*INSTRUCTION MANUAL*

# COMMUNICATION CONTROLLER
## (DeviceNet)

MODEL **M2BD**

# 1. 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:**
Communication controller ................................................................................................................................... (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.

**■ EDS FILE**
EDS files are downloadable at our web site.

# 2. GENERAL DESCRIPTION

The model M2BD is an I/O Terminal Block for DeviceNet. Variety of input and output types can be mixed, selected from Mini-M series signal conditioners.
Model number and suffix codes are designated as follows:

<div align="center">

## M2BD–[1][2]–[3][4]

</div>

**MODEL**

**[1] CAPACITY**
    **04** : 4 positions
    **08** : 8 positions
    **16** : 16 positions

**[2] I/O TYPE**
    **1** : Input
    **2** : Output

**[3] POWER INPUT**
    **K** : 85–132V AC*
    **R** : 24V DC
    * CE or UL not available

**[4] OPTIONS**
    Standards & Approvals
    blank : without UL or CE
    **/UL**: UL approval & CE marking**
    ** 24V DC power only. Voltage at the field terminals limited within 30V DC.
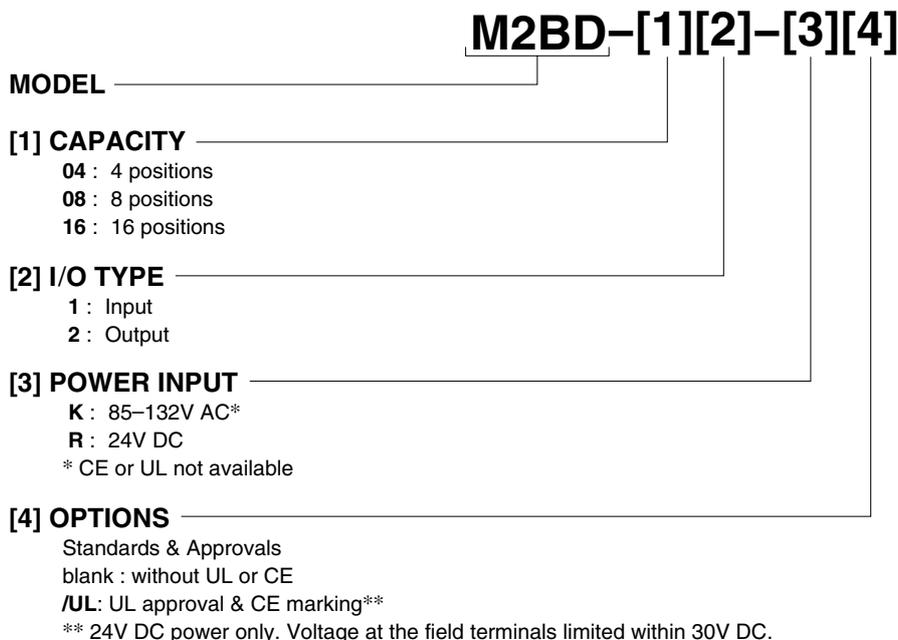
The Communication Controller Module of an Input Terminal Block converts analog inputs (0 – 100%) proportionally into 16-bit binary signals. The one for an Output Terminal Block converts 16-bit binary signals proportionally into analog outputs (0 – 100%).
This instruction manual explains hardware specifications, component identification, and wiring instructions, etc.

# 3. POINTS OF CAUTION

## ■ WARNING

• If the equipment is used in a manner not specified by this manual, the protection provided by the equipment may be impaired.

## ■ NONINCENDIVE APPROVAL OPTION

• This equipment is suitable for use in Class I, Div. 2, Groups A, B, C and D or Non-Hazardous Locations only.
• **WARNING!** Before You Remove the Unit from Its Base Socket or Mount It, Turn Off the Power Supply and Input Signal for Safety.
• **WARNING! – Explosion Hazard –**
Substitution of Components May Impair Suitability for Class I, Div. 2.
• **WARNING! – Explosion Hazard –**
Do Not Disconnect Equipment Unless Power Has Been Switched Off or The Area is Known To Be Non-Hazardous.
• The equipment was evaluated for use in the ambient temperature and relative humidity as mentioned in 'ENVIRONMENT" section.
• The input and output wiring must be in accordance with Class I, Div. 2 wiring methods and in accordance with the authority having jurisdiction for use in these hazardous locations.

## ■ CONFORMITY WITH EU DIRECTIVES OR UL

• This equipment is suitable for Pollution Degree 2 and Measurement Category II (input, 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.
• The equipment must be mounted inside a suitable fire enclosure.
• Altitude up to 2000 meters.
• The equipment must be installed such that appropriate clearance and creepage distances are maintained to conform to CE/UL requirements. Failure to observe these requirements may invalidate the CE/UL 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

• Refer to signal conditioner data sheet. Choose the same power input specification for all units.

## ■ GENERAL PRECAUTIONS

• Before you remove the unit from its base 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 -5 to +55°C (23 to 131°F) with relative humidity within 30 to 90% 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.

