PC3000

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EUROTHERM

ENG

Installation guide

CONTENTS

PREFACE

This handbook provides detailed information on the PC3000 Hardware.
The handbook is primarily intended for use by those involved with installation and commissioning but will also be of use to maintenance personnel and PC3000 configurers.

The information provided will allow you to understand:

- The function and purpose of each hardware component
- How to configure and install modules
- How to wire modules to the plant
- How to calibrate analogue I/O modules
- How to install operator panels and interfaces to computers

For further information refer to the PC3000 reference documents:

PC3000 Installation Supplement - provides installation details for Version 1 format modules and racks. Part No. HA023808.

PC3000 Real Time Operating System Reference - provides detailed information on PC3000 Real Time operation including user program execution and memory organisation. Part No. HA022918.

PC3000 Functions Reference - describes all the functions that can be called within the structured Text (ST) language. Part No.HA022916.

PC3000 Function Block Reference - describes the numerous function blocks available to be incorporated into your control program for PID control, Ramps, Counters, Filters, Timers etc. Part No. HA022917.

SAFETY and EMC INFORMATION

Please read this section carefully before installing the PC3000

The PC3000 meets the requirements of the European Directives on Safety and EMC, however, it is the responsibility of the installer to ensure the safety and EMC compliance of any particular installation.

Safety

This PC3000 complies with the European Low Voltage Directive 72/23/EEC, amended by 93/68/EEC, by the application of the safety standard EN 61010.

Electromagnetic compatibility

This PC3000 conforms with the essential protection requirements of the EMC Directive 89/336/EEC, amended by the application of a Technical Construction File.

Equipment ratings

Power Supply Module	
Supply voltage:	85 to 132V a.c. ~ with link fitted 176 to 264V a.c. ~ without link.
Supply frequency:	48 to 62Hz a.c. ~.
Power consumption:	50 Watts. Integral 1.6A IEC 127 time-lag type fuse.
Relay Module	
Relay output:	Maximum of 264V a.c. ~. Minimum 30V a.c. or d.c. Maximum current, 1A resistive.
Leakage current:	The leakage current through relay contact suppression components is less than 2mA at 264V a.c., 50Hz.
Protection:	External over-current protection devices are required and should match the wiring of the installation. Use independent fuses for each relay output. Suitable fuses are T type, (IEC 127 time-lag type) for relay output : 1A (T).
Digital Input	High Level Module: 264 V max, input current 5.5mA.
Low level i/o:	All other input and output connections are intended for low level signals less than 42V.

Environmental ratings

Enclosure rating:	PC3000 is intended to be mounted inside an enclosure. The rack offers a rating of IP20 (EN60529).
Operating temperature:	0 to 50°C. Ensure the enclosure provides adequate ventilation and that 3U spacing is provided between adjacent racks.
Relative humidity:	5 to 95%, non condensing.
Atmosphere:	The instrument is not suitable for use above 2000m or in explosive or corrosive atmospheres.

Electrical safety	EN 61010 (93), Installation category II, pollution degree 2.
Installation category II:	Voltage transients on any mains power connected to the instrument must not exceed 2.5kV.
Pollution degree 2:	Conductive pollution must be excluded from the cabinet in which the equipment is mounted.
Isolation:	All inputs and outputs have a reinforced insulation from *the system* which provides protection against electric shock. Channel to channel insulation is module type dependent.

Safety Symbols

Various symbols are used on the instrument, they have the following meaning:


Caution, (refer to the accompanying documents)


Protective conductor terminal


Functional earth (ground) terminal

A functional earth is provided for a purpose other than safety such as grounding EMC filters.

Installation Safety Requirements

For safe operation Eurotherm Controls products must be correctly installed in a suitable environment. The following installation guidelines should be carefully considered before operating the equipment;

- **Personnel.** Installation must only be carried out by qualified personnel.

- **Wiring installations should comply with all local wiring regulations.**

- **A safety earth connection is essential before connecting the supply.** This equipment may have a high earth leakage current. The safety earth connection is to the bolt on the rack marked with the protective conductor symbol.

- **The installation must include a power isolating switch or circuit breaker.** This device should be in close proximity to the PC3000, within easy reach of the operator and marked as the disconnecting device for the equipment.

- **The PC3000 must not be wired to a three phase supply with an unearthed star connection.** This is because under fault conditions the supply voltage can rise above 264Vac with respect to earth. The product will not be safe under these conditions.

- **Voltage rating.**
  The maximum continuous voltage applied between any of the following terminals must not exceed 264Vac:
  Line or neutral to any other connection;
  Relay output to logic I/O, analogue I/O, or sensor input connections:
  Any connection to ground.
  Voltage transients across the power supply connections, and between the power supply and ground, must not exceed 2.5kV. Where occasional voltage transients over 2.5kV are expected or measured, the power installation to both PC3000 and its load circuits should include a transient limiting device.
  These units will typically include gas discharge tubes and metal oxide varistors that limit and control voltage transients on the supply line due to lightning strikes or inductive load switching. Devices are available in a range of energy ratings and should be selected to suit conditions at the installation.

- **Caution: Live sensors**
  All PC3000 plant I/O is provided with reinforced insulation to the system and other modules which provides protection against electric shock. However, there may only be functional insulation between the channels of a PC3000 module. (See individual module specifications for details). Functional insulation is provided to enable the proper functioning of the equipment, but does not provide protection against electric shock.
  Where one channel is live, (e.g. a thermocouple input connected to a live electrical heating element) the installer must ensure that any other functionally insulated channel is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

- **Conductive pollution must be excluded from the PC3000 enclosure.** Carbon dust is a conducting pollution, but even particles that are normally non conducting may become conductive with condensation. To secure a suitable atmosphere in conditions of conductive pollution, fit a filter to the air intake of the cabinet. Where condensation is likely, for example in low temperatures, include a thermostatically controlled heater in the cabinet.

Independent Policeman/Watchdog Protection

When designing a control system, it is essential to consider what will happen if any part of the system should fail. In process control applications, failure of the intended control strategy may cause a hazardous situation. In temperature control applications for example , the primary danger may be that the heating will remain constantly on. Apart from spoiling the product, this could damage any process machinery being controlled, or even cause a fire, or explosion.

Considering the heating example, there are many reasons why the heating might remain constantly on which include:

- the temperature sensor becoming detached from the process.
- thermocouple or thermocouple wiring becoming short circuit.
- the controller failing with its heating output constantly on.
- an external valve or contactor sticking in the heating condition
- the controller setpoint set too high

Where damage or injury is possible, we recommend fitting a separate policeman, or watchdog protection unit, with an independent sensor. This unit should be able to implement a safe shutdown strategy independent of the PC3000.

Please note that the alarm relays within the PC3000 will not give protection under all failure conditions.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces or this product.

Installation Requirements for EMC

To ensure compliance with the European EMC directive certain installation precautions are necessary as follows:

- For general guidance refer to Eurotherm Controls EMC Installation Guide, HA025464.
- For compliance the front cover MUST be fitted securely to the rack.
- When using relay outputs it may be necessary to fit a filter to suppress the emissions. For typical applications we would recommend Schaffner FN321 or FN612, but the filter requirements will depend on the type of load.

Chapter 1

INTRODUCTION

Contents

BEFORE YOU BEGIN

Before installing the PC3000 system hardware ensure that:

- All modules are of the correct type for the application.

  Check advice note and/or module label for module identities.

- The Local Controller Module is fitted with the correct version of system firmware and that it is compatible with the associated Function Block Library in the PC based Programming Station.

  Refer to Chapter 5 LCM for compatability details.

  Refer to Chapter 6 LCM-Plus for compatability details.

- The location and wiring requirements for each module is understood.

  Refer to the chapters covering installation for each of the system hardware components.

Unpacking the system

All PC3000 racks and modules are packaged in shipping containers designed to withstand reasonable transit shocks. It is suggested that each item be unpacked carefully and the contents inspected for damage. The original packaging should be retained if re-shipment is required.

If there is evidence of shipping damage, please notify Eurotherm or the carrier within 72 hours. The packaging should be retained for inspection by a Eurotherm representative and/or carrier.

All packaging contains anti-static materials to prevent the build up of static which can damage electronic assemblies.

Unpacking the rack

The PC3000 rack packaging includes an insert intended to retain the card guides during transit. The rack fascia should be removed and the polystyrene insert removed from the rack and discarded unless re-shipment is required.

Unpacking the modules

All modules are boxed individually. Packaging contains anti-static foam to protect the electronic assemblies. All packaging must be retained if subsequent re-shipment is required.

Each module is provided with a plastic peg in order to 'polarise' the field wiring connector to one of 12 corresponding positions in the rack. The peg should be retained for use during installation.

Retain any installation, wiring or other data provided with each module for future reference.

Unpacking the terminals

Refer to documentation supplied with each terminal.

ASSEMBLING THE PC3000

It is recommended that this check list is used when assembling a PC3000 system. Details of the various module types and operations may be found in the relevant chapters of this handbook. Page references are given alongside the topics covered by this chapter.

Racks

Main and Extension racks are physically identical.
Racks MUST be earthed.
There are no switches or links to be set up on the rack or backplane.
Allow 3U spacing between racks.
Allow sufficient slack on the field wiring to permit module header removal.

Power Supply

This module is plugged into the first slot of the racks.

Before applying power, check the wiring suits the voltage being supplied. The link between terminals 10 and 11 is fitted for low voltage supplies (85 to 132V ac). See label on connector.

If the 'watchdog' relay is to be used check the position of the links which determine the action of the watchdog relay (Immediate action or activate after 1s hold off) and the relay contact protection for normally open or normally closed contact pair. Page 4-5 describes the link positions and operation.

Local Controller Module/or Local Controller Module-Plus

Before fitting the Local Controller Module (LCM) to the rack check:

1. That the Group Identifier (GID) switch is set correctly. It should match the setting on the Programming Station used to program the PC3000 or the address defined by the supervisory computer e.g. ESP. See page 5-4. Default address is 7.
2. That the Baud Rate for the 'default' EI Bisync communications between the PC3000 and the PC is set correctly. The factory default is 9600 Baud. See page 5-4.
3. If the PC3000 is used in a multi-drop configuration (e.g. one of several slaves to another PC3000) check the termination resistors are correctly fitted. The factory default is to supply the LCM with receive termination resistors fitted.
   See pages 5-6 to 5-8 for LCM information, 6-5, 6-6, 6-9 to 6-12 for LCM-Plus information, 20-17 for cabling.
   Notes:
   1. Only port C of the LCM supports multi-drop communications as a slave. Avoid using Port C as a Master.
   2. Ports A, B and C of the LCM-Plus support multi-drop communications.
4. That the correct amount of RAM is fitted and that the cards are fitted in the correct slots. (See page 5-10 for LCM, 6-15 for LCM-Plus).

Rack Interface Module

This is used in the LCM slot of extension racks.

Before fitting the RIM check:

1. That the Rack address is set to the correct **extension** rack number; first extension rack takes address 1, second 2 etc. (Page 7-3).
2. That the termination impedance for the extension cable is correct. The module is supplied with the termination impedance fitted which is correct for the final RIM in a multi-rack system. Thus for a system with three or more RIMs the links 8 and 9 must be removed from the RIMs on all extension racks except the final one. (Page 7-3).
3. The special manufactured extension rack cable must be used between the LCM and the RIMs.

Intelligent Communications Module

This may only be used on the main rack with the LCM and must use slots 1 to 5, starting with slot 1 and without leaving any spaces. Thus in a system with 1 ICM it must be in slot 1; in a system with 2 ICMs they must be in slots 1 and 2 etc.

Before fitting the ICM check:

1. That the termination impedances on Ports A, B C (RS485) are correctly fitted/ omitted to suit the application (Page 18-4, 5).
2. That the base address is correctly set. (Page 18-3)

Communications Cables

Note that the extension rack cables cannot be used directly for communications between 2 PC3000 system. If it is required to connect 2 PC3000 ports together (using, say, EI Bisync) an extension rack cable must first be cut and then the red connected to black, black to red, green to blue, blue to green and the grey and white connected to grey and white. Brown and orange are unused.

Analogue Input

There are 5 types of module: Quad mV, Quad Volt and Quad PT100 and 2 application specific versions, see page 9-2.

The mA version is the same as the mV version except that 5 ohm burden resistors are fitted to the module header.

The HiZ has a +10V to -2V high I/P impedance input on channel 1 and ordinary thermocouple millivolt inputs for the other three channels, for Zirconia probes.

F–V variant has frequency to voltage convertors at the front of channels 1 and 3 for use with tachogenerators and low speed encoders. Channels 2 and 4 are configured as normal Voltage input channels (+/-10V).

Before fitting the Analogue Input Module check that the module is the correct type.

Analogue Output

This is one type of module and each channel may be configured for mA or volt output.

Before fitting check that the mode of each output is correctly set (page 10-3).

Chapter 2

THE PC3000 SYSTEM

Contents

MAJOR PRODUCT FEATURES

The PC3000 Production Process Controller offers the following major features:

- Precision Analogue Control

  Direct sensor inputs with over 40 tables

  Highly configurable PID

  Self tune and Least Squares Adaptive tuning

- Digital Control

  Boolean and combinational logic functions

- Sequential Control

  Using Sequential Function Charts as described in the International Standard, IEC 1131/3

- Statistical Control

  On-line calculation of SPC variables, standard deviation, mean, upper and lower control limits etc.

- Communications

  Two RS422 plus one RS485 port as standard

  Expandable to 23 channels total

  Many protocols:-

  Eurotherm EI Bisync

  Modbus/Siemens 3964R/Toshiba EX

  Simple DIY driver for printers, gauges etc.

PC3000 brings all of these features together into a single control system product. Configuration is by means of a PC based, high productivity programming toolkit which uses a unified configuration methodology.

System components

The PC3000 hardware is modular, allowing system size, I/O type and number and communications facilities to be tailored to your application.

The major components within the PC3000 hardware are:

Rack

The rack forms the basic chassis into which all modules are fitted. There are no address switches or backplane polarisation combs to be set. In the main, modules may be installed in any posistion. Racks may be panel or bulkhead mounted.

Power supply

Every rack requires a power supply. This is a universal design permitting operation over a wide range of international supply voltages. It provides the power for the Local Controller Module or the Rack Interface Module, plus up to 12 I/O modules.

Local controller module (LCM)

This provides the 'core' of the PC3000 hardware. The Local Controller runs, in real time, the control program which has been defined 'off-line' on the PC based Programming Station. It is responsible for the control of all I/O, PID control, communications, operator interfaces and time sequenced events.

Rack interface module (RIM)

This provides a means of expanding the I/O count of a PC3000 system by allowing additional racks to be fitted. It handles the messages to the I/O modules under the control of the Local Controller.

I/O modules

I/O modules provide the interface to the plant. A wide range of modules are available permitting direct transducer interface, connections to a wide range of sensors and actuators plus digital I/O for alarms, switches and interlocks.

Communications modules

Communication modules may be used to increase the number of serial ports on a PC3000.

A wide range of communications protocols allow interfaces to PLC's, remote instruments, etc. A high speed network module is in development, which will allow rapid real time data exchange between multiple PC3000 systems or between PC3000 and a supervisory production control computer.

Operator panels

Panels provide the run time interface to the process operators. Important process parameters may be monitored and displayed and operator entry of data is supported. Panels range from 2 line, 40 character displays through to PC based supervisory systems.

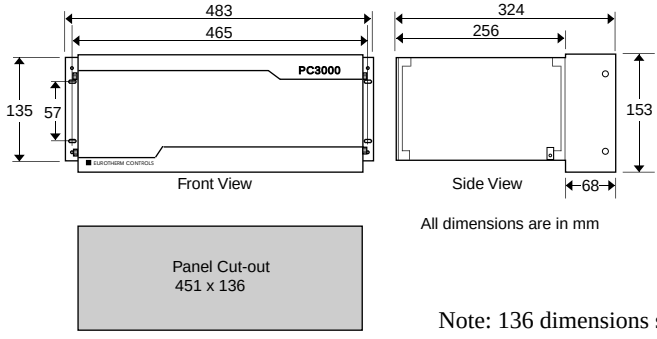
Chapter 3

THE RACKING SYSTEM

Contents

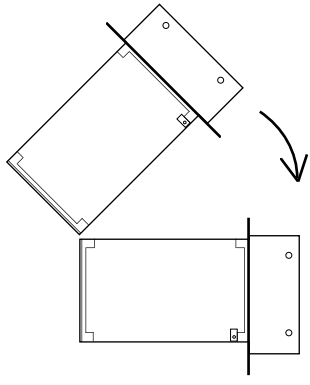
RACK INSTALLATION

- Racks may be panel or bulkhead (rear) mounted.
- A single PC3000 system may comprise 1 main rack and up to 7 extension racks.
- Main and Extension racks are physically identical.
- The maximum total length of the serial communications link between the Local Controller Module and the **last** extension rack is 200m.



Note: 136 dimensions should be increased to 180 if it is desired to route cables back through the panel (permits 1U clearance).

Rack orientation



For optimum operation of the PC3000, it is recommended that the rack be mounted between the 0° (horizontal) and 45°positions.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Front/panel mounting

The front mounting racks product code is :

Type	Code
Primary rack	**PC3000/RACK/VERSION3/MAIN/FRONT** Note (1)
Extension rack	**PC3000/RACK/VERSION3/EXT/FRONT** Note (1)

Note (1) For this version these two types are the same.

The rack is mounted by means of pre-drilled holes in the front mounting brackets. Two alternative fixing centres are provided:

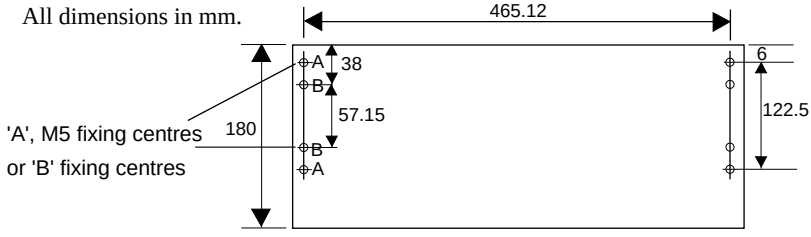
‘A’ M5 fixing on 122.5 centres

‘B’ M6 fixing on 57.15 centres

The ‘B’ centres comply with industry standard fixing for 19" rack mounted equipment.

It is recommended that these fixing centres are used wherever possible.

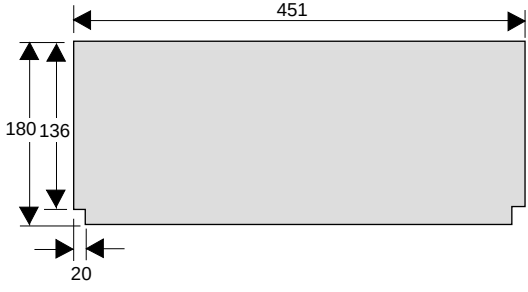
All dimensions in mm.



Minimum panel cut-out size is 451 by 136.

The panel cut-out height should be increased from 136 to 180 if it is required to route cables back through the panel. This permits 1U clearance. Whilst a panel cut-out of 451 by 180 will provide adequate clearance, the following cut-out may be used to ensure that cabling or cut-out is not visible at the lower corners of the rack.
This cut-out should be used if the rack is mounted at head height.

Minimum clearance required behind panel is 260mm.



Rear/bulkhead mounting

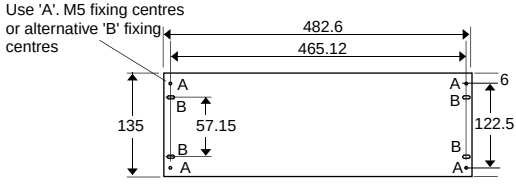
The rear/bulkhead mounting rack's product code is:

Type	Code
Primary rack	**PC3000/RACK/VERSION3/MAIN/REAR** Note (1)
Extension rack	**PC3000/RACK/VERSION3/EXT/REAR** Note (1)

Note (1) For this version two types are the same.

The M5 ‘A’ fixing centres are recommended for use in bulkhead (rear) mounting applications in order to distribute the cantilever load over a wider area. They may also be used in conjunction with the ‘B’ fixings to provide additional security.

The diagram below shows the ‘footprint’ of the rack on its’ mounting surface. The rack backplane is covered by a metal shield and the brackets provide adequate clearance.



Minimum clearance required in front of bulkhead is 330mm.

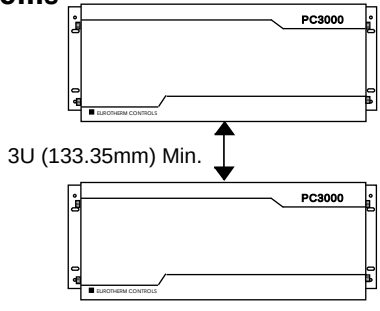
It is recommended that screws penetrate the nut or other threaded medium by at least one diameter (i.e 5 or 6mm)

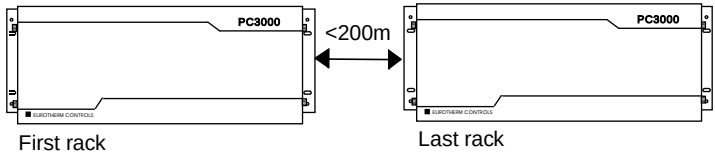
Extension racks and multi-rack systems

A multi-rack system comprises one main rack plus 1 to 7 extension racks.

In order for the PC3000 racks to operate without risk of over-heating, it is recommended that racks, when stacked vertically, be positioned at least 3U (133mm) apart.

When mounted adjacent to one another, no spacing is required. It is also recommended that the cabinet is vented and force cooled.





The maximum number of racks that can be linked together is 8. The maximum distance racks can be mounted from each other is 200m. Note, however this represents the total cable length on the 'extension rack' communication link. Therefore 8 racks each separated by 25m would be equivalent to 2 racks separated by 200m.

Standard inter-rack cables are provided for separations of 1.5, 4 and 6m. Where greater separation is required a cable assembly with the inter-rack connector on one end and a standard 9 way 'male' 'D' connector is available. This should be used in conjunction with a DIN rail mounted unit which converts from 'D' connector to a terminal block which is also available from Eurotherm Controls. Connections to the converter should be made via 4 core screened twisted pair cable; suitable types include Belden 9729 and 9829.

Inter-rack cables (order codes)

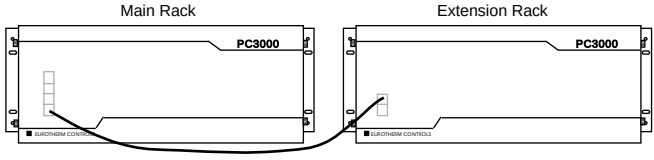
PC3000/CABLE/COMM/COMM/6.0M - 6m length
PC3000/CABLE/COMM/COMM/4.0M - 4m length
PC3000/CABLE/COMM/COMM/1,5M - 1.5m length

DIN Rail Converter (order code)

PC3000/CONV/TERBLK/9PIN

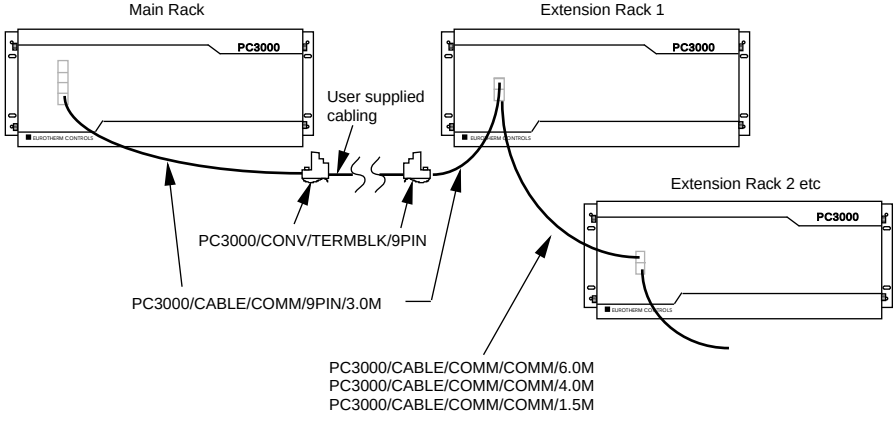
Rack to DIN rail converter cable (order code)

PC3000/CABLE/COMM/9PIN/3.0M - 3m length



PC3000/CABLE/COMM/COMM/6.0M
PC3000/CABLE/COMM/COMM/4.0M
PC3000/CABLE/COMM/COMM/1.5M

Rack separation up to 6M



Extending rack separation beyond 6M

Multiple rack PC3000 systems in a single installation of more than four racks may cause radio interference unless special mitigation measures are employed. Please consult Eurotherm Controls Ltd for EMC Guidance before installing and operating such systems.

For connection information see:

MODULE INSTALLATION

- The Power Supply Unit resides in the first ‘slot’ in every rack.
- The second ‘slot’ contains the Local Controller Module, in the case of the main rack, or the Rack Interface Module in extension racks.
- Always ensure the module is fully home before fitting connectors.

Module removal and connector/fascia assembly removal

To remove the connector/fascia assembly from the module and remove the module from the rack:

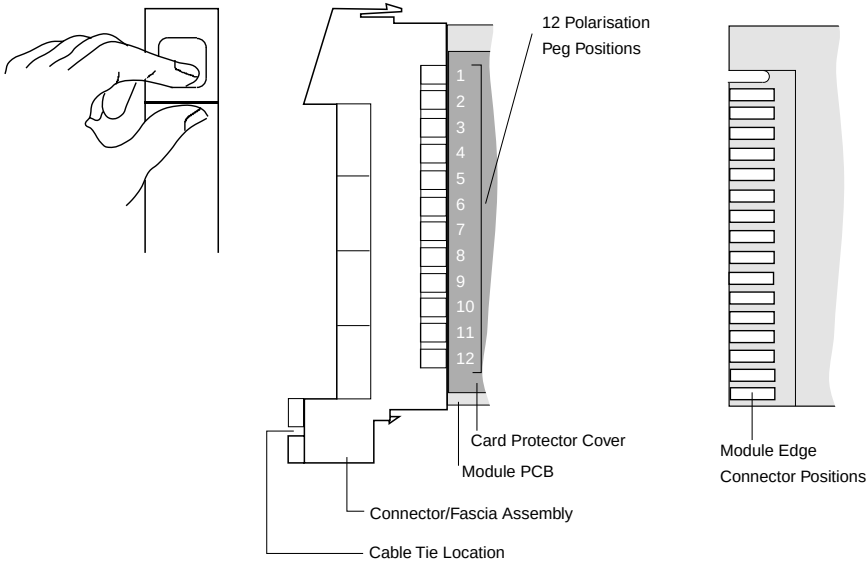


Figure A

(1) Remove power to the system including I/O.

(2) Remove the rack cover.

(3) Remove the front cable comb, (3 screws underneath)

(4) Remove the connector/fascia assembly from the module. Initially, pull the bottom of the front cover and then pull the top to disengage from the rail groove.

(5) A module extraction tool is provided to aid removal of the module from the rack. The peg on the tool is designed to locate in any one of the polarising peg positions.

Caution

Special care should be taken when removing or fitting connectors to Analogue Input modules. These modules have temperature sensors which are located at the edge of the modules' circuit board. Always ensure that the connector is aligned correctly and is parallel to the circuit board before pushing fully home. Failure to observe caution could result in damage to the temperature sensors.

Cable

Wiring to the PC3000 is by means of captive screws within the detachable connector and module fascia. The wiring capacity is:

1 x 2.0mm^2 (14 awg)
or2 x 1.3mm^2 (16 awg)

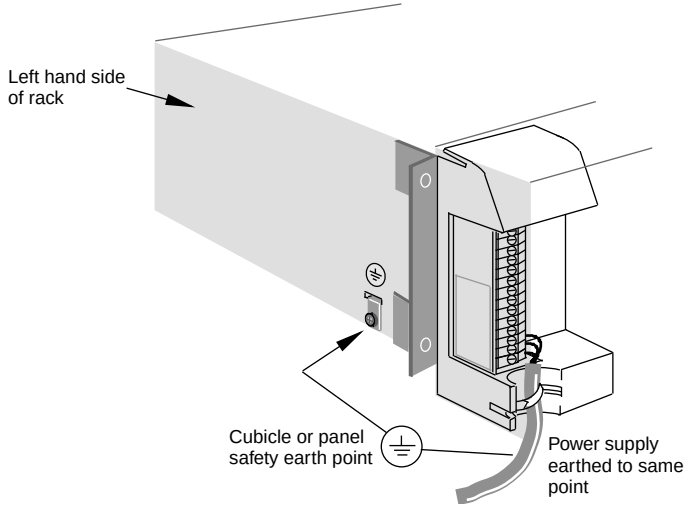
Minimum cable size is 0.2mm^2 (24 awg). The recommended conductor size is 1mm^2.

All wiring may be fixed (strain-relieved) to the connector/fascia assembly by the cable tie fixing points provided.

Caution

Excessive force to clamp wires is not necessary. Maximum torque is 0.4Nm.

Rack earthing



The rack should be connected to the safety earth in the cubicle or panel. The use of earth braid is recommended to ensure a low impedance connection. The earth connection should be made using a suitable crimped ring terminal.

The earth connection to the power supply module should also be taken to the same star point.

All module ‘slots’ within the rack include an earthing clip which is fitted to each module guide. This is used to provide an earth return path for noise filters provided in each module. The connection to earth is made via the rack earthing screw.

WARNING

An ac leakage current will flow through the earth connection if the thermocouple or other input/output signals are elevated to mains potential. This should be taken into account when selecting earth leakage breakers and designing wiring systems.

Polarisation/connector coding

The connector/fascia assembly features a twelve position 'comb'; the top cover of the module has twelve corresponding holes labelled 1-12. Each module is provided with a loose plastic peg which may be used to 'polarise' the module fascia in order that it may be plugged onto one module only. The appropriate position on the comb should be removed with a pair of side cutters and trimmed, if necessary, with a knife. The peg should be placed in the corresponding hole.

Note that the positions 1 and 12 are pre-set at the factory for millivolt input modules. This is to help ensure correct insertion and removal of the header, to protect the CJC sensors.

Two methods of coding are possible:

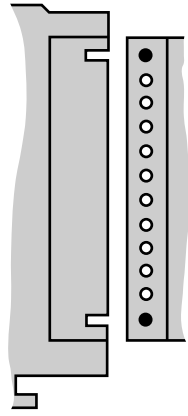
Method 1
Assign each module's connector a code which matches the slot in which it is fitted. As an example, a module fitted in slot 5 would have the peg fitted to position 5 and the matching comb position removed.

Method 2
Assign each module type a unique connector code as the following table suggests:

Product Code	Module Type	Peg & cut out positions
PC3000/AI/VERSION3/mV4	Analogue Input, 4 ch, mV, TC	1, 12
PC3000/AI/VERSION3/mV3/HiZ1	Analogue Input, 3 ch, mV + 1ch high impedance suitable for Zirconia probe	1, 3, 12
PC3000/AI/VERSION3/mA4	Analogue Input, 4 ch, mA	2, 12
PC3000/AI/VERSION3/V4	Analogue Input, 4 ch,V	4, 12
PC3000/AI/VERSION3/RT4	Analogue Input , 4 ch, RT	5, 12
PC3000/AI/VERSION3/V2/FV2	Analogue Input, 2 ch, for frequency inputs, 2 ch, V	6, 12
PC3000/AO/VERSION3/V4	Analogue Output, 4 ch, V	7, 12
PC3000/AO/VERSION3/mA4	Analogue Output, 4 ch, mA	8, 12
PC3000/DO/VERSION3/RLYSTD12	Digital Output, 12 ch, Relay (normally open)	2, 11
PC3000/DO/VERSION3/RLYFS11	Digital Output, 12 ch, 2 Relay n/o + 'Health' Relay	3, 11
PC3000/DO/VERSION3/LGC12	Digital Output, 12 ch, Logic, Open Collector NPN	4, 11
PC3000/DI/VERSION3/5LL14	Digital Input, 14 ch, 5V DC	5, 11
PC3000/DI/VERSION3/24LL14	Digital Input, 14 ch, 24V DC	6, 11
PC3000/DI/VERSION3/ACLL14	Digital Input, 14 ch, 24V AC	7, 11
PC3000/DI/VERSION3/HL14	Digital Input, 14 ch, 85-264V AC	8, 11
PC3000/DI/VERSION3/CC14	Digital Input, 14 ch, Contact Closure	9, 11

e.g.

