MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-A

User's Manual

External charactor display unit type A6FD

MITSUBISHI ELECTRIC

REVISIONS

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

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Sep., 1987	IB (NA) 66139-A	First edition
Apr., 1989	IB (NA) 66139-B	Correction Page 2-1, 3-1 "Instructions for Strategic Materials" added

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.

CONTENTS

1. GENERAL DESCRIPTION

This User's Manual describes the specifications, handling, programming procedures, etc. of the A6FD external display unit (hereinafter referred to as "A6FD") for use with the MELSEC-A series of Programmable Controllers.
The examples used in this manual are based on the MELSEC-A Series PCs. Other systems may be compatible providing the A6FD specifications are met.

1.1 How to Use This Manual

This manual is divided as follows:

Chapter 2 System Configuration
Describes the system configurations required for using the A6FD.

Chapter 3 Specifications
Performance, electrical and power supply specifications.

Chapter 4 Handling
Nomenclature and handling instructions.

Chapter 5 Loading and Installation
Installation and wiring instructions

Chapter 6 Display control signals and timing.
Explains the control signals required from the output unit to the A6FD.

Chapter 7 Programming
Explains the special instructions used to control the A6FD and gives program examples that do not use the special A6FD control instructions.

Chapter 8 Test
Pre-test and test procedures

Chapter 9 Troubleshooting

Chapter 10 Maintenance and Inspection

IB (NA) 66139-A

Appendices

External dimensions, character set and codes. Notes on connection of the A6FD with general types of output devices.

The following manuals may also be required

A1(E), A2(E), A3(E)CPU User's Manual
A1(E), A2(E), A3(E)CPU Programming Manual
A0J2CPU User's Manual (CPU edition)
A0J2CPU Programming Manual
A6GPP Operating Manual (A series)
Other A series manuals

2 SYSTEM CONFIGURATION

2.1 System Configuration

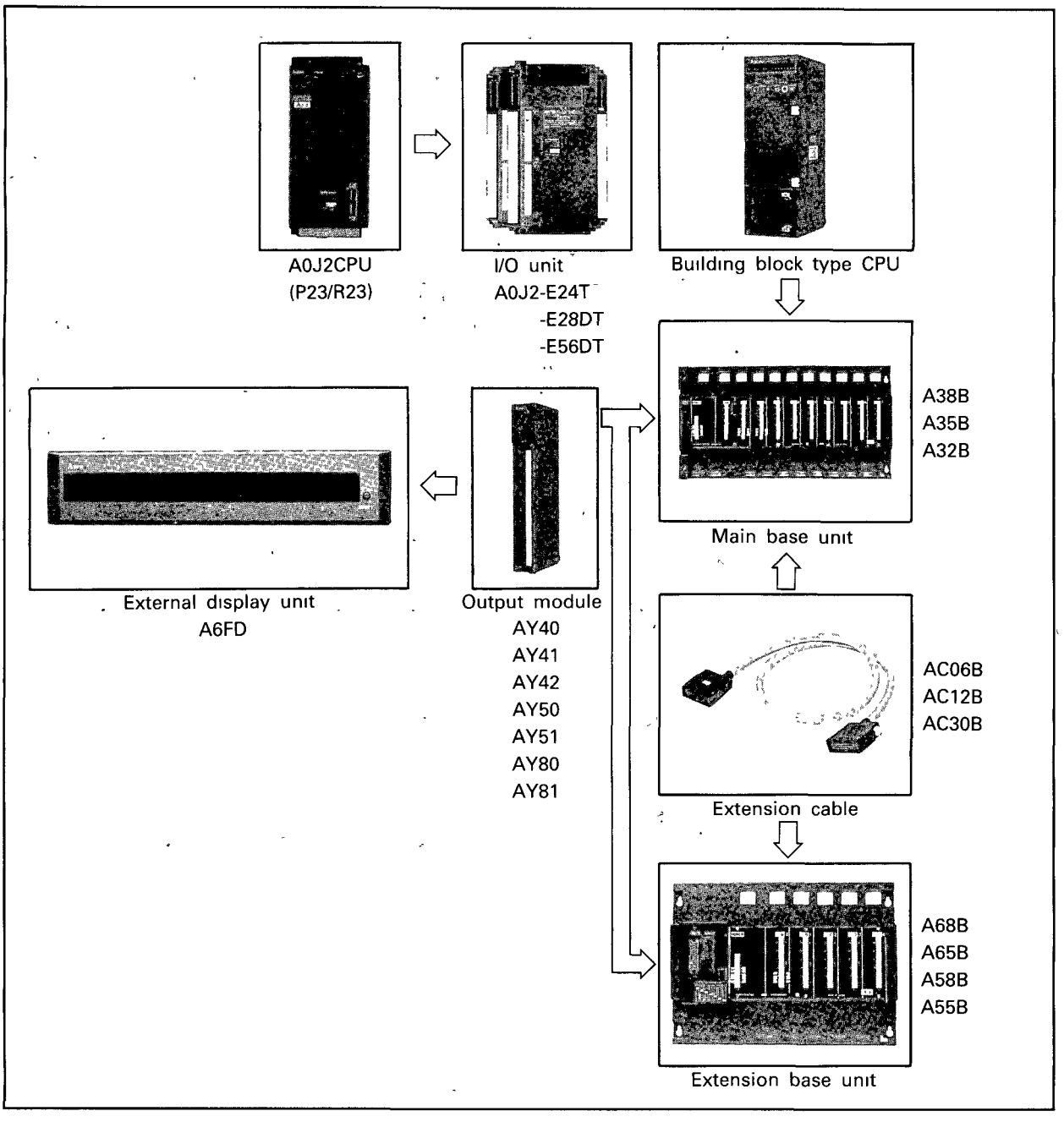


Fig. 2.1 System Configuration

POINT

1. **If using the A6FD in a data link system remote I/O station, refer to Section 6.1"Display Output Timing" (1) and Section 7.2 "Programming Application Example" (4).**
2. **An extension base unit cannot be connected to the A32B main base unit which does not have an extension connector.**

2.2 Equipment

Table 2.1 lists the A series output and I/O units to which the A6FD can be connected. (available at time of printing):

Name	Type	Output Specifications
Output unit (for A1, 2, 3CPU)	AY40	16-point, 12/24V DC transistor output unit (for 0.1A) (Sink output)
	AY41	32-point, 12/24V DC transistor output unit (for 0.1A) (Sink output)
	AY42	64-point, 12/24V DC transistor output unit (for 0.1A) (Sink output)
	AY50	16-point, 12/24V DC transistor output unit (for 0.5A) (Sink output)
	AY51	32-point, 12/24V DC transistor output unit (for 0.5A) (Sink output)
	AY80	16-point, 12/24V DC transistor output unit (for 0.5A with fuse) (Source output)
	AY81	32-point, 12/24V DC transistor output unit (for 0.5A with fuse) (Source output)

Name	Type	Output Specifications	
I/O unit (for A0J2)	A0J2-E24T	24 points	12/24V DC transistor output unit (for 0.5A) (Sink output)
	A0J2-E28DT	12 points	
	A0J2-E56DT	24 points	

Table 2.1 Unit List

POINT

1. **Relay output units should not be used due to the duty cycles imposed by the special A6FD control instructions**
2. **Any I/O slot may be used for the control of the A6FD.**

3. SPECIFICATIONS

3.1 General Specifications

Table 3.1 shows general specifications of the A6FD.

Item	Specifications				
Operating ambient temperature	0 to 55°C				
Storage ambient temperature	−20 to 75°C				
Operating ambient humidity	10 to 90%RH, non-condensation				
Storage ambient humidity	10 to 90%RH, non-condensation				
Vibration resistance	Conforms to *1JIS C 0911	Frequency	Acceleration	Amplitude	Sweep Count
		10 to 55Hz	—	0.075mm	10 times *(1 octave/minute)
		55 to 150Hz	1g	—	
Shock resistance	Conforms to JIS C0912 (10g x 3 times in 3 directions)				
Noise durability	By noise simulator 1500Vpp noise voltage, 1μs noise width and 25 to 60Hz noise frequency				
Dielectric withstand voltage	1500V AC for 1 minute across batch of AC external terminals and ground 500V AC for 1 minute across DC external terminals and ground				
Insulation resistance	5MΩ or larger by 500V DC insulation resistance tester across AC external terminals and ground				
Grounding	Class 3 grounding, grounding is not necessary of the operation of the unit				
Operating ambience	Free of corrosive gases. Dust should be minimal				
Cooling method	Self-cooling				

Table 3.1 General Specifications

REMARKS

One octave marked * indicates a change from the initial frequency to double or half frequency. For example, any of the changes from 10Hz to 20Hz, from 20Hz to 40Hz, from 40Hz to 20Hz, and 20Hz to 10Hz are referred to as one octave.

*1JIS: Japanese Industrial Standard.

3.2 Performance Specifications

Table 3.2 shows the A6FD performance specifications.

Item	Specifications
Line voltage	Input voltage. 100V AC/200V AC (0 12A max)
Applicable line voltage	85 to 264V AC (50/60Hz ± 5%)
Applicable unit	AY40, AY41, AY42, AY50, AY51, A0J2-E24T, A0J2-E28DT, A0J2-E56DT sink output units AY80, AY81 source output units
Interface Rated input voltage Rated input current Applicable voltage Input resistance	8 data lines (D0 to D7), 1 strobe line (STROBE), 1 common line (COM) 12/24V DC 4mA (12V DC), 10mA (24V DC) 10 2 to 26.4V DC(Ripple ratio within 5%) Approx. 2.4KΩ
Internal isolation	Photocoupler
Display type	LED (red) 5 x 7 dots, dynamic method, 16 digits in 1 line ASCII
Controls fitted	Manual reset switch
External connection	20-point terminal connector M3 (Metric thread) x 6 screws
Applicable wire size	2mm² (14AWG) or less (Applicable tightening torque· 7kg cm (0.51lb·ft))
Applicable solderless terminal	To fit 3mm (0 12 inch) dia. terminal screws 1 25-3, 1.25-YS3A, 2S3, 2-YS3A, V1 25-3, V1.25-YS3A, V2-S3, V2-YS3A
Size mm(inch)	145(5.71) (D) x 290(11 42) (W) x 60(2 36) (H)
Weight kg(lb)	Approximately 1 5(3.3)

Table 3.2 Performance Specifications

The A6FD is not guaranteed against instantaneous power failure.

REMARKS

Before shipment, the A6FD is checked to ensure that it displays data properly, using a shielded cable 200m(656 18ft) in length and 0 18mm²(24AWG) CSA

3.3 Interface Specifications

The external equipment interface of the A6FD are given below.

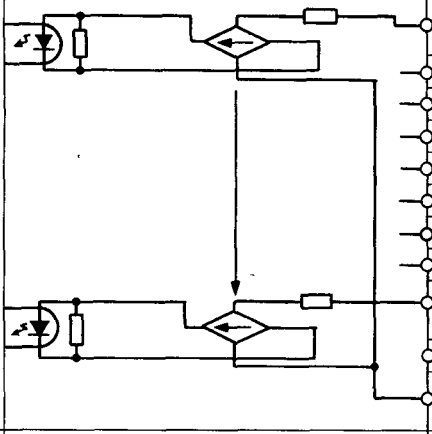
I/O	Internal Circuit	Terminal Number	Signal	A6FD ← PC Output (I/O in slot "n")	
				Sink output unit	Source output unit
Input		TB1	D0	D0 ← Yn + 0 D1 ← Yn + 1 D2 ← Yn + 2 D3 ← Yn + 3 D4 ← Yn + 4 D5 ← Yn + 5 D6 ← Yn + 6 D7 ← Yn + 7 STROBE ← Yn + 8 Consists of 8 outputs for data signals Yn+0 to Yn+7 (D0 to D7), 1 output for strobe signal Yn+8 (STROBE), and COM (TB11).	
		TB2	D1		
		TB3	D2		
		TB4	D3		
		TB5	D4		
		TB6	D5		
		TB7	D6		
		TB8	D7		
		TB9	STROBE (Strobe signal)		
		TB10	NC		
		TB11	COM (Common)	Connect 12/24V DC. (+)	Connect 12/24V DC. (0V)
Output	Reset switch — RA — RA — A6FD To display switch	TB12	NC	The reset switch clears the A6FD display and outputs a reset signal from TB13 and TB14 to the field. TB13 and TB14 are relay contact outputs Refer to Table 3.4	
		TB13	RESET1		
		TB14	RESET2		
		TB15	NC		
		TB16	NC		

Table 3.3 External Interface Specifications

Item	Specifications
Applicable voltage	100V AC, 200V AC, 5 to 48V DC
Minimum contact current value	1mA
Maximum contact current value	2A (Resistor load)

Table 3.4 "Reset" output from A6FD

POINT

1. **The same 12/24V DC power supply should be used for both the A6FD and the transistor output module.**
2. **The reset switch clears the display and initializes the unit. It also closes the relay contacts across TB13 and TB14.**
3. **The "NC" terminals are unused by the A6FD (NC for no connection)**

REMARKS

For the sink and source output units, refer to Appendix 3

3.4 Power Supply Specifications

The A6FD power supply specifications are given below.

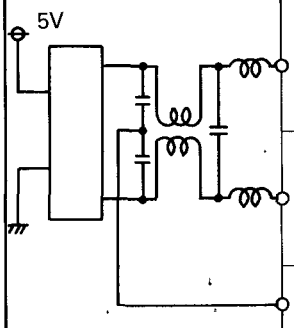
Internal Circuit	Terminal Number	Signal	Specifications
	TB18	100, 200V AC	Any supply of between 85 and 264V AC may be applied to terminals TB18 and TB19. Input current 0 12A (max.) Frequency. 50/60Hz ± 5% Internal voltage: 5V DC 2A
	TB19	100, 200V AC	
	TB20	LG	Power filter ground

Table 3.5 Power Supply Specifications

POINT

1. **A 200msec delay occurs between power-up and the A6FD becoming active.**
2. **Half the supply voltage appears at the LG terminal (TB20). Do not touch this terminal if the unit is not grounded.**

IB (NA) 66139 A

4. HANDLING

4.1 Handling Instructions

Handle the A6FD carefully as described below:

(1) Do not subject the unit to impact loads.

(2) Guard against the entry of conductive debris into the unit. If any should enter, switch off the power and remove it.

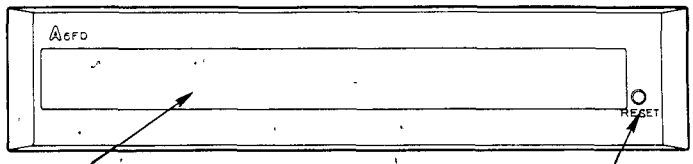
(3) Do not touch the printed circuit board.

(4) Tighten screws to the torques given below:

Screw	Torque Range kg cm (lb ft)
Terminal block screws (M3 metric thread)	8 (0 58) to 14 (1.01)
Terminal block fixing screws (M4 metric thread)	8 (0.58) to 14 (1.01)
Unit mounting screws (M4 metric thread)	5 (0.36) to 8 (0 58)

4.2 Nomenclature

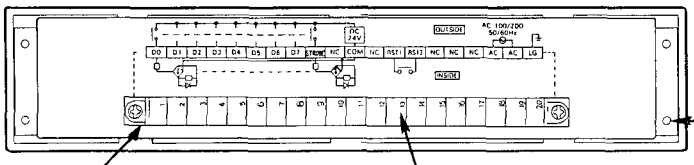
Front View



LED Indicator
Displays 16 ASCII characters.

Manual Reset Switch
Clears and initializes the display and closes the relay output contacts across TB13 and TB14.

Rear View

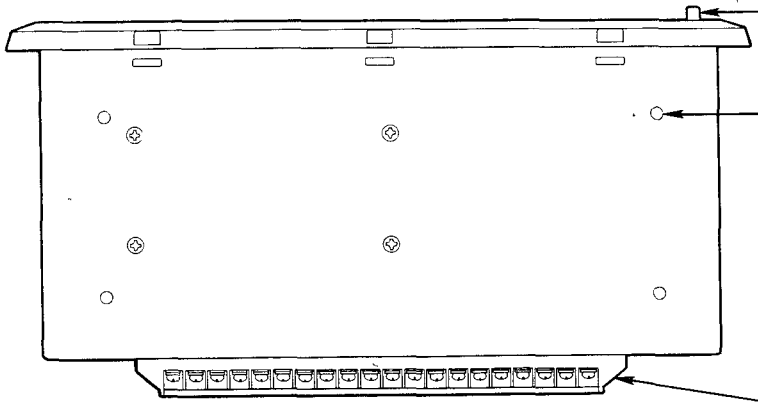


Terminal Block Fixing Screw (M4 metric thread)
Fixes the unit to the terminal block.

