
**User's
Manual**

**YPK110
Fieldbus-to-Pneumatic Converter**

IM 21B04D01-01E

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YPK110 Fieldbus-to-Pneumatic ConverterC MPL 21B04D01-01E

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INTRODUCTION

The YPK110 fieldbus-to-pneumatic converter is fully factory-tested according to the specifications indicated upon the order.

This User's Manual consists of two parts: Hardware and Functions. The Hardware part gives instructions on handling, wiring set-up and maintenance of YPK110, and the Functions part describes the software functions of YPK110.

In order for the YPK110 to be fully functional and to operate in an efficient manner, both parts in this manual must be carefully read, so that users become familiar with the functions, operation, and handling of the YPK110.

■ Notes on the User's Manual

- This manual should be delivered to the end user.
- The information contained in this manual is subject to change without prior notice.
- The information contained in this manual, in whole or part, shall not be transcribed or copied without notice.
- In no case does this manual guarantee the merchantability of the instrument or its adaptability to a specific client need.
- Should any doubt or error be found in this manual, submit inquiries to your local dealer.
- No special specifications are contained in this manual.
- Changes to specifications, structure, and components used may not lead to the revision of this manual unless such changes affect the function and performance of the instrument.
- Some of the diagrams in this instruction manual are partially omitted, described in writing, or simplified for ease of explanation. The drawings contained in the instruction manual may have a position or characters (upper/lower case) that differ slightly from the what are actually seen to an extent that does not hinder the understanding of functions or monitoring of operation.

● Symbols used in this manual

WARNING

Contains precautions to protect against the chance of explosion or electric shock which, if not observed, could lead to death or serious injury.

CAUTION

Contains precautions to protect against danger, which, if not observed, could lead to personal injury or damage to the instrument.

IMPORTANT

Contains precautions to be observed to protect against adverse conditions that may lead to damage to the instrument or a system failure.

NOTE

Contains precautions to be observed with regard to understanding operation and functions.

■ For Safe Use of Product

For the protection and safety of the operator and the instrument or the system including the instrument, please be sure to follow the instructions on safety described in this manual when handling this instrument. In case the instrument is handled in contradiction to these instructions, Yokogawa does not guarantee safety. Please give your highest attention to the followings.

(a) Installation

- The instrument must be installed by an expert engineer or skilled personnel. The procedures described about INSTALLATION are not permitted for operators.
- Some of the operations will stroke the valve. Keep clear of the valve while the positioner is pneumatically or electrically supplied, so as not to be hit by unexpected movements of the valve.

■ **Warranty**

- The warranty period of the instrument is written on the estimate sheet that is included with your purchase. Any trouble arising during the warranty period shall be repaired free of charge.
- Inquiries with regard to problems with the instrument shall be accepted by the sales outlet or our local dealer representative.
- Should the instrument be found to be defective, inform us of the model name and the serial number of the instrument together with a detailed description of nonconformance and a progress report. Outline drawings or related data will also be helpful for repair.
- Whether or not the defective instrument is repaired free of charge depends on the result of our inspection.

● **The following conditions shall not be eligible for charge-exempt repair.**

- Problems caused by improper or insufficient maintenance on the part of the customer.
- Trouble or damage caused by mishandling, misuse-age, or storage that exceeds the design or specification requirements.
- Problems caused by improper installation location or by maintenance conducted in a non-conforming location.
- Trouble or damage was caused by modification or repair that was handled by a party or parties other than our consigned agent.
- Trouble or damage was caused by inappropriate relocation following delivery.
- Trouble or damage was caused by fire, earthquake, wind or flood damage, lightning strikes or other acts of God that are not directly a result of problems with this instrument.

■ **Trade Mark**

- FOUNDATION Fieldbus is a trademark of the Fieldbus Foundation.
- Registered trademarks or trademarks appearing in this manual are not designated by a TM or ® symbol.
- Other company names and product names used in this manual are the registered trademarks or trademarks of their respective owners.

- In case where ambient temperature is high, care should be taken not to burn yourself, because the surface of the body of the instrument reaches a high temperature.

- All installation shall comply with local installation requirement and local electrical codes.

- Do not supply air at a pressure exceeding the maximum rated air supply pressure. Doing so may result in a high risk of damage or cause an accident.
- To avoid injury or the process being affected when installing or replacing a positioner on a control valve, ensure that:

- 1) All inputs to the valve actuator and other accessories of the valve and actuator, including air supply and electrical signal, are cut off;
- 2) The process has been shut down or the control valve is isolated from the process by using bypass valves or the like; and
- 3) No pressure remains in the valve actuator.

- Auto-Manual switch must not be moved by anyone except for the authorized engineer.

(b) **Wiring**

- The instrument must be installed by an expert engineer or skilled personnel. The procedures described about WIRING are not permitted for operators.
- Please confirm voltages between the power supply and the instrument before connecting the power cables and that the cables are not powered before connecting.

(c) **Operation**

- Wait three minutes after power is turned off, before opening the covers.
- Only the procedures written in maintenance descriptions are allowed for users. When further maintenance is needed, please contact nearest YOKOGAWA office.
- Care should be taken to prevent the build up of dirt, dust or other material on the data plate. In case of its maintenance, use clean, soft and dry cloth.
- The instrument modification or parts replacement for explosion-protected type instruments by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval.

(d) **Maintenance**

1. NOTES ON HANDLING

The YPK110 fieldbus-to-pneumatic converter is fully factory-tested upon shipment. When the YPK110 is delivered, visually check that no damage occurred during the shipment.

1.1 Nameplate

The model name and configuration are indicated on the nameplate. Verify that the configuration indicated in the “Model and Suffix Code” in Chapter 7 is in compliance with the specifications written on the order sheet.

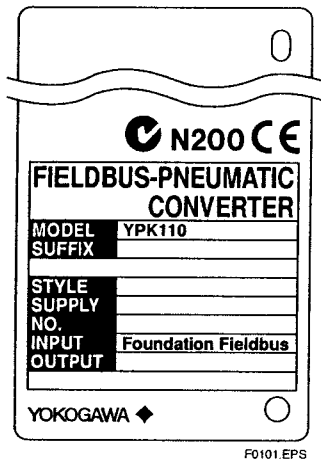


Figure 1.1 Nameplate

1.2 Transport

To prevent damage while in transit, leave the positioner in the original shipping container until it reaches the installation site.

1.3 Storage

When an extended storage period is expected, observe the following precautions:

- (1) If at all possible, store the positioner in factory-shipped condition, that is, in the original shipping container.
- (2) Choose a storage location that satisfies the following requirements.
 - A location that is not exposed to rain or water.
 - A location subject to a minimum of vibration or impact.

- The following temperature and humidity range is recommended. Ordinary temperature and humidity (25°C, 65%) are preferable.

Temperature: -40 to 85°C

Humidity: 5 to 100% RH (at 40°C)

- (3) The performance of the positioner may be impaired if stored in an area exposed to direct rain and water.

To avoid damage to the positioner, install it immediately after removal from the shipping container. Follow wiring instructions in this manual.

1.4 Choosing the Installation Location

Although the advanced valve positioner is designed to operate in a vigorous environment, to maintain stability and accuracy, the following is recommended:

(1) Ambient Temperature

It is preferable not to expose the instrument to extreme temperatures or temperature fluctuations. If the instrument is exposed to radiation heat a thermal protection system and appropriate ventilation is recommended.

(2) Environmental Requirements

Do not allow the positioner to be installed in a location that is exposed to corrosive atmospheric conditions. When using the positioner in a corrosive environment, ensure the location is well ventilated. The unit and its wiring should be protected from exposure to rainwater.

(3) Impact and Vibration

It is recommended that the positioner is installed in a location that is subject to a minimum amount of impact and vibration.

1.5 Use of a Transceiver

Although the positioner is designed to resist influence from high frequency noise, use of a transceiver in the vicinity of installation may cause problems. Installing the transmitter in an area free from high frequency noise (RFI) is recommended.

1.6 Insulation Resistance Test and Withstand Voltage Test



(1) Overvoltage of the test voltage that is so small that it does not cause an dielectric breakdown may in fact deteriorate insulation and lower the safety performance; to prevent this it is recommended that the amount of testing be kept to a minimum.

(2) The voltage for the insulation resistance test must be 500V DC or lower, and the voltage for the withstand voltage test must be 500V AC or lower. Failure to heed these guidelines may cause faulty operation.

(3) Where a built-in arrester is provided (suffix code: /A), the voltage for the insulation resistance test must be 100V DC or lower, and the voltage for the withstand voltage test must be 100V AC or lower. Failure to heed these guidelines may cause faulty operation.

Follow the steps below to perform the test, the wiring of the communication line must be removed before initiating testing.

■ Insulation resistance test procedure

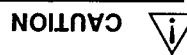
1. Lay transition wiring between the + terminal and the - terminal.
2. Connect the insulation resistance meter (with the power turned OFF) between the transition wiring of Step 1 above and ground terminal. The polarity of the input terminals must be positive and that of the ground must be negative.
3. Turn the power of the insulation resistance meter ON and measure the insulation resistance. The duration of the applied voltage must be the period during which 100 MΩ or more is confirmed (or 20 MΩ if the unit is equipped with a built-in arrester).
4. Upon completion of the test, remove the insulation resistance meter, connect a 100 kΩ resistor between the transition wiring, and allow the electricity to discharge. Do not touch the terminal with your bare hands while the electricity is discharging for more than one second.

■ Withstand voltage test procedure

Testing between the input terminals and the grounding terminal

1. Lay the transition wiring between the + terminal and the - terminal, and connect the withstand voltage tester (with the power turned OFF) between the transition wiring and the grounding terminal.
2. Connect the grounding side of the withstand voltage tester to the grounding terminal.
3. After setting the current limit value of the withstand voltage tester to 10 mA, turn the power ON, and gradually increase the impressed voltage from 0 V to the specified value.
4. The voltage at the specified value must remain for a duration of one minute.
5. Upon completion of the test, carefully reduce the voltage so that no voltage surge occurs.

1.7 Notes for Safety



When air is supplied to a valve, do not touch the moving part (a stem of the valve), as it may suddenly move.



- While A/M selection switch is set to manual side (M), the pressure set in the regulator for air supply will be directly output. Before changing the mode from auto to manual, check and confirm thoroughly that there will be no effect which may cause a danger in process or personal injury by changing the mode.
- As soon as the manual operation is finished, make it sure to change the mode to auto by moving the A/M selection switch to Auto(A) side.

1.8 EMC Conformity Standards

EN61326, AS/NZS2064

1.9 Installation of Explosion Protected Type



CAUTION

To preserve the safety of explosionproof equipment requires great care during mounting, wiring and piping. Safety requirements also place restrictions on maintenance and repair activities. Please read the following section very carefully.

1.9.1 FM Explosionproof Type

Caution for FM explosionproof type.

