Multifunction counter board, optically isolated, fast counter inputs – programmable, for PCI Express

The board APCI-1710 is a fast multifunction and multi-channel counter board for the PCI Express bus. The strengths of this board are its wide range of applications and high precision and reliability for though industrial applications.

With this board you can realise many different applications on the same hardware base. The board is supplied with a pool of functions which provides the user with maximum efficiency yet minimum space and parts requirement. The functions are individually configured for each channel through the supplied software. The flexible programming facilities on this board allow many different user applications to be quickly and easily developed and reconfigured as further requirements arise. Thanks to the FPGA board structure, further counting applications can be realised through software adaptation. Contact us!

**Features**

- 32-bit data access
- Up to 5 MHz input frequency
- Signals in TTL or RS422 mode (APCIe-1711), 24 V signals (APCIe-1711-24 V)
- Four onboard function modules
- Programmable functions

**Functions**

- Incremental counter for the acquisition of incremental encoders (90° phase-shifted signals)
- SSI synchronous serial interface. The SSI function is an interface for systems which allow an absolute position information via serial data transfer.
- Customized functions
- Counter/timer (8x54)
  - Pulse acquisition
  - Frequency measurement
  - Pulse width modulation (PWM)
  - Period duration measurement
  - Velocity measurement
  - BiSS-Master
  - Digital inputs and outputs
  - Edge time measurement (ETM)

**Available channels for all four function modules**

- 12 channels for digital inputs, optically isolated
- 16 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

**APCIe-1711**

**Available functions:**

- Incremental counter, SSI synchronous serial interface, counter/timer, pulse acquisition, frequency, pulse width, period duration, velocity measurement, PWM, BiSS-Master, digital inputs and outputs, ...

**Function selection through software**

Optical isolation

TTL, RS422, 24 V

**Customized functions**

**Available lines for each function module**

8 lines are available for each function module.

The multifunction counter board APCIe-1711 is available in different versions:

- **APCIe-1711**
  - 16 x RS422/TTL inputs and outputs, 12 x 24 V inputs, 4 x 24 V outputs

- **APCIe-1711-24V**
  - 28 x 24 V inputs, 4 x 24 V outputs

- **APCIe-1711-5V-I**
  - 16 x RS422/TTL inputs and outputs, 12 x TTL-inputs, 4 x 24 V outputs

**Safety features**

- Creeping distance IEC 61010-1
- Optical isolation 1000 V
- Noise neutralization of the PC supply

**Applications**

- Event counting
- Position acquisition
- Motion control
- Batch counting
- ...

**Software drivers**

A CD-ROM with the following software and programming examples is supplied with the board.

**Standard drivers for:**

- Linux, Windows Vista™ (32-bit)/XP/2000

**On request:** RTX drivers

**Samples for the following compilers:**

Depending on the function, the samples are not always available for each compiler. You fill find a detailed list on the web.

- Microsoft VC++ 5.0
- Borland C++ 5.01
- Visual Basic 5.0 • Delphi 4

**Drivers for the following software packages:**

- LabVIEW 5.01 (depending on the function)
- DasyLab 6/7 • Diadem 6

Current driver list on the web: www.addi-data.com

The software functions can be adapted to your application on request. The board can also be implemented for other application softwares.
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Wide range of applications through the free combination of functions

4 function modules quickly and easily programmable with numerous functions
Each of the four modules is programmed with one function. You can program 4 times the same function or freely combine 4 different functions.

<table>
<thead>
<tr>
<th>Function module 0</th>
<th>Function module 1</th>
<th>Function module 2</th>
<th>Function module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Incremental counter</td>
<td>Incremental counter</td>
<td>Pulse acquisition</td>
<td>Timer/counter</td>
</tr>
</tbody>
</table>

Configuration example 2

<table>
<thead>
<tr>
<th>Function module 0</th>
<th>Function module 1</th>
<th>Function module 2</th>
<th>Function module 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>SSI</td>
<td>SSI</td>
<td>Incremental counter</td>
<td>Digital I/O</td>
</tr>
</tbody>
</table>

