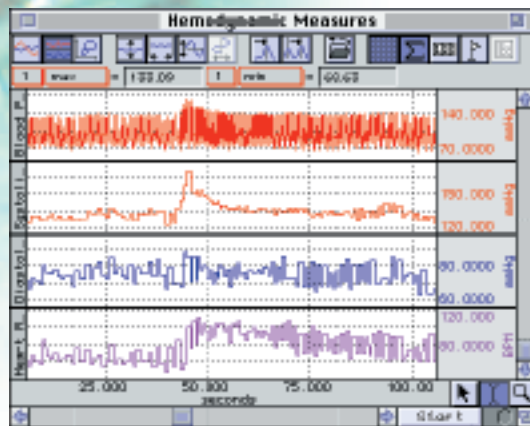


Utilize the powerful on-line analysis capabilities for chronic, acute and *in-vitro* preparations in both long- and short-term experiments. Pre-program the software to synchronize recording sessions with a user-specified dosing routine. Sophisticated algorithms provide on- and off-line, beat-by-beat analysis of the primary cardiovascular signals. Advanced data reduction features perform automatic statistical measurements and multiple display modes allow users to view the data in a familiar format.

## FEATURES

- ON-LINE ANALYSIS (BEAT-BY-BEAT)
- ECG ANALYSIS FEATURES
- LVP (INTERFACE WITH MILLAR MIKRO-TIP™ CATHETERS)
- BLOOD PRESSURE
- PRESSURE VOLUME LOOPS: X/Y DISPLAY
- BLOOD FLOW
- AUTOMATIC DATA REDUCTION
- AUTOMATICALLY CONTROL PUMPS & VALVES
- INTERFACE WITH EXISTING EQUIPMENT
- AUTOMATE ACQUISITION PROTOCOLS
- CREATE STANDARD OPERATING PROCEDURES
- 24-HOUR STUDIES (CHRONIC IMPLANTS/SWIVEL TETHER)
- MRI APPLICATION
- DEFIBRILLATION & ELECTROCAUTERY
- RECORD & ANALYZE DATA FROM MULTIPLE ANIMALS
- NONINVASIVE CARDIAC OUTPUT MEASUREMENT



### ON-LINE ANALYSIS **Q25**

Sophisticated algorithms will record and analyze, on-line, a variety of hemodynamic signals. The calculation channels process raw hemodynamic data to provide meaningful parameters on a beat-by-beat basis. The result of one calculation can be fed into another calculation channel to provide sophisticated multi-level analysis.

### ECG ANALYSIS **Q20**

Collect ECG data from one-, three- or multi-lead montages. Investigate heart rate variability with the on-line R-R interval calculator. Use the powerful ECG averaging function to evaluate changes in the ECG

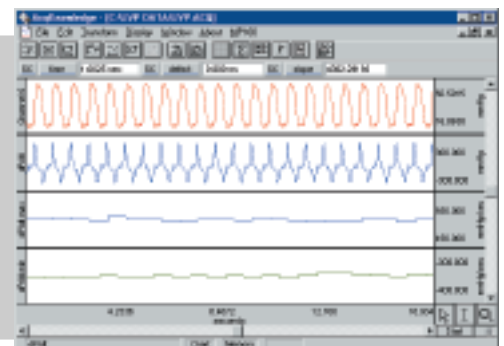
- Heart rate
- Systolic
- Diastolic
- Mean
- dP/dt
- dP/dt max
- dP/dt min
- Pulse height
- LVEDP
- X/Y plots

complex before, during and after exercise or dosing. Combine ECG data with other parameters to perform a complete physiological examination. Apply the Template functions to isolate certain phenomena within the ECG recording and analyze data over user-defined time periods with the automated data reduction function. Compare waveforms, find peaks and perform complex analyses in real time or after data collection.

### LVP **Q28**

Calculate and record LVP data from acute, chronic and isolated heart preparations. Interface with a variety of invasive transducers, including the popular series of Millar Mikro-Tip™ Catheters.

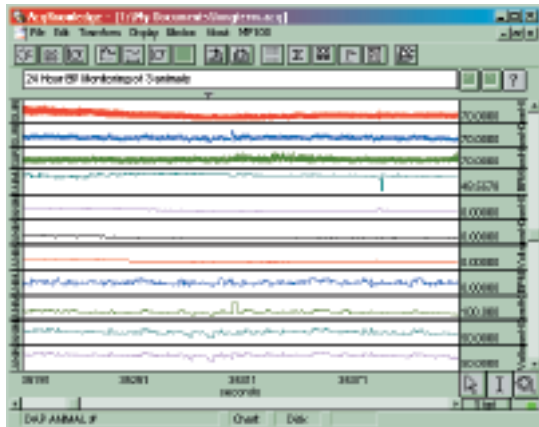
- Heart rate
- R-R interval
- R-height
- Powerful ECG averaging function
- Multi-lead recording (3-, 6- and 12-lead)