# 4. HARDWARE SPECIFICATIONS

## 4.1. M2BD-x1 (suffix codes 04, 08, or 16 in x)

| ITEM | SPECIFICATIONS | |
|---|---|---|
| Analog input | Refer to the data sheets for Mini-M series Signal Conditioners. | |
| Digital output | 16-bit binary | |
| I/O characteristics | Hexadecimal 0000 – 1770 (0 – 6000) in proportion to analog input range 0 – 100% [1] | |
| Maximum resolution | 1mV for 1 – 5 V DC range | |
| Accuracy | ≤ ±0.1% excluding the accuracy of I/O modules | |
| Maximum input voltage | Refer to the data sheets for Mini-M series Signal Conditioners. Limited to less than 30V r.m.s. and 42.4V peak or 60V DC for /UL option. | |
| No. of analog input channels | M2BD-041 | 4 |
| | M2BD-081 | 8 |
| | M2BD-161 | 16 |
| Isolation | Input to DeviceNet to power to FG1 (isolated between channels) | |
| Required nodes [2] | M2BD-041 | 30 points (30 points × 1) |
| | M2BD-081 | 50 points (40 points × 1, 10 points × 1) |
| | M2BD-161 | 100 points (30 points × 2, 40 points × 1) |
| Connection | DeviceNet | Euro type connector terminal (applicable wire size: 0.2 – 2.5 mm², stripped length 7 mm) |
| | Input | M3 screw terminals (torque 0.8 N·m) |
| | Power input | M3 screw terminals (torque 0.8 N·m) |
| Mounting screw for the base | M5 × 6 mm or larger | |
| Noise immunity | 500V p-p, 1μsec. | |
| Dielectric strength | 1000V AC @ 1 minute (power to input module to DeviceNet module to FG1) | |
| Insulation resistance | ≥ 100 MΩ with 500V DC (power to input module to DeviceNet module to FG1) | |
| Weight | M2BD-041 | 1.2 kg (2.6 lb) |
| | M2BD-081 | 1.5 kg (3.3 lb) |
| | M2BD-161 | 2.0 kg (4.4 lb) |
| Power input | M2BD-x1-K | 85 – 132V AC, 47 – 66 Hz |
| | M2BD-x1-R | 24V DC ±10% |
| Power consumption | M2BD-x1-K | approx. 6VA without I/O modules |
| | M2BD-041-K | approx. 30VA with 4 modules (M2DY) |
| | M2BD-081-K | approx. 50VA with 8 modules (M2DY) |
| | M2BD-161-K | approx. 90VA with 16 modules (M2DY) |
| Current consumption | M2BD-x1-R | approx. 0.25A without I/O modules |
| | M2BD-041-R | approx. 1A with 4 modules (M2DY) |
| | M2BD-081-R | approx. 1.5A with 8 modules (M2DY) |
| | M2BD-161-R | approx. 2.5A with 16 modules (M2DY) |
| Supply voltage/current to network | 11 – 25V DC (supplied from the communication terminals); 60mA max. at 24V | |

[1]. In the firmware version 3.00 or later, analog input range 0 – 100% can be converted into hexadecimal 0000 – 2710 (0 – 10000).
   In addition, negative values of analog input range -15 to 0% can be converted into signed absolute values.
[2]. Applicable to OMRON CompoBus/D

## 4.2. M2BD-x2 (suffix codes 04, 08, or 16 in x)

| ITEM | SPECIFICATIONS | |
|---|---|---|
| Analog output | Refer to the data sheets for Mini-M series Signal Conditioners. | |
| Digital input | 16-bit binary | |
| I/O characteristics | Hexadecimal 0000 – 1770 (0 – 6000) in proportion to analog output range 0 – 100% *1 | |
| Maximum resolution | 1mV for 1 – 5V DC range | |
| Accuracy | ≤ ±0.1% excluding the accuracy of I/O modules | |
| Maximum output voltage | Refer to the data sheets for Mini-M series Signal Conditioners. Limited to less than 30V r.m.s. and 42.4V peak or 60V DC for /UL option. | |
| No. of analog input channels | M2BD-042 | 4 |
| | M2BD-082 | 8 |
| | M2BD-162 | 16 |
| Isolation | Output to DeviceNet to power to FG1 (isolated between channels) | |
| Required nodes *2 | M2BD-042 | 18 points (8 points × 1, 10 points × 1) |
| | M2BD-082 | 26 points (16 points × 1, 10 points × 1) |
| | M2BD-162 | 42 points (10 points × 3, 12 points × 1)p |
| Connection | DeviceNet | Euro type connector terminal (applicable wire size: 0.2 – 2.5 mm², stripped length 7 mm) |
| | Output | M3 screw terminals (torque 0.8 N·m) |
| | Power input | M3 screw terminals (torque 0.8 N·m) |
| Mounting screw for the base | M5 × 6 mm or larger | |
| Noise immunity | 500V p-p, 1μsec. | |
| Dielectric strength | 1000V AC @ 1 minute (power to output module to DeviceNet module to FG1) | |
| Insulation resistance | ≥ 100 MΩ with 500V DC (power to output module to DeviceNet module  to FG1) | |
| Weight | M2BD-042 | 1.2 kg (2.6 lb) |
| | M2BD-082 | 1.5 kg (3.3 lb) |
| | M2BD-162 | 2.0 kg (4.4 lb) |
| Power input | M2BD-x2-K | 85 – 132V AC, 47 – 66 Hz |
| | M2BD-x2-R | 24V DC ±10% |
| Power consumption | M2BD-x2-K | approx. 6VA without I/O modules |
| | M2BD-042-K | approx. 30VA with 4 modules (M2DY) |
| | M2BD-082-K | approx. 50VA with 8 modules (M2DY) |
| | M2BD-162-K | approx. 90VA with 16 modules (M2DY) |
| Current consumption | M2BD-x2-R | approx. 0.25A without I/O modules |
| | M2BD-042-R | approx. 1A with 4 modules (M2DY) |
| | M2BD-082-R | approx. 1.5A with 8 modules (M2DY) |
| | M2BD-162-R | approx. 2.5A with 16 modules (M2DY) |
| Supply voltage/current to network | 11 – 25V DC (supplied from the communication terminals); 60mA max. at 24V | |

*1. In the firmware version 3.00 or later, analog output range 0 – 100% can be converted into hexadecimal 0000 – 2710 (0 – 10000).
   In addition, negative values of analog output range -15 to 0% can be converted into signed absolute values.
*2. Applicable to OMRON CompoBus/D

