1. INTRODUCTION

The FX2N-2DA type analog output block (hereafter referred to as the FX2N-2DA) is used to convert a digital value of 12 bits into an analog output of two points (voltage and current output), and to forward the values to the Programmable Controller (hereafter referred to as a PLC). FX2N-2DA can connected to the FXPLC, FXN, FXX, FXXC, FX1C, FX2C, FX3C, and the FX3C series Programmable Controllers.

1) The analog output is selected from the voltage or current output by the method of connecting wires. At this time, assume setting to be two channels common analog output.
2) The two analog output channels can accept outputs of 0 to 10V DC, 0 to 5V DC, or 4 to 20mA. (A mixture of voltage/current output is possible.)
3) Resolution is 2.5mV (0 to 10V DC) and 4mA (4 to 20mA).
4) The digital to analog conversion characteristics can be adjusted.
5) The block occupies 8 I/O points which can be allocated from either the inputs or outputs.
6) The data transfer with the PLC uses the優惠/TO instructions. FX3/FX3C series PLC can use direct specification of buffer memory.

2. EXTERNAL DIMENSIONS AND PARTS

Dimensions: mm (inches)
- Mass (Weight): Approx. 0.2kg (0.44lbs)
- Accessories: Special Function block number label

3. WIRING

1) Connect a 0.1 to 0.47 µF 25V DC capacitor respective to position "1" when there is voltage ripple in the voltage output or there is a lot of noise.
2) For voltage output please short circuit IOUT and COM as shown in the diagram.
3) Channel number enter 0.

4. CONNECTION WITH PROGRAMMABLE CONTROLLER

1) The FX2N-2DA and main unit are connected by a cable on the right of the main unit.
2) Up to 4 FX2N-2DA units can connect to the FXN series PLC, up to 5 for FXN, up to 8 for FXN/FXNs/FXN/FXNs/FXN/FXNs, or up to 4 for the FX2N series PLC, all with powered extension units. However the following limitation exists when the undermentioned special function blocks are connected.
   a) FX2N: Main unit and powered extension units of 32 points I/O or less. Consumption current available for undermentioned special function blocks is 190mA.
   b) FXX: Main unit and powered extension units of I/O 48 points or more. Consumption current available for undermentioned special function blocks ≤ 300mA.
   c) FX2C: Main unit and powered extension units of I/O 64 points or more. Consumption current available for undermentioned special function blocks ≤ 500mA.

5. SPECIFICATIONS

5.1 General specification

5.2 Power supply specification and others

5.3 Defining gain and offset

6. ALLOCATION OF BUFFER MEMORY (BFM)

6.1 Buffer memory

BFM#16: The D/A conversion data of the channel specified with BFM#17 (digital value) is written.
BFM#17: The D/A conversion of CH2 begins by changing of 1→0.
BFM#18 or more: The D/A conversion of CH1 begins by changing of 1→0.

Write data in the above-mentioned buffer memory by “8. Program example”.

---

**Table:**

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric withstand voltage</td>
<td>500V AC 1min (Between analog output terminals and case)</td>
</tr>
</tbody>
</table>

**General specifications other than the above are the same as the main unit of the Programmable Controller.** (Refer to the Hardware manual of the Programmable controller)
The FX2N-2DA type analog output block (hereafter referred to as the FX2N-2DA) is used to convert a digital value of 12 bits into an analog output of two points (voltage and current output), and to forward the values to the Programmable Controller (hereafter referred to as a PLC).

FX2N-2DA can connected to the FX0N, FX1N, FX2N, FX3G, FX3GC, FX3U, and the FX3UC series Programmable Controllers.

1) The analog output is selected from the voltage or current output by the method of connecting wires.
2) The two analog output channels can accept outputs of 0 to 10V DC, 0 to 5V DC, or 4 to 20mA. (A mixture of voltage/current output is possible.)
3) Resolution is 2.5mV (0 to 10V DC) and 4mA (4 to 20mA).
4) The digital to analog conversion characteristics can be adjusted.
5) The block occupies 8 I/O points which can be allocated from either the inputs or outputs.
6) The data transfer with the PLC uses the FROMO/TO instructions.

