

*DIGIO-01*

**User's Guide**

*(PC and Macintosh)*

Revision 1.0

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1999-2001

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## 1 Welcome

Thank you for choosing a quality product from MEET Electronics!

Reading this document will help you get the best out of your new instrument and avoid common mistakes.

We are sure that our product will work to your full satisfaction and let you enjoy troublefree operation over many many years.

## 2 Content of the package

The present package contains:

- 1 DIGIO-01 unit
- 1 DIGIO CD (fits both Windows and Macintosh) containing documentation and software
- computer serial cable (Macintosh serial cable must be ordered separately)
- DC-power-input cable

## 3 Product Highlights

DIGIO stands for DIGital Input Output Module and as the name implies, it is a data acquisition and control (DAQ) instrument, to be operated from a personal computer.

Each DIGIO unit offers up to sixteen logic inputs and sixteen relay (SPDT) outputs.

Built-in networking capabilities allow to connect a chain of up to 15 DIGIO-01 (or other similar equipment, such as MEET's DIGIO) to a single computer's RS-232 port. No PCI slot and no GPIB adapter is needed !

The instrument was designed for applications in industry, building automation, education and laboratory.

For more details, please read the enclosed product datasheet.

MEET provides a comprehensive range of free software tools for the DIGIO, including drivers in C/C++ and LabVIEW<sup>i</sup>, as well as ready to use stand-alone software applications.

The enclosed CD contains software for both Windows PCs and Macintosh computers. Software updates are available for free from our web site.

Alternatively, MEET also offers custom software design services to its customers.

A range of optional accessories round up the offerings, including:

- signal conditioning modules for various physical variables
  - power supplies
  - connectors and cables
- (please contact the factory or your local sales representative)

Third party accessories available include:

- USB-to-RS-232 adapter (for both PC and Mac)

## 4 Minimum System Requirements

### 4.1 PC compatible computer:

- 486 processor or higher
  - 16 MB RAM or more
  - 50 MB free hard disk space<sup>ii</sup>
  - CD ROM drive
  - 1 serial port (COM1..4)
  - Windows3.1 or Windows95/98 or Windows NT or higher<sup>ii</sup>
  - LabVIEW 5.0 or higher<sup>ii</sup> or VisualC<sup>ii</sup>
- (Note: the enclosed demos have been tested only on PCs running Windows95/98)

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<sup>i</sup> LabVIEW is a registered trademark of National Instruments Corporation

<sup>ii</sup> Not required to run the demos contained on the CD. Only needed for LabVIEW or C/C++ application development

## 4.2 Macintosh computer:

- PowerPC processor or 68k processor with math coprocessor
- 16 MB RAM or more
- 50 MB free hard disk space<sup>iii</sup>
- CD ROM drive
- 1 serial port (printer or modem port) (also some external USB-to-serial adapters may work. Please contact MEET Ltd. for information)
- MacOS 7.0 or higher
- LabView 5.0 or higher<sup>iii</sup> or CodeWarrior<sup>iii</sup>

(Note: the enclosed demos have been tested only on PowerPC machines with MacOS 8.x or higher)

## 5 Installation

### 5.1 Hardware

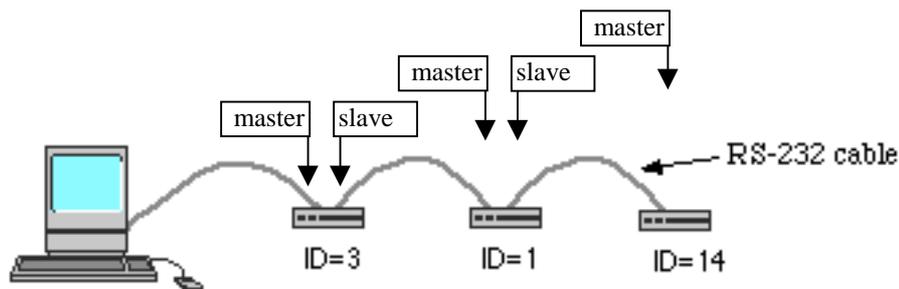
- turn off the DIGIO instrument
- configure the Address ID of DIGIO by means of the rotary switch on the rear panel (use a small screwdriver). connect the serial cable between the computer's serial port and DIGIO. Make sure that the cable is inserted into the lower ('Master') connector on the DIGIO.
- connect DIGIO to the power supply (24 Volts DC) using the cable included in the package. Either power input connector (upper or lower) can be used on DIGIO's rear panel.
- turn on DIGIO by pressing the button on the front panel. The green LED on the front panel must go on. (to turn off DIGIO, press again the button on the front panel)

DIGIO is now ready to work and waits to receive command from the personal computer.

