MITSUBISHI

PROGRAMMABLE CONTROLLER

MELSEC-K

Instruction Manual

type MELSEC-K0J2

IA1 66013-A

MITSUBISHI ELECTRIC

CONTENTS

1. GENERAL DESCRIPTION

1. GENERAL DESCRIPTION

The K0J2 is an A4-size, highly economical and small-scaled programmable controller and has the following features:

(1) The number of inputs/outputs can be extended from 56 points of the basic unit to a maximum of 280 points.

(2) The operation speed of sequence instruction is as high as 5.6μS/step. When the extension base is used, the operation speed is 7μS/step.

(3) The maximum program capacity is 4096 steps. 1024 or 4096 steps can be selected for the RAM, and 2048 or 4096 steps can be selected for the ROM.

(4) In addition to the sequence instructions (18 types) and data instructions (8 types), the K0J2 is provided with 19 types of application instructions including the addition, subtraction, multiplication and division of BCD six digits.

(5) The number of inputs/outputs can be extended to a maximum of 184 points by use of the extension base which is commonly used for K1, K2 and K3. At this time, special units such as positioning unit and A/D converter unit can be used.

2. EQUIPMENT LIST

2. EQUIPMENT LIST

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2.1 Equipment List

Unit Division	Description	Type Name		Remarks
Basic unit	Basic unit	K0J2-AR K0J2-AS K0J2-DR K0J2-DS K0J2-DT	Input: 32 points Output: 24 points Total: 56 points	*1 Input A: 100VAC, 10mA Photocoupler insulation D: 24VDC, 10mA Photocoupler insulation Output R: Relay contact output 200VAC/24VDC, 2A S: Triac output 200VAC, 1A T: Transistor output 24VDC, 0.5A All points indicated by LEDs Terminal block connection
Extension unit	32-point extension unit (with extension cable K0J61CBL)	K0J1-E32AR K0J1-E32AS K0J1-E32DR K0J1-E32DS K0J1-E32DT	Input: 16 points Output: 16 points Total: 32 points	
	56-point extension unit (with extension cable K0J-61CBL)	K0J1-E56AR K0J1-E56AS K0J1-E56DR K0J1-E56DS K0J1-E56DT K0J2-E56AR K0J2-E56AS K0J2-E56DR K0J2-E56DS K0J2-E56DT	Input: 32 points Output: 24 points Total: 56 points	
Memory	EP-ROM	2KROM	For 2K steps	Select required memory and load it into socket. (RAM for 1K step is standard-equipped.)
		4KROM	For 4K steps	
	IC-RAM	4KRAM	For 4K steps	
Extension adaptor	Extension adaptor	K0J2-EX1	For connection of extension unit (E32, E56)	
		K0J2-EX2	For connection of extension unit (K65BN, K68BN)	
Extension power supply	Power supply for extension unit	K0J1-PW	100VAC input, 24VDC 1A output *5	
Extension base	Extension base	K65BN	Five I/O units for K1, 2, 3 can be loaded.	
		K68BN	Eight I/O units for K1, 2, 3 can be loaded.	
Extension cable	Extension cable used between K0Js	K0J61CBL	500mm length	K0J6-CBL of 500-mm length is provided on extension unit E32, E56. Other extension cables are separately available.
		K0J-61CBL2	1000mm length	
	Extension cable for K65B, K68B	K0J-62CBL	500mm length	
		K0J62-CBL2	1000mm length	
Fuse *2	For power supply	MN51NR	Encased in glass tube, 250V, 2A	
	For triac (S) output	MP75	Plug type, 7.5A	
Battery *3	Lithium battery	K6BAT	For IC-RAM, standard-equipped for basic unit, commonly used for K0, 1, 2 and 3.	
Switch	Switch unit	K0SW	For simulation input, 16 points/unit	

Table 2.1 List of Equipment

*1: The last two letters of type names of basic units and extension units indicate inputs/outputs.

Example: K0J2 - A R

- Output: R: relay contact output; S: triac output; T: transistor output
- Input: A: 100VAC input; D: 24VDC input

*2: A fuse is provided for each unit as spare.

*3: If the memory is ROM, a battery is required for back up for power failure.

*4: When the 32-point extension unit is used, the system configuration is restricted. (See Section 4.2.)

*5: The extension power supply can be loaded only to Type E56 extension unit.

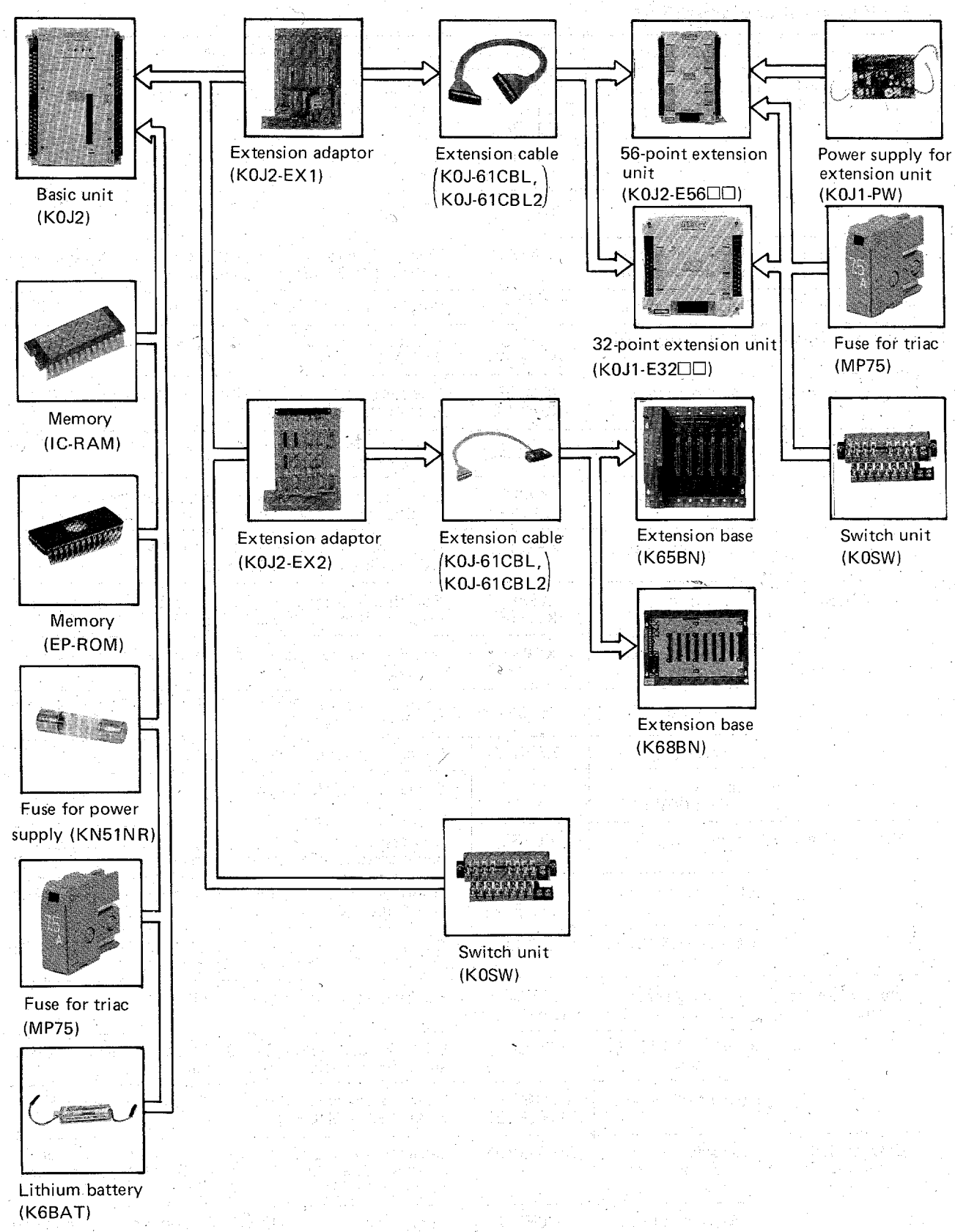


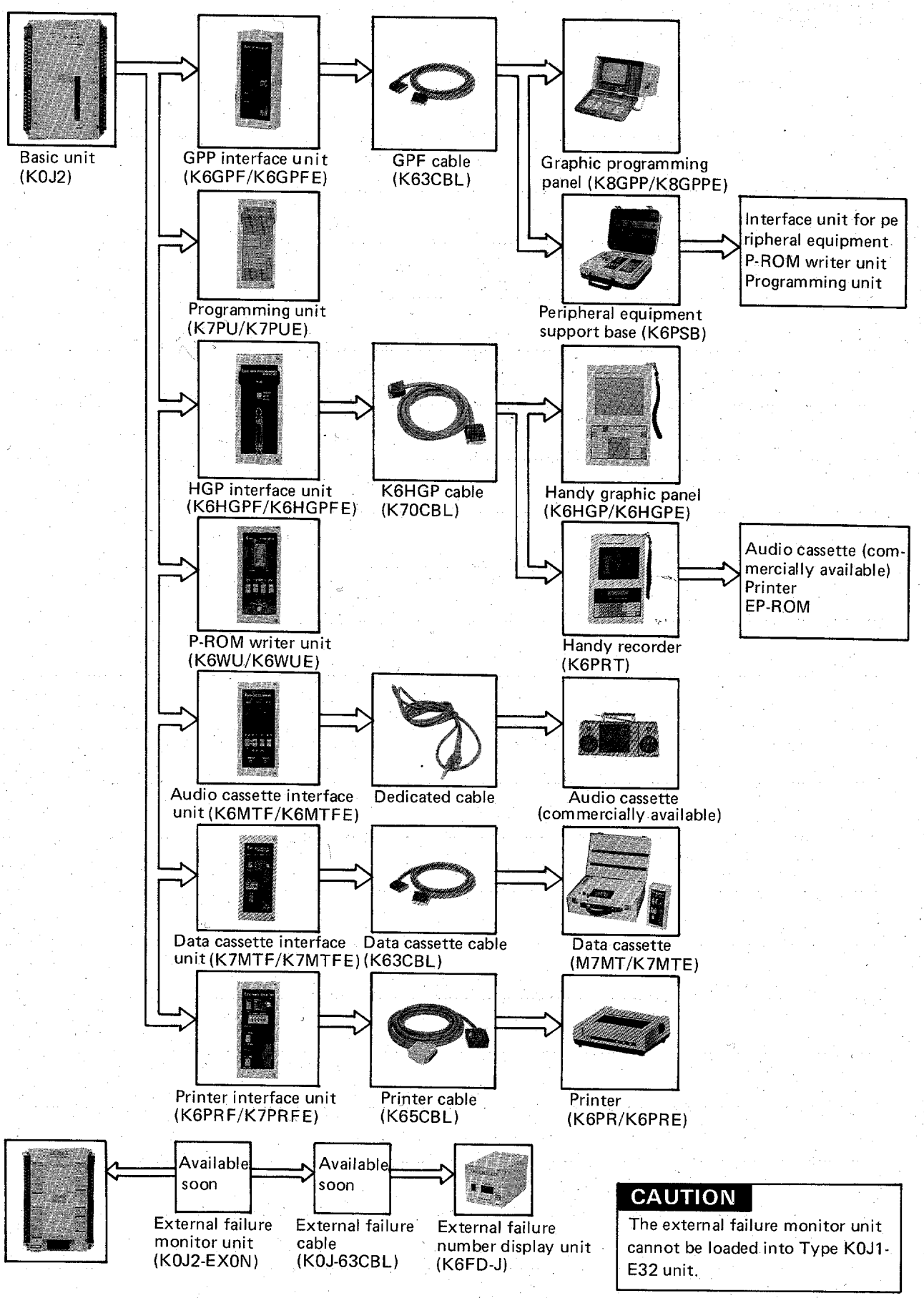
Fig. 2.1 Equipment

2.2 Peripheral Equipment List

Unit	Description	Type	Remarks
Programming unit with CRT	Graphic programming panel GPP	K7GPP (K7GPPE) / K8GPP (K8GPPE)	Programming unit with CRT, used together with K6GPF (K6GPFE) and K63CBL.
	GPP interface unit	K6GPF (K6GPFE)	Interface used for connection of main unit CPU and GPP or K6PSB.
	GPF cable	K63CBL	Cable for connection of K6GPF (K6GPFE) and GPP, length 3m
Support base	Peripheral equipment support base	K6PSB	Two peripheral units can be loaded, used together with K6GPF (K6GPFE) and K63CBL.
Programming unit	Programming unit	K7PU (K7PUE)	Program I/O unit loaded into main unit CPU or K6PSB
P-ROM writer	P-ROM writer unit	K6WU (K6WUE)	Loaded into main unit CPU, GPP, or K6PSB, for 2KROM
Audio cassette	Audio cassette interface	K6MTF (K6MTFE)	Interface for commercially available audio cassette, with dedicated cable.
Data cassette	Data cassette interface	K7MTF (K7MTFE)	Interface for connection of main unit CPU, GPP, or K6PSB and K7MT (K7MTE)
	Data cassette	K7MT (K7MTE)	Data cassette for industrial use. Tape for this unit is CT-300 by TEAC and is commercially available.
	Data cassette cable	K63CBL	Cable for connection of K7MT (K7MTE) and K7MTF (K7MTFE), same as CPF cable.
Printer	Printer	K6PR (K6PRE)	For circuit diagram of program and hard copy of list, used together with K6PRF (K7PRFE) and K65CBL.
	Printer interface unit	K6PRF (K7PRFE)	Interface of connection of K6PR (K6PRE) and main unit, GPP, or K6PSB.
	Printer cable	K65CBL	Cable for connection of K6PR (K6PRE) and K6PRF (K7PRFE), length 3m.
	Printer paper	K6PR-Y	9-inch paper, available in units of 2000 sheets.
	Ink ribbon for K6PR (K6PRE)	K6PR-R	Replacement ink ribbon
Handy recorder	Handy recorder	K6PRT	Equipped with P-ROM writer, printer interface, and audio cassette interface functions.
	HGP interface unit	K6HGPF (K6HGPFE)	Interface for connection of main unit CPU and K6PRT or K6HGP (K6HGPE)
	K6HGP (K6HGPE) cable	K70CBL	Cable for connection of K6HGP (K6HGPE) or K6PRT and K6HGPF (K6HGPFE), length 2m.
Handy graphic programmer	Handy graphic programmer	K6HGP (K6HGPE)	Handy graphic programming unit with LCD.
	K6HGP (K6HGPE) cable	K70CBL	Cable for connection of K6HGP (K6HGPE) or K6PRT and K6HGPF (K6HGPFE), length 2 m.
	HGP interface unit	K6HGPF (K6HGPFE)	Interface for connection of main unit CPU and K6PRT or K6HGP (K6HGPE)
External failure monitor*	External failure monitor unit	K0J2-EX0N	Capable of displaying external failure number in decimal three digits. Number is displayed by connecting K6FD-J.
	External failure number display unit	K6FD-J	Connected with K0J2-EX0N, capable of displaying failure numbers of 100 ~ 999.

Table 2.2 Peripheral Equipment

*: External failure monitors (K0J2-EX0N and K6FD-J) will be available soon.



CAUTION

The external failure monitor unit cannot be loaded into Type K0J1-E32 unit.

Fig. 2.2 Peripheral Equipment

MEMO

3. SPECIFICATIONS

3. SPECIFICATIONS

3.1 Common Specifications

Item		Specifications	
Power Supply	Applied voltage	100–110VAC, 85 ~ 110%, single phase 50/60Hz ± 2Hz	
	Power Consumption	66VA, current: maximum 0.9A, inrush current 20A, 10mS (110VAC 60Hz)	
Operating ambient temperature		0 ~ 55°C	
Storing ambient temperature		−10 ~ 75°C	
Operating ambient humidity		10 ~ 90% RH, free of dew condensation	
Storing ambient humidity		10 ~ 90% RH, free of dew condensation	
Vibration resistance		Conforms to class 3, IIB, JIS C 00911 (16.7 Hz, 3-mm double amplitude, 2 hrs.)	
Shock resistance		Conforms to JIS C 0912 (10 g x 3 times in X, Y, Z, directions)	
Noise resistance		1000 Vp-p noise voltage, 1μs noise width, 25 ~ 60 Hz noise frequency by noise simulator	
Dielectric withstand voltage		1500VAC for 1 minute	Across 100VAC external I/O terminals and case
			Across 100VAC external I/O terminals and 24VDC external I/O terminals
			Across 100VAC power supply voltage terminals and case
			Across 24VDC external I/O terminals and case
Insulation		5MΩ or larger by 500VDC insulation resistance meter	Across 100VAC external I/O terminals and case
			Across 100VAC external I/O terminals and 24VDC external I/O terminals
			Across 100VAC power supply voltage terminals and case
			Across 24VDC external I/O terminals and case
Grounding		Class 3 grounding. Grounding may not be required when it is impossible.	
Operating ambience		Particularly dust and corrosive gas should be minimal.	
Cooling method		Self-cooling	

Note: Before voltage withstand test, disconnect the grounded terminal. Also, apply voltage to batch of 100V AC power supply terminals.

Table 3.1 Common Specifications

3.2 Performance Specifications

3.2.1 CPU performance specifications

(1) Performance specifications

Item		Specifications
Control method		Stored program, repeated operation
I/O control method		Input and output are provided each time during repeated operation.
Programming language		Dedicated language to sequence control (relay symbol type, used together with logic symbolic language)
Instruction	Number of instruction	26 types of basic instructions (sequence instructions + data instructions) + 19 types of application instructions
	Word length	16 bits/step
Sequence instruction execution time		5.6μs/step/step on average.(*1)
Data instruction execution time		See Section 2 of APPENDIX.
Program capacity and memory		IC-RAM / EP-ROM 1024 steps: * / — 2048 steps: — / 2KROM 4096 steps: 4KRAM / 4KROM ● Select required memory and load it into socket. (*: RAM for 1K step is standard-standard-equipped.) ● RAM is backed up by lithium battery. Total power failure guarantee period: 300 days*4
Number of I/O points(*2)		Basic unit: input – 32 points, output – 24 points
		E32 extension unit: input – 16 points, output – 16 points
		E56 extension unit: input – 32 points, output – 24 points
		K65BN extension base: a maximum of five I/O units for K1, 2, 3 can be loaded. (*3)
		K68BN extension base: a maximum of eight I/O units for K1, 2, 3 can be loaded. (*3)
Number of temporary memories		254 points (M0 ~ M253); M254 turned on by battery error. M255 turned on when normal self-diagnostic result is output during run.
Timer/counter (built-in)	Number of points	128 points (T/C0 ~ 127 including timers and counters)
	Timer specifications	T0 ~ T95: 0.1 ~ 999.9 sec setup time; 0.1 sec setup time increments; on delay T96 ~ T127: 0.01 ~ 99.99 sec setup time; 0.01 sec setup time increments; on delay
	Counter specifications	1 ~ 9999 setting range; maximum counting speed of 10 ~ 20 pulses/sec. (at 1 K step)
Shift register	Number of usable points	253 bits (M1 ~ M253) excluding those used for temporary memory.
	Specifications	With temporary memories combined in units of one bit, up to 253 bits are possible (data shift is also possible).
Data register	Specifications	96 points (D0 ~ 95), 16 bits for 1 data, maximum of four digits can be handled in units of four bits.
	Data input/output	Four I/O points make up one digit. Usable jointly with process input/output. Decimal one ~ four digits in the range of 0 ~ 9999.
Power failure latch range		Power failure latch is possible by LATCH key switch of basic unit. M128 ~ 253, T/C64 ~ 111, D64 ~ 95
Allowable instantaneous stop time		20 mS
Self-diagnostic function		Watch dog error monitor (WDT = 170ms), error machine code detection, power supply error detection, RUN signal is output by program from exterior.

Note: *1: *Sequence instruction execution time of K0J2 is 5.6μs/step when the basic, E32 and E56 units are combined, and 7.0μs/step when basic and K65BN or K68BN are combined.*

*2: *The maximum number of inputs/outputs is 280 points when the basic, E32 and E56 units are combined.*
The maximum number of inputs/outputs is 184 points when the basic and K65BN or K68BN unit are combined.

*3: *Various types of I/O units can be loaded. However, the KJ71, KJ61, data link unit and KL61 latch unit cannot be used.*
A maximum of eight I/O units can be used within the range of 128 points.

*4: *For replacement of battery, see Section 6.4.*

Table 3.2 Performance Specifications

(2) List of devices

	Device	Description	Number	Number of Points	Remarks
1	X	Input	X00 ~ 1F	160 points	Numbers allotted to basic unit (32 points)
			X80 ~ 9F		Numbers allotted to extension 1 (32 points)
			XC0 ~ DF		Numbers allotted to extension 2 (32 points)
			X180 ~ 19F		Numbers allotted to extension 3 (32 points)
			X1C0 ~ 1DF		Numbers allotted to extension 4 (32 points)
			X80 ~ FF	128 points	Numbers allotted to extension base (common to X and Y)
2	Y	Output	Y20 ~ 37	120 points	Numbers allotted to basic unit (24 points)
			YA0 ~ B7		Numbers allotted to extension 1 (24 points)
			YE0 ~ F7		Numbers allotted to extension 2 (24 points)
			YA0 ~ 1B7		Numbers allotted to extension 3 (24 points)
			Y1E0 ~ 1F7		Numbers allotted to extension 4 (24 points0
			Y80 ~ FF	128 points	Numbers allotted to extension base (common to X and Y)
3	M	Temporary memory	M0 ~ 253	254 points	○M254: Turns on when battery voltage reduces. ○M255: Turns on when output of self-diagnostic result is normal during run. Turns off at stop, error and power-off.
4	T	Timer	0 ~ 127 for both T and C	128 points	○T and C are numbered in series like T0, T1, C2, T3, C4 ..... The same number cannot be used for T and C. ○T0 ~ 95 (96 points) are 100ms timers. T96 ~ 127 (32 points) are 10ms timers.
5	C	Counter			
6	F	Function number	F0 ~ 126	118 points	○F0 ~ 99: failure ○F100 ~ 104, 108 ~ 119, 126: application instructions
7	D	Data register	D0 ~ 95	96 points	D100 and following numbers are for special application.
8	K	Constant	K0 ~ 9999		○Numeric contant: 0 ~ 9999 ○Master control: 0 ~ 63 ○Digit designation: 1 ~ 4 1 ○Jump destination step number: 3 ~ 4095

Table 3.3 Device List

(3) Instruction list

No.	Instruction Symbol (Name)	Function	Drawing Representation	No.	Instruction Symbol (Name)	Function	Drawing Representation
1	LD Load	Logic operation start (Contact a operation start)	X.Y.M.T.C.F	10	MC Master control	Master control start	MC Kn n=0~63
2	LDI Load inverse	NOT logic operation start (Contact b operation start)	X.Y.M.T.C.F	11	MCR Master control reset	Master control reset	MCR Kn n=0~63
3	AND AND	Logical product (Contact a series connection)	X.Y.M.T.C.F	12	SET Set	Set of Y, M, F	SET Y.M.F
4	ANI AND inverse	Logic NAND (Contact b series connection)	X.Y.M.T.C.F	13	RST Reset	Reset of Y, M, F Reset of counter temporary value	RST Y.M F.C
5	OR OR	Logical add (Contact a parallel connection)	X.Y.M.T.C.F	14	SFT Shift	1-bit shift of temporary value	SET M
6	ORI OR inverse	Logic NOR (Contact b parallel connection)	X.Y.M.T.C.F	15	CJ Conditional jump	Conditional jump (Jump to latter step number when input signal is on)	CJ K Jump destination number
7	ANB AND block	Logic block AND (Series connection between blocks)		16	PLS Pulse	Pulse (Pulses for 1 cycle of program is generated at rise of input signal)	PLS M
8	ORB OR block	Logic block OR (Parallel connection between blocks)		17	NOP NOP	No operation	For program delete or space
9	OUT OUT	Coil output (Y, M) Timer output (T) Counter output (C) Function No. output (F)	*1 Y.M.T.C.F	18	END END	Program end	Return to step 0 Be sure to enter END at the end of program.

Table 3.4 Sequence Instruction List

*Note: *1: T and C set values can be specified for constant K and data register D.*
**2: OUT T, C and CJ are 2-word instructions. All others are 1-word instructions.*

No.	Instruction Symbol (Name)	Function	Drawing Representation	No.	Instruction Symbol (Name)	Function	Drawing Representation
1	MOV Move	Data transfer S→D	*5 *1 *2 MOV S D	5	+ Plus	Addition *4 D+S→D	*5 *1 *2 + S D
2	> Larger	Magnitude comparison S>D	*5 *6 *1 *2 > S D Y.M.T.C.F	6	− Minus	Subtraction *4 D−S→D	*5 *1 *2 − S D
3	< Smaller	Magnitude comparison S<D	*5 *6 *1 *2 < S D Y.M.T.C.F	7	BCD BCD	BIN→BCD conversion S→BCD conversion →D	*5 *1 *2 BCD S D
4	= Equal	Coincidence S=D	*5 *6 *1 *2 = S D Y.M.T.C.F	8	BIN Binary	BCD→BIN conversion S→BIN conversion →D	*5 *1 *2 BIN S D

Table 3.5 Data Instructions

*Note: *1: S stands for source.*
**2: D stands for destination.*
**3: All data instructions are 3-word instructions.*
**4: Negative numbers are not handled.*
**5: Instruction data operation is initiated when input signal is on.*
**6: These instructions are used for series contact a, while others are for coils.*

MOV BCD BIN +, −

S \ D	K	D	T	C	X	Y	M
K		○	○	○		○	○
D		○	○	○		○	○
T		○	○	○		○	○
C		○	○	○		○	○
X		○	○	◎		○	○
Y		○	○	○		○	○
M		○	○	○		○	○

>,<,=

S \ D	K	D	T	C	X	Y	M
K	○	○	○	○	○	○	○
D	○	○	○	○	○	○	○
T	○	○	○	○	○	○	○
C	○	○	○	○	○	○	○
X	○	○	○	○	○	○	○
Y	○	○	○	○	○	○	○
M	○	○	○	○	○	○	○

MOV	Km	Dn	Constant set : constant Km (0 ~ 9999) is set to Dn.
MOV	Dm	Dn	Transfer : Content of Dm is transferred to Dn.
MOV	Dm	T,Cn	Change of T, C temporary value : Content of Dm is written into T, C temporary value.
MOV	Dm	KnY,M	Batch output : Dm content is output in blocks in units of 4 points up to 16 points.
MOV	T,Cm	Dn	Read of T, C temporary value : T, C temporary value is transferred to Dn.
MOV	KmX,M	Dn	Batch input : X, M content is inputted to Dn in blocks in units of 4 points up to 16 points.
MOV	Km	KnY	Pattern output to Y : Bit pattern is output to Y in blocks in units of 4 points up to 16 points.
MOV	KmX	KnM	Batch input of X to M : X is inputted to M in blocks in units of 4 points up to 16 points.
MOV	KmY	Dn	Output pattern save of Y : Y is transferred to Dn in units of 4 points up to 16 points.
BCD	Dm	Dn	Binary data of data register is converted into BCD.
BCD	T,Cm	Dn	T, C temporary value is read and converted into BCD.
BIN	Dm	Dn	BCD data of data register is converted into binary.
BIN	KmX	Dn	BCD data of input is converted into binary and inputted in blocks.
BCD	T,Cm	KnY	T, C temporary value (binary) is converted into BCD and output directly to Y.
BCD	Dm	KnY	Binary data of Dm is converted into BCD and output directly to Y.
+	Km	Dn	Constant addition : Km (0 ~ 9999) + Dn content is done and the result is stored into Dn.
+	Dm	Dn	Addition : Dn content + Dm content is done and the result is stored into Dn.
−	Km	Dn	Constant subtraction : Dn content − Km (0 ~ 9999) is done and the result is stored into Dn.
−	Dm	Dn	Subtraction : Dn content − Dm content is done and the result is stored into Dn.
>	Dm	Dn	Magnitude comparison : Dm content > Dn content is judged.
<	Km	Dn	Magnitude comparison : Constant Km (0 ~ 9999) < Dn content is judged.
=	Dm	Dn	Coincidence judgement : Dm content = Dn content is judged.
>,<,=	Km	T,Cn	Direct comparison of T, C temporary value and reference value (Km).
>,<,=	Km	KnY	Comparison of output pattern and reference pattern (Km).

Table 3.6 S, D Instruction List of Data Instructions

CAUTION

Note that when programming is performed by use of PU (programming unit) or GPP (graphic programming panel) having a lenged plate which does not indicate "DATE" as shown below, only the S and D combinations of programmable data instructions shown in the following tables can be used.