Note 1. Model YPK110 fieldbus-to-pneumatic converter with optional code /FF1 are applicable for use in hazardous locations.

- Explosionproof for Class I, Division 1, Groups A, B, C and D
- Dust-ignitionproof for Class II/III, Division 1, Groups E, F and G
- Enclosure Rating: NEMA 4X
- Temperature Class: T6
- Ambient Temperature: -40 to 80°C

Note 2. Wiring

- All wiring shall comply with National Electrical Code ANSI/NEPA70 and Local Electrical Codes.
- "FACTORY SEALED, CONDUIT SEAL NOT REQUIRED."

Note 3. Operation

- Note a warning label worded as follows:
WARNING: OPEN CIRCUIT BEFORE REMOVING COVER.
- Take care not to generate mechanical spark when accessing to the instrument and peripheral devices in hazardous locations.

Note 4. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Yokogawa Electric Corporation is prohibited and will void the approval of Factory Mutual Research Corporation.

1.9.2 FM Nonincendive approval

Model YPK110 fieldbus-to-newmatic converter with optional code /FN15.

- Nonincendive Approval
Class I, Division 2, Groups A, B, C and D
Class II, Division 2, Groups F and G

Class III, Division 1 and
Class I, Zone 2, Group IIC in Hazardous (Classified) Locations.

Temperature Class: T4

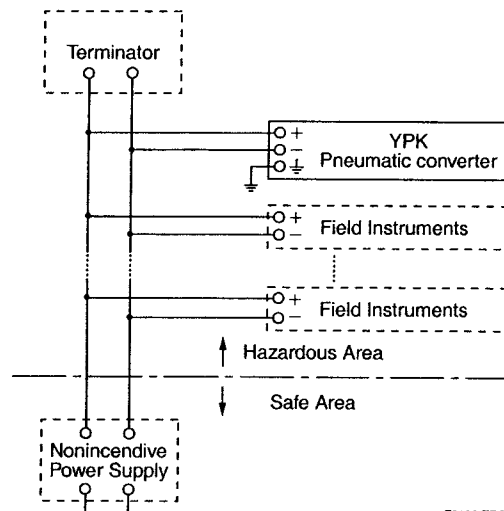
Ambient Temperature: -40 to 60°C

Ambient Humidity: 0 to 100%R.H. (No condensation)
Enclosure: NEMA Type4X

- Electrical Parameters:
Vmax = 32 Vdc
Ci = 1.76 nF
Li = 0 μH
- Caution for FM Nonincendive type. (Following contents refer to "DOC. No. NFM010-A12 p.1 and p.2")

■ NFM011-A12

Installation Diagram:



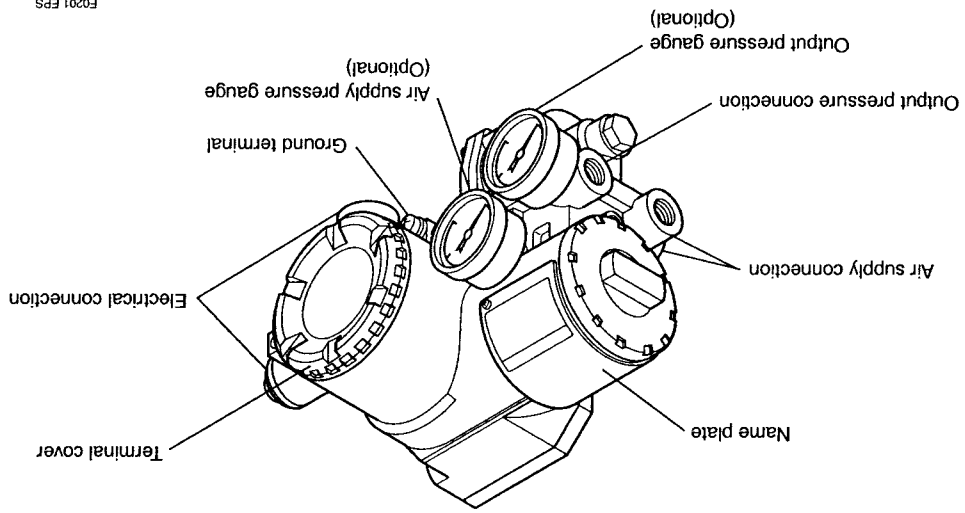
F0102 EPS

Note:

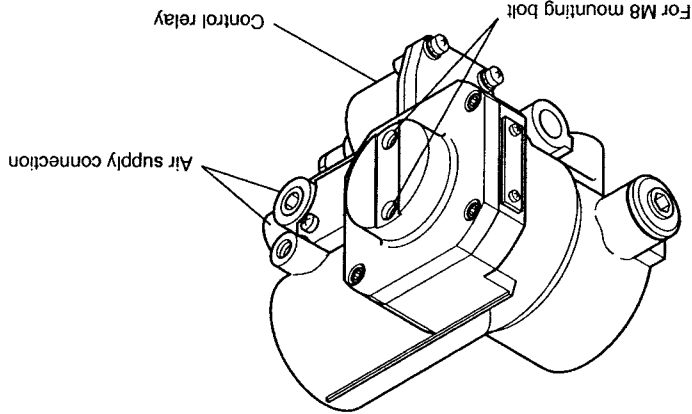
- 1: Dust-tight conduit seal must be used when installed in Class II and Class III environments.
- 2: Installation should be in accordance with National Electrical Code (ANSI/NFPA 70) Sections 504, 505 and Local Electrical Code.
- 3: The configuration of Associated Apparatus must be Factory Mutual Research Approved.
- 4: Associated Apparatus manufacturer's installation drawing must be followed when installing this equipment.
- 5: No revision to drawing without prior Factory Mutual Research Approval.
- 6: Terminator and supply unit must be FM approved.
- 7: Installation requirements;
Vmax ≥ Voc or Vt
Ca ≥ Ci + Ccable
La ≥ Li + Lcable

2. PART NAMES

2.1 Appearance and Part Names

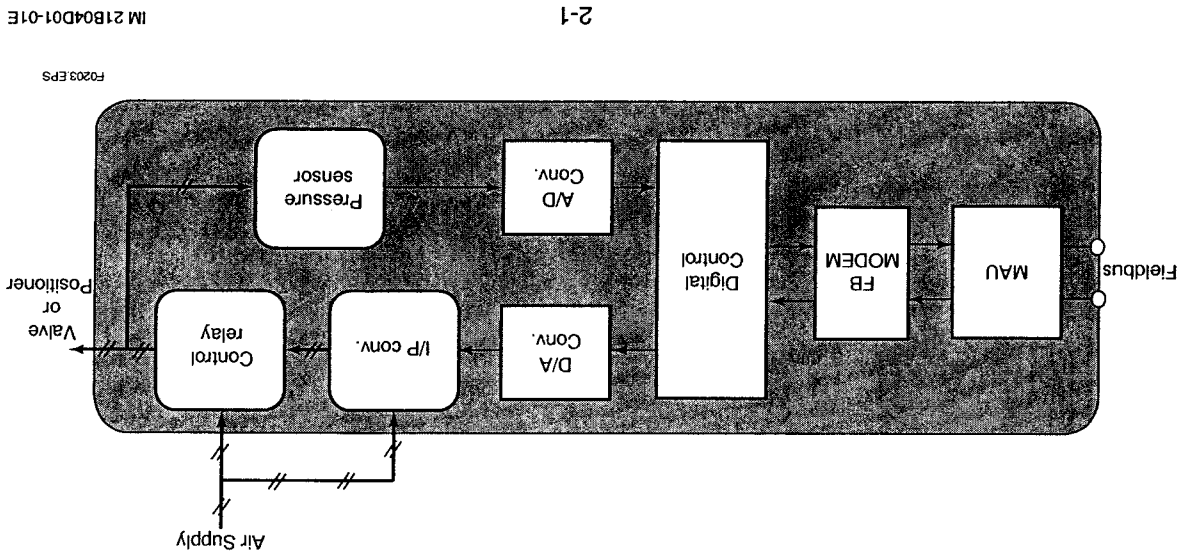


F0201 EPS



F0202 EPS

2.2 Block Diagram



F0203 EPS

3. INSTALLATION

3.1 Overview

When installing the YPK110 fieldbus-to-newmatic converter, see section 1.4 “Choosing the Installation Location.” For the ambient environmental conditions of an installation place, see Chapter 7 “Standard Specifications.”

3.2 Installation

YPK110 can be installed on a pipe using a mounting bracket provided or directly installed on the wall. Select either method, taking into account the installation space and service method.

3.2.1 Pipe Mounting

When this instrument is mounted on a pipe, use the mounting bracket and U-bolt provided. The pipe dia. available is 50mm (2-INCH) and the instrument can be installed on either a horizontal or vertical pipe.

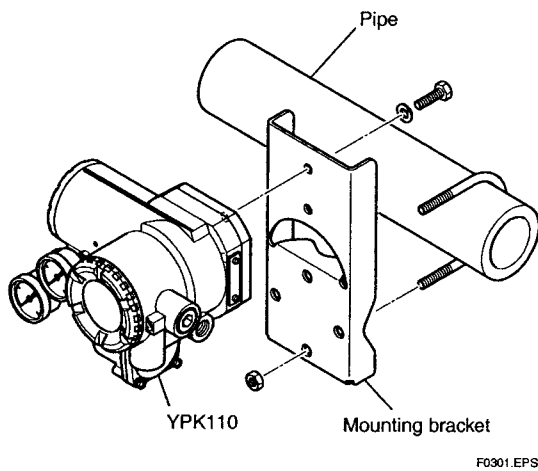


Figure 3.1 Pipe Mounting

3.2.2 Wall Mounting

When the instrument is installed on the wall, use the two M8 screws provided.

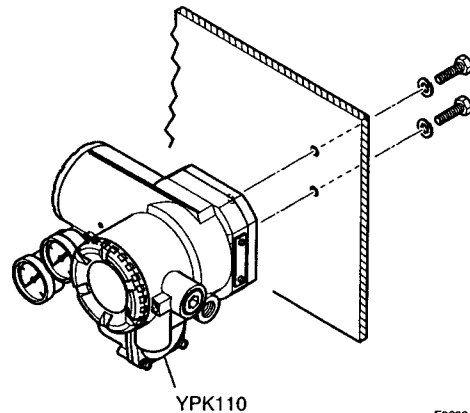


Figure 3.2 Wall Mounting

4. WIRING AND PIPING

4.1 General

This chapter describes the air piping and electric wiring connections.



WARNING

- Be sure to cut off all inputs to the valve actuator and other accessories of the valve and actuator, including the air supply and electric signal before making or modifying the piping and wiring connections.
- The process must be shut down or the control valve isolated from the process by using bypass valves or the like when making or modifying the piping and wiring connections.
- Always cap the unused wiring ports with blind plugs.

