Advanced Technology Group

IBM

DS8000 Host Adapter Configuration Guidelines

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R9.3

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Document Outline

- General Host Adapter Information and Factory Install Sequence
  - DS8900F Family
  - DS8880 Family
  - DS8870 Family
  - Prior Generations
- Host Adapter and Host Port Best Practices and Performance Guidance
- Specific Host Adapter Install sequence diagrams
  - DS8900F Family
  - DS8880 Family
  - DS8870 Family
  - Prior Generations
- zHyperlink Information
- Transparent Cloud Tiering Information

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DS8950F/DS8980F Port Counts and HA Card Installation Sequence

- DS8950F/DS8980F (996/998/E96) – 16 Gb and 32 Gb host adapters
  - Host adapter cards may be installed in Frame 1 and Frame 2 (if present)
  - For dual frame configurations, the adapters should be ordered with ½ of the adapters in each frame
  - Subsystems should be configured to avoid having only 1 I/O enclosure pair in a frame, either base or expansion
  - Maximum port count is 128 – maximum adapter count is 32 (16 in base frame + 16 in expansion frame)
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 8 I/O enclosures (4 pairs)
  - Installation order of adapters from the factory:
    - 32 Gb 4-port Long Wave host adapters
    - 32 Gb 4-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters

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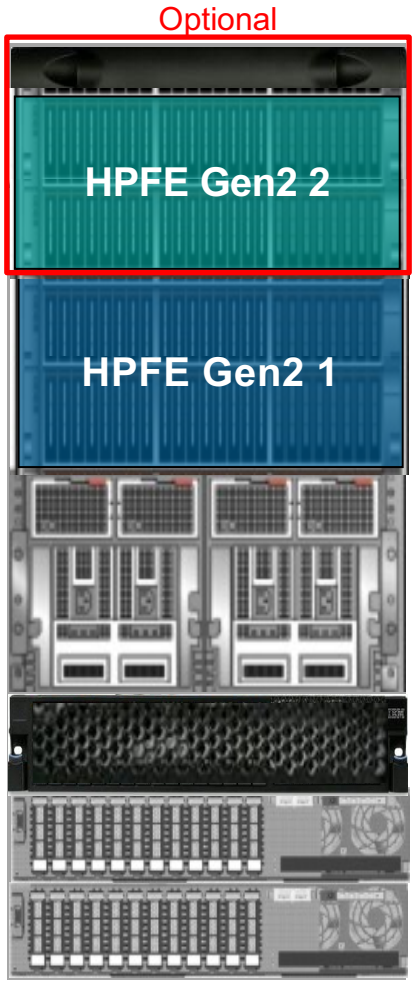
DS8910F Port Counts and HA Card Installation Sequence

- DS8910F (993) – 16 Gb and 32 Gb host adapters
  - Host adapter cards may be installed in the single I/O enclosure pair
  - Maximum port count is 32 – maximum adapter count is 8
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 2 I/O enclosures (1 pair)
  - Installation order of adapters from the factory:
    - 32 Gb 4-port Long Wave host adapters
    - 32 Gb 4-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters
  - Note: Model 993 pictured here is for installation in a customer supplied rack. If installed in an IBM Z frame, the keyboard and display, and “HPFE Gen2 2” at the top of the picture cannot be included



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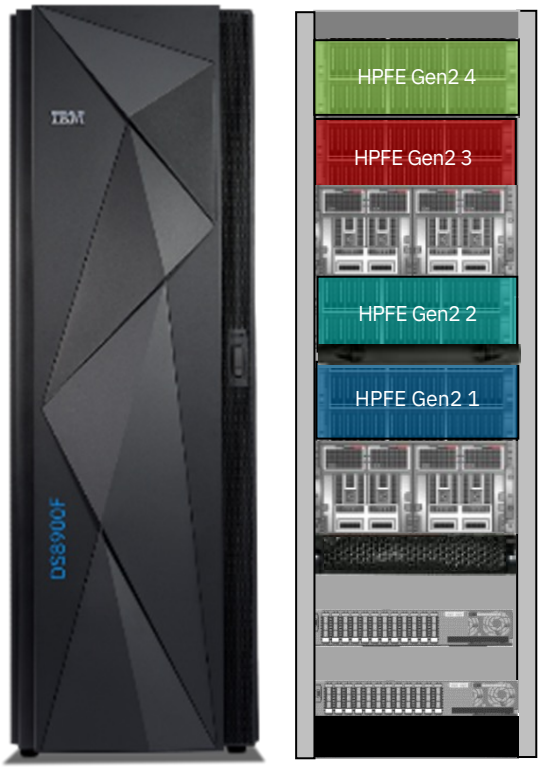
DS8910F Port Counts and HA Card Installation Sequence

- DS8910F (994) – 16 Gb and 32 Gb host adapters
  - Host adapter cards may be installed in one or two I/O enclosure pairs, both in the base frame
  - Maximum port count is 64 – maximum adapter count is 16
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 4 I/O enclosures (2 pair)
  - Installation order of adapters from the factory:
    - 32 Gb 4-port Long Wave host adapters
    - 32 Gb 4-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters



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DS8888 Port Counts and HA Card Installation Sequence

- DS8888 (982/988) – 8 Gb and 16 Gb host adapters
  - DS8888 is an all flash version of DS8880 family
  - Host adapter cards may be installed in Frame 1 and Frame 2 (if present)
  - Maximum port count is 128 – maximum adapter count is 32 (16 in base frame + 16 in first expansion frame)
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 8 I/O enclosures (4 pairs)
  - Installation order of adapters from the factory:
    - 8 Gb 8-port Long Wave host adapters
    - 8 Gb 8-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters
    - 8 Gb 4-port Long Wave host adapters
    - 8 Gb 4-port Short Wave host adapters
  - Special note:
    - If an 8-port host adapter is installed into card slot 1, then card slot 2 cannot be utilized
    - If an 8-port host adapter is installed into card slot 4, then card slot 5 cannot be utilized

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DS8886 Port Counts and HA Card Installation Sequence

- DS8886 (981/984/985) – 8 Gb and 16 Gb host host adapters
  - Host adapter cards may be installed in Frame 1 and Frame 2 (if present)
  - Maximum port count is 128 – maximum adapter count is 32 (16 in base frame + 16 in first expansion frame)
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 8 I/O enclosures (4 pairs)
  - Installation order of adapters from the factory:
    - 8 Gb 8-port Long Wave host adapters
    - 8 Gb 8-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters
    - 8 Gb 4-port Long Wave host adapters
    - 8 Gb 4-port Short Wave host adapters
  - Special note:
    - If an 8-port host adapter is installed into card slot 1, then card slot 2 cannot be utilized
    - If an 8-port host adapter is installed into card slot 4, then card slot 5 cannot be utilized

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DS8884 Port Counts and HA Card Installation Sequence

- DS8884 (980/984) – 8 Gb and 16 Gb host host adapters
  - Host adapter cards may be installed in Frame 1 or Frame 2 (if present)
  - Maximum port count is 64 – maximum adapter count is 16 (8 in base frame + 8 in first expansion frame)
  - Maximum ports per I/O enclosure is 16 ports – there can be up to 4 I/O enclosures (2 pairs)
  - Installation order of adapters from the factory:
    - 8 Gb 8-port Long Wave host adapters
    - 8 Gb 8-port Short Wave host adapters
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters
    - 8 Gb 4-port Long Wave host adapters
    - 8 Gb 4-port Short Wave host adapters
  - Special note:
    - If an 8-port host adapter is installed into card slot 1, then card slot 2 cannot be utilized
    - If an 8-port host adapter is installed into card slot 4, then card slot 5 cannot be utilized

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DS8870 Port Counts and HA Card Installation Sequence

- DS8870 (961) – 8 Gb and 16 Gb host adapters
  - Host adapter cards may be installed in Frame 1 or Frame 2 (if present)
  - Rack 1 optionally may have only one pair of I/O enclosures
  - Maximum port count is 128 – maximum adapter count is 16
  - DS8870 Host adapter install order into slots:
    - 16 Gb 4-port Long Wave host adapters
    - 16 Gb 4-port Short Wave host adapters
    - 8 Gb 8-port Long Wave host adapters
    - 8 Gb 4-port Long Wave host adapters
    - 8 Gb 8-port Short Wave host adapters
    - 8 Gb 4-port Short Wave host adapters

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DS8800 Port Counts and HA Card Installation Sequence

- DS8800 (951) – 8 Gb host adapters
  - Host adapter cards may be installed in Frame 1 or Frame 2 (if Frame 2 present)
    - Standard configuration would have two pairs of I/O enclosures in Frame 1 (4 enclosures total)
    - If present, first expansion frame would have two additional pairs of I/O enclosures (4 additional enclosures)
    - Frame 1 optionally may have only one pair of I/O enclosures for smaller Business Class configurations
  - Maximum port count is 128 – maximum adapter count is 16
  - DS8800 Host adapter install order into slots:
    - 8 Gb 8-port long wave
    - 8 Gb 4-port long wave
    - 8 Gb 8-port short wave
    - 8 Gb 4-port short wave

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DS8700 Port Counts and HA Card Installation Sequence

- DS8700 (941) – 4 Gb and 8 Gb host adapters
  - Host adapter cards may be installed in Frame 1 or Frame 2 (if present)
  - Frame 1 optionally may have only one pair of I/O enclosures
  - Maximum port count is 128 – maximum adapter count is 32
  - DS8700 Host adapter install order into slots:
    - 8 Gb 4-port long wave
    - 8 Gb 4-port short wave
    - 4 Gb 4-port long wave
    - 4 Gb 4-port short wave

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DS8300 Port Counts and HA Card Installation Sequence

- DS8300 (922/932) – 2 Gb and 4 Gb host adapters
  - Host adapter cards may be installed in Frame 1 or Frame 2 (if present)
  - Maximum port count is 128 – maximum adapter count is 32
  - DS8300 Host adapter install order into slots:
    - 4 Gb 4-port long wave
    - 4 Gb 4-port short wave
    - 2 Gb 4-port long wave
    - 2 Gb 4-port short wave

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DS8100 Port Counts and HA Card Installation Sequence

- DS8100 (921/931) – 2 Gb and 4 Gb host adapters
  - All host adapter cards are installed in base frame (Frame 1)
  - Optional expansion frame does not support additional host adapter cards
  - Maximum port count is 64 – maximum adapter count is 16
  - DS8100 Host adapter install order into slots:
    - 4 Gb 4-port long wave
    - 4 Gb 4-port short wave
    - 2 Gb 4-port long wave
    - 2 Gb 4-port short wave

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Host Adapter Performance Considerations

- A single host adapter will not provide full line rate bandwidth with all ports active
  - **Customers should not plan to drive the Ports/Links/Host Adapters to their defined limits**
- Most of these recommendations will be needed in cases where the utilization is high
  - Running only 10 MB per second per port will never overload a host adapter
  - But trying to run 400 MB per channel will definitely have severe performance impact when all ports are used for example with 2 Gb or 4 Gb host adapter cards
- If in doubt, get RMF, Spectrum Control, or Storage Insights performance data and use Disk Magic or StorM modelling tool for recommended adapter counts
- Start planning for additional resources when you reach approximately 50% of the maximum values during some intervals (and not a single number for one day)
- Each DS8000 host port has an internal queue depth of 2,048 per port

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Port / Host Adapter Utilization Guidelines

Metric	Green	Amber	Red
FICON Host Adapter Utilization Percent	< 35%	35%	60%
FICON Port Utilization Percent	< 35%	35%	50%
Fibre Host Adapter Utilization Percent	< 60%	60%	80%
Fibre Port Utilization Percent	< 60%	60%	80%
Metro and Global Mirror Link Utilization Percent	< 60%	60%	80%
zGM (XRC) Link Utilization Percent	< 60%	60%	80%

- The table above is produced and documented by the StorM and Disk Magic modeling tools and the values represent IBM recommendations at the time that this document was published

Best practice is to keep utilization not to exceed Amber levels

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Port Assignment Best Practices

- Spreading a Host workload or PPRC workload over Host Adapters in 4 I/O enclosures (single frame) or 8 I/O enclosures (two frames) will result in workload being spread evenly over internal DS8000 resources
- Always have symmetric pathing by connection type (i.e., use the same number of paths on all host adapters used by each connection type). For z/OS, all path groups should be symmetric (i.e., uniform number of ports per HA) and spread path groups as widely as possible across all CKD host adapters
- Always have additional (redundant) resources in case of failure – best practices is to plan for host adapter, SAN network or even enclosure failure
- Size the number of host adapters needed based on expected aggregate maximum bandwidth and maximum IOPS (use Disk Magic, StorM, or other common sizing methods based on actual or expected workload

Note: These recommendations are from the DS8000 host adapter perspective are not intended to address SAN or FICON fabric considerations

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Port Assignment Best Practices - continued

- Consider using 8-port 8 Gb/second host adapters for connectivity only – use 4-port 8 Gb/second host adapters to meet maximum bandwidth requirements if using 8 Gb adapters

- Sharing different connection types (FCP and FICON) within an I/O enclosure and host adapter is encouraged
  - Corollary: dedicating entire adapters for FICON vs PPRC is not encouraged, unless all 32 host adapters are being deployed, in which case you may benefit from dedicated adapters

- When utilizing multipathing, try to zone ports from different I/O enclosures to provide redundancy and balance (i.e., include port from a host adapter in enclosure 0 and enclosure 1)

- Don’t share a mainframe CHPID with tape and disk devices
  - Keep large block and small block transfers isolated to different host adapter ports

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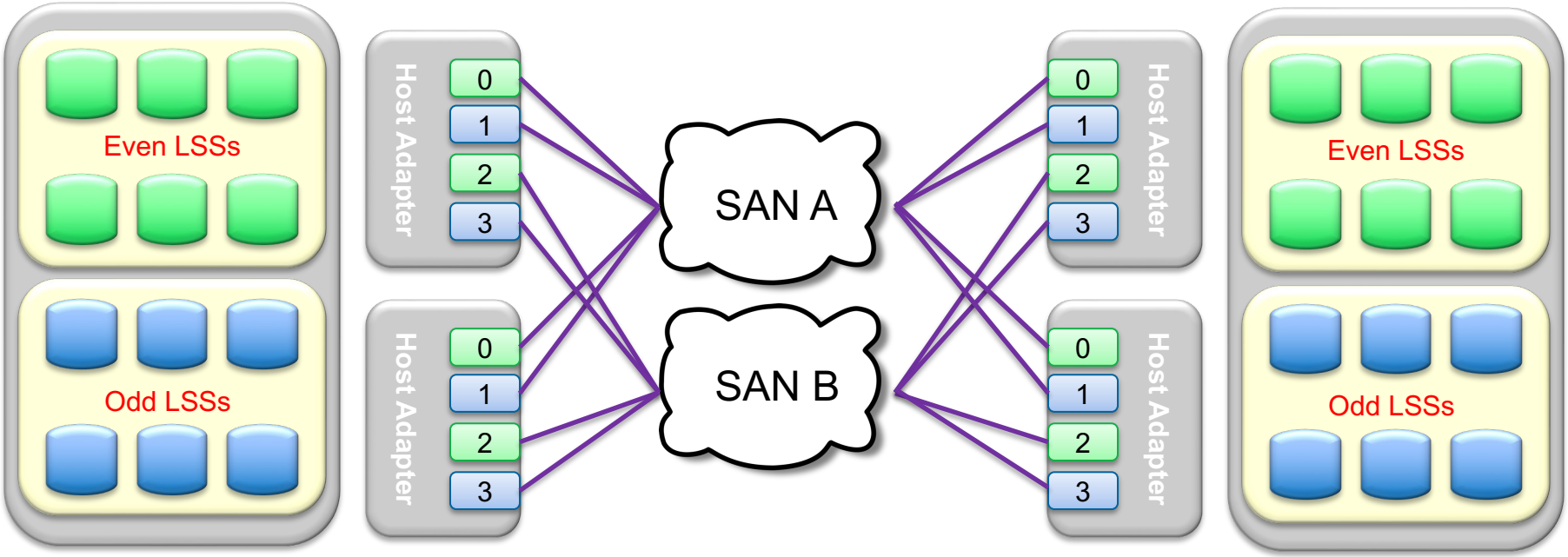
Replication Port Best Practice (1 of 2)



- Replication – for best performance:
  - Replication port pairs (primary to secondary) should be zoned 1:1
  - With current DS8000 models, there is no need to separate host ports from replication ports on the same adapter since unlike the earlier adapters a single port cannot overload the total bandwidth or CPU of the host adapter
  - Avoid using FCP ports for both host attachment and replication
  - For async replication (Global Copy or Global Mirror), assign even and odd LSS/LCU to different ports
  - Do not allow a Metro Mirror source port to also be a Global Copy or Global Mirror source port. Heavy preference will be given to the MM function, and the GC/GM function will be limited in its throughput capability

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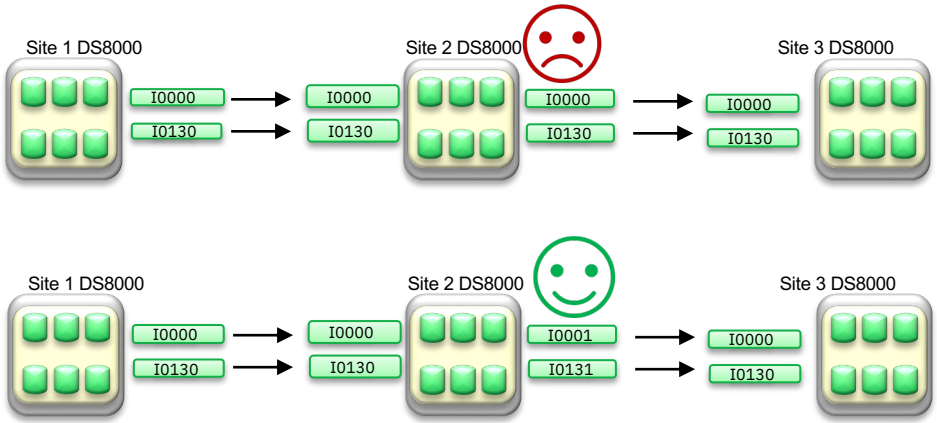
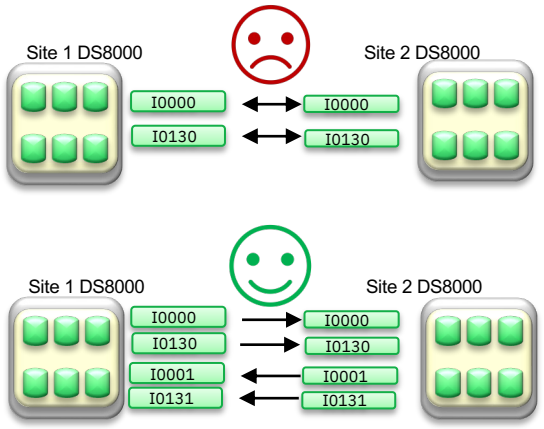
Replication Port Best Practice (2 of 2)

