

Multi-P/I Converter

Model KUX121/128

User's Manual

Azbil Corporation

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1. SCOPE

This manual covers information required for operation, calibration and maintenance of Model KUX121 Multi-P/I Converter. Be sure to read this manual before handling the instrument.

2. DESCRIPTION

2.1 Outline

The Multi-P/I Converter is comprised of P/I converter modules and a file. Each of the P/I converter modules converts a pneumatic signal of 20 - 100 kPa (or 3 - 15 psi, 0.2 - 1.0 bar, or 0.2 - 1 kgf/cm²) into an electrical signal of 4 - 20 mA DC (or 1 - 5 VDC), employing a diffused silicon semiconductor for the pressure to current conversion element. The file accommodates up to eight modules.

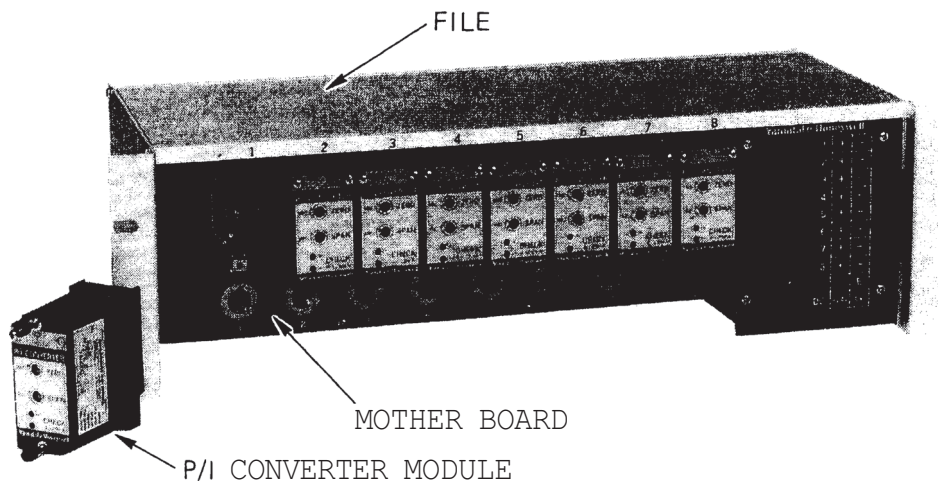


Fig. 1.1

2.2 Structures and Features

The module can be readily installed into or removed from the file, simply by fixing or removing two screws. The module can be removed without requiring to shut down the loop since the pneumatic signal circuit is automatically closed as you remove the module from the file. The module has CHECK terminals on its front panel, allowing you to check the output current signal simply by connecting a milliammeter to these terminals.

Files can be installed on a rack or a wall. On the JAST cabinet (a standard TDCS cabinet of Azbil Corporation), up to eight files (four on the front and four on the rear) can be installed.

There are two types of files, namely, AC type and DC type. The AC type of files have an AC power supply for the P/I converter modules. The DC type of files have no AC power supply and call for external DC power sources.

The DC type of files are classified further into an individual power source type and a common power source type. The former type of files call for individual power sources for respective modules. The latter type of files can be served in common with a single power source.

The AC type of files are available only in the multiple power source type (a single power source used in common for multiple modules).

3. SPECIFICATIONS

3.1 Performance Specifications

Input Signal: 20 - 100 kPa, 3 - 15 psi, 0.2 - 1.0 bar, or
0.2 - 1.0 kgf/cm². (Pressure rating 200 kPa)

Output Signal: 4 - 20 mA DC (current limit at approx. 30 mA),
1 - 5 VDC (for common power source type only)

Power Source: DC type (both individual type
and multiple type): 24 VDC +15%, -10%

AC type: 100/110/115 V ±10% 50/60 Hz
±2 Hz AC

Power Consumption: AC type: 19.2 VA (max.)

DC type: 3.84 W (max.)

External Load: DC type (both individual type
and common type): 480 ohms

$$R = \frac{(V - 14.4)}{0.020}$$

R: External load (ohm)

V: Supply voltage (volt)

AC type: 480 ohms (max.), for ±10% deviation
from nominal voltage

Air Connections: Rc1/4, 1/4NPT internal thread

Ambient Temperature: 0 to 50 degrees C

Ambient Humidity: 10 to 90% RH

Accuracy: ±0.25% FS

Temperature Characteristics

Zero Shift: 0.6% FS per 25°C (max.)

Span Shift: 0.6% FS per 25°C (max.)

Zero Drift: 0.5% FS per 6 months (max.)

Installation: Wall mount or 19-inch rack mount (EIA, RS-310-B)

Weight: DC type (individual power source type): 3.9 kg (max.)

DC type (common power source type): 4.3 kg (max.)

AC type: 5.1 kg (max.)

Option: Input air pressure check terminal

Zero Drift: 0.5% FS per 6 months (max.)

Installation: Wall mount or 19-inch rack mount (EIA, RS-310-B)

Weight: DC type (individual power source type): 3.9 kg (max.)
DC type (common power source type): 4.3 kg (max.)
AC type: 5.1 kg (max.)

Option: Input air pressure check terminal

3.2 Model Number Tables

Basic model No.	Selections							Options	Description
	Power source	Input	Output	Air connection	Modules	Installation	Environments		
KUX121									Multi-P/I Converter
	-1								24 VDC, individual power source type
	-2								24 VDC, common power source type
	-3								100 VAC, 50/60 Hz, common power source type
	-4								110 VAC, 50/60 Hz, common power source type
	-5								115 VAC, 50/60 Hz, common power source type
		1							0.2 - 1.0 kgf/cm ²
		2							3 - 15 psi
		3							0.2 - 1.0 bar
		4							20 - 100 kPa
			1						4 - 20 mA
			2						1 - 5 VDC (Selectable only for power source specification 2 - 6)
				A					Rc1/4
				B					1/4NPT internal thread
					0				File only
					1				File + 1 converter module
					2				File + 2 converter modules
					3				File + 3 converter modules
					4				File + 4 converter modules
					5				File + 5 converter modules
					6				File + 6 converter modules
					7				File + 7 converter modules
					8				File + 8 converter modules
						C			19-inch rack mount
						S			Wall mount
							X		Standard
								-X	No options
								-P	With input air pressure check terminal

(2) P/I Converter Module Model Number

Basic model No.	Selections				Options	Description
	Power source	Input	Output	Environ-ments		
KUX128						Module for Multi-P/I Converter (for KUX121)
	-1					24 DVC power source
		1				0.2 - 1.0 kgf/cm ²
		2				3 - 15 psi
		3				0.2 - 1.0 bar
		4				20 - 100 kPa
			1			4 - 20 mA
				X		Standard
					-X	No options

- Notes: 1. The AC type of file rectifies the AC line voltage into a 24-VDC supply voltage.
2. The 1 - 5 VDC output is delivered by converting the 4 - 20 mAC signal into a 1 - 5 VDC signal within the file.

4. OPERATING PRINCIPLES

The input pressure signal which represents a process variable is fed to a silicon sensor which is a resistance bridge with a piezoresistance effect and converts the pressure signal into a resistance signal. A constant current is fed to the resistance bridge and its resistance change is detected into a voltage signal. The voltage signal is amplified by an amplifier and then it is converted into a current signal by a voltage-to-current converter.

