



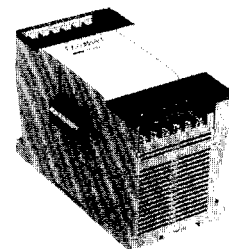
PROGRAMMABLE CONTROLLERS

MELSEC-F

**FX**

**FX-2AD-PT**

**USER'S MANUAL**



## Foreword

- This manual provides technical information on the use of the FX-2AD-PT Analog Input Block in connection with the FX programmable controller.
- Users should ensure that the details of this manual are studied and understood before attempting to install or use these units.

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# 1. INTRODUCTION

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## (1) Introduction

The FX-2AD-PT analog input block amplifies the input from two platinum temperature sensors (PT 100 3 wire, 100Ω), converts the data into a 12-bit digital reading, and transfers the results to an FX series programmable controller. Optical coupling is used to ensure that voltage surges do not damage other parts of your equipment.

## (2) Compatible Programmable Controllers

The FROM/TO instructions are used for transferring data to/from the programmable controller. Hence, versions 2.0 or subsequent versions of the FX series programmable controllers (those with serial no. of 13XXXX or larger) are required.

## (3) Unit Specifications

The FX-2AD-PT occupies 8 I/O's but does not affect the addressing of input and output relays. For the purposes of power consumption, the FX-2AD-PT unit draws 30mA from the 5v rail of the base unit.

## (4) Measuring Units

The FX-2AD-PT unit measures temperature in Centigrade (°C) to a resolution of 0.2 °C, or in Fahrenheit (°F) to a resolution of 0.36 °F.

## (5) Status Information

Information concerning the working status of the FX-2AD-PT including error messages can be sent to the programmable controller.

## (6) Suitable Sensors

3-wire, 100Ω PT100 platinum temperature sensors with the following specification are usable:

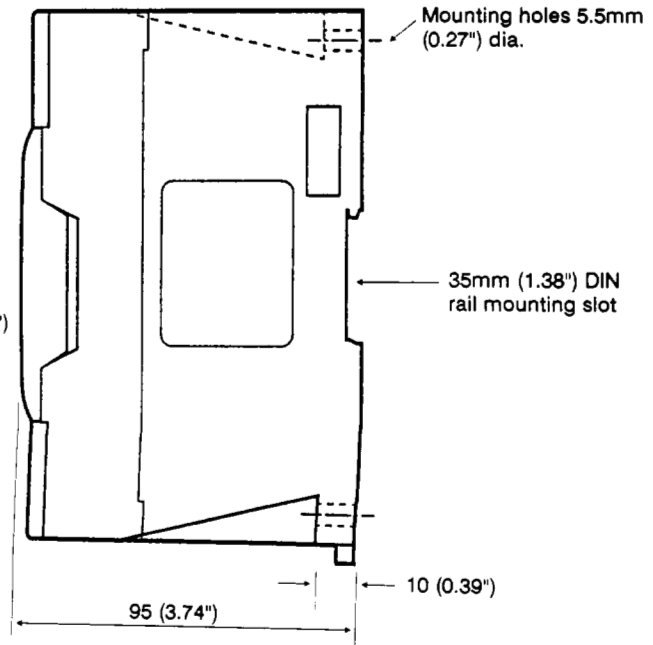
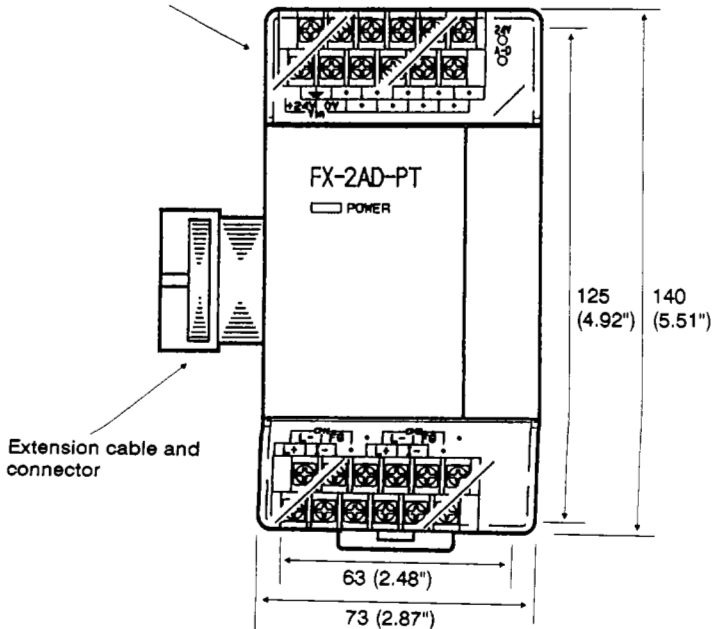
3850 PPM/°C (JIS C1604-1989)  
(DIN 43760)

