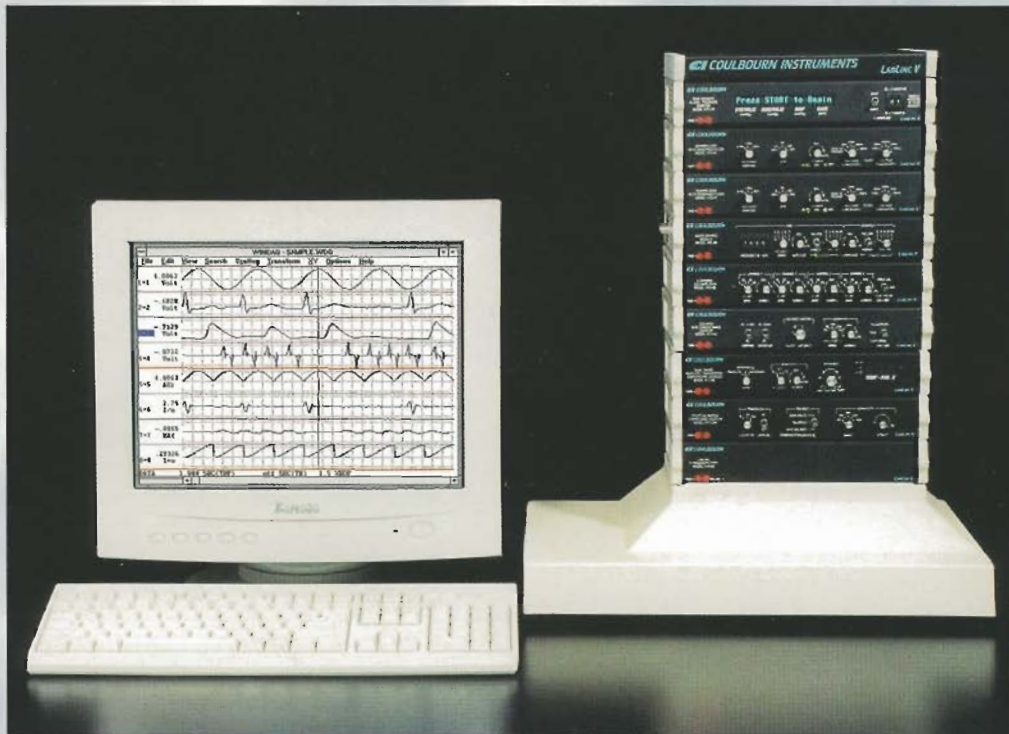


# LabLinc<sup>®</sup> V



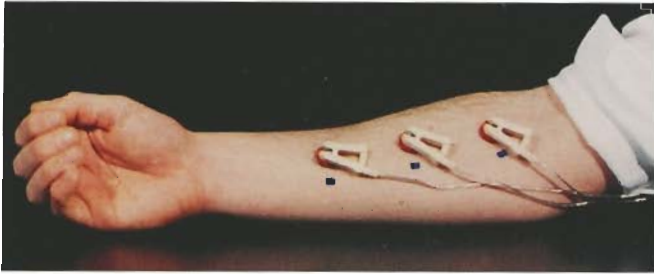
Physiological  
Data Acquisition

 **COULBOURN INSTRUMENTS**

# The LabLinc V<sup>®</sup> System

LabLinc V makes it easy and economical to use today's state-of-the-art electronics for physiological, biomedical, audiological, and biofeedback applications. LabLinc V fully integrates and automates test procedures and experiment control, with stimulus synthesis, graphic recording, data acquisition and analysis using computers.

Economical tabletop packaging confers simplicity and cost advantage. The distributed, modular processing concept maintains high signal quality and offers the convenience of fingertip controls with the power of a computer-based system.



## System Configuration

LabLinc V (for vertical) is a modular instrument system. It consists of an isolated, medical-grade power base, signal acquisition, processing, stimulus synthesis, control, and computer interface modules.

Modules stack on the base unit one atop the other on power posts. A safety interlock circuit prevents powering the stack until the top is in place.

Setting up the system is a simple matter of selecting the modules you require for your procedure, stacking them on the base and making connections between them. Connect the electrodes and transducers and you're ready to start.

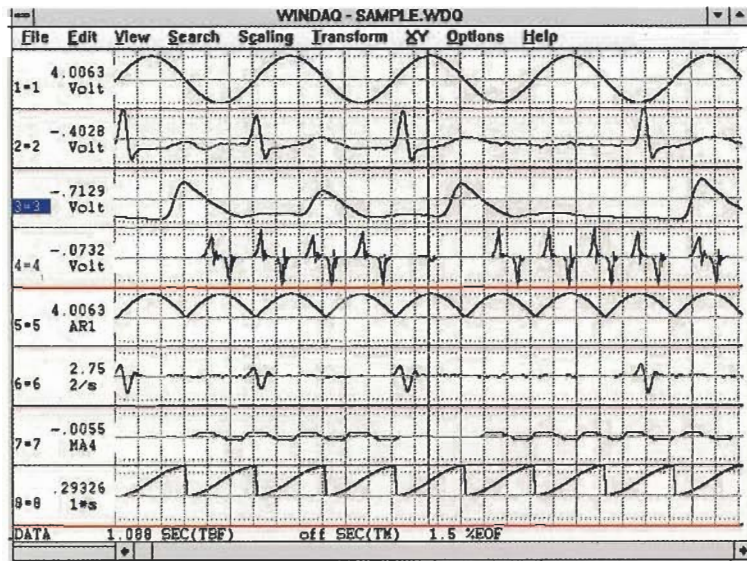
# COMPUTER INTERFACE & SOFTWARE OPTIONS

Although modules may be used alone or with a basic chart recorder for many monitoring functions, the system is generally used as a modular or virtual instrument system with a computer.

The array of modules offered and their individual configurations of controls and outputs are intended to maximize simplicity of use, and to get the most out of your computer and software.

By selecting the appropriate LabLinc V port module, you may use software provided by us or developed by others for use with industry-standard, high-speed, parallel interface boards.

We offer WINDAQ and BioBench software packages. See pages 18 to 21 for information covering them.



## MODULES

Coulbourn's LabLinc V modules offer the most advanced electronic and package designs available. For user convenience, module interconnects are located on the back of the modules with transducer and electrode inputs on the side plate, leaving the front panel unobstructed for a clear view of displays and easy access to the controls.

Many modules are available in both isolated and economical, unisolated versions. Both types are designed to UL and AAMI standards for patient contact when used with our isolated base unit.

### MODULES ARE PRESENTED ON THE PAGES THAT FOLLOW

A guide to selection of modules for your application is at the end of the book.

More complete descriptions and specifications, as well as applications information is available in our LabLinc V Users Guide. It is free on request.

Visit us on the web at:

<http://www.coulbourn.com>

# MODULES

## V19-02 LABLINC WINDAQ PORT

This module provides connection via a cable to the data acquisition / video accelerator board supplied with **WINDAQ** software.

It has 16 analog inputs, 8 digital inputs (one of which is dedicated as a recording trigger) and 8 digital outputs on

the rear panel. It is simply a terminal module for the card in the computer.

It should be mounted on the bottom of the module stack so that the cable will not interfere with module-to-module lead connections.

Installing the card and connecting the cable is discussed in the manual provided with **WINDAQ** software.

## V19-22 NATIONAL INSTRUMENT'S E-SERIES PORT

This module supports the National Instruments E-series DAQ boards which support a variety of software packages including National's **LabVIEW** and their **BioBench** physiological signal acquisition and analysis software. Other software packages from a variety of third-party sources, including **Visual Basic** and **Excel** to mention two, may be used with this port.

The Linc interfaces CI V-series modules to the computer via the National Instruments E-series DAQ boards for use with these programs.

We offer the National Instruments **BioBench** physiological data acquisition and analysis software package (page 20). You can refer to their product literature for information on their boards and the use of other software packages.

## V21-10 DUAL COMPARATOR / WINDOW DISCRIMINATOR

Comparators detect the voltage level of a signal. Other names for this type of circuit are: threshold detector, level detector, and amplitude trigger or detector. A window discriminator discriminates the height of a signal to determine if it is between two levels and/or to determine if a rise is of

at least one given amplitude but not above a second, higher amplitude before it falls back below the first.

This module has 2 comparators that may be used independently or in combination as a window discriminator. It features high accuracy and digital displays for the set points. High resolution, 10-turn controls allow the user to set the comparators precisely.

## V71-23 ISOLATED SKIN CONDUCTANCE COUPLER

This module measures SC, skin conductance (the reciprocal of skin resistance). This is the most used method of measuring the electrodermal response or EDR. The output represents conductance in Siemens (formerly Mhos). The coupling switch allows the user to select either direct coupling (DC) for the measurement of basal tonic - skin conductance

level, SCL, or AC coupling to measure the skin conductance response, SCR. The SCR time constant is 5 seconds. The unit is isolated to prevent interference with bioamplifiers and other couplers.

**Requires V91-33 Cable, 2 - V91-11 leads and 2 - V91-01 Electrodes.** Order separately.

## V71-30 DUAL-PROBE ABSOLUTE / DIFFERENTIAL TEMPERATURE COUPLER

This coupler offers three modes of operation: the reading of the absolute temperature of one probe, the difference or change from user defined reference point, or the difference between two probes. Temperature is displayed in degrees C in a 3-digit display. There is a calibrated output and a

cursively adjustable vernier output. The difference and reference modes are ideal for biofeedback and other applications involving short-term temperature changes of one degree or so when a large signal is desired.

**Requires one or two V-93 Series thermistor probes.** Order separately.

Each module is described in the corresponding panel on the page to the left.