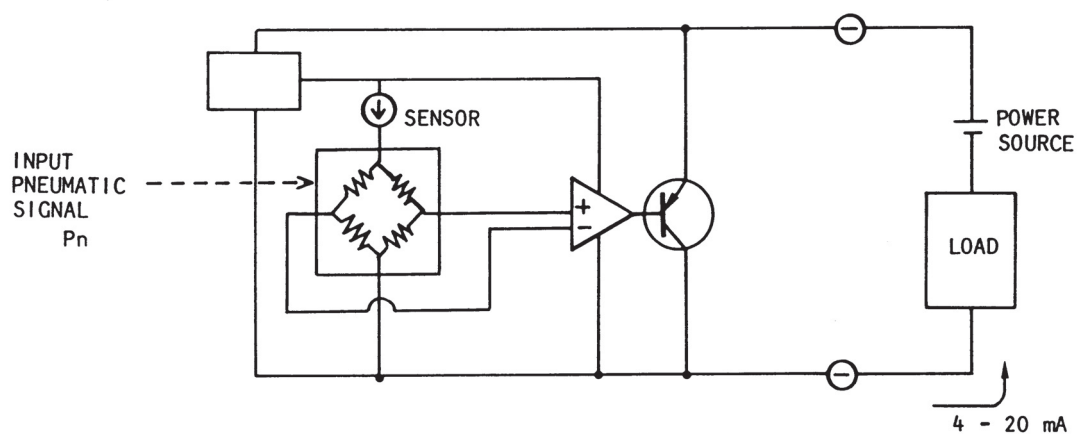


Fig. 4.1. Operating Principle

5. INSTALLATION

5.1 Mounting Dimensions

For the mounting dimensions refer to the overall dimension drawings at the end of this manual.

5.2 Place of Installation

The place of installation must be in an instrumentation room where ambient temperature is within 0 to 50°C and with less temperature change and where atmosphere is not highly humid. The place must be reasonably free from mechanical vibration.

5.3 Customer Connections

(1) Input Air Connections

The input air connection [Rc1/4 (or 1/4NPT internal thread)] are provided at a lower section on the mother board and are numbered 1 - 8 for respective P/I converter modules. The connecting work can be made easier by removing the terminal cover and terminal block as shown in Fig. 5.1.

(2) Electrical Output Signal Connections

Connect the cables to the customer connection terminals as indicated on the terminal cover. The terminal screws are M3 x 6 mm.

For the individual power supply type of instrument, connect the signal lines only. For the common power supply type of instrument, connect the signal lines and power supply line.

For individual power supply type of instrument, electrical connections can be conveniently made by using DigitroniK Line Wiring Blocks (Model KMW 110-X-X).

5.4 Examples of Cabinet Piping and Wiring

Upto eight files (up to four files on each of the front and rear sides) can be installed on a JAST cabinet (a standard TDCS cabinet of Azbil Corporation). Examples of piping and wiring are given in Fig. 5.2.

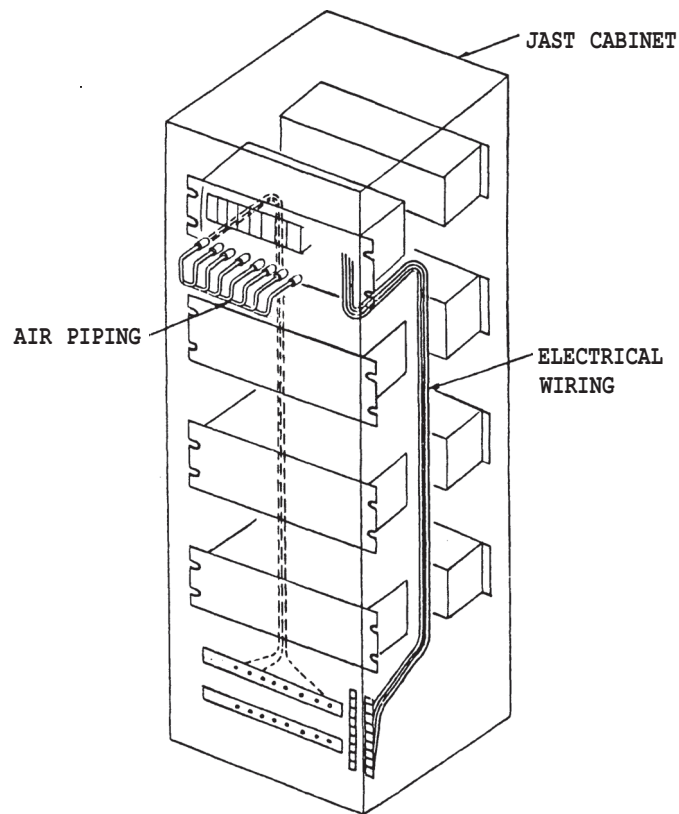


Fig. 5.2

5.5 Installing or Removing the Modules

(1) Removing Modules from File Mother Board

Loosen the two screws (top and bottom) of each module and remove the module from the board. As the module is removed, the input air circuit is closed automatically.

(2) Installing Modules on File Mother Board

Connect the air circuit by inserting the air pressure input port in the guide hole of the mother board and pushing the module toward the mother board. Keeping the module in this state with one hand, secure the two screws (top and bottom) of the module with the other hand.

PRECAUTION: Tightening torque of the screws should be approximately $0.2 \text{ N}\cdot\text{m}$ $\{2 \text{ kgf}\cdot\text{cm}\}$. Do not tighten them excessively – do not apply a tightening force of greater than $0.29 \text{ N}\cdot\text{m}$ $\{3 \text{ kgf}\cdot\text{cm}\}$.

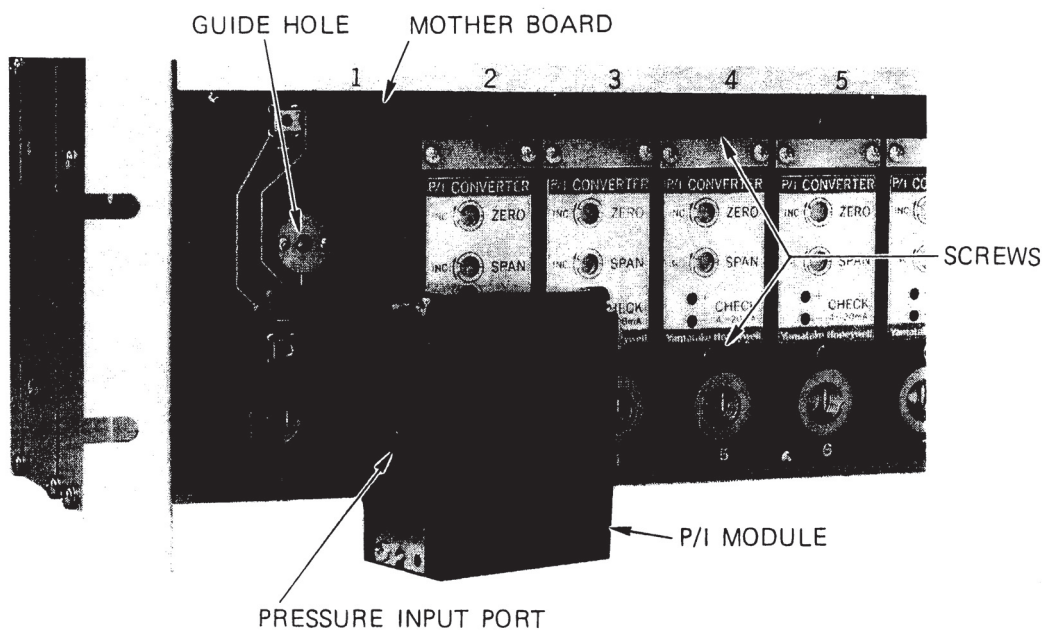


Fig. 5.3. Removing and Installing Modules

6. OPERATING PROCEDURE

When air piping and electrical wiring are complete and pneumatic input signal and power supply are turned on, the instrument is ready to operated. For the file of the common power source type, turn on the POWER switch at the right hand end of the file (refer to Fig. 5.1). To turn on/off the switch, move it up/down in a state that it is pulled.

