Nanopositioning Modular System

MAIN RACK AND CONTROLLER

Model Number 17MMR001
17MRC001
17MRC002

MELLES GRIOT

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About the Company

Melles Griot is an established global force in the design and manufacture of mechanical hardware, motion control systems, vibration isolation systems, machine vision products and multi-element optical systems for fiber-optic, semiconductor and reprographic applications.

We offer customers an in-depth understanding of fiber component manufacture, allowing us to quickly and confidently develop optimal positioning solutions.

As a part of BarloWorld, global providers of world-leading industrial brands, we are committed to providing the service, relationships and attention to detail that make businesses excel.

Trademarks

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ActiveX is a trademark of Microsoft Corporation.

LabVIEW is a trademark of National Instruments Corporation.

Melles Griot is a registered trademark of Melles Griot Ltd.

NanoStep is a registered trademark of Melles Griot Ltd.

NanoTrak is a registered trademark of Melles Griot Ltd.

Revision History

Issue No.	Date	Summary
1	030798	Initial Issue
2	250998	CN2231
3	170399	CN2307
4	170102	CN2841

Contents

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Introduction

How to use this Handbook

This handbook contains all the information necessary to set up the Main Rack and Controller. Read the Safety Information in chapter 1 before using the equipment, and carefully heed all cautionary notes. If you have any questions or comments about this manual please call your local sales or service office or contact the factory at +44 (0) 1353 654500 and ask for Customer Service.

Alternatively, visit our website at www.mellesgriot.com/technicalsupport

The Structure of this Manual

Chapter 1, Introduction, gives an overview of the handbook structure and draws attention to the importance of the safety information. Chapter 2, For Your Safety, provides critical information needed for the safe installation and operation of the equipment. Chapter 3, Getting Started, gives an overview of the modular control system and its software. Chapter 4, Set up, details the location of the software files and describes how to configure the system via the MG17_Config configuration program. Chapter 5, Installation, explains how to install or remove modules from the rack and provides electrical installation instructions together with general information and guidelines on mounting and siting the equipment. Configuration details for each module are contained in the respective handbooks. Finally, Chapter 6 details the parts list.

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For Your Safety

2.1 Safety Information

For the continuing safety of the operators of this equipment, and the protection of the equipment itself, the operator should take note of the **Warnings, Cautions** and **Notes** throughout this handbook and, where visible, on the product itself.

The following safety symbols may be used on the equipment:

Read the operating instructions before use

Connection to Earth

High voltages present

Earth point

The following safety symbols may be used throughout the handbook:

Warning. An instruction which draws attention to the risk of injury or death.

Caution. An instruction which draws attention to the risks of damage to the product, process or surroundings.

Note. Clarification of an instruction or additional information.

The Equipment, as described herein, is designed for use by personnel properly trained in the use and handling of mains powered electrical equipment. Only personnel trained in the servicing and maintenance of this equipment should remove its covers or attempt any repairs or adjustments.

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Getting Started

3.1   Overview

Melles Griot has an extensive range of one-, two- and three-axis controllers for stepper motor and piezo actuator control. Increasingly, production of optoelectronic components requires fully automated or semiautomated control of a large number of mechanical stages. In such applications, it is often more convenient to use a modular system of controllers to drive a modular system.

The Melles Griot Modular Control System has been developed to meet the challenges of the modern optoelectronic production environment and provides unsurpassed ease of installation, reconfiguration, flexibility and upgradability.

The basic modular system comprises a rack with a reconfigurable power supply and a back plane which provides power and communications to the individual modules. The control modules are slotted into the front of the rack in any location and in any combination. The backplane of the rack connects all modules and the Controller on a Controller Area Network (CAN).

As many as 16 racks may be connected to a single Controller. Additional CAN interfaces may be fitted to the controller, enabling control of up to 64 racks, which can contain as many as 448 individual modules. Both bench top and rack mounted versions are available.

The Controller is an IBM-compatible PC configured at our factory. The hub of the control software is the **MG17_Server.** The server has access to all the functionality of the individual modules. It exposes this functionality via ActiveX Interfacing Technology.

