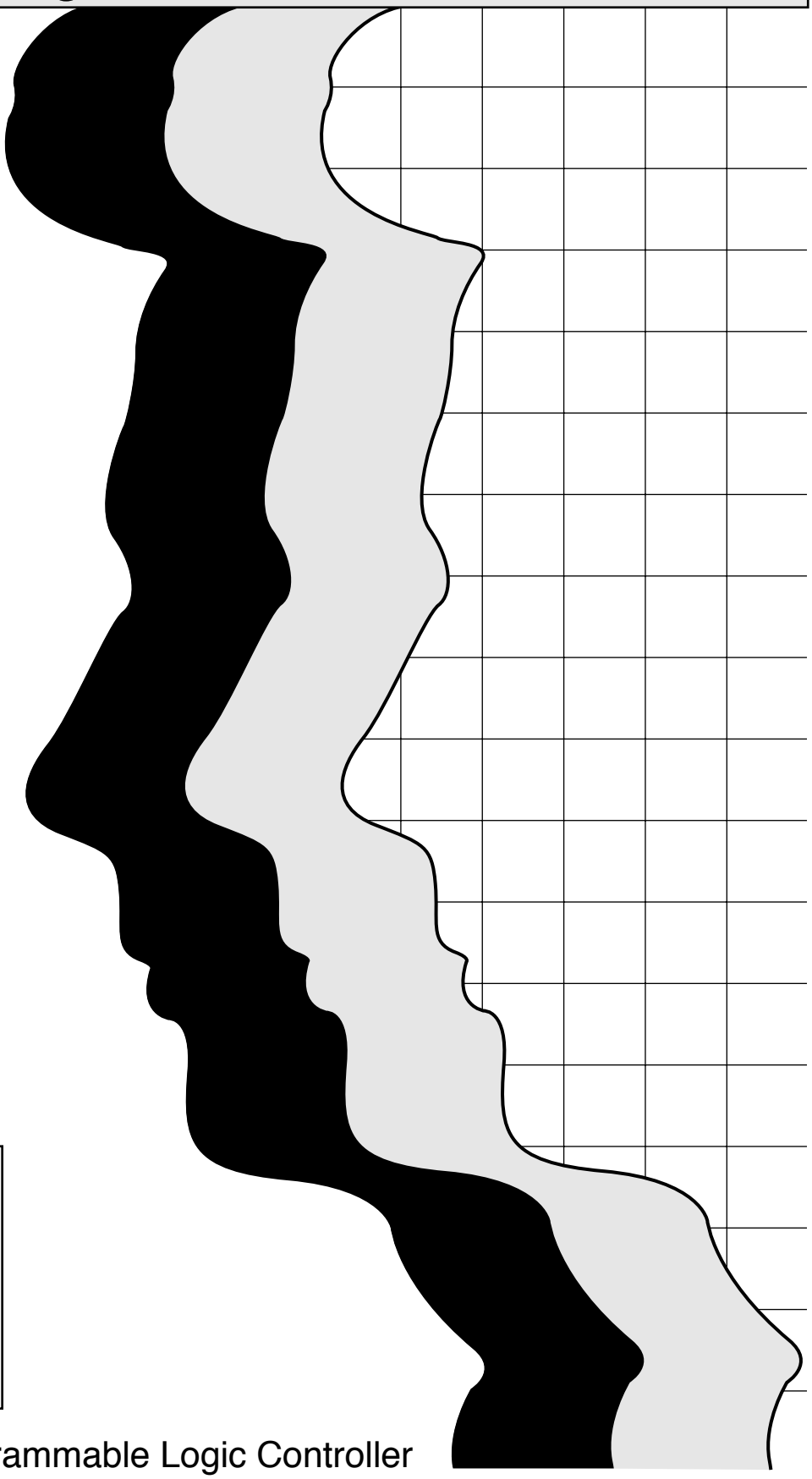
MITSUBISHI

Type AnACPU/AnUCPU (AD57 control Instructions)

Programming Manual



A

MELSEC

Mitsubishi Programmable Logic Controller

SAFETY CAUTIONS

(You must read these cautions before using the product)

In connection with the use of this product, in addition to carefully reading both this manual and the related manuals indicated in this manual, it is also essential to pay due attention to safety and handle the product correctly.

The safety cautions given here apply to this product in isolation. For information on the safety of the PC system as a whole, refer to the CPU module User's Manual.

Store this manual carefully in a place where it is accessible for reference whenever necessary, and forward a copy of the manual to the end user.

INTRODUCTION

Thank you for choosing the Mitsubishi MELSEC-A Series of General Purpose Programmable Controllers. Please read this manual carefully so that the equipment is used to its optimum. A copy of this manual should be forwarded to the end User.

REVISIONS

※The manual number is given on the bottom left of the back cover.

Print Date	*Manual Number	Revision
Oct., 1990	IB (NA) 66257-A	First edition
Aug., 1993	IB (NA) 66257-B	Changes made to manual by adding supplement: A2U(S1)/A3U/A4UCPU. Old manual name: A2A(S1)/A3ACPU (AD57 instructions) New manual name: AnACPU/AnUCPU (AD57 control instructions) Correction CONTENTS, Section 1, 1.1, 2, 3.1, 4, 4.3, 5, 5.2, 5.3, 6.1, 6.1.1, 6.5.11, 7.1, 8.2, APP.1 Addition Section 1.2, 8.3, APP.2
Dec., 2003	IB (NA) 66257-C	Correction SAFETY PRECAUTIONS, Capter 1, Section 8.2, 8.3 Addition WARRANTY

CONTENTS

1. INTRODUCTION

This manual describes sequence program instructions used to control the AD57(S1)/AD58 CRT/LCD controllers with the following CPUs.

- A2ACPU(S1), A3ACUP (hereafter called the AnACPU)
- A2UCPU(S1), A3UCPU, A4UCPU (hereafter called the AnUCPU)

Because the AnACPU/AnUCPU support the instructions to be used for the AD57(S1)/AD58 as standard instructions, these CPUs can use the AD57(S1)/AD58 without merging microcomputer program packages for the AD57.

POINT

(1) An AD57S2 monitor display controller cannot be used with an AnACPU/AnUCPU.

(2) To control an AD57(S1)/AD58, create the canvas ROM and character generator ROM using the SW1GP-AD57P system floppy disk and install them in the AD57(S1)/AD58.
For the procedure to create a canvas ROM and character generator ROM, refer to the SW1GP-AD57P Operating Manual.

When controlling the AD57(S1)/AD58, use character string processing instructions described in the AnACPU/AnUCPU Programming Manual (Dedicated Instructions). This allows displaying of data on the screen, reading/storing the displayed data, and other similar operations to be performed easily.

When using an AnACPU/AnUCPU, refer to the manuals among those listed below that are relevant.

[Reference Manuals]

(a) For details on instructions other than those covered in this manual:
- ACPU Programming Manual (Fundamentals) IB-66249
- ACPU Programming Manual (Common instructions) IB-66250
- AnACPU/AnUCPU Programming Manual (Dedicated instructions) IB-66251
- AnACPU/AnUCPU Programming Manual (AD57 control instructions) IB-66257

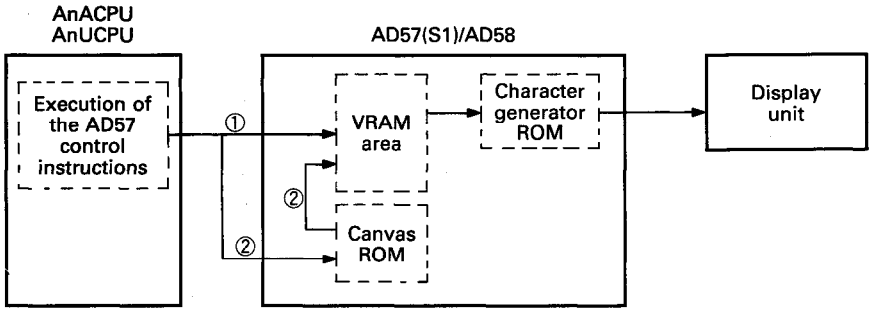
(b) For details on the AnACPU/AnUCPU:
- A2A(S1)/A3ACPU User's Manual (Hardware) IB-66255
- A2A(S1)/A3ACPU User's Manual (Control functions) IB-66256
- A2U(S1)/A3U/A4UCPU User's Manual IB-66436

(c) For details on operating peripheral device
1) When using an A6GPP/A6PHP:
- SW4GP-GPPA Operating Manual IB-66259

2) When using an IBM PC/AT or 100% compatible PC:
- SW0IX-GPPAE Operating Manual IB-66314

1.1 Displaying Characters

How characters are displayed on the display unit connected to the AD57(S1)/AD58.



By writing the characters to be displayed to the AD57(S1)/AD58 VRAM area, these characters are displayed automatically on the display unit.

To display characters on the display unit connected to the AD57(S1)/AD58 using an AnACPU/AnUCPU, use the AD57 control instructions.

By executing the AD57 control instructions, designate data is written to the VRAM area of AD57(S1)/AD58. (① in the above illustration)

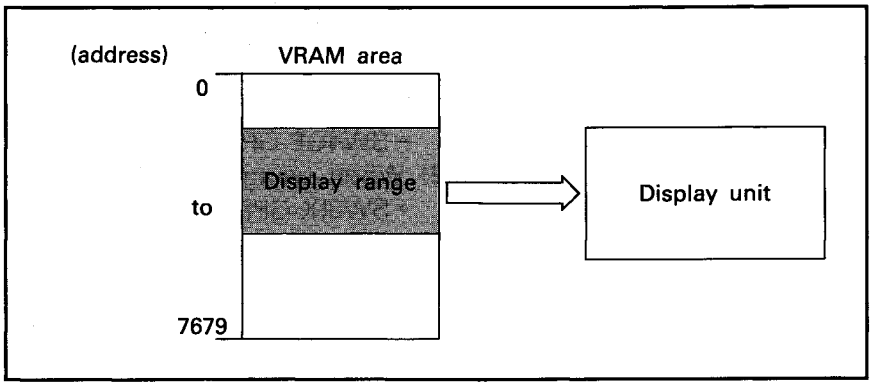
To display the screen data stored in the canvas ROM, designated the number of the screen to be displayed. The designated canvas screen data is automatically read from the canvas ROM and written to the VRAM area. (② in the above illustration)

1.1.1 VRAM area configuration

The VRAM area consists of the area of addresses 0 to 7679, where the screen data of 7680 words can be stored.

On the screen, the following amount of data among 7680 words is displayed in one display page.

Standard display mode of CRT (for AD57(S1)) ····· 1600 words
Enlarged display mode of CRT (for AD57) ····· 400 words
LCD mode (for AD58) ····· 800 words



(1) The screen display data stored in the VRAM area is as indicated below. By changing the area to be displayed, the stored data is displayed according to the designated display range.

	AD57		AD58
	AD57-S1		
	Standard display mode	Enlarged display mode	
0	Display data 1	Display data 1	Display data 1
400		Display data 2	
800		Display data 3	Display data 2
1200		Display data 4	
1600	Display data 2	Display data 5	Display data 3
2000		Display data 6	
2400		Display data 7	Display data 4
2800		Display data 8	
3200	Display data 3	Display data 9	Display data 5
3600		Display data 10	
4000		Display data 11	Display data 6
4400		Display data 12	
4800	Display data 4	Display data 13	Display data 7
5200		Display data 14	
5600		Display data 15	Display data 8
6000		Display data 16	
6400	(Vacant)	Display data 17	Display data 9
6800		Display data 18	
7200		Display data 19	(Vacant)
7600		(Vacant)	
7679			

(a) In the "vacant" areas shown above, it is not possible to store the data to be displayed. However, users can use these areas.

(b) To store the display data in the VRAM area, use the AD57 control instructions such as the CPS1 and CMOV instructions.

(c) Use the CPS2 instruction (AD57 control instruction) to select the area to be displayed. The display areas can be changed in units of addresses.
The head address of the area to be displayed is called the VRAM display head address.

(d) When the AD57 is used, standard mode display data and enlarged mode display data can be stored at random in the VRAM area as illustrated below.

VRAM area	
0	Enlarged mode display data
399	
400	Standard mode display data
1999	
2000	Standard mode display data
3599	
3600	Enlarged mode display data

(2) Correspondence between the VRAM area addresses and the display position in the display unit is shown below.
At VRAM area addresses, character codes of the characters to be displayed are stored.

(A: The head address of the VRAM area displayed in the display unit)

Standard mode

Line \ Column	0	1	2	~	77	78	79
0	A+0	A+1	A+2		A+77	A+78	A+79
1	A+80	A+81	A+82		A+157	A+158	A+159
2	A+160	A+161	A+162		A+237	A+238	A+239
⟆							
18	A+1440	A+1441	A+1442		A+1517	A+1518	A+1519
19	A+1520	A+1521	A+1522		A+1597	A+1598	A+1599

Enlarged mode

Line \ Column	0	1	2	~	37	38	39
0	A+0	A+1	A+2		A+37	A+38	A+39
1	A+40	A+41	A+42		A+77	A+78	A+79
2	A+80	A+81	A+82		A+117	A+118	A+119
⟆							
8	A+320	A+321	A+322		A+357	A+358	A+359
9	A+360	A+361	A+362		A+397	A+398	A+399

LCD mode

Line \ Column	0	1	2	~	77	78	79
0	A+0	A+1	A+2		A+77	A+78	A+79
1	A+80	A+81	A+82		A+157	A+158	A+159
2	A+160	A+161	A+162		A+237	A+238	A+239
⟆							
8	A+640	A+641	A+642		A+717	A+718	A+719
9	A+720	A+721	A+722		A+797	A+798	A+799

1.2 Differences between the Dedicated Instructions and the Microcomputer Package

The names and specifications of the dedicated instructions used with the AnACPU/AnUCPU differ somewhat from those of the AD57 instructions stored in the SW1GP-AD57P system FD used with units other than the AnACPU/AnUCPU.

Table 1.1 Differences Between AD57 Instructions and Dedicated Instructions

Item	AD57 instructions		Corresponding dedicated instruction
	Type	Instruction name	
Instructions with different names	Cursor position setting	CSET	LOCATE
	ASCII character display	CPRA	PRN
	Character display	CPRC	EPRN
	— (minus) display	CIN-1	CPNMP
	- (hyphen) display	CIN-2	CPNHP
	Space display	CINSP1	CPNSP
	Designated column clear	CINSP2	CINCLR
	Storage of an ASCII code in a specified device	CASC	INPUT
Instructions that substitute for others	Device comment display	CCOM	COMRD*1+PR*2
	Display of 16-bit data in decimal notation	CDEC1	BINDA*1+PR*2
	Display of 32-bit data in decimal notation	CDEC2	DBINDA*1+PR*2
	Display of 16-bit data in hexdecimal notation	CHEX1	BINHA*1+PR*2
	Display of 32-bit data in hexadecimal notation	CHEX2	DBINHA*1+PR*2
	Binary conversion of numerals	CBIN	INPUT*2+VAL*1

REMARKS

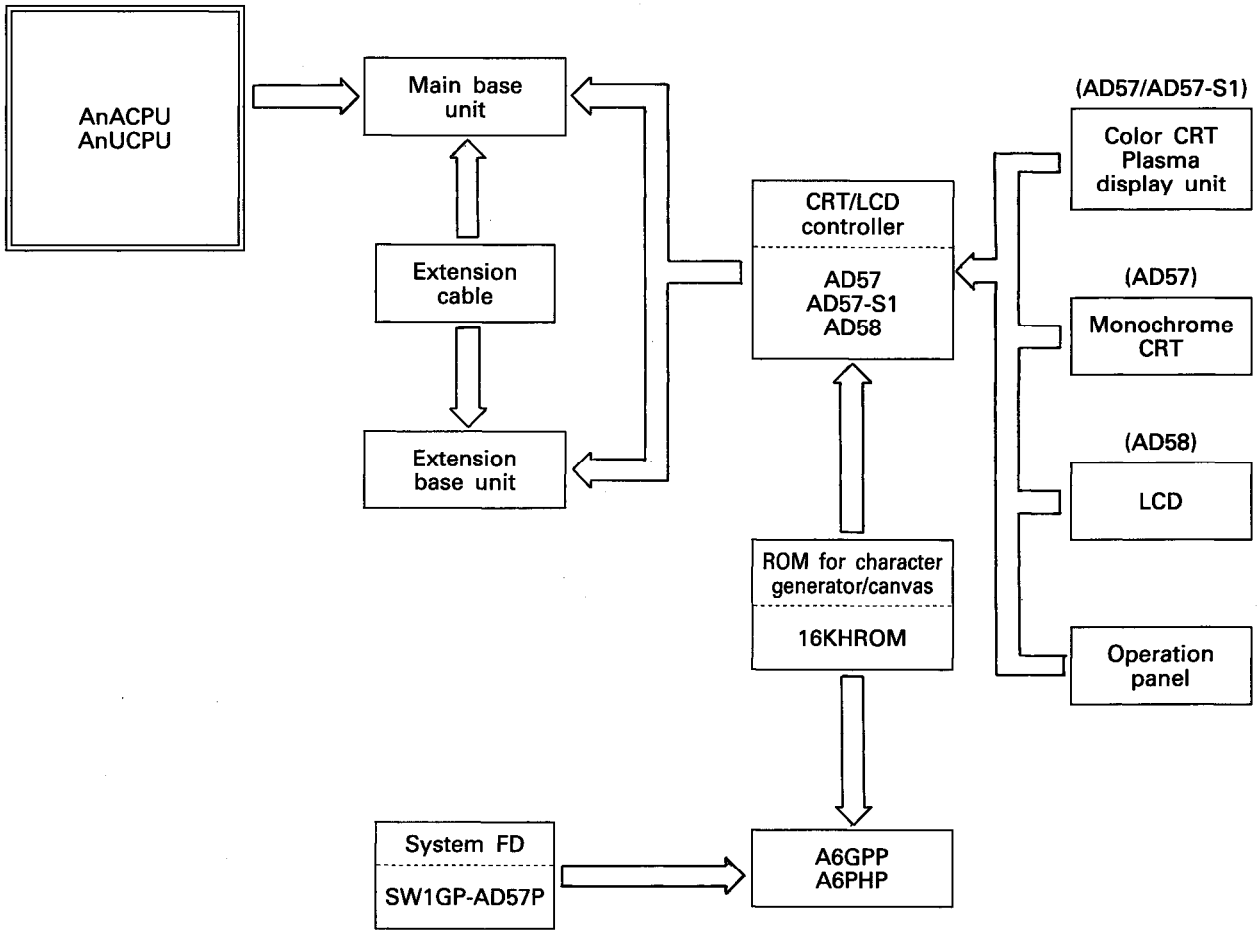
*1: Use AnACPU/AnUCPU dedicated commands.
(For details, refer to the AnACPU/AnUCPU Programming Manual (Dedicated instructions volume))

*2: These are AD57(S1)/AD58 control instructions
(For details, see section 6.7.2 of this manual.)

MEMO

2. SYSTEM CONFIGURATION FOR CONTROLLING AD57(S1)/AD58

This chapter describes the configuration of the system used to control the AD57(S1)/AD58 with the AD57 control instructions.



POINT

The equipment in the system configuration will differ according to the CPU module used. Refer to the user's manual for the relevant CPU for guidance on the equipment that can be used.

(1) The number of AD57(S1)/AD58 modules that can be used with one AnACPU/AnUCPU varies depending on the number of the following modules.

- AD59(S1)
- AJ71C24(S3/S6/S8)
- AJ71UC24
- AJ71C21(S1)
- AJ71PT32(S3)

Use the following formula to calculate the number of usable AD57(S1)/AD58.

$$\boxed{\text{Usable AD57(S1)/AD58}} = \frac{\begin{array}{l}1344 - (5 \times \text{(Used number of AD59(S1))} \\ \quad + 10 \times \text{(Loaded number of AJ71C24(S3/S6/S8) or AJ71UC24)} \\ \quad + 29 \times \text{(Loaded number of AJ71C21(S1))} \\ \quad + 125 \times \text{(Loaded number of AJ71PT32(S3)))}\end{array}}{8} \text{ [units]}$$

Example: Assume that the following number of devices is used.

AD59 ····· 3 units
AJ71C24-S3 ····· 5 units
AJ71PT32-S3 ····· 2 units

$$\boxed{\text{The number of usable AD57(S1)/AD58}} = \frac{1344 - (5 \times 3 + 10 \times 5 + 29 \times 0 + 125 \times 2)}{8}$$

$$= 128.625 \cdots\cdots 128 \text{ units}$$

Although the above indicated number is obtained as the result of calculation, actual number of loadable AD57(S1)/AD58 is limited to the following number due to the I/O number of the PC Pus.

A2ACPU, A2UCPU ····· 8 modules
A2ACPU-S1, A2UCPU-S1 ···· 16 modules
A3ACPU, A3UCPU ····· 32 modules
A4UCPU ····· 64 modules

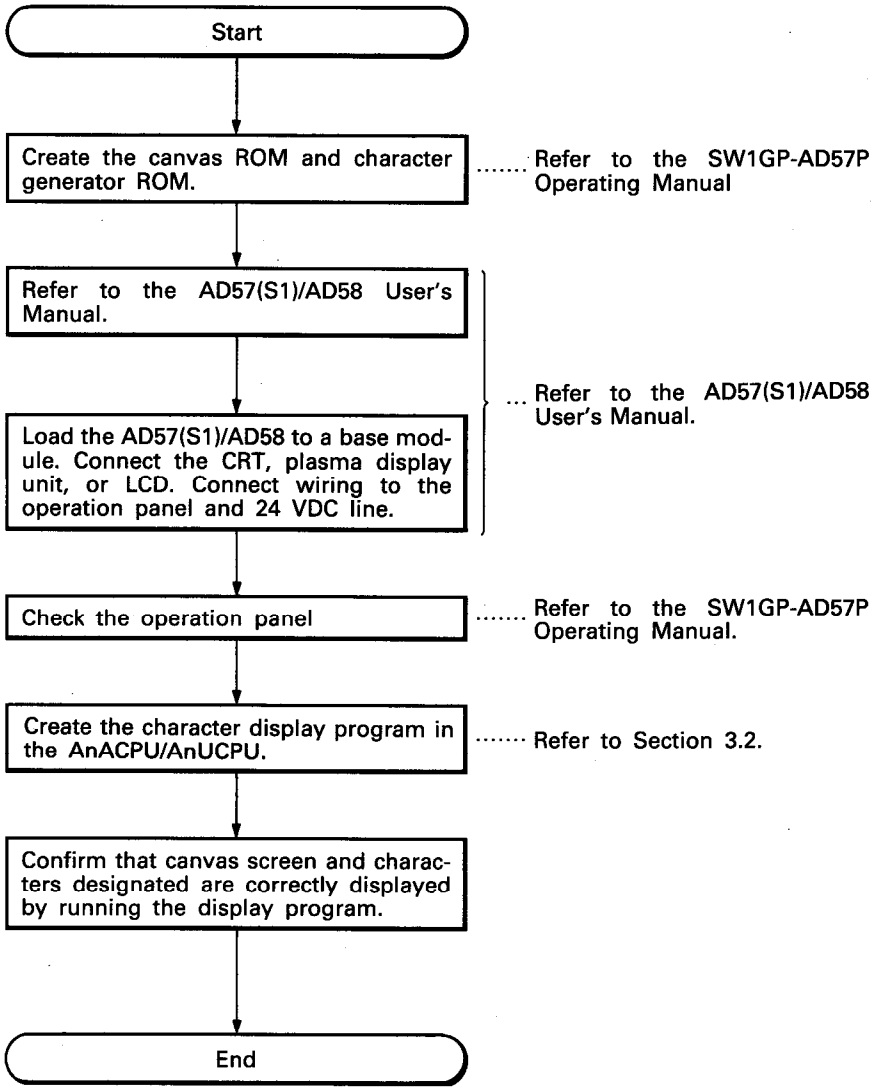
(2) To control AD57(S1)/AD58, create the canvas ROM and character generator ROM using the SW1GP-AD57P system FD and install these Ross in AD57(S1)/AD58. For the procedure to create the canvas ROM and character generator ROM, refer to the SW1GP-AD57P Operating Manual.

3. PROGRAMMING PROCEDURE

This chapter describes the setting and programming procedure to display characters in the display unit connected to the AD57(S1)/ AD58.

3.1 Displaying Procedure

This section describes the procedure to display characters on the display unit.



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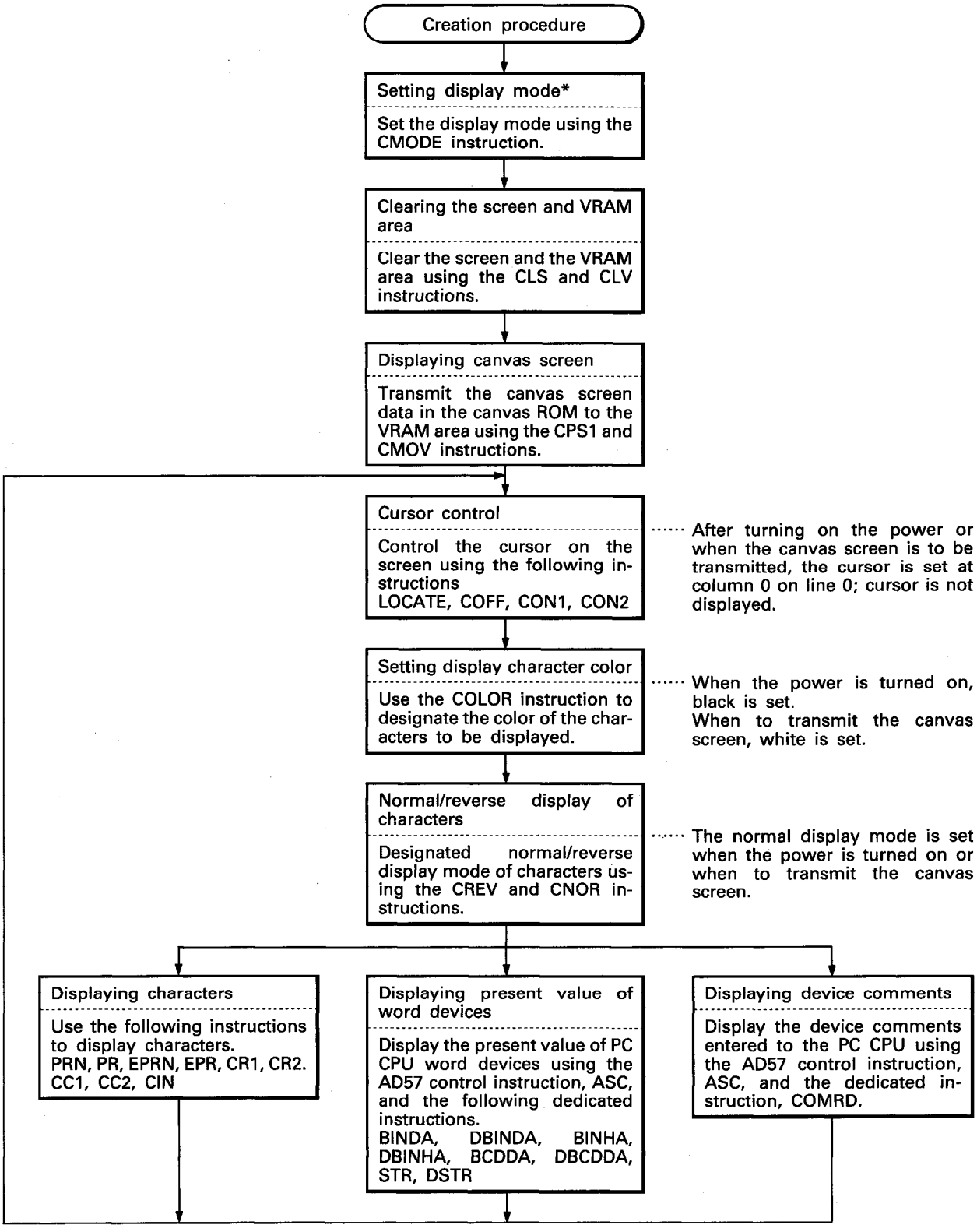
3.2 Programming Procedure

This section describes the procedure to create the program to display the canvas screen and the characters on the display unit connected to the AD57(S1)/AD58 using the AD57 control instructions.



* When a canvas ROM is created using the SW1GP-AD57P system FD and module name entry is done by I/O assignment in parameter settings at a peripheral device, it is not necessary to set the display mode by using the CMODE instruction.
  If the canvas ROM is created using a system FD other than the SW1GP-AD57P system FD, the sequence program shown in Appendix 2 is necessary.
  The following mode is automatically set when the PC CPU state is changed from STOP to RUN.

  AD57 entered ····· "0" is set
  AD57-S1 entered ····· "5" is set
  AD58 entered ····· "2" is set

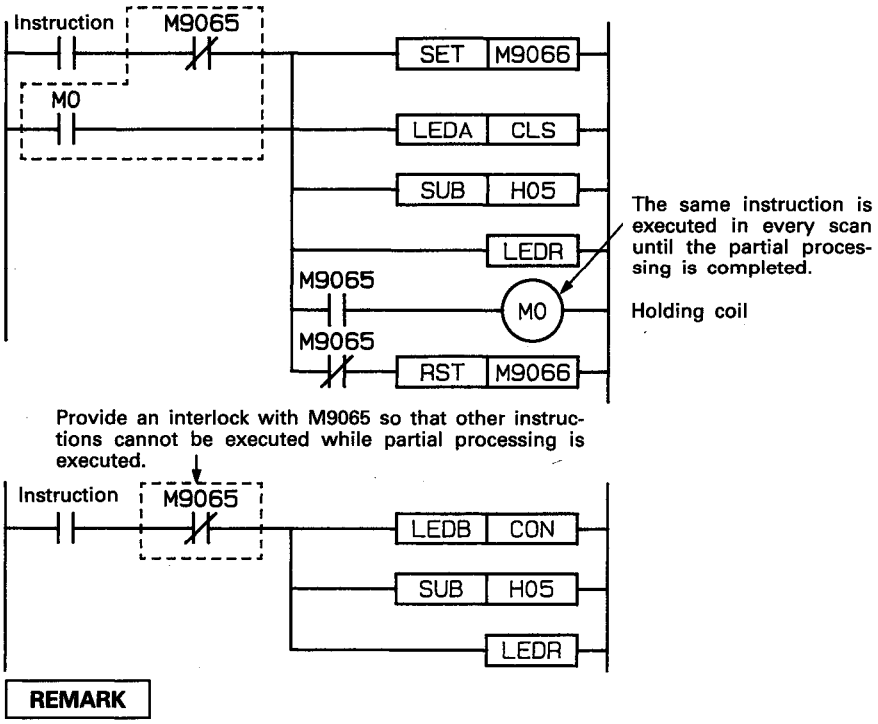
For details of module name entry procedure, refer to the reference manual (C) of section 1.

3.3 Cautions on Writing Programs

(1) Always set the display mode using the CMODE instruction when the PC power is turned on, the PC CPU is reset, or when the PC CPU RUN/STOP switch position is changed from STOP to RUN.
The display unit will fail to give correct display if the display mode is not set or correct display mode is not set.
However, when module name entry is executed in parameter setting, it is not necessary to set the display mode with the CMODE instruction. The display mode is automatically set when the PC CPU power supply is turned on, the PC CPU is reset, or when the PC CPU state is changed from STOP to RUN.

(2) If the PC CPU state is changed from STOP to RUN while the enlarged display mode is set with the AD57, the display will not be incorrect.
Correct display is possible by setting the enlarged display mode while the PC CPU is running.

(3) To execute the canvas display instruction (CPS1), the canvas transmission instruction (CMOV), the screen clear instruction (CLS), or the VRAM clear instruction (CLV) in partial processing mode, always take interlock as shown below so that other instructions cannot be executed by the same AD57(S1)/AD58.
While a partial processing instruction is executed, CPS1, CMOV, CLS, and CLV instructions cannot executed by other AD57(S1)/AD58.
If such instructions are executed, correct display is impossible.



REMARK

The partial processing function is added to the instructions which require longer than 4 msec processing time if processed in batch. When partial processing is executed for such instructions, the instruction is processed in several scans. Therefore, processing time per scan can be shortened.

4. AD57(S1)/AD58 CONTROL INSTRUCTIONS

This chapter describes the dedicated instructions to control AD57(S1)/AD58.

4.1 Classification of Instructions

The dedicated instructions used to control AD57(S1)/AD58 are largely classified into the following instruction groups.

Category	Description
Display mode setting instruction	Sets the display mode according to the display unit connected to AD57(S1)/AD58.
Display screen control instructions	Execute the following: Clearing screen and VRAM area, display and transmission of canvas screen, changing display address, and controlling the display such as scrolling
Cursor control Instructions	Control cursor; cursor movement, cursor display (visible/invisible)
Display condition setting instructions	Set the conditions to display characters; designation character color, normal/reverse display, etc.
Designated character display instructions	Display the designated characters
Fixed character display instructions	Display the predetermined characters; alphanumerics, minus/hyphen, period/decimal point, etc.)
Designated column clear instruction	Clears the designated column on the screen.
ASCII code conversion instruction	Converts the ASCII characters displayed on the screen into the ASCII codes and stores them in the designated devices.
VRAM data read/ write instructions	Reads the designated data in VRAM area to store it into devices, or writes the data stored in devices to the VRAM area.
Display state read instruction	Reads the screen display state (VRAM display address, cursor state, etc.)

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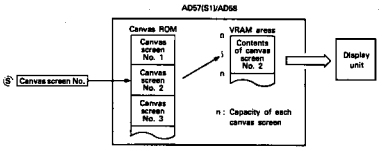
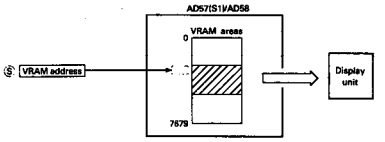
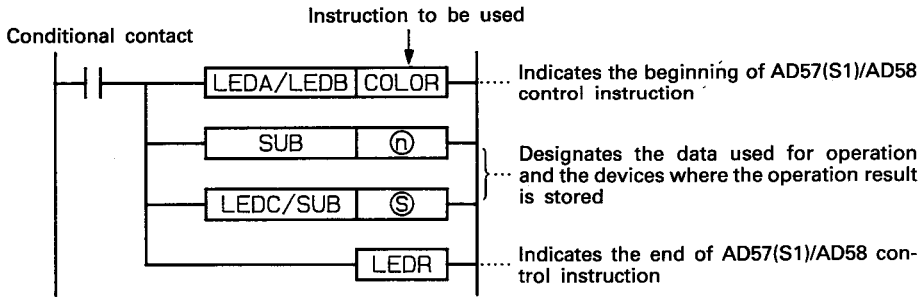
4.2 How to Read Instruction Lists

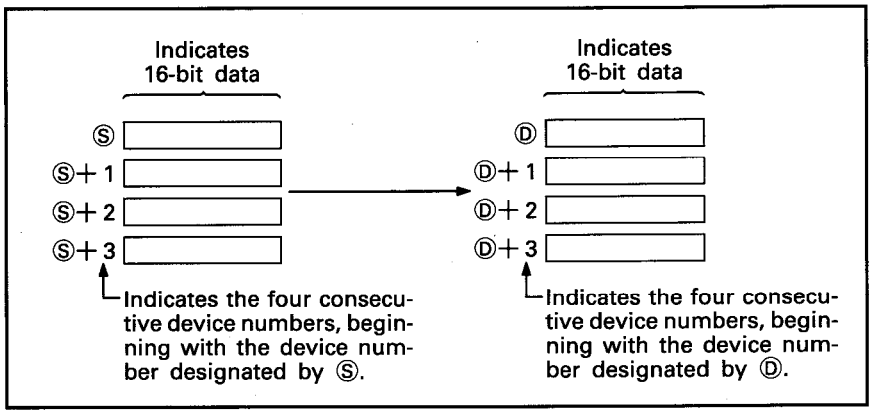
① Category	② Instruction name	③ Format	④ Processing	⑤ Condition	⑥ Number of steps	⑦ Index qualification	⑧ Subset processing	⑨ See
Canvas screen display	CPS1	LEDA/LEDB CPS1 SUB ⓝ LEDC/SUB Ⓢ LEDR	Displays the designated canvas screen. ⓝ : Head I/O number 	(LEDA) (LEDB)	20	○		6-6
VRAM display address change	CPS2	LEDA/LEDB CPS2 SUB ⓝ LEDC/SUB Ⓢ LEDR	Sets the address of the VRAM area to be displayed ⓝ : Head I/O number 	(LEDA) (LEDB)	20	○		6-10

① ····· Category of the instructions
② ····· Symbols to be used in writing a sequence program
③ ····· Format of an instruction to be used in writing a ladder of a sequence program.

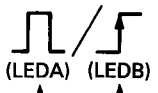


For details, refer to Chapter 5.

④ ····· Details of instruction processing contents



⑤ ····· Instruction execution timing



Indicates the four consecutive device numbers, beginning with the device number designated by (D).o execute LEDB instruction.

Indicates the four consecutive device numbers, beginning with the device number designated by (D).o execute LEDA instruction.

Symbol	Execution timing
	An instruction is executed every scan while the condition to execute the instruction is satisfied (ON).
	An instruction is executed only once at the leading edge (OFF to ON) of the instruction execution condition.

⑥ ····· The number of steps
Depending on the devices to be used, the number of steps actually required might become larger than the step number indicated here.
For details, refer to Section 5.2.

⑦ ····· A circle in this column shows that an index register (Z, V) can be used for the devices or constants used by an instruction.

⑧ ····· A circle in this column shows that subset processing is possible.

⑨ ····· Shows the manual page in which detailed description of the instruction is given.

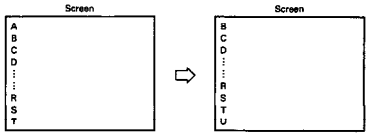
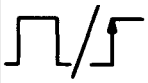
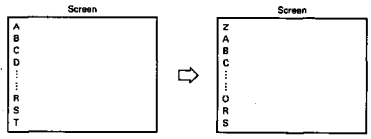
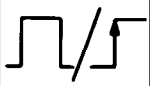
4.3 AD57(S1)/AD58 Control Instruction Lists

(1) Display mode setting instruction

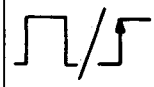
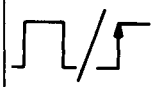
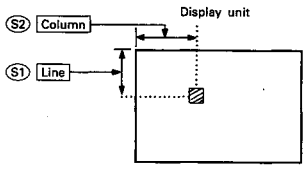
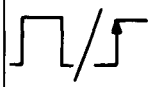
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Display mode setting	CMODE	LEDA/LEDB CMODE SUB (n) LEDC/SUB (S) LEDR	Sets the display mode. (n) : Head I/O number (S) : Display mode setting code 0 ···· Color CRT, standard display mode (AD57) 1 ···· Enlarged display mode (AD57) 2 ···· LCD mode (AD58) 3 ···· Monochrome CRT, standard display mode (AD57) 5 ···· Color CRT, standard display mode (AD57-S1)	(LEDA) (LEDB)	20	○		6-2

(2) Display screen control instructions

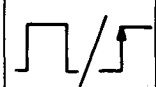
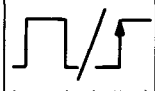
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Canvas screen display	CPS1	LEDA/LEDB CPS1 SUB (n) LEDC/SUB (S) LEDR	Displays the designated canvas screen. (n) : Head I/O number	(LEDA) (LEDB)	20	○		6-6
VRAM display address change	CPS2	LEDA/LEDB CPS2 SUB (n) LEDC/SUB (S) LEDR	Sets the address of the VRAM area to be displayed (n) : Head I/O number	(LEDA) (LEDB)	20	○		6-10
Canvas transmission	CMOV	LEDA/LEDB CMOV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Transmits the designated canvas screen to the designated address in the VRAM area (n) : Head I/O number	(LEDA) (LEDB)	23	○		6-14
Screen clear	CLS	LEDA/LEDB CLS SUB (n) LEDR	Clears the screen displayed in the display unit. (n) : Head I/O number	(LEDA) (LEDB)	17	○		6-19
VRAM clear	CLV	LEDA/LEDB CLV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Clears the designated size of VRAM area beginning with the designated address (n) : Head I/O number	(LEDA) (LEDB)	23	○		6-23

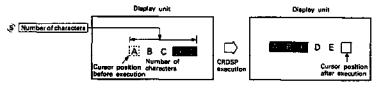
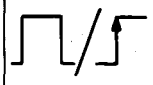
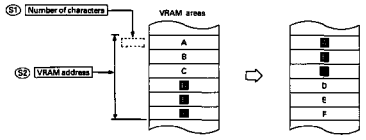
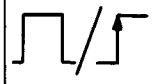
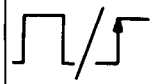
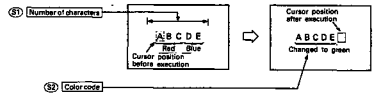
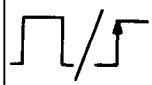
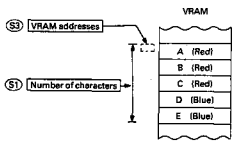
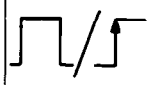
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Scroll up/down	CSCRU	LEDA/LEDB CSCRU SUB (n) LEDR	Increases VRAM area display address by one line and scrolls the display up by one line. (n) : Head I/O number 		17	○		6-27
	CSCRD	LEDA/LEDB CSCRD SUB (n) LEDR	Decreases VRAM area display address by one line and scrolls the display down by one line. (n) : Head I/O number 		17	○		6-27

(3) Cursor control instructions

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Cursor display	CON1	LEDA/LEDB CON1 SUB (n) LEDR	Displays the cursor having one-character size. (n) : Head I/O number		17	○		6-32
	CON2	LEDA/LEDB CON2 SUB (n) LEDR	Displays the cursor having two-character size. (n) : Head I/O number		17	○		6-32
Deleting cursor	COFF	LEDA/LEDB COFF SUB (n) LEDR	Deletes the cursor on the screen. (n) : Head I/O number		17	○		6-35
Cursor position setting	LOCATE	LEDA/LEDB LOCATE SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Moves the cursor to the designated position on the screen. (n) : Head I/O number 		23	○		6-37

(4) Display condition setting instructions

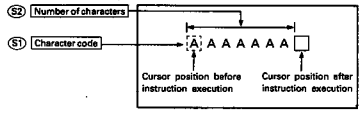
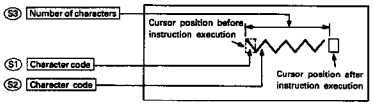
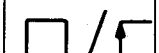
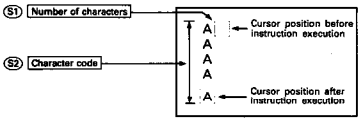
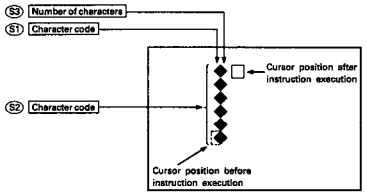
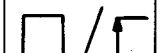
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Normal/ reverse display of characters	CNOR	LEDA/LEDB CNOR SUB (n) LEDR	Sets the normal display of characters. (n) : Head I/O number		17	○		6-41
	CREV	LEDA/LEDB CREV SUB (n) LEDR	Sets the reverse display of characters. (n) : Head I/O number		17	○		6-41

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Changing normal/ reverse display of characters	CRDSP	LEDA/LEDB CRDSP SUB (n) LEDC/SUB (S) LEDR	Changes normal/reverse display mode for the designated number of characters beginning with the cursor-located character. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-44
	CRDSPV	LEDA/LEDB CRDSPV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Changes normal/reverse display mode for the designated number of characters beginning with the designated address in the VRAM area. (n) : Head I/O number 	 (LEDA) (LEDB)	23	○		6-48
Character color designation	COLOR	LEDA/LEDB COLOR SUB (n) LEDC/SUB (S) LEDR	Sets the color of characters to be displayed. (n) : Head I/O number (S) : Color code	 (LEDA) (LEDB)	20	○		6-51
Changing character color	CCDSP	LEDA/LEDB CCDSP SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Changes the color of the designated number of characters beginning with the cursor-located character. (n) : Head I/O number 	 (LEDA) (LEDB)	23	○		6-54
	CCDSPV	LEDA/LEDB CCDSPV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDC/SUB (S3) LEDR	Changes the color of the designated number of characters beginning with designated address in the VRAM area. (n) : Head I/O number 	 (LEDA) (LEDB)	26	○		6-59

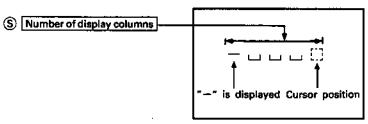
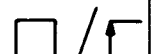
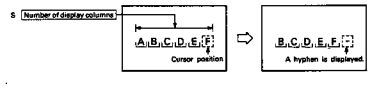
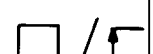
(5) Designated character display instructions

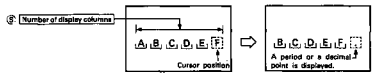
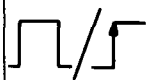
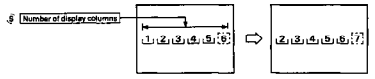
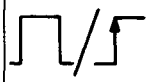
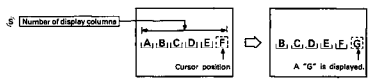
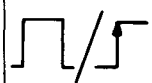
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
ASCII character display	PRN	LEDA/LEDB PRN SUB (n) LEDC/SUB (S1) LEDC (S2) LEDR	Displays the designated number of ASCII characters stored in the devices following the designated device. (n) : Head I/O number	(LEDA (LEDB)	23	○		6-64
	PR	LEDA/LEDB PR SUB (n) LEDC (S) LEDR	Displays the ASCII characters stored in the devices beginning with the designated device and up to the device which stores the 00H code. (n) : I/O number	(LEDA (LEDB)	20	○		6-68
Writing ASCII characters	PRNV	LEDA/LEDB PRNV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDC (S3) LEDR	Writes the designated number of ASCII characters stored in the devices following the designated device to the addresses in the VRAM area beginning with the designated address. (n) : Head I/O number	(LEDA (LEDB)	20	○		6-72
	PRV	LEDA/LEDB PRV SUB (n) LEDC/SUB (S1) LEDC (S2) LEDR	Writes the ASCII characters stored in the devices beginning with the designated device and up to the device which stores the 00H code to the addresses in the VRAM area beginning with the designated address. (n) : Head I/O number	(LEDA (LEDB)	23	○		6-76

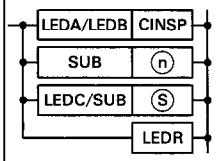
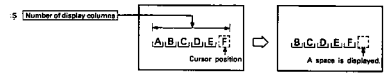
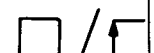
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Continuous display of the same character	EPRN	LEDA/LEDB EPRN SUB (n) LEDC/SUB (S1) LEDC (S2) LEDR	Displays the designated number of the designated character to the right beginning from the cursor position. (n) : Head I/O number	(LEDA) (LEDB)	23	○		6-80
	EPR	LEDA/LEDB EPR SUB (n) LEDC (S) LEDR	Displays the characters stored in the devices beginning with the designated device and up to the device storing the 00H code. (n) : Head I/O number	(LEDA) (LEDB)	20	○		6-84
Writing characters	EPRNV	LEDA/LEDB EPRNV SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDC (S3) LEDR	Writes the designated number of characters stored in the devices following the designated device to the addresses in the VRAM area beginning with the designated address. (n) : Head I/O number	(LEDA) (LEDB)	26	○		6-88
	EPRV	LEDA/LEDB EPRV SUB (n) LEDC/SUB (S1) LEDC (S2) LEDR	Writes the characters stored in the devices beginning with the designated device and up to the device which stores the 00H code to the addresses in the VRAM area beginning with the designated address. (n) : Head I/O number	(LEDA) (LEDB)	23	○		6-91

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Continuous display of the same character(s)	CR1	LEDA/LEDB CR1 SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Displays the designated number of designated characters to the right beginning from the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	23	○		6-94
	CR2	LEDA/LEDB CR2 SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDC/SUB (S3) LEDR	Displays the designated number of the designated two different characters in pairs to the right beginning from the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	26	○		6-97
	CC1	LEDA/LEDB CC1 SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDR	Displays the designated number of designated characters downward beginning from the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	23	○		6-101
	CC2	LEDA/LEDB CC2 SUB (n) LEDC/SUB (S1) LEDC/SUB (S2) LEDC/SUB (S3) LEDR	Displays the designated number of the designated two different characters in pairs downward beginning from the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	26	○		6-104

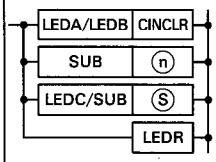
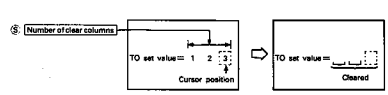
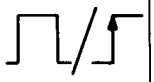
(6) Fixed character display instructions

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
"—" (minus symbol) display	CINMP	LEDA/LEDB CINMP SUB (n) LEDC/SUB (S) LEDR	Displays the "—" (minus symbol) at the position left to the cursor position by the designated number of columns. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-108
"-" (hyphen) display	CINHP	LEDA/LEDB CINHP SUB (n) LEDC/SUB (S) LEDR	Displays the "-" (hyphen) at the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-111

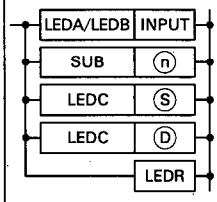
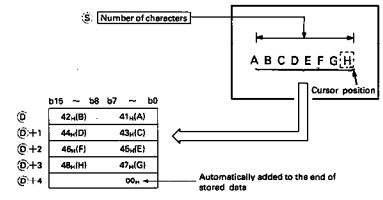
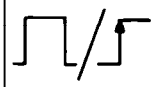
Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
"." (period) display	CINPT	LEDA/LEDB CINPT SUB (n) LEDC/SUB (S) LEDR	Displays the "." (period) at the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-114
Display of number	CIN0 to CIN9	LEDA/LEDB ※1 SUB (n) LEDC/SUB (S) LEDR *1: CIN0 CIN1 CIN2 CIN3 CIN4 CIN5 CIN6 CIN7 CIN8 CIN9	Displays the number corresponding to an instruction at the cursor position. (n) : Head I/O number CIN0 ····· Displays "0", CIN1 ····· Displays "1" CIN2 ····· Displays "2", CIN3 ····· Displays "3" CIN4 ····· Displays "4", CIN5 ····· Displays "5" CIN6 ····· Displays "6", CIN7 ····· Displays "7" CIN8 ····· Displays "8", CIN9 ····· Displays "9" 	 (LEDA) (LEDB)	20	○		6-117
Display of alphabet	CINA to CINZ	LEDA/LEDB ※1 SUB (n) LEDC/SUB (S) LEDR *1: CIN A CIN B CIN C CIN D CIN E CIN F CIN G CIN H CIN I CIN J CIN K CIN L CIN M CIN N CIN O CIN P CIN Q CIN R CIN S CIN T CIN U CIN W CIN X CIN Y CIN Z	Displays the alphabet corresponding to an instruction at the cursor position. (n) : Head I/O number CIN A ····· Displays "A", CIN B ····· Displays "B" CIN C ····· Displays "C", CIN D ····· Displays "D" CIN E ····· Displays "E", CIN F ····· Displays "F" CIN G ····· Displays "G", CIN H ····· Displays "H" CIN I ····· Displays "I", CIN J ····· Displays "J" CIN K ····· Displays "K", CIN L ····· Displays "L" CIN M ····· Displays "M", CIN N ····· Displays "N" CIN O ····· Displays "O", CIN P ····· Displays "P" CIN Q ····· Displays "Q", CIN R ····· Displays "R" CIN S ····· Displays "S", CIN T ····· Displays "T" CIN U ····· Displays "U", CIN V ····· Displays "V" CIN W ····· Displays "W". CIN X ····· Displays "X" CIN Y ····· Displays "Y", CIN Z ····· Displays "Z" 	 (LEDA) (LEDB)	20	○		6-117

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Display of space	CINSP		Displays a " " (space) at the cursor position. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-121

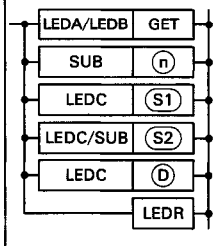
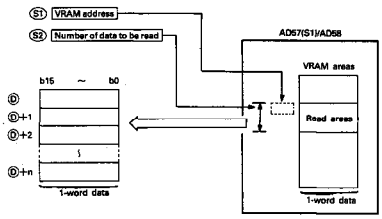
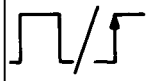
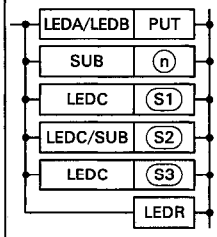
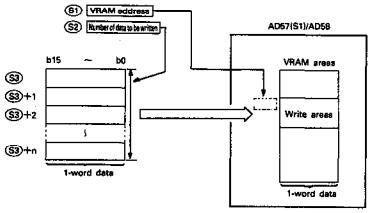
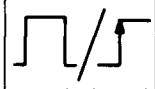
(7) Designated column clear instruction

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Designated column	CINCLR		Clears the designated number of characters from the cursor position in the left. (n) : Head I/O number 	 (LEDA) (LEDB)	20	○		6-125

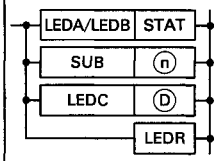
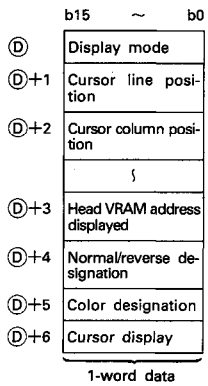
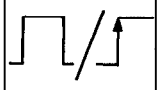
(8) ASCII code conversion instruction

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
ASCII code conversion	INPUT		Converts the designated number of characters from the cursor position in the left into the ASCII code and stores the designated device. (n) : Head I/O number 	 (LEDA) (LEDB)	23	○		6-129

(9) VRAM data read/write instructions

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Read VRAM data	GET		Reads the screen data in the designated range of the VRAM area to the designated devices. (n) : Head I/O number 		26	○		6-134
Write VRAM data	PUT		Writes the character data stored in the designated devices by the designated words to the designated VRAM area addresses. (n) : Head I/O number 		26	○		6-139

(10) Reading display state

Category	Instruction name	Format	Processing	Condition	Number of steps	Index qualification	Subset processing	See
Read display state	STAT		Reads the screen display state set in the AD57(S1)/AD58. 		20	○		6-145

MEMO

5. USING AD57(S1)/AD58 CONTROL INSTRUCTIONS

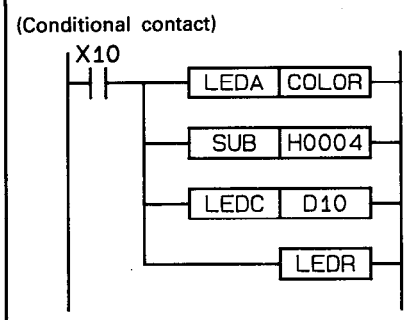
This chapter describes how to use the instructions which control the AD57(S1)/AD58 with the AD57 control instructions.

5.1 Stating Instructions

This section describes the procedure to state AD57(S1)/AD58 control instructions.

The AD57(S1)/AD58 control instructions are stated in combination with an LEDA, LEDB, LEDC, LEDR, or SUB instruction.

Statement in Ladder Form



Stating an instruction

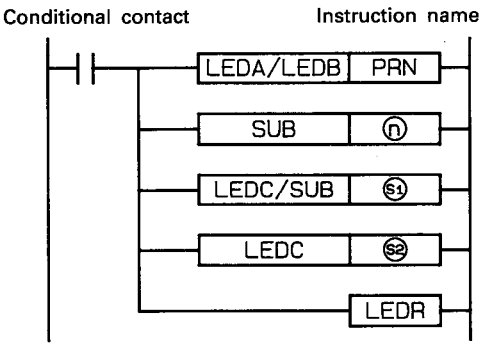
Designates the data used for operation and the devices where the operation result is stored

Indicates the end of the AD57(S1)/AD58 control instruction

Statement in Instruction List Form

LD	X10
LEDA	COLOR
SUB	H0004
LEDC	D10
LEDR	

With the format in the instruction list in Section 4.3 and in the detailed description of instructions given in Chapter 6, the instructions are stated in the following format.



(1) The LEDA, LEDB, LEDC, LEDR, and SUB instructions are used in the following manner.

LEDA/LEDB | Instruction name ····· This indicates the beginning of an AD57(S1)/AD58 control instruction.

LEDA | instruction name : An instruction is executed every scan while the conditional contact is ON.

LEDB | instruction name : An instruction is executed only once at the leading edge of the conditional contact.

LEDC/SUB | (S1) ····· These designate the device for setting the data used for an operation called by an instruction and the device for storing the operation result.
LEDC | (S) ·····
SUB | (S2) ·····

LEDC/SUB | (S1) : This indicates that either LEDO or SUB can be designated.

LEDC | (S) : This indicates that only LEDC can be designated.

SUB | (S2) : This indicates that only SUB can be designated.

The LEDC instruction is used to set a device number.

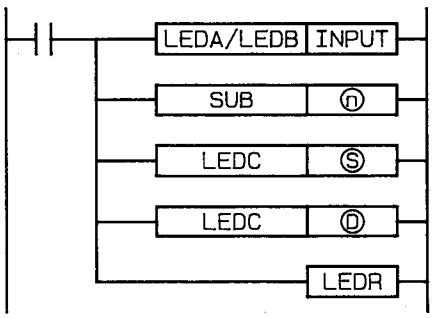
LEDC | D0, LEDC | W10A

The SUB instruction is used to set a 16 bit constant. Setting range is either "−32768 to 32767" or "0000_H to $FFFF_H$".

SUB | K32767, SUB | HFFFF

LEDR ····· This indicates the end of the AD57(S1)/AD58 control instruction.
In some cases, this statement is not necessary.

(2) (n), (S), and (D) written with the LEDC or SUB instruction are used to designate the following.



(n) ·····Designates the head I/O number of the AD57(S1)/AD58 (designates the upper 2 digits in the expressed 3 digits)
(S) ·····Designates the data to be written or designation value, or the device where either of them is stored.
(D) ·····Designates the device number where the read data is stored.

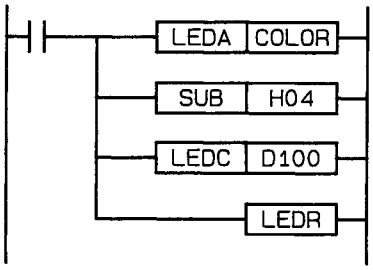
5.2 Number of Instruction Steps

The number of instruction steps increases one when each of the following device numbers (devices extended by the AnACPU/ AnUCPU) is used with the control instructions.

Device Name		Device Number Range	
		AnACPU	AnUCPU
Internal relay (M, L, S)		2048 to 8191	
Timer (T)		256 to 2047	
Counter (C)		256 to 1023	
Data register (D)		1024 to 6143	1024 to 8191
Link register (W)		400 to FFF	400 to 1FFF
Annunciator (F)		256 to 2047	
Index register	(Z)	1 to 6	
	(V)	1 to 6	

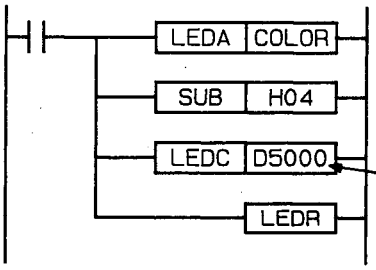
Example

• When extended devices are not used:



Number of steps = 20

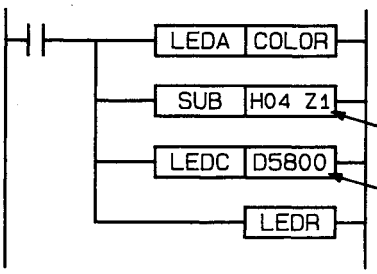
• When extended devices are used:



Number of steps = 20 + 1 = 21

Increase due to extended device

Extended device



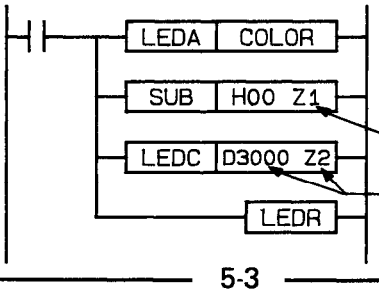
Number of steps = 20 + 1 + 1 = 22

Extended device

Extended device

Increase due to extended device (D5800)

Increase due to extended device (Z1)



Number of steps = 20 + 1 + 1 = 22

Extended device

Extended device

Increase due to extended device (D3000 Z2)

Increase due to extended device (Z1)

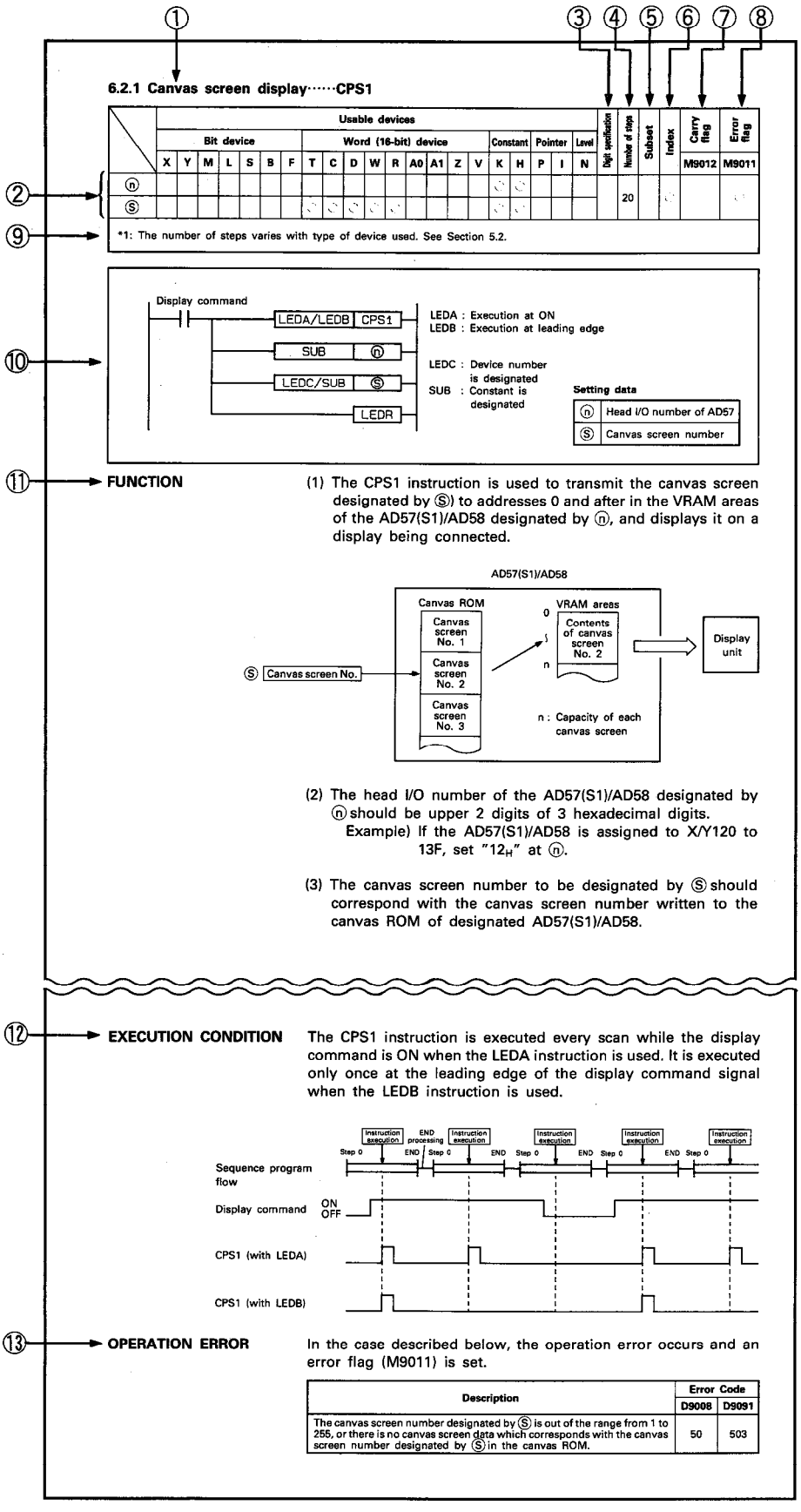
5.3 Cautions on Using Dedicated Instructions

(1) An AD57(S1)/AD58 control instruction consists of a group of instructions beginning from LEDA/LEDB and ending with LEDR.
Therefore, if an instruction not conforming to the predetermined format is stated within this range, it causes an error. An error also occurs if the instruction statement differs from the predetermined format.