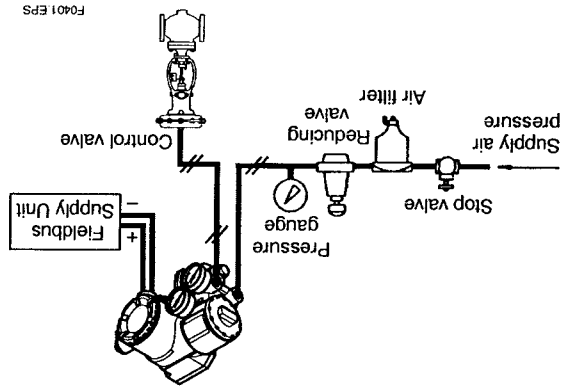


Figure 4.1 Example for general-use wiring and piping

4.2 Piping

4.2.1 Air Supply

For stable operation of the YPK110 over a long term, a clean and dry supply of air needs to be maintained. Therefore, be careful about the following:

- (1) To prevent moisture, oil, and dust from being led into the YPK110 through pipes, give careful consideration to the choice of the air supply system and supply air suction point as well as installation of the air supply header and air supply piping.
- (2) The desired supply air must:
 - Be dry air whose dew point is at least 10°C lower than that of the ambient temperature.
 - Be free from solid particles as a result of being passed through a 5-µm or finer filter.
 - Not contain oil at a concentration higher than 1 ppm in weight or volume.
 - Not be contaminated by a corrosive, explosive, flammable, or toxic gas.

- Comply with ANSI/ISA-57.3 1975 (R1981) or ISA-S7.3-1975 (R1981).

- (3) The YPK110 requires an air supply of following table.

Table 4.1

Unit	Standard output	Doubled output
Pa	130 to 150 KPa	230 to 260 KPa
bar	1.3 to 1.5 bar	2.3 to 2.6 bar
psi	19 to 22 psi	34 to 37 psi

T0401 EPS



WARNING

Do not supply air at a pressure exceeding 400 kPa. Doing so may result in a high risk of damage to the equipment or lead to an accident.

4.2.2 Pneumatic Piping

Connect the air supply pipe to the SUP port of the YPK110, and the output pressure pipe to the OUT port. Use O.D. 6-mm/I.D. 4-mm or O.D. 8-mm/I.D. 6-mm copper tubes for piping, and pneumatic pipe fittings for joints. After finishing the piping, check that there is no leakage from the joints.

Note that a YPK110 has two air supply ports (SUP): one at the rear and the other on the side. When delivered, the rear SUP port is capped with a blind plug. Thus, to use the rear SUP port, remove the blind plug and cap the side SUP port with it. At this time, be very careful that no foreign matter or dust caught in the sealing tape is allowed to enter inside the pipe.

Figure 4.2 shows the pneumatic piping ports. The port specification can be chosen when ordering the YPK110.

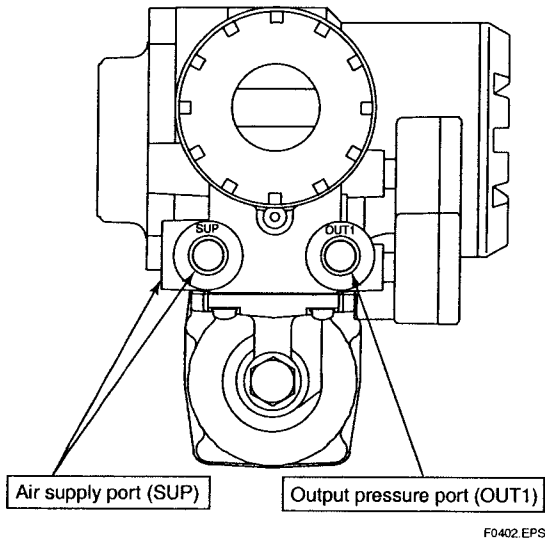


Figure 4.2 Pneumatic Piping Ports

CAUTION

- To obtain the maximum air processing flow rate of the YPK110, the inner diameter of the piping tube needs to be at least 6 mm. When the YPK110 is combined with a high-capacity actuator and a minimum response speed is required, use a tube whose inner diameter is 6 mm or larger.
- Do not use an unnecessarily long tube or piping as it will decrease the air flow rate, thus leading to a decrease in response speed.
- Perform sufficient flushing of the piping tubes and fittings before use to ensure that no foreign matter such as metal refuse may enter the piping.
- When performing the piping connection, be sufficiently careful that a piece of sealing tape or other solid or fluid sealing material does not enter the piping.

4.3 A/M Switching

To perform manual operation of the valve using the A/M (automatic/manual) mode switching mechanism of the YPK110, there needs to be a pressure regulator for the air supply. To perform manual operation, follow the procedure below.

- (1) Turn the A/M selector switch clockwise to change the switch position to M until it stops.
- (2) In manual mode, you can vary the pneumatic pressure output by changing the regulator output pressure regardless of the input signal of the YPK110. For a YPK110 equipped with pressure gauges, you can read the output pressure.
- (3) After you have finished manual operation, turn the A/M selector switch counterclockwise until the stopper pin touches the side of the YPK110's casing in order to ensure the switch position changes to A.

WARNING

- Changing the A/M selector switch position to M (manual) causes air at the pressure setting of the pressure regulator for air supply to be output regardless of the input signal. Therefore, prior to switching to manual mode, make sure that doing so will neither cause an injury nor affect the process.
- If the pressure larger than the allowable range of pressure gauge is applied, the pressure gauge may possibly be damaged.

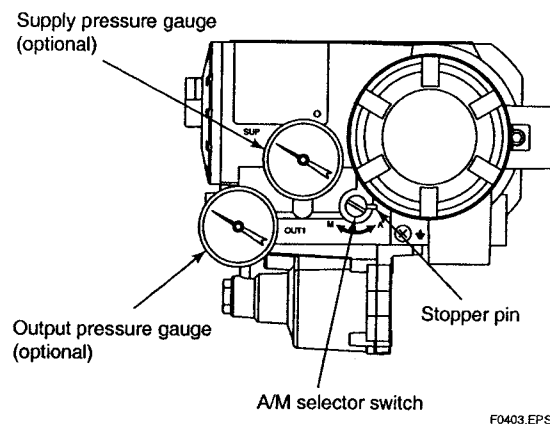


Figure 4.3 A/M Selector Switch

4.4 Wiring

CAUTION

For the intrinsically safe equipment, nonincendive and flameproof equipment, including peripherals are strictly restricted. Users absolutely must wired in accordance with specific requirements (and, in certain countries, legal regulation) in order to preserve the effectiveness of their explosionprotected features.

4.4.1 Recommended Cables

For wiring for a YPK110, use a cable for HI fieldbus segments specified by the Fieldbus FOUNDATION™. A shielded cable is recommended. For the details of cables required for HI fieldbus segments, see "Fieldbus Technical Information" (TI 38K3A01-01).

Choose cables suitable for the respective ambient temperature ranges, especially when they are to be laid in a hot or cold place.

When laying cables in or through a place where the atmosphere may include a toxic gas or liquid, or oil or solvent, choose wires and cables made of materials that have sufficient durability.

4.4.2 Precautions on Wiring

IMPORTANT

- Prevent the cables from being affected by noise induced from a high-capacity transformer or power supply to a motor.
- As shown in Figure 4.4, remove the terminal box cover and dust proofing plug when performing a wiring connection. Be sure to securely seal the unused wiring port with a blind plug.
- To make the cables watertight and to prevent them from being damaged, it is recommended to use a cable conduit and duct. Also for the same reasons, be sure to use a watertight adapter for the connection of the conduit to the port.

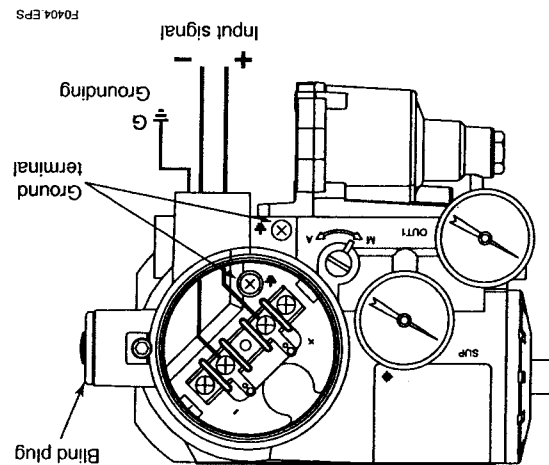


Figure 4.4 Wiring

(1) General-use Type and Nonincendive Type

- Make cable wiring using metallic conduit or water-proof glands.-
- Apply a non-hardening sealant to the terminal box connection port and to the threads on the flexible metal conduit for waterproofing.

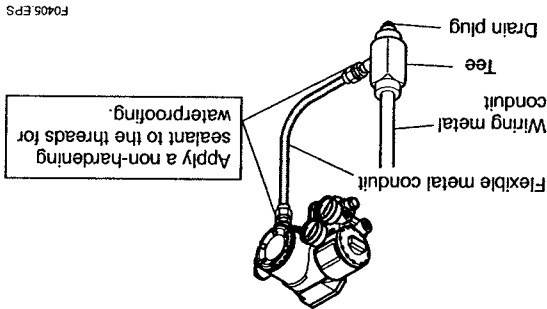
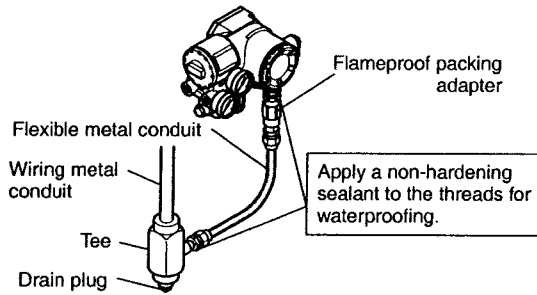


Figure 4.5 Typical Wiring Using Flexible Metal Conduit

(2) Flameproof Type

Wire cables through a flameproof packing adapter, or using a flameproof metal conduit.

- Wiring cable through flameproof packing adapter (see Figure 4.6).
 - Apply a nonhardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing.

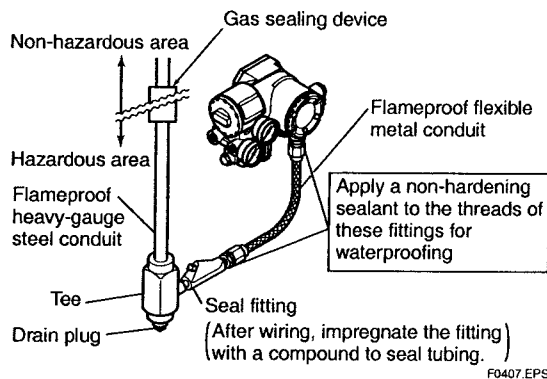


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Figure 4.6 Typical Cable Wiring Using Flameproof Packing Adapter

- Flameproof metal conduit wiring

- A seal fitting must be installed near the terminal box connection port for a sealed construction.
- Apply a non-hardening sealant to the threads of the terminal box connection port, flexible metal conduit and seal fitting for waterproofing.



