

# Deep Dive - PCIe3 RAID SAS Adapters Optimized for SSD's

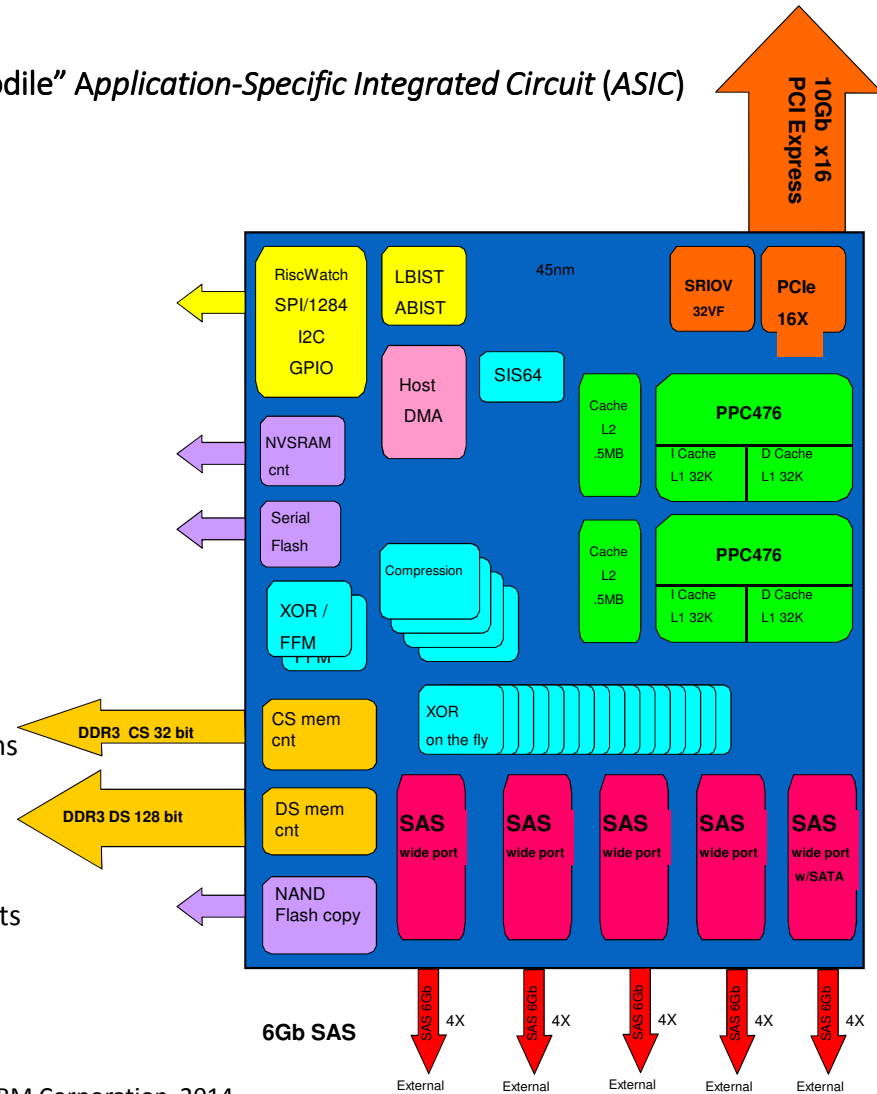
PCIe3 RAID SAS Adapter Quad-port 6Gb x8 (#EJ0J/EJ0M)  
PCIe3 12GB Cache RAID SAS Adapter Quad-port 6Gb x (#EJ0L)

# Contents

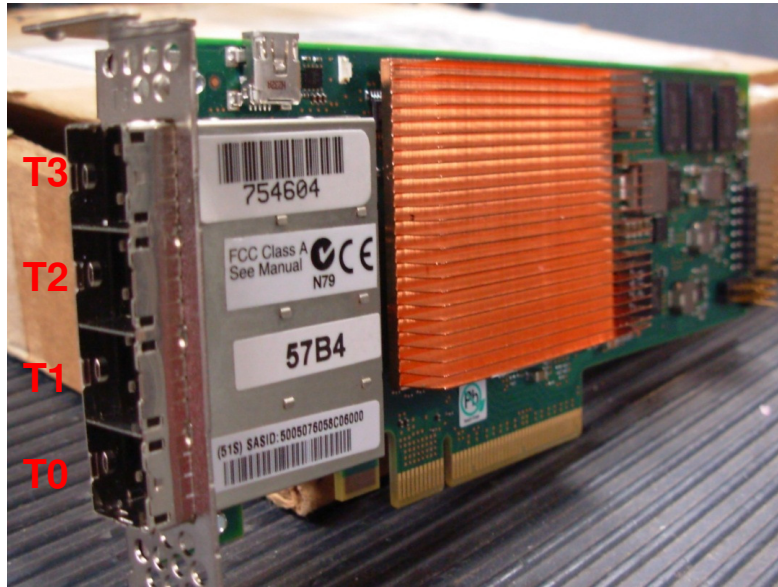
- ASIC Overview
- PCIe3 RAID SAS Adapter Quad-port 6Gb x8 (#EJ0J/EJ0M) Configurations
- PCIe3 12GB Cache RAID SAS Adapter Quad-port 6Gb x (#EJ0L) Configurations

## SSD Optimized RAID Controller Implemented Using “Crocodile” Application-Specific Integrated Circuit (ASIC)

- Industry-leading SSD-optimized RAID controller
  - 16x PCIe Gen 3 with SRIOV
  - Dual 476 with separate L2 cache per core
  - 20 6Gb SAS ports
  - Separate Control Store and Data Store using DDR3 memory
- Industry-leading performance
  - 1M JBOD Read ops/sec per chip!
  - Up to 500K 4K Write IOPs (Industry leading)
  - 7.2GB/sec Rd Throughput 8X PCIe (9GB Sec in 16X)
  - Delivers performance via accelerators
  - Up to 32GB DRAM Backed Write Cache.
- True enterprise-class Raid-on-Chip (ROC)
  - Compression to Cache to logically double/triple Cache.
  - Advanced end-to-end checking
  - Flash-backed DIMM for power outage protection
  - 2nd processor as a platform for SSD-optimized functions
  - Flash Cache
- Enterprise class RAID Stack – VRAID FW
  - Supports AIX, IBM i, Linux, DS8000, Z
  - Industry leading Dual adapter functionality with mirrored write cache / mirrored parity update footprints



PCIe3 RAID SAS Adapter Quad-port 6Gb x8  
FC EJOJ / EJOM (CCIN 57B4)