Metro Global Mirror example



Bi-directional Global Mirror example



- Avoid using an adapter port for both replication send and receive data, simultaneously
- In the MGM example above, the “poor configuration” uses the same port to receive MM traffic from Site 1 and to send data to Site 3
- In the GM example above, the “poor configuration” would be not ideal when Site 1 is actively sending GM data to Site 2, while Site 2 is also actively sending data to Site 1. In this case, it is recommended to move to separate send and receive ports. However, in a failover/failback configuration, where either Site 1 or Site 2 is active and sending GM data to its partner, this port configuration is not a problem – only one site is active at a time

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Plug Order

- For optimal performance
  - Avoid using adjacent ports (if possible) on 2, 4, 32Gb host adapters (for 8, 16Gb adapters the plug order does not matter and could match the order of other adapters for consistency)
  - Use 8 port cards for connectivity requirements
    - At very high utilization a better alterative would be to use two four-port cards rather than one eight-port card.
    - Note: 8 port adapters are not available for DS8900 family
  - Follow the following plug order sequence

	Plug Order (2, 4, 32Gb 4-port cards)	Plug Order (8, 16Gb 4-port cards)	Plug Order (8 Gb 8 - port card)
Port 0	1	1	1
Port 1	3	3	2
Port 2	2	2	3
Port 3	4	4	4
Port 4			5
Port 5			6
Port 6			7
Port 7			8

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System z Plug Order - Example

- For System Z
  - Place each path in a path group in a different I/O bay.
  - Do not have two paths from the same path group sharing a card
  - This will balance the workload over the available HBAs

	Base Frame Only Port #	Base and Expansion Frame Port #
Path 1	**I0230**	**I0230 (frame 1)**
Path 2	**I0300**	**I0300 (frame 1)**
Path 3	**I0030**	**I0030 (frame 1)**
Path 4	**I0100**	**I0100 (frame 1)**
Path 5	**I0200**	**I0630 (frame 2)**
Path 6	**I0330**	**I0700 (frame 2)**
Path 7	**I0000**	**I0430 (frame 2)**
Path 8	**I0130**	**I0500 (frame 2)**

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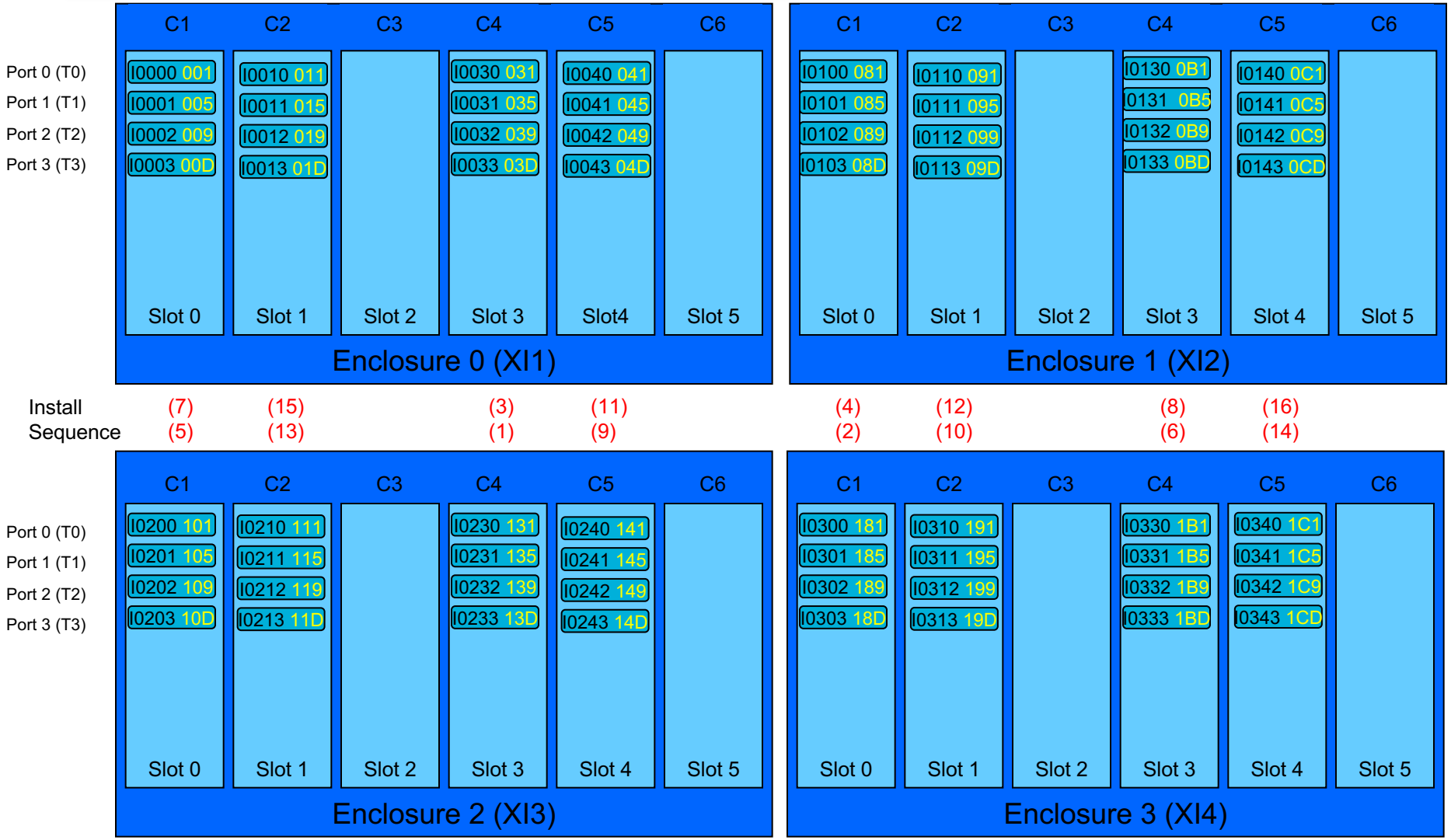
DS8950F/DS8980F Model 996/998 Base Frame with 2 Enclosure Pairs
Host I/O Port Assignments (Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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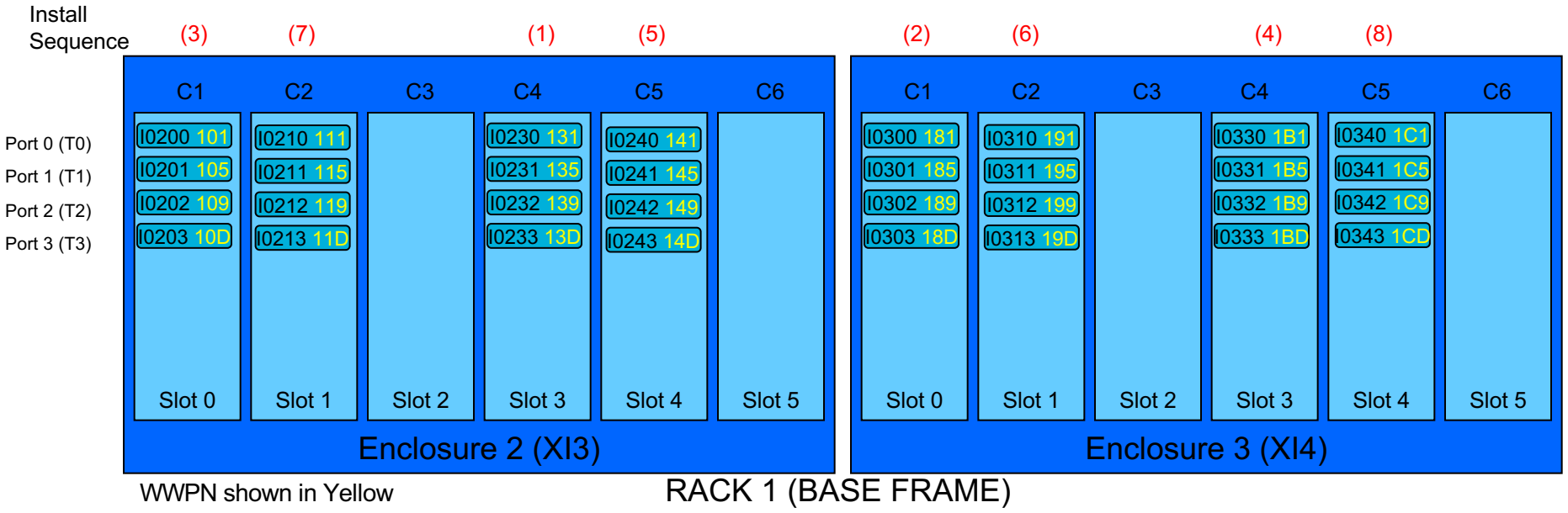
DS8950F/DS8980F Model 996/998 Base Frame with 1 Enclosure Pair
Host I/O Port Assignments (Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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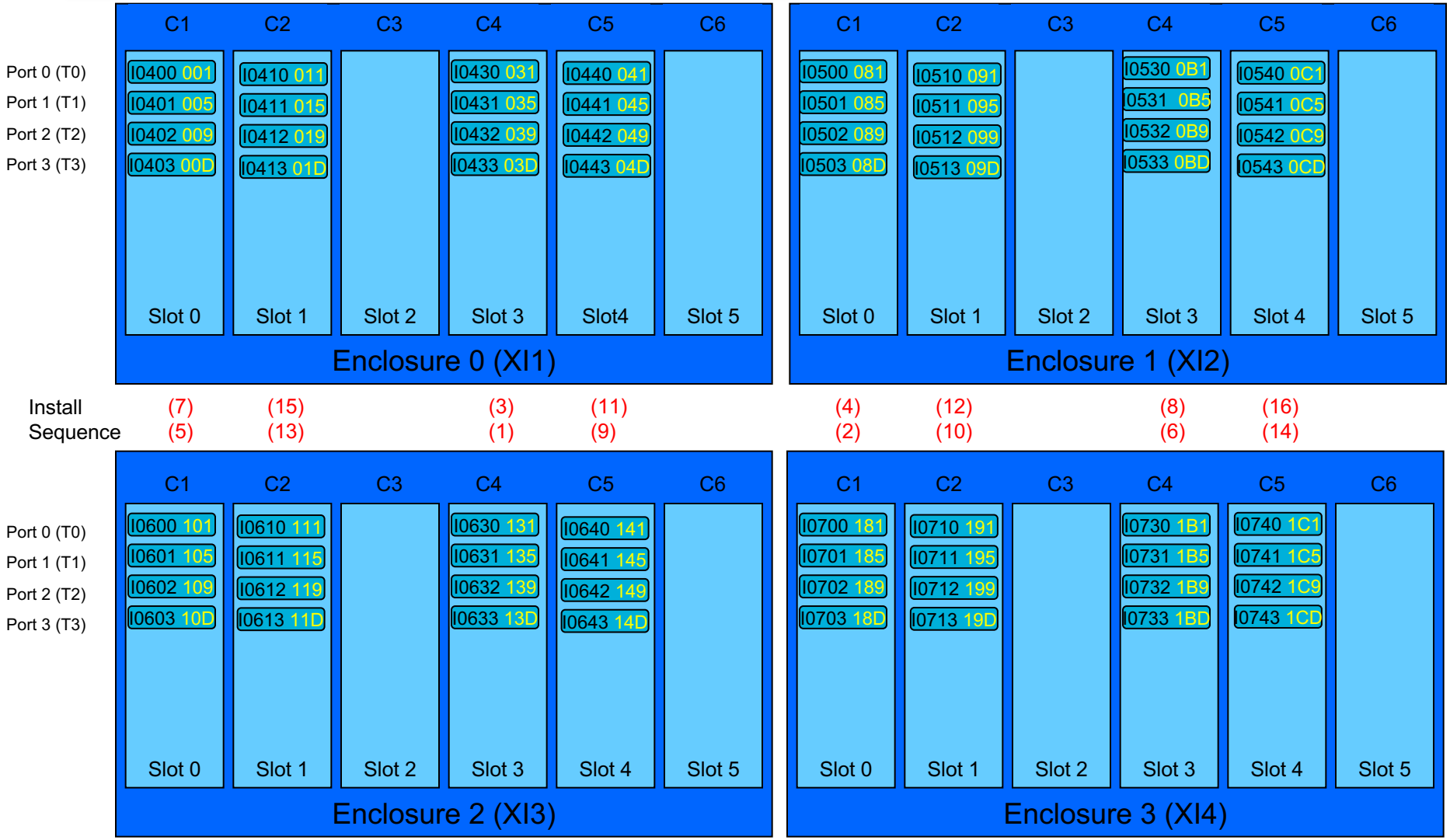
DS8950F/DS8980F Model E96 Expansion Frame with 2 Enclosure Pairs
Host I/O Port Assignments (Rear View)



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RACK 2 (EXPANSION FRAME)

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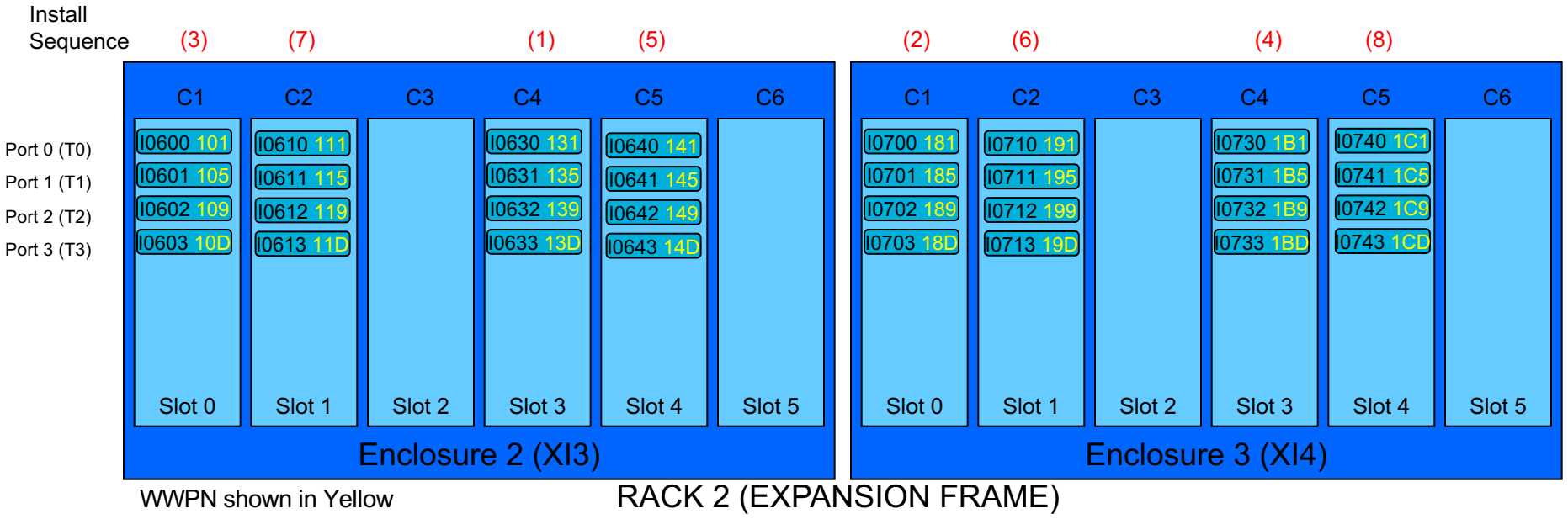
DS8950F/DS8980F Model E96 Expansion Frame with 1 Enclosure Pair Host I/O Port Assignments (Rear View)



