

Field-Type I/P Converter

Model : KUX113

User's Manual



Azbil Corporation

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Chapter 1 : General

External view

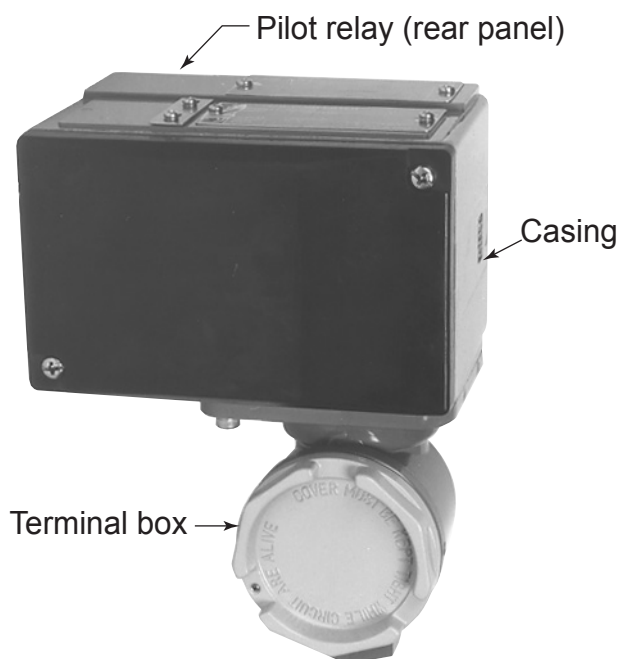


Figure 1-1 External view

Accessories

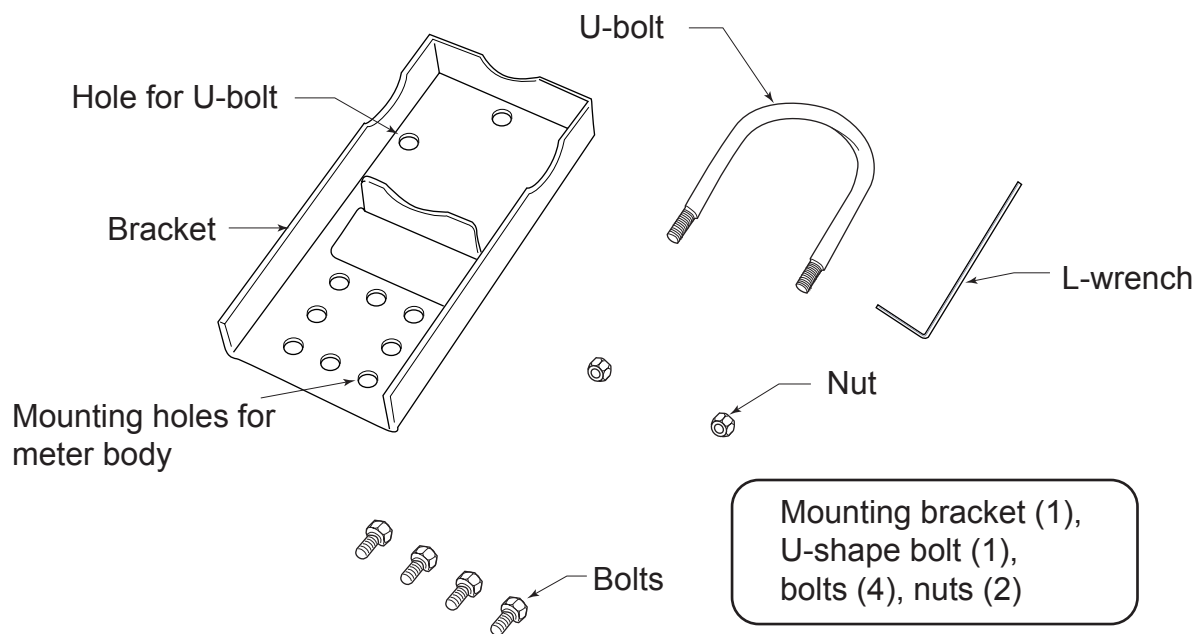


Figure 1-2 Accessories

1-1 : Description

The model KUX113 Field-type I/P Converter is a field installation type of instrument (to be installed on a 2-inch pipe stanchion). It converts an electric current signal of 4 - 20mA DC into a pneumatic pressure signal of 0.2 - 1.0 kgf/cm² (or other unit of measure).

1-2 : Structure and Features

The KUX113 I/P Converter is comprised of a casing (in which the converter mechanism is directly installed), a pilot relay and a cover. The KUX113 can be installed on a 2-inch pipe stanchion employing a standard type of mounting bracket (which is identical to those used for other DSTJ3000 field-type instruments).

The protective feature of a water splashproof casing, a flameproof enclosure, or of an intrinsic safety barrier.

The water splashproof casing complies with of JIS F8001 Class 3 requirements.

For the flameproof type, flameproof structure consists of the terminal box and magnet unit. These structures allow you to open the cover of the casing to maintain even while the instrument is operating in a hazardous area.

The intrinsic safety barrier type of instrument employs two spark killer diodes connected in parallel to the coil in the magnet section, in conjunction with a barrier.

If a bypass manifold is provided, the Converter can use manually produced signals as its outputs.

Chapter 2 : Specifications

2-1 : Performance Specifications

Table 2-1 Performance specifications

Item	Specifications
Input signal	4 to 20mA DC (Maximum allowable current approx. 30mA.)
Input resistance	250 ohms maximum
Output signal	20 to 100 kPa, 3 to 15 psi, 0.2 to 1.0 bar, 0.2 to 1.0 kgf/cm ² (Maximum allowable pressure 200kPa)
Air supply pressure	140 kPa { 1.4 kgf/cm ² } ±10%
Air consumption	4 ℓ/min(N) (With output 50% balanced)
Maximum air supply capacity	110 ℓ/min(N)
Maximum air exhaust capacity	110 ℓ/min(N)
Minimum load capacity	I.D. 4 mm copper tube × 3 m + 20 cc
Air piping connections	Rc1/4, 1/4NPT internal thread
Electrical conduit connection	G1/2 internal thread
Material of major components	Aluminum alloy
Operating temperature range	Waterproof, dust proof type: -30 to +80°C Flame-proof type explosionproof type: -10 to +70°C Intrinsic-safety explosionproof type: -10 to +60°C
Operating humidity range	10 to 90% RH
Accuracy	± 0.5% F.S.
Linearity (with reference to zero)	± 0.2% F.S.
Hysteresis error	≤ 0.5% F.S.
Reproducibility	≤ 0.4% F.S.
Dead band	≤ 0.05% F.S.
Temperature effect	Zero shift: ±3% F.S. /30°C (Maximum) Span shift: ±2% F.S. /30°C (Maximum)
Mounting	2-inch pipe (Horizontal or vertical)
Net weight	Approx. 3 kg
Finish and color	Finish: Acrylic baked finish Color: Case; Dark beige, Cover; Black PPS resin, Terminal box cover; Light beige
Construction	Waterproof, dust proof type: JIS C 0920 Watertight, JIS F 8001 Class 3 Splashproof Flame-proof type explosionproof type: JIS C 0903, d2G4 (Operating temperature -10 to +70°C) Intrinsic-safety explosionproof type: JIS C 0903, i3aG5 (Operating temperature: -10 to +60°C, signal power supply: 23 to 27.5V DC)

