Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...

APCI-1710

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

The board APCI-1710 is a fast multifunction and multi-channel counter board for the PCI bus. The strength 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 zu 5 MHz input frequency
- Signals in TTL or RS422 mode (APCI-1710), 24 V signals (APCI-1710-24 V)
- Four onboard function modules
- Reprogrammable 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.
- Counter/timer (82x54)
- Pulse acquisition
- Frequency measurement
- Pulse width modulation (PWM)
- Period duration measurement
- Velocity measurement
- BiSS-Master
- Digital inputs and outputs
- Edge time measurement (ETM)
- Customised functions

Available channels for all four function modules

- 20 channels for digital inputs, optically isolated
- 8 channels, programmable either as digital inputs or outputs, optically isolated
- 4 digital power outputs, optically isolated

Available lines for each function module
8 lines are available for each function module
- Input lines:
  - 2 x TTL and RS422 (APCI-1710)
    or 2 x 24 V (APCI-1710-24)
  - 3 x 24 V, optional 5 V for channels E, F, G
- Output lines:
  - 1 x 24 V, optional 5 V (power output)
- 2 channels, programmable either as digital inputs or outputs, optically isolated: 2 x TTL, RS422

Safety features

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

Applications

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

Software drivers

A CD-ROM with the following software and programming samples is supplied with the board.
Standard drivers for:
Linux Kernel version 2.4.2,
Windows Vista (32-bit)/2000/NT/98;
Windows 3.11 and MS-Dos.
Real-time drivers for Windows Vista (32-bit)/2000/NT/98.
On request: RTX drivers
Samples for the following compilers:
Depending on the function, the samples are not always available for each compiler. You will find a detailed list on the web.
Microsoft VC++ 5.0 • Microsoft C 6.0
Borland C++ 5.01 • Borland C 3.1•
Visual Basic 1.0; 4.0; 5.0 • Delphi 1; 4 • Turbo Pascal 7.0
Drivers for the following software packages:
LabVIEW 5.01 (depending on the function)
On request: DasyLab 6/7 • DIAdem 6

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

The software functions can be adapted to your applications on request. The board can also be implemented for other software applications.

RoHS 2002/95/EC

LabVIEW™

DIAdem®

DASYLab 7.0 *
DASYLab™

* for SSI, incremental counter, digital I/O

Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...

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.

Configuration example 1			
Function module 1	Function module 2	Function module 3	Function module 4
1 x 32-bit incremental counter	1 x 32-bit incremental counter	4 x pulse acquisition	3 x timer/counter

Configuration example 2			
Function module 1	Function module 2	Function module 3	Function module 4
3 x SSI	3 x SSI	1 x 32-bit incremental counter	8 x digital I/O, 24 V

Programmable onboard modules

Each onboard module can be programmed with the function of your choice. You can simultaneously operate up to 4 different functions on one board.
If your application must be modified, you can load a new function quickly and easily per mouse click in the SET1710 configuration program which is delivered with the board.

Available functions per function module

1 x 32-bit acquisition of incremental encoders
2 x 16-bit acquisition of incremental encoders
3 x acquisition of absolute encoders/SSI
3 x counter/timer
1 x chronos/TOR for frequency measurement
4 x pulse acquisition
1 x chronos for pulse width modulation
1 x chronos for period duration measurement
2 x TOR for velocity measurement
8 digital I/O, 24 V, TTL, RS422
2 x PWM
1 x BiSS-Master
2 x ETM

Application and description of the functions

Application	Function	Page
Acquisition of incremental encoders	Function incremental counter	86
Acquisition of absolute encoders/SSI	Function SSI	86
Counter/Timer	Function Counter/Timer (82x54)	88
Frequency measurement	Function Chronos	87
Frequency measurement	Function TOR	89
Pulse acquisition	Function Pulse counter	90
Pulse width modulation	Function Chronos	87
Period duration measurement	Function Chronos	87
Velocity measurement	Function TOR	89
Digital I/O, 24 V, TTL, RS422	Function Digital I/O	91
PWM	Function PWM (pulse width modulation)	90
BiSS	Function BiSS-Master	87
Edge Time Measurement	Function ETM	91
TTL I/O	Function TTL I/O	91

Pin assignment

*Each number corresponds to the number of the function module

Available functions

Selected configuration

Click the function you want to load. Hold the mouse key pressed ...