## 2. CONFIGURATION AND SPECIFICATIONS

### (1) Configuration and Specifications

- Weight: Approx. 0.5 kg (1.1 lbs)
- Accessories: Self-adhesive labels for special block number identification

M3.5 (0.14") terminal screws



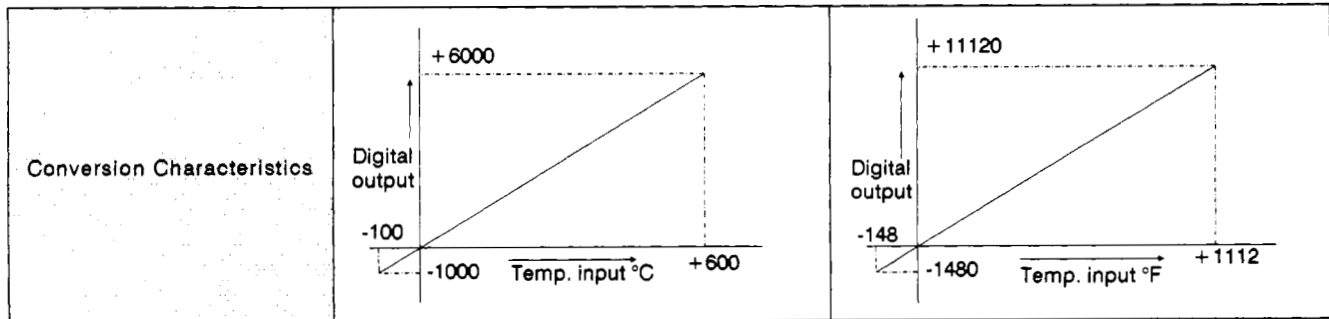
## 2. CONFIGURATION AND SPECIFICATIONS

### (2) Performance Specifications

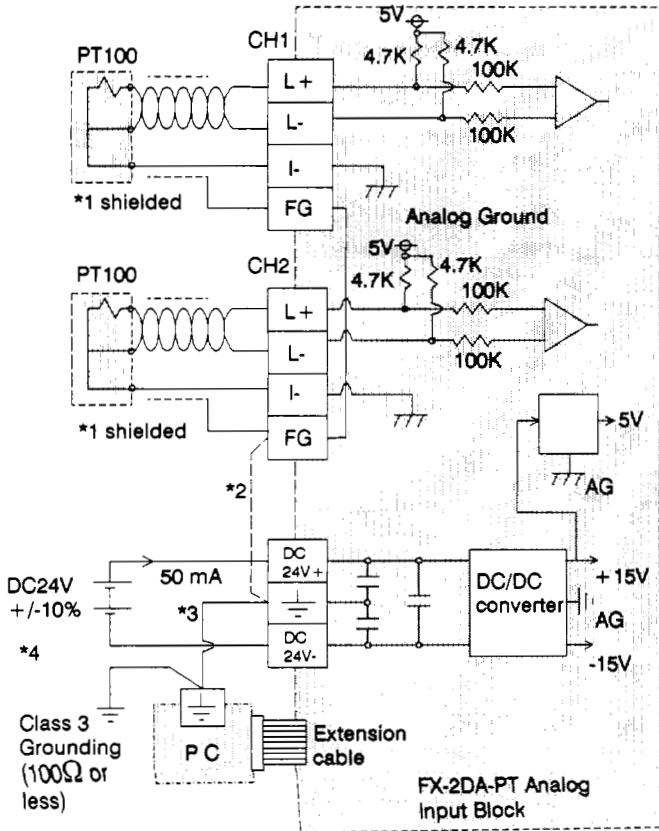
The environmental specifications for the FX-2AD-PT are the same as those for your base unit.

