## Digital Display with Wire-saving Serial Transmission Function (B7A Output)

- Single-color (red or green) and three-color (red, green, or orange selectable) displays with a character height of 80,120, or 200 mm are available for a variety of applications and locations.
- Thin design with a $39.5-\mathrm{mm}$ depth for the $120-\mathrm{mm}$ model is perfect for saving space in equipment and devices.
- Decimal display including negative sign (-) display with signal codes is possible.



## Ordering Information

## List of Models

## Models with 80 mm-high Characters

| Display contents | Type |  | Logic input | Display color | Model |
| :---: | :---: | :---: | :---: | :---: | :---: |
| Decimal | Front mounting |  | Negative | Red | M7E-08DRN2 |
|  |  |  |  | Green | M7E-08DGN2 |
| Hexadecimal | Front mounting | $0$ |  | Red | M7E-08HRN2 |
|  |  |  |  | Green | M7E-08HGN2 |

Models with 120 mm-high Characters

| Display contents | Type | Logic input | Display color | Model |
| :---: | :---: | :---: | :---: | :---: |
| Decimal | Rear mounting | Negative | Red | M7E-12DRN1 |
|  |  |  | Green | M7E-12DGN1 |
|  |  |  | Red/green/orange | M7E-12DKN1 |
|  | Front mounting |  | Red | M7E-12DRN2 |
|  |  |  | Green | M7E-12DGN2 |
|  |  |  | Red/green/orange | M7E-12DKN2 |
| Hexadecimal | Rear mounting |  | Red | M7E-12HRN1 |
|  |  |  | Green | M7E-12HGN1 |
|  |  |  | Red/green/orange | M7E-12HKN1 |
|  | Front mounting |  | Red | M7E-12HRN2 |
|  |  |  | Green | M7E-12HGN2 |
|  |  |  | Red/green/orange | M7E-12HKN2 |

Models with 200 mm-high Characters

| Display contents | Typ | Logic input | Display color | Model |
| :---: | :---: | :---: | :---: | :---: |
| Decimal | Rear mounting | Negative | Red | M7E-20DRN1 |
|  |  |  | Green | M7E-20DGN1 |
|  |  |  | Red/green/orange | M7E-20DKN1 |
| Hexadecimal | Rear mounting |  | Red | M7E-20HRN1 |
|  |  |  | Green | M7E-20HGN1 |
|  |  |  | Red/green/orange | M7E-20HKN1 |

## Specifications

Ratings

| Rated power supply |  |  | 24 VDC |
| :---: | :---: | :---: | :---: |
| Allowable voltage fluctuation range |  |  | $90 \%$ to $110 \%$ of rated voltage |
| Current consumption (per display) |  |  | M7E-08 (at 24 VDC) Red LED: 120 mA max. Green LED: 160 mA max. |
|  |  |  | M7E-12 (at 24 VDC) <br> Red LED: 200 mA max. <br> Green LED: 330 mA max. <br> Red/Green LED (orange: lit): 330 mA max. |
|  |  |  | M7E-20 (at 24 VDC) <br> Red LED: 420 mA max. <br> Green LED: 500 mA max. <br> Red/Green LED (orange: lit): 500 mA max. |
| Input level | Negative logic | Standard | High: 4 V to power supply voltage Low: 0 to 1.5 V |
| Ambient temperature |  |  | Operating: -10 to $55^{\circ} \mathrm{C}$ (with no icing) Storage: -25 to $70^{\circ} \mathrm{C}$ (with no icing) |
| Ambient humidity |  |  | Operating: 35\% to 85\% (with no condensation) |

## Characteristics

| Insulation <br> resistance | $100 \mathrm{M} \Omega$ min. (at 500 VDC) between each <br> terminal and mounting panel |
| :--- | :--- |
| Dielectric <br> strength | $500 \mathrm{VAC}, 50 / 60 \mathrm{~Hz}$ for 1 min between each <br> terminal and mounting panel |
| Noise immunity <br> (See note.) | Power terminal: $\pm 500 \mathrm{~V}$ <br> Input terminals: <br> $\pm 500 \mathrm{~V}$ (normal mode) <br> $\pm 1,500 \mathrm{~V}$ (common mode) |
| Vibration <br> resistance | Destruction: 10 to $55 \mathrm{~Hz}, 0.75-\mathrm{mm}$ double <br> amplitude |
| Shock resistance | Destruction: $300 \mathrm{~m} / \mathrm{s}^{2}$ |
| Degree of <br> protection | IEC IP40 (portion on panel surface) |

Note: 1. Initial values
2. Impulse conditions:

Rise time: 1 ns $+10 \%$ max.
Pulse width: $100 \mathrm{~ns}, 1 \mu \mathrm{~s}$
Polarity: Positive, negative, asynchronous to power frequency, 100 Hz repeat frequency.