... and drag the function to the selected function module
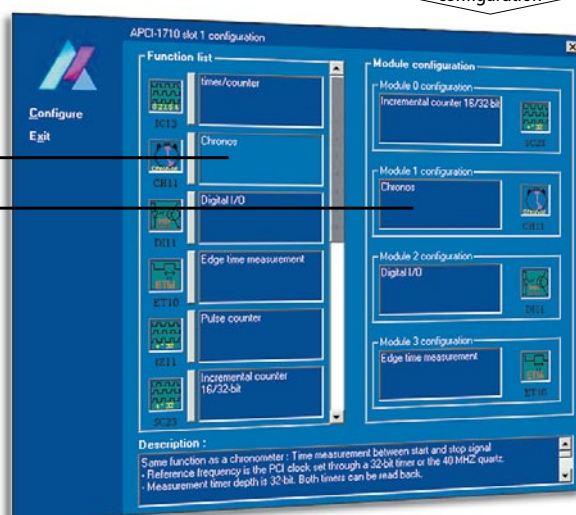
Customer-tailored modifications, designed to suit your needs. Hardware and software, firmware, PLDs, ... Contact us!

Multifunction counter board APCI-1710
Function incremental encoder / SSI

Function Incremental encoder

1 or 2 incremental encoders can be connected to a 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
- Electronic mouse

Possible configurations as follows:
- 1 counter channel with a 32-bit counter depth, for TTL or differential incremental encoders (option 24 V: APCI-1710-24 V)
- 2 counter channels with a 16-bit counting depth for TTL or differential incremental encoders (option 24 V: APCI-1710-24 V)
- 1 "INDEX" input for reference point logic
- 1 "UAS" input, which can be used as error input
- 1 "REF" input as usual dig. input or for reference point logic
- 2 "EXTSTB" 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 / external strobe, latch strobe synchronised with an internal clock pulse
- 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
- Interrupt indication triggered through the external strobe inputs
- Compare logic

Used signals

Signals	On connector	Polarity	Function
A	Ax +/-	Diff./TTL/24 V*	A signal of the 1st incremental encoder
B	Bx +/-	Diff./TTL/24 V*	B signal of the 1st incremental encoder
INDEX	Cx +/-	Diff./TTL/24 V*	INDEX signal of the incremental encoder in 32-bit mode
C	Cx +/-	Diff./TTL/24 V*	A signal of the 2nd incremental encoder in 16-bit mode.
UAS	Dx +/-	Diff./TTL/24 V*	Error signal input in 32-bit mode.
D	Dx +/-	Diff./TTL/24 V*	B signal of the 2nd incremental encoder in 16-bit mode
REF	E	24 V/5 V optional	Usual digital input, readable through register can also control the reference point logic
ExtStrb_a	F	24 V/5 V optional Active High	Digital input, which latches the counter 16/32-bit in the first latch register. Can also generate an interrupt.
ExtStrb_b	G	24 V/5 V optional Active High	Digital input, which latches the counter 16/32-bit the 2nd latch register. Can also generate an interrupt.

x: Number of the function module (See pin assignment page 85)

* 24 V for the APCI-1710-24 V

## Function Synchronous serial interface (SSI)

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

Typical application examples:
- Acquisition of displacement measurement systems
- Axis control
- Tolerance measurement ...

Block diagramm SSI
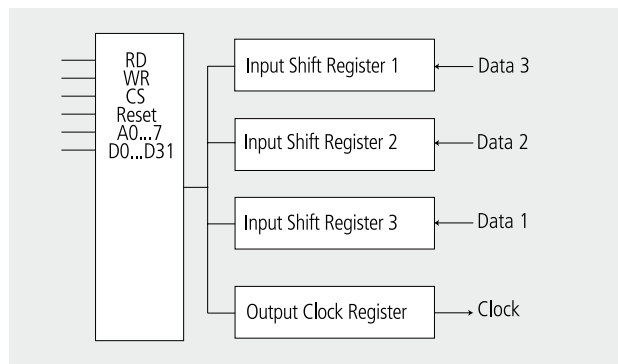
Connection of 1 up to 3 SSI encoders per function module:
- Common clock pulse for the 3 interfaces (depending on the clock frequency and line length)
- The clock frequency is software-programmable
- The number of data bits is programmable, which allows a flexible resolution.
- GRAY to BINARY convertion possible

The interface includes:
- Three independent 32-bit SHIFT registers, which can be read through the data bus
- Clock and pulse generator
- Function and control logic

Used signals

On connector	Polarity	Function
Ax +/-	Diff.	Clock output signal for the SSI encoders
Bx +/-	Diff./TTL/24 V*	DATA input 1 for the first encoder
Cx +/-	Diff./TTL/24 V*	DATA input 2 for the second encoder
Dx +/-	Diff./TTL/24 V*	DATA input 3 for the third encoder
Ex	24 V/5 V optional	Digital input 1
Fx	24 V/5 V optional	Digital input 2
Gx	24 V/5 V optional	Digital input 3
Hx	24 V/5 V optional	Digital output