□□ K3 □
- → Version
- → Year and month of manufacture

MOV

S \ D	K	D	T	C	X	Y	M
K		○					
D		○	○	○		○	○
T		○					
C		○					
X		○					
Y							
M		○					

>,<,=,+,−

D	K	D	T	C	X	Y	M
K		○					
D		○					
T							
C							
X							
Y							
M							

BCD(○)
BIN(•)

S \ D	K	D	T	C	X	Y	M
K							
D		○ •					
T		○					
C		○					
X		•					
Y							
M							

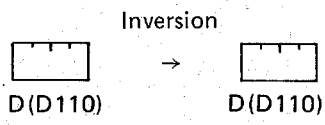
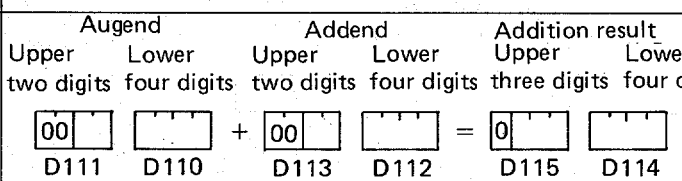
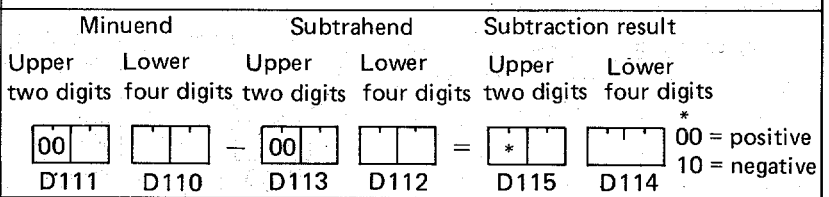
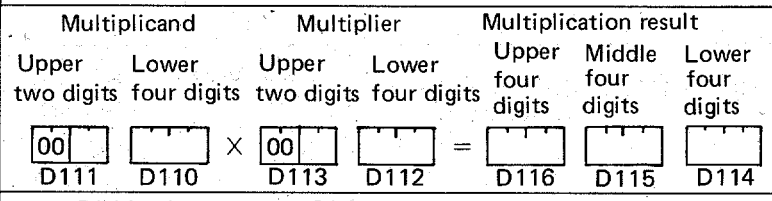
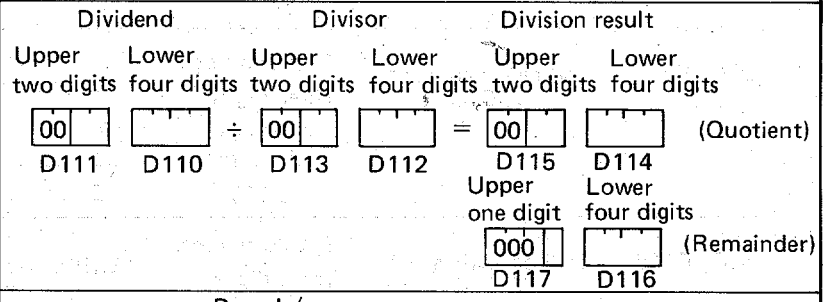
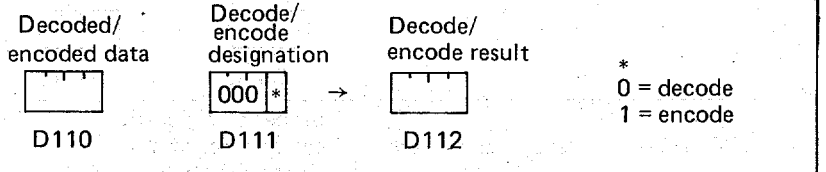
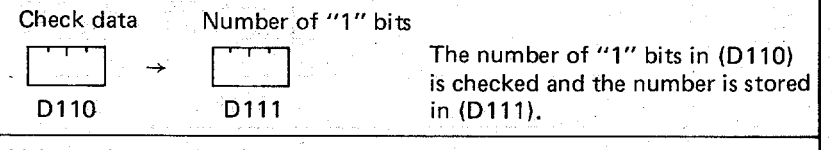
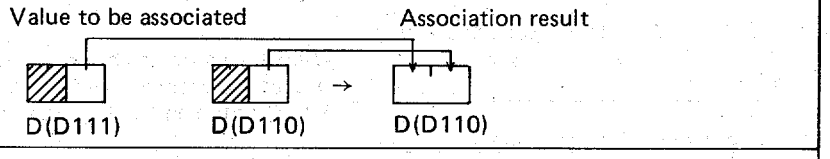
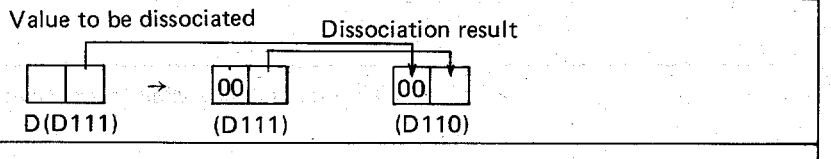
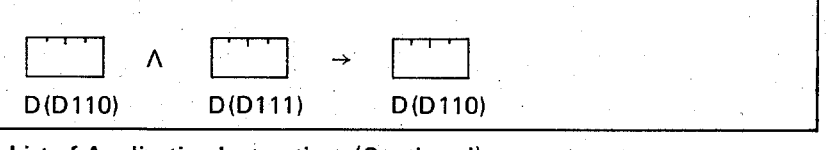
Instruction	Function	Operation Result
OUT F100	Indirect inversion of 16-bit data	 • 1's complement • (D110) is data register number.
OUT F101	BCD 6 digit Addition	
OUT F102	BCD 6 digit subtraction	
OUT F103	BCD 6 digit multiplication	
OUT F104	BCD 6 digit division	
OUT F108	4 ⇔ 16 bit decode/encode	
OUT F109	16 bit check	 The number of "1" bits in (D110) is checked and the number is stored in (D111).
OUT F110	8-bit data association	
OUT F111	16-bit data dissociation	
OUT F112	Indirect AND operation of 16-bit data	

Table 3.7 List of Application Instructions (Continued)

Instruction	Function	Operation Result
OUT F113	Indirect OR operation of 16-bit data	D(D110) V D(D111) → D(D110)
OUT F114	Batch shift of temporary memory M	Head number of M: 0 D110; Number of D points to be shifted: 0 D111; Designation of shift direction: 000 * D112 (*0 = leftward shift, 1 = rightward shift). Head number of M is placed in (D110) and the number of points in (D111) is shifted once.
OUT F115	Batch shift of data resistor D	Head number of D: 00 D110; Number of D points to be shifted: 00 D111; Designation of shift direction: 000 * D112 (*0 = leftward shift, 1 = rightward shift). Head number of D is placed in (D110) and the number of points in (D111) is shifted once.
OUT F116	Batch reset of data register D	Head number of D: 00 D110; Number of D points to be reset: 00 D111. Head number of D is placed in (D110) and the number of points in (D111) is reset.
OUT F117	Indirect reading of T, C, D	T, C, D number Three digits: * D110 → Reading result: D111 (*0 = T·C, 1 = D)
OUT F118	Indirect writing of T, C, D	T, C, D number Three digits: * D110 → Writing result: D111 (*0 = T·C, 1 = D)
OUT F119	Data transfer from Y to D	Number of digits and head number of Y: Number of digits; Head number; D110 → D number of transfer destination: 1 D111. Batch transfer from output Y to data register D. A maximum of 16 points are transferred in units of four points.
OUT F126	High-speed processing program call	Used for call of high-speed processing program (SET F126) in normally processed program and return to normally processed program (RST F126) at the end of high-speed processing program.
RST F126	High-speed processing program return	

Table 3.7 List of Application Instructions

3.2.2 Memory specifications

	RAM		ROM	
Type name	*	4KRAM	2KROM	4KROM
Capacity	1024 steps	4096 steps	2048 steps	4096 steps
Construction	IC chip	IC chip	IC chip	IC chip
Remarks	*Standard-equipped RAM		ROM writer K6WU K6PRT	ROM writer K6PRT

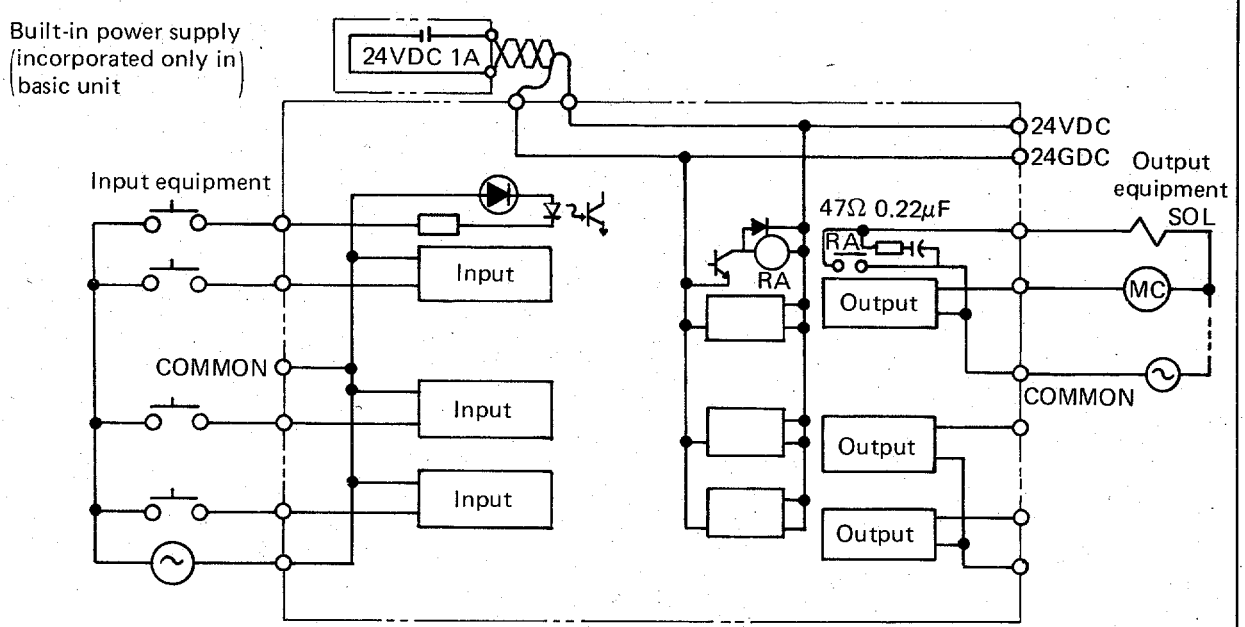
Note: Applicable RAM and ROM are restricted to Mitsubishi's products.

Table 3.8 Memory Specifications

3.2.3 I/O specifications

(1) Type AR (100VAC input, relay contact output)

Input Specifications			Output Specifications		
Insulation system	Photocoupler		Insulation system	Relay	
Operating indicator	All points indicated by light-emitting diodes		Operating indicator	All points indicated by light-emitting diodes	
Input voltage	85 ~ 121VAC		Maximum load voltage	250VAC/125VDC	
			Load power supply	1 point	2A (120VAC cosφ=0.7, 24VDC L/R=7mS)
Operating current	10mA (100VAC)			8 points	8A (all points simultaneous ON)
Operating voltage	OFF → ON	80VAC minimum	Maximum inrush load current	5A/points	
	ON → OFF	40VAC maximum	Minimum load current	5mA (100V/200VAC), 10mA (24VDC)	
Response time	OFF → ON	5 ~ 15mS	Response time	OFF → ON	5mS
	ON → OFF	15 ~ 30mS		ON → OFF	15mS
Input impedance	10kΩ		Contact life	Electrical	500 thousand times or more (110VAC 1.5A)
				Mechanical	20 million times or more
Common wiring	All points/common (provided with terminal block for bridging external wiring per 16 points)		Leak current	2mA (200VAC 60Hz)	
			Common wiring	8 points/common	
External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)		External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)	
Applicable solderless terminals	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)		Applicable solderless terminal	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)	
Applicable wire size	2mm² maximum		Applicable wire size	2mm² maximum	

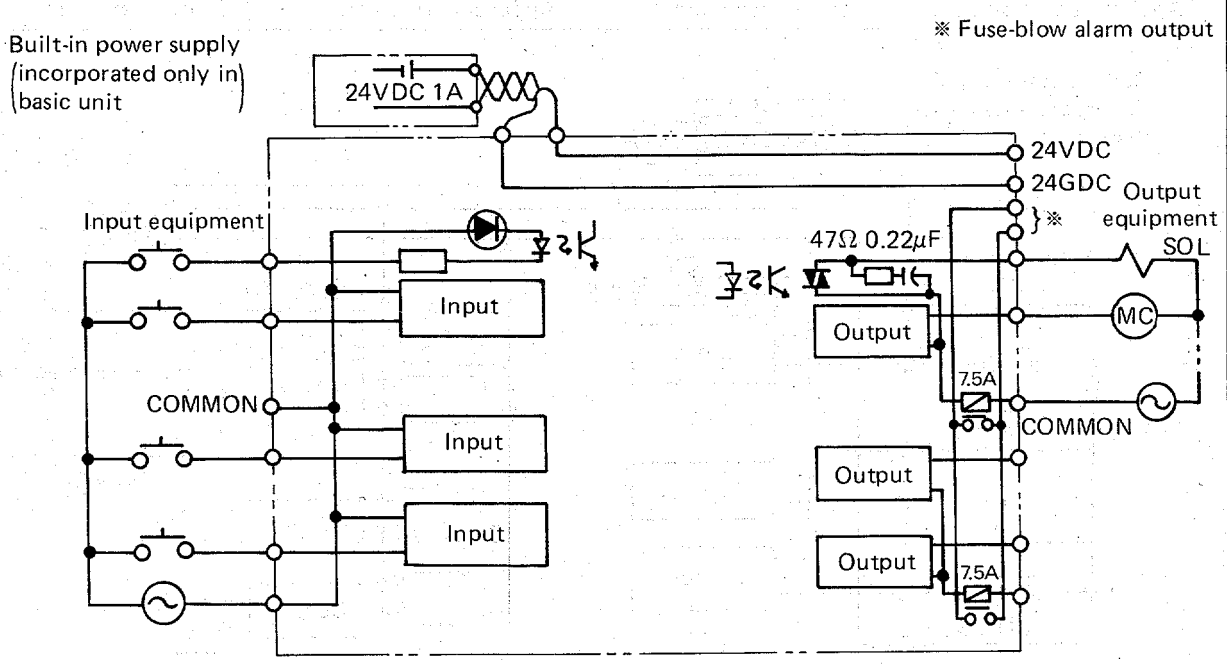


Since the basic unit incorporates 24V DC power supply, it is not required to supply the relay power supply for output circuit from the exterior. Connect E32, E56 extension unit in the exterior so that power is supplied from the 24V DC supply terminal of basic unit.

Table 3.9 Type AR Specifications

(2) Type AS (100VAC input, triac output)

Input Specifications			Output Specifications		
Insulation system	Photocoupler		Insulation system	Photocoupler	
Operating indicator	All points indicated by light-emitting diodes		Operating indicator	All points indicated by light-emitting diodes	
Input voltage	85 ~ 121VAC		Load voltage	80 ~ 242VAC	
			Load power supply	1 point	1A
Operating current	10mA (100VAC)			8 points	5A (8 points simultaneous ON)
Operating voltage	OFF → ON	80VAC minimum	Maximum inrush load current	30A/point (1 cycle)	
	ON → OFF	40VAC maximum	Minimum load current	30mA (25°C)	
Response time	OFF → ON	5 ~ 15mS	Response time	OFF → ON	5mS
	ON → OFF	15 ~ 30mS		ON → OFF	1/2 cycle
Input impedance	10kΩ		Fuse-blow alarm contact	125VAC Maximum current: 0.5A	
Common wiring	All points/common (provided with terminal block for bridging external wiring per 16 points)		Leak current	3mA (200VAC 60Hz)	
			Common wiring	8 points/common	
External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)		External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)	
Applicable solderless terminals	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)		Applicable solderless terminal	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)	
Applicable wire size	2mm² maximum		Applicable wire size	2mm² maximum	

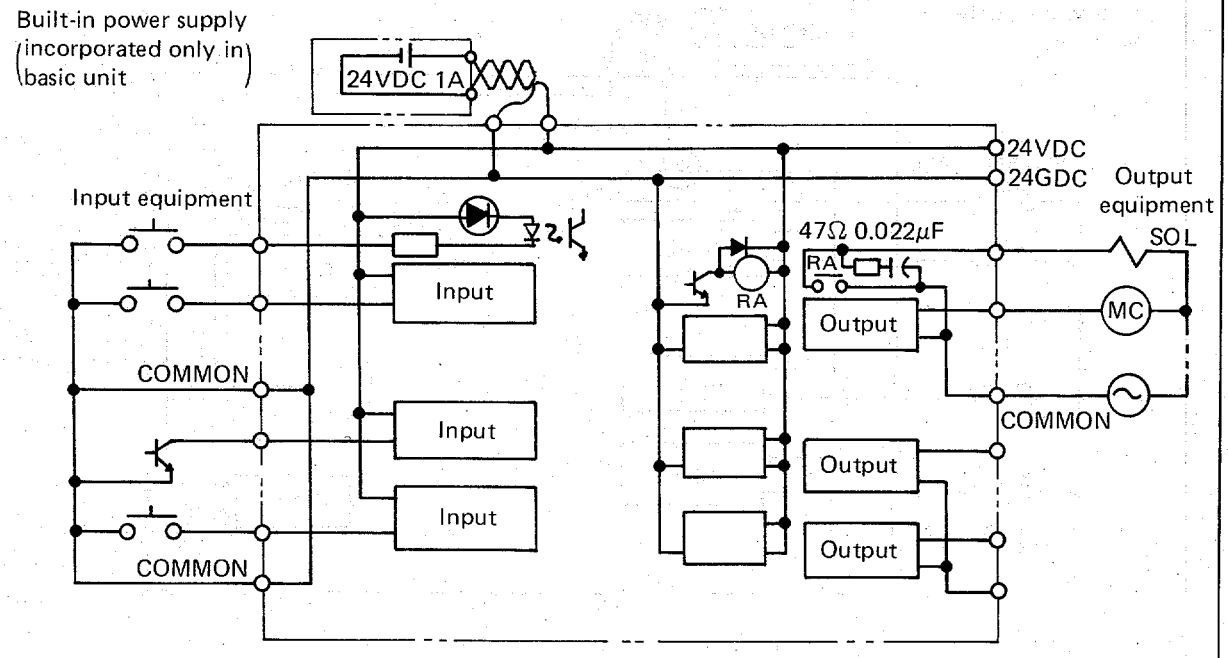


The basic unit incorporates 24V DC power supply. When Type DR, AR, DT or DS is used, connect E32, E56 extension unit in the exterior so that power is supplied from the 24V DC supply terminal.

Table 3.10 Type AS Specifications

(3) Type DR (24VDC input, relay contact output)

Input Specifications			Output Specifications		
Insulation system	Photocoupler		Insulation system	Relay	
Operating indicator	All points indicated by light-emitting diodes		Operating indicator	All points indicated by light-emitting diodes	
Input voltage	24VDC +10 ~ −10%		Maximum load voltage	250VAC/125VDC	
	(Power supply built in basic unit is used)		Load power supply	1 point	2A (120VAC coxϕ=0.7 24VDC L/R=7mS)
Input current	8.5 ~ 11mA (24VDC)			8 points	8A (8 points simultaneous ON)
Operating voltage	OFF → ON	8 ~ 10VDC	Maximum inrush load current	5A/points	
	ON → OFF	8 ~ 10VDC	Minimum load current	5mA (100V/200VAC), 10mA (24VDC)	
Response time	OFF → ON	9 ~ 15mS	Response time	OFF → ON	5mS
	ON → OFF	9 ~ 15mS		ON → OFF	15mS
Input resistance	Approximately 2.4kΩ		Contact life	Electrical	500 thousand times or more (110VAC 1.5A)
Input system	Sink input (input current efflux system)			Mechanical	20 million times or more
Common wiring	32 points/common (provided with terminal block for bridiging external wiring per 16 points)		Leak current	2mA (200VAC 60Hz)	
			Common wiring	8 points/common	
External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)		External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)	
Applicable solderless terminals	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)		Applicable solderless terminal	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)	
Applicable wire size	2mm² maximum		Applicable wire size	2mm² maximum	

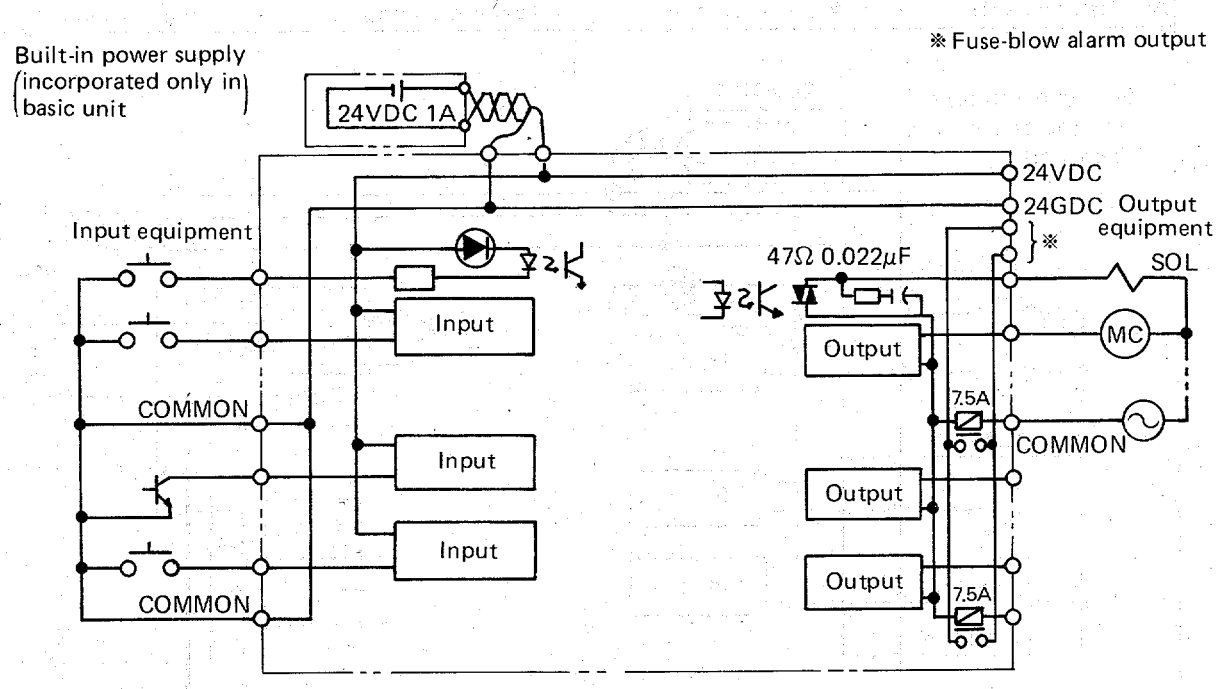


Since the basic unit incorporates 24V DC power supply, it is not required to supply the power supply for input circuit and the relay power supply for output circuit from the exterior. Connect E32, E56 extension unit in the exterior so that power is supplied from the 24V DC supply terminal of basic unit.

Table 3.11 Type DR Specifications

(4) Type DS (24VDC input, triac output)

Input Specifications			Output Specifications		
Insulation system	Photocoupler		Insulation system	Photocoupler	
Operating indicator	All points indicated by light-emitting diodes		Operating indicator	All points indicated by light-emitting diodes	
Input voltage	24VDC +10 ~ −10%		Load voltage	80 ~ 242VAC	
	(Power supply built in basic unit is used)		Load power supply	1 point	1A
Input current	8.5 ~ 11mA (24VDC)			8 points	5A (8 points simultaneous ON)
Operating voltage	OFF → ON	8 ~ 10VDC	Maximum inrush load current	30A/point (1 cycle)	
	ON → OFF	8 ~ 10VDC	Minimum load current	30mA/point (25°C)	
Response time	OFF → ON	9 ~ 15mS	Response time	OFF → ON	1mS
	ON → OFF	9 ~ 15mS		ON → OFF	1/2 cycle
Input resistance	Approximately 2.4kΩ		Fuse-blow alarm contact	125VAC Maximum current: 0.5A	
Input system	Sink input (input current efflux system)				
Common wiring	All points/common (provided with terminal block for bridiging external wiring per 16 points)		Leak current	3mA (200VAC 60Hz)	
			Common wiring	8 points/common	
External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)		External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)	
Applicable solderless terminals	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)		Applicable solderless terminal	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)	
Applicable wire size	2mm² maximum		Applicable wire size	2mm² maximum	

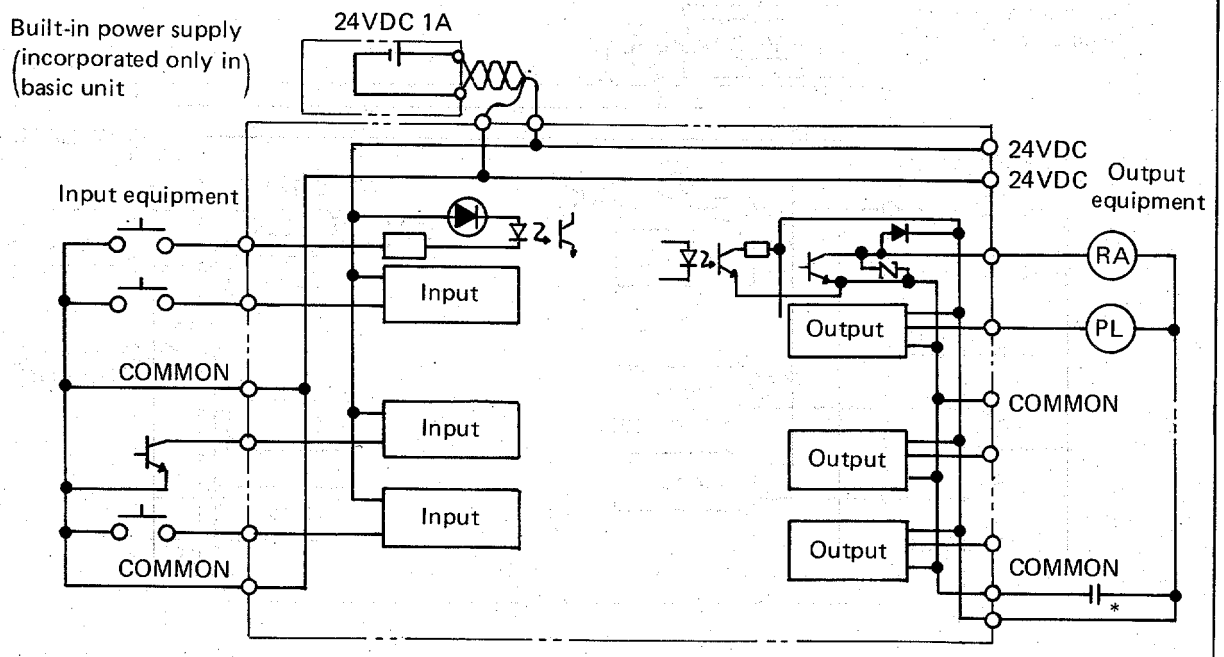


Since the basic unit incorporates 24V DC power supply, it is not required to supply the power supply for input circuit and the relay power supply for output circuit from the exterior. Connect E32, E56 extension unit in the exterior so that power is supplied from the 24V DC supply terminal of basic unit.

Table 3.12 Type DS Specifications

(5) Type DT (24VDC input, transistor output)

Input Specifications			Output Specifications		
Insulation system	Photocoupler		Insulation system	Photocoupler	
Operating indicator	All points indicated by light-emitting diodes		Operating indicator	All points indicated by light-emitting diodes	
Input voltage	24VDC +10 ~ −10%		Rated load voltage	5/12/24VDC	
	(Power supply built in basic unit is used)		Maximum Load power supply	30VDC	
Input current	8.5 ~ 11mA (24VDC)		Load power supply	1 point	0.5A
Operating voltage	OFF → ON	8 ~ 10VDC		8 points	4A (8 points simultaneous ON)
	ON → OFF	8 ~ 10VDC	Maximum inrush load current	15A (50mS)	
Response time	OFF → ON	9 ~ 15mS	Response time	OFF → ON	0.1mS
	ON → OFF	9 ~ 15mS		ON → OFF	0.5mS
Input resistance	Approximately 2.4kΩ		Maximum voltage drop at ON	1.5V	
Input system	Sink input (input current efflux system)		External supply unit	160mA/16 points (24VDC)	
Common wiring	All points/common (provided with terminal block for bridiging external wiring per 16 points)		Common wiring	All points/common (provided with terminal block for bridiging external wiring per 16 points)	
External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)		External connection system	20-point terminal block connector (terminal screw: M3 x 0.5 x 6)	
Applicable solderless terminals	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)		Applicable solderless terminal	1.25–3, 2–S3 (proper tightening torque: 7kg/cm)	
Applicable wire size	2mm² maximum		Applicable wire size	2mm² maximum	

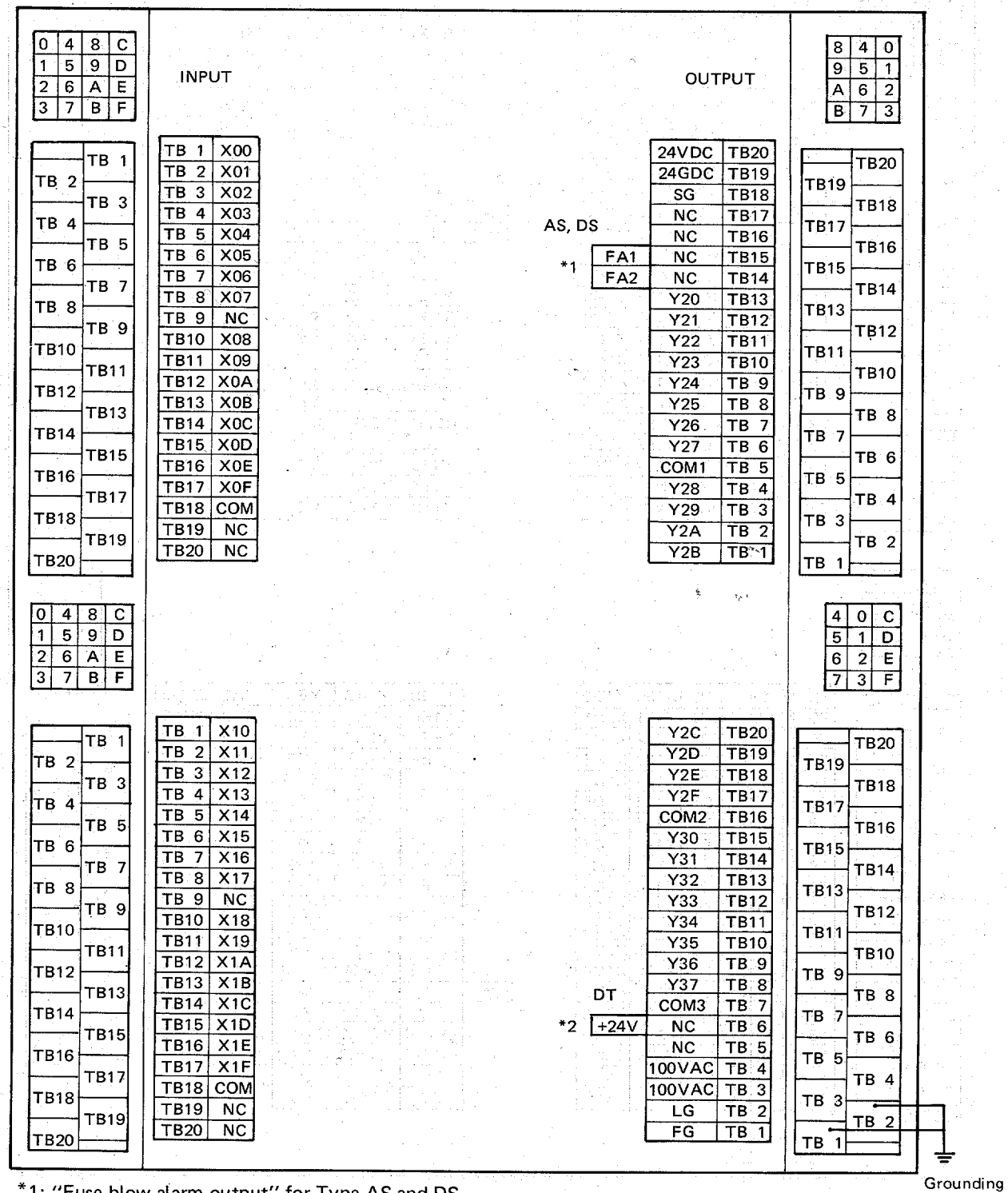


Since the basic unit incorporates 24V DC power supply, it is not required to supply the power supply for input circuit from the exterior. Connect E32, E56 extension unit in the exterior so that power is supplied from the 24VDC supply terminal of basic unit. The power supply with * mark is a power supply device in the exterior and used for load.

