

# iWorx RA-834 Recorder

## Hardware Manual



*iWorx RA Recorder (IX-RA-834)*

### Overview

The iWorx RA Recorder is the most advanced and feature-rich physiological data acquisition system on the market. It comes standard with eight general purpose input channels, a low voltage and high voltage stimulator, eight digital inputs and outputs, a built-in barometric pressure sensor, and four iWire™ inputs. The iWorx RA exhibits the high resolution, low noise, and flexibility required for a variety of research applications including cardiac function, hemodynamics, isolated tissue and organ studies, exercise physiology research, metabolic function studies, neuroscience and both oocyte and epithelial voltage clamp applications. Incorporating innovative iWire serial interface technology and advanced LabScribe data acquisition and analysis software, the iWorx RA Recorder accommodates a wide range of sensors, transducers, and other devices.

### Included Items

- RA Recorder (IX-RA-834)
- USB cable (C-USB)
- Universal 12 VDC power supply (A-UP12-DC-25-1A)
- LabScribe data acquisition software and Quick Start guide (LS-20)

### Front Panel



*iWorx RA Recorder Front Panel*

**A1 through A4:** BNC connectors for single-ended transducers.



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**A5 through A8:** Each channel is equipped with a transducer amplifier to allow connection of virtually any physiologic transducer via a DIN8 connector.

**iWire Connectors:** Accept up to four serial iWire interfaces including the iWire-B3G, iWire-BIO4, iWire-BIO8, and iWire-ECG12. The iWire-B3G interface can record up to four channels of data. Three of the channels are isolated biopotential amplifiers capable of recording ECGs, EMGs, EOGs, EGGs, and EEGs, while the fourth is a dedicated GSR amplifier (used with the C-ISO-GSR sensor). The iWire-BIO4 and iWire-BIO8 include four or eight biopotential amplifiers respectively. The iWire-ECG12 is capable of recording a 12-lead human electrocardiogram.

**S1 and S2:** Low voltage stimulators. Parameters for the stimulators, such as pulse width, frequency and amplitude, may be changed on the fly using controls located in the LabScribe software toolbar. Standard protocols include Pulse, Train, Step, Triangle, Ramp, and Custom. Connected via BNC connectors.

**HV Stimulator:** High voltage isolated stimulator. Suitable for human striated muscle studies. Connected via HV safety connectors.

## Rear Panel



***iWorx RA Recorder Rear Panel***

### Power switch

**DC Power connector:** Accepts 12VDC, 1.5 A DC converter.

**Ground:** Accepts a banana plug.

**EM1 and EM2:** Accept the Event Marker (EM-220) and certain other transducers (including the FRS-220 Foot Reaction Switch and the PHRM-100 Polar Heart Rate Monitor receiver).

**Sync-Out, Sync-In:** To synchronize recordings across multiple RA Recorders so that channels from multiple devices can be sampled simultaneously. BNC connectors.

### USB connector

**Digital Input/Output 1 and 2:** Up to eight digital inputs and outputs are available to monitor and control external TTL devices like pumps and valves.



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## SPECIFICATIONS

### BNC INPUTS (A1-A4)

Number of inputs	4
Input range	$\pm 10$ VDC
Resolution	16 bit
Connector	BNC cable

### DIN8 TRANSDUCER INPUTS (A5-A8)

Number of inputs	4
Input range	$\pm 10$ VDC
Resolution	16 bit
Isolation	No
Excitation	$\pm 5$ VDC, 100 mA
Connectors	DIN8 (see figure below for pin configuration)
Gain	Programmable with input resistor

### HIGH VOLTAGE STIMULATOR OUTPUT

Connectors	HV Safety
Output range	0-1 mA
Compliance	100 V
Max ON time	10 ms

### LOW VOLTAGE STIMULATOR OUTPUTS (S1 and S2)

Resolution	16 bit
Connectors	BNC
Output range	$\pm 15$ VDC at 35 mA
Modes	Pulse, Train, Constant, Step, Ramp, Triangle, Custom

### DIGITAL INPUTS and OUTPUTS

Input	8 independent lines, TTL input, 1 Megohm input impedance, 5 V maximum
Output	8 independent lines, TTL output level, 24 mA maximum load per line