All key high level commands, settings and system parameters are exposed through a set of **ActiveX** Drivers. These exposed objects allow the modular electronics system to be 'driven' from applications written by the user without the need to understand or alter the core system software. In addition, ActiveX technology is language independent, allowing custom applications development to be undertaken using any language or development system that supports ActiveX. Current development systems that support ActiveX include Visual Basic, LabVIEW, Visual C++, Delphi, Borland C++ Builder and, via VBA, Microsoft Office applications such as Excel and Word.

> **Note.** Visual Basic is a relatively easy development system to use and is recommended for those users who are new to Windows applications development. In this documentation, implementation specific explanations and code samples are written using Visual Basic syntax. Some familiarity of software development using Visual Basic is therefore assumed. Refer to the documentation supplied with other development environments for information on accessing and programming ActiveX objects.

When a complete system is shipped from the factory, the Controller is configured according to the modules supplied with the rack. However, modules can be added or removed as required, and the Controller re-configured using the interactive software provided.

The rack unit contains a power supply that configures itself according to the requirements of the modules used. It has a dedicated microprocessor that monitors the power supply and shuts the system down if an error should occur. The microprocessor supervises the routing of analog signal among modules (e.g. from a NanoTrak to a Piezo Module) along the backplane, reducing the need for external cable connections.
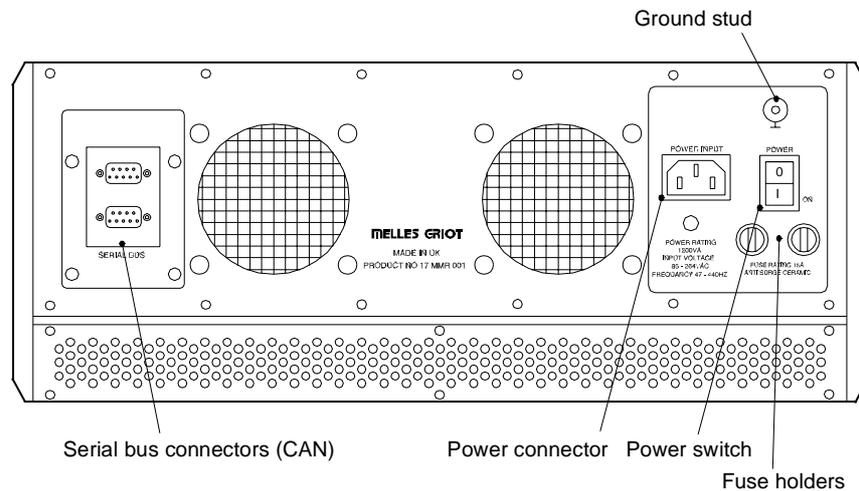
3.2   Rear Panel Controls

Ground stud

Serial bus connectors (CAN)   Power connector   Power switch

Fuse holders

Fig. 3.1 Main rack rear pane

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Setting up

4.1   Software

4.1.1   System Files

The various software components are supplied loaded onto the hard disk of the Controller. Most are contained in the path **C:Start/Program Files/Melles Griot/Melhost/ Config** – see Fig. 4.1.
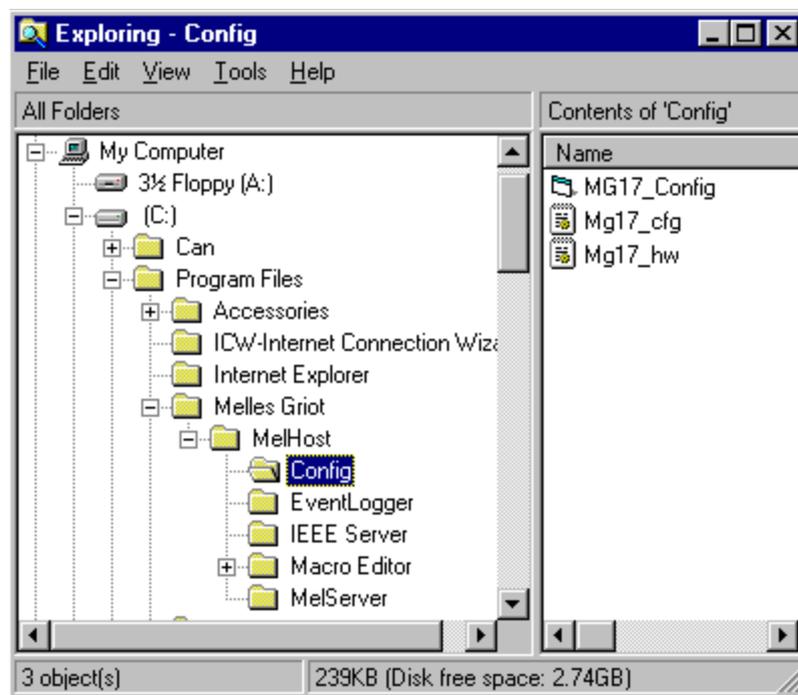
Fig. 4.1 Melhost directory structure

