ETHERCAT 100 BASE-T

ETHERNET (GIG-E)

STATUS LED'S

HDMI OUTPUT

USB (X4)

DUAL INPUT, POWER

BATTERY COVER

CHASSIS EARTH SCREW

QUICK START GUIDE

PC-MCAT 64

P760

SAFETY WARNING

During the installation or use of control systems, users of Trio products must ensure that there is no possibility of injury to any person or damage to machinery.

Control systems, especially during installation, can malfunction or behave unexpectedly. Bearing this in mind, users must ensure that even in the event of a malfunction or unexpected behaviour, the safety of an operator or programmer is never compromised.

INTRODUCTION

The PC-MCAT combines a Windows® PC with the familiar and powerful Trio *Motion Coordinator* core software. Using a Quad Core ARM processor, the *Motion Coordinator* firmware runs in real time with performance that is at least double that of the equivalent MC4N-ECAT EtherCAT stand-alone *Motion Coordinator.* This guide will take the user from initial power up to programming and setup of the PC-MCAT in a typical application.

> It is assumed that the reader has some experience with Windows and the *Motion* Perfect V4 programming application from Trio Motion Technology.

EQUIPMENT

In addition to the PC-MCAT, the user will need the following;

- USB keyboard.
- USB mouse or trackball.
- An HDMI monitor and HDMI connecting cable.
- A 24V d.c. power supply rated at 2 Amps.

INITIAL CONNECTIONS

Plug the HDMI lead into the HDMI socket on the front face of the PC-MCAT. Connect the other end to a suitable monitor display.

Plug the Keyboard into any of the available 4 USB sockets on the front of the PC-MCAT.

Plug the mouse into one of the USB sockets on the front of the PC-MCAT.

Do not connect peripheral devices to the USB socket on the upper face of the PC-MCAT.

INTERNAL BATTERY

A PLC type battery is provided inside the top cover of the PC-MCAT 64. This battery powers the Real Time Clock and holds the PC's bios settings. The battery lasts approximately 8 years and can be replaced while the PC-MCAT is powered to preserve the settings.

BATTERY REPLACEMENT

1. Obtain replacement battery from Trio
2. Insert flat bladed screwdriver to cut-out shown in image 1
3. Compress the "lug" on the battery cover
4. Gently lever the battery cover up and forward
5. Lift away the cover taking care not to damage the wiring or case shown in image 2
6. Remove 2 pin connector from the PCB in the PC-MCAT
7. Remove battery from the battery cover
8. Reassembly is the reverse of the procedure

If the battery is disconnected at any time when the PC-MCAT is unpowered it is essential to reset the clock and bios.

📄 **The clock and date must be set to the correct values. These are used during RTX operation so must be correct.**

BIOS SETTING

- Under "Setup Utility" -> "Thermal Configuration" set Critical Trip Point and Passive Trip Points to <Disabled>. This is because the processor temperature is monitored by the real time *Motion Coordinator.*

```
Thermal configuration Parameters
Critical Trip Points                 <Disabled>
Passive Trip Points                  <Disabled>
Active Trip Points                   <Disabled>

Dynamic Platform & Thermal Framework
DTPF Featire                         <Disabled>
CPU Sensors
Critical                             <70 °C>
Passive                              <60 °C>
Ambient Sensor Participants
Critical                             <60 °C>
Passive                              <43 °C>
```

- Under "Setup Utility" -> "Boot Configuration" set Numlock to <Off>. This is because setting to On can affect the entry of Windows user passwords on small keyboards.

CONNECTORS

Dual Input / Power connector:

Note: Use ferrules on all wires for best connection.

1. Connection: Push wire into hole of connector. Tighten screw. Insert connector into PC-MCAT.

2. Removal: Reverse the procedure.
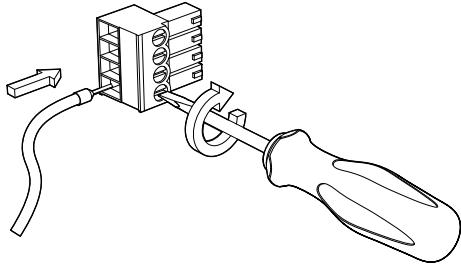
POWER CONNECTOR

The 24V Main connection, pin 2, is the primary supply to the PC-MCAT. The 24V Main connection is monitored and when it drops below 18V, IN(0) is set to ON. This can be used as a trigger to run a controlled shutdown of the PC-MCAT.

Aux 12 - 24V
Main 24V
0V
0V

If a controlled shutdown is required, then the Aux (pin 1) must be connected to a battery or other maintained source that lasts for the length of time needed to complete the shutdown.

