User's
Manual

DPharp EJX™

EJX110B
Differential Pressure and Pressure Transmitters

vigilantplant®

DPharp
FOR THE DIGITAL WORLD

YOKOGAWA
Yokogawa Electric Corporation

2. Handling Cautions

2.4 Selecting the Installation Location

The transmitter is designed to withstand severe environmental conditions. However, to ensure that it will provide years of stable and accurate performance, take the following precautions when selecting the installation location.

(a) Wireless Communication
The installation location of this transmitter must meet the following conditions:
- Adjust the direction of the antenna to be in the upright position regardless of the orientation of this transmitter. See section 4 for adjusting the antenna.
- Install the transmitter at least 1 m above the ground or floor.
- Ensure that there are no obstacles such as walls or pipes within a 30-cm radius of each antenna.
- Ensure that there are three or more other field wireless equipment devices within the line of sight of each field wireless device (this transmitter, field wireless access points, and other field wireless devices with HART protocol). However, if there are only four or fewer field wireless equipment devices in the network, ensure that all the devices are within the line of sight of the field wireless access point. This guideline enables a highly reliable mesh network to be configured.
- If any of the above conditions cannot be met, install field wireless repeaters. For the limitations on the number of field wireless devices and repeaters that can be connected to a field wireless network, see the General Specifications LFS9292, LFSDM01 Field Wireless System, GS33M20S10-40E, or General Specifications LFS9292 Field Wireless System, GS33Q03S10-31E.

(b) Ambient Temperature
Avoid locations subject to wide temperature variations or a significant temperature gradient. If the location is exposed to radiant heat from plant equipment, provide adequate thermal insulation and/or ventilation.

(c) Ambient Atmosphere
Do not install the transmitter in a corrosive atmosphere. If this cannot be avoided, there must be adequate ventilation.

(d) Shock and Vibration
Although the transmitter is designed to be relatively resistant to shock and vibration, an installation site should be selected where this is kept to a minimum.

(e) Installation of Explosion-protected Transmitters
An explosion-protected transmitters is certified for installation in a hazardous area containing specific gas types. See subsection 2.8 "Installation of an Explosion-Protected Transmitters."

4. Installation

4.1 Precautions

Before installing the transmitter, read the cautionary notes in section 2.4, "Selecting the Installation Location." For additional information on the ambient conditions allowed at the installation location, refer to subsection 11.1 "Standard Specifications."

IMPORTANT

- When welding piping during construction, take care not to allow welding currents to flow through the transmitter.
- Do not step on this instrument after installation.
- For the EJX430B, the atmospheric opening is located on the low pressure side cover flange. The opening must not face upward. See section 11.4, "Dimensions," for the location of the opening.

4.2 Mounting

- The transmitter is shipped with the process connection, according to the ordering specifications. To change the orientation of the process connections, refer to section 4.3.
- With differential pressure transmitters, the distance between the impulse piping connection ports is usually 54 mm (figure 4.1). By changing the orientation of the process connector, the dimension can be changed to 51 mm or 57 mm.
- The transmitter can be mounted on a nominal 50 mm (2-inch) pipe using the mounting bracket supplied, as shown in figure 4.2 and 4.3. The transmitter can be mounted on either a horizontal or a vertical pipe.
- When mounting the bracket on the transmitter, tighten the (four) bolts that hold the transmitter with a torque of approximately 39 N·m {4kgf·m}.

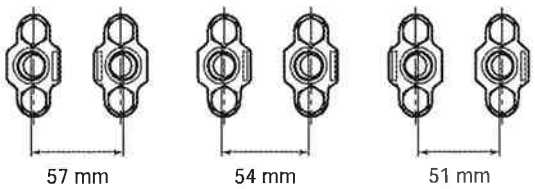


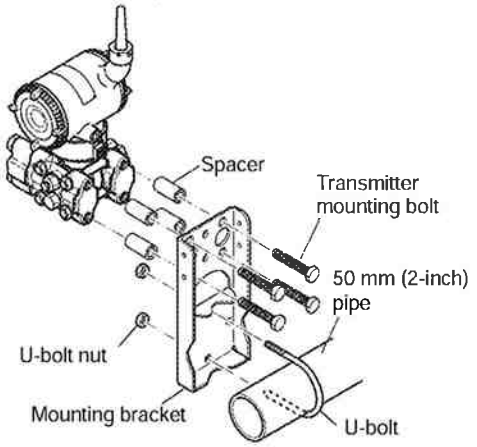
Figure 4.1 Process Connector Impulse Piping Connection Distances for Differential Pressure Transmitters

Figure 4.2 and 4.3 show the mounting of the transmitter for horizontal piping and vertical piping with using the mounting bracket. The transmitters with the installation code -U (Universal flange) can be used for either type of mounting.

CAUTION

When the suffix code of the mounting bracket is "B," make sure to put the spacer between the bracket and transmitter as shown in Figure 4.2.