Table 3.13 Type DT Specifications

3.2.4 Terminal arrangement

(1) Terminal arrangement of basic unit



*1: "Fuse-blow alarm output" for Type AS and DS
*2: Load power supply input for Type DT

Fig. 3.1 Terminal Arrangement of Basic Unit

(2) Terminal arrangement of Type E56 extension unit

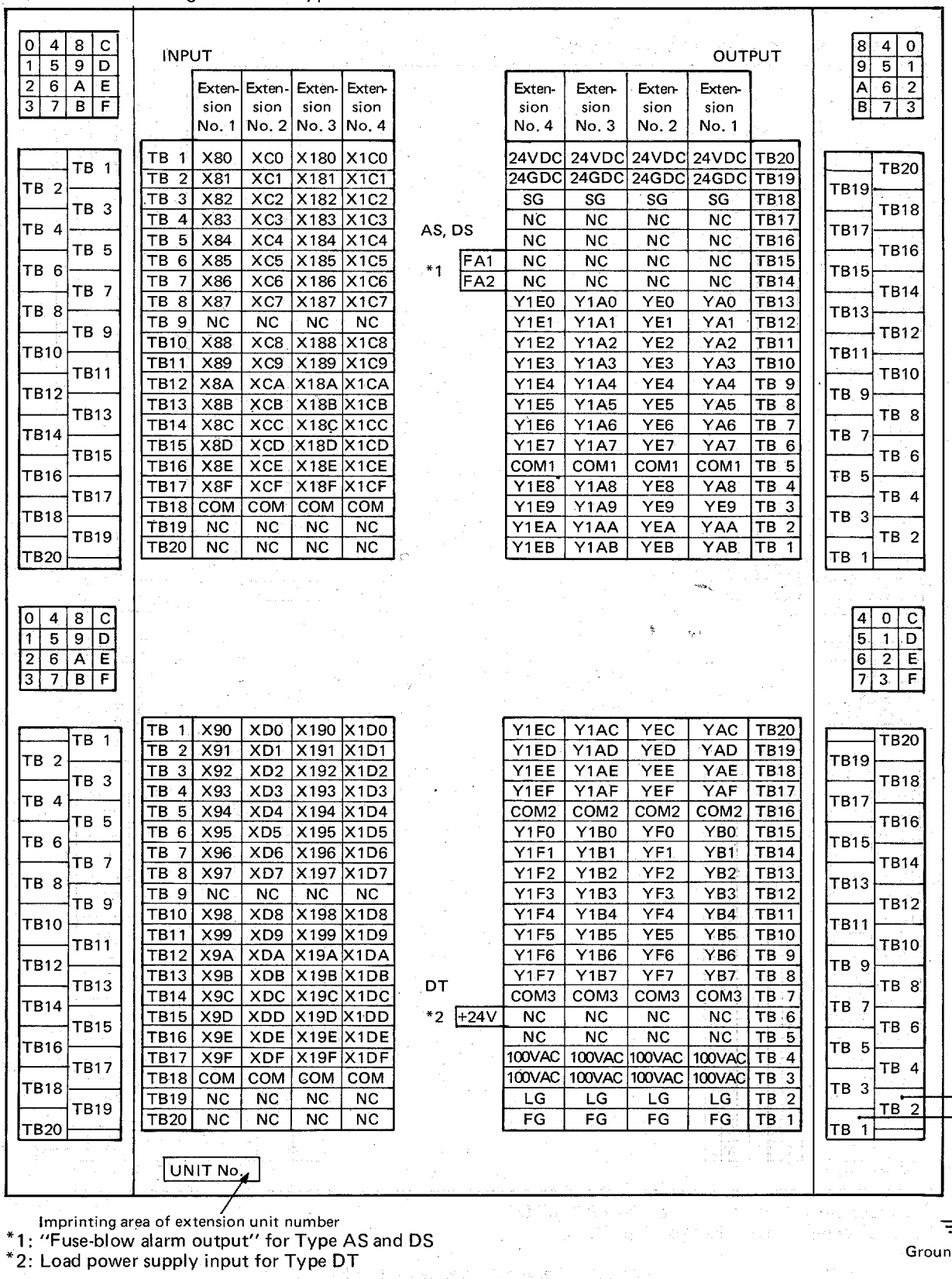
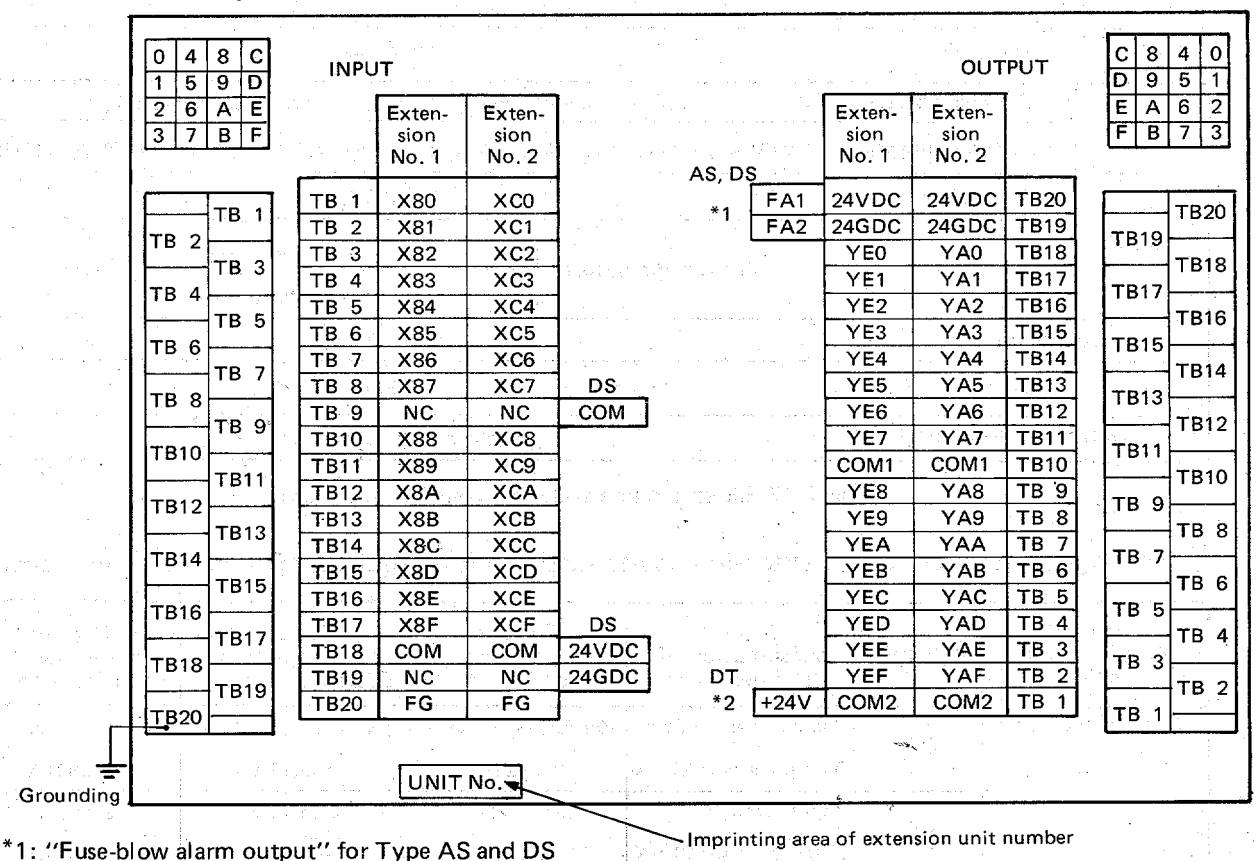


Fig. 3.2 Terminal Arrangement of Type E56 Extension Unit

(3) Terminal arrangement of Type E32 extension unit



*1: "Fuse-blow alarm output" for Type AS and DS
*2: Load power supply input for Type DT

Fig. 3.3 Terminal Arrangement of Type E32 Extension Unit

(4) Terminal arrangement of extension base

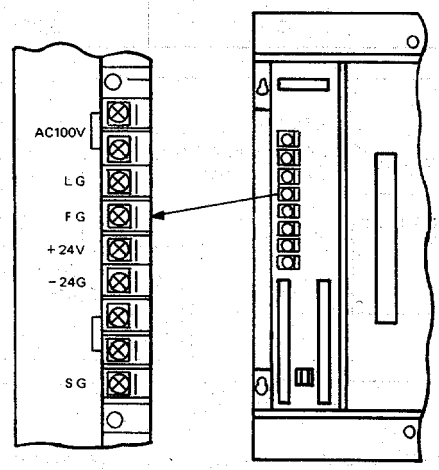


Fig. 3.4 Terminal Arrangement of Extension Base

Terminal	Application
TB1 ~ 20	Terminal numbers. Take care because there are the same numbers.
Xm	Input number
Yn	Output number
NC	Abbreviation of No. Connection. An empty terminal which is not connected with interior. Can be used as a junction terminal.
COM	Abbreviation of Common. A common terminal to input or output.
24VDC	+ side of 24VDC of programmable controller interior.
24GDC	0V side of 24VDC of programmable controller interior.
100VAC	100VAC power supply input
LG	Grounding of line filter
FG	Grounding for prevention of noise
SG	0V terminal of internal power 5VDC. Do not ground.
FA1, 2	Fuse-blow alarm output which outputs fuse blow to exterior for protection of triac of Type AS and DS. Turns on when fuse is blown.
+24V	Connect +24V of power supply for load.

Table 3.16 Applications of Terminals

3.2.5 Extension power supply unit specifications

Type name		K0J1-PW	
Input	Applied voltage	100 – 110VAC, 85 ~ 110%, single phase 50/60Hz ± 2Hz	
	Power consumption	66VA, current: maximum 0.9A, inrush current 20A, 10ms (110VAC 60Hz)	
Output	Voltage	24VDC	
	Current	Ambient temperature	45°C 1.0A
			55°C 0.8A
External dimensions		120 x 170 mm	
Weight		0.5kg	
Usable extension unit		Type E56 extension unit	

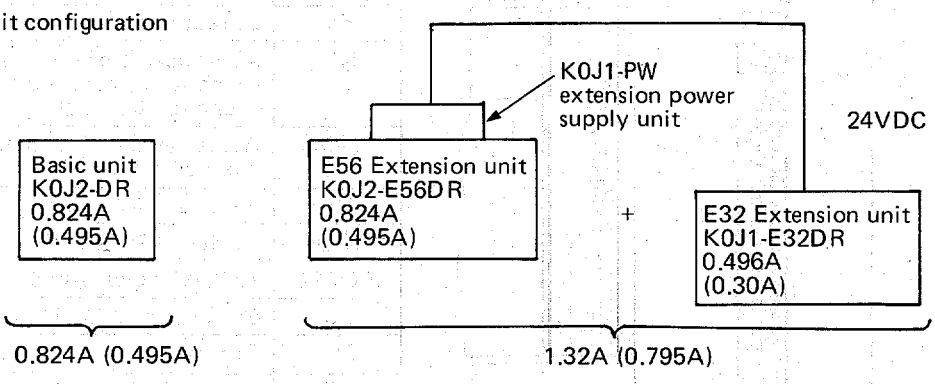
Table 3.17 Extension Power Supply Unit Specifications

*: To judge whether or not the extension power supply unit is required, refer to the table shown below.

Current consumption of 24VDC (at all I/O simultaneous ON)	I/O symbol	Current consumption of 24V per point	Current consumption of basic unit	Current consumption of E32 extension unit	Current consumption of E56 extension unit
	DR	Input current: 10mA Output current: 21mA	10mAx32+21mAx24 =0.824A	10mAx16+21mAx16 =0.496A	10mAx32+21mAx24 =0.824A
	AR	Input current: – Output current: 21mA	21mAx24 =0.504A	21mAx16 =0.336A	21mAx24 =0.504A
	AS	Input current: – Output current: –	–	–	–
	DT	Input current: 10mA Output current: –	10mAx32 =0.32A	10mAx16 =0.16A	10mAx32 =0.32A
	DS	Input current: 10mA Output current: –	10mAx32 = 0.32A	10mAx16 =0.16A	10mAx32 =0.32A

Calculation example of current consumption of 24VDC

Unit configuration



When current consumption is calculated assuming that the simultaneous ON ratio of each unit is 60%, the result is as indicated in parenthesis. Therefore, add the K0J1-PW power supply unit to the E56 extension unit to supply power also to the E32 extension unit.

3.2.6 Extension adaptor specifications

Type Name	K0J2-EX1	K0J2-EX2
Applied unit	K0J2	K0J2
Connected unit	K0J1-E32, K0J1-E56, K0J2-E56	K65BN, K68BN
Connection cable	K0J-61CBL, K0J-61CBL2	K0J-62CBL, K0J-62CBL2
External dimensions	114 x 150 mm	114 x 150 mm
Weight	0.05 kg	0.1 kg

Table 3.18 Extension Adaptor Specifications

3.2.7 Extension unit specifications

		32-point Extension Unit	56-point Extension Unit
Type name		K0J1-E32□□ *	K0J2-E56□□ *
Extended unit	Basic unit	K0J1, K0J1H, K0J2, K0J2P	K0J1, K0J1H, K0J2, K0J2P
	Extension unit	K0J1-E32, K0J1-E56, K0J2-E56	K0J1-E32, K0J1-E56, K0J2-E56
Connection cable		K0J-61CBL, K0J-61CBL2	K0J-61CBL, K0J-61CBL2
Number of I/O points	Input	16 points	32 points
	Output	16 points	24 points
External dimensions		210 x 210 x 100 mm	210 x 300 x 100 mm
Weight		1.3kg	1.6kg

Note: (*) The last two letters of extension unit indicate I/O specifications. (See Section 2.1 "List of Equipment" and Section 3.2.3 "I/O specifications".)

Table 3.19 Extension Unit Specifications

3.2.8 Extension base specifications

Type Name	K65BN	K68BN
Applied unit	K0J2	K0J2
Loading range of I/O units	Five units can be loaded	Eight units can be loaded
Terminal screw size	M3 x 0.5 x 6	
Applicable wire size	$2mm^2$ maximum	
Applicable solderless terminal	1.25-3, 2-S3 (proper tightening torque: 7kgf·cm)	

Table 3.20 Extension Base Specifications

3.2.9 Extension cable specifications

Type Name	K0J-61CBL	K0J-61CBL2
Cable length	500 mm	1000 mm
Dielectric withstand voltage	500V AC for one minute	
Application	(1) Connection of K0J basic unit and extension unit (2) Connection of K0J extension unit and extension unit	

Note: One piece of Type K0J-61CBL extension cable is provided per extension unit.

Table 3.21 Extension Cable Specifications (1)

Type Name	K0J-62CBL	K0J-62CBL2
Cable length	500 mm	1000 mm
Dielectric withstand voltage	500V AC for one minute	
Application	(1) Connection of K0J basic unit (except K0J2P) and extension unit	

Table 3.22 Extension Cable Specifications (2)

3.2.10 Switch unit specifications

Type name	K0SW
Number of switch points	16 points
Rated voltage	125V AC/DC, 250V AC/DC
Rated current	0.1A
Contact resistance	50mΩ or lower at 2～4VDC, 0.1A
Insulation resistance	1000Ω or higher at 1000V AC
Switch life	30000 times
Operating power	1 kg or less

Table 3.23 Switch Unit Specifications

3.2.11 Battery specifications

Type name	K6BAT
Rated voltage	3.6V
Battery guarantee period	Five years
Total power failure time	300 days (7200 hours)
Application	Back up of IC-RAM memory Back up of latch function

Table 3.24 Battery Specifications

3.2.12 Fuse specifications

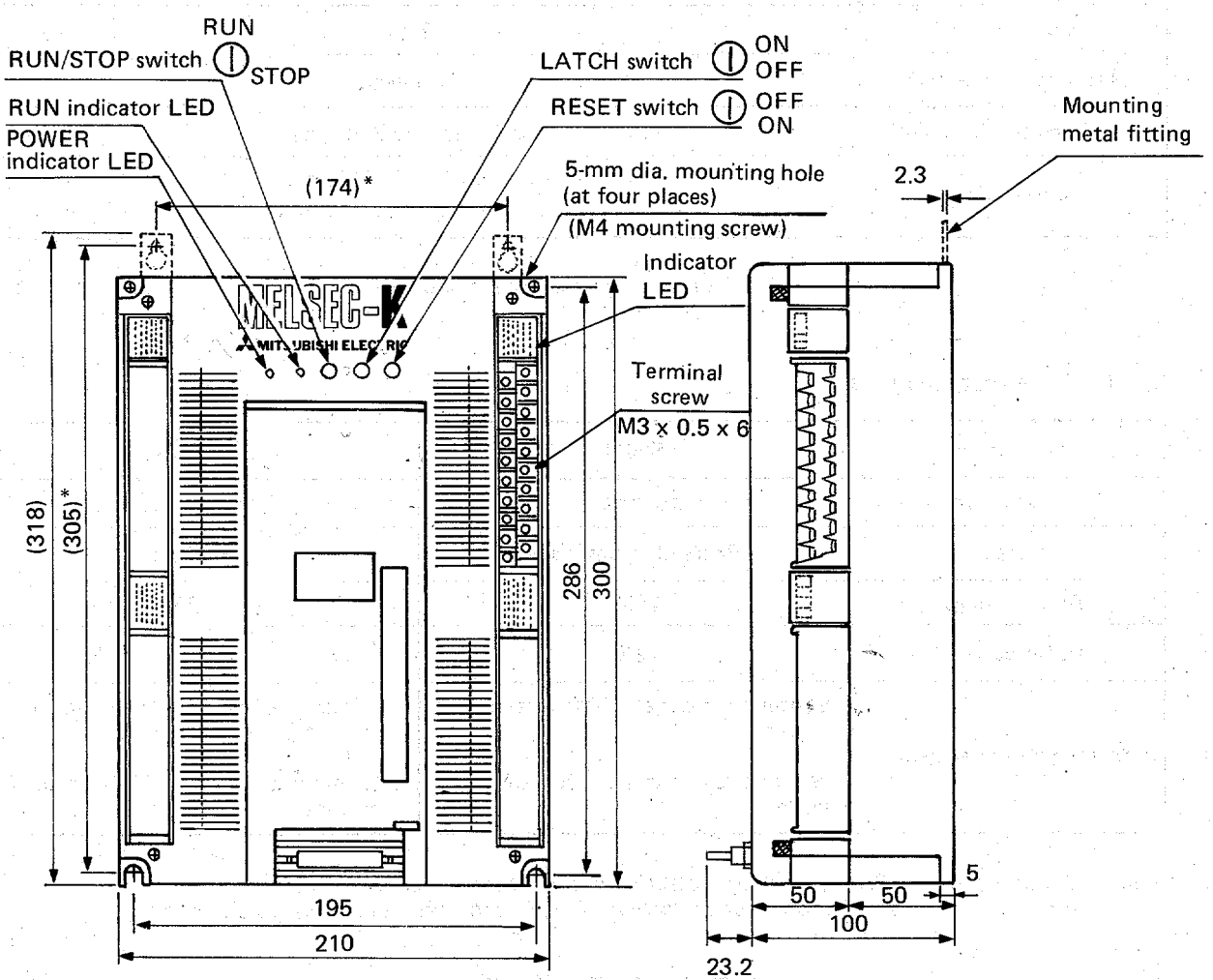
Type name	MN51R	MP75
Application	For power supply	For triac output*
Shape	Encased in glass tube	Plug type
Rated voltage	250V	125V
Rated current	2A	7.5A
Melting characteristics	Wihtin one hour at 160% of rated current Within two minutes at 200% of rated current	Within one hour at 135% of rated current Within one second at 250% of rated current

Note: **Fuse for triac (MP75) is used for protection of unit at the time of short-circuit. Provide the fuse, which is used for protection of load, at the exterior in units of one point.*

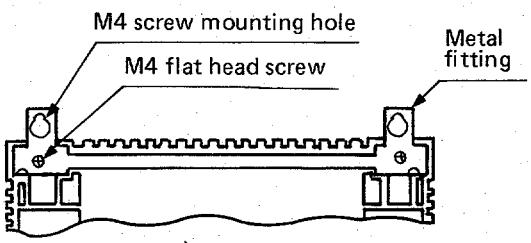
Table 3.25 Fuse Specifications

3.3 External Dimensions

(1) Basic unit K0J2-□□ 2.6 kg

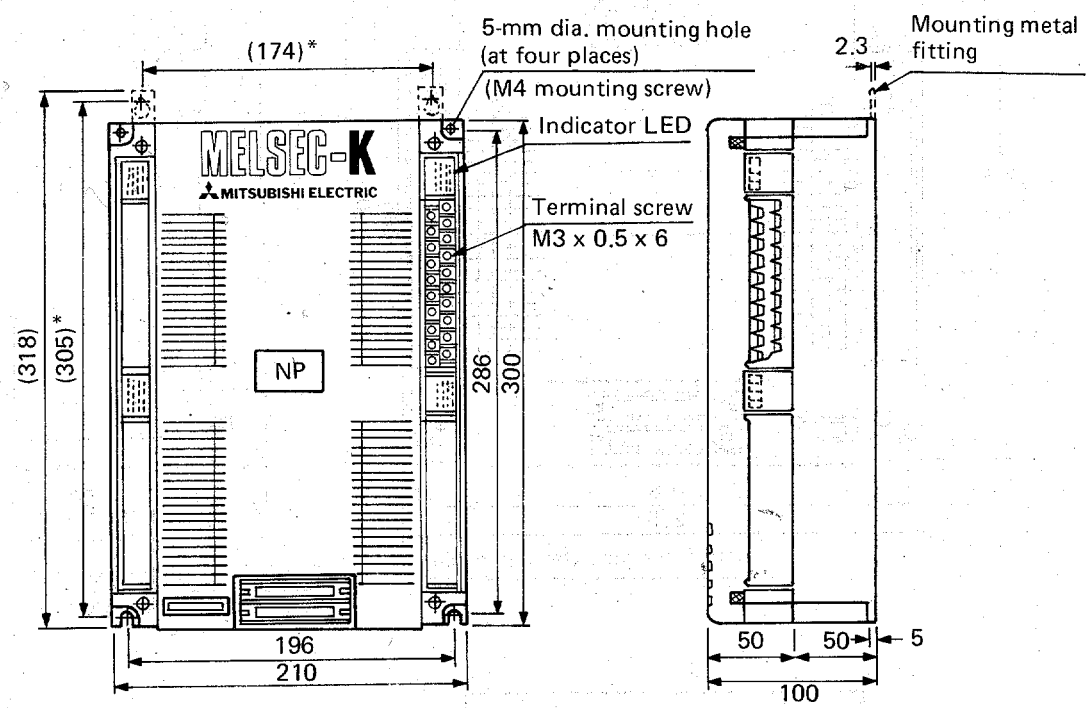


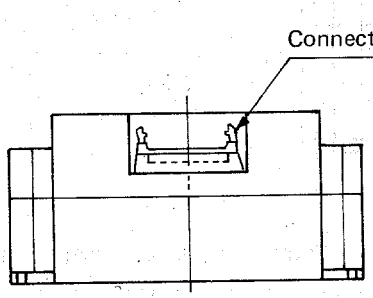
*Note: Upper mounting holes can be changed to * mark by changing the mounting positions of metal fittings.*



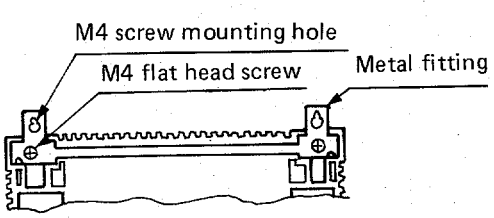
By removing two M4 flat head screws, the metal fittings can be mounted as shown above.

(2) Extension unit K0J2-E56□□ 2.2 kg





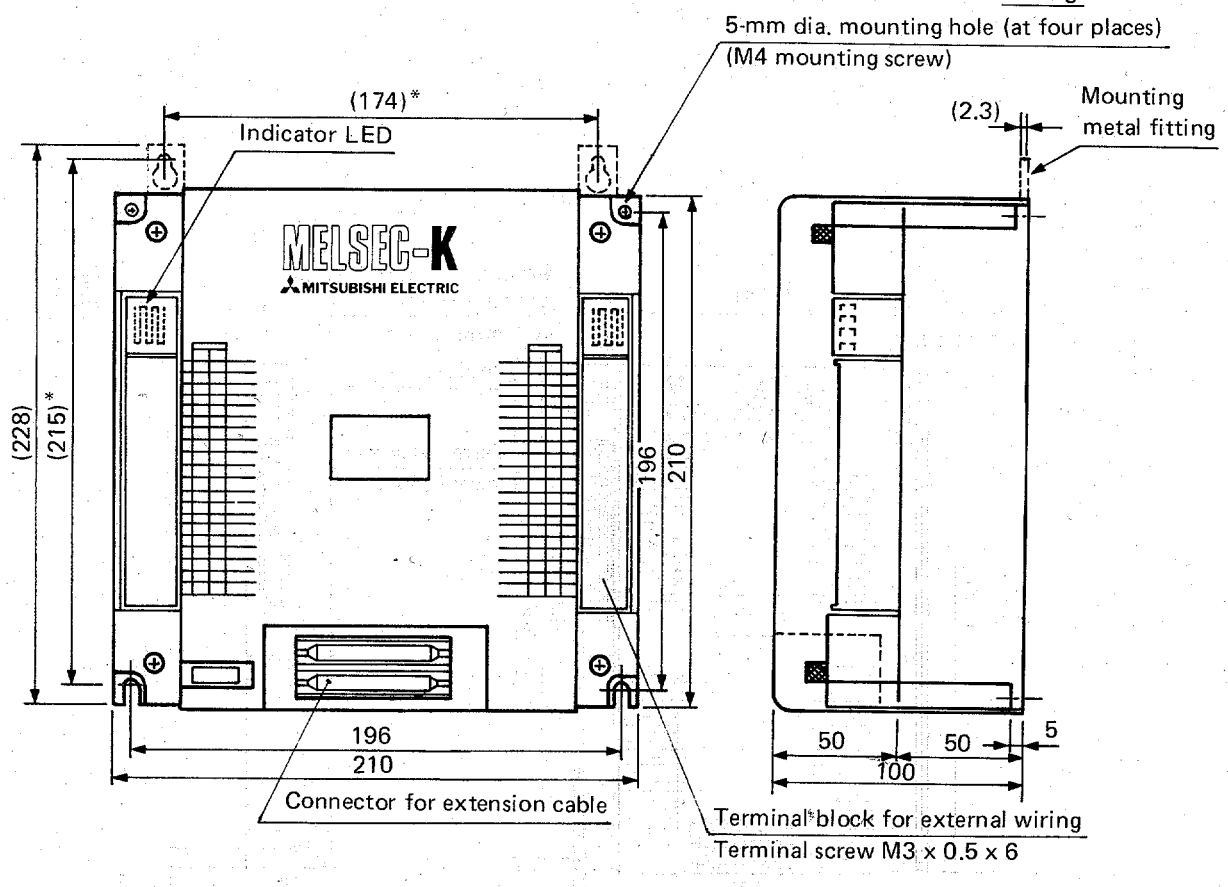
*Note: Upper mounting holes can be changed to * mark by changing the mounting positions of metal fittings.*

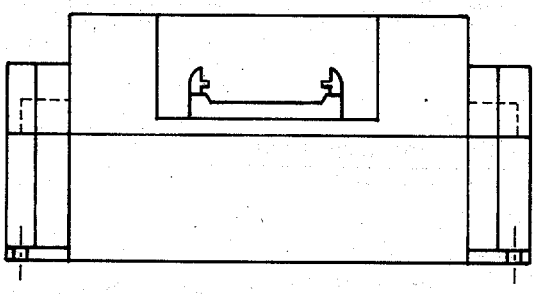


By removing two M4 flat head screws, the metal fittings can be mounted as shown above.