Product Code	Module Type	Recommended Connection Coding Scheme
PC3000/AI/VERSION3/mV4	Analogue Input...	



Chapter 4

THE POWER SUPPLY

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header.
Version 3 modules may be used in the old Version 2 rack together with the enclosed new connector header.

Note: Version 1 racks require an original Version 1 Power Supply Unit.

Description

Each rack requires a Power Supply Unit; this provides the supply for the Local Controller Module, or in the case of the extension rack, the Rack Interface Module plus up to 12 I/O modules. The Power Supply is a universal design permitting operation over a wide range of international supply voltages.

The Power Supply Unit (PSU) occupies the extreme left hand position in a rack and includes indication of the status of the 24V and 5V supply rails. Absence of illumination of either indicator implies a failure of the corresponding supply rail.

The PSU is configured for operation on two supply ranges. Linking 10 and 11 enables the power supply to operate on lower line voltages.

The PSU has a metal cover to provide shielding of electromagnetic interference to the adjacent system modules.

The PSU includes a 'health' relay suitable for use in an external failsafe strategy.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

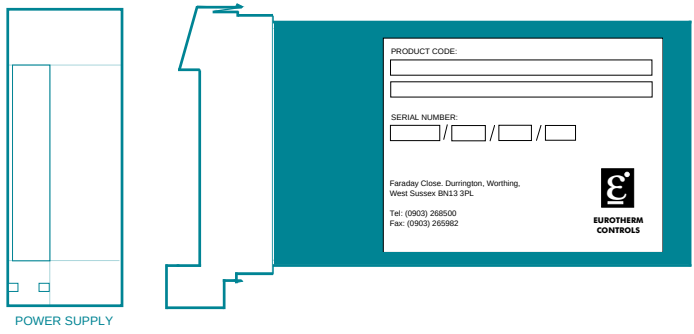
Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **PSU**.

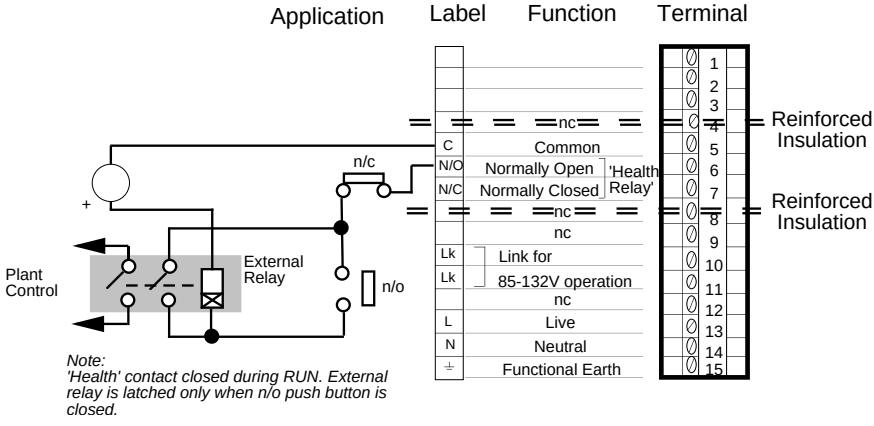
Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and reads:

PC3000/PSU/VERSION3/HAC/NONE - universal mains operation

Note: The 24V auxilary supply board is no longer available in Version 3 PSU.



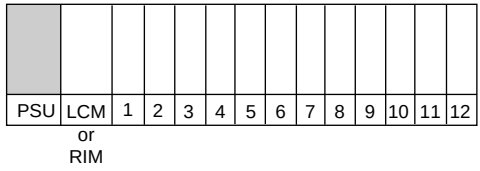
Connections



Note:
'Health' contact closed during RUN. External relay is latched only when n/o push button is closed.

The "Health" relay contacts have reinforced insulation to the line inputs, the"System", and to other modules.

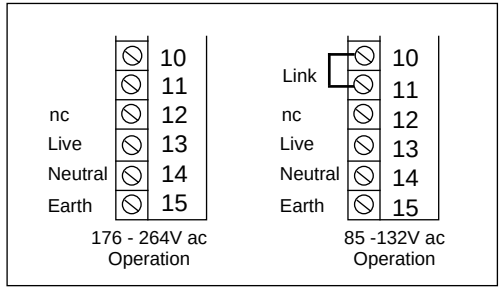
Location



Specification

Supply voltage:	85-132Vac 176-264Vac Link selectable on wiring connections
Supply frequency:	48-62Hz
Outputs:	24Vdc @ 1.6A max 5Vdc @ 2.5A max
Protection:	1.6A IEC 127 T Type
Inrush current:	25A cold start
VA requirement:	130VA max.

Link operation



CONFIGURATION OPTIONS

The following items must be checked prior to installing the module in the rack:

· Ensure that the watchdog or health relay operation is set:

(1) To activate after repeated watchdog errors and 1s delay following detection of the first occurrence (Holdoff).

(2) To activate immediately following detection of first error. See page 4-5 'Setting the Watchdog Relay Operation'.

WARNING

Ensure that the selected voltage range is correct before applying the mains supply.

Removing the metal sleeve

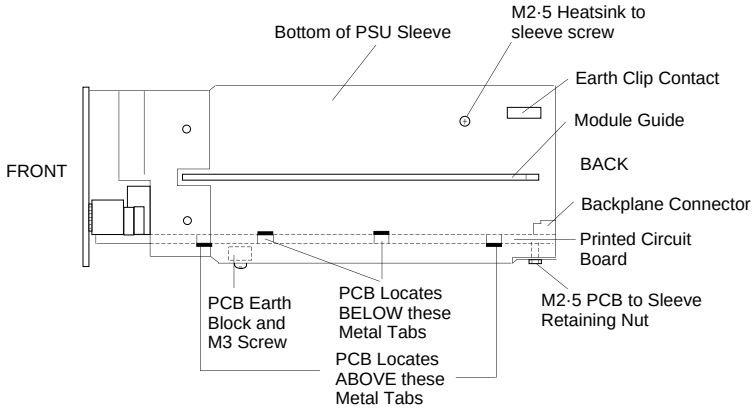
Caution

The module contains static sensitive components and care must be taken to ensure that the surface onto which the printed circuit board assemblies are to be placed and the user are at the same potential. Standard anti-static precautions should be observed.

If full anti-static precautions cannot be observed, personal grounding may be achieved by touching an earthed metal chassis or component prior to handling the module.

The metal sleeve must be removed in order to gain access to the motherboard:

(1) Remove the M3 screw and shakeproof washer which retains the printed circuit board earthing block to the sleeve, from the lower left hand side of the metal sleeve.



(2) Remove the two M2.5 screws that secure the main heatsink to the sleeve.

(3) Loosen the two M2.5 nuts retaining the backplane end of the motherboard to the sleeve.

(4) Slide the motherboard out of the metal sleeve towards the back of the sleeve.

(5) Fitment is the reversal of the process. However, care should be taken to ensure that the motherboard is located correctly within the metal tabs inside the sleeve (earlier versions only) and that the daughterboard retainer is fitted and aligned with the screw holes before tightening any fixing.

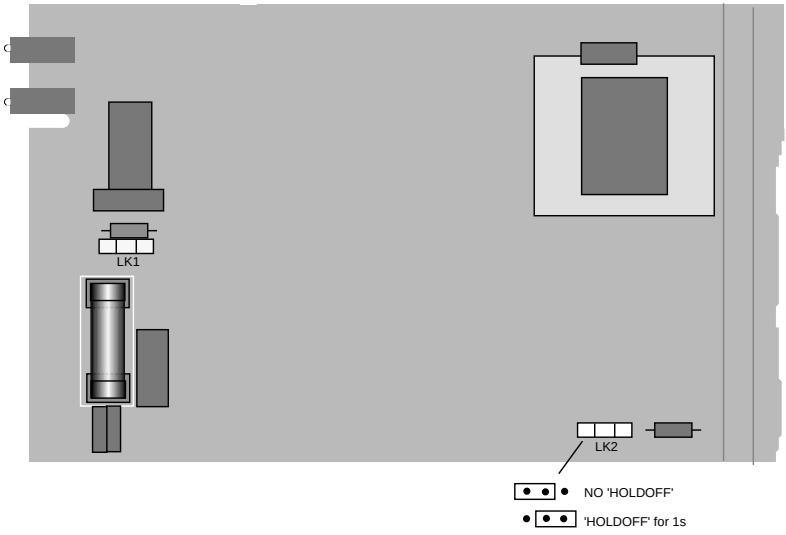
Setting the watchdog relay operation

The module includes a 'health' relay which is driven by the Local Controller or Rack Interface Modules' reset signal. At system start up, or following a fault which causes the modules' watchdog to generate a reset signal, the relay contacts will open for a minimum period of 100ms. The relay is non-latching and is intended to be used in conjunction with an external latching relay as part of an external 'failsafe' strategy. The status of the relay is indicated on the front of the power supply module. The status indicator is lit when the relay is closed i.e. the system is healthy.

The activation of the relay may be delayed by means of a link fitted to the power supply motherboard. This is used to ignore a single watchdog reset, but to take action if repeated resets occur.

This is an exceptional condition and the relay may be used as part of an external failsafe, or recovery strategy in order to ensure controlled recovery in the event of faults.

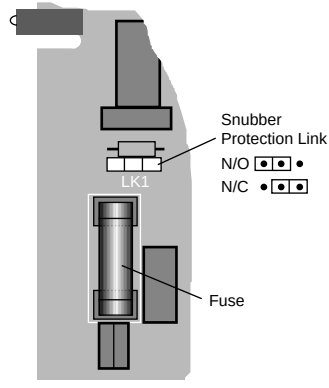
Link 2 selects the mode of operation.



The module is supplied with the link fitted in the 'NO HOLDOFF' position.

Setting the watchdog relay snubber protection

A resistor-capacitor combination is provided for contact protection. It may be connected across normally open or closed contacts. Link 1 selects the position. The snubber is connected across the normally open contact when the link is fitted in the position closest to the front of the pcb.



Fuse replacement

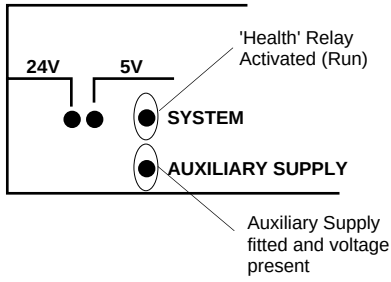
The only maintenance operation possible on the PC3000 Power Supply is fuse replacement. The fuse is located on the printed circuit board. To gain access the module must be removed from the rack as described previously. The fuse may be accessed through the side of the modules' metal sleeve.

A suitable replacement fuse is a glass 20mm, 1.6A time lag type (EN60127 type T) (Eurotherm part number:CH510162).

DIAGNOSTICS

Status indication

The following status indicators are provided:



The indicators are connected directly to the power supply outputs and indicate the presence of a voltage; there is a comparator function provided, which checks that the voltage rails are greater than the minimum value.The voltage rail indicators illuminate when the 24V rail exceeds 20V and the 5V rail exceeds 4.5V.

Procedure in the Event of Faults

(1) In the event of a flashing supply rail indicator check the following:

Is one of the voltage rails short circuit ?

Unplug modules until the fault is eliminated.

Can the fault be repeated with the module on the bench with no load connected ?

Is the supply selection link set for the correct mains voltage ?

(2) One or both supply rail indicators are off.

Is the mains input supply correct ?

Check and replace input fuse and cubicle main circuit breaker.

Check the voltage rails at the back of the module.

Chapter 5

LOCAL CONTROLLER MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

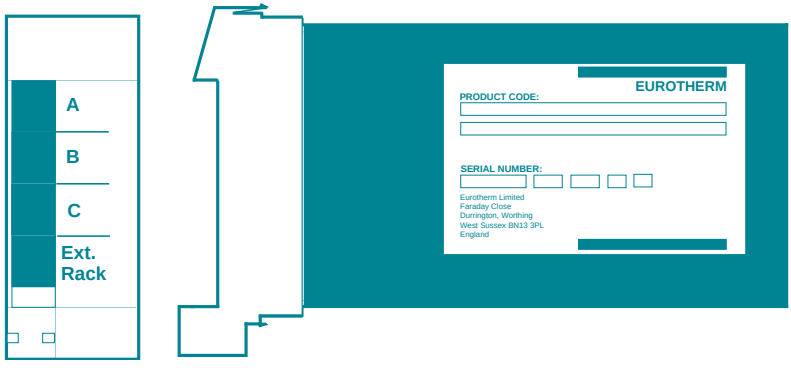
The Local Controller Module (LCM) is the central processor of the system and only resides in a slot within the master rack of a system. Subsequently slave racks use a Rack Interface Module (RIM) in place of the LCM and these occupy the LCM slot in these racks.

The LCM or RIM's occupy the slot immediately to the right of the PSU.

The LCM provides 3 x RS422 ports for communications with operator panels etc. The lower socket is provided for communication with extension racks.

Ports A and B support point-to-point communications only. Port C may be used in point-to-point or multidrop applications where multiple LCM's may be slave to a single master e.g. a supervisory computer.

Module identification



A label on the side of the module carries a serial number and product code in the form:

PC3000/LCM/VERSION2/slot1/slot2

slot1 and 2 refer to the expansion slots provided in the LCM. The contents of each will vary according to LCM configuration. The LCM includes 256K RAM as standard. Slot 1 may be fitted with RAM if larger application program memory is required. Slot 2 is reserved for special functions such as custom Function Block Libraries or application program source. Consult your local Eurotherm Controls

office for advice. Valid configurations are:

slot1 - NOMEM, 128KRAM, 512KRAM
slot2 - NOMEM, 128KRAM only

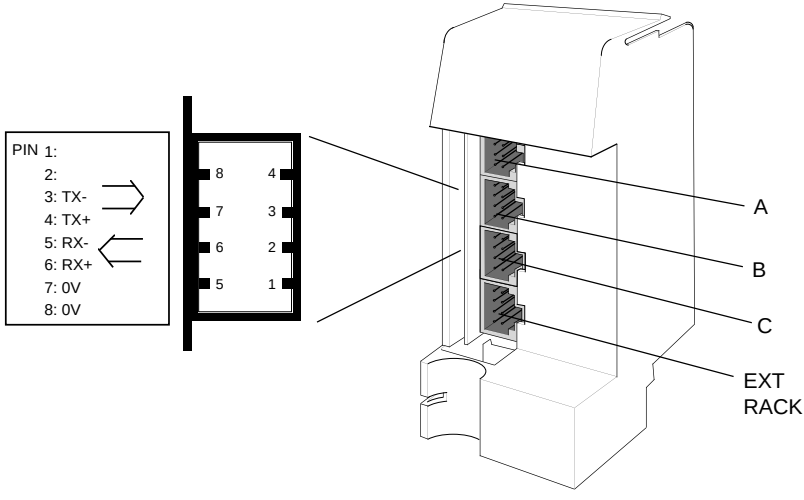
Examples are shown on the following page.

Type	Code
Local Controller fitted with 256K of RAM.	**PC3000/LCM/VERSION2/NOMEM/NOMEM**
Local Controller fitted with 768K of RAM.	**PC3000/LCM/VERSION2/512KRAM/NOMEM**
Local Controller fitted with 256K plus 128K for storage of source program	**PC3000/LCM/VERSION2/NOMEM/128KRAM**

Connections to serial ports

All serial communication connections including the extension rack interface are made via high density, latching, shielded connectors.

LCM serial ports A, B or C and extension rack connector

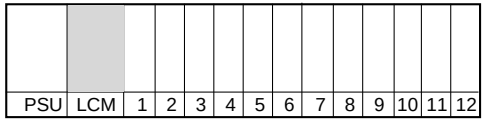


A range of cable assemblies are available from Eurotherm Controls to allow direct connection to a variety of standard devices. A list of available cable types may be found in the *PC3000 Technical Summary (HA022230)*

All serial ports, A, B and C support EI Bisync slave protocol at 9600 Baud by default with no program running. This provides direct compatibility with the PC based Programming Station. Other protocols may be selected from a range of supporting Function Blocks including JBus/Modbus, Toshiba EX, Siemens 3964R or a simple DIY-driver for custom protocols. Other protocols are under development. Consult your Eurotherm Controls contact for details.

I/O communication via the extension rack interface is by means of a proprietry Eurotherm Controls high speed protocol.

Location



Specification

Port A:	EI BiSynch (Slave) protocol at 9,600 baud	Default configuration following power on
Port B:	EI BiSynch (Slave) protocol at 9,600 baud	
Port C:	EI BiSynch (Slave) protocol at 9,600 baud	
Ext:	SI-BUS	

For alternative port baud rates consult the PC3000 Function Block Manual.

CONFIGURATION OPTIONS

The following items must be configured prior to installing the module in the rack:

(1) The communications base address or Group Identifier (GID)

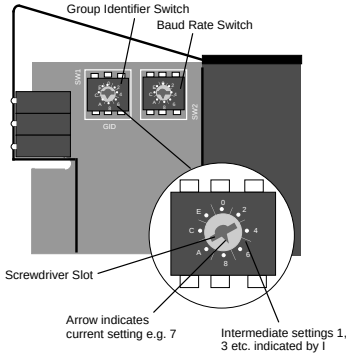
(2) The baud rate setting. This is used by the default EI BiSynch communications to the computer used for programming the PC3000.

(3) Receiver termination impedance on port C

Additional checks should include;

Are the correct number and type of RAM cards fitted?
Is the correct version of system and IOC firmware fitted ?

Setting the group identifier



It is necessary to set the group identifier (GID), or base address, in order to be able to communicate with the PC based Programming Station.

The GID is defined by the Eurotherm EI Bisync communications protocol used between the Programming Station and the PC3000.

The GID may also be necessary for use on other LCM serial ports using Bisync protocol.

A rotary switch located at the top of the module should be set by means of a screwdriver. It is accessed via the right hand side of the module. It may be set to any address in the range 0 to F.

The module must be removed from the rack for this operation or the adjacent I/O module slots in the rack must be empty so that sufficient space to insert a screwdriver is available. There is no requirement to remove the metal sleeve.

The position of the rotary switch is reflected in the Function Block parameter 'HW_Links'. This parameter is an output from the PcsSTATE Function Block.

For further details of the PcsSTATE Function Block see the Function Block reference HA022917.

> **Note:** The module is supplied with the switch set to position 7. This ensures compatibility with all late issue 'Version 1' format Local Controller Modules. These modules are fitted with links to set the GID and the factory despatches with all links fitted, setting GID to 7.

Setting the Baud rate

The right hand switch, SW2, sets the baud rate for communications between PC3000 and the computer used for programming. This baud rate setting only applies to the 'default' EI BiSynch communications link. It has no effect on the baud rate of other ports, which may be assigned to other protocols and different baud rates by the user program.

Baud Rate Switch Setting	Baud Rate Selected Port A and Port B	Baud Rate Selected Port C
0	1200 Baud	1200 Baud
1	2400 Baud	2400 Baud
2	4800 Baud	4800 Baud
3	9600 Baud (Note a)	9600 Baud
4	19200 Baud (Note b)	19200 Baud
5	38400 Baud (Note b)	38400 Baud
6	38400 Baud	57600 Baud (Note c)

Notes:

a. The highlighted row represents the default setting as supplied by the factory. A change to any other setting must be accompanied by a corresponding change on the PC based Programming Station. Refer to the PC3000 User Guide - Book 1 Programming for details of editing "Device Configuration".

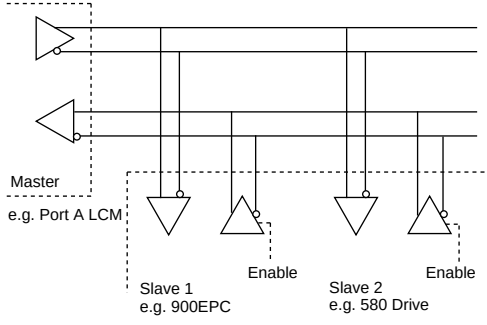
b. If 19200 baud is selected as the default baud rate then ports A and B on the LCM cannot run at 38400 baud with user program comms drivers. Similarly if the default is set to 38400 then 19200 will be reflected on drivers running on ports A or B of the LCM.

c. Experience gained with the use of these higher baud rates (above 38400), has shown that most PC's tend to become unreliable in terms of their response to communications messages. Whilst the Programming Software has built in retry mechanisms for communications errors, the use of rates above 38400 is not recommended and performance cannot be guaranteed.

Types of communication

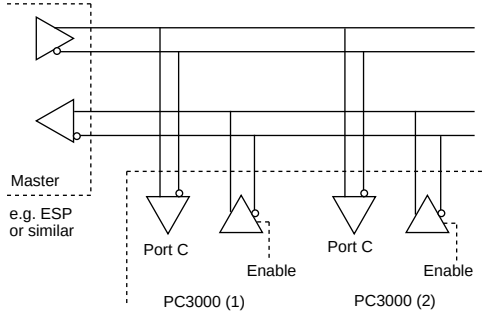
Point-to-point communications (RS422)

Only one master. The master has its transmitter permanently enabled. Ports A and B behave in this way on the LCM. On early LCM's port C also only operated in this mode. This restriction means that Port A and B cannot be used in situations where a PC3000 must share a comms link with other PC3000's, instruments etc. e.g. a link to ESP. Ports A and B have the electrical characteristics of RS422 which permits up to 10 slave devices.

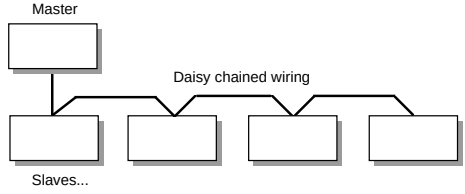


Multi-drop communications (RS422/RS485)

Only one master. Note that here the PC3000's are multi-dropped because port C provides a transmit enable line. This connection still uses the 4 wire interface. Port C has the electrical characteristics of RS485 but only supports the 4 wire configuration. This permits up to 31 slave devices.



Note: These diagrams are shown using a 'bussed' structure for ease of drawing. In practice the racks would be wired together in a 'daisy chain' e.g.



Removing the metal sleeve

The metal sleeve must be removed for the following operations:

- Fitment of additional RAM cards
- Selection of termination impedance on communications port C.

Caution

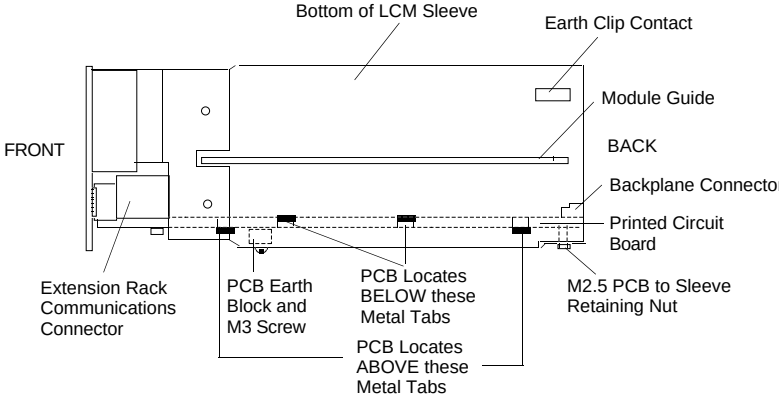
The module contains static sensitive components and care must be taken to ensure that the surface onto which the printed circuit board assemblies are to be placed and the user are at the same potential. Standard anti-static precautions should be observed.

If full anti-static precautions cannot be observed, personal grounding may be achieved by touching an earthed metal chassis or component prior to handling the module.

The metal sleeve must be removed in order to gain access to the mother-board.

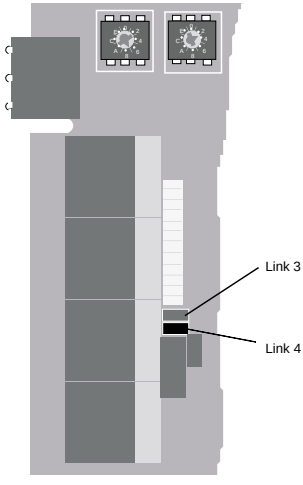
(1) Remove the M3 screw and shakeproof washer which retains the printed circuit board earthing block to the sleeve, from the lower left hand side of the metal sleeve.

(2) Loosen the two M2.5 nuts retaining the backplane end of the motherboard to the sleeve.



(3) Slide the motherboard out of the metal sleeve towards the back of the sleeve.

(4) Fitment is the reversal of the process. However, care should be taken to ensure that the motherboard is located correctly within the metal tabs inside the sleeve before tightening any fixing.



Selecting the termination impedance on port C

Links are provided to select termination impedance for both transmit and receive channels. The links are located behind the port C serial connector on the motherboard. The metal sleeve must be removed in order to carry out this operation. The module is supplied with both links fitted. This is intended for point-to-point use.

Link 3 may be fitted for 100 R termination on the receive pair.
Link 4 may be fitted for 100 R termination on the receive pair.

In multi-drop applications care should be taken to ensure that the receive pair is terminated at one point only to avoid excessive loading.

It is recommended that the PC3000 furthest from the master carries the termination.

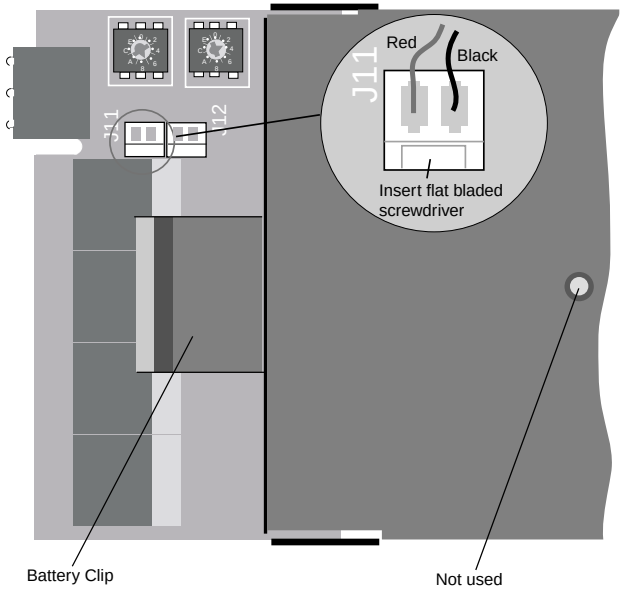
Note: The internal termination resistors are intended for use on a point-to-point link. In multi-drop applications it is recommended that both link 3 and 4 are omitted and that all PC3000's or instruments are terminated externally. This eases spares holding since all units may be identically configured (refer to diagram on 21-19).

Other links

	Default	Function
Link 1	Not fitted (note 1)	Hardware Bus Error handling enabled when removed
Link 2 interrupt	Not fitted (note 2)	Power fail generates a non-maskable if fitted
Note 1.	From July 1993 the LCM is supplied with Version 2.27 firmware. This link MUST be removed for use with this version.	
	Earlier versions e.g. 2.09 require that the link is fitted.	
Note 2.	Provided for future development - do not fit	

Battery replacement

Battery life is determined by a number of factors; the number of RAM cards fitted, the 'utilisation' of the PC3000 and the operating temperature. Whilst it is not



uncommon for batteries to operate over a 5 year period, Eurotherm Controls recommend batteries are replaced every year.

The module is fitted with dual battery connectors. The program and the real time clock may be maintained if a second battery is connected on the second connector before the original battery is disconnected.

Whilst not recommended practice the battery may be replaced with the module in situ and with power providing suitable care is taken to ensure that the power supply is not shorted, which will result in lost application program.

The Lithium cell may be replaced whilst the module is on the bench by removing the connector from J11 and the battery from the retaining clip located on the metal sleeve. Replacement is the reversal of replacement. It should be noted that both program and real time clock will be lost as a result, in the event that an error results in program corruption.

WARNING

Lithium cells contain corrosive materials that ultimately decompose and form harmless substances. However, in small quantities Lithium batteries may be disposed of on landfill sites because they do not contain heavy metals, organic poisons, or other non-volatile toxic agents. The reaction products are inorganic and do not represent a danger to the environment.

Batteries must not be disposed of by incineration or crushing. It is recommended that spent cells are packed suitably for transit to landfill sites, by removal or by isolation of the terminals and inclosing individual batteries in polythene bags.

Note: Storage of spare batteries; the storage life of a Lithium cell is largely determined by temperature. Life will be maximised if spares are maintained below 25°C.

A new battery has a terminal voltage of 3.6V. The PC3000 Function Block Library contains a Function Block, PcsSTATE, which includes a parameter for 'Battery_Cond', which reports the state of the battery. The following states are reported:

Voltage	'Battery_Cond'
3.6->3.0V	GOOD
3.0->2.8V	LOW
<2.8V	FAULTY

Once the LOW condition is indicated, it is recommended that the battery is replaced within one week.

The application program will be lost if the battery voltage falls below 2V.

Note: Because of micro-amp leakage currents into the battery the 'Battery_Cond' parameter should be examined within 30 seconds of power-up, for an accurate indication of the battery condition.

UPGRADING HARDWARE

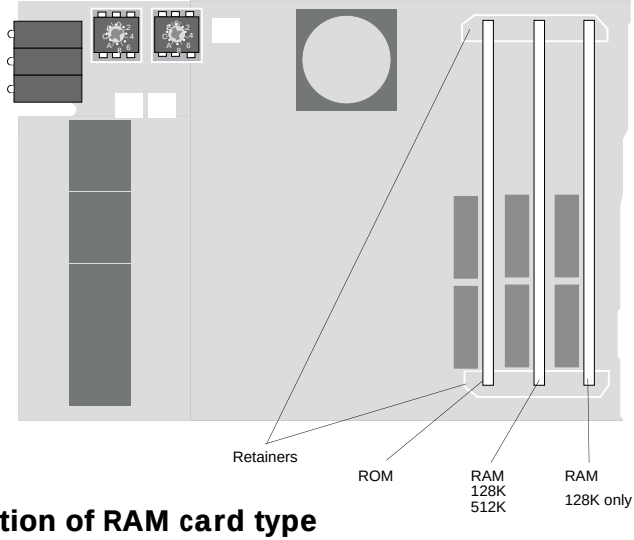
Adding additional RAM cards

In the event of an installed PC3000 application being extended to provide additional control features it may be necessary to fit additional, or larger capacity, RAM cards.

The metal sleeve should be removed as described previously.

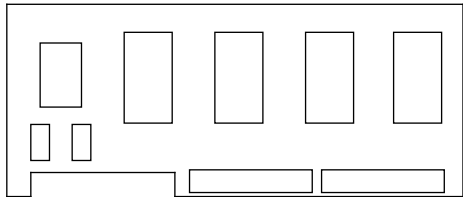
With the motherboard on a suitable anti-static surface remove the retainers by unscrewing the self-tapping screws. The RAM card may be replaced by unplugging and removing the card and plugging in the replacement, taking care to ensure that the sockets are aligned correctly and that the RAM card sits squarely on the mother-board. Refit daughterboard retainer and sleeve in the reverse order.

Note: The second RAM board slot may only be fitted with the 128K byte RAM card.

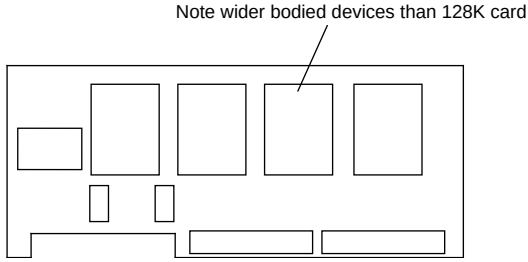


Identification of RAM card type

128K: Part No. 021724



512K card: Part No. 024297



Identification of firmware version

The system firmware is recorded on a label fitted to the plug-in EPROM card. It may be viewed through the gap between the extension rack connector and the case. The label reads:

RD023577UXXX where XXX refers to the version number e.g. 209 = V2.09

The I/O Concentrator (IOC) firmware version is recorded on a label fitted to the EPROM. It may be viewed through the back of the sleeve. The label reads:

RD023576UXXX where XXX refers to the version number e.g. 102=V1.02

Version compatibility

The table shows the major interfaces. In general, I/O modules are compatible with one another and all interfaces listed in the table. However, Eurotherm Controls operates a policy of continuous product development, adding new features and modules to subsequent releases. If in doubt, please contact your local Eurotherm Controls office.

