INSTRUCTION MANUAL

UNIVERSAL TRANSMITTER
(field- and PC-configurable)

MODEL **M3LU2**

BEFORE USE ....

Thank you for choosing us. Before use, please check contents of the package you received as outlined below.
If you have any problems or questions with the product, please contact our sales office or representatives.

■ PACKAGE INCLUDES:

Signal conditioner .....(1)
Terminal block with CJC sensor .....(1)
I/O range and tag name label sheet .....(1)

■ MODEL NO.

Confirm Model No. marking on the product to be exactly what you ordered.

■ INSTRUCTION MANUAL

This manual describes necessary points of caution when you use this product, including installation, connection and basic maintenance procedures. For detailed information, refer to the operating manual (EM-2653-B).
The M3LU2 with Option A is programmable using the PC configurator software. For detailed information on the PC configuration, refer to the M3LUCFG instruction manual. The M3LUCFG PC Configurator Software and operating manual are downloadable at our web site.

POINTS OF CAUTION

■ CONFORMITY WITH EU DIRECTIVES

- This equipment is suitable for Pollution Degree 2 and Installation Category II (transient voltage 2500V). Reinforced insulation (signal input or output to power input: 300V) and basic insulation (signal input to output: 300V) are maintained. Prior to installation, check that the insulation class of this unit satisfies the system requirements.
- Altitude up to 2000 meters.
- The equipment must be mounted inside a panel.
- The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE requirements. Failure to observe these requirements may invalidate the CE conformance.
- The actual installation environments such as panel configurations, connected devices, connected wires, may affect the protection level of this unit when it is integrated in a panel system. The user may have to review the CE requirements in regard to the whole system and employ additional protective measures* to ensure the CE conformity.
  * For example, installation of noise filters and clamp filters for the power source, input and output connected to the unit, etc.
- Install lightning surge protectors for those wires connected to remote locations.

■ POWER INPUT RATING & OPERATIONAL RANGE

- Locate the power input rating marked on the product and confirm its operational range as indicated below:
  100 – 240V AC rating: 85 – 264V, 47 – 66 Hz, approx. 4 – 6VA
  10 – 32V DC rating: 9 – 36V, approx. 3W

■ GENERAL PRECAUTION

- Before you remove the unit or mount it, turn off the power supply and input signal for safety.

■ ENVIRONMENT

- Indoor use.
- When heavy dust or metal particles are present in the air, install the unit inside proper housing with sufficient ventilation.
- Do not install the unit where it is subjected to continuous vibration. Do not subject the unit to physical impact.
- Environmental temperature must be within -25 to +60°C (-13 to +140°F) with relative humidity within 30 to 95% RH in order to ensure adequate life span and operation.
- Be sure that the ventilation slits are not covered with cables, etc.

■ WIRING

- Do not install cables close to noise sources (relay drive cable, high frequency line, etc.).
- Do not bind these cables together with those in which noises are present. Do not install them in the same duct.

■ AND ....

- The unit is designed to function as soon as power is supplied, however, a warm up for 10 minutes is required for satisfying complete performance described in the data sheet.

LIGHTNING SURGE PROTECTION

We offer a series of lightning surge protector for protection against induced lightning surges. Please contact us to choose appropriate models.

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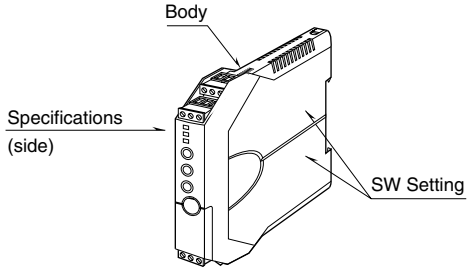
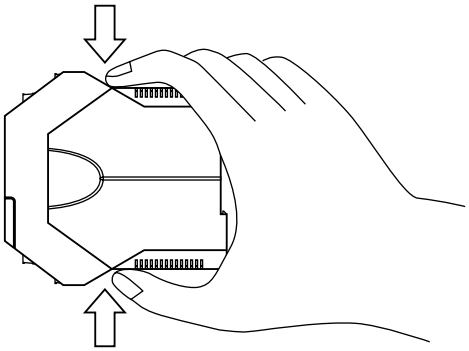
COMPONENT IDENTIFICATION



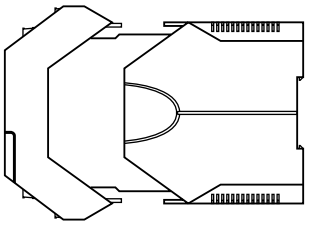
■ HOW TO OPEN THE COVER WHEN SETTING DIP SW

Hold at the top and bottom of the unit as shown below and slide the housing cover gently to open until it hits the latching inside the unit.

