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AUTROL AMERICA
AUTOMATION CONTROL

# APT 3200

## Smart Pressure Transmitter

For Differential / Gauge / Absolute Pressure Measurement

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# Instruction Manual

**Document Number: IM-APT 3200**




www.autroltransmitters.com

# APT 3200 Smart Pressure Transmitter

This manual is made so that general user can help to install and operate APT 3200 Smart Pressure Transmitter efficiently.
Before handling APT 3200 transmitter, all users have to be fully aware of it.

Information on this manual can be changed without an advance notice

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Appendix II
275 Hart Communicator User Guide for APT 3200 Smart Pressure Transmitter

Appendix III
APT User Guide for APT 3200 Smart Pressure Transmitter

# Chapter 1 Introduction

The APT 3200 Smart Pressure Transmitter is correctly calibrated at the factory before shipment. To ensure correct and efficient use of the instrument, please read this manual thoroughly and fully understand how to operate the instrument before operating it

① The contents of this manual are subject to change without prior notice.
② All rights reserved. No part of this manual may be reproduced in any form without Autrol's written permission.
③ If any question arises or errors are found, or if any information is missing from this manual, please inform the nearest Autrol's sales office.
④ The specifications covered by this manual are limited to those for the standard type under the specified model number break-down and do not cover custom-made instrument.
⑤ Please note that changes in the specifications, construction, or component parts of the instrument may not immediately be reflected in this manual at the time of change, provided that postponement of revisions will not cause difficulty to the user from a functional or performance standpoint.

## 1.1 Using This Manual

The Chapters in this operating manual provide information on installing, operating, and maintaining devices from the AUTROL Model APT 3200 Smart Pressure Transmitter. The Chapters are organized as follows.

### Chapter 2 Handling Cautions

This chapter consists of core information for installing APT3200 on operating place after buying it. Chapter 2 provides instruction on commissioning and operating Model APT-3200 Smart Pressure Transmitters. Information on software functions, configuration parameters, and on-line variables are also included.

### Chapter 3 Transmitter Functions

Chapter 3 contains in consideration of handling Model APT3200 Smart Pressure Transmitters.

### Chapter 4 Installation

Chapter 4 contains mechanical, environment consideration and electrical installation instructions on the Model APT3200 Smart Pressure Transmitters.

### Chapter 5 On-line Operation

Chapter 5 describes the configuration the parameter how to use variety of the Model APT3200 Smart Pressure Transmitters' software fucntion and configuration. See the following list for the details.

① Regulations of circuit's Input/Output characteristics; Sensor or Output Trim
② Changed of output characteristic; Range Configuration, Output Type, Damping,Unit
③ Changed of general data; Tag No.,Date,Message etc.

### Chapter 6 Maintenance

Chapter 6 contains hardware diagnostics ,troubleshooting and maintenace task.



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## 1.2 Overview of Transmitter

Autrol® Smart Pressure Transmitter based in a microprocessor is the pressure transmitter, has a designed capacitance sensor optimized for draft measurement. APT-3200 has a true draft analog range from 0 to 20mA offering that features that a pressure range or after convert the analog range to HART (Communication) digital signal transmit for control systems like DCS, PLC. This Model has explosion protected type (Intrinsically Safety) and high precision, better reliability and is available on digital communication for the use remotes communication system. This transmitter is enabled in HART communication with Host, HHT (HART Hand-Held Terminal), PC Configurator, or PDA Configurator. Thus, transmitter various variables in host is enable to be changed, configured and tested calibrated by users. For the HART Communication between DC Power Supply of 24 Vdc and Transmitter has to terminate 250~ 550 Ohm as loop resistance by series connection.

## 1.3 Software Compatibility

Autrol® Smart Pressure Transmitter's software is implemented and complemented if necessary. Uses of the transmitter will not be a compatibility software is contained in the host of the HHT(Model 275 HART Communicator). In this case contact us for software DD(Device Descriptor) to be able to use with the transmitter, you must to use loading in HHT, etc.
There may be some differences on supported functions as to Firmware Revision of transmitter. This manual is based on Firmware Revision 58. Function deviations as to firmware Revision are same as under box

| FUNCTION | Function Supports | | | |
|---|---|---|---|---|
| | ZERO / SPAN Botton | | Autrol PC/PDA | HART 275/375 |
| | Before Rev. 58 | Rev. 58 | | |
| ZERO/SPAN | ● | ● | ● | ● |
| ZERO TRIM | ● | ● | ● | ● |
| ZERO Adj | ● | ● | ● | ● |
| Units set | × | ● | ● | ● |
| Range set | × | ● | ● | ● |
| Damping set | × | ● | ● | ● |
| LCD Decimal set | × | ● | ● | Δ |

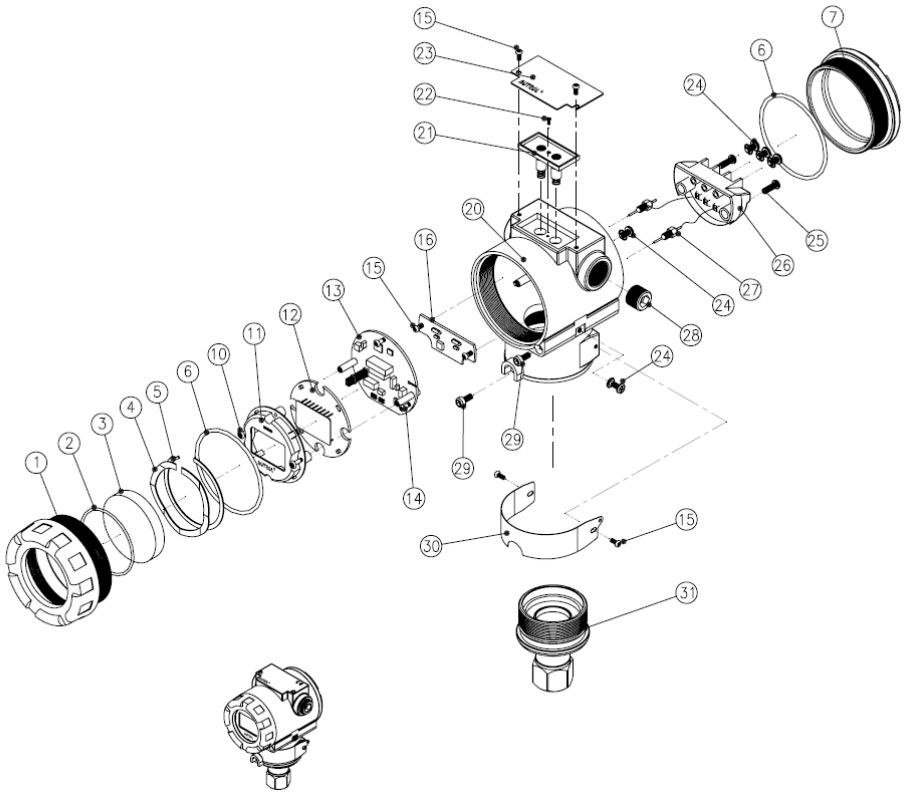
● : Supported.

× : Not Supported

Δ : Supported but update required

# 1.4 Transmitter Components

The components and figure of Autrol® Smart Pressure Transmitter is suggested on the next page. Follow the precedure described on figure 1-1.



| P.N | PART NAME | P.N | PART NAME |
|---|---|---|---|
| 1 | FRONT COVER | 20 | HOUSING |
| 2 | O-RING/GLASS | 21 | ZERO/SPAN ADJUSTMENT SWITCH |
| 3 | GLASS | 22 | SCREW/ SWITCH COVER |
| 4 | WAVE WASHER | 23 | NAMEPLATE |
| 5 | C-SNAP RING | 24 | SCREW |
| 6 | O-RING/COVER | 25 | SCREW/TERMINAL BLOCK |
| 7 | REAR COVER | 26 | TERMINAL BLOCK |
| 10 | SCREW/LCD | 27 | EMI FILTER |
| 11 | LCD COVER | 28 | PIPE PLUG |
| 12 | LCD BOARD | 29 | SCREW |
| 13 | MAIN BOARD | 30 | TAGPLATE |
| 14 | SCREW/MAIN BOARD | 31 | SENSOR MODULE |
| 15 | SCREW | | |
| 16 | TERMINAL BOARD | | |

[Figure 1-1 Transmitter Exposed View and Components]

# *Chapter 2 Handling Cautions*

This chapter consists of cautions for transmitter handling and storage, selection of installation locations, insulation and explosion structure, etc.

[Quick Reference Manual]

| Step | Job | Job Details | Instrument |
|---|---|---|---|
| 1 | Unpacking | - Unpack transmitter packing | |
| 2 | Model and Specifications Check | - Make sure whether the delivered transmitter is same as options attached on its nameplate | |
| 3 | Storage | - Places not exposed to water, non-vibration and non-impact area<br>- Ambient temperature 25 deg C and relative humidity 65% RH | |
| 4 | Calibration on a Calibration Room | - Configuration of Range, Zero/Span, Unit, Tag, Damping Time, Transfer Function, DA Trim and other parameters | - HHT<br>- Pressure Source (requested)<br>- Galvanometer |
| 5 | Installation Locations | - Where ambient temperature is not fluctuated<br>- Where corrosion happens by chemical materials, etc.<br>- Where vibration and impact is not severe<br>- Where non-explosion area is matched on explosionproof regulations<br>- Where maintenance is very easy | (Engineering) |
| 6 | Mechanical Considerations | - Where transmitter can be handled easily<br>- Be cautious not leaking the pressure. | (Engineering) |
| 7 | Electrical Considerations | - Connect 24 Vdc (Power Supply is 11.9 Vdc – 45 Vdc)<br>- For HART communication, total resistance on transmitter terminal loop should be 250 – 550 Ohm. | (Engineering) |
| 8 | Mounting and Installation | - For mounting transmitter, an appropriate bracket should be used.<br>- Transmitter should be fixed well against swing. | (Mounting and Installation) |
| 9 | Calibration on Spot | - Sensor Zero Trim has to be done after ten seconds, namely, differential pressure become zero and stabilized.<br>- Make sure that PV value of transmitter is zero and current is 4 mA. | HHT or Zero/Span button |
| 10 | Pressure | - Do not apply the regulated differential and line pressure.<br>- Close equalizing valve of 3 valve manifold, Then, open stop valve on high and low side slowly and simultaneously. | (Applying pressure) |
| 11 | Operation | - Make sure whether transmitter operates well or not | Eye or HHT |

## 2.1 Unpacking

When moving the transmitter to the installation site, keep it in its original packaging. Then, unpack the transmitter there to avoid damage on the way.

## 2.2 Models and Specifications Check

The model name and specifications are indicated on the nameplate to the case. Please check your specification and wanted model.

## 2.3 Storage

The following precautions must be observed when storing the instrument, especially for a long period.

(1) Select a storage area that meets the following conditions:
(a) It is not exposed to rain or water.
(b) It suffers minimum vibration and shock.
(c) If possible, it is preferable at normal temperature and humidity (approx. 25°C, 65% RH).

However, it has an ambient temperature and relative humidity within the following ranges.
● Ambient Temperature: -40 ~ 85°C (without LCD module)
-30 ~ 80°C (with LCD module)
* General Use -20 ~ 60°C (CSA Explosionproof)
● Relative Humidity: 5% ~ 98% RH (at 40°C)

(2) When storing the transmitter, repack it as nearly as possible to the way it was packed when delivered from the factory.

(3) If storing a transmitter that has been used, thoroughly clean diaphragm surfaces (the pressure-detector sections) of the diaphragm seals, so that no measured fluid remains on them. In addition, make sure before storing that the pressure-detector and transmitter assemblies are securely mounted.

## 2.4 Selecting Installation Locations

The transmitter is designed to withstand severe environmental conditions. However, to ensure stable and accurate operation for many years, the following precautions must be observed when selecting an installation location.

(1) 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 insulation or ventilation.

(2) Corrosive Atmosphere
Avoid installing the transmitter in a corrosive atmosphere. If the transmitter must be installed in a corrosive atmosphere, there must be adequate ventilation as well as measures to prevent intrusion or stagnation of rainwater in conduits. Moreover, there should be appropriate ventilation preventing corrosion by rain gathered on conduct.

(3) Shock and Vibration
Select an installation site suffering minimum shock and vibration (although the transmitter is designed to be relatively resistant to shock and vibration)

(4) Installation of Explosion-protected Transmitters
Explosion-protected transmitters can be installed in hazardous areas according to the gas types for which they are certified.

(5) Select a place where transmitter maintenance is very easy.

## 2.5 Calibration on Spot after Installation

(1) Sensor Zero Trim should be done after transmitter is installed on spot, because zero point is not accurate as to mounting status.