Horizontal pipe mounting



Vertical pipe mounting

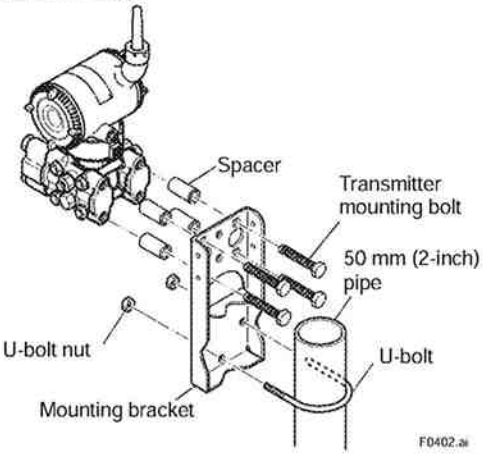
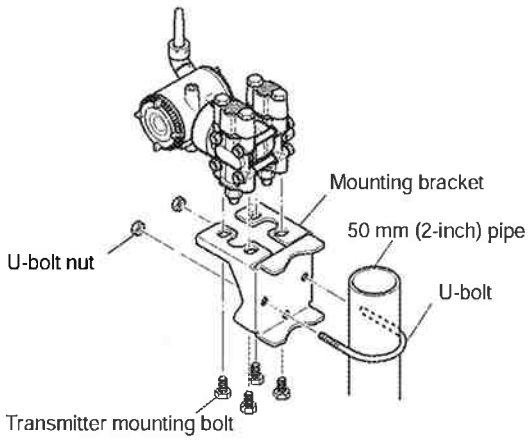


Figure 4.2 Transmitter Mounting (Horizontal Impulse Piping Type)

Vertical pipe mounting (Process connector upside)



Vertical pipe mounting (Process connector downside)

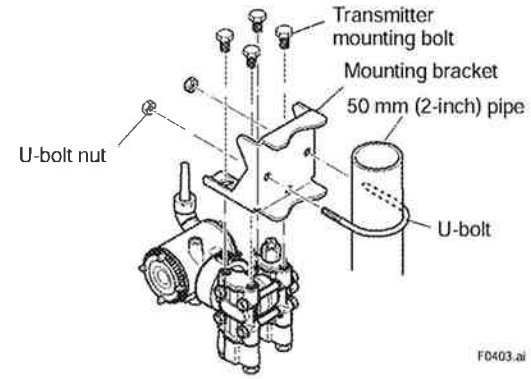


Figure 4.3 Transmitter Mounting (Vertical Impulse Piping Type)

4.3 Changing the Process Connection

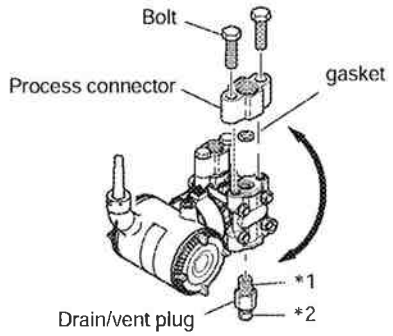
The transmitter is shipped with the process connection specified at the time of ordering. To change the process connection, the drain (vent) plug must be repositioned.

To reposition a drain (vent) plug, use a wrench to slowly and gently unscrew it. Then, remove and remount it on the opposite side. Wrap sealing tape around the drain (vent) plug threads (*1 in the figure below), and apply a lubricant to the threads of the drain (vent) screw(s) (*2 below). To tighten the drain (vent) plugs, apply a torque of 34 to 39 N·m (3.5 to 4 kgf·m). Process connector bolts are to be tightened uniformly to a torque shown in table 4.1.

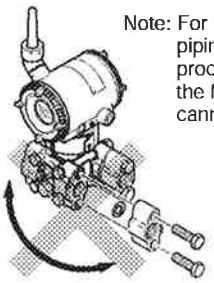
Table 4.1 Torque

Model	EJX110B EJX310B EJX430B
Torque(N·m) {kgf·m}	39 to 49 {4 to 5}

Vertical impulse piping type



Horizontal impulse piping type



Note: For a horizontal impulse piping type, moving the process connectors from the front side to the back cannot be made.

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Figure 4.4 Changing Process Connection

4.4 Swapping the High/Low-pressure Side Connection

IMPORTANT

This section is applicable only for EJX110B differential transmitters, and not applicable for gauge or absolute pressure transmitters.

4.4.1 Rotating Pressure-detector Section 180°

This procedure can be applied only to a transmitter with a vertical impulse piping type.

The procedure below can be used to turn the pressure detector assembly 180°. Perform this operation in a maintenance shop with the necessary tools laid out and ready for use, and then install the transmitter in the field after making the change.

