**2. EXTERNAL DIMENSIONS**

Weight: Approx. 0.3 kg (0.66 lbs)  
Dimensions: mm (inches)

**3. CONNECTION WITH PLC**

The FX2N-4AD-PT unit can be connected to the FXX/FX1/FX2N/FX2NC/FX3G/FX3U/FX3UC PLCs. Other special units of blocks that use FROM/TO instructions, such as analog input blocks, analog output blocks and high-speed counter blocks, can be directly connected to the main unit of the PLC or to the right side of other extension blocks or units. For the connection with PLCs, refer to the respective PLC manual.

**4. WIRING**

**4.1 Wiring**

1. The cable of the Pt 100 sensor or a twisted shielded cable should be used for the analog input cable. This analog input cable should be wired separately from power lines or any other lines which may induce noise.

2. The three wire method improves the accuracy of the sensors by compensating voltage drops.

3. If there is electrical noise, connect the FG (frame ground) terminal and the ground terminal. (In CH1, there is no FG terminal. Use FG terminal of other channels.)

4. Connect the ground terminal on the FX2N-4AD-PT unit with the grounded terminal on the main unit. Use grounding in the main unit, if grounding is possible.

5. Either an external or the 24V built-in supply in the PLC may be used.

For additional data regarding EMC considerations please see section 10.

**4.2 Using crimp terminations**

1. Use crimp terminals as indicated on the left.

2. The tightening torque must be 0.5 and 0.8 N\*cm. Failure to do so may cause equipment failures or malfunctions.

3. Wire only to the module terminals discussed in this manual. Leave all others vacant.

**5. INSTALLATION NOTES AND USAGE**

**5.1 General specification**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Item</td>
<td>Specifikation</td>
</tr>
</tbody>
</table>

1. **Analog circuits**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>±10V/±5V (between all terminals and ground)</td>
</tr>
</tbody>
</table>

2. **Digital circuits**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Input voltage</td>
<td>±2.5V (between all terminals and ground)</td>
</tr>
</tbody>
</table>

**5.2 Power supply specification**

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
<td>24V DC ±10%, 50mA</td>
</tr>
<tr>
<td>Digital circuits</td>
<td>5V DC, 30mA (internal power supply from the main unit)</td>
</tr>
</tbody>
</table>

**6. ALLOCATION OF BUFFER MEMORIES (BFM)**

**6.1 Buffer memories**

The FX2N-4AD-PT communicates with the PLC via buffer memories. BFM (buffer memories) #21 to #27 and #31 are reserved. All BFM data can be read by the PLC using the FROM instruction. PLC can read/write the BFM (marked with ***) using FROM/TO instructions.

**BFM CONTENTS**

<table>
<thead>
<tr>
<th>BFM</th>
<th>Characteristic change</th>
</tr>
</thead>
<tbody>
<tr>
<td>#0</td>
<td></td>
</tr>
<tr>
<td>#1 - #4</td>
<td>CH1 to CH4 Averaged temperature reading to be averaged (1 to 256) Default = CH1</td>
</tr>
<tr>
<td>#5</td>
<td>CH1 to CH4 Averaged temperature in 0.1°C units</td>
</tr>
<tr>
<td>#6</td>
<td>CH1 to CH4 Present temperature in 0.1°C units</td>
</tr>
<tr>
<td>#13 - #16</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#17 - #20</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#21</td>
<td>#27 Reserved</td>
</tr>
<tr>
<td>#28</td>
<td>Digital range error latch</td>
</tr>
<tr>
<td>#29</td>
<td>Error status</td>
</tr>
<tr>
<td>#30</td>
<td>Identification code 023040</td>
</tr>
<tr>
<td>#31</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

1. BFM #5 value (K0 or K1) decides the Pt100 characteristic to be used.  

2. The number of samples to be averaged are assigned in BFM #1 to #4. Only the range 1 to 4096 is valid. Values outside this range are ignored. The default value of #5 is used.

3. A number of recently converted readings are averaged to give a smoother readout. The averaged data is stored in BMFs #5 to #8 and #13 to #16.