# 5. COMPONENT IDENTIFICATIONS & HARDWARE ADJUSTMENTS

## 5.1. M2BD-x1
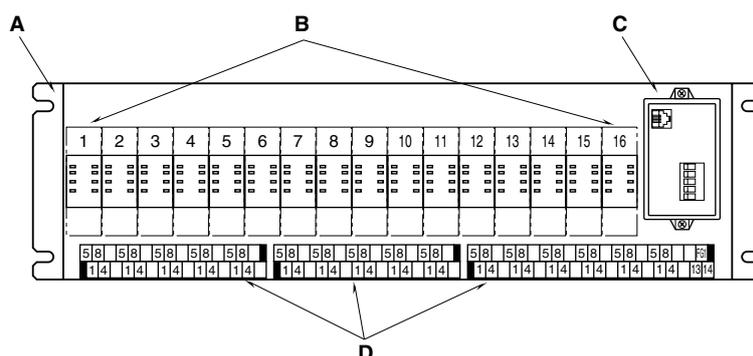


| REF. | NAME | FUNCTION |
|------|------|----------|
| **A** | Base | Installation base |
| **B** | Base socket | Mounting Mini-M modules |
| **C** | Communication Controller Module | Interfacing field I/Os with DeviceNet |
| **D** | Terminal blocks | Connecting field inputs and power input |

Note: The above figure indicates model M2BD-161.

## 5.2. M2BD-x2
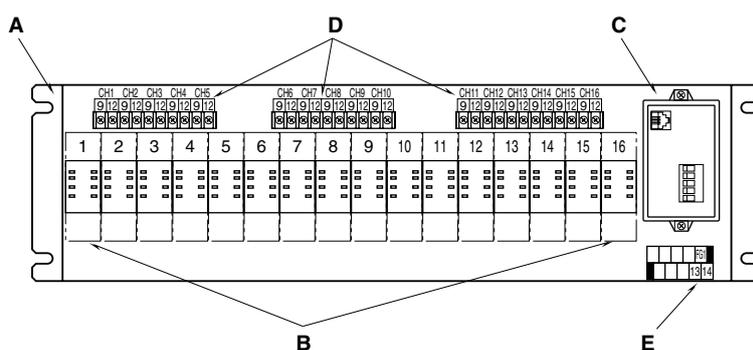


| REF. | NAME | FUNCTION |
|------|------|----------|
| **A** | Base | Installation base |
| **B** | Base socket | Mounting Mini-M modules |
| **C** | Communication Controller Module | Interfacing field I/Os with DeviceNet |
| **D** | Output terminal blocks | Connecting field outputs |
| **E** | Power input terminal block | Connecting power input |

Note: The above figure indicates model M2BD-162.

## 5.3. COMMUNICATION CONTROLLER MODULE
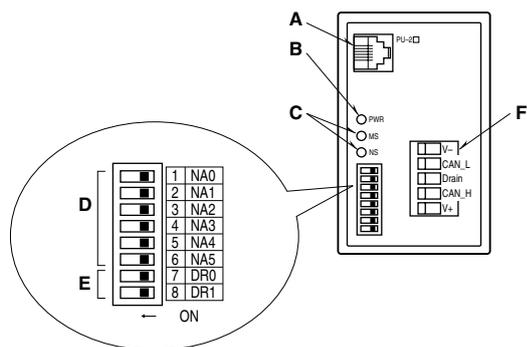


| REF. | NAME | FUNCTIONS | | |
|------|------|-----------|---|---|
| **A** | PU-2x modular jack | Modular jack for connecting with the Programming Unit (model: PU-2x). | | |
| **B** | I/O status LED | Marking (color) | Function | |
| | | PWR (green) | ON: Power is supplied.<br>OFF: Power is not supplied. | |
| **C** | Controller status LED | Marking | Function | |
| | | MS | Indicating operating status of the Communication Controller Module. | |
| | | NS | Indicating operating status of the network. | |
| **D** | Node address setting | Bit | Node Address (set with ON position) | |
| | | NA0 | $2^0$ | |
| | | NA1 | $2^1$ | |
| | | NA2 | $2^2$ | |
| | | NA3 | $2^3$ | |
| | | NA4 | $2^4$ | |
| | | NA5 | $2^5$ | |
| **E** | Baud rate setting | DR0 | DR1 | Baud Rate |
| | | OFF | OFF | 125 kbps (factory default) |
| | | ON | OFF | 250 kbps |
| | | OFF | ON | 500 kbps |
| **F** | Euro type connector terminal for DeviceNet | For wiring to DeviceNet. | | |

# 6. EXTERNAL DIMENSIONS  unit: mm (inch)

### 6.1. M2BD-x1
■ **M2BD-041**



16–M3 INPUT TERMINALS
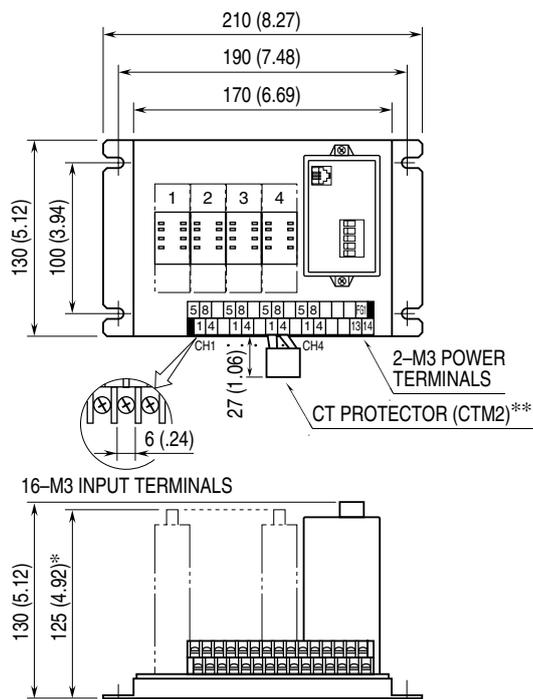
\* 165 (6.50) required for pneumatic tubing for M2PV.
\*\* Attached to M2CA and M2CE.

