http://www.delta.com.tw/products/plc.asp

2004-12-16

5011624501-4PE1

DVP-EH DVP04PT-H Platinum Temperature Sensors Instruction Sheet

1 WARNING

⚠ Please carefully read this instruction thoroughly prior to use the DVP04PT-H.

⚠ In order to prevent electric shock, do not touch the terminals or conduct any maintenance while power to the PLC is ON. Do NOT open the PLC. Only qualified personel or Delta staff is allowed to conduct any internal electrical work on the PLC.

⚠ This is an OPEN-TYPE device, and was certified to meet the IEC 61131-2 (UL 508) safety requirements when installed in an enclosure.

⚠ The DVP04PT-H must be kept under the environment away from high temperatures, high humidity, exceessive vibration, corrosive gases, liquids, airborne dust, and metallic particles.

⚠ Do not apply AC power to any of the input/output terminals, or it may damage the DVP04PT-H.

⚠ Make sure that the DVP04PT-H is properly grounded ⏚, to prevent any electromagnetic noise.

⚠ Use wires with resistance when connect the platinum resistance thermister (RTD) to PLC.

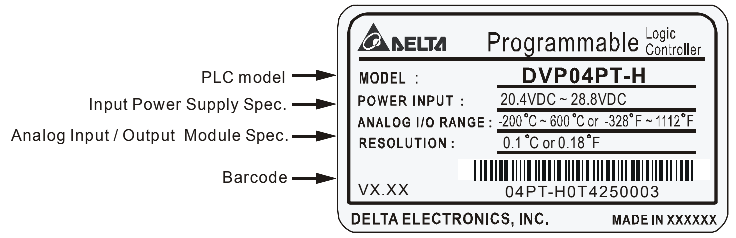
⚠ Please keep the wires as short as possible when connecting the RTD to PLC, and keep power wires as far away as possible from I/O wires to prevent noise interference.

2 INTRODUCTION

2.1 Model Explanation and Peripherals

- Thank you for choosing DELTA DVP PLC Series. DVP04PT-H allows the connection of four platinum temperature sensors (PT100 3-WIRE 100Ω 3850 PPM/°C (DIN 43760 JIS C1604-1989)). The DVP-PLC EH MPU converts the sensors input into a 14 bit digital signal, and then be manipulated by using TO and FROM instructions in the ladder logic program. There are 49 Controlled Registers (CR, each register has 16 bits) in each module.
- Software version DVP04PT-H platinum temperature sensors can be updated via RS-485 communication.
- DVP04PT-H displays both Centigrade and Fahrenheit. The input resolution for Centigrade is 0.1 degrees and for Fahrenheit is 0.18 degrees.

■ Nameplate Explanation


PLC model
Input Power Supply Spec.
Analog Input / Output Module Spec.
Barcode

DELTA Programmable Logic Controller

MODEL : DVP04PT-H

POWER INPUT : 20.4VDC ~ 28.8VDC

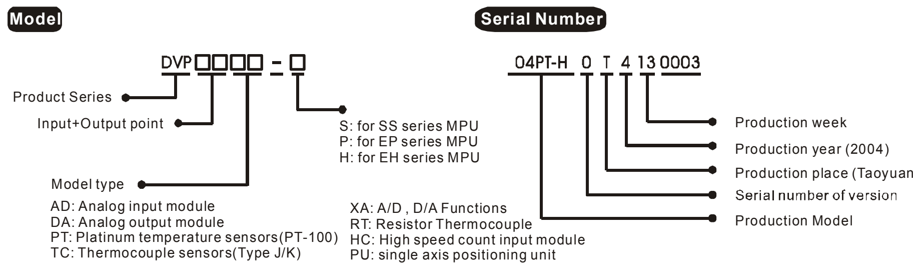
ANALOG I/O RANGE : -200°C ~ 600°C or -328°F ~ 1112°F

