

Pulse Input Module






PI711-S11

User manual

IM23H48-E

Notices
<ul style="list-style-type: none"> ● The reproduction, transmission or use of this document or its contents is not permitted without express written authority. ● Information and specifications in this document are subject to change without notice. ● While information in this document is well edited and checked, mistake or omission may exist. Please don't hesitate to contact SUPCON if you have any question about this document. ● Please contact SUPCON via email "SMS@supcon.com" if you have any question.

Trademarks
<p>Trademarks or marks SUPCON, SPlant, Webfield, ESP-iSYS, MultiF, InScan, SupField are all registered, registering or using by Zhejiang SUPCON Technology Co., Ltd., which owns the properties of all trademarks or marks above. Without the written authority from Zhejiang SUPCON Technology Co., Ltd, no individual or company shall use any trademarks or marks above. We reserve the right to take legal action for any individual or company using trademarks or marks above illegally.</p>

Symbol Definition	
	WARNING: Indicates information that a potentially hazardous situation which, if not avoided, could result in serious injury or death.
	RISK OF ELECTRICAL SHOCK: Indicates information that Potential shock hazard where HAZARDOUS LIVE voltages greater than 30V RMS, 42.4V peak, or 60V DC may be accessible.
	ESD HAZARD: Indicates information that Danger of an electro-static discharge to which equipment may be sensitive. Observe precautions for handling electrostatic sensitive devices
	ATTENTION: Identifies information that requires special consideration.
	TIP: Identifies advice or hints for the user.

Security& Caution Symbols

The following table lists Security& Caution symbols used on equipments.














No.	Symbol	Description
1		Direct current (DC)
2		Alternating current (AC)
3		Ground (Earth) terminal
4		Protective earth (ground) terminal
5		Reference ground (Earth) terminal
6		Frame or chasis
7		Equipotentiality
8		On (power)
9		Off (power)
10		Caution, risk of electric shock
11		Caution, hot surface
12		Caution, risk of danger
13		Electrostatic sensitive devices (ESD)

Table of Contents

Pulse Input Module PI711-S11	1
Section 1 Description	1
Section 2 Technical Specifications	2
Section 3 Usage Instruction	3
3.1 Led indicators	3
3.2 The Installing of I/O Module	3
3.3 Interface Features	3
3.3.1 Non-power pulse signal (proximity switch of three-wire NPN type)	4
3.3.2 Non-power pulse signal (proximity switch of three-wire PNP type)	5
3.3.3 Non-power pulse signal (proximity switch of two-wire type)	6
3.3.4 Voltage pulse signal (two-wire type)	6
3.3.5 Voltage pulse signal (with auxiliary power supply).....	7
3.3.6 Voltage pulse signal (with external power supply)	7
3.3.7 Current pulse signal (with auxiliary power supply).....	8
3.3.8 Current pulse signal (with external power supply)	8
3.4 Terminals definition & connection	9
3.5 Base/Terminal Board Selection	13
3.6 Configuration instruction.....	13
3.7 Maintenance	13
Section 4 Applicatoin	14
4.1 Application example.....	14
4.1.1 Application example of accumulation function	14
4.1.2 Example	15
4.2 Application notices.....	16
4.3 Fault diagnosis and troubleshooting	17
Section 5 Revision.....	18

Pulse Input Module PI711-S11

Section 1 Description

PI711-S11 module is a pulse input module of 6-channel which channel-channel isolated. According to the configuration, this module can measure pulse signal with the range of 0Hz~10000Hz (single cycle low-level pulse width $\geq 30\mu\text{s}$, pulse width of high-level $\geq 20\mu\text{s}$), calculate the frequency value and accumulated value, and send the result to the controller through communication bus.

PI711-S11 module can change the connection method of the external connection terminal according to the field signal type, realizing sampling of pulse signal of different electric level standards. In addition, the module also provides 6 pairs of connection terminals for 24V power distribution to the outside; facilitating the field connection (the module is uniformly isolated during power distribution to the outside).

PI711-S11 module has a working status indicator on the top, indicating the working status of the module, and various signal interfaces at the bottom, which are used for power-supply of the module, data communication and field signal sampling etc.

PI711-S11 module doesn't support redundant configuration, and has free range setting function. The measurement range of the module can be set according to the practical measure scope of the project site, raising the resolution of the module to a certain extent.

Section 2 Technical Specifications

Table 2-1 technical specifications of PI711-S11

Parameter		Description
Module model		PI711 -S11
Module Type		Pulse Input Module
Channel number		6
Redundancy		Not support
Type of isolation		Unified isolation when power distribution, and channel-channel isolation when non-power distribution
Temperature	Operation Temperature	(-20~70) °C
	Storage Temperature	(-40~85) °C
Humidity	Operation humidity	10%RH~90%RH, No Condensation
	Storage humidity	5%RH~95%RH, No Condensation
System Power Supply		24V DC $\pm 10\%$
24VDC system power consumption		<1.2W
24VDC auxiliary power consumption		<0.96W/ channel
Minimum pulse width		High-level of one cycle>20 μ s, low-level >30 μ s
Requirement for input signal voltage		Low-voltage range: low-level<2V, 4V<high-level<12V High-level range: low-level<3V, 12V \leq high-level<30V
Input frequency		0Hz~10000Hz(minimum range is 0.5Hz)
Resolution		(0~1)kHz range: ± 0.1 Hz
		(0~10)kHz range: ± 0.5 Hz
Measure precision	Frequency type	(0~1)kHz range: ± 0.2 Hz
		(0~10)kHz range: ± 1 Hz
	Accumulation type	The pulse will not be lost after normal work of the module.
Data updating cycle		5Hz~10000Hz: 200ms
		0Hz~5Hz: Related to the cycle of the measured pulse signal