The folder **Config** contains the configuration program **MG17_Config,** which is used to configure the Controller according to the modules present in the rack and the stages connected to them. It also contains data files, maintained by the configuration program, that hold the configuration information.

The folder **EventLogger** contains a diagnostic tool, **MG17_Logger**, that monitors the activity on the CAN.

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The folder **MelServer** contains **MG17_Server**. Different versions of the server exist according to the type of CAN card installed in the Controller. The server will be loaded automatically as soon as an application calls it.

The remaining components, two Dynamic Link Libraries called **MG17_LoLevel.dll** and **MG17_HiLevel.dll**, are contained in the folder **C:/Windows/System**.

4.2   Loading New Software

The Controller is a standard PC and any standard software (e.g., drivers for instruments from other manufacturers) can be installed. This enables an integrated system to be built which incorporates both these instruments and those from Melles Griot.

However, to reduce the likelihood of unexpected conflicts among applications, the amount of software installed should be kept to a reasonable minimum.

It is possible to download firmware upgrades to the rack and individual modules. Any disks supplied will contain instructions on how to do this. System software upgrades are distributed on CD.

4.3 Configuring the Controller

4.3.1 Introduction

A configuration provides basic information about the system, (i.e., the modules used, the stages connected, NanoTrak scan parameters etc.), which may be needed by software applications that operate the system.

The system must be configured when it is set up for the first time, or when the hardware is changed. The configuration program **MG17_Config** allows such information to be entered and saved on the hard disk under a *configuration name*, which is then specified at the beginning of a software application to enable the information to be retrieved. Fig. 4.2 shows a typical configuration screen.
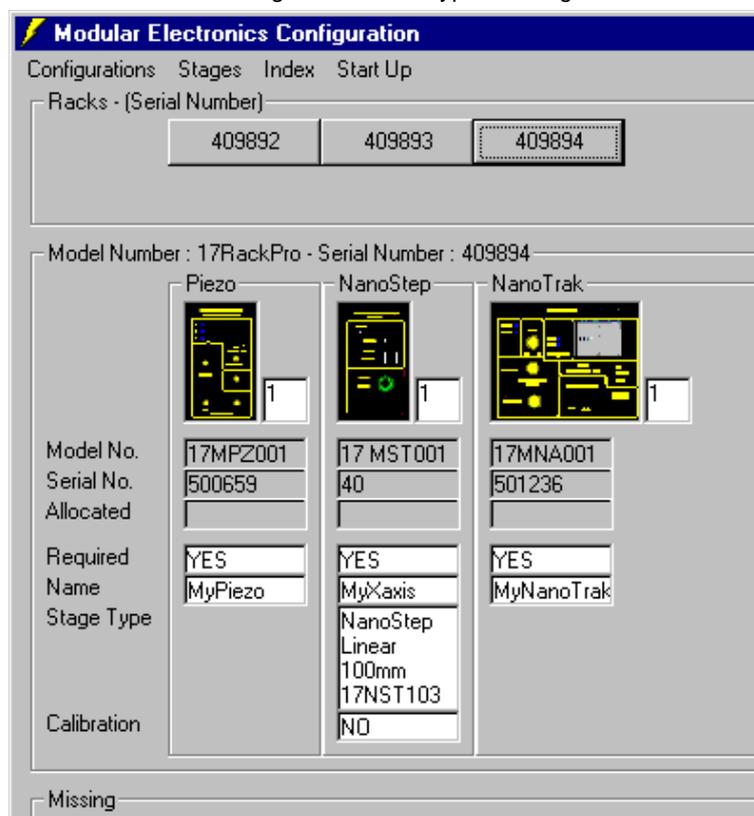

