Remote Terminal Unit

PZ-K32

(32 Switch inputs DI)

Version: 20100524

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1. General

The PZ-K32 unit allows the simultaneous collection of 32 actives or passive switch signals. The unit is connected to upper computer with an RS485 interface and utilizes Polling for data exchange to reflect the switch status on a real-time basis. This unit can store the sequence of 2000 events (SOE information), and therefore can accurately indicate the time of the switch status changes.

2. Norms

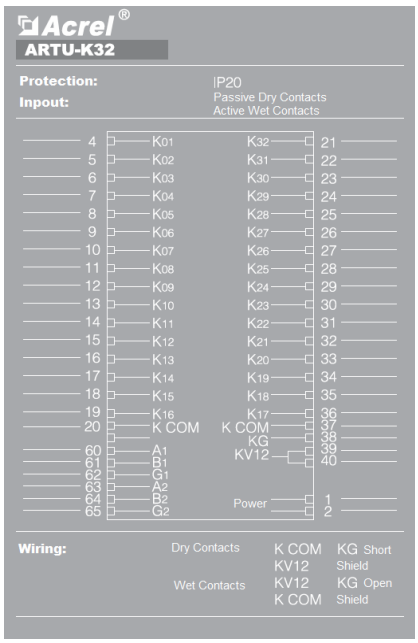
IEC61000-4-2	(EN61000-4-2)	Personnel Electrostatic Discharge Immunity
IEC61000-4-3	(EN61000-4-3)	Testing and measurement techniques - Radiated
IEC61000-4-4	(EN61000-4-4)	Electrical fast transient burst immunity test
IEC61000-4-5	(EN61000-4-5)	Combination wave and surge impulse test
IEC61000-4-6	(EN61000-4-6)	Measurement Uncertainty In Immunity Test
EN55011		Measuring radiated emissions

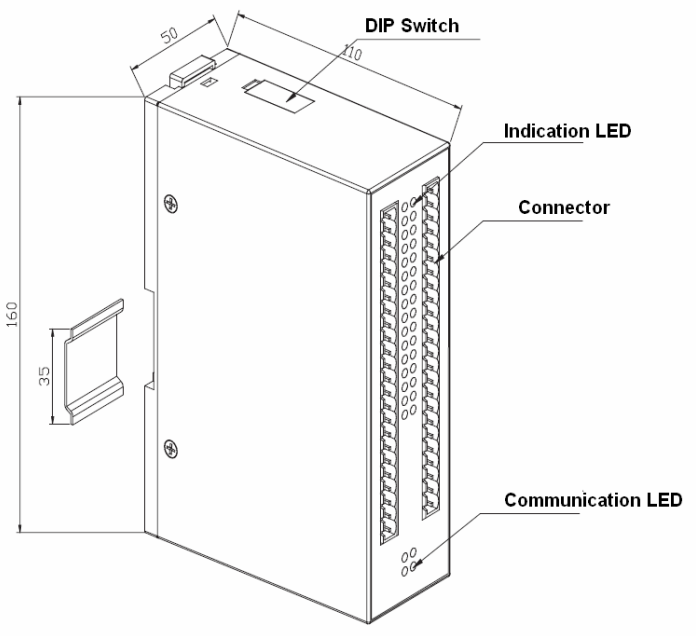
3. Technical Feature

Feature		Value
Input	32 Signals	32 Passive Dry Contacts 32 Active Wet Contacts
	Response time	< 2ms
	Scanning time	1ms
Power Supply	Voltage range	24 VDC(18-36VDC) or AC/DC 80-270V
	Consumption	≤ 5W
Communication	Bus Mode	2-wires half-duplex RS485/Modbus protocol
	Bus Capacity	≤ 32
	Response Time	20ms
	Baud rate	9600 / 4800 / 2400 / 1200 bps
Capacity of Sequence of Events (SOE)		≤1600
Others	Degree of Protection	IP40, Terminal IP20
	Isolation	2Kv/1min,50Hz (inputs, output and supplier)
	Work Temperature	-5℃ - 55℃
	Storage Temperature	-25℃ - 85℃
	Mounting	TS35 Standard DIN rail
	Dimension	160 × 50 ×110mm