(2) With the AnACPU/AnUCPU, device number is not checked when index qualification is written to increase processing speed. Note that device number is checked only for file register (R).
Therefore, processing might be executed for devices exceeding the final device number if index qualification is not written correctly. Or, processing might be executed for other devices if "0" is exceeded, or the PC CPU might malfunction. (This does not cause an error.)

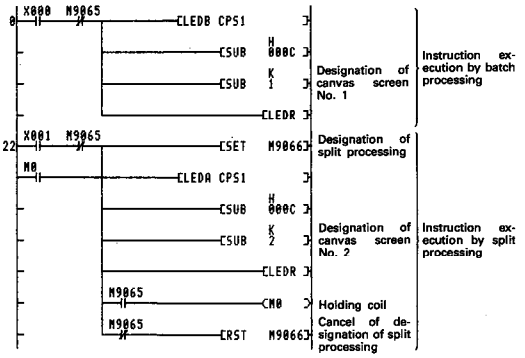
5.4 How To Read Instruction Explanation

This section describes how to read the detailed explanation of instructions given in Chapter 6.



⑭ → **PROGRAM EXAMPLE**

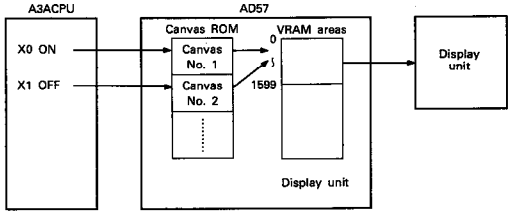
The following is an example of the program used to display canvas screens on the AD57 loaded at X/Y0C0 to 0FF.
When X000 is turned ON, canvas screen No. 1 is displayed by batch processing. When X001 is turned ON, canvas screen No. 2 is displayed by split processing.



Designation of batch/split processing is done by setting M9066 as follows.

When M9066 is OFF ····· Batch processing
When M9066 is ON ····· Split processing

M9065 is the split processing flag and used to provide interlock so that other instructions may not be executed during split processing.
M0 is used to hold so that the CPS1 instruction may be executed till split processing is completed.



① Shows the function of an instruction and instruction symbol.
② A circle indicates the device that can be used with the instruction.
③ A circle indicates that the instruction requires designation of digits when a bit device is used.
④ This column indicates the number of steps occupied by the instruction.
For details of the number of steps, refer to Section 5.2.
⑤ A circle indicates that the subset processing is possible.
⑧ A circle indicates that index qualification (Z, V) is possible.
⑦ A circle indicates that the ON/OFF state of the carry flag (M9012) changes according to the result of execution of the instruction.
⑧ A circle indicates that the error flag (M9011) is set if an operation error occurs.
⑨ This indicates precautions concerning ② to ⑧ above. If an asterisk (*) is given, always read the precaution.
⑩ This indicates the format of the instruction stated using ladder diagram.
⑪ This explains the details of the instruction.
⑫ This indicates the instruction execution timing.
⑬ This indicates conditions causing an operation error and the error code of the operation error.
⑭ A program example in which the instruction is used is shown using ladder diagram.

MEMO

6. AD57(S1)/AD58 CONTROL INSTRUCTIONS

This section describes details of instructions used to control the AD57(S1)/AD58.

6.1 Display Mode Setting Instruction

The display mode setting instruction is used to execute display mode setting of the AD57(S1)/AD58 according to the type of the display being connected.
By execution of display mode setting, the AD57(S1)/AD58 can display characters. Correct display of characters is not available without proper display mode setting.
If module type setting has been done by I/O assignment of parameter setting, display mode setting is not necessary.*
When the PC CPU is switched from STOP to RUN, the following display modes are automatically set.

When AD57 is set ·····"0" (AD57 CRT standard mode)
When AD57-S1 is set ····"5" (AD57-S1 CRT standard mode)*
When AD58 is set ·····"2" (LCD mode)

For detail of module type registration, refer to the reference manual (C) of section 1.
Display mode setting is used also to switch display mode between standard and enlarged for the AD57.

Display mode setting is executed using the instruction mentioned below.

Category	Instruction Name	Description
Display mode setting	CMODE	Sets display mode of the AD57(S1)/AD58. Switches display mode of the AD57 between standard and enlarged.

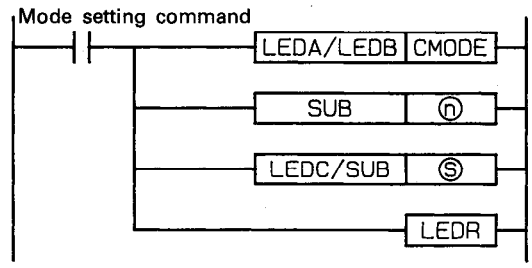
POINT

***: Applies only if the canvas ROM is created using the SW1GP-AD57P system FD when the AD57-S1 is used. If the canvas ROM is created by using a system FD other than the SW1GP-AD57P system FD, the sequence program shown in Appendix 2 will be necessary.**

6.1.1 Display mode setting·····CMODE

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					20		○		○
Ⓢ								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Display mode setting data

FUNCTION

(1) The CMODE instruction is used to set the display mode designated by Ⓢ to the AD57(S1)/AD58 designated by ⓝ. By execution of display mode setting, display of characters on the display unit connected to the AD57(S1)/AD58 becomes possible.
Correct display of characters is not possible without proper display mode setting.

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The display mode setting data to be designated by Ⓢ should be as follows according to type of module.
0 : Color CRT standard mode ····· for AD57
1 : Color/monochrome CRT enlarged mode ··· for AD57
2 : LCD mode····· for AD58
3 : Monochrome CRT standard mode····· for AD57
5 : Color CRT standard mode ····· for AD57-S1

POINT

***: Applies only if the canvas ROM is created using the SW1GP-AD57P system FD when the AD57-S1 is used. If the canvas ROM is created by using a system FD other than the SW1GP-AD57P system FD, the sequence program shown in Appendix 2 will be necessary.**

(4) If module type of AnACPU/AnUCPU is already set by parameters, the following data is automatically set when the PC CPU is in the RUN state.
It is not necessary to use the CMODE instruction if it is not necessary to change display mode.
When AD57 is set ····· Set "0".
When AD57(S1) is set ···· Set "5".
When AD58 is set ····· Set "2".

(5) After execution of the CMODE instruction, conditions of the display become as follows.

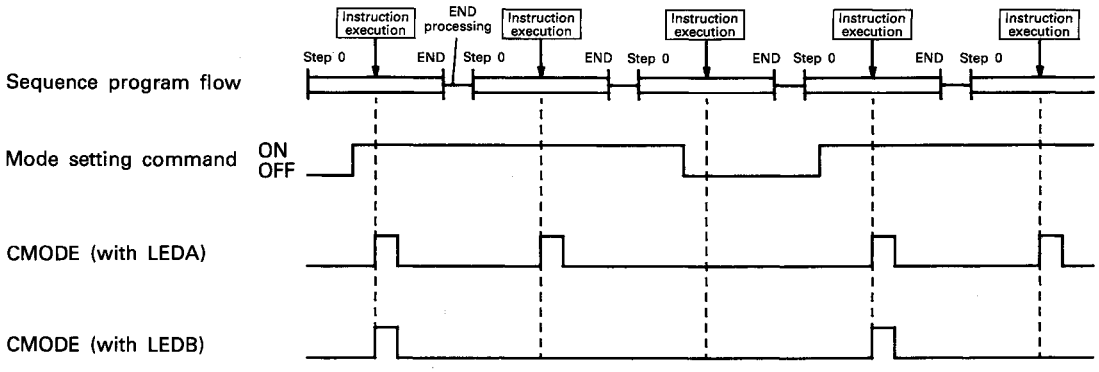
Item	Condition
Display mode	Designated data
Cursor line position	Line "0"
Cursor column position	Column "0"
Head VRAM address displayed	Address "0"
Normal/reverse designation	(no change)
Color designation	
Cursor display	Not displayed

POINT

If the CMODE instruction is executed every scan using the LEDA instruction, the screen sometimes becomes distorted momentarily. To avoid this problem, it is recommended that the CMODE instruction be executed only once at the leading edge using the LEDB instruction.

EXECUTION CONDITION

The CMODE instruction is executed every scan while the mode setting command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the mode setting command signal when the LEDB instruction is used.



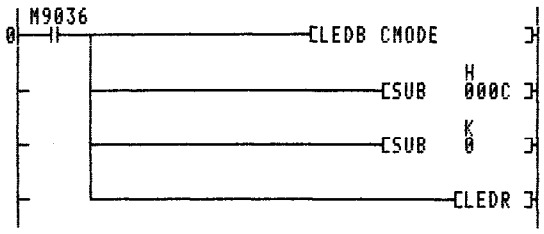
OPERATION ERROR

In the case described below, the operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The display mode setting data designated by Ⓢ is out of the range from 0 to 3 and 5.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to set the CRT standard mode to the AD57 assigned to X/Y0C0 to 0FF.
Setting is executed when the PC CPU is powered on or reset.



By use of the LEDB instruction and M9036 as a conditional contact, the CMODE instruction is executed only once when the PC CPU is powered on or reset.
To set the CRT standard mode to the AD57, "0" should be designated.

6.2 Display Screen Control Instructions

The display screen control instructions are used to clear display screen and VRAM areas, display and transmit canvas screens and scroll up and down the screen.
Using the display screen control instructions, display of the canvas screen in the canvas ROM, switching of screens and scrolling of screen can be easily controlled.

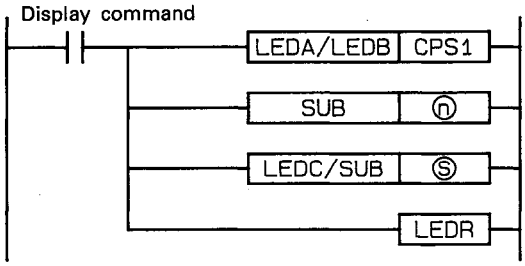
Display screen control is executed using the instructions mentioned below.

Category	Instruction Name	Description
Canvas screen display	CPS1	Reads a designated canvas screen in the canvas ROM to addresses 0 and after in the VRAM areas and displays it on the screen.
VRAM display address change	CPS2	Changes addresses of the VRAM areas displayed on the screen by one address.
Canvas screen transmission	CMOV	Transmits canvas screens in the ROM to a designated address and after in the VRAM areas.
Screen clear	CLS	Writes 20_H (space code) to the address of the VRAM areas being displayed and clears the screen.
VRAM area clear	CLV	Writes 20_H (space code) to a designated address and after in the VRAM areas.
Scroll up/down	CSCRU	Scrolls up a screen by one line.
	CSCRD	Scrolls down a screen by one line.

6.2.1 Canvas screen display·····CPS1

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					20		○		○
Ⓢ								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

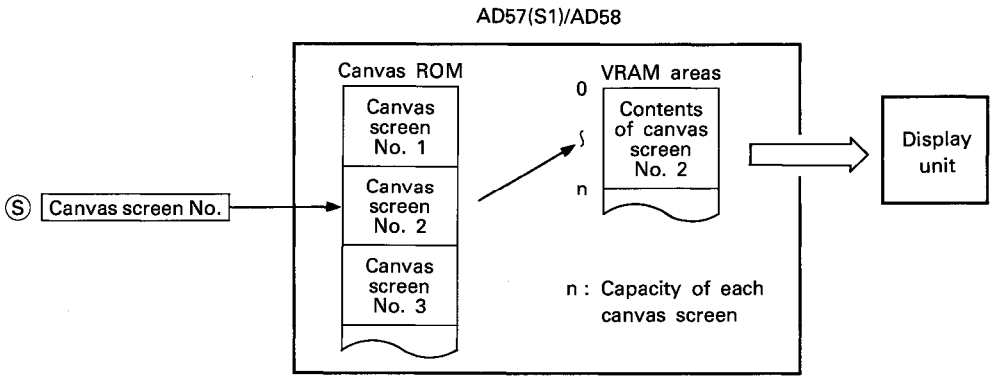
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Canvas screen number

FUNCTION

(1) The CPS1 instruction is used to transmit the canvas screen designated by Ⓢ to addresses 0 and after in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ, and displays it on a display being connected.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The canvas screen number to be designated by Ⓢ should correspond with the canvas screen number written to the canvas ROM of designated AD57(S1)/AD58.

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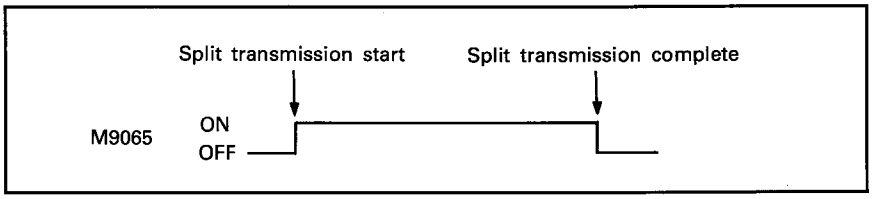
(4) There are 2 ways of transmission of canvas screens to the VRAM areas, as mentioned below. Use special relay M9066 to switch the method of transmission.

1) Batch transmission (M9066 is OFF)
Data of designated canvas screen is transmitted in batch to the VRAM areas.
The scan time in which batch transmission is performed accordingly becomes longer than that in which transmission is not performed.

2) Split transmission (M9066 is ON)
Data of designated canvas screen is transmitted by 100 words per scan.
Scan time is not lengthened so much by the transmission operation.
However, the split transmission operation requires more processing time than the batch transmission operation.

(Number of scans required for transmission processing
In the CRT standard mode ····· 16 scans
In the CRT enlarged mode ····· 4 scans
In the LCD mode ····· 8 scans)

Special relay M9065 is turned ON when split transmission is started, and turned OFF when it is completed.



POINT

(1) During split transmission, execution of other instructions cannot be accepted by the AD57(S1)/AD58 to which screen data is being transmitted.
Also, execution of the following instructions cannot be accepted by other AD57(S1)/AD58.
CPS1 instruction, CMOV instruction, CLS instruction, CLV instruction

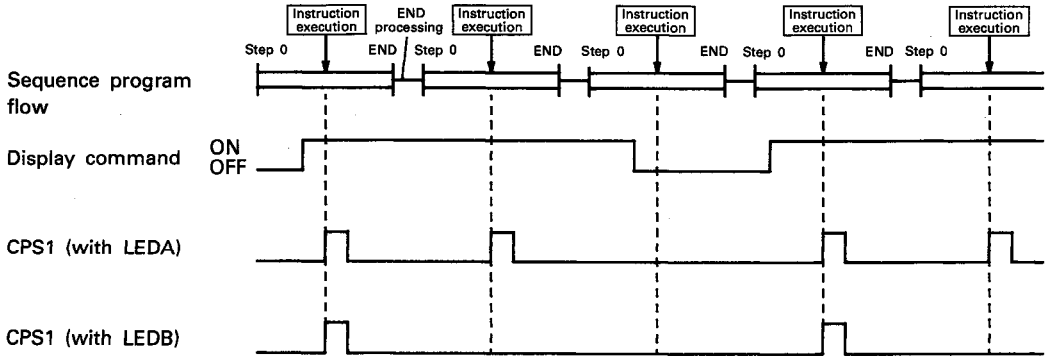
(2) The LEDB instruction cannot be used when split transmission is performed.
Display command (conditional contact) and M9066 should be held at ON during split transmission.

(5) After execution of the CPS1 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Line "0"
Cursor column position	Column "0"
Head VRAM address displayed	Address "0"
Normal/reverse designation	Normal
Color designation	White
Cursor display	Not displayed

EXECUTION CONDITION

The CPS1 instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



OPERATION ERROR

In the case described below, the operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The canvas screen number designated by Ⓢ is out of the range from 1 to 255, or there is no canvas screen data which corresponds with the canvas screen number designated by Ⓢ in the canvas ROM.	50	503

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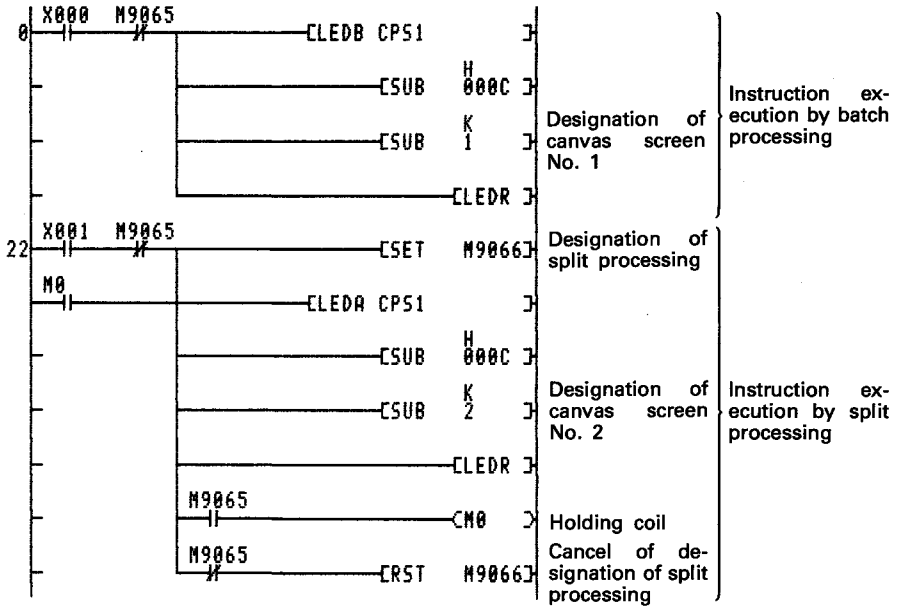
PROGRAM EXAMPLE

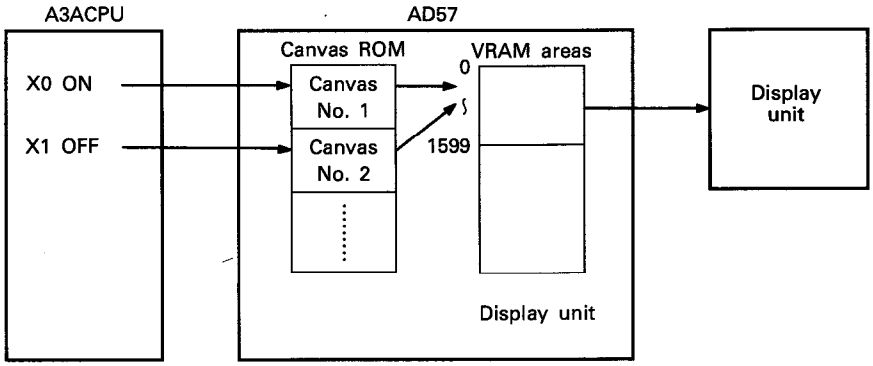
The following is an example of the program used to display canvas screens on the AD57 loaded at X/Y0C0 to 0FF.
When X000 is turned ON, canvas screen No. 1 is displayed by batch processing. When X001 is turned ON, canvas screen No. 2 is displayed by split processing.



Designation of batch/split processing is done by setting M9066 as follows.

When M9066 is OFF····· Batch processing
When M9066 is ON····· Split processing

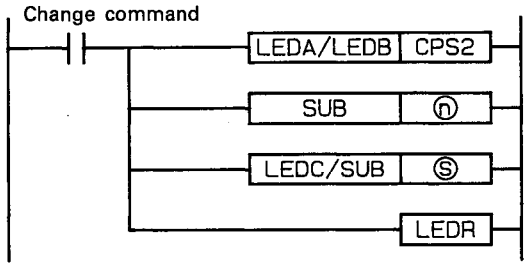
M9065 is the split processing flag and used to provide interlock so that other instructions may not be executed during split processing.
M0 is used to hold so that the CPS1 instruction may be executed till split processing is completed.



6.2.2 VRAM display address change·····CPS2

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
Ⓢ								○	○	○	○	○					○	○					20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

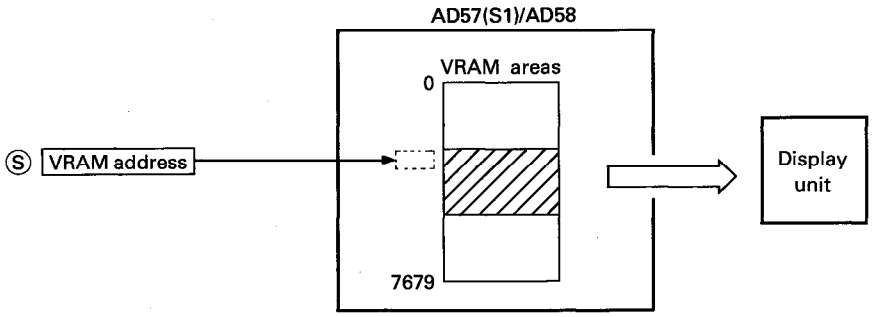
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Head VRAM address where the screen data to be displayed is stored

FUNCTION

(1) The CPS2 instruction is used to change the range of VRAM areas (addresses 0 to 7679) of the AD57(S1)/AD58 designated by ⓝ, which is to be displayed, to the addresses starting with one designated by Ⓢ.



(2) Screen switching time as well as scan time of the sequence program can be shortened by switching display addresses using the CPS2 instruction instead of the CPS1 instruction. Before execution of the CPS2 instruction, canvas screens should have been transmitted to VRAM areas using the CMOV instruction.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The range of addresses to be displayed varies with preset display mode.
- CRT standard mode··· From (designated address) to (designated address + 1599)
- CRT enlarged mode··· From (designated address) to (designated address + 399)
- LCD mode····· From (designated address) to (designated address + 799)

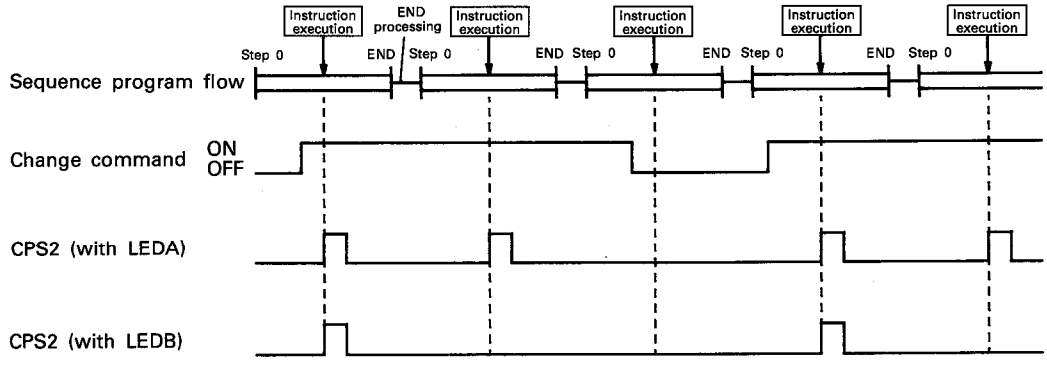
(5) The VRAM address designated by Ⓢ should be the head address of the range to be displayed.
The available range of addresses is from 0 to 7679.
If the area ranging from a designated address to address 7679 is smaller than the capacity of one screen area, the address designated by Ⓢ is automatically changed as mentioned below so that one screen area is filled with display of data.
- CRT standard mode
  If addresses starting with 6081 are designated ..... Designation is changed to address 6080.
- CRT enlarged mode
  If addresses starting with 7281 are designated ..... Designation is changed to address 7280.
- LCD mode
  If addresses starting with 6881 are designated ..... Designation is changed to address 6880.

(6) After execution of the CPS2 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Line "0"
Cursor column position	Column "0"
Head VRAM address displayed	Designated address
Normal/reverse designation	Normal
Color designation	White
Cursor display	Not displayed

EXECUTION CONDITION

The CPS2 instruction is executed every scan while the change command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the change command signal when the LEDB instruction is used.



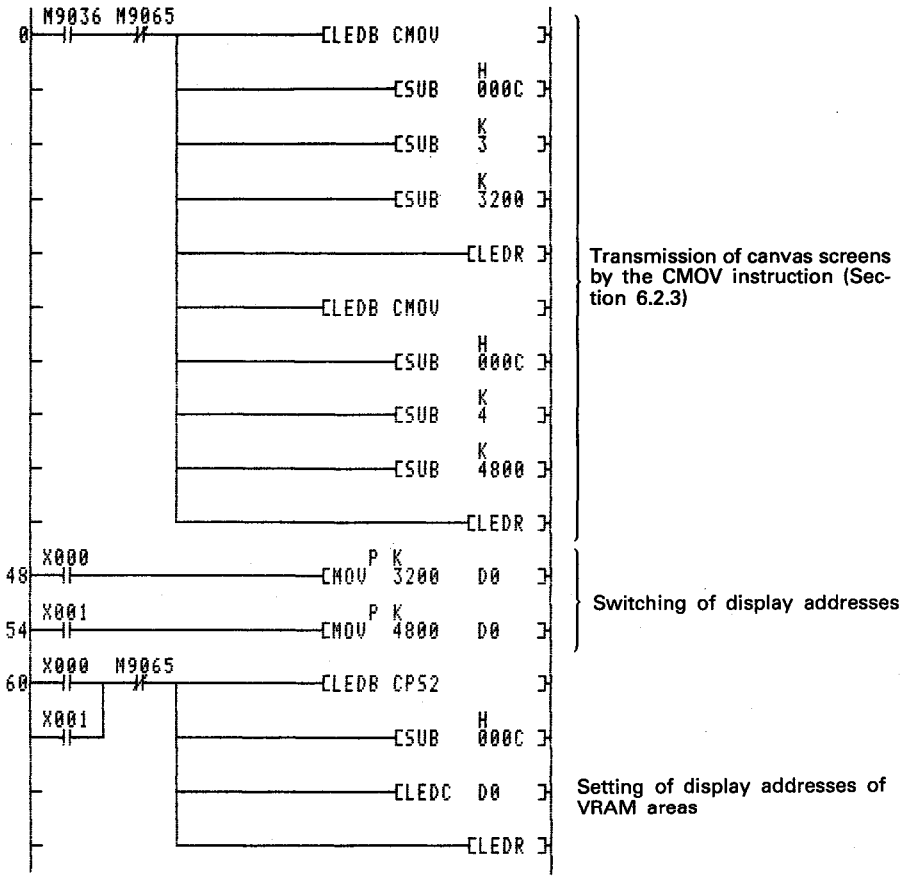
OPERATION ERROR

In the case described below, the operation error occurs and an error flag (M9011) is set.

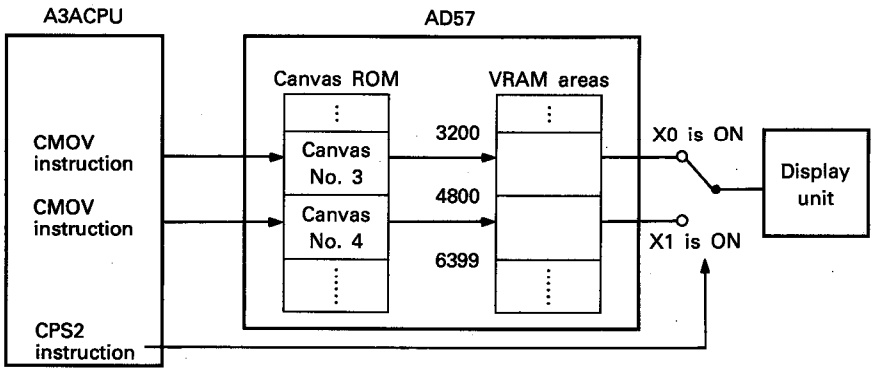
Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S) is out of the range from 0 to 7679.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to change display addresses of the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
When X000 is turned ON, display data stored at addresses 3200 to 4799 in the VRAM areas is displayed. When X001 is turned ON, display data stored at addresses 4800 to 6399 in the VRAM areas is displayed.



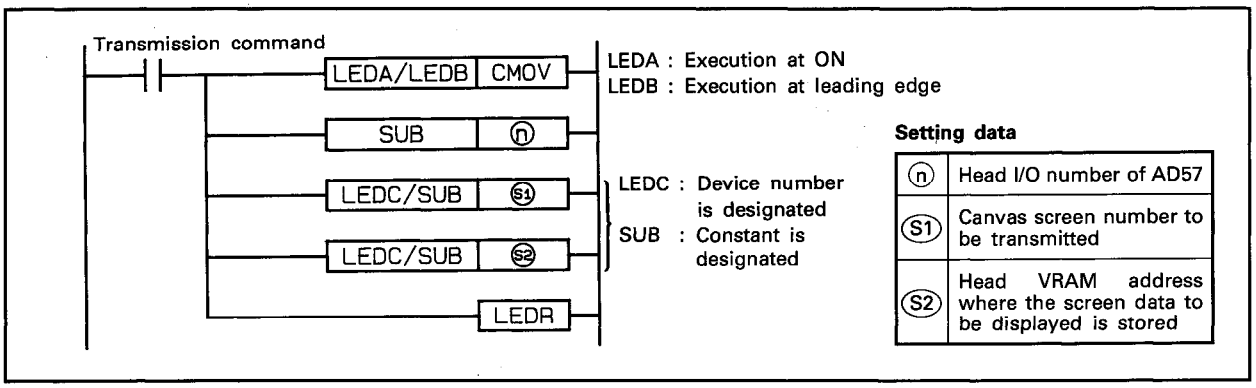
In the example above, canvas screen No. 3 is transmitted to addresses 3200 to 4799, and canvas screen No. 4 to addresses 4800 to 6399, in the VRAM areas by execution of the CMOV instruction.



6.2.3 Canvas screen transmission to VRAM areas·····CMOV

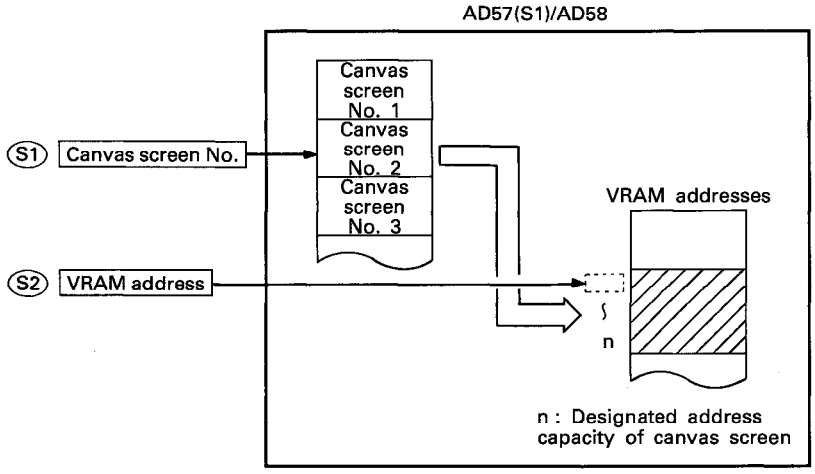
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○	○
(S2)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CMOV instruction is used to transmit the canvas screen designated by (S1) to the addresses starting with one designated by (S2) in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

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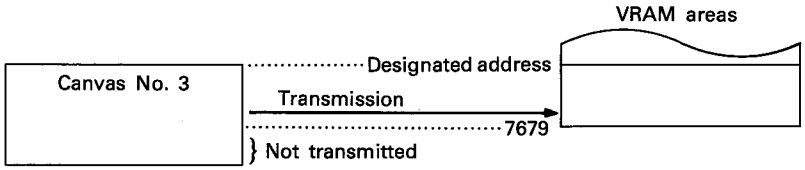
(3) The canvas screen number to be designated by (S1) should correspond with the canvas screen number written to the canvas ROM of designated AD57(S1)/AD58.

(4) The VRAM address designated by (S2) should be the head address of the areas to be transmitted.
The available range is from 0 to 7679.
The range of addresses where transmitted data is to be stored varies with preset display mode of the canvas screen to be transmitted.
- CRT standard mode··· From (designated address) to (designated address + 1599)
- CRT enlarged mode··· From (designated address) to (designated address + 399)
- LCD mode····· From (designated address) to (designated address + 799)

If the area ranging from a designated address to address 7679 is smaller than the capacity of one canvas screen area to be transmitted, only the area starting with the designated address to address 7679 is transmitted, as mentioned below.

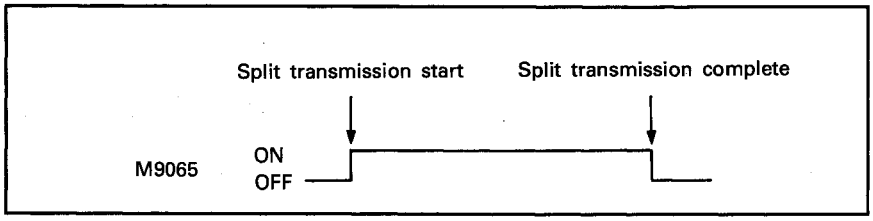


(5) There are 2 ways of transmission of canvas screens to the VRAM areas, as mentioned below. Use special relay M9066 to switch the method of transmission.
1) Batch transmission (M9066 is OFF)
Data of designated canvas screen is transmitted in batch to the VRAM areas.
The scan time in which batch transmission is performed accordingly becomes longer than that in which transmission is not performed.

2) Split transmission (M9066 is ON)
Data of designated canvas screen is transmitted by 100 words per scan.
Scan time is not lengthened so much by the transmission operation.
However, the split transmission operation requires more processing time than the batch transmission operation.

(Number of scans required for transmission processing
In the CRT standard mode ····· 16 scans
In the CRT enlarged mode ····· 4 scans
In the LCD mode ····· 8 scans)

Special relay M9065 is turned ON when split transmission is started, and turned OFF when it is completed.



POINT

(1) During split transmission, execution of other instructions cannot be accepted by the AD57(S1)/AD58 to which screen data is being transmitted.
Also, execution of the following instructions cannot be accepted by other AD57(S1)/AD58.
CPS1 instruction, CMOV instruction, CLS instruction, CLV instruction

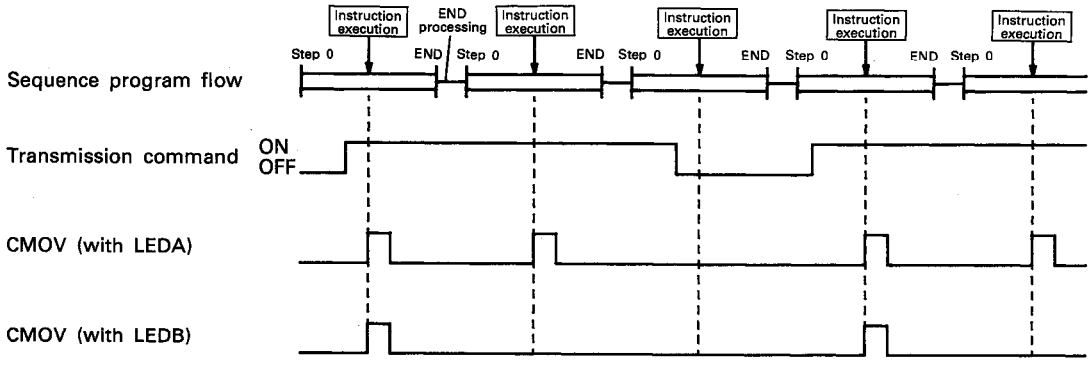
(2) The LEDB instruction cannot be used when split transmission is performed.
Display command (conditional contact) and M9066 should be held at ON during split transmission.

(6) After execution of the CMOV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	The cursor is not displayed only when transmission is done to the area being displayed on the display unit.

EXECUTION CONDITION

The CMOV instruction is executed every scan while the transmission command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the transmission command signal when the LEDB instruction is used.



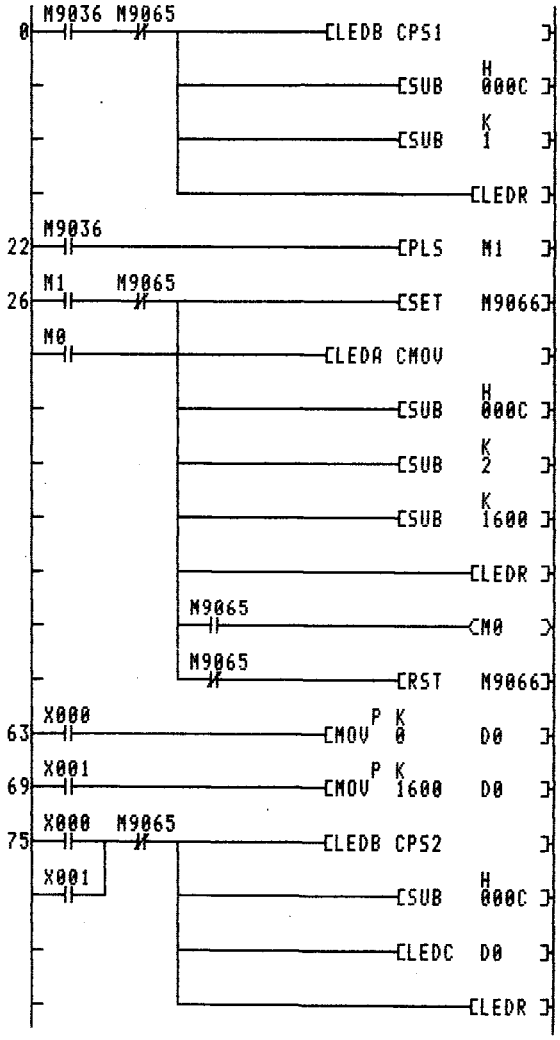
OPERATION ERROR

In the cases described below, the operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The canvas screen number designated by (S1) is out of the range from 1 to 255, or there is no canvas screen data which corresponds with the canvas screen number designated by (S1) in the canvas ROM.	50	503
The VRAM area address designated by (S2) is out of the range from 0 to 7679.		

PROGRAM EXAMPLE

The following is an example of the program used to display canvas screens and to transmit canvas screen data to the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Display of canvas screens and transmission of canvas screen data are performed when the PC CPU is turned on or reset.
Display of canvas screen No. 1 is executed by batch processing, and transmission of canvas screen No. 2 to addresses 1600 to 3199 is executed by split processing.



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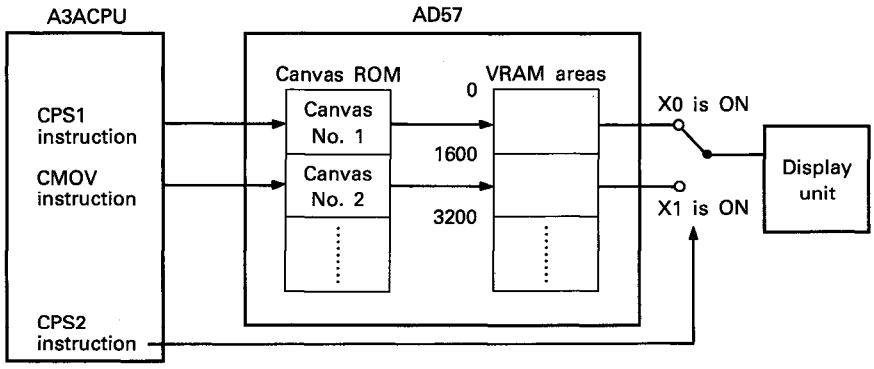
The CPS1 instruction is used to transmit canvas screen data to addresses 0 to 1599 in the VRAM areas and to display it on a display unit.
If the CMOV instruction is used, canvas screen data is transmitted to the VRAM areas, and it is not displayed on a display unit.
In the example, the canvas screen displayed by the CPS1 instruction can be switched to the canvas screen, transmitted by the CMOV instruction, by execution of the CPS2 instruction.

X0 ON ···The canvas screen displayed by the CPS1 instruction is displayed again.
X1 ON ···The canvas screen transmitted by the CMOV instruction is displayed.

Designation of batch/split processing at execution of the CPS1 and CMOV instructions is done by setting M9066 as follows.

When M9066 is OFF····· Batch processing
When M9066 is ON····· Split processing

M9065 is the split processing flag and used to provide interlock so that other instructions may not be executed during split processing.
M0 is used to hold so that the CMOV instruction may be executed till split processing is completed.

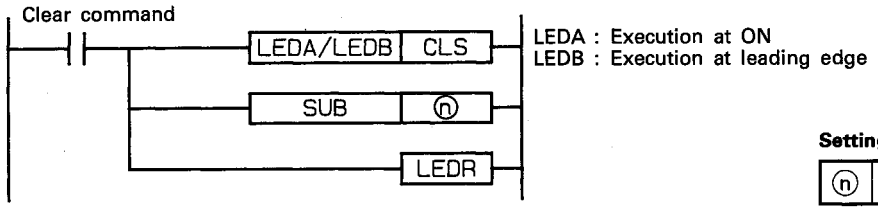


MEMO

6.2.4 Screen clear·····CLS

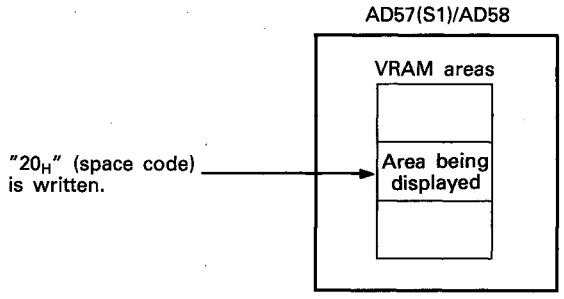
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					17		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CLS instruction is used to clear the VRAM areas of the AD57(S1)/AD58 designated by ⓝ to clear the screen.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

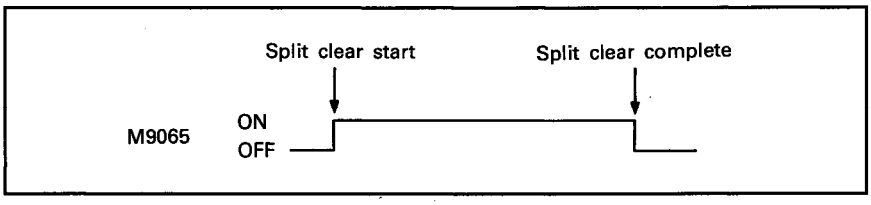
(3) There are 2 ways of clear of VRAM areas being displayed, as mentioned below. Use special relay M9066 to switch the method of processing.

1) Batch clear (M9066 is OFF)
Data of the VRAM areas being displayed is cleared in batch.
The scan time in which batch clear processing is performed accordingly becomes longer than that in which batch clear processing is not performed.

2) Split clear (M9066 is ON)
Data of the VRAM areas being displayed is cleared by 100 words per scan.
The scan time is not lengthened so much by the clear processing operation.
However, the split clear operation requires more processing time than the batch clear operation.

(Number of scans required for transmission processing
In the CRT standard mode ····· 16 scans
In the CRT enlarged mode ····· 4 scans
In the LCD mode ····· 8 scans)

Special relay M9065 is turned ON when the split clear operation is started, and turned OFF when it is completed.



POINT

(1) During the split clear operation, execution of other instructions cannot be accepted by the AD57(S1)/AD58 of which VRAM area data is being cleared.
Also, execution of the following instructions cannot be accepted by other AD57(S1)/AD58 modules.
CPS1 instruction, CMOV instruction, CLS instruction, CLV instruction

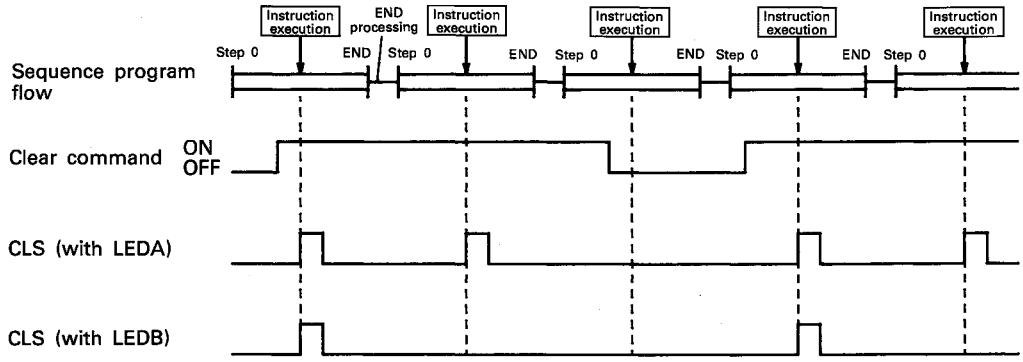
(2) The LEDB instruction cannot be used when the split clear operation is performed.
The clear command (conditional contact) and M9066 should be held at ON during the split clear operation.

(4) After execution of the CLS instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Line "0"
Cursor column position	Column "0"
Head VRAM address displayed	(no change)
Normal/reverse designation	Normal
Color designation	White
Cursor display	Not displayed

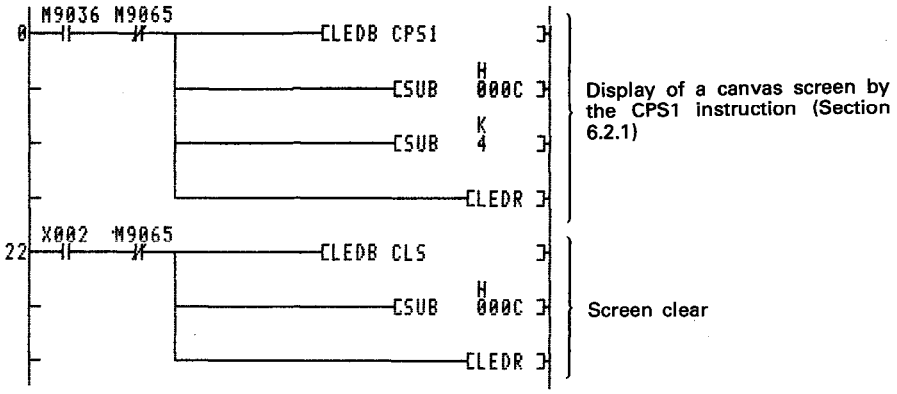
EXECUTION CONDITION

The CLS instruction is executed every scan while the clear command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the clear command signal when the LEDB instruction is used.

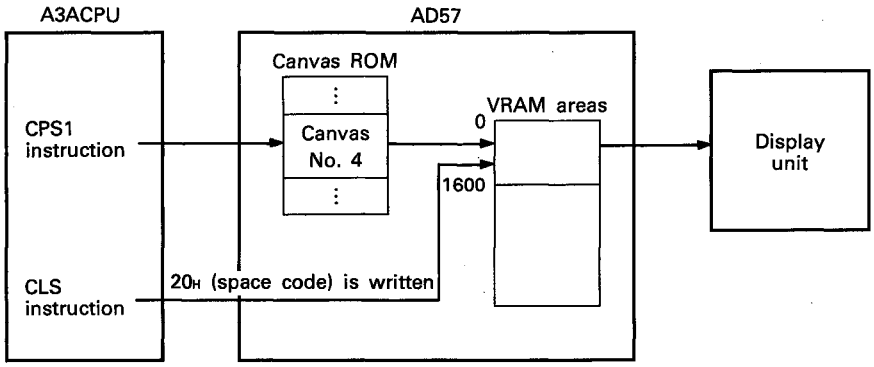


PROGRAM EXAMPLE

The following is an example of the program used to clear data displayed on a display unit which is connected to the AD57 loaded at X/Y0C0 to 0FF.
Data on the screen is cleared by turning on X002.



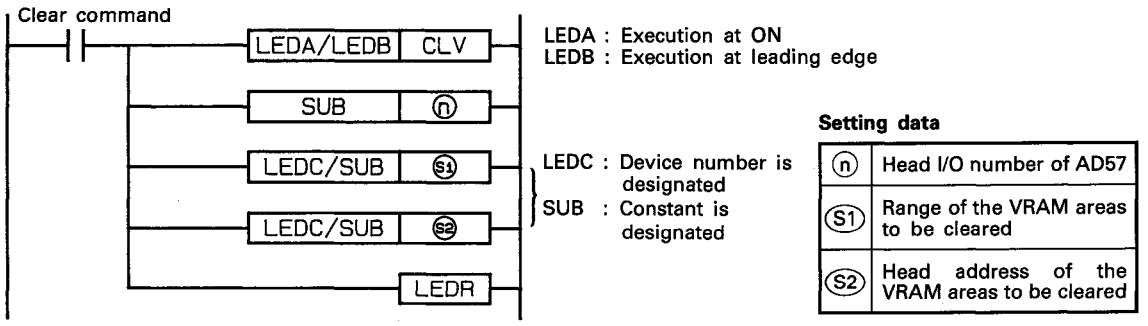
In the program example above, the CPS1 instruction is used to display canvas screen No. 4 when the PC CPU is turned on or reset.



6.2.5 VRAM area clear·····CLV

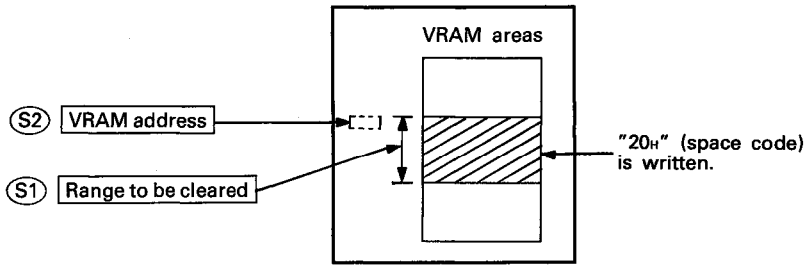
	Usable devices																			Number of steps	Digit specification	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
(n)																	○	○									
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

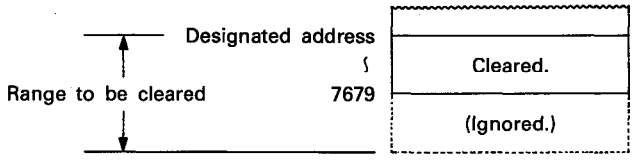
(1) The CLV instruction is used to clear the VRAM areas designated by (S1) starting with the address designated by (S2) with respect to the AD57(S1)/AD58 designated by (n).



(2) The head I/O number of the AD57(S1)/AD58 designated by (n) should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at (n).

(3) The range to be cleared designated by (S1) should be set within the range of "0" to "3" as mentioned below.
0, 3 or 5·····From (designated address) to (designated address + 1599)
1·····From (designated address) to (designated address + 399)
2·····From (designated address) to (designated address + 799)

(4) The VRAM address designated by (S2) should be the head address of the areas to be cleared.
The available range of setting is from 1 to 7679.
If the area ranging from a designated address to address 7679 is smaller than the areas to be cleared designated by (S1), only the area starting with the designated address to address 7679 is cleared, as mentioned below.

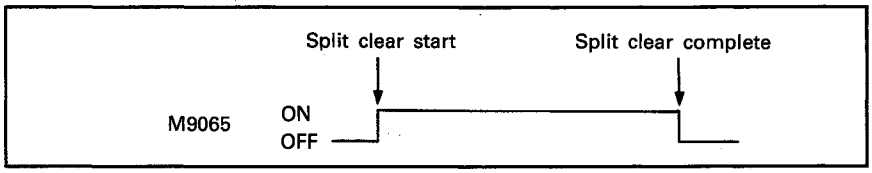


(5) There are 2 ways of clearing of VRAM areas, as mentioned below. Use special relay M9066 to switch the method of processing.
1) Batch clear (M9066 is OFF)
Data of designated VRAM areas is cleared in batch.
The scan time in which batch clear processing is performed accordingly becomes longer than that in which batch clear processing is not performed.

2) Split clear (M9066 is ON)
Data of designated VRAM areas is cleared by 100 words per scan.
The scan time is not lengthened so much by the clear processing operation.
However, the split clear operation requires more processing time than the batch clear operation.

(Number of scans required for transmission processing
In the CRT standard mode ····· 16 scans
In the CRT enlarged mode ····· 4 scans
In the LCD mode ····· 8 scans)

Special relay M9065 is turned ON when the split clear operation is started, and turned OFF when it is completed.



POINT

(1) During the split clear operation, execution of other instructions cannot be accepted by the AD57(S1)/AD58 of which VRAM area data is being cleared.
Also, execution of the following instructions cannot be accepted by other AD57(S1)/AD58 modules.
CPS1 instruction, CMOV instruction, CLS instruction, CLV instruction

(2) The LEDB instruction cannot be used when the split clear operation is performed.
The clear command (conditional contact) and M9066 should be held at ON during the split clear operation.

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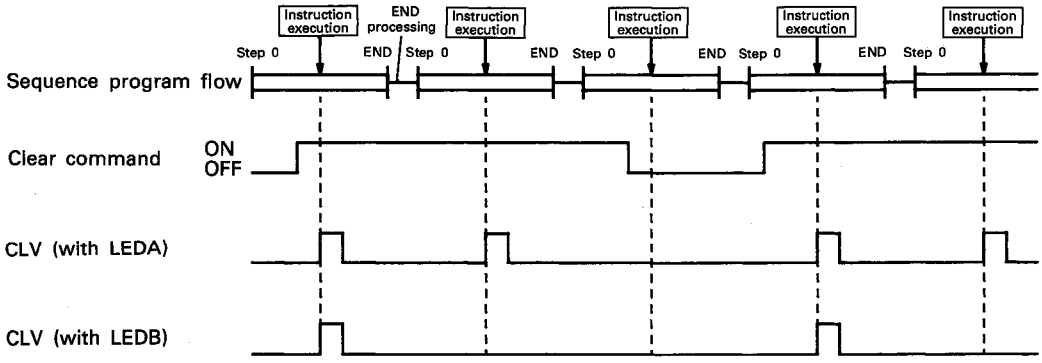
(6) After execution of the CLV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	Not displayed only when the areas displayed on a display unit are cleared.

EXECUTION CONDITION

The CLV instruction is executed every scan while the clear command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the clear command signal when the LEDB instruction is used.



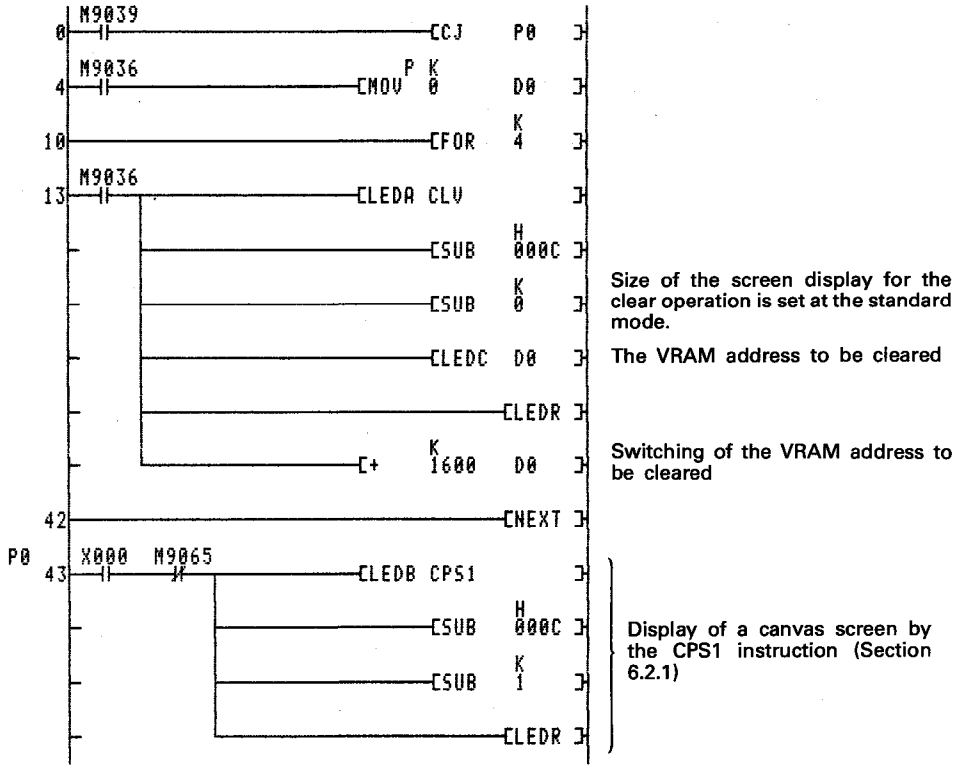
OPERATION ERROR

In the cases described below, the operation error occurs and an error flag (M9011) is set.

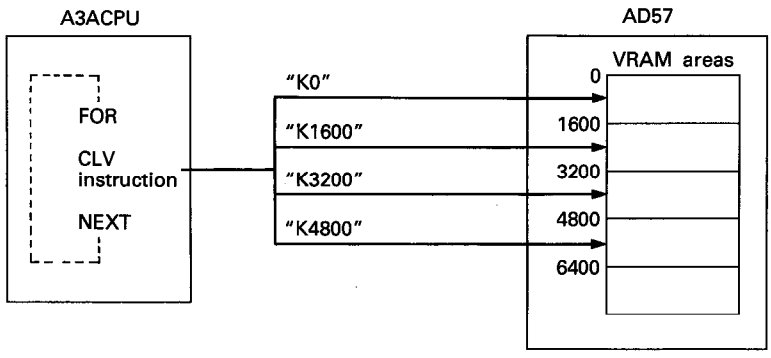
Description	Error Code	
	D9008	D9091
The display mode setting data designated by (S1) is out of the range from 0 to 3 and 5.	50	503
The VRAM area address designated by (S2) is out of the range from 0 to 7679.		

PROGRAM EXAMPLE

The following is an example of the program used to clear data of the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Data of addresses 0 to 6399 of the VRAM areas is cleared by batch processing.
Clearing of the VRAM area data is performed only once when the PC CPU is turned on or reset.



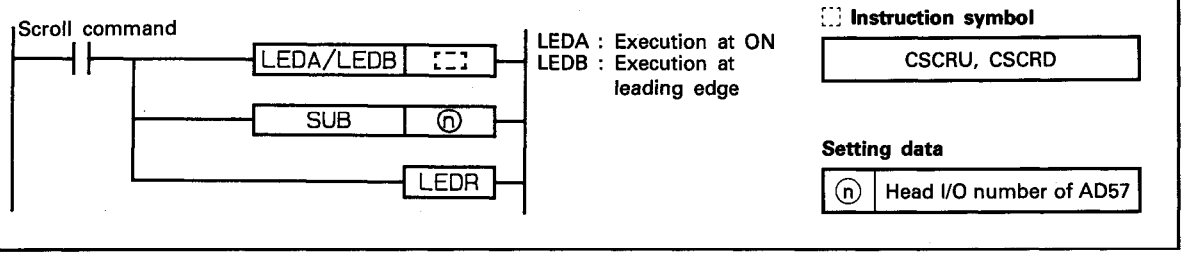
The VRAM area clear operation by the CLV instruction is performed according to the size of the screen display in the display mode currently set. In the program example, the display mode is considered to be set at the CRT standard mode.
Data in the VRAM areas from address 0 to 6399 is cleared 4 times in units of 1600 addresses per one time.



6.2.6 Screen scroll·····CSCRU, CSCRD

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					17		○		○

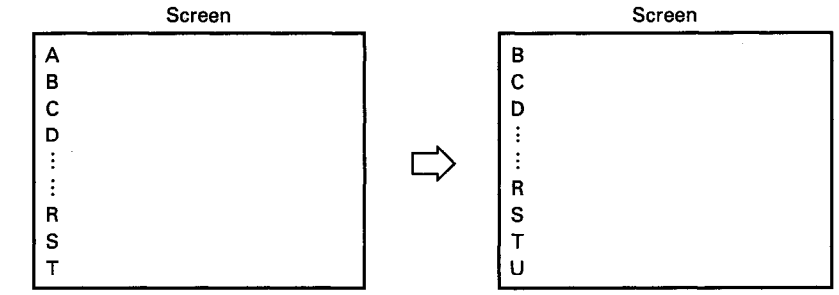
*1: The number of steps varies with type of device used. See Section 5.2.



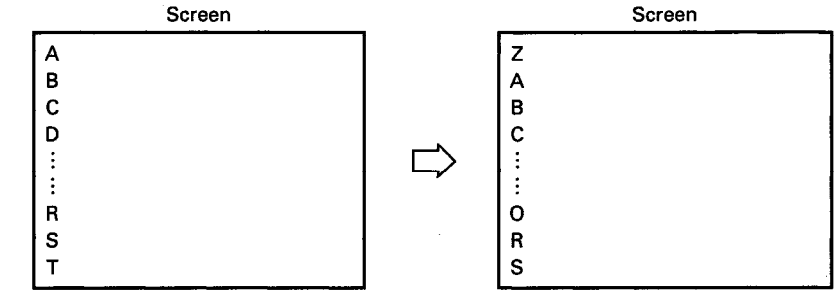
FUNCTION

(1) The CSCRU and CSCRD instructions are used to scroll up and down the screen one line at a time on the display unit connected to the AD57(S1)/AD58 designated by ⓝ.
CSCRU instruction ····· Scroll up
CSCRD instruction····· Scroll down

Scroll up

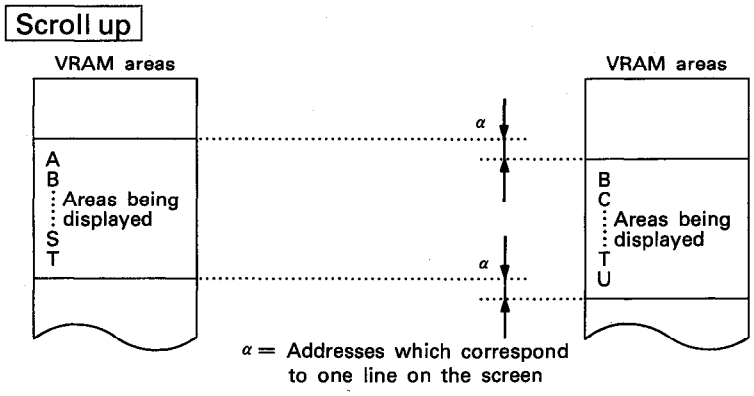


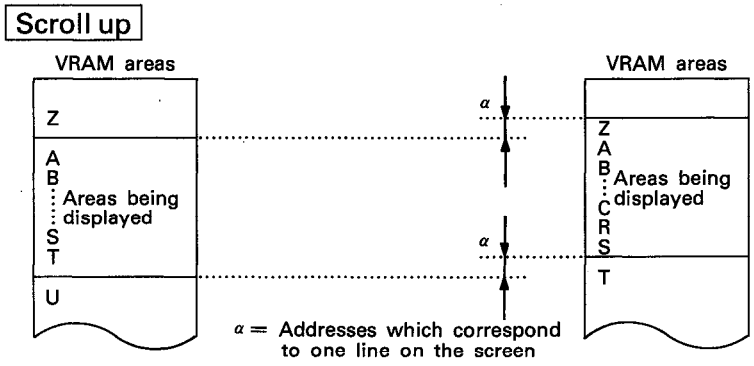
Scroll down



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The scroll up/down operations are performed by adding or subtracting the address data mentioned below to or from the address of the VRAM areas being displayed.
In the CRT standard mode ····· 80 addresses
In the CRT enlarged mode ····· 40 addresses
In the LCD mode ····· 80 addresses





(4) The operation error occurs when the head of the VRAM area addresses being displayed exceeds the address mentioned below in the scroll up operation. The operation error occurs also when the head address exceeds address 0 in the scroll down operation.
In the CRT standard mode ····· Address 6080
In the CRT enlarged mode ····· Address 7280
In the LCD mode ····· Address 6880
The CSCRU and CSCRD instructions should be used in the sequence program so that they may be executed when the head address is within the ranges mentioned below.
In the CRT standard mode ····· Addresses 80 to 6000
In the CRT enlarged mode ····· Addresses 40 to 7240
In the LCD mode ····· Addresses 80 to 6800

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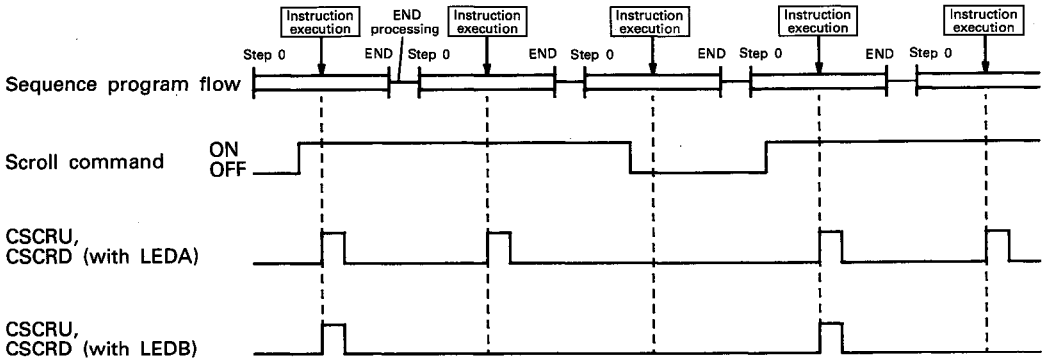
(5) After execution of the CSCRU and CSCRD instructions, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	CSCRU instruction Addresses for addition of one line CSCRD instruction Addresses for subtraction of one line
Normal/reverse designation	(no change)
Color designation	
Cursor display	

EXECUTION CONDITION

The CSCRU and CSCRD instructions are executed every scan while the scroll command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the scroll command signal when the LEDB instruction is used.