FX2N-2DA SPECIAL FUNCTION BLOCK

2. EXTERNAL DIMENSIONS AND PARTS

Dimensions: mm (inches)

| Mass (Weight): Approx. 0.2kg (0.44lbs) |
| Accessories: Special Function block number label |

**3. WIRING**

1) Connect a 0.1 to 0.47 µF 25V DC capacitor respective to position *1 when there is voltage ripple in the voltage output or there is a lot of noise.

2) For voltage output please short circuit IOUT and COM as shown in the diagram.

3) Channel number enter 0.

4. CONNECTION WITH PROGRAMMABLE CONTROLLER

1) The FX2N-2DA and main unit are connected by a cable on the right of the main unit.

2) Up to 4 FX2N-2DA units can connect to the FX2N series PLC, up to 5 for FX3U or FX3G series PLC, or up to 4 for the FX3U series PLC, all with powered extension units. However the following limitation exists when the undermentioned special function blocks are connected.

**FX2N:**
- Main unit and powered extension units of 32 points I/O or less. Consumption current available for undermentioned special function blocks is 190mA.

**FX3U:**
- Main unit and powered extension units of 40 points I/O or more. Consumption current available for undermentioned special function blocks is ≤300mA.

**FX3G:**
- Up to 4 undermentioned special function blocks can be connected regardless of the system I/O.

**FX3UC:**
- Main unit and powered extension units. Up to 2 undermentioned special function blocks can be connected regardless of the system I/O.

5. SPECIFICATIONS

5.1 General specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dielectric withstand voltage</td>
<td>500V AC 1min (Between analog output terminals and case)</td>
</tr>
</tbody>
</table>

5.2 Power supply specification and others

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
<td>24V DC ±10% 85mA (Internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Digital circuits</td>
<td>5V DC 30mA (Internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Isolation</td>
<td>Photo-coupler isolation between analog and digital circuits. (No isolation between analog channels)</td>
</tr>
<tr>
<td>Number of occupied I/O points</td>
<td>The blocks occupies either 8 input or output points. (Can be either inputs or outputs)</td>
</tr>
</tbody>
</table>

5.3 Defining gain and offset

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage output</td>
<td>Range of analog output 6V to 10V DC, 0 to 5V DC (External load resistance 2kΩ to 1MΩ)</td>
</tr>
<tr>
<td>Current output</td>
<td>4 to 20mA (External load resistance 400Ω or less)</td>
</tr>
<tr>
<td>Resolution</td>
<td>2.5mV: 10V/4000 (At shipment)</td>
</tr>
<tr>
<td>Change depending on the output characteristic.</td>
<td>±4mA (±20mA for 4000Ω)</td>
</tr>
<tr>
<td>Integrated accuracy</td>
<td>±0.1V</td>
</tr>
<tr>
<td>±0.15mA</td>
<td></td>
</tr>
<tr>
<td>Processing time</td>
<td>4ms/1 channel (synchronized to be sequence program)</td>
</tr>
</tbody>
</table>

6. ALLOCATION OF BUFFER MEMORY (BFM)

**BFM 6.1 Buffer memory**

<table>
<thead>
<tr>
<th>BFM number</th>
<th>b15 to b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>b15 to b0</td>
<td>b0 to b1</td>
</tr>
</tbody>
</table>

| BFM 6.16 | The D/A conversion data of the channel specified with BFM6.17 is valid. The D/A data is written in binary in order of the lower bits and higher bit divided into two portions.

BFM6.17: If the D/A conversion of CH2 begins by changing of 1→0, b1=1 The D/A conversion of CH1 begins by changing of 1→0, b2=1 The lower eight bit data for the D/A conversion is held by changing of 1→0.

Write data in the above-mentioned buffer memory by “8. Program example”.

---

**Caution for CE Directive**

The FX2N-2DA have been found to be compliant to the European standards in the aboved described and directed. However, for the very best performance from what are in fact delicate measuring and controlled output device Mitsubishi Electric would like to make the following points:

As analog devices are sensitive by nature, their use should be considered carefully.

For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers installation requirements.