2-2 : Model Number Table

Basic model no.	Selections						Options	Description
	Power supply	Case type	Input	Output	Connections	Environments		
KUX113								Filed-type I/P converter
	-X							not necessary
		W						Waterproof (JIS)
		E						Flame-proof type explosionproof (JIS)
		H						Intrinsic-safety explosionproof (JIS)
			1					Input 4 to 20mA DC
				1				Output 0.2 to 1.0 kgf/cm ²
				2				Output 3 to 15 psi
				3				Output 0.2 to 1.0 bar
				4				Output 20 to 100 kPa
					A			Air pressure connections Rc1/4
					B			Air pressure connections 1/4NPT
						X		Standard
						A		Corrosion-resistant paint
						B		Heavy-corrosion-resistant paint
						D		Silver finish
							-X	No options
							-P	With flameproof-packing-type cable connecting adapter
							-G	With output air pressure gauge
							-6	With by-pass set (on special order)
						-7	With air set	
						-J	With elbow for flame-proof type explosionproof	

2-3 : Dimension Drawings

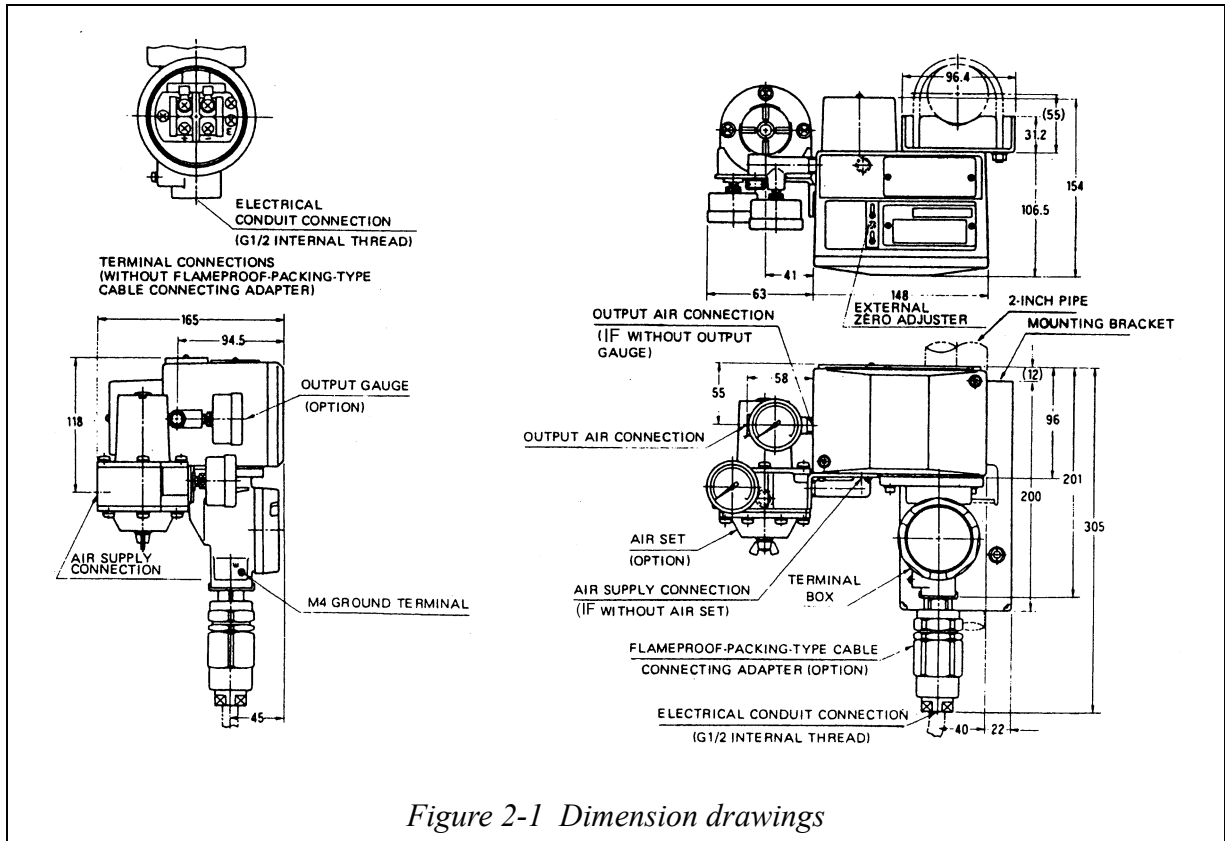


Figure 2-1 Dimension drawings

Chapter 3 : Operating Principle

The electrical input signal (current signal) is converted by the magnet unit into a mechanical force which causes the beam position to change. The change in beam position is converted by the nozzle/flapper mechanism into a pneumatic signal, which is boosted by the pilot relay into the pneumatic output signal. The pneumatic output signal is fed back via the feedback bellows to the beam, thereby attaining a state of equilibrium. Thus, the electrical input signal is converted into a pneumatic output signal, which is directly proportional to the input signal.

