

PLG240
Programmable Bipolar Stepping Motor Driver/Controller
(Preliminary release)

Operating Instructions

Key Features

Controller features:

- **Constant speed** movement or **Indexed** movement
- **If <inputs> Then...** and **Goto** instructions
- **I/O control** **Timer** **Loop** control **Set Current**
- Programmable run speed, start/stop speed, index distance...

- RS232 programmable, Window95 commander software
- **Fill-in-the-form** style programming, No protocol or language to learn
- 255 bytes of code space (~150 complex instruction lines)
- 23 sets of motion parameters
- Emergency stop input
- Opto-isolated general purpose I/O ports (3 inputs and **2 outputs**)

Driving capability:

- **Bipolar driver**
- High input voltage: 12-48 VDC
- High running current: 1-3 A/phase
- **Micro stepping** mode: 1/8, 1/4, 1/2, full step

Additional features:

- All **pluggable** terminal blocks for easy cabling
- LED indicator for power
- **Small size : 3.2" x 4.2" x 1"**

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A Subsidiary of Mycom[®], Inc

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Table of Contents

1. Description
2. Specifications
3. Hardware Description
 - 3.1 Pin Description & Input Circuits
 - 3.2 Input/Output circuits
 - 3.3 RS232 communication port connection
 - 3.4 PLG240 operation mode
4. Software Description
5. Mechanical Specification

1. Description

PLG240 is the new generation of Nyden's bipolar stepping motor driver to address market demanding for lower cost, higher performance and higher system integration. It delivers the embedded control, bipolar driving technology, user programming capability, and I/O operation in one small package (3.1"x4.1"x1.1").

The embedded micro-controller allows PLG240 communicate with the host PC. It executes user program, generate control signals for stepping motor driver module and I/O module. On board switching power supply allows single voltage supply for both logic and power circuits.

Three (3) inputs and two (2) outputs allows PLG240 to interface with the rest of custom motion control system. A small motion system can be built around PLG240 with few external devices, e.g. limit switches, opto-sensors, and solenoid. Simple and easy interface (pluggable terminals) is ideal for quick turn-around projects.

PLG240 programming might be the easiest task for your project. Eleven task oriented PLG instructions are directly listed on the screen with full description. Single click of any command button will add that command to the end of commander list or the next line of your current selected line, and then prompt you the command edit dialog for entering related parameters. Double-click the instruction list allows you to edit PLG instructions. All instructions and parameters are explicitly spelled out in full English description, -- **so you don't have to learn and remember any 'shortcuts'**. A single "Up-Down Load" button opens the gateway to PLG240 board. The PLG240 program automatically configures the selected communication port and restores the original configuration upon exit.

2. Specifications

Absolute Maximum Ratings

DC input voltage : 60 VDC
Continuous Phase Current : 3 A

Peak Phase Current : 6 A
 Input Current : 30 mA
 Output Current : 150 mA

Electrical ratings

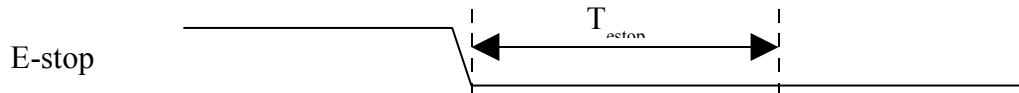
Symbol	Description	minimum	typical	maximum	units
V_{mm}	Main board source	12		50	V
I_{ss}	Main input current	0.7		3	A
I_{motor}	phase output current	1.0		3.0	A
$I_{in-source}$	Logic input current	5	10	15	mA
$V_{in-source}$	Logic input source		*		V
I_{out}	Output port current	0		150	mA
T_{estop}	Hold time for emergency stop	10			μ s
T_{in}	Input hold time before it is accepted by controller	50**			μ s
B_{rate}	Baud rate	9600	9600	9600	
T_{amb}	ambient temperature	0		+50	$^{\circ}$ C
T_{stg}	storage temperature	-40		+125	$^{\circ}$ C

Notes:

* Standard version is 24VDC. Also available for 5 VDC input interface.

