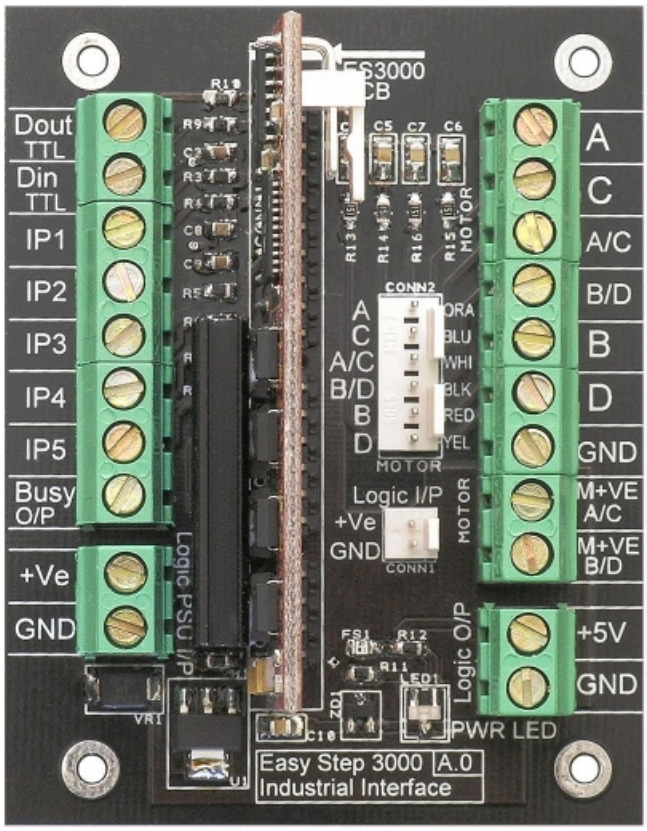
ACTIVE ROBOTS

EASY STEP™ 3000
Industrial Interface



User Guide

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Easy Step ™ 3000 Module Firmware – 1V29 -1V30
Easy Step ™ ISP Software – 1V27 - 1V29

Document History

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TABLE OF CONTENTS

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1 Description

The Easy-Step™ 3000 Industrial Interface is compatible with the Easy Step™ 3000 (ES3000) advanced stepper motor drive/control system module.
The interface serves two purposes; firstly, to the increase electrical operating range and robustness, and secondly, to add screw terminal type connectivity.

This product is normally used with the ES3000 PRO version, but is equally useful for the standard Easy Step™ 3000. The Standard ES3000 version can be upgraded by means of an unlock code, which is entered in the Windows® Easy Step™ ISP software.

1.1 Main Features

- Small footprint
- Motor connections via screw terminal or 6 pin plug-in header
- Motor phase coil 'electrical noise' suppression
- Extended 'Logic supply' voltage input range – 6.5 to 30VDC
- Logic supply reverse polarity protected
- Input protection and filtering on IP1-5 and Din/Dout
- Transient voltage suppression on Logic supply input
- Current protected 5V output/Input
- Power LED (Orange = indicates 5V is Healthy)
- 5V PSU over current fault LED (100mA trip level, self re-setting)
- 5V PSU input crowbar over-voltage protection (5V6 clamp)
- High quality 'rising clamp' screw terminal blocks
- Logic supply via screw terminals or 2 pin plug-in header

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1.2 Hints and tips – do's and don'ts

1.2.1 The 5V output/input explained

The 5V terminals are normally used as a supply output. But the unit can also be powered from these terminals (if a regulated 5V power source is available).

1.2.2 Logic Supply Voltage

The logic Supply for the ES3000 is a minimum of 6.5Vdc, and no more than 31Vdc. The unit may appear to function correctly with lower voltages but several obscure problems arise if it's too low.

The unit can also be run from 5V via a separate set of terminals – see 1.2.1 above

There is also a 2pin header for use with a crimp terminal housing (Molex® Part: 10-01-4024) this is in fact connected directly to the Logic Supply terminals. A 9V (PP3) battery snap with crimp housing is available from Active Robots.

1.2.3 Logic PSU protection circuits

Although the 5V PSU circuit has over current self resetting fuse, a short circuit on the 5V PSU output may cause the main 5V regulator to shut down first and nothing will work. This will not cause permanent damage.

If you intend to run the logic supply input at its maximum (31V) then the amount of current available from the 5V output will be reduced as the regulator will be generating more heat, and as little as 35mA will be available. Conversely if you are using a 12V PSU 140mA is available. *These figures may vary, and are affected by ambient temperature conditions.*

If you exceed **37V** then damage may result. If you wish to run the unit from a higher voltage then you must use a pre-regulator. Conversely if you have less than 5V available you will have to use a step-up regulator.