RESOLUTION : 0.1°C or 0.18°F

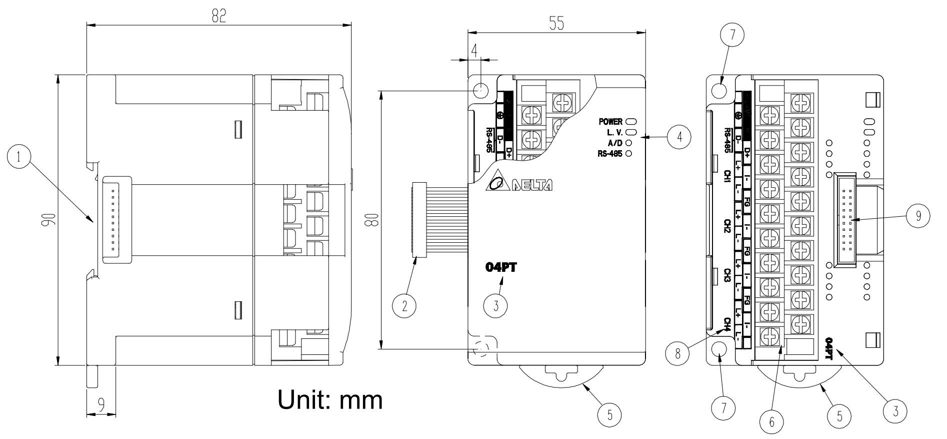
VX.XX 04PT-H0T4250003

DELTA ELECTRONICS, INC. MADE IN XXXXXX

■ Model Explanation

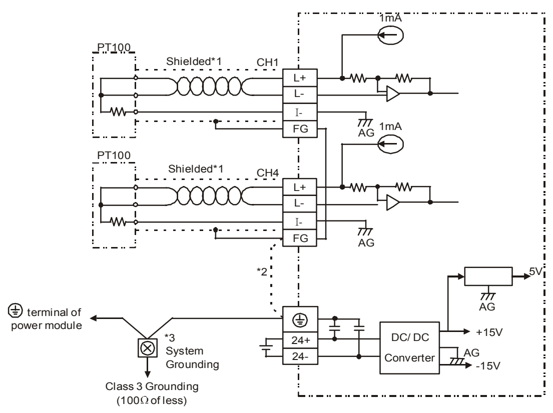


2.2 Product Profile and Outline



1. DIN rail track (35mm)	6. Terminals
2. Mounting hole for wire to connect extension unit/extension module	7. Mounting hole
3. Model name	8. Terminal layout
4. Indicator for power, error and run status	9. Mounting port to connect extension unit/extension module
5. DIN rail clip	

2.3 External wiring



Note 1: Use only the wires that are packed with the temperature sensor (PT 100) for analog input and separate from other power line or any wire that may cause noise. Please use 3wire for PT 100.

Note 2: Terminal FG is a ground location for noise suppression.

Note 3: Please connect ⏚ power supply module terminal and ⏚ DVP04PT-H platinum temperature sensors module terminal to system earth ground or connect it to machine cover.

Warning: DO NOT connect wires to the No Connection (●) terminals.