** Inputs are polled in the different stage of program execution, may vary significantly.

Timing diagram:



3. Hardware Description

3.1 Pin Description and Input Circuits

3.1.1 Pin Assignment Table

Port 1:

Pin #	Assignment	Description
1	I/O common	I/O common
2	$V_{in-source}$	Source voltage supply for logic I/O
3	Output#2*	Output#1 (open collector)
4	Output#1*	Output#2 (open collector)
5	E-Stop/Halt	Low input at this input halt Plg240
6	Input#2*	Input#2 (internal pull high)
7	Input#1*	Input#1 (internal pull high)
8	Input#3	Input#3 (internal pull high)

* Assignment of these pins will be changed in the future release version.

Port 2:

Pin #	Assignment	Description
1	/B	Connect to motor /B phase
2	B	Connect to motor B phase
3	/A	Connect to motor /A phase
4	A	Connect to motor A phase

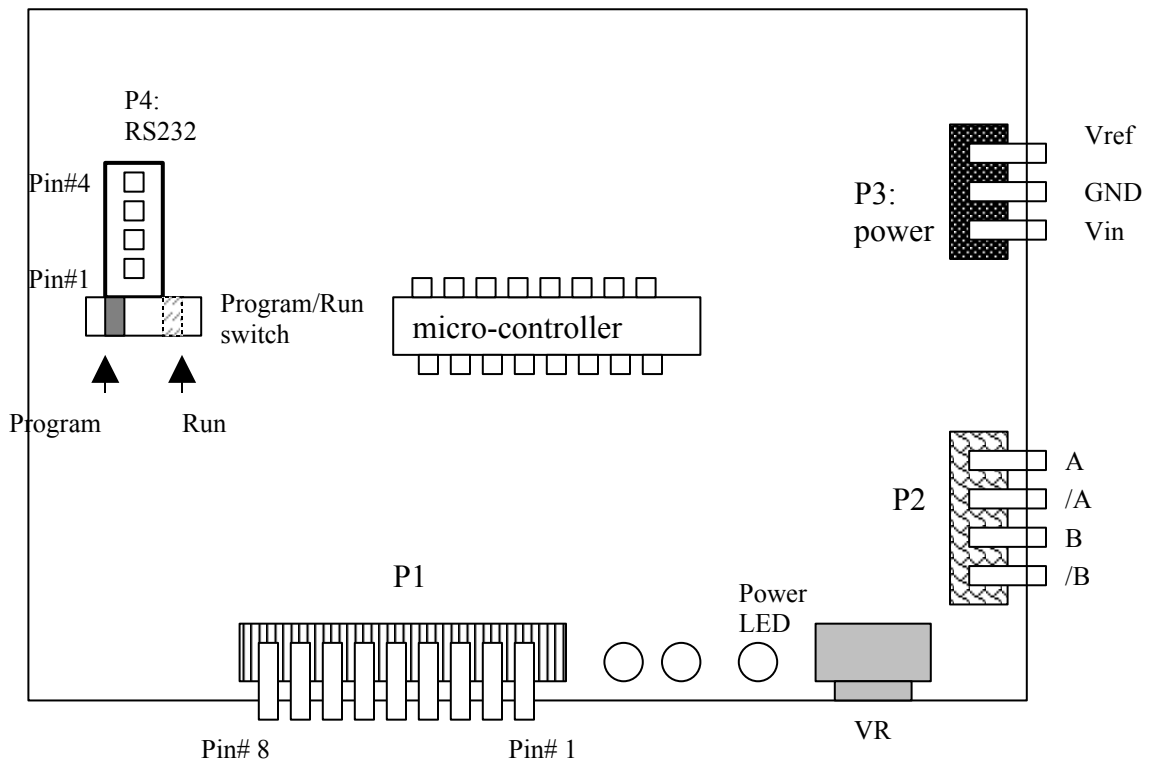
Port 3:

Pin #	Assignment	Description
1	Vmm	Power supply for Plg240
2	GND	Ground
3	Vref	Reference voltage input

Port 4:

Pin #	Assignment	Description
1	TX	Data transmit out from PLG240
2	RX	Data receive line
3	GND	Ground
4	N/C	No connection

3.1.2 Connector Location and Pin Position



3.2 Input/Output circuits

The logic input circuit diagram is shown in Figure 1. And the output circuit is shown in Figure 2. Figure 1 also shows the typical connection methods for these I/O ports.

