Job Aid
Server and CSS Separation—Avaya S8700 Media Server

This job aid provides information regarding the separation of S8700 Media Servers and the Separation of duplicated Center Stage Switch (CSS) elements of Port Network Connectivity (PNC) in a critical reliability system. Separation of S8700 Media Servers is addressed first followed by CSS separation. Be aware that most of the typical server separation drawings show, at a high level, CSS separation. Refer to Overview of Center Stage Switch separation on page 13 for more detail.

Overview of server separation

This feature provides for the geographical separation of each S8700 Media Servers to improve their survivability. A maximum distance of 10km separation is supported. This maximum is dictated by the transceiver power budget available on the DAJ1 board (fiber duplication link) in the S8700 Media Servers. The actual distance may be less. It can be calculated based on details provided in the next section of this document.

Server separation is applicable to Avaya S8700 Media Servers in both Multi-Connect and IP-Connect configurations.

S8700 Media Server separation in its basic configuration is relatively straight-forward to implement. However, variations of the basic configuration introduce some complex issues and concerns. Each server separation design must be reviewed by the Avaya Technical Assistance Center for accuracy and technical feasibility.

Power budgets, specifications, and calculation factors

This section shows how to assure that the power required to drive the fiber optic cable between S8700 Media Servers does not exceed the Power Budget of the transceivers used. You may also use this section to calculate the maximum distance between S8700 Media Servers based on your configuration. There are three steps involved in making these calculations:

1. Calculate the Power Budget available with the transceivers used. See Optical power budgets on page 2 and Table 2, Power budget calculations for selected components, on page 3.
2. Estimate or measure the loss in the fiber and connections between sites. See Fiber optic calculation factors on page 4.

CAUTION:
Calculating the fiber connection loss and power budget provides a degree of confidence that the fiber will operate well, but it is **not a guarantee** that the link will operate. Actual measurement of the proposed fiber using a Optical Time Domain Reflectometer (OTDR) is **highly recommended** and yields the most accurate results.

3 Verify that the power budget is greater than or equal to the loss on the fiber optic cable between server locations.

Optical power budgets

The Optical Power Budget is the amount of light power available to drive data across a fiber optic connection. The power budget is calculated using the specifications for the fiber optic transceivers used at each end of a fiber connection. See Transceiver Specifications on page 2. Optical Power budget is calculated using the formula:

Power Budget = Minimum Transceiver Transmit Power - Minimum Transceiver Receive Sensitivity

Transceiver Specifications

This table details the essential parameters of selected optical components.

CAUTION:
With the 300A transceiver it is possible, when there is low loss in the fiber between 300A transceivers, that the receiver may saturate and not recover data correctly from the link. An in-line, single mode (1310 nm), attenuator may be required to increase the loss to greater than 10 dB but less than 17 dB. In-line attenuators are available that provide 5, 10, or 15 dB of attenuation.

Table 1: Transceiver Specifications

Specification	Allied Telesyn AT-MC103XL*	Allied Telesyn AT-MC102XL†	DAJ1 ‡	300A §	9823B¶	9823A**
Maximum Distance	15 km	2 km	10 km	35 km	25,000 feet	4900 feet
Fiber Connector Type	SC	SC	SC	ST-II	ST-II	ST-II
Transmitter Wavelength	1310 nm	1310 nm	1310 nm	1310 nm	1310 nm	850 nm
Mode Field Diameter	9 microns	62.5 nm	9 microns	9 microns	62.5 micron	62.5 micron
Cladding Diameter	125 micron	125 micron	N/A		125 micron	125 micron
Transmitter Output Power (Min.)	-15 dBm	-19 dBm	-9.5dBm	-8 dBm	-19 dBm	-18 dBm
Transmitter Output Power (Typical)	-11.5 dBm	-16.8 dBm	N/A	-8 dBm	-18 dBm	-17 dBm
Transmitter Output Power (Max)	-8 dBm	-14 dBm	-3 dBm	-5 dBm	-13 dBm	-12 dBm
Receiver Wavelength	1310 nm	1310 nm	1310 nm	1310nm	1310 nm	850 nm

1 of 2

Table 1: Transceiver Specifications

Specification	Allied Telesyn AT-MC103XL*	Allied Telesyn AT-MC102XL†	DAJ1 ‡	300A §	9823B¶	9823A**
Receiver Sensitivity (Minimum)	-31dBm	-31.8 dBm	-20 dBm	-30 dBm	-30 dBm	-30 dbm
Receiver Sensitivity (Typical)	-31dBm	-34.5 dBm	N/A	-30 dBm	-30 dBm	-30 dBm
Receiver Sensitivity (Saturation)	-8 dBm	-14 dBm	-3 dBm	-11 dBm	-11 dBm	-11 dBm
						2 of 2

* Single Mode Fiber Media Converter.

† MultiMode Fiber Media Converter.

‡ Fiber duplication optical interface in the S8700 media server.

§ Single mode fiber transceiver used for fiber connections between a expansion interface (EI) in a media gateway and switch node interface (SNI) in a Center Stage Switch.

¶ Multimode fiber transceiver employing a 1310 nanometer wavelength. Used for fiber connections between a expansion interface (EI) in a media gateway and a switch node interface (SNI) in a Center Stage Switch.

** Multimode fiber transceiver employing a 810 nanometer wavelength. Used for fiber connections between a expansion interface (EI) in a media gateway and a switch node interface (SNI) in a Center Stage Switch.

dBm	The measure of power loss with 1 milliwatt as the transmission reference.
nm	Nanometer

Table 2: Power budget calculations for selected components

Component	Fiber Type (wavelength)	Minimum Transmit Power	-	Minimum Receive Power	=	Power Budget
Allied Telesyn AT-MC103XL Media Converter	Single mode (1310 nm)	-15 dBm	-	-31 dBm	=	16 dB
Allied Telesyn AT-MC102XL Media Converter	Multi-mode (1310 nm)	-19 dBm	-	-31.8 dBm	=	12.8 dB
DAJ1	Single mode (1310 nm)	-9.5 dBm	-	-20 dBm	=	10.5 dB
300A Transceiver	Single mode	-8 dBm	-	-30 dBm	=	22 dB
9823B Transceiver	Multi-mode (1310 nm)	-19 dBm	-	-30 dBm	=	11 dB
9823A Transceiver	Multi-mode (850 nm)	-18 dBm	-	-30 dBm	=	12 dB