Caution:
Handle the cover carefully to protect internal components from damage. DO NOT pull beyond where the housing cover is latched. The plastic housing may be damaged.

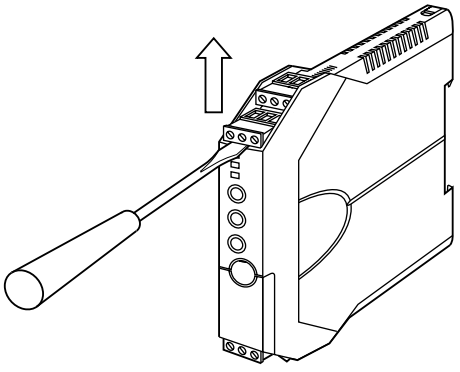


• Housing Cover Fully Opened



■ HOW TO SEPARATE THE EURO TYPE CONNECTOR TERMINAL BLOCKS

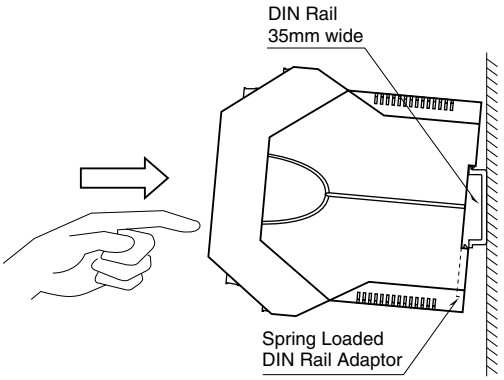
When you need to separate the euro type connector terminal blocks from the transmitter body for wiring, insert a minus driver between the euro type connector terminal block and the housing body, pull up the driver and pull out the euro type connector terminal block.



INSTALLATION

■ DIN RAIL MOUNTING

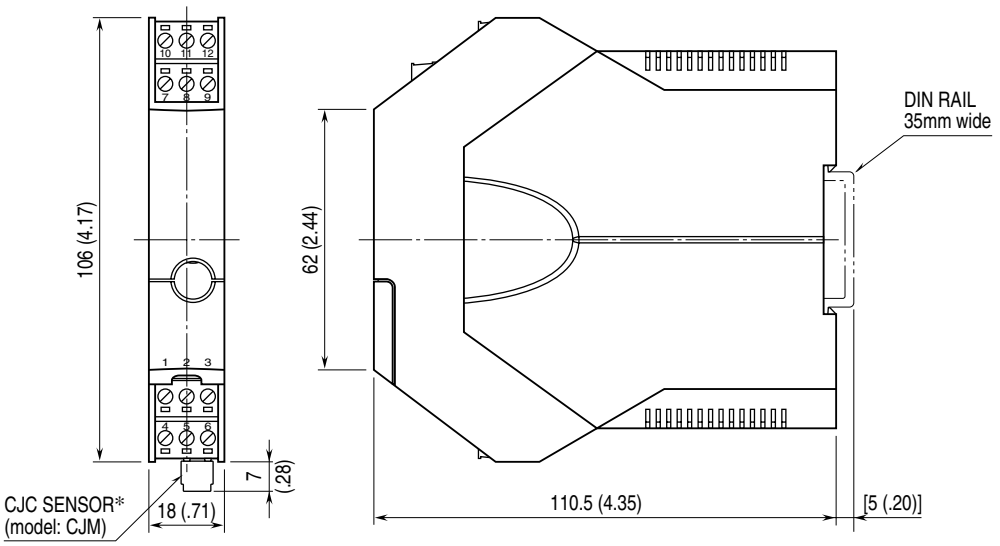
Set the unit so that its DIN rail adaptor is at the bottom. Position the upper hook at the rear side of the unit on the DIN rail and push in the lower. When removing the unit, push down the DIN rail adaptor utilizing a minus screwdriver and pull.



TERMINAL CONNECTIONS

Connect the unit as in the diagram below or refer to the connection diagram on the side of the unit.

