Micro Channel Adapter Design

Figures

General Guidelines

This section provides some basic guidelines to design adapters for systems using the Micro Channel architecture. Topics include physical specifications, general design considerations and design guidelines.

There are two sizes of adapters: Type 3 and Type 5. The type number corresponds to the relative height of the adapter. Type 3 and Type 3 half card adapters can be plugged into systems that provide space and current capacity for Type 5 adapters.

Systems can support different combinations of connectors and extensions on adapters. Figure 1 on page 2 shows the 32-bit and 16-bit connectors and the acceptable extensions for video and matched-memory.

Note: Not all systems support all types of adapters, or connectors and extensions. For information on the type of adapters, connectors, and extension supported and the power provided, see the system-specific technical manual.

To prevent wear, connector contacts should be provided for signals not used by an adapter. See the description of the Micro Channel architecture for more information on channel connectors and signals.
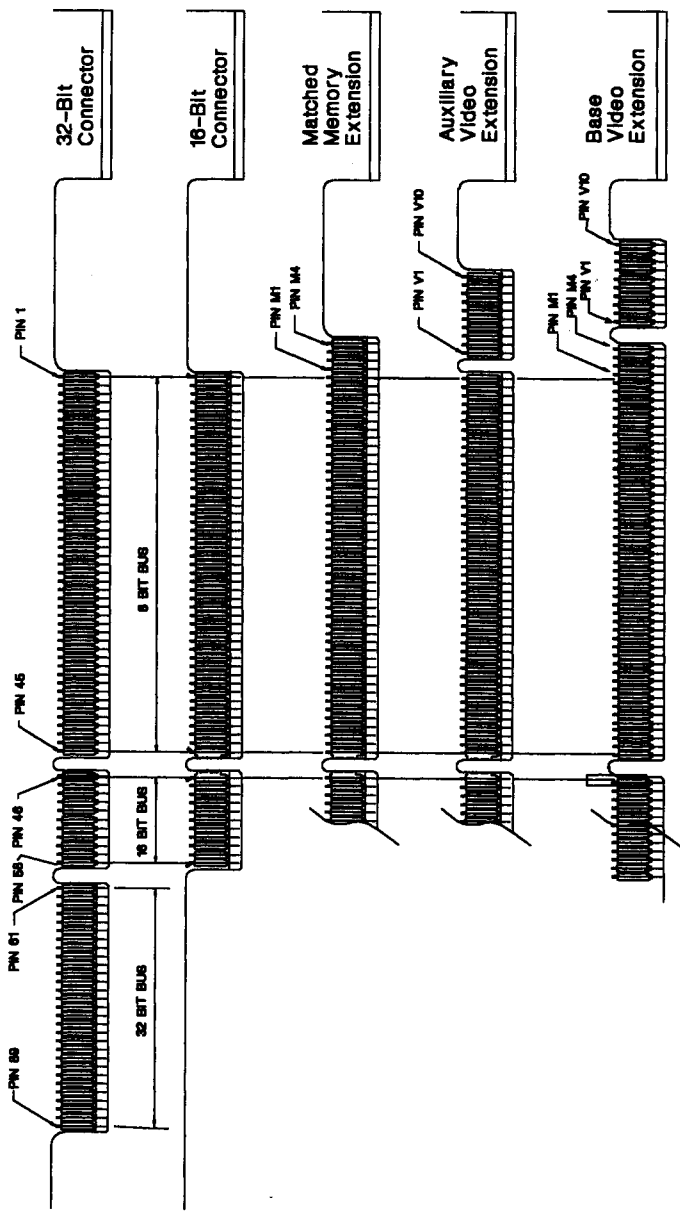
Figure 1. Examples of Adapter Connectors

Dimensions

The following figures show the dimensions of each type of adapter and the associated mounting hardware. The tolerances shown include all individual process tolerances and are not cumulative.

Regardless of the size of the adapter, the maximum height for components mounted on the adapter is 15.240 millimeters (0.600 inch) on the component side (A side) and is 2.667 millimeters (0.105 inch) on the B side. The maximum height on the A side can be extended to 17.145 millimeters (0.675 inch) if the card can be properly cooled and electrically insulated. The width of the electrical insulator must be included in this dimension.

Electrical insulation is also required if the card bows in excess of .635 millimeters (0.025 inch). Measure the bow at a point 2.54 millimeters (0.100 inch) from the top of the card and 146 millimeters (5.75 inches) from the connector end (rear) of the card.