(2) For Sensor Zero Trim, make differential pressure of transmitter for zero in advance. Then, make Sensor Zero Trim after pressure is sufficiently stabilized (after approximately 10 seconds).

(3) There are two ways for making differential pressure for zero. One is to apply zero differential pressure (making same pressure both high and low side pressure). The other is to close Hign and Low side of stop valve of 3 valve manifold and to open its equalizing valve.

(4) Sensor Zero Trimming is to use HHT (275 calibrator), PC or PDA configurator, and to use Zero/Span button. Make sure all details on this manual.

(5) Refer to online Operation for configuring another parameters except Sensor Zero Trim

## 2.6 Pressure Connections

**▲ Warning**

◈ Instrument installed in the process is under presure. Never loosen or tighten the flange bolts as it may cause dangerous spouting of process fluid.

◈ If the accumulated process fluid may be toxic or otherwise harmful, take approriate care to avoid contack with the bodym of inhalation of vapors even after dismounting the instrument from process line for maintenance.

The following precautions must be observed in order to safely operate the transmitter under pressure.
(1) Never apply a pressure higher than the specified maximum working pressure.
(2) Confirm the option of pressure connection of transmitter. Necessarily use standardized and quality-approved parts.
(3) In case of being needed by hard circumstances and regulations, there should be seal equipment for leakage.

## 2.7 Waterproofing of Cable conduct Connections

Apply a non-hardening sealant (silicone or tape, etc.) to the threads to waterproof the transmitter cable conduct connections.

## 2.8 Restrictions on Use of Radio Transceivers

**▲ Warning**

◈ Although the transmitter has been designed to resist high frequency electrical noise, if a radio transeiver is used near the transmitter of its external wiring, the transmitter may be affected by high frequency noise pickup. To test for such effects, bring the transceiver in use slowly from a distance of several meters from the transmitter, and observe the measurement loop for noise effects. Thereafter, always use the transceiver outside the area affected by noise.

## 2.9 Insulation Resistance Test and Dielectric Strength Test

Since the transmitter has undergone insulation resistance and dielectric strength tests at the factory before shipment, normally these tests are not required. However, if required, observe the following precautions in the test procedures.

(1) Do not perform such tests more frequently than is absolutely necessary. Even test voltages that do not cause visible damage to the insulation may degrade the insulation and reduce safety margins.

(2) Never apply a voltage exceeding 500 Vdc (100 Vdc with an internal lightening protector) for the insulation resistance test, nor a voltage exceeding 500V AC (100V AC with an internal lighting protector) for the dielectric strength test.

(3) Before conducting these tests, disconnect all signal lines from the transmitter terminals. Perform the tests in the following procedure.

(4) Insulation Resistance test

(a) Short-circuit the + and - SUPPLY terminals in the terminal box.

(b) Turn OFF the insulation tester. Then connect the insulation tester plus (+) lead wire to the shorted SUPPLY terminals and the minus (-) lead wire to the grounding terminal.

(c) Turn ON the insulation tester power and measure the insulation resistance. The voltage should be applied short as possible to verify that insulation resistance is at least 20MΩ.

(d) After completing the test and being very careful not to touch exposed conductors disconnect the insulation tester and connect a 100kW resister between the grounding terminal and the short-circuiting SUPPLY terminals. Leave this resistor connected at least three second to discharge any static potential. Do not touch the terminal while it is discharging.

(5) Dielectric Strength Test

(a) Short-circuit the + and - SUPPLY terminals in the terminal box.

(b) Turn OFF the dielectric strength tester. Then connect the tester between th shorted SUPPLY terminal and the grounding terminal. Be sure to connect the grounding lead of the dielectric strength tester to the ground terminal.

(c) Set the current limit on the dielectric strength tester to 10mA, then turn ON the power and gradually increase the tester voltage from '0' to the specified voltage.

(d) When the specified voltage is reached, hold it for one minute.

(e) After completing this test, slowly decrease the voltage to avoid any voltage surges.

# 2.10 Installation of Explosion Protected Type Transmitters

## 2.10.1 KOSHA Certification

Caution for KOSHA Flameproof is following type.

[Note1] Model APT3100 diaphragm sealed for potentially explosive atmosphere:

- Type of Protection and Marking Code: Ex d ⅡC T6
- Temperature Class: T6
- Ambient Temperature: -20 ~ 60'C
- Process Temperature: Max. 80'C

[Note2] Electrical Data
- Supply Voltage: Maximum 45 Vdc
- Output signal: 4 ~ 20mA, maximum 22mA

[Note3] Installation
- All wiring shall comply with local installation requirement.
- The cable entry devices shall be of a certified flameproof type, suitable for conditions of use.

[Note4] Operation
- Wait one minute after power -disconnection, before opening the enclosure.
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

[Note5] Maintenance and Repair
- The instrument modification or parts replacement by other than authorized representative of Autrol is prohibited and will void KOSHA Flameproof.

## 2.10.2 KEMA / ATEX Certification

ATEX Certification number : KEMA07ATEX0103

CE 0344  II 2 G

Note 1. Model APT3100 for potentially explosive atmosphere
- Ex d IIC T6...T4
- Operating Temperature : -20℃ ≤ $T_{amb}$ ≤ +60°C
- T6 for process ≤ 85°C;
- T5 for process ≤ 100°C;
- T4 for process ≤ 130°C;

Note 2. Electrical Data
- Supply Voltage : 42 Vdc Max
- Output Signal : 4 to 20 mA + HART

Note 3. Electrical Connection : 2 x 1/2-14NPT Female

Note 4. APT3100 ATEX Certification is according to the below standards
EN 60079-0 : 2006
EN 60079-1 : 2007

Note 5. Installation

- All wiring shall comply with local installation requirement.
- The cable glands and blanking elements shall be of a certified flameproof type, sutable for the condition of use and correctly installed. Also those devices should be endured at the 130°C.
- Housing Ground must be followed to "local electrical codes". The most efficient ground procedure is to connect directly to the earth at least impedance.
- How to Housing Ground:
- * Internal Ground Connection: Internal ground connection screw is located in terminal in housing, the screw can be identified as ground sign.
- * External Ground Assembly: This is located in the right side of housing and identified as ground sign. (For grounding use a cable lug)
- When use tubing, Stopping boxes must be connected with the wall of housing directly.
- Tubing is installed a minimum of 5 threads.
- Sensor is to be threaded a minimum of 7 threads and prevented from turing by tightening the housing rotation set screw.
- Do not disassemble flameproof Joints but in an unavoidable case to disassemble it or need the specification of flameproof Joints, contact the manufacturer before doing.

Note 6. Operation

- WARNING-DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT
- Take care not to generate mechanical spark when access to the instrument and peripheral devices in hazardous location.

Note 7. Maintenance and Repair

- The instrument modification or parts replacement by other than authorized representative of Autrol is prohibited and will void KEMA/ATEX Explosion-proof / Flame-proof.

## 2.11 EMC Conformity Standards

**EMI (Emission): EN55011**
**EMS (Immunity): EN50082-2**

Autrol recommends customer to apply the Meta l conduct Wiring or to upset he twisted pair Shield Cable for signal wiring to conform the requirement of EMC Regulation, when customer installs AUTROL Series Transmitters to the plant.

# Chapter 3 Transmitter Functions

## 3.1 Overview

This Chapter contains information on operating Model APT3200. Tasks that should be performed on the bench prior to installation are explained in this chapter.

## 3.2 Safety Message

Procedures and instructions in this chapter may require special precautions to ensure the safety of the personal performing the operations. Information that raises potential safety issues is indicated by warning symbol(▲). Refer to the following safety messages before performing an operation preceded by this symbol.

## 3.3 Warning

| ▲ Warning |
|---|
| **Explosion can result in death or serious injury:**<br>◈ Do not remove the transmitter covers in explosion environments when the circuit is alive.<br>◈ Check transmitter to install accroding to Intrinsically safe regulation before HHT connect to Transmitter in explosive environment.<br>◈ Transmitter covers must be fully engaged to meet explosionproof requirements. |

| ▲ Warning |
|---|
| **Electrical can result in death serious injury:**<br>◈ The qualification which is educated only the person whom it prepares will be able to establish the transmitter. |

| ▲ Warning |
|---|
| **Electrical can result in death serious injury:**<br>◈ Avoid contact with the leads and terminals. High voltage that may be present on leads can cause electrical shock. |

## 3-4. Fail Mode Alarm

AUTROL® Smart Pressure Transmitter automatically and continuously performs self-diagnostic routines. If the self-diagnostic routines detect a failure, the transmitter drives its output outside of the normal saturation values. The transmitter will drive its output low(down) or high(up) based on the position of the failure mode alarm jumper . See Table 3.1 for Output values.

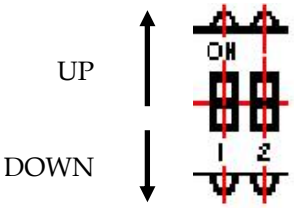
[Table 3-1 Standard Alarm and Saturation Value]

| Level | 4~20mA Saturation | 4~20mA Alarm |
|---|---|---|
| Low/Down | 3.9 mA | ≤ 3.75 mA |
| High/Up | 20.8 mA | ≥ 21.75 mA |

Fail Mode Select Jumper Switch has in LCD Module and Main CPU Module and Jumper Switch Line is connected circuital. In case of Not LCD Module, we can use CPU Module's Fail Mode Select Jumper Switch and In case of LCD Module we can use LCD Module's Jumper Switch. In this case, CPU Module is selected "Down" side. No selected we can select "Down" side.
(Jumper Select Switch is followed in Figure 3-2, 3-3)

| Select Fail Mode | Both LCD Module and CPU Module | | Only CPU Module |
|---|---|---|---|
| | CPU Module | LCD Module | CPU Module |
| Fail Down | Down | D | D |
| Fail Up | Down | U | U |
| | Up | U or D | |

< Fail Mode Selection DIP Switch of CPU Module >




1. WR_EN (EEPROM Write Enable)
   DOWN : ENABLE
   UP : DISABLE
2. Fial Mode(Alarm)
   DOWN : LOW
   UP : HIGH

< Fail Mode Selection Jumper Switch of LCD Module >

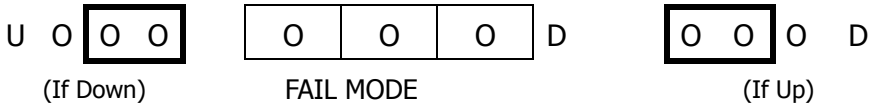



Figure 3-1. Fail Mode and EEPROM-Write Selection Jumper Switch




[Figure 3-2 LCD Module's Fail Mode Select Jumper]

## 3-5. EEProm-Write Enable / Disable Mode Switch

There is the EEPROM (Electrically Erasable Programmable ROM) restoring various configuration variables in Transmitter. For protect to change configuration variable data in software, hardware side there is Write-Protect Mode and Jumper Switch selected it segmented "EEP-Write DIS / EN " in Main CPU Module. Thus if you connect Jumper to DIS you can't change configuration data in EEPROM, when you connect Jumper to EN you can change configuration data in EEPROM. No connected Jumper, it is classified EN. At the factory before shipment, it is configured "EN". (Following figure 3-3)

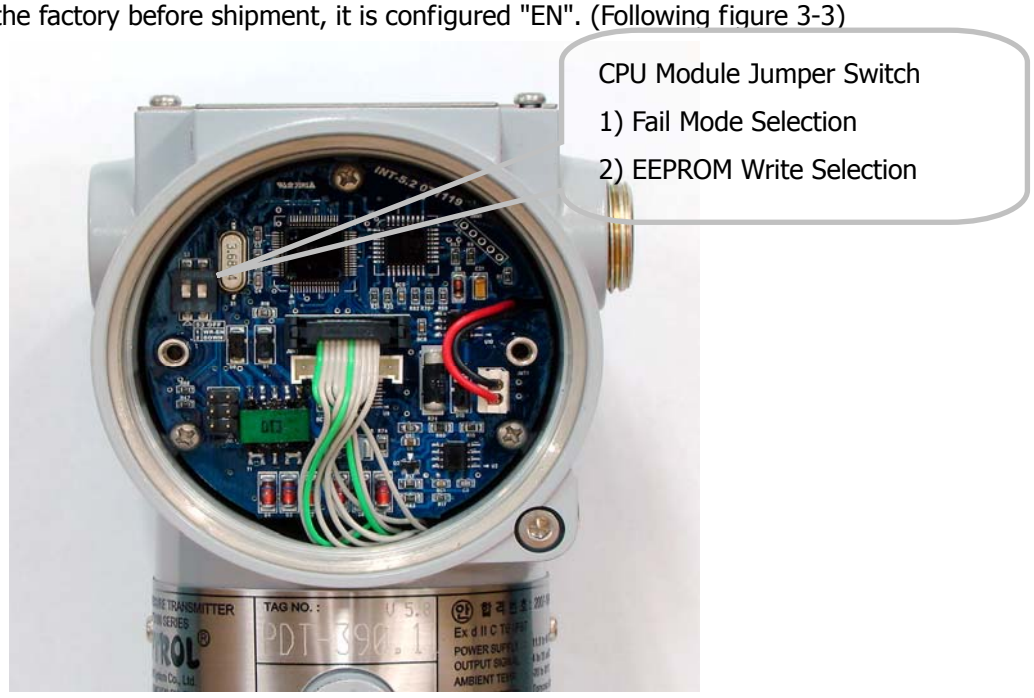



Figure 3-3. CPU Module Fail Mode, EEPROM-Write Selection Jumper Switch

There are two security methods in APT 3200. Following this.