■ EXTERNAL DIMENSIONS unit: mm (inch)

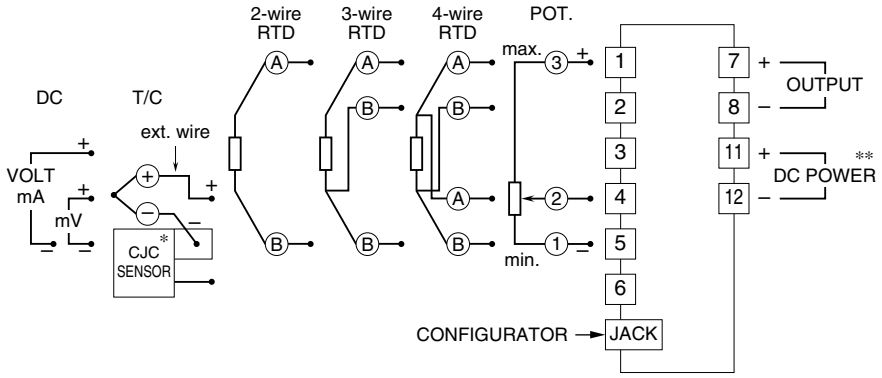


*Used only with a thermocouple input

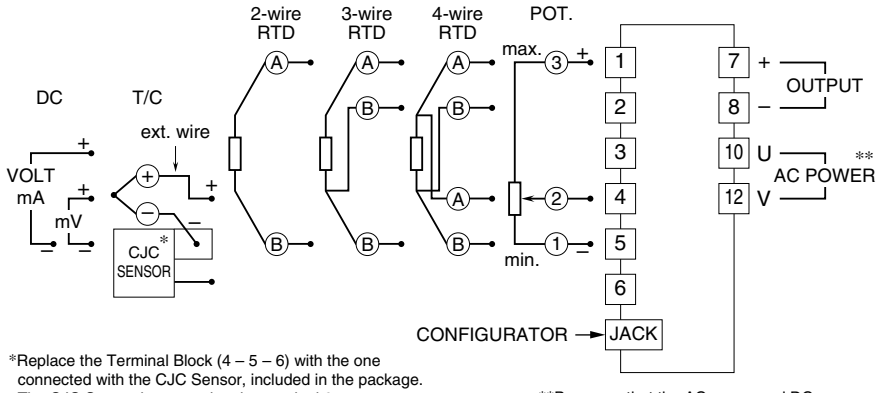
• When mounting, no extra space is needed between units.

■ CONNECTION DIAGRAM

■DC POWERED TYPE



■AC POWERED TYPE



*Replace the Terminal Block (4 – 5 – 6) with the one connected with the CJC Sensor, included in the package. The CJC Sensor is secured to the terminal 6. Loosen only the terminal 4 – 5 and connect the T/C extension wires.

**Be aware that the AC power and DC power connect to different terminals.

■ WIRING INSTRUCTIONS

• Applicable wire size

Solid: 0.2 to 2.5 mm² (0.55 to 1.75 dia.)

Stranded: 0.2 to 2.5 mm²

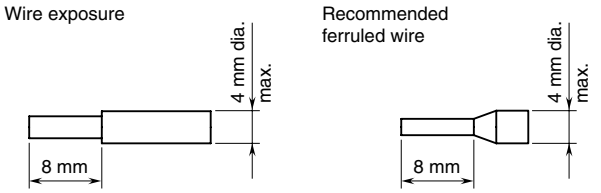
Tinning wire ends may cause contact failure and therefore is not recommended.

Ferruled: 0.2 to 1.5 mm² (0.55 to 1.35 dia.)

The following Phoenix Contact terminals are recommended:

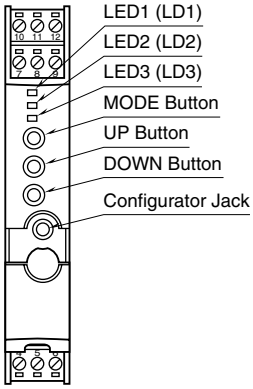
AI 0,25-8YE	0.2 to 0.25 mm²
AI 0,34-8TQ	0.25 to 0.34 mm²
AI 0,5-8WH	0.34 to 0.5 mm²
AI 0,75-8GY	0.5 to 0.75 mm²
AI 1,0-8RD	0.75 to 1.0 mm²
AI 1,5-8BK	1.0 to 1.5 mm²

• Expose wire conductors by 8 mm (0.31").