Fiber optic calculation factors

Various factors must be taken into account when estimating the loss over end to end fiber optic facilities. These include:

- Fiber attenuation per kilometer.
  - — Single-mode fiber typically measures 0.22dB to 0.5dB of loss per kilometer. Use the conservative value of 0.5dB per kilometer for power budget estimates.
  - — Multi-mode fiber, depending on which transmitter wavelength is used, produces two different loss factors. Use these values for power budget estimates:
    - 1300 nm (9823B) - 1 dBm of loss per kilometer
    - 850 nm (9823A) - 2.3 dBm of loss per kilometer
- Connector loss. A conservative value for connector loss budget estimates is 0.75 dB.
- Splice attenuation. A conservative value for splice loss budget estimates is 0.15 dB.
- Safety margin. A safety margin value takes into account unforeseen future changes such as, temperature extremes, additional connectors and splices. A minimum of 2.0dB of power budget must be set aside for a safety margin.

Calculations can be made using typical values for these factors. However, estimating the loss in a fiber connection does not guarantee that the connection functions. Actual measurement of the proposed fiber using a Optical Time Domain Reflectometer (OTDR) is **highly recommended** and yields the most accurate results.

Sample fiber loss calculations

Assuming a 7 kilometer fiber optic cable distance with two splices, and four connectors an example of calculations are shown in Table 3, Sample fiber loss calculations, on page 4:

Table 3: Sample fiber loss calculations

Fiber Type	Fiber Loss per kilometer		Connector loss		Splice Loss		Safety Margin		Overall Loss
Single-mode (1310 nm)	7 * 0.5	+	4 * 0.75	+	2 * 0.15	+	2.0	=	8.8 dB
Multi-mode (1310 nm)	7 * 1.0	+	4 * 0.75	+	2 * 0.15	+	2.0	=	12.3 dB
Multi-mode (850 nm)	7 * 2.3	+	4 * 0.75	+	2 * 0.15	+	2.0	=	21.4 dB

Comparing fiber loss estimates and power budgets

Using the sample fiber loss calculations shown in Table 3, Sample fiber loss calculations, on page 4 and the power budgets shown in Table 2, Power budget calculations for selected components, on page 3 several conclusions can be drawn.

- With single-mode fiber any of the single-mode transceivers are well within their power budgets.
- With multi-mode fiber, using either the 9823A or 9823B transceiver, the power budget is exceeded.

  The Allied Telesyn AT-MC102XL Media Converter is just within its power budget and actual measurement of the proposed fiber using a Optical Time Domain Reflectometer (OTDR) is **highly recommended** to assure that the connection operates properly.

Option switch settings

Allied Telesyn Media Converter

- Link Test/Missing Link button. Allows a link test to be performed on the media converter. The Link Test function is invoked when the button is in the *out* position.

  The missing link function enables the ports on the media converter to pass the link status of their connections to each other. For example, if the network twisted pair cable to the 100Base-TX port on the media converter were to fail, the media converter would respond by dropping the link on the 100 Base-FX fiber optic port. The Missing Link function is enabled when the button is in the *in* (default) position. For normal operation set the Link Test/Missing Link button in the out position.

  CAUTION:
  For normal operation set the **Link Test/Missing Link** button in the *out* position. If the button is left in the *in* position (Missing Link) the link will not automatically recover after network problems are encountered and resolved.

- Auto-negotiation button. When the button is *in* the auto-negotiation feature is on. When the button is *out* the auto-negotiation feature is off. For the duplication link between S8700 servers this features operation should mirror the administration setting for the duplication link on the server. If the server Ethernet port is set to *auto-negotiate* the button on the media converter should be in the *in* position. If the Ethernet port for the duplication link is explicitly set to half/full duplex the button on the media converter should be *out*.

  CAUTION:
  Setting the media converter to auto-negotiate and setting the S8700 Server to 100Mps/Full explicitly results in a duplex mismatch and cause error conditions on the link and degrade performance. Verify that the duplication ethernet port on the S8700 Server is set to auto-negotiate. Verify that the auto-negotiate button on the media converter is pushed *in*.

- MDI/MDI-X button. This button provides a crossover function on the RJ45 100BaseT port.
  When the button is pushed *in*, the connection is straight through.
  When the button is *out*, a crossover function is performed on the connection.

  The duplication link requires a crossover between the duplication ports on the S8700 Media Servers. When media converters are used back to back, as they are for S8700 Media Server separation, the fiber connection between media converters provides a crossover. This means that crossover Ethernet cables, or the crossover function of the media converter are not required. Verify that straight through CAT5 cables are used on both ends of the connection between the media servers and the media converters. Verify that the MDI/MDI-X option button is pushed *in* on both media converters. See Table 4, Typical Media Converter option switch settings, on page 6.

Table 4: Typical Media Converter option switch settings

Location 1			Location 2		
Missing Link/ Link Test	Auto Negotiate *	MDI/ MDI-X	Missing Link/ Link Test	Auto Negotiate *	MDI/ MDI-X
OUT	IN	IN	OUT	IN	IN

* Verify that the Ethernet port on either the media server or the control network Ethernet switch is also set to *auto-negotiate*.