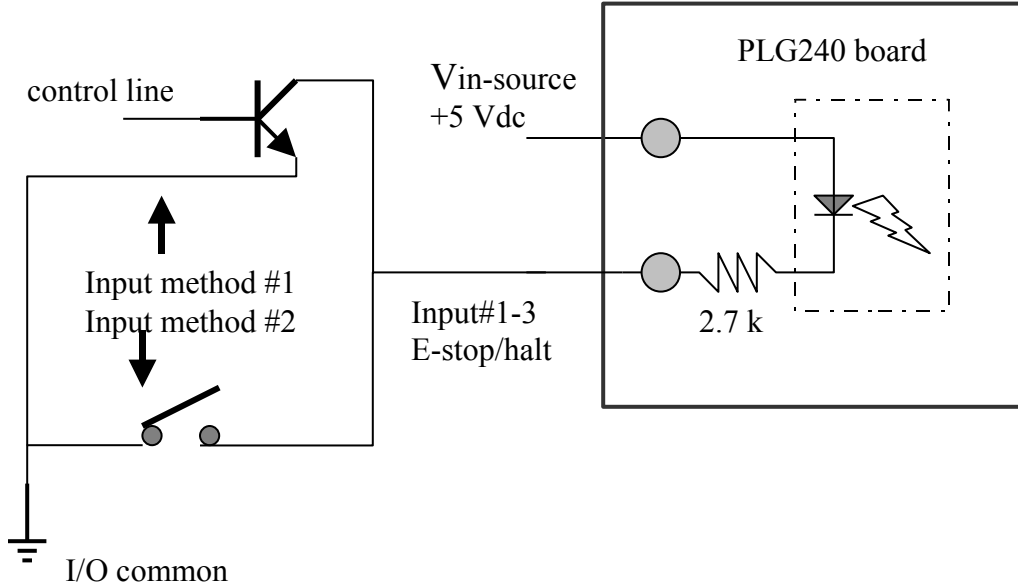


Figure 1. Input circuit and connection diagram

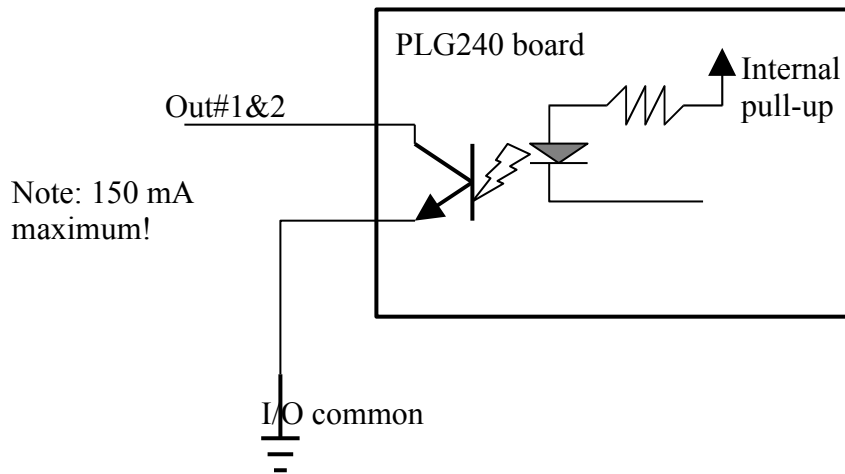


Figure 2. Output circuit diagram. The methode#1 in fig.1 is the typical wiring for these output circuits.

The emergency stop input is interrupt input. When E-Stop shorted to ground, PLG240 will be halted and cut the motor current to zero within $\sim 10 \mu\text{s}$. Upon release of

E-stop, PLG240 return to normal operation routine and continue from where is interrupted. To completely reset PLG240, you may turn off-on the power supply.

All inputs are general purpose in nature. They can be connected to operator panel switches, travel limit switches, optical sensors and etc.

Output circuit is opto-isolated from PLG240 internal circuit, and can be used to control a variety of devices as long as the current through the output loop is within the spec (150 mA/pin).

3.3 RS232 communication port connection

To make your own cable for host PC connection, following the wiring diagram of Figure 3.