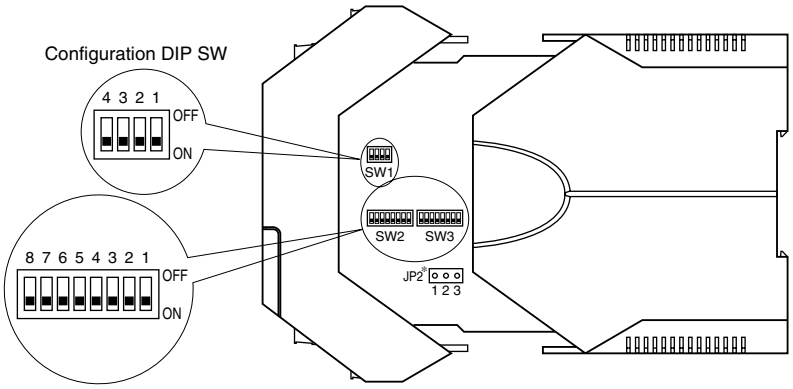


EXTERNAL & INTERNAL VIEWS

■ FRONT VIEW

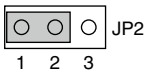


■ SIDE VIEW

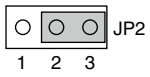


*For Voltage Input (V) range, switch the JP2 jumper to the 2 – 3 position.

Normal Position (other than DC Voltage [V] range)



DC Voltage [V] Range Position



The DIP switch setting is required to select output types before setting a precise output range using the PC configurator software.

CONFIGURATION MODE & DIP SW SETTINGS

When you program the transmitter module, two configuration modes are available: Field Configuration using DIP SW / control buttons, and PC Software. (The Option B type is for the field configuration only.)

The internal DIP switches are used to configure input and output type. Once the module is configured, precise ranges are set up with the front control buttons using a simulator connected to the input terminals and a multimeter connected to the output terminals as a reference.

The calibrated input and output ranges are stored in the internal memory. The module reads the DIP-switch-calibrated configuration only once after the power supply is turned on. Set the switches with the power supply removed.

Selectable I/O type and ranges are listed in Table 12 and 13.

■ DIP SW CONFIGURATION MODE

Turn the SW3-8 OFF to enable the DIP SW (Field Configuration) mode as shown in Table 1.

See Table 3 through 9 to configure the input and Table 10 for the output.

■ PC CONFIGURATION MODE

Turn the SW3-8 ON to enable the PC Configuration mode as shown in Table 1. All programmable features can be set up on a PC regardless of other DIP SW setting except for: (1) JP2 to be switched from 1 – 2 to 2 – 3 for DC voltage input (See Notes under Table 3), and (2) the output type must be selected with the DIP SW1-1 through SW1-4 (See Table 11). For detailed information on the PC configuration, refer to the M3LUCFG instruction manual.

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■ CONFIGURATION MODE (SW3) Table 1

MODE	SW3-8	
DIP SW	OFF	Configuration mode can be Confirmed with the front LED.
PC	ON	

■ FRONT CONTROL BUTTON LOCK (SW2) Table 2

LOCK	SW2-6	
Unlock	OFF	PC Configuration is not disabled when the front control button function is locked.
Lock	ON	

■ INPUT TYPE (SW3) Table 3

INPUT	SW3-7	SW3-6	SW3-5	SW3-4...3-1
DC Current	OFF	OFF	OFF	—
DC mV	OFF	OFF	ON	—
DC Voltage*1	OFF	ON	OFF	—
Thermocouple	OFF	ON	ON	Table 4
RTD	ON	OFF	OFF	Table 5
Potentiometer	ON	OFF	ON	Table 6
Resistance	ON	ON	OFF	—

*1. JP2 position switched from (1 – 2) to (2 – 3) for both DIP SW and PC configuration.

■ THERMOCOUPLE TYPE (SW3) Table 4

T/C	SW3-4	SW3-3	SW3-2	SW3-1
(PR)	OFF	OFF	OFF	OFF
K (CA)	OFF	OFF	OFF	ON
E (CRC)	OFF	OFF	ON	OFF
J (IC)	OFF	OFF	ON	ON
T (CC)	OFF	ON	OFF	OFF
B (RH)	OFF	ON	OFF	ON
R	OFF	ON	ON	OFF
S	OFF	ON	ON	ON
C (WRe 5-26)	ON	OFF	OFF	OFF
N	ON	OFF	OFF	ON
U	ON	OFF	ON	OFF
L	ON	OFF	ON	ON
P (Platinel II)	ON	ON	OFF	OFF