ITEM	CENTIGRADE	FAHRENHEIT
	Both °C and °F readings are available by reading the appropriate buffer memory area.	
Analog input signal	Platinum temperature PT100 sensors (100Ω), 3-wire, 2-channel (CH1, CH2), 3850PPM/°C (DIN 43760, JIS C1604-1989)	
Current to sensor	1mA. sensor: 100Ω PT100	
Compensated range	-100°C to +600°C	-148°F to +1112°F
Digital output	-1000 to +6000	-1480 to +11120
	12-bit conversion stored in 16-bit 2's complement form.	
Minimum resolvable temp.	0.2°C	0.36°F
Overall accuracy	+/-1% full scale (compensated range)	
Conversion speed	15 ms for 2 channels	
Isolation	Photo-coupler isolation between analog and digital circuits. DC/DC converter isolation of power from the base unit. (No isolation between inputs)	
Power consumption	DC 24V +/-10% 50mA	
I/O Occupation	8 I/O points are occupied in the software (i.e. the base unit image table). They may be regarded as either inputs or outputs. Power consumption from the base unit is 5v 30mA.	

## 2. CONFIGURATION AND SPECIFICATIONS



# 3. 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.

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

\*2 If there is electrical noise, connect the frame ground terminal (FG) with the ground terminal.

\*3 Connect the ground terminal on the FX-2AD-PT unit with the grounded terminal on the base unit. Use class 3 grounding on the base unit, if grounding is possible.

\*4 Either an external or the 24V built-in supply in the programmable controller may be used.

# 3. WIRING

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## (1) Using crimp terminations

Less than  
6.8mm (0.27 in)



Use M3.5 (0.14 in)

Less than  
6.8mm (0.27 in)



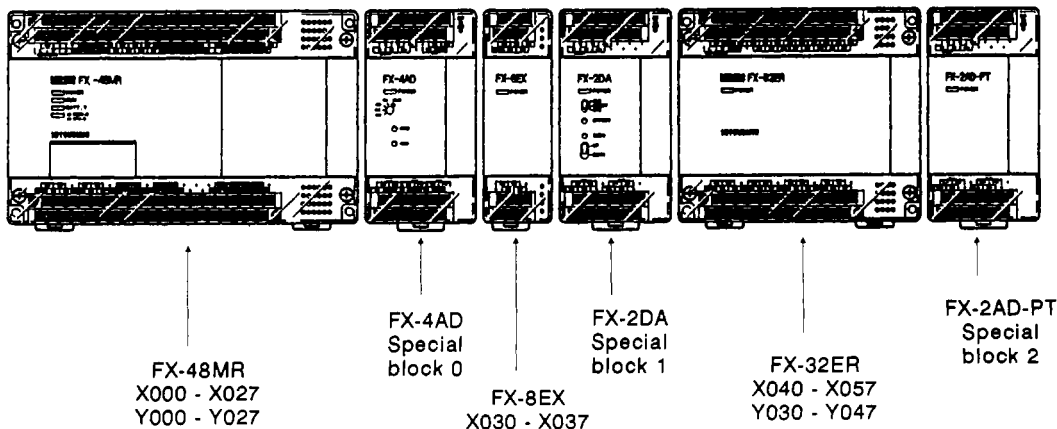
- Use crimp terminations of the type indicated on the left.
- Secure the termination using a tightening torque of between 5 and 8 kg·cm.
- Wire only to the module terminals discussed in this manual. Leave all others vacant.



# 3. WIRING

## (2) Use with other special blocks

Other special units or blocks that use FROM-TO commands, such as analog input blocks, analog output blocks and high-speed counter blocks, can be directly connected to the base unit of the FX programmable controller or to the right side of other extension blocks or units. Each special block is consecutively numbered from 0 to 7 beginning from the one closest to the base unit. A maximum of eight special blocks can be connected.