Mitsubishi Electric recommend that shielded cables should be used. If NO other EMC protection is provided, then users may experience temporary or loss accuracy between ±10% in very heavy industrial areas.

However, Mitsubishi Electric suggest that if adequate EMC precautions are followed for the users complete control system, users should expect accuracy as specified in this manual.

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidently created.
The FX-2N-2DA type analog output block (hereafter referred to as the FX-2N-2DA) is used to convert a digital value of 12 bits into an analog output of two points (voltage and current output), and to forward the values to the Programmable Controller (hereafter referred to as a PLC).

FX-2N-2DA can be connected to the FX1N, FX1N, FX2N, FX3N, FX3G, FX4N, and the FX2CN series Programmable Controllers.

The analog output is selected from the voltage or current output by the method of connecting wires. At this time, assume setting to be two channels common analog output.

The two analog output channels can accept outputs of 0 to 10 V DC, 0 to 5 V DC, or 4 to 20 mA. (A mixture of voltage/current output is possible.)

Resolution is 2.5 mV (0 to 10 V DC) and 4 A: (20-4) A/4000 (At shipment)

Differing voltage output except 0 to 10 V DC, it is necessary to adjust the offset and gain.

This note does not guarantee that an entire mechanical module produced in accordance with the contents of this note will comply with the following standards.

Compliance with EMC directive (CE Marking)

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Caution for EC Directive

The FX-2N-2DA have been found to comply with the European standards in the abovedirective and directive. However, for the very best performance from what are in fact delicate measuring and controlled output device Mitsubishi Electric would like to make the following points:

As analog devices are sensitive by nature, their use should be considered carefully. For users of proprietary cables (integral with sensors or actuators), these users should follow those manufacturers installation requirements.

Mitsubishi Electric recommend that shielded cables should be used. If no other EMC protection is provided, then users may experience temporary or loss of accuracy between ±10% in very heavy industrial areas.

However, Mitsubishi Electric suggest that if adequate EMC precautions are followed for the users' complete control system, users should expect accuracy as specified in this manual.

- Sensitive analog cable should not be laid in the same trunking or cable conduit as high voltage cabling. Where possible users should run analog cables separately.
- Good cable shielding should be used. When terminating the shield at Earth - ensure that no earth loops are accidentally created.

3. WIRING

1) Connect a 0.1 to 0.47 μF/25 V DC capacitor respective to position *1 when there is voltage ripple in the voltage output or there is a lot of noise.

2) For voltage output please short circuit IOUT and COM as shown in the diagram.

3) Channel number enter 0.

4) CONNECTION WITH PROGRAMMABLE CONTROLLER

Up to 4 FX-2N-2DA units can connect to the FX-series PLC, up to 5 for FX1N, up to 8 for FX2N/FX3N/FX3G/FX0N/FX2CN series PLC, all with powered extension units. However the following limitation exists when the undermentioned special function blocks are connected.

FX2N: Main unit and powered extension units of 32 points I/O or less. Consumption current available for undermentioned special function blocks ≤ 190mA.

FX3N: Main unit and powered extension units of 48 points I/O or less. Consumption current available for undermentioned special function blocks ≤ 300mA.

FX3N & FX2CN: Main unit and powered extension units of 2 or more undermentioned special function blocks can be connected regardless of the system I/O.

The consumption of the above units is to be subtracted from the service power supply of the host PLC.

The consumption of the above units is to be subtracted from the service power supply of the host PLC.

The blocks occupies 8 I/O points (the 8 points can be allocated from either inputs or outputs).

FX-2N-2DA consumes 5V DC 30mA.

The total 5V consumption of all special function blocks connected to either a main unit or an extension unit must not exceed the 5V source capacity of the system.

6. ALLOCATION OF BUFFER MEMORY (BFM)

6.1 Buffer memory

<table>
<thead>
<tr>
<th>BFM number</th>
<th>b15 to b0</th>
<th>b7 to b3</th>
<th>b2</th>
<th>b1</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>reserved</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>reserved</td>
<td></td>
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<td>reserved</td>
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<tr>
<td>reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BFM16: The D/A conversion data of the channel specified with BFM17 (digital value) is written. The D/A data is written in binary in order of the lower 8bit and higher 4bit and divided into two portions.

