

Multiport II Multichannel Analyzer

User's Manual

9234709B



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The information in this document describes the product as accurately as possible, but is subject to change without notice.

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1. Introduction

Existing amplifier and HVPS modules are to be combined with a high analog performance, low-cost ADC/MCA. It provides greater flexibility than traditional bus plug-in boards but at a comparable cost. Multiport II can be purchased in versions from one to six inputs. Units with fewer than six inputs can be field upgraded with additional inputs. Two communications interface versions are available: Ethernet/USB and USB only.

The Multiport II is easy to install and easy to link. Host computer interfacing is accomplished via a standard USB port or a standard Ethernet port (unshielded twisted pair) and through standard protocols. These widely recognized interfaces make the Multiport II compatible with a wide range of computer platforms, so the Multiport II user need not worry about compatibility as computer bus standards evolve. Also, multiple Multiport II units can be totally remote-controlled from a single computer. The Multiport II provides better performance and lower noise than plug-in PC board based MCAs by keeping all sensitive components out of the computer itself and by putting the MCA close to the radiation detectors. Furthermore, there is only one cable between the host computer and the Multiport II NIM module for simplicity of inter connection.

Multiport II is suitable for use with a wide range of radiation detectors. Selecting a proper preamplifier, amplifier and high voltage power supply, makes Multiport II compatible with NaI(Tl), HPGc, SiLi, CdTe, ion implanted, plastic scintillation, BGO and other detector technologies. Modular NIM packaging makes it easy to reconfigure systems as needs change or as new technologies become available.

The use of parallel processing technique results in an effective zero time to "add one" in memory, resulting in a fast conversion time. Furthermore, the on-board implementation of the sliding scale method improves the linearity and the channel uniformity. To protect long collections from power failure, the Multiport II features on-board data and settings retention at fixed time intervals for each of its MCAs.

Multiport II provides full I/O support, including Canberra standard PUR/LTC, sample changer synchronization and advanced PHA operations.

For more flexibility and more applications, Multiport II supports both Pulse Height Analysis (PHA and SCA) and Multichannel Scaling (MCS) modes of operation.

Software Support

The Multiport II is fully supported by Genie 2000 software family suite. Multiport II is fully remote controlled under Genie 2000 (parameters such as gain, LLD, ULD, ADC zero and MCS parameters) via standard Genie 2000 tools. Genie 2000 supports a wide range of time proven spectral analysis algorithms, modern spectrum display and user interface as well as a variety of special applications programs. Genie 2000 software solutions are available for applications ranging as widely as laboratory gamma and alpha spectroscopy, waste measurement, whole body counting and nuclear safeguards.

2. Controls and Connectors

Front Panel

This is a brief description of the Multiport II's front panel indicators and connectors. For more detailed information, refer to Appendix A, *Specifications*.

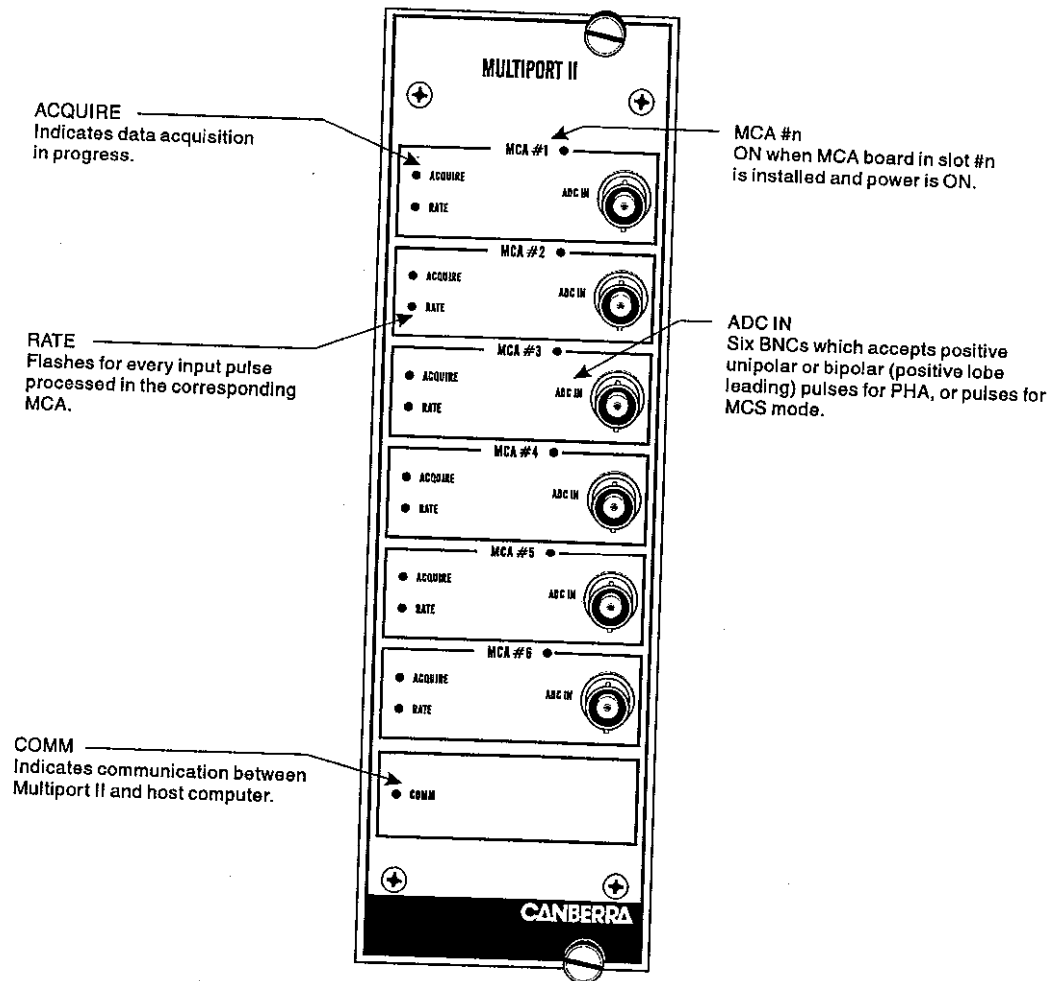


Figure 1 Front Panel Indicators and Connectors

Rear Panel

This is a brief description of the Multiport II's rear panel connectors. For more detailed information, refer to Appendix A, Specifications.

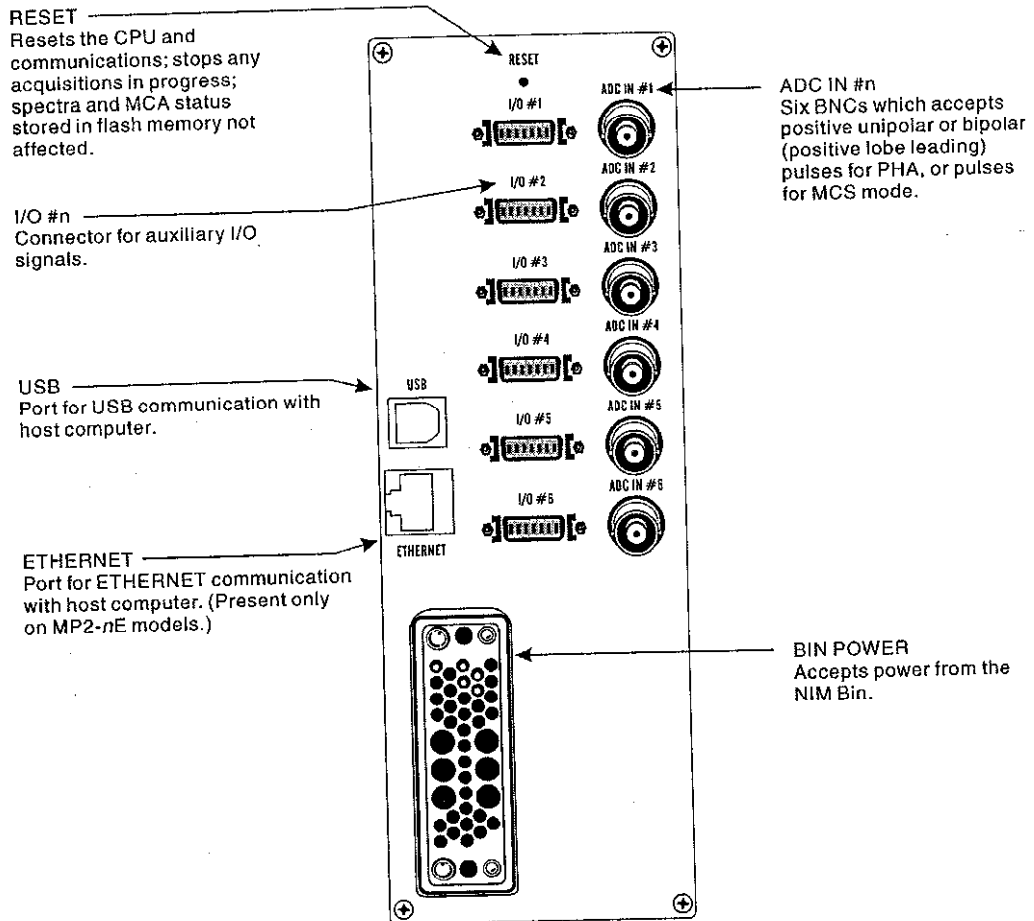


Figure 2 Rear Panel Indicators and Connectors

Internal Controls and Connectors

Main Board – Front

This is a brief description of the controls and connectors on the front of the Main Board. For more detailed information, refer to Appendix A, Specifications.

