



CHAPTER 1

Cabling the RF Switch With the Cisco uBR10012 CMTS Cable Interface Line Cards

This chapter provides information about connecting cables between the Cisco uBR 3x10 RF Switch and working and protect cable interface line cards in a Cisco uBR10012 CMTS.

This chapter contains the following sections:

- [Protection Scheme for the Cisco uBR10012 CMTS, page 1-1](#)
- [RF Cable Assemblies, page 1-4](#)
- [RF Cable Assemblies for Cisco uBR10-MC5X20S/U/H Line Cards, page 1-6](#)
- [Installing the Header Blocks on the Cisco uBR 3x10 RF Switch, page 1-8](#)
- [Mapping the RF Cables from the Working and Protect Line Cards \(MC16x, MC28C\) to the Cisco uBR 3x10 RF Switch, page 1-9](#)
- [Connecting the RF Cables \(MC16x, MC28C Line Cards\), page 1-15](#)
- [Mapping the Working and Protect Cisco uBR10-MC5X20S/U/H Line Cards RF Cables to the RF Switch, page 1-21](#)
- [Connecting the RF Cables \(Cisco uBR10-MC5X20S/U/H\), page 1-25](#)
- [Powering On the RF Switch, page 1-30](#)

Protection Scheme for the Cisco uBR10012 CMTS

The N+1 redundancy protection scheme you select for your system depends largely on the number and type of cable interface line cards you have installed in your Cisco uBR10012 router. The 7+1 eight-card redundancy scheme supports redundancy among the cable interface line cards installed in a fully populated Cisco uBR10012 router. Other redundancy schemes are designed to support partial cable interface line card population in a Cisco uBR10012 router.



Note

We recommend that the protect card be installed in slot 5/0 because this slot is directly below the PROTECT section on the RF switch.

Cisco uBR 3x10 RF Switch with the Cisco uBR-LCP2-MC16x (C, E, S) or MC28C Cable Interface Line Cards

A single Cisco uBR10012 router supports:

- Up to eight Cisco uBR10-LCP2-MC16C, E, or S cable interface line cards, each featuring one downstream and six upstream cable interfaces for a total of 8 downstream and 48 upstream interfaces in the chassis.
- Up to eight Cisco uBR10-LCP2-MC28C cable interface line cards, each featuring up to two downstream and eight upstream cable interfaces for a total of 16 downstream and 64 upstream interfaces in the chassis.

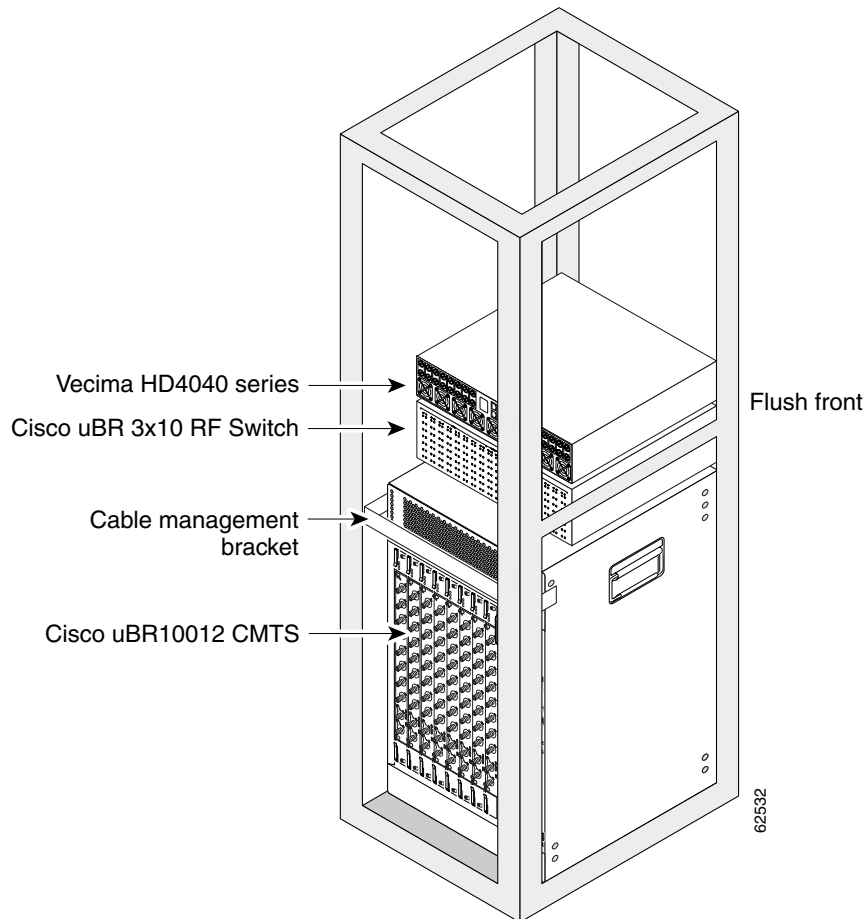
A single Cisco uBR 3x10 RF Switch is connected to the Cisco uBR10012 router, allowing you to employ a redundancy scheme in which one protect cable interface line card supports from one to seven working line cards in the same chassis. Keep in mind that like cards back up like cards (for example, a Cisco uBR10-LCP2-MC28C line card is required to back up Cisco uBR10-LCP2-MC28C line cards).



Note

An upconverter is required with this configuration.

Figure 1-1 Racked Cisco uBR 3x10 RF Switch with Cisco uBR10-LCP2-MC28C Cable Interface Line Cards and a Vecima HD4040 Upconverter



Cisco uBR 3x10 RF Switch with the Cisco uBR10-MC5X20S/U/H Cable Interface Line Cards

A single Cisco uBR10012 router supports up to eight Cisco uBR10-MC5X20S/U/H cable interface line cards, each featuring 5 downstream and 20 upstream cable interfaces for a total of 40 downstream and 160 upstream interfaces in the chassis.

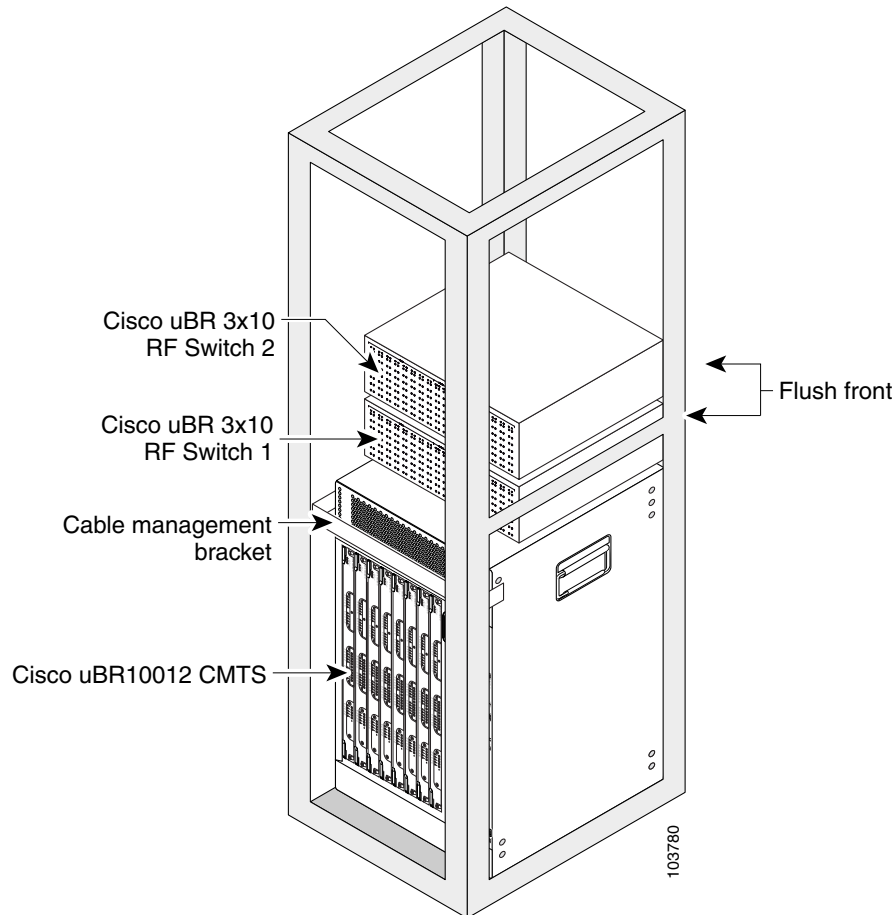
For this installation, two Cisco uBR 3x10 RF Switches are required to deploy a redundancy scheme in which one protect cable interface line card supports from one to seven working cable interface line cards in the same chassis. See [Figure 1-2](#).