■ **M2BD-081**
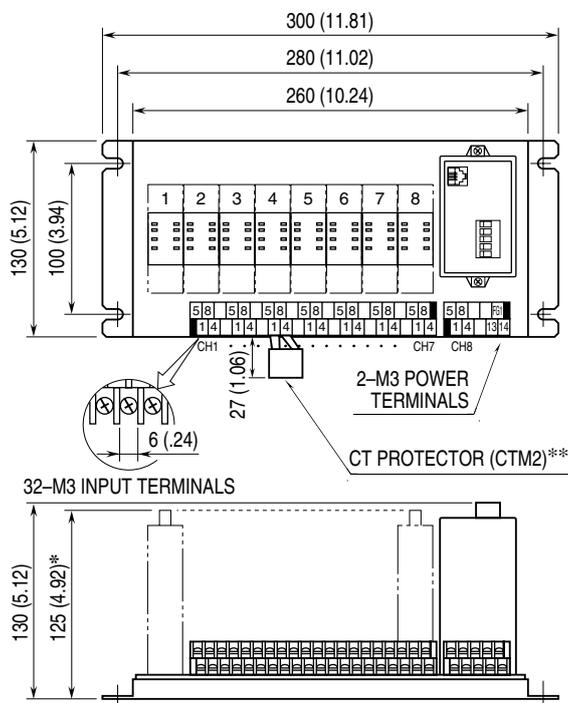


32–M3 INPUT TERMINALS

\* 165 (6.50) required for pneumatic tubing for M2PV.
\*\* Attached to M2CA and M2CE.

■**M2BD-161**

480 (18.90)
460 (18.11)
440 (17.32)

130 (5.12)
100 (3.94)

| 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 |

CH1 · · · · · · · · · CH5  CH6 · · · · · CH10  CH11 · · · · · · · · · CH16

27 (1.06)

CT PROTECTOR (CTM2)**

2–M3 POWER
TERMINALS

6 (.24)

64–M3 INPUT TERMINALS

130 (5.12)
125 (4.92)*
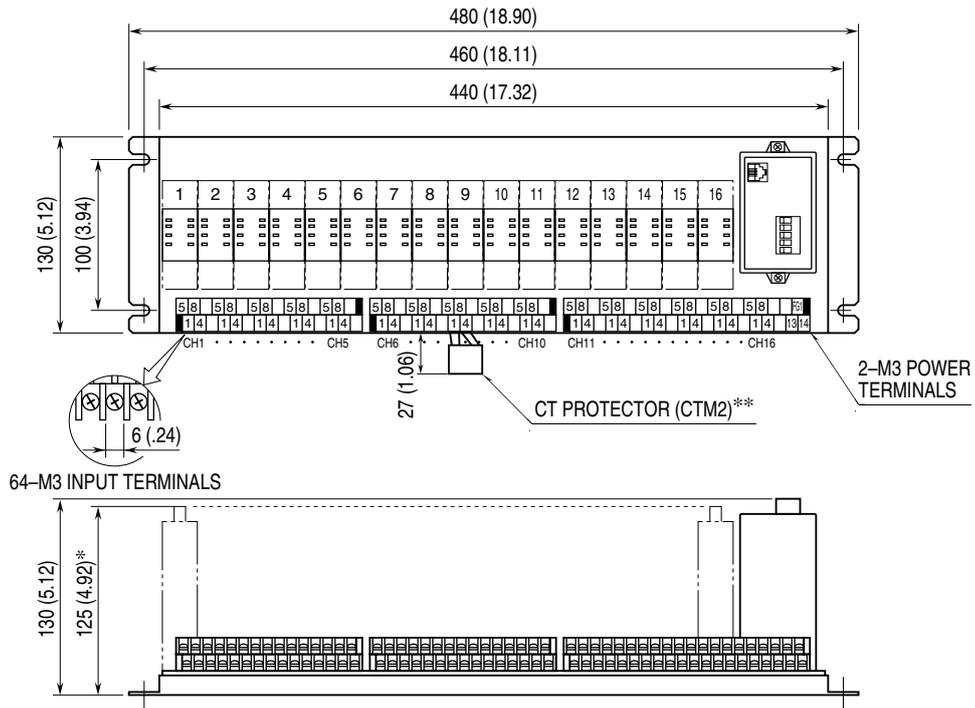
  *  165 (6.50) required for pneumatic tubing for M2PV.
  ** Attached to M2CA and M2CE.

## 6.2. M2BD-x2
■**M2BD-042**

210 (8.27)
190 (7.48)
170 (6.69)

6 (.24)

8–M3 OUTPUT
TERMINALS

CH1 CH2 CH3 CH4
9 12 9 12 9 12 9 12

| 1 | 2 | 3 | 4 |

130 (5.12)
100 (3.94)

F9
13 14

2–M3 POWER
TERMINALS

130 (5.12)
125 (4.92)

■**M2BD-082**

300 (11.81)
280 (11.02)
260 (10.24)
6 (.24)
16–M3 OUTPUT TERMINALS
130 (5.12)
100 (3.94)

CH1 CH2 CH3 CH4 CH5 CH6 CH7 CH8
9 12 9 12 9 12 9 12 9 12 9 12 9 12 9 12

1 2 3 4 5 6 7 8

13 14

2–M3 POWER TERMINALS

130 (5.12)
125 (4.92)

■**M2BD-162**

480 (18.90)
460 (18.11)
440 (17.32)
6 (.24)
32–M3 OUTPUT TERMINALS

130 (5.12)
100 (3.94)

CH1 CH2 CH3 CH4 CH5    CH6 CH7 CH8 CH9 CH10    CH11 CH12 CH13 CH14 CH15 CH16
9 12 9 12 9 12 9 12 9 12    9 12 9 12 9 12 9 12 9 12    9 12 9 12 9 12 9 12 9 12 9 12

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16

13 14

2–M3 POWER TERMINALS

130 (5.12)
125 (4.92)

