

ADIO-01

User's Guide

(PC and Macintosh)

Revision 1.0

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Contents:

1	WELCOME	4
2	CONTENT OF THE PACKAGE	4
3	PRODUCT HIGHLIGHTS	4
4	MINIMUM SYSTEM REQUIREMENTS	4
4.1	PC COMPATIBLE COMPUTER:	4
4.2	MACINTOSH COMPUTER:.....	5
5	INSTALLATION	5
5.1	HARDWARE.....	5
5.2	SOFTWARE	6
6	ADIO OPERATING INSTRUCTIONS	7
6.1	USING THE INPUTS (FRONT SIDE)	7
6.2	USING THE OUTPUTS/INPUTS (REAR SIDE)	8
6.3	USING THE RELAYS.....	9
7	DEVELOPMENT TOOLS	10
7.1	PC (WINDOWS):.....	10
7.2	MACINTOSH (68K, PPC).....	10
7.3	OVERVIEW OF THE SERIAL COMMUNICATION PROTOCOL (RS-232)	10
8	ORGANIZATION OF THE CD	11
8.1	WINDOWS:	11
8.2	MACINTOSH.....	12
9	WARRANTY	13
10	CONTACT INFORMATION	13

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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 ADIO-01 unit
- 1 ADIO 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

ADIO stands for Analog+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 ADIO unit offers up to eight analog outputs and 8 to 16 analog inputs, in addition to two relay outputs.

Unlike other products on the market, the analog outputs of the ADIO-01 are capable of driving **loads over 30 Watts** per channel.

Built-in networking capabilities allow to connect a chain of up to 15 ADIO-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 ADIO, including drivers in C/C++ and LabVIEWⁱ, 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 spaceⁱⁱ
- CD ROM drive
- 1 serial port (COM1..4)
- Windows3.1 or Windows95/98 or Windows NT or higher
- LabView 5.0 or higherⁱⁱ or VisualCⁱⁱ

(Note: the enclosed demos have been tested only on PCs running Windows95/98)

ⁱ LabVIEW is a registered trademark of National Instruments Corporation

ⁱⁱ 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 spaceⁱⁱⁱ
- 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 higherⁱⁱⁱ or CodeWarriorⁱⁱⁱ

(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 ADIO instrument
- configure the Address ID of ADIO 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 ADIO. Make sure that the cable is inserted into the lower ('Master') connector on the ADIO.
- connect ADIO 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 ADIO's rear panel.
- turn on ADIO by pressing the button on the front panel. The green LED on the front panel must go on. (to turn off ADIO, press again the button on the front panel)

ADIO 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, ADIO must therefore be turned off and on again

Connecting multiple ADIO (or other equivalent, e.g. DIGIO) 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 ADIOs as follows (the figure shows which connector (on the rear panel) must be connected to what cable):

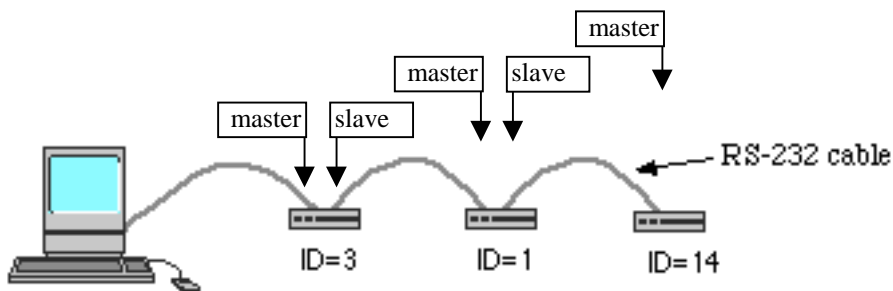


Fig. 1 ADIO in chained operation

ⁱⁱⁱ 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/ADIO/Examples/ADIO/

Double click on the ADIO Application icon.