Adapters using CMOS technology should have all plated connector contacts the same length to reduce the exposure of incorrect bias to modules.
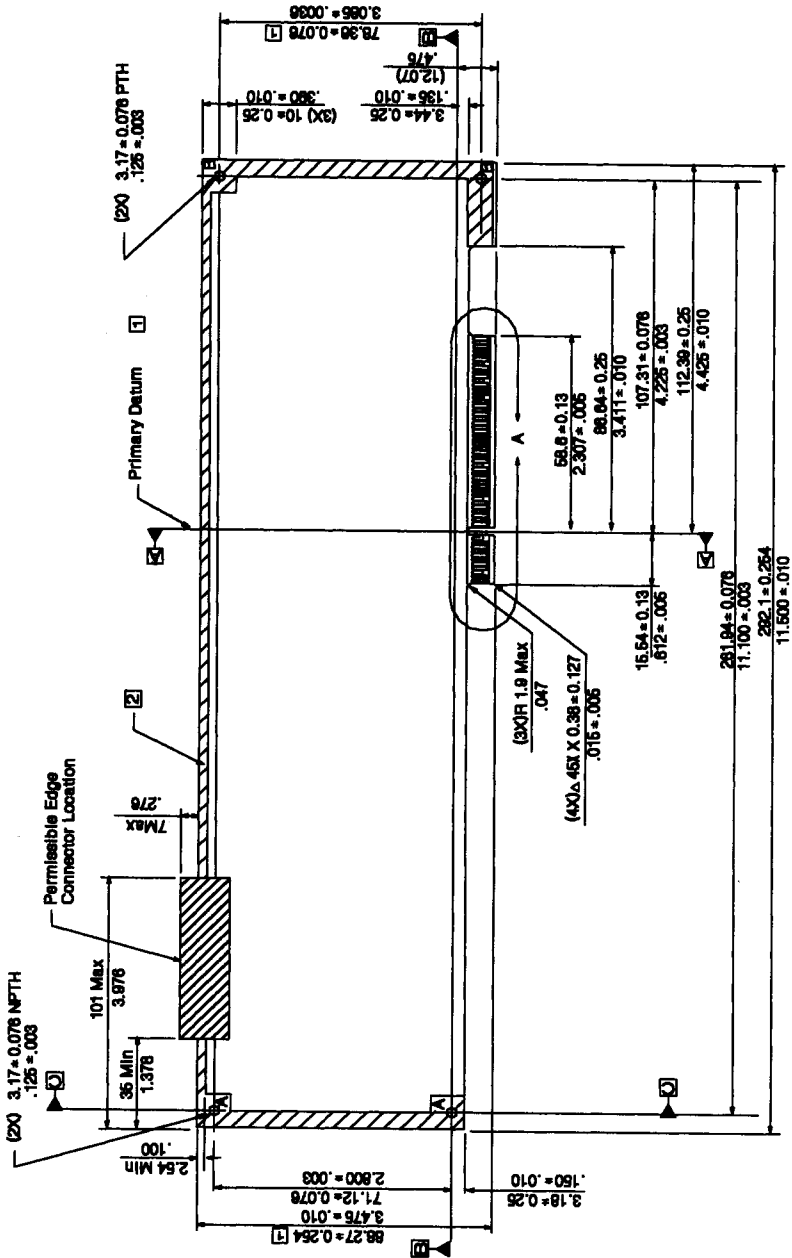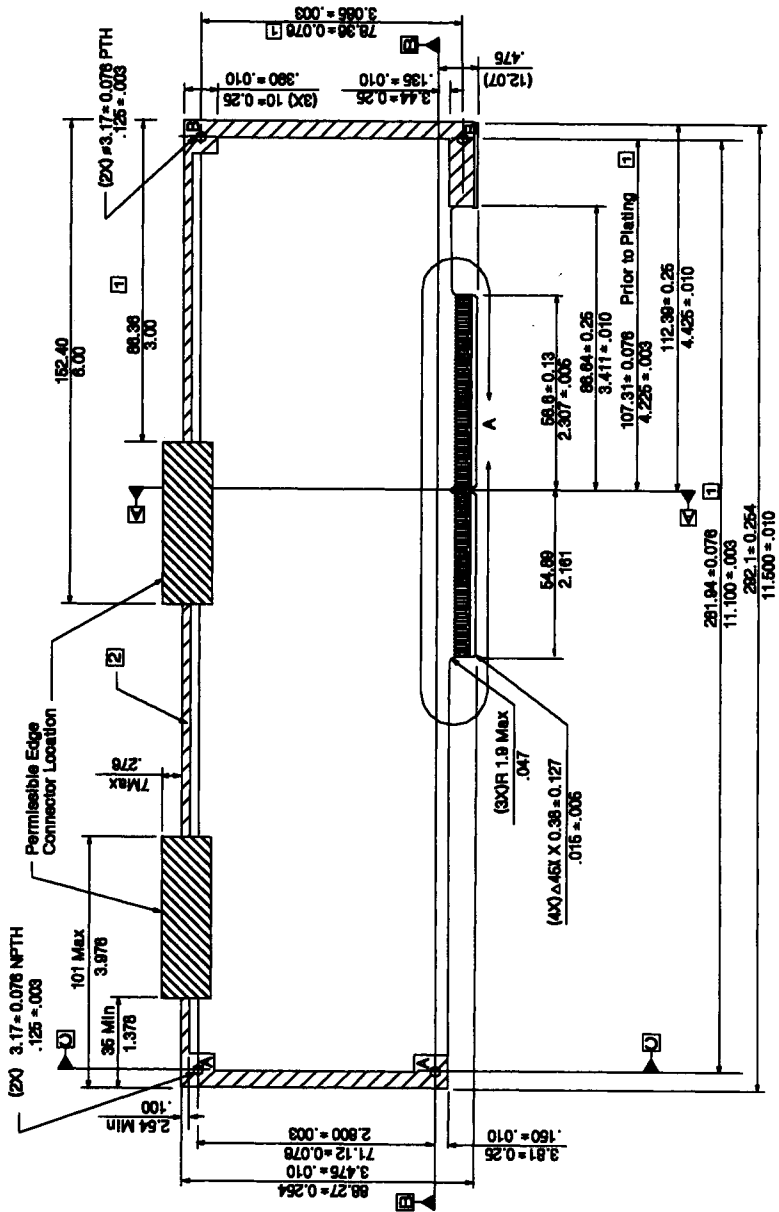
Figure 2. Type 3 Adapter Dimensions (16-Bit)