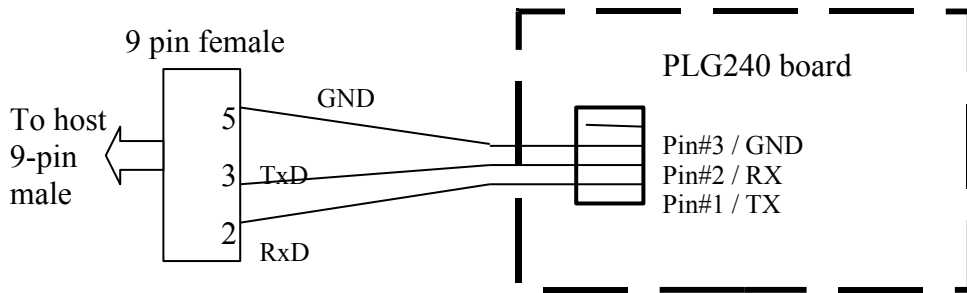


Figure 3. RS232 cable wiring method

Note: If a 25 pin connector is used by the host PC, then use Pin#7 of the 25 pin connector instead of Pin#5 for logic ground signal. Pin 2 and 3 remain unchanged.

3.4 PLG240 operation mode

PLG240 has two basic operation modes: Programming mode and Auto-Run mode. Upon power up, the on-board micro-controller enters initialization phase. During this stage, the motor current is set to zero and output pins are 'open'. PLG240 checks the Program/Run switch at this stage. If switch was in 'Program' position, PLG240 enters the programming mode. During programming mode, the RS232 communication module is activated and inputs have no effect on the PLG240. All outputs are in open status and motor current is cut back to zero. For details of PLG240 programming mode operation, please refer to section 4 - " Software Description".

If the switch was in 'auto-run' position during initialization phase, PLG240 will enable interrupt for E-Stop and enter auto-run mode. Please note that PLG240 will be halted in any time if E-stop line is pulled low.

4. Software Description

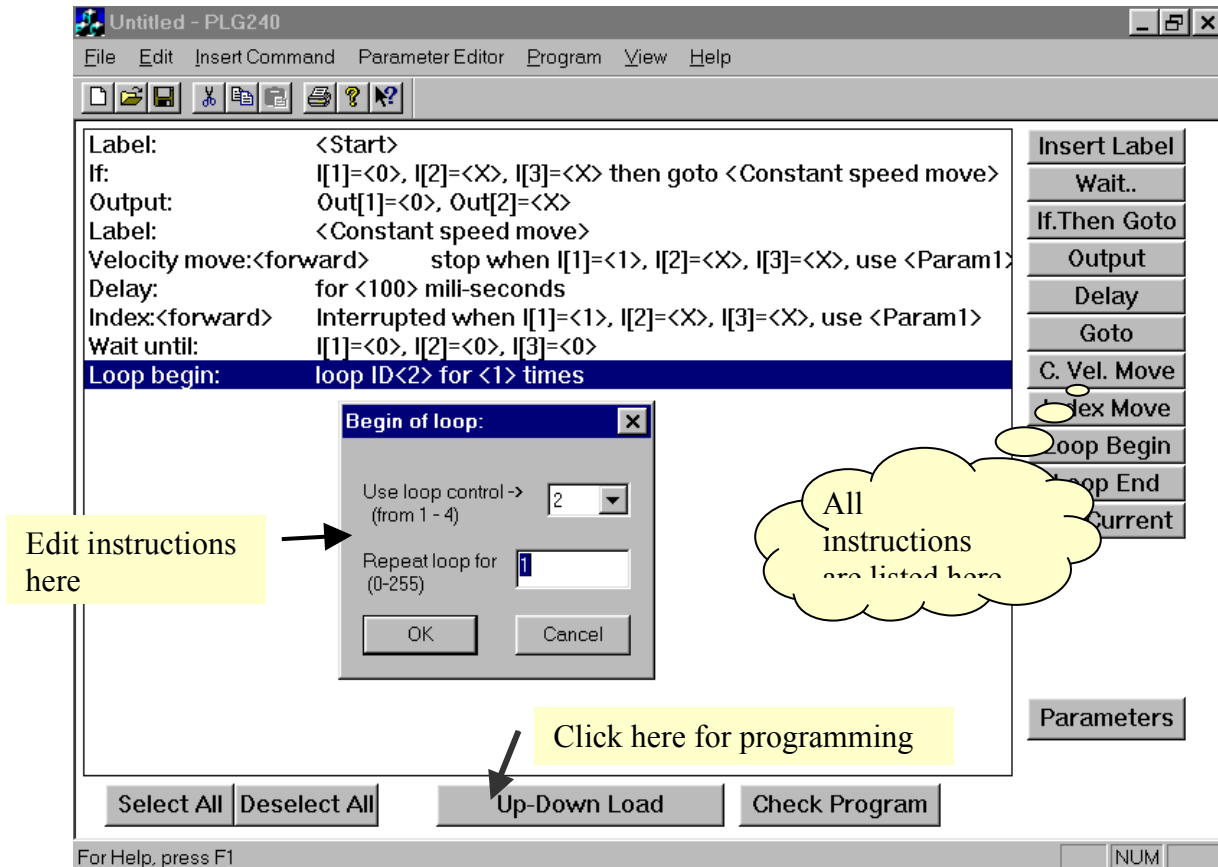
The PLG240 commander contains two main modules: commander editor and communication module. The editor incorporate most windows standard editing features. All eleven (11) instructions for PLG240 are shown on screen. Each click of instruction buttons will add it to the *Command List Box*. Double click any items in *Command List Box* will bring the Command Edit Dialog to the front window for user input. All commands are automatically formatted and checked for syntax error or out-of-range.