4. BMFs #9 to #12 and #17 to #20 store the current value of the input data. This value is in units of 0.1°C or 0.1°F, but the resolution is only 0.2°C to 0.3°C or 0.36°F to 0.5°F.
2. EXTERNAL DIMENSIONS

Weight: Approx. 0.3 kg (0.66 lbs) Dimensions: mm (inches)

Item | Weight | Dimensions
--- | --- | ---
55 (2.17) | 0.3 kg (0.66 lbs) | (0.66 mm)
55 (2.17) | 0.3 kg (0.66 lbs) | (0.66 mm)

3. CONNECTION WITH PLC

The FX2N-4AD-PT unit can be connected to the FX2N/FPx/FPw/FPx/c/FX3U/FX3Uc/FX3Uc PLCs. Other special units of blocks that use FROM/TO instructions, such as analog input blocks, analog output blocks and high-speed counter blocks, can be directly connected to the main unit of the PLC or to the right side of other extension blocks or units. For the connection with PLCs, refer to the respective PLC manual.

4. WIRING

4.1 Wiring

- The cable of the Pt 100 sensor or a twisted shielded cable should be used for the analog input cable. This analog input cable should be wired separately from power lines or any other lines which may induce noise. The three wire method improves the accuracy of the sensors by compensating voltage drops.
- If there is electrical noise, connect the FG (frame ground) terminal to the ground terminal. (in CH1, there is no FG terminal. Use FG terminal of other channels.)
- Connect the ground terminal on the FX2N-4AD-PT unit with the grounded terminal on the main unit. Grounding on the main unit, if grounding is possible.
- Either an external or the 24V built-in supply in the PLC may be used.

For additional data regarding EMC considerations please see section 7.0.

4.2 Using crimp terminations

- Use crimp terminals as indicated on the left.
- The tightening torque must be 0.5 and 0.8 Nm. Do not tighten terminal screws exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.
- Wire only to the module terminals discussed in this manual. Leave all others vacant.

5. INSTALLATION NOTES AND USAGE

5.1 General specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal specifications</td>
<td>Same as those for the main unit</td>
</tr>
<tr>
<td>Electric withstand voltage</td>
<td>600V AC, 1min (between all terminals and ground)</td>
</tr>
</tbody>
</table>

5.2 Power supply specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
<td>24V DC ±10%, 50mA</td>
</tr>
<tr>
<td>Digital circuits</td>
<td>5V DC, 30mA (internal power supply from the main unit)</td>
</tr>
</tbody>
</table>

6. ALLOCATION OF BUFFER MEMORIES (BFM)

6.1 Buffer memories

The FX2N-4AD-PT communicates with the PLC via buffer memories. BFM (buffer memories) #21 to #27 and #31 are reserved. All BFM data can be read by the PLC using the FROM instruction.

PLC can read/write the BFM (marked with **), using FROM/TO instructions.

The BFM #0 value (K0 or K1) decides the Pt100 characteristic to be used.

- K0 : JIS C 1604-1997
- K1 : JIS C 1604-1981

2) The number of samples to be averaged are assigned in BFM #1 to #4. Only the range 1 to 4096 is valid. Values outside this range are ignored. The default value of 8 is used.

3) A number of recently converted readings are averaged to give a smoother read out. The averaged data is stored in BFM #5 to #8 and #13 to #16.

4) BFM #9 to #12 and #17 to #20 store the current value of the input data. This value is in units of 0.1°C or 0.1°F, but the resolution is only 0.2°C to 0.3°C or 0.36°F to 0.5°F.

---

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

Further information can be found in the main unit manual and programming manual.

Guidelines for the Safety of the User and Protection of the FX2N-4AD-PT special function block.

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

- Any engineer using the product associated with this manual, should be of a competent nature, trained and qualified to the local or national standards. These engineers should be fully aware of all aspects of safety with regards to automated equipment.
- Any commissioning or service engineer must be of a competent nature, trained and qualified to the local or national standards.
- Any operators of the completed equipment should be trained to use this 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 is 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.

- 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.
- 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.
- Owing to the very great variability in possible applications for this equipment, you must satisfy yourself as to its suitability for your specific application.
2. EXTERNAL DIMENSIONS

| Weight: 0.3 kg (0.66 lbs) | Dimensions: (mm) |

3. CONNECTION WITH PLC

The FX2N-4AD-PT unit can be connected to the FX2N/FX1N/FX3N/FX3UC/FX5U/FX1UC PLCs. Other special units of blocks that use FROM/TO INSTRUCTIONS, such as analog input blocks, analog output blocks and high-speed counter blocks, can be directly connected to the main unit of the PLC or to the right side of other extension blocks or units. For the connection with PLCs, refer to the respective PLC manual.