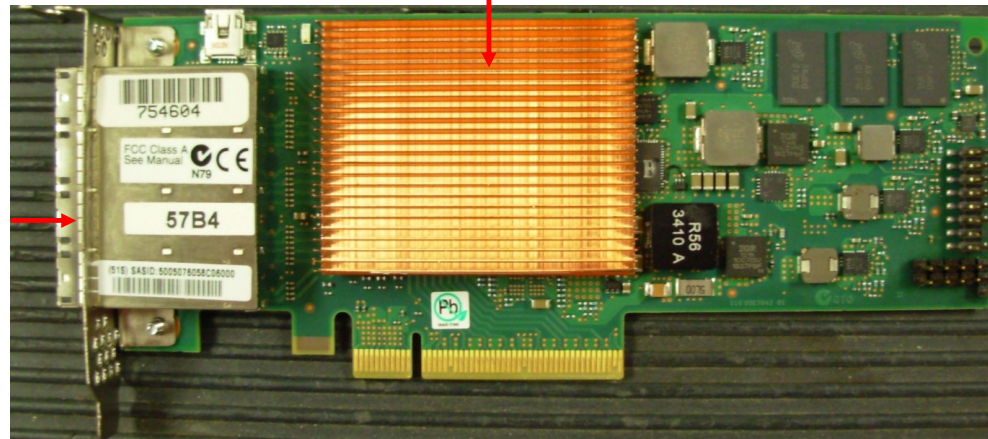


# FC EJOJ & EJOM (LP)

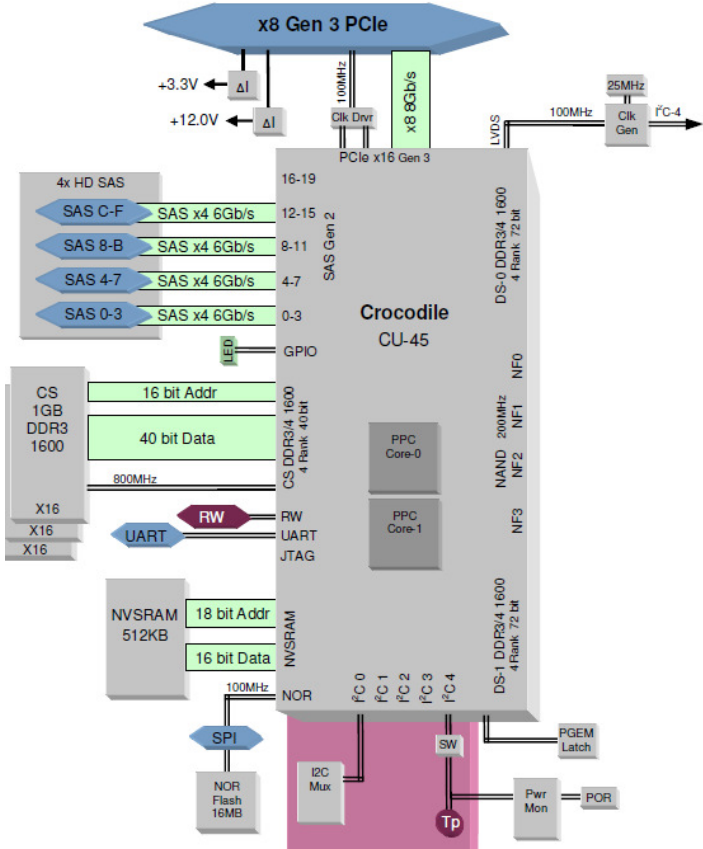
(CCIN 57B4)

ASIC (PPC now inside ASIC)

HD SAS Ports



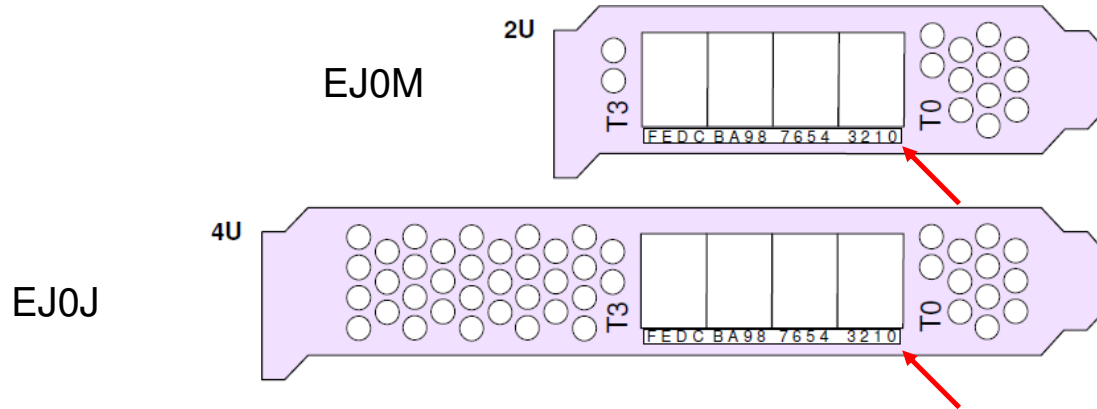
# EJ0J/EJ0M Block Diagram



## *EJ0J & EJ0M* Supported Configuration Summary

- SSD's and/or HDD's
- 48 SSD's max (Specific rules for each enclosure)
- Single or Dual controller configs (no write cache)
- Raid-0,10,5,6, (JBOD support also on single controller only)
- Max devices per array = 32
- SSD's / HDDs in EXP24S (#5887) or #5803
  - ❖ Specific rules for mixing SSD's and HDD's (cannot mix on port)
  - ❖ #5803 mode 1 not supported with SSD's
- SAS Tape support on Single controller (cannot mix Tape/Disk on same controller)

# Physical Port Labeling



High Density  
(HD) connectors

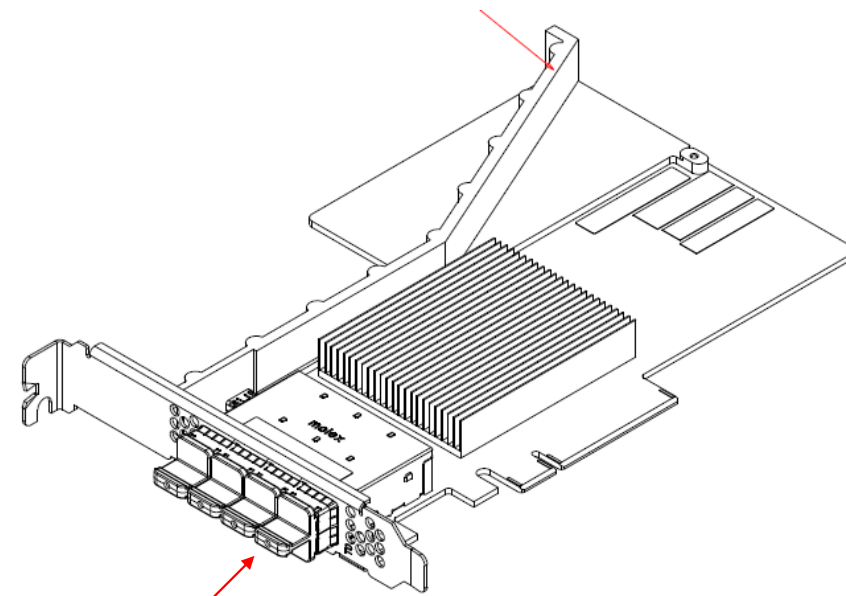


# EJ0J & EJ0M

## Baffle for Full height card only - #EJ0J

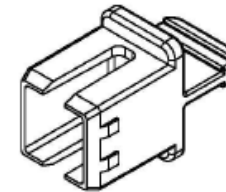
- Part of the feature (MES)
- Part of the FRU