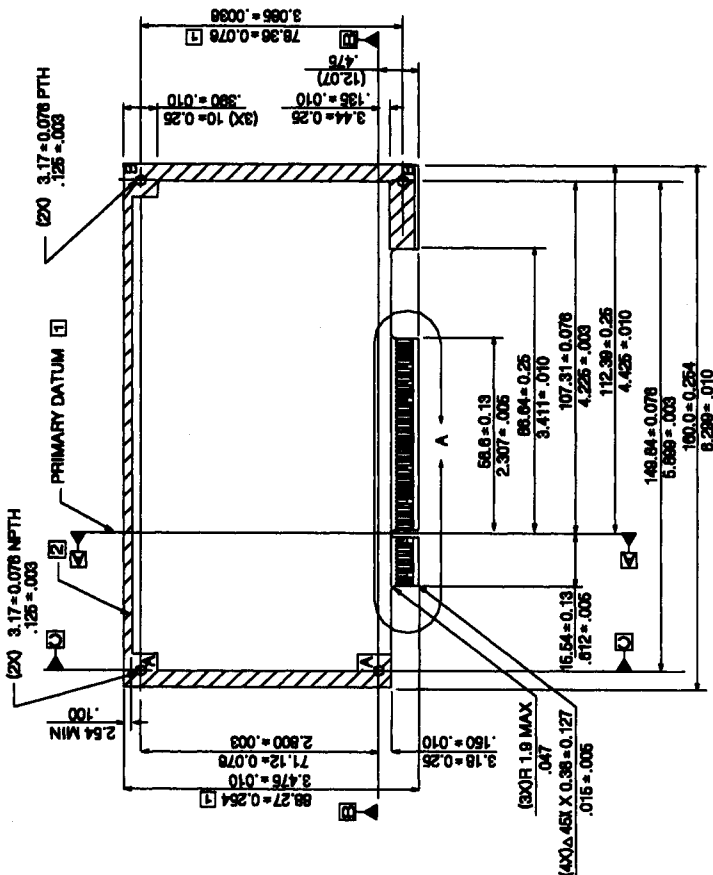*Figure 3. Type 3 Adapter Dimensions (32-Bit)*
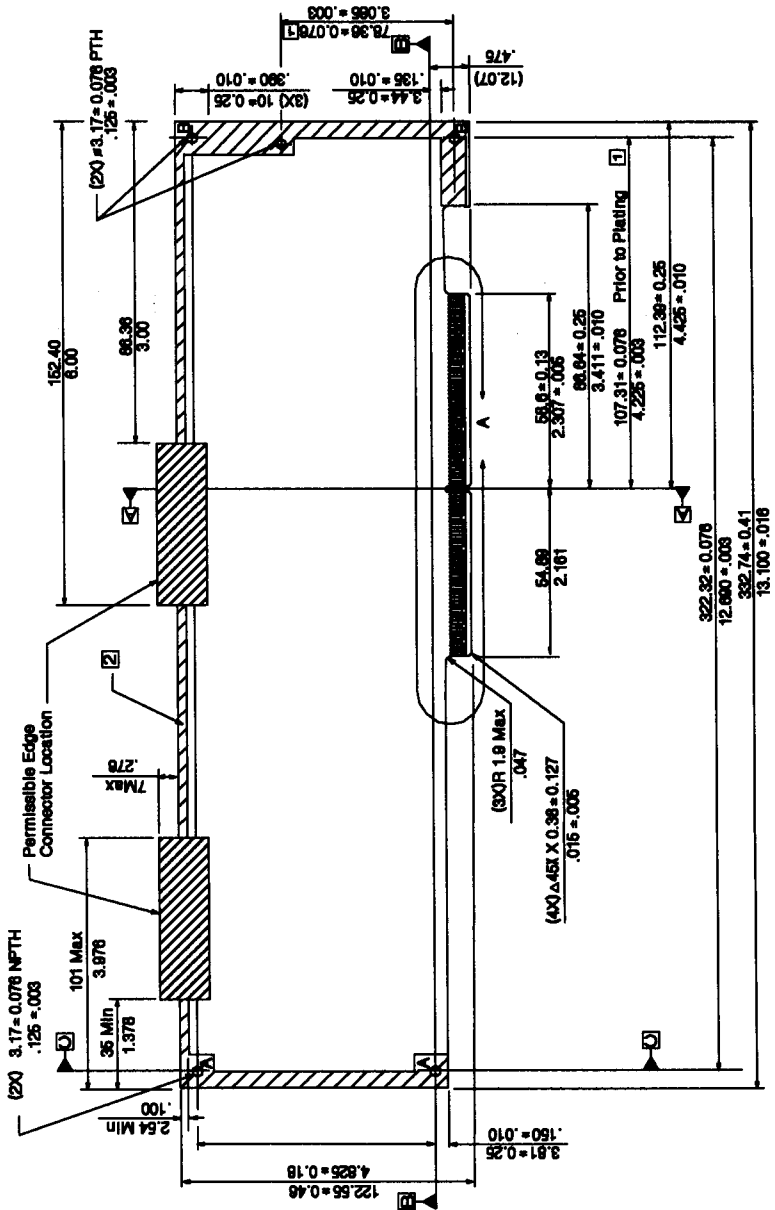
Figure 4. Type 3 Adapter Dimensions (Half-Card)

Figure 5. Type 5 Adapter Dimensions (32-Bit)

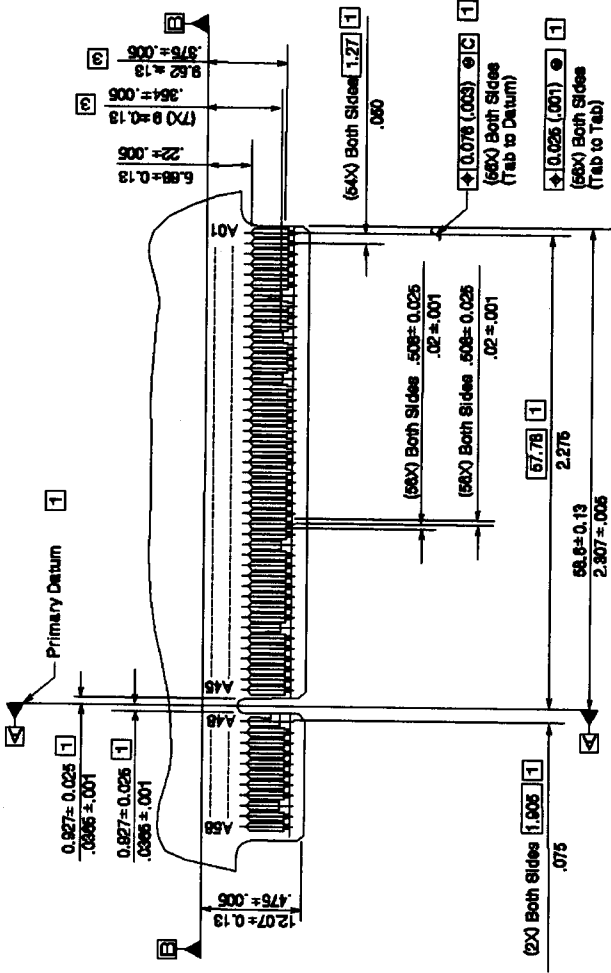Figure 6. Connector Dimensions (16-Bit)
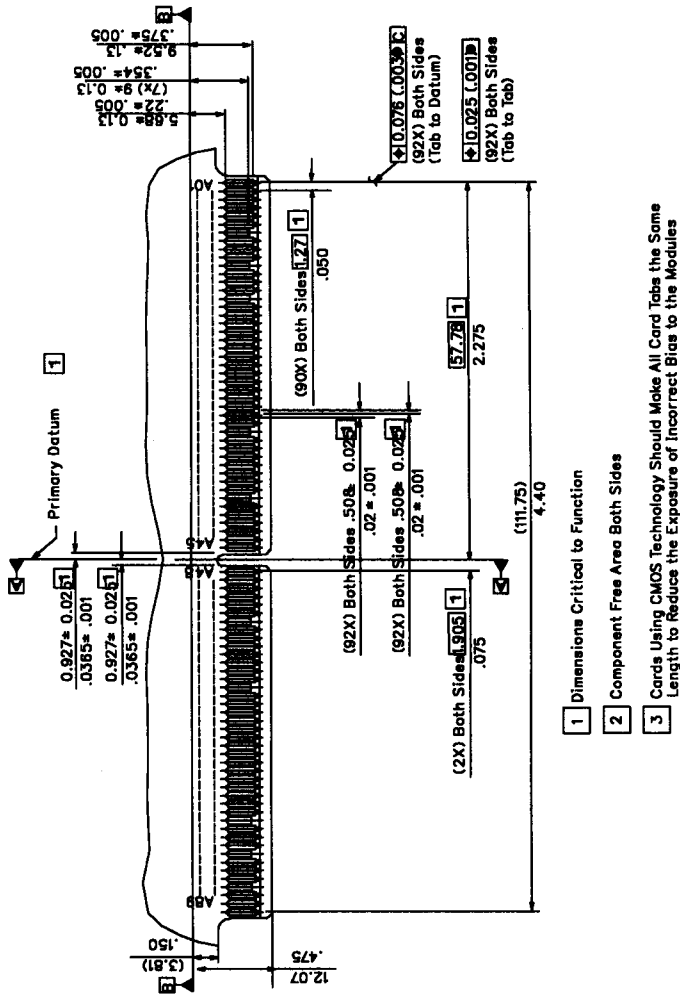
Figure 7. Connector Dimensions (32-Bit)
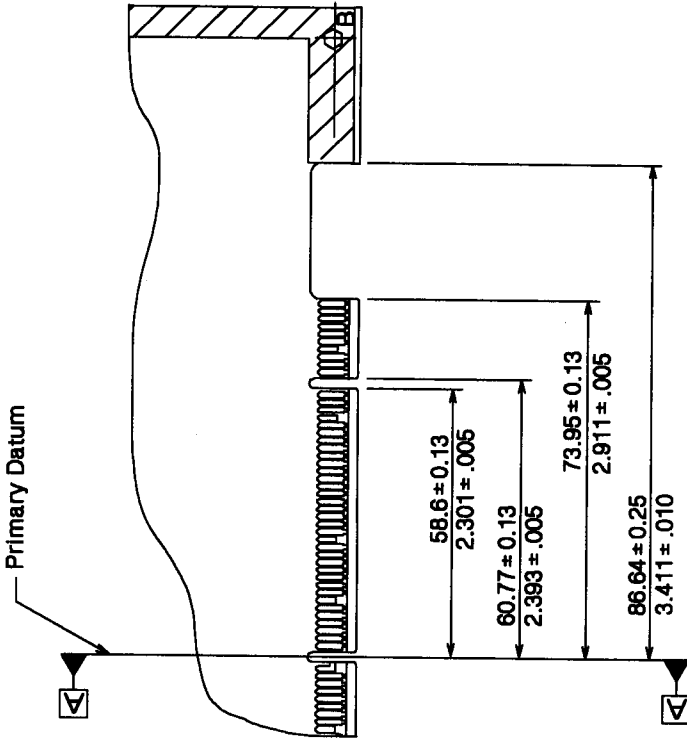
Figure 8 (Part 1 of 2). Connector Dimensions (Auxiliary Video Extension)