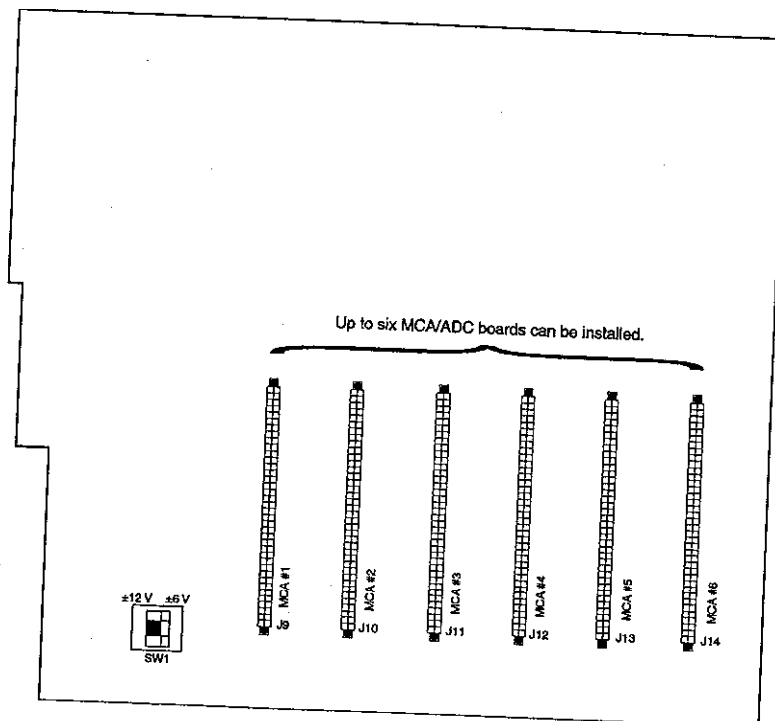


Figure 3 Main Board – Front

SW1: Selects either $\pm 12\text{ V}$ (default) or $\pm 6\text{ V}$ power for the unit.

Note: If the NIM bin in which the Multiport II will be used is equipped with $\pm 6\text{ V}$ power, change SW1 to the $\pm 6\text{ V}$ position to reduce power dissipation ($\pm 6\text{ V}$ lines have higher current ratings than $\pm 12\text{ V}$ lines).

Main Board – Rear

This is a brief description of the controls and connectors on the rear of the Main Board. For more detailed information, refer to Appendix A, Specifications.

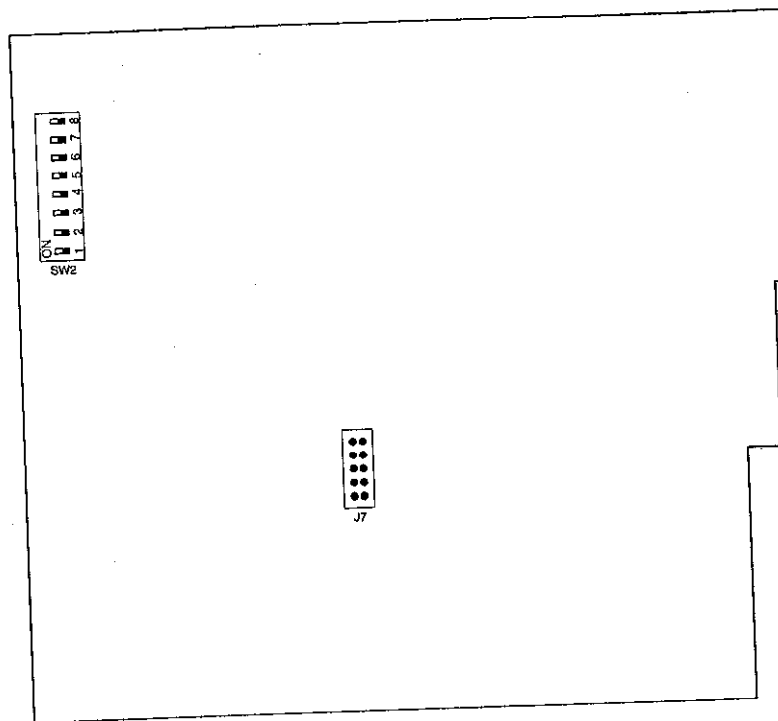


Figure 4 Main Board – Rear

- SW2: This switch, if installed, is for Factory Diagnostics only; all switches must be left in the OFF position.
- J7: This jumper is for Factory Use Only; do not connect anything to it.

MCA Board

This is a brief description of the MCA Board's control and connectors. For more detailed information, refer to Appendix A, Specifications.

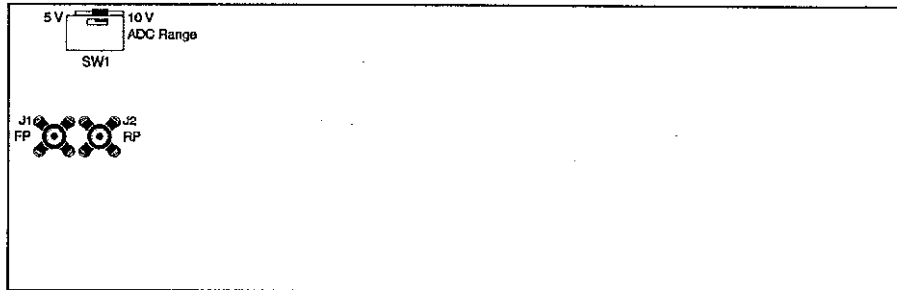


Figure 5 MCA Board

SW1: Sets the ADC input range to 5 V or 10 V (default).

J1: Signal input, connect from front panel.

J2: Signal input, connect from rear panel.

3. Setup and Configuration

This chapter will guide you through to connecting and setting up the system.

Installation

The Canberra Model 2100 Bin and Power Supply, or other bin and power supply systems conforming to the mechanical and electrical standards set by DOE/ER-00457T will accommodate the Multiport II NIM module. The module's right side cover acts as a guide for insertion of the instrument. The module is secured by turning the two front panel captive screws clockwise until finger tight. It is recommended that the NIM bin power switch be OFF whenever the module is installed or removed. To ensure safety, be sure to use a NIM Bin which complies with all applicable safety requirements.

The Multiport II can be operated where the ambient air temperature is between 0°C and +50°C (+120°F maximum). Perforations in the top and bottom sides permit cooling air to circulate through the module. When relay rack mounted along with other heat generating equipment, adequate clearance should be provided to allow for sufficient air flow through both the perforated top and bottom covers of the NIM Bin.

Field Installing Additional Boards

Each Multiport II NIM module can accommodate up to six MCA/ADC boards. Additional MCA/ADC boards can be field installed. Though the boards can be installed in any available slot, the recommended practice is to install them in numerical order.

To install additional MCA/ADC boards, follow these steps:

1. Turn off the NIM Bin's power and remove the Multiport II NIM module from the Bin.
2. Remove both of the Multiport II's side covers.
3. When the Multiport II is shipped, each pair of unused signal cables, one from the rear panel and one from the front panel, is tied to each slot's card guides. Before installing a board, you'll have to cut and remove the cable tie from a board slot.
4. Plug the front panel signal cable into the board's J1 connector and the rear panel signal cable into the J2 connector. Refer to Figure 5, MCA Board, on page 7 for connector locations.

Connecting the System

5. Slide the MCA/ADC board into the slots in the board guides. Make sure that the multi-pin connector on the edge of the board is aligned with the mating connector on the main board.
6. Press the MCA/ADC board in, while supporting the main board from the bottom to prevent excessive flexing. The board is properly inserted when its top edge does not protrude above the board guides.
7. Repeat steps 3–6 for each additional board being installed.
8. Replace the Multiport II's side covers.
9. Insert the Multiport II into the NIM Bin, turn on the Bin's power and verify that the Multiport II is functioning correctly.

Connecting the System

Each of the installed MCA boards can be connected to an amplifier output signal. Connect the amplifier signal to the board's front or rear ADC IN connector.

Connecting to the Host Computer

The Multiport II supports two computer interface systems; high speed USB 1.1 and Ethernet. Connect the Multiport II to the host computer using the USB or Ethernet interface as described below. Refer to Appendix D, *Software Installation*, and Appendix E, *Configuring the Ethernet Option*, for instructions on how to install/configure the USB or Ethernet communications.

Connecting the USB Cable

The USB cable allows transfer of computer commands and spectral data between the Multiport II and the host computer. Both ends have USB connectors which are defined by the USB standard; one end is rectangular, the other end is square. Connect the square end to the USB port located on the rear panel of the Multiport II, connect the rectangular end to the USB port on the host computer.

Note: The Multiport II ships with a 3 m (10 ft) USB cable. A maximum cable length of up to 5 m (16 ft) may be used.

Connecting the Ethernet Cable

The Multiport II connects to the local network using a standard RJ-45 (8-pin) patch cable. The Multiport II may be used by any computer on the local network. The Multiport II's IP Address or Device name is assigned using the `Multiport_II_Ethernet_Configuration.exe` program. Refer to Appendix E, *Configuring the Ethernet Option*, for complete instructions on using the configuration program.

MID Definition

Before the Multiport II can be used with Genie-2000, the communication interface must be defined and configured in the Genie-2000 MCA Input Definition (MID) Editor.

