Technical Bulletin:

Application of Wide SCSI on AlphaServer 2000/2100/2100A

Revision/Update Information:
Version 1.5 - December 15, 1995

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INTRODUCTION

AlphaServer 2000, AlphaServer 2100, and AlphaServer 2100A pedestal systems support wide (16-bit) SCSI devices. Wide SCSI disks can improve the performance of applications that need very high bandwidth I/O data transfers. Also, wide devices allow migration to the newest PCI SCSI controllers

System Requirements for Wide Operation

The four system elements required for wide operation are:

1. Wide drives

RZ29B-VW	4.3 GB 3.5” 7200 RPM Drive
RZ28D-VW	2.1 GB 3.5” 7200 RPM Drive
RZ28-VW	2.1 GB 3.5” 5400 RPM Drive
RZ28M-VW	2.1 GB 3.5” 5400 RPM Drive
RZ26L-VW	1.05 GB 3.5” 7200 RPM Drive
RZ26N-VW	2.1 GB 3.5” 5400 RPM Drive

   Rules for using both wide and narrow drives are explained in later sections.

2. Wide Shelves

   The wide (16-bit) drives require wide (16-bit) shelves. Wide drives may NOT be used in narrow (8-bit) shelves. All the AlphaServer 2100A models have a wide internal StorageWorks shelf (4/275, 5/250, 5/300). The following models of AlphaServer 2100 have a wide internal StorageWorks shelf: 4/233, 4/275, 5/250, 5/300. The AlphaServer 2000 systems has a "wide-ready" shelf -- the internal StorageWorks shelf is electrically compatible with wide (16-bit) devices.

   The first internal shelf that is integral to the AlphaServer 2100 model's 4/200 is narrow. However, a wide BA35E enclosure can be added as the optional second internal shelf.

   The BA356 storage external expansion unit supports wide (16-bit) devices.

   Rules for using both wide and narrow shelves are explained in later sections.

3. Wide Controller

   The following SCSI controllers allow wide devices to operate in wide (16-bit) mode:

KZPSC	Fast, wide controller for either RAID array or native SCSI operation
KZPSA	Fast, wide, differential connection to disks in BA35x- shelves

   Rules for using both wide and narrow controllers are explained in later sections.

4. Cables and Terminators

   Requirements for cables and terminators depend on the particular platform and controller. Rules are given in later sections

Later sections list the minimum revisions of operating system software and console firmware required to support the various SCSI devices and controllers.

Mixing Narrow and Wide Devices, Controllers, and Shelves

Wide drives may ONLY be used in wide shelves. However, wide drives may operate in narrow (8-bit) mode when connected to a narrow SCSI controller such as the AlphaServer 2000/2100 internal B2110/B2111 controller or the KZPAA PCI backplane controller or the 2100A backplane. There is no performance advantage if wide drives run in narrow (8-bit) mode. However, it allows a new drive such as the RZ29B-VW to run in a current AlphaServer 2000/2100/2100A configuration without modification, and later upgrade to a wide controller.

Narrow devices will work in wide shelves and can be mixed with wide devices. The narrow devices always run in narrow (8-bit) mode, even when connected to a wide SCSI controller. Minimum revision levels for the narrow devices are listed in a later section.

Table 1 shows the permitted combination of controllers, shelves, drives, and cables.

Table 1 Combinations of Wide and Narrow Devices

BACKPLANE ADAPTER/ CONTROLLER	SHELF	DRIVE	CABLES	MODE
N	N	N	N	N
N	W	N	N	N
N	W	W	N	N
W	N	N	N	N
W	W	N	W	N
W	W	W	W	W

N = narrow
W = wide

Frequently Asked Questions

1. Can a narrow device plug into a wide shelf?

ANS: Yes, the physical connections on the wide and narrow StorageWorks Building Blocks (SBBs) are the same. However, the device must be at the correct revision level. These revision levels are clearly labeled on the side of the SBB. For example, all narrow disk drives shipped in SBB since Nov. 1993 (see Table 2) will function properly as a narrow disk drive when installed in a wide shelf.

2. Can narrow and wide devices be mixed into a wide shelf?

ANS: Yes. If the controller is narrow, all drives run in narrow mode. If the controller is wide, wide drives run in wide mode and narrow drives run in narrow mode.

3. Can a wide device plug into a narrow shelf? What happens if it is plugged in?

ANS: No! The device would not be seen by the console.

4. Can narrow shelves and wide shelves be mixed in the same cabinet?

ANS: Yes. Narrow drives must be in the narrow (lower address bits) shelf.

5. Are wide devices clearly labeled so that they can be easily identified?

ANS: Yes, on the front of the StorageWorks Building Block (SBB) bezel.

6. Are there wide and narrow choices for all devices (including disks/tapes/CD/loader)?

ANS: The strategy is to provide both wide and narrow devices at the SBB level for all devices, as wide devices become available. (Currently, only disks are available).

7. Can wide and narrow add-on storage enclosures be attached to the same system?

ANS: If the system configuration rules permit it. Requires special adapter cables or boards if wide and narrow shelves are daisychained. Requires system supports both wide and narrow SCSI.

8. Can customers with narrow devices convert these to plug into wide shelves and will they function properly?

ANS: Yes, see ans. 2 above.

9. What functional/performance advantages will the customer see when they use wide drives without wide controllers?

ANS: There will be neither a functional nor performance advantage. However, once the wide device is operated in wide mode on a wide controller, there will be an improvement in the data throughput performance depending on the configuration and the application.

CONFIGURATION RULES

Rules for Drives

Narrow Drive Rules

- Can be used in narrow shelf
- Can be used in wide shelves. If wide drives are in the same shelf, the narrow drives must be at the minimum device revision level listed in Table 2. (Wide drives would not be seen by the console firmware or the operating system if an older narrow drive were present.)
- Can be used with HSD05/HSD10
- Can be used on narrow controllers such as AlphaServer2100A backplane, AlphaServer2100 B2110 Standard I/O or AlphaServer2000 B2111 Standard I/O and KZESC.
- Can be used on wide controllers such as KZPSA (requires DWZZA) and KZPSC. Will run in narrow mode.
- Can be installed behind DWZZA and DWZZB

Supported Narrow Drive Revision Matrix

The following narrow device revisions are required in order to mix them with wide drives in a wide shelf. These revisions are clearly labeled on the bottom of the StorageWorks Building Block (SBB).

