2. EXTERNAL DIMENSIONS AND PARTS

3. CONNECTION WITH PLC

The FX-4DA-4DA unit can be connected to the PLCs as follows. Restrictions apply to the maximum number of connectable units, depending on the DC24V/DC5V Power Supply capacities and the Main Unit/Special Function Unit types. For details, refer to the respective PLC manual.

**FX2N/ FX2NC**: The maximum connectable units is 8.
To connect the FX-4DA with the FX2N main unit, FX2NC-CN-V1 or FX2NC-1PS-5V is required.
**FX3U**: The maximum connectable units is 4.
To connect the FX-4DA with the FX3U main unit, FX3U-CN-V1 is required.
**FX1N**: The maximum connectable units is 4.

Handling of crimp-style terminal

- Be sure to use the crimp-style terminals that satisfy the dimensional requirements shown in the left figure.
- Apply 0.5 to 0.9 Nm torque to tighten the terminals. Firmly tighten the terminals to prevent abnormal operation.

4. WIRING

The terminal layout shown below may differ from the actual layout. For the correct terminal layout, refer to section 2 External Dimensions and Parts.

5. SPECIFICATIONS

5.1 General specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output range</td>
<td>DC 0mA to +20mA (external load resistance: 500Ω).</td>
</tr>
<tr>
<td>Digital input</td>
<td>16 bits, binary with sign (Effective bits for numeric value: 11 bits and sign bit (1 bit))</td>
</tr>
<tr>
<td>Resolution</td>
<td>1/1000</td>
</tr>
<tr>
<td>Power consumption</td>
<td>DC 24V ±10% 200mA</td>
</tr>
<tr>
<td>Power consumption (digital inputs)</td>
<td>5V ±5% ±4mA (max.)</td>
</tr>
<tr>
<td>Power consumption (analog inputs)</td>
<td>10μA (20mA max.)</td>
</tr>
<tr>
<td>Number of occupied inputs</td>
<td>4 channels</td>
</tr>
<tr>
<td>Power consumption (analog outputs)</td>
<td>DC 24V ±10% 200mA</td>
</tr>
</tbody>
</table>

5.2 Performance specification

- **Analog output**: ±15V, 4-20mA
- **Digital input**: 5V, 16 bits
- **Power consumption**: 5V, 30mA (Internal power supply from MPU or powered extension unit)

I/O characteristics

Default: mode 0
Follow the procedure described in section 8 to change.
Command sent from the programmable controller can change the mode. The voltage/current output mode selected will determine the output terminals used.

6. ALLOCATION OF BUFFER MEMORIES (BFM)

Buffer memories marked “W” can be written to using the “T” instruction in the main unit. The status of BFM #0, #4, and #21 (marked “E”) will be written to EEPROM, therefore the set values will be retained even after turning off the power.

1. [BFM #0] Output mode selection: EF (Read H1000)
2. [BFM #1] Output data (big-end 16 binary, actual value 11 bits + sign) : #1: CH1, #2: CH2, #3: CH3, #4: CH4
3. [BFM #5] Holding module: Factory setting H1000

**BFM**

<table>
<thead>
<tr>
<th>BFM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Output mode select: EF (Read H1000)</td>
</tr>
<tr>
<td>T</td>
<td>Output data (big-end 16 binary, actual value 11 bits + sign) : #1: CH1, #2: CH2, #3: CH3, #4: CH4</td>
</tr>
<tr>
<td>#1</td>
<td>CH1: Voltage output (-10 V to +10 V)</td>
</tr>
<tr>
<td>#2</td>
<td>CH2: Current output (+4 mA to 20 mA)</td>
</tr>
<tr>
<td>#3</td>
<td>CH3: Current output (+4 mA to 20 mA)</td>
</tr>
<tr>
<td>#4</td>
<td>CH4: Current output (+4 mA to 20 mA)</td>
</tr>
</tbody>
</table>

**Switching the output mode resets the I/O characteristics to the factory-default characteristics. Refer to the performance specifications described in section 4.**

Example: H110
- CH1: Voltage output (-10 V to +10 V)
- CH2 and CH3: Current output (+4 mA to 20 mA)
- CH4: Current output (+4 mA to 20 mA)

2. [BFM #1, #2, #3 and #4] Output data channels CH1, CH2, CH3, and CH4

BFM #1: Output data of CH1 (Initial value: 0BFM #2: Output data of CH2 (Initial value: 0)
BFM #3: Output data of CH3 (Initial value: 0BFM #4: Output data of CH4 (Initial value: 0)
2. EXTERNAL DIMENSIONS AND PARTS

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>5.2 Performance specification</td>
<td></td>
</tr>
<tr>
<td>6. ALLOCATION OF BUFFER MEMORIES (BFM)</td>
<td></td>
</tr>
</tbody>
</table>

3. CONNECTION WITH PLC

The FX2N-4DA unit can be connected to the PLCs as follows. Restrictions apply to the maximum number of connectable units, depending on the DC24V/DC5V Power Supply capacities and the Main Unit/Special Function Unit types. For details, refer to the respective PLC manual.