- When using Ethernet, the Multiport II's Network (IP) Address or Device Name must be entered into the MID Configuration. Prior to that, the Multiport II's Ethernet port has to be enabled by using the Multiport II's USB connection (see Appendix D, *Software Installation*).
- When using USB, the Multiport II's serial number must be entered into the MID Configuration to allow the Genie-2000 software to identify the specific Multiport II instrument.

If this has not already been done please refer to "The MID Wizard" on page 11 for instruction on defining the Multiport II MID input definition for USB or Ethernet operation.

4. User Interface and Controls

This chapter provides basic information on the user interface and functional operation of the setup control for the Multiport II.

Creating an MCA Input Definition

After you've set up and connected your system, the first step in using your Multiport II is to create an MCA Input Definition (MID) for each MCA board.

For most cases, you'll use the MID Wizard to help you set up your Multiport II's Input Definition quickly and easily.

If your Input Definition is more complex than the MID Wizard was designed to handle you'll need to use the MID Editor (page 14) to create your definition. The MID Editor is also used to change (edit) an existing definition.

The MID Wizard

To use the MID Wizard, open the Genie-2000 folder and select the MID Wizard icon to start the definition process.

Step 1

The first screen (Figure 6) lets you select the MCA you want to define. Select either Multiport II Ethernet from the "Network MCAs" list or Multiport II USB from the "USB MCAs" list.

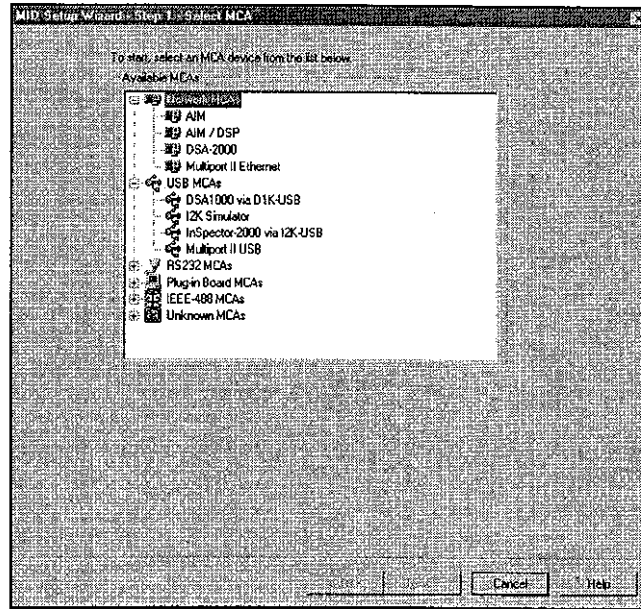


Figure 6 Selecting the MCA

Steps 2 and 3

The second screen (Figure 7) asks you to select the MCAs to include in the MID definition and enter the module's IP Address, Device Name, or Serial Number. The default Input Name for an MCA is MP2_MCA#, where # is the MCA number (1–6).

- For the Multiport II Ethernet, enter the Network (IP) Address or Device Name.
- For the Multiport II USB, enter the unit's serial number.

After selecting an MCA you can change the default Acquisition Mode, Input Name, Detector Type, and Input Size for that MCA.

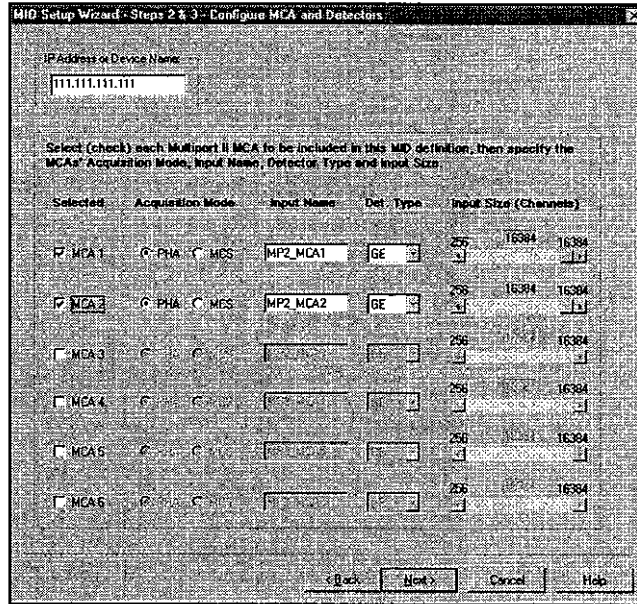


Figure 7 Specifying the MCA Board

Steps 4 through 6

You won't see the screens for Steps 4 through 6; these steps are not used when setting up a Multiport II.

Step 7

The Step 7 screen in Figure 8 displays a summary of the current MCA's configuration for review and lets you enter the name of the MID file that the configuration is to be saved to.

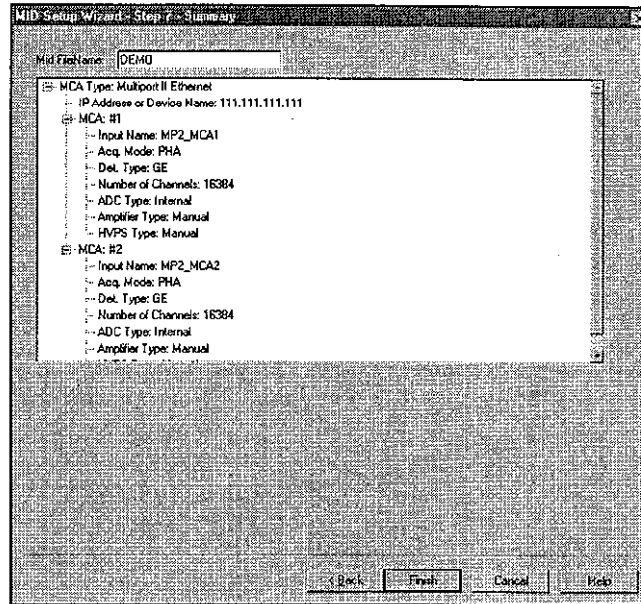


Figure 8 Naming the MID File

Ending the Definition

To complete your Input Definition, select **Finish**. The input that you just defined will be stored as an MID file named `inputname.MID` and automatically loaded into the Genie-2000's MCA Runtime Configuration Database (described in "Using MCA Definition Tables" in the *MCA Input Definition* chapter of the *Genie-2000 Operations Manual*).

The Step 7 Input Name defaults to `UNTITLED`, which you'll probably want to change to something more meaningful. If the name you enter is the same as that of an existing MID file, the system will ask if you want to overwrite the existing file.

When you select **Finish**, you will be asked if you would like to define another input. Answer **Yes** to define another MID file. Answer **No** to close the Wizard.

The MCA Input Definition Editor

For most situations, the MID Wizard is the best choice, but some situations will require the MCA Input Definition (MID) Editor, which allows you great flexibility in creating, editing and managing MCA definitions. You'll have to use the MID Editor only for one of these reasons:

- To select a sample changer for use with the Multiport II.

The MCA Input Definition Editor

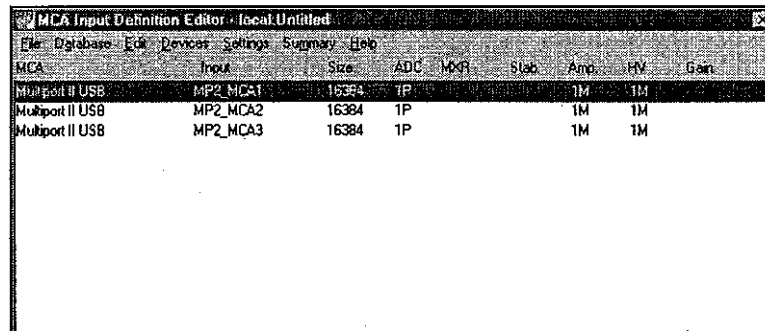
- To change input Settings such as detector type.
- To choose between PHA and MCS modes.
- To change the default ADC settings.

Note: You can not change the MCS Settings using the MID Editor.

The editing procedure is described in “Editing an MCA Definition” in the *MCA Input Definition* chapter of the *Genie-2000 Operations Manual*. That chapter also has detailed information on using the MID Editor.

Starting the MID Editor

Start the MID Editor by double clicking on its icon in the Genie 2000 Program Group. The MID Editor window in Figure 9 shows that three Multiport II MCAs have already been defined.



The screenshot shows a window titled "MCA Input Definition Editor - local.Unfiled". The window contains a table with the following columns: MCA, Input, Size, ADC, MCP, Stab, Amp, HV, and Gen. There are three rows of data:

MCA	Input	Size	ADC	MCP	Stab	Amp	HV	Gen
Multiport II USB	MP2_MCA1	16384	1P			1M	1M	
Multiport II USB	MP2_MCA2	16384	1P			1M	1M	
Multiport II USB	MP2_MCA3	16384	1P			1M	1M	

Figure 9 The MID Editor Window

Adding an MCA

To add an MCA, select the **Add MCA** command in the **Edit** menu (Figure 10). You'll see the "Add MCAs to Definition Table" Dialog Box (Figure 11).