Table 2 Minimum Revision Levels for Narrow SBBs in Wide Shelves

StorageWorks Device Number	Description	Min REV
EZ51R-VA	100 Mbyte Ele Disk	E03
EZ45R-VA	300 Mbyte Ele Disk	E03
EZ58R-VA	800 Mbyte Ele Disk	C03
RRD42-VB	CDROM	B03
RRD42-VU	CDROM	B04
RRD43-VA	CDROM 2x	B05
RRD43-VC	CDROM 2x	B05
RRD43-VU	CDROM 2x hi per	B05
RRD44-VA	CDROM 2x hi per	B03
RRD44-VU	CDROM 2x hi per	B03
RRD45-VA	CDROM 4x	A01
RRD45-VU	CDROM 4x	A01
RWZ52-VA	Optical	B03
RX26-VA	2.88 Mbyte floppy	B03
RZ25-VA	426 Mbyte disk	D01
RZ25L-VA	535 Mbyte disk	ALL
RZ26-VA	1.05 Gbyte disk	H02
RZ26L-VA	1.05 Gbyte disk	B01
RZ28-VA	2.1 Gbyte disk	C01
RZ28B-VA	2.1 Gbyte disk	A01
RZ28M-VA	2.1 Gbyte disk	B01
RZ29B-VA	4.3 Gbyte disk	
RZ73-VA	2 Gbyte disk	B04
RZ74-VA	4 Gbyte disk	C04
SWXTE-AA	8 mm tape	B03
SWXTE-AB	8 mm tape	B03
TZ86 -VA	6 Gbyte DLT	C01
TX87 -VA	20 Gbyte DLT	ALL
TLZ06-VA	2 Gbyte DAT	B04
TLZ07-VA	5 Gbyte DAT	B04
TKZ09-VA	8 mm tape fh	B03
TKZ15-VA	8 mm tape hh	B03
TZK10-VA	QIC tape	C04
TZK10-VU	QIC tape	C04
TZK11-VA	QIC tape	B03
TZK11-VU	QIC Tape	B03

Wide Drive Rules

- Can be used ONLY in wide shelves.
- Cannot be used behind HSD05/HSD10. Wide drives will not be seen at console or operating system level.
- Cannot be used in a shelf with any narrow drive having a revision level less than that listed in Table 2.

Wide Drives

RZ26L-VW	1.05 GB 3.5” Wide Drive
RZ28-VW	2 .1 GB 3.5” Wide Drive
RZ28D-VW	2 .1 GB 3.5” Wide Drive
RZ29B-VW	4.3 GB 3.5” Wide Drive

New wide disk storage devices information / min Rev O/S Requirement

RZ26L-VW:	FW = 442E OSF/1 V1.3 OpenVMS V6.1 WNT V3.5	RZ28-VW:	FW = 442E OSF/1 V1.3 OpenVMS V6.1 WNT V3.5
RZ29B-VW:	FW = 0007 OSF/1 V3.2 OpenVMS V6.1 * WNT V3.5		

* Can't build OpenVMS V6.1 from distribution media to RZ29B.
Patch AXPDRIV02_061.1 is required. This is corrected in OpenVMS V6.2.

Rules for Shelves

Overview

All AlphaServer2000 systems have internal shelves that run wide and narrow devices.

The AlphaServer2100-4/233,275,-5/250 have internal shelves that run wide and narrow devices.

The AlphaServer2100-4/200 has one Internal Shelf that is narrow.

The AlphaServer2100-4/200 second (optional) Internal Shelf that runs wide and narrow devices.
(System shipments after December 94)

All AlphaServer2100A systems have internal shelves that run wide and narrow devices.

Narrow Shelves

Internal:	Rev.	
BA35E-SA	A01	Narrow internal 8 bay RZXX shelf. (First/default shelf for AlphaServer2100-4/200 systems)
External:		
BA350-KB		Modular storage pedestal includes BA350-SB basic shelf, BA35X-HA universal ac power supply, pedestal mounting kit, and 120 V power cord, requires SCSI cable (BN21H-xx).

Narrow Shelf Rules

- Narrow drives only
- Can use DWZZA
- Can use HSD05/HSD10

Wide Shelves

Internal:	Rev.	
BA35E-SA	B01	Wide internal 8 bay RZXX shelf. (Add on shelf for all AlphaServer 2100 systems.) Default internal shelf for AlphaServer2000, 2100-4/233,275,-5/250, and all 2100A systems currently shipping.
External:		
BA356-KC		Modular storage pedestal includes BA356-xx basic shelf, BA35X-HA universal ac power supply, pedestal mounting kit, and 120 V power cord, requires SCSI cable (BN31S-1E).

Wide Shelf Rules

- Can use both wide and narrow drives. Narrow drives must have the revision listed in Table 2 if both narrow and wide drives will reside in the same shelf. Otherwise, the wide drives will not be seen at console or at the operating system level. (All of the narrow drives will be seen.)
- Can use DWZZB
- Can use HSD05/HSD10 ONLY if all drives in the shelf are narrow.
- Split bus/shelf configuration requires that a terminator module be ordered (BA35X-ME).
- Left-most connector (on recessed side) of Personality module is input connector and right-most connector (at front) of Personality module is output connector, for daisy-chaining/expanding enclosures. Personality card provides bus termination for the enclosure; plugging a cable into the right-most connector disables the termination.
- OpenVMS and OSF currently support only IDs 0-7. WNT supports 0-15.
  If running Windows NT in an expanded (two BA356 enclosures daisy chained) configuration containing a mixture of narrow and wide drives, the narrow drives must be located in the BA356 shelf containing drive IDs 0-7.
  (Refer to EK-BA356-UG StorageWorks Solutions wide shelf and SBB Users Guide for appropriate switch settings.)

Rules for Controllers

Overview

The following SCSI controllers can be used with both the Narrow and Wide SCSI devices:

2100A backplane, B2110, B2111, KZESC, PB2HA, KZPAA, KZPSA, KZPSC
Only the wide SCSI controllers (KZPSA and KZPSC) will allow wide drives to operate in wide mode.

2100A backplane/B2110/B2111 Internal Standard Controller

- Supports wide drives in wide shelves. Drives run in narrow mode. Use existing narrow cable.
- Supports mixed (narrow/wide) configurations in wide shelves.

KZESC-EISA Raid Controller

- Controller is Fast Narrow Single Ended.
- Each channel supports SCSI ID's 0-7
- A total of 8 logical drives can be created per controller
- Supports both narrow and wide drives within the internal shelves.
- Wide drives are supported externally ONLY thru the bulkhead, i.e. NOT thru the expansion bulkhead using the CK-SWXCR-AA cable kit.
- Minimum Supported Operating System:
    - OpenVMS V6.1 (four-controller support; does not support host-base shadowing)
    - Windows NT Server V3.5 (two-controller support)
    - Digital UNIX V3.0B (four-controller support)

- ARC console bug - cannot see beyond first logical drive if a raid controller is installed. Affects WNT only. Drives are seen once booted. Will be fixed in Rev 4.0 of console (contains 4.2x ARC).

HW = C02 FW = 2.15

Sable SRM V3.8 (4-controller support)

Raid Configuration Utility (RCU) =
V3.08 for Rev V3.xx console
V3.11 for Rev V4.xx of console (backwards compatible)
V3.11 supports AlphaServer 2100 5/250

Note: Utilizing V3.08 RCU with Rev V4.xx of console will likely render the KZESC unusable.

KZPSA - PCI Fast Wide Differential SCSI Controller

- Controller is FWD so must connect to either a DWZZA, DWZZB or HSZ40.
- Minimum Supported Operating System:
    - OpenVMS V6.2 (support is TBD)
    - Windows NT Server 3.5
    - Digital UNIX (OSF/1) V3.2A

  HW = F01, FW = A07*, FW update Utility = V1.2
  Sable SRM V3.11-19
  ARC V3.5-31
- 2100A PCI Option Restrictions:

  The AlphaServer 2100A system has an on-board PCI-to-PCI bridge (DECchip 21050)
  Physical slots 4, 5, 6, and 7 are the bottom 4 slots in front of the bridge (primary PCI)
  Physical slots 0, 1, 2, and 3 are the top 4 slots behind the bridge (secondary PCI)

    - ♦ On 2100A systems, install the KZPSA only in front of the bridge for correct configutation with ARC firmware utilities. Once configured, the KZPSA can be moved behind the bridge on systems running OpenVMS.