4. WIRING

4.1 Wiring

- The cable of the Pt 100 sensor or a twisted shielded cable should be used for the analog input cable. This analog input cable should be wired separately from power lines or any other lines which may induce noise. The three wire method improves the accuracy of the sensors by compensating voltage drops.
- If there is electrical noise, connect the FG (frame ground) terminal with the ground terminal. (In CH1, there is no FG terminal. Use FG terminal of other channels.)
- Connect the ground terminal on the FX2N-4AD-PT unit with the grounded terminal on the main unit. Use grounding on the main unit, if grounding is possible.
- Either an external or the 24V built-in supply in the PLC may be used.

For additional data regarding EMC considerations please see section 10.

4.2 Using crimp terminations

- Use crimp terminals as indicated on the left.
- The tightening torque must be 0.5 and 0.8 Nm. Do not tighten terminal screws exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.
- Wire only to the module terminals discussed in this manual. Leave all others vacant.

5. INSTALLATION NOTES AND USAGE

5.1 General specification

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

5.2 Power supply specification

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog circuits</td>
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6. ALLOCATION OF BUFFER MEMORIES (BFM)

6.1 Buffer memories

- The FX2N-4AD-PT communicates with the PLC via buffer memories. BFM (buffer memories) #21 to #27 and #31 are reserved.
- All BFM data can be read by the PLC using the FROM INSTRUCTION. PLC can write the BFM (marked with *), using FROM TO INSTRUCTIONS.

BFM CONTENTS

<table>
<thead>
<tr>
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<th>Contents</th>
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<tbody>
<tr>
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<td>Characteristic change</td>
</tr>
<tr>
<td>#1 – #4</td>
<td>CH1 to CH4 Averaged temperature reading to be averaged (1 to 256) Default = 8</td>
</tr>
<tr>
<td>#5 – #8</td>
<td>CH1 to CH4 Averaged temperature in 0.1°C units</td>
</tr>
<tr>
<td>#9 – #12</td>
<td>CH1 to CH4 Present temperature in 0.1°C units</td>
</tr>
<tr>
<td>#13 – #16</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#17 – #20</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#21 – #27</td>
<td>Reserved</td>
</tr>
<tr>
<td>#28</td>
<td>Digital range error latch</td>
</tr>
<tr>
<td>#29</td>
<td>Error status</td>
</tr>
<tr>
<td>#30</td>
<td>Identification code K2040</td>
</tr>
<tr>
<td>#31</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

Notes:

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- All diagrams and examples 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.
- Wiring to the very great variety in possible applications for this equipment, you must satisfy yourself as to its suitability for your specific application.

This manual contains text, diagrams and explanations which will guide the reader in the correct installation and use of the FX2N-4AD-PT special function block and should be read and understood before attempting to install or use the unit. Further information can be found in the main unit manual and programming manual.

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- Wiring to the very great variety in possible applications for this equipment, you must satisfy yourself as to its suitability for your specific application.

1) BFM #0 value (K0 or K1) decides the Pt100 characteristic to be used.

2) The number of samples to be averaged are assigned in BFM #1 to #4. Only the range 1 to 4096 is valid. Values outside this range are ignored. The default value of #8 is 8.

3) A number of recently converted readings are averaged to give a smoother read out. The averaged data is stored in BFM #5 to #8 and #13 to #16.

4) BFM #9 to #12 and #17 to #20 store the current value of the input data. This value is in units of 0.1°C or 0.1°F, but the resolution is only 0.2°C to 0.3°C or 0.36°F to 0.54°F.
In the program shown below, the FX2N-4AD-PT block occupies the position of special block number 2 (that is the third closest block to the PLC). The averaging amount is four. The averaged values in degrees C of input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

### 8. EXAMPLE PROGRAM

#### Block No.2 BP#30 (digital range error)

- BFM #29 is used to judge whether the measured temperature is within the unit’s range or not.

#### Buffer Memory BFM #29: Error status

- **OFF**
  - Not used
- **ON**
  - Latches ON when the temperature measurement data drops below the lowest temperature measurement limit.
- **High**
  - Turns ON when the temperature measurement data rises above the highest temperature measurement limit.

When an error occurs the temperature data before the error is latched. If the measured value returns to within valid limits the temperature data returns to normal operation. (Note: The error remains latched in (BFM #29).

An error can be cleared by writing K0 to BFM #28 using the TO instruction or turning off the power.

#### Buffer Memory BFM #30: Identification Code

- The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FROM instruction. This number for the FX2N-4AD-PT unit is K2040.