## 4. BUFFER MEMORY ASSIGNMENT

The FX-2AD-PT analog input unit transfers data with the programmable controller through its buffer memory (16-bit, 32-point RAM).

BFM	
#0	Reserved
*#1	Number of samples for averaging CH1 (1 to 4096) Default = 8
*#2	Number of samples for averaging CH2 (1 to 4096) Default = 8
#5	CH1 Averaged temperature in 0.1°C units
#6	CH2 Averaged temperature in 0.1°C units
#9	CH1 temperature - present value in 0.1°C units
#10	CH2 temperature - present value in 0.1°C units
#13	CH1 Averaged temperature in 0.1°F units
#14	CH2 temperature in 0.1°F units
#17	CH1 temperature - present value in 0.1°F units
#18	CH2 temperature - present value in 0.1°F units
#19 - #28	Cannot be used
#29	Error status (see page 10)
#30	Identification code K2020 (see page 11)
#31	Cannot be used

BFMs #0, #3, #4, #7, #8, #11, #12, #15, #16, #19 to #28, and #31 cannot be used.

For BFM's without the "\*" mark, data can be read to the programmable controller using the FROM command.

In BFM's (buffer memory) marked with an "\*", data can be written from the programmable controller using the TO command.

## **4. BUFFER MEMORY ASSIGNMENT**

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- (1) BFMs #9, #10 and #17, #18 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 or 0.36°F.
- (2) A number of recently converted readings are averaged to give a smooth read out and the averaged data is stored in BFMs #5, #6, and #13, #14.
- (3) Number of samples to be averaged are assigned in BFMs #1 and #2. Only the range 1 to 4096 is valid. Values outside this range are ignored and the default value of 8 is used.

## 5. STATUS INFORMATION

### Status information Buffer Memory BFM #29

Bit	ON	OFF
b0: Error	When any of b1 to b4 is ON A/D conversion is stopped for the error channel	No error
b1: Not used	Not used	Not used
b2: Power source abnormal	DC 24V power supply failure	Power supply normal
b3: Hardware error	A/D converter or other hardware failure	Hardware normal
b4: Program error	Incorrect installation or FROM/TO command misused (BFM data error)	No error
b5 to b9: Not used	Not used	Not used
b10: Digital range error	Digital output / analog input value is out- side the specified range.	Digital output value is normal.
b11: Averaging error	Averaging is 4097 or more or 0 or less (default of 8 will be used).	Averaging is normal. (between 1 and 4096)
b12 to 15: Not used	Not used	Not used

## **5. STATUS INFORMATION**

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### **(1) Identification Code Buffer Memory BFM #30**

The identification code number for a Special Block is read from buffer memory BFM #30 using the FROM command.

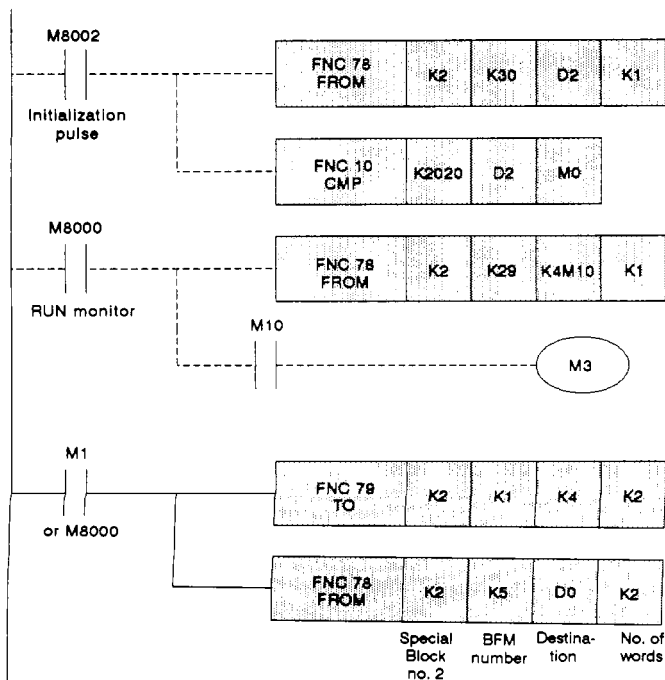
This number for the FX-2AD-PT unit is K2020.