Terminal Block
For connection of supply and I/O wiring.

Unit Mounting Hole
4 x M4 (metric thread) screw holes

Bottom View



Manual Reset Switch

Unit Mounting Hole
4 x M4 (metric thread) screw holes

Terminal Block

5. LOADING AND INSTALLATION

5.1 Installation Environment

The installation environment should meet the following requirements:

(1) Ambient temperature between 0 and 55°C.
(2) Ambient humidity between 10 and 90%.
(3) No condensation (e.g. due to sudden temperature changes)
(4) No corrosive and/or combustible gases.
(5) No airborne conductive or organic powders or mists.
(6) Protected from direct exposure to sunlight.
(7) Protected from strong power and magnetic fields.
(8) Protected from vibration and shock.
(9) Away from sources of heat such as heating elements.

The installation environment should meet the specifications quoted in Section 3.1.

5.2 Mounting

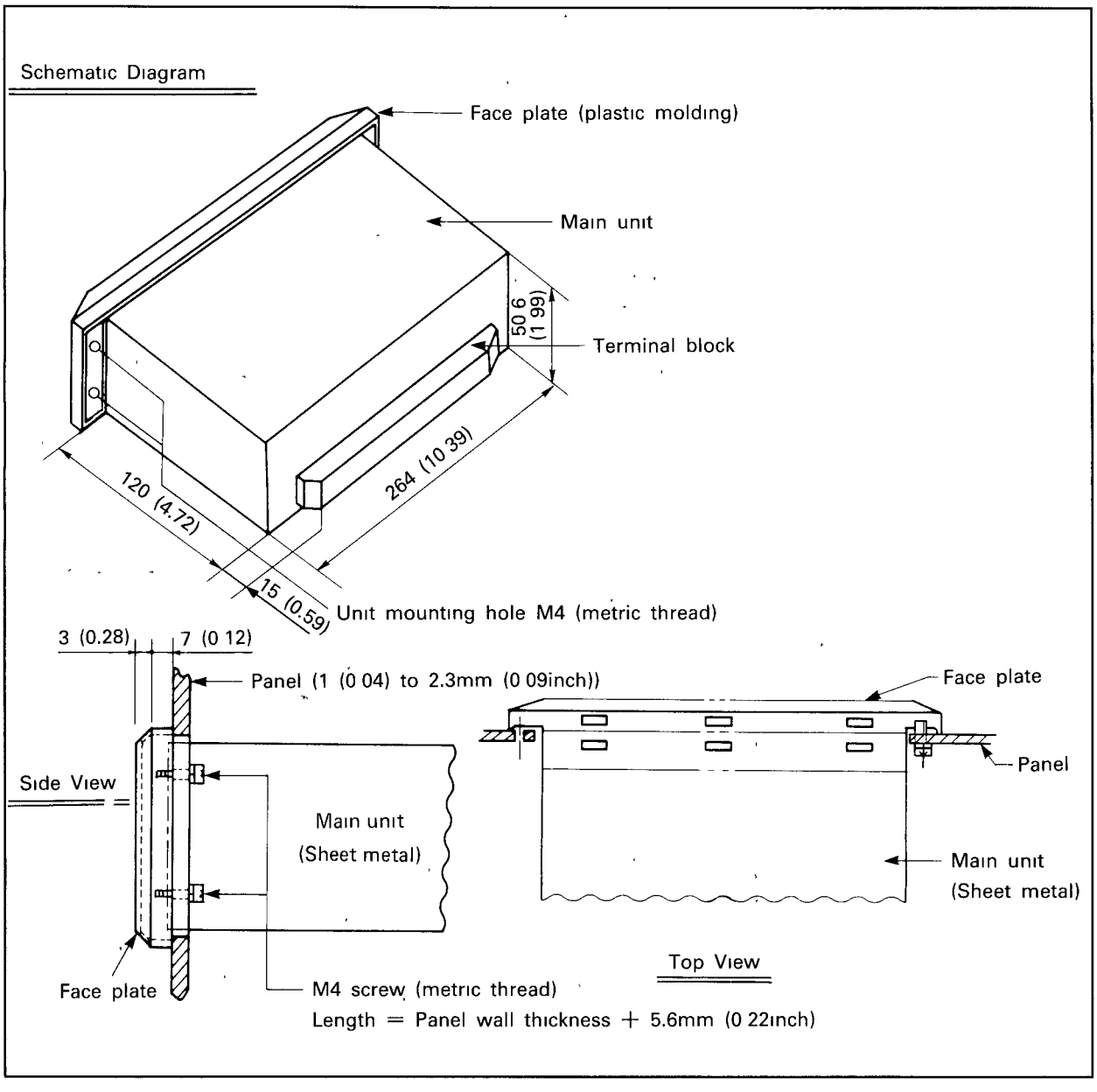
5.2.1 General precautions

When installing the A6FD in a panel etc. note the following:

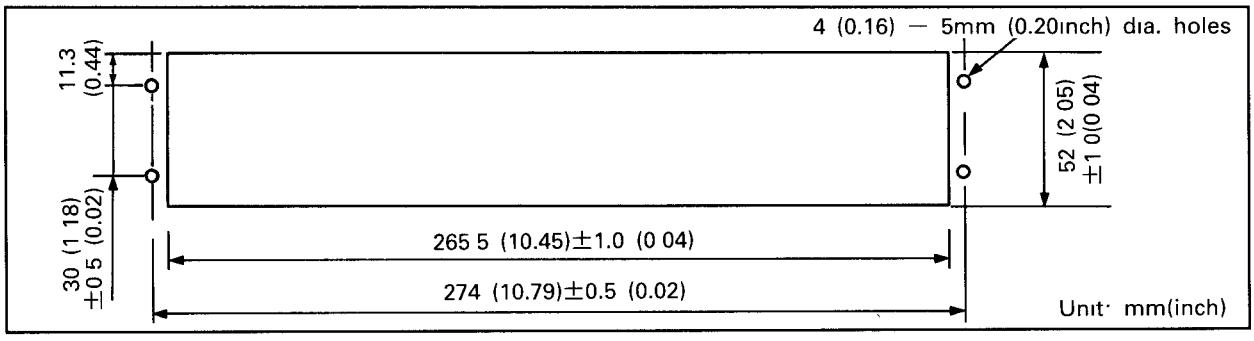
(1) Install the unit in a well-ventilated place with the operating ambient temperature less than 55°C.
(2) Avoid installing the unit over large sources of heat (such as a large-capacity resistor, transformer, or heater).
(3) Do not install the unit near sources of vibration or impact loads such as large magnetic contactors and no-fuse breakers.
(4) Ensure any "L" brackets used do not obstruct the air flow for ventilation.
(5) When installing the A6FD on a flat surface, ensure that there is sufficient clearance for the connection of solderless terminals to the terminal block.
(6) The mounting holes in the rear of the face plate are tapped for M4 (Metric thread) screws. Recommended screw length is 5.6mm (0.22inch) plus the panel wall thickness.
(7) The mounting holes in the rear of the face plate are tapped for M4 (Metric thread) screws. Recommended screw length is mounting surface thickness plus 5mm (0.20inch).

5.2.2 Mounting

(1) Installing the unit in a panel cut-out.

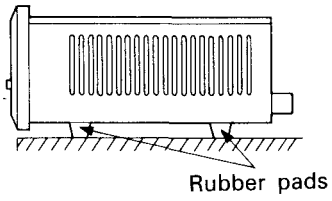


(2) Cut-out dimensions and hole centres.

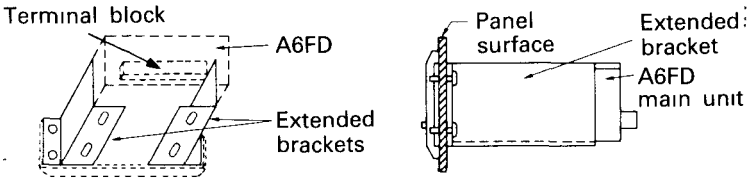


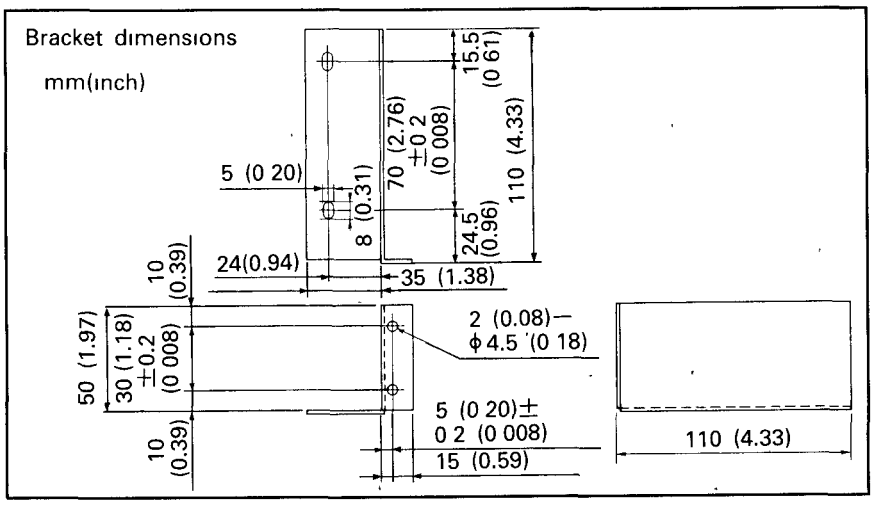
Refer to the rear view in Appendix 1.

(3) Installation on a flat surface
Rubber pads should be used to provide clearance between the flat surface and the A6FD for the face plate and solderless terminal connections, as shown below.



(4) Installation using extended brackets.
See below.

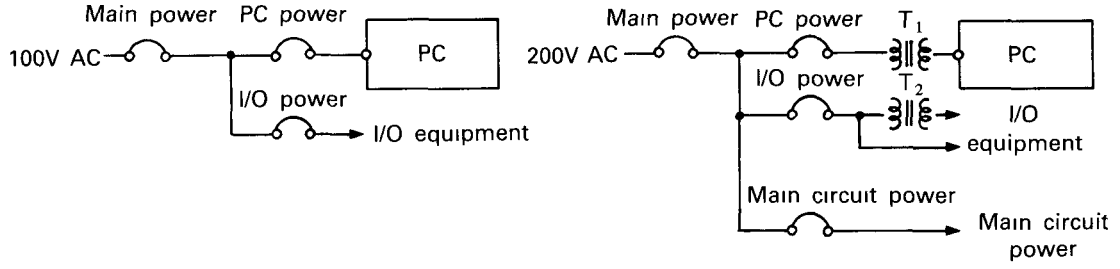




5.3 Wiring

5.3.1 Wiring precautions

(1) Power supply wiring
(a) When line voltage fluctuations are liable to cause the supply voltage to go outside the specified range, use a constant voltage transformer.
(b) The power supply used should generate minimal noise between lines and between lines and ground. If the noise generated is excessive, an isolation transformer should be used.
(c) Separate PC power supply, I/O equipment and main circuit wiring as shown below:

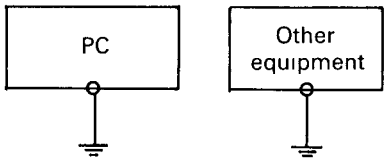


(d) Use twisted wire for 100V AC, 200V AC and 24V DC wiring and use the shortest wire length possible.
(e) Use the maximum cable size possible (up to $2mm^2$ (14AWG)) to minimize voltage drops.
(f) Do not bundle 100V AC and 24V DC wires with the main circuit (high voltage or large current) and I/O signal cables. Avoid running these wires near the main circuit and I/O signal cables and, if possible, keep them more than 100mm (3.94inch) away.

(2) I/O equipment wiring
(a) Use $2mm^2$ (14AWG) wire or smaller for I/O wiring.
(b) Run the input wires separately from the output wires.
(c) Keep the I/O signal wires more that 100mm (3.94 inch) away from any main circuit wiring.
(d) Where I/O signal wires are run in close proximity to other wiring, use shielded cable, preferably grounded at the PC end.
(e) Ground any piping used to route cables.
(f) Separate the 24V DC I/O signal lines from 100V AC and/or 200V AC wires.

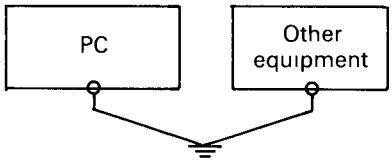
(3) Grounding wiring
(a) Use class 3 grounding (Grounding resistance 100Ω or less). Where possible, ground the PC independently of other equipment.
(b) Use $2mm^2$ (14AWG) or larger cable for grounding.
(c) The grounding point should be as near to the PC as possible.
The grounding cable length should be minimal.
(d) The unit will still operate if it is not grounded.

(e) if independent grounding is impractical, use the common grounding method shown below.



