Isolated PROFIBUS Bus Connector with Programming Port

PFB-GP

User Manual

Contents

Introduction

Thank you for using field bus network components manufactured by Deyang FOURSTAR Electronic Technology Co., Ltd.

Please read this User Manual carefully before use. You will know the product's outstanding anti-interference and protect function as well as easy operation.

Isolated PROFIBUS bus connector with programming port (also called PROFIBUS bus isolator) manufactured by FOURSTAR is named PFB-GP. For brevity and convenience, it is called by the model. FOURSTAR has manufactured a product modeled PFB-G which has the similar appearance. It is isolated PROFIBUS bus connector without programming port. Except for programming port, PFB-G has the same functions as PFB-GP.

This product is mainly used for PROFIBUS, MPI, PPI port of the device, isolating RS485 signal and carrying out surge and lightning protection, suppressing interference in communication and protect device port. It is particularly applicable for interfering relatively larger and extreme environment such as network that has frequency converter communication! It solves troubles such as frequent port damage and communication jamming caused by potential difference. Application method of isolated PROFIBUS bus connector is the same as common PROFIBUS bus connector and can replace traditional bus connector directly.

Please operate the device in accordance with specification and parameters specified in User Manual. The company is not responsible for any property loss or personal injury caused by improper operation by user.

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Copyright statement

Version information

Document name: Isolated PROFIBUS Bus Connector with Programming Port

Version：HW：3.0

Date of modification: May 29, 2012

Including:

1. One set of PFB-GP.
2. One copy of User Manual.

I. Main applications and features of FOURSTAR isolated PROFIBUS bus connector

Applications of isolated PROFIBUS bus connector PFB-GP are as below:

1. Suppress interference by communication port. Many devices that have PROFIBUS/MPI/PPI port, such as PLC, PROFIBUS long distance I/O, frequency converter and field instrument, their communication port are generally non-isolated. When PROFIBUS network is constituted by various ports, as each port has different ground potential, ground potential difference between ports will generate longitudinal interference on communication port, especially when there is frequency converter communication in the network, the interference is most severe, which makes communication blackout, error data or no communication. When PFB-GP isolator is installed on communication port of each device to isolate signal, ground potential difference between ports can be eliminated and interference

will be removed.

2. Solve communication damage caused by excessive ground potential difference between ports. PROFIBUS/MPI/PPI all adopts RS485 interface chip. In accordance with EIA/TIA-RS485, the maximum signal voltage range born by RS485 chip is -7V～+12V. Out of this range will damage chip or cause abnormal communication. Due to nonstandard factors such as construction wiring, power distribution, and other unknown reasons, potential difference between ports will exceed dozens of volts.

3. Prevent communication port damage caused by surge or lightning. In case of lightning or close distance between communication cable and strong current cable or start-stop moment of high power electric equipment, surge voltage will be generated in communication cable to damage communication port. Surge and lightening protection components in accordance with ITU-TK20/21 inside isolated PFB-GP bus connector will suppress surge voltage within safe range so as to protect communication port from damage. Even when surge lightning exceeds protection range of components, it will damage PFB-GP isolator only, without damaging the equipment. After replacing PFB-GP, production will be recovered immediately. Downtime caused by lightning stroke will be shortened to the largest extent.

4. Restore communication port. Occasionally, due to design or manufacture defect or communication port failure (not completely failure), some equipment will have strange soft fault during communication. Such faults can be eliminated by using PFB-GP.

FOURSTAR isolated PROFIBUS bus connector PFB-GP has the following features:

1. Its appearance and application method are the same as traditional PROFIBUS bus connector plug, small in size, compact, easy installation, unnecessary for single power supply, just plug in equipment's PROFIBUS-DP socket or MPI/PPI socket. Technology development and highly integration of chip makes mounting isolator with such complicated circuit on small plug a reality!

2. Transparent transmission of physical layer. FOURSTAR isolated PROFIBUS bus connector adopts physical layer bit-position transparency transmission, which is irrelevant with upper layer protocol, therefore, it is applicable for all PROFIBUS protocols based on RS485, including PROFIBUS-DP/V0, V1, V2, and other common profile. It supports multi-master stations communication, such as S7 FUNCTION protocol, secondary master station communication; it also supports MPI protocol, PPI protocol and RS485 free port mode communication, and applicable for other field bus or network with RS485 transmission technology.