Fig. 4.2 MG17_Config configuration program

Several configurations, each with a different name, can be stored and called as required. All configurations are stored in a single file called **Mg17_cfg.ini.**

4.3.2   Creating a Configuration

MG17_Config displays a row of icons corresponding to the modules in the rack. Below each icon, are the fields where configuration data is entered and viewed. When an icon is selected (clicked), the green STATUS light flashes on the associated module in the rack. To create a configuration proceed as follows:

1) Ensure the power to the rack is on.
2) Run **MG17_Config** which can be found in the folder **Start/Programs/MellesGriot/ Melhost/Config**, or access the program via the **Start/Modular Electronics Host** menu.

> ✳ **Note.** Item (3) applies only to NanoStep modules in multi-rack systems.

3) Respond to the dialog box requesting the location of the NanoStep. The serial number of the rack is labelled on the rear panel (to identify the module, click on its icon and the STATUS light on the front panel of the actual module illuminates).
4) LH Click-and drag the icons among the slots to put them in the same order as the modules in the actual rack (this allows for easy identification of each module).
5) LH click in the **Required** field and select 'YES' for each module that is required.
6) LH click in the **Name** field and enter a unique name for each module (including the axis it controls if applicable). Later, this name is used as a 'handle' to operate the axis in high-level applications (e.g., LabVIEW or Visual Basic).

> ✳ **Note**. Items (7) and (8) apply only to NanoStep modules.

7) LH click in the **Stage Type** field and enter the type of stage being used. It is important to specify the correct stage type, otherwise the stage will move through the wrong distance or at the wrong velocity.
8) LH click in the **Calibration** field and select which Calibration file (if any) to apply to the axis – see *Handbook HA0085 NanoStep Control Module* for more details.
9) If multiple racks are being configured, select the next rack using the **Racks (Serial Number)** buttons. Repeat steps (4) to (8) for each rack.
10) From the **Configuration** menu (top left-hand corner of screen), save the configuration using a meaningful name. This name may be used in the initialization part of a program. Note that a single configuration covers all racks.

> ✳ **Note.**
> - The **Allocated** field indicates whether the module is currently allocated to an application. Modules cannot be allocated to more than one application at a time. However, a new configuration that specifies the module can be created, irrespective of whether the module is currently allocated or not.
> - Similarly to dragging an icon horizontally within a rack to correspond to the actual position of the module, a NanoStep icon can also be moved from one rack to another by dragging it onto the 'Serial Number' button for the relevent rack.
> - The ordering of the module icons into slots and racks is optional. Its purpose is to make the icons easier to identify against the real modules and racks.

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4.4   Loading a Saved Configuration

From the **Configuration** menu (top left-hand corner), any configuration already created can be loaded. When a previously saved configuration is loaded, stored settings (e.g., the scanning frequency of a NanoTrak) are sent to the modules in the rack.

Only one configuration at a time can be loaded.

4.5   Missing Modules

If the loaded configuration calls for modules which the system does not recognise as present, these will be listed in the **Missing** field – see Fig. 4.2. The **Missing Modules** dialog box is displayed automatically and gives possible reasons for the error– see Fig. 4.3.

