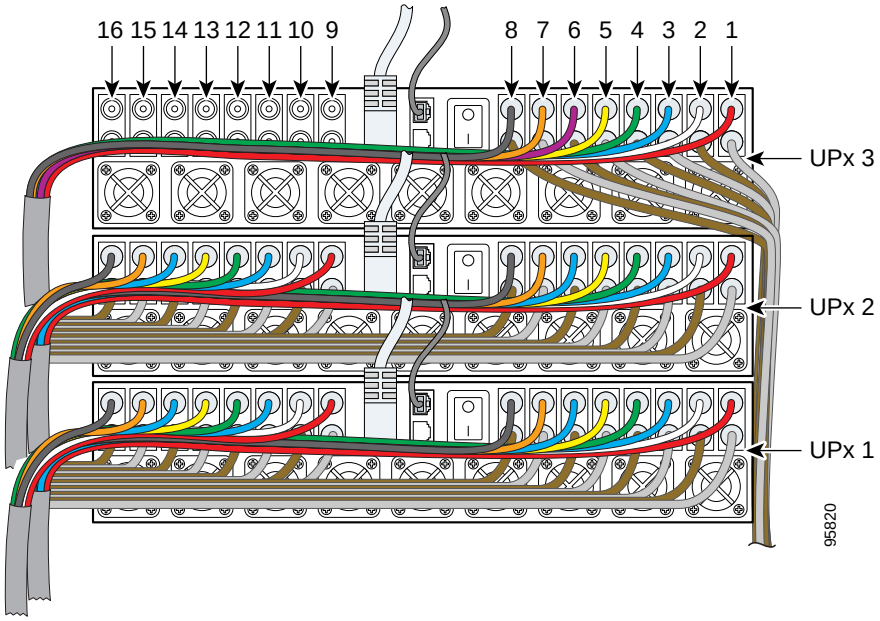
Step 4 Repeat Step 1 through Step 3 for the remaining cables, alternating between the F and M ports on the header blocks.

Table 28 UPx Cables Back to the RF Switch

Color	UPx1 Output	RFS Ports	a	UPx2 Output	RFS Ports	a	UPx3 Output	RFS Ports	a
Gray	1	RFS-2, 1F		1	RFS-2, 3F		1	RFS-2, P2F	
Brown	2	RFS-2, 1M		2	RFS-2, 3M		2	RFS-2, P2M	
Gray	3	RFS-2, 5F		3	RFS-2, 7F		3	RFS-2, P1F	
Brown	4	RFS-2, 5M		4	RFS-2, 7M		4	RFS-2, P1M	
Gray	5	RFS-1, 1F		5	RFS-1, 3F		5	RFS-1, P2F	
Brown	6	RFS-1, 1M		6	RFS-1, 3M		6	RFS-1, P2M	
Gray	7	RFS-1, 5F		7	RFS-1, 7F		7	RFS-1, P1F	
Brown	8	RFS-1, 5M		8	RFS-1, 7M		8	RFS-1, P1M	
Gray	9	RFS-2, 2F		9	RFS-2, 4F		—	—	
Brown	10	RFS-2, 2M		10	RFS-2, 4M		—	—	
Gray	11	RFS-2, 6F		11	RFS-2, 8F		—	—	
Brown	12	RFS-2, 6M		12	RFS-2, 8M		—	—	
Gray	13	RFS-1, 2F		13	RFS-1, 4F		—	—	
Brown	14	RFS-1, 2M		14	RFS-1, 4M		—	—	
Gray	15	RFS-1, 6F		15	RFS-1, 8F		—	—	
Brown	16	RFS-1, 6M		16	RFS-1, 8M		—	—	

Tip Use different colored cables for each connection. The example shows alternating gray and brown.

Figure 23 Cabling the Output Ports, (Gray and Brown Cables)



Cabling the RF Switch Output (CABLE PLANT to HUB)

The following section describes cabling the RF switch for output.

Note The output cables (CABLE PLANT) on the RF switch are cabled in the reverse order of the input cables (CMTS).

Equipment

- 16 RF cable bundle kits, CAB-RFSW-3X10-10T, (10-m, MCX connector to F-connector—multicolor)
- 16 header blocks (installed)

To cable the output to the cable plant, complete the following steps:

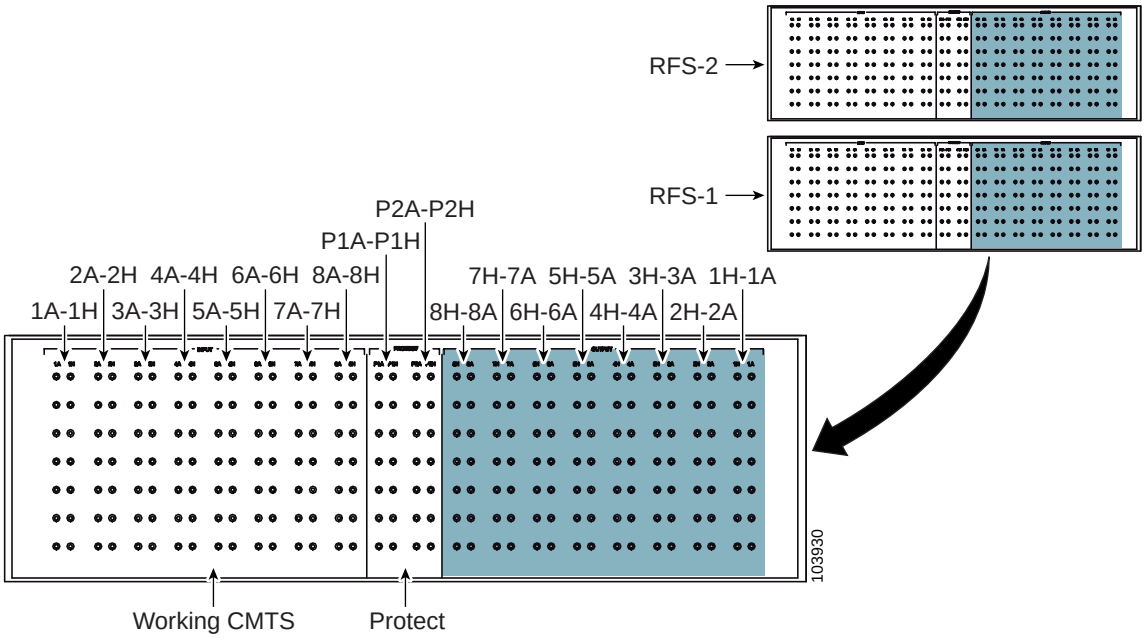
Step 1 Install the output cables in the header blocks. Start with the header block on the far right (1H—1A). See Figure 24. Refer to the "Cabling the Working Line Card (VXR1–VXR4) to the RF Switch" section on page 30 for installation instructions.

Tip For easier troubleshooting, use the same color sequence that was used for CMTS cabling.
A–red, B–white, C–blue, D–green. H–yellow, I–violet, J–orange, K–black.

Step 2 Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters

Step 3 Run the output cables (M–F) to the splitters and combiners, DS laser transmitters, or the high side of the diplex filters.

Figure 24 RF Switch Cable Plant Outputs (Turquoise)



8 Powering On the RF Switch

Perform this procedure only after installing and cabling the RF switch.

To power on the RF switch, complete the following steps:

Perform this procedure only after installing and cabling the RF switch.

To power on the RF switch, complete the following steps:

Step 1 Check that the cables connecting the cable interface line cards in the Cisco uBR7246VXR to the Cisco uBR 3x10 RF Switch are in place.

Step 2 Verify that the power cables are properly connected and secured.

- **a.** The AC-input power cable is connected and secured with the cable-retention clip.
- **b.** The AC power cord is connected to the AC power source.

or

- **a.** The DC-input leads (+48 and –48 DC) are connected and secured in the strain-relief on the power supply faceplate.
- **b.** The DC ground wire is securely connected to the ground location (rack).
- **c.** The DC leads are connected to the DC power source.

Step 3 Place the power switch on the power supply in either the AC or DC position, depending on which type of power source is connected to your Cisco RF Switch. The green LED on the power supply goes on.

Step 4 During the boot process, monitor the Cisco uBR 3x10 RF Switch system initialization and LED behavior for any errors or failures.

9 Troubleshooting

This section covers troubleshooting the cable installation. For information about troubleshooting the Cisco uBR 3x10 RF Switch, refer to the *Cisco uBR 3x10 RF Switch Installation and Cabling Guide* at the following URL:

http://www.cisco.com/univercd/cc/td/doc/product/cable/rfswitch/icg/index.htm

1. Verify that the cards are securely installed in both CMTS and RF switch chassis. We recommend that you tighten the captive screws on the cards to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).
2. Verify that the MCX connectors are securely installed in the header blocks and that the header blocks are securely installed on the RF switch. We recommend that you tighten the captive screws on the header blocks to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).
3. If you are using Cisco uBR-MC16*x* or Cisco uBR-MC28C line cards, verify that the F-connectors on the cables are securely attached to the line card. We recommend that you tighten the F-connectors to a value between 10 (recommended) and 15 (maximum) inch-pounds (1.1298 Nm and 1.7339 Nm).
4. If you are using Cisco uBR5x20S/U/H line cards, verify that the cables are secure in the UCH and that the UCH is securely installed on the line card. Tighten the captive screws to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).
5. Make sure that the cables are not bent or positioned at too acute an angle.
6. Make sure that none of the connections between the cables and the connectors are broken or damaged. Replace the connector if necessary.
7. Check the STATUS LEDs on the RF switch modules. See Table 29.

Table 29 Switch Board LED Descriptions

LED Name	Color	Description
Protect 1	Green/Yellow	Idle/protect
Protect 2	Green/ Yellow	Idle/protect
Error 1	Off/Continuous Yellow	No problem/communications failure or switch position failure
Error 2	Off/Continuous Yellow	No problem/communications failure or switch position failure

Americas Headquarters
Cisco Systems, Inc.
170 West Tasman Drive
San Jose, CA 95134-1706
USA
www.cisco.com
Tel: 408 526-4000
800 553-NETS (6387)
Fax: 408 527-0883

Asia Pacific Headquarters
Cisco Systems, Inc.
168 Robinson Road
#28-01 Capital Tower
Singapore 068912
www.cisco.com
Tel: +65 6317 7777
Fax: +65 6317 7799

Europe Headquarters
Cisco Systems International BV
Haarlerbergpark
Haarlerbergweg 13-19
1101 CH Amsterdam
The Netherlands
www-europe.cisco.com
Tel: 31 0 800 020 0791
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