
User's Manual MS3900 Series Isolated Signal Conditioning System

Thank you very much for employing MTT products.

Upon receipt of the product(s) please check the affixed label to make sure the specifications shown therein conform to your requirements. If you find any discrepancies and/or any damage on the product(s), please contact MTT or its local representatives.

You can be assured that all the MTT products are manufactured according to the strict quality control standards.

WARRANTY PERIOD AND SCOPE

WARRANTY PERIOD

MTT's hardware products are warranted for a period of seven (7) years from the date of shipment.

WARRANTY SCOPE



- 1) MTT warrants that its hardware products are free from defects in materials and workmanship and conform to its product specifications.
- 2) MTT ships the products under its appropriate quality management system and quality control, but does not warrant, expressed or implied, that the operation, output, or indication of the hardware will be uninterrupted or error free. MTT shall not be liable and make no warranty for any damage to or any safety or performance trouble in the customer's or any other third party's equipment if the operation, output, or indication is interrupted or faulty.
- 3) If, during the warranty period, the product proves to be defective when used in accordance with the relevant user's manual, the product will be repaired or replaced.
- 4) This warranty does not apply to any malfunction or failure resulting from the following:
 1. Improper or incomplete maintenance or calibration,
 2. Any other cause, which does not relate with the delivered product,
 3. Modification or repair by any person other than MTT, and
 4. Natural disasters or other unavoidable accidents, for which MTT is not liable.

1. Introduction


For proper operation of the instrument(s), we recommend that you carefully read this manual prior to operation. The manual should be retained for future reference. Please also refer to the relevant product specification sheets.


2. For Safe Operation


Be sure to observe the following safety clauses in your operation of the instrument(s). MTT cannot undertake any responsibility and guarantee for any damage and/or loss caused by improper operation contrary to or neglecting these clauses.


 WARNING	Disregard of this clause may cause fatal harm or serious bodily injury due to fire or electric shock.
 CAUTION	Disregard of this clause may cause bodily harm or damages to nearby objects due to electric shock or other accidental happenings.

The following safety symbols are used on the instrument and in this document:

 Equipment protected throughout by double insulation or reinforced insulation (only for RC3900A-08AI(16AI)-AU-□/C)

 Functional earth terminal (Do not use this as a protective earth terminal.)

 WARNING	<ul style="list-style-type: none"> ■ All electrical connections must be made to the terminal blocks on the chassis. All connections and disconnections must be made with no power applied to the chassis. Otherwise, electric shock may result. ■ Do not disassemble or modify the product, and do not replace the power fuse. Otherwise, fire or electric shock could result. ■ Do not allow any foreign matter (metal chips, water, liquid, etc.) to get into the product. Should any foreign matter enter the product, immediately unplug the power cable, and contact MTT or its distributor. ■ When the product is used for applications that require higher reliability and safety, such as transportation, communication, power generation control and medical equipment, special consideration should be taken in safety design to prevent such equipment from malfunctioning as a whole system. ■ Do not operate the product in an explosive atmosphere containing flammable vapors, gases or dusts. Otherwise, an explosion may result. ■ Do not place any combustible materials in the vicinity of the product. ■ Be sure to provide a power circuit breaker for the power source of a chassis to be used. Note that the breaker should be installed in a location close to the product for the convenience of operation. And the breaker should be marked as a “disconnecting device” for the product.
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 CAUTION	<ul style="list-style-type: none"> ■ Use the product within the operating conditions described in the published product specification. Failure to do so may cause fire or damage to the product. ■ Avoid operating the product in locations where extreme temperature changes can cause condensation. Otherwise, it may be damaged. ■ Avoid operating or storing the product in locations where corrosive gases are present or chemical solvents may splash. ■ Hot-swapping may not cause immediate defects in the module(s), but this should be avoided as far as possible. ■ For the sake of safety, installation and wiring must be performed by qualified personnel with expertise in electronics, electricity or instrumentation engineering.
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3. Precautions

Be sure to observe the following precautions to ensure proper operation of the product. If these precautions are disregarded, the performance of the product cannot be guaranteed.

For Handling:

- This is a precision instrument. Do not drop or throw the product.
- This product contains electronic parts. Do not splash water on the product and do not dip it in water. For installation, select a place where no condensation occurs.
- Avoid storing or installing the product in locations subject to direct sunlight, high temperature, dust, high humidity or vibration.

On Power Supply:

Check the power rating on the specification label affixed to the chassis to ensure you use the correct power supply.

- Rating 100 to 240V AC, 50Hz to 60Hz (Input range: 85 to 264V AC, 47 to 63Hz)
 - RC3900A-04AI-AU: 35VA max.
 - RC3900A-04AO-AU: 25VA max.
 - RC3900A-08AI-AU: 60VA max.
 - RC3900A-08AO-AU: 35VA max.
 - RC3900A-16AI-AU: 95VA max.
 - RC3900A-16AO-AU: 60VA max.
 - RS3900A-01TB-AU: 11VA max.
- Rating 24V DC (Input range: 24V DC \pm 10%)
 - RC3900A-04AI-D1: 8.4W max.
 - RC3900A-04AO-D1: 4.8W max.
 - RC3900A-08AI-D1: 14.4W max.
 - RC3900A-08AO-D1: 9.6W max.
 - RC3900A-16AI-D1: 28.8W max.
 - RC3900A-16AO-D1: 18.0W max.
 - RS3900A-01TB-D1: 2.4W max.

For Installation:

- The product is intended for indoor installation.
- Refer to section 15 "Mounting / Demounting" to install the product on a DIN rail or wall.
- Operating environmental conditions are as follows:
 - Temperature range: 0 to 55°C
 - Humidity: 5 to 90% RH
 - Altitude up to 2000 meters
- Be careful not to ground the minus (–) terminal of the power supply.
- Use an independent grounding or alternative grounding which does not allow current to flow in.
- For installation position, refer to section 15-4.

On Wiring

- Wiring connections should be made to the terminals on the chassis. For terminal assignments, refer to section 7.
- For lead wires, use a highly flexible stranded conductor. The recommended nominal cross-section of the lead wire conductor is 0.5 to 2.0 mm².
- The connection of the lead wire to the chassis should be made with the insulated crimp terminal attached to the end of the wire. Without the insulation, short circuit or electric shock may occur. The recommended thickness of the crimp terminal is 0.7 to 1.0 mm.
Note that only up to two (2) crimp terminals can be connected to one (1) terminal screw. In this case, the thickness of the crimp terminal should be not greater than 0.8 mm.

To Avoid Erroneous Measurements:

- In order to reduce the influence of noise, the input/output wire and power supply wire should not be used in a same bundle or same conduit. They should be installed separately with a minimum distance of 200 mm.
- Avoid wiring the signal lines in the vicinity of equipment generating magnetic fields or electromagnetic waves, such as electric motors and large-scale transformers. If inevitable, anti-noise measures such as employment of shielded wires are indispensable.
- Allow the product to warm up for at least 30 minutes before operation.
- Any sensor or equipment to be connected to the product should be selected in consideration of the input/output impedance of the same. (For detailed specifications, refer to the relevant product specification sheet that can be downloaded from our website at <https://www.mtt.co.jp>.)

Special Notes for CE Marking:

- Some of the models are designed and manufactured to conform to the following EMC and Low Voltage Directives (refer to the individual specification sheets):
 - EMC Directive (2014/30/EU)
 - Standard Conformity: EN61326-1:2013 Class A
 - Low Voltage Directive (2014/35/EU)
 - Standard Conformity: IEC61010-1
EN61010-1:2010/A1:2019
 - Overvoltage Category: II
 - Pollution Degree: 2
- The product must be installed in a control panel.
- The product maintains basic insulation between input and output, and between output and GND. Prior to installation, check that the insulation class of the instrument satisfies your system requirements.
- When the product is installed in a control panel, the measures to be taken for CE marking conformity may vary with the type of devices connected, wiring to the product or structure of the control panel. Therefore, you should check that the control panel as an overall system conforms to the CE marking regulations.

4. About the Product

The MS3900 series offers an isolated signal conditioning system. The system comprises modular isolated signal conditioners (signal conditioning modules) housed in compact resin cases and a chassis (RC3900A) that accommodates the modules.

Signal Conditioning Modules

All MS3900 series signal conditioning modules are housed in compact, UL approved flame-retardant ABS resin casings. The modules are designed for use with the RC3900A chassis outlined below. Power supply to all modules and signal input to and output from each module are provided via input and output connectors on the rear of the module.

The series models include modules intended for input isolation and for output isolation. Most of the modules have a single input channel and two isolated output channels. The input, output 1, output 2 (where applicable), and power circuits are isolated with each other by transformers or photocouplers.

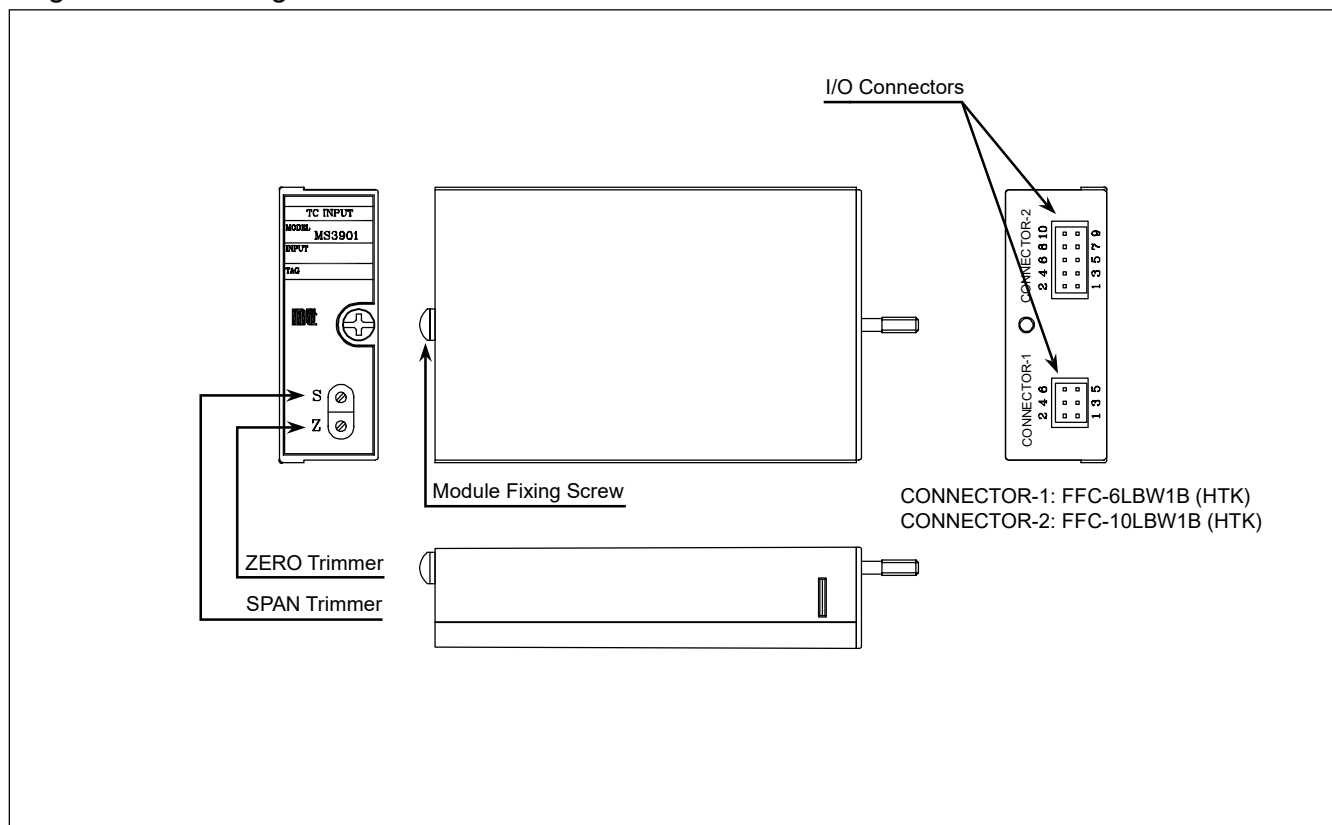
RC3900A

The RC3900A is a chassis intended for installation of any MS3900 series signal conditioning modules. The chassis has a backplane inside it, thereby allowing externally supplied power to be distributed to each of the modules mounted, and I/O signals from these modules to be accessed via the terminal blocks and to be delivered to your computer via the connectors. The number of module slots and the type of modules that can be mounted vary depending on the chassis type.

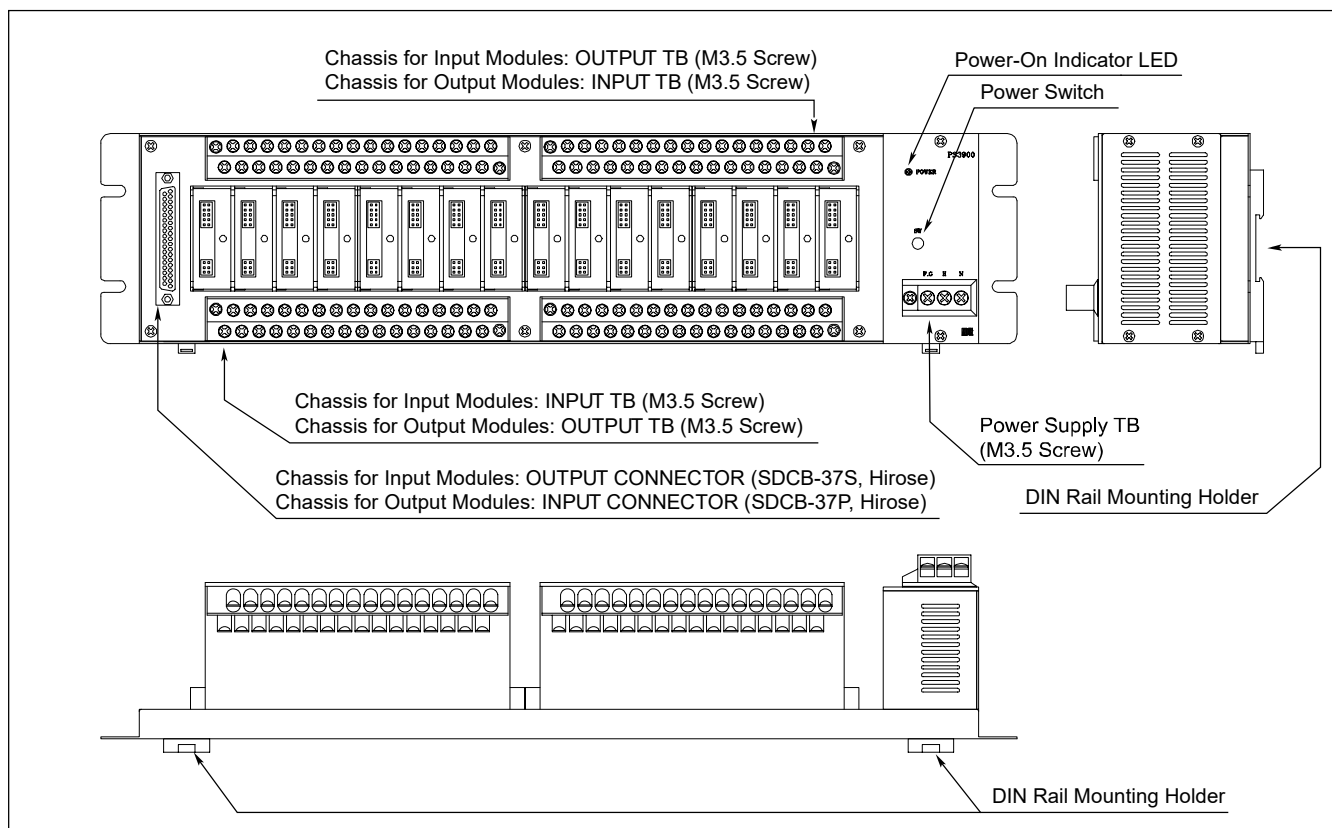
The RC3900A is available in two versions: chassis for input modules and chassis for output modules. Note that it is impossible to have a mix of input and output modules mounted in a same chassis.