(1) Security Jumper: protect to writing configuration parameters of transmitter.

(2) Physical removing Zero and Span Magnetic Buttons of Transmitter: you are not able to regulate Zero and Span in Local.

[Notification] If EEP-Write is not connected, it is classified Security Off state.

### 3.5.1 Security Jumper (EEPROM Write Protect)

Protect to change Configuration Parameter of transmitter to Write Protect Jumper.

### 3.5.2 Zero and Span Magnetic Button

To remove Magnetic Button, you can't configure Zero and Span in Local.

.

## 3.6 Configuration of Alarm and Security Jumper Procedures

To change Jumper's position, follow this.

(1) If install the transmitter, cutoff power.

(2) Open the housing front side covers. In case Power Supply, don't open the covers of transmitter

(3) After turn off Jumper, turn on at wanted position.

(4) Close the housing covers. You must fully engage to meet explosion proof requirements

## 3.7 Configuration of Zero and Span Procedures

There are ZERO and SPAN Buttons when the nameplate opened of the transmitter. For the previous version of transmitter, ZERO, SPAN, ZERO TRIM and ZERO ADJ. functions were supported using ZERO / SPAN Buttons. But, from the version of 58, Units, Range, Damping, LCD decimal set functions are included. Also, the procedure is changed as below.

.

But ZERO and SPAN set function is same as before Revision of 58.

Using functions which supported by buttons,

(1) Zero/Span Button mounted in Transmitter.

(2) HHT Configurator by HART Communication (following chapter 4)

** Refer to "275 Hart Communicator User Guide" on Appendix II for details.

Zero/Span configuration process by Zero/Span Button of transmitter is following this.

(1) Release to both sides bolts of Name Plate in the upper part of transmitter and if push down right of Name Plate, appear to Zero/Span Button (following figure 3-4)

(2) Zero Configurations

Set the current process value for Lower Range Value (4 mA).

Put purposed pressure for zero over 10 seconds and push Zero Button over 5 seconds. Then show

"Zero" in LCD window. After checking this message, take off the finger from the button. Push the button over 3 seconds after 1 second passes. Then show "-ZE-" in LCD window. By this message, all zero configurations have finished. If the works has failed, show "SPEr" or "SEtE" in LCD window.

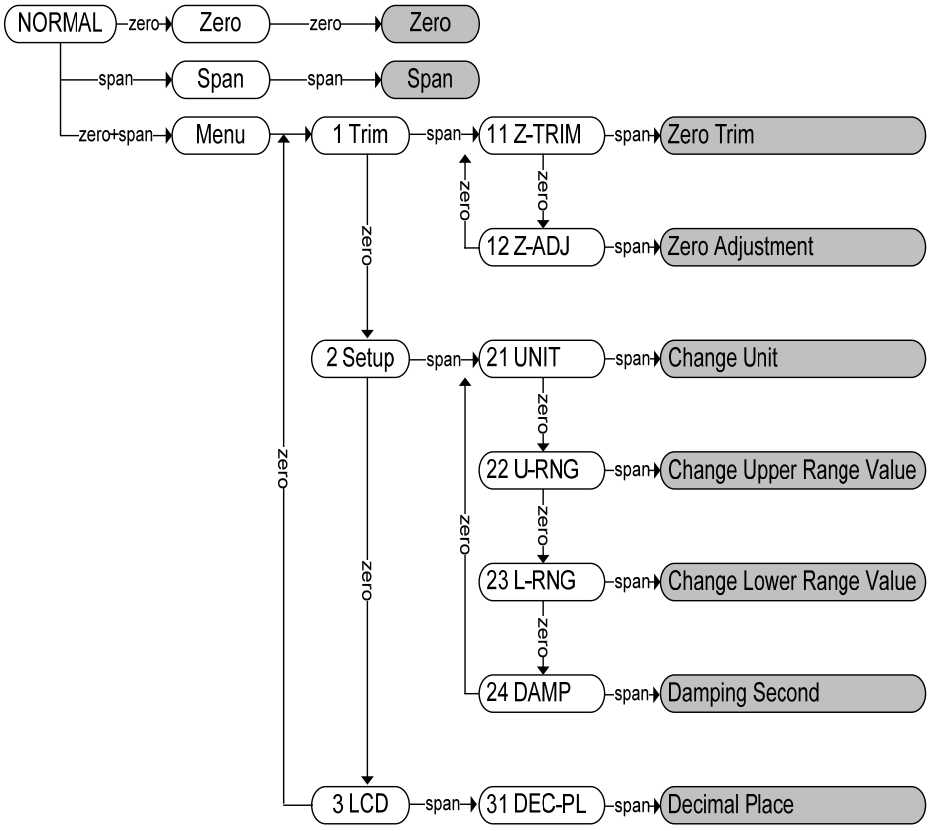
(3) Span Configurations

Set the current process value for Upper Range Value (20 mA).

Put purposed pressure for zero over 10 seconds and push Span Button over 5 seconds. Then show "SPAN" in LCD window. After checking this message, take off the finger from the button. Push the button over 3 seconds after 1 second passes. Then show "-SP-" in LCD window. By this message, all zero configurations have finished. If the works has failed, show "SPER" or "SET" in LCD window.

- Please refer to Appendix 1 for the button error and LCD display message

The other functions which supported by ZERO / SPAN Buttons are available as below.




[Menu Tree of ZERO+SPAN Button Function]

(1) Moving between menus : Zero

(2) Enter or moving to sub menu : Span

(3) Moving to top menu : Zero+Span

• Put the button for 3 seconds to execute each function. After 3 seconds to put the ZERO+SPAN button, LCD Display will be changed from Menu to Trim. To see next menu, put the Zero Button for 3 seconds and then Setup Menu will be displayed. Use Zero button to move down to the next directory.
• Put the Span button to select the displayed menu. The same procedure will be applicable for the sub menus.

Caution : After about 30 seconds without any action, the button function will be finished.

• How to put numerical value

① Functions needed to put numerical value : 12 Zero Adjustment, 22 Change Upper Range Value, 23 Change Lower Range Value, 24 Damping Second

② How to put numerical value : Firstly, select a increasing rate(10n) and then, change the each decimal value to increase or decrease as wanted.

③ For example, to select 3810 : Select increasing rate as 1000 -> Increase 3 times as 1000 -> Select increasing rate as 100 -> Increase 8 times as 100 -> Select increasing rate as 10 -> Increase 1 time as 10

④ To select the increase / decrease steps : SelInc Message will be displayed on the bottom of LCD. Select step to put the Zero button : The decimal value will be changed whenever put Zero button.
After set the wanted step, put the span button to execute the item no. 2

⑤ How to set the required value using Zero, Span buttons. : VALUE Message will be displayed on the bottom of LCD window.
When put the Zero button, the step will be increased as the set on the item 1.
When put the Span button, the step will be decreased as the set on the item 1.
After setting, execute again the item 1 to put Zero+Span button.

⑥ Set the final value to repeat ④, and ⑤
After setting the final value, finish the procedure to put the Zero+Span button while executing

• Exercises for each function

- ZERO TRIM
  - Executing the menu to put ZERO+SPAN button.
  - Moving to the sub directory to put Span button when 1 TRIM message appear.
  - Executing Zero Trim Function to put the Span button when 11 Z-TRIM message appear.

- Zero Adjustment : To change the PV value as 14
  - Executing the menu to put ZERO+SPAN button.
  - Moving to the sub directory to put Span button when 1 TRIM message appear.
  - Moving to the sub directory to put Zero button when 11 Z-TRIM message appear.
  - Executing Zero Adjustment function to put Span button when 12 Z-ADJ message appear.
  - When SelInc message appear, put the Zero button repeatedly until appearing 10.0 message on LCD. And then, set the value to put Span button.
  - When VALUE message appear, change the LCD value 10.0 as to put Zero button, and then put Zero+Span button.
  - When SelInc message appear, change the LCD value 1.0 as to put Zero button, and then set the value to put Span button.
    Put the Zero+Span button after change the LCD value 14.0 when VALUE message appear.
  - To save the setting value to put Zero+Span button when SelInc message appear.

- Change Unit
  - Executing the menu to put Zero+Span button.
  - Moving to next menu to put Zero button when 1 TRIM message appear.
  - Moving to sub directory to put Span button when 2 SETUP message appear.
  - Executing the Change Unit function to put Span button when 21 UNIT message appear.
  - Saving the setting value to put Span button when the wanted value is displayed on the botton of LCD to put Zero button repeatedly.

- Change Upper Range Value
  - Executing the menu to put Zero+Span button.
  - Moving to the next menu to put Zero button when 1 TRIM message appear.
  - Moving to the sub directory to put Span button when 2 Setup message appear.
  - Moving to the next menu to put Zero button when 21 Unit message appear.
  - Executing the function to put Span button when 22 U-RNG message appear.
  - The procedure of setting value is same as Zero Adjustment.

- Change Lower Range Value
  - Executing the menu to put Zero+Span button.
  - Moving to the next menu to put Zero button when 1 TRIM message appear.
  - Moving to the sub directory to put Span button when 2 Setup message appear.
  - Moving to the next menu to put Zero button when 21 Unit message appear.
  - Moving to the next menu to put Zero button when 22 Unit message appear.
  - Executing the function to put Span button when 23 L-RNG message appear.
  - The procedure of setting value is same as Zero Adjustment.

- Decimal Place
  - Executing the menu to put Zero+Span button.
  - Moving to the next menu to put Zero button when 1 TRIM message appear.
  - Moving to the next menu to put Zero button when 2 Setup message appear.
  - Moving to the sub directory to put Span button when 3 LCD message appear.
  - Executing the function to put Span button when 31 DEC-PL message appear.

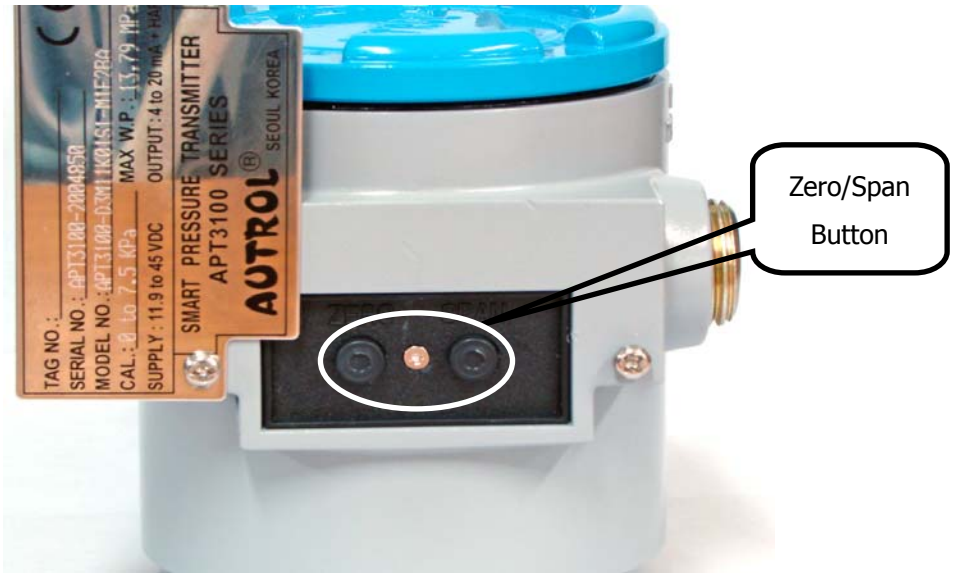
When Decimal Place function excuted, the type of decimal place will be appear on the secondline of LCD as below.

| Display | Explanation | Max. Value | Remark |
|---|---|---|---|
| AUTO | Target value will be displayed automatically (Former Display Type) | 99999 | |
| 5-0 | None decimal place | 99999 | |
| 4-1 | Display one decimal place | 9999.9 | |
| 3-2 | Display two decimal place | 999.99 | |
| 2-3 | Display three decimal place | 99.999 | |
| 1-4 | Display four decimal place | 9.9999 | |

- Firstly, 0.0 will be display on the first line of LCD.
- Decimal place will be change whenever put the Zero button. Saving the setting value to put Span button after select the required decimal palce.
- The set value will be applicable for displaying PV value and Engineering value. 3-2 format will be displayed for mA and % regardless any setting.
- LCD_OV message and current setting Unit will be displayed when over the LCD limitvalue.



