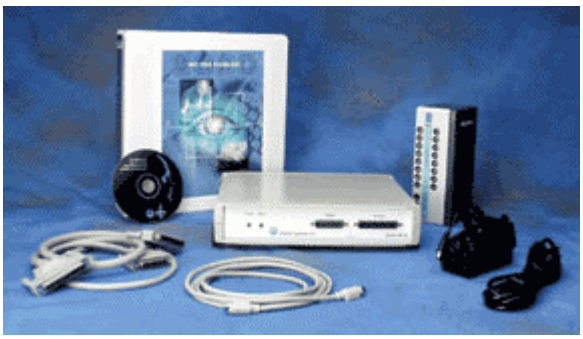
MP100 STARTER SYSTEM



*MP100 Specifications are on page 12.

The MP100 system offers USB-ready data acquisition and analysis. Record multiple channels with differing sample rates. Record at speeds up to 70 kHz or 16 kHz (aggregate to disk)

MP100 System includes*:*

Data acquisition unit: MP100A-CE

Universal interface module: UIM100C

USB adapter: USB1W (PC) *or* USB1M (Macintosh)

Transformer: AC100A

Cables: CBLSERA cable, CBLS100 cable set

Acq*Knowledge*® software: ACKv3.7 for Windows *or*
ACKv3.5 for Macintosh

Recommended MP100 configuration:

For the best possible performance, connect the MP System to the computer's USB port, with no other USB traffic intensive devices (e.g. scanners, hard drives, cameras) running simultaneously. If a computer has no USB port, users need to install an industry standard PCI USB card.

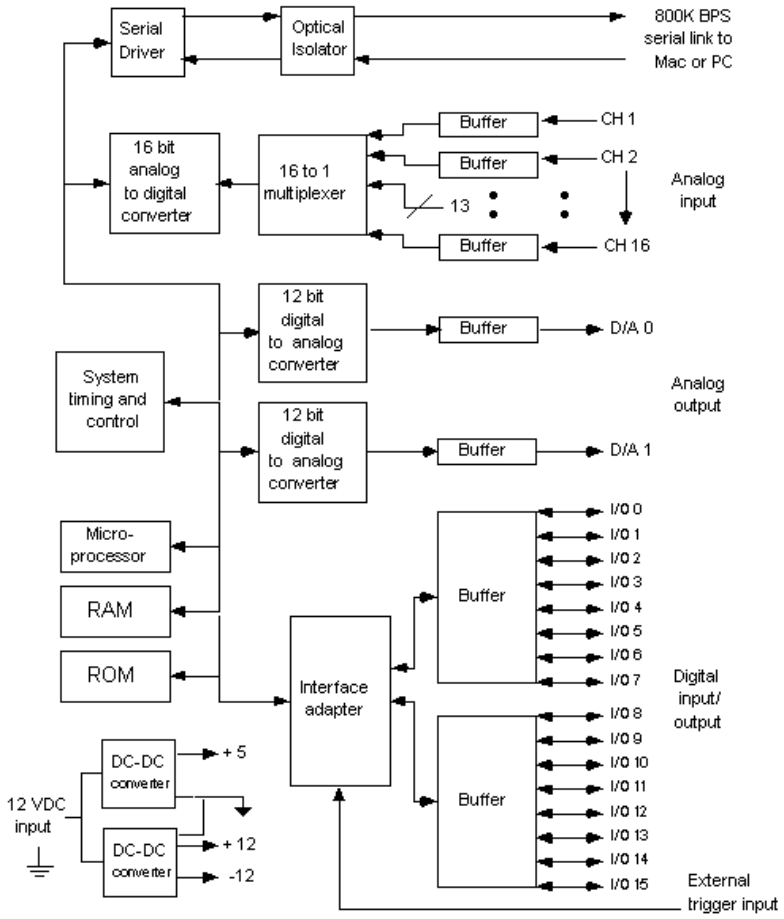
MP100 Symbology

Front panel		
POWER	Power status	**On** if MP100 is turned ON. **Off** if MP10 is turned OFF.
BUSY	MP100 acquisition status	**On** during acquisition or during the first 1-5 seconds after the MP100 is powered ON.
CABLE INPUTS	25-pin cable connection	Digital signals
	37-pin cable connection	Analog signals
Back panel		
Power switch	**On** powers up the MP100 **Off** cuts the flow of power to the MP100	
Fuse holder	Next to the power switch is a 2 Amp fast-blow fuse holder. To remove the fuse, use a screwdriver to remove the fuse cover, which is located below the word **Fuse**. The maximum capacity of the fuse is 2 Amps.	

