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QC100 Quadrature Converter User Guide

Rev 1.1g

Introduction

The QC100 Quadrature Converter is designed to convert the Step and Direction or Clockwise/Counterclockwise signals from motor controllers, indexers, or encoders into quadrature signals as if they were coming from encoders having quadtrature output signals.

This allows open-loop stepper motor systems to inform other hardware or software products such as Inspection Ware or Winspect of the assumed motor positions without actually having to install encoders.

The QC100 Quadrature Converter is typically used on scanning rigs that do not employ encoders on their scan or step axes. It is also used on small manipulators that rotate or swivel transducers where encoders are not installed.

The QC100 Quadrature Converter can convert signals for one or two axes of motion.

System Requirements

The QC100 Quadrature Converter accepts the following inputs for each channel:

- STEP and DIRECTION signals from motor indexer
- CW/CCW signals from encoders with this type of output

The QC100 provides the following outputs for each channel:

- Quadrature signal A and /A (/A is the inverted A signal)
- Quadrature signal B and /B

The QC100 requires the following DC power:

- +5 VDC regulated power, or +8VDC to +24VDC unregulated power at 15 mA

Performance Characteristics

Maximum STEP input frequency is 6MHz.

Inputs are filtered, protected from transients and are Schmitt trigger TTL level sensitive.

Inputs have 10KΩ pull-up resistors to +5V, can be driven by open-collector indexer outputs.

Inputs are individually inverted when the corresponding switch on SW1 is at the “ON” position.

Outputs are protected from transients, short circuits and accidental power connection.

Outputs can drive long cables with 24mA of output current.

All power supply inputs are protected from reverse polarity connection and are fused.

If 8-24VDC is supplied, the onboard 5 Volt regulator can be used to supply power to external circuits via the 5VDC terminal.

The phase of the quadrature outputs on each channel is determined by the DIR input for the channel and the state of the DIR-inversion switch for the channel.

DIR	SW1-DIR	Phase*
LOW	OFF	A leads B
HIGH	OFF	B leads A
LOW	ON	B leads A
HIGH	ON	A leads B
* "A leads B": Rising edge of A is followed by rising edge of B, falling edge of A is followed by falling edge of B.		

Transitions on the A and B outputs occur on the falling edge of STEP when the STEP signal is not inverted (SW1-STEPx is OFF), and on the rising edge of STEP when the STEP signal is inverted (SW1-STEPx is ON).

It is possible to convert a QC100 with Step and Direction inputs to CW/CCW inputs, and vice versa. Contact the factory for details.

Connections

All connections are via horizontal-entry screw terminal blocks. The screw terminals accept stranded wire sizes in the range AWG #26 to #16 (0.14 to 1.5mm)

Available Configurations

The QC100 is available in two mounting versions, and two input types, as follows.

UTEX Part Number	Input type	Installation
AY12-027-001/001	STEP + DIRECTION	#4 or M3 screws and standoffs
AY12-027-001/002	STEP + DIRECTION	DIN rail
AY12-027-001/003	CW / CCW	#4 or M3 screws and standoffs
AY12-027-001/004	CW / CCW	DIN rail

The DIN-rail versions may be installed on 35mm or offset 32mm DIN rail.

Input Signals

PCB Label	Function	Notes*
8-24V	Unregulated power supply input	Use this as input or 5V but not both
GND	Ground	All grounds are common
5V	5VDC power supply input	Can supply 5VDC when using 8-24V
GND	Ground	
STEP1	Step or CW signal input -- axis 1	Inverted when SW1-STEP1 is ON*
GND	Ground	
DIR1	Direction or CCW signal input -- axis 1	Inverted when SW1-DIR1 is ON*
GND	Ground	
STEP2	Step or CW signal input -- axis 2	Inverted when SW1-STEP2 is ON*
GND	Ground	
DIR2	Direction or CCW signal input -- axis 2	Inverted when SW1-DIR2 is ON*
GND	Ground	

* On the CW/CCW input version of the QC100, input inversion is not available. All four switches must be maintained in the OFF position.

Output Signals

PCB Label	Function	Notes
A1	Quadrature output A -- channel 1	Use A1 when driving single-ended inputs.
GND	Ground	All grounds are common
/A1	Inverted quadrature output A - channel 1	Use A1 and /A1 when driving differential inputs
GND	Ground	
B1	Quadrature output B -- axis 1	Use B1 when driving single-ended inputs.
GND	Ground	
/B1	Inverted quadrature output B -- axis 1	Use B1 and /B1 when driving differential inputs
GND	Ground	
A2	Quadrature output A -- axis 2	Use A2 when driving single-ended inputs
GND	Ground	
/A2	Inverted quadrature output A -- axis 2	Use A2 and /A2 when driving differential inputs
GND	Ground	
B2	quadrature output B -- axis 2	Use B2 when driving single-ended inputs
GND	Ground	
/B2	inverted quadrature output B -- axis 2	Use B2 and /B2 when driving differential inputs
GND	Ground	

Quadrature Converter Dimensions and Mounting

Dimensions in inches.