The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

### 7. SYSTEM BLOCK DIAGRAM

#### PLC Command Information Write and Data Status Read

- **POWER LED**
  - A/D conversion is stopped for the error channel.
- **Reserved**
  - No error.
- **Reserved**
  - Power source 24V DC power supply failure. Power supply normal.
- **A/D conversion or other hardware failure.**
  - Hardware Normal.
- **Reserved**
  - Digital output/analog input value is outside the specified range.
- **Reserved**
  - Digital output value is normal.
- **Reserved**
  - Selected number of averaged results is outside the available range.
- **Reserved**
  - Averaging normal.
- **Reserved**
  - No error.

#### A/D conversion

- **Reserved**
  - No error.
- **Reserved**
  - Power source 24V DC power supply failure. Power supply normal.
- **Reserved**
  - A/D conversion or other hardware failure. Hardware Normal.
- **Reserved**
  - Digital output/analog input value is outside the specified range.
- **Reserved**
  - Digital output value is normal.
- **Reserved**
  - Selected number of averaged results is outside the available range.
- **Reserved**
  - Averaging normal.
- **Reserved**
  - No error.

### 9. DIAGNOSTICS

#### 9.1 Preliminary checks

1. Check whether the input/output wiring and/or extension cables are properly connected on the FX2N-4AD-PT analog special function block.
2. Check that the PLC system configuration limits have not been exceeded, i.e. the number of special function blocks, and the total system I/O are within the specified range.
3. Ensure that the correct operating range has been selected for the application.
4. Check that there is no power overload on either the 5V or 24V power sources, remember the loading on main unit or a powered extension unit varies according to the number of extension blocks or special function blocks connected.
5. Make sure that the main unit has been switched to RUN.

#### 9.2 Error checking

If the FX2N-4AD-PT special function block does not seem to operate normally, check the following items:

- **Check the status of the POWER LED.**
  - The extension cables is properly connected.
  - Otherwise: Check the connection of the extension cable.
- **Check the external wiring.**
- **Check the status of the “A/D” LED.**
  - Otherwise: Possible 24V DC power failure, if ON possible FX2N-4AD-PT failure.
  - Otherwise: A/D conversion is proceeding normally.
  - Otherwise: Check buffer memory #29 (error status). If any bits (b0, b2, b3) are ON, then this is why the A/D LED is OFF.
1) Buffer Memory BFM #28: Digital range error latch

BFM #28 b10 (digital range error) is used to judge whether the measured temperature is within the unit’s range or not. BFM #28 latches the error status of each channel.

b15 or b16 b17 b18 b19 b20 b21 b22 b23
Not used

Low : Latches ON when the temperature measurement data drops below the lowest temperature measurement limit.
High : Turns ON when the temperature measurement data rises above the highest temperature measurement limit.

When an error occurs the temperature data before the error is latched. If the measured value returns to within valid limits the temperature data returns to normal operation. (Note: The error remains latched in (BFM #28).

An error can be cleared by writing K0 to BFM #28 using the TO instruction or turning off the power.

2) Buffer Memory BFM #29: Error status

Bit devices of BFM #29

<table>
<thead>
<tr>
<th>Bit</th>
<th>Description</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>b0</td>
<td>Error</td>
<td>No error</td>
<td></td>
</tr>
<tr>
<td>b1</td>
<td>Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>b2</td>
<td>Power source</td>
<td>Power supply normal</td>
<td>Power supply failure</td>
</tr>
<tr>
<td>b3</td>
<td>Hardware error</td>
<td>Hardware Normal</td>
<td>A/D converter or other hardware failure</td>
</tr>
<tr>
<td>b4 to b9</td>
<td>Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>b10</td>
<td>Digital range error</td>
<td>Digital output/analog input value is outside the specified range.</td>
<td>Digital output value is normal.</td>
</tr>
<tr>
<td>b11</td>
<td>Averaging error</td>
<td>Averaging is normal. (between 1 to 4096)</td>
<td>Selected number of averaged results is outside the available range - see BFM #1 to #4</td>
</tr>
<tr>
<td>b12 to b15</td>
<td>Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

3) Buffer Memory BFM #30: Identification Code

The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FROM instruction. This number for the FX2N-4AD-PT unit is K2040.

The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

7. SYSTEM BLOCK DIAGRAM

8. EXAMPLE PROGRAM

In the program shown below, the FX2N-4AD-PT block occupies the position of special block number 2 (that is the third closest block to the PLC). The averaging amount is four. The averaged values in degrees C of input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

9. DIAGNOSTICS

9.1 Preliminary checks

I. Check whether the input/output wiring and/or extension cables are properly connected on the FX2N-4AD-PT analog special function block.