■ RTD TYPE (SW3) Table 5

RTD	SW3-4	SW3-3	SW3-2	SW3-1
Pt 100	OFF	OFF	OFF	OFF
Pt 200	OFF	OFF	OFF	ON
Pt 300	OFF	OFF	ON	OFF
Pt 400	OFF	OFF	ON	ON
Pt 500	OFF	ON	OFF	OFF
Pt 1000	OFF	ON	OFF	ON
Pt 50 Ω	OFF	ON	ON	OFF
JPt 100	OFF	ON	ON	ON
Ni 100	ON	OFF	OFF	OFF
Ni 120	ON	OFF	OFF	ON
Ni 508.4 Ω	ON	OFF	ON	OFF
Ni-Fe 604	ON	OFF	ON	ON
Cu 10 @ 25°C	ON	ON	OFF	OFF

■ POTENTIOMETER (SW3) Table 6

RESISTANCE	SW3-4	SW3-3	SW3-2	SW3-1
2500 – 4000 Ω	OFF	OFF	OFF	OFF
1200 – 2500 Ω	OFF	OFF	OFF	ON
600 – 1200 Ω	OFF	OFF	ON	OFF
300 – 600 Ω	OFF	OFF	ON	ON
150 – 300 Ω	OFF	ON	OFF	OFF
80 – 150 Ω	OFF	ON	OFF	ON

■ RTD/RESISTANCE WIRES (SW2) Table 7

WIRES	SW2-2	SW2-1
2-wire	OFF	OFF
3-wire	OFF	ON
4-wire	ON	ON

■ COLD JUNCTION COMPENSATION (SW2) Table 8

COLD JUNCTION COMP.	SW2-3
Disable	ON
Enable	OFF

■ BURNOUT (SW2) Table 9

BURNOUT	SW2-5	SW2-4
No burnout	OFF	OFF
Upscale	OFF	ON
Downscale	ON	ON

■ OUTPUT TYPE (SW2 & 1) Table 10

OUTPUT	SW2-8	SW2-7	SW1-4	SW1-3	SW1-2	SW1-1
0 – 20 mA	OFF	OFF	OFF	ON	OFF	OFF
-2.5 – +2.5 V	OFF	ON	ON	OFF	OFF	ON
-10 – +10 V	ON	OFF	ON	OFF	ON	OFF

■ OUTPUT TYPE / PC CONFIG (SW1) Table 11

OUTPUT	SW1-4	SW1-3	SW1-2	SW1-1
0 – 20 mA	OFF	ON	OFF	OFF
-2.5 – +2.5 V	ON	OFF	OFF	ON
-10 – +10 V	ON	OFF	ON	OFF

CHECKING

1) Terminal wiring: Check that all cables are correctly connected according to the connection diagram.
2) DIP SW setting: Check that the switches are set to appropriate positions.
3) Power input voltage: Check voltage across the terminal 10 – 12 (AC) or 11 – 12 (DC) with a multimeter.
4) Input: Check that the input signal is within 0 – 100% of full-scale.

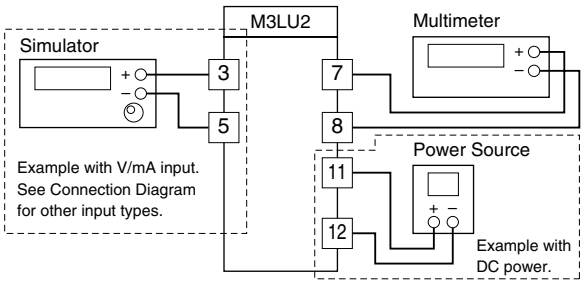
   If the thermocouple, RTD, potentiometer, resistance or their extension wires, or lead wires of mV input are broken, the output goes over 100% (below 0% with downscale protection) due to burnout function. Confirm the status indicator LED pattern and check leadwires in such a case.
5) Output: Check that the load resistance meets the described specifications.

I/O RANGING & FINE ADJUSTMENTS

After the DIP SW setting is complete, set up the precise input and output range using the front control buttons. Be sure that the front control button function is enabled with the DIP switch setting.
The front LEDs' colors and blinking patterns help you to easily identify the transmitter's status and confirm the set-up actions in each step of Calibration Modes. Please read the following explanations referring to "Calibration Flow Chart".

■ PREPARATION (e.g. M3LU2-R4/A, DC powered type)

1) Mount the DIP-SW-configured M3LU2 on to a DIN rail.
2) Connect the M3LU2 to a simulator and a multimeter and to a DC power source as shown below.
3) Turn the power supply on and wait for 10 minutes.



