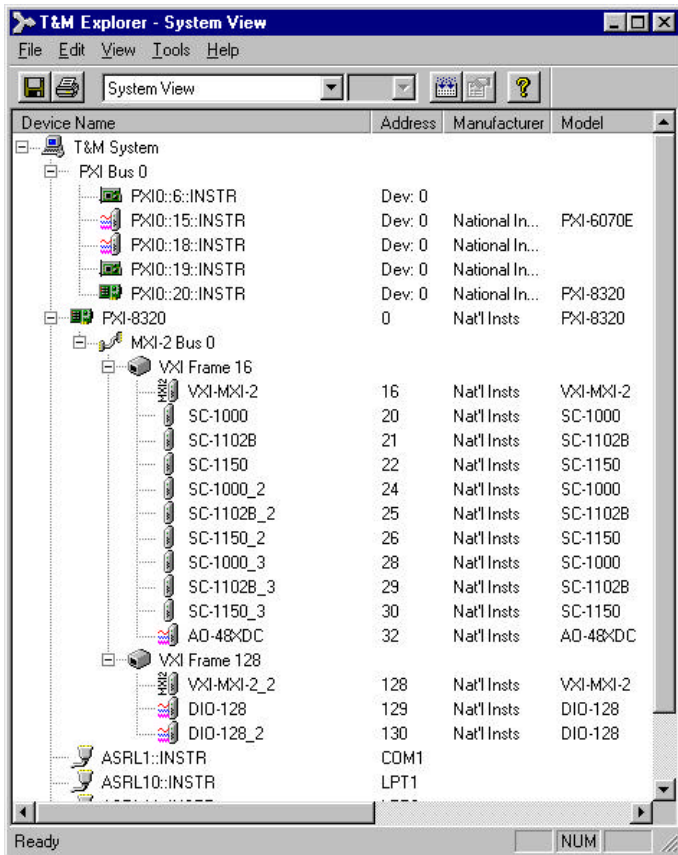# VXI/VMEbus Multiple Mainframe
System Configurations (MXI-2)

Two chassis configuration as viewed from T&M Explorer

This configuration guide is written for the MXI-2 product line (MXIbus Version 2). If you are using MXI-1 products, please refer to the MXI-1 Multiple Mainframe Configuration note. An easy way to determine whether you have a MXI-1 or a MXI-2 product is by looking at the cable that came with your kit. If the cable consists of one thick cable, it is a MXI-1 cable. If the cable consists of a dual cable in parallel, you have a MXI-2 product. The label on the connectors will also read either *MXI* or *MXI-2*.

Mainframe extenders allow you to transparently extend the VXI/VME bus cycles from one mainframe to another mainframe. With the MXI-2 protocol, you are restricted to a total length of 20m for one particular cable chain. You are also required to have no more than eight nodes or MXI devices on that particular cable chain. Of course, you may use more than one MXI extender device in the same mainframe which would allow you to have more than one cable chain for your particular configuration. This document doesn't discuss configuring more than one mainframe extender in the same mainframe. Please

refer to the documentation which came with your controller for information on configuring more than one extender in the same mainframe.

On a bus with several bus masters, such as the VME or VXI bus, there must be only one bus controller or bus arbiter. The same applies to the MXI bus - there can be only one MXI bus controller device. For a single cable chain, only one device may be configured as the MXI controller while the other devices must configured as non-controllers. This configuration is performed in software with the T&M Explorer or VXIEdit/VXItedit. In addition, the MXI-2 cables are polarized where one end has a label which must be plugged into the MXI controller while the end without the label must be connected to the non-controller device.

For daisy-chain configurations, the cables are designed so that the daisy chain connector end will be oriented towards non-controller devices while the other end of the cable will have the label for the MXI controller end. Hence, each cable in the system must be oriented so that the end of the cable with the label will be oriented towards the MXI controller device and the daisy chain connectors will be connected to non-controller devices.

The MXI-2 bus has an automatic detection mechanism when it is configured for automatic detection mode (the default mode). In auto-detection mode a MXI-2 device can detect whether it needs to be a MXI controller or non-controller, depending on the orientation of the cable. Upon power-up, the device will automatically configure itself as controller or non-controller depending on whether it detects the cable end with the label. For this document, we will assume that the MXI devices are configured in the default, automatic detection, mode.