3. PFB-GP has standard DB9F programming socket, easy to plug in various programming cable and connect to various communication card and touch screen.

4. Data communication indicator is installed on PFB-GP, easy to search for network and equipment fault.

5. Baud rate 0~10Mbps self-adaption, with no need for switch setting or any software configuration.

6. Power input port-power output port, power port-RS485, and RS485-RS485 are all isolated.

II. Product features and main technical parameters

- Isolation voltage: 1000VDC， all isolation between power and RS485, RS485 and RS485.
- Power supply: automatically select 24VDC±10% provided by PLC programming port or PROFIBUS-DP socket (DB9F socket) pin 7(+) and pin 2 (-) for power supply; or 5VDC±10% provided by pin 6 (+) and pin 5(-) for power supply. Choose either.
- Power consumption: 0.7W.
- Communication rate: 0～10Mbps auto adaption without time delay.

- Integration terminal and biasing resistor, data communication indicator.
- The maximum communication cable length allowed at each transmission rate shall comply with PROFIBUS standard:

Transmission rate （bit/s）	9.6K	19.2K	45.45K	93.75K	187.5K	500K	1.5M	3M	6M
Maximum cable length（meter）	1200				1000	400	200	100	

- At most 32 PFB-GP can be mounted on a bus. By adding PROFIBUS repeater or concentrator, the number can be several hundred.
- The isolated RS485 port has lightning and surge protector, the repeatable surge capacity is Ipp=100A（10/700us，4KV）, meeting up with standard of ITU-TK20/21, VDE 0433. Meanwhile, it has ±15KV ESD (static electricity) protection.
- Automatic restoration over current protection, the isolated RS485 port can bear continuous over current caused by continuous voltage up to 60V.
- Work temperature: -40～+85 ℃ technical grade.
- Dimension: 80mm×17mm×42mm (L×W×H), weight:50g
- Installation: directly plug in to standard socket of PROFIBUS/MPI/PPI (DB9F socket).

III. External structure and pin definition

1. PFB-GP product external form:

Figure 3-1 PFB-GP product outline

2. PFB-GP internal structure:

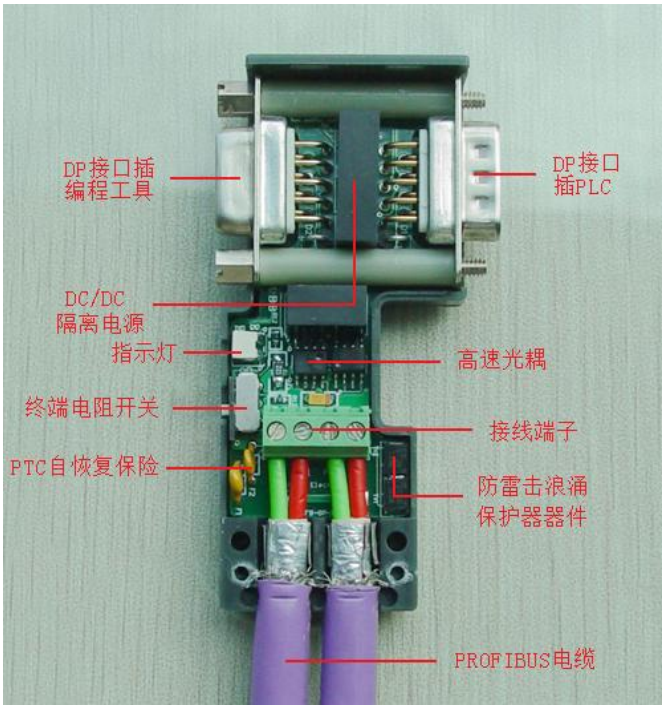


Figure 3-2 PFB-GP internal structure

3. Indicator: LED indicator TXD is mounted on PFB-GP, when PFB-GP sends data to bus cable, indicator flashes at frequency of 5Hz.

4. Signal definition of PROFIBUS port DB9M pin plug of PFB-GP:

DB9M Pin No.	Signal name	Function	Signal direction
3	DB（+）	RS485 Signal positive	Input /output
8	DA（-）	RS485 Signal negative	Input /output
6	+5VDC	5VDC Power input positive	Input
5	GND	5VDC Power input negative	Input
7	+24V	24VDC Power input positive	Input
2	0V	24VDC Power input negative	Input
1、4、9	Not in use	Not in use	Not in use

Note: only when Pin 6 and Pin 5 of equipment PROFIBUS/MPI/PPI (DB9F socket) has 5VDC power output, or pin 7 and pin 2 has 24VDC power output, PFB-GP will sure have normal work power supply.

