# Specifications

## USB-4302

**MEASUREMENT COMPUTING™**

# Specifications

**Typical for 25 °C unless otherwise specified.**

**Specifications in *italic* text are guaranteed by design.**

## Counter

Refer to the CTS9513-2 data sheet for complete 9513 specifications and operating modes. The CTS9513-2 data sheet is available on our web site at www.mccdaq.com/PDFmanuals/9513A.pdf.

Table 1. Counter specifications

| Parameter | Conditions |
|---|---|
| Counter type | 9513 |
| Configuration | One 9513 device. Five up/down counters, 16-bits each. |
| Compatibility | 5V/TTL |
| The 9513 device is programmable for: | |
| Clock source | Software selectable:<br>External:<br>▪ Counter 1-5 clock inputs<br>▪ Counter 1-5 gate inputs<br>Internal:<br>▪ Terminal count of previous counter<br>▪ Internal clock frequency scaler (default; divided by 1) |
| Gate | Software selectable source:<br>External:<br>▪ Active high or low level or edge, counter 1 – 5 gate input<br>▪ Active high level previous gate or next gate<br>▪ All external gate signals (CTRxGATE) individually pulled up through 47 K resistors to +5 V.<br>Internal:<br>▪ Active high previous counter terminal count<br>▪ No gating (default) |
| Output | Software selectable:<br>▪ Always low (default)<br>▪ High pulse on terminal count<br>▪ Low pulse on terminal count<br>▪ Toggle on terminal count<br>▪ Inactive, high impedance at user connector counter # output. |
| Osc Out | Software selectable source:<br>▪ Counter # input<br>▪ Gate # input<br>▪ Prescaled internal clock (default)<br>Software selectable divider:<br>▪ Division by 1-16 (default = 16) |
| Clock input frequency | 20 MHz max (50 nS min period) |
| Internal clock frequencies<br>(Generated from 12 MHz crystal oscillator.) | Software selectable:<br>▪ 5.0000 MHz (default)<br>▪ 3.3333 MHz<br>▪ 1.6667 MHz<br>▪ 1.0000 MHz |
| Internal clock frequency prescaler | BCD scaling (Internal clock divided by 1, 10, 100, 1000 or 10000) or<br>Binary scaling (Internal clock divided by 1, 16, 256, 4096 or 65536) |
| *Internal clock generator accuracy* | *±2 ppm* |
| 12 MHz crystal oscillator accuracy | ±50 ppm |
| *High pulse width (clock input)* | *25 ns min* |

| Parameter | Conditions |
|---|---|
| *Low pulse width (clock input)* | *25 ns min* |
| *Gate width* | *70 ns min* |
| *Input low voltage* | *-0.5 V min, 0.8V max* |
| *Input high voltage* | *2.0 V min, USB +5V power max* |
| *Output low voltage @ IIl = 4 mA* | *0.4 V max* |
| *Output high voltage @ IIH = 4 mA* | *2.4 V min* |

## Digital input / output

Table 2. Digital I/O specifications

| Digital type | Discrete, 5V/TTL compatible |
|---|---|
|  | Output:    74ACT373 |
|  | Input:      74ACT373 |
| Number of I/O | 8 input, 8 output |
| Configuration | 1 bank of 8 as output, 1 bank of 8 as input |
| *Input high voltage* | *2.0 V min,5.5 V absolute max* |
| *Input low voltage* | *0.8 V max, –0.5 V absolute min* |
| *Output high voltage* | *3.3 volts min @ -24 mA (Vcc = 4.5 V)* |
| *Output low voltage* | *0.8 volts max @ 10 mA* |
| Data transfer | Programmed I/O |
| Power-up / reset state | Digital outputs reset to TTL low |
| Digital I/O transfer rate (system paced) | System dependent, 33 to 1000 port reads/writes or single bit reads/writes per second. |
| Pull-up/pull-down configuration | User configurable for pull-up/-down through 47 kΩ resistor (Note 1). |
|  | All pins floating (default) |

**Note 1:**   Pull-up and pull-down configurations are available using the DI CTL connector pin 21. The pull-down configuration requires the DI CTL pin (pin 21) to be connected to a GND pin (pin 11). For a pull-up configuration, the DI CTL pin should be connected to the +5V pin (pin 20).

## Interrupt Input

Table 3. Interrupt specifications

| Implementation | Interrupts the microcontroller operation on the device to execute one or more of several firmware routines. |
|---|---|
| Interrupt characteristics | Rising edge (default) or falling edge triggered, user selectable |
| Firmware routines | Any or all of the following can be activated by the user:<br>▪ Generate USB event notification<br>▪ Latch digital inputs (Reading digital inputs returns most recently latched value.)<br>▪ Latch digital outputs (Most recently written digital output value is latched.)<br>▪ Save counts on any/all of counters 1-5. |
| Event latency to PC | 1-33 ms (4 ms typical) |
| Maximum event notification rate | 33-1000 Hz (system dependent) (Note 2) |
| Interrupt latency for latch operations | 100 μs maximum (80 μs typical) |

**Note 2:**   The interrupt rate, when transferring information to the PC (event notification), is limited by the USB to a theoretical limit of 1 kHz. Some systems may not be able to achieve this maximum rate due to differences in USB controller implementation, traffic on the USB, or operating system activity.