### 6.3. MOUNTING REQUIREMENTS  unit: mm (inch)

■ **M2BD-04x**

190 (7.48)
4–M5 SCREW
100 (3.94)

■ **M2BD-08x**

280 (11.02)
4–M5 SCREW
100 (3.94)

■ **M2BD-16x**

460 (18.11)
4–M5 SCREW
100 (3.94)
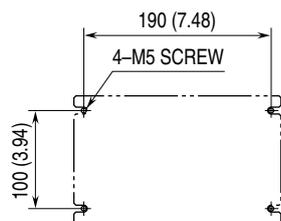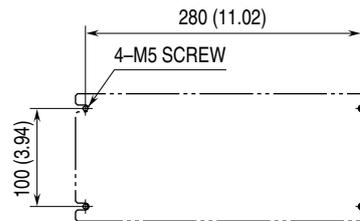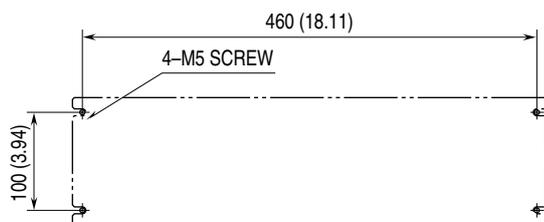
# 7.  CONNECTING DATA LINK WIRES

The following explanations apply to the wires connecting the M2BD to the Master Unit.

## 7.1. COMMUNICATION WIRE

The following types of wire are recommended for connecting the M2BD to the Master Unit.

| | |
|---|---|
| OMRON | DCA1-5C10 (THIN) |
| | DCA2-5C10 (THICK) |
| KURAMO ELECTRIC | KND-SB (THIN) |
| | KND-SB (THICK) |
| SHOWA ELECTRIC WIRE & CABLE | TDN24U-100G (THIN) |
| | TDN18U-100G (THICK) |
| SUMITOMO WIRING SYSTEMS | DN-24P1+20P1 SBS (THIN) |
| | DN-18P1+15P1 SBS (THICK) |

Paired Wires
for Power Output

Paired Wires
for Transmission

Grounding Wire

red    blue
black  white
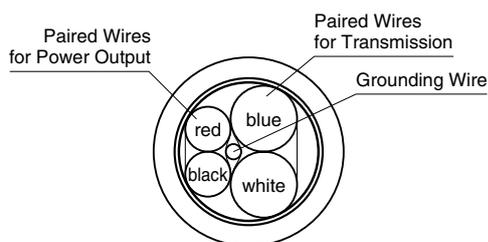
### 7.2. POINTS OF CAUTION IN HANDLING WIRES

DO NOT apply extraordinary forces to the wires as explained in the following:

1) DO NOT SQUEEZE the wires with a sharp-edged tool.
2) DO NOT TWIST the wires extraordinarily.
3) DO NOT PULL the wires extraordinarily tight.
4) DO NOT TRAMPLE on the wires.
5) DO NOT PUT objects onto the wires.
6) DO NOT DAMAGE the insulation tube of wires.

### 7.3. WIRE IDENTIFICATION

The following table defines wire insulation colors and designations.  The M2BD terminal block is labeled also in the same colors so that the correct assignment can be confirmed.

| COLOR | DESIG. | DESCRIPTION |
|-------|--------|-------------|
| black | V – | Power (–) |
| blue | CAN_L | Signal Low |
| bare | Drain | Shield |
| white | CAN_H | Signal High |
| red | V + | Power (+) |

# 8.  CONNECTING WIRES

This section explains points of caution when wiring I/O modules and examples of wiring diagrams.

### 8.1. POINTS OF CAUTION

Appropriate precautions are required such as follows for protecting the system from external noise interference:

1) Separate analog I/O and communication wires from others in order to prevent surge or induction noises.
2) Separate power input wires (AC) from those for driving motors.
3) Do not install these wires next to main supply circuits or high voltage cables.
   Never bind them to these circuits.
4) Ground the shield of communication wires at one point.
   Consideration about locations of the ground may be necessary according to external noise interference.

## 8.2. WIRING EXAMPLES OF M2BD-x1

### 1) Input Signal

The terminal No. marked on the Input Terminal Block are the same as those marked on individual Mini-M series I/O Signal Conditioners.  Refer to data sheets for the I/O modules when wiring each module.

Typical wiring diagrams are shown in the following:

■ **DC VOLTAGE**
(model: M2VS)
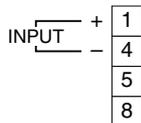
■ **DC CURRENT**
(model: M2VS)
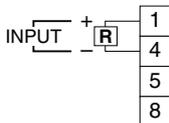
■ **THERMOCOUPLE**
(model: M2TS)
comp. leadwire
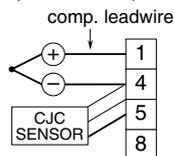
■ **RTD**
(model: M2RS)
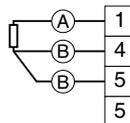
■ **POTENTIOMETER**
(model: M2MS)

### 2) Power Input

■ **AC POWER INPUT**

85 – 132V AC

| U | 13 |
| V | 14 |
|   | FG1 |

■ **DC POWER INPUT**

24V DC

| + | 13 |
| – | 14 |
|   | FG1 |
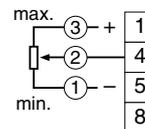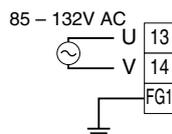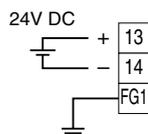
## 8.3. WIRING EXAMPLES OF M2BD-x2

### 1) Output Signal

The terminal No. marked on the Output Terminal Block are the same as those marked on individual Mini-M series I/O Signal Conditioners.  Refer to data sheets for the I/O modules when wiring each module.

Output range may be different between modules even though all output signals are connected to the 9 (+) – 12 (–) terminals.

