Product Description

The PO7079 and PO7080 modules are part of the Ponto Series and have 4 high speed programmable counters with 32-bit resolution each. These modules allows pulse counting of signals with frequency up to 1 Mhz and quadrature signals of up to 250 KHz. They are the ideal solution to measure linear or rotative position transducers.

The picture shows one module mounted on the spring terminal base.

These modules are suitable for following main applications:

- Control positioning
- Flow metering
- Speed control and monitoring of gas turbines
- Dosage plants
- Selection and distribution plants

Each counter has the following main features:

- Two pulse inputs (A and B) that can count on up/down or quadrature mode
- One digital input (I) configurable as instantaneous reading, reset or enable
- One transistor output (T) that indicates if the counter is above an up limit, below a low limit or inside a window of two limits.
- Configurable counting range from -2.147.483.648 to +2.147.483.647 (32-bit, signed)
- Measurement Mode, allowing period and frequency measurement
- Inputs and outputs (A, B, I, T) isolated from comunication bus
- Hot swap without interference on panel wiring
- Local and remote diagnostics through LEDs and operands.
- Field wiring connected directly to the base, allowing connection of all field signals without intermediate terminals
- Remote parameterization by software
- Automatic addressing
- Automatic module type identification by CPU or fieldbus head

ATTENTION

These modules must be used with CPUs that supports 32-bit operand processing, as Altus AL-2004 CPU firmware version 2.10 or higher, or from another manufactures with PROFIBUS interface.

Ordering Information

Included Items

The product package contains the following items:

- PO7079 or PO7080 Module
- Installation guide

Product Code

The following codes must be used when ordering the products:

Code	Description
PO7079	High Speed Counter Module 24 Vdc
PO7080	High Speed Counter Module 5 Vdc

Mandatory Related Products

The following products are mandatory when using PO7079/PO7080:

Code	Description
PO6000	Digital I/O spring-clamp terminal base

Related Products

The following products must be purchased separately when necessary:

Code	Description
PO8510	10 sheets with 14 labels of 16 tags for printer
PO8523	Spring Terminal Tool

Notes

PO8510: this product consists of A4 sheets with labels where the tags may be printed, in the case the user wishes so, using MasterTool ProPonto Software - MT6000.

PO8523: this product is an isolated tool to connect the cables into the spring-clamp terminal bases PO6000.

Product Features

General Features

	PO7079, PO7080
Module	4 High speed 32-bit counters
Measurement Modes	Mode 0: Counter Mode 1: Frequency Mode 2: Period
Counting Modes	Mode 0: A = up, B = down Mode 1: A = direction, B = up / down. Mode 2: A / B 2x quadrature, 2 counts / period Mode 3: A / B 4x quadrature, 4 counts / period
Data	32-Bit Signed Integer
Operation Limits	Counter Mode: range from -2.147.483.648 to +2.147.483.647 (I%). Maximum signal frequency of 1 MHz Frequency measurement: 1 Hz to 1 MHz, with resolution of 1 Hz. Sampling period of 1s Period measurement: 1 μs to 2.000.000 μs, with resolution of 1 μs
Status Indication	3 LEDs for active input (A, B and I) 1 LED for active output
Diagnostic Indication	Multifunctional LED (DG)
Configurable Parameters	Measurement Mode Counter mode Input function (I) Output function (O) Comparison registers Input filters
Hot Swap	Yes
External Power Supply	19 to 30 Vdc, including ripple
Protections	Power supply polarity inversion Short circuit on output points
Isolation **Inputs – Ground / Power Supply** **Inputs – Logic** **Input – Input** **Logic – GBL Bus** **Logic – Outputs** **Logic – Power Supply**	 1500 Vac / 1 minute, 250 Vac continuos 1500 Vac / 1 minute, 250 Vac continuos 500 Vac / 1 minute 1500 Vac / 1 minute, 250 Vac continuos No isolation No isolation
Bus Current Consumption	24 mA
Power Consumption	5 W with all inputs active – PO7079 2.5 W with all inputs active – PO7080
Operating Temperature	0 °C to 60 °C
Dimensions	99 x 49 x 81 mm
Compatible Base	PO6000

Digital Inputs

	PO7079
Input voltage	24 Vdc nominal 15 to 30 Vdc, on state (1) 0 to 5 Vdc, off state (0)
Input current	10 mA with nominal voltage
Input type	Type 1, sink, source or differential
Input impedance	2.4 kΩ
Maximum frequency	1 MHz

	PO7080
Input voltage	5 Vdc nominal 3.2 to 5.6 Vdc, on state (1) 0 to 0.8 Vdc, off state (0)
Input current	12.5 mA with nominal voltage
Input type	Sink, source or differential
Input impedance	300 Ω
Maximum frequency	1 MHz

Digital Outputs

	PO7079, PO7080
Maximum current / point	500 mA @ 25 °C
Operation voltage	19 to 30 Vdc
Output type	Transistor, source type
Protection	4 A @ 25 °C (total current)
Commutation period	250 μs
Maximum frequency for switching with load	2 kHz

Compatibility With Other Products

PO7079

	PO7079 - Compatible Version
CPU PO3x47	1.07 or greater
CPU PO3x42	2.00 or greater
PROFIBUS Head PO5063V1	2.03 or greater
PROFIBUS Head PO5063V5	5.03 or greater
PROFIBUS Head PO5064	1.00 or greater
PROFIBUS Head PO5065	1.00 or greater
ProPonto MT6000	1.41 or greater
MasterTool MT8000	5.00 or greater
ALT_059A.GSD	1.22 or greater
ALT_0BAF.GSD	1.27 or greater
ALT_0BB0.GSD	1.27 or greater

PO7080

	PO7080 - Compatible Version
CPU PO3x47	1.07 or greater
CPU PO3x42	2.00 or greater
PROFIBUS Head PO5063V1	2.03 or greater
PROFIBUS Head PO5063V5	5.03 or greater
PROFIBUS Head PO5064	1.00 or greater
PROFIBUS Head PO5065	1.00 or greater
ProPonto MT6000	1.62 or greater
MasterTool MT8000	5.51 or greater
ALT_059A.GSD	1.28 or greater
ALT_0BAF.GSD	1.28 or greater
ALT_0BB0.GSD	1.28 or greater