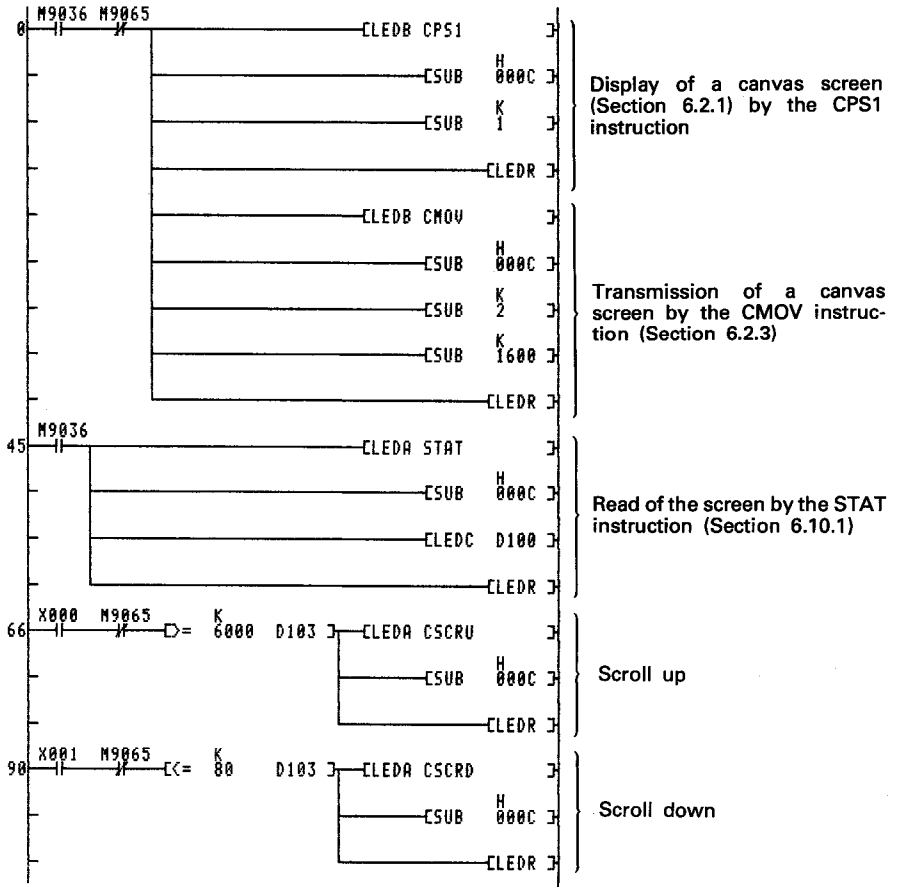
OPERATION ERROR

In the cases described below, the operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The head of the VRAM area addresses being displayed exceeds the values mentioned below in the scroll up (CSCRU) operation. In the CRT standard mode ····· Address 6080 In the CRT enlarged mode ····· Address 7280 In the LCD mode ····· Address 6880	50	503
The head of the VRAM area addresses being displayed exceeds 0 in the scroll down (CSCRD) operation.		

PROGRAM EXAMPLE

The following is an example of the program used to scroll up/down the screen one line at a time on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Scrolling up is performed by turning on X0. Scrolling down is performed by turning on X1.



The STAT instruction (Section 6.10.1) is used to read the display condition of the screen. In this example, the STAT instruction is used to read the head of the VRAM addresses being displayed and to check the range of the displayed areas if scrolling up or down is possible by execution of the CSCRU or CSCRD instruction.
Since the scroll up/down operations are executed by changing the addresses of the VRAM areas being displayed for one line at a time, execution of scrolling up/down exceeding specified VRAM areas will result in an operation error.

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6.3 Cursor Control Instructions

The cursor control instructions are used to turn on and off display of the cursor and to move the cursor on the screen.

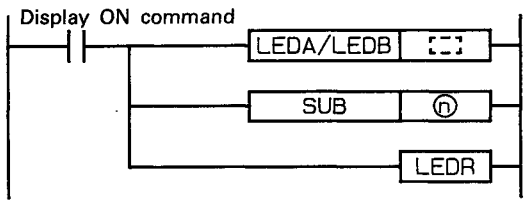
Cursor control is executed using the instructions mentioned below.

Category	Instruction Name	Description
Cursor display ON	CON1	The one-character cursor is displayed at current cursor position.
	CON2	The two-character cursor is displayed at current cursor position.
Cursor display OFF	COFF	Display of the cursor is turned off.
Cursor movement	LOCATE	The cursor on the display is moved.

6.3.1 Cursor display ON·····CON1, CON2

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					17		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CON1 and CON2 instructions are used to display the cursor at current cursor position on the screen of a display unit connected to the AD57(S1)/AD58 designated by ⓝ.
CON1 instruction ····· Displays the one-character cursor (8×16 dots).
CON2 instruction ····· Displays the two-character cursor (16×16 dots).

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) Any character displayed at the cursor position is reversed when the cursor is displayed.

(4) When the two-character cursor, being displayed by execution of the CON2 instruction, is moved to 79th column on any line on the screen, the cursor changes to the one-character size. When the cursor is moved to any other column, it returns to the two-character size.

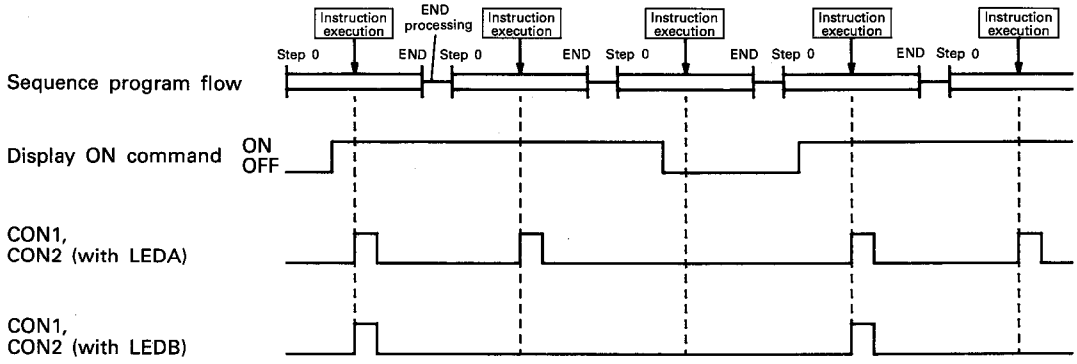
(5) Refer to the description of instruction for moving or turning off the cursor.
Cursor movement ····· LOCATE instruction
Cursor display off····· COFF instruction

(6) After execution of the CON1 and CON2 instructions, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	CON1 instruction The one-character cursor is displayed. CON2 instruction The two-character cursor is displayed.

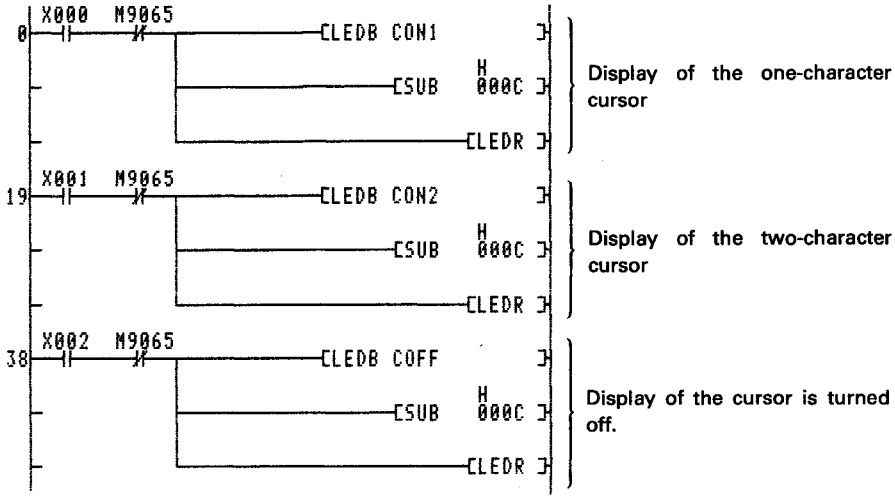
EXECUTION CONDITION

The CON1 and CON2 instructions are executed every scan while the display ON command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display ON command signal when the LEDB instruction is used.



PROGRAM EXAMPLE

The following is an example of the program used to turn on/off the cursor on the screen of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
The one-character cursor is displayed by turning on X0. The two-character cursor is displayed by turning on X1.
Display of the cursor is turned off by turning on X2.



By execution of the CON1 instruction, the one-character cursor is displayed at current cursor position. By execution of the CON2 instruction, the two-character cursor is displayed.
By execution of the COFF instruction, display of the cursor on the screen is turned off.

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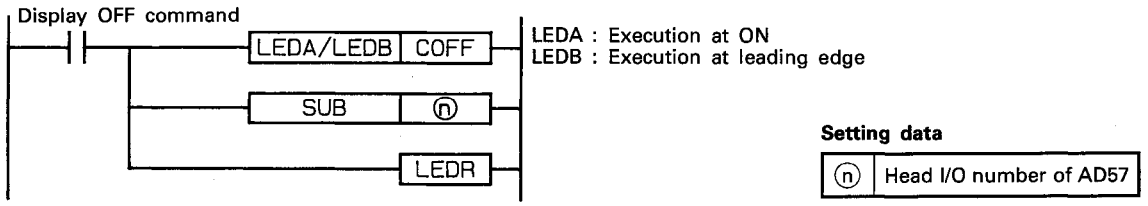
6.3.2 Cursor display OFF·····COFF

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○					17		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The COFF instruction is used to turn off display of the cursor on the screen of a display unit connected to the AD57(S1)/AD58 designated by ⓝ.

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

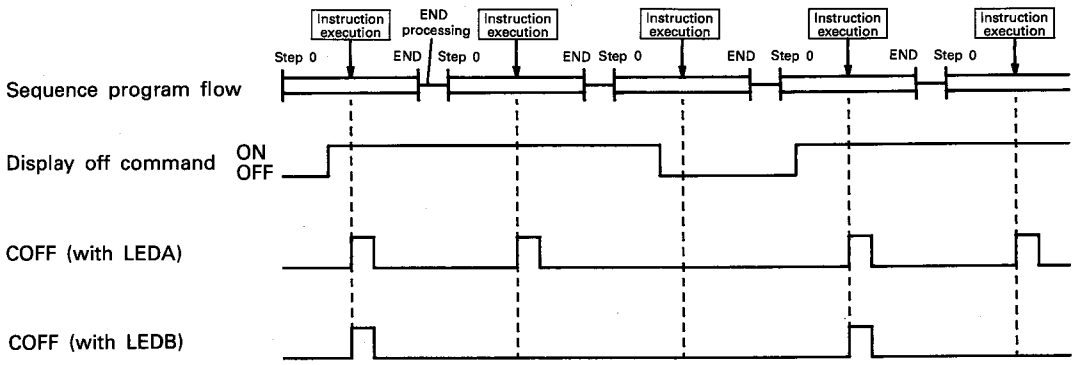
(3) Refer to the description of instruction for moving or turning on the cursor.
Cursor display on ····· CON1 and CON2 instructions
Cursor movement ····· LOCATE instruction

(4) After execution of the COFF instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	Not displayed

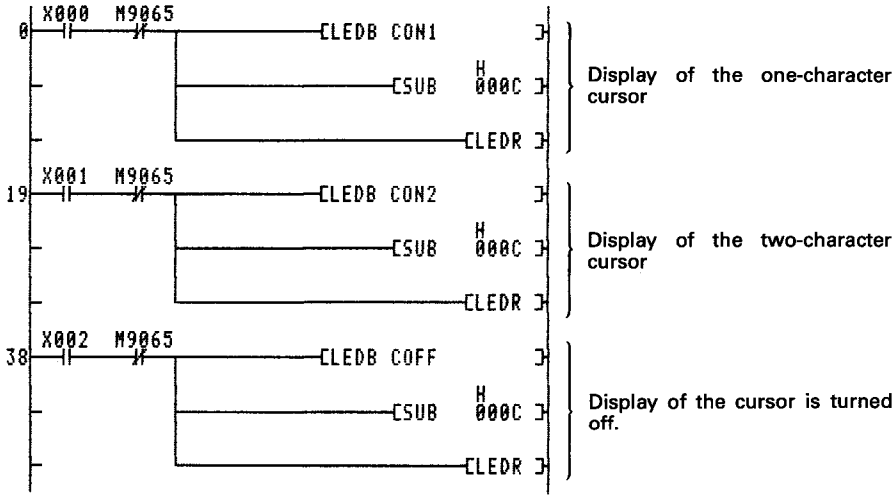
EXECUTION CONDITION

The COFF instruction is executed every scan while the display off command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display off command signal when the LEDB instruction is used.



PROGRAM EXAMPLE

The following is an example of the program used to turn on/off the cursor on the screen of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
The one-character cursor is displayed by turning on X0. The two-character cursor is displayed by turning on X1.
Display of the cursor is turned off by turning on X2.

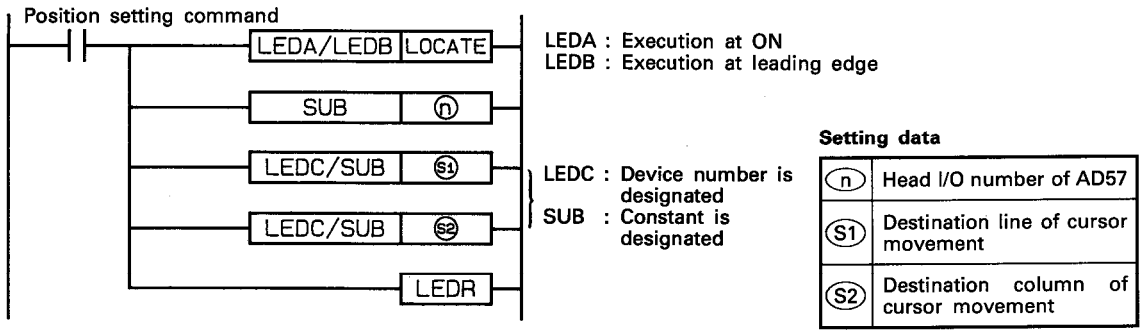


By execution of the CON1 instruction, the one-character cursor is displayed at current cursor position. By execution of the CON2 instruction, the two-character cursor is displayed.
By execution of the COFF instruction, display of the cursor on the screen is turned off.

6.3.3 Cursor position setting·····LOCATE

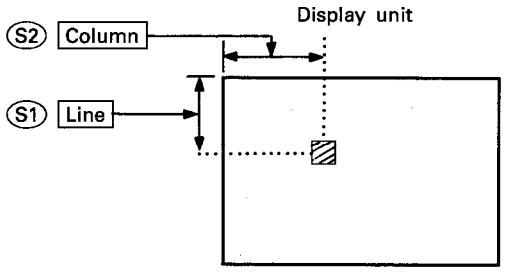
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The LOCATE instruction is used to move the cursor to the line designated by (S1) and to the column designated by (S2) on the screen of a display unit connected to the AD57(S1)/AD58 designated by ⓝ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The range available for setting destination lines and columns at (S1) and (S2) varies with the display mode being used as mentioned below.

Display Mode	Line ((S1))	Column ((S2))
CRT standard mode (0 or 3)	0~19	0~79
CRT enlarged mode (1)	0~ 9	0~39
LCD mode (2)	0~ 9	0~79

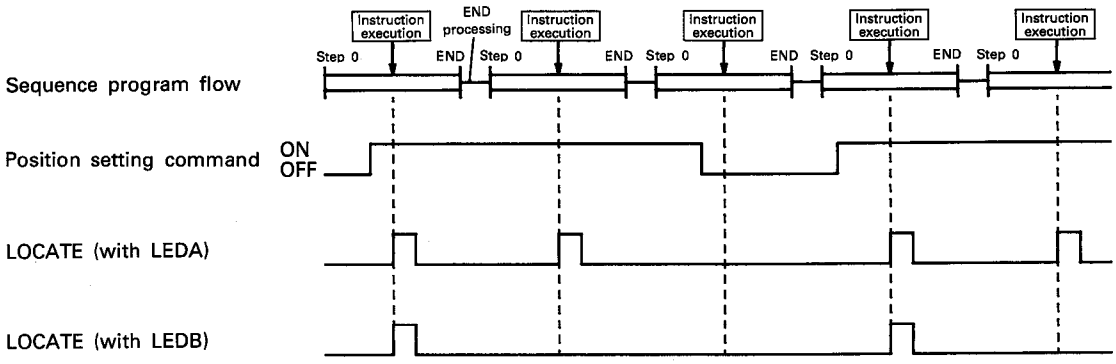
(4) If the LOCATE instruction is used when display of the cursor is turned off, only the cursor position is moved.

(5) After execution of the LOCATE instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Designated line
Cursor column position	Designated column
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The LOCATE instruction is executed every scan while the position setting command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the position setting command signal when the LEDB instruction is used.



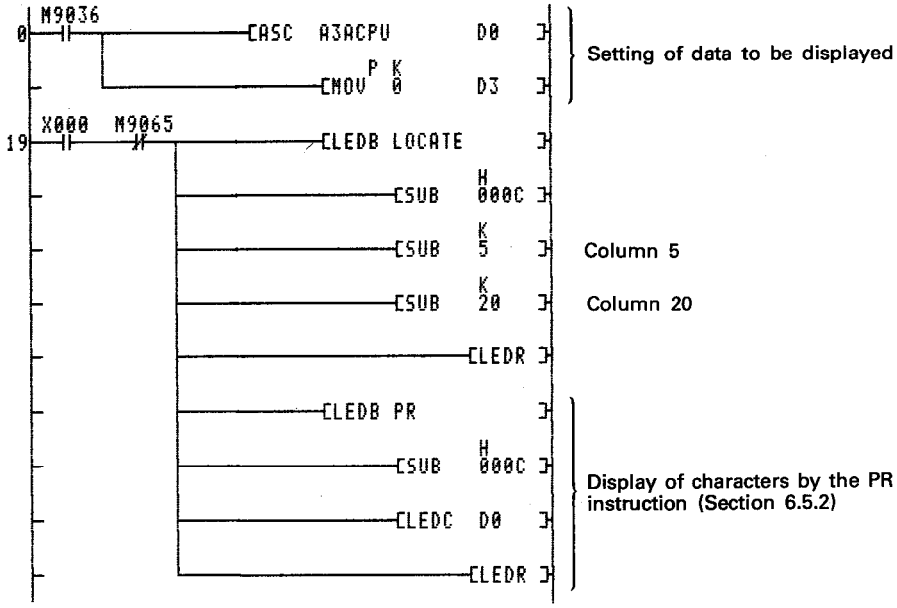
OPERATION ERROR

In the cases described below, the operation error occurs and an error flag (M9011) is set.

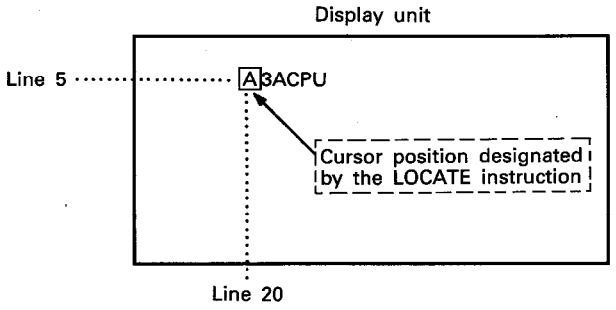
Description	Error Code D9008	Error Code D9091
The line position designated by (S1) is out of the ranges mentioned below. In the CRT standard mode ····· 0 to 19 In the CRT enlarged mode ····· 0 to 9 In the LCD mode ····· 0 to 9	50	503
The column position designated by (S2) is out of the ranges mentioned below. In the CRT standard mode ····· 0 to 79 In the CRT enlarged mode ····· 0 to 39 In the LCD mode ····· 0 to 79		

PROGRAM EXAMPLE

The following is an example of the program used to move the cursor on the screen of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
By turning on X000, the cursor on the screen is moved to column 20 on line 5.



In this example, characters "A3ACPU" are displayed by execution of the ASCII character display instruction (PR) after cursor movement.



6.4 Display Condition Setting Instructions

The display condition setting instructions are used to change color or perform normal/reverse switching of characters to be or being displayed.
Using the display condition setting instructions, color designation and normal/reverse switching of character display can be easily performed.

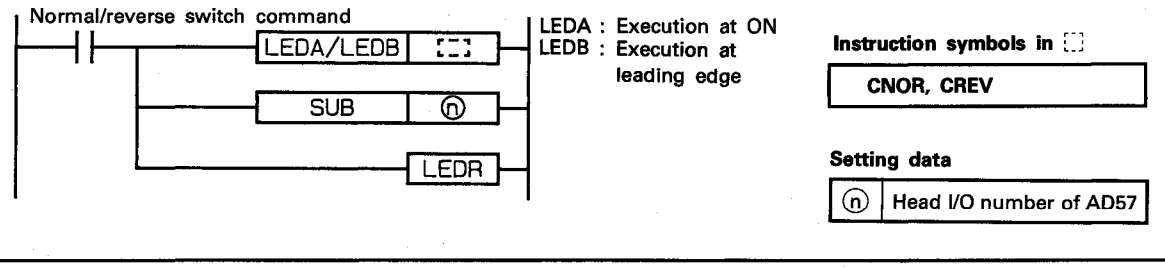
Display condition setting is executed using the instructions mentioned below.

Category	Instruction Name	Description
Normal/reverse switching	CNOR	Designates characters to be displayed in the normal display mode.
	CREV	Designates characters to be displayed in the reverse display mode.
	CRDSP	Switches the display mode of characters being displayed from normal to reverse or vice versa.
	CRDSPV	Switches the display mode of the characters stored at designated addresses in the VRAM areas from normal to reverse or vice versa.
Color designation	COLOR	Designates color of characters to be displayed.
	CCDSP	Changes color of characters being displayed.
	CCDSPV	Changes color of the characters stored at designated addresses in the VRAM areas.

6.4.1 Normal/reverse display of characters·····CNOR, CREV

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					17		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CNOR and CREV instructions are used to designate the normal or reverse display of characters to be displayed on the screen of a display unit connected to the AD57(S1)/AD58 designated by ⓝ.
CNOR·····Normal display (ABC)
CREV·····Reverse display (ABC)

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

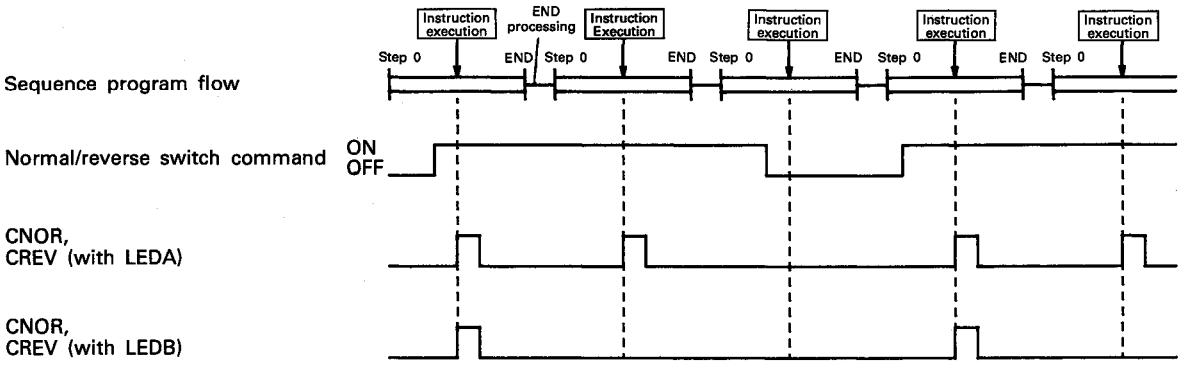
(3) The normal or reverse display mode of characters automatically sets to the normal display mode when the following instructions are executed.
CPS1
CPS2
CLS

(4) After execution of the CNOR or CREV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	CNOR Normal display CREV Reverse display
Color designation	(no change)
Cursor display	

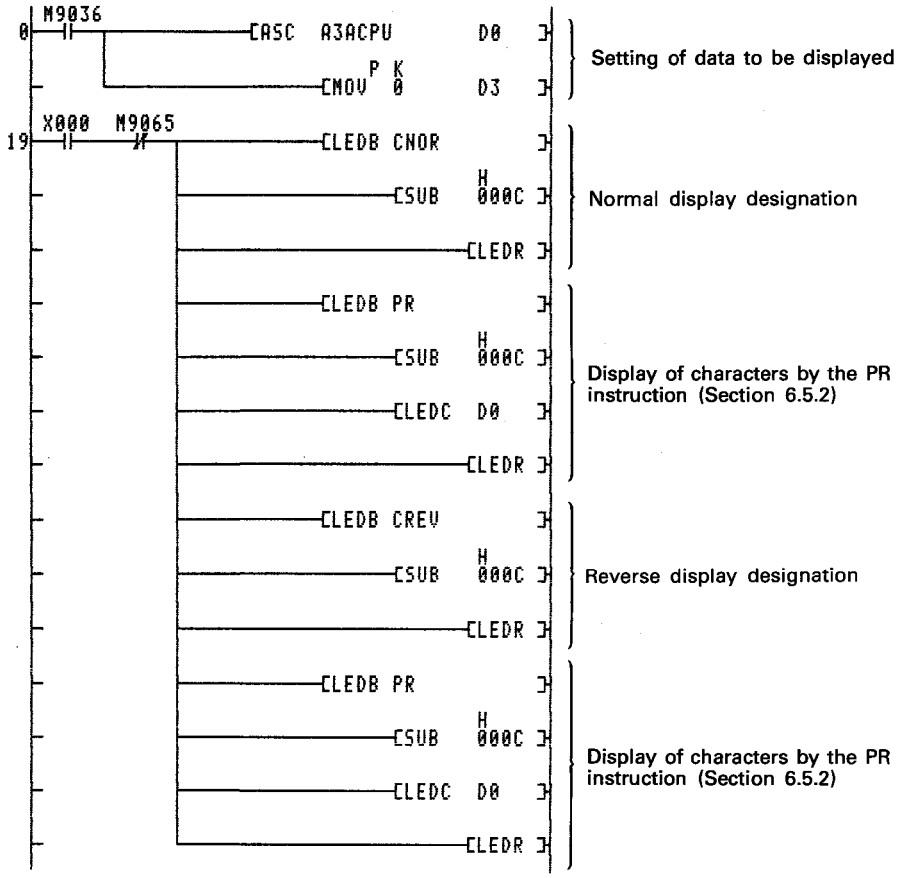
EXECUTION CONDITION

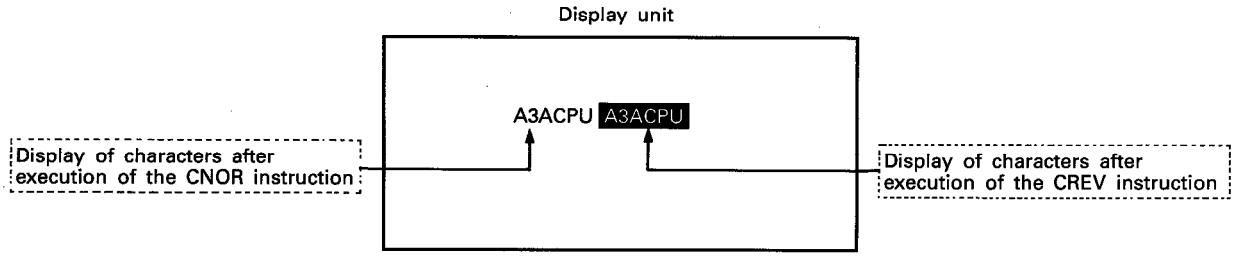
The CNOR and CREV instructions are executed every scan while the normal/reverse switch command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the normal/reverse switch command signal when the LEDB instruction is used.



PROGRAM EXAMPLE

The following is an example of the program used to execute switching of normal/reverse display of characters on the screen of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF. Characters "A3ACPU" are displayed in the normal and reverse display modes at current cursor position on the screen of the display unit.



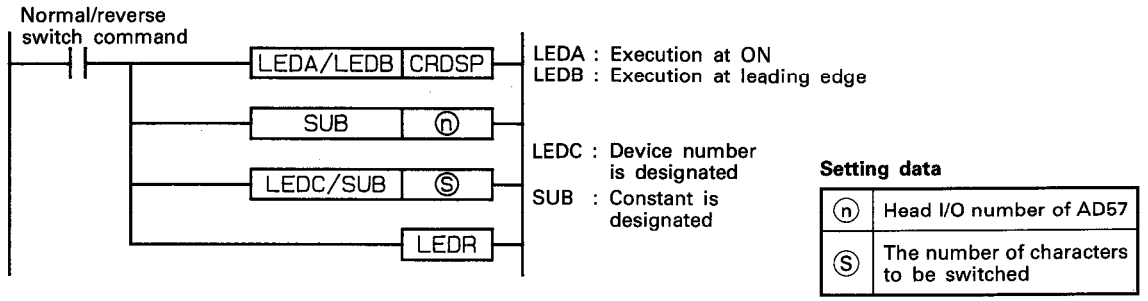


MEMO

6.4.2 Normal/reverse display switching of characters being displayed·····CRDSP

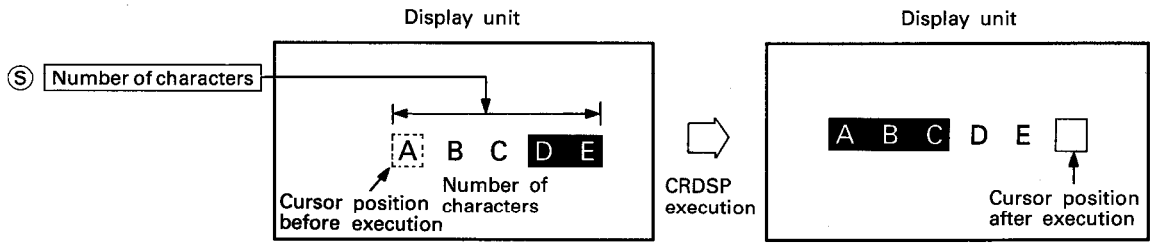
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
Ⓢ								○	○	○	○	○					○	○					20		○	○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CRDSP instruction is used to switch display mode (normal/reverse) of characters, which are being displayed on the screen of a display unit connected to the AD57(S1)/AD58 designated by ⓝ, of the number designated by Ⓢ starting with the cursor position.



(2) Execution of the CRDSP instruction switches normal character display to reverse display or reverse display to normal display.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The number of characters designated by Ⓢ can be selected from 1 to the total number of characters starting with the cursor position to the last column on the last line on the screen.

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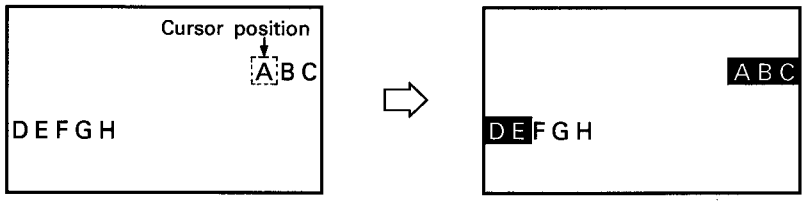
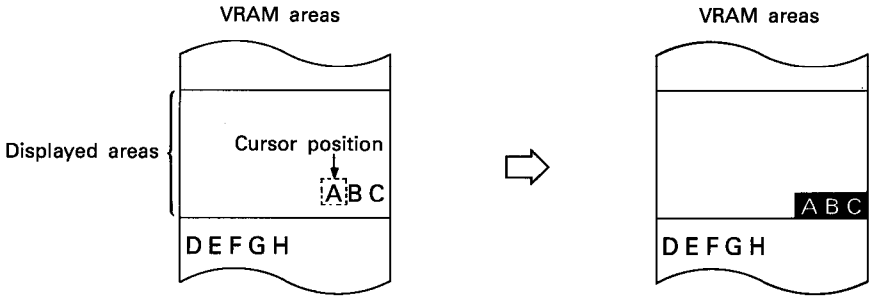
(5) If the range of the number of characters designated by (S) exceeds the last column on a line, the excess range laps around to the next line.
If the designated range exceeds the last column of the last line on the screen, display switching is executed only for the characters being displayed.

When Ⓢ 5:



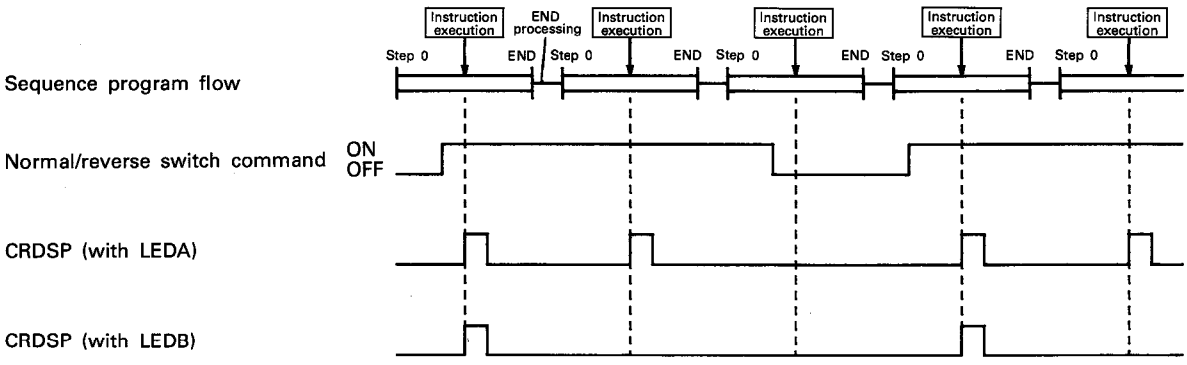


(6) After execution of the CRDSP instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CRDSP instruction is executed every scan while the normal/reverse switch command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the normal/reverse switch command signal when the LEDB instruction is used.



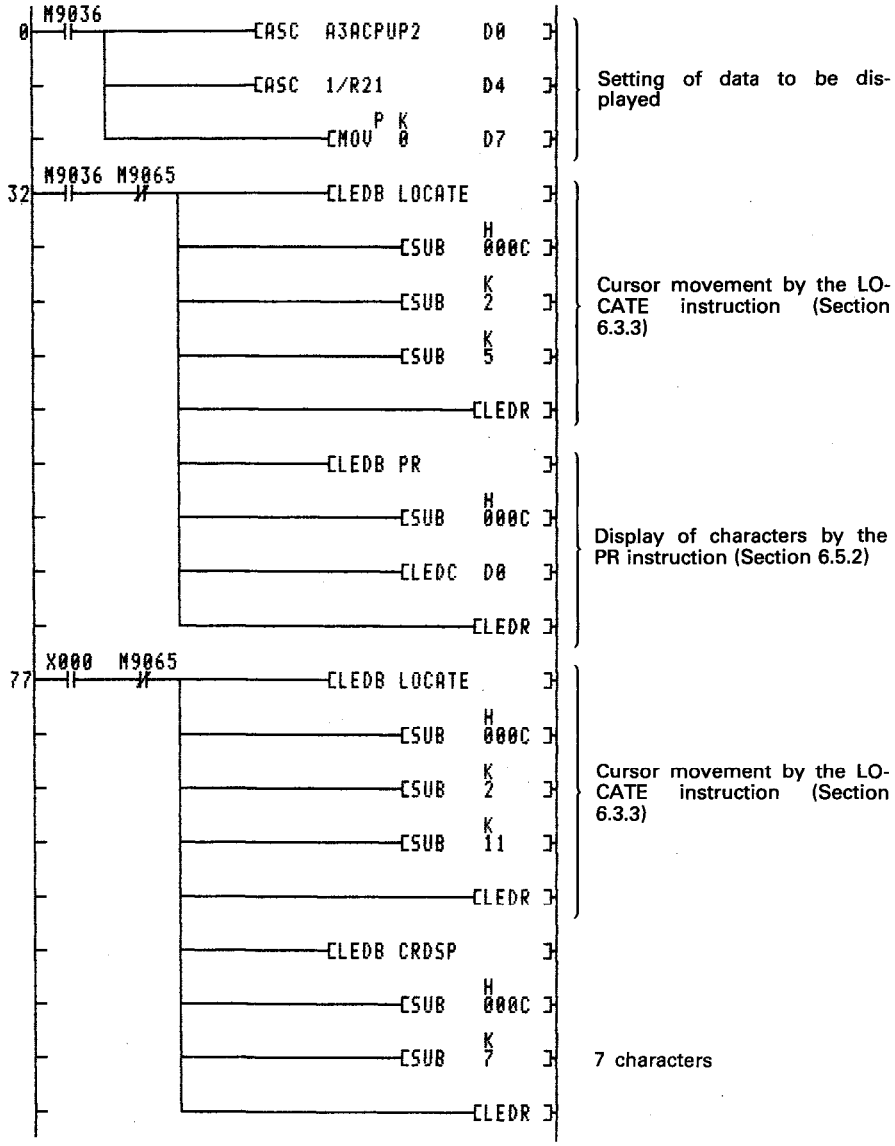
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

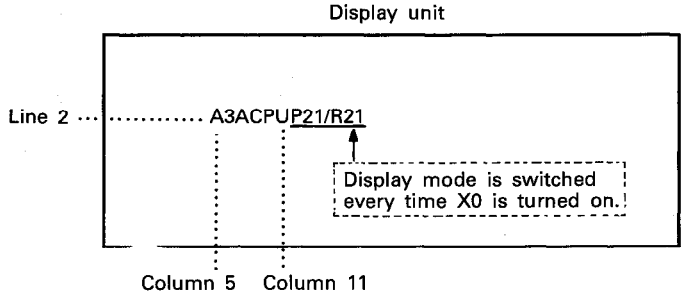
Description	Error Code	
	D9008	D9091
The number of characters designated by Ⓢ is 0 or a negative value.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to execute switching of normal/reverse display of characters on the screen of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF. Characters "P21/R21" of "A3ACPUP21/R21" are switched between the normal and reverse display modes by turning on X000.



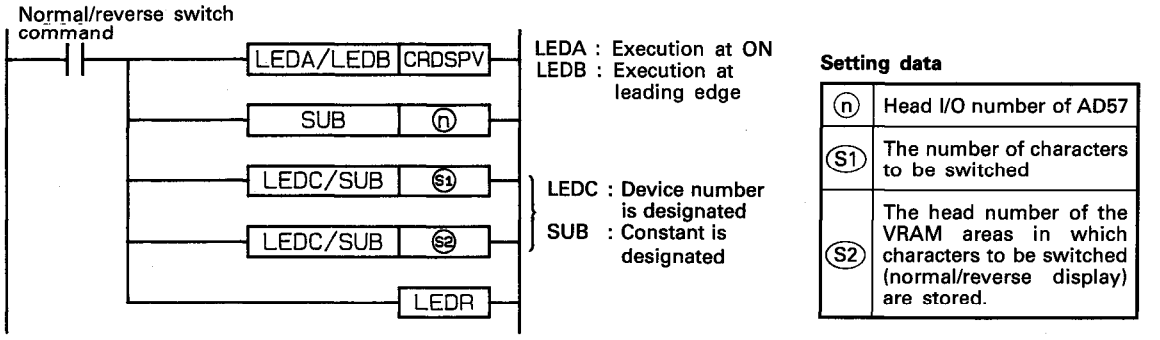
Since characters "A3ACPUP21/R21" are displayed starting at column 5 on line 2, the range of characters for display switching is designated starting at column 11 on line 2 for 7 characters.



6.4.3 Normal/reverse display switching of characters in the VRAM areas·····CRDSPV

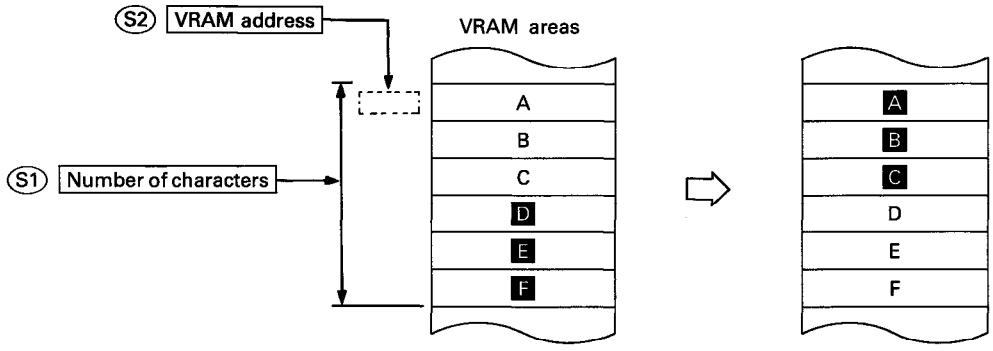
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○					○	○					23		○		○
(S1)								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CRDSPV instruction is used to switch display mode (normal/reverse) of characters, which are stored in the VRAM areas and to be displayed on a display unit connected to the AD57(S1)/AD58 designated by ⓝ.
The range of characters for display switching starts at the address designated by (S2) in the VRAM areas and covers the number of characters designated by (S1).



(2) Execution of the CRDSPV instruction switches normal character display to reverse display or reverse display to normal display.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The VRAM addresses designated by (S2) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM addresses.)

(5) The number of characters designated by (S1) can be set at any number of characters stored at addresses starting with the address designated by (S2) to address 7679.

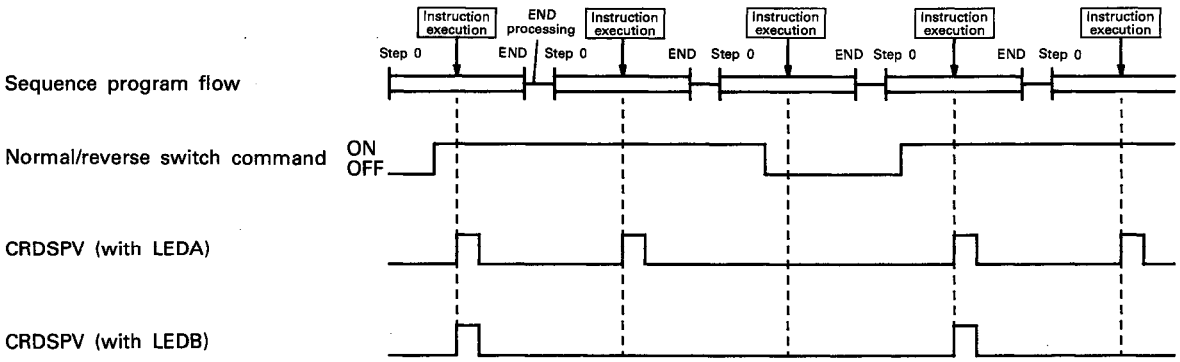
(6) If designated VRAM areas include the areas being displayed on the display unit, the display mode of the characters being displayed on the screen also switches.

(7) After execution of the CRDSPV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CRDSPV instruction is executed every scan while the normal/reverse switch command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the normal/reverse switch command signal when the LEDB instruction is used.



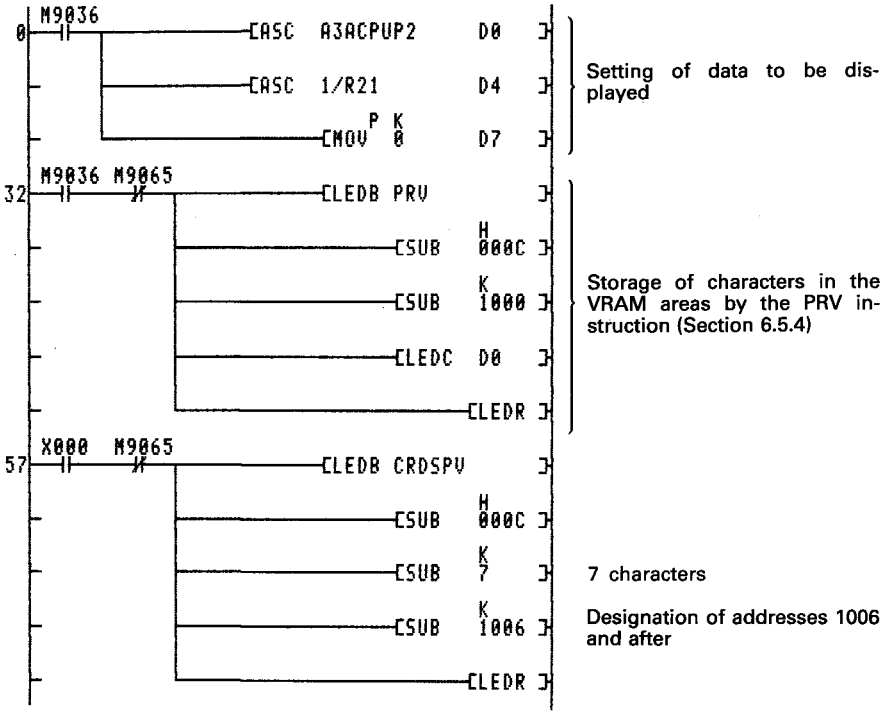
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code D9008	Error Code D9091
The number of characters designated by (S1) is 0 or a negative value.	50	504
The VRAM area address designated by (S2) is out of the range from 0 to 7679.		
The range of the number of characters designated by (S1) starting with the address designated by (S2) exceeds address 7679 of the VRAM areas.		

PROGRAM EXAMPLE

The following is an example of the program used to execute switching of normal/reverse display of characters stored in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Characters stored at addresses 1007 to 1013 are switched between the normal and reverse display modes by turning on X000.



In this example, characters "A3ACPUP21/R21" are written to the VRAM areas at addresses 1000 and after, and the display mode of "P21/R21" is switched.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, condition of display mode switching can be monitored on the display unit.

VRAM areas

	⋮
1000	A
1001	3
1002	A
1003	C
1004	P
1005	U
1006	P
1007	2
1008	1
1009	/
1010	R
1011	2
1012	1
	⋮

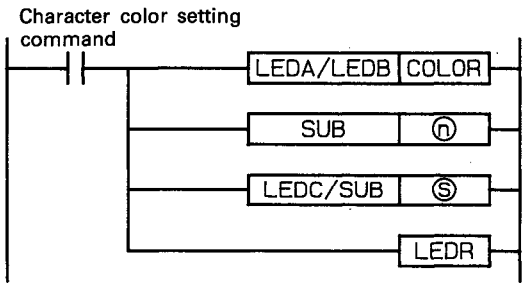
Normal/reverse switching is executed every time X0 is turned on.

MEMO

6.4.4 Character color designation·····COLOR

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
Ⓢ								○	○	○	○	○					○	○					20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge.

LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Character color

FUNCTION

(1) The COLOR instruction is used to designate color of characters, which are to be displayed on a display unit connected to the AD57(S1)/AD58 designated by ⓝ, to the color which corresponds to the color code designated by Ⓢ.

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) Tables shown below indicate available character colors and corresponding color codes to be designated by Ⓢ.

Color	Color Code
Black	0
Blue	1
Red	2
Purple	3

Color	Color Code
Green	4
Light blue	5
Yellow	6
White	7

(4) If color of a character is already set by use of the canvas screen data, color designation by the COLOR instruction is ignored.

(5) Character color designation automatically switches to white when the following instructions are executed.
CPS1
CPS2
CLS

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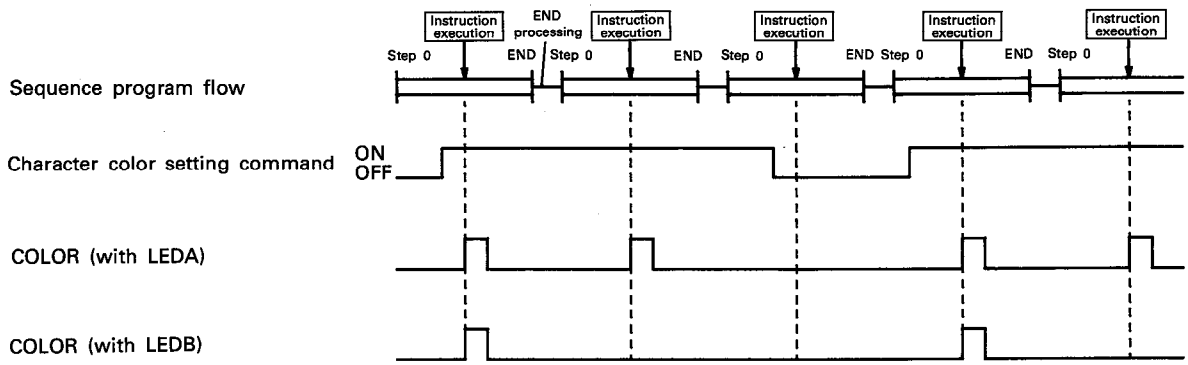
(6) After execution of the CMODE instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	Designated color code
Cursor display	(no change)

EXECUTION CONDITION

The COLOR instruction is executed every scan while the character color setting command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the character color setting command signal when the LEDB instruction is used.



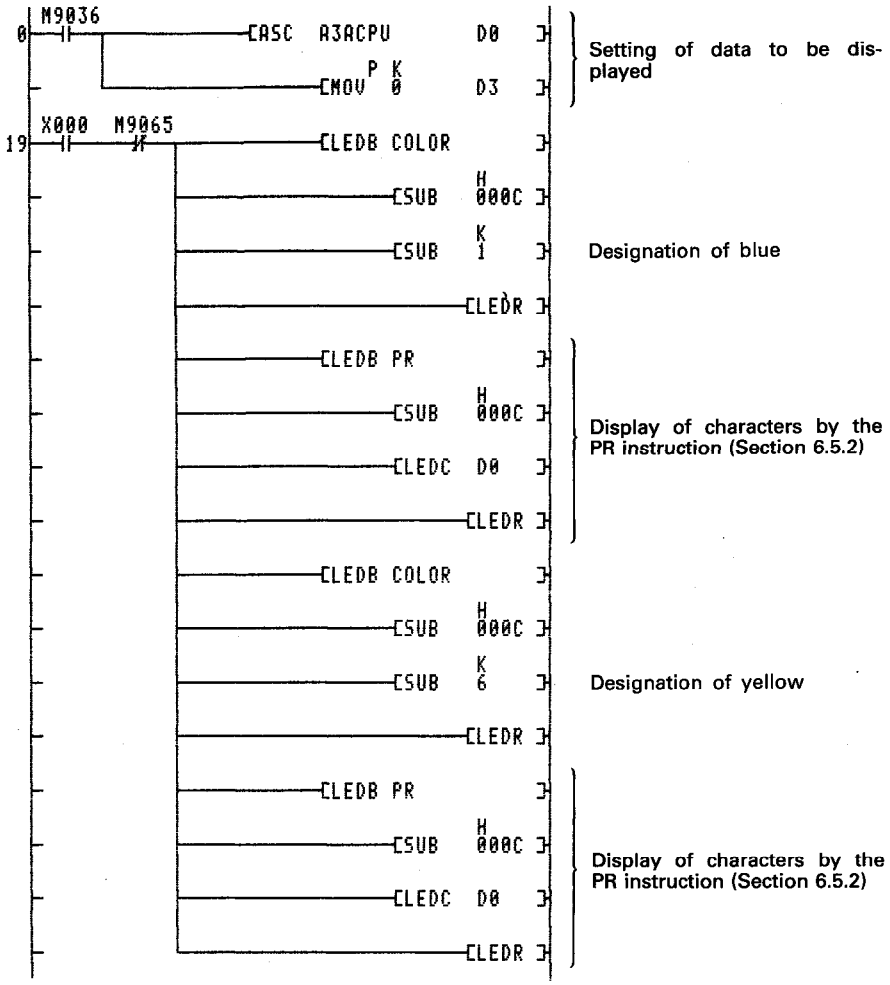
OPERATION ERROR

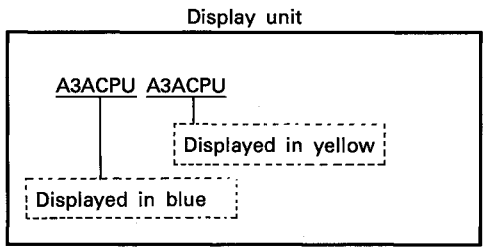
In the following case, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The color code designated by (S) is out of the range from 0 to 7.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to designate color of the characters to be displayed on the display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Characters "A3ACPU" are displayed in blue and then in yellow at current cursor position on the screen by turning on X0.



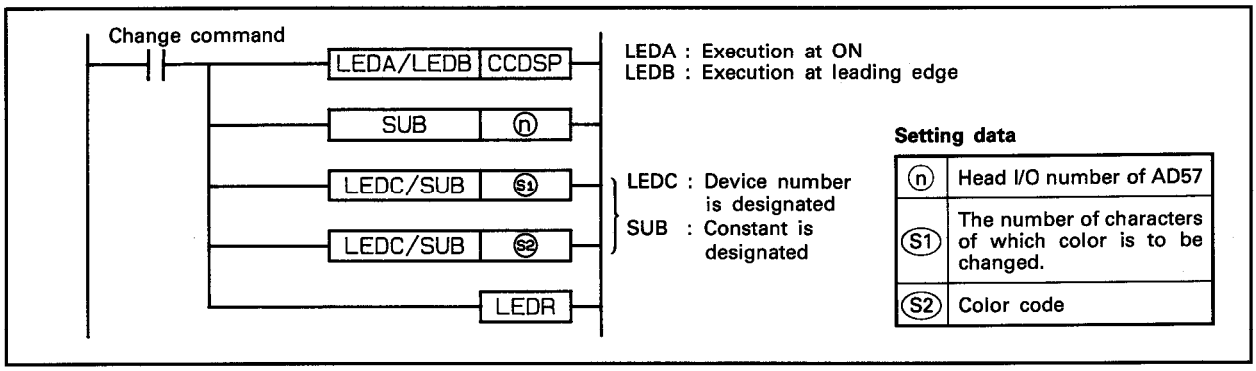


MEMO

6.4.5 Change of character color being displayed·····CCDSP

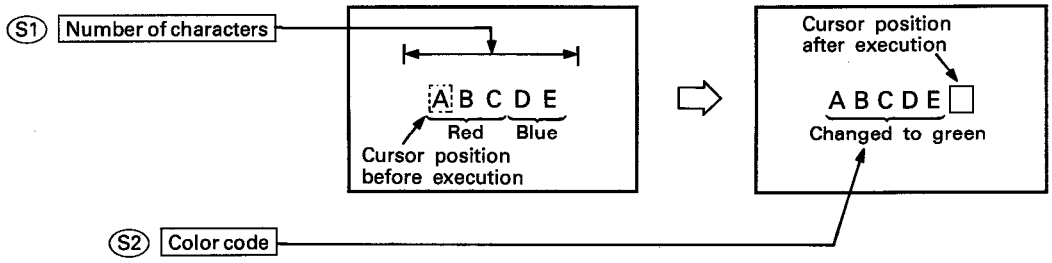
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CCDSP instruction is used to change color of the number of characters designated by (S1), which are being displayed on a display unit connected to the AD57(S1)/AD58 designated by ⓝ, to the color which corresponds to the color code designated by (S2) starting with the character at the cursor position.



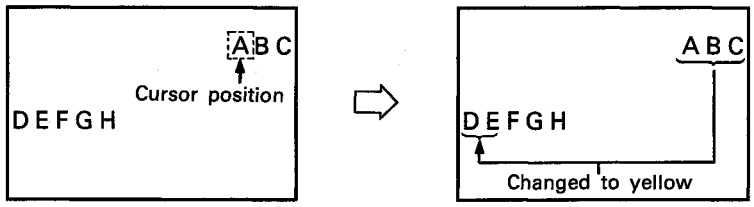
(2) The CCDSP instruction changes only the display color of designated characters.
The color of characters after execution of the CCDSP instruction is the color designated by the COLOR instruction.

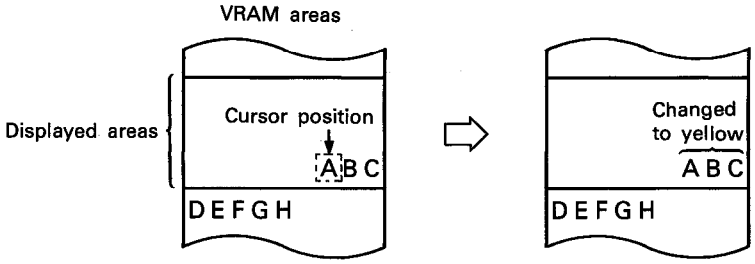
(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The number of characters designated by (S1) can be selected from 1 to the total number of characters starting with the cursor position to the last column on the last line on the screen.

(5) If the range of the number of characters designated by (S1) starting at the cursor position exceeds the last column on a line, the excess range laps around to the next line.
If the designated range exceeds the last column of the last line on the screen, color changing is executed only for the characters being displayed.

When (S1) 5 and (S2) = 6:





(6) Tables shown below indicate available character colors and corresponding color codes to be designated by (S2).

Color	Color Code
Black	0
Blue	1
Red	2
Purple	3

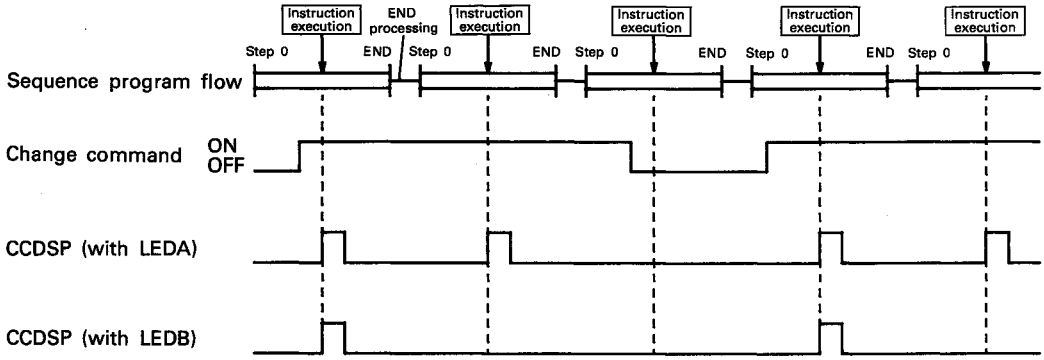
Color	Color Code
Green	4
Light blue	5
Yellow	6
White	7

(7) After execution of the CCDSP instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CCDSP instruction is executed every scan while the change command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the change command signal when the LEDB instruction is used.



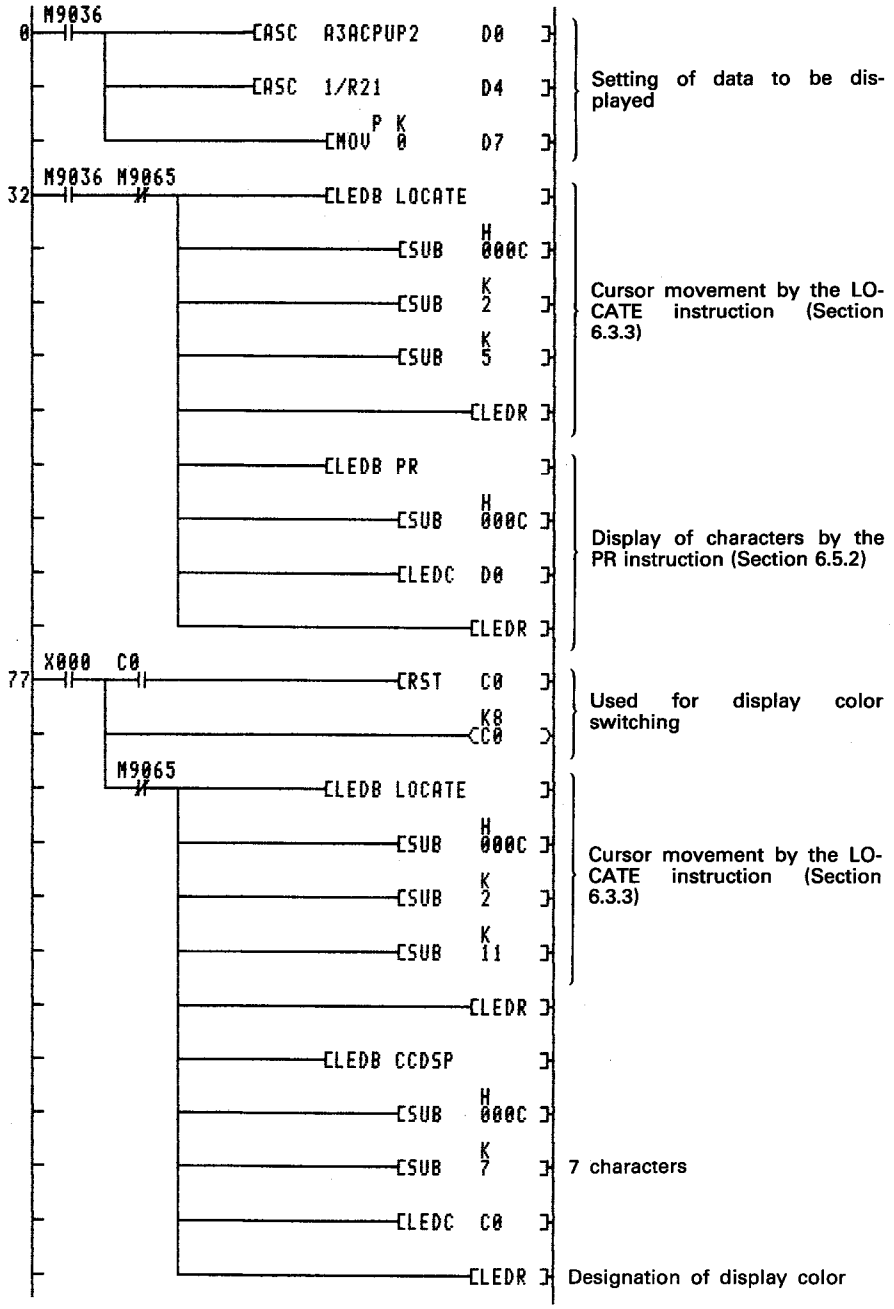
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

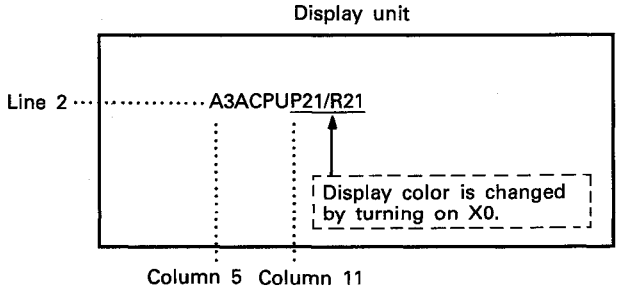
Description	Error Code	
	D9008	D9091
The number of characters designated by (S2) is 0 or a negative value.	50	503
The color code designated by (S2) is out of the range from 0 to 7.		