## Connectable PLCs

| M7E model |  | PLC's output method |  |
| :--- | :---: | :---: | :---: |
| Display | Logic <br> input | Static output |  |
|  |  | PNP output | NPN output |
| Decimal | Negative | Not connectable | Connectable |
| Hexadecimal | Negative | Not connectable | Connectable |

## Accessories (Order Separately)

Harness Connector

| Dimensions | Model |
| :--- | :--- |
| 70 mm | M7E-WH0111A |
| 500 mm | M7E-WH0511A |
| $1,000 \mathrm{~mm}$ | M7E-WH1011A |

## Installation

## Cables

Refer to M7E Options for information on using cables (OMRON G79- $\square$ C, G79-Y $\square \mathbf{C}$, and G79-O $\square \mathbf{C}-\square$ ).

## M7E-WH $\square 11 A$ Harness Connector



## Input Codes

## Negative Logic Standard Unit

|  | Input signal |  |  |  |  |  |  |  | Output display condition |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: | :---: |
| Connector pin No. (CN1) | (1) | (14) | (13) | (12) | (11) | (5) | (6) |  |  |  |  |
| Terminal symbol | LE | D | C | B | A | DP | BI | RBI | RBO | Decimal | Hexadecimal |
| Input signals | H | H | H | H | H | H | H | L | L | Blank | Blank |
|  | H | H | H | H | H | H | H | H | H | 0 | 0 |
|  | H | H | H | H | H | L | H | * | H | 0 | 0 |
|  | H | H | H | H | L | H | H | * | H | 1 | ; |
|  | H | H | H | L | H | H | H | * | H | 2 | 2 |
|  | H | H | H | L | L | H | H | * | H | 3 | 3 |
|  | H | H | L | H | H | H | H | * | H | 4 | 4 |
|  | H | H | L | H | L | H | H | * | H | 5 | 5 |
|  | H | H | L | L | H | H | H | * | H | 5 | 5 |
|  | H | H | L | L | L | H | H | * | H | 7 | 7 |
|  | H | L | H | H | H | H | H | * | H | 8 | 8 |
|  | H | L | H | H | L | H | H | * | H | 9 | 9 |
|  | H | L | H | L | H | H | H | * | H | - | 8 |
|  | H | L | H | L | L | H | H | * | H | Blank (See note 1.) | b |
|  | H | L | L | H | H | H | H | * | H | DP lights at serial input. (See note 2.) | [ |
|  | H | L | L | H | L | H | H | * | H | DP lights at serial input. (See note 3.) | d |
|  | H | L | L | L | H | H | H | * | H | Blank (See note 1.) | $\varepsilon$ |
|  | H | L | L | L | L | H | H | * | H | Blank (See note 1.) | F |
|  | * | * | * | * | * | L | H | * | H | - | - |
|  | * | * | * | * | * | * | L | * | H | Blank (See note 1.) | Blank (See note 1.) |
|  | L | * | * | * | * | * | H | * | H | (See note 4.) | (See note 4.) |

* Either low or high. All inputs are pulled up internally. Therefore high can be open.

Note: 1. Only the numeral will be OFF. (There is no relationship to the decimal point.)
2. Only the numeral will be OFF if there is parallel input with CN1. The decimal point will be lit if there is B7A serial input with TB1
3. Only the numeral will be OFF if there is parallel input with CN1. The decimal point will be OFF if there is B7A serial input with TB1
4. The previous statuses of A to $D$ before LE goes low will be held. There is no relationship to the decimal point. The LE latch function will not, however, operate at the time of serial transmission.