If you intend to run the unit from an external 5V power source (via the 5V Terminals) 'clamping' protection is utilised; if more than 5V6 is supplied or the supply is reversed a temporary short circuit is generated and shortly thereafter a self re-setting fuse device will operate, repeatedly abusing the input protection may cause permanent damage to the unit.

1.2.4 Serial Communications

If you are using RS232 (Via a PC) then you must make this connection via the supplied lead, to the 3 Pin right angled connector on the ES3000 motor board.
The Din/out terminals on this interface board are for TTL (0 to5V) logic levels only, which may attach directly to an integrated sub-circuit i.e. a Microcontroller.

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2 EASY STEP ™ Industrial Interface PCB Diagram

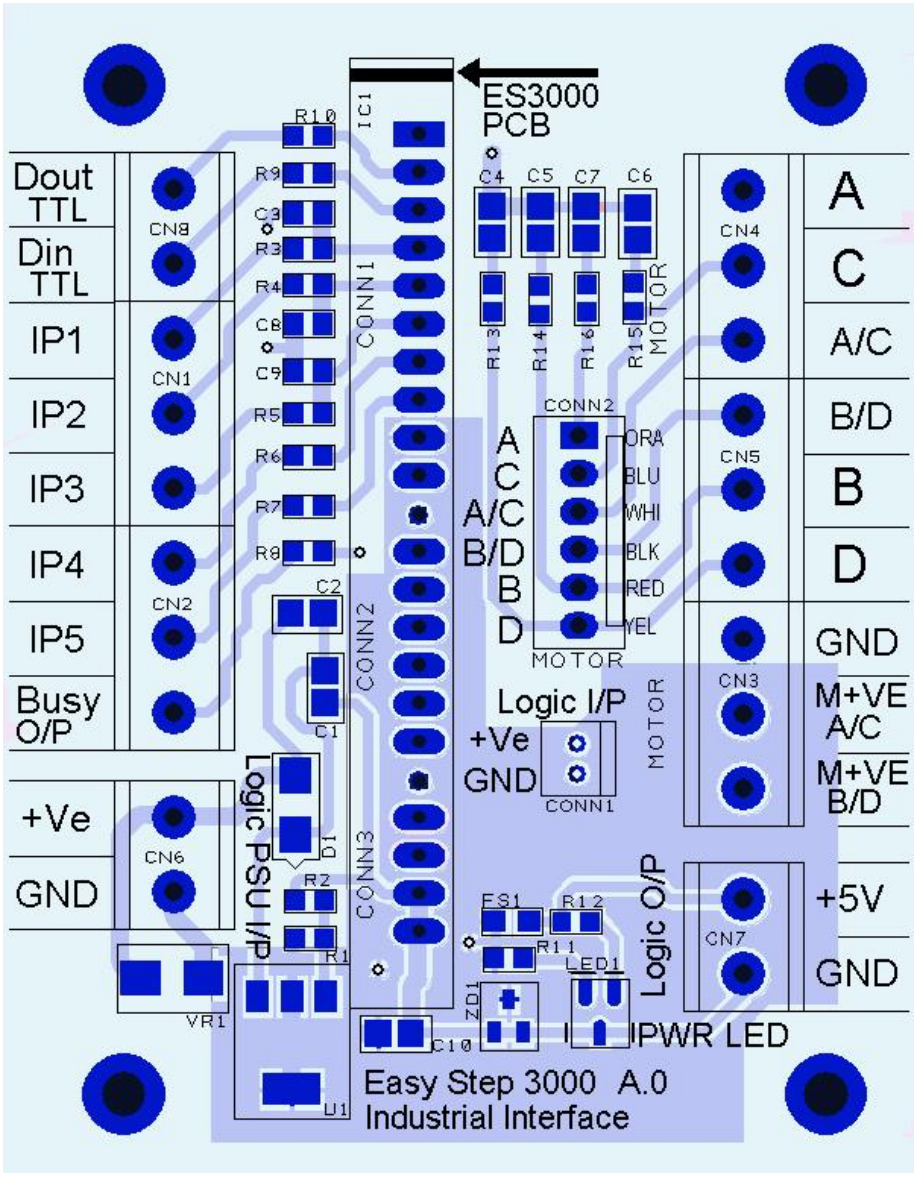

Fig. 1 Easy Step™ Industrial Interface - Terminal Names

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2.1 Terminal Descriptions

Terminal Ref. CN	Terminal Name	Description
CN8	**Dout TTL**	Serial Comms Data Out (TTL)
CN8	**DIN TTL**	Serial Comms Data Input (TTL)
CN1	**IP1**	Digital Input - Step Input. Each "1" to "0" transition causes the motor to rotate by 1 step (or ½ step in Half Step mode)
CN1	**IP2**	Digital Input - Direction **select** Control, in "Remote/Slave" mode (used in conjunction with IP1- clock input) Logic "0" = Counter Clockwise, "1" = Clockwise Select.
CN1	**IP3**	Digital Input, Replay all sequences (Logic 1-0-1) in Slave mode.
CN2	**IP4**	Digital Input, Replay one sequence at a time (logic1-0-1) in Slave mode.
CN2	**IP5**	Analogue Voltage Input (0 to 5V). This input has a "weak" pull-up resister to +5V
CN2	**BUSY**	Digital Output signal, ES3000 busy status; 1= Ready, 0=Busy
CN6	**+Ve**	Logic PSU input Positive connection
CN6	**GND**	Logic PSU Input Ground connection
CN4	**MOTOR A**	Output to Motor Phase coil A (Negative)
CN4	**MOTOR C**	Output to Motor Phase coil C (Negative)
CN4	**C/T AC**	Output to Common Phase coils AC (Positive)
CN5	**C/T BD**	Output to Common Phase coils BD (Positive)
CN5	**MOTOR B**	Output to Motor Phase coil B (Negative)
CN5	**MOTOR D**	Output to Motor Phase coil D (Negative)
CN3	**GND**	Motor PSU Ground Connection (GND)
CN3	**M+VE A/C**	Motor Supply Input - Positive A-coil
CN3	**M+VE B/D**	Motor Supply Input - Positive B-coil
CN7	**+5V**	+5V **Output** for Potentiometer etc or Logic 5V Input