Note

No upconverter is required here as the Cisco uBR10-MC5X20 line cards have built in upconverters.

Figure 1-2 Racked Cisco uBR 3x10 RF Switches with Cisco uBR5X20S/U/H Cable Interface Line Cards



RF Cable Assemblies

The following sections describe the coaxial cables, header blocks, and F-connector assemblies required to support N+1 redundancy in networks using the RF switch when the Vecima HD4040 series IF-to-RF upconverter is used and the Cisco uBR10012 CMTSs chassis is populated with either the Cisco uBR10-LCP2-MC16x line cards or the Cisco uBR10-LCP2-MC28x.



Note

Although you may construct and implement your own cabling system according to the specifications outlined here, We recommend using the Cisco N+1 redundancy cabling solution designed specifically for this CMTS feature (Cisco part numbers CAB-RFSW-3X10-T and CAB-RFSW-3X10-10T for pre assembled, terminated cable bundles).

- 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:

Header blocks—MCXHEADERBK

MCX connectors—MCXFP (dual-shielded)

Adapters, MCX female connector to F female connector—MCXF/FF

F-connectors—ASFP (dual-shielded)

Crimper for F and MCX connectors—ACT-483

Stripper for MCXFP—CPT-7538-125 (dual-shielded)

Stripper for ASFP—CPT-7538 (dual-shielded)

Connectors for quad-shielded cables—MCXFPQ MCX

Adapters, MCX female connectors to F female connectors—MCXF/FF

Stripper for F-connectors (quad-shielded)—CPT-7538Q

Stripper for MCX connector (quad-shielded)—CPT-7538-200Q

For more information on Vecima HD4040 series IF-to-RF upconverters, go to the following URL:

<http://www.vecima.com/>

Coaxial Cables

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

- CAB-RFSW-3X10-10T (bundled cable kit: 10-m, RFS to HUB, MCX to F)
- 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)

Figure 1-3 and Figure 1-4 on page 1-5 show header blocks that are cabled using the Cisco cable kit CAB-RFSW-3X10-10T.



Note

The header block shown in Figure 1-3 on page 1-5 is cabled for a Cisco uBR-MC16x card; the header block in Figure 1-4 on page 1-5 is cabled for the Cisco uBR-MC28x card.

Figure 1-3 Cable Solution for the Cisco uBR 3x10 RF Switch and Cisco uBR10-LCP2-MC16x Line Card

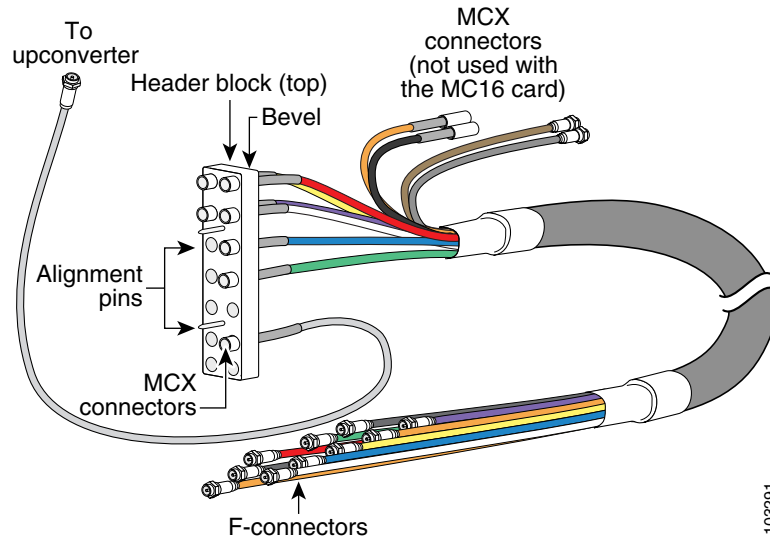
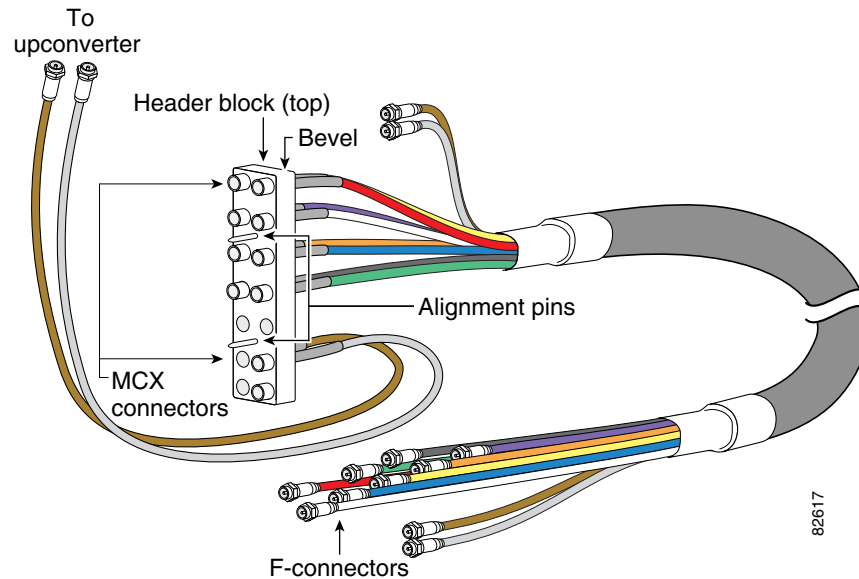


Figure 1-4 Cable Solution for the Cisco uBR 3x10 RF Switch and Cisco uBR10-LCP2-MC28x Line Card



Header Blocks

The header block holds the MCX connectors that are connected to the individual coaxial cables. These are Cisco MCX header blocks that mate to the Cisco uBR 3x10 RF Switch. Input cable kits have two extra header blocks. Output cable kits do not have header blocks.



Note

The header blocks are slightly beveled at the top for easy identification. The alignment pins on the header blocks are offset, preventing you from accidentally connecting the header block upside down.

F-Connectors and MCX Connectors

MCXFP—75-ohm MCX connector available from WhiteSands Engineering. This connector is attached to the end of the cable that terminates at the Cisco uBR 3x10 RF Switch.

ASFP or alternate—F-connectors available from WhiteSands Engineering. This connector is attached to the end of the cables that terminate at the upstream and downstream ports on the cable interface line cards. The output cabling kit includes 13 F-connectors to use for modification or repair.



Note

An extraction tool is shipped with the Cisco uBR 3x10 RF Switch to remove MCX connectors from the header blocks. Additional extraction tools can be obtained from WhiteSands Engineering.

Attenuators

A 10-dB attenuator may be required (due to a higher IF output, +42 dBmV), between the line card and the upconverter IF input ports.

RF Cable Assemblies for Cisco uBR10-MC5X20S/U/H Line Cards

The following sections describe the coaxial cable and header block assembly required to support N+1 redundancy between the Cisco uBR 3x10 RF Switches and a Cisco CMTS populated with Cisco uBR10-MC5X20S/U/H cable interface line cards.



Note

Although you may construct and implement your own cabling system, we recommend using the N+1 redundancy cabling solution designed specifically for this Cisco CMTS feature (Cisco part numbers CAB-RFSW520G for pre-assembled, terminated cable bundles). Pre-assembled cable sets are designed to fit the example racking configuration described in the *Rack-Mounting Cisco uBR 3x10 RF Switches with the Cisco uBR10012 CMTS and Cisco uBR10-MC5X20S/U/H Cable Interface Line Cards*. Other configurations require custom cables.



Note

In Europe only, the Cisco uBR10-MC5X20H card must use quad-shielded cables to connect to the RF Switch (Cisco part numbers CAB-RFSW520TIMM and CAB-RFSW520TPMF for pre-assembled, terminated cable bundles). In all other regions, the Cisco uBR10-MC5X20H card can use dual-shielded or quad-shielded cables.