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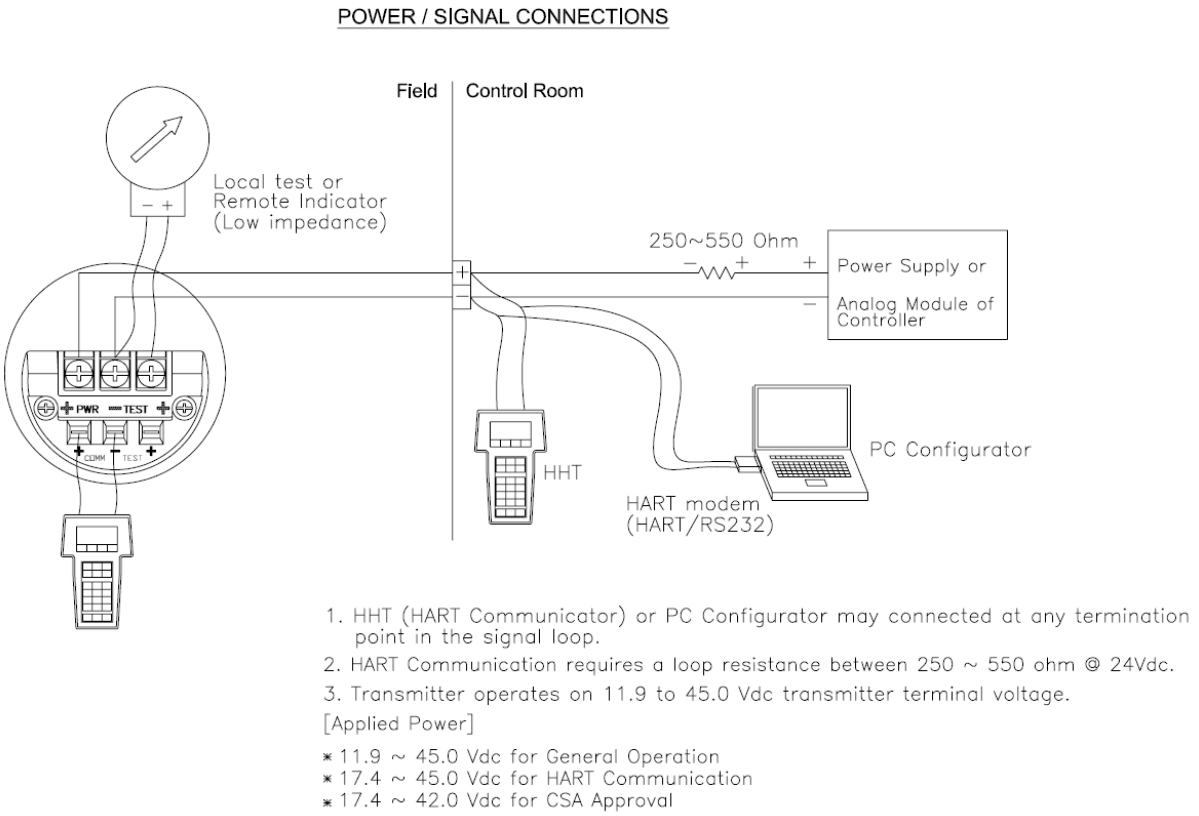



[Figure 3-4 Transmitter's Zero/Span configuration Button]

# 3.10 Commissioning on the bench using HHT

Commissioning consists of testing the transmitter, testing the loop, and verifying transmitter configuration data. APT-3100 Pressure Transmitter may be commissioned using HHT of HART supported either before of after installation.

▲ If you connect "TEST" pin, it's not communicated. If it doesn't exposed electronics circuits after install, you must connect all Jumper of transmitter in the shop commissioning level. Analog output of transmitter is 4~20 mA, thus it requires Power Supply at 11.9 V ~ 45 Vdc and Ampere meter for measuring output current. You must connect 250~550 ohm resistor in Power Loop for HART Communication and HHT or PC Configurator.




[Figure 3-5 Connection the transmitter to HHT]

# Chapter 4 Installation

## 4.1 Overview

The information in this chapter 4 covers installation considerations. Dimensional drawings for Model APT-3100 variation and mounting configuration are included in this chapter.

## 4.2 Safety Message

Procedures and instructions in this chapter may require special precautions ensure the safety of the personnel performing the operation. Information that raises potential safety issues is indicated by a warning symbol(▲). Refer to the following safety messages before performing an operation proceeded by this symbol.

## 4.3 Warning

| ▲ Warning |
| --- |
| Explosion can result in death or serious injury :<br>◈ Do not remove the transmitter covers in explosion environments when the circuit is alive.<br>◈ Check transmitter to install accroding to Intrinsically safe regulation before HHT connect to Transmitter in explosive environment.<br>◈ Check environment is fully engaged to the transmitter's harzadous location certificate<br>◈ Both transmitter covers must be fully engaged to meet explosionproof requirements |

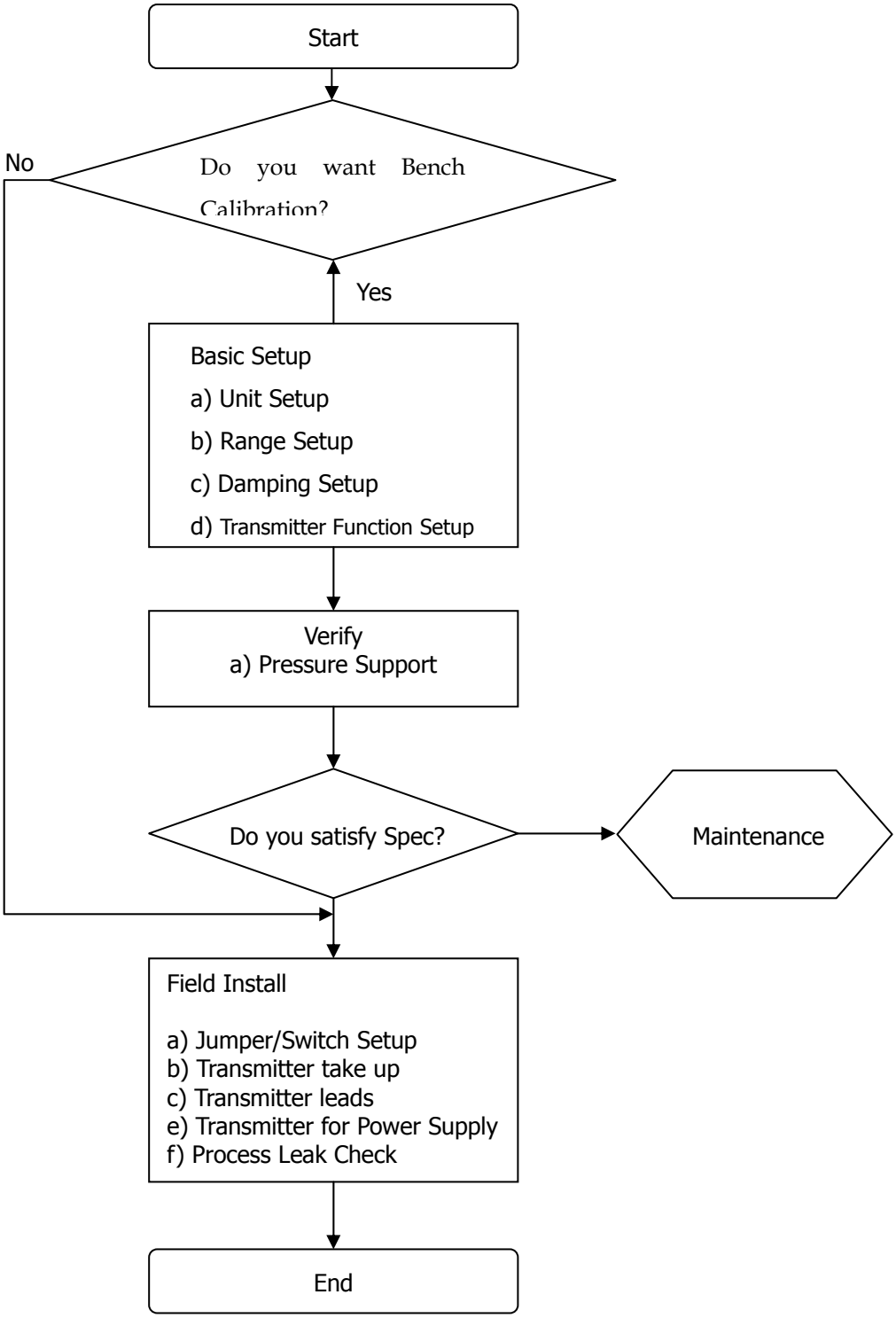
| ▲ Warning |
| --- |
| Electrical can result in death serious injury:<br>◈ The qualification which is educated only the person whom it prepares will be able to establish the transmitter. |

| ▲ Warning |
| --- |
| Process leaks can cause death or serious injury:<br>◈ Install and tighten before applying pressure. Ift you don't llike this, it can cause process leaks. |

| ▲ Warning |
| --- |
| Electrical shock can result in death or serious injury. If you install high voltage environment or false condition, power line and lead will be apprered high voltages.<br>◈ Avoid contact with the leads and terminals. |

# 4.4 Commissioning on the bench with Hand-Held Terminal

After and before installation, You can handle upon commissioning. However, for correctly handling and knowing the function, before installation you have to handle upon commissioning on the bench with Hand-Held Terminal.




[Figure 4-1 Installation Flow Chart]



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# 4.5 General Considerations

This transmitter uses the Piezo-Registive pressure sensor. If it changes the pressure sensor, capacitive pressure is changed minutely.
It transfer electrical signal minutely to 4~20mA analog signal. Thus mount the transmitter close to the process and use a minimum of piping to achieve best accuracy. However keep in mind the need for easy access, safety of personnel, practical field calibration, and a suitable transmitter environment.
In general, install the transmitter so as to minimize vibration, shock, and temperature fluctuations.

# 4.6. Electrical Considerations (Power Supply)

The transmitter housing composes of two parts. One side is electronics circuit, and other side is Terminal Block. Terminal Block side is transmitter's frontside and is indicated " Field Terminal" in transmitter housing external. Open this side's housing cover, there is Terminal Block in housing inside. Consider to this Terminal Block polarity, connect to Transmitter's Power Supply. Configurator supported HART connects to "COMM" pin in Power Supply downside. In the field Indicator connects to "TEST" pin.

## 4.6.1 Power Supply

In the transmitter's power supply Input Current Voltage is currently DC voltage between DC 11.9 volt ~ 45 volt and power supply's ripple is not up to 2%. Loop resistance means all resistor sums in loop.
In case of using Intrinsic Safety Barrier, same includes resistor of barrier.

Max. Loop Resistance [Ω] = (E-11.9) [vdc] / 0.022 [mA]

Here, loop resistance is preferable at 250 ~ 550Ω (24 Vdc) for the HART communication.

# 4.7. Wiring

## 4.7.1 Caution of Wiring

(1) Install cable in the far from electrical noise resources like capacitive transformer, motors power supply as soon as possible.
(2) Before wiring put out electrical lead connect cap.
(3) All screw-lined portions paste suture for waterproof. (It promotes the silicon type that is not hardened.)
(4) Don't lead signal line to power line in same duct for no received noise signal.
(5) The explosion-proof transmitter in order to maintain the explosion-proof quality of the corresponding transmitter effectively follows in the demand explosion-proof specification that is provided and must be lead.

## 4.7.2 Selecting the Wiring Materials

(1) Use over 600V PVC shielded wire or standard lead line of same class or cable. (In order to ensure proper communication use 24 AWG or lager wire, and do not exceed 1500 meters.)
(2) Use the shielded wire in electrical noise effected area.
(3) At the higher or lower temperature area than ambient temperature it uses the wire or the cable that is suitable like that temperature.
(4) You have to use suitable wire, cable in environment like oil, solvent, toxic gas or liquid.
(5) Terminal process of lead line must use to not soldered terminal lug. Recommend isolating lead end terminal using contract tube.