## Terminal Arrangement/Functions

## 1. Input Terminal

## TB1

| Terminal symbol | Name | Function |
| :--- | :--- | :--- |
| +V | Power supply | Positive (+) power-supply terminal. |
| GND | Power supply | 0 V power-supply terminal. |
| SI | Serial data input | B7A serial data received |

CN1 (XG4A-2034)

| Terminal No. | $\begin{gathered} \text { XG4- } \\ 2034 \text { pin } \\ \text { No. } \end{gathered}$ | Terminal symbol | Name | Function |
| :---: | :---: | :---: | :---: | :---: |
| 1 | (20) | LE1 | Control input | 1st-digit latch input: The previous display is held when this signal is input. |
| 2 | (18) | LE2 | Control input | 2nd-digit latch input: The previous display is held when this signal is input. |
| 3 | (16) | LE3 | Control input | 3rd-digit latch input: The previous display is held when this signal is input. |
| 4 | (14) | LE4 | Control input | 4th-digit latch input: The previous display is held when this signal is input. |
| 5 | (12) | DP | Data input | The decimal point lights. Operates independently of the LE signal. |
| 6 | (10) | BI | Control input | Blank input: Turns OFF all the displays. |
| 7 | (8) | R | Control input | Color selector input: Red is lit when low is input (See note.) |
| 8 | (6) | G | Control input | Color selector input: Green is lit when low is input (See note.) |
| 9 | (4) | GND | Power supply | 0 V power-supply terminal. (Terminals 9 and 19 are connected internally.) |
| 10 | (2) | +V | Power supply | Positive side (+) power-supply terminal. (Terminals 10 and 20 are connected internally.) |
| 11 | (19) | A | Data input | A ( $2^{0}$ ) |
| 12 | (17) | B | Data input | $\mathrm{B}\left(2^{1}\right)$ The value and symbol corresponding to the input code |
| 13 | (15) | C | Data input | C ( $2^{2}$ ) contents of display. |
| 14 | (13) | D | Data input |  |
| 15 | (11) | NC | Open | --- |
| 16 | (9) | NC | Open | --- |
| 17 | (7) | NC | Open | --- |
| 18 | (5) | NC | Open | --- |
| 19 | (3) | GND | Power supply | 0 V power-supply terminal. (Terminals 9 and 19 are connected internally.) |
| 20 | (1) | +V | Power supply | Positive side (+) power-supply terminal. (Terminals 10 and 20 are connected internally.) |

Note: If the R and G of the multi-color display are set low, the Unit will display in orange.

## Terminal Arrangement

Models with 120/200-mm-high Characters


## 2. Multi-digit Connection Terminals CN2, CN3

## CN1 Terminal Arrangement

| Terminal No. | CN2 (IN) |  |  | CN3 (OUT) |  |  |
| :---: | :---: | :---: | :---: | :---: | :---: | :---: |
|  | Symbol | Name | Function | Symbol | Name | Function |
| 1 | A | Data input | A (20) | A | Data output | A (20) |
| 2 | B | Data input | B (21) | B | Data output | B (2 ${ }^{1}$ ) |
| 3 | C | Data input | C ( $2^{2}$ ) | C | Data output | C ( $2^{2}$ ) |
| 4 | D | Data input | D (2 ${ }^{3}$ ) | D | Data output | D (23) |
| 5 | +V | Power supply | Positive side (+) power-supply terminal | +V | Power supply | Positive side (+) power-supply terminal |
| 6 | GND | Power supply | 0 V power-supply terminal | GND | Power supply | 0 V power-supply terminal |
| 7 | SI | Control input | B7A serial data received | SO | Control output | B7A serial data transmitted |
| 8 | RBO | Control output | Zero-suppress output (See note 3.) | RBI | Control input | Zero-suppress input (See note 3.) |
| 9 | LEI1 | Control input | 1st-digit latch input | LEO1 | Control output | 2nd-digit latch output |
| 10 | LEI2 | Control input | 2nd-digit latch input | LEO2 | Control output | 3rd-digit latch output |
| 11 | LEI3 | Control input | 3rd-digit latch input | LEO3 | Control output | 4th-digit latch output |

Note: 1. The CN2 or CN3 Multi-digit Connector must be used for serial transmission and dynamic control with the B7A Link Terminal. Refer to page 5 for details. Use the CN2 and CN3 for connection with the M7E only.
2. Use the following connectors for the connector terminals:

CN1: XG4M-2030 or equivalent
CN2 and CN3: M7E-WH $\square 11 \mathrm{~A}$
Refer to CN1 Terminal Arrangement for the pin numbers. Refer to page 2 for the dedicated harness.
3. Refer to the list of input codes for RBO or RBI control.