Air Baffle



Connector plug

HD SAS Connector Plug



- Dust Plug
- Strengthens connector for cable plug/unplug

IBM PN 00E9345

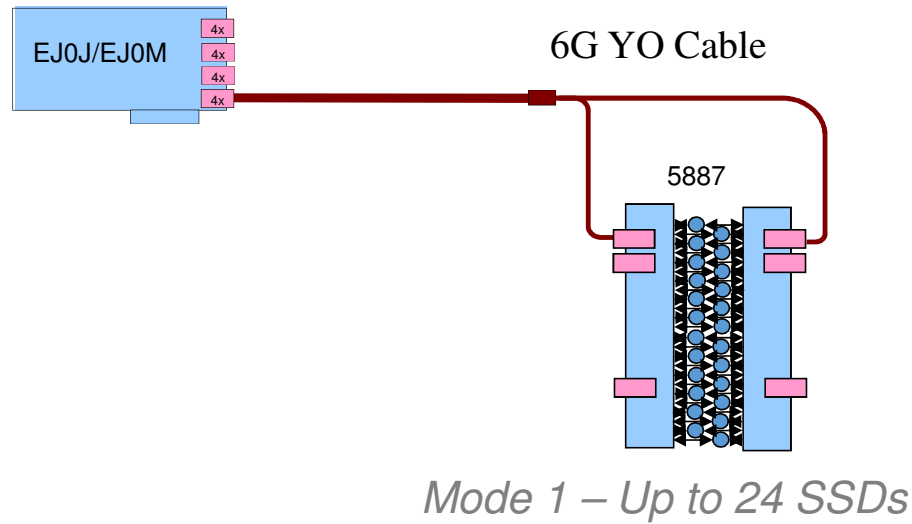
## SAS Adapter connect to Media drawer

<b><i>EJ0J &amp; EJ0M</i></b>	
<b>Link speed</b>	Supports 3 and <b>6 Gbps</b> SAS
<b>Ports/PHYs</b>	4 ports with 4 PHYs in each port
<b>Connector</b>	smaller port connector form factor (new cables needed)
<b>Chip</b>	Crocodile ASIC
<b>Device Support</b>	<b>NO SATA DVD support</b> , but SAS tape support

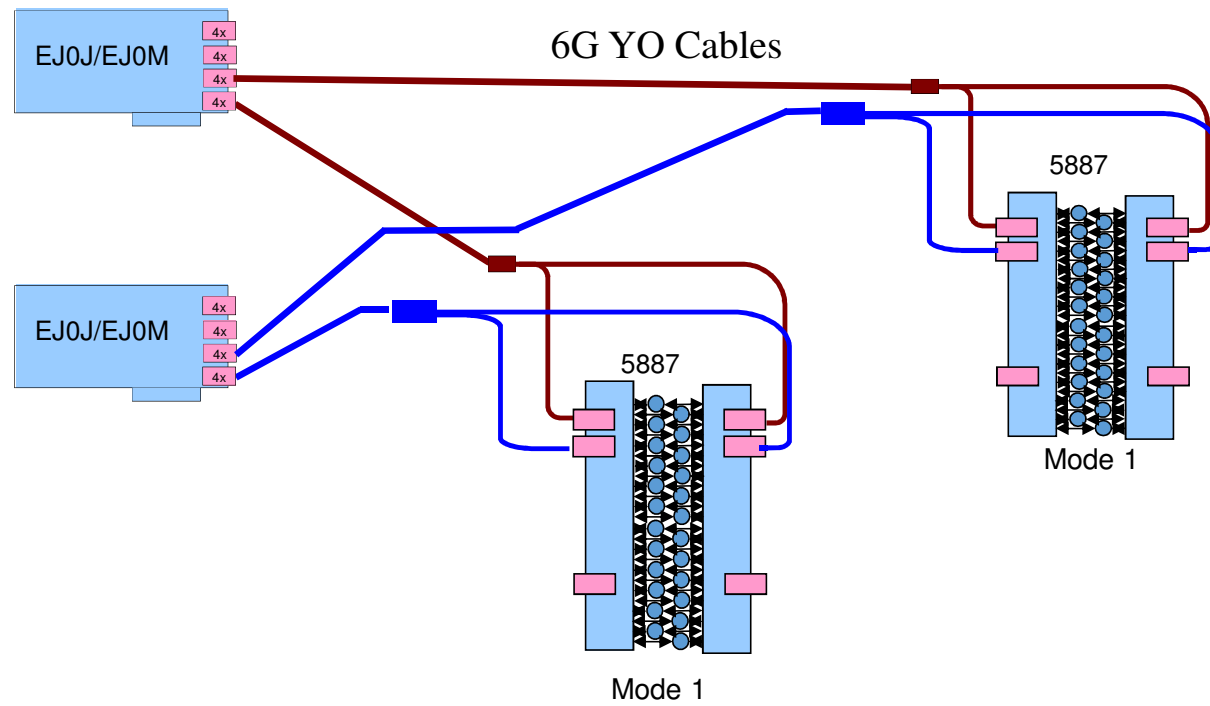
## New 6Gb HD SAS Cables

- Narrower backshell on new cables than the backshell on the existing cables due to higher density 4 gang SAS connectors
- Backwards compatible with current HD SAS adapters (57B5, 57C4)
- YO, X, AT, AA (\*no AA cables with EJ0J & EJ0M )
- New Feature Codes and P/N's
- Same Lengths. Same Basic Function
- New HD SAS cables for R/M (Oliver attach) = AE1 (4m) and YE1 (3m)