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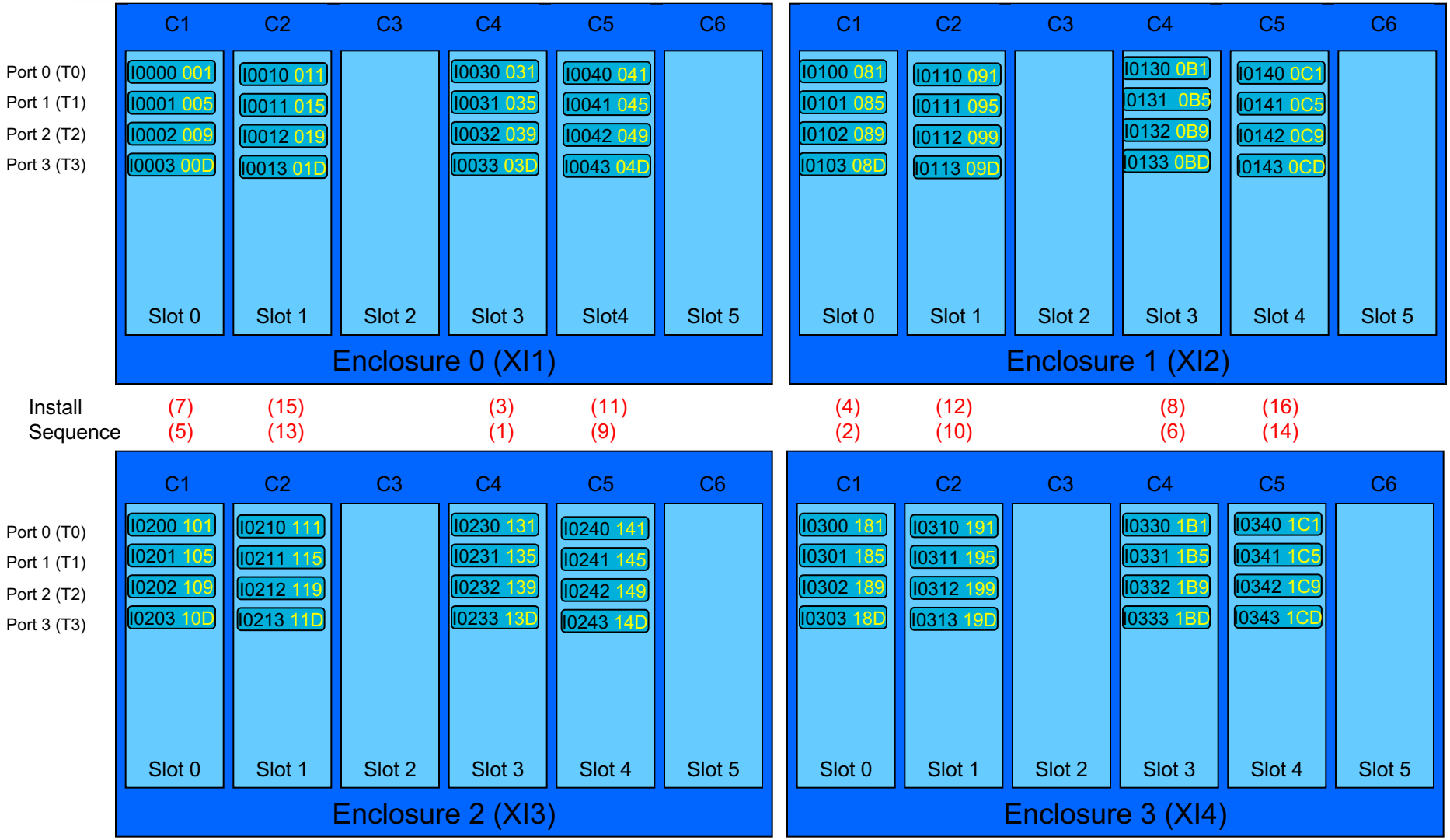
DS8910F Model 994 with 2 Enclosure Pairs Host I/O Port Assignments (Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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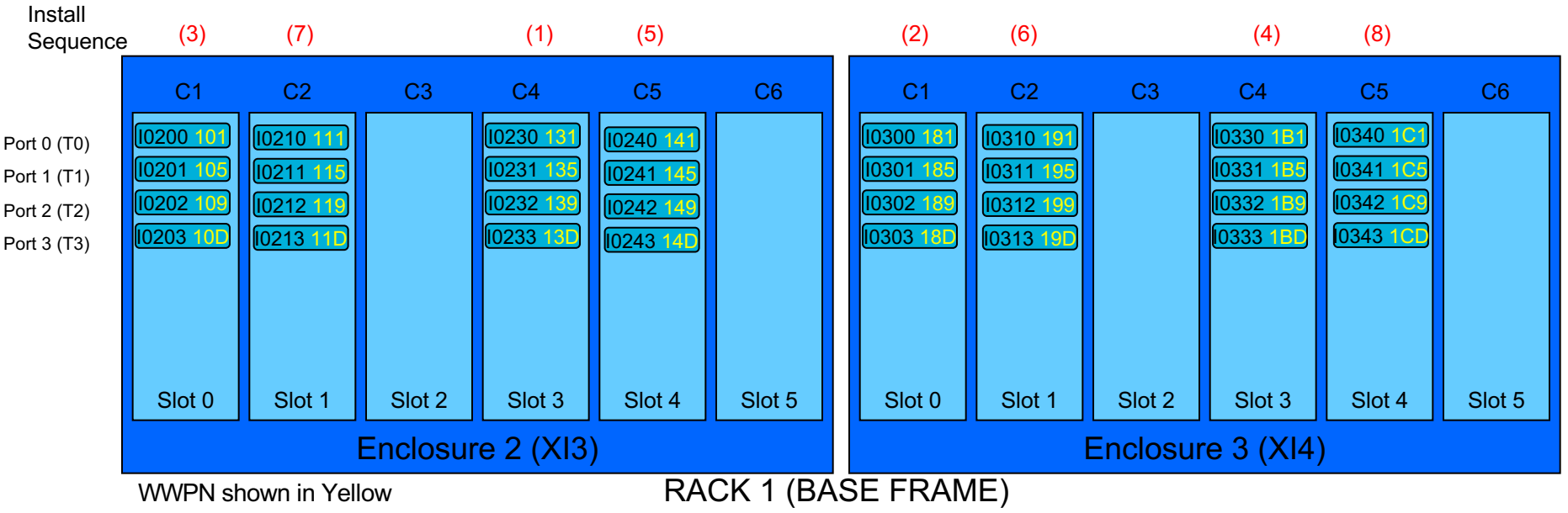
DS8910F Model 994 with 1 Enclosure Pair Host I/O Port Assignments (Rear View)



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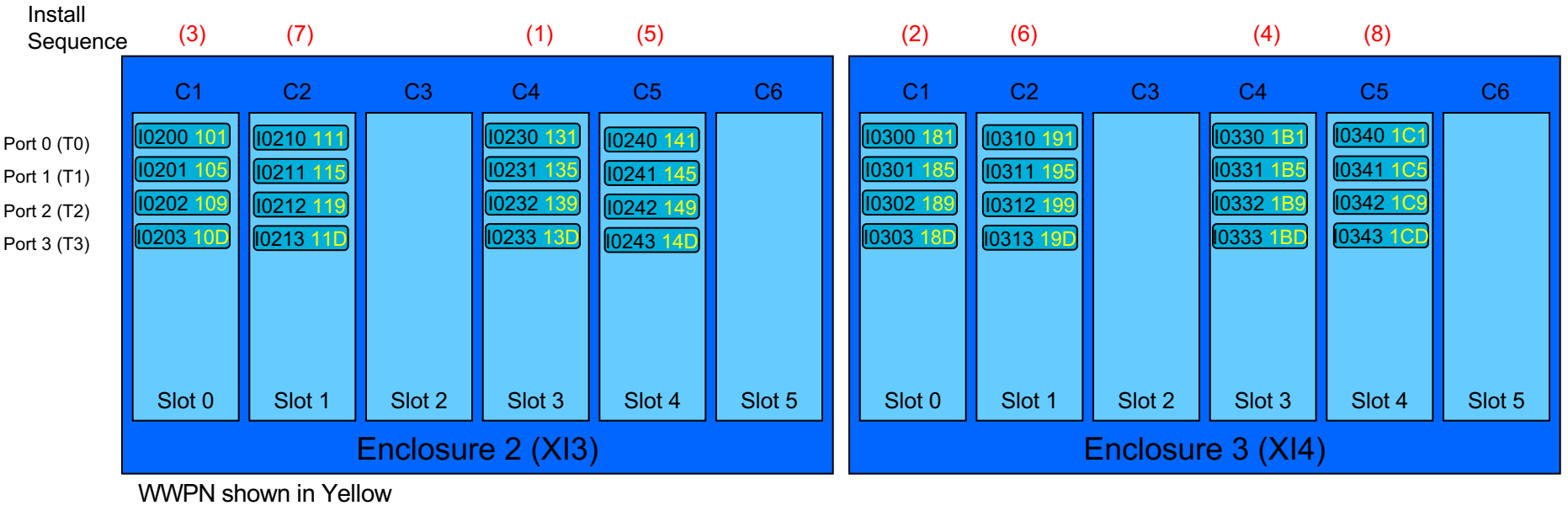
DS8910F Model 993 Host I/O Port Assignments
(Rear View)



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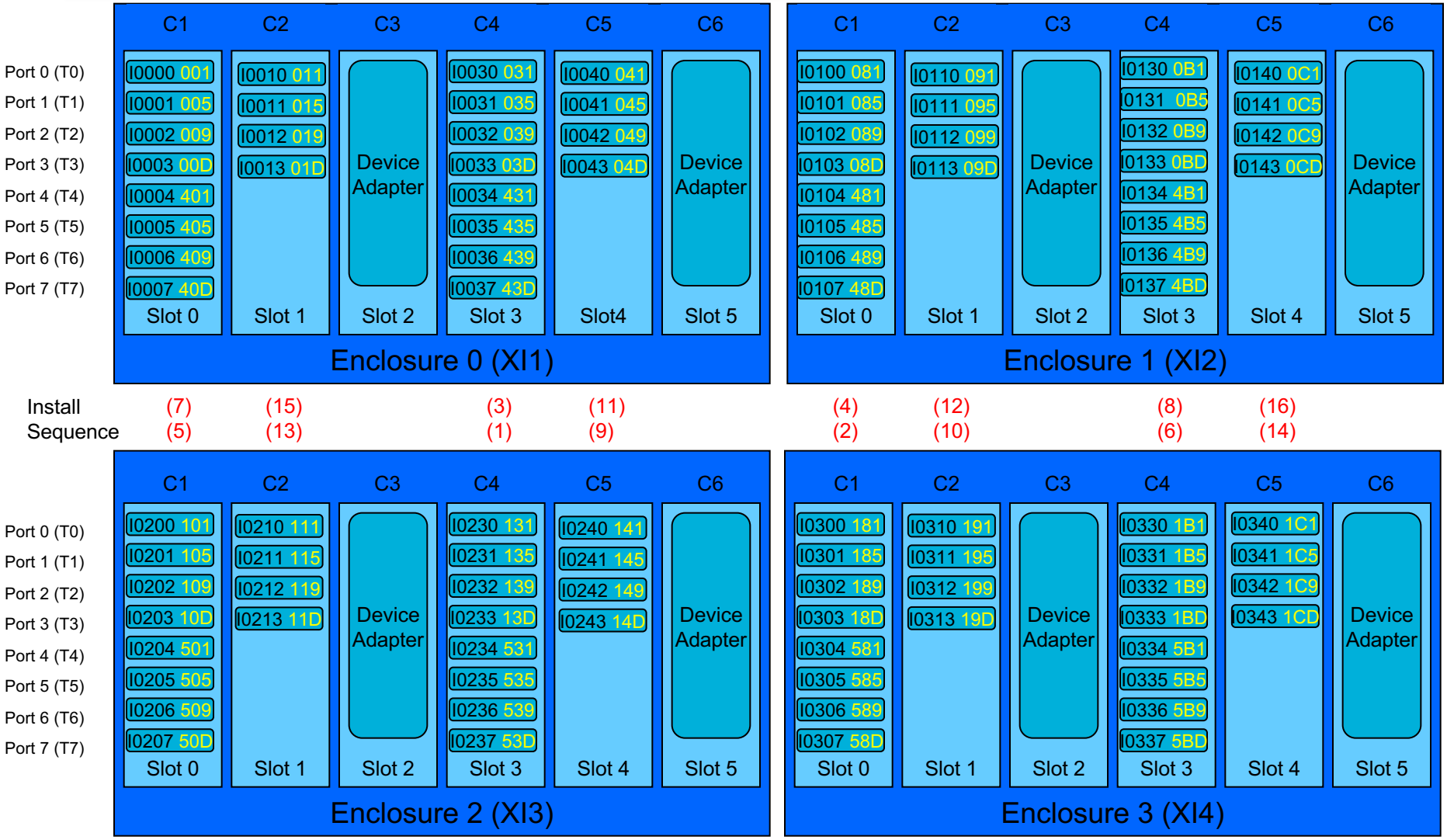
DS8888 Base Frame Host I/O Port Assignments

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8888 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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DS8888 Expansion Frame Host I/O Port Assignments

(Rear View)

WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

Note: The DS8888 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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DS8886 Base Frame Host I/O Port Assignments

(Rear View)

WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8886 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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DS8886 Expansion Frame Host I/O Port Assignments
(Rear View)

WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

Note: The DS8886 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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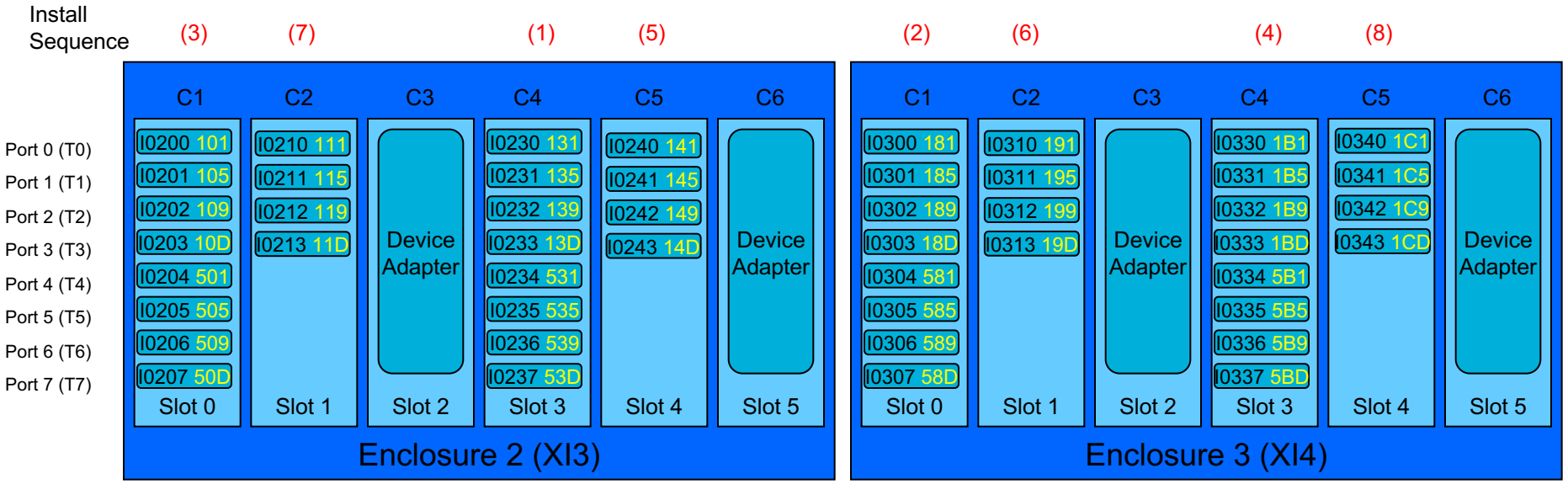
DS8884 Base Frame Host I/O Port Assignments (2 I/O Enclosures)
(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8884 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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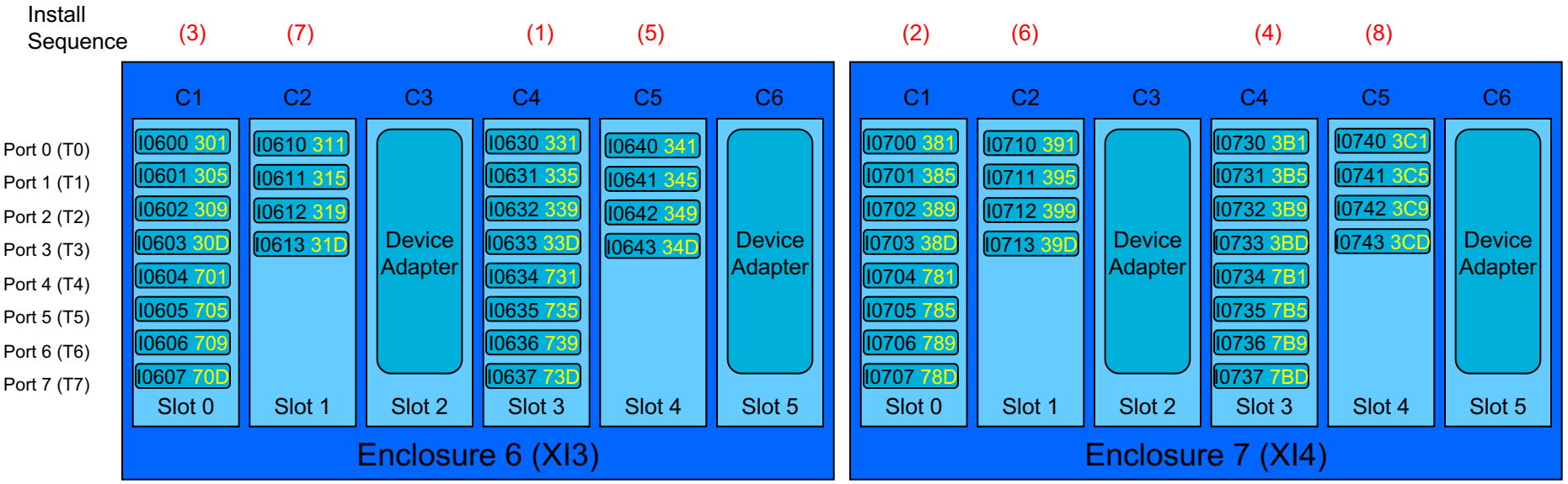
DS8884 Expansion Frame Host I/O Port Assignments (2 I/O Enclosures)
(Rear View)



WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

Note: The DS8884 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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DS8884F w/ Optional 4 I/O Enclosures Host I/O Port Assignments (Rear View)

(2 I/O Enclosures would match DS8884 Base Frame)

WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8884 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).
If C1 (slot 0) is populated with an 8-port card, C2 (slot 1) must be empty. If C4 (slot 3) is populated with an 8-port card, C5 (slot 4) must be empty.