The Cisco uBR10-MC5X20S and U can use dual-shielded or quad-shielded cables in all regions.



Note

Prepopulated custom cables for this configuration, or cable components such as header blocks, crimping tools, or connectors, are available from custom cable fabricators such as WhiteSands Engineering (1-800-JUMPERS).

Coaxial Cables

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

- CAB-RFSW520TIMM (dual-shielded cable kit: 1-m cable, MC5X20S/U to RFS, two 10-bundle, one 5-bundle, and 4 headers)
- CAB-RFSW520TPMF (dual-shielded cable kit: 3-m MCX to F cable, two 10-bundle, one 5-bundle)
- CAB-RFSW520QTIMM (quad-shielded cable kit: 1-m cable, MC5X20S/U/H to RFS, five 5-bundle, and 4 headers)"
- CAB-RFSW520QTPMF (quad-shielded cable kit: 3-m MCX to F cable, five 5-bundle)



Note

In Europe only, the Cisco uBR10-MC5X20H card must use quad-shielded cables. In all other regions, the Cisco uBR10-MC5X20H card can use dual-shielded or quad-shielded cables.

The Cisco uBR10-MC5X20S and U can use dual-shielded or quad-shielded cables in all regions.

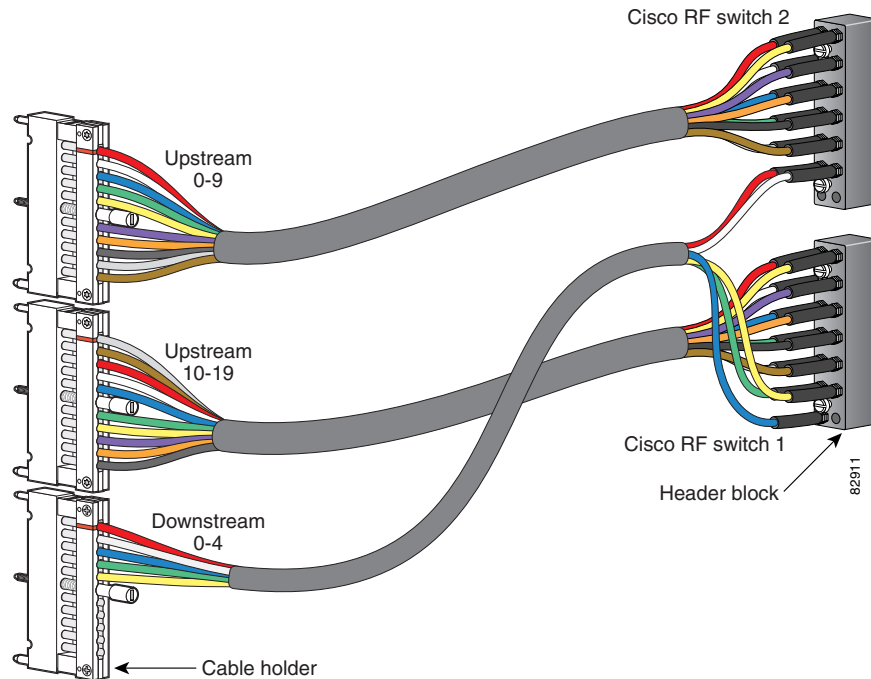
These coaxial cables are approved for use in the Cisco N+1 redundancy solution. The 5- and 10-cable bundle features individual coaxial cables enclosed in an external sheath. Each cable is a different color.



Note

The header block shown in [Figure 1-5 on page 1-7](#) is cabled for a Cisco uBR-MC5X20S/U/H card.

Figure 1-5 Cable Solution Used with the Cisco uBR10-MC5X20S/U/H Line Card



Universal Cable Holders

Universal cable holders (UCH) are used to attach the cables to the Cisco uBR10-MC5X20S/U/H cable interface line cards (see [Figure 1-5](#)). There are two types of UCH for use with these line cards: UCH1 and UCH2.



Note

Universal cable holders are not included in the RF switch cable kits. The UCH are shipped with the Cisco uBR10-MC5X20S/U/H cable interface line card cable.



Caution

The Cisco uBR10-MC5X20S/U/H cable interface line card must be used with a UCH for *all* cable connections to the line card. Failure to use the UCH may cause permanent damage to the line card connectors, resulting in low or no RF output in the downstream or low or no RF input in the upstream.

Header Blocks

See the “[Header Blocks](#)” section on [page 1-5](#). An extraction tool ships with the Cisco uBR 3x10 RF Switch to remove MCX connectors from the header blocks and UCH, if necessary.

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 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

- 18 header blocks—one RF switch
- 34 header blocks—two RF switches
- Flat-blade screwdriver

To install the header blocks, complete the following steps:

-
- Step 1** With the beveled edge of the header block at the top, align the two alignment pins on the header block with the two alignment holes on the RF switch (CMTS, PROTECT, or CABLE PLANT section).
 - 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.

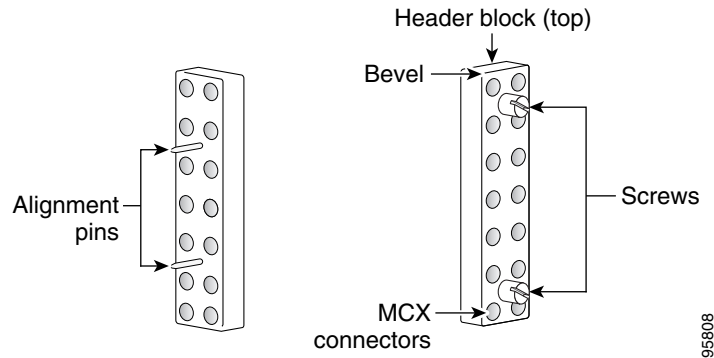


Note Tighten the header blocks to the Cisco uBR 3x10 RF Switch only after installing and gently pulling on the cables to be sure that they are firmly seated in the header block.



Caution Do not overtighten. We recommend tightening to 5 to 7 inch-pounds (0.5649 to 0.7909 Nm).

Figure 1-6 Header Block Description



Mapping the RF Cables from the Working and Protect Line Cards (MC16x, MC28C) to the Cisco uBR 3x10 RF Switch

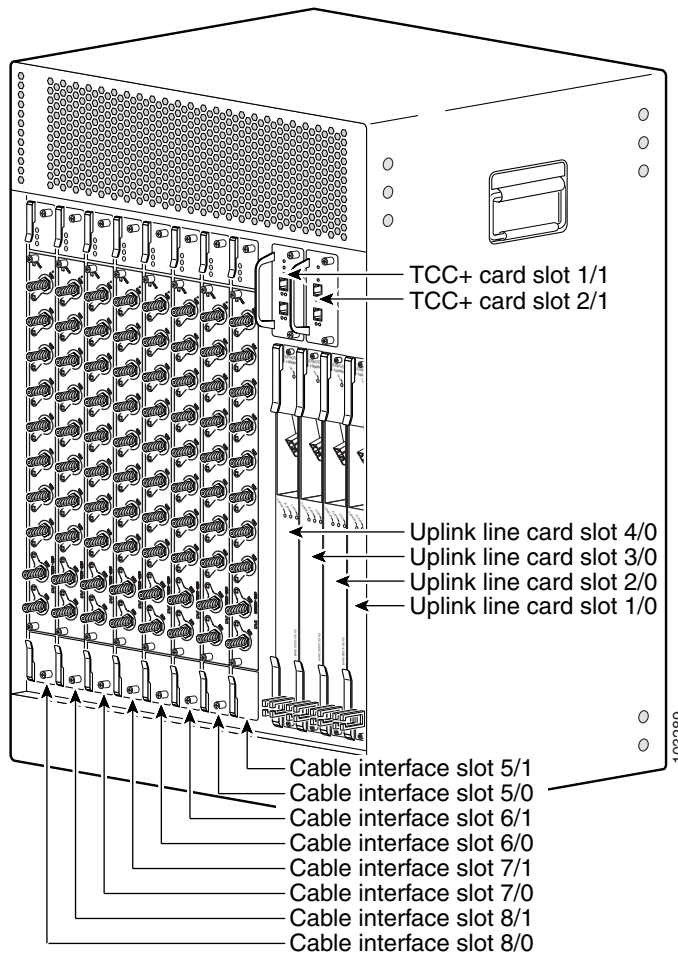
This section provides guidelines for mapping the RF cables and contains the following subsections:

- [Mapping the Cisco uBR10-LCP2-MC28C Cable Interface Line Cards to the RF Switch, page 1-13](#)
- [Mapping the Cisco uBR10-LCP2-MC16x \(C,E,S\) Cable Interface Line Cards to the RF Switch, page 1-10](#)



Note This sample mapping (or any other valid mapping method) is applicable to both working and protect cable interface line cards when employing N+1 redundancy.

