4ch 32Bit High-Speed Up/Down Counter Board for Low Profile PCI (TTL Input)
CNT32-4MT(LPCI)

Features

Can input two-phase and single-phase signals.

Can input pulse signals up to 10MHz and can resolve phase differences as short as 25nsec.

Can be converted to a differential input interface using the differential unit (CTP-4D) and connection cable (CNT-68M/50M) which are sold separately.

One control signal input pin per channel.

Can count values sampling at a maximum sampling rate of 20 MHz.

Supporting bus mastering, enabling high-speed data transfer between the board and the PC without intervention from the CPU.

Can generate an interrupt, issuing an external signal, or presetting/zero-clearing the count value when it matches an arbitrary prede fined value.

Support for both of low-profile and standard PCI slots (interchangeable with a bundled bracket).

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Input</strong></td>
<td></td>
</tr>
<tr>
<td>Channel count</td>
<td>4 channels</td>
</tr>
<tr>
<td>Count system</td>
<td>Up/down counting</td>
</tr>
<tr>
<td>Max. count</td>
<td>FFFFFFFFh(binary data, 32Bit)</td>
</tr>
<tr>
<td>Input type</td>
<td>Unisolated LVTTL level input</td>
</tr>
<tr>
<td>Input signal</td>
<td>Phase-A/UP 1 x 4 channels</td>
</tr>
<tr>
<td>Digital filter</td>
<td>0.1μsec - 1.6384msec or not used</td>
</tr>
<tr>
<td>Timer</td>
<td>1μsec - 65536μsec 1μsec unit</td>
</tr>
<tr>
<td>Counter start trigger</td>
<td>Software/External start input/Sampling start trigger</td>
</tr>
<tr>
<td>Counter stop trigger</td>
<td>Software/External stop input/Sampling stop trigger</td>
</tr>
</tbody>
</table>

| **Sampling** |
| Sampling start trigger | Software/External start input/Count match |
| Sampling stop trigger | Software/External stop input/Specification number/Bus master transfer error/Count match |
| Sampling clock | Sampling timer/External clock input |
| Sampling timer | 50μsec - 107sec 25nsec unit(can not be independently set for each channel.) |
| External sampling start signal | Unisolated LVTTL level input (Select Rise or Fall) |
| External sampling stop signal | Unisolated LVTTL level input (Select Rise or Fall) |
| External sampling clock signal | Unisolated LVTTL level input (Fall) |
| Response frequency | 10MHz 50% duty |

| **Control** |
| Control input signal type | Unisolated LVTTL level input |
| Control input channel | 1 x 4 channels |
| Control input signal | - Preset(Select Rise or Fall) |
| - Zero-clear(Select Rise or Fall) |
| - Counter start/stop(Select Rise or Fall) |
| - General-purpose input(positive logic) |
| Software-selected from among the above four options |
| Response time | 100nsec (Max.) |

| **Interrupt event** |
| Count match(8 points), Counter error(2 points), Sampling factor(6 points), Carry/Borrow(1 points), Timer(1 points) |

This is a PCI bus compliant interface board for counting the pulses input from the external device.

The board supports a low-profile PCI slot and, if replaced with the supplied bracket, supports a PCI slot, too.

The board has four channels of 32-bit up/down counters, allowing external devices such as a rotary encoder and a linear scale to be connected. Given below are examples of using the board for “detecting a position of the table of a machine tool” and “detecting a change in weight”.

The pulse signal inputting interface is unisolated LVTTL-level input that can input pulse signals at high speed.

The application for this board can transfer data between the board and the PC at high speed using PCI bus mastering.

<Example>

- Detecting a position of the table of a machine tool
- Detecting a change in weight
### Output

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control output signal type</td>
<td>Unisolated LVTTL level output</td>
</tr>
<tr>
<td>Control output channel</td>
<td>1 x 4 channels</td>
</tr>
</tbody>
</table>

#### Control output signal

- Count match 0 output (one-shot pulse output)
- Count match 1 output (one-shot pulse output)
- Abnormal input error output (one-shot pulse output)
- General-purpose output (Level output)

Software-selected from among the above five options (Positive/negative logic is selected with the software.)

#### One shot output signal amplitude

Selected between 10 μsec, 100 μsec, 1msec, 10msec and 100msec

(Can be set for each channel, within precision +1μsec)

#### Response time

100 nsec (Max.)