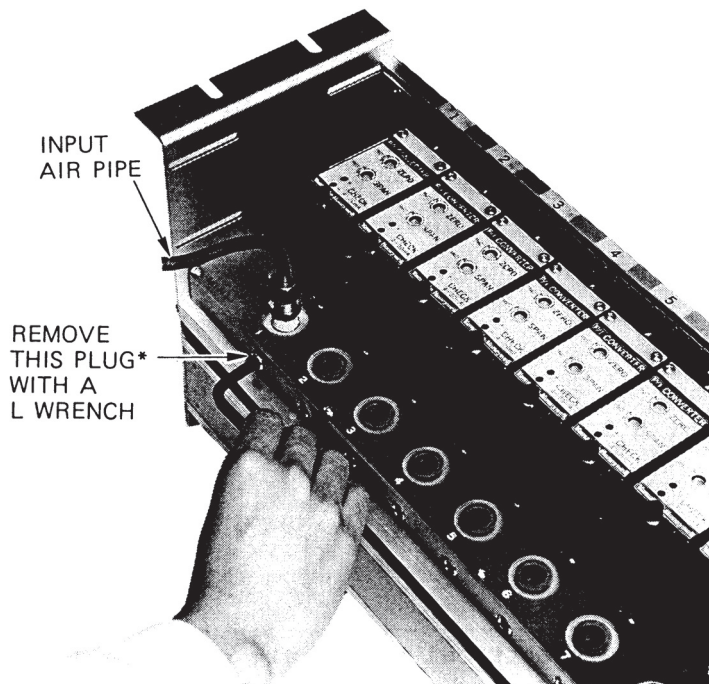
7. CALIBRATION AND ADJUSTMENTS

7.1 Setup

Set one of the module spaces (bases) of the file mother board to an unused state, by removing the module and disconnecting the piping. This space (base) may be used as a test stand.

Install the module to be tested on the test-stand base. Connect a variable air pressure source and a precision pressure gauge (or mercury column) to the air piping and connect a digital voltmeter to the corresponding voltage output terminal. For a 4 - 20 mA DC output, connect a 250-ohm precision resistor and a digital voltmeter (DVM) in parallel, to the output circuit of the test-stand base.

Note: The 4 - 20 mA DC current output can be measured more accurately by connecting a 250-ohm precision resistor in series to develop a voltage drop of 1 - 5 VDC across the resistor and measuring this voltage with a digital voltmeter than by measuring the current signal directly with a milliammeter although it may be used simply to monitor the output current.



* OPTION

Fig.7.1.1

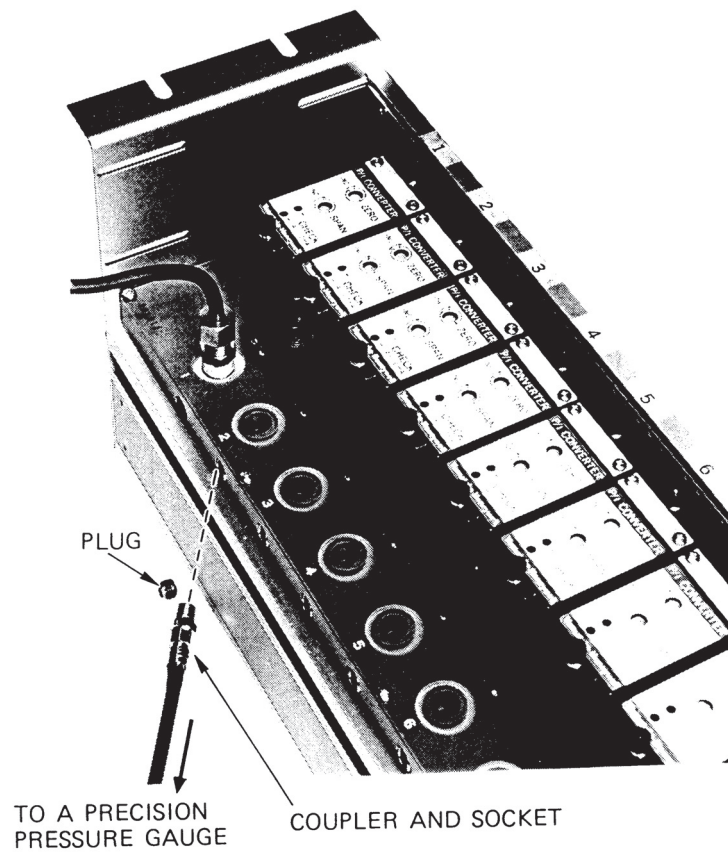


Fig. 7.1.2

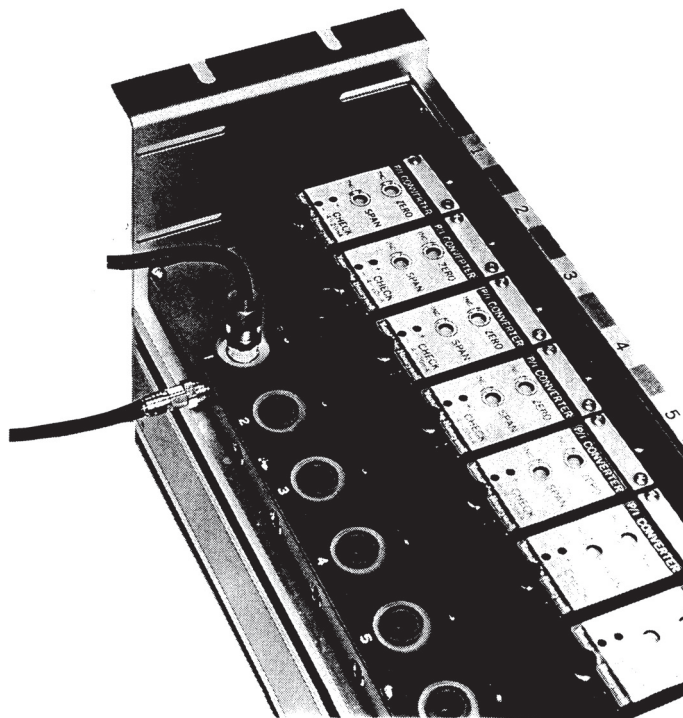


Fig. 7.1.3

7.2 Calibration

Adjustment of inputs and outputs are completed at the factory before shipment. Check the accuracies referring to the below table and made adjustments if the accuracies are not met within the required tolerance ($\pm 0.25\%$ FS).

Input					Output	
%	kgf/cm ²	psi	bar	kpa	mA DC	V DC
0	0.2	3	0.2	20	4	1
25	0.4	6	0.4	40	8	2
50	0.6	9	0.6	60	12	3
75	0.8	12	0.8	80	16	4
100	1.0	15	1.0	100	20	5

7.3 Adjustment

To adjust the zero and span, turn respective potentiometer using a fine screwdriver from the front of the P/I converter module in the procedure mentioned below. The potentiometers are clockwise.