## Single EJ0J / EJ0M with SSD in EXP24S (Mode 1)



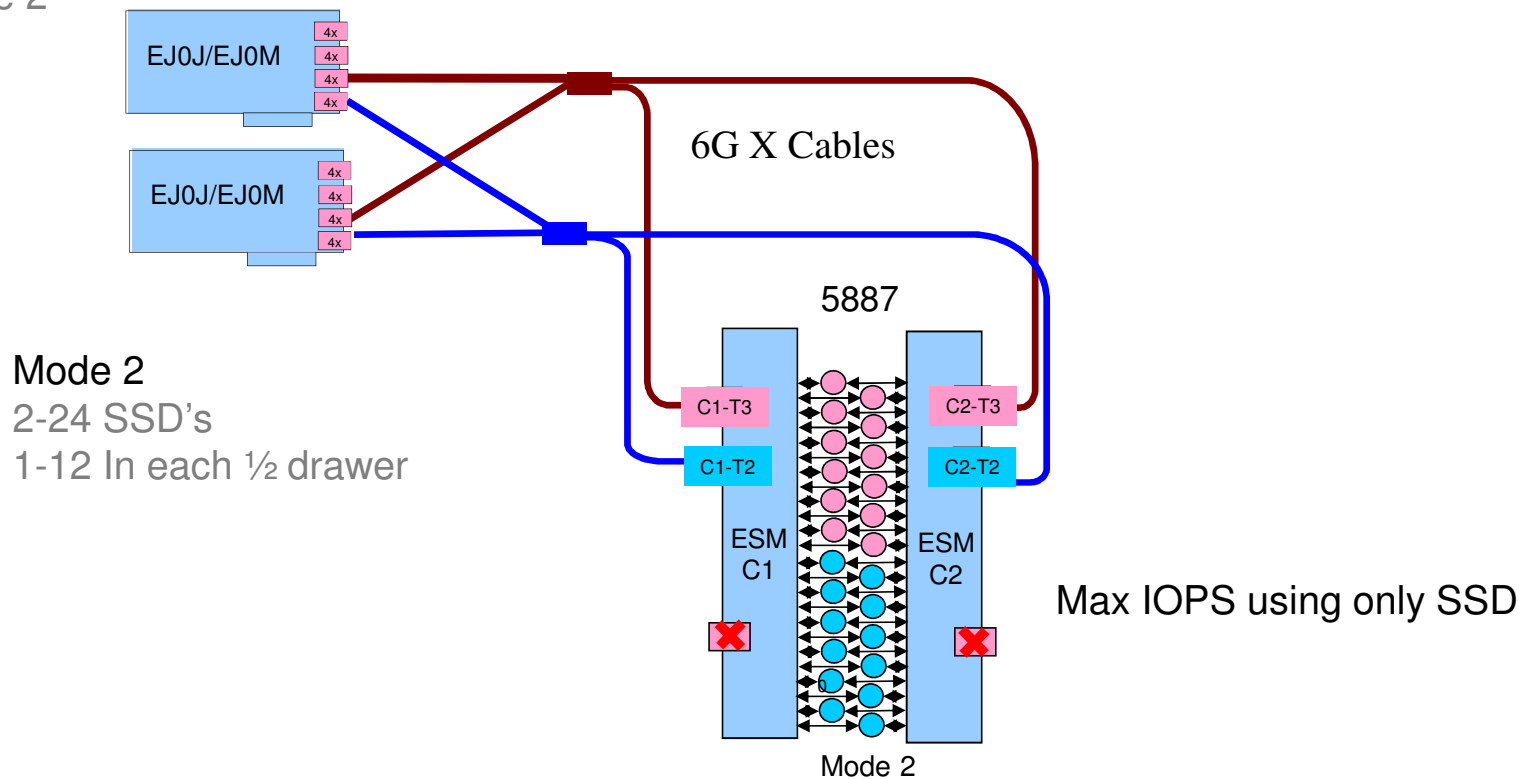
## Dual EJ0J/EJ0M with Max 48 SSD in EXP24S (Mode 1)



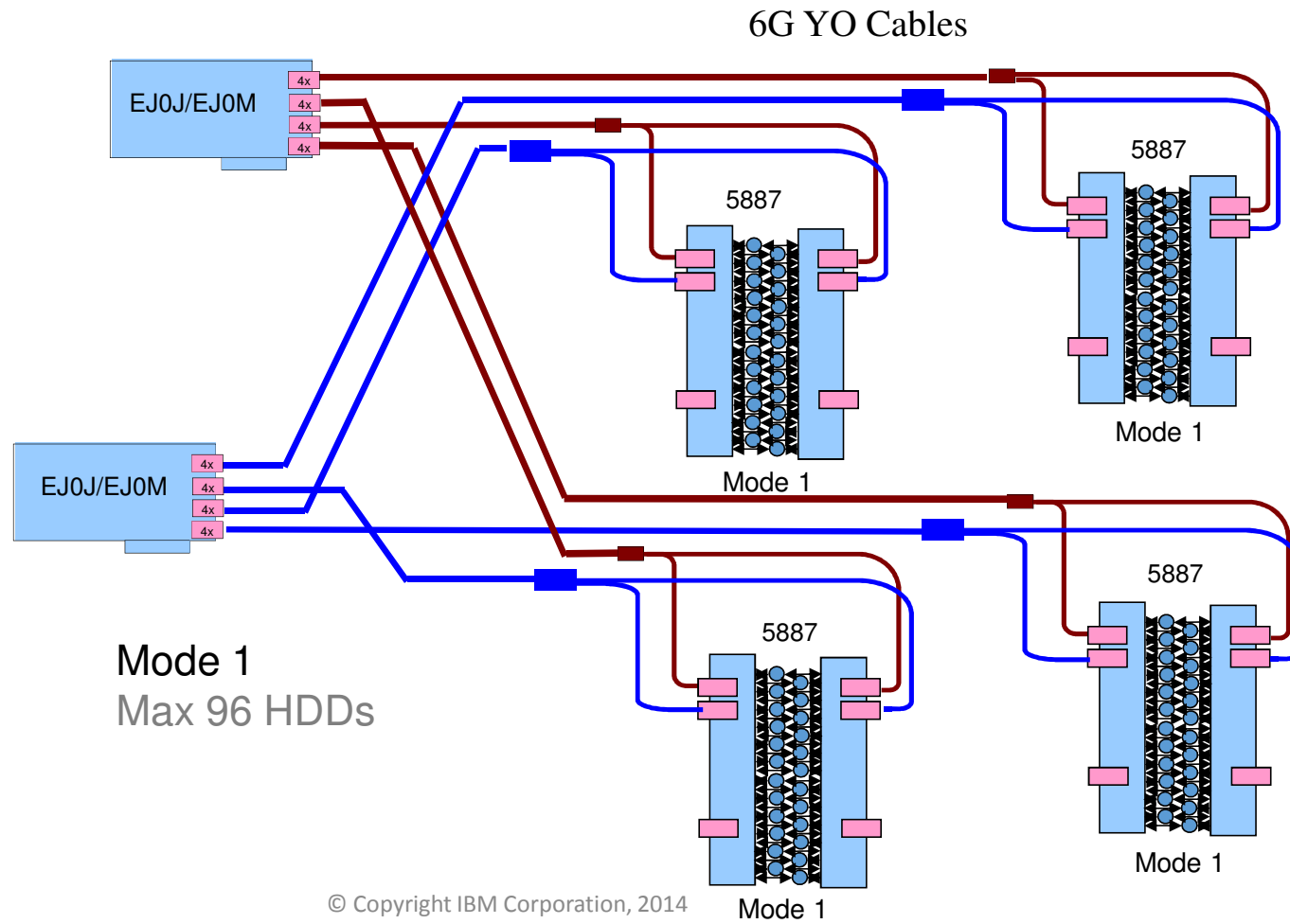
## Dual EJ0J/EJ0M to one EXP24S (Mode 2) with SSDs Special High IOPS Configuration

AIX & Linux only  
No IBM i support for  
EXP24S Mode 2

No AA cables needed (no write cache)