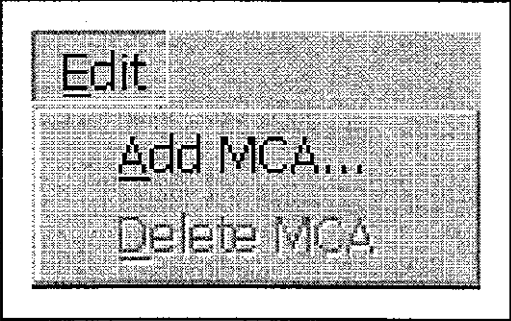


Figure 10 The Edit Menu

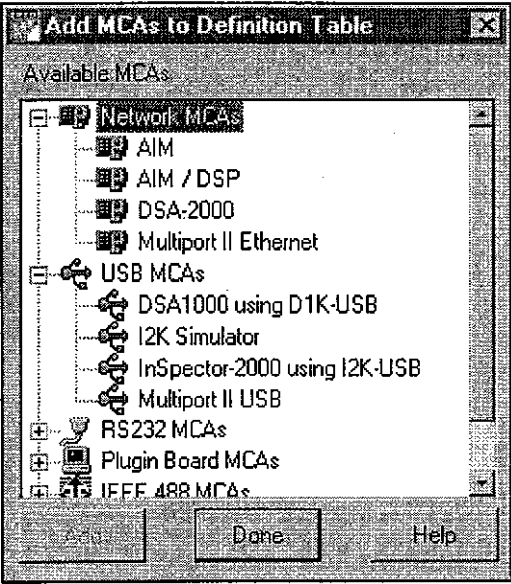


Figure 11 The Add MCA Dialog

This typical Add MCA tree view shows the MCAs grouped by MCA type. Clicking on the '+' next to a MCA type lets you choose a specific MCA.

You can add as many MCAs to the definition as are necessary for your system, highlight each MCA and then click the **Add** button to add them to the MCA Definition Table. When you've finished adding MCAs, click on the **Done** button.

Deleting an MCA

If you want to remove an MCA that you have added to the definition, you can do it easily by:

1. Selecting the table entry you want to delete.
2. Clicking on the **Delete MCA** command in the **Edit** menu to see the “Delete MCA” Dialog Box in Figure 12. Click on **OK** to remove the entry.

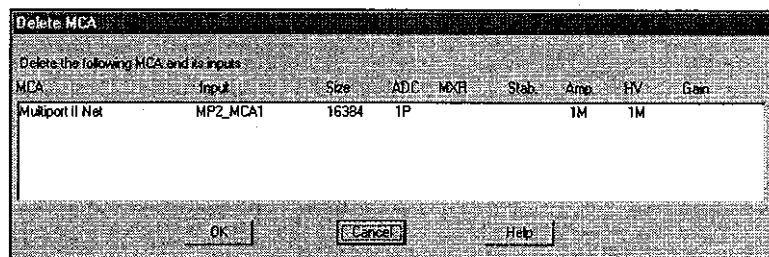


Figure 12 The Delete MCA Dialog

Defining an MCA

To define the MCA, click on the definition table entry for the MCA module. That selects it as the MCA to be operated upon.

Device Setup

Device setup covers setting the parameters for the system's hardware, starting with the MCA itself. Clicking on **Device** in the Menu bar shows the menu in Figure 13. There is a command in the menu for each of the hardware sections of the MCA. The disabled (grayed) commands do not apply to the MCA currently being set up.

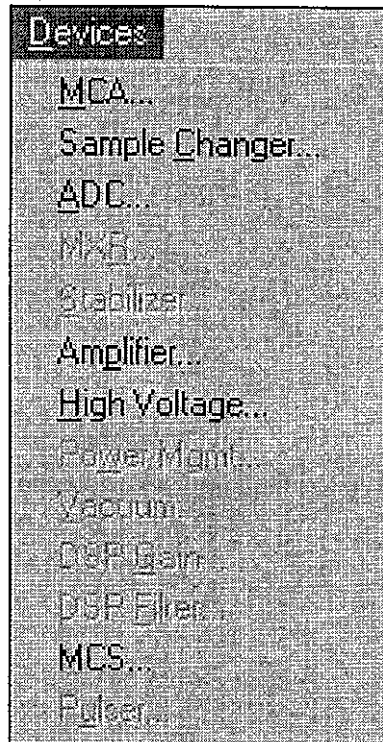


Figure 13 The Devices Menu

MCA

Selecting the **MCA** command in the **Devices** menu displays a dialog box which lets you set the IP address, Device Name, or Serial Number for the Multiport II and select the Acquisition Mode and MCA Number.

USB Interface

For the USB interface, the dialog box in Figure 14 appears.

- **Device Serial Number** is the 8-digit serial number
- **MCA Number** defines the MCA number for this MCA board.
- **Acquisition Mode** selects the MCA's input type.

Defining an MCA

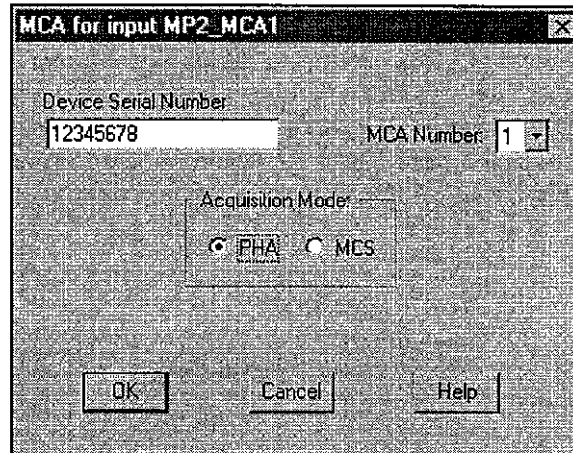


Figure 14 MCA Setting for USB Interface

Ethernet Interface

For the Ethernet interface, the dialog box in Figure 15 appears.

- **IP address** or **Device Name** specifies the network address or device name that will be used to communicate with the module. See Appendix E, *Configuring the Ethernet Option* for more details.
- **MCA Number** defines the MCA number for this MCA board.
- **Acquisition Mode** selects the MCA's input type.

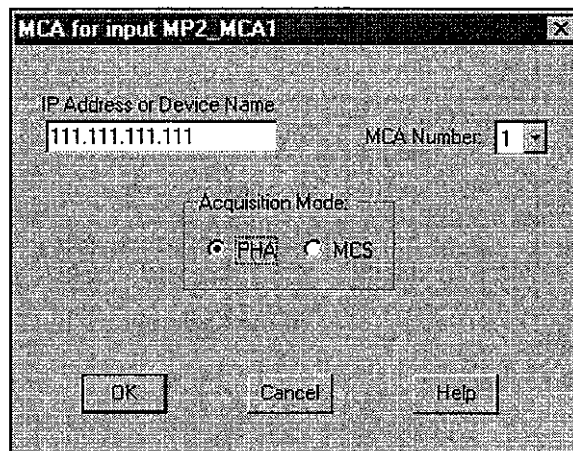


Figure 15 MCA Settings for Ethernet Interface

Sample Changer

The Sample Changer screen in Figure 16 lets you select either Internal or LPT Sample Changer interface, or no Sample Changer (none), which is the default setting. The LPT interface uses the computer's printer port to communicate with the sample changer. The Internal interface uses the Multiport II's I/O connector (XINPUT signal, pin 1 and XOUTPUT signal, pin 2) to communicate with the sample changer.

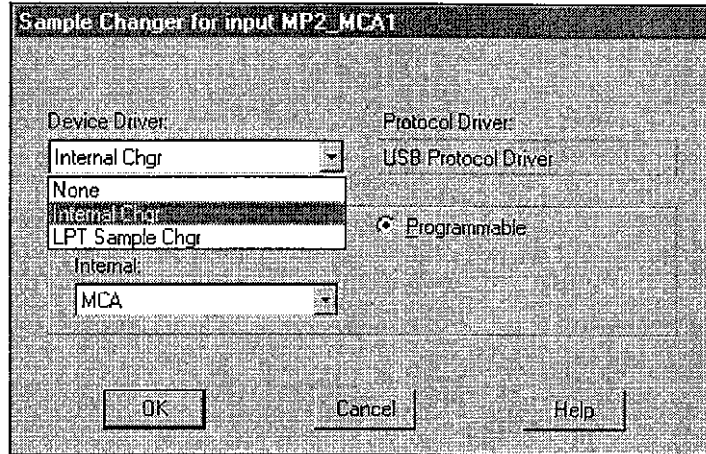


Figure 16 The Sample Changer Controls

Amplifier, High Voltage, and MCS

For the Multiport II, these components are already selected, so these screens are used for general information.

The Settings

The commands in the Settings menu set the MCA's operating parameters. Note that for many of the parameters, the initial values entered during Settings can be adjusted as necessary from within the Acquisition and Analysis application. The following descriptions of each parameter specify which controls can be changed from the MID Editor. Begin your Settings setup in the MID definition table by clicking on the MCA input that is to be set up. Once you've selected the input, the **Settings** menu, shown in Figure 17, is used to set its initial operating parameters.

Defining an MCA

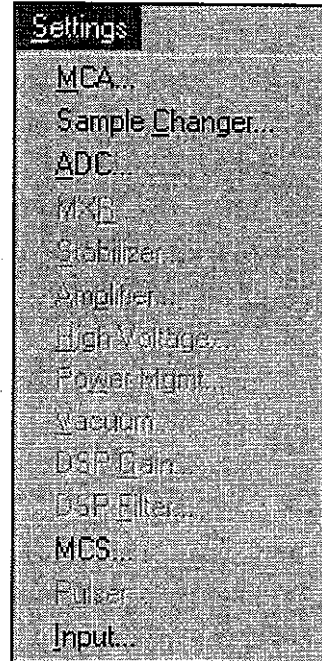


Figure 17 The Settings Menu

You'll notice that some commands are disabled here, since those functions are not available for a Multiport II.