Section 3 Usage Instruction

3.1 Led indicators

Table 3-1 LED indicators in PI711-S11

LED indicator	Fault(red)	Status(green)	Duplex(green)	L-Bus(green)	Supply(green)
Description Status	Fault indicator	Running indicator	Work/standby indicator	Communication indicator	Auxiliary power supply status indicator
ON	Fault	Normal	Work	Normal	Normal
Flashing	--	No configuration	--	IP confliction	--
OFF	Normal	--	--	Communication link break	Abnormal auxiliary power supply

3.2 The Installing of I/O Module

PI711-S11 is installed on I/O Module base, which equips with power terminal and field signal terminal.

Please refer to *Control Station Hardware User Manual*.

3.3 Interface Features

PI711-S11 can measure pulse signal of different types. The interface circuit of the module is shown in Figure 3-1~ Figure 3-8.

Each channel of PI711-S11 has 6 connection terminals. For signals of different type, the module has different connection methods.

The connection diagrams of the module when connected to signals of different type are listed as bellow (with the first loop as example).

3.3.1 Non-power pulse signal (proximity switch of three-wire NPN type)

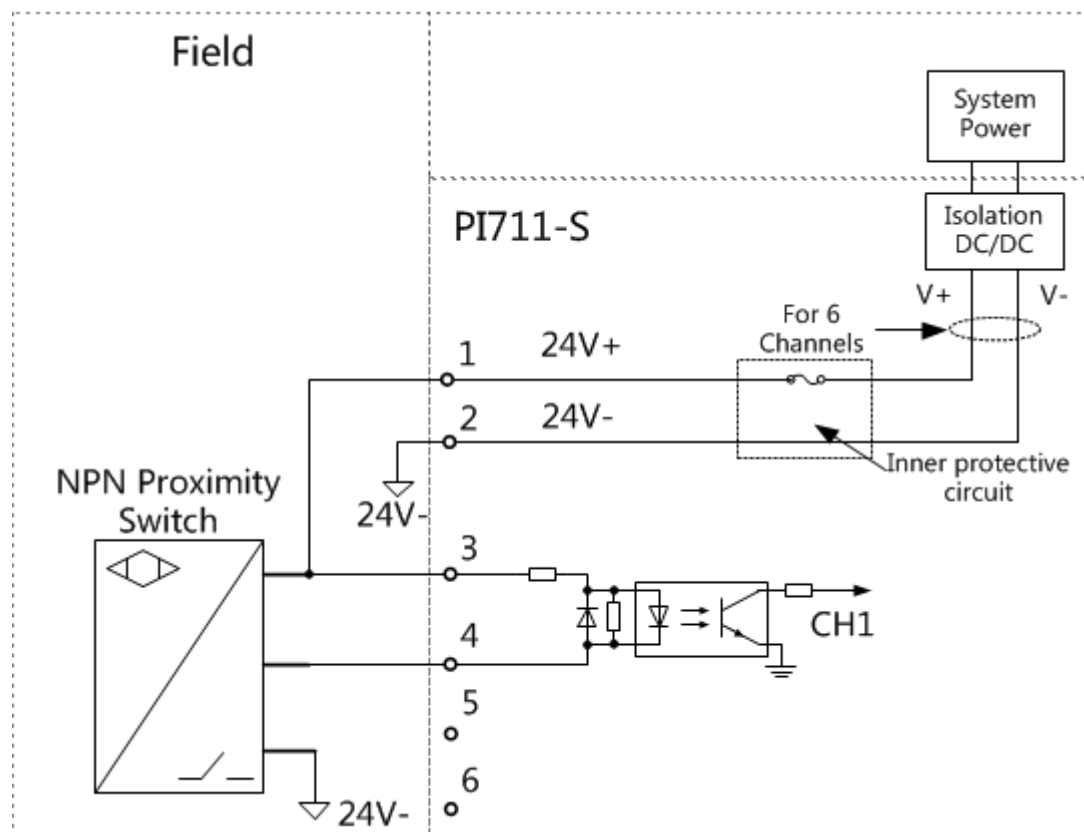


Figure 3-1 Connection diagram for a three-wire NPN proximity switch