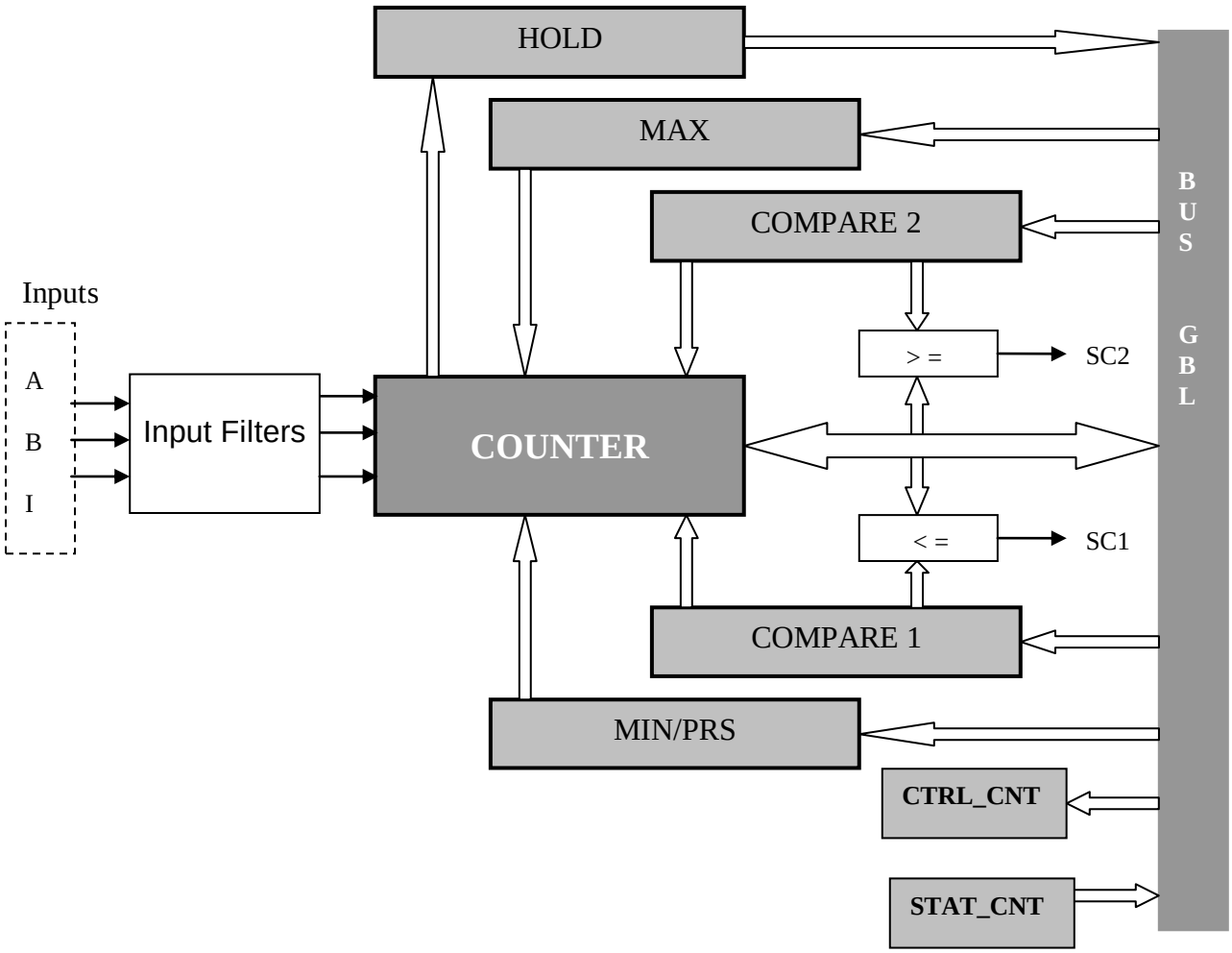
Counter Functionalities

Functional Description

The PO7079 and PO7980 modules have 4 binary 32-bit counters, Counter 0, Counter 1, Counter 2 and Counter 3.

Each counter have three signal inputs, one counter register, two limit registers and two compare registers.

The counter architecture is described according following diagram.



Counter Components

- COUNTER

  COUNTER is the binary 32-bit signed counter, covering the range of integer numbers from -2.147.483.648 to +2.147.483.647.

- MIN/PRS

  This register defines the counter's lower limit. When it reaches the limit established by MIN/PRS, the counter is set to zero or to the value of MAX register (according to parameterization).

  The value of MIN/PRS register is copied to COUNTER every time that PRESET command is enable. This command can be enable by I input (when configured) or through the register CTRL_CNT.

- MAX

  This register defines the counter's upper limit. When it reaches the limit established by MAX, the counter is set to zero or to the value of MIN register (according to parameterization).

- COMPARE 1 and COMPARE 2

  These registers are the reference for comparison with the value of COUNTER, informing the CPU if COUNTER is less or equal than COMPARE 1 or greater or equal than COMPARE 2.

- HOLD

  It captures the COUNTER value when the freeze command is received by input I (according to parameterization).

- STAT_CNT

  It have the counter status like zero crossing, counting overflow, I input, negative value and comparators result.

- CTRL_CNT

It controls the counter operation including counter enable, output enable, reset and preset.

- A / B Counting inputs

  The counting is executed through electrical signals present on A / B inputs. These signals are processed by the counting processor that, according to the operation mode, determines the number of pulses and the direction (up or down).

- I Input

  I is a multifunctional input that can be configure to execute the following operations:

  - Zero function (reset).
  - MIN/PRS load function.
  - Freeze function (hold).

Register initialization and exception behavior

When the module is initialized the registers ate set to the values described on the following table. These values can only be changed by a CPU or Profibus Head command.

In exception situations like a communication failure or CPU/Profibus Head hot swapping, the module keeps it's operating mode without any change in configuration and/or register values. On these cases, only the output points will be disabled.

	Register values on initialization
COUNTER	0 (Zero)
HOLD	0 (Zero)
MIN/PRS	–2.147.483.648
MAX	+2.147.483.647
COMPARE 1	0 (Zero)
COMPARE 2	0 (Zero)

ATTENTION

When a hot swap operation occurs the module is re-configured, however the data of registers MIN/PRS, MAX, COMPARE 1 and COMPARE 2 remains unchanged.

For applications that may use the hot swapping funcionality, it's recommended the implementation of a periodic update/refresh procedure of these registers.

Input Filters

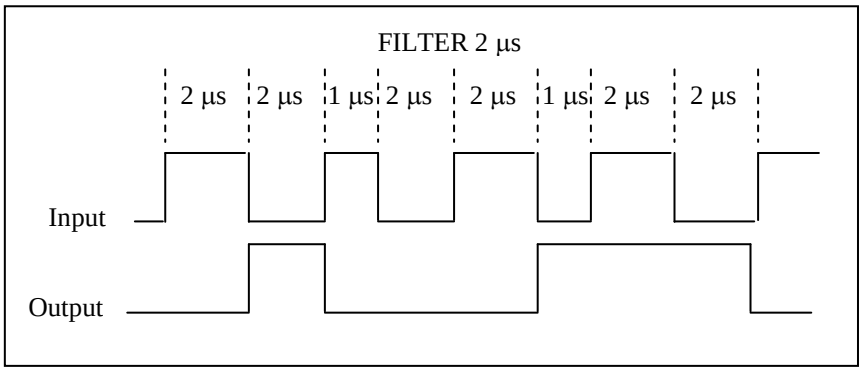
Each counter have a parameterized digital filter for its inputs (A, B and I). These filters works as first-order RC analog filters.

The configured value sets the minimum time that the signal must be on (or off) to guarantee the on (or off) state.

Input signals with pulse width less than 2/3 of configured period are ignored. For signals between 2/3 and configured value on filter are considered undetermined.

Parameter [5 4]	Filter Period	Maximum Frequency
00	0.5 μs	1 MHz
01	2 μs	250 KHz
10	20 μs	25 KHz
11	200 μs	2.5 KHz

The following graph shows the behaviour of the input filters (filter time = 2 μs).



ATTENTION

The indicative LEDs (A0~A3, B0~B3, I0~I3) and the bit 2 of status registers are connected to the signals after the input filter, thus showing the valid status of the inputs. If the input signal is outside of the filter's pass band, the presence of this signal will be not indicated.