	*Aug 1993 on	Nov 1991-Aug 1993	
System	2.27	2.09	1.08
IOC	1.02	1.02	1.01
Intelligent Comms Module	2.01	1.00 1.02	1.00 1.02
Function Blocks	2.27		1.10
PS	1.03/x	1.03/x	1.02/x
Microcell	**	1.64	-

* At the time of publication (March 1994), a new release of System Firmware, Function Blocks and PS is scheduled for release in April 1994. Compatibility will be

detailed in the accompanying release notes.

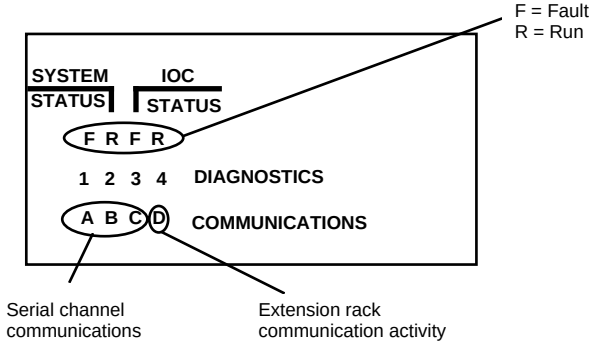
** Please contact Eurotherm Controls Inc.U.S.A. (Address and telephone on back of handbook)

DIAGNOSTICS

Status indication

The LCM has a set of status indicators which are visible through the rack fascia. The primary functions and positions are shown above.

Fault indicators will be illuminated during initialisation and during reset. During normal operation the two green status indicators will be illuminated.



The upper group of four indicators are:

Function	Colour	Notes
System Run	Green	System passed all power on tests and ‘healthy’
System Fault	Red	System watchdog or reset has occurred
I/O Processor Run	Green	IOC power on confidence tests passed and 'healthy'
I/O Processor Fault	Red	IOC watchdog or reset has occurred

The system fault indicator is used to encode any fault condition detected during the power on confidence tests by means of a 'morse' code dot-dash indication. There is a pause of approximately 1 second between repetitions of the morse code.
The IOC 'Run' indicator will normally be illuminated under these conditions.

Main processor 'Fault' codes

Fault Indicator	Morse Code	Diagnostic Indicators	Fault
Off	None	Off Off Off Off	No fault
On	None	Off Off Off Off Off	No or badly fitted EPROM card
On	dot,dot,dot,dash	Off Off Off On	EPROM card not properly fitted
On	dot,dot,dash,dot	Off Off On Off	Motherboard RAM Failure
On	dot,dot,dash,dash	Off Off On On	RAM board slot 2 failure
On	dot, dash, dot,dot	Off On Off Off	RAM board slot 3 failure
On	dot,dash,dot,dash	Off On Off On	Floating Point Unit failure
On	dot,dash,dash,dot	Off On On Off	Watchdog recovery failure

Main processor 'Fault' codes (continued)

Fault Indicator	Morse Code	Diagnostic Indicators	Fault
On	dot, dash, dash, dash	Off On On On	Reserved
On	dash,dot,dot,dot	On Off Off Off	Reserved
On	dash,dot,dot,dash	On Off Off On	Reserved
On	dash,dot,dash,dot	On Off On Off	Real-Time clock failure
On	dash,dot,dash,dash	On Off On On	Port A comms failure
On	dash,dash,dot,dot	On On Off Off	Port B comms failure
On	dash,dash,dot,dash	On On Off On	Port C comms failure
On	dash,dash,dash,dot	On On On Off	(Reserved)
On	dash,dash,dash,dash	On On On On	Recurrent spurious interrupt

The Diagnostic Indicators listed above refer to the middle row of yellow indicators on the Version 2 LCM. They are only driven by V2-27 firmware or later; earlier firmware versions indicate a fault by means of the morse indication.
The lower row of indicators provide a monitor of communications channel activity:

Function	Colour	
Port A	Yellow	Transmit/Receive on port A
Port B	Yellow	Transmit/Receive on port B
Port C	Yellow	Transmit/Receive on port C
Ext Rack	Yellow	Transmit/Receive on Ext Rack

Procedure in the event of faults

(1) In the event of a flashing system fault indicator after power on check the following:

Can the 'morse' be identified and matched to the table above?

Are the RAM and EPROM boards correctly and securely fitted?

Are the Programming Station, System Firmware and Function Block issues compatible with one another?

Are special modules such as the communications modules or the eight channel analogue input/output module (i.e. modules located in the first five slots of the main rack) correctly fitted?

(2) Program lost on power down or failure for program to restart.

Is the battery voltage low?

Check PcsSTATE Function Block and replace battery.

Has the start up strategy been selected correctly?

Check the PcsSTATE Function Block.

Check the contents of the system error log. Refer to error codes in the PC3000 Real Time Operating System Reference (HA022918).

(3) Failure during program download.

Is the RAM fitted to the LCM large enough to accommodate the program?

Is PC3000ORG set correctly on the Programming Station for this issue of system firmware? Refer to the PC3000 User Guide Book 1, Programming, for details of PC3000ORG, and Appendix C in this handbook.

If the program includes a downloadable Function Block library, is a 128K RAM card fitted in slot 2?

Is the GID set correctly?

Is the PC3000 in the correct mode to download?

Chapter 6

LOCAL CONTROLLER PLUS MODULE

Contents

Description

The Local Controller Plus Module is an enhanced version of the standard Local Controller Module (LCM). It is the central processor of the system and only resides in a slot within the master rack of a system. Subsequent slave racks use a Rack Interface Module (RIM) in place of the LCM and these occupy the LCM slot in these racks.

The LCM-Plus or RIM's occupy the slot immediately to the right of the PSU.

The LCM-Plus provides 2 x RS232/422/485 + 1 x RS422/485 for communications with operator panels etc. The lower socket is provided for communication with extension racks ONLY.

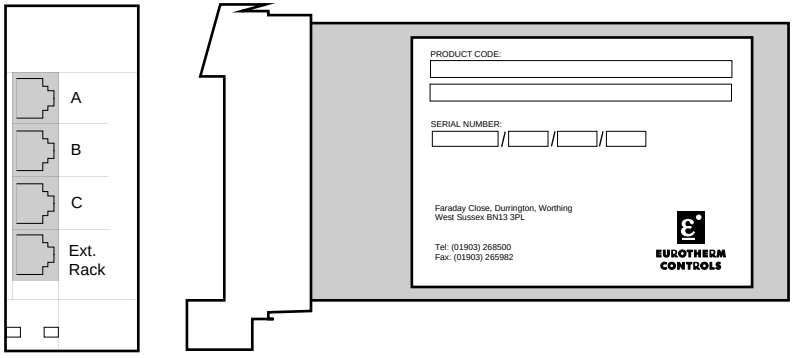
Ports A, B and C may be used in point-to-point or multidrop applications where multiple LCM's may be slave to a single master e.g. a supervisory computer.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces or this product.

Module identification



A label on the side of the module carries a serial number and product code in the form:

PC3000/LCMPLUS/VERSION3/slot1/slot2

Slot 1 - expansion memory for applications

Slot 2 - further expansion and memory for downloadable function blocks

Valid configurations are:

slot1 - NOMEM, 128KRAM, 512KRAM, user Eprom
slot2 - NOMEM, 128KRAM, 512KRAM

Examples are shown on the following page.

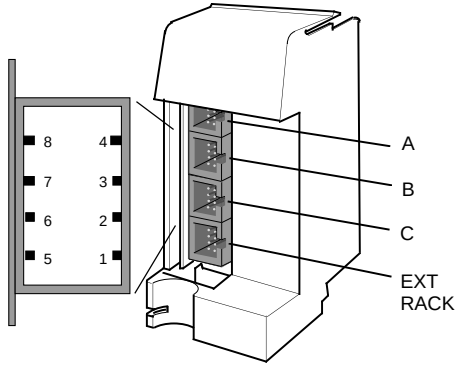
Type	Code
Local Controller Module Plus fitted with 512K of RAM.	**PC3000/LCM-PLUS/VERSION3/NOMEM/NOMEM/312**
Local Controller Module Plus fitted with 1536K of RAM.	**PC3000/LCM-PLUS/VERSION3/512KRAM/512KRAM/312**
Local Controller Module Plus fitted with 512K plus 128K for storage of source program	**PC3000/LCM-PLUS/VERSION3/NOMEM/128KRAM/312**

Connections to serial ports

All serial communication connections including the extension rack interface are made via high density, latching, shielded connectors.

LCM serial ports A, B or C and extension rack connector

Pin Number	Operating Mode		
	RS232	RS485 2-wire	RS485 4-wire
1	Rx	N/A	N/A
2	Tx	N/A	N/A
3	N/A	Rx/Tx-	Tx-
4	N/A	Rx/Tx+	Tx+
5	N/A	N/A	Rx-
6	N/A	N/A	Rx+
7	0V	0V	0V
8	0V	0V	0V
Cable screen	Rack earth	Rack earth	Rack earth



Notes

1. The RS232 connections on the

   LCM-Plus differ from those on the version 2 ICMs.

2. RS232 is not available on Port C, as there are no connections to Port C's pins 1 and 2.

3. The connection system automatically connects the cable screen to the LCM's case, and hence to the rack.

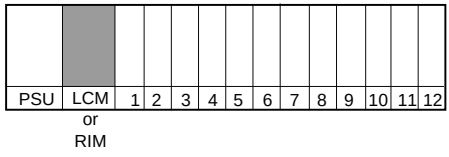
4. In 4-wire RS485 mode the receive pair may be exchanged with the transmit pair on Port A using links on the PCB.

A range of cable assemblies is available from Eurotherm Controls to allow direct connection to a variety of standard devices. A list of available cable types may be found in the *PC3000 Technical Summary (HA022230)*

All serial ports, A, B and C support EI Bisync slave protocol the baud rate set by SW2, by default with no program running. This provides direct compatibility with the PC based Programming Station. Other protocols may be selected from a range of supporting Function Blocks including JBus/Modbus, Toshiba EX, Siemens 3964R or a simple DIY-driver for custom protocols.

I/O communication via the extension rack interface is by means of a proprietary Eurotherm Controls high speed protocol.

Location



CONFIGURATION OPTIONS

The following items must be configured prior to installing the module in the rack:

(1) The communications base address or Group Identifier (GID)

(2) The default baud rate setting. This is used by the default EI BiSynch communications to the computer used for programming the PC3000.

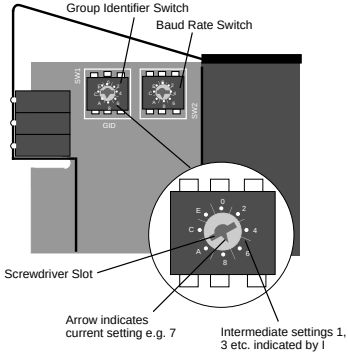
(3) Communications standard on ports A, B and C.

(4) Receiver termination impedance port A, B and C.

Additional checks should include;

Are the correct number and type of RAM cards fitted?
Is the correct version of system and IOC firmware fitted ?

Setting the group identifier



It is necessary to set the group identifier (GID), or base address, in order to be able to communicate with the PC based Programming Station.

The GID is defined by the Eurotherm EI Bisync communications protocol used between the Programming Station and the PC3000.

The GID may also be necessary for use on other LCM-Plus serial ports using Bisync protocol.

A rotary switch located at the top of the module should be set by means of a screwdriver. It is accessed via the right hand side of the module. It may be set to any address in the range 0 to F.

The module must be removed from the rack for this operation or the adjacent I/O module slots in the rack must be empty so that sufficient space to insert a screwdriver is available. There is no requirement to remove the metal sleeve.

The position of the rotary switch is reflected in the Function Block parameter 'HW_Links'. This parameter is an output from the PcsSTATE Function Block.

For further details of the PcsSTATE Function Block see the Function Block reference HA022917.

> **Note:** The module is supplied with the switch set to position 7. This ensures compatibility with all late issue 'Version 1' format Local Controller Modules. These modules are fitted with links to set the GID and the factory despatches with all links fitted, setting GID to 7.

Setting the Baud rate

The right hand switch, SW2, sets the baud rate for communications between PC3000 and the computer used for programming. This baud rate setting only applies to the 'default' EI BiSynch communications link. It has no effect on the baud rate of other ports, which may be assigned to other protocols and different baud rates by the user program.

Baud Rate Switch Setting	Baud Rate Selected Port A and Port B	Baud Rate Selected Port C
0	1200 Baud	1200 Baud
1	2400 Baud	2400 Baud
2	4800 Baud	4800 Baud
3	9600 Baud (Note a)	9600 Baud
4	19200 Baud (Note b)	19200 Baud
5	38400 Baud (Note c)	38400 Baud
6	38400 Baud	57600 Baud (Note c)

Notes:

a. The highlighted row represents the default setting as supplied by the factory. A change to any other setting must be accompanied by a corresponding change on the PC based Programming Station. Refer to the PC3000 User Guide - Book 1 Programming for details of editing "Device Configuration".

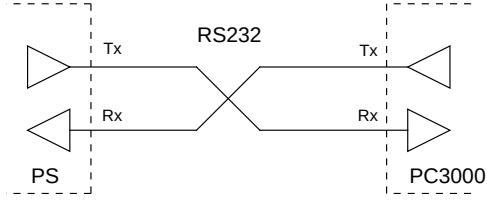
b. If 19200 baud is selected as the default baud rate then ports A and B on the LCM-Plus cannot run at 38400 baud with user program comms drivers. Similarly if the default is set to 38400 then 19200 will be rejected on drivers running on ports A or B of the LCM-Plus.

c. Experience gained with the use of these higher baud rates (above 38400), has shown that most PC's tend to become unreliable in terms of their response to communications messages. Whilst the Programming Software has built in retry mechanisms for communications errors, the use of rates above 38400 is not recommended and performance cannot be guaranteed.

Types of communication

Point-to-point communications

RS232 can only be used for point-to-point communications such as the programming tools communicating with one LCM-Plus. RS485 may also be used for this type of communication where an increased level of noise immunity and connection distance is required.



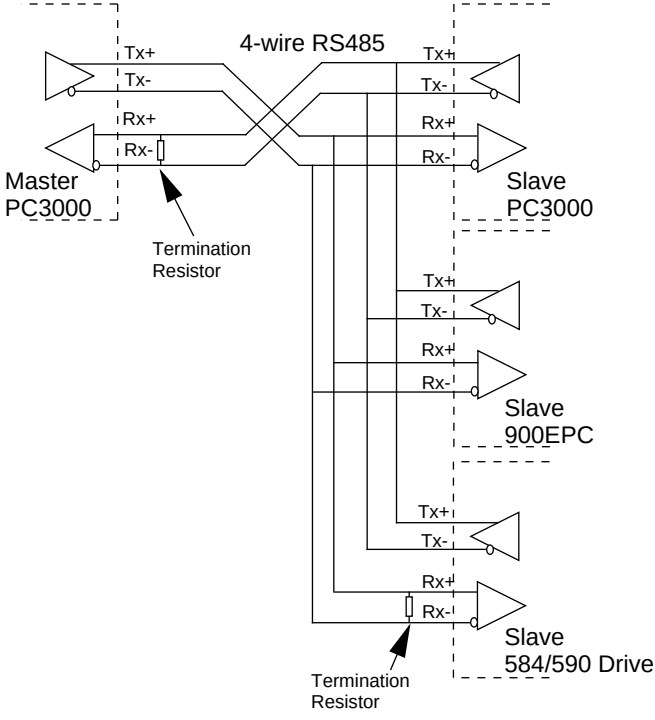
Note: The RS232 connections on the LCM-Plus differ from those on the version 2 ICM.

Version 3 ICM will work with either cable.

All communication channels have functional insulation (50V) from the system, but share a common ground - 0V. Care is therefore required when mixing RS232 and RS485 communications which may well require insulation between them.

Multi-drop communications

In multi-drop communications one master is connected to many slaves. Multi-drop communications requires the ports to be RS485.



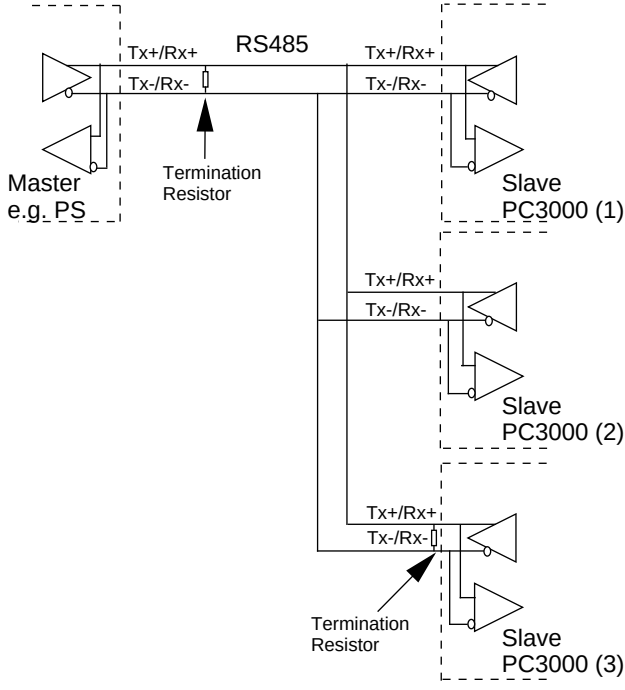
With 4-wire RS485 connection the transmit pair from the communications master are connected to the receive pair of all the slaves. Correspondingly the transmit pairs from all the slaves are connected to the receive pair of the master. An RS485 link of this type uses two connections for each direction making a total of four wires plus one ground.

Notes:

1. Note position of termination resistors

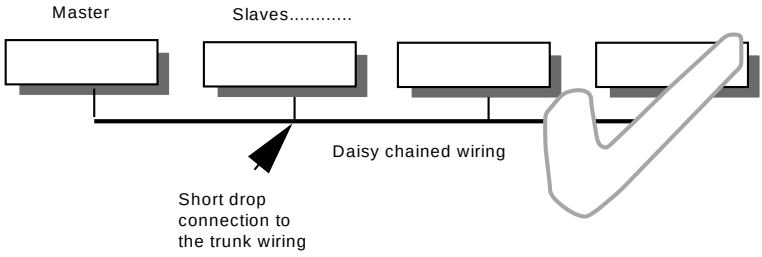
2. Keep spur lengths very short.

With the 2-wire RS485 communication standard two wires are used for both directions of communication. This communications standard will not be suitable for Master-Slave protocols which allow a reply to begin before the request has been completed (known as FULL DUPLEX protocols).

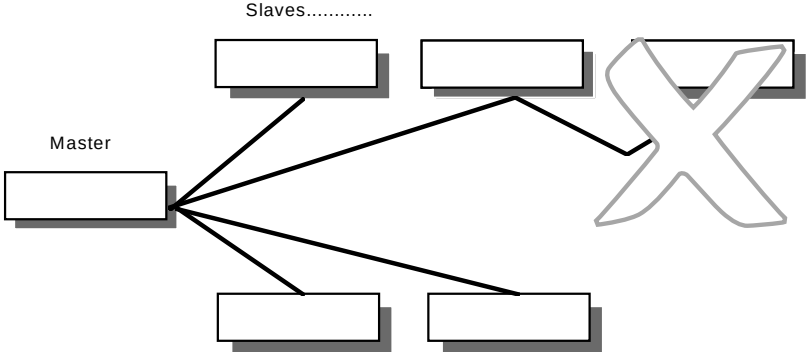


The above diagrams show the specific connections for multi-drop communications. In practice the racks would be wired together in a ‘daisy chain’. The two ends of the daisy chain should be terminated either by using link options on the LCM-Plus or by fitting external 120Ω resistors. Termination is particularly important where cable lengths are long or baud rates are high.

More detail on how to connect termination resistors is shown in the section on communication configuration links.



Multi-drop communications should not be connected together in a star or other non chain configuration.



Removing the metal sleeve

The metal sleeve must be removed for the following operations:

- Fitment of additional RAM cards
- Selection of communication standard for ports A, B and C.
- Selection of termination impedance on communications ports A, B and C.

Caution

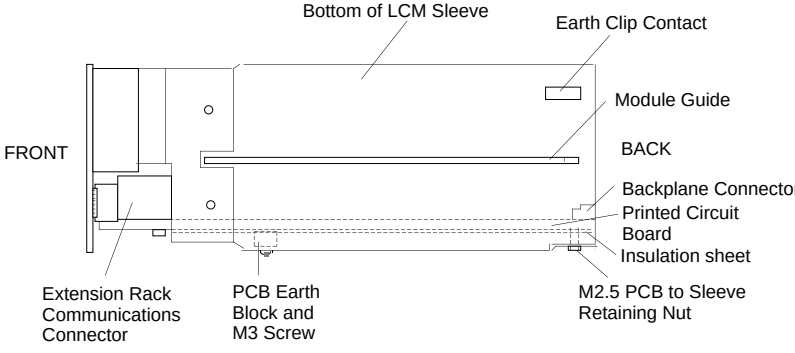
The module contains static sensitive components and care must be taken to ensure that the surface onto which the printed circuit board assemblies are to be placed and the user are at the same potential. Standard anti-static precautions should be observed.

If full anti-static precautions cannot be observed, personal grounding may be achieved by touching an earthed metal chassis or component prior to handling the module.

The metal sleeve must be removed in order to gain access to the motherboard.

(1) Remove the M3 screw and shakeproof washer which retains the printed circuit board earthing block to the sleeve, from the lower left hand side of the metal sleeve.

(2) Loosen the two M2.5 nuts retaining the backplane end of the motherboard to the sleeve.



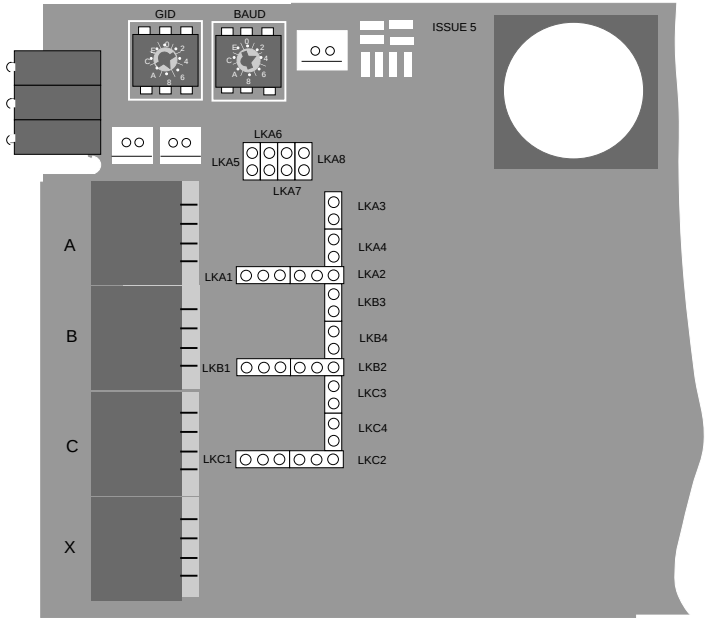
(3) Slide the motherboard out of the metal sleeve towards the back of the sleeve.

(4) Fitment is the reversal of the process. However, care should be taken to ensure that the motherboard is located correctly within the metal tabs inside the sleeve before tightening any fixing.

Communication configuration links

(The following refers to LCM-Plus modules Issue 5 onwards.)

Links are provided to select termination, transmitter and receiver enable, 2 or 4 wire operation and Tx/Rx swap for RS485 communications. The links are located behind the serial connectors on the front of the motherboard. The metal sleeve must be removed in order to change the serial port links.



LKA1-8 configure port A, LKB1-4 configure port B and LKC1-4 configure port C. The links have the following functions -

3 pin links may have the shorting link fitted in the forward position (towards the front of the LCM-Plus), the rear position (towards the rear of the LCM-Plus) or not fitted at all. When not fitted the shorting link may be 'parked' by hanging it off one pin.

Links	Forward position	Rear position	Not fitted
LKA1	120Ω termination	Not terminated	Not terminated
LKB1	on receiver (default)		
LKC1			
LKA2	Transmitter	Transmitter disabled	Transmitter disabled
LKB2	permanently enabled	when not transmitting	when not transmitting
LKC2	Receiver permanently enabled (default)	Receiver disabled when transmitter enabled	Receiver always enabled

2 pin links may be fitted or not fitted with a shorting link. When not fitted the shorting link may be 'parked' by hanging it off one of the pins.

Links	Fitted	Not fitted
LKA3 & 4	Transmit and receive	Transmit and receive
LKB3 & 4	shorted (2-wire)	separate (4-wire) (default)
LKC3 & 4		

Swap links may be fitted with all four vertical or all four horizontal. The swap links (LKA5-LKA8) are only available on channel A of the LCM-Plus and permit simple swapping of the transmit and receive pairs.

Links	Vertical - 	Horizontal - 
LKA5-LKA8	Swapped	Normal (default)

RS232 is chosen by selection of appropriate wiring of the connectors. The configuration links have no effect for RS232. RS232 is not available on port C of the LCM-Plus.

It is not possible to cover all possible uses of the communication links to and from an LCM-Plus but the following table shows how the links would be set for some of the typical uses. In the table link LK*1 refers to LKA1 for channel A, LKB1 for channel B and LKC1 for channel C etc.

Requirement	**Links**	**Comments**
RS232 Point to point	not applicable	The links are ignored for RS232 connection
RS485 Point to point 4-Wire	LK*1 forward position LK*2 forward position LK*3 & 4 not fitted LKA5-8 as required (port A only)	Receiver terminated Tx and Rx permanently enabled Tx and Rx separate Optional swap if not in cable (Note 1)
RS485 Point to point 2-wire (Suitable for half duplex protocols only)	LK*1 forward position LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Receiver terminated Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Swap not required
RS485 Master 4-wire	LK*1 as required LK*2 forward position LK*3 & 4 not fitted LKA5-8 vertical (port A only)	Optional receiver termination (Note 2) Tx and Rx permanently enabled Tx and Rx separate Swapped (Note 1)
RS485 Master 2-wire (Suitable for half duplex protocols only)	LK*1 as required LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Not swapped
RS485 Slave 4-wire	LK*1 as required LK*2 not fitted LK*3 & 4 not fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disable when not transmitting, Rx permanently enabled Tx and Rx separate Not swapped
RS485 Slave 2-wire (Suitable for half duplex protocols only)	LK*1 as required LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Not swapped

Notes:

1. PC3000 cables supplied by Eurotherm do not swap the receive and transmit pairs. Where these cables are used to connect from one PC3000 to another it will be necessary to introduce a swap on one end of point to point connections or the master connection of Master-Slave connections. This can be done either by using links LKA5-8 (port A only) or external to the LCM-Plus on terminal block assemblies. For further details of cabling options please refer to the section on cabling in the PC3000 installation handbook.

2. Termination resistor(s) should be fitted to *both* ends of the cable used for RS485 connections. All other connections to the cable should not be terminated. Correct termination is particularly important when cable lengths are long. A '4-wire' cable can be terminated by connecting a 120Ω resistor between the Rx+ and Rx- for each end. A '2-wire' cable can be terminated by connecting a single 120Ω resistor between Rx/Tx+ and Rx/Tx-. A single link selectable termination resistor is provided on the LCM-Plus between Rx+ and Rx- (Rx/Tx+ & Rx/Tx- when Tx and Rx are shorted by LK*3 & 4). This link can be used to provide the required termination in some configurations but other configurations will require external termination resistors.

Battery

Caution

The battery used in this device may present a risk of fire or chemical burn if mistreated. Do not recharge, disassemble, heat above 100°C, or incenerate.

Only replace battery assembly with Eurotherm part, **SUB3K/SPARE/LCM/VERSION3/BATT**.

Use of another battery may present a risk of fire or explosion.

Battery life

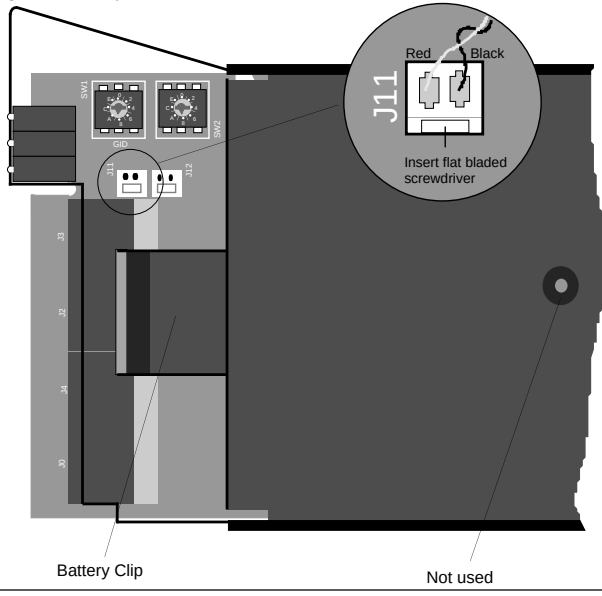
Battery life is determined by a number of factors; the number of RAM cards fitted, the 'utilisation' of the PC3000 and the operating temperature. Whilst it is not uncommon for batteries to operate over a 5 year period, Eurotherm Controls recommend batteries are replaced every year.

> **Note:** Storage of spare batteries; the storage life of a Lithium cell is largely determined by temperature. Life will be maximised if spares are maintained below 25°C.

Battery replacement

The Lithium cell may be replaced whilst the module is on the bench by removing the battery from the retaining clip located on the metal sleeve and then removing the battery connector. Refitting is the reversal of replacement.

The module is fitted with dual battery connectors. The program and the real time clock may be maintained if a second battery is connected on the second connector before the original battery is disconnected.



Lithium cells contain corrosive materials that ultimately decompose and form harmless substances. The reaction products are inorganic and do not represent a danger to the environment once the decomposition process has terminated.

Dispose of used batteries promptly. Keep away from children. Do not disassemble and do not dispose of in fire.

Battery condition

A new battery has a terminal voltage of 3.6V. The PC3000 Function Block Library contains a Function Block, PcsSTATE, which includes a parameter for 'Battery_Cond', which reports the state of the battery. The following states are reported:

Voltage	'Battery_Cond'
3.6->3.0V	GOOD
3.0->2.8V	LOW
<2.8V	FAULTY

Once the LOW condition is indicated, it is recommended that the battery is replaced within one week.

The application program will be lost if the battery voltage falls below 2V.

> **Note:** Because of micro-amp leakage currents into the battery the 'Battery_Cond' parameter should be examined within 30 seconds of power-up, for an accurate indication of the battery condition.

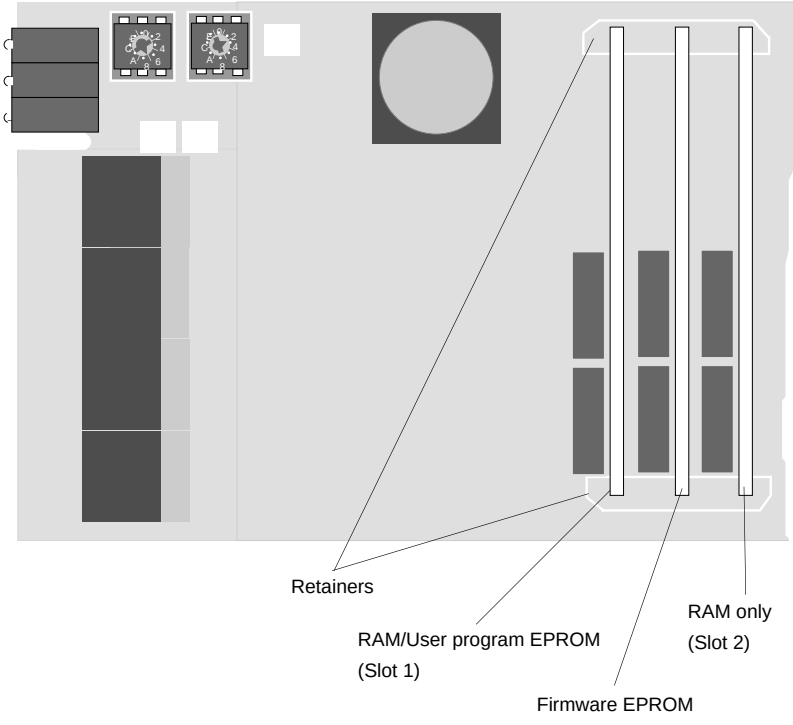
UPGRADING HARDWARE

Adding additional RAM cards

In the event of an installed PC3000 application being extended to provide additional control features it may be necessary to fit additional, or larger capacity, RAM cards.