PROGRAM EXAMPLE

The following is an example of the program used to change color of the characters being displayed on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Color of characters "P21/R21" of "A3ACPUP21/R21" being displayed is changed from black to blue, red, purple, green, light blue, yellow, white and black by turning on X000.



Since characters "A3ACPUP21/R21" are displayed starting at column 5 on line 2, the range of characters for display switching is designated starting at column 11 on line 2 for 7 characters.
In this example, the number of inputs of X000 is counted by C0, and the result of counting is used as the color code.

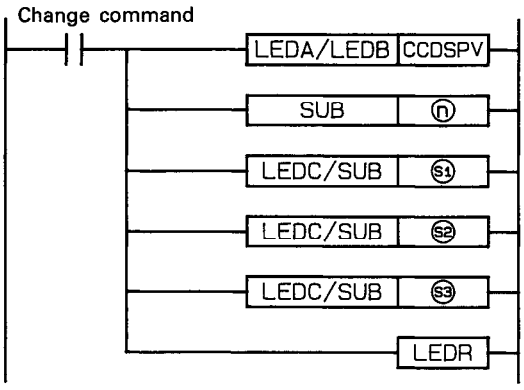


MEMO

6.4.6 Change of character color in the VRAM areas·····CCDSPV

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					26		○		○
(S2)								○	○	○	○	○					○	○								
(S3)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.

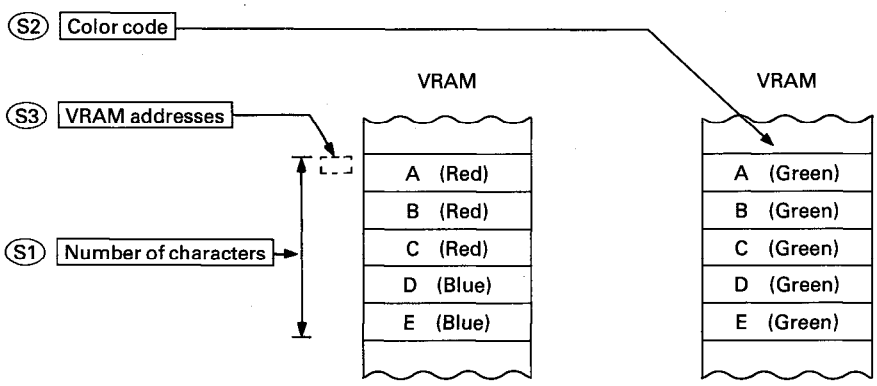


Setting data

ⓝ	Head I/O number of AD57
(S1)	The number of characters of which color is to be changed.
(S2)	Color code
(S3)	The head number of the VRAM areas in which characters to be changed in color are stored.

FUNCTION

(1) The CCDSPV instruction is used to change color of the number of characters designated by (S1), which are stored in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ, to the color which corresponds to the color code designated by (S2) starting with the address designated by (S3).



(2) The CCDSPV instruction changes only the display color of designated characters.
The color of characters after execution of the CCDSPV instruction is the color designated by the COLOR instruction.

(3) The head I/O number of the AD57(S1)/AD58 designated by (n) should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at (n).

(4) The VRAM addresses designated by (S3) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM addresses.)

(5) The number of characters designated by (S1) can be set at any number of characters stored at addresses starting with the address designated by (S3) to address 7679.

(6) If designated VRAM areas include the areas being displayed on the display unit, the display mode of the characters being displayed on the screen also switches.

(7) Tables shown below indicate available character colors and corresponding color codes to be designated by (S2).

Color	Color Code
Black	0
Blue	1
Red	2
Purple	3

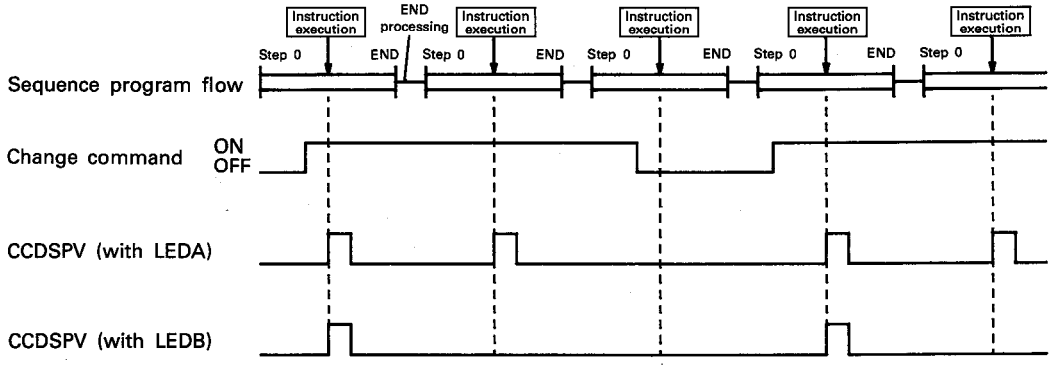
Color	Color Code
Green	4
Light blue	5
Yellow	6
White	7

(8) After execution of the CCDSPV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CCDSPV instruction is executed every scan while the change command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the change command signal when the LEDB instruction is used.



OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The color code designated by (S2) is out of the range from 0 to 7.	50	503
The number of characters designated by (S1) is 0 or a negative value.		504
The VRAM area address designated by (S2) is out of the range from 0 to 7679.		
The range of the number of characters designated by (S1) starting with the address designated by (S3) exceeds address 7679 of the VRAM areas.		

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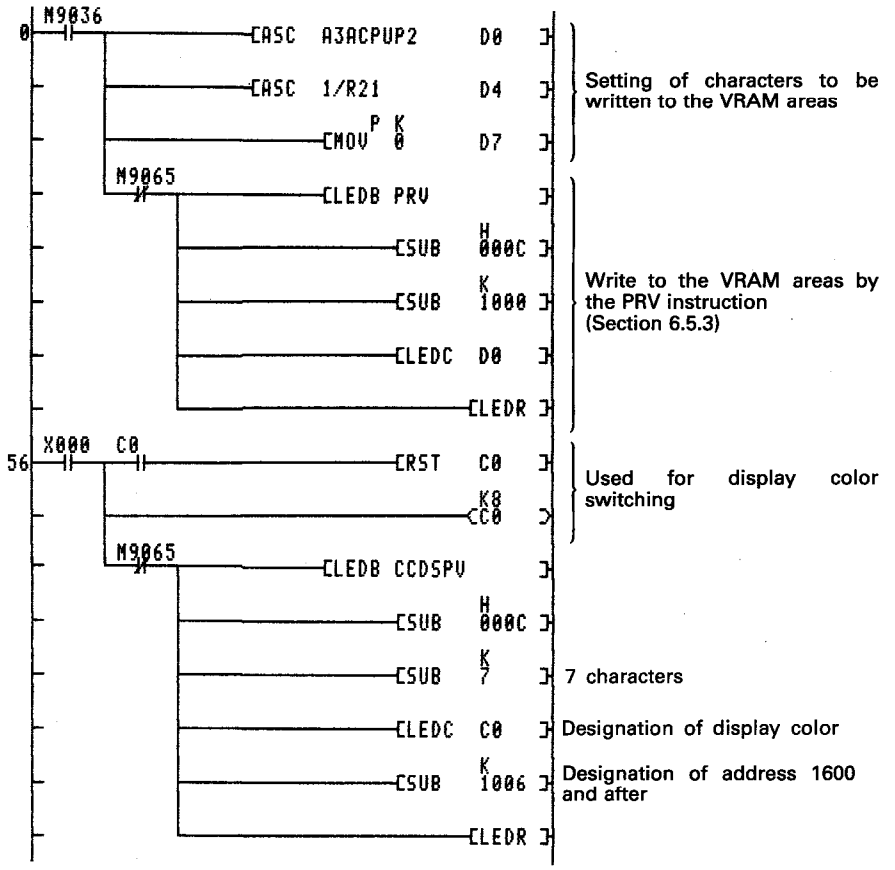
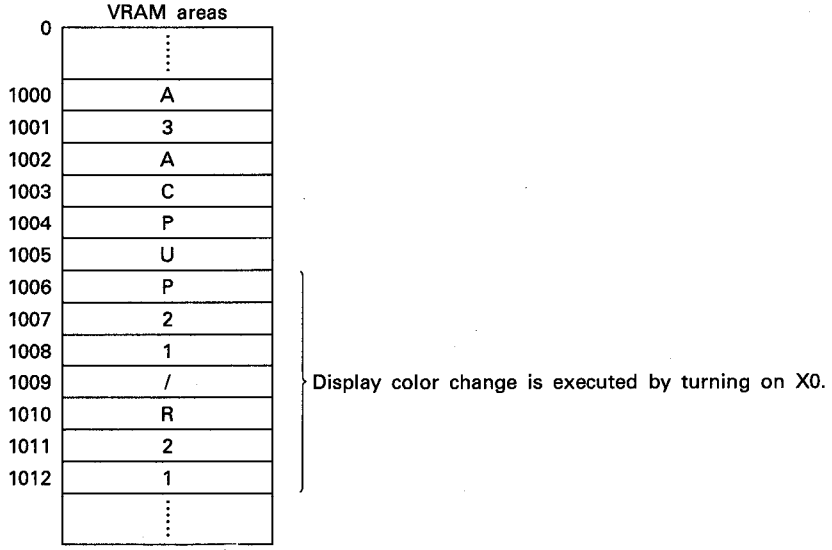
PROGRAM EXAMPLE

The following is an example of the program used to change color of the characters stored in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Color of the characters stored at addresses 1007 to 1013 in the VRAM areas is changed from black to blue, red, purple, green, light blue, yellow, white and black by turning on X000.



In this program, characters "A3ACPUP21/R21" are written to address 1000 and after in the VRAM areas, and display color of "P21/R21" is changed.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, color changing can be monitored on the display unit.



MEMO

6.5 Designated Character Display Instructions

The designated character display instructions are used to display designated characters on a display unit or to write designated characters to the VRAM areas.

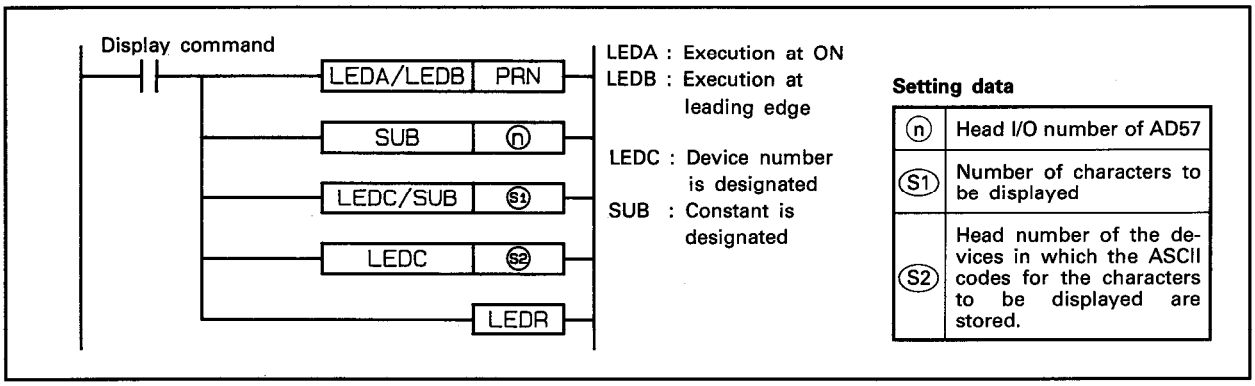
Designated character display and write are executed using the instructions mentioned below.

Category	Instruction Name	Description
ASCII character display	PRN	Displays designated number of ASCII characters.
	PR	Displays the ASCII characters till code 00_H.
ASCII character write to the VRAM	PRNV	Writes designated number of ASCII characters to the VRAM areas beginning with designated address.
	PRV	Writes the ASCII characters till code 00_H to the VRAM areas beginning with designated address.
Designated character display	EPRN	Displays designated number of characters which correspond to character codes 0 to $3FF_H$.
	EPR	Writes characters till code 00_H (characters which correspond to 1 to $3FF_H$) to the VRAM areas beginning with designated address.
Designated character write to the VRAM	EPRNV	Writes designated number of characters which correspond to character codes 0 to $3FF_H$ to the VRAM areas beginning with designated address.
	EPRV	Writes designated number of characters till code 00_H (characters which correspond to 1 to $3FF_H$) to the VRAM areas beginning with designated address.
Horizontal repeated display of characters	CR1	Displays a designated character horizontally for designated number of times of repetition.
	CR2	Displays a pair of designated characters horizontally for designated number of times of repetition.
Vertical repeated display of characters	CC1	Displays a designated character vertically for designated number of times of repetition.
	CC2	Displays a pair of designated characters vertically for designated number of times of repetition.

6.5.1 Display of designated number of the ASCII characters·····PRN

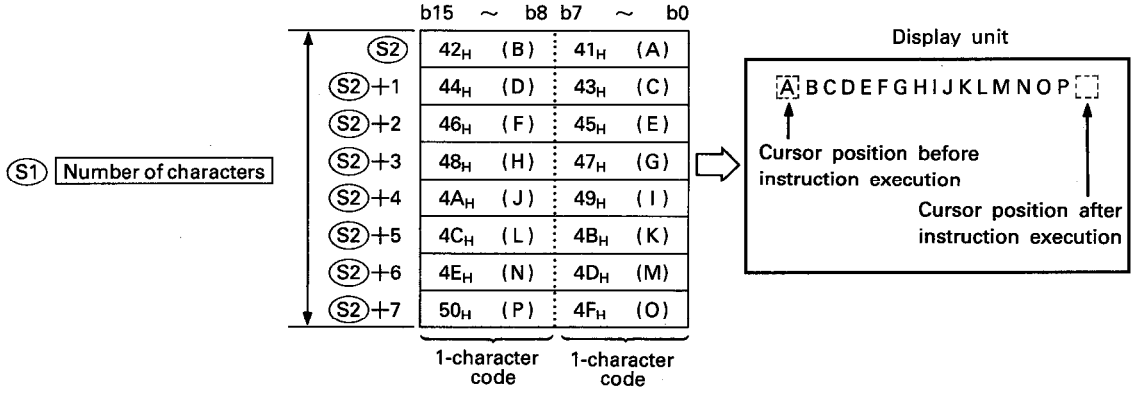
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The PRN instruction is used to display designated ASCII characters beginning with current cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ.
The ASCII characters to be displayed correspond to the ASCII codes which are stored in the devices which correspond to the number of characters designated by (S1) beginning with the device number designated by (S2).

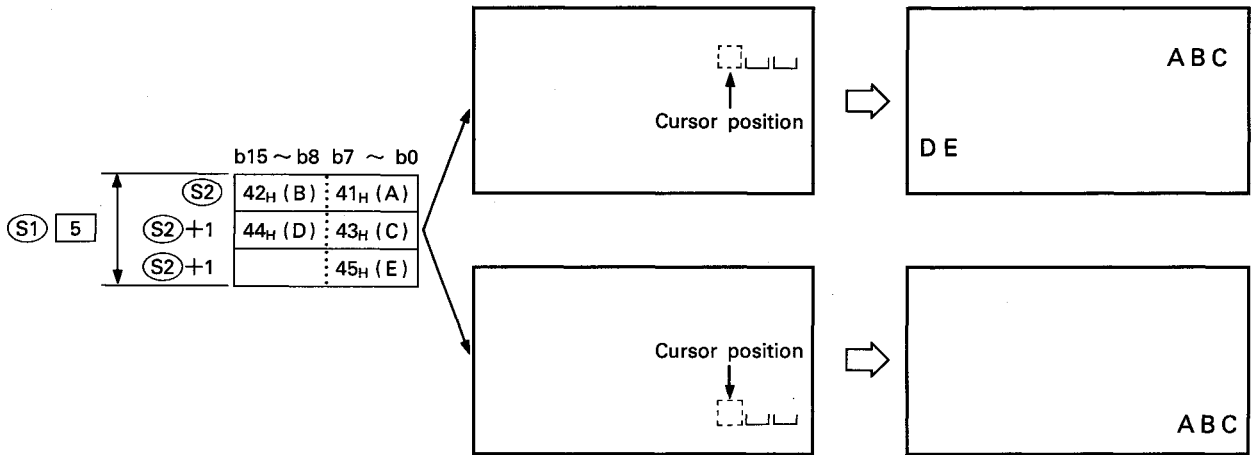


(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The number of characters designated by (S1) can be selected from 1 to the total number of characters beginning with the cursor position to the last column on the last line on the screen.
However, the number of characters to be designated should not exceed the value specified by the last device which is designated by (S2).

(4) The ASCII codes to be stored in the devices designated by (S2) can be set in the range of 00_H to FF_H.

(5) If the range of the number of characters designated by (S1) beginning with the cursor position exceeds the last column on a line, the excess range laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.



"DE" are ignored.

(6) After execution of the PRN instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

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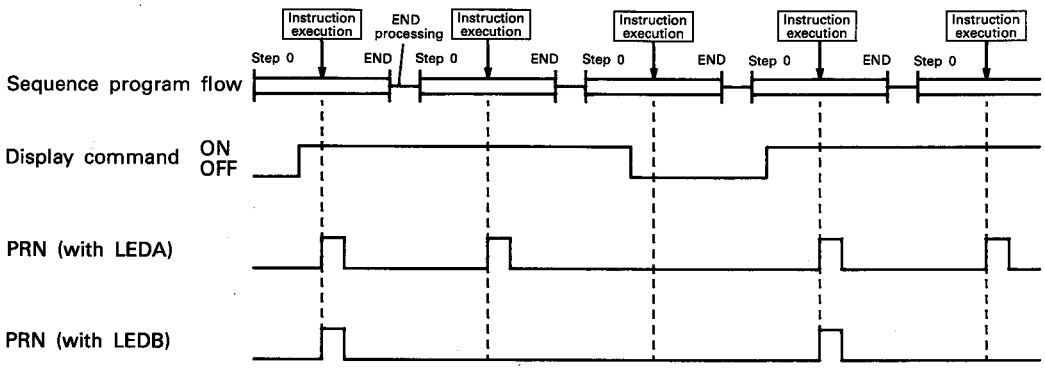
EXECUTION CONDITION

The PRN instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



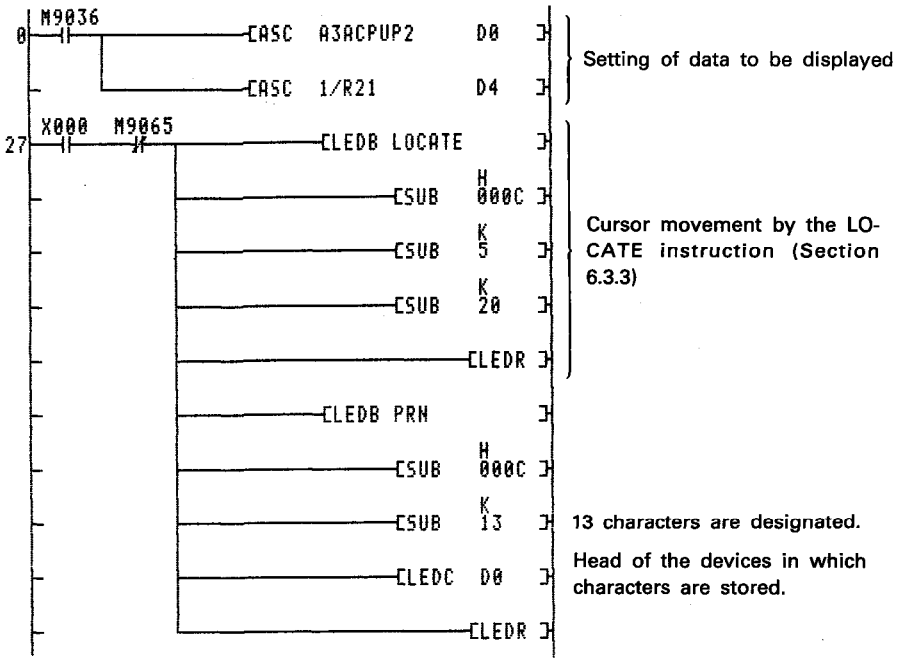
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

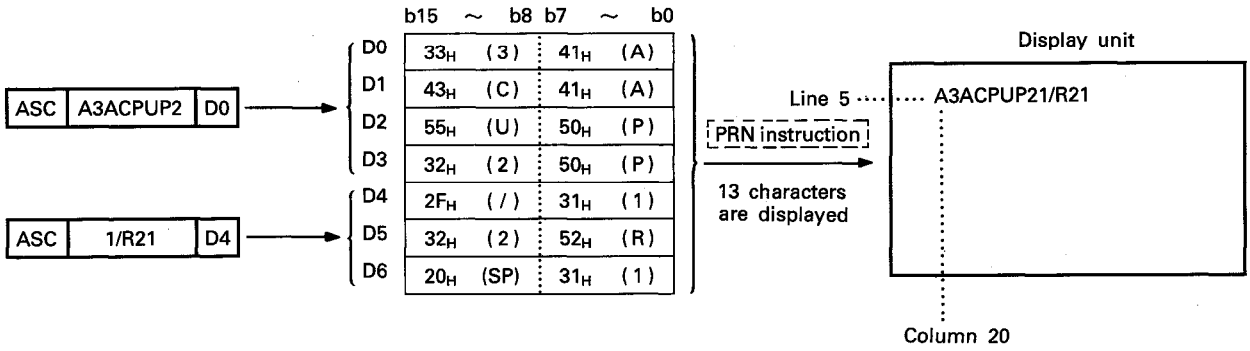
Description	Error Code	
	D9008	D9091
The range of the number of characters designated by (S1) beginning with the device number designated by (S2) exceeds the last device number of corresponding device.	50	504
The number of characters designated by (S1) is 0 or a negative value.		

PROGRAM EXAMPLE

The following is an example of the program used to display characters "A3ACPUP21/R21" at column 20 and after on line 5 on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF. Characters "A3ACPUP21/R21" are displayed by turning on X000.



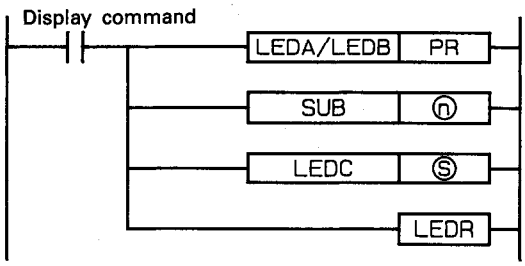
The ASCII instruction is used to convert characters to be displayed (A3ACPUP21/R21) to the ASCII codes. Converted ASCII codes are stored in D0 to D6.



6.5.2 Display of the ASCII characters up to code 00_H·····PR

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
Ⓢ								○	○	○	○	○											20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



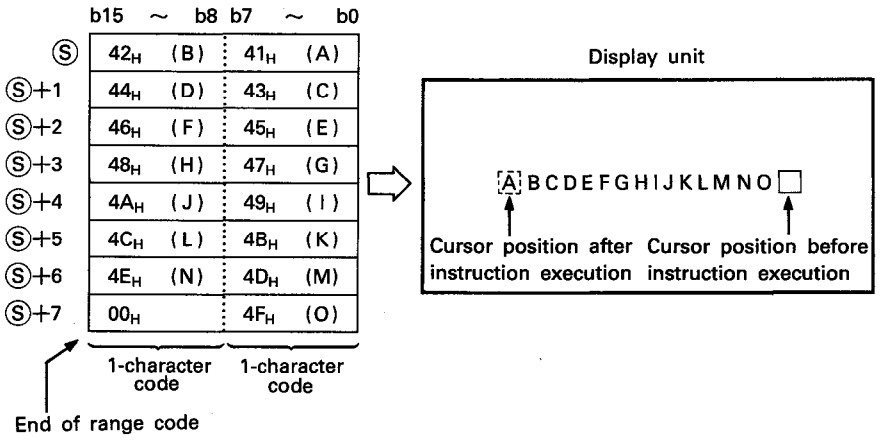
LEDA : Execution at ON
LEDB : Execution at leading edge

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Head number of the devices in which the ASCII codes for the characters to be displayed are stored.

FUNCTION

(1) The PR instruction is used to display designated ASCII characters beginning with current cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ.
The ASCII characters to be displayed correspond to the ASCII codes which are stored in the devices beginning with the device number designated by Ⓢ up to the device in which code "00_H" is stored.

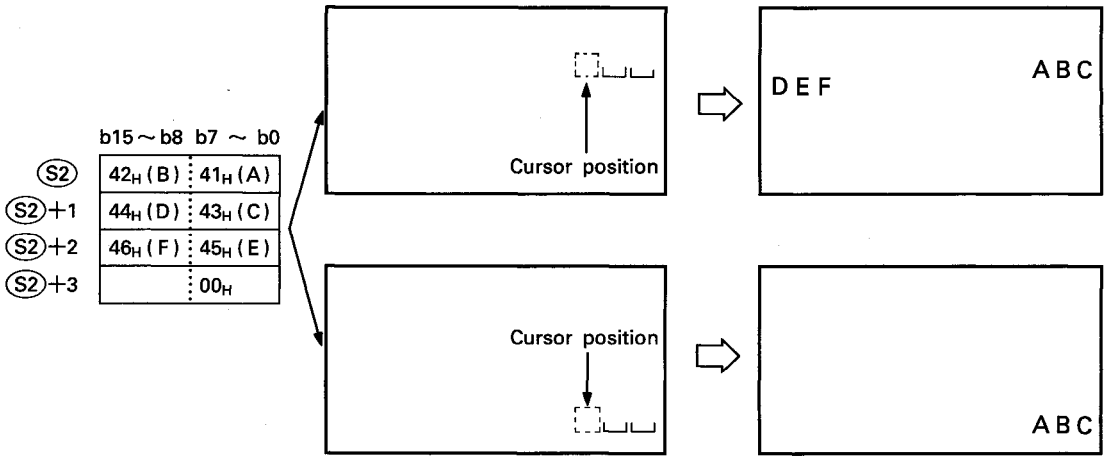


(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The ASCII codes to be stored in the devices designated by Ⓢ can be set in the range of 01_H to FF_H.
Since code "00_H" designates the end of the range of characters to be displayed, it cannot be set as an ASCII code.

(4) The number of characters which can be displayed by one time of processing equals to the number of characters from the cursor position to the last column on the last line on the screen.

(5) If the range of the number of characters beginning with the cursor position exceeds the last column on a line, the excess range laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.



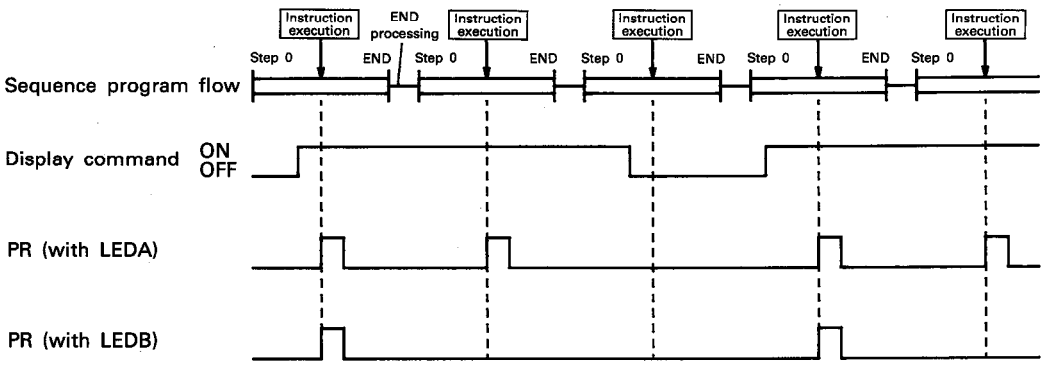
"DEF" are ignored.

(6) After execution of the PR instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position Current cursor position plus designated number of characters	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The PR instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



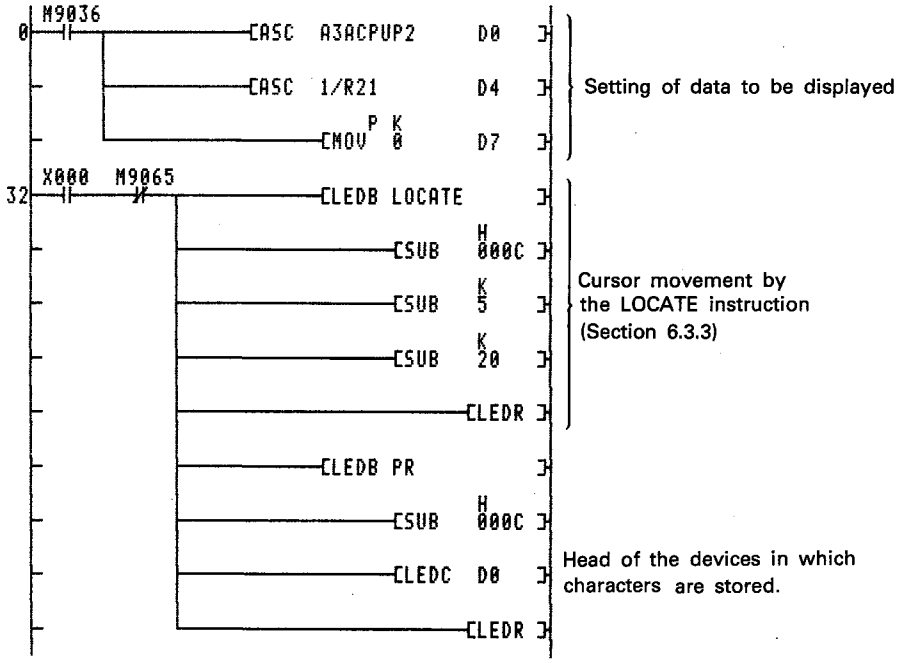
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

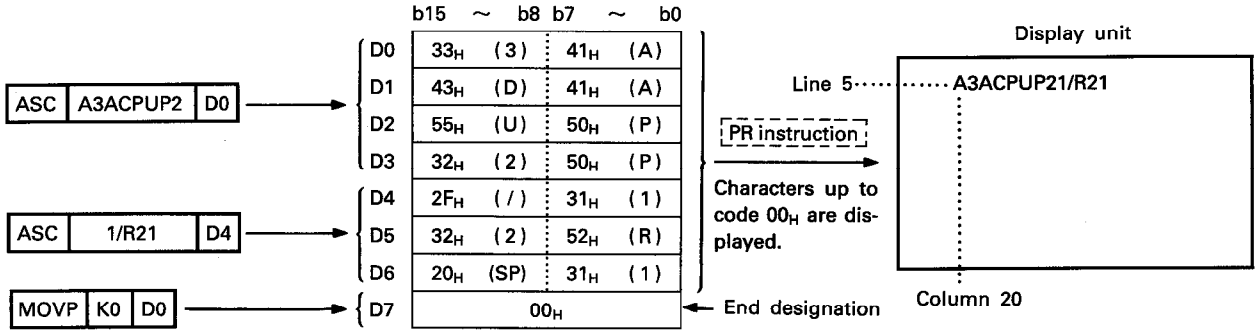
Description	Error Code	
	D9008	D9091
Code 00_H is not provided between the device number designated by Ⓢ and the last device number of corresponding device.	50	504
The number of characters to be displayed is 0.		

PROGRAM EXAMPLE

The following is an example of the program used to display characters "A3ACPUP21/R21" at column 20 and after on line 5 on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF. Characters "A3ACPUP21/R21" are displayed by turning on X000.



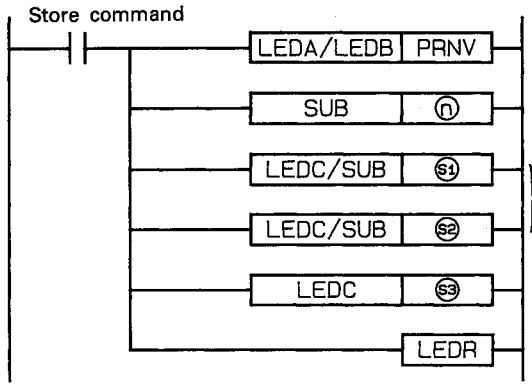
The ASCII instruction is used to convert characters to be displayed (A3ACPUP21/R21) to the ASCII codes. Converted ASCII codes are stored in D0 to D6.
"0" is stored in D7 to designate the end of the range of characters to be displayed.



6.5.3 Store of the ASCII characters of designated number of characters in the VRAM areas····· PRNV

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					26		○	○
(S2)								○	○	○	○	○					○	○								
(S3)								○	○	○	○	○														

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

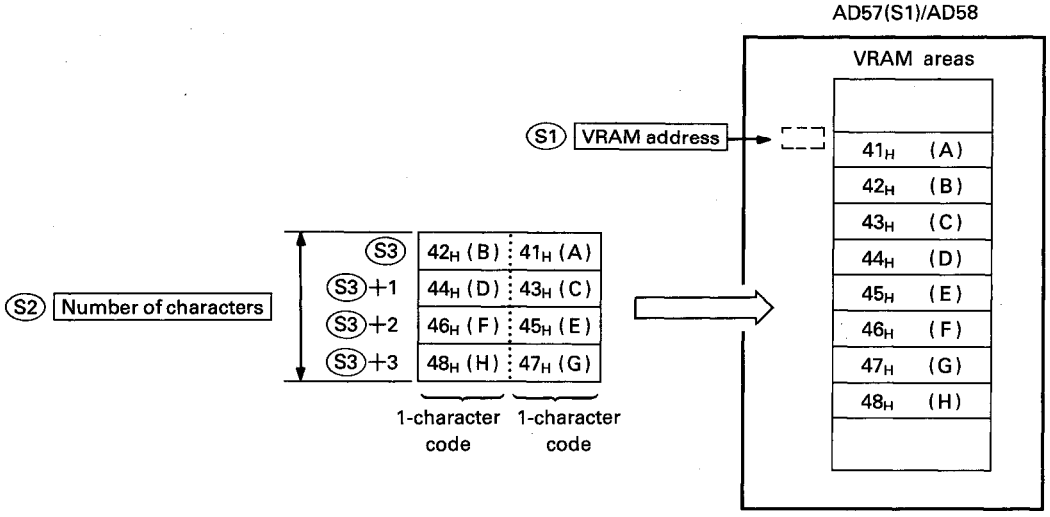
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas where the ASCII characters are to be stored
(S2)	Number of characters to be stored
(S3)	Head number of the devices in which the ASCII codes for the characters to be stored are stored.

FUNCTION

(1) The PRNV instruction is used to store designated ASCII characters in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ beginning with the address designated by (S1). The ASCII characters to be stored correspond to the ASCII codes which are stored in the devices which correspond to the number of characters designated by (S2) beginning with the device number designated by (S3).



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(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The VRAM address to be designated by (S1) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM areas.)

(4) The number of characters to be designated by (S2) can be set at any number of characters stored at addresses beginning with the address designated by (S1) up to address 7679.
However, a value which exceeds the last device number of the devices designated by (S3) cannot be set.

(5) The ASCII codes to be stored in the devices designated by (S3) can be set in the range of 00_H to FF_H.

(6) If the range of the number of characters designated by (S2) beginning with the address designated by (S1) exceeds address 7679, an error occurs and processing is not performed. Such range setting is ignored.

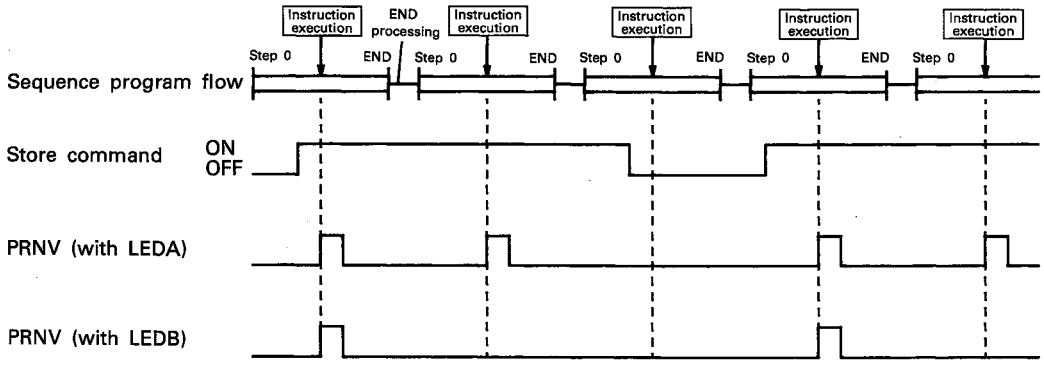
(7) If characters are stored in the areas currently being displayed, such characters are displayed on the screen.

(8) After execution of the PRNV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The PRNV instruction is executed every scan while the store command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the store command signal when the LEDB instruction is used.



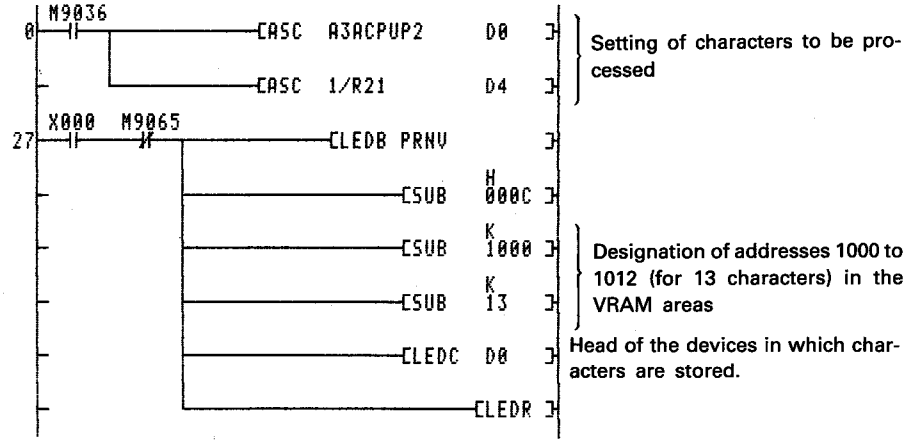
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

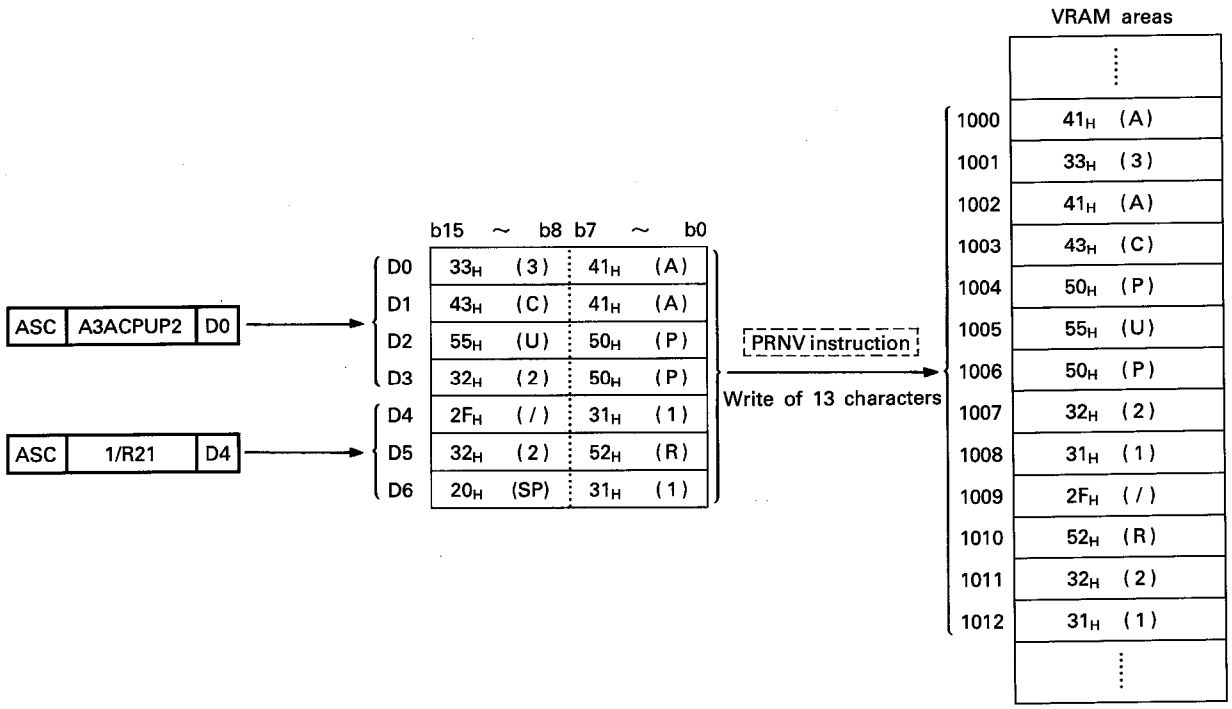
Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S1) is out of the range of 0 to 7679.	50	504
The number of characters designated by (S2) is 0 or a negative value.		
The range of the number of characters designated by (S2) beginning with the device number designated by (S3) exceeds the last device number of corresponding device.		
The range of the number of characters designated by (S2) beginning with the VRAM area address designated by (S1) exceeds address 7679.		

PROGRAM EXAMPLE

The following is an example of the program used to store characters "A3ACPUP21/R21" at address 1000 and after in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Characters "A3ACPUP21/R21" are stored in the VRAM areas by turning on X000.



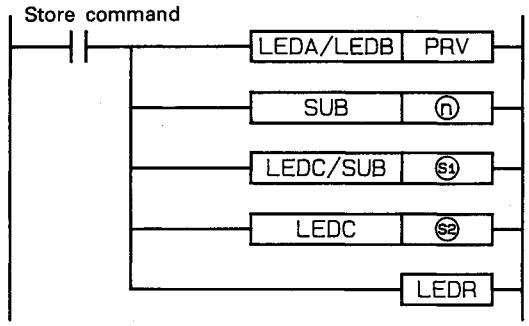
The ASCII instruction is used to convert characters to be displayed (A3ACPUP21/R21) to the ASCII codes. Converted ASCII codes are stored in D0 to D6.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, the character store operation can be monitored on the display unit.



6.5.4 Store of the ASCII characters of designated number of characters up to code 00_H in the VRAM areas·····PRV

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○														

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

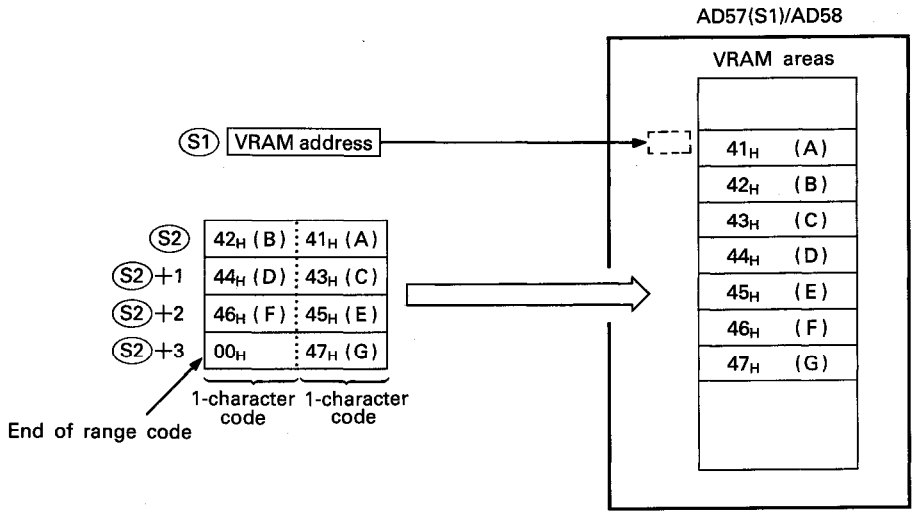
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas where the ASCII characters are to be stored
(S2)	Head number of the devices in which the ASCII codes for the characters to be stored are stored.

FUNCTION

(1) The PRV instruction is used to store designated ASCII characters in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ beginning with the address designated by (S1).
The ASCII characters to be stored correspond to the ASCII codes which are stored in the devices beginning with the device number designated by (S2) up to the device in which code "00_H" is stored.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The VRAM address to be designated by (S1) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM areas.)

(4) The ASCII codes to be stored in the devices designated by (S2) can be set in the range of 01_H to FF_H.
Since code "00_H" designates the end of the range of characters to be displayed, it cannot be set as an ASCII code.

(5) The number of characters which can be stored by one time of processing equals to the number of characters from the address designated by (S1) up to address 7679.

(6) If the range of the number of characters beginning with the address designated by (S1) exceeds address 7679, an error occurs and processing is not performed.

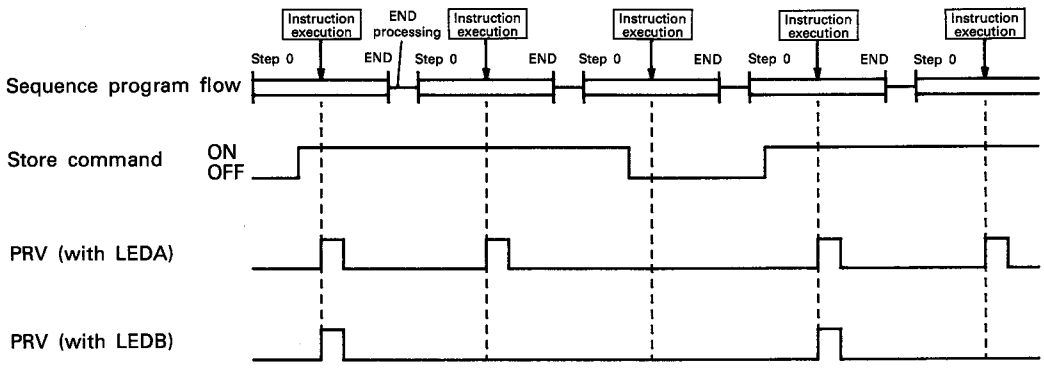
(7) If characters are stored in the areas currently being displayed, such characters are displayed on the screen.

(8) After execution of the PRV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	Not displayed

EXECUTION CONDITION

The PRV instruction is executed every scan while the store command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the store command signal when the LEDB instruction is used.



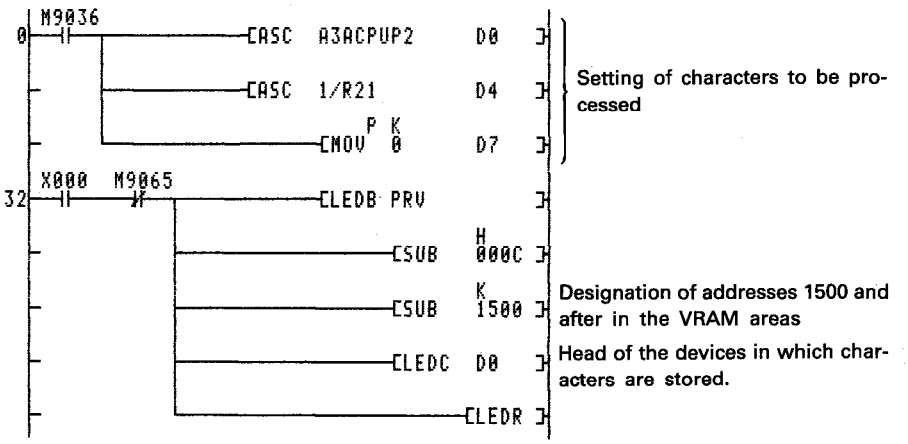
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

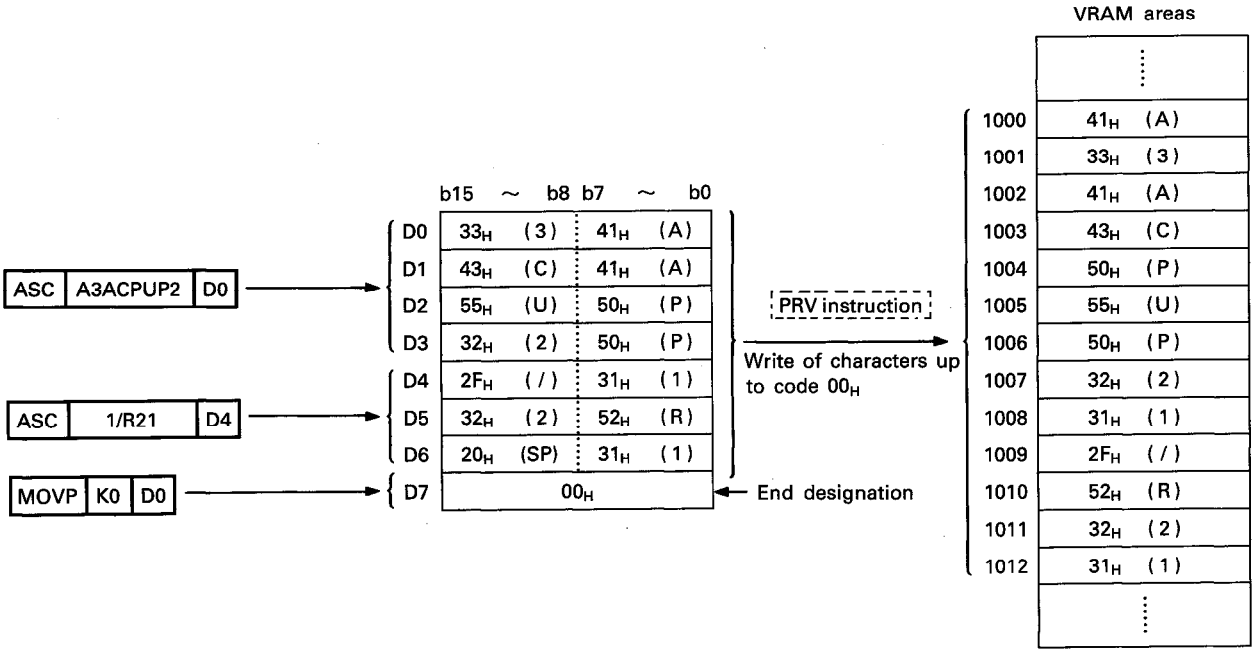
Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S1) is out of the range of 0 to 7679.	50	504
Code 00_H is not provided between the device number designated by (S2) and the last device number of corresponding device.		
The range of the number of characters to be stored beginning with the VRAM area address designated by (S1) exceeds address 7679.		
The number of characters to be stored is 0.		

PROGRAM EXAMPLE

The following is an example of the program used to store characters "A3ACPUP21/R21" at address 1000 and after in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Characters "A3ACPUP21/R21" are stored in the VRAM areas by turning on X000.



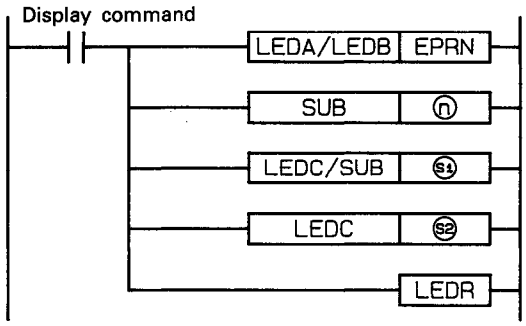
The ASCII instruction is used to convert characters to be displayed (A3ACPUP21/R21) to the ASCII codes. Converted ASCII codes are stored in D0 to D6.
"0" is stored in D7 to designate the end of the range of characters to be displayed.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, the character store operation can be monitored on the display unit.



6.5.5 Display of designated number of designated characters·····EPRN

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N						
ⓝ																	○	○									
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

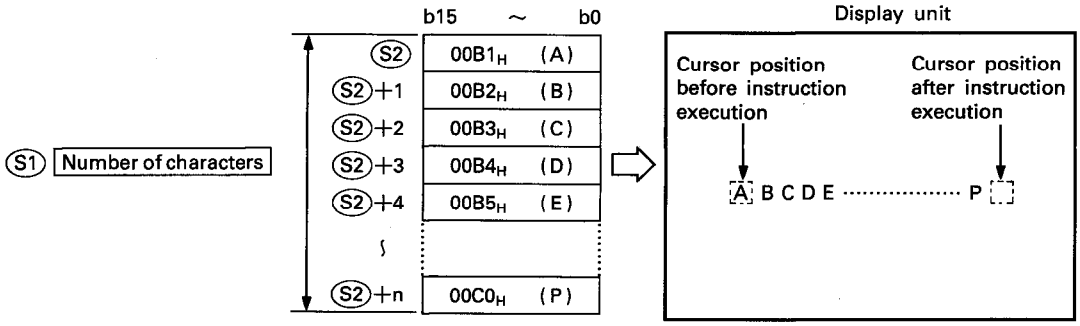
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Number of characters to be displayed
(S2)	Head number of the devices in which the ASCII codes for the characters to be displayed are stored.

FUNCTION

(1) The EPRN instruction is used to display designated ASCII characters beginning with current cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ.
The characters to be displayed correspond to the ASCII codes which are stored in the devices which correspond to the number of characters designated by (S1) beginning with the device number designated by (S2).

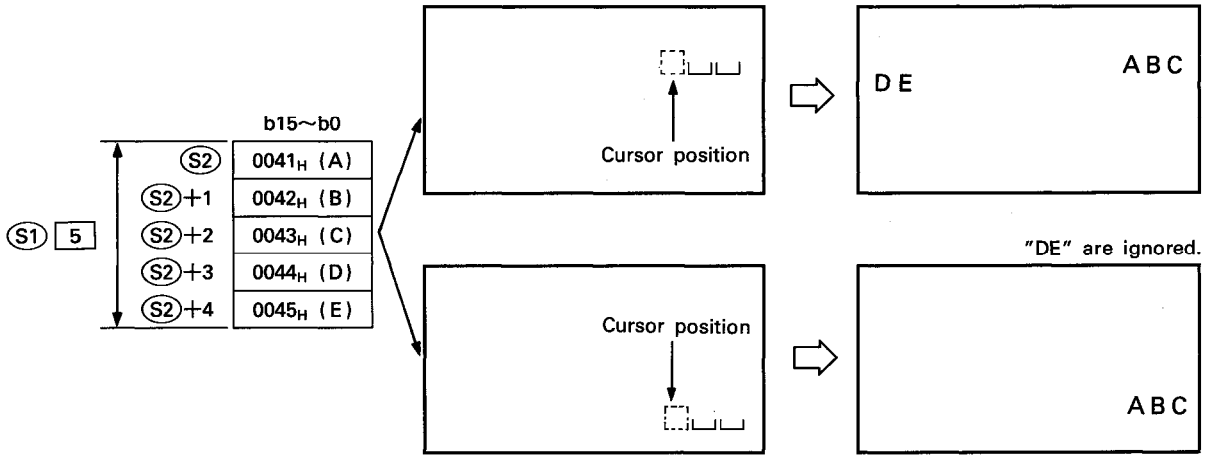


(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The number of characters designated by (S1) can be selected from 1 to the total number of characters beginning with the cursor position to the last column on the last line on the screen.
However, the number of characters to be designated should not exceed the value specified by the last device which is designated by (S2).

(4) The ASCII codes to be stored in the devices designated by (S2) can be set in the range of 0000_H to $03FF_H$.
If code 0400H or a higher code number is set, it is processed as code 0020_H (space code).

(5) If the range of the number of characters designated by (S1) beginning with the cursor position exceeds the last column on a line, the excess range laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.

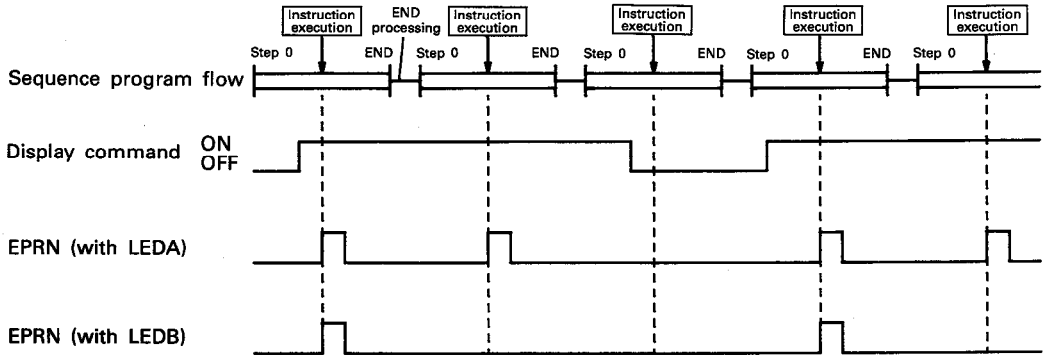


(7) After execution of the EPRN instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The EPRN instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



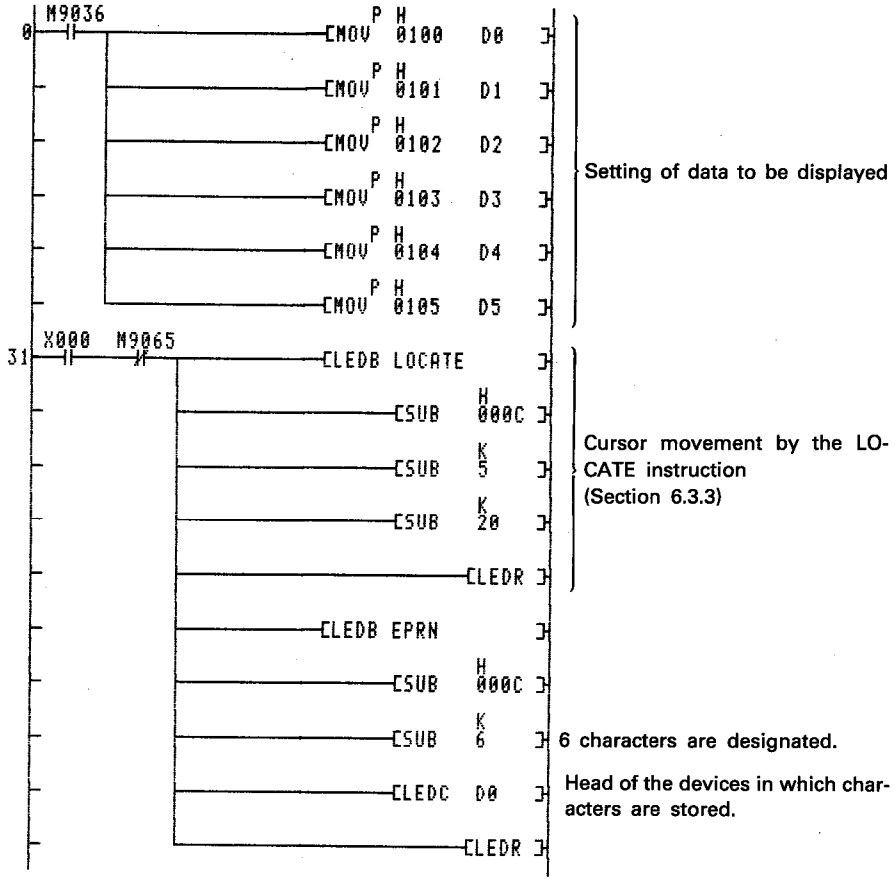
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

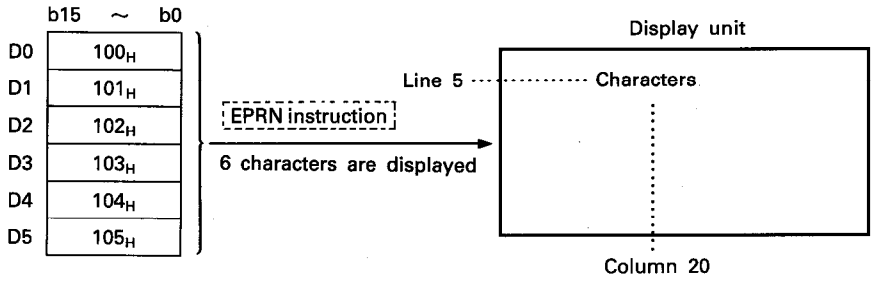
Description	Error Code	
	D9008	D9091
The range of the number of characters designated by (S1) beginning with the device number designated by (S2) exceeds the last device number of corresponding device.	50	504
The number of characters designated by (S1) is 0 or a negative value.		

PROGRAM EXAMPLE

The following is an example of the program used to display characters which correspond to character codes 100_H to 105_H beginning with column 20 on line 5 on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Characters are displayed by turning on X000.



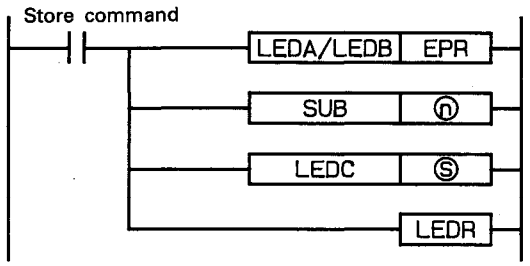
The character codes which correspond to the characters to be displayed are stored in D0 to D5.



6.5.6 Display of designated characters up to code 00_H·····EPR

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○					20	○		○
Ⓢ									○	○	○	○	○													

*1: The number of steps varies with type of device used. See Section 5.2.

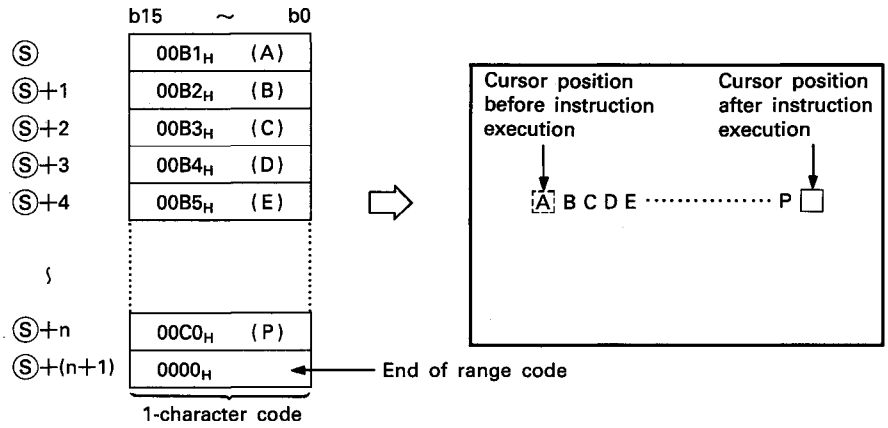


Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Head number of the devices in which character codes for the characters to be displayed are stored.

FUNCTION

(1) The EPR instruction is used to display designated characters beginning with current cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ.
The characters to be displayed correspond to the character codes which are stored in the devices beginning with the device number designated by Ⓢ up to the device in which code "0000_H" is stored.