MCA Settings

This device has no adjustable controls.

Sample Changer Settings

This device has no adjustable controls.

ADC Settings

The ADC command in the **Settings** menu uses the dialog box in Figure 18 to establish the initial control settings for the Multiport II.

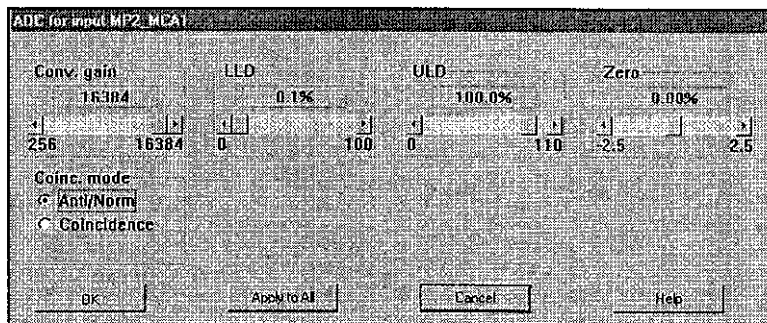


Figure 18 The ADC Setting Dialog

Since the ADC settings may need to change often in the course of daily work, they can be adjusted both here and in the Acquisition and Analysis application.

Conversion Gain

This Scroll Bar is used to set the **Conversion Gain** of the ADC. Clicking on the arrows at the ends of the Scroll Bar changes the gain by a factor of two.

LLD

The ADC's Lower Level Discriminator (**LLD**) can be set from 0.0% to 100.0% of the ADC's full scale input.

ULD

The ADC's Upper Level Discriminator (**ULD**) can be set from 0.0% to 110.0% of the ADC's full scale input.

The window between the LLD and ULD settings is used as a "filter" to limit the energy range to be considered by the ADC. Only signals within this window will be converted.

Zero

The **ADC Zero** can be set between -2.5% and +2.5% of full scale.

Coincidence Mode

The ADC's input gating is either **Coincidence** mode or **Anticoincidence** mode.

MCS Settings

This device has no adjustable controls.

Input Settings

The **Input** command is used to change the name of the Input and Input Size via the dialog box shown in Figure 19. These commands are not available in the Acquisition and Analysis application.

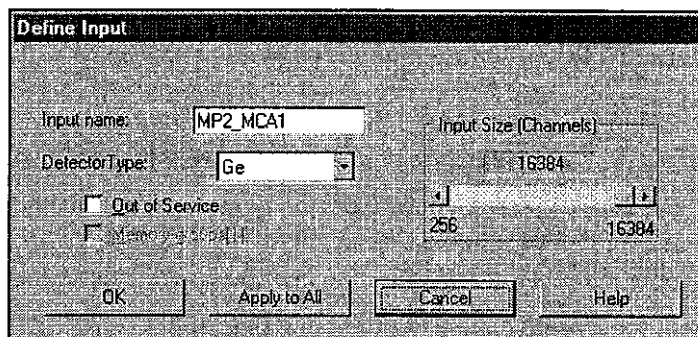


Figure 19 The Input Setting Dialog

Note: This window's initial focus is on the **Cancel** button; pressing the keyboard's ENTER key after making changes in this dialog box will cancel the changes. Be sure to click on the **OK** key to accept the changes.

Input Name

MP2_MCA# is the default input name where # is the MCA number. This can be changed to a more meaningful name up to eight characters.

Detector Type

Use this drop-down list to select the type of detector to be used with this MCA; this also assigns appropriate default values to the spectrum display and analysis parameters. Three choices are available: Ge, NaI, or Alpha. For additional information please refer to *Genie-2000 documentation*.

Input Size

This parameter defaults to 16K, the number of channels assigned during Device setup for the MCA, on the assumption that you'll be using "Full Memory" for your data acquisition. To use less than the maximum available memory size, use this control to select the size you want to use. For instance, for NaI spectra, you wouldn't want to use more than 1024 channels.

Out of Service

This check box allows you to place this Input temporarily "out of service". That is, it will remain as an entry in your MCA Definition File but will not be available for data acquisition. It is meant to be used when the MCA or its front end electronics are temporarily disconnected.

Memory Groups

Is always 1 memory group.

Saving and Loading the Input Definition

Having completed a definition, the next step is to save it in a disk file so it can be used in the future. From the **File** menu the command **Save As** saves the definition to a user defined MID file and the command **Save** saves the settings to an existing MID file.

After having saved the definition, the next step is to load it into the run-time database so that it can be used by the Genie2000 applications. Use the **Load To** command in the **Database** menu to load the definition.

Refer to the *MCA Input Definition* chapter of the *Genie 2000 Operations Manual* for additional information regarding saving and loading definition files, as well as editing existing files.

More Information on the MID Editor

You can find information on Changing the Editor's Summary View, Editing an MCA Definition and Using MCA Definition Tables in the *MCA Input Definition* chapter of the *Genie-2000 Operations Manual*.

Acquisition Window Adjust Dialogs

The MCA Adjust Screens, which are accessed from the Gamma Acquisition and Analysis application's Menu Bar, allow you to adjust the Multiport II's programmable controls.

As adjustments are made in the dialog box, the new values are sent to the Multiport II. To save the adjustments to the datasource's MID file, use the Gamma Acquisition and Analysis application's **File | Save** command so that the next time this datasource is selected, the proper setting will be loaded into the Multiport II.

Acquisition Window Adjust Dialogs

The **Next** and **Prev(ious)** buttons at the left side of the Adjust screen are used to move to the next (or previous) "page" of the controls when there are more control elements than will fit in the basic box.

To access the Adjust screens, a Multiport II datasource must have been opened. To open, select **File | Open Datasource**, then select "Detector" in the Type box. Next, select the datasource file and click on open.

Each of the following sections describes one of the Multiport II parameters that can be changed in the Gamma Acquisition and Analysis (GAA) application's Adjust dialog. To change a parameter, click on **MCA | Adjust** in the GAA application's Main Menu, then select the radio button for the parameter you want to change.

ADC

The ADC setting screen (Figure 20) for the Multiport II contains the following controls.

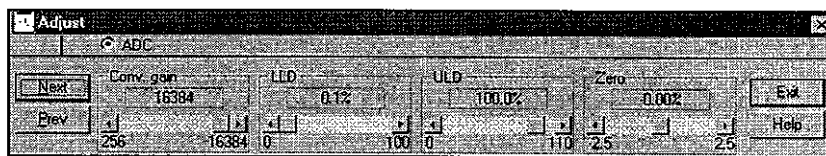


Figure 20 Adjust Screen's ADC Settings

Conv. Gain

Clicking either on the arrows at the ends of the Scroll Bar or in the area to either side of the Scroll Bar's "Slider" will change the gain by a factor of two over the control's range of 256 to 16 384 channels.

LLD

The ADC's Lower Level Discriminator (LLD) can be set as a percentage of the ADC's full scale input.

ULD

The ADC's Upper Level Discriminator (ULD) can be set as a percentage of the ADC's full scale input.

Zero

The ADC's Zero is factory set for each conversion gain, so that a Zero setting of 0% corresponds to zero intercept (zero energy input stores in channel 1, the first channel used for spectral data storage) for that conversion gain. The Zero control can be used to change the zero intercept to another channel.

Coinc. Mode

Sets the coincidence mode for the extended Gate signal, when external gating is used.

MCS Parameters

The MCS settings screen (Figure 21) for the Multiport II contains the following controls.

Note: The MCS Adjust Screen and the associated selection button are available only if MCS was selected as the Acquisition Mode when setting up the MCA controls in the **Devices | MCA** screen of the MID Editor. If MCS was not selected, the selection button and adjust screen are hidden from view.

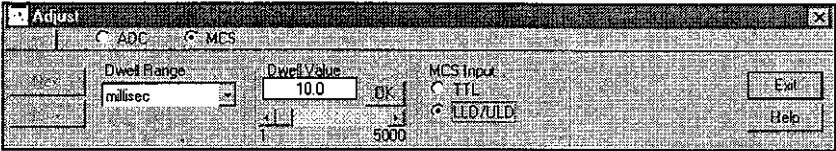


Figure 21 Adjust Screen's MCS Setting

Dwell Range

Choose seconds, milliseconds, microseconds, or external as the Range for the dwell time.

Dwell Value

Sets the dwell-time, within the selected Range.

MCS Input

Choose TTL or LLD/ULD as the MCS input.

Acquire Setup Screen

The Gamma Acquisition and Analysis application's Acquire Setup Screen (Figure 22) is described in detail in the *Genie-2000 Operations Manual*. However, the External Start and Stop options on this screen is of particular significance for Multiport II.