Class 3 grounding

(1) Exclusive grounding. Best

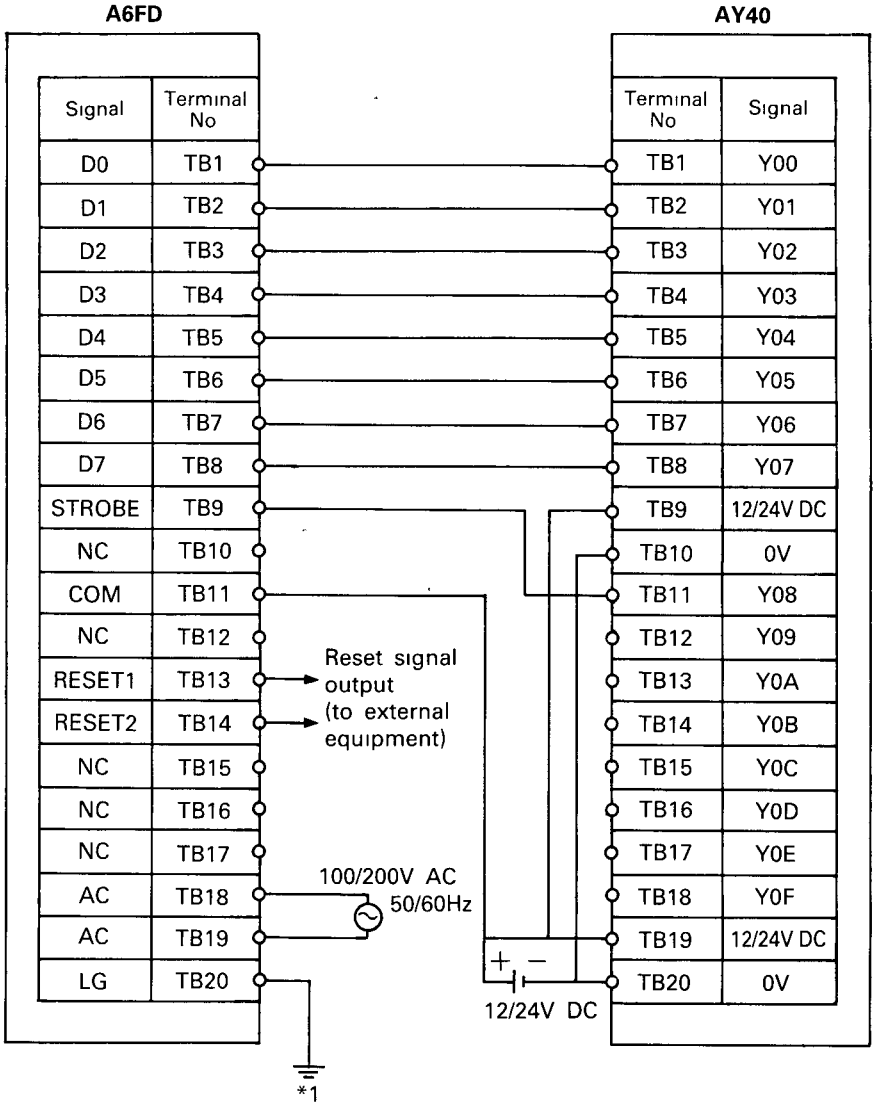


Class 3 grounding

(2) Common grounding. Good

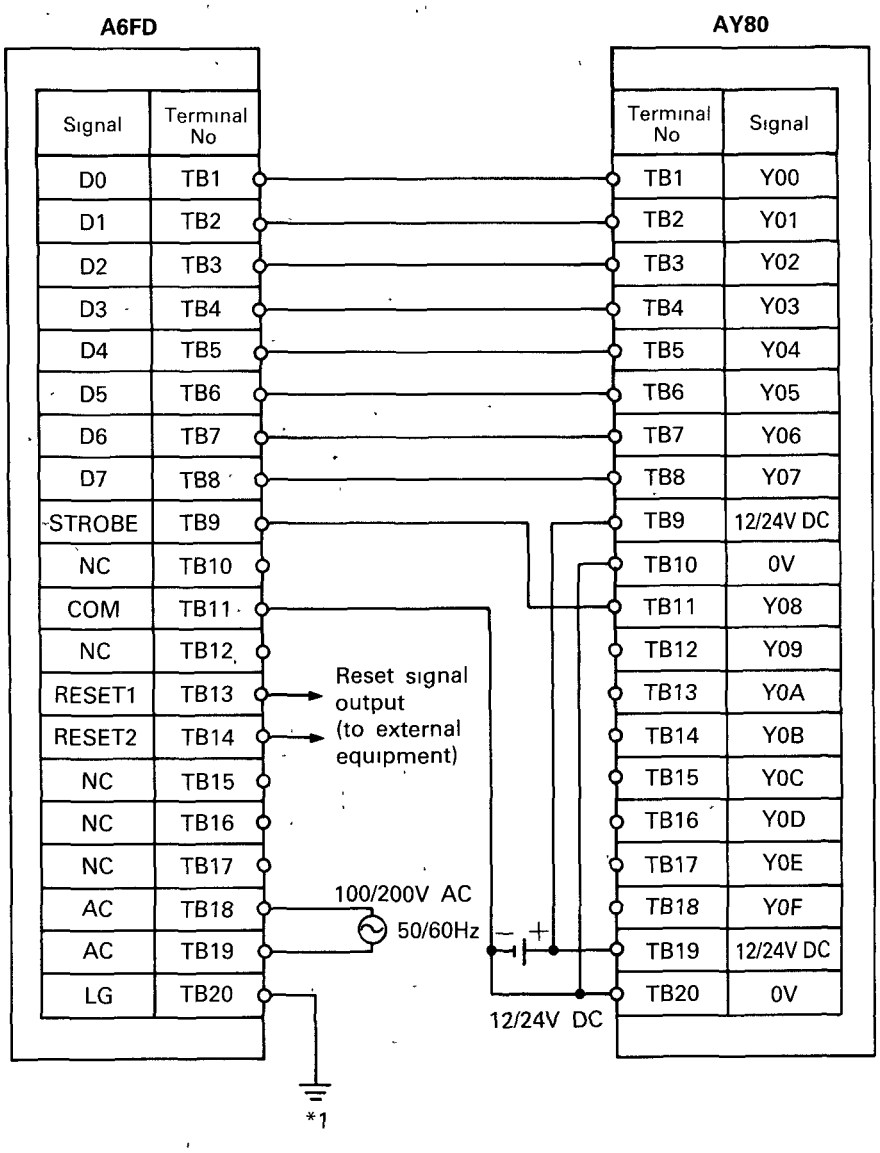
5.3.2 Output unit wiring

(1) Connection with sink output unit (AY40, AY41, AY42, AY50, AY51, A0J2-E24T, A0J2-E28DT, A0J2-E56DT)
Connection with the AY40 output unit is shown below. The I/O numbers used in this example assume that the AY40 is loaded in slot 0 of the main base unit.



*1: The LG terminal must always be grounded.

(2) Connection with source output unit(AY80, AY81)
Connection with the AY80 output unit is shown below. The I/O numbers used in this example assume that the AY80 is loaded in slot 0 of the main base unit.



*1: The LG terminal must always be grounded.

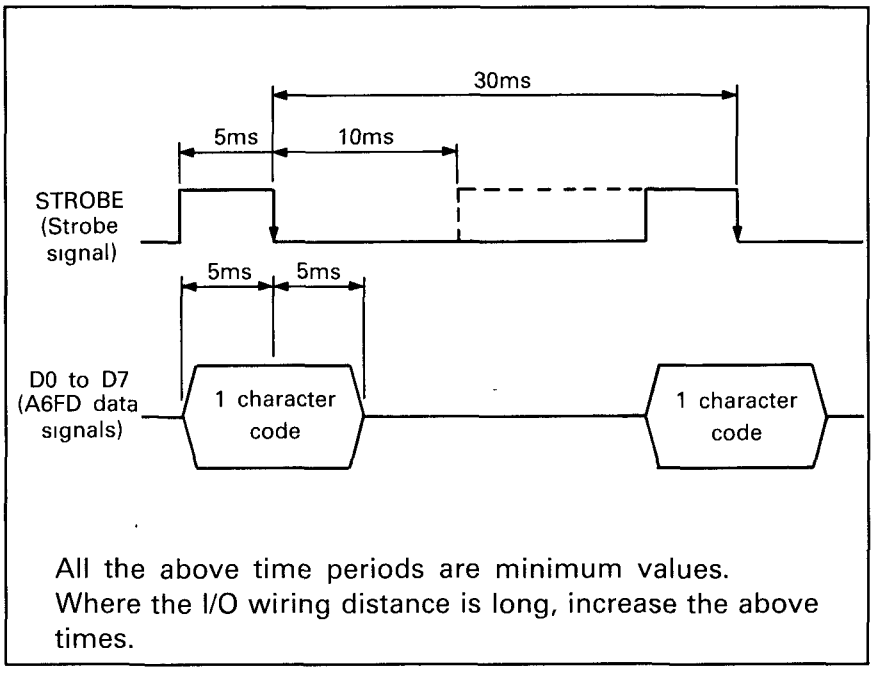
6. DISPLAY CONTROL SIGNALS AND TIMING

The MELSEC-A series range of programmable controllers features two special instructions which may be used to control the A6FD display. These instructions load a series of 16* characters onto the display automatically by controlling the data and strobe lines from the PC operating system. Where other types of message display are required, e.g. a slow scroll, or where a different PC is being used, the sequence program must control the data and strobe lines as explained in this section.

6.1 Display Output Timing

(1) Display control signal timing

The data and strobe signals should be controlled as follows:



All the above time periods are minimum values.
Where the I/O wiring distance is long, increase the above times.

1) The character code (ASCII code in binary) is presented to the data inputs. After a minimum of 5ms, the strobe signal a switches from high to low.
2) The character code is read when the strobe signal switches from high to low, and must be present for a minimum of 5 ms.
3) The strobe signal should be on for a minimum of 5ms and off for a minimum of 10ms, however the cycle time should be a minimum of 30ms. (To allow for software processing in the A6FD)

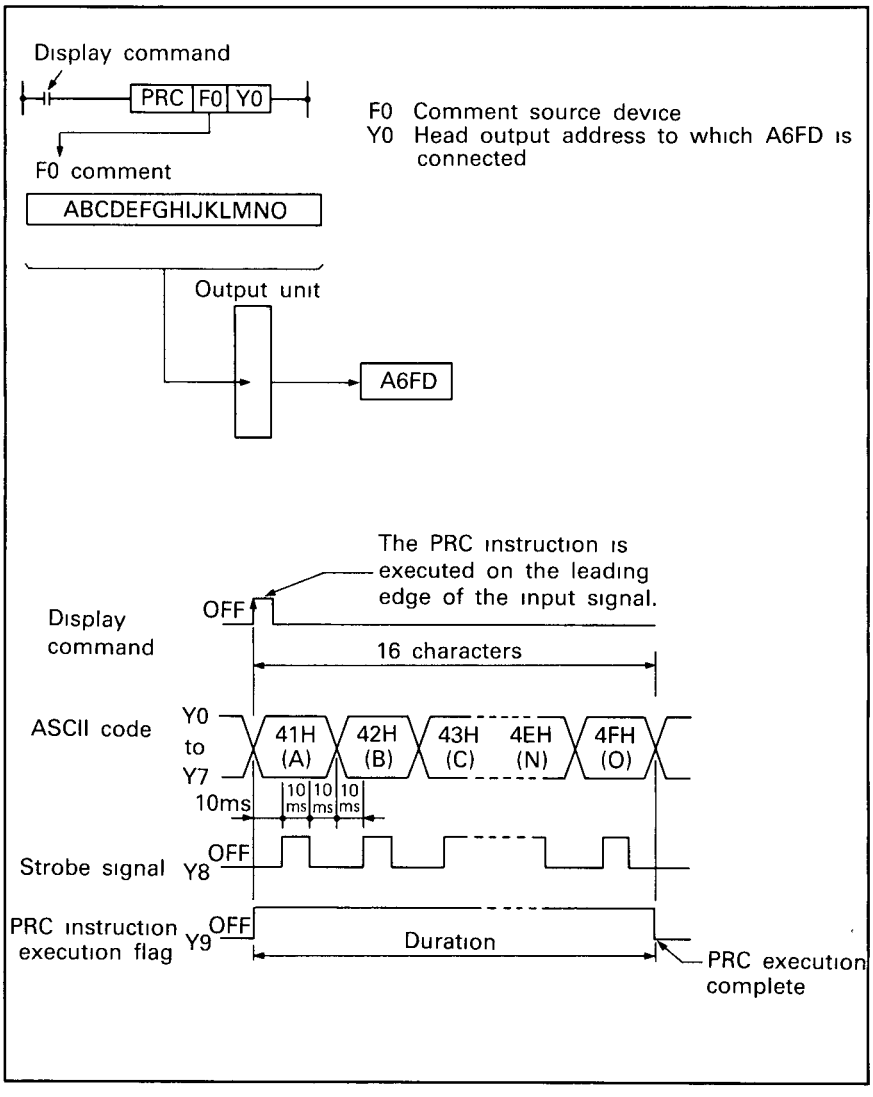
* When the A3HCPU is used the number of characters is unlimited. In this case consecutive characters are output until code 00H is read from the source data.

IB (NA) 66139-A

POINT

1. When the A6FD is being used in a remote I/O station (i.e. in the MELSEC-NET datalink network) the PR and PRC instructions cannot be used and the sequence program must control the data and strobe signals.

(2) The PR and PRC instructions generate the following data and strobe signal timings.



1) The comment data associated with the source device is displayed via the output module at head address Y0.
2) One character is output every 30ms, the total processing time is therefore 30 x 16 = 480ms.
   Processing of the PR and PRC instructions is independent of the PC scan time and does not effect it.
3) The strobe signal is generated automatically when the PR and PRC instructions are executed. The strobe signal causes the characters on the display to shift one space to the left.
4) The PRC instruction execution flag is switched on to indicate that the character codes are being output. This remains on until all 16 characters have been displayed. It should be used as an interlock in the sequence program to prevent the display instruction from being repeated before all 16 characters have been displayed.

6.2 Display Method

(1) One character consists of 5 by 7 dots on the LED (red).
(2) 16 ASCII characters are displayed from right to left in order. The display may be cleared by pressing the manual reset button. This also initializes the A6FD.

In the example shown on the previous page, when the display command contact closes the comment associated with device F0 (ABCDEFGHIJKLMNO) is displayed on the A6FD.

7. PROGRAMMING

7.1 Basic Display Programs

ASCII Print Instructions

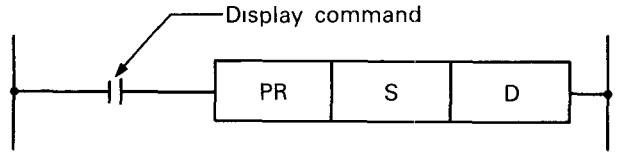
(1) PR instruction
(2) PRC instruction (device comment)

POINT

Only devices marked ⊛ are available on the A0J2CPU.

(1) PR instruction

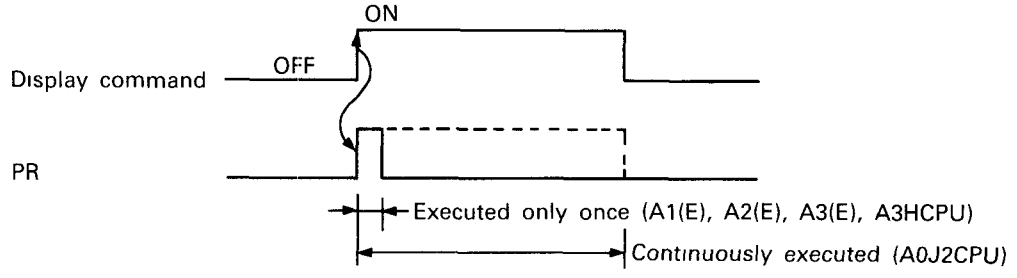
	Available Device																			Digit Specification	Number of Steps	Subset	Index	Carry Flag	Error Flag	
	Bit device						Word (16-bit) device									Constant		Pointer		Level							
	X	Y	M	L	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9010	M9011
S							⊛	⊛	⊛	⊛	○											7		○		○	○
D		⊛																								



S	Head number of devices containing ASCII code
D	First output address for data output.

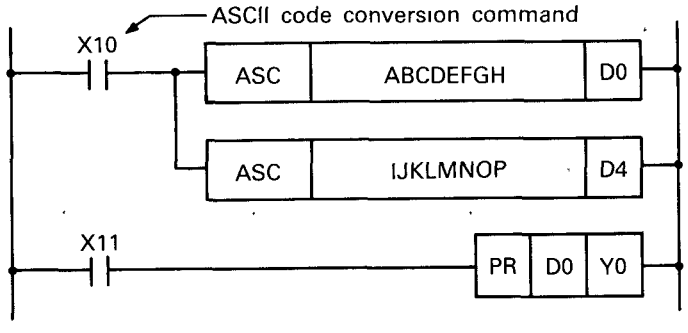
Outputs the ASCII data stored in consecutive source devices starting at device "S" to the specified series of output points.

Execution condition



IB (NA) 66139-A

Basic Program



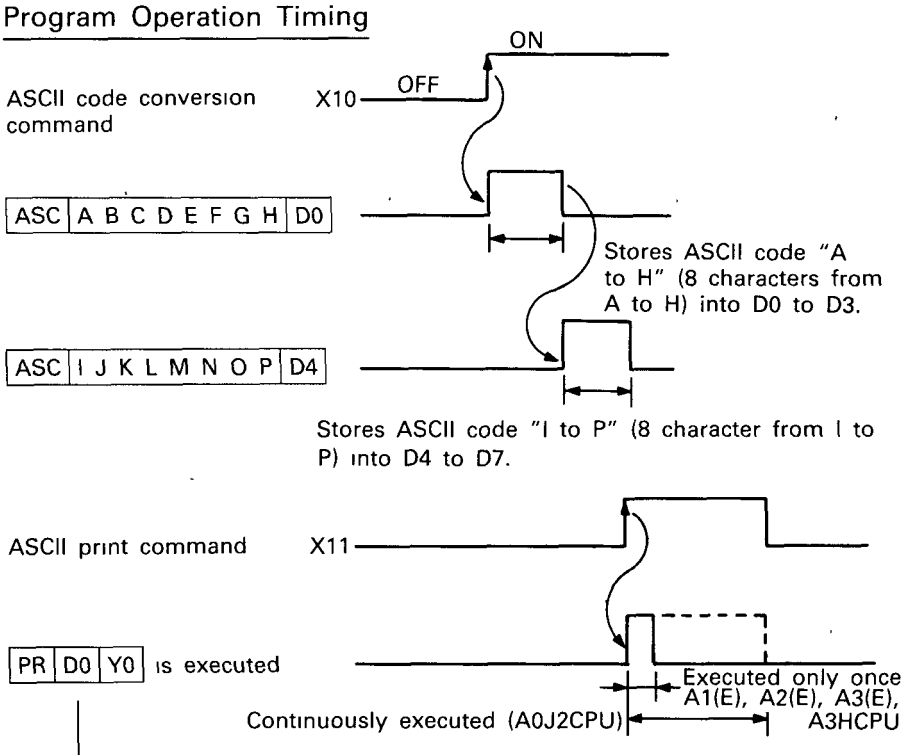
Number of Steps	Instruction	Device	
0	LD	X10	
1	ASC	ABCDEFGH	D0
14	ASC	IJKLMNOP	D4
27	LD	X11	
28	PR	D0	Y0
35	END		

Program Operation

When X10 turns on, "ABCDEFGHIJKLMNOP" is converted into ASCII codes and stored into D0 to D7. When X11 turns on, the ASCII code in D0 to D7 is output to Y0 to Y9.

When the A0J2CPU, the A1(E), A2(E) or A3(E) CPUs are used, 16 consecutive characters are output by this instruction. When the A3HCPU is used the number of output characters is unlimited, the ASCII string is continuously output until the code "00H" is read from the souce data.

Program Operation Timing



The 16-character ASCII code stored in D0 to 7 (8 points) are output from the output unit at head address Y0.
Outputs used Y0 to 9.
Output data
Y0 to Y7: ASCII code output
Y8: Strobe signal
Y9: PR instruction execution flag
For the display output timing, refer to Section 6.1.