5. Signal definition of programming port DB9F socket of PFB-GP:

DB9F pin No.	Signal name	Function	Signal direction
3	DB（+）	Isolated RS485Signal positive	Input/output
8	DA（-）	Isolated RS485Signal negative	Input/output
6	+5VDC	Isolated 5VDCPower input positive	Output
5	GND	Isolated 5VDCPower input negative	Output
7	+24V	Non-isolated 24VDCPower input positive	Output
2	0V	Non-isolated 24VDCPower input negative	Output
1、4、9	Not in use	Not in use	Not in use

Note: Pin 6 and Pin 5 on programming port DB9F socket can provide 5VDC and maximum 50mA output current.

6. RS485 signal terminal of PFB-GP:

Signal terminal	Function	Cable color	Description
A1	Isolated RS485 signal negative	Green	Disconnect from A2 when switch is ON; connect with A2 when switch is OFF.
B1	Isolated RS485 signal positive	Red	Disconnect from B2 when switch is ON; connect with B2 when switch is OFF.
A2	Isolated RS485 signal negative	Green	Disconnect from A1 when switch is ON; connect with A1 when switch is OFF.
B2	Isolated RS485 signal positive	Red	Disconnect from B1 when switch is ON; connect with B1 when switch is OFF.
Grounding piece	Housing	Shield layer	Connect with equipment housing

