Quantum™ MCA2500R

SYSTEM MANUAL

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TRADEMARK ACKNOWLEDGMENTS

IMPORTANT!! PLEASE READ CAREFULLY

NOTIFICATION OF COPYRIGHT

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LIMITED WARRANTY / LIMITATION OF REMEDIES

GENERAL

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SERVICE AND SUPPORT

You may contact PGT at any time for support issues. We can be reached by phone at 609-924-7310 or by FAX at 609-924-1729. We will be happy to discuss both technical and application problems with you.

1. Setting Up The System

The Quantum™ MCA2500R is a remote-controlled NaI(Tl) spectroscopy system. This manual contains only minimal safety and setup information. The detailed operation of the system is described in the manual for the system of which it is a part.

NOTE: If you are using an existing detector and tube base or any other system not supplied by PGT, please heed the instructions and warning with regard to connecting tube base on the next page.

1.1 Getting Acquainted
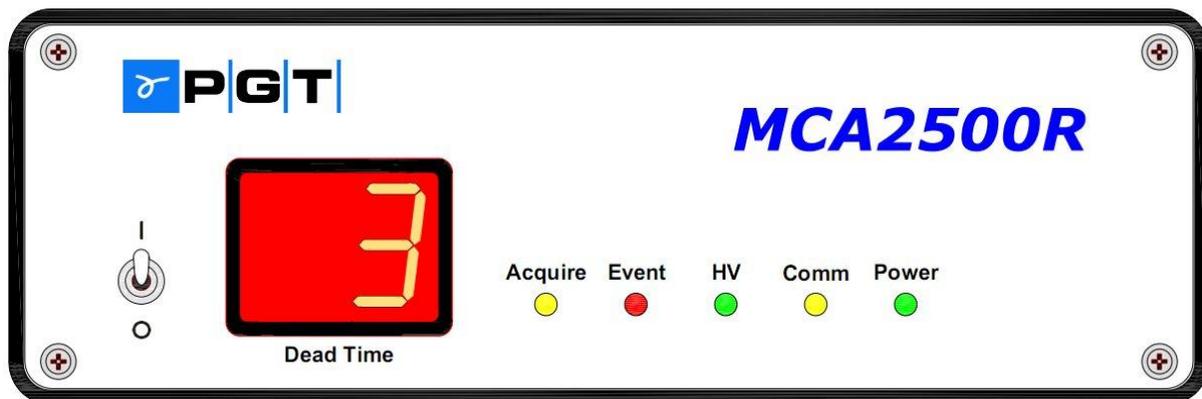
The green **Power** LED will be lit any time power is on. Toggle the front panel **Power** switch to the up position to apply power.

The yellow **Acquire** LED will light when the system is put into acquire mode.

The yellow **Comm** LED flashes each time serial or Ethernet communication has taken place between the PC and the MCA2500R. The flashing rate increases during acquisition.

The **Event** LED will flash during acquisition each time a pulse is detected. Its brightness is therefore proportional to the pulse rate. The color changes from green to yellow to red as the count rate increases.

The green **HV** LED indicates that the High Voltage Bias is on.

The **Dead Time** display gives an indication of dead time.
If the dead time goes over 80%, do not operate the instrument in this condition for a prolonged period.

1.2 Rear Panel Connections

All MCA2500R connections are located on the rear panel:
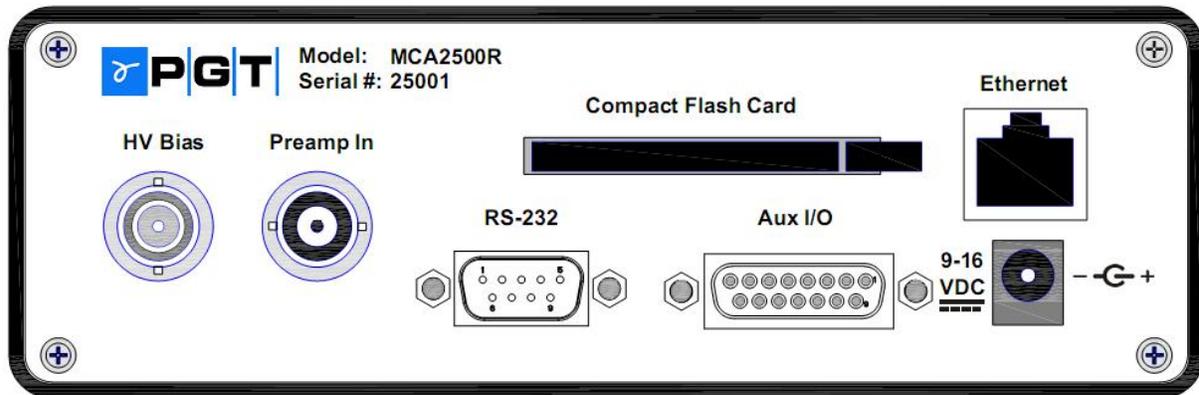
9 to 16 VDC power is connected to the system through the power connector on the lower right corner. A 12VDC 20W power supply with a universal AC input (90-264VAC @ 47-63Hz) is included allowing the system to operate on virtually any AC voltage found worldwide. The on/off switch is located on the front panel. The unit is internally protected with a resettable fuse.