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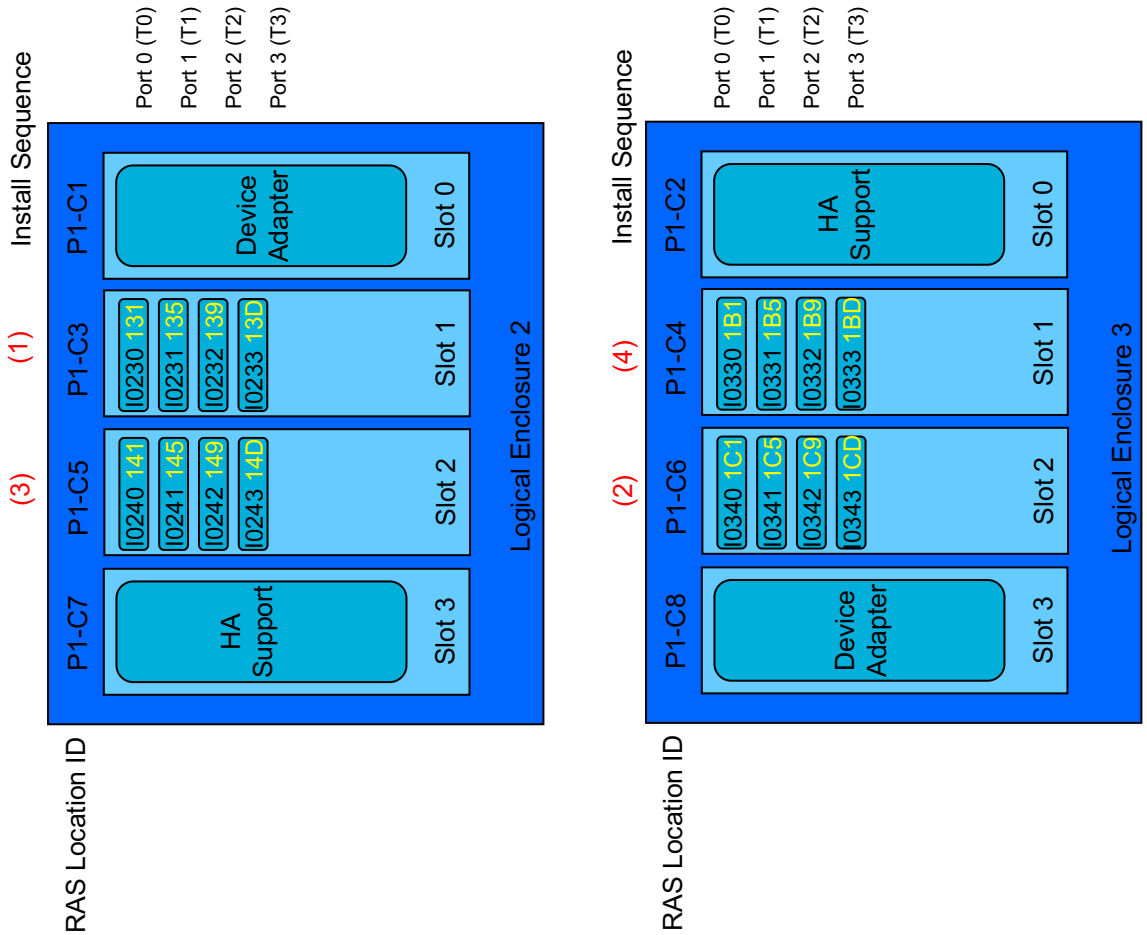
DS8882F I/O Port Assignments (2 Logical I/O Enclosures)



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Single 2U I/O Adapter Enclosure

Note: The Device Adapter card supports the adjacent Host Adapter. Optional Host Adapters require the additional HA Support card in the adjacent slot.
Note: Install sequence: First 2 Host Adapters are required (1) (2), additional Host Adapters should be installed in a pair but are orderable one at a time.

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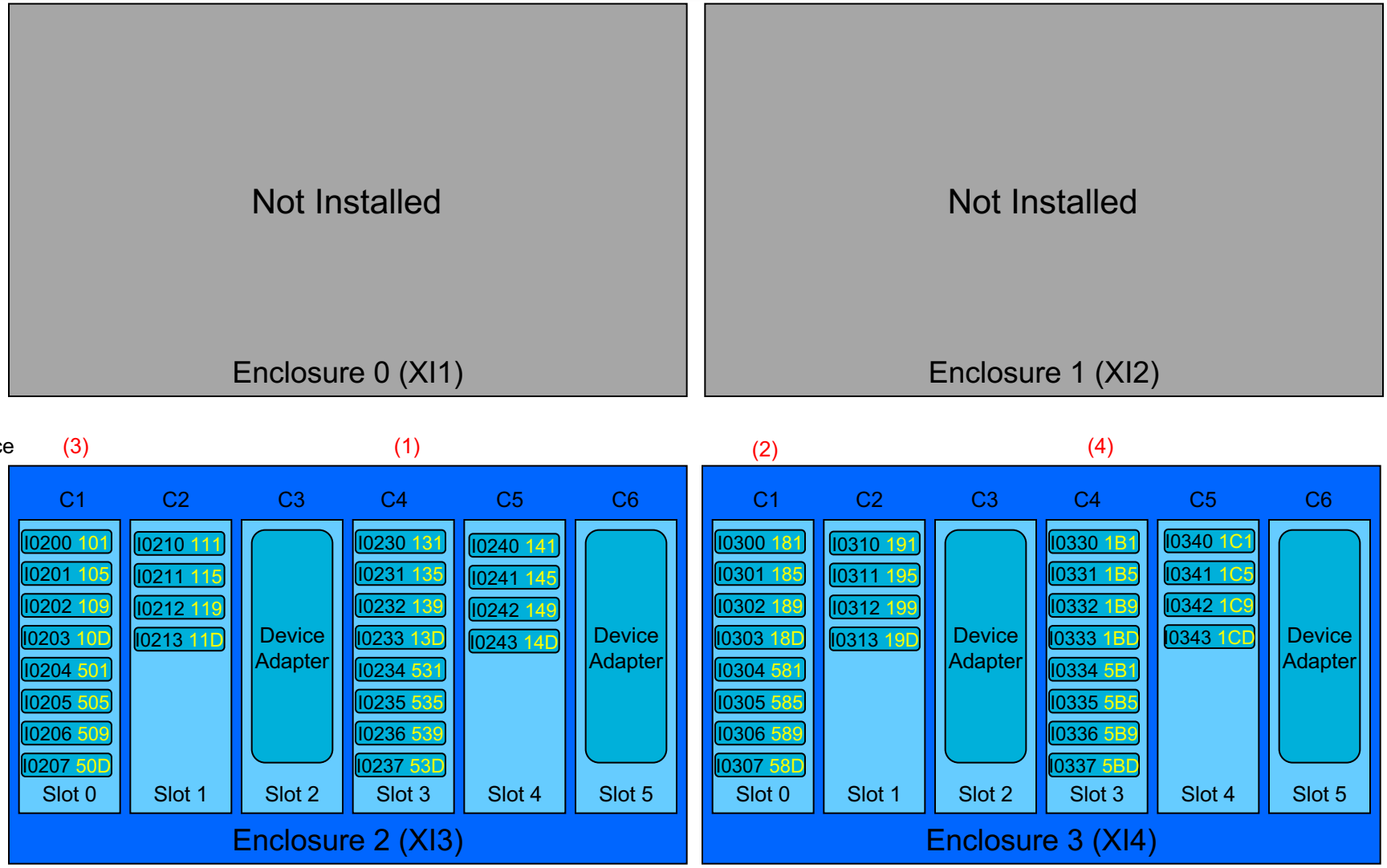
DS8870 Base Frame Host I/O Port Assignments (2 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8800/DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).

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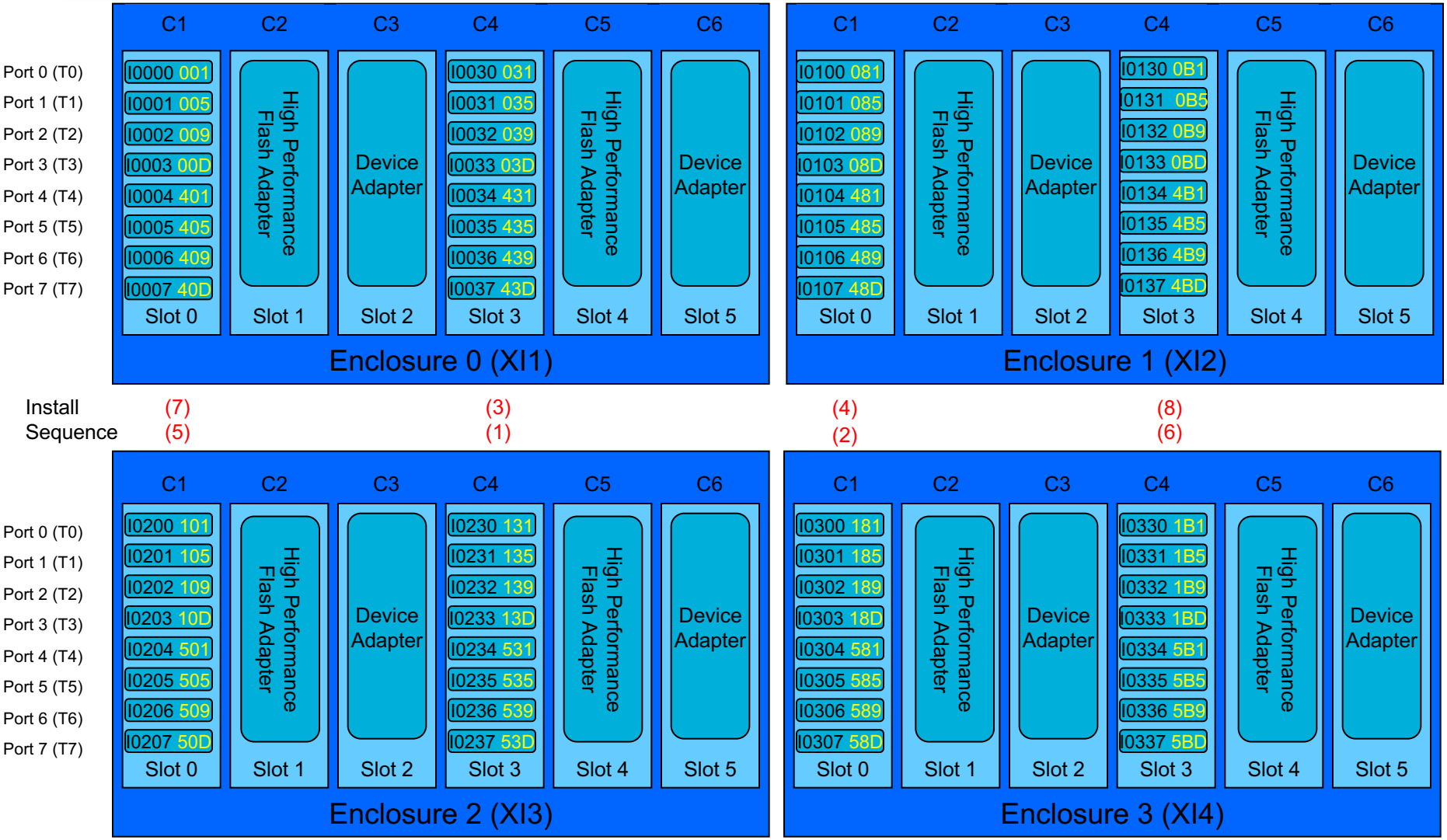
DS8870 Base Frame Host I/O Port Assignments (4 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8800/DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).

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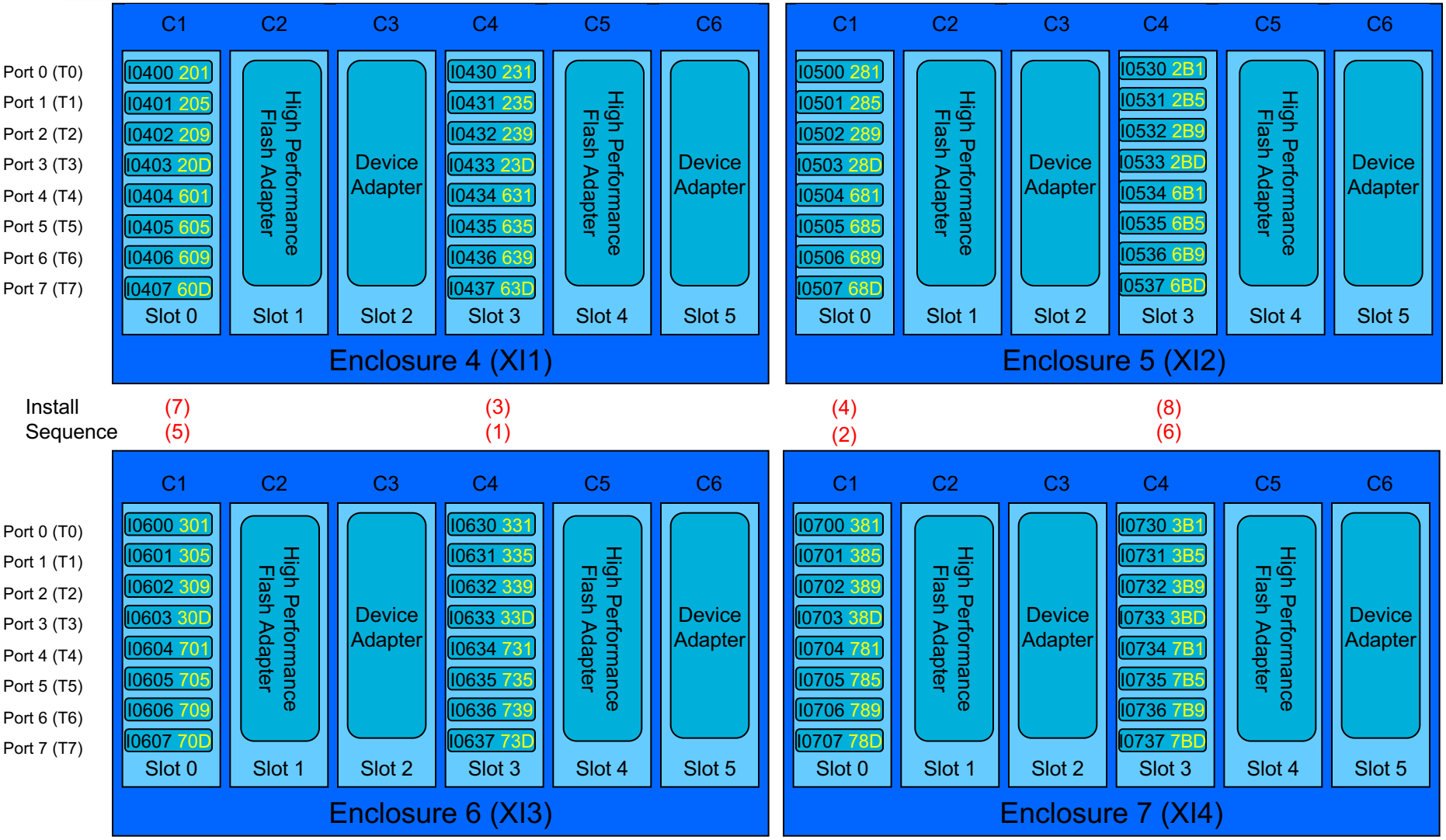
DS8870 Expansion Frame Host I/O Port Assignments

(Rear View)



WWPN shown in Yellow

RACK 2 (EXPANSION FRAME) or RACK 1 (All Flash)

Note: The DS8800 and DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).

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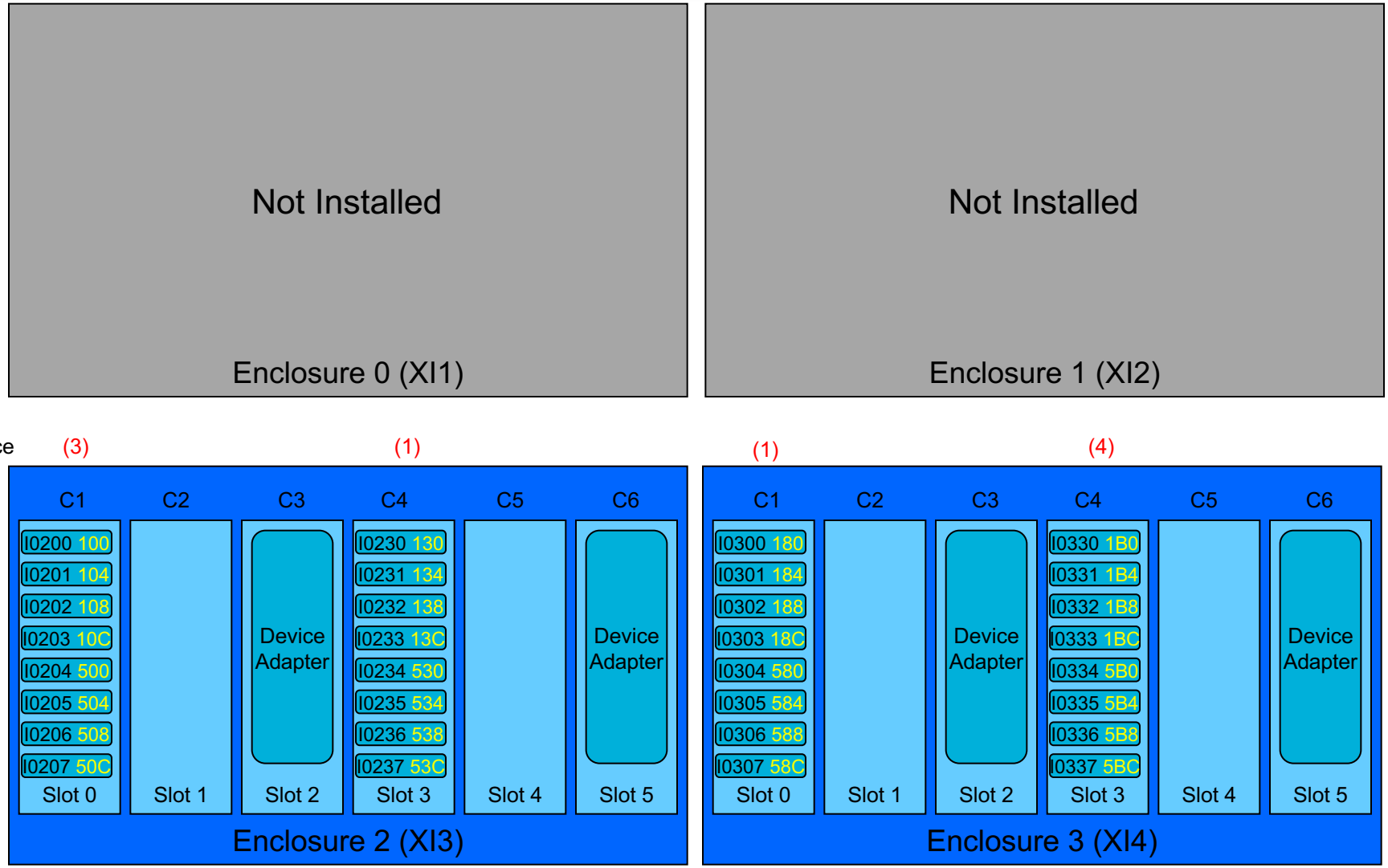
DS8800 Base Frame Host I/O Port Assignments (2 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8800/DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist)

Note: Later models of the DS8800 switched the WWPN value – increasing the last digit (yellow) by 0x01. For example, 100 becomes 101.