BFM17: b1=b2 The D/A conversion of CH2 begins by changing of 1→0.

b1=b0 The D/A conversion of CH1 begins by changing of 1→0.

b0 The lower eight bit data for the D/A conversion is held by changing of 1→0.

Write data in the above-mentioned buffer memory by “8. Program example”.

I. INTRODUCTION

2. EXTERNAL DIMENSIONS AND PARTS

Dimensions: mm (inches)

Mass (Weight): Approx. 0.2kg (0.44lbs)

Accessories: Special Function block number label

2.1 Buffer memory

<table>
<thead>
<tr>
<th>BFM number</th>
<th>b15 to b0</th>
<th>b7 to b3</th>
<th>b2</th>
<th>b1</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>reserved</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>reserved</td>
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<tr>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BFM16: The D/A conversion data of the channel specified with BFM17 (digital value) is written. The D/A data is written in binary in order of the lower 8bit and higher 4bit and divided into two portions.

BFM17 = b1 = b2 The D/A conversion of CH2 begins by changing of 1→0.

b1 = b0 The D/A conversion of CH1 begins by changing of 1→0.

b0 The lower eight bit data for the D/A conversion is held by changing of 1→0.

Write data in the above-mentioned buffer memory by “8. Program example”.

5. SPECIFICATIONS

5.1 General specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Voltage output</td>
<td>Digital withstand voltage 500V AC 1min (Between analog output terminals and case)</td>
</tr>
</tbody>
</table>

5.2 Power supply specification and others

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
<td>24V DC ±10% 85mA (Internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Digital circuits</td>
<td>5V DC 30mA (Internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Isolation</td>
<td>Photo-coupler isolation between analog and digital circuits. (No isolation between analog channels)</td>
</tr>
</tbody>
</table>

3. Buffer memory

| Number of occupied I/O points | The blocks occupies either 8 input or output points. (Can be either inputs or outputs) |

3.3 Defining gain and offset

<table>
<thead>
<tr>
<th>Range of analog output</th>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 10 V DC, 0 to 5 V DC (External load resistance 2k to 1MΩ)</td>
<td>≤ 20mA (External load resistance 400Ω or less)</td>
<td></td>
</tr>
</tbody>
</table>

3.4 Resolution

Change depending on the output characteristic.

<table>
<thead>
<tr>
<th>Integrated accuracy</th>
<th>±0.1%</th>
</tr>
</thead>
</table>

3.5 Processing time

4×1 channel (synchronized to be sequence program)
7. ADJUSTMENT OF OFFSET AND GAIN

7.1 Change in output characteristic

At shipment, 0 to 4000 range is selected for 0 to 10V DC output. When using an Fx2n-2DA for current or differing voltage output except 0 to 10 DC, it is necessary to readjust the offset and gain. The output characteristic can be set for each of the two channels.

Set analog values within the range specified in the table below when changing the output characteristic.

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value when digital value is 0</td>
<td>0 to 1V</td>
</tr>
<tr>
<td>Analog value when digital value is 4000</td>
<td>0 to 20mA</td>
</tr>
</tbody>
</table>

Resolution changes depending on the set value when the output characteristic changes accordingly. Example: Resolution becomes (5-0)/4000=1.25mV at voltage output 0 to 5V to 4000.

Integrated accuracy does not change. (Voltage output: ±0.1V, Current output: ±0.16mA)

7.2 Adjustment of the output characteristic

The adjustment of the offset and gain values sets a digital equivalent to the analog data. (The "POT" requires 18 revolutions to move between MIN and MAX setting.)