Note that the **HV Bias** and **Preamp In** connectors are shown for a standard system and may vary for different model options.
Bias High Voltage is provided via a SHV connector on the rear panel. The Bias supply of the MCA2500R can provide +200 to +1200 volts at up to 1250 µA. Tube bases with less than 2.7 megaohms total resistance should not be used with the unit. Tube bases with built in preamplifiers should also not be used with the unit.

Warning!

When energized, there may be up to 1200 volts on the center pin of the bias voltage connector. Detector bias high voltage is provided via a SHV connector on the rear panel. It is marked "HV BIAS."

Do not attempt to connect or disconnect the detector while the power switch is on.

Doing so may damage the detector or the system, and with some detectors could present hazardous voltages at the connections.

The signal from the tube base anode should be connected to the isolated BNC labeled **PREAMP IN**. For the NaI detectors sold by PGT, the connector on the back of the detector is labeled **SIGNAL**.

An **RS-232 serial** connector (DB-9) is provided for system setup and an **RJ-45 Ethernet** jack is provided for communication during normal system operation. A maximum of 8 units can be connected to the PC.

An **Aux I/O** connector is provided for miscellaneous input / output signals and a **Compact Flash Card** slot is provided for a Compact Flash Card containing the unit's operating system firmware.

Warning!

Never insert or remove the Compact Flash Card while the unit power is on.
Doing so may corrupt the contents making the system inoperable.

1.2.1 RS-232C Communications

Note: RS-232 communications is used for system setup only and is not intended for data collection. After setup, the use of Ethernet communication is recommended.

The MCA2500 communicates at baud rates 19,200 and 115,200 only (**Units are shipped set to 115200**).

The pin out of the **RS-232** connector is shown to the right. To make connection to a standard PC COM port a serial "null modem" cable is required. The correct cable is included with the MCA2500R. The MCA2500R may be connected to any serial port of the host computer, provided that this serial port is accessible from Microsoft Windows. Simply align the connector on one end of the cable with the 9-pin serial connector on the MCA2500R, and press to insert. Repeat with the connector on the host computer. The baud rate and port configuration of your computer will be set by the application software. The **HWSSUPER.EXE** program will automatically detect the MCA2500R once the appropriate COM port, instrument setting, and baud rate have been selected.

```
MCA2500R RS-232 Connections

No Connection              1
Receive Data       RX      2
Transmit Data      TX      3
No Connection              4
Ground             GND     5
No Connection              6
Request to Send    RTS     7
Clear to Send      CTS     8
No Connection              9
```

1.2.2 Ethernet Communications

The MCA2500R is intended to be connected to a remote computer running one of PGT's Quantum™ MCA software packages. **Quantum MCA** is a full-function MCA emulator which provides tools for qualitative analysis. **Quantum Gold** adds full function quantitative analysis for nuclear spectroscopy.

Ethernet is provided as the main form of communications which permits multiple units to be connected to the PC. The 10/100 base-T Ethernet is connected via the RJ-45 jack (right) on the rear panel. The pin out for this connector is shown in the following table. Use the crossover Ethernet cable provided to connect the MCA2500R directly to a PC, or a straight through cable to connect to a network hub or switch.

```
RJ-45 Connections

TD+                1
TD-                2
RD+                3
No Connection      4
No Connection      5
RD-                6
No Connection      7
No Connection      8
```

To use the **Ethernet** connection, first check for the presence of **NETSETUP.EXE** in the **Quantum** folder. Establish communications with the MCA2500R via **RS-232**. Use the **HWSSUPER.EXE** hardware search program set for **115200** (factory default).