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Figure 4.7 Typical Wiring Using Flameproof Metal Conduit

4.5 Grounding

Grounding is always required for the proper operation of transmitters. Follow the domestic electrical requirements as regulated in each country.

Ground terminals are located on the inside and outside of the terminal box. Either of these terminals may be used. See Figure 4.4.

⚠ WARNING

For flameproof type and Nonincendive type, grounding should be required.

5. SETUP

5.2 Setting Output Range

First, set the target mode's in the parameters `MODE_BLK` of the transducer block and `AO` function block to `O/S` (Out of Service). When either one or both of the transducer block and `AO` function block in the transducer block's parameters that determine the output air pressure are write-locked.

According to the input pressure range of the pneumatic positioner (pneumatic-to-pneumatic positioner) or valve to be used, set `PRESSURE_LO` and `PRESSURE_HI`.

In `PRESSURE_LO`, which is the output pressure value when `FINAL_VALUE.value` is 0%, set a value within -10% to +10% of its rated span. Likewise in `PRESSURE_HI`, which is the output pressure value when `FINAL_VALUE.value` is 100%, set a value within +0% to +25% of its rated span plus the `PRESSURE_LO` value set above. Table 5.1 shows the setting ranges of `PRESSURE_LO` and `PRESSURE_HI`.

Setting values exceeding the limits of their respective ranges shown in this table are excluded from the scope of guarantee for accuracy and performance provided in the product specifications. In addition, the converter indicates a warning message in `XD_ERROR`. This warning message can be prevented from displaying using `MASK_XD_ERROR`. See Chapter 12 "TRANS-DUCER BLOCK", for more information.

Table 5.1

Rated Output Pressure Values Point Setting [PRESSURE_LO]	Range of 0% Values [PRESSURE_HI]	
	Range of 100% Point Setting Values	Range of 0% Point Setting Values
20 to 100 kPa	12 to 28	(80 to 100) + <code>PRESSURE_LO</code>
40 to 200 kPa	24 to 56	(160 to 200) + <code>PRESSURE_LO</code>
3 to 15 psi	1.8 to 4.2	(12 to 15) + <code>PRESSURE_LO</code>
6 to 30 psi	3.6 to 8.4	(24 to 30) + <code>PRESSURE_LO</code>
0.2 to 1.0 bar	0.12 to 0.28	(0.8 to 1.0) + <code>PRESSURE_LO</code>
0.4 to 2.0 bar	0.24 to 0.56	(1.6 to 2.0) + <code>PRESSURE_LO</code>

Note that the upper and lower limits of these `PRESSURE_LO` and `PRESSURE_HI` setting ranges can only be entered when they satisfy the following conditions:

- 0 to supply pressure
- `PRESSURE_LO` > `PRESSURE_HI`

CAUTION

During the setup especially when calibration is being executed, the output air pressure may happen to move suddenly to an unexpected direction. Before starting the setup, check and confirm that the output air pressure is not affect to the plant operation.

5.1 General

After finishing the wiring and piping to `YPK110`, connect the `YPK110` to a fieldbus and make settings, such as carrying out output range, low cut and so on, using a parameter setting tool or the like.

IMPORTANT

For the operation of a parameter setting tool, read the manual of each tool. Also, read the Chapters 8 through 10 and 12 of this manual to become familiar with the configuration of the fieldbus instrument and the function of the transducer block before starting adjustment.

Check that the piping and wiring connections are all correct, and then supply the specified input voltage and air pressure. For the connection to the fieldbus, see the chapters 4.4 'Wiring' and 8.4 'System Configuration'.

Parameter settings for the actuator and valve are to be made in the parameters in the transducer block inside the `YPK110`. For details of each parameter, refer to the parameters list in Appendix 1. Follow the procedure below.

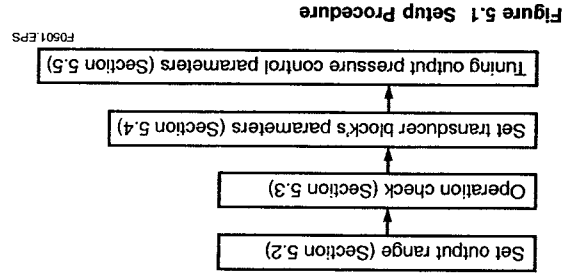


Figure 5.1 Setup Procedure

**IMPORTANT**

For the transducer block, the 0% output always means complete low pressure. Nonetheless, the 0-100% of the transducer block's output can be logically reversed by setting IO_OPTS in the AO block to "Increase to close."

Independently of the above setting, YPK110 always acts identical upon power off and cut-off of the air supply.

When a power failure or serious hardware damage is detected, the YPK110 cuts the current signal being fed to the I/P module to zero, changing the output pressure to min. side. The action of the YPK110 upon occurrence of a communication error can be predefined by AO block's parameters; see Section 13.3.1, "Fault State."

5.3 Operation Check

After setting the output range, rewrite FINAL_VALUE.value to check step responses. Also check that the converter outputs correct pressure across the 0-100% range.

Note that the converter enables the user to precisely adjust the 0%, 50% and 100% point output pneumatic pressure values using the user calibration function. This function is not needed during normal operation but can be executed using a high-precision pressure-measuring instrument. See Section 12.4 "User Calibration", for more information.

**CAUTION**

Only when the target mode's in MODE_BLK parameters in both the AO and transducer blocks are O/S, can FINAL_VALUE.value be written.

5.4 Setting Parameters of Transducer Block

Set the following parameters as necessary. For the settings made as default when shipped, see the parameter lists in Appendix 1.

(1) Low-cutoff and High-cutoff Function

The Low-cutoff function is an action to decrease the output pressure to a level much lower than the 0% pressure level when FINAL_VALUE.value is less than FINAL_VALUE_CUTOFF_LO. Conversely, the High-cutoff function is an action to increase the output pressure to a level much higher than the 100% pressure level when FINAL_VALUE.value is larger than FINAL_VALUE_CUTOFF_HI.

A hysteresis of 1% is applied to the thresholds, FINAL_VALUE_CUTOFF_LO and FINAL_VALUE_CUTOFF_HI.

(2) Final-value Limits

Eu_100 and Eu_0 in the parameter FINAL_VALUE_RANGE define the upper and lower limits of FINAL_VALUE.value of the transducer block.

**CAUTION**

Even if the range of FINAL_VALUE.value is limited by FINAL_VALUE_RANGE, output pressure is set to outside the FINAL_VALUE_RANGE setting when the Low-cutoff and High-cutoff action described above is activated.

(3) Output pressure Characteristic Type

The parameter OUTPUT_CHAR_TYPE defines the characteristics between output of AO block and output pressure and is set to linear by default.

Write the appropriate value:

- 1 = linear
- 2 = equal percent (50:1)
- 3 = equal percent (30:1)
- 4 = quick open (reversal of equal % - 50:1)
- 255 = user-defined

Writing the value 255 allows you to define the desired characteristics by 10 line segments for evenly divided input levels. The coordinates (0,0) and (100,100) are fixed; set the values corresponding to OUT(Output of AO block) = 10%, 20%, 30%..., 80%, 90%. Note that a set value must be greater than the preceding set value; the output must increase as the input increases.



- To make a DI block read the on/off statuses of a limit switch, set CHANNEL of the DI block to:
- 2, for reading the on/off status of the upper limit switch.
 - 3, for reading the on/off status of the lower limit switch.

(5) Thresholds for Operation Result Integration Alarms

The YPK110 has a function to integrate the following operation result quantities individually:

- PRESS_VERTICAL_FEED_COUNT (incremented by 1 at each change in the direction of the action)
 - TOTAL_PRESS_VARIATION (incremented by pressure output variation in $\times 100\%$)
 - TOTAL_PRESS_OUT_TIME (incremented by time in hours when pressure output is in normal state.)
 - TOTAL_CUTOFF_LO_TIME (incremented by time in hours when pressure output is in Low cut-off state.)
- When these values exceed the respective thresholds below, corresponding alarms are output. Set the thresholds as necessary.

For other alarms and self-diagnostic functions, see Chapter 12 "Transducer Block".

5.5 Tuning Control Parameters

In the YPK110, the pneumatic control parameters are changed automatically, depending on the capacity of the pneumatic positioner or valve connected to the output pressure port and on the length of piping. The control parameters therefore need not be tuned in most cases. Tune the parameters as instructed below, however, if for example the load capacity significantly differs from the assumed condition and therefore excess overshoots are present or pneumatic control is oscillatory.

(If the problem still persists even after tuning, see Chapter 17 "TROUBLESHOOTING".)

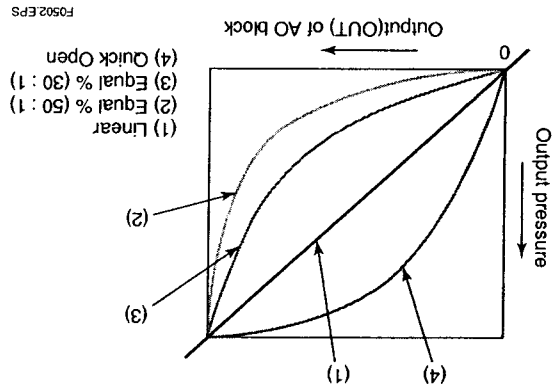
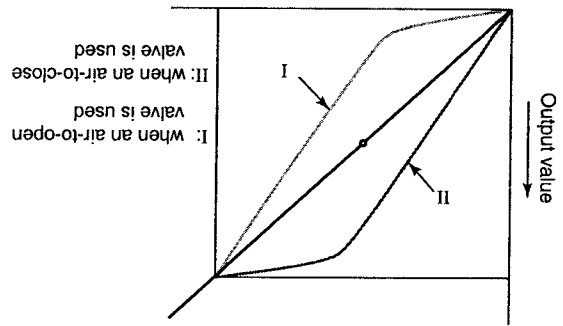


Figure 5.2 Output pressure Characteristics Type



Invert the output characteristics curve, depending on the setting of ACT_FAIL_ACTION which is the parameter for selecting the direction of valve action. The output characteristics curve is inverted symmetrically around the 50% point of the "linear" output characteristics graph. This direction of action is also true with cases where the "User define" option is set for the output characteristics. The following figure illustrates the relationship between the output characteristics and the direction of valve action.



(4) Thresholds for Limit Switches

Just like hardware limit switches for a valve, on/off status signals can be generated when the output pressure read-back signal FINAL_PRESSURE_VALUE reaches specified levels. These on/off statuses can be transferred to a DI function block.

Write the threshold for the upper limit switch to LIMSW_HI_LIM, and the threshold for the lower limit switch to LIMSW_LO_LIM.