IV. Internal functional block diagram

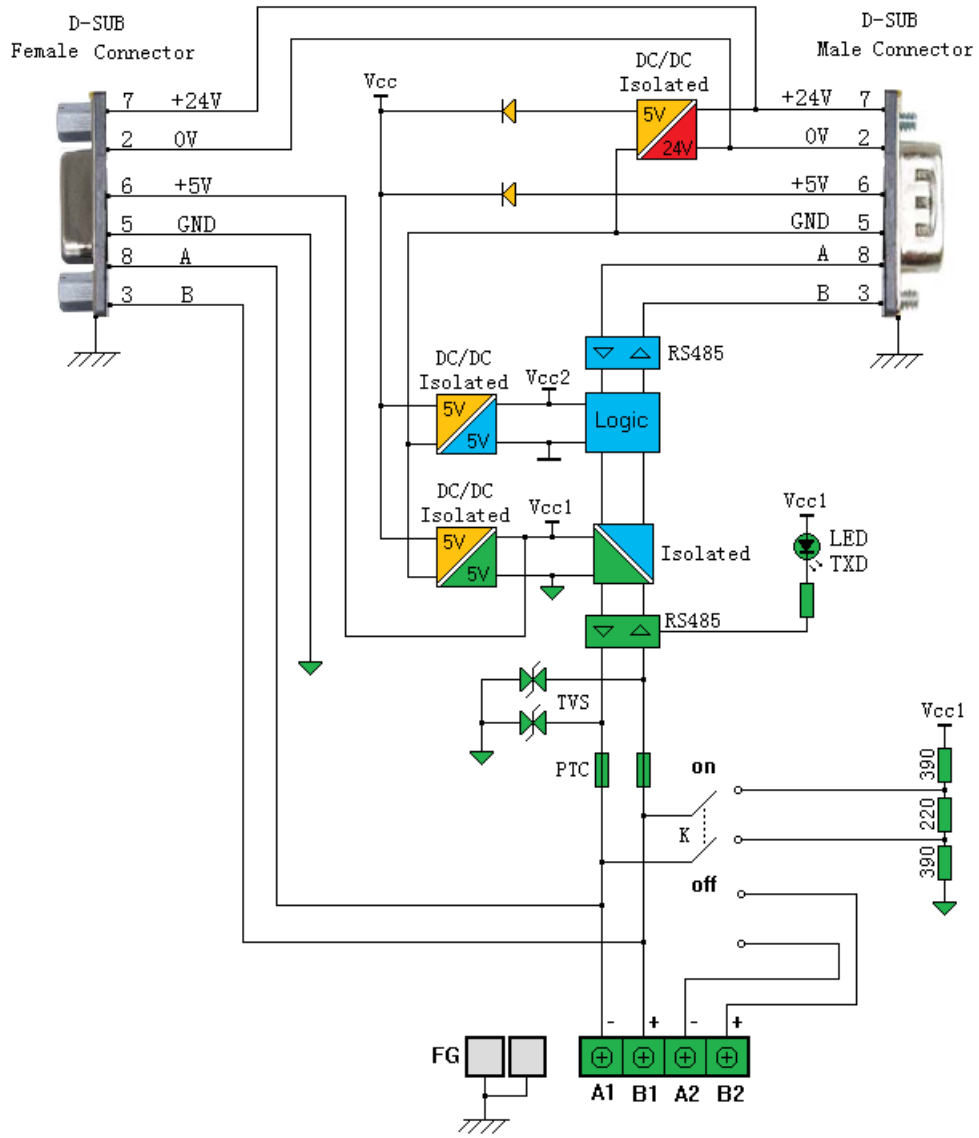


Figure 4-1 Internal functional block diagram of FOURSTAR Isolated PROFIBUS bus connector PFB-GP

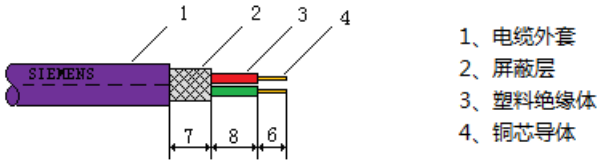
V. Application method of FOURSTAR isolated PROFIBUS bus connector

Similar to traditional non-isolated PROFIBUS bus connector, communication cable connecting to PFB-GP isolator shall be private cable which meets up with PROFIBUS

standard (Siemens product No.: 6XV1 830-0EH10). General characteristics of the cable are shown in the following Table 5-1:

Table 5-1 Characteristics of 6XV1 830-0EH10 private cable

General characteristics	Standard
Type	Shielded twisted pair
Sectional area of conductor	24AWG（0.35mm^2）or thicker
Cable capacitance	<60pf/m
Characteristic impedance	100Ω～120Ω



PROFIBUS专用电缆剥线尺寸

PFB-GP shall be plugged in to DB9F socket of equipment PROFIBUS/MPI/PPI directly. There shall be no extended cable between PFB-GP and equipment DB9F socket, nor other bus plug.

1. Wiring when PFB-GP is installed on bus terminal

The head and end of a section of PROFIBUS cable is called terminal. When PFB-GP is installed on terminal, cable connects to A1 and B1 terminal only. Terminal resistance switch shall be turned to “On” position.

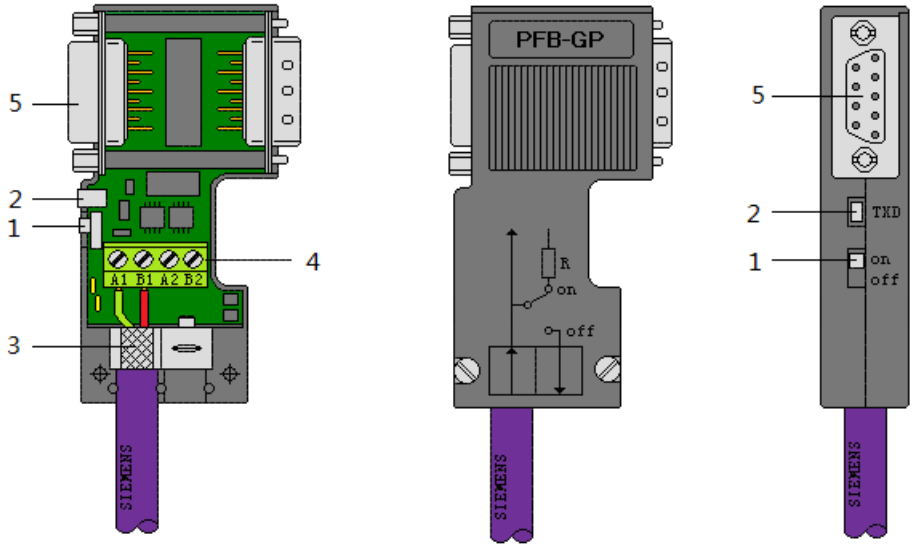


Figure 5-1 Wiring when PFB-GP is installed on bus terminal

In the figure:

1. Terminal resistance switch and two terminals' PFB-GP on the network are turned to "On".

2. LED data transmitting indicator

3. PROFIBUS bus cable.

4. RS485 connecting terminal, two terminals in network are connected to A1 (RS485 signal negative, green), B1 (RS485 signal positive, red).

