![BIOPAC Systems, Inc. logo]

**PRODUCT SHEET**

info@biopac.com
**support@biopac.com**
www.biopac.com

## STP100C ISOLATED DIGITAL INTERFACE



STP100C (center) connected to MP160 and HLT100C (not included)

The STP100C provides 8 lines for digital data inputs and 8 lines for digital data outputs. All inputs and outputs associated with the STP100C safely isolate connections to the MP System to 1500 VDC isolation.

- MP System Digital Input Lines: I/O 8-15
- MP System Digital Output Lines: I/O 0-7

The STP100C is used to safely isolate digital input and output lines to and from the MP System (MP160 and MP150).

The STP100C connects the MP System to computers running SuperLab, E-Prime, Inquisit, DirectRT, and other psychophysiological stimulation applications. The STP100C also includes output to drive solid state relay and incorporates a BNC accessible External Trigger input line. The STP100C module can also be used to connect digital signals (standard logic level) from any mains powered external equipment to the MP System when the system also connects to electrodes attached to humans.

- **STP100C** Digital I/O card 37-pin connector pins (10-3) map to I/O15 - I/O8 on MP unit.

**NOTE:** To interface the STP100C with devices that use BNC outputs, such as the fNIR System trigger ports, use the CBL125 BNC-to-BNC cable.

### SuperLab Interface (uses Digital I/O card with 37 pin DSUB connector)

The STP100C optical interface can be used to interface to the MP System when SuperLab™ and the Digital I/O card with the Support Pack are already available. The STP100C interface connects between the SuperLab™ Digital I/O card and the AMI100D/HLT100C module. (Or UIM100C module if using MP150 hardware.)

PORT A - Input to SuperLab: (pins 37-30) connect to MP System Digital I/O lines 0-7

PORT B - Output from SuperLab: (pins 3-10) connect to MP System Digital I/O lines 8-15

5 V power provided on pin 20

### Parallel Port Interface (uses standard PC printer port with DSUB 25 connector)

Output from E-Prime: (pins 2-9) connect to MP System Digital I/O lines 8-15

Input to E-Prime: (pins 13, 12, 11, and 10) connect to MP System Digital I/O lines 4, 5, 7, and 6.

5 V power provided on pin 15

### Output Drives (for relays or general purpose logic level outputs)

The STP100C can drive up to four (4) solid state relays directly via the MP System Digital I/O lines 0-3.

| MP Digital I/O Line | Corresponding BNC Output |
|:---:|:---:|
| 0 | 1 |
| 1 | 2 |
| 2 | 3 |
| 3 | 4 |

MP System Digital I/O line 4 is used as an enable to activate these drive lines.

ON = low (0 V) signal on I/O line 4

OFF = high (5 V) signal on I/O line 4

**PRODUCT SHEET**

info@biopac.com
**support@biopac.com**
www.biopac.com

The output drives (for relays or general purpose logic level outputs) have 0 to 5 V output voltages and are current limited with 200 Ω resistors. This means that for solid state relay drive requirements, output current will be limited to approximately 20 mA, assuming an optically isolated solid state relay input diode drop of 1.2 V. Nearly all solid state relays can operate with as little as 5 mA of current drive.

## Digital Inputs

The STP100C is designed to work with digital inputs in the range of 0-3.0 V, 0-3.3 V and 0-5.0 V. The STP100C Digital inputs pull high and require current sinking ability of 4 ma to drive low. Digital high inputs must be greater than 2.5 V and Digital low input voltage must be less than 0.5 V.

### MP160 Hardware with AMI100D

For recognition of AMI100D and Smart Amplifier hardware, Digital channel 15 must be set high. When no external hardware controls the channel, it is normally held high. If connecting to hardware that affects Digital channel 15 (e.g., parallel port or parallel port adapter), third party software must be configured to allow D15 to remain high during three critical periods: (1) when Acq*Knowledge* is launched, (2) during channel setup when Acq*Knowledge* is asked to detect Smart Amplifiers, and (3) when the "Start" button is pressed either to commence acquisition or to begin waiting for a trigger.

