

# MD-EXP4040 Expansion Board Installation Guide

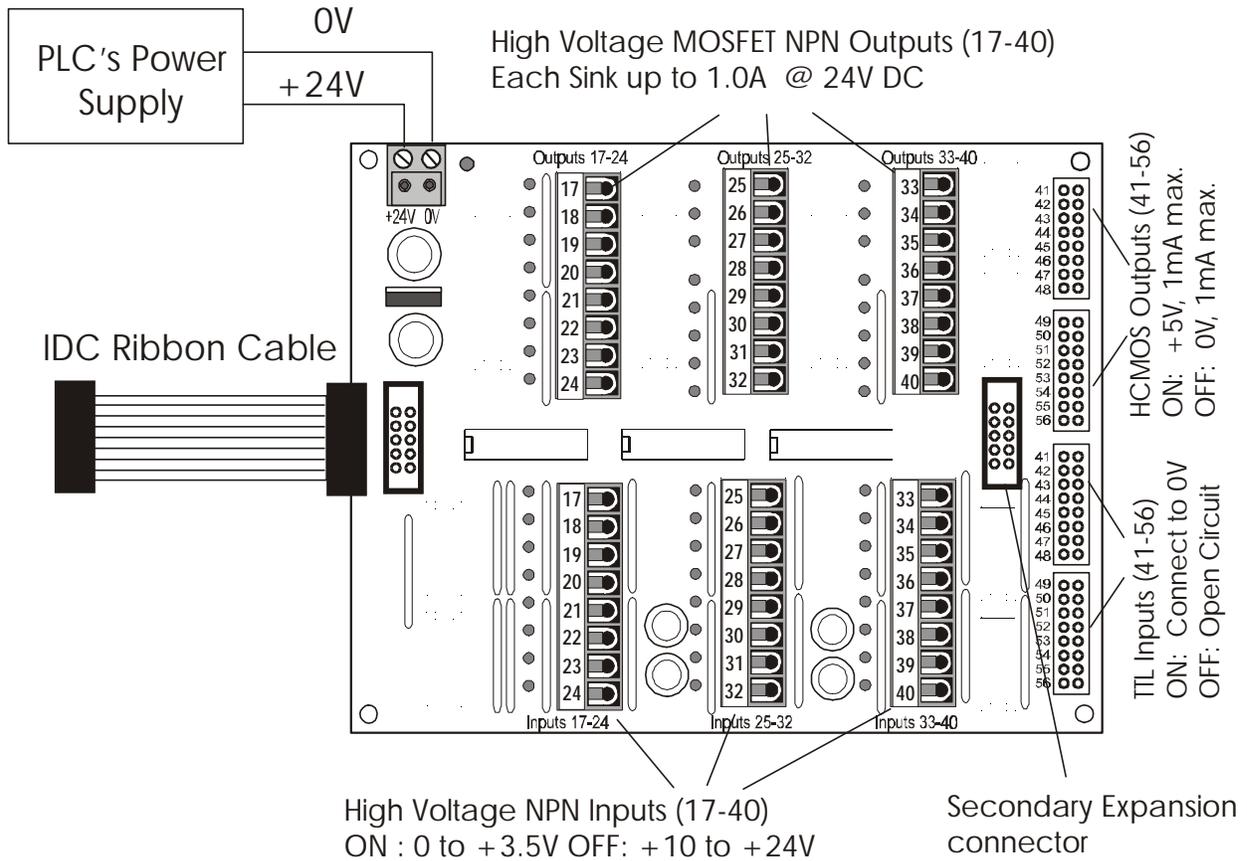


Figure 1 - 40 I/O Expansion board for T100MD PLC

## 1. Introduction

The MD-EXP4040 is an expansion board specifically designed for the T100MD PLC. It adds additional 40 digital inputs and 40 digital outputs to the T100MD1616+, giving it a total of 56 digital inputs and 56 digital outputs. Of these expansion I/Os, 16 of the expansion digital inputs are TTL levels, and 16 of the expansion digital outputs are 5V HCMOS logic level type. Newer generation of MD-EXP4040 also has an secondary expansion connector on the right side of the PCB which allows a second expansion board or a HMI to be connected. When using two MD-EXP4040s, a T100MD+ PLC can be expanded to a total I/O of 96 inputs and 96 outputs.