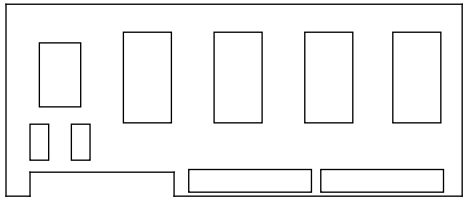
The metal sleeve should be removed as described previously.

With the motherboard on a suitable anti-static surface remove the retainers by unscrewing the self-tapping screws. The RAM card may be replaced by unplugging and removing the card and plugging in the replacement, taking care to ensure that the sockets are aligned correctly and that the RAM card sits squarely on the mother-board. Refit daughterboard retainer and sleeve in the reverse order.

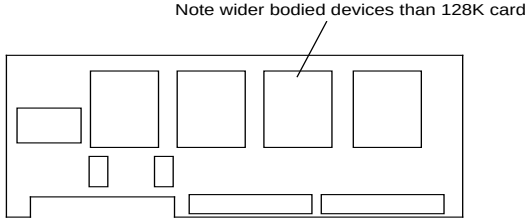


Identification of RAM card type

128K: Part No. 021724



512K card: Part No. 024297



Daughter Card Configuration Information

The base board contains 512k of RAM. The front slot may be fitted with a 128k or 512 RAM card in order to extend the memory available for the user program.

If downloadable function block libraries are required then a 128k RAM card should be fitted in the rear slot.

When the front slot is fitted with a 512k RAM card the rear slot can be fitted with a 512k RAM card, 128k of which will provide space for downloadable function block libraries and the remaining 384k will be available for the user program.

For EPROM based User Programs, 256k or 512k EPROM boards should be fitted into the front slot. In these cases the user program size is limited to the EPROM size for the code + the on-board RAM for data.

The options are summarised below:

Front Slot (kbytes)	Rear Slot (kbytes)	Max. User Program Size total / code+data	Max. Downloadable Function Block Library Size (bytes)
None	None	475134	0
None	128 RAM	475134	131070
128 RAM	None	606206	0
128 RAM	128 RAM	606206	131070
512 RAM	None	999422	0
512 RAM	128 RAM	999422	131070
512 RAM	512 RAM	1392638	131070
256 EPROM	None	262140+475134	0
256 EPROM	128 RAM	262140+475134	131070
512 EPROM	None	524284+475134	0
512 EPROM	128 RAM	524284+475134	131070

Identification of firmware version

The system firmware is recorded on a label fitted to the plug-in EPROM card. It may be viewed through the gap between the extension rack connector and the case if additional RAM is not fitted. The label reads:

RD024883UXXX where XXX refers to the version number e.g. 312 = V3.12

The I/O Concentrator (IOC) firmware version is recorded on a label fitted to the EPROM. It may be viewed through the back of the sleeve. The label reads:

RD023576UXXX where XXX refers to the version number e.g. 106=V1.06

Version compatibility

The table shows the major firmware releases. In general, I/O modules are compatible with one another and the releases listed in the table. However, Eurotherm Controls operates a policy of continuous product development, adding new features and modules to subsequent releases. If in doubt, please contact your local Eurotherm Controls office.

	Aug 1995 onward
System	3.12 A
IOC	1.06
Intelligent Comms Module	3.12
Function Blocks	3.12
PS	3.12/x
Microcell	*

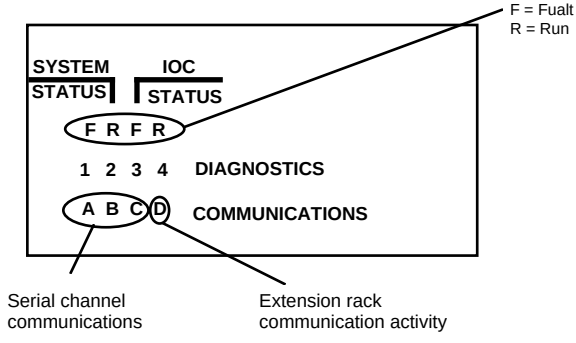
* Please contact Eurotherm Controls Inc.U.S.A. (Address and telephone on back of handbook)

DIAGNOSTICS

Status indication

The LCM-Plus has a set of status indicators which are visible through the rack fascia. The primary functions and positions are shown below.

Fault indicators will be illuminated during initialisation and during reset. During normal operation the two green status indicators will be illuminated.



The upper group of four indicators are:

Function	Colour	Notes
System Run	Green	System passed all power on tests and ‘healthy’
System Fault	Red	System watchdog or reset has occurred
I/O Processor Run	Green	IOC power on confidence tests passed and 'healthy'
I/O Processor Fault	Red	IOC watchdog or reset has occurred

The yellow diagnostic indicators are used to encode any fault condition detected during the power on confidence tests.
The IOC 'Run' indicator will normally be illuminated under these conditions.

System Fault Indicator	Diagnostic Indicators	Fault
Off	Off Off Off Off	No fault
On	Off Off Off Off	No or badly fitted EPROM card
Flashing	Off Off Off On	EPROM card not properly fitted
Flashing	Off Off On Off	Motherboard RAM Failure
Flashing	Off Off On On	Failure of RAM board nearest front of LCM-Plus
Flashing	Off On Off Off	Failure of RAM board nearest back of LCM-Plus
Flashing	Off On Off On	Floating Point Unit failure
Flashing	Off On On Off	Watchdog recovery failure
Flashing	Off On On On	Reserved
Flashing	On Off Off Off	Reserved
Flashing	On Off Off On	Reserved
Flashing	On Off On Off	Real-Time clock failure
Flashing	On Off On On	Port A comms failure
Flashing	On On Off Off	Port B comms failure
Flashing	On On Off On	Port C comms failure
Flashing	On On On Off	(Reserved)
Flashing	On On On On	Recurrent spurious interrupt

The Diagnostic Indicators listed above refer to the middle row of yellow indicators on the LCM-Plus.
Note that the flashing of the System Fault Indictor reflects the state of the diagnostic indicators in morse code for use in older systems where diagnostic indicators were not fitted.

The lower row of indicators provide a monitor of communications channel activity:

Function	Colour	
Port A	Yellow	Transmit/Receive on port A
Port B	Yellow	Transmit/Receive on port B
Port C	Yellow	Transmit/Receive on port C
Ext Rack	Yellow	Transmit/Receive on Ext Rack

Procedure in the event of faults

(1) In the event of a flashing system fault indicator after power on check the following:

Can the diagnostic LED's be matched to the table above?

Are the RAM and EPROM boards correctly and securely fitted?

Are the Programming Station, System Firmware and Function Block issues compatible with one another?

Are special modules such as the communications modules or the eight channel analogue input/output module (i.e. modules located in the first five slots of the main rack) correctly fitted?

Is there a battery fitted and is the battery voltage sufficient?

(2) Program lost on power down or failure for program to restart.

Is the battery voltage low?

Check PcsSTATE Function Block and replace battery.

Has the start up strategy been selected correctly?

Check the PcsSTATE Function Block.

Check the contents of the system error log. Refer to error codes in the PC3000 Real Time Operating System Reference (HA022918).

(3) Failure during program download.

Is the RAM fitted to the LCM-Plus large enough to accommodate the program?

If the program includes a downloadable Function Block library, is a RAM card fitted in the slot nearest the back of the LCM?

Is the GID set correctly?

Is the PC3000 in the correct mode to download?

Has the programming Software LCM-Plus Supplementory Disc been appropriately installed?

Chapter 7

RACK INTERFACE MODULE

Contents

PC3000 CE Approval

Multiple rack PC3000 systems in a single installation of more than four racks may cause radio interference unless special mitigation measures are employed. Please consult Eurotherm Controls Limited for EMC Guidance before installing and operating such systems.

Version compatibility

This module is Version 3 and introduces a new style connector header.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

The Rack Interface Module serves as an intelligent I/O communications handler. It interprets and acts upon messages passed by the Local Controller Module in the main rack and controls the update of I/O modules installed in the extension rack. Each extension rack requires a Rack Interface Module. The Rack Interface Module communicates with the Local Controller Module via a high speed serial link. A system may contain up to 7 Rack Interface Modules. Racks may be distributed, allowing I/O to be grouped with specific processes or machines. The Rack Interface Module provides a facility for 'daisy-chaining' racks together simplifying installation.

Cleaning

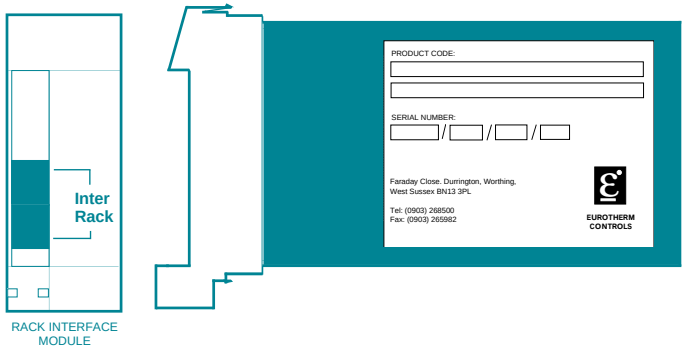
Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

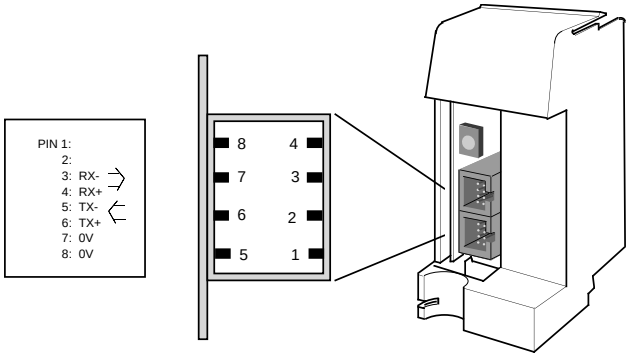
Module identification

A label fitted to the side of the module carries a serial number and product code in the form:

PC3000/RIM/VERSION3



Connections



Location

PSU	RIM	1	2	3	4	5	6	7	8	9	10	11	12

Specification

Inter-rack ports	Serial comms input from previous rack (LCM or RIM). SI-BUS @ 375K Baud.
	Serial comms output to next extension rack (RIM). SI-BUS @ 375K Baud.

Note: Use only extension rack inter-connection cables supplied by Eurotherm Controls to connect PC3000 racks together.

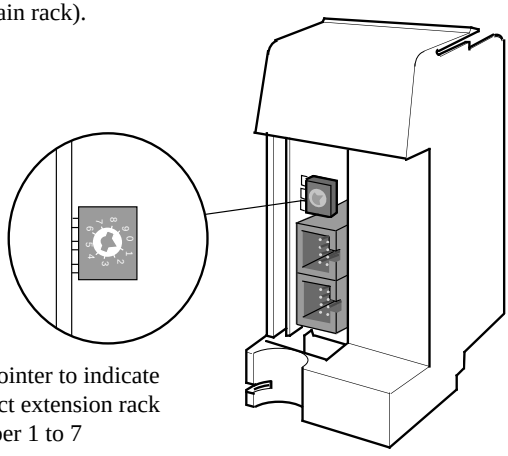
Multiple rack PC3000 systems in a single installation of more than four racks may cause radio interference unless special mitigation measures are employed. Please consult Eurotherm Controls Limited for EMC Guidance before installing and operating such systems.

CONFIGURATION OPTIONS

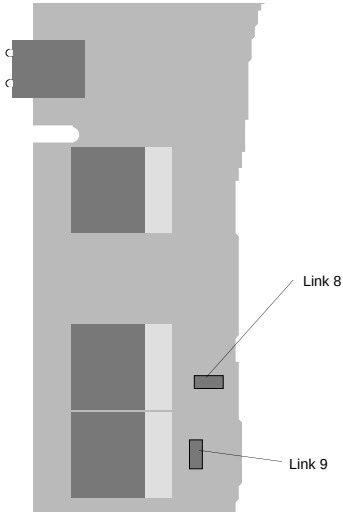
Setting the rack address

The Rack Address for the rack in which the RIM will be fitted is set by means of a rotary switch.

It is located at the front of the module, above the inter-rack serial ports and should be set by means of a screwdriver. It can be accessed without removing the module from the rack. It should be set to any address in the range 1 to 7. (address 0 is used as a diagnostic position and is also the address taken by the Local Controller Module located in the main rack).



Set pointer to indicate correct extension rack number 1 to 7



Selecting the termination impedance

A link selects the termination impedance on the receive pair. The module is supplied with the link fitted. The metal sleeve must be removed in order to carry out this operation.

Link 8 terminates the transmit pair with 100R.

Link 9 terminates the receive pair.

Only the last extension rack in the chain should have the termination resistors fitted.

Removing the metal sleeve

Caution

The module contains static sensitive components and care must be taken to ensure that the surface onto which the printed circuit board assemblies are to be placed and the user are at the same potential. Standard anti-static precautions should be observed.

If full anti-static precautions can not be observed, personal grounding may be achieved by touching an earthed metal chassis or component prior to handling the module.

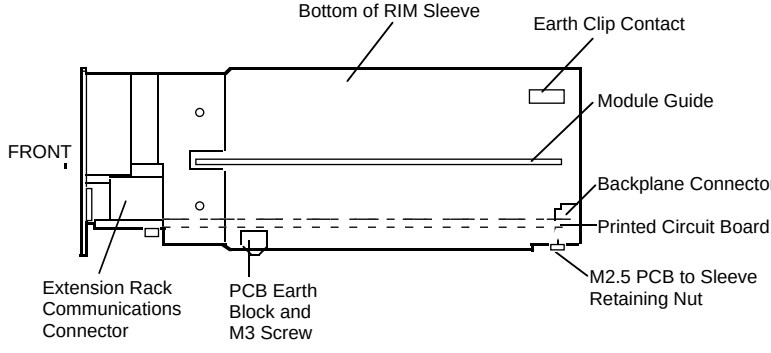
The metal sleeve must be removed in order to gain access to the motherboard.

(1) Remove the M3 screw and shakeproof washer which retains the printed circuit board earthing block to the sleeve, from the lower left hand side of the metal sleeve.

(2) Loosen the two M2.5 nuts retaining the backplane end of the motherboard to the sleeve.

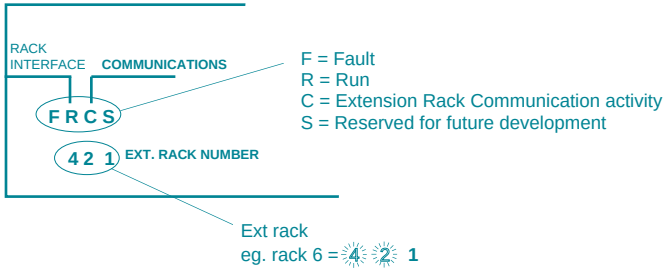
(3) Slide the motherboard out of the metal sleeve towards the back of the sleeve.

(4) Fitment is the reversal of the process. However, care should be taken to ensure that the motherboard is located correctly within the metal tabs (earlier versions only) inside the sleeve before tightening any fixing.



DIAGNOSTICS

Status indication



The RIM has a set of status indicators which are visible through the rack fascia. The primary functions and positions are shown above.

Fault indicators will be illuminated during initialisation and during reset. During normal operation the two green status indicators will be illuminated.

The upper group of four indicators are:

Function	Colour	Notes
System Run	Green	System passed all power on tests and ‘healthy’
System Fault	Red	System watchdog or reset has occurred
Comms active	Green	Power on confidence tests passed and 'healthy'
Swap	Green	Reserved for future development

Procedure in the event of faults

(1) Is the rack address set correctly ?
Check that two racks do not share the same address.

(2) Failure to communicate with the modules in the extension rack.

Are any of the I/O modules registered as 'Actual Module' on the Hardware Definition screen ?

Are analogue input or output modules listed on the screen but no digital I/O ?

Is the inter-rack cable sound ?

Are the modules fitted in the extension rack of the correct type (i.e. any module except communication or combined analogue input or output) ?

(3) Is the communications link terminated correctly?

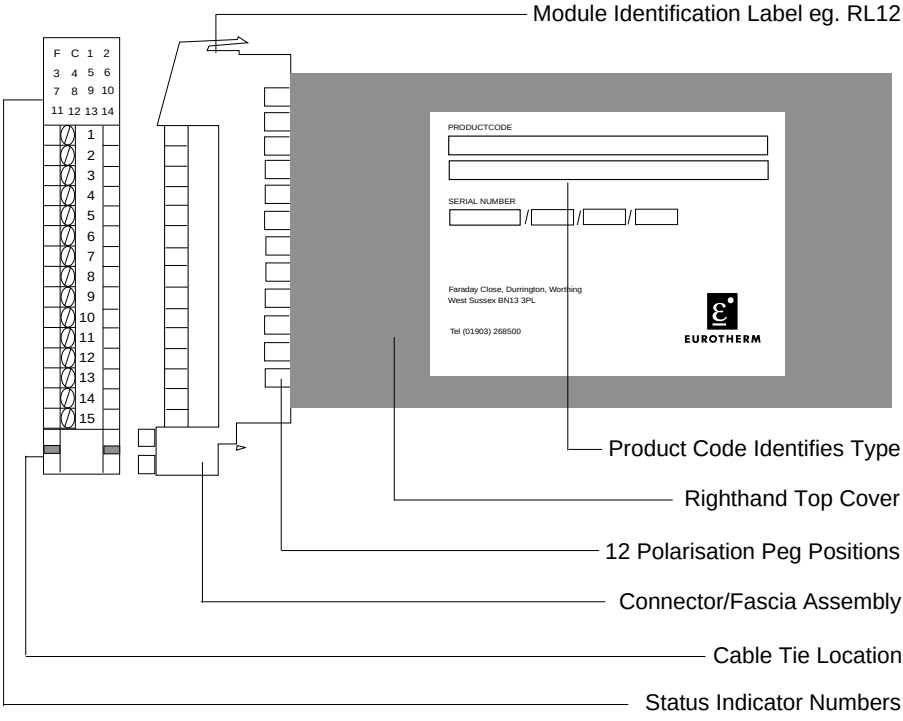
Ensure that LK 8 and 9 are fitted to the LAST rack only.

Chapter 8

I/O MODULES

Contents

General form/module identification



Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces or this product.

Removing the plastic PCB covers

In order to set a channel's configuration, the top and bottom plastic pcb covers must be removed:

Caution

The module contains static sensitive components and care must be taken to ensure that the surface onto which the printed circuit board assemblies are to be placed and the user are at the same potential. Standard anti-static precautions should be observed.

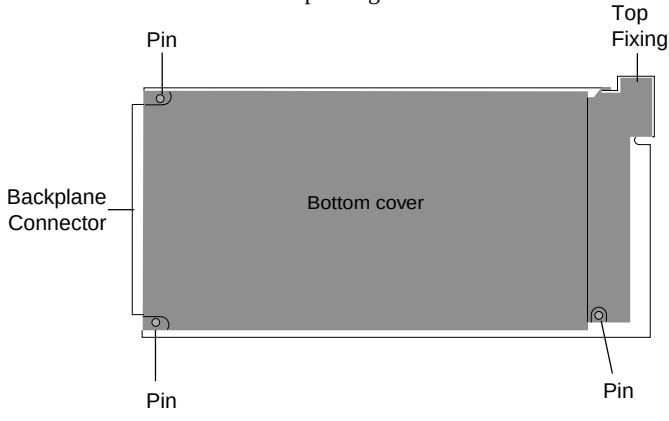
If full anti-static precautions cannot be observed, personal grounding may be achieved by touching an earthed metal chassis or component prior to handling the module.

(1) Remove the connector/fascia assembly by pulling it squarely off the module.

(2) Turn the module over such that the thinner, bottom cover faces upward.

(3) Lift the cover clear of the retaining plastic pegs adjacent to the backplane connector.

(4) Unhook the cover from its' top fixing.



(5) Remove the top cover.

Chapter 9

4 CHANNEL ANALOGUE INPUT MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Safety instructions

· All input channels have reinforced insulation to the "System".

· Channels 1 and 2 have reinforced insulation to channels 3 and 4.

· Channel 1 has functional insulation to channel 2.

· Channel 3 has functional insulation to channel 4.

Caution live sensors

All PC3000 plant I/O is provided with reinforced insulation to the system and other modules which provides protection against electric shock. Functional insulation is provided to enable the proper functioning of the equipment, but does not provide protection against electric shock.

Where one channel may be live, (e.g. a thermocouple input connected to a live electrical heating element) the installer must ensure that any adjacent functionally insulated channel is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Description

The 4 Channel Analogue Input Module provides four channels suitable for direct connection to a wide range of input sources.

Modules are offered in six variants normally providing four identically configured channels. Range, sensor type etc. are user configurable per channel via the supporting Function Block and the PC based Programming Station.

The millivolt input variant supports a wide range of thermocouples, pyrometers and other millivolt level sources.

The resistance input variant may be used with two or three wire transducers. Automatic compensation for lead resistance is provided when used with three wire sources.

The process level input variant permits direct connection of high level (up to 10v) signals, without the need for external attenuation.

Current inputs are handled by means of an external burden resistor fitted to the detachable connector assembly. A 5 ohm burden permits the 50mV linear range to represent 10mA full scale. For 20mA inputs the range should be set to 100mV.

The .../mV3/HiZ1 variant is hardware configured to give one channel of high input impedance for high level (up to 10V) and three standard mV/thermocouple inputs.

The ...V2/FV2 variant is hardware configured to give two channels of frequency measurement for tachogenerators or low speed encoders, and two channels of high level (up to 10V) signal measurement.

All channel configurations are user configurable via the supporting Function Block and the PC based Programming Station.

All modules offer four ranges. Range selection is made via the supporting Function Block and the PC based Programming Station. Refer to the 'PC3000 Function Block Manual' for further details.

Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **AI 4**.

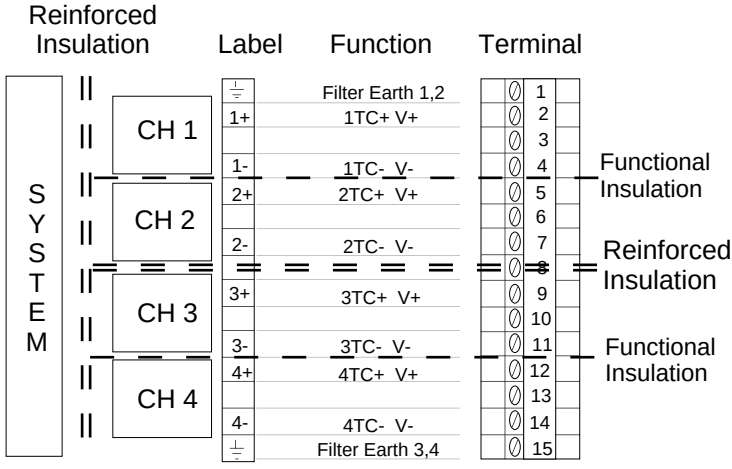
Additionally, a label fitted to the side of the module carries details of serial number etc. The modules product code is included and should read:

PC3000/AI/VERSION3/mV4 for millivolt inputs
PC3000/AI/VERSION3/mA4 for current inputs (includes burdens)
PC3000/AI/VERSION3/V4 for process level inputs
PC3000/AI/VERSION3/RT4 for resistance thermometers
PC3000/AI/VERSION3/mV3/HiZ1 for Zirconia probes
PC3000/AI/VERSION3/V2/FV2 for frequency inputs (0-10kHz)

Connections

Connection by means of a detachable 15 way connector and fascia assembly. The following terminal assignment applies:

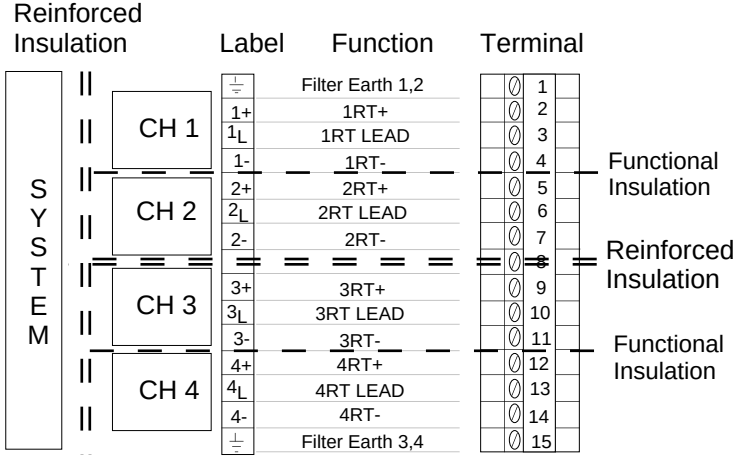
Millivolt, current and voltage variants



Note: .../mV3/HiZ1 channel 1 is high Z input.

Note: .../V2/FV2 channels 1 and 3 are frequency inputs.

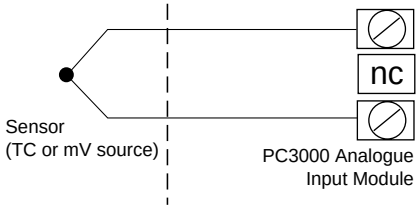
Resistance thermometer variant



The usage depends upon input type:

Thermocouple and millivolt level inputs

If internal cold junction compensation is to be employed, compensating cable of the correct type for the thermocouple used or the thermocouple itself must be wired to the terminals. Copper wire must NOT be used. If external compensation is required, copper wires must be used to connect the cold junction reference to the module.

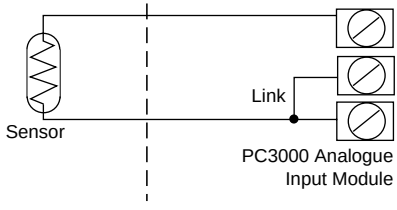


	Terminal Number			
Function	CH1	CH2	CH3	CH4
TC +	2	5	9	12
CJC Sensor	3	6	10	13
TC-	4	7	11	14

Resistance thermometer

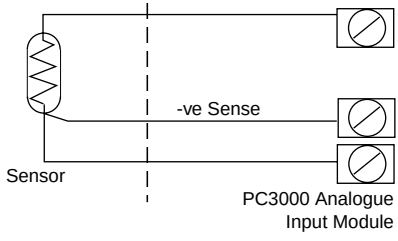
For these wire connections, lead lengths must be equal for the effects of lead resistance to be minimised.

2 Wire Version



	Terminal Number			
Function	CH1	CH2	CH3	CH4
RT +	2	5	9	12
RT LEAD	3	6	10	13
RT-	4	7	11	14

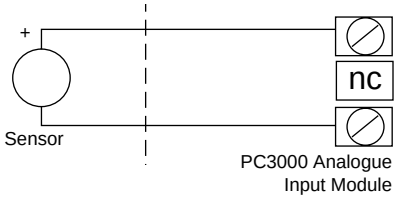
3 Wire Version



	Terminal Number			
Function	CH1	CH2	CH3	CH4
RT +	2	5	9	12
RT LEAD	3	6	10	13
RT-	4	7	11	14

Process level voltage inputs

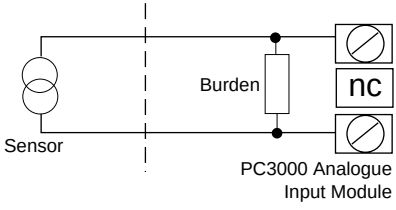
An input is provided on each channel to permit direct connection of process level voltages. Offset ranges 1-5V etc. are selected via the Programming Station.



	Terminal Number			
Function	CH1	CH2	CH3	CH4
V+	2	5	9	12
NC	3	6	10	13
V-	4	7	11	14

Current inputs

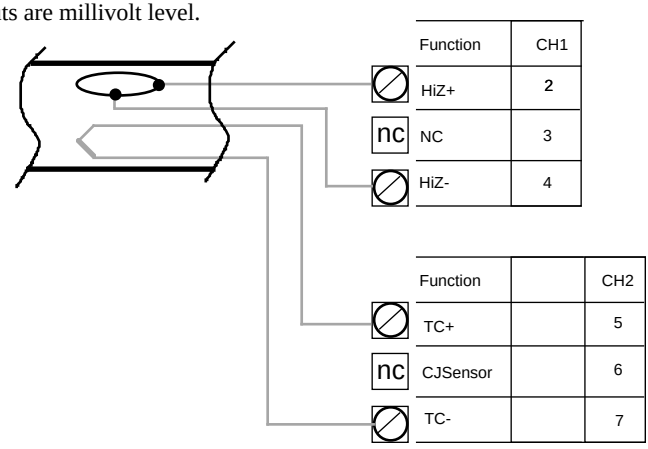
For use with current inputs, an external, terminal block mounted burden resistor should be fitted. A 5 ohm burden is available to permit the 50mV range to be configured for 0-10mA; similarly the 100mV range can accomodate 0-20mA inputs. Offset ranges 4-20mA etc. are selected via the Programming Station.



	Terminal Number			
Function	CH1	CH2	CH3	CH4
I+	2	5	9	12
NC	3	6	10	13
I-	4	7	11	14

Zirconia probe input

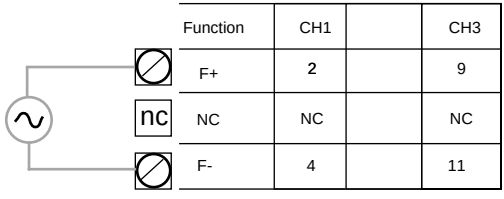
The ../mV3/HiZ1 variant allows direct connection of a high impedance source such as an oxygen probe channel 1 should be set on the 2V range (Range_2). All other inputs are millivolt level.



CH3, 4 connections as standard

Frequency inputs

The ../V2/FV2 variant supports frequncy inputs in the range 0-10kHz. Typical sources include tachogenerators and low speed encoders. Channels 1 and 3 support frequency inputs. All other channels are process level voltage inputs.

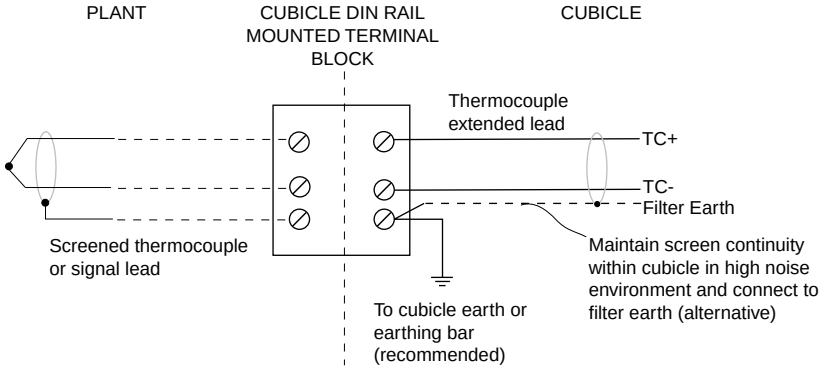


Notes
1. Frequency scaling of frequency input is 1V ≡1k Hz
2. CH 2 and 4 connections as standard voltage inputs.

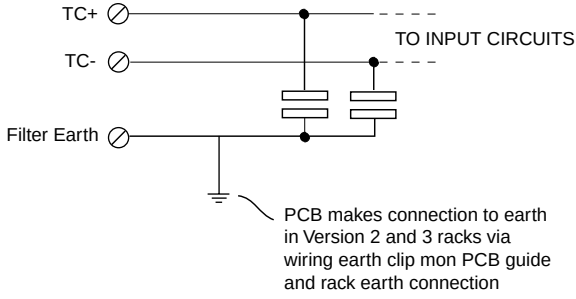
Filter earth connections and signal screens

Each channel is fitted with an LC input filter to provide rejection of high frequency noise spikes on the input signal. The return for this filter is connected to earth by means of a spring clip fitted to the rack pcb guide and the rack earth connection.

Use of screened cables on thermocouples and other signals:



Internal analogue input signal connections:



Upscale break/RT current source

The module provides upscale break as standard. Four links, LK101, LK201, LK301 and LK401 are fitted by the factory. This results in a small (250nA) input bias current which can lead to measurement errors in certain applications.