**NOTE** that the rotary switch is only read at power-up. To make a change in the position of the rotary switch become effective, DIGIO must therefore be turned off and on again

Connecting multiple DIGIO (or other equivalent, e.g. ADIO) units to a single personal computer

- turn off all instruments
- make sure that every instrument has a different Address ID (rotary switch on the rear panel)
- connect the single DIGIOs as follows (the figure shows which connector (on the rear panel) must be connected to what cable):



**Fig. 1 DIGIO in chained operation**

<sup>iii</sup> Not required to run the demos contained on the CD. Only needed for LabVIEW or C/C++ application development

## 5.2 Software

Locate the stand-alone LabVIEW application (virtual instrument user interface) on the enclosed CD, which can be found under /Labview/DIGIO/Examples/DIGIO/  
Double click on the DIGIO Application icon.  
Then, the following window should come up:

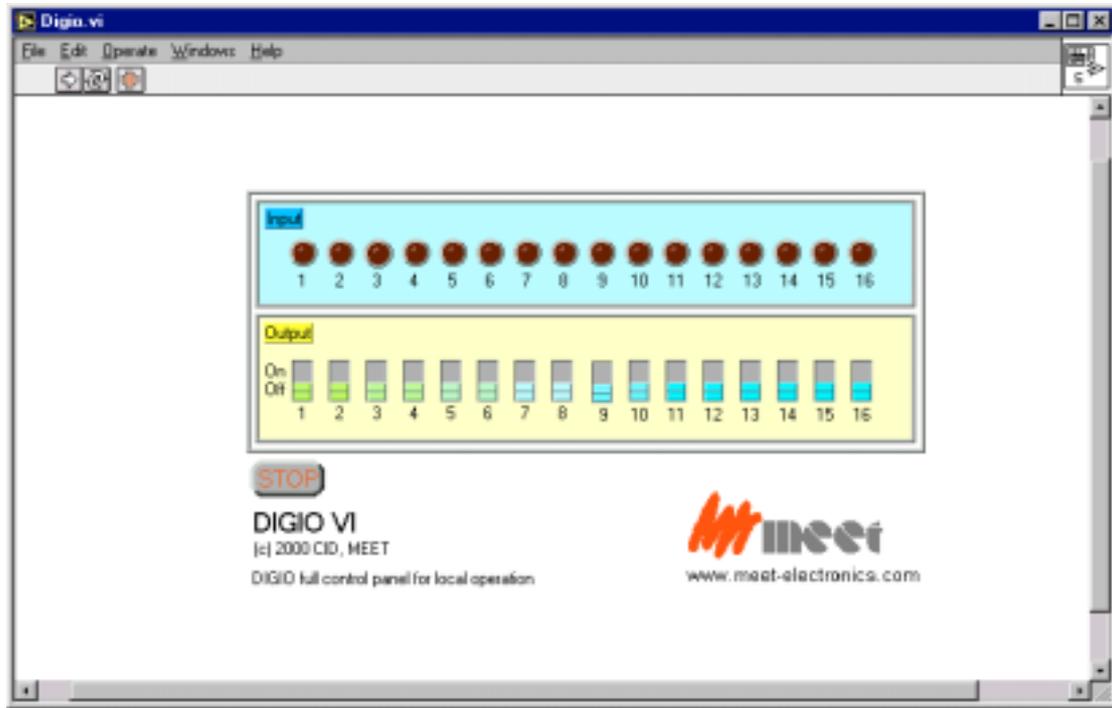


Fig. 2 DIGIO virtual instrument user interface (LabVIEW)

To start the execution of the program, click on the icon indicated by the arrow:

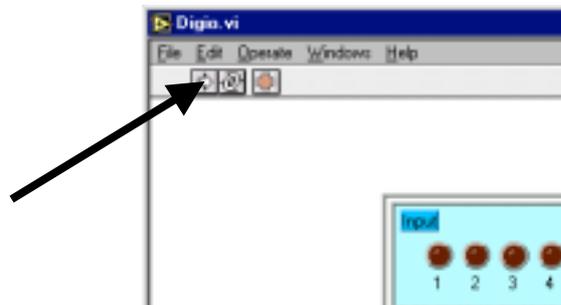
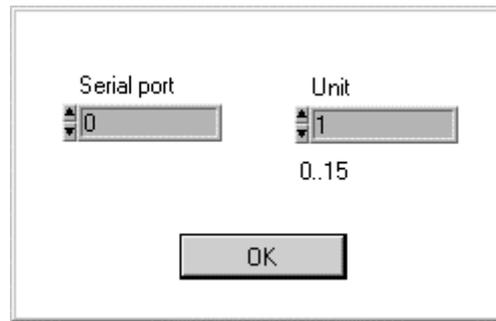


Fig. 3 How to launch the program

The software then asks you to which serial port of the computer you have connected the DIGIO and what's the Address ID of the unit that you want to control:



**Fig. 4 Communications settings dialog**

The following table shows the correspondence between the serial port number and the physical serial port on your computer:

---

Serial port number correspondence:

PC: 0 → Com1 1 → Com2 2 → Com3 3 → Com4 etc.

Mac: 0 → Modem 1 → Printer

---

**Table 1 Serial port identification**

Please enter the correct values according to the installation that you have made. After pressing OK, you should get full control over the DIGIO.

*Example:*

The rotary switch on your DIGIO is set to 1 and you have connected the serial cable to the COM1 port (PC) or Modem port (Mac). Then the settings you have to make are exactly the same as those indicated in Fig. 4

In a similar way, you can now try out all the other software examples provided on the CD (some of them do actually not require an DIGIO to be physically present but simulate it instead).

## 6 DIGIO Operating Instructions

The DIGIO has two main functional blocks:

- isolated inputs on the front side
- relay outputs on the rear side

The following paragraphs explain how to use these functions with our sample software provided on the CD. Please start the DIGIO computer program according to the instructions given in paragraphs 5.1 and 5.2.

(More flexibility can be achieved by programming custom applications, using our C/C++ or LabVIEW drivers).

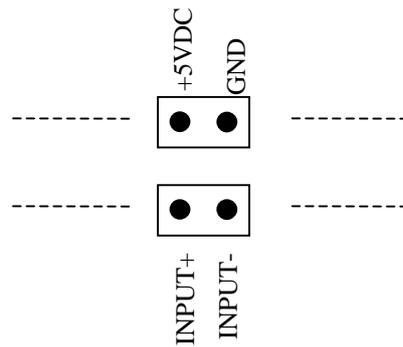
### 6.1 Using the inputs (front side)

The sixteen inputs on the front side all have a full galvanic isolation. They are all "digital", i.e. they can be 1 or 0. Allowable input voltages go from 0 to 24Volts. Voltages greater than 4.5Volts are considered as a logic "1". Voltages below that value are read as "0".

In the upper half of the "Virtual User Interface" (Fig. 2) window, each input channel has its own lamp, indicating the logic status of the applied signal.

DIGIO's front panel has two connector rows. The connectors on the lower row are the actual inputs. The upper row provides optional 5VDC outputs (not isolated), intended to power external sensors or signal conditioning circuits. Each input can be considered as consisting of a pair of connectors (one on the upper row and one on the lower row).

The pin-out of each input is then as follows:



**Fig. 5 Front side input connector pin-out**

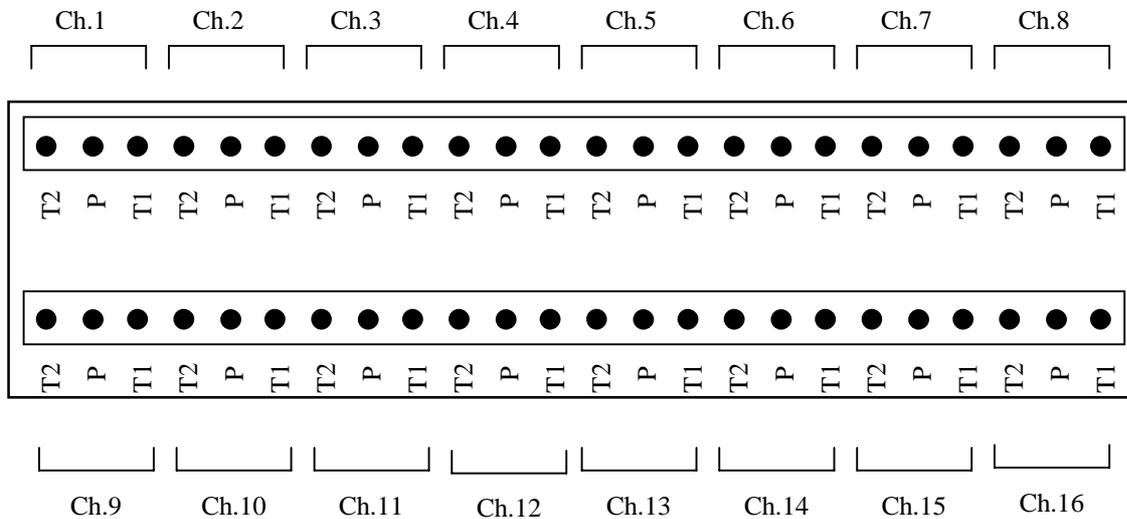
Please refer to the datasheet for detailed technical specifications. Exceeding the maximum values may result in a permanent damage of the instrument.