Back panel	cont'd
DC Input	The **DC Input,** located between the fuse holder and the serial cable, is where a battery, AC/DC converter or other power supply connects to the MP100. The power supply requirements for the MP100 are 12 VDC @ 1 Amp, The receptacle is configured to accept a "+" (positive) input in the center of the connector and a "–" (negative) input on the connector housing.
Serial port	The MP100 connects to the computer via a serial port, located just below the word **Serial**. Uses a standard MINI DIN 8 connector. Should only be used to connect the MP100 to a PC or Macintosh.

MP100A-CE Data Acquisition Uni Block Diagram

The MP100 has an internal microprocessor to control the data acquisition and communication with the computer. There are 16 analog input channels, two analog output channels, 16 digital channels that can be used for either input or output, and an external trigger input. The digital lines can be programmed as either inputs or outputs and function in 8 channel blocks. Block 1 (I/O lines 0 through 7) can be programmed as either all inputs or all outputs, independently of block 2 (I/O lines 8 through 15).



MP100 block diagram

*MP100 Specifications follow.

MP System Specifications — for MP150 and MP100

MP150 and MP100 Data Acquisition Unit Specifications:

Analog Inputs		
Number of Channels:	16	
Input Voltage Range:	±10V	
A/D Resolution:	16 Bits	
Accuracy (% of FSR):	±0.003	
Input impedance:	1.0 MΩ	
Analog Outputs		
Number of Channels:	2	
Output Voltage Range:	±10V	
D/A Resolution:	MP150: 16 bits, MP100: 12 Bits	
Accuracy (% of FSR):	MP150: ±0.003, MP100: ±0.02	
Output Drive Current:	±5mA (max)	
Output Impedance:	100Ω	
Digital I/O		
Number of Channels:	16	
Voltage Levels:	TTL, CMOS	
Output Drive Current:	±20mA (max)	
External Trigger Input:	TTL, CMOS compatible	
Time Base		
Min Sample Rate:	2 samples/hour	
Trigger Options:	Internal, External or Signal Level	
Power		
Amplifier Module Isolation:	Provided by the MP unit	
CE Marking:	EC Low Voltage and EMC Directives	
Leakage current:	<8µA (Normal), <400µA (Single Fault)	
Fuse:	2A (fast blow)	
Device specific specs	***MP150A***	***MP100A***
Max Sample Rate		
MP Internal Memory:	200K samples/sec (400K aggregate)	70K samples/sec (70 K aggregate)
PC Memory/Disk:	200K samples/sec (400K aggregate)	11K samples/sec (16K aggregate)
Internal Buffer Size:	6M samples	16K samples
Serial Interface Type/Rate:	Ethernet: DLC type I (10M bits/sec) Serial: RS422 (800K bits/sec)	Serial: RS422 (800 Kbits/sec)
Transmission Type:	Ethernet	USB only (PC via USB1W or Macintosh via USB1M)
Maximum cable length:	100 meters (Ethernet cable)	7 meters (USB + SERIAL cable)
Power Requirements:	12VDC @ 2 amp (uses AC150A)	12 VDC @ 1amp (uses AC100A)
Dimensions:	10cm x 11cm x 19cm	7cm x 29cm x 25cm
Weight:	1.0 kg	1.8 kg
OS Compatibility		
Ethernet Interface		
PC	Windows 98, 98SE, 2000, NT 4.0, Me	Not supported
Macintosh	System 8.6 or better	Not supported
USB Interface		
PC	Not supported	Windows 98, 98SE, 2000, Me
Macintosh	Not supported	System 8.6 or better

Isolation

Designed to satisfy the following Medical Safety Test Standards affiliated with IEC601-1:

- Creepage and Air Clearance
- Dielectric Strength
- Patient Leakage Current

Contact BIOPAC for additional details.