**COULBOURN**

LABLINC WINDAQ® PORT  
MODEL V19-02

PWR + ● - ● ON LINE ●

LABLINC V

**COULBOURN**

NATIONAL INSTRUMENTS®  
E-SERIES PORT  
MODEL V19-22

PWR + ● - ● ON LINE ●

LABLINC V

**COULBOURN**

DUAL COMPARATOR/  
WINDOW  
DISCRIMINATOR  
MODEL V21-10

THRESHOLD ADJUST RANGE & POLARITY

2.75  
LO THRESHOLD

ABOVE THRESHOLD IN WINDOW

3.45  
HI THRESHOLD

ABOVE THRESHOLD

THRESHOLD ADJUST RANGE & POLARITY

PWR + ● - ●

LABLINC V

**COULBOURN**

ISOLATED  
SKIN CONDUCTANCE  
COUPLER  
MODEL V71-23

AC - 5 SEC AC 100Hz  
DC DC  
COUPLING EXCITATION

BALANCE CONTROL  
ADJUST - (DC ONLY)

SENSITIVITY  
10 50 100 500 1K  
mV/μSIEMENS RANGE VERNIER

10 μSIEMENS  
RUN  
1 μSIEMENS  
CAL / REF

PWR + ● - ●

LABLINC V

**COULBOURN**

DUAL PROBE  
ABSOLUTE / DIFFERENTIAL  
TEMPERATURE COUPLER  
MODEL V71-30

DIFFERENTIAL ABSOLUTE REFERENCE  
MODE

SENSITIVITY  
.01 0.1 1.0  
V / DEGREE VERNIER

REFERENCE  
SET TO ZERO OR  
ANY STARTING POINT

37.5  
TEMP - DEG. C

PWR + ● - ●

LABLINC V

# MODULES

## **V71-40 PULSE MONITOR / OPTICAL DENSITOMETER (BLOOD FLOW MONITOR)**

The V71-40 uses a light source and photo-transistor in either the transmissive or reflective mode to measure pulsatile blood flow by optical densitometry. The light is emitted and received by a dual-element emitter and sensor mounted in the transducer head. When used on translucent areas, such as the ear, the light is transmitted completely through the tis-

sue and reflected back by the ear clip. When used where there is underlying bone, the bone itself reflects the light back to the sensor. As opaque blood components flow through the light path, they partially obstruct the beam to generate the signal. The unit may also be used for eye blink and other events producing a pulsatile change in reflectance.

**Requires V95-01 pulse transducer.** Order separately.

## **V72-25A RESISTIVE BRIDGE STRAIN GAGE TRANSDUCER COUPLER**

This coupler accepts almost any resistive bridge transducer. It provides for 5, 7.5, or 10 volt excitation. Coupling may be DC or 1.0 Hz AC. Five sensitivity ranges and an off-calibrate vernier sensitivity adjustment afford the user a wide latitude of control. A major feature of this unit is the auto-balance control. A simple press of the auto-balance switch brings any transducer into zero balance with 20 mV accura-

cy. Transducer offset errors and weight or tension pre-loads such as encountered in startle, tremor, and ergometric activity or muscle preparations can be instantly zeroed out. The unit may be re-balanced to zero at any time via the manual switch or from program control via the logic input on the rear panel. A mating connector is available for your transducers.

**Use with V94-Series transducers.** Order separately.

## **V72-34 NON-INVASIVE BLOOD PRESSURE MONITOR (OSCILLOMETRIC TYPE)**

Like the auscultatory method, the non-invasive, oscillometric method of measuring blood pressure employs a cuff. However this method does not use a microphone to "listen" for Korotkoff sounds as pressure falls. Rather, the oscillometric method senses the oscillations in the artery wall caused by turbulent blood flow and computes pressure from changes in the oscillations. A major advantage is that there is no microphone to place. Just place the cuff with its single tube. It is easier to use, more reliable and has no microphone to pick up ambient acoustic noise to render signal error. An empirically-developed, proprietary algorithm analyzes the oscillations over the course of the cuff deflation cycle and produces the measure. The pressures reported correlate very well with directly measured values from invasive transducers. The unit has both manual and computer controlled capabilities and displays systolic, diastolic, and mean arterial pressure as well as heart rate.

The V72-34 consists of the V-module, a remote cuff con-

trol unit (Cuff Linc) which contains the pump and a microprocessor to perform the analysis on the pressure signal, and an air-line-connected cuff. The module contains a second microprocessor to generate the display information and synthesize the analog outputs reflecting the measure.

A nice feature of this unit is that after the first cycle, the microprocessor remembers the pressure and pumps only to that level plus a 50 mm Hg margin rather than pumping to the initial target pressure of 180 mm Hg. When taking the first reading, it inflates to 180 mm Hg and if it detects no pulse, begins the deflate routine. If it does detect a pulse it will increase pressure in 40 mm Hg increments until it detects no pulse.

After 50 seconds, if the initial or subsequent target pressure is not reached, the unit will display the "Air Leak" message.

The unit is supplied with a standard adult cuff. Inquire for different sizes or replacements

## **V73-22 ISOLATED TRANSTHORACIC IMPEDANCE COUPLER (PNEUMOGRAPH / ECG)**

The Transthoracic Impedance Coupler is used for recording respiratory and ECG activity by measuring the thoracic impedance between two electrodes. IPG (Impedance pneumography) measures respiration rate and relative volume. Absolute volumes can be measured by first calibrating with a spirometer. In addition, the unit provides simultaneous measurement of ECG, a particularly attractive feature when

working with small animals. Transthoracic impedance is determined by passing a four microamp, 50 KHz constant current through the subject's thorax and measuring the voltage across the electrodes. It is isolated to prevent interference from the excitation voltage when recording other signals.

**Requires V-91-43 Cable, 2 - V91-11 leads and 2 - V91-01 Electrodes.** Order separately.

# MODULES

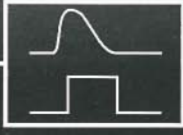
Each module is described in the corresponding panel on the page to the left.


**COULBOURN**



PULSE MONITOR  
OPTICAL DENSITOMETER  
MODEL V71-40

3 4 5  
2 6  
1 7  
0 8

AUTO GAIN  
SENSITIVITY TRIM

IN  ANALOG OUT  
DIGITAL OUT

DIGITAL OUT TRIGGERED 

PWR +  - 

LABLINC V


**COULBOURN**

RESISTIVE BRIDGE  
STRAIN GAGE COUPLER  
MODEL V72-25A

5V 7.5V 10V AC  
DC


EXCITATION COUPLING



BALANCE  
UNBALANCED  
BALANCED  
AUTO BALANCE

TRANSUCER BALANCED 

200 266 500 1000

RANGE

VERNIER  CAL

PWR +  - 

LABLINC V

**COULBOURN**


NON-INVASIVE  
BLOOD PRESSURE  
MONITOR  
MODEL V72-34

1 2 6      7 4      9 2      7 6

**SYSTOLIC**      **DIASTOLIC**      **MAP**      **RATE**

(mmHg)      (mmHg)      (mmHg)      (bpm)

PWR +  - 

STOP  START 

00 = 3 SAMPLES  
7 7  
SAMPLE INTERVAL  
02 TO 99  
MINUTES  
01 = 1 SAMPLE

 SAMPLING

LABLINC V



**COULBOURN**

TRANSTHORACIC  
IMPEDANCE COUPLER  
(PNEUMOGRAPH / ECG)  
MODEL V73-22

AC  
DC

COUPLING

BALANCE CONTROL  
0-1 2-3 3-4 4-5

ADJUST  
BALANCE

Kohms  
RANGE

PNEUMOGRAPH  
1 2 5 10 X100  
.5 20


mV/OHM  
SENSITIVITY

X1  
RANGE



ECG  
0.2 0.5 1.0 2.0

V/mV  
SENSITIVITY

CAL / REF +5Ω

RUN 

TRACE RESTORE

PWR +  - 

LABLINC V

# MODULES

## **V75-01 BIOAMPLIFIER WITH ADJUSTABLE BANDPASS FILTER**

This is a general-purpose bioamplifier designed for a wide range of applications. It has a built-in bandpass filter network consisting of 5 high cutoff (low-pass) and 5 low cutoff (high-pass) filter frequencies. A 60 (or 50) Hz notch filter is also built in, as is a coupler filter between the preamp and main amplifier section to permit decoupling of artifact-

caused saturation. The filters provide 12dB per octave attenuation for the most frequently studied phenomena including EMG, ECG, EEG, SPR, and others. An isolated version is available - V75-04 as is a version without filters - V75-02.

**Requires V91-33 Cable, 3 - V91-11 leads and 3 - V91-01 Electrodes.** Order separately.

## **V75-02 BIOAMPLIFIER WITHOUT FILTERS**

The V75-02 is identical to the V75-01 except that it does not have a bandpass filter section. It does have the preamplifier coupling filters and the 60 (or 50) Hz notch filter. This amplifier is used when filtered signals in bands not available on the V75-01 are to be studied or when sharper cutoffs are desired. It can be used with the V75-50 EEG Band Separation Filter, the V75-48 High Performance

Bandpass Filter or in virtual applications when DSP filtering is done in the computer. Like the V75-01, it has high gain and low noise making it useful for all physiological signals. Also, like the V75-01, it has an isolated counterpart, the V75-05 Isolated Bioamplifier without Filter.

**Requires V91-33 Cable, 3 - V91-11 leads and 3 - V91-01 Electrodes.** Order separately.

## **V75-03 DIRECT COUPLED BIOAMPLIFIER**

The V75-03 is directly coupled to the input signal without a preamplifier-coupling filter. It is used for very low frequency signals. A 60 (or 50) Hz notch filter is built in. Biopotentials from electrodes may be of very large potential with only a small variation "riding on top" of the overall signal. AC coupled amplifiers like the other 4 bioamplifiers in our line, de-couple any overall, large DC potential and pass only the variation (above the frequency selected on

the preamplifier coupling control). This amplifier is used when the entire signal (absolute level) or very slow variations are of interest. It is used for signals like ENG and EOG.

The isolated version of this amplifier is V75-06.

**Requires V91-33 cable, 3 - V91-11 leads and 3 - V91-01 electrodes.** Order separately.

## **V75-04 ISOLATED BIOAMPLIFIER WITH BANDPASS FILTER**

This bioamplifier is an isolated version of the V75-01 and, like the V75-01, it is designed for a wide range of applications. It has a built-in bandpass filter network, a 60 (or 50) Hz notch filter, and a coupler filter between the preamp and main amplifier section. Amplifiers like this one, the V75-05 and V75-06 are indicated when isolation is

required to prevent interference when multiple signals are being recorded from one subject. Isolation from earth ground for safety may also be required in situations where other sources of voltage with respect to earth ground are present in the environment and represent a hazard to the subject.

**Requires V91-33 cable, 3 - V91-11 leads and 3 - V91-01 electrodes.** Order separately.

## **V75-05 ISOLATED BIOAMPLIFIER WITHOUT FILTERS**

The V75-05 is identical to the V75-04 except that it does not have a bandpass filter section. It does have the preamplifier coupling filters and the 60 (or 50) Hz notch filter. This amplifier is used when filtered isolated signals in bands not available on the V75-04 are to be studied or when sharper cutoffs are desired. It can be used with the V75-50 EEG Band Separation Filter, the V75-48 High

Performance Bandpass Filter, the V75-21 Adjustable Bandpass Filter, or in virtual applications when DSP filtering is done in the computer. It is used when isolation is required for the same reasons as with the V75-04 discussed above.

**Requires V91-33 cable, 3 - V91-11 leads and 3 - V91-01 electrodes.** Order separately.

Each module is described in the corresponding panel on the page to the left.