■ INPUT & OUTPUT RANGING

[Example] Setting both input and output to 1 – 5 V DC

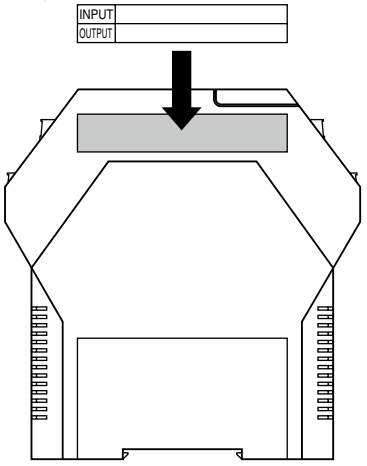
1) Run Mode: Confirm that the green LED is blinking (model M3LU2-x/A) or the green LED turns on (model M3LU2-x/B).
2) Input Ranging Mode: Hold down MODE button for longer than 5 seconds until the LD1 red LED is ON and the LD2 red LED is blinking.
3) 0% Input Ranging: Apply the desired minimum input level (e.g. 1 V) from the simulator and hold down DOWN button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.

   The blinking LD1 means that the value is stored in the memory. If the LED does not change, the entered level may be inappropriate: too small a span, or out of usable range (same for all steps).
4) 100% Input Ranging: Apply the desired maximum input level (e.g. 5 V) from the simulator and hold down UP button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
5) Output Ranging Mode: Press MODE button and confirm that the LD3 red LED instead of LD2 is blinking.
6) 0% Output Ranging: Increase or decrease the simulated input until the meter shows the desired minimum output level (e.g. 1 V). Hold down DOWN button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
7) 100% Output Ranging: Increase or decrease the simulated input until the meter shows the desired maximum output level (e.g. 5 V). Hold down UP button until the LD1 blinks for approx. 2 sec. and then turns OFF. When you release the button, the LD1 is returned to ON.
8) Run Mode: When calibration is completed, press MODE button once and confirm that: the LD1 green LED is blinking in case of M3LU2-x/A; and the LD1 green LED is ON in case of M3LU2-x/B.

■ I/O RANGE LABEL

Blank I/O range labels are included in the product package. Write in the configured ranges and put the label on the side as shown below.

I/O Range Label (included in the product package)



■ HOW TO RESET TO DEFAULT STATUS

1) Set and SW2-1 to OFF and SW2-2 to ON position.
2) Turn on the power supply to the transmitter while pressing MODE button.
3) Wait until green LED turns on at the LD1, LD2 and LD3.
4) Reset SW2-1 and SW2-2 to the previous position. Turn off and on the power supply.

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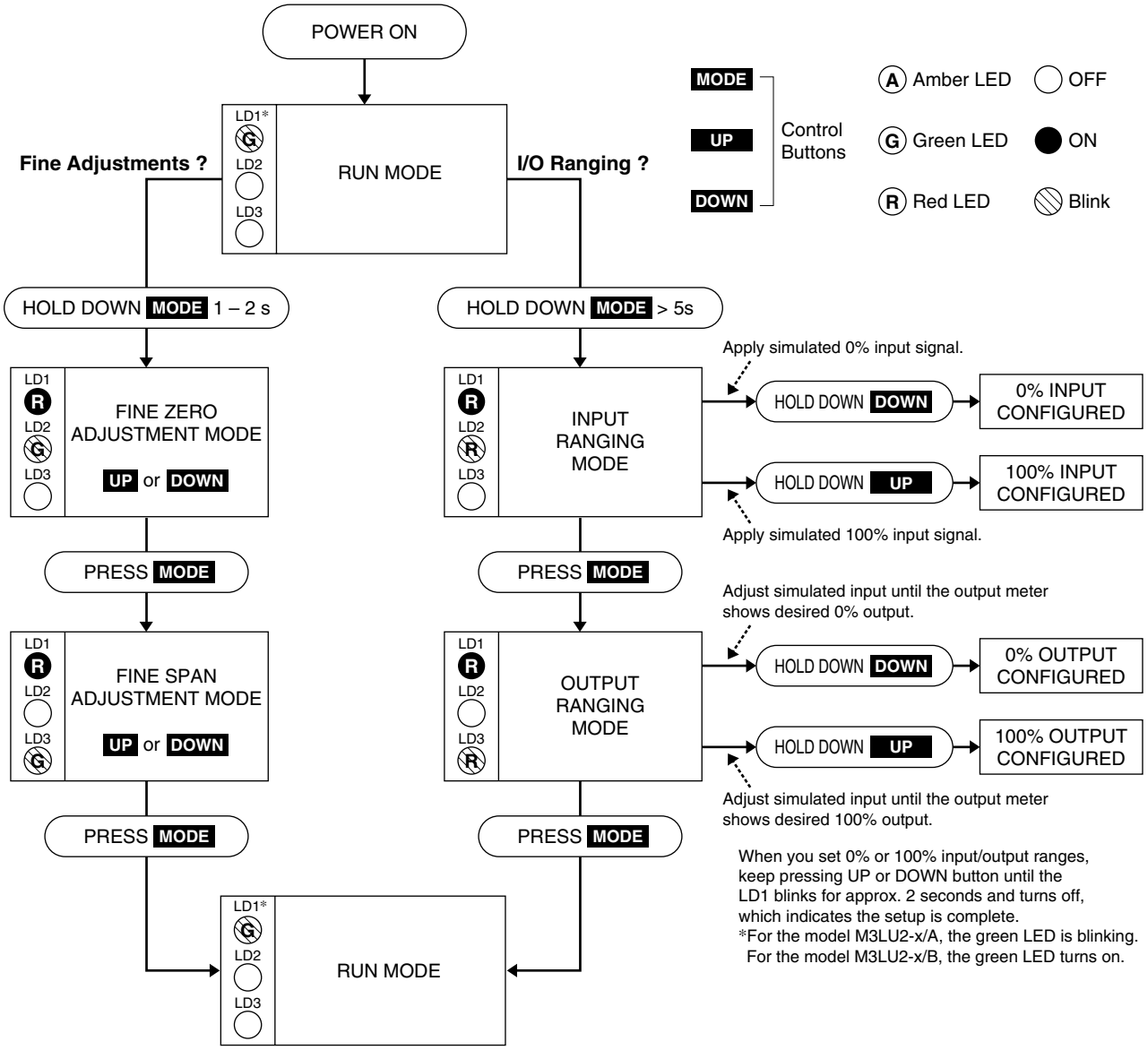
■ CALIBRATION FLOW CHART