II. Check that the PLC system configuration limits have not been exceeded, i.e. the number of special function blocks, and the total system I/O are within the specified range.

III. Ensure that the correct operating range has been selected for the application.

IV. Check that there is no power overvoltage on either the 5V or 24V power sources, remember the loading on main unit or a powered extension unit varies according to the number of extension blocks or special function blocks connected.

V. Make sure that the main unit has been switched to RUN.

9.2 Error checking

If the FX2N-4AD-PT special function block does not seem to operate normally, check the following items:

- Check the status of the POWER LED.
- Check the external wiring.
- Check the status of the “A/D” LED (top right corner of the FX2N-4AD-PT).
- Check buffer memory #29 (error status). If any bits (b10, b12) are ON, this is why the A/D LED is OFF.
8. EXAMPLE PROGRAM

In the program shown below, the FX2N-4AD-PT block occupies the position of special block number 2 (that is the third closest block to the PLC). The averaging amount is four. The averaged values in degrees C of input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

1) Buffer Memory BFM #28: Digital range error latch

BFM #28 b10 (digital range error) is used to judge whether the measured temperature is within the unit range or not.

BFM #28 latches the error status of each channel.

<table>
<thead>
<tr>
<th>b15 or b8</th>
<th>b7</th>
<th>b6</th>
<th>b5</th>
<th>b4</th>
<th>b3</th>
<th>b2</th>
<th>b1</th>
<th>b0</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>Low</td>
<td>High</td>
<td>High</td>
<td>Low</td>
<td>Low</td>
<td>Low</td>
</tr>
</tbody>
</table>

Low : Latches ON when the temperature measurement data drops below the lowest temperature measurement limit.

High : Turns ON when the temperature measurement data rises above the highest temperature measurement limit.

When an error occurs the temperature data before the error is latched. If the measured value returns to valid limits the temperature data returns to normal operation. (Note: The error remains latched in (BFM #28).)

An error can be cleared by writing 0 to BFM #28 using the TO instruction or turning off the power.

2) Buffer Memory BFM #29: Error status

<table>
<thead>
<tr>
<th>Bit devices of BFM #29</th>
<th>ON</th>
<th>OFF</th>
</tr>
</thead>
<tbody>
<tr>
<td>00 : Error</td>
<td></td>
<td>No error</td>
</tr>
<tr>
<td>01 : Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>02 : Power source</td>
<td>24 V DC power supply failure</td>
<td>Power supply normal</td>
</tr>
<tr>
<td>03 : Hardware error</td>
<td>A/D converter or other hardware failure</td>
<td>Hardware Normal</td>
</tr>
<tr>
<td>04 to 09 : Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
<tr>
<td>10 : Digital range error</td>
<td>Digital output/analog input value is outside the specified range.</td>
<td>Digital output value is normal.</td>
</tr>
<tr>
<td>11 : Averaging error</td>
<td>Selected number of averaged results is outside the available range - see BFM #1 to #4</td>
<td>Averaging is normal. (between 1 to 4096)</td>
</tr>
<tr>
<td>12 to 15 : Reserved</td>
<td>Reserved</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

3) Buffer Memory BFM #30: Identification Code

The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FFROM instruction. This number for the FX2N-4AD-PT unit is K2040.

The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

7. SYSTEM BLOCK DIAGRAM

The following instructions can be read by the program step, and output as a bit device in the PLC (Y010 in this example). Additional Error devices can be output in a similar manner, i.e. b10 BFM #29 (see below).

M8002 FG
FNC78
FROM
K2040
CMP
D10
M10

When (K2040) = (D10), M1 = ON

K2     K29    K4M10    K1
FROM
M10
M20

This step is the actual reading of the FX2N-4AD-PT input channels. It is essentially the only program step which is needed. The “TO” instruction in this example, sets the input channels, CH1 to CH4, to take the average reading of four samples.

The “FROM” instruction reads the average temperatures (BFM #5 to #8) for input channels CH1 to CH4 of the FX2N-4AD-PT. If direct temperature readings are required BFM #9 to #12 should be read instead, ex.

M8029
FROM
K2040
CMP
D10
M10

This step provides optional monitoring of the FX2N-4AD-PT Error Buffer Memory (29). If there is an Error on the FX2N-4AD-PT, bit b0 of BFM #29 will be set on. This can be used by the program step, and output as a bit device in the PLC (Y010 in this example). Additional Error devices can be output in a similar manner, i.e. b10 BFM #29 (see below).