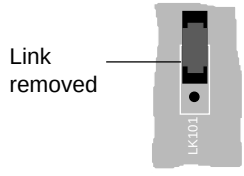
The RT variant uses the same four links for connecting the current source to the RT+ terminal.

The links should be removed:

(1) During input calibration if the output impedance of the millivolt source is significent.

(2) In applications involving strain gauge bridges with external excitation.

(3) To use the RT variant for measuring millivolt level signals.



Range selection

The input range is set by means of a parameter {Input_Type}on the **Analog_In/ Analog_In_R** Function Block. The parameter may be changed via the PC based programming station. The input range is considered to be the normal maximum working range of the input. In practice there is approximately 20-25% headroom above the maximum range setting after which the input channel will declare a hardware overrange condition. This parameter is not automatically linked to thermocouple type or maximum and minimum sensor range; these must be set independently selecting the linearisation type {Lin_Type}, the maximum expected temperature or input value {PV_Max} and the minimum input value {PV_Min}.

The 4 channel modules come in 4 different derivatives. The setting depends upon the module type:

Module Type: **PC3000/AI/VERSION3/MV4**

Range	Hardware Range
Range_1	-10 to 10mV
Range_2	-10 to 20mV
Range_3	-10 to 50mV
Range_4	-10 to 100mV
Range_5	NA
Range_6	NA

Module Type: **PC3000/AI/VERSION3/MA4**

Assumes module is fitted with 5R burden resistors

Range	Hardware Range
Range_1	0 to 2mA (Not used)
Range_2	0 to 4mA (Not used)
Range_3	0 to 10mA
Range_4	0 to 20mA
Range_5	NA
Range_6	NA

Module Type: **PC3000/AI/VERSION3/V4**

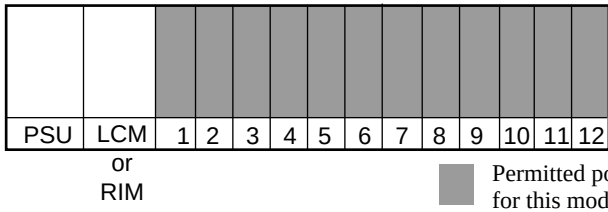
Note bipolar input range

Range	Hardware Range
Range_1	-1 to 1V
Range_2	-2 to 2V
Range_3	-5 to 5V
Range_4	-10 to 10V
Range_5	NA
Range_6	NA

Module Type: **PC3000/AI/VERSION3/RT4**

Range	Hardware Range
Range_1	0 to 50 Ohms
Range_2	0 to 100 Ohms
Range_3	0 to 250 Ohms
Range_4	0 to 500 Ohms
Range_5	NA
Range_6	NA

Location



Specification

Channels:	4	Input Characteristic
Millivolt Input Range:	-10mV to 10mV -10mV to 20mV -10mV to 50mV -10mV to 100mV	upscale break current <300nA (Link selectable) + bias current <5nA
Voltage Input Range:	-1V to 1V -2V to 2V -5V to 5V -10V to 10V	input impedance > 500Kohms
Resistance Range:	0 to 50 ohms 0 to 100 ohms 0 to 250 ohms 0 to 500 ohms	current <200 µA
Current Range:	0 to 10mA 0 to 20mA	5 ohm external burden, 50mV range 5 ohm external burden, 100 mV range
Hiz	-1V to 1V -2V to 2V -2V to +5V -2V to +10V	bias current < 1nA
F to V	10Hz to 1KHz 10Hz to 2KHz 10Hz to 5KHz 10Hz to 10KHz	100K ohms ac coupled by 330nF

DIAGNOSTICS

Status indication

Output, 'health' and communications status indication are provided by means of indicators visible through the detachable connector fascia assembly. The following assignment applies.

Indicator Number	Function	Colour
1	Fault	Red
2	Comms active	Green
3	Run	Green
4	Reserved for diagnostics	Green
5 - 16	Not used	

MAINTENANCE /CALIBRATION

It is recommended that channels are calibrated annually.

Equipment required:

- A PC3000 rack, power supply and Local Controller Module (LCM) together with module to be calibrated
- A Programming Station PC which is compatible with the chosen PC3000 Programming Software.
  Refer to the '*PC3000 User Guide - Part 1 Programming'* or the '*Microcell User Guide'* for details of PC hardware requirements.
- A Eurotherm Controls 261 serial converter (or similar 232/422 converter)
- A Eurotherm Controls 239 temperature compensated millivolt source or suitable equivalent
- A precision decade resistance box capable of resolving 0.01 ohms and offering accuracy of 0.1%. (Cropico RBB5 is a suitable reference). Alternatively precision resistors 50 ohms and 450ohms 0.1%.

General

The module to be calibrated should be installed in the PC3000 rack and allowed at least 30 minutes of warm up time prior to calibration. It is recommended that the module be orientated vertically and the rack mounted flat (i.e not at an angle) if application permits. This will minimize the potential for temperature gradients across the module.

The module should be located away from heat sources such as thyristor units and solid state relays. Draughts should also be avoided.

The use of copper cable is recommended for all calibrations unless otherwise stated.

Lead length should be minimized in order to reduce the effects of input bias current flowing back into the calibration input source (Approximately 250mA); if long leads are unavoidable, calibration accuracy may be improved by measuring the true applied voltage at the input terminals of the input module and using this value as the calibration reference rather than the value as set at source.

Calibration overview

The purpose of calibration is to eliminate or reduce inherent errors associated with the modules hardware. As an example, the voltage references used for the analog/ digital converter have an initial tolerance; calibration serves to reduce or eliminate this error such that the measurand reflects the true value more closely. Additionally errors in calibration occur over time as electronic components age, requiring that routine calibration is carried out at regular intervals.

It is not suggested that calibration is used as a means of correcting for errors associated with the sensor; this type of error should be eliminated by use of the pre-linearisation scaler and offset parameters provided on the Analog_In Function Block.

The PC 3000 analog input module employs a two point calibration scheme in order to correct for both gain and zero offset errors. The two arbitrary calibration points may be calibrated independently and the resultant calibration data stored. However, it is recommended that both points are calibrated during the same calibration session.

Calibration is performed on the currently selected range and configuration e.g. 50mV linear, 0 to 5V etc. Each range/configuration has separate calibration data associated with it. All ranges/configurations are calibrated when the module is despatched from the factory.

Calibration data is stored in EEPROM in the input module.

A channel requiring calibration due to corrupted data or a ‘raw’ channel which has no calibration data will declare the state *No_Cal* (4) via the **Analog_In** function block parameter**,** *Status_Info.*

General calibration scheme

All parameters associated with calibration are included in the Analog Input Module function block (**Analog_In or Analog_In_R**).

Ensure that the displayed resolution on the Programming Station is adequate for the range being calibrated. The '*PC3000 User Guide - Part 1 Programming*' describes the use of the FORMAT key to alter displayed resolution. As a general recommendation set displayed resolution to 3 decimal places when carrying out calibration. Note that display resolution may only be altered as part of the off-line configuration and must be set prior to compiling the program.

The parameters associated with calibration are as follows:

Cal_Lo_P	the lower of the two calibration input values e.g 5mV on the 50mV range
Cal_Hi_P	the upper of the two calibration input values e.g 45mV on the 50mV range
Cal_CJC_P	the calibration reference point for the cold junction sensor
Cal_Mode	the mode of operation for the channel. Normally, channel is in the *Run* state. During calibration the states *I/P_Hi* and *I/P_Lo* followed by *Save* are selected from the list

The parameter *Input_Type* is used to select the input range for which calibration is required. The channel is calibrated when the calibration mode is changed from *Run* (0) to *I/P_Hi* (2) or *I/P_Lo* (3).

> **Note:** This is different to the calibration scheme for the 2 channel card in which the change of calibration point causes calibration to take place.

The input is averaged over 80 cycles and the input must be stable following a change of calibration mode from Run (0) to I/P_Hi (2) or I/P_Lo(3).

It is recommended that the input is allowed to settle for a minimum of 5s following a change in applied input voltage. Reset the pre and post-linearisation scalers and offsets to 1 and 0 set *Lin_Type* to Linear (0) **prior** to calibration. The measured value is displayed in units consistant with selected configuration, mV, V etc. Several calibration dates appear within the Function Block parameter list; these are associated with the date of calibration of each confioguration, low level, RTD and high level.

> **Note:** At the present time calibration dates are not supported.

If Input_Type is changed following calibration but prior to saving the new calibration data, the calibration data which existed prior to the start of the calibration session will be restored. (Aborted calibration - may be used as a means of leaving the calibration process in the event of an error).

Step-by-step calibration guide

The following sections describe the actions which should be performed for calibration of a specific input type. These steps are described in terms of the Function Block parameters associated with calibration and are intended to be independent of the Programming Station used to perform the calibration.

Millivolt level inputs

This applies to module variants:

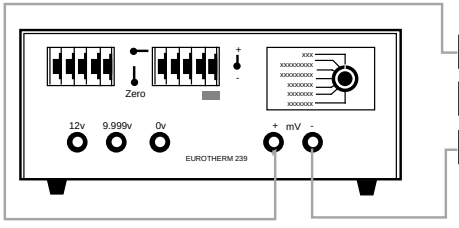
PC3000/AI/VERSION3/mV4
PC3000/AI/VERSION3/mA4

There are four ranges to be calibrated; 10mV, 20mV, 50mV and 100mV. Each range is calibrated in a similar fashion.

The parameter *Input_Type* must be set to the appropriate range prior to calibration.

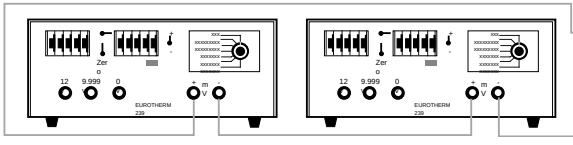
The millivolt reference source should be connected to the input module as detailed below:

10mV, 20mV and 50mV range



	Terminal Number			
Function	CH1	CH2	CH13	CH4
TC +	2	5	9	12
nc CJ Sensor	3	6	10	13
TC -	4	7	11	14

100mV range



	Terminal Number			
Function	CH1	CH2	CH3	CH4
TC +	2	5	9	12
nc CJ Sensor	3	6	10	13
TC -	4	7	11	14

The calibration input voltages are arbitrary but the following points are suggested for each of the ranges:

Input Range	Low cal point	High cal point
10mV	1mV	9mV
20mV	2mV	18mV
50mV	5mV	45mV
100mV	10mV	90mV

Separate modes exist for calibration of the low and high point. Prior to calibration ensure that the following parameters are reset to their default values:

Parameter	Value	Parameter	Value
Filter_Time	0s	*Post_Scaler*	1
Pre_Scaler	1	*Post_Offset*	0
Pre_Offset	0		

Procedure for calibration is:

(1) Set parameter *Lin_Type* to 'Linear'. Set *Input_Type* to select desired range.

(2) Set up high calibration point on calibration source e.g. 239. Set input to 90% of full scale e.g. 90mV.

(3) Enter this value into *Cal_Hi_P*.

(4) Allow at least 5 seconds for the input to settle following a change in value before performing step 5.

(5) Change *Cal_Mode* from 'Run(0)' to 'I/P_Hi(2)'. Mode will revert to 'Run' automatically following calibration.

(6) Set millivolt input to low calibration.

(7) Enter this value into *Cal_Lo_P*.

(8) Allow at least 5 seconds for the input to settle following a change in value before performing step 9.

(9) Change *Cal_Mode* from 'Run(0)' to 'I/P_Lo(3)'. Mode will revert to 'Run(0)' automatically following calibration.

(10) To save calibration data, change *Cal_Mode* from 'Run(0)' to 'Save(1)'. Mode will revert to 'Run(0)' automatically following save and *Status_Info* will indicate OK(1). To abort calibration either recalibrate as steps 1 to 9 or change range without saving.

(11) Repeat for all ranges or 100mV range plus required range only. Both the CJC scaling and main input are calibrated.

(12) In the event of an error occuring whilst calibrating e.g. entering the wrong value for the applied millivolt input, the calibration procedure may be aborted by changing the *Input_Type* parameter to a different range and then back to its' original value. The calibration data that existed prior to the session will be restored.

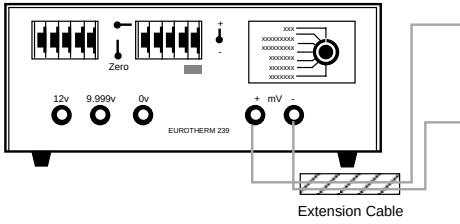
Note: That current inputs require an externally mounted burden resistor and should be configured as 50mV (0-10mA range) or 100mV (0-20mA) range. There is no separate calibration required for current inputs; calibration of a current input using a current source is not recommended since the accuracy of most current sources is lower than voltage sources. If required, check the burden resistor with an Ohmeter with a measurement accuracy of better than 0.05%.

Check that the burden resistor is within 0.1% of stated value.

Calibration of the cold junction sensor

The Cold Junction Sensor is calibrated on one range only, normally the 10mV range.

The millivolt input **must** have been calibrated prior to this process.



	Terminal Number			
Function	CH1	CH2	CH3	CH4
I+	2	5	9	12
NC	3	6	10	13
I-	4	7	11	14

A reference thermocouple or a temperature compensated millivolt source may be used to provide a known 'hot junction' temperature. This data is then used to compute the cold junction sensor calibration data. The parameter *Lin_Type* must be set to match the required thermocouple type and the parameter *Input_Type* should be set to the appropriate millivolt range prior to calibration. It is calibrated in the factory using type 'K' thermocouple. It is recommended that calibration is performed using this sensor type, although other sensor types may be selected as required.

If a temperature compensated source such as the Eurotherm Controls 239 is employed, this must be connected to the wiring terminals using thermocouple extension cable appropriate to the sensor type selected on the 239. Ensure that both the extension cable and the sensor type selected on the 239 match the *Lin_Type* selected for the module.

The procedure is as follows:

(1) Ensure that the following parameters are reset to their default values:

Parameter	Value
Filter_Time	0s
Pre_Scaler	1
Pre_Offset	0
Post*_Scaler*	1
Post_Offset	0

(2) Set the 239 to the correct number of millivolts for the equivalent hot junction temperature e.g 60°C. Alternatively an ice cell may be used.

(3) Enter the temperature of the ice cell or 239 equivalent millivolt signal into the parameter, *Cal_CJC_P*.

(4) Allow 15 seconds for the input voltage to be averaged. Note that if the prescribed time is not allowed, and the next step is performed before the input has been averaged, the resultant calibration may be in error.

(5) Change the parameter *Cal_Mode* from Run (0) to CJC (4) in order to commence calibration. The mode will revert back to Run (0) on completion of calibration.

(6) The value read by the CJC_Val will be the temperatue of the CJC sensor i.e. approximately the temperature of the module.

(7) Change the parameter *Cal_Mode* from Run (0) to Save (1) in order to store the new calibration data. On completion of the save operation the *Cal_Mode* will automatically revert to Run (0) and *Status_Info* will indicate Ok (1)

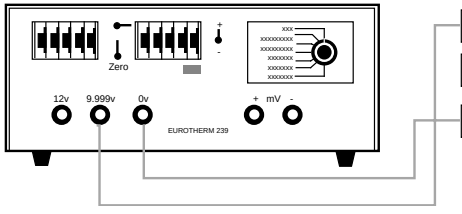
(8) In the event of an error occurring whilst calibrating e.g.entering the wrong value for the applied millivolt input, the calibration procedure may be aborted by changing *Input_Type* to a different range and then back to its' original value. The calibration data that existed prior to the session will be restored.

Calibration of high level inputs

This applies to module variant:

PC3000/AI/VERSION3/V4

There are four ranges to be calibrated; 1V, 2V, 5V, and 10V. Each range is calibrated in a similar fashion. Ranges are bi-polar i.e. -1V to 1V etc.The parameter *Input_Type* must be set to the appropriate range prior to calibration.The millivolt reference source should be connected to the input module as detailed.



	Terminal Number			
Function	CH1	CH2	CH3	CH4
V+	2	5	9	12
	3	6	10	13
V-	4	7	11	14

The calibration input voltages are arbitrary but the following points are suggested for each of the ranges:

Input Range	Low cal point	High cal point
1V	-0.9V	0.9V
2V	-1.8V	1.8V
5V	-4.5V	4.5V
10V	-9.0V	9.0V

Separate modes exist for calibration of the low and high point. Prior to calibration ensure that the following parameters are reset to their default values:

Parameter	Value
Filter_Time	0s
Pre_Scaler	1
Pre_Offset	0
Post_Scaler	1
Post_Offset	0

Procedure for calibration is:

(1) Set parameter *Lin_Type* to 'Linear(0)'. Set *Input_Type* to select desired range.

(2) Set up high calibration point on calibration source e.g. 239. Set input to 90% of full scale e.g. 9V.

(3) Enter this value into *Cal_Hi_P*.

(4) Allow at least 5 seconds for the input to settle following a change in value before performing step 5.

(5) Change *Cal_Mode* from 'Run(0)' to 'I/P_Hi(2)'. Mode will revert to 'Run(0)' automatically following calibration.

(6) Set up low calibration point, e.g.-9V.

(7) Enter this value into *Cal_Lo_P*.

(8) Allow at least 5 seconds for the input to settle following a change in value before performing step 9.

(9) Change *Cal_Mode* from 'Run(0)' to 'I/P_Lo(3)'. Mode will revert to 'Run(0)' automatically following calibration.

(10) To save calibration data, change *Cal_Mode* from 'Run(0)' to 'Save(1)'. Mode will revert to 'Run' automatically following save and *Status_Info* will indicate OK (1). To abort calibration either recalibrate as steps 1 to 9 or change range without saving.

(11) Repeat for all required ranges.

(12) In the event of an error occuring whilst calibrating e.g. entering the wrong value for the applied input, the calibration procedure may be aborted by changing the *Input_Type* parameter to a different range and then back to its' original value. The calibration data that existed prior to the session will be restored.

Calibration of resistance inputs

This applies to module variant:

PC3000/AI/VERSION3/RT4

This module use the Function Block, **Analog_In_R.** The block provides the following parameters:

Input_Type	50_Ohm (0)	; 0 to 50 Ohm (-10 to 10mV)
	100_Ohm (1)	; 0 to 100 Ohm (-10 to 20mV)
	250_Ohm (2)	; 0 to 250 Ohm (-10 to 50mV)
	500_Ohm (3)	; 0 to 500 Ohm (-10 to 100mV)
Lin_Type	Lin_mV (0)	; Linear mV ranges as above
	Lin_Ohm (1)	; Linear Ohm ranges as above
	Pt_100 (2)	; Platinum resistance therm.
Cal_Mode	Run (0)	; Normal mode
	Save (1)	; Save calibration data
	mV_Hi (2)	; Calibrate mV (high point)
	mV_Lo (3)	; Calibrate mV (Low point)
	Res (4)	; Single point resistance cal.
Cal_Hi_Pt	fixed units of mV	Cal point data entry
Cal_Lo_Pt	fixed units of mV	Cal point data entry
Cal_Res_P	fixed units of Ohm	Cal point data entry
C_Cal_Hi_P	fixed units of mV	Stored cal data
C_Cal_Lo_P	fixed units of mV	Stored cal data
C_Cal_Res_P	fixed units of Ohm	Stored cal data
Lead_Val	fixed units of mV	Diagnostic used during calibration. Voltage across lead.

All other parameters identical to the Analog_In Function Block template.

The calibration process has two stages:

(1) Millivolt calibration
(2) Resistance calibration

During millivolt calibration, the sense lead input 1_L,2_L, etc. must be connected to the respective positive input 1+, 2+ etc. by a short external wire link.

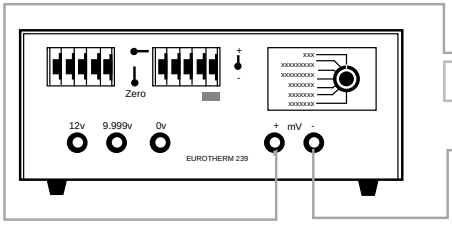
Remove the links fitted to the pcb, LK101, LK201, LK301, LK401 (only 4 links on board) **prior** to millivolt calibration. (Prevents offset caused by sensor bias current through input filter). Access to the links requires that the plastic pcb covers are removed. Observe Static Handling procedures.

There are four ranges to be calibrated; 50 ohm, 100 ohm, 250 ohm and 500 ohm. Each range is calibrated in a similar fashion.

The parameter *Input_Type* must be set to the appropriate range prior to calibration.

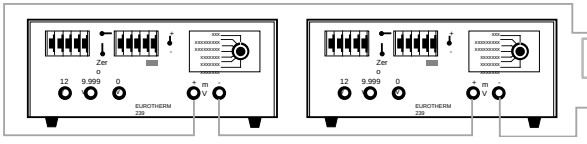
The millivolt reference source should be connected to the input module as detailed below:

50 ohm, 100 ohm and 250 ohm range



	Terminal Number			
Function	CH1	CH2	CH3	CH4
RT+	2	5	9	12
nc RT lead	3	6	10	13
RT-	4	7	11	14

500 ohm range



	Terminal Number			
Function	CH1	CH2	CH3	CH4
RT+	2	5	9	12
nc RT lead	3	6	10	13
RT-	4	7	11	14

The calibration input voltages are arbitrary but the following points are suggested for each of the ranges:

Input Range	Low cal point	High cal point
50 ohm	1mV	9mV
100 ohm	2mV	18mV
250 ohm	5mV	45mV
500 ohm	10mV	90mV

Always calibrate the 10mV range. This is used for the sense lead input calibration.

Separate modes exist for calibration of the low and high point. Prior to calibration ensure that the following parameters are reset to their default values:

Parameter	Value	Parameter	Value
Filter_Time	0s	*Post_Scaler*	1
Pre_Scaler	1	*Post_Offset*	0
Pre_Offset	0		

Procedure for calibration is:

(1) Set parameter *Lin_Type* to 'Lin_mV'. Set *Input_Type* to select desired range.

(2) Set up high calibration point on calibration source e.g. 239. Set input to 90% full scale e.g. 90mV.

(3) Enter this value into *Cal_Hi_P*.

(4) Allow at least 5 seconds for this input to settle following a change in value before performing step 5.

(5) Change *Cal_Mode* from 'Run' to 'mV_Hi'. Mode will revert to 'Run' automatically following calibration.

(6) Set millivolt input to low calibration point.

(7) Enter this value into *Cal_Lo_P*.

(8) Allow at least 5 seconds for this input to settle following a change in value before performing step 9.

(9) Change *Cal_Mode* from 'Run' to 'mV_Lo'. Mode will revert to 'Run' automatically following calibration.

(10) To save calibration data, change *Cal_Mode* from 'Run' to 'Save'. Mode will revert to 'Run' automatically following save. To abort calibration either recalibrate as steps 1 to 9 or change range without saving.

(11) Repeat for all ranges or 10mV range plus required range only. Millivolt calibration is complete. Both the sense and main inputs are calibrated.

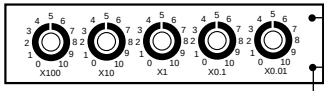
(12) In the event of an error ocurring whilst calibrating e.g. entering the wrong value for the applied millivolt input, the calibration procedure may be aborted by changing the Input_Type parameter to a different range and then back to its' original value. The calibration data that existed prior to the session will be restored.

During Resistance calibration, the link between the sense lead input 1_L,2_L, etc. and the respective positive input 1+, 2+ etc. must now be removed. Connect the sense input to the decade resistance box or calibration resistor using the three wire configuration.

Fit the links, LK101, LK201, LK301, LK401 **prior** to Resistance calibration.

The calibration resistances are arbitrary but the following points are suggested for each of the ranges:

Input Range	Resistance cal point
50 Ohm	45 Ohm
100 Ohm	90 Ohm
250 Ohm	225 Ohm
500 Ohm	450 Ohm



Function	Terminal Number CH1	CH2	CH3	CH4
RT+	2	5	9	12
RT sense	3	6	10	13
RT-	4	7	11	14

Procedure for calibration is:

(1) Set parameter *Lin_Type* to 'Lin_Ohm'. Set *Input_Type* to select desired range.

(2) Set up resistance input on calibration source.e.g Croster RBB5 Set input to 90% of full scale e.g 45 Ohms.

(3) Enter this value into *Cal_Res_P*.

(4) Change *Cal_Mode* from 'Run' to 'Res'. Mode will revert to 'Run' automatically following calibration.

(5) To save calibration data, change *Cal_Mode* from 'Run' to 'Save'. Mode will revert to 'Run' automatically following save. To abort calibration either recalibrate as steps 1 to 4 or change range without saving.

(6) Repeat for all ranges or required range only.

This completes the calibration of both the sense and main inputs.

Calibration dates on the Analog In function block

The **Analog_In** function block provides four calibration dates:

Cal_Hi_Date

Cal_Lo_Date

Cal_CJC_Date

Cal_RT_Date

These dates represent the date of calibration for the four input types.

> **Note:** At the present time calibration dates are not supported. There is no method for entering a date into the parameters. Future releases will provide a facility to permit this. Calibration dates should be ignored.

Other parameters associated with calibration

The **Analog_In** function block provides three calibration point ‘outputs’:

C_Cal_Hi_P

C_Cal_Lo_P

C_Cal_CJC_P

This is the data read from the module at initialization and represents the value of the calibration points used on the last calibration of the currently selected range.

Chapter 10

4 CHANNEL ANALOGUE OUTPUT MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style of connector header.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

The outputs are * bipolar, i.e. -10V to +10V, or -20mA to +20mA with a resolution of +/- 4000 divisions. The channels can be individually calibrated, with the calibration correction values stored in EEPROM in the module. There is also the capability within the Analogue Output Module's function block for transducer calibration, in order to overcome individual transducer errors.

* For versions of system firmware up to and including 2.27 and for analogue output modules fitted with firmware prior to version 1.06 this module can provide unipolar outputs only.

The available ranges are fullyu defined in the PC3000 Function Block reference (HA022917 issue 2), but are summarized in the following table.

Range	LCM Firmware V2.xx 0 to 100%	LCM Firmware V3.xx -100% to 100%
mA_20 (0)	0 to 20mA @ 12V	-20 to 20mA @ 12V
mA4_20 (1)	4 to 20mA @ 12V	-12 to 20mA @ 12V
V_10 (2)	0 to 10V @20mA	-10 to 10V @ 20mA
V2_10 (3)	2 to 10V @ 20mA	-6 to 10V @ 20mA
V_5 (4)	0 to 5V @ 20mA	-5 to 5V @ 20mA
V1_5 (5)	1 to 5V @ 20mA	-3 to 5V @ 20mA

The outputs have reinforced insulation to the "System" and the other modules. There is no inter-channel isolation.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

The module is identified by a label which is visible through the top of the detachable fascia carrying the text, **AO 4**

Additionally, a label on the side of the module's plastic cover carries details of the serial number.

The module's product code is included:

PC3000/AO/VERSION3/mA4 For the current output variant

PC3000/AO/VERSION3/V4 For the voltage output variant

These two variants are the same module with different default link settings.

Connections

Label	Function	Terminal
1+	1 Output	1
1-	1 Return	2
		3
2+	2 Output	4
2-	2 Return	5
		6
3+	3 Output	7
3-	3 Return	8
		9
4+	4 Output	10
4-	4 Return	11
		12
		13
		14
⏚	Filter Earth	15

Notes:

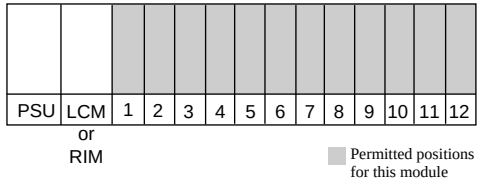
(1) All outputs share a common power supply return. This does not mean that the negative connection for each of the outputs are all common. In voltage mode they are connected via separate common mode chokes. In current mode there is a current sensing resistor between the negative output and the common return. Separate returns for each output channel must always be employed.

(2) In voltage mode, channels will current limit with loads in excess of 20mA.

(3) In current output mode, the output headroom is limited to 13 volts.

(4) If there is a module fault associated with communications with the LCM, the outputs are forced to zero. This should be taken into account in applications where an offset range is specified (e.g 1 to 5V or 4-20mA).

Location



Specification

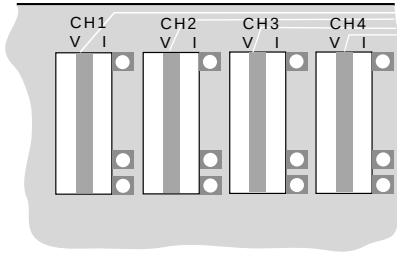
Channels:	4
Range (V):	-10V to +10V @ 20mA
Range (mA):	-20mA to + 20mA @ 12V
Protection:	Outputs short circuit proof
Insulation:	Module to module

CONFIGURATION OPTIONS

The module is supplied with jumpers fitted that determine the output configuration as being voltage mode or current mode. Modules leaving the factory are supplied with these links fitted in the appropriate position with respect to the product code.

However, channels may be configured for voltage or current output on a per channel basis by changing the link position. The links may only be altered having first removed the pcb covers as described in chapter 7.

Links may be set:



Ensure that all links are fitted securely, aligned correctly and that channels are set as desired before refitting covers following the reverse sequence.

Although the channel configuration may be verified by means of the Programming Station it is good practice to mark the side label of the module following any changes. This will assist other personnel and Eurotherm Controls service staff.

DIAGNOSTICS

Status indication

Indicator number	Function	Colour
1	Fault	Red
2	Comms active	Green
3	Run	Green
4 - 16	Not used	

MAINTENANCE/CALIBRATION

It is recommended that the module is re-calibrated on an annual basis.

Equipment required:

A PC3000 rack, power supply and Local Controller Module (LCM) together with module to be calibrated.

A Programming Station PC which is compatible with the chosen PC3000 Programming Software. Refer to the *'PC3000 User Guide Part 1 'Programming''* for details of PC hardware requirements.

A Eurotherm 261 serial converter (or similar 232/422 converter)(not essential with LCM Plus)

A precision (better than (0.05%) voltage meter, such as a Fluke 8840. The selected meter should be capable of resolving 0.1mV on voltage ranges and 1µA on current ranges.

General

The means of selecting the appropriate parameters will depend upon the Programming Station used. The following detail, outlines the required steps in order to perform the full module calibration. A two point calibration is required on each channel, for each mode of operation.

Calibration need only be performed in the mode in which a channel is used, however the voltage calibration will have no effect upon the current calibration, and visa versa.

Calibration overview

The purpose of calibration is to eliminate or reduce inherent errors associated with the modules' hardware. As an example, the voltage references used for the digital/analogue converter have an initial tolerance; calibration serves to reduce or eliminate this error such that the output value reflects the requested value more closely. Additionally errors in calibration occur over time as electronic components age, requiring that routine calibration is carried out at regular intervals.

It is not suggested that calibration is used as a means of correcting for errors associated with the actuator; this type of error should be eliminated by use of the transducer

calibration parameters provided on the Analog_Out Function Block.

The PC 3000 analog output module employs a two point calibration scheme in order to correct for both gain and zero offset errors. The two arbitrary calibration points may be calibrated independently and the resultant calibration data stored. However, it is recommended that both points are calibrated during the same calibration session.

Calibration is performed on the currently selected range and configuration e.g. -10V to +10V, -20mA to +20mA etc. Each range/configuration has separate calibration data associated with it. All ranges/configurations are calibrated when the module is despatched from the factory. For routine calibration it is only necessary to calibrate the configured mode, voltage or current.

Calibration data is stored in EEPROM in the output module.

A channel requiring calibration due to corrupted data or a 'raw' channel which has no calibration data will declare the state No_Cal (6) via the Analog_Out function block parameter, Status_Info.

General calibration scheme

All parameters associated with calibration are included in the Analog Output Module function block (Analog_Out).

HW_Cal_Lo_P	the lower of the two calibration input values e.g 0.5V on the 10V range
HW_Cal_Hi_P	the upper of the two calibration input values e.g 9.5V on the 10V range
HW_Cal_V	the value read from the Voltmeter and converted into a percentage of fullscale.
Cal_Mode	the mode of operation for the channel. Normally, the channel is in the Run state. During calibration the states Hcal_Hi and Hcal_Lo followed by Save are selected from the list.

The parameter *Output_Type* is used to select the output type e.g millamp, or voltage, for which calibration is required.