FX2N/FX2NC : The maximum connectable units is 4.

FX3U/FX3UC : The maximum connectable units is 8.

FX3UC-1PS 5V : The maximum connectable units is 16.

FX3UC-2PS 5V : The maximum connectable units is 24.

BFM #0: Output mode select. Factory setting 0 (Output mode: analog)

BFM #1: Output data of CH1 (Initial value: 0)

BFM #2: Output data of CH2 (Initial value: 0)

BFM #3: Output data of CH3 (Initial value: 0)

BFM #4: Output data of CH4 (Initial value: 0)

BFM #5: Analog input data (0 to 10V) to digital input (0 to 20mA)

BFM #6, #7: Reserved

4. WIRING

The terminal layout shown below may differ from the actual layout. For the correct terminal layout, refer to section 2 External Dimensions and Parts.

5. SPECIFICATIONS

5.1 General specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output range</td>
<td>0V DC to +10V DC (external load resistance: 2kΩ to 1MΩ)</td>
</tr>
<tr>
<td>Digital input</td>
<td>16 bits, binary, with sign (Effective bits for numeric value: 11 bits and sign bit (1 bit))</td>
</tr>
<tr>
<td>Resolution</td>
<td>5mV (10V to 1000Ω) 25μA (20mA to 1000Ω)</td>
</tr>
<tr>
<td>Conversion speed</td>
<td>4.0μs for 4 channels (Conversion time in the number of channels used will not change the conversion speed.)</td>
</tr>
<tr>
<td>Isolation</td>
<td>No isolation between analog and digital circuits</td>
</tr>
<tr>
<td>Power consumption</td>
<td>24V DC (if used) 200mA</td>
</tr>
<tr>
<td>Number of occupied I/O points</td>
<td>The analog block occupies 8 I/O points, and/or 4 digital input or output</td>
</tr>
<tr>
<td>Power consumption</td>
<td>5V, digital (external power supply from main power or powered extension unit)</td>
</tr>
</tbody>
</table>

5.2 Performance specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output range</td>
<td>0V DC to +10V DC (external load resistance: 50Ω)</td>
</tr>
<tr>
<td>Digital input</td>
<td>16 bits, binary, with sign (Effective bits for numeric value: 10 bits)</td>
</tr>
<tr>
<td>Resolution</td>
<td>5mV (10V to 1000Ω) 25μA (20mA to 1000Ω)</td>
</tr>
<tr>
<td>Conversion speed</td>
<td>4.0μs for 4 channels (Conversion time in the number of channels used will not change the conversion speed.)</td>
</tr>
<tr>
<td>Isolation</td>
<td>No isolation between analog and digital circuits</td>
</tr>
<tr>
<td>Power consumption</td>
<td>24V DC (if used) 200mA</td>
</tr>
<tr>
<td>Number of occupied I/O points</td>
<td>The analog block occupies 8 I/O points, and/or 4 digital input or output</td>
</tr>
<tr>
<td>Power consumption</td>
<td>5V, digital (external power supply from main power or powered extension unit)</td>
</tr>
</tbody>
</table>

6. ALLOCATION OF BUFFER MEMORIES (BFM)

Data is transmitted between the FX2N-4DA and the main unit via buffer memories (16-bit 32-point RAM).

BFM | Description |
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>E3</td>
<td>Output mode select. Factory setting H0000</td>
</tr>
<tr>
<td>T1</td>
<td>Output data (16 bits binary: actual value (11 bits + sign))</td>
</tr>
<tr>
<td>#1, #2, #3, #4</td>
<td>CH1, CH2, CH3, CH4</td>
</tr>
<tr>
<td>#5</td>
<td>CH3, CH4</td>
</tr>
<tr>
<td>#6</td>
<td>Data holding mode. Factory setting H0000</td>
</tr>
<tr>
<td>#7</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

1) BFM #0: Output mode select. The value of BFM #0 switches the analog output between voltage and current on each channel. It takes the form of a 4-digit hexadecimal number. The first digit will be the command for output mode (CH1), and the second digit for channel 2 (CH2) etc. The numeric values of these four digits respectively represent the following items:

O: 0 = Sets the voltage output mode (-10V to +10V). 1 = Sets the current output mode (-4mA to +20mA) 2 = Sets the current output mode (0mA to +20mA).