## Memory

Table 4. Memory specifications

| EEPROM | 256 bytes EEPROM memory available for external use. |
|---|---|

## Microcontroller

Table 5. Microcontroller specifications

| Type | High performance 8-bit RISC microcontroller |
|---|---|

## USB +5V voltage

Table 6. USB +5V voltage specifications

| Parameter | Conditions | Specification |
|---|---|---|
| USB +5V (VBUS) input voltage range | | 4.75 V min. to 5.25 V max. |

## LEDs

Table 7. USB +5V voltage specifications

| Power LED | Indicates that the device's microcontroller has power and is running |
|---|---|
| Status LED | Indicates that the USB is configured; blinks to indicate USB traffic. |

## Power

Table 8. Power specifications

| Parameter | Conditions | Specification |
|---|---|---|
| Supply current (Note 3) | USB enumeration | 100 mA max |
| Supply current | Maximum load | 302 mA max. |
| User +5V output voltage range (pin 20) | Connected to self-powered hub. (Note 4) | 4.75 V min. to 5.25 V max. |
| User +5V output current (pin 20) | Bus-powered and connected to a self-powered hub. (Note 4) | 10 mA max. |

**Note 3:** This is the total current requirement for the USB-4302 which includes up to 14 mA for the Power and Status LEDs, but does not include current sourced from the User +5V output or from the digital output pins.

**Note 4:** Self-Powered Hub refers to a USB hub with an external power supply. Self-powered hubs allow a connected USB device to draw up to 500 mA.

Root Port Hubs reside in the PC's USB Host Controller. The USB port(s) on your PC are root port hubs. All externally powered root port hubs (desktop PC's) provide up to 500 mA of current for a USB device. Battery-powered root port hubs provide 100 mA or 500 mA, depending upon the manufacturer. A laptop PC that is not connected to an external power adapter is an example of a battery-powered root port hub.

# USB specifications

Table 9. USB specifications

| | |
|---|---|
| USB device type | USB 2.0 (full-speed) |
| Device compatibility | USB 1.1, USB 2.0 |
| Power requirements | Self-powered, 500 mA consumption max |
| *USB cable type* | *A-B cable, UL type AWM 2725 or equivalent. (min 24 AWG VBUS/GND, min 28 AWG D+/D-)* |
| USB cable length | 3 meters max. |

# Environmental

Table 10. Environmental specifications

| | |
|---|---|
| Operating temperature range | 0 to 60 ° C |
| Storage temperature range | -40 to 85 ° C |
| Humidity | 0 to 90% non-condensing |

# Mechanical

Table 11. Mechanical specifications

| | |
|---|---|
| Dimensions | 157.6 mm (L) x 92.7 mm (W) x 15.2 mm (H) |
| User connection length | 3 meters max. |

# Main connector and pin out

Main connector P1 is compatible with the PCI-CTR05 and the CIO-CTR05.

Table 12. Main connector specifications

| | |
|---|---|
| Connector type | 37 pin shielded D-type, right angle |
| Compatible cables | ▪ C37FF-x, unshielded ribbon cable<br>▪ C37FFS-x, shielded round cable |
| Compatible accessory products | CIO-MINI37<br>CIO-MINI37-VERT<br>CIO-TERMINAL<br>SCB-37 |

## P1 pin out

Table 13. Main connector P1 pin out

| Pin | Signal Name | Pin Description |
|-----|-------------|-----------------|
| 1 | INT | Interrupt Input |
| 2 | NC | Not Connected |
| 3 | DO7 | Digital Output |
| 4 | DO6 | Digital Output |
| 5 | DO5 | Digital Output |
| 6 | DO4 | Digital Output |
| 7 | DO3 | Digital Output |
| 8 | DO2 | Digital Output |
| 9 | DO1 | Digital Output |
| 10 | DO0 | Digital Output |
| 11 | GND | Ground |
| 12 | CTR5GATE | Counter 5 Gate |
| 13 | CTR5IN | Counter 5 input |
| 14 | CTR4GATE | Counter 4 Gate |
| 15 | CTR4IN | Counter 4 input |
| 16 | CTR3GATE | Counter 3 Gate |
| 17 | CTR3IN | Counter 3 input |
| 18 | CTR2GATE | Counter 2 Gate |
| 19 | CTR2IN | Counter 2 input |
| 20 | +5V | +5V Output |
| 21 | DI CTL | Pull-up/down connection |
| 22 | DI7 | Digital Input |
| 23 | DI6 | Digital Input |
| 24 | DI5 | Digital Input |
| 25 | DI4 | Digital Input |
| 26 | DI3 | Digital Input |
| 27 | DI2 | Digital Input |
| 28 | DI1 | Digital Input |
| 29 | DI0 | Digital Input |
| 30 | OSC OUT | Oscillator Output |
| 31 | CTR5OUT | Counter 5 output |
| 32 | CTR4OUT | Counter 4 output |
| 33 | CTR3OUT | Counter 3 output |
| 34 | CTR2OUT | Counter 2 output |
| 35 | CTR1OUT | Counter 1 output |
| 36 | CTR1IN | Counter 1 input |
| 37 | CTR1GATE | Counter 1 Gate |

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