**COULBOURN**

BIOAMPLIFIER WITH BANDPASS FILTER MODEL V75-01

PWR + ● - ●

AMPLIFIER COUPLING: 0.1Hz, 1.0Hz, 10Hz

GAIN: 100, 1K, 5K, 10K, 50K

VERNIER CAL: ON ● CAL ● OFF

HIGH PASS (LOW CUTOFF) FILTER: OPEN TO PREAMP, 8Hz, 13Hz, 90Hz, 150KHz

LOW PASS (HIGH CUTOFF) FILTER: 40Hz, 150Hz, 1KHz, 10KHz

LABLINC V

**COULBOURN**

BIOAMPLIFIER MODEL V75-02

PWR + ● - ●

AMPLIFIER COUPLING: 0.1Hz, 1.0Hz, 10Hz

GAIN: 100, 1K, 5K, 10K, 50K

VERNIER CAL: ON ● CAL ● OFF

LABLINC V

**COULBOURN**

DIRECT COUPLED BIOAMPLIFIER MODEL V75-03

PWR + ● - ●

BALANCE: - ● +

GAIN: 10, 1K, 5K, 10K

VERNIER CAL: ON ● CAL ● OFF

COUPLING: DC, AC(.1Hz)

LOW PASS FILTER (HIGH CUTOFF): 40Hz, 150Hz, 1KHz, 10KHz

LABLINC V

**COULBOURN**

ISOLATED BIOAMPLIFIER WITH BANDPASS FILTER MODEL V75-04

PWR + ● - ●

AMPLIFIER COUPLING: 0.1Hz, 1.0Hz, 10Hz

GAIN: 100, 1K, 5K, 10K, 50K

VERNIER CAL: ON ● CAL ● OFF

HIGH PASS (LOW CUTOFF) FILTER: OPEN TO PREAMP, 8Hz, 13Hz, 90Hz, 150KHz

LOW PASS (HIGH CUTOFF) FILTER: 40Hz, 150Hz, 1KHz, 10KHz

LABLINC V

**COULBOURN**

ISOLATED BIOAMPLIFIER MODEL V75-05

PWR + ● - ●

AMPLIFIER COUPLING: 0.1Hz, 1.0Hz, 10Hz

GAIN: 100, 1K, 5K, 10K, 50K

VERNIER CAL: ON ● CAL ● OFF

LABLINC V

# MODULES

## **V75-06 ISOLATED DIRECT COUPLED BIOAMPLIFIER**

The V75-06 is directly coupled to the input signal without a preamplifier-coupling filter. It is used when isolation is required for very low frequency signals. There is an unisolated version of this amplifier available, see V75-03 above. Isolated amplifiers like this one, the V75-04 and V75-05, are indicated for isolation from earth ground for safety, or

to prevent interference when multiple signals are being recorded from one subject. Especially when one or more of the other signals is being generated by another module that places an excitation voltage across the subject.

**Requires V91-33 cable, 3 - V91-11 leads and 3 - V91-01 electrodes.** Order separately.

## **V75-08 4-CHANNEL EEG AMPLIFIER.**

The V75-08 features four independent amplifiers for EEG recording. This allows multi-site recording of full band EEG in a minimum amount of space and with great economy. Continuous recording sleep studies using 16 channels can be accomplished with just 5 modules (4 amplifiers and an interface module). The unit has a gain control for each channel consisting of a range switch and a vernier control. Maximum

gain is 50 thousand. Gain ranges of 5, 10, 20 or 50 thousand are set with the switch and are precisely calibrated. The vernier control may be switched off of the calibrated position and used to set any gain from the full gain selected with the switch to zero by turning counterclockwise.

**Requires V91-39A cable-electrode box assembly, 9 - V91-12 electrode leads and 9 - V91-02 electrodes.** Order separately.

## **V75-11 ISOLATED ECG AMPLIFIER/COUPLER**

The V75-11 ECG Isolated Amplifier/Coupler performs all the standard multi-lead ECG monitor functions by either manual or program control. Switch selectable options are available to make the module meet the requirement of almost any application. Sensitivity is selected manually; lead selection and calibration may be performed manually or by program control. The unit is isolated so that it may

be used with other amplifiers and couplers and to provide isolation for safety. The notch filter (50 or 60Hz) may be switched off. It features a low frequency cutoff filter switch for 0, 1, 1.0 or 10 Hz, and artifact suppression, time-constant-select-switching for 1.0 seconds or 10 seconds.

**Requires V91-35 cable, 5 - V91-11 leads and 5 - V91-01 electrodes.** Order separately.

## **V75-48 HIGH PERFORMANCE BANDPASS FILTER**

The V75-48 consists of independent low pass and high pass filter sections. When used as a bandpass filter (DC to 10 KHz at 48 dB/O), the output of the high pass is connected to the input of the low pass section using a standard analog connection lead. This lead is removed when using either of the sections independently. Each filter is continuously adjustable either by manual or program control.

The extremely sharp filter skirts and the continuous adjustment make this filter the choice for demanding applications for very narrow band and/or precisely defined signals in EEG or other applications. Use this filter when switch-select filters do not have setpoints to define the signal you want.

**The V75-48 is recommended for use with either the V75-02 or V75-05, the bioamplifiers without filters.**

## **V75-50 EEG BANDPASS FILTER (With simultaneous five band output)**

This filter separates EEG signals into five bands simultaneously. The input may come from any bioamplifier capable of amplifying signals between 1 and 40 Hz (all of Coulbourn Instruments' bioamplifiers are capable of wider band performance than this). The 4-pole Butterworth bandpass filters give 24 dB/octave cutoffs. This level of attenuation is

adequate at the nominal EEG pass bands of this filter for nearly any purpose. The V75-02 and V75-05 bioamplifiers without filters are recommended for use with this filter owing to the economy of not paying more for the models with onboard filters. Of course one (or more) of these may be used on one (or more) of the channels of the V75-08 4-channel EEG amplifier.

# MODULES

Each module is described in the corresponding panel on the page to the left.

**COULBOURN**

ISOLATED DIRECT COUPLED BIOAMPLIFIER MODEL V75-06

PWR + ● - ●

BALANCE

GAIN (100, 1K, 5K, 10K)

VERNIER (ON ● CAL ● OFF ●)

COUPLING (DC, AC(.1Hz))

LOW PASS FILTER (HIGH CUTOFF) (40Hz, 150Hz, 1KHz, 10KHz)

LabLinc V

**COULBOURN**

4 CHANNEL EEG AMPLIFIER MODEL V75-08

PWR + ● - ●

CHANNEL 1: GAIN (5, 10, 20, 50), VERNIER (ADJ., CAL.), X1000

CHANNEL 2: GAIN (5, 10, 20, 50), VERNIER (ADJ., CAL.), X1000

CHANNEL 3: GAIN (5, 10, 20, 50), VERNIER (ADJ., CAL.), X1000

CHANNEL 4: GAIN (5, 10, 20, 50), VERNIER (ADJ., CAL.), X1000

HOLD CAL. USE (50µV -1Hz Sq. CAL / REF)

LabLinc V

**COULBOURN**

ISOLATED EEG AMPLIFIER / COUPLER MODEL V75-11

PWR + ● - ●

COUPLING (1, 10 Hz)

NOTCH FILTER (IN, OUT)

ARTIFACT RECOVERY (10 SEC, 1 SEC)

LEAD SELECT (III, aVR, aVL, aVF, V, PROG, OFF)

RANGE (0.1, 0.2, 0.5, 1.0, 2.0, 5.0, 10 V/mV)

VERNIER (ADJ., CAL.)

CAL/REF (1mV-1Hz Sq. USE)

LabLinc V

**COULBOURN**

HIGH PERFORMANCE BANDPASS FILTER MODEL V75-48

PWR + ● - ●

FREQUENCY ADJUST (1.0, 10, 100, 1.0K, 10K, DC)

RANGE (Hz) (10, 100, 1.0K, 10K, DP)

HI PASS (LO CUTOFF) (8 KHz, 13 Hz, DC ●)

LO PASS (HI CUTOFF) (8 KHz, 13 Hz, OPEN ●)

FREQUENCY ADJUST (1.0, 10, 100, 1.0K, 10K, DP)

RANGE (Hz) (10, 100, 1.0K, 10K, DP)

LabLinc V

**COULBOURN**

EEG BANDPASS FILTER MODEL V75-50

PWR + ● - ●

BIOAMPLIFIER

SIMULTANEOUS FIVE BAND EEG OUTPUT AT 24dB/OCTAVE

<b>FULL</b> 1-40 Hz	<b>DELTA</b> 1-4 Hz	<b>THETA</b> 4-8 Hz	<b>ALPHA</b> 8-13 Hz	<b>BETA</b> 13-40 Hz
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LabLinc V

# MODULES

## V76-23A MULTI-FUNCTION INTEGRATOR

The Multi-Function Integrator has both a contour following and a cumulating/resetting circuit. The two functions operate simultaneously and independently. Time constants may be set independently and each circuit has its own output. The contour following integrator is used to "smooth out" high frequency signals such as EMG where

the contour or "envelope" of the signal is of interest. The cumulating section provides a measure of area under the curve and a corresponding cumulative trace.

A switch allows selection of the full wave, negative, or positive regions of bipolar signals. A negative offset control can be adjusted to eliminate noise or background signal.

## V76-42 DIFFERENTIATOR

The function of the differentiator is to produce a voltage (level) at the output as a function of a rate of change (slope) in voltage at the input. It is used in physiology to produce derivative signals, such as acceleration and velocity, for ECG, blood flow, eye movement, tremor, respiration, and integrated EMG. Its state-of-the-art design offers a very broad dynamic range and ultra high precision.

Slope is determined by two high-speed, sample-and-hold circuits driven by a high frequency quartz clock. A high cutoff filter is provided for extreme precision in lower frequency applications such as ECG and ENG. Multiple units may be connected in series to generate the second and third derivatives. Each sensitivity range will produce an output up to ten times the range of change listed to yield a ten-volt output.

## V77-26 TACHOMETER

The V77-26 is a microprocessor-based tachometer that produces an analog (voltage level) output proportional to the rate of events on the input and displays the number of events per minute on the module face. It is used when a digital display of rate is desired and you don't want to clutter a chart-recorder-emulation screen with windows; or

sacrifice processing speed in multi-channel recording to calculate and display, or record, a channel of cursive rate data. It is also used when there is no computer in use and is especially useful in biofeedback for rapid-change stimulus synthesis. The unit can operate in a rolling average mode or an "Nth" event-sampling mode.

## V77-34 BLOOD PRESSURE PROCESSOR

This module accepts a pressure waveform signal from a transducer coupler. A control on the front panel permits the user to select a sample on every cardiac cycle, or on the 2nd, 4th, or 8th cycle. The outputs are stable state, analog "staircase" values, calculated between each pressure pulse, updated on each beat, and held in memory

until the next beat-update cycle. The "staircase" outputs represent the actual value of each function eliminating visual interpolation of peaks and valleys on the trace and producing an easy-to-read up-down staircase on the chart record. Three displays show the current value of systolic, diastolic and mean pressure while eliminating screen clutter and processing time when digital display is desired.