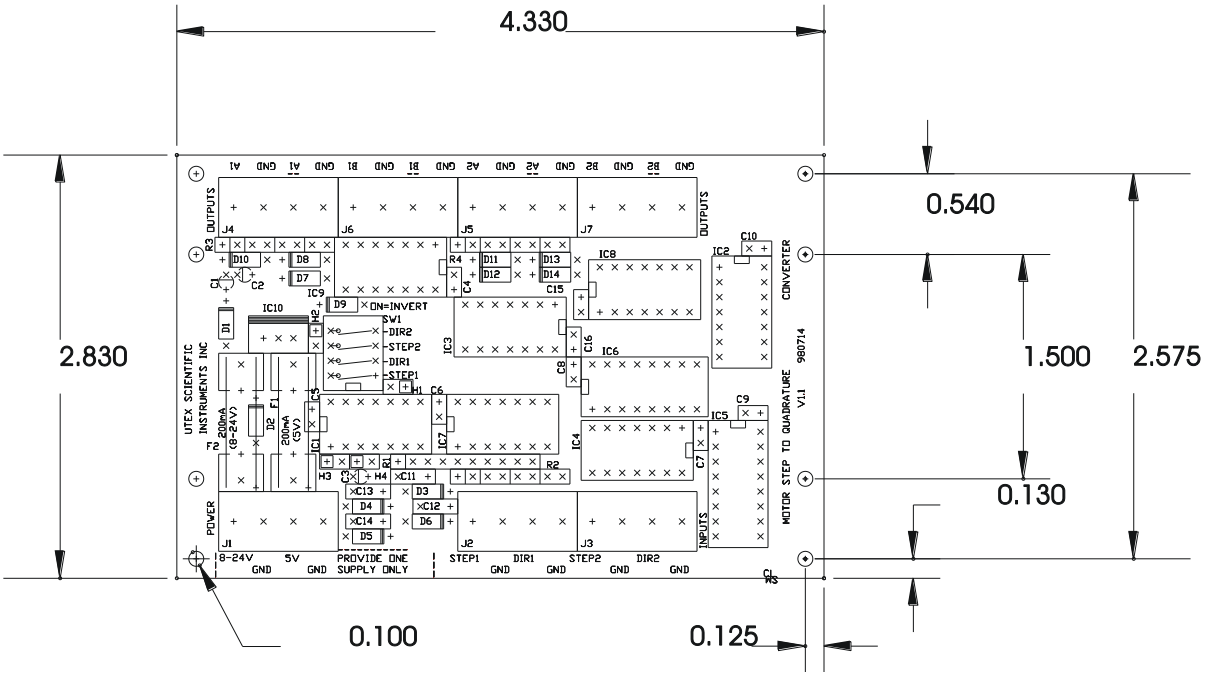

Figure 1. QC100 dimensions (/001 or /003 screw/standoff mounting option)

The /002 and /004 rail mounted versions have overall dimensions of 4.43 by 3.05 inches.

Replacement fuses.

Fuses F1 and F2 are 200mA slow-blow, 5 x 20 mm, Littelfuse part number 218.200 or equivalent.

Order numbers

AY12-027-001/001	QC100 Quadrature Converter, Step + Direction input, panel mounted
AY12-027-001/002	QC100 Quadrature Converter, Step + Direction input, DIN rail mounted
AY12-027-001/003	QC100 Quadrature Converter, CW/CCW input, panel mounted
AY12-027-001/004	QC100 Quadrature Converter, CW/CCW input, DIN rail mounted

Revision History

Date	Rev	Description
2002/10/17	1.1	Initial Release
2002/10/23	1.1a	States of SW1-DIR in Table 1 corrected.. Note re units added to dimensional drawing.
2003/05/06	1.1b	Part numbers for replacement fuses added.
2005/09/15	1.1c	Removed duplicate sentence under "Performance Characteristics". Added 20mm length in description of fuses. Added details of mounting options and terminal blocks. Added 20mm length in description of fuses. Added order numbers
2005/10/31	1.1d	File name changed
2007/06/01	1.1e	Added information regarding CW/CCW version. Added dimensions of rail-mounted version.
2014/02/05	1.1f	Add mention of TTL levels in Characteristics. Corrected description of tab numbers in Fig 1 Corrected spelling of "Littelfuse"
2014/11/03	1.1g	Corrected part numbers – Were AY13-, should be AY12-