### 6.2 Using the relays

Each DIGIO contains sixteen SPDT (single pole dual throw) relays rated at 250VAC/8A each, whose contacts are available at the rear panel of the instrument.

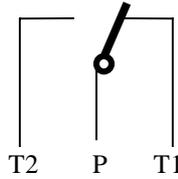
The relays can be controlled by the switches provided on the lower half side of the "Virtual User Interface" (Fig. 2).

The connectors on the rear panel are organized as two rows of 24 contacts each. The pin-out is as follows:



**Fig. 6 DIGIO rear panel pin-out**

The wiring of each relay is as follows (P-T1 are connected in the inactive position):



**Fig. 7 DIGIO's relay wiring**

Please refer to the datasheet for maximum output load and voltage ratings. Exceeding these values may result in a permanent damage of the instrument.

## 7 Development Tools

It is quite easy to design custom applications for the DIGIO on both Windows and Macintosh platforms, using the software driver package provided on the enclosed CD. (The developer must have a full version of either LabVIEW (Win or Mac), or VisualC (Win) or CodeWarrior (Mac)).

Free drivers offered include:

### 7.1 PC (Windows):

- VisualC<sup>iv</sup> (source code)
- LabVIEW

More details (programmer's reference manuals) can be found directly in the corresponding directory on the CD.

### 7.2 Macintosh (68k, PPC)

- Code Warrior<sup>v</sup> (source code)
- LabVIEW

More details (programmer's reference manuals) can be found directly in the corresponding directory on the CD.

Check on our web site for updates.

### 7.3 Overview of the serial communication protocol (RS-232)

DIGIO implements a special "multi-drop" serial protocol (over RS-232), allowing multiple units to be connected in a chained topology. Each instrument acts as a repeater in this protocol.

The communication is made of command and response telegrams. All telegrams are sequences of bytes containing ASCII characters (numbers are also encoded as ASCII numbers), with exception of the first byte of a telegram, which contains the address field (i.e. the information required to select to which instrument the telegram is directed or from which it is coming).

All telegrams are terminated by a CARRIAGE RETURN ("`\r`") (=0x0d). A line feed (0x0a) can also be appended, but is not required.

Telegram format:

**n** OPCODE[ = | ? ] {parameter} "`\r`"

(n is the first byte transmitted, "`\r`" is the last)

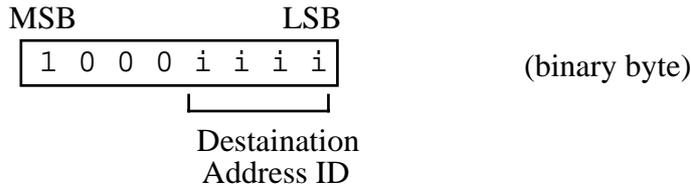
where:

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<sup>iv</sup> VisualC is a registered trademark of Microsoft Corporation

<sup>v</sup> Code Warrior is a registered trademark of Metrowerks Corporation

- n : address of the instrument to which the command is directed, with the following format:



(Important: the most significant bit (MSB) must be 1 in order to differentiate this byte from the remaining ones, which are all pure ASCII with the first bit set to 0)

- OPCODE: is a "word" that specifies the command type (ASCII string)
- = or ? specify if the command is affirmative or interrogative (ASCII character).
- Parameter is required for some commands: this field contains additional information required by the command (ASCII string)

#### Response telegrams and error checking:

To answer to a command, the addressed instrument echoes it and then appends its own response parameter field (if required). The software on the computer must be implemented in such a way to check against errors in the returned echo and eventually discard wrong telegrams.