3.3.2 Non-power pulse signal (proximity switch of three-wire PNP type)

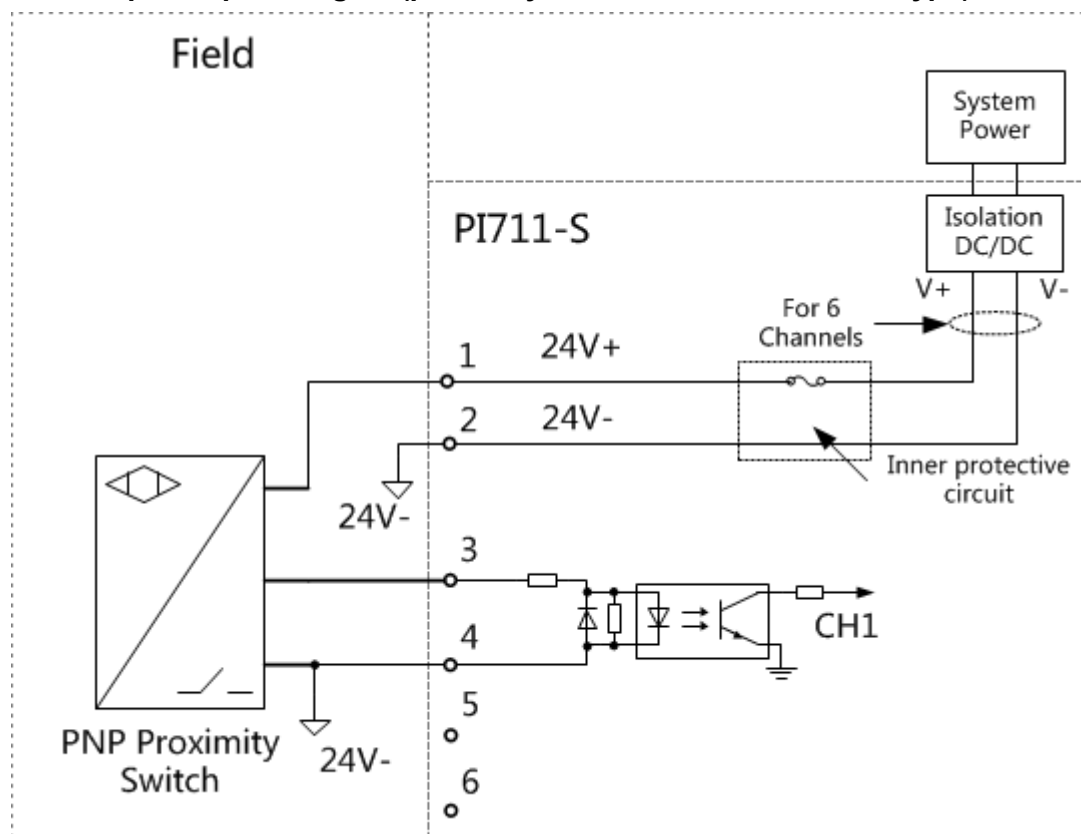


Figure 3-2 Connection diagram for a three-wire PNP proximity switch

3.3.3 Non-power pulse signal (proximity switch of two-wire type)

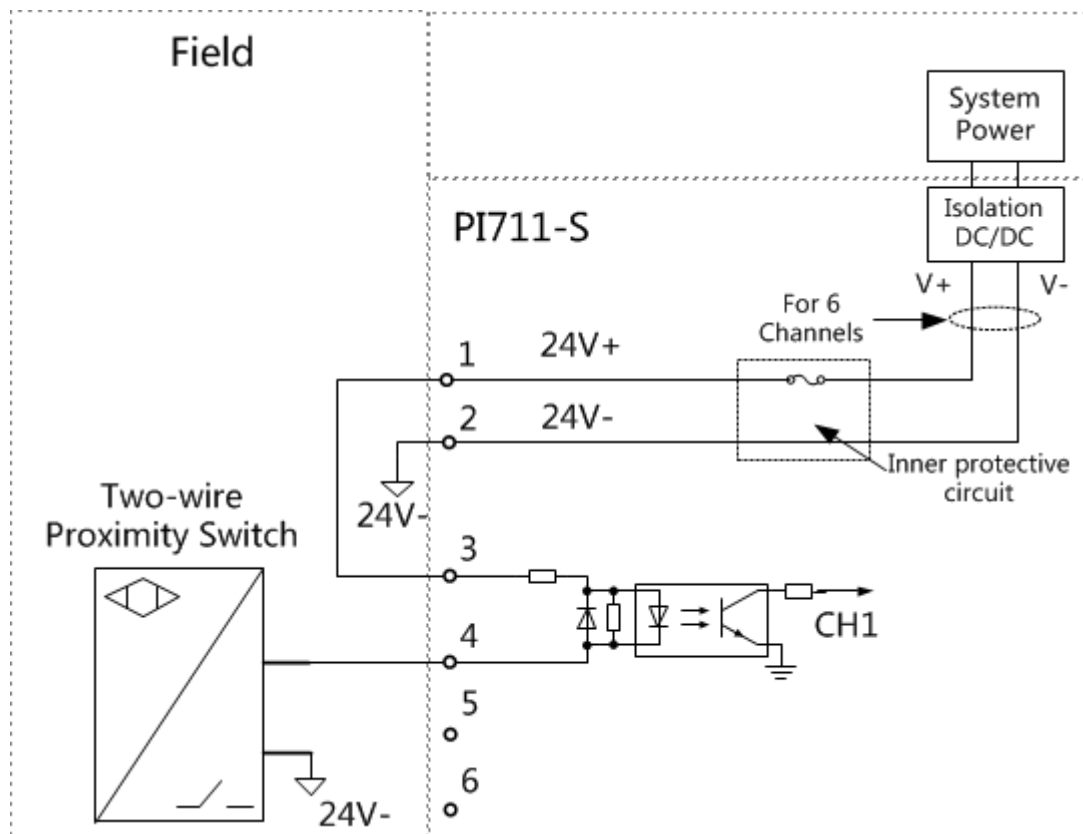


Figure 3-3 Connection diagram for a two-wire proximity switch

3.3.4 Voltage pulse signal (two-wire type)

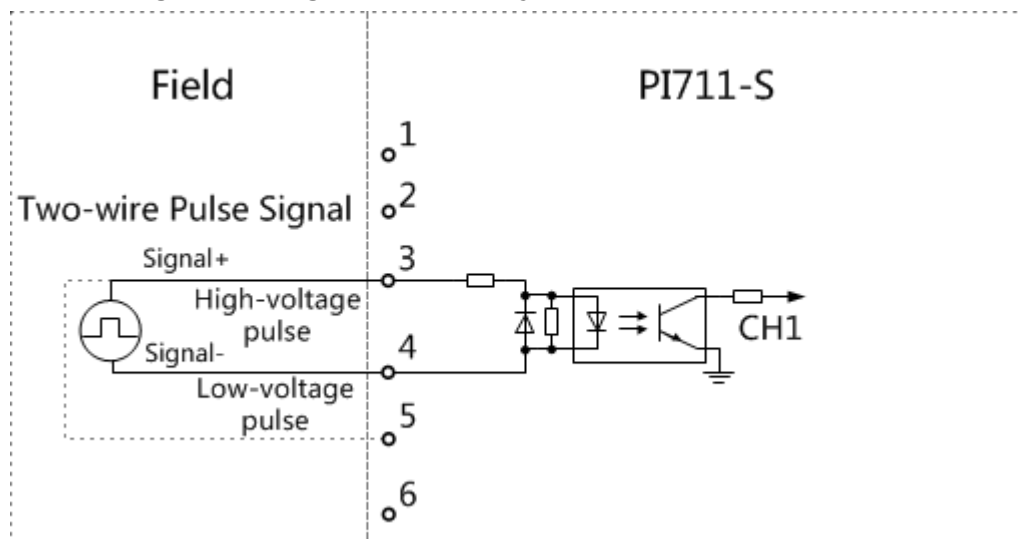


Figure 3-4 Connection diagram for voltage pulse signals

3.3.5 Voltage pulse signal (with auxiliary power supply)

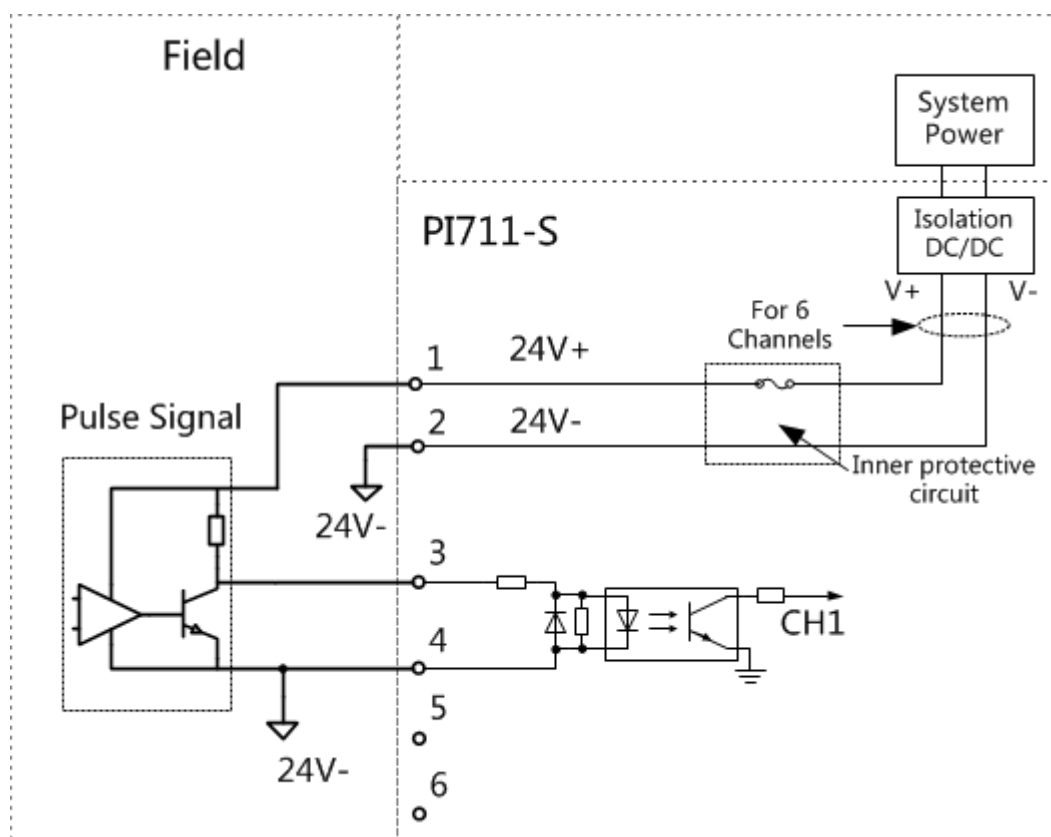


Figure 3-5 Connection diagram for voltage pulse signals (three-wire)