Figure 1-7 Cable Interface Line Card Slot Numbers (Cisco uBR10-LCP2-MC28C Line Card Shown)



Mapping the Cisco uBR10-LCP2-MC16x (C,E,S) Cable Interface Line Cards to the RF Switch

The following guidelines can help you map the RF cables between the Cisco uBR 3x10 RF Switch and the Cisco uBR10-LCP2-MC16x cable interface line cards in the Cisco uBR10012 router:

- The RF switch ports labeled A to E and H to L on the header block connect to the upstream ports on the Cisco uBR10-LCP2-MC16C, MC16E, or MC16S cable interface line cards installed in the Cisco uBR10012 CMTS.
- The RF switch ports labeled F are used only for the downstream port connections.
 - The DS0 port on Cisco uBR10-LCP2-MC16x (C, E, S) line card is cabled first to the upconverter and then from the upconverter to the RF switch. A 10-dB attenuator may be required (due to a higher IF output) between the line cards and the upconverter.
- The MCX connection labeled N on the header block does not connect to anything in the RF switch and should not be connected to any cable interface port either.

**Note**

We recommend that the protect card be installed in slot 5/1 because this slot is directly below the PROTECT section on the RF switch.

Table 1-1 provides one permutation of the connection between a header block attached to a Cisco uBR 3x10 RF Switch and the cable interface ports on a Cisco uBR10-LCP2-MC16x line card installed in a Cisco uBR10012 CMTS.

Table 1-1 Sample Mapping of a Cisco uBR10-LCP2-MC16x Cable Interface Line Card to the Cisco uBR 3x10 RF Switch

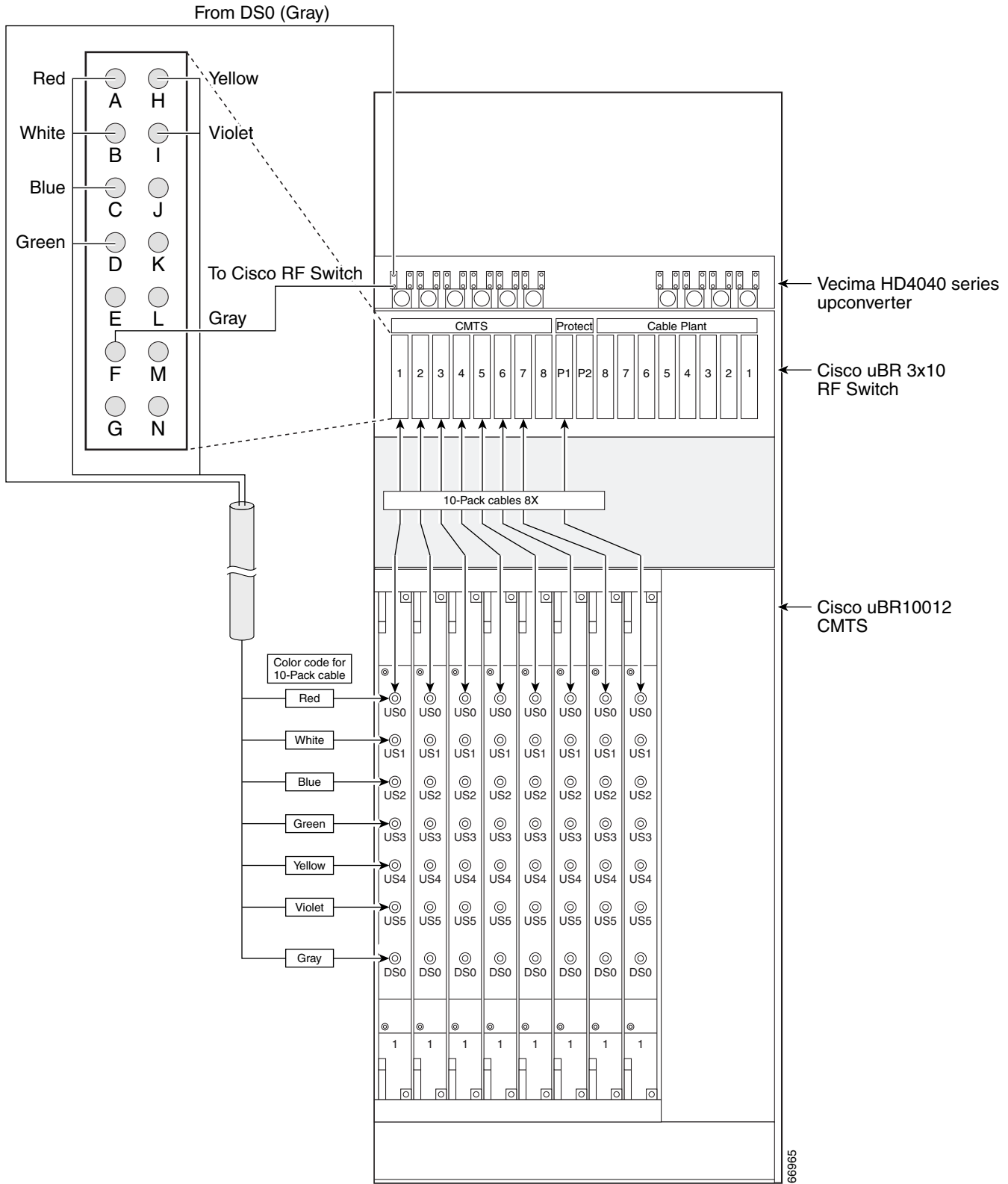
Connect to the Cable Interface on the CMTS	RFS ¹ (Color)	RFS (Color)	Connect to the Cable Interface on the CMTS
US0	A (Red)	H (Yellow)	US4
US1	B (White)	I (Violet)	US5
US2	C (Blue)	J	(Unused upstream)
US3	D (Green)	K	(Unused upstream)
(Unused upstream)	E	L	(Unused upstream)
DS0	F (Gray)	M	(Unused downstream)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

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

**Note**

This sample mapping (or any other valid mapping method) is applicable to both working and protect cable interface line cards when employing N+1 redundancy. The distinction between which line card serves as the protect card and which ones serve as the working cards is decided by whether the header block is plugged into a working (switch side) or protect group of interfaces on the RF switch and by the configuration you specify using the information in the “N+1 Redundancy for the Cisco CMTS” chapter of the *Cisco Cable Modem Termination System Feature Guide*.

Figure 1-8 Mapping a Cisco uBR10012 CMTS Populated with Cisco uBR10-LCP2-MC16x Line Cards to the RF Switch



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Mapping the Cisco uBR10-LCP2-MC28C Cable Interface Line Cards to the RF Switch

When you connect RF cables between the RF switch and a Cisco uBR10-LCP2-MC28C cable interface line card installed in a Cisco uBR10012 router, ensure that all the RF cables in the bundle attach to interfaces on the same cable interface line card installed in the Cisco uBR10012 chassis. (See [Figure 1-9 on page 1-14](#).)

The following guidelines can help you map the cables between the RF switch and the Cisco uBR10012:

- The cable interface ports labeled A to E and H to L on the header blocks are used for the upstream port connections on the Cisco uBR10-LCP2-MC28C line card installed in the Cisco uBR10012 CMTS.
- The cable interface ports labeled F, G, and M are used only for the downstream port connections.
 - The DS0 and DS1 ports on Cisco uBR10-LCP2-MC28C are cabled first to the upconverter and then from the upconverter to the RF switch. A 10-dB attenuator may be required between the line card and the upconverter., due to a higher IF output.
- The cable interface port labeled N on the header block does not connect to anything in the Cisco uBR 3x10 RF Switch and should not be connected to any cable interface port either.



Note

We recommend that the protect card be installed in slot 5/1 because this slot is directly below the PROTECT section on the RF switch.