Switching the output mode resets the I/O characteristics to the factory-default characteristics. Refer to the performance specifications described in section 6.

Example: H0110

CH1: Voltage output (-10V to +10V)
CH2, CH3, CH4: Current output (+4mA to +20mA)
CH4: Current output (0mA to +20mA)

2) BFM #1, #2, and #3: Output data channels CH1, CH2, CH3, and CH4.

BFM #1: Output data of CH1 (Initial value: 0BFM #2: Output data of CH2 (Initial value: 0)
BFM #3: Output data of CH3 (Initial value: 0BFM #4: Output data of CH4 (Initial value: 0)

3) The FX2N-4DA analog special function block has four analog output channels. The output channels take a digital value and output an equivalent analog signal. This is known as a D/A conversion. The FX2N-4DA has a maximum resolution of 12 bits.

4) The selection of voltage or current based input/output is by user wiring. Analog ranges of -10 to 10V DC (resolution: 5mV), and/or 0 to 20mA (resolution: 20μA) may be selected independently for each channel.

5) The FX2N-4DA can connected to the FX2N/FX2NC/FX3U/FX3UC/FX-2N/SX-3UC series Programmable Controllers (PLC).

6) The FX2N-4DA and the main unit is connected by a buffered memory exchange. There are 32 buffer memories (each of 16 bits) in the FX2N-4DA.

7) The FX2N-4DA occupies 8 I/O points on the FXN expansion bus. The 8 I/O points can be allocated from either inputs or outputs. The FX2N-4DA draws 30mA from the 5V rail of the main unit or powered extension unit.

8) The FX2N-4DA draws 30mA from the 5V rail of the main unit or powered extension unit.
Specifications

2. EXTERNAL DIMENSIONS AND PARTS

Dimensions: mm (inches)

- Weight: Approx. 0.3 kg (0.66 lbs)
- Accessory: Special block number label

3. CONNECTION WITH PLC

The FX2N-4DA unit can be connected to the PLCs as follows. Restrictions apply to the maximum number of connectable units, depending on the O2C4V/DC5V Power Supply capacities and the Main Unit/Special Function Unit types. For details, refer to the respective PLC manual.

FX2N/4F: The maximum connectable units is 8.
FX2NC: The maximum connectable units is 4.
FX2NC-C: The maximum connectable units is 2.
FX2NC-D: The maximum connectable units is 1.

4. WIRING

The terminal layout shown below may differ from the actual layout. For the correct terminal layout, refer to section 2 External Dimensions and Parts.

5. SPECIFICATIONS

5.1 General specifications

- Analog output range: 0V DC to +10V DC (external 1% load resistance: 2kΩ to 1MΩ)
- Digital input: 16 bits, binary, with sign (Effective bits for numeric value: 11 bits and sign bit (1 bit))
- Resolution: 16 bits, binary, with sign (Effective bits for numeric value: 10 bits)
- Diode withstand voltage: 500V AC, 1min (between all terminals and ground)
- Operating power consumption: 0.1W (24V DC) (Switching power consumption of analog channels)
- Maximum output current: 20mA (per channel)
- Maximum input current: 15mA (per channel)
- Conversion speed: 2.5ms for 1 channel

I/O characteristics

- Input open collector, pull-up电阻: 24V DC, 100kΩ
- Power consumption: 5V DC 2mA (Internal power supply from MPU or powered extension unit)

6. ALLOCATION OF BUFFER MEMORIES (BFM)

Data is transmitted between the FX2N-4DA and the main unit via buffer memories (16-bit 32-point RAM).