## V79-01 SIGNAL INTERFACE/PROCESSOR (NON-ISOLATED)

## V79-02 ISOLATED SIGNAL INTERFACE / PROCESSOR (ISOLATED)

The V79-01 is designed to take signals either from outside the system or from the other system modules and perform basic signal manipulations on them. It can accept positive, negative or bipolar signals from millivolt levels up to 100 Volts peak from

external amplifiers/signal sources and bring them into the system via the three binding posts on the side plate for recording or interaction with other modules. Signals from either source may have the following operations performed upon them: Coupling (DC plus 3 ranges of AC), Polarity Inversion, Offset, Rectification (+, -, and full wave), Attenuation or Gain (1/100th to 100 times). The isolated version, maintains isolation of an external signal from the system ground reference in addition to the above functions.

Each module is described in the corresponding panel on the page to the left.

**COULBURN**

MULTI-FUNCTION INTEGRATOR  
MODEL V76-23A

POSITIVE  
FULL WAVE  
NEGATIVE

NEG ZERO

CONTOUR FOLLOWING  
20 50 100 200 500 1000

CUMULATING / RESETTING  
X100 2 5 10 100  
X1

HOLD  
RUN  
RESET

RESET REPORT

PWR + -

INPUT RECTIFIER NEG OFFSET TIME CONSTANT (mS) TIME CONSTANT (mVSEC) LABLinc V

**COULBURN**

DIFFERENTIATOR  
MODEL V76-42

OUT  
IN

OPEN

150Hz 36dB/O

OUTPUT SENSITIVITY  
1.0 .5 .25 .10 .05 .025 .01  
10

X10  
X1

PWR + -

INPUT/OUTPUT RELATIONSHIP LO PASS FILTER V/sec FOR 1V OUTPUT MULTIPLIER LABLinc V

**COULBURN**

TACHOMETER  
MODEL V77-26

SAMPLE  
AVERAGE

2 3 5 7  
1

0  
- +

1 10 100

77  
RATE

PWR + -

NUMBER OF EVENTS 1 EVENT(S) N TRIGGER ADJUST EVENT WAVEFORM mV/EVENT/MIN SENSITIVITY LABLinc V

**COULBURN**

BLOOD PRESSURE PROCESSOR  
MODEL V77-34

ON  
OFF

2ND 4TH 8TH  
1ST

122  
SYSTOLIC

74  
DIASTOLIC

98  
MEAN

mmHg mmHg mmHg

END OF CARDIAC CYCLE END OF SAMPLED CYCLE

PWR + -

AUDIO CARDIAC CYCLE SAMPLED LABLinc V

**COULBURN**

SIGNAL INTERFACE / PROCESSOR  
MODEL V79-01

CAUTION - BEFORE CONNECTING INPUT TO EXTERNAL EQUIPMENT, SEE REAR PANEL.

DC .1Hz 1Hz

NORMAL  
INVERTED

NONE POS NEG FULL

NONE POS  
NEG OFFSET

OFFSET ADJUST

.01 1 10 100

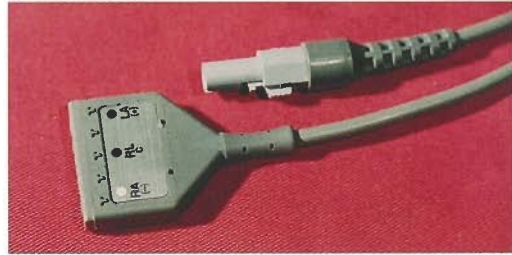
ADJ.  
CAL.

PWR + -

COUPLING POLARITY RECTIFICATION NEG OFFSET OFFSET ADJUST GAIN VERNIER LABLinc V

# ELECTRODES and CABLES

**NOTE: LabLinc V does not require an expensive adapter box for electrode leads. All you need is an industry standard cable with a connector to the module on one end and lead connections on the distal end.**



## **V91-01 REUSABLE ELECTRODE 8 mm (AgCl)**

## **V91-02 REUSABLE ELECTRODE 4 mm (AgCl)**

Sintered-pellet silver chloride electrodes for general skin surface signal pickup applications. The raised-button connection dome on either is compatible with snap-type electrode leads or with either of our V91-11 or V91-12 leads.

Well (Sensor) Diameter: V91-01 - 8 mm; V91-02 - 4 mm.

Well Depth: V91-01 - 2 mm; V91-02 - 1 mm.

Outside Diameter: V91-01 - 16 mm; V91-02 - 13 mm.

Electrode Collar Required: -01 - X11-70; -02 - X11-72.

Electrode Gel Required: X11-71 Microlyte™ or equal.

## **V91-35 5-CONDUCTOR ECG ELECTRODE CABLE**

This cable is used on the Isolated ECG amplifier, V75-11. It accepts five V91-11 (or -12) electrode leads. Like the V91-33, it also features the DIN safety terminations. The connector for the amplifier-coupler end of the cable, and the receptacle on the side of the module, also have recessed connections similar to the V91-33. In addition, the (larger) connector for this cable has a breakdown voltage rating of 2.5 K VAC to prevent arc-over shorting of defibrillator outputs.

Cable Length: 10 ft.

## **V91-39A 9-CONDUCTOR EEG ELECTRODE BOX & CABLE**

This cable is used on the 4-channel EEG amplifier, V75-08. It accepts nine V91-11, or -12 electrode leads (-12 is recommended for EEG). Like the cables above, the electrode receptacles at the subject end are recessed DIN connections. The connector for the amplifier/coupler end of the cable is a 15 pin "D" shell.

Cable Length: 10 ft - 3.66 m.



## **V91-11 STANDARD PINCH TYPE ELECTRODE LEAD**

## **V91-12 MINI-PINCH ELECTRODE LEAD for EEG**

These leads feature the DIN safety termination and serve to connect the electrode to a DIN safety termination electrode cable that in turn connects to the input on the side plate of the amplifier. Either electrode lead may be used with either electrode. The pinch-type heads provide a positive, firm grip on the attachment dome of the V91-01 or -02 electrode as well as other snap-compatible electrodes, including the disposable types. This leads' firm grip eliminates one of the most significant sources of artifact, specifically that caused by slippage of the connection. The V19-02 is a smaller, lower profile electrode. The V19-02 along with the mini-pinch lead are recommended for EEG applications to reduce bulk under EEG caps. Length: 24 in - 61 cm.

## **V91-33 3-CONDUCTOR ELECTRODE CABLE**

This cable is used for all amplifiers and couplers employing 2 or 3 electrodes. It accepts three V91-11 or -12 electrode leads, and features the DIN safety termination which completely shields the metal contacts between the electrode leads and cables to make them water resistant and prevent them from contacting sources which could be a hazard to the subject. The connector for the amplifier-coupler end of the cable, and the receptacle on the side of the module, also have recessed connection pins to insure safety.

Cable Length: 10 ft.

## **V91-93 ELECTRODE KIT (FOR 3-LEAD CABLE)**

The electrode kit contains everything you need to get started. It includes 3 - V91-01 sintered-pellet silver chloride electrodes, 3 - V91-11 pinch-type electrode leads, 100 - X11-70 electrode collars, and one 250 ml tube of Microlyte electrode gel. Reorder gel and collars when you have used what comes with the kit.

## **V91-95 ELECTRODE KIT (FOR 5-LEAD CABLE)**

This kit is like the one above except that you get 5 - V91-01 electrodes, 5 - V91-11 pinch-type leads, 100 collars, and one tube of Microlyte electrode gel.

## **V91-99 ELECTRODE KIT (FOR 9-LEAD CABLE)**

Like the ones above except that you get 9 - V91-02 electrodes, 9 - V91-12 mini-pinch type leads, and gel. (No collars in this kit; a cap is recommended).

## **X11-70 ELECTRODE COLLARS (For V91-11 Electrodes)**

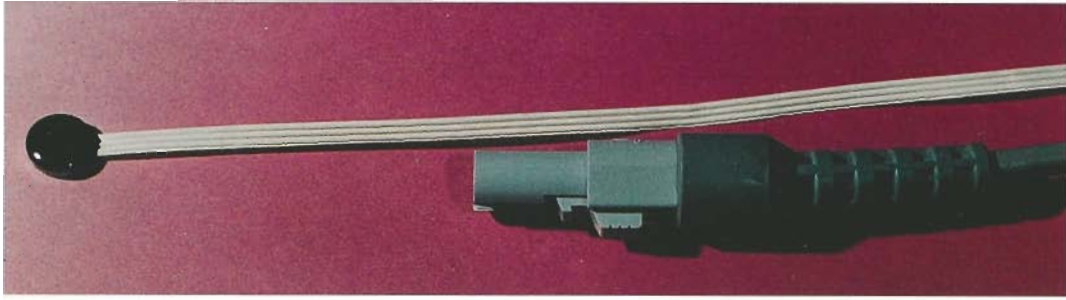
## **X11-72 ELECTRODE COLLARS (For V91-12 Electrodes)**

Roll of 1000 double-faced adhesive electrode collars.

## **X11-71 MICROLYTE™ ELECTRODE GEL**

Package of 6 tubes, 250 milliliters each tube. This gel is formulated for skin surface attachment of sintered-pellet silver chloride electrodes.

# THERMISTOR PROBES



## V-93 SERIES THERMISTOR PROBES

One or two probes are used, depending on whether single-point or differential measures are desired. Differential measures may be made with two similar or dissimilar transducers using the V71-30 module. The resistive element in all units is the same. The time constant (shown for each unit) varies as a function of the mechanical package form and material. The V93-09 is recommended for most applications involving skin surface temperature.

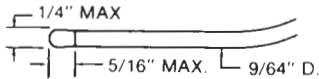
### SPECIFICATIONS FOR ALL THERMISTORS:

**Maximum Operating Temperature:** 100°C

**Accuracy / Interchangeability:**  $\pm 0.150^\circ\text{C}$ ,  $-30^\circ\text{C}$  to  $+100^\circ\text{C}$

Time constants listed individually

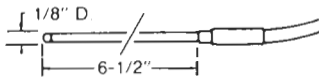
**Electrical Isolation:** Sensing elements are isolated from the outer probe surfaces for maximum safety.



### General Purpose Flexible

#### Model No. V93-01

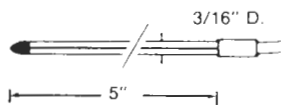
9.0 sec. Vinyl insulated probe. Usable for short-term water and other readings.



### Small Flexible General Purpose

#### Model No. V93-02

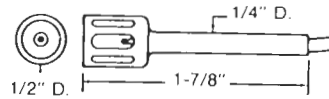
3.6 sec. Small diameter, vinyl insulated probe. Often used for esophageal, nasal or cuvette temperatures. Also used for short-term, liquid immersion.