* FW = A08 (currently) for OpenVMS V6.2

KZPSC-PCI Raid Controller

- Controller can run either Fast Wide Single Ended or Fast Narrow Single Ended. In mixed (wide/narrow) drive configurations the controller will negotiate to capabilities of individual drives.
- In a mixed (narrow/wide) configuration, if the wide drives are not seen and a drive appears with FMT (format required) status (seen at the Raid Configuration Unit Level) - then the drive is not at the correct revision level (See table 2)
- Adapter plug(H4086-AA) required to cable to narrow internal shelf.
- Each channel supports SCSI ID's 0-7
- A total of 8 logical drives can be created per controller
- Wide drives require wide shelves
- Minimum Supported Operating System:
    - OpenVMS V6.2 (supports host-based shadowing support and on-line GUI monitor utilities).
    - Windows NT Server 3.5
    - Digital UNIX (OSF/1) V3.0B

  HW = B01, FW = 2.19
  Sable SRM V3.8

  Raid Configuration Utility (RCU) =
  V3.08 for Rev V3.xx console
  V3.11 for Rev V4.xx of console (backwards compatible)

DWZZA-Fast Wide Differential to Fast Narrow Single Ended Converter

- Slot 0 for -VA version
- Min. revision level: DWZZA-AA/VA E01/F01
- Used in narrow shelves only.

DWZZB-Fast Wide Differential to Fast Wide Single Ended Converter

- Slot 0 for -VW version
- Min. revision level: DWZZB-AA/VW A01/A01
- Used in wide shelves only.
- Will support both narrow and wide drives.

Rules for Cables and Terminators

AlphaServer 2100/2100A Internal Cables

KZPSC to an internal narrow shelf (field upgrades or AlphaServer 2100 -4/200), the BC25R-3B cable would be utilized along with H4086-AA 68/50-pin-adapter-plug.

KZPSC to internal (wide) BA35E shelf: BC25T-3L

KZPSC to EISA cable bracket (to route outside of enclosure): BN31K-0E

KZPSA is a Fast Wide Differential device. FWD is not supported internal to the 2100 hence there is no connection. (Also, there is no internal connector on the KZPSA.)

AlphaServer 2000 Internal Cables

KZPSC to internal (wide) BA35E shelf: BC25U-2H

KZPSC to EISA cable bracket (to route outside of enclosure): BN31K-0E

KZPSA is a Fast Wide Differential device. FWD is not supported internal to the 2000 hence there is no connection. (Also, there is no internal connector on the KZPSA.)

KZPSA External Cables

BN21K-** from KZPSA to DWZZA/DWZZB/HSZ40(straight to right angle)

BN21W-0B Y SCSI-2 Cable 68 Pins for utilizing KZPSA in
mid-bus (daisy-chained) configurations.

** = Variants depend on cable length

KZPSC External Cables

BN31L-1E from KZPSC to BA350

BN31S-1E from KZPSC to BA356

Cable Length

The maximum cable length for the SCSI-2 bus depends on whether it is
- Fast or Slow
- Single Ended or Differential

	Fast	Slow
*Single Ended	3 Meters	6 Meters
Differential	25 Meters	25 Meters

* This includes .5 Meter cable length used inside the AlphaServer 2000 and 2100 systems.
BA35X includes 1.0 Meter internal etch.

Terminators

H879-AA SCSI-3 Terminator Block - 68 pin Male passive terminator (terminate the end of a wide differential bus)

H8862-AA (Future) 68 Pin active terminator (terminates the end of a wide single ended bus)

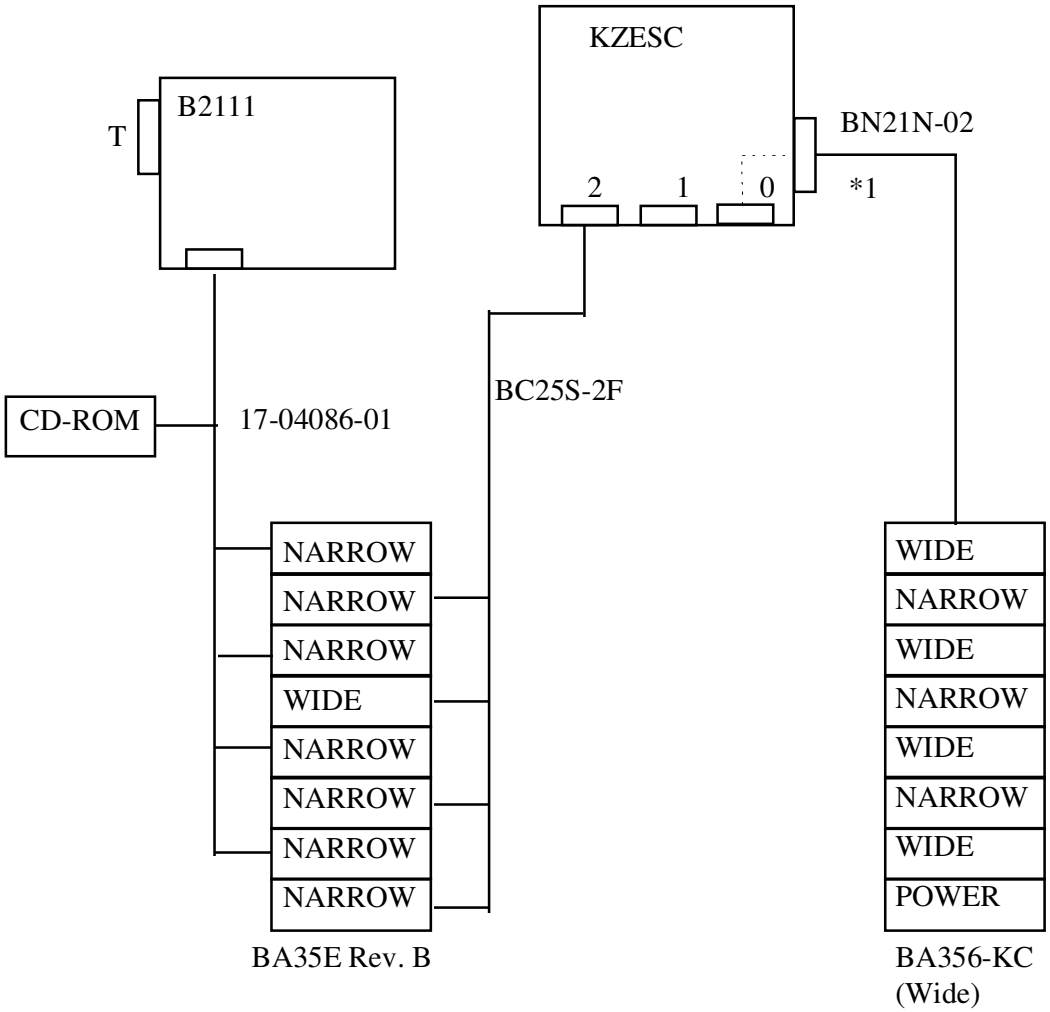
H885-AA SCSI-3 Tri-link Connector Block for DWZZA/DWZZB

In case of questions, please contact Ray Ligenza at 508-493-0802 (DTN 223-0802)