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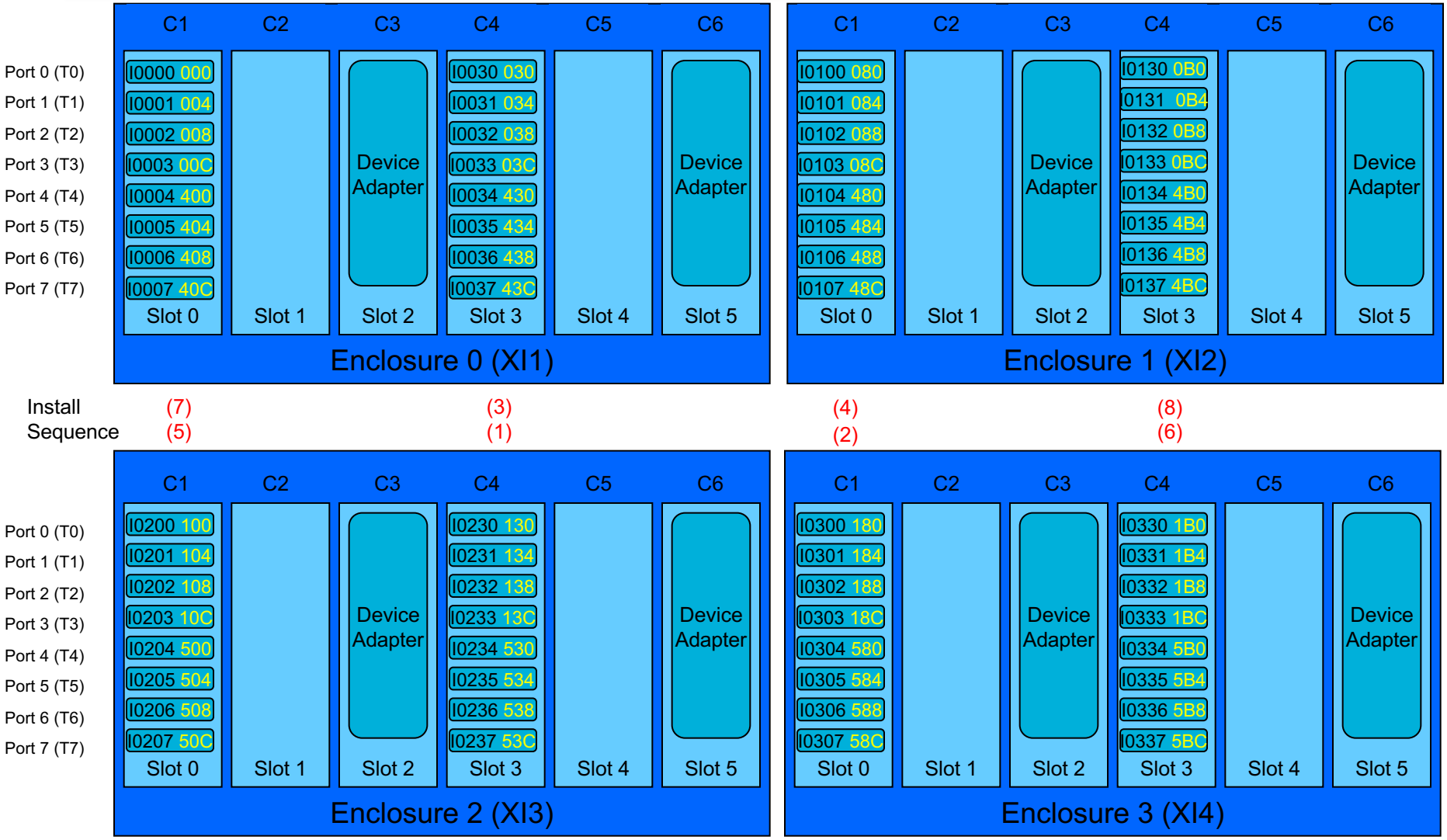
DS8800 Base Frame Host I/O Port Assignments (4 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

Note: The DS8800/DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).

Note: Later models of the DS8800 switched the WWPN value – increasing the last digit (yellow) by 0x01. For example, 100 becomes 101.

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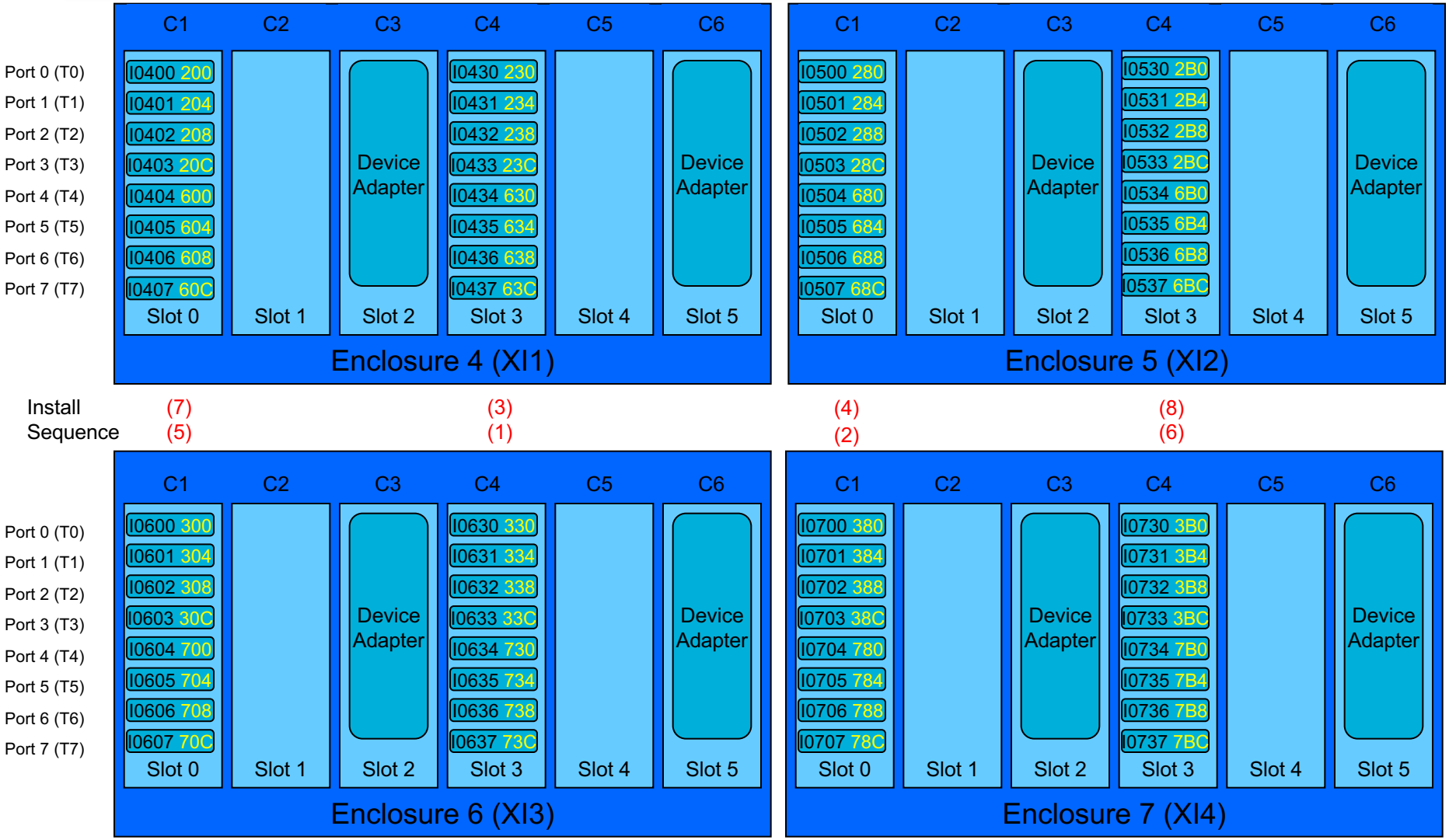
DS8800 Expansion Frame Host I/O Port Assignments

(Rear View)



WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

Note: The DS8800 and DS8870 supports both 4 port and 8 port host adapter cards. Four port cards include only the first 4 ports (Ixx04-Ixx07 do not exist).

Note: Later models of the DS8800 switched the WWPN value – increasing the last digit (yellow) by 0x01. For example, 100 becomes 101.

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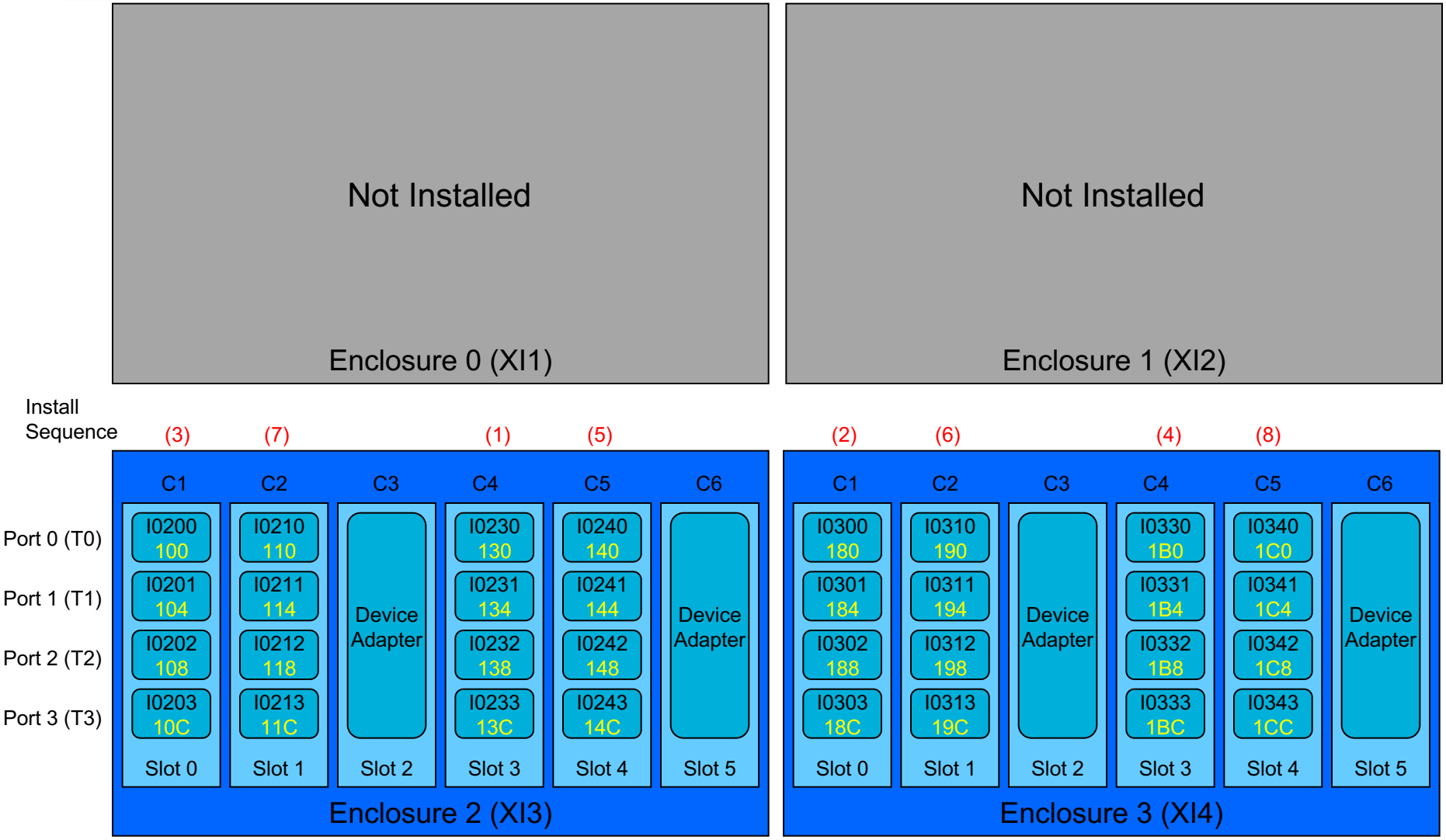
DS8700 Base Frame Host I/O Port Assignments (2 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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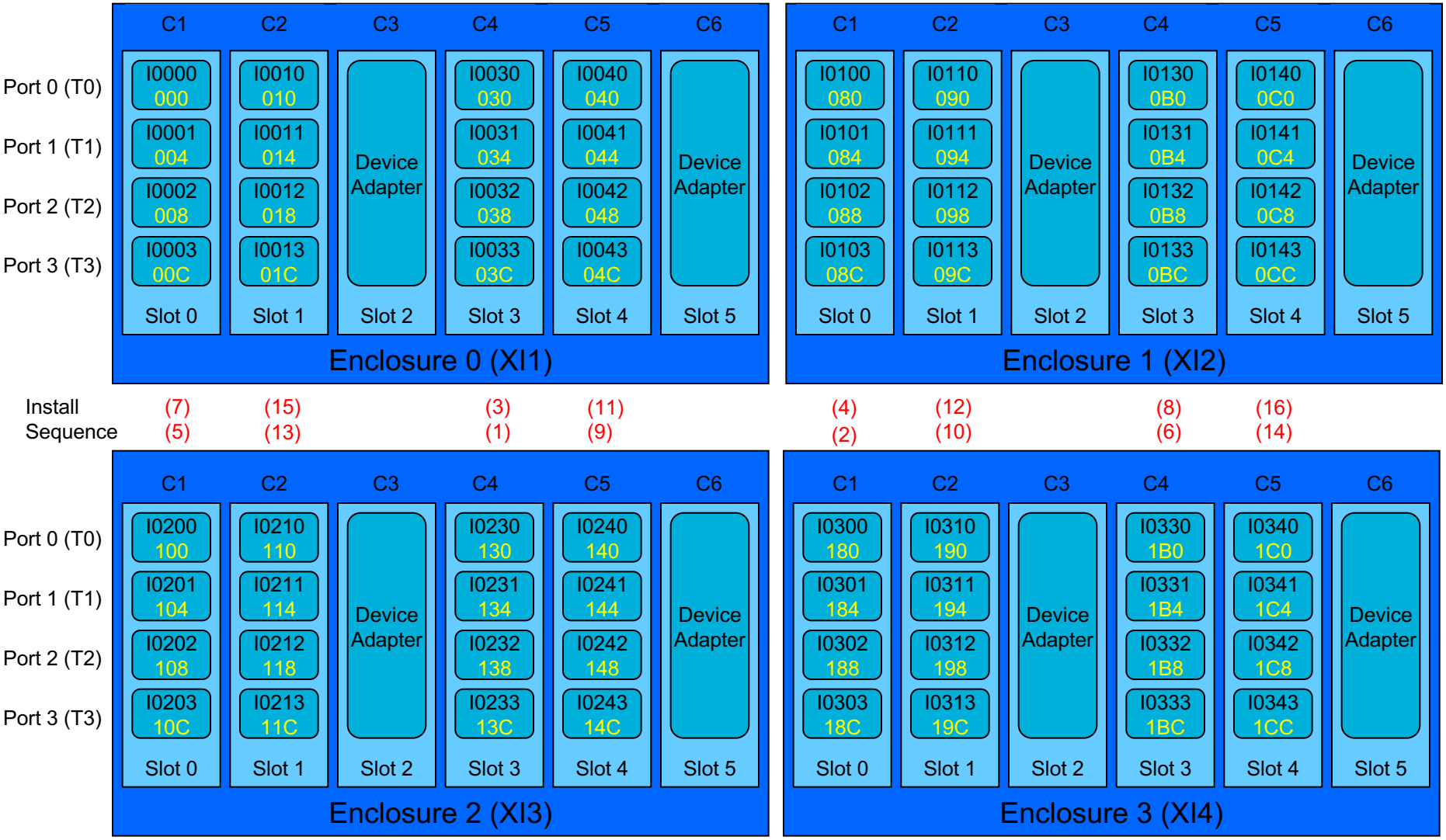
DS8700 Base Frame Host I/O Port Assignments (4 I/O Enclosures)

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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DS8700 Expansion Frame Host I/O Port Assignments

(Rear View)

WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

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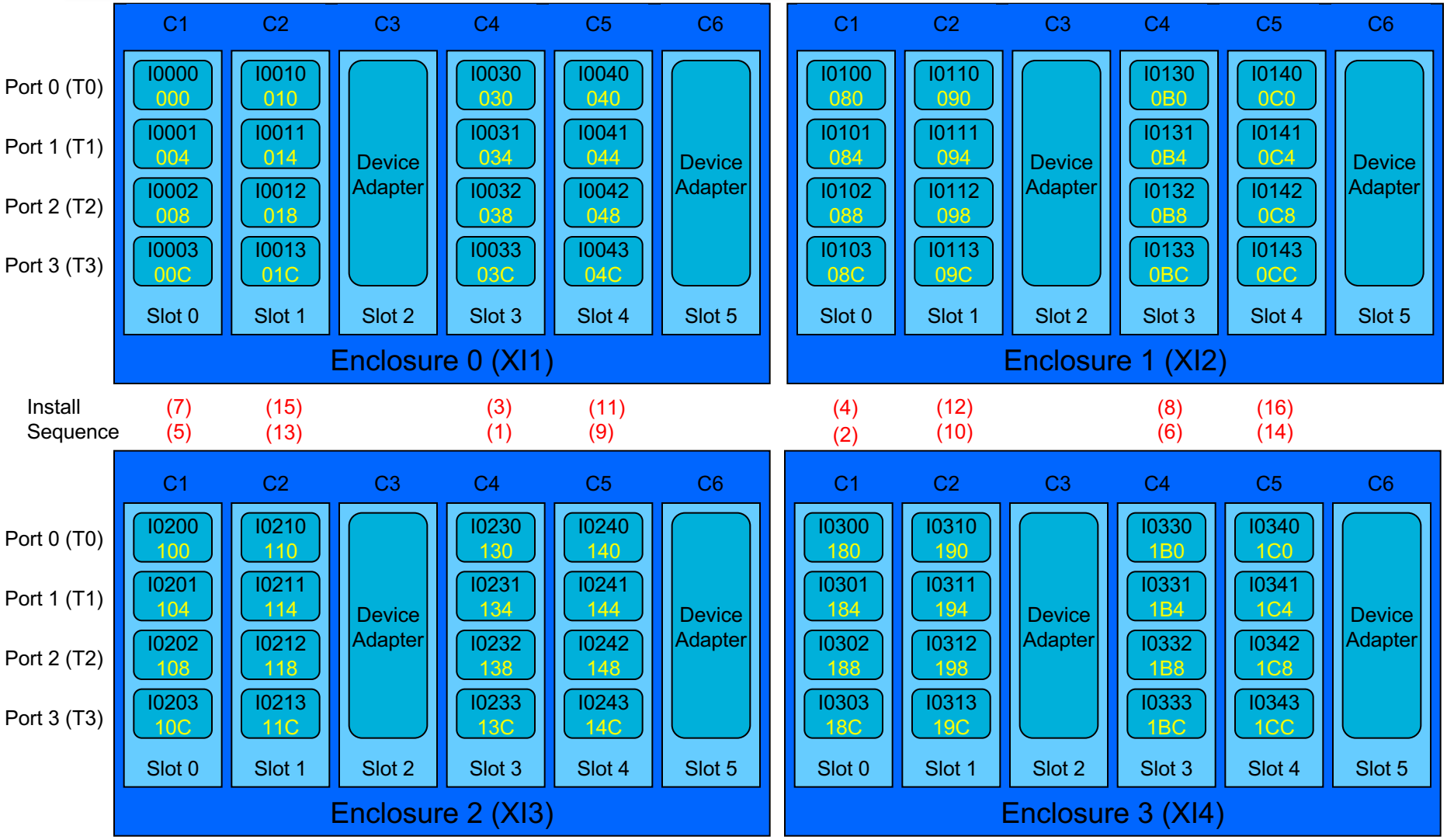
DS8100 and DS8300 Base Frame Host I/O Port Assignments