The data displayed on the A6FD is shifted from right to left in order until the complete string ABCDEFGHIJKLMNOP is displayed.

POINT

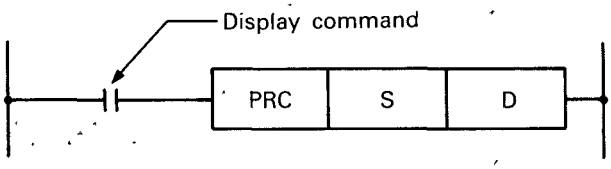
1. **The ASCII codes used for the PR instruction may be generated using the ASC instruction (alphanumeric character to ASCII code conversion) or may be stored in the PC device memory after using the List Test function to load the alphanumeric data into the source data registers.**
2. **Devices to which the PR instruction is applicable are marked ○.**

(2) PRC instruction

	Available Device																			Digit Specification	Number of Steps	Subset	Index	Carry Flag	Error Flag	
	Bit device						Word (16-bit) device									Constant		Pointer	Level							
	X	Y	M	L	B	F	T	C	D	W	R	A0	A1	Z	V	K	H	P	I	N					M9012	M9010	M9011
S	○	○	○	○	○	⊛	○	○	○	○	○							○	○			7		○			
D		⊛																									

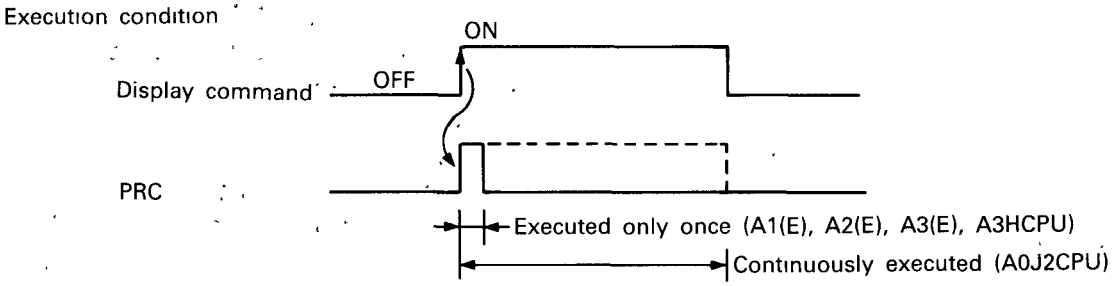
POINT

Only devices marked ⊛ are available on the A0J2CPU.

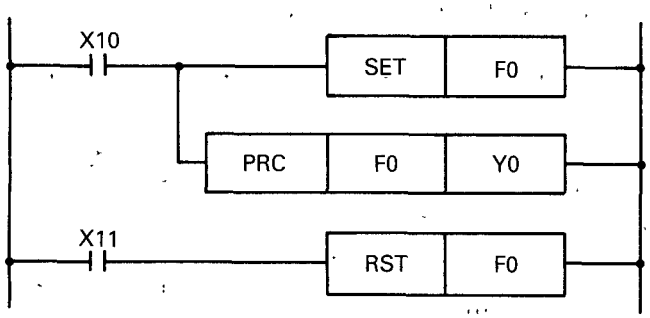


S	Source device of comment data.
D	First output address for data output.

Outputs the alphanumeric comment assigned to the specified source device.



Basic Program



Coding

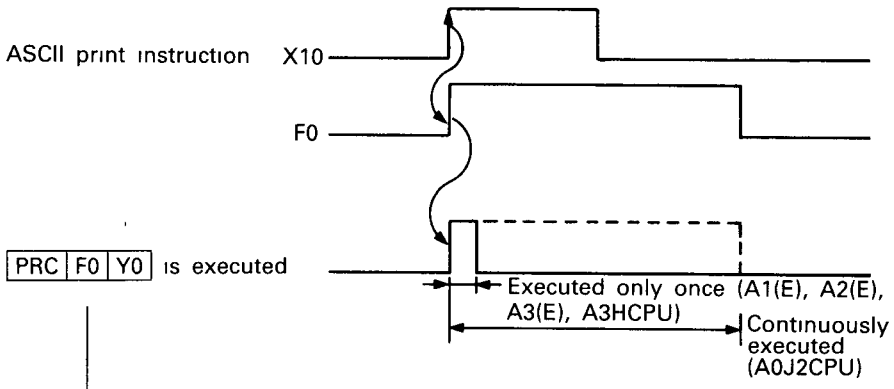
Number of Steps	Instruction	Device	
0	LD	X10	
1	SET	F0	
4	PRC	F0	Y0
11	LD	X11	
12	RST	F0	
15	END		

Program Operation

When X10 is turned on, F0 is turned on and, at the same time, the comment of F0(ASCII code) is output to Y0 to Y9.

In this case, the F0 comment ABCDEFGHIJKLMNO *has already* been entered as comment data.

Program Operation Timing



The comment (ASCII code) of F0 is output from the output unit at head address Y0.
Used outputs are Y0 to 9.
Output data
- Y0 to Y7: ASCII code output
- Y8: Strobe signal
- Y9: PRC instruction execution flag

For the display output timing, refer to Section 6.1

The data displayed on the A6FD is shifted from right to left in order until the complete string ABCDEFGHIJKLMNOP is displayed

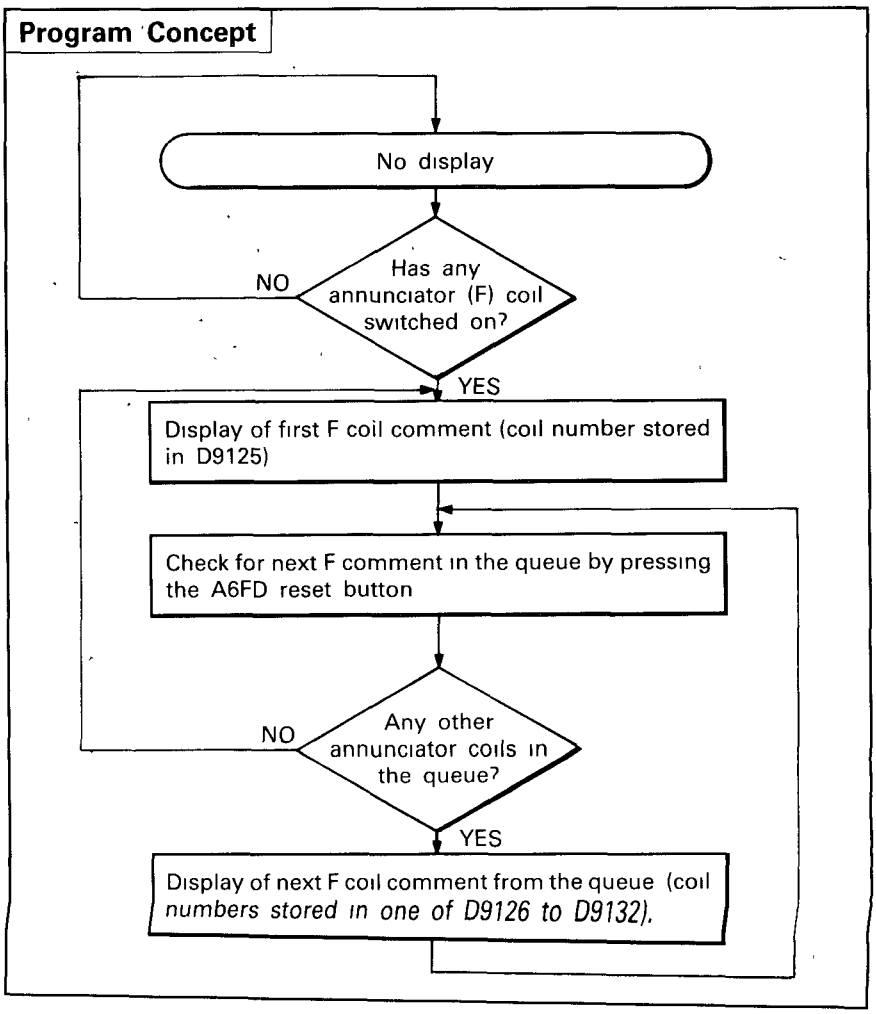
POINT

1. **Before executing the PRC instruction, comments must be entered into the PC memory comment area.**
2. **Only 128 comments (dedicated to F0 to F127) may be entered on the A1(E)CPU(P21/R21).**
   Only 95 comments (dedicated to F0 to F94) may be entered on the A0J2CPU(P21/R21).
3. **F coils must be switched on by the OUT or SET instructions only.**

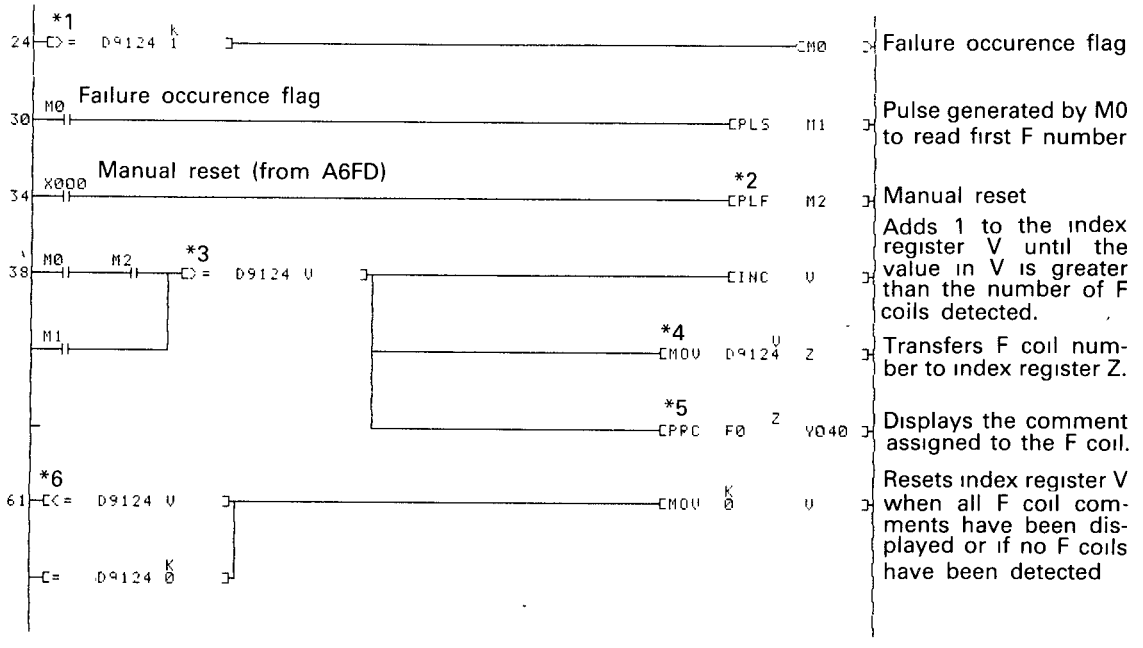
7.2 Programming Application Examples 1 (For A1, A2, A3CPU)

In the following program examples the annunciator devices (F) are used to flag error messages. The annunciator devices may be used to queue error codes (in the form of annunciator device numbers) in special function FIFO data registers.
The following special function data registers have been used: D9124(stores the number of F coils which have been switched on, up to a maximum of 8.) and D9125 to D9132 (A sequence of 8 consecutive special registers arranged as a FIFO table in which the annunciator coil numbers are stored as they are switched on).
When the first annunciator coil (F) is switched on, D9124 is incremented by 1 and the F coil number is stored in special data register D9125.
Any subsequent annunciator coil switching on which has not already been entered into the queue will cause D9124 to be incremented by 1 and its coil number will be entered into the first empty register after D9125 (up to D9132).

(1) Display of annunciator comment using manual reset.
In this program, the comment for any annunciator coil which has been switched on is output to the display. Pressing the reset button on the A6FD causes the next comment in the queue to be displayed.
The program flow chart is shown below.



Program Example



Program Explanation

*1: [>=][D9124][K1] ..... Continuity when the number of detected F coil "on" occurences is one or more.

*2: [PLF][M2] ..... The reset switch is wired to input X0. When the reset button is released, (i.e. X0 goes from on to off) a pulse is output on M2. This prevents the PRC instruction from being executed while the A6FD is being reset.

*3: [>=][D9124][V] ..... Allows 1 to be added to index register V if the value in D9124 is greater than that in V.

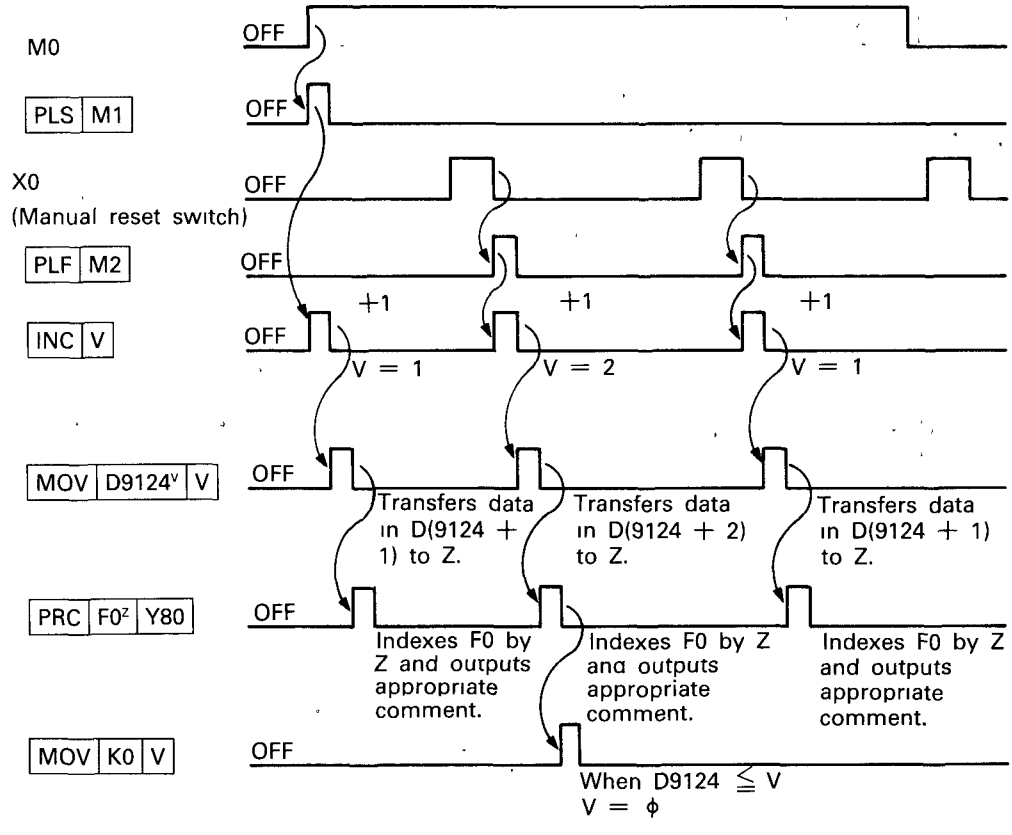
*4: [MOV][D9124^{V}][Z] ..... Moves the contents of data register D9124, indexed by V, (i.e. D(9124 + V)) to index register Z.

*5: [PRC][F0^{Z}][Y80] ..... Displays the appropriate F coil comment on the A6FD wired to outputs Y80 ~ Y8F. The F coil number is specified as F0 indexed by Z (i.e. F(0+Z).

*6: [<=][D9124][V] ..... Checks that all F coil "on" occurences have been processed. If they have, the index register V is reset to 0, and the program will repeat its operation.

