Isolated Multi-Port RS422
M.2 and PCI Express Mini Card
Hardware Manual

Models M.2-ICM422-4, M.2-ICM422-2, M.2-ICM422-1, mPCIe-ICM422-4 mPCIe-ICM422-2, and mPCIe-ICM422-1

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MADE IN THE USA

Chapter 1: Quick Start

It is recommended that you install the software package before installing the card in your computer. You can install the software[1] using either a stand-alone installer downloaded from the website or an optional Software Master CD.

Run the installer you downloaded (or autorun.exe on the Software Master CD) and follow the prompts to install the software.

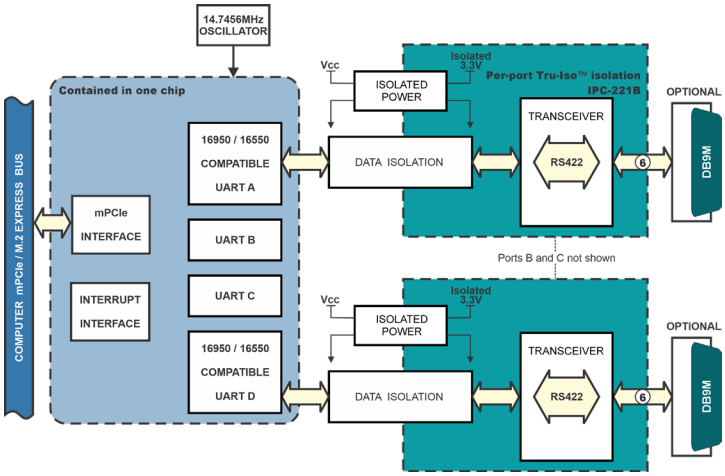
Please note: during the installation you may be prompted regarding the installation of non-WHQL-certified drivers; please carefully confirm the digitally signed source of the drivers and accept the installation.

Once the software has been installed, shut down your system and carefully install the card.

Re-start your system. Once the computer finishes booting your new serial ports should already be installed and ready for use; you can confirm this by launching Device Manager and looking under the "Ports" section. If, for any reason, the card or its ports display a warning triangle, right-click and select "Update Driver".

[1] In Linux or OSX please refer to github.com/accesio/aioserial.

Chapter 2: Introduction



PCI Express Mini Card (mPCIe), a low-profile small-footprint bus standard originally intended for adding peripherals to notebook computers, has become the de-facto standard for high-performance, small form-factor devices in many applications.

- 1-, 2- or 4- port RS422 / 4-wire 485 serial port on mPCIe
- Tru-Iso™ provides signal isolation recognized under IPC-2221B and IEC 60950-1
  - 500V (150V M.2) port-to-port, 1500V port-to-PC isolation
  - 2500 VRMS Max Transient Isolation
  - 848 Volt Peak Max Work Isolation
- 3 Mbps, up to 12M with factory option
- RoHS and Industrial temperature standard

The mPCIe-ICM422 family of cards feature high performance 16C950-class UARTs. Each port is capable of communication speeds up to 921.6kbps and has 128-byte deep transmit and receive FIFOs which protect against data loss in multitasking operating systems, reduce CPU utilization, and improve data throughput. The advanced integrated circuit supports a wide variety of custom baud rates, and any rates not otherwise achievable can be supported via a factory-installed custom crystal oscillator.

The ports provided by the card are 100% software compatible with industry-standard serial COM devices. In addition, they provide Tru-Iso™ port-to-port and port-to-PC isolation.

Communication is possible either with custom application software, with off-the-shelf applications (such as HyperTerminal), or with provided samples and utilities, including WinRISC™ ("Windows Really Incredibly Simple Communication").

The serial ports on the device are accessed using a low-profile latching 5-pin Hirose connector. Optional breakout cable kits are available, and bring each port connection to a panel-mountable DB9-M.

There are no user-selectable option settings for this device family.

Chapter 3: Hardware

This manual applies to the following models:	
M.2 or mPCIe-ICM422-4	Four port RS422 Tru-Iso™ card
M.2 or mPCIe-ICM422-2	Two port RS422 Tru-Iso™ card
M.2 or mPCIe-ICM422-1	One port RS422 Tru-Iso™ card

The M.2 models are M.2 B- & M-key cards in the 2280 size (22 × 80 mm) with a break-away for 2260 (22 × 60 mm). The mPCIe models are full-length "F1" mPCIe devices (30 × 50.95 mm).

All units are RoHS compliant and support Industrial temperature environments (-40°C to 85°C operating, -65°C to 150°C storage.)