* 24 V for the APCI-1710-24 V

x: Number of the function module (See pin assignment page 85)

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Multifunction counter board APCI-1710
Function Chronos / Function BiSS-Master

Function Chronos

The function "CHRONOS" is a timer interface which allows to measure the time between two "events" like a chronometer.
3 functions are available:
- a 32-bit timer to create a time reference,
- a 32-bit measuring timer to determinate and measure the time between start and stop pulse.
- 3 digital inputs and 3 digital outputs

Properties
- Complete isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Interrupt status at the end of the measuring time
- Timer readable
- Input and output channels can be inverted through software
- Software GATE possible

Function description
The pulse signals from Timer 0 are counted between the start pulse signal and the stop pulse signal. The number of pulses is then stored in the measuring timer and can be read through I/O read commands. The timer 0 is used as a time reference generator. The divider factor is written in timer 0 and determines the output frequency.

The input frequency is set according to the PCI clock pulse or to the 10 MHz onboard clock generator. Timer 0 is synchronised with the start event or with the 40 MHz quartz of the board.
Timer 0 can be read at any time.
The "Chronos" function can be used in 8 different modes.

Used signals

Signals	On connector	Polarity	Function
Ax	+/-	Diff./TTL, 24 V*	Dig. output 1; set to "0" after reset
Bx	+/-	Diff./TTL, 24 V*	Dig. output 2; set to "0" after reset
Cx	+/-	Diff/TTL/24 V*	Start pulse for measuring
Dx	+/-	Diff/TTL/24 V*	Stop pulse for measuring
E	x	24 V/5 V optional	Digital input 0
F	x	24 V/5 V optional	Digital input 1, inverting
G	x	24 V/5 V optional	Digital input 2, inverting
H	x	24 V/5 V optional	Dig. output 0; set to "0" after reset

x: Number of the function module (See pin assignment page 85)

* 24 V for the APCI-1710-24 V

Block diagram Chronos

Function BiSS-Master

The function "BiSS-Master" is a **bi**directional **s**ensor interface for the communication with positioning encorders. The following types of communications are supported:

Functions of the BiSS-Master:
- Sensor data transmission
- Register data transmission
- Multicycle data transmission

More information about the function range of the BiSS interface on www.biss-interface.com.

Limits and differences with respect to the BiSS specification:
- One channel available, to which a BiSS slave can be connected
- The functionality „automatic sensor data request" is not available
- Data buffer for two sensor registers available
- The board APCI-1710-10K20 is required

Used signals

Signals	On connector	Polarity	Function
Input1_x	Cx +/-	Diff.	Dig. input 1 (data line from slave to master)
Ausgang1_x	Ax +/-	Diff.	Dig. output 2; set to "0" after reset

x: Number of the function module (See pin assignment page 85)

Block diagram BiSS-Master

Multifunction counter board APCI-1710
Function Counter/Timer

Function Counter/Timer

Function equivalent to Intel® 82C54

The module programmed with this function can be used as a programmable interval timer/counter (similar to Intel 82C54) with 3 x 32-bit.

It generates time delays through software control. Instead of setting up timing loops in software, the user programs the module for the desired delays. After this delay, the module will interrupt the PC.

- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- 3 x 32-bit counters/timers, binary counting only
- 6 programmable modes
- Status readback and latch command
- Inputs and outputs can be inverted through software
- Hardware and software gate possible, readable
- Simple interface: no multiple assignment of the addresses
- Interrupt enabled with an individual release bit per counter/timer and interrupt status register
- PCI clock or 10 MHz of the quartz oscillator available as clock (PCI/4), selectable through software

Typical applications:

- Event counter
- Programmable rate generator
- Binary rate multiplier
- Square-wave generator
- Complex motor controller

Programmable modes

3 x 32-bit counters/timers are available on one function module.
Each counter/timer can be programmed independently in one of the 6 following modes (mode0 to mode5).

Mode definition

CLK PULSE: falling edge after a rising edge of the counter clock input.
TRIGGER: rising edge of the counter gate input.
COUNTER LOADING: counter transfer from the counter register to the counter

Mode0: Interrupt on terminal count

Mode0 is particularly suitable for event counting. The output is initially set to „Low" and remains „Low" until the counter reaches 0.
The output then goes „High" and holds this state until a new count or a new counter value is written into the counter.

Mode1: Hardware retriggerable one-shot

This mode is identical to mode0 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

Mode2: Rate generator

This mode is used for generating a real-time clock interrupt. The output is initially set to „High". When the initial count has decremented to 1, the output goes „Low" for one clock pulse. The output then goes „High" again, the counter reloads the initial count (ul_ReloadValue) and the process is repeated. An interrupt can be generated at the end of the cycle.