A hysteresis of 1% is applied to the thresholds, LIMSW_HI_LIM and LIMSW_LO_LIM.

(1) Fixing the Control Parameters

Write a number into `SERVO_GAIN_SELECTION` according to the option numbers listed below. The rule-of-thumb capacity values including 3 m or shorter pipe lengths are 100 to 500 cc for “Small capacity”, 500 to 1000 cc for “Middle capacity”, and 1000 to 3000 cc for “Large capacity”.

- Automatic = 1
(automatic parameter set selection [default])
- Small capacity = 2
(parameter set for small-capacity valves)
- Middle capacity = 3
(parameter set for medium-capacity valves)
- Large capacity = 4
(parameter set for large-capacity valves)
- Pneumatic positioner = 5
(parameter set for pneumatic positioners)

Sorting the magnitudes of control gain by the option number results in “4 > 3 > 2 > 5.” For longer pipe lengths (3 m or greater, as a rule), decrease the gain of the parameter set one or two steps further. This strategy will provide better controllability.

After selecting `SERVO_GAIN_SELECTION`, determine the following control parameter set. See Section 5.3 “Operation Check” to verify step responses, stability, etc.

- `SERVO_ADV_GAIN` (proportional gain)
- `SERVO_ADV_RESET` (integral time)
- `SERVO_ADV_RATE` (derivative time)
- `SERVO_ADV_GAM1`
(reciprocal of derivative gain)
- `SERVO_ADV_TD2`
(derivative time of phase compensator)
- `SERVO_ADV_GAM2`
(reciprocal of derivative gain of phase compensator)

(2) Tuning the Control Parameters

Should adequate controllability or response characteristics fail to be obtained even if the control parameters have been configured as instructed in the previous step, increase or decrease the value of `SERVO_ADV_GAIN`. If the converter reacts with oscillatory responses, decrease the value in units of 20 to 30% as a rule. If the converter is too slow in response, increase the value in units of 20 to 30%. If the overshoot is intolerably large on the air intake side in particular, increase the value of `SERVO_ADV_RATE` in increments of approximately 0.1 (to a maximum of 0.6). This strategy may sometimes improve the response characteristics.

If the overshoot is intolerably large when a medium-capacity valve is used, increase the value of `SERVO_ADV_TD2` in increments of approximately 0.05 (to a maximum of 0.3). This strategy sometimes improves the response characteristics.

6. MAINTENANCE

6.1 General

The modular structure of the YPK110 increases the ease of maintenance work. This chapter describes cleaning and part replacement procedures that should be done for maintenance of the YPK110.

The YPK110 is a precision instrument; read the following carefully when carrying out maintenance. For calibrations, see Chapter 5.

6.2 Periodic Inspections

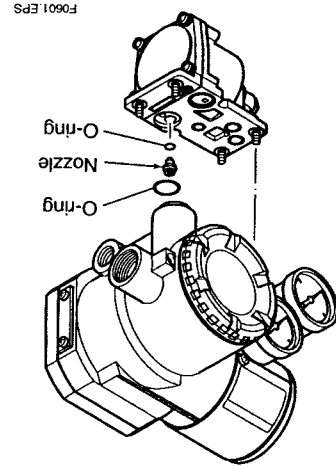
To maintain problem-free plant operation, periodic inspections are essential. At each periodic inspection, be especially careful when ensuring that:

- No external damage can be seen.
- No leakage from the YPK110 or the piping around it can be detected.
- No build up in the drain, or dust or oil adhering to the air supply line has occurred.

6.2.1 Cleaning the Fixed Nozzle

The fixed nozzle of the YPK110 is attached to the control relay's surface that engages the YPK110's main structure (see Figure 6.1). Detach the control relay from the main structure of YPK110 by following the instruction shown in 6.3.1. Thread a wire with a 0.25-mm diameter through the nozzle to clean it. After cleaning the nozzle, place the nozzle and O-ring at the original position and attach the control relay again. After attaching check that pressure output correctly according to chapter 5.3 "Operation Check".

Figure 6.1 Cleaning the Nozzle

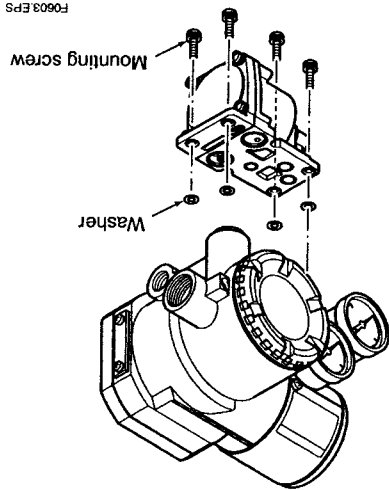


6.3 Part Replacement

6.3.1 Replacing the Control Relay Assembly

- (1) Decrease the air supply pressure to zero.
 - (2) Using a Phillips screwdriver, unscrew the four mounting screws on the bottom face.
 - (3) Pull the relay assembly downwards to detach it.
 - (4) To mount a new relay assembly, remove the mounting screws and washers from the old assembly and use them to mount the new assembly in place by tightening them from below.
- After attaching check that pressure output correctly according to chapter 5.3 "Operation Check".

Figure 6.2 Replacing the Control Relay Assembly



CAUTION

All the O-rings used for the sealing of pneumatic signal circuits are made of silicon rubber. The sealing capability is degraded if general silicon grease is applied. When applying grease to a sealing part, use a type of grease compatible with silicon rubber, such as fluoride grease and grease for silicon rubber.

6.3.2 Replacing the Screen Filters

When the screen filters installed deep in the air supply port and output pneumatic signal port become clogged, replace them with new filters using a tool with pointed tips such as a set of tweezers.

After attaching check that pressure output correctly according to chapter 5.3 “Operation Check”.

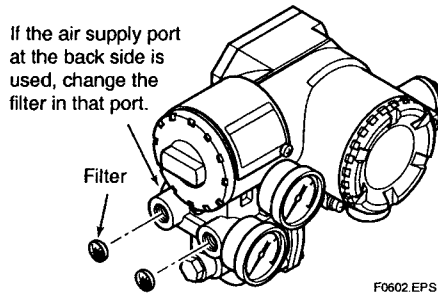


Figure 6.3 Replacing the Screen Filters

6.3.3 Replacing the Internal Air Filter

An air filter is provided at the opening to the internal pneumatic circuits. Follow the procedure below to replace it.

- (1) Decrease the air supply pressure to zero.
- (2) Remove the relay assembly (in reference with Section 6.3.1).
- (3) Remove the pneumatic circuit holding plate and gasket.
- (4) Remove the air filter and O-ring.
- (5) Set the new filter in place.
- (6) Perform steps (3), then (2) to restore the YPK110 to its original state.

After attaching check that pressure output correctly according to chapter 5.3 “Operation Check”.

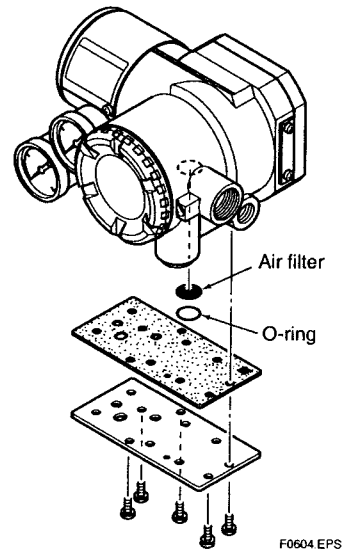


Figure 6.4 Replacing the Internal Air Filter

7. STANDARD SPECIFICATIONS

■ STANDARD SPECIFICATIONS

Functions:

Function blocks:

AO: One analog output

DI: Two discrete inputs

PID: One PID control function (optional)

OS: One output splitter

Output pressure characterization feature:

Linear

Equal percentage (50:1)

Equal percentage (30:1)

Quick opening

Customer characterization (10 segments)

Limit switch function:

Output pressure of high and low

Diagnostic function:

A/D converter error, pressure sensor failure,

temperature sensor failure, etc.

Operation result integrate function

Communication:

FOUNDATION Fieldbus

Supply Voltage:

9 to 32 V DC

Steady-state current:

16 mA DC typical (17 mA max.)

Software Download (optional):

Current during Flash ROM blanking time;

Max. 24 mA additional to steady-state current

Class I

Output signal, Supply Air and Pressure Gauge

Scale:

No gauge in standard. Pressure gauge can be selected as option.

Output signal	Output signal	Pressure gauge scale	Air supply pressure gauge	Air supply pressure gauge	Standard output
Pa	20 to 100kPa	0 to 200kPa	130 to 150kPa	0 to 200kPa	0 to 200kPa
bar	0.2 to 1.0bar	0 to 2.0bar	1.3 to 1.5bar	0 to 2.0bar	0 to 2.0bar
psi	3 to 15psi	0 to 30psi	19 to 22psi	0 to 30psi	0 to 30psi

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Class I, Division 1, Group A, B, C and D

FM Explosionproof Approval:

Class I, Zone 2, Group II C

Class III, Division I

Class II, Division 2, Group A, B, C, D, F & G

FM Nonincendive:

Complies with NEMA type 4X and IEC IP65

Waterproof and Dust proof Construction:

-40 to 85°C (-40 to 185°F)

Storage Temperature Limits:

-40 to 80°C (-40 to 176°F) (Explosion proof model)

-40 to 60°C (-40 to 140°F) (FM Nonincendive)

-40 to 85°C (-40 to 185°F) (Standard model)

Ambient Temperature Limits:

air supply pressure

Max. 110 NI/min. or 6.6 Nm³/hr at 140 kPa (20 psi)

Output Air Capacity:

air supply pressure

Max. 5.4 NI/min. or 0.32 Nm³/hr at 140 kPa (20 psi)

Air Consumption:

of supply pressure

The maximum output pressure will be up to 90%

Adjustable range; 100 to 125% of span

Span Adjustment:

Adjustable range; ±10% of span

Zero Adjustment:

pressure regulator

output signal varied by adjusting the external supply

Mounted on front of housing, in manual mode,

Auto/Manual(A/M) Transfer Switch:

supply pressure

The maximum output pressure will be up to 90% of

Output signal	Output signal	Pressure gauge scale	Air supply pressure gauge	Air supply pressure gauge	Doubled output
Pa	40 to 200kPa	0 to 400kPa	230 to 260kPa	0 to 400kPa	0 to 400kPa
bar	0.4 to 2.0bar	0 to 4.0bar	2.3 to 2.6bar	0 to 4.0bar	0 to 4.0bar
psi	6 to 30psi	0 to 60psi	34 to 37psi	0 to 60psi	0 to 60psi

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■ PERFORMANCE SPECIFICATIONS

Linearity:

±0.2% of Span

Hysteresis:

0.2% of Span

Repeatability:

0.1% of Span

■ PHYSICAL SPECIFICATIONS

Housing and Cover Material:

Cast aluminum alloy, finished with polyurethane paint.