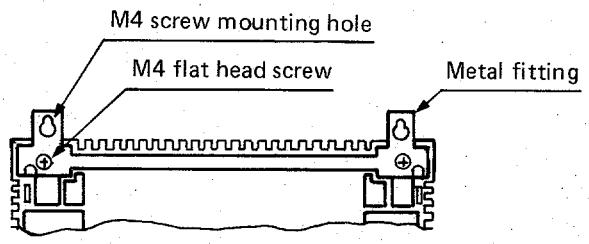
(3) Extension unit K0J1-E32□□

1.1 kg





Note: *Upper mounting holes can be changed to * mark by changing the mounting positions of metal fittings.*

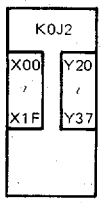
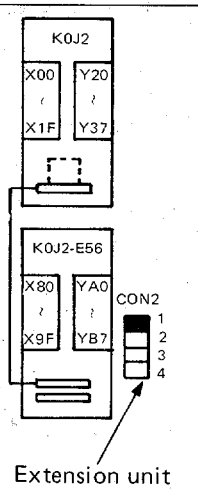
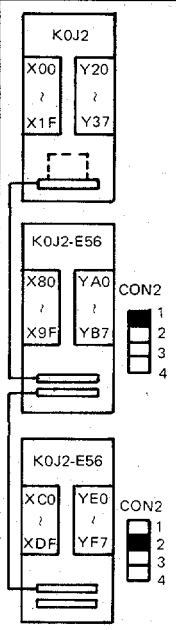
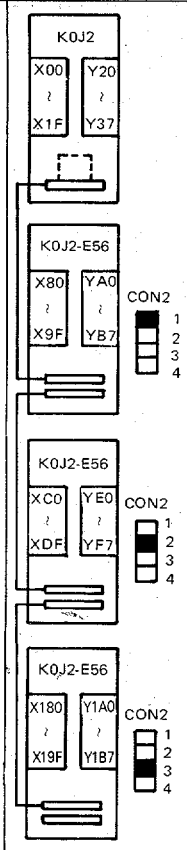
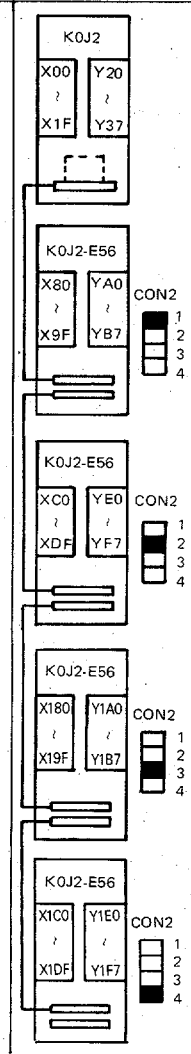


By removing two M4 flat head screws, the metal fittings can be mounted as shown above.

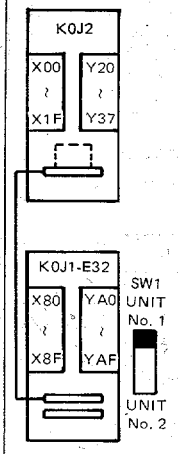
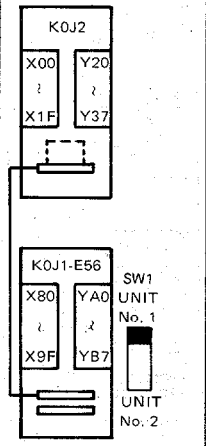
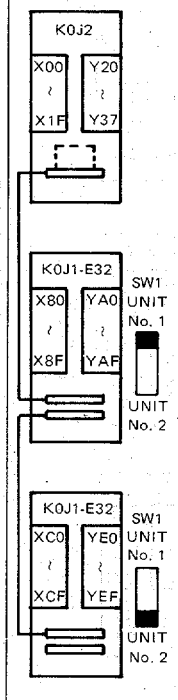
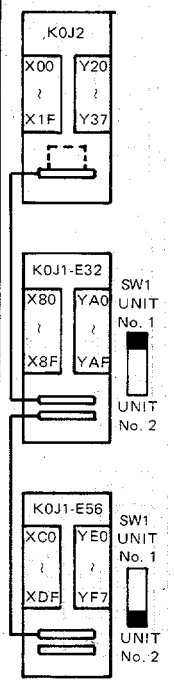
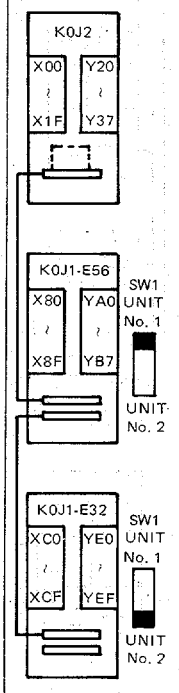
4. SYSTEM CONFIGURATION

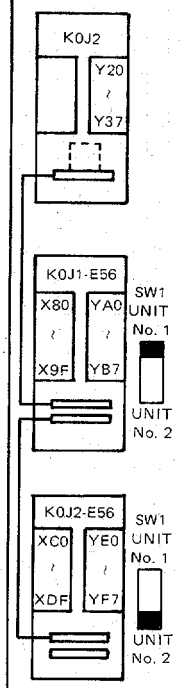
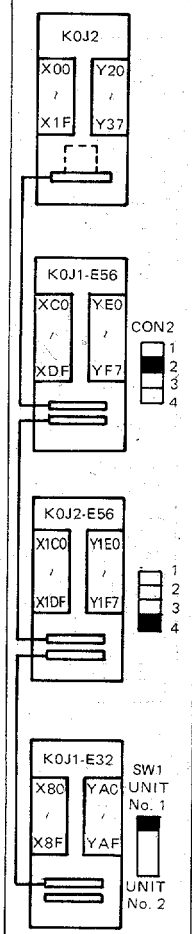
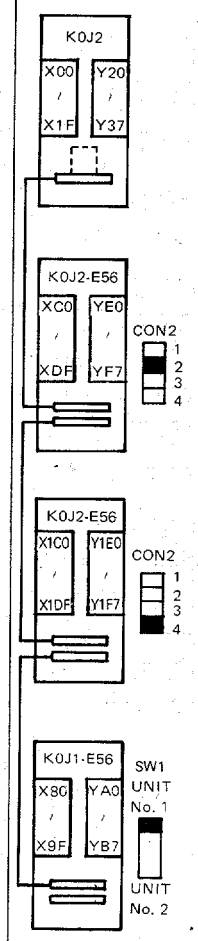
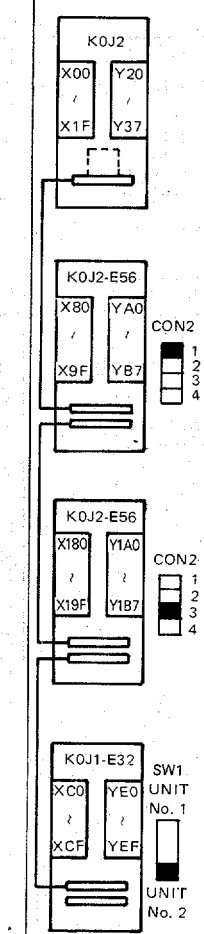
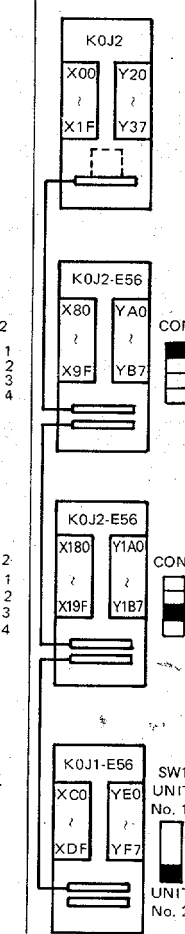
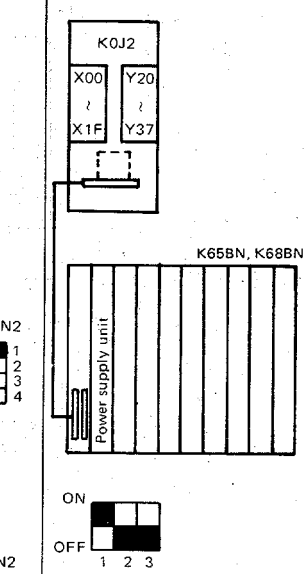
4. SYSTEM CONFIGURATION

4.1 Extension System by Use of Type K0J2-E56 Extension Unit

	1	2	3	4	5
Combination (Basic unit) (Extension unit)					
Number of I/O points	56 points	112 points	168 points	224 points	280 points
Number of input points	32 points	64 points	96 points	128 points	160 points
Number of output points	24 points	48 points	72 points	96 points	120 points
Y numbers which can be used as temporary memory	Y numbers which are not used as output Y00~1F, Y38~BF YE0~1BF, Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YE0~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~19F Y1B8~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~19F Y1B8~1BF Y1F8~1FF
Loading of external failure monitor unit (K0J2-EX0N)	Cannot be loaded	Can be loaded into only the unit located at the last stage.			
Caution		Load Type K0J2-EX1 extension adaptor into basic unit.			

4.2 Extension System by Use of Type K0J1-E32, E56 and K0J2-E56 Extension Units

	1	2	3	4	5
Combination (Basic unit) (Extension unit)					
Number of maximum I/O points	88 points	112 points	120 points	144 points	144 points
Number of input points	48 points	64 points	64 points	80 points	80 points
Number of output points	40 points	48 points	56 points	64 points	64 points
Y numbers which can be used as temporary memory	Y numbers which are not used as output Y00~1F, Y38~9F YB~BF, YE0~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YE0~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB0~BF, YB8~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF0~1BF Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~8F, YF0~1BF Y1E0~1FF
Loading of external failure monitor unit (K0J2-EX0N)	Cannot be loaded	Can be loaded into only the unit located at the last stage (K0J1-E56)	Cannot be loaded	Can be loaded into only the unit located at the last stage (K0J1-E56)	Cannot be loaded
Caution	Load Type K0J2-EX1 extension adaptor into basic unit.				

6	7	8	9	10	11
					
168 points 96 points 72 points	200 points 112 points 88 points	224 points 128 points 96 points	200 points 112 points 88 points	224 points 128 points 96 points	184 points 32+16xn points(m+n=8) 24+16xn points
Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~1BF, Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB0~BF, YF8~1BF, Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~1BF, Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF0~1BF, Y1E0~1FF	Y numbers which are not used as output Y00~1F, Y38~9F YB8~BF, YF8~1BF, Y1E0~1FF	Y numbers which are not used as output Input unit is used as Y. Empty slot
Can be loaded into only the unit located at the last stage (K0J-E56)	Cannot be loaded	Can be loaded into only the unit located at the last stage (K0J1-E56)	Cannot be loaded	Can be loaded into only the unit located at the last stage (K0J1-E56)	Cannot be loaded
Load Type K0J2-EX1 extension adaptor into basic unit	1) Load Type K0J2-EX1 extension adaptor into basic unit. 2) The setting order of setting switches is different from the connecting order of extension units. 3) The allocating order of I/O numbers is the same as the setting order of setting switches. 4) Only Type K0J1-E32 and E56 extension units can be used. For other two units, use Type K0J2-E56 extension unit.				1) Load Type K0J2-EX2 extension adaptor into basic unit. 2) The number of I/O units, which can be loaded into K65BN or K68BN points is extension base, is up to eight units and the number of I/O points is whithin 128 points.

5. HANDLING

5. HANDLING

5.1 Nomenclature and Explanation

5.1.1 Basic unit

(1) External view of basic unit

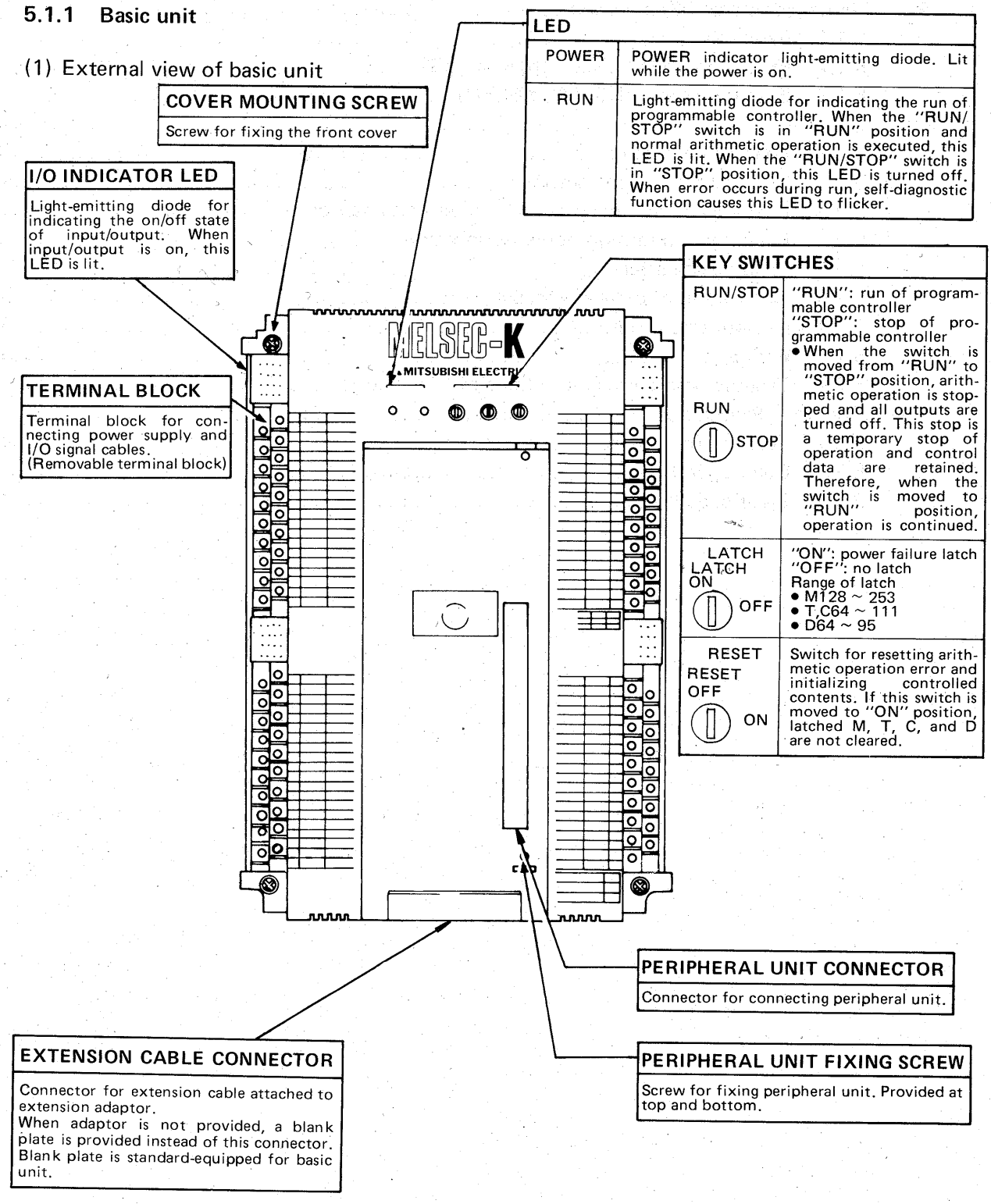
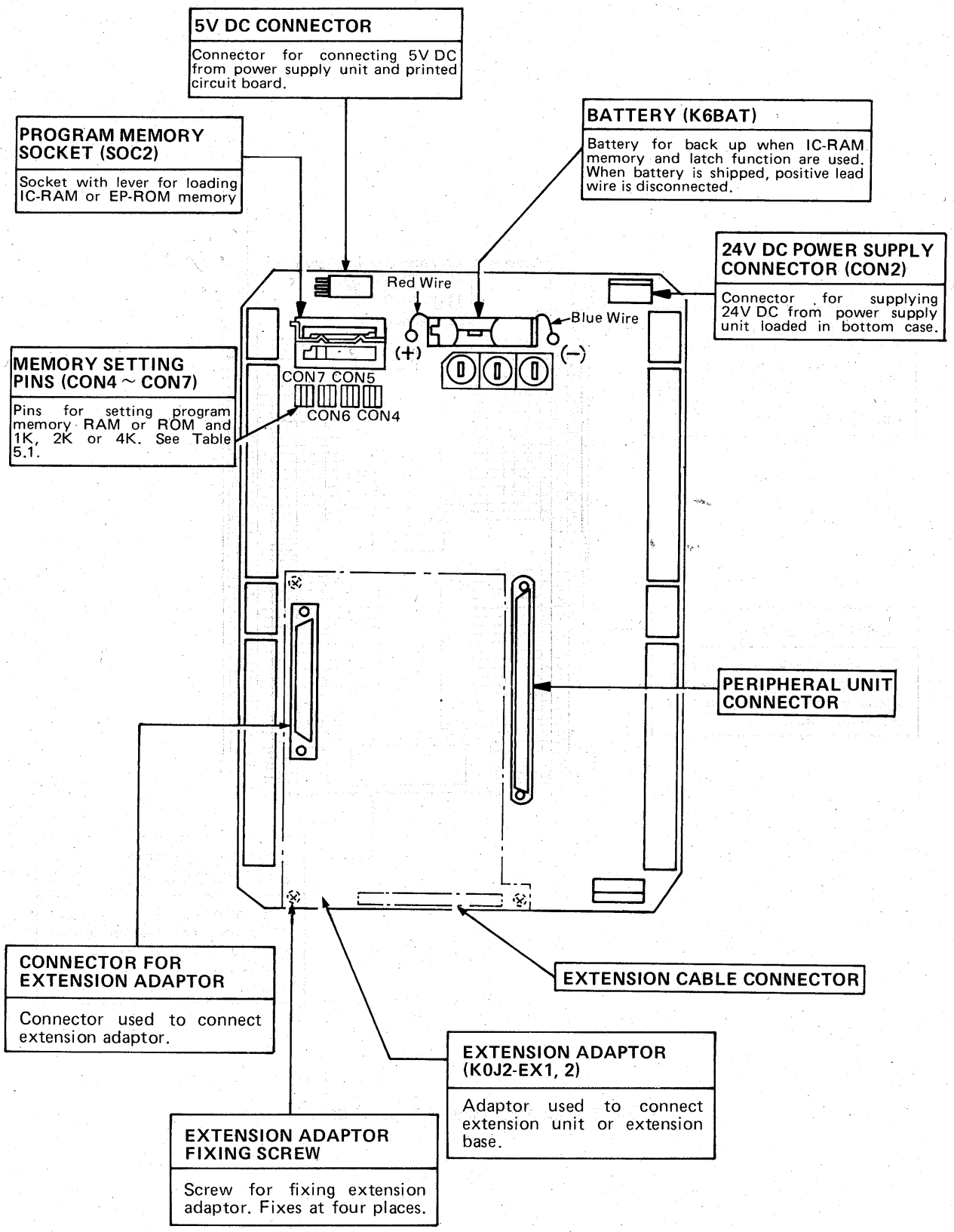