## Dual EJOJ/EJOM to four EXP24Ss (Mode 1) with Max 96 HDD

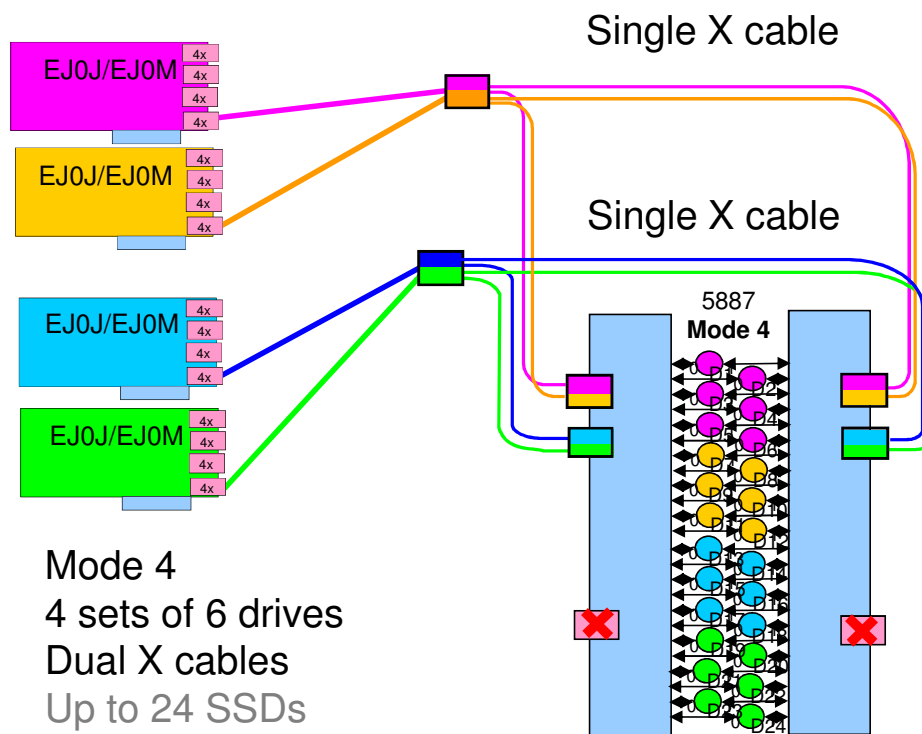


## 4 Single EJ0J/EJ0M to one EXP24S in 4 way split mode

The adapters do not see each other and can only see the 6 drives in the drive bays that are zoned for them to access