Mode3: Square wave mode

Mode3 is used for baud rate generation. It is similar to Mode2 except for the duty cycle of the output. The output is initially set to „High". When half the initial count has expired, the output is set to „Low" for the remainder of the count. Mode3 is periodic; the same sequence is repeated indefinitely.

Mode4: Software-triggered strobe

The output is initially set to „High". When the initial count expires, the output goes „Low" for one clock pulse and then goes „High" again. The counting sequence is triggered by writing the initial count.
If a new count is written during counting, it will be loaded on the next clock pulse and counting will continue from the new count.

Mode5: Hardware-triggered strobe (retriggerable)

This mode is identical to mode4 except for the GATE input. The GATE input is not used to activate or deactivate the timer, but to trigger it.

Used signals

On SUB-D	Polarity	Function
Ax +/-	Diff./TTL	Output of the first counter/timer
Bx +/-	Diff./TTL	Output of the second counter/timer
Hx	24 V/5 V optional	Output of the third counter/timer
Ex	24 V/5 V optional	GATE Input of the first counter/timer
Fx	24 V/5 V optional	GATE Input of the second counter/timer
Gx	24 V/5 V optional	GATE Input of the third counter/timer
-	-	Internal clock (PCI-Clock/4)
Cx +/-	Diff./ 24V*	Clock counter input of the second counter/timer
Dx +/-	Diff./ 24V*	Clock counter input of the third counter/timer

x: Number of the function module (see pin assignment page 85)

* 24 V for the APCI-1710-24V

Block diagram Counter/Timer
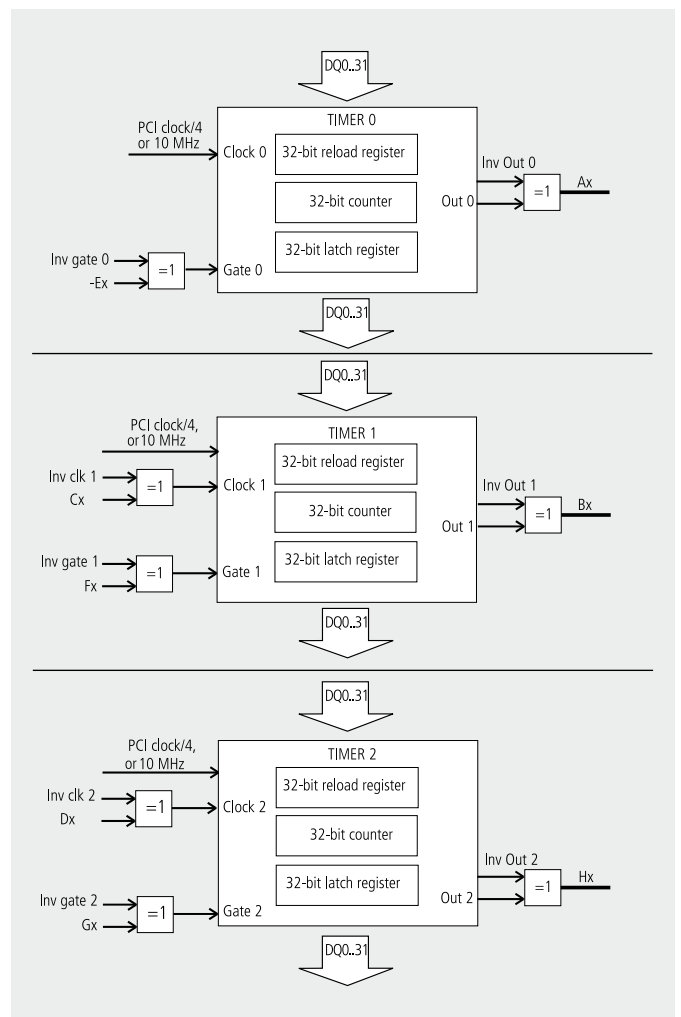
Multifunction counter board APCI-1710
Function TOR

Function TOR

The „TOR" function is a counter interface which allows counting input signals in a defined time interval.

2 TOR counters are available on each function module. Each TOR counter includes 2 x 32-bit timers.
The TOR function is a scaled-down version of the Timer/counter function. The pulse signal of Timer 1 gives the start and stop pulse signal to Timer 0. Timer 0 counts the input signals. After the stop signal from Timer 0 the number of pulses is stored and can be read through I/O read commands. The timer 1 is used as a time reference generator.
The divider factor is written in timer 1 and determines the output frequency. The input frequency is set according to the PCI clock pulse or the 40 MHz on-board quartz clock. Timer 0 is synchronised with the start event.