This document discusses several common configurations. However, this document does not cover all the different permutations available or all possible logical address settings. By observing these configurations, you can usually configure other, less common configurations.
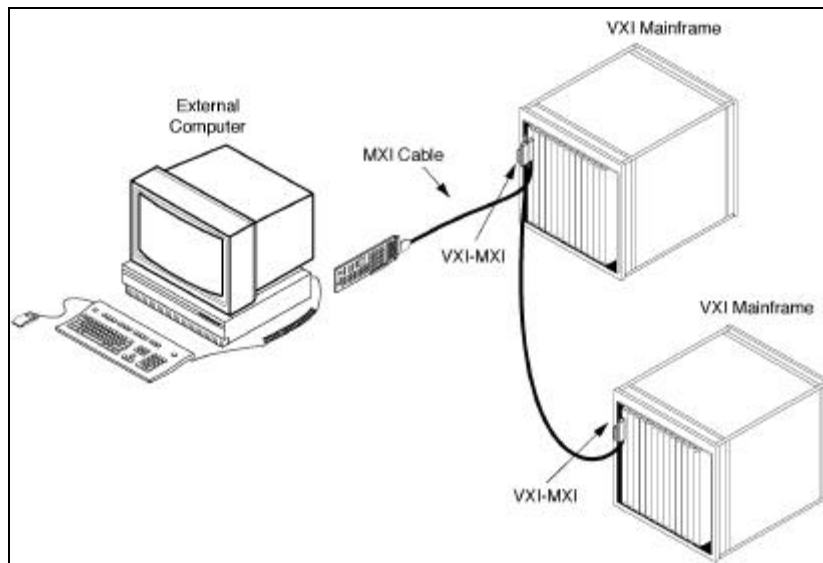
Table of Contents

       <u>Example</u>:   VXIpc-850 in VXI mainframe to two other VXI
                    mainframes

Embedded VME Controller <-> One Additional VME Mainframe   (Page 10)

       <u>Example</u>:   Embedded VME controller in VME mainframe to another
                    VME mainframe

External MXI Controller Board <-> Multiple VXI/VME Mainframes

Hardware

Note : This configuration assumes that the VXI-MXI-2s will be placed in Slot 0 of the VXI mainframes and that the VME-MXI-2s will be placed in Slot 1 of the VME mainframes. If you need to use these modules in other slots, refer to the document, *Setting Up Embedded Controllers and Mainframe Extenders as Non-Slot 0 Devices, Non-Resource Managers*, or the getting started manual for your controller.

External MXI Controller

Examples of external MXI controller boards include the PCI-MXI-2 and AT-MXI-2. In this configuration, the external MXI controller board will be MXIbus System Controller of the MXIbus system. This configuration requires no changes to the external MXI controller hardware.

VXI-MXI-2

1. If you are using VXI-MXI-2s in your system, you should assign them unique logical addresses that are multiples of 16, starting from 16. Use the logical address DIP switches to set the VXI-MXI-2s to appropriate logical addresses.

Note : In general, the logical addresses of the VXI-MXI-2s limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses for VXI devices in a particular mainframe are bounded by the logical address of the VXI-MXI-2 to less than the logical address of the next VXI-MXI-2.

$$LA_{VXI\text{-}MXI\text{-}2} < LA_{Devices} < LA_{Next\ VXI\text{-}MXI\text{-}2}$$

2. Insert the VXI-MXI-2 in Slot 0 of the mainframe.

Note: The VXI-MXI-2 will automatically terminate the MXIbus cable if it is the last device in the cable chain.

VME-MXI-2

1. If you are using VME-MXI-2s in your system, you should assign them unique logical addresses that are multiples of 16, starting from 16. Use the logical address DIP switches to set the VME-MXI-2s to appropriate logical addresses.

2. Insert the VME-MXI-2 in Slot 1 of the mainframe. If your VME chassis does not comply with the VME64 specifications, use VXIedit or the Soft Front Panel to configure the VME-MXI-2 for Slot 1 operation rather than rely on the automatic detection of Slot 1.

Note: The VME-MXI-2 will automatically terminate the MXIbus cable if it is the last device in the cable chain.

MXIbus Cabling

1. Attach a MXIbus cable from the external MXI controller to the first mainframe extender. Use a MXIbus cable that has one daisy-chain (double-ended) connector, such as a MXIbus M2 cable. Connect the cable's single-ended connector to the external MXI controller board and the cable's double-ended connector to the first mainframe extender.