> **Note 1:** Calibration data is only sent from the PC3000 Local Controller Module to the module under calibration when the data changes value. All calibration parameters are classed as 'unsolicited' type messages. Refer to the 'PC3000 Real Time Operating System Reference' chapter covering the 'I/O sub-system' for a full description of 'unsolicited' parameters.
>
> **Note 2:** From Analogue Output module firmware version 1.01 (February 1993) onwards, entering calibration mode (Hcal_Lo or HCal_Hi) will cause the output to be set according to the default calibration values.

As an example, say that it is required to recalibrate an output at 9.5V (95% on 10V range). The parameter Hw_Cal_Hi_P will already contain the value, 95. If this value is re-entered calibration will not occur. The value must be changed to say 95.1 and then changed back to 95 in order for the data to be transmitted to the module. All calibration data must be treated accordingly.

Step-by-step calibration guide

The actions which should be performed for calibration are described. They are described in terms of the Function Block parameters associated with calibration and are intended to be independent of the Programming Station used to perform the calibration.

Outputs are calibrated on the full scale ranges (-10V to +10V and -20mA to +20mA) only.

The following calibration values are recommended:

Output range	Low point	High point
-10V to +10V	-90% (-9V)	90% (9V)
-20mA to +20mA	-90% (-18mA)	90% (18mA)

(1) Select Output_type for the current or voltage mode to be calibrated.

(2) Change the parameter Cal_Mode from Run (0) to HCal_Lo (4).

(3) Select Hw_Cal_Lo_P, and enter a value at or near zero corresponding to the percentage of full scale required for the low calibration point e.g. -90%. The module will output its value corresponding to the percentage entered as the Hw_Cal_Lo_P

(4) Read the value displayed by the DVM and record this value. As an example, assume the meter reads -8.97 at the calibration point -90%. Convert this to the percentage of full scale, in this case, -89.7%. Enter this as the value of the Hw_Cal_V. The voltage read on the meter will now equal the requested value e.g. -9.0V.

(5) Change the parameter Cal_Mode from Run to HCal_Hi (5).

(6) Select Hw_Cal_Hi_P, and enter a value at or near full scale corresponding to the percentage of full scale required for the high calibration point e.g. 90%. The module will output its value corresponding to the percentage entered as the Hw_Cal_Hi_P

(7) Read the value displayed by the DVM and record this value. As an example, assume the meter reads 9.03 at the calibration point 90%. Convert this to the percentage of full scale, in this case, 90.3%. Enter this as the value of the Hw_Cal_V. The voltage read on the meter will now equal the requested value e.g. 9.0V.

(8) Change the parameter Cal_Mode from HCal_Hi to (Save) in order to store the new calibration data. On completion of the save operation the Cal_Mode will automatically revert to Run and Status_Info will indicate Ok.

(9) In the event of an error occurring whilst calibrating e.g.entering the wrong value for the measured voltage, the calibration procedure may be aborted by changing Cal_Mode from HCal_Hi or HCal_Lo to Run. The calibration data that existed prior to the session will be restored.

The examples given assume that the channel being calibrated is in voltage mode. Current channels may be calibrated in a similar fashion. As an example say a 0 to 20mA output channel produces 3mA in response to a request for 10% (2mA). A reading of 3mA corresponds to 15% and this value should be entered into the parameter Hw_Cal_V. (Tip: halve the value read from the meter and multiply by 10 to get percentage of full scale)

This procedure must be repeated for each channel. Note that there only need be one calibration in voltage mode, and one in current mode, as the alternative ranges are subsets and use the same calibration values.

Calibration dates on the Analog Out function block

The **Analog_Out** function block provides a calibration date:

Hw_Cal_Date

This represents the date of last hardware calibration for the currently selected configuration (Voltage or Current)

> **Note:** From Fb V3.00 words calibration dates are not supported. There is no method for entering a date into the parameters. Future releases will provide a facility to permit this. Calibration dates on older versions should be ignored.

Other parameters associated with calibration

The **Analog_Out** function block provides two calibration point ‘outputs’:

C_Hw_Cal_Hi

C_Hw_Cal_Lo

This is the data read from the module at initialization and represents the value of the calibration points used on the last calibration of the currently selected range.

Transducer calibration

Transducer calibration provides a method of scaling and offsetting non-standard output ranges. It also provides a means for correcting actuator errors e.g. 100% or 10V output does not correspond to valve fully open due to valve inaccuracy.

The PC 3000 analog output module uses a two point transducer calibration scheme in

order to correct for both gain and zero offset errors. Two arbitrary calibration points may be specified.

Transducer calibration is performed on the currently selected configuration type e.g. -10V to 10V, -20mA to 20mA etc. Each configuration type has separate calibration data associated with it.

Transducer calibration data is stored in LCMs' memory not in the module. This ensures that spare modules will be compatible; the transducer calibration data is downloaded to the module when the PC3000 is placed in the Run state.

Transducer calibration scheme

All parameters associated with transducer calibration are included in the Analog Output Module function block (Analog_Out).

The parameters associated with calibration are as follows:

Tr_Cal_Lo_P	the lower of the two calibration inputvalues e.g 0%
Tr_Cal_Hi_P	the upper of the two calibration inputvalues e.g 100%
Tr_Cal_Lo_V	the actual output value required to achieve the low calibration point value e.g -0.1% results in valve fully shut
Tr_Cal_Hi_V	the actual output value required to achieve the high calibration point value e.g 100.2% results in valve fully open
Cal_Mode	the mode of operation for the channel. Normally, the channel is in the Run state. During calibration the states TCal_Hi and TCal_Lo are selected from the list

The actions which should be performed for transducer calibration are described. They are described in terms of the Function Block parameters associated with calibration and are intended to be independent of the Programming Station used to perform the calibration.

(1) Change the parameter Cal_Mode from Run to TCal_Lo.

(2) Select Tr_Cal_Lo_P, and enter a value at or near zero corresponding to the percentage of full scale required for the low calibration point. The module will output its value corresponding to the percentage entered as the Tr_Cal_Lo_P.

(3) Enter the required output value for a requested output of Tr_Cal_Lo_P. As the example given earlier, if it is required that the output is trimmed to produce -0.1% at zero, enter -0.1 via the parameter, Tr_Cal_Lo_V. The analogue ouput will take on this value.

(4) Change the parameter Cal_Mode from TCal_Lo to TCal_Hi.

(5) Select Tr_Cal_Hi_P, and enter a value at or near full scale corresponding to the percentage of full scale required for the high calibration point. The module will output its value corresponding to the percentage entered as the Tr_Cal_Hi_P.

(6) Enter the required output value for a requested output of Tr_Cal_Hi_P. As the example given earlier, if it is required that the output is trimmed to produce 100.2% at full scale, enter 100.2 via the parameter, Tr_Cal_Hi_V. The analogue ouput will take on this value.

(7) Change the parameter Cal_Mode from TCal_Hi to Run in order to store the new calibration data.

(8) In the event of an error occuring whilst calibrating e.g.entering the wrong value for the desired output level, simply re-enter the value via Tr_Cal_Hi_V or Tr_Cal_Lo_V.

Chapter 11

DIGITAL INPUT (LOW DC) MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header and a change to the numbering of the Status Indicator Leds.

Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides fourteen channels of low voltage dc digital input.

The inputs have reinforced insulation to the "System" and other modules.
There is no inter-channel isolation.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **DI 14**.

Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/DI/VERSION3/5LL14 for the 5v dc input

PC3000/DI/VERSION3/24LL14 for the 24v dc input

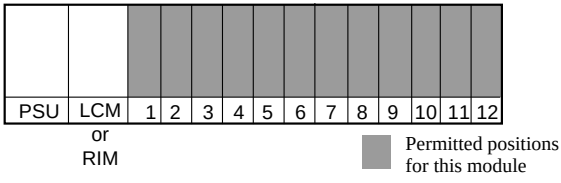
Connections

Connection by means of a detachable 15 way connector and fascia assembly.

The following terminal assignment applies:

Label	Function	Terminal
1	Input 1	1
2	Input 2	2
3	Input 3	3
4	Input 4	4
5	Input 5	5
6	Input 6	6
7	Input 7	7
8	Input 8	8
9	Input 9	9
10	Input 10	10
11	Input 11	11
12	Input 12	12
13	Input 13	13
14	Input 14	14
C	Input 15	15

Location



Specification

Channels:	14
Range:	0-5V dc 0-24V dc Depending on type (Note 1)
Thresholds:	'On' typically 70% range 'Off' typically 30% range
Insulation:	Module to Module

Note 1: A link is provided on the pcb for changing range. It is labelled '5V/24V'.

Status indication

Input and communications status indication are provided by means of indicators visible through the detachable connector fascia assembly. The following assignment applies:
Version 3 has introduced a change in the numbering of the Status Indication LED's

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	1	Dig In 1	Yellow
4	2	Dig In 2	Yellow
5	3	Dig In 3	Yellow
6	4	Dig In 4	Yellow
7	5	Dig In 5	Yellow
8	6	Dig In 6	Yellow
9	7	Dig In 7	Yellow
10	8	Dig In 8	Yellow
11	9	Dig In 9	Yellow
12	10	Dig In 10	Yellow
13	11	Dig In 11	Yellow
14	12	Dig In 12	Yellow
15	13	Dig In 13	Yellow
16	14	Dig In 14	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	1	2
3	4	5	6
7	8	9	10
11	12	13	14

Chapter 12

DIGITAL INPUT (LOW AC) MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header and a change to the numbering of the Status Indicator Leds.

Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides fourteen channels of low voltage ac digital input. The inputs have reinforced isolation to the "System" and other modules.
There is no inter-channel isolation.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module, is not accessible to service personnel whilst it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O pointthat may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

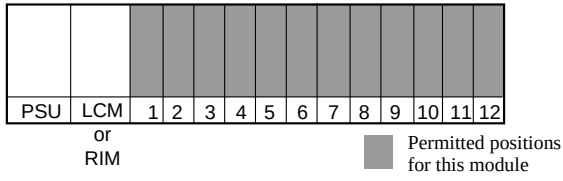
Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **DI 14**. Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/DI/VERSION3/ACLL14

Connections

Label	Function	Terminal
1	Input 1	1
2	Input 2	2
3	Input 3	3
4	Input 4	4
5	Input 5	5
6	Input 6	6
7	Input 7	7
8	Input 8	8
9	Input 9	9
10	Input 10	10
11	Input 11	11
12	Input 12	12
13	Input 13	13
14	Input 14	14
C	Common	15

Location



Specification

Channels:	14
Range:	0-24V ac
Threshold:	'On' typical 70% range
	'Off' typically 30% range
Isolation:	Module to module

Status indication

Input and communications status indication are provided by means of indicators visible through the detachable connector fascia assembly. The following assignment applies:

Version 3 has introduced a change in the numbering of the Status Indication LED's

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	1	Dig In 1	Yellow
4	2	Dig In 2	Yellow
5	3	Dig In 3	Yellow
6	4	Dig In 4	Yellow
7	5	Dig In 5	Yellow
8	6	Dig In 6	Yellow
9	7	Dig In 7	Yellow
10	8	Dig In 8	Yellow
11	9	Dig In 9	Yellow
12	10	Dig In 10	Yellow
13	11	Dig In 11	Yellow
14	12	Dig In 12	Yellow
15	13	Dig In 13	Yellow
16	14	Dig In 14	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	1	2
3	4	5	6
7	8	9	10
11	12	13	14

Chapter 13

DIGITAL INPUT (CONTACT CLOSURE) MODULE

Contents

Version compatibility

This module is Version 3 that introduces a new style connector header and a change to the numbering of the Status Indicator Leds.

Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides fourteen channels of digital input suitable for connection to dry contacts. The inputs have reinforced insulation to the "System" and other modules. There is no inter-channel isolation.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

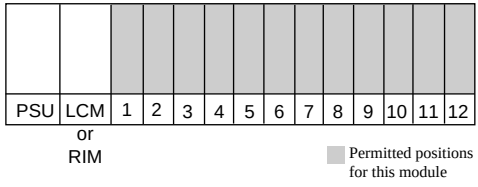
The module may be identified by means of a label visible through the top of the detachable fascia carrying the text **DI 14**. Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/DI/VERSION3/CC14

Connections

Label	Function	Terminal
1	Input 1	1
2	Input 2	2
3	Input 3	3
4	Input 4	4
5	Input 5	5
6	Input 6	6
7	Input 7	7
8	Input 8	8
9	Input 9	9
10	Input 10	10
11	Input 11	11
12	Input 12	12
13	Input 13	13
14	Input 14	14
C	Common	15

Location



Specification

Channels:	14
Range:	2.5mA/channel
Threshold:	'On' typical 950 ohms 'Off' typically 9.5k ohms
Insulation:	Module to module

Note: This module is intended for use with low level type contacts i.e. gold flash (14V, 2.5mA wetting supply).

Status indication

Input and communications status indication are provided by means of indicators visible through the detachable connector fascia assembly. The following assignment applies:

Version 3 has introduced a change in the numbering of the Status Indication LED's

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	1	Dig In 1	Yellow
4	2	Dig In 2	Yellow
5	3	Dig In 3	Yellow
6	4	Dig In 4	Yellow
7	5	Dig In 5	Yellow
8	6	Dig In 6	Yellow
9	7	Dig In 7	Yellow
10	8	Dig In 8	Yellow
11	9	Dig In 9	Yellow
12	10	Dig In 10	Yellow
13	11	Dig In 11	Yellow
14	12	Dig In 12	Yellow
15	13	Dig In 13	Yellow
16	14	Dig In 14	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	1	2
3	4	5	6
7	8	9	10
11	12	13	14

Chapter 14

DIGITAL INPUT (HIGH AC) MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header and a change to the numbering of the Status Indicator Leds.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides fourteen channels of high level ac (up to 250V ac) digital input. The inputs have reinforced insulation to the "System" and other modules.
There is no inter-channel isolation.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

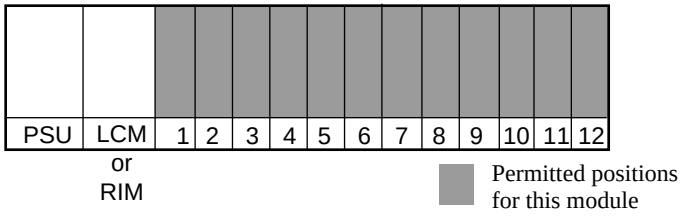
Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **DI 14**. Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/DI/VERSION3/HL14

Connections

Label	Function	Terminal
1	Input 1	1
2	Input 2	2
3	Input 3	3
4	Input 4	4
5	Input 5	5
6	Input 6	6
7	Input 7	7
8	Input 8	8
9	Input 9	9
10	Input 10	10
11	Input 11	11
12	Input 12	12
13	Input 13	13
14	Input 14	14
C	Common	15

Location



Specification

Channels:	14
Range:	85-264V ac
Threshold:	'On' typical 70% range of 85V 'Off' typically 30% range of 85V
Insulation:	Module to module

Status indication

Input and communications status indication are provided by means of indicators visible through the detachable connector fascia assembly. The following assignment applies:

Version 3 has introduced a change in the numbering of the Status Indication LED's

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	1	Dig In 1	Yellow
4	2	Dig In 2	Yellow
5	3	Dig In 3	Yellow
6	4	Dig In 4	Yellow
7	5	Dig In 5	Yellow
8	6	Dig In 6	Yellow
9	7	Dig In 7	Yellow
10	8	Dig In 8	Yellow
11	9	Dig In 9	Yellow
12	10	Dig In 10	Yellow
13	11	Dig In 11	Yellow
14	12	Dig In 12	Yellow
15	13	Dig In 13	Yellow
16	14	Dig In 14	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	1	2
3	4	5	6
7	8	9	10
11	12	13	14

Chapter 15

PULSE INPUT MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector header.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

This module provides 2 channels for general purpose high speed counting and totalising applications, and a supply for powering encoders.
A variant of this module permits decoding of quadrature encoders.

The module can handle pulse inputs up to 200kHz.
All data in this chapter refers to the later 'Mk 2' pulse input module.

The inputs have reinforced insulation to the "System" and other modules.
There is no inter-channel isolation.

Caution live sensors

Where one channel may be live, the installer must ensure that the other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

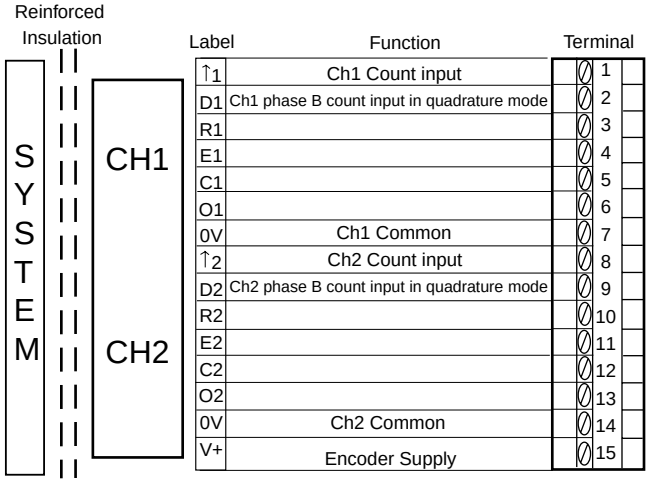
A label fitted to the side of the module carries details of serial number etc. Product identification is:

PC3000/PI/Version2/5P2	2 channels,	5Volt input,	up counter
PC3000/PI/Version2/12P2	2 channels,	12Volt input,	up counter
PC3000/PI/Version2/5Q2	2 channels,	5Volt input,	quadrature counter
PC3000/PI/Version2/12Q2	2 channels,	12Volt input,	quadrature counter

Note: Different module firmware is required for modules type P and Q.
Please consult your local Eurotherm office for further information.

Connections

Connection by means of a detachable 15 way connector and fascia assembly. The following terminal assignment applies:



Label	Function	Terminal
↑1	Ch1 Count input	1
D1	Ch1 phase B count input in quadrature mode	2
R1		3
E1		4
C1		5
O1		6
0V	Ch1 Common	7
↑2	Ch2 Count input	8
D2	Ch2 phase B count input in quadrature mode	9
R2		10
E2		11
C2		12
O2		13
0V	Ch2 Common	14
V+	Encoder Supply	15

Count channel 1

- ↑1 Count Input when in up-counter mode. Input phase A when in quadrature count mode
- D1 Not used when in up-counter mode, Input phase B when in quadrature count mode
- 0V Common

The other input terminals have no function in either mode. No connections should be made to these terminals.

Count channel 2

- ↑2 Count Input when in up-counter mode. Input phase A when in quadrature count mode.
- D2 Not used when in up-counter mode. Input phase B count when in quadrature count mode.
- 0V Common

The other input terminals have no function in either mode. No connections should be made to these terminals.

Encoder supply

· V+ Encoder Supply with 12V @ 150mA or 5V @ 500mA capability, including short-circuit protection.

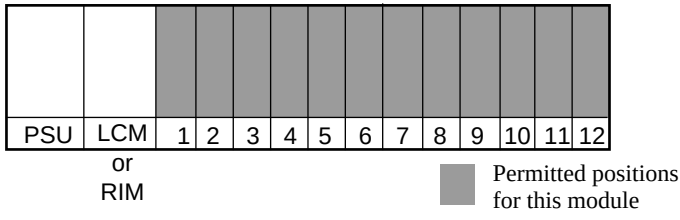
12V/5V Configuration

All inputs have switching levels of 30% and 70% of the encoder supply voltage, which in turn depends on the position of the user-selectable jumper LK2 which is located at the front of the bottom edge of the card. This link should be closed to operate the inputs at 12 Volt levels and should be open to operate at 5 Volt levels. Both channels of the board operate at the same voltage levels.

Isolation

In common with other module types, the input channels are isolated from the processor and the rest of the PC3000 system. The two channels of this module share the same common connections so there is no inter-channel isolation.

Location



Specification

Channels:	2
Frequency:	0-200kHz (800kHz 4 x quadrature encoder)

Status indication

There are sixteen LEDs at the front of the PIM, arranged as part of the normal 4 x 4 matrix used on other PC3000 modules.

Assuming that LED 1 is top left when the board is in a rack, and working from left to right, and from top to bottom, the LED functions are as follows:

LED	Function	Colour
1	Module fault indication	Red
2	SIBUS communications active	Green
3	Module run indication	Green
4	Diagnostic LED	Green
5	Channel 1 count input active	Yellow
6	Channel 1 Phase B count input active (Quadrature mode)	Yellow
7	Channel 2 count input active	Yellow
8	Channel 2 Phase B count input active (Quadrature mode)	Yellow
9	No operation	Yellow
10	No operation	Yellow
11	No operation	Yellow
12	No operation	Yellow
13	No operation	Yellow
14	No operation	Yellow
15	No operation	Yellow
16	No operation	Yellow

Note that the LED is on if the logic level at the I/O connector is high, i.e. the default inactive state. Thus these modules, if nothing is connected to them, will have all the LEDs illuminated.

Compatibility

Modules must be fitted with firmware E103 or later. They will not work with any earlier versions which are only compatible with earlier versions of hardware.

The module may be used with IOC firmware version V1.02 or later version.

User programming hints

Do NOT request a PIM in the "Required Module" section of the Hardware Definition Screen. Instead, create an instance of the PIM2 function block (to be found under MODULES in the function block "Class List").

The address must be set to the address of the module, for example a PIM in slot 5 of rack 3 will have the address 3:5. This address is NOT generated automatically as it is with many other PC3000 module types.

Create an instance of a PI_Smpl_Ctr for each required counter channel. This is found under INPUTS in the Class List. The address for each channel must again be explicitly entered, this with either a :1 or :2 appended to the module address, dependent on the channel. For example, channel 2 of a PIM in slot 4 rack 1 would have an address 1:4:2.

Set the Capt_Period parameter for each channel, preferably to at lest 2 times the task assigned to the PI_Simpl_Ctr function block. Under no circumstances should this parameter be set to equal the task time as this will cause malfunctioning of the function block, which shows up as an incorrect Delta_Count value.

When the Mode parameter is set to RUN the Total_Count parameter value will contain the total number of pulses received and the Delta_Count parameter value will be updated at intervals of the Capt_Period with the change in Total_Count during that period.

Non-Valid Delta_Counts will be seen under certain circumstances:

When the Total_Count parameter wraps around (at 16777215) to 0 a large Delta_Count will be generated. The user program can overcome this by detecting that the overflow has occurred and adding 16777216 to get the correct value.

If the PC3000 warm starts, the first Delta_Count will be invalid.

If the Sample_Period is changed whilst the program is running the first Delta_Count will be invalid.

Chapter 16

RELAY OUTPUT MODULE

Contents

Version compatibility

This module is version 3 that introduces a new style connector header and a change to the numbering of the Status Indicator Leds.

Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides twelve channels of relay output with form A (normally open) contacts. Relay outputs are grouped as three groups of four channels, each group having a separate common terminal.

The relay outputs have reinforced insulation to the "System" and other modules. Reinforced insulation is NOT provided between the separate relay groups.

Relays are provided with contact suppression and are rated at 1A, 264V ac maximum.

A variant of this module, provides eleven directly addressable outputs and the last output is driven by the system watchdog in order to provide a link to an external 'failsafe' strategy. The watchdog relay is non-latching.

Caution live connections

Where one channel may be live, (e.g. a relay driving a mains powered contactor) the installer must ensure that any other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

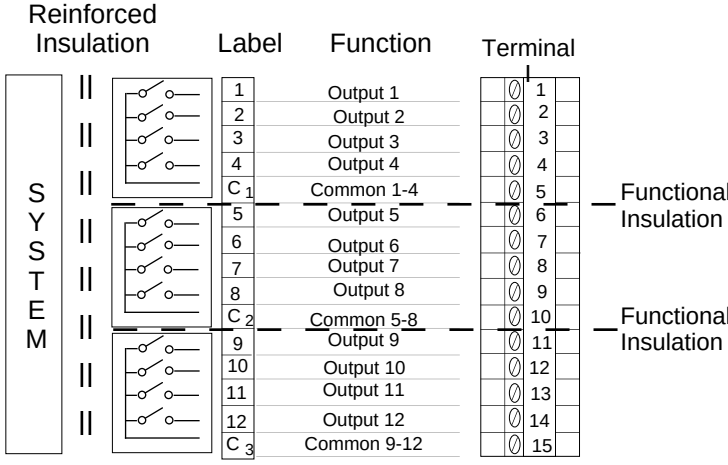
The module may be identified by means of a label visible through the top of the detachable fascia carrying the text **RL 12**.

Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/DO/VERSION3/RLYSTD12 or .../**RLYFS11** in the case of the 'failsafe' variant.

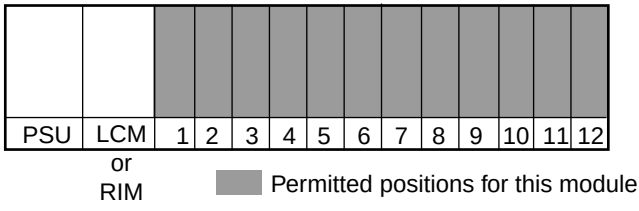
Connections

Connection by means of a detachable 15 way connector and fascia assembly.
The following terminal assignment applies:



Note: Output 12 becomes System Watchdog on ../RLYFS11

Location



Specification

Channels:	12
Contact life:	> 500K operations at 1 amp resistive load Mechanical life > 50M operations
Max Voltage:	264V ac 50/60Hz
Max Current:	1A per channel
Protection:	Contacts protected by RC network (Off leakage current = 2mA @ 264V ac)
Insulation:	Insulated as 3 groups - Ch1-4, 5-8, 9-12 Functional insulation Channel group to Channel group. Reinforced insulation Module to Module.

Status indication

Output, 'health' and communications status indication are provided by means of indicators visible through the detachable connector/fascia assembly. The following assignment applies:

RLY12 Version 3 has introducted a change to the numbering of the Status Indication LED's.

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	R	Run	Green
4	N/A		
5	1	Output 1 status	Yellow
6	2	Output 2 status	Yellow
7	3	Output 3 status	Yellow
8	4	Output 4 status	Yellow
9	5	Output 5 status	Yellow
10	6	Output 6 status	Yellow
11	7	Output 7 status	Yellow
12	8	Output 8 status	Yellow
13	9	Output 9 status	Yellow
14	10	Output 10 status	Yellow
15	11	Output 11 status	Yellow
16	12	Output 12 status	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	R	
1	2	3	4
5	6	7	8
9	10	11	12

Note:

The Relay Output module will indicate a fault under the following conditions:

1. When the PC3000 is in the reset mode i.e. program not running. It will clear when the PC3000 is placed in the run state.
2. If the module is placed in a slot which is not referenced by the PC3000 program.
3. A hardware fault.

Caution

The relay module is fitted with an RC snubber network to protect the relay contacts when switching full load current. However, with very low current loads such as small ac solenoids, the leakage current that flows through the snubber can 'hold' the solenoid in the on state. There are 2 solutions to this problem:

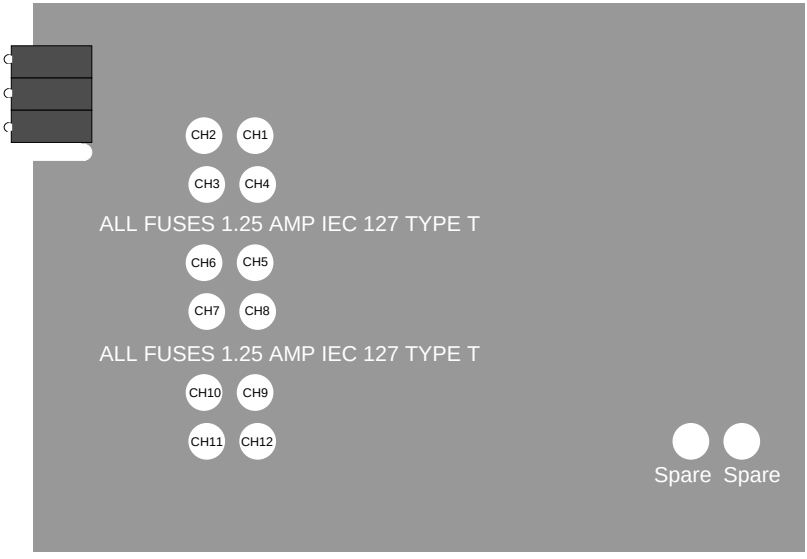
1. Remove the 100R resistor with a pair of cutters from each affected channel.

In this case care must be taken to replace any module that has been modified with a module which has been similarly modified. If in doubt please contact your local Eurotherm Controls' office.

2. Increase the load current demand by connecting additional resistance in parallel with the solenoid. The value may be calculated from the drop-out characteristic of the solenoid.

Fusing

Each channel is fitted with a fuse to protect the PCB from damage. They are not intended to protect the external wiring or plant. These fuses are 1.25 amp IEC 127 type T rating. Wickman Part No. 1.24A No. 19372K. They are available as a spares item from Eurotherm, Eurotherm part number CS022078.



Note:

For convenience, 2 spare fuses have been provided, at the other end of the board.

The user should fit, externally, appropriate fusing for protecting the wiring and plant, for details consult your local wiring standards. A minimum requirement is a 4 amp IEC 127 Type T fuse in each of the three Common lines, terminals 5, 10 and 15.

Chapter 17

LOGIC OUTPUT MODULE

Contents

Version compatibility

This module is Version 3 and introdues a new style connector header and a change to the numbering of the Status Indicator Leds.
Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

Description

Provides twelve channels of Logic output (open collector, npn). Outputs are grouped in group of four channels, each group having a separate common terminal.

The logic outputs have reinforced insulation to the "System" and other modules.

Reinforced insolation is NOT provided between the separate groups.

Caution live connections

Where one channel may be live, the installer must ensure that any other channel in the same module, is not accessible to service personnel while it is live. The installer must also ensure that this situation will not damage other connected equipment. All cables, connectors and switches for connecting external equipment to an I/O point that may be at live potential, must be mains rated.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

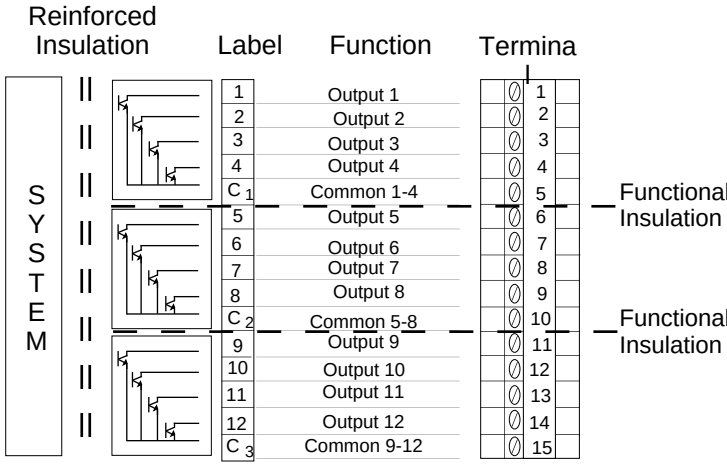
Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **LGC 12**.

Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

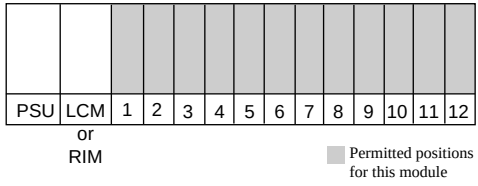
PC3000/DO/VERSION3/LGC12

Connections

Connection by means of a detachable 15 way connector and fascia assembly. The following terminal assignment applies:



Location



Specification

Channels:	12 open collector, NPN
Max Voltage:	30V dc
Max Current:	100mA per channel
Insulation:	Insulated as 3 groups - Ch1-4, 5-8, 9-12 Functional insulation Channel group to Channel group. Reinforced insulation Module to Module.

Status indication

Output, 'health' and communications status indication are provided by means of indicators visible through the detachable connector/fascia assembly. The following assignment applies:

Version 3 has introduced a change in the numbering of the Status Indication LED's

Indicator Number		Function	Colour
Version 2	Version 3		
1	F	Fault	Red
2	C	Comms	Green
3	R	Run	Green
4		n/a	
5	1	Logic 1	Yellow
6	2	Logic 2	Yellow
7	3	Logic 3	Yellow
8	4	Logic 4	Yellow
9	5	Logic 5	Yellow
10	6	Logic 6	Yellow
11	7	Logic 7	Yellow
12	8	Logic 8	Yellow
13	9	Logic 9	Yellow
14	10	Logic 10	Yellow
15	11	Logic 11	Yellow
16	12	Logic 12	Yellow

VERSION 2

1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16

VERSION 3

F	C	R	
1	2	3	4
5	6	7	8
9	10	11	12

Note:

The Logic Output module will indicate a fault under the following conditions:

1. When the PC3000 is in the reset mode i.e. program not running. It will clear when the PC3000 is placed in the run state.
2. If the module is placed in a slot which is not referenced by the PC3000 program.
3. A hardware fault.