Signal conditioning module compatibility

$CO_2$100C	EGG100C	HLT100C	PPG100C
DA100C	EMG100C	LDF100C	RSP100C
EBI100C	EOG100C	MCE100C	SKT100C
ECG100C	ERS100C	$O_2$100C	STM100C
EEG100C	GSR100C	OXY100C	TEL100C

Cleaning procedures

Be sure to unplug the power supply from the MP150/100 before cleaning. To clean the MP150/100, use a damp, soft cloth. Abrasive cleaners are not recommended as they might damage the housing. Do not immerse the MP150/100 or any of its components, as this can damage the system. Let the unit air-dry until it is safe to reconnect the power supply.

AC150/100A Power Supplies

The 12-volt in-line switching transformer connects the MP unit to the AC mains wall outlet. One transformer is included with each MP System; replacements can be ordered separately.

Chapter 2 Interface Modules

UIM100C Universal Interface Module

HLT100C ***UIM100C***

The UIM100C Universal Interface Module is the interface between the MP150/100 and external devices. Typically, the UIM100C is used to input pre-amplified signals (usually greater than +/– 0.1 volt peak-peak) and/or digital signals to the MP150/100 acquisition unit. Other signals (e.g., those from electrodes or transducers) connect to various signal-conditioning modules.

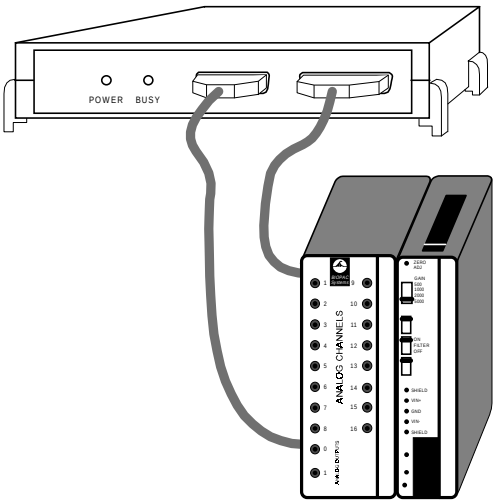
The Universal Interface Module (UIM100C) is designed to serve as a general-purpose interface to most types of laboratory equipment. The UIM100C consists of sixteen 3.5 mm mini-phone jack connectors for analog inputs, two 3.5 mm mini-phone jack connectors for analog outputs, and screw terminals for the 16 digital lines, external trigger, and supply voltages.

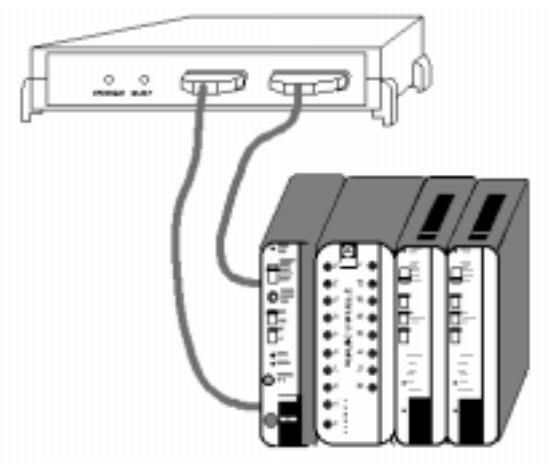
The UIM100C is typically used alone to connect polygraph and chart recorder analog outputs to the MP System. BIOPAC Systems, Inc. offers a series of cables that permit the UIM100C to connect directly to a number of standard analog signal connectors. Most chart recorders or polygraphs have analog signal outputs, which can be connected directly to the UIM100C.

The UIM100C allows access to 16 analog inputs and 2 analog outputs on one side, and 16 digital input/output lines, an external trigger, and supply voltages on the other side. The UIM100C is designed to be compatible with a variety of different input devices, including the BIOPAC series of signal conditioning amplifiers (such as the ECG100C).