The MD-EXP4040 is identical in size to the T100MD1616+ PLC. This allows the expansion board to be "stacked" on top or below a T100MD1616+ PLC for applications where the controller must be fitted within a very tight space.

## 2. Physical Mounting & Wiring

The MD-EXP4040 requires 4 PCB standoffs (or some screws and nuts) to support the board. It is usually mounted side-by-side to the right of the T100MD1616+ PLC. You must plug the supplied ribbon cable to the PLC's expansion connector located along the right edge of the PLC.

The supplied ribbon cable is meant for side by side mounting of the expansion board. If you wish to stack the MD-EXP4040 on top or below the T100MD1616+, you will need to make or purchase a longer expansion ribbon cable (approximately 8 inches long) in order to connect the PLC to the expansion board.

**Digital I/O Ports:** Detachable screw terminals are provided for quick connection to all digital inputs, outputs and power supply wires. Each block of screw terminals can easily be detached from the controller body, enabling easy replacement of the controller board when necessary. Since the terminal block for digital I/O is inserted vertically to the board surface, you need to remove the terminal block before you can start wiring. Use a small flat-head screw-driver and insert underneath the terminal block, apply even pressure to raise the terminal block until it becomes loosened from the connecting-pin strip, as shown below:

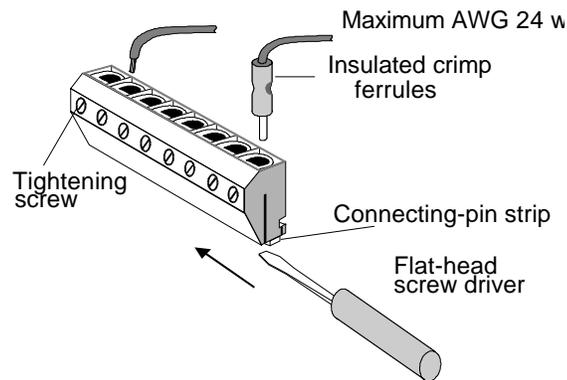


Figure 2 - Removing Screw Terminal block

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### 3. Power Supply

The MD-EXP4040 must be connected to **SAME** 12-24V power supply as the PLC. The power supply is to be connected to the 2-way detachable screw terminal located on the top left side of the board as shown in Figure 1.

Although the expansion board actually draws +24V power from the PLC via the ribbon cable so that it appears to work even if you don't wire the external power to the power supply screw terminal, we strongly recommend wiring up the power supply terminals to reduce chances of high current induced spikes from interfering with the expansion I/O signal.

Please use only industrial grade linear or switching regulated power supply from established manufacturers for best results. Using a poorly made switching power supply can give rise to a lot of problems for the PLC.

Always place the power supply as near to the PLC and the expansion board as possible and use separate wires to connect the power to I/O. Keep the power supply wire as short as possible and avoid running it along side high current cable in the same cable conduit.

## 4. Digital Input Circuits

Input #	Type	Voltage Level
17- 40	12-24V DC NPN	OFF: Open Circuit or +10V to +24VDC. ON: 0V to +3.5V DC
41 - 56	5V TTL Logic-Level	OFF: Open Circuit or +2.0V to +5.0VDC. ON: 0V to +0.8V DC

### High Voltage NPN Inputs

When connected to a T100MD888+ or T100MD1616+ PLC, the first 24 expanded inputs should occupy Input #17 to #40. These are all high voltage NPN type and they are identical to the digital inputs (#1-16) of the other T100MD+ PLCs. All these inputs have green color LED indicators. Every 8 inputs are grouped together into a single strip of detachable screw terminal. The input numbers are marked on their screw terminals as well as on the PCB alongside the solder pin. Please refer to T100MD1616+ installation guide for the wiring diagram for these inputs. (Note: when used with the T100MD2424+ PLC, these inputs occupy #25 to 48, and when used as a second expansion board, these inputs occupy #57-80. Please use the supplied labels for non-default I/O numbering).