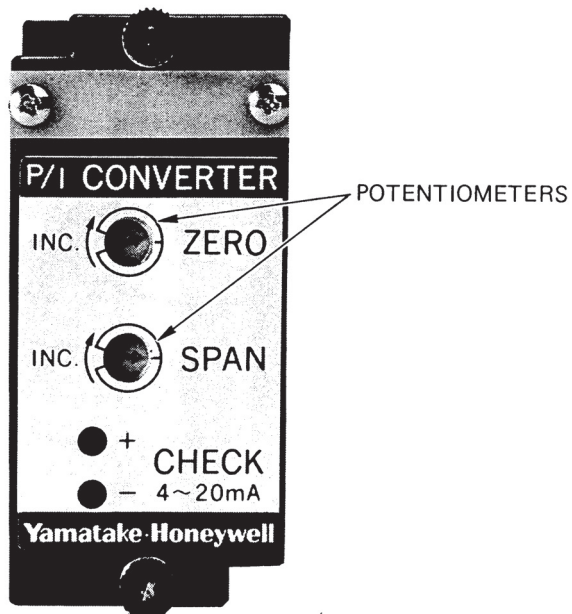


Fig. 7.2

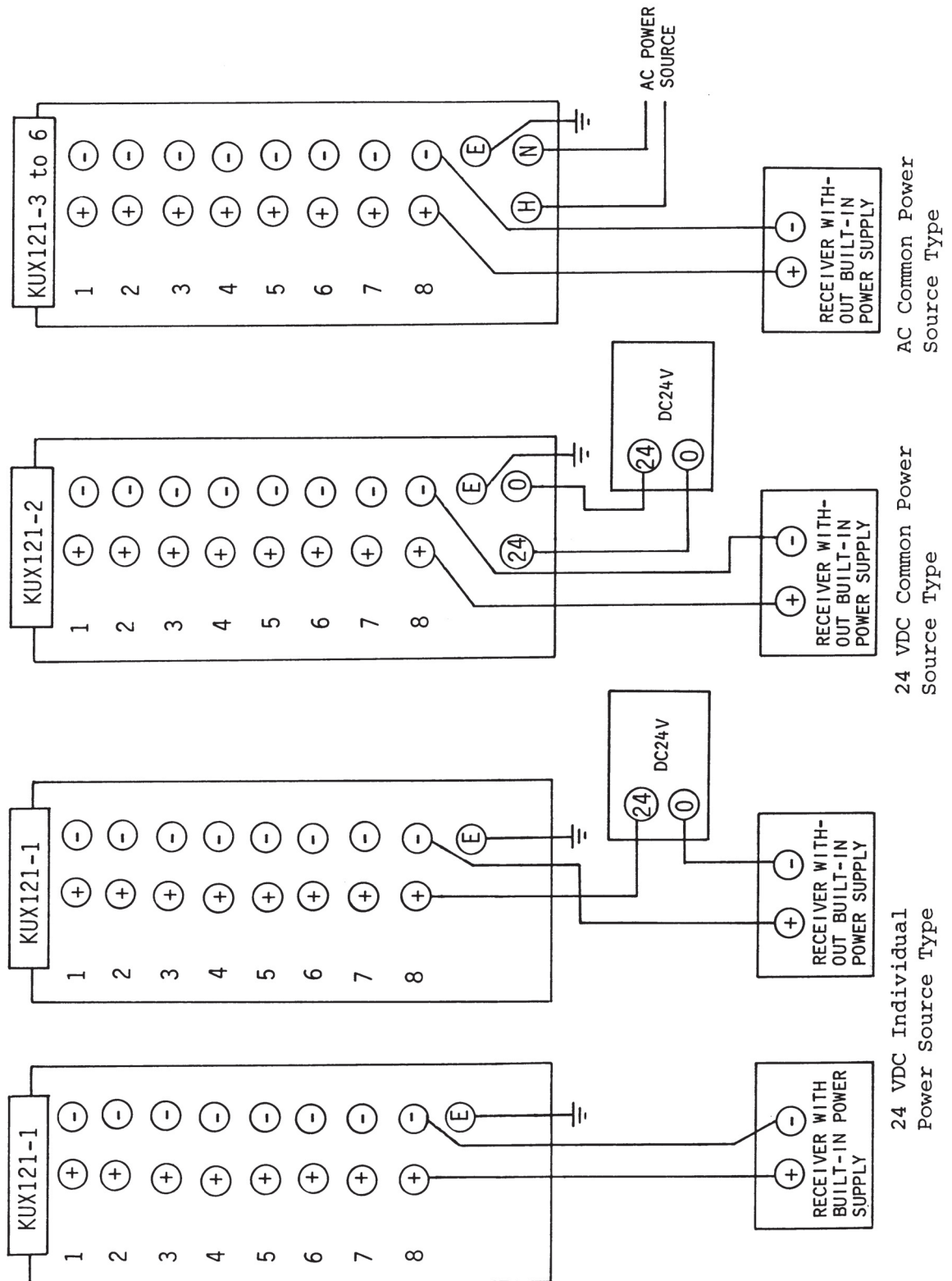
- (1) Set the ZERO and SPAN potentiometers in the mid-position (horizontal position).
- (2) Set the input at 0% and note the output "a" volts.
- (3) Set the input at 100% and note the output "b" volts.
- (4) Calculate $b_1 (V) = 5 + (5a - b)/4$.
- (5) With the input remaining at 100%, adjust the output to "b₁" volts with the SPAN potentiometer.
- (6) Set the input at 0% and adjust the output to 1 volt with the ZERO potentiometer.
- (7) Set the input at 100% and check that the output is 5 volts.

8. INSTALLING THE COUPLER (OPTION)

If the instrument is with model number "P" (option), a coupler (a socket and a plug) and an allen wrench accompanies the instrument. Install the coupler as shown in Fig. 7.1.2.

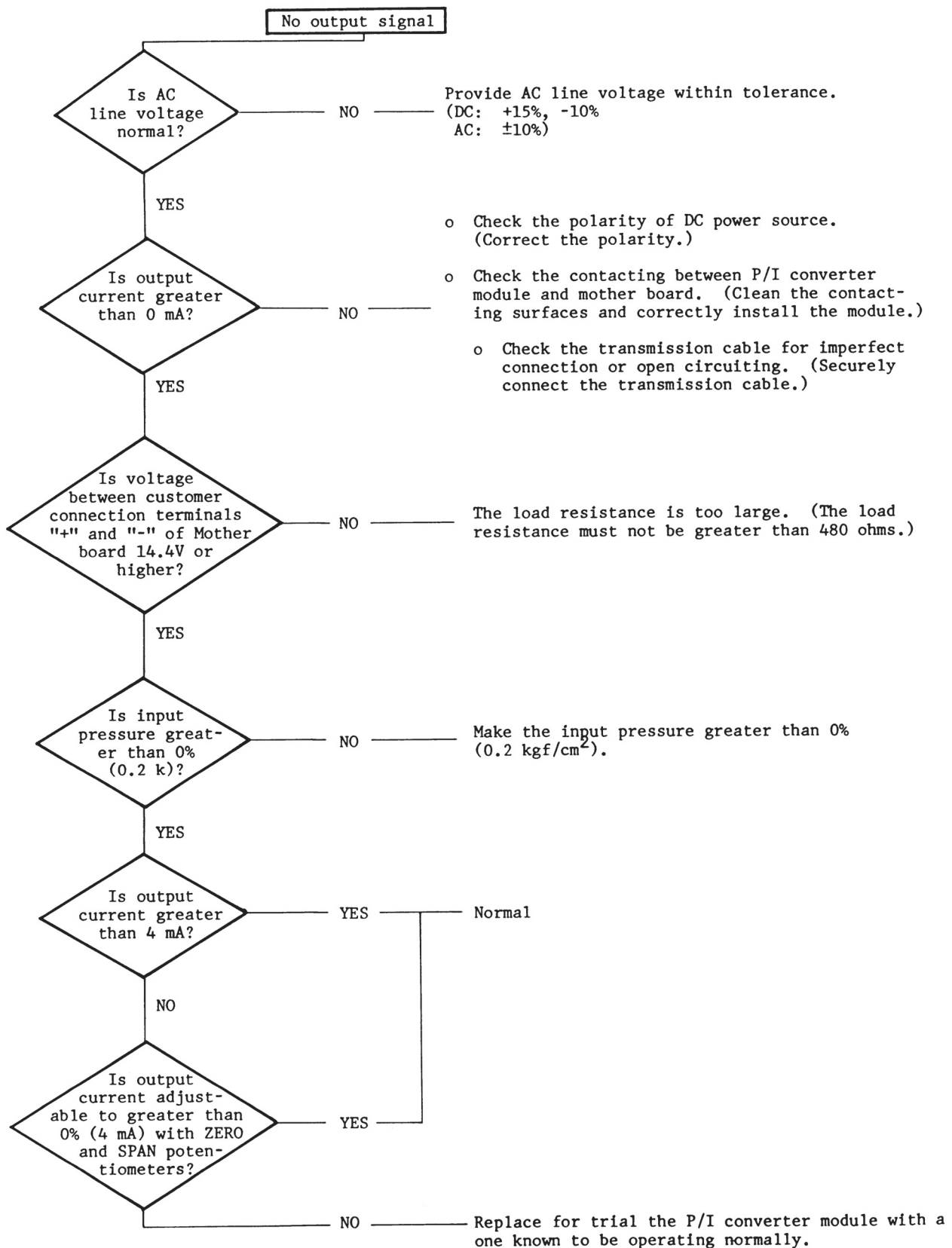
- (1) Remove the blind plug which has a hex hole.
- (2) Mount the socket.