- Voltage output: Current output (Volume 1)
- Voltage output characteristic (0 to 10V) at shipment: Current output characteristic (0 to 5V) at ship ment

Voltage output: Current output

<table>
<thead>
<tr>
<th>Voltage output characteristic (0 to 10V) at shipment</th>
<th>Current output characteristic (0 to 5V) at shipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value when digital value is 0</td>
<td>0 to 1V</td>
</tr>
<tr>
<td>Analog value when digital value is 4000</td>
<td>0 to 20mA</td>
</tr>
</tbody>
</table>

6.3 Connection to FX1N, FX2N, FX2NC, FX3G, FX3GC, FX3U or FX3UC series PLC

Digital to analog conversion execution input of CH1: X000
Digital to analog conversion execution input of CH2: X001

At the same time X000 and X001 can be turned ON.
D/A output data CH1: D101 (Replace with auxiliary relay M100 to M131. Assign these numbers only once)
D/A output data CH2: D101 (Replace with auxiliary relay M100 to M131. Assign these numbers only once)

Processing time: 4ms / 1 channel

8. PROGRAM EXAMPLE

The following program examples (8.1 and 8.2) are formula circuits.

- Voltage output (Voltage output: ±0.1V, Current output: ±0.16mA)

8.1 At connection to FXN series PLC

- Digital data (D100) is progressed to supplementary relay (M100-M115).
- The lower 8 bit data is moved.
- The lower 8 bit data is written to the Fx2n-2DA.
- The lower 8 bit data is held.
- The higher 4 bit data is moved.
- The higher 4 bit data is written to the Fx2n-2DA.
- The D/A conversion of CH1 is executed.
- The D/A conversion of CH2 is executed.

Example: Resolution becomes (5 - 0V)/4000=1.25mV at voltage output 0 to 5V/0 to 4000. Integrated accuracy does not change. (Voltage output: ±0.1V, Current output: ±0.16mA)

8.2 At connection to FXN series PLC

- Digital data (D100) is progressed to supplementary relay (M100-M115).
- The lower 8 bit data is moved.
- The lower 8 bit data is written to the Fx2n-2DA.
- The lower 8 bit data is held.
- The higher 4 bit data is moved.
- The higher 4 bit data is written to the Fx2n-2DA.
- The D/A conversion of CH1 is executed.
- The D/A conversion of CH2 is executed.

Example: Resolution becomes (5 - 0V)/4000=1.25mV at voltage output 0 to 5V/0 to 4000. Integrated accuracy does not change. (Voltage output: ±0.1V, Current output: ±0.16mA)

8.3 Connection to FXN series PLC

7. ADJUSTMENT OF OFFSET AND GAIN

7.1 Change in output characteristic
At shipment, 0 to 4000 range is selected for 0 to 10V DC output. When using an FX2N-2DA for current or differing voltage output except 0 to 10V DC, it is necessary to readjust the offset and gain.

The output characteristic can be set for each of the two channels.

Set analog values within the range specified in the table below when changing the output characteristic.

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog value when digital value is 0</td>
<td>0 to 1V</td>
</tr>
<tr>
<td>Analog value when digital value is 4000</td>
<td>5 to 20mA</td>
</tr>
</tbody>
</table>

Resolution changes depending on the set value when the output characteristic changes accordingly.

Example: Resolution becomes (5 - 0)/4000 = 1.25mV at voltage output 0 to 5V/0 to 4000.

Integrated accuracy does not change. (Voltage output: ± 0.1V, Current output: ± 0.16mA)

7.2 Adjustment of the output characteristic

The adjustment of the offset and gain values sets a digital equivalent to the analog data.

(The “OPT” requires 18 revolutions to move between MIN and MAX setting.)

Voltage output | Current output | Volume 1 |
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Digital value 0</td>
<td>Analog value</td>
<td>0 to 1V</td>
</tr>
<tr>
<td>Digital value 4000</td>
<td>Analog value</td>
<td>5 to 20mA</td>
</tr>
</tbody>
</table>

*1 The analog value increases if the volume is turned clockwise.

7.2.1 Adjustment of gain

The gain value can be set to an arbitrary digital value. However, using the maximum of 128 resolution provides the user with a full scale analog value.

Voltage output characteristic (to 100V) at shipment

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned on.