5. Parts Names

Signal Conditioning Module



Chassis



6. Connections

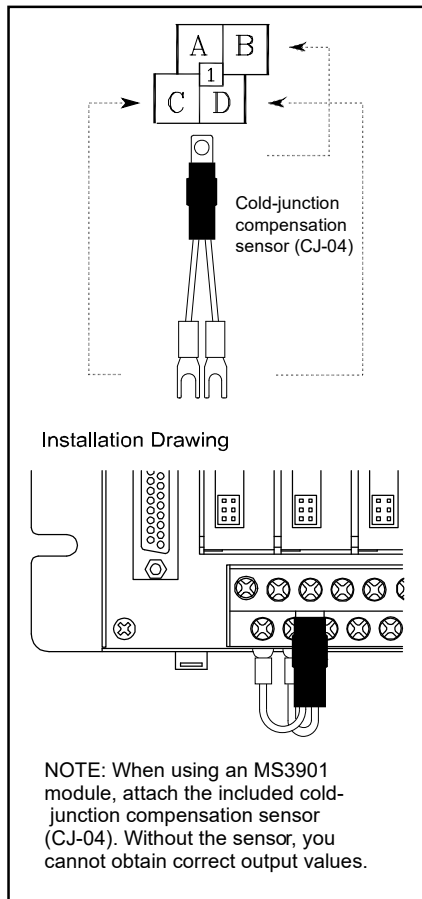
6-1. Field-Side Connections

Field-side connections for each signal conditioning module should be made to the terminal blocks on the RC3900A chassis. For terminal assignments for each model, refer to section 7.

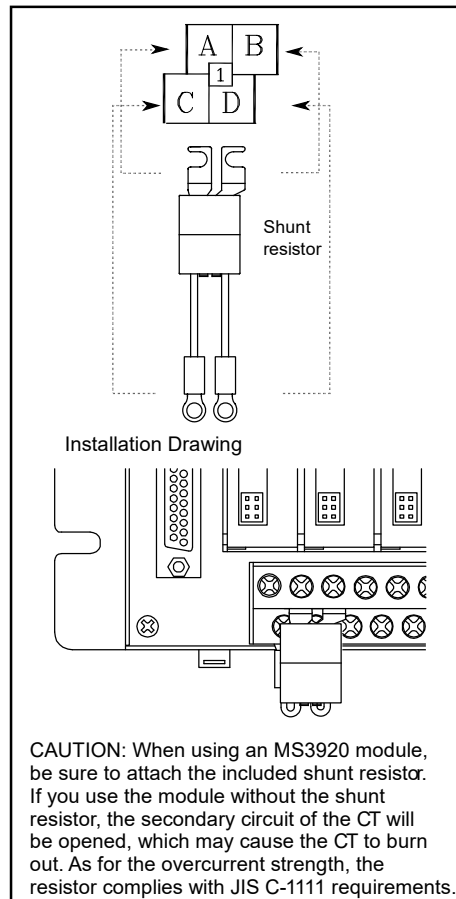
NOTE: When making connections to MS3901, MS3920, or MS3971 modules, you need to attach the included cold-junction compensation sensor (CJ-04 for MS3901, CJ-05 for MS3971) or shunt resistor (SR-03-2 for MS3920).

Additionally, the cold-junction compensation sensor and shunt resistor are not interchangeable. Be sure to use the accessory that has the same serial number as its paired module.

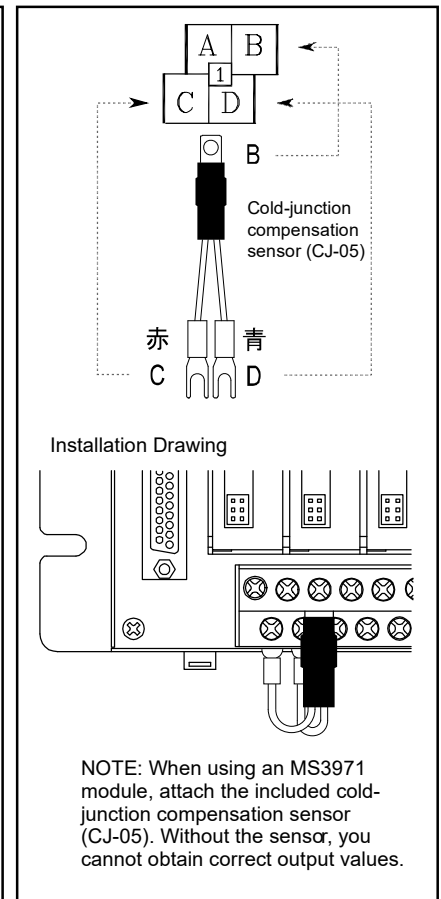
MS3901 CJC sensor



MS3920 shunt resistor



MS3971 CJC sensor



6-2. System-Side Connections

System-side connections for each signal conditioning module should be made to the terminal blocks or output connector on the RC3900A chassis. For terminal assignments for each module type, refer to section 7.

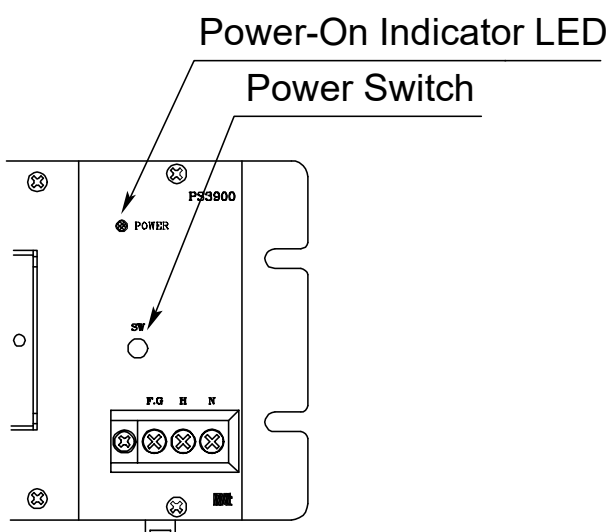
6-3. Power Connections

All MS3900 series signal conditioning modules require a 24V DC power. This power shall be supplied to the RC3900A chassis. This allows the required voltage to be distributed through its backplane to all modules mounted in the same chassis.

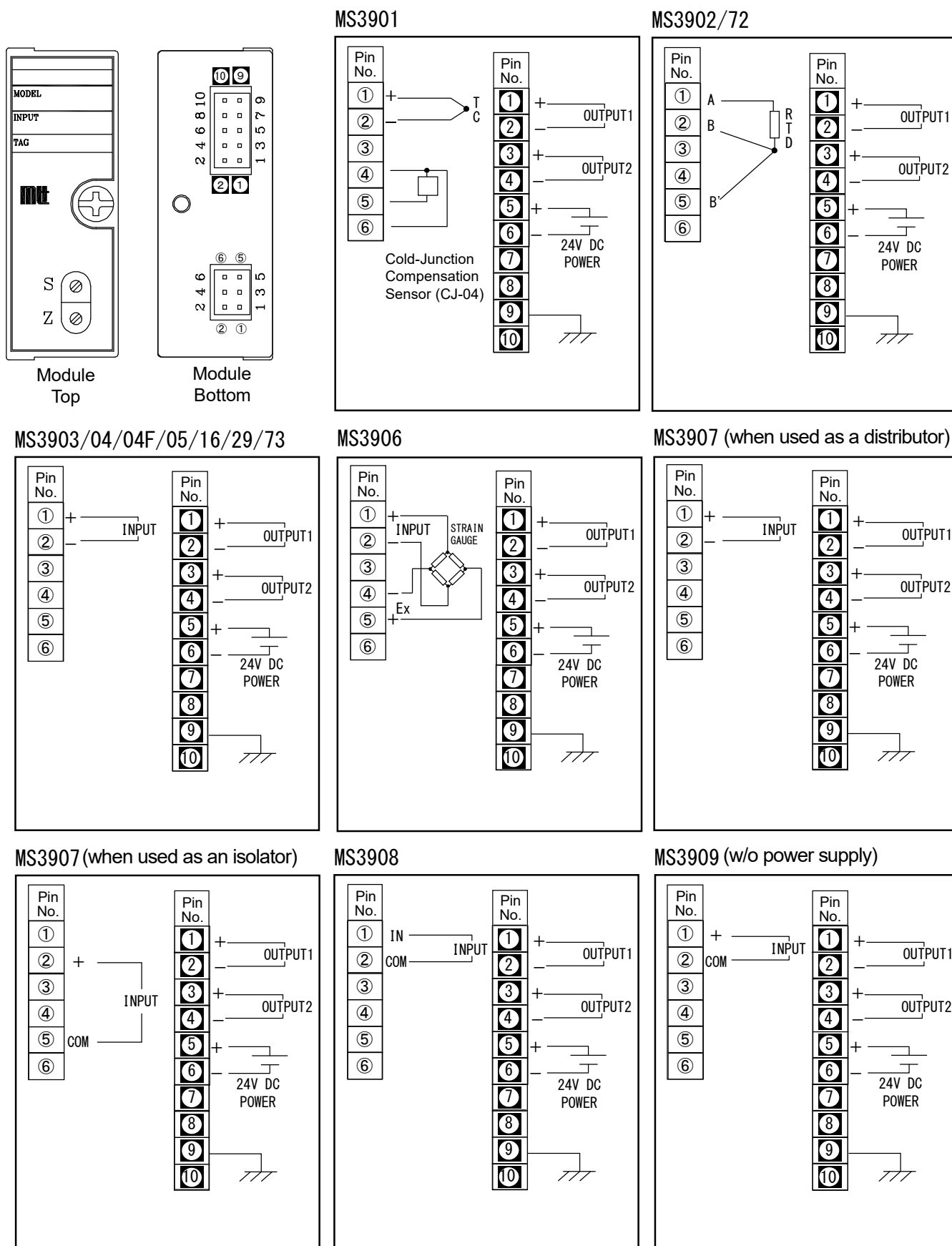
An external power should be connected to the power input terminals located on the RC3900A chassis. For terminal assignments, refer to section 7.

The RC3900A-16 and RC3900A-08 chassis have a push-button power switch. By default, it is set to off, so push it with a small screwdriver until it clicks into place. When it is turned on, power will be supplied to all of the mounted modules and the power-on indicator LED will light green.

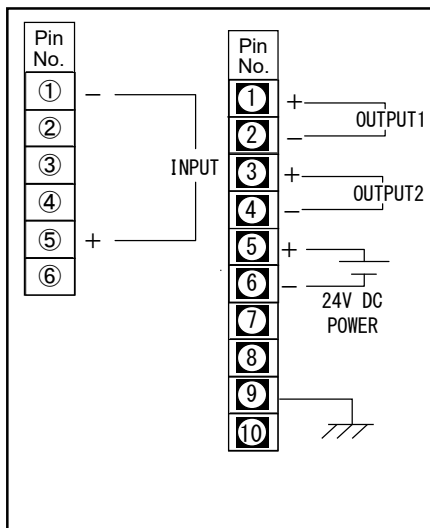
NOTE: For your safety, do not make any electrical connections or disconnections with power applied to the chassis. Make sure that all terminal screws are properly tightened each time you finish the tightening. If you need to measure voltage between power terminals, wear protective gear such as insulated gloves and safety boots.



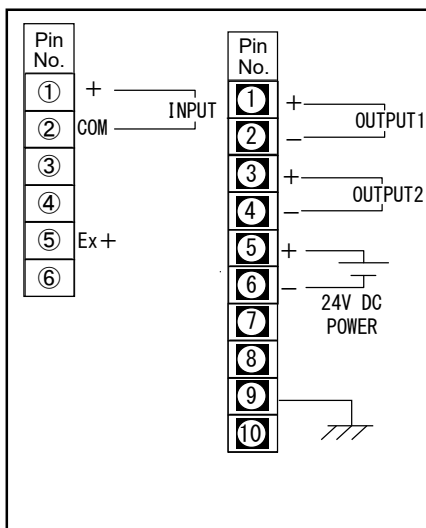
6-4. Signal Conditioning Modules and Pin Assignments – Input Modules



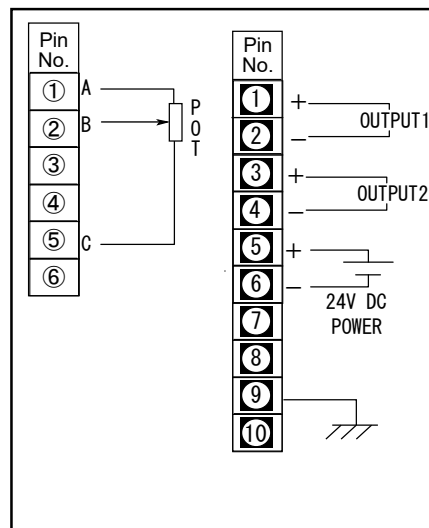
MS3909



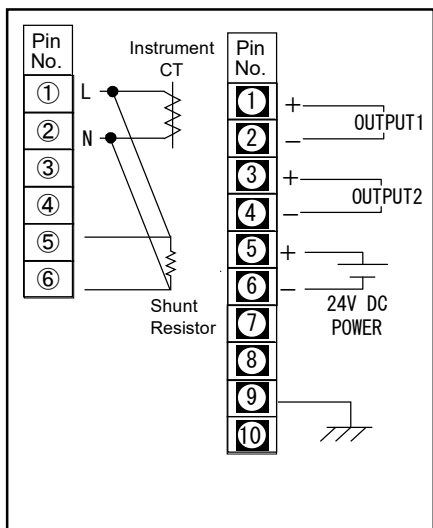
MS3909 (w/ 3-wire power supply)