Fig. 5.1 External View of Basic Unit

(2) Internal view of basic unit



5.1.2 Extension units (K0J2-E56, K0J1-E32)

(1) External view of Type K0J2-E56

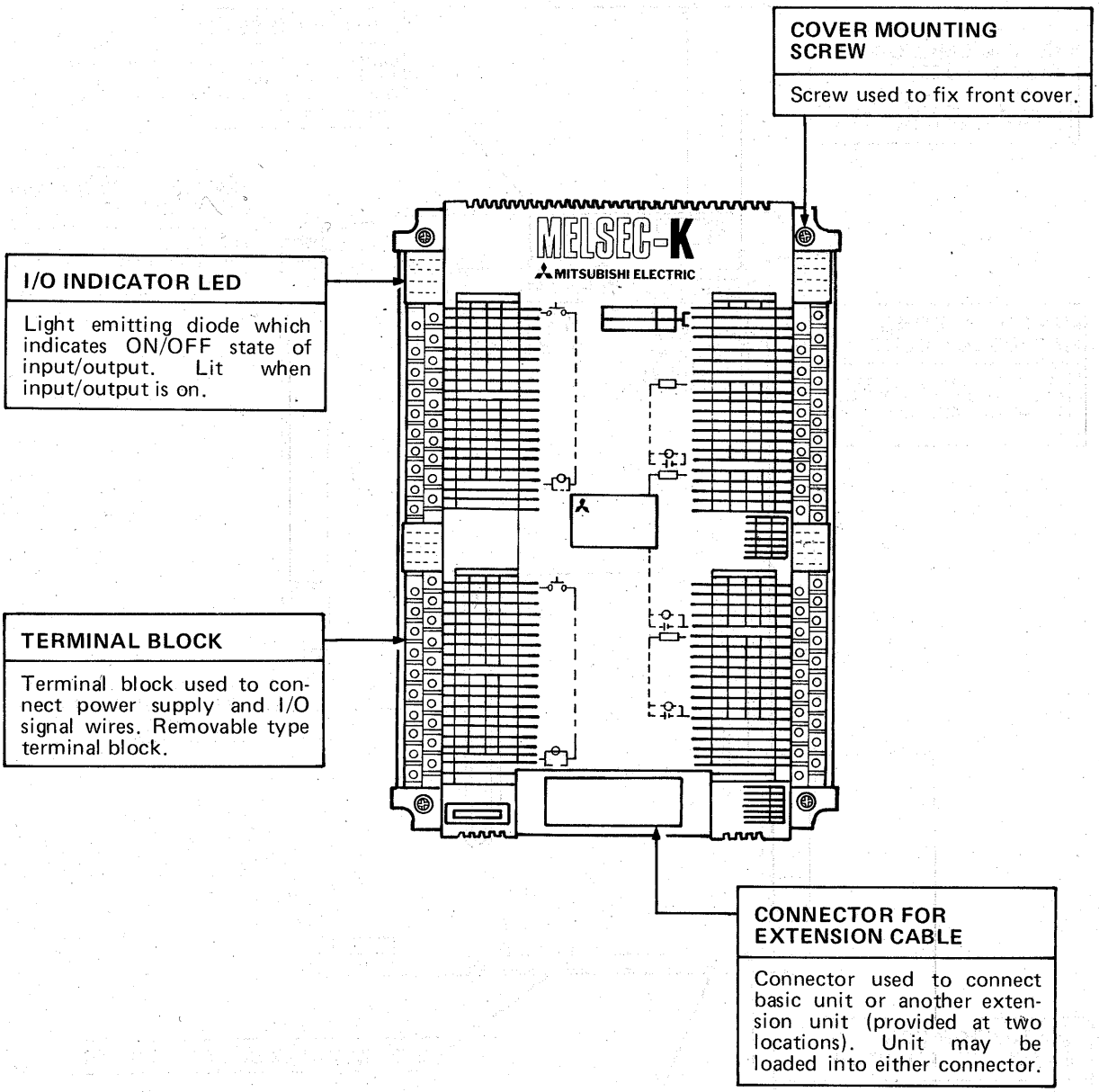


Fig. 5.3 External View of Type K0J2-E56

(2) Internal view of Type K0J2-E56

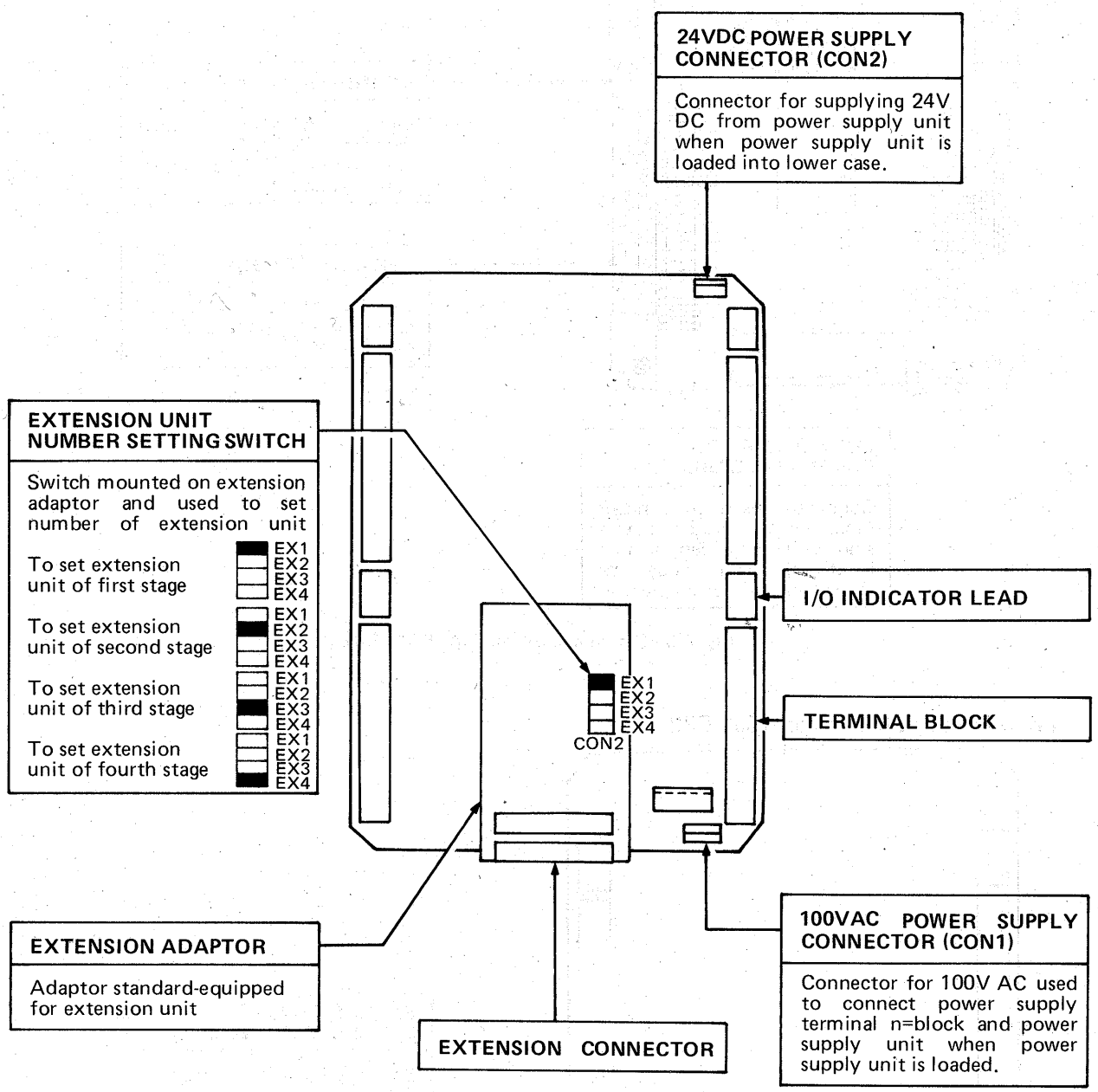


Fig. 5.4 Internal View of Type K0J2-E56

(3) External view of Type K0J1-E32

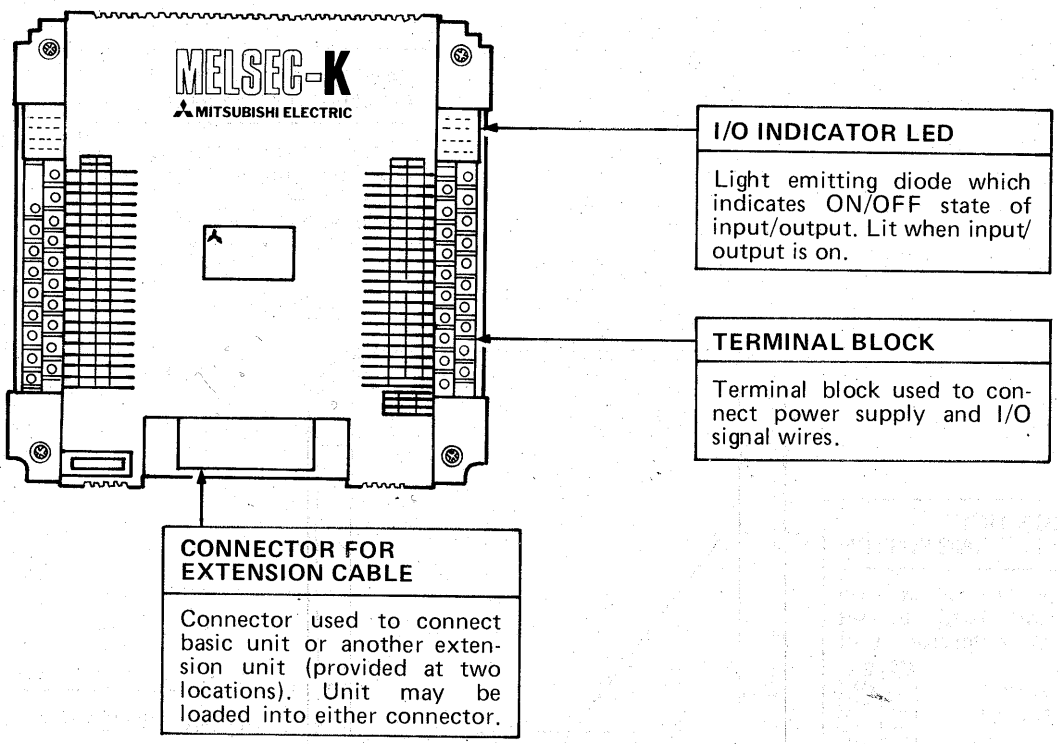


Fig. 5.5 External View of Type K0J1-E32

(4) Internal view of Type K0J1-E32

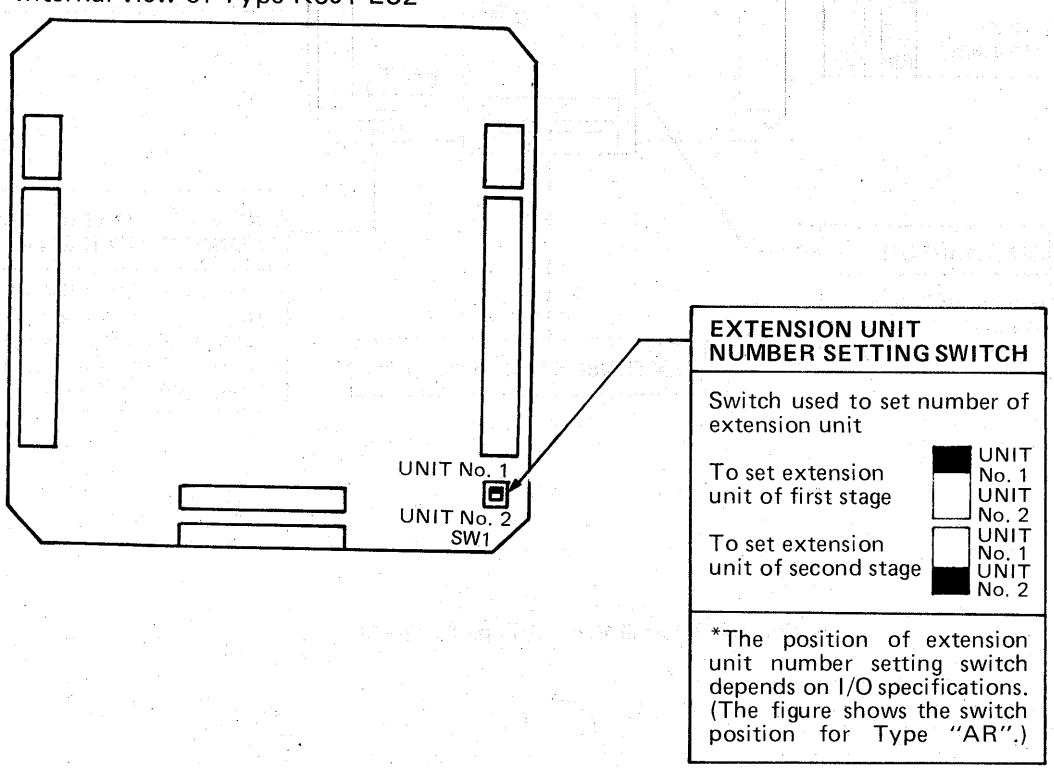
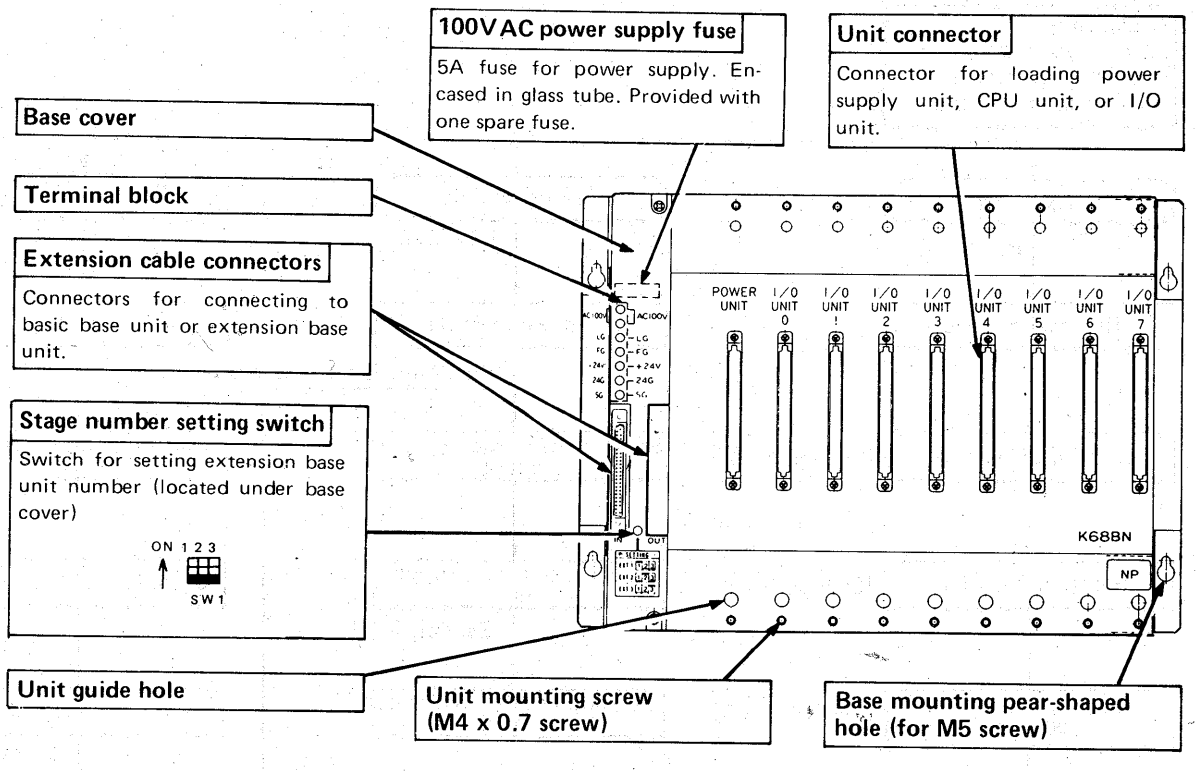


Fig. 5.6 Internal View of Type K0J1-E32

5.1.3 Extension bases (K65BN, K68BN)

(1) External view of Type K68BN



Details of terminal block

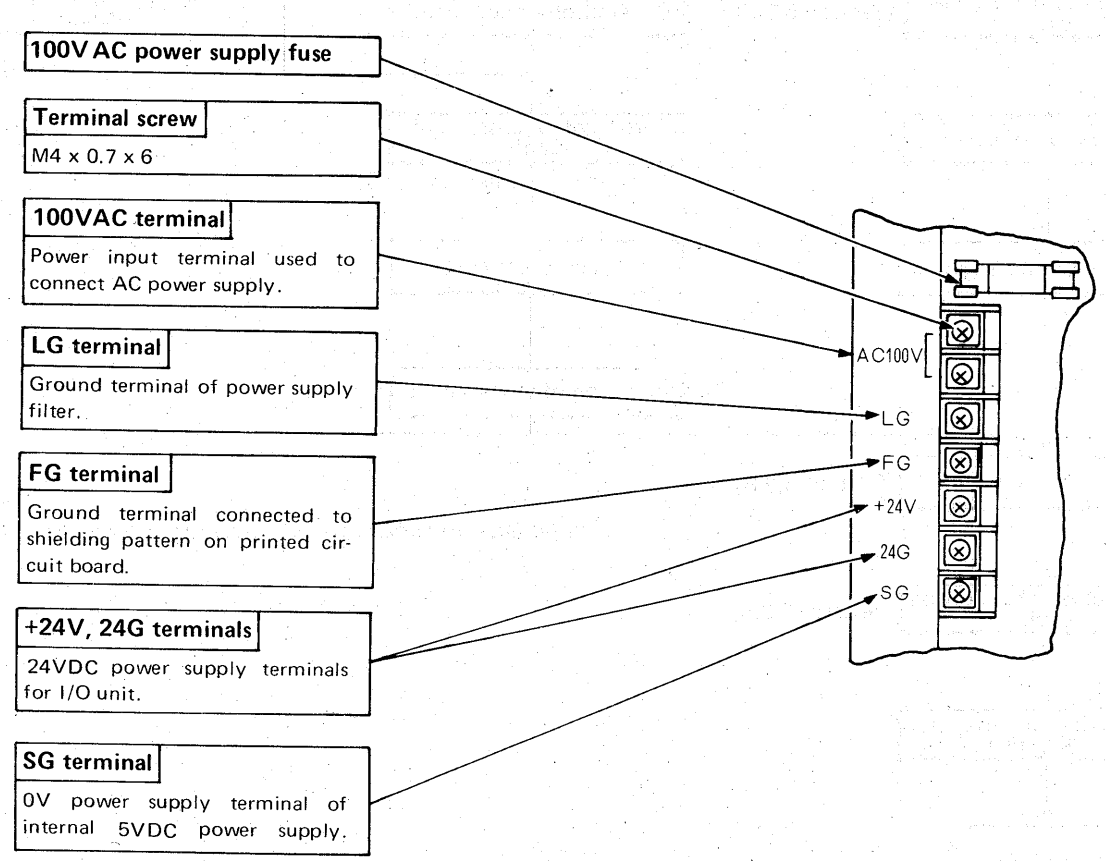
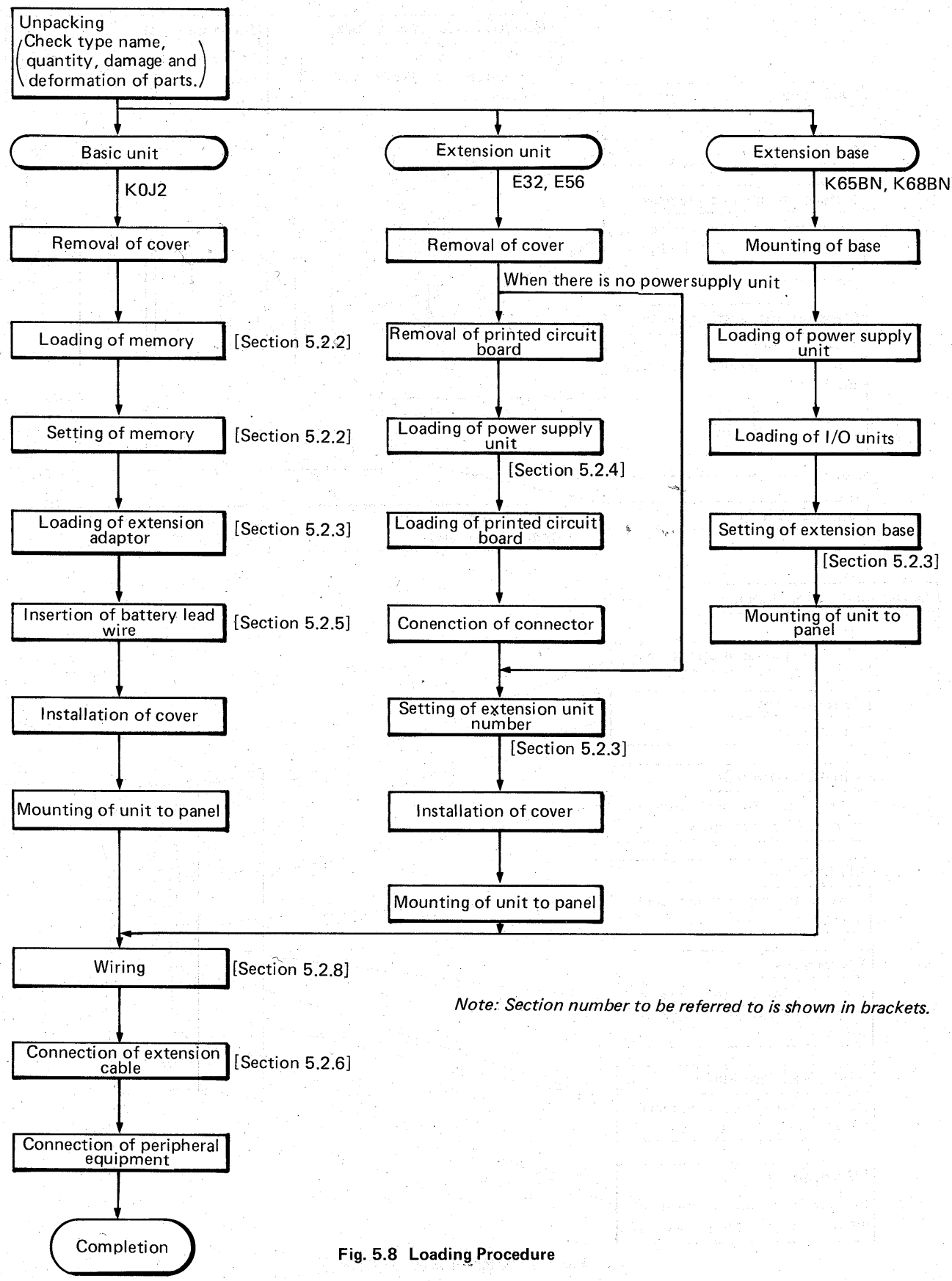


Fig. 5.7 External View of K68BN

5.2 Loading

5.2.1 Loading procedure



Note: Section number to be referred to is shown in brackets.

Fig. 5.8 Loading Procedure

5.2.2 Memory loading and setting

Hold memory with attention not to touch memory read area.

↓

Raise lever of socket.

↓

Insert memory so that slots of memory are positioned at slots indicated on socket.

↓

While pressing memory with fingers, lower lever of socket.

↓

Check that memory is not lifted from socket.

↓

Set connector CON4 ~ CON7 with short-circuit chips depending on type of memory to be loaded.

↓

When ROM is used, apply attached masking tape to surface.

⇩

Completion

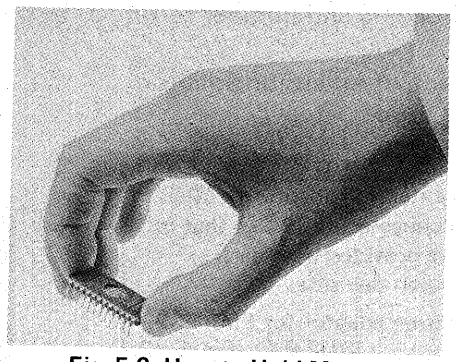
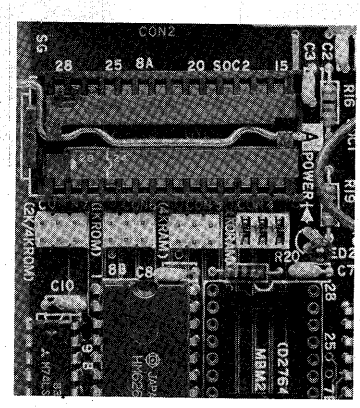


Fig. 5.9 How to Hold Memory



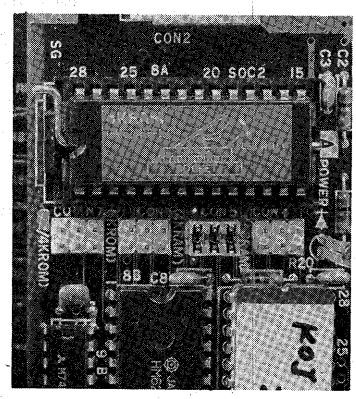


Fig. 5.10 Before Loading Memory Fig. 5.11 After Loading Memory

(*Factory-set position)

	Number of Steps	Memory Loaded into Socket	Connector Type and Setting			
			CON7	CON6	CON5	CON4
RAM	1024	K0RAM	○○○ ○○○	○○○ ○○○	○○○ ○○○	●●● ○○○ *
	4096	4KRAM	○○○ ○○○	○○○ ○○○	●●● ○○○	○○○ ○○○
ROM	2048	2KROM	○○○ ○○○	●●● ○○○	○○○ ○○○	○○○ ○○○
	4096	4KROM	●●● ○○○	○○○ ○○○	○○○ ○○○	○○○ ○○○

Table 5.1 Setting of Memory

CAUTION

1. Be sure to load the memory according to the indication on the socket.
   Snugly fit the memory into the socket. Be careful not to loosely fit the memory into the socket.
2. Do not touch the read area of memory. Also, do not bend the reads.
3. Be sure to store the memory in the case which has been used for the delivery of memory.
4. Never place the memory on a metal, which leaks or may possibly leak, or on an object which is charged with static electricity, such as wood, plastic, vinyl, fiber, cable, and paper.

5.2.3 Loading and number setting of extension adaptor

(1) Loading of extension adaptor

Load extension adaptor to CPU side connector of CPU so that its surface provided with parts is located on rear side.

Extension adaptor for E56, E32: K0J2-EX1 (Fig. 5.12)

Extension adaptor for K65BN, K68BN: K0J2-EX2 (Fig. 5.13)

Tighten and fix adaptor with four attached screws (two M2.6 and two M3 screws).

Completion

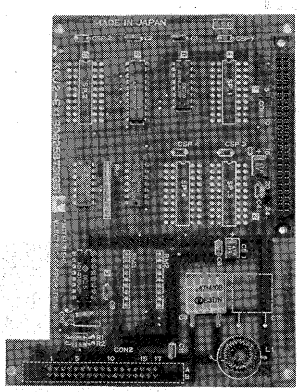


Fig. 5.12 K0J2-EX1

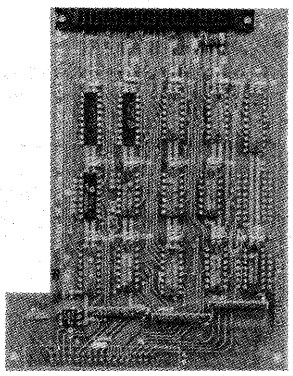
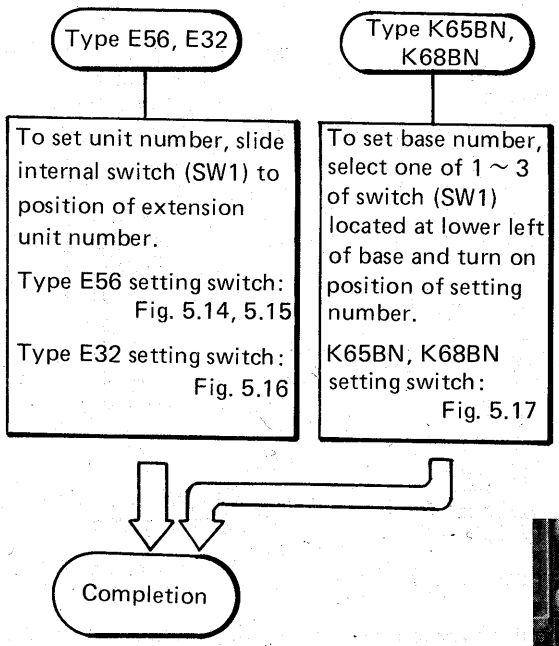


Fig. 5.13 K0J2-EX2

(2) Number setting of extension unit and base



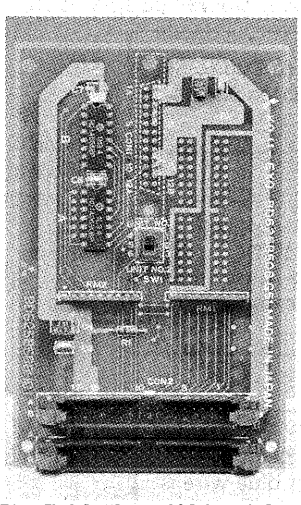


Fig. 5.14 Type K0J1-E56 Setting Switch

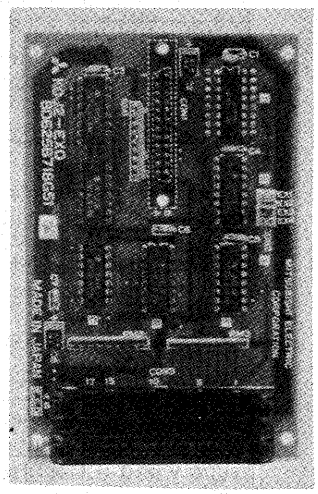


Fig. 5.15 Type K0J2-E56 Setting Switch

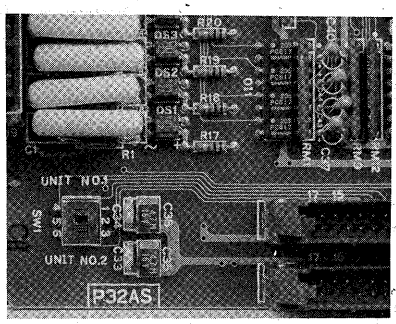


Fig. 5.16 Type E32 Setting Switch

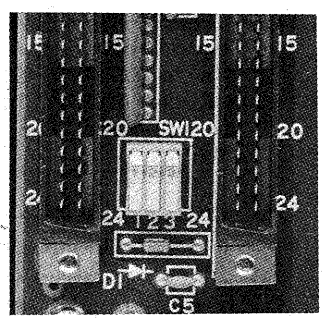


Fig. 5.17 Type K65BN, K68BN Setting Switch

Setting of Extension Unit and Base Numbers

	Type K0J1-E56	Type K0J2-E56	Type K0J1-E32	Type K65BN, K68BN
Detail of setting switch	UNIT No. 1 4 1 5 2 6 3 UNIT No. 2	EX1 EX2 EX3 EX4 CON2	UNIT No. 1 4 1 5 2 6 3 UNIT No. 2	2 3 1 2 3 SW1
Setting	For first extension stage: UNIT No. 1 / UNIT No. 2 For second extension stage: UNIT No. 1 / UNIT No. 2	For first extension stage: EX1 For second extension stage: EX2 For third extension stage: EX3 For fourth extension stage: EX4	For first extension stage: UNIT No. 1 / UNIT No. 2 For second extension stage: UNIT No. 1 / UNIT No. 2	For first extension stage: 2 3 / 1 2 3 *Note:* *When Type K65BN or K68BN is used, only one extension stage is can be used.*

*:Black area indicates the setting position of slide switch.
The switch of K65BN or K68BN is turned on when its top position is pressed. (Black area indicates the position is on.)

5.2.4 Loading of extension power supply unit

Load power supply unit into Type E56 extension unit case and tighten and fix it with four fixing screws.

↓

Connect 24VDC connector with lead wire (Fig. 5.18 ①) to 24VDC/24GDC connector (CON2) of I/O printed circuit board so that red wire is located on 24VDC side.

↓

Connect 5V DC connector with lead wire (Fig. 5.18 ②) to connector of power supply unit (CON1) so that blue wire is located on top side.

↓

Connect 100VDC connector with lead wire to 100VAC/FG (Fig. 5.18 ③) connector (CON1) of I/O printed circuit board so that green wire is located on FG side.

⇩

Completion

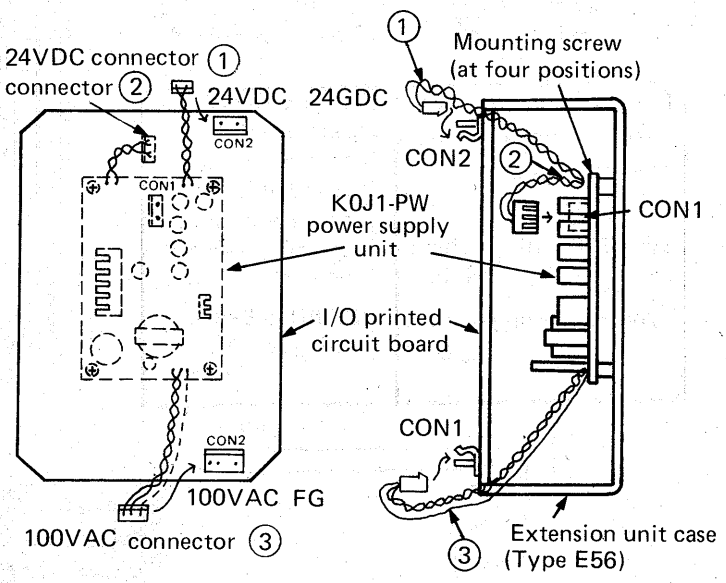
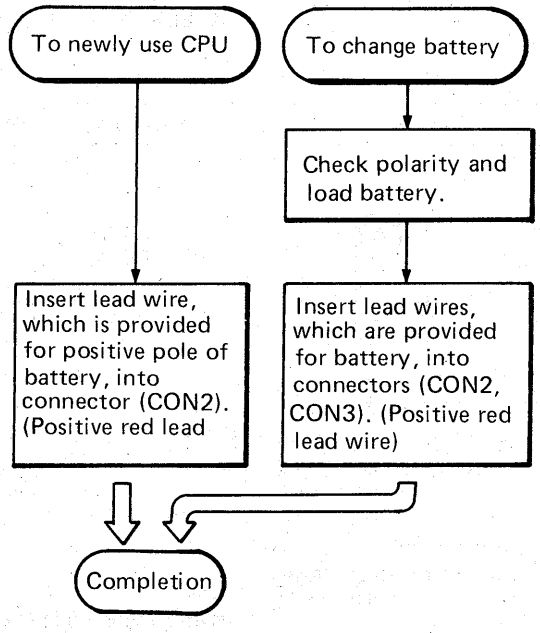


Fig. 5.18 Loading Procedure of Power Supply Unit to Type E56

5.2.5 Loading of battery



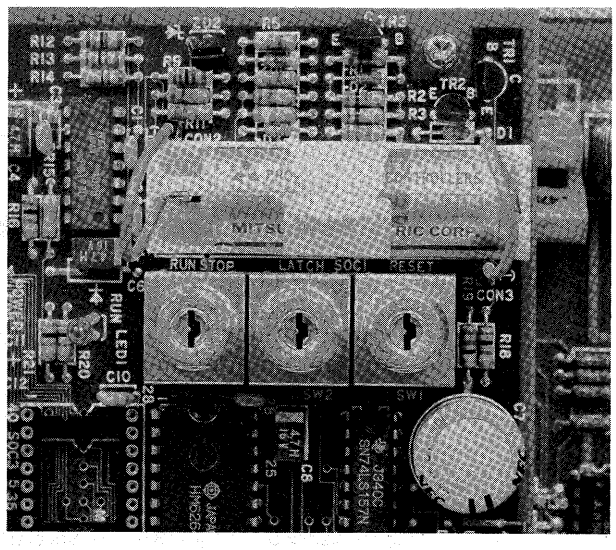


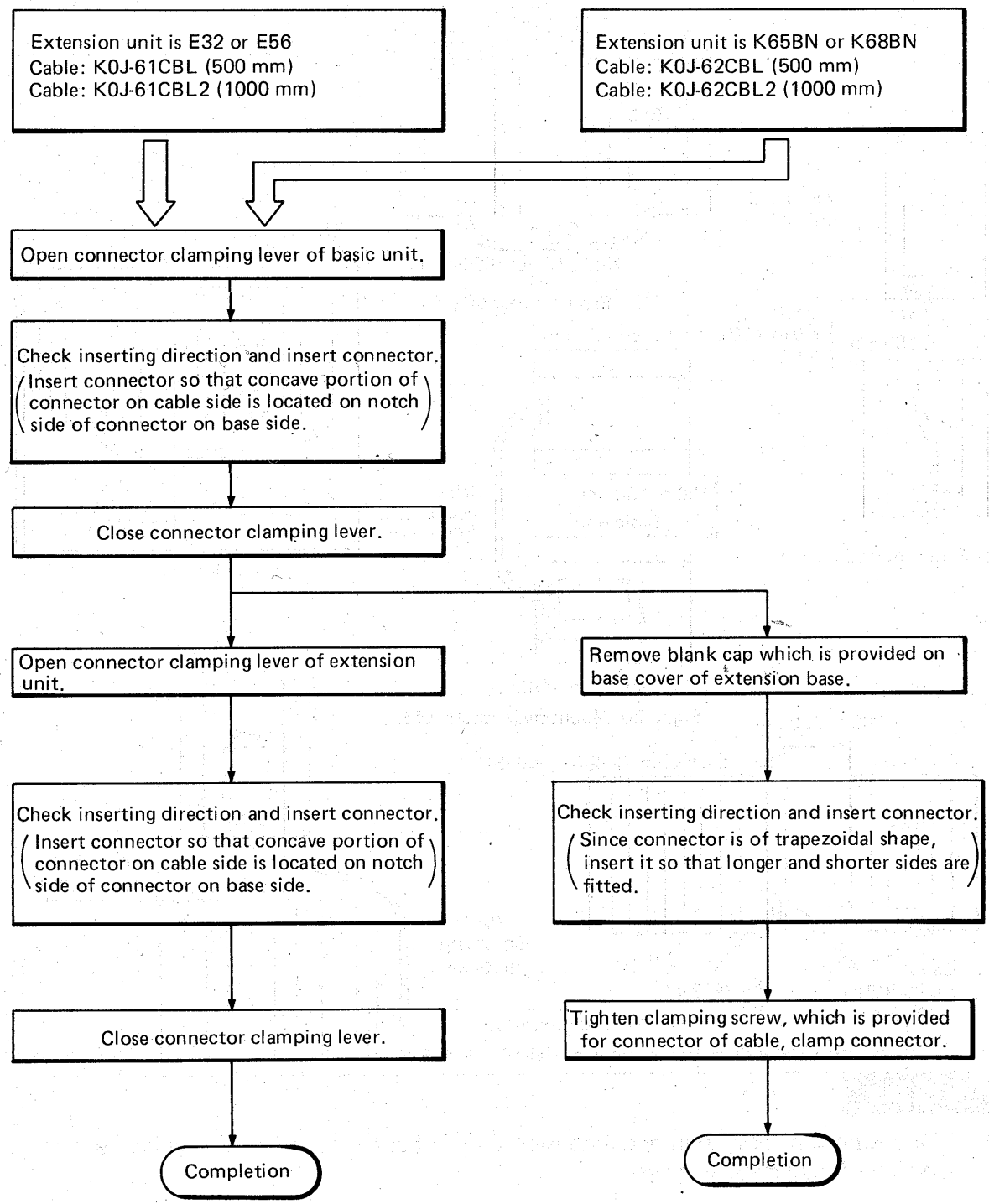
Fig. 5.19 Loading of Battery

CAUTION

1. To prevent the battery from being consumed, the positive lead wire of battery is disconnected at the time of shipment. When the memory is IC-RAM or even when it is EP-ROM, connect the lead wire when power failure backup is required.