Note: The numbers in parentheses are the pin numbers for the XG4C-2031 Connector for Models with 80-mm-high Characters and for the XG4A-2034 Connector for Models with 120/200-mm-high Characters.

## Models with $\mathbf{8 0} \mathbf{m m}$-high Characters



Block Diagram
Note: Circled numbers are the connector pin numbers.


## Signal Input Circuit

## Negative Logic Model



Operation Examples of Zero Suppression
Zero suppression operates when the display is 0, RBI is low, and the decimal point is not lit. Then low is output to RBO.
Example 1: Zero suppression is not required and the RBI input and RBO output of each digit are open.
Example 2: Zeros are suppressed only for the digits on the left of the digit where the decimal is lit when both zero suppression and a where the decimal is lit when
decimal point are being used.


Example 2


Note: Use RBO output for the connection with RBI input only.

## External Connections

Refer to Block Diagram on page 4 and Terminal Arrangement/Functions on page 3 for external connections for each Unit.

## PLC Connections

Refer to your PLC operation manual before connecting the PLC.

## Static Control

Connected to C500-OD213 Transistor Output Unit


Dynamic Control
Connected to C200H-OD215 (Static Mode) Transistor Output Unit



Connect the PLC's output to the A to D (BCD output), DP, and BI terminals individually.

Note: Use separate output terminals for DP or BI control.

Note: 1. The display colors of the three-color displays must be selected individually. LE4: Forth digit (example: 1,000 's digit)
2. In static mode, ladder programming is required for latch control.

## B7A Link Terminal

Connected to C500-OD219 Transistor Output Unit


- By supplying power to a single display, all the displays will be supplied with power.
- The B7A's serial output must be connected to the SI terminal of the rightmost TB1.
- Use OMRON's M7E-WH $\square 11$ A Harness Connectors or equivalent to connect all Units.
- The DP and BI terminals can be controlled by transmitting the following special data
Hexadecimal C data: Turns ON the decimal point of the relevant digit.
Hexadecimal D data: Turns OFF the decimal point of the relevant digit.
Hexadecimal F data: Deletes the display (BI control) of the relevant digit.
- Use the B7A Link Terminal with a normal I/O delay of 19.2 ms . The B7A with short I/O delay cannot be used.
Note: The display colors of the three-color displays must be selected individually.


## Serial Transmission with B7A Link Terminal

A series of models incorporating a communications (serial transmission) function is available.
By using the B7A Link Terminal (PLC connector model), the Units can be connected to the PLC with ease. The 16-point B7A Link Terminal allows the control of a maximum of four digits over two wires.

## Power Supplies Placed on Both the Transmitting and Receiving Sides



## Power Supply Placed Only on the Receiving Side

M7E-08/12/20


## Available Link Terminal Models

| Transmission side | Wiring | No. of I/O points | Connectable M7E <br> Display Units |
| :--- | :--- | :--- | :--- |
| B7A-T10S1 | Screw terminal model | 10 | 2 |
| B7A-T10S3 | Screw terminal model | 10 | 2 |
| B7A-T10M2 | Module model | 10 | 2 |
| B7A-T6A1 | Screw terminal model | 16 | 4 |
| B7A-T6B1 | Screw terminal model | 16 | 4 |
| B7A-T6C1 | Screw terminal model | 16 | 4 |
| B7A-T6D2 | Module model | 16 | 4 |
| B7A-T6E3 | Connector model | 16 | 4 |
| B7A-T3E3 (See note 2.) | Connector model | 32 | 8 |
| C200H-B7A (See note 3.) | Screw terminal model | $16 \times \square$ ports | $4 \times \square$ ports |
| CQM1-B7A (See note 3.) | Screw terminal model | $16 \times \square$ ports | $4 \times \square$ ports |
| CJ1W-B7A (See note 3.) | Screw terminal model | $16 \times \square$ ports | $4 \times \square$ ports |
| CS1W-B7A (See note 3.) | Screw terminal model | $16 \times \square$ ports | $4 \times \square$ ports |