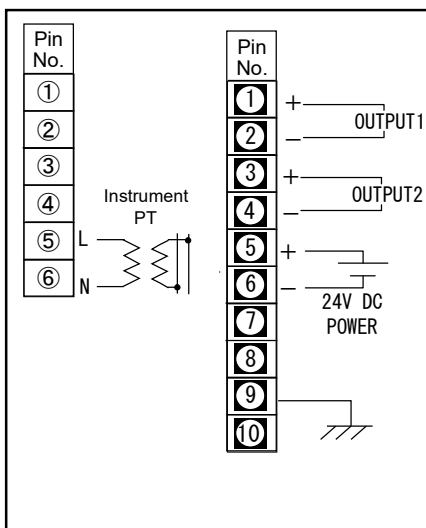
MS3910



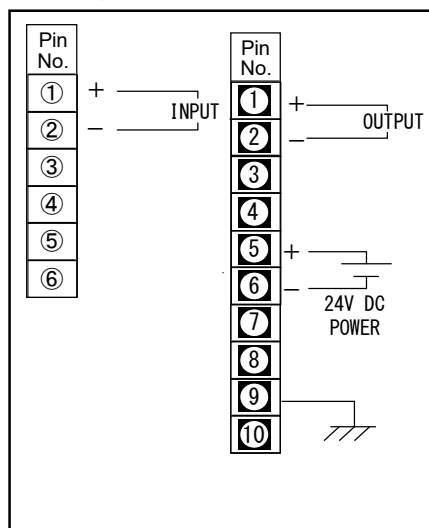
MS3920



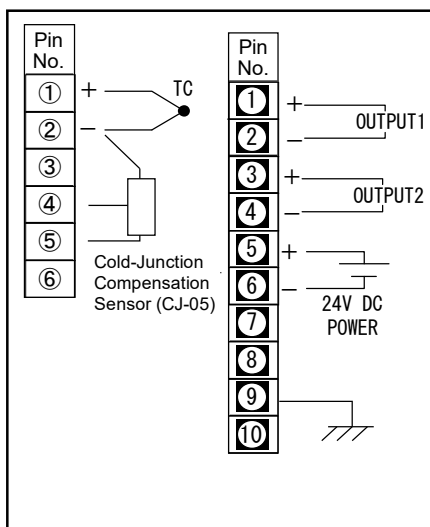
MS3921



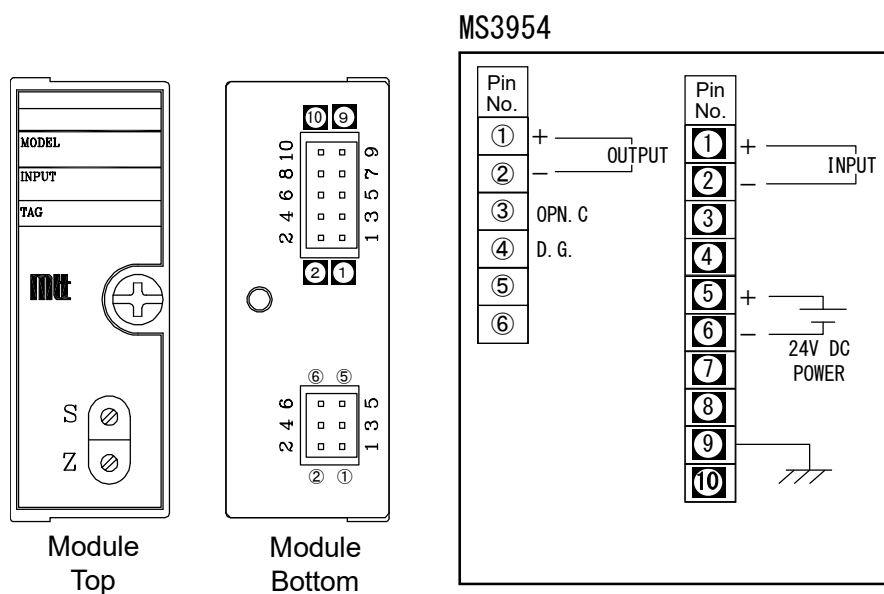
MS3919/44



MS3971



6-5. Signal Conditioning Modules and Pin Assignments – Output Module

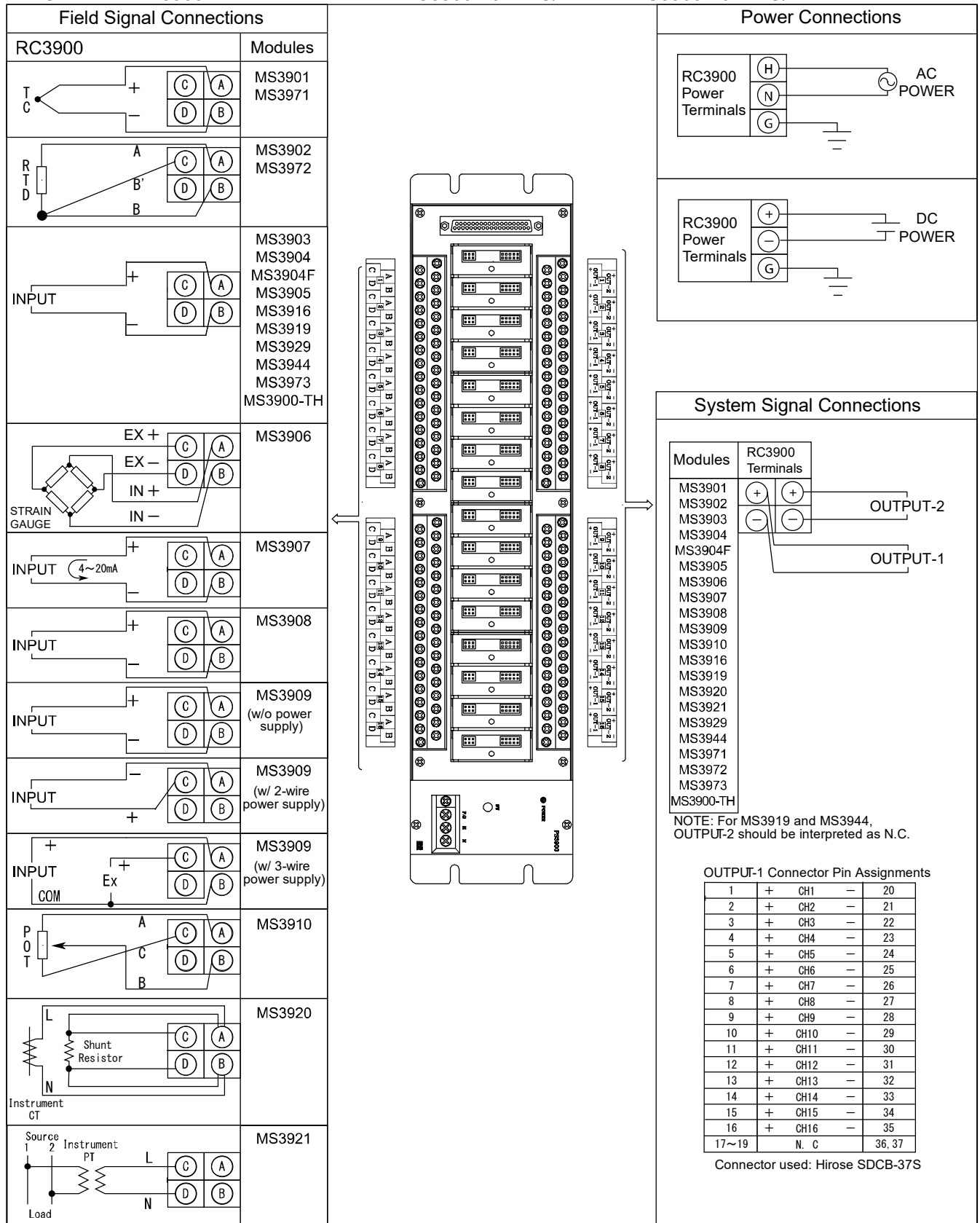


7. I/O and Power Connections to Chassis

- 1) RC3900-16AI-AU/D1-R (wall mounting), RC3900-16AI-AU/D1-D (DIN rail mounting), RC3900A-16AI-AU/D1-R (wall mounting), and RC3900A-16AI-AU/D1-D (DIN rail mounting)

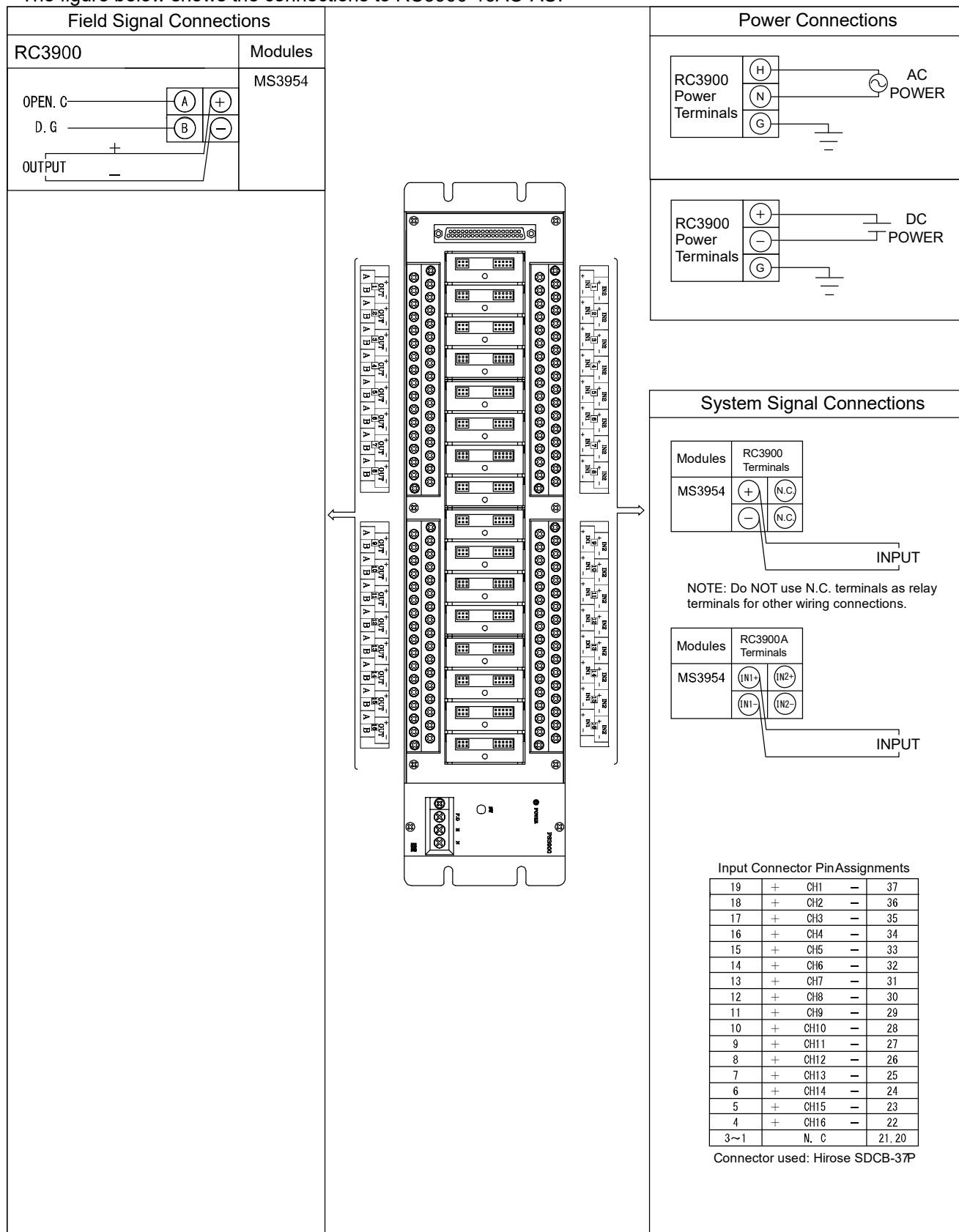
The figure below shows the connections to RC3900-16AI-AU.

NOTE: The MS3905 cannot be mounted in RC3900-16AI-AU/D1-R or RC3900-16AI-AU/D1-D.



- 2) RC3900-16AO-AU/D1-R (wall mounting), RC3900-16AO-AU/D1-D (DIN rail mounting),
RC3900A-16AO-AU/D1-R (wall mounting), and RC3900A-16AO-AU/D1-D (DIN rail mounting)

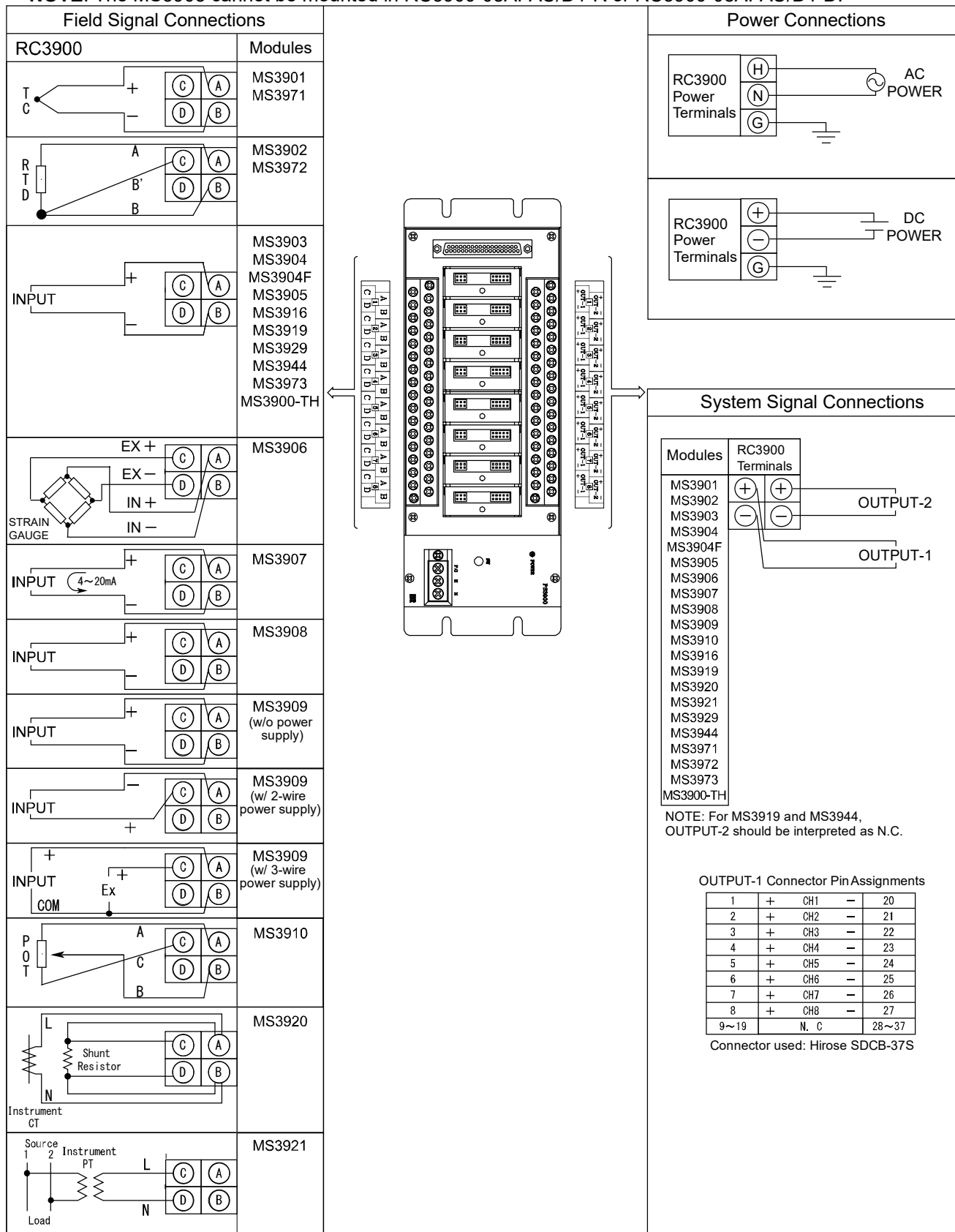
The figure below shows the connections to RC3900-16AO-AU.