📄 **The Aux power input can be between 12 - 24V**
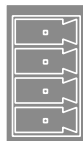
POWER UP SEQUENCE

The PC-MCAT 64 will automatically boot into Windows Embedded with RTX real time running. The default password "trio" for default user "Trio" needs to be entered.

The *Motion Coordinator* program will be run as a service using the RTX real time executive automatically.

If the RTX is not required the boot sequence must be altered to bypass running RTX during the startup sequence.

POWER DOWN SEQUENCE

A controlled power down sequence should be used to avoid damaging Windows and to allow the machine to complete a cycle.

Windows should be shutdown using the command EX(2) inside a *Motion Coordinator* program. Alternatively EX(3) can be used to re-start Windows. Using EX(2) allows the *Motion Coordinator* service to be closed then Windows to shutdown. This process takes about 30 seconds.

Input 0 can be used to detect the main 24v power supply rail if an auxiliary power supply (12-24v) is provided from a battery or UPS.

Input 1 is used by Windows to indicate to the *Motion Coordinator* that a Windows shutdown has been requested.

USB PORT (X4)

The USB ports on the front panel are for use with standard Windows peripheral devices. If a keyboard and mouse are used, connect them to 2 of these ports.

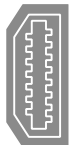There are two different current limits set on the USB ports.

Ports 0, 1 (Lower pair on front of PC-MCAT) and **port 2** (single USB on top of PC-MCAT) are set to 100mA limit.

Ports 3 and 4 (Upper pair on front of PC-MCAT) are set to 500mA limit.
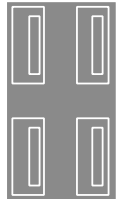
HDMI PORT

The HDMI port allows cthe PC-MCAT to drive high resolution screens.

ETHERCAT PORT

The PC-MCAT acts as an EtherCAT master. EtherCAT drives and I/O devices are normally connected in a chain.

ETHERCAT OPERATION

All motion and Input/Output physical connections are via the EtherCAT port on the PC-MCAT. There is no local I/O but the Inputs 0 to 15 and Outputs 8 to 15 are reserved for internal use by the PC-MCAT system. This means the external I/O aligns with other *Motion Coordinators* that do have their own I/O.

PLUG AND PLAY

The PC-MCAT comes with an internal database of EtherCAT slave definitions. This allows many well-known devices to be connected and automatically configured by the PC-MCAT on startup.

NETWORK TOPOLOGY

EtherCAT networks are logically one string of devices. Connect the Master to the first slave IN connection, then the OUT of the first to the IN on the second and so on. There is no return cable, the last slave device automatically sets its OUT socked to be a terminator.

Star and branch topology is possible using an approved EtherCAT hub.

💣 **STANDARD ETHERNET HUBS AND SWITCHES DO NOT WORK WITHIN AN ETHERCAT NETWORK.**

The EtherCAT port is automatically configured for use by the *Motion Coordinator* when it starts up. It can be viewed from the Windows Network "Change Adapter Settings" window. In Windows, the EtherCAT port is shown as Disabled. This is correct and must not be changed.

ETHERCAT NETWORK DETECTION
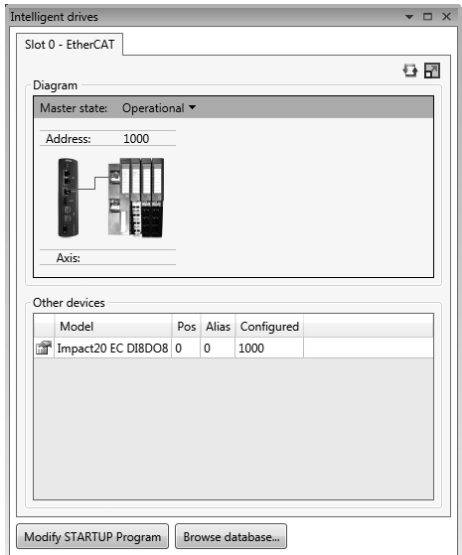
EtherCAT Intelegent drives Window in Motion Perfect