Figure 8 (Part 2 of 2). Connector Dimensions (Auxiliary Video Extension)
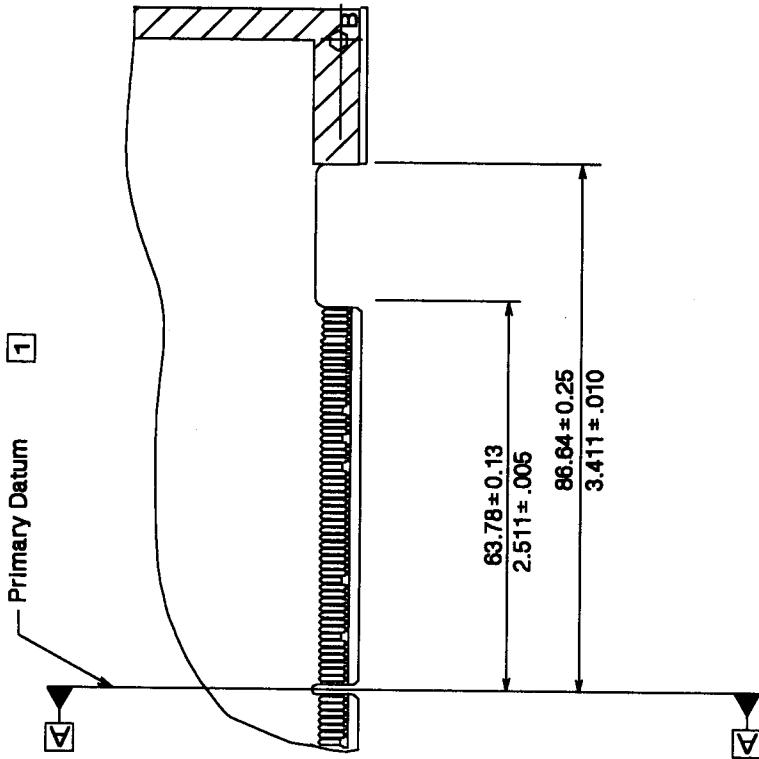
Figure 9 (Part 1 of 2). Connector Dimensions (Matched Memory Extension)