<table>
<thead>
<tr>
<th>Buffer Memory</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>#1</td>
<td>Output mode select. Set to 00000010 in H3, to 00000001 in H2, to 00000000 in H1.</td>
</tr>
<tr>
<td>#2</td>
<td>Input data (labeled 16 bits binary: actual value 11 bits + sign)</td>
</tr>
<tr>
<td>#3</td>
<td>CH1, CH2, CH3, CH4</td>
</tr>
<tr>
<td>#4</td>
<td>CH1, CH2, CH3, CH4</td>
</tr>
<tr>
<td>#5</td>
<td>Data holding mode. Factory setting H0000</td>
</tr>
<tr>
<td>#6</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

1) [BFM #4] Output mode select. The value of BF4 #4 switches the analog output between voltage and current on each channel. It takes the form of a 4 digit hexadecimal number. The first digit will be the command for the CH1 channel, and the second digit for channel 2 (CH2). etc. The numeric values of these four digits respectively represent the following items:

<table>
<thead>
<tr>
<th>Digit</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Sets the voltage output mode (-10V to +10V)</td>
</tr>
<tr>
<td>1</td>
<td>Sets the current output mode (0 mA to +20 mA)</td>
</tr>
<tr>
<td>2</td>
<td>Sets the current output mode (0 mA to +20 mA)</td>
</tr>
<tr>
<td>3</td>
<td>Sets the current output mode (0 mA to +20 mA)</td>
</tr>
</tbody>
</table>

Switching the output mode resets the I/O characteristics to the factory-default characteristics. Refer to the performance specifications described in section 4.

Example: H0110

CH1: Voltage output (-10V to +10V)
CH2 and CH3: Current output (+4 mA to +20 mA)
CH4: Current output (+4 mA to +20 mA)

2) [BFM #1, #2, #3 and #4] Output data channels CH1, CH2, CH3, and CH4

BFM #1: Output data of CH1 (Initial value: 00000000) #2: Output data of CH2 (Initial value: 00000000) #3: Output data of CH3 (Initial value: 00000000) #4: Output data of CH4 (Initial value: 00000000)
3) [BFM #5] Data handling mode: While the programmable controller is in the STOP mode, the last output value in the RUN mode will be held. To reset the value to the output value, write the hexadecimal value in BFM #5 as follows:

<table>
<thead>
<tr>
<th>Status when bit is set to &quot;1&quot;</th>
<th>Status when bit is set to &quot;0&quot;</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Error</td>
<td>No error</td>
</tr>
<tr>
<td>- Offset/gain data in EEPROM is abnormal or a data setting error occurs.</td>
<td>Offset/Gain data normal</td>
</tr>
<tr>
<td>- Power supply error</td>
<td>Power supply normally</td>
</tr>
<tr>
<td>- Hardwire error</td>
<td>Hardwire error</td>
</tr>
<tr>
<td>- Ranged error</td>
<td>Ranged error</td>
</tr>
<tr>
<td>- I/O Adjustment inhibit status</td>
<td>I/O Adjustment inhibit status</td>
</tr>
</tbody>
</table>

Example: H0101 .... CH1 and CH2 = Offset value CH3 and CH4 = Output holding

In addition to the above functions, the buffer memories can adjust the I/O characteristics of the FX4N-4DA and report the status of the FX4N-4DA to the PLC.

Note: BFM #'s marked E.

z

When the slope of the I/O characteristic line is gentle:

- Changes to the digital input will not always change the analog output.

Note that the resolution (minimum possible change of analog output) of the FX4N-4DA is fixed.

9. ADJUSTMENT OF THE I/O CHARACTERISTICS

9.1 I/O characteristics

The standard characteristics (factory default) are shown by the solid lines in the figure below. These characteristics can be adjusted according to the conditions of the user's system.

![Diagram showing I/O characteristics](image)

- Standard characteristics of voltage output
- Standard characteristics of current output (+4mA to +20mA)
- Standard characteristics of current output (0mA to +20mA)

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Date: April 2015
### 3. [BFM #5] Data holding mode: While the programmable controller is in the STOP mode, the last output value in the RUN mode will be held. To reset the value to the offset value, write the hexadecimal value in BFM #5 as follows:

<table>
<thead>
<tr>
<th>BFM #5</th>
<th>Offset value</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Holds the output.</td>
</tr>
<tr>
<td>1</td>
<td>Resets to the offset value.</td>
</tr>
</tbody>
</table>

Example: H0101 | CH1 and CH2 = Offset value CH3 and CH4 = Output holding

In addition to the above functions, the buffer memories can adjust the I/O characteristics of the FX2N-4DA, and report the status of the FX2N-4DA to the PLC.

#### 9. ADJUSTMENT OF THE I/O CHARACTERISTICS

### 9.1 I/O characteristics

The standard characteristics (factory default) are shown by the solid lines in the figure below. These characteristics can be adjusted according to the conditions of the user’s system.