Available functions

- Acquisition of incremental encoders (1 x 32-bit or 2 x 16-bit)
- SSI (max. 3 encoders per module)
- Counter/Timer (3 counters similar to 82 C 54)
- Pulse counter (4 x 32-bit counter per module)
- Chronos (chronometer)
- TOR (pulse counter with time slices)
- Digital I/O (8 I/O, 24 V, TTL, RS422)
- PWM (pulse width modulation, 2 x per module)
- BiSS-Master (fast sensor interface)
- ETM (Timer interface for period duration measurement, edge time, ...)
- TTL (TTL-I/O, without isolation)
- Customized functions

Programmable onboard modules

Each module can be programmed with the function of your choice. You can operate simultaneously up to 4 different functions on one board. If your application must be modified, you can load a new function quickly and easily.

Customer-tailored modifications, designed to suit your needs.
Hardware and software, firmware, PLDs, ...
Contact us!
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**Function incremental encoder**

1 to 2 incremental encoders can be connected to the module programmed with this function.

- **90° phase-shifted input signals** (displacement measurement systems)
- **Motion control**
- **Pulse width and frequency measurement**
- **Incremental encoder acquisition**
- **Tolerance measurement**
- **Velocity measurement**
- **Rotation measurement**

**Possible configurations:**

- 1 counter channel with a 32-bit counting depth, for TTL or differential incremental encoders (option 24 V: APcie-1711-24 V)
- 2 counter channels with a 16-bit counting depth for TTL or differential incremental encoders (option 24 V: APcie-1711-24 V)
- 1 input for reference point logic
- 1 input which can be used as error input
- 1 input as usual dig. input or for reference point logic
- 2 inputs to latch the counter value
- **Fast counting**

**Function range of the counter component**

- Simple, double, quadruple analysis of 2 phase-shifted clock pulses (A, B)
- Direction recognition for upwards or downwards counting
- Hysteresis circuit for the absorption of the first pulse after a change in rotation; switchable
- 2 x 32-bit data latches, indiv. programmable for internal or ext. strobe
- The operating mode is defined by an internal mode register, loadable and readable through the data bus.
- Strobe inputs, which can be triggered either through 2 external pins (24 V input) or by writing in a register

**Used signals**

<table>
<thead>
<tr>
<th>On connector</th>
<th>Polarity</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ax +/-</td>
<td>Diff/TTL24 V*</td>
<td>A signal of the 1st incremental encoder</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff/TTL24 V*</td>
<td>B signal of the 1st incremental encoder</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff/TTL24 V*</td>
<td>INDEX signal of the incremental encoder in 32-bit mode</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff/TTL24 V*</td>
<td>Error signal input in 32-bit mode.</td>
</tr>
<tr>
<td>Ex</td>
<td>24 V/5 V optional</td>
<td>Digital input, readable through register, can control the reference point logic</td>
</tr>
<tr>
<td>Fx</td>
<td>24 V/5 V optional</td>
<td>Digital input, which latches the counter 16/32-bit in the first latch register. Can also generate an interrupt.</td>
</tr>
<tr>
<td>Gx</td>
<td>24 V/5 V optional</td>
<td>Digital input, which latches the counter 16/32-bit in the second latch register. Can also generate an interrupt.</td>
</tr>
</tbody>
</table>

**Function synchronous serial interface (SSI)**

The function module is programmed as a synchronous serial interface. The SSI function is an interface for systems which allows an absolute position information through serial data transfer.

**Typical application examples:**

- Acquisition of displacement measurement systems
- Axis control
- Tolerance measurement ...