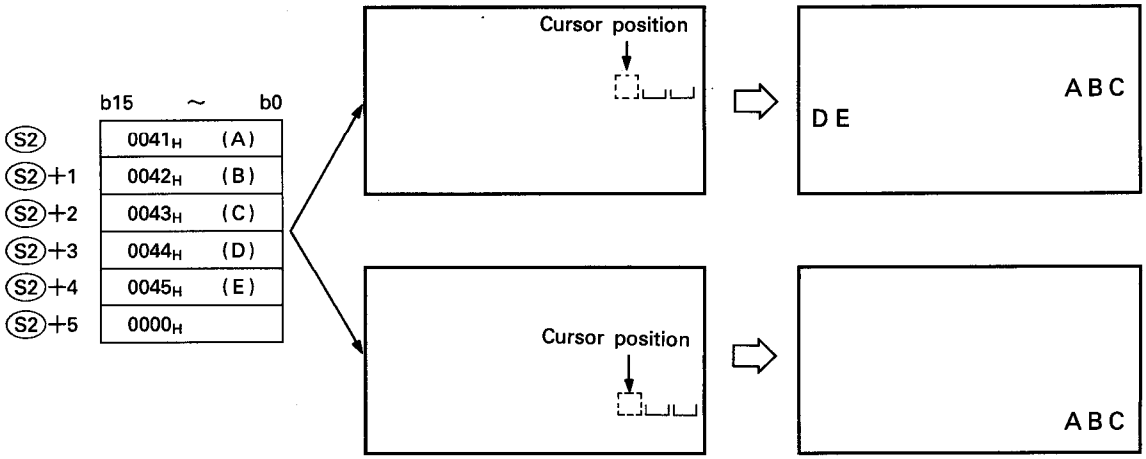


(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The character codes to be stored in the devices designated by Ⓢ can be set in the range of 0001_H to $03FF_H$.
Since code "0000_H" designates the end of the range of characters to be displayed, it cannot be set as a character code.
If code "0400_H" or a higher code is set, it is processed as code "0020_H".

(4) The number of characters which can be displayed by one time of processing equals to the number of characters from the cursor position to the last column on the last line on the screen.

(5) If the range of the number of characters beginning with the cursor position exceeds the last column on a line, the excess range laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.



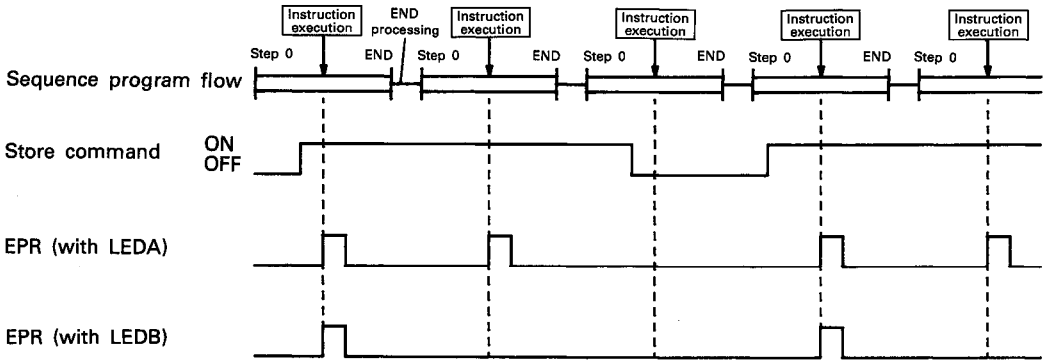
"DE" are ignored.

(6) After execution of the EPR instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The EPR instruction is executed every scan while the store command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the store command signal when the LEDB instruction is used.



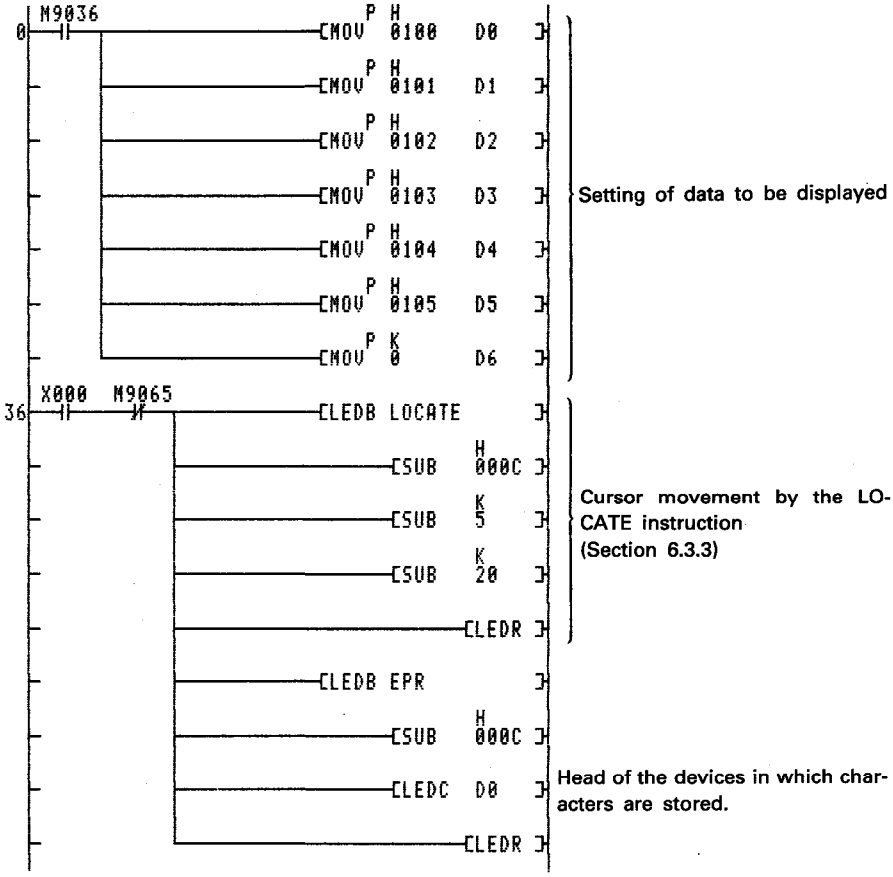
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

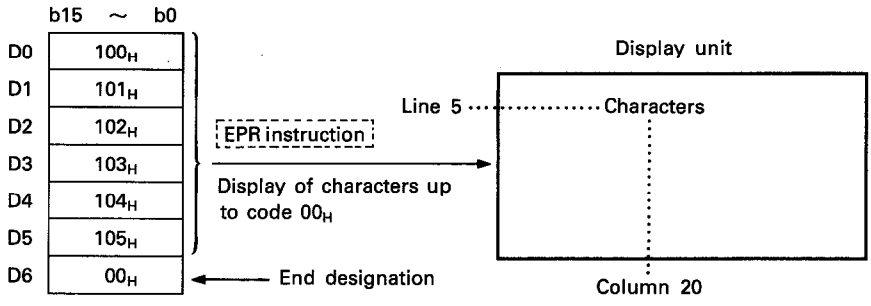
Description	Error Code	
	D9008	D9091
Code 00_H is not provided between the device number designated by Ⓢ and the last device number of corresponding device.	50	504
The number of characters to be displayed is 0.		

PROGRAM EXAMPLE

The following is an example of the program used to display characters which correspond to character codes 100_H to 105_H beginning with column 20 and after on line 5 on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Characters are displayed by turning on X000.



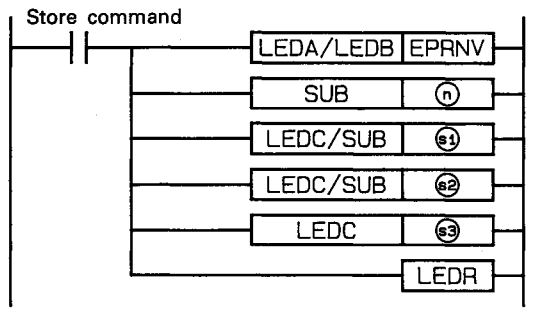
The character codes which correspond to the characters to be displayed are stored in D0 to D5.
"0" is stored in D6 to designate the end of the range of characters to be displayed.



6.5.7 Store of designated number of designated characters in the VRAM areas·····EPRNV

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○					○	○					26		○		○
(S2)								○	○	○	○	○					○	○									
(S3)								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.

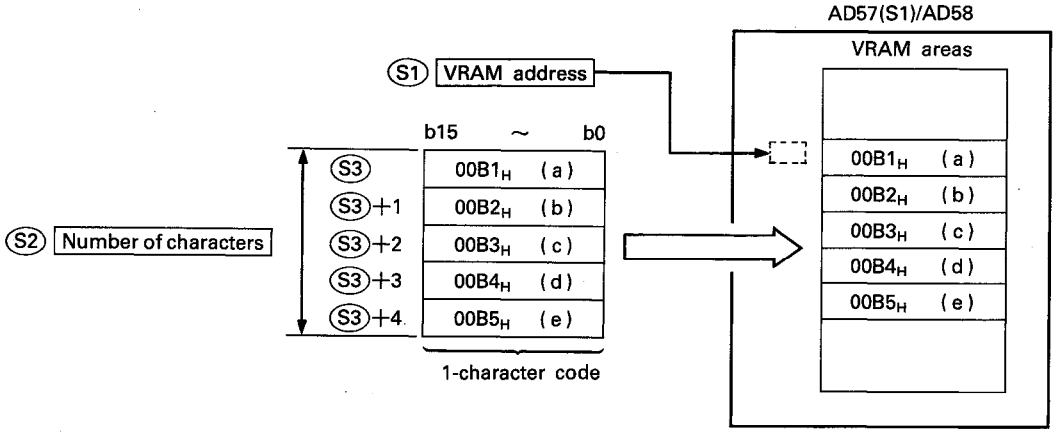


Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas where characters are to be stored
(S2)	Number of characters to be stored
(S3)	Head number of the devices in which character codes for the characters to be stored are stored.

FUNCTION

(1) The EPRNV instruction is used to store designated characters in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ beginning with the address designated by (S1).
The characters to be stored correspond to the character codes which are stored in the devices which correspond to the number of characters designated by (S2) beginning with the device number designated by (S3).



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12H" at ⓝ.

(3) The VRAM address to be designated by (S1) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM areas.)

(4) The number of characters to be designated by (S2) can be set at any number of characters stored at addresses beginning with the address designated by (S1) up to address 7679.
However, a value which exceeds the last device number of the devices designated by (S3) cannot be set.

(5) The character codes to be stored in the devices designated by (S2) can be set in the range of 0000_H to $03FF_H$.
If code "0400_H" or a higher code is set, it is processed as code "0020_H" (space code).

(6) If the range of the number of characters designated by (S2) beginning with the address designated by (S1) exceeds address 7679, an error occurs and processing is not performed.

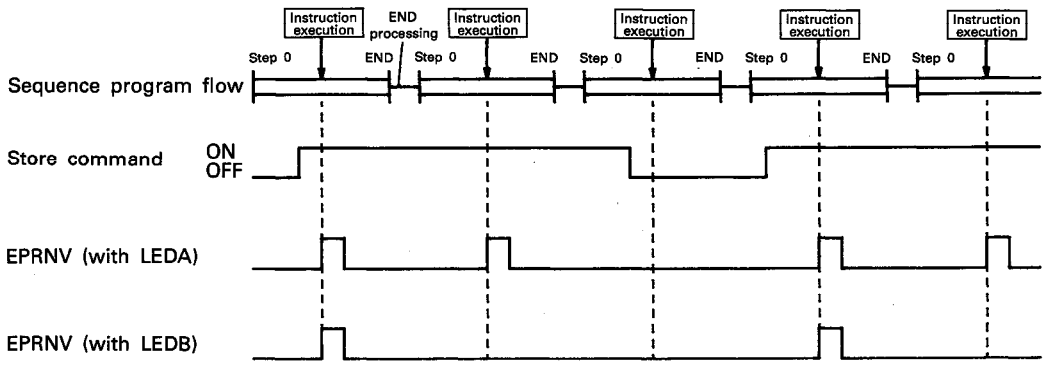
(7) If characters are stored in the areas currently being displayed, such characters are displayed on the screen.

(8) After execution of the EPRNV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The EPRNV instruction is executed every scan while the store command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the store command signal when the LEDB instruction is used.



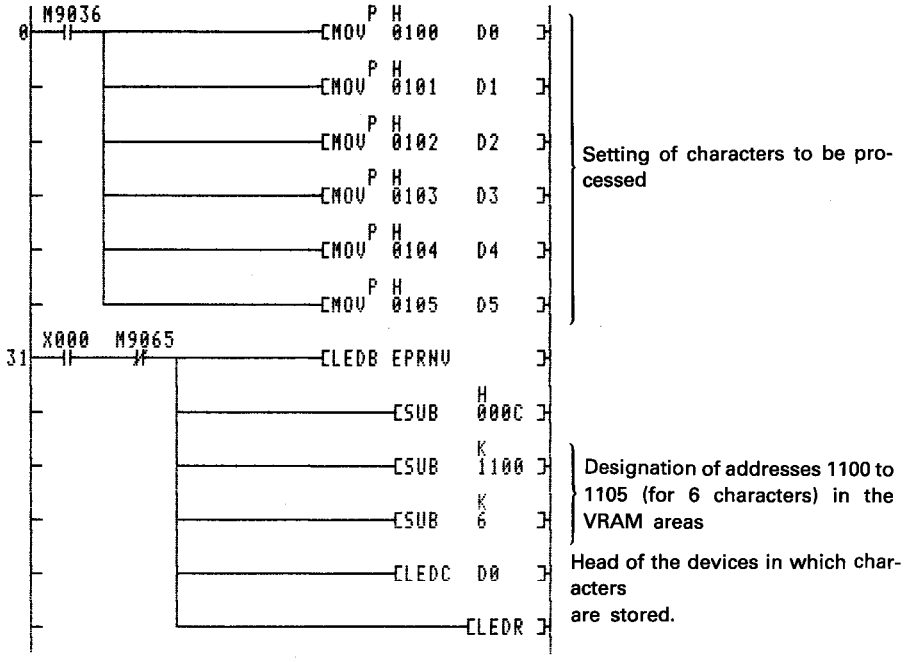
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

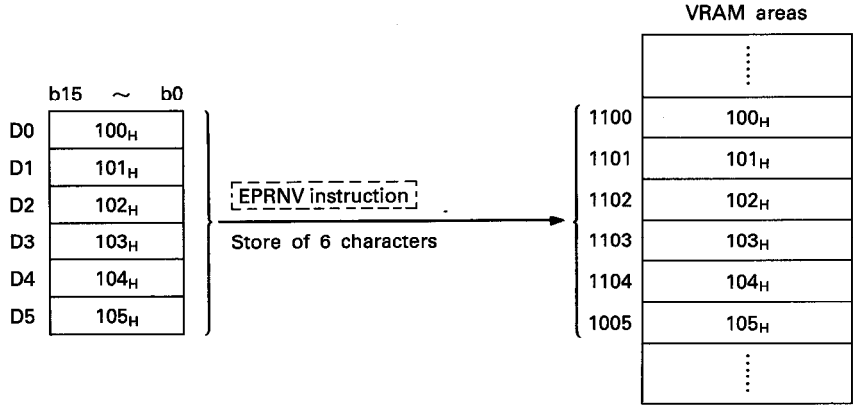
Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S1) is out of the range of 0 to 7679.	50	504
The number of characters designated by (S2) is 0 or a negative value.		
The range of the number of characters designated by (S2) beginning with the device number designated by (S3) exceeds the last device number of corresponding device.		
The range of the number of characters designated by (S2) beginning with the VRAM area address designated by (S1) exceeds address 7679.		

PROGRAM EXAMPLE

The following is an example of the program used to store characters which correspond to character codes 100H to 105H beginning with address 1000 in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Characters are stored in the VRAM areas by turning on X000.



The character codes which correspond to the characters to be stored are stored in D0 to D5.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, the character store operation can be monitored on the display unit.

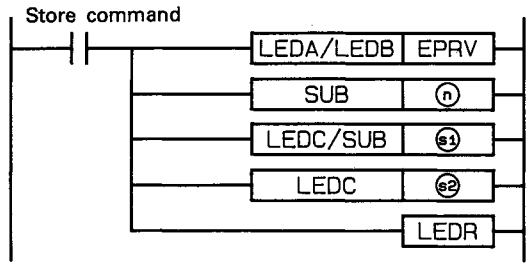


MEMO

6.5.8 Store of designated characters up to code 00_H in the VRAM areas·····EPRV

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○														

*1: The number of steps varies with type of device used. See Section 5.2.



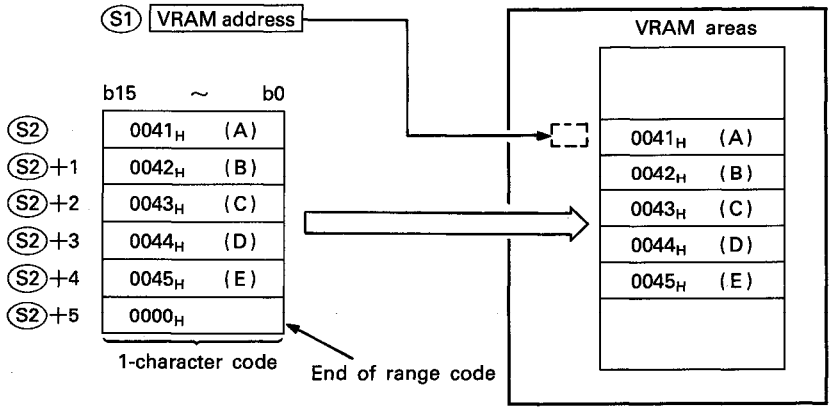
LEDA : Execution at ON
LEDB : Execution at leading edge
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas where characters are to be stored.
(S2)	Head number of the devices in which character codes for the characters to be stored are stored.

FUNCTION

(1) The EPRV instruction is used to store designated characters in the VRAM areas of the AD57(S1)/AD58 designated by ⓝ beginning with the address designated by (S1).
The characters to be stored correspond to the character codes which are stored in the devices beginning with the device number designated by (S2) up to the device in which code "00_H" is stored.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(3) The VRAM address to be designated by (S1) can be set within the range of 0 to 7679.
(See Section 1.1.1 for detail of the VRAM areas.)

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(4) The character codes to be stored in the devices designated by Ⓢ can be set in the range of 0001_H to $03FF_H$.
Since code "0000_H" designates the end of the range of characters to be displayed, it cannot be set as a character code.
If code "0400_H" or a higher code is set, it is processed as code "0020_H" (space code).

(5) The number of characters which can be stored by one time of processing equals to the number of characters from the address designated by Ⓢ1 up to address 7679.

(6) If the range of the number of characters beginning with the address designated by Ⓢ1 exceeds address 7679, an error occurs and processing is not performed.

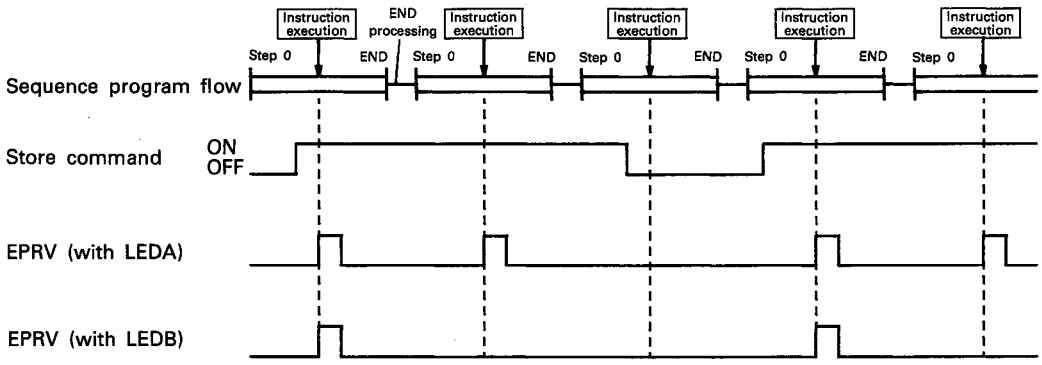
(7) If characters are stored in the areas currently being displayed, such characters are displayed on the screen.

(8) After execution of the EPRV instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The EPRV instruction is executed every scan while the store command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the store command signal when the LEDB instruction is used.



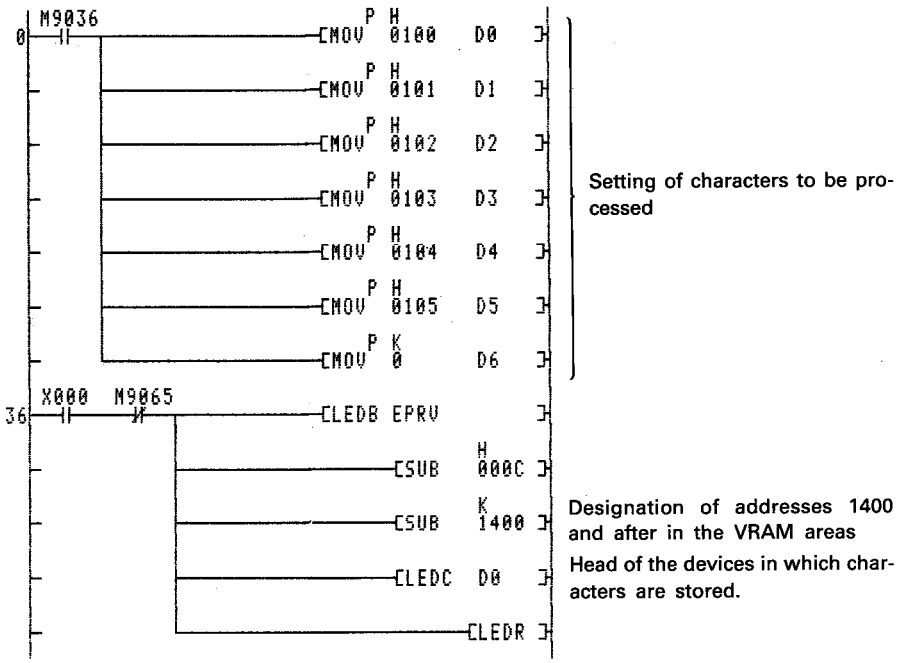
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

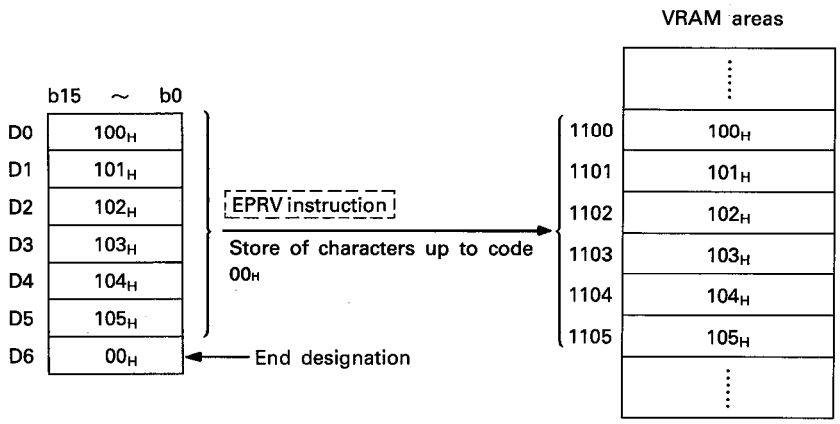
Description	Error Code D9008	Error Code D9091
The VRAM area address designated by Ⓢ1 is out of the range of 0 to 7679.	50	504
Code 00_H is not provided between the device number designated by Ⓢ2 and the last device number of corresponding device.		
The range of the number of characters to be stored beginning with the VRAM area address designated by Ⓢ1 exceeds address 7679.		
The number of characters to be stored is 0.		

PROGRAM EXAMPLE

The following is an example of the program used to store characters which correspond to character codes 100H to 105H at addresses 1000 and after in the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF.
Characters are stored in the VRAM areas by turning on X000.



The character codes which correspond to the characters to be stored are stored in D0 to D5.
"0" is stored in D6 to designate the end of the range of characters to be displayed.
By setting the head of the VRAM addresses to be displayed at address 1000 or before by use of the CPS2 instruction, the character store operation can be monitored on the display unit.

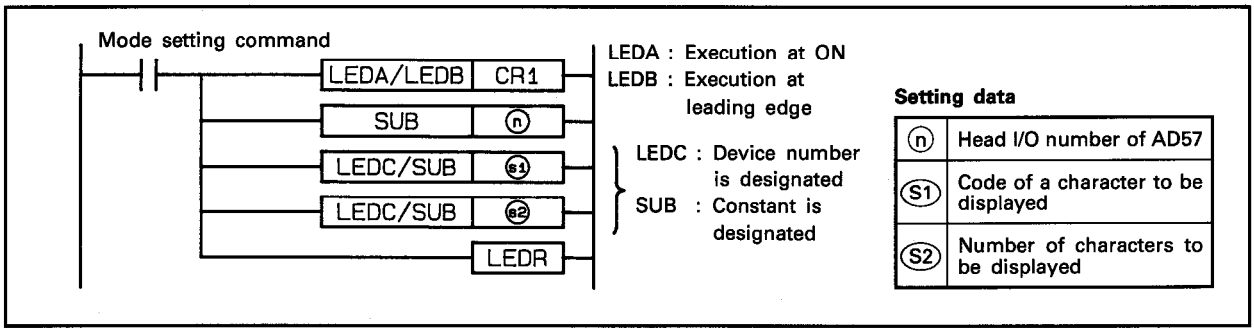


MEMO

6.5.9 Horizontal repeated display of a designated character·····CR1

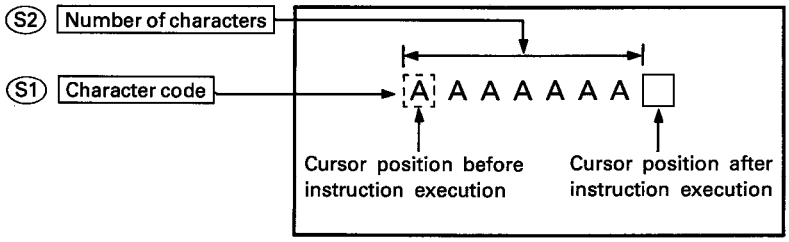
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○		○
(S2)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CR1 instruction is used to display a designated character which correspond to the character code designated by (S1) for the number of characters designated by (S2) beginning with current cursor position to the right on the display unit of the AD57(S1)/AD58 designated by ⓝ.



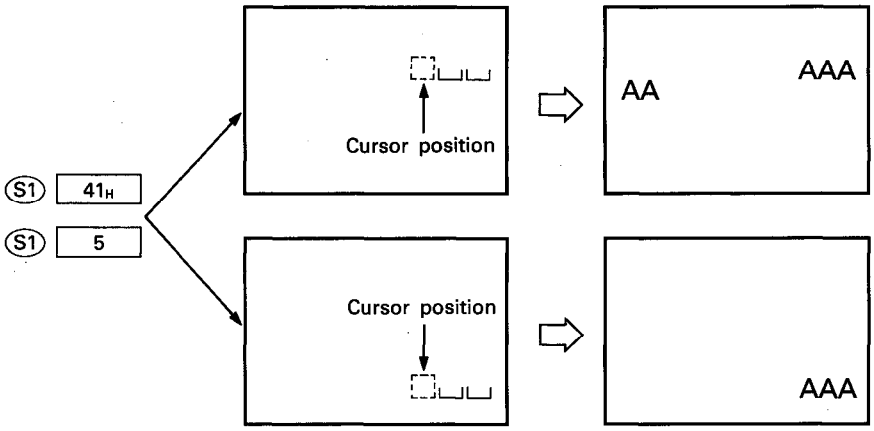
(2) The CR1 instruction is used to display horizontal lines of a table and bar graphs.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The character code designated by (S1) can be set within the range of 00_H to $3FF_H$.
If code 400_H or higher is designated, an error occurs.

(5) The number of characters designated by (S2) can be set within the range of 1 to 80.

(6) If the range of the number of characters designated by (S2) beginning with the cursor position exceeds the last column on a line, the excess range of characters laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.

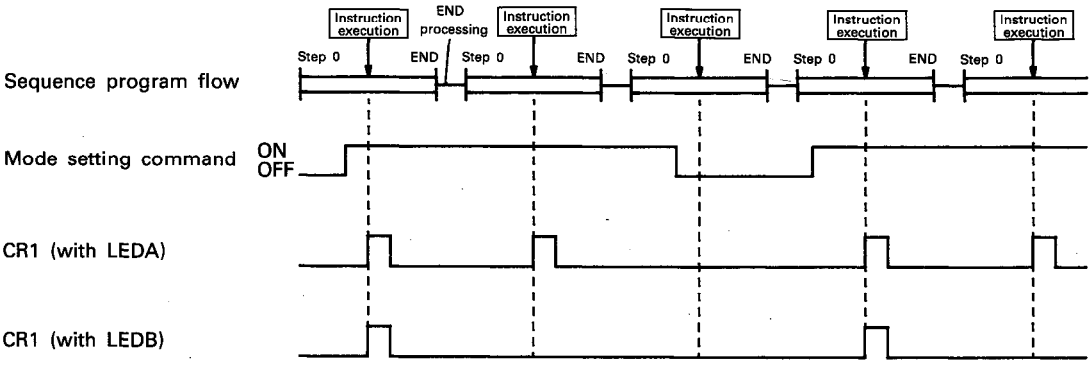


(7) After execution of the CR1 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CR1 instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



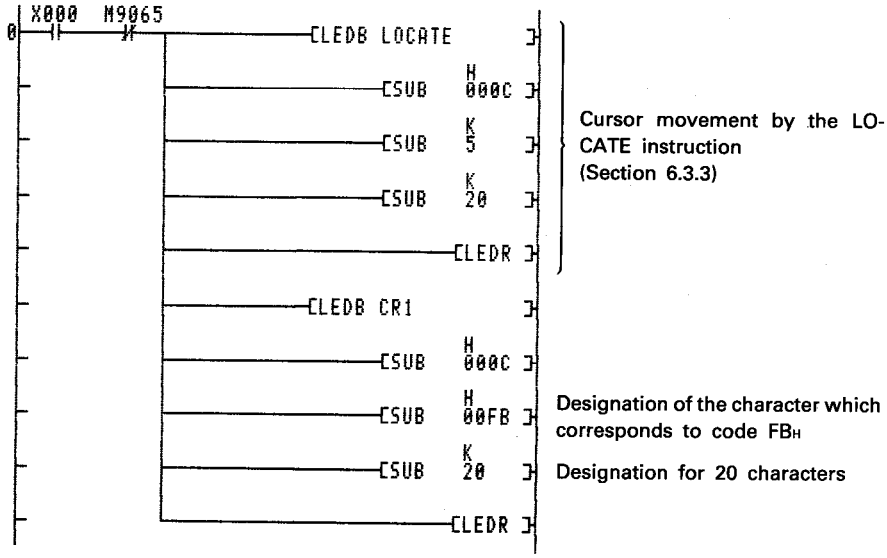
OPERATION ERROR

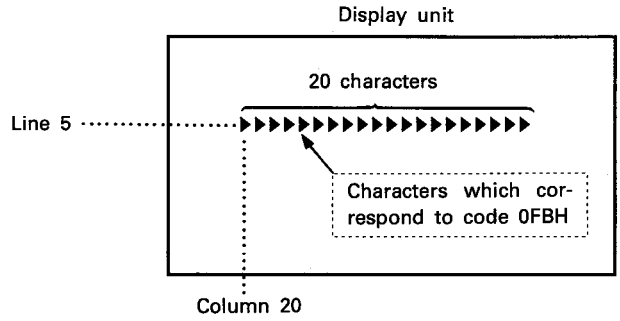
In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The character code designated by (S1) is out of the range of 0 to 3FF.	50	503
The number of characters designated by (S2) is out of the range of 1 to 80.		

PROGRAM EXAMPLE

The following is an example of the program used to display the character which corresponds to character code 0FBH twenty times horizontally on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A designated character is displayed repeatedly beginning with column 20 on line 5 by turning on X000.



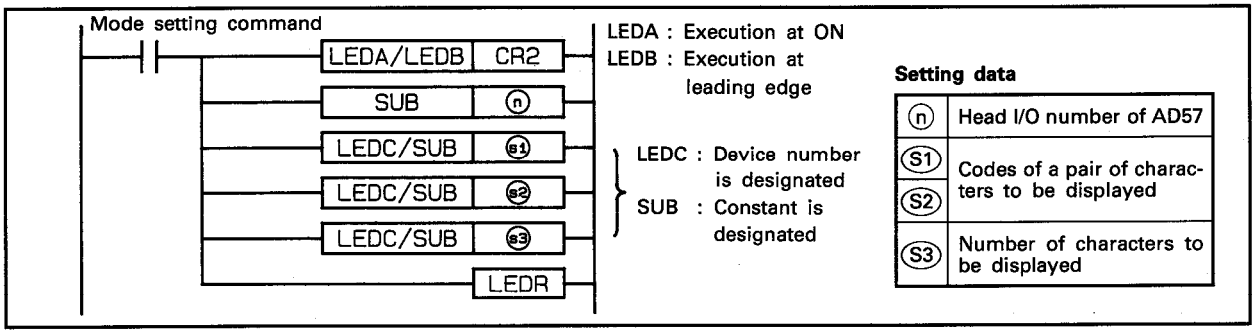


MEMO

6.5.10 Horizontal repeated display of a pair of designated characters·····CR2

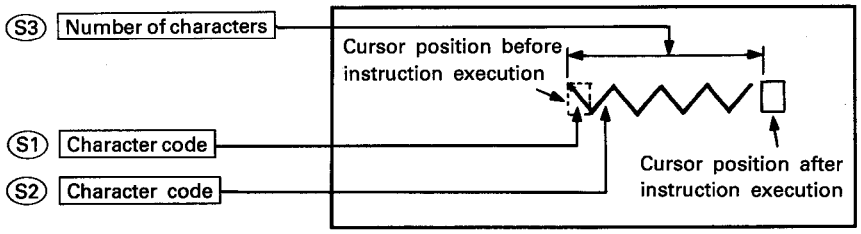
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					26		○	○
(S2)								○	○	○	○	○					○	○								
(S3)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CR2 instruction is used to display repeatedly a pair of designated characters each of which corresponds to respective character code designated by (S1) and (S2) on a display unit connected to the AD57(S1)/AD58 which is designated by ⓝ.
Repeated display begins with the cursor position and continues horizontally to the right for the number of pairs of characters designated by (S3).



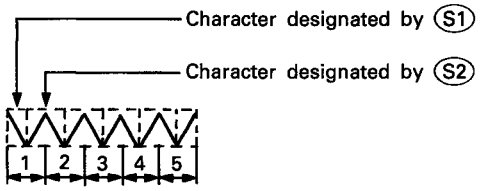
(2) The CR2 instruction is used to display repeatedly on a horizontal line a pair of characters which make one complete figure.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

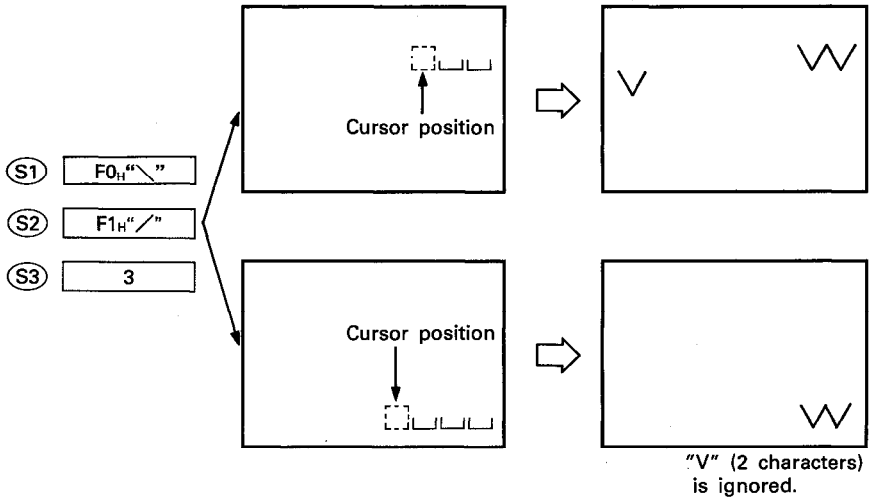
(4) The character codes designated by (S1) and (S2) can be set within the range of 00_H to $3FF_H$.
If code 400_H or higher is designated, an error occurs.

(5) The character code designated by (S1) corresponds to the left half of each pair, and the character code designated by (S2) corresponds to the right half of each pair.

(6) The number of characters designated by (S3) corresponds to the number of pairs of characters which are designated by (S1) and (S2) and can be set within the range of 1 to 40.
Example)



(7) If the range of the number of characters designated by (S3) beginning with the cursor position exceeds the last column on a line, the excess range of characters laps around to column 0 on the next line.
If the designated range exceeds the last column of the last line on the screen, characters up to the last column on the last line are displayed. The excess characters are ignored.

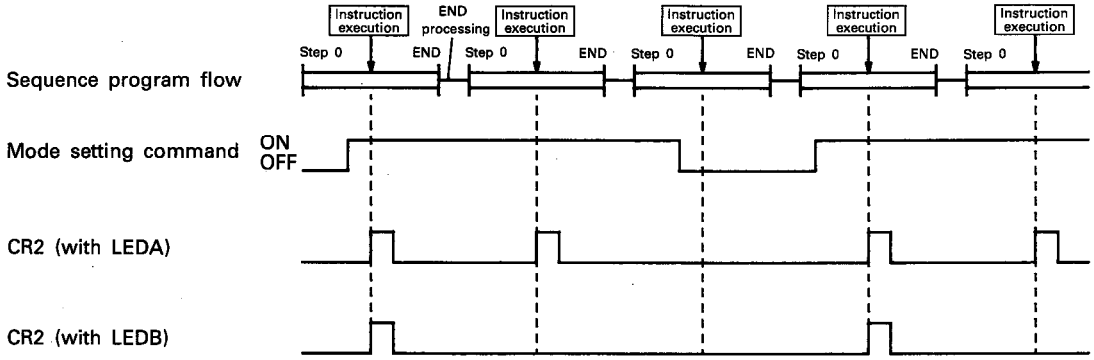


(8) After execution of the CR2 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Plus one line if the designated range exceeds the last column.
Cursor column position	Current cursor position plus twice the designated number of characters
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CR2 instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



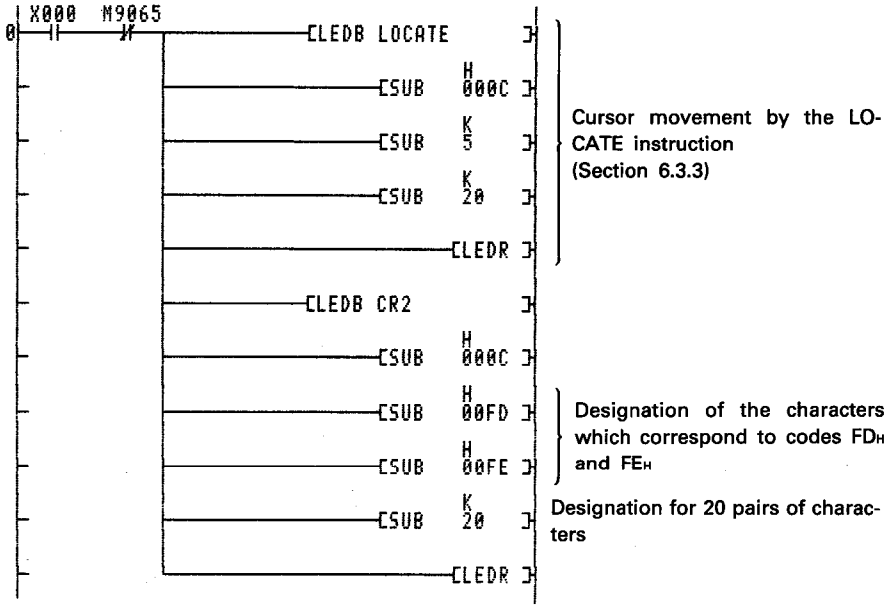
OPERATION ERROR

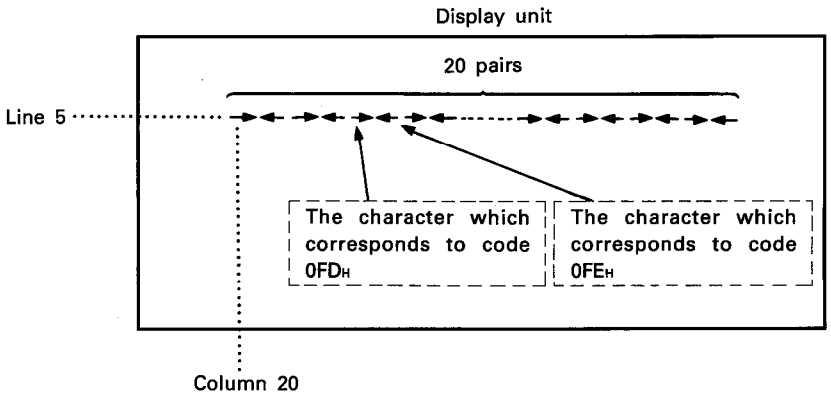
In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The character codes designated by (S1) and (S2) are out of the range of 0 to 3FF.	50	503
The number of characters designated by (S2) is out of the range of 1 to 40.		

PROGRAM EXAMPLE

The following is an example of the program used to display horizontally 20 pairs of characters which correspond to character codes 0FD$_H$ and 0FE$_H$ on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A pair of designated characters is displayed repeatedly beginning with column 20 on line 5 by turning on X000.

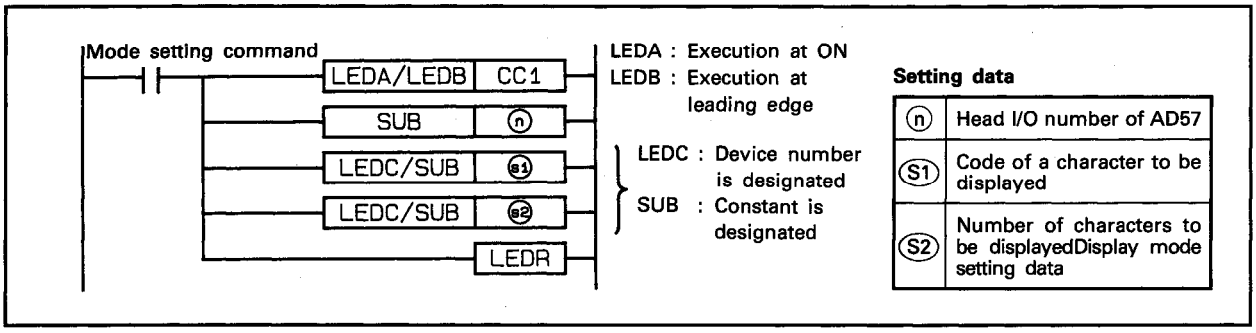




6.5.11 Vertical repeated display of a designated character·····CC1

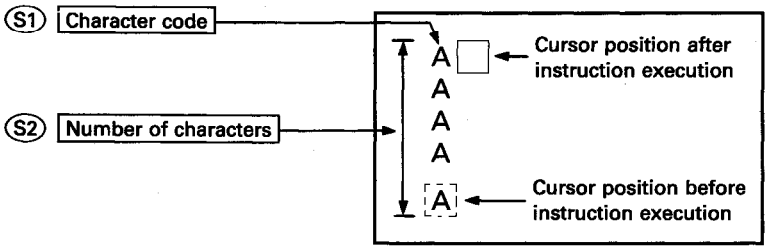
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
(S1)								○	○	○	○	○					○	○					23		○	○
(S2)								○	○	○	○	○					○	○								

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CC1 instruction is used to display repeatedly a designated character which correspond to the character code designated by (S1) for the number of characters designated by (S2) in a vertical direction beginning with current cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ.



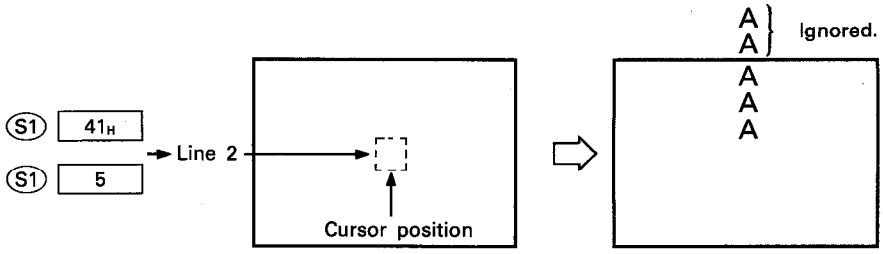
(2) The CC1 instruction is used to display vertical lines of a table and bar graphs.

(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The character code designated by (S1) can be set within the range of 00_H to $3FF_H$.
If code 400_H or higher is designated, an error occurs.

(5) The number of characters designated by (S2) can be set within the range of 1 to 20.

(6) If the range of the number of characters designated by (S2) beginning with the cursor position exceeds line 0, only the characters from the cursor position to line 0 are displayed. The excess characters are ignored.

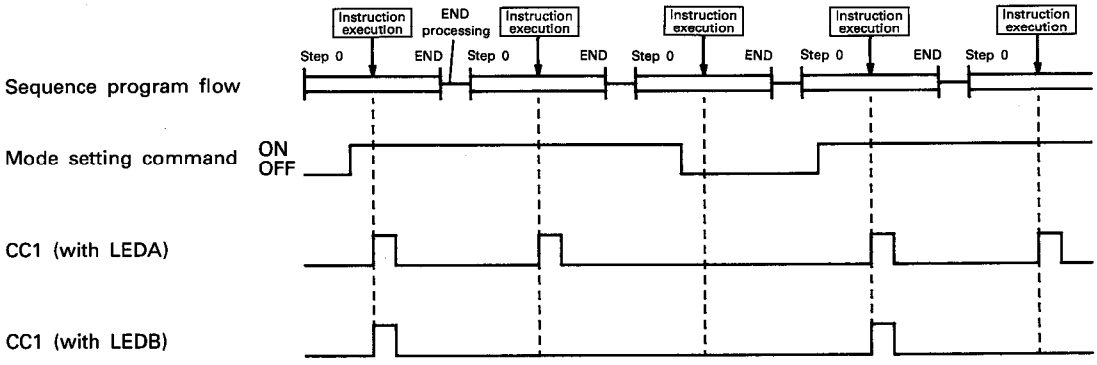


(7) After execution of the CC1 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Current line minus the number of designated characters
Cursor column position	Current column position plus one
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CC1 instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



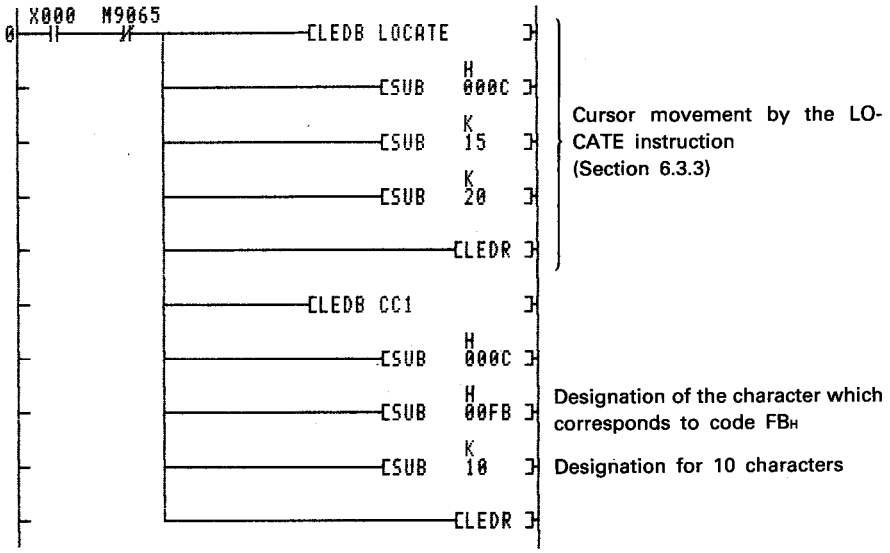
OPERATION ERROR

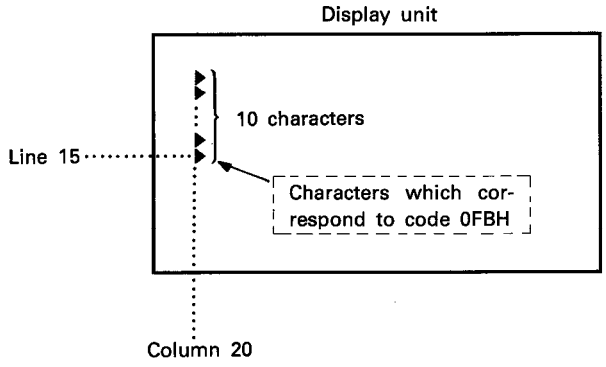
In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The character code designated by (S1) is out of the range of 0 to 3FF.	50	503
The number of characters designated by (S2) is out of the range of 1 to 20.		

PROGRAM EXAMPLE

The following is an example of the program used to display vertically 10 characters which corresponds to character code 0FB$_H$ on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF. A designated character is displayed repeatedly beginning with column 20 on line 15 by turning on X000.



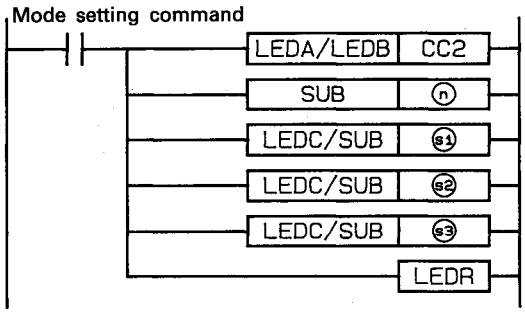


MEMO

6.5.12 Vertical repeated display of a pair of designated characters·····CC2

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○					○	○									
(S2)								○	○	○	○	○					○	○					26		○		○
(S3)								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

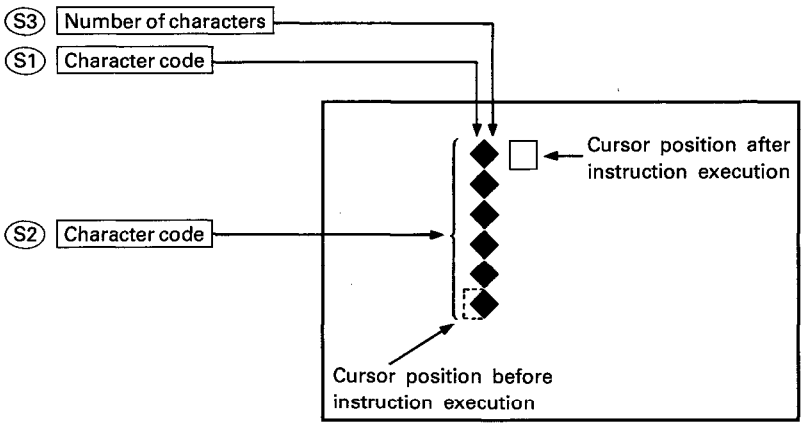
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Codes of a pair of characters to be displayed
(S2)	
(S3)	Display mode setting data

FUNCTION

(1) The CC2 instruction is used to display repeatedly a pair of designated characters each of which corresponds to respective character code designated by (S1) and (S2) on a display unit connected to the AD57(S1)/AD58 which is designated by ⓝ. Characters are paired side by side and displayed vertically beginning with the cursor position for the number of pairs of characters designated by (S3).



(2) The CC2 instruction is used to display vertically pairs of characters. Each pair makes one complete figure.

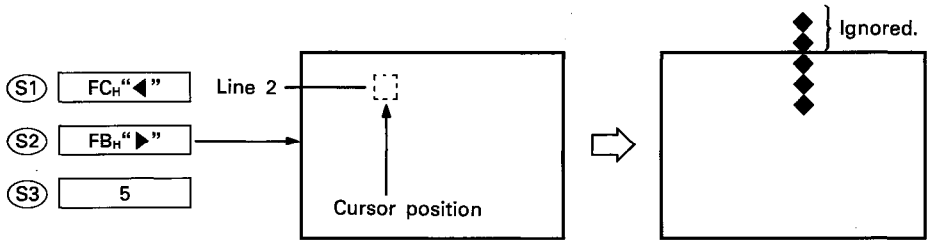
(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12_H" at ⓝ.

(4) The character codes designated by (S1) and (S2) can be set within the range of 00_H to $3FF_H$.
If code 400_H or higher is designated, an error occurs.

(5) The character code designated by (S1) corresponds to the left half of each pair, and the character code designated by (S2) corresponds to the right half of each pair.

(6) The number of characters designated by (S3) can be set within the range of 1 to 20.

(7) If the range of the number of characters designated by (S2) beginning with the cursor position exceeds line 0, only the characters from the cursor position to line 0 are displayed. The excess characters are ignored.

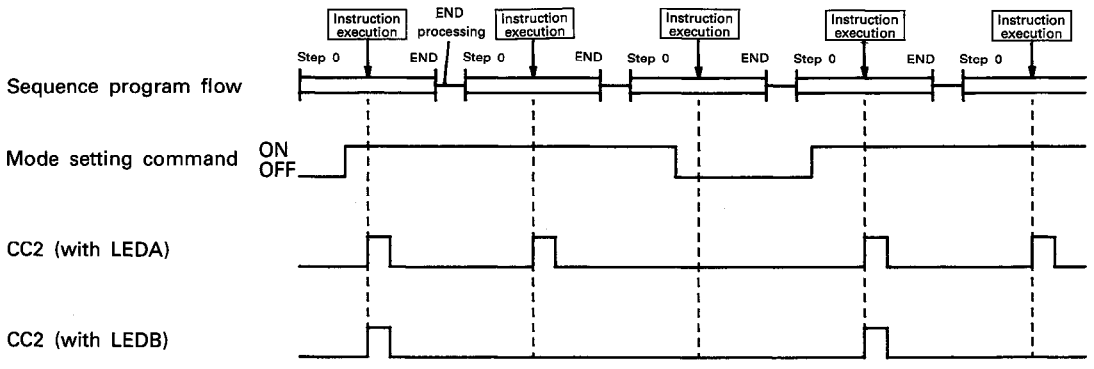


(8) After execution of the CC2 instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	Current line minus the designated number of characters
Cursor column position	Current column plus two columns
Head VRAM address displayed	(no change)
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CC2 instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



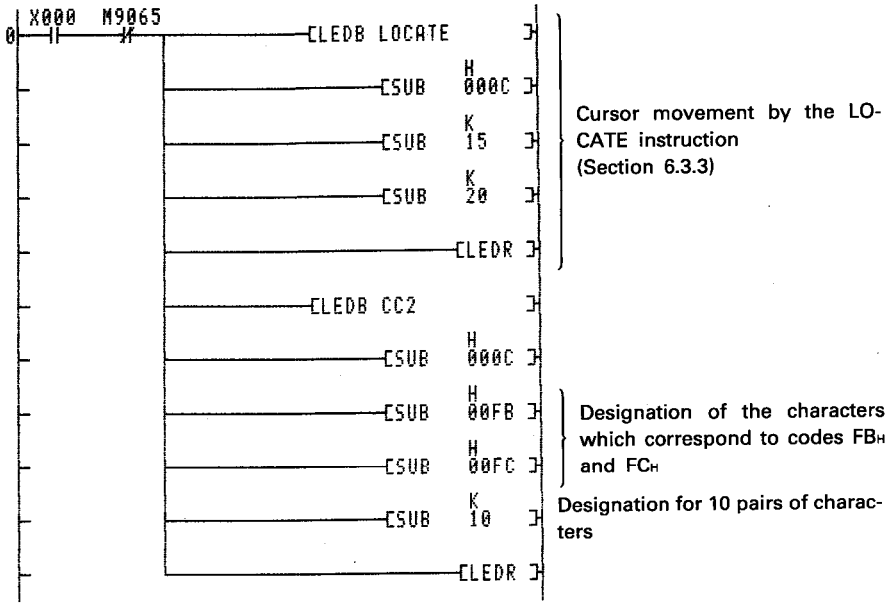
OPERATION ERROR

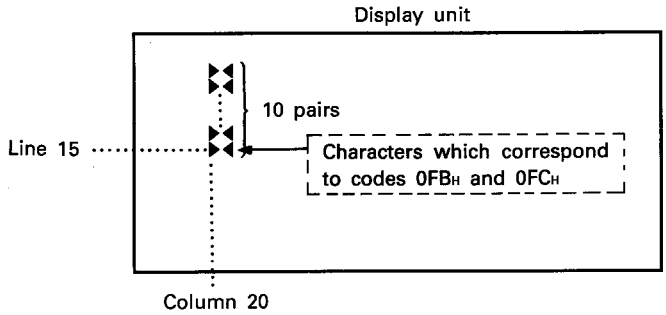
In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The character codes designated by (S1) and (S2) are out of the range of 0 to 3FF.	50	503
The number of characters designated by (S2) is out of the range of 1 to 20.		

PROGRAM EXAMPLE

The following is an example of the program used to display vertically 10 pairs of characters which correspond to character codes 0FBH and 0FCH on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A pair of designated characters is displayed repeatedly beginning with column 20 on line 15 by turning on X000.





6.6 Fixed Character Display Instructions

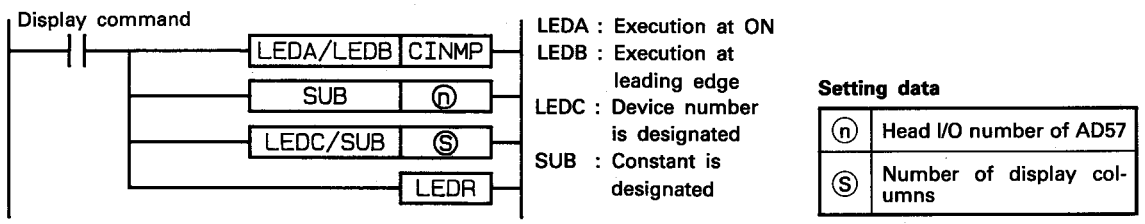
The fixed character display instructions are used to display characters each of which corresponds to respective display instruction at the cursor position.
Entry of setting data can be easily done with the fixed character display instructions.
The fixed character display instructions are classified as follows.

Category	Instruction Name	Description
"—" (minus symbol) display	CINMP	Displays a minus symbol (—) one column to the left of the designated number of columns beginning with the cursor position.
"-" (hyphen) display	CINHP	Displays a hyphen (-) at the cursor position.
"." (period or decimal point) display	CINPT	Displays a period or a decimal point (.) at the cursor position.
"0" display	CIN0	Displays "0" at the cursor position.
"1" display	CIN1	Displays "1" at the cursor position.
"2" display	CIN2	Displays "2" at the cursor position.
"3" display	CIN3	Displays "3" at the cursor position.
"4" display	CIN4	Displays "4" at the cursor position.
"5" display	CIN5	Displays "5" at the cursor position.
"6" display	CIN6	Displays "6" at the cursor position.
"7" display	CIN7	Displays "7" at the cursor position.
"8" display	CIN8	Displays "8" at the cursor position.
"9" display	CIN9	Displays "9" at the cursor position.
"A" display	CINA	Displays "A" at the cursor position.
"B" display	CINB	Displays "B" at the cursor position.
"C" display	CINC	Displays "C" at the cursor position.
"D" display	CIND	Displays "D" at the cursor position.
"E" display	CINE	Displays "E" at the cursor position.
"F" display	CINF	Displays "F" at the cursor position.
"G" display	CING	Displays "G" at the cursor position.
"H" display	CINH	Displays "H" at the cursor position.
"I" display	CINI	Displays "I" at the cursor position.
"J" display	CINJ	Displays "J" at the cursor position.
"K" display	CINK	Displays "K" at the cursor position.
"L" display	CINL	Displays "L" at the cursor position.
"M" display	CINM	Displays "M" at the cursor position.
"N" display	CINN	Displays "N" at the cursor position.
"O" display	CINO	Displays "O" at the cursor position.
"P" display	CINP	Displays "P" at the cursor position.
"Q" display	CINQ	Displays "Q" at the cursor position.
"R" display	CINR	Displays "R" at the cursor position.
"S" display	CINS	Displays "S" at the cursor position.
"T" display	CINT	Displays "T" at the cursor position.
"U" display	CINU	Displays "U" at the cursor position.
"V" display	CINV	Displays "V" at the cursor position.
"W" display	CINW	Displays "W" at the cursor position.
"X" display	CINX	Displays "X" at the cursor position.
"Y" display	CINY	Displays "Y" at the cursor position.
"Z" display	CINZ	Displays "Z" at the cursor position.
" " (space) display	CINSP	Displays a space symbol (" ") at the cursor position.

6.6.1 Display of a minus symbol ("—")·····CINMP

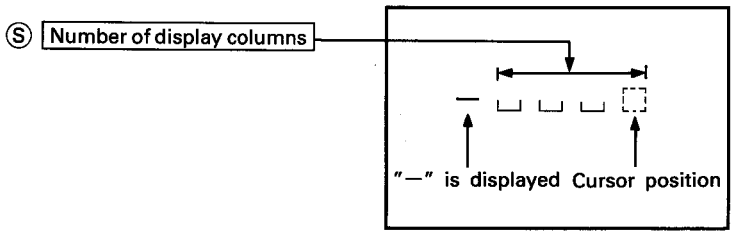
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
Ⓢ								○	○	○	○	○					○	○					20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

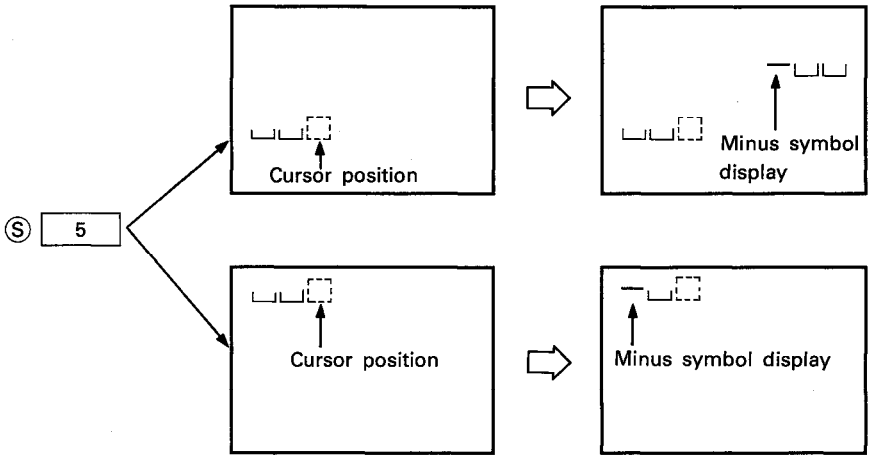
(1) The CINMP instruction is used to display a minus (—) symbol one column to the left of the columns designated by Ⓢ beginning with the cursor position on the display unit of the AD57(S1)/AD58 designated by ⓝ. The characters between the minus symbol and the cursor are cleared.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The number of display columns designated by Ⓢ can be set within the range of 1 to 16.
Characters can be displayed at the designated display columns using the CIN□ instructions.

(4) If the range of the number of columns designated by Ⓢ plus one column beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line, and a minus symbol is displayed one column to the left of the excess columns.
If the designated range exceeds column 0 of line 0 on the screen, a minus symbol is displayed at column 0 on line 0.