Figure 9 (Part 2 of 2). Connector Dimensions (Matched Memory Extension)
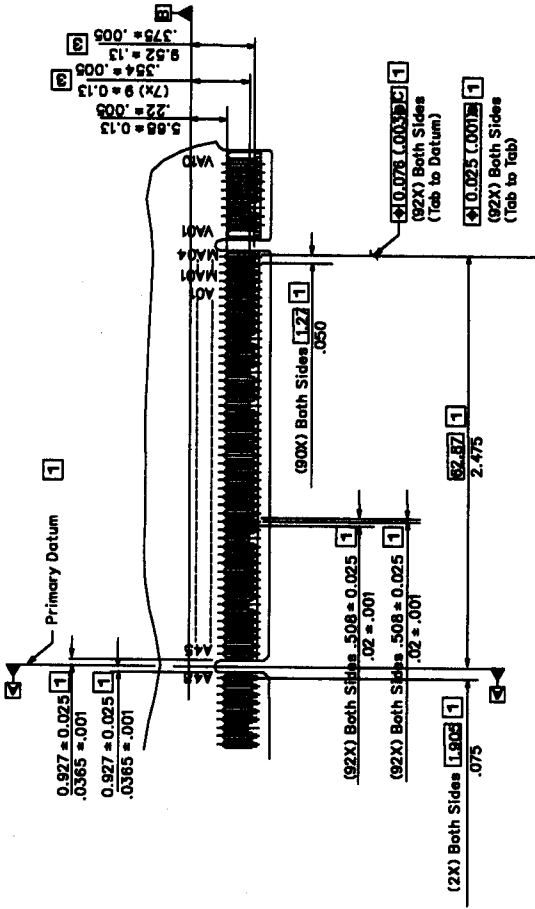
Figure 10 (Part 1 of 2). Connector Dimensions (Base Video Extension)
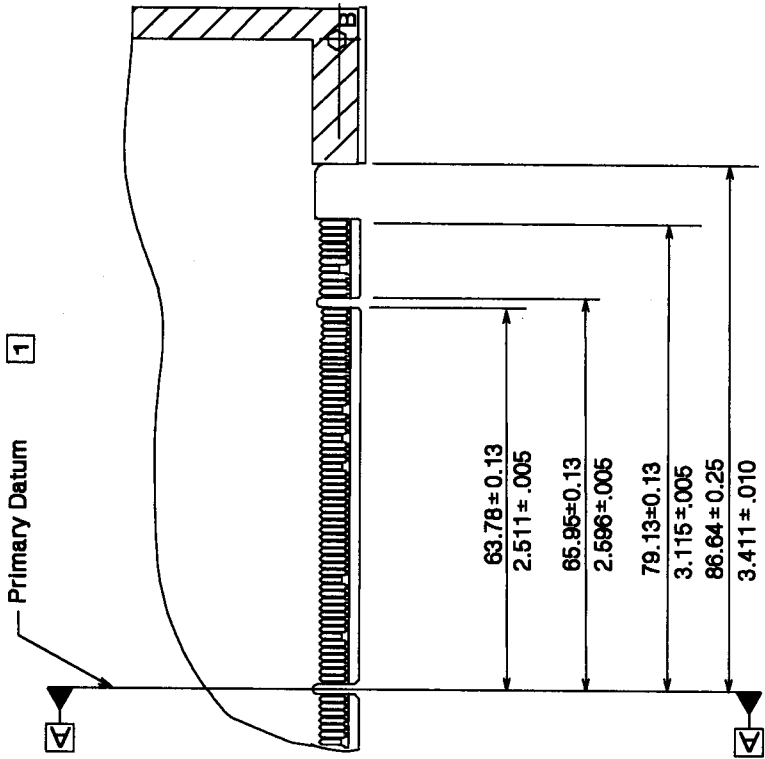
Figure 10 (Part 2 of 2). Connector Dimensions (Base Video Extension)
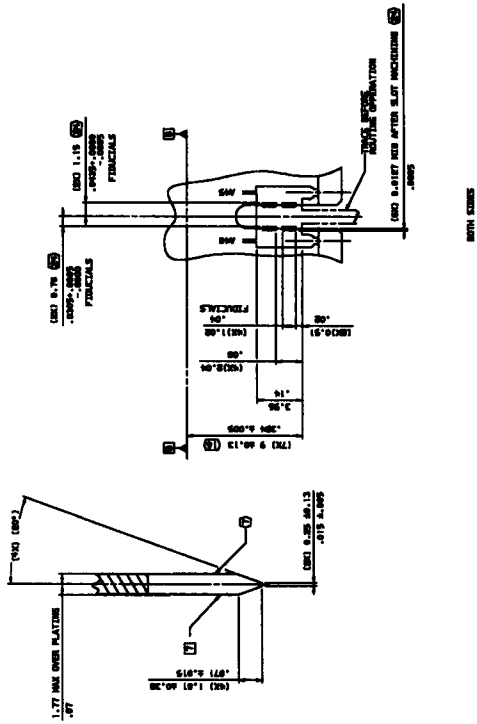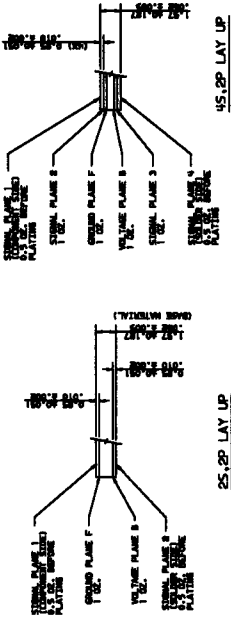
Figure 11. Connector Dimensions (Common Detail)
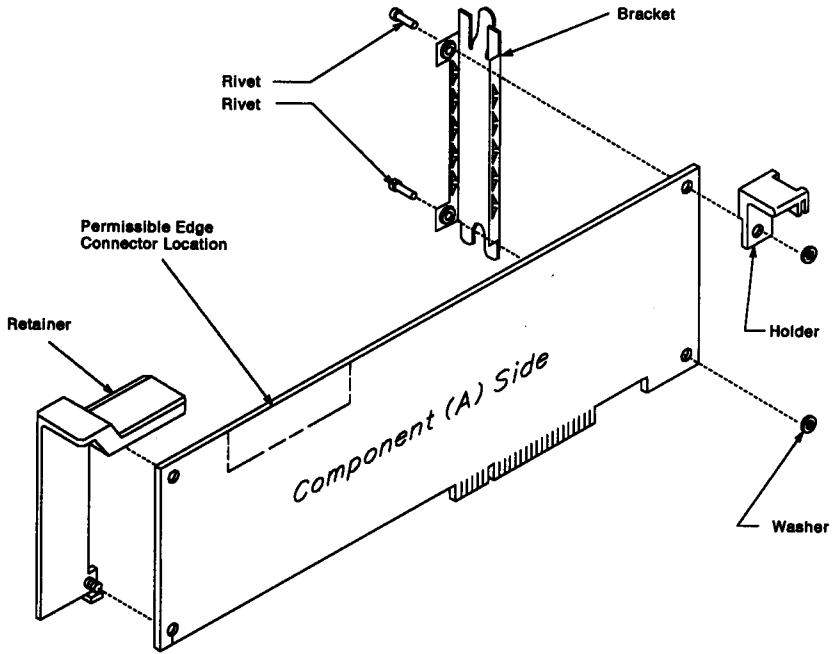
Materials:
  Holder and Retainer - Polycarbonate UL 94 V-0
  Bracket - AISI Type 302 1/4 Hard Stainless Steel

Figure 12. Typical Assembly for Type 3 Adapter
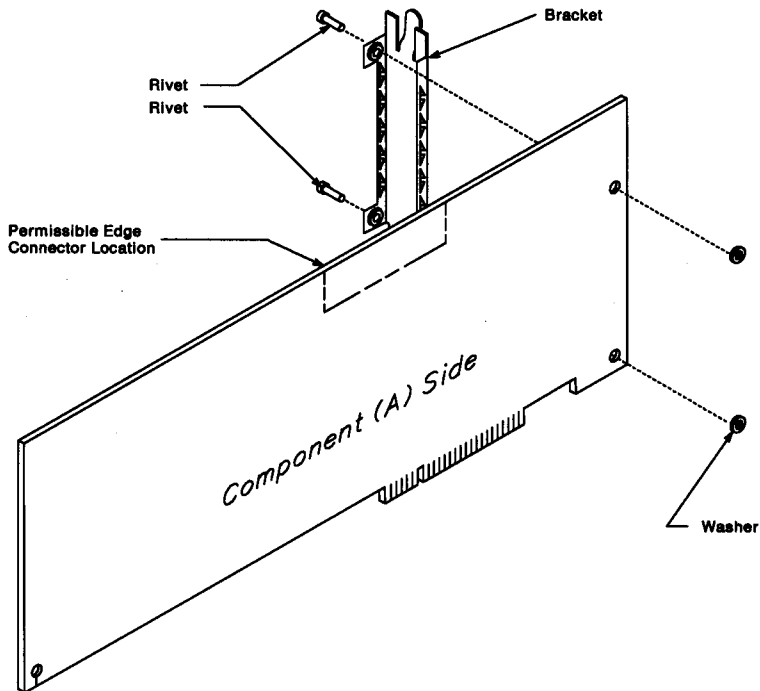
Materials:

Bracket - AISI Type 302 1/4 Hard Stainless Steel

Figure 13. Typical Assembly for Type 5 Adapter
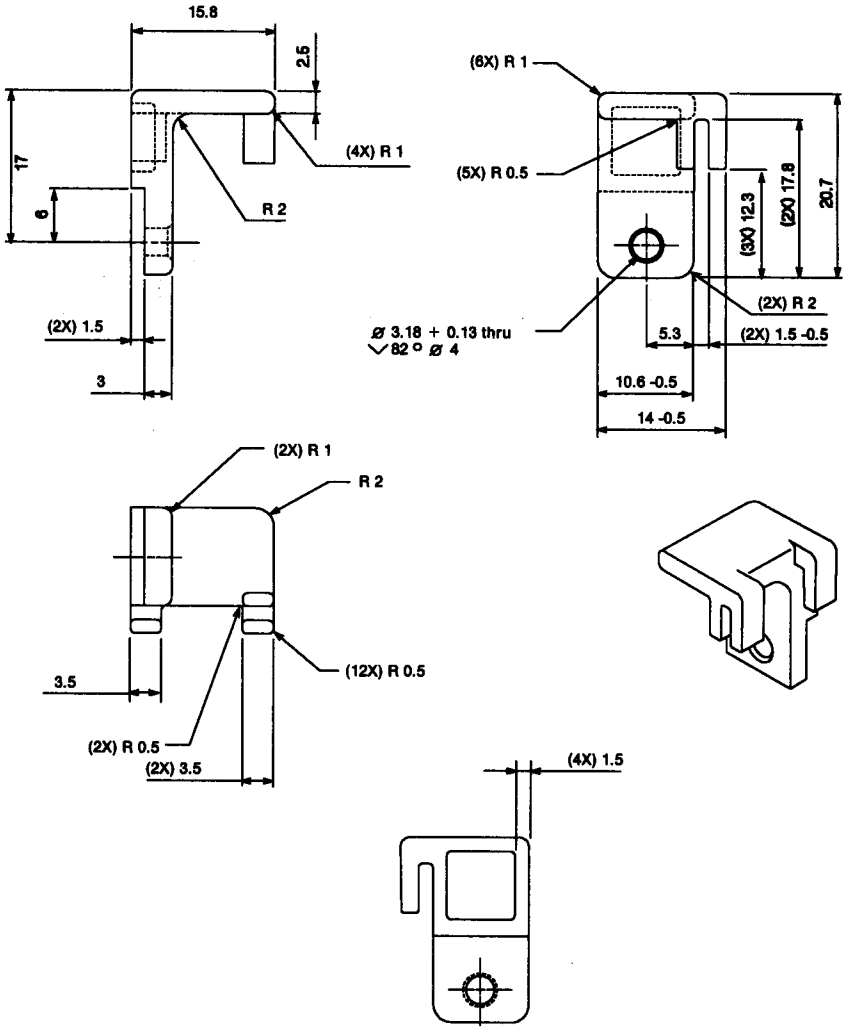
Figure 14. Adapter Holder
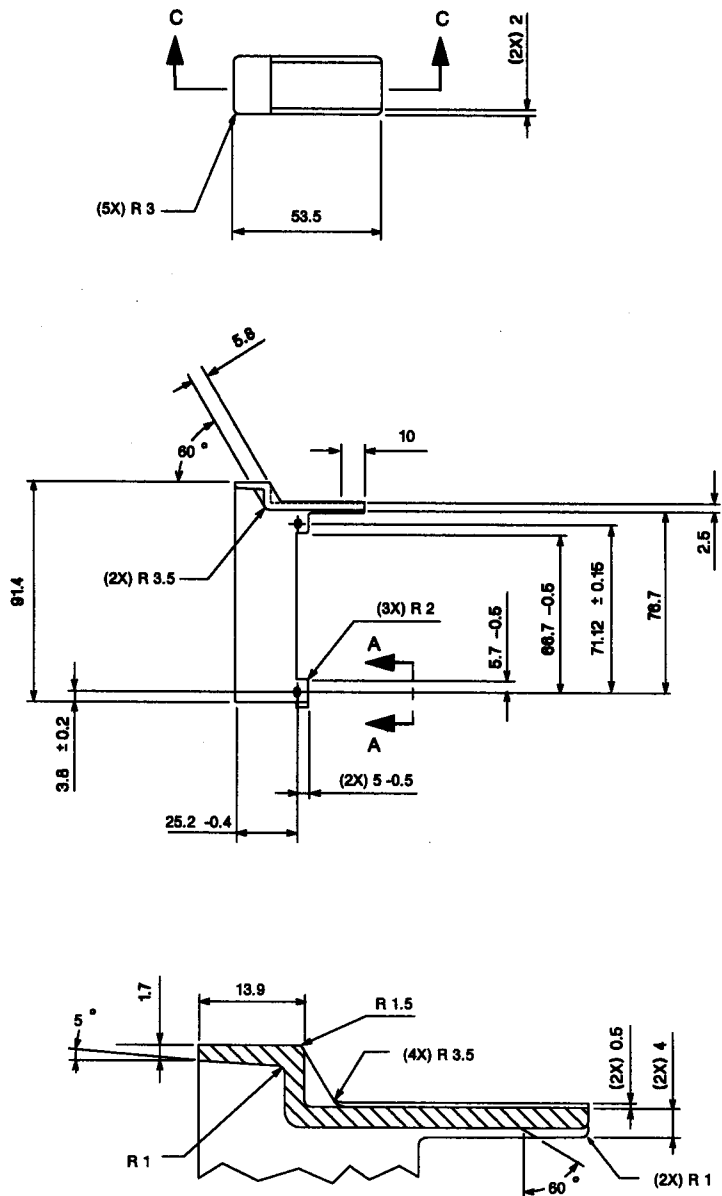
Figure 15 (Part 1 of 2). Adapter Retainer