Program operation

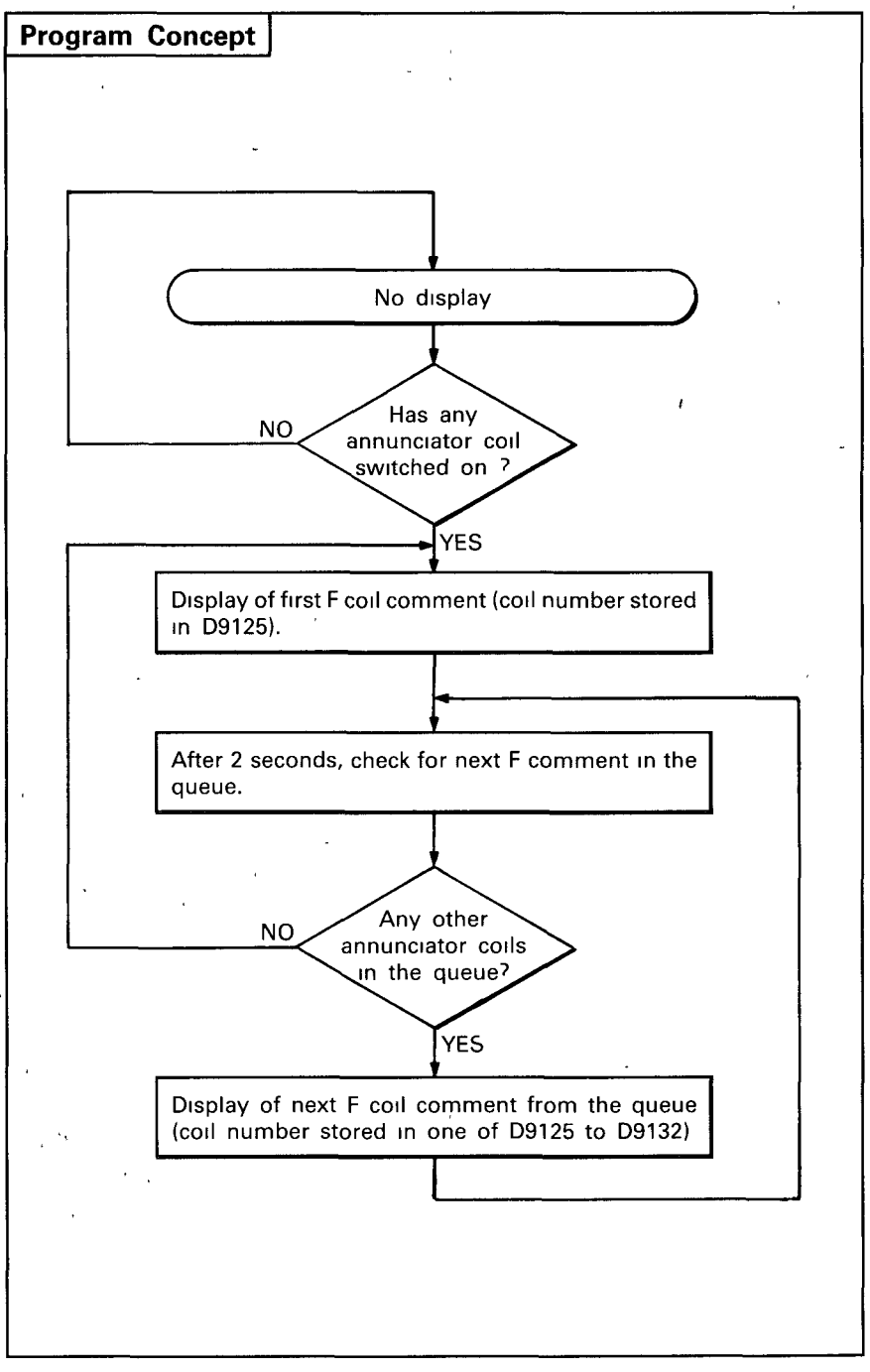
The following explanation assumes that two F coils have been detected (i.e. the value in D9124 is 2).



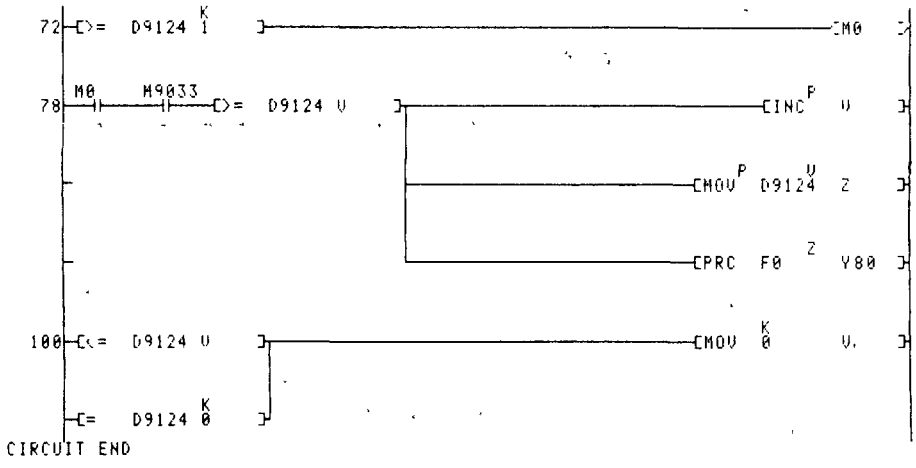
POINT

1. **Press the manual reset switch to clear the A6FD display.**
2. **Only 8 F coil occurences can be stored in the FIFO table (D9125 to D9132).**
   Removing an entry from the FIFO table causes all subsequent entires to move up one place.
   When the A3(E)CPU or A3HCPU is used, 1 is subtracted from the contents of D9124 each time the INDICATOR RESET button is pressed. (The INDICATOR RESET button is located on the front of the CPU and is used to reset the CPU's ASCII display).
3. **Provide interlocks in the PC program to prevent data output to the A6FD before its 200msec start-up time has elapsed.**

(2) Display of annunciator comment using PC timer
The comment for any annunciator coil which has been switched on is output to the display. Successive F coil entries in the FIFO table are displayed by the internal clock pulse (M9033).
The program flow chart is shown below:



Program Example



Failure occurrence flag

Adds 1 to V when M9033 is on, when D9124 ≧ V

Transfers F coil number number from D(9124+V) to Z.

PRC execution
Displays the relevant F coil comment.

Clears data in V if D9124 ≦ V or D9124 = 0

Resets V when D9124 ≦ V or D9124 = 0.

Instruction Explanation

*1: [>=][D9124][K1] ..... Continuity when the number of detected F coil "on" occurences is one or more.

*2: M9033 ..... Special function contacts. Close every 1 second.

*3: [>=][D9124][V] ..... Allows 1 to be added to index register V if the value in D9124 is greater than that in V.

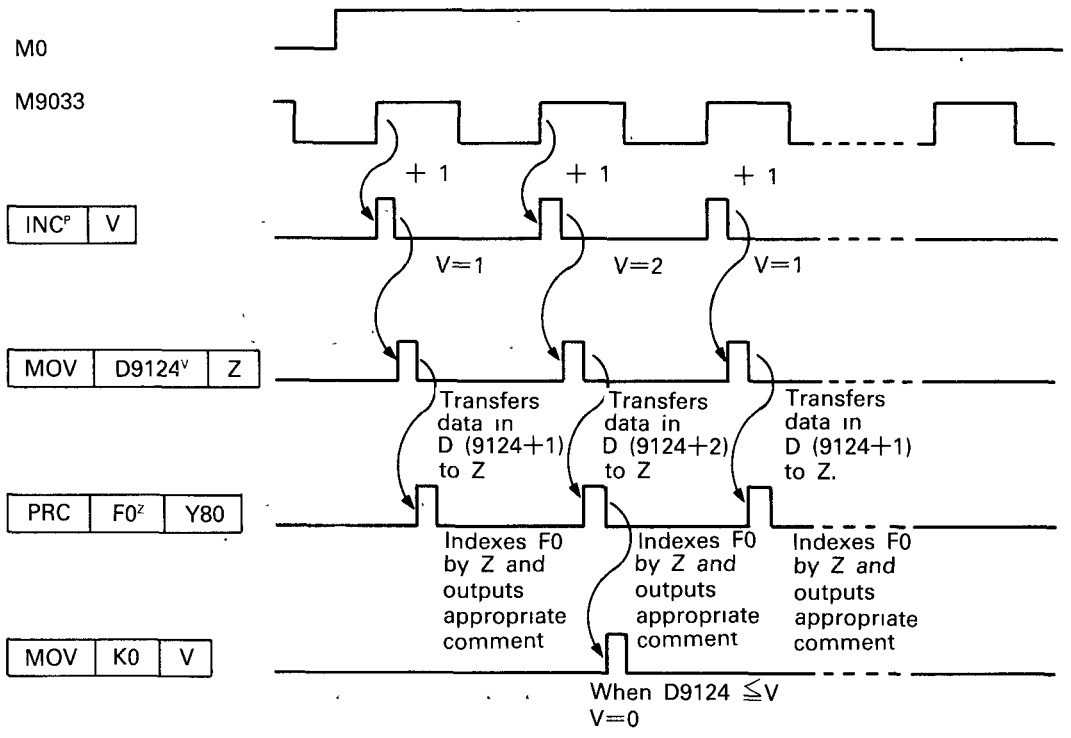
*4: [MOV^{P}][D9124^{V}][Z] ..... Moves the contents of data register D9124, indexed by V, (i.e. D(9124 + V)) to index register Z.

*5: [PRC][F0^{Z}][Y80] ..... Displays the appropriate F coil comment on the A6FD wired to outputs Y80 ~ Y8F. The F coil number is specified as F0 indexed by Z. (i.e. F(0+Z)).

*6: [<=][D9124][V] ..... Checks that all F coil "on" occurences have been processed. if they have, the index register V is reset to 0 and the program will repeat its operation.

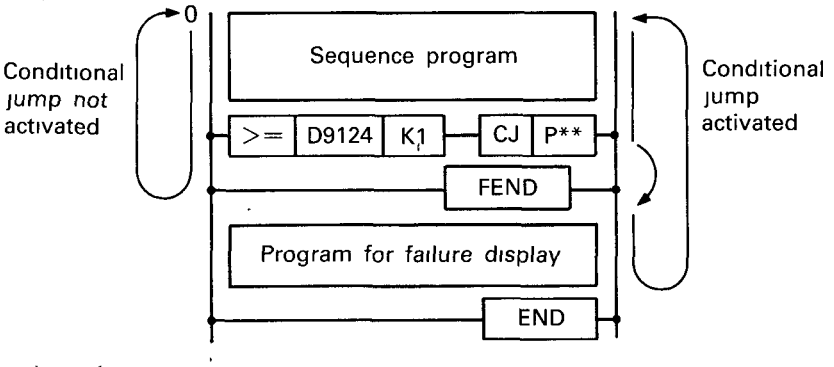
Program operation

The following explanation assumes that two F coils have been detected (i.e. the value in D9124 is 2).

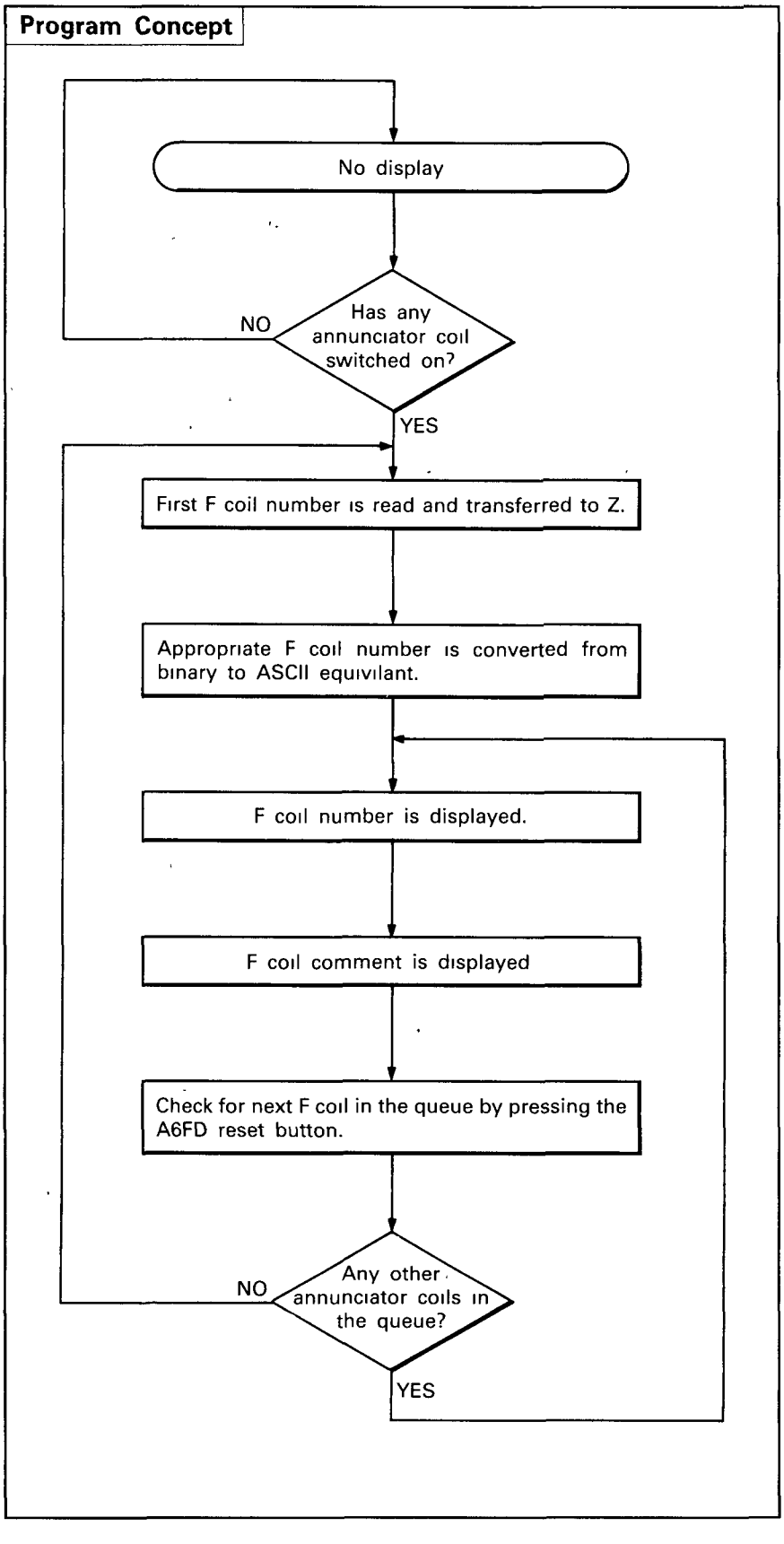


POINT

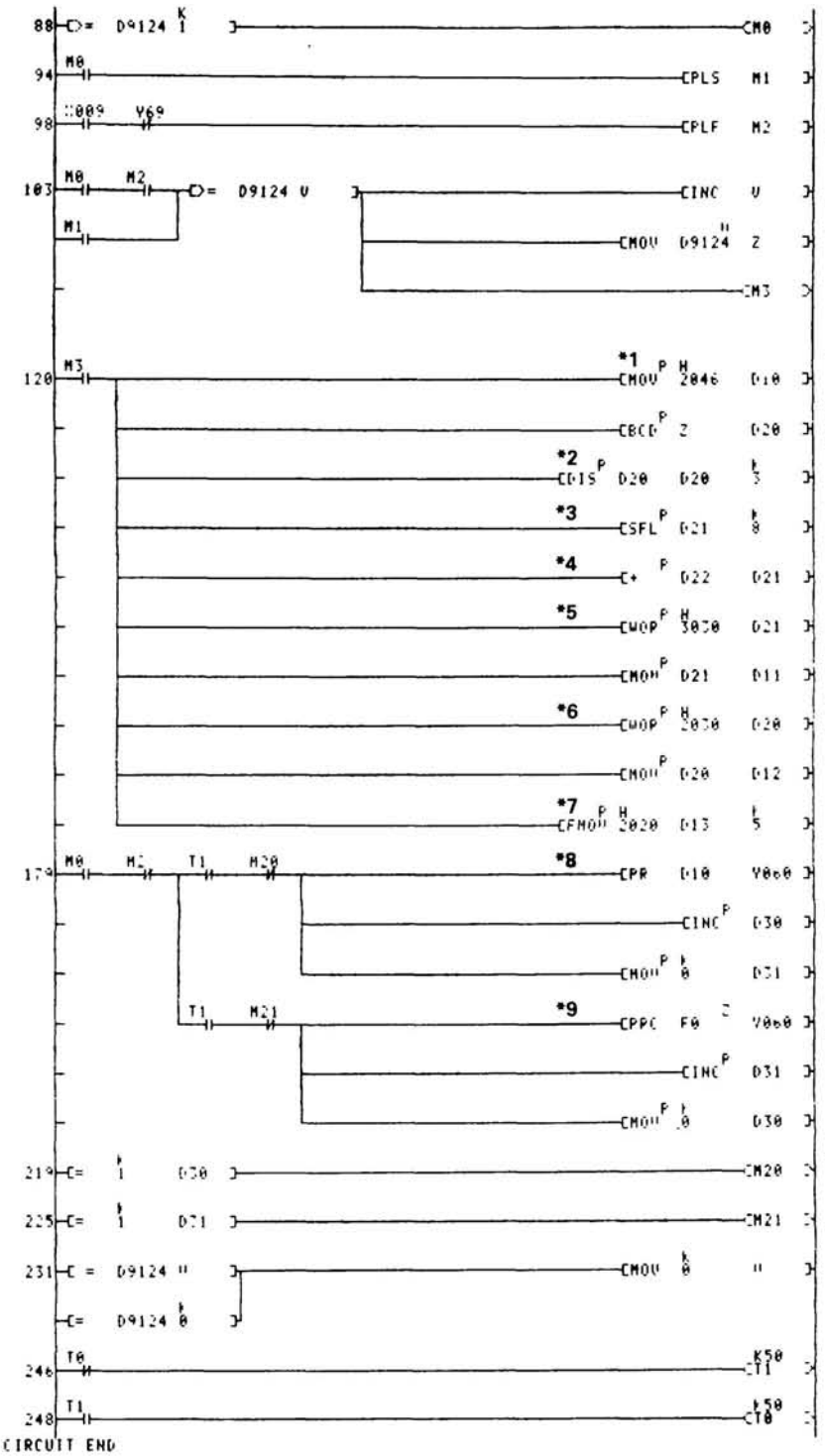
1. **Comments must be written and stored in the PC before the PRC instruction can be used.**
2. **The CJ instruction may be used to jump to the message generating part of the program as described below:**



(3) Alternate display of F coil number and comment.
This program example outputs a numerical variable (i.e. the F coil number) and a comment alternately.