9. ELECTRICAL CONNECTIONS

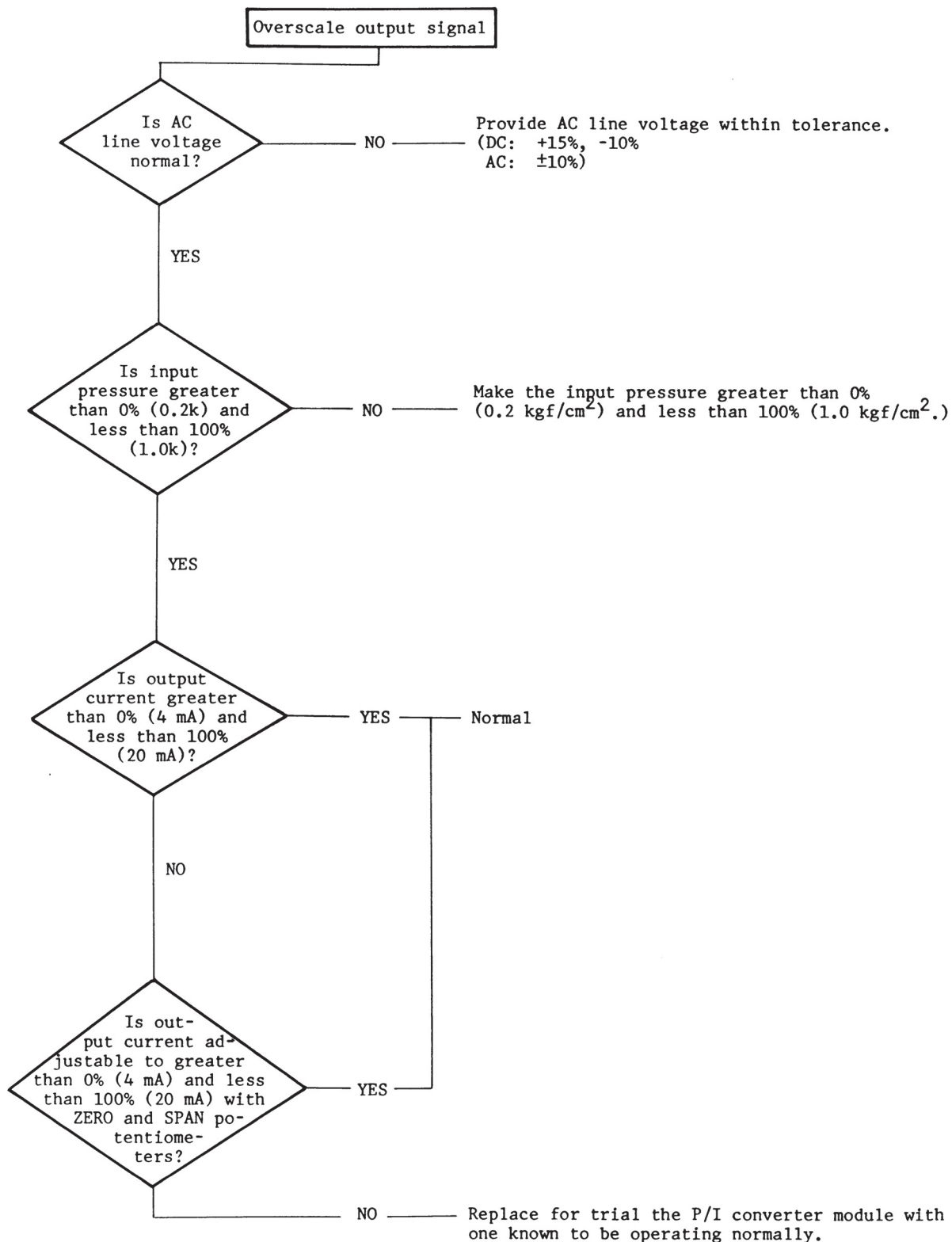


10. TROUBLESHOOTING

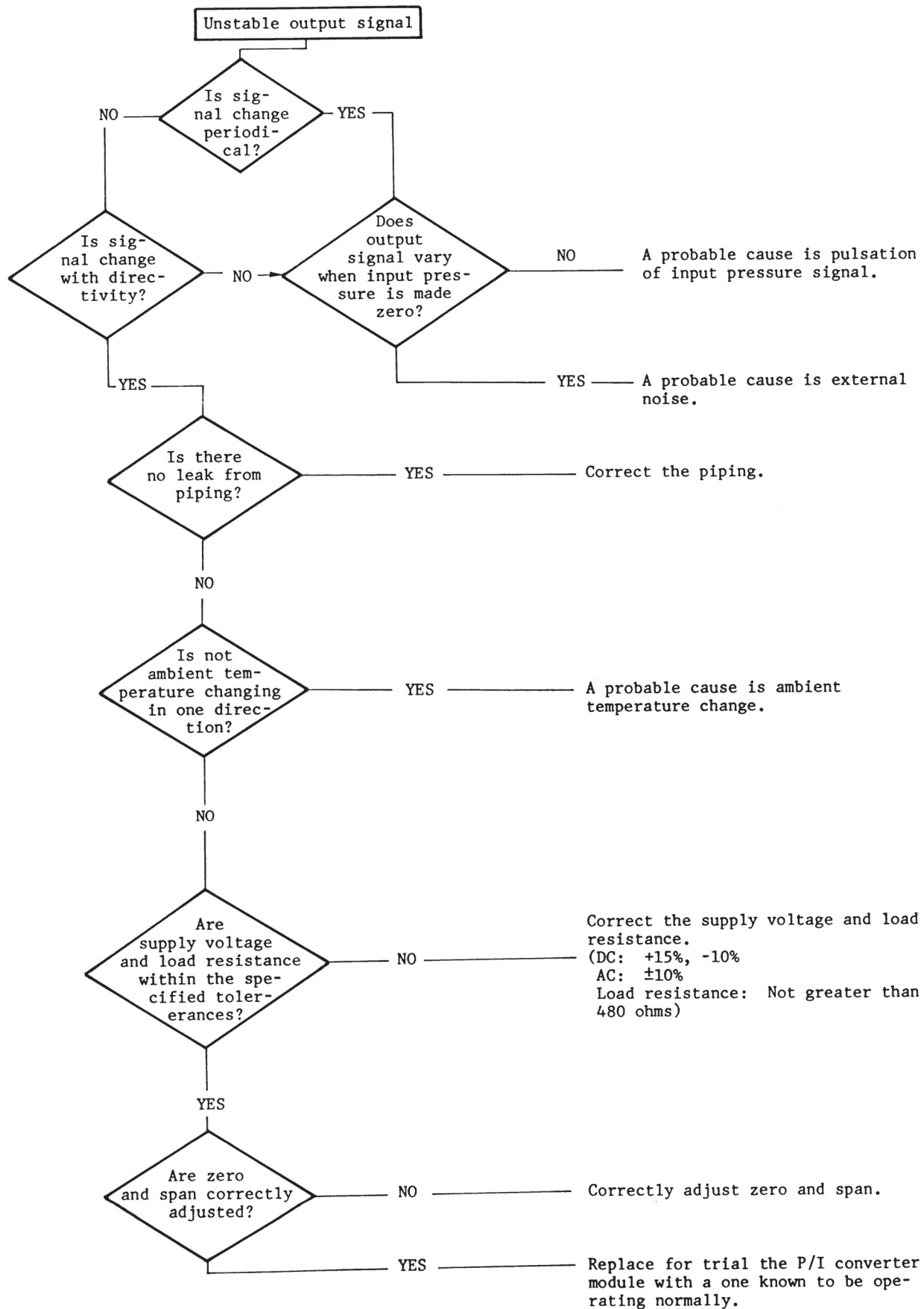
(1) No output signal is delivered.



(2) The output signal deflects overscale.



(3) The output signal is unstable.