AIX & Linux only  
No IBM i support

6G SAS  
Mode 4

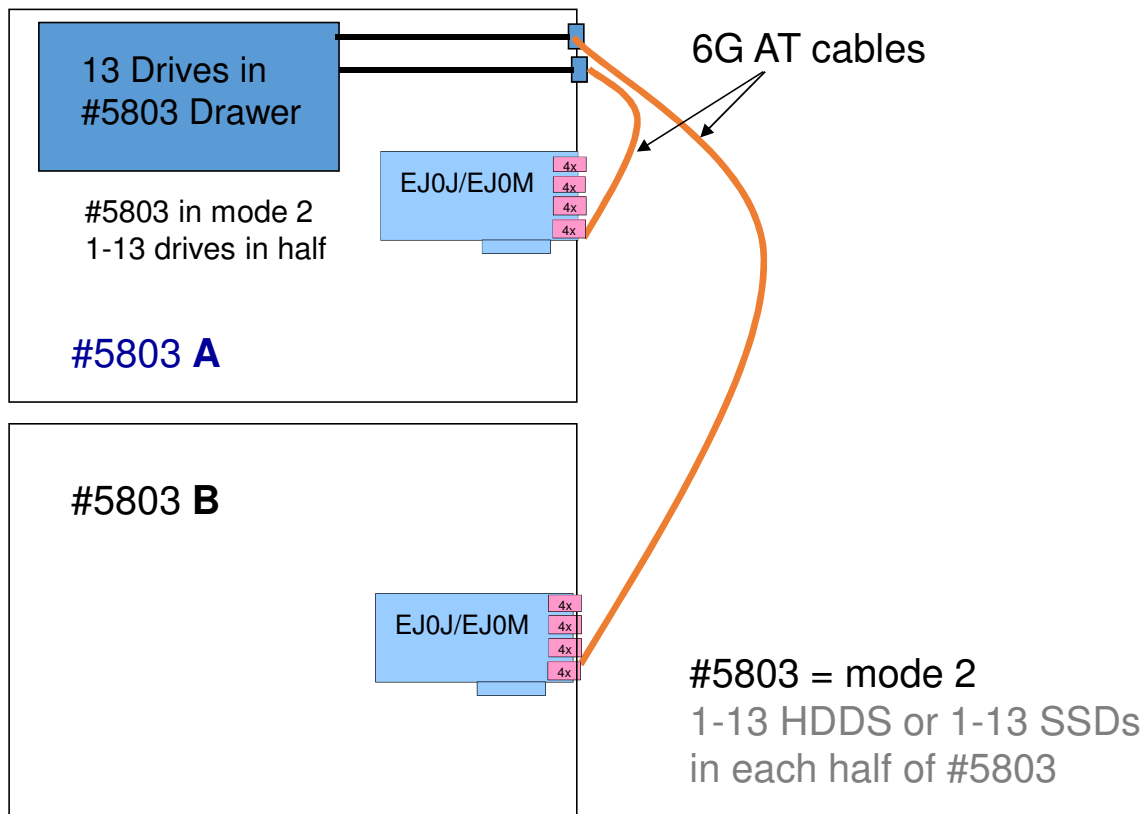


Mode 4  
4 sets of 6 drives  
Dual X cables  
Up to 24 SSDs

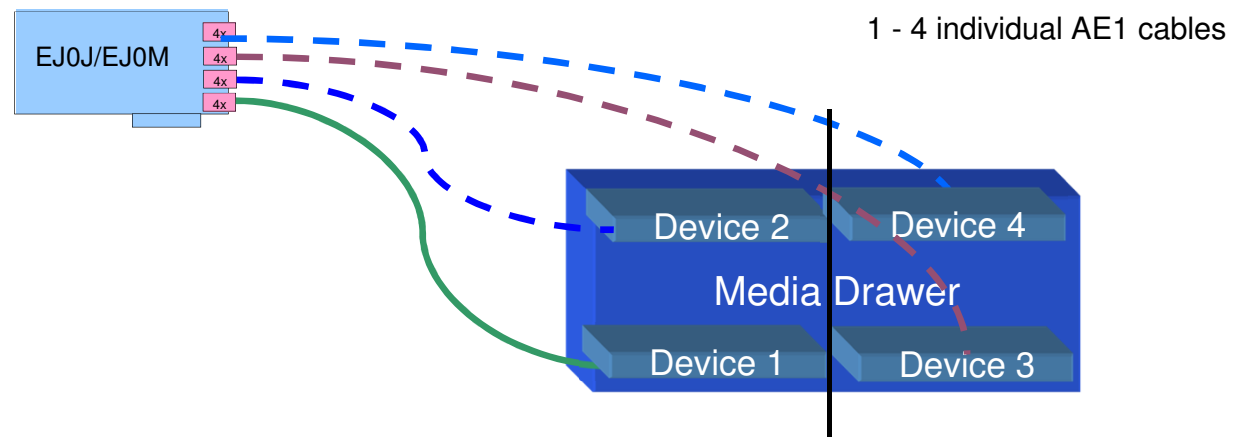


## Dual EJ0J/EJ0M in #5803 drawer to #5803 drawer drives

Field support config only, not supported in SBT/econfig tools

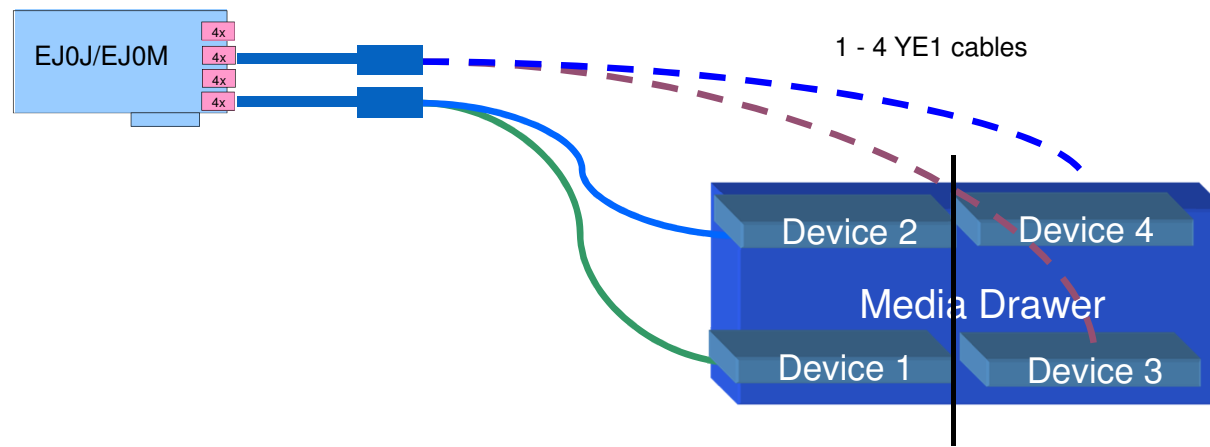


## Single EJ0J/EJ0M to SAS media drawer (one adapter port to one device)



- 2 SAS TAPE / Media drawer (4 max physically)

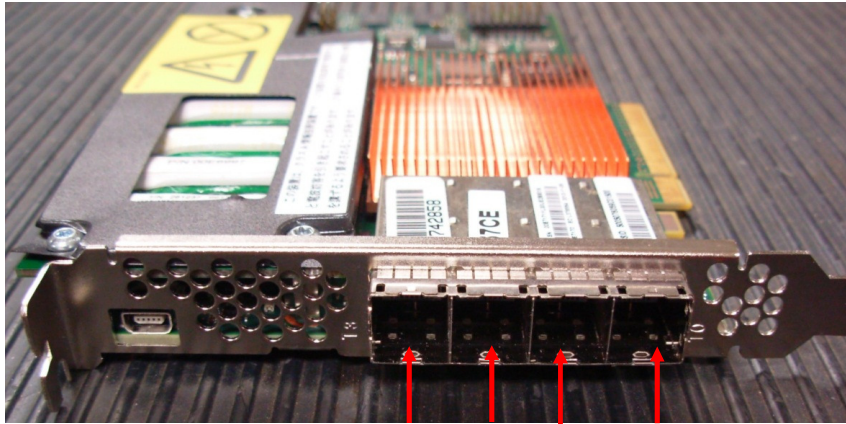
## Single EJ0J/EJ0M to SAS media drawer – Alternate Configuration (one HBA port to two devices)



- 2 SAS TAPE / Media drawer
- 8 Max Tape / adapter (physically)

PCIe3 12GB Cache RAID SAS Adapter Quad-port 6Gb x8  
FC EJ0L (CCIN 57CE)

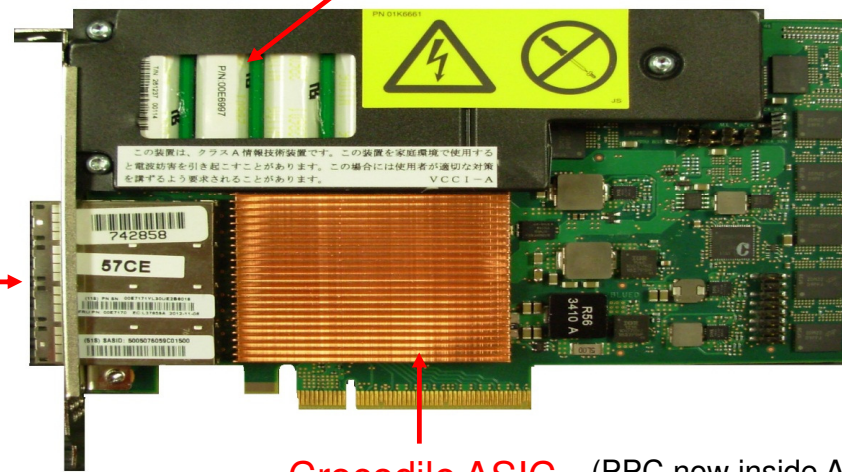
# EJ0L (57CE)



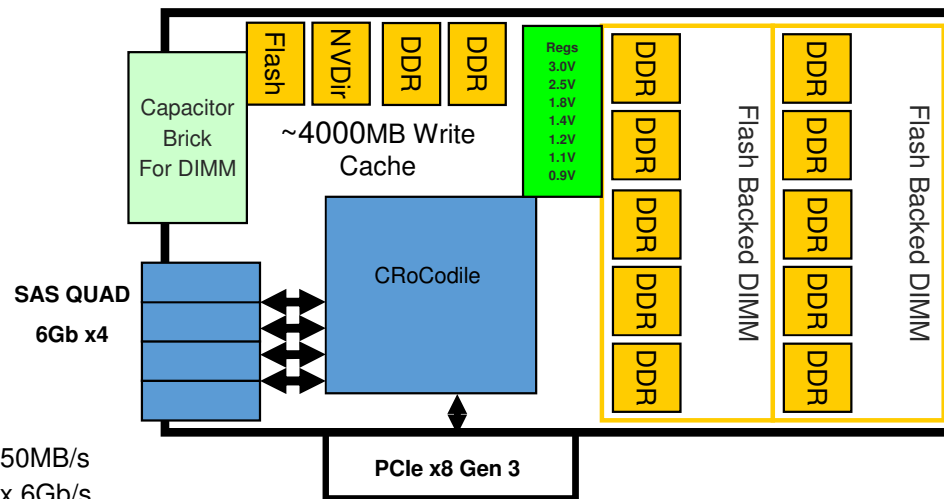
T3 T2 T1 T0

PowerGEM (capacitor card)

HD SAS Ports



Crocodile ASIC (PPC now inside ASIC)



6Gb/s = 450MB/s  
 1Port = 4 x 6Gb/s  
 1 Port = 1800MB/s  
 4 Port = 7200MB/s

# Super Caps vs Battery

(Flash backed DRAM vs battery backed DRAM)

Super Caps provide power long enough to copy data from Write Cache memory to non-volatile Flash on abnormal power down/loss

- No Battery Maintenance
- No ~ 10 day retention limitation after abnormal power off
- No 3 year EOL Battery replacement.
- FW monitors PowerGem health. HW error log for Card replacement if necessary.
- Projected for life of adapter