5. Programming port, able to be inserted by programming cable or other communication cards. Allowable maximum length of cable is 5 meters.

2. Wiring when PFB-GP is installed in the middle position of bus

At most 30 PFB-GP can be installed between two terminals of a bus. Cable shall connect to A1, B1 terminal and A2, B2 terminal, terminal resistance switch shall be turned to "Off" position.

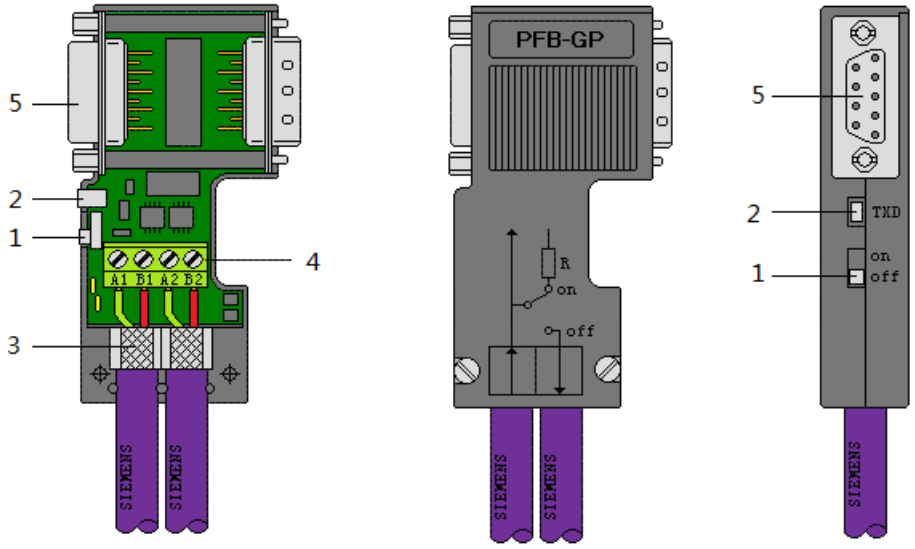


Figure 5-2 Wiring when PFB-GP is installed in the middle position of bus

In the figure：

1. Terminal resistance switch and all PFB-GP in the middle of network are turned to “Off”.

2. LED data transmitting indicator

3. PROFIBUS bus cable.

4. RS485 connecting terminal, PFB-GF in the middle of network are connected to A1 (RS485 signal negative, green), B1 (RS485 signal positive, red), A2 (RS485 signal negative, green), B2 (RS485 signal positive, red).

5. Programming port, able to be inserted by programming cable or other communication cards. Allowable maximum length of cable is 5 meters.

3. Network topology of PFB-GP

Similar to traditional non-isolated PROFIBUS bus connector, PFB-GP still has bus topology. No branch is allowed in bus. When branch is required, PROFIBUS repeater or concentrator shall be added to branch.

PFB-GP programming port DB9F (hole) socket shown in figure can be inserted by programming cable or connected to communication card or human-computer interface equipment. Maximum length of cable inserted is 5 meters. When station number in bus

exceeds 32 or bus length exceeds maximum length corresponding to transmission rate specified in PROFIBUS standard, PROFIBUS repeater or concentrator split bus.