M8029
FROM
K2040
CMP
D10
M10

This step checks that the special function blocks placed at position 2 is actually an FX2N-4AD-PT, i.e. its unit identification number is 2D0 (BFM #29).

This step is optional, but it provides a software check that the system has been configured correctly.

9. DIAGNOSTICS

9.1 Preliminary checks

I. Check whether the input/output wiring and/or extension cables are properly connected on the FX2N-4AD-PT analog special function block.

II. Check that the PLC system configuration limits have not been exceeded, i.e. the number of special function blocks, and the total system I/O are within the specified range.

III. Ensure that the correct operating range has been selected for the application.

IV. Check that there is no power overload on either the 5V or 24V power sources, remember the loading on main unit or a powered extension unit varies according to the number of extension blocks or special function blocks connected.

V. Make sure that the main unit has been switched to RUN.

9.2 Error checking

If the FX2N-4AD-PT special function block does not seem to operate normally, check the following items.

• Check the status of the POWER LED.

Lit : The extension cables is properly connected.

Otherwise : Check the connection of the extension cables.

• Check the external wiring.

• Check the status of the “24V” LED (top right corner of the FX2N-4AD-PT).

Lit : FX2N-4AD-PT is ON, 24V DC power source is ON.

Otherwise : Possible 24V DC power failure, if ON possible FX2N-4AD-PT failure.

• Check the status of the “A/D” LED (top right corner of the FX2N-4AD-PT).

Lit : A/D conversion is proceeding normally.

Otherwise : Check buffer memory #29 (error status). If any bits (b0, b2, b3) are ON, then this is why the A/D LED is OFF.
2. EXTERNAL DIMENSIONS

- Weight: Approx. 0.3 kg (0.66 lbs)
- Dimensions: mm (inches)

3. CONNECTION WITH PLC

The FX2n-4AD-PT unit can be connected to the FX2n/FX3U/FX3UC/FX3G/FX0N/FX1N/FX2N/FX2NC PLCs, other special units of blocks that use FROM/TO instructions, such as analog input blocks, analog output blocks, and high-speed counter blocks, can be directly connected to the main unit of the PLC or to the right side of other extension blocks or units. For the connection with PLCs, refer to the respective PLC manual.

4. WIRING

4.1 Wiring

- The cable of the Pt 100 sensor or a twisted shielded cable should be used for the analog input cable. This analog input cable should be wired separately from power lines or any other lines which may induce noise. The shield method improves the accuracy of the sensors by compensating voltage drops.
- If there is electrical noise, connect the FG (frame ground) terminal and L- (ground terminal). (In CH1, there is no FG terminal. Use FG terminal of other channel.)
- Connect the ground terminal on the FX2n-4AD-PT unit with the ground terminal on the main unit. Use grounding on the main unit, if grounding is possible.
- Either an external or the 24V built-in supply in the PLC may be used.

For additional data regarding EMC considerations, please see section 10.

4.2 Using crimp terminations

- Use crimp terminals as indicated on the left.
- The tightening torque must be 0.5 and 0.8 N⋅m for crimp terminals exceeding the specified torque. Failure to do so may cause equipment failures or malfunctions.
- Wire only to the module terminals discussed in this manual. Leave all others vacant.

5. INSTALLATION NOTES AND USAGE

5.1 General specification

- General purpose: Analog input blocks
- Input: 4-channel input, 24+ and 24- input, CH1 to CH4
- Output: 4-channel output, 24+ and 24- output, CH1 to CH4
- A/D converter: 11-bit conversion, 16-bit binary with sign
- Conversion speed: 60ms (15 ms for 4 channels)
- Minimum resolvable temp.: 0.2°C to 0.3°C
- Isolation: 3600V AC, 1min

5.2 Power supply specification

- Power supply: 24V DC ±10%, 50mA
- Digital circuits: 5V DC, 30mA (internal power supply from the main unit)

5.3 Performance specification

Analog Inputs

<table>
<thead>
<tr>
<th>Item</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input signal</td>
<td>Both C and F are available by reading the appropriate buffer memory (BFM)</td>
</tr>
<tr>
<td>Current to sensor</td>
<td>1 mA: sensor 100Ω Pt 100</td>
</tr>
<tr>
<td>Compensated range</td>
<td>-100°C to +600°C</td>
</tr>
<tr>
<td>Digital output</td>
<td>-140°F to +1100°F</td>
</tr>
</tbody>
</table>

Analog Inputs continued...