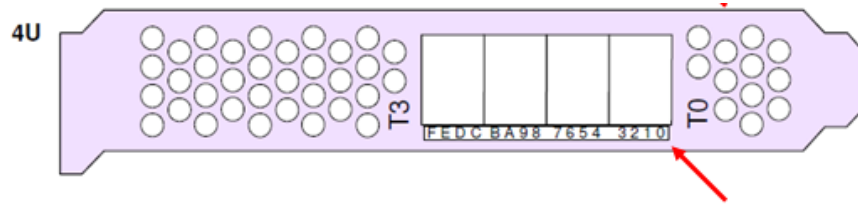
# Supported Configs

- SSD's and/or HDD's
- 48 SSD's max (Specific rules for each enclosure)
- Dual Controller only
- Max devices per array = 32
- Raid-0,10,5,6, no JBOD (except for initial formatting)
- EXP24S (#5887), #5803
  - ❖ Specific rules for mixing SSD's and HDD's
  - ❖ 5803 mode 1 not supported with SSD's



# Physical Port Labeling

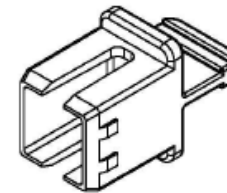
EJ0L



\*\*All Crocodile Adapters

**HD SAS Connector Plug**

High Density  
(HD) connectors



- Dust Plug
- Strengthens connector for cable plug/unplug

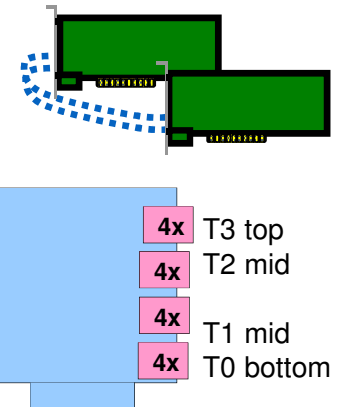
IBM PN 00E9345

# New 6Gb HD SAS Cables

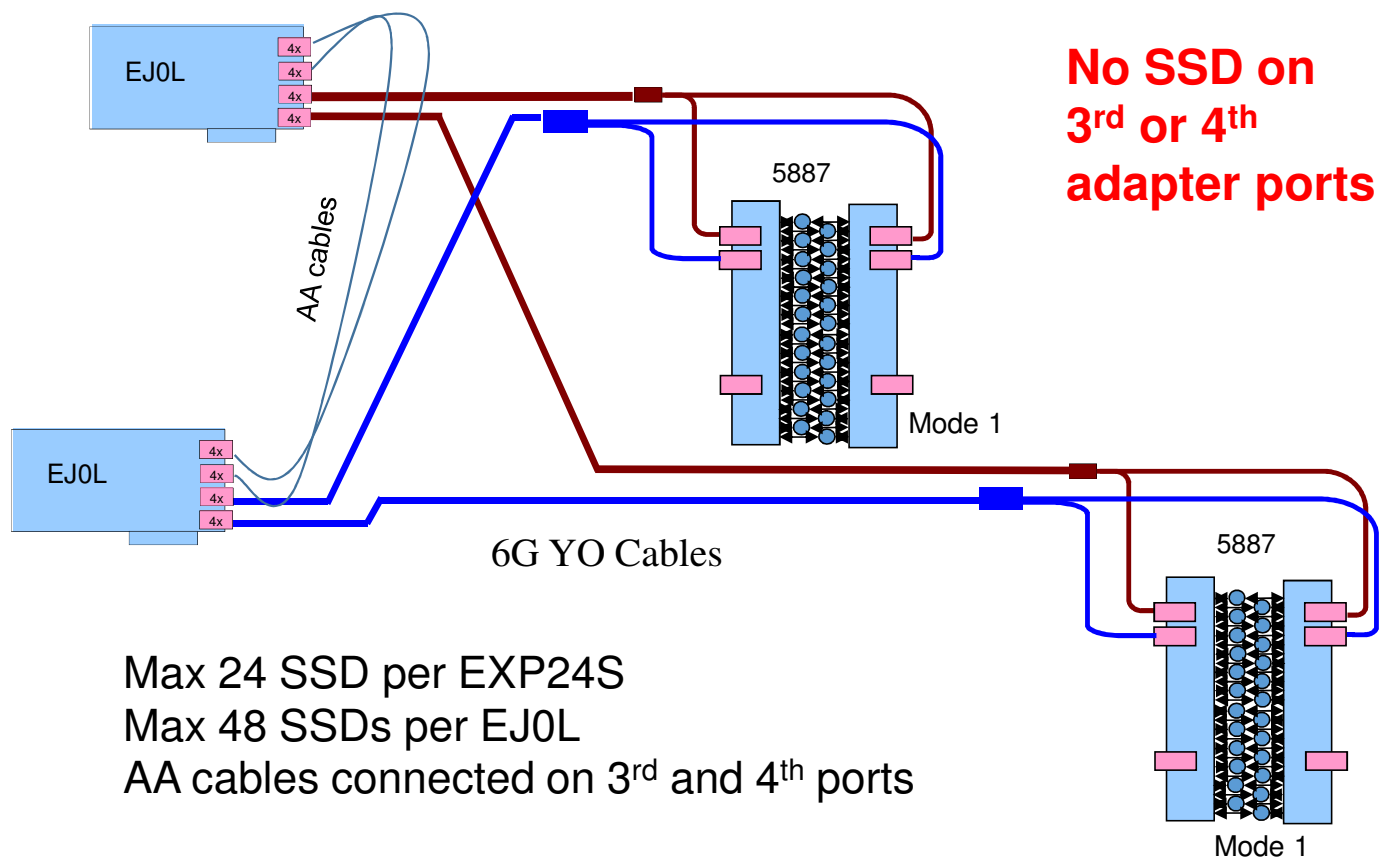
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- Backwards compatible with current HD SAS adapters (57B5, 57C4)
- YO, X, AT, AA
- New Feature Codes and P/N's
- Same Lengths. Same Basic Function