#### 9.1.1 Standard characteristics

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output (+4 mA to +20 mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V</td>
<td>0 mA</td>
</tr>
<tr>
<td>5 V</td>
<td>20 mA</td>
</tr>
<tr>
<td>10 V</td>
<td>40 mA</td>
</tr>
</tbody>
</table>

- **Gain value**: Analog output value when the digital input is +1,000
- **Offset value**: Offset value when the digital input is 0

### 10. TROUBLESHOOTING

If the FX2N-4DA does not operate properly, check the following itens.

#### 1. Check the external wiring.

- **OFF**: Check that the PLC system configuration rules have not been broken, i.e. the number of blocks, and the total system I/O are within the specified range.

#### 2. Check that the status of the D/A conversion indicator lamp (LED) of the FX2N-4DA.

#### 3. Check that there is no power overload on either the 5V or 24V power source, remember the loading current output: 500

#### 4. Check the status of the D/A conversion indicator lamp (LED) of the FX2N-4DA.

#### 5. Check that the external load resistance connected to each analog output terminal does not exceed the capacity of the FX2N-4DA drive (voltage output: 2kΩ to 1 MΩ, current output: 500Ω).

#### 6. Check the output voltage or current value using a voltmeter or ammeter, and confirm that the output meets the I/O characteristics. If the output does not meet the I/O characteristics, adjust the offset and gain again. Refer to section 9.

#### 7. To test the withstand voltage of the FX2N-4DA, connect all the terminals to the grounding terminal.

#### 8. Variables of BFM #10 through #17:

- **BFM #10**: Initialize BFM #10 to 0, all values will be initialized to the factory default (Note that the BFM #20 data will override the BFM #21 data.)
- **BFM #11**: Initialize BFM #11 to 0, all values will be initialized to the factory default (Note that the BFM #20 data will override the BFM #21 data.)

### 9. ADJUSTMENT OF THE I/O CHARACTERISTICS

#### 9.1.2 I/O characteristics

The standard characteristics (factory default) are shown by the solid lines in the figure below. These characteristics can be adjusted according to the conditions of the user’s system.

#### 9.1.3 Standard characteristics of output current (+4 mA to +20 mA)

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output (+4 mA to +20 mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V</td>
<td>0 mA</td>
</tr>
<tr>
<td>5 V</td>
<td>20 mA</td>
</tr>
<tr>
<td>10 V</td>
<td>40 mA</td>
</tr>
</tbody>
</table>

#### 9.1.4 Standard characteristics of output current (0 mA to +20 mA)

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output (0 mA to +20 mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 V</td>
<td>20 mA</td>
</tr>
<tr>
<td>5 V</td>
<td>40 mA</td>
</tr>
<tr>
<td>10 V</td>
<td>60 mA</td>
</tr>
</tbody>
</table>
3) [BFM #5] Data holding mode: While the programmable controller is in the STOP mode, the last output mode in the RUN mode will be held. To reset the value to the output value, write the hexadecimal value in BFM #5 as follows:

```
0 = Hold the output.
1 = Reset to the offset value.
```

Example: H0111 → CH1 and CH2 = Offset value CH3 and CH4 = Output holding

In addition to the above functions, the buffer memories can adjust the I/O characteristics of the FX2N-4DA, and report the status of the FX0X-4DA to the PLC.

- Buffer memories marked “W” can be written to using the TO instruction in the main unit. The status of BFM #0, #5, and #21 (marked E) will be written to EEPROM, therefore the set values will be retained even after turning off the power.
- Actual analog output value when corresponding output data (BFM #1 through #4) is 0
  - Offset data: The offset and gain values are set in BFM #1 through #4, and the offset data is set as a hexadecimal value in BFM #5. The gain data is set as a hexadecimal value in BFM #5.
  - When current output mode (1 mA to +20 mA) is set, the output data is automatically set to 0, and the gain data is set as a hexadecimal value in BFM #5.

5) Check that the external load resistance connected to each analog output terminal does not exceed the load capacity of the FX2N-4DA drive (voltage output: 2kΩ, current output: 500Ω).

9. ADJUSTMENT OF THE I/O CHARACTERISTICS

9.1 I/O characteristics

The standard characteristics (factory default) are shown by the solid lines in the figure below. These characteristics can be adjusted according to the conditions of the user’s system.