3.3.6 Voltage pulse signal (with external power supply)

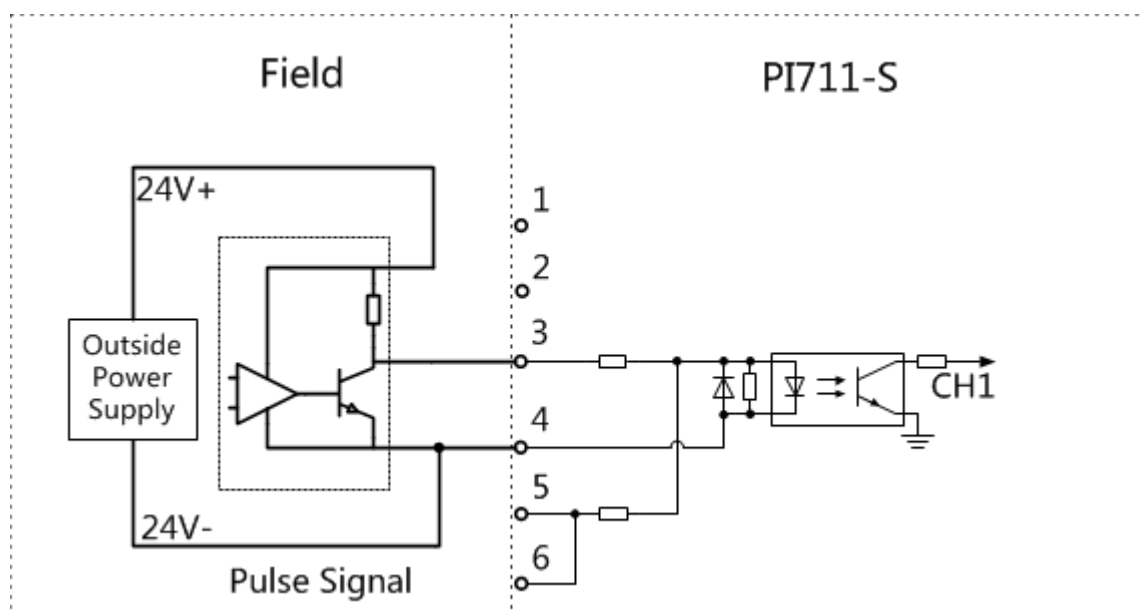


Figure 3-6 Connection diagram for voltage pulse signals (two-wire)

3.3.7 Current pulse signal (with auxiliary power supply)

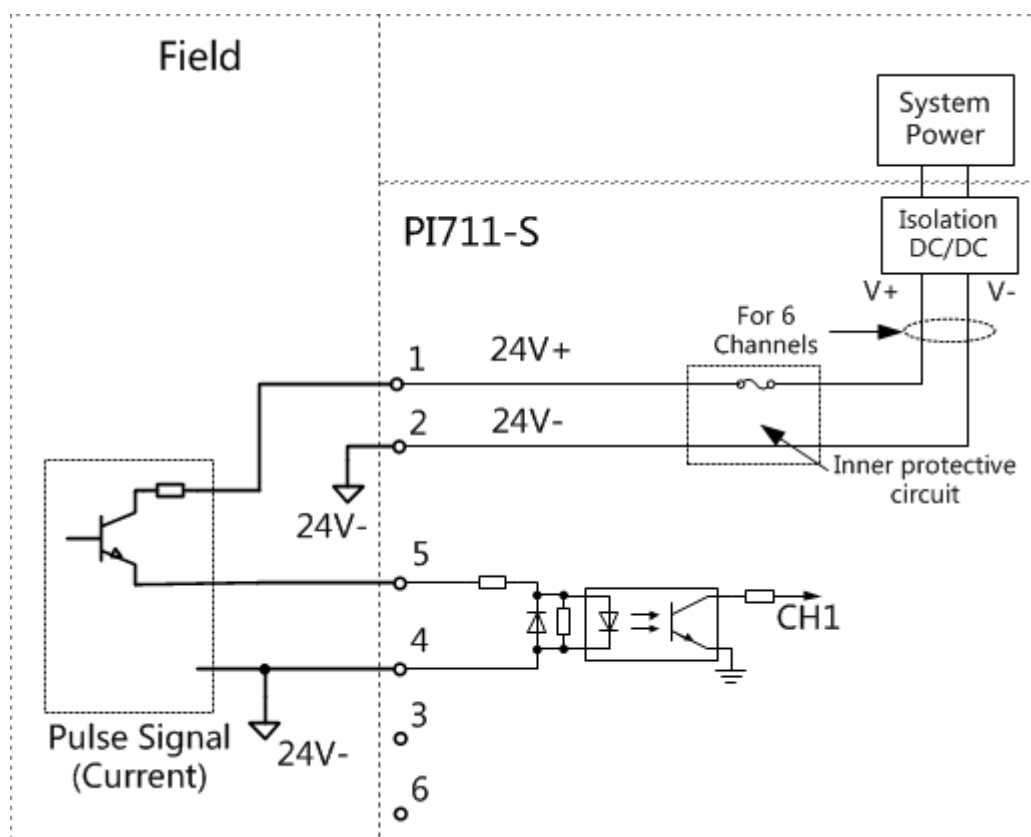


Figure 3-7 Connection diagram for current pulse signals (two-wire)