## Isolated External Trigger Input

The optically isolated external trigger input is standard logic level compatible. This line is accessible via a BNC female connector (labeled TRIG on the front of the STP100C)* and connects to the MP unit External Trigger input via optical isolation, compliant to 1500 VDC. The voltage range for this drive can support digital triggers in the range of 0-3.0 V, 0-3.3 V and 0-5.0 V.

*Alternatively, the isolated trigger input is also accessible via pin 12 of the DB-37 connector on the rear panel. (STP100C units manufactured after May of 2017 only.)

When the STP100C trigger is unused, it is pulled to a high state (+5 V) via an internal 100 kΩ resistor. To properly drive this line, connect a standard logic level driver to this port. For non-logic level type drivers, the low voltage applied to a trigger should ideally be between 0 and 1.0 V. The high voltage applied to the trigger should ideally be between 3.5 and 5 V. The maximum recommended source impedance of the driver should not exceed 1 kΩ. The trigger will accommodate logic levels anywhere in ±10 V range, but low level should be less than 1.0 V and high level should be greater than 3.5 V.

The pulse width to the STP100C trigger input should be greater than 100 µsec and can be high going or low going. The MP system can be set up via Acq*Knowledge* to trigger on positive or negative edges.

Additionally, to use the STP100C external trigger in a manual mode, the input can be pulled low with an external switch connected between the trigger input and ground.

To externally trigger MP Unit acquisition, send a logic level signal to the External Trigger of the STP100C (TRIG). This line connects to the MP Unit External Trigger via optical isolation.

### MP150 Hardware with UIM100C only:

To use an MP System line normally dedicated to an I/O input (lines 8-15) to sample the External Trigger drive, use a JUMP100 jumper wire to connect that line directly to External Trigger (EXT T) on the back of the UIM100C. To increase the speed of the trigger response, place a 500 Ω resistor from TRIG to 5 V on the back of the UIM100C with STP100C connected. This will allow the STP100C to process pulse widths as narrow as 1 msec.

**PRODUCT SHEET**

info@biopac.com
**support@biopac.com**
www.biopac.com

## STP100C Instructions

1. Snap the STP100C module DSUB I/0 connectors on the left side of the AMI100D, HLT100C, or UIM100C module.

2. Use the 3-meter ribbon cable to connect the STP100C module (computer I/O 37-pin connector) to the digital I/O card in the PC.

   - Connects Port A (inputs; pins 37-30) on the digital I/O card to digital I/O lines 0-7 on the MP unit.
   - Connects Port B (outputs; pins 3-10) on the digital I/O card to digital I/O lines 8-15 on the MP unit.

3. For debugging purposes, ground pins are:

   - 37-pin digital I/O cable (CBL110A): pins 19 and 21 are GND.
   - 25-pin printer port cable (CBL110C): pins 18 and 25 are GND.

---

**Application example — P300 visual evoked response test**

To set up the STP100W with an MP System to perform a P300 visual evoked response test:

1. Connect two **SuperLab** outputs to the respective MP System digital inputs.

   - These **SuperLab** outputs are assigned to respective images that will be presented to the subject during the recording session. Typically, image presentation occurs within a statistical framework, i.e., *Image 1* is presented 20% of the time and *Image 2* is presented 80%. The **SuperLab** outputs will be tightly (1 ms) synchronized to the respective image presentation.

2. Set the MP System up to record EEG and the two **SuperLab** outputs, which should be directed to the MP System digital inputs.

3. After the recording session has been completed, use Acq*Knowledge* to perform specific averaging on the collected EEG data.

   a) Use the digital input corresponding to **SuperLab** output 1 as a "Control Channel" in the Find Peak Averaging Setup; all the responses resulting from *Image 1* presentation will be averaged together to create the composite response for *Image 1* presentation.

   b) Repeat the above procedure with the "Control Channel" assigned to **SuperLab** Output 2 to create the composite response for *Image 2* presentation.

   For more information on setting up the **Find Cycle (Cycle Detector) Off-line Averaging** for this kind of measurement, see the Acq*Knowledge* Software Guide.pdf.

---