CN7	**GND**	Ground Connection (GND) for five volt output/input

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3 Detailed Functional Description

To control the Easy Step™ 3000 (ES3000) motor drive PCB please refer to the Easy Step™ 3000 user guide. Detailed *operation* of the ES3000 is not included in this document.

This Interface board allows the ES3000 to be easily used in final applications or as part of the development process, allowing ease of connectivity.

All the connection names and terminology are exactly the same as those used in the ES3000 user guide and ES3000 serial communications protocol documents. However the following sections add additional information which is applicable to this 'Industrial Interface'

3.1 Logic Power supply (+Ve, GND [CN6])

These connections supply an on board regulator which supplies the logic voltage necessary for the microcontroller on the ES3000 module to function.

The logic PSU provided on the industrial interface board is superior to the one used on the module ES3000 module itself, the input voltage range is wider and more current is available. It also has additional transient suppression.

The input voltage range is; 6.5 to 31VDC.

3.2 Logic I/P Power supply (+Ve, GND [CONN1])

This has exactly the same function as 3.1 above, it is merely a duplicated connection via a 2 pin upright Molex® header, for use with a crimp terminal housing (Molex® Part: 10-01-4024). A 9V (PP3) battery snap with crimp housing is available from Active Robots.

3.3 Motor Power Supply (M+VE A/C. M+VE B/D, GND [CN3])

The Motor supply is the same as that specified in the ES3000 User Guide. Generally speaking motor voltages vary anywhere from 3 to 30V.

If you are using forcing resistors then these would be in series with M+VE A/C and M+VE B/D as described in the ES3000 user guide (which also contains details of calculating values for forcing resistors).

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3.4 Motor Connections (Motor A/B/C/D and C/T AC, C/T BD [CN4/5 and CONN2])

The Motor (Unipolar type) can be connected using two methods; one via the six screw terminal connections the other via a 6 pin Molex® header (CONN2) for use with a crimp terminal housing (Molex® Part: 22-01-2065).

You can purchase the Motor correctly pre-wired with a with a 6pin Molex® plug fitted from Active Robots (Available on request).