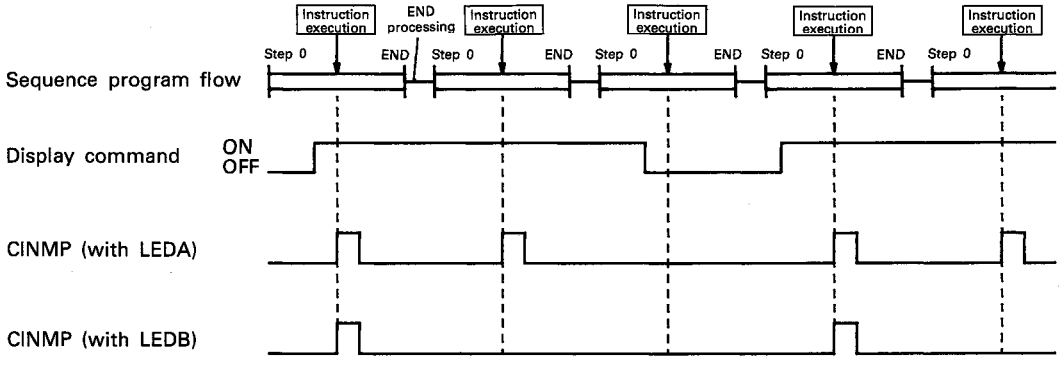


(5) After execution of the CINMP instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CINMP instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



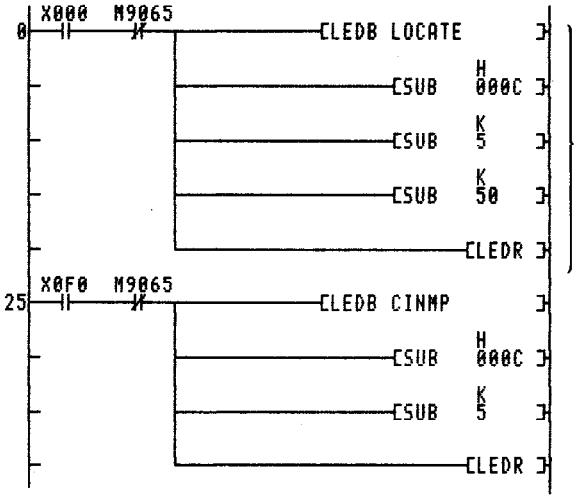
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

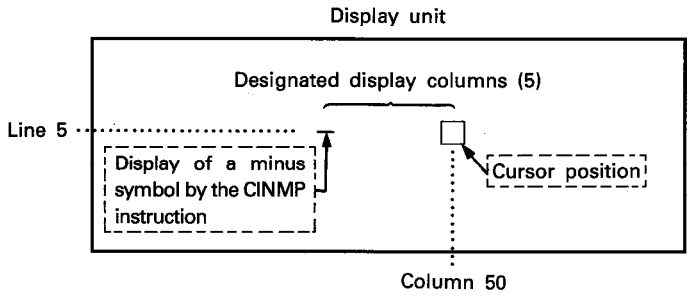
Description	Error Code	
	D9008	D9091
The number of display columns designated by Ⓢ is out of the range of 1 to 16.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to display a minus symbol (—) on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A minus symbol is displayed by turning on X0F0.
The position of display is designated at columns 45 to 50 on line 5.



The CINMP instruction is used for data entry together with other instructions such as CINHP, CINPT, CIN (alphanumerics), CINSP, CINCLR and INPUT. (Refer to Section 7.3 for details.)
By execution of the CINMP instruction, a minus symbol (—) is displayed one column to the left of the designated columns.

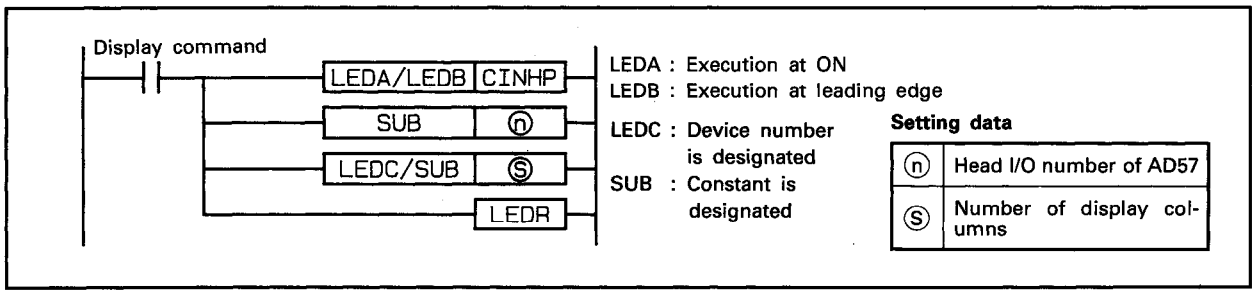


MEMO

6.6.2 Display of a hyphen ("-")·····CINHP

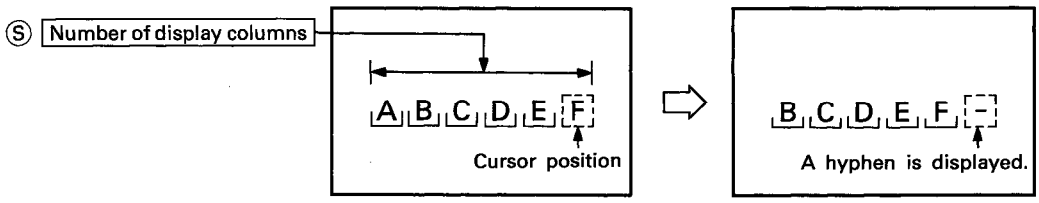
	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○								
Ⓢ								○	○	○	○	○					○	○					20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

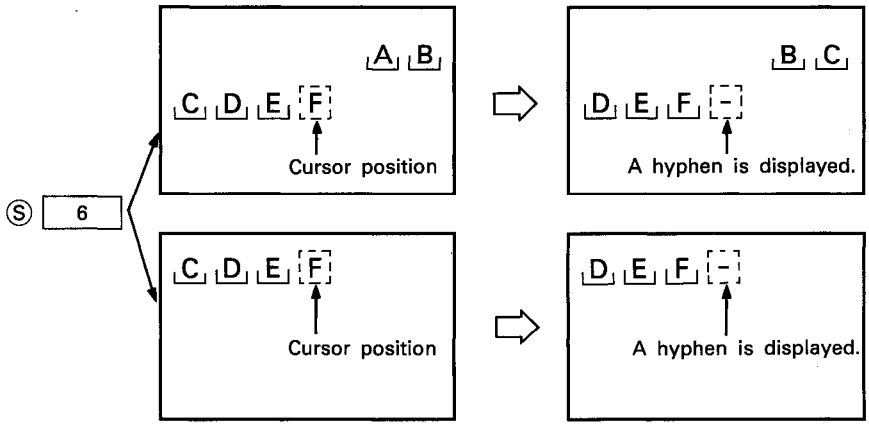
(1) The CINHP instruction is used to display a hyphen (-) at the cursor position and shift the characters in the range designated by Ⓢ beginning with the cursor position one column to the left on the display unit of the AD57(S1)/AD58 designated by ⓝ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The number of display columns designated by Ⓢ can be set within the range of 1 to 16.
Characters can be displayed at the designated display columns using the CIN[ ] instructions.
When a character is displayed by use of the CIN[ ] instruction within the designated display columns, characters are shifted one column to the left.

(4) If the range of display columns designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are shifted one column to the left.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are shifted.
Characters which exceed column 0 on line 0 are erased.

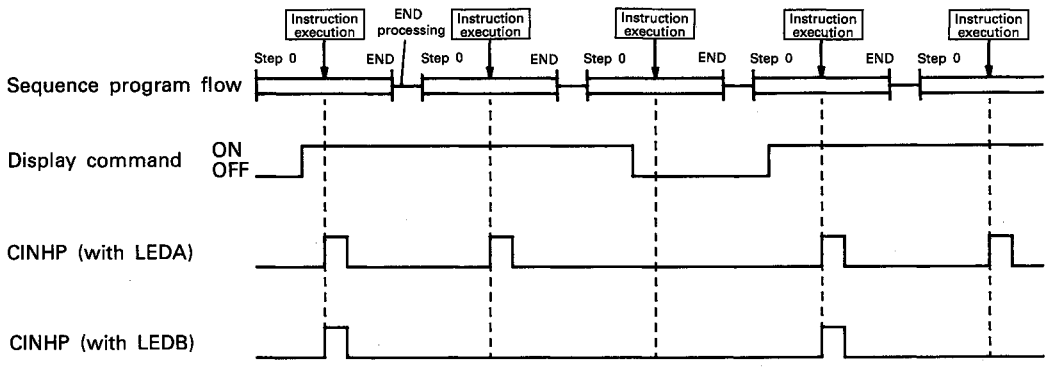


(5) After execution of the CINHP instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CINHP instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



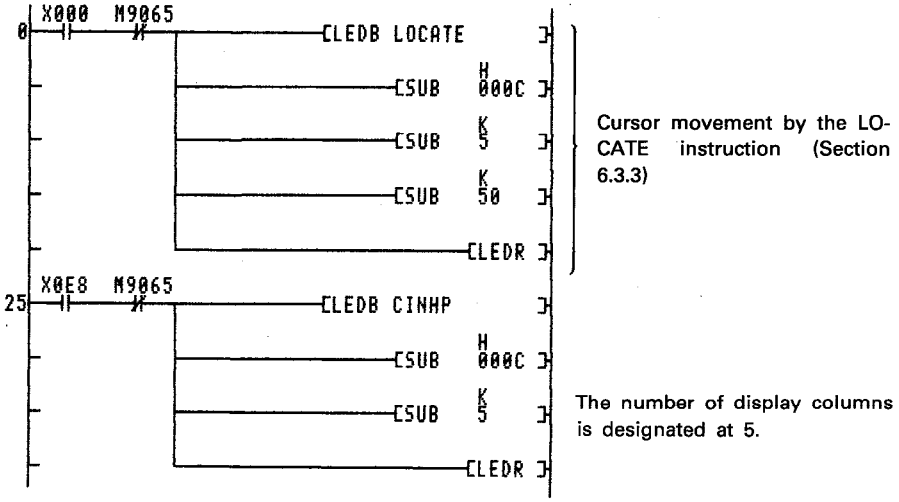
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

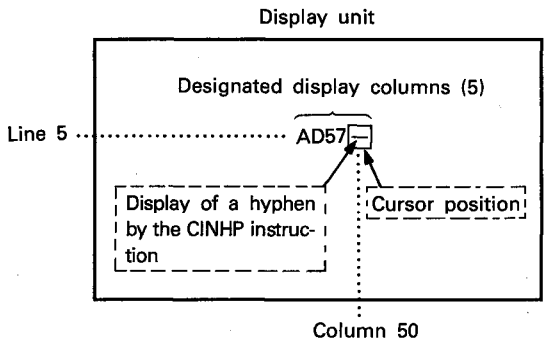
Description	Error Code	
	D9008	D9091
The number of display columns designated by (S) is out of the range of 1 to 16.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to display a hyphen (-) on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A hyphen is displayed by turning on X0E8.
The position of display is designated at columns 45 to 50 on line 5.



The CINHP instruction is used for data entry together with other instructions such as CINMP, CINPT, CIN (alphanumerics), CINSP, CINCLR and INPUT. (Refer to Section 7.3 for details.)
By execution of the CINHP instruction, a hyphen (-) is displayed at the cursor position, and the characters within the designated range are shifted one column to the left.

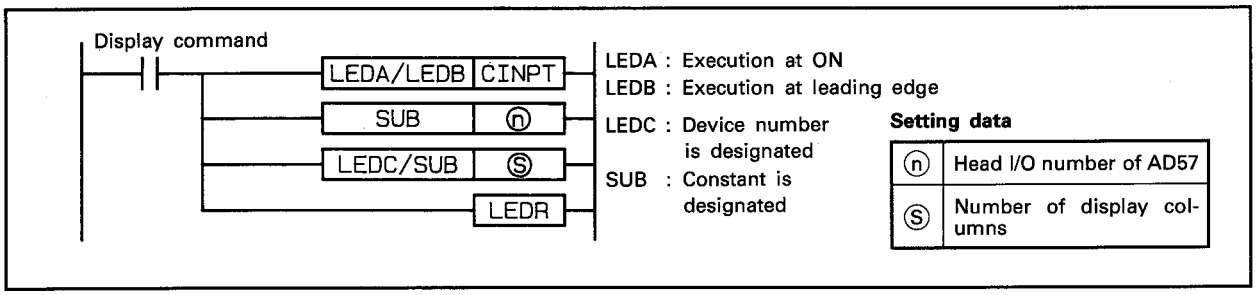


MEMO

6.6.3 Display of a period or a decimal point (".")·····CINPT

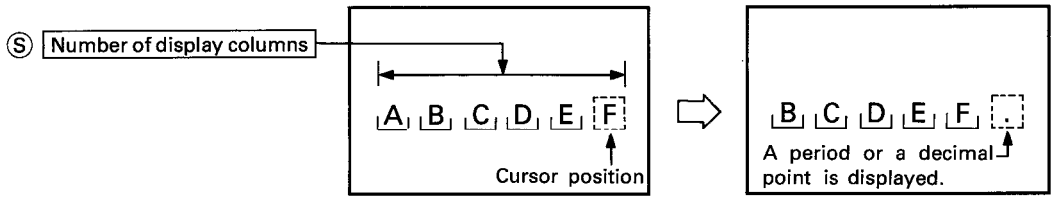
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
Ⓢ								○	○	○	○	○					○	○					20		○		○

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

(1) The CINPT instruction is used to display a period or a decimal point (.) at the cursor position and shift the characters in the range designated by Ⓢ beginning with the cursor position one column to the left on the display unit of the AD57(S1)/AD58 designated by ⓝ.

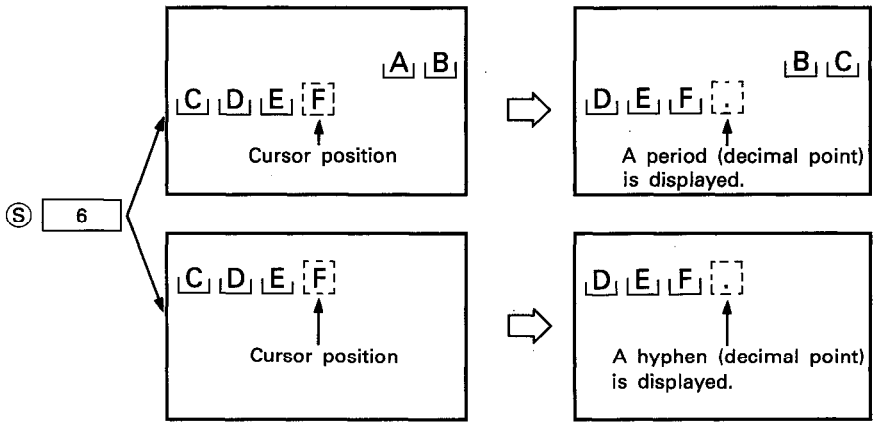


(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.

Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The number of display columns designated by Ⓢ can be set within the range of 1 to 16.
Characters can be displayed at the designated display columns using the CIN⬚ instructions.
When a character is displayed by use of the CIN⬚ instruction within the designated display columns, characters are shifted one column to the left.

(4) If the range of display columns designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are shifted one column to the left.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are shifted.
Characters which exceed column 0 on line 0 are erased.

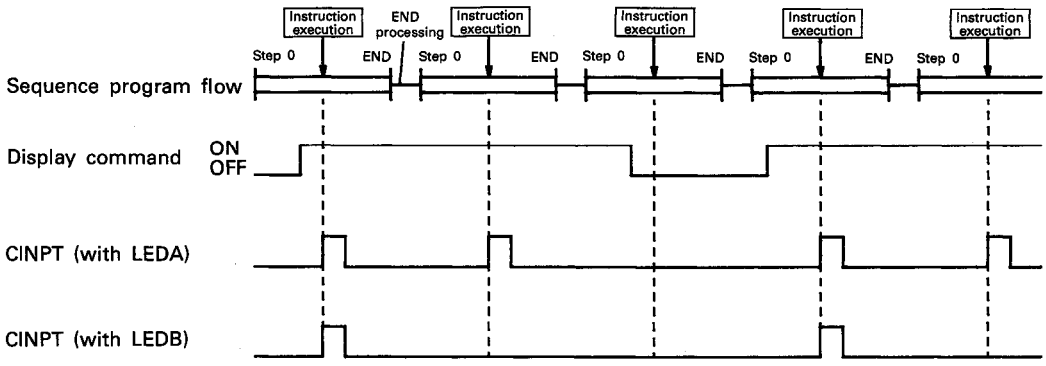


(5) After execution of the CINPT instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CINPT instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



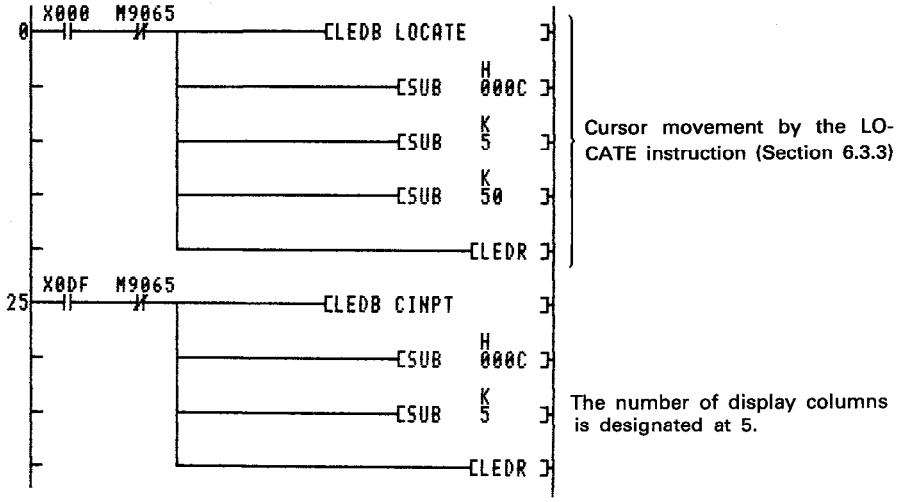
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

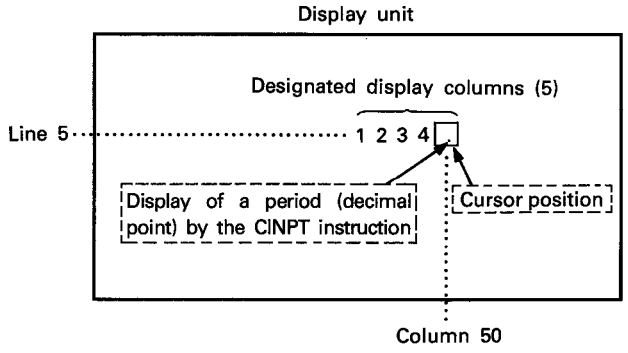
Description	Error Code	
	D9008	D9091
The number of display columns designated by Ⓢ is out of the range of 1 to 16.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to display a period or a decimal point (.) on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A period or a decimal point is displayed by turning on X0DF.
The position of display is designated at columns 45 to 50 on line 5.



The CINPT instruction is used for data entry together with other instructions such as CINMP, CINHP, CIN (alphanumerics), CINSP, CINCLR and INPUT. (Refer to Section 7.3 for details.)
By execution of the CINPT instruction, a period or a decimal point (.) is displayed at the cursor position, and the characters within the designated range are shifted one column to the left.



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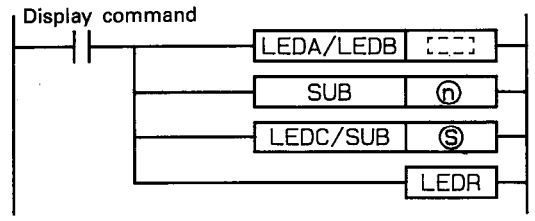
6.6.4 Display of the alphanumeric characters "0" to "9" and "A" to "Z"·····CIN□ (□ : 0 to 9 or A to Z)

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					20		○		○
Ⓢ								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge
LEDC : Device number is designated
SUB : Constant is designated

Instruction number in □

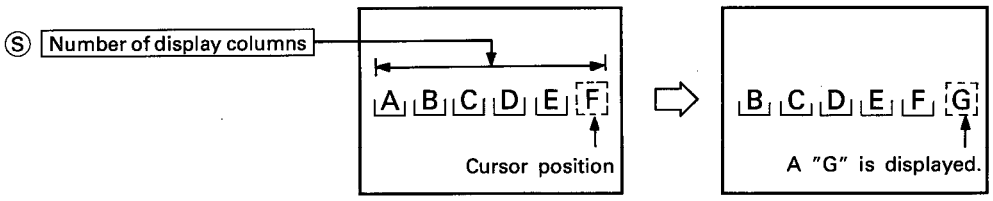
CIN0~CIN9
CINA~CINZ

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Number of display columns

FUNCTION

(1) The CIN□ instruction is used to display the alphanumeric characters ("0" to "9" or "A" to "Z") at the cursor position and shift the characters in the range designated by Ⓢ beginning with the cursor position one column to the left on the display unit of the AD57(S1)/AD58 designated by ⓝ.



(2) Use the following instructions according to the alphanumeric characters to be displayed.

Instruction	Character	Instruction	Character	Instruction	Character	Instruction	Character
CIN0	"0"	CINA	"A"	CINK	"K"	CINU	"U"
CIN1	"1"	CINB	"B"	CINL	"L"	CINV	"V"
CIN2	"2"	CINC	"C"	CINK	"M"	CINW	"W"
CIN3	"3"	CIND	"D"	CINN	"N"	CINX	"X"
CIN4	"4"	CINE	"E"	CINO	"O"	CINY	"Y"
CIN5	"5"	CINF	"F"	CINP	"P"	CINZ	"Z"
CIN6	"6"	CING	"G"	CINQ	"Q"		
CIN7	"7"	CINH	"H"	CINR	"R"		
CIN8	"8"	CINI	"I"	CINS	"S"		
CIN9	"9"	CINJ	"J"	CINT	"T"		

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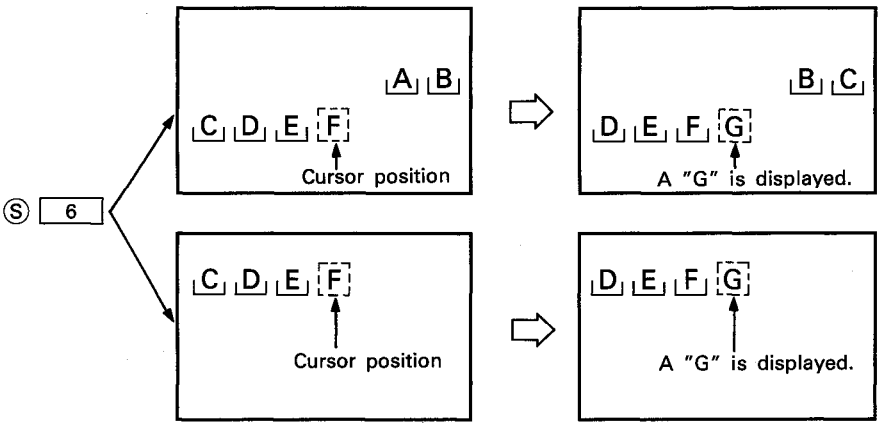
(3) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(4) The number of display columns designated by Ⓢ can be set within the range of 1 to 16.
Characters can be displayed at the designated display columns using the CIN[ ] instructions.
When a character is displayed by use of the CIN[ ] instruction within the designated display columns, characters are shifted one column to the left.

(5) If the range of display columns designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are shifted one column to the left.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are shifted.
Characters which exceed column 0 on line 0 are erased.

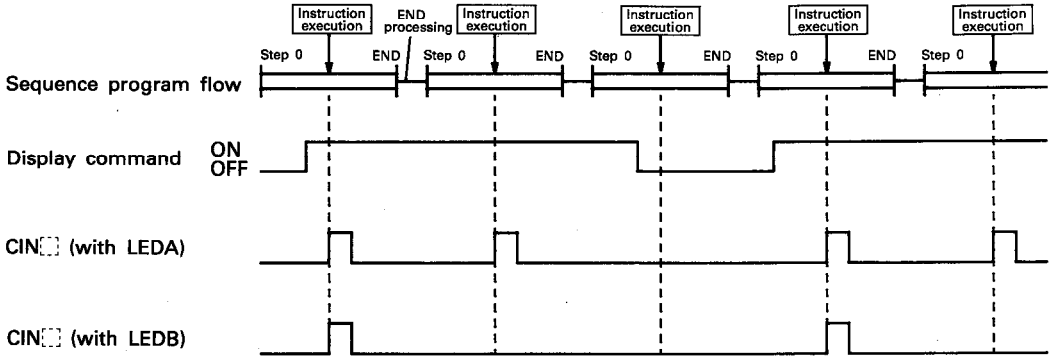


(6) After execution of the CIN[ ] instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CIN[ ] instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



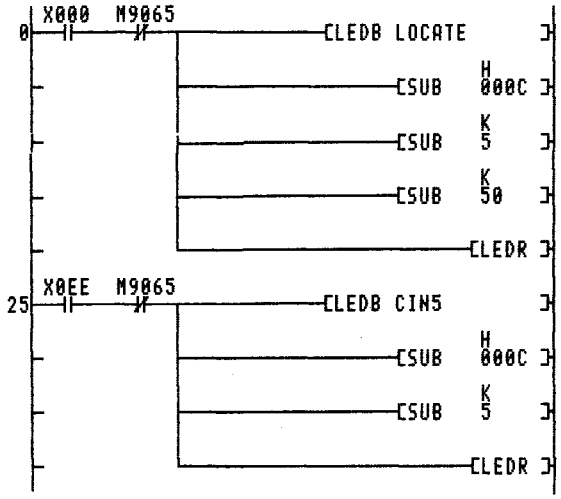
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

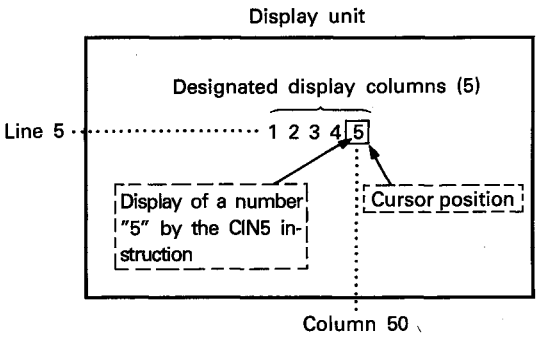
Description	Error Code	
	D9008	D9091
The number of display columns designated by Ⓢ is out of the range of 1 to 16.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to display a number "5" at a designated position on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
The alphanumeric characters are displayed by turning on X0EE.
The position of display is designated at columns 45 to 50 on line 5.



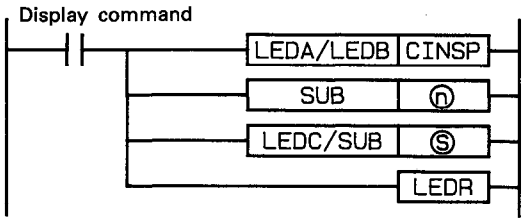
The CIN5 instruction is used for data entry together with other instructions such as CINMP, CINHP, CIN (alphanumerics), CINSP, CINCLR and INPUT. (Refer to Section 7.3 for details.)
By execution of the CIN5 instruction, a number "5" is displayed at the cursor position, and the characters within the designated range are shifted one column to the left.



6.6.5 Display of a space ("␣")·····CINSP

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N				M9012	M9011
ⓝ																	○	○					20			
Ⓢ								○	○	○	○	○					○	○						○		○

*1: The number of steps varies with type of device used. See Section 5.2.



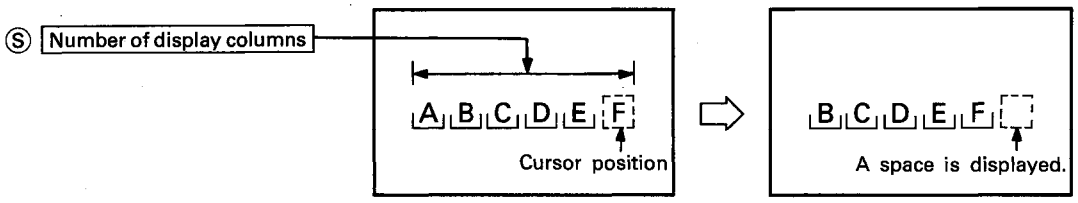
LEDA : Execution at ON
LEDB : Execution at leading edge
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Number of display columns

FUNCTION

(1) The CINSP instruction is used to display a space ("␣") at the cursor position and shift the characters in the range designated by Ⓢ beginning with the cursor position one column to the left on the display unit of the AD57(S1)/AD58 designated by ⓝ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12_H" at ⓝ.

(3) The number of display columns designated by Ⓢ can be set within the range of 1 to 16.
Characters can be displayed at the designated display columns using the CIN⬚ instructions.
When a character is displayed by use of the CIN⬚ instruction within the designated display columns, characters are shifted one column to the left.

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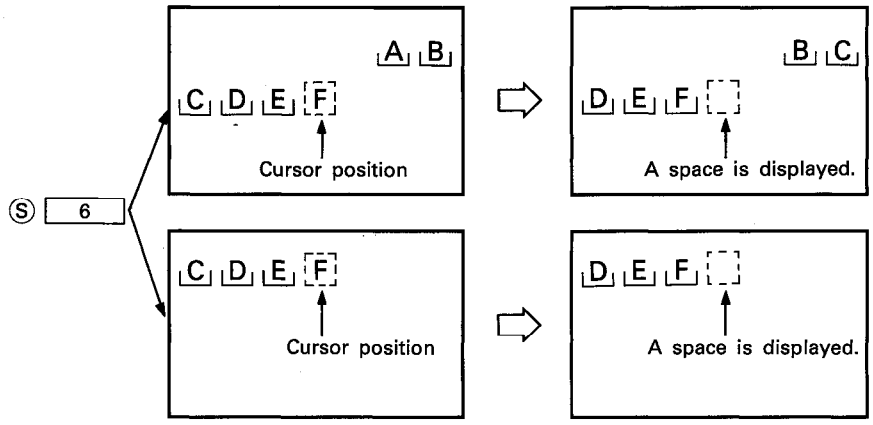
(4) If the range of display columns designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are shifted one column to the left.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are shifted.
Characters which exceed column 0 on line 0 are erased.

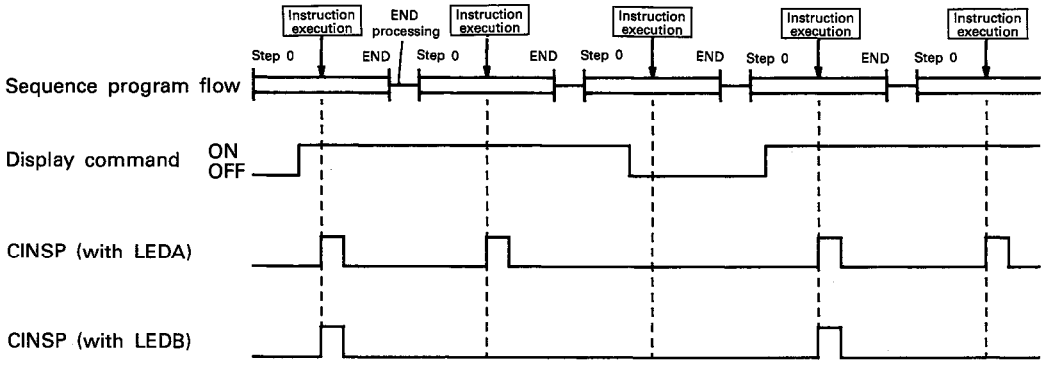


(5) After execution of the CINSP instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CINSP instruction is executed every scan while the display command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the display command signal when the LEDB instruction is used.



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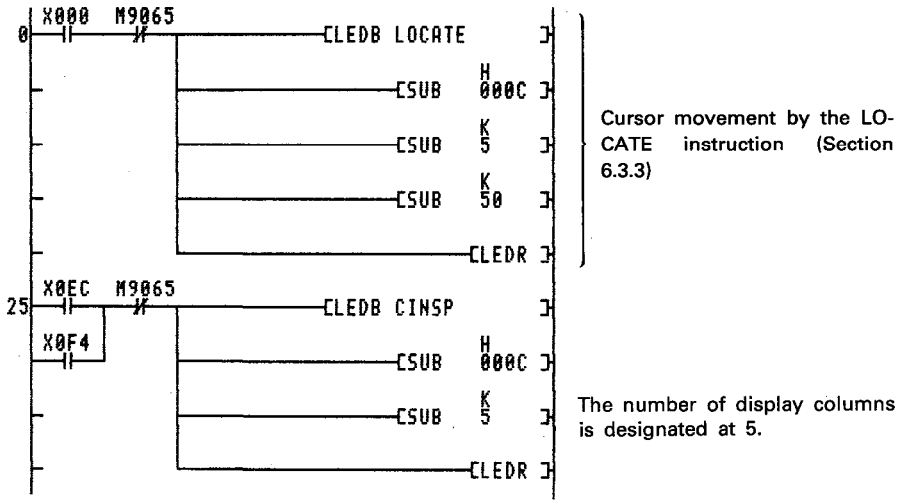
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

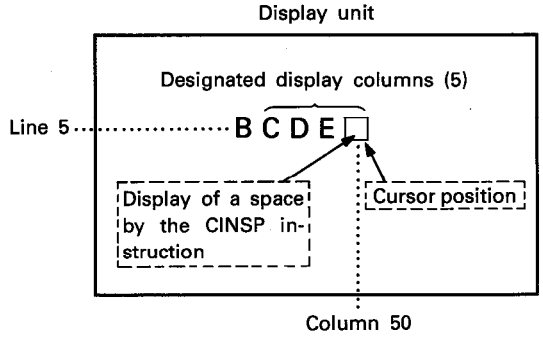
Description	Error Code	
	D9008	D9091
The number of display columns designated by Ⓢ is out of the range of 1 to 16.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to display a space at a designated position on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
A space ("␣") is displayed by turning on X0EC or X0F4.
The position of display is designated at columns 45 to 50 on line 5.



The CINSP instruction is used for data entry together with other instructions such as CINMP, CINHP, CINPT, CIN (alphanumerics), CINCLR and INPUT. (Refer to Section 7.3 for details.)
By execution of the CINSP instruction, a space is displayed at the cursor position, and the characters within the designated range are shifted one column to the left.



6.7 Designated Column Clear Instruction

The designated column clear instruction is used to clear characters at designated positions on the screen.

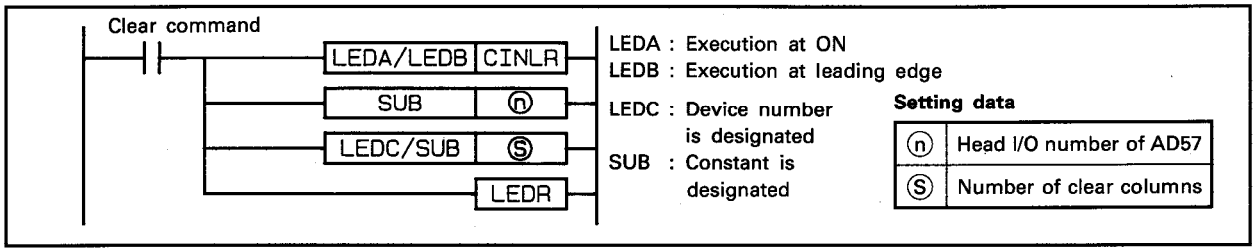
Execute designated column clear by use of the following instruction.

Category	Instruction Name	Description
Designated column clear	CINCLR	Clears characters at designated columns to the left of the cursor position.

6.7.1 Designated column clear·····CINCLR

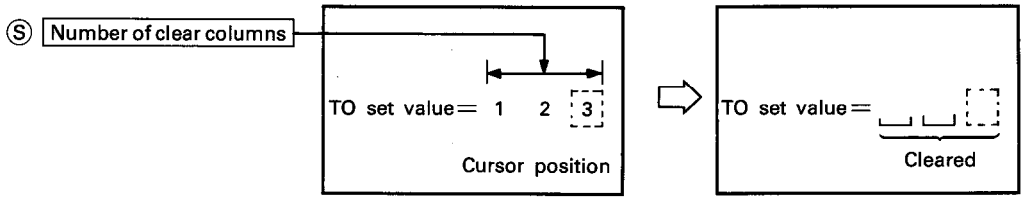
	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					20		○		○
Ⓢ								○	○	○	○	○					○	○									

*1: The number of steps varies with type of device used. See Section 5.2.



FUNCTION

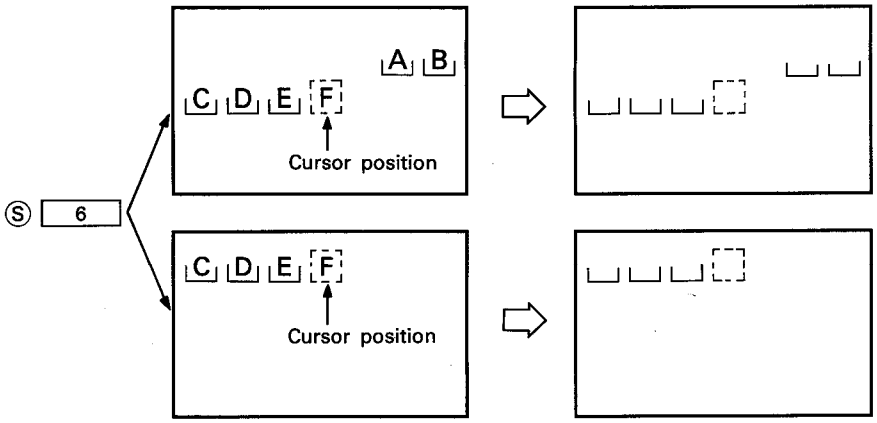
(1) The CINCLR instruction is used to clear characters of the number of columns designated by Ⓢ to the left of, and beginning with, the cursor position on a display unit connected to the AD57(S1)/AD58 designated by ⓝ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12H" at ⓝ.

(3) The number of clear columns designated by Ⓢ can be set within the range of 1 to 80.

(4) If the range of clear columns designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are cleared to the left.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are cleared.
Characters which exceed column 0 on line 0 are ignored.

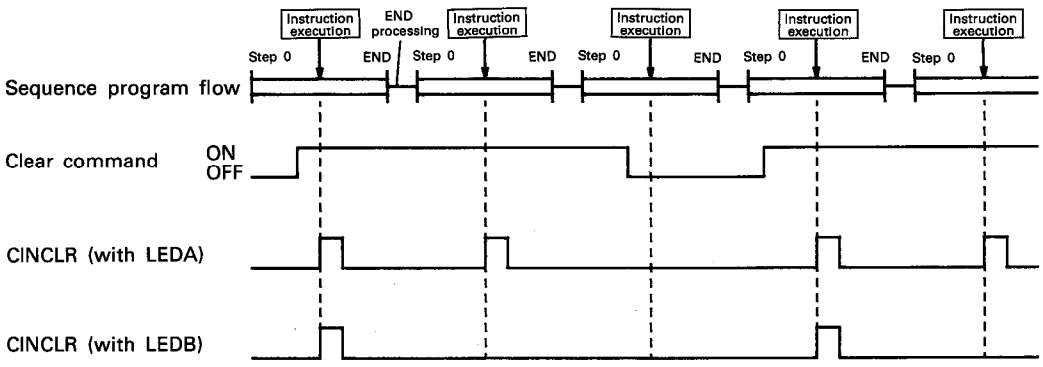


(5) After execution of the CINCLR instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The CINCLR instruction is executed every scan while the clear command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the clear command signal when the LEDB instruction is used.



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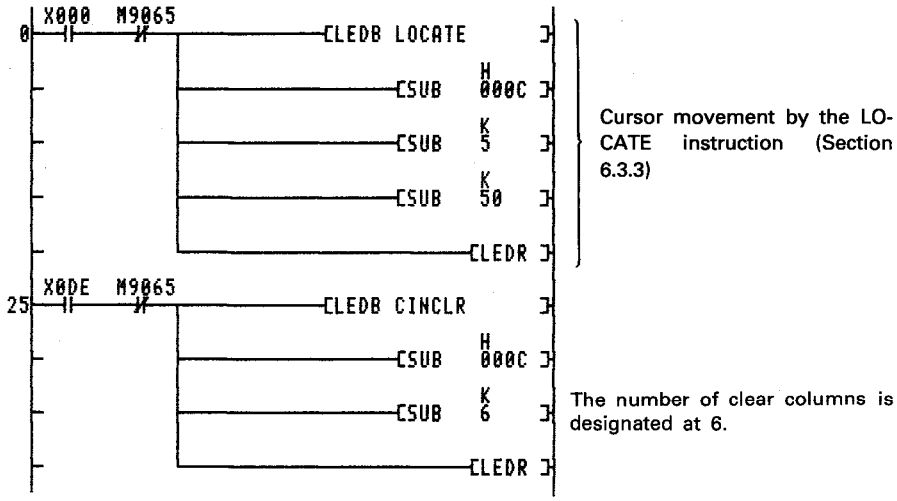
OPERATION ERROR

In the following case, an operation error occurs and an error flag (M9011) is set.

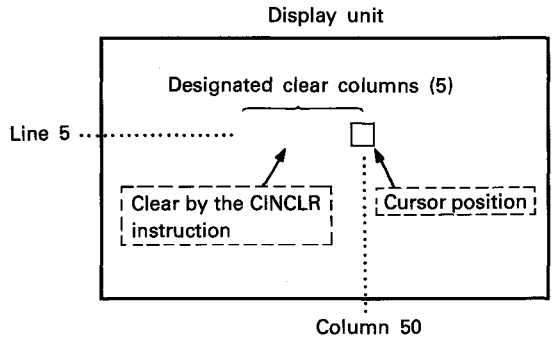
Description	Error Code	
	D9008	D9091
The number of clear columns designated by Ⓢ is out of the range of 1 to 80.	50	503

PROGRAM EXAMPLE

The following is an example of the program used to clear designated number of columns on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF.
Clear is executed by turning on X0DE.
The position of display is designated at columns 45 to 50 on line 5.



The CINCLR instruction is used for data entry together with other instructions such as CINMP, CINHP, CINPT, CIN (alphanumerics), CINSP and INPUT. (Refer to Section 7.3 for details.)
By execution of the CINCLR instruction, characters within the designated range to the left of the cursor position are cleared.



6.8 ASCII Code Conversion Instruction

The ASCII code conversion instruction is used to convert the ASCII characters being displayed on the screen to the ASCII codes and store them in designated devices.
By use of the ASCII code conversion instruction, the store processing of designated data in the PC CPU can be easily performed.

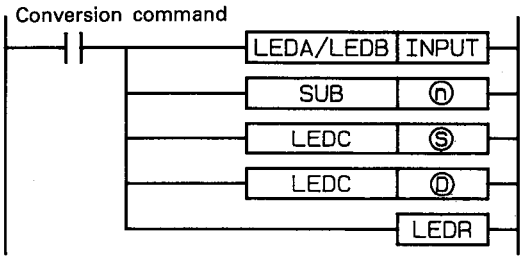
Execute the ASCII code conversion of displayed characters by use of the following instruction.

Category	Instruction Name	Description
ASCII code conversion of displayed characters	INPUT	Inputs the ASCII codes which correspond to the ASCII characters displayed on the screen.

6.8.1 ASCII code conversion of displayed characters·····INPUT

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
Ⓢ								○	○	○	○	○											23		○		○
Ⓓ								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.



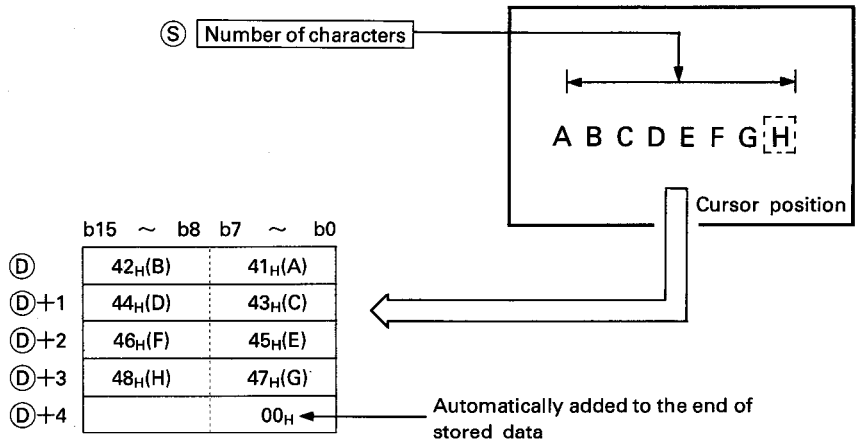
LEDA : Execution at ON
LEDB : Execution at leading edge

Setting data

ⓝ	Head I/O number of AD57
Ⓢ	Number of characters to be converted
Ⓓ	Head number of the devices which store converted ASCII codes

FUNCTION

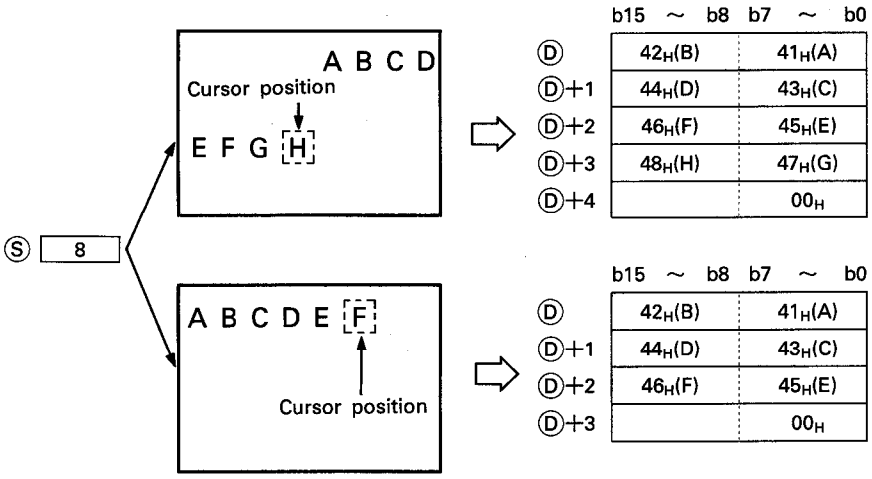
(1) The INPUT instruction is used to convert the ASCII characters which are being displayed on a display unit connected to the AD57(S1)/AD58 designated by ⓝ to corresponding ASCII codes and store them in the devices beginning with the device designated by Ⓓ.
The number of characters to be stored as the ASCII codes, beginning with the cursor position and moving to the left, is designated by Ⓢ.



(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X.Y120 to 13F, set "12H" at ⓝ.

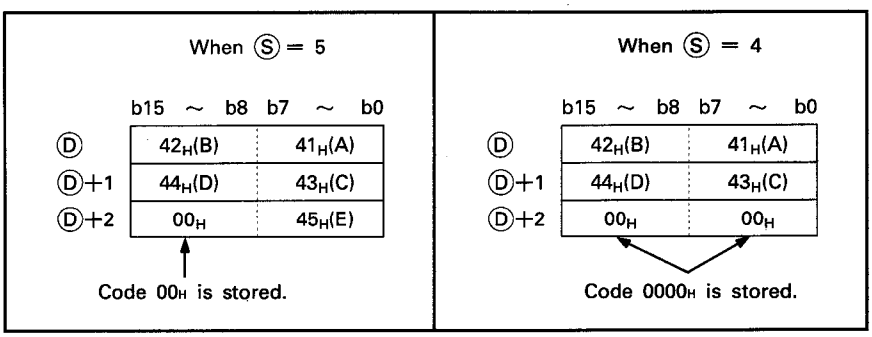
(3) The number of characters to be designated by Ⓢ can be set at any number of characters beginning with the cursor position up to column 0 on line 0.
However, if a value designated by Ⓢ exceeds the last device number of the devices designated by Ⓓ, an error will occur.

(4) If the range of characters designated by Ⓢ beginning with the cursor position exceeds column 0 on a line, the excess range laps around to the last column of the previous line. And, characters in the excess range are converted and stored.
If the designated range exceeds column 0 of line 0 on the screen, only the characters up to column 0 on line 0 are converted and stored.



(5) The ASCII codes to be stored in Ⓓ correspond to designated characters and are within the range of 00_H to FF_H.
If a designated character corresponds to code 100_H or above, it is automatically converted to code 20_H (space code) and stored.

(6) Code 00_H is automatically stored in the end of the ASCII codes stored in Ⓓ.
The method of storage of code 00_H when the number of designated characters is an even number differs from that when the number of designated characters is an odd number, as shown below.

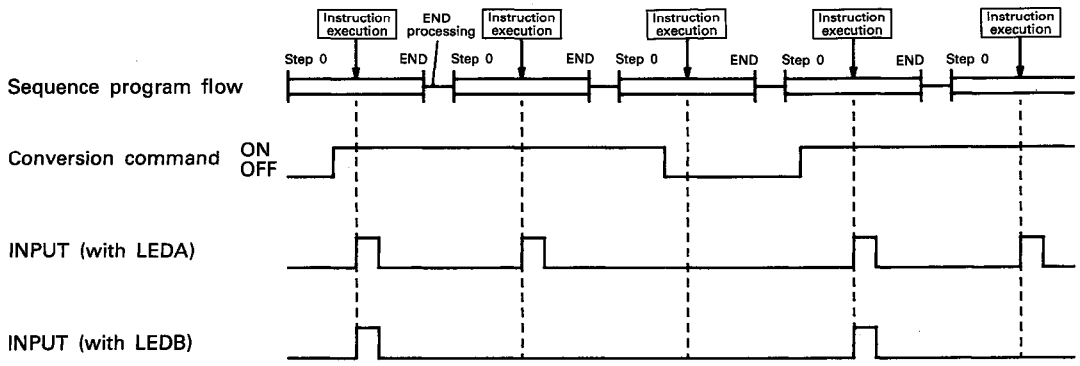


(7) After execution of the INPUT instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The INPUT instruction is executed every scan while the conversion command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the conversion command signal when the LEDB instruction is used.



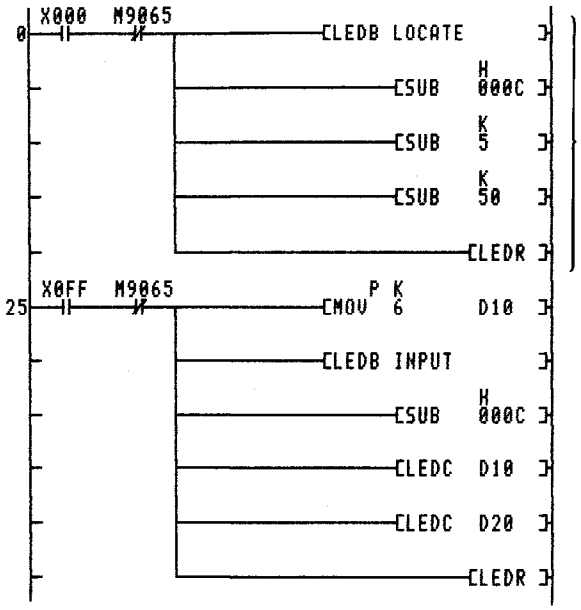
OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The number of characters designated by Ⓢ is 0 or a negative value. The number of characters to be converted exceeds the last device number of the devices designated by Ⓓ.	50	504

PROGRAM EXAMPLE

The following is an example of the program used to store the ASCII character codes of the characters displayed on a display unit connected to the AD57 loaded at X/Y0C0 to 0FF in designated devices.
Character codes which correspond to the characters displayed at columns 45 to 50 on line 5 are stored in devices D20 to D25.

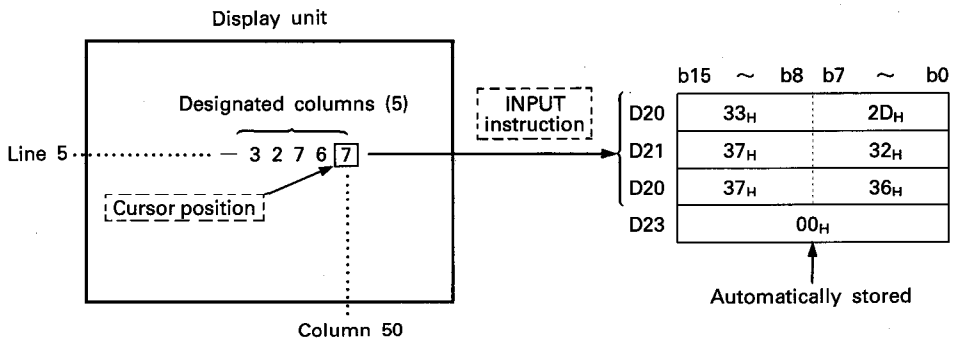


Cursor movement by the LOCATE instruction (Section 6.3.3)

The number of characters is designated.

The codes of the characters are stored in devices D20 and after.

The INPUT instruction is used for data entry together with other instructions such as CINMP, CINHP, CINPT, CIN (alphanumerics), CINSP and CINCLR. (Refer to Section 7.3 for details.)
By execution of the INPUT instruction, character codes which correspond to the characters within the designated range to the left of the cursor position are stored.



MEMO

6.9 VRAM Data Read and Write Instructions

The VRAM data read and write instructions are used to read the display data stored in the VRAM areas or to write the display data stored in the VRAM areas.
By use of the VRAM data read and write instructions, display data can be moved in the VRAM areas, and display screen data can be stored.

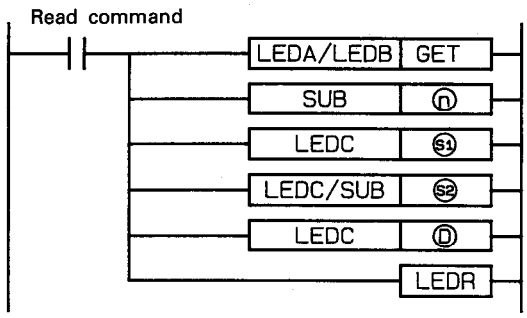
Execute VRAM data read and write by use of the following instructions.

Category	Instruction Name	Description
VRAM data read	GET	Reads designated number of display data from designated addresses of the VRAM areas and stores it in devices.
VRAM data write	PUT	Writes display data stored in devices to designated addresses of the VRAM areas.

6.9.1 VRAM data read·····GET

	Usable devices																			Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device								Constant		Pointer		Level					
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○															
(S2)								○	○	○	○	○					○	○					26		○		○
Ⓓ								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

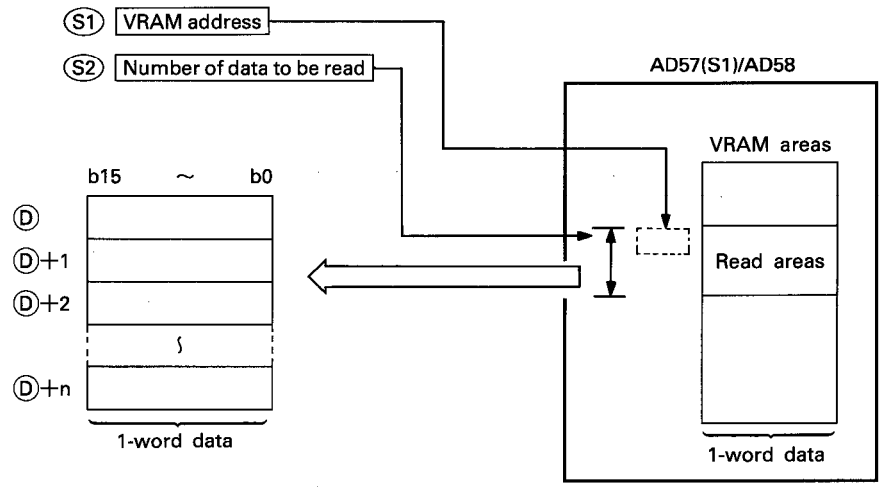
LEDC : Device number is designated
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas where display data to be read is stored
(S2)	Number of data to be read
Ⓓ	Head number of the devices which store read data

FUNCTION

(1) The GET instruction is used to read the number of data designated by (S2) beginning with the address designated by (S1) of the VRAM areas of the AD57(S1)/AD58 designated by ⓝ and to store it in the devices designated by Ⓓ.



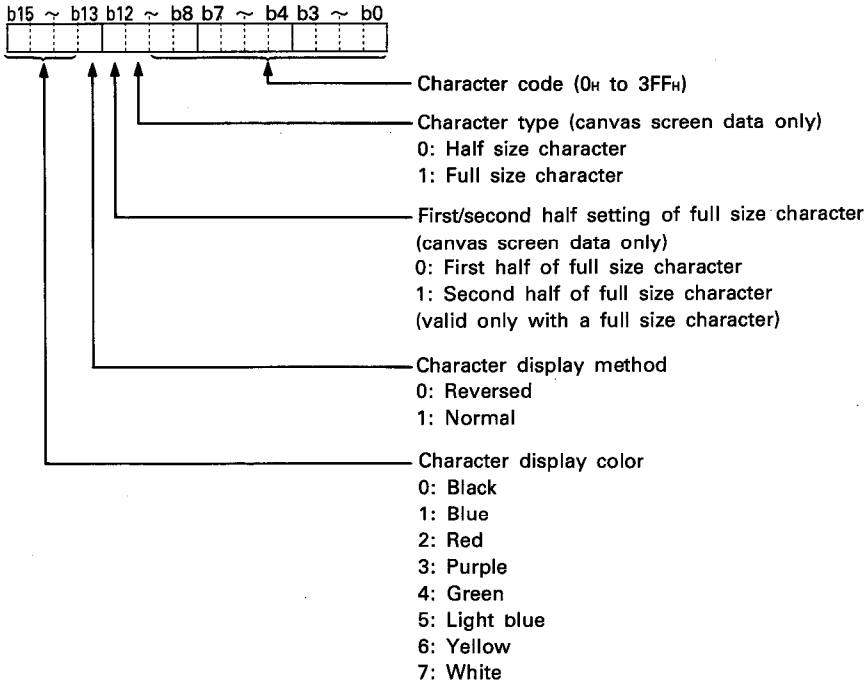
(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12H" at ⓝ.

(3) The VRAM address to be designated by (S1) can be set within the range of −1 to 7679. Setting of "−1" corresponds to the cursor position of the areas being displayed.
(See Section 1.1.1 for detail of the VRAM areas.)

(4) The number of read data to be designated by (S2) can be set at any number within the range of the VRAM address designated by (S1) up to address 7679.
However, a value which exceeds the last device number of the devices designated by Ⓓ cannot be set.

(5) If the range of the number of data designated by (S2) beginning with the address designated by (S1) exceeds address 7679, an error occurs and read processing is not executed.

(6) The figure below describes the data stored in the VRAM areas.

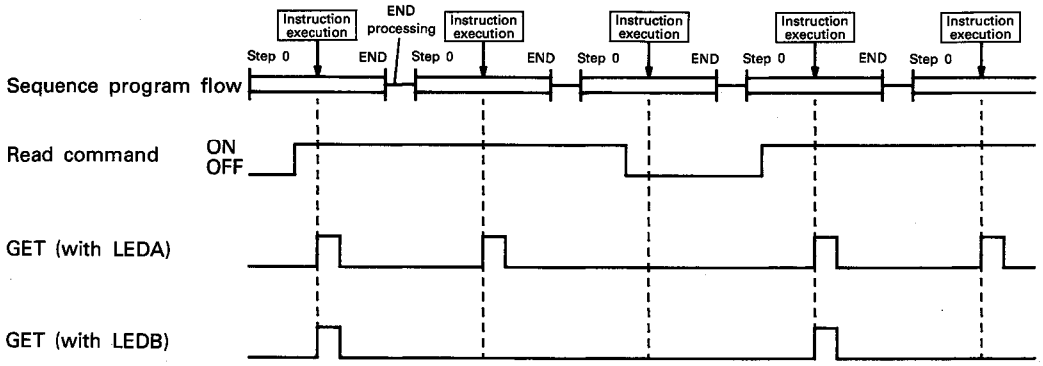


(7) After execution of the GET instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The GET instruction is executed every scan while the read command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the read command signal when the LEDB instruction is used.



OPERATION ERROR

In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S1) is out of the range of −1 to 7679.	50	504
The number of characters designated by (S2) is 0 or a negative value.		
The range of the number of data designated by (S2) beginning with the VRAM area address designated by (S1) exceeds address 7679.		
The range of the number of data designated by (S2) beginning with the device number designated by (D) exceeds the last device number of corresponding device.		

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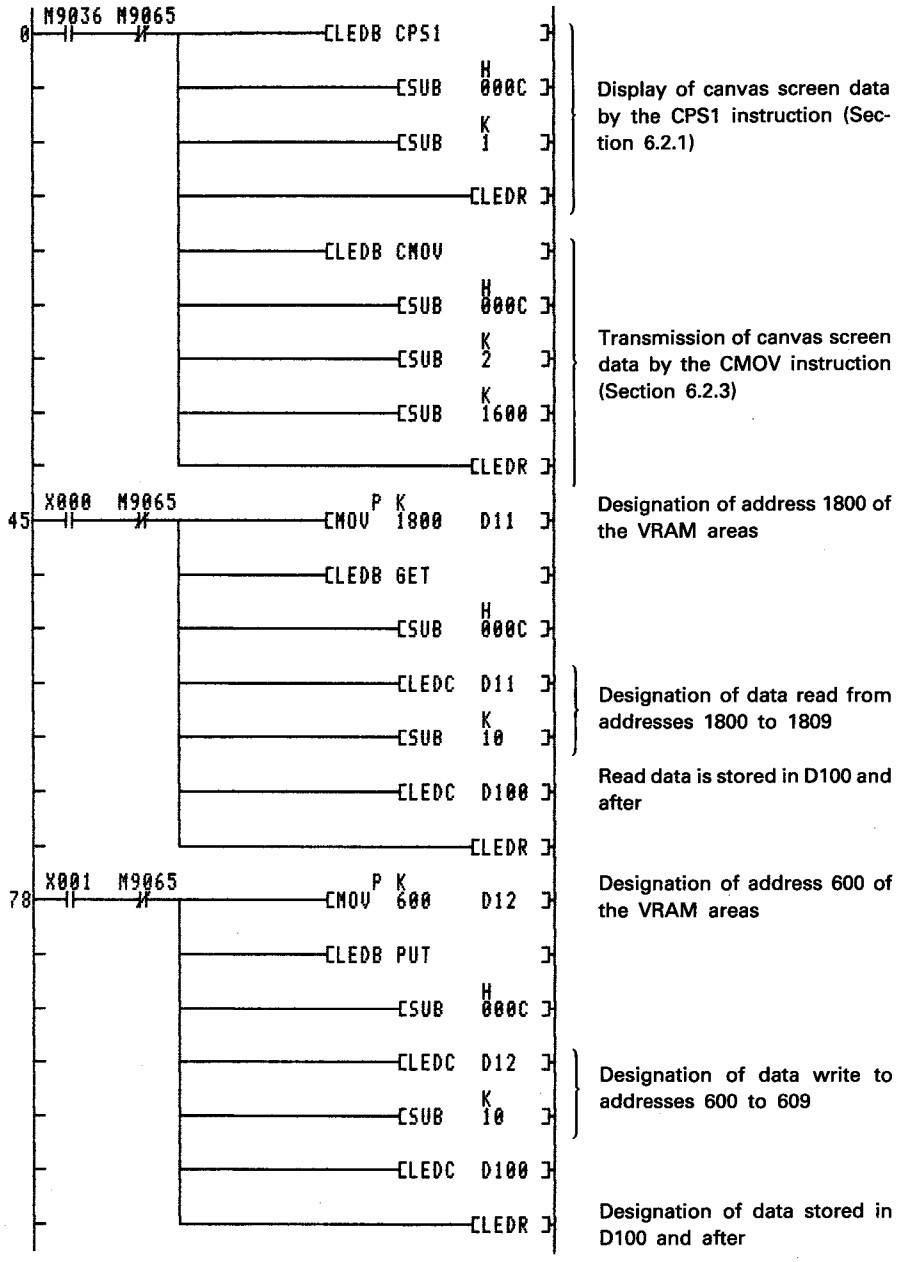
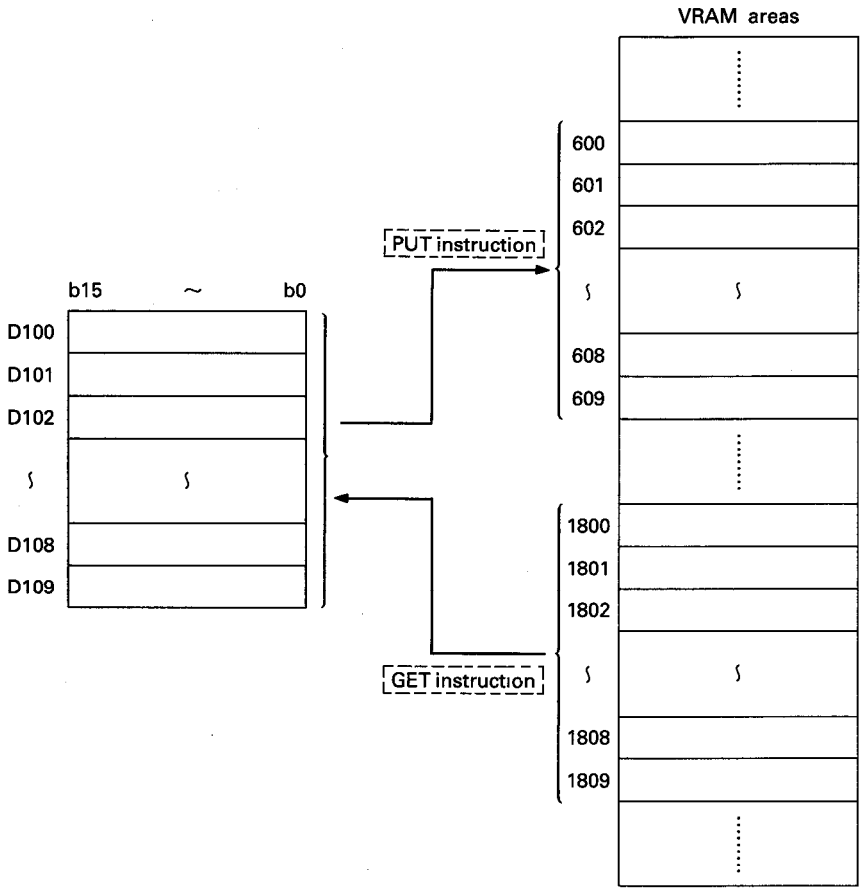
PROGRAM EXAMPLE

The following is an example of the program used to read display data from the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF and to store it in other VRAM areas.
Display data is read from addresses 1800 to 1809 of the VRAM areas and written to addresses 600 to 609.
The read data is written to devices D100 to D109.