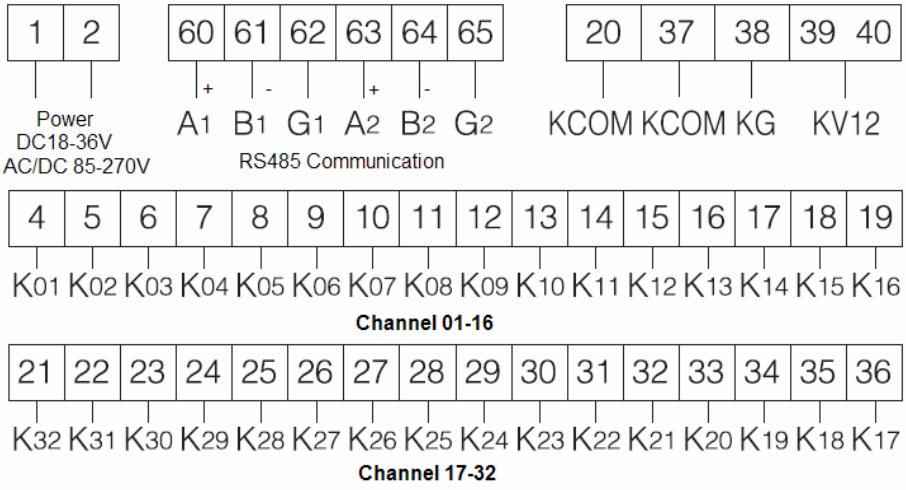
4. Fix and wire

4.1 Size: 160 × 50 ×110mm (L*W*H)





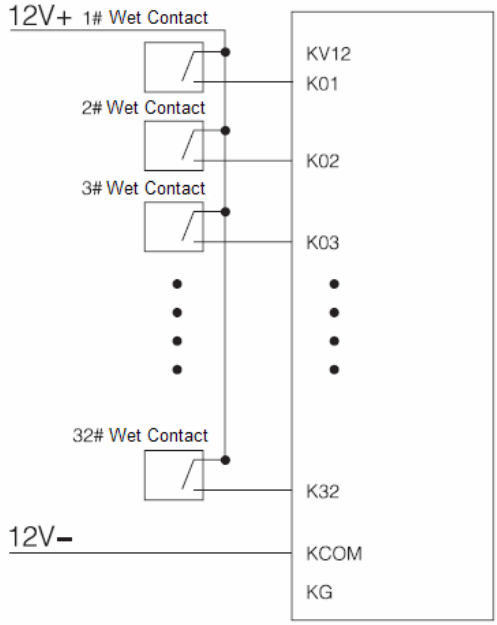
4.2 Fixing: standard DIN TS35



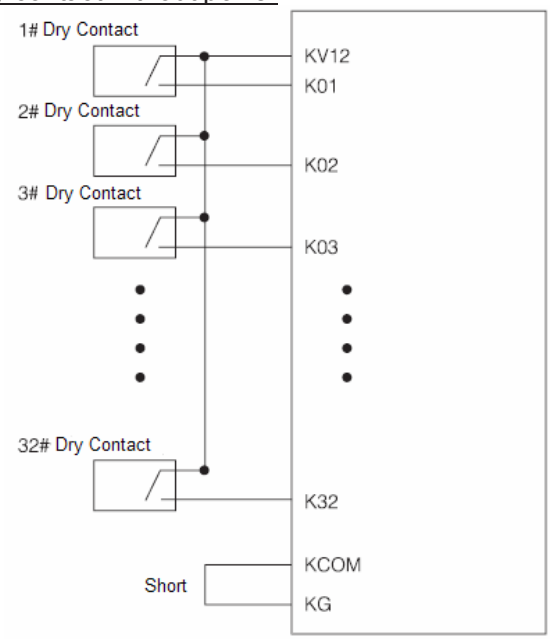
Note:
Wet contact, every Ki（i=1~32）connect with common port KCOM, at the same time KV12 and KG port GND
Dry contact: every Ki（i=1~32） connect with Pi common port KV12, at the same time KCOM and KG short.