Allied Telesyn Media Converter LEDs

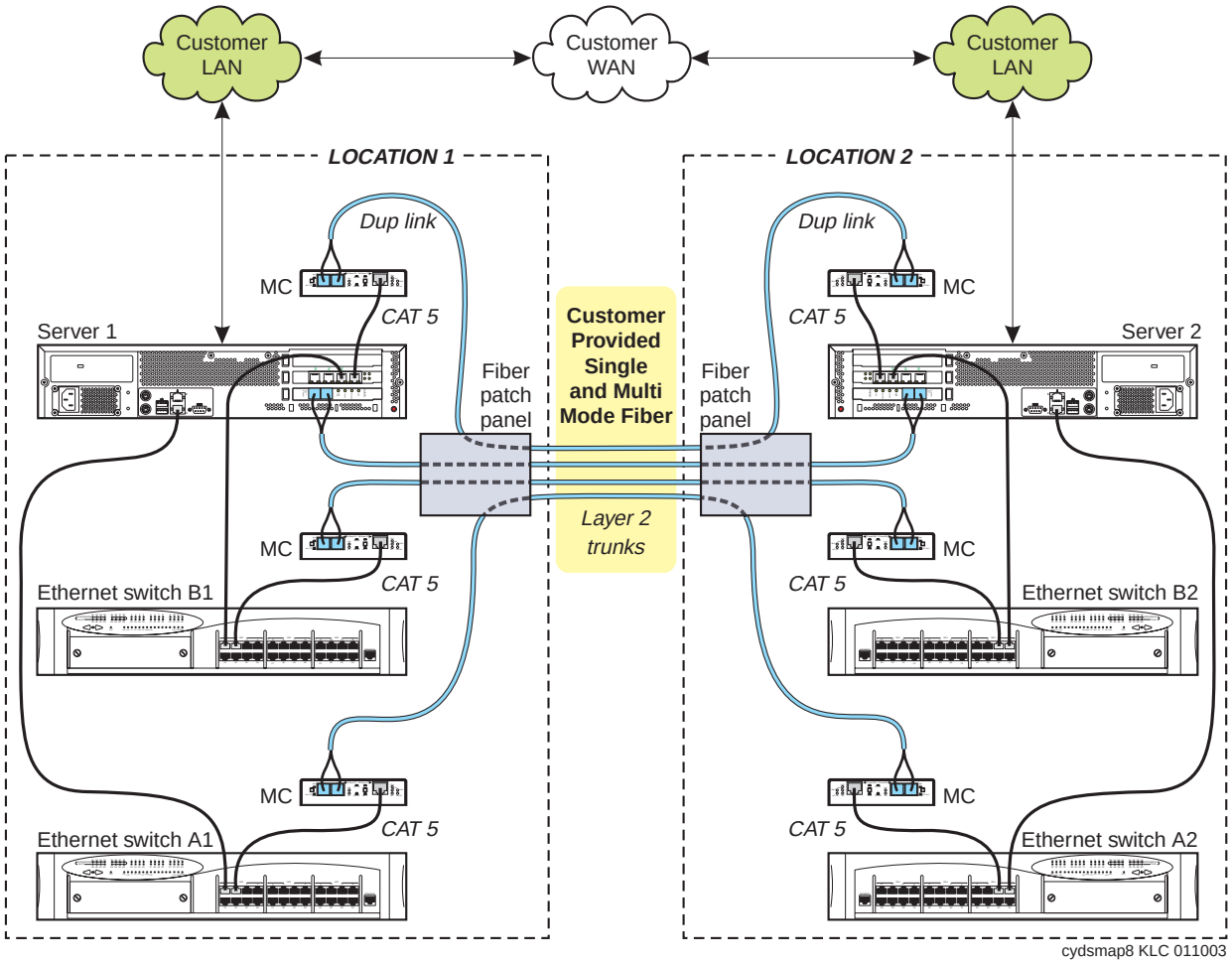
See Table 5, Allied Telesyn Media Converter Status LEDs, on page 6 for Light Emitting Diode (LED) definitions and states for normal operation.

Table 5: Allied Telesyn Media Converter Status LEDs

LED	Normal State	Description
LNK	On	A link has been established on the port. There are two *LNK* LEDs on each media converter. One for the 100Base-FX fiber optic port and one for the 100Base-TX twisted pair port. During normal operation they should both be on.
ACT	On or Flash	Data is being received on the port. There are two *ACT* LEDs on each media converter. One for each port.
FDX	On	Indicates the unit is operating in full-duplex mode.
PWR	On	Power is applied to the media converter.
M/L ON	OFF	The Missing Link feature is disabled.

Basic media converter connections

Figure 1: Media Converter—Ethernet and Fiber connections



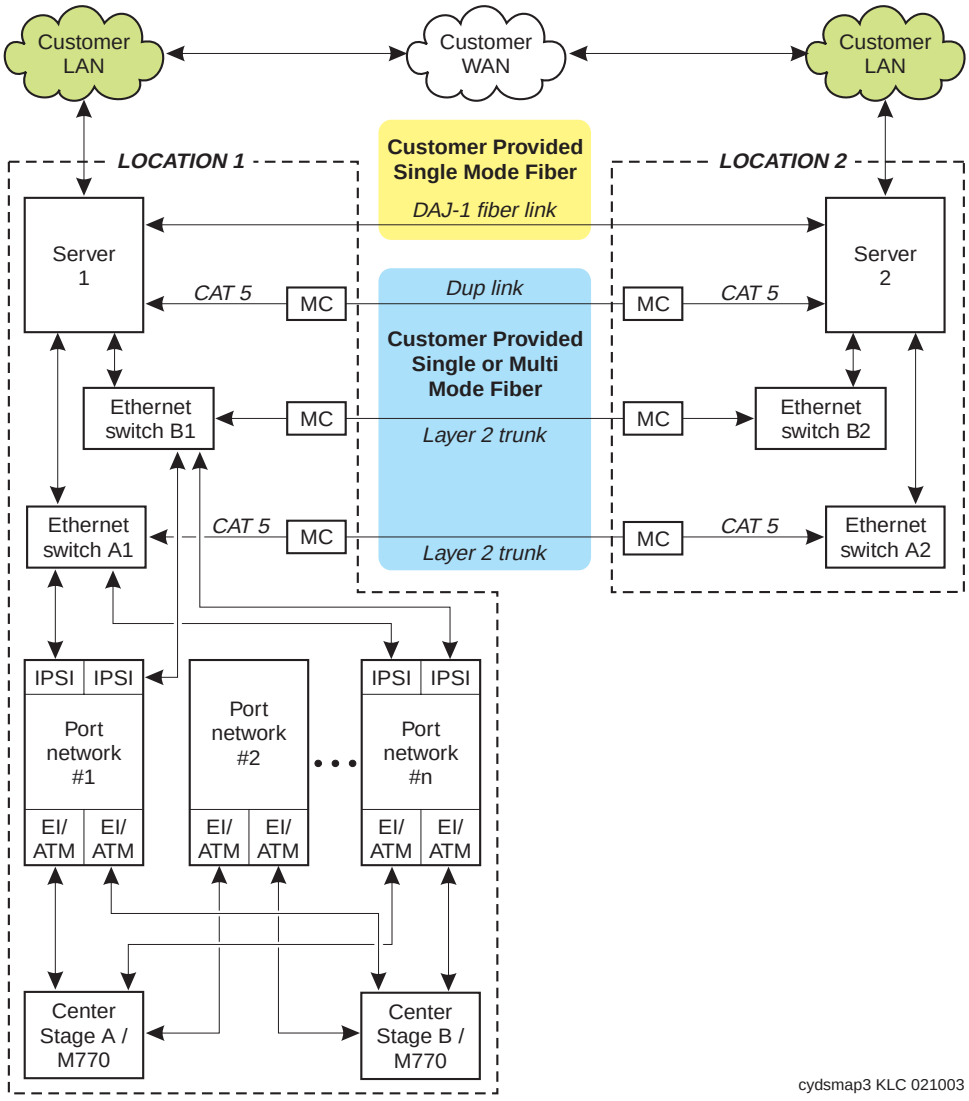
MC = Media Converter (Fiber/Copper)
NOTE: The duplication link fiber connection must be single-mode fiber.