Note: 1. Use the B7A Link Terminal with a normal I/O delay of 19.2 ms . The B7A with short I/O delay cannot be used.
2. The connection of the 32-point connector model is as follows:

3. For details on corresponding models, refer to each applicable model's catalog.

## Transmission Path

Transmission distance:
A maximum transmission distance of 500 m is possible by using the VCTF $0.75 \times 2 \mathrm{C}$ Cable if power is supplied independently to the Input and Output Link Terminals.
A maximum transmission distance of 100 m is possible by using the VCTF $0.75 \times 3 \mathrm{C}$ Cable if a single power supply is connected to the Input or Output Link Terminal, in which case the current flow on the power lines (positive and negative lines) is 1.8 A maximum.
Transmission delay:
A maximum of 50 ms for data display after the A maximum of 50 ms for data display
Minimum Input Time
Use an input time of 80 ms min. to the Input Unit for the B7A.

## Signal Allocation

B7A-M7E Corresponding Pin List
The B7A's switch terminals correspond to the M7E's parallel input signals as follows:

| B7A switch terminal | M7E parallel input |  |
| :---: | :--- | :--- |
| A0 | First digit | A |
| A1 | (1's digit) | B |
| A2 |  | C |
| A3 |  | D |
| A4 | Second digit | A |
| A5 | (10's digit) | B |
| A6 |  | C |
| A7 |  | D |
| A8 | Third digit | A |
| A9 | (100's digit) | B |
| A10 |  | C |
| A11 |  | D |
| A12 | Fourth digit | A |
| A13 | (1000's digit) | B |
| A14 |  | C |
| A15 |  | D |

Note: A maximum of two Display Units can be connected when the 10-point B7A Link Terminal is used and a maximum of four Display Units can be connected when the 16-point B7A Link Terminal is used.

## Errors

1. No signal transmission is available due to the disconnection of the transmission path (the SI or GND wire).
2. The waveform is greatly distorted due to external noise interference or because the transmission path is longer than the permissible transmission path.

## Error Indication

When an error results, "-" will be displayed and the display will flash. After the condition returns to normal, reception data will be displayed.

## Display after Error Correction

After the condition returns to normal, the display will be reset automatically and reception data will be displayed.

## Serial Transmission Control Examples

1. 1234 is displayed.

Note: The transmission data is hexadecimal.

2. -123 is displayed.

3. 12.34 is displayed.

4. 9.876 is displayed.

Transmission data $\rightarrow$ Display CDDD
 (The decimal point Transmission data $\rightarrow$ Display 9876
 is controlled first.) (Numeral data is transmitted next.)

## 5. $4.2-1$ is displayed

| $\begin{array}{l}\text { Transmission data } \rightarrow \text { Display } \\ \begin{array}{l}42 \mathrm{~A} 1\end{array}\end{array}$4. $\mathbf{2}$ - $\mathbf{1}$ $\begin{array}{l}\text { (Numeral setting } \\ \text { is possible.) }\end{array}$ |
| :--- |

6. The displayed decimal point will be OFF.

7. Changing the numeral and decimal point simultaneously. (It is, however, impossible to change the numeral and decimal point on the same digit simultaneously.)

8. Turn OFF the display by sending data $F$.


Note: DP and BI control using serial transmission is not displayed in hexadecimal.

## ■ A Variety of Control Operations with Short-circuit Sockets

By removing the rear cover of the Display Unit and setting the XJ8A-0211 Short-circuit Socket, the following control operations are possible.

1. DP (J5) $\qquad$ - Decimal Control

- Short-circuit the DP (J5) terminals with a short-circuit socket so that the decimal point will be always lit.
- The short-circuit socket is short circuited at the factory (i.e., normally lit). Open the short-circuit socket if external control or lighting are not required

2. RBI (J9)

TER (J11)

-     -         - Zero Suppression Control
- When the zero suppression function is not used, the RBI (J9) terminals must be open. The TER
(J11) terminals can be either short-circuited or open.
- When zero suppression is not used, the RBI (J9) terminals of the M7E Digital Display Unit for the leftmost digit must be short-circuited, those of all the other M7E Digital Display Units must be open, the TER (J11) terminals of the M7E Digital Display Unit for the rightmost digit must be open, and those of all the other M7E Digital Display Units must be short-circuited.


