8909U DIN-RAIL
STEPPER MOTOR DRIVER

USERS MANUAL

PCB Issue 2
Xilinx Version 8909V202

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Revision History

The following table shows the revision history for this document.

Date	Version	Revision
05/10/15	1.0	Use manual issue
13/11/07	1.1/1.2	
30/12/19	1.3	Change from Hytec to Newwood Solutions for contact details The Hytec 8601 has been updated to the Newwood Solutions 8602/1 but has the same functionality as the original 8601.

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1. PRODUCT DESCRIPTION

The 8909U is a simple and compact DIN-rail mounted stepper motor driver for use with 5, 6 or 8-lead hybrid stepper motors. A Xilinx FPGA device is used to control the phase excitation of each motor under the control of STEP and DIRECTION signals from the 8602/1. Additionally, the AUX1 output of the 8602/1 on each channel can be used to control the power ON/OFF function of each drive channel. A green status indicator LED shows the active status of the card as follows:

Status   Indication

IDLE – OK, no motors active   HEARTBEAT – brief flash every second
ACTIVE – OK, one or more motors running   ON- semi-continuous illumination while running.
ERROR – one or more motors in current limit   PANIC – high speed on/off flashing.

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1.1 Key Features

- Four channels of unipolar stepper motor drive at up to 1 amp per phase.

- Single external 12 or 24-volt power supply.

- Direct SCSI cable connection to the 8602/1 Stepper IP card via transition card.

- Simple hook-up to the motor and limit switches via screw terminals

- Limit switch and incremental encoder inputs on all four channels

- Fully opto isolated on the VME/8602/1 side

- Full over-current detection on all motor driving outputs – adjustable setting via VR1.

- Very low electrical noise – silent at standstill.

- Direct drive of 12 and 24-volt rated stepper motors or use external series resistors.

- Use with readily available DIN-rail mounted power supplies, connected via screw terminals.

2. CONNECTING UP

2.1 MOTOR CONNECTIONS

See figure 1 for details.

2.1.1 Motor types

The driving outputs of this card are compatible with all four-phase hybrid stepper motors with 5, 6 or 8 leads.

These motors typically have two pairs of windings, each with 'driven' connections and 'common' connections. In 6-lead motors, the centre-point of each pair is brought out as this common connection. The 'driven' or phase leads of the motor should be connected to the PHASE (A to D) outputs of the card and the 'common' or centre-tap lines connected either directly to the motor supply voltage at terminals 2 and 5, in the case of motors with windings rated at the full supply voltage, or through high power series current limiting resistors in the case of motors with lower winding voltage ratings.

Series resistor values should be calculated as follows:

VM is the motor supply voltage you supply (12 or 24 volts)
VP is the rated phase voltage
IP is the rated phase current in amps.
RS is the required series resistance.

$$RS = (VM - VP) / IP.$$

The maximum power dissipated in each series resistor (at standstill with phases on) will be:

$$P_{RS} = (VM - VP) * IP \text{ watts.}$$

8-lead motors should have the centre-tap ends of their windings connected together (to create a 6-lead configuration) and then these centre-taps should be connected as above.

5-lead motors are always of the 'full rated voltage' type where the normal phase voltage is equal to the supply voltage. In this case, the single 'common' connection can be wired to either of the centre-tap terminals.

2.1.2 Setting Motor Current Limits

All 8909 Motor Drives have current sensing circuitry, and the current limit can be set via VR1. The current in any motor winding exceeding the current limit setting will cause the motor to stop and a "drive fault" condition will indicated back to the 8602/1 IP Card.

To set this current limit (i.e. the maximum current for each individual motor phase winding and not the combined draw) monitor the Voltage between "GND" and the "VSET" terminal. A Voltage here of 40mV approximately is equivalent to 0A and 90mV is approximately equivalent to 1A. Adjust VR1 (Clockwise to Decrease Limit and Anti-Clockwise to Increase) to the desired Voltage / Current Limit.

As a guide, you should set the current limit to twice the motor's normal phase current, so for a 1 amp motor, set the VSET voltage to 140mV.

2.2 ENCODER AND LIMIT SWITCH CONNECTIONS

See figure 1 for connection details.