<table>
<thead>
<tr>
<th>Conversion Characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Analog input to digital output</td>
</tr>
<tr>
<td>Digital output to analog input</td>
</tr>
<tr>
<td>Digital output to digital output</td>
</tr>
</tbody>
</table>

6. ALLOCATION OF BUFFER MEMORIES (BFM)

6.1 Buffer memories

The FX2n-4AD-PT communicates with the PLC via buffer memories. BFM (buffer memories) #21 to #27 and #31 are reserved. All BFM data can be read by the PLC using the FROM instruction. PLC can read/write the BFM (marked with **), using FROM/TO instructions.

**BFM**

<table>
<thead>
<tr>
<th>BFM</th>
<th>CONTENTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>#0</td>
<td>Characteristic change</td>
</tr>
<tr>
<td>#1 - #4</td>
<td>CH1 to CH4 Averaged temperature reading to be averaged (1 to 256) Default = 8</td>
</tr>
<tr>
<td>#5 - #8</td>
<td>CH1 to CH4 Averaged temperature in 0.1°C units</td>
</tr>
<tr>
<td>#9 - #12</td>
<td>CH1 to CH4 Present temperature in 0.1°C units</td>
</tr>
<tr>
<td>#13 - #16</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#17 - #20</td>
<td>CH1 to CH4 Present temperature in 0.1°F units</td>
</tr>
<tr>
<td>#21 - #27</td>
<td>Reserved</td>
</tr>
<tr>
<td>#28</td>
<td>Digital range error latch</td>
</tr>
<tr>
<td>#29</td>
<td>Error status</td>
</tr>
<tr>
<td>#30</td>
<td>Identification code K2040</td>
</tr>
<tr>
<td>#31</td>
<td>Reserved</td>
</tr>
</tbody>
</table>

1) BFM #5 value (K0 or K1) decides the Pt100 characteristic to be used. K0: JIS C 1604-1997 K1: JIS C 1604-1981
2) The number of samples to be averaged is assigned in BFM #1 to #4. Only the range 1 to 4096 is valid. Values outside this range are ignored. The default value of 8 is used.
3) A number of recently converted readings are averaged to give a smoother read out. The averaged data is stored in BFM #5 to #8 and #13 to #16.
4) BFM #9 to #12 and #17 to #20 store the current value of the input data. This value is in units of 0.1°C or 0.1°F, but the resolution is only 0.2°C to 0.3°C or 0.36°F to 0.54°F.

Guidelines for the Safety of the User and Protection of the FX2n-4AD-PT 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 and national standards.

c) All operators of the completed equipment should be trained to use the 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.

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

1. INTRODUCTION

- The FX2n-4AD-PT analog block amplifies the input from four platinum temperature sensors (Pt 100, 3 wires, 100Ω) and converts it over 12 bit of reading's stored in the main unit. Both Centigrade (°C) and Fahrenheit (°F) can be read. Reading resolution is 0.2°C to 0.3°C. 0.36°F to 0.54°F.
- The FX2n-4AD-PT can be connected to the FX2n/FX3U/FX3UC/FX3G/FX0N/FX1N/FX2N/FX2NC Programmable Controllers (PLC).
- All data transfers and parameter setups are adjusted via software control of the FX2n-4AD-PT; by use of the TO/FROM applied instructions in the PLC.
- The FX2n-4AD-PT occupies 8 I/O points on the PLC expansion bus. The 8 I/O points can be allocated from either inputs or outputs. The FX2n-4AD-PT draws 30mA from the 9V rail of the main unit or powered extension unit.
In the program shown below, the FX2N-4AD-PT block occupies the position of special block number 2 (that is the third closest block to the PLC). The averaging amount is four. The averaged values in degrees C of input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

BFM #29 latches the error status of each channel.

BFM #29 b10 (digital range error) is used to judge whether the measured temperature is within the unit's range or not. Mitsubishi recommend that the PT 100 sensors used, should be fitted with a form of shield or screening input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

BFM #28 latches the error status of each channel.

If some form of cable protection is used, the “Shield” must be terminated at the terminals or b8 or b15. In many cases it is not possible to fit an additional shield, in which case different cables should be used.

This initial step checks that the special function blocks placed at position 2 is actually an FX2N-4AD-PT, i.e. its unit identification number is 2040 (BFM #20).

This step is optional, but it provides a software check that the system has been configured correctly.

An error can be cleared by writing b0 to BFM #28 using the TO instruction or turning off the power.