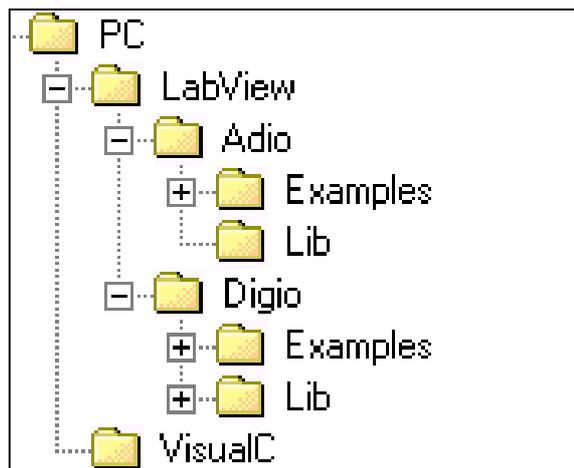
The instrument itself also contains a simple syntax check and it discards command telegrams with wrong syntax (or transmission errors).

All connected instruments receive all the telegrams sent by the computer ("downstream"), but only the one that's addressed is allowed to send an answer. The "upstream" data flow is not monitored by the other instruments.

## 8 Organization of the CD

The CD is a hybrid, i.e. it can be opened both on Windows and Macintosh machines, looking different on both of them: each platform actually sees only the part intended for it.

### 8.1 Windows:



**Fig. 8 Windows CD organization**

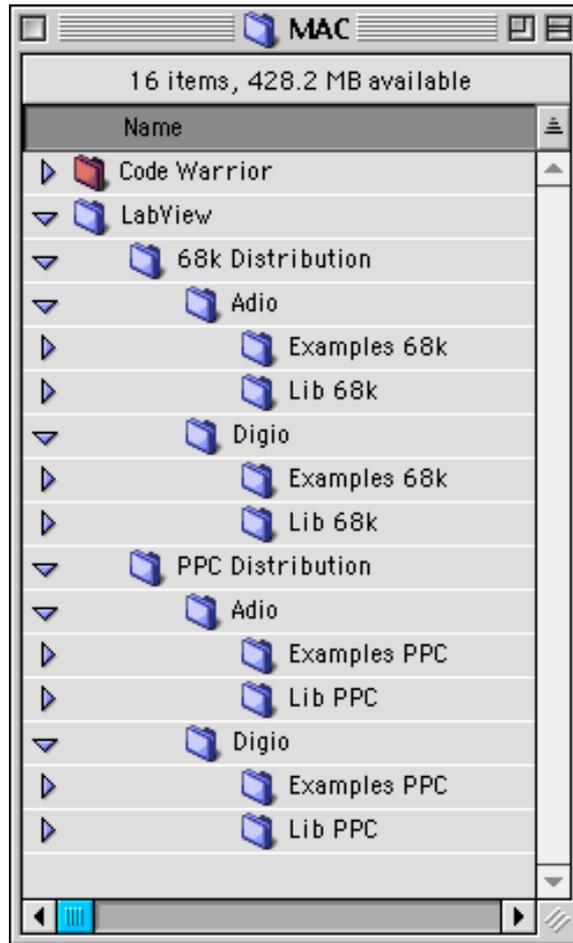
The folder "VisualC" contains the driver routines (source files) and related documentation for VisualC developers.

Both ADIO and DIGIO folders inside the LabVIEW folder contain software for the corresponding instrument.

The subfolders of ADIO and DIGIO are Examples and Lib. The first contains stand-alone running application programs and examples (including DIGIO, described in chapter 5.2), all designed with LabVIEW.

The second contains LabVIEW drivers (VI's) and related documentation for LabVIEW developers.

## 8.2 Macintosh



**Fig. 9 Macintosh CD organization**

The structure and content of the CD for Macintosh users is very similar to its Windows counterpart. The main differences are:

- the CodeWarrior folder contains driver source code and related documentation for CodeWarrior developers (instead of VisualC)
- LabVIEW software is split into two categories: 68k and PPC. The software in the PPC folder is intended for machines with a PowerPC processor, the software in the 68k folder is for the older 680x0 computers. Documentation for developers is included.

## 9 Warranty

This product is guaranteed to be free from defects in materials and workmanship for a period of 1 (one) year from the time of its original purchase. The warranty is limited to the replacement of the defective material. Transport costs are not covered.

## 10 Contact information

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