Then, the following window should come up:

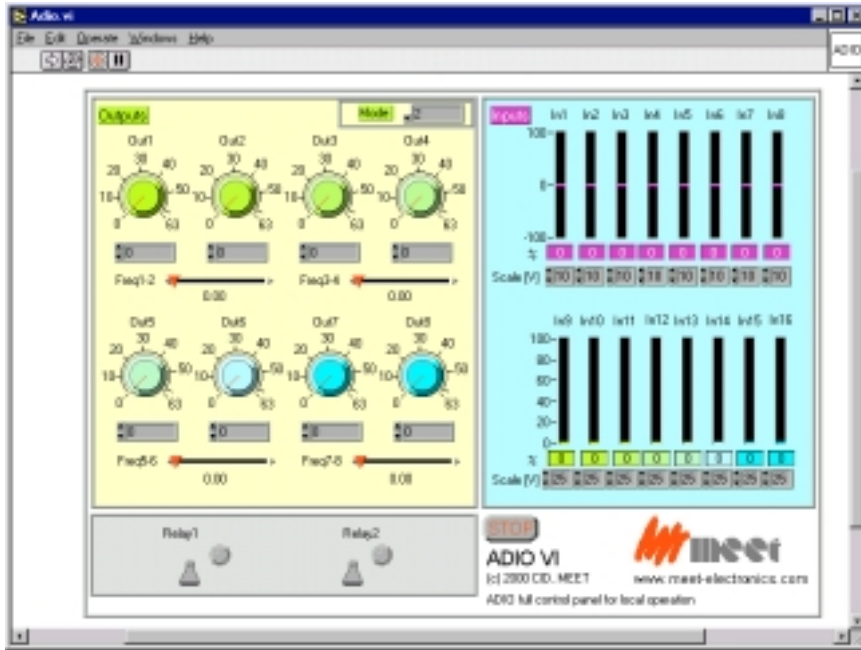


Fig. 2 ADIO virtual instrument user interface (LabVIEW)

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

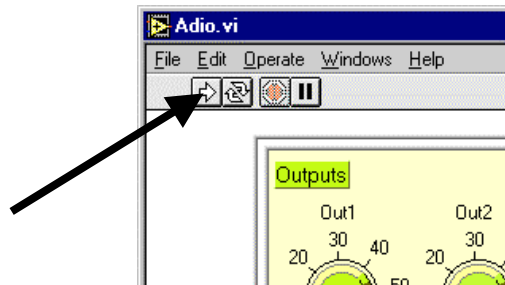


Fig. 3 How to launch the program

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

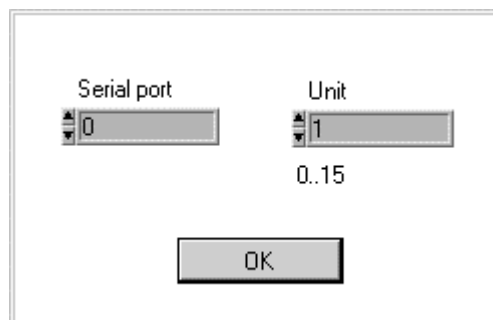


Fig. 4 Communications settings dialog

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 ADIO.

Example:

The rotary switch on your ADIO 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 ADIO to be physically present but simulate it instead).

6 ADIO Operating Instructions

The ADIO has three main functional blocks:

- inputs on the front side
- inputs/outputs on the rear 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 ADIO 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)

Each of the eight inputs on the front side can have a different sensitivity scale. The input voltage ranges of the various scales are as follows:

Scale	Channels 1..8 (front panel) Sensitivity
0	- 10 V...+10V
1	- 5 V...+5V
2	- 2 V...+2V
3	- 1 V...+1V

Table 2 Sensitivity scales for frontpanel inputs

In the "Virtual User Interface" (Fig. 2) window, the virtual instruments associated to the eight front panel inputs are those in the upper right part.

For each of them, it is possible to select the scale by clicking on the arrows located below the display bar.

The pin-out of each input connector (DIN, 3 pin) is as follows:

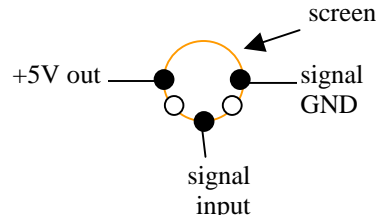


Fig. 5 Front side input connector pin-out

The optional 5VDC power supply output is provided for active sensors or external signal conditioning circuits.

