

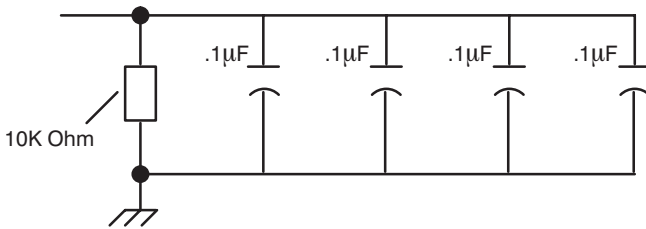
Appendix G

Using Foreign Modules in an AutoMax Rack

A foreign module must meet the following hardware and software requirements before it can be used in a local or remote AutoMax rack. See the AutoMax Power Supply Module and Racks Instruction Manual (J2-3008) for more information.

Hardware Requirements

1. The foreign module must conform to general IEEE 796 specifications. The AutoMax rack will support foreign modules which meet the following level of IEEE Standard bus compliance: D16M20116.
2. For foreign modules that have field connections, the field connections must be electrically isolated because the rack does not have a direct connection to ground. See the figure below for more information.



3. The BCLK (Bus Clock) signal is activated only by the presence of the Common Memory module (M/N 57C413 or 57C423). Consequently, if the foreign module requires this signal, the Common Memory module must be in slot 0 in the rack.
4. For foreign modules that can serve as bus masters, i.e., can control the bus, if the rack already contains a Processor, the Common Memory module (M/N 57C413 or 57C423) must be in slot 0 in the rack.
5. The bus arbitration method used by AutoMax systems is parallel round-robin. Any foreign module that can serve as a bus master must support parallel round-robin bus arbitration. Bus arbitration is supported only in slots 1 through 4. Bus masters can be placed only in these slots.
6. The CCLK (Constant Clock) signal is activated only through one of the following modules: Resolver Input module (57C411), 2-Channel Analog Input module (57C409), UDC module (57552), or the Pulsetach module (57C421). If the foreign module requires the CCLK signal, one of these modules must be in the rack and the command to activate CCLK using the appropriate bit in one of these modules must be issued in an application task.
7. Foreign modules must not generate interrupts.
8. For foreign modules in remote racks, inputs must respond only to Multibus memory read. Outputs must respond to both Multibus memory read and write. If this is not the case, the foreign module will be treated as an output module only by the remote I/O system.

9. Each slot has 64K of address space. Foreign modules that have more memory can be addressed in the rack if the proper number of slots to the right of the foreign module are left empty. For example, a foreign module with 128K of memory can be used fully by leaving the slot to the right of the foreign module empty ($64K + 64K = 128K$ total).
10. Foreign I/O modules that drive pins 24 and 26 on the bus cannot be used in the rack.
11. All modules in local racks must respond to requests on the bus within 10 μ sec. All modules in remote racks must respond to requests on the bus within 3 μ sec.

Software Requirements

For use in local racks, the foreign module must support 20-bit address lines.

For use in remote racks:

1. The foreign module must support 20-bit address lines;
2. The foreign module must support 16-bit data transfer only;
3. The foreign module must be memory-mapped, not I/O mapped;
4. The foreign module address must begin on a 64K boundary.

Accessing Foreign Modules

If a foreign module meets all the hardware requirements and software requirements above, it can be used in an AutoMax rack. For local racks, the method of accessing the foreign module depends upon further software specifications of the foreign module. There is only one method of accessing a foreign module in a remote rack.

Accessing a Foreign Module in a Local Rack

Method A

Requirements:

1. The module must be capable of 16-bit data transfers.
2. If it is an output module, it must be able to respond to read as well as write commands from the AutoMax Processor.
3. Addresses must begin on a 64K boundary.
4. Input and output registers must be a separate addresses.

Reference to the appropriate variable names in application tasks.

Method B

No requirements beyond the Hardware Requirements and Software Requirements listed above.

Access the module through BASIC IOWRITE and IOREAD statements in application tasks.

Accessing a Foreign Module in a Remote Rack

No requirements beyond the Hardware Requirements and Software Requirements listed above.

Reference to the appropriate variable names in application tasks.