Deep-sea moss-green (Munsell 0.6GY3.1/2.0)

Pressure Gauge Case: (Optional)

Stainless steel JIS SUS 304

Supply Air, Output Signal, Output Gauge Connections:

1/4 NPT female or Rc 1/4

Electrical Connection:

1/2 NPT female or G1/2, M20

Mounting:

Surface or 2-inch pipe.

Weight:

2.4 kg (5.3 lb) without gauge

2.5 kg (5.5 lb) with gauge

7. STANDARD SPECIFICATIONS

■ MODEL AND SUFFIX CODES

Model	Suffix codes	Description
YPK110		Foundation Fieldbus-to-Pneumatic Converter
Input signal	-F	Foundation Fieldbus
Output signal	1	Output signal: 20 to 100 kPa, (Gauge scale: 0 to 200 kPa ³)
	2	Output signal: 40 to 200 kPa, (Gauge scale: 0 to 400 kPa ³)
	5	Output signal: 0.2 to 1.0 bar, (Gauge scale: 0 to 2 bar ³)
	6	Output signal: 0.4 to 2.0 bar, (Gauge scale: 0 to 4 bar ³)
	7	Output signal: 3 to 15 psi, (Gauge scale: 0 to 30 psi ³)
	8	Output signal: 6 to 30 psi, (Gauge scale: 0 to 60 psi ³)
Connections	1	Air connection: Rc 1/4 female, Electric connection: G 1/2 female
	2	Air connection: 1/4 NPT female, Electric connection: 1/2 NPT female
	6	Air connection: Rc 1/4 female, Electric connection: M20 female
Option codes	N	Always N
	<input type="checkbox"/>	Optional specification

*1: Applicable for Output signal 1, 2, 5 and 6.

*2: Applicable for Output signal 5, 6, 7 and 8.

*3: No gauge in standard. Pressure gauge can be selected as option.

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■ OPTIONAL SPECIFICATIONS

Item	Description	Code
Lightning protection	Power supply 9 to 32V DC Allowable current Max. 6000 A (1x 40 μs), repeating 1000 A (1x 40 μs), 100 times	A
Painting	Epoxy resin coating	X1
PID Function	PID control function	LC1
With pressure gauge	Scale unit: Pa ¹	GP
	Scale unit: bar ²	GB
	Scale unit: psi ³	GE
Explosionproof type	FM Explosionproof Approval	FF1
	FM Nonincendive Approval	FN15
Software download	Software download for FOUNDATION Fieldbus Download class: Class 1	EE

*1: Applicable for Output signal 1 and 2.

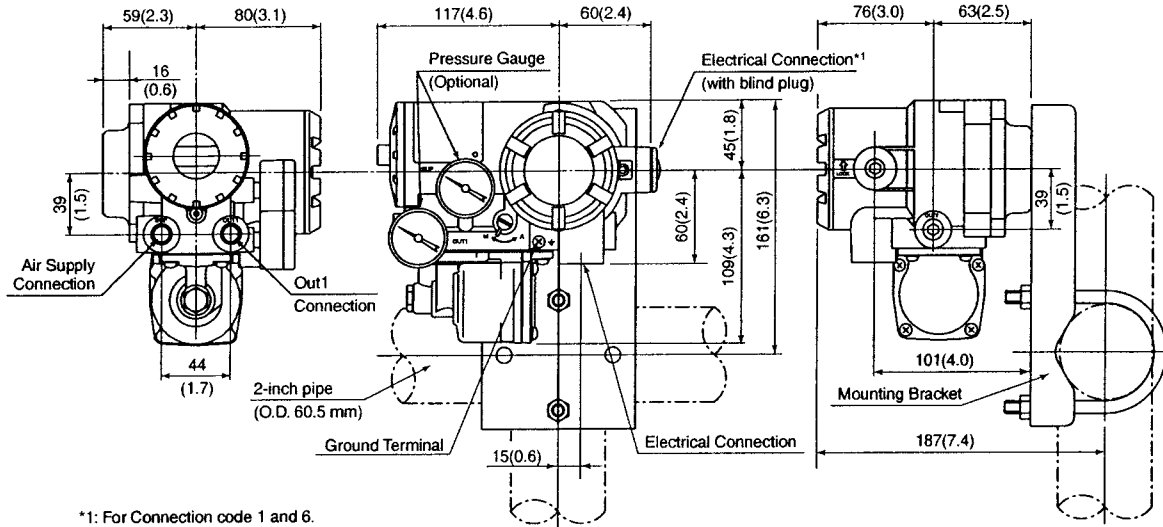
*2: Applicable for Output signal 5 and 6.

*3: Applicable for Output signal 7 and 8.

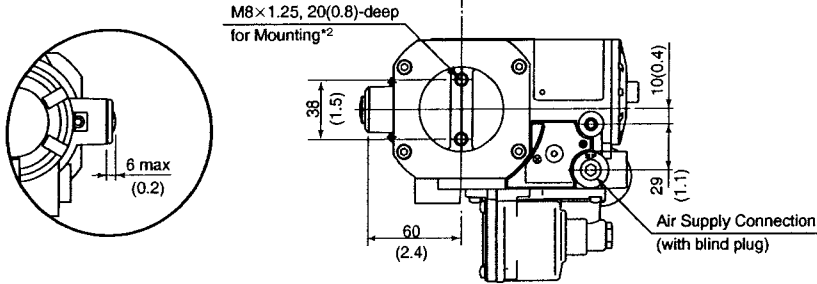
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■ DIMENSIONS

Unit: mm (approx. inch)



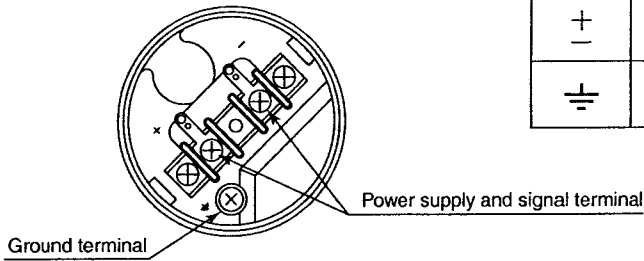
*1: For Connection code 1 and 6.



*2: Attached with 2 mounting bolts (M8, 25 mm) and spring washers (applicable 3 to 6 mm thick brackets).

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● Terminal Configuration



● Terminal Wiring

+	Power supply and signal terminal
-	
⊥	Ground terminal

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8. ABOUT FIELDBUS

8.1 Outline

Fieldbus is a bi-directional digital communication protocol for field devices, which offers an advancement in implementation technologies for process control systems and is widely employed by numerous field devices.

YPK110 employs the specification standardized by The Fieldbus Foundation, and provides interoperability between Yokogawa devices and those produced by other manufacturers. Fieldbus comes with software consisting of AO function block, two DI function blocks and optional PID function block, providing the means to implement a flexible instrumentation system. For information on other features, engineering, design, construction work, startup and maintenance of Fieldbus, refer to "Fieldbus Technical Information" (TI 38K3A01-01E).

8.2 Internal Structure of YPK110

The YPK110 contains two virtual field devices (VFD) that share the following functions.

8.2.1 System/network Management VFD

- Sets node addresses and Physical Device tags (PD Tag) necessary for communication.
- Controls the execution of function blocks.
- Manages operation parameters and communication resources (Virtual Communication Relationship: VCR).

8.2.2 Function Block VFD

- (1) Resource block
 - Manages the information common to each FB VFD in YPK110.
- (2) Transducer block
 - Located between Hardware I/O(actuator, sensor) and AO/DI function blocks, pass the control signal from AO function block to I/P module to control the valve position.
- (3) AO function block
 - Accepts a control signal from an upstream block and pass the signal to Transducer block.

8.3 Logical Structure of Each Block

- Accept a valve position signal from Transducer block and feedback it to an upstream block.
- (4) DI function block
 - Receives the discrete signal from Transducer block and output them.
- (5) PID function block(optional)
 - Offers PID control function.

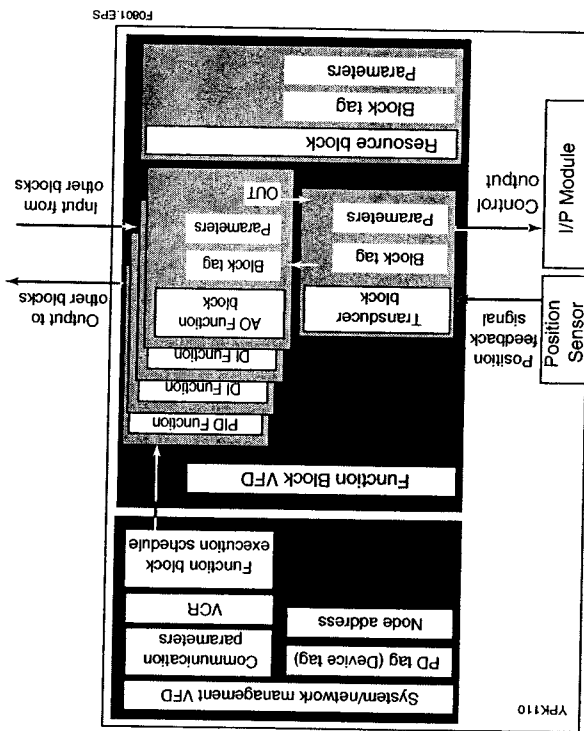


Figure 8.1 Logical Structure of Each Block

Setting of various parameters, node addresses, and PD Tags shown in Figure 8.1 is required before starting operation.

8.4 System Configuration

The following instruments are required for use with Fieldbus devices:

- **Power supply:**

Fieldbus requires a dedicated power supply. It is recommended that current capacity be well over the total value of the maximum current consumed by all devices (including the host). Conventional DC current cannot be used as is.

- **Terminator:**

Fieldbus requires two terminators. Refer to the supplier for details of terminators that are attached to the host.

- **Field devices:**

Connect the field devices necessary for instrumentation. YPK110 has passed the interoperability test conducted by The Fieldbus Foundation. In order to properly start Fieldbus, it is recommended that the devices used satisfy the requirements of the above test.

- **Host:**

Used for accessing field devices. A dedicated host (such as DCS) is used for an instrumentation line while dedicated communication tools are used for experimental purposes.

- **Cable:**

Used for connecting devices. Refer to “Fieldbus Technical Information” (TI 38K3A01-01E) for details of instrumentation cabling. Provide a cable sufficiently long to connect all devices. For field branch cabling, use terminal boards or a connection box as required. If the total length of the cable is in a range of 2 to 3 meters for laboratory or other experimental use, the following simplified cable (a twisted pair wire with a cross section of 0.9 mm² or more (AWG #18) and cycle period of within 5 cm (2 inches) may be used. Termination processing depends on the type of device being deployed. For YPK110, use an M4 screw terminal claw. Some hosts require a connector.