1) Use an Allen wrench (JIS B4648, nominal 2.5 mm) to remove the five setscrews at the joint between the pressure-detector section and transmitter section.
2) Leaving the transmitter section in position, rotate the pressure-detector section 180°.
3) Tighten the five setscrews to fix the pressure-detector section and transmitter section together (at a torque of 1.5 N·m).
   Reposition the process connector and drain (vent) plugs to the opposite side as described in subsection 4.3.

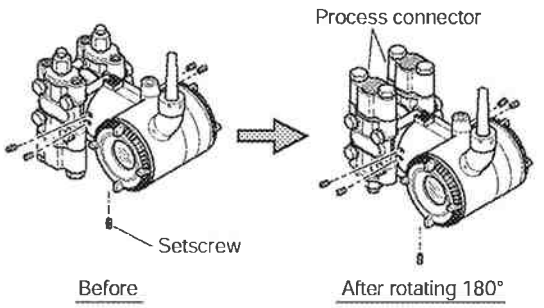

Figure 4.5 Before and After Modification

4.5 Rotating Transmitter Section

The transmitter section can be rotated approximately 360° (180° to either direction or 360° to one direction from the original position at shipment, depending on the configuration of the instrument.) It can be fixed at any angle within above range.

1) Remove the five setscrews that fasten the transmitter section and capsule assembly, using the Allen wrench.
2) Rotate the transmitter section slowly and stop it at designated position.
3) Tighten the five setscrews to a torque of 1.5 N·m.

IMPORTANT

Do not rotate the transmitter section more than the above limit.

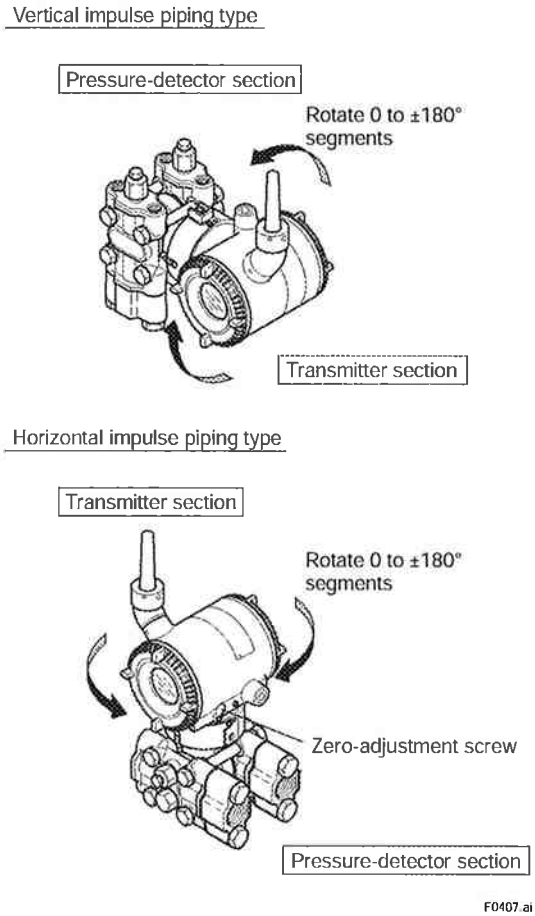

Figure 4.7 Rotating Transmitter Section (Left Side High Pressure Type)

4.6 Changing the Direction of Integral Indicator

IMPORTANT

Always turn OFF power, release pressure and remove a transmitter to non-hazardous area before disassembling and reassmbling an indicator.

An integral indicator can be rotated in four positions at 90°. Follow the instructions in section 9.4.1 for removing and attaching the integral indicator.

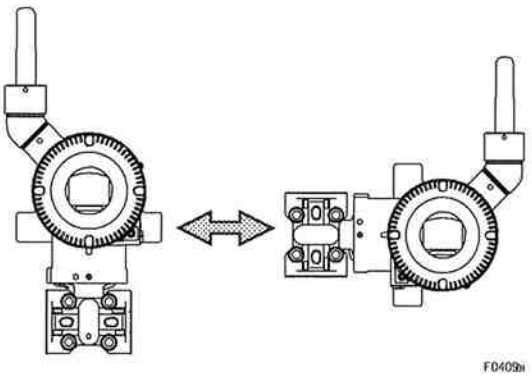

Figure 4.9 Adjusting Antenna Position

4.7 Changing the direction of the antenna

Adjust the direction of the antenna to be in the upright position. To change the installation angle, follow the procedure below.

1) Loosen the two mounting screws at the bottom of the antenna by using a 2.5 mm Allen wrench (see Figure 4.8).
   The screws might come off and be lost if loosened too much; loosen the screws by about three rotations.
2) Press forward and down 90 degrees by rotating the axis at the bottom of the antenna.
3) Tighten the two screws to a torque of 1.5 N·m by using a torque wrench. When doing this, be careful not leave a gap between the antenna and housing.