Program Example



Pulse for first F number display.

Manual reset pulse.
X9=manual reset input.
Y69=PR and PRC execution flag.

Add 1 to V.

Transfer F number to Z.

Transfers 2046H (character code (S), F) to D10.

Converts failure detection number in Z into BCD and transfers it to D20.

Divides failure detection number into 3 digits and stores them into D20 to D22.

Shifts 16 bits in D21 to the left by 8 bits.

Executes addition of values in D22 and D21.

Logical addition of 3030H and D21 and stores the result into D21.

Transfers D21 data to D11.

Logical addition of 2030H and D20 data, and stores the result into D20.

Transfers D20 data to D12.

Transfers 2020H in blocks to D13 to D17.

Outputs failure detection number to Y60 with PR instruction.

Executes PR instruction once.

Outputs comment relevant to F(0+Z) to Y60 with PRC instruction.

Executes PRC instruction once.

Executes PR and PRC instructions alternately depending on conditions of T1, M20, and M21.

Clears V data if D9124≦V or D9124 = 0.

*10
Alternating timers.

(SP) indicates character code for space.

Instruction Explanation

*1: [MOV(P) | H2046 | D10] ..... Transfers the character codes for space (H20) and "F" H46 to data register D10.

*2: [DIS(P) | D20 | D20 | K3] ..... Takes the three BCD coded digits in D20 and places the least significant in D20 the middle digit in D21 and the most significant in D22. The annunciator coil number digits have therefore been placed in three consecutive registers. (Example: For coil F123 the digits will be stored as follows, 3 in D20, 2 in D21 and 1 in D22.)

*3: [SFL(P) | D21 | K8] ..... Shifts the value in D21 8 bits to the left (Example: D21 contains the data 0002. This step of the program will change that to 0200.)

*4: [+(P) | D22 | D21] ..... Adds D22 and D21 and stores the result in D21. (Example: Contents of D21 is 0200, contents of D22 is 0001. This step of the program stores 0201 in D21.)

*5: [WOR(P) | H3030 | D21] ..... Logical addition of H30 to each digit in D21 to convert from BCD to ASCII (Example: Contents of D21 is now H3231, i.e. ASCII code for 2 and 1)

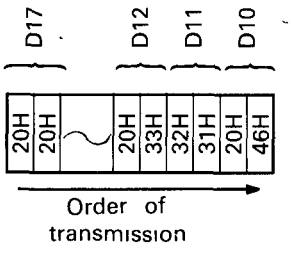
*6: [WOR(P) | H2030 | D20] ..... Logical addition of H2030 to digits in D20 (Example: Contents of D20 is now H2033, i.e. ASCII code for space and 3.)

*7: [FMOV(P) | H2020 | D13 | K5] ... Transfers space codes H20 into each byte of the five word registers D13 to D17.

*8: [PR][D10][Y60] ..... Outputs the 16 character codes from D10 to D17 to outputs Y60 to Y67 in A6FD compatible format.

Character codes sourse

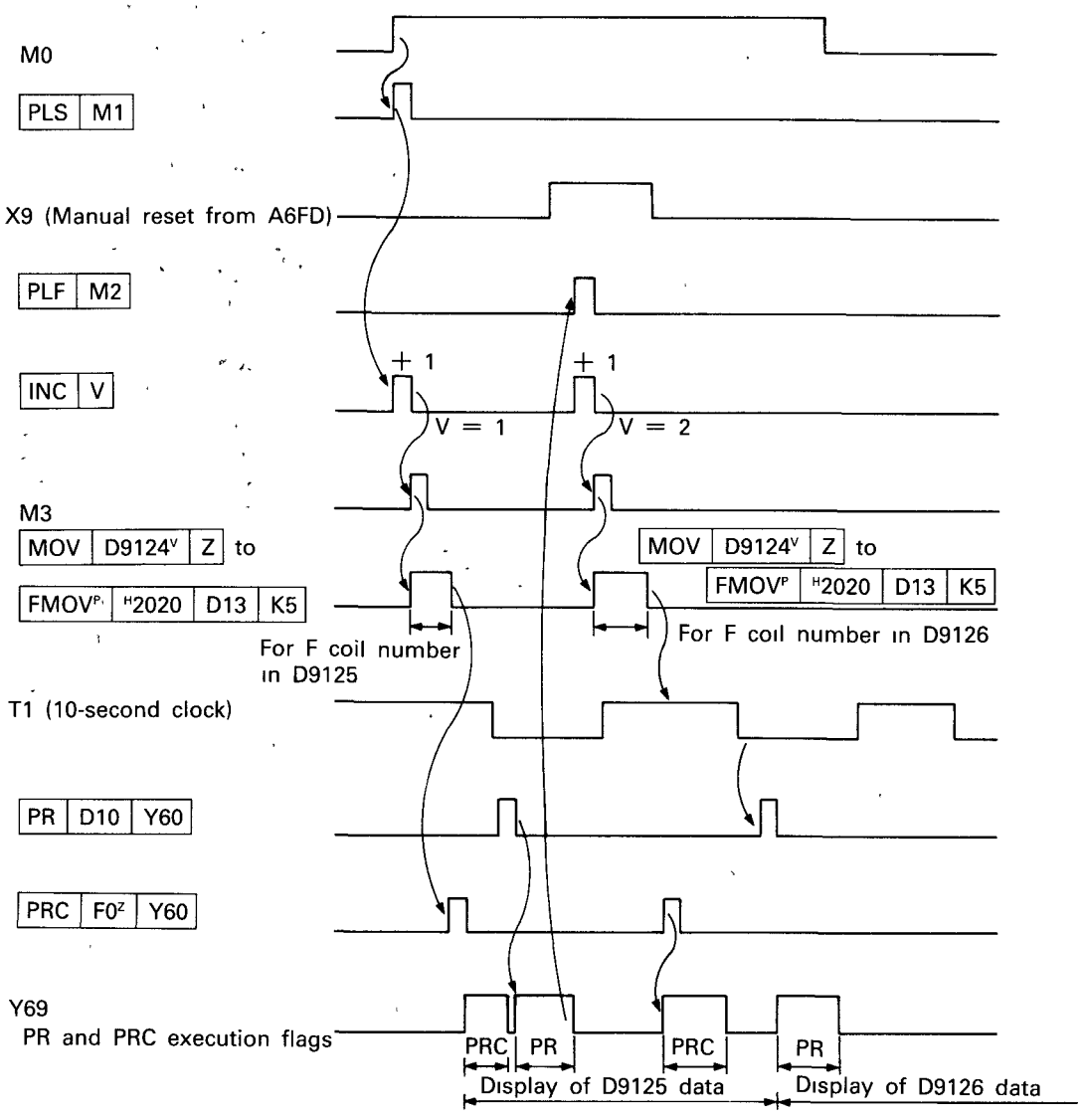
	Upper 8 bits	Lower 8 bits
D10	20H	46H
D11	32H	31H
D12	20H	33H
D13	20H	20H
D14	20H	20H
D15	20H	20H
D16	20H	20H
D17	20H	20H



*9: [PRC][F0[z]][Y60] ..... Outputs the comment assigned to the appropriate F coil to outputs Y60 to Y67 in A6FD compatible format.

*10: T0, T1 flicker circuit ..... Calls the PR and PRC instructions alternately.

Program Operation

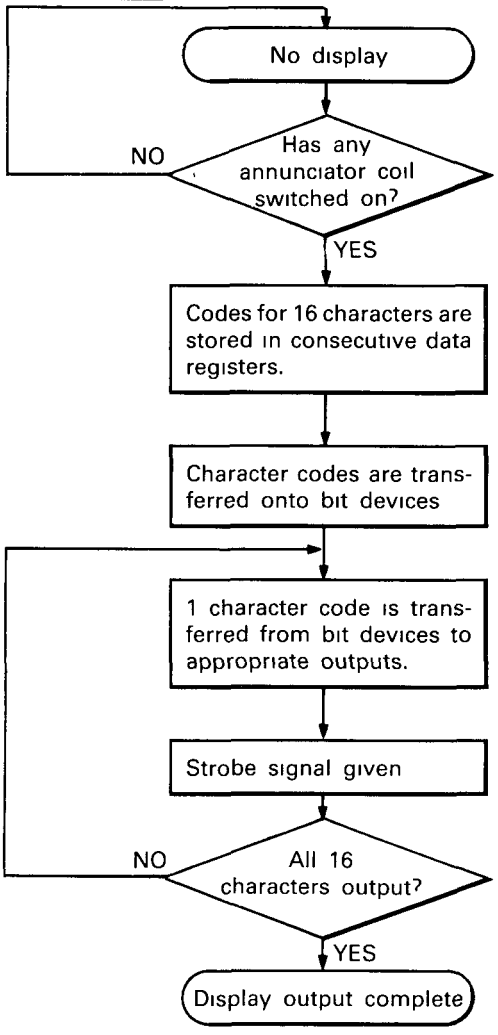


POINT

1. **When the PR instruction is executed data is transmitted starting from the lower byte of the source data head address.**
   Similarly, the lower byte of the subsequent string of registers is transmitted before the upper byte.
2. **Interlocks must be provided to prevent the PR and PRC instructions from being called simultaneously.**
3. **Alternating output is provided by T1 (5-second clock). Interlocks are provided using the INC(P) and MOV(P) instructions so that the PR instruction is executed once during the OFF period of T1 and the PRC instruction executed once during the ON period.**

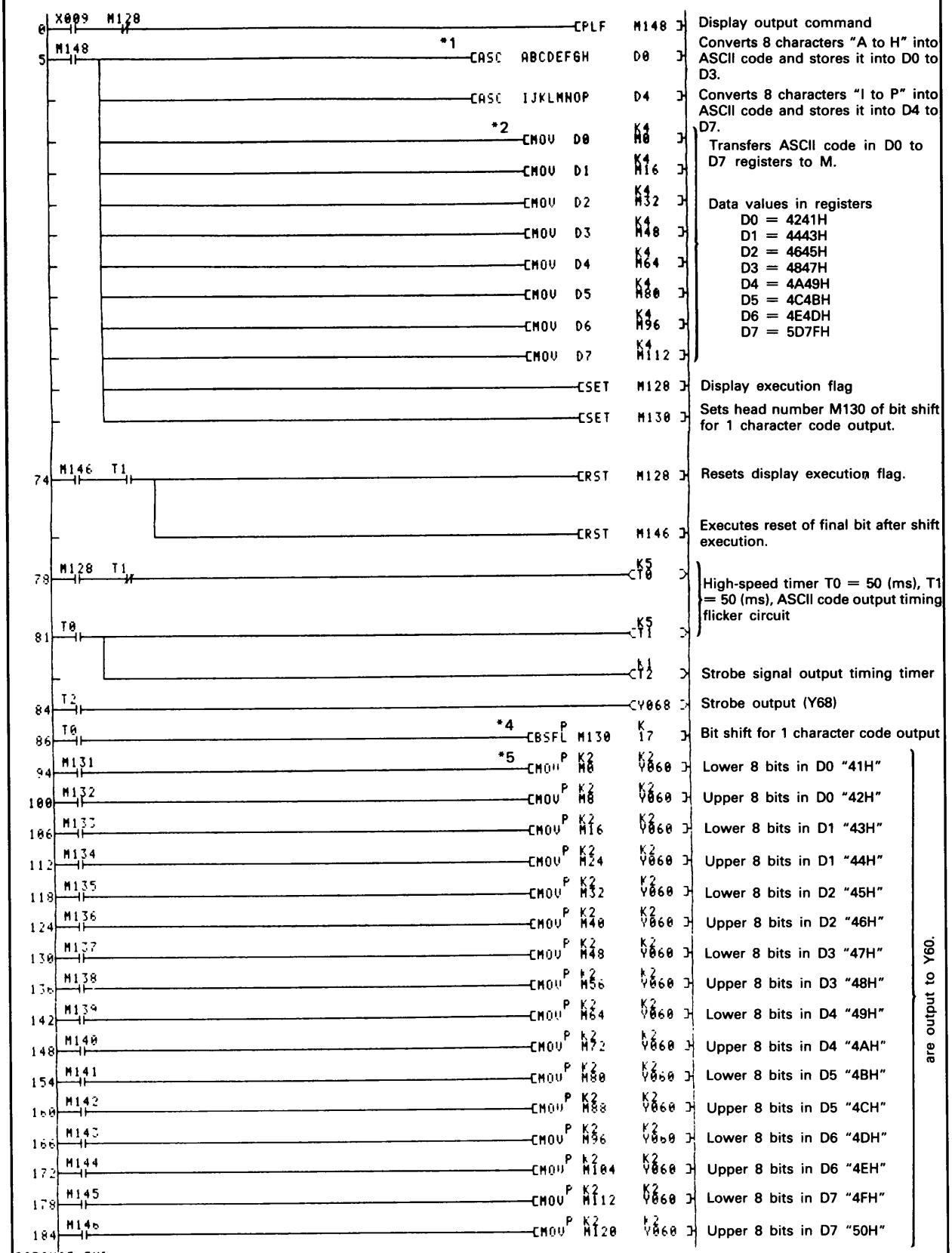
(4) A6FD control without using the PR and PRC instructions (Also for use in remote I/O station)
The 16 characters for display on the A6FD are stored in eight consecutive data registers and then moved onto a series of internal relays (M). These are moved to the appropriate outputs in batches of 8 bits (one character) and a strobe signal given.

Program Concept



(1) The 16 character codes are output one by one using the MOV instruction. Note that the strobe signal must be given after the character code has been moved to the outputs. Care must be taken to co-ordinate this with the link scan time when the A6FD is being used at a remote station.

Program Example



*1: Data in registers is indicated in hexadecimal (H).

Instruction Explanation

*1: [ASC][ABCDEFGH][D0] ... The ASC instruction coverts alpha-numeric characters into ASCII code and stores it into four consecutive devices beginning with the one specified.

(Instruction execution)

[ASC][ABCDEFGH][D0]

D0	41 (A)	Lower 8 bits
	42 (B)	Lower 8 bits
D1	43 (C)	
	44 (D)	
D2	45 (E)	
	46 (F)	
D3	47 (G)	
	48 (H)	

Character codes shown in hexadecimal.

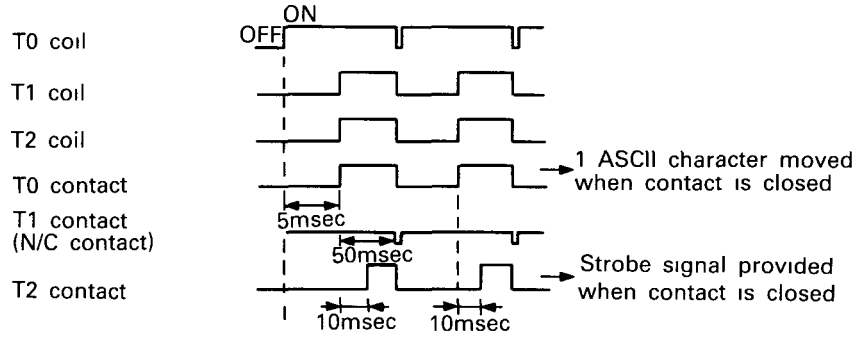
*2: [MOV][D0][K4M0] ..... Transfers the ASCII code bit pattern onto M0 to M15 (K4M0).