<table>
<thead>
<tr>
<th>Standard characteristics of voltage output</th>
<th>Standard characteristics of current output (+4mA to +20mA)</th>
<th>Standard characteristics of current output (0mA to +20mA)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Change the output wiring and/or expansion cables properly connected on the FX2N-4DA</td>
<td>Change the output wiring and/or expansion cables properly connected on the FX2N-4DA</td>
<td>Change the output wiring and/or expansion cables properly connected on the FX2N-4DA</td>
</tr>
<tr>
<td>24V DC power supply</td>
<td>FX0X-4DA special function block</td>
<td>External analog unit</td>
</tr>
</tbody>
</table>

Note: [BFM #30] The identification code for a special function block is read using the FROM instruction. The buffer memories marked “W” can be written to using the TO instruction in the main unit. The status of BFM #0, #5, and #21 (marked E) will be written to EEPROM, therefore the set values will be retained even after turning off the power.

- Actual analog output value when corresponding output data (BFM #1 through #4) is 0
  - Offset data: The offset and gain values are set in BFM #1 through #4, and the offset data is set as a hexadecimal value in BFM #5. The gain data is set as a hexadecimal value in BFM #5.
  - When current output mode (1 mA to +20 mA) is set, the output data is automatically set to 0, and the gain data is set as a hexadecimal value in BFM #5.

- Actual analog output value when corresponding output data (BFM #1 through #4) is 0
  - Offset data: The offset and gain values are set in BFM #1 through #4, and the offset data is set as a hexadecimal value in BFM #5. The gain data is set as a hexadecimal value in BFM #5.
  - When current output mode (1 mA to +20 mA) is set, the output data is automatically set to 0, and the gain data is set as a hexadecimal value in BFM #5.

- Actual analog output value when corresponding output data (BFM #1 through #4) is 0
  - Offset data: The offset and gain values are set in BFM #1 through #4, and the offset data is set as a hexadecimal value in BFM #5. The gain data is set as a hexadecimal value in BFM #5.
  - When current output mode (1 mA to +20 mA) is set, the output data is automatically set to 0, and the gain data is set as a hexadecimal value in BFM #5.

8. CAUTION REGARDING OPERATION

1) Check whether the output wiring and/or expansion cables are properly connected on the FX2N-4DA and that the special function block is set in the program.

2) Set the PLC to STOP and turn on the PLC. Write the above program then switch the PLC to RUN.

3) Analog values will be sent from D0 (BFM #1), D1 (BFM #2), D2 (BFM #3), and D3 (BFM #4) to the respective output channels of the FX2N-4DA. When the PLC is in STOP, the analog values set before stopping the PLC will remain output. (The output will be held.)

4) When the PLC is in STOP, the offset values can also be output. For a detailed description, refer to Section 6.3.

10. TROUBLESHOOTING

If the FX2N-4DA does not operate properly, check the following items:

1) Check the external wiring. Refer to Section 4 of this manual.

2) Check the status of the POWER indicator lamp (LED) of the FX2N-4DA.

3) Check the status of the D/A converter indicator lamp (LED) of the FX2N-4DA.

4) Check that the current output voltage or current value using a voltmeter or ammeter, and confirm that the output matches the I/O characteristics. If the output does not meet the I/O characteristics, adjust the offset and gain again. Refer to Section 9.

Note: The wizard temperature of the FX0X-4DA, connect all the terminals to the grounding terminal.

This manual covers no industrial property rights or any rights of any other kind, nor does it confer any patent licenses. Mitsubishi Electric Corporation cannot be held responsible for any problems involving industrial property rights which may occur as a result of using the contents noted in this manual.
FX2N-4DA SPECIAL FUNCTION BLOCK

USER’S GUIDE

This manual contains text, diagrams and explanations which will guide the reader in the correct installation and operation of the FX2N-4DA special function block and should be read and understood before attempting to install or use the unit.

Further information can be found in the FX PROGRAMMING MANUAL (II) and FX2N/FX1N/FX3U/FX3UC /FXON/ FX5UC SERIES HARDWARE MANUAL.

Guidelines for the Safety of the User and Protection of the FX2N-4DA special function block:

This manual should be used by trained and competent personnel. The definition of such a person or persons is as follows:

a) Any engineer using the product associated with this manual, should be of a competent nature, trained and qualified to the local and national standards. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
b) Any commissioning or service engineer must be of a competent nature, trained and qualified to the local national standards.
c) All operators of the completed equipment should be trained to produce a product in a safe and coordinated manner in compliance to established safety practices.

Note: The term completed equipment refers to a third party constructed device which contains or uses the product associated with this manual.

Notes on the Symbols Used in this Manual

At various times throughout this manual certain symbols will be used to highlight points of information which are intended to ensure the users personal safety and protect the integrity of equipment.

1) Indicates that the identified danger WILL cause physical and property damage.