3 STANDARD SPECIFICATIONS

3.1 Function Specifications

Platinum Temperature Module (04PT)	Centigrade (°C)	Fahrenheit (°F)
Power supply voltage	24 VDC (20.4VDC~28.8VDC) (–15%~+20%)	
Analog input channel	4 channels per module	
Sensors type	3-WIRE PT100Ω 3850 PPM/°C(DIN 43760 JIS C1604-1989)	
Current excitation	1mA	
Temperature input range	-200°C~600°C	-328°F~1112°F
Digital conversion range	K-2000~K6000	K-3280~K11120
Resolution	14 bits (0.1°C)	14 bits (0.18°F)
Overall accuracy	±0.5% of full scale of 25°C(77°F), ±1% of full scale during 0~55°C (32~131°F)	
Response time	200 ms × channels	
Isolation Method	Isolation between digital and analog circuitry. But no isolation between channels.	
Digital data format	2's complement of 16-bit, (13 Significant Bits)	
Average function	Yes (CR#2~CR#5 may be set and the range is K1~K4096)	
Self diagnostic function	Upper bound and lower bound detection per channel	
Communication mode (RS-485)	Yes, either ASCII or RTU modes, communication rate can be 4800 /9600 /19200 /38400 /57600 /115200. Communication format of ASCII mode is 7Bit, even bit, 1 stop bit of (7 E 1). Communication format of RTU mode is 8Bit, even bit, 1 stop bit (8 E 1). When connecting to PLC MPU in series, RS-485 can't be used. The RS-485 is disabled when the DVP04PT-H is connected in series to an MPU (use the RS485 on MPU).	
Connection to a DVP-PLC MPU in series	When DVP04PT-H modules are connected to an MPU, the modules are numbered from 0 – 7. 0 is the closest and 7 is the furthest to the MPU. 8 modules is the max and they do not occupy any digital I/O points of the MPU.	

3.2 Other Specification

Power Specification	
Maximum Power Consumption	2W at 24 VDC (20.4VDC~28.8VDC) (-15 % ~ + 20%)

Environment Condition	
Environment Condition	Follow the DVP-PLC MPU.
Static Electricity Prevention	All places between terminals and ground comply with the spec

4 CR (CONTROLLED REGISTER)

DVP04PT-H platinum temperature sensors					Explanation
CR No.	RS-485 Parameter address	Latched		Register name	b15 b14 b13 b12 b11 b10 b9 b8 b7 b6 b5 b4 b3 b2 b1 b0
#0	H 4064	○	R	Model type	System used, data length is 8bits (b7~b0). DVP04PT-H model code = H 0402
#1				Reserved	
#2	H 4066	○	R/W	CH1 average number	The number piece of readings used for the calculation of "average" temperature on channels CH1~CH4. Setting range is K1~K4096 and factory setting is K10.
#3	H 4067	○	R/W	CH2 average number	
#4	H 4068	○	R/W	CH3 average number	
#5	H 4069	○	R/W	CH4 average number	
#6	H 406A	╳	R	CH1 average degrees(°C)	Average degrees for channels CH1~CH4. (unit: 0.1 degrees C)
#7	H 406B	╳	R	CH2 average degrees(°C)	
#8	H 406C	╳	R	CH3 average degrees(°C)	
#9	H 406D	╳	R	CH4 average degrees(°C)	
#10~ #11				Reserved	
#12	H 4070	╳	R	CH1 average degrees(°F)	Average degrees for channels CH1~CH4. (unit: 0.1 degrees F)
#13	H 4071	╳	R	CH2 average degrees(°F)	
#14	H 4072	╳	R	CH3 average degrees(°F)	
#15	H 4073	╳	R	CH4 average degrees(°F)	
#16~ #17				Reserved	
#18	H 4076	╳	R	Present temperature of CH1 (°C)	Present temperature of channels CH1~CH4. (unit: 0.1 degrees C)
#19	H 4077	╳	R	Present temperature of CH2 (°C)	
#20	H 4078	╳	R	Present temperature of CH3 (°C)	
#21	H 4079	╳	R	Present temperature of CH4 (°C)	
#22~ #23				Reserved	
#24	H 407C	╳	R	Present temperature of CH1 (°F)	Present temperature of channels CH1~CH4. (unit: 0.1degrees F)
#25	H 407D	╳	R	Present temperature of CH2 (°F)	
#26	H 407E	╳	R	Present temperature of CH3 (°F)	
#27	H 407F	╳	R	Present temperature of CH4 (°F)	
#28~ #29				Reserved	
#30	H 4082	╳	R	Error status	Data register stores the error status. Refer to the fault code chart for details.
#31	H 4083	○	R/W	Communication address setting	RS-485 communication address. Setting range is 01~255 and factory setting is K1
#32	H 4084	○	R/W	Communication baud rate setting	Communication baud rate (4800, 9600, 19200, 38400, 57600 and 115200 bps). Communication format: ASCII mode is 7Bit, even bit, 1 stop bit (7 E 1). Communication format of RTU mode is 8Bit, even bit, 1 stop bit (8 E 1). b0: 4800 bps (bit/sec). b1: 9600 bps (bit/sec). (factory setting) b2: 19200 bps (bit/sec). b3: 38400 bps (bit/sec). b4: 57600 bps (bit/sec). b5: 115200 bps (bit/sec). b6~b13: Reserved. b14: switch between low bit and high bit of CRC code (RTU mode only) b15: RTU mode.
#33	H 4085	○	R/W	Reset to factory setting	b15 b14 b13 b12: Definition of ERR LED; b11 b10 b9: CH4; b8 b7 b6: CH3; b5 b4 b3: CH2; b2 b1 b0: CH1 Example: Setting of CH1 1. b0 Reserved 2. b1 Reserved 3. b2: Set to 1 and PLC will be reset to factory settings. Definition of ERR LED: b12~b15=1111(factory settings) 1. b12 corresponds to CH1: when b12=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 2. b13 corresponds to CH2: when b13=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 3. b14 corresponds to CH3: when b14=1, scale exceeds the range or external contact has no connection, ERR LED flashes. 4. b15 corresponds to CH4: when b15=1, scale exceeds the range or external contact has no connection, ERR LED flashes.
#34	H 4086	○	R	Software version	Display software version in hexadecimal. Example: H 010A = version 1.0A.
#35~#48				System used	