NETWORK SETUP

If the PC-MCAT is connected to a network, its IP address may be given by the network DHCP address server. Use the windows command line to discover the IP address given, or check the PC-MCAT tray application.


```
Command Prompt
Microsoft Windows [Version 6.1.7601]
Copyright (c) 2009 Microsoft Corporation.  All rights reserved.

C:\Users\Trio>ipconfig

Windows IP Configuration

Ethernet adapter Local Area Connection 6:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :

Ethernet adapter PC-MCAT Top:

   Connection-specific DNS Suffix  . :
   Link-local IPv6 Address . . . . . : fe80::97a:278b:5252:9d85x15
   IPv4 Address. . . . . . . . . . . : 192.168.0.247
   Subnet Mask . . . . . . . . . . . : 255.255.255.0
   Default Gateway . . . . . . . . . :

Ethernet adapter PC-MCAT Middle:

   Media State . . . . . . . . . . . : Media disconnected
   Connection-specific DNS Suffix  . :
```
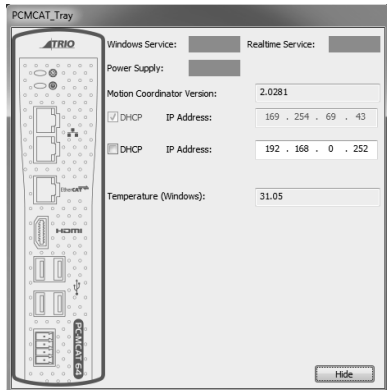

OTHER PORTS AVAILABLE

All communication with the *Motion Coordinator* in the PC-MCAT is through the given Windows IP address. There is no function to set IP_ADDRESS on the PC-MCAT *Motion Coordinator*. Any external device that wants to open a *Motion Coordinator* Server connection must do so using the Windows IP address for the connection.

There are 2 Ethernet connections available; each has its own IP address configuration in Windows.

Ethernet Server connections on the *Motion Coordinator*:

- Port 502 - Modbus TCP
- Port 2222 - Ethernet IP (ODVA Industrial Protocol) UDP connection
- Port 44818 - EtherNet/IP explicit messaging
- Port 3240 – TrioPC Motion ActiveX
- Port 23 - *Motion* Perfect connection

Many Windows services provide server functions and have port numbers allocated according to the Internet Assigned Numbers Authority. (IANA) Clients that open connections to these port numbers will be communicating with a Windows Application and not the *Motion Coordinator*.

Any application running in the PC-MCAT itself must use the internal IP address 127.0.0.1 to communicate with the *Motion Coordinator*. For example a Modbus Client running in the PC-MCAT will use 127.0.0.1 and not the IP address of either of the physical Ethernet connections.

RUNNING *MOTION* PERFECT ON REMOTE PC

Connect the PC to the PC-MCAT Ethernet port, either directly with a fixed IP address on both the PC and the PC-MCAT, or via a network with automatic IP address control.
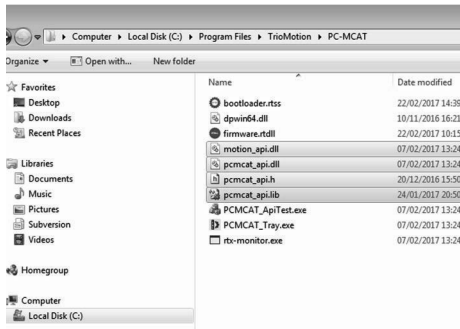
Close the *Motion* Perfect v4 that is running in the PC-MCAT. You can now use *Motion* Perfect v4 on the remote PC to connect to the *Motion Coordinator* in the PC-MCAT. *Motion* Perfect version 4.2 or later is required.
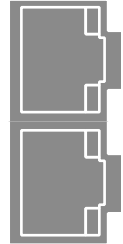
PC-MCAT API

There is a shared memory API that allows Windows programmes to interact with the PC-MCAT *Motion Coordinator*.

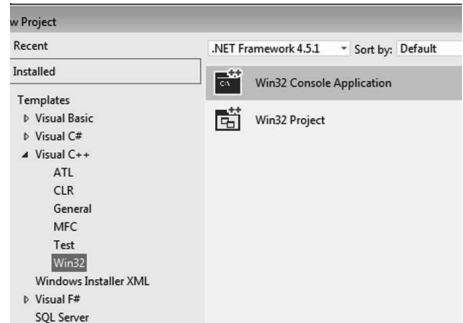The API is installed in C:\Program Files\TrioMotion\PC-MCAT.

The PCMCAT_ApiTest.exe application uses the API to talk to the *Motion Coordinator*.

The pcmcat_api.h file contains definitions that should be included into your MSVC C/C++ source code. The pcmcat_api.dll and motion_api.dll contain the implementation.