### Tubular Pyrex Glass

#### Model No. V93-04

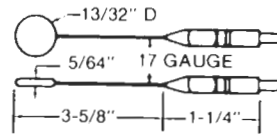
5.0 sec. Glass portion is chemically inert for continuous immersion. Thermometric titration, freezing point and tissue bath temperatures.



### Air Temperature (With Guard)

#### Model No. V93-05

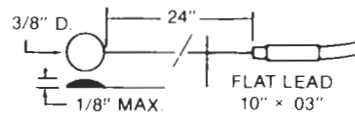
0.6 sec. Stainless steel probe suitable for test rooms, animal cages and cubicles, incubators, remote air readings, monitoring of gas streams, etc.



### "Banjo" Surface Temperature

#### Model No. V93-08

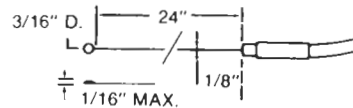
1.0 sec. Skin, oral, water bath, air, and surface temperatures. Stainless steel.



### Attachable Surface Temperature

#### Model No. V93-09

1.1 sec. Stainless steel cup, epoxy backed. Easy to tape on flat surfaces. Best general-purpose sensor for human applications.



### Small Surface Temperature

#### Model No. V93-29

0.3 sec. Use for cuvette, water bath, nasal, skin and other surfaces. For use where space is at a premium; half the size of the V93-09. 24-inch Teflon-covered flexible wire. Stainless steel disc with epoxy back.

# BRIDGE TRANSDUCERS



## V94-05 DIFFERENTIAL ANEROID PRESSURE TRANSDUCER - 5PSI, V94-15 - 15PSI

Used for monitoring either gage (single input port pressure with respect to ambient air pressure) or differential pressure between the two ports. It may be used with a cuff for blood pressure waveforms, with the V94-19 chest bellows for respiration, or balloon devices for gastric and similar applications. These units have been used for a variety of novel applications including hand-squeezing and biting responses using a closed-end, firm, flexible hose and sucking pressure, with the transducer ported to a closed vessel above the liquid.

### SPECIFICATIONS:

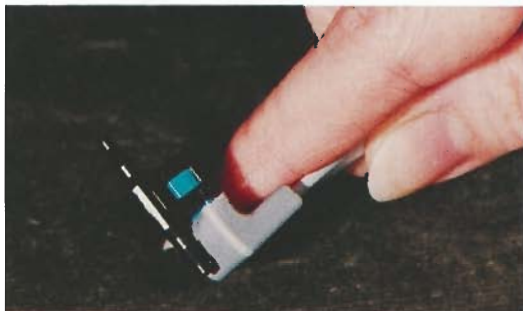
**Range:** V94-05 -5 to +5 PSI, V94-15 -15 to +15 PSI

**Overpressure:** V94-05 - 20 PSI, V94-15 - 45PSI

**Operating Temperature:** -550C to +1250C

## V94-19 ANEROID CHEST BELLOWS

Used with the aneroid pressure transducer for measurement of respiration. The bellows is secured around the chest. As the chest expands the bellows is stretched causing a change in pressure which is sensed by the transducer.



## V94-21 LOW-COST BLOOD PRESSURE TRANSDUCER

In addition to blood pressure applications, this transducer may be used for other aneroid or fluid pressure applications. It is an excellent blood pressure transducer for the animal lab. Though it has two port connections, it is not a differential transducer; it is a flow-through (or flush-through) design. It measures gage pressure referenced to a protected vent (port) in the housing.

### SPECIFICATIONS:

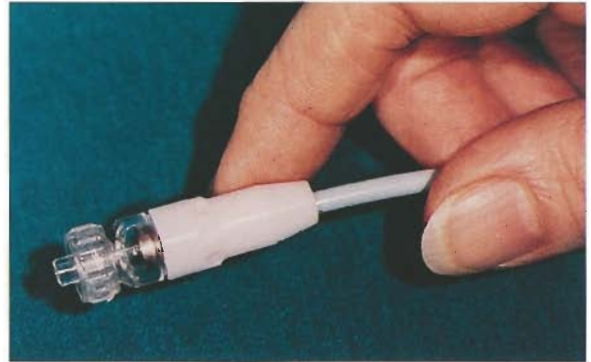
**Range:** -50 to +300 mm Hg.

**Overpressure:** 1000 mm Hg.

**Sensitivity:** 200mV / mm Hg (at 10V excitation)

**Linearity & Hysteresis:**  $\pm 1\%$  full scale

**Volume Displacement:** Less than .001 mm<sup>3</sup> / mm Hg



## V94-25 LOW-VOLUME BLOOD PRESSURE TRANSDUCER

This transducer is lightweight, small in size and has a very small volume displacement. It is rugged and withstands dropping, overpressure and other abuse. It is for use with very small animals (rats, mice etc.). It features low fill, and displacement volume and has a high frequency response for high pressure rise rates. It is of single-port gage-pressure design with a reusable dome.

### SPECIFICATIONS:

**Range:** -50 to +300 mm Hg.

**Overpressure:** 6000 mm Hg.

**Sensitivity:** 500mV / mm Hg (With V72-25A at 10V excitation)

**Linearity & Hysteresis:**  $\pm 0.5\%$  FS (Fluid Coupled)

**Volume Displacement:** .002 mm<sup>3</sup> / 100 mm Hg

**Frequency Response:** Min. 100 Hz

**Long Term Stability:**  $\pm 1\%$  FS / 24 Hr., 32 to 420C

**Sterilization:** Ethylene Oxide Gas.



## V94-31 ISOMETRIC FORCE TRANSDUCER (50GM) V94-32 ISOMETRIC FORCE TRANSDUCER (500GM)

These transducers are used to measure force with near-zero displacement (movement of the transducer-sensing member). They may be mounted directly on the V99-50 mounting stand or mounted to the V94-38 which, in turn, is mounted to the V99-50 stand. Applications include in-vivo exerted force and in-vitro tissue contractility measurements. Preloading is easily accomplished by using the V94-38 vernier controlled mount while reading the output on the computer screen or with a meter. Between the two it is possible to measure from 1/100 of a gram to 500 grams (1000 grams in overrange). Either unit may be used with the coupler in the AC mode to measure instantaneous changes in force as baseline drifts over a longer interval. A nylon clevis pin is provided to simplify load attachment. All other parts are aluminum and stainless steel.

# BRIDGE TRANSDUCERS

## SPECIFICATIONS:

**Range:** V94-31 - 0 to 50 gm, V94-32 - 0 to 500 gm.

**Sensitivity:** (With V72-25 at 10V excitation)

V94-31: 200 mV per gram.

V94-32: 20 mV per gram.

**Deflection at full-scale output:** .03 in.

**Resonant Frequency:** 65Hz.

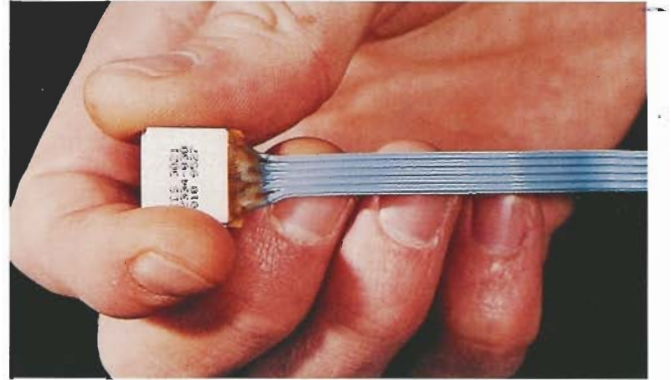
**Temperature Coefficient:** .03% / 0C

**Overload Limit:** 5% Full Scale

**Dimensions:** 0.75 X 0.75 X 4.25 in.

(1.9 X 1.9 X 10.8 cm.)

**Weight:** 2.2 oz. (65 gm.)



## V94-41 ACCELEROMETER - (10 G)

The V94-41 is a miniature solid-state piezoresistive accelerometer. It features overrange protection to 200 g. When used with the V72-25 Strain Gage Coupler it is capable of measuring acceleration up to 10 g and offers a resolution of .01 g. It may be mounted on a mechanical device or directly on a subject by a variety of techniques using brackets, straps or tape. It is used to measure tremors, activity, impact and other movement related factors in physiology, human factors research, time and motion study, and sports medicine.

## SPECIFICATIONS:

**Excitation Voltage:** 5 Volts.

**Sensitivity:** 1 mV / V / g.

**Frequency Response:** 0 to 500 Hz typ.

**Resonant Frequency:** 850 Hz,  $\pm 15\%$

**Linearity & Hysteresis:**  $\pm .02\%$  typ.

**Temperature Coefficient:** .022% / 0C typ.

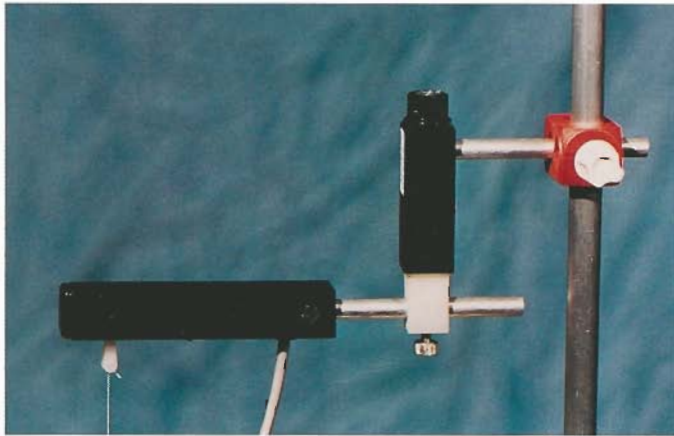
**Dimensions:** 0.6 x 0.6 x 0.2 in. - 15 x 15 x 0.5 cm.

**Weight:** 12 grams (Sensor head only - wire excluded)



## E-SERIES STARTLE / TREMOR PLATFORMS

These platforms are listed in our animal behavior catalog in the startle response system section and with the ergometric activity monitor. They are also used for the measurement of tremor. A large size and a small size (shown above) are available in a variety of sensitivity ranges.



## V94-38 VERNIER CONTROLLED MOUNT

This precision, linearly adjustable mount permits accurate positioning and preloading (tensioning) of preparations for the V94-31 and V94-32 force transducers (previous page). The V94-38 provides over one inch of adjustment travel with a resolution of 25 thousandths of an inch per turn of the dial. Preparations are usually pre-tensioned while reading the trace provided by the signal from the V72-25 transducer coupler.