(Rear View)



WWPN shown in Yellow

RACK 1 (BASE FRAME)

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DS8300 Expansion Frame Host I/O Port Assignments

(Rear View)

WWPN shown in Yellow

RACK 2 (EXPANSION FRAME)

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DS8000 WWPN Determination*

- DS8000 WWNN is based on: 50:05:07:63:0z:FF:Cx:xx
- The z and x:xx values will be a unique combination for each machine and each Storage Facility Image (SFI).
- Each SFI has its own WWNN. The Storage Unit itself also has a unique WWNN.
- Use lssi to get the SFI WWNN (don't use lssu):
- DS8000 WWPN is a child of the SFI WWNN, based on 50:05:07:63:0z:YY:Yx:xx
- Take the z and x:xx value from the WWNN and use the YY:Y location derived from the port location as per the diagrams
- All DS8000 diagrams are from a REAR view of the machine.
- There are no differences for WWPN determination between DS8000 models

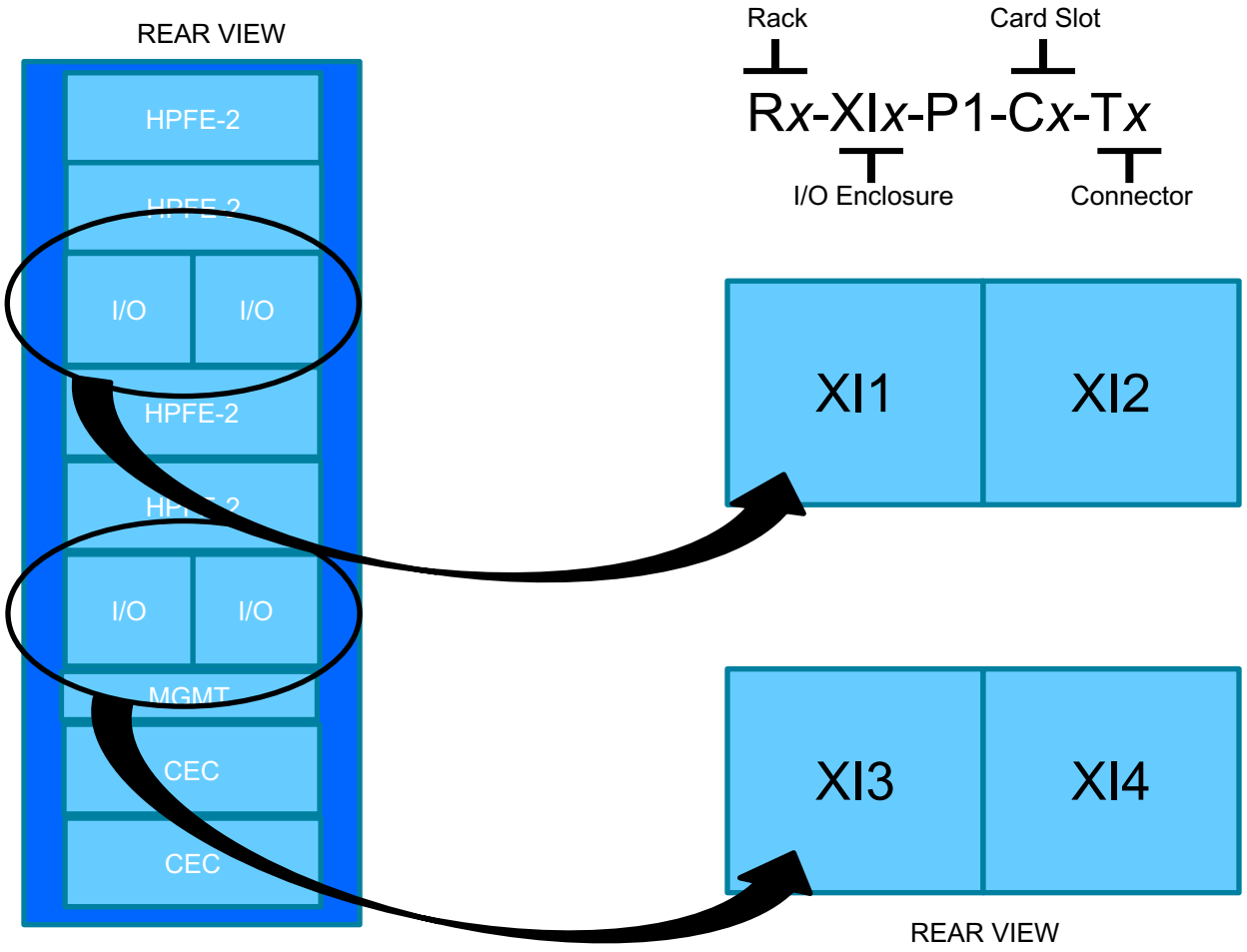
```
dscli> lssi IBM.2107-7503461

  Name ID               Storage Unit     Model WWNN             State  ESSNet
  ==========================================================================
  -    IBM.2107-7503461 IBM.2107-7503460 922   5005076303FFC08F Online Enabled
```

- `dscli> lsioport -dev IBM.2107-7503461`

```
  ID    WWPN             State  Type             topo     portgrp
  ===============================================================
  I0000 500507630300008F Online Fibre Channel-SW SCSI-FCP 0
  I0001 500507630300408F Online Fibre Channel-SW SCSI-FCP 0
  I0002 500507630300808F Online Fibre Channel-SW SCSI-FCP 0
  I0003 500507630300C08F Online Fibre Channel-SW SCSI-FCP 0
```

** For a complete discussion on IBM Storage WWPN determination, refer to Anthony Vanderwerdt's document on Techdocs.* http://www-03.ibm.com/support/techdocs/atsmastr.nsf/WebIndex/TD105450

Rack-Enclosure-Card-Connector – DS8900F



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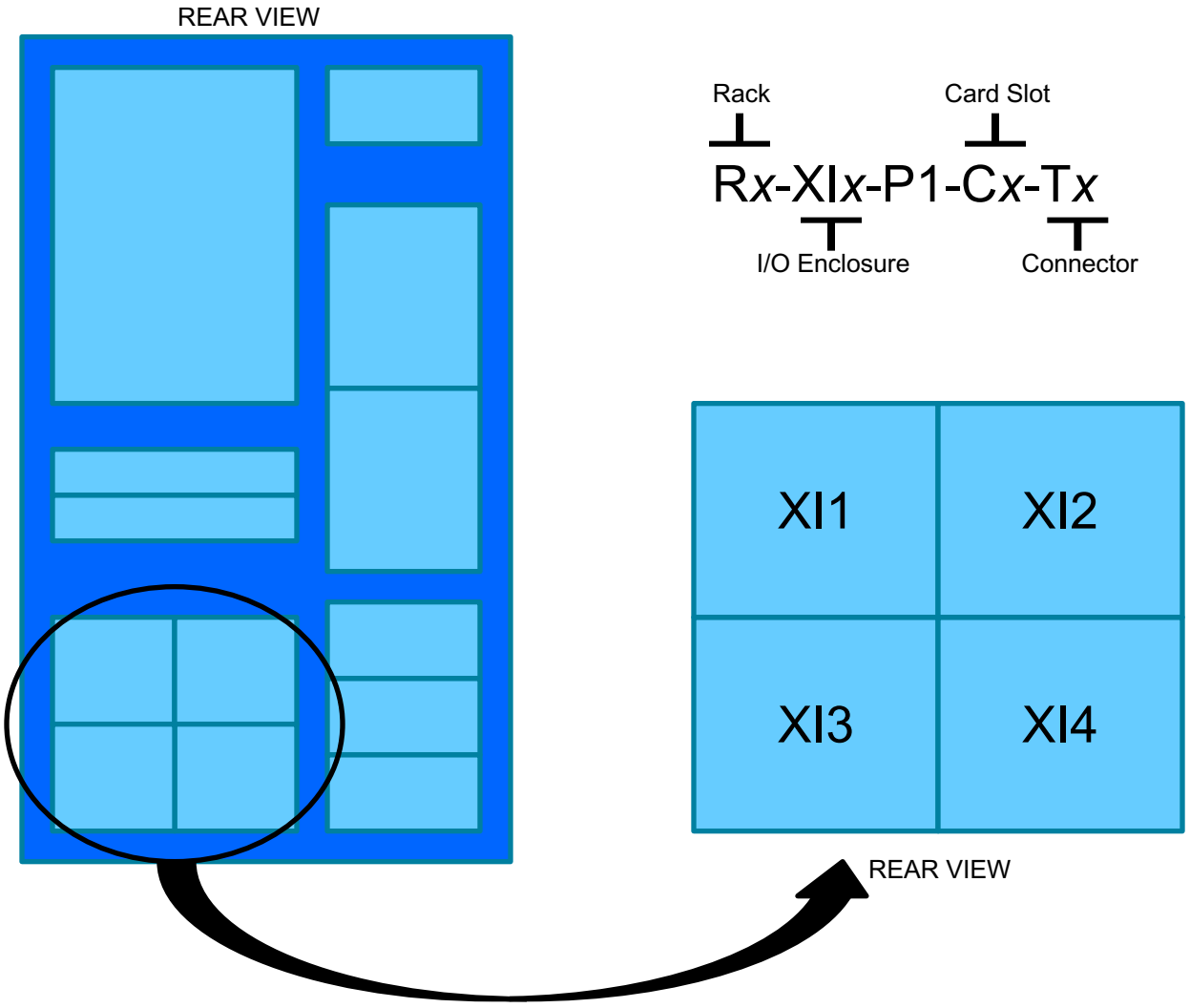
Rack-Enclosure-Card-Connector – Prior Generations



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zHyperLink Information

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Maximum zHyperLink Connections – DS8900F Family

System/Model	Cores per CEC	zHyperLink Support	Maximum zHyperLink Connections (increments of 2)
DS8910F-993	8	Yes	4
DS8910F-994	8	Yes	4
DS8950F-996	10	Yes	6
DS8950F-996 DS8980F-998 DS89x0F-E96	20	Yes	8 per frame 12 total

- This table shows the maximum number of zHyperLink connections allowed based on DS8900F model and number of processor cores (per node). zHyperLink ports are always installed in increments of two.
- In a dual frame environment, it is preferred to utilize the first 4 plug-order locations in the expansion frame before utilizing ports in base frame.
- In a dual frame environment, if up to 8 ports are to be utilized, prefer the first 4 plug-order locations in the expansion frame, then use the first 4 plug-order locations in the base frame
- In a dual frame environment, if up to 12 ports are to be utilized, prefer the first 4 plug-order locations in the expansion frame, then use the first 4 plug-order locations in the base frame, then fill the remaining connections in the expansion frame.

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Maximum zHyperLink Connections – DS8880 Family

System/Model	Cores per CEC	zHyperLink Support	Maximum zHyperLink Connections (increments of 2)
DS8884 / DS8884F	6	No	None
	12	Yes	4
DS8886 / DS8886F	8	No	None
	16	Yes	8
	24	Yes	12
DS8888 / DS8888F	24	Yes	8
	48	Yes	16

This table shows the maximum number of zHyperLink connections allowed based on DS8880 model and number of processor cores (per node). zHyperLink ports are always installed in increments of two. In a dual frame environment, the total number of zHyperLink ports still applies, and in some models, zHyperLink ports can be placed in frame 1, frame 2 or split across the available I/O bays in both frames.

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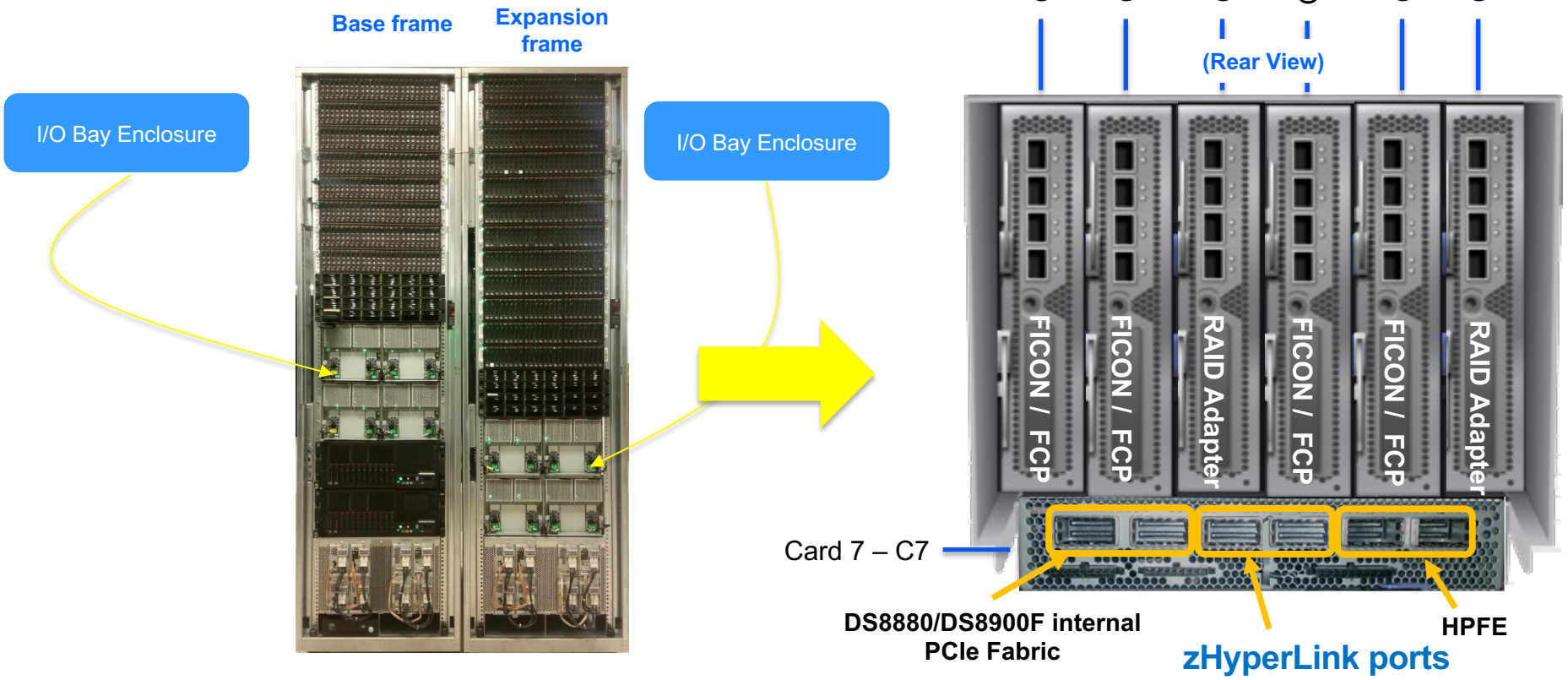
Location of zHyperLink ports within the I/O Bay

The DS8880/DS8900F I/O bay supports up to six external interfaces using a CXP connector type.



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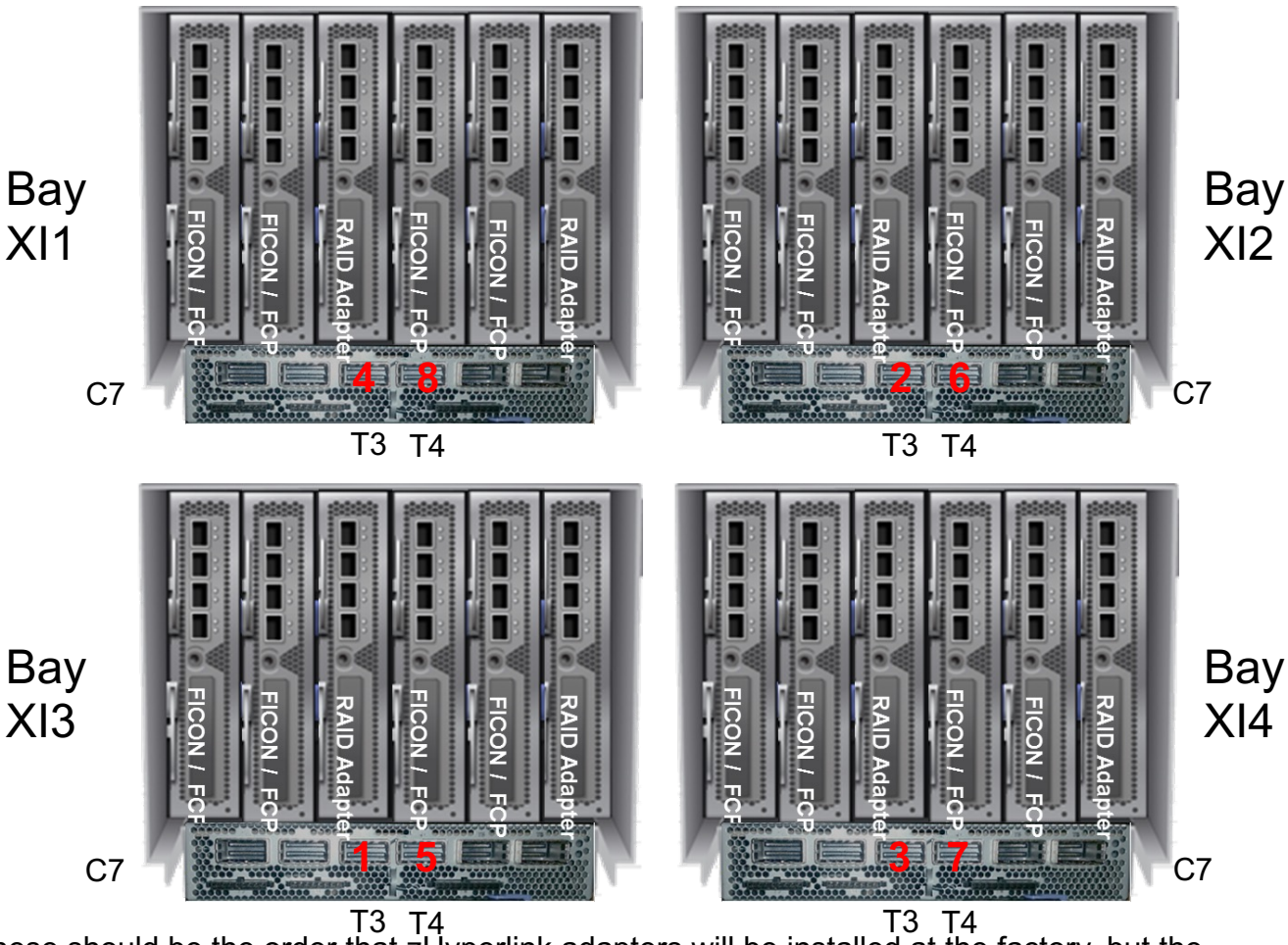
zHyperLink Plug Order DS8910F, DS8950F, or DS8980F Single Rack

Plug Order



Note that these should be the order that zHyperlink adapters will be installed at the factory, but the adapters can be moved from install location to install location as needed.