Included in your package

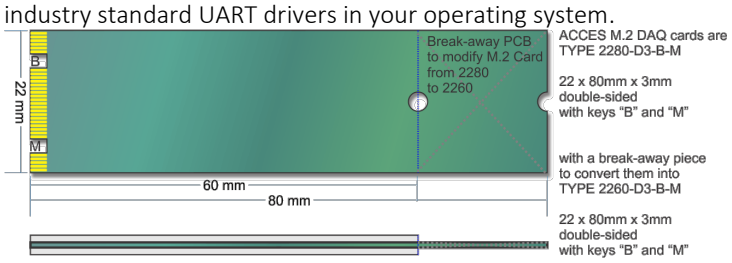
Four-, two-, or one-port M.2 or mPCIe ICM422 card

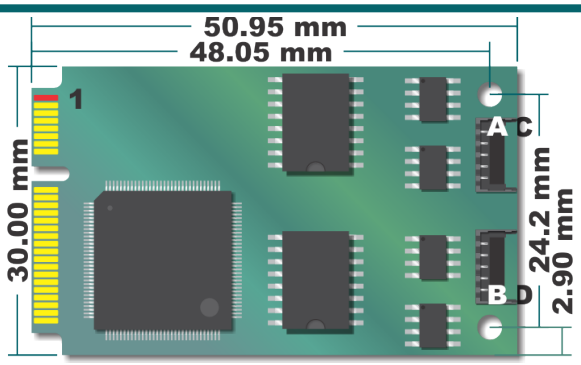
Available accessories include:	
CAB-mPCIe-1S	One port DB-9 cable accessory kit
CAB-mPCIe-2S	Two port DB-9 cable accessory kit
CAB-mPCIe-4S	Four port DB-9 cable accessory kit
ADAP9	DB-9 Screw Terminal Accessory
mPCIe-HDW-KIT2	Mounting hardware for 2mm
mPCIe-HDW-KIT2.5	Mounting hardware for 2.5mm

Contact the factory for information regarding additional accessories, options, and specials that may be available to best fit your specific application requirements.

Chapter 4: Configuration Settings

This product has no user configurable hardware options. All possible configuration settings can be performed through the industry standard UART drivers in your operating system.





The RS422 ports are terminated by a 120Ω load in series with a 0.01µF capacitor across the Rx+/Rx- pair.

Chapter 5: PC Interface

This product interfaces with a PC using either a PCI Express M.2 or PCI Express Mini Card (mPCIe) connection; a small-form-factor, high-performance, rugged peripheral interconnect technology first introduced for use in laptops and other portable computers.

The small size and powerful PCI Express performance, combined with perfect software compatibility with PCIe peripheral designs, has led to their recent adoption as go-to standards for embedded Data Acquisition and Control, and many other applications.

Although M.2 is a broadly adopted industry standard, the actual connection to the computer shares a specification with mSATA: both mSATA and M.2 use the same edge-connector. In fact, well-designed PCs can automatically detect and configure their onboard connectors to work with either M.2 or mSATA devices – and, according to the standards for M.2 and mSATA they are *supposed* to do so! However, some PC manufacturers ship computers that *only* support mSATA devices. Please confirm in your PC documentation that your edge-connector is *actually* PCI Express M.2 Card compliant before installing this, or any, M.2 card.

M.2 and mPCIe define mounting holes for securing the otherwise loose end of the card, so it is impossible for these cards to wiggle or flap themselves loose devices. Eliminating this concern for M.2 and mPCIe cards is a major reason these standards have seen rapid adoption by the Data Acquisition and Control industry.

Caution: Although the 1- and 2-Port card is fully compliant with all standard dimensions for the design, the 4-port card violates the component-height limit on the back of the card, by up to 1.3mm. This may result in mechanical incompatibility with some motherboard designs, if, and only if, they place other motherboard components inside the footprint of the card.

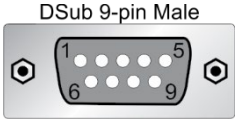
Chapter 6: I/O Interface

This card provides one 5-pin latching Hirose DF57 connector per serial port. The mating connector is the Hirose DF57H-5S-1.2C. Order the CAB-mPCIe-4S or –2S cable kit accessory to cable the DF57 connectors to industry standard DB9 Male connectors. Alternately, custom hardware interfaces can be produced to fit your specific application requirement.

