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MP ACQUISITION UNIT

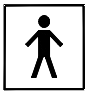
MP35 Four Channel Data Acquisition System

NOTE: The MP35 is a discontinued product. See MP36 for current product offering.

This document covers the following information for the MP35 Data Acquisition System:

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 four analog input channels on the MP35, 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.

Symbols ð MP35

Symbol	Description	Explanation
	**Type BF Equipment**	Classification
	**Attention**	Consult accompanying documents
	**On** (partial)	Turns MP35 on assuming AC300A power adapter is powered by the mains
	**Off** (partial)	Turns MP35 off if but AC300A power adapter remains powered by the mains
	**Direct current**	Direct current output
	**USB**	USB port

COMPLIANCE

Safety

The MP35 satisfies the Medical Safety Test Standards affiliated with IEC 60601-1. The MP35 is designated as Class I Type BF medical equipment

EMC

The MP35 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 MP35: electrodes, transducers, and I/O devices.

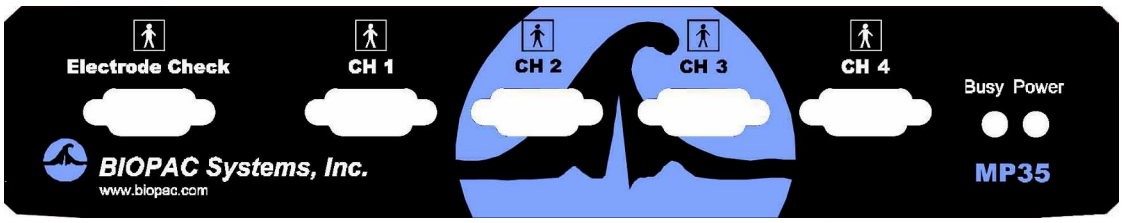
- Electrodes are relatively simple instruments that attach to the surface of the skin and pick up electrical signals in the body.
- Transducers, on the other hand, convert a physical signal into a proportional electrical signal.
- Input/Output devices (I/O for short) are specialized devices like pushbutton switches and headphones.

Simple Sensor Connectors

Regardless of the type of device connected, every sensor or I/O device connects to the MP35 using a ñSimple Sensorò connector. Simple Sensor connectors are designed to plug only one way into the MP unitð 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 .
- Headphones and the stimulator connect to the ñAnalog outò port on the back panel.
- A digital device may connect to the ñI/O Portò on the back panel.
- A trigger device may be connected to the ñTriggerò port on the back panel.

Front Panel



Front Panel, MP35

The front panel of the MP35 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.

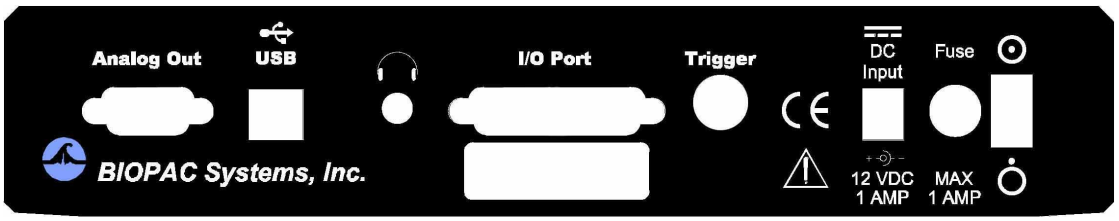
Input Ports: CH 1, CH 2, CH 3, and CH 4

- The 9-pin female analog input ports on the MP acquisition unit are referred to as Channels. There are four on the front panel of the MP35. The Biopac Student Lab Lessons software will always check to see that the proper sensors are connected to the appropriate channel.

Status Indicators

- **Busy**ð indicator is activated when the MP35 is acquiring data and also during the first few seconds after the MP35 is powered on to indicate that a self-test is in progress. (When the MP35 passes the power-on test, the Busy light will turn off.)
- **Power**ð status indicator is illuminated when the MP35 is turned on.

Back Panel



Back Panel, MP35

The back panel of the MP35 has an analog output port, a USB port, an I/O Port, a Trigger Port, a DC input, a fuse holder, a power switch, and the unitôs serial number.

Analog Out Port

There is one 9-pin male ñDò analog output port on the back of the MP35 that allows signals to be amplified and sent out to devices such as headphones.

USB Connection

The MP35 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 MP35 to a PC or Mac.

I/O Port

- Accepts a DB 25 Female connector.
- Input/Output port used to connect digital devices to the MP35.

Trigger Input

- Accepts a male BNC connector.
- Input port used to send trigger signals from another device to the MP35.
- MP system external trigger inputs are TTL compatibleð 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 resistorsð 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

Use the DC Input to connect a battery, AC/DC converter or other power supply to the MP35.

