METRABUS

Industrial Data Acquisition Interfaces

METRABUS FAMILY OF INDUSTRIAL I/O INTERFACES FOR THE IBM PC/XT/AT AND COMPATIBLES

- **Low-cost, high speed analog and digital I/O**
- **Up to 512 digital I/O and 256 analog I/O supported from a single slot in the PC**
- **Wide range of analog and digital signals supported**
- **Parallel bus for high speed data transfers**
- **Simple register based programming in any standard language**
- **Windows 3.1X/95/98/NT/2000 included**
- **Example software written in Basic included with extensive documentation**
- **Supported by Labtech Notebook and LT/Control plus IPC-XPERT application programs for those who do not wish to program**
- **Accessories include 19" rack mount kit for easy installation**
- **Serial port interface available for remote operation from any host computer**
- **Stand alone controller available**

The METRABUS family of Industrial Data Acquisition Interfaces provides a cost-effective means of connecting analog and digital signals to an IBM PC or compatible.

A METRABUS system consists of:

- Single controller board that either plugs into a slot in the PC backplane or communicates serially to any host computer.
- A cable that connects to a 50-pin connector on the rear edge of the controller board.
- Up to 32 analog or digital I/O boards that can support as many as 256 analog channels or 512 digital channels or any combination of analog and digital I/O. Fourteen different boards provide a wide variety of interfaces, allowing the user to address many different types of signals and applications.

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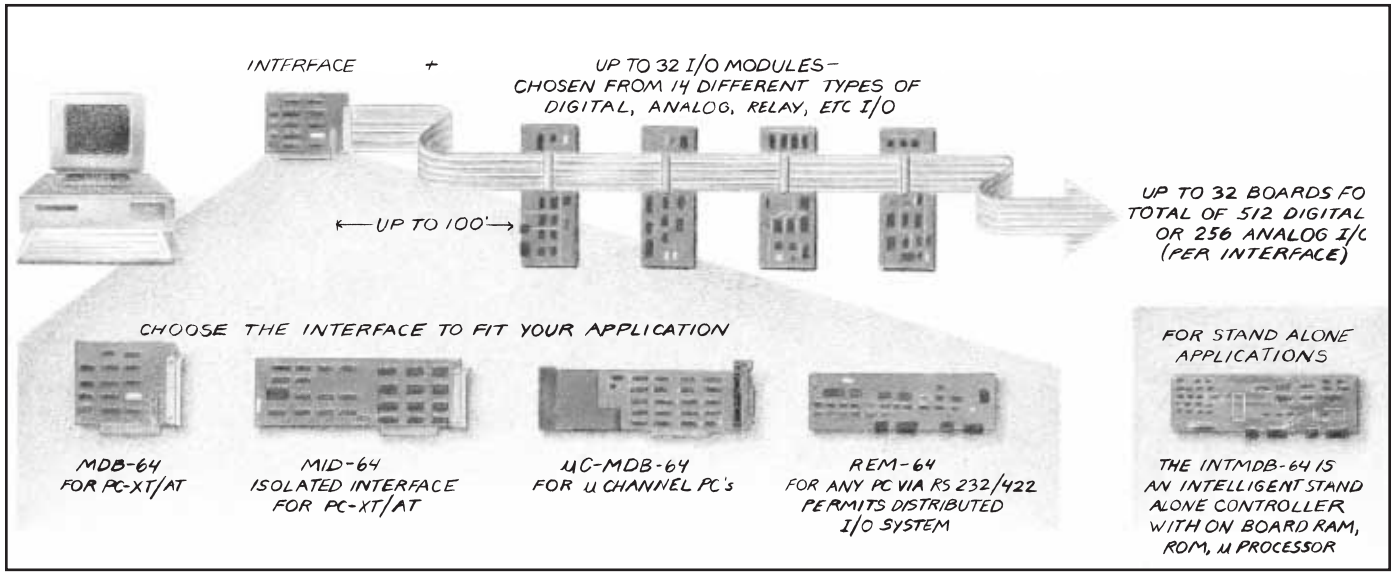
QUESTIONS?