[Table 1-2](#) provides one permutation of the connection between a header block attached to a Cisco uBR 3x10 RF Switch and the cable interfaces on a Cisco uBR10-LCP2-MC28x installed in a Cisco uBR10012 CMTS.



Tip

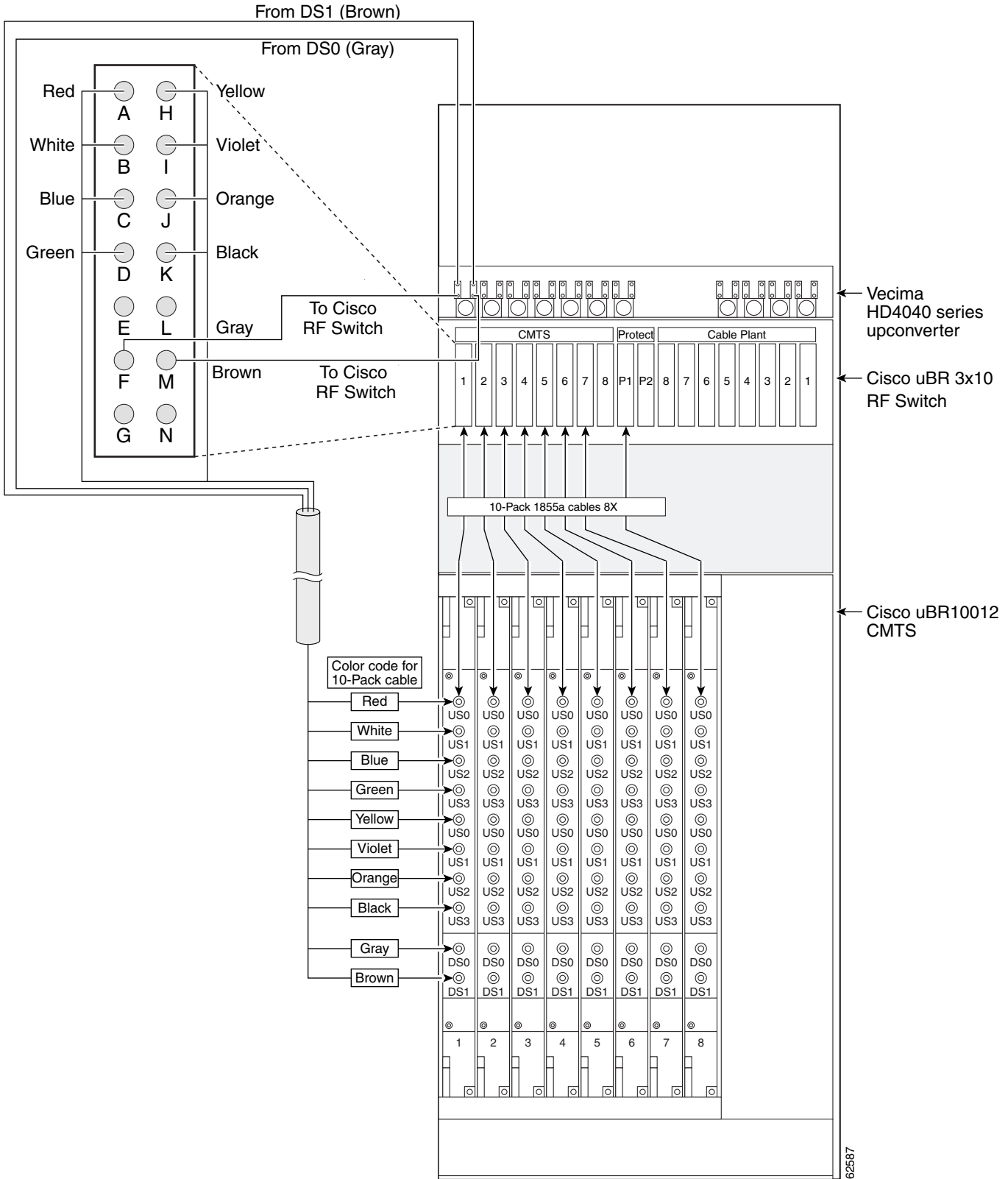
Notice the relationship between the cable color and location in the RF switch.

Table 1-2 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.

Figure 1-9 Mapping a Cisco uBR10012 CMTS Populated with Cisco-uBR10-LCP2-MC28C Line Cards to the RF Switch



Connecting the RF Cables (MC16x, MC28C Line Cards)

The RF cables are connected between the Cisco uBR10-LCP2-MC16x (C, E, S) line cards or the Cisco uBR10-LCP2-MC28C line cards, and the CMTS and PROTECT portions of the Cisco uBR 3x10 RF Switch in bundles of RF cables. The cables terminate at header blocks that connect to the RF switch at one of the following locations:

- CMTS—These groups of RF cables connect to cable interface line cards designated as the working line cards and to IF-to-RF upconverters.
- PROTECT—These groups of RF cables connect to cable interface line cards designated as the protect line cards.

For information about cabling to the Vecima HD4040 upconverter, refer to the [“Cabling the Output Ports from the Upconverter to the RF Switch”](#) section on page 1-18.

**Note**

CABLE PLANT connections are made after all the other connections have been made. The CABLE PLANT RF cables connect to the coaxial or fiber-optic cable transceivers (in the upstream direction) and IF-to-RF upconverters (in the downstream direction) at the cable headend or hub.

For cable mapping information, refer to:

- [“Mapping the Cisco uBR10-LCP2-MC28C Cable Interface Line Cards to the RF Switch”](#) section on page 1-13.
- [“Mapping the Cisco uBR10-LCP2-MC16x \(C,E,S\) Cable Interface Line Cards to the RF Switch”](#) section on page 1-10.

Cabling the Working and Protect Line Cards to the RF Switch

This section describes cabling the working and protect line cards from the Cisco uBR10012 CMTS to the RF switch.

**Tip**

Use the card in slot 5/1 for the protect card. See [Figure 1-7 on page 1-10](#) for slot number locations.

Equipment

- 8–RF cable bundles (CAB-RFSW-3X10-T)
- 8–header blocks (installed)
- Flat-blade screwdriver (extended length)

To cable the card, complete the following steps.

Step 1 Connect the cables to the cable interface line card connectors (upstream and downstream).

**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).

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 1-2 on page 1-13](#) and [Table 1-1 on page 1-11](#) for cable interface and CMTS connection locations. Note that 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 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 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.



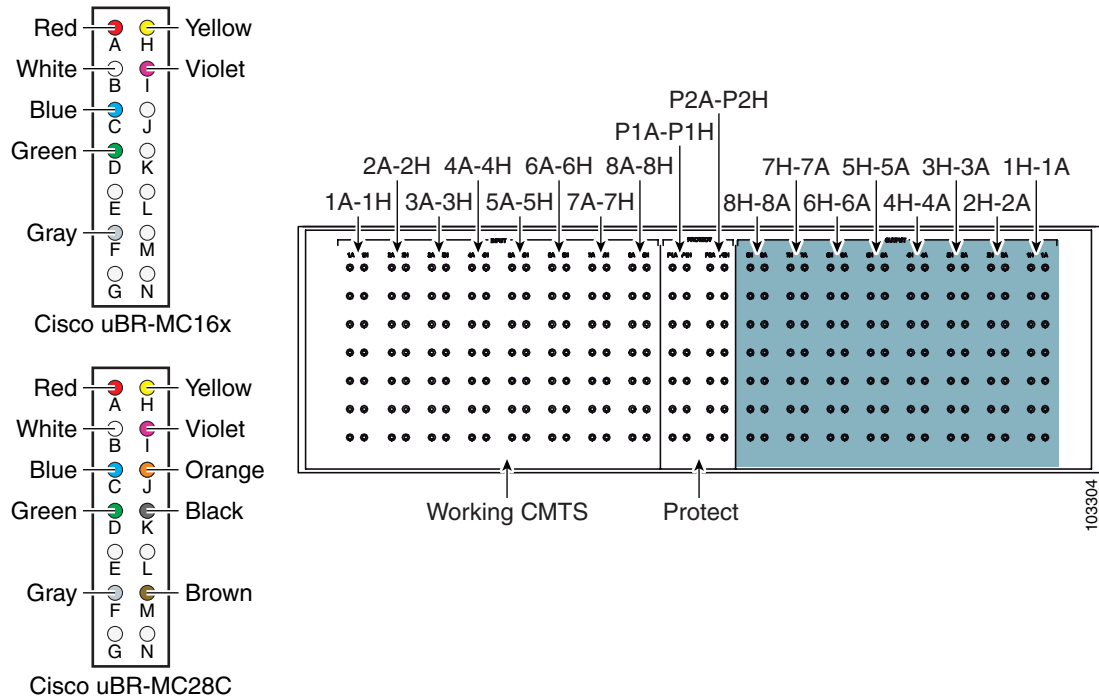
Caution To ensure proper installation and avoid poor connections, be sure that the cables are not positioned at too acute an angle.