Then continue as follows on the next page.

Quit all Quantum-related software. Then run **NETSETUP.EXE**. In the panel, click on the **IP Address** tab. You must see the system device ID in the lower left; this verifies that the program is talking to the MCA2500R. Enter the static **IP address** and **Subnet Mask** suitable for your system. PGT uses **IP Address 10.0.0.2** and **Subnet Mask 255.255.0.0** as defaults. With this configuration, the PC **IP Address** must be set to a corresponding address such as **10.0.0.1**. Consult with your system administrator if you have any concerns about using these default settings.

After the setting has been sent to the MCA2500R, the MCA must be **turned off and then back on** for the new IP Address setting to be used.

Finally, use the hardware search program to find the MCA2500R using **Ethernet** instead of RS-232.

Note: If the MCA2500R and PC are on a local area network, you must use a straight through Ethernet cable (not supplied) plugged into an Ethernet management device such as a hub or switch. The MCA2500R IP Address, Subnet Mask and Gateway address will have to be set to match your network.

Click on **Ethernet** at the top of the **Hardware Search** dialog and then on **ANS Ethernet** (right). You must then enter the **IP address** of the device.

Once you have checked all of the devices you wish to scan, click **Update**. The program will interrogate the ports and locate any MCA devices.

Each device located will be listed in the scrolling report window. PGT devices report model, firmware version and serial number of the device. Other devices may only provide a subset of this information.

When the search is complete, exit (**Close**) the program.
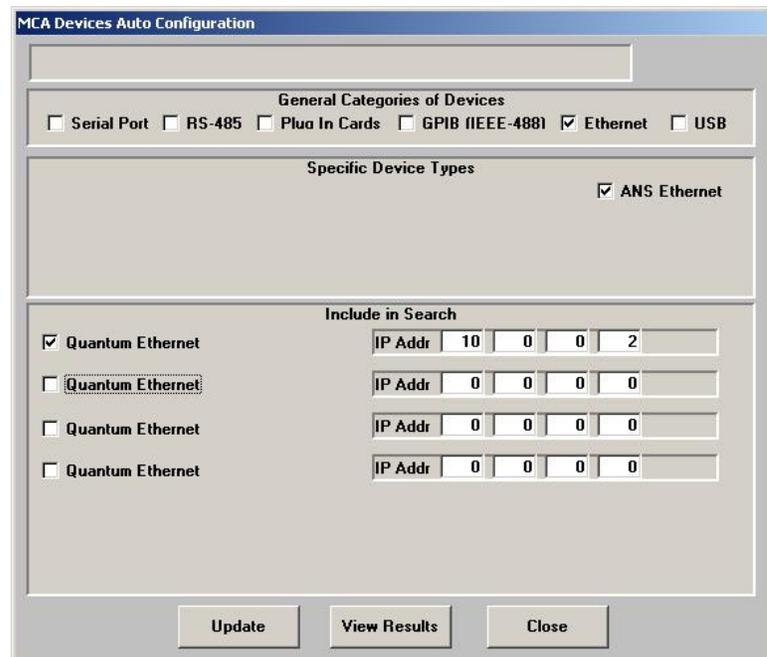
1.2.3 Auxiliary Input/Output

An auxiliary I/O connector is provided for various input/output functions. The pin out for the 15-pin female D connector is shown at the right. The specifications are:

Aux I/O Connections	
V5.0PIO	1
ILOOP+(Reserved)	2
GATE	3
XICR	4
GND	5
VPWR	6
RELAY NC	7
RELAY NO	8
SCA OUT	9
ILOOP(GND)(Reserved)	10
AMPOUT	11
NO CONNECTION	12
ALARM OC1	13
ALARM OC2	14
RELAY COMMON	15

External Power

Pin 1   V5.0PIO: Output +5VDC @ 1A (max) for external use

Pin 6   VPWR: Raw Power Output – +12VDC 1A (max)

Pin 5   GND: Ground

4-20mA Current Loop

Pin 2   ILOOP+: 4-20mA current loop (not implemented in software)

Pin 10   GND for current loop

Logic Signal Inputs (Use pin 5 for GND)

Pin 3   GATE IN: TTL signal input with computer-selectable positive or negative polarity for coincidence or anticoincidence mode.