All PLG240 commands can be grouped into 4 groups based on their function. Group I command include standard window operations, such as file and print operation, common edit features. Most of them are available through pull down menu. In addition, *Select All* and *Deselect All* are also available on the top window.

Group II command includes *Parameter Editor* and *Check Program*.

Group III contains one button - 'Up and Down Load' - is the gateway to PLG240.

Group IV is PLG240 instruction set, and includes 11 on screen control buttons.



On screen command buttons:

Note: Bit field sequence used in following section is always from Bit7 (MSB).... Bit0 (LSB)

Group I. *Select All, Deselect All* - select and deselect items listed in *Command List Box*.

Group II.

Parameter Editor and Check Program

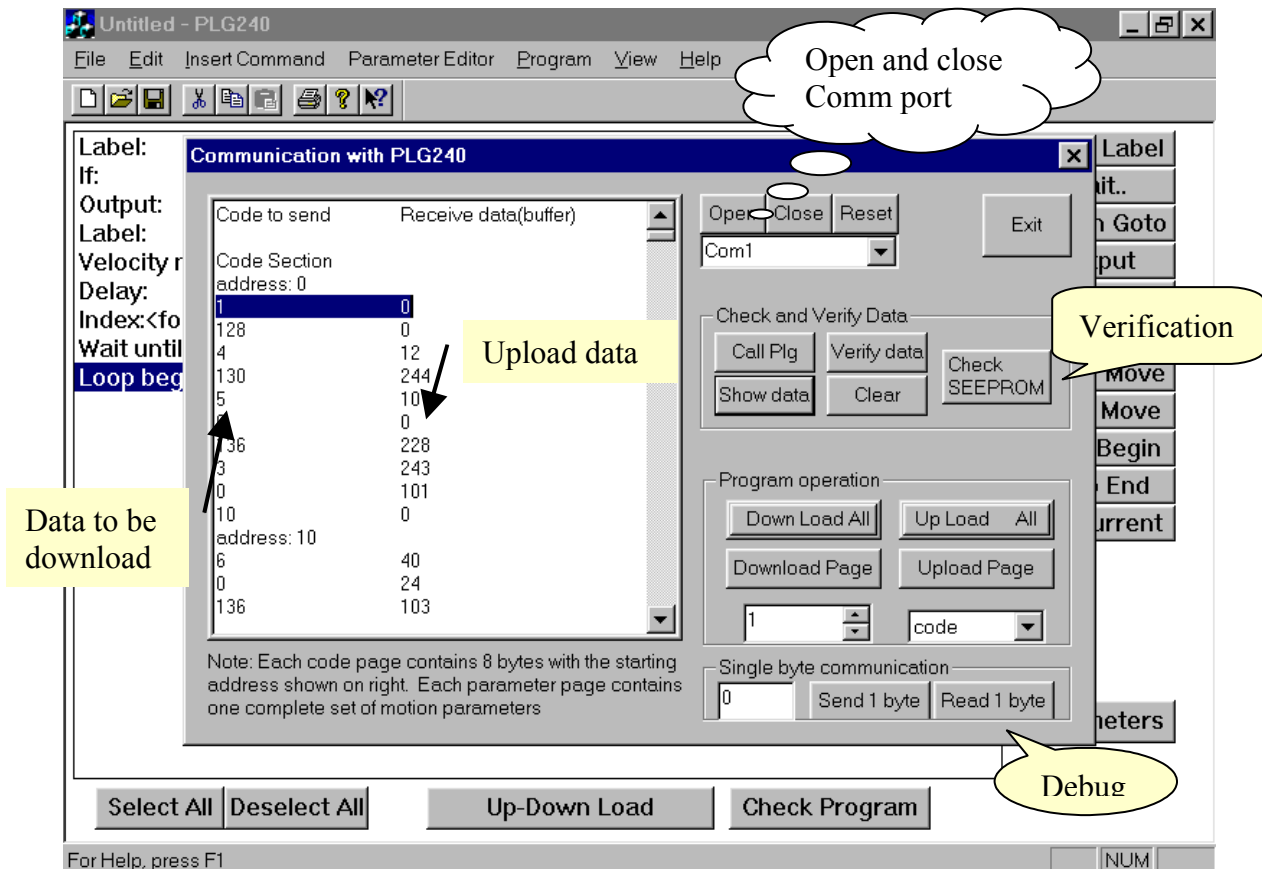
Click on "Parameters" will bring you the parameter editor dialog to the front. In parameter editor, you can freely edit the 23 sets of motion parameters to be used in user program. The parameters include maximum run speed, start speed, stop speed, ramp rate, stepping mode, and index distance.

"Check Program" will check user program and report errors and warning.

Group III.

Communication

When "Up-Down Load" clicked, the software will check user program first. If there is no error or the command list is empty, it brings up the "*Communication with PLG240*" window. The message window provides all necessary information as you programming you devices.



At the top of "*Communication with PLG240*" window there are three Comm Port related controls. "*Open*" and "*Close*" for open and close Comm port and "*Reset*" for reports and clears errors might occur during communication. You may choose one of predefine port names, or type the port name in the edit field. In addition to regular download-upload