## 4.7.3 Connections of External Wiring to Transmitter Terminal Box

Wiring method is following this.
▲ (1) Open the housing cover indicated "FIELD TERMINAL". In explosion environment when circuit is powered on, don't open the covers.
▲ (2) Connect the power supply in the terminal indicated "+PWR"(left terminal) and "-" power supply in the central terminal. Don't connect "+" power supply in "+" terminal of the point indicated "TEST". It will be damage to test diode used to connecting TEST terminal.
(3) Seal and close the non-using conduct Connection Part for severe humidity and explosion on the terminal box of housing.
(4) Transmitter power is supplied to Signal Wiring. So, don't install near to Signal Wiring with Power Wiring or near to Power Apparatus. In case of ground signal, ground the signal loop's one side and other side is not grounded. Promote to ground "-" side of power.
(5) For the better adjustment completely turn Screw terminal.
(6) Again close the transmitter cover. Specially in case of using in explosion area, you must to satisfy requirement about explosion.
[Note]
Don't supply high voltage (AC power) in transmitter leads. It can be caused damages to transmitter.
(7) You have to connect 250~600 W Loop Resistor in Current Loop(between Power Supply and Transmitter) for HART Communication HART. Following Figure 4-2 about conection of Current Loop.

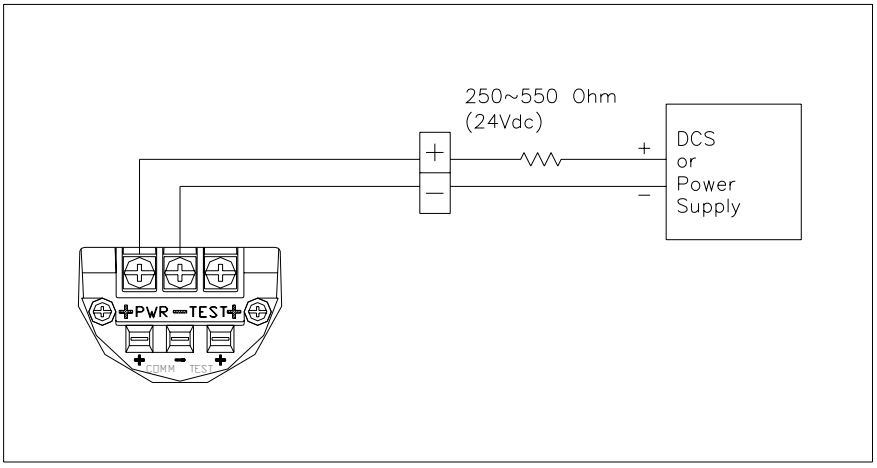



Figure 4-2 Connection with Terminal Board of Transmitter

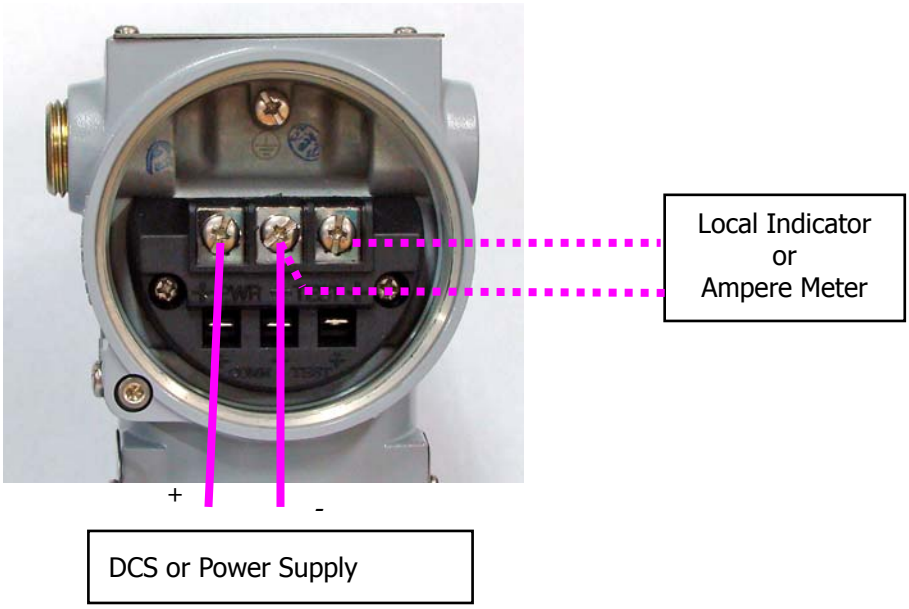



Figure 4-3 Picture of Terminal Board of Transmitter

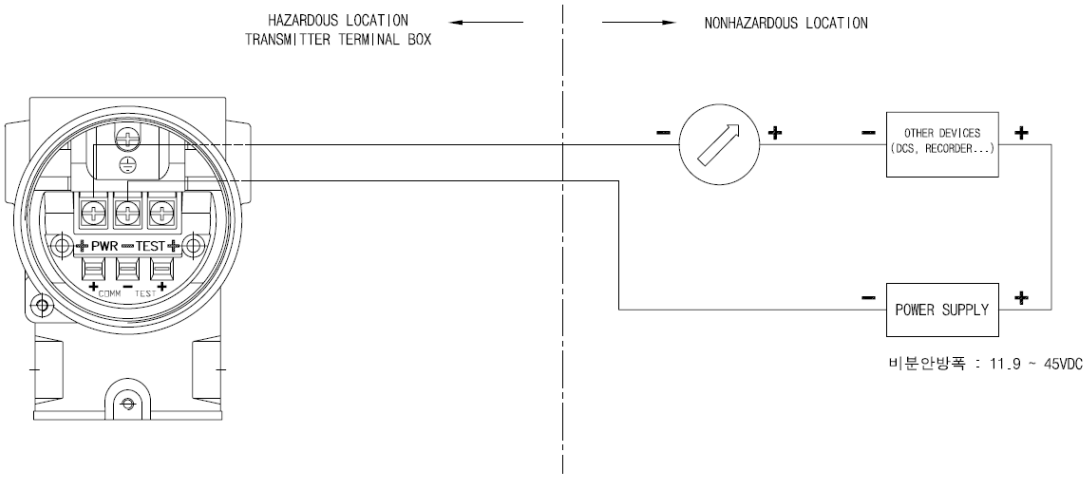
## 4.7.4 Wiring

| ▲ Warning |
|---|
| Explosion can result in death or serious injury:<br>◈ Do not remove the transmitter covers in explosion environments when the circuit is alive.<br>◈ Before connection HHI in explosion zone, confirm that the configure device has to be installed by intrinsic safety regulations.<br>◈ Check environment is fully engaged to the transmitter's harzadous location certificate<br>◈ Both transmitter covers must be fully engaged to meet explosion proof requirements |

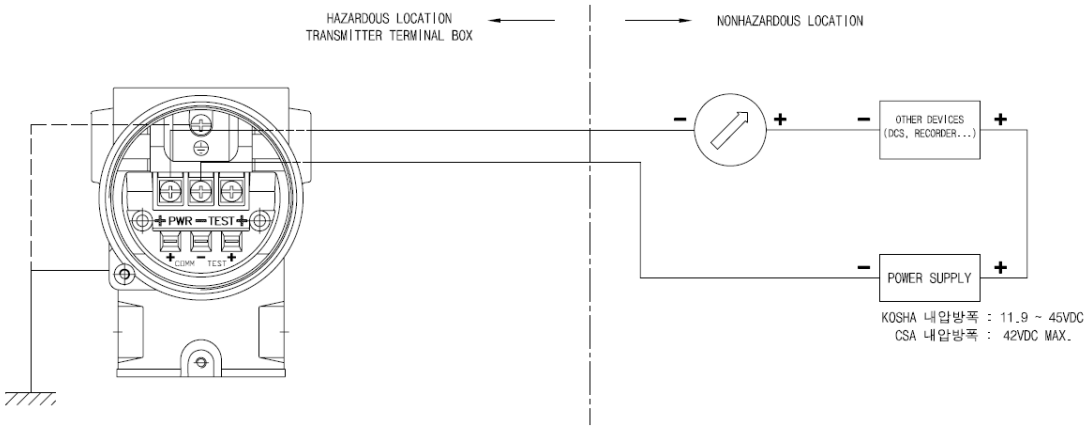
### A. Loop Configuration

AUTROL Series Transmitters use a two-wire system for power supply, 4~20mA analog signal transmission and HART digital transmission.
DC Power Supply is required for the transmitter loop. The Transmitter and distributor are connected as shown below.

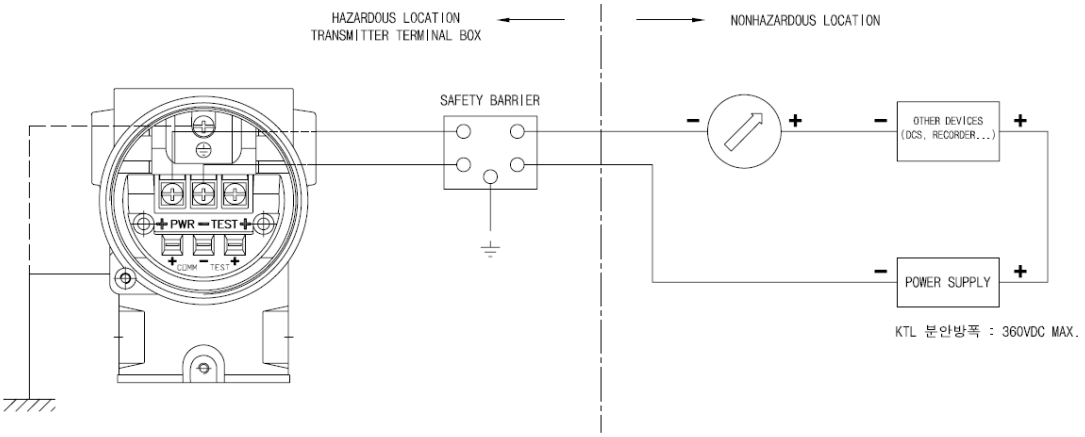
(1) Non-Explosionproof / Flameproof Type



(2) Explosionproof Type



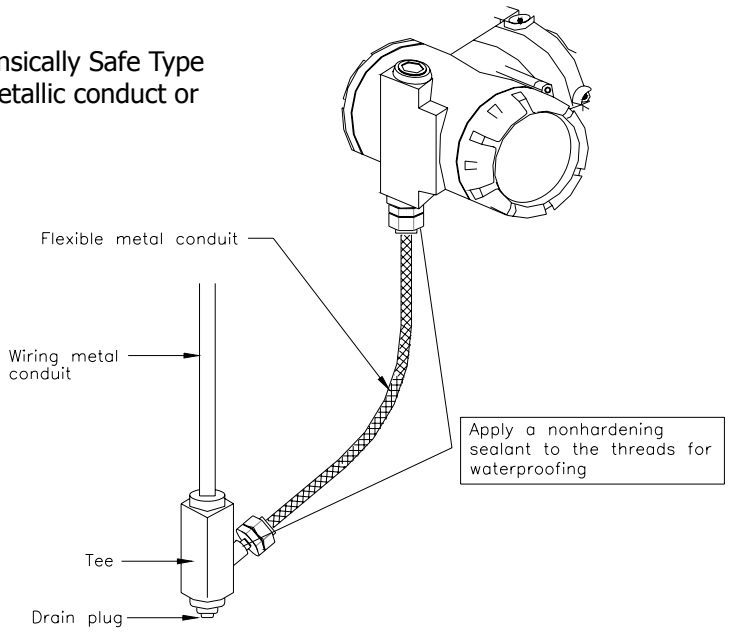

(3) Intrinsical Safety Type : Safety barrier should be connected within the loop




## B. Wiring Installation

(1) General-use Type and intrinsically Safe Type
Make cable wiring using metallic conduct or Waterproof cable glands.

o. Apply a non-hardening sealant to the terminal box connection port and the threads on the flexible metal conduct for the waterproofing.



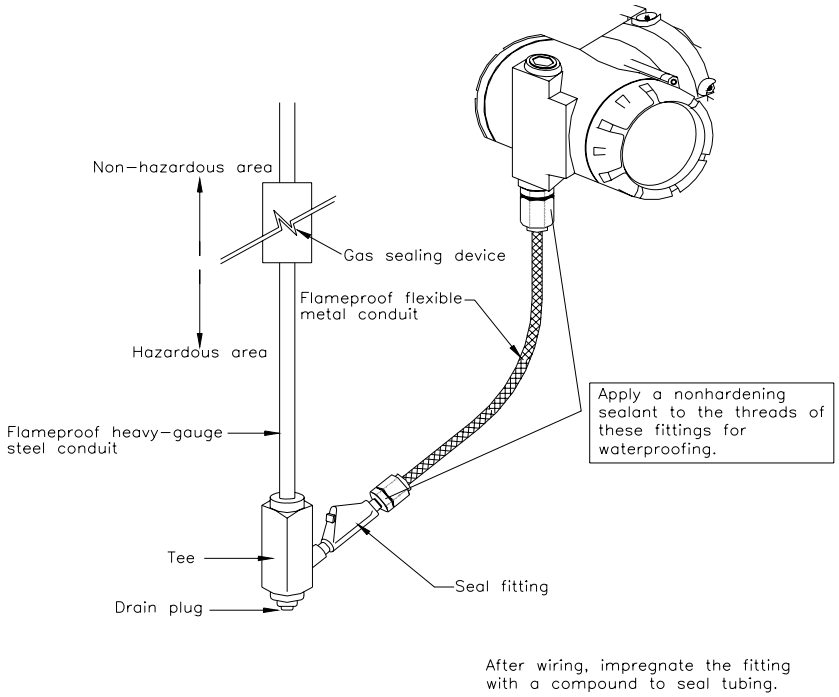

[Figure 4-4a Typical Wiring using Flexible Metal conduct]



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(2) KOSHA Flameproof Type
Wire cables through a flameproof packing adapter, or using a flameproof metal conduct.