4.3 The application example:

Wet contact with power



Dry contact without power`



5. RS485 Communication

5.1 The list of registers

Register code	Items	R/W	Order	Byte	Port
00	Meter code	R	03 / 04	2	
01	Software version	R	03 / 04	2	
02	Slave device address	R/W	03 / 04 /16	2	COMM2
03	Baud rate	R/W	03 / 04 /16	2	COMM2
04	Parity mode (Note1)	R/W	03 / 04 /16	2	COMM2
05	Time: second, minute	R/W	03 / 04 /16	2	COMM2
06	Date: hour, Day	R/W	03 / 04 /16	2	COMM2
07	Date: Month, Year	R/W	03 / 04 /16	2	COMM2
08	Allow clock: (1: yes, 0: no)	R/W	03 / 04 /16	2	COMM2
09	Reserved				
10					
11	SOE indexes (25-8021)		03 / 04	2	
12	Reserved				
13	Current time: second, minute	R	03 / 04	2	
14	Current date: hour, Day	R	03 / 04	2	
15	Current date: Month, Year	R	03 / 04	2	
16	The state of contact inputs (32^{nd} – 17^{th})	R	03 / 04	2	
17	The state of contact inputs (16^{th} – 1^{st})	R	03 / 04	2	
18	The delay of contact (1-99ms)	R/W	03 / 04 /16	2	COMM1
19	Reset of SOE	R/W	03 / 04 /16	2	COMM1
20	Reserved				
21					
22					
23					
24					
25	Duration of 1^{st} SOE (unit: ms)	R	03 / 04	2	
26	The time of 1^{st} SOE (ss:mm)	R	03 / 04	2	
27	The time of 1^{st} SOE (hh:dd)	R	03 / 04	2	
28	The time of 1^{st} SOE (mm:yy)	R	03 / 04	2	
29	Event of 1^{st} SOE (32^{nd} -17^{th})	R	03 / 04	2	
30	Event of 1^{st} SOE (16^{th} -17^{th})	R	03 / 04	2	
31	The state of event of 1^{st} SOE (32^{nd} -17^{th})	R	03 / 04	2	
32	The state of event of 1^{st} SOE (16^{th} -17^{th})	R	03 / 04	2	
……					
12817	Duration of 1600^{th} SOE (unit: ms)	R	03 / 04	2	
12818	The time of 1600^{th} SOE (ss:mm)	R	03 / 04	2	
12819	The time of 1600^{th} SOE (hh:dd)	R	03 / 04	2	
12819	The time of 1600^{th} SOE (mm:yy)	R	03 / 04	2	
12820	Event of 1600^{th} SOE (32^{nd} -17^{th})	R	03 / 04	2	
12821	Event of 1600^{th} SOE (16^{th} -17^{th})	R	03 / 04	2	
12822	The state of event of 1600^{th} SOE (32^{nd} -17^{th})	R	03 / 04	2	
12823	The state of event of 1600^{th} SOE (16^{th} -17^{th})	R	03 / 04	2	

Note:

There are 1600 SOE. Each SOE has 8 registers and 16 bytes. The first register is from register25.

For example:

25	Duration of 1st SOE (unit: ms)	03 45H
26	The time of 1st SOE (ss:mm)	23 45H
27	The time of 1st SOE (hh:dd)	12 30H
28	The time of 1st SOE (mm:yy)	07 07H
29	Event of 1st SOE (32nd -17th)	00 02H
30	Event of 1st SOE (16th -17th)	00 04H
31	The state of event of 1st SOE (32nd -17th)	00 02H
32	The state of event of 1st SOE (16th -17th)	00 00H

Register25: the first SOE was during Hex(345) 837ms

Register26 / 27 /28: the time of first SOE is 12:45:23, 30-07-2007

Register29: there is event on 18th input

32	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Register30: there is event on 3rd input

16	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0

(0: there is no event for this contact input, there is no sense for regster31 and 32; 1: there is event for this contact input)

Register31: 18th contact from NO to NC

32	**31**	**30**	**29**	**28**	**27**	**26**	**25**	**24**	**23**	**22**	**21**	**20**	**19**	**18**	**17**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0

Register32: 3rd contact from NC to NO

16	**15**	**14**	**13**	**12**	**11**	**10**	**9**	**8**	**7**	**6**	**5**	**4**	**3**	**2**	**1**
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

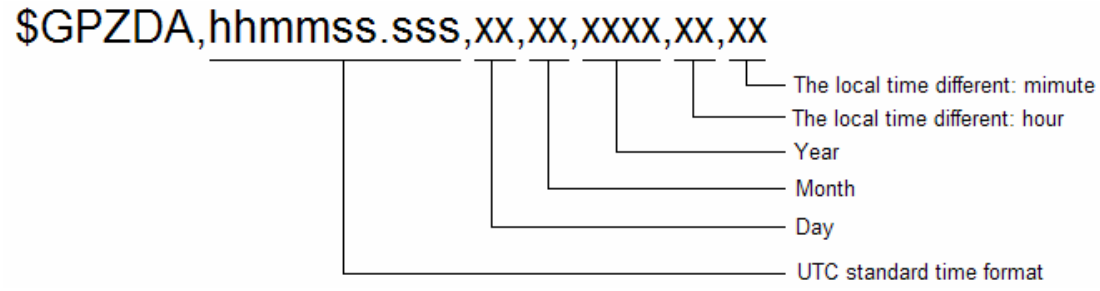
(0: from NC to NO; 1: from NO to NC)