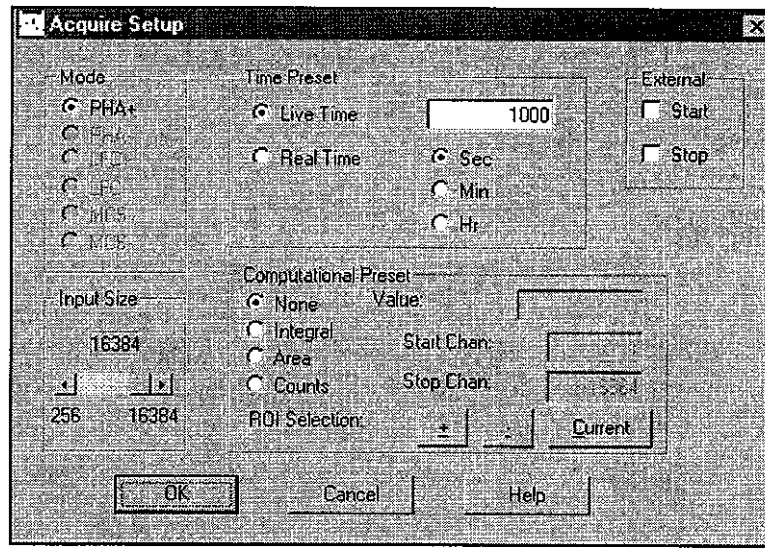


Figure 22 The Acquire Setup Screen

Checking External Start enables Multiport II's External Sync function for Acquire Start, which works in conjunction with the XINPUT or XMCSRESTART signal at the rear panel I/O port. In PHA mode, a positive TTL level enables data acquisition and the Real Time and Live Time clocks. In MCS mode, a positive TTL pulse starts/re-starts a sweep.

Checking External Start enables XINPUT (pin 1) in PHA mode and XMCSRESTART (pin 10) in MCS mode for external start. Note that XMCSRESTART is used to start acquire and to begin each subsequent sweep.

Checking External Stop enables XINPUT (pin 1) in both modes for external stop.

A. Specifications

ADC Inputs

ADC IN – Accepts positive unipolar or bipolar, positive lobe leading, pulses for PHA and MCS, LLD/ULD selected for Internal Pulse Source; amplitude 0 to +10 V or 0 to +5 V, switch selectable; rise time $>0.25 \mu\text{s}$; width $>0.5 \mu\text{s}$; $Z_{in} = 1.33 \text{ k}\Omega$ (10 V range) or $2 \text{ k}\Omega$ (5 V range); direct coupled; front and rear panel BNCs, one pair per MCA.

Logic Inputs

Rear panel mini-D I/O connectors for logic input and output signals, one per MCA.

XINPUT – External start/stop and sample changer ready input; active high, active low setting; $10 \text{ k}\Omega$ pull-up to +5 V; TTL pulse; pin 1 of the I/O connector.

XSUSPEND – Suspends pulse processing and preset counters; fixed active low; $10 \text{ k}\Omega$ pull-up to +5 V; TTL pulse; pin 3 of the I/O connector.

XDT – PUR dead time input; active high, active low setting; forced to inactive state by $1 \text{ k}\Omega$ pull-up to +5 V or pull-down to GND when no signal is present; TTL pulse; pin 5 of the I/O connector.

XMCSRESTART – MCS sweep advance input; active high, active low setting; edge triggered; $10 \text{ k}\Omega$ pull-up to +5 V; TTL pulse; pin 10 of the I/O connector.

XMCSADVANCE – External channel advance input; active high, active low setting; edge triggered; duration $\geq 10 \text{ ns}$; max. rate 1 MHz; $10 \text{ k}\Omega$ pull-up to +5 V; positive TTL pulse; pin 11 of the I/O connector.

XMCSPULSE – MCS input; active high, active low setting; edge triggered; duration $\geq 10 \text{ ns}$; rate $\leq 10 \text{ MHz}$; $10 \text{ k}\Omega$ pull-up to +5 V; positive TTL pulse; pin 12 of the I/O connector.

XCOINC – Coincidence/Anticoincidence input; active high, active low setting; edge triggered, level sensitive selection; forced to inactive state by $1 \text{ k}\Omega$ pull-up to +5 V or pull-down to GND when no signal is present; TTL pulse; pin 13 of the I/O connector.

XREJ – Pileup reject input; must occur during the ADC linear gate (LG) time active high, active low setting; forced to inactive state by $1 \text{ k}\Omega$ pull-up to +5 V or pull-down to GND when no signal is present; positive TTL pulse; pin 14 of the I/O connector.

Logic Outputs

Rear panel mini-D I/O connectors for logic input and output signals, one per MCA.

XOUTPUT – Advance sample changer output; active high, active low setting; 150 ms TTL pulse; pin 2 of the I/O connector.

XSCA – Single channel analyzer output; ≈ 250 ns TTL pulse generated for input pulses detected between LLD and ULD; active high; pin 4 of the I/O connector.

XLG – PUR linear gate output; active when ADC acquires an input pulse; active high, active low setting; TTL pulse; pin 6 of the I/O connector.

XCOLLECTSTATUS – External acquire status; active high, active low setting; TTL pulse; pin 9 of the I/O connector.

+5 V – Power output for external circuitry; 100 mA max. per connector; pin 7 of the I/O connector.

Rear Panel Control

RESET – Resets the CPU and communication; stops any acquisition in progress; spectra and MCA status stored in flash memory not affected; rear panel pushbutton.

Internal Controls

ADC INPUT RANGE – Sets the ADC input range to 0–10 V (default) or 0–5 V; slide switch on the MCA board.

POWER SUPPLY VOLTAGE – Selects either ± 12 V (default) or ± 6 V; slide switch on the main board.

Software Controls

ADC LLD – 0 to 100% of full scale (4096 steps).

ADC ULD – 0 to 110% of full scale (4096 steps).

ADC ZERO – $\pm 2.5\%$ of full scale (4096 steps).

ADC CONVERSION GAIN – 256, 512, 1024, 2048, 4096, 8192, 16 384.

REAL TIME PRESET – Maximum of ≈ 49.71 days.

LIVE TIME PRESET – Maximum of ≈ 49.71 days.

Indicators

MCA #*n* – ON when MCA board in slot #*n* is installed and power is ON; front panel green LED.

ACQUIRE – ON when the corresponding MCA is acquiring; front panel green LED.

RATE – Flashes for every input pulse processed in the corresponding MCA; front panel yellow LED.

COMM – ON when unit is ready for USB and/or Ethernet communication; flashes brighter when data transfer occurs; front panel yellow LED.

Communication

USB – Standard USB port; rear panel USB type-B connector.

ETHERNET – Optional Ethernet port; rear panel RJ-45 connector.

Performance

INTEGRAL NONLINEARITY – $< \pm 0.025\%$ of full scale over the top 99.5% of selected range.

DIFFERENTIAL NONLINEARITY – $< \pm 0.9\%$ of full scale over the top 99.5% of range including effects from differential nonlinearity.

GAIN DRIFT – $< \pm 0.005\%$ of full scale/ $^{\circ}\text{C}$.

ZERO DRIFT – $< \pm 0.005\%$ of full scale/ $^{\circ}\text{C}$.

LONG TERM DRIFT – $< \pm 0.005\%$ of full scale/24 h at a constant temperature.

Power

PEAK SHIFT – $< \pm 0.025\%$ of full scale at rates up to 100 kHz.

ADC DEAD TIME – Linear gate time +1.2 μ s.

CHANNEL PROFILE – Typically flat over 90% of channel width.

MCS –

INPUT RATE – Up to 10 MHz.

DWELL TIME – Software selectable from 1 μ s to ≈ 71 min, with varying resolution in increments of 1 μ s.

SWEEP SELECTION – Software selectable preset sweeps from 1 to $2^{32}-1$.

DEAD TIME – Between channels: 0. Between sweeps: 0 for internal sweep restart, 0–40 ns for external sweep restart.

NUMBER OF CHANNELS – 16 384.

COUNTS/CHANNEL – $2^{32}-1$.

Power

Depends on the setting of the internal control for Power Supply Voltage (± 12 V or ± 6 V):

± 12 V Power Supply –

One MCA board:

+12 V – 250 mA -12 V – 50 mA

Each additional MCA board:

+12 V – 90 mA -12 V – 50 mA

± 6 V Power Supply –

One MCA board:

+6 V – 475 mA -6 V – 50 mA

Each additional MCA board:

+6 V – 150 mA -6 V – 50 mA

Physical

SIZE – Standard double width NIM module 6.86 x 22.12 cm (2.70 x 8.71 in.) per DOE/ER-0457T.

NET WEIGHT – 1.36 kg (3.0 lb) with one MCA/ADC board.

Environmental

OPERATING TEMPERATURE – 0–45 °C.

OPERATING HUMIDITY – 0–80% relative, non-condensing.

Meets the environmental conditions specified by EN 61010, Installation Category I, Pollution Degree 2.

System Requirements

A PC-based system with a USB port. Ethernet version also requires Ethernet connection.

Model S500 Genie 2000 Basic Spectroscopy Software, V2.1a or later.

Ordering Information

MP2-*n*U – Multiport II USB module with *n* inputs, where *n* is 1 to 6; not field upgradable to the Ethernet module; includes one 3 m (10 ft) shielded USB cable.

MP2-*n*E – Multiport II Ethernet/USB module with *n* inputs, where *n* is 1 to 6; includes one 3 m (10 ft) shielded USB cable.

MPT2-MCA – One additional Multiport II MCA/ADC board.

C1801 – Multiport II PUR/LTC Cable (included with each MCA/ADC board).

Ordering Information

C1802 -- Multiport II PUR/LTC Start/Stop and Sample Changer Cable.