### A/D CONVERTER

Sampling speed	200k Hz aggregate
Interface	USB 1.1, 2.0, full speed

### GENERAL

Power	12 VDC, 1.5 A
Enclosure and Dimensions	Plastic; 23 cm W, 15 cm D, 6.5 cm H
Warranty	3 years
Software	LabScribe recording and analysis software



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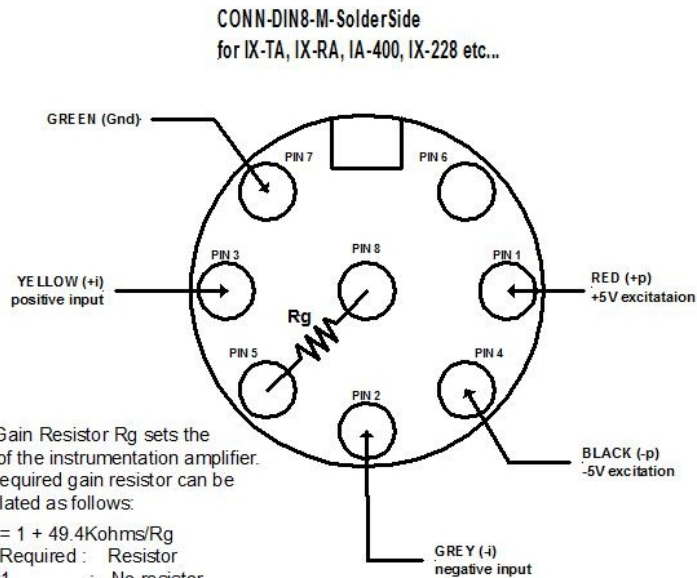
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## DIN8 TRANSDUCER INPUTS (A5-A8):

The A5-A8 inputs of the IX-RA-834 have a bridge amplifier interface. These inputs provide +/- 5V excitation power for transducers and have a differential inputs that go to an instrumentation amplifier. The Gain of the instrumentation amplifier can be set by placing a gain resistor between pins 5 and 8 of the DIN8 input. This allows for customizing the gain for each sensor.

The wiring diagram for the DIN8 Transducer inputs is shown below.



## DIN8 transducer connector pin configuration

### Digital Input connections:

Digital outputs are available on a DB9 Male Connector on the back.

Digital Inputs	
Din	Pin
0	1
1	2
2	3
3	4
4	5
5	6
6	7
7	8
5V	9



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## Digital Output connections:

Digital outputs are available on a DB9 Female Connector on the back.

The mapping of the digital outputs is as follows:

Digital Outputs	
Dout	Pin
0	5
1	6
2	7
3	8
4	1
5	2
6	3
7	4
5V	9

## How to Use the iWorx RA Recorder

The iWorx RA Recorder is controlled by LabScribe recording and analysis software. LabScribe has an intuitive interface for setting up acquisition screens, calibrating signals, and analyzing data on up to 128 channels simultaneously at sampling rates as high as 200K samples/second.

### To set up and start to use the iWorx RA Recorder:

- 1) Download LabScribe from [www.iworx.com](http://www.iworx.com). Be sure to install the software for the appropriate computer platform (Windows or Mac OS) before connecting the hardware for the first time. In order to download software from the iWorx website, you will need to register as a user.
- 2) Plug in and switch on the iWorx RA Recorder. If you will be running an experiment that uses an iWire device, connect the device before turning on the RA Recorder.
- 3) Double-click on the LabScribe shortcut to open the software. You should see a message indicating that the iWorx RA Recorder has been recognized by the software.
- 4) There are a number of advanced software modules available for LabScribe. These include modules for research involving intravascular blood pressure, ventricular pressure-volume loops, metabolic function, and ECG analysis.
- 5) Connect the desired transducers to the appropriate channels.
- 6) If you need to connect an iWire device once the RA Recorder is already running, it must be turned off, the device connected, and then the RA Recorder turned back on.
- 7) Channels can be configured manually by using the LabScribe Preferences, accessed in the Windows Edit menu, and the Macintosh LabScribe menu.

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Here channels can be turned on or off, pre-set filters can be selected, and computed channels can be configured. Views can be configured, and stimulator parameters can be set. See the LabScribe User Manual for details.

- 8) Some channel parameters can also be changed from the individual channel menus in the recording window.
- 9) If you are using the Low Voltage Stimulator or the isolated High Voltage Stimulator, connect your stimulating electrodes to the appropriate stimulator and use LabScribe to control the stimulator as instructed in the LabScribe manual.



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