The Sanyo Denki 103H546-0440 motor wire colours relate to the connectors as follows:

```
Motor A - Orange
Motor C - Blue
C/T AC  - Grey
C/T BC  - Black
Motor B - Red
Motor D - Yellow
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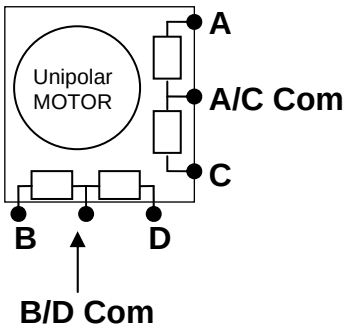

3.5 Serial Data RS232 (ES3000 module, 3 pin right angle connector)

RS232 Serial data (Usually via the comport of a PC) must connect directly to the ES3000 module.

A serial comms lead is available for use with the ES3000 module and this connects to the 3 Pin right angled Molex® header on the module, the other end fits a standard 9pin male D-type connector (as found on a typical desk top PC).

3.6 Serial Data RS232 (Dout TTL, Din TTL [CN8])

These connect directly (via 1K2 series resistors) to the UART port pins of the microcontroller on the ES3000 module.

These connections are provided to allow you to control the ES3000 module from another Microcontroller (5V TTL levels) without the need to translate the data signals to RS232 levels.

DO NOT connect **RS232** signals to these terminals, at best you will get corrupted data.

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3.7 Control Inputs (IP1/2/3/4/5 [CN1, CN2])

The functionality of these inputs is described in the ES3000 user guide.

Some input filtering (CR) is provided on IP1, IP2 and IP3 this is to reduce fast glitch signals entering the port pins of the microcontroller in ES3000 module.

The filter on IP1 helps clean up clock signals generated with simple switches, some microswitches produce prodigious amounts of 'bounce' noise, an alternate specification of switch may be required.

If a noisy signal source is all that is available then a proper de-bounce circuit needs to be considered.