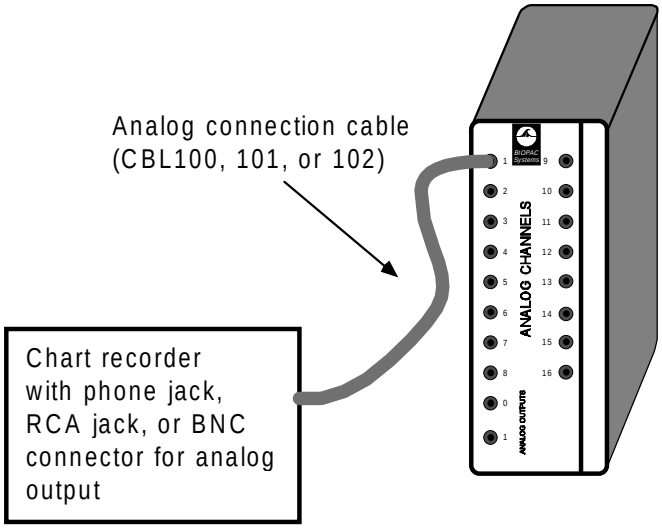
Connections between the UIM100C and the MP150/100 acquisition unit are made via two cables: one for analog signals (with a 37-pin connector) and one for digital signals (with a 25-pin connector). Use the 0.6-meter cables included with your system to connect the UIM100C to the acquisition unit.

When using the Universal Interface Module (UIM100C) with other 100-Series modules, the UIM100C is usually the first module cascaded in the chain. If using the STM100C, OXY100C or HLT100C, the module must be plugged in on the **left** of the UIM100C. Up to seventeen modules (including the UIM100C) can be snapped together, as illustrated in the following diagrams:





MP100 to UIM100C and amplifier moduleSTM100C and UIM100C and amplifier modules



Typical UIM100C to polygraph interface

When using the UIM100C, be careful not to short the "analog output" terminals together, and not to short across any of the connectors on the "Digital" (back) side of the module.

IMPORTANT USAGE NOTE

Mains powered external laboratory equipment should be connected to an MP System through signal isolators when the system also connects to electrodes attached to humans.

To couple external equipment to an MP System, use:

- For **analog** signals — **INISO** or **OUTISO** isolator (with **HLT100C**)
- For **digital** signals — **STP100** (with **UIM100C**)

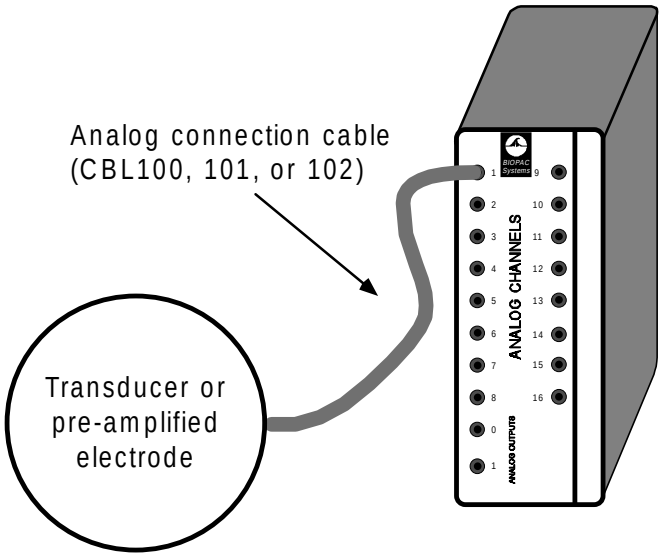
Contact BIOPAC for details.

Analog connections

As noted, the UIM100C requires cables equipped with standard 3.5mm mini-phone plugs to connect to analog signal sources. This type of connector is commonly available with many different mating ends. BIOPAC Systems, Inc. carries several different types, including BNC and phone plugs. Since the MP150/100 analog inputs are single-ended, the tip of the mini-phone plug is the input and the base (shield) of the mini-phone plug is the ground (or common).

NOTE: Make sure the cable that you route into the UIM100C is a **mono** 3.5 mm phone plug.

To connect to existing equipment (such as polygraphs or chart recorders), run a cable from the analog output terminal of the external device to the UIM100C. Since there are so many different devices that can connect to the MP150/100 it's impossible to cover them all.