(a) Wiring cable through flameproof packing adapter for KOSHA flameproof type (see Figure 4-4b)
◇ Use only flameproof packing adapter by KOSHA.
◇ Apply a non-hardening sealant to the terminal box connection port and to the threads on the flameproof packing adapter for waterproofing
◇ Mounting flameproof packing adapter to the terminal box.
o. Screw the flameproof packing adapter into the terminal box until the O-ring touches the terminal box wiring port (at least 5 full turns), and tighten the lock net.

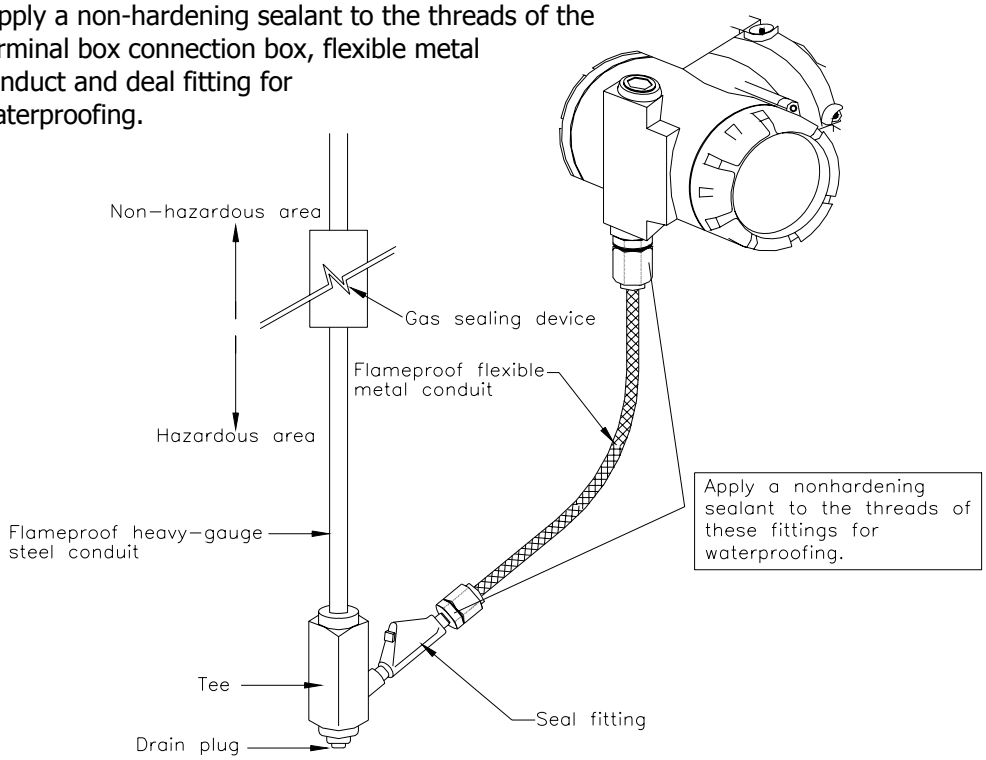



[Figure 4-4b
Typical Wiring using Flameproof Packing Adapter]

(b) Flameproof metal conduct wiring (Figure 4-4c)

◇ A seal fitting must be installed near the terminal box connections port for a sealed construction.

◇ Apply a non-hardening sealant to the threads of the terminal box connection box, flexible metal conduct and deal fitting for waterproofing.




[Figure 4-4c
Typical Wiring using Flameproof Metal conduct]



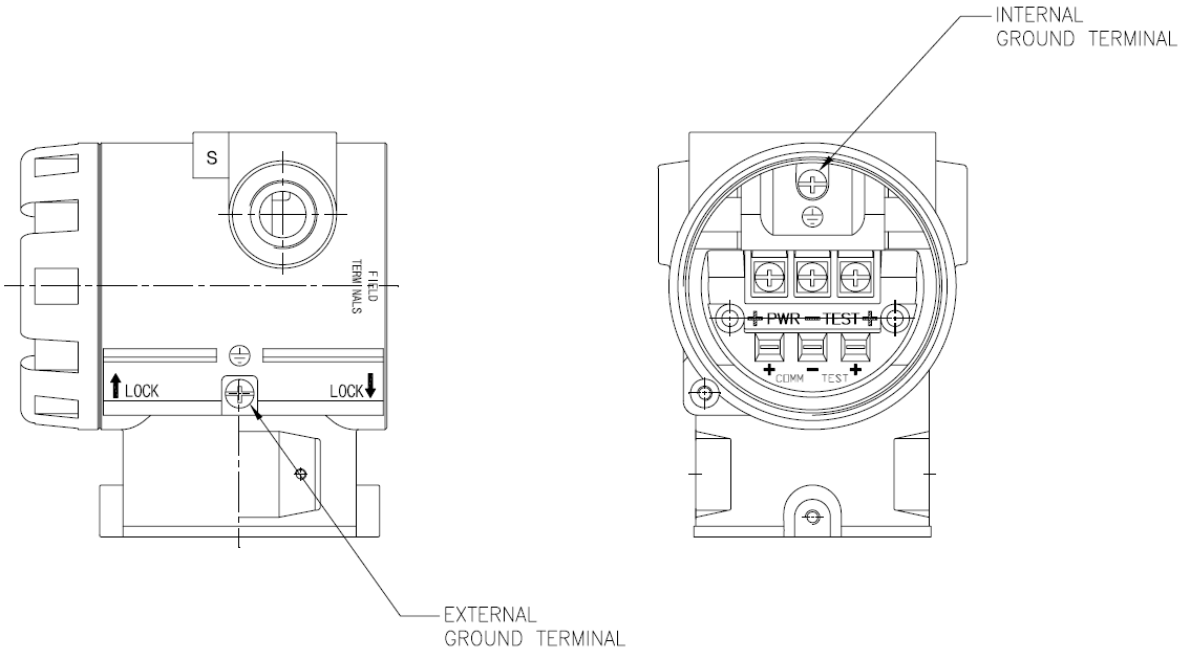
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## 4.7.5 Grounding

(a) Grounding should satisfy KS requirements (grounding resistance, 10 Ohm or less). Grounding is required below 10 Ohm for explosionproof and intrinsic safety.
[Note] In case of with Built-in Lightening Protector, Grounding should satisfy Special KS requirements (grounding resistance, 10 Ohm or less)

(b) There are ground terminal on the inside and outside of the terminal box. Either of these terminals may be used.

(c) Use 600V grade PVC insulated wire for grounding.




APT3200 SMART PERSSURE TRANSMITTER
INTERNAL AND EXTERNAL GROUND TERMINAL

## 4.7.6 Power Supply Voltage and Load Resistance

When configuring the loop, make sure that the external load resistance is within the range in the figure below. Since the voltage of transmitter terminal input is same as follows.

- General Standard : 11.9 to 45 Vdc
- Hart Communication : 17.4 to 45 Vdc
- KOSHA Explosionproof: 11.9 to 45 Vdc
- CSA Explosionproof : 17.4 to 42 Vdc max.

And maximum loop current is 24mA, Load resistance R:

R = (E-11.9) / 0.022 (E = Power Supply Voltage)

[Note] In case of an intrinsically safe transmitter, external load resistance includes safety barrier resistance.

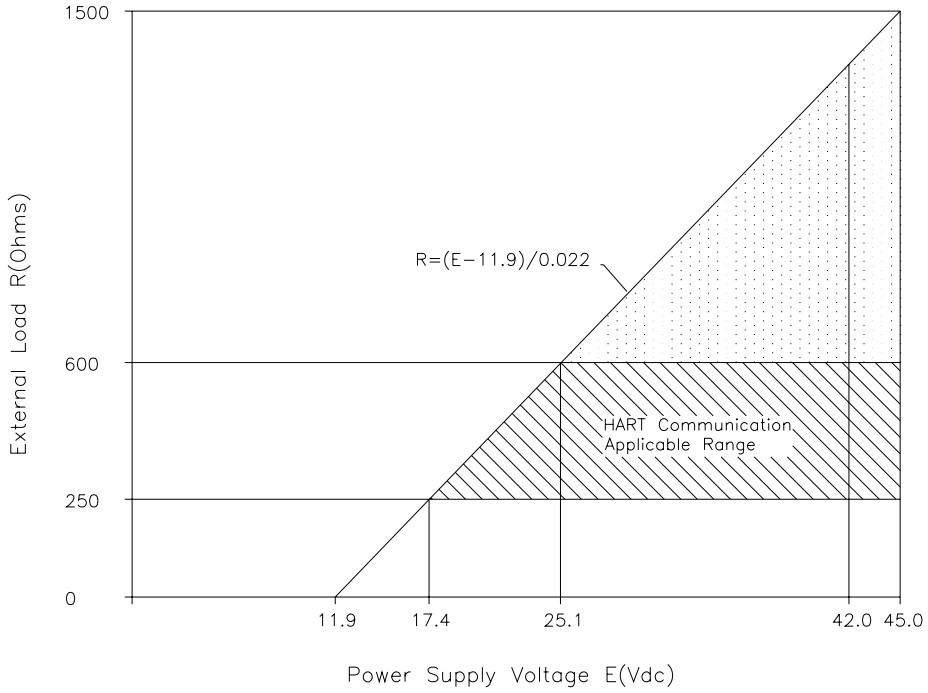


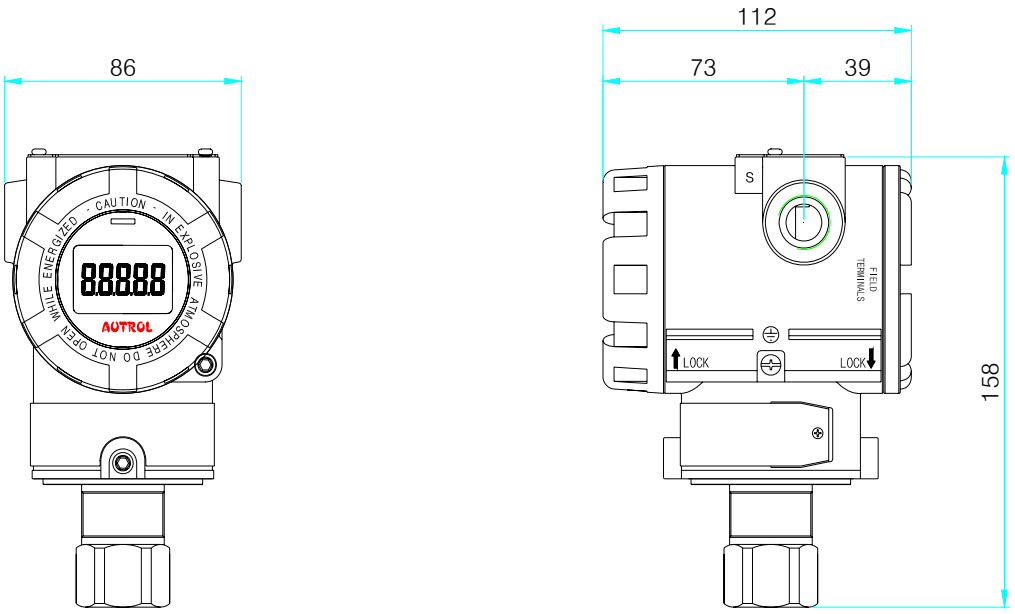

Figure 4-5 Model APT3200 Smart Pressure Transmitter Power Supply



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# 4.8 Mechanical Considerations

Figure 4-3 is transmitter dimensional drawings of APT3200. A mounting example and dimensional drawings is shown in Figure 4-4.