D/A output data CH1-D100 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

D/A output data CH2-D101 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

Processing time: 4ms / channel

8. PROGRAM EXAMPLE

8.1 At connection to FXn series PLC

a) Digital data (D100) is progressed to supplementary relay (M100-M115).

b) The lower 8 bit data is written to the FX2N-2DA.

c) The lower 8 bit data is written to the FX2N-2DA.

d) The lower 8 bit data is held.

e) The higher 4 bit data is written to the FX2N-2DA.

f) The higher 4 bit data is written to the FX2N-2DA.

g) The D/A conversion of CH1 is executed.

h) Digital data (D101) is progressed to supplementary relay (M100-M115).

i) The lower 8 bit data is moved.

j) The lower 8 bit data is written to the FX2N-2DA.

k) The lower 8 bit data is held.

l) The higher 4 bit data is moved.

m) The higher 4 bit data is written to the FX2N-2DA.

n) The D/A conversion of CH2 is executed.

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned on.

D/A output data CH1-D100 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

D/A output data CH2-D101 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

Processing time: 4ms / channel

8.2 At connection to FXn, FXnx, FXnx, FXnxc, FXnxc, FXnfx or FX2N series PLC

a) Digital data (D100) is progressed to supplementary relay (M100-M115).

b) The lower 8 bit data is written to the FX2N-2DA.

c) The lower 8 bit data is written to the FX2N-2DA.

d) The lower 8 bit data is held.

e) The higher 4 bit data is written to the FX2N-2DA.

f) The higher 4 bit data is written to the FX2N-2DA.

g) The D/A conversion of CH1 is executed.

h) Digital data (D101) is progressed to supplementary relay (M100-M115).

i) The lower 8 bit data is moved.

j) The lower 8 bit data is written to the FX2N-2DA.

k) The lower 8 bit data is held.

l) The higher 4 bit data is moved.

m) The higher 4 bit data is written to the FX2N-2DA.

n) The D/A conversion of CH2 is executed.

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned on.

D/A output data CH1-D100 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

D/A output data CH2-D101 (Replace with auxiliary relay M100 to M131. Assign those numbers only once)

Processing time: 4ms / channel

8.3 Connection to FXn, FXnx (V3.00 or later), FXnxc (V3.00 or later), FXn, FXnxc, FXnxc or FX2N series PLC

Please use FNC 177 (WR3A).

Refer to series Programming Manual of or FxS/FxSy/FxSyC/FxU/FxUc Programming Manual.

9. NOTES IN DRIVE

9.1 ADJUSTMENT OF OFFSET AND GAIN

9.2 PROGRAM EXAMPLE

9.3 NOTES IN DRIVE

9.4 Notes on operation

10. ERROR CHECK

10.1 Error check

11. SPECIFICATIONS

Guidelines for the safety of the user and protection of the FX2N-2DA SPECIAL FUNCTION BLOCK

This manual has been written to be used by trained and competent personnel. This is defined by the European directives for machinery, low voltage and EMC.

If in doubt at any stage during the installation of the FX2N-2DA always consult a professional electrical engineer who is qualified and trained to the local and national standards. If in doubt about the operation or use of the FX2N-2DA please consult your local Mitsubishi Electric representative.

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 actual use of the product based on these illustrative examples.

Owing to the very great variety in possible application of this equipment, you must satisfy yourself as to its suitability for your specific application.
7. ADJUSTMENT OF OFFSET AND GAIN

7.1 Change in output characteristic

At shipment, 0 to 4000 range is selected for 0 to 10V DC output. When using an Fx2n-2DA for current of differing voltage output except 0 to 10V DC, it is necessary to adjust the offset and gain. The output characteristic can be set for each of the two channels. Set analog values within the range specified in the table below when changing the output characteristic.

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1V</td>
<td>4mA</td>
</tr>
<tr>
<td>5 to 20mA</td>
<td></td>
</tr>
</tbody>
</table>

Resolution changes depending on the set value when the output characteristic changes accordingly.

Example: Resolution becomes (5 - 0) / 4000 = 0.00125V at voltage output 0 to 5V to 4000.

Integrated accuracy does not change. (Voltage output: a 0.1V, Current output: a 0.16mA)

7.2 Adjustment of the output characteristic

The adjustment of the offset and gain values sets a digital equivalent to the analog data. (The “POT” requires 18 revolutions to move between MIN and MAX setting.)

7.2.1 Adjustment of gain

The gain value can be set to an arbitrary digital value. However, using the maximum of 12bit resolution provides the user with a full scale analog value.