11. NOTES FOR REPLACEMENT OF KUX120

Model KUX129 P/I Converter Modules of KUX120 can be replaced with Model KUX128 P/I Converter Modules of KUX121. For replacement, note the following:

(1) KUX120 of DC power source type

Pay attention to be external load. If the load resistance is less than 360 ohms for each P/I converter module, supply voltage change of +15% and -10% from 24 VDC is permissible. For details, refer to Section 3 "SPECIFICATIONS."

When the load resistance is greater than 360 ohms, Model NAX50□ CurrentpaK Impedance Converter should be used.

(2) KUX120 of AC power source type

Pay attention to the external load. If the load resistance is less than 360 ohms for each P/I converter module, supply voltage change of $\pm 10\%$ from the nominal voltage is permissible.

(3) The KUX128 (for KUX121) is higher than the KUX129 (for KUX120) by approximately 30 mm.

12. DRAWING

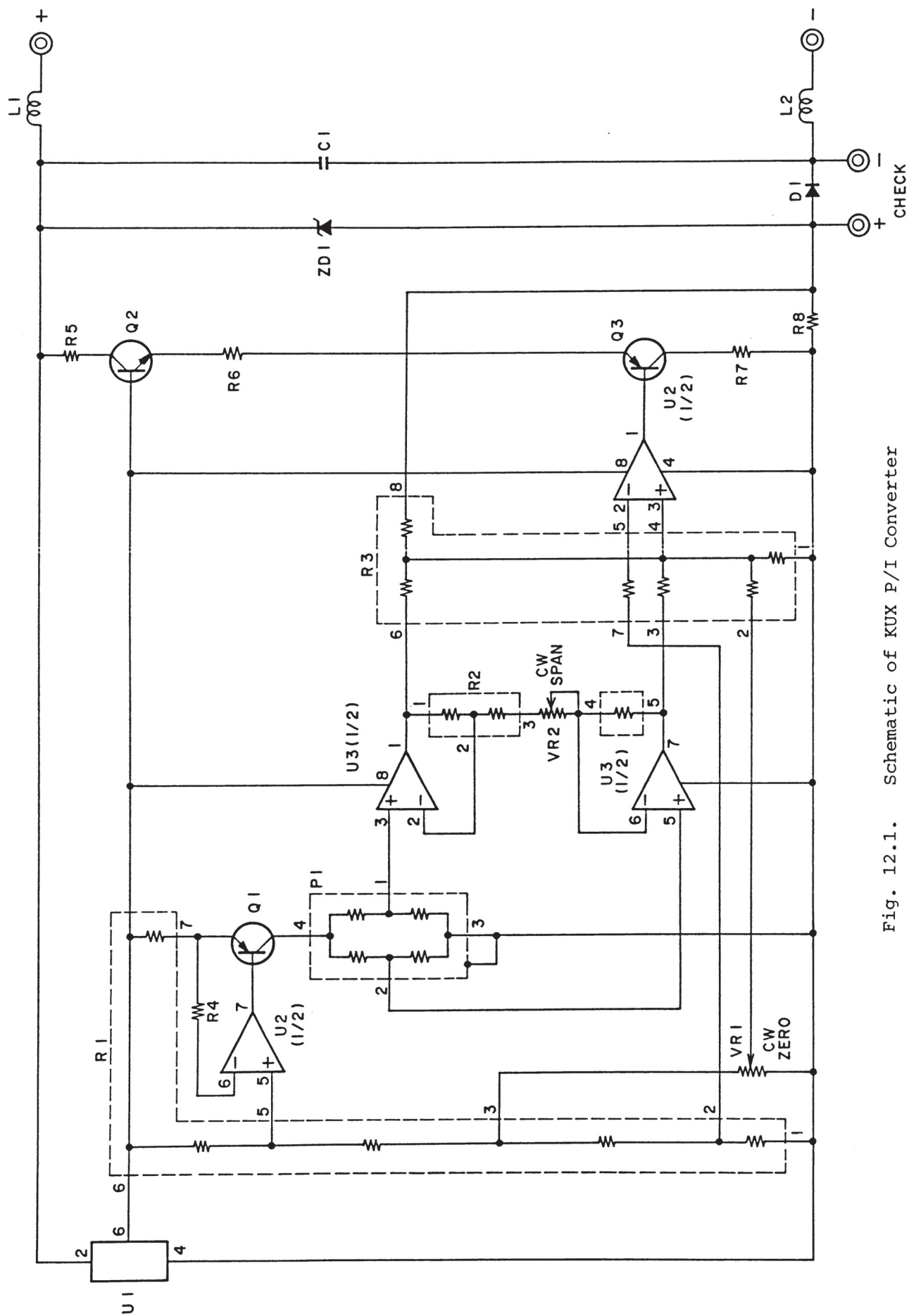
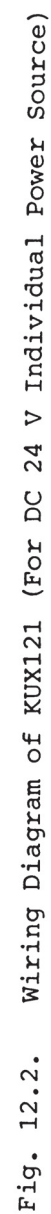


Fig. 12.1. Schematic of KUX P/I Converter



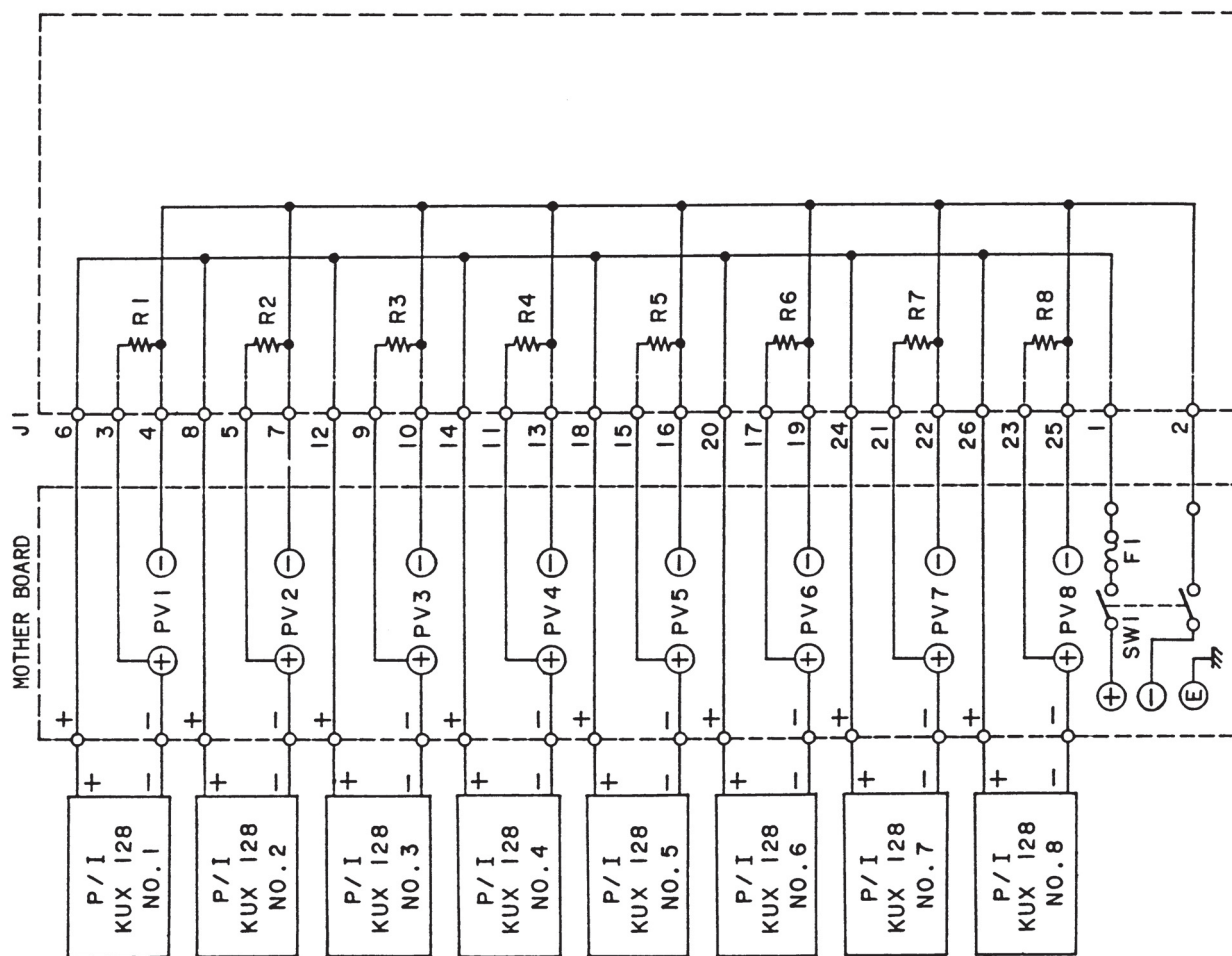


Fig. 12.3. Wiring Diagram of KUX121 (For DC 24 V Common Power Source)