#### Rated output current

I_{OL} = 8mA (Max.)   I_{OH} = -8mA (Max.)

### Test pulse

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test pulse output signal type</td>
<td>Unisolated LVTTL level output</td>
</tr>
<tr>
<td>Test pulse output point</td>
<td>One for each of phases A and B</td>
</tr>
</tbody>
</table>

#### Output frequency

10kHz fixed

### Sampling

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sampling output signal type</td>
<td>Unisolated LVTTL level output</td>
</tr>
</tbody>
</table>

#### Output point

Sampling start trigger, sampling stop trigger, Sampling clock trigger 1 point each

#### One shot output signal width

Negative logic 100nsec (fixed)

#### Response speed

100nsec (Max.)

#### Rated output current

I_{OL} = 8mA (Max.)   I_{OH} = -8mA (Max.)

### Bus master

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>DMA channel</td>
<td>1 channel</td>
</tr>
<tr>
<td>Transfer bus width</td>
<td>32-Bit width</td>
</tr>
<tr>
<td>Transfer data length</td>
<td>8 PCI Words length (Max.)</td>
</tr>
<tr>
<td>Transfer rate</td>
<td>80MB/sec (Max. 133MB/sec)</td>
</tr>
<tr>
<td>FIFO</td>
<td>1K-Word</td>
</tr>
<tr>
<td>Scatter/Gather function</td>
<td>64MB</td>
</tr>
<tr>
<td>Interrupt event</td>
<td>Bus master event (7 points)</td>
</tr>
</tbody>
</table>

### Common

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>I/O address</td>
<td>Occupies 2 locations, any 32-byte and 64-byte boundary</td>
</tr>
<tr>
<td>Power consumption</td>
<td>5VDC 300mA (Max.)</td>
</tr>
<tr>
<td>Operating condition</td>
<td>0 - 50°C, 10 - 90%RH (No condensation)</td>
</tr>
<tr>
<td>PCI bus specification</td>
<td>32bit, 33MHz, Universal key shapes supported *1</td>
</tr>
<tr>
<td>Dimension (mm)</td>
<td>121.6(L) x 63.41 (H)</td>
</tr>
<tr>
<td>Weight</td>
<td>60g</td>
</tr>
</tbody>
</table>

*1 This board requires power supply at +5 V from an expansion slot (it does not work on a machine with a +3.3-V power supply alone).

### Accessories

#### Accessories (Option)

- **Termination Panel with Differential Receivers**
  - For Counter Input: CTP-4D *1
  - Screw Terminal (M3 x 50P): EPD-50A *1
  - Screw Terminal (M3 x 68): EPD-68A *2

*1 CNT-68M/50M optional cable is required separately.

*2 PCB68PS-0.5P or PCB68PS-1.5P optional cable is required separately.

* Check the CONTEC’s Web site for more information on these options.

#### Packing List

- Board [CNT32-4MT(LPCI)] …1
- First step guide …1
- CD-ROM *1 [API-PAC(W32)] …1
- Bracket for PCI…1

*1 The CD-ROM contains the driver software and User's Guide.

### Support Software

#### Driver Library API-PAC(W32) (Bundled)

API-PAC(W32) is the library software that provides the commands for CONTEC hardware products in the form of Windows standard Win32 API functions (DLL). It makes it easy to create high-speed application software taking advantage of the CONTEC hardware using various programming languages that support Win32 API functions, such as Visual Basic and Visual C/C++.

It can also be used by the installed diagnosis program to check hardware operations.

CONTEC provides download services to supply the updated drivers and differential files.

For details, read Help on the bundled CD-ROM or visit the CONTEC’s Web site.

< Operating environment >

**OS**

Windows XP, 2000, Me, 98, etc..

**Adaptation language**

Visual C/C++, Visual Basic, Delphi, Builder, etc..

**Others**

Each piece of library software requires 50 MB of free hard disk space.
Using the On-Board Connectors

Connecting a Board to a Connector
Use the optional connection cable (CNT-68M/50M or PCA68PS-**P, PCB68PS-**P) to connect the board to an external device. Uses the cable together with a terminal block SCA68PS-**P, PCB68PS-**P) to connect the board to an external device. The wiring between the board and external device.

CNT32-4MT(LPCI)

The control input can serve as the general-input, counter start/stop, preset, and zero-clear.

*1 The control output can serve as the general-output, count match, abnormal input error and digital filter error.