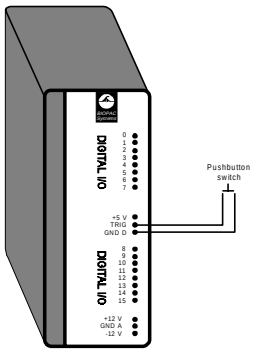


UIM100C connected to external analog signal source

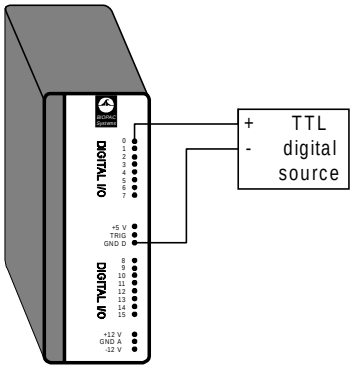
Please contact a BIOPAC Systems, Inc. applications engineer if you are not sure how to connect the MP System to your device or if you need a special cable.

Digital connections

A digital signal has only two voltage levels: 0 and +5 volts. Zero volts is a binary "0" and +5 volts is a binary "1." A **positive edge** is a 0 to 1 transition and a **negative edge** is a 1 to 0 transition. The MP150/100 digital I/O lines have internal pull-up resistors so that unconnected inputs will read "1."



Trigger connected to UIM100C

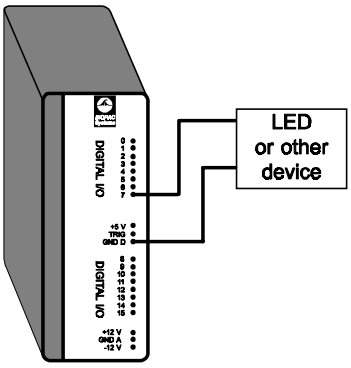


MP unit to digital source connection

The UIM100C allows access to 16 digital input/output lines through screw terminals which can accept either pin plugs or bare wires, as shown above. Be careful not to short the +5, +12V and –12V terminals together or to the GND A or GND D output terminal, or you may damage the MP150/100.

The 16 digital lines are divided into two blocks, I/O 0 through 7 and I/O 8 through 15. Each of these blocks can be programmed as either inputs or outputs. Do not connect a digital input source to a block that is programmed as an output.

It is also possible to connect an output device (such as an LED) to the digital side of the UIM100C. Leeds and similar devices can be connected so that they are "on" either when a signal output from the UIM100C reads 0 Volts or when a +5 Volt signal is being output. To connect an LED so that it defaults to "off" (i.e., the digital I/O reads 0), attach one lead of the output device to the GND D terminal on the UIM100C and connect the other lead to one of the digital I/O lines (I/O 7, for example). When configured this way, the device will be "off" when I/O 7 reads 0, and "on" when I/O 7 reads a digital "1"(i.e., +5 Volts). When connecting to an LED, be sure to use a current-limiting resistor (typically 330Ω) in series with the LED. Alternatively, you can connect one of the device leads to the +5V terminal on the UIM100C and leave the other lead connected to the digital line (e.g., I/O 7). With this setup, the device will be on whenever the I/O line (in this case digital I/O 7) reads 0, and on whenever the I/O reads a digital "1" (i.e., +5 Volts)

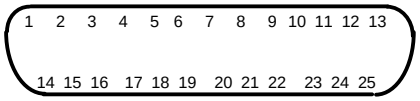


UIM100C Specifications

Analog I/O:	16 channels (front panel) – 3.5mm phone jacks
D/A Outputs:	2 channels (front panel) – 3.5mm phone jacks
Digital I/O:	16 channels (back panel) – screw terminals
External Trigger:	1 channel (back panel) – screw terminal
Isolated Power:	±12V, +5V @ 100 ma (back panel) – screw terminals
Weight:	520 grams
Dimensions:	7cm (wide) x 11cm (deep) x 19cm (high)

MP System Pin-outs — for MP150 and MP100

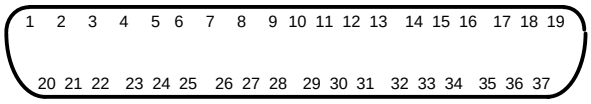
Digital DSUB 25 (male) Pin-outs



DIGITAL

Pin	Description	Pin	Description
1	I/O 0	**14**	I/O 4
2	I/O 1	**15**	I/O 5
3	I/O 2	**16**	I/O 6
4	I/O 3	**17**	I/O 7
5	GND D	**18**	GND A
6	GND D	**19**	Out 1
7	EXT T	**20**	Out 0
8	+5 VD	**21**	GND A
9	+5 VD	**22**	I/O 12
10	I/O 8	**23**	I/O 13
11	I/O 9	**24**	I/O 14
12	I/O 10	**25**	I/O 15
13	I/O 11		