- The power supply requirements for the MP35 are 12 VDC @ 1 Amp. Only use the AC300A power adapter with the MP35. 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 ñ+ò (positive) input in the center of the connector and a ñ-ò (negative) input on the connector housing.

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Fuse Holder

The fuse holder contains a fast-blow fuse that helps protect the MP35 from shorts on its power, analog, and digital I/O lines. The MP35 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

-  ON position ð powers up the MP Unit  OFF position ð 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: The low pass filter is set at approximately 20 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: 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 MP35. To clean the MP35, use a damp, soft cloth. Abrasive cleaners are not recommended as they might damage the housing. Do not immerse the MP35 or any of its components in water (or any other fluid) or expose to extreme temperatures as this can damage the unit.

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MP35 Specifications

Analog Inputs	Front panel DSUB 9f labeled ñCH #ò
Number of Channels:	Isolated human-safe universal input amplifiers, 4 channels
A/D Sampling Resolution:	24-bit
Gain Ranges:	10x to 50,000x
Input Voltage Range:	Adjustable from ± 200 µV to ± 2 V
Signal to Noise Ratio	> 89 dB min
Input Noise Voltage:	9 nV rms /sqrt (Hz) and 0.1 µV rms noise (0.1 Hz to 35 Hz) - nominal
Input Noise Current:	100 fA rms /sqrt (Hz) and 10 pA p-p noise (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 ï 20 KHz High pass ï DC, 0.05 Hz, 0.5 Hz, 5 Hz
Analog Output	± 1 V output
Sample Rate:	100,000 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:	7 cm x 29 cm x 25 cm / 1.4 kg
Analog Output:	Back panel DUSB 9m labeled ñAnalog Outò
Voltage Output:	Range -10 V to +10 V Resolution: 16-bits
Pulse Output:	Width: variable, 50 µsec ï 100 msec Repetition: variable. 100 µsec ï 5 seconds
Pulse Level:	Adjustable from -10 V to +10 V With BSLSTMB Stimulator: 0 ï 100 V
Input Triggering Options	
External Trigger:	Back panel BNC labeled ñTriggerò TTL positive or negative edge
Analog Trigger:	Any Input channel (front panel ñCH1 ï CH4ò)
Digital Trigger:	Any of the eight input lines (back panel DSUB 25m)
Electrode Check:	0-100 KΩ (MP35) (Checks Impedance between Vin+ and GND, Vin- and GND)

(See www.biopac.com for detailed specifications)

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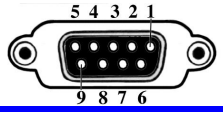
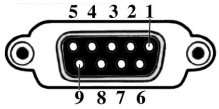
MP Unit Pin-outs

Electrode Check ð MP35 Front Panel
9-PIN FEMALE DSUB



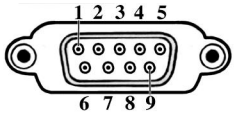
Pin		
2	Vin+	Electrode connection
3	GND	
4	Vin-	Electrode connection

MP Input ð Front
CH 1, CH 2, CH 3, CH 4
9 PIN FEMALE DSUB
(1 of 4 for MP35



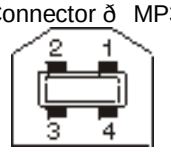
Pin	
1	Shield drive
2	Vin+
3	GND
4	Vin–
5	Shield drive
6	+5 V (100 mA max aggregate)
7	ID resistor lead 1; I2C SCL
8	ID resistor lead 2; I2C SDA
9	–5 V (100 mA max aggregate)

MP Analog Output ð MP35 Back
9 PIN MALE DSUB



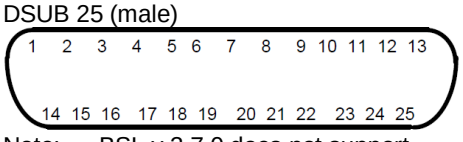
Pin	
1	Buffered analog or pulse output A.C. coupled (1,000 uF) Analog range: +/- 2.048 V Pulse range: 0 to 2.048 V
2	Pulse or CH data Buffered, D.C. coupled Z out = 50 q Range: 0 V to +4.096 V
3	GND
4	+5 V (100mA max.)
5	Buffered pulse output Z out = 1 kq Range: 0 to 5 V
6	+12 V (100 mA max)
7	I2C SCL ï Do not connect
8	I2C SDA
9	Monitor ï Do not connect

Connector ð MP35 Back



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 ð MP35 Back
DSUB 25 (male)



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

À 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 1À 0-5 V	21	I2C-SCL 3.3 V
11	Digital Input 2À 0-5 V	22	Digital Input 5
12	Digital Input 3À 0-5 V	23	Digital Input 6
13	Digital Input 4À 0-5 V	24	Digital Input 7
		25	Digital Input 8