- 3) RC3900-08AI-AU/D1-R (wall mounting), RC3900-08AI-AU/D1-D (DIN rail mounting), RC3900A-08AI-AU/D1-R (wall mounting), and RC3900A-08AI-AU/D1-D (DIN rail mounting)

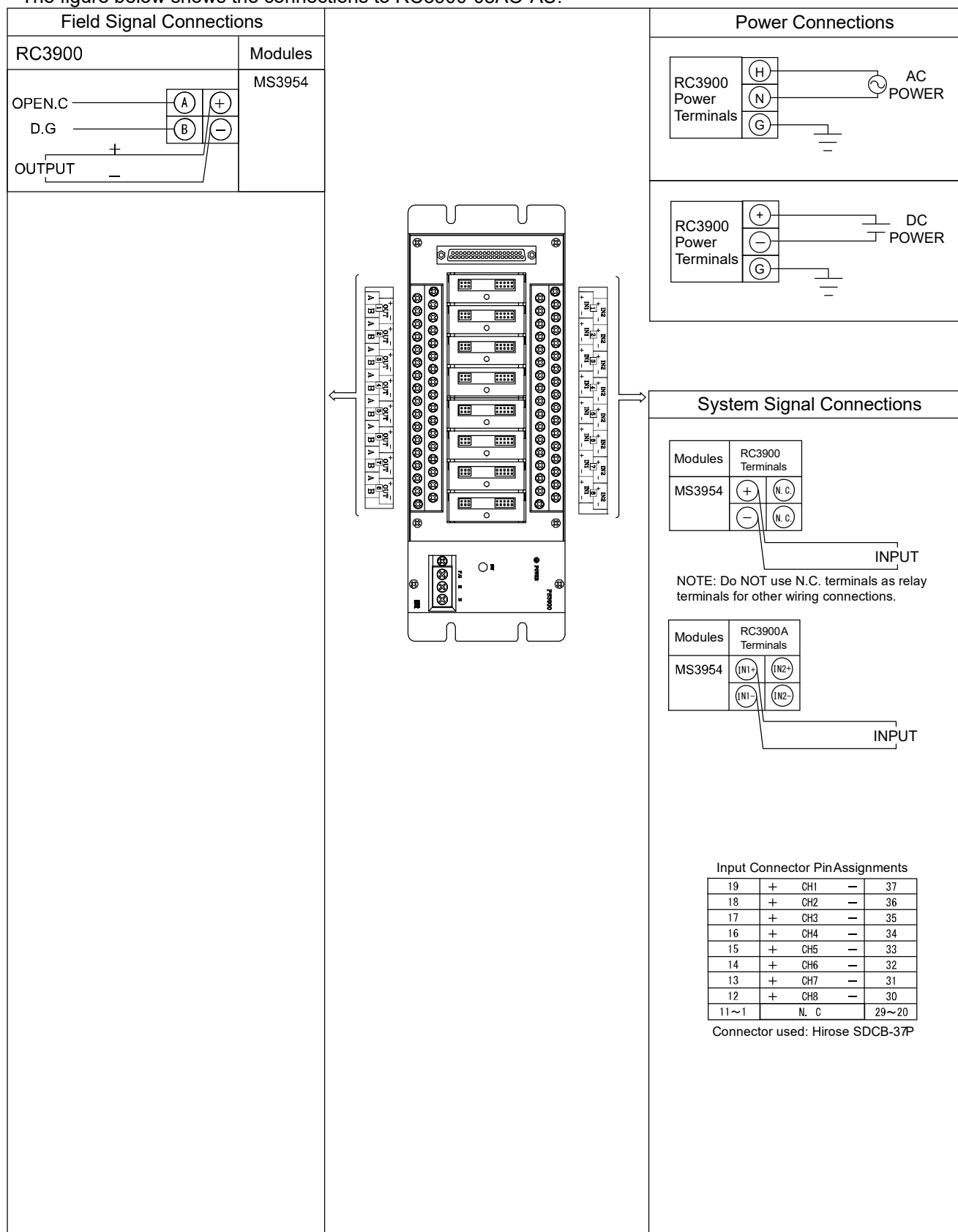
The figure below shows the connections to RC3900-08AI-AU.

NOTE: The MS3905 cannot be mounted in RC3900-08AI-AU/D1-R or RC3900-08AI-AU/D1-D.



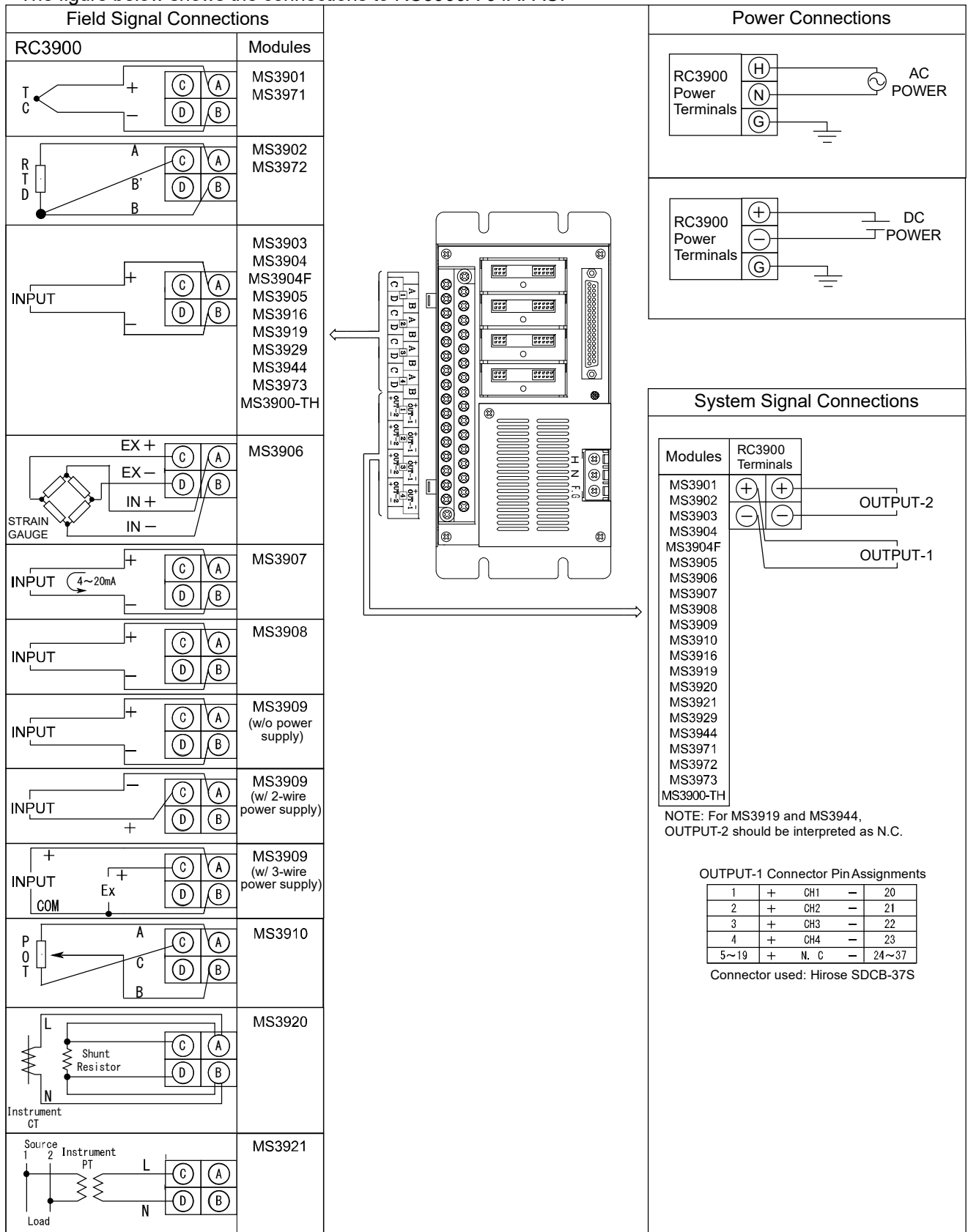
- 4) RC3900-08AO-AU/D1-R (wall mounting), RC3900-08AO-AU/D1-D (DIN rail mounting),
RC3900A-08AO-AU/D1-R (wall mounting), and RC3900A-08AO-AU/D1-D (DIN rail mounting)

The figure below shows the connections to RC3900-08AO-AU.



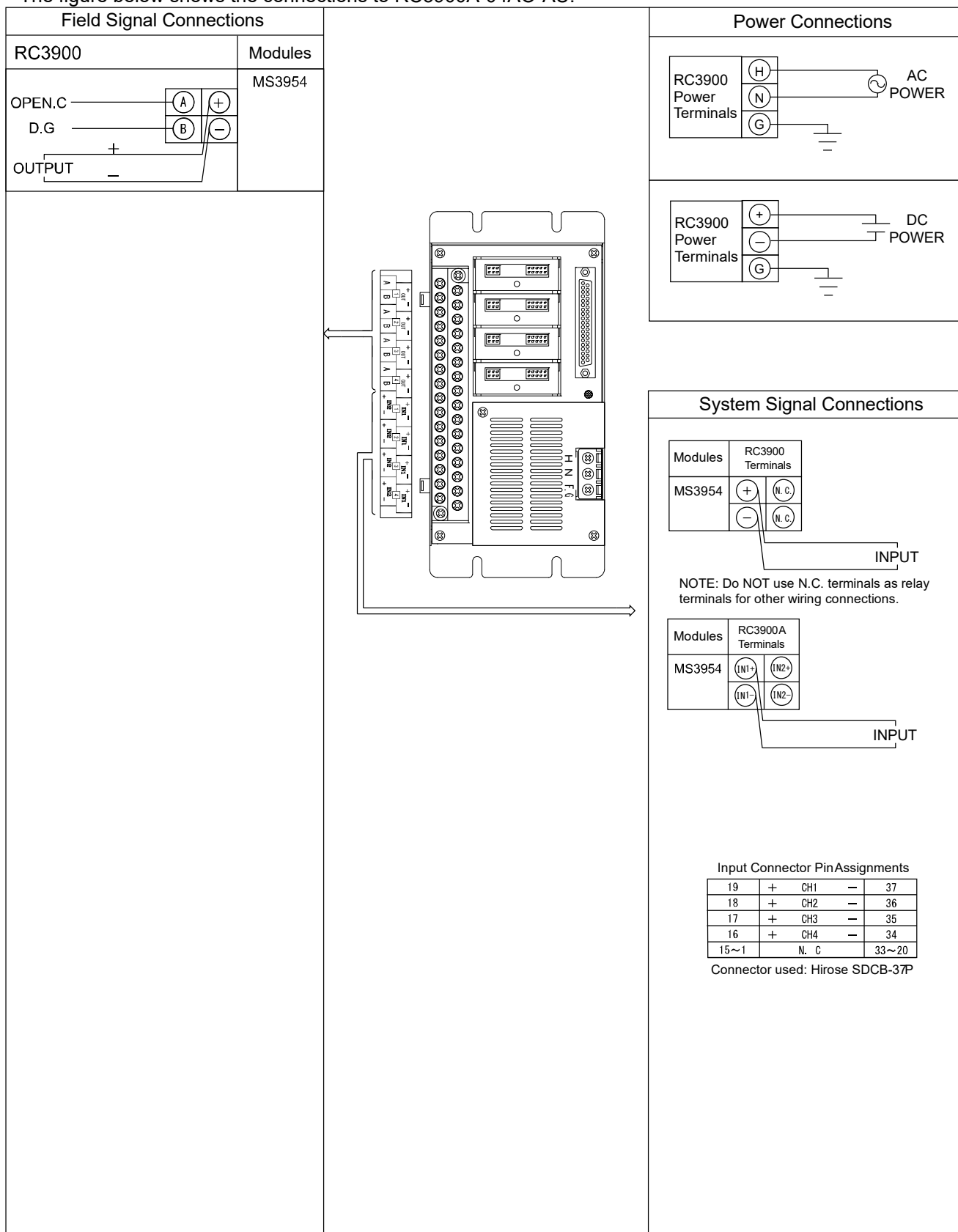
5) RC3900A-04AI-AU/D1-R (wall mounting) and RC3900A-04AI-AU/D1-D (DIN rail mounting)

The figure below shows the connections to RC3900A-04AI-AU.



6) RC3900A-04AO-AU/D1-R (wall mounting) and RC3900A-04AO-AU/D1-D (DIN rail mounting)

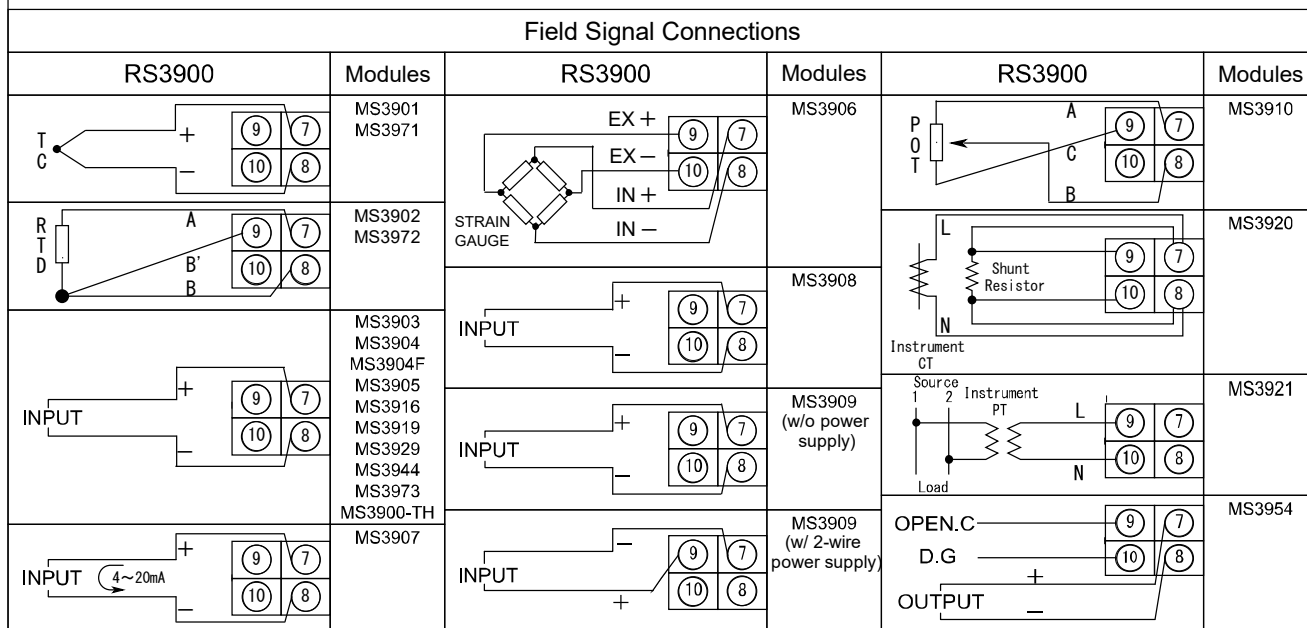
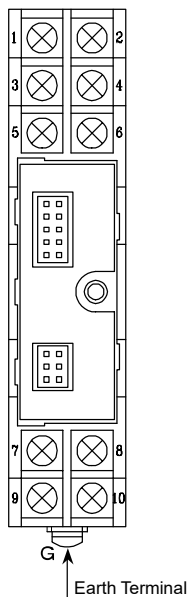
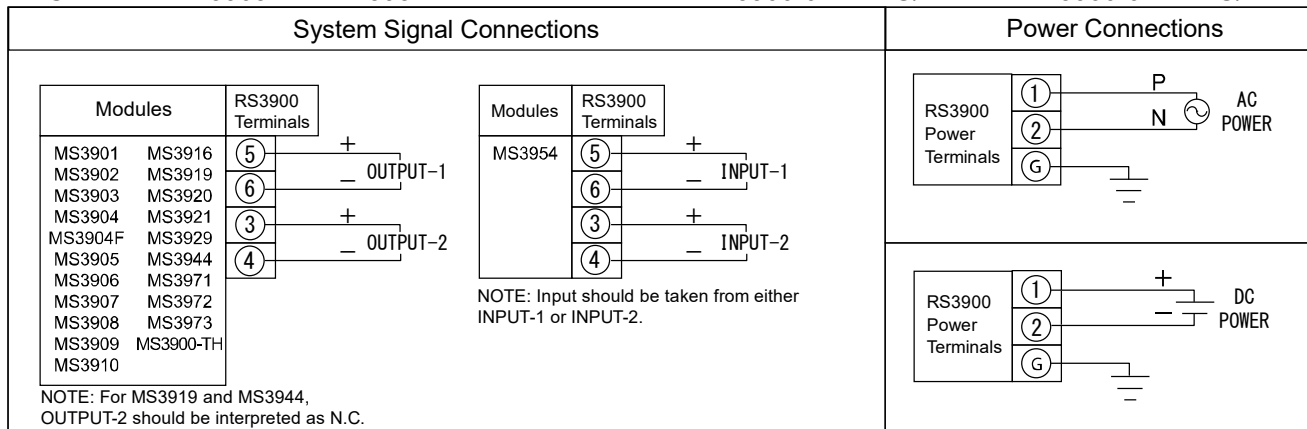
The figure below shows the connections to RC3900A-04AO-AU.