Fig. 4.3 Missing modules dialog box

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If a module in the rack becomes unservicable it is listed in the **Missing** field. After a servicable module is fitted, the module details can be dragged from the **Missing** field onto the icon position for the original module – see Fig. 4.4. The replacement module is allocated the same details as the original module and is then included in the configuration.
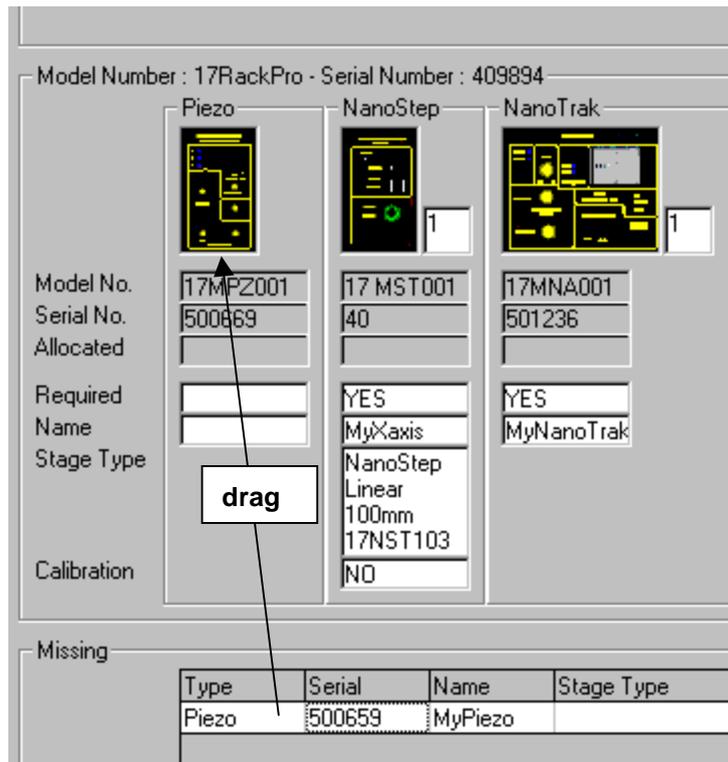

Fig. 4.4 Dragging a module into the configuration

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4.5.1   Setting the Index
The **Index** field is to the immediate right of each module – see Fig. 4.5.

Fig. 4.5 Index field

The index allows modules of the same type to be referenced by a sequential number. (There is separate index sequence for each module type). From a Visual Basic (or any other) application, a request can be sent to list the module names in an array. The order in which the names appear in the array is determined by the index. To change the index, RH click on the **index** field to bring up the **Indexing** window, then drag the entries into the desired order – see Fig. 4.6. The indexing window can also be accessed by selecting **Index** from the menu bar.
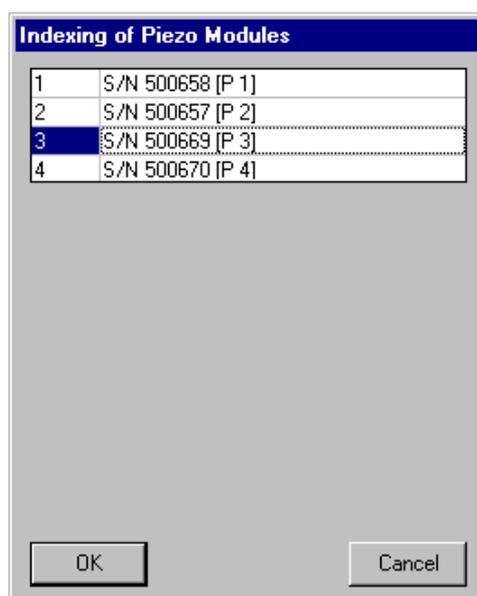

Fig. 4.6 Indexing modules

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4.5.2 Selecting a Start Up Configuration

A start up configuration can be selected, which is loaded automatically whenever **MG17_Config** is run, configuring the rack and modules accordingly. To select a start up configuration, click on the **Start Up** entry in the menu bar and select 'Auto Start Selected' – see Fig. 4.7.

To run **MG17_Config** automatically when the Controller is switched on, move the **MG17_Config** file to the Windows start up folder,
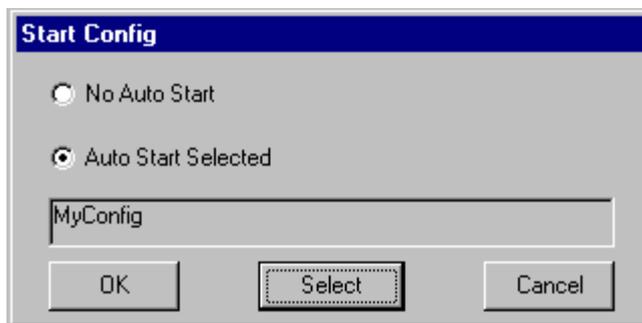

Fig. 4.7 Start up configuration selection

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Chapter 5

Installation

5.1   General

5.1.1   Identifying unsafe equipment
Whenever it is suspected that the safety of the product has been impaired, it is recommended that an appropriate label, recognised by your company, be attached and that the unit be removed to a place of repair.