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned ON. D/A output data CH1 D100 (Replace with auxiliary relay M100 to M131. Assign these numbers only once)

D/A output data CH2 D101 (Replace with auxiliary relay M101 to M131. Assign these numbers only once)

Processing time: 4ms / channel

8. PROGRAM EXAMPLE

8.1 At connection to Fxnx series PLC

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned ON. D/A output data CH1 D100 (Replace with auxiliary relay M100 to M131. Assign these numbers only once)

D/A output data CH2 D101 (Replace with auxiliary relay M101 to M131. Assign these numbers only once)

Processing time: 4ms / channel

8.2 At connection to Fxnx, Fxnx/C, Fxnh, Fxnh/C, Fxnx or Fxnh series PLC

Digital to analog conversion execution input of CH1 : X000

Digital to analog conversion execution input of CH2 : X001

At the same time X000 and X001 can be turned ON. D/A output data CH1 D100 (Replace with auxiliary relay M100 to M131. Assign these numbers only once)

D/A output data CH2 D101 (Replace with auxiliary relay M101 to M131. Assign these numbers only once)

Processing time: 4ms / channel

For instance, when a digital range of 0 to 4000 is used with the analog range of 0 to 10V, a digital value of 40 is equal to an analog output of 100mV (40 x 100 mV/4000 digital points). When a digital range of 0 to 4000 is used with the analog range of 4 to 20mA, a digital value of 0 is equal to an analog output of 4mA.

1) Adjust the offset and gain respectively for CH1 and CH2.
2) Repeat offset and gain adjustments until a stable value is obtained.
3) Adjust the gain before the offset.

8.3 Connection to Fxnx, Fxnh (V3.00 or later), Fxnh/C, Fxnx/C, Fxnh/C or Fxnx/C series PLC

1. INTRODUCTION
The FXm-2DA type analog output block (hereafter referred to as the FXm-2DA) is used to convert a digital value of 12 bits into an analog output of two points (voltage and current output), and to forward the values to the Programmable Controller (hereafter referred to as a PLC). FXm-2DA can connected to the FXm series, FXmN, FXmXN, FXmXC, FXmXG, FXmXH, and the FXmX series Programmable Controllers.

1) The analog output is selected from the voltage or current output by the method of connecting wires. At this time, assume setting to be two channels common analog output.
2) The two analog output channels can accept outputs of 0 to 10V DC, 0 to 5V DC, or 4 to 20mA. (A mixture of voltage/current output is possible.)
3) Resolution is 2.5mV (0 to 10V DC) and 4mA (4 to 20mA).
4) The digital to analog conversion characteristics can be adjusted.
5) The block occupies 8 I/O points which can be allocated from either the inputs or outputs.
6) The data transfer with the PLC uses the FROM/TO instructions.

2. EXTERNAL DIMENSIONS AND PARTS
Dimensions: mm (inches)

3. WIRING

4. CONNECTION WITH PROGRAMMABLE CONTROLLER
1) The FXm-2DA and main unit are connected by a cable on the right of the main unit.

5. SPECIFICATIONS

5.1 General specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Diode withstand voltage</td>
<td>500V AC 1min (Between analog output terminals and case)</td>
</tr>
</tbody>
</table>

General specifications other than the above are the same as the main unit of the Programmable Controller. (Refer to the hardware manual of the Programmable controller)

5.2 Power supply specification and others

<table>
<thead>
<tr>
<th>Item</th>
<th>Content</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
<td>24V DC ±10% 85mA (internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Digital circuits</td>
<td>5V 30mA (internal power supplied from the main unit)</td>
</tr>
<tr>
<td>Isolation</td>
<td>Photo-coupler isolation between analog and digital circuits. (No isolation between analog channels)</td>
</tr>
<tr>
<td>Number of occupied I/O points</td>
<td>The blocks occupies either 8 input or output points. (Can be either inputs or outputs)</td>
</tr>
</tbody>
</table>

5.3 Defining gain and offset

6. ALLOCATION OF BUFFER MEMORY (BFM)

6.1 Buffer memory

<table>
<thead>
<tr>
<th>BFM number</th>
<th>b15 to b0</th>
<th>b7 to b3</th>
<th>b2</th>
<th>b1</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>60 to 15</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Reserved</td>
<td>Digital data source for output (8 bit)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Reserved</td>
<td>Lower data holding bit, CH1 D/A conversion beginning, CH2 D/A conversion beginning</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>18 or more</td>
<td>Reserved</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

BFM-16: The D/A conversion data of the channel specified with BFM-17 (digital value) is written. The D/A data is written in binary in order of the lower 8bit and higher 4bit and divided into two portions.