3.3.8 Current pulse signal (with external power supply)

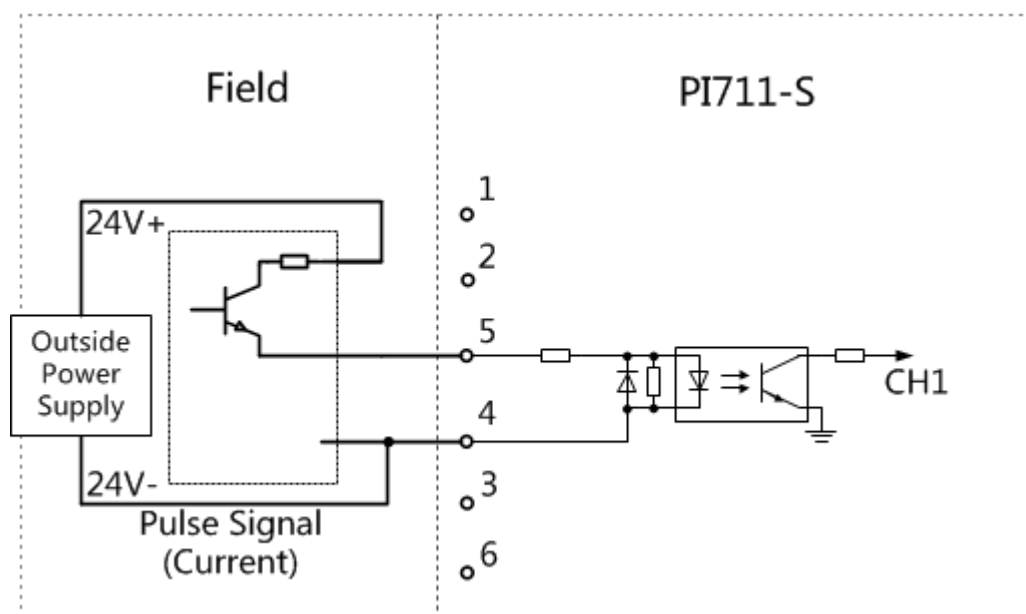


Figure 3-8 Connection diagram of PI711-S11 connected to current pulse signals (power distribution by the external distribution supply)

3.4 Terminals definition & connection

Each channel of PI711-S11 module has 6 connection terminals, two of which are used for field power distribution.

Table 3-2 Connections of terminals of PI711-S11

Terminal	Description	Channel
1	24V+	CH1
2	24V-	
3	SG1	
4	SG2	
5	SG3	
6	SG4	
7	24V+	CH2
8	24V-	
9	SG1	
10	SG2	
11	SG3	
12	SG4	
13	24V+	CH3
14	24V-	

Terminal	Description	Channel
15	SG1	
16	SG2	
17	SG3	
18	SG4	
19	24V+	CH4
20	24V-	
21	SG1	
22	SG2	
23	SG3	
24	SG4	
25	24V+	CH5
26	24V-	
27	SG1	
28	SG2	
29	SG3	
30	SG4	

Terminal	Description	Channel
31	24V+	CH6
32	24V-	
33	SG1	
34	SG2	
35	SG3	
36	SG4	

Non-power pulse signal (proximity switch of three-wire NPN type), refer to Figure 3-1.

- 24V+: proximity switch power supply +
- 24V-: proximity switch signal - (proximity switch power supply -)
- SG1: selected 24V+
- SG2: proximity switch signal +
- Other terminal: not connection

Non-power pulse signal (proximity switch of three-wire PNP type), refer to Figure 3-2.

- 24V+: proximity switch power supply + (proximity switch signal +)
- 24V-: proximity switch power supply -
- SG1: proximity switch signal -
- SG2: selected 24V-
- Other terminal: not connection

Non-power pulse signal (proximity switch of two-wire type), refer to Figure 3-3.

- 24V+: selected SG1
- 24V-: proximity switch signal -
- SG2: proximity switch signal +
- Other terminal: not connection

Voltage pulse signal (two-wire type), refer to Figure 3-4.

- SG2: signal -
- SG3: signal +
- Other terminal: not connection

Voltage pulse signal (with auxiliary power supply), refer to Figure 3-5.

- SG1: signal +
- SG2: signal -
- Other terminal: not connection

Voltage pulse signal (with external power supply), refer to Figure 3-6.

- 24V+: transmitting instrument 24V+
- 24V-: signal -
- SG2: selected 24V-
- SG3: signal +
- Other terminal: not connection

Current pulse signal (with auxiliary power supply), refer to Figure 3-7.

- 24V+: transmitting instrument 24V+
- 24V-: signal -
- SG1: signal +
- SG2: selected 24V-
- Other terminal: not connection

Current pulse signal (with external power supply), refer to Figure 3-8.

- 24V+: transmitting instrument 24V+
- SG2: signal -, selected 24V-
- SG2: signal +
- Other terminal: not connection

3.5 Base/Terminal Board Selection

Selection of bases/terminal board matching PI711-S11 is shown in Table 3-3.

Table 3-3 Selection of bases/terminal board matching PI711-S11

Signal connection requirement	Module work model	Base model	Terminal board model
Pulse input	Single	MB735-S11	-
	Single	MB745-S11	TUA711-GS00

PI711-S11 of this version is totally compatible with last version.

3.6 Configuration instruction

Please refer to Hardware Module Builder User Manual and Tags Builder User Manual for details.

The module address is determined according to the module's position in rack (please refer to the *Control Station Hardware User Manual*). When configuring, select the corresponding control domain address (0~15), controller address (2~126), IO link module address (1~7), IO rack address (0~3), module address (0~15) and channel No. (0~5) according to the position of the module in the rack.