## BLOOD PRESSURE Q26

Record continuously for short- and long-term single- and multi-animal studies (24+ hours), or pre-program to record for specific time periods and dosing schedules. The software provides a detailed, beat-by-beat analysis of blood pressure signals. Powerful automatic data reduction tools reduce large data files into manageable sizes. Extract a variety of values over user-defined time periods. AcqKnowledge can provide mathematically precise mean blood pressure via the arithmetic mean calculator from the Rate function, or can estimate mean arterial pressure via the following MAP formula in the Equation Generator:

$$\text{MAP} = [(2 \cdot \text{Diastolic}) + \text{Systolic}] / 3$$



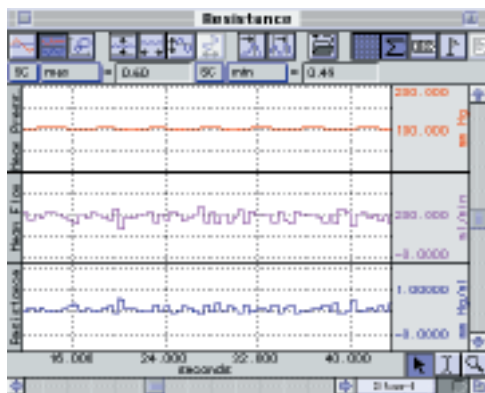
- Heart rate
- Systolic
- Diastolic
- Mean
- dP/dt
- dP/dt max
- dP/dt min
- Pulse height
- Max
- Min
- Mean
- Std dev
- Delta
- Pk-Pk

## PRESSURE VOLUME LOOPS

Flexible graphing capabilities let users display data in a variety of formats (Chart, Scope or X/Y); simple toolbar icons make it easy to switch between display modes. For example, use the X/Y mode to plot Left Ventricular Pressure against Myocardial Wall Thickness, or any other data channel.

## BLOOD FLOW Q27

Interface with an array of flow meters including ultrasonic, electromagnetic, and the LDF100C Laser Doppler Flow module. The software will provide beat-by-beat, on-line analysis for acute, chronic and *in-vitro* preparations. Take full advantage of the data reduction features in AcqKnowledge to summarize large data files.



- Pulsatile flow max
- Pulsatile flow min
- Mean flow
- Cardiac output
- Stroke volume
- Resistance

## AUTOMATIC DATA REDUCTION

The powerful data reduction function will reduce large (24-hour) data files to manageable sizes. Select the appropriate measurements (Max, Min, Mean, Std Dev, Delta, Pk-Pk, Time of max, Time of min) and the summary time delta—the software will automatically analyze the data and enter the values into a Journal file and display them as new data channels. Analyze both primary signals (such as arterial blood pressure) and

derived data (such as Systolic BP). The summarized data can be automatically displayed within AcqKnowledge for full access to all the analysis and measurement tools for further refined analysis.

## AUTOMATICALLY CONTROL OTHER EQUIPMENT

The MP System will interface with a wide variety of devices such as pumps, valves, stimulators and switches. The MP System has 16 digital I/O lines that can be manually or automatically controlled from within the software. Use the on-line Calculation and Control channels to automatically trigger devices to turn on and off.

## INTERFACE WITH EXISTING EQUIPMENT

MP Systems will interface with a wide variety of third-party equipment such as flow meters, force plates, sono-micrometers, telemetry equipment, transducers, amplifiers, metabolic carts, and bedside monitors. BIOPAC offers two interface solutions: isolated for human use and non-isolated for animal and *in-vitro* applications. See the *Amplifiers & Interfaces* application on page 48.

## AUTOMATE ACQUISITION PROTOCOLS

Automatically trigger pre-programmed trials to record the data around dosing periods, 24 hours a day, seven days a week. Record continuously (24+ hours) or pre-program to record for specific time periods and dosing events. The system will accept outputs from other equipment to provide automatic event marking during hemodynamic experiments.

## CREATE STANDARD OPERATING PROCEDURES

Save customized algorithms and display settings to a Template file. Tailor the menu displays by removing options and use the Journal to display specific procedural instructions for Standard Operating Procedures.

## MRI APPLICATIONS

New (EL254-RT and EL258-RT) carbon fiber lead electrodes provide high quality signals without interfering with the MRI. Add an ECG alarm (OUT102) for an audible reference of the subject's heart rate while in the imager.

## DEFIBRILLATION & ELECTROCAUTERY

Use the MEC111C Module Extension Cable to protect the MP System amplifiers against high frequency currents.

## NONINVASIVE CARDIAC OUTPUT MEASUREMENT Q13

Cardiac Output can be determined, noninvasively, by employing electrical bioimpedance measurement techniques with the EBI100C. With pairs of electrodes attached to the neck and torso, the EBI100C can isolate the base  $[Z(t)]$  and delta impedance ( $dZ/dt$ ) values, which vary as the heart pumps blood. Determine  $dZ/dt$  maximum and BPM on a cycle-by-cycle basis, in real time. Simultaneously identify aortic valve opening and closing times with the DA100C and the TSD108. To compute Stroke Volume and Cardiac Output on-line, combine data from these various sources with the Equation Generator.

<b>DA100C</b>	54
General-purpose Transducer Amplifier	
<b>TSD104A</b>	69
Precision Pressure Transducer	
<b>TSD108</b>	70
Physiological Sounds Microphone	
<b>ECG100C</b>	56
Electrocardiogram Amplifier	
<b>EBI100C</b>	60
Electrical Bioimpedance Amplifier	
<b>LDF100C</b>	60
Laser Doppler Flow Module	
<b>SKT100C</b>	59
Temperature Amplifier	
<b>OXY100C</b>	61
Pulse Oximeter Module	
<b>NIBP100A</b>	68
Noninvasive Arterial Blood Pressure Monitor	
<b>HLT100C</b>	53
High Level Transducer Module	
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Input Signal Isolated Adapter	
<b>OUTISO</b>	53
Output Signal Isolated Adapter	
<b>STM100C</b>	64
Stimulator Module	
<b>STMISO SERIES</b>	64
Electrical Stimulus Isolation Accessories	
<b>TSD116C</b>	72
8-channel Digital Marker	
<b>CBL100 SERIES</b>	88
Analog Connection Cables	
<b>CBL204</b>	86
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Electrodes	
<b>LEAD SERIES</b>	83
Electrode Leads	
<b>MEC SERIES</b>	87
Module Extension Cables	