2) Indicates that the identified danger could POSSIBLY cause physical and property damage.

3) Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment.

4) All examples and diagrams shown in this manual are intended only as an aid to understanding the text not to guarantee operation. Mitsubishi Electric will accept no responsibility for the actual use of the product based on these illustrative examples.

5) Owing to the very great variety in possible application for this equipment, you must satisfy yourself as to its suitability for your specific application.

1. INTRODUCTION

The FX2N-4DA analog special function block has four analog output channels. The output channels take a digital value and output an equivalent analog signal. This is known as a D/A conversion. The FX2N-4DA has a maximum resolution of 12 bits.

The selection of voltage or current based input/output is by user wiring. Analog ranges of -10 to 10V DC (resolution: 5mV), and 0 to 20mA (resolution: 25mA) may be selected independently for each channel.

The FX2N-4DA can be connected to the FX2N/FX1N/FX3U/FX3UC/FXON/FX5UC series Programmable Controllers (PLC).

Data transfer between the FX2N-4DA and the main unit is completed buffer memory exchange. There are 32 buffer memories (each of 16 bits) in the FX2N-4DA.

The FX2N-4DA occupies 8 I/O points on the FX2N expansion bus. The 8 I/O points can be allocated from either inputs or outputs. The FX2N-4DA draws 30mA from the 5V rail of the main unit or powered extension unit.

2. EXTERNAL DIMENSIONS AND PARTS

Dimensions: mm (inches)

- Weight: Approx. 0.3 kg (0.66 lbs)
- Accessories: Special block number label

3. CONNECTION WITH PLC

The FX2N-4DA unit can be connected to the PLCs as follows. Restrictions apply to the maximum number of connectable units, depending on the DC24V/DC5V Power Supply capacities and the Main Unit/Special Function Unit types. For details, refer to the respective PLC manual.

FX2N/FX3U: The maximum connectable units is 8.

FX3UC: The maximum connectable units is 8.

FX3UC*: The maximum connectable units is 8.

To connect the FX2N-4DA with the FX3UC main unit, the FX3UC-CN3-IF is required.

FX3UC**: The maximum connectable units is 8.

FX3UC: The maximum connectable units is 8.

*1: Up to 7 units can be connected to an FX2N-32MT-L PLC.

4. WIRING

The terminal layout shown below may differ from the actual layout. For the correct terminal layout, refer to section 2 External Dimensions and Parts.

5. SPECIFICATIONS

5.1 General specifications

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>NPN transistor</td>
<td>Same as those for the main unit</td>
</tr>
<tr>
<td>Characteristic voltage</td>
<td>Same as input terminals and ground</td>
</tr>
</tbody>
</table>

5.2 Performance specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog output range</td>
<td>±10 V DC or ±20 mA DC (external load resistance: 20kΩ to 1kΩ)</td>
</tr>
<tr>
<td>Digital output</td>
<td>16 bits, binary, with sign</td>
</tr>
<tr>
<td>Effective bits for numeric value</td>
<td>11 bits and sign bit (1 bit)</td>
</tr>
<tr>
<td>Resolution</td>
<td>1/1000</td>
</tr>
<tr>
<td>Total accuracy</td>
<td>±1% (at full scale of +10V) ±1% (at full scale of +20mA)</td>
</tr>
<tr>
<td>Conversion speed</td>
<td>2.5ms per channel</td>
</tr>
</tbody>
</table>

6. ALLOCATION OF BUFFER MEMORIES (BFM)

Data is transmitted between the PX2N-4DA and the main unit via buffer memories (16-bit 32-point RAM).

BFM Description

<table>
<thead>
<tr>
<th>BFM</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>E</td>
<td>Output mode select. Factory setting H0000</td>
</tr>
<tr>
<td>F</td>
<td>Output data (16 bits binary: actual value 11 bits + sign)</td>
</tr>
<tr>
<td>#1: C1, #2: C2, #3: C3, #4: C4</td>
<td></td>
</tr>
<tr>
<td>G</td>
<td>Data holding mode. Factory setting H0000</td>
</tr>
<tr>
<td>R</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

1) [BFM 40] Output mode select: The value of BFM 40 switches the analog output between voltage and current on each channel. It takes the form of a 4 digit hexadecimal number. The first digit will be the command for current output (C1), and the second digit for channel 2 (C2) etc. The numeric values of these four digits respectively represent the following items:

H O = 0: Sets the voltage output mode (-10 V to +10 V) O = 1: Sets the current output mode (±4 mA to ±20 mA) O = 2: Sets the current output mode (0 mA to +20 mA)

Switching the output mode resets the BFM values and current output on the main unit (0 V/0 mA) may damage the FX2N-4DA.