Pin 4   XICR IN: External Count Input (TTL)

Signal Outputs (Use pin 5 for GND)

Pin 9   SCA OUT: TTL Signal 1uSec Pulse per Processed Event

Pin 11   AMPOUT: Synthesized filter output 0-5V (1Kohm load)

Open Collector Alarm Outputs (Use pin 5 for GND)

Pin 13   ALARM OC1: Open collector alarm output (12VDC @ 500mA max.)

Pin 14   ALARM OC2: Open collector alarm output (12VDC @ 500mA max.)

Isolated Alarm Relay Contacts

Pin 7   RELAY NC: Isolated alarm relay contacts

Pin 8   RELAY NO: 250VAC @ 5A Max.

Pin 15   RELAY COMMON: 120VDC @ 500mA Max.

Pin 12   No Connection

2. MCA2500R Specifications

Quantum™ Software Features

- Library-driven nuclide markers with readout in energy or channels
- Log and linear vertical displays with auto-scale
- Library for storing calibration standards information
- ROI markers displayed after peak search is performed
- QScript - user-defined automation templates

Digital Pulse Processing

- 50 MHz, 14-bit pipelined flash ADC
- Trapezoidal shaping times from 40 ns up to 10 µs
- Digital coarse and fine gain control
- Built-in dead time correction
- No pole-zero adjustment required
- 16-bit logical discriminator setting
- +/- 5% zero adjustment via computer in increments of 0.4%
- Maximum throughput: over 75,000 cps

Spectrum memory

- QCC mode: 256 or 512 channels
- Linear mode: 256, 512, or 1024 channels
- Maximum counts per channel: $2^{31}-1$ (over 2 billion)

Counting presets

- Real time, live time
- Total internal amplifier counts (ICR)
- Total SCA counts

Computer control

- 10/100 base-T Ethernet standard
- RS-232 also available with baud rates of 19200 and 115200
- Maximum number of units connected to PC:
  - 8 total with standard software (Quantum MCA)
  - Unlimited with custom software

Bias supply

- 0 to +1200 V in 1-V increments (computer controlled)
- Other bias supplies available on special orders

Preamplifier

- Charge sensitive
- Internal for use with detector PMTs

Nonvolatile storage

- Compact flash card holds setup parameters
- Battery-backed real-time clock

Front panel indicators and controls

- Power switch
- Dead-time meter (percent dead time display)
- Acquire
- Pulse event detect/pileup
- Communication active
- High voltage on
- Power on

Rear panel controls and connectors

- 12 V DC power connector
- AUX I/O (auxiliary input/output) rear panel connector (female 15-pin D) with the following connections: +5 VDC @ 1A output; fused/switched Vin @ 1A; ground; SCA output (TTL); ADC gate input (TTL signal with software-selectable positive or negative polarity for coincidence or anticoincidence mode); external count input (TTL); 4-20mA current loop output (Type-4 transmitter-sourced); synthesized filter output ("amplifier output", 0-5V range); isolated relay contact closures (NO, NC, and common, 250 VAC @ 5A or 120 VDC @ 500 mA max); two open collector 'alarm' contacts (12 VDC @ 500 mA max)
- RJ-45 connector for Ethernet (Model MCA2100R-EN)
- 9-pin D male RS232 connector (use with null modem cable to PC)
- BNC female connector for input to the preamplifier
- SHV female connector for detector bias
- Compact Flash slot for configuration data

Power

- 90-247 VAC, 50-60 Hz with universal power converter (included); or
- 9-16 VDC @ 500mA direct input for use with batteries
- Built-in self-resetting 1.5A fuse
- Typical power consumption: 6 watts

Weight

- 1.7 lb. (0.77 kg)

Dimensions

- 2.2 inches (5.5 cm) high
- 6.3 inches (16 cm) deep
- 6.3 inches (16 cm) wide

Software

- 32-bit QuantumMCA compatible with Windows®

Accessories

- 14-pin tube base
- Selection of signal, interface, and detector bias cables
- Sodium iodide detectors
- Quantum NaI, Quantum NaI/D, Quantum Gold for advanced quantitative analysis

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*U.S. Patent 5,608,222