5.2 Read 32 DI states. (read by order 02 and by COMM1)

Register	Content	Format	R/W	Order	Value
0000	DI1	bit	R	02	1=NC 0=NO
0001	DI2	bit	R	02	1=NC 0=NO
0002	DI3	bit	R	02	1=NC 0=NO
0003	DI4	bit	R	02	1=NC 0=NO
0004	DI5	bit	R	02	1=NC 0=NO
0005	DI6	bit	R	02	1=NC 0=NO
0006	DI7	bit	R	02	1=NC 0=NO
0007	DI8	bit	R	02	1=NC 0=NO
0008	DI9	bit	R	02	1=NC 0=NO
0009	DI10	bit	R	02	1=NC 0=NO
0010	DI11	bit	R	02	1=NC 0=NO
0011	DI12	bit	R	02	1=NC 0=NO
0012	DI13	bit	R	02	1=NC 0=NO
0013	DI14	bit	R	02	1=NC 0=NO
0014	DI15	bit	R	02	1=NC 0=NO
0015	DI16	bit	R	02	1=NC 0=NO
0016	DI17	bit	R	02	1=NC 0=NO
0017	DI18	bit	R	02	1=NC 0=NO
0018	DI19	bit	R	02	1=NC 0=NO
0019	DI20	bit	R	02	1=NC 0=NO
0020	DI21	bit	R	02	1=NC 0=NO
0021	DI22	bit	R	02	1=NC 0=NO
0022	DI23	bit	R	02	1=NC 0=NO
0023	DI24	bit	R	02	1=NC 0=NO
0024	DI25	bit	R	02	1=NC 0=NO
0025	DI26	bit	R	02	1=NC 0=NO
0026	DI27	bit	R	02	1=NC 0=NO
0027	DI28	bit	R	02	1=NC 0=NO
0028	DI29	bit	R	02	1=NC 0=NO
0029	DI30	bit	R	02	1=NC 0=NO
0030	DI31	bit	R	02	1=NC 0=NO
0031	DI32	bit	R	02	1=NC 0=NO

5.3 GPS timing check

We can check the date and time of PZ-K32 by COMM2 in standard protocol NMEA and data format $GPZDA.



For example:
GPS sends: $GPZDA,020102.012,05,11,2007
(ASCII: 24 47 50 5A 44 41 2C 30 32 30 31 30 32 2E 30 31 32 2C 30 35 2C 31 31 2C 32 30 30 37 2C)
PZ-K32 is set as time (02:01:02) and date (November 5, 2007)

5.4 Examples

Examples1
Read the state of 32 contacts of device02 (by order 03H)
Request: 0x02,0x03,0x00,0x10,0x00,0x02,0xC5,0xFD
Reply: 0x02,0x03,0x04,0x00,0x00,0x00,0x03,0x89,0x32
Explanation: On device02, its 1st and 2nd contacts are NC, the others are NO.

Examples2
Read the state from channel1 to channel5 on device01 (by order 02H)
Request: 0x01,0x02,0x00,0x00,0x00,0x05,0xB8,0x09
Reply: 0x01,0x02,0x01,0x10,0xA0,0x44
Explanation: 0x10 to binary is 0001,0000; the channel5 is NC and others are NO.

Examples3
Read the state of all 32 channels on device01 (by order 02H)
Request: 0x01,0x02,0x00,0x00,0x00,0x20,0x79,0xD2
Reply: 0x01,0x02,0x04,0x00,0x00,0x8E,0x04,0x9F,0x81
Explanation: 0x00,0x00,0x8E,0x04 to binary is 0000,0000,0000,0000,1000,1110,0000,0100; the channel 3, 10, 11, 12, 16 are NC and others are NO.