Counting Modes

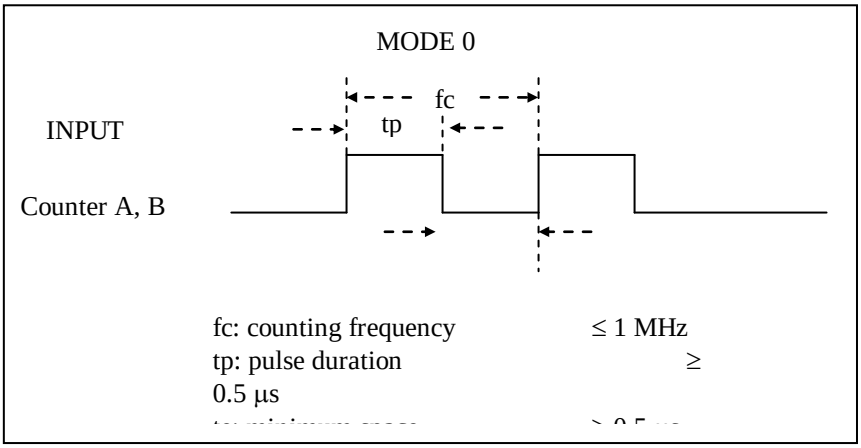
The counter processing unit can operate in 4 different modes. The counter programming can be done by the software AL-3865 PROFITool or by the configuration tool of PROFIBUS master device.

- Mode 0

  On this mode, a positive pulse applied in channel A increments the counter's value (one step) and decrements the counter's value when applied on channel B.

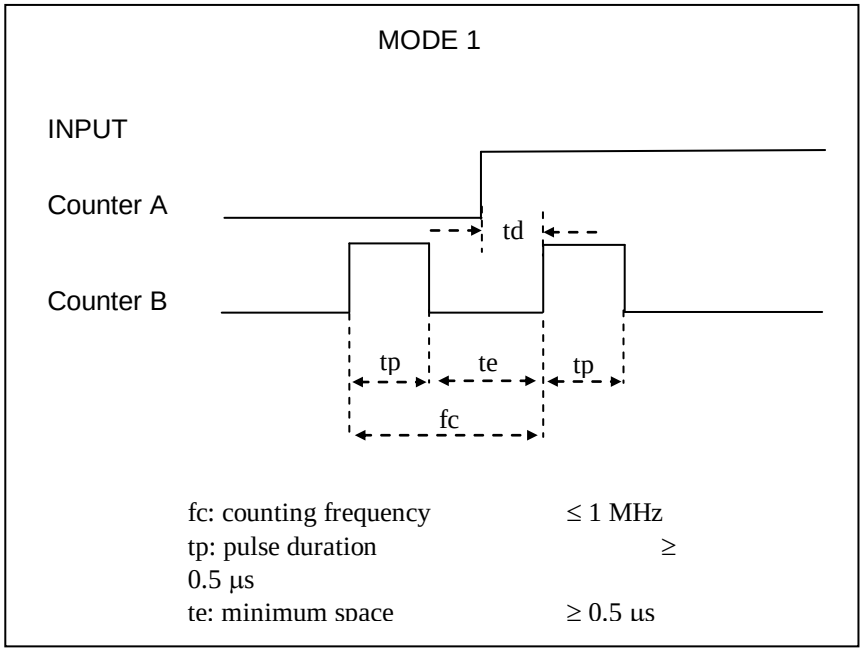
  For unidirectional operation, one channel must be used and the other one must be opened or grounded.

  The following graph shows the frequency limits (considering filters disable).



- Mode 1

  On this mode, the count pulse mus be applied on channel B while the direction signal is applied on channel A, where logic level 0 indicates increase and level 1 indicates decrease.
  The following graph shows the frequency limits (considering filters disable).

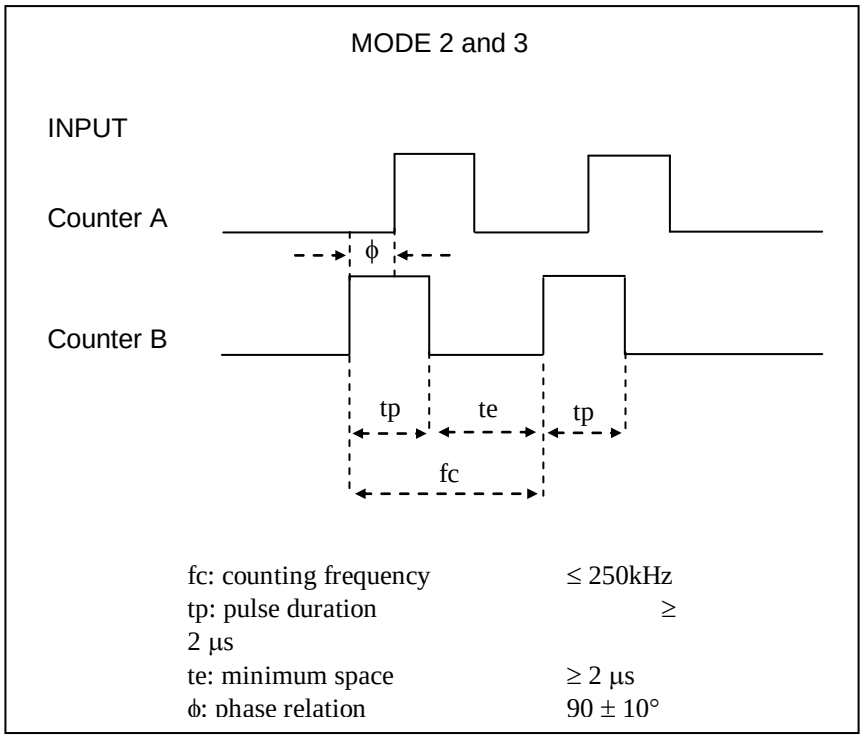


- Mode 2 and 3

  On these modes, the counter processing unit decodes the input signals on quadrature format according to standards that are usually adopted by manufacturers of optical position transducers. The direction of counting is obtained according to the phase relation between inputs, while the counting pulses are obtained by the transitions.

  Mode 3 generates 4 pulses per input signal period (x 4), while mode 2 generates 2 pulses per input signal period (x 2).

  The following graph shows the frequency limits (considering filters disable).



The specified limits are due to the tolerance of phase relationship between signals.

The basic application of these two modes is interfacing with optical position transducers.

Outputs

The high speed counter module has 4 transistor outputs (source type) T0, T1, T2 and T3.

The output can be associated to counter by parameterization, respecting the following conditions.

- T0 output is associated to Counter 0 or Counter 1.
- T1 output is associated to Counter 0 or Counter 1.
- T2 output is associated to Counter 2 or Counter 3.
- T3 output is associated to Counter 2 or Counter 3.

Also it is possible to define the output behavior (parameterization). The output can assume the following functionalities.

- Output active when COUNTER > COMPARE 1
- Output active when COUNTER < COMPARE 2
- Output active when COMPARE 1 < COUNTER <COMPARE 2
- 2 ms pulse when COUNTER = COMPARE 1

> ATTENTION:
> The outputs must be active to promptly work. It is necessary to activate bit 6 from control operand to enable the outputs. If this bit stay in logic level 0 the outputs will remain disable. When CPU is in programming mode or in error mode the outputs will be disabled.