Pulse measurement
As soon as a start signal occurs from Timer 1, the Timer 0 is reset. It counts the pulse signals of the channel Ax(Bx).
During the process the status bit „Counter in Progress" is set.
As soon as a stop signal occurs from Timer 1, the Timer 0 is stopped and the status bit „Counter in Progress" is reset.
An interrupt can also be generated. The value can then be read. The latest measured value is read in the counter measurement register.

Properties:
• Complete isolation through opto-couplers for the input and output channels to avoid earth circuit
• Interrupt status at the end of the measuring period
• Inputs and output can be inverted through software
• Software GATE
The function "TOR" occupies 4 inputs (A to D) of the corresponding function module of the APCI-1710 or CPCI-1710.
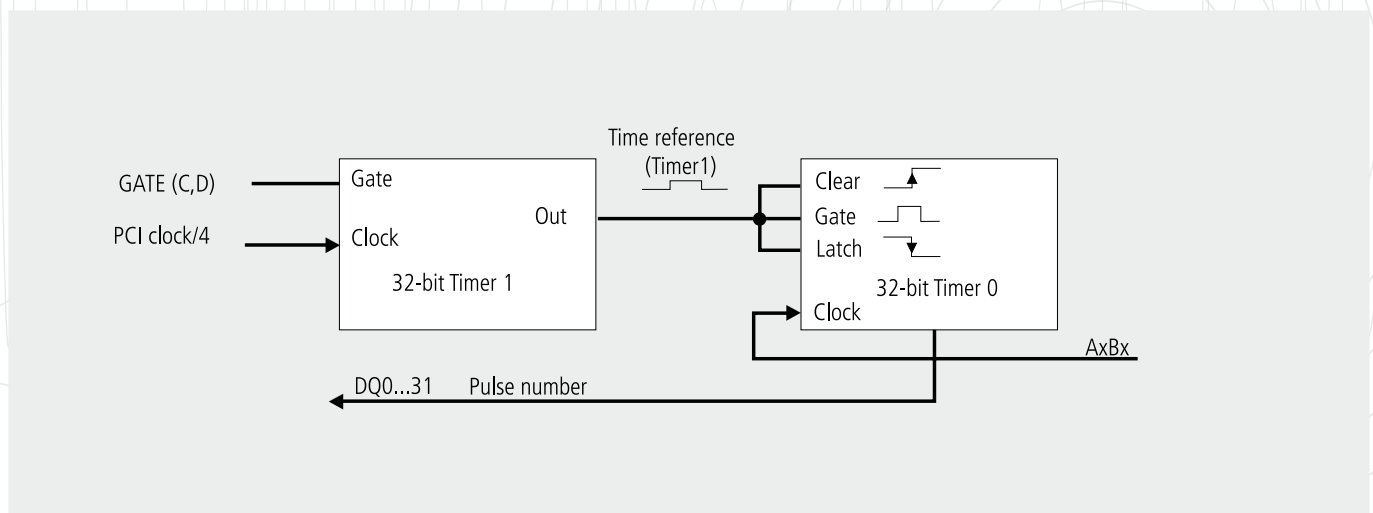
Used signals

On connector	Polarity	Function
Ax +/-	Diff./TTL/24 V*	Digital input 1 (TOR1)
Bx +/-	Diff./TTL/24 V*	Digital input 2 (TOR2)
Cx +/-	Diff./TTL/24 V*	External Gate (TOR1)
Dx +/-	Diff./TTL/24 V*	External Gate (TOR2)

x: Number of the function module (see pin assignment page 85)
*24 V for the APCI-1710-24 V

Block diagram TOR

Multifunction counter board APCI-1710
Function Pulse counter / Function PWM

Function Pulse counter

The "pulse counter" is an interface for the acquisition of external digital pulses. Each rising or falling edge on the counter input starts decrementing from the initially set counter value. An interrupt is generated at logical "0", i.e. the digital output is set or reset.

- 4 x 32-bit down counters
- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Each counter can be loaded with a predefined counter value
- Interrupt at overflow
- Output can be set or reset at overflow
- Polarity of the inputs selectable through software

The interface includes:
- 4 x 32-bit counters
- 4 independent 32-bit registers, readable through the data bus
- a function and control logic.