C1804 -- Multiport II PUR/LTC and MCS Start/Stop Cable.

B. Cables and Connectors

I/O Connector

<u>Pin</u>	<u>Signal</u>	<u>Description</u>
1	XINPUT	TTL Input. Can be used for External Start, External Stop, or to Monitor for Sample Changer Ready.
2	XOUTPUT	TTL Output. Software Settable. Can be used to Advance Sample Changer.
3	XSUSPEND	TTL Input. Suspends pulse processing and preset counters.
4	XSCA	Single Channel Analyzer Output.
5	XDT	TTL Input. PUR Dead Time Signal. Hardware will force to its inactive state when no signal is hooked up.
6	XLG	TTL Output. PUR Linear Gate Signal.
7	+5 V	Fused 5 V output, 100 mA max.
8	GND	
9	XCOLLECTSTATUS	TTL Output. Active while collecting.
10	XMCSRESTART	TTL Input. Used during MCS Multisweep collections to synchronize the start of each sweep with an external event.
11	XMCSADV	TTL Input. Used for MCS External Channel Advance instead of Dwell Counter.
12	XMCSPULSE	TTL Input. If enabled, provides Pulses for MCS collection.
13	XCOINC	Coincidence Input. Edge Triggered, Level Sensitive Setting. Anticoincidence, Coincidence Setting. Hardware will force to its active state when no signal is hooked up
14	XREJ	TTL Input. PUR Reject. Hardware will force to its inactive state when no signal is hooked up.

C1801 PUR/LTC Cable

PUR/LTC Cable		Multiport II I/O Connector	
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	LG	6	XLG
2	REJ	14	XREJ
3	GND	8	GND
BNC	DT	5	XDT

C1802 PUR/LTC Start/Stop and Sample Changer Cable

PUR/LTC Start/Stop and Sample Changer Cable		Multiport II I/O Connector	
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	LG	6	XLG
2	REJ	14	XREJ
3	GND	8	GND
BNC	DT	5	XDT
BNC	STA/STO	1	XINPUT
BNC	RDY	2	XOUTPUT

C1804 PUR/LTC – MCS Start/Stop Cable

MCS Start/Stop Cable		Multiport II I/O Connector	
<u>Pin</u>	<u>Signal</u>	<u>Pin</u>	<u>Signal</u>
1	LG	6	XLG
2	REJ	14	XREJ
3	GND	8	GND
BNC	DT	5	XDT
BNC	TRG/STA	10	XMCSRESTART
BNC	ADV	11	XMCSADV
BNC	MCS IN	12	XMCSPULSE
BNC	STA/STO	1	XINPUT

Communication Connectors

The Multiport II supports two serial computer interface systems; high speed USB 1.1 and Ethernet.

USB Connector

The Multiport II, which is capable of operating with any USB transceiver, uses this type-B connector for electrical interface to the USB transceiver cable. Refer to Figure 2 on page 4.

<u>Pin</u>	<u>Signal</u>	<u>Description</u>
1	+5V	Power input.
2	+D	Differential data line.
3	-D	Differential data line.
4	GND	USB ground and power return.

Ethernet Connector

The Multiport II, which is capable of operating with any IEEE 802.3-compliant Ethernet transceiver, uses this RJ45 connector for electrical interface to the Ethernet transceiver cable. Refer to Figure 2 on page 4.

<u>Pin</u>	<u>Signal</u>	<u>Description</u>
1	TD+	Transmitted data to terminal.
2	TD-	Transmitted data to terminal.
3	RD+	Received data from terminal.
4	NC	No connection.
5	NC	No connection.
6	RD-	Received data from terminal.
7	NC	No connection.
8	NC	No connection.

C. Registry Variables

The Multiport II Parameters shown below cannot be modified directly within the Genie Applications (e.g. GAA) using adjust controls. However, the predetermined parameter values will be stored in the system registry and used to set the Multiport II hardware accordingly. These parameters define hardware settings which are typically not modified in most Genie customer applications. However, those customers who do need to modify these settings may change the values stored in the registry before starting the Genie Application. These parameters will be stored in registry key: "HKEY_LOCAL_MACHINE\SOFTWARE\Canberra Industries, Inc.\GENIE-2000 Environment\Multiport II".

Most of the parameters specify the "active" state of a particular input/output signal. Also specified is the state which the hardware internally pulls the signal when no external signal is applied. In some cases the hardware pulls the signal High (+5), in which case the default value of Active Low (0 V) should be maintained when no signal is applied. In other cases the hardware always pulls to the Inactive state as defined by the polarity setting.

The [default] specification defines this setting as the default value, which is the value set in the registry when Genie is installed (i.e. the value unmodified by a customer).

Pin	Signal	Description	Registry Settings
1	XINPUT	Polarity of External Input - External Start, Stop, or Sample Changer Ready. Pulled High (+5V) internally.	XinputPolarity: 0 = Active Low (0V) 1 = Active High (5V) [default]
2	XOUTPUT	Polarity of Programmable Output - Sample Changer Advance signal.	XOutputPolarity: 0 = Active Low (0V) [default] 1 = Active High (5V)
3	XSUSPEND (in)	External Suspend. Pulled High (+5) internally.	Not programmable. Fixed Active Low.
4	XSCA (out)	Single Channel Analyzer output.	Not programmable. Fixed Active High.
5	XDT (in)	Polarity of PUR Dead Time Correction signal. Pulled Inactive internally.	XAdcExtrnlDeadTPolarity: 0 = Active Low (0V) [default] 1 = Active High (5V)
6	XLG (out)	Polarity of PUR Linear Gate Signal.	XAdcExtrnlLGatePolarity 0 = Active Low (0V) [default] 1 = Active High (5V)
9	XCOLLECTSTATUS (out)	Polarity of Collection Status.	XAdcExtrnlLGatePolarity: 0 = Active Low (0V while collecting) [default] 1 = Active High (5V while collecting)

Pin	Signal	Description	Registry Settings
10	XMCSRESTART (in)	Polarity of MCS external restart signal. Sets which edge to start next sweep on (rising or falling). Pulled High (+5V) internally.	XMcsRestartPolarity: 0 = Active Low/Falling (0V) [default] 1 = Active High/Rising (5V)
11	XMCSADV (in)	Polarity of MCS External Dwell signal. Sets which edge to advance channel on (rising or falling). Pulled High (+5V) internally.	XMcsExtrnlAdvncPolarity: Active Low/Falling (0V) [default] Active High/Rising (5V)
12	XMCS PULSE (in)	Polarity of MCS external pulse source. Sets which edge to count on (rising or falling). Pulled High (+5V) internally.	XMcsExtrnlPulsePolarity: 0 = Active Low/Falling (0V) [default] 1 = Active High/Rising (5V)
13	XCOINC (in)	Coincidence signal Polarity. Pulled In-active internally.	XAdcCoincidencePolarity: 0 = Coincidence when 0V or falling edge 1 = Coincidence when 5V or rising [default]
		Coincidence Trigger	XAdcCoincidenceTrigger: 0 = Level Sensitive Coincidence [default] 1 = Edge Triggered Coincidence
14	XREJ (in)	Polarity of PUR Reject signal. Pulled In-active internally.	XAdcExtrnlRejctPolarity: 0 = Active Low (0V) 1 = Active High (5V) [default]

Multiport II Parameter	Description	Registry Settings
SaveStateInterval	Interval in minutes to save current state of MP2 (counters, spectrum, settings) to flash.	1 - 60 minutes [default = 15]
AdcAboveUldPulse	Setting for handling pulses above ULD.	0 = Reject pulses above ULD [default] 1 = Add pulses into last channel

D. Software Installation

If your system wasn't integrated by Canberra please follow the instructions on the Genie-2000 installation CD to install the Genie-2000 software and purchased options.

Note: The Multiport II is supported under the following operating systems: Windows 98, Windows Me, Windows NT® V4.0 (Ethernet only), Windows 2000, or Windows XP.

USB Driver Installation

The USB driver must be installed for both Multiport II USB module and the Multiport II Ethernet/USB model, since the USB connection is required to configure the Multiport II's Ethernet port. This cannot be performed on Windows NT systems due to lack of USB support. The Multiport II must be configured on a system that supports USB.

If this has not already been done please follow the directions below for setting up the USB driver.

1. Connect the Multiport II to the host computer using the USB port and using the supplied USB cable. Please reference "Connecting the USB Cable" on page 9.
2. Turn the Multiport II power to ON.
3. Windows 98/Me/2000/XP will automatically prompt you for the USB driver diskette as part of its plug and play device architecture. There is no need to re-boot your system.
4. Follow the steps in the "Add New Hardware" Wizard to add your new USB driver. Use the default steps by clicking "Next".
5. Choose "Search for the best driver for your device" by clicking the Next button (default).
6. Click on the check box for "specify a location". The USB driver files, Mport2.inf and Mport2.sys, are located in the "CIUSB" folder on the installation CD or disk (disk #2).

Note: Window XP will display a warning message indicating the Multiport II driver is not signed. Acknowledge this menu and continue.

USB Driver Installation

7. Click Next and Finish to complete the steps to install the USB driver. It is not necessary to reboot.

Note: These steps are only required once, i.e. when Windows detects that new hardware has been added to your system or if the drivers are missing or need to be re-installed.