Analog DSUB 37 (male) Pin-outs



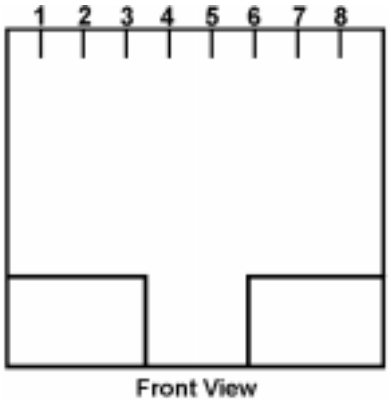
ANALOG

Pin	Description	Pin	Description
1	GND A	**20**	CH 1
2	GND A	**21**	CH 2
3	GND A	**22**	CH 3
4	GND A	**23**	CH 4
5	GND A	**24**	CH 5
6	GND A	**25**	CH 6
7	GND A	**26**	CH 7
8	GND A	**27**	CH 8
9	+12 V	**28**	+12 V
10	GND A	**29**	- 12 V
11	-12 V	**30**	CH 9
12	GND A	**31**	CH 10
13	GND A	**32**	CH 11
14	GND A	**33**	CH 12
15	GND A	**34**	CH 13
16	GND A	**35**	CH 14
17	GND A	**36**	CH 15
18	GND A	**37**	CH 16
19	GND A		

Serial MINI DIN 8 (female) Pin-outs

Pin	Description
1	No Connection
2	Clock (MP Output)
3	Rx+ (MP Input)
4	GND computer
5	Tx+ (MP Output)
6	Rx- (MP Input)
7	No Connection
8	Tx- (MP Output)

Ethernet connector Pin-outs (for model MP150 only)



Pin	Description
1	TXD+
2	TXD-
3	RXD+
4	No Connection
5	No Connection
6	RXD-
7	No Connection
8	No Connection

MP System Applications

Features

With proper hardware selection and setup, the MP System with Acq*Knowledge* software can be used for a wide array of application features. See the MP System Guide for descriptions of the following features. For additional support, or for help with an unlisted application, please contact the BIOPAC Technical Support Division — an Applications Specialist will be glad to help you.