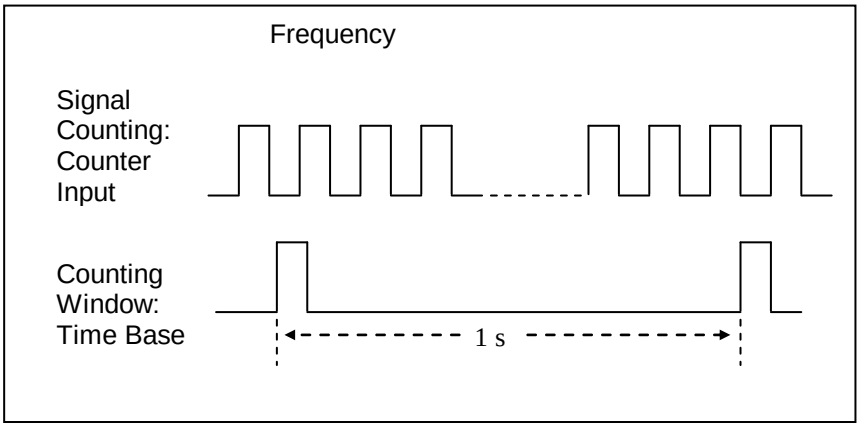
Frequency Measurement Mode

On frequency measurement mode, the input signal can be on any of the previously described modes.The only difference is that the counter direction signal will not be considered.

On this mode, the counter opens a window of 1s and during this time will sum the received pulses. When the window is finished the value is copied to HOLD register and a new cycle is started. The result of the frequency measurement will be stored on HOLD register (Hz unit) and will be refreshed every 1s.

The minimum frequency counting is 1 Hz. Eventually the frequency signal with less than 1 Hz can produce 1 unit (count).

For low frequency signals (10 Hz range) it's recommended the use of Period Measurement Mode.



Period Measurement Mode

On frequency measurement mode, the input signal can be on any of the previously described modes.The only difference is that the counter direction signal will not be considered.

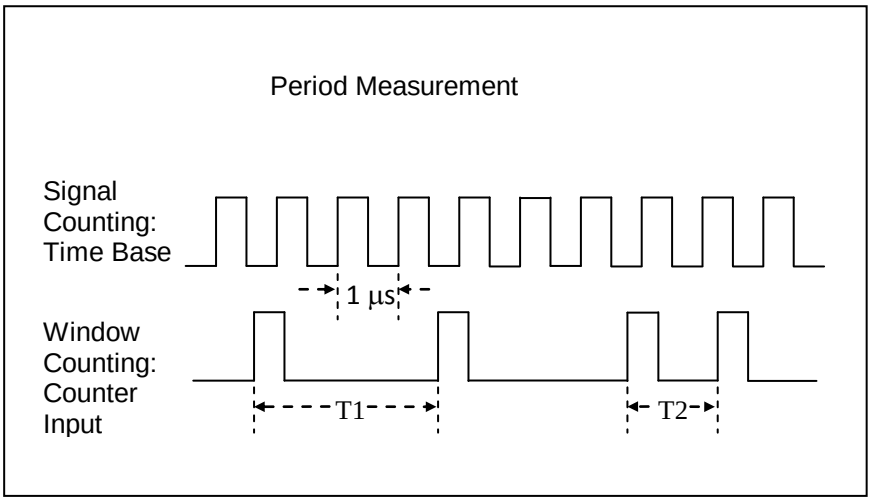
On this mode, the counter have an internal 1 μs resolution time base. When the counter receives the input pulse it starts a counting window and the time increment is started using the internal counter. When the second pulse is received the counting is finished and the value will be copy to HOLD register.

The period value is stored on HOLD register directly in microseconds.

The measurement can have a variation of 1 unit when the input signal is near to 1 μs. Signals between 700 ns and 900 ns (out of range values) can cause incorrect period readings.

It needs a pair of pulses to execute a period measurement (T1). When this measurement finishes it needs a new pair of pulses for another measure (T2).

If there is no counting pulse between 2 and 3 seconds the period measurement is reset. This limits to 2 seconds the maximum measurable period value.



Counting Modes and Measurement Modes

The frequency and period measurement mode use the signals processed by the counting modes. This operation allows the measurement of optical encoder or other devices

It is important to consider the measure signal and the counting mode, because the obtained result can be different from the expected result.
Important considerations:

- The direction on frequency and period mode is not considered. The change of direction can lead to incorrect measurements. It's highly recommended the use of mode 0 or mode 1. The B counter must be use only for counting.

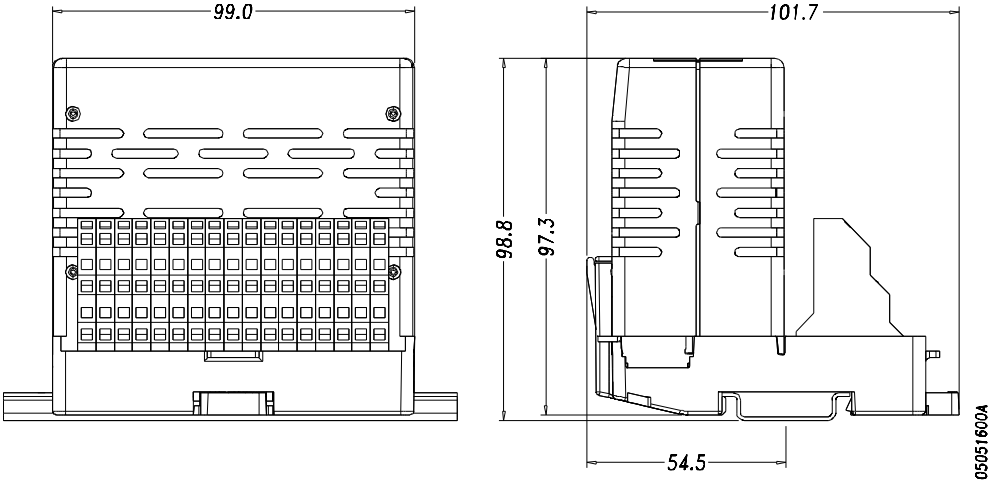
- The counting modes 2 and 3 generate respectively 2 and 4 pulses per each quadrature signal cycle. On counting mode 2/3 the counter will increase or decrease with a frequency 2/4 times superior than the input frequency. The duty cycle on counting modes 2 and 3 can change the measure value.

Physical Dimensions

Dimensions in mm.

The electrical panel dimensions should take into consideration the module terminal base sizes.

Ponto Series Utilization Manual must be consulted for panel general dimensioning.



Installation

Electrical Installation

The following picture shows the connection for sensors with 2 and 3 wires, sink and source type. The PO7079/ PO7080 is mounted over the PO6000 base.