○ means latched.
╳ means not latched.
R means read data by using FROM instruction or RS-485.
W means write data by using TO instruction or RS-485.

Explanation:

1. CR#0: The PLC model type.
2. CR#1, CR#10, CR#11, CR#16, CR#17, CR#22, CR#23, CR#28, CR#29 are reserved.
3. CR#2 ~ CR#5: Used to set the number piece of input readings used for the average temperature calculation. The available range is K1~K4096 and factory setting is K10.
4. CR#6 to CR#9: The average temperature (°C). Temperature is calculated by averaging multiple pieces temperature readings. Example: If CR#2 is 10, the temperature in CR#6 will be the average of the last 10 readings on CH1.
5. CR#12 to CR#15: The average temperature (°C). Temperature is calculated by averaging multiple pieces temperature readings. Example: If CR#2 is 10, the temperature in CR#12 will be the average of the last 10 readings on CH1.
6. CR#18 ~ CR#21: display the present temperature (°C) of CH1~CH4 input signal.

7. CR#24 ~ CR#27: display the present temperature (°F) of CH1~CH4 input signal.
8. CR#30 is the fault code register. Refer to the chart below.

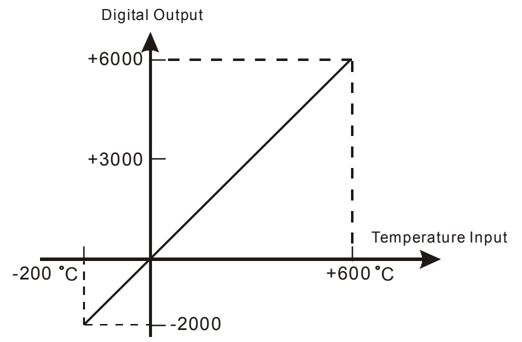
Fault description	Content	b15~b8	b7	b6	b5	b4	b3	b2	b1	b0
Power source abnormal	K1(H1)	Reserved	0	0	0	0	0	0	0	1
Analog input value error	K2(H2)		0	0	0	0	0	0	1	0
Setting mode error	K4(H4)		0	0	0	0	0	1	0	0
Offset/Gain error	K8(H8)		0	0	0	0	1	0	0	0
Hardware malfunction	K16(H10)		0	0	0	1	0	0	0	0
Digital range error	K32(H20)		0	0	1	0	0	0	0	0
Average times setting error	K64(H40)		0	1	0	0	0	0	0	0
Instruction error	K128(H80)		1	0	0	0	0	0	0	0
Note: Each fault code has the corresponding bit (b0~b7). Two or more faults may happen at the same time. 0 means normal and 1 means fault happened.										