1.2) Output data: The FX2N-4DA draws 30mA from the 5V rail of the main unit or powered extension unit.

1.3) The FX2N-4DA occupies 8 I/O points on the FX2N expansion bus. The 8 I/O points can be allocated from either inputs or outputs. The FX2N-4DA draws 30mA from the 5V rail of the main unit or powered extension unit.

1.4) Use a twisted pair shielded cable for the analog output cable. This cable should be wound away from power lines or any other lines which could induce noise.

2) Apply point grounding at the load side of the output cable (grounding: 100Ω or less).

3) If electrical noise or a voltage ripple exists at the output, connect a smoothing capacitor of 0.1 to 0.47μF, 25V.

4) Connect the [ ] terminal on the FX2N-4DA with the [ ] terminal on the main unit of the PLC.

5) Set the switching output terminal or connecting the current output load to the voltage output terminal may damage the FX2N-4DA.

6) The 24V DC service power of the PLC can also be used.

7) Do not connect any unit to the unused terminal.
BFM #5: Data holding mode: While the programmable controller is in the STOP mode, the last output value in the RUN mode will be held. To reset the value to the output value, write the hexadecimal value in BFM #5 as follows:

```
BFM #5: 0 = Holds the output.
         1 = Resets to the offset value.
```

Example: H0101. CH1 and CH2 = Offset value CH3 and CH4 = Output holding.

In addition to the above functions, the buffer memories can adjust the I/O characteristics of the FX2N-4DA, and report the status of the FX4N-4DA to the PLC.

Note: BFM #'s marked E.

### 7. OPERATION AND PROGRAM EXAMPLES

If the factory-default I/O characteristics are not changed and the status information is not used, you can operate the FX4N-4DA using the following simple program. For the FROM and TO instructions, refer to the FX Programming Manual (II).

#### Operation procedure
1. Turn OFF the power of the PLC, and then connect the FX4N-4DA. After that, wire the I/O lines of the FX4N-4DA.
2. Set the PLC to STOP and turn on the PLC to RUN.
3. Analog values will be sent from D0 (BFM #1), D1 (BFM #2), D2 (BFM #3), and D3 (BFM #4) to the respective output channels of the FX4N-4DA. When the PLC is in STOP, the analog values set before stopping the PLC will remain output. (The output will be held.)
4. When the PLC is in STOP, the offset values can also be output. For a detailed description, refer to Section 6.3.

#### 8. CAUTION REGARDING OPERATION

1. Check whether the output wiring and/or expansion cables are properly connected on the FX2N-4DA.
2. Ensure that the correct output mode has been selected for the application.
3. Ensure that the correct output mode has been selected for the application.
4. Put the main unit or a powered extension unit varies according to the number of extension blocks or special function blocks connected.
5. The external load resistance connected to each analog output terminal does not exceed +20,000.

#### Example of preventive measure

- **24V DC power supply**
- **FX4N-4DA special function block**
- **Analog data cut OFF circuit**
- **External analog unit**

#### 9. ADJUSTMENT OF THE I/O CHARACTERISTICS

##### 9.1 I/O characteristics

The standard characteristics (factory default) are shown by the solid lines in the figure below. These characteristics can be adjusted according to the conditions of the user's system.

#### BFM #1 through to #17 (Offset/gain setting command CH1, CH2)

**BFM #8** Offset/gain setting command CH1, CH2 Initial value H0000

**BFM #10** Offset data CH1 *1

**BFM #11** Gain data CH1

**BFM #12** Offset data CH2 *1

**BFM #13** Gain data CH2

**BFM #15** Gain data CH3

**BFM #16** Offset data CH4 *1

**BFM #17** Gain data CH4

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**BFM #30: The identification code for a special function block is read from the UROM instruction.** The identification code for the FX4N-4DA unit is K3020. The main unit can use this facility in the program to identify the special function block before commencing any data transfers from and to the special function block.

---

**BFM #1 through to #17 (Offset/gain setting command CH1, CH2)**

**BFM #8** Offset/gain setting command CH1, CH2 Initial value H0000

**BFM #10** Offset data CH1 *1

**BFM #11** Gain data CH1

**BFM #12** Offset data CH2 *1

**BFM #13** Gain data CH2

**BFM #15** Gain data CH3

**BFM #16** Offset data CH4 *1

**BFM #17** Gain data CH4

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