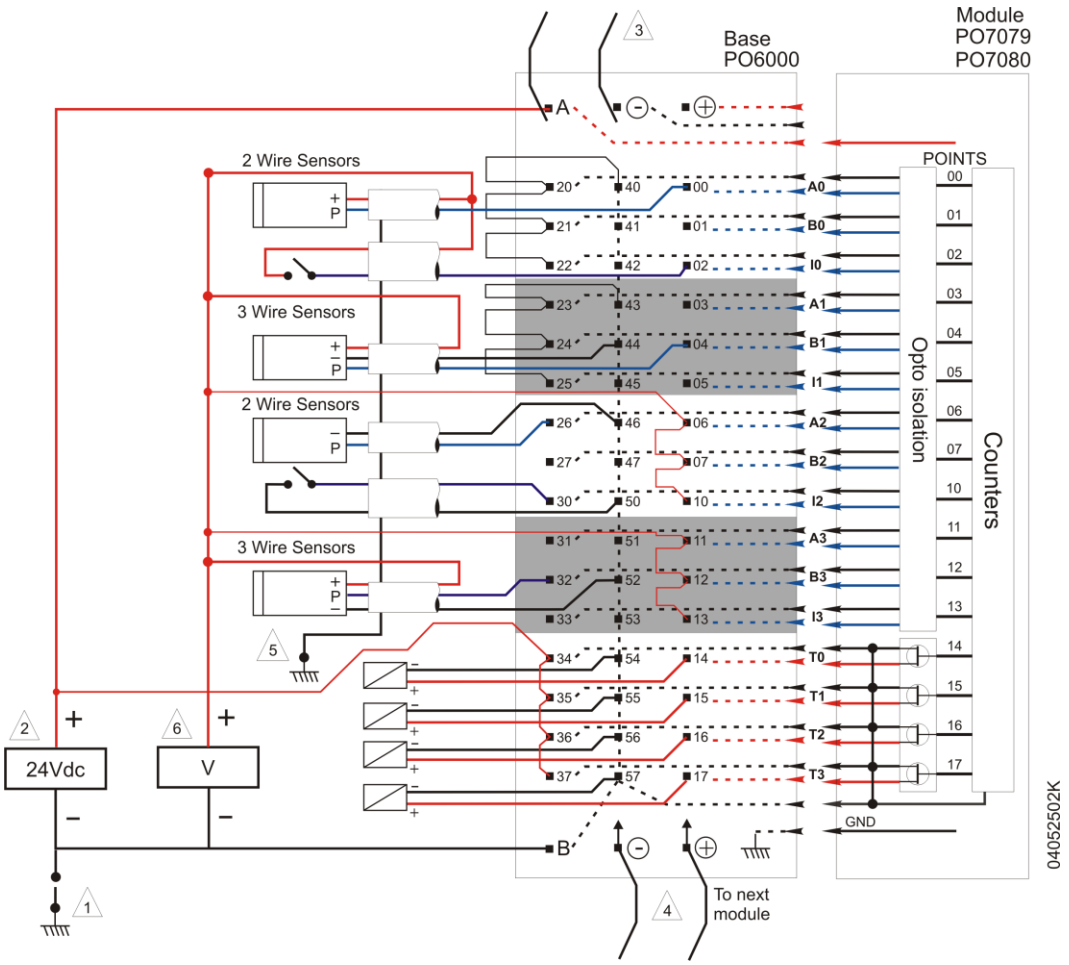


Diagram Notes

1 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

2 – The power supply must be connected on terminal A (+24 Vdc) and B (0 Vdc). The power supply must guarantee a signal according module specification. The power supply must be direct current and regulated.

3 – Terminal + and - can be used to supply energy to other modules installed on bus. The PO7079/ PO7080 do not use this connection, because it doesn't use external power supply.

4 – The next module must be fed through terminals + and -. The maximum number of bases that may connected in such way is 10 and the current limit is 2 A for each terminal.

5 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground only in one point.

6 – The power supply "V" must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

The following picture shows details about the connection of a sensor type P with 2 wires to sink input.

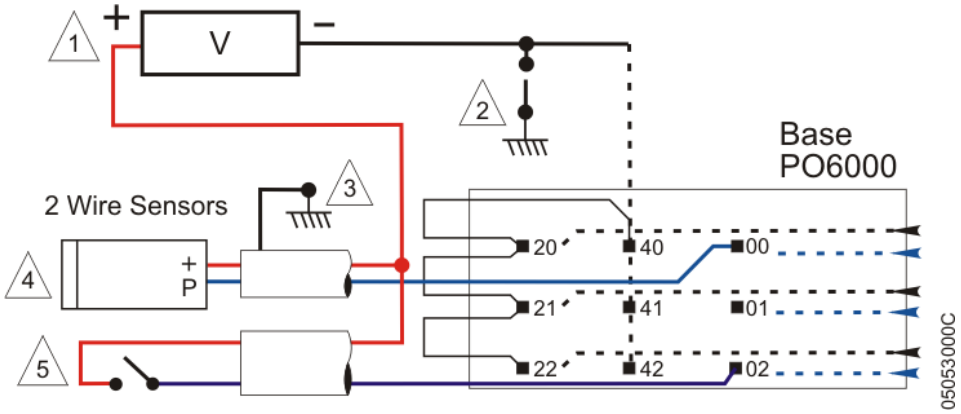


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – Two wire sensors (type P) are connected to the terminals identify as 00, 01, 03, 04, 06, 07, 11, 12 and its supply to positive pole (+) of the power supply. The terminals 20, 21, 23, 24, 26, 27, 31 e 32 must be connected to negative pole (-) of the power supply when the respective input is used.

5 – Two wire sensors can be connected to special inputs identify as 02, 05, 10, 13 and its supply to positive pole (+). The terminals 22, 25, 30 and 33 must be connected to negative pole (-) of the power supply when the respective input is used.

The following picture shows details about the connection of a sensor type P with 3 wires to sink input.

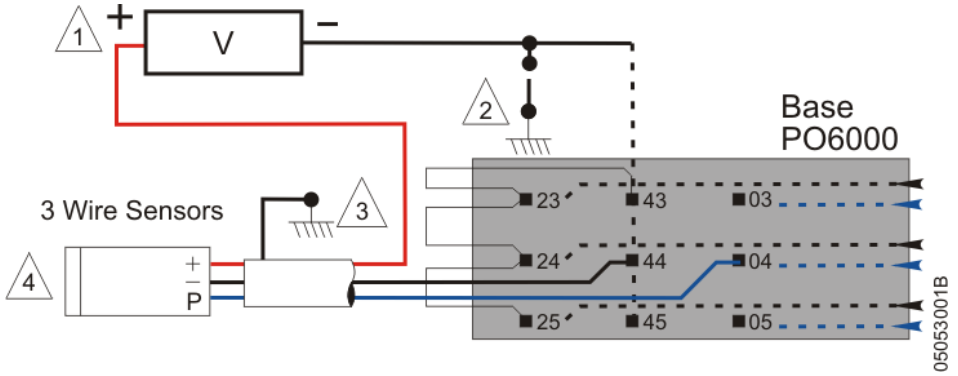


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – Three wire sensors (type P) are connected to the terminals identify as 00 to 07 and 10 to 13 and its supply to positive pole (+) and zero pole (-) of the power supply. The terminals 40 to 47 and 50 to 53 can be an alternative for zero Volts connection. The terminals 20 to 27 and 30 to 33 must be connected to negative pole (-) of the power supply when the respective input is used.

The following picture shows details about the connection of a sensor type N with 2 wires to source input.