[Figure 4-3 Transmitter Outline Dimensional Drawings]

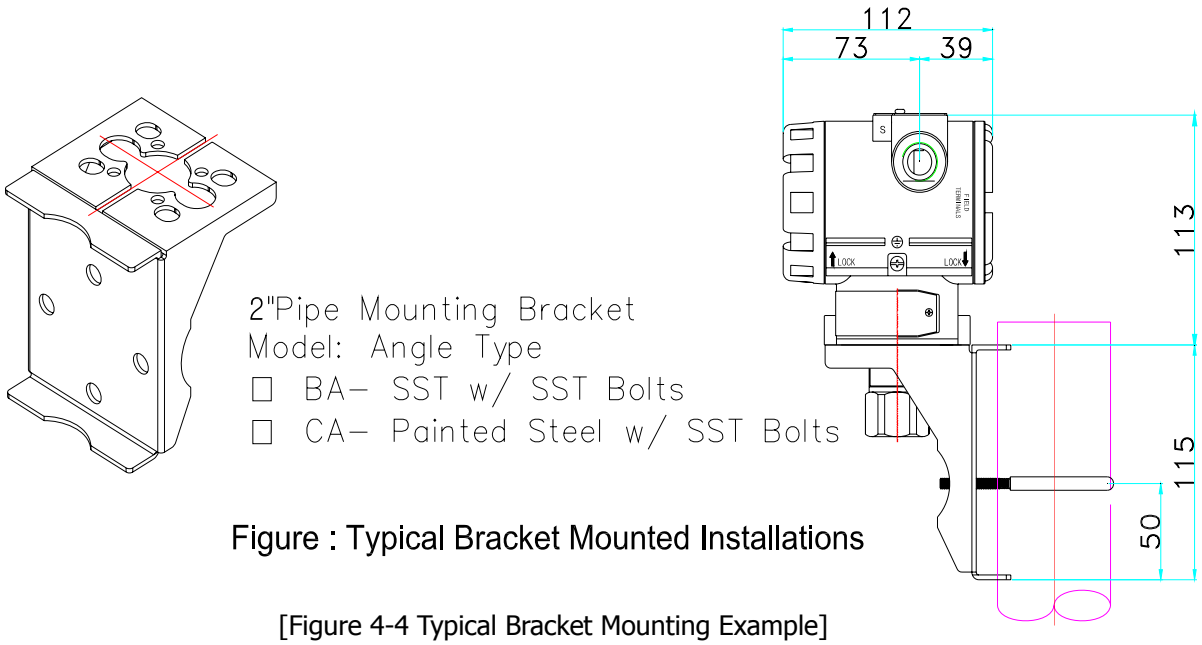



Figure : Typical Bracket Mounted Installations

[Figure 4-4 Typical Bracket Mounting Example]

### 4.8.1 Mounting

To use the cadence carrier from the environment where the vibration is heavy and must install the transmitter. In the environment where the vibration is heavy you will have to install the transmitter by using an assistant support. In the case of severe vibration, promote to mount on pipe using a mounting bracket as option.

### 4.8.2 Consideration of Transmitter Access

When selecting the establishment location or a place of the transmitter, it treats the transmitter it probably is a location that is convenient must consider.

① Rotation of housing: housing can be rotated up to 90°.
② Terminal sides of transmitter: location ease us terminal space where be able to pull out transmitter cover
③ Circuits side of transmitter: the space where there is a possibility of treating a electronic circuit / the space where be able to pull out transmitter cover / If LCD meter is installed, it requires extra space.

## 4.9 Environmental Considerations

### 4.9.1 Effect of Ambient Temperature

You have to install at -20℃~60℃ (-4~180°F), operating ambient temperature range. If predicted heat seems to exceed or equivalent to ambient temperature range limit, you have to consider additional method to cutoff the process heat.

### 4.9.2 Environment of toxic, moisture

Housing of APT-3200 can be protected to moisture or toxic material. Electronic circuit side is separating from terminal side. When O-ring Seal cover covers, it is intrinsic safety. But, some drip could penetrate to the housing of transmitter through conduct pipeline. Therefore, transmitter should be set up over the position of conduct pipe for preventing drip.

### 4.9.3 Installation of dangerous place

Transmitter is designed to explosion-proof housing. Installation environment of transmitter must be confirmed explosion-proof specification.

# Chapter 5 On-line Operation

## 5.1 Overview

This chapter describes to configure function of APT3200 SMART Pressure Transmitter. Transmitter can be configured to On-Line or Off-Line mode. In On-Line Configuration Mode, you must connect configuration such as HHT (Hand Held Terminal), etc. Configuration data inputs in Working Register of HHT and this data is sent to corresponding transmitter.

## 5.2 Safety Message

Send operation. Do specially notice for safety of operator. In damage and place required specially safety, We indicate Warning symbol(▲). When you operate work of Warning symbol, follow Safety Message.

### 5.2.1 Warning

| ▲ Warning |
| --- |
| Explosion can result in death or serious injury:<br>◈ Do not remove the transmitter covers in explosion environments when the circuit is alive.<br>◈ Before connecting HHT in explosion zone, confirm that the configure device has to be installed by intrinsic safety regulations.<br>◈ Both transmitter covers must be fully engaged to meet explosion-proof requirements |

| ▲ Warning |
| --- |
| Electrical shock can result in death or serious injury. If you install high voltage environment or false condition, power line and lead will be appeared high voltages.<br>◈ Avoid contact with the leads and terminals. |

### 5.2.2 Configuration current to passive mode

In the case of short Current Loop, send or request data to change transmitter output you must configure Current Loop to passive mode. Don't believe in message indicating HHT, must configure Current Loop to passive mode with other operation.

## 5.3 Configuration Data Review

In case of install transmitter in fact site, before operate transmitter reexamine and certify whether configuration data correspond with fact application environment.

## 5.4 Check Output

Before other handle transmitter to on-line, you must examine and confirm whether transmitter currently operate and suitably configure progress variable.

### 5.4.1 Process Variable

We use two progress variable in APT-3200 SMART Pressure Transmitter pressure value is Primary Variable and temperature value of pressure value configure SV(Secondary Variable) with fixed value.
Moreover this PV value ouputs with 4~20mA analog value.

## 5.5 Basic Setup

You must configure correlation variable for operating currently transmitter.

### 5.5.1 Select Sensor Range

Pressure range to measure is depended Range Code of sensor. This value is classified from pressure sensor module automatically.

### 5.5.2 Set Output Units

Select from the following engineering units:
Unit: kPa, kg/cm2, bar, psi, mmH2O etc

### 5.5.3 Rerange

Set the Zero and Span of 4~20mA analog output.

## 5.6 Detailed Setup

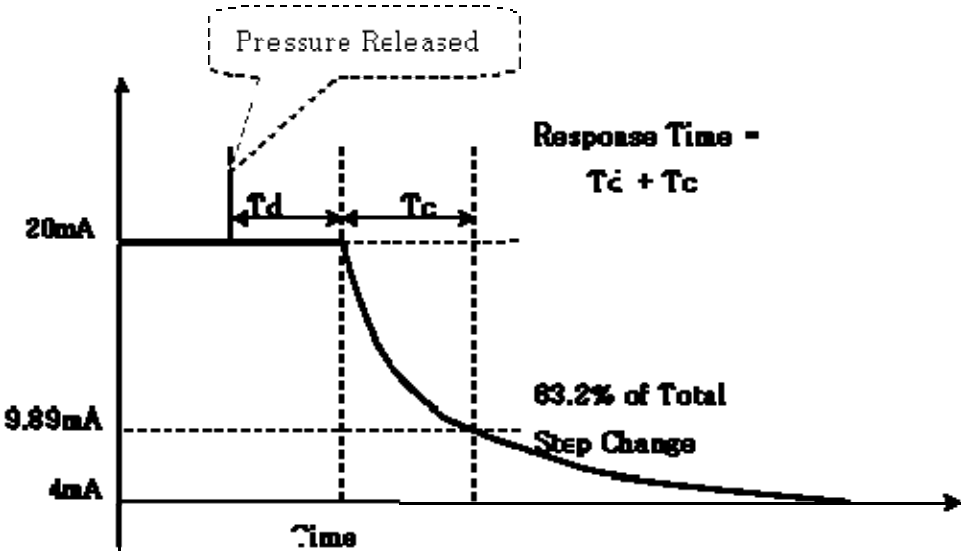
### 5.6.1 Set Fail Mode

When sensor is wrong or microprocessor of transmitter doesn't operate normally in order to outputs current value of High or Low.

### 5.6.2 Set Damping Time

The sensor input value changes the response time of the transmitter to smooth variations in output readings caused by rapid changes in input. Determine the appropriate damping setting based on the necessary response time, signal stability, and other requirements of the loop dynamics of your system. The default damping value is 1.0 seconds, and can be reset to damping values between 0 and 60 seconds.

[ Graph of Damping Second ]




# 5.7 Configuration of Information Variable

## 5.7.1 Set Tag

Tag variable is better easy method to classify to transmitter in multi transmitter install environment. Tag Character can be used to 8 word of English/number.

## 5.7.2 Set Messages

When use several transmitter, user can define for classification each transmitter and use 32 words of English/number. This message is saved in EEPROM of transmitter.

# 5.8 Diagnostics and Services

## 5.8.1 Loop Test

The Loop Test verifies the output of the transmitter, the integrity of the loop, and the operations of any recorders or similar devices installed loop. Perform the following procedure for a loop test.

① Connect a reference meter to the transmitter.
② Select the Loop Test of HHT and operate the Loop Test.
③ Select output current ( 4mA/20mA/etc )
④ If the readings match, then the transmitter and the loop are configured and functioning properly. If the readings do not match, then you may have the current meter attached to the wrong loop, there maybe a fault in the wiring, the transmitter may require an output trim, or the electrical current meter may be malfunctioning.

# 5.9 Calibration

Scaled system implement by calibrating the transmitter. Trim function have several function for the calibration. Smart transmitters operate differently than analog transmitter. A Smart transmitter uses a microprocessor that contains information about the sensor's specific characteristics in response to pressure and temperature inputs for calculating Process Variable. The trim and rerange functions also differ. Reranging sets the transmitter analog output to the selected upper and lower range points and can be done with or without an applied pressure. Reranging does not change the factory characterization curve stored in the microprocessor. Sensor trimming requires an accurate pressure input and adds additional compensation that adjusts the position of the factory characterization curve to optimize transmitter performance over a specific pressure range. Rerange functions provides ability to readjust the 4~20mA points sensor inputs.

## 5.9.1 Sensor Trim

The Sensor Trim the transmitter sensor input signal convert A/D to lead and how it interprets the values which it inputs with digital the contents of such interpretation and it is regarding to change is connected actually in the sensor which in order to correspond.

There are three waysto trim the sensor : Sensor zero trim, full trim and zero adjustment.

Sensor zero trim is a one-point adjustment typically used to compensate for mounting position effects or zero shifts caused by static pressure.

Two point trim is a full sensor tirm, in which two accurate end-point pressure are applied(equal to or greater than the range values), and all output is linearized between them. You should always adjust the low trim value first to establish the correct offset.

## 5.9.2 DA (Digital to Analog) Trim

When the D/A trim convert sensor input signal to 4~20mA output, this ouput value scale minuteness. Cyclic you recommend to scale analog output for maintain scale. This function can manage the error about analog conversion if digital value for loop current output.

# Chapter 6 Maintenance

## 6.1 Overview

This chapter describes breakdown diagnostic and maintenance.

## 6.2 Safety Message

When operation, it requires specially notice for the safety of operator. Information that raises potential safety issues is indicated by a warning symbol(▲). Refer to the following safety messages before performing an operation proceeded by this symbol.

### 6.2.1 Warning

| ▲ Warning |
| --- |
| Explosion can result in death or serious injury:<br>◈ Do not remove the transmitter covers in explosion environments when the circuit is alive.<br>◈ Before connecting HHT in explosion zone, confirm that the configure device has to be installed by intrinsic safety regulations.<br>◈ Both transmitter covers must be fully engaged to meet explosion-proof requirements |

| ▲ Warning |
| --- |
| Electrical shock can result in death or serious injury. If you install high voltage environment or false condition, power line and lead will be apprered high voltages.<br>◈Avoid contact with the leads and terminals. |

| ▲ Warning |
| --- |
| Electrical can result in death serious injury:<br>◈ The qualification which is educated only the person whom it prepares will be able to establish the transmitter. |

| ▲ Warning |
| --- |
| Process leak can result in death serious injury:<br>◈ Before approval pressure install Thermowell or sensor and then close completely. If don't this, it cause process leak.<br>◈ when operating, don't take out Thermowell. |

# 6.3 Hardware Diagnostics

If you suspect a malfunction despite the absence of any diagnostic messages on the HHT follow Table 6-1 described here to verify that transmitter hardware and process connections are in good working order.

If you suspect a malfunction despite the absence of any diagnostic messages on the HHT follow Table 6-1 described here to verify that transmitter hardware and process connections are in good working order.