2. Change the battery within 15 minutes.

5.2.6 Connection of extension cable



CAUTION

1. Although the extension unit and extension base have two connectors, respectively, the cable may be connected to either of the connectors.

2. Since Type K0J-62CBL(2) has different connectors at its ends, connect the cable using the connector which will fit the mating connector. (Since K0J-61CBL(2) has the same connectors at its ends, the cable may be connected to either of the mating connectors.)

5.2.7 Mounting to panel

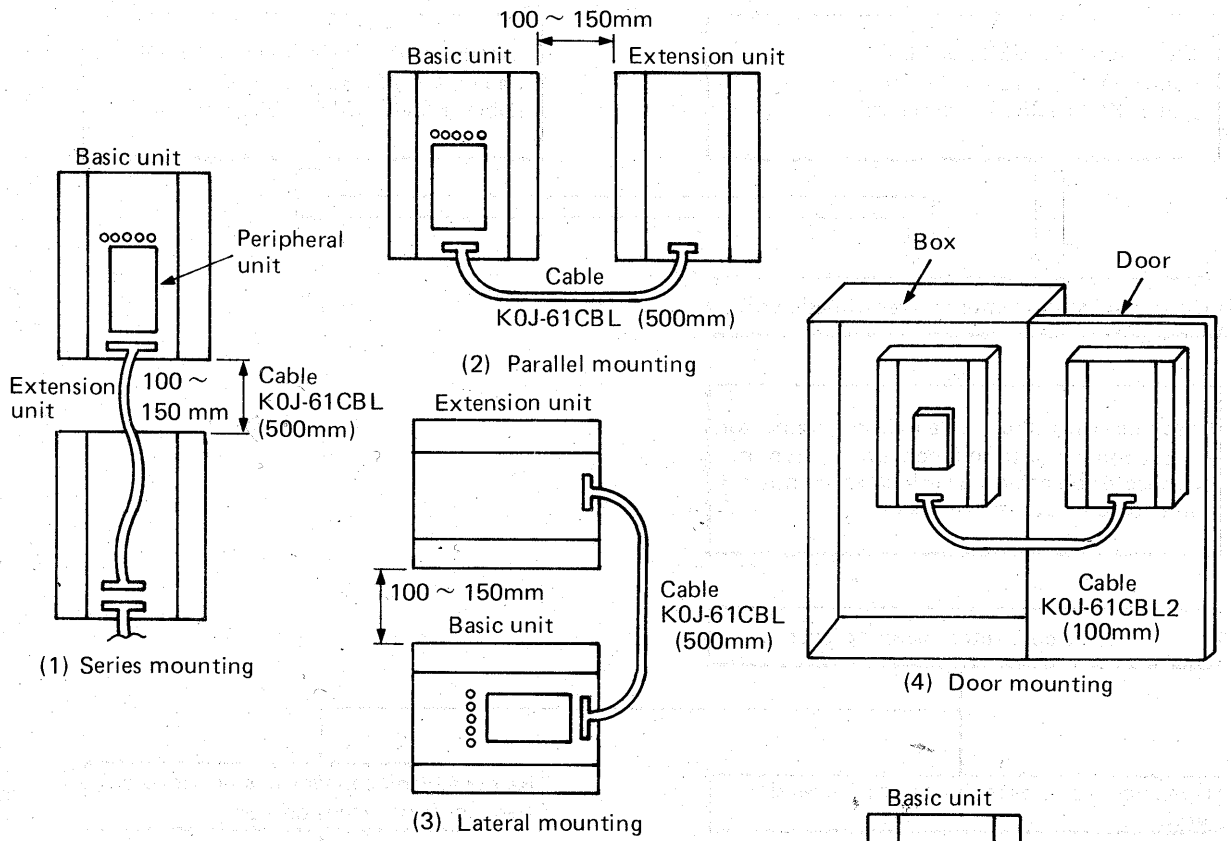


Fig. 5.20 Mounting Methods of K0J

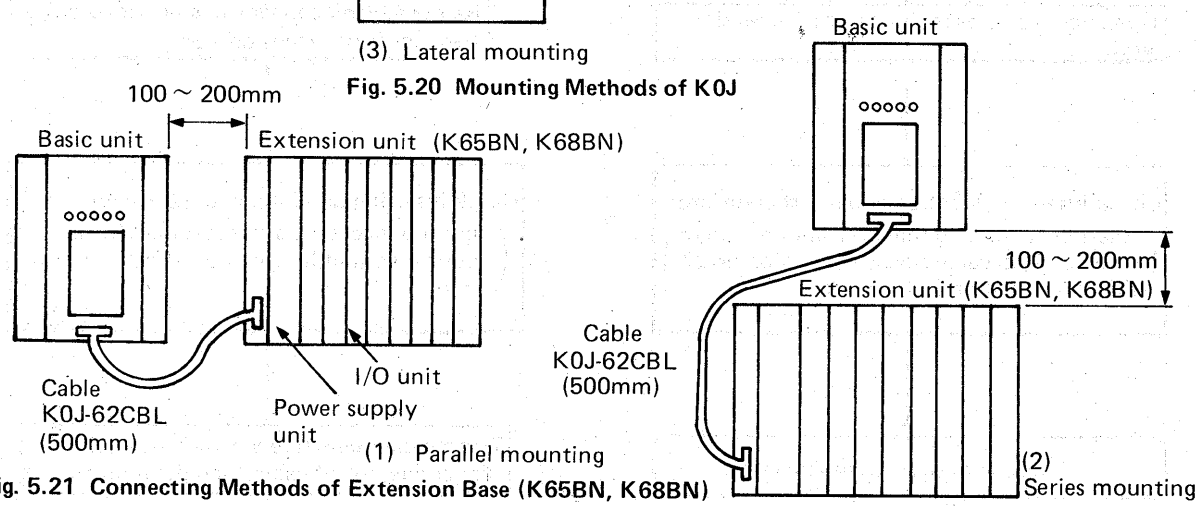


Fig. 5.21 Connecting Methods of Extension Base (K65BN, K68BN)

CAUTION

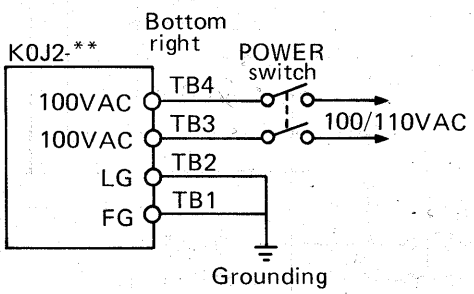
1. The positions of basic unit and extension unit or basic unit and extension base shown in the above figure may be reverse.
2. The K0J2, K0J2-E56, K0J1-E56 and E53 units can be mounted horizontally on the bottom of operation panel. In this case, provide cooling means.
3. Horizontal mounting and the mounting method in which I/O units are mounted laterally are not applicable to the K65BN and K68BN.
4. The mounting surface should be level and should not be uneven and distorted. When there are parts which generate vibration and shock (such as contactor and breaker), provide sufficient distance from such parts or mount the units on another panel.

5.2.8 Wiring

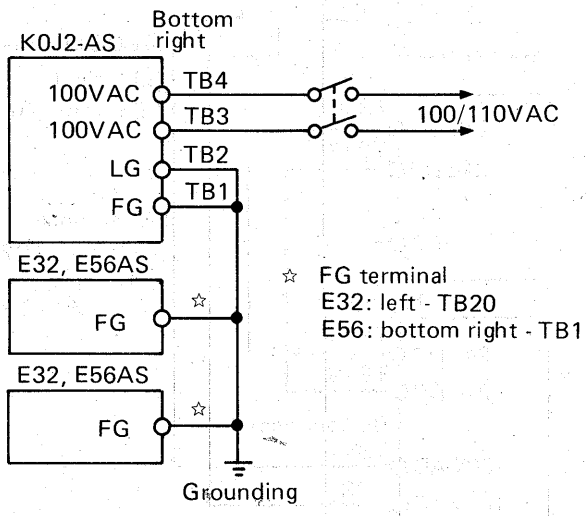
(1) Wiring of power supply and grounding

When the system consists of only basic unit or has been extended, perform the wiring of power supply and grounding in accordance with I/O type name.

System consists of only basic unit

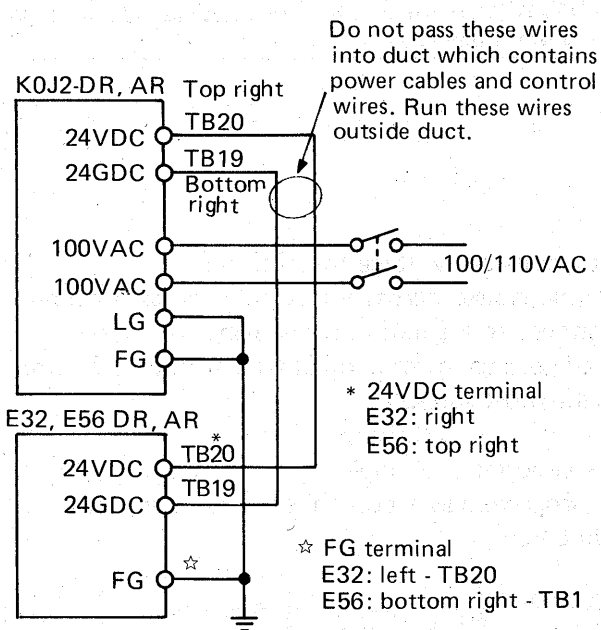


Both basic and extension units are AS

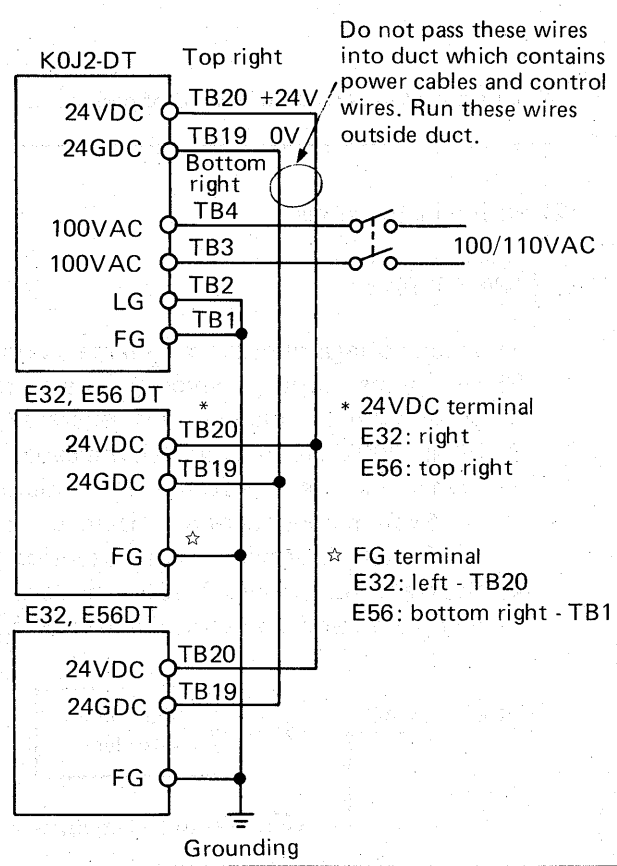


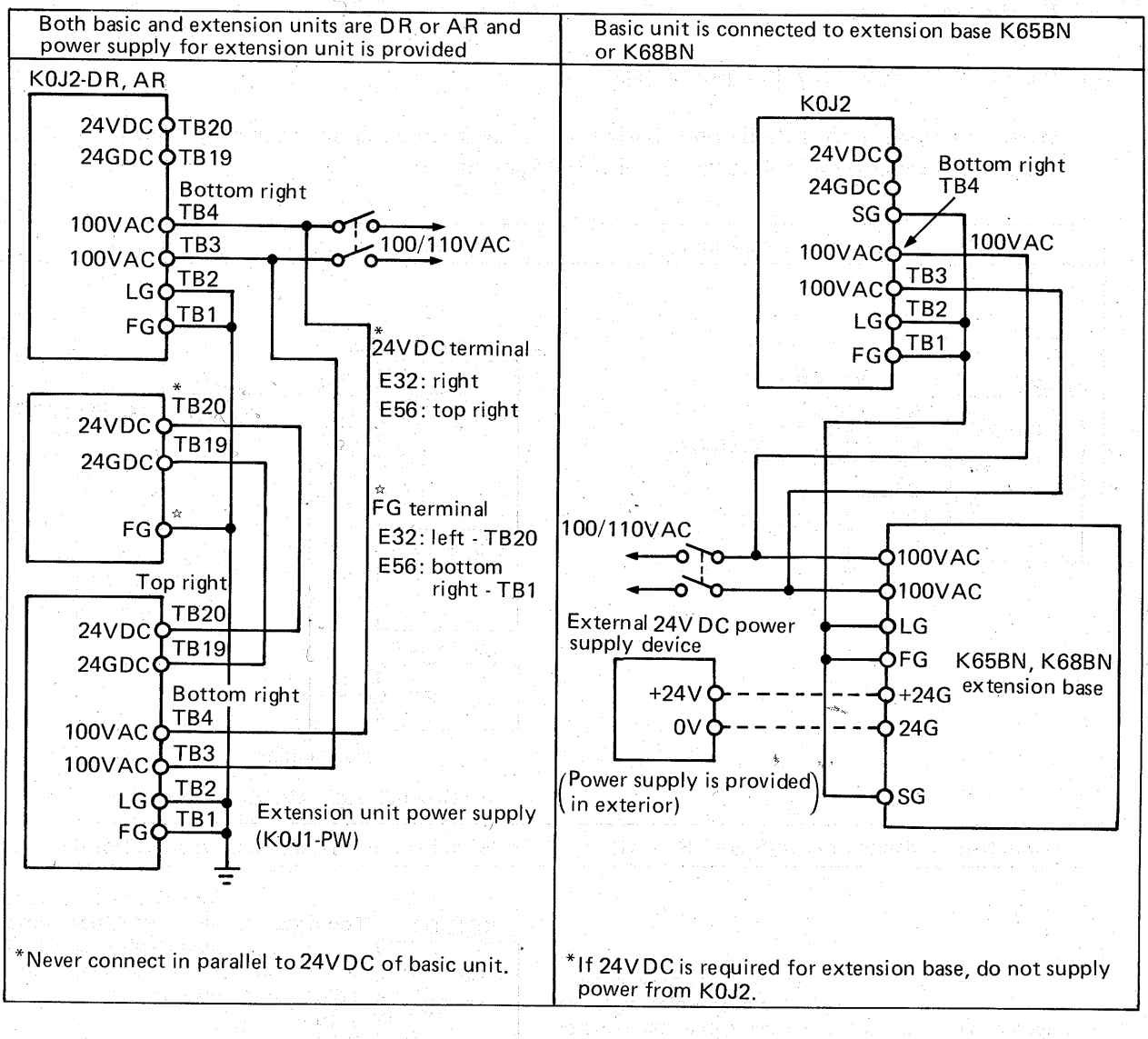
*Grounding of 24VDC is not required.

Both basic and extension units are DR or AR



Both basic and extension units are DT or DS

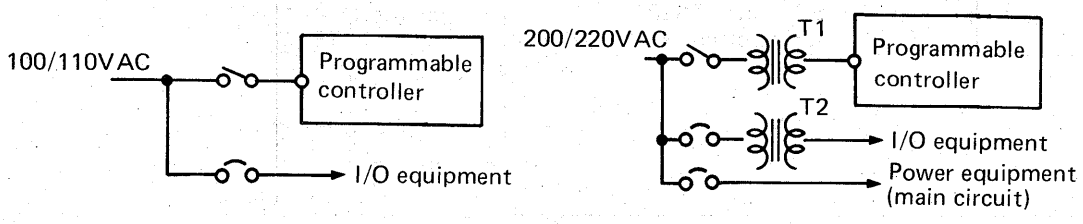




(2) Wiring instructions

Power supply

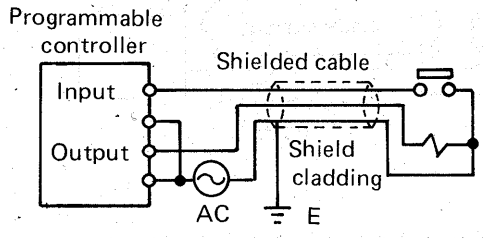
1) When voltage fluctuation is large, connect a constant-voltage transformer.
2) Use power supply, which generates minimal noise, across wires and across terminals and ground. When much noise is generated, connect an insulation transformer or filter.
3) When 200V AC is supplied, the capacity of voltage lower control transformer is as indicated below, and the transformer with shield is the most suitable.
   System consists of only basic unit: 100VA
   System is provided with extension power supply: 150VA
4) Separate the route of power supply of programmable controller from the routes of I/O equipment and power equipment as shown below.



5) Twist the 100VAC cable and the 24VDC cable to extension unit as closely as possible, and connect the units at the shortest distance.
6) Do not use 24VDC of K0J as the power supply of output equipment.
7) Do not bundle both 100VAC and 24VDC cables with main circuit (high-voltage, large-current) wire and I/O signal wire. Also do not wire the cables in the vicinity of the wires. If possible, separate the cables at least 100 mm away from the wires.

I/O equipment

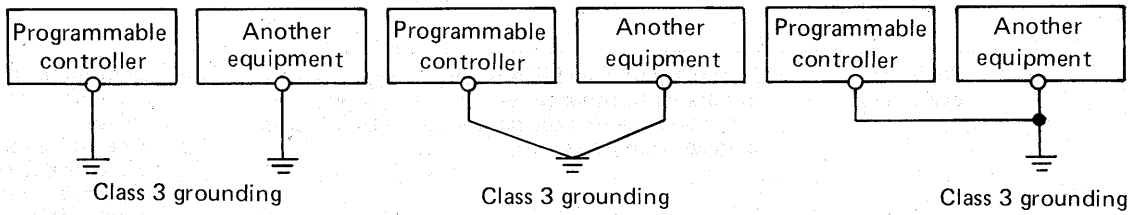
1) If possible, wire the I/O equipment separately from the input and output wires.
2) Wire the I/O signal wires at least 100 mm away from high-voltage, large-current main circuit cable.
3) When it is impossible to separate the I/O signal wires from the main circuit cable and power cable, use batch-shielded cables and ground on the programmable controller side.



4) When wiring has been conducted by use of conduit, securely ground the conduit.
5) Separate the I/O wires of 24VDC from the 100VAC and 200V wires.
6) When wiring has been conducted at a long distance more than 200 mm, trouble will occur due to leak current caused by line capacity. Take preventive means described in Example 4 of Section 5.2.9 (1) or Example 2 of (2).

Grounding

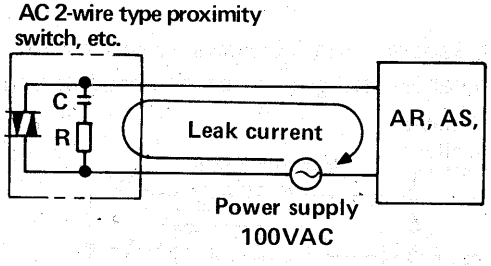
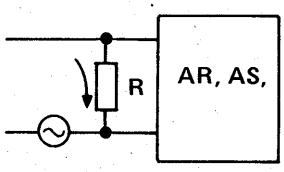
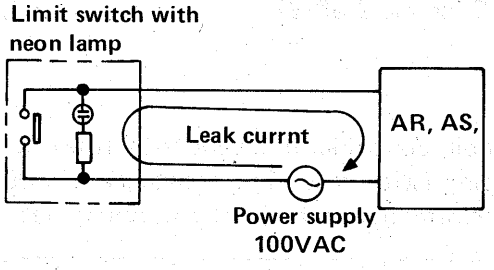
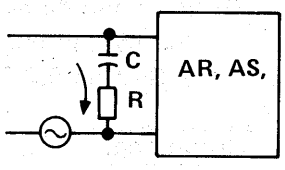
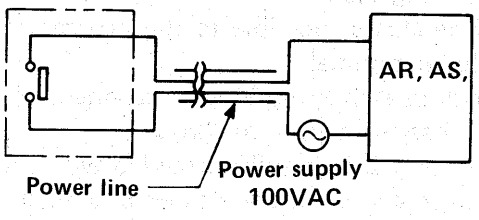
1) Ground the programmable controller independently if possible. Perform grounding work by way of Class 3 grounding (with grounding resistance of 100Ω or less). When independent grounding cannot be performed, use the joint grounding method (2) shown below.

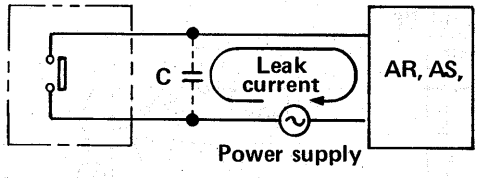
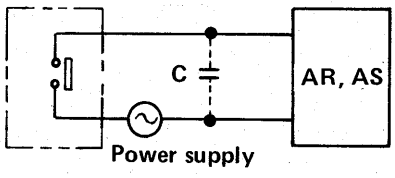
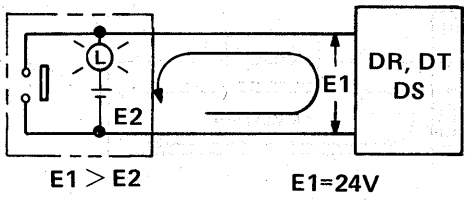
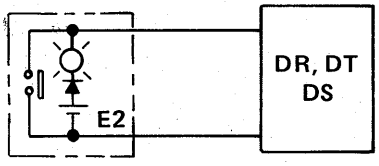


2) Use 2 mm^2 or larger grounding cable.
3) Grounding point should be closest possible to the programmable controller and the length of grounding cable should be minimal.
4) Should malfunction occur due to grounding, disconnect either or both of the grounding terminals (LG and FG) of base unit from the ground.
5) Since this programmable controller is fully provided with measures against noise, it can be used without grounding except when there is especially much noise.

5.2.9 Troubles and corrective actions of I/O circuits

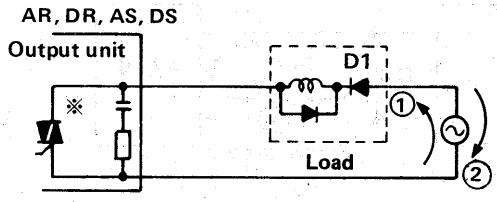
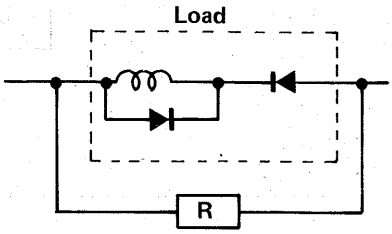
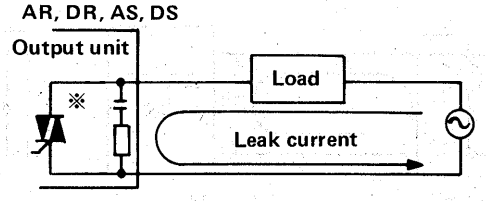
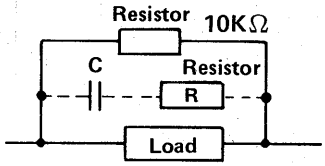
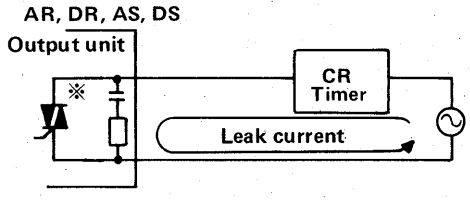
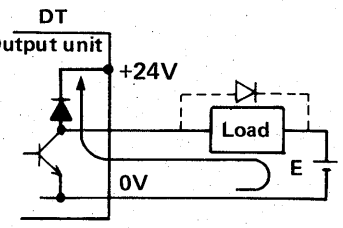
(1) Troubles and corrective actions of input circuit

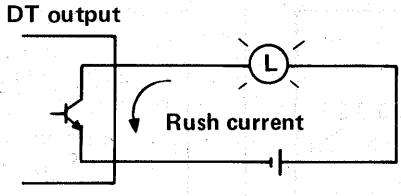
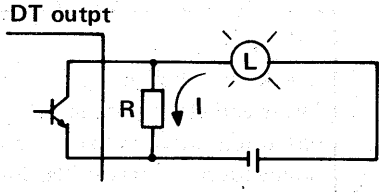
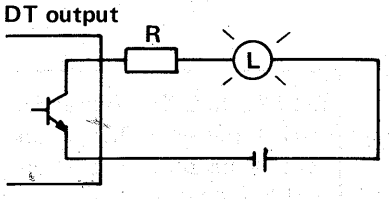
Ex.	Condition	Cause	Corrective Action
1	Though triac is not on, input turns on. Though triac is turned off, input fails to turn off.	Input is turned on by leak current from the CR absorber used to protect triac from surge.  This occurs in AR or AS when leak current excedds 4 mA.	Connect resistor or series co-mbination of resistor and capacitor as shown below in order to reduce input impedance so that voltage across input terminals of input unit is lower than input operation "off" voltage.  **Example: R: 15KΩ 2W**
2	Though limit switch is not on, input turns on. Though limit switch is turned off, input fails to turn off.	When limit switch is provided with neon lamp, input is turned on by leak current caused by neon lamp. 	 **Example: CR: 0.5μF + 50Ω DCR2-1203-5041 (Matsuo Electric make)**
3	Same as example 2.	In case input signal line is wired long distance in parallel to other power line, etc., input turns on because voltage is induced by induced voltage from power line. 	*Note: Determine R and CR values depending on leak current values. When only resistors is used, more heat is generated. If possible, use the combination of resistor and capacitor. This combination produces an effect also on large surge.*

Ex.	Condition	Cause	Corrective Action
4	Same as example 2.	Input is turned on by leak current caused by line-to-line capacity across wired cable. 	(a) Same as examples 1, 2, and 3. (b) As shown below, provide power supply on limit switch side. 
5	Same as example 2. Though limit switch is not on, lamp turn on.	With 2 power supplies used, since E1 voltage is larger than E2 voltage, unidentified flowing current flows as show below. 	(a) Use 1 power supply. (b) Take action so that E1 ≦ E2 is established. (c) Connect snake path prevention diode as shown below. 

(2) Troubles and corrective actions of output circuit

(Varistor with * mark is provided for only AS and DS.)

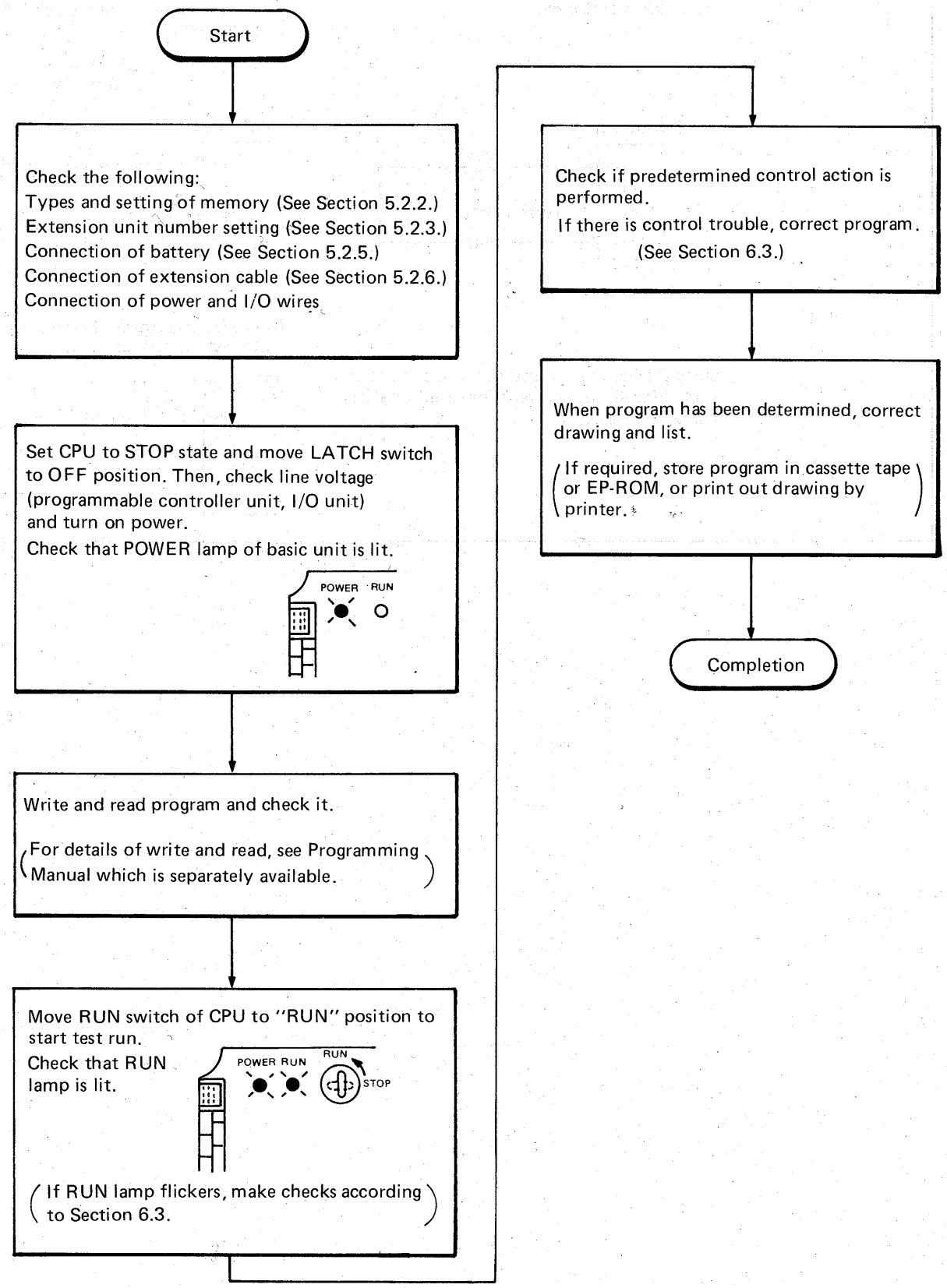
Ex.	Condition	Cause	Corrective Action
1	When output off, ecess voltage is applied to load.	○ Load is half-wave rectified internally (seen in some solenoids)  ○ When power supply polarity is as shown by ①, C is charged. When polarity is as shown by ②, voltage charged in C plus line voltage are applied across D1. Max. voltage is approx. $2\sqrt{2E}$.	○ Connect resistor of several ten KΩ ~ several hundred KΩ across load. *Note: When resistor is used in this way, it does not offer problem to output elemnt, be may sometimes cause the diode, which is built in the load, to deteriorate or burn.*  Several ten ~ several hundred KΩ
2	Load does not turn off.	○ Leak current caused by built-in snubber. This is especially liable to occur in the case of small-capacity load. 	○ Connect resistor of approx. several ten KΩ across load. *Note: In case wiring distance from output card to load is long, take care because there may exist leak current due to line-to-line capacity.* ○ Connect C and R across load.  CR: 0.1 ~ 0.47μF + 47 ~ 120 Ω
3	When motor or CR type timer is used as load, time limit fluctuates.		○ After driving relay, drive timer at the same contact. ○ Use load which is other than CR timer. *Note: Since some timers are half-wave rectified internally, caution described in Example 1 is required.*
4	Load fails (for direct current)	○ Circulation occurs because 2 power supplies are used.  ○ +24V < E, circulation occurs.	○ Use load power supply of 24VDC. *Note: In case relay or the like is used as load, it is necessary to connect reverse voltage absorbing diode (shown in dotted line in figure at left) with load.*

Ex.	Condition	Cause	Corrective Action
5	Output transistor is destroyed.	In case transistor is used for output and lamp is used as load, since inrush current flows through lamp when transistor turn on, output transistor is destroyed.  Since DT has max. withstand rush current or 1.5A (50mS), rush current for lamp should be below this value.	(a) Provide resistor as shown below so that small current, which will not turn on the flows at all times, in order to prevent rush current from generating. Example I : rush current x 1/3 ~ 1/4  (b) Provide resistor as shown below to restrict rush current. 