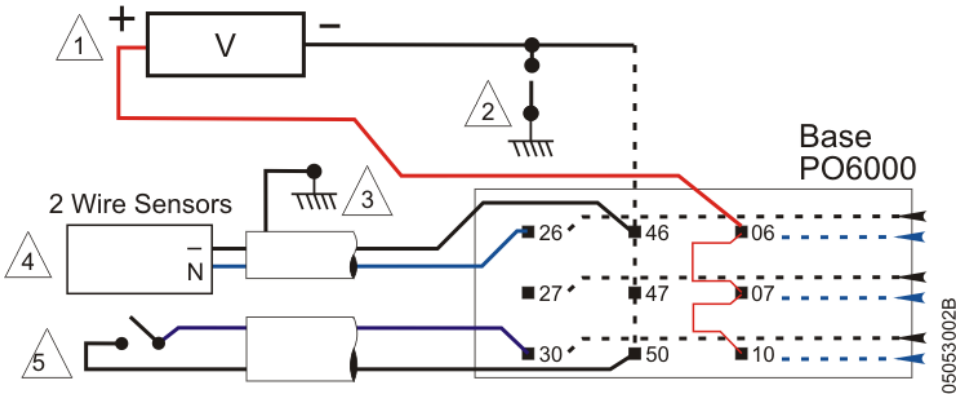


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – Two wire sensors (type N) are connected to the terminals identify as 20, 21, 23, 24, 26, 27, 31, 32 and its supply to negative pole (-) of the power supply. The terminals 00, 01, 03, 04, 06, 07, 11, 12 must be connected to positive pole (+) of the power supply when the respective input is used.

5 – Two wire sensors and contacts can be connected to special inputs identify as 22, 25, 30, 33 and its supply to negative pole (-) of the power supply. The terminals 02, 05, 10 and 13 must be connected to negative terminal (-) of the power supply when the respective input is used.

The following picture shows details about the connection of a sensor type N with 3 wires to source input.

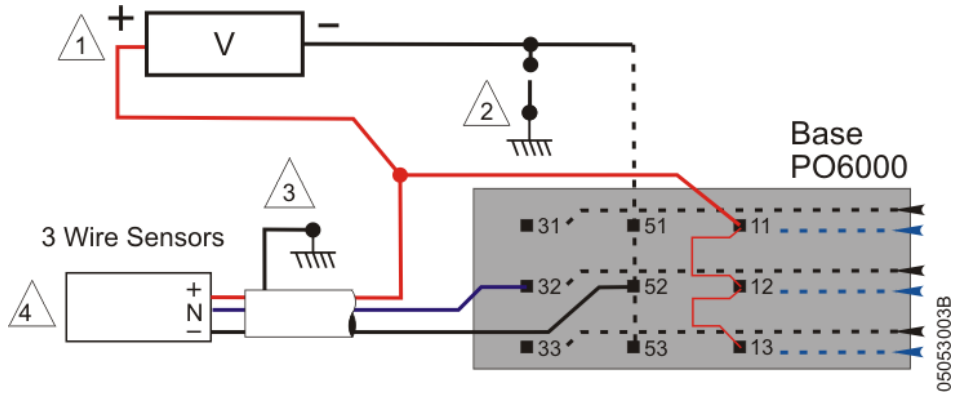


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – Three wire sensors (type N) are connected to the terminals identify as 20 to 27 and 31 to 33 and its supply to positive pole (+) and zero pole (-) of the power supply. The terminals 00 to 07 and 10 to 13 must connected to positive pole (+) of the power supply when the respective input is used.

The following picture shows details about the connection of a linear or rotative encoder to sink input.

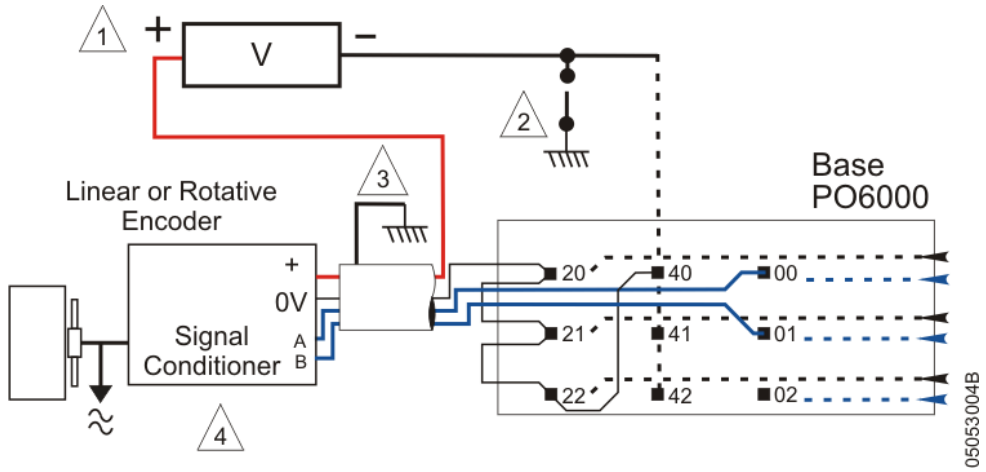


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – The A output must be connected to terminals 00, 03, 06 and 11 (according each encoder). The B output must be connected to terminals 01, 04, 07 and 12. The terminals 20, 21, 23, 24, 26, 27, 31, 32 must be connected to negative pole (-) of the power supply. Inverting A and B connection the counting sequence is inverted. The supply for sensor must be connected directly to power supply. The terminals 40, 41, 43, 44, 46, 47, 51, 52 can be an alternative for zero volt connection. The index signal can be connected to terminal I on terminals 02, 05, 10 and 11.

The following picture shows details about the connection of a differential sensor.

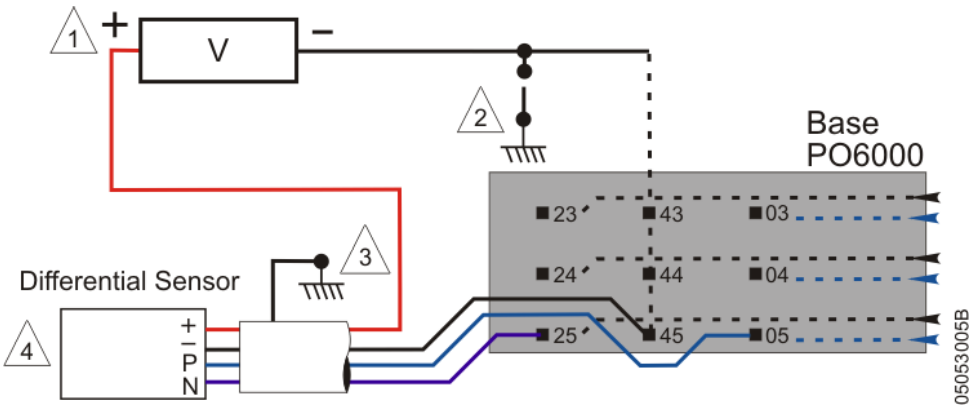


Diagram Notes

1 – The power supply “V” must be 24 Vdc when using PO7079 and 5 Vdc when using PO7080.

2 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

3 – It is recommended the use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground in order to minimize electrical noise on system automations.

4 – Positive output (P) must be connect to the terminals identify as 00 to 07 and 10 to 13. The negative output (N) must be connect to the terminals identify as 20 to 27 and 30 to 33 and its supply to negative pole (-) of the power supply. The terminals 40 to 47 and 50 to 53 can be an alternative for zero volt connection.