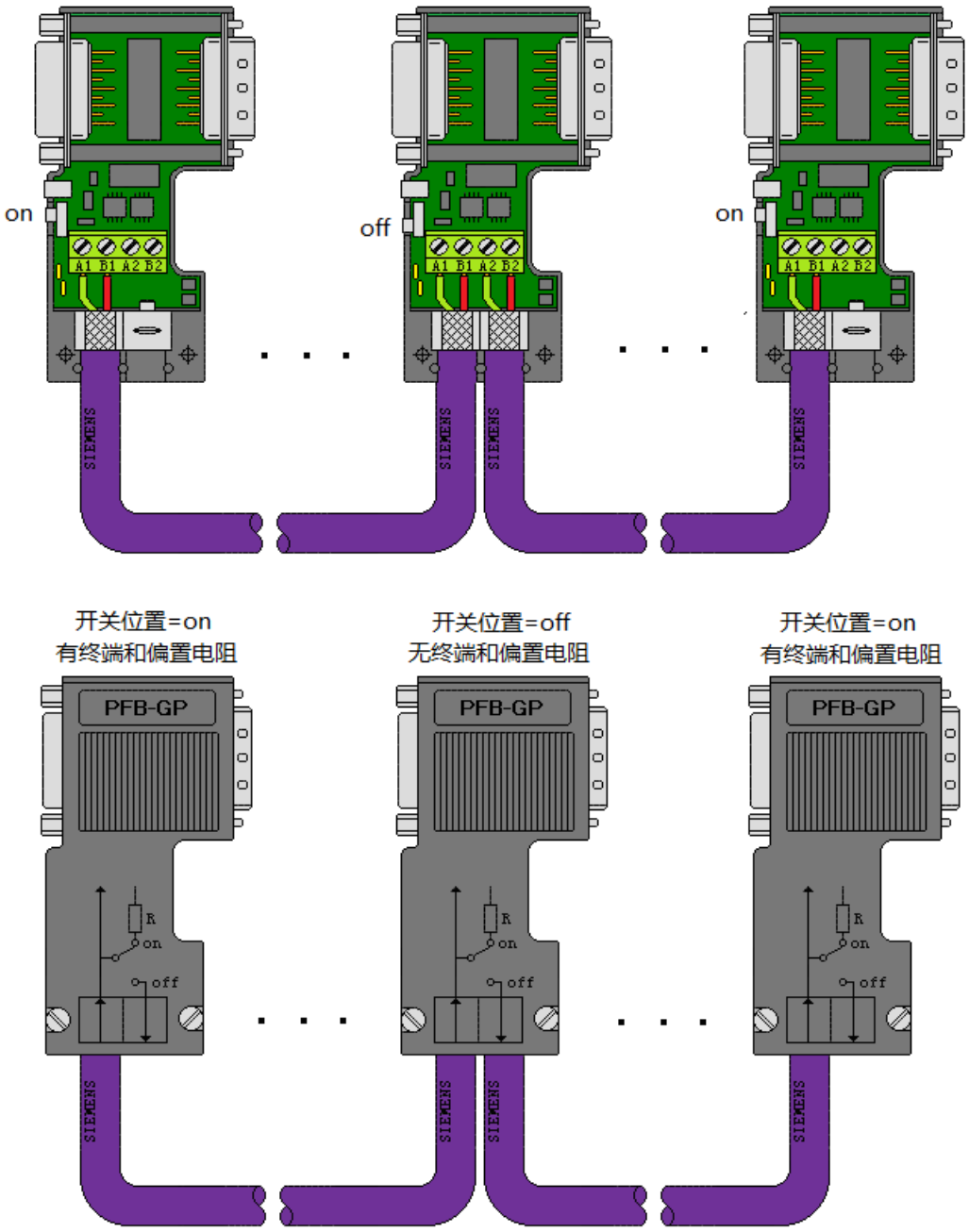


Figure 5-3 Network topology of PFB-GP

4. Application figure of PFB-GP

It is possible to mix PFB-GP with PFB-G which has no programming port. Install PFB-GP on station which requires to be connected to programming equipment. For station

which doesn't require to be connected to programming equipment, install PFB-G to save cost. PFB-GP can be installed on all stations to make it possible for operators to connect to debugging system of programming equipment at any station.

Some RS485 port of inverter has terminal form, not convenient for installing PFB-GP, user can select another type of RS485 isolator by FOURSTAR, the model is BH-485G or E485GP. Its structure is standard guide rail-mounted with connecting terminal.