Chapter 18

INTELLIGENT COMMUNICATIONS MODULE

Contents

Version compatibility

This module is Version 3 and introduces a new style connector. Version 3 modules may be used in the old Version 2 or Version 1 rack together with the enclosed new connector header.

The following information applies to Issue 4 PCBs onwards, the issue can be found on the top-side of the PCB.
For earlier Issues refer to the Installation guide HA023824 Issue 1, as supplied with those modules.

Description

The PC3000 Intelligent Communications Module or ICM, provides four insulated communications channels. Ports A, B and C are RS485. Port D is RS232.

Ports are functionally insulated from each other and other comms ports.
The PC3000 insulation strategy guarantees that all comms ports have reinforced insulation to all plant I/O.

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text **COM**.

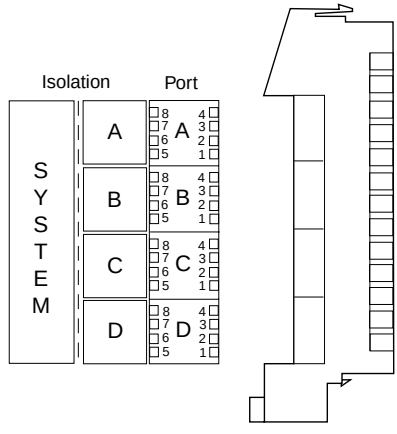
Additionally, a label fitted to the side of the module carries details of serial number etc. The module's product code is included and should read:

PC3000/COMM/VERSION3/PORTS4/NOMEM/320A[Note (1)]

Note (1) Required firmware, must be the same as LCM.

Connections

Connection is via four eight way 'Telephone' style connectors. RS485 Pin-out is identical to ports A, B and C on the Local Controller Module. The following port assignments apply. The configuration of the ports depends upon the configuration of links described on page 18-2. The table headings used here refer to mode of operation.



Port A Connections

Pin Number	4Wire (Standard)	4 Wire (Swapped)	2 Wire (Standard)	2 Wire (Swapped)
1	nc	nc	nc	nc
2	nc	nc	nc	nc
3	Tx-	Rx-	Tx-/Rx-[3]	Tx-/Rx-[3]
4	Tx+	Rx+	Tx+/Rx+[4]	Tx+/Rx+[4]
5	Rx-	Tx-	Tx-/Rx-[3]	Tx-/Rx-[3]
6	Rx+	Tx+	Tx+/Rx+[4]	Tx+/Rx+[4]
7	Common	Common	Common	Common
8	Common	Common	Common	Common
9	Cable Screen	Cable Screen	Cable Screen	Cable Screen
10	Cable Screen	Cable Screen	Cable Screen	Cable Screen
11	Cable Screen	Cable Screen	Cable Screen	Cable Screen
12	Cable Screen	Cable Screen	Cable Screen	Cable Screen

Port B and C Connections

Pin Number	4 Wire (Standard)	2 Wire
1	nc	nc
2	nc	nc
3	Tx-	Tx-/Rx-[3]
4	Tx+	Tx+/Rx+[4]
5	Rx-	Tx-/Rx-[3]
6	Rx+	Tx+/Rx+[4]
7	Common	Common
8	Common	Common
9	Cable Screen	Cable Screen
10	Cable Screen	Cable Screen
11	Cable Screen	Cable Screen
12	Cable Screen	Cable Screen

Notes:

1 Pins 7 and 8 are connected together and then to the isolated areas OV, via 1MΩ
2 The voltage levels are appropriate for 485, not 422.
Note that the Driver can be tri-stated, so it is not restricted to point to point communications.
3 RS485 2 wire mode, the Tx- connection is physically shorted to the Rx- connection.
4 RS485 2 wire mode, the Tx+ connection is physically shorted to the Rx+ connection.

There are no hardware configuration options on port D.

Port D Connections

Pin Number	RS232 (Standard)
1	Rx[1]
2	Tx
3	Rx
4	RTS
5	CTS
6	nc
7	Common
8	Common
9	Cable Screen
10	Cable Screen
11	Cable Screen
12	Cable Screen

Note:

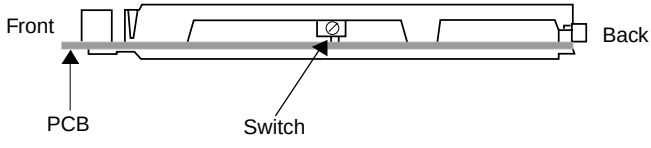
1 RS232 on Port D the Rx connection is doubled up to terminals 1 and 3 to provide compatibility with the LCM-Plus V3, ports A & B, where Rx is on terminal 1. (Tx for ICM port D and LCM-Plus ports A & B are all on Pin 2. The LCM-Plus does not provide RTS and CTS).

CONFIGURATION OPTIONS

Setting the base address (Group Identifier)

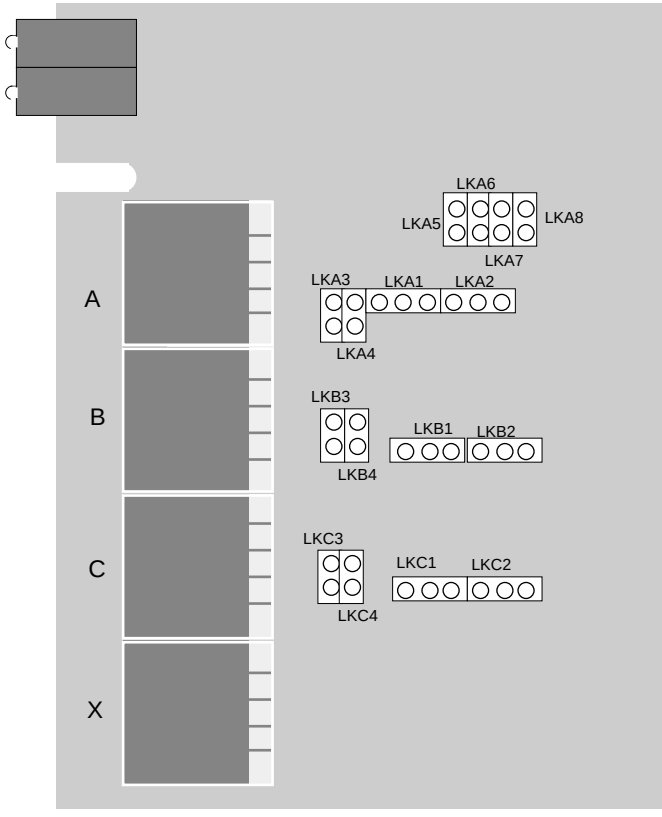
A rotary switch accessible through the side cover of the module should be set by screwdriver. It may be set in the range 0-9. Refer to 'PC3000 Function Block Manual' (HA022917), section 'Communications' for further details.

Position of address switch - underside of module.



Communications Configuration Jumpers

The communication configuration jumpers function in a very similar manner to those on the LCM_Plus, although their layout is rather different.



LKA1-8 configure port A, LKB1-4 configure port B and LKC1-4 configure port C. The links have the following functions -

3 pin links may have the shorting link fitted in the forward position (towards the front of the LCM-Plus), the rear position (towards the rear of the LCM-Plus) or not fitted at all. When not fitted the shorting link may be ‘parked’ by hanging it off one pin.

Links	Forward position	Rear position	Not fitted
LKA1 LKB1 LKC1	120Ω termination on receiver (default)	Not terminated	Not terminated
LKA2 LKB2 LKC2	Transmitter permanently enabled Receiver permanently enabled (default)	Transmitter disabled when not transmitting Receiver disabled when transmitter enabled	Transmitter disabled when not transmitting Receiver always enabled

2 pin links may be fitted or not fitted with a shorting link. When not fitted the shorting link may be 'parked' by hanging it off one of the pins.

Links	Fitted	Not fitted
LKA3 & 4 LKB3 & 4 LKC3 & 4	Transmit and receive shorted (2-wire)	Transmit and receive separate (4-wire) (default)

Swap links may be fitted with all four vertical or all four horizontal. The swap links (LKA5-LKA8) are only available on channel A of the ICM and permit simple swapping of the transmit and receive pairs.

Links	Vertical - 	Horizontal - 
LKA5-LKA8	Swapped	Normal (default)

It is not possible to cover all possible uses of the communication links to and from an ICM but the following table shows how the links would be set for some of the typical uses. In the table link LK*1 refers to LKA1 for channel A, LKB1 for channel B and LKC1 for channel C etc.

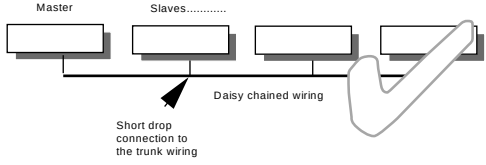
Requirement	**Links**	**Comments**
RS232 Point to point	not applicable	The links are ignored for RS232 connection (Port D only)
RS485 Point to point 4-Wire	LK*1 forward position LK*2 forward position LK*3 & 4 not fitted LKA5-8 as required (port A only)	Receiver terminated Tx and Rx permanently enabled Tx and Rx separate Optional swap if not in cable (Note 1)
RS485 Point to point 2-wire (Suitable for half duplex protocols only)	LK*1 forward position LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Receiver terminated Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Swap not required
RS485 Master 4-wire	LK*1 as required LK*2 forward position LK*3 & 4 not fitted LKA5-8 vertical (port A only)	Optional receiver termination (Note 2) Tx and Rx permanently enabled Tx and Rx separate Swapped (Note 1)
RS485 Master 2-wire (Suitable for half duplex protocols only)	LK*1 as required LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Swap not required
RS485 Slave 4-wire	LK*1 as required LK*2 not fitted LK*3 & 4 not fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disable when not transmitting, Rx permanently enabled Tx and Rx separate Not swapped
RS485 Slave 2-wire (Suitable for half duplex protocols only)	LK*1 as required LK*2 rear position LK*3 & 4 fitted LKA5-8 horizontal (port A only)	Optional receiver termination (Note 2) Tx disabled when not transmitting, Rx disabled when transmitting Tx and Rx shorted Swap not required

Notes:

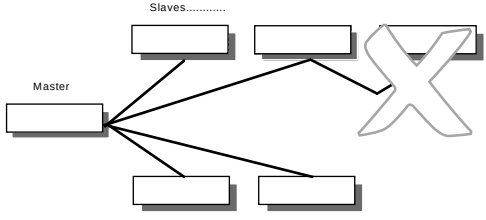
1. All PC3000 cables supplied by Eurotherm do not swap the receive and transmit pairs. Where these cables are used to connect from one PC3000 to another it will be necessary to introduce a swap on one end of point to point connections or the master connection of Master-Slave connections. This can be done either by using links LKA5-8 (port A only) or external to the ICM on terminal block assemblies. For further details of cabling options please refer to the section on cabling in the PC3000 installation handbook.

2. Termination resistor(s) should be fitted to *both* ends of the cable used for RS485 connections. All other connections to the cable should not be terminated. Correct termination is particularly important when cable lengths are long. A '4-wire' cable can be terminated by connecting a 120Ω resistor between Rx+ and Rx- for each end. A '2-wire' cable can be terminated by connecting a 120Ω resistor between Rx/Tx+ and Rx/Tx- at each end.

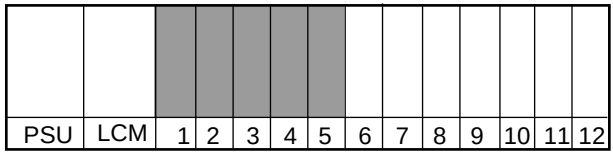
More detail on how to connect termination resistors is shown in the section on communication configuration links.



Multi-drop communications should not be connected together in a star or other non chain configuration.



Location



Note: Communications Module must be fitted in contiguous locations with the LCM i.e. if only one unit is required, locate adjacent to LCM; if two are required fit in slots 1 and 2 etc.

Specification

Consult 'PC3000 Function Block Reference' for details of protocol selection.

Port A,B,C:	300-115·2K baud - Protocol user definable RS485
Port D:	75-19·2K Baud - Protocol user definable RS232
Insulation:	Channel to Channel and Module to Module

Cables

A range of cables for ports A, B and C are available for connection to a variety of communicating devices. Cables providing a PC3000 'telephone' style connector at one end and a 9 or 25 pin 'D' type at the other is available for use with Port D. Order number:

PC3000/CABLE/COMM232/9PIN/3·0M
PC3000/CABLE/COMM232/25PIN/3·0M

DIAGNOSTICS

Status indication

The module provides eight status indicators. The following status indicators are assigned:

Indicator Number	Function	Colour
1	Fault	Red
2	Run	Green
3	Diag 1	Green
4	Diag 0	Green
5	A	Yellow
6	B	Yellow
7	C	Yellow
8	D	Yellow
9 - 16	not used	

Notes:
Diag 0, Diag 1, refer to diagnostics.
Error code indicates errors detected at power up.
An error will be indicated by Fault plus the appropriate error code.
A, B, C, D refer to communications port activity. A refers to port A etc.

Chapter 19

PROFIBUS MASTER FIELDBUS CARD

Contents

Version compatibility

The module is Version 3 but may be used in existing Version 2 and Version 1 racks. It is designed to be used with the LCM-PLUS and firmware version 3.20 or higher.

> *It is not possible to use the library with earlier versions of the firmware or with a simple LCM.*

Description

The PC3000 Profibus DP Master module provides one isolated communications channel. It can be used in any of the first five slots in a PC3000 main rack. More than one module can be mounted in the rack and the only limitation is that they must be mounted to the right (higher slot address) of any ICM, or other Lbus modules.

The module comprises a motherboard that carries a plug-on COM-DPM Profibus module. The motherboard provides:-

- physical mounting for the module, connectors and diagnostics LEDs
- power supply
- Lbus interface to the DPM module's dual port memory

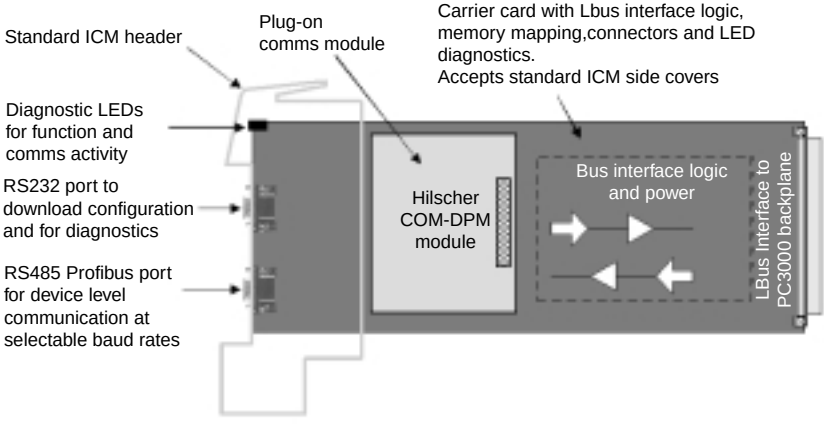


Figure 1 Module layout

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text COM.

Additionally, a label fitted to the side of the module carries details of the serial number etc. The product code is included and should read:-

PC3000/COMM/VERSION3/PROFIDP/MASTER

The COM-DPM card is the 2K varient, which describes the size of the dual port RAM.

Connections

User connection to the module is via two 9 way, D-type connectors at the front of the module.

Configuration port

The top connector is a male and is an unisolated RS232 configuration port. It is for connection to a computer running the configuration software for download and diagnostics.

Pin No.	Function
2	Tx
3	Rx
5	Common

Table 1 Configuration port connections

Profibus port

The bottom connector is a female and is the isolated RS485 Profibus port. The actual network connection to remote instruments via a twisted pair cable and the D-type connector header should contain a terminator network as shown in the diagram.

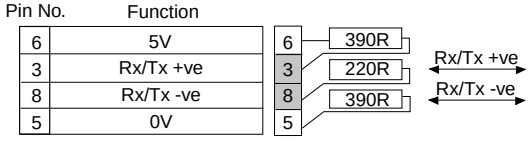


Table 2 Profibus port connections

Configuration options

There is no hardware configuration necessary on this module. There are jumpers on the mother board for setting interrupt levels and test features but the module is shipped with the necessary jumpers fitted and these should not be altered.

Location

The module must be located in the main rack in one of the first five I/O positions starting on the left. It must also be fitted to the right of any standard COM/PORTS4 modules.

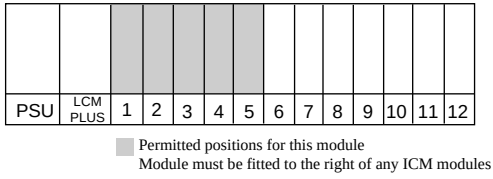


Figure 2 Module location

Specification

This card performs the functions of a Profibus DP Master and includes surport for Demand Data.

Technical data

·	PROFIBUS-DP connection	Potential-free RS485 interface
·	Transmission rates	Max 12 Mbaud
·	Configuration connection	Potential-linked RS232 interface
·	Host interface	2 kByte dual port memory
·	Input data	512bytes
·	Output data	512bytes
·	Diagnostics	LED's and via RS232 port
·	Operating temperature	0-50 degrees

Cables

An RS232 9way D-type female to 9way D-type female cable is available for configuration. The Hilscher part number is KAB-SRV. The cable details are as follows:

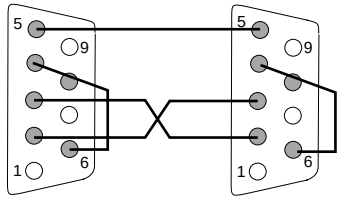


Figure 3 Cable details

The Profibus port is a standard configuration and any standard Profibus cable will also contain the termination network. For field wiring, either of the two cable types shown below can be used. Type_A cable is recommended because it allows higher speed and longer cable lengths.

	Type A cable	**Type B cable**
Characteristic impedance	135 to 165Ω at 3 to 20 MHz	135 to 165Ω at >100 kHz
Cable capacitance	<30pF per metre	Typically <60pF per metre
Core diameter	Max 0.34mm^2 corresponds to AWG 22	Max 0.22mm^2 corresponds to AWG 24
Cable type	twisted pair. 1x2, 2x2 or 4x2 lines	twisted pair, 1x2, 2x2 or 4x2 lines
Resistance	<100 Ω/km	-
Shielding	Copper shielding braid or shielding braid and shielding foil	Copper shielding braid or shielding braid and shielding foil.

Table 3 Profibus cable types

Belden cable B3079A meets the specification for type A cable but there are other choices. For more information, refer to the 'PROFIBUS Product Guide' produced by the PROFIBUS User Group.

Baud rate (kbit/sec)	**9.6**	**19.2**	**93.75**	**187.5**	**500**	**1500**
Type A cable	1200m	1200m	1200m	1000m	400m	200m
Type B cable	1200m	1200m	1200m	600m	200m	

Table 4 Maximum line length per segment

DIAGNOSTICS

There are four LEDs on the front of the module to provide information about the module operations. These are as follows. In normal operation, R, 1 and 0 will be steady and F will be off.

Label	Colour	Function
F	Red	Error
R	Green	Run
1	Green	Ready
0	Green	Status

Table 5 Diagnostic indication

Hardware requirement

The software support for the Profibus module requires the installation of a 128K RAM card in the second RAM slot of the LCM-PLUS. This is the rearmost position behind the EPROM card.

IMPORTANT

The downloadable function blocks require a 128K RAM card installed in the LCM-PLUS.

Software requirement

The PC3000 function blocks that support this module for the DOS PS tool come in the form of a downloadable function block library on a single 31/2" diskette. The files supplied on the diskette must be copied to the relevant directories on the computer running the DOS version of PC3000 programming software. The Windows version of the tool WinPS already has the necessary FIELDBUS library to support this module.

Chapter 20

DEVICENET SLAVE FIELDBUS CARD

Contents

Version compatibility

The module is Version 3 but may be used in existing Version 2 and Version 1 racks. It is designed to be used with the LCM-PLUS and firmware version 3.20 or higher.

> *It is not possible to use the library with earlier versions of the firmware or with a simple LCM.*

Description

The PC3000 DeviceNet Slave module provides one isolated communications channel. It can be used in any of the first five slots in a PC3000 main rack. More than one module can be mounted in the rack and the only limitation is that they must be mounted to the right (higher slot address) of any ICM, or other Lbus modules.

The module comprises a motherboard that carries a plug-on COM-DNS DeviceNet. The motherboard provides:-

- physical mounting for the module, connectors and diagnostics LEDs
- power supply
- Lbus interface to the DNS module's dual port memory

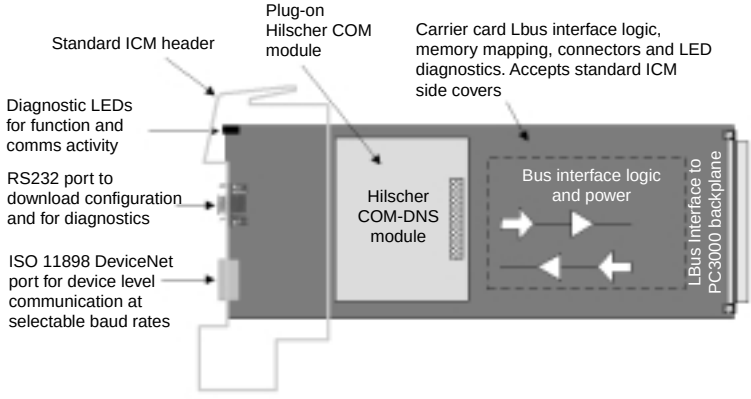


Figure 1 Module layout

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Module identification

Module may be identified by means of a label visible through the top of the detachable fascia carrying the text COM.

Additionally, a label fitted to the side of the module carries details of the serial number etc. The product code is included and should read:-

PC3000/COMM/VERSION3/DEVICENET/SLAVE

Connections

User connection to the module is via two connectors at the front of the module. A 9 way D-type for configuration and diagnostics and a 5 way CombiCon connector for the DeviceNet network.

Configuration port

The top connector is a male and is an unisolated RS232 configuration port. It is for connection to a computer running the configuration software for download and diagnostics.

Pin No.	Function
2	Tx
3	Rx
5	Common

Table 1 Configuration port connections

DeviceNet port

The bottom connector is a 5 way CombiCon connector and is the isolated ISO 11898 DeviceNet port. The actual network connection to remote instruments is via standard DeviceNet cable, which contains both the signal and the power.

Pin No.	Function
1	0V external power
2	CANL - data line low
3	Shield
4	CANH - data line high
5	24V external power

External termination, at last unit = 124Ω

Table 2 DeviceNet port connections

Configuration options

There is no hardware configuration necessary on this module. There are jumpers on the mother board for setting interrupt levels and test features but the module is shipped with the necessary jumpers fitted and these should not be altered.

Location

The module must be located in the main rack in one of the first five I/O positions starting on the left. It must also be fitted to the right of any standard COM/PORTS4 modules.

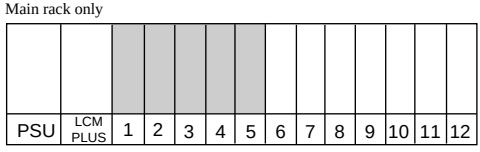


Figure 2 Module location

Specification

This card performs the function of a DeviceNet Slave.

Technical data

·	DeviceNet Slave connection	Potential-free ISO 11898 interface
·	Transmission rates	Max 500 Kbaud
·	Configuration connection	Potential-linked RS232 interface
·	Host interface	510 byte dual port memory
·	Consumed data	255bytes
·	Produced data	255bytes
·	Diagnostics	LED's and via RS232 port
·	Operating temperature	0-55 degrees

Connectors and Cables

Configuration and Diagnostics

An RS232 9way D-type female to 9 way D-type female cable is available for configuration and dignostics. The Hilscher part number is KAB-SRV. The wiring details are shown in Figure 3.

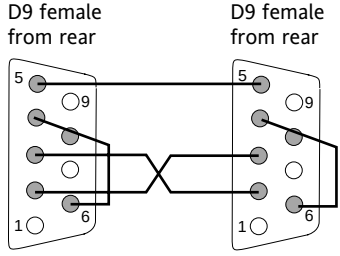


Figure 3 Configuration/diagnostic cable

DeviceNet

The DeviceNet connection is via a five-way 5.08 pitch male CombiCon connector mounted on the PCB. The cable, therefore, terminates in a matching female connector. A wide variety of such connectors are available with screw-less terminals, spring leaf and rising clamp terminals. They are also available with strain relief features and with cables entering at the side or at the rear. A typical simple connector with screw clamp terminals would be the Weidmuller product, part number BLZ 5.08/5.

The cables are specified by the Open DeviceNet Vendor Association (ODVA). A suitable cable for trunk lines is belden type 3082A and, for drop lines, is Belden type 3084A.

DIAGNOSTICS

There are four LED's on the front of the module to provide information about the module operations. These are shown in Table 3.

Note: With the current release of this module, the LED's do not conform to the DeviceNet standard and the differences are shown in Table 5.

Label	Colour	Function		
F	Red	NET	See Table 5	
R	Green	RUN	On	Communication running
			Flashing non-cyclic	Parameter error
			Off	Communication stopped
1	Green	RDY	On	COM ready
			Flashing cyclic	Bootstrap loader active
			Flashing non-cyclic	Hardware or system error
			Off	Hardware error
0	Green	MOD	See Table 5	

Table 3 Diagnostic LED's

DeviceNet Specification				PC3000 Implementation
Function	**Colour**	**State**	**Explanation**	
NET	Red	On	Critical link failure	Red LED F On
		Flashing	Connection time out	Red LED F flashing
		Off	Device not powered	Red LED F Off
	Green	On	On-line, link ok	Red LED F Off
		Flashing	On-line, not connected	Red LED F Off
		Off	Device not powered	Red LED F Off
MOD	Red	On	Unrecoverable fault	Green LED 0 off
		Flashing	Minor fault	Green LED 0 Off
		Off	No power	Green LED 0 Off
	Green	On	Normal operation	Green LED 0 On
		Flashing	Configuration failure	Green LED 0 flashing
		Off	No power	Green LED 0 Off

Table 4 LED non-conformance details

Hardware requirement

The software support for the DeviceNet module requires the installation of a 128K RAM card in the second RAM slot of the LCM-PLUS. This is the rearmost position behind the EPROM card.

IMPORTANT

The downloadable function blocks require a 128K RAM card installed in the LCM-PLUS.

Deliverables

The PC3000 function blocks that support this module for the DOS PS tool come in the form of a downloadable function block library on a single 31/2" diskette. The files supplied on the diskette must be copied to the relevant directories on the computer running the DOS version of PC3000 programming software. The Windows version of the tool WinPS already has the necessary FIELDBUS library to support this module.

Chapter 21

OPERATOR PANELS

Contents

EUROPANEL 2L X 40C

Description

Two line by 40 character vacuum fluorescent display with 23 key membrane key-pad including numeric, three function keys and scroll keys. The unit may be mounted in a control panel using the brackets provided

Cleaning

Isopropyl alcohol may be used to clean the labels, do not use water or water based products or they will become illegible.

A mild soap solution may be used to clean the exterior surfaces of this product.

Identification

Panel identification by label fitted to top, right hand side of display bezel carrying the text 'Eurotherm PC3000'.

Additionally, a label is provided on the rear of the panel carrying details of product code, and serial number. The product code reads:

PC3000/PANEL/VERSION3/EP2X40/PANELMNT or

PC3000/PANEL/VERSION3/EP2X40/SURFACEMNT

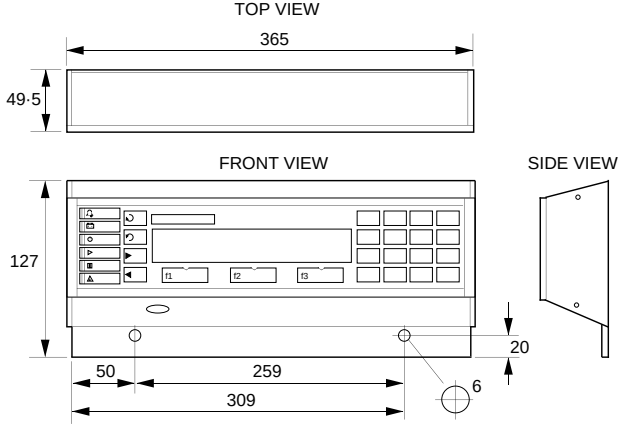
Specification

Communications	RS422 (Point-to-Point only)
Supply Requirements	24V dc ±5%, 300mA

Installation

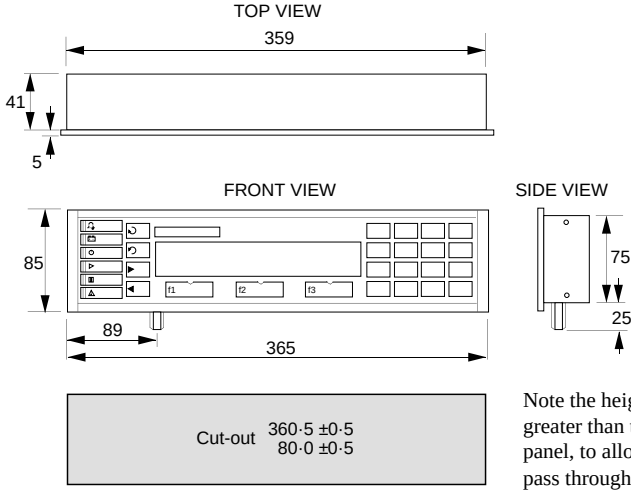
All dimensions in mm

PC3000/PANEL/VERSION3/EP2X40/SURFACEMNT



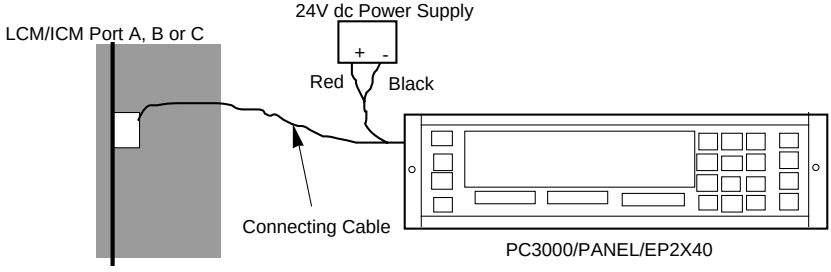
All dimensions in mm

PC3000/PANEL/VERSION3/EP2X40/PANELMNT



Note the height of the cut-out is greater than the height of the panel, to allow the cable clamp to pass through.

Connections



A cable for connecting the panel to a PC3000 Local Control Module or Intelligent Communication Module:

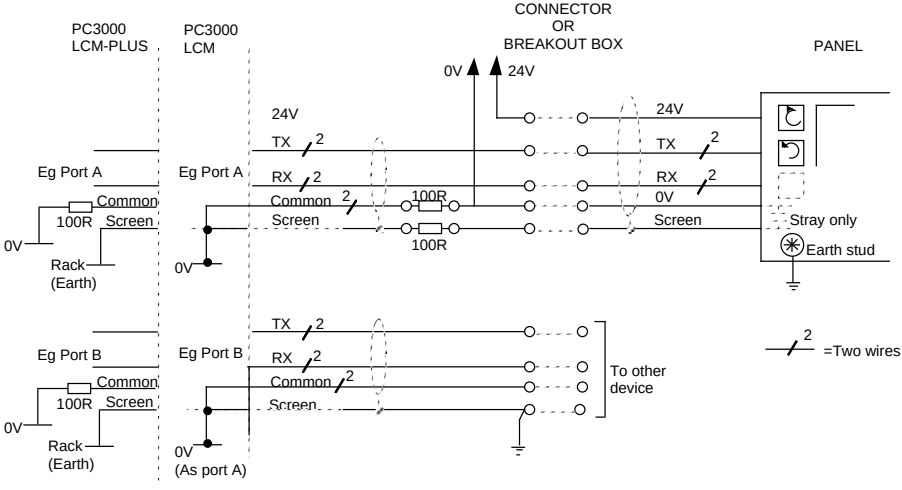
PC3000/CABLE/COMM/EP2X40/3.0M

The cable includes a spur for connection to an external power supply unit.