### TTL Logic-Level Inputs

The MD-EXP4040 features 16 TTL-level inputs #41 to #56 which are internally pulled up to +5V via 2.2K resistors. These TTL inputs are ideal for connecting to push buttons and many low cost sensors that operates at TTL or CMOS logic level. They are also ideal for connecting to keypads which offer a low cost solution for connecting 12 or 16 keys to the PLC.

These TTL inputs are negative logic type. I.e. An input is ON when it is connected to 0V and OFF when it is open-circuit or connected to +2.0V to +5.0V. these inputs are made available on 2.54mm (0.1") center header pins which can be connected easily using IDC connectors that can be purchased from any local electronics stores.

To simplify wiring, a 0V pin is made available adjacent to every input pin. Hence to turn on an input one only has to short the input pin to its adjacent 0V pin! There is no need to connect to external +5V power. Connection to push button switches is hence extremely simple, as shown in the following diagram:

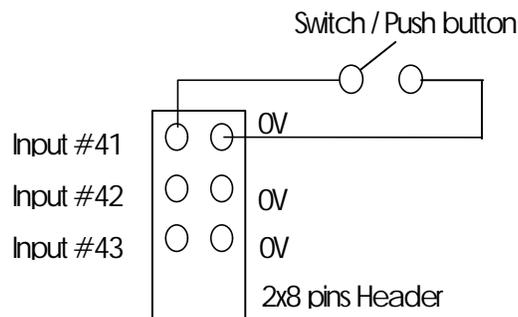


Figure 3 - Close the switch will turn ON a TTL Logic-Level Input.

## 5. Digital Output Circuits

Output #	Type	Voltage Level
17- 40	12-24V DC NPN MOSFET driver	OFF: pulled up to +24VDC via 5.6K resistor ON: 1.2V @ 1.0A per output.
41 - 56	5V HCMOS Logic level	OFF: 0V sink 1.0mA max. ON: +5V source 1.0mA max.

### High Voltage MOSFET Outputs

Output #17 to #40 are high voltage, high current DC NPN type outputs which are identical to the digital outputs (#1-16 ) of the T100MD1616+ PLC. All these outputs have red color LED indicators. Every 8 outputs are grouped together into a single strip of detachable screw terminal. The output numbers are marked on their screw terminals as well as on the PCB alongside the solder pin. Please refer to T100MD1616+ installation guide for the wiring diagram for these outputs. (The output numbering follows the Input numbering when connected to a T100MD2424+ PLC or when connected as a second expansion board. Please refer to section 4 for description the I/O numbering scheme.)

### HCMOS Logic-Level Outputs

The MD-EXP4040 features 16 HCMOS logic-level outputs #41 to #56. These outputs are also compatible with TTL logic level and hence are ideal for connecting to many low cost electronics control hardware that are controlled by TTL or CMOS level signals.

Please note that these outputs are positive logic type, i.e. If an output has been turned ON, the corresponding pin will output a +5V and if it is turned OFF, it will drive the output pin to 0V. Since the driver type is HCMOS both source and sink operation are capable of delivering up to 1.0mA.

To simplify wiring, a 0V pin is made available adjacent to every output pin. Hence to interface to an external logic device one only has to connect the output directly to the device and connect the 0V to the device's ground signal, as follow:

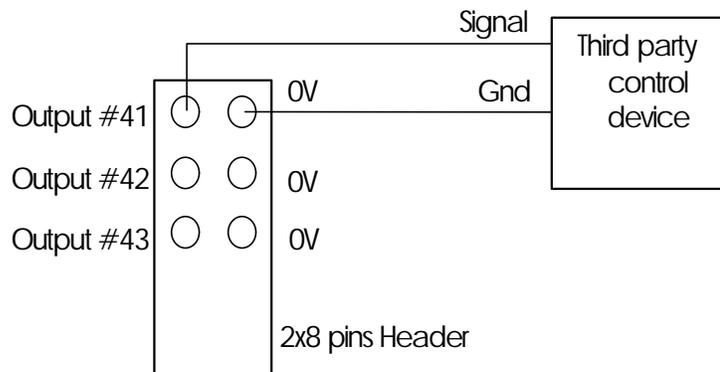


Figure 4 - Interfacing HCMOS Outputs to External Logic Device.