D0 = 4241 (hexadecimal)

Instruction execution

M15	M14	M13	M12	M11	M10	M9	M8	M7	M6	M5	M4	M3	M2	M1	M0
0	1	0	0	0	0	1	0	0	1	0	0	0	0	0	1
4				2				4				1			

*3: Timers T0, T1, T2 ..... T0 and T1 time movement of the ASCII bit patterns to the outputs.
T2 provides the strobe signal.



*4: [BSFL^{P}][M130][K17] ... Shifts 17 bits starting at M130 one bit to the left each time T0 switches on.
Used as a 1-character code sending flag.

*5: | MOV(P) | K2M0 | K2Y60 | .... Outputs one character code of K2M0 ("41H" in lower 8 bits of D0) to K2Y60. (Hexadecimal)
Moves one character code from K2M0 to outputs Y60 ~ Y67.

K2M0

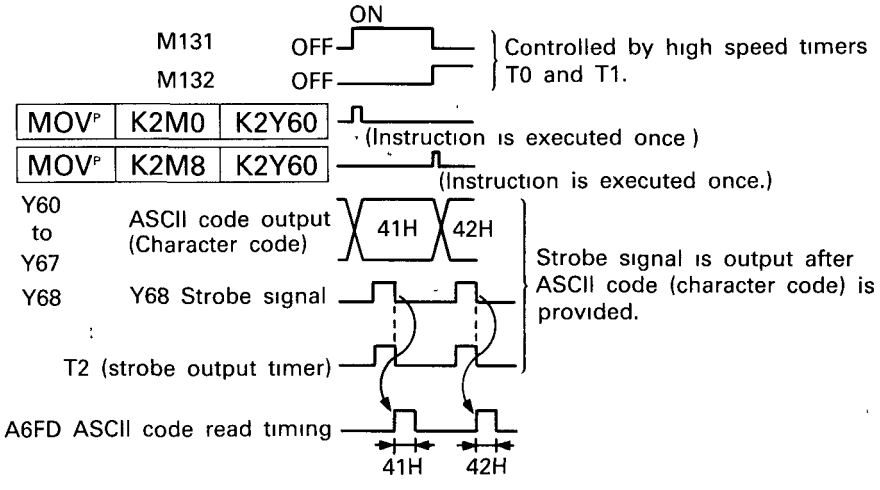
M7	M6	M5	M4	M3	M2	M1	M0
0	1	0	0	0	0	0	1
		4				1	

(Instruction execution)

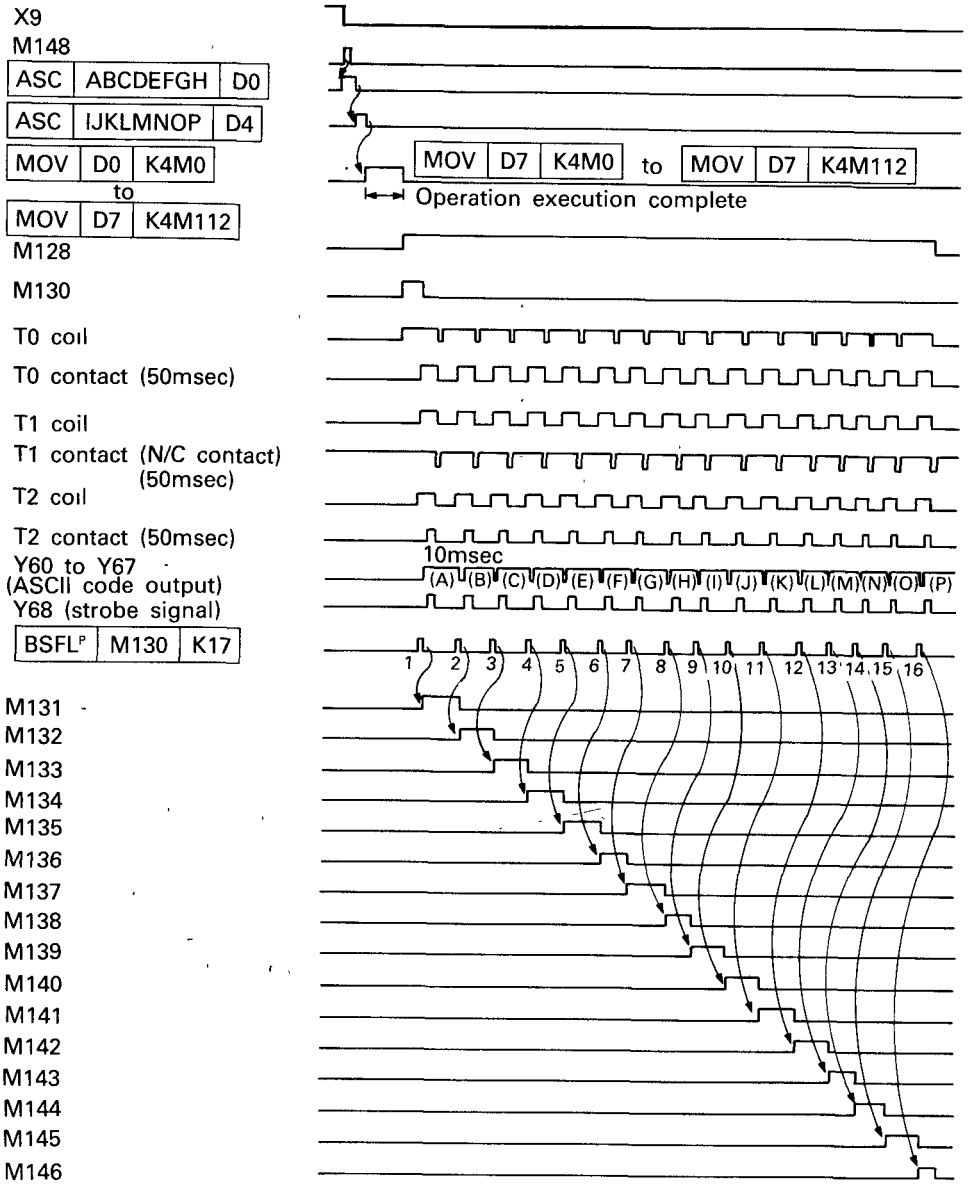
Instruction execution

Y67	Y66	Y65	Y64	Y63	Y62	Y61	Y60
0	1	0	0	0	0	0	1
		4				1	

For example, the display output timing for M131 is shown below.



Program operation



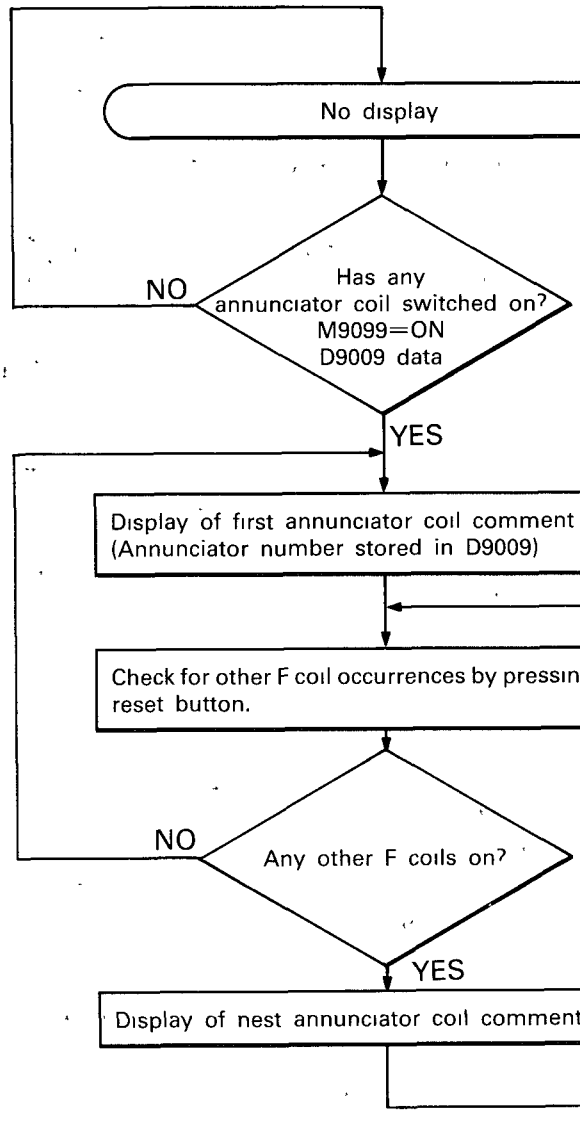
POINT

1. **The PR and PRC instruction cannot be used to output data from a remote I/O station (owing to the link scan and refresh times). The data output and strobe signals must therefore be controlled from the sequence program.**
2. **The ASC instruction allows alphanumeric character to be converted into character codes. When other characters are to be displayed, use the MOV instruction to transfer the hex. code to the source device.**
3. **Transmit the code for blank space (H20) to character areas which are to remain blank. 16 character codes must therefore always be transmitted even if the message is only 8 characters long for example.**
4. **Only use character codes listed in Appendix 2.**

7.3 Programming Application Example 2 (For A0J2CPU)

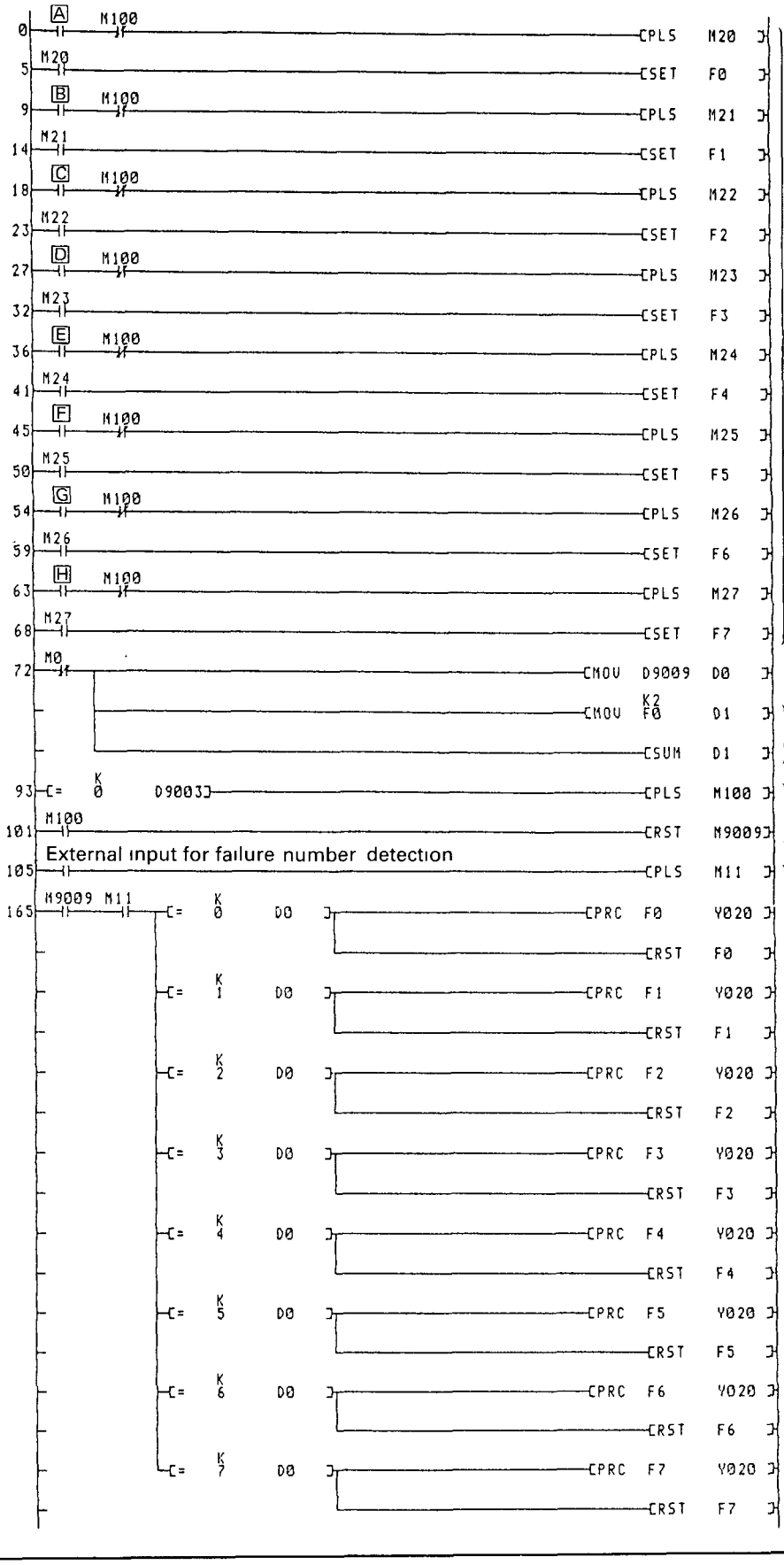
A6FD control programs are different for the A0J2CPU.
The following example displays failure numbers generated when inputs are switched on.

Program Concept



*: Pressing the A6FD manual reset button loads the next F coil number into D9090.

Program Example



A to H respresent failure signal inputs

Stores the first failure number into D9009.

Stores the number of F coils which have been switched on

Resets M9009 as soon as failure is removed (When failure occurs, M9009 turns on.)

Since the PRC instruction in the A0J2 is not leading edge triggered, it is necessary to convert external inputs into pulses D0 stores the current failure number This failure is detected by the comparison instruction and the relevant failure number comment is displayed If other failures exist, resetting the displayed failure number stores the lowest failure number into D9009 (D0)

7.4 Display of Numerical Variables

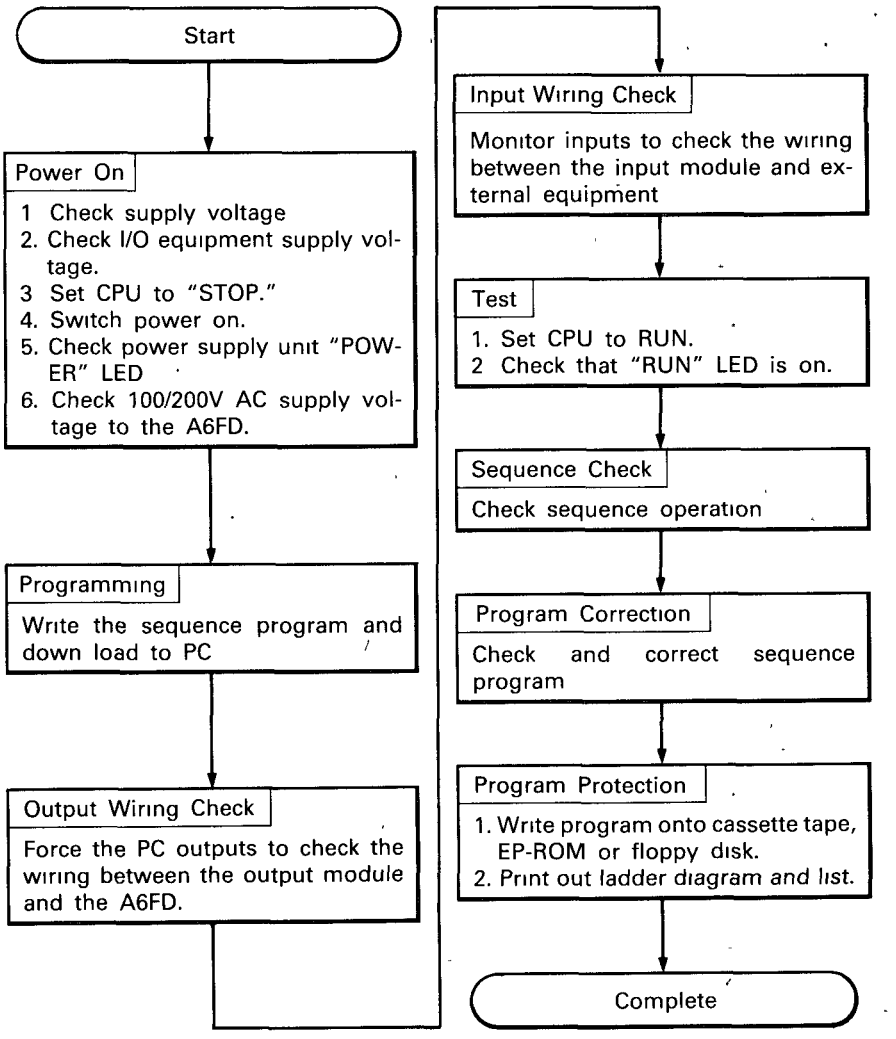
Numerical values may be output using the method described in Section 7.2 (i.e splitting the number into digits and adding H30 to each digit to change it to ASCII).
Where this is impractical the SW0GHP-UTLP-FN1 micro computer software package may be used to change numerical data to the equivilant ASCII string.