VIEW A-A
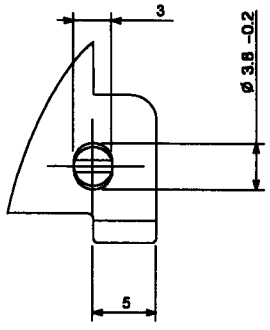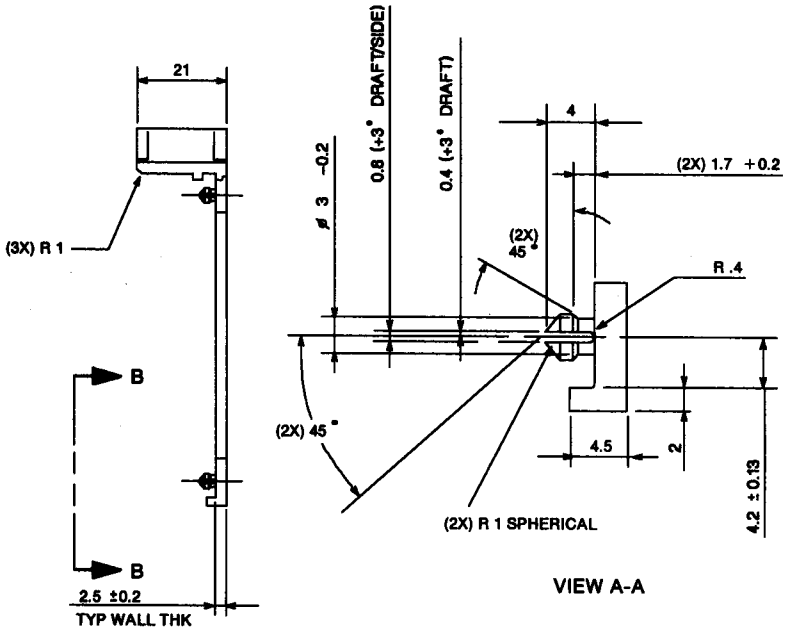
VIEW B-B

Figure 15 (Part 2 of 2). Adapter Retainer
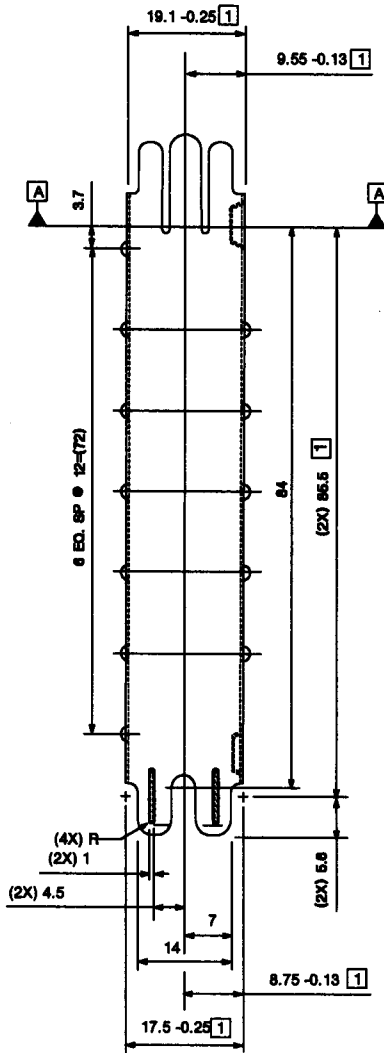
☐ DIMENSION IS CRITICAL TO FUNCTION.

Figure 16 (Part 1 of 4). Adapter Bracket

Figure 16 (Part 2 of 4). Adapter Bracket
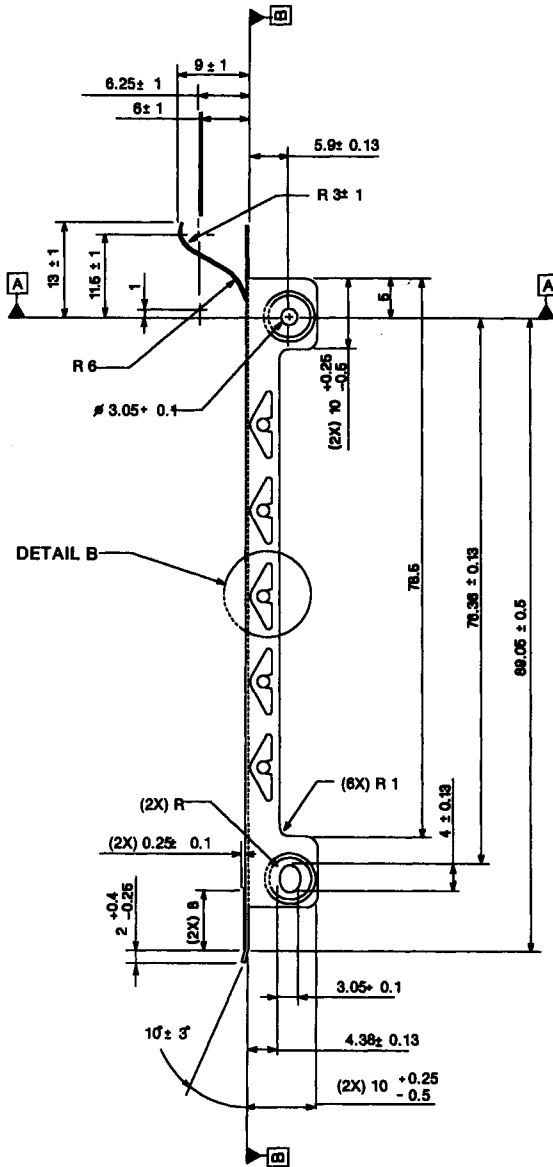
Figure 16 (Part 3 of 4). Adapter Bracket

ADAPTER REF

VIEW C-C

(INSIDE OF FORM)

0.25 2.5

R 1

R 2

OPEN

OPEN

10.5

5.3

0.76 3.24

(4X) R 0.5

5
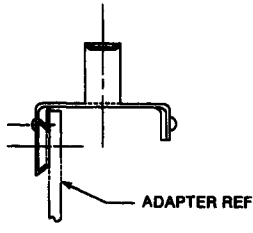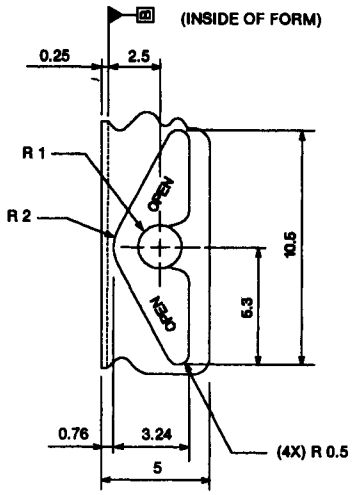
DETAIL B

SCALE 10/1
(12X)

R 1
SPHERICAL

0.75 ±0.13
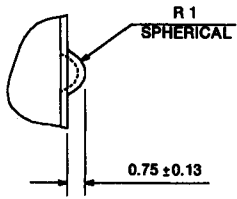
DETAIL A

SCALE 10/1
(12X)

Figure 16 (Part 4 of 4). Adapter Bracket

General Design Considerations

Each designer must take the precautions necessary to protect the safety of the end user, provide reliable operation of the device, and ensure the device does not interfere with the operation of the system or any other installed devices. The design considerations described in this section are not the **only** considerations, but rather those that might otherwise be overlooked.

Safety

Avoid exposed high-voltage or current points, sharp edges, and exposed components that operate at high temperatures. Devices must not channel dc power outside the system unit in any manner that violates Underwriters Laboratory and Canadian Standards Association guidelines.