Hirose 5-pin	422
1	GND
2	Rx+
3	Tx+
4	Rx-
5	Tx-

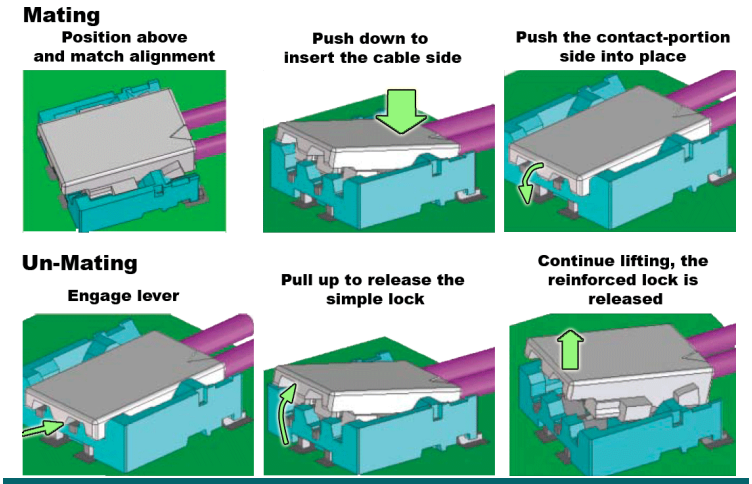
The DF57 connector is a low profile latching device. In order to operate it correctly, please note: the front of the cable connector clicks down, into a locked position, *after* the rear has been mated by pushing it into the socket. To disconnect, pop the front of the cable connector upwards to disengage the latch before moving the connector away from the card.

DSub 9-pin Male



DB-9 Male Pin	422
1	Tx-
2	Tx+
3	Rx+
4	Rx-
5	GND
6	
7	*Rx-*[1]
8	
9	

Note 1: pin 4 and pin 7 are connected.



Chapter 7: Software Interface

Although the UARTs provided by this card are fully 16550/16950 compatible, the advanced features are best enabled by using the provided software drivers.

The card installs ports into the OS as standard serial COM devices. Therefore, in each OS or programming environment, standard COM APIs are used to communicate. For example, in the .NET Common Language Runtime you would use the methods provided by the System.IO.Ports namespace. In Linux, the tty*Sn* device controls port *n*. Other operating systems have similar, OS-specific, standard methods of communication with serial devices.
Various sample programs are provided to demonstrate application programming of the serial ports, in a variety of popular programming languages.
WinRISC is a Windows serial port utility provided with this card. It is very useful when working with any serial device: it provides a very simple, very easy, interface.

Important: **It is necessary to disable "hardware handshaking" (DTR) in your communication program when operating in RS485 or RS422 mode.**

The latest information can always be found on the product page on the website. Here are some useful links:

Links to useful downloads	
Main web site	https://accesio.com
Product web page	accesio.com/mPCIe-ICM422-4
	accesio.com/M.2-ICM422-4
This manual	accesio.com/MANUALS/M.2-_mPCIe-ICM422-4.pdf
Windows Software Install Package	accesio.com/files/packages/M.2-_mPCIe-ICM422-4 Install.exe

CHAPTER 8: SPECIFICATIONS

PC Interface

PCI Express Mini Card	Type F1 "Full Length"
M.2 PCI Express	2280/2260 B+M-Key

Communications Interface

I/O connector	Hirose DF57 5-pin latching
I/O mating connector	Hirose DF57H-5S-1.2C
Serial Ports	4, 2, or 1 RS-422
UART	Quad 16C950
FIFO	128-byte transmit & receive
Baud Rates	up to 3 MBaud (3Mbps) (12M with factory option) advanced-prescaler allows a wide variety of additional rates to be achieved
Character length	5, 6, 7, 8 bits (contact factory for assistance with 9-bit data)
Parity	Even, Odd, None, Mark, Space
Stop Interval	1, 1½, 2 bits
Flow Control	Xon/Xoff, None

Environmental

Temperature	
Operating	-40°C to 85°C
Storage	-65°C to 150°C
Humidity	5% to 95%, non-condensing
Power required	+3.3VDC @ 480mA (typical, 4 ports)

PHYSICAL

Size, mPCIe	
length	50.95mm (2.006")
width	30.00mm (1.181")
Size, M.2	
length	80 mm or 60 mm
width	22 mm
Weight	7.4 grams RS422 x4

Isolation

ESD Protection	±15kV on all signal pins (IEC 61000)
Tru-Iso™	
port-to-port breakdown	500 V peak (AC or DC) (IPC-2221B) (150 V peak on M.2)
port-to-PC breakdown	1500 V peak (AC or DC) (IPC-2221B)
Max Transient Isolation	2500 V rms (UL1577 "Single protection")
Max Work Isolation	353 V peak (V_{IORM}) (IEC 60950-1 "Reinforced Insulation") 848 V peak (V_{IORM}) (IEC 60950-1 "Basic Insulation")

Tru-Iso™: Careful attention has been paid to isolation design, including extensive keep-out zones and hand-routed circuit paths, as well as component and material selection.

CHAPTER 9: CERTIFICATIONS

CE & FCC

These devices are designed to meet all applicable EM interference and emission standards. However, as they are intended for use installed on motherboards, and inside the chassis of industrial PCs, important care in the selection of PC and chassis is important to achieve compliance for the computer as a whole.