9. CR#31: RS-485 communication address. Setting range is 01~255 and factory setting is K1.
10. CR#32: RS-485 communication baud rate: 4800, 9600, 19200, 38400, 57600 and 115200. b0:4800bps, b1:9600bps (factory setting), b2:19200bps, b3:38400 bps, b4:57600 bps, b5:115200 bps, b6~b13: Reserved, b14: switch between low bit and high bit of CRC code (only for RTU mode) b15=0: ASCII mode, b15=1: RTU mode. Communication format for ASCII mode is 7Bit, even bit, 1 stop bit (7 E 1), while for RTU mode is 8Bit, even bit, 1 stop bit (8 E 1).
11. CR#33: b0~b11: Used to reset the settings of CH1~CH4 to factory defaults.

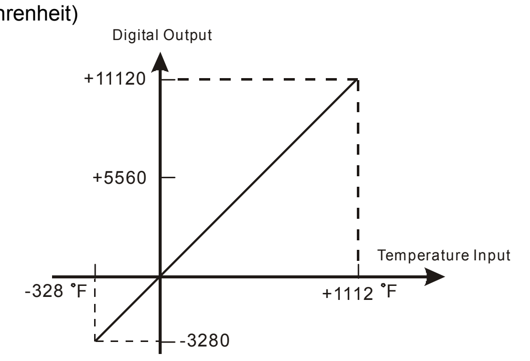
    b12~b15: defined the ERR LED, factory setting is b12~b15=1111.
12. CR#34: software version.
13. CR#35~ CR#48: Reserved for internal system use.
14. The corresponding parameters address H4064~H4095 of CR#0~CR#48 are provided for users to read/write data via RS-485 communication.
    A. Baud rate can be 4800, 9600, 19200, 38400, 57600, 115200bps.
    B. MODBUS communication protocol can be either ASCII or RTU mode. Communication format for ASCII mode is 7Bit, even bit, 1 stop bit (7 E 1), while for RTU mode is 8Bit, even bit, 1 stop bit (8 E 1).
    C. Function code: 03H read data from register.
       06H write 1pcs WORD into register.
       10H write multiple WORD into register.

5 TEMPERATURE/DIGITAL CHARACTERISTIC CURVE

Temperature mode: (Centigrade)



Temperature mode: (Fahrenheit)

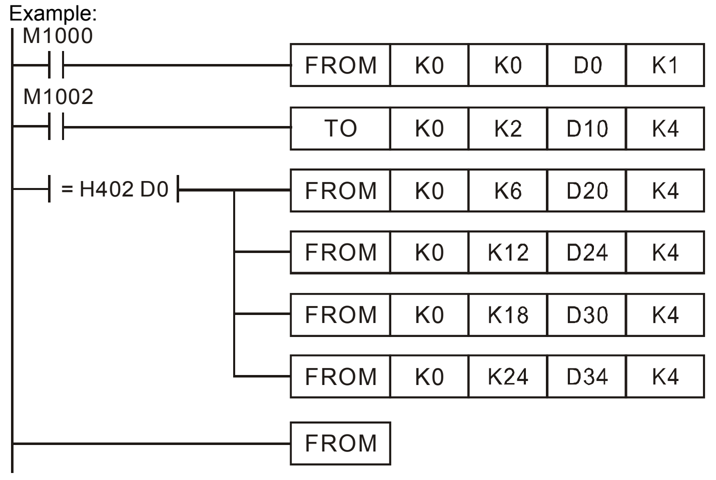


6 INITIAL PLC START-UP

- LED display:
  1. Upon power-up, the ERROR LED will light on for 0.5 seconds the POWER LED will light on continuously.
  2. POWER LED on and ERROR LED off means No Error.