- 7) RS3900-01TB-AU/D1-R (wall mounting), RS3900-01TB-AU/D1-D (DIN rail mounting), RS3900A-01TB-AU/D1-R (wall mounting) and RS3900A-01TB-AU/D1-D (DIN rail mounting)

The figure below shows the connections to RS3900-01TB-AU-D.

NOTE: The MS3905 and MS3954 cannot be mounted in RS3900-01TB-AU/D1-R or RS3900-01TB-AU/D1-D.



8. Adjustment

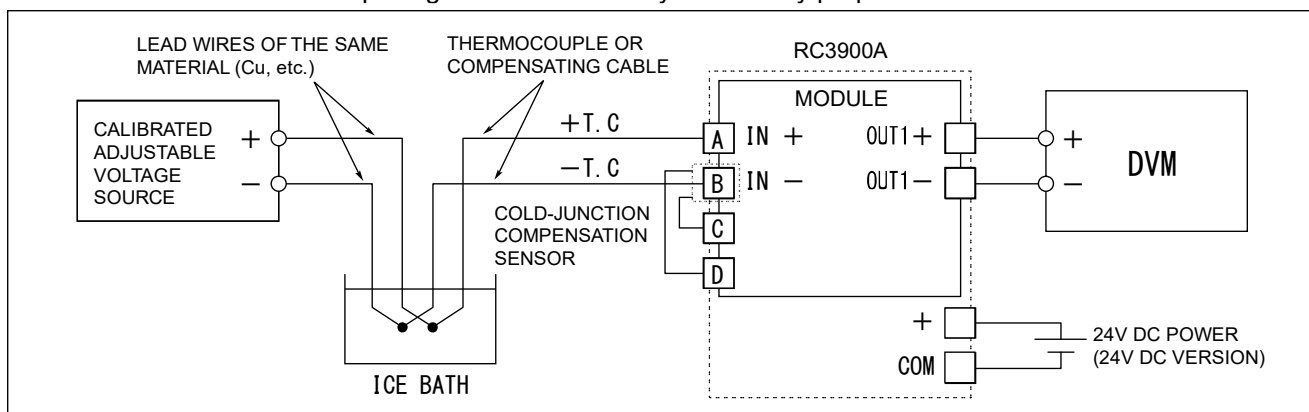
Since MS3900 modules are precisely factory-adjusted before shipment, no further adjustment is needed at the user's side. Adjustment of signal conditioners requires technical expertise and fine craftsmanship. We recommend that you use adjustment service of MTT to save costs and ensure accuracy. Please contact MTT or its local representatives. Just for your reference, the adjustment procedures are described below.

8-1. Preparation

- For terminal assignments, refer to section 7.
- The wiring work should be performed with no power applied to the instrument.
- Wiring should be connected to the terminal blocks on the chassis.
- At least 30 minutes of warm-up is required before operation.
- Since the ZERO and SPAN Trimmers work on both the output 1 and output 2, adjustment should be performed on the output 1. (Adjustment of the output 1 has the same effect on the output 2.)

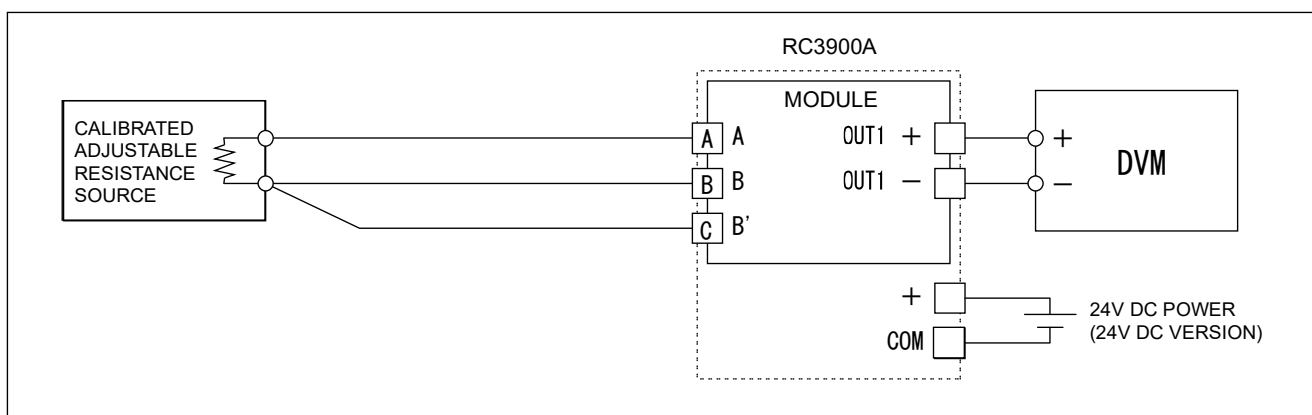
8-1-1. Adjustment for MS3901

- (1) Connect the module as illustrated below.
- (2) Adjust the voltage source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the voltage source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the voltage source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

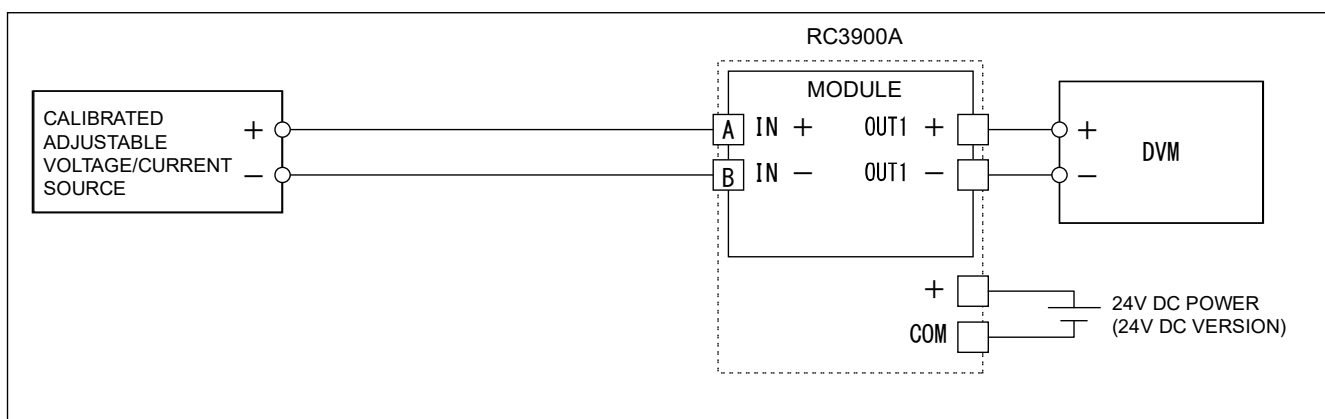


8-1-2. Adjustment for MS3902

- (1) Connect the module as illustrated below.
- (2) Adjust the resistance source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the resistance source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the resistance source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

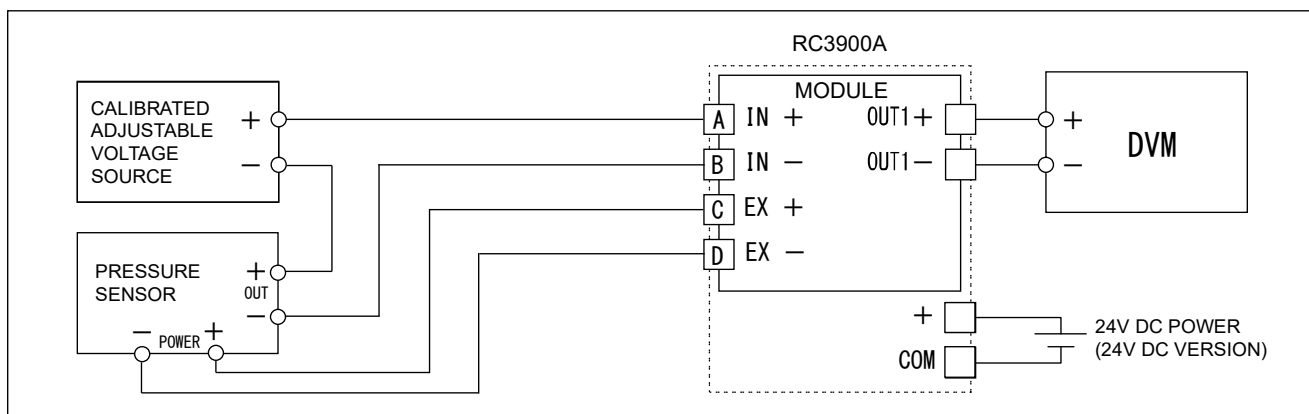
**8-1-3. Adjustment for MS3903/MS3904/MS3904F/MS3916/MS3919/MS3944**

- (1) Connect the module as illustrated below.
- (2) Adjust the voltage or current source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the voltage or current source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the voltage or current source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

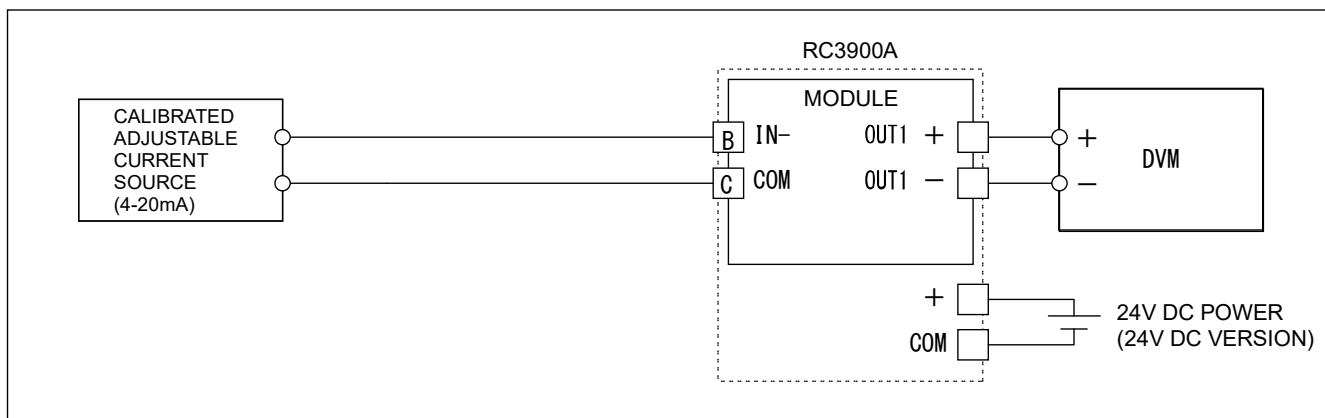


8-1-4. Adjustment for MS3906

- (1) Connect the module as illustrated below.
- (2) Adjust the voltage source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the voltage source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the voltage source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

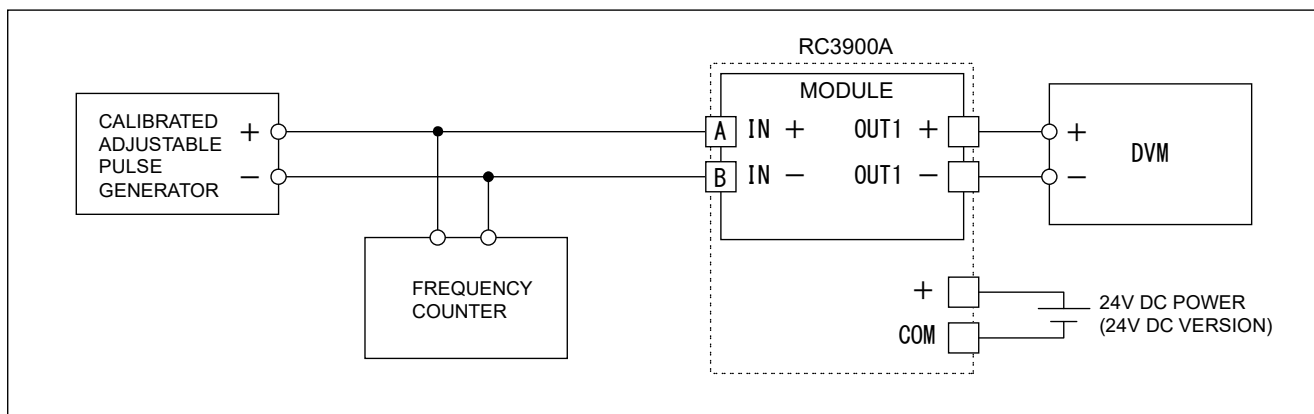
**8-1-5. Adjustment for MS3907**

- (1) Connect the module as illustrated below.
- (2) Adjust the current source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the current source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the current source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

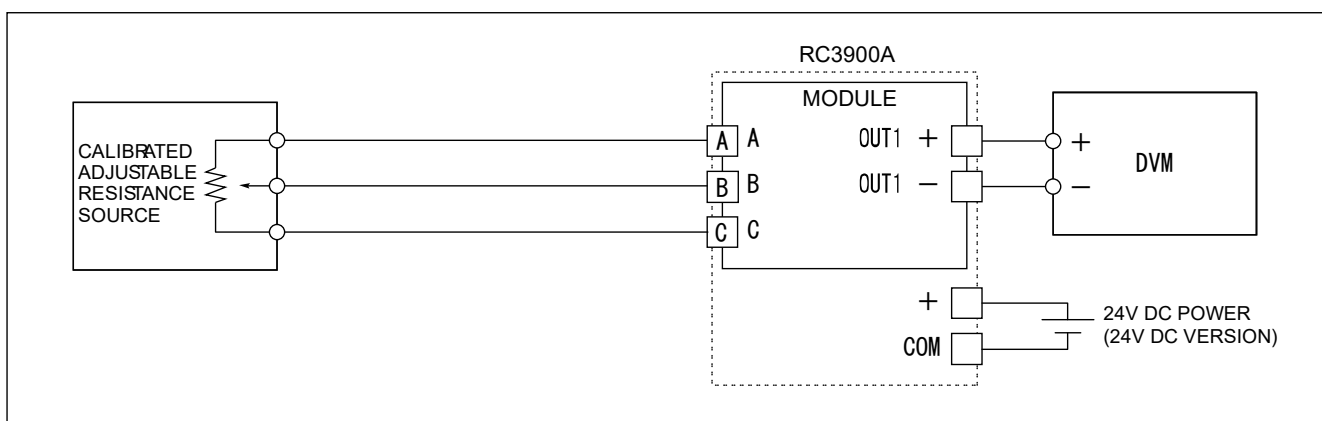


8-1-6. Adjustment for MS3908

- (1) Connect the module as illustrated below.
- (2) Adjust the pulse generator to generate a signal equivalent to 10% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 10% output while applying 10% input as above.
- (4) Adjust the pulse generator to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the pulse generator to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