Typical server separation configurations

Included here are six typical configurations. The first five of these configurations concern the S8700 Multi-Connect while the last one addresses the S8700 IP connect. Note that with the control and bearer signals carried on the customer's non-dedicated network, S8700 IP Connect is by far the simplest of server separation configurations. Category 5 (Cat 5) Ethernet cabling is the minimum level supported.

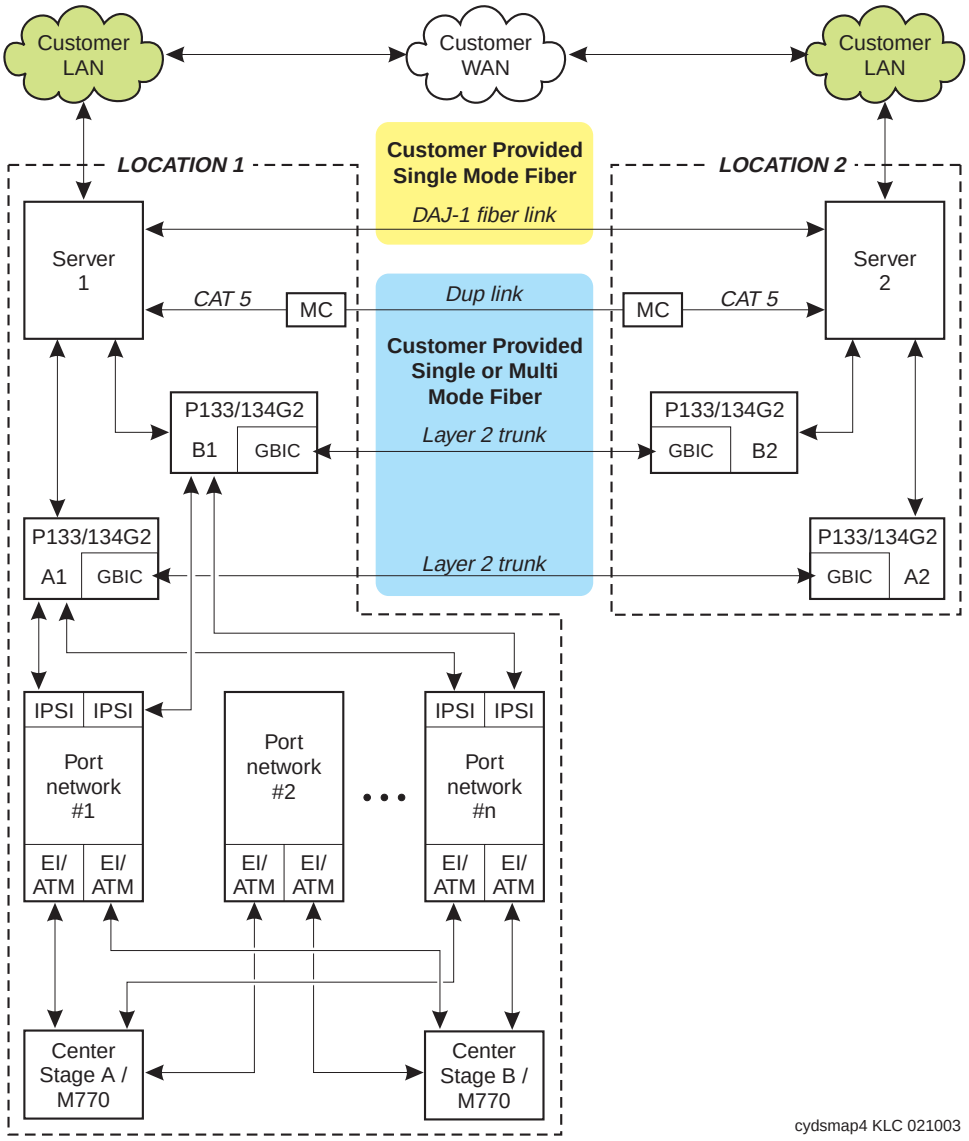
Basic separation—100BaseT FX trunks (Multi-Connect configuration)

Figure 2: Basic separation—100BaseT FX trunks (Multi-Connect configuration)



Basic separation—GBIC FX trunks (Multi-Connect configuration)