Refer to Yokogawa when making arrangements to purchase the recommended equipment.

8.4.1 Connection of Devices

The number of devices that can be connected to a single bus and the cable length vary depending on system design. When constructing systems, both the basic and overall design must be carefully considered to allow device performance to be fully exhibited.

Connect the devices as shown in Figure 9.1. Connect the terminators at both ends of the trunk, with a minimum length of the spur laid for connection.

The polarity of signal and power must be maintained.

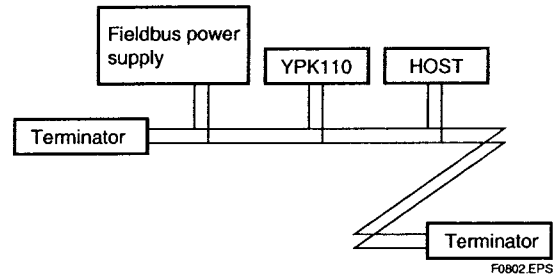


Figure 8.2 Cabling

Before using a Fieldbus configuration tool other than the existing host, confirm it does not affect the loop functionality in which all devices are already installed in operation. Disconnect the relevant control loop from the bus if necessary.

8.5 Integration of DD

If the host supports DD (Device Description), the DD of the YPK110 needs to be installed. Check if host has the following directory under its default DD directory.

594543/000A

(594543 is the manufacturer number of Yokogawa Electric Corporation, and 000A is the YPK110 device number, respectively.)

If this directory is not found, DD of YPK110 has not been included. Create the above directory and copy the DD file (0m0n.ffo,0m0n.sym) (m, n is a numeral) into the directory.

Once the DD is installed in the directory, the name and attribute of all parameters of the YPK110 are displayed.

Off-line configuration is allowed by using the capability file (CFF). If you do not have the DD or capability file for the YPK110, you can download it from following address.

www.yokogawa.com/fi/fieldbus/download.htm



IMPORTANT

For offline configuration, use the CFF which matches the specification of the instrument to be configured. For YPK110, there are two types of CFF file; one for standard type instruments and the other for the instruments with /LC1 option in which PID function block is available. Using unmatched CFF will cause an error upon downloads, etc.

9. CONFIGURATION

This chapter contains information on how to adapt the function and performance of the YPK110 to suit specific applications. Because two or more devices are connected to Fieldbus, settings including the requirements of all devices need to be determined. Practically, the following steps must be taken.

- (1) **Network design**
Determines the devices to be connected to Fieldbus and checks the capacity of the power supply.

- (2) **Network definition**
Determines the tag and node addresses for all devices.

- (3) **Definition of combining function blocks**
Determines the method for combination between each function block.

- (4) **Setting tags and addresses**
Sets the PD Tag and node addresses one by one for each device.

- (5) **Communication setting**
Sets the link between communication parameters and function blocks.

- (6) **Block setting**
Sets the parameters for function blocks.

The following section describes each step of the procedure in the order given. Using a dedicated configuration tool allows the procedure to be significantly simplified. This section describes the procedure to be assigned for a host which has relatively simple functions. For operation of the host, refer to the instruction manual for each host. No details of the host are explained in the rest of this material.



Connecting a Fieldbus configuration tool to a loop with its existing host may cause communication data scrambles resulting in a functional disorder or a system failure.

Do not turn off the power immediately after setting. If the power is turned off within 60 seconds after setting is made, the modified parameters are not saved and the settings return to the original values.



9.1 Network Design

Select the devices to be connected to the Fieldbus network. (Refer to 8.4 'System Configuration' for selection of the devices.)

First, check the capacity of the power supply. The power supply capacity must be greater than the sum of the maximum current consumed by all devices to be connected to Fieldbus. The maximum current consumed (power supply voltage 9 V to 32 V) for YPK110 is 17 mA. The cable must have the spur in a minimum length with terminators installed at both ends of the trunk.

9.2 Network Definition

Before connection of devices with Fieldbus, define the Fieldbus network. Allocate PD Tag and node addresses to all devices (excluding such passive devices as terminators).

The PD Tag is the same as the conventional one used for the device. Up to 32 alphanumeric characters may be used for definition. Use a hyphen as a delimiter as required.

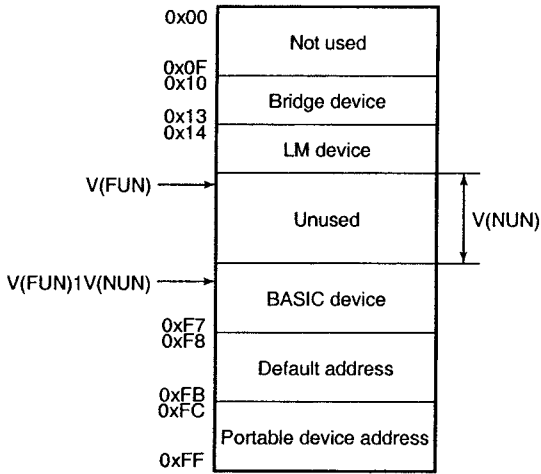
The node address is used to specify devices for communication purposes. Because data is too long for a PD Tag, the host uses the node address in place of the PD Tag for communication. A range of 20 to 247 (or hexadecimal 0x14 to 0xF7) can be set. Generally, the device (LM device) with bus control function (Link Master function) is allocated from a smaller address number (20) side, and other devices (BASIC device) without bus control function allocated from a larger address number (247) side respectively. Set the range of addresses to be used to the LM device, Unused, and BASIC device. Set the following parameters.

Table 9.1 Parameters for Setting Address Range

Symbol	Parameters	Description
V (FUN)	First-Unpolled-Node	Indicates the address next to the address range used for the host or other LM device.
V (NUN)	Number-of-consecutive-Unpolled-Node	Unused address range

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The devices within the address range written as “Unused” in Figure 9.1 cannot be used on a Fieldbus. For other address ranges, the range is periodically checked to identify when a new device is mounted. Care must be taken not to allow the address range to become wider, which can lead to exhaustive consumption of Fieldbus communication performance.



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Figure 9.1 Available Range of Node Addresses

To ensure stable operation of Fieldbus, determine the operation parameters and set them to the LM devices. While the parameters in Table 9.2 are to be set, the worst-case value of all the devices to be connected to the same Fieldbus must be used. Refer to the specification of each device for details. Table 9.2 lists YPK110 specification values.

Table 9.2 Operation Parameter Values of the YPK110 to be Set to LM Devices

Symbol	Parameters	Description and Settings
V (ST)	Slot-Time	Indicates the time necessary for immediate reply of the device. Unit of time is in octets (256 μs). Set maximum specification for all devices. For YPK, set a value of 4 or greater.
V (MID)	Minimum-Inter-PDU-Delay	Minimum value of communication data intervals. Unit of time is in octets (256 μs). Set the maximum specification for all devices. For YPK, set a value of 4 or greater.
V (MRD)	Maximum-Reply-Delay	The worst case time elapsed until a reply is recorded. The unit is Slot-time; set the value so that V (MRD) 3V (ST) is the maximum value of the specification for all devices. For YPK, the setting must be a value of 12 or greater.

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9.3 Definition of Combining Function Blocks

The input/output parameters for function blocks are combined. Practically, setting is written to the YPK110 link object with reference to “Block setting” in Section 9.6 for details.

For the YPK110, in order to minimize the delay in data transfer between Transducer block and AO function block, transducer block are designed to be executed in conjunction with the execution of AO function block. Therefore, in order to activate Transducer block, it is necessary that AO function block is always defined in the schedule.

The combined blocks need to be executed synchronously with other blocks on the communications schedule. In this case, change the YPK110 schedule according to the following table. Enclosed values in the table are factory-settings. YPK110 schedule is set as shown in the following. Change it as necessary.

For the case where the control period (macrocycle) is set to 4 seconds or longer, set the following interval larger than 1% of the macrocycle.

- The interval between the end of block execution and the start of releasing CD from LAS;
- The interval between the end of a block execution and the start of the next block execution;

9.4 Setting of Tags and Addresses

This section describes the steps in the procedure to set PD Tags and node addresses in the YPK110. Connect YPK110 with other network devices and turn on the power of the host and the bus.

There are three states of Fieldbus devices as shown in Figure 9.4, and if the state is other than the lowest SM_OPERATIONAL state, no function block is executed. YPK110 must be transferred to this state when a tag or address is changed.

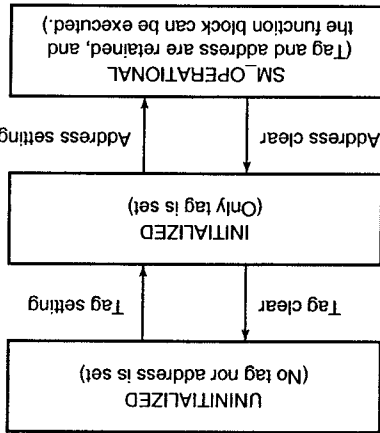


Figure 9.4 Status Transition by Setting PD Tag and Node Address

YPK110 has a PD Tag (CV1001) and node address (247, or hexadecimal 0xF7) that are set upon shipment from the factory unless otherwise specified. If two YPK110s are connected at a time, one YPK110 will keep the address upon shipment while the other will have a default address (See Figure 9.2). To change only the node address, clear the address once and then set a new node address. To set the PD Tag, first clear the node address and clear the PD Tag, then set the PD Tag and node address again.

Devices whose node address was cleared will await the default address (randomly chosen from a range of 248 to 251, or from hexadecimal 0xF8 to 0xFB). At the

Table 9.3 Execution Schedule of the YPK110 Function Blocks

Index	Parameters	Setting (Enclosed is factory-setting)
269 (SM)	MACROCYCLE_DURATION	Cycle (MACROCYCLE) period of control or measurement. Unit is 1/32 ms. (3200 = 1 s)
276 (SM)	FB_START_ENTRY.1	AO block startup time. Elapsed time from the start of MACROCYCLE specified in 1/32 ms. (3200 = 1 s)
278 (SM)	FB_START_ENTRY.2	—
289 (SM)	FB_START_ENTRY.14	—

A maximum of 105 ms is taken for execution of an AO block, a maximum of 40 ms for execution of each DI block a maximum of 95 ms for an OS block, and a maximum of 120 ms is taken for execution of PID block. For scheduling of communications for combination with the next function block, the execution is so arranged as to start after a lapse of longer than the time above mentioned. In no case should two function blocks of the YPK110 be executed at the same time (execution time is overlapped).

Figure 9.3 shows an example of schedule based on the loop shown in Figure 9.2.