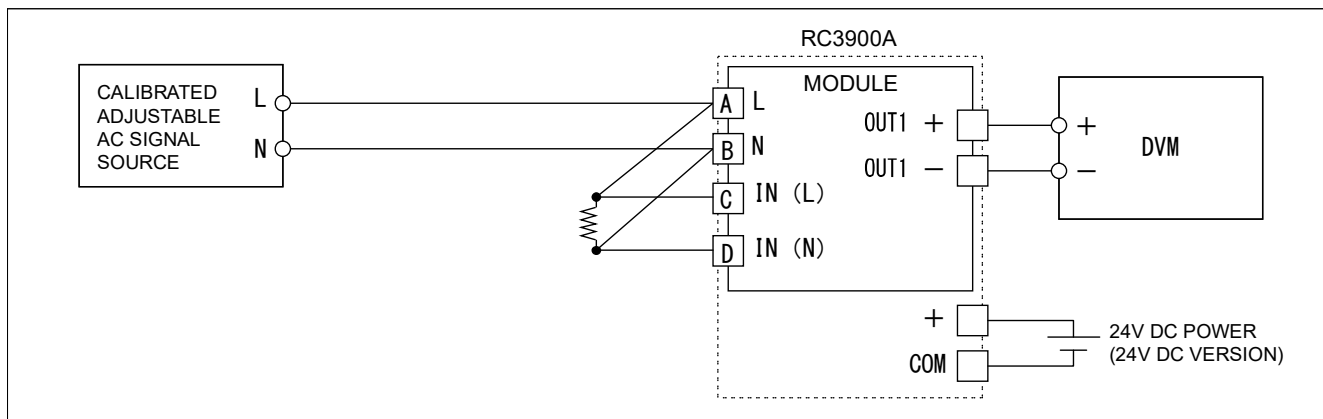
**8-1-7. Adjustment for MS3910**

- (1) Connect the module as illustrated below.
- (2) Adjust the resistance source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the resistance source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the resistance source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

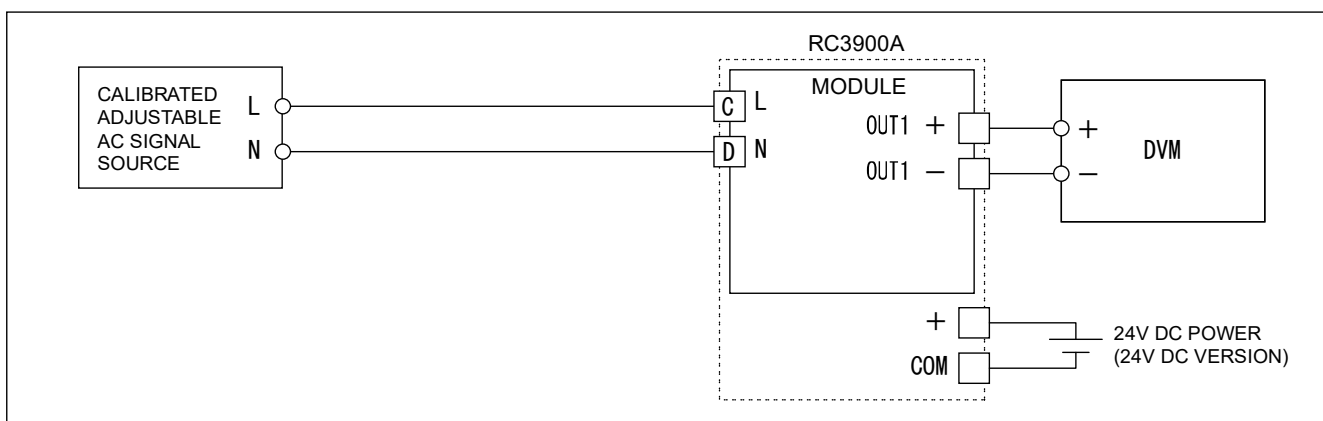


8-1-8. Adjustment for MS3920

- (1) Connect the module as illustrated below.
- (2) Adjust the AC signal source to generate a signal equivalent to 10% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 10% output while applying 10% input as above.
- (4) Adjust the AC signal source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the AC signal source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

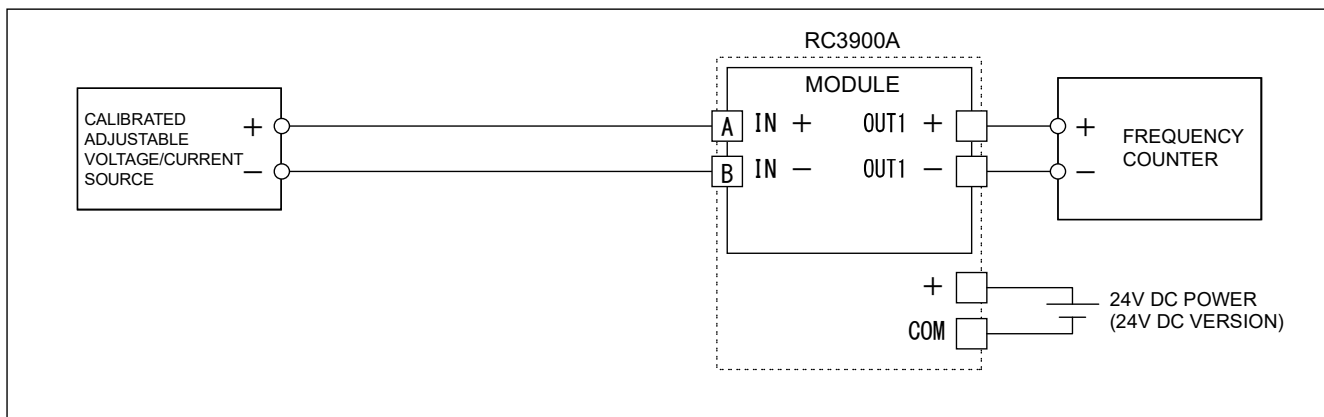
**8-1-9. Adjustment for MS3921**

- (1) Connect the module as illustrated below.
- (2) Adjust the AC signal source to generate a signal equivalent to 10% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 10% output while applying 10% input as above.
- (4) Adjust the AC signal source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the AC signal source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

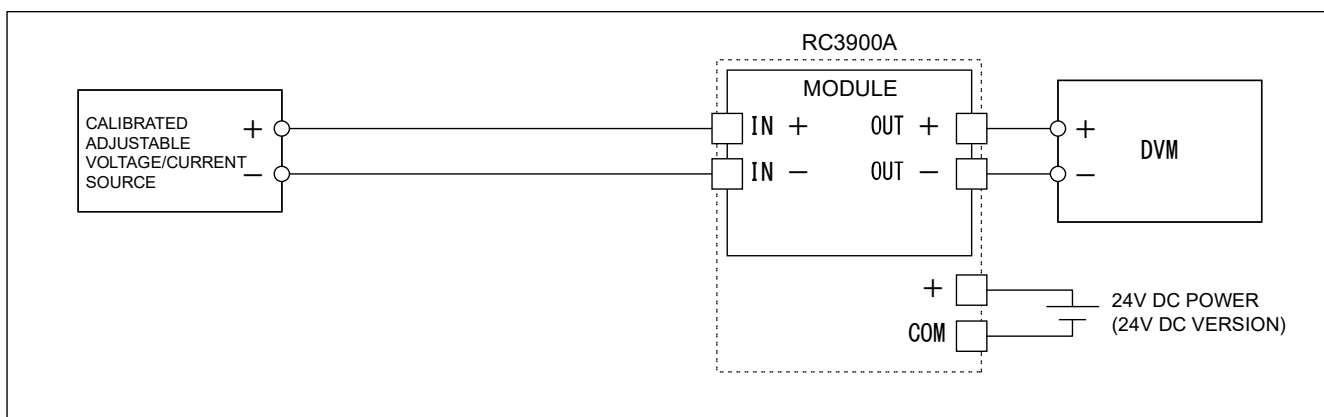


8-1-10. Adjustment for MS3929

- (1) Connect the module as illustrated below.
- (2) Adjust the voltage or current source to generate a signal equivalent to 0.5% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0.5% output while applying 0.5% input as above.
- (4) Adjust the voltage or current source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the voltage or current source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.

**8-1-11. Adjustment for MS3954**

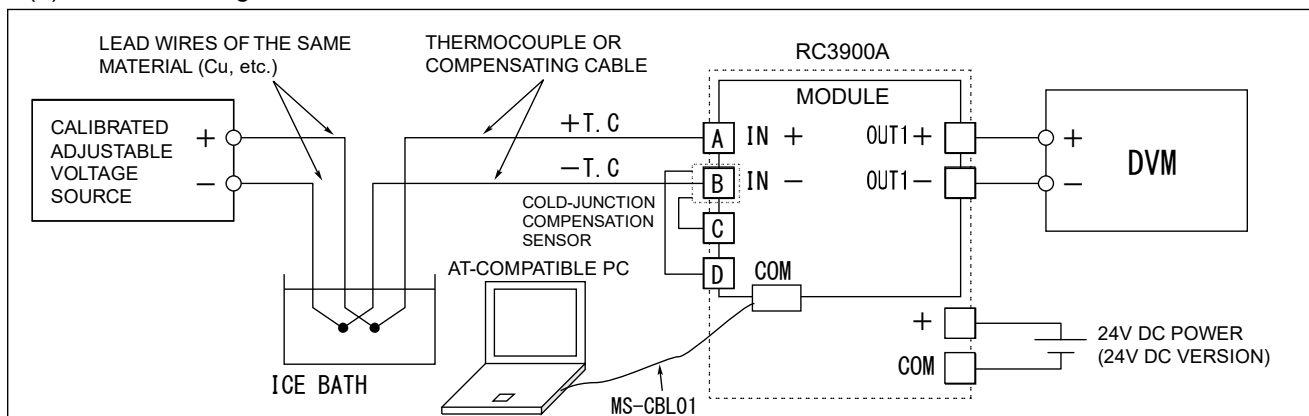
- (1) Connect the module as illustrated below.
- (2) Adjust the voltage or current source to generate a signal equivalent to 0% of the input range of the module.
- (3) Slowly turn the ZERO Trimmer to get 0% output while applying 0% input as above.
- (4) Adjust the voltage or current source to generate a signal equivalent to 100% of the input range of the module.
- (5) Slowly turn the SPAN Trimmer to get 100% output while applying 100% input as above.
- (6) Repeat steps (2) through (5) until zero and span are precisely adjusted.
- (7) Adjust the voltage or current source to generate 25%, 50% and 75% of the input signal range of the module and record the values of output signals to confirm they are linearly proportional.



8-1-12. Adjustment for MS3971

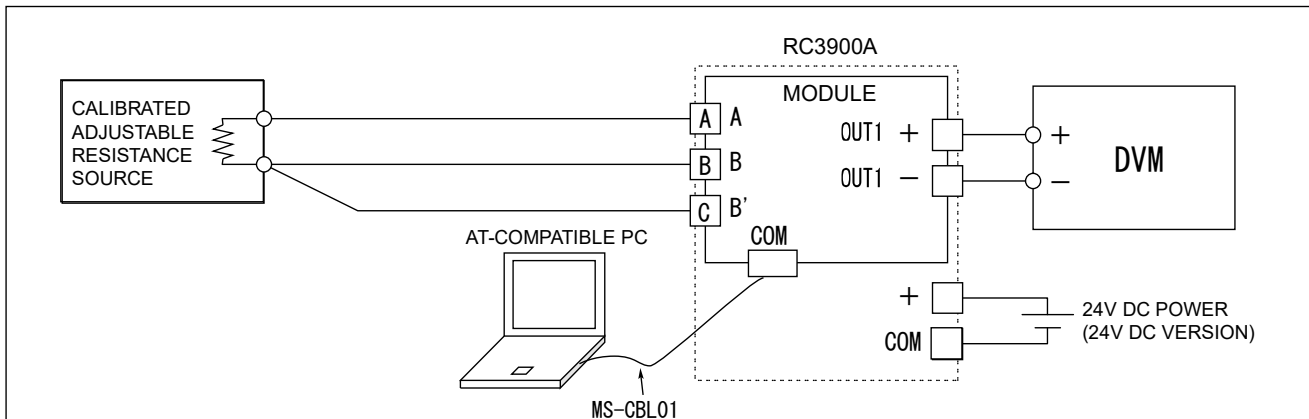
Adjustment is performed with configuration software "Set3x7x". Refer to the software manual and follow these steps:

- (1) Connect the module as illustrated below. Use an optional serial cable, MS-CBL01 for connection to your AT-compatible PC.
- (2) Adjust the voltage source to generate a signal equivalent to 0% of the input range of the module. Applying an input signal of 0%, run the configuration software "Set3x7x" to display the configuration window.
- (3) In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "ZERO" box to adjust the output setting to 0 (0%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (4) Adjust the voltage source to generate a signal equivalent to 100% of the input range to apply an input signal of 100%. In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "SPAN" box to adjust the output setting to 100 (100%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (5) Apply 0% input again to check that the output is 0%. If it is not, repeat steps (3) and (4).
- (6) Exit the configuration window.

**8-1-13. Adjustment for MS3972**

Adjustment is performed with configuration software "Set3x7x". Refer to the software manual and follow these steps:

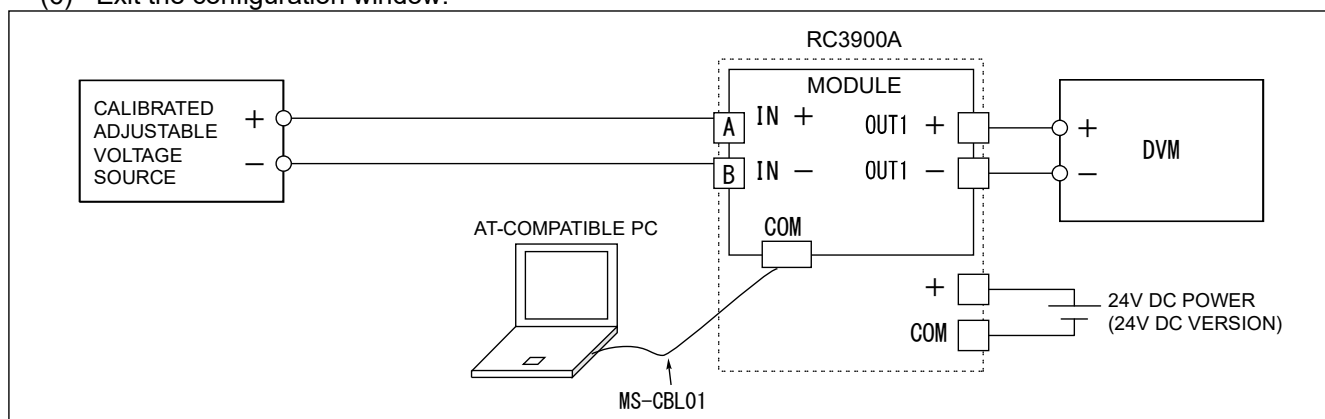
- (1) Connect the module as illustrated below. Use an optional serial cable, MS-CBL01 for connection to your AT-compatible PC.
- (2) Adjust the resistance source to generate a signal equivalent to 0% of the input range of the module. Applying an input signal of 0%, run the configuration software "Set3x7x" to display the configuration window.
- (3) In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "ZERO" box to adjust the output setting to 0 (0%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (4) Adjust the resistance source to generate a signal equivalent to 100% of the input range to apply an input signal of 100%. In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "SPAN" box to adjust the output setting to 100 (100%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (5) Apply 0% input again to check that the output is 0%. If it is not, repeat steps (3) and (4).
- (6) Exit the configuration window.