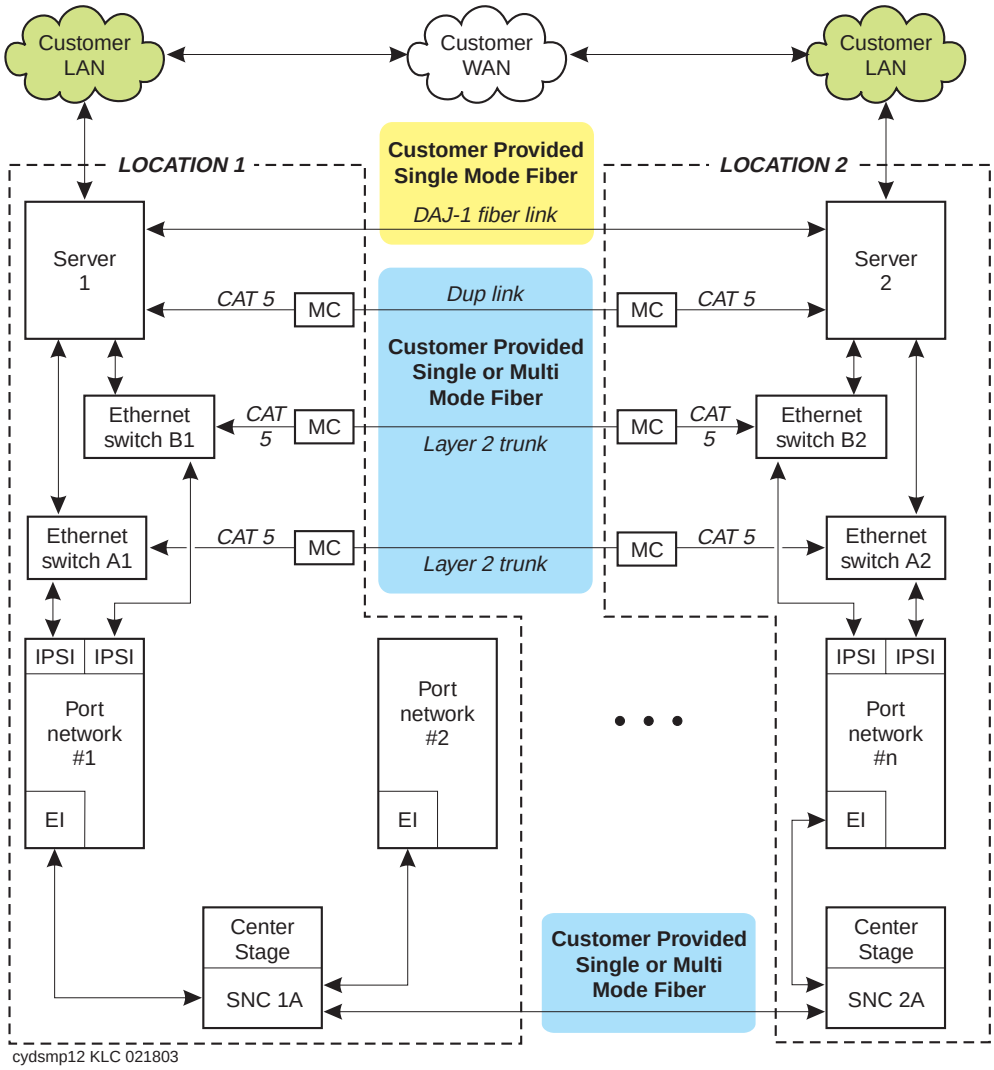
Figure 3: Basic separation—GBIC FX trunks (Multi-Connect configuration)



GBIC = GigaBit Interface Converter

Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration —high reliability)

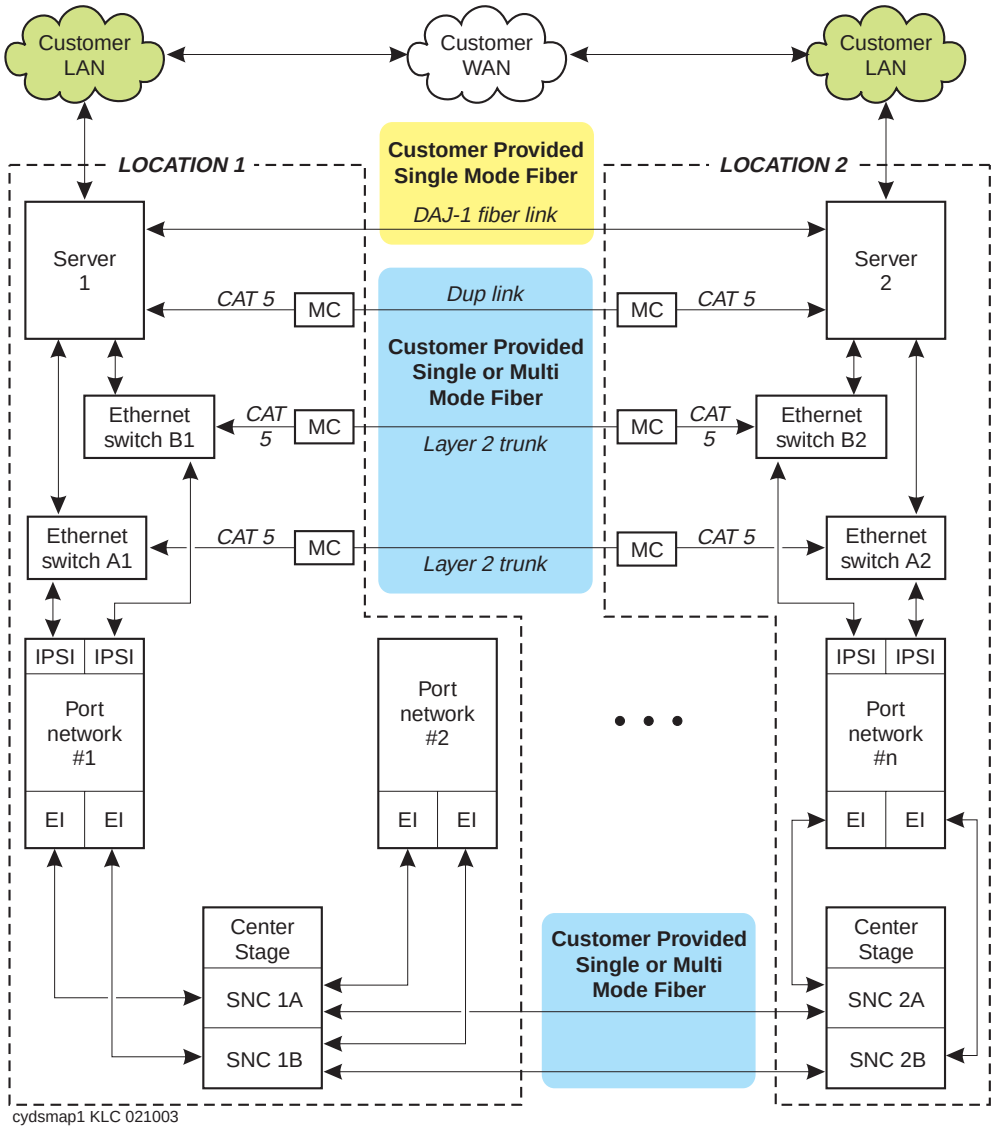
Figure 4: Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—high reliability)



NOTE:
Figure 4, Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—high reliability), on page 10 depicts high reliability separated switch nodes.

Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability)

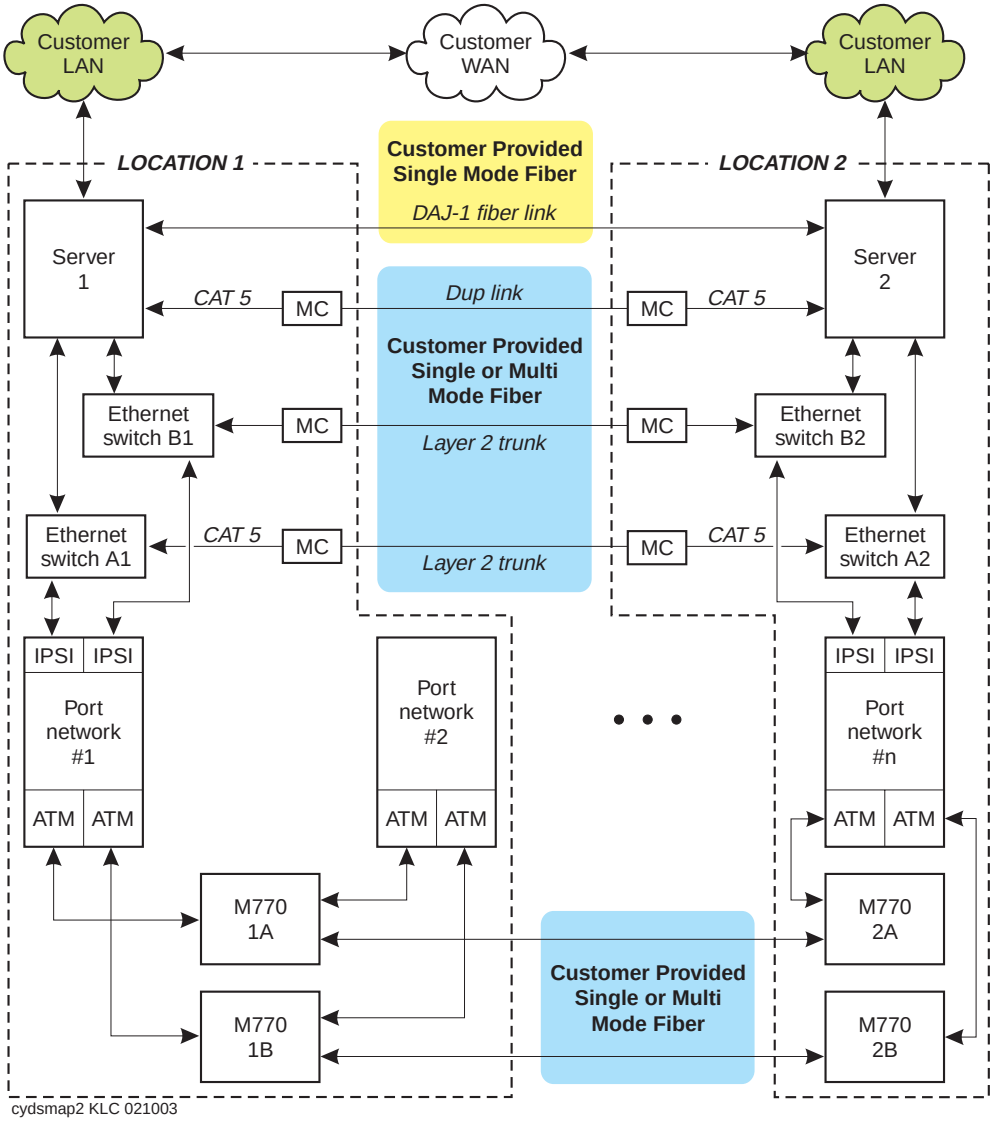
Figure 5: Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability)



NOTE:
Figure 5, Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability), on page 11 depicts critical reliability separated switch nodes.

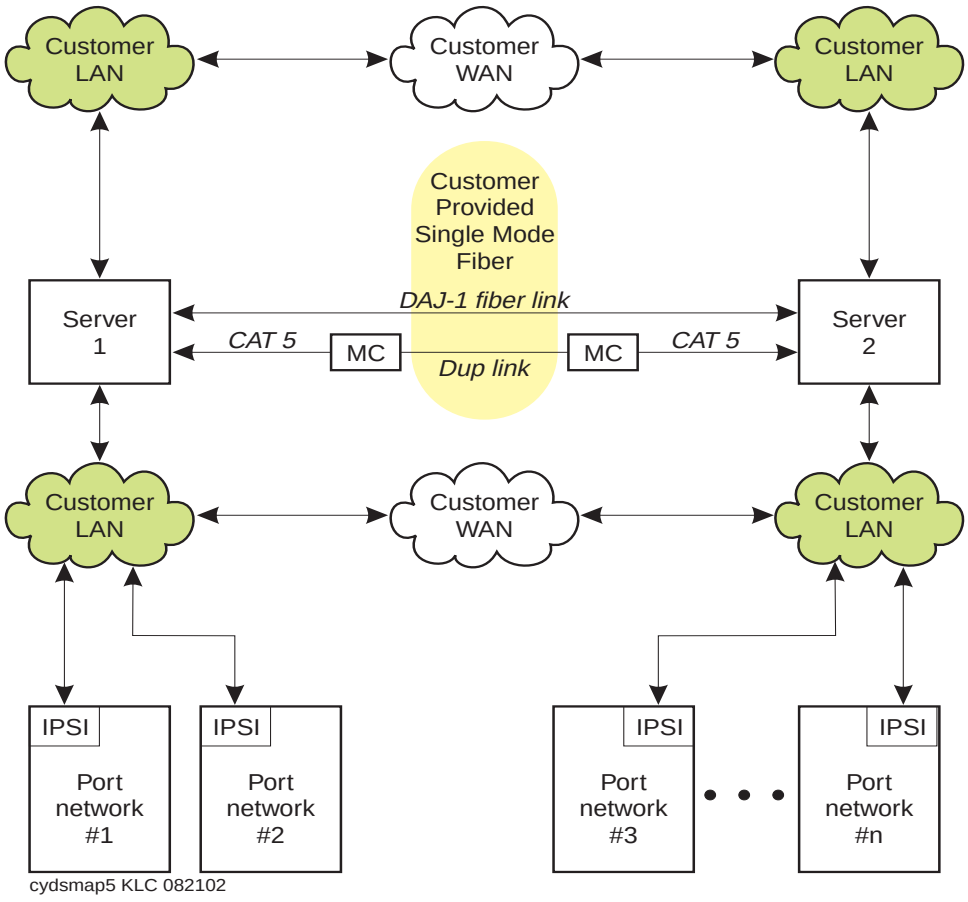
Server and CSS separation—GBIC FX trunks (Multi-Connect configuration)