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

6.2 Using the outputs/inputs (rear side)

A total of eight input/output channels are available on the rear side of the instrument. The pin-out of the connector is as follows:

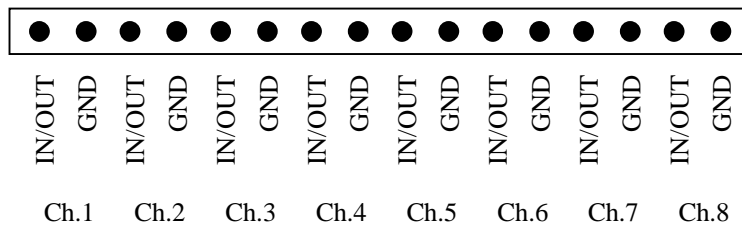


Fig. 6 Rear side input/output connector

After power-up, the eight channels are all set-up as inputs. The user can then configure four or all eight of them as outputs, by changing the MODE setting:

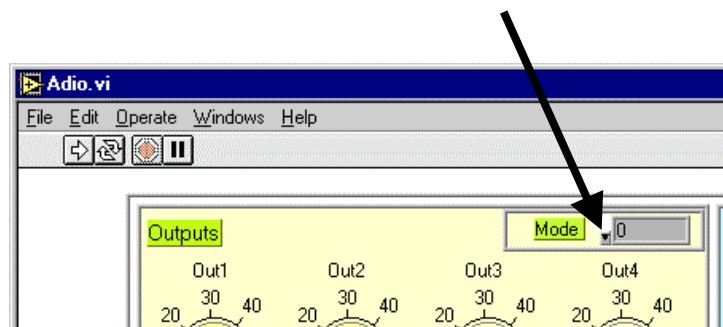


Fig. 7 Rear side channels MODE setting

MODE value	.. result is..
2	all eight rear panel channels are inputs (IN9..IN16) (this is the default at power-up)
1	the first four rear panel channels are outputs (OUT1..OUT4). The remaining are inputs (IN13..IN16)
0	all eight rear panel channels are outputs (OUT1..OUT8)

Table 3 MODE configuration for rear panel input/output channels

NOTE

It is only possible to decrease the mode setting (2→1→0), but it is not possible to go back. To go back, the ADIO must be turned off and back on and the software restarted. This will bring the mode setting back into mode 2.

The rear panel channels can always be read as inputs (regardless of their mode of operation).

In the "Virtual User Interface" (Fig. 2) window, the virtual instruments associated to the eight rear panel inputs/outputs are those in the lower right part.

For each of them, it is possible to select the scale by clicking on the arrows located below the display bar.

The input voltage ranges of the various scales are as follows:

Value	Channels 9..16 (rear panel)
0	0...25 V
1	0...12.5 V
2	0...5 V
3	0...2.5 V

Table 4 Sensitivity scales for rear panel inputs

When using the rear panel channels as outputs, their output value (voltage) can be set by means of the rotary knobs on the left side of the "Virtual User Interface" (Fig. 2).

At the same time, the associated input instruments (lower right side) show the actual value read back. You can use this feature to implement control loops or check against short circuits or overloads.

Outputs can also be used to generate AC waveforms (7.7 to 200 Hz approx.). This functionality can be set by means of the horizontal "Frequency" slider controls on the left side of the "Virtual User Interface".

Frequency 0 (zero) defaults to DC.

The waveform in AC mode is basically trapezoidal (with constant, limited slopes to reduce harmonic content and noise emissions).

Since the slope of the waveform's edges is constant and independent of the frequency, at higher frequencies the trapezoids look more like triangles and the effective amplitude decreases.

When operating in AC mode, two adjacent outputs are always automatically paired and driven with complementary polarity but same amplitude and frequency. Therefore, a command sent to channel 1 also affects channel 2, the command sent to channel 3 also affects channel 4 and so on.

The user can choose if he/she wants to connect his load between an output and ground, or across two paired outputs. The latter case corresponds to a "bridge" mode operation. It actually doubles the output voltage and removes the DC component across the load.