features, there are two special control buttons allow you send and read individual bytes (protocol) to or from PLG240. In any time you may click the "*Show Data*" button to view your program data and the contents of the upload buffer. "*Verify Data*" will upload the entire PLG240 memory and compare against the user program data.

Note: At present time, uploaded data are placed in <upload buffer>. You may view uploaded data by using "Show Data: function. However, data decoding and saving features haven't been implemented yet.

Group IV. PLG240 commands

1. Insert Label - Insert a label to command list, for software instruction only. Label information will not be downloaded to PLG240 memory.

2. Wait... - Wait until inputs matches the mask before continue execution. Code length: 0 byte

Code length: 3 bytes

3. If. Then Goto - If input matches mask, then jump to label location, else continue on the next instruction.

Code length: 3 bytes

4. Output - Output operation.

Code length: 1 byte

5. Delay - Delay before continue execution.

Code length: 3 bytes

6. Goto - Unconditional jump.

Code length: 2 bytes

7. C. Vel. Move - Constant velocity movement. Stop when input matches the input mask.

Code length: 3 bytes

8. Index Move - Indexed movement. Aborted when input matches the input mask.

Code length: 3 bytes

9. Loop Begin - Initialize one of the four loop control registers.

Code length: 2 bytes

10. Loop End - End of loop instruction.

Code length: 1 byte

11. Set Current - Set the motor current to Run, Idle, Off.

Note: The motor current will be set to Run level automatically before execution of *Indexed movement* or *Constant velocity movement*. And motor current will stay at Run level until the next *Set Current* instruction.

Code length: 1 byte

5. Mechanical Specification (Sample drivers only, final specifications to be determined)