## SPECIFICATIONS:

**Range:** 1 inch (-0.5 to +0.5 on the scale.)

**Resolution:** .025 in. per turn of control knob.

**Mounting Hole:** 3/8in. diameter with set screw.

**Mounting Rod:** 5/16 X 3in. (supplied)

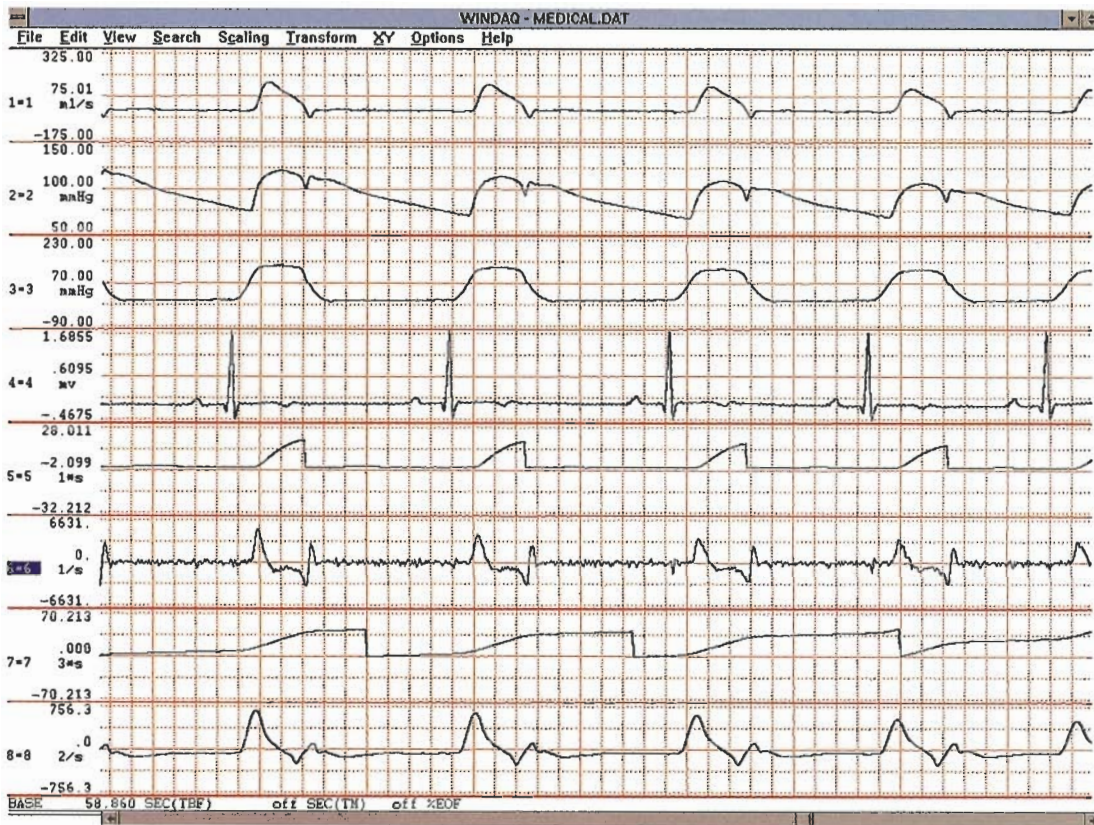
## V99-50 MOUNTING STAND

This stand is used to mount the V94-31, -32, and -38. It may be used as a general-purpose ring stand to mount any devices normally mounted on ring stands. Conversely the transducers may be mounted on any stand you already have.

## SPECIFICATIONS:

**Height:** 24 in.     **Rod Diameter:** 1/2 in.

# WINDAQ SOFTWARE



## Windaq (Coulbourn Product Number - V18-82)

Windaq is the software to use for real-time graphics. It operates in the Windows environment providing either a smooth (chart recorder) scroll or triggered sweep (oscillographic) mode of operation with disk streaming at sample rates up to 250 KHz. With Windaq's multitasking feature, you can record waveform data to disk in the background while running any combination of programs in the foreground. Windaq's playback review allows you to simultaneously analyze data from previously stored data files or the data being recorded in the background.

Record and display up to 16 channels simultaneously in real units of measurement. Enter as many as 8,000 event markers with comments while recording in real time. Windaq's waveform compression allows you to vary the real time display rate independently of the sample rate. All data are automatically time and date stamped.

Windaq's powerful playback review has a built-in file translator that will import data files recorded from a wide variety of data acquisition packages for review and analysis or export data files to other spreadsheet and analysis programs. More than ten statistical calculations over any portion of the data file are immediately displayed and can be written to a data file for future retrieval.

Windaq's playback review includes frequency analysis and digital filtering. Calculate FFTs or DFTs with four preprogrammed windows and on-screen power spectrum graphics.

Graphically edit a power spectrum for high-pass, low-pass, bandpass, and notch filters. Windaq supports IFT of modified spectrum for comparison with the original time domain waveform.

With Windaq, there is no need for expensive chart recorders. Produce an on-line hard copy of the waveforms regardless of the disk streaming activity. Windaq's waveform compression feature will support compression factors from one (no compression) to any factor required to display the entire waveform file on one screen. Waveforms may be displayed in overlapping or non-overlapping modes. Windaq also supports Videocalc (V18-81) for integrating, differentiating, averaging, etc. waveforms.

Purchase Windaq (V18-82) and the V19-02 I/O Port and bring the most powerful data acquisition and waveform review system into your lab.

## SPECIFICATIONS

### ANALOG INPUTS

Number of Channels: 16  
Resolution: 12 Bits  
Sampling Rate: 82,901 Hz Max.  
Relative Accuracy: 0.05%  
Integral Nonlinearity:  $\pm 1$  LSB Max.  
Diff. Nonlinearity:  $\pm 0.9$  LSB Max.  
Maximum Input:  $\pm 10$  Volts  
Programmable Gain: 1, 2, 4, 8, 10, 100, 1000  
Analog Trigger: Any Analog Channel  
Trigger Conditions:  $\pm$  Slope or  $\pm$  Level  
Polarity: Unipolar or Bipolar

# WINDAQ SOFTWARE

## DISK AND DISPLAY

Continuous Thruput to Disk: 82.9 KHz Max.  
Continuous Real Time Display Thruput: 250 kHz  
Maximum File Size: Unlimited with DOS 4.1 or >  
User Annotation: Selectable per Channel  
Waveform Display: Continuous Smooth Scroll, Freeze,  
Triggered or Non-Triggered Sweep  
Compression: 1 to 9,000  
Displayed Channels: 16 Max.  
Acquired Channels: 16 Max.  
Display Formats: Overlap and Non-Overlap

## EVENT MARKER AND TIME/DATE STAMP

Event Marker Modes: Manual or Remote, with or without  
Comments  
Number of Markers: 8,181 Max.  
Time and Date: Data and Event Markers

## WAVEFORM DISPLAY SCALING

Scaling: Expansion, Contraction, Offset  
Conversion: Scale and Offset Applied to Each Channel as y  
= mx + b

## HARD COPY

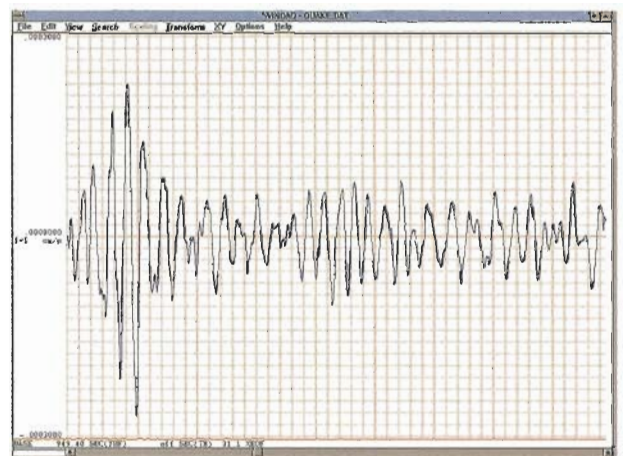
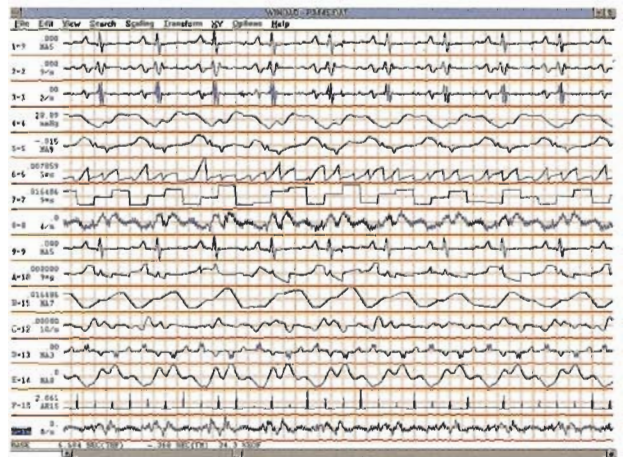
Mode: Print Screen in Background  
Supported Printers: Most Types

## WAVEFORM ANALYSIS

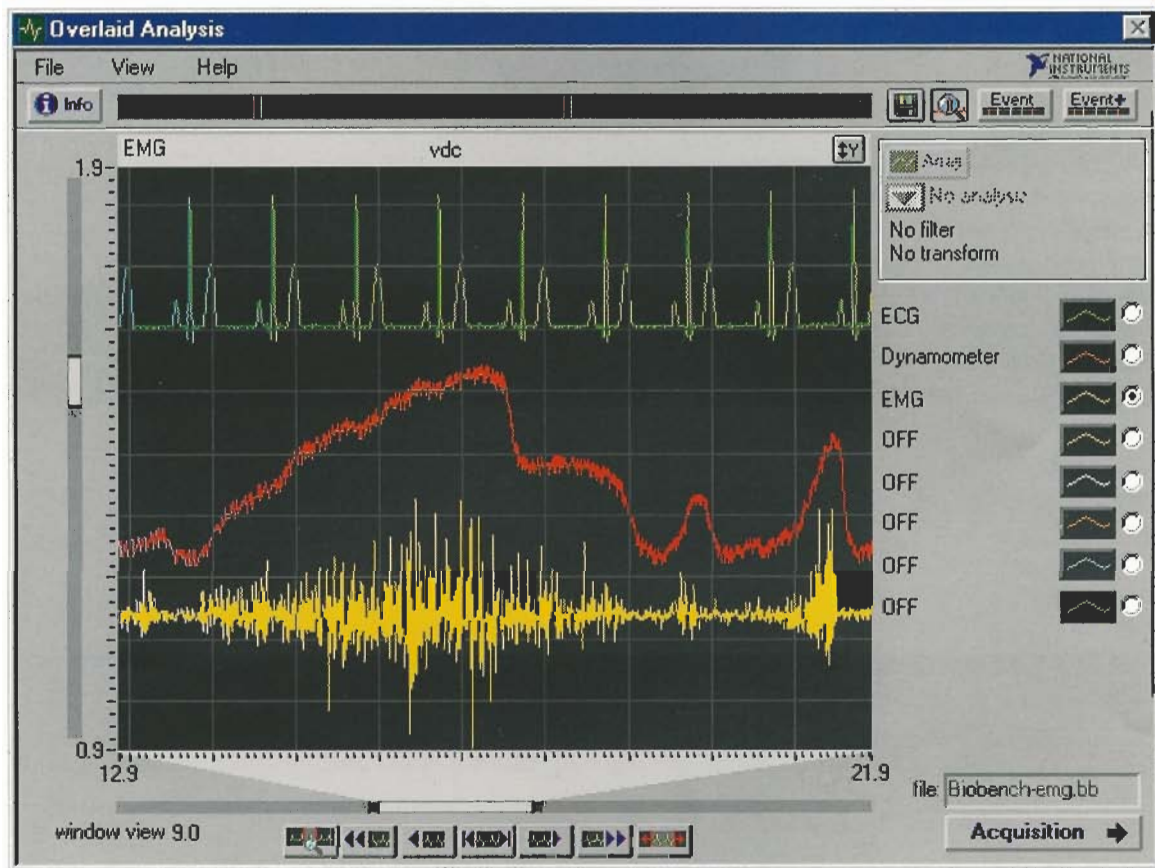
Statistical: Min., Max., Variance, Standard Deviation, Mean,  
Median, Sum, Sum of Squares, Skewness, rms, Least squares  
Differential, Area Bounded by Curve  
Range: Unlimited  
Fourier Transform: FFT (32 to 16384 points), DFT (2 to 8191  
points), IFT (2 to 16384 points)  
FFT Windows: sin2 , Hamming, Bartlett, Blackman  
Graphical Power Spectrum: High-Pass, Low-Pass, Bandpass  
NotchFile Export Translators: Any Spreadsheet (CVS), ASYST,  
ASYSTANT, DADiSP, General Purpose Binary, ASCII  
File Import Translators: Any Spreadsheet (CVS), ASYST,  
ASYSTANT, DADiSP, CODAS, ACODAS, General Purpose  
Binary, ASCII, DIF, LabTech Notebook ASCII, and Binary  
Integral/Real