OUTPUT

| + | 9 |
| – | 12 |

### 2) Power Input

■ **AC POWER INPUT**

85 – 132V AC

| U | 13 |
| V | 14 |
|   | FG1 |

■ **DC POWER INPUT**

24V DC

| + | 13 |
| – | 14 |
|   | FG1 |
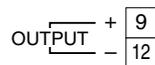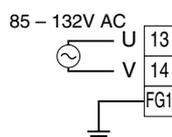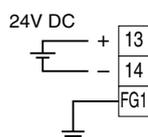
# 9. INPUT/OUTPUT DATA

## 9.1. DATA CONVERSION

### 1) M2BD-x1

Analog signal range 0 – 100% is converted into hexadecimal and provided to the Master Unit.

CONVERTED DATA
Hexadecimal
(Decimal)

1AF4 (6900)
1770 (6000)

-15

FC7C (-900)

100    115    INPUT (%)
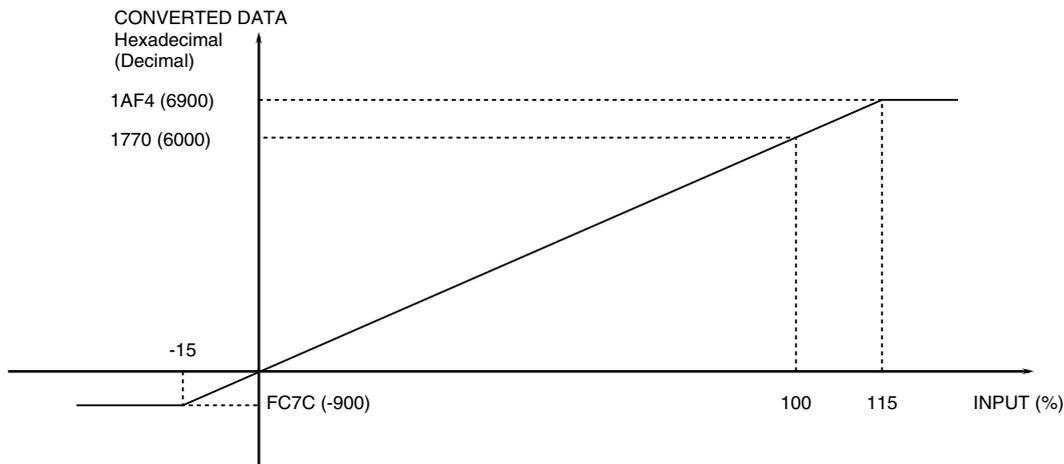
### 2) M2BD-x2

Hexadecimal from the Master Unit is converted into analog signal range 0 – 100%.

OUTPUT (%)

115
100

FC7C (-900)

-15

1770 (6000)    1AF4 (6900)
DIGITAL INPUT DATA
Hexadecimal (Decimal)
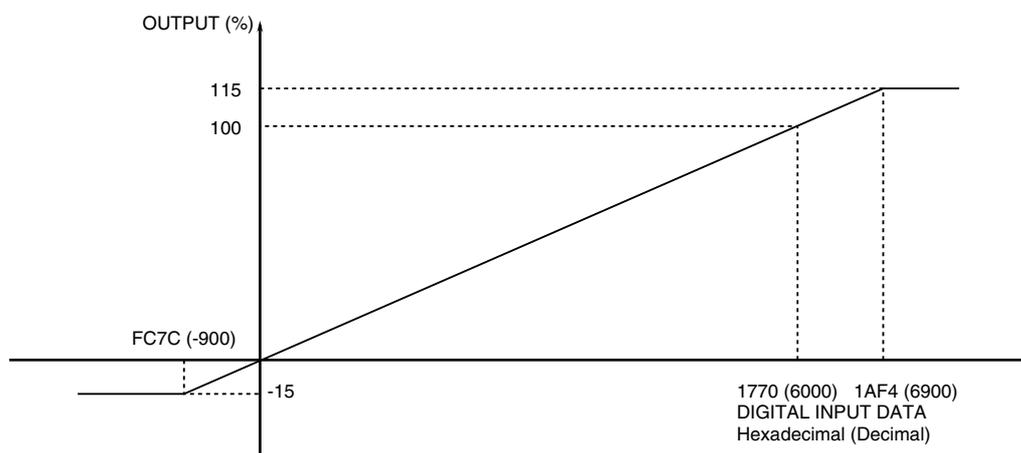
In the firmware version 3.00 or later, digital input and output data in hexadecimal can be scaled and negative representation can be changed.
Confirm the firmware version of the M2BD unit using the programming unit (model: PU-2x).
Connect the programming unit to the M2BD and press [GROUP] 00 and [ITEM] 99, to display the firmware version number.

## 9.2. SCALING SETTING (firmware version 3.00 or later)

Scaling of converted data is selectable between 0 – 6000 (default) and 0 – 10000 using the programming unit.

■ **Scaling data to 0 – 6000**

1) Connect the programming unit to the M2BD, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
2) Press [GROUP] 02, [ITEM] 03, [DATA] 0, and [ENTER].
   Confirm that [SCALE: 0 – 6000] is displayed.
3) Turn off and on the power supply to the M2BD unit to apply the setting.

■ **Scaling data to 0 – 10000**

1) Connect the programming unit to the M2BD, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PROGRAM mode.
2) Press [GROUP] 02, [ITEM] 03, [DATA] 1, and [ENTER].
   Confirm that [SCALE: 0 – 10000] is displayed.
3) Turn off and on the power supply to the M2BD unit to apply the setting.

### 9.3. NEGATIVE REPRESENTATION SETTING (firmware version 3.00 or later)

Representation of negative values can be selected between 2's complement and signed absolute values using the programming unit.

■**Negative representation in 2's complement**

1) Connect the programming unit to the M2BD, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PRO-GRAM mode.
2) Press [GROUP] 02, [ITEM] 02, [DATA] 2, and [ENTER].
  Confirm that [MINUS: 2's comp] is displayed.
3) Turn off and on the power supply to the M2BD unit to apply the setting.