> **Note:** An external supply, smoothed and capable of supplying 300mA must be provided. It is recommended that the supply is also isolated to reduce the possibility of multiple earth connections.

Euro Panel to LCM/LCM-Plus

The following cable arrangement is advised in applications where a Euro Panel is connected to an LCM serial port and a second unisolated communicating device is connected to a second port. All ports on the LCM share a common 0V which is also connected to the cable screens on the LCM motherboard.



Earth loops may occur when the panel and another connected device are both earthed. 100 Ohms 1/4W carbon resistors may be inserted in the common and screen lines to minimise circulatory currents.

Alternatively a Eurotherm Controls 261 converter may be used to isolate the second device.

Chapter 22

CABLING AND DEVICES

Contents

PC3000 CABLING

Although standard cables are available from Eurotherm Controls for all common PC3000 interfaces it is recognised that every application is different. This section provides details for all PC3000 interfaces.

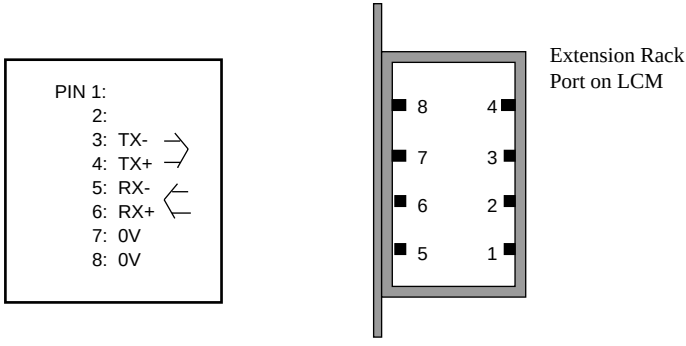
Inter-rack cables

The following standard cables are available:

PC3000/CABLE/COMM/COMM/1.5M
PC3000/CABLE/COMM/COMM/4.0M
PC3000/CABLE/COMM/COMM/6.0M

Usage: For connecting the PC3000 Rack Interface Module to the extension rack connections on the Local Controller Module. The same cable should be used to 'daisy-chain' further extension racks off the first.

Pin numbering, function and wire colours are as follows. Connections are all one-to-one i.e pin 2 connects to pin 2, pin 3 to pin 3 etc.



Pin Number	Function	Wire Colour
1	nc	Brown
2	nc	Orange
3	Tx-	Red
4	Tx+	Black
5	Rx-	Green
6	Rx+	Blue
7	Common	Grey
8	Common	White

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip.

Cables for connecting 261 Serial Converter to PC3000

The following cables are available:

PC3000/CABLE/COMM/261/3.0M

Usage: For connecting a PC3000 RS-422 Serial Port to a 261 converter. May be used with Local Controller Module ports A, B or C and Intelligent Communications Module ports A, B and C only.

Pin numbering, function and wire colours are as follows.

LCM Port Pin	Function	261 Port Pin	Function	Wire Colour
1	nc		nc	Brown
2	nc		nc	Orange
3	Tx-	16	Rx-	Red
4	Tx+	3	Rx+	Black
5	Rx-	13	Tx-	Green
6	Rx+	12	Tx+	Blue
7	Common	7	Common	Grey
8	Common	7	Common	White
Note 1, 2 & 3	Screen	(1)	Note 4	

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected to 0v on the Local Controller Module printed circuit board via the three spring contacts in the socket.

(3) LCM-Plus and ICM version 3, the screen is taken via the module earth clips, to the Rack, as a Safety and RFI Ground.

(4) The screen is connected to pin 1 on the 25 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.This pin has no function on the 261.

PC3000/CABLE/COMM232/261/3.0M

Usage: For connecting the PC3000 Intelligent Communications Module RS-232 port to a 261 converter. For use with port D only. The cable is functionally identical to PC3000/CABLE/COMM232/25PIN/3.0M

Pin numbering, function and wire colours are as follows.

ICM Port Pin	Function	261 Port Pin	Function	Wire Colour
1	nc		nc	Brown
2	Tx	3	Rx	Orange
3	Rx	2	Tx	Red
4	RTS	(4)	Note 3	Black
5	CTS	(5)	Note 3	Green
6	nc	12	nc	Blue
7	Common	7	Common	Grey
8	Common	7	Common	White
Note 1 & 2	Screen	(1)	Note 4	

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip.

(3) The RTS/CTS connections have no function on the 261. They are included to allow cable extension if required.

(4) The screen is connected to pin 1 on the 25 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended. This pin has no function on the 261.

Cables for use with terminal block assemblies

In many applications it is convenient to bring all communications connections out to conventional screw terminals. This allows terminal blocks to be mounted using standard DIN rail type fittings and permits easy extension of communications cabling using standard communications cables.

Two terminal block assemblies are available from Eurotherm Controls. Each provides a multi-pin female D socket and a row of screw terminals. The assemblies may be mounted on an industry standard DIN rail. All pins are connected one-to-one.

PC3000/CONV/TERMBLK/9PIN - fitted with 9 pin D socket

PC3000/CONV/TERMBLK/25PIN - fitted with 25 pin D socket

Each of the assemblies should be used in conjunction with the following cable assemblies.

PC3000/CABLE/COMM/25PIN/3.0M

Usage: For connecting a PC3000 RS-485 Serial Port to a terminal block assembly as described above. May be used with Local Controller Module ports A, B or C and Intelligent Communications Module ports A, B and C only.

May be used to extend separation between the 261 port B (RS-485 connection) and the PC3000 or for any PC3000 communications interface which requires screw terminal connections.

Pin numbering, function and wire colours are as follows.

LCM/ICM Port Pin	Function	25 way D Pin	Wire Colour
1	nc		Brown
2	nc		Orange
3	Tx-	16	Red
4	Tx+	3	Black
5	Rx-	13	Green
6	Rx+	12	Blue
7	Common	7	Grey
8	Common	7	White
Note 1 & 2	Screen	(1)	

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip, in Version 3 ICMs and LCM-Plus.

(3) The screen is connected to pin 1 on the 25 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.

PC3000/CABLE/COMM/9PIN/3.0M

Usage: For connecting a PC3000 RS-485 Serial Port to a terminal block assembly as described above. May be used with Local Controller Module ports A, B or C and Intelligent Communications Module ports A, B and C only.

May be used for extending cables where the smaller space taken up by the 9 way terminal blocks may be important.

Pin numbering, function and wire colours are as follows.

LCM/ICM Port Pin	Function	9 way D Pin	Wire Colour
1	nc		Brown
2	nc		Orange
3	Tx-	3	Red
4	Tx+	4	Black
5	Rx-	5	Green
6	Rx+	6	Blue
7	Common	7	Grey
8	Common	7	White
Note 1 & 2	Screen	9	

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip, in Version 3 ICMs and LCM-Plus.

(3) The screen is connected to pin 9 on the 9 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.

PC3000/CABLE/COMM232/25PIN/3.0M

Usage: For connecting a PC3000 RS-232 Serial Port to a terminal block assembly as described above. For use with Intelligent Communications Module port D only.

The cable is functionally identical to PC3000/CABLE/COMM232/261/3.0M

Pin numbering, function and wire colours are as follows.

ICM Port Pin	Function	25 way D Pin	Wire Colour
1	nc		Brown
2	Tx	3	Orange
3	Rx	2	Red
4	RTS	4	Black
5	CTS	5	Green
6			Blue
7	Common	7	Grey
8	Common	7	White
Note 1 & 2	Screen	1	Note 3

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip, in Version 3 ICMs.

(3) The screen is connected to pin 1 on the 25 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.

PC3000/CABLE/25PIN/261/3.0M

Usage: To extend separation between 261 converter and the PC3000. Cable assembly fitted with two male 25 pin D connectors.

Pin numbering, function and wire colours are as follows.

261	Function	25 way D	Function	Wire Colour
16	Tx-	16	Tx-	Red
3	Tx+	3	Tx+	Black
13	Rx-	13	Rx-	Green
12	Rx+	12	Rx+	Blue
7	Common	7	Common	Screen

Grey/White
Brown/Orange
] Not used

Cables for use with operator panels

EuroPanel 2L x 40C

PC3000/CABLE/COMM/EP2X40/3.0M

Usage: Used to connect PC3000 RS-422 port (Local Controller Module A, B or C and Intelligent Communications Module A, B and C only) to the two line by 40 character Euro Panel display.

The cable includes a spur for connection to a dc power supply for powering the panel.

Pin numbering, function and wire colours are as follows.

LCM/ICM Port Pin	Function	Panel 25 way	Function	Wire Colour
1	nc		nc	Brown
2	nc		nc	Orange
3	Tx-	2	Rx-	Red
4	Tx+	3	Rx+	Black
5	Rx-	4	Tx-	Green
6	Rx+	5	Tx+	Blue
7	Common	1	Common	Grey
8	Common	1	Common	White
Note 2	Screen		Note 1	
		18	24v	Red
		25	0v	Black

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug. There is no connection on the 25 way connector.

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip, in Version 3 ICMs and LCM-Plus.

(3) Observe **24v dc power supply** connections.

Cables for connecting the PC to the 261 Serial Converter

PC3000/CABLE/9PIN/261/3.0M

Usage: A cable fitted with a 9 pin D type female suitable for connecting the PC to a 261 serial converter.

Pin numbering, function and wire colours are as follows.

PC COMM Port Pin	Function	Terminal	Function 25 way	Wire Colour	
3	Tx		3	Rx	Clear
2	Rx		2	Tx	Black
1	RSLD				
4	DTR	Link			
6	DSR				
7	RTS	Link			
8	CTS				
5	Common		7	Common	Screen

Cable is functionally identical to PC3000/CABLE/9PIN/CRT12C/3.0M

Other cables

PC3000/CABLE/COMM232/9PIN/3.0M

Usage: For connecting a PC3000 RS-232 Serial Port to a standard PC Comm port. For use with Intelligent Communications Module port D only. Fitted with 9 way Female 'D' type.

Pin numbering, function and wire colours are as follows.

ICM Port Pin	Function	9 way D	Function	Wire Colour
1	nc			Brown
2	Tx	2	Rx	Orange
3	Rx	3	Tx	Red
4	RTS	7	RTS	Black
5	CTS	8	CTS	Green
6				Blue
7	Common	5	Common	Grey
8	Common	5	Common	White
Note 1 & 2	Screen	9	Note 3	

Notes:

(1) The screen is connected to the metal band around the outside of the 8 pin plug

(2) The screen is connected directly to the Rack as a Safety and RFI Ground, via the module's front earth clip, in Version 3 ICMs.

(3) Although not a standard 9 way D RS-232 pin function the screen is connected to pin 9 to allow screen continuity. This connection must be **cut** if original pin function is required.

Recommended cable types for PC3000 communication links

Cable meeting the following specification and type should be used for all applications where the standard cables are extended.

Cabling should be dual screened twisted pair suitable for use in RS-422/485 applications. Suitable cables should ensure a nominal characteristic impedance of the order of 100 ohms to frequencies not greater than 100kHz and a dc series loop resistance not exceeding 240 ohms. Typical cables are:

Belden 9729 - 7/0.2mm (24awg) twisted pair, screened with overall aluminised tape and PVC sheath.

Belden 9829 - 7/0.2mm (24awg) twisted pair, overall aluminised tape and overall screening braid. PVC sheath.

For the best performance the following cable is recommended:

Belden 9730 or Brand-Rex BE-57730 -7/0.2mm (24awg) 3 x twisted pair and screen.

This allows the third twisted pair to be used to connect the common of the two communicating devices together. The screen may then be used for signal screening only. The screen must only be connected to earth at one end.

The RS-422 specification recommends that the receive line is terminated with 100 ohms to avoid possibility of reflections on the line.

Belden 8761 is a suitable cable for RS-232 cables.

Recommendations for connection of screened cables

Extension racks

On the LCM, the serial port for the extension racks is not isolated, but connects the screen of the cable to 0v. There is a 10M ohm impedance between the 0v connection and the chasis earth. The RIM's serial port connection is isolated and requires the screen of the cable to be connected, in order to provide an earth connection via the LCM.

(For other communications cables it is recommended that the screen is connected to Ground wherever possible)

LCM comms channels

The LCM's and LCM-Plus' three serial channels, Ports A, B and C, all share a common connection. They have functional insulation from the 0V of the 'system', but there is no interport isolation. Where there is a mixing of RS232 and RS485 connections as in the LCM-Plus, to un-isolated equipment, problems may arise with the RS232 side, because of its lower common mode input voltage range.

On connections which are made direct to PC3000 Local Controller communications port, the screen is connected to the isolated 0V, by means of the spring contacts within the 8 pin sockets. On connections made to Version 3 ICMs, and the LCM-Plus, the screen is taken via the spring contacts direct to the rack earth. On these modules, functional, but not reinforced insulation, is provided to the system, and in the ICM, between channels.

This means that any connected equipment which connects the screen to chassis earth, will connect all Local Controller ports to earth. Therefore, when using a standard LCM, if the connected equipment does NOT provide a connection to mains earth than a single connection should be made. This is to prevent the possibility of static build up on the screen which could cause potential damage. Similarly, on earlier versions of the ICM, where no ground connection is made to the screen, one must be provided externally.

In communication links which make use on the 261 serial convertor it is recommended that the screen is connected to the ground of the equipment connected on the RS422 side.

In the case of the RS232 links the screen is always used for the common connection.

LCM TO COMPUTER CONNECTION

Direct RS232 connection

Where the Computer is sited close to the PC3000 system, and the cable can be less then 15 metres the computer's RS232 Port may be coupled directly to the LCM-Plus. For details of acceptable distances, cabling, and baud rates refer to the RS232 standard.

Both 9 pin and 25 pin formats are available.

The connections between the PC and PC3000 are tabulated below:

PC (9 way)			LCM-Plus Port		Wire Colour
Tx	3		Rx	1	Brown
Rx	2		Tx	2	Orange
RTS	7	] Link			
CTS	8	] Link			
DSR	6	]			
RSLD	1	] Link			
DTR	4	]			
Comm	5		Comm	7 & 8	Grey & White
Screen	9		Screen		

Note that the screen connected to pin 9 on the 9 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.

Order code:

PC3000/CABLE/LCM232/9PIN/3.0M

PC (25 way)			LCM-Plus Port		Wire Colour
Tx	2		Rx	1	Brown
Rx	3		Tx	2	Orange
RTS	4	] Link			
CTS	5	] Link			
DSR	6	]			
RSLD	8	] Link			
DTR	20	]			
Comm	7		Comm	7 & 8	Grey & White
Screen	1		Screen		

Note that the screen connected to pin 1 on the 25 pin D connector. This is provided in order that screen continuity can be maintained if cables are extended.

Order code:

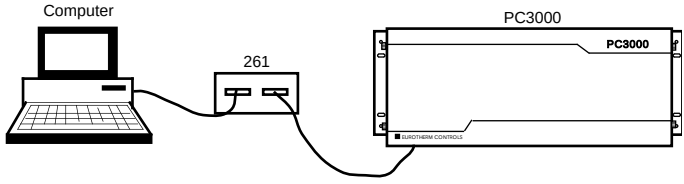
PC3000/CABLE/LCM232/25PIN/3.0M

Note that either of these cables will also work with Port D of the ICM. The module's Rx connection is doubled up on the ICM to both pins 1 and 3 for this purpose. Their cables, PC3000/CABLE/COMM232/25PIN/3.0M and PC3000/CABLE/COMM232/261/3.0M will **NOT** work with the LCM-Plus.

Use of 261 Serial Interface Unit

The 261 is a universal serial interface providing 232/422 conversion order codes:

261/230 220V-240V operation
261/115 110V-120V operation



The connections between the PC, 261 and PC3000 are tabulated below:

PC (9 way)			261 Port A (RS232)	PC to 261 Comms Connections
Tx	3		Rx 3	
Rx	2		Tx 2	
RTS	7	Link		
CTS	8	Link		
DSR	6	Link		
RSLD	1	Link		
DTR	4	Link		
Comm	5		Comm 7	

PC (25 way)			261 Port A (RS232)	PC to 261 Comms Connections
Tx	2		Rx 3	
Rx	3		Tx 2	
RTS	4	Link		
CTS	5	Link		
DSR	6	Link		
RSLD	8	Link		
DTR	20	Link		
Comm	7		Comm 7	

261 Port B (RS422)		LCM Port		Wire Colour	261 to PC3000
Rx-	16	Tx-	3	Red	Comms Connections
Rx+	3	Tx+	4	Black	
Tx-	13	Rx-	5	Green	
Tx+	12	Rx+	6	Blue	
Comm	7	Comm	7	Grey	
Comm	7	Comm	8	White	

The cable between the computer and the 261 is available in 9 pin format only as an optional item. Order code:

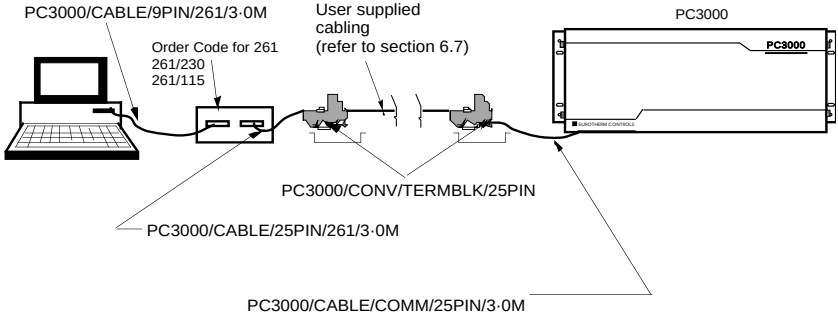
PC3000/CABLE/9PIN/261/3.0M

Connections are as defined above.

The PC3000 may be connected to the 261 using cables available from Eurotherm:

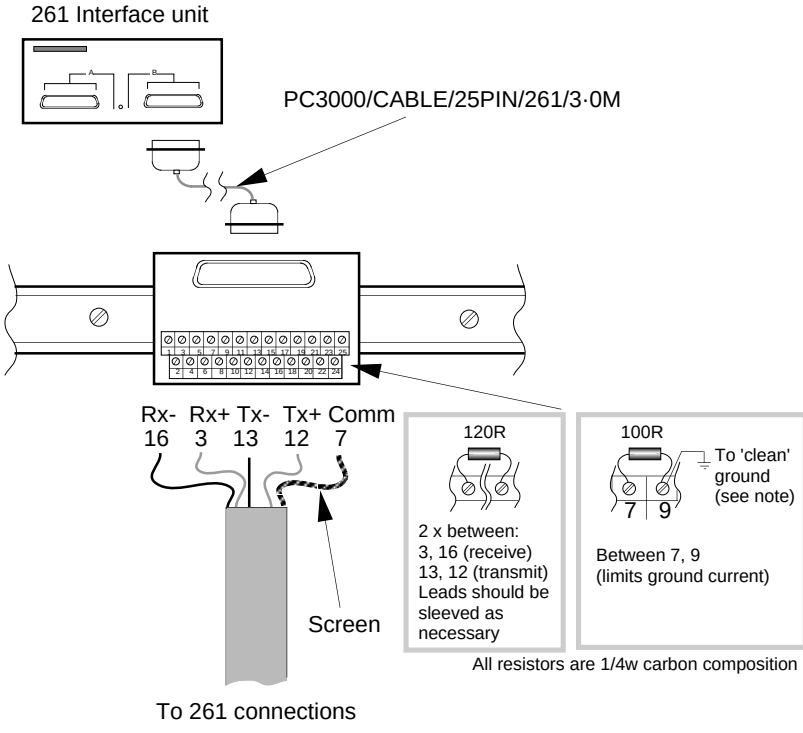
PC3000/CABLE/COMM/261/3·0M

where separation of greater than 3m is required between 261 and PC3000 the following configuration is suggested.



Multi-drop cable arrangements

In applications where several PC3000's are multi-dropped from a single supervisory computer or from other PC3000's the following arrangement may be used.
Termination and ground current limit resistors should be fitted to the terminal block.
Only terminate at the LAST PC3000 in the chain.



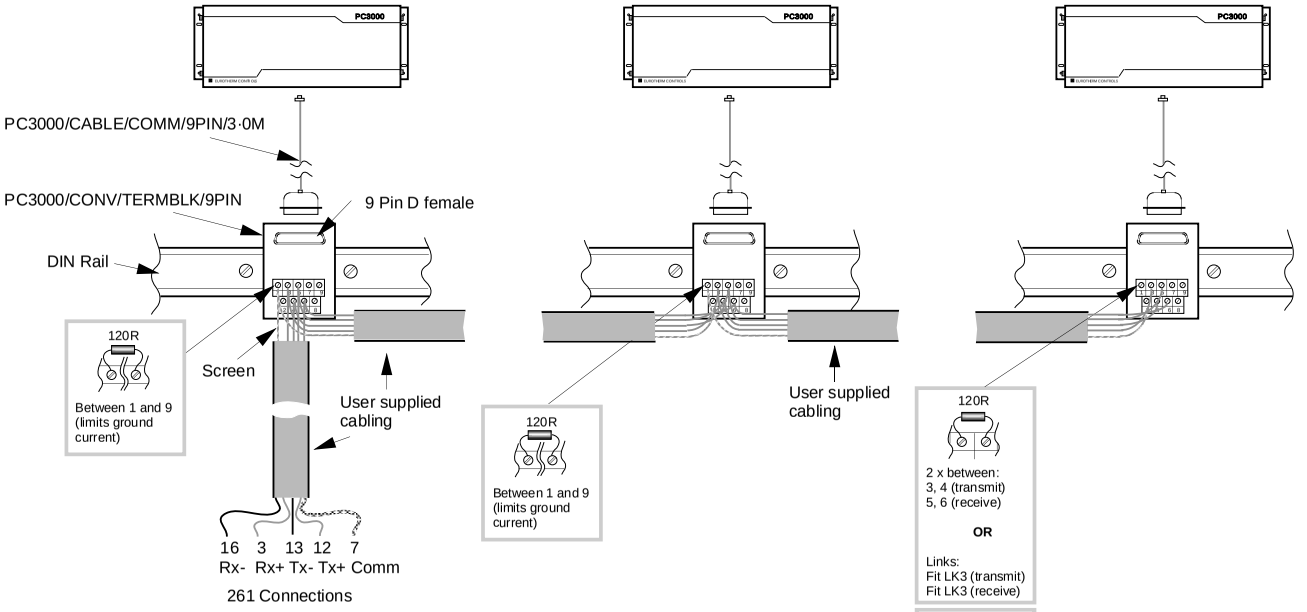
Notes:

All resistors are 1/4W carbon composition.

Care should be taken when earthing the screens since all LCM ports share a common isolated ground.

The screen is connected to this ground at each LCM and earth loops may result if other equipment connected to LCM ports earth the screen indirectly via the common ground.

For Baud rates above 5600 the stub length from PC3000 to the DIN rail should be reduced to 1metre.



Notes:

All resistors are 1/4w carbon composition

Care should be taken when earthing the screens since all LCM ports share a common functionally insulated ground connection.

The screen is connected to this ground at each LCM and earth loops may result if other equipment connected to LCM ports earth the screen indirectly via the common ground.

For Baud rates above 5600 the stub length from PC3000 to the DIN rail should be reduced to 1m.

GUIDELINES FOR SAFE USE OF ELECTRONIC EQUIPMENT

Before installing, operating or servicing the PC3000 or any of its modules, please read the following instructions for its SAFE USE.

These instructions indicate good and safe practice, however, if PC3000 is used in a manner not specified the protection provided may be impaired.

All Eurotherm Controls equipment is designed to operate in harsh industrial environments and is thoroughly tested. These guidelines represent good engineering principles for safe and trouble-free operation and are recommended for all control equipment, whether from Eurotherm Controls or any other supplier.

They should be used in conjunction with local regulations.

Overcurrent protection

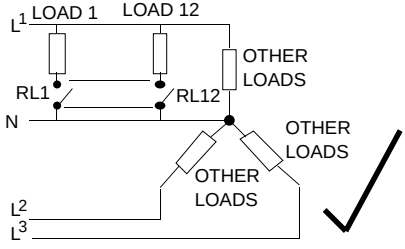
It is recommended that AC supplies to individual PC 3000 racks be protected by fuses or automatic circuit breakers rated at not more than 5 Amperes, and must be separated from any load current circuits.

Voltage ratings

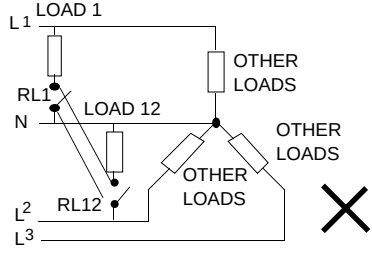
Care must be taken to ensure that maximum voltage ratings are not exceeded. Unless otherwise stated in the specification of any particular unit, the maximum voltage which may be applied between any two isolated circuits, or between any isolated circuit and earth, is limited to the highest rated supply voltage for that unit.

Take particular care not to connect AC supplies to low voltage control inputs, such as, sensor inputs, logic inputs and outputs.

On modules where inter-channel isolation is offered e.g. Relay Output, care should be taken to ensure that all channels are associated with the same phase in order to avoid line voltage between adjacent channel groups. Separate modules should be used where different phases are to be driven/monitored. Refer to diagram for twelve channel relay module usage.



Note: RL1, RL12 on same module



Note: RL1, RL12 on same module

Enclosure of live parts

Metal parts of certain types of equipment can become electrically “live” under normal operating conditions.

Unless clearly intended to be panel mounted and accessible during normal operation, all units should be installed inside a suitable earthed metal enclosure to prevent live parts being accessible to human hands and metal tools.

Wiring

It is important to connect all equipment correctly in accordance with the installation data provided for each type of unit.

Most connections to equipment require correct polarity to be maintained and due attention must be given to ensure this.

Unlabelled terminals must not be used as “tie points” for other wires.

Conductors should be commensurate with voltage and current ratings of the units, and should conform to appropriate standards of good practice and local codes and regulations.

Screened cables

In installations where high electrical noise cannot be avoided, twisted pairs or screened cables are recommended as below:

Thermocouple Inputs	Use screened compensating cable
Resistance Thermometers	Use screened cable
Logic Inputs/Outputs	Use screened twisted conductors
Analogue Control Outputs	Use screened twisted pairs
Logic Control Outputs	Use twisted pairs
Retransmission Signals	Use twisted pairs
Relay Outputs	Use standard cable

Where screened twisted pairs are used the screen must be earthed at one end only, preferably at the instrument.

Routing of wiring

Care should be taken to ensure maximum separation between low current or signal wiring and power wiring.

Control wiring refers to those connections to the input of the PC3000 system, analogue or logic outputs, digital inputs, remote setpoint inputs and relays switching control signals .

Power wiring refers to those connections to relay or triac AC supplies, and wiring associated with external devices such as contactors, alarm relays or motor speed drives etc.

This requires that the mechanical design must take into account all the different items to be included and the type of wiring involved. The design layout should

include the separation described above.

The AC supply to all the modules fitted to the rack, should be taken from as close to the in-coming source as possible and should not under any circumstances be “daisy chained” from other equipment, especially if it is likely to generate supply borne, electrical noise.

For digital communications, it is strongly recommended that screened cable is used and that only one end of the screen is earthed at the “cleanest” end, usually at the computer. The screened cable should be routed with the control wiring. Do not use ‘spare’ wires in the cable for other signals.

It is essential that communications, control and power wiring are routed separately through the cabinets and plant.

Earthing

All earth terminals must be securely connected directly to a good local earth by conductors appropriate to the current ratings of the modules.

Any Input/Output module provided with a filter return connection must be connected to a low impedance earth point conforming to local wiring standards. Connections must not be routed to earth via the rack chassis and earth stud connection.

Before switching on PC3000, the protective earth terminal, located on the left hand side of the rack, must be connected to a protective conductor i.e. a low impedance earth point.

WARNING

Any interruption of the protective conductor inside or outside PC3000 or disconnection of the protective earth terminal could potentially make the apparatus dangerous. Intentional interruption is prohibited.

Most Eurotherm Controls instruments have internal circuits which are isolated or “floating”. This is necessary to prevent the occurrence of an “earth loop” in signal circuits. To avoid possible shock hazards in the event of an internal fault causing breakdown of insulation, it is recommended that all equipment connected to any PC 3000 module be enclosed in an earthed metal enclosure. Sheaths of thermocouples (or other sensors) should be properly earthed by a separate conductor (instead of being dependent on earthing via the machine framework).

The top and bottom covers together with the rear cover on the PC3000 rack, form an integral part of the earthing system and should not be removed. Additionally, the rack fascia fixings must be quarter-turn tightened following replacement.

Supply isolators

Every electrical system should be provided with means for isolating the system from the AC supply to allow safe working during repair and maintenance.

Thyristors and triacs are not adequate means of isolating the supply and should always be backed by a suitable mechanical isolator.

Fuses

It is essential that only fuses with the required rated current and of the specified type are used for replacement. The use of makeshift fuses and the short circuiting of fuse holders is prohibited.

Supply impedance

Control cabinets and equipment should be sited as close to the incoming supply as possible. In all cases, both inside and outside the cabinet, long supply cables should be avoided. If they are unavoidable, conductors of an adequate rating must be used. Avoid running instruments from a supply which has shared wiring with high current circuits, particularly if these are switched by contactors or thyristors.

Module/channel insulation

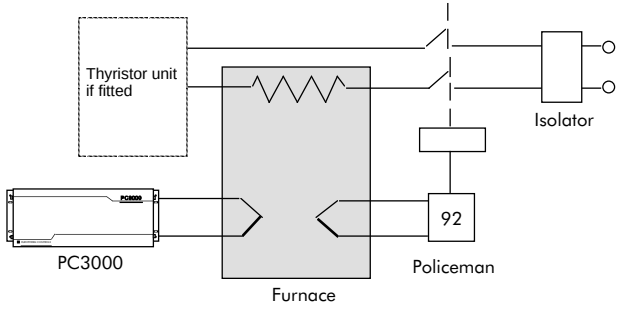
The plant I/O on all PC3000 modules has reinforced insulation to the PC3000 system circuitry and all other PC3000 modules. Certain modules do not provide channel to channel isolation.

Static

All modules within the PC3000 contain static sensitive devices and when handling, extreme caution should be taken.

Plant and personnel protection

In control applications it is essential to consider what will happen if any individual part of the system malfunctions. Where excessive deviation of a controlled parameter due to equipment failure could cause damage to machinery or materials, or injury to personnel, it is recommended that an additional separate unit, such as the Eurotherm Controls 92, with its own separate sensor, be used to give alarm indication or to shut down the process or both, as may be appropriate.



Note: Outputs designated as “Alarm outputs” within the PC3000 itself may not give sufficient protection in all possible circumstances. When “alarm outputs” are used they should be checked for correct operation and calibration at regular intervals.

Hazardous atmospheres

No product should be connected to a circuit which passed into or through a hazardous area unless appropriate precautions are taken (even though the instrument itself may be located in a safe area). Such an installation should conform to the requirements of the relevant local regulations.

Unless categorically stated in the published specification of any particular unit, it should be assumed they are not suitable for direct use in area subject to hazardous atmospheres.

Procedure in the event of trouble

When PC3000 is connected to its supply, terminals may be 'live' and the opening of covers or removal of parts is likely to expose live parts. PC3000 should be disconnected from all voltage sources and isolated before it is opened for any adjustment, replacement, maintenance or repair. Units suspected of being faulty should be disconnected and removed to a properly equipped workshop for testing or returned to the manufacturer for repair. Any attempt to troubleshoot while installed could be hazardous to personnel and equipment.

The preferred route in the event of a fault occurring within a module is to replace the entire module. Suspect units should be returned to your nearest Eurotherm office.

If you have any questions regarding any aspect of installing, operating or servicing your Eurotherm equipment, please contact your nearest Eurotherm Sales or Service engineer.

Non-volatile memory

The PC3000 Local Controller Module contains a lithium battery. The user's application programme resides in battery backed RAM. Battery replacement is covered in chapters 5 and 6.

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