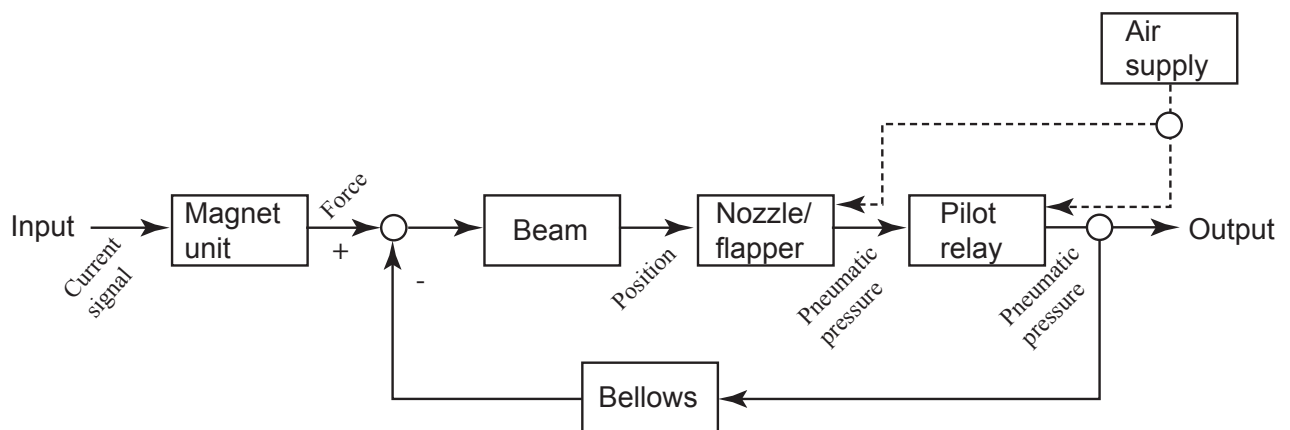
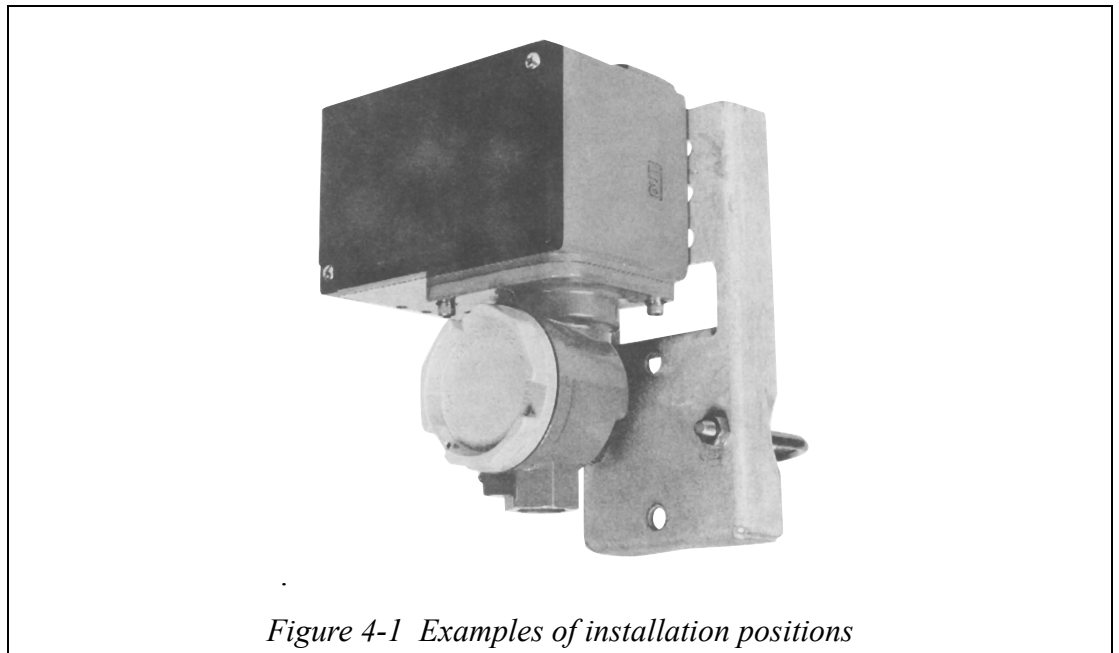


Figure 3-1 Block diagram of I/P converter

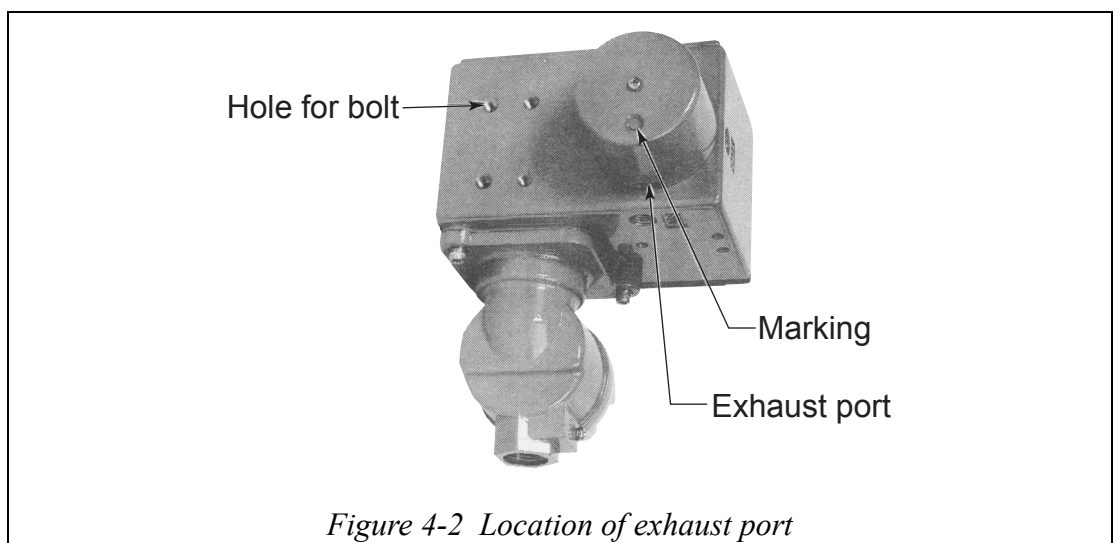
Chapter 4 : Installation

4-1 : Installation Method

- (1) The mounting holes are drilled through the rear panel of the casing as shown in Figure 4-2. Fix the bracket (supplied) to the casing with the four bolts. Select an appropriate mounting position according to the direction of the 2-inch pipe stanchion.
- (2) Hook the U-shape bolt onto the 2-inch pipe stanchion and pass its ends through the bracket holes and fix the ends securely with the nuts.



- (3) The I/P Converter should be installed vertically as shown in Figure 2-1. Note that the exhaust port of the pilot relay must face downward. To position the exhaust port downward, loosen the screw of the cover and rotate the cover. The location of the exhaust port is labelled on the surface of the cover.



4-2 : Environmental Conditions

The place of installation must be within the specified temperature and humidity range (See Chapter 2 :Specifications) and must be reasonably free from mechanical vibration.