■**Negative representation in signed absolute values**

1) Connect the programming unit to the M2BD, press [GROUP] 02, [ITEM] 01, [DATA] 1, and [ENTER] to shift to PRO-GRAM mode.
2) Press [GROUP] 02, [ITEM] 02, [DATA] 1, and [ENTER].
  Confirm that [MINUS: Signed abs] is displayed.
3) Turn off and on the power supply to the M2BD unit to apply the setting.

# 10. DEVICE PROFILE & OBJECT IMPLEMENTATION

## 10.1. SLAVE DEVICE PROFILE

| General Device Data | Conform to Device Net Specification | Volume I - Release 2.0 Volume II - Release 2.0 | |
|---|---|---|---|
| | Vendor Name | M-SYSTEM CO., LTD. | Vendor ID = 184 |
| | Device Profile Name | Slave: Generic | Profile No. = 0 |
| | Device Type | 0 | |
| Physical Conformance Data | Network Power Consumption | 60mA | |
| | Connector Style | Open-Pluggable | |
| | Isolated Physical Layer | Yes | |
| | LEDs Supported | MS (Module Status) | |
| | | NS (Network Status) | |
| | MAC ID Setting | DIP Switch | |
| | Default MAC ID | 0 | |
| | Communication Rate Setting | DIP Switch | |
| | Communication Rates Supported | 125k bit/s, 250k bit/s, 500k bit/s | |
| Communication Data | Predefined Master/Slave Connection Set | Group Only 2 Server | |
| | Dynamic Connections Supported (UCMM) | No | |
| | Fragmented Explicit Message Implemented | Yes | |

## 10.2. OBJECT IMPLEMENTATION

### 1) Identity Object (01H)

| Object Class | Attributes | None Supported |
|---|---|---|
| | Services | None Supported |

| Object Instance | Attributes | ID | Description | Get | Set | Value Limit |
|---|---|---|---|---|---|---|
| | | 1 | Vendor | Yes | No | 184 |
| | | 2 | Device type | Yes | No | 0 |
| | | 3 | Product code | Yes | No | * |
| | | 4 | Revision | Yes | No | 1.5 |
| | | 5 | Status (bits supported) | Yes | No | bit 0, bit 10 |
| | | 6 | Serial number | Yes | No | Each unit |
| | | 7 | Product name | Yes | No | * |
| | | 8 | State | No | No | |
| | | 9 | Configuration consistency value | No | No | |
| | | 10 | Heartbeat interval | No | No | |
| | Services | | DeviceNet Services | Parameter Options | | |
| | | 05H | Reset | No | | |
| | | 0EH | Get_Attribute_Single | No | | |

*Depending upon model numbers as in the table below.

| Model | Product Code Product | Name |
|---|---|---|
| M2BD-161-x | 1 | M2BD-161 |
| M2BD-162-x | 2 | M2BD-162 |
| M2BD-081-x | 3 | M2BD-081 |
| M2BD-082-x | 4 | M2BD-082 |
| M2BD-041-x | 5 | M2BD-041 |
| M2BD-042-x | 6 | M2BD-042 |

**2) Message Router Object (02H)**

| Object | Class Attributes | None Supported |
|---|---|---|
| | Services | None Supported |
| Object Instance | Attributes | None Supported |
| | Services | None Supported |
| Vendor Specific Additions | | None |

**3) DeviceNet Object (03H)**

| Object Class | Attributes | ID | Description | Get | Set | Value Limit |
|---|---|---|---|---|---|---|
| | | 1 | Revision | Yes | No | 02H |
| | Services | | DeviceNet Services | Parameter Options | | |
| | | 0EH | Get_Attribute_Single | No | | |

| Object Instance | Attributes | ID | Description | Get | Set | Value Limit |
|---|---|---|---|---|---|---|
| | | 1 | MAC ID | Yes | No | |
| | | 2 | Baud rate | Yes | No | |
| | | 3 | BOI | Yes | No | 00H |
| | | 4 | Bus-off counter | Yes | No | |
| | | 5 | Allocation information | Yes | No | |
| | | 6 | MAC ID switch changed | No | No | |
| | | 7 | Baud rate switch changed | No | No | |
| | | 8 | MAC ID switch value | No | No | |
| | | 9 | Baud rate switch value | No | No | |
| | Services | | DeviceNet Services | Parameter Options | | |
| | | 0EH | Get_Attribute_Single | No | | |
| | | 4BH | Allocate M/S connection set | No | | |
| | | 4CH | Release M/S connection se | No | | |

**4) Assembly Object (04H)**

| Object Class | Attributes | None Supported |
|---|---|---|
| | Services | None Supported |

| Object Instance 1 | Section | | Information | | Max Instance | |
|---|---|---|---|---|---|---|
| | Instance Type | Static I/O | | | 1 | |
| | Attributes | ID | Description | Get | Set | Value Limit |
| | | 1 | Numbers of members in list | No | No | |
| | | 2 | Member list | No | No | |
| | | 3 | Data | Yes | Yes | |
| | Services | | DeviceNet Services | Parameter Options | | |
| | | 0EH | Get_Attribute_Single | No | | |
| | | 10H | Set_Attribute_Single | No | | |