Figure 6: Server and CSS separation—ATM CSS (Multi-Connect configuration—critical reliability)



Basic separation—IP Connect

Figure 7: Basic separation—IP Connect



Overview of Center Stage Switch separation

Center Stage Switch—High Level Description

Multi-Connect systems with four or more port networks (PNs) may use a Center Stage Switch (CSS) to interconnect the PNs. The CSS is comprised, depending on the number of equipped PNs, of one, two, or three switch node carriers (SNC). The SNC contains switch node interface (SNI) circuit packs that terminate the fiber connection from a expansion interface (EI) circuit pack in a PN. Switch node carriers are also referred to simply as switch nodes and are numbered 1, 2, and 3. The first switch node supports 16 PNs. When more than one switch node is required they are interconnected with fiber using SNIs at each end.

The CSS, as a whole, is referred to by letter with the initial CSS (duplex and high reliability) being A. The largest configuration available (44 PNs) would consist of switch nodes 1A, 2A, and 3A. The CSS

and its associated fiber connections and EI circuit packs are also referred to as the port network connectivity (PNC). You may see references, especially on administration screens, to A-PNC (standard, high and critical reliability) and B-PNC (critical reliability).

The CSS may be duplicated to provide critical reliability. When duplicate CSS connectivity is provided, the second CSS is referred to as the B CSS or B-PNC. All components are duplicated including SNCs, SNIs, fiber connections, and EIs in the port networks. With duplicate CSS connectivity each switch node consists of two separate SNCs, one from each PNC. The first switch node is comprised of 1A and 1B, the second switch node is 2A and 2B, and the last switch node is 3A and 3B.

CSS Separation configurations

There are two configurations that may be considered for separation of the CSS.

- The first configuration (See Figure 4, Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—high reliability), on page 10) consists of separated ***switch nodes.*** For the A-PNC, the first switch node (1A) is at location 1 and the second switch node (2A) is at location 2. For critical reliability the duplicate switch nodes for the B-PNC are similarly separated (See Figure 5, Server and CSS separation—100BaseT FX trunks (Multi-Connect configuration—critical reliability), on page 11).

  These switch nodes, 1A to 2A and 1B to 2B, are linked together by fiber connections between locations.

  With these configurations the fiber connections from the PNs go to the switch node that they are closest to or collocated with.

- The second configuration type (See Figure 8, CSS Separation example—SNC in different cabinets, on page 16) consists of separated, duplicate switch nodes. With this configuration the switch nodes that comprise the A-PNC are located at one location and the switch nodes that comprise the B-PNC are located at the other location. At each location the switch nodes are linked together by fiber connections. Each SNC is located in the E carrier position of its cabinet.

  With this configuration each PN is connected, via fiber, to each CSS. This results in more long range fiber connections.

  NOTE:
  Figure 8, CSS Separation example—SNC in different cabinets, on page 16 shows a duplicate two switch node configuration that would be required to support more than 15 port networks. For smaller configurations (15 port networks or less) the 2A and 2B switch node carriers would not be required.

Center Stage Switch separation administration

Switch Node Carrier administration

Locating switch node carriers at separate locations does not impact their translation. Each SNC must have its duplicate specified on the **add/change cabinet** administration screen. See Figure 9, CSS Separation Cabinet 1 administration, on page 17 through Figure 12, CSS Separation Cabinet 5 administration, on page 19 for examples of typical cabinet translations.

The installation of Switch Node Interface circuit packs for connection to PNs is in alternating order working from the extreme left and right of the carrier inwards for each CSS location, starting on the left.

DS1C remote port networks

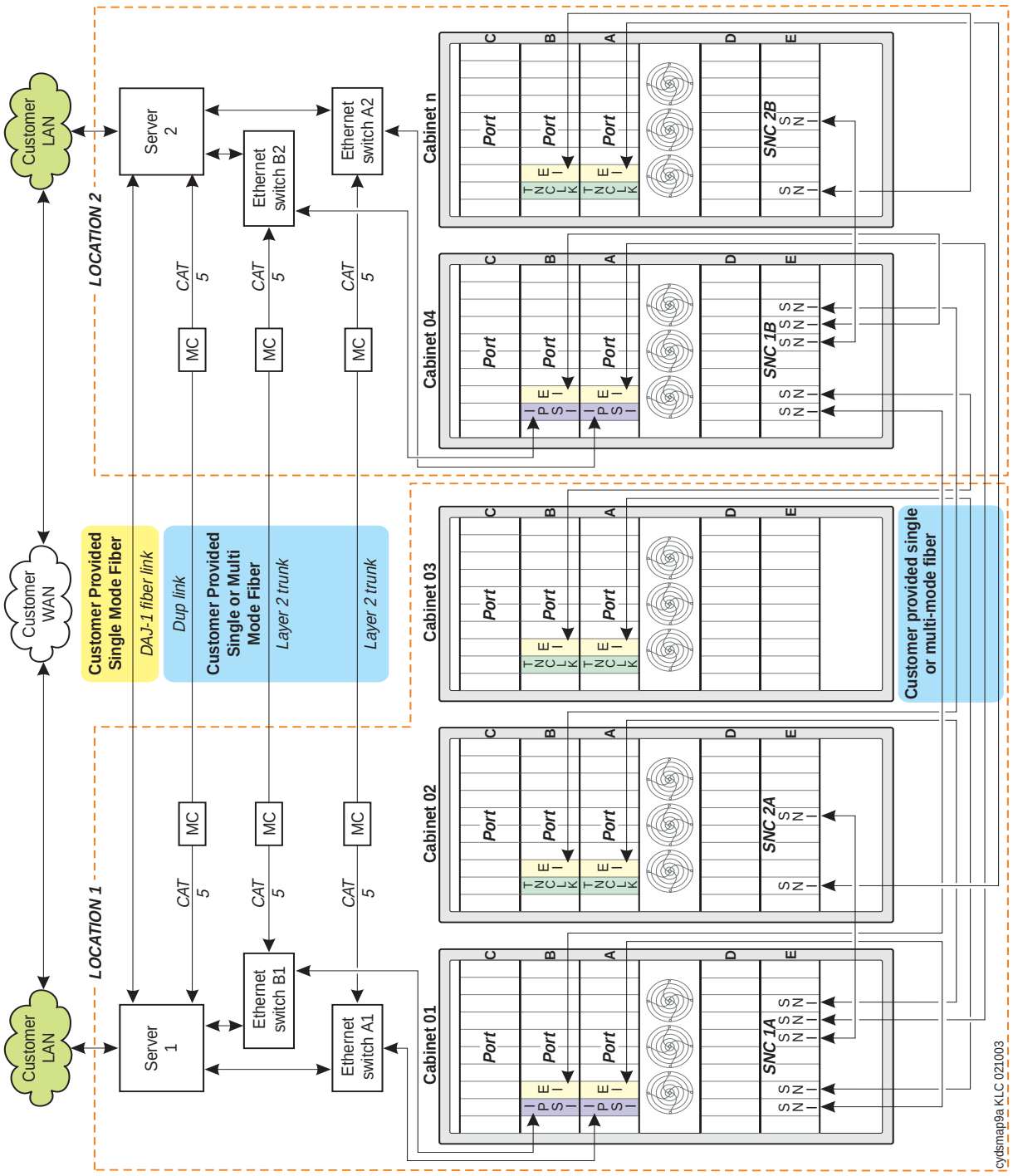
A Switch Node Carrier **cannot** be located in a DS1C-remoted port network.