When you set 0% or 100% input/output ranges, keep pressing UP or DOWN button until the LD1 blinks for approx. 2 seconds and turns off, which indicates the setup is complete.
*For the model M3LU2-x/A, the green LED is blinking.
For the model M3LU2-x/B, the green LED turns on.

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■ ZERO & SPAN ADJUSTMENTS

After the transmitter is installed and operational, fine zero and span tuning can be performed as explained below. Both zero and span are adjustable within ±15%.

1) Run Mode: Confirm that the green LED is blinking (model M3LU2-x/A) or the green LED turns on (model M3LU2-x/B).
2) Fine Zero Adjustment Mode: Hold down MODE button for 1 or 2 seconds until the LD1 red LED is ON and the LD2 green LED is blinking.

   Use UP (increase) and DOWN (decrease) buttons to adjust the output to 0%.
3) Fine Span Adjustment Mode: Press MODE button and confirm that the LD3 green LED instead of LD2 is blinking.

   Use UP (increase) and DOWN (decrease) buttons to adjust the output to 100%.
4) Run Mode: When fine adjustment is completed, press MODE button once and confirm that: the LD1 green LED is blinking in case of M3LU2-x/A; and the LD1 green LED is ON in case of M3LU2-x/B.

Note 1: Calibration steps can be skipped when not needed by repeating pushing MODE buttons.

Note 2: There is no stated order of setting 0% and 100% levels or no limitation of entering values for multiple times within one step of Calibration Mode. Signal level is stored each time the respective UP or DOWN button is pressed.

■ INPUT TYPE, RANGE & ACCURACY

Table 12

INPUT TYPE	MIN. SPAN	MAXIMUM RANGE	ACCURACY*1
DC Current	1 mA	0 to 20 mA	±20 µA
DC Millivolt	4 mV	-1000 to +1000 mV	±10 µV at F.S. input ≤ 50 mV ±40 µV at F.S. input ≤ 200 mV ±60 µV at F.S. input ≤ 500 mV ±80 µV at F.S. input > 500 mV
DC Voltage	1 V	-10 to +10 V	±0.1%
Potentiometer	2%	total resistance 80 to 4000 Ω	±0.1 Ω
Resistance	10 Ω	0 to 4000 Ω	±0.1 Ω