2.2.1 Limit switch functions

The limit switch inputs on this card are compatible with voltage-free contacts from micro-switches or the transistor outputs of opto switches. The wetting current of these inputs at 0.4 volts is 0.5mA. All these inputs are conditioned and opto-isolated before being sent to the 8602/1. The limit switch inputs assumed function is 'Normally Closed', meaning that an open condition indicates travel at the limit. If limit switches are not used in a system, the positive and negative travel limit switch inputs should be strapped to ground.

The 'Home' limit switch input is only used in systems where the software function 'go to home limit' will be used. It therefore has no function and can be left open in systems where just the two travel limits are used.
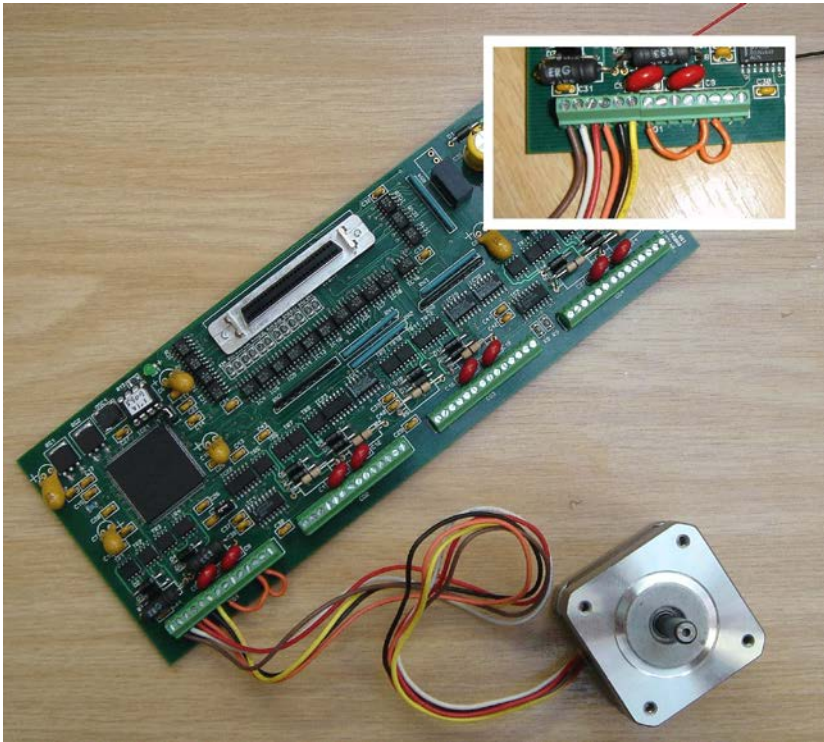
2.2.2 Encoder types

The encoder inputs on this unit are compatible with any encoder which works with a 5-volt supply at up to 50 milliamps and gives TTL compatible quadrature outputs in phase A / phase B format. These signals are received and opto-isolated by the 8909U and fed to the 8602/1 where they are used to update the Absolute Position Accumulator if selected in the 8602/1 channel CSR.
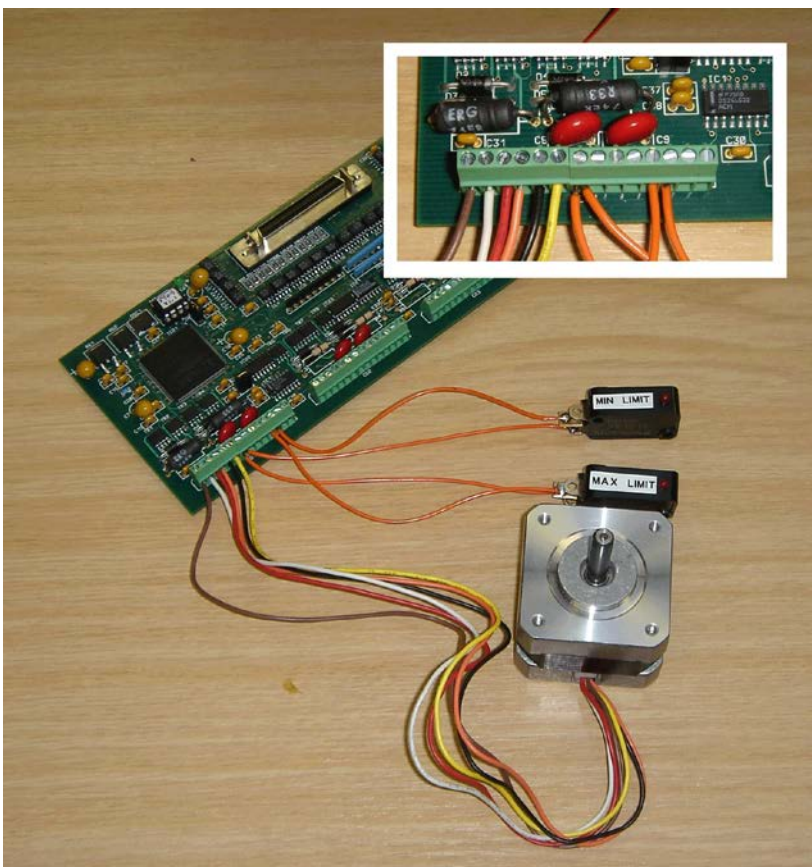
2.3 Appendix A PCB Jumpers and Adjustable Pots