8-1-14. Adjustment for MS3973

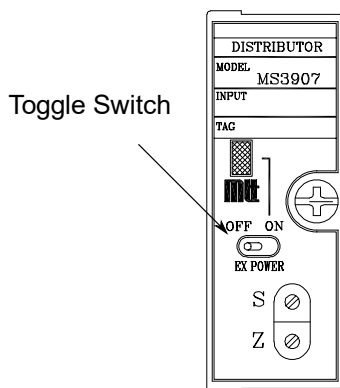
Adjustment is performed with configuration software "Set3x7x". Refer to the software manual and follow these steps:

- (1) Connect the module as illustrated below. Use an optional serial cable, MS-CBL01 for connection to your AT-compatible PC.
- (2) Adjust the voltage source to generate a signal equivalent to 0% of the input range of the module. Applying an input signal of 0%, run the configuration software "Set3x7x" to display the configuration window.
- (3) In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "ZERO" box to adjust the output setting to 0 (0%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (4) Adjust the voltage source to generate a signal equivalent to 100% of the input range to apply an input signal of 100%. In the "USER ZERO/SPAN ADJUSTMENT" field, click the "+" or "-" button next to the "SPAN" box to adjust the output setting to 100 (100%). (Note: Changes to the output will not be reflected unless you click the +/- button.)
- (5) Apply 0% input again to check that the output is 0%. If it is not, repeat steps (3) and (4).
- (6) Exit the configuration window.

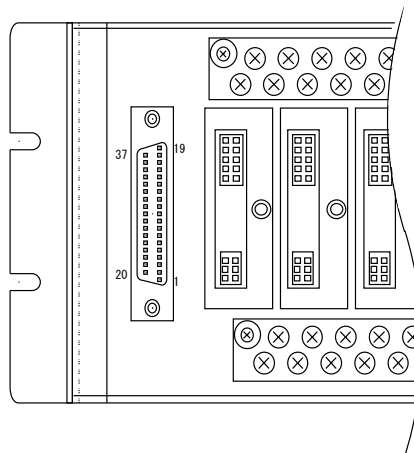


9. Using MS3907 as an Isolator

MS3907 Module Front Panel



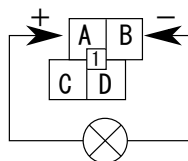
RC3900A



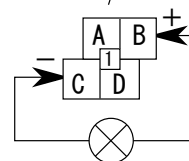
When used as a distributor
(Toggle switch: ON)



When used as an isolator
(Toggle switch: OFF)



When wired as a distributor



When wired as an isolator



CAUTION

When using MS3907 as an isolator, observe the following precaution. Failure to do so may result in personal injury or property damage.

When using the MS3907 model as an isolator, be sure to turn off the transmitter power switch. If it remains on, the following incidents may occur.

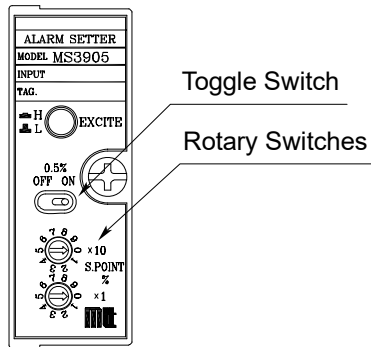
1. If terminals A and B are connected, the 24V DC power will be short-circuited to the ground through the internal input resistor (250Ω). This may cause the resistor to burn out.
2. If terminals A and C are connected, the 24 VDC power will be short-circuited directly to the ground. This may cause damage to the power circuit.
3. If terminal A is connected to the receiving instrument, 24V DC will be applied to the receiving instrument. This may cause damage to that instrument.

NOTE: In both of the above cases 1 and 2, a short-term faulty connection may not cause any problem. If the faulty connection is kept for more than one hour, the problem described will occur.

10. Configuring MS3905

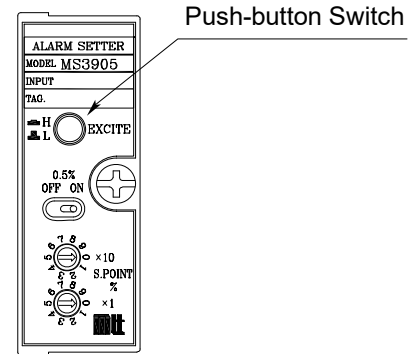
Setting Trip Point and Mode of Operation

1. You can use the rotary switches on the front panel to set the trip point you want. Turn on the toggle switch to add +0.5% to the value set by the rotary switches, as needed. The setting methods are given in the table below.



		Setting Method
Rotary Switch	S.POINT×10%	Turn this switch to a number in the tens place of set point for input span.
	S.POINT×1%	Turn this switch to a number in the ones place of set point for input span.
Toggle Switch	ON	+0.5%
	OFF	+0.0%

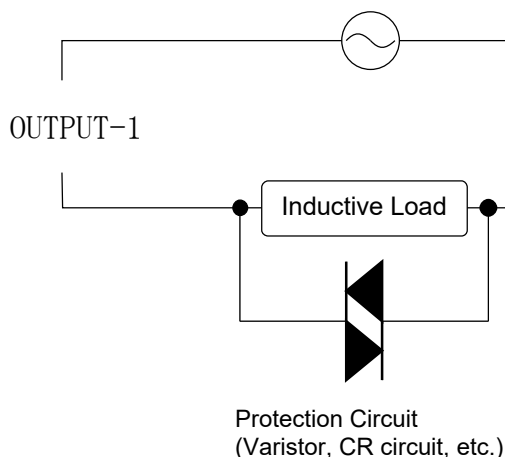
2. Relay operation without power is factory-set and cannot be changed at the field. You can still alter the mode of operation as indicated below, using the push-button switch on the front panel.



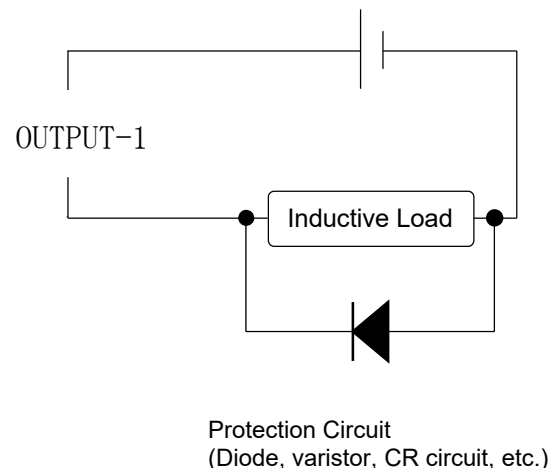
Relay State w/o Power	Switch	Output Code	Relay State with Power Applied
OFF		OH	(Input < Set point) = OFF (Input > Set point) = ON
		OL	(Input < Set point) = ON (Input > Set point) = OFF
ON		CH	(Input < Set point) = ON (Input > Set point) = OFF
		CL	(Input < Set point) = OFF (Input > Set point) = ON

3. When connecting an inductive load, such as an electric motor, to the output, connect a relay contact protection circuit across the load as shown below.

Example of AC power connection

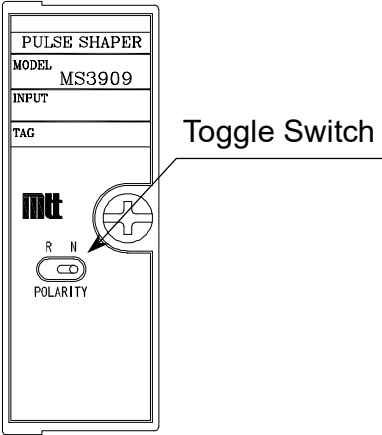


Example of DC power connection

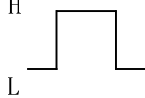



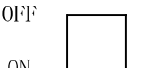
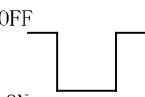






11. Setting MS3909 Output Polarity

You can use the toggle switch on the front panel to select an output polarity. Refer to the following table for details on the output logic.



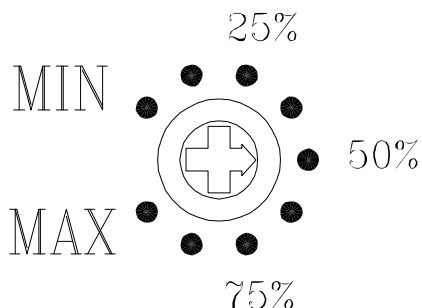
The diagram shows the front panel of the MS3909 Pulse Shaper. It includes labels for MODEL (MS3909), INPUT, and TAG. A toggle switch is shown with a plus sign and a minus sign, and a label 'POLARITY' with 'R' and 'N' indicators. A line points from the text 'Toggle Switch' to the switch.

Input Signal	Input Waveform	Polarity Reversing Switch	Voltage Pulse Output	Open Collector Output
Voltage Pulse		NORMAL		
		REVERSE		
Open Collector		NORMAL		
		REVERSE		

12. Setting MS3916 Time Constant

You can use the time constant setting trimmer on the front panel to set a time constant for first-order delay within the range of time constants you have specified when ordering. The trimmer has scales as shown below. Use these scales as a guide to set the time constant.

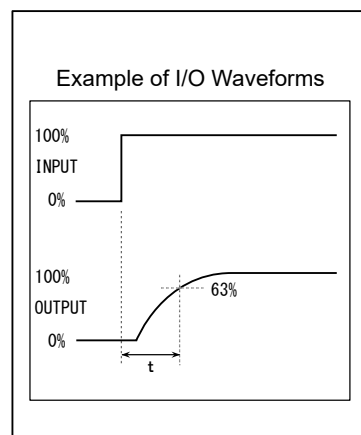
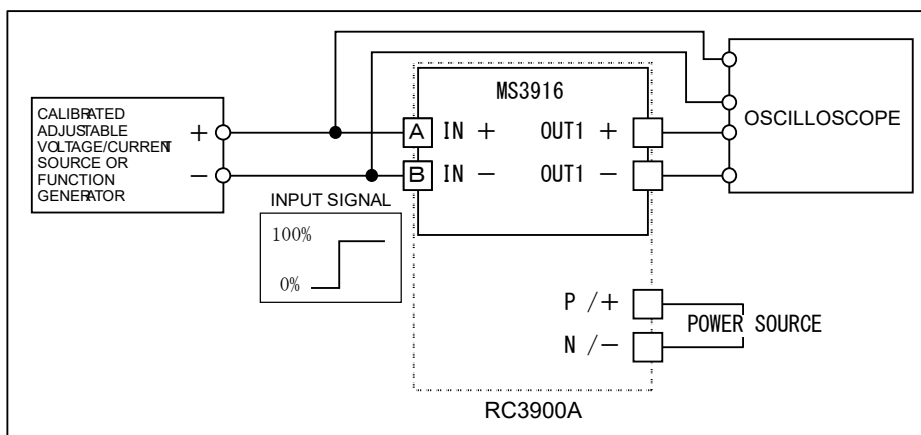
NOTE: Output adjustment may be required after completion of the time constant setting.



NOTE: Percentage figures shown (25%, 50%, 75%) are for illustrative purposes only and NOT printed on the product.

After the setting, follow these steps to verify the time constant.

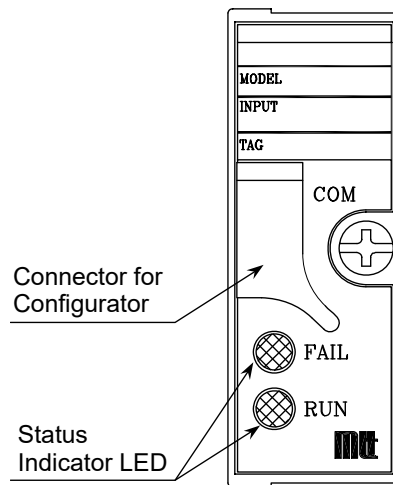
(1) Connect the module as illustrated below. (Connections must be made with all devices powered off.)



- (2) Power on the devices and perform a warm-up for at least 30 minutes. Note that insufficient warm-up will lead to inaccurate measurements.
- (3) Apply a step input from 0% to 100% of the input range of the MS3916 unit and observe the input and output waveforms on the oscilloscope.
- (4) Read time t shown in the above example to determine the time constant.
- (5) Adjust the trimmer and repeat steps (3) and (4) until you get a desired time constant.

13. MS3971/MS3972/MS3973

13-1. MS3971/MS3972/MS3973 Front Panel Parts



13-2. LED Status Indicators

These models have two LED status indicators: RUN and FAIL. You can identify operating status of the module from these indicators. The blue RUN LED is lit when the module is operating properly; the red FAIL LED is lit or blinks when the module is faulty.

Indicator Light Patterns

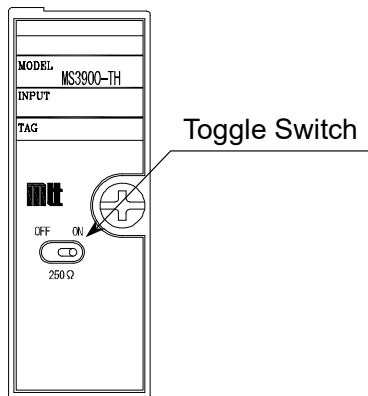
Module Status	Description	LED		Remarks
		Blue (RUN)	Red (FAIL)	
INIT		●	●	
RUN		●	-	
PAUSE	Common to all commands	◎	-	Blink pattern: ●●●●○○○○
ERROR	ADC error	-	◎	Blink pattern: ●●●●○○○○●○
	DA output error	-	◎	Blink pattern: ●●●●○○○○●●○
	Burn-out	-	◎	Blink pattern: ●●●●○○○○●○●○●○
	Power error	-	◎	Blink pattern: ●●●●○○○○
HALT	WDT	-	●	May fail to turn on.
	Memory	-	●	May fail to turn on.
	Power error	-	●	May fail to turn on.

NOTES:

1. OFF: - or ○, ON: ●, Blink: ◎
2. Each of the circle symbols (○, ●) in the Remarks column indicates a duration of 0.25 seconds.

14. MS3900-TH

The MS3900-TH has a toggle switch on its front panel. When you turn this switch on, the internal 250Ω shunt resistor will be connected across the input, and an input signal of 4-20mA will be converted to a 1-5V output.



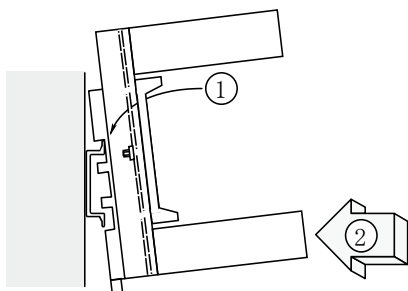
Input	Switch Setting	Internal Shunt Resistor	Output
4-20mA	ON	250Ω	1-5V
1-5V	OFF	—	1-5V

NOTE: The switch must be always off for voltage input. Before toggling the switch, make sure that no input signals are applied.

15. Mounting/Demounting

15-1. DIN Rail Mounting

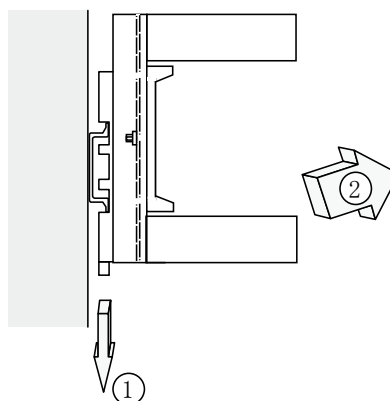
1. Mounting chassis on a DIN rail



Holding the chassis with the slide clamp facing down, hook the upper groove of the DIN rail holder onto the top of the rail (①). Then, press the lower part of the chassis against the rail until the slide clamp locks into place (②).

NOTE: If you have difficulty in fitting the chassis into the DIN rail, slide the clamp downward.