For an explosionproof type of instrument, fasten the terminal box cover with the lock screw after installing the cover. Install the instrument observing all applicable explosionproof instrument installation standards and recommendations.

4-3 : Customer Connections

Electrical Connections

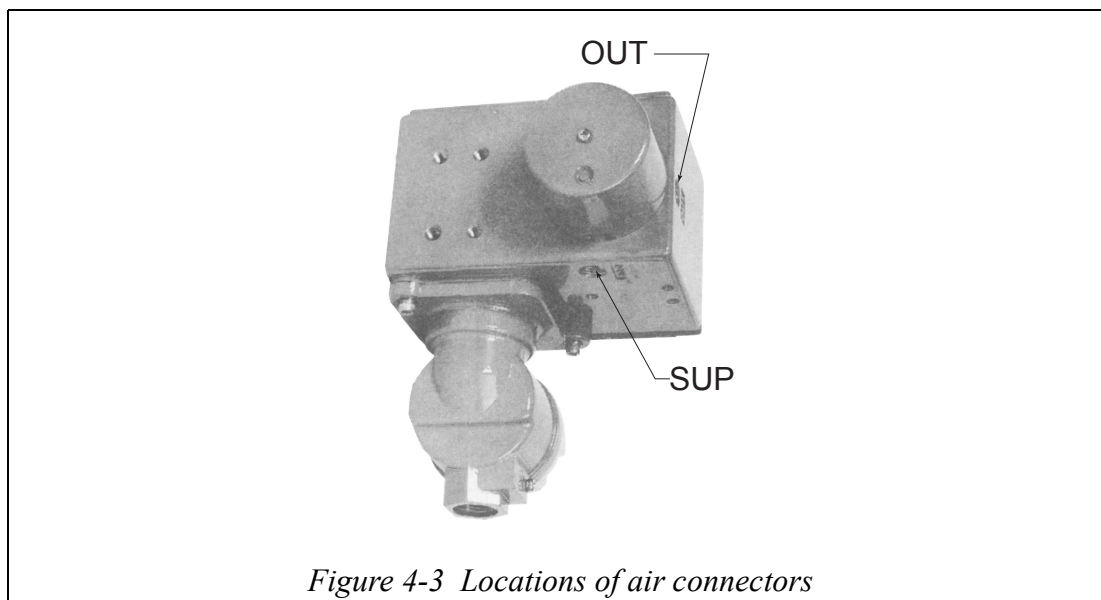
Connect the electrical input signal to the “+” and “-” terminals in the terminal box. The terminals have binding screws (M4, 6mm). For earth grounding, connect the “-” terminal to the “E” terminal.

The instrument has no internal fuse or switch. Provide them externally (if possible a wiring block should be used).

Air Connections

Two air connectors (Rc1/4 or 1/4NPT internal thread) are provided near the pilot valve. Remove the caps and connect the air supply piping to the SUP connector and the output air pressure piping to the OUT connector.

The supply air must be clean. Provide it via an Airset (a regulator and a filter). The air supply pressure must be 140 kPa {1.4 kgf/cm²}



Chapter 5 : Operation Procedure

After the I/P Converter has been installed and electrical wiring and air piping have been completed, it is ready for operation. Provide the air supply.

Chapter 6 : Calibration

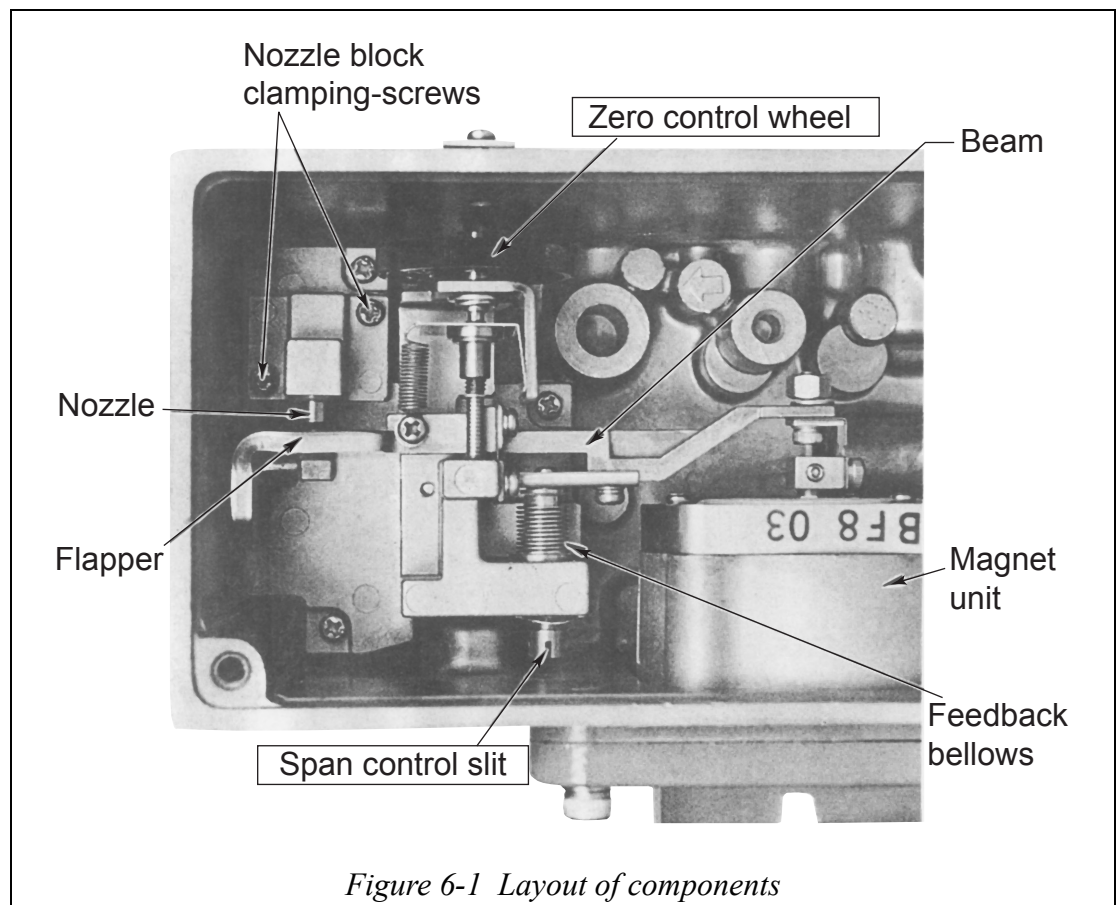


Figure 6-1 Layout of components

- (1) Connect an air supply to the SUP connector and a precision air pressure gauge to the OUTPUT connector.
- (2) Connect a precision electrical signal source (4 - 20mA DC) to the electrical input terminals.