Used signals

On connector	Polarity	Function
Ax +/-	Diff./TTL/24 V*	Input of the 1st counter
Bx +/-	Diff./TTL/24 V*	Input of the 2nd counter
Cx +/-	Diff./TTL/24 V*	Input of the 3rd counter
Dx +/-	Diff./TTL/24 V*	Input of the 4th counter
H	24 V/5 V optional	Common digital output of the counter

x: Number of the function module (see pin assignment page 85)
* 24 V for the APCI-1710-24V

Block diagram Pulse counter
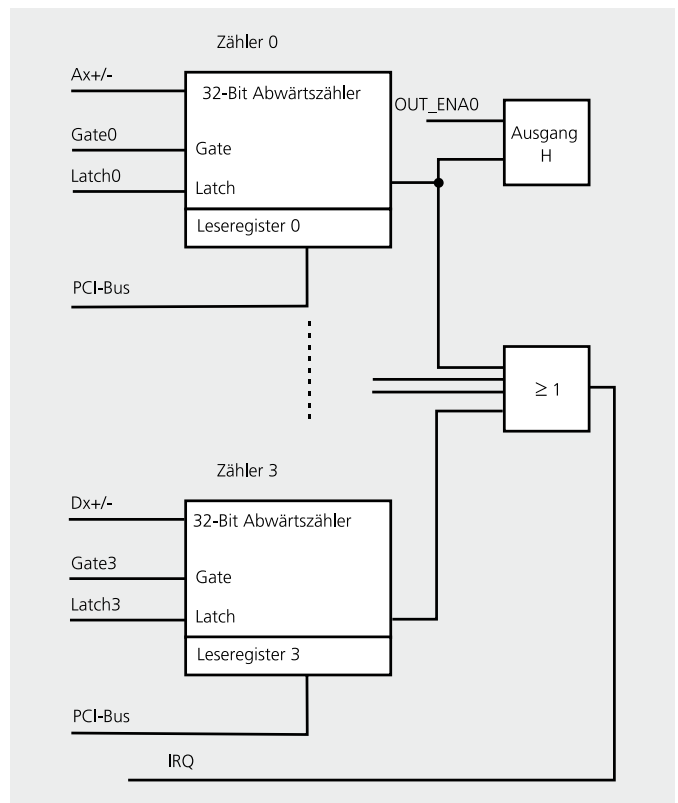
Function PWM (Pulse width modulation)

The function "PWM" is an interface for pulse width modulation. It generates a frequency and defines the time duration (pulse width) of the "Low" and "High" level. The function generates rectangle signals. The output pulses from the timer generate the pulse width modulation.

PWM generator
The "Low/High" time-divider factor is written in the timer and determines the output frequency. The input frequency is set according to the PCI clock or the 40 MHz quartz of the board.
The function includes:
- a 32-bit frequency generator for setting the "Low" and "High" levels
- 2 digital inputs as start or stop trigger
- 2 digital frequency outputs

Properties:
- Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits.
- Interrupt status after end of period
- Selection of the start level
- Selection of the stop level
- Hardware gate
- Software gate

Typical applications
- Frequency generation
- Pulse width modulation
- Drive technology

Used signals

On connector	Polarity	Function
Ax +/-	Diff./TTL	Digital output (PWM0)
Bx +/-	Diff./TTL	Digital output (PWM1)
Cx +/-	Diff./TTL	External Gate (PWM0)
D x+/-	Diff./TTL	External Gate (PWM1)

x: Number of the function module (See pin assignment page 85)
The PWM function cannot be programmed on the APCI-1710-24 V.

Block diagram PWM

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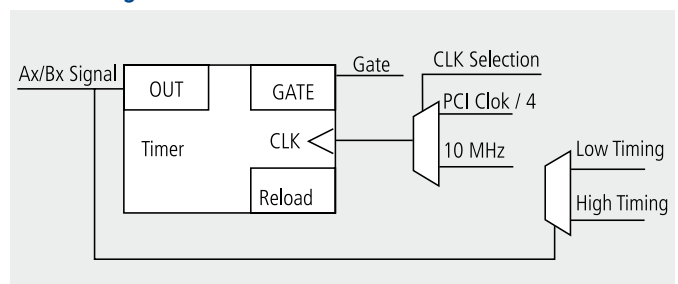
Multifunction counter board APCI-1710
Function ETM / Function Digital I/O

Function ETM (Edge Time Measurement)

The "ETM" function is a timer interface, which allows to measure simulta-neously the time of a period and the time of the "High" or "Low" levels of this period. 2 functions are implemented:
- 1 x 32-bit timer which is set as the reference time
- 2 x 32-bit measuring timers which measure the time of the period and of the "High" or "Low" levels

Properties:
Optical isolation through opto-couplers for the input and output channels for avoiding earth circuits
- Interrupt can be generated at the end of the measurement
- Timer can be read back
- Inputs and outputs can be inverted through software
- Software GATE

The interface includes:
- 1 gate input
- 2 independent 32-bit timers which can be written or read back through the data bus.