## HARDWARE REQUIREMENTS

One V19-02; Any PC compatible computer, Windows 3.0 or  
higher.



# BioBench SOFTWARE



The V19-22 Linc module (page 4) interfaces Coulbourn Instruments' V-series physiological signal acquisition modules to the computer via the National Instruments E-series DAQ boards for use with a variety of software packages including **National Instruments' LabVIEW** and their **BioBench** physiological signal acquisition and analysis software. Other software packages from a variety of third-party sources, including **Visual Basic** and **Excel** to mention two, may be used with this port.

We offer **National Instruments' BioBench** software packaged with your choice of any one of three National 250 KHz boards: Order V18-61 for BioBench with their ISA card, V18-62 with the PCI card or V18-63 with the PCMCIA card. Contact National Instruments or other third party vendors to purchase other software packages.

## **BioBench** (CI product numbers: V-18-Series)

**Overview** - BioBench is a low-cost turnkey software application designed specifically for the life sciences field. It incorporates PC-based data acquisition and analysis of real-world (physiological) signals into one software package. Because you have nothing to program, you can begin acquiring data immediately after installation. With the LabLinc V modules, BioBench can be used to monitor any type of physiological signal, such as EEG, ECG, EMG, EOG, ERG, arterial and lung pressure volume flow temperature, and force.

**Student Labs** - Demonstrations and teaching files are shipped with BioBench to aid in classroom instruction. You can play back any signal acquired with BioBench, and when students are running real experiments, BioBench saves critical time in experiment and system setup.

**Data Acquisition and Stimulus Control** - BioBench gives users complete control over starting and stopping acquisition in their experiment. BioBench will begin acquiring data on your mouse click, after a specified delay, or on a particular trigger value. You can stop data acquisition either with a mouse click or by specifying a duration length for your acquisition. BioBench also has the capability to output an analog signal for stimulus.

**Logging Data to Disk** - You can log 16 channels of data to disk at 1 kHz per channel. It can be enabled before or during acquisition.

**Event Logging** - BioBench gives you this capability through the use of user-defined events, stimulus events, and file logging events. With user-defined events, you can enter and associate time-stamped notes with user actions or regions of data. Stimulus events are time-stamped and give the user information about whether a stimulus has been turned on or off. File logging events note when data has been logged to disk.

**Data Trending** - During data acquisition, you can set up and view trends that have occurred in your data. Pick one of the signals being displayed and a trending type, then click on the trend button to display a graph of your data. Trend types include min, max, mean, and a BPM (beats per minute) algorithm for ECG data.

**Analysis** - After acquiring data, the analysis features of BioBench offer you simple and easy-to-use analysis routines. You have the choice of importing recently acquired data or opening previously acquired data files for comparison or instructional purposes. Once you have opened the data file, simply highlight the area of data you are interested in and choose the analysis functions button to perform specific routines. If you are interested in writing your own analysis routines, BioBench can export all logged data to a spreadsheet format (.txt) file.

**Scalar Analysis** - BioBench implements a number of scalar analysis routines. Finding the peak, slope, or integral of a piece of data is as simple as highlighting the data area of interest and selecting the function. BioBench incorporates a number of scalar analysis tools to choose from.

**Array Analysis** - If you are interested in array analysis, BioBench offers many routines, very specific to physiological data. Included are histogram, power spectrum peak detection, and XY analysis. The peak detection routine is ideal for ECG data and includes a printable chart with the number of peaks, time stamp of each peak, and particular value of each peak. XY analysis is another built-in routine especially useful in cardiopulmonary relationships of flow versus volume. With XY analysis, you can choose from linear, exponential, or polynomial fit regression.

**Filtering and Transforms** - You can apply certain filters and / or transforms to the raw data. Filtering options include digital, median, and notch filters. You can also apply a number of transforms to raw data before displaying it in BioBench. Examples of the transform options are standard deviation, integral, and a BPM algorithm.

**Comparing Data Files** - In BioBench, you can open up to eight files you have recorded for comparing particular signals against others. With the Overlaid Analysis view, you can plot up to eight signals on top of each other. For an example of file comparison, please refer to the Two-Graph Analysis picture on this page. This picture shows two graphs; the first is raw ECG data while the second graph contains the BPM transform of the raw ECG data.

**Printing** - You can print any window from within BioBench. This means you can print your acquired data, data trends, as well as the results of any analysis screens.

## HARDWARE SPECIFICATIONS V19-22 PORT

**SAMPLE RATE:** (With These National Instruments' E-Series Boards) 500KS/s – 16E-4, 6040E, 16E-2: 200KS/s – 6024E: 100KS/s – 16E-10, 6020E, 116XE-10, 6030E.

### ANALOG INPUTS

16, 12 -Bit Inputs. Maximum Input  $\pm$  10 Volts

### ANALOG OUTPUT (DAC)

2, 12 -Bit Outputs. 130KHz, 12 Bits,  $\pm$  .012 (% of FSR)

### DIGITAL I/O

8 input - output, level sensitive, 5 Volt TTL, low true\*

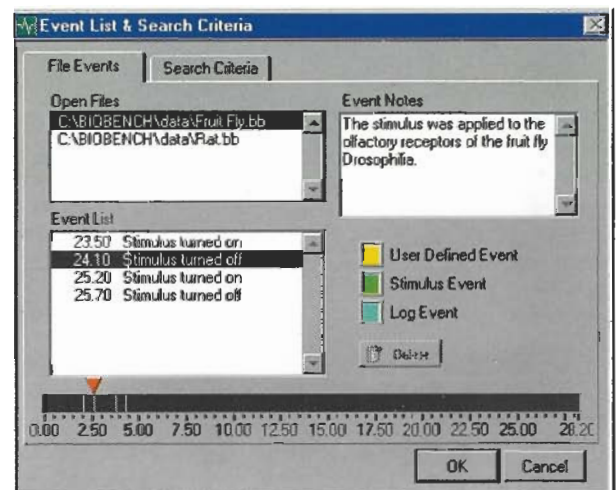
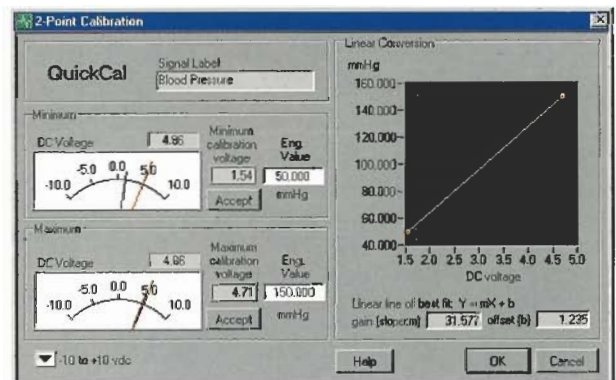
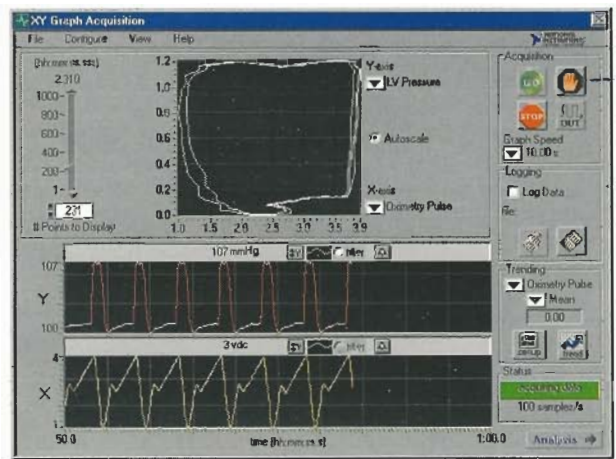
\*(Low true in the CI system = high true in the NI system, the conversion is automatic NI "on" = CI "on")

## SUPPORT

National Instruments provides extensive support for their software to assist users in any application.

## ADDITIONAL INFORMATION

National Instruments' product literature is available on request.



# HOW TO ORDER

From the bottom up...



...start here with the base

(ORDER FROM THE CURRENT PRICE LIST)

## 6 ASSISTANCE IS FREE!

The information given below is a guide to help you get ready to order or to prepare you to discuss your needs with one of our technical sales representatives. If you have a good idea what to order, please feel free to call us anyway to confirm that the products you have selected are the best for your current, as well as future applications.

**TOLL FREE: 800-424-3771 (IN THE USA ONLY)**  
**TELEPHONE: 610-395-3771 (INTERNATIONAL)**  
**FAX: 610-391-1333**  
**E-MAIL: sales@coulbourn.com**

## 5 ORDER ANALOG AND DIGITAL LEADS

Connections between modules and to the ports are made using ultra miniature phono leads (V12-10, -18, & -32) for analog signals and .040 pin tip leads (V11-10, -18, & -32) for digital signals. Order sufficient leads to have one for each signal you are recording and one for each processing operation the signal must undergo before it goes to a channel input on the port.