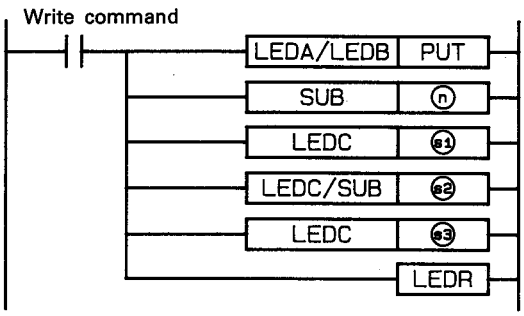

VRAM areas
600
601
602
PUT instruction
608
609
b15 ~ b0
D100
D101
D102
D108
D109
1800
1801
1802
GET instruction
1808
1809

MEMO

6.9.2 VRAM data write·····PUT

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○									
(S1)								○	○	○	○	○															
(S2)								○	○	○	○	○					○	○					26		○		○
(S3)								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

LEDC : Device number is designated

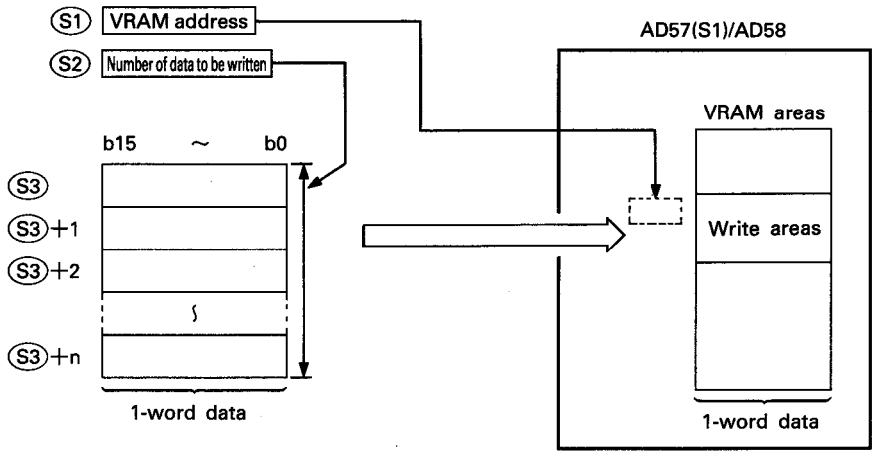
SUB : Constant is designated

Setting data

ⓝ	Head I/O number of AD57
(S1)	Head address of the VRAM areas to where display data is to be written
(S2)	Number of data to be written
(S3)	Head number of the devices which store data to be written

FUNCTION

(1) The PUT instruction is used to write the number of data designated by (S2) beginning with the device number designated by (S3) to the addresses beginning with that designated by (S1) of the VRAM areas of the AD57(S1)/AD58 designated by ⓝ.



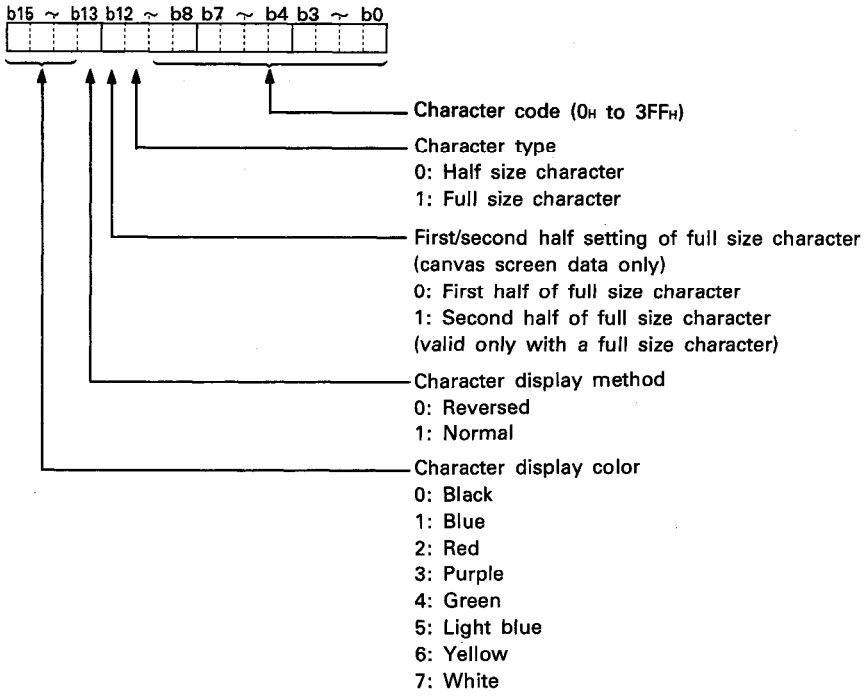
(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12H" at ⓝ.

(3) The VRAM address to be designated by Ⓢ1 can be set within the range of −1 to 7679. Setting of "−1" corresponds to the cursor position of the areas being displayed.
(See Section 1.1.1 for detail of the VRAM areas.)

(4) The number of write data to be designated by Ⓢ2 can be set at any number within the range of the VRAM address designated by Ⓢ1 up to address 7679.
However, a value which exceeds the last device number of the devices designated by Ⓢ3 cannot be set.

(5) If the range of the number of write data designated by Ⓢ2 beginning with the address designated by Ⓢ1 exceeds address 7679, an error occurs and write processing is not executed.

(6) The figure below describes the data to be stored at the devices designated by Ⓢ3 in the VRAM areas.

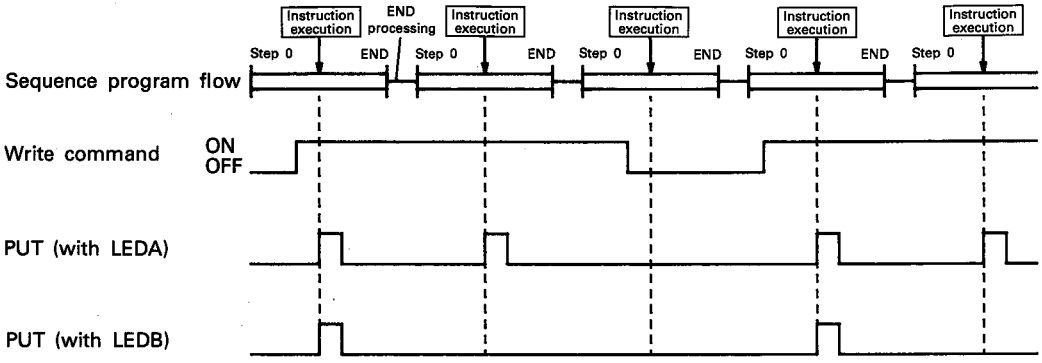


(7) After execution of the PUT instruction, conditions of the display become as follows.

Item	Condition
Display mode	(no change)
Cursor line position	
Cursor column position	
Head VRAM address displayed	
Normal/reverse designation	
Color designation	
Cursor display	

EXECUTION CONDITION

The PUT instruction is executed every scan while the write command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the write command signal when the LEDB instruction is used.



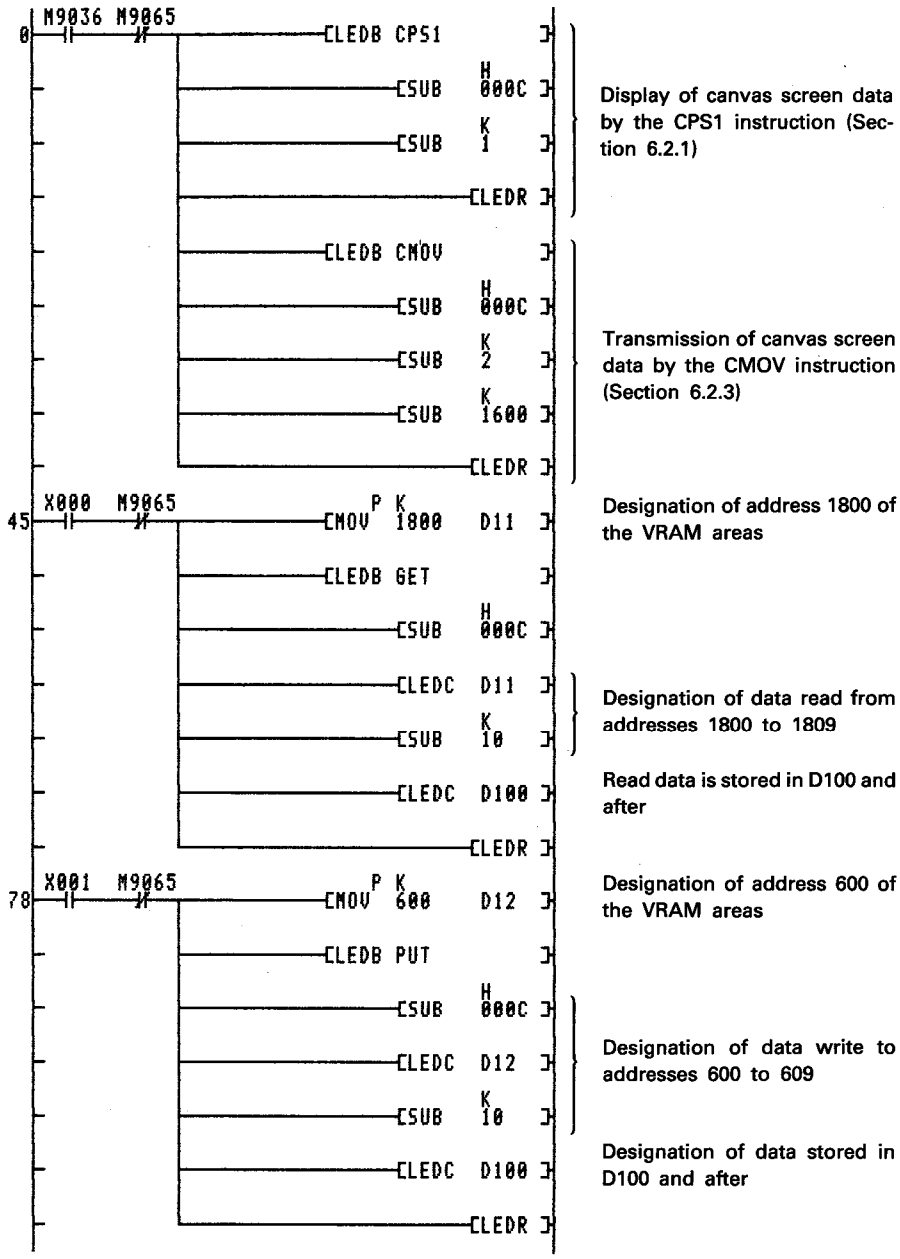
OPERATION ERROR

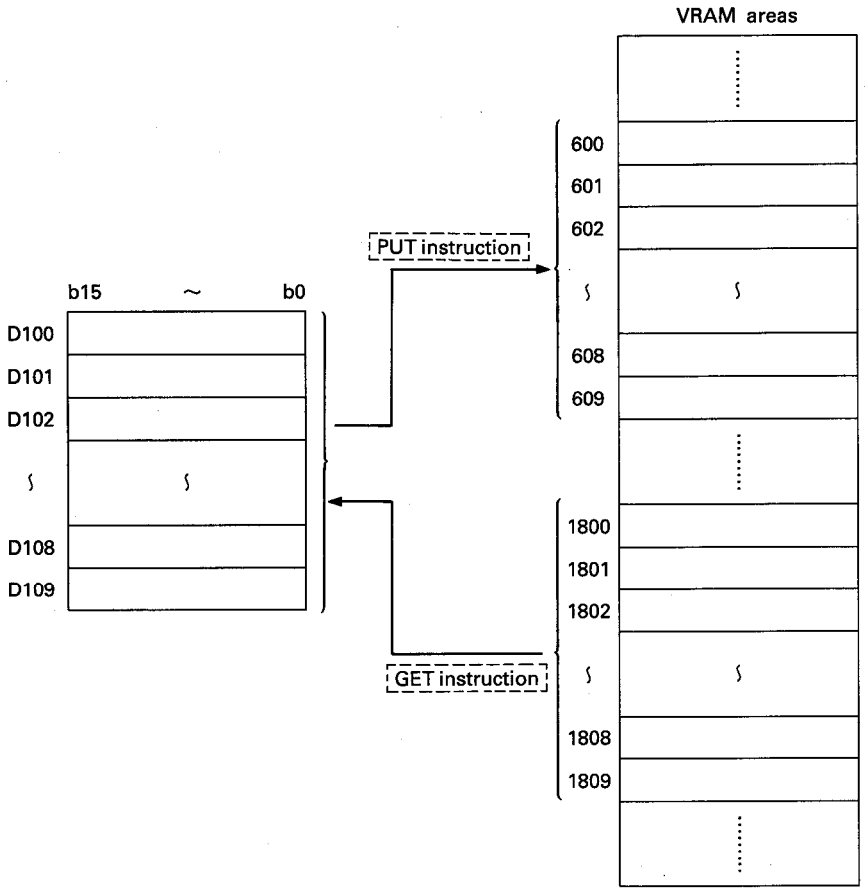
In the following cases, an operation error occurs and an error flag (M9011) is set.

Description	Error Code	
	D9008	D9091
The VRAM area address designated by (S1) is out of the range of −1 to 7679.	50	504
The number of characters designated by (S2) is 0 or a negative value.		
The range of the number of data designated by (S2) beginning with the VRAM area address designated by (S1) exceeds address 7679.		
The range of the number of data designated by (S2) beginning with the device number designated by (S3) exceeds the last device number of corresponding device.		

PROGRAM EXAMPLE

The following is an example of the program used to read display data from the VRAM areas of the AD57 loaded at X/Y0C0 to 0FF and to write it to other VRAM areas.
Display data is read from addresses 1800 to 1809 of the VRAM areas and written to addresses 600 to 609.
The read data is written to devices D100 to D109.




VRAM areas
b15 ~ b0
D100
D101
D102
D108
D109
600
601
602
608
609
1800
1801
1802
1808
1809
PUT instruction
GET instruction

6.10 Display State Read Instruction

The display state read instruction is used to read the state of display settings mentioned below.

- Display mode
- Cursor position
- Head VRAM address displayed
- Normal/reverse display
- Color designation
- Cursor display

By use of the display state read instruction, current state of display settings can be checked.

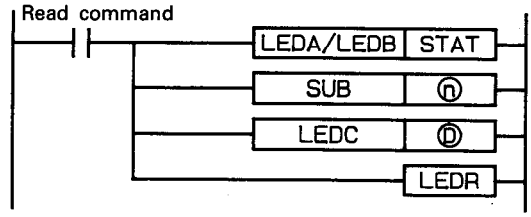
Execute display state read by use of the following instruction.

Category	Instruction Name	Description
Display state read	STAT	Reads the state of display settings.

6.10.1 Display state read·····STAT

	Usable devices																				Digit specification	Number of steps	Subset	Index	Carry flag	Error flag
	Bit device							Word (16-bit) device									Constant		Pointer		Level						
	X	Y	M	L	S	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9011
ⓝ																	○	○					20		○		○
Ⓓ								○	○	○	○	○															

*1: The number of steps varies with type of device used. See Section 5.2.



LEDA : Execution at ON
LEDB : Execution at leading edge

Setting data

ⓝ	Head I/O number of AD57
Ⓓ	Head number of the devices which store read data

FUNCTION

(1) The STAT instruction is used to read the state of display settings of a display unit connected to the AD57(S1)/AD58 designated by ⓝ and to store the data in the devices designated by Ⓓ.

	b15 ~ b0
Ⓓ	Display mode
Ⓓ+1	Cursor line position
Ⓓ+2	Cursor column position
	⟆
Ⓓ+3	Head VRAM address displayed
Ⓓ+4	Normal/reverse designation
Ⓓ+5	Color designation
Ⓓ+6	Cursor display

1-word data

(2) The head I/O number of the AD57(S1)/AD58 designated by ⓝ should be upper 2 digits of 3 hexadecimal digits.
Example) If the AD57(S1)/AD58 is assigned to X/Y120 to 13F, set "12H" at ⓝ.

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(3) Data to be stored in devices Ⓓ to Ⓓ+6 are as follows.

1) Display mode (stored in Ⓓ)
Current display mode setting is stored.
- Color CRT standard mode (for AD57) ····· 0000_H
- Monochrome CRT standard mode (for AD57) ····· 0003_H
- Color/monochrome CRT enlarged mode ····· 0101_H
- LCD mode ····· 0202_H
- Color CRT standard mode (for AD57-S1) ····· 0005_H

2) Cursor line position (stored in Ⓓ+1)
The line position where the cursor is set is stored.
- Line 0 to 19

3) Cursor column position (stored in Ⓓ+2)
The column position where the cursor is set is stored.
- Column 0 to 79

4) Head VRAM address displayed (stored in Ⓓ+3)
The head VRAM address of the range being displayed is stored.
- Address 0 to 7679

5) Normal/reverse designation (stored in Ⓓ+4)
Current setting of the normal/reverse display mode is stored.
- Normal display setting ····· 0
- Reverse display setting ····· 1

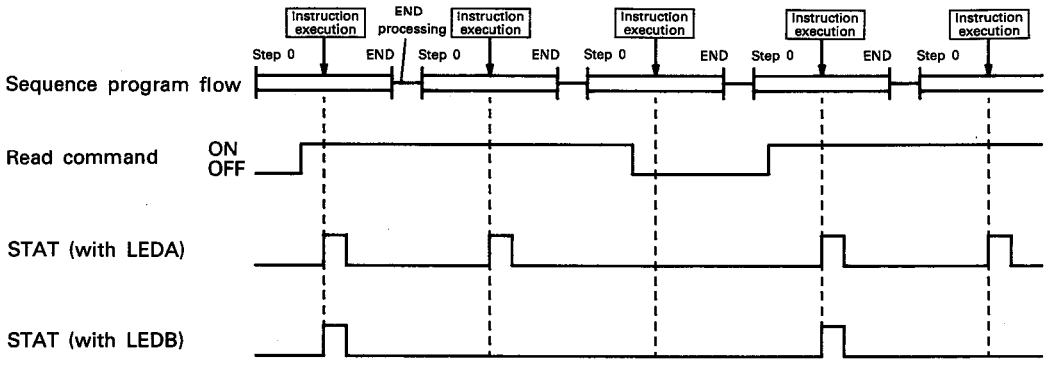
6) Color designation (stored in Ⓓ+5)
Current setting of character color designation is stored.

Set Color	Data Stored	Set Color	Data Stored
Black	0	Green	4
Blue	1	Light blue	5
Red	2	Yellow	6
Purple	3	White	7

7) Cursor display (stored in Ⓓ+6)
Current setting of cursor display is stored.
- Cursor is not displayed ····· 0
- 1-character cursor is displayed ····· 1
- 2-character cursor is displayed ····· 2

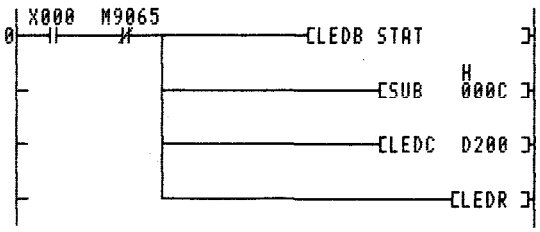
EXECUTION CONDITION

The STAT instruction is executed every scan while the read command is ON when the LEDA instruction is used. It is executed only once at the leading edge of the read command signal when the LEDB instruction is used.



PROGRAM EXAMPLE

The following is an example of the program used to read current state of display settings of a display unit connected to the AD57 loaded at X/Y0C0 to 0FF and to store it in devices D200 to D206.



State of display settings are stored in D200 to D206

The STAT instruction stores the state of display settings in seven devices beginning with designated device number.

	b15 ~ b0
D200	Display mode
D201	Cursor line position
D202	Cursor column position
D203	Head VRAM address displayed
D204	Normal/reverse designation
D205	Color designation
D206	Cursor display

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7. APPLICATION PROGRAM EXAMPLES

This chapter gives application programs using the instructions which control the AD57(S1)/AD58.

7.1 Initial Processing Program

This section gives an example program used to set the display mode and to clear the screen display/VRAM area.
To display characters to the display unit with the AD57(S1)/AD58, it is necessary to set the display mode to the AD57(S1)/AD58 meeting the display unit to be used. If the display mode does not match the display unit, characters cannot be displayed correctly.
Just after the PC CPU is started up, abnormal data might be stored in the AD57(S1)/AD58 VRAM area causing incorrect display on the display unit.
Therefore, it is recommended to set the display mode and clear the VRAM area after turning on the power supply to the PC CPU.

Programming Conditions

(1) AD57 is used.

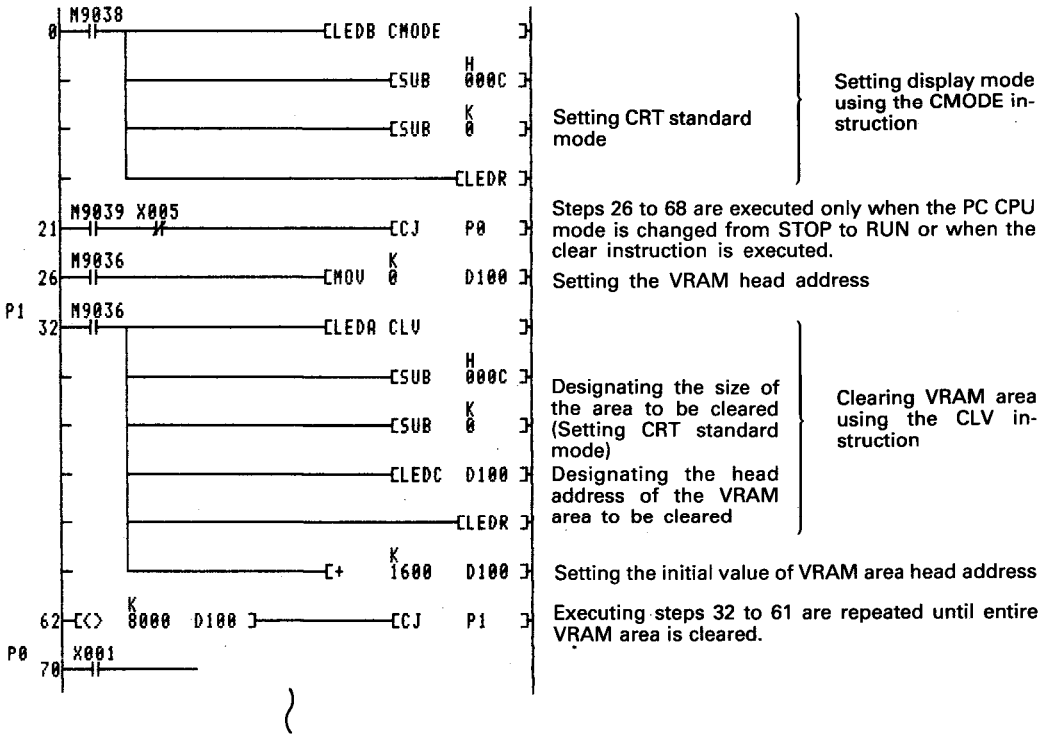
(2) AD57 is loaded to use addresses X/Y0C0 to X/Y0FF.

(3) The CRT standard mode (0) is set as the display mode.

(4) Display mode is set only once when the PC CPU starts running.

(5) VRAM area is cleared when the PC CPU starts running or when X005 is turned ON; the area cleared is from address 0 to address 7679.

Program Example



Explanation

(1) Display mode is automatically set when the PC CPU starts running if unit name has been entered at the time AnACPU/ AnUCPU parameters are set. In this case, therefore, it is not necessary to set the display mode in a sequence program using the CMODE instruction.
If the unit name has not been entered using a peripheral device, the AD57 CRT standard mode is automatically set. This means that setting of the display mode is not required when the AD57 is used in the CRT standard mode.

(2) VRAM area of addresses 0 to 7679 is cleared in five area clear operations in 1600 address units.
When clearing the VRAM area, an error does not occur if address to be cleared exceed address 7679. Therefore, the VRAM area clear is attempted in the range of address 0 to address 7999 to simplify the program.

(3) Use the CLS instruction to clear only the display screen.
The display screen is also cleared using the CLV instruction, by clearing the corresponding VRAM area with the CLV instruction.

7.2 Displaying Canvas Screen

This section gives an example of the program used to display the canvas screen on the display unit.

Programming Conditions

(1) AD57 is used.

(2) AD57 is loaded to use addresses X/Y0C0 to X/Y0FF.

(3) The CRT standard mode (0) is set as the display mode.

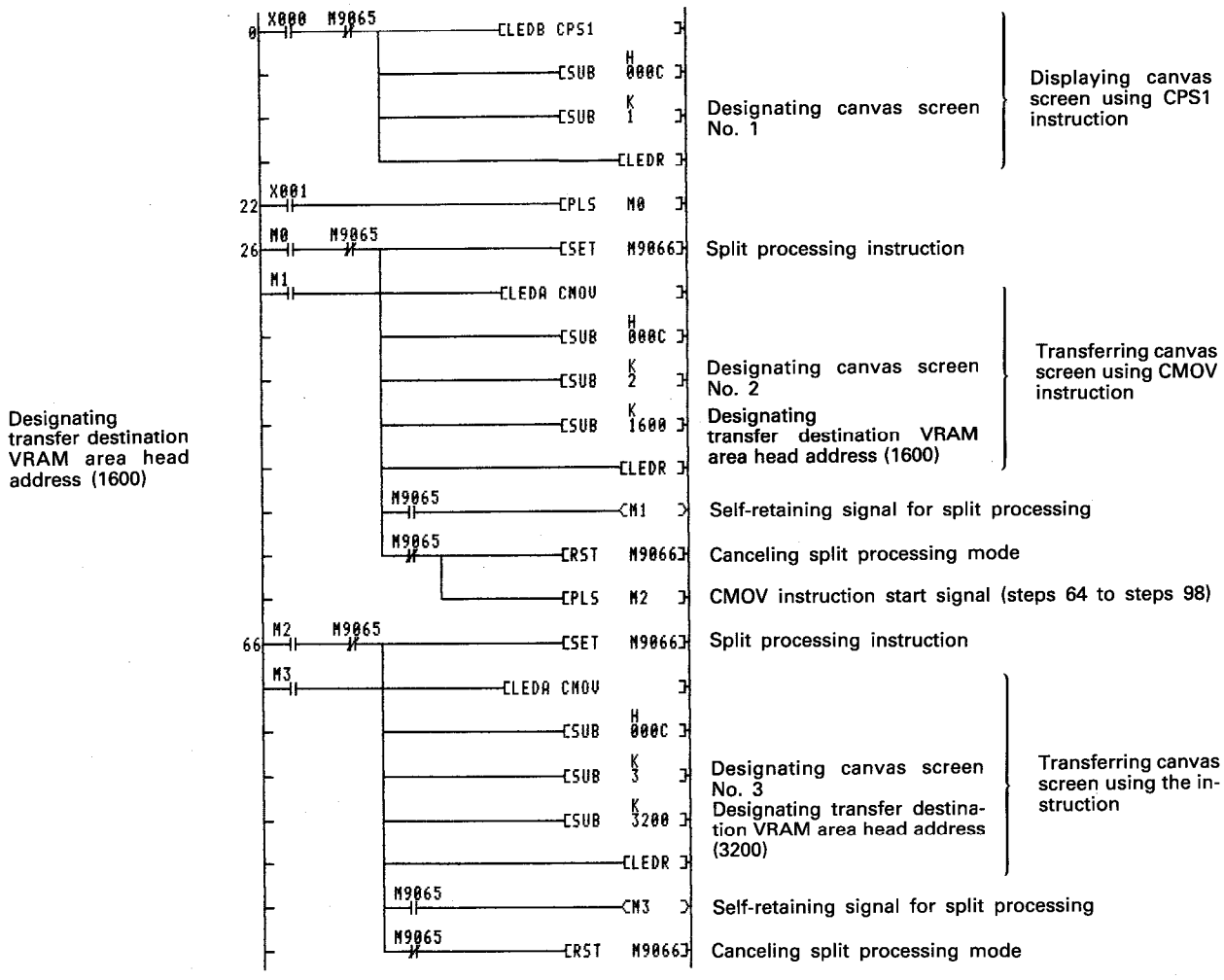
(4) Canvas screen No. 1 displayed on the display unit in batch by turning ON X000.

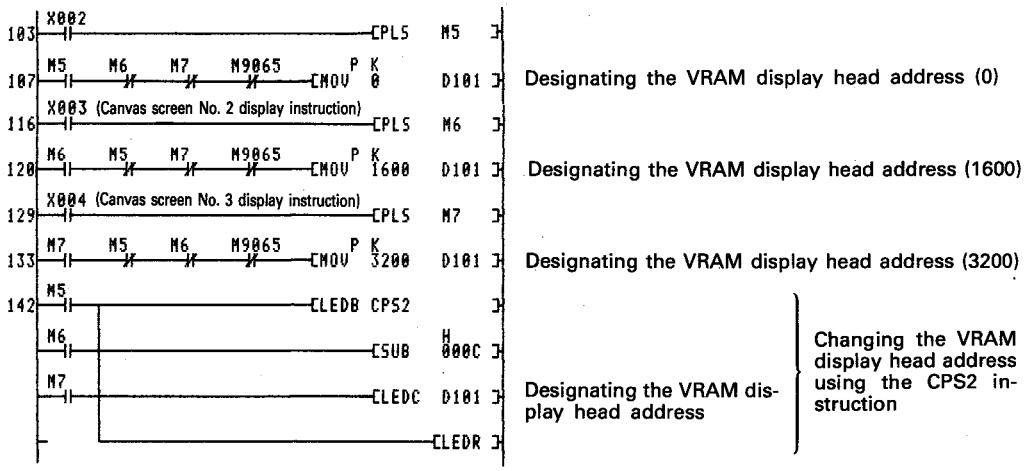
(5) Canvas screen No. 2 and No. 3 are transferred to the VRAM area by turning ON X001 in split processing.

(6) Canvas screen to be displayed is changed according to the input number (X002, X003, X004) that is turned ON.

X002 ON ····· Canvas No. 1 screen is displayed.
X003 ON ····· Canvas No. 2 screen is displayed.
X004 ON ····· Canvas No. 3 screen is displayed.

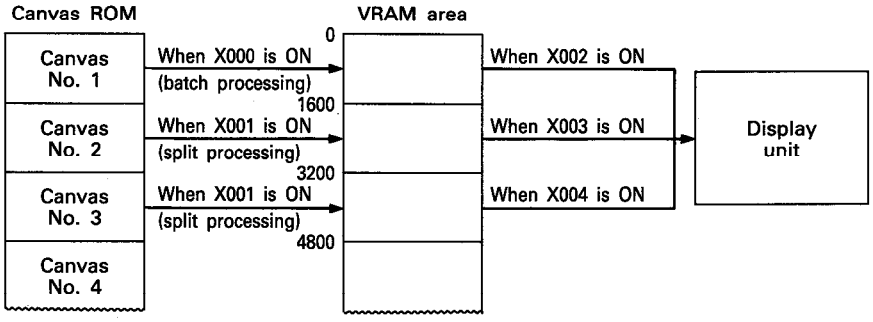
Example Program





Explanation

(1) Flow of processing of the example program is shown below.



1) Canvas screen No. 1 in the canvas ROM is transferred to address 0 to address 1599 of the VRAM area when the CPS1 instruction is executed.

2) Canvas screen No. 2 in the canvas ROM is transferred to address 1600 to address 3199 of the VRAM area when the CMOV instruction is executed.

3) Canvas screen No. 3 in the canvas ROM is transferred to address 3200 to address 4700 of the VRAM area when the CMOV instruction is executed.

4) Canvas screen No. 1 stored at address 0 to address 1599 of the VRAM area is displayed using the CPS2 instruction.

5) Canvas screen No. 2 stored at address 1600 to address 3199 of the VRAM area is displayed using the CPS2 instruction.

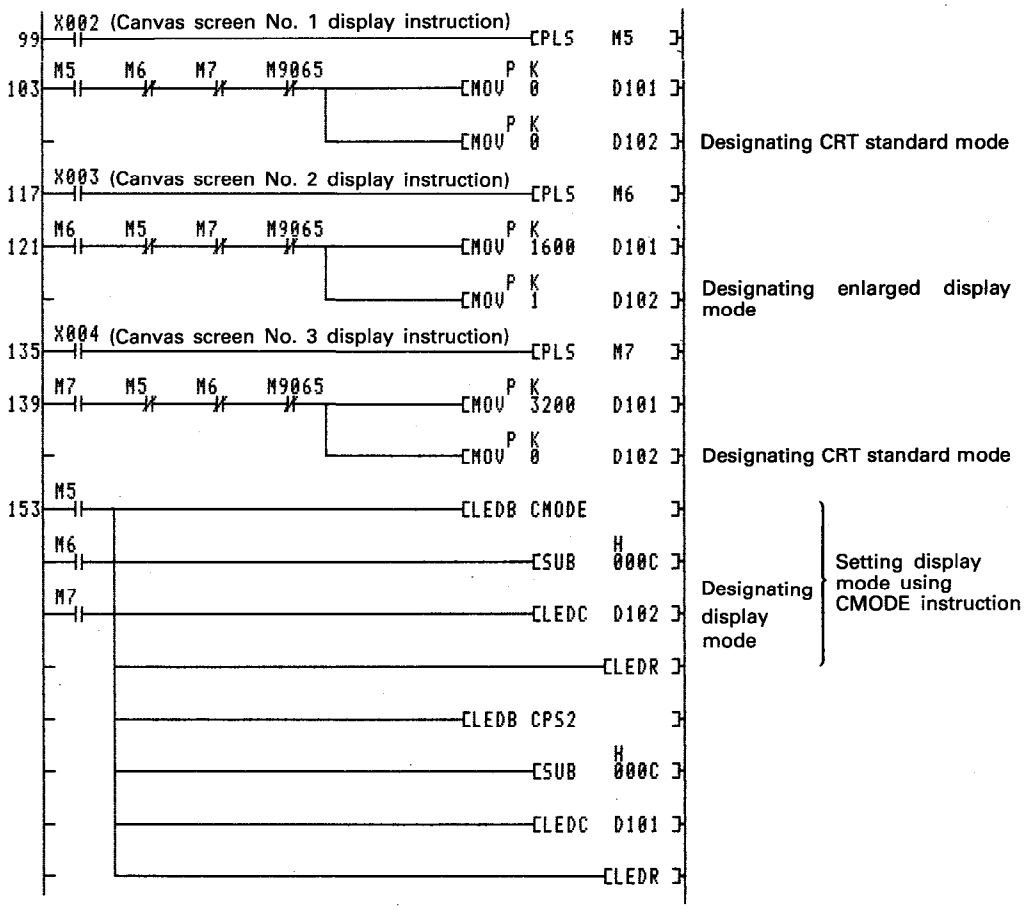
6) Canvas screen No. 3 stored at address 3200 to address 4799 of the VRAM area is displayed using the CPS2 instruction.

(2) Take an interlock with M9065 so that other instructions will not be executed while split transferring of canvas screen No. 2 and No. 3.
It is also necessary to take an interlock so that canvas screen No. 2 and No. 3 will not be transferred at the same time.

(3) To change the screen display modes (CRT standard mode, enlarged display mode) while the AD57 is used, change the display mode by using the display mode setting instruction (CMODE instruction).
If the display mode preset for the canvas screen data and the mode set by a display mode setting instruction differ from each other, correct display cannot be obtained.

Example: Display mode for each canvas screen

Canvas screen No. 1 ····· CRT standard mode (0)
Canvas screen No. 2 ····· Enlarged display mode (1)
Canvas screen No. 3 ····· CRT standard mode (0)



7.3 Setting Data Using Keys

This section gives an example of the program used to input numerical data with the keys on the operation panel connected to the AD57 and to store the data into the PC CPU data register (D).

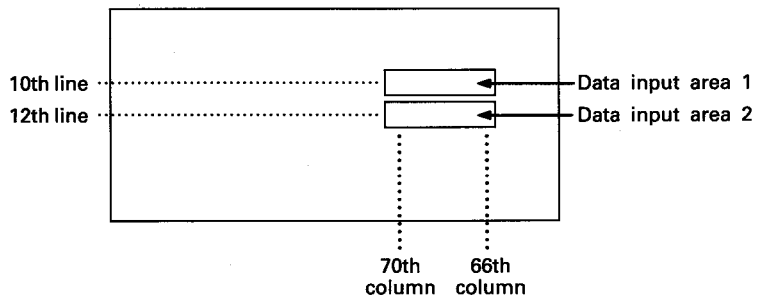
Programming Conditions

(1) AD57 is used.

(2) AD57 is loaded to use addresses X/Y0C0 to X/Y0FF.

(3) The CRT standard mode (0) is set as the display mode.

(4) Data input column positions on the screen are as indicated below.



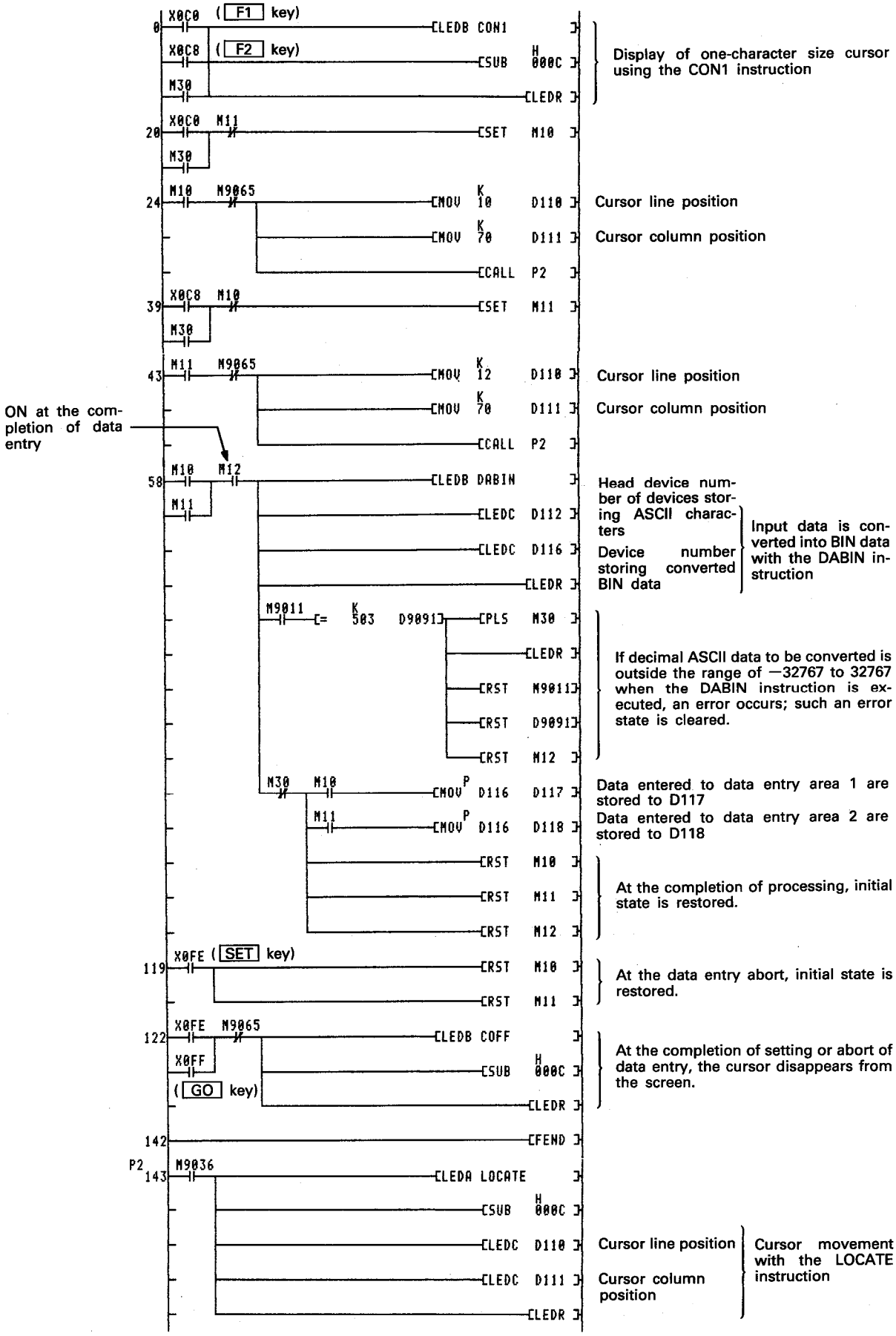
(5) The first place (66th column) of each data input area is used for the entry of a sign.

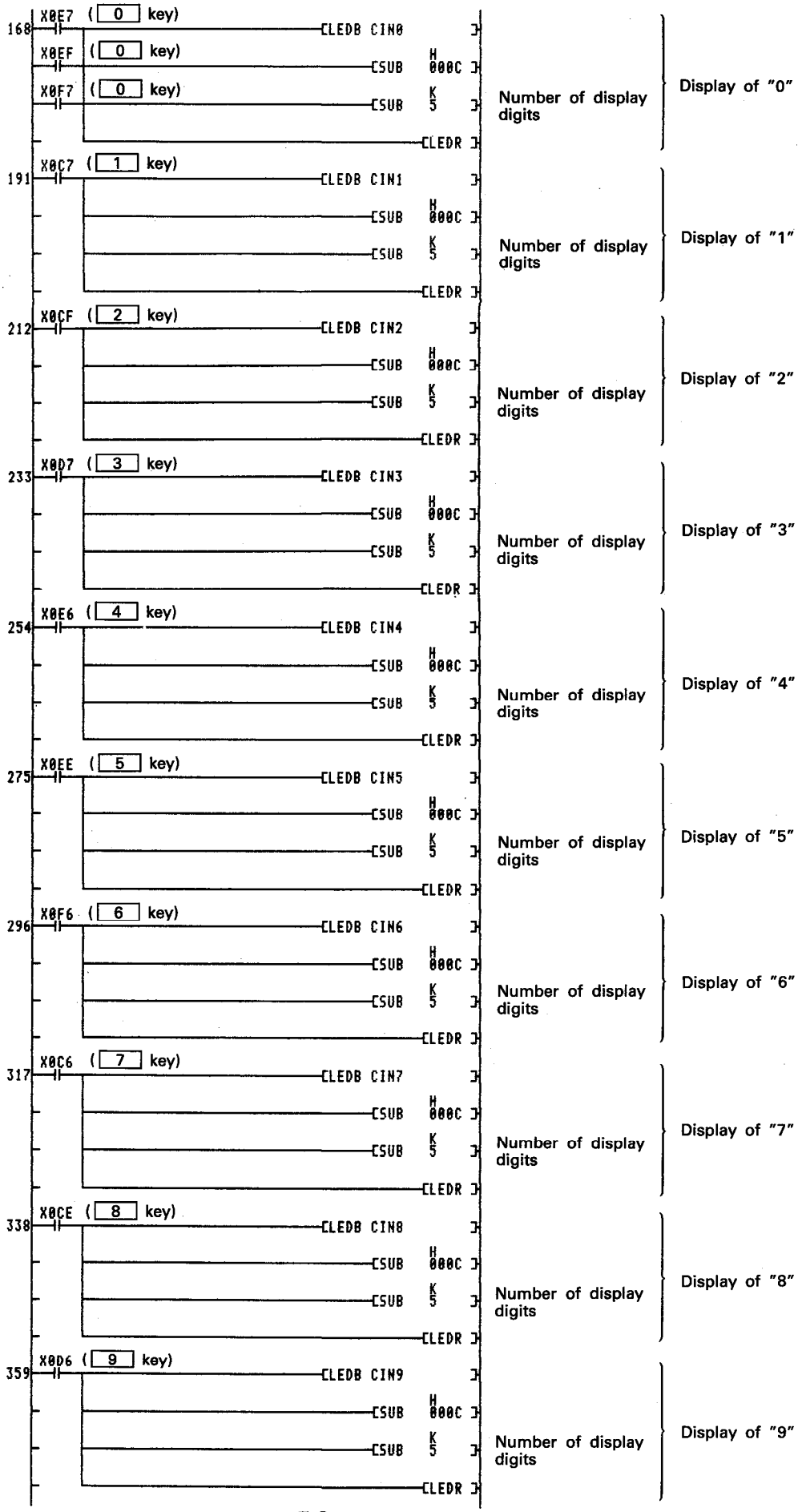
(6) The input data is a decimal consisting of up to 5 digits.

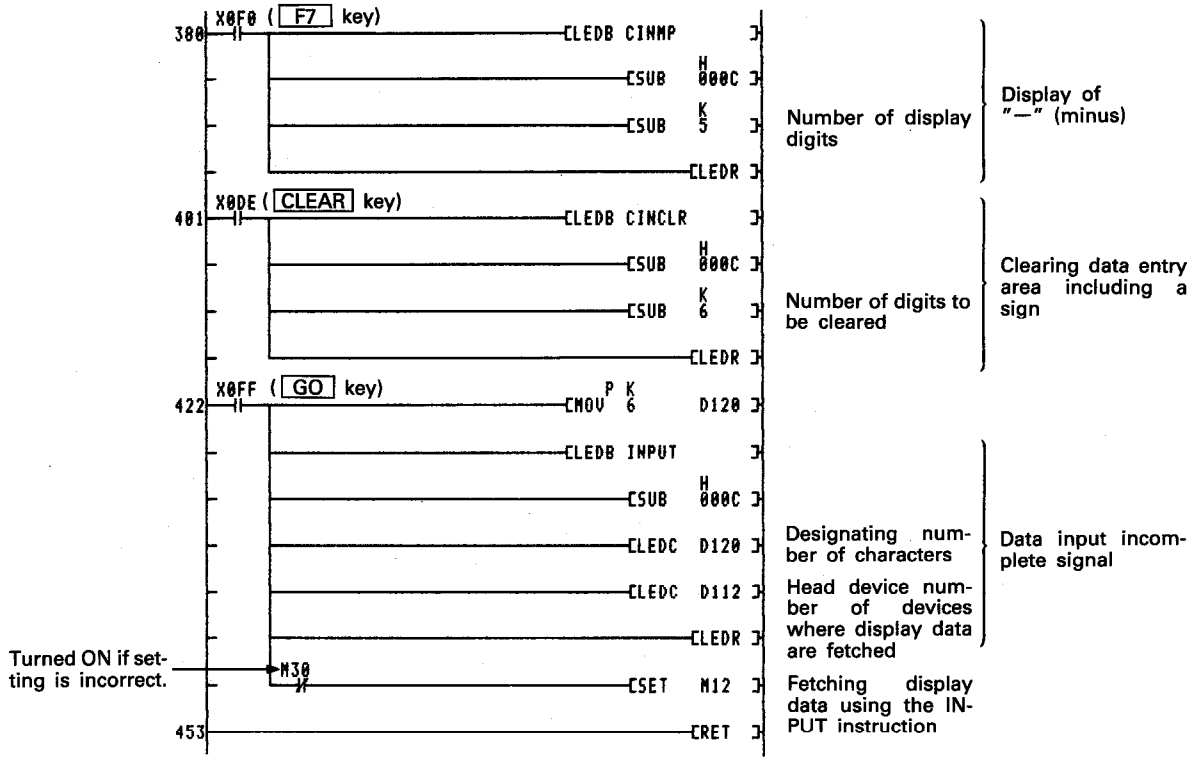
(7) The keys on the operation panel correspond to the input (X) device numbers as shown below.

[0] key ····· X0E7, X0EF, X0F7
[1] key ····· X0C7
[2] key ····· X0CF
[3] key ····· X0D7
[4] key ····· X0E6
[5] key ····· X0EE
[6] key ····· X0F6
[7] key ····· X0C6
[8] key ····· X0CE
[9] key ····· X0D6
[F1] key ····· X0C0 (start of data entry into data input area 1)
[F2] key ····· X0C8 (start of data entry into data input area 2)
[F7] key ····· X0F0 (display of a minus (−) sign)
[CLEAR] key ····· X0DE (clearing the data entered to data input area)
[GO] key ····· X0FF (end of data entry)
[SET] key ····· X0FE (aborting data entry)

Program Example



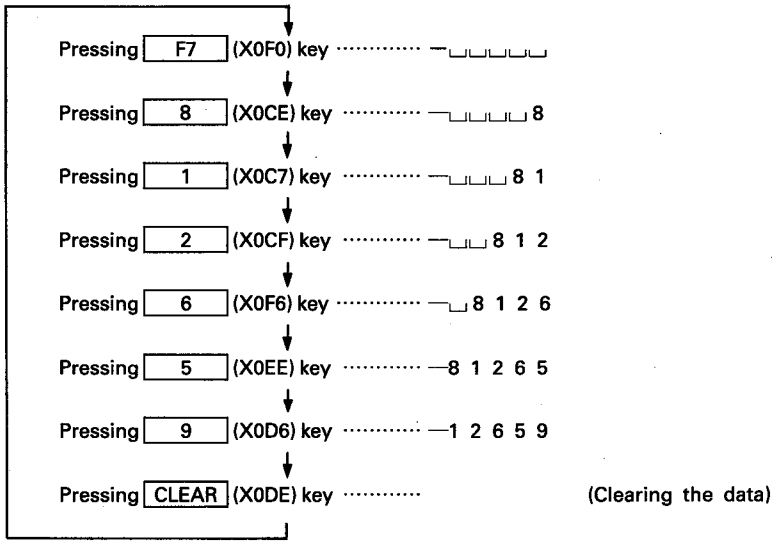

168
X0E7 (0 key)
CLEDB CIN0
X0EF (0 key)
CSUB H 000C
X0F7 (0 key)
CSUB K 5
CLEDR
Number of display digits
Display of "0"
191
X0C7 (1 key)
CLEDB CIN1
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "1"
212
X0CF (2 key)
CLEDB CIN2
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "2"
233
X0D7 (3 key)
CLEDB CIN3
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "3"
254
X0E6 (4 key)
CLEDB CIN4
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "4"
275
X0EE (5 key)
CLEDB CIN5
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "5"
296
X0F6 (6 key)
CLEDB CIN6
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "6"
317
X0C6 (7 key)
CLEDB CIN7
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "7"
338
X0CE (8 key)
CLEDB CIN8
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "8"
359
X0D6 (9 key)
CLEDB CIN9
CSUB H 000C
CSUB K 5
CLEDR
Number of display digits
Display of "9"



Explanation

(1) By pressing the F1 or F2 key, one-character size cursor is displayed in the designated data entry area, thereby permitting the entry of data.

(2) Keyed in data is displayed in the data entry area in the order as shown below corresponding to the keys pressed.



(3) After the completion of keying in of the data, press the GO (X0FF) key. Upon receiving the GO key signal, the following processing is executed.

1) Fetching the display data with the INPUT instruction
The data displayed in the data entry area is stored to D120 to D122 in the ASCII code.

Display unit

−12659

	b15 ~ b8	b7 ~ b0
D120	31_H	$2D_H$
D121	36_H	32_H
D122	39_H	35_H

2) Converting the data with the DABIN instruction
The data stored in the ASCII code are converted into binary data and stored to D116.

	b15 ~ b8	b7 ~ b0
D120	31_H	$2D_H$
D121	36_H	32_H
D122	39_H	35_H

	b15 ~ b0
D116	−12659

In the binary data conversion processing using the DABIN instruction, an error occurs if the data to be converted is outside the range of −327678 to 32767 and processing is not executed.

Therefore, the example program is written to detect an error with M9011 and M9091 if the entered data is outside the allowable range (−32768 to 32767). If an error is detected, the data is cleared and the data entry using the operation panel keys is prompted.

7.4 Displaying Characters and Word Device Present Values

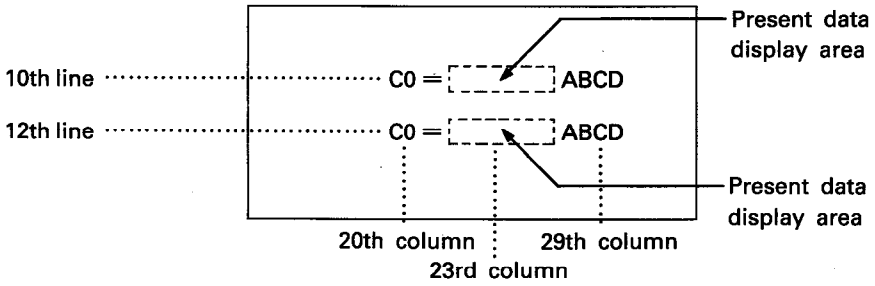
This section gives an example of the program used to display the ASCII characters and the present value of the word devices.

Programming Conditions

(1) AD57 is used.

(2) AD57 is loaded to use addresses X/Y0C0 to X/Y0FF.

(3) Display positions are as indicated below.

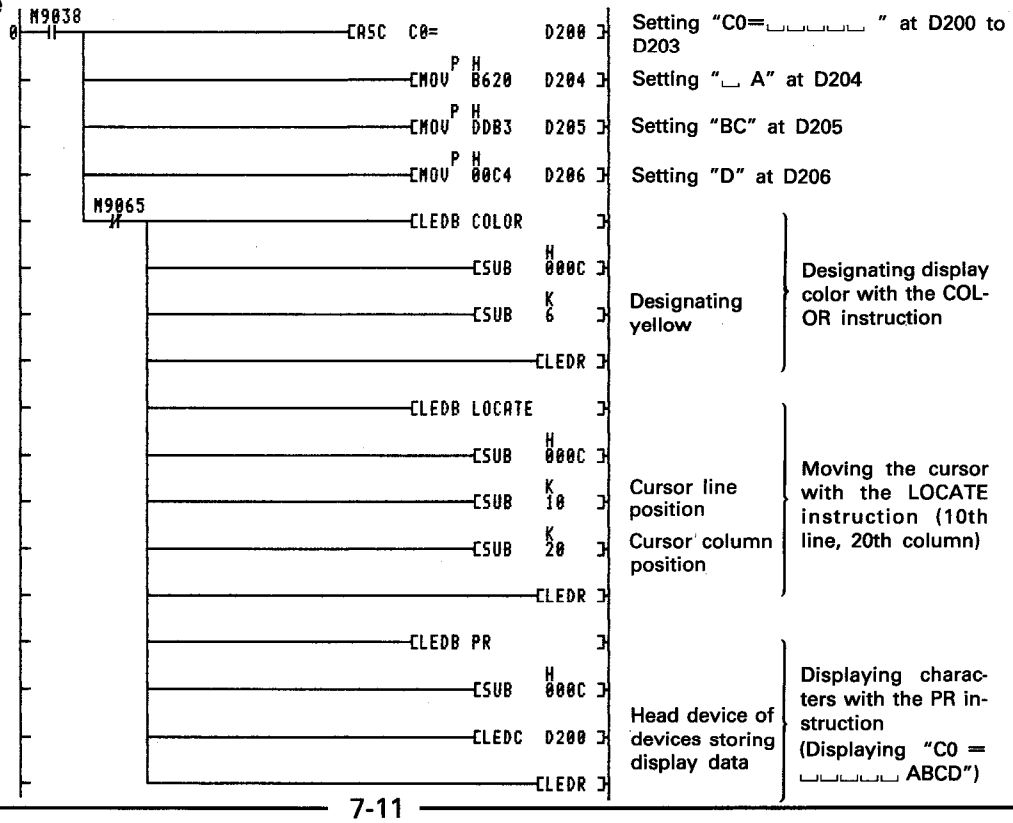


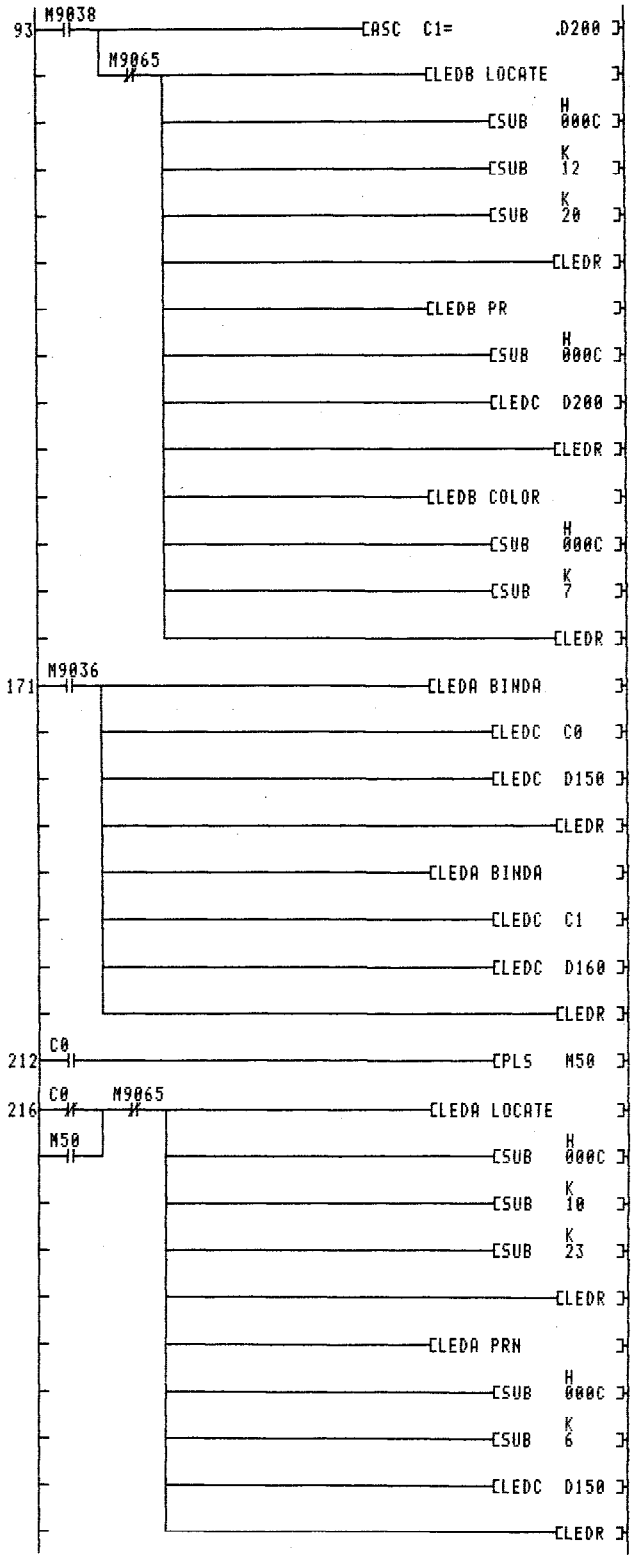
(4) The present data is displayed in up to 6 digits with a sign displayed in the highest digit place (23rd column).

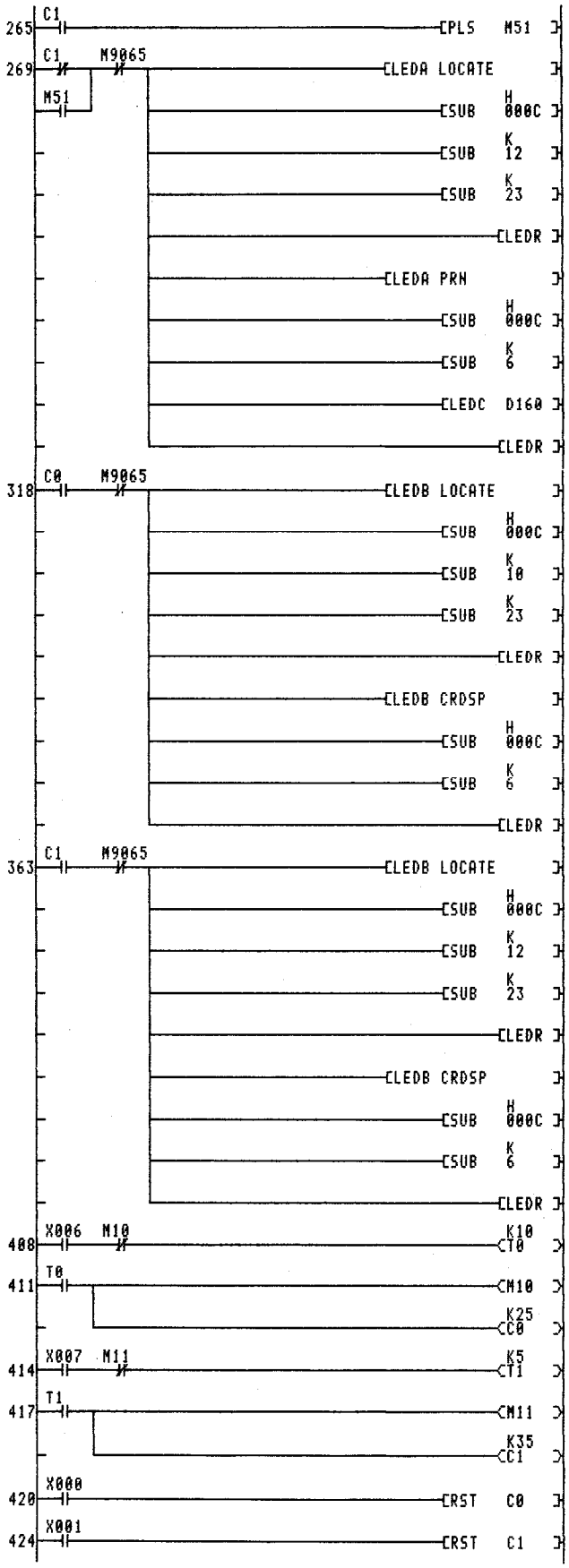
(5) Display is given in yellow for the ASCII characters and in white for present data.

(6) At the count-up of a counter, the present data displayed is highlighted.