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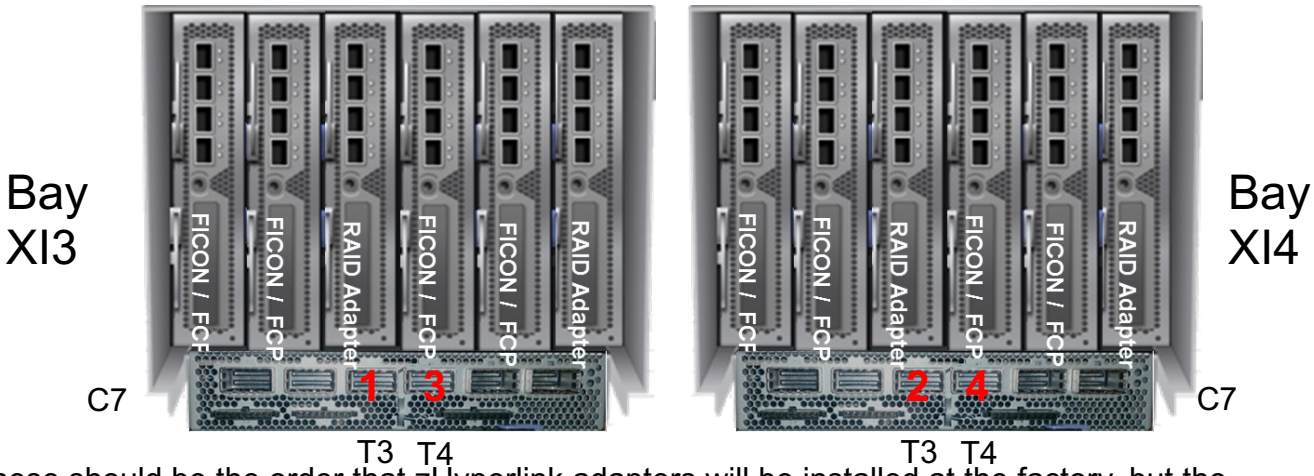
zHyperLink Plug Order DS8910F or DS8950F Single Rack and Single I/O Enclosure Pair

- It is possible, though unlikely, to have a single I/O enclosure pair on a DS8980F
- It is possible, but a not recommended configuration, to have a single I/O enclosure pair in each rack of a dual rack DS8950F/DS8980F system. This possibility is not documented here as the configuration is highly discouraged

Plug Order



Note that these should be the order that zHyperlink adapters will be installed at the factory, but the adapters can be moved from install location to install location as needed.

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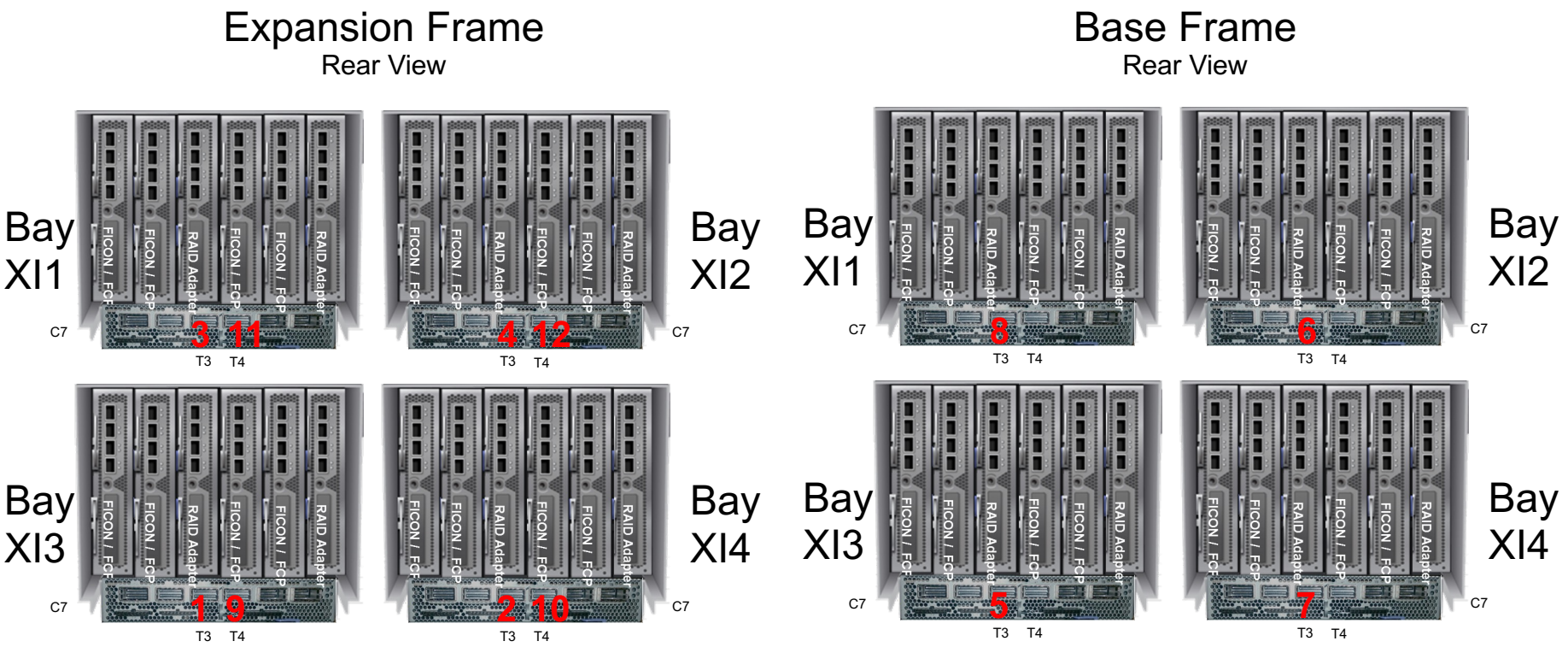
zHyperLink Plug Order DS8950F or DS8980F Dual Rack

Plug Order



This view assumes that the expansion frame is installed to the right of the base frame, as viewed from the front, as is “usual”, but not mandatory.

This is the factory install order if 8 zHyperlink adapters are ordered in the expansion frame and 4 adapters in the base frame. e-config does not enforce this, just insures a max of 8 per frame and 12 per subsystem. If adapters are ordered in some other configuration, the adapters should be physically relocated to this install order at implementation time.

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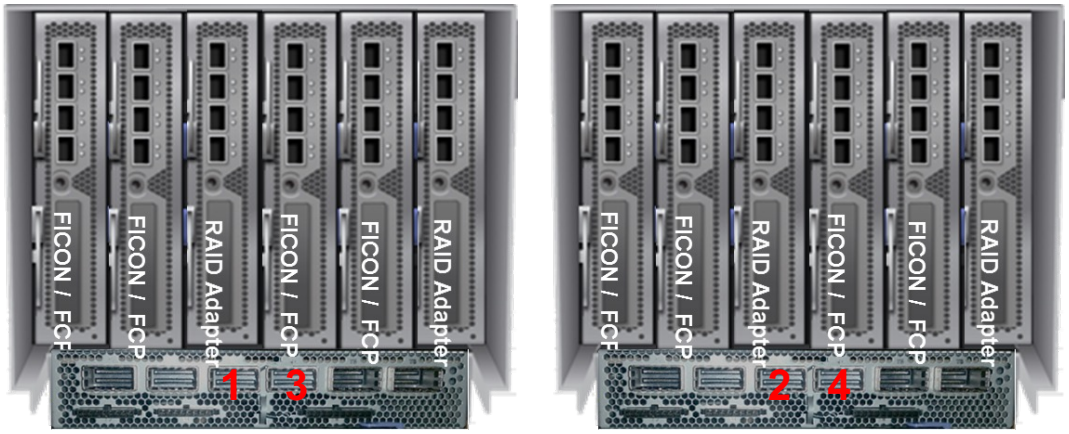
zHyperLink Plug Order DS8884 with 1 Enclosure Pair

Plug Order

Bay XI3



Bay XI4

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zHyperLink Plug Order DS8886, DS8888, DS8910F, DS8950F, or DS8980F (Rack 1 and Rack 2)

Plug Order

Note that these are not necessarily the order that zHyperlink adapters will be installed at the factory, but the adapters can be moved from install location to install location as needed.

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Transparent Cloud Tiering (TCT) Ethernet Adapter

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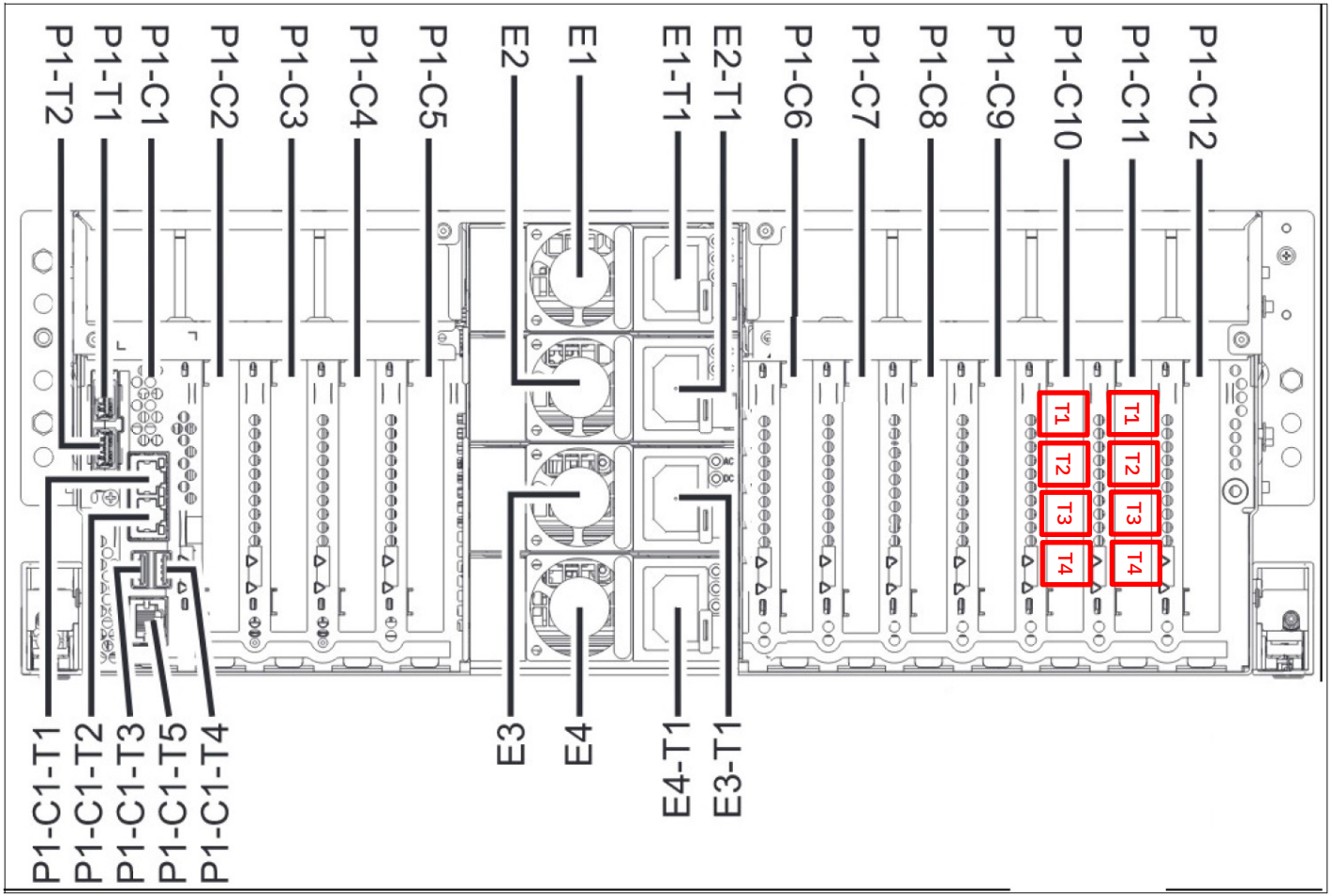
DS8950F Model 996 (4U POWER9 CPC) – Ethernet Adapters

See next page for description of adapters and ports used for these ethernet connections.



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DS8950F/DS8980F Model 996/998 (4U POWER9 CPC) – Ethernet Adapters

- Ethernet Adapter P1-C11
  - 4 port (RJ45 copper) 1Gb ethernet adapter
  - Standard adapter shipped on all Model 996 CPCs
  - Ports T1 and T2 are cabled and used for internal communications
  - Ports T3 and T4 can optionally be used for TCT
- Ethernet Adapter P1-C10
  - 4 port ethernet adapter
  - Optional feature code 3603 for TCT
  - Ports T1 and T2 are optical SR 10Gb ports – Note: Short Reach optics
  - Ports T3 and T4 are RJ45 copper 1Gb ports

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DS8950F/DS8980F Model 996/998 (4U POWER9 CEC) – DSCLI nomenclature

Model 996 or 998

CEC	DSCLI Port ID	Physical Port	Port Speed
0	I9893	P1-C10-T3	1Gbps
0	I9894	P1-C10-T4	1Gbps
0	I98A1	P1-C11-T1	10Gbps
0	I98A2	P1-C11-T2	10Gbps
0	I98A3	P1-C11-T3	1Gbps
0	I98A4	P1-C11-T4	1Gbps
1	I9B93	P1-C10-T3	1Gbps
1	I9B94	P1-C10-T4	1Gbps
1	I9BA1	P1-C11-T1	10Gbps
1	I9BA2	P1-C11-T2	10Gbps
1	I9BA3	P1-C11-T3	1Gbps
1	I9BA4	P1-C11-T4	1Gbps

Original 1 Gbit Ports (2 for redundancy)

New 10Gbit Ports (2 for redundancy)

New Additional 1Gbit Ports (2 for redundancy)

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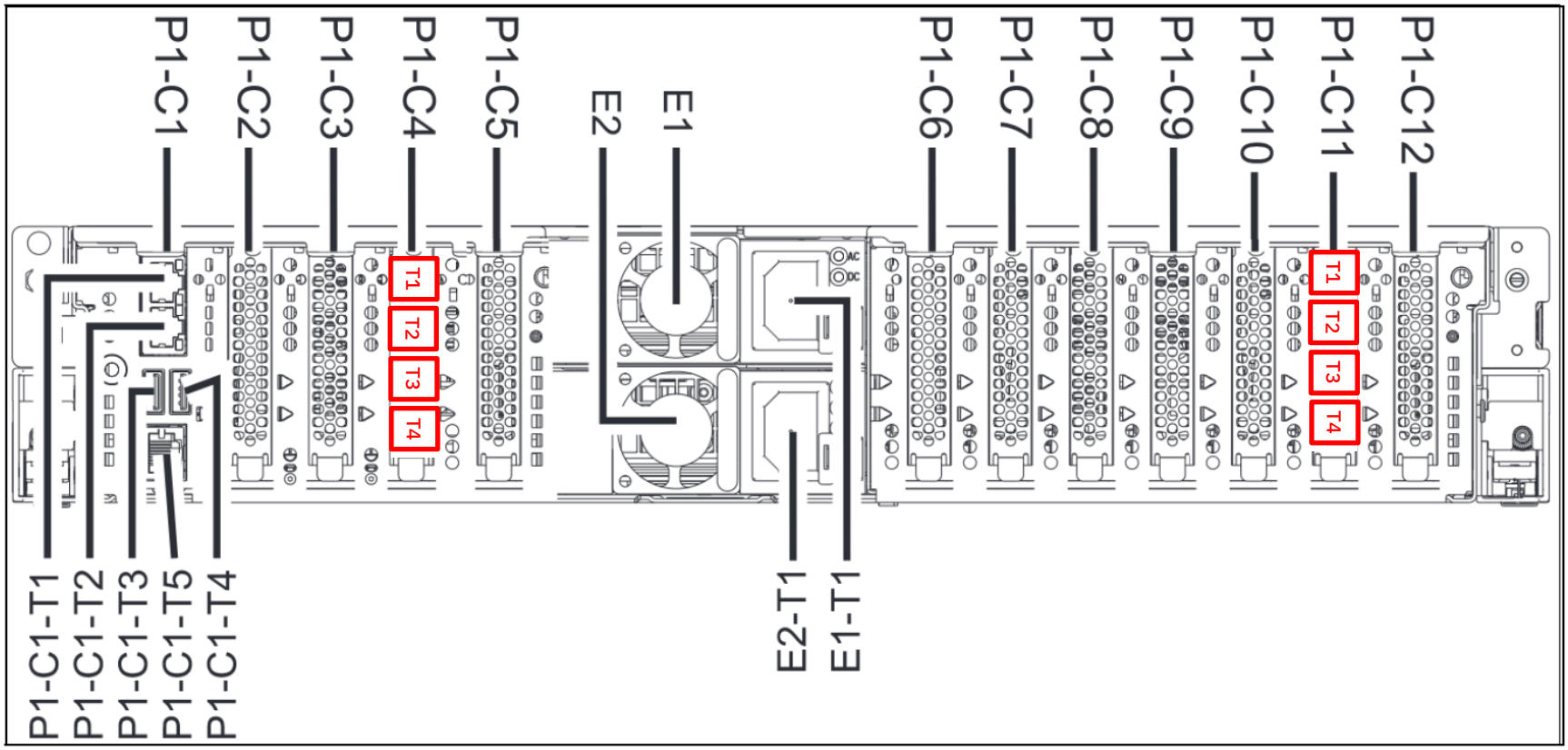
DS8910F Model 993 or 994 (2U Power9 CPC) – Ethernet Adapters

See next page for description of adapters and ports used for these ethernet connections.