## Example of Zero Suppression Setting for Four Digits on the M7E (120)

 200-mm Model)Note: To use zero suppression, CN2 and CN3 must be connected with an M7EWH $\square 11$ A Harness Connector.


Example of Zero Suppression Setting for Four Digits on the M7E (80-
mm Model)

3. $\mathrm{R}(\mathrm{J} 8)$

G (J10)

-     - Display Color Control (Three-color Model Only)
- Short-circuit the R (J8) terminals with a short-circuit socket so that the display will be lit in red.
- Short-circuit the G (J10) terminals with a short-circuit socket so that the display will be lit in green.
- Short-circuit the R (J8) as well as G (J10) terminals with two short-circuit sockets so that the display will be lit in orange.
Note: When the R (J8) as well as $\mathrm{G}(\mathrm{J} 10)$ terminals are open, the display will be OFF if the CN1 Input Connector has not been connected yet.
Note: 1. All the terminals are short-circuited before shipping. Short-circuit or open the terminals according to the application.

2. Single-color (red or green) models do not incorporate the $R(J 8)$ and $G$ (J10) terminals.
3. These terminals must be open when controlling the DP (J5), R (J8), and G (J10) terminals externally by inputting signals from the CN1. (The short-circuit socket will take precedence.)
4. All the terminals J 5 to J 11 are connected to GND.
5. The $80-\mathrm{mm}$ Model uses DIP switches. ON: Short-circuited OFF: Open (SEL1 and SEL2 are switches to adjust brightness.)


80-mm Model
DIP Switch


- Pins 1 to 4 are all factory-set to OFF.
- Pins 5 and 6 are factory-set for brightness adjustment. Do not change the setting of these pins; the brightness will change.


## Operation

Operation Timing (Input Signal Timing)
Negative Logic


## Operation Chart

The following example shows the relationship between each input terminal and the display condition.


## Dimensions

Note: All units are in millimeters unless otherwise indicated.


Note: Tolerance is $\pm 0.4 \mathrm{~mm}$ unless otherwise specified.

## Safety Precautions

## - Precautions for Correct Use

## Environment

- Use the switches in locations that are not subject to organic solvents (thinner, benzene, etc.), strong alkali, strong acid, sunlight, corrosive gases, water, and oil.
- Use the units in areas not subject to vibration or shock in excess of specifications.


## Wiring

- When wiring with terminals or a connector, remove the rear cover of the M7E and connect the M7E to the terminals or connector properly, and be sure not to leave any wire cuttings inside the Display Unit.

- Make sure that no wire is more than five meters long when wiring the B7A link terminal.


## Mounting

When mounting Display Units to a box, make slits on the rear part and the top of the box for ventilation. If there is no proper ventilation, the life of each Display Unit may be shortened.

## Connecting Cable

When connecting an XG4M-2030 or XG4M-2030-T G79 Cable to a Digital Display with 80-mm-high Characters, an XG4Z-0002 Lock Lever can be used.

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## CHANGE IN SPECIFICATIONS

Product specifications and accessories may be changed at any time based on improvements and other reasons.
It is our practice to change model numbers when published ratings or features are changed, or when significant construction changes are made. However, some specifications of the products may be changed without any notice. When in doubt, special model numbers may be assigned to fix or establish key specifications for your application on your request. Please consult with your OMRON representative at any time to confirm actual specifications of purchased products

## DIMENSIONS AND WEIGHTS

Dimensions and weights are nominal and are not to be used for manufacturing purposes, even when tolerances are shown.

## PERFORMANCE DATA

Performance data given in this catalog is provided as a guide for the user in determining suitability and does not constitute a warranty. It may represent the result of OMRON's test conditions, and the users must correlate it to actual application requirements. Actual performance is subject to the OMRON Warranty and Limitations of Liability.

## ERRORS AND OMISSIONS

The information in this document has been carefully checked and is believed to be accurate; however, no responsibility is assumed for clerical, typographical, or proofreading errors, or omissions.