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

# 6. OPERATION PROCEDURE

## Example Program

In the program shown below, the FX-2AD-PT block occupies the position of special block number 2 (that is the third closest block to the programmable controller). The averaging amount is four. The averaged values in degrees C of input channels CH1 and CH2 are stored respectively in data registers D0 and D1.



Block No.2 BFM #30 → (D2)  
Identification code

When (K2020) = (D2), M1 = ON. i.e. When identification code is K2020, M1 = ON.

Block No.2 BFM #29 → (K4M10)  
Transfer the error status to (M25 to M10).  
When error is found, M10 = ON.

Error found

(K4) → (BFM #1) , (K4) → (BFM #2)  
Sampling time is changed to four on both CH1 and CH2.

(BFM #5) → (D0) , (BFM #60) → (D1)  
Transfer the averaged temperature value in °C to the data registers.

# 6. OPERATION PROCEDURE

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## (1) Standard Operation

1. Check that the analog input cable, power line, and extension cable for the FX-2AD-PT are all properly connected.
2. 5v 30mA is supplied from the base or extension units for the FX-2AD-PT. Check that there is no power overload caused by this and other special blocks.
3. When DC 24V power is supplied from the base and extension units of the programmable controller, check that the current is below the allowable limit (this varies according to the number of extension blocks connected).
4. Put the programmable controller into RUN mode.

## (2) Troubleshooting

The following LEDs on the front cover of the FX-2AD-PT can help you troubleshoot the unit.

### (a) The POWER LED

This lights up when 5V power is supplied from the programmable controller. If it is not lit, check to see if the extension cable is properly connected.

### (b) The 24V LED

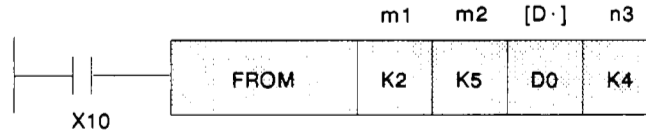
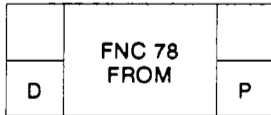
This lights up when DC 24V power is supplied to the FX-2AD-PT. If it is not lit, even if DC 24V  $\pm$  10% is being supplied, failure of the FX-2AD-PT unit may have occurred.

### (c) The A-D LED

This lights up when A/D conversion is proceeding normally. If any of b2 to b4 of buffer memory #29 (error status) is ON, this LED turns OFF.

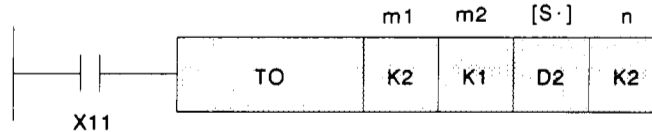
# 7. FROM/TO COMMANDS

## (1) FROM/TO Commands Explained



BFM #6, #5 in special block No. 2 are transferred to D1, D0.

- m1: Special function unit or block number. These are numbered consecutively from K0 to K7 starting from the one closest to the base unit.
- m2: Buffer memory head address. (m2 = K0 to K31)
- [D·]: Transfer destination head address. T,C,D, KnM, KnY, KnS, V or Z can be specified. This argument can be used with an index register.
- n: The number of words to be transferred (n = K1 to K32)



D3, D2 transferred to special block No. 0 BFM#2, #1.