**5) Connection Object (05H)**

| Object Class | Attributes | | None Supported | |
|---|---|---|---|---|
| | Services | | None Supported | |
| | Total Active Connections Possible | | 1 | |

| Object Instance 1 | Section | | Information | Max Instance | |
|---|---|---|---|---|---|
| | Instance Type | | Explicit Message | 1 | |
| | Production Trigger | | Cyclic | | |
| | Transport Type | | Server | | |
| | Transport Class | | 3 | | |
| | Attributes | ID | Description | Get | Set | Value Limit |
| | | 1 | State | Yes | No | |
| | | 2 | Instance type | Yes | No | 00H |
| | | 3 | Transport class trigger | Yes | No | 83H |
| | | 4 | Produced connection ID | Yes | No | |
| | | 5 | Consumed connection ID | Yes | No | |
| | | 6 | Initial comm. characteristics | Yes | No | 21H |
| | | 7 | Produced connection size | Yes | No | FE00H |
| | | 8 | Consumed connection size | Yes | No | FE00H |
| | | 9 | Expected packet rate | Yes | Yes | |
| | | 12 | Watchdog time-out action | Yes | Yes | One of 01, 03 |
| | | 13 | Produced connection path length | Yes | No | 0000 |
| | | 14 | Produced connection path | Yes | No | |
| | | 15 | Consumed connection path length | Yes | No | 0000 |
| | | 16 | Consumed connection path | Yes | No | |
| | Services | | DeviceNet Services | Parameter Options | |
| | | 05H | Reset | No | |
| | | 0EH | Get_Attribute_Single | No | |
| | | 10H | Set_Attribute_Single | No | |

| Object Instance 2 | Section | | Information | Max Instance | |
|---|---|---|---|---|---|
| | Instance Type | | Polled I/O | 1 | |
| | Production Trigger | | Cyclic | | |
| | Transport Type | | Server | | |
| | Transport Class | | 2 | | |
| | Attributes | ID | Description | Get | Set | Value Limit |
| | | 1 | State | Yes | No | |
| | | 2 | Instance type | Yes | No | 01H |
| | | 3 | Transport class trigger | Yes | No | 82H |
| | | 4 | Produced connection ID | Yes | No | |
| | | 5 | Consumed connection ID | Yes | No | |
| | | 6 | Initial comm. characteristics | Yes | No | 01H |
| | | 7 | Produced connection size | Yes | No | ** |
| | | 8 | Consumed connection size | Yes | No | ** |
| | | 9 | Expected packet rate | Yes | Yes | |
| | | 12 | Watchdog time-out action | Yes | No | 00 |
| | | 13 | Produced connection path length | Yes | No | 0000 (OUT) / 0600 (IN) |
| | | 14 | Produced connection path | Yes | No | No data (OUT) / 20_04_24_65_30_03 (IN) |
| | | 15 | Consumed connection path length | Yes | No | 0000 (IN) / 0600 (OUT) |
| | | 16 | Consumed connection path | Yes | No | No data (IN) / 20_04_24_64_30_03 (OUT) |
| | | 17 | Production inhibit time | Yes | No | 00 |
| | Services | | DeviceNet Services | Parameter Options | |
| | | 05H | Reset | No | |
| | | 0EH | Get_Attribute_Single | No | |
| | | 10H | Set_Attribute_Single | No | |

**Depending upon model numbers as in the table below.  The actual data is composed of two bites, of which the MSB (00H) and LSB (table below) are inverted.

| Model | Produced Connection Size | Consumed Connection Size |
|---|---|---|
| M2BD-161-x | 20H | 00H |
| M2BD-081-x | 10H | 00H |
| M2BD-041-x | 08H | 00H |
| M2BD-162-x | 00H | 20H |
| M2BD-082-x | 00H | 10H |
| M2BD-042-x | 00H | 08H |

# 11. TROUBLESHOOTING

Basic troubleshooting methods using MS and NS indicator LEDs are explained in this section.
For problems concerning the PLC CPU and Master Unit, consult users manuals for these units.

## 11.1. MS & NS INDICATORS

| ID | STATE | TO INDICATE |
|----|-------|-------------|
| MS | Green | Operating in a normal condition |
|    | Blinking Green | Standby (needs commissioning) |
|    | Red | Critical failure |
|    | Blinking Red | Minor failure |
|    | OFF | No power supplied |
| NS | Green | Link on-line and connections in the established state |
|    | Blinking Green | Link on-line but no connections in the established state |
|    | Red | Critical link failure |
|    | Blinking Red | Minor link failure |
|    | OFF | No power supplied |

## 11.2. TROUBLESHOOTING

| MS LED | NS LED | STATUS | | NOTES & TROUBLESHOOTING |
|--------|--------|--------|--|-------------------------|
| Green ON | Green ON | Communicating | Communicating | The M2BD is in communication with Master Unit. |
| Green ON | OFF | Node address is already used. Checking. | Waiting for the Master Unit to check node address. | |
| Green ON | Green blink | Standby for commissioning. | Standby for the Master Unit to establish connection. | |
| Red ON | OFF | Watch-dog timer error | Watch-dog timer error | The M2BD error. |
| Red blink | OFF | Invalid switch setting | Invalid DIP SW setting. | Check DIP SW setting and restart the M2BD. |
| Green ON | Red ON | Node address is already used. | The same node address is used for the Master Unit. | Change the node address and restart the M2BD. |
| Green ON | Red ON | Bussoff | Bussoff (abnormal data transmission) | Check the following points and restart the M2BD.<br>•Are the baud rate for both Master and Slave the same?<br>•Is the wire length (main and sub) appropriate?<br>•No breakdown or loosening of wires?<br>•Are the terminators only at the both ends of transmission line?<br>•No excessive noise? |
| Green ON | Red blink | Timeout | ---- | Check the following points and restart the M2BD.<br>•Are the baud rate for both Master and Slave the same?<br>•Is the wire length (main and sub) appropriate?<br>•No breakdown or loosening of wires?<br>•Are the terminators only at the both ends of transmission line?<br>•No excessive noise? |

## 11.3. ANALOG ZERO & SPAN ADJUSTMENTS FOR I/O SIGNAL CONDITIONERS

I/O types and ranges can be field-selectable for certain types of Mini-M series I/O Signal Conditioners, and zero and span adjustments are available for most types. Refer to data sheets for the I/O modules for detailed information.

# 12. LIGHTNING SURGE PROTECTION

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

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