Putting the frequency back to 0 (=DC) lets the (previously) paired outputs again become independent.

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

6.3 Using the relays

Each ADIO contains two relays rated at 230VAC/8A, whose contacts are available at the rear panel of the instrument. The relays can be controlled by the switches provided on the bottom left side of the "Virtual User Interface" (Fig. 2). An LED indicates the relay status. The relays are normally open in the inactive position.

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 ADIO on both Windows and Macintosh platforms, by 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^{iv} (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^v (source code)
- LabVIEW

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

Check our web site for updates.

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

ADIO 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.

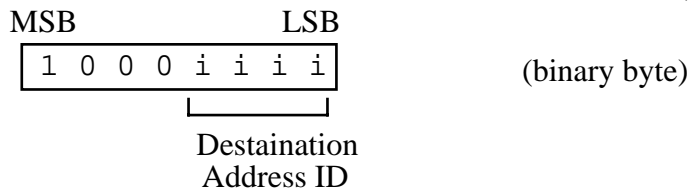
Telegram format:

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

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

where:

- 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)

^{iv} VisualC is a registered trademark of Microsoft Corporation

^v Code Warrior is a registered trademark of Metrowerks Corporation

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:

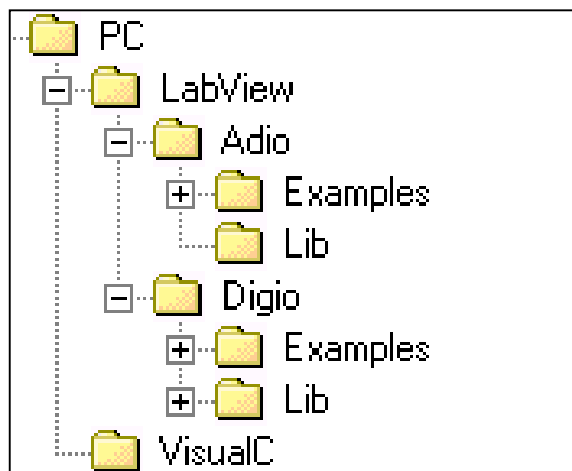


Fig. 8 Windows CD organization

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 ADIO, 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

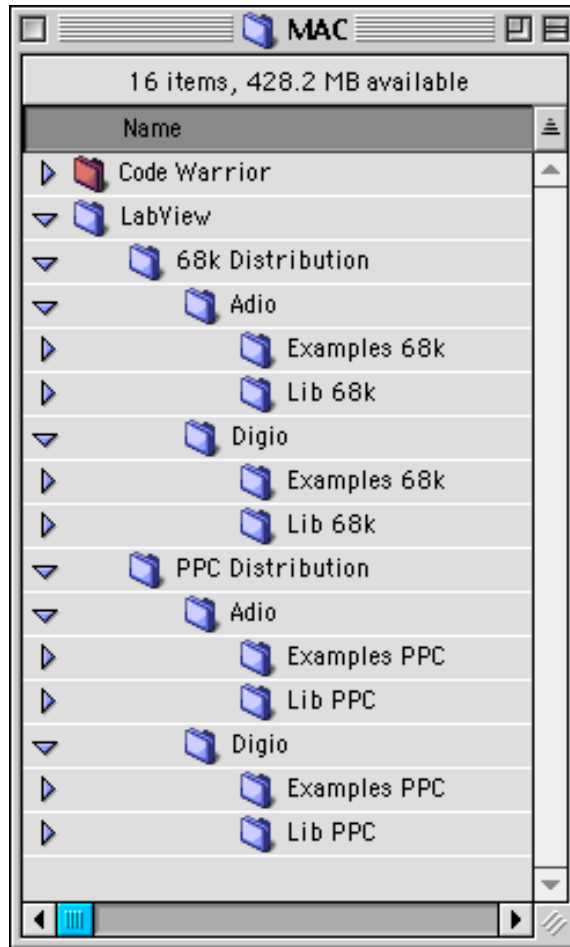


Fig. 9 Macintosh CD organization

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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