Typical applications
- Period duration measurement
- Level duration measurement

Used signals
The ETM function requires 4 inputs (A to D) on each function module of the APCI-1710 or CPCI-1710 (see page 142).
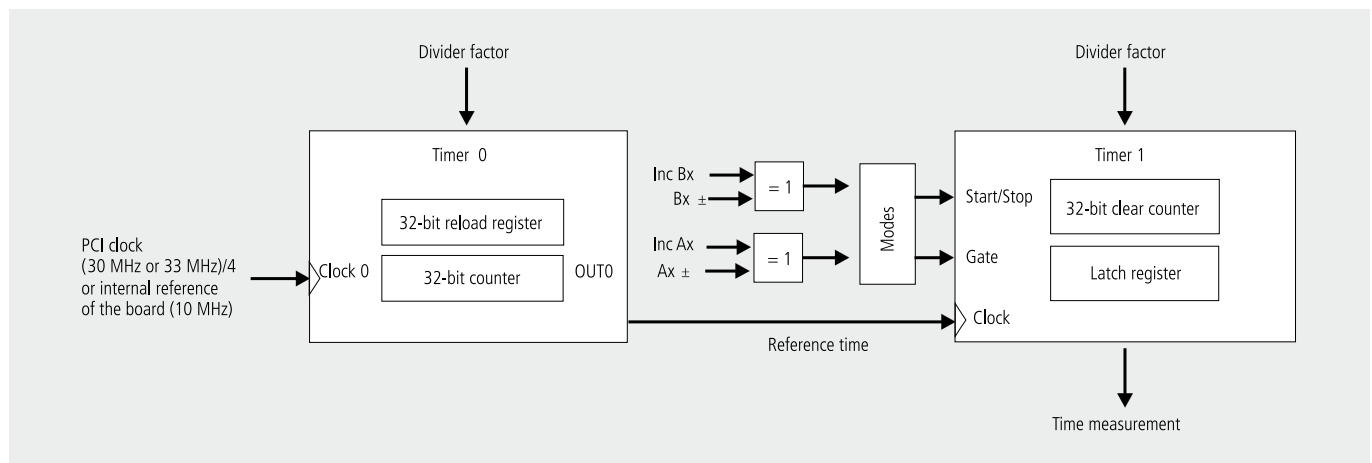Up to 8 ETM (2 per module) can be used on one board.

Used signals

On connector	Polarity	Function
Ax +/-	Diff./TTL/24 V*	Gate input of the ETM counter 0
Bx +/-	Diff./TTL/24 V*	Input of the ETM counter 0
Cx +/-	Diff./TTL/24 V*	Gate of the ETM counter 1
Dx +/-	Diff./TTL/24 V*	Input of the ETM counter 1

x: Number of the function module (see pin assignment page 85)
*24 V for the APCI-1710-24V

Block diagram ETM

Function Digital input and output

The digital I/O function allows an easy access to the digital I/O available on the function modules. The I/O level of the input and output channels are read and set or reset through read/write commands. The digital I/O have no logical connection to each other. The connection can only be made through software. The complete isolation through opto-couplers avoids earth circuits.

Available channels
- 3 x 24 V mass-related input channels. Optional 5 V.
- 2 x differential input channels (RS422/485). Can also be used as TTL input channels.
- 1 digital output, 24 V, load to ground. (10 to 36 V / 500mA)
- 2 differential inputs or outputs (RS485). Can also be used as TTL input or output channels. Software configuration.

When the "digital I/O" function is programmed on all function modules, up to 28 digital input and 12 digital output channels are available

Used signals

On connector	Polarity	Function
Cx +/-	Diff./TTL/24 V*	Digital input
Dx +/-	Diff./TTL/24 V*	Digital input
Ex	Diff./TTL/24 V*	Digital input
Fx	24 V/5 V optional	Digital input
Gx	24 V/5 V optional	Digital input
Hx	24 V / 500 mA (10..36 V)	Digital output
Ax +/-	Diff/TTL/24 V*	Dig. input and output (with 24 V* only input)
Bx +/-	Diff/TTL/24 V*	Dig. input and output (with 24 V* only input)

x: Number of the function module (see pin assignment page 85)
*with the APCI-1710-24V

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Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM, ...

Specifications

Counter components

Counting depth: 32-bit, Counting frequency: up to 5 MHz

Free programming of the functions

	32-bit or 16-bit acquisition of incremental encoders
	Acquisition of absolute encoders/SSI
	Counter/timer
	Chronos/TOR for frequency measurement
	Pulse acquisition
	Chronos for pulse width modulation
	Chronos for period duration measurement
	TOR for velocity measurement
	BiSS-Master
	Digital I/O, 24 V, TTL, RS422
	PWM
	ETM
	Customised functions