5.1.2   Packing
Many of the components are fragile and should be shipped either in the original packing or packing of similar quality. Retain the packing for later use when shipping the equipment.

5.2   Siting

5.2.1   Environmental conditions

Warning. Operation outside the following environmental limits may adversely affect operator safety.

Location	Indoor use only
Maximum altitude	2000 m
Temperature range	5^oC to 40^oC
Maximum humidity	Less than 75%

5.2.2   Operating Position
The Main Rack and Controller unit is designed to be used in a horizontal position.

5.3   Mechanical Installation

5.3.1   Mounting
The Main Rack

The Main Rack is supplied fitted with two handles and flanges, ready for mounting into a 19 in. frame. For benchtop use, two trim strips are supplied separately which may be fitted in place of the handles and flanges. Each rack accommodates up to 7 single-width (12 HP) modules.

The Controller

The Controller is supplied either for mounting into a 19 in. frame or for use on the benchtop.

⚠️ **Caution**.
- When mounting the Main Rack or the Controller into a 19 in. frame, use side support rails (not supplied).
- Ensure there is adequate ventilation above and below the units.

Blanking plates

⚠️ **Warning**. Unoccupied module slots in the rack must always be covered by the purpose made blanking plates provided. Do not operate the equipment with the blanking plates removed.

5.3.2   Fitting a module

⚠️ **Warning**. Ensure that all power to the rack is disconnected before fitting or removing a module.

To fit a module into the rack, refer to Fig. 5.1 and proceed as follows;

1)   Ensure that the plastic guide rails are correctly positioned – see Section 5.3.3.

2)   Ensure the rack is the right way up, with the feet at the bottom.

✳️ **Note**. During item (3) ensure that the fins on the module are correctly located in the upper and lower guide rails.

3)   Gently slide the module into the guide rails until it engages with the back plane connector. If the module does not go in easily, check it lines up with the connector and that the guide rails are positioned correctly.

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4) Tighten the four securing screws on the module front panel.

✳ **Notes**.

- If fitting a double-width module where previously two single-width modules were fitted, remove the four (two upper and two lower) guide rails from the middle of the double slot – see Fig. 5.2. Retain the rails for future use.
- If fitting two single-width modules where previously a double-width module was fitted, insert four (two upper and two lower) guide rails in the middle of the double slot previously occupied – see Fig. 5.2.

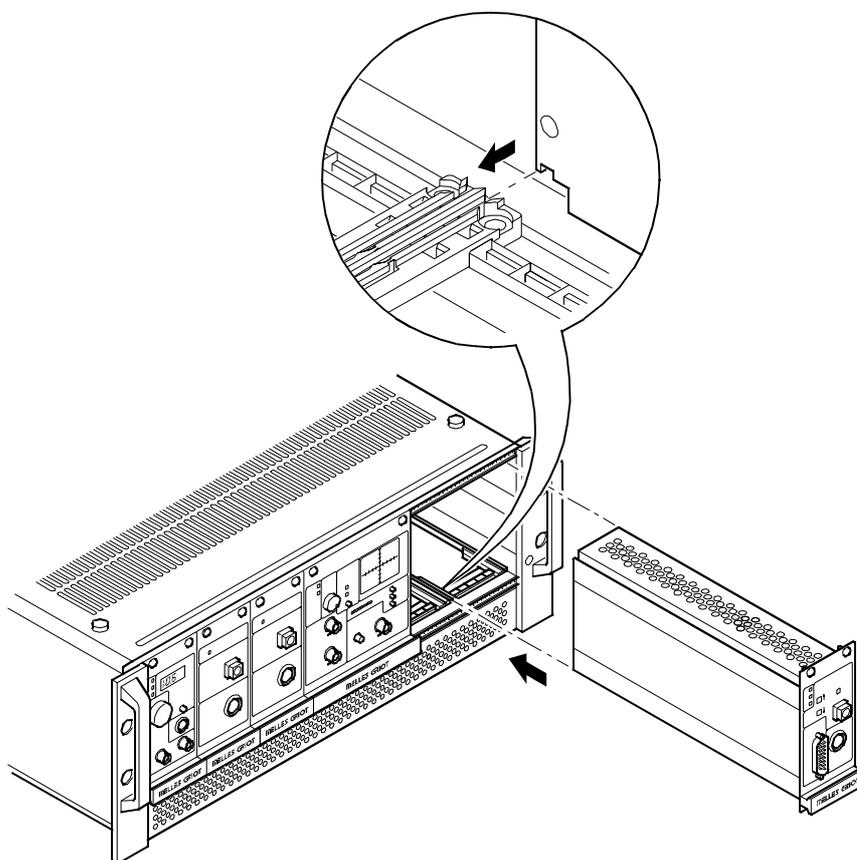5) To remove a module reverse steps (1) to (4).