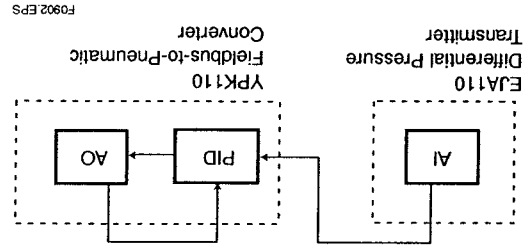


Figure 9.2 Example of Loop Connecting Function Block of YPK110 with other Instruments

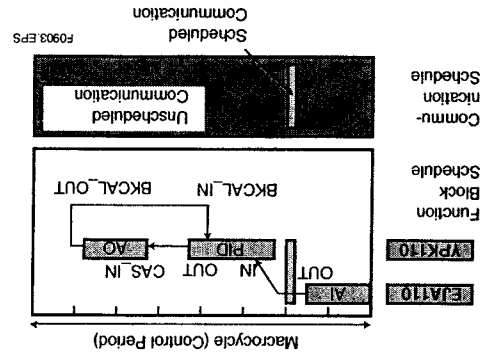


Figure 9.3 Function Block Schedule and Communication

same time, it is necessary to specify the device ID in order to correctly specify the device. The device ID of the YPK110 is 594543000Axxxxxxx. (The xxxxxxxx at the end of the above device ID is a total of 8 alphanumeric characters.)

9.5 Communication Setting

To set the communication function, it is necessary to change the database residing in SM-VFD.

9.5.1 VCR Setting

Set VCR (Virtual Communication Relationship), which specifies the called party for communication and resources. YPK110 has 29 VCRs whose application can be changed, except for the first VCR, which is used for management.

YPK110 has VCRs of four types:

Server(QUB) VCR

A Server responds to requests from a host. This communication needs data exchange. This type of communication is called QUB (Queued User-triggered Bidirectional) VCR.

Source (QUU) VCR

A Source multicasts alarms or trends to other devices. This type of communication is called QUU (Queued User-triggered Unidirectional) VCR.

Publisher (BNU) VCR

A Publisher multicasts AI block output to another function block(s). This type of communication is called BNU (Buffered Network-triggered Unidirectional) VCR.

Subscriber (BNU) VCR

A Subscriber receives the data from another function block(s). This type of communication is called BNU (Buffered Network-triggered Unidirectional) VCR.

A Server VCR is capable to respond to requests from a Client (QUB) VCR after the Client initiates connection to the Server successfully. A Source VCR transmits data without established connection. A Sink (QUU) VCR on another device can receive it if the Sink is configured so. A Publisher VCR transmits data when LAS requests so. An explicit connection is established from Subscriber (BNU) VCR(s) so that a Subscriber knows the format of published data.

Parameters must be changed together for each VCR because modification for each parameter may cause inconsistent operation.

9.5.2 Function Block Execution Control

According to the instructions given in Section 9.3, set the execution cycle of the function blocks and schedule of execution.

9.6 Block Setting

Set the parameter for function block VFD.

9.6.1 Link Object

Link object combines the data voluntarily sent by the function block with VCR. YPK110 has 25 link objects. A single link object specifies one combination. Each link object has the parameters listed in Table 9.4. Parameters must be changed together for each VCR because the modifications made to each parameter may cause inconsistent operation.

Table 9.4 Link Object Parameters

Sub-index	Parameters	Description
1	LocalIndex	Sets the index of function block parameters to be combined; set "0" for Trend and Alert.
2	VcrNumber	Sets the index of VCR to be combined. If set to "0", this link object is not used.
3	RemoteIndex	Sets the index of remote object associated with this link object.
4	ServiceOperation	Set one of the following. Set only one each for link object for Alert or Trend. 0: Undefined 1: Local 2: Publisher 6: Alert 7: Trend
5	StaleCountLimit	Set the maximum number of consecutive stale input values which may be received before the input status is set to BAD. Setting of "2" or larger value is recommended to avoid unnecessary mode transfer which is caused when subscriber failed to receive data correctly.

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25 link objects are not factory-set.

9.6.3 View Object

This is the object to form groups of parameters in a block. One of advantage brought by forming groups of parameters is the reduction of load for data transaction. YPK110 has 10 View objects for Transducer block and four View objects for each Resource block, AO block and DI1 and DI2 function block, and each View object has the parameters listed in Table 9.7 to 9.12.

Table 9.6 Purpose of Each View Object

Description	VIEW_1	VIEW_2	VIEW_3	VIEW_4
	Set of dynamic parameters required by operator for plant operation. (FV, SV, OUT, Mode etc.)	Set of static parameters which need to be shown to plant operator at once. (Flange etc.)	Set of all the dynamic parameters.	Set of static parameters for configuration or maintenance.

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9.6.2 Trend Object

It is possible to set the parameter so that the function block automatically transmits Trend. YPK110 has seven Trend objects, five of them are for analog data, and two of them are for discrete data. A single Trend object specifies the trend of one parameter.

Each Trend object has the parameters listed in Table 9.5. The first four parameters are the items to be set.

Table 9.5 Parameters for Trend Objects

Sub-Index	Parameters	Description
1	Block Index	Sets the leading index of the function block that takes a trend.
2	Parameter Relative Index	Sets the index of parameters taking a trend by a value relative to the beginning of the function block.
3	Sample Type	Specifies how trends are taken. Choose one of the following 2 types: 1: Sampled upon execution of a function block. 2: The average value is sampled.
4	Sample Interval	Specifies sampling intervals in units of 1/32 ms. Set the integer multiple of the function block execution cycle.
5	Last Update	The last sampling time.
6 to 21	List of Status	Status part of a sampled parameter.
21 to 37	List of Samples	Data part of a sampled parameter.

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Seven objects are not factory-set.

Table 9.7 View Object for Transducer Block

Idx.	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3 1st	VIEW 3 2nd	VIEW 4 1st	VIEW 4 2nd	VIEW 4 3rd	VIEW 4 4th	VIEW 4 5th	VIEW 4 6th
1	ST_REV	2	2	2	2	2	2	2	2	2	2
2	TAG_DESC										
3	STRATEGY					2					
4	ALERT_KEY					1					
5	MODE_BLK	4		4							
6	BLOCK_ERR	2		2							
7	UPDATE_EVT										
8	BLOCK_ALM										
9	TRANSDUCER_DIRECTORY										
10	TRANSDUCER_TYPE	2	2	2		2					
11	XD_ERROR	1		1							
12	CORRECTION_DIRECTORY										
13	FINAL_VALUE	5		5							
14	FINAL_VALUE_RANGE		11								
15	FINAL_VALUE_CUTOFF_HI					4					
16	FINAL_VALUE_CUTOFF_LO					4					
17	FINAL_PRESSURE_VALUE	5		5							
18	ACT_FAIL_ACTION					1					
19	ACT_MAN_ID					4					
20	ACT_MODEL_NUM					32					
21	ACT_SN					32					
22	VALVE_MAN_ID						4				
23	VALVE_MODEL_NUM						32				
24	VALVE_SN						32				
25	VALVE_TYPE						1				
26	XD_CAL_LOC							32			
27	XD_CAL_DATE							7			
28	XD_CAL_WHO							32			
29	ALARM_SUM	8		8							
30	FINAL_PRESS_HI		4								
31	FINAL_PRESS_LO		4								
32	SUPPLY_PRESSURE		4								
33	PRESSURE_UNIT		2								
34	OUT_PRESSURE	4		4							
35	PRESSURE_HI		4								
36	PRESSURE_LO		4								
37	CAL_PRESS_HI		4								
38	CAL_PRESS_LO		4								
39	CAL_PRESS_P		4								
40	OUTPUT_CHAR_TYPE		1								
41	OUTPUT_CHAR										
42	LIMSW_HI_LIM		4								
43	LIMSW_LO_LIM		4								
44	TEMPERATURE_UNIT		2								
45	ELECT_TEMP	4		4							
46	USER_CAL_EXEC			1							
47	USER_CAL_RESET			1							
48	USER_CAL_RESULT			1							

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9. CONFIGURATION

Idx.	Parameter Mnemonic	VIEW 1	VIEW 2	VIEW 3 1st	VIEW 3 2nd	VIEW 4 1st	VIEW 4 2nd	VIEW 4 3rd	VIEW 4 4th	VIEW 4 5th	VIEW 4 6th
49	CAL_PRESSURE			4							
50	ADVAL_FW			2							
51	ADVAL_BW			2							
52	ADVAL_T			2							
53	PRESS_VERTICAL_FEED_COUNT			4							
54	TOTAL_PRESS_VARIATION			4							
55	TOTAL_PRESS_OUT_TIME			4							
56	TOTAL_CUTOFF_LO_TIME			4							
57	PRESSURE_VARIATION_DEADBAND					4					
58	PRESS_VERTICAL_FEED_COUNT LIM					4					
59	TOTAL_PRESS_VARIATION LIM					4					
60	TOTAL_PRESS_OUT_TIME LIM					4					
61	TOTAL_CUTOFF_LO_TIME LIM					4					
62	DEVIATION LIM							4			
63	DEVIATION_TIME_TH							8			
64	RELEASE_FAILSAFE			1							
65	MODEL								32		
66	DEV_OPTIONS							2			
67	RATING_OUTPUT_TYPE							1			
68	RELAY_TYPE							1			
69	MASK_XD_ERROR							2			
70	CURRENT_GAIN_NUM				1						
71	SERVO_OUTPUT_SIGNAL		4								
72	SERVO_DEADBAND				4						
73	SERVO_OFFSET								4		
74	SERVO_GAIN_SELECTION			1							
75	SERVO_ADV_GAIN								4		
76	SERVO_ADV_RESET								4		
77	SERVO_ADV_RATE								4		
78	SERVO_ADV_GAM1								4		
79	SERVO_ADV_TD2								4		
80	SERVO_ADV_GAM2								4		
81	SERVO_RESERVE1								4		
82	SERVO_RESERVE2								4		
83	SERVO_RESERVE3								4		
84	SERVO_RESERVE4								4		
85 to 132	TEST_1 to TEST_48		0	0	29	97	0	0	0	5	88
	Total (in Bytes)	41	61	100	100	84	91	91	87	90	49

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Table 9.10 View Object for OS Function Block

Relative Index	Parameters			
	VIEW 1	VIEW 2	VIEW 3	VIEW 4
1	ST_REV	2	2	2
2	TAG_DESC			2
3	STRATEGY			2
4	ALERT_KEY			1
5	MODE_BLK	4		4
6	BLOCK_ERR	2		2
7	SP	5		5
8	OUT_1	5		5
9	OUT_2	5		5
10	OUT_1_RANGE		11	
11	OUT_2_RANGE		11	
12	GRANT_DENY		2	
13	STATUS_OPTS			2
14	CAS_IN	5		5
15	BKCAL_OUT			5
16	IN_ARRAY			16
17	OUT_ARRAY			16
18	LOCKVAL			1
19	BKCAL_IN_1			5
20	BKCAL_IN_2			5
21	BAL_TIME			4
22	HYSTAL			4
23	UPDATE_EVT			
24	BLOCK_ALM			
	Total (in bytes)	28	26	43
				48

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