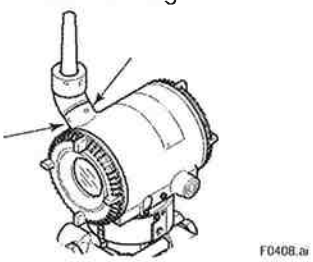

Figure 4.8 Mounting Screw Position

5. Installing Impulse Piping

5.1 Impulse Piping Installation Precautions

The impulse piping that connects the process outputs to the transmitter must convey the process pressure accurately. If, for example, gas collects in a liquid-filled impulse line, or the drain for a gas-filled impulse line becomes plugged, it will not convey the pressure accurately. Since this will cause errors in the measurement output, select the proper piping method for the process fluid (gas, liquid, or steam). Pay careful attention to the following points when routing the impulse piping and connecting the impulse piping to a transmitter.

5.1.1 Connecting Impulse Piping to a Transmitter

(1) Check the High and Low Pressure Connections on the Transmitter (Figure 5.1)

Symbols "H" and "L" have been placed on the capsule assembly to indicate high and low pressure side. With differential pressure transmitters, connect the high pressure side impulse line to the "H" side, and the low pressure side impulse line to the "L" side.

With gauge/absolute pressure transmitters, connect the impulse line to the 'H' side.

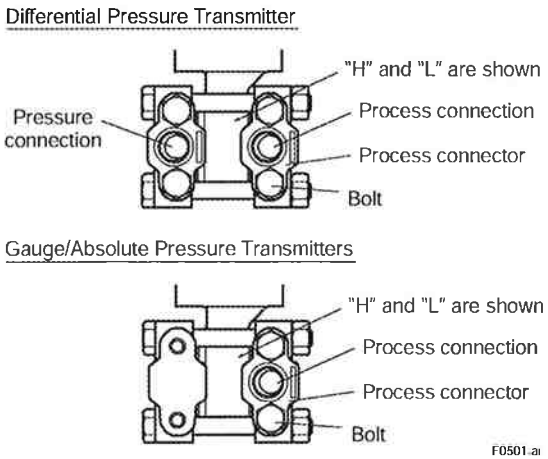

Figure 5.1 "H" and "L" Symbols on a Capsule Assembly

(2) Changing the Process Connector Piping Connections (Figure 4.1) (for differential pressure transmitters)

The impulse piping connection distances can be changed between 51 mm, 54 mm and 57 mm by changing the orientation of the process connectors. This is convenient for aligning an impulse line with a process connectors.

(3) Tightening the Process Connector Mounting Bolts

After connecting an impulse line, tighten the process connector mounting bolts uniformly.

(4) Removing the Impulse Piping Connecting Port Dustproof Cap

The impulse piping connecting port on the transmitter is covered with a plastic cap to keep out dust. This cap must be removed before connecting the line. (Be careful not to damage the threads when removing this cap. Never insert a screwdriver or other tool between the cap and port threads to remove the cap.)

(5) Connecting the Transmitter and 3-Valve Manifold (for differential pressure transmitters)

A 3-valve manifold consists of two stop valves to block process pressure and an equalizing valve to equalize the pressures on the high and low pressure sides of the transmitter. Such a manifold makes it easier to disconnect the transmitter from the impulse piping, and is convenient when adjusting the transmitter zero point.

There are two 3-valve manifold types: the pipe-mounting type and the direct-mounting type; care should be taken with respect to the following points when connecting the manifold to the transmitter.

■ Pipe-Mounting Type 3-Valve Manifold (Figure 5.2)

1) Screw nipples into the connection ports on the transmitter side of the 3-valve manifold, and into the impulse piping connecting ports on the process connectors. (To maintain proper sealing, wind sealing tape around the nipple threads.)
2) Mount the 3-valve manifold on the 50 mm (2-inch) pipe by fastening a U-bolt to its mounting bracket. Tighten the U-bolt nuts only lightly at this time.
3) Install the pipe assemblies between the 3-valve manifold and the process connectors and lightly tighten the ball head lock nuts. (The ball-shaped ends of the pipes must be handled carefully, since they will not seal properly if the ball surface is scratched or otherwise damaged.)
4) Now tighten the nuts and bolts securely in the following sequence:
   Process connector bolts → transmitter-end ball head lock nuts → 3-valve manifold ball head lock nuts → 3-valve manifold mounting bracket U-bolt nuts

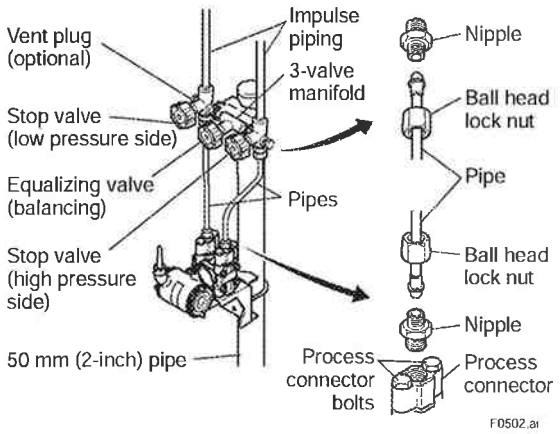

Figure 5.2 3-Valve Manifold (Pipe-Mounting Type)