- 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 screws to 5 to 7 inch-pounds (0.5647 to 0.7909 Nm).

Figure 1-10 Cisco uBR 3x10 RF Switch—MCX Connection Locations



Cabling the Downstream Ports to the Input Ports on the Upconverter

This section describes cabling the Cisco uBR10-LCP2-MC16x and Cisco uBR10-LCP2-MC28C line card downstream (DS) ports to the upconverter.

Equipment

These cables are part of the cable bundles (CAB-RFSW-3X10-T).



Tip Alternate gray and brown cables when cabling the Cisco uBR10-LCP2-MC28C card.

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

-
- Step 1** Connect the cables to the downstream ports (MC16x–DS0, MC28C–DS0, DS1) on the line cards.
- Step 2** Run the cables up to the upconverter and add a 10-dB attenuator to the input cable, if necessary.
- Step 3** Connect the cables to the input ports (top) on the upconverter.
- See [Table 1-3](#) and [Figure 1-11](#) on page 1-17 when cabling a Cisco uBR10-LCP2-MC16x line card.
 - See [Table 1-4](#) and [Figure 1-12](#) on page 1-18 when cabling a Cisco uBR10-LCP2-MC28C line card.
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Figure 1-11 Cabling the Upconverter (MC16x)

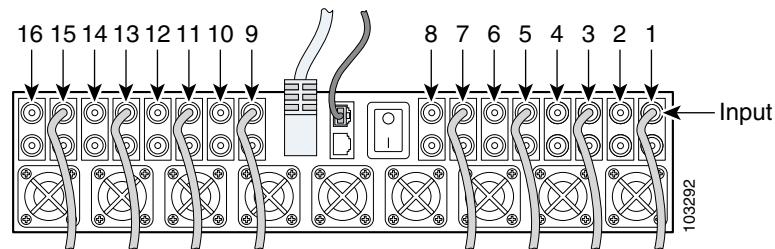


Table 1-3 Cisco uBR10-LCP2-MC16x Cabling (DS Ports to the Upconverter)

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 1-12 Cabling the Input Ports on the Upconverter (MC28C)**Table 1-4 Cisco uBR10-LCP2-MC28C Cabling (DS Ports to 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

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

Equipment

- 8 cables for Cisco uBR10-LCP2-MC16x cards (F-connector to MCX connector—gray)
- 16 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 CABLE PLANT header block.
- For Cisco uBR10-LCP2-MC16x cards, see [Table 1-5 on page 1-19](#).
 - For Cisco uBR10-LCP2-MC28C cards, see [Table 1-6 on page 1-19](#).
- Step 3** Repeat [Step 1](#) through [Step 2](#) for the remaining cables
-

Table 1-5 Upconverter Output Cables to the Working Plant on the RF Switch (for MC16x Line Cards)

Color	UPx Output	RFS-CMTS	LC Slot (DS)	a
Gray	15	1F—cable plant	8/0—working (DS)	
Gray	13	2F—cable plant	8/1—working (DS)	
Gray	11	3F—cable plant	7/0—working (DS)	
Gray	9	4F—cable plant	7/1—working (DS)	
Gray	7	5F—cable plant	6/0—working (DS)	
Gray	5	6F—cable plant	6/1—working (DS)	
Gray	3	7F—cable plant	5/0—working (DS)	
Gray	1	1P F—protect (1P)	5/1—protect (DS)	

Table 1-6 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 Cables (CABLE PLANT to HUB)

This section describes cabling the RF switch for output (from the RF switch CABLE PLANT to the cable headend equipment).

The output cables are connected to the CABLE PLANT section of the RF switch. The CABLE PLANT header blocks are wired in the opposite sequence to the CMTS and PROTECT header blocks (see [Figure 1-14 on page 1-21](#)). Use the same installation and connection procedures as described in these sections:

- [Installing the Header Blocks on the Cisco uBR 3x10 RF Switch, page 1-8](#)
- [Connecting the RF Cables \(MC16x, MC28C Line Cards\), page 1-15](#)

Equipment

- 7 cable bundles (10m), MCX connector to F-connector—multicolor, CAB-RFSW-3X10-10T
- 14 single cables
- 7 header blocks (installed)



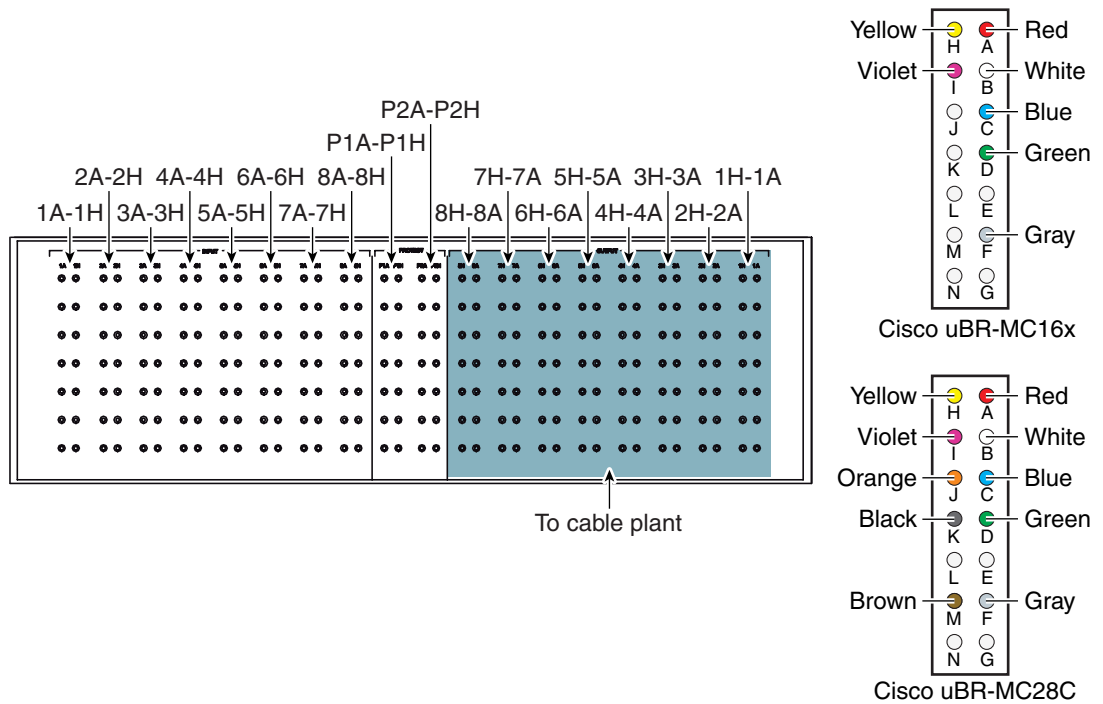
Tip

For shorter cables (3m) use cable kit CAB-RFSW520TPMF (dual-shielded) or CAB-RFSW520QTPMF (quad-shielded).

To cable the output connections, complete the following steps.

- Step 1** Install the header blocks on the CABLE PLANT section of the RF switch. Refer to [Installing the Header Blocks on the Cisco uBR 3x10 RF Switch](#), page 1-8, if necessary.
- Step 2** Install the output cables in the header blocks. Refer to [Mapping the Cisco uBR10-LCP2-MC28C Cable Interface Line Cards to the RF Switch](#), page 1-13 for RF switch/MCX connector installation instructions, if necessary.
- Step 3** Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters
- Step 4** Run the output cables (F) or (M–F) to the splitters/combiners, DS laser transmitters, or the high side of the diplex filters.