Note: Canadian Standards Association C22.2, paragraph 4.11.3, number 154 requires protection of conductors of external interconnecting cords and cables connected to secondary circuits.

IBM does not support installing or removing Micro Channel adapters or components when the system power is on.

Thermal

The system unit is cooled internally by low-volume forced air. Adapter designs must allow for adequate air space between the adapters. Avoid using internal cables as a mechanism for signal communication inside the system unit, they can interfere with the air flow. If inter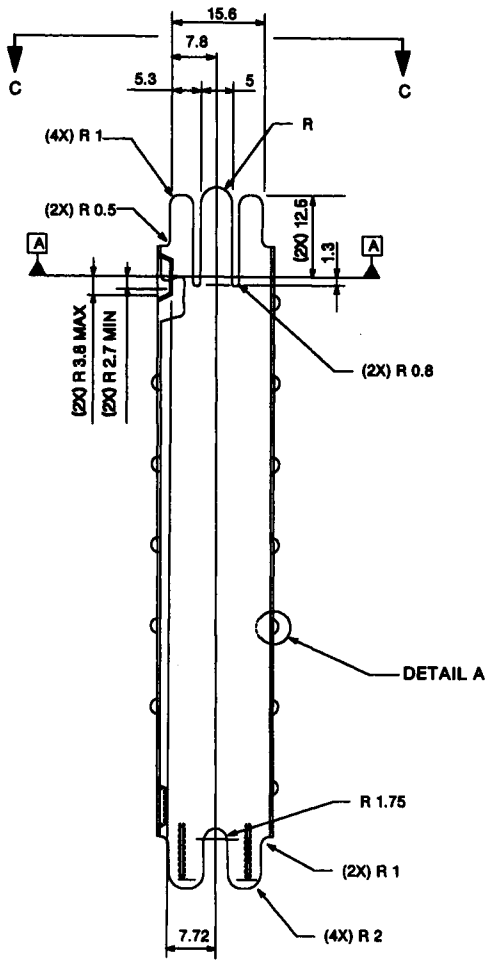nal cables are required, they must be positioned to minimize the impact on airflow. The maximum height for components mounted on the adapter should not exceed the dimensions specified under "Dimensions" on page 3. The adapter design should avoid clustering of high-temperature components. No component should exceed its maximum thermal rating.

Electromagnetic Compatibility

Adhere to the following guidelines to reduce electromagnetic compatibility (EMC) problems.

- The adapter end brackets make a continuous 360° connection to the outside "skin" of the system unit cabinet. A similar 360° connection to the inside skin should also be provided. The adapter bracket must not be used as a dc voltage return path, a logic-ground connection, or an audio ground connection.

- The end bracket at the rear of the adapter is isolated from dc ground on the adapter. The bracket must be grounded through a screw connection to the system unit and designed as shown in Figure 16 on page 22.

- All connector ground pins must be connected to the interplane ground at the channel connector, and the +5 Vdc power must be immediately connected to the +5 Vdc power plane.

- All adapters must provide nonsegmented internal power and ground planes.

- Each surface-mount technology module position should provide a decoupling capacitor pad with minimal connection inductance. Pin-in-hole modules should be decoupled if they drive or contain edge-triggered logic. Capacitors can range between 0.01 and 0.10 microfarad and should be low-inductance ceramic or a layered design.

- Internal cables should be avoided as a mechanism for signal communication inside the system unit. The channel should not be extended outside the system unit, except by an adapter.

- Clocks should be properly imbedded and terminated. When clocks, strobes, and handshakes are generated or received, care should be taken to control the rise-and-fall times to minimize radiation.

- External cables should connect through 360° shielded D-shell or equivalent connectors. Avoid the use of "pigtail" shield connections. Shield terminations should be connected to the external shield of the cable connector. Do not bring the shield through the connector and connect it to either logic ground or the inside skin of the cabinet.

- High-current power within the system unit should provide adjacent return paths to allow the maximum cancelation of radiated magnetic fields by the mutual coupling between the supply and return lines.

Diagnostics

All writable registers typically are readable at the same address. External interfaces typically include 100% diagnostic wrap capability by electronic switching or an external wrap tool.

Design Guidelines

Adapters designed for the Micro Channel architecture must comply with the following design guidelines:

- Each I/O adapter must decode all 16 lines of the I/O address.

| • Each 24-bit memory adapter must decode all 24 lines of the memory address and MADE 24.

- Each 32-bit memory adapter must decode all 32 lines of the memory address when MADE 24 is inactive. When MADE 24 is active, A24 through A31 are undefined.

- Each adapter must replace the function of switches and jumpers with registers that incorporate POS logic.

| • Each adapter must respond with an *adapter ID* to the data bus when interrogated.

  The following figure shows the recommended ID values for
| vendors. ID values 8200 to FFFE are assigned for IBM products
| only.

  Note: Programs should not make decisions based on the high nibble of the Adapter ID groupings.

ID	Definition
0000	Device Not Ready
0001 to 0FFF	Bus Master
5000 to 5FFF	Direct Memory Access Devices
6000 to 6FFF	Direct Program Control (Including Memory-Mapped I/O)
7000 to 7FFF	Storage*
8000 to 81FF	Video
FFFF	Device Not Attached

* Multiple-function adapters containing storage typically respond as storage.

Figure 17. Vendor Adapter ID Assignments

| The adapter IDs hex 7DB8 through 7DBF are reserved for the
| prototyping, developing, and testing of adapters and adapter
| designs and for adapters used in the testing of system designs.

| **Note:** Do not use these IDs for purposes other than the local
| development of your adapters or systems.

- Each enabled adapter must return a '-card selected feedback'
  signal (-CD SFDBK) to the system microprocessor when an access
  is made to the address space of the adapter, or when the adapter
  is selected by arbitration level. -CD SFDBK must not be generated
  when the '-card setup' signal (-CD SETUP) is active.

- Each adapter design must be capable of degating all outputs to
  the system board (including -CD SFDBK, -DS CD 16/32, interrupts, and
  so on) if bit 0 of POS Register 2 is set to 0.

- Following a reset, each adapter must set bit 0 (Card Enable) of its
  POS Register 2 to 0.

| - All adapters must provide adapter description files (.ADF) on a
  3.5-inch diskette for system configuration.

- Adapter designs should not extend the card-edge connector
  beyond the basic 16- or 32-bit connector unless the signals
  provided by the extension are used by the adapter.

| - A physical notch at positions 59 and 60 is required for 32-bit
| adapters that can function as a 16-bit adapter in a 16-bit
| connector. 32-bit adapters that can function in a 16-bit connector
| are usable in both 16 and 32-bit systems and have improved
| performance in 32-bit systems. The improved performance is a
| result of the increased data width and the ability to address over
| 16MB of memory.

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