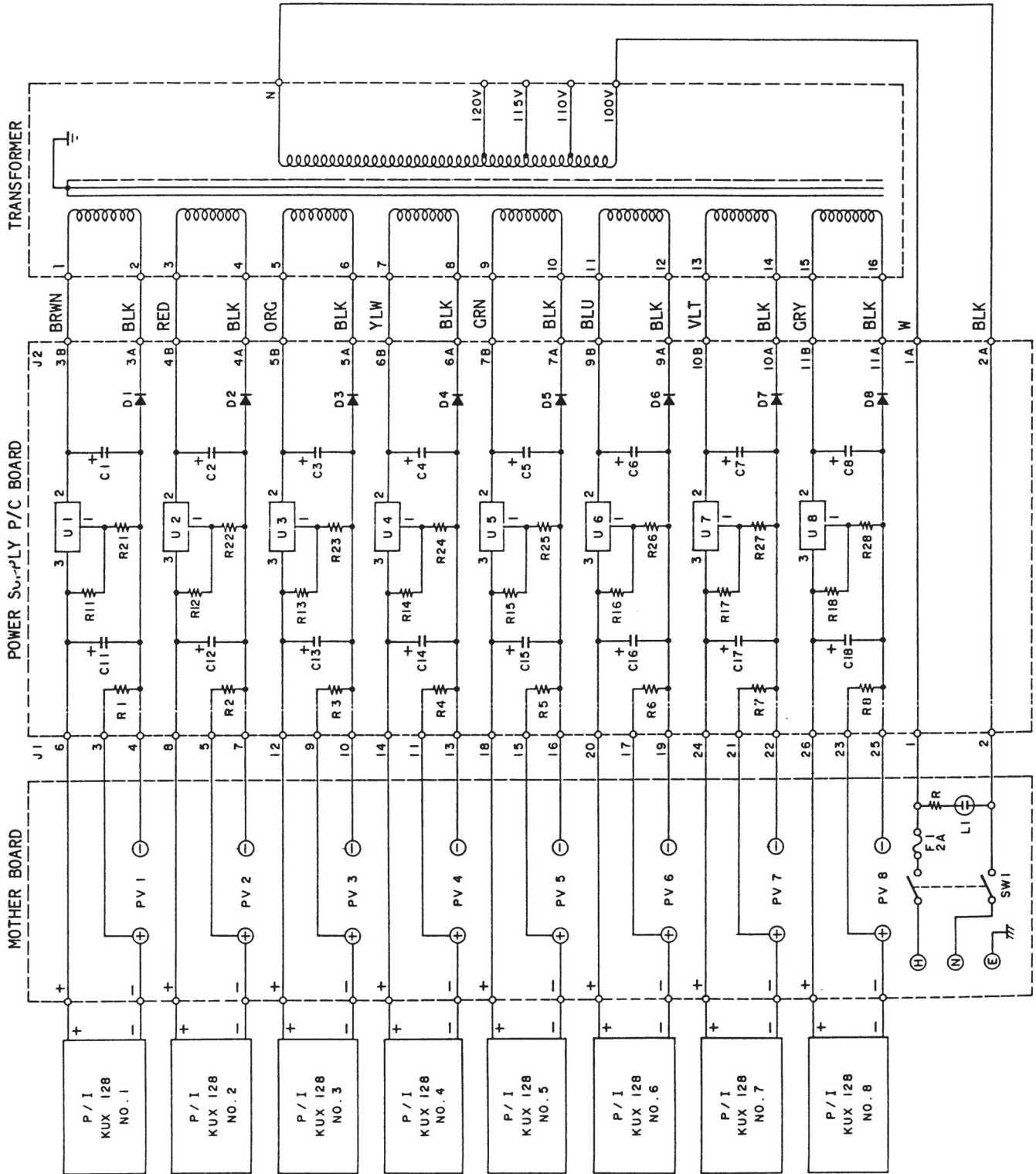


Fig. 12.4. Wiring Diagram of KUX121 (For AC 100 V Power Source)

Technical drawing of a cabinet or rack. The drawing shows a side view with a total height dimension of 435 and a total width dimension of 203.2. The cabinet features eight numbered compartments (1 through 8) arranged vertically. The compartments are separated by horizontal dividers. The drawing includes various mounting points, screws, and a curved line indicating a cable or wire running along the side of the cabinet. The bottom of the cabinet has a base with four feet. The drawing is labeled with '2' at the bottom right corner.

Unit: mm

RACK MOUNT TYPE

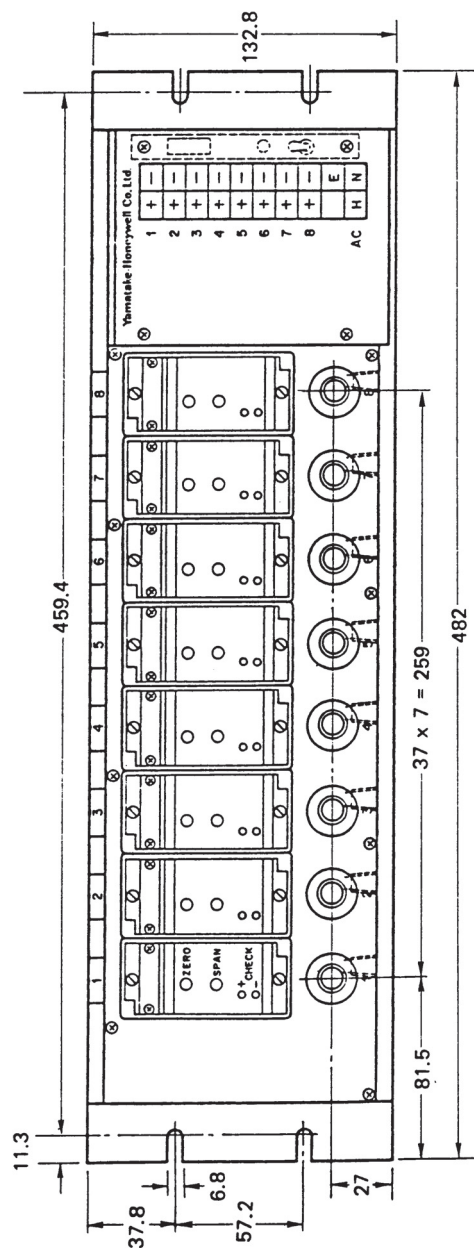


Fig. 12.5 Dimension Drawing

MEMO

Terms and Conditions

We would like to express our appreciation for your purchase and use of Azbil Corporation's products.

You are required to acknowledge and agree upon the following terms and conditions for your purchase of Azbil Corporation's products (system products, field instruments, control valves, and control products), unless otherwise stated in any separate document, including, without limitation, estimation sheets, written agreements, catalogs, specifications and instruction manuals.

1. Warranty period and warranty scope

1.1 Warranty period

Azbil Corporation's products shall be warranted for one (1) year from the date of your purchase of the said products or the delivery of the said products to a place designated by you.