■ Direct-Mounting Type 3-Valve Manifold (Figure 5.3)

1) Mount the 3-valve manifold on the transmitter. (When mounting, use the two gaskets and the four bolts provided with the 3-valve manifold. Tighten the bolts evenly.)
2) Mount the process connectors and gaskets on the top of the 3-valve manifold (the side on which the impulse piping will be connected).

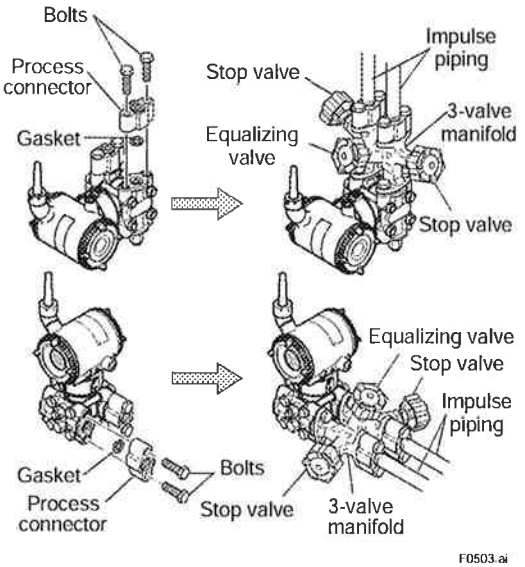

Figure 5.3 3-Valve Manifold (Direct-Mounting Type)

NOTE

After completing the connection of the transmitter and 3-valve manifold, be sure to CLOSE the low pressure and high pressure stop valves, OPEN the equalizing valve, and leave the manifold with the equalizing valve OPEN.
You must do this in order to avoid overloading the transmitter from either the high or the low pressure side when beginning operation.
This instruction must also be followed as part of the startup procedure (chapter 7.)

5.1.2 Routing the Impulse Piping

(1) Process Pressure Tap Angles

If condensate, gas, sediment or other extraneous material in the process piping gets into the impulse piping, pressure measurement errors may result. To prevent such problems, the process pressure taps must be angled as shown in figure 5.4 according to the kind of fluid being measured.

NOTE

- If the process fluid is a gas, the taps must be vertical or within 45° either side of vertical.
- If the process fluid is a liquid, the taps must be horizontal or below horizontal, but not more than 45° below horizontal.
- If the process fluid is steam or other condensing vapor, the taps must be horizontal or above horizontal, but not more than 45° above horizontal.

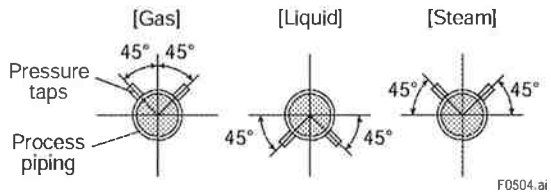

Figure 5.4 Process Pressure Tap Angle (For Horizontal Piping)

(2) Position of Process Pressure Taps and Transmitter

If condensate (or gas) accumulates in the impulse piping, it should be removed periodically by opening the drain (or vent) plugs. However, this will generate a transient disturbance in the pressure measurement, and therefore it is necessary to position the taps and route the impulse piping so that any extraneous liquid or gas generated in the leadlines returns naturally to the process piping.

- If the process fluid is a gas, then as a rule the transmitter must be located higher than the process pressure taps.
- If the process fluid is a liquid or steam, then as a rule the transmitter must be located lower than the process pressure taps.

(3) Impulse Piping Slope

The impulse piping must be routed with only an upward or downward slope. Even for horizontal routing, the impulse piping should have a slope of at least 1/10 to prevent condensate (or gases) from accumulating in the pipes.

(4) Temperature Difference Between Impulse Lines (for differential pressure transmitters)

If there is a temperature difference between the high and low impulse lines, the density difference of the fluids in the two lines will cause an error in the measurement pressure. When measuring flow, impulse lines must be routed together so that there is no temperature difference between them.

(5) Condensate Pots for Steam Flow Measurement (for differential pressure transmitters)

If the liquid in the impulse piping repeatedly condenses or vaporizes as a result of changes in the ambient or process temperature, this will cause a difference in the fluid head between the high pressure and low pressure sides. To prevent measurement errors due to these head differences, condensate pots are used when measuring steam flow.