3.7 Maintenance

Clean and fasten all the power and grounding points every six months (or during the time system stops running).

Vacuum the modules, bases, racks, fan unit, power supply terminal boards, etc via static-resistant vacuum every six months (or during the time system stops running).

Please refer to "Control Station Hardware User Manual" for the installation and disassembly.

Section 4 Applicatoin

4.1 Application example

4.1.1 Application example of accumulation function

1. Start a new program in VFExplorer.

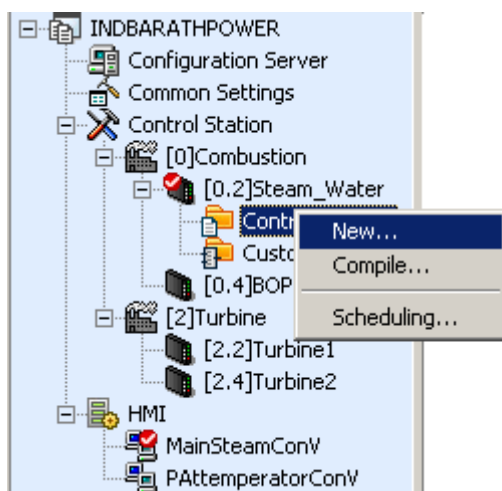


Figure 4-1 Sketch map of starting a new program

2. Open the new-built program file (FBD file), and search for PIACCUM function block.

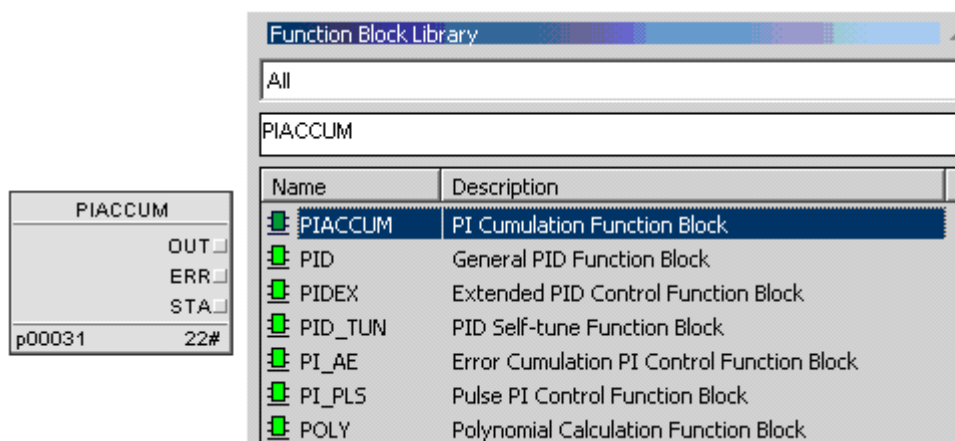


Figure 4-2 Sketch map of function block searching

3. Double click the PIACCUM function block, and set corresponding property of the function block.

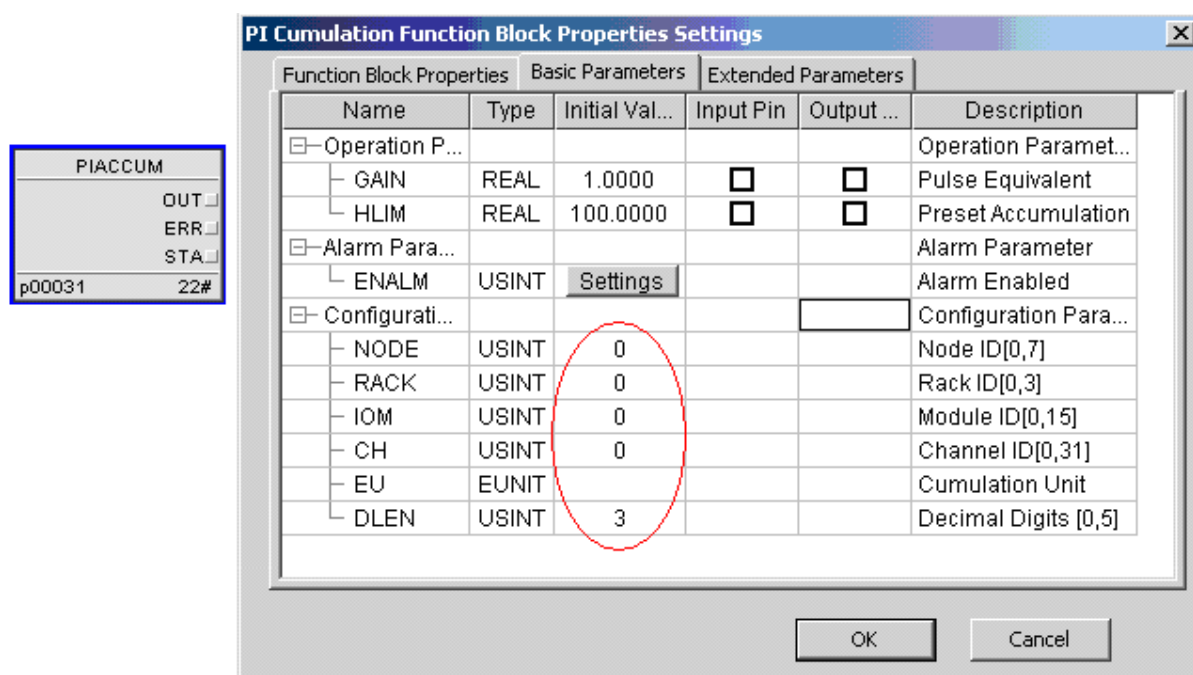


Figure 4-3 Sketch map of function block property setup

Set the unchangeable parameters in the debugging interface, including node sequence number, bus sequence number, module sequence number, channel sequence number, accumulation value unit, number of decimal digits etc.