Examples4
Read the state from channel17 to channel32 on device01 (by order 02H)
Request: 0x01,0x02,0x00,0x10,0x00,0x10,0x78,0x03
Reply: 0x01,0x02,0x02,0x8E,0x04,0xDD,0xDB
Explanation: 0x8E,0x04 to binary is 1000,1110,0000,0100; the channel 19, 25, 26, 27, 32 are NC and others are NO.

Examples5
Set the current time on device01 (by order 10H)
Request: 0x01,0x10,0x00,0x05,0x00,0x04,0x08,0x12,0x14,0x10,0x21,0x09,0x07,0x00,0x01,0xA3,0xA8
Reply: 0x01,0x10,0x00,0x05,0x00,0x04,0xD1,0xCB
Explanation: Set device01 time as 10:14:12 and September 21,2007

Examples5
Set delay of relay on device01 (by order 10H)
Request: 0x01,0x10,0x00,0x12,0x00,0x01,0x02,0x00,0x04,0xA4,0xE1
Reply: 0x01,0x10,0x00,0x12,0x00,0x01,0xA1,0xCC
Explanation: Set device of delay of contact input as 4ms

6. Others

6.1 DIP Switch setting

6.1.1 DIP definition

1	2	3	4	5	6	7	8	9	10
Address setting					Baud rate setting		Mode setting	communication	
1	0	0	0	0	0	0	0	0	0

6.2.1 Address setting

DIP1	DIP2	DIP3	DIP4	DIP5	Address
1	0	0	0	0	1
0	1	0	0	0	2
31					
1	1	1	1	1	31
0	0	0	0	0	32

6.1.3 Baud rate setting

Baud rate	DIP6	DIP7
9600 bps	0	0
4800 bps	1	0
2400 bps	0	1
1200 bps	1	1

6.1.4 Mode setting

	DIP8	Note: when reset DIP8, have to reset address and baud rate, then the PZ-K32 can work under new mode.
Setting address and baud rate locally	0	
Setting address and baud rate by PC	1	

6.1.5 Data format setting

Format	DIP9	DIP10
10 bits: 1 start, 8 data, 1 stop	0	0
11bits: 1 start, 8 data, 2 stop	1	0
11bits: 1 start, 8 data, even parity, 1 stop	0	1
11bits: 1 start, 8 data, odd parity, 1 stop	1	1

Note: the explanation of DIP: 1(off), 0(on)

6.2 Function data

6.2.1 The reply format when receiving error order

PC read (MODBUS 01H/02H)			
Address	Error function	Error data	CRC
Byte	Byte	Byte	Word
XX	XX(Demand code + 08H)	01H, 02H, 03H, 04H	XXXX (CRC value)

Definition of error code
01 error function code
02 error position of data
03 error value
04 the rupture of slave

6.2.2 The 01H/02H order code

PC master request (MODBUS 01H/02H)				
Code	Function	Address	Data	CRC
Byte	Byte	Word	Word	Word
XX	XX(01H/02H)	XXXX	XXXX	XXXX (CRC value)

Slave reply (MODBUS 01H/02H)				
Code	Function	Data length	Data	CRC
Byte	Byte	Byte	N Byte	Word
XX	XX(01H/02H)	XX	XXXX….	XXXX (CRC value)

Error slave reply (MODBUS 81H/82H)			
Code	Error function	Error Data	CRC
Byte	Byte	Byte	Word
XX	XX(81H/82H)	XX(02H error address, 03H error data)	XXXX (CRC value)

6.2.3 The 03H/04H order code

PC master request (MODBUS 03H/04H)				
Code	Function	Start address	Data	CRC
Byte	Byte	Word	Word	Word
XX	XX(03H/04H)	XXXX	XXXX (N)	XXXX (CRC value)

Slave reply (MODBUS 03H/04H)				
Code	Function	Data length	Data	CRC
Byte	Byte	Byte	2*N Byte	Word
XX	XX(03H/04H)	XX (2*N)	XXXX….	XXXX (CRC value)

Error slave reply (MODBUS 83H/84H)			
Code	Error function	Error Data	CRC
Byte	Byte	Byte	Word
XX	XX(83H/84H)	XX(02H error address, 03H error data)	XXXX (CRC value)

6.2.4 The 05H order code

PC master request (MODBUS 05H)				
Code	Function	Address	Data	CRC
Byte	Byte	Word	Word	Word
XX	XX(05H)	XXXX	OFF00H or 000H	XXXX (CRC value)