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DS8910F Model 993 or 994 (2U Power9 CPC) – Ethernet Adapters

- Ethernet Adapter P1-C11
  - 4 port (RJ45 copper) 1Gb ethernet adapter
  - Standard adapter shipped on all Model 993/994 CPCs
  - Ports T1 and T2 are cabled and used for internal communications
  - Ports T3 and T4 can optionally be used for TCT
- Ethernet Adapter P1-C4
  - 4 port ethernet adapter
  - Optional feature code 3602 for TCT
  - Ports T1 and T2 are optical SR 10Gb ports – Note: Short Reach optics
  - Ports T3 and T4 are RJ45 copper 1Gb ports

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DS8910F Model 993 or 994 (2U Power9 CPC) – DSCLI nomenclature

Models 993 and 994

CEC	DSCLI Port ID	Physical Port	Port Speed
0	I9893	P1-C10-T3	1Gbps
0	I9894	P1-C10-T4	1Gbps
0	I9831	P1-C4-T1	10Gbps
0	I9832	P1-C4-T2	10Gbps
0	I9833	P1-C4-T3	1Gbps
0	I9834	P1-C4-T4	1Gbps
1	I9B93	P1-C10-T3	1Gbps
1	I9B94	P1-C10-T4	1Gbps
1	I9B31	P1-C4-T1	10Gbps
1	I9B32	P1-C4-T2	10Gbps
1	I9B33	P1-C4-T3	1Gbps
1	I9B34	P1-C4-T4	1Gbps

Original 1 Gbit Ports (2 for redundancy)

New 10Gbit Ports (2 for redundancy)

New Additional 1Gbit Ports (2 for redundancy)

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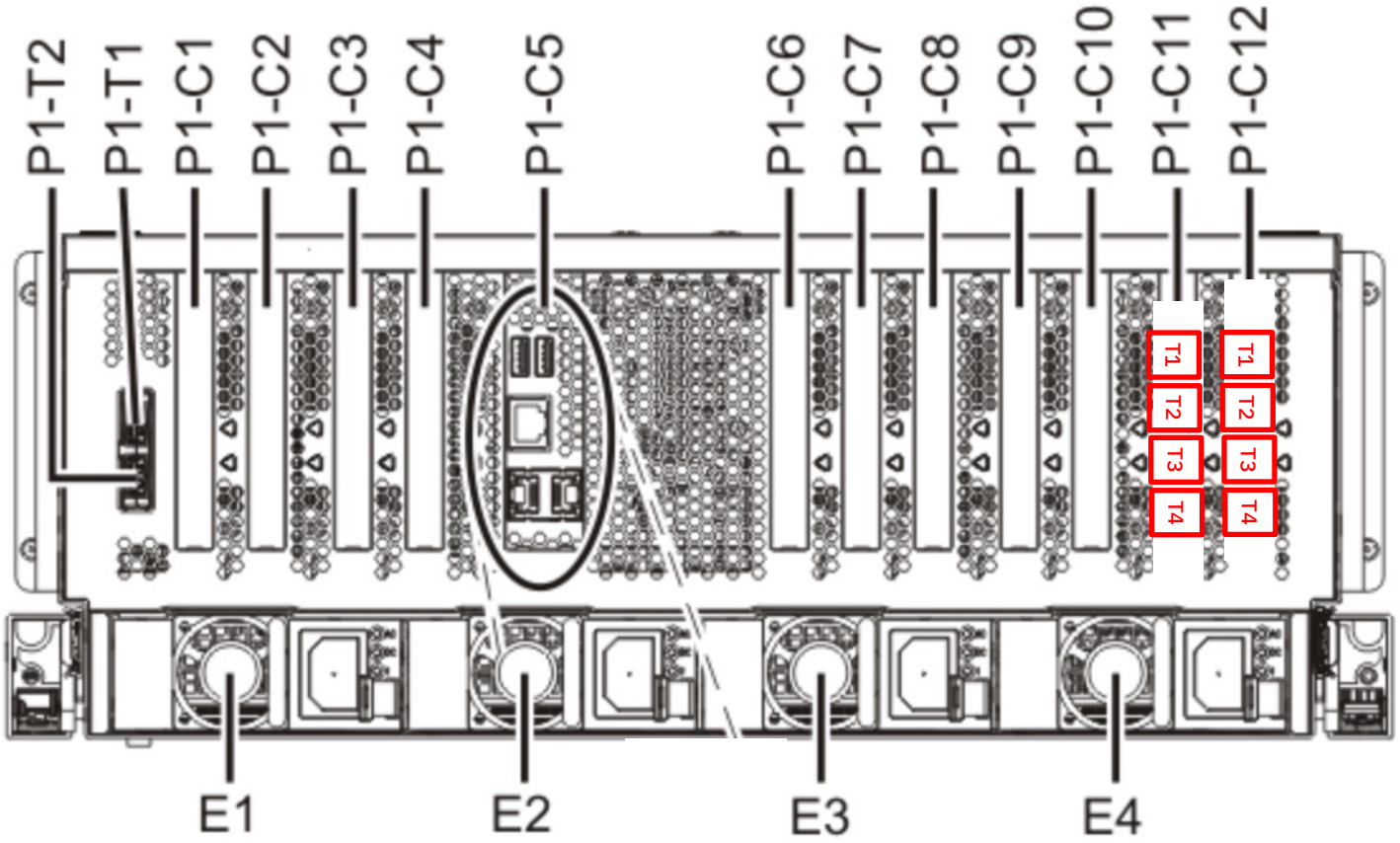
DS8888F Model 988 (4U POWER8 CPC) – Ethernet Adapters

See next page for description of adapters and ports used for these ethernet connections.



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DS8888F Model 988 (4U POWER8 CPC) – Ethernet Adapters

- Ethernet Adapter P1-C11
  - 4 port (RJ45 copper) 1Gb ethernet adapter
  - Standard adapter shipped on all Model 988 CPCs
  - Ports T1 and T2 are cabled and used for internal communications
  - Ports T3 and T4 can optionally be used for TCT
- Ethernet Adapter P1-C12
  - 4 port ethernet adapter
  - Optional feature code 3601 for TCT
  - Ports T1 and T2 are optical LR 10Gb ports – Note: Long Reach optics
  - Ports T3 and T4 are RJ45 copper 1Gb ports

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DS8888F Model 988 (4U POWER8 CPC) – DSCLI nomenclature

Model 988

CEC	DSCLI Port ID	Physical Port	Port Speed
0	I98A3	P1-C11-T3	1Gbps
0	I98A4	P1-C11-T4	1Gbps
0	I98B1	P1-C12-T1	10Gbps
0	I98B2	P1-C12-T2	10Gbps
0	I98B3	P1-C12-T3	1Gbps
0	I98B4	P1-C12-T4	1Gbps
1	I9BA3	P1-C11-T3	1Gbps
1	I9BA4	P1-C11-T4	1Gbps
1	I9BB1	P1-C12-T1	10Gbps
1	I9BB2	P1-C12-T2	10Gbps
1	I9BB3	P1-C12-T3	1Gbps
1	I9BB4	P1-C12-T4	1Gbps

Original 1 Gbit Ports (2 for redundancy)

New 10Gbit Ports (2 for redundancy)

New Additional 1Gbit Ports (2 for redundancy)

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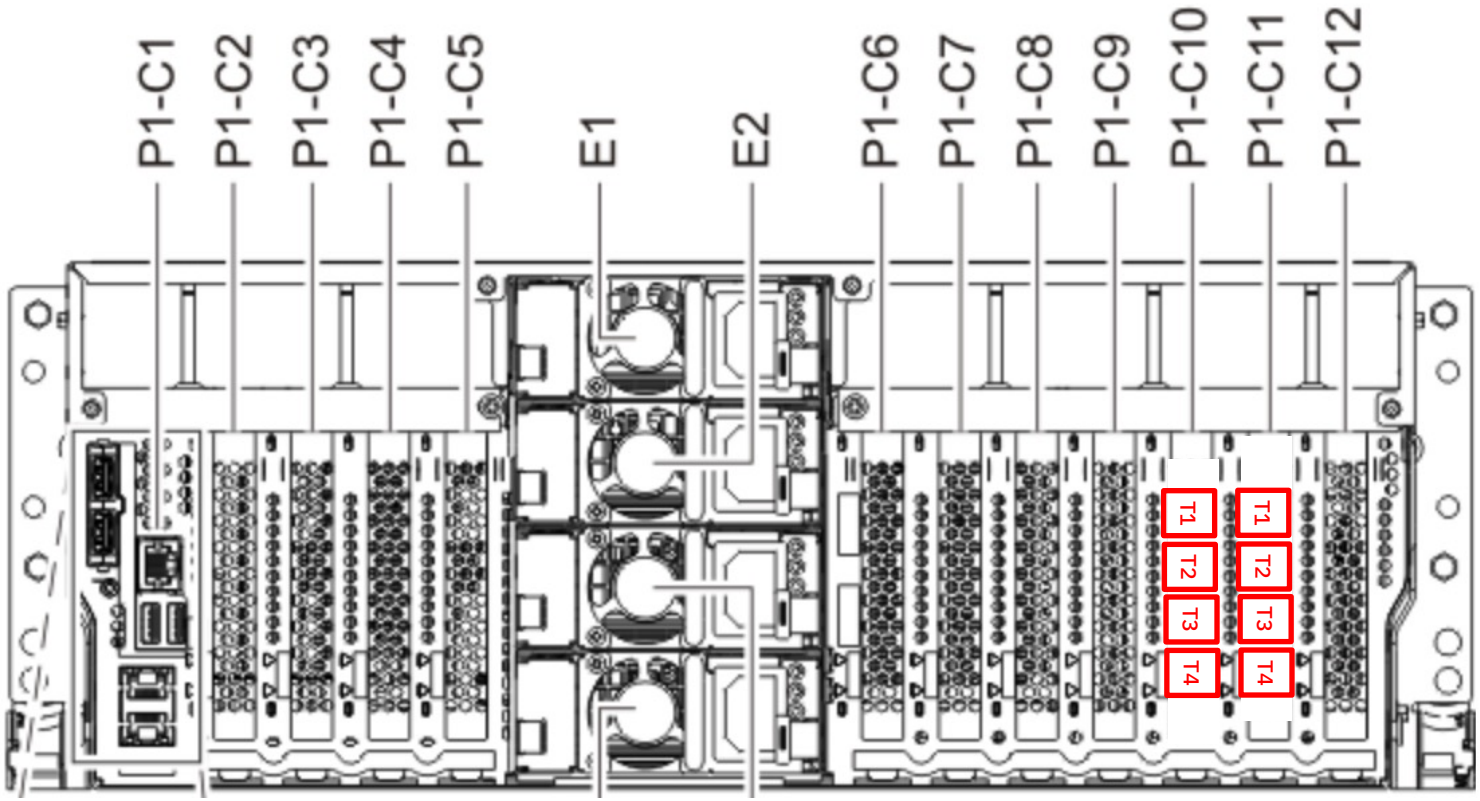
DS88886/F Model 981, 985, 986 (4U POWER8 CPC) – Ethernet Adapters

See next page for description of adapters and ports used for these ethernet connections.



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DS88886/F Model 981, 985, 986 (4U POWER8 CPC) – Ethernet Adapters

- Ethernet Adapter P1-C10
  - 4 port (RJ45 copper) 1Gb ethernet adapter
  - Standard adapter shipped on all Model 981, 985, 986 CPCs
  - Ports T1 and T2 are cabled and used for internal communications
  - Ports T3 and T4 can optionally be used for TCT

- Ethernet Adapter P1-C11
  - 4 port ethernet adapter
  - Optional feature code 3601 for TCT
  - Ports T1 and T2 are optical LR 10Gb ports – Note: Long Reach optics
  - Ports T3 and T4 are RJ45 copper 1Gb ports

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DS88886/F Model 981, 985, 986 (4U POWER8 CPC) – DSCLI nomenclature

Models 981, 985, 986

CEC	DSCLI Port ID	Physical Port	Port Speed
0	I9893	P1-C10-T3	1Gbps
0	I9894	P1-C10-T4	1Gbps
0	I98A1	P1-C11-T1	10Gbps
0	I98A2	P1-C11-T2	10Gbps
0	I98A3	P1-C11-T3	1Gbps
0	I98A4	P1-C11-T4	1Gbps
1	I9B93	P1-C10-T3	1Gbps
1	I9B94	P1-C10-T4	1Gbps
1	I9BA1	P1-C11-T1	10Gbps
1	I9BA2	P1-C11-T2	10Gbps
1	I9BA3	P1-C11-T3	1Gbps
1	I9BA4	P1-C11-T4	1Gbps

Original 1 Gbit Ports (2 for redundancy)

New 10Gbit Ports (2 for redundancy)

New Additional 1Gbit Ports (2 for redundancy)

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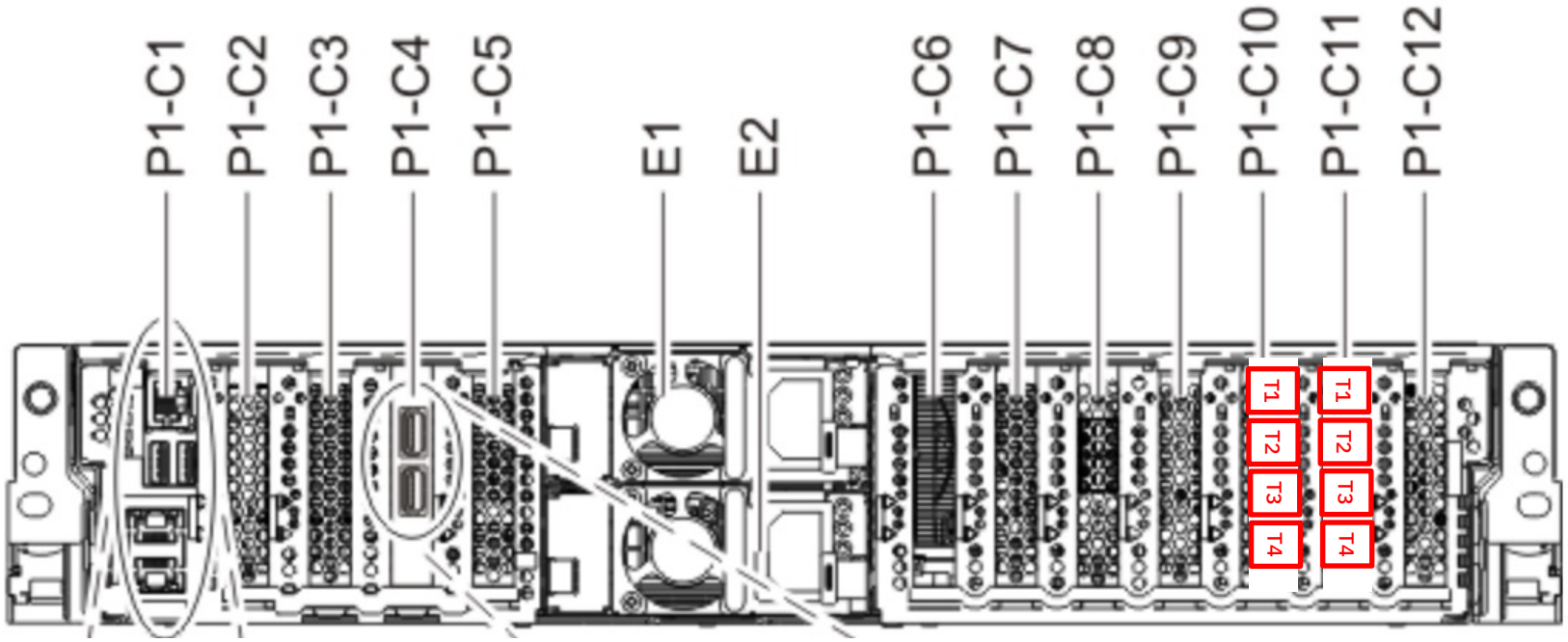
DS8884/F Model 980, 984 & DS8882F Model 983 (2U POWER8 CPC) – Ethernet Adapters

See next page for description of adapters and ports used for these ethernet connections.



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DS8884/F Model 980, 984 & DS8882F Model 983 (2U POWER8 CPC) – Ethernet Adapters

- Ethernet Adapter P1-C10
  - 4 port (RJ45 copper) 1Gb ethernet adapter
  - Standard adapter shipped on all Model 980, 983, 984 CPCs
  - Ports T1 and T2 are cabled and used for internal communications
  - Ports T3 and T4 can optionally be used for TCT

- Ethernet Adapter P1-C11
  - 4 port ethernet adapter
  - Optional feature code 3600 for TCT
  - Ports T1 and T2 are optical LR 10Gb ports – Note: Long Reach optics
  - Ports T3 and T4 are RJ45 copper 1Gb ports

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DS8884/F Model 980, 984 & DS8882F Model 983 (2U POWER8 CPC) – Ethernet Adapters

Models 980, 983, 984

CEC	DSCLI Port ID	Physical Port	Port Speed
0	I9893	P1-C10-T3	1Gbps
0	I9894	P1-C10-T4	1Gbps
0	I98A1	P1-C11-T1	10Gbps
0	I98A2	P1-C11-T2	10Gbps
0	I98A3	P1-C11-T3	1Gbps
0	I98A4	P1-C11-T4	1Gbps
1	I9B93	P1-C10-T3	1Gbps
1	I9B94	P1-C10-T4	1Gbps
1	I9BA1	P1-C11-T1	10Gbps
1	I9BA2	P1-C11-T2	10Gbps
1	I9BA3	P1-C11-T3	1Gbps
1	I9BA4	P1-C11-T4	1Gbps

Original 1 Gbit Ports (2 for redundancy)

New 10Gbit Ports (2 for redundancy)

New Additional 1Gbit Ports (2 for redundancy)

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