## 4 SELECT TRANSDUCERS AND/OR ELECTRODES

The table to the right also indicates the transducers and electrodes required to go with the modules for each application. Remember transducers, electrodes and electrode leads are priced and ordered separately.

## 3 SELECT MODULES FOR YOUR APPLICATION

First, select the appropriate port module for the software you want to use from page 4. Refer to the applications guide on the facing page (to the right) and select the modules for your application taking into account the suggestions in the information that appears above the table. If you need assistance please do not hesitate to call us. There is no charge for this service.

## 2 PICK THE SOFTWARE YOU WOULD LIKE TO USE

Decide which one of our software packages you want to use (pgs. 18-21). If you want to use other software, call us for interface information. We also have special application packages and do a limited amount of custom software - please inquire.

## 1 EVERY SYSTEM NEEDS A POWER BASE

Order a power base V15-17. It includes the lid for the top of the module stack and a UL listed, hospital grade power cord. The base will support up to 15 modules. Specify line (mains) voltage and frequency on the order if it is for use in a country which has other than 115 / 60Hz VAC.

# APPLICATIONS AND ORDERING GUIDE

When selecting modules for your application, there are several things to consider. If you want to use Windaq to display data in either the multi-channel, continuous-chart-recorder or retrace-oscilloscope-emulation mode on your computer screen, and you also want to display processed functions of the raw signals on the same time line in real time, then you should use the on-line processing modules like the Multi-Function Integrator, Tachometer, Blood Pressure Processor, and perhaps the Dual Comparator/Window Discriminator. This will allow the computer to acquire and display data at full speed, unfettered by the processing time allocated to processing these signals. It will also leave a full screen view of the record, uncluttered by overlying windows, when you want digital displays of current values of some of the signals.

Processing time (if you are working with a large number of traces), signal quality, and filter characteristics should be con-

sidered before using DSP (software-based Digital Signal Processing) filters instead of hardware filter modules.

It is also important to consider what kind of filtering you need for your study. For example, with the bioamplifiers, are the cutoffs and nominal bands of the built-in filters acceptable or should you use the amplifiers without filters and use one of the separate filter modules? You may also want to consider a separate filter module like the V75-48 as an adjunct to the limited filtering of the couplers as well as the amplifiers; especially the V72-25A Strain Gage Bridge Coupler.

We also have a very detailed **LabLinc V USERS GUIDE** with detailed module specifications and descriptions as well as a more extensive discussion of the information above. It is **free upon request** - call, write, fax or E-mail and ask.

TO STUDY	USE AMPLIFIER / COUPLER	WITH OTHER MODULE(S)	AND TRANSDUCER(S)
<b>ACCELERATION</b>	V72-25A	V75-48 (If narrow band needed)	V94-41
<b>BLOOD FLOW</b>	V71-40 (relative, peripheral)		V95-01
<b>BLOOD PRESSURE</b>	V72-25A (Invasive) V72-34 (Non-invasive) (Also rate)	V77-34 (Also rate with V77-26)	V94-21 or V94-25 (Cuff included)
<b>ECG - 3 Electrode</b>	V75-01 or V75-04		V91-01, -11, -33
<b>ECG - 7 Lead</b>	OR V75-02 or V75-05 V75-11	V75-21 or V75-48 V75-48 (If narrow band needed)	V91-01, -11, -33 V91-01, -11, -33
<b>(EDR, GSR)* EEG</b>	Use SC or SPR V75-01 or V75-04 (LIMITED) OR V75-02 or V75-05 OR V75-48	V75-21, -48, or -50 V75-21, -48, or -50	V91-01, -11, -33 V91-01, -11, -33 V91-01, -11, -33
<b>EMG</b>	V75-01 or V75-04 OR V75-02 or V75-05	V75-21 or V75-48	V91-01, -11, -33 V91-01, -11, -33
<b>ENG, EOG EYE BLINK</b>	V75-03 or V75-06 V71-40	V75-48 (If sharp hi-cut needed)	V91-01, -11, (or smaller), -33 V95-01
<b>FORCE</b>	V72-25A	V75-48 (If narrow band needed)	V94-31, or -32 And -38
<b>GASTRIC PRESSURE</b>	V72-25A		V94-05 and Balloon
<b>HEART RATE</b>	V75--01, -02, -04, -05, or -11 OR V71-40 (With Blood Flow) OR V72-34 (Pressure included) OR V73-22 (With Respiration)	V77-26 V77-26 V77-26	V91-01, -11, -33, or -35 V95-01 V91-01, -11, -33
<b>IPG (see respiration)</b>			
<b>SC, (SR*)</b>	V71-23		V91-01, -11, -33
<b>SPR*</b>	V75-01 or V75-04		V91-01, -11, -33
<b>RESPIRATION</b>	V71-30 (Temp. of expired air flow) OR V72-25A (Chest bellows) OR V73-22 (IPG - transthoracic imp.)	V77-26 (For Rate) V77-26 (For Rate) V77-26 (For Rate)	V93-09, or -29 V94-05 and V94-19 V91-01, -11, -33
<b>TEMPERATURE</b>	V71-30		Any V93-00 Series Probe
<b>TREMOR</b>	V72-25A	V75-48 (If defined, narrow Startle / Tremor platform	V94-41 or E-Series
<b>frequency band is needed)</b>			

\*EDR Electrodermal Response is the collective / generic name for the following: GSR - Galvanic Skin Response, SPR - Skin Potential Response, SR - Skin Resistance, and SC - Skin Conductance. The terms imply the historic methods of measurement.. GSR (also used generically in the past) and SPR measure voltage produced at the skin surface by using a bioamplifier. SR - Skin resistance, and SC - Skin Conductance, use an excitation voltage from a specific coupler and measure resistance expressing the output in Ohms or Siemens respectively. Siemens is the reciprocal of Ohms (Mhos was formerly the unit of measure but is no longer in use). SC - Skin Conductance is the method currently in common use to measure the EDR - GSR phenomenon.

# OTHER PRODUCTS STIMULATORS



## E13-65 ISOLATED PHYSIOLOGICAL STIMULATOR

### FEATURES AND APPLICATIONS:

SYNCHRONIZED, MULTI-SITE STIMULATION.  
MONOPHASIC, BIPHASIC, OR DUAL PULSE.  
AUTOMATIC LEAD SHUNTING.  
FEEDBACK REGULATED FOR CURRENT OR VOLTAGE.  
CONSTANT CURRENT (10 mA TO 60 MA).  
CONSTANT VOLTAGE (1MV TO 100V).  
COUNTED PULSES OR TIMED TRAINS.  
STIMULUS SETUP VIA KEYPAD OR COMPUTER.  
STORES 255 STIMULUS PROTOCOLS ONBOARD FOR  
INSTANT ACCESS AND PRESENTATION.  
MICROELECTRODES, IMPLANTED OR SURFACE  
ELECTRODES, AND ORGAN BATHS.  
IONTOPHORESIS, LESION MAKING AND TISSUE  
MARKING.

This general-purpose stimulator serves almost any application. The unit is AC operated and requires no batteries for isolated operation. All functions are isolated from the subject including the oscilloscope monitor output. It features automatic lead shunts to prevent tissue charging and to allow for recording. You can set up stimuli with a computer or via the keypad following simple prompts with "yes - no" or parameter entry. You have to read the brochure to fully appreciate this stimulator.



## E13-75 BIOELECTRIC STIMULUS ISOLATOR

The E13-75 allows you to have full feedback regulated control over current or voltage for stimulus waveforms produced by any other device. It is generally (though not necessarily) used with a D-A converter so that a computer can synthesize the waveform of the stimulus. The E13-75 then isolates and converts the waveform to a feedback regulated constant current or constant voltage stimulus. It has the shunts and other features of the E13-65 stimulator.

ASK FOR OUR STIMULATOR BROCHURE

## SYSTEM SPECIFICATIONS

Analog Signals, Output:  $\pm 1-3$  V typ,  $\pm 10$  V max.  
Analog Signal Connections: .098 in - 2.5 mm,  
Ultraminiature Phono Connector.  
Frequency Response: 20 kHz (Except where  
limited by specific application filters.)  
Typical Common Mode Rejection: 105-110 dB.  
Typical Input Impedance: 109 Ohms  
Digital Signals: +5V, Low True logic.  
Digital Signal Connections: .040 in - 1 mm pin.  
Digital Signal Minimum Pulse: 10 microsec.  
Materials: Aluminum and UL fire-rated plastics.  
Design Standards: Designed to 544 patient  
contact requirements. CE tested and approved.  
Base: 12 x 18 x 4.5 inches - 305 x 457 x 114  
mm 13 lb. - 12 oz. - 6.2 kg. 115 VAC (nominal),  
60 Hz, or 220 VAC (nom), 50 or 60 Hz - (specify)  
Modules: 10.1 x 8 x 1.8 inches - 275 x 203 x  
45.7 mm. 1 lb. 2 oz typ., 1 lb. - 6 oz max., 510 gm  
typ., 624 gm max. Powered from base  $\pm 15$  VDC

FOR MORE DETAILED SPECIFICATIONS AND  
MODULE FUNCTION DESCRIPTIONS CALL,  
FAX, OR E-MAIL AND ASK FOR YOUR FREE  
COPY OF THE LABLINC V USERS GUIDE.

## BIO-SYSTEM CALBRATOR

### B68-02 BIO-SYSTEM CALBRATOR

The unit is capable of providing signals on 2 channels simultaneously for calibration from electrode leads through computer signal acquisition. There are 16 stored waveforms synchronized so that two signals such as ECG and pressure or flow can be run together in order to check module calibration and interrelated - function signal processing.

In addition to biological waveforms, there are standard calibration signals, geometric functions, and sine signals available to calibrate and check data input ports, filters,



integrators, and differentiators or FFT and other processing programs. The unit is adjustable for rate and amplitude.

### STORED SIGNALS

ECG AAMI standard ECG calibration, Blood pressure waveform, Blood flow waveform, Fast depolarization action potential, Saw tooth - 0° phase, Saw tooth - 90° phase, Sine - 0° phase, Sine - 180° phase, Cosine - 0° phase, Sine - 0° phase (2X freq. Above), Half cycle "square" wave, 1 Cycle ramp - 1% of cycle, 16-step staircase, Precision DC reference

ASK FOR CALBRATOR SHEET

**COULBOURN INSTRUMENTS, L.L.C. - 7462 PENN DRIVE, ALLENTOWN, PA 18106 USA**  
**TELEPHONE: (610) 395-3771 - (TOLL FREE - USA ONLY) (800) 424-3771**  
**FAX: (610) 391-1333 - INTERNET: [www.coulbourn.com](http://www.coulbourn.com) - E-MAIL: [sales@coulbourn.com](mailto:sales@coulbourn.com)**