2. Attach a MXIbus cable between each subsequent pair of mainframe extenders.

   The position of the mainframes along the MXI cable chain does not need to correspond to the order of the logical addresses of the VXI/VME-MXI-2s. There is no relation between the order along the cable and the logical addresses of the devices. In fact, the external MXI controller can reside in the middle of the cable chain as long as you remove the MXI termination resistors. Unlike the MXI extender devices, the external MXI controllers cannot automatically enable or disable MXI termination.

   If you are *not* connecting to the last mainframe extender in the MXIbus cable chain, use a MXIbus cable that has *one* daisy-chain (double-ended) connector, such as a MXIbus M2 cable. Connect the cable's single-ended connector to the mainframe extender that is closer to the external MXI controller board and the cable's double-ended connector to the mainframe extender that is farther from the external MXI controller board.

   If you *are* connecting to the last mainframe extender in the MXIbus cable chain, you can use a MXIbus cable that has *two* single-ended connectors, such as a MXIbus M1 cable. Connect the cable between the two mainframe extenders. Note that one end of

the M1 cable must go closer to the MXIbus system controller which by default will be the external MXI controller.

Software

1. If you are using VME devices in your system, run the external MXI controller's VXI Resource Editor (T&M Explorer, VXIedit, or VXItedit) and provide information about the VME resources (address ranges, interrupts, and so on) that are required by the VME devices in your system.

T&M Explorer:
   Add your VME devices to the NI-VXI configuration information tables by selecting *Add VME Device* under the *Edit* menu. Set the **Frame** parameter to the logical address of the VME-MXI-2 that resides in the same mainframe as the VME device.

VXIedit or VXItedit:
   Enter the Non-VXI Device Editor. Set the **Frame** parameter to the logical address of the VME-MXI-2 that resides in the same mainframe as the VME device. However, the VME-MXI-2 itself does not need to be added to the non-VXI Device Editor. Save your changes and exit the external MXI controller's VXI Resource Editor, and rerun VXIinit on the external MXI controller.

2. Next, run RESMAN on the external MXI controller to configure the entire system. The display for the external MXI controller should indicate that the system has been configured correctly. There should be no indication of any problems.

Note: Do not attempt to run RESMAN with the MXI-2 cable disconnected or reversed. RESMAN could hang if the MXI controller end of the cable is not oriented toward the MXI controller device (if not in automatic detection mode).

Embedded VXI Controller <-> One Additional VXI or VME Mainframe
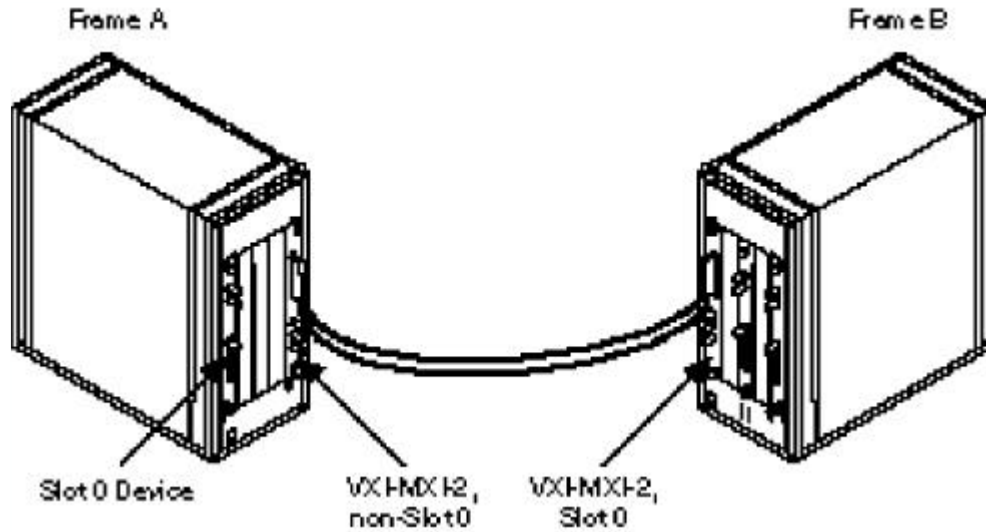
Hardware

Embedded VXIpc-800/700 Series Controller (in Slot 0 of First Mainframe)

No changes are necessary to the embedded VXI controller hardware because it is being used in Slot 0. Insert the embedded VXI controller in Slot 0 of the first mainframe.