(6) Preventing Wind Speed Effects in Very Low Differential Pressure Measurement (for differential pressure transmitters)

IMPORTANT

When using a differential pressure transmitter to measure very low pressures (draft pressure), the low pressure connection port is left open to atmospheric pressure (the reference pressure). Any wind around the differential pressure transmitter will therefore cause errors in the measurement. To prevent this, it will be necessary either to enclose the transmitter in a box, or to connect an impulse line to the low pressure side and insert its end into a wind-excluding pot (cylindrical with a base plate).

(7) Preventing Freezing

If there is any risk that the process fluid in the impulse piping or transmitter could freeze, use a steam jacket or heater to maintain the temperature of the fluid.

NOTE

After completing the connections, close the valves on the process pressure taps (main valves), the valves at the transmitter (stop valves), and the impulse piping drain valves, so that condensate, sediment, dust and other extraneous material cannot enter the impulse piping.

5.2 Impulse Piping Connection Examples

Figure 5.5 and 5.6 show examples of typical impulse piping connections. Before connecting the transmitter to the process, study the transmitter installation location, the process piping layout, and the characteristics of the process fluid (corrosiveness, toxicity, flammability, etc.), in order to make appropriate changes and additions to the connection configurations.

Note the following points when referring to these piping examples.

- The high pressure connecting port on the transmitter is shown on the right (as viewed from the front).
- The transmitter impulse piping connection is shown for a vertical impulse piping connection configuration in which the direction of connection is either upwards or downwards.
- If the impulse line is long, bracing or supports should be provided to prevent vibration.
- The impulse piping material used must be compatible with the process pressure, temperature, and other conditions.
- A variety of process pressure tap valves (main valves) are available according to the type of connection (flanged, screwed, welded), construction (globe, gate, or ball valve), temperature and pressure. Select the type of valve most appropriate for the application.

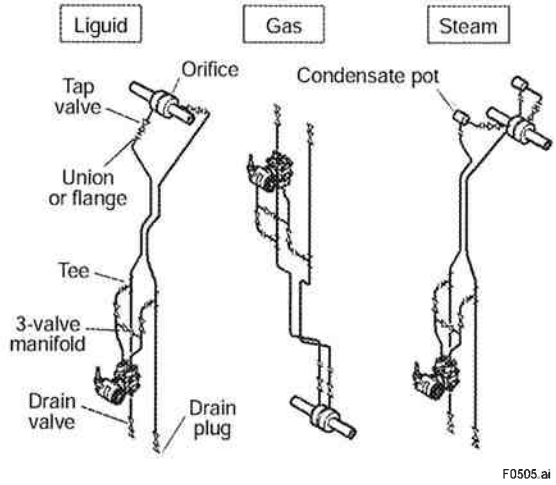

Figure 5.5 Impulse Piping Connection Examples for Differential Pressure Transmitters

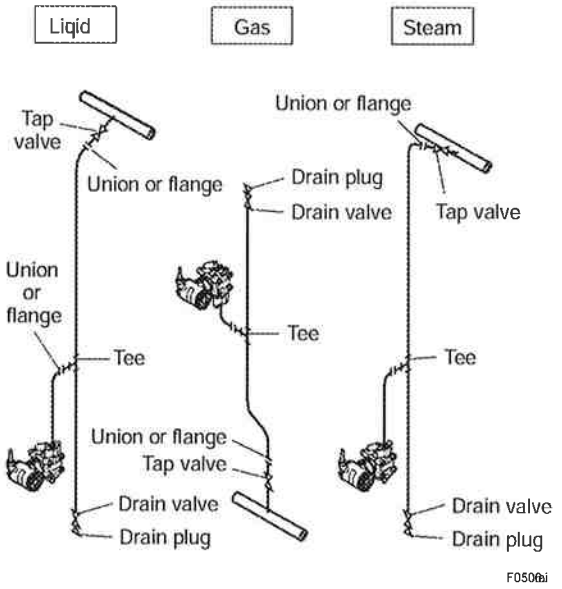

Figure 5.6 Impulse Piping Connection Examples for Gauge/absolute Pressure Transmitters

6. Wiring

6.1 Grounding

Grounding is always required for the proper operation of transmitters. Follow the domestic electrical requirements as regulated in each country. For a transmitter with a built-in lightning protector, grounding should satisfy ground resistance of 10Ω or less.

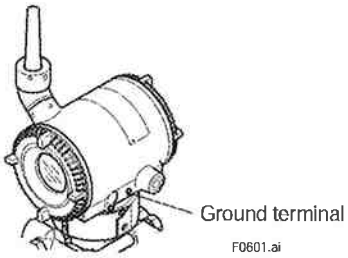

Figure 6.1 Ground Terminal

8. Setting Parameters

8.3.12 Integral Indicator Scale Setup

Available displays	Description and related parameters
% of range (PRES %) 	Indicates input pressure in –2.5 to 110% range depending on the set range (**LRV** and **URV**). PRES % 45.6 %

The LCD turns off for 60 seconds after displayed on the indicator to differential pressure % and occurring alarm for 3 seconds

8.4.2 Checking with Integral Indicator

NOTE

If an error is detected by running self-diagnostics, an error number is displayed on the integral indicator. If there is more than one error, the error number changes at three-second intervals. See table 9.3 regarding the alarm codes.