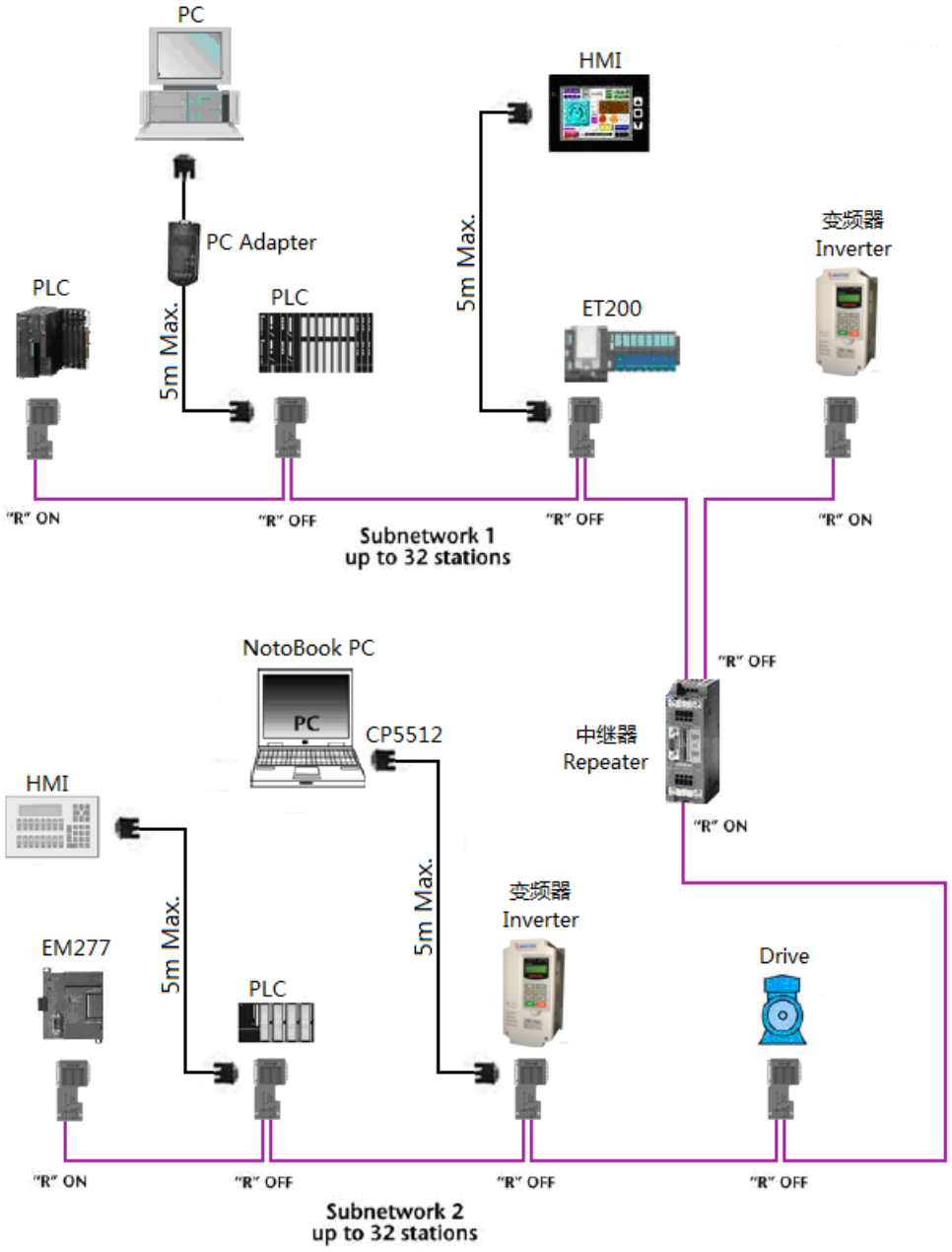


Figure 5-4 PFB-GP application schematic diagram

VI. FAQ

1. Where to obtain work power supply for PFB-GP?

As long as Pin 6 and Pin 5 of PROFIBUS/MPI/PPI socket (DB9F hole seat) has 5VDC power output or Pin 7 and Pin 2 has 24VDC power output, PFB-GP will have normal work power.

2. Why power outage is not allowed in station which is served as terminal in network?

The head and end of PROFIBUS segment is called terminal. To suppress reflection and distortion of RS485 signal, terminal cable shall connect to A1 and B1 terminal of bus connector. Terminal resistance switch on bus connector plug of terminal port shall be turned to “ON” position, then terminal port is connected to a 220 ohm terminal resistance, a 390 ohm pull-up resistor and a 390 ohm pull-down resistor to make sure stable operation of network. Pull-down and pull-up resistor requires Pin 6 and Pin 5 on DP socket to provide 5VDC work power. When terminal station blackout occurs, 5 VDC work power supplied to pull-down and pull-up resistor is shutdown. This will cause abnormal network communication or communication failure.

Internal schematic diagram of traditional non-isolated PROFIBUS bus connector plug is shown below.