Signals

Digital I/O signals, TTL or RS422

Inputs

Number of inputs:	20
Differential inputs or outputs	5 V inputs: 8/16 (8 can be used as inputs or outputs)
Nominal voltage:	5 VDC
Common mode range:	+12 / -7 V
Max. differential voltage	±12 V
Input sensitivity:	200 mV
Input hysteresis:	50 mV
Input impedance:	12 kΩ
Terminal resistor:	150 Ω serial with 10 nF (typ.)
Signal delay:	120 nS (at nominal voltage)
Max. input frequency:	5 MHz (at nominal voltage)

Mass-related inputs, 24 V (channels E, F, G):

Number of inputs:	12	
Nominal voltage:	24 VDC	
Input current:	11 mA (typical) at nominal voltage	
Logic input levels:	Unominal:	24 V
	UH max.:	30 V
	UH min.:	19 V
	UL max.:	15 V
	UL min.:	0 V
Signal delay:	120 ns (at nominal voltage)	
Maximal input frequency:	2.5 MHz (at nominal voltage)	

Outputs

Nominal voltage:	5 VDC
Maximum output frequency:	5 MHz (diff. outputs)
Max. number of outputs:	8 (if they are not used as diff. inputs)

Digital outputs, 24 V:

Output type:	High-side (load to ground)
Number of outputs:	4
Nominal voltage:	24 VDC
Range of the supply voltage:	10 V to 36 VDC (via 24 V ext. pin)
Maximum current for 4 outputs:	2 A typ. (limited to the voltage supply)
Maximum output current: output at 24 V, R_{last} < 0.1 R:	500 mA short-circuit current/ 1.5 A max. (output switches off)
ON-resistance of the output (RDS ON resistance):	0.4 Ω max.

Overtemperature:

Overtemperature:	170 °C (all outputs switch off)

Overtemperature protection (24 V outputs)

Activated:	From approx. 150-170 °C (chip temperature)
Deactivated (automatically):	From approx. 125-140 °C (chip temperature)
Outputs (at overtemperature):	Outputs switch off

Protection against undervoltage (effective at V ext.<5 V)**:**

Outputs (at undervoltage):	All outputs switch off

Switching characteristics of the 24 V outputs
(V ext. = 24 V, T=25 °C, ohmic load: 500 mA)**:**

Switch ON time:	200 µs
Switch OFF time:	15 µs

Digital outputs, 5 V (option): Output type: TTL

Number of outputs:	4
Nominal voltage:	5 VDC

Switching characteristics of the 5 V outputs
(T=25 °C, TTL load)**:**

Switch ON time:	0.06 µs
Switch OFF time:	0.02 µs

Technical data for board version APCI-1710-24 V

24 V inputs (channels A to G).   This board version is exclusively used for connecting 24 V encoders. Only 24 V signals can be connected to the input channels.

Nominal voltage:	24 VDC / 10 mA	
Max. input frequency:	1 MHz (at nominal voltage)	
Logic input levels :	Unominal:	24 V
(Standard)	UH max.:	30 V
	UH min.:	19 V
	UL max.:	15 V
	UL min.:	0 V

Safety

|	
Optical isolation:	1000 V

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.

Physical and environmental conditions

Dimensions:	179 x 99 mm
System bus:	PCI 32-bit 5 V acc. to specification 2.1 (PCISIG)
Space required:	1 slot
Operating voltage:	+5 V, ± 5 % from the PC +24 V ext. /10 mA
Current consumption:	APCI-1710-x: 1.15 A typ. ± 10 %
Front connector:	50-pin SUB-D male connector
Additional connector:	Male connector for the TTL I/O function
Temperature range:	0 to 60 °C (with forced cooling)

ADDI-DATA connection
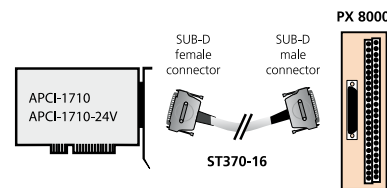
Ordering information

APCI-1710

Multifunction counter board, optically isolated, encoder, incremental counter, timer/counter, SSI, PWM,...
Incl. technical description and software drivers.

APCI-1710:	Multifunction counter board, optically isolated.
APCI-1710-24V:	24 V for differential input signals (A and B for counter, I (Index) and UAS (error) signals).
APCI-1710-5V-I:	5 V inputs (E, F, G) instead of 24 V
APCI-1710-5V-I-0:	5 V inputs (E, F, G) instead of 24 V, outputs (H1, H2, H3, H4) 5 V instead of 24 V
APCI-1710-10K20:	Same as APCI-1710, with additional function for connecting a **BiSS** interface

Option

Opt. 5V: Outputs (H1, H2, H3, H4) 5 V instead of 24 V

Accessories

ST370-16:	Shielded round cable, 2 m
PX 8000:	2-row terminal panel for DIN rail
PX 8001:	3-row terminal panel for DIN rail
FB8001:	Ribbon cable for connecting the TTL I/O function