DIAGRAMS OF TYPICAL CONFIGURATIONS

AlphaServer 2000-4/233, 275, 5/250, 5/300

KZESC

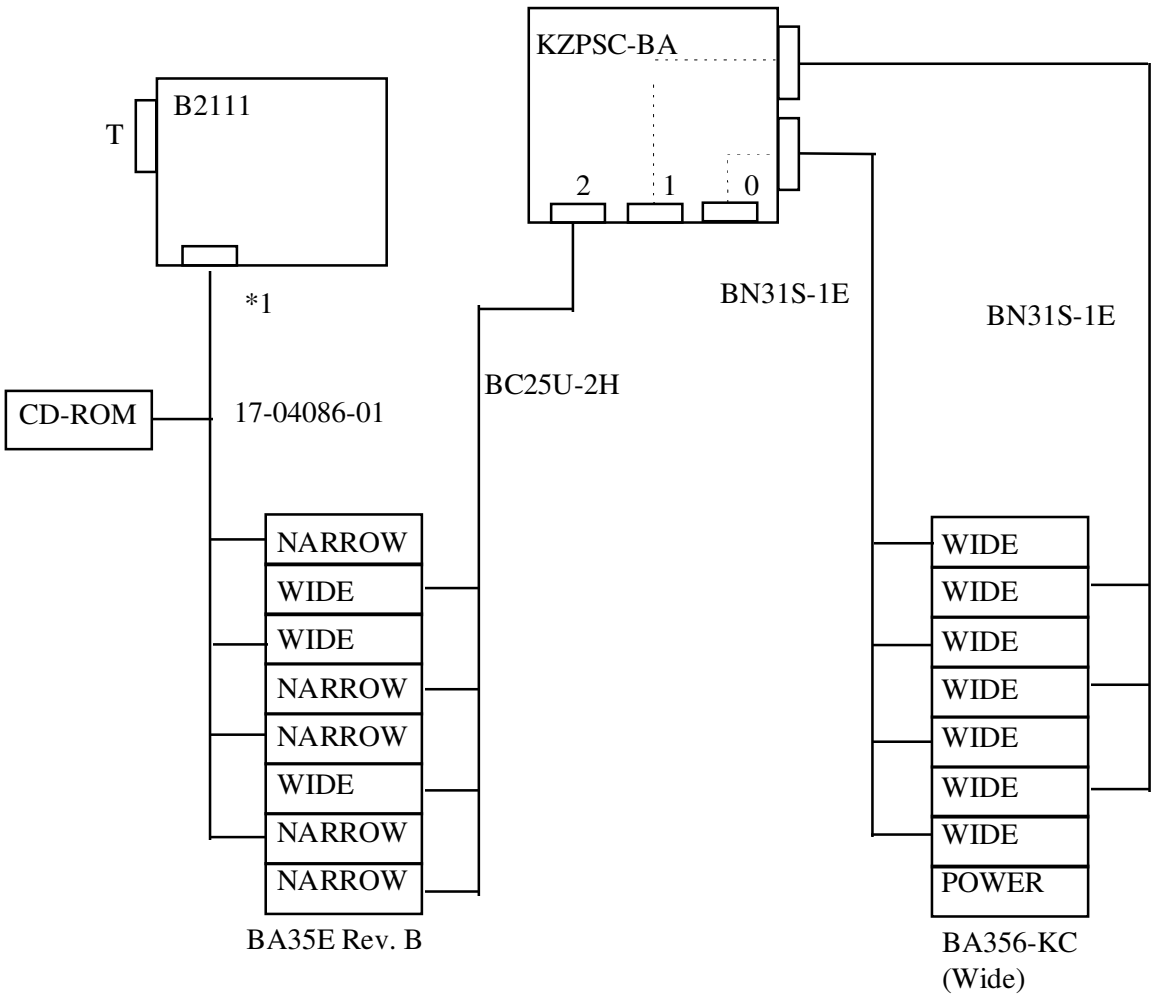


Notes:

1) Wide Drives are supported when running on KZESC controller internal to the system and externally only when cabled through the bulkhead to a BA356. However, they run in Narrow mode.

AlphaServer 2000-4/233, 275, 5/250, 5/300

KZPSC

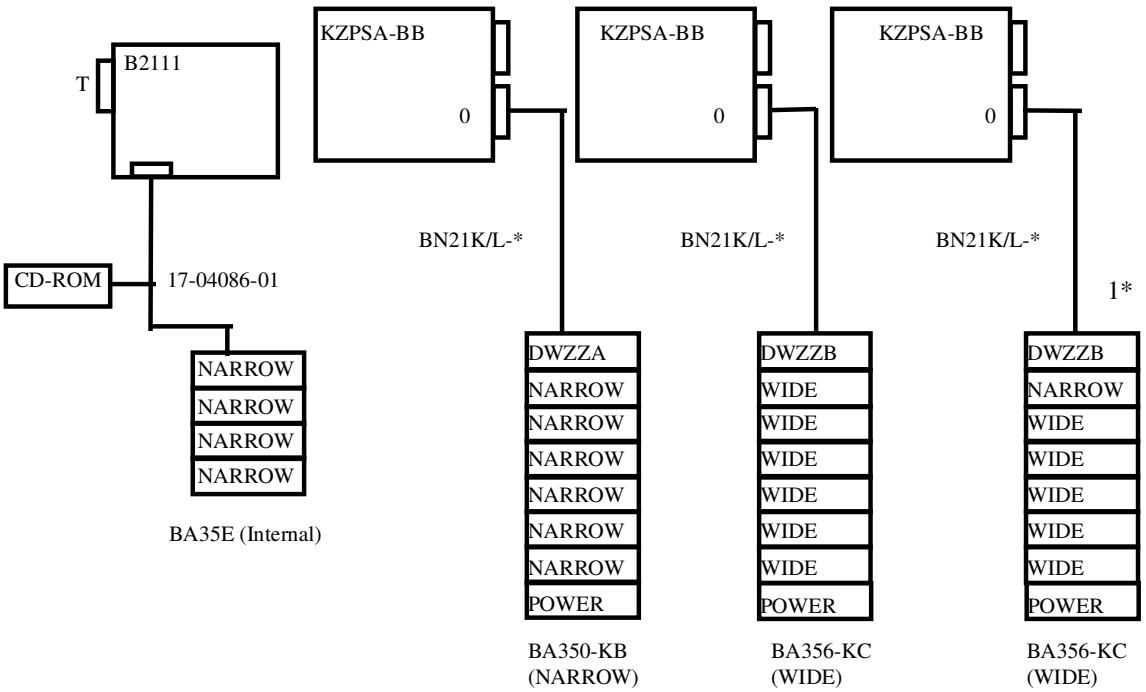


Notes:

1) Wide drives off of B2111 SCSI Controller run in narrow mode.
2) KZPSC: Narrow/Wide combination supported. Wide drives run in wide mode; Narrow drives run in narrow mode.