VXI-MXI-2 (in Non-Slot 0 of First Mainframe)

No changes are necessary. By default the VXI-MXI-2 automatically detects if it is in slot 0.

1. In the first mainframe, you should let the VXI-MXI-2 perform the VXIbus Timeout function, if at all possible, because this will generally allow MXIbus transfers more time to complete. Since both devices should not be allowed to perform the VXIbus Timeout function, you must disable the VXIbus timeout on the embedded VXI controller.

    Use the embedded VXI controller's VXI Resource Editor (T&M Explorer, VXIedit, or VXItedit).

    T&M Explorer:
        Enter the Hardware Configuration Editor for the VXIpc. Under the VXI tab, set the **VXI Bus Timeout** parameter to **Disabled**

    VXIedit or VXItedit:

Enter the VXIpc-Configuration Editor, enter the Bus Configuration Editor, and change the **VXI Bus Timeout** parameter to **DISABLE**. Note that if your embedded VXI controller is the VXIpc-500 series, set the **Local Bus Timeout** to **DISABLE**, but if your embedded VXI controller is the VXIcpu-030, do not set the **Local Bus Timeout** to **DISABLE**. Save your changes and exit the embedded VXI controller's VXI Resource Editor (VXIedit/VXItedit), and rerun VXIinit on the embedded VXI controller.

2. Change the logical address of the VXI-MXI-2 to 127 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 127 for this configuration.

Note: In general, the logical address of the VXI-MXI-2 limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses is from 1 to 126.

3. Insert the VXI-MXI-2 in a slot other than Slot 0.

VXI-MXI-2 (in Slot 0 of Second Mainframe)

1. Change the logical address of the VXI-MXI-2 to 128 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 128 for this configuration.

Note: In general, the logical address of the VXI-MXI-2 limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses is from the VXI-MXI-2's logical address plus 1 to 254.

2. Insert the VXI-MXI-2 in Slot 0 of the second mainframe.

VME-MXI-2 (in Slot 1 of Second Mainframe)

1. Change the logical address of the VME-MXI-2 to 128 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 128 for this configuration.

2. Insert the VME-MXI-2 in Slot 1 of the second mainframe. If your VME chassis does not comply with the VME64 specifications, use T&M Explorer, VXIedit, or the Soft Front Panel to configure the VME-MXI-2 for Slot 1 operation rather than rely on the automatic detection of Slot 1.

MXIbus Cabling

1. Attach a MXIbus cable between the two VXI-MXI-2s.

   If you are using a MXIbus cable that has *one* daisy-chain (double-ended) connector, such as a MXIbus M2 cable, connect the cable's single-ended connector to the

VXI-MXI-2 that resides in non-Slot 0 of the first mainframe and connect the cable's double-ended connector to the VXI-MXI-2 or VME-MXI-2 in the second mainframe.

If you are using a MXIbus cable that has *two* single-ended connectors, such as a MXIbus M1 cable, connect the cable between theVXI-MXI-2 in the first mainframe to the VXI-MXI-2 or VME-MXI-2 in the second mainframe. Note that one end of the M1 cable must go closer to the MXIbus System Controller. If you are using the VXI-MXI-2s in the default, automatic detection mode, you can orient the cable either way.

Software

If using a VME mainframe do step 1; otherwise, proceed to step 2.

2. If you are using VME devices in your system, run the external MXI controller's VXI Resource Editor (T&M Explorer, VXIedit, or VXItedit) and provide information about the VME resources (address ranges, interrupts, and so on) that are required by the VME devices in your system.

T&M Explorer:
Add your VME devices to the NI-VXI configuration information tables by selecting *Add VME Device* under the *Edit* menu. Set the **Frame** parameter to the logical address of the VME-MXI-2 that resides in the same mainframe as the VME device.

VXIedit or VXItedit:
Enter the Non-VXI Device Editor. Set the **Frame** parameter to the logical address of the VME-MXI-2 that resides in the same mainframe as the VME device. However, the VME-MXI-2 itself does not need to be added to the non-VXI Device Editor. Save your changes and exit the external MXI controller's VXI Resource Editor, and rerun VXIinit on the external MXI controller.

2. Run RESMAN on the embedded VXI controller to configure the entire system. The display for the embedded VXI controller should indicate that the system has been configured correctly. There should be no indication of any problems.