[Table 6-1 Troubleshooting]

| Symptom | Potential Source | Corrective Action |
|---|---|---|
| Transmitter Does not Communicate With HART Communicator | Loop Wiring | • Check for a minimum of 250 ohms resistance between the power supply and HHT.<br>• Check for adequate voltage to the transmitter. The transmitter always requires 11.9 ~ 45 Vdc.<br>• Check for intermittent shorts, open circuits, and multiple grounds. |
| High Output | Sensor Input Failure | • Connect HHT and enter the Transmitter test mode to isolate a sensor failure. |
| | Loop Wiring | • Check for dirty or defective terminals, interconnecting pins, or receptacles. |
| | Power Supply | • Check the output voltage of the power supply at the transmitter terminals. It should be 11.9 to 45 Vdc in spite of loop scale. |
| | Electronics Module | • Connect HHT and enter the Transmitter test mode to isolate module failure. Check the sensor limits to ensure calibration adjustments are within the sensor range. |
| Erratic Output | Loop Wiring | • Check the output voltage of the power supply at the transmitter terminals. It should be 11.9 to 45 Vdc.<br>• Check for intermittent shorts, open circuits, and multiple grounds.<br>• Check for proper polarity at the signal terminals.<br>• Incase measuring electric current while digital communication, output appear around +-0.013mA |
| | Electronics Module | • Connect HHT and enter the Transmitter test mode to isolate an electronics mode failure. |
| Low Output or No Output | Sensor Element | • Connect HHT and enter the Transmitter test mode to isolate a sensor failure.<br>• Check the PV to see if it is out of range. |
| | Loop Wiring | • Check for adequate voltage to the transmitter. The transmitter always requires 11.9 ~ 45 Vdc.<br>• Check for intermittent shorts, open circuits, and multiple grounds.<br>• Check polarity of singal terminal<br>• Check the loop impedence. |
| | Electronics Module | • Connect HHT and check the sensor limits to ensure calibration adjustments are within the sensor range. |



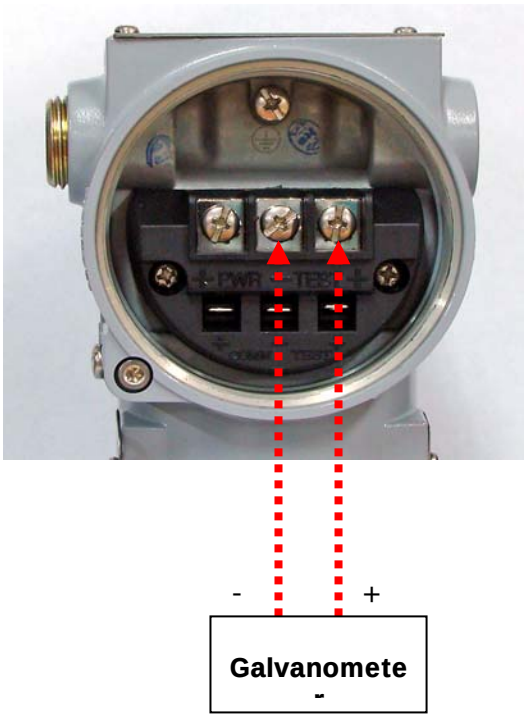
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# 6.4 Hardware Maintenance

Autrol APT3200 Smart Transmitters have no moving parts and require a minimum of scheduled maintenance. Both transmitters feature modular design for easy maintenance. If you suspect a malfunction, check for an external cause before performing the diagnostics as discussed later in this section. If you must return failed transmitters or parts, send them to Autrol Co., Ltd. for inspection, repair, or replacement.

## 6.4.1 Test Terminals

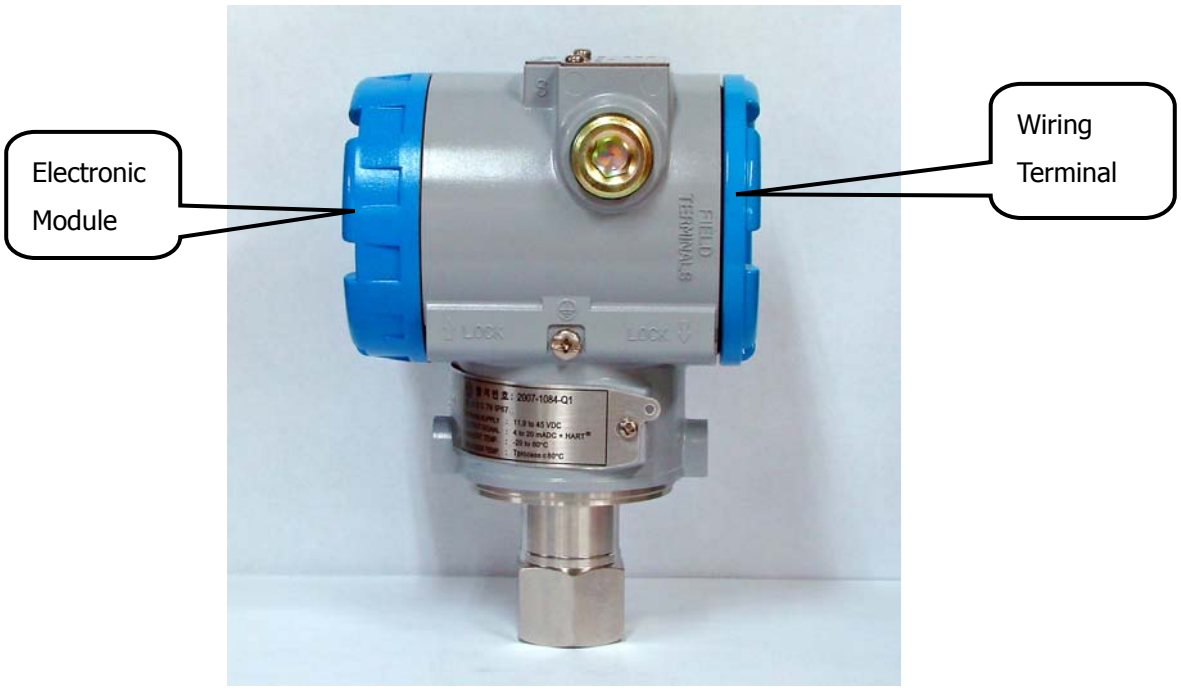
The test terminal, marked as TEST on the terminal block. The test and negative terminals are connected to the test terminals; so long as the voltage across the receptacles is kept below the diode threshold voltage, no current passes through the diode. To ensure that there is no leakage current through the diode while making a test reading, or while an indicating meter is connected, the resistance of the test connection or meter should not exceed 10 ohms. A resistance value of 30 ohms will cause an error of approximately 10 percent of reading.




[Figure 6.1 Test Terminals]

## 6.4.2 Disassembling the Electronics Housing

The transmitter is designed with dual-compartment housing; one contains the electronics module, and the other contains all wiring terminals and the communication receptacles.




[Figure 6.2 Structure of Housing]

### 6.4.2.1 Disassembling Electronics Module

Use the following procedure to remove the electronics module.

[Note1]
The electronics are sealed in a moisture-proof plastic enclosure referred to as the electronics module. The module is a non-repairable unit; if a malfunction occurs the entire unit must be replaced.

1. Disconnect the power to the transmitter.
2. Remove the cover from the electronics side of the transmitter housing (Figure 6.2). Do not remove the instrument cover in explosive atmospheres when the circuit is alive. Remove the LCD meter, if applicable.
3. Remove the three screws that anchor the electronics module to the transmitter housing.
4. Firmly grasp the electronics module and pull it straight out of the housing, taking care not to damage the interconnecting pins.

[Note2]
The transmitter EEP-Write Jumpers and failure mode are located on the front of the electronics module. When it will be replaced for a new one, make a same jumper location.

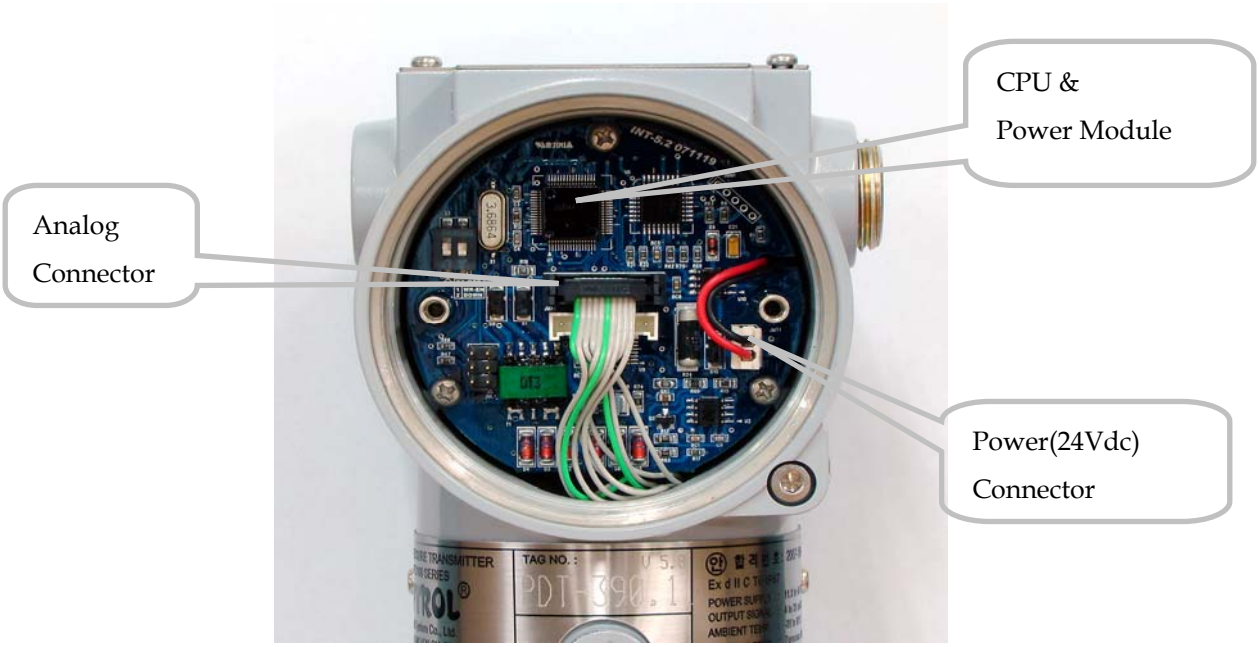



Figure 6.3 Structure of Electronics Module inner Transmitter

#### 6.4.2.2 Fail Mode and Jumper Switch of EEPROM-write

Fail-mode and jumper switch of EEPROM-write is located front of electronics module(Refer to Figure 2-2, 2-3)

### 6.4.3 Assembling the Electronics Housing

Re-assembling procedure is same as follows.

1. Make sure that Fail-mode and Jumper Switch are set exactly.
2. Insert electronics module in housing
3. Firstly, connect the connector of sensor board with power connector.
   - Mis connection of the two connectors cause wrong output(4~20mA) and effect on power of Transmitter.
   - In case of power connector sandwitched between board and housing, it may cause wrong output signal and effect on power of transmitter.
4. Fix electronics module with 3 screws.
5. Close the cover of housing..

# Appendix I

## APT3100 SMART PRESSURE TRANSMITTER

LCD DISPLAY CODE

| Message | Description | Remarks |
|---|---|---|
| ADJ-U | Out of Zero setting value when Zero Adj function using button(Upper side) | |
| ADJ-L | Out of Zero setting value when Zero Adj function using button(Lower side) | |
| ZERO | Innitial message in using Zero button | |
| SPAN | Innitial message in using Span button | |
| BT-ERR | Button input Sequence error | |
| P-LOCK | Button input error when Protect Locked | |
| ZT-ERR | Setting Limit(10%) Error when Zero Trim | |
| -TR- | Zero Trim Done | |
| ZR-ERR | Setting Limit error when executing Zero button function | |
| SP-ERR | Setting Limit error when executing Span button function | |
| -ZR- | Zero button function done | |
| -SP- | Span button function done | |
| -ZA- | Zero Adjustment done | |
| -DONE- | Setting Done using button | |
| RNGOVR | Setting Limit error when executing other setting function | |
| LCD_OV | Over figure values for LCD | |
| SCD-ER | Sensor Code Error | |
| F-RST | Flash Setting Data Reset | |
| F-LOCK | While Flash Setting Data Reset, Protect Locked | |
| F-FAIL | Flash Setting Data Reset Failure | |
| -FR- | Flash Reset Done | |
| A-RST | Analog EEPROM Initializing Start | |
| A-STOR | Analog EEPROM Whole Write | |
| A-FAIL | Analog EEPROM Whole Write Failure | |

| Message | Description | Remarks |
|---|---|---|
| -AC- | Analog EEPROM Whole Write Done | |
| S-FL | Sensor Fail | |
| S-OP | Sensor Overpressure | |
| AEP-RF | Analog EEPROM read checksum error | |
| TS-FL | Temperature Sensor Error | |
| AEP-WF | Analog EEPROM write fail | |
| EOSC | Crystal Element Defect Alarm | |
| FAVE | Flash Access Violation | |
| ADC-FL | ADC INITIAL ERROR | |

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