AlphaServer 2000-4/233, 275, 5/250, 5/300

KZPSA

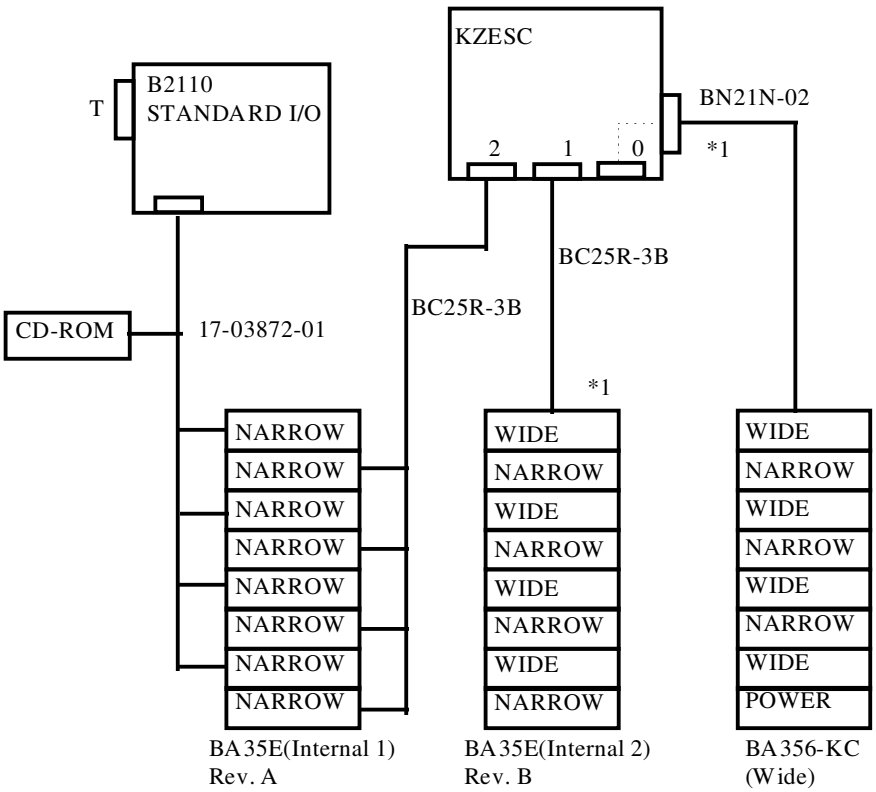


Notes:

1) If controller and path are wide, the controller will negotiate with each drive, so that wide drives will run in wide mode, and narrow drives will run in narrow mode.

AlphaServer 2100-4/200

KZESC

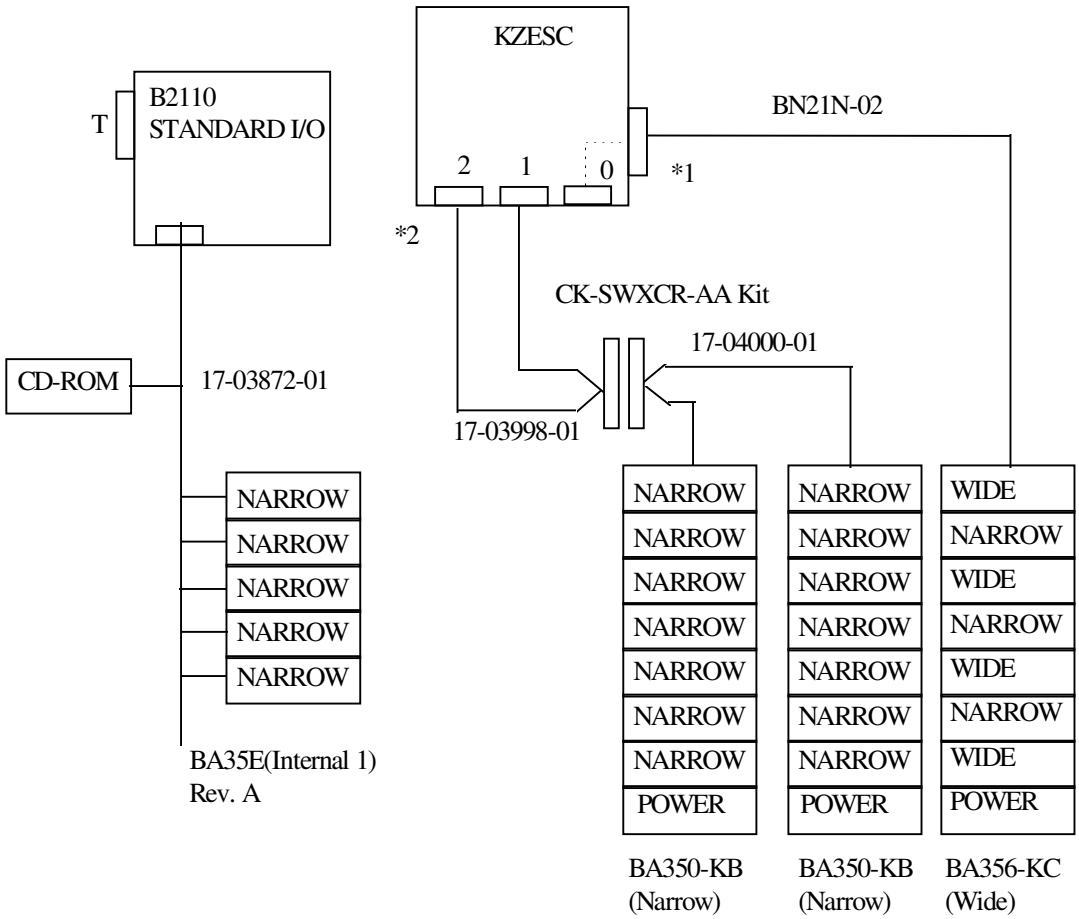


Notes:

1) Wide Drives are supported when running on KZESC controller internal to the system. However, the disks will run in narrow mode.
Wide Drives are supported externally only when cabled through the bulkhead.

AlphaServer 2100-4/233, 275,-5/250, 5/300

KZESC

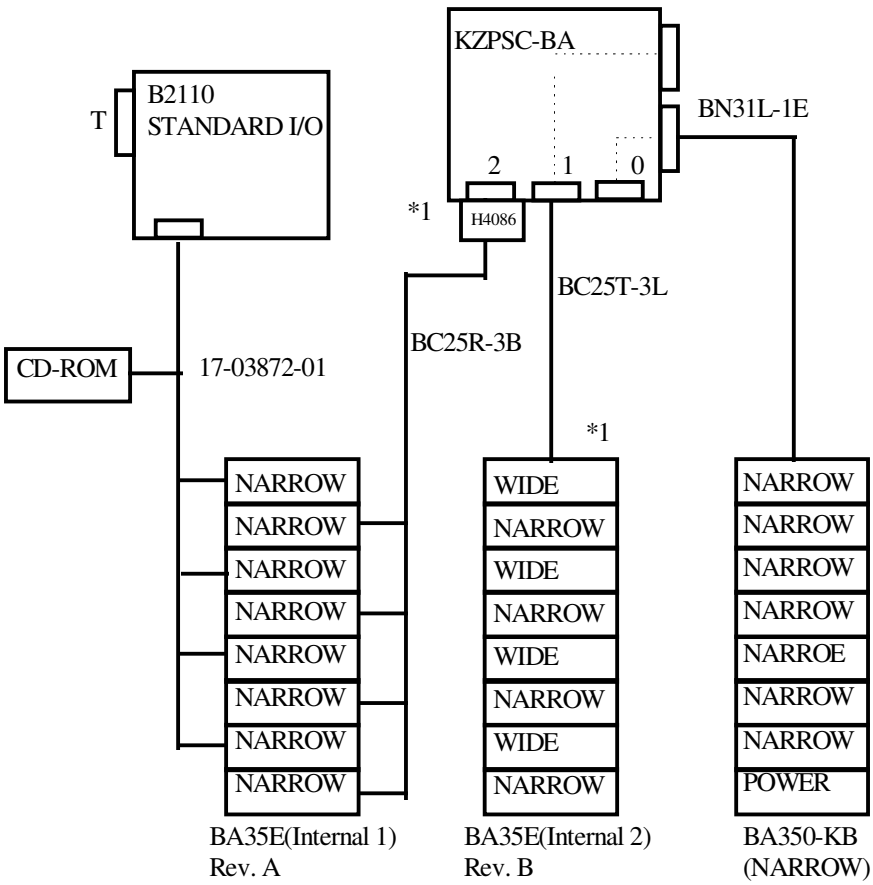


Notes:

1) Wide Drives are supported when running on KZESC controller internal to the system. Wide Drives are supported externally **only** when cabled through the bulkhead.
2) Only narrow drives are supported when cabling through the expansion bulkheads - using the CK-SWXCR-AA cable kit

AlphaServer 2100-4/200

KZPSC

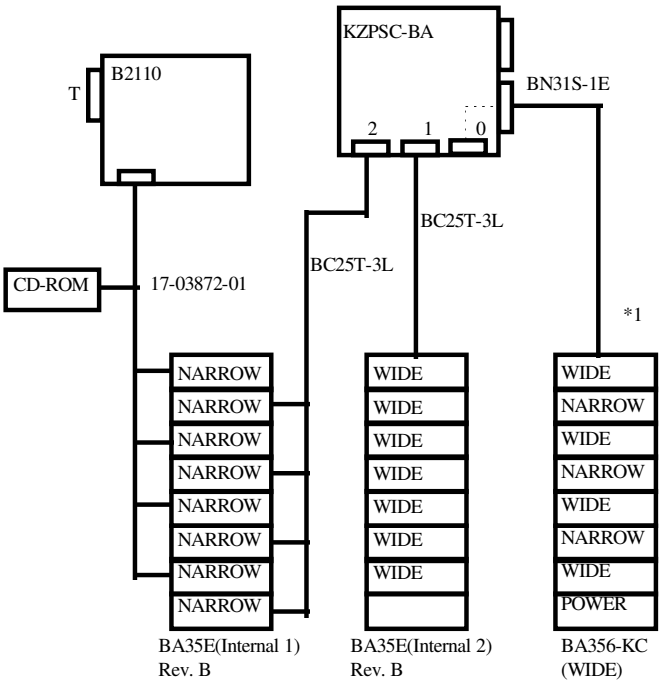


Notes:

1) H4086-AA required to attach cables between KZPSC and Pre "Wide-Ready" Rev B BA35e internal enclosures.

AlphaServer 2100 4/233 , 4/275,-5/250, -5/300

KZPSC-BA

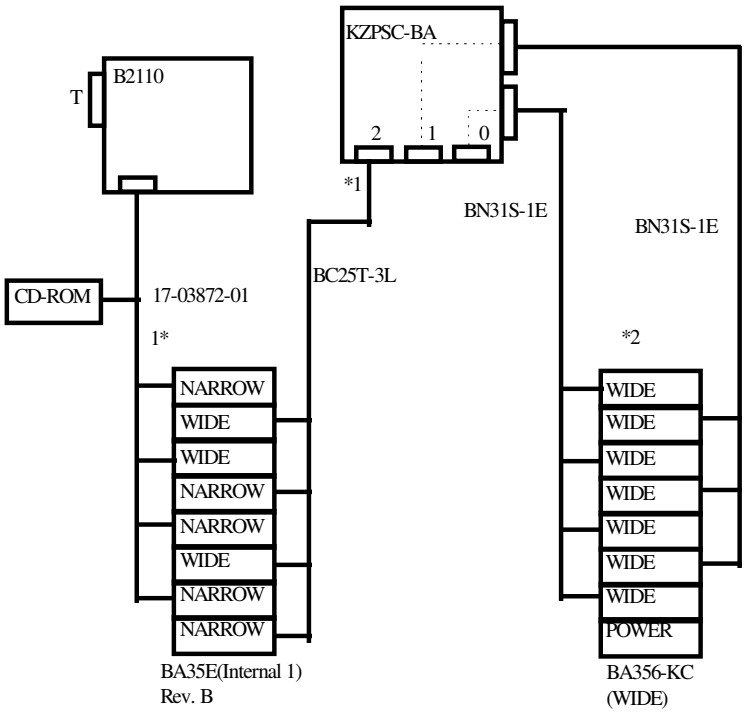


Notes:

1) If controller and path are wide, the controller will negotiate with each drive, so that wide drives will run in wide mode, and narrow drives will run in narrow mode.

AlphaServer 2100, 4/233, 4/275,-5/250, -5/300

KZPSC-BA

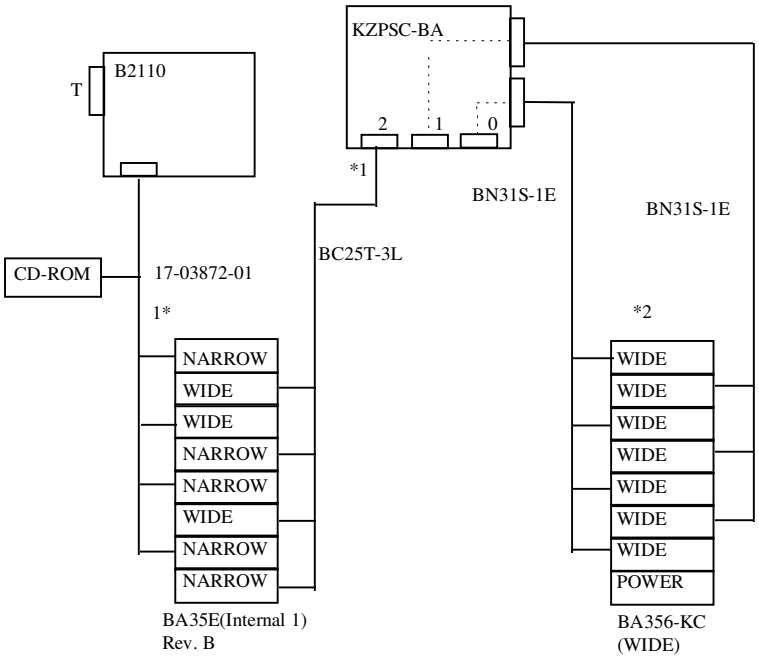


Notes:

1) Wide drives off of the B2110 run in Narrow mode
2) Wide drives off of the KZPSC run in Wide mode.