Program Example

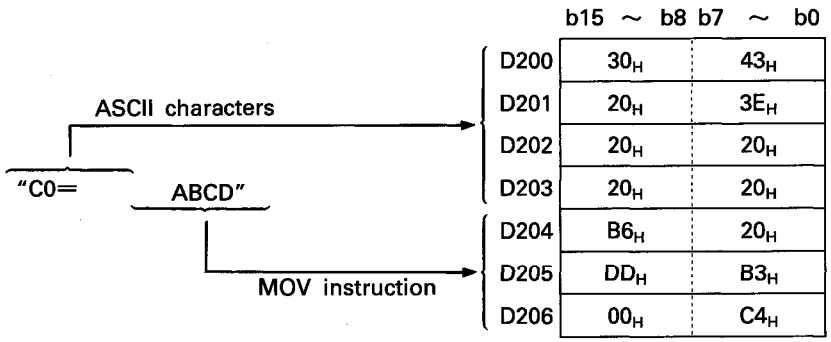


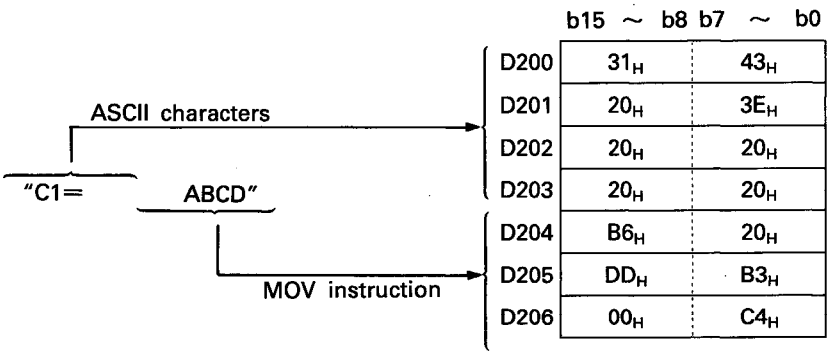

93
M9038
ASC C1= .D200
Changing the data in D200 to "C1=␣␣␣␣␣"
M9065
CLEDB LOCATE
CSUB H 000C
CSUB K 12
CSUB K 20
Cursor line position
Cursor column position
CLEDR
Moving the cursor with the LOCATE instruction (12th line, 20th column)
CLEDB PR
CSUB H 000C
CLEDC D200
Head device of devices storing display data
CLEDR
Displaying characters with the PR instruction (Displaying "C1 =␣␣␣␣␣ ABCD")
CLEDB COLOR
CSUB H 000C
CSUB K 7
Designating white
CLEDR
Designating display color with the COLOR instruction
171
M9036
CLEDA BINDA
CLEDC C0
CLEDC D150
CLEDR
Converting present data of C0 into ASCII character-string with the BINDA instruction; the result of conversion are stored in D150 to D152
CLEDA BINDA
CLEDC C1
CLEDC D160
CLEDR
Converting present data of C1 into ASCII character-string with the BINDA instruction; the result of conversion are stored in D160 to D162
212
C0
CPLS M50
216
C0
M9065
M50
CLEDA LOCATE
CSUB H 000C
CSUB K 10
CSUB K 23
Cursor line position
Cursor column position
CLEDR
Moving the cursor with the LOCATE instruction (10th line, 20th column)
CLEDA PRN
CSUB H 000C
CSUB K 6
CLEDC D150
Number of characters to be displayed
Head device of devices storing the characters to be displayed
CLEDR
Displaying present data of C0 with the PRN instruction


265 C1 PLS M51
269 C1 M9065 LEDA LOCATE
M51
SUB H 000C
SUB K 12
SUB K 23
LEDR
LEDA PRN
SUB H 000C
SUB K 6
LEDC D160
LEDR
318 C0 M9065 LEDB LOCATE
SUB H 000C
SUB K 10
SUB K 23
LEDR
LEDB CRDSP
SUB H 000C
SUB K 6
LEDR
363 C1 M9065 LEDB LOCATE
SUB H 000C
SUB K 12
SUB K 23
LEDR
LEDB CRDSP
SUB H 000C
SUB K 6
LEDR
408 X006 M10 K10 T0
411 T0 M10
K25 C0
414 X007 M11 K5 T1
417 T1 M11
K35 C1
420 X000 RST C0
424 X001 RST C1
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction (12th line, 20th column)
Number of characters to be displayed
Head device of devices storing the characters to be displayed
Displaying present data of C1 with the PRN instruction
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction (10th line, 23rd column)
Number of characters to be highlighted
Highlighting the C0 present data with the CRDSP instruction
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction (12th line, 23rd column)
Number of characters to be highlighted
Highlighting the C1 present data with the CRDSP instruction
C0 and C1 counting program

Explanation

(1) Set the character code which corresponds to the ASCII characters to be displayed at D200 to D206.





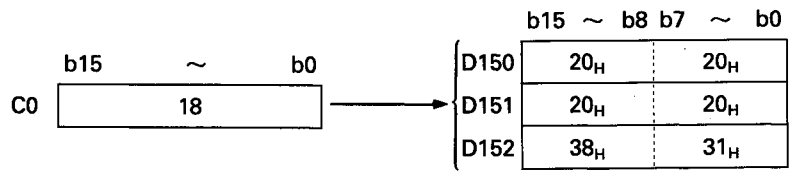
(2) Set the character display color to yellow with the COLOR instruction.

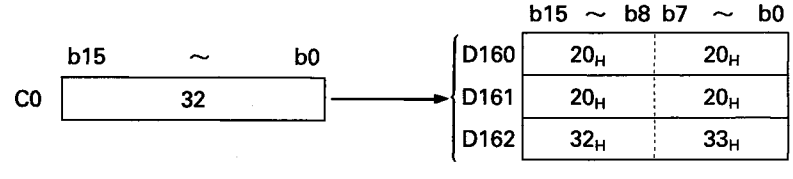
(3) Move the cursor to the position where characters are displayed with the LOCATE instruction.

(4) Display the characters corresponding to the ASCII code stored in D200 to D206 with the PR instruction.

(5) Set the character display color to white with the COLOR instruction.

(6) Convert the present data to be displayed into the ASCII code with the BINDA instruction. The conversion results are stored to D150 to D152 and D160 to D162.





(7) Move the cursor to the present data display position and present data character-strings, stored in D150 to D152 and D160 to D162, are displayed.

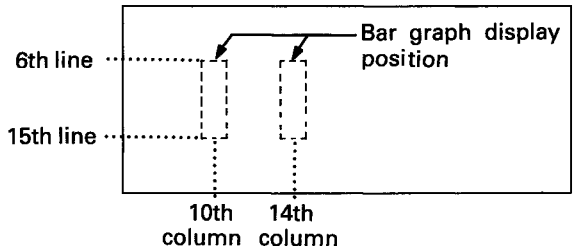
(8) Upon counting-up of the counter, the contact of the corresponding device is turned ON. This highlights the present data currently displayed when the CRDSP instruction is executed.

7.5 Displaying a Bar Graph

This section gives an example of the program used to display a bar graph with bars arranged vertically.

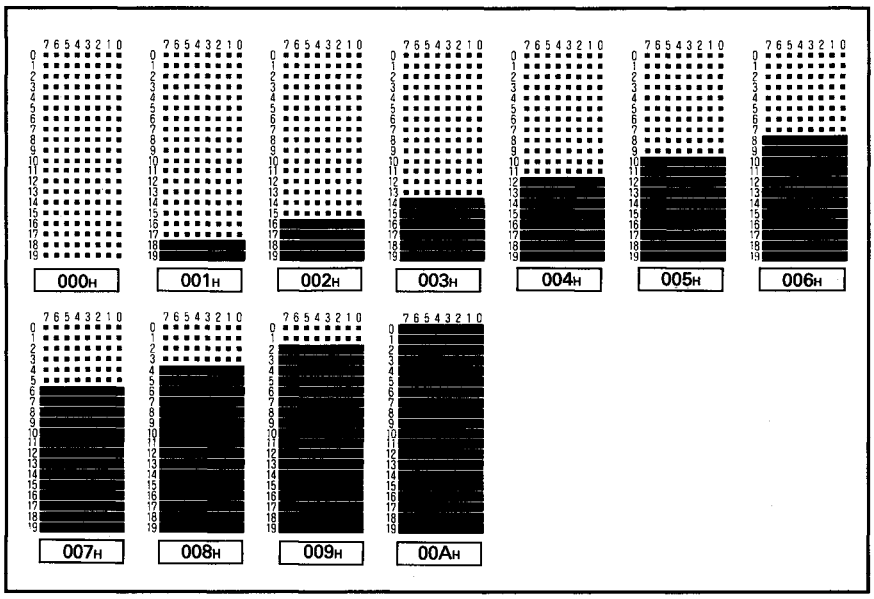
Programming Conditions

(1) AD57 is used.
(2) AD57 is loaded to use addresses X/Y0C0 to X/Y0FF.
(3) Bar graph display position is as indicated below.

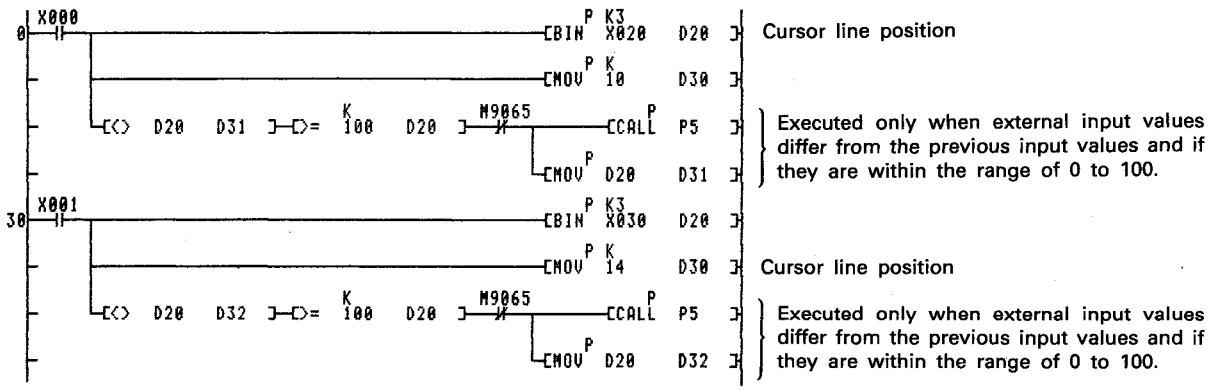


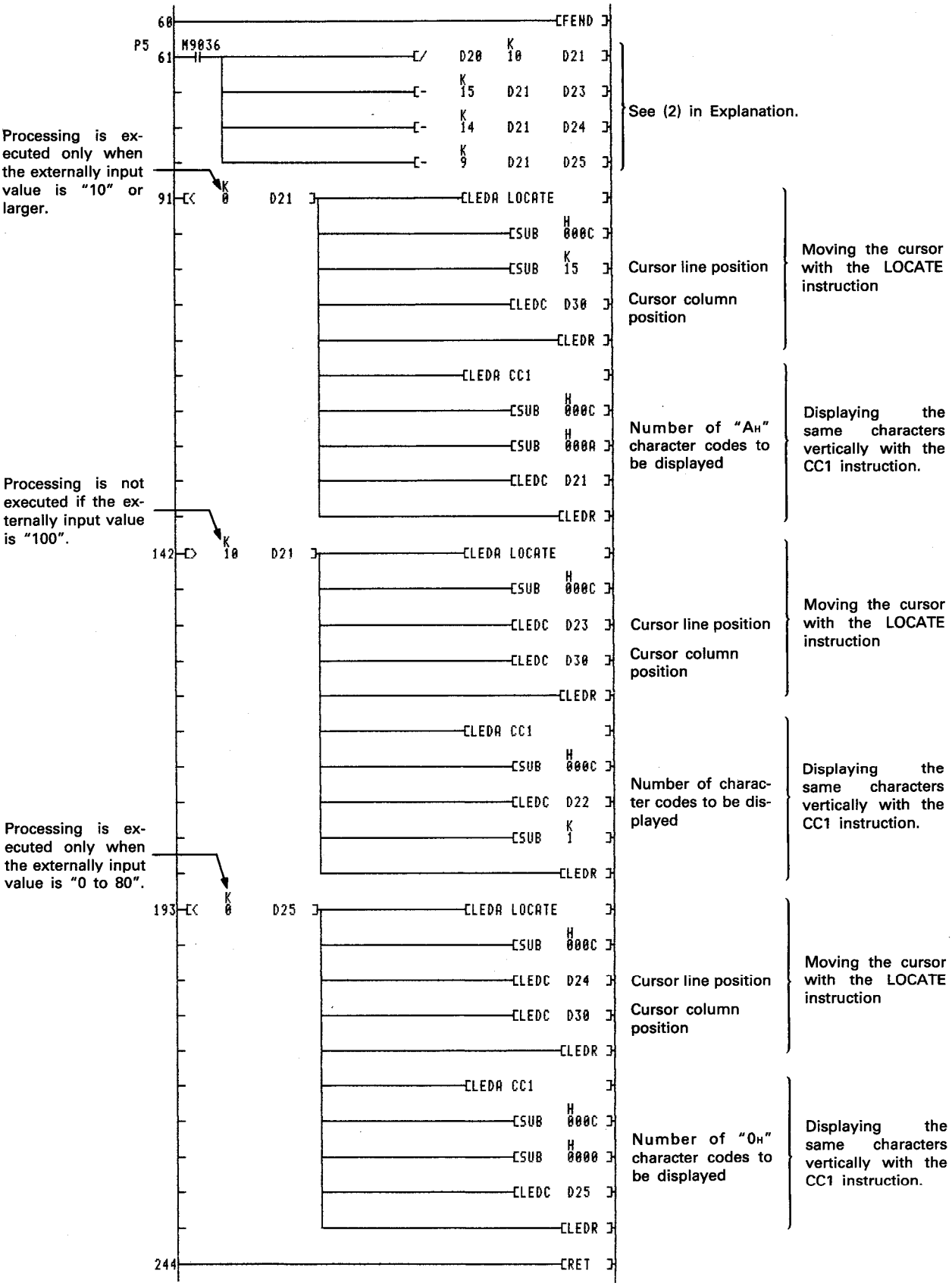
(4) Bar graph display is given for values 0 to 100; 1 division corresponding to 2 dots.

(5) The following characters are used to display a bar graph.



Program Example



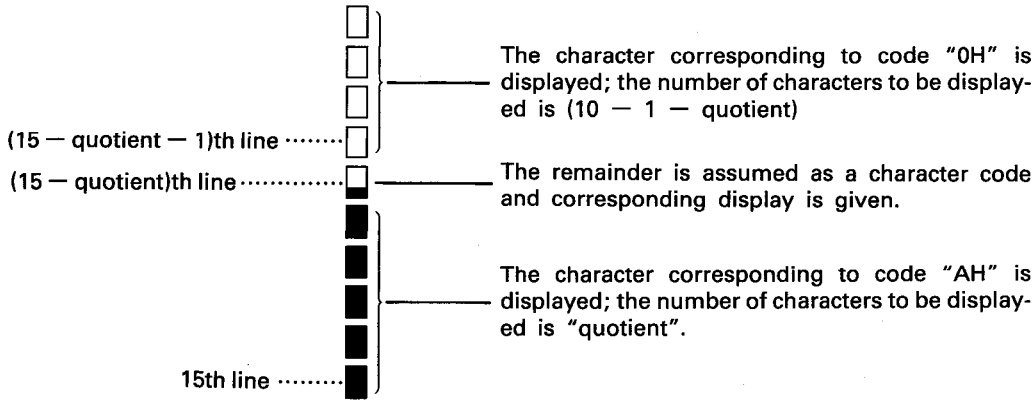

60 FEND
P5 M9036
61 / D20 K10 D21
- K15 D21 D23
- K14 D21 D24
- K9 D21 D25
See (2) in Explanation.
Processing is executed only when the externally input value is "10" or larger.
91 K0 D21 LEDA LOCATE
SUB H000C
SUB K15
LEDC D30
LEDR
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction
LEDA CC1
SUB H000C
SUB H000A
LEDC D21
LEDR
Number of "AH" character codes to be displayed
Displaying the same characters vertically with the CC1 instruction.
Processing is not executed if the externally input value is "100".
142 K10 D21 LEDA LOCATE
SUB H000C
LEDC D23
LEDC D30
LEDR
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction
LEDA CC1
SUB H000C
LEDC D22
SUB K1
LEDR
Number of character codes to be displayed
Displaying the same characters vertically with the CC1 instruction.
Processing is executed only when the externally input value is "0 to 80".
193 K0 D25 LEDA LOCATE
SUB H000C
LEDC D24
LEDC D30
LEDR
Cursor line position
Cursor column position
Moving the cursor with the LOCATE instruction
LEDA CC1
SUB H000C
SUB H0000
LEDC D25
LEDR
Number of "0H" character codes to be displayed
Displaying the same characters vertically with the CC1 instruction.
244 RET

Explanation

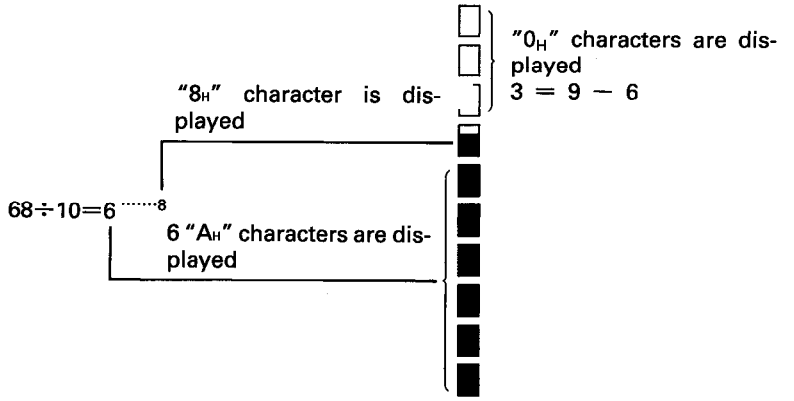
(1) In response to an external input in the range of 0 to 100, the input value is displayed in a bar graph.

(2) Bar graph is displayed in the following manner.

D20 [Input value] ÷ 10 = D21 [Quotient] ··· D22 [Remainder]



Example) Input value of 68



(3) The following are the interlock so that processing will not occur if the input value is the same as the value input previously.

[<>] [D20] [D31] , [<>] [D20] [D32]

(4) The following is the interlock so that processing will not occur if the input value is "100" or larger.

[>=] [K100] [D20]

8. ERROR CODE LISTS

If an error occurs when the PC CPU is switched to the RUN state or in the RUN state, error indication is given or corresponding error code is stored in register D9008, detail error code is stored in register D9091 and error step is stored in register D9011. Refer to Table 8.1 and 8.2 for description, causes and corrective action.

8.1 How to Read Error Codes

When an error has occurred, corresponding error code can be read by use of a peripheral device.
Refer to the Operating Manual of respective peripheral device for the procedure of read of error codes.

8.2 Error Code List for the AnACPU

The following lists give error messages, error code numbers, detail error code numbers, description, causes and corrective action.

Table 8.1 Error Code List for the AnACPU (Continue)

Error Message	Error Code (D9008)	Detailed Error Code (D9091)	Error and Cause	Corrective Action
"INSTRCT CODE ERR." (Checked when STOP→RUN or at execution of instruction.)	10	101	Instruction codes which the CPU cannot decode are included in the program.	(1) Read the error step using a peripheral device and correct the program of the step. (2) Check the ROM if it contains instruction codes which cannot be decoded. If it does, replace it with a correct ROM.
		102	Index qualification is specified for a 32-bit constant.	Read the error step using a peripheral device and correct the program of the step.
		103	Device specified by an extended application instruction is not correct.	
		104	An extended application instruction has incorrect program structure.	
		105	An extended application instruction has incorrect command name.	
		106	Index qualification using Z or V is included in the program between [LEDA/B][IX] and [LEDA/B][IXEND].	
		107	(1) Index qualification is specified for the device numbers and set values in the OUT instruction of timers and counters. (2) Index qualification is specified at the label number of the pointer (P) provided to the head of destination of the [CJ], [SCJ], [CALL], [CALLP], [JMP], [LEDA/B][FCALL] and [LEDA/B][BREAK] instructions or at the label number of the interrupt pointer (I) provided to the head of an interrupt program.	
		108	Errors other than 101 to 107 mentioned above.	

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"PARAMETER ERROR" (Checked at power on and at STOP/PAUSE → RUN.)	11	111	STOP	Capacity settings of the main and sub programs, microcomputer program, file register comments, status latch, sampl-ing trace and extension file registers are not within the usable range of the CPU.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory.
		112		Total of the set capacity of the main and sub programs, file register comments, status latch, sampling trace and extension file registers exceeds capacity of the memory cassette.	
		113		Latch range set by parameters or setting of M, L or S is incorrect.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory
		114		Sum check error	
		115		Either of settings of the remote RUN/ PAUSE contact point by parameters, operation mode at occurrence of error, annunciator indication mode, or STOP → RUN indication mode is incorrect.	
		116		The MNET-MINI automatic refresh setting by parameters is incorrect.	
		117		Timer setting by parameters is incorrect.	
		118		Counter setting by parameters is incorrect.	
"MISSING END INS" (Checked at STOP → RUN.)	12	121	STOP	The [END] ([FEND]) instruction is not given in the main program.	Write the [END] instruction at the end of the main program.
		122		The [END] ([FEND]) instruction is not given in the sub program if the sub program is set by parameters.	Write the [END] instruction at the end of the sub program.

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CAN'T EXECUTE (P)" (Checked at execution of instruction.)	13	131	STOP	The same device number is used at two or more steps for the pointers (P) and interrupt pointers (I) used as labels to be specified at the head of jump destination.	Eliminate the same pointer numbers provided at the head of jump destination.
		132		Label of the pointer (P) specified in the CJ, SCJ, CALL, CALLP, JMP, LEDA/B FCALL or LEDA/B BREAK instruction is not provided before the END instruction.	Read the error step using a peripheral device, check contents and insert a jump destination pointer (P).
		133		(1) The RET instruction was included in the program and executed though the CALL instruction was not given. (2) The NEXT LEDA/B BREAK instructions were included in the program and executed though the FOR instruction was not given. (3) Nesting level of the CALL, CALLP and FOR instructions is 6 levels or deeper, and the 6th level was executed. (4) There is no RET or NEXT instruction at execution of the CALL or FOR instruction.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of nesting levels of the CALL, CALLP and FOR instructions to 5 or less.
		134		The CHG instruction was included in the program and executed though no sub program was provided.	Read the error step using a peripheral device and delete the CHG instruction circuit block.
		135		(1) LEDA/B IX and LEDA/B IXEND instructions are not paired. (2) There are 33 or more sets of LEDA/B IX and LEDA/B IXEND instructions.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of sets of LEDA/B IX and LEDA/B IXEND instructions to 32 or less.

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/PAUSE → RUN.)	14	141	STOP	Instructions (including NOP) other than LDX, LDIX, ANDX and ANIX are included in the CHK instruction circuit block.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
		142		Multiple CHK instructions are given.	
		143		The number of contact points in the CHK instruction circuit block exceeds 150.	
		144		The LEDA CHK instructions are not paired with the LEDA CHKEND instructions, or 2 or more pairs of them are given.	
		145		Format of the block shown below, which is provided before the CHK instruction circuit block, is not as specified. P254 ⊣⊢ CJ P□□	
		146		Device number of D1 in the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.	
		147		Index qualification is used in the check pattern circuit.	
		148		(1) Multiple check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are given. (2) There are 7 or more check condition circuits in the LEDA CHK - LEDA CHKEND instructions. (3) The check condition circuits in the LEDA CHK - LEDA CHKEND instructions are written without using X and Y contact instructions or compare instructions. (4) The check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are written with 257 or more steps.	

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CAN'T EXECUTE (I)" (Checked at occurrence of interrupt.)	15	151	STOP	The IRET instruction was given outside of the interrupt program and was executed.	Read the error step using a peripheral device and delete the IRET instruction.
		152		There is no IRET instruction in the interrupt program.	Check the interrupt program if the IRET instruction is given in it. Write the IRET instruction if it is not given.
		153		Though an interrupt module is used, no interrupt pointer (I) which corresponds to the module is given in the program. Upon occurrence of error, the problem pointer (I) number is stored at D9011.	Monitor special register D9011 using a peripheral device, and check if the interrupt program that corresponds to the stored data is provided or if two or more interrupt pointers (I) of the same number are given. Make necessary corrections.
"CASSETTE ERROR"	16	—	STOP	Memory cassette is not loaded.	Turn off the PC power and load the memory cassette.
"RAM ERROR" (Checked at power on.)	20	201	STOP	The sequence program storage RAM in the CPU module caused an error.	Since this is CPU hardware error, consult Mitsubishi representative.
		202		The work area RAM in the CPU module caused an error.	
		203		The device memory in the CPU module caused an error.	
		204		The address RAM in the CPU module caused an error.	
"OPE CIRCUIT ERROR" (Check during execution of END process)	21	211	STOP	The operation circuit for index qualification in the CPU does not work correctly.	Since this is CPU hardware error, consult Mitsubishi representative.
		212		Hardware (logic) in the CPU does not operate correctly.	
		213		The operation circuit for sequential processing in the CPU does not operate correctly.	
		214		The operation circuit for indexing in the END process check of the CPU does not function correctly.	
		215		Hardware inside the CPU does not function in the END process check of the CPU.	
"WDT ERROR" (Checked at execution of END processing.)	22	—	STOP	Scan time is longer than the WDT time. (1) Scan time of the user's program has been extended due to certain conditions. (2) Scan time has been extended due to momentary power failure occurred during scanning.	(1) Calculate and check the scan time of user program and reduce the scan time using the CJ instruction or the like. (2) Monitor contents of special register D9005 using a peripheral device. If the contents are other than 0, power supply voltage may not be stable. Check power supply and reduce variation in voltage.

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"END NOT EXECUTE" (Checked at execution of the END instruction.)	24	241	STOP	Whole program of specified program capacity was executed without executing the [END] instructions. (1) When the [END] instruction was to be executed, the instruction was read as other instruction code due to noise. (2) The [END] instruction changed to other instruction code due to unknown cause.	(1) Reset and run the CPU again. If the same error recurs, Since this is CPU hardware error, consult Mitsubishi representative.
"MAIN CPU DOWN"	26	—	STOP	The main CPU is malfunctioning or faulty.	Since this is CPU hardware error, consult Mitsubishi representative
"UNIT VERIFY ERR" (Checked continuously.)	31	—	Stop or Continue (set by para-meter)	Current I/O module information is different from that recognized when the power was turned on. (1) The I/O module (including special function modules) connection became loose or the module was disconnected during operation, or wrong module was connected.	Read detailed error code using a peripheral device and check or replace the module which corresponds to the data (I/O head number). Or, monitor special registers D9116 to D9123 using a peripheral device and check or replace the modules if corresponding data bit is "1".
"FUSE BREAK OFF" (Checked continuously.)	32	—	Stop or Continue (set by para-meter)	There is an output module of which fuse is blown.	(1) Check the FUSE BLOWN indicator LED on the output module and replace the fuse. (2) Read detailed error code using a peripheral device and replace the fuse of the output module which corresponds to the data (I/O head number). Or, monitor special registers D9100 to D9107 using a peripheral device and replace the fuse of the output module of which corresponding data bit is "1".
"CONTROL-BUS ERR"	40	401	STOP	Due to the error of the control bus which connects to special function modules, the FROM/TO instruction cannot be executed.	Since it is a hardware error of special function module, CPU module or base module, replace and check defective module(s). Consult Mitsubishi representative for defective modules.
		402		If parameter I/O assignment is being executed, special function modules are not accessible at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"SP.UNIT DOWN"	41	411	STOP	Though an access was made to a special function module at execution of the FROM/TO instruction, no response is received.	Since it is hardware error of the special function module to which an access was made, consult Mitsubishi representative.
		412		If parameter I/O assignment is being executed, no response is received from a special function module at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"LINK UNIT ERROR"	42	—	STOP	(1) Either data link module is loaded to the master station. (2) There are 2 link modules which are set to the master station (station 0).	(1) Remove data link module from the master station. (2) Reduce the number of master stations to 1. Reduce the link modules to 1 when the 3-tier system is not used.
"I/O INT. ERROR"	43	—	STOP	Though the interrupt module is not loaded, an interrupt occurred.	Since it is hardware error of a module, replace and check a defective module. For defective modules, consult Mitsubishi representative.
"SP.UNIT LAY.ERR."	44	441	STOP	A special function module is assigned as an I/O module, or vice versa, in the I/O assignment using parameters from the peripheral device.	Execute I/O assignment again using parameters from the peripheral device according to the loading status of special function modules.
		442		There are 9 or more special function modules (except the interrupt module) which can execute interruption to the CPU module loaded.	Reduce the special function modules (except the interrupt module) which can execute interrupt start to 8 or less.
		443		There are 2 or more data link modules loaded.	Reduce the data link modules to 1 or less.
		444		There are 7 or more modules such as a computer link module loaded to one CPU module.	Reduce the computer link modules to 6 or less.
		445		There are 2 or more interrupt modules loaded.	Reduce the interrupt modules to 1 or less.
		446		Modules assigned by parameters for MNT/MINI automatic refresh from the peripheral device do not conform with the types of station modules actually linked.	Perform again module assignment for MNT/MINI automatic refresh with parameters according to actually linked station modules.
		447		The number of modules of I/O assignment registration (number of loaded modules) per one CPU module for the special function modules which can use dedicated instructions is larger than the specified limit. (Total of the number of computers shown below is larger than 1344.) (AD59 x 5) (AD57(S1)/AD58 x 8) (AJ71C24(S3/S6/S8) x 10) (AJ7IUC24 x 10) (AJ71C21(S1) (S2) x 29) + ((AJ71PT32(S3) in extension mode x 125) Total > 1344	Reduce the number of loaded special function modules.

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"SP.UNIT ERROR" (Checked at execution of the FROM/TO instruction or the dedicated instructions for special function modules.)	46	461	Stop or Continue (set by para-meter)	Module specified by the FROM / TO instruction is not a special function module.	Read the error step using a peripheral device and check and correct contents of the FROM / TO instruction of the step.
		462		Module specified by the dedicated instruction for special function module is not a special function module or not a corresponding special function module.	Read the error step using a peripheral device and check and correct contents of the dedicated instruction for special function modules of the step.
"LINK PARA. ERROR"	47	—	Continue	(1) Data written to the parameter areas of the link of which range was set by parameters using a peripheral device does not conform with the data of link parameters read by the CPU. Or, link parameters are not written. (2) Total number of local stations is set at 0.	(1) Write in parameters again and check. (2) Check setting of station numbers. (3) If the same error indication is given again, it is hardware failure. Consult Mitsubishi representative.
"OPERATION ERROR" (Checked at execution of instruction.)	50	501	Stop or Continue (set by para-meter)	(1) When file registers (R) are used, operation is executed outside of specified ranges of device numbers and block numbers of file registers (R). (2) File registers are used in the program without setting capacity of file registers.	Read the error step using a peripheral device and check and correct program of the step.
		502		Combination of the devices specified by instruction is incorrect.	
		503		Stored data or constant of specified device is not in the usable range.	
		504		Set number of data to be handled is out of the usable range.	
		505		(1) Station number specified by the LEDA/B LRDP LCDA/B LWTP, LRDP, LWTP instructions is not a local station. (2) Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, RFRP, RTOP instructions is not of a remote station.	
		506		Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, RFRP, RTOP instructions is not of a special function module.	
		507		(1) When the AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed to either of them. (2) When an AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed in divided mode to another AD57(S1) or AD58.	Read the error step using a peripheral device and provide interlock with special relay M9066 or modify program structure so that, when the AD57(S1) or AD58 is executing instructions in divided processing mode, other instructions may not be executed to either of them or to another AD57(S1) or AD58 in divided mode.

Table 8.1 Error Code List (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"OPERATION ERROR" (Checked at execution of instruction.)	50	509	STOP	(1) An instruction which cannot be executed by remote terminal modules connected to the MNET/MINI-S3 was executed to the modules. (2) When the PRC instruction was executed to a remote terminal, the communication request registration areas overflowed. (3) The PIDCONT instruction was executed without executing the PIDINIT instruction. The PID57 instruction was executed without executing the PIDINIT or PIDCONT instruction.	(1) Read the error step using a peripheral device and correct the program, meeting loaded conditions of remote terminal modules. (2) Provide interlock using M9081 (communication request registration areas BUSY signal) or D9081 (number of vacant areas in the communication request registration areas) when the PRC instruction is executed to a remote terminal. (3) Execute the PIDCONT instruction after execution of the PIDINIT instruction. Execute the PID57 instruction after execution of the PIDINIT and PIDCONT instructions.
"MAIN CPU DOWN"	60	—	STOP	(1) The CPU malfunctioned due to noise. (2) Hardware failure.	(1) Take proper countermeasures for noise. (2) Hardware failure.
		602		(1) Failure in the power module, CPU module, main base unit or expansion cable is detected.	(1) Replace the power module, CPU module, main base unit or expansion cable.
"BATTERY ERROR" (Checked at power on.)	70	—	Continue	(1) Battery voltage has lowered below specified level. (2) Battery lead connector is not connected.	(1) Replace battery. (2) If a RAM memory or power failure compensation function is used, connect the lead connector.

8.3 Error Code List for the AnUCPU

The following lists give error messages, error code numbers, detail error code numbers, description, causes and corrective action.
(*: The dedicated error code newly set for the AnUCPU.)

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"INSTRCT CODE ERR" (Checked when STOP → RUN or at execution of instruction.)	10	101	STOP	Instruction codes which the CPU cannot decode are included in the program.	(1) Read the error step using a peripheral device and correct the program of the step. (2) Check the ROM if it contains instruction codes which cannot be decoded. If it does, replace it with a correct ROM.
		102		Index qualification is specified for a 32-bit constant.	Read the error step using a peripheral device and correct the program of the step.
		103		Device specified by a dedicated instruction is not correct.	
		104		An dedicated instruction has incorrect program structure.	
		105		An dedicated instruction has incorrect command name.	
		106		Index qualification using Z or V is included in the program between LEDA/B IX and LEDA/B IXEND.	
		107		(1) Index qualification is specified for the device numbers and set values in the OUT instruction of timers and counters. (2) Index qualification is specified at the label number of the pointer (P) provided to the head of destination of the CJ, SCJ, CALL, CALLP, JMP, LEDA/B, FCALL and LEDA/B, BREAK instructions or at the label number of the interrupt pointer (I) provided to the head of an interrupt program.	
		108		Errors other than 101 to 107 mentioned above.	

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"PARAMETER ERROR" (Checked at power on and at STOP/PAUSE → RUN.)	11	111	STOP	Capacity settings of the main and sub programs, microcomputer program, file register comments, status latch, sampl-ing trace and extension file registers are not within the usable range of the CPU.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory.
		112		Total of the set capacity of the main and sub programs, file register comments, status latch, sampling trace and extension file registers exceeds capacity of the memory cassette.	
		113		Latch range set by parameters or setting of M, L or S is incorrect.	Read parameters in the CPU memory, check the contents, make necessary corrections and write them again to the memory
		114		Sum check error	
		115		Either of settings of the remote RUN/ PAUSE contact point by parameters, operation mode at occurrence of error, annunciator indication mode, or STOP → RUN indication mode is incorrect.	
		116		The MNET-MINI automatic refresh setting by parameters is incorrect.	
		117		Timer setting by parameters is incorrect.	
		118		Counter setting by parameters is incorrect.	
"MISSING END INS" (Checked at STOP → RUN.)	12	121	STOP	The [END] ([FEND]) instruction is not given in the main program.	Write the [END] instruction at the end of the main program.
		122		The [END] ([FEND]) instruction is not given in the sub program if the sub program is set by parameters.	Write the [END] instruction at the end of the sub program.
		123		(1) When subprogram 2 is set by a parameter, there is no END (FEND) instruction in subprogram 2. (2) When subprogram 2 is set by a parameter, subprogram 2 has not been written from a peripheral device.	
		124		(1) When subprogram 3 is set by a parameter, there is no END (FEND) instruction in subprogram 3. (2) When subprogram 3 is set by a parameter, subprogram 2 has not been written from a peripheral device.	

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CAN'T EXECUTE (P)" (Checked at execution of instruction.)	13	131	STOP	The same device number is used at two or more steps for the pointers (P) and interrupt pointers (I) used as labels to be specified at the head of jump destination.	Eliminate the same pointer numbers provided at the head of jump destination.
		132		Label of the pointer (P) specified in the CJ, SCJ, CALL, CALLP, JMP, LEDA/B FCALL or LEDA/B BREAK instruction is not provided before the END instruction.	Read the error step using a peripheral device, check contents and insert a jump destination pointer (P).
		133		(1) The RET instruction was included in the program and executed though the CALL instruction was not given. (2) The NEXT LEDA/B BREAK instructions were included in the program and executed though the FOR instruction was not given. (3) Nesting level of the CALL, CALLP and FOR instructions is 6 levels or deeper, and the 6th level was executed. (4) There is no RET or NEXT instruction at execution of the CALL or FOR instruction.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of nesting levels of the CALL, CALLP and FOR instructions to 5 or less.
		134		The CHG instruction was included in the program and executed though no sub program was provided.	Read the error step using a peripheral device and delete the CHG instruction circuit block.
		135		(1) LEDA/B IX and LEDA/B IXEND instructions are not paired. (2) There are 33 or more sets of LEDA/B IX and LEDA/B IXEND instructions.	(1) Read the error step using a peripheral device, check contents and correct program of the step. (2) Reduce the number of sets of LEDA/B IX and LEDA/B IXEND instructions to 32 or less.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/PAUSE → RUN.)	14	141	STOP	Instructions (including NOP) other than LDX, LDIX, ANDX and ANIX are included in the CHK instruction circuit block.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
		142		Multiple CHK instructions are given.	
		143		The number of contact points in the CHK instruction circuit block exceeds 150.	
		144		The LEDA CHK instructions are not paired with the LEDA CHKEND instructions, or 2 or more pairs of them are given.	
		145		Format of the block shown below, which is provided before the CHK instruction circuit block, is not as specified. P254 ⊣⊢ CJ P□□	
		146		Device number of D1 in the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.	
		147		Index qualification is used in the check pattern circuit.	
		148		(1) Multiple check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are given. (2) There are 7 or more check condition circuits in the LEDA CHK - LEDA CHKEND instructions. (3) The check condition circuits in the LEDA CHK - LEDA CHKEND instructions are written without using X and Y contact instructions or compare instructions. (4) The check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are written with 257 or more steps.	
"CAN'T EXECUTE (I)" (Checked at occurrence of interrupt.)	15	151	STOP	The IRET instruction was given outside of the interrupt program and was executed.	Read the error step using a peripheral device and delete the IRET instruction.
		152		There is no IRET instruction in the interrupt program.	Check the interrupt program if the IRET instruction is given in it. Write the IRET instruction if it is not given.
		153		Though an interrupt module is used, no interrupt pointer (I) which corresponds to the module is given in the program. Upon occurrence of error, the problem pointer (I) number is stored at D9011.	Monitor special register D9011 using a peripheral device, and check if the interrupt program that corresponds to the stored data is provided or if two or more interrupt pointers (I) of the same number are given. Make necessary corrections.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CHK FORMAT ERR" (Checked at STOP/PAUSE → RUN.)	14	141	STOP	Instructions (including NOP) other than LDX, LDIX, ANDX and ANIX are included in the CHK instruction circuit block.	Check the program of the CHK instruction and correct it referring to contents of detailed error codes.
		142		Multiple CHK instructions are given.	
		143		The number of contact points in the CHK instruction circuit block exceeds 150.	
		144		The LEDA CHK instructions are not paired with the LEDA CHKEND instructions, or 2 or more pairs of them are given.	
		145		Format of the block shown below, which is provided before the CHK instruction circuit block, is not as specified. P254 — CJ P□□	
		146		Device number of D1 in the CHK D1 D2 instruction is different from that of the contact point before the CJ P□ instruction.	
		147		Index qualification is used in the check pattern circuit.	
		148		(1) Multiple check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are given. (2) There are 7 or more check condition circuits in the LEDA CHK - LEDA CHKEND instructions. (3) The check condition circuits in the LEDA CHK - LEDA CHKEND instructions are written without using X and Y contact instructions or compare instructions. (4) The check pattern circuits of the LEDA CHK - LEDA CHKEND instructions are written with 257 or more steps.	
"CAN'T EXECUTE (I)" (Checked at occurrence of interrupt.)	15	151	STOP	The IRET instruction was given outside of the interrupt program and was executed.	Read the error step using a peripheral device and delete the IRET instruction.
		152		There is no IRET instruction in the interrupt program.	Check the interrupt program if the IRET instruction is given in it. Write the IRET instruction if it is not given.
		153		Though an interrupt module is used, no interrupt pointer (I) which corresponds to the module is given in the program. Upon occurrence of error, the problem pointer (I) number is stored at D9011.	Monitor special register D9011 using a peripheral device, and check if the interrupt program that corresponds to the stored data is provided or if two or more interrupt pointers (I) of the same number are given. Make necessary corrections.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"CASSETTE ERROR"	16	—	STOP	Memory cassette is not loaded.	Turn off the PC power and load the memory cassette.
"RAM ERROR" (Checked at power on.)	20	201	STOP	The sequence program storage RAM in the CPU module caused an error.	Since this is CPU hardware error, consult Mitsubishi representative.
		202		The work area RAM in the CPU module caused an error.	
		203		The device memory in the CPU module caused an error.	
		204		The address RAM in the CPU module caused an error.	
"OPE CIRCUIT ERROR" (Checked at power on.)	21	211	STOP	The operation circuit for index qualification in the CPU does not work correctly.	Since this is CPU hardware error, consult Mitsubishi representative.
		212		Hardware (logic) in the CPU does not operate correctly.	
		213		The operation circuit for sequential processing in the CPU does not operate correctly.	
"OPE. CIRCUIT ERR." (Checked at execution of the END instruction)		214		In the END processing check, the operation circuit for index qualification in the CPU does not work correctly.	
		215		In the END processing check, the hardware in the CPU does not operate correctly.	
"WDT ERROR" (Checked at execution of END processing.)	22	—	STOP	Scan time is longer than the WDT time. (1) Scan time of the user's program has been extended due to certain conditions. (2) Scan time has been extended due to momentary power failure occurred during scanning.	(1) Calculate and check the scan time of user program and reduce the scan time using the [CJ] instruction or the like. (2) Monitor contents of special register D9005 using a peripheral device. If the contents are other than 0, power supply voltage may not be stable. Check power supply and reduce variation in voltage.
"END NOT EXECUTE" (Checked at execution of the END instruction.)	24	241	STOP	Whole program of specified program capacity was executed without executing the [END] instructions. (1) When the [END] instruction was to be executed, the instruction was read as other instruction code due to noise. (2) The [END] instruction changed to other instruction code due to unknown cause.	(1) Reset and run the CPU again. If the same error recurs, Since this is CPU hardware error, consult Mitsubishi representative.
"MAIN CPU DOWN"	26	—	STOP	The main CPU is malfunctioning or faulty.	Since this is CPU hardware error, consult Mitsubishi representative
"UNIT VERIFY ERR" (Checked continuously.)	31	—	Stop or Continue (set by para-meter)	Current I/O module information is different from that recognized when the power was turned on. (1) The I/O module (including special function modules) connection became loose or the module was disconnected during operation, or wrong module was connected.	Read detailed error code using a peripheral device and check or replace the module which corresponds to the data (I/O head number). Or, monitor special registers D9116 to D9123 using a peripheral device and check or replace the modules if corresponding data bit is "1".

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"FUSE BREAK OFF" (Checked continuously.)	32	—	Stop or Continue (set by para-meter)	(1) There is an output module of which fuse is blown. (2) The external power supply for output load is turned OFF or is not connected.	(1) Check the FUSE BLOWN indicator LED on the output module and replace the fuse. (2) Read detailed error code using a peripheral device and replace the fuse of the output module which corresponds to the data (I/O head number). Or, monitor special registers D9100 to D9107 using a peripheral device and replace the fuse of the output module of which corresponding data bit is "1". (3) Check the ON/OFF status of the external power supply for output load.
"CONTROL-BUS ERR"	40	401	STOP	Due to the error of the control bus which connects to special function modules, the FROM/TO instruction cannot be executed.	Since it is a hardware error of special function module, CPU module or base module, replace and check defective module(s). Consult Mitsubishi representative for defective modules.
		402		If parameter I/O assignment is being executed, special function modules are not accessible at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"SP.UNIT DOWN"	41	411	STOP	Though an access was made to a special function module at execution of the FROM/TO instruction no response is received.	Since it is hardware error of the special function module to which an access was made, consult Mitsubishi representative.
		412		If parameter I/O assignment is being executed, no response is received from a special function module at initial communication. At error occurrence, the head I/O number (upper 2 digits of 3 digits) of the special function module that caused error is stored at D9011.	
"LINK UNIT ERROR"	42	—	STOP	(1) Either data link module is loaded to the master station. (2) There are 2 link modules which are set to the master station (station 0).	(1) Remove data link module from the master station. (2) Reduce the number of master stations to 1. Reduce the link modules to 1 when the 3-tier system is not used.
"I/O INT. ERROR"	43	—	STOP	Though the interrupt module is not loaded, an interrupt occurred.	Since it is hardware error of a module, replace and check a defective module. For defective modules, consult Mitsubishi representative.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"SP.UNIT LAY.ERR."	44	441	STOP	A special function module is assigned as an I/O module, or vice versa, in the I/O assignment using parameters from the peripheral device.	Execute I/O assignment again using parameters from the peripheral device according to the loading status of special function modules.
		442		There are 9 or more special function modules (except the interrupt module) which can execute interruption to the CPU module loaded.	Reduce the special function modules (except the interrupt module) which can execute interrupt start to 8 or less.
		443		There are 2 or more data link modules loaded.	Reduce the data link modules to 1 or less.
		444		There are 7 or more modules such as a computer link module loaded to one CPU module.	Reduce the computer link modules to 6 or less.
		445		There are 2 or more interrupt modules loaded.	Reduce the interrupt modules to 1 or less.
		446		Modules assigned by parameters for MNT/MINI automatic refresh from the peripheral device do not conform with the types of station modules actually linked.	Perform again module assignment for MNT/MINI automatic refresh with parameters according to actually linked station modules.
		447		The number of modules of I/O assignment registration (number of loaded modules) per one CPU module for the special function modules which can use dedicated instructions is larger than the specified limit. (Total of the number of computers shown below is larger than 1344.) (AD59 × 5) (AD57(S1)/AD58 × 8) (AJ71C24(S3/S6/S8) × 10) (AJ7IUC24 × 10) (AJ71C21(S1) (S2) × 29) + ((AJ71PT32(S3) in extension mode x 125) Total > 1344	Reduce the number of loaded special function modules.
		448*		(1) Five or more network modules have been installed. (2) A total of five or more of network modules and data link modules have been installed.	Make the total of the installed network modules and data link modules four or less.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"SP.UNIT ERROR" (Checked at execution of the FROM/TO instruction or the dedicated instructions for special function modules.)	46	461	Stop or Continue (set by para-meter)	Module specified by the FROM / TO instruction is not a special function module.	Read the error step using a peripheral device and check and correct contents of the FROM / TO instruction of the step.
		462		(1) Module specified by the dedicated instruction for special function module is not a special function module or not a corresponding special function module. (2) A command was issued to a CC-Link module with function version under B. (3) A CC-Link dedicated command was issued to a CC-Link module for which the network parameters have not been set.	(1) Read the error step using a peripheral device and check and correct contents of the dedicated instruction for special function modules of the step. (2) Replace with a CC-Link module having function version B and above. (3) Set the parameters.
"LINK PARA. ERROR"	47	0	Continue	[When using MELSECNET/(II)] (1) When the link range at a data link CPU which is also a master station (station number = 00) is set by parameter setting at a peripheral device, for some reason the data written to the link parameter area differs from the link parameter data read by the CPU. Alternatively, no link parameters have been written. (2) The total number of slave stations is set at 0.	(1) Write the parameters again and check. (2) Check the station number settings. (3) Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		470*		[When using MELSECNET/10] (1) The contents of the network refresh parameters written from a peripheral device differ from the actual system at the base unit. (2) The network refresh parameters have not been written.	Write the network refresh parameters again and check.
		471*		[When using MELSECNET/10] (1) The transfer source device range and transfer destination device range specified for the inter-network transfer parameters are in the same network. (2) The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters spans two or more networks. (3) The specified range of transfer source devices or transfer destination devices for the inter-network transfer parameters is not used by the network.	Write the network parameters again and check.
		472*		[When using MELSECNET/10] The contents of the routing parameters written from a peripheral device differ from the actual network system.	Write the routing parameters again and check.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"LINK PARA. ERROR"	47	473*	Continue	[When using MELSECNET/10] (1) The contents of the network parameters for the first link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the first link unit have not been written. (3) The setting for the total number of stations is 0.	(1) Write the parameters again and check. (2) Check the station number settings. (3) Persistent error occurrence may indicate a hardware fault. Consult your nearest Mitsubishi representative, explaining the nature of the problem.
		474*		[When using MELSECNET/10] (1) The contents of the network parameters for the second link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the second link unit have not been written. (3) The setting for the total number of stations is 0.	
		475*		[When using MELSECNET/10] (1) The contents of the network parameters for the third link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the third link unit have not been written. (3) The setting for the total number of stations is 0.	
		476*		[When using MELSECNET/10] (1) The contents of the network parameters for the fourth link unit, written from a peripheral device, differ from the actual network system. (2) The link parameters for the fourth link unit have not been written. (3) The setting for the total number of stations is 0.	
		477		A ink parameter error was detected by the CC-Link module.	(1) Write the parameters in again and check. (2) If the error appears again, there is a problem with the hardware. Consult your nearest System Service, sales office or branch office.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"OPERATION ERROR" (Checked at execution of instruction.)	50	501	Stop or Continue (set by para-meter)	(1) When file registers (R) are used, operation is executed outside of specified ranges of device numbers and block numbers of file registers (R). (2) File registers are used in the program without setting capacity of file registers.	Read the error step using a peripheral device and check and correct program of the step.
		502		Combination of the devices specified by instruction is incorrect.	
		503		Stored data or constant of specified device is not in the usable range.	
		504		Set number of data to be handled is out of the usable range.	
		505		(1) Station number specified by the LEDA/B LRDP LCDA/B LWTP, LRDP, LWTP instructions is not a local station. (2) Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, RFRP, RTOP instructions is not of a remote station.	
		506		Head I/O number specified by the LEDA/B RFRP LEDA/B RTOP, RFRP, RTOP instructions is not of a special function module.	
		507		(1) When the AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed to either of them. (2) When an AD57(S1) or AD58 was executing instructions in divided processing mode, other instructions were executed in divided mode to another AD57(S1) or AD58.	Read the error step using a peripheral device and provide interlock with special relay M9066 or modify program structure so that, when the AD57(S1) or AD58 is executing instructions in divided processing mode, other instructions may not be executed to either of them or to another AD57(S1) or AD58 in divided mode.
		508		A CC-Link dedicated command was issued to three or more CC-Link modules.	The CC-Link dedicated command can be issued only to two or less CC-Link modules.

Table 8.2 Error Code List for the AnUCPU (Continue)

Error Massage	Error Code (D9008)	Detailed Error Code (D9091)	CPU States	Error and Cause	Corrective Action
"OPERATION ERROR" (Checked at execution of instruction.)	50	509	STOP	(1) An instruction which cannot be executed by remote terminal modules connected to the MNET/MINI-S3 was executed to the modules. (2) Though there are 32 entries of FROM or TO instructions registered with a PRC instruction in the mailbox (memory area waiting for execution), another PRC instruction is executed to cause an overflow in the mail box (memory area waiting for execution). (3) The PIDCONT instruction was executed without executing the PIDINIT instruction. The PID57 instruction was executed without executing the PIDINIT or PIDCONT instruction. The program presently executed was specified by the ZCHG instruction. (4) The number of CC-Link dedicated command executed in one scan exceeded 10.	(1) Read the error step using a peripheral device and correct the program, meeting loaded conditions of remote terminal modules. (2) Use special register D9081 (number of empty entries in mailbox) or special relay M9081 (BUSY signal of mail box) to suppress registration or execution of the PRC instruction. (3) Correct the program specified by the ZCHG instruction to other. (4) Set the number of CC-Link dedicated commands executed in one scan to 10 or less.
"MAIN CPU DOWN"	60	—	STOP	(1) The CPU malfunctioned due to noise. (2) Hardware failure.	(1) Take proper countermeasures for noise. (2) Hardware failure.
		602		(1) Failure in the power module, CPU module, main base unit or expansion cable is detected.	(1) Replace the power module, CPU module, main base unit or expansion cable.
"BATTERY ERROR" (Checked at power on.)	70	—	Contin ue	(1) Battery voltage has lowered below specified level. (2) Battery lead connector is not connected.	(1) Replace battery. (2) If a RAM memory or power failure compensation function is used, connect the lead connector.

MEMO

APPENDIX

APPENDIX 1 PROCESSING TIME LISTS

The following lists give the processing time required for the AnACPU/AnUCPU to execute the AD57(S1)/AD58 control instructions.

POINT

The processing time given in the following lists has been measured under the conditions mentioned below. The processing time may vary with type of module and operation mode to be used.
The AD57 module is used.
The CRT standard mode is set.
The cursor is not displayed.

Category	Instruction Name	Condition	Processing Time (μ sec)	
			A3ACPU A3UCPU A4UCPU	A2ACPU A2UCPU
Display mode setting instruction	CMODE		794	851
Display screen control instructions	CPS1	Batch processing	23231	24348
		Split processing	1536	1668
	CPS2		111	159
	CMOV	Batch processing	23018	24175
		Split processing	1548	1685
	CLS	Batch processing	15510	16184
		Split processing	1074	1141
	CLV	Batch processing	15525	16228
		Split processing	1100	1177
	CSCRU		139	167
	CSCRD		129	158
Cursor control instructions	CON1		109	177
	CON2		113	188
	COFF		113	188
	LOCATE	Cursor ON	180	219
		Cursor OFF	62	76

Category	Instruction Name	Condition	Processing Time (μ sec)	
			A3ACPU A3UCPU A4UCPU	A2ACPU A2UCPU
Display condition setting instructions	CNOR		38	49
	CREV		39	50
	CRDSP	1 character	152	188
		96 characters	2027	2219
	CRDSPV	1 character	152	184
		96 characters	2076	2213
	COLOR		47	61
	CCDSP	1 character	162	236
		96 characters	2102	2247
	CCDSPV	1 character	160	197
		96 characters	2051	2247
Designated character display instructions	PRN	1 character	176	216
		96 characters	1140	1234
	PR	1 character	169	208
		96 characters	1240	1371
	PRNV	1 character	178	217
		96 characters	1144	1245

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Category	Instruction Name	Condition	Processing Time (μsec) A3ACPU A3UCPU A4UCPU	Processing Time (μsec) A2ACPU A2UCPU
Designated character display instructions	PRV	1 character	172	212
		96 characters	1232	1377
	EPRN	1 character	168	208
		96 characters	1205	1326
	EPR	1 character	162	202
		96 characters	1328	1490
	EPRNV	1 character	168	209
		96 characters	1207	1329
	EPRV	1 character	158	197
		96 characters	1326	1488
	CR1	1 character	113	191
		80 characters	910	981
	CR2	1 character	172	219
		40 characters	956	1041
	CC1	1 character	149	187
		20 character	349	400
	CC2	1 character	168	208
		10 characters	348	398

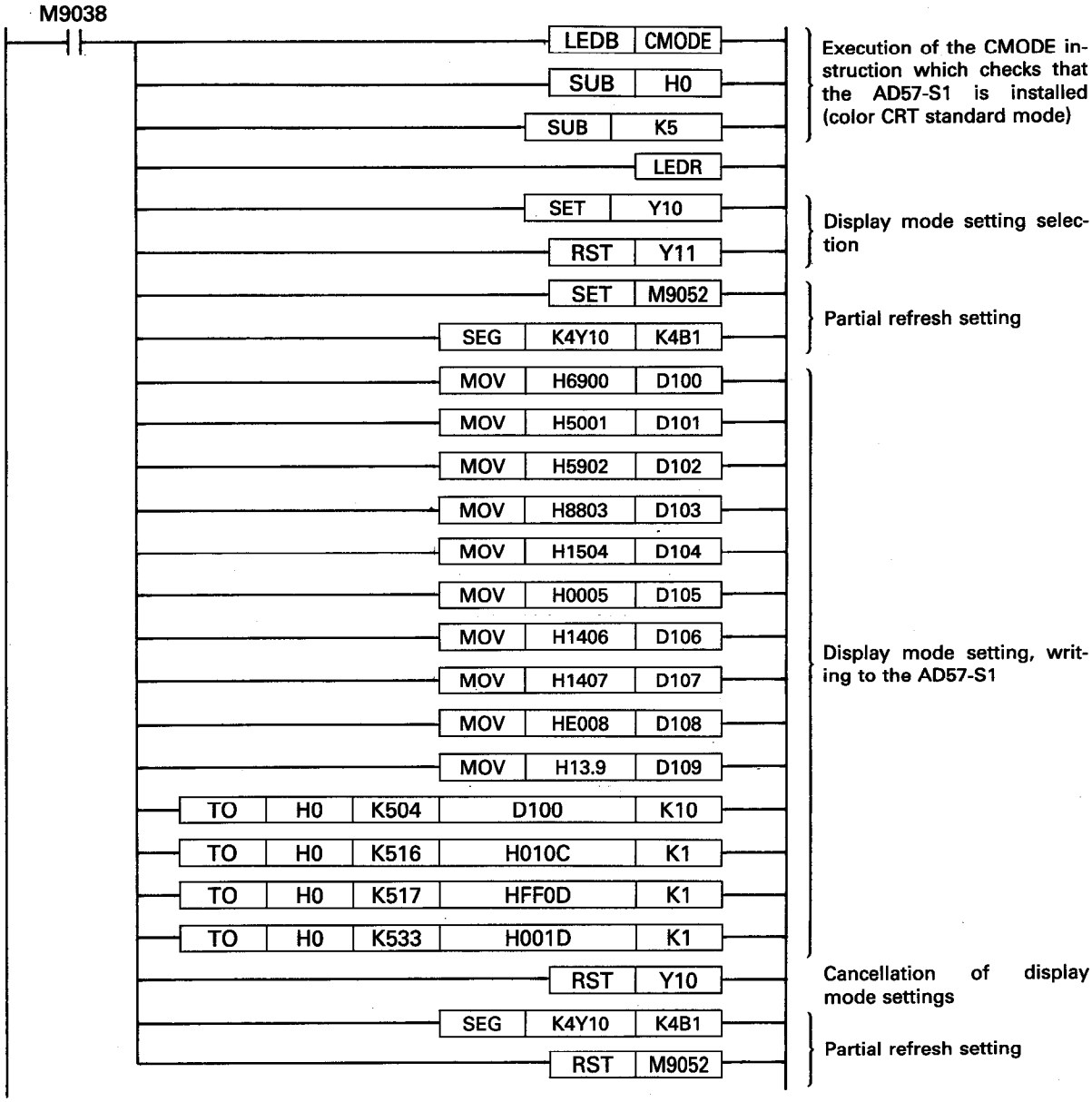
Category	Instruction Name	Condition	Processing Time (μsec) A3ACPU A3UCPU A4UCPU	Processing Time (μsec) A2ACPU A2UCPU
	CINMP	16 characters	293	333
	CINHP	16 characters	437	490
	CINPT	16 characters	437	490
	CIN0~ CIN9	16 characters	437	490
	CINA~ CINZ	16 characters	437	490
	CINSP	16 characters	437	490
Designated column clear instruction	CINCLR		282	322
ASCII code conversion of display characters	INPUT	1 character	153	192
		16 characters	322	376
VRAM data read/write instructions	GET	1 word	177	221
		96 words	1103	1191
	PUT	1 word	175	219
		96 words	1102	1189
Display state read	STAT		56	72

APP

APPENDIX 2 AD57-S1 DISPLAY MODE SETTING PROGRAM

Shown below is the AD57-S1 display mode setting program. Include this program at the head of the sequence program (see Section 6.1 for advice on whether it is necessary to create this program or not).

[AD57-S1 display mode setting program]
Shown below as an example is the program used when an AD57-S1 is installed at the 0 slot of the main base unit.



IB (NA) 66257-B

WARRANTY

Please confirm the following product warranty details before starting use.

1. Gratis Warranty Term and Gratis Warranty Range

If any faults or defects (hereinafter "Failure") found to be the responsibility of Mitsubishi occurs during use of the product within the gratis warranty term, the product shall be repaired at no cost via the dealer or Mitsubishi Service Company. Note that if repairs are required at a site overseas, on a detached island or remote place, expenses to dispatch an engineer shall be charged for.

[Gratis Warranty Term]

The gratis warranty term of the product shall be for one year after the date of purchase or delivery to a designated place.

Note that after manufacture and shipment from Mitsubishi, the maximum distribution period shall be six (6) months, and the longest gratis warranty term after manufacturing shall be eighteen (18) months. The gratis warranty term of repair parts shall not exceed the gratis warranty term before repairs.

[Gratis Warranty Range]

(1) The range shall be limited to normal use within the usage state, usage methods and usage environment, etc., which follow the conditions and precautions, etc., given in the instruction manual, user's manual and caution labels on the product.

(2) Even within the gratis warranty term, repairs shall be charged for in the following cases.

1. Failure occurring from inappropriate storage or handling, carelessness or negligence by the user. Failure caused by the user's hardware or software design.
2. Failure caused by unapproved modifications, etc., to the product by the user.
3. When the Mitsubishi product is assembled into a user's device, Failure that could have been avoided if functions or structures, judged as necessary in the legal safety measures the user's device is subject to or as necessary by industry standards, had been provided.
4. Failure that could have been avoided if consumable parts (battery, backlight, fuse, etc.) designated in the instruction manual had been correctly serviced or replaced.
5. Failure caused by external irresistible forces such as fires or abnormal voltages, and Failure caused by force majeure such as earthquakes, lightning, wind and water damage.
6. Failure caused by reasons unpredictable by scientific technology standards at time of shipment from Mitsubishi.
7. Any other failure found not to be the responsibility of Mitsubishi or the user.

2. Onerous repair term after discontinuation of production

(1) Mitsubishi shall accept onerous product repairs for seven (7) years after production of the product is discontinued. Discontinuation of production shall be notified with Mitsubishi Technical Bulletins, etc.

(2) Product supply (including repair parts) is not possible after production is discontinued.

3. Overseas service

Overseas, repairs shall be accepted by Mitsubishi's local overseas FA Center. Note that the repair conditions at each FA Center may differ.

4. Exclusion of chance loss and secondary loss from warranty liability

Regardless of the gratis warranty term, Mitsubishi shall not be liable for compensation to damages caused by any cause found not to be the responsibility of Mitsubishi, chance losses, lost profits incurred to the user by Failures of Mitsubishi products, damages and secondary damages caused from special reasons regardless of Mitsubishi's expectations, compensation for accidents, and compensation for damages to products other than Mitsubishi products and other duties.

5. Changes in product specifications

The specifications given in the catalogs, manuals or technical documents are subject to change without prior notice.

6. Product application

(1) In using the Mitsubishi MELSEC programmable logic controller, the usage conditions shall be that the application will not lead to a major accident even if any problem or fault should occur in the programmable logic controller device, and that backup and fail-safe functions are systematically provided outside of the device for any problem or fault.

(2) The Mitsubishi general-purpose programmable logic controller has been designed and manufactured for applications in general industries, etc. Thus, applications in which the public could be affected such as in nuclear power plants and other power plants operated by respective power companies, and applications in which a special quality assurance system is required, such as for Railway companies or National Defense purposes shall be excluded from the programmable logic controller applications.

Note that even with these applications, if the user approves that the application is to be limited and a special quality is not required, application shall be possible.

When considering use in aircraft, medical applications, railways, incineration and fuel devices, manned transport devices, equipment for recreation and amusement, and safety devices, in which human life or assets could be greatly affected and for which a particularly high reliability is required in terms of safety and control system, please consult with Mitsubishi and discuss the required specifications.

Type AnACPU/AnUCPU (AD57 control Instructions)

Programming Manual

MODEL	A2A/A3A-AD57-P-E
MODEL CODE	13J743
IB(NA)-66257-C(0312)MEE	

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