This step provides optional monitoring of the FX2N-4AD-PT Error Buffer Memory (29). If there is an Error on the FX2N-4AD-PT, bit b0 of BFM #29 will be set on.

This can be read by the program step, and output as a bit device in the PLC (TO in this example). Additional Error devices can be output in a similar manner, i.e. b10 BFM #25 (see below).

Averaging is normal.

M8000

b1 : Reserved Reserved Reserved
b2 : Power source 24V DC power supply failure. Power supply normal
b3 : Hardware error A/D converter or other hardware failure. Hardware Normal
b4 to b9 : Reserved Reserved
b10 : Digital range error Digital output/analog input value is outside the specified range.

Averaging error

Selected number of averaged results is outside the available range - see BFM #1 to #4

Averaging is normal. (between 1 to 4096)

b11 to b15 : Reserved Reserved Reserved

The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FROM instruction. This number for the FX2N-4AD-PT unit is K2040. The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

2) Buffer Memory BFM #29: Error status

3) Buffer Memory BFM #30: Identification Code

7. SYSTEM BLOCK DIAGRAM

8. EXAMPLE PROGRAM

In this example, the FX2N-4AD-PT block occupies the position of special block number 2 (that is the third closest block to the PLC). The averaging amount is four. The averaged values in degrees C of input channels CH1 to CH4 are stored respectively in data registers D0 to D3.

This initial step checks that the special function blocks placed at position 2 is actually an FX2N-4AD-PT, i.e. its unit identification number is 2040 (BFM #20).

This step is optional, but it provides a software check that the system has been configured correctly.

An error can be cleared by writing b0 to BFM #28 using the TO instruction or turning off the power.

This step provides optional monitoring of the FX2N-4AD-PT Error Buffer Memory (29). If there is an Error on the FX2N-4AD-PT, bit b0 of BFM #29 will be set on.

This can be read by the program step, and output as a bit device in the PLC (TO in this example). Additional Error devices can be output in a similar manner, i.e. b10 BFM #25 (see below).

Averaging is normal.

M8000

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Selected number of averaged results is outside the available range - see BFM #1 to #4

Averaging is normal. (between 1 to 4096)

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The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FROM instruction. This number for the FX2N-4AD-PT unit is K2040. The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

2) Buffer Memory BFM #29: Error status

3) Buffer Memory BFM #30: Identification Code

The identification code or ID number for this Special Block is read from buffer memory BFM #30 using the FROM instruction. This number for the FX2N-4AD-PT unit is K2040. The PLC can use this facility in its program to identify the special block before commencing data transfer from and to the special block.

9. DIAGNOSTICS

9.1 Preliminary checks

I. Check whether the input/output wiring and/or extension cables are properly connected on the FX2N-4AD-PT analog special function block.

II. Check that the PLC system configuration limits have not been exceeded, i.e. the number of special function blocks, and the total system I/O are within the specified range.

III. Ensure that the correct operating range has been selected for the application.

IV. Check that there is no power overload on either the 5V or 24V power sources, remember the loading on main unit or powered extension unit varies according to the number of extension blocks or special function blocks connected.

V. Make sure that the main unit has been switched to RUN.

9.2 Error checking

If the FX2N-4AD-PT special function block does not seem to operate normally, check the following items.

• Check the status of the POWER LED.

Lit : The extension cables is properly connected.

Otherwise : Check the connection of the extension cables.

• Check the external wiring.

• Check the status of the “24V” LED (top right corner of the FX2N-4AD-PT). Lit (ON) FX2N-4AD-PT is ON, 24V DC power source is ON.

Otherwise : Possible 24V DC power failure, if ON possible FX2N-4AD-PT failure.

• Check the status of the “A/D” LED (top right corner of the FX2N-4AD-PT). Lit A/D conversion is proceeding normally.

Otherwise : Check buffer memory #29 (error status). If any bits (b0, b2, b3) are ON, this is why the A/D LED is OFF.

9.1 Preliminary checks

I. Check whether the input/output wiring and/or extension cables are properly connected on the FX2N-4AD-PT analog special function block.

II. Check that the PLC system configuration limits have not been exceeded, i.e. the number of special function blocks, and the total system I/O are within the specified range.

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Otherwise : Possible 24V DC power failure, if ON possible FX2N-4AD-PT failure.

• Check the status of the “A/D” LED (top right corner of the FX2N-4AD-PT). Lit A/D conversion is proceeding normally.

Otherwise : Check buffer memory #29 (error status). If any bits (b0, b2, b3) are ON, this is why the A/D LED is OFF.

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