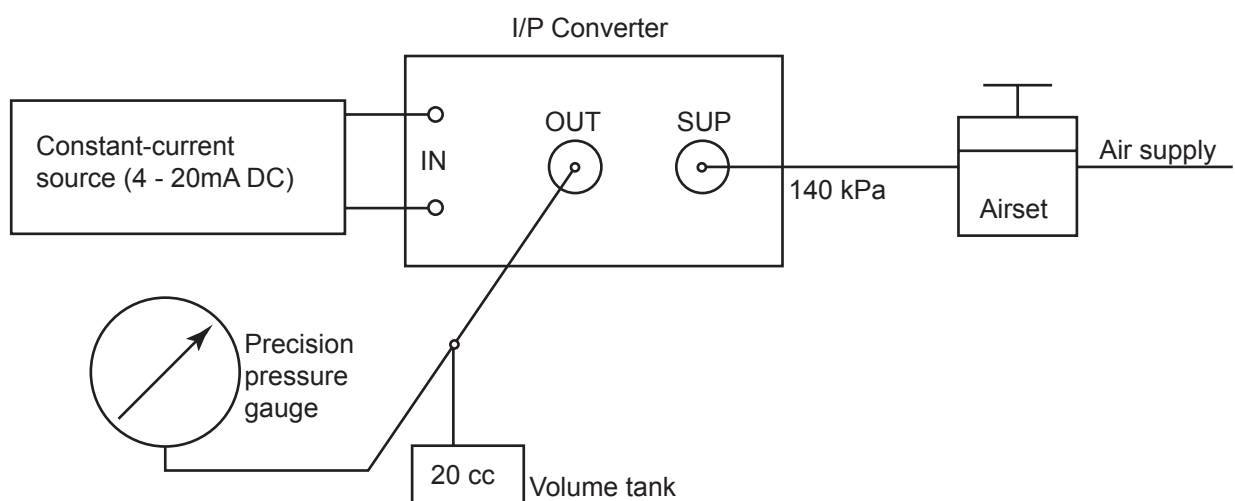


Figure 6-2 Calibration setup

- (3) Feed a current signal of 4mA from the constant-current source. Adjust the ZERO control wheel so that the output pressure become 20 kPa {0.2 kgf/cm²}±0.25%. The output pressure rises as you turn the wheel counterclockwise as viewed from the top in the attitude shown in Figure 6-1.
 - (4) Feed a current signal of 20mA from the constant-current source. Adjust the SPAN control by inserting a screwdriver into the SPAN control slit so that the output pressure becomes 100 kPa {1.0 kgf/cm²} ±0.25%. The output span becomes wider as you move the screw driver to the right as viewed in the attitude shown in Figure 6-1.
 - (5) Repeat step (3) and (4) until the required zero and span accuracies are obtained.
- The ZERO control is also adjustable externally.

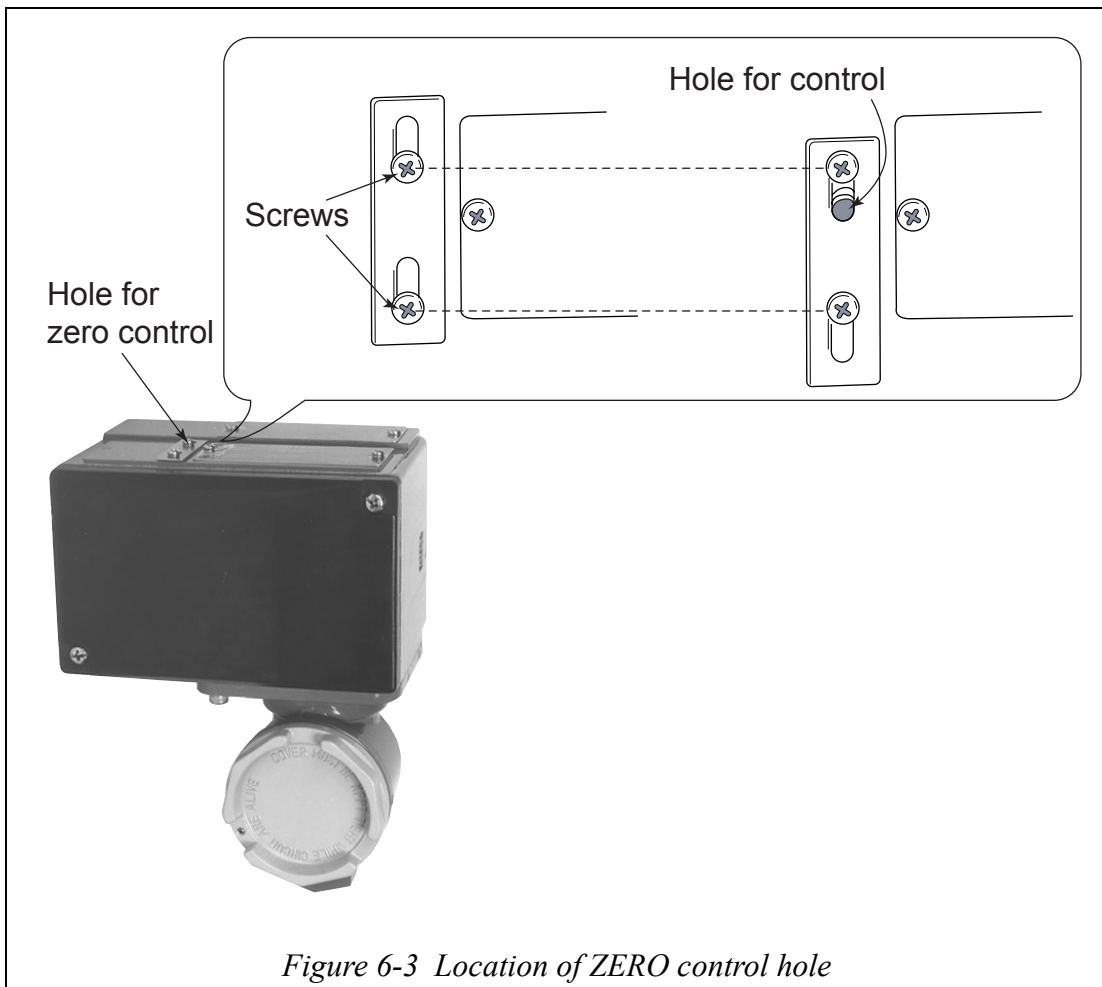


Figure 6-3 Location of ZERO control hole

To gain access to the ZERO control hole, loosen the two screws of the cap near the nameplate on the casing, then slide it downward.