Note: Do not attempt to run RESMAN with the MXI-2 cable disconnected or reversed. RESMAN could hang if the MXI controller end of the cable is not oriented toward the MXI controller device (if not in automatic detection mode).

Embedded VXI Controller <-> Two Additional VXI Mainframes
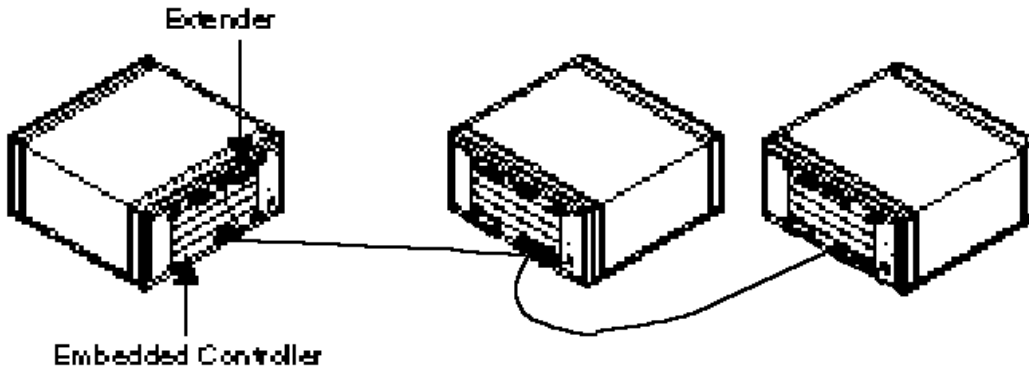
Hardware

Embedded VXIpc-800/700 Series VXI Controller (in Slot 0 of First Mainframe)

No changes are necessary to the embedded VXI controller hardware because it is being used in Slot 0. Insert the embedded VXI controller in Slot 0 of the first mainframe.

VXI-MXI-2 (in Non-Slot 0 of First Mainframe)

No changes are necessary. By default, the VXI-MXI-2 automatically detects if it is in slot 0.

1. In the first mainframe, you should let the VXI-MXI-2 perform the VXIbus Timeout function, if at all possible, because this will generally allow MXIbus transfers more time to complete. Since both devices should not be allowed to perform the VXIbus Timeout function, you must disable the VXIbus timeout on the embedded VXI controller.

   Use the embedded VXI controller's VXI Resource Editor (T&M Explorer, VXIedit, or VXItedit).

   T&M Explorer:
   >   Enter the Hardware Configuration Editor for the VXIpc. Under the VXI tab, set the **VXI Bus Timeout** parameter to **Disabled**

   VXIedit or VXItedit:
   >   Enter the VXIpc-Configuration Editor, enter the Bus Configuration Editor, and change the **VXI Bus Timeout** parameter to **DISABLE**. Note that if your embedded VXI controller is the VXIpc-500 series, set the **Local Bus Timeout** to **DISABLE**, but if your embedded VXI controller is the VXIcpu-030, do not set the **Local Bus Timeout** to **DISABLE**. Save your changes and exit the embedded VXI controller's VXI Resource Editor (VXIedit/VXItedit), and rerun VXIinit on the embedded VXI controller.

2. Change the logical address of the VXI-MXI-2 to 127 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 127 for this configuration.

Note: In general, the logical address of the VXI-MXI-2 limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses is from 1 to 126.

3. Insert the VXI-MXI-2 in a slot other than Slot 0.

VXI-MXI-2 (in Slot 0 of Second Mainframe)

1. Change the logical address of the VXI-MXI-2 to 128 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 128 for this configuration.

Note: The logical address of the VXI-MXI-2 limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses is from the VXI-MXI-2's logical address plus 1 to the next VXI-MXI-2's logical address minus 1. We recommend setting the logical addresses of the VXI-MXI-2s by multiples of 16. This translates to a logical address range of 128 to 143.

2. Insert the VXI-MXI-2 in Slot 0 of the second mainframe.

Note: The VXI-MXI-2 will automatically terminate the MXIbus cable if it is the last device in the cable chain.

VXI-MXI-2 (in Slot 0 of Third Mainframe)

1. Change the logical address of the VXI-MXI-2 to 144 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 144 for this configuration.