**Block diagramm of the SSI**

- **Output register**
- **SSI clock**
- **Input register1**
- **SSI Data 1**
- **Input register2**
- **SSI Data 2**
- **Input register3**
- **SSI Data 3**
- **Digital I/O**

**Connection of 1 up to 3 SSI encoders per function module:**

- Common clock pulse for the 3 interfaces (depending on the clock frequency, line length and input drivers of the sensors)
- The clock frequency is software programmable
- The number of data bits is programmable, which allows a flexible resolution.
- GRAY to BINARY conversion possible

**The interface includes:**

- Three independent SHIFT registers, which can be read through the data bus
- **Clock and pulse generator**
- **Function and control logic**

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<th>Function</th>
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<tbody>
<tr>
<td>Ax +/-</td>
<td>Diff</td>
<td>Clock output signal for the SSI encoders</td>
</tr>
<tr>
<td>Bx +/-</td>
<td>Diff/TTL24 V*</td>
<td>DATA input 1 for the first encoder</td>
</tr>
<tr>
<td>Cx +/-</td>
<td>Diff/TTL24 V*</td>
<td>DATA input 2 for the second encoder</td>
</tr>
<tr>
<td>Dx +/-</td>
<td>Diff/TTL24 V*</td>
<td>DATA input 3 for the third encoder</td>
</tr>
<tr>
<td>Ex</td>
<td>24 V/5 V optional</td>
<td>Digital input 1</td>
</tr>
<tr>
<td>Fx</td>
<td>24 V/5 V optional</td>
<td>Digital input 2</td>
</tr>
<tr>
<td>Gx</td>
<td>24 V/5 V optional</td>
<td>Digital input 3</td>
</tr>
<tr>
<td>Hx</td>
<td>24 V/5 V optional</td>
<td>Digital output</td>
</tr>
</tbody>
</table>

x: Number of the function module (See pin assignment page 43)

* 24 V with the APcie-1711-24 V

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*Preliminary product information*
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- Chronos (chronometer)
- TOR (pulse counter with time slices, ...)
- Digital I/O (24 V), 24 V, TTL, RS422
- PWM (pulse width modulation, 2 x per module)
- BISS-Master (fast sensor interface)
- ETM (Timer interface for period duration measurement, edge time, ...)
- TTL (TTL I/O without isolation)
- Customized functions

Ordering information

- PX 8000: Screw terminal panel with housing for DIN rail
- ST7111-50: Standard round cable, shielded, twisted pairs, 2 m, 78-pin male connector to 50-pin male connector
- ST370-16: Standard round cable, shielded, twisted pairs, 2 m
- FB8000: Ribbon cable

Technical data

Version APCI-1710-24 V

- 24 V inputs (channels A to D).
- This board version is intended for the connection of 24 V encoders.
- Only 24 V signals can be connected to the inputs.

- Nominal voltage: 24 VDC
  - Max. input frequency: 1 MHz (at nominal voltage) depending on the function

Logic input levels:
- Unominal: 24 V
- UH max.: 30 V
- UH min.: 19 V
- UL max.: 14 V
- UL min.: 0 V

All functionalities with port A, B, C, D cannot be used as outputs.

See the manuals of the functions!

EMC – Electromagnetic compatibility

The product complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326).

The limit values as set out by the European EMC directive for an industrial environment are complied with. The respective EMC test report is available on request.

PC system requirements and environmental conditions

- Dimensions: 168 x 98 mm
- System bus: Acc. to PCI Express base specification, Revision 1.0a (PCI Express r1.0a)
- Space required: 1/4-lane PCI Express slots
- Operating voltage: +3.3 V / +12 V from the PC
- +24 V ext.
- Current consumption APCIe-1711: +3.3 V / 340 mA
  - 12 V / 80 mA typ.
- Front connector: 78-pin SUB-D female connector
- Additional connector: 50-pin SUB-D male connector
- Temperature range: 0 to 60 °C (with forced cooling)

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APCIe-1711

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Incl. technical description and software drivers.

- APCIe-1711: Isolated counter board with programmable functions
- APCIe-1711-24V: 5 V inputs (E, F, G) instead of 24 V

Accessories

- PX 8000: Screw terminal panel with housing for DIN rail
- ST7111-50: Standard round cable, shielded, twisted pairs, 2 m, 78-pin male connector to 50-pin male connector
- For the TTL I/O function
- ST370-16: Standard round cable, shielded, twisted pairs, 2 m
- FB8000: Ribbon cable

* Preliminary product information