+3.3V output *3

3.3V output pin

Input signal

The connection cable length should be within 1.5 m.

To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.

How to Connect the Counter Input Signal

You can connect to a rotary encoder or linear scale with a TTL level output circuit, or to an open-collector output circuit. The signal must be an LVTTL level input and can be up to 10MHz.

As pull-up resistors are provided on the board, connect the pull-up voltage (3.3V to 5.5V max.) to the pull-up pins if connecting to an open collector output circuit/TTL-level output circuit. (If using 3.3V, connect to the VCC pin on the board.) Not connecting the pull-up voltage may affect the counter input channel left unconnected.

For a two-phase input, connect both phase A and phase B. For a single phase input, connect to either phase A or phase B. If not using the Z phase, this does not need to be connected.

Remarks

The pull-up pins are PUP1 (pin 32 *1) for the counter input signal and PUP2 (pin 66 *1) for the control input signal.

PUP1 (pin 32):
- Pull-up for A, B, and Z phase input signal (A0, B0, Z0, A1, B1, Z1, A2, B2, Z2, A3, B3, Z3).
- PUP2 (pin 66):
- Pull-up for the control input signals and for the sampling input signals (DI0, DI1, DI2, DI3, CLKIN, STARTIN, STOPIN).

Example Connection for Counter Input Circuit

Connection pulled up with external 5-V power

Counter Input

Board

Remote device

+3.3V output pin (+)

Control output pin

Input signal

Output signal

CAUTION

The connection cable length should be within 1.5 m.

To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.

Connection pulled up with internal 3.3-V output power

Counter Input

Board

Remote device

+3.3V OUTPUT *3

Control output pin

Input signal

Output signal

CAUTION

The connection cable length should be within 1.5 m.

To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.

Example Connection for Counter Input Circuit

Connection pulled up with external 5-V power

Counter Input

Board

Remote device

+3.3V output pin (+)

Control output pin

Input signal

Output signal

CAUTION

The connection cable length should be within 1.5 m.

To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.
Connecting the control signal input/output

Connection of a control input

The control input signals consist of one pin per channel that can be selected as the channel’s counter start/stop or preset, and one pin per board that can be used as the start, stop, and clock for sampling. The signals are LVTTTL-level inputs. As pull-up resistors (10KΩ) are provided on the board, connect the pull-up voltage (3.0V to 5.5V max.) to the pull-up pins if connecting to an open collector output circuit/TTL-level output circuit. (If using 3.3V, connect to the VCC pin on the board.) Not connecting the pull-up voltage may affect the control input pin left unconnected.

Remarks

The pull-up pins are PUP1 (pin 32 *1) for the counter input signal and PUP2 (pin 66 *1) for the control input signal.

PUP1 (pin 32):
Pull-up for A, B, and Z phase input signal (A0, B0, Z0, A1, B1, Z1, A2, B2, Z2, A3, B3, Z3).

PUP2 (pin 66):
Pull-up for the control input signals and for the sampling input signals (DI0, DI1, DI2, DI3, CLKIN, STARTIN, STOPIN).

*1 Connector pin number on the board.

Control input circuit and its sample connection

Connection pulled up with external 5-V power (Control input DI0, DI1, DI2, DI3, CLKIN, STARTIN, STOPIN)

Connection pulled up with internal 3.3-V output power (Control input DI0, DI1, DI2, DI3, CLKIN, STARTIN, STOPIN)

CAUTION

The connection cable length should be within 1.5 m.
To prevent noise from causing a malfunction, arrange the connection cable as away from any other signal conductor or noise source as possible.

External sampling clock signal (EXTCLK)

Pin used to input the external pacer clock. The maximum frequency is 10MHz. If the external clock input is selected as the sampling clock, sampling occurs on the falling edge of the signal.

Other control input signals (DI0 to DI3, EXTSTART, EXTSTOP)

These signals are TTL-level compatible and the trigger edge is software-programmable at either the rising or falling edge. High- and low-level hold times of at least 50 nsec are required to detect an edge of the signal.

Connection of a control output

This outputs a general-purpose output signal (level output) or a one-shot pulse output to indicate a hardware event such as a count match. The signal is an LVTTTL level output and can be set to positive or negative logic by software.

Control output circuit and its sample connection

*1: The pull-up pins are PUP1 for the counter input signal and PUP2 for the control input signal.