Fig. 5.1 Fitting a module into the rack

5.3.3   Removing/Fitting Guide Rails

The guide rails are designed to be removed or refitted as necessary, and are a simple push fit.

To remove a guide rail, refer to Fig. 5.2 and proceed as follows:

1) Grasp the rail gently but firmly.

2) Pull the rail upwards whilst rotating away from any adjacent rail.

To fit a rail, position the clips in the relevent locating slot and push down firmly until the rail clicks into place.
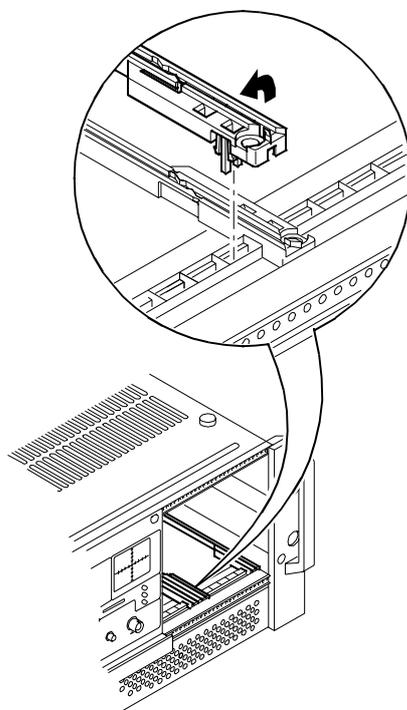
Fig. 5.2 Removing guide rails

5.4   Electrical Installation

5.4.1   Connecting the Rack and Controller – Fig. 5.3.
The Controller is an IBM-compatible PC complete with monitor, mouse and keyboard. It is supplied with the software already loaded and configured for your system. It should be connected to its accessories in the normal way, according to the instruction manual from the OEM supplier.

The rack is connected to the Controller via the PC CAN Patch Lead terminated with 9-pin D-type connectors. **It is important that the connector with the red sleeve be connected directly to the Controller (PC), as shown below.**

A second rack can be connected via a CAN Patch Lead from the first rack, as shown. Additional racks may be added in a similar fashion. **The last rack in the chain must have the 9-pin D-type CAN terminator attached to its unused outlet.**
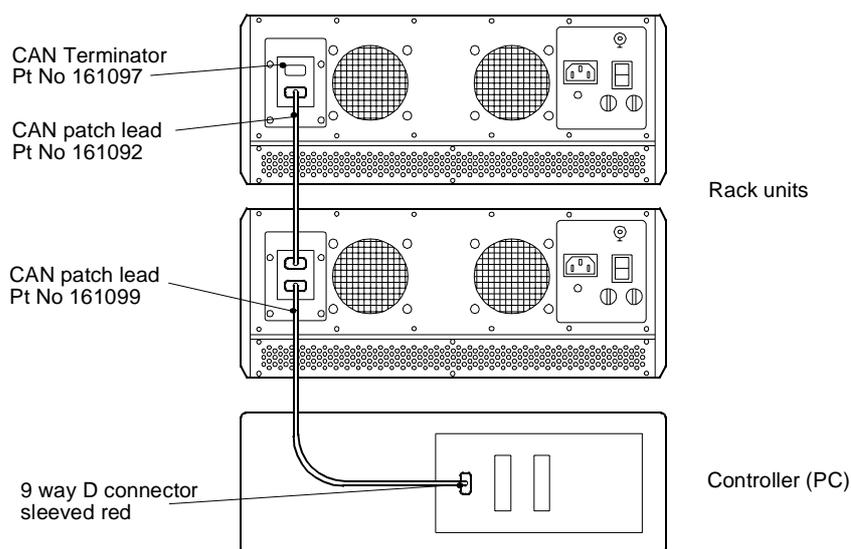
CAN Terminator
Pt No 161097