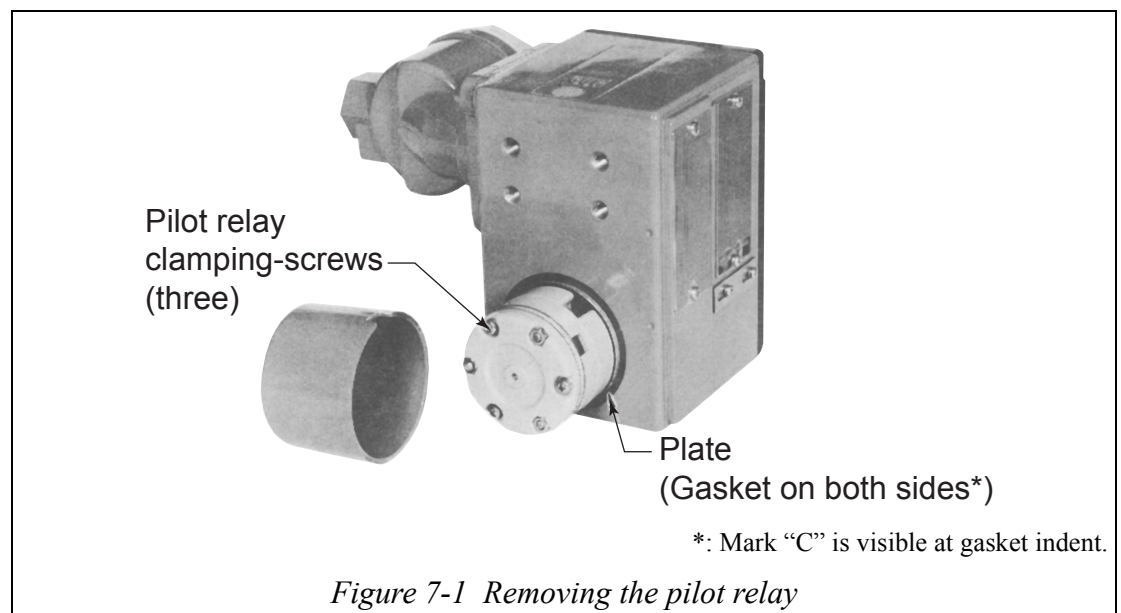
~Note *If you have removed the cap by mistake, exercise care not to misplace the O-ring of the ZERO control hole.*

Chapter 7 : Maintenance

Normally the I/P Converter requires no maintenance service. However, if the I/P Converter is operated in adverse conditions (such as in environments prone to dust), disassemble the pilot relay and clean the restriction hole (employing a steel wire of 0.27 mm dia.) and the port and seat (employing a soft cloth). If the output pressure has become abnormally high and cannot be lowered, clean the nozzle with a steel wire of 0.6 mm dia. To do this, remove the nozzle block. (See Figure 6-1)

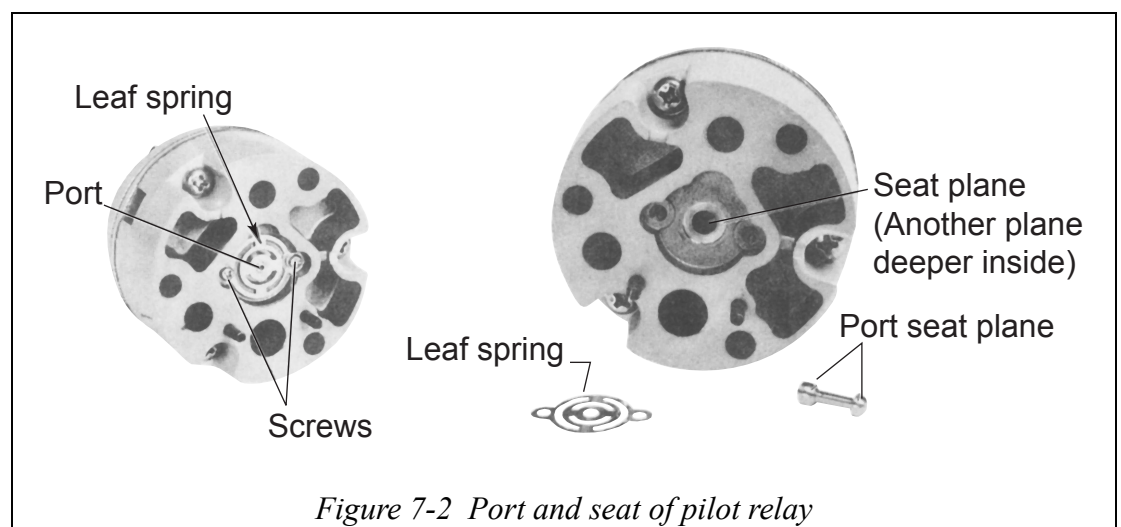
7-1 : Cleaning the Pilot Relay Port and Seat

(1) Remove the pilot relay cover by loosening its screws.



(2) Detach the pilot relay by removing its three clamping-screws.