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Figure 8.6 Integral Indicator

Process Variable is updated at 30–second priod.

Output:
Channel Process Variable
CH1 Differential Pressure (inH2O)
CH2 Differential Pressure(%)
CH3 Static Pressure (psi)
CH4 Capsule temperature (deg F)

9. Maintenance

9.4.6 Replacing the Battery Pack

■ **Removing**

1) Remove the terminal box cover.
2) Loosen the two battery pack mounting screws (see Figure 9.5).
3) Pull the battery pack.

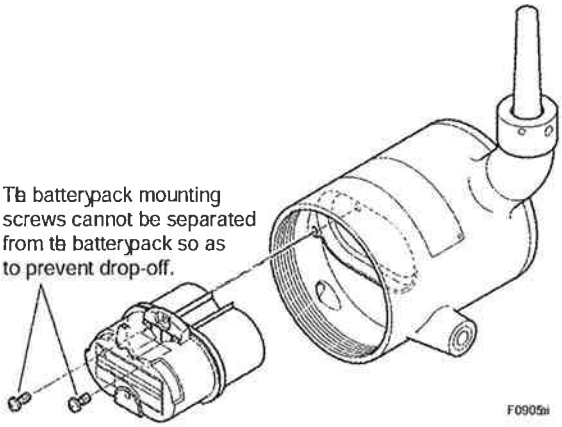

Figure 9.5 Removing the Battery Pack

■ **Remounting**

1) Insert the new battery pack lightly.
2) Push the center of the battery pack and insert it securely.
3) Tighten the two battery pack mounting screws to a torque of approximately 0.7 N·m.
4) Replace the terminal box cover.

9.4.7 Handling Batteries

This battery pack contains two "D" size primary lithium/thionyl chloride batteries. Each battery contains approximately 5 grams of lithium, for a total of 10 grams in each pack. Under normal conditions, the battery materials are self-contained and are not reactive as long as the batteries and the pack integrity are maintained. Care should be taken to prevent thermal, electrical or mechanical damage. Protect the electrode of the battery pack to avoid rapid electrical discharge. Discharged a battery may lead to fluid leakage and excessive heat. Batteries should be stored in a clean and dry area. For maximum battery life, storage temperature should not exceed 30°C.

WARNING

Handling the battery pack
The following precautions must be observed in order to safely and effectively use a battery pack. Improper use may lead to fluid leakage, excessive heat, ignition, or explosion.

- Never charge it.
- Do not short-circuit it.
- Do not disassemble, transform, or modify it.
- Do not heat it or throw it into a fire.
- Do not soak it in fresh water or seawater.

CAUTION

Observe the following precautions for the safe disposal of batteries.

- Do not incinerate the battery, and do not expose it to a high temperature of 100°C or more. This may lead to fluid leakage or explosion.
- Dispose of the battery according to laws and regulations.

The battery pack must use the following dedicated parts.

Part Number: F9915MA

Transportation of products containing lithium batteries
The battery pack contains lithium batteries. When transporting this transmitter equipped with the battery pack, keep it in standby mode in order to conserve the batteries. For details on how to switch to standby mode, refer to subsection 8.3.20 "Standby." Primary lithium batteries are regulated in transportation by the U.S. Department of Transportation, and are also covered by the International Air Transport Association (IATA), the International Civil Aviation Organization (ICAO), and the European Ground Transportation of Dangerous Goods (ARD). It is the responsibility of the shipper to ensure compliance with these or any other local requirements. Consult current regulations and requirements before shipping.