Note: The logical address of the VXI-MXI-2 limits the range of logical addresses that can be assigned to VXI devices in the mainframe. The allowable range of logical addresses is from the VXI-MXI-2's logical address plus 1 to the next VXI-MXI-2's logical address minus 1. We recommend setting the logical addresses of the VXI-MXI-2s by multiples of 16. This translates to a logical address range of 145 to 159.

2. Insert the VXI-MXI-2 in Slot 0 of the third mainframe.

Note: The VXI-MXI-2 will automatically terminate the MXIbus cable if it is the last device in the cable chain.

MXIbus Cabling

1. Attach a MXIbus cable between the first VXI-MXI-2 and the second VXI-MXI-2.

   If you are using a MXIbus cable that has *one* daisy-chain (double-ended) connector, such as a MXIbus M2 cable, connect the cable's single-ended connector to the VXI-MXI-2 that resides in non-Slot 0 of the first mainframe and connect the cable's double-ended connector to the VXI-MXI-2 that resides in Slot 0 of the second mainframe.

2. Attach a MXIbus cable between the second VXI-MXI-2 and the third VXI-MXI-2.

   If you are using a MXIbus cable that has *one* daisy-chain (double-ended) connector, such as a MXIbus M2 cable, connect the cable's single-ended connector to the VXI-MXI-2 that resides in Slot 0 of the second mainframe and connect the cable's double-ended connector to the VXI-MXI-2 that resides in Slot 0 of the third mainframe.

   If you are using a MXIbus cable that has *two* single-ended connectors, such as a MXIbus M1 cable, connect the cable between theVXI-MXI-2 in the first mainframe to the VXI-MXI-2 or VME-MXI-2 in the second mainframe. Note that one end of the M1 cable must go closer to the MXIbus System Controller. If you are using the VXI-MXI-2s in the default, automatic detection mode, you can orient the cable either way.

Software

Run RESMAN on the embedded VXI controller to configure the entire system. The display for the embedded VXI controller should indicate that the system has been configured correctly. There should be no indication of any problems.

Note: Do not attempt to run RESMAN with the MXI-2 cable disconnected or reversed. RESMAN could hang if the MXI controller end of the cable is not oriented toward the MXI controller device (if not in automatic detection mode).

Embedded VME Controller <-> One Additional VME Mainframe

Hardware

Embedded VME Controller (in Slot 1 of First Mainframe)

This assumes that you are using a VME controller other than the VXIpc-600 series. Refer to the documentation for the embedded VME controller to determine which hardware changes are necessary. Insert the embedded VME controller in Slot 1 of the first mainframe.

VME-MXI-2 (in Non-Slot 1 of First Mainframe)

No changes are necessary. By default, the VXI-MXI-2 uses automatic Slot 0 detection.

1. In the first mainframe, you should let the VME-MXI-2 perform the VMEbus Timeout function, if at all possible, because this will generally allow MXIbus transfers more time to complete. Since both devices should not be allowed to perform the VMEbus Timeout function, you must disable the VMEbus timeout on the embedded VME controller. Refer to the documentation for the embedded VME controller to determine how to disable its VMEbus Timeout function.

2. Change the logical address of the VME-MXI-2 to 127 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 127 for this configuration.

3. Insert the VME-MXI-2 in a slot other than Slot 1.

VME-MXI-2 (in Slot 1 of Second Mainframe)

1. Change the logical address of the VME-MXI-2 to 128 using the logical address DIP switches. Although you can use other logical addresses, we recommend the use of logical address 128 for this configuration.

2. Insert the VME-MXI-2 in Slot 1 of the second mainframe.

MXIbus Cabling

1. Attach a MXIbus cable between the two VME-MXI-2s.

   If you are using a MXIbus cable that has *one* daisy-chain (double-ended) connector, such as a MXIbus M2 cable, connect the cable's single-ended connector to the VME-MXI-2 that resides in non-Slot 1 of the first mainframe and connect the cable's double-ended connector to the VME-MXI-2 that resides in Slot 1 of the second mainframe.

If you are using a MXIbus cable that has *two* single-ended connectors, such as a MXIbus M1 cable, connect the cable between the two VME-MXI-2s.

Software

You will need to program the Logical Address, A16, A24, and A32 Window Map Registers on the VME-MXI-2s to allow accesses between the two VME mainframes. This is discussed in the VME-MXI-2 User Manual.

If you have further questions on these configurations, please contact National Instruments.