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MP ACQUISITION UNITS

MP36 Four Channel Data Acquisition System
MP46 Two Channel Data Acquisition System

NOTE: Biopac Student Lab and BSL *PRO* software is not yet compatible with macOS 11 Big Sur--check compatibility.

The MP data acquisition unit is the heart of all BSL System packages. The MP Unit has an internal microprocessor to control data acquisition and communication with the computer. The MP Unit takes incoming signals and converts them into digital signals that can be processed with the computer. There are analog input channels (four on MP36 units, two on MP46), one of which can be used as a trigger input. The MP Unit must be connected to the computer and electrodes, transducers, and/or I/O devices must be connected to the MP Unit. Users are suggested to take a few minutes to become familiar with the MP Unit prior to making any connections.

MP46 units with current software are available to MP45 users via an upgrade program. Please contact your BIOPAC sales representative about MP46U-M (Mac upgrade) or MP46U-W (Windows upgrade).

Symbols — MP36 or MP46

Symbol	Description	Explanation
	**Type BF Equipment**	Classification
	**Attention**	Consult accompanying documents
	**On** (partial)	Turns MP36 on assuming AC300A power adapter is powered by the mains
	**Off** (partial)	Turns MP36 off if but AC300A power adapter remains powered by the mains
	**Direct current**	Direct current output
	**USB**	USB port

COMPLIANCE

Safety

The MP36/46 satisfies the Medical Safety Test Standards affiliated with IEC 60601-1. The MP36/46 is designated as Class I Type BF medical equipment

EMC

The MP36/46 satisfies the Medical Electromagnetic Compatibility (EMC) Test Standards affiliated with IEC 60601-1-2.

Types of Input Devices

There are three types of devices that connect to the MP36 and MP46: electrodes, transducers, and I/O devices.

- Electrodes are relatively simple instruments that attach to the surface of the skin and pick up electrical signals in the body.

- Transducers, on the other hand, convert a physical signal into a proportional electrical signal.
- Input/Output devices (I/O for short) are specialized devices like pushbutton switches and headphones.

Simple Sensor Connectors

Regardless of the type of device connected, every sensor or I/O device connects to the MP36 using a "Simple Sensor" connector. Simple Sensor connectors are designed to plug only one way into the MP unit—no need to worry about plugging things in upside down or into the wrong socket!

- Electrodes, transducers, and the pushbutton switch all connect to the channel input ports on the front panel of the MP36 and MP46.
- Headphones and the stimulator connect to the "Analog out" port on the back panel of the MP36 and to the headphone jack on the top of the MP46.
- MP36 only: A digital device may connect to the "I/O Port" on the back panel
- MP36 only: A trigger device may be connected to the "Trigger" port on the back panel.

Front Panel

Front Panel, MP36

The front panel of the MP36 has an electrode check port, four analog input ports, and two status indicators.

Electrode Check

- The Electrode Check port is a diagnostic tool used with the BSL *PRO* software to determine if the electrodes are properly attached to the subject. *The MP45 does not have an Electrode Check port. Use BIOPAC's* EL-CHECK *standalone electrode impedance checker to measure electrode/skin contact.*

MP46 is
CH 1 and CH 2 only.

Input Ports: CH 1, CH 2, CH 3, and CH 4

- The 9-pin female analog input ports on the MP acquisition unit are referred to as Channels. There are four on the front of MP36 Units and two on the MP46. The Biopac Student Lab Lessons software will always check to see that the proper sensors are connected to the appropriate channel.

Status Indicators

- **Busy**—indicator is activated when the MP36 is acquiring data and also during the first few seconds after the MP36 is powered on to indicate that a self-test is in progress. (When the MP36 passes the power-on test, the Busy light will turn off.)
- **Power**—status indicator is illuminated when the MP36 is turned on.
- **Ready**—status indicator is illuminated when the MP46 is plugged in and communicating.

Back Panel

Back Panel, MP36

The back panel of the MP36 has an analog output port, a USB port, a headphone port, an I/O Port, a Trigger Port, a DC input, a fuse holder, a power switch, and the unit's serial number.

The back panel of the MP46 has a USB cable and headphone port.

Analog Out Port – Low Voltage Stimulator

There is one 9-pin male "D" analog output port on the back of the MP36 that allows signals to be amplified and sent out to devices such as headphones. On the MP36, Analog Out is built-in low voltage stimulator.
Not available for MP46.

USB Connection

The MP36 connects to the computer via a USB Port, located just below the word USB.

- Uses a standard USB connector.
- Should only be used to connect the MP36 to a PC or Mac.

The MP46 USB cable is a full-speed USB connector and should only be used to connect the MP46 to a PC or Mac USB port.

Headphone Output

- Accepts a standard (1/8" or 3.5 mm) stereo headphone jack.

I/O Port (MP36 only)

- Accepts a DB 25 Female connector.
- Input/Output port used to connect digital devices to the MP36.