AlphaServer 2100-4/233,-4/275,-5/250,-5/300

KZPSC-BA

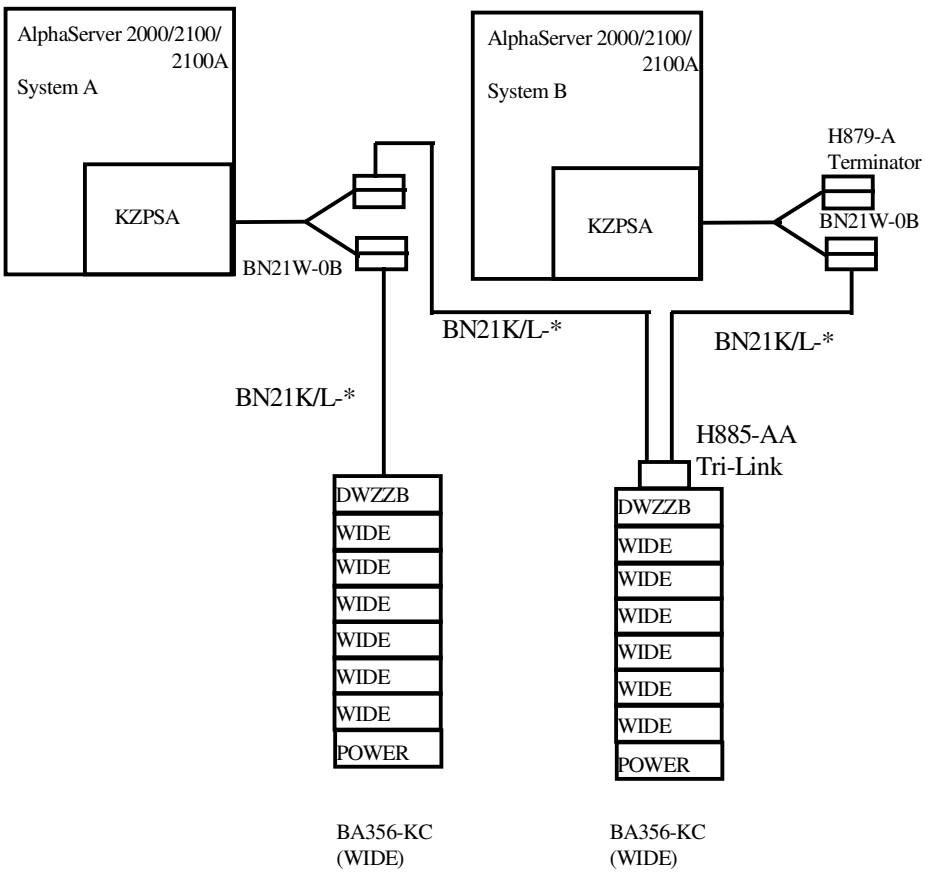


Notes:

1) Wide drives off of the B2110 run in Narrow mode
2) Wide drives off of the KZPSC run in Wide mode.

AlphaServer 2x00-4/233, 275,-5/250, 5/300

KZPSA Mid-Bus Systems

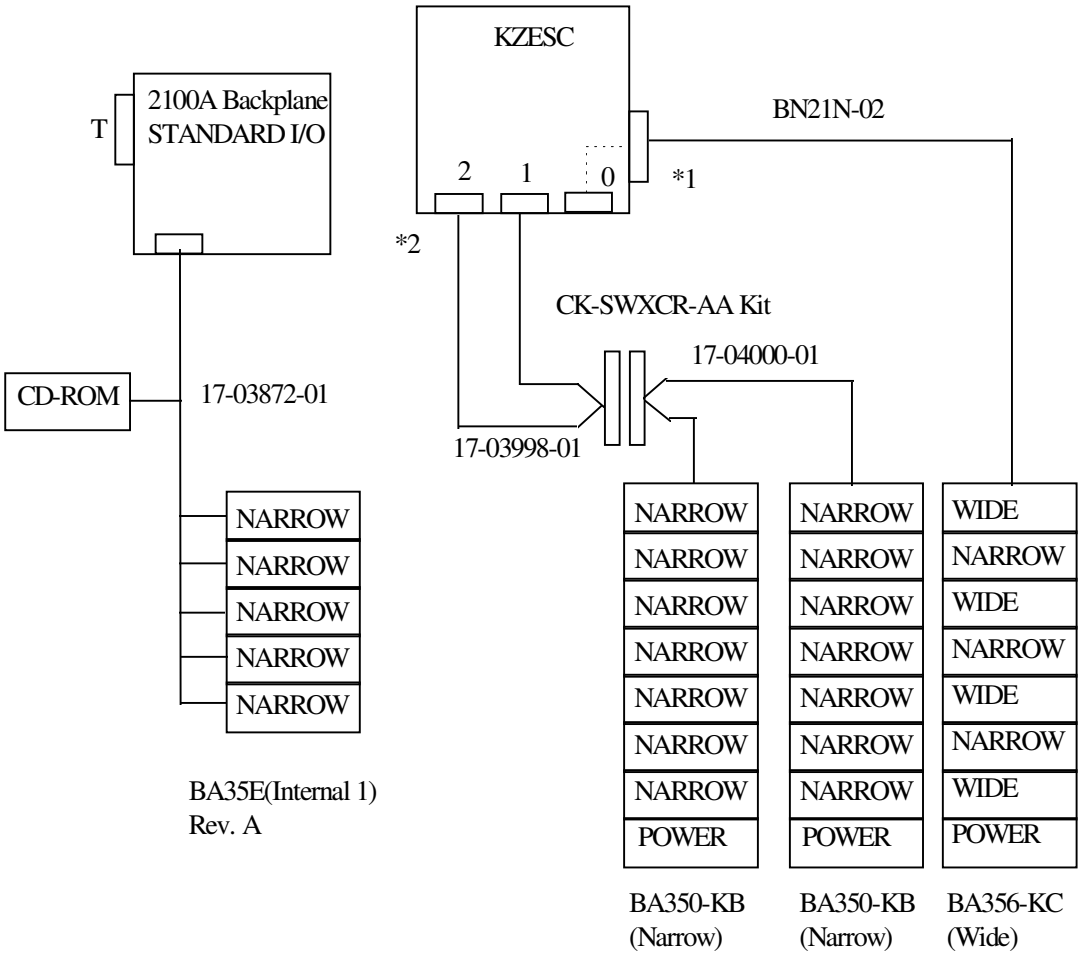


Notes:

1) All Controllers and DWZZB's must have termination set per documentation.

AlphaServer 2100A-4/275,-5/250, 5/300

KZESC

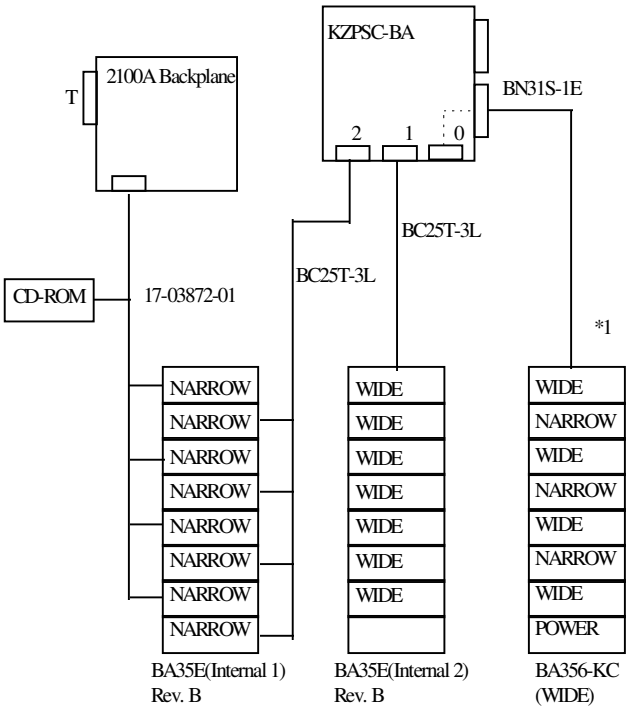


Notes:

1) Wide Drives are supported when running on KZESC controller internal to the system. Wide Drives are supported externally **only** when cabled through the bulkhead.
2) Only narrow drives are supported when cabling through the expansion bulkheads - using the CK-SWXCR-AA cable kit