     Low Voltage error (lower than 19.5V), ERROR LED will blink continuously till the power supply goes above 19.5V.
  3. DVP04PT-H is connected to PLC MPU in series = RUN LED on MPU will be lit and A/D LED or D/A LED should blink.
  4. After receiving the first RS-485 instruction the A/D LED or D/A LED will blink.
  5. If the input or output exceeds the upper or lower bounds, then the ERROR LED will blink.

- Example:



Explanation:

- Read the model type of extension module K0 (should be H0402 for DVP04PT-H model type).
- The average values of CH1~CH4 saved in D10~D13 are written into CR#2~CR#5.
- For DVP04PT-H model. The read average temperature (°C) of CH1~CH4 (4 data) from CR#6~CR#9 and saved to D20~D23.
- The read average temperature (°F) of CH1~CH4 (4 data) from CR#12~CR#15 and saved into D24~D27.
- The read present temperature (°C) of CH1~CH4 (4 data) from CR#18~CR#21 and saved into D30~D33.
- The read present temperature (°F) of CH1~CH4 (4 data) from CR#24~CR#27 and saved into D34~D37.

7 RELATED INSTRUCTIONS EXPLANATION

API						Applicable model		
78	D	FROM	P	m1 m2 D n	Read special module CR data	ES	EP	EH
						✓	✓	✓

	Bit device				Word device										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	E	F
m_1					*	*									
m_2					*	*									
D								*	*	*	*	*	*	*	*
n					*	*									

- Note: The usage range of operand m_1 is 0~7.
  The usage range of operand m_2: ES/EP: 0-48, EH: 0-254.
  The usage range of operand n: ES/EP: n= 1~(49-m2), EH: 1~(255-m2).
  ES series model doesn't support pulse execution instruction (FROMP, DFROMP).

16-bit instruction (9 STEPS)

FROM	Continuous execution	FROMP	Pulse execution

32-bit instruction (17 STEPS)

DFROM	Continuous execution	DFROMP	Pulse execution

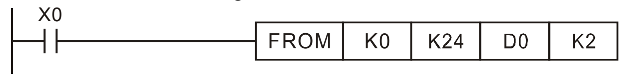
- Flag: When M1083 On, it allows to enable interrupt during FROM/TO. Refer to the below for detail.

Command Explanation

- m1: the module number you are probing. m2: the number of Controlled Registers to be read. D: the data register location for storing data. n: the number of CRs to read at one time.
- DVP-series PLC uses this instruction to read CR data of each special module.
- D: When assigning bit operand, K1~K4 are used for 16-bit and K5~K8 are used for 32-bit.
- Please refer the following footnote for calculating of special module number.

Program Example

- Read the content of CR#24 and CR#25 of module#0 and save it into D0 and D1 when n=2.
- Instruction will be executed when X0=ON. However, nothing will occur and the stored data has no change when X0=OFF.



API						Applicable model		
79	D	TO	P	m1 m2 S n	Special module CR data write	ES	EP	EH
						✓	✓	✓

	Bit device				Word device										
	X	Y	M	S	K	H	KnX	KnY	KnM	KnS	T	C	D	E	F
m_1					*	*									
m_2					*	*									
S					*	*	*	*	*	*	*	*	*	*	*
n					*	*									

- Note: The usage range of operand m_1 is 0~7.
  The usage range of operand m_2: ES/EP: 0-48, EH: 0-254.
  The usage range of operand n: ES/EP: n= 1~(49-m2), EH: 1~(255-m2).
  ES series does not support pulse execution instruction (TOP, DTOP)

16-bit instruction (9 STEPS)

TO	Continuous execution	TOP	Pulse execution

32-bit instruction (17 STEPS)

DTO	Continuous execution	DTOP	Pulse execution

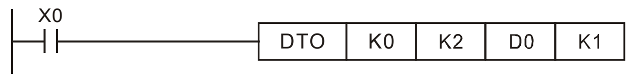
- Flag: When M1083=On, it allows to insert interrupt during FROM/TO. Refer to following for detail.