Figure 1-13 RF Switch Cable Plant Outputs (Turquoise)



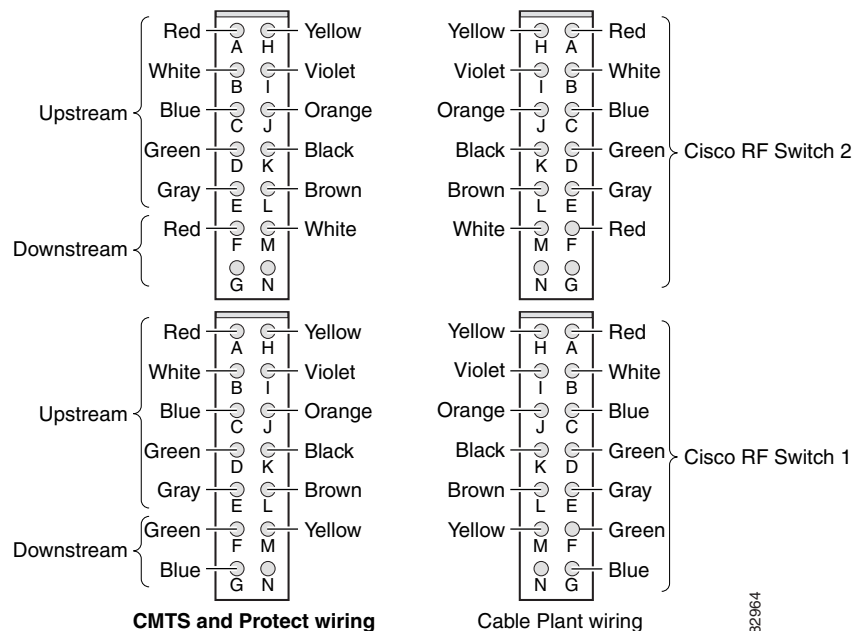
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Mapping the Working and Protect Cisco uBR10-MC5X20S/U/H Line Cards RF Cables to the RF Switch

This section describes the mapping of RF cables from the working and protect line cards to the Cisco uBR 3x10 RF Switch. Refer to [Figure 1-14](#) for header block and cable designations as viewed from the cable side of the header blocks.

When you connect RF cables between the RF switch and a cable interface line card installed in a Cisco uBR10012 chassis, ensure that all the RF cables in the bundle attach to interfaces on the same cable interface line card installed in the Cisco uBR10012 chassis. (Refer to [Table 1-7](#), [Table 1-8](#), [Table 1-9](#), and [Table 1-10](#) for line card-to-RF switch port mapping information.)

Figure 1-14 Wiring the CMTS and Protect Headers (Cable Plant Headers Shown for Comparison)



Use the following guidelines to map cables between the Cisco uBR 3x10 RF Switch and the Cisco uBR10012 CMTS:

- The cable interface ports labeled A through E and H through L on the header block all must attach to upstream interfaces on the Cisco uBR10012 chassis.
- The cable interface ports labeled F, G, and M are applicable only to downstream connection.
- The cable interface port labeled N on the header block does not attach to anything in the RF switch. Therefore, it should not be connected to any cable interface on the Cisco uBR10012 CMTS.



Note

This mapping is applicable to both working and protect cable interface line cards when employing N+1 redundancy. The distinction between which cable interface line card serves as a protect line card and which serve as working line cards is determined by whether the header block is plugged into a working

(switch side) or protect group of slots on the Cisco uBR 3x10 RF Switch and by the configuration you specify. Refer to the “N+1 Redundancy for the Cisco CMTS” chapter of the *Cisco Cable Modem Termination System Feature Guide*.

Table 1-7 RF Switch Ports and Line Card Ports for Line Card Slots 8/0 and 8/1

Cable Color	Working Line Card Slot 8/0—Ports	RF Switch—Port		Working Line Card Slot 8/1—Ports	RF Switch—Port	
Red	US0	RFS-2-1A		US0	RFS-2-2A	
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	
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	
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 1-8 RF Switch Ports and Line Card Ports for Line Card Slots 7/0 and 7/1

Cable Color	Working Line Card Slot 7/0—Ports	RF Switch—Port	a	Working Line Card Slot 7/1—Ports	RF Switch—Port	a
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	
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	
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 1-9 RF Switch Ports and Line Card Ports for Line Card Slots 6/0 and 6/1

Cable Color	Working Line Card Slot 6/0—Ports	RF Switch—Port	a	Working Line Card Slot 6/1—Ports	RF Switch—Port	a
Red	US0	RFS-2-5A		US0	RFS-2-6A	
White	US1	RFS-2-5B		US1	RFS-2-6B	

Table 1-9 RF Switch Ports and Line Card Ports for Line Card Slots 6/0 and 6/1 (continued)

Cable Color	Working Line Card Slot 6/0—Ports	RF Switch—Port	a	Working Line Card Slot 6/1—Ports	RF Switch—Port	a
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	
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	
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 1-10 RF Switch Ports and Line Card Ports for Line Card Slots 5/0 and 5/1

Cable Color	Working Line Card Slot 5/0—Ports	RF Switch—Port	a	Protect Line Card Slot 5/1—Ports	RF Switch—Port	a
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	

Table 1-10 RF Switch Ports and Line Card Ports for Line Card Slots 5/0 and 5/1 (continued)

Cable Color	Working Line Card Slot 5/0—Ports	RF Switch—Port	a	Protect Line Card Slot 5/1—Ports	RF Switch—Port	a
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	
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	
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	

Connecting the RF Cables (Cisco uBR10-MC5X20S/U/H)

This section describes connecting the Cisco uBR-MC5X20S/U/H cable interface line card to the RF switch. RF cable bundles are used to connect the Cisco uBR-MC5X20S/U/H cable interface line card to the CMTS, PROTECT, and CABLE PLANT portions of the Cisco uBR 3x10 RF Switches (RFS).

- CMTS—cabled to the designated working line cards.
- PROTECT—cabled to the designated protect line card.
- CABLE PLANT—cabled to the coaxial or fiber-optic transceivers at the cable headend or hub.



Note

Two Cisco uBR 3x10 RF Switches are required for this configuration, see [Figure 1-2 on page 1-3](#).

Equipment

- 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)
- 34 header blocks (for the CMTS, PROTECT, CABLE PLANT sections on the RF switch)
- Flat-blade screwdriver

**Note**

You can use any combination of dual- and quad-shielded cables, depending on personal preference and which MC5X20 boards you have installed.

In Europe only, the Cisco uBR10-MC5X20H card must use quad-shielded cables. In all other regions, the Cisco uBR10-MC5X20H card can use dual-shielded or quad-shielded cables.

The Cisco uBR10-MC5X20S and U can use dual-shielded or quad-shielded cables in all regions.

This procedure assumes that the RF cables are already installed in the universal cable holder (UCH) and mounted on the Cisco uBR-MC5X20S/U/H cable interface line card. If the cables have not been installed in the UCH 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/en/US/docs/interfaces_modules/cable/broadband_processing_engines/ubr10_mc5x20s_u_h/installation/guide/ubrmc520.html

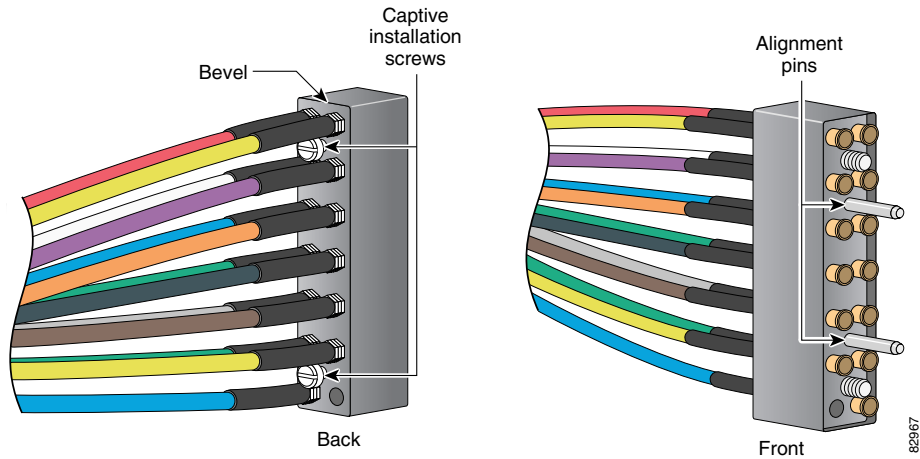
To connect the header blocks and install the cables on the RF switch, complete the following steps:

-
- Step 1** Install the header blocks on the Cisco uBR 3x10 RF Switches.
- 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 (CMTS, PROTECT, or CABLE PLANT) on the RF switch. See [Figure 1-15 on page 1-27](#).
 - Press the header block into place, using equal pressure on both the upper and lower portions of the header block.
- 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 according to the mapping in the “[Mapping the Working and Protect Cisco uBR10-MC5X20S/U/H Line Cards RF Cables to the RF Switch](#)” section on [page 1-21](#).
- For cabling locations, refer to:
- [Table 1-7 on page 1-22](#) for slot 8/0 and 8/1 working line card RF switch connections.
 - [Table 1-8 on page 1-23](#) for slot 7/0 and 7/1 working line card RF switch connections.
 - [Table 1-9 on page 1-23](#) for slot 6/0 and 6/1 working line card RF switch connections.
 - [Table 1-10 on page 1-24](#) 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.
- 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.