AlphaServer 2100A-4/275,-5/250, -5/300

KZPSC-BA

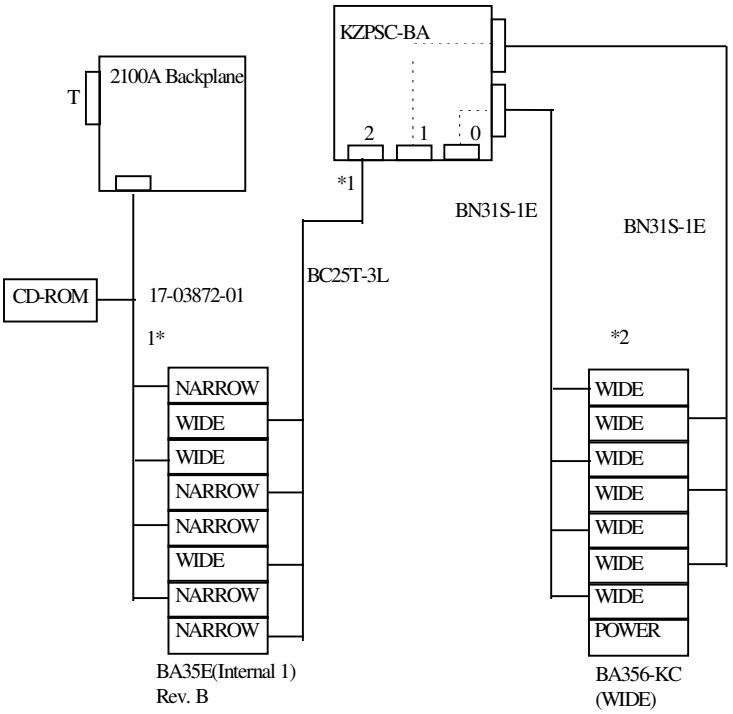


Notes:

1) If controller and path are wide, the controller will negotiate with each drive, so that wide drives will run in wide mode, and narrow drives will run in narrow mode.

AlphaServer 2100A-4/275,-5/250,-5/300

KZPSC-BA

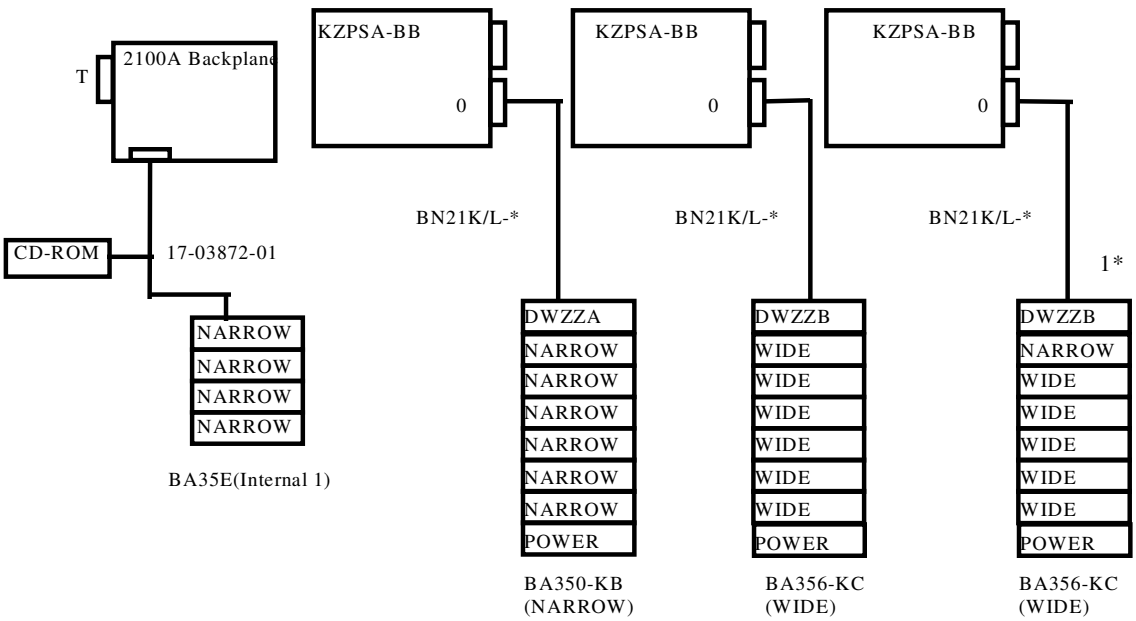


Notes:

1) Wide drives off of the 2100A Backplane run in Narrow mode
2) Wide drives off of the KZPSC run in Wide mode.

AlphaServer 2100A-4/275,-5/250, -5/300

KZPSA-BB



Notes:

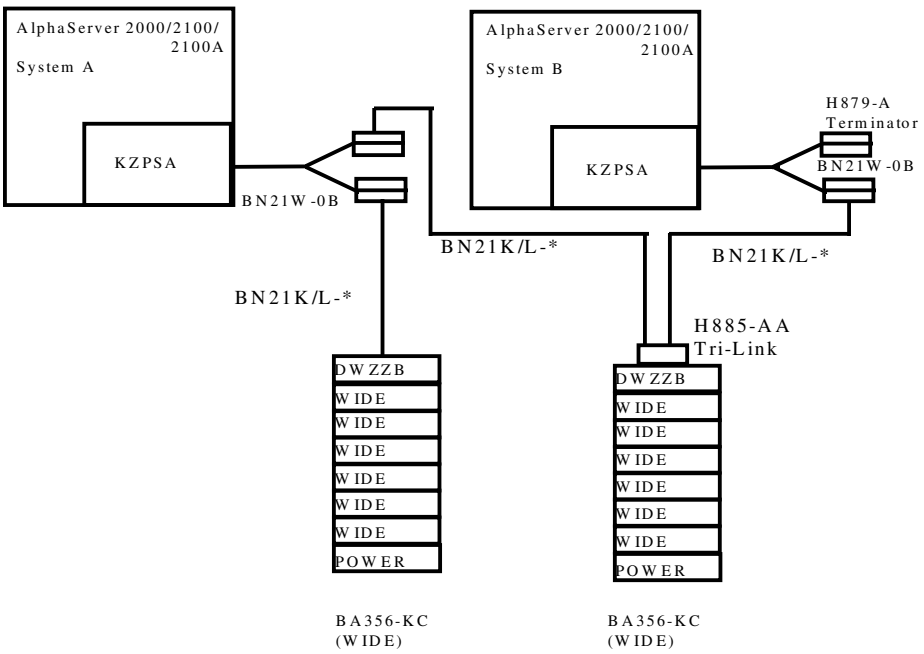
1) If controller and path are wide, the controller will negotiate with each drive, so that wide drives will run in wide mode, and narrow drives will run in narrow mode.

- 2100A PCI Option Restrictions:

  The AlphaServer 2100A system has an on-board PCI-to-PCI bridge (DECchip 21050)
  Physical slots 4, 5, 6, and 7 are the bottom 4 slots in front of the bridge (primary PCI)
  Physical slots 0, 1, 2, and 3 are the top 4 slots behind the bridge (secondary PCI)

  - ♦ On 2100A systems, install the KZPSA only in front of the bridge for correct configutation with ARC firmware utilities. Once configured, the KZPSA can be moved behind the bridge on systems running OpenVMS.

AlphaServer 2x00-4/233,-4/275,-5/250,-5/300
AlphaServer 2100A-4/275,-5/250,-5/300
KZPSA Mid-Bus Systems



Notes:

1) All Controllers and DWZZB's must have termination set per documentation.

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