CREATING AN EXAMPLE WINDOWS CONSOLE APPLICATION

1. Open Visual Studio version 2012.
2. Create a new C++ Windows console application.

3. Copy the API to the solution directory.

4. Add in the references to the API file.

```
ConsoleApplication1.cpp  ⊟ ×
(Global Scope)                                          ▼
    // ConsoleApplication1.cpp : Defines the entry point for the console applic
    //

    #include "stdafx.h"

    #include "pcmcat_api.h"
    #pragma comment(lib, "pcmcat_api.lib")

    static void __stdcall pcmcat_api_callback(void *context, pcmcat_api_callbac
    {
        // if there is no data then ignore
        if (!pcmcat_api_callback_data)
            return;

        // process this data type
```

5. Add the PCMCAT API calls.

```
ConsoleApplication1.cpp  ⊟ ×
(Global Scope)                                          ▼ ⊙
    int _tmain(int argc, _TCHAR* argv[])
    {
        // open the PCMCAT connection
        if (pcmcat_api_open(pcmcat_api_callback, NULL))
            printf("Could not open PCMCAT API\r\n");
        else
        {
            // set output
            if (pcmcat_api_set_op(16, 1))
                printf("Could not turn OP(16) on\r\n");
            else
            {
                // wait for a second
                Sleep(1000);

                if (pcmcat_api_set_op(16, 0))
                    printf("Could not turn OP(16) on\r\n");
            }

            // close the PCMCAT connection
            pcmcat_api_close();
        }
        return 0;
    }
```
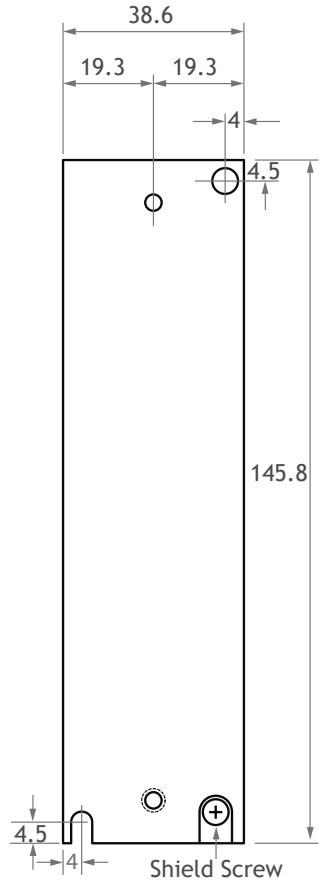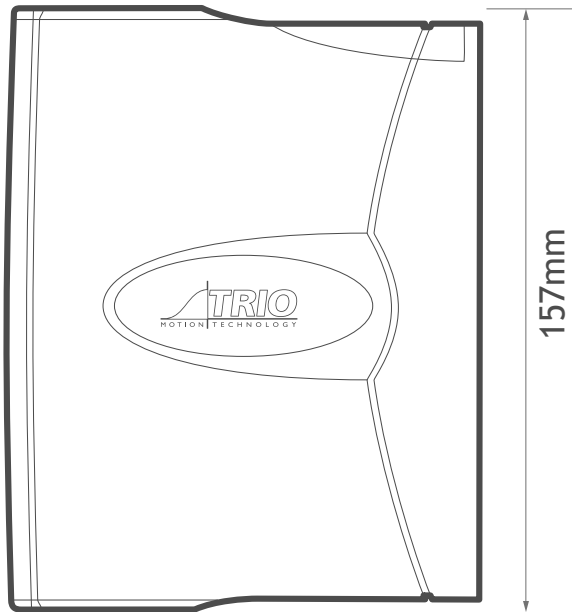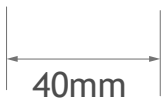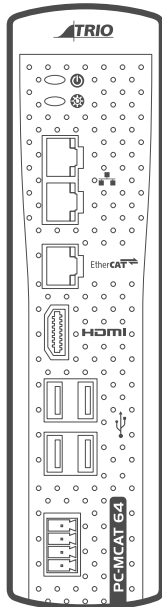
CHASSIS MOUNTING DIMENSIONS (LOOKING FROM FRONT)

M4 screws should be used in 2 places to mount the PC-MCAT to an unpainted metal panel.

The best EMC performance is obtained when the PC-MCAT is attached from the shield screw (marked) using a flat braided conductor with a cross section of 4mm x 1mm. Do NOT use a circular section wire or run the braid to a central star point.

⚠ **ENSURE THAT THE VENTILATION SLOTS AT THE TOP AND BOTTOM OF THE PC-MCAT ARE KEPT CLEAR TO ENSURE A FREE FLOW OF AIR THROUGH THE MODULE.**

38.6

19.3   19.3

4

4.5

145.8

4.5

4

Shield Screw

157mm

40mm

120mm