Thermocouple	°C				°F			
	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY*1	MIN. SPAN	MAXIMUM RANGE	CONFORMANCE RANGE	ACCURACY*1
(PR)	20	0 to 1760	0 to 1760	±1.00	36	32 to 3200	32 to 3200	±1.80
K (CA)	20	-270 to +1370	-150 to +1370	±0.25	36	-454 to +2498	-238 to +2498	±0.45
E (CRC)	20	-270 to +1000	-170 to +1000	±0.20	36	-454 to +1832	-274 to +1832	±0.36
J (IC)	20	-210 to +1200	-180 to +1200	±0.25	36	-346 to +2192	-292 to +2192	±0.45
T (CC)	20	-270 to +400	-170 to +400	±0.25	36	-454 to +752	-274 to +752	±0.45
B (RH)	20	100 to 1820	400 to 1760	±0.75	36	212 to 3308	752 to 3200	±1.35
R	20	-50 to +1760	200 to 1760	±0.50	36	-58 to +3200	392 to 3200	±0.90
S	20	-50 to +1760	0 to 1760	±0.50	36	-58 to +3200	32 to 3200	±0.90
C (WRe 5-26)	20	0 to 2315	0 to 2315	±0.25	36	32 to 4199	32 to 4199	±0.45
N	20	-270 to +1300	-130 to +1300	±0.30	36	-454 to +2372	-202 to +2372	±0.54
U	20	-200 to +600	-200 to +600	±0.20	36	-328 to +1112	-328 to +1112	±0.36
L	20	-200 to +900	-200 to +900	±0.25	36	-328 to +1652	-328 to +1652	±0.45
P (Platinel II)	20	0 to 1395	0 to 1395	±0.25	36	32 to 2543	32 to 2543	±0.45

RTD	°C			°F		
	MIN. SPAN	MAXIMUM RANGE	ACCURACY*1	MIN. SPAN	MAXIMUM RANGE	ACCURACY*1
Pt 100 (JIS '97, IEC)	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 200	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 300	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 400	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 500	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 1000	20	-200 to +850	±0.15	36	-328 to +1562	±0.27
Pt 50 Ω (JIS '81)	20	-200 to +649	±0.15	36	-328 to +1200	±0.27
JPt 100 (JIS '89)	20	-200 to +510	±0.15	36	-328 to +950	±0.27
Ni 100	20	-80 to +260	±0.15	36	-112 to +500	±0.27
Ni 120	20	-80 to +260	±0.15	36	-112 to +500	±0.27
Ni 508.4 Ω	20	-50 to +200	±0.15	36	-58 to +392	±0.27
Ni-Fe 604	20	-200 to +200	±0.15	36	-328 to +392	±0.27
Cu 10 @ 25°C	20	-50 to +250	±0.50	36	-58 to +482	±0.90

*1. DC, RTD, Resistance, Potentiometer input: Or ±0.1% of span, whichever is greater.
Thermocouple input: [Accuracy + Cold Junction Compensation Error 1.0°C (1.80.9°F)] or ±0.1% of span, whichever is greater.
For current output, overall accuracy degrades another 0.1% with spans ≤ 2 mA.

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■ **OUTPUT TYPE & RANGE** **Table 13**

OUTPUT TYPE	MINIMUM SPAN	MAXIMUM RANGE	CONFORMANCE RANGE
DC Current	1 mA	0 to 20 mA	0 to 23 mA
DC Voltage, Narrow Spans	250 mV	-2.5 to +2.5 V	-3 to +3 V
DC Voltage, Wide Spans	1 V	-10 to +10 V	-11.5 to +11.5 V

STATUS INDICATOR LED

Combinations of the three front LEDs (LD1, LD2, LD3) indicate the transmitter's operating status by different blinking patterns.
Examples are shown below.

(A) Amber LED ◯ OFF
(G) Green LED ● ON
(R) Red LED ▨ Blink

NORMAL OPERATION (RUN) MODE			
LD1 (G) LD2 ◯ LD3 ◯	**PC Configuration RUN Mode (Option A)** The transmitter is configured via PC and is in normal operating conditions.	LD1 ● LD2 ◯ LD3 ◯	**DIP SW Configuration RUN Mode** The transmitter is configured via DIP SW and is in normal operating conditions.
ERROR MODE			
LD1 (A) LD2 (A) LD3 (A)	**System Error** Indicates the CPU's communication error.	LD1 (R) LD2 (R) LD3 (R)	**DIP SW Error** DIP SW configuration is inappropriate. Check the DIP SW setting referring to Tables 2 – 11.
LD1 (G) LD2 (A) LD3 (A)	**Burnout in PC Configuration Mode (Option A)**	LD1 ● LD2 (A) LD3 (A)	**Burnout in DIP SW Configuration Mode**
LD1 (G) LD2 ◯ LD3 (A)	**Output Saturated in PC Configuration Mode (Option A)** The output is below -15% or above 115%.	LD1 ● LD2 ◯ LD3 (A)	**Output Saturated in DIP SW Configuration Mode** The output is below -15% or above 115%.

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