BFM-17: The D/A conversion data of CH2 begins by changing of 1 to 0, b1=The D/A conversion of CH1 begins by changing of 1 to 0, b2=The lower eight bit data for the D/A conversion is held by changing of 1 to 0.

Write data in the above-mentioned buffer memory by "8. Program example".
7. ADJUSTMENT OF OFFSET AND GAIN

7.1 Change in output characteristic
At shipment, 0 to 4 000 range is selected for 0 to 10V DC output. When using an FX2N-2DA for current or differing voltage output except 0 to 10V DC, it is necessary to readjust the offset and gain. The output characteristic can be set for each of the two channels. Set analog values within the range specified in the table below when changing the output characteristic. Range of output characteristic:

<table>
<thead>
<tr>
<th>Voltage output</th>
<th>Current output</th>
</tr>
</thead>
<tbody>
<tr>
<td>0 to 1V</td>
<td>4mA</td>
</tr>
<tr>
<td>0 to 5V</td>
<td>20mA</td>
</tr>
</tbody>
</table>

Resolution depends on the set voltage when the output characteristic changes accordingly. Example: Resolution becomes (5-0)/10000=1.25mV at voltage output 0 to 5V to 4000. Integrated accuracy does not change. (Voltage output: a 0.1V, Current output: ±0.16mA)

7.2 Adjustment of the output characteristic

The adjustment of the offset and gain values sets a digital equivalent to the analog data. (The "POT" requires 18 revolutions to move between MIN and MAX setting.)

- Voltage output
- Current output
- Volume 1

8. PROGRAM EXAMPLE

8.1 At connection to FXN series PLC

- Digital to analog conversion execution input of CH1: X0000
- Digital to analog conversion execution input of CH2: X0001
- At the same time X000 and X001 can be turned ON.
- D/A output data CH1: D100 (Replace with auxiliary relay M100 to M115. Assign these numbers only once)
- D/A output data CH2: D101 (Replace with auxiliary relay M100 to M115. Assign these numbers only once)

Processing time: 4ms / channel

8.2 At connection to FXN, FXN2, FXN3, FXN4, FXS0, FXS2 or FXU series PLC

- Digital to analog conversion execution input of CH1: X0000
- Digital to analog conversion execution input of CH2: X0001
- At the same time X000 and X001 can be turned ON.
- D/A output data CH1: D100 (Replace with auxiliary relay M100 to M115. Assign these numbers only once)
- D/A output data CH2: D101 (Replace with auxiliary relay M100 to M115. Assign these numbers only once)

Processing time: 4ms / channel

8.3 Connection to FXN, FXN2, FXN3, FXN4, FXS0, FXS2 or FXU series PLC

Please use FNC 177 (WRSA).

9. NOTES IN DRIVE

9.1 Voltage output and Current output

- Confirm the state of POWER LED.
  - Lit: The extension cable is correctly connected. Turn off or blinks: Confirm the proper connection of the extension cable.

9.2 Error Check

- Analog value when digital value is 0
  - 0 to 1V: 4mA
  - 0 to 5V: 20mA
  - Voltage output
  - Current output
  - Volume 1

10. ERROR CHECK

Confirm the following items when it seems that the FXN-2DA does not operate correctly.

- Analog value when digital value is 4000
  - 5 to 10V: 20mA

Guidelines for the safety of the user and protection of the FXN-2DA SPECIAL

For safe use

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, consult with Mitsubishi Electric.
- This product has been manufactured under strict quality control. However when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

Manual number: JY992D74901
Manual revision: G
Date: December 2016

For use in countries/regions

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.

Specifications are subject to change without notice.