1.2 Warranty scope

In the event that Azbil Corporation's product has any failure attributable to azbil during the aforementioned warranty period, Azbil Corporation shall, without charge, deliver a replacement for the said product to the place where you purchased, or repair the said product and deliver it to the aforementioned place. Notwithstanding the foregoing, any failure falling under one of the following shall not be covered under this warranty:

- (1) Failure caused by your improper use of azbil product (noncompliance with conditions, environment of use, precautions, etc. set forth in catalogs, specifications, instruction manuals, etc.);
- (2) Failure caused for other reasons than Azbil Corporation's product;
- (3) Failure caused by any modification or repair made by any person other than Azbil Corporation or Azbil Corporation's subcontractors;
- (4) Failure caused by your use of Azbil Corporation's product in a manner not conforming to the intended usage of that product;
- (5) Failure that the state-of-the-art at the time of Azbil Corporation's shipment did not allow Azbil Corporation to predict; or
- (6) Failure that arose from any reason not attributable to Azbil Corporation, including, without limitation, acts of God, disasters, and actions taken by a third party.

Please note that the term "warranty" as used herein refers to equipment-only-warranty, and Azbil Corporation shall not be liable for any damages, including direct, indirect, special, incidental or consequential damages in connection with or arising out of Azbil Corporation's products.

2. Ascertainment of suitability

You are required to ascertain the suitability of Azbil Corporation's product in case of your use of the same with your machinery, equipment, etc. (hereinafter referred to as "Equipment") on your own responsibility, taking the following matters into consideration:

- (1) Regulations and standards or laws that your Equipment is to comply with.
- (2) Examples of application described in any documents provided by Azbil Corporation are for your reference purpose only, and you are required to check the functions and safety of your Equipment prior to your use.
- (3) Measures to be taken to secure the required level of the reliability and safety of your Equipment in your use

Although azbil is constantly making efforts to improve the quality and reliability of Azbil Corporation's products, there exists a possibility that parts and machinery may break down. You are required to provide your Equipment with safety design such as fool-proof design,*1 and fail-safe design*2 (anti-flame propagation design, etc.), whereby preventing any occurrence of physical injuries, fires, significant damage, and so forth. Furthermore, fault avoidance,*3 fault tolerance,*4 or the like should be incorporated so that the said Equipment can satisfy the level of reliability and safety required for your use.

*1. A design that is safe even if the user makes an error.

*2. A design that is safe even if the device fails.

*3. Avoidance of device failure by using highly reliable components, etc.

*4. The use of redundancy.

3. Precautions and restrictions on application

3.1 Restrictions on application

Please follow the table below for use in nuclear power or radiation-related equipment.

	Nuclear power quality*5 required	Nuclear power quality*5 not required
Within a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Cannot be used (except for limit switches for nuclear power*7)
Outside a radiation controlled area*6	Cannot be used (except for limit switches for nuclear power*7)	Can be used

*5. Nuclear power quality: compliance with JEAG 4121 required

*6. Radiation controlled area: an area governed by the requirements of article 3 of "Rules on the Prevention of Harm from Ionizing Radiation," article 2 2 4 of "Regulations on Installation and Operation of Nuclear Reactors for Practical Power Generation," article 4 of "Determining the Quantity, etc., of Radiation-Emitting Isotopes," etc.

*7. Limit switch for nuclear power: a limit switch designed, manufactured and sold according to IEEE 382 and JEAG 4121.

Any Azbil Corporation's products shall not be used for/with medical equipment.

The products are for industrial use. Do not allow general consumers to install or use any Azbil Corporation's product. However, azbil products can be incorporated into products used by general consumers. If you intend to use a product for that purpose, please contact one of our sales representatives.

3.2 Precautions on application

you are required to conduct a consultation with our sales representative and understand detail specifications, cautions for operation, and so forth by reference to catalogs, specifications, instruction manual, etc. in case that you intend to use azbil product for any purposes specified in (1) through (6) below. Moreover, you are required to provide your Equipment with fool-proof design, fail-safe design, anti-flame propagation design, fault avoidance, fault tolerance, and other kinds of protection/safety circuit design on your own responsibility to ensure reliability and safety, whereby preventing problems caused by failure or nonconformity.

- (1) For use under such conditions or in such environments as not stated in technical documents, including catalogs, specification, and instruction manuals
- (2) For use of specific purposes, such as:
 - * Nuclear energy/radiation related facilities
[When used outside a radiation controlled area and where nuclear power quality is not required]
[When the limit switch for nuclear power is used]
 - * Machinery or equipment for space/sea bottom
 - * Transportation equipment
[Railway, aircraft, vessels, vehicle equipment, etc.]
 - * Antidisaster/crime-prevention equipment
 - * Burning appliances
 - * Electrothermal equipment
 - * Amusement facilities
 - * Facilities/applications associated directly with billing
- (3) Supply systems such as electricity/gas/water supply systems, large-scale communication systems, and traffic/air traffic control systems requiring high reliability
- (4) Facilities that are to comply with regulations of governmental/public agencies or specific industries
- (5) Machinery or equipment that may affect human lives, human bodies or properties
- (6) Other machinery or equipment equivalent to those set forth in items (1) to (5) above which require high reliability and safety

4. Precautions against long-term use

Use of Azbil Corporation's products, including switches, which contain electronic components, over a prolonged period may degrade insulation or increase contact-resistance and may result in heat generation or any other similar problem causing such product or switch to develop safety hazards such as smoking, ignition, and electrification. Although acceleration of the above situation varies depending on the conditions or environment of use of the products, you are required not to use any Azbil Corporation's products for a period exceeding ten (10) years unless otherwise stated in specifications or instruction manuals.

5. Recommendation for renewal

Mechanical components, such as relays and switches, used for Azbil Corporation's products will reach the end of their life due to wear by repetitious open/close operations.

In addition, electronic components such as electrolytic capacitors will reach the end of their life due to aged deterioration based on the conditions or environment in which such electronic components are used. Although acceleration of the above situation varies depending on the conditions or environment of use, the number of open/close operations of relays, etc. as prescribed in specifications or instruction manuals, or depending on the design margin of your machine or equipment, you are required to renew any Azbil Corporation's products every 5 to 10 years unless otherwise specified in specifications or instruction manuals. System products, field instruments (sensors such as pressure/flow/level sensors, regulating valves, etc.) will reach the end of their life due to aged deterioration of parts. For those parts that will reach the end of their life due to aged deterioration, recommended replacement cycles are prescribed. You are required to replace parts based on such recommended replacement cycles.

6. Other precautions

Prior to your use of Azbil Corporation's products, you are required to understand and comply with specifications (e.g., conditions and environment of use), precautions, warnings/cautions/notices as set forth in the technical documents prepared for individual Azbil Corporation's products, such as catalogs, specifications, and instruction manuals to ensure the quality, reliability, and safety of those products.

7. Changes to specifications

Please note that the descriptions contained in any documents provided by azbil are subject to change without notice for improvement or for any other reason. For inquiries or information on specifications as you may need to check, please contact our branch offices or sales offices, or your local sales agents.

8. Discontinuance of the supply of products/parts

Please note that the production of any Azbil Corporation's product may be discontinued without notice. After manufacturing is discontinued, we may not be able to provide replacement products even within the warranty period.

For repairable products, we will, in principle, undertake repairs for five (5) years after the discontinuance of those products. In some cases, however, we cannot undertake such repairs for reasons, such as the absence of repair parts. For system products, field instruments, we may not be able to undertake parts replacement for similar reasons.

9. Scope of services

Prices of Azbil Corporation's products do not include any charges for services such as engineer dispatch service. Accordingly, a separate fee will be charged in any of the following cases:

- (1) Installation, adjustment, guidance, and attendance at a test run
- (2) Maintenance, inspection, adjustment, and repair
- (3) Technical guidance and technical education
- (4) Special test or special inspection of a product under the conditions specified by you

Please note that we cannot provide any services as set forth above in a nuclear energy controlled area (radiation controlled area) or at a place where the level of exposure to radiation is equivalent to that in a nuclear energy controlled area.

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