1-800-552-1115 (U.S. only)

Call toll free for technical assistance, product support or ordering information, or visit our website at **www.keithley.com**.



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METRABUS Controllers

There are five different versions of the METRABUS controller board. The MDB-64 is a half slot board that plugs into the backplane of an IBM PC or compatible. The MID-64 is a full-size board that isolates the connections between the METRABUS Boards and the PC bus. This provides another level of protection for applications where the system is located in a harsh and electrically noisy environment. The µCMD64 fits into PS/2 based Microchannel backplanes, and is one of the few direct means of connecting PS/2 computers to analog and digital I/O.

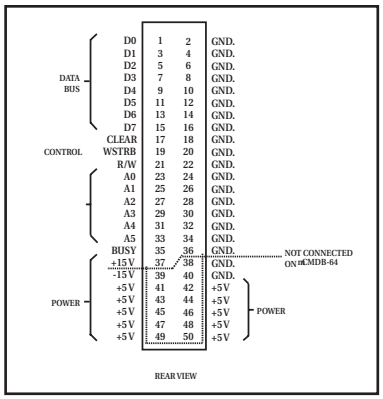
In addition to the bus-based controllers, the REM-64 is a controller that operates from an RS-232 or RS-422 serial port. This controller allows the METRABUS system to be located as much as 5000 feet away from the host computer. The REM-64 can be used with other types of computers such as DEC or SUN workstations as long as they support serial communications.

Finally, the INTMD64 provides stand alone operation for a METRABUS system. The INTMD64 is an intelligent I/O controller made for dedicated, measure and control applications. It provides several serial ports and, more importantly, an onboard version of INTEL's Basic-52 that supports all METRABUS functions. Up to 16 INTMD64 controllers can be connected by RS-422, providing the ability of controlling thousands of I/O channels.

Please refer to the product data sheets for more detailed discussions of the capabilities of each controller board.

Cables

The METRABUS controllers are connected to 32 (max) I/O boards by the METRABUS parallel data cable. The cable is a 50-pin conductor ribbon cable that is available in several versions. METRABUS operates at distances up to 100 feet between the controller board and the I/O boards. Distances greater than 100 feet are addressed by the REM-64 controller board. The METRABUS cable transmits all signals between a controller and an I/O board including address, data, control and power. Ground lines are interleaved between data signals to insure reliable communications. The METRABUS distribution of power allows the user to install a small system without external power supplies. Many of the METRABUS I/O boards will run off the PC +5VDC power supply. For large applications or those with requirements for power other than +5 VDC, a METRABUS power supply (MBUS-PWR) is available.



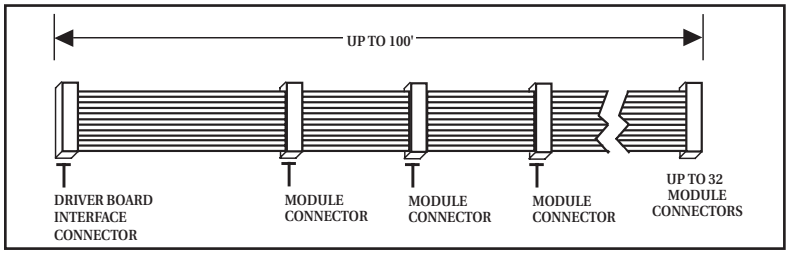
Note that only the MDB-64 controller provides power to the METRABUS cable directly. The MID-64 is an isolated controller that isolates the PC, including power, to the outside world.

I/O Boards

A wide variety of METRABUS analog and digital I/O boards are available. The following list shows the range of boards and also documents how much address space in the METRABUS system the board occupies. A single METRABUS controller supports up to 64 addresses. For more detailed descriptions of the functionality of each board, please refer to the specific data sheets following this introduction.