2. Demounting chassis from the DIN rail

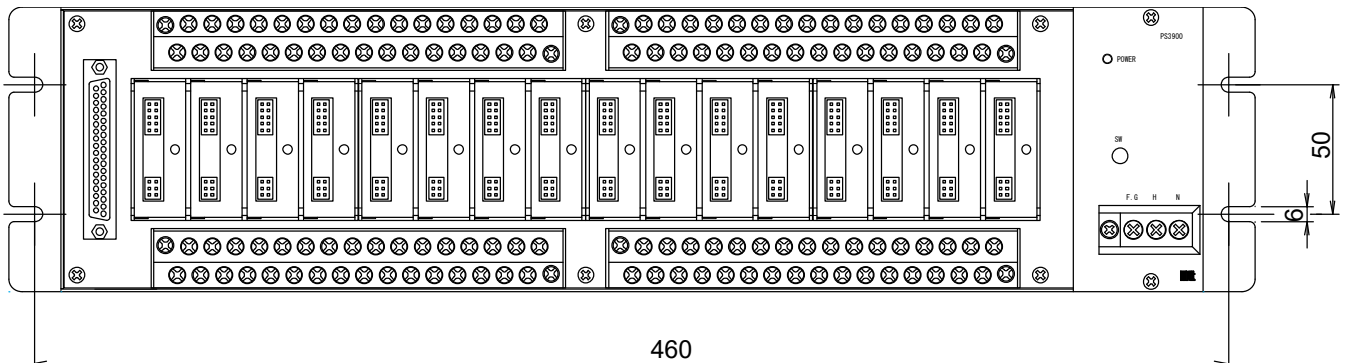


Push the slide clamp downward with a flat-head screwdriver (①) and pull the lower part of the chassis toward you (②).

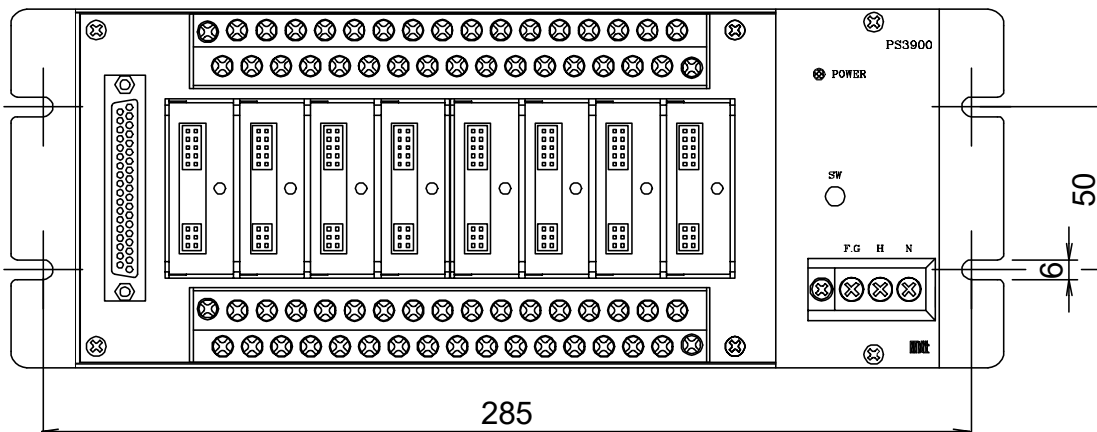
15-2. Wall Mounting

Referring to the dimensions shown below, mount the chassis on a wall with four screws.

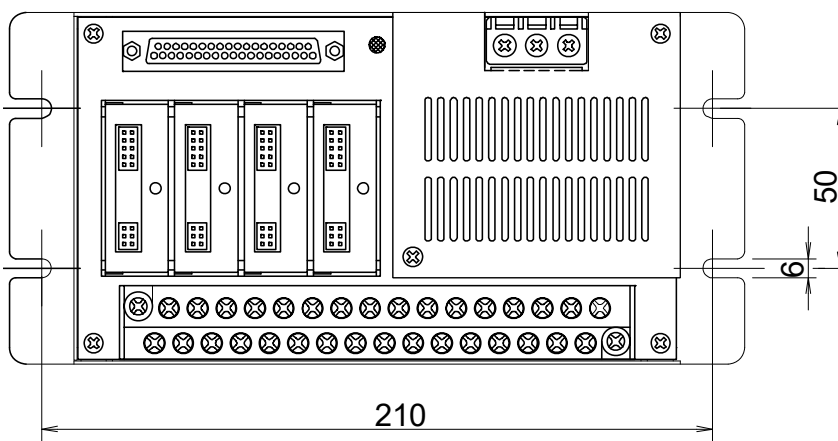
RC3900-16AI/AO-AU/D1, RC3900A-16AI/AO-AU/D1



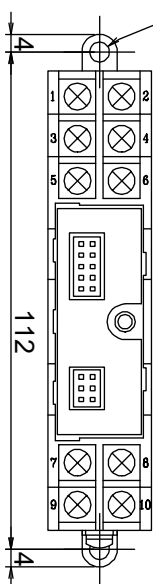
RC3900-08AI/AO-AU/D1, RC3900A-08AI/AO-AU/D1



RC3900A-04AI/AO-AU/D1

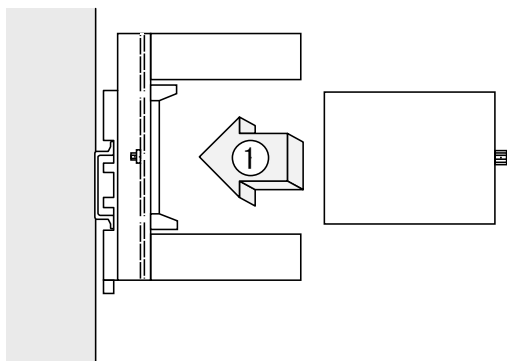


RS3900-01TB-AU/D1-R
2-4.5 Φ

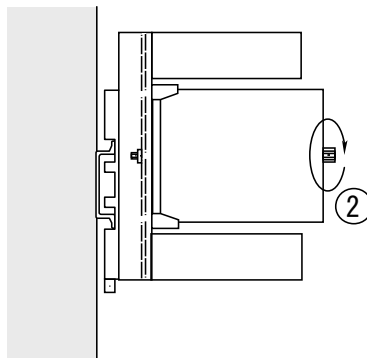


15-3. Installing/Removing a Signal Conditioning Module

Installing a module

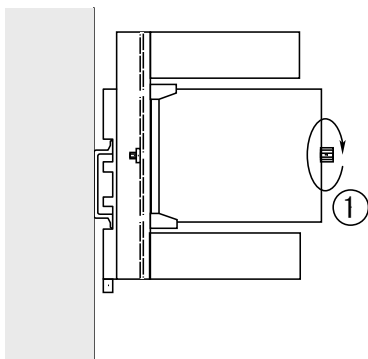


1. Insert the module straight into the slot, along the guide.

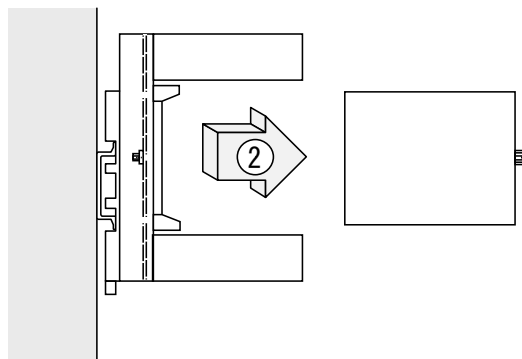


2. Tighten the fixing screw to secure the module into place.
Recommended torque: 0.1 to 0.2 Nm

Removing a module



1. Loosen the fixing screw.

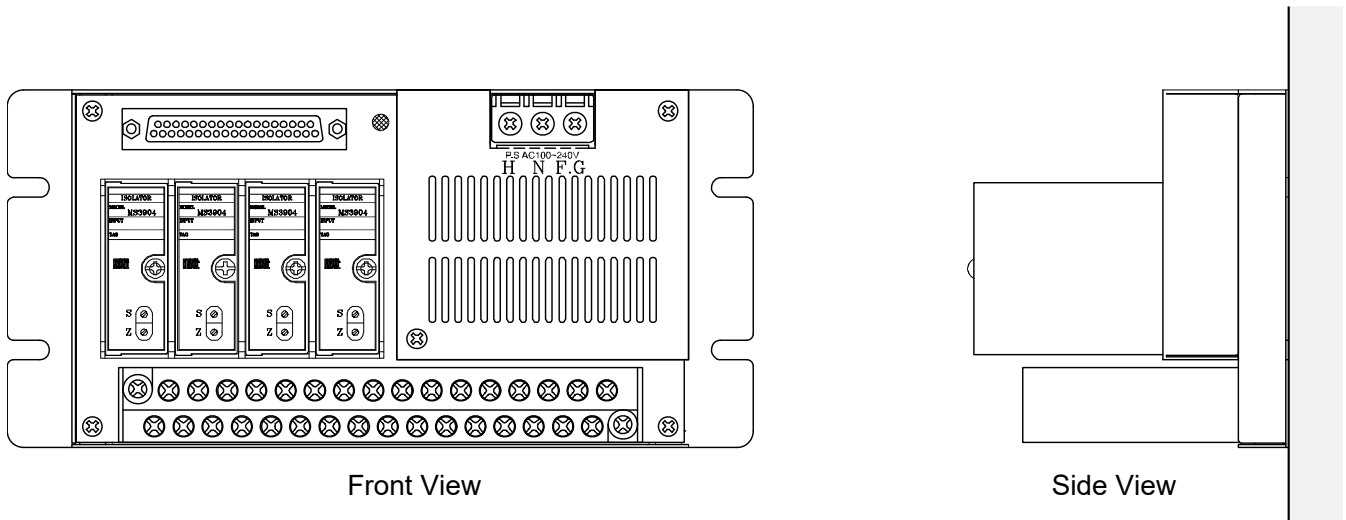


2. Pull out the module carefully not to bend the I/O pins.

15-4. Installation Position

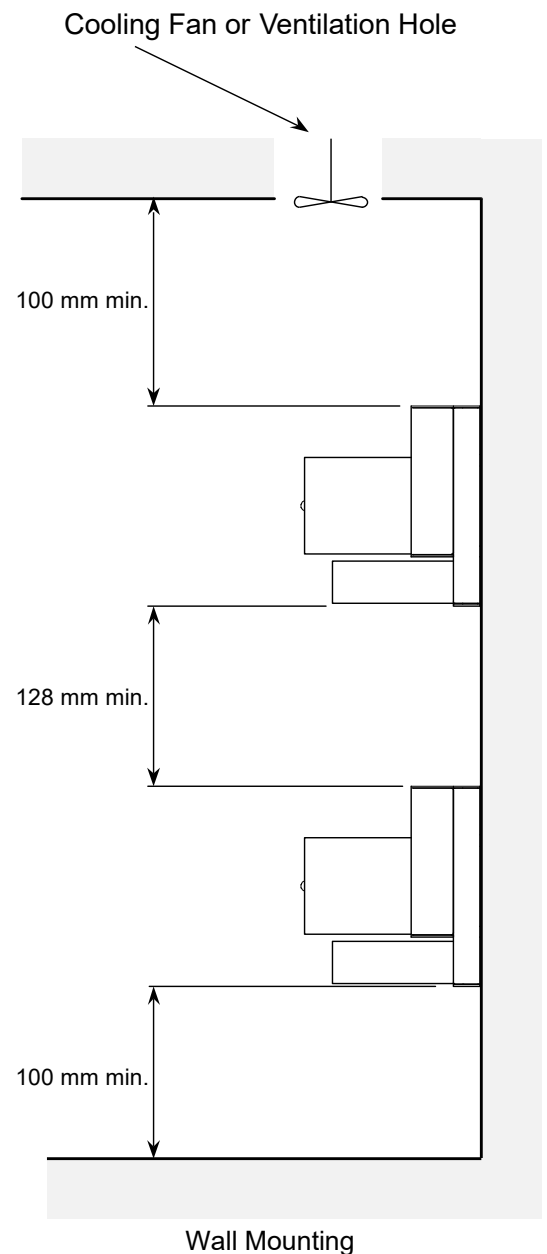
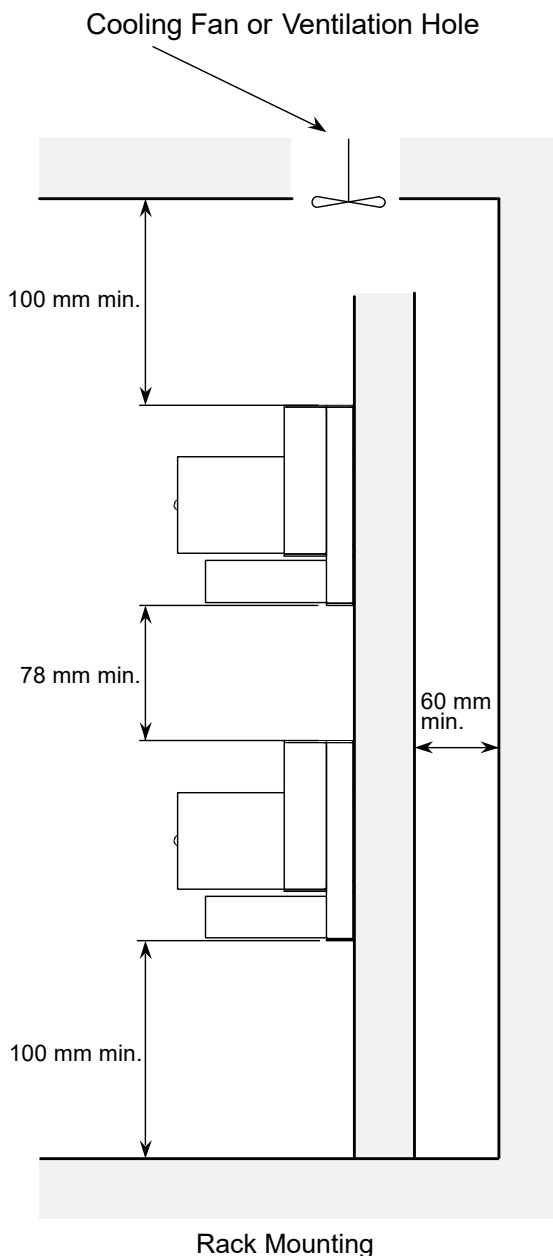
MS3900 modules should be installed as shown in the sketch below, namely, in such a position that the label on the front panel is readable in the right direction.

The figure below shows an example in which MS3904 modules are mounted in RC3900A-04AI-AU-R.



15-5. Installation Requirements

- (1) For effective heat dissipation, ensure adequate space above and below the chassis.
 - When there is a floorboard under the chassis, keep a minimum distance of 100 mm from the floor.
 - Leave a minimum clearance of 100 mm above the chassis and install a ventilation hole or a cooling fan.
 - When mounting the chassis in a rack, keep the rack at least 60 mm away from a wall surface to ensure proper air circulation.
- (2) Allow adequate space in front of modules and on both sides of the chassis.
- (3) When using the system in a cabinet or similar enclosure, provide forced cooling to prevent overheating.
- (4) Do not place the system on a heat-generating object.
- (5) When installing chassis in vertical stacks, space the chassis as shown below.



16. Maintenance and Inspection

16-1. Cleaning

When cleaning, wipe the unit gently with a soft cloth, dampened with water. Do not use solvents such as alcohol or benzene.

16-2. Periodic Inspection

Check the unit for proper characteristics and settings about once every two years.

When measuring the voltage between any pair of terminals on the terminal block, be careful not to touch the conductive parts.