The following diagram shows details about the load connections.

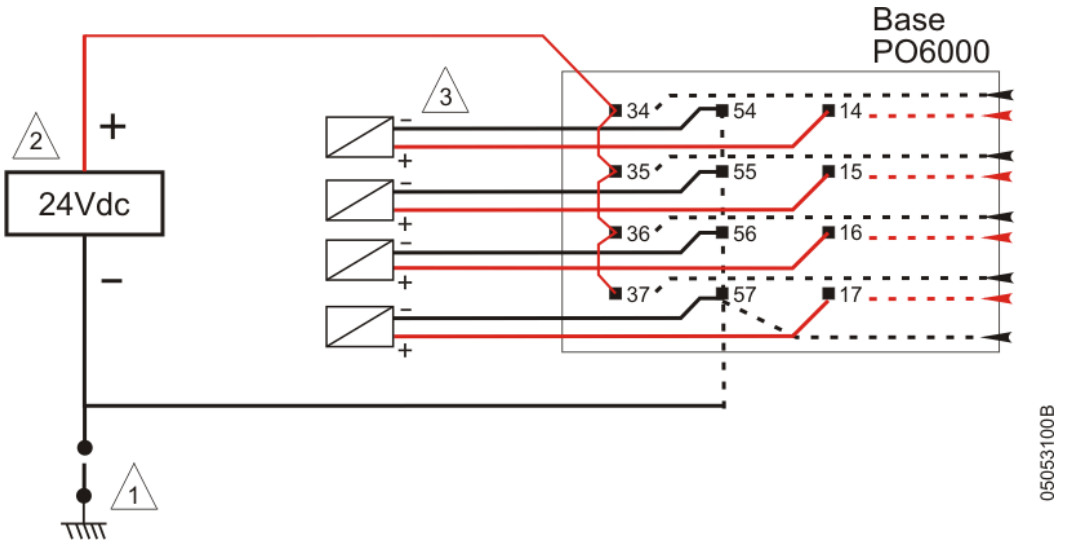


Diagram Notes

1 – The common point between power supply and field sensors (0 V) can be connected to electrical panel grounding. This connection is not mandatory but it is recommended in order to reduce electrical noise in automation systems.

2 – It is recommended the connection of power supply on terminals 34, 35, 36 and 37. These terminals are short circuited to terminal A on the base (internal connection), the external connection it is recommended to have a better distribution of the current from the external power supply.

3 – The positive pole (+) from loads must be connected to terminals 14, 15, 16 and 17. The negative pole (-) is connected to terminals 54, 55, 56 and 57.

> ATTENTION
> In order of minimize electrical noise on inputs it is highly recommended:
> - The use of shielded cables to connect the sensors on input terminals. The shield must be connected to the ground only in one point (extremity).
> - Correct parameterization of input filters, according the measure signal.

Terminal Connections

The terminal connections are described according PO6000 Base:

Module Point	A0	B0	I0	A1	B1	I1	A2	B2	I2	A3	B3	I3	T0	T1	T2	T3
Positive Input / Output Terminal	00	01	02	03	04	05	06	07	10	11	12	13	14	15	16	17
Negative Input Terminal / Output Power Input	20	21	22	23	24	25	26	27	30	31	32	33	34	35	36	37
Common Terminal	40	41	42	43	44	45	46	47	50	51	52	53	54	55	56	57

- Digital inputs: Sink: 00, 01, 02, 03, 04, 05, 06, 07, 10, 11, 12, 13
  Source : 20, 21, 22, 23, 24, 25, 26, 27, 30, 31, 32, 33
- Transistor Digital outputs: 14, 15, 16, 17
- Power supply +24 Vdc: A
  0 Vdc: B
- Common terminals with terminal B: 40, 41, 42, 43, 44, 45, 46, 47, 50, 51, 52, 53, 54, 55, 56, 57
- Output Power Supply: 34, 35, 36, 37

Maintenance

The hot swap procedure is described on Ponto Series Utilization Manual.

Parameterization

PO7079 and PO7080 module are configured via software through CPU or PROFIBUS head. MasterTool software, in case of Altus CPUs (Ponto Series CPUs use MasterTool ProPonto to make the parametrization), or the software that configures the master of the bus makes the parameterization. For further details see Ponto Series Utilization Manual, MasterTool User's Manual and Interfaces and Filedbus Head Manuals. The parameterization most of case present a user friendly interface. The following tables show the binary codes just for reference.

Parameters Bytes

The module parameterization is defined in 10 bytes. The first two bytes defines general options of the modules, the last ones define characteristics of each counter.

Byte	Parameters
0	General
1	General
2	Counter 0
3	Counter 0
4	Counter 1
5	Counter 1
6	Counter 2
7	Counter 2
8	Counter 3
9	Counter 3

Byte 0 – General								Description
7	6	5	4	3	2	1	0	
				1	0	1	0	Number of parameter bytes (always 10)
0	0	0	1					Reserved (always 0001)

Byte 1 – General								Description
7	6	5	4	3	2	1	0	
							1	Reserved (always one)
				0	0	0		Reserved (always zero)
			0					Output T0 active by counter 0
			1					Output T0 active by counter 1
		0						Output T1 active by counter 0
		1						Output T1 active by counter 1
	0							Output T2 active by counter 2
	1							Output T2 active by counter 3
0								Output T3 active by counter 2
1								Output T3 active by counter 3

Byte 2, 4, 6, 8								Description
7	6	5	4	3	2	1	0	
						0	**0**	Pulses count mode
						0	**1**	Frequency measurement mode
						1	**0**	Period measurement mode
						1	**1**	Reserved
				0	**0**			Mode 0: A = count up, B = count down
				0	**1**			Mode 1: A = select up/down, B = count
				1	**0**			Mode 2: A / B 2x quadrature (2 counts / period)
				1	**1**			Mode 3: A / B 4x quadrature (4 counts / period)
		0	**0**					Input filter 0.5 μs
		0	**1**					Input filter 2 μs
		1	**0**					Input filter 20 μs
		1	**1**					Input filter 200 μs
	0							After maximum count (MAX), COUNTER is set zero
	1							After maximum count (MAX), COUNTER is set as MIN/PRS
0								After minimum count (MIN/PRS), COUNTER is set zero
1								After minimum count (MIN/PRS), COUNTER is set as MAX

Byte 3, 5, 7, 9								Description
7	6	5	4	3	2	1	0	
							0	Input Ix active on zero or falling edge
							1	Input Ix active on level 1 or edge
				0	**0**	**0**		Input Ix not enable
				0	**0**	**1**		Stop counting on active edge Ix
				0	**1**	**0**		Reset counting on active edge Ix
				0	**1**	**1**		Load value MIN/PRS on active edge Ix
				1	**0**	**0**		Counting value saved on HOLD when active edge Ix
				1	**0**	**1**		Counting value saved on HOLD and load counter with MIN/PRS when active edge I0
				1	**1**	**0**		Counting value saved on HOLD and load counter with MIN/PRS when active edge I0. Stop counting meanwhile I0 is active
				1	**1**	**1**		Reserved
			0					Reserved
0	**0**	**0**						Output disable
0	**0**	**1**						Output active when COUNTER > COMPARE 1
0	**1**	**0**						Output active when COUNTER < COMPARE 2
0	**1**	**1**						Output active when COMPARE 1 < COUNTER < COMPARE 2
1	**0**	**0**						2ms Pulse when COUNTER = COMPARE 1
1	**0**	**1**						Reserved
1	**1**	**0**						Reserved
1	**1**	**1**						Reserved

Programming

PO7079/ PO7080 block data uses 24 words, 12 words transmitted to the module and 12 words received from module.