5.3 Operating Procedures

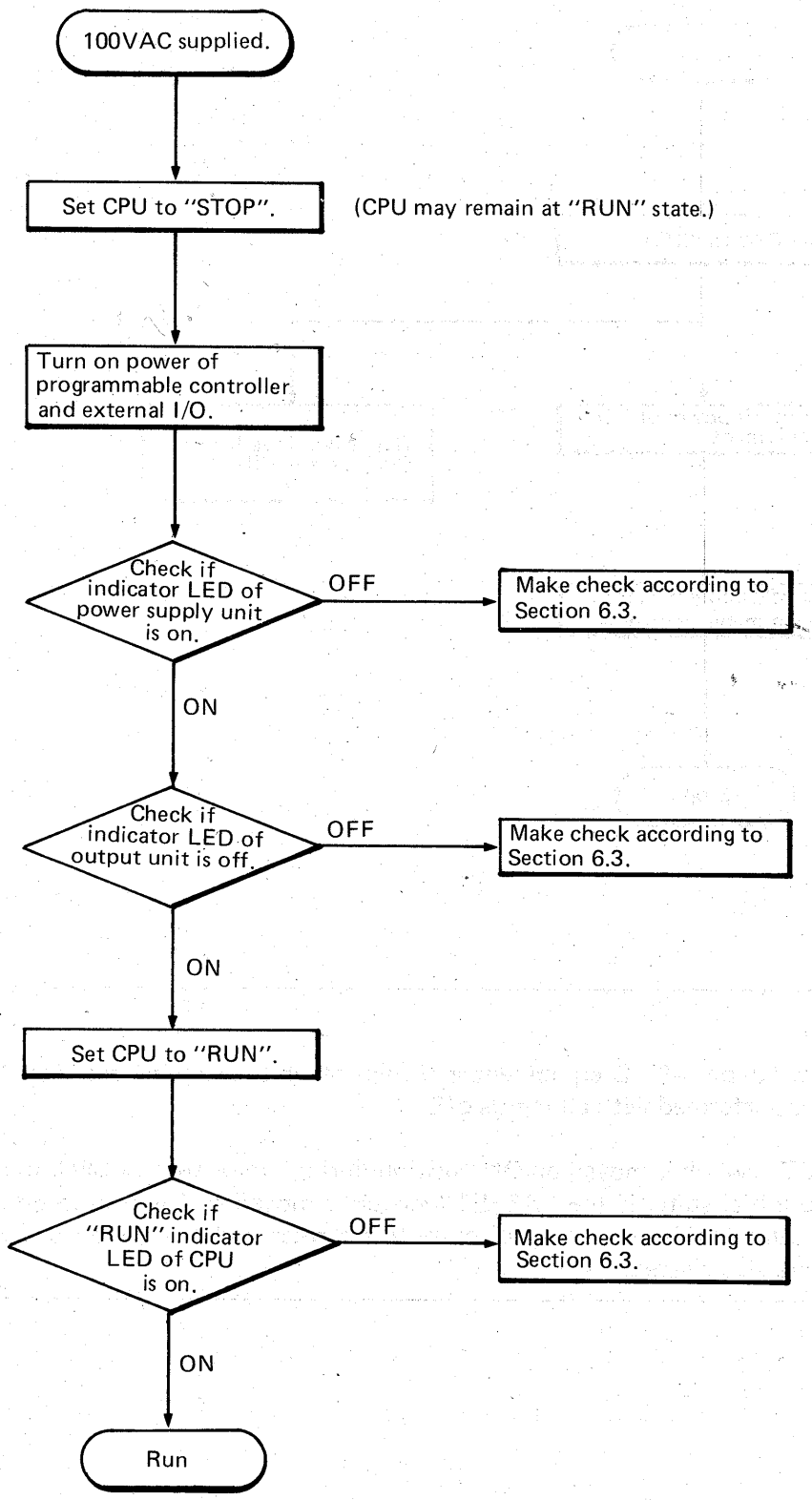
5.3.1 Test run flow chart

This section shows the test run flow chart after completion of programmable controller installation.



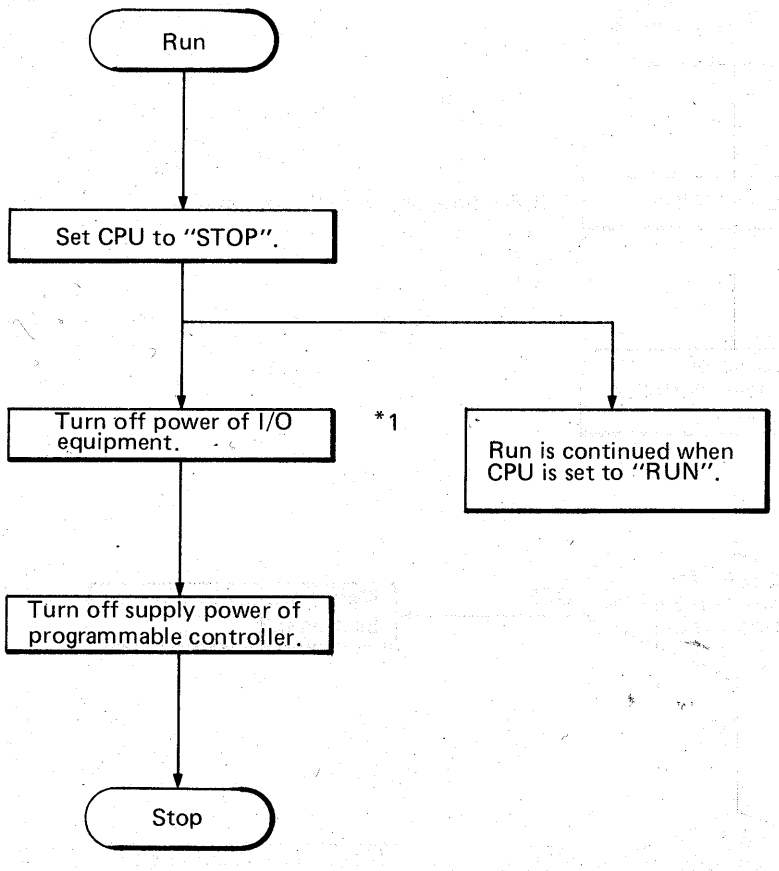
5.3.2 Daily operation

(1) Operation start



(2) Operation stop

Stop operation when operation can be stopped, judging the controlled state of controlled unit.



CAUTION

1. If only the power supply of I/O equipment is turned off in the step indicated by *1, arithmetic operation is performed with all inputs off.
2. When the "RESET" switch is moved on ON position during run or stop of CPU, the interior of CPU is set to initial state. If the "RESET" switch is moved to ON position during run when the latch function is not used, all outputs are reset and the temporary values of timers/counters are also cleared.

5.3.3 Error code list

When error has been detected as a result of self-diagnosis by turning on the RUN switch of K0J2, the error code can be read by the test function of programming unit (PU) or graphic programming panel (GPP).

Example: 1) PU

[Operation]

TEST | K | STEP ±

[Display]

| | K | 5021 |

2) GPP

[Operation]

KCPU

TEST | K | GO

[Display] ..... CRT

ERROR STEP
5021

Table 5.2 shows the error code types and corrective actions.

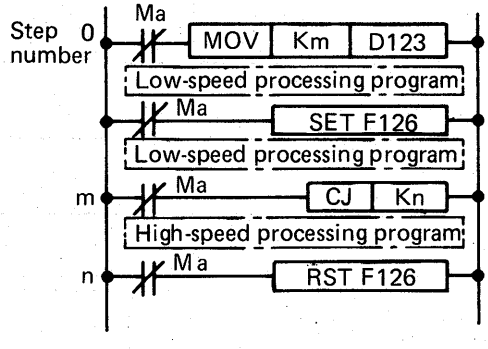
Error Display	Content	Corrective Action
0 ~ 4095	Display of error step number (1) The instruction code of program, which is being processed, has a code which the CPU cannot decode. (2) The result of conversion into BCD exceeds "9999". (3) Since the program has jumped to a step below END by CJ instruction, END has not been executed.	The step indicated by error display has a program error. Correct the program.
4096	The program is not provided with END.	Write END in the Program. (When END instruction is not provided, GPP cannot display a circuit mode.)
5021	The process time of program has exceeded 200mS.	Reduce the process time of program by using a CJ instruction, for example.
5031	Jump instruction (CJKn) to END, which is specified at the end of low-speed processing program, or return instruction (RST F126), which is specified at the end of high-speed processing program, has not been written.	Correctly write the instruction, referring to the programming manual.
5032	The format of high-speed processing program has error.	Modify the format of high-speed processing program as shown below. 

Table 5.2 Error Code List

MEMO

6. MAINTENANCE AND INSPECTION

6. MAINTENANCE AND INSPECTION

6.1 Daily Inspection

Check the items in Table 6.1 when the power is turned on or the door of panel is opened.

Item	Checking Item	Checking Point	Judgement	Corrective Action
1	Unit mounting conditions	Check for looseness and play of mounting, looseness of cover, disconnection of terminal cover.	Unit should be mounted firmly.	Retighten screws.
2	Connecting conditions	Looseness of terminal screw.	Screws should not be loose.	Retighten terminal screws.
		Closeness of solderless terminals.	Terminals should be tightened parallel to each other.	Retighten terminal screws.
		Connector of extension cable.	Connectors should be connected firmly.	Latch connectors.
3	Unit indicator lamp			
	1) "POWER" lamp	Check that lamp is on.	On. Off is error.	See Section 6.3.3.
	2) "RUN" lamp	Check that lamp turns on when switch is moved to "RUN" position.	On. Off or flicker is error.	See Section 6.3.4 and Section 6.3.5.
	3) Input lamp	Check that lamp is turned on or off.	On when input is on. Off when input is off. State other than above is error.	See Section 6.3.6.
	4) Output lamp	Check that lamp is turned on or off.	On when output is on. Off when output is off. State other than above is error.	See Section 6.3.6.
4	When external indicator lamps are provided			
	1) "Run" check by M255	Check that lamp turns on when "RUN" switch is moved to ON position.	On. Off is error.	See Section 6.3.4 and Section 6.3.5.
	2) "Battery error" check by M254	When lamp is on, battery capacity has reduced.	When lamp is off, battery is normal.	Change battery.

Table 6.1 Daily Inspection Items

6.2 Periodic Inspection

Check the items in Table 6.2 once six months. Also check the items when the facility has been moved, modifications have been made, or wiring has been changed.

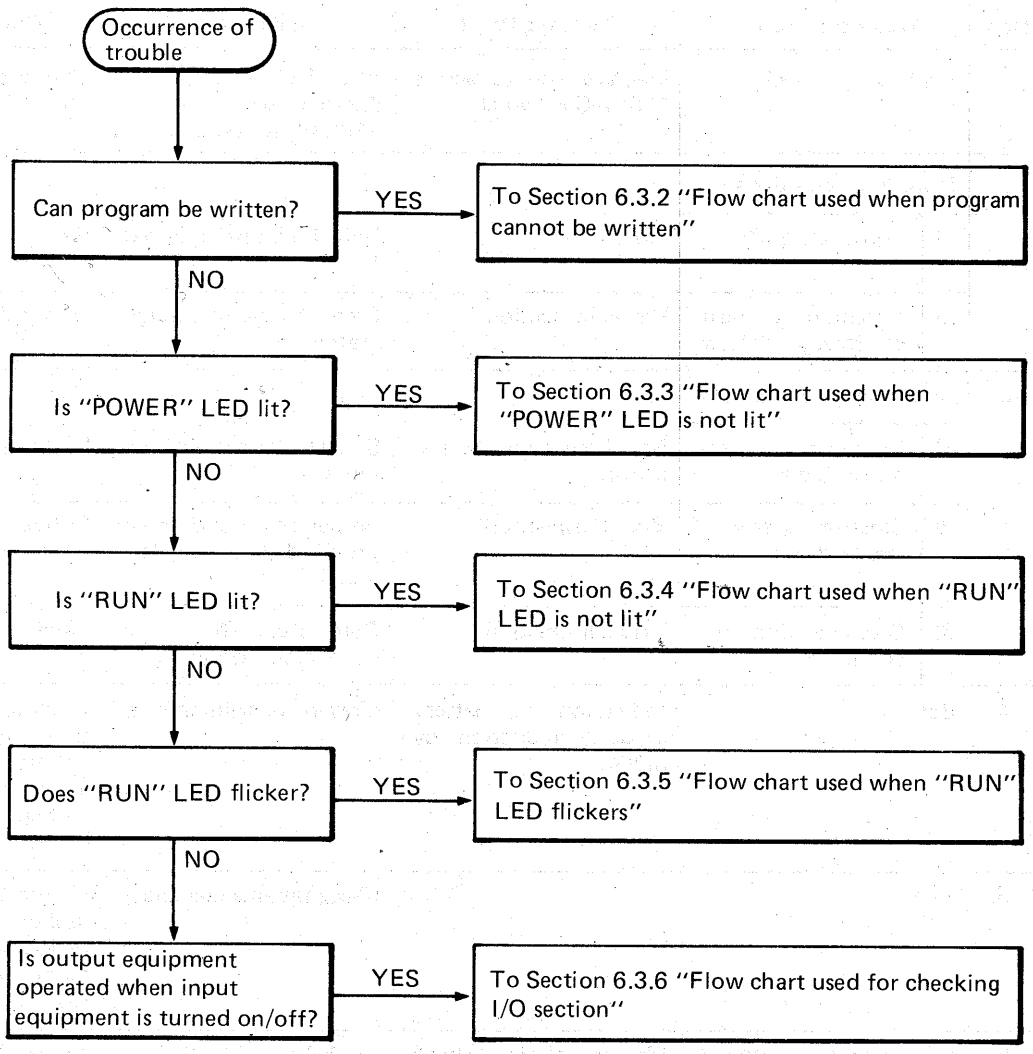
Item	Checking Item	Checking Point	Judgement	Corrective Action
1	Line voltage check	Measure voltage across 100VAC terminal.	85 ~ 121VAC. Approximately 95 ~ 110VAC is desirable.	Change supply power. Change transformer tap.
2	Mounting conditions			
	1) Looseness, play	Move unit.	Unit should be mounted firmly.	Retighten screws.
	2) Adhesion of dust or foreign matter	Visual inspection	Free of dust or foreign matter.	Remove and clean.
3	Connecting conditions			
	1) Looseness of terminal screw	Retighten by screwdriver.	Screws should not be loose.	Retighten.
	2) Closeness of solderless terminals	Visual inspection	Proper space should be provided between terminals.	Correct.
	3) Disconnection of connector	Visual inspection	Connectors should be connected firmly.	Latch connectors.
4	Battery	Indication of battery capacity reduction by M254.	(Preventive maintenance)	If battery capacity reduction is not indicated, change battery when predetermined life has exceeded. It is also desired to change battery periodically.
5	Fuse		(Preventive maintenance)	If fuse is not melted, it is desired to change fuse periodically because element may be worn due to rush current.
6	DC voltage of power supply unit (K61PN, (K62PN) when K65BN, K68BN is used	Measure voltage at check terminal of power supply unit.	5V 4.9 ~ 5.1V 24V 23 ~ 25V	Adjust voltage by power supply unit.
7	Misadjustment of A/D (KA62A), D/A (KA63A), insulation amplifier (KA64)	See Instruction Manual for KA62A, KA63A and KA64	See Instruction Manual for KA62A, KA63A and KA64	See Instruction Manual for KA62A, KA63A and KA64

Table 6.2 Periodic Inspection Items

6.3 Troubleshooting

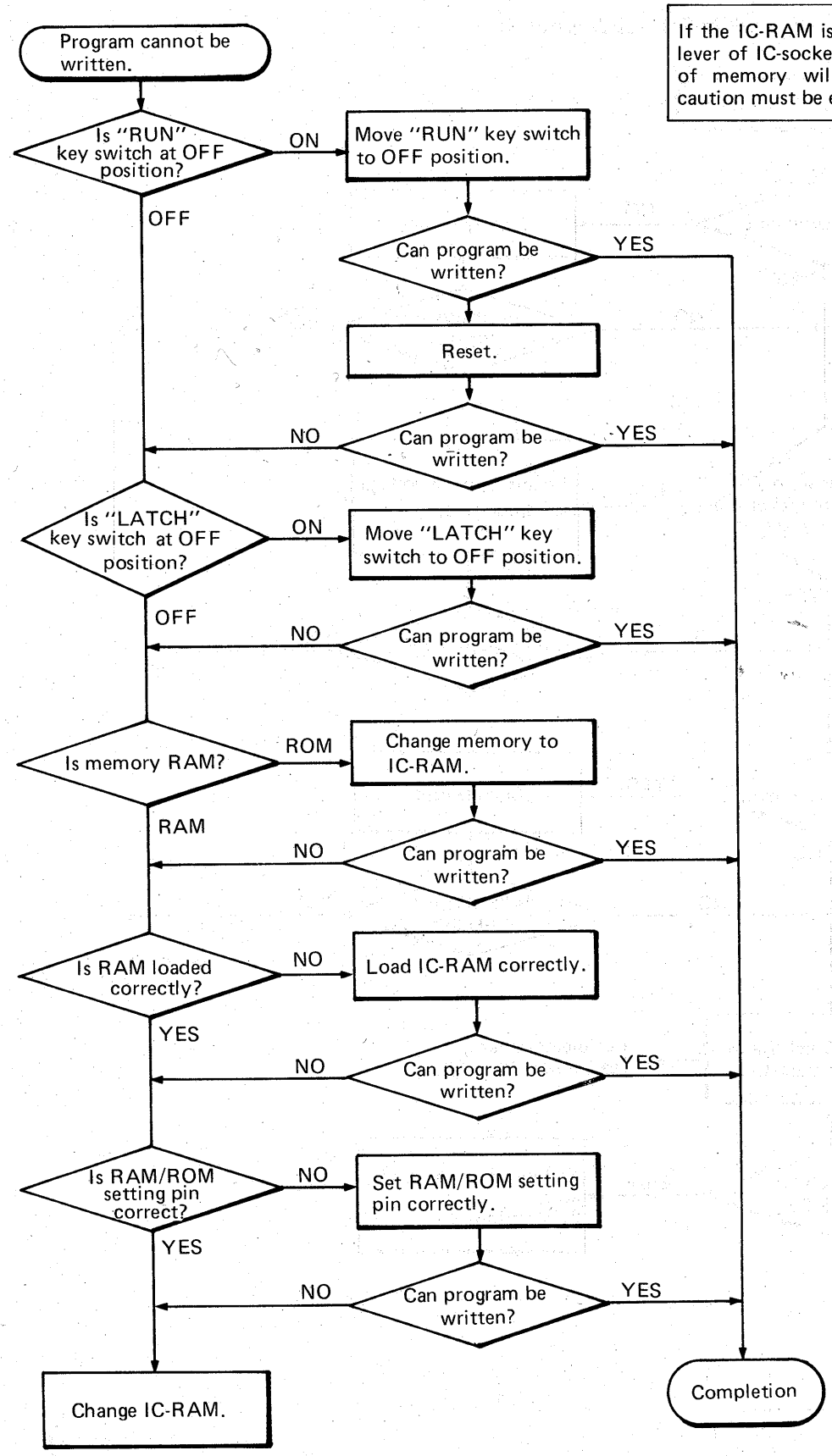
This section explains simple troubleshooting procedures.

6.3.1 Troubleshooting flow chart



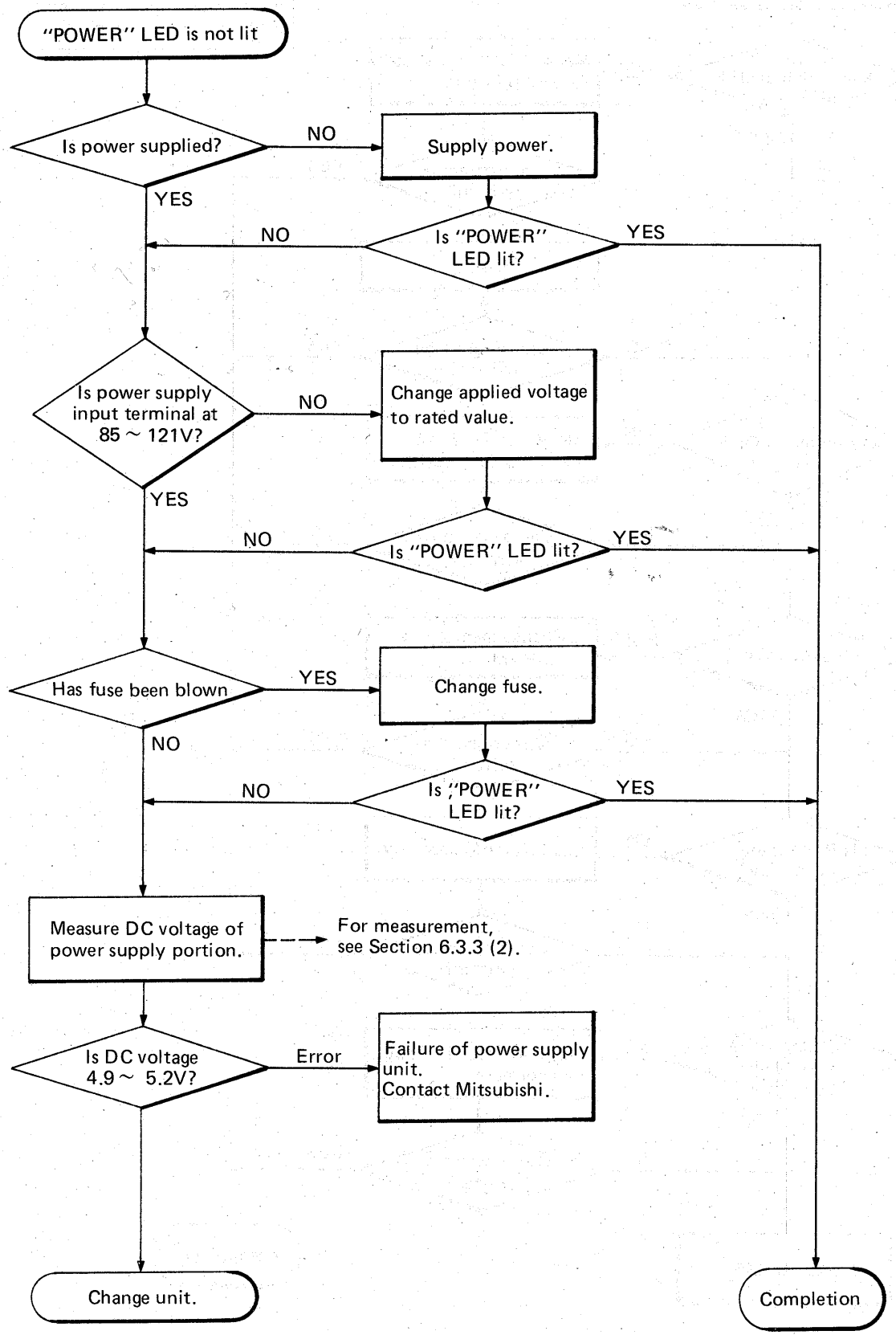
6.3.2 Flow chart used when program cannot be written

If the IC-RAM is unloaded or the loading lever of IC-socket is moved, the contents of memory will be erased. Therefore, caution must be exercised.



6.3.3 "POWER" LED is not lit

(1) Flow chart used when "POWER" LED is not lit



(2) Measurement of direct current power supply

1) Basic unit
   a. Measure 5V at 5V of CON2 and SG. (Fig. 6.1)
   b. Measure 24V across terminals TB19 (–) and TB20 (+).

2) Type E56 extension unit
   a. Measure 5V at the pin of IC as shown in Fig. 6.2.
   b. Measure 24V across terminals TB19 (–) and TB20 (+).