E. Configuring the Ethernet Option

The Multiport II is configured at the factory for USB communications only. If you have a Model MP2-*nE* with Ethernet/USB capability, you must configure its Ethernet option before trying to communicate with your host computer via the Ethernet. The Utility `Multiport_II_Ethernet_Configuration.exe` is installed into the “...Genie2k\Exefiles” directory. Run this utility to configure the Multiport II for Ethernet communication.

The `Multiport_II_Ethernet_Configuration.exe` utility mainly assigns an IP Address or Network ID to the module, to allow it to communicate over Ethernet using TCP/IP. You can assign a Device Name (for systems using DHCP) or IP Address.

Note: USB communication with the Multiport II module is required to run the Ethernet Configuration Utility. Therefore, install the USB driver before running the configuration utility. Refer to Appendix D, *Software Installation*, for details.

The utility searches for any connected Multiport II modules (via USB) and lists the modules' serial numbers (see Figure 23). It also determines whether or not each module is a model Multiport II Ethernet, with Ethernet support. If not then the module is listed as “USB only”.

IP Address, Device name and Subnet Mask are validated according to standard rules, and appropriate error messages are displayed.

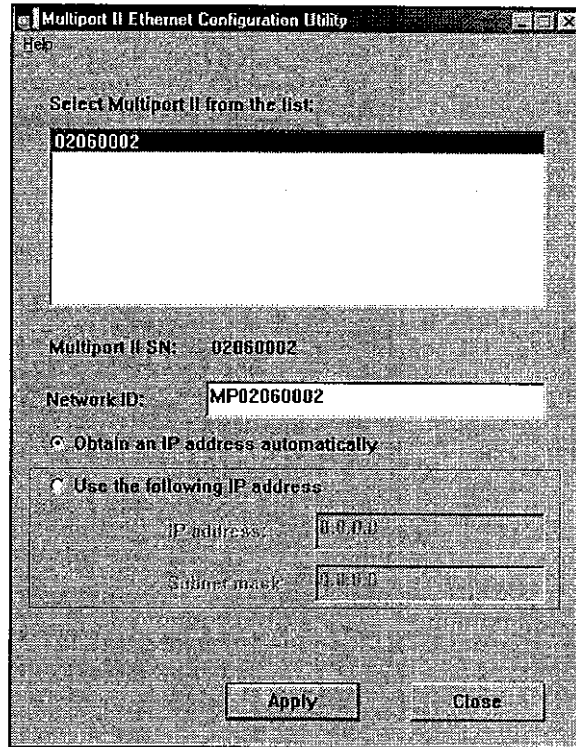


Figure 23 Ethernet Configuration Utility

Click **Apply** to send settings to the selected Multiport II module. After the Multiport II module receives these settings, it will begin a (10 - 30 second) reset procedure to implement the settings. During this time its USB connection will be disconnected (internally), "Applying Settings..." will be shown (see Figure 24) and the COMM light on the front panel will be off. If the USB cable is *manually* disconnected during this time then "Applying Settings" is displayed until the cable is reconnected.

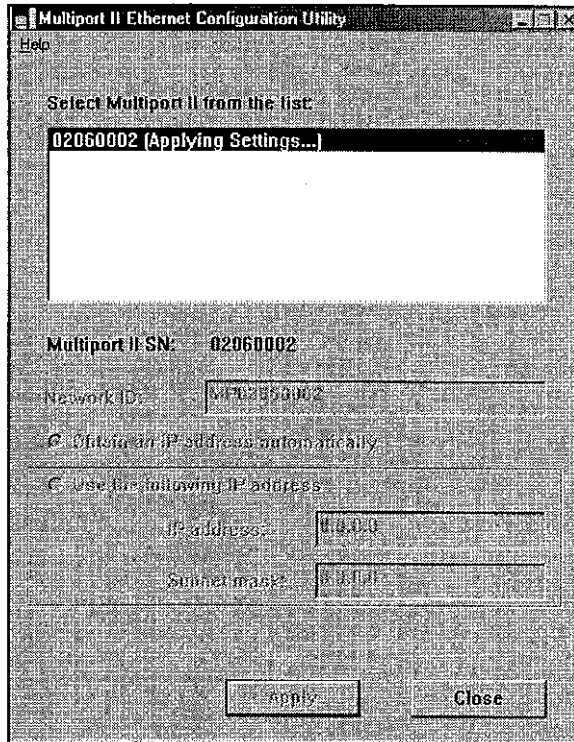


Figure 24 Applying the Ethernet Configuration Settings

Note that the Utility may be shut down immediately after “Applying Settings...” is displayed and before the reset procedure is complete. This will not affect the procedure.

F. Installation Considerations

This unit complies with all applicable European Union requirements.

Compliance testing was performed with application configurations commonly used for this module; i.e. a CE compliant NIM Bin and Power Supply with additional CE compliant application-specific NIM were racked in a floor cabinet to support the module under test.

During the design and assembly of the module, reasonable precautions were taken by the manufacturer to minimize the effects of RFI and EMC on the system. However, care should be taken to maintain full compliance. These considerations include:

- A rack or tabletop enclosure fully closed on all sides with rear door access
- Single point external cable access
- Blank panels to cover open front panel Bin area
- Compliant grounding and safety precautions for any internal power distribution
- The use of CE compliant accessories such as fans, UPS, etc.

Any repairs or maintenance should be performed by a qualified Canberra service representative. Failure to use exact replacement components, or failure to reassemble the unit as delivered, may affect the unit's compliance with the specified EU requirements.

G. Preventive Maintenance

Preventive maintenance is not required for this unit.

When needed, the front panel of the unit may be cleaned. Remove power from the unit before cleaning. Use only a soft cloth dampened with warm water and make sure the unit is fully dry before restoring power. Because of access holes in the NIM wrap, DO NOT use any liquids to clean the wrap, side or rear panels.

Request for Schematics

Schematics for this unit are available directly from Canberra. Write, call or FAX:

Training and Technical Services Department
Canberra Industries
800 Research Parkway, Meriden, CT 06450
Telephone: (800) 255-6370 or (203) 639-2467
FAX: (203) 235-1347

If you would like a set of schematics for this unit, please provide us with the following information.

Your Name _____

Your Address _____

Unit's model number MP2-14

Unit's serial number 11035672 / DN 3024296

Note: Schematics are provided for information only; if you service or repair or try to service or repair this unit without Canberra's written permission you may void your warranty.



Warranty

Canberra (we, us, our) warrants to the customer (you, your) that for a period of ninety (90) days from the date of shipment, software provided by us in connection with equipment manufactured by us shall operate in accordance with applicable specifications when used with equipment manufactured by us and that the media on which the software is provided shall be free from defects. We also warrant that (A) equipment manufactured by us shall be free from defects in materials and workmanship for a period of one (1) year from the date of shipment of such equipment, and (B) services performed by us in connection with such equipment, such as site supervision and installation services relating to the equipment, shall be free from defects for a period of one (1) year from the date of performance of such services.

If defects in materials or workmanship are discovered within the applicable warranty period as set forth above, we shall, at our option and cost, (A) in the case of defective software or equipment, either repair or replace the software or equipment, or (B) in the case of defective services, reperform such services.

LIMITATIONS

EXCEPT AS SET FORTH HEREIN, NO OTHER WARRANTIES OR REMEDIES, WHETHER STATUTORY, WRITTEN, ORAL, EXPRESSED, IMPLIED (INCLUDING WITHOUT LIMITATION, THE WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE) OR OTHERWISE, SHALL APPLY. IN NO EVENT SHALL CANBERRA HAVE ANY LIABILITY FOR ANY SPECIAL, EXEMPLARY, PUNITIVE, INDIRECT OR CONSEQUENTIAL LOSSES OR DAMAGES OF ANY NATURE WHATSOEVER, WHETHER AS A RESULT OF BREACH OF CONTRACT, TORT LIABILITY (INCLUDING NEGLIGENCE), STRICT LIABILITY OR OTHERWISE. REPAIR OR REPLACEMENT OF THE SOFTWARE OR EQUIPMENT DURING THE APPLICABLE WARRANTY PERIOD AT CANBERRA'S COST, OR, IN THE CASE OF DEFECTIVE SERVICES, REPERFORMANCE AT CANBERRA'S COST, IS YOUR SOLE AND EXCLUSIVE REMEDY UNDER THIS WARRANTY.

EXCLUSIONS

Our warranty does not cover damage to equipment which has been altered or modified without our written permission or damage which has been caused by abuse, misuse, accident, neglect or unusual physical or electrical stress, as determined by our Service Personnel.

We are under no obligation to provide warranty service if adjustment or repair is required because of damage caused by other than ordinary use or if the equipment is serviced or repaired, or if an attempt is made to service or repair the equipment, by other than our Service Personnel without our prior approval.

Our warranty does not cover detector damage due to neutrons or heavy charged particles. Failure of beryllium, carbon composite, or polymer windows, or of windowless detectors caused by physical or chemical damage from the environment is not covered by warranty.

We are not responsible for damage sustained in transit. You should examine shipments upon receipt for evidence of damage caused in transit. If damage is found, notify us and the carrier immediately. Keep all packages, materials and documents, including the freight bill, invoice and packing list.

Software License

When purchasing our software, you have purchased a license to use the software, not the software itself. Because title to the software remains with us, you may not sell, distribute or otherwise transfer the software. This license allows you to use the software on only one computer at a time. You must get our written permission for any exception to this limited license.

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