Word	Description
Word 0 / 1	Operand %I, data read from Counter 0
Word 2 / 3	Operand %I, data read from Counter 1
Word 4/5	Operand %I, data read from Counter 2
Word 6 / 7	Operand %I, data read from Counter 3
Word 8 / 9	Operand %I, data write on Counter 0
Word 10/11	Operand %I, data write on Counter 1
Word 12 / 13	Operand %I, data write on Counter 2
Word 14 / 15	Operand %I, data write on Counter 3
Word 16	Counter 0 Status
Word 17	Counter 1 Status
Word 18	Counter 2 Status
Word 19	Counter 3 Status
Word 20	Counter 0 Control
Word 21	Counter 1 Control
Word 22	Counter 2 Control
Word 23	Counter 3 Control

The 32 bits data transport values, instead status/control word that transfer information of module STATUS/CONTROL and identifies 32 bits data.

> ATTENTION:
> To enable a counter and its output, it's necessary to configure the respective Control Word.

Write Operation in Counter Registers

The write operation occurs with values stored on write operands (words 8 to 15) and it is controlled by the respective control operand.

This operation must follow the following steps.

- Load the value to operand %I.
- Set the corresponding bit on control operand, according the desired register. (while the bit is set the respectively operation will be enabled).
- Wait the operand write confirmation or error on operation (bit 15 from Status).
- Turn off the bit to write controlling.

> ATTENTION
> If the counter outputs are disable by the communication menu of MasterTool, the counting will be interrupted.

Word 20, 21, 22 e 23 - Control Word																Description
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
																Counter control byte
															0	No action
															1	Confirms information from reset
														0		No action
														1		Confirms Overflow / Underflow
													0			No action
													1			Confirms information from input I action
												0				No action
												1				No action
											0					No action
											1					Reset COUNTER
										0						No action
										1						Load MIN/PRS in COUNTER
									0							Output disable
									1							Output enable
								0								Count disable
								1								Count enable
																32 Bits data specification byte
							0									No action.
							1									Instantaneous value from counter (COUNTER)
						0										No action
						1										Held value from counter (HOLD)
					0											No action.
					1											Operand %I with value to write in MIN/PRS
				0												No action
				1												Operand %I with value to write in MAX
			0													No action.
			1													Operand %I with value to write in COUNTER
		0														No action
		1														Operand %I with value to write in COMPARE 1
	0															No action
	1															Operand %I with value to write in COMPARE 2
0																No action
1																No action

Notes

32 Bits data specification byte: if both register are selected or no one is select for reading operation the returned values will be COUNTER register.

32 Bits data specification byte: If more than one register is selected to write operation an error is presented on STATUS register and the operation is not concluded.

Reset COUNTER: the reset operations (bit 4 = 1) present priority over MIN/PRS load operation (bit 5 = 1) and write operations (bit 12 = 1).

Load MIN/PRS in COUNTER: The MIN/PRS load operation (bit 5 = 1) presents priority over write operations (bit 12 = 1).

Word 16, 17, 18 e 19 - Status Word																**Description**
15	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**	**0**	
																Counter status
															0	COUNTER value different from zero
															1	COUNTER value zero or cross zero
														0		No Overflow / underflow
														1		Overflow / underflow in COUNTER
													0			No action
													1			Active edge input I
												0				COUNTER value positive
												1				COUNTER value negative
											0					COUNTER value bigger than COMPARE 1
											1					COUNTER value COMPARE 1
										0						COUNTER value less than COMPARE 2
										1						COUNTER value equal or bigger tha COMPARE 2
									0							T Output level 0
									1							T Output level 1
								0								I Input level 0
								1								I Input level 1
																32 Bits data specification byte
							0									No action
							1									Operand %I with COUNTER value
						0										No action
						1										Operand %I with HOLD value
					0											No action
					1											Operand %I with value to write in MIN/PRS
				0												No action
				1												Operand %I with value to write in MAX
			0													No action
			1													Operand %I with value to write in COUNTER
		0														No action
		1														Operand %I with value to write in COMPARE 1
	0															No action
	1															Operand %I with value to write in COMPARE 2
0																Well succeed write operation
1																Write operation error

Diagnostic

Diagnostic Byte

PO7079 and PO7080 present one byte for diagnostic that indicates general aspects about the module.

The diagnostics bits are described according the following table.

Byte 0 – General								PROFIBUS Message Code	Description
7	6	5	4	3	2	1	0		
					0	**0**	**0**	-	Always zero
				0				-	Correct parameterization
				1				31	No parameterized module Counter value out of range
			0					-	Always zero
		0						-	Normal outputs
		1						01	Outputs short-circuited
	0							-	Normal external voltage
	1							02	External voltage under 19 Vdc
0								-	Always zero

Notes

Reserved bytes: when the PO7079 and PO7080 modules using in the bus of Ponto Series CPUs, three diagnostic bytes are reserved beyond that already described before. So the diagnostics totalize four bytes for each module.

Diagnostic LED

The diagnostic LEDs indicates the following situations.

LED DG	Description	Causes
Off	Module without power supply	Power supply not connected Damage module
On	Normal operation.	
Blinking 1X	Module not accessed or logic failure	Misplace module Module not declared Damage module
Blinking 2X	Outputs short-circuited	Outputs short-circuited
Blinking 3X	Low external power supply	External voltage under 19 Vdc
Blinking 4X	Module without parameterization or counter out of range	Damage module Noise level exceeds specification Misplace module Wrong parameterization Counting value out of range (defined by MIN and MAX)

ATTENTION

In case of power supply failure, the PO7079 and PO7080 modules can not communicate to the CPU or PROFIBUS Head, thus not being able to indicate LED diagnostics.

On installations that use separated power supplies for CPU/PROFIBUS Head and PO7079/PO7080, there may be problems at system start-up if the CPU/PROFIBUS Head is configured with startup consistence enabled.

If more than one diagnostic is active at the same time, will be showed the diagnostic if the minor number of blinks.

Manuals

For further technical details, configuration, installation and programming of Ponto Series products, please consult the following documents:

Document Code	Description
CE109000	Ponto Series General Characteristics
MU219000	Ponto Series Utilization Manual
MU299040	User Manual MT6000 – MasterTool ProPonto
MU209104	User Manual PO3042/ PO3142/ PO3242/ PO3342 Ponto Series CPU
MU209108	User Manual PO3047/ PO3147/ PO3247 Ponto Series CPU
MU299605	User Manual MasterTool MT8000
MP399103	Ladder Programming Manual MasterTool Extended Edition MT8000
MP399603	ST Programming Manual MasterTool Extended Edition MT8000
MU299032	User Manual ProfiTool - AL-3865
MU209511	User Manual PO5064 and PO5065 - PROFIBUS Head
MU209508	User Manual PO5063V1 PROFIBUS Head and PO5063V5 Redundant PROFIBUS Head.