

CNT01 Quad Quadrature Encoder

4 Channels, 64 Bit, 40 MHz, TTL Compatible Inputs

Product Description

The CNT01 device is a versatile and easy-to-use quad absolute counter and quadrature encoder. Every counter supports the up/down counting mode to detect impulses of an arbitrary clock source as well as the quadrature encoder mode which is usually utilized to count the revolutions per minute of a spinning shaft or motor.

Every counter is equipped with a separate enable line which inhibits it from capturing impulses as long as being active.

Every digital input line is continuously over-voltage protected which is especially important if inductive pick-up coils are utilized to detect the position of the shaft.

The versatility and the straightforward usability make the device ideal for industrial applications as well as for scientific experiments. The position or angular velocity of a spinning axle can easily determined as well as accurate duration measurements can be performed if the pulses of an external reference clock are counted.

Features

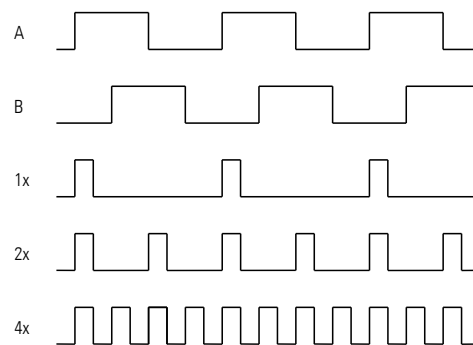
- ▶ Connected to 10/100BASE-TX Ethernet over RJ45 jack
- ▶ Four independent absolute counters / quadrature encoders
- ▶ Software-configurable up/down counter or quadrature encoder
- ▶ Every counter has its separate enable signal
- ▶ Internal pull-up resistors ensure minimum wiring efforts
- ▶ 40 MHz maximum frequency is configured as up/down counter and 5 MHz in quadrature mode
- ▶ Internal +5V / 200 mA power supply for arbitrary use
- ▶ Over-voltage protected pins up to $\pm 30V$
- ▶ Surveillance of all voltages and board temperature
- ▶ Powered via PoE (Power over Ethernet)
- ▶ Idle power consumption of less than 1.2W
- ▶ Compatible with all modern Ethernet standards
- ▶ Drivers for Microsoft® Visual C++™, MathWorks® MATLAB™, Python and National Instruments® LabVIEW™ programming environment

Operation Modes

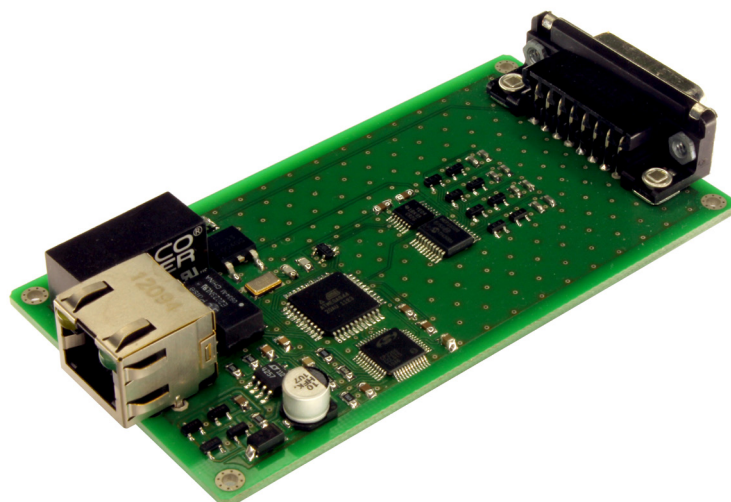
When a channel of the CNT01 device is configured as a counter (normal mode) the clock source is connected to input A and the direction depends on the input B (high corresponds to up and low to down direction). Since the input B is equipped with an internal pull-up resistor it can be left unconnected and the device counts upwards by default.

When the device is operated in quadrature mode it can be configured to count one, two or four steps per revolution where especially the latter case highly improves the resolution at low angular velocities. The 50% duty cycle and the 90° phase shift are important for the uniform counting sequence. If the phase shift between the inputs A and B is -90° the counting direction is reversed.

The following diagram shows the waveform of the inputs A and B and the corresponding counting sequence for the quadrature modes 1x, 2x and 4x.



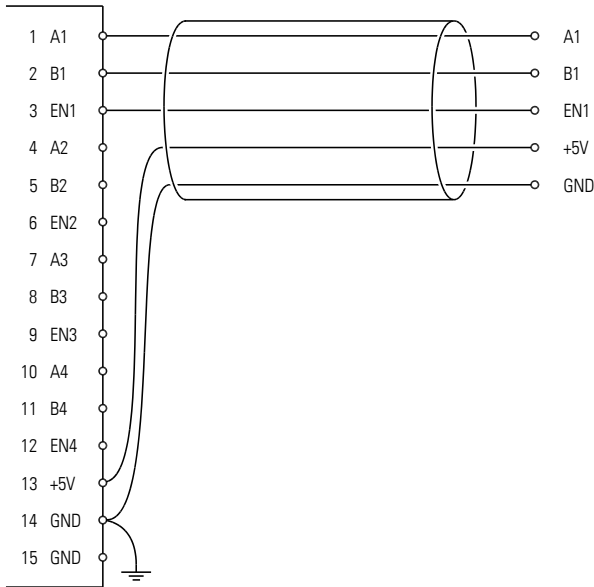
In both normal and quadrature operation mode every counter can independently be enabled or disabled with the use of the signal line EN (pins 3, 6, 9 and 12, high corresponds to enabled and low to disabled). Each enable line is equipped with an internal pull-up resistor and can be left unconnected to enable the corresponding counter by default. With the aid of the accompanied driver each counter can separately be reset, disabled and re-enabled anytime by software.



Transducer Connection

The following figure shows the recommended pin configuration of the CNT01 device (for the sake of clarity only the first channel is shown). All pins are protected against continuous over-voltage of up to ± 20 V. Clamping diodes to ground and to +5V protect the device from damage. Only one digital line can be in an over-voltage condition at a time. The nominal input current is less than $50 \mu\text{A}$. In case of over-voltage the sensitivity may decrease. After some seconds the normal operation is restored when the fault condition vanishes.

Gold-plated connectors ensure reliable and low impedance transducer connectivity. Do not connect or disconnect wires unless power has been switched off in order not to endanger the sensitive electronics.



Shielding and Grounding

For lowest error-proneness the transducers should be connected to the CNT01 device by using a single shielded cable with multiple leads or multiple coaxial cables. Since pins 14 and 15 represent the ground signal of the printed circuit board and are connected internally, any shield must be connected to one of these pins.

+5 V Power Supply

The CNT01 device allows the operator to use the internal +5V power supply (pin 13) for arbitrary applications. The ground signal pins 14 and 15 serve as reference for the power supply and the digital lines. No external power supply is needed to serve attached analog components like hall switches or light barriers.

The +5V power supply can source current up to 200mA, sink current up to 100mA and is over-current protected by the means of an automatically resetting fuse.

Physical Specifications

Dimensions: 100 mm x 54 mm x 18 mm (3.94 in x 2.13 in x 0.71 in)

Mounting: 4 holes \varnothing 2.2 mm (0.087 in) at a distance of 94 mm x 48 mm (3.70 in x 1.89 in), intended for the use with metric M2 screws

PCB operating temperature: 0 °C to 70 °C (32 °F to 158 °F), ambient operating temperature depends on the case and its thermal isolation

Weight: 42 g (1.48 oz)

This product is not authorized for use as a critical component in life support devices or systems without the express written approval.