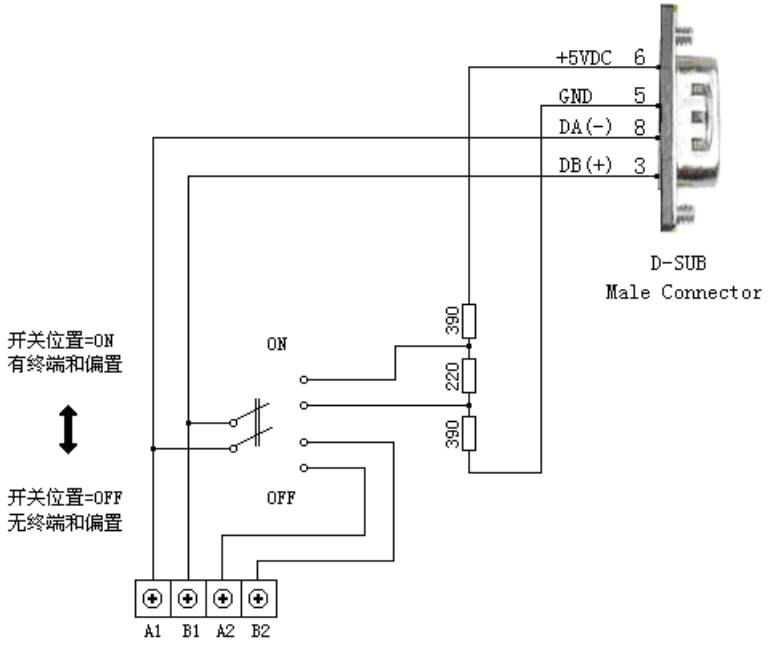


Figure 6-2 Internal schematic diagram of PROFIBUS bus connector plug

3. What to do when blackout occurs to station served as terminals?

If due to restrictions by field condition, terminal station requires blackout or DP port in the terminal station is connecting terminal which can't be installed on bus connector, to ensure normal communication in network, active terminal resistance (make sure no power failure)is needed to installed on segment terminal to serve as terminal for segment. Product number of active terminal resistance by Siemens is: 6ES7 972-0DA00-0AA0，active terminal resistance by FOURSTAR is: PB-TR485.

When active terminal resistance is added to PROFIBUS segment terminal, it will keep bus voltage at standard level. Therefore, no matter which station on bus is disconnected from network, no network fault will be caused. Blackout in any segment terminal will affect communication in other segment, therefore, terminals that may have power failure shall be replaced by active terminal resistance to make sure active terminal resistance will have no power failure.

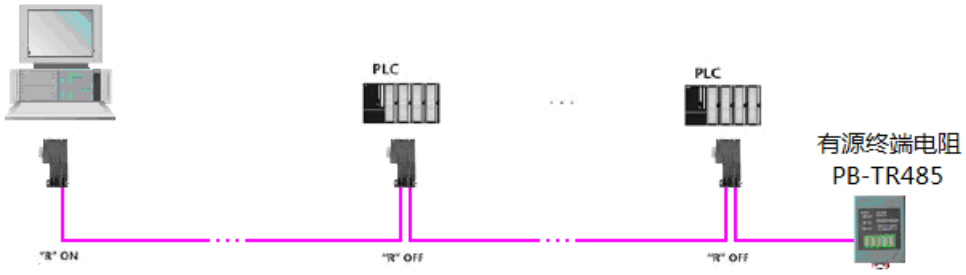


Figure 6-3 Install active terminal resistance on segment terminal that may have power failure

4. How to realize high speed and long distance communication of PROFIBUS?

High speed communication is one advantage of PROFIBUS. But when PROFIBUS uses relatively high speed communication, such as transmission speed exceeding 3Mbps, cable transmission can only reach 100meters. Addition of many repeaters or concentrator will cause problems, such as increasing signal delay, increasing cost or complicate power supply. Optical transmission is currently the solution with best cost performance. For example, PROFIBUS fiber module FS-OLM-S and FS-OLM-M by FOURSTAR.

VII. Order information

Product name: Isolated PROFIBUS Bus Connector with Programming Port

Model：PFB-GP

Statement: this document aims at providing instructions for users to use isolated PROFIBUS bus connector modeled PFB-GP. As new technology is developing rapidly, product function is subject to actual condition. Deyang FOURSTAR Electronic Technology Co., Ltd. preserves right to modify this document without prior notice.

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