9.5.3 Alarms and Countermeasures

Table 9.3 Alarm Message Summary

Integral indicator	Configurator display	Cause	Output operation during error	Countermeasure	Status group
AL. 01 CAP. ERR	P sensor error	Sensor problem.	Outputs the signal (High or Low) set with burnout direction switch. [status output: undefined]	Replace capsule when error keep appearing error even after restart.	1
	CT sensor error	Capsule temperature sensor problem.		Replace capsule.	
	Cap EEPROM error	Capsule EEPROM problem.			
AL. 02 AMP. ERR	AT sensor error	Amplifier temperature sensor problem.		Replace amplifier.	
	Amp EEPROM error	Amplifier EEPROM problem.			
	CPU board error	Amplifier problem.			2
–	No device ID	No device ID is found.	Continues to operate and output.		
AL. 10 PRESS	P outside limit	Input is outside measurement range limit of capsule.	Outputs AO upper limit or AO lower limit.	Check input or replace capsule when necessary.	3
AL. 11 ST. PRSS	SP outside limit	Static pressure exceeds limit.	Continues to operate and output.		
AL. 12 CAP. TMP	CT outside limit	Capsule temperature is outside range (–50 to 130°C).		Use heat insulation or make lagging to keep temperature within range.	
AL. 13 AMP. TMP	AT outside limit	Amplifier temperature is outside range (–50 to 95°C).			
AL. 30 RANGE	P over range	Output is outside upper or lower range limit value.	Outputs AO upper limit or AO lower limit.	Check input and range setting, and change them as needed.	4
AL. 31 SP. RNG	SP over range	Static pressure exceeds specified range.	Continues to operate and output.		
AL. 35 P. HI	P high alarm	Input pressure exceeds specified threshold.		Check input.	5
AL. 36 P. LO	P low alarm				
AL. 37 SP. HI	SP high alarm	Input static pressure exceeds specified threshold.			
AL. 38 SP. LO	SP low alarm				
AL. 39 TMP. HI	CT high alarm	Detected temperature exceeds specified threshold.		Check capsule temperature.	
AL. 40 TMP. LO	CT low alarm				
AL. 50 P. LRV	Illegal P LRV	Specified value is outside of setting range.	Holds output immediately before error occurred.	Check settings and change them as needed.	6
AL. 51 P. URV	Illegal P URV				
AL. 52 P. SPN	Illegal P SPAN				
AL. 53 P. ADJ	P SPAN trim err		Continues to operate and output.	Adjust settings and change them as needed.	
	P ZERO trim err				
AL. 54 SP. RNG	Illegal SP LRV		Continues to operate and output holding static pressure in %.	Check settings and change them as needed.	
	Illegal SP URV				
	Illegal SP SPAN				

Integral indicator	Configurator display	Cause	Output operation during error	Countermeasure	Status group
AL. 55 SP. ADJ	SP SPAN trim err	Specified value is outside of setting range.	Continues to operate and output.	Adjust settings and change them as needed.	7
	SP ZERO trim err				
AL. 60 SC. CFG	SC config error	Specified values or settings do not meet the conditions.	Continues to operate and output without signal characterizing.	Check settings and change them as needed.	
AL.70 LOW BAT	WL low-battery	The battery power is low.	Continues to operate and output.	Replace the battery pack as needed.	8
AL.70 COMMU	WL comm. err	Wireless communication problem.		Check the wireless device location, Network ID, the gateway, and so forth.	
AL. 79 OV. DISP	–	Displayed value exceeds limit.		Check the settings and change them as needed.	–

11. General Specifications

■ SPAN AND RANGE LIMITS

EJX110B

Measurement Span/Range		kPa	inH_2O(/D1)	mbar(/D3)	mmH_2O(/D4)
L	Span	0.1 to 10	0.4 to 40	1 to 100	10 to 1000
	Range	-10 to 10	-40 to 40	-100 to 100	-1000 to 1000
M	Span	0.5 to 100	2 to 400	5 to 1000	50 to 10000
	Range	-100 to 100	-400 to 400	-1000 to 1000	-10000 to 10000
H	Span	2.5 to 500	10 to 2000	25 to 5000	0.025 to 5 kgf/cm²
	Range	-500 to 500	-2000 to 2000	-5000 to 5000	-5 to 5 kgf/cm²
V	Span	0.07 to 14 MPa	10 to 2000 psi	0.7 to 140 bar	0.7 to 140 kgf/cm²
	Range	-0.5 to 14 MPa	-71 to 2000 psi	-5 to 140 bar	-5 to 140 kgf/cm²

■ NORMAL OPERATING CONDITION

(Optional features or approval codes may affect limits.)

Ambient Temperature Limits

-40 to 85°C (-40 to 185°F)
-30 to 80°C (-22 to 176°F) with LCD display

Process Temperature Limits

-40 to 120°C (-40 to 248°F)
– Except EJX310B L capsule
-40 to 100°C (-40 to 212°F)
– EJX310B L capsule

Ambient Humidity Limits

0 to 100% RH

Working Pressure Limits (Silicone oil)

Maximum Pressure Limits

EJX110B

Capsule	Pressure
L	16 MPa (2300 psi)
M, H, V	25 MPa (3600 psi)*

* 16 MPa for wetted parts material code H, M, T, A, D, and B.

FCC and IC Regulations

- This device complies with Part 15 of the FCC Rules and RSS-Gen of IC Rules. Operation is subject to the following two conditions :(1) this device may not cause harmful interference, and(2) this device must accept any interference received, including interference that may cause undesired operation.
- This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of the FCC Rules, These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at this own expense.
- Intentional or unintentional changes or modifications not expressly approved by the party responsible for compliance must not be made to this equipment. Any such changes or modifications could void the user's authority to operate the equipment.

FCC WARNING
Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Co-location : This transmitter must not be co-located or operated in conjunction with any other antenna or transmitter.