 **Caution**

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

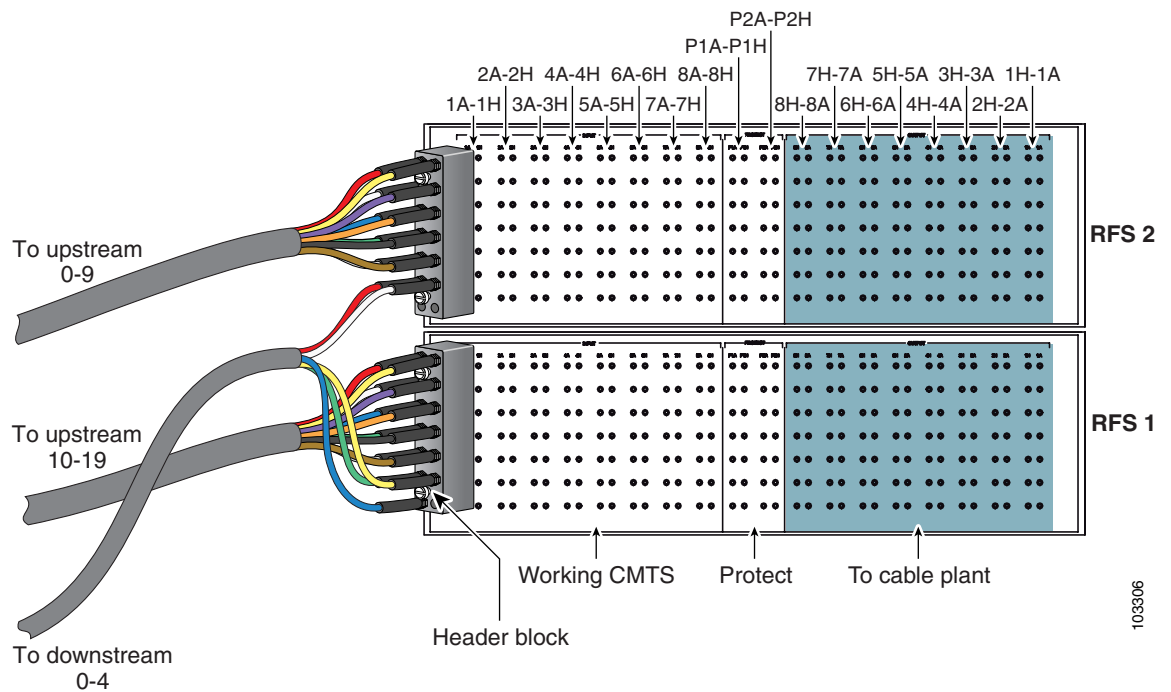
Figure 1-15 Cisco uBR 3x10 RF Switch Header Block with Cables Installed



 **Caution**

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

Figure 1-16 RF Switch MCX Connector Locations



**Tip**

Alternatively, 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.

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 1-11](#) for a list of the cable ports and associated cable color applicable when using MC5X20 dual/quad-shielded 10-color cables.

Table 1-11 MC5X20 Dual/Quad-Shielded 10-Color 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	Gray		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

Cabling the Output Cables (CABLE PLANT to HUB)

This section describes cabling the RF switch for output.

CABLE PLANT cable headers are wired in the reverse sequence of the CMTS and PROTECT headers (see [Figure 1-17 on page 1-29](#)). Use the same connection methods as described in:

- “[Mapping the Working and Protect Cisco uBR10-MC5X20S/U/H Line Cards RF Cables to the RF Switch](#)” section on page 1-21
- “[Connecting the RF Cables \(Cisco uBR10-MC5X20S/U/H\)](#)” section on page 1-25

**Note**

CABLE PLANT slots on the Cisco uBR 3x10 RF Switch are numbered in reverse sequence from CMTS and PROTECT. Slot number one is on the far right. Refer to [Figure 1-17 on page 1-29](#) for header block and cable designations as viewed from the cable side of the header blocks.

Equipment

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

To cable the output connections, complete the following steps. See [Figure 1-17 on page 1-29](#).

- Step 1** Install the header blocks on the CABLE PLANT section of the RF switch.
- Step 2** Install the output cables in the header blocks. Refer to the [“Connecting the RF Cables \(Cisco uBR10-MC5X20S/U/H\)” section on page 1-25](#) for MCX connector installation instructions.



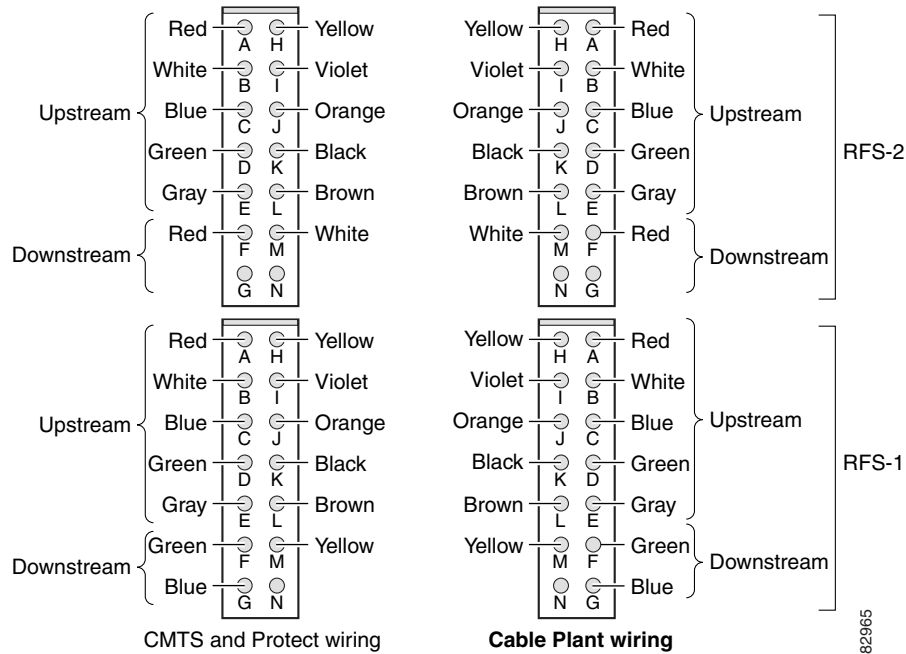
Note The output cables (CABLE PLANT) on the Cisco uBR 3x10 RF Switches are cabled in the reverse order of the input cables (CMTS).

- Step 3** Run the output cables (H–A) from header blocks to splitters, US laser receivers, or the low side of the diplex filters.
- Step 4** Run the output cables (M, F, G) to the splitters/combiners, DS laser transmitters, or the high side of the diplex filters.



Note N is not used.

Figure 1-17 *Wiring the Cable Plant Cable Headers (CMTS/Protect Headers Shown for Comparison)*



Powering On 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 uBR10012 CMTS 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 RF switch. The green LED on the power supply comes on.
- Step 4** During the boot process, monitor the Cisco uBR 3x10 RF Switch system initialization and LED behavior for any errors or failures.
-