METRABUS ADDRESS SPACE

I/O BOARD	DESCRIPTION	ADDRESSES REQUIRED
MDI-16/MSS-16	16-Channel Solid-State Relay Board	2
MSSR-32	32-Channel Solid-State Relay Board	4
MEM-8	8-Channel EM DPDT Relay Board	1
MEM-32	32-Channel EM SPST Relay Board	4
MCPT-8x8	8×8 Crosspoint Matrix Relay Board	2
MIO-32	32-Channel Logic Level Output Board	4
MII-32	32-Channel Logic Level Input Board	4
MCN-8	8-Channel Counter Board	8
MAI-16	16-Channel Analog Input Board	4
MTHERM-20	20-Channel Thermocouple Input Board	4
MAO-8	8-Channel, 8-bit Analog Output Board	8
MAO-12	8-Channel, 12-bit Analog Output Board	8
MBB-32	METRABUS I/O Breadboard	4
MDG-1	METRABUS Diagnostic Board	2



The METRABUS cable used to connect all METRABUS I/O modules to a METRABUS controller is available in standard and non-standard configurations for virtually any arrangement. (See page 550 for ordering details.)

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Software

There are two means of programming a METRABUS system. One is to write your own program. Simple input and output commands are all that are required. The second way of programming the METRABUS system is to use a menu-driven application package that has incorporated a METRABUS driver. Several commercially available packages support METRABUS. Some of the most popular are TestPoint, LABTECH NOTEBOOK, LT/CONTROL and IPC-XPERT. LABTECH NOTEBOOK is a general purpose data acquisition software package that adds process display and control capabilities with the LT/CONTROL version of the software. IPC-XPERT is specifically designed to address process control applications. It has many visual tools tailored for the process control industry. Both packages allow you to program the METRABUS system without going through the task of actually writing programming code, and they are available in Windows 3.X.

METRABUS programming is simplified by the fact that the METRABUS controllers provide all the low-level timing and control required to communicate with different I/O boards. Simple writing and reading to addresses in the PC I/O address space are all that is required to program the system. The METRABUS controllers take up 4 consecutive bytes of I/O space. Each address has a specific function that is documented in the METRABUS manual.

There are two steps to programming a METRABUS I/O board. The first step is to select the METRABUS board address. This address is set by DIP switches on the METRABUS board and is selected by writing the controller's BASE ADDRESS +1. This address remains selected until changed. The second step is to read or write data. It is as simple as that. For example, if we use BASIC as our programming language, the two commands used are INP and OUT. The following program fragment shows how simple this programming really is.

100	BASEADR = 768	The METRABUS controller is located at I/O address 768
110	OUT(BASEADR+1),16	Selects METRABUS I/O board at METRABUS address 16
120	OUT(BASEADR),55	Write 55 to selected METRABUS board located at address 16
200	OUT(BASEADR+1),0	Selects METRABUS I/O board at METRABUS address 0
210	X=INP(BASEADR)	Reads data from selected METRABUS board located at address 0

The type of board in the system does not matter to the program. All boards have the same structure which simplifies programming. To ease the programming task further, software is included with each METRABUS controller. Many application programming examples, written in BASIC, document the use of all 14 METRABUS I/O boards.

Configuring a System

A METRABUS system always consists of at least three parts: a controller board, a cable and one or more I/O boards. Accessories can include a power supply or a rack-mount kit. Installation is simplified because the METRABUS controller distributes +5VDC power to the I/O boards. Also METRABUS can be mounted in both 19″ racks or flush against panel walls.

Regardless of the controller selected, all METRABUS systems provide 64 addresses for I/O boards. Please refer to the list of I/O boards for the number of addresses a specific board uses. In general, digital I/O boards use 2 consecutive METRABUS addresses for 16 channels of I/O while analog I/O boards use 4 consecutive METRABUS addresses for 16 channels of analog I/O. Therefore, a METRABUS system can provide up to 512 digital I/O or 256 analog I/O or some proportional number of each. Please refer to the following pages for part numbers and detailed specifications for each part of the METRABUS system.

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