3.8 Busy Output (Busy [CN2])

This output tells external control equipment that the ES3000 module is busy and any control or serial commands may be lost.

The output is normally Hi (+5V) and goes Low (0V, GND) when the ES3000 module is busy.

The output has a series 1K2 resistor for current limiting/protection purposes. An LED can be directly connected to this O/P.

3.9 (+5V) Power Output/Input (+5V, GND [CN7])

This output normally provides +5V to power your logic circuits/Potentiometers etc and is has a maximum output current of 100mA (a self resetting fuse [100mA] is used for protection).

Alternatively the board Logic can be supplied by using these terminals as an input, any 5V power source can be used (25mA).

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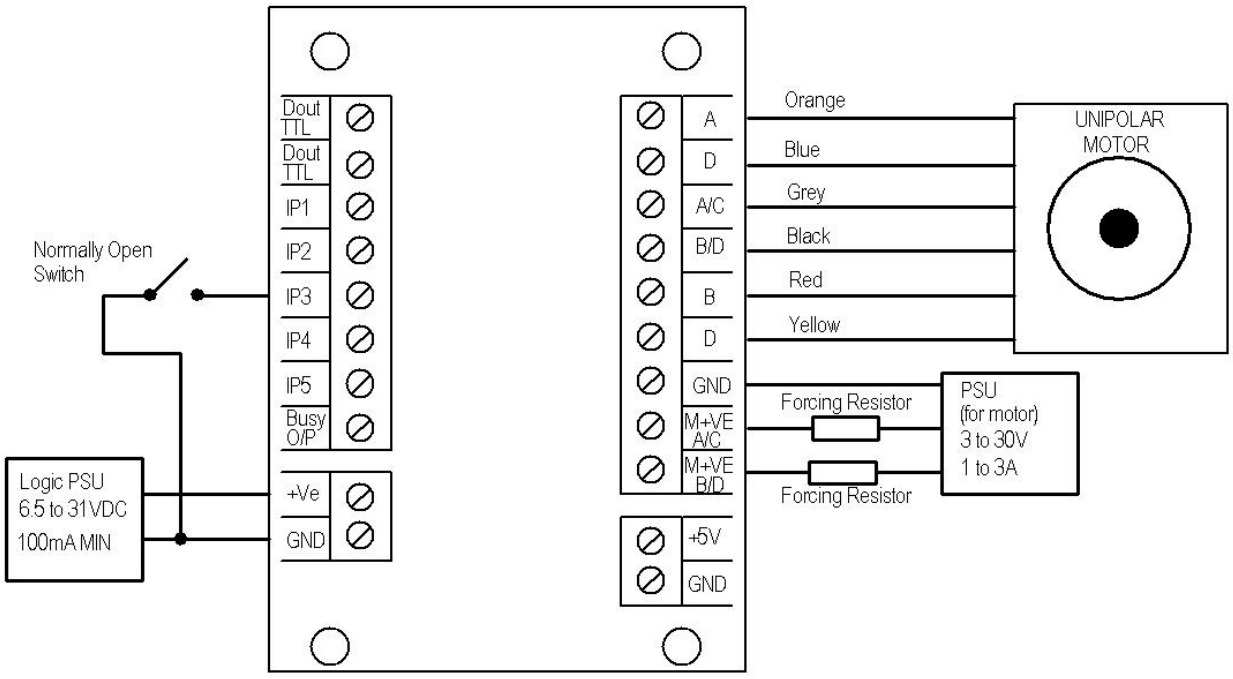
4 Connection Schematic Diagrams

Shown below are some schematic diagrams, showing typical applications.

4.1 Single Interface with Forcing resistors

The following diagram shows how to connect forcing resistors and use of the replay input (IP3).



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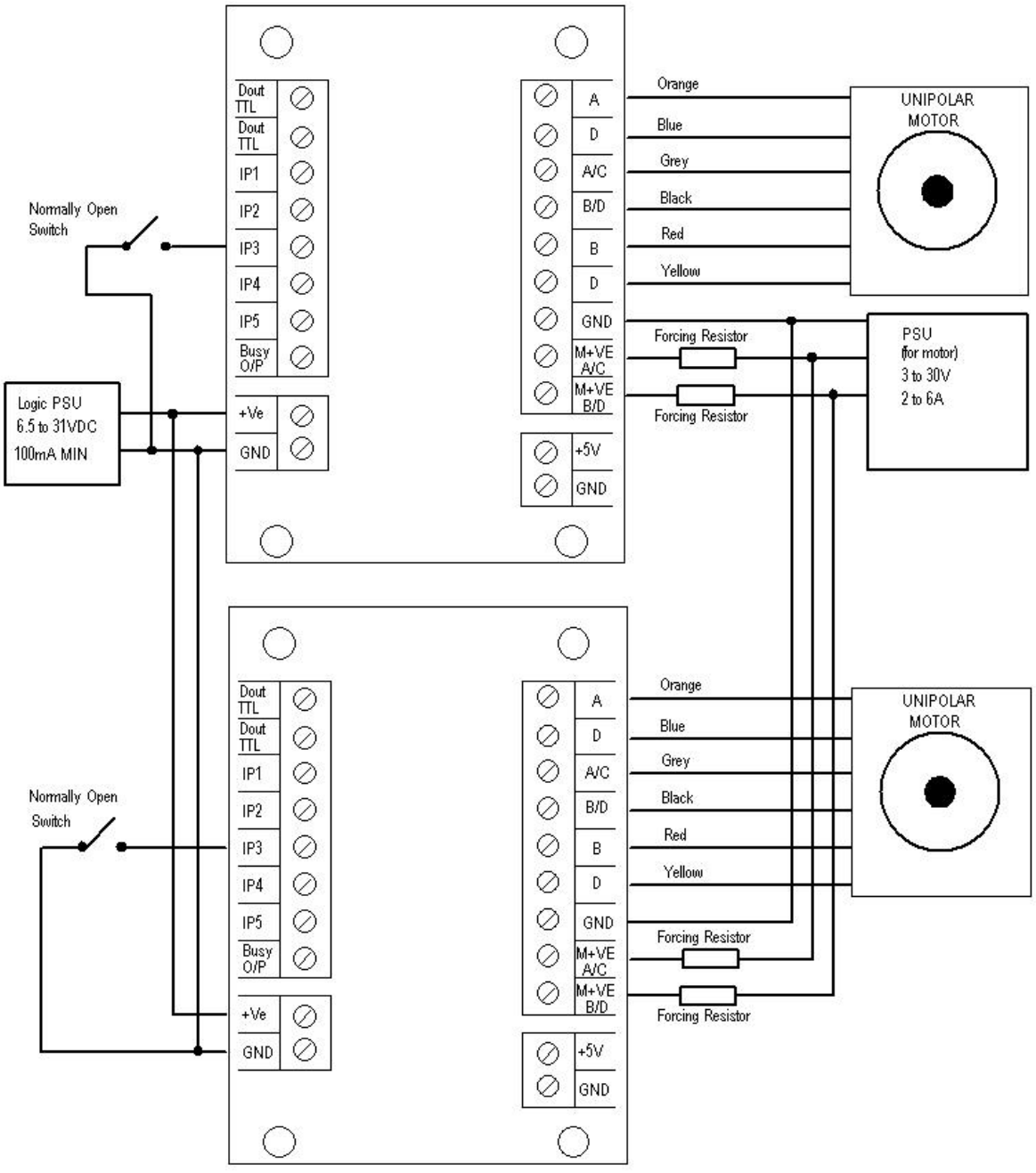
4.2 Two interfaces using common PSU

The following diagram shows how to control two ES3000 Industrial interfaces from common motor and logic Power Supplies.



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5.0 LED (*LED1*)

LED1 is capable of displaying three colours, the colour and indication is as follows:

OFF = No Power

Orange = 5V PSU Healthy

Green = External +5V/GND (CN7) terminals short circuit

Red = If powered from external supply internal PSU short on ES3000 PCB

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