4. Select OK after finishing settings.

4.1.2 Example

Application: a 50pulses/gallon flow meter, with maximum flux of 100gallons/minute

If 0.1Hz resolution is desired, users should carry out the following operations.

$$50\text{pulses/gallon} \times 100\text{gallons/minute} \div 60\text{second/minute} = 83.33 \text{ pulses/second} = 83.33\text{Hz}.$$

1. Firstly, find out whether the maximum frequency value meets the requirement, i.e. the measure resolution of the module reaches 0.1Hz. According to the performance index of the module, the measured frequency should be less than 1kHz to realize 0.1Hz resolution. And the maximum frequency in this example is :

$$50\text{pulses/gallon} \times 100\text{gallons/minute} \div 60\text{second/minute} = 83.33 \text{ pulses/second} = 83.33\text{Hz}.$$

2. The following operations should be carried out during hardware configuration:
 - Select the power distribution condition. False selection might lead to incorrect sampling (refer to caution 3 for details).
 - Select signal type 0Hz~1000Hz
 - Fill in the upper and lower limit of power range (setup of free range). Lower limit: 0Hz; Upper limit: 83.33Hz (4 digits after decimal point can be fill in at most)
3. The following operations should be carried out during tag configuration:

- Select “regular AI tag” for “tag type” in “input channel setup” option.
- Select “linear conversion” in “signal conversion processing” option.
- Fill in upper limit and lower limit of project value in “input range setup” column.
Lower limit: 0 gallons/minute, upper limit: 100 gallons/minute. Or fill in lower limit of 0% and upper limit of 100% according to other requirements.
- Select “tag value keeping” in “tag selection when fault” according to the field technical requirement.

Note: The upper and lower limits of frequency should strictly match the upper and lower limit of project value, that is 0Hz represents 0 gallons/minute, and 83.33Hz represents 100 gallons/minute.

4. The accumulation function is accomplished in accumulation function block (refer to application example of accumulation function block in 4.1.1). The pulse coefficient (coefficient parameter, each pulse represents the project value) should be setup in function block. Pulse coefficient in this example is $1 \div 50 = 0.02$ (i.e. each pulse represents flux of 0.02gal).

4.2 Application notices

- Because there's no unified standard of the pulse signals, there are various kinds of pulse transmitter used in the project site, resulting in various pulse signals. Users have to select appropriate measure range of the PI711-S11 module according to the field signal type, i.e. the appropriate connection terminal. Generally, pulse signal, with rated high electric level value 24V, is connected to the connection terminal of high voltage level for measurement, while the pulse signal, with rated high electric level value 12V, is connected to the connection terminal of high voltage level for measurement. If there's no pulse detected in the module after connection, connect the pulse signal to the connection terminal of low-level voltage for measurement. For pulse signal, with high-level rated value of 5V, connect it to connection terminal of low-voltage for measurement.
- For example: The pulse signal outputted by field transmitter, with high-level rated voltage of 12V, when it is connected to high-voltage for measurement, the module can't detect the pulse, and only 8V practical high-level can be detected in other equipments. In this case, user can connect the signal to low-level voltage for measurement.
- When the frequency of field signal surpasses the maximum measurable frequency (13Hz) of the module, the frequency value sent in the module might be 0.
- When the module is applied in project site, the “power distribution condition” of each channel in the configuration information of master computer should be chosen strictly in accordance with field power distribution condition. Specially, if power distribution is selected in configuration but the practical module is with no power distribution, it may lead to sampling data invalid. Note: Power distribution condition here refers to whether the auxiliary power of 24V is connected, if it is connected, it's with power distribution; otherwise, it's without power distribution.

4.3 Fault diagnosis and troubleshooting

1. The Fault indicator being ON all the time indicates that PI711-S11 has the severe fault. The solution is to replace the fail module.
2. The L-Bus indicator being OFF all the time indicates communication fault or damage of L-Bus indicator circuit or there is no other node in the I/O bus. Please check the communication connection.
3. If the L-Bus indicator is flashing, there is address confliction. Please check if there is module confliction in the bus.
4. If Power Supply indicator is OFF, there is bad connection of auxiliary 24V power source or unreliable module connection. Please check the auxiliary power supply connection and the connection between module and base.
5. If all indicators are OFF when the module is energized, the power supply of module has problem. Check the system power connection. If the connection is reliable, please replace the module.

Section 5 Revision

Table 5-1 Retrofit list of the version

Document Version	Applicable Module Model	Remarks
V1.0	PI711-S V11.11.00	
V2.0(20131224)	PI711-S11 V13.12.00 and later versions	Bases selection and power distribution have been changed Add model information
V2.1(20141218)	PI711-S11 V13.12.00 and later versions	Modify connection diagram
V2.2(20150917)	PI711-S11 V13.12.00 and later versions	Modify IO link module address
V2.3(20170519)	PI711-S11 V13.12.00 and later versions	Add minimum range Add code