8. TEST

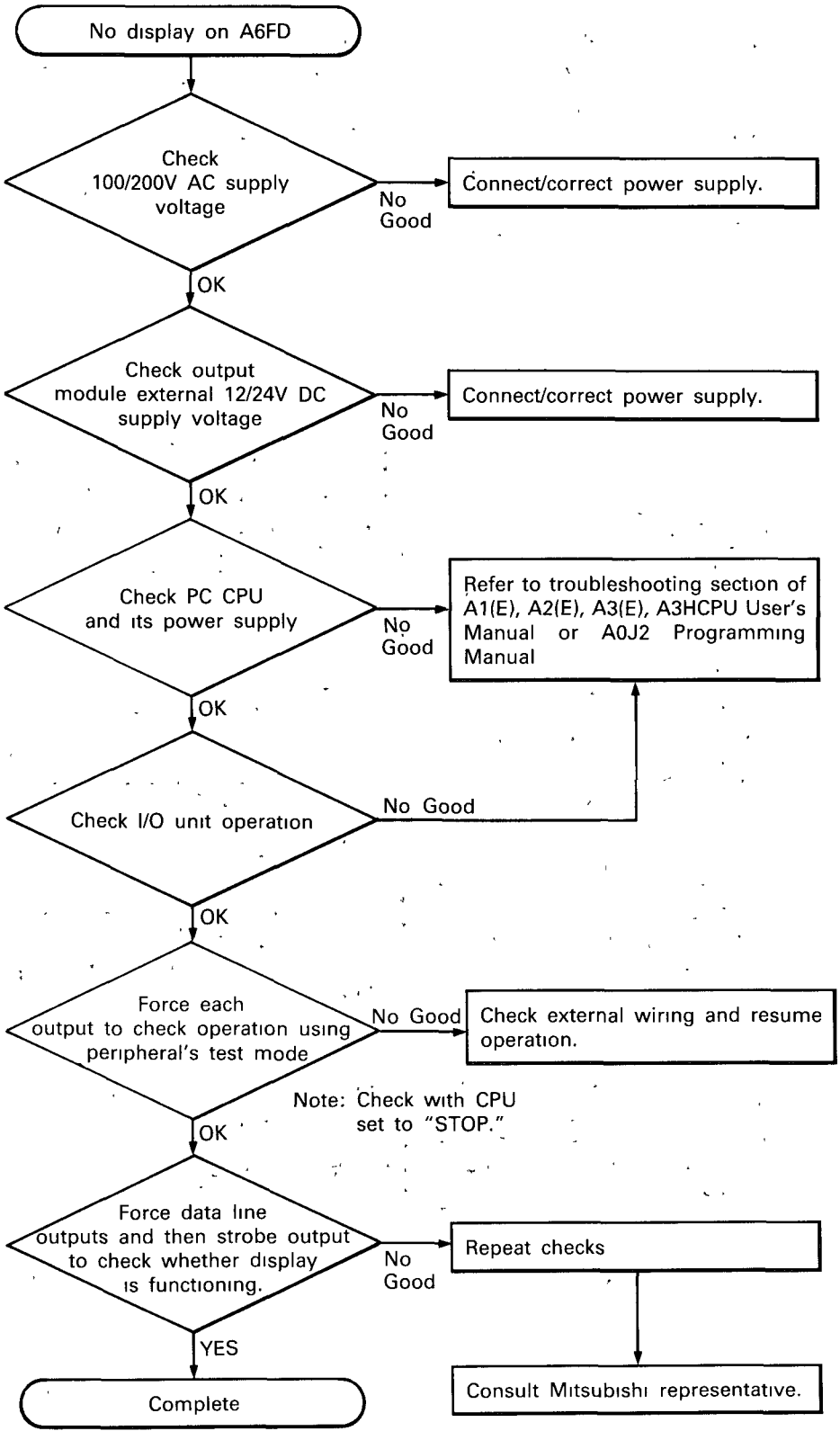
8.1 Pre-Test Checks

Check the following before powering up the A6FD:
1. Installation environment and conditions;
2. Output unit type driving the A6FD;
3. Output unit correctly loaded in base unit;
4. Wiring and connections;
5. Wire guages used;
6. Power and control line fuses; and
7. Supply voltage.

8.2 Test and Adjustment



9. TROUBLESHOOTING



1) Check error using A6GPP or A7PU

Check voltage at the eight A6FD input terminals (D0 to D7 and STROBE) using circuit tester.

10. MAINTENANCE AND INSPECTION

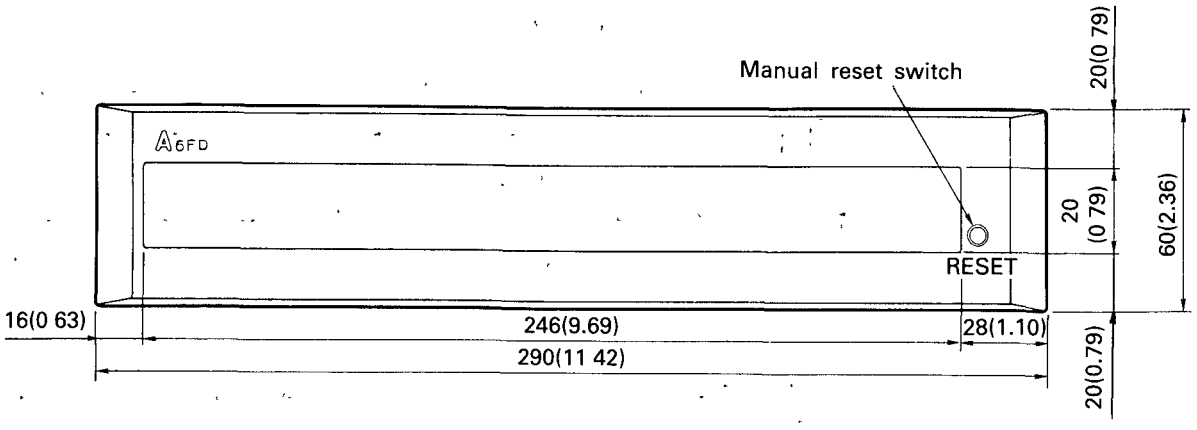
There are no components in the A6FD which require regular service or replacement.
The following periodic checks should be made.

Item	Check for		Corrective action
1	Mountings	Looseness, play	Tighten screws
		Dust and debris	Remove dust and debris
2	Connecting conditions	Loose terminal screws	Tighten screws
		Clearance between solderless terminals	Ensure that there is adequate clearance between solderless terminals.
		Loose terminal block	Tighten terminal block screws.
3	Line voltage		Line voltage should be between 85 and 264V AC.
4	Ambient environment	Ambient temperature	Must be between 0° and 55°C
		Ambient humidity	Must be between 10% and 95% RH
		Ambience	Must be within the specifications given in section 3 1

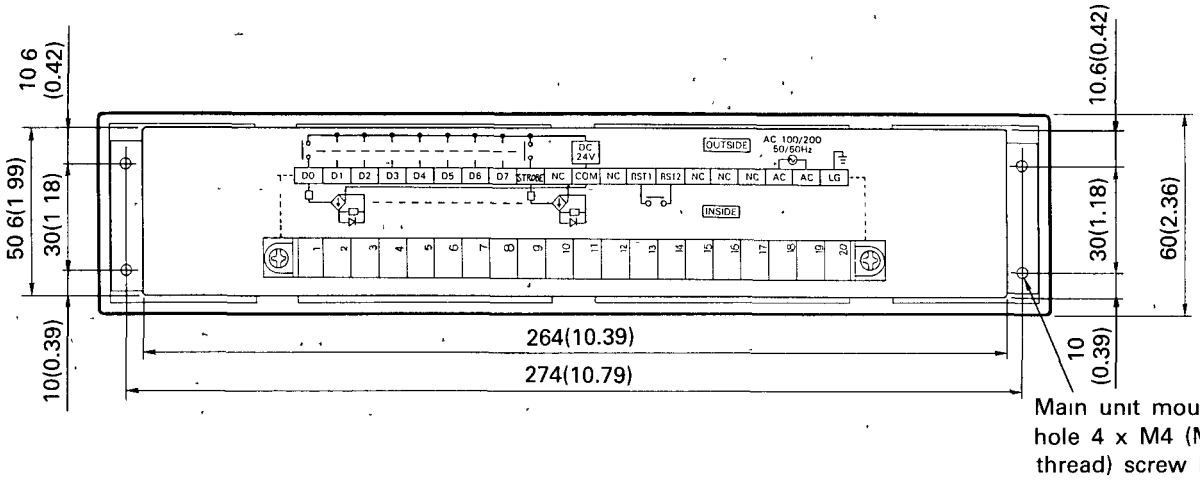
Fig. 10.1 Check List

APPENDIX 1 External Views

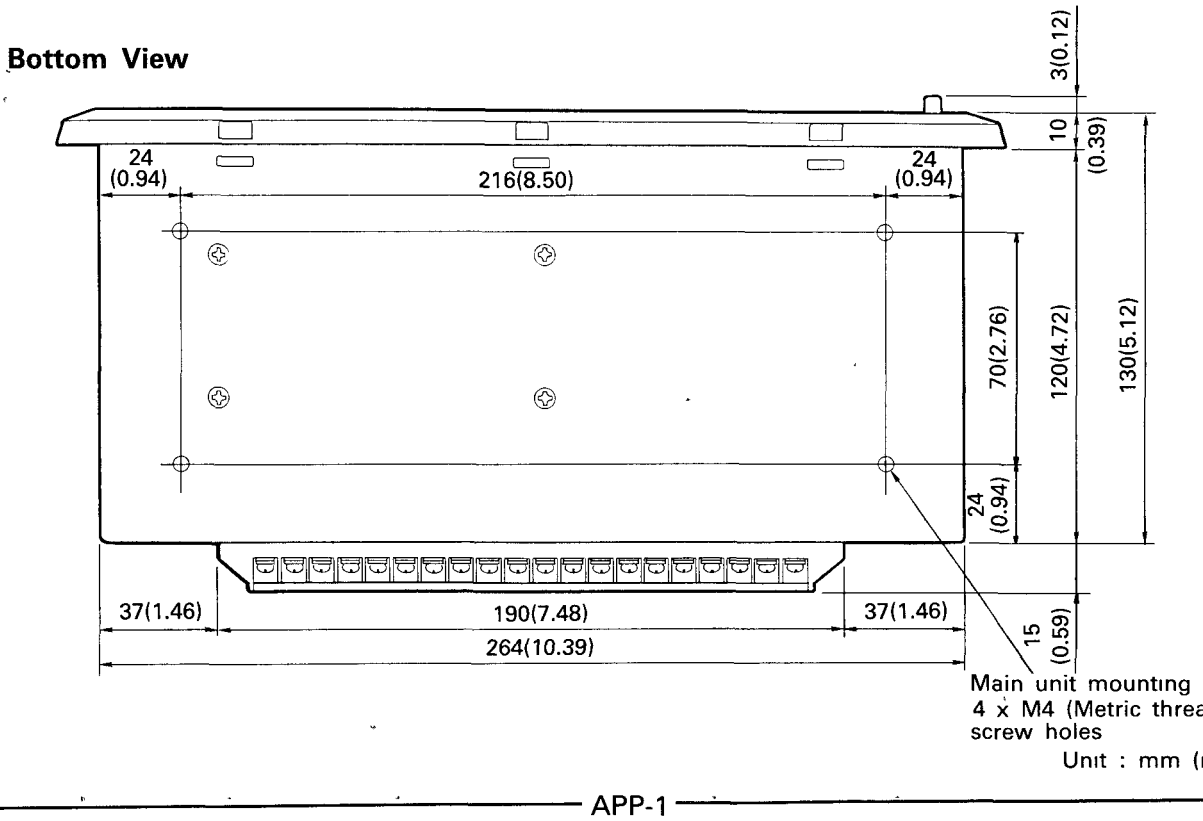
Front View



Rear View

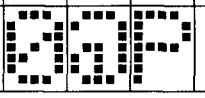
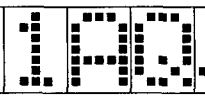
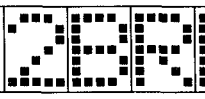
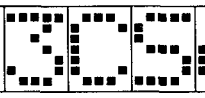
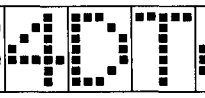
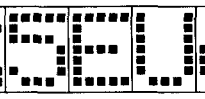
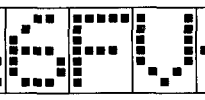
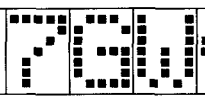
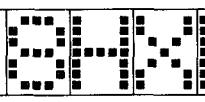
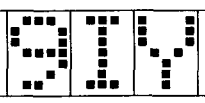
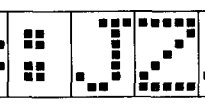
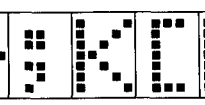
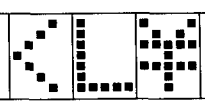
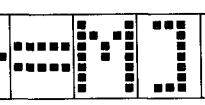
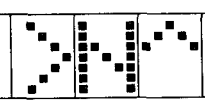
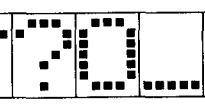


Bottom View



Unit : mm (inch)

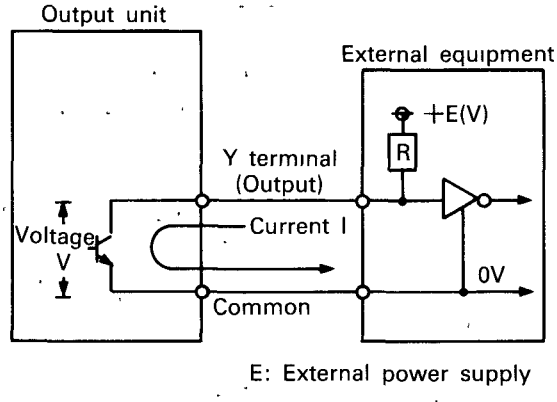
APPENDIX 2 Character Code List

Upper 4 bits / Lower 4 bits	0010	0011	0100	0101	0110	0111
xxxx0000	(SP)					
xxxx0001						
xxxx0010						
xxxx0011						
xxxx0100						
xxxx0101						
xxxx0110						
xxxx0111						
xxxx1000						
xxxx1001						
xxxx1010						
xxxx1011						
xxxx1100						
xxxx1101						
xxxx1110						
xxxx1111						

(SP) indicates space.

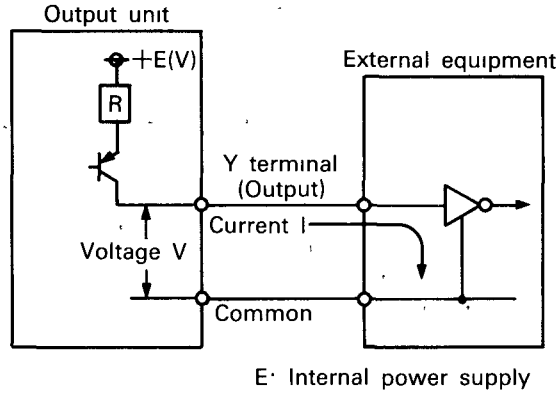
APPENDIX 3 Sink Output and Source Output Units

Sink Output Unit or Current Output Type



When the output unit output signal is on, current flows from the external equipment, via resistor R, into the output unit.
At this time, the voltage V across the output terminal and its common is Low.
When the output signal is off, the voltage is high and there is no current flow.

Source Output Unit or Voltage Output Type



When the output unit output signal is on, the output voltage V becomes high and current flows from the output unit to the external equipment.
At this time, the voltage V across the output terminal and its common is high
When the output signal is off, the voltage is low

Index

IMPORTANT

The components on the printed circuit boards will be damaged by static electricity, so avoid handling them directly. If it is necessary to handle them take the following precautions.

(1) Ground human body and work bench.

(2) Do not touch the conductive areas of the printed circuit board and its electrical parts with any non-grounded tools etc.

Under no circumstances will Mitsubishi Electric be liable or responsible for any consequential damage that may arise as a result of the installation or use of this equipment

All examples and diagrams shown in this manual are intended only as an aid to understanding the text, not to guarantee operation. Mitsubishi Electric will accept no responsibility for actual use of the product based on these illustrative examples.

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

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