Command Explanation

- m1: the module number you are probing. m2: the number of Controlled Registers to be written to. S: the data to write. n: the number of CR to be written to in one time.
- DVP-series PLC uses this instruction to write data to Controlled Registers of special modules.
- S: When assign the bit operand, K1~K4 are used for 16-bit and K5~K8 are used for 32-bit.

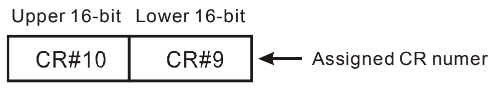
Program Example

- Using the 32-bit instruction DTO. The program will write D11 and D10 into CR#3 and CR#2 of special module#0. DTO only allows one group of data to be written at a time (n=1).
- The instruction is executed when X0=ON. Nothing will occur and the stored data will have no change when X0=OFF.

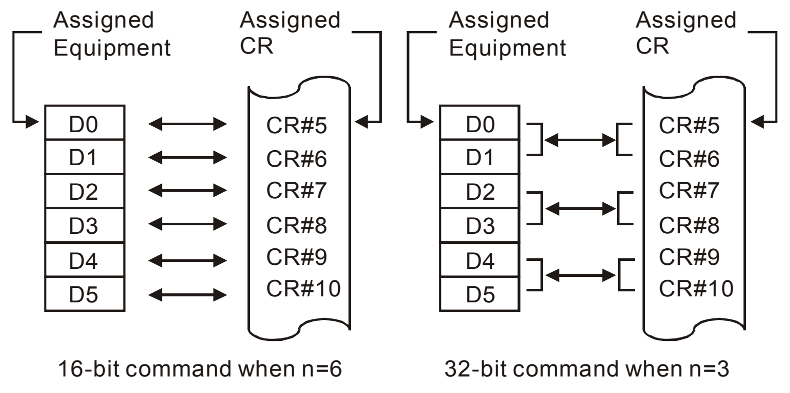


Footnote

- The rules for adding multiple special modules to a Main Processing Unit:
  - m1: The maximum number of special modules attached to an MPU is 8. The module closest to the MPU is 0 and the module furthest from the MPU is 7.
  - m2: The number of Controlled Registers (CR) built in is 49. (#0~#48).
  - FROM/TO instruction read/write one CR at a time, while DFROM/DTO instruction read/write two CR at a time. Example below:



(Access16-bit if n=2, or 32-bit if n=1. Same controlled registers are accessed).



- In ES series models, flag M1083 is not provided. When FROM/TO instruction is executed, all interrupts (including external or internal interrupt subroutines) will be disabled. All interrupts will be executed after FROM/TO instruction is completed. Besides, FROM/TO instruction also can be executed in the interrupt subroutine.
- The function of the flag M1083 (FROM/TO mode exchange) provided in EP/EH series models:
  a. When M1083=Off, all interrupts (including external or internal interrupt subroutines) will be disabled when FROM/TO instruction is executed. The Interrupts will resumed after FROM/TO instruction complete. Please be advised FROM/TO instruction can be executed in the interrupt subroutine.
  b. When M1083=On, if an interrupt enable occurs while FROM/TO instruction are executing, the interrupt FROM/TO instruction will be blocked till the requested interrupt finish. Unlike M1080 off situation, FROM/TO instruction cannot be executed in the interrupt subroutine.