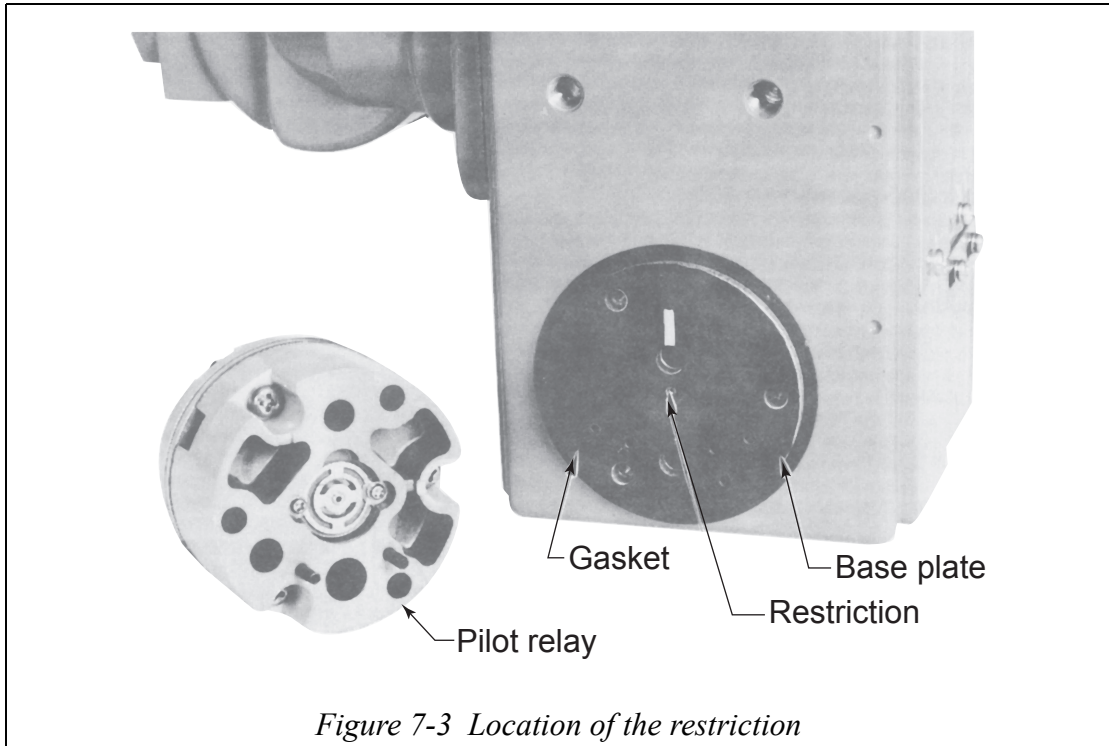
Remove the leaf spring from the bottom of the pilot relay by loosening its two screws, and then take out the port.



- (3) Clean the seating planes. There are two seating planes to be cleaned - one at the front and another deeper inside the hole. To clean the deeper seat plane, use a cloth formed into a bar shape.

7-2 : Cleaning the Restriction for Nozzle Back-pressure

To gain access to the restriction for the nozzle back-pressure, proceed as follows: Remove the pilot relay. Now the plate which is sandwiched between the two gaskets is accessible. The restriction is located in the center of the plate.



7-3 : Notes on Installing the Pilot Relay

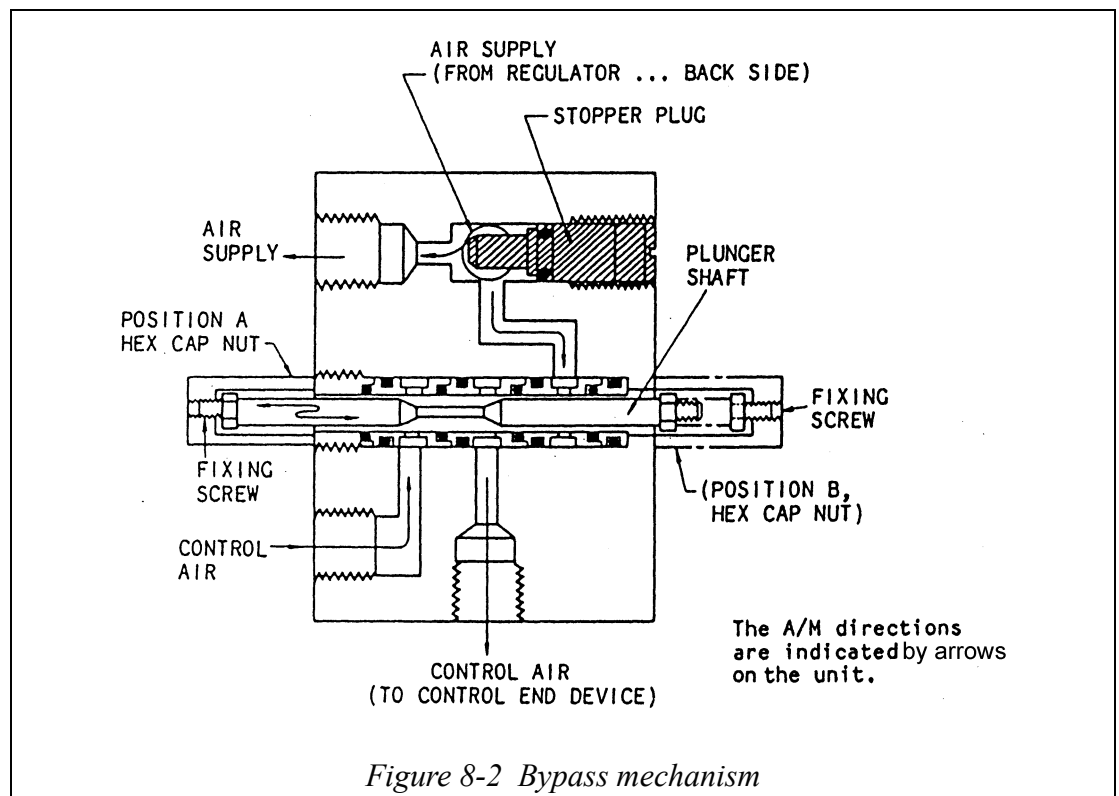
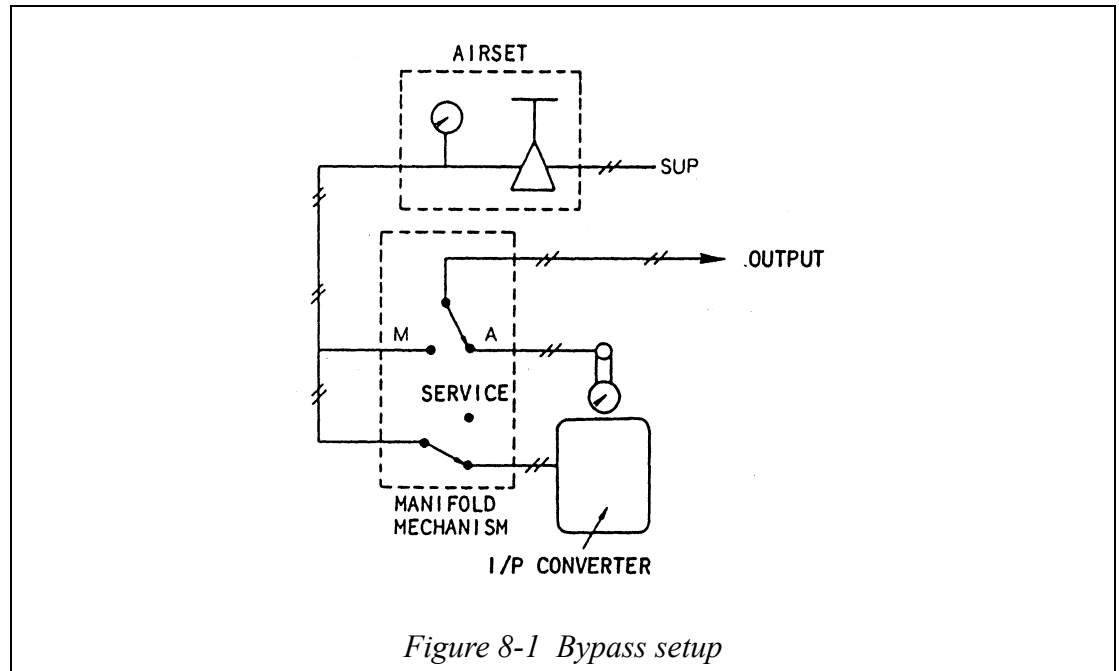
Install the pilot relay by following the two guide pins and exercising care not to damage the two gaskets. Position the gasket so that its indentation is aligned with the “C” mark on the plate. A circlet mark is provided on the side of the pilot relay to facilitate positioning. Align the circlet to the position of the OUT connector.