Fiber link administration

Fiber link administration is not affected by CSS Separation.

NOTE:
Many installations may use multi-mode fiber for the connection from a PN to the collocated CSS while single-mode fiber is used to connect the PN to the distant CSS. There is a field on the fiber link administration form (Fiber Translation) that specifies the fiber type for **both** fiber runs, i.e. multi-mode or single-mode. See Figure 13, Fiber Link administration, on page 19. This is an information only field that can be set to either value. Be careful to properly document the actual fiber type used for each PN. This may assist any future maintenance activity that is required.

Figure 8: CSS Separation example—SNC in different cabinets



Typical SNC administration screen captures

Figure 9, CSS Separation Cabinet 1 administration, on page 17 through Figure 13, Fiber Link administration, on page 19 are typical translations for the configuration shown in Figure 8, CSS Separation example—SNC in different cabinets, on page 16.

Figure 9: CSS Separation Cabinet 1 administration

```
display cabinet 1
                                    CABINET
 CABINET DESCRIPTION
                  Cabinet: 1
            Cabinet Layout: five-carrier
              Cabinet Type: expansion-portnetwork
   Number of Portnetworks: 1
    Survivable Remote EPN? n
                  Location: 1
         Cabinet Holdover: A-carrier-only
                      Room:              Floor:             Building:

 CARRIER DESCRIPTION
   Carrier       Carrier Type        Number      Duplicate

      C          not-used            PN  01
      B          port                PN  01
      A          expansion-control   PN  01
      X          Fan
      D          not-used            PN  01
      E          switch-node         SN  01        04E


Command:
```

Figure 10: CSS Separation Cabinet 2 administration

```
display cabinet 2
                                    CABINET
 CABINET DESCRIPTION
                  Cabinet: 2
            Cabinet Layout: five-carrier
              Cabinet Type: expansion-portnetwork
   Number of Portnetworks: 1
    Survivable Remote EPN? n
                 Location: 1
          Cabinet Holdover: A-carrier-only
                      Room:              Floor:             Building:

 CARRIER DESCRIPTION
   Carrier       Carrier Type        Number     Duplicate

      C        not-used              PN  02
      B        port                  PN  02
      A        expansion-control     PN  02
      X        Fan
      D        not-used              PN  02
      E        switch-node           SN  02       05E


Command:
```

Figure 11: CSS Separation Cabinet 4 administration

```
display cabinet 4
                                    CABINET
 CABINET DESCRIPTION
                  Cabinet: 4
            Cabinet Layout: five-carrier
              Cabinet Type: expansion-portnetwork
   Number of Portnetworks: 1
    Survivable Remote EPN? n
                 Location: 2
          Cabinet Holdover: A-carrier-only
                      Room:              Floor:             Building:

 CARRIER DESCRIPTION
   Carrier       Carrier Type        Number     Duplicate

      C        not-used              PN  04
      B        port                  PN  04
      A        expansion-control     PN  04
      X        Fan
      D        not-used              PN  04
      E        dup-switch-node       SN  01       01E


Command:
```

Figure 12: CSS Separation Cabinet 5 administration

```
display cabinet 5
                                  CABINET
 CABINET DESCRIPTION
                 Cabinet: 5
           Cabinet Layout: five-carrier
             Cabinet Type: expansion-portnetwork
   Number of Portnetworks: 1
    Survivable Remote EPN? n
                 Location: 2
         Cabinet Holdover: A-carrier-only
                     Room:              Floor:             Building:

 CARRIER DESCRIPTION
   Carrier       Carrier Type        Number     Duplicate

      C        not-used             PN  05
      B        port                 PN  05
      A        expansion-control    PN  05
      X        Fan
      D        not-used             PN  05
      E        dup-sw-node          SN  02       02E


Command:
```

Figure 13: Fiber Link administration

```
display fiber-link 1
                           FIBER LINK ADMINISTRATION

Fiber Link #: 1
Is one endpoint remoted via DS1 Converter Complex? no

             ENDPOINT-1                              ENDPOINT-2
              (A-PNC)                                 (A-PNC)
         Board Location: 01A01                   Board Location: 01E04
         Board Type: ei                          Board Type: sni



             ENDPOINT-1                              ENDPOINT-2
              (B-PNC)                                 (B-PNC)
         Board Location: 01B02                   Board Location: 04E04
         Board Type: ei                          Board Type: sni



         Fiber Translation: multi-mode           Converter? no
         Type of Transceivers: A
```