CAN patch lead
Pt No 161092

Rack units

CAN patch lead
Pt No 161099

9 way D connector
sleeved red

Controller (PC)

Fig. 5.3 Connecting the Controller and rack(s)

5.4.2   Earthing

The unit is supplied with a 3 core mains lead which carries a protective earth/ground conductor and is fitted with an IEC plug. The mains plug should be inserted only into a socket that provides a protective earth/ground contact to ensure safe operation.

Alternatively, a separate connection may be made to the earth/ground stud on the rear panel of the unit.

5.4.3   Mains Voltage

The rack contains a universal power supply requiring the following input:

Voltage   85 to 264 VAC

Frequency   47 to 440 Hz

Power rating   1200 VA

The Controller power supply is also universal. Please consult the manual provided by the OEM supplier for details.

5.4.4   Mains Voltage Cord and Fuses

Different power cords are available for various mains outlets and the appropriate version is delivered with the unit. Seek technical advice if there is any doubt over the mains power connections. Two fuse holders are located on the rear panel. Each carries a 15A T type anti-surge ceramic high rupture current, 1.25 by 0.25 inch, fuse.

5.4.5   Internal Fuses

Warning. The following fuses are located internally and must be replaced only by trained personnel authorized by Melles Griot.

Fuse	Rating/A	Type
F1	8	T HRC
F2	8	T HRC
F3	5	T HRC
F4	5	T HRC
F5	3.15	T HRC
F6	10	T HRC
F7	10	T HRC

Spares and Accessories

6.1   Spares list

Table 6.1 Main rack and controller spares

Description	Part number
Main Rack	17MMR001
Controller – Benchtop mounting	17MRC001
Controller – 19" Frame mounting	17MRC002
Dongle, CAN card, and software	17MRC005
Dongle, cable and software	17MRC006
Melles Griot NanoPositioning Software	17CDM002
CAN terminator 9-pin D-type	161097
CAN patch lead	161092
PC CAN patch lead 400 mm	161099
PC CAN patch lead 1500 mm	161089
Handles for rack (pair)	BF0083
Flanges for mounting rack into 19-inch frame (pair)	BF0082
Trim strips for benchtop use (pair)	BF0080
Single-width blanking plate	17MBP001

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Products and Customer Support

A Comprehensive Product Range

Optical Components,

Singlets, Doublets and Triplets; Cylindrical Optics, Mirrors, Prisms and Retroreflectors, Beamsplitters, Polarization Components, Filters, High Energy Laser Optics, Diode Laser Optics, UV Optics, Machine Vision.

Opto-mechanical Hardware

'MicroLab System, Micro-optics, Lens, Filter and Polarizer Mounts, Mirror/ Beamsplitter Mounts and Prism Tables.

Nanopositioning

Stages, Mechanical Accessories, Piezo-electric and Stepper-motor Controllers, Autoalignment, Modular System Controllers.

Optical Tables, Breadboards and Vibration Isolators

Optical Table-tops, Vibration-isolation and support systems, Optical Breadboards and Baseplates, Workstations.

Lasers

Diode-pumped Solid State, Ion, Helium Cadmium, Helium Neon, Diode Laser Assemblies, Laboratory Diode Laser Drivers, Accessories.

Laser Measurement Instrumentation

Laser-beam characterization, Photodiodes, Power and Energy Meters.

Lab Accessories

Technical Support

Melles Griot provides a comprehensive after sales service. Contact us through your local representative, or at the address below:

Melles Griot Ltd

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Cambridgeshire CB7 4EX, UK

Tel: +44 (0) 1353 654500

Fax: +44 (0) 1353 654555

email: nanosupport@mellesgriot.com

Client Warranty

Prior to installation, the equipment referred to in this handbook must be stored in a clean, dry environment, in accordance with any instructions given. Periodic checks must be made on the equipment's condition.

It is always helpful to have detailed and accurate information about any problems encountered by customers

We welcome comments or suggestions about any aspect of the equipment and instruction handbooks.

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