7-4 : Cleaning the Nozzle

To clean the nozzle, detach the nozzle block by loosening its two clamping-screws (see Figure 6-1).

Chapter 8 : Bypass Manifold

This chapter is for the Bypass Manifold which is installed on a I/P Converter. The Bypass Manifold is comprised of an Airset and an air switching mechanism, and allows the selection between an auto (A) position, a manual (M) position, and a service position. A bypass setup is shown in Figure 8-1 and the manifold mechanism is shown in Figure 8-2.



8-1 : A/M Switching

The bypass manifold is used when it is necessary to drive the control valve manually into the full open state or fully closed state (A/M position change).

When manually operating the control valve, it is recommended to change the manifold to the service position by means of the plug, in addition to the A/M position change. (This is recommended as this will prevent hunting which could be caused when in the M mode).

To return to the control valve to the manual mode, set the manifold to the A position.

8-2 : Switchover Procedures and Functions

Switchover from Auto (A) to Manual (M)

- (1) Turn the fixing screw counterclockwise at the head of the hex cap nut with a screwdriver.
- (2) Remove the hex cap nut by turning it counterclockwise.
- (3) Push the plunger shaft into the manifold in the M direction until the shaft touches the stopper.
- (4) Replace the hex cap nut at the M position.

When in manual, the I/P converter remains idle. The air supply adjusted by turning the knob of the Airset is fed to the actuator, allowing you to manually drive the control valve.

Service Position

To set the manifold to the service position from the manual (M) state, drive the stopper plug into the manifold with a screwdriver, until the plug touches the stopper. The service position basically is of an M state.

When in the service position, the I/P converter air supply is shut off. The control valve, however, can be driven manually the same as when the manifold is in manual.

Switchover from Manual (M) to Auto (A)

- (1) If the stop plug has been set to the service position, rotate the plug by several turns counterclockwise with a screwdriver to allow the air supply to flow.
- (2) Turn counterclockwise the fixing screw at the head of the hex cap nut with a screwdriver.
- (3) Remove the hex cap nut by turning it counterclockwise.
- (4) Push the plunger shaft into the manifold in the A direction until the shaft touches the stopper.
- (5) Replace the hex cap nut at the A position.

When in auto the actuator is driven by the output of I/P converter.

The air supply for the converter is fed through the Airset.

Adjust its output pressure to obtain the required value.

Chapter 9 : Handling Procedure for A/M Switch (Pipingless type)

9-1 : Setting the A/M Switch

To set the A/M switch to the A (auto) or M (manual) mode, proceed as follows

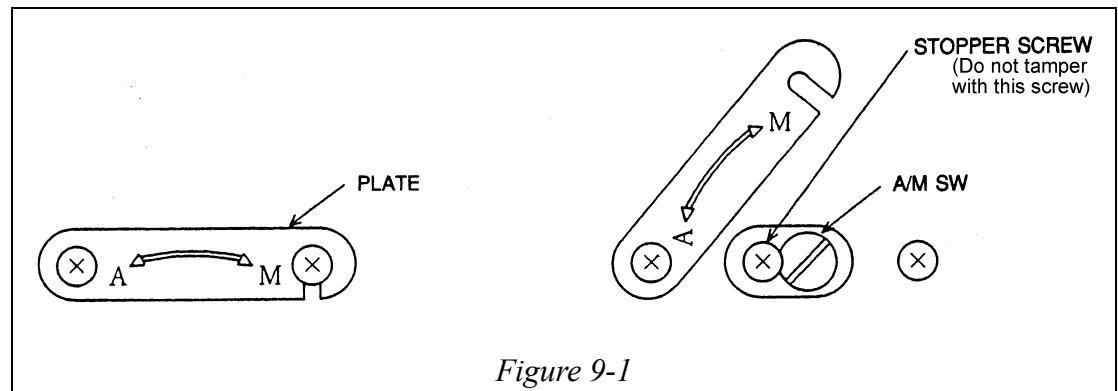


Figure 9-1

- (1) Loosen the clamping-screw of the plate and move the plate to a position where it grants you access to the A/M switch.
- (2) If you want to change the A/M switch to the A mode, turn the A/M switch in the “A” direction (counterclockwise) until it hits the stopper screw.
- (3) If you want to change the A/M switch to the M mode, turn the A/M switch in the “M” direction (clockwise) until it hits the stopper screw.

9-2 : Verifying the A/M Switch

To verify the setting of the A/M switch, proceed as follows:

(A) Verifying the A mode

- (1) Be sure that the A/M switch has been set to the A mode.
- (2) Set the pressure regulator output to 140 kPa {1.4 kgf/cm²}.
- (3) Check and adjust overall operation of the I/P converter.

(B) Verifying for the M mode

- (1) Be sure that the A/M switch has been set to the M mode.
- (2) Set the pressure regulator output to 140 kPa {1.4 kgf/cm²}
- (3) Check that the I/P converter output can be adjusted between a range of 0 to 140 kPa {1.4 kgf/cm²} by changing the pressure regulator output.

After setting and checking for the M mode of operation has been completed, return the A/M switch to the A mode, and replace the plate to its original position and fix it securely with the clamping-screw. Finally, reset the pressure regulator output to 140 kPa {1.4 kgf/cm²}

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