# EJOL

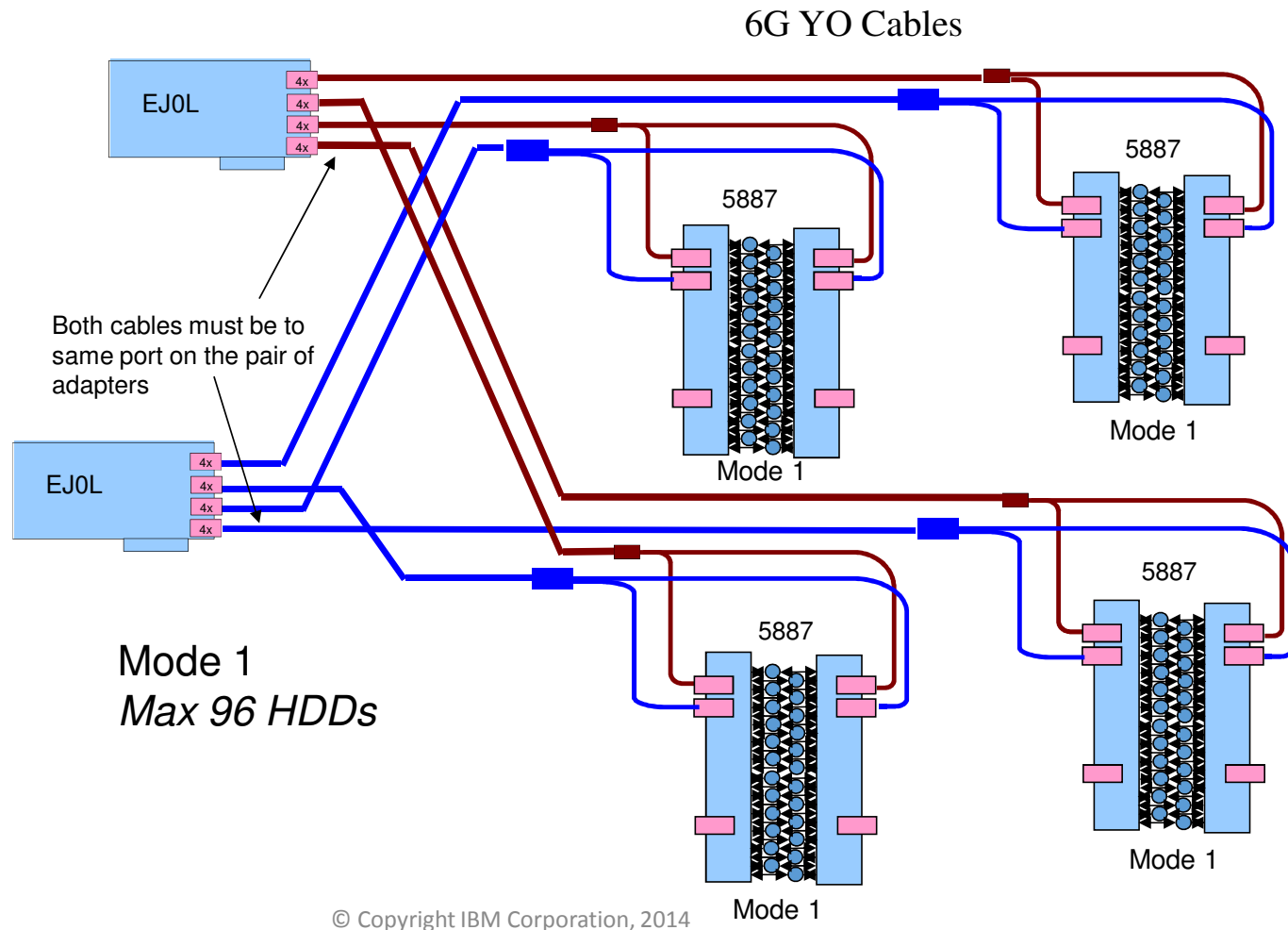
- Always Paired, full-high, single-slot adapters
  - One exception, If AIX running HACMP, then the pair is split between two servers ... each server having one adapter.
- AA cables (2) defaulted between two EJOL
  - The top ports (3<sup>rd</sup> and 4<sup>th</sup>) are reserved for the AA cable or I/O drawers with **HDD**
  - All four ports can have drive attachment with
  - AA cables 3m, 6m, 1.5m and 0.6 meter
- Supports SAS HDD/SSD
  - Drives located in
    - #5803 12X I/O Drawers
    - EXP24S SFF I/O drawers
  - Drives NOT located in system units or EXP12S



## EJ0L to two EXP24S (Mode1) with Max 48 SSD

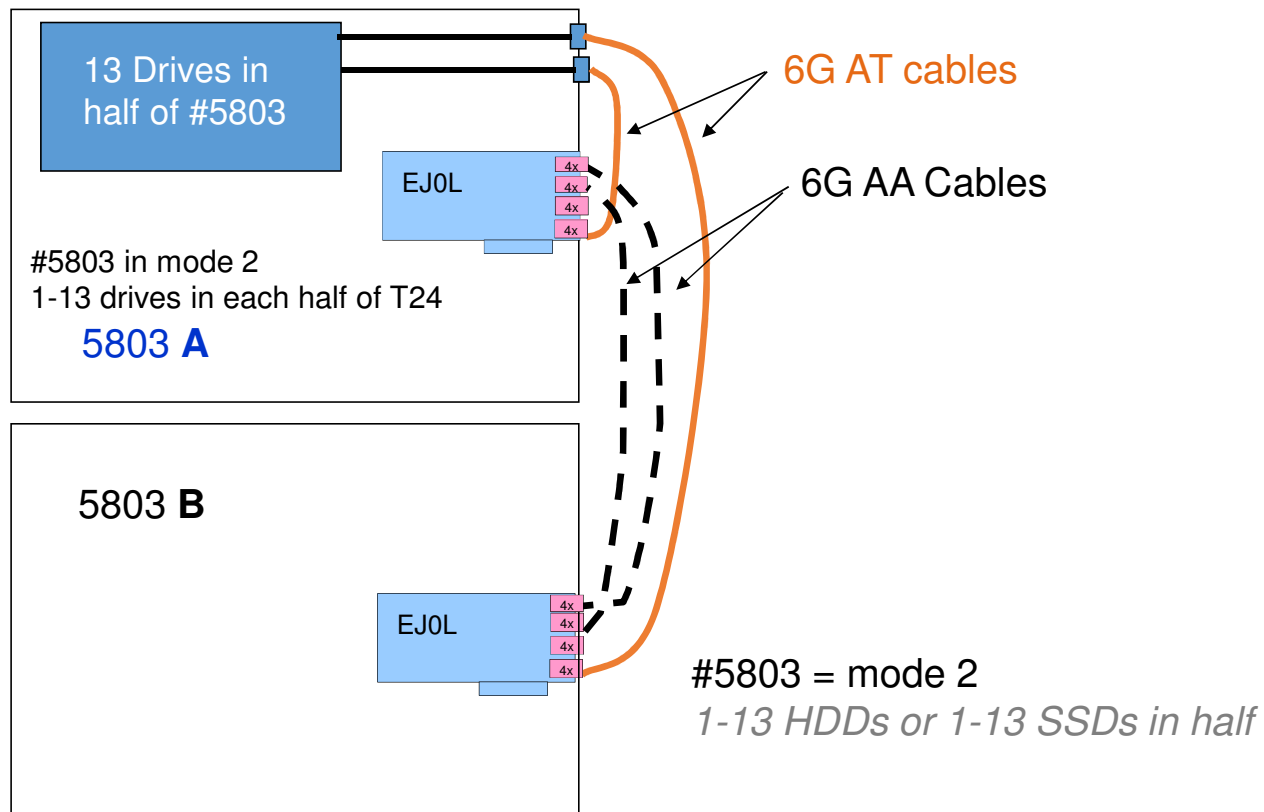


# EJOL to four EXP24S (Mode1) with Max 96 HDD



## Dual EJ0L in #5803 drawer to #5803 drawer drives only

Field support config only, not supported in SBT/econfig tools



# Documentation Links

- [Booting AIX From SSDs](#)

[http://www.ibmssystemsmag.com/aix/administrator/systemsmanagement/booting\\_ssds/](http://www.ibmssystemsmag.com/aix/administrator/systemsmanagement/booting_ssds/)

- SAS Raid Controllers:

- [SAS RAID controllers for AIX](#)

<http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ebj/p7ebjkickoff.htm>

- [SAS RAID controllers for IBM i](#)

<http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ed5/p7ed5kickoff.htm>

- [SAS RAID controllers for Linux](#)

<http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7ebk/p7ebkkickoff.htm>

- [Feature Specific Information](#)

<http://publib.boulder.ibm.com/infocenter/powersys/v3r1m5/topic/p7hcd/pcibyfeature.htm>