UL & TUV

No DC voltages above 5V, and no AC voltages of any kind, are consumed or produced during normal operation of this device. This product is therefore exempt from any related safety standards. Use it with confidence!

TRU-ISO™ STATEMENT

Our Tru-Iso™ products are designed under IPC-2221B Generic Standard on Printed Board Design. The circuit is isolated with a ≥ 300mil gap between all signal and plane layers between the ports and the PC, and a ≥ 100mil gap port to port. These gaps are rated

under IPC-2221B at a peak working voltage of 1500V (Port to PC) and 500V (150V on M.2) (Port to Port). Our circuit uses a chip-level high-frequency DC-DC isolator which is rated at 2500VRMS for 1 minute under UL 1577 optical isolators standard. This isolation component has an over 50 year isolation lifespan even if the isolation voltage potential is in excess of 350 volts AC. Tru-Iso products are also designed to meet EN60601 medical electrical equipment standard. TRU-ISO™, for true signal isolation.

ROHS / LEAD-FREE STATEMENT

All models are produced in compliance with RoHS and various other lead-free initiatives.

WARNING

A SINGLE STATIC DISCHARGE CAN DAMAGE YOUR CARD AND CAUSE PREMATURE FAILURE! PLEASE FOLLOW ALL REASONABLE PRECAUTIONS TO PREVENT A STATIC DISCHARGE SUCH AS GROUNDING YOURSELF BY TOUCHING ANY GROUNDED SURFACE PRIOR TO TOUCHING THE CARD. ALWAYS CONNECT AND DISCONNECT YOUR FIELD CABLING WITH THE COMPUTER POWER OFF. ALWAYS TURN COMPUTER POWER OFF BEFORE INSTALLING A CARD. CONNECTING AND DISCONNECTING CABLES, OR INSTALLING CARDS, INTO A SYSTEM WITH THE COMPUTER OR FIELD POWER ON MAY CAUSE DAMAGE TO THE I/O CARD AND WILL VOID ALL WARRANTIES, IMPLIED OR EXPRESSED.

WARRANTY

Prior to shipment, ACCES equipment is thoroughly inspected and tested to applicable specifications. However, should equipment failure occur, ACCES assures its customers that prompt service and support will be available. All equipment originally manufactured by ACCES which is found to be defective will be repaired or replaced subject to the following considerations:

GENERAL

Under this Warranty, liability of ACCES is limited to replacing, repairing or issuing credit (at ACCES discretion) for any products which are proved to be defective during the warranty period. In no case is ACCES liable for consequential or special damage arriving from use or misuse of our product. The customer is responsible for all charges caused by modifications or additions to ACCES equipment not approved in writing by ACCES or, if in ACCES opinion the equipment has been subjected to abnormal use. "Abnormal use" for purposes of this warranty is defined as any use to which the equipment is exposed other than that use specified or intended as evidenced by purchase or sales representation. Other than the above, no other warranty, expressed or implied, shall apply to any and all such equipment furnished or sold by ACCES.

TERMS AND CONDITIONS

If a unit is suspected of failure, contact ACCES' Customer Service department. Be prepared to give the unit model number, serial number, and a description of the failure symptom(s). We may suggest some simple tests to confirm the failure. We will assign a Return Material Authorization (RMA) number which must appear on the outer label of the return package. All units/components should be properly packed for handling and returned with freight prepaid to the ACCES designated Service Center, and will be returned to the customer's/user's site freight prepaid and invoiced.

COVERAGE

FIRST THREE YEARS: Returned unit/part will be repaired and/or replaced at ACCES option with no charge for labor or parts not excluded by warranty. Warranty commences with equipment shipment.

FOLLOWING YEARS: Throughout your equipment's lifetime, ACCES stands ready to provide on-site or in-plant service at reasonable rates similar to those of other manufacturers in the industry.

EQUIPMENT NOT MANUFACTURED BY ACCES

Equipment provided but not manufactured by ACCES is warranted and will be repaired according to the terms and conditions of the respective equipment manufacturer's warranty.

TRADEMARKS

Tru-Iso™ is a trademark of ACCES I/O Products, Inc., San Diego CA 92121-1506

DISCLAIMER

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PCI EXPRESS MINI CARD STANDARD NOTICE AND EXCEPTION

The mPCIe-ICM422-2 is fully compliant with PCI Express Mini Card v1.2.

NOTICE: The mPCIe-ICM422-4 (four-port) exceeds the component height limit on the bottom of the card. Depending on the specific device, the components on the bottom of the card may protrude between 1.0 and 1.3 millimeters further “down” than the standard allows.

Please verify your intended host PC motherboard / adapter has not located components within the 51x30mm footprint of the mPCIe card.