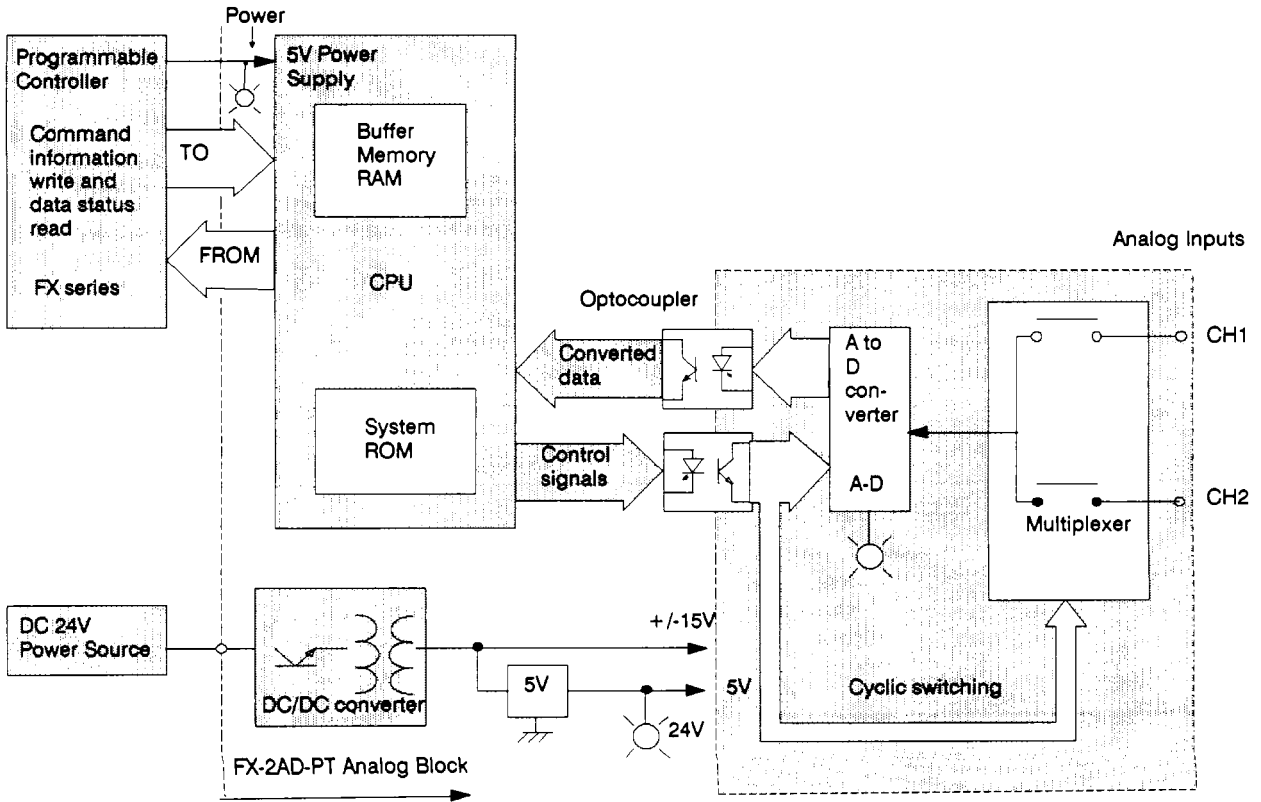
- m1, m2, n: The same as above.
- [S·]: Transfer destination head address. T, C, D, KnX, KnY, KnM, KnS, V, Z, K or H can be specified. This argument can be used with an index register.

*Note* ●When X10 or X11 is OFF, transfer is disabled.



# 8. REFERENCE

## (1) System Block Diagram



## Revisions

EDITION DATE	MANUAL NUMBER	REVISION
Jun. 1991	JY992D28501A	First edition
Apr. 1992	JY992D28501B	<p>P.8 BFM number            #3, #4, #7, #8, #11, #12,            #15 and #16 are added.            #11 → #19</p> <p>In Table            #3 → #5            #4 → #6            #5 → #9            #6 → #10            #7 → #13          #8 → #14            #9 → #17          #10 → #18            #11 → #19</p> <p>P.9 #7, #8 → #13, #14.</p>
Jan. 1993	JY992D28501C	TEXT : Pages 1, 3, 7, 8, 13

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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 applications of this equipment, you must satisfy yourself as to its suitability for your specific application.



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