- Active Electrodes
- Allergies
- Amplitude Histogram
- Anaerobic Threshold
- Animal studies
- Auditory Evoked Response (AER)
- Automate Acquisition Protocols
- Automated Data Analysis
- Automatic Data Reduction
- Autonomic Nervous System Studies
- Biomechanics Measurements
- Blood Flow / Blood Pressure /Blood Volume
- Body Composition Analysis
- Breath-By-Breath Respiratory Gas Analysis
- Cardiac Output
- Cardiology Research
- Cell Transport
- Cerebral Blood Flow
- Chaos Plots
- Common Interface Connections
- Connect to MP Systems
- Control Pumps and Valves
- Cross- and Auto-correlation
- Current Clamping
- Defibrillation & Electrocautery
- Dividing EEG into Specific Epochs
- ECG Analysis
- ECG Recordings, 12-Lead
- ECG Recordings, 6-Lead
- EEG Spectral Analysis
- Einthoven's Triangle
- EMG and Force
- EMG Power Spectrum Analysis
- End-tidal CO2
- Episode Counting
- Ergonomics Evaluation
- Event-related Potentials
- Evoked Response
- Exercise Physiology
- External equipment, controlling
- Extra-cellular Spike Recording
- Facial EMG
- FFT & Histograms
- FFT for Frequency Analysis
- Field Potential Measurements
- Fine Wire EMG
- Forced Expiratory Flow & Volume
- Gait Analysis
- Gastric Myoelectric Activity
- Gastric Slow Wave Propagation
- Gastrointestinal Motility Analysis
- Hardware Flexibility
- Heart Rate Variability
- Heart Sounds
- Histogram Analysis
- Imaging Equipment, Interfacing
- Indirect Blood Pressure Recordings
- Integrated (RMS) EMG
- Interface with Existing Equipment
- Interface with Third-party transducer
- Invasive Electrode Measurements
- Ion-selective Micro-electrode Interfacing
- Iontophoresis
- Irritants & Inflammation
- Isolated Inputs & Outputs
- Isolated Lung Studies
- Isometric Contraction
- Isotonic Contraction
- Jewett Sequence
- Langendorff Heart Preparations
- Laser Doppler Flowmetry
- Left Cardiac Work
- Long-term Monitoring
- Lung Volume Measurement
- LVP
- Median & Mean Frequency Analysis
- Micro-electrode signal amplification
- Migrating Myoelectric Complex
- Motor Unit Action Potential
- Movement Analysis
- MRI Applications
- Multi-Channel Sleep Recording
- Nerve Conduction Studies
- Neurology Research
- Noninvasive Cardiac Output
- Noninvasive Electrode Measurements
- Nystagmus Investigation
- Oculomotor Research
- Off-line ECG Averaging
- On-line Analysis
- On-line ECG Analysis
- Orthostatic Testing
- Peripheral Blood Flow
- Peristaltic (Slow Wave) Propagation
- Planted Tissue
- Pressure Volume Loops
- Psychophysiology
- Pulsatile Tissue Studies
- Pulse Rate Measurement
- Pulse Transit Time
- Range of Motion
- Real-time EEG Filtering
- Real-time EEG Filtering
- Recurrent Patterns
- Regional Blood Flow
- Relative BP Measurement
- Remote Monitoring
- Respiration Monitoring
- Respiratory Exchange Ratio
- Rheumatology
- Saccadic Eye Movements
- Sexual Arousal Studies
- Signal Averaging
- Simultaneous Monitoring
- Single Channel Analysis
- Single-fiber EMG
- Software-controlled Stimulator
- Somatosensory Evoked Response
- Spectral Analysis
- Spike Counting
- SpO2 Analysis
- Stand Alone Amplifiers
- Standard Operating Procedures
- Startle Eye Blink Tests
- Startle Response
- Stimulator, software-controlled
- Systemic Vascular Resistance
- Template Analysis
- Tissue Bath Monitoring
- Tissue Conductance Measurement
- Tissue Magnitude & Phase Modeling
- Tissue Resistance & Reactance
- Ussing Chamber Measurements
- Ventricular Late Potentials
- Vestibular Function
- Video Capture, Synchronous
- Visual Attention
- Visual Evoked Response
- VO2 Consumption
- Volume/Flow Loop Relationships
- Working Heart Preparations

Application Notes

BIOPAC has prepared a wide variety of application notes as a useful source of information concerning certain operations and procedures. The notes are static pages that provide detailed technical information about either a product or application. A partial list of Application Notes follows.

You can view or print application notes directly from the "Support" section of the BIOPAC web site www.biopac.com.

APP NOTE	Application
#AH101	Transducer Calibration and Signal Re-Scaling
#AH102	Biopotential Amplifier Testing using CBLCAL
#AH103	Remote Monitoring System (TEL100C)
#AS105	Auditory Brainstem Response (ABR) Testing
#AS105b	ABR Testing for Jewett Sequence
#AS108	Data Reduction of Large Files
#AS109	3-, 6-, and 12-Lead ECG
#AH110	Amplifier Baseline (Offset) Adjustment
#AS111	Nerve Conduction Velocity
#AH114	TSD107A Pneumotach Transducer
#AH114b	TSD107B Pneumotach Transducer
#AS115	Hemodynamic Measurements — Part I
#AS116	Hemodynamic Measurements — Part II
#AS117	Pulse Transit Time and Velocity Calculation
#AS118	EMG Signal Analysis
#AS119	EMG Power Spectrum Analysis
#AS120	X/Y Loop Area Analysis
#AS121	Waveform Data Reduction
#AS122	Power Spectrum Analysis
#AH125	Pulse Oximeter Module Operation
#AH127	Precision Force Transducers
#AH128	Active Electrode Specifications and Usage
#AS129	Heart Rate Variability
#AH130	Blood Pressure Measurement
#AS131	Averaging Mode
#AH132	TSD105A Variable Force Transducer
#AH135	TSD117 Pneumotach Transducer
#AH136	BAT100 Instructions
#AH140	Angular Measurements with Goniometers
#AH141	Tri-Axial Accelerometer Calibration
#AS142	Acq*Knowledge* Rate Detector Algorithm
#AS143	Importing Acq*Knowledge* Data Into Excel