I/O PORT (MP46)

- Accepts BN-SMART-IOCBL TTL interface cable (can be used to connect digital devices).
- 1 meter cable connects to the small I/O port on the MP46 and terminates in a male DSub25 connector.

Trigger Input (MP36 only)

- Accepts a male BNC connector.
- Input port used to send trigger signals from another device to the MP36.
- MP system external trigger inputs are TTL compatible—this means that one needs to send the external trigger input 0 volts for a TTL low and 5 volts for a TTL high.

  The external trigger inputs are equipped with internal pull-up resistors—this means that they automatically sit at TTL high, if left unattached.

  - This is a common and helpful implementation, because all one requires to implement an external trigger is to pull the external trigger input low.
  - This implementation is typically performed with an external switch placed between the external trigger input and ground.

- When the switch is closed the external trigger input is pulled to TTL low.
- When the switch is opened the external trigger input is pulled back (by the internal pull-up resistor) to TTL high.

To sync several MP systems together, so that one external trigger can start all the MP systems simultaneously:

1. Connect all the MP systems grounds together.
2. Connect all the MP systems external trigger inputs together.
3. Place a switch between any MP system external trigger input and ground.

When the switch is pressed, all the MP systems that are connected together will be triggered simultaneously.

DC Input (MP36 only)

Use the DC Input to connect a battery, AC/DC converter or other power supply to the MP36.

- The power supply requirements for the MP36 are 12 VDC @ 1 Amp. Only use the AC300A power adapter with the MP36. The AC300A is a 12 VDC @ 1.25 Amp power supply adapter that can connect to any mains rated as 100-250 VAC @ 50/60Hz, 40 VA.
- The receptacle is configured to accept a "+" (positive) input in the center of the connector and a "-" (negative) input on the connector housing.

Fuse Holder (MP36 only)

The fuse holder contains a fast-blow fuse that helps protect the MP36 from shorts on its power, analog, and digital I/O lines. The MP36 uses a 1.0 amp fast-blow fuse.

- To remove the fuse, use a screwdriver to remove the fuse cover located below the word Fuse.

Power Switch (MP36 only)

- ON position — powers up the MP Unit OFF position — cuts the flow of power

Fixed Hardware Low Pass Filters

To provide for anti-aliasing for the digital IIR filters and to reduce high frequency noise, the MP unit employs a low pass filter. These filtering options are incorporated into each MP unit channel:

MP36: Low pass filter is set at approximately 20 KHz

MP45: Low pass filter is set at approximately 8 KHz

Fixed Hardware High Pass Filters

To accommodate the DC offsets associated with a range of biopotential and transducer signals, the MP unit employs a switchable bank of single pole high pass filters. These filtering options are incorporated into each MP unit channel:

MP36/46: High pass filter option of DC (HP filter off), 0.05Hz, 0.5Hz and 5 Hz.

Cleaning Procedures

Before cleaning, be sure to unplug the power supply from the MP36 or unplug the MP46 USB cable from the computer. To clean the MP36, use a damp, soft cloth. Abrasive cleaners are not recommended as they might damage the housing. Do not immerse the MP36 or any of its components in water (or any other fluid) or expose to extreme temperatures as this can damage the unit.

MP36/46 Specifications

Analog Inputs	Front panel DSUB 9f labeled “CH #”	
Number of Channels:	Isolated human-safe universal input amplifiers	
	MP36: 4 Channels MP46: 2 Channels	
A/D Sampling Resolution:	MP36: 24-bit MP46: 16-bit	
Gain Ranges:	MP36: 5x to 50,000x (13 steps) MP46: 10x to 20000x (11 steps)	
Input Voltage Range:	MP36: Adjustable from ± 200 µV to ± 2 V MP46: Adjustable from ± 500 µV to ± 1 V MP36/46 ± 10 V with SS70LA	
Signal to Noise Ratio	MP36: > 89 dB min MP46: > 65 dB min at 20000x gain	
Input Noise Voltage:	MP36: 0.1 µV rms noise (0.1 Hz to 35 Hz) – nominal MP46: 0.3 µV rms noise (0.1 Hz to 35 Hz) - nominal	
Input Noise Current:	2.1 pA rms (0.1 Hz to 10 Hz) - nominal	
CMRR:	85 dB minimum	
Software Filters:	Three programmable digital (IIR) filters; automatic or user-adjustable	
Hardware Filters:	Low pass – 20 KHz (MP36); none (MP46) High pass – DC, 0.05 Hz, 0.5 Hz, 5 Hz (MP36/46)	
Channel-to-Channel Latency:	None: Channels are sampled simultaneously	
Analog Output		± 0.5 V output Headphone jack (MP36/46): 3.5 mm stereo jack connection
Sample Rate:	MP36: 100,000 samples/sec each channel MP46: 20,000 samples/sec each channel	
Serial Interface Type:	USB 2.0 full speed	
Certification:	Complies with IEC 60601-1 EMC complies with IEC 60601-1-2 CE Marked	
Dimensions/Weight:	MP36: 7 cm x 29 cm x 25 cm / 1.4 kg MP46: 3 cm x 18 cm x 10 cm / 0.3 kg	
Additional Specs MP36 Only		
Analog Output:	Back panel DUSB 9m labeled “Analog Out”	
Voltage Output:	Range -10 V to +10 V Resolution: 16-bits	
Pulse Output:	Width: variable, 50 µsec – 100 msec Repetition: variable. 100 µsec – 5 seconds	
Pulse Level:	Adjustable from -10 V to +10 V With BSLSTMB Stimulator: 0 – 100 V	
Electrode Check:	Impedance Range 0-1 MΩ (Checks Impedance between Vin+ and GND, Vin- and GND)	
Input Triggering Options (MP36 only)		
External Trigger:	Back panel BNC labeled “Trigger” TTL positive or negative edge	
Analog Trigger:	Any Input channel (front panel “CH1 – CH4”)	
Digital Trigger:	Any of the eight input lines (back panel DSUB 25m)	
Additional Specs		
Operating Temperature Range:	0 – 70 deg C	
Storage Temperature Range:	-10 – 70 deg C	
Operating / Storage Humidity Range:	0 – 95% (non-condensing)	
Operating / Storage Pressure Range:	0 – 300 kPA	