Slave reply (MODBUS 05H)				
Code	Function	Data length	Data	CRC
Byte	Byte	Byte	2*N Byte	Word
XX	XX(05H)	XX (as PC read)	XXXX(as PC read)	XXXX (CRC value)

Error slave reply (MODBUS 85H)			
Code	Error function	Error Data	CRC
Byte	Byte	Byte	Word
XX	XX(85H)	XX(02H error address, 03H error data)	XXXX (CRC value)

6.2.5 The 06H order code

PC write one data (MODBUS 06H)				
Code	Function	Start Address	Data	CRC
Byte	Byte	Word	Word	Word
XX	XX(06H)	XXXX	XXXX	XXXX (CRC value)
Error Slave reply (MODBUS 06H)				
Code	Function	Start Address	Data	CRC
Byte	Byte	Word	Word	Word
XX	XX(06H)	XXXX	XXXX	XXXX (CRC value)

Error slave reply (MODBUS 86H)			
Code	Error function	Error Data	CRC
Byte	Byte	Byte	Word
XX	XX(86H)	XX(02H error address, 03H error data, 04H no wrote)	XXXX (CRC value)

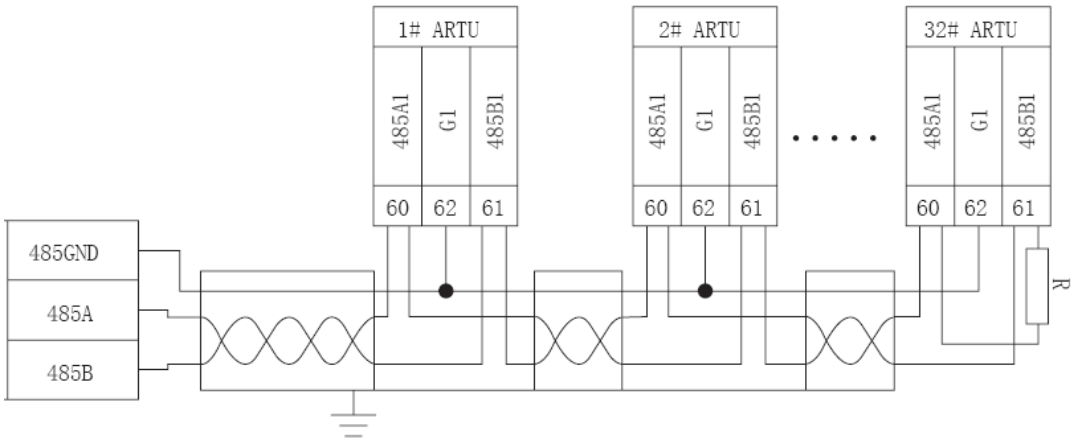
6.2.6 The 10H order code

PC write multi data (MODBUS 16(10H))						
Code	Function	Start Address	Data number	Data length	Data	CRC
Byte	Byte	Word	Word	Byte	2*N bytes	Word
XX	XX(06H)	XXXX	XXXX(n)	XX (2*N)	XXXX	XXXX (CRC value)

Slave reply (MODBUS 16(10H))				
Code	Function	Start Address	Data number	CRC
Byte	Byte	Word	Word	Word
XX	XX(10H)	XXXX	XXXX	XXXX (CRC value)

Error slave reply (MODBUS 90H)			
Code	Error function	Error Data	CRC
Byte	Byte	Byte	Word
XX	XX(90H)	XX(02H error address, 03H error data, 04H no wrote)	XXXX (CRC value)

6.3 Connection mode:



Note: When in a network, there are several PZ-K32, the connectors A and B of last PZ-K32 have to parallel one terminal R (120ohm~10kohm) to assure suitable communication resistance. According to the wiring, the terminal R is different.
In the schema above, use 3 cores cable, Shield connects GND; the connect G1 of each equipment parallel.

6.4 Adjustment and maintenance

6.4.1 Adjustment

Check whether the wiring is OK;
After powered, the power LED is ON, the running LED is glittering, and the interval is 1s.
Setting communication
Wire RS485 cable and to PC
After PC read the slave according to its address and baud rate, the communication LED glitters. The communication has realized.

6.4.1 Maintenance

Check power cable
Check the power LED on
Check the running LED on. If off, the unit doesn't work
Check the communication LED on.
Set the PC read interval. Because the bus is half-duplex, the PC should be set the suitable read interval, which is defined by the length of demand / answer order and baud rate. If the interval is not good, the communication maybe is not realized.