APP NOTE	Application
#AH144	Hand Dynamometer Calibration
#AH145	TSD101B Respiratory Effort Transducer
#AS148	Automated ECG Analysis
#AH149	O2100C Module
#AH150	O2100C Module — Sample application
#AH151	CO2100C Module
#AH152	CO2100C Module — Sample Application
#AH153	Physiological Sounds Microphone
#AH154	HLT100C High Level Transducer
#AS158	Analysis of Inspired and Expired Lung Volume
#AH159	TSD116 Series Hand Switch and Foot Switch
#AH160	Gas Analysis Module Response Time
#AS161	Automated Tissue Bath Analysis
#AH162	Stimulation Features
#AS168	Analysis of Intraventricular Pressure Wave Data (LVP Analysis)
#AS169	Speech Motor Control
#AH170	LDF100A Laser Doppler Flow Module
#AH175	Using the STMISOC Stimulus Isolator
#AS177	ECG Analysis using the Offline Averaging Mode
#AS183	VO_2 Measurement
#AH186	Psychological Assessment using the TSD115
#AH187	Electrodermal Response (EDR) using the GSR100 or TEL100
#AH190	Using the MCE100C Micro-electrode Amplifier
#AS191	Cardiac Output Measurement using the EBI100C and Acq*Knowledge*

AcqKnowldege QUICK STARTS for PC 3.7

"Quick Start" template files were installed to the Sample folder of the BIOPAC Program folder. Use a Quick Start template to establish the hardware and software settings required for a particular application or as a good starting point for customized applications.

Q##	Application(s)	Feature
1	EEG	Real-time EEG Filtering
	Sleep Studies	Real-time EEG Filtering
2	EEG	Evoked Responses
3	EEG	Event-related Potentials
	Evoked Response	Event-related Potentials
4	Evoked Response	Nerve Conduction Studies
5	Evoked Response	Auditory Evoked response & Jewett Sequence
6	Evoked Response	Visual Evoked Response
7	Evoked Response	Somatosensory Evoked Response
9	Evoked Response	Extra-cellular Spike Recording
10	Pyschophysiology	Autonmic Nervous System Studies
12	Pyschophysiology	Sexual Arousal Studies
13	EBI	Cardiac Output
	Cardiovasc. Hemodynamics	Noninvasive Cardiac Output Measurement
	Exercise Physiology	Noninvasive Cardiac Output
15	EOG	Nystagmus Investigation
16	EOG	Saccadic Eye Movements
17	Plethsymography	Indirect Blood Pressure Recordings
19	Sleep Studies	Multiple-channel Sleep Recording
20	Sleep Studies	Cardiovasc. Hemodynamics
	ECG	On-line ECG Analysis
	ECG Analysis	On-line ECG Analysis
21	Sleep Studies	SpO_2 Analysis
22	ECG	Einthoven's Triangle & 6-lead ECG
23	ECG	12-lead ECG Recordings
24	ECG	Heart Sounds
25	Cardiovasc. Hemodynamics	On-line Analysis
26	Cardiovasc. Hemodynamics	Blood Pressure
27	Cardiovasc. Hemodynamics	Blood Flow
28	Cardiovasc. Hemodynamics	LVP
31	NIBP	Pyschophysiology
32	*In vitro* Pharmacology	Tissue Bath Monitoring
33	*In vitro* Pharmacology	Pulsatile Tissue Studies
34	*In vitro* Pharmacology	Langendorff & Working Heart Preparations
35	*In vitro* Pharmacology	Pulmonary Function
	Isolated Lung Studies	Animal Studies
38	Pulmonary Function	Lung Volume Measurement
39	Exercise Physiology	Respiratory Exchange Ratio
40	EMG	Integrated (RMS) EMG
41	EMG	EMG and Force
42	Biomechanics	Gait Analysis
43	Remote Monitoring	Biomechanics Measurements
44	Biomechanics	Range of Motion