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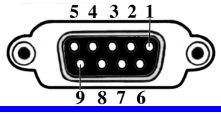
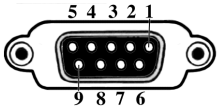
MP Unit Pin-outs

Electrode Check — MP36 Front Panel
9-PIN FEMALE DSUB



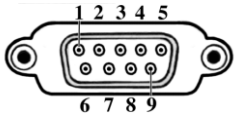
Pin		
2	Vin+	Electrode connection
3	GND	
4	Vin-	Electrode connection

MP 45/46 Input — Front
CH 1, CH 2, CH 3, CH 4
9 PIN FEMALE DSUB
(1 of 4 for MP36 or 1 of 2 for MP45)



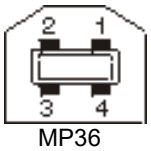
Pin	
1	Shield drive
2	Vin+
3	GND
4	Vin–
5	Shield drive
6	+5 V (50mA totally for 2 channels)
7	ID resistor lead 1; I2C SCL
8	ID resistor lead 2; I2C SDA
9	–5 V (50mA totally for 2 channels)

MP Analog Output — MP36 Back
9 PIN MALE DSUB



Pin	
1	Buffered analog or pulse output A.C. coupled (1,000 uF) Analog range: +/- 2.048 V Pulse range: 0 to 2.048 V
2	MP36 Low voltage stimulator Buffered, D.C. coupled Z out = 50 Ω Range: MP36 -10 V to +10 V
3	GND
4	+5 V (100mA max.)
5	Buffered pulse output Z out = 1 kΩ Range: 0 to 5 V
6	+12 V (100 mA max)
7	I2C SCL – Do not connect
8	I2C SDA
9	Monitor – Do not connect

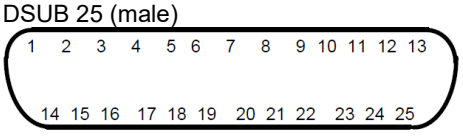
Connector — Back



MP36

Pin	
1	+5
2	-Data
3	Data +
4	GND
5	n/a
6	n/a
7	n/a
8	n/a

MP UNIT PIN OUTS continued
I/O Port — MP36 Back
DSUB 25 (male)



Note: BSL v 3.7.0 does not support Pins 7, 9, 18, 19, 20 and 21.

† Digital Input are 0-5 V with 100 K ohm pullups to 5 V on board

Pin		Pin	
1	Digital Output 1 0-5 V 8 ma	14	Digital Output 5
2	Digital Output 2 0-5 V 8 ma	15	Digital Output 6
3	Digital Output 3 0-5 V 8 ma	16	Digital Output 7
4	Digital Output 4 0-5 V 8 ma	17	Digital Output 8
5	GND Unisolated	18	Analog Input, Right 1 VRMS, centered at 0 V
6	GND Unisolated		
7	RS-232-RX	19	Analog Input, Left 1 VRMS, centered at 0 V
8	+5 V Unisolated/fused		
9	I2C-SDA 3.3. V	20	RS-232-TX 0-5 V
10	Digital Input 1† 0-5 V	21	I2C-SCL 3.3 V
11	Digital Input 2† 0-5 V	22	Digital Input 5
12	Digital Input 3† 0-5 V	23	Digital Input 6
13	Digital Input 4† 0-5 V	24	Digital Input 7
		25	Digital Input 8