J1   Factory set: must be fitted

J2   Select motor energizing mode:
          OUT = always ON.
          IN = energize motors only when stepping or when the 'AUXn' signal is at logical '1'.

J3   Factory set: must be fitted

VR1   Motor Drive Current Limit Set: Clockwise = Decrease; Anti-Clockwise = Increase.

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2.4 Suggested Wiring Diagram for a Typical Application

HYTEC ELECTRONICS LTD
8909U DIN-RAIL MOUNTED
UNIPOLAR STEPPER MOTOR
DRIVER BOARD.

SUGGESTED WIRING DIAGRAM

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2.5 8909 Minimum Wiring.

2.6 8909 with Maximum and Minimum Limit Switches Wiring.

2.7 8909 with Maximum, Minimum and Home Limit Switches Wiring.
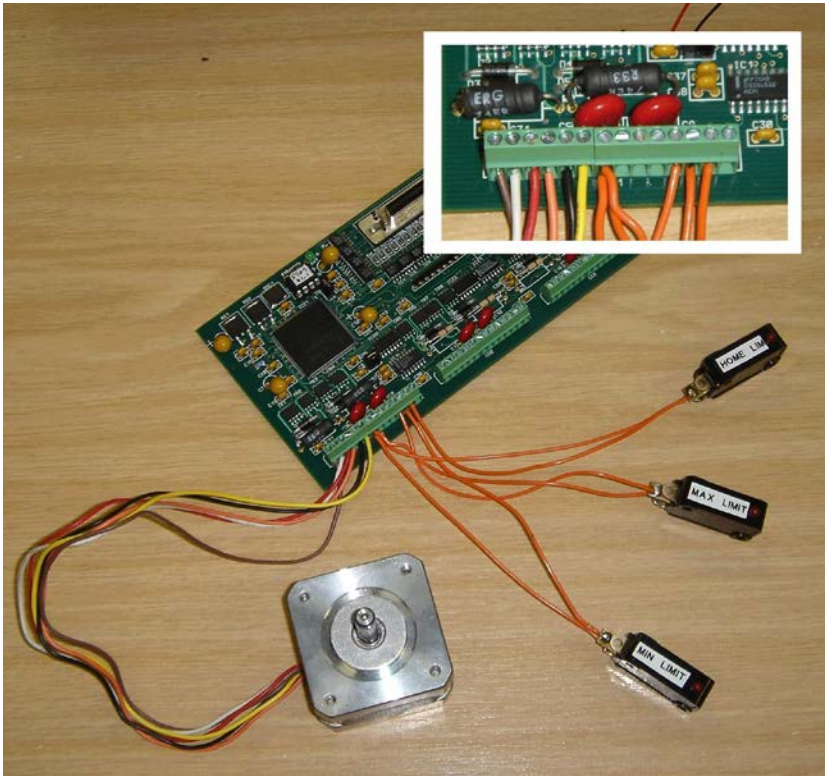
2.8 8909 with All Limit Switches and Rotary Encoder Wiring.