Fig. 6.1 Voltage Measuring Points of Basic Unit

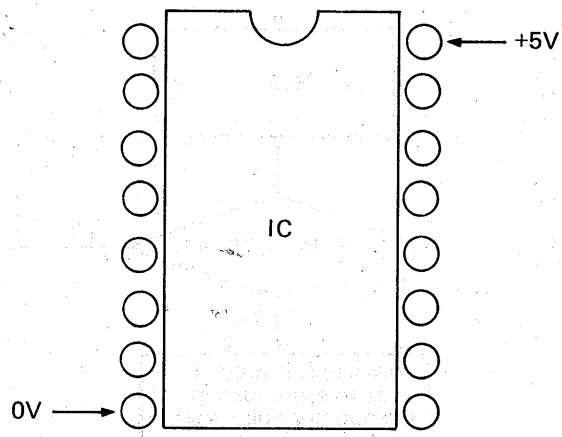
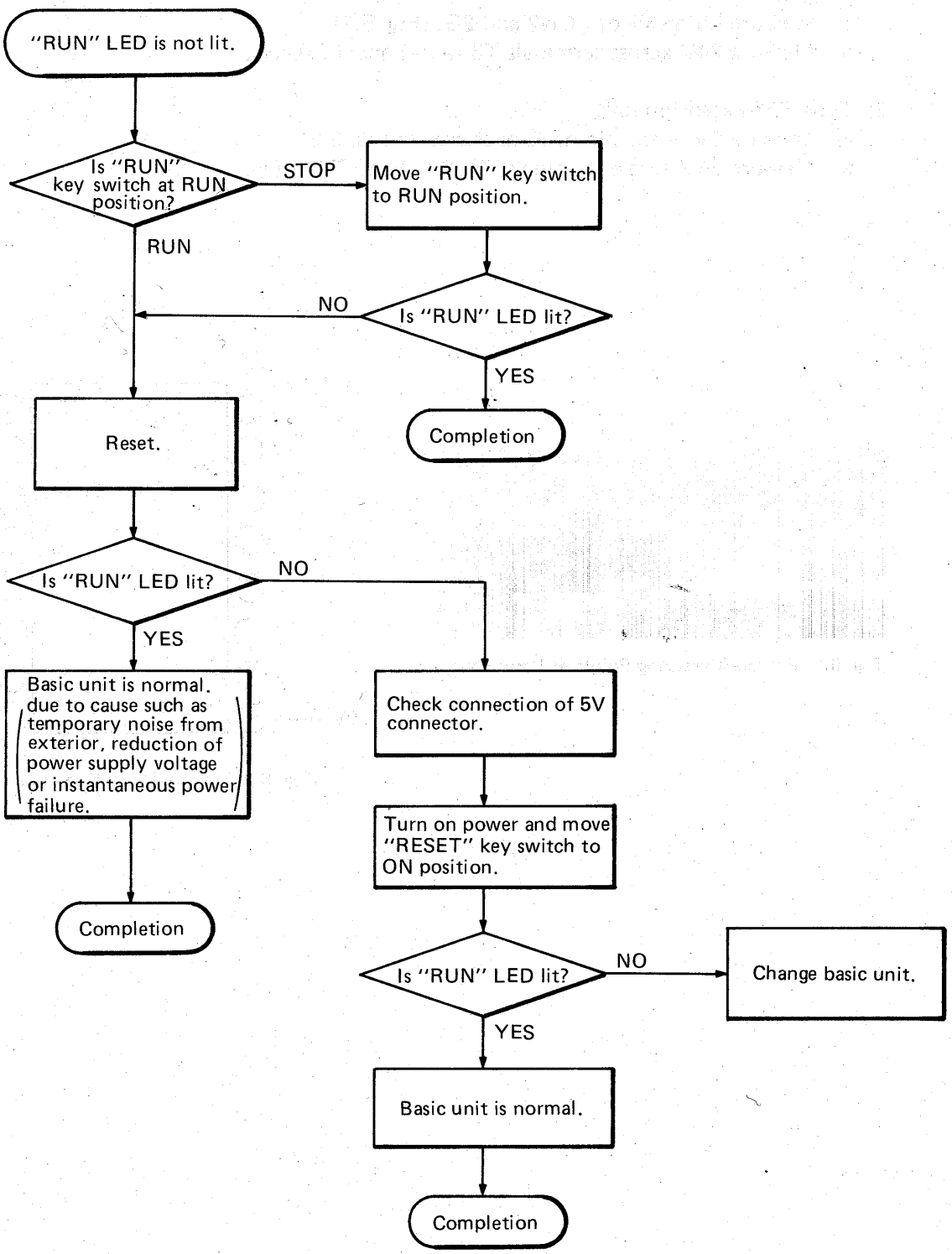
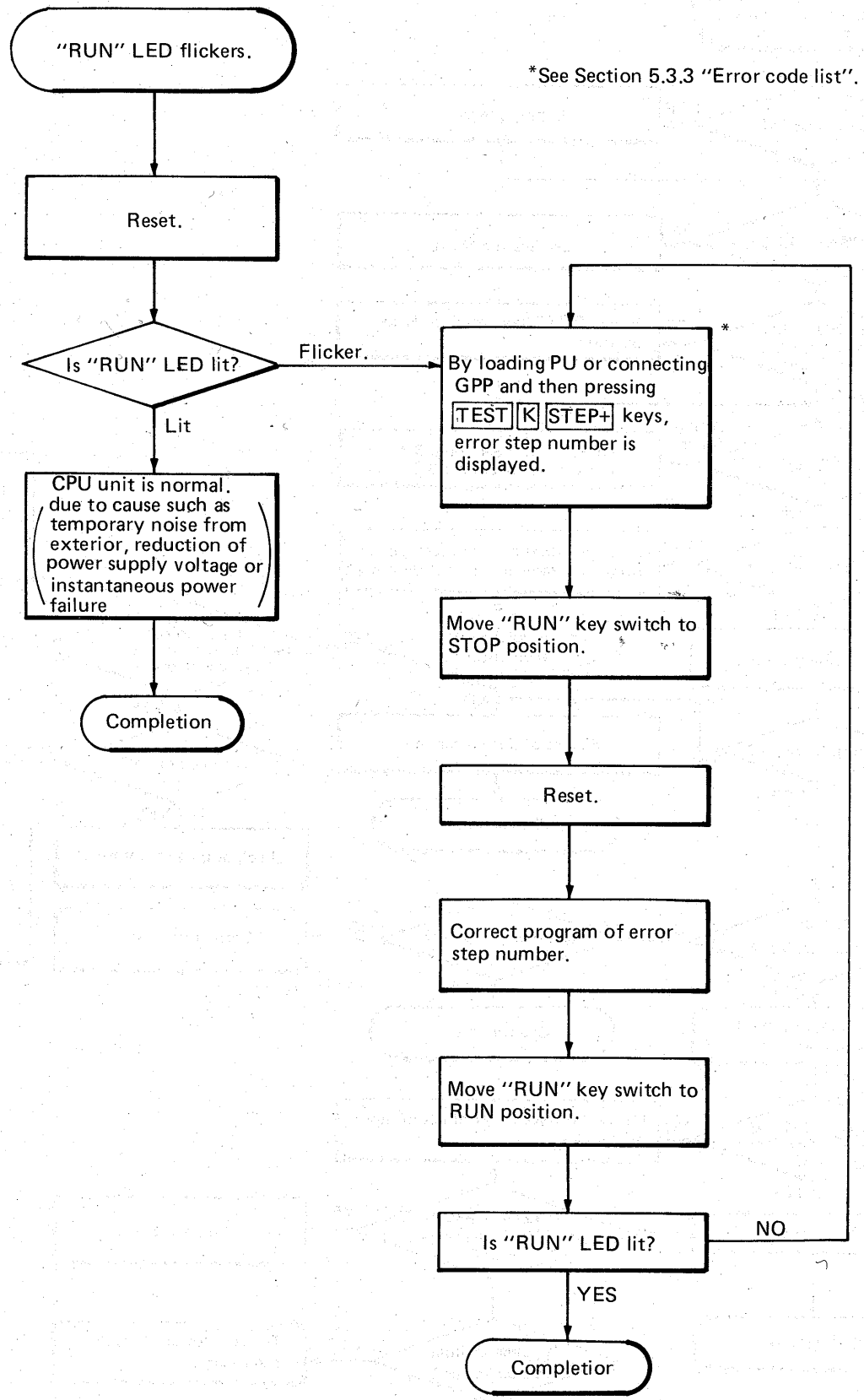


Fig. 6.2 Voltage Measuring Points of IC

6.3.4 Flow chart used when "RUN" LED is not lit



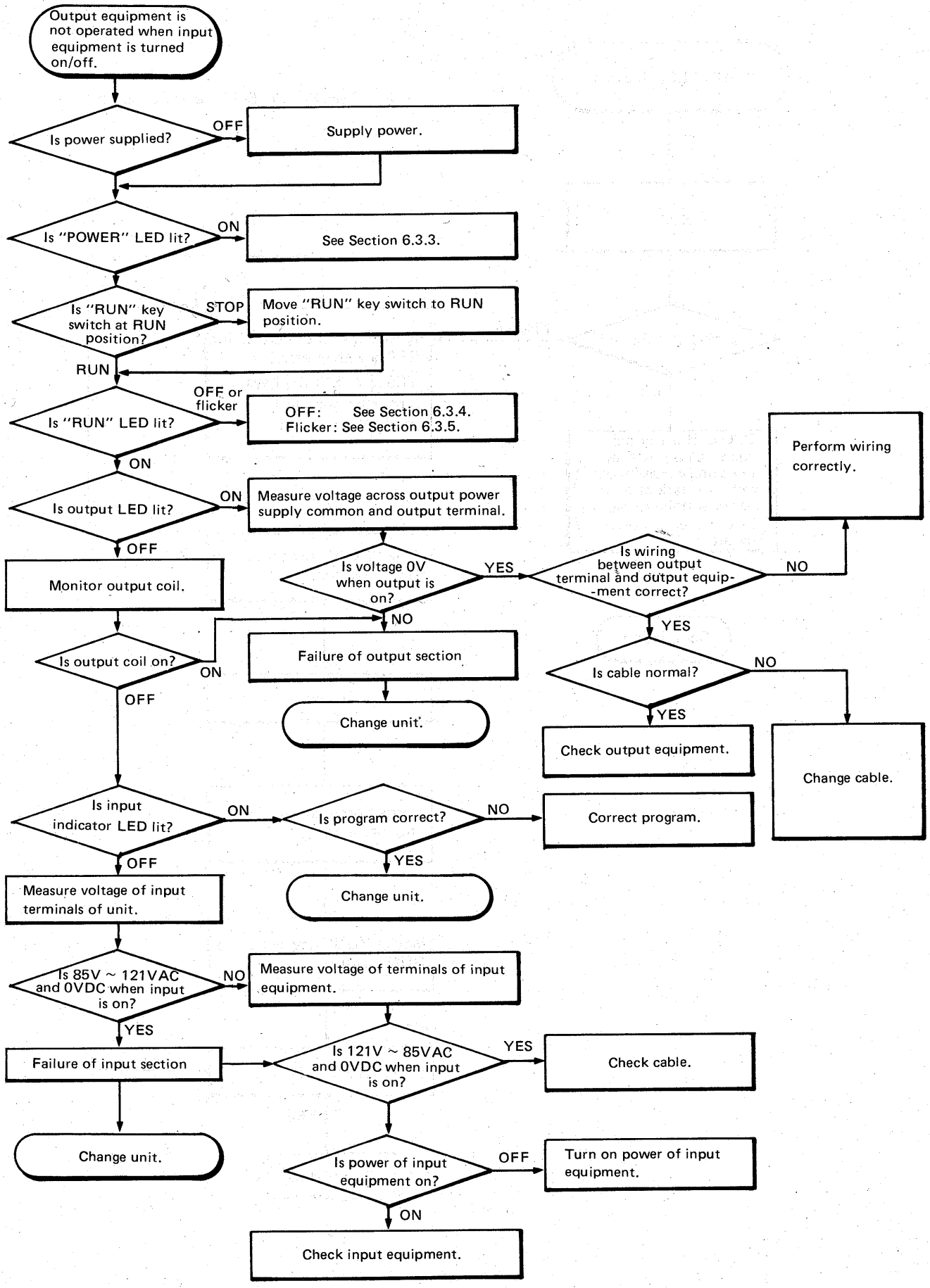
6.3.5 Flow chart used when "RUN" LED flickers



*See Section 5.3.3 "Error code list".

6

6.3.6 Flow chart for I/O section



6.4 Change of Battery

6.4.1 Life of battery

The battery for backup of IC-RAM and power failure gives alarm (M254) when the battery voltage (capacity) reduces. The battery can provide back up for power failure for approximately one month after this alarm is given. However, the alarm may escape the operator's notice. Therefore, it is recommended to change the battery as soon as possible.

The guides of preventive maintenance are as follows:

1) When the battery is guaranteed within five years and the total power cut time is less than 300 days (7200 hours), change the battery in four to five years.
2) When the battery is guaranteed within five years and the total power cut time has exceeded 300 days (7200 hours), calculate the day when the total power cut time will exceed 7200 hours, in terms of the operating hours during one day or one week, and also the power cut time, thus obtaining the time to change the battery.

Example: If the operating time is 10 hours a day (i.e. power is stopped for 14 hours a day) and the power is stopped for two days (i.e. 24 hours) a week,

14 hours x 5 = 70 hours

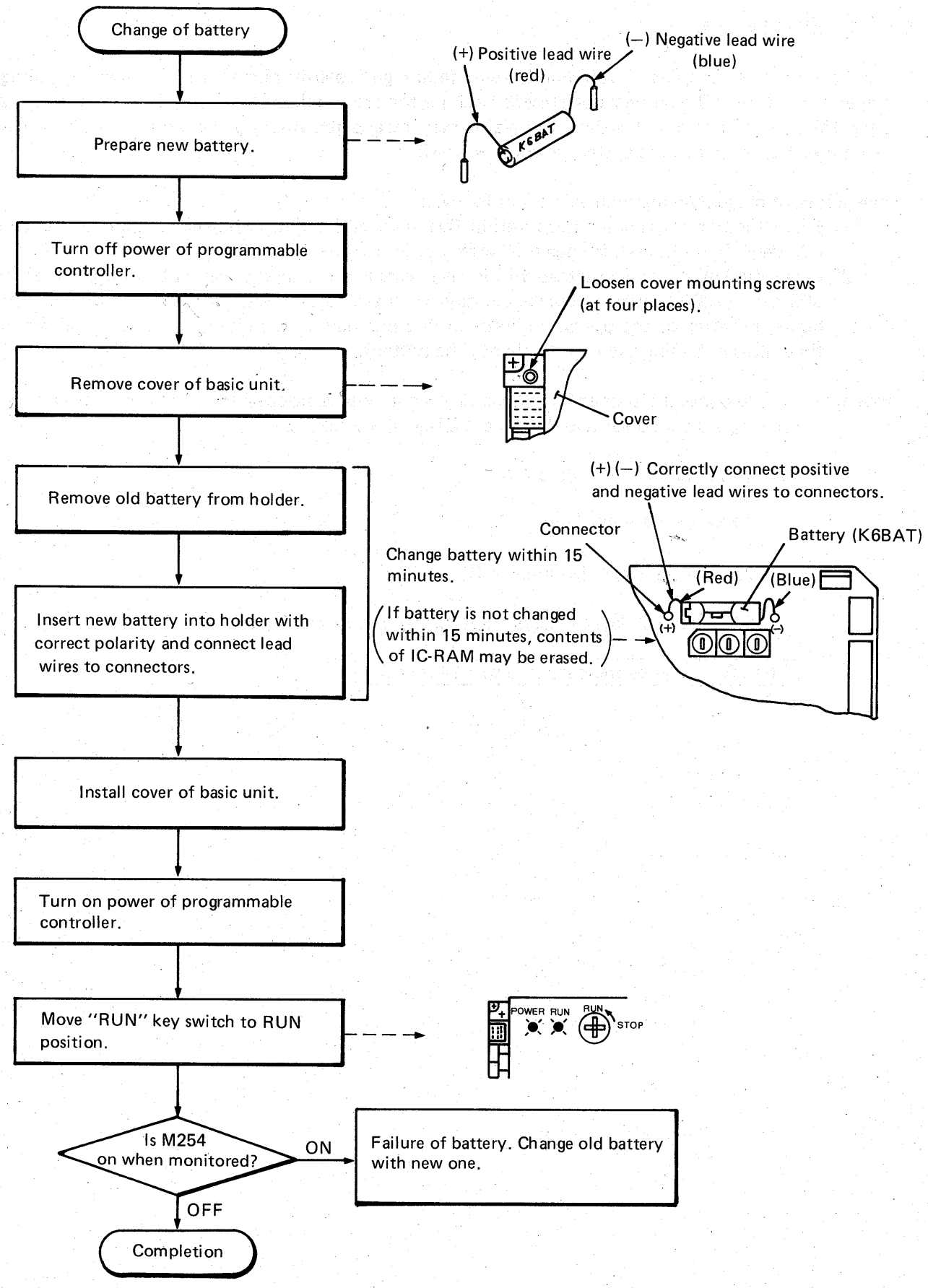
24 hours x 2 = 48 hours

7200 hours/(70 + 48) hours = 61 weeks

61 weeks x 7 days/30 days = approx. 14 months

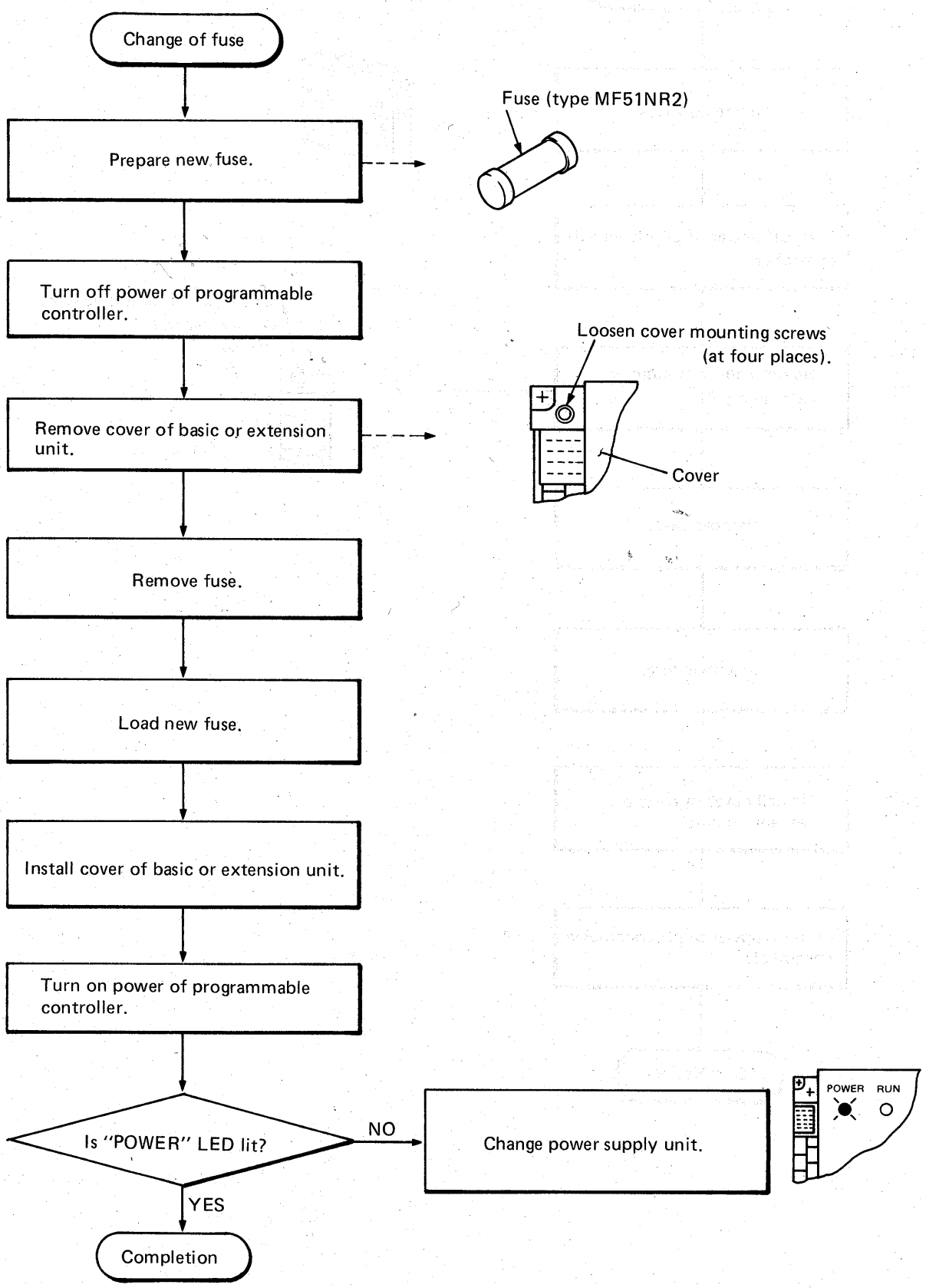
Therefore, change the battery every 14 months.

6.4.2 Battery changing procedure

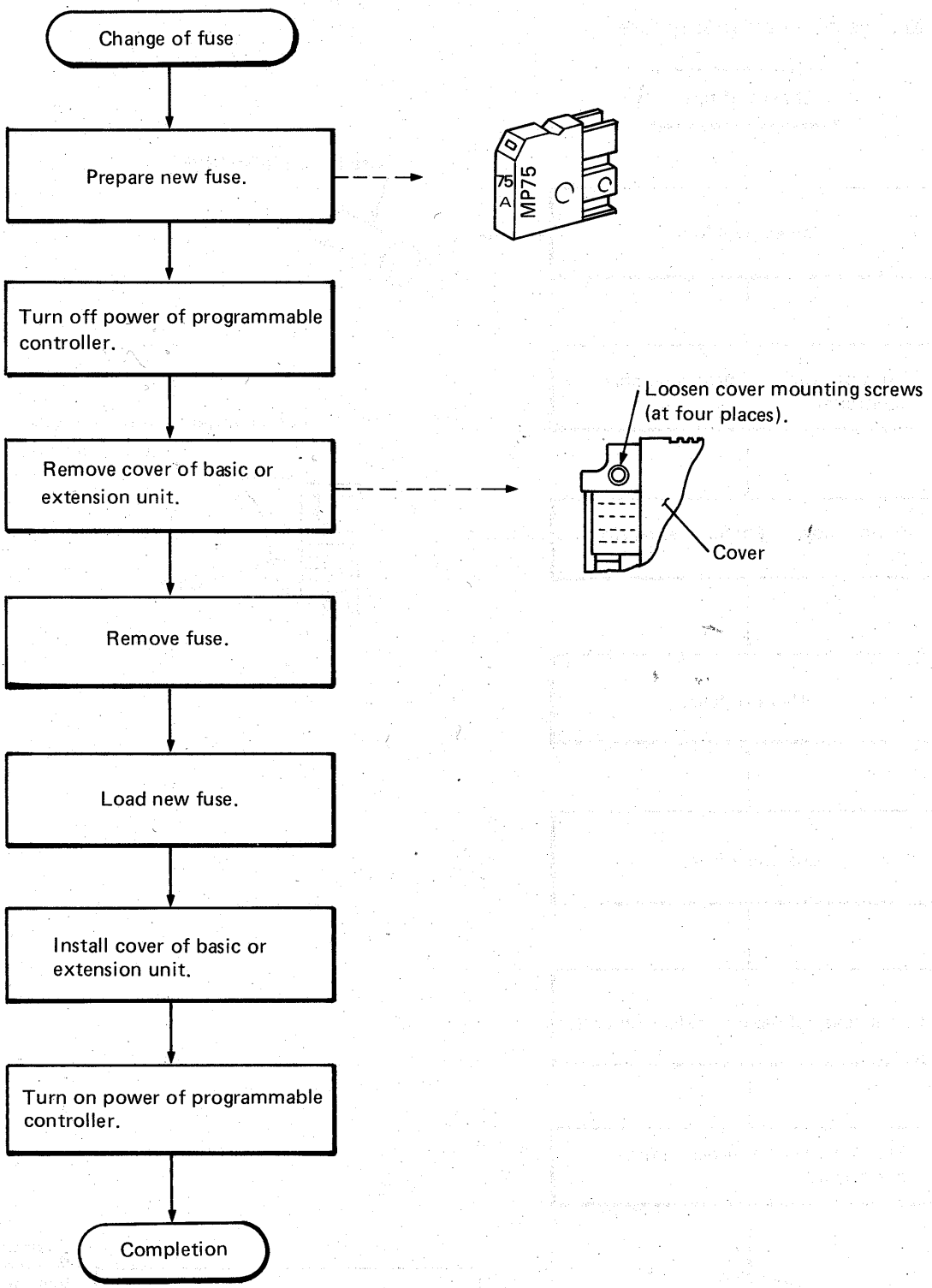


6.5 Change of Fuse

(1) Change of power supply fuse



(2) Change of fuse for triac output



7. INSTRUCTIONS FOR SPECIFICATIONS

7. INSTRUCTIONS FOR SPECIFICATIONS

7.1 Watch DOG Timer (WDT)

(1) The watchdog timer is the self-diagnostic function of hardware and detects the following:

- The predetermined period of one program cycle (scan time) has been exceeded. (Software)
- Failure of component or memory, stop of arithmetic operation due to noise. (Hardware)

(2) The watchdog timer is set to 0.17 second by the hardware.

(3) When WDT error has been detected, the display of "RUN" LED and the cause of error are as follows:

"RUN" LED	Cause
Flicker	Scan time has exceeded 0.17 sec. *1
Off*2	• Due to failure of component or memory, WDT error has been detected and arithmetic operation has been stopped. • Due to noise, WDT error has been detected and arithmetic operation has been stopped.

Note: *1 *The "RUN" LED also flickers when program error occurs, namely:*
- *END is not written.*
- *Instruction is abnormal.*

*2 *When the "RUN" LED has turned off due to the cause indicated above, the error code "5021" is not displayed.*

7.2 Accuracy of Timer

The accuracy of timer depends on scan time (timer accuracy = ± scan time). Fig. 7.1 shows an example in which the 10ms timer, T127, is used with a set value of 6 seconds (K 600) for a program with 25 ms scan time.

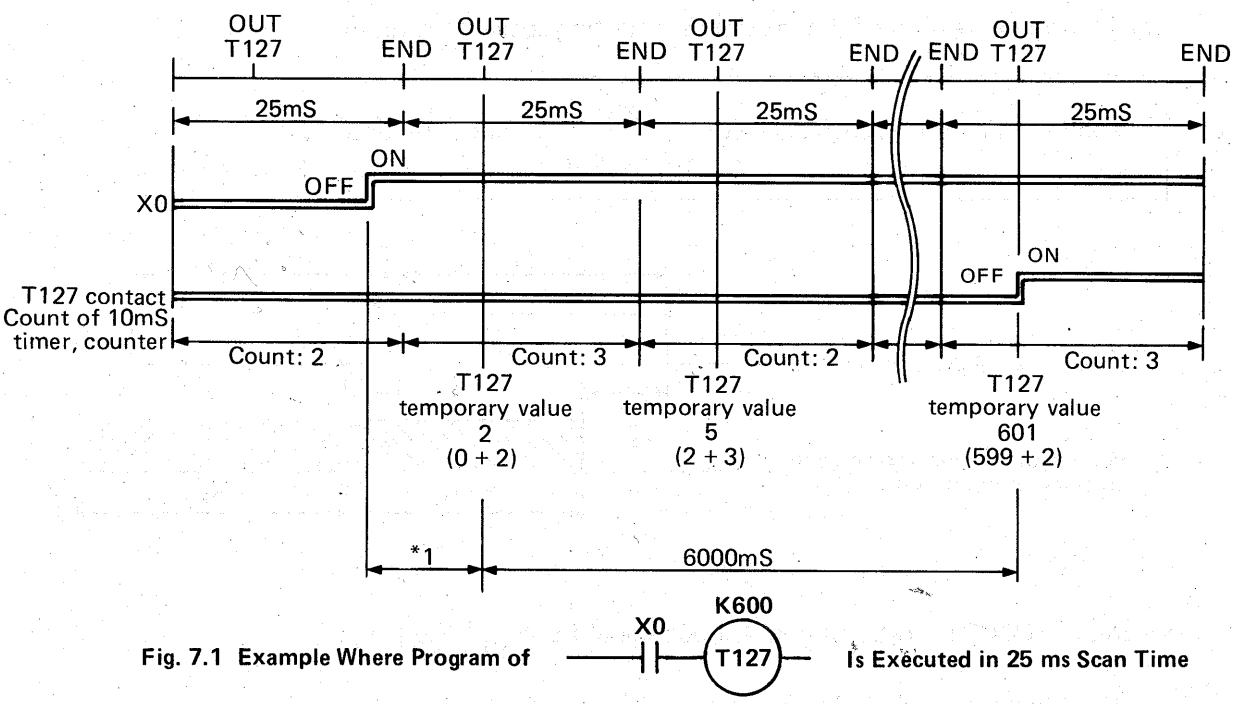


Fig. 7.1 Example Where Program of Is Executed in 25 ms Scan Time

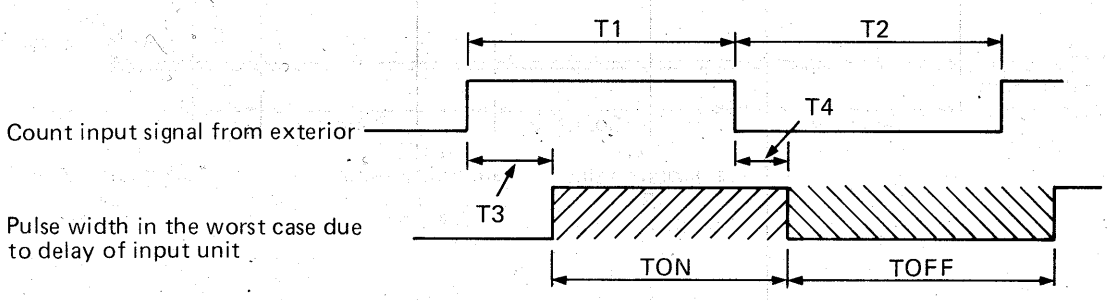
The interval of time until when the 10ms timer times up includes the counting error of 10ms timer ($\pm^{\text{scan time}}_{0}$) and also the error produced depending on where the timer start condition has been set in the program*1 ($\pm^{0}_{\text{scan time}}$). Therefore, the accuracy of timer is ± (scan time). Accordingly, the accuracy of timer in the above example is ± 0.025 second in relation to the set value of 6 seconds.

7.3 Maximum Counting Speed of Counter

The maximum counting speed of counter depends on the arithmetic operation time of one program cycle (scan time) and the response time of input unit. Counting is possible only when each of TON and TOFF is greater than scan time in the following figure.

Calculation expression of the maximum counting speed of counter

$$\text{Maximum counting speed } Cmax < \frac{1000}{\frac{1}{n} \cdot ts + \alpha} \quad \text{(counts/second)}$$



where, n = ON/OFF ratio of count input signal ($n = \frac{T1}{T1 + T2}$)

$$\text{When } n = \frac{T1}{T1 + T2} \leqq 0.5,\ n = \frac{T1}{T1 + T2}$$

$$\text{When } n = \frac{T1}{T1 + T2} \geqq 0.5,\ n = 1 - \frac{T1}{T1 + T2}$$

ts = scan time (mS)

α = response time constant of input unit

$$\alpha = T1 + T2 - T3 - T4$$

T1 = maximum ON response time of input unit (mS)
T2 = minimum OFF response time of input unit (mS)
T3 = maximum OFF response time of input unit (mS)
T4 = minimum ON response time of input unit (mS)

[Exercise]

Calculate the maximum counting speed under the following conditions:

Scan time = 100 ms
ON response time of input unit = max. 20 mS, min. 5 mS
OFF response time of input unit = max. 30 mS, min. 10 mS
ON/OFF ratio = 40%

$\alpha = 20 + 10 - 30 - 5 = -5$ (mS)

$$C\,max < \frac{1000}{\frac{100}{40} \times 100 + (-5)}$$

Consequently, the maximum counting speed is 4 (counts/second) or lower.

7.4 Latch Function

The retention of control data at the time of power failure is referred to as the latch function (power failure latch). Retained at the time of power failure are timers (T), counters (C), data registers (D) and temporary memories (M).

(1) Selection of latch
When the "LATCH" key switch on the front panel of basic unit is in "ON" position, data is retained at the time of power failure. When the switch is in "OFF" position, data is not retained.

(2) All clear of latched contents
When it is desired to clear all of latched contents, move the "LATCH" key switch to "OFF" position and move the "RESET" key switch to "ON" position.

(3) Latch range

LATCH switch	Unlatch Range			Latched Range		
	Temporary memory	Timer, counter	Data register	Temporary memory	Timer, counter	Data register
OFF	M0 ~ 255	T.C0 ~ 127	D0 ~ 95	None	None	None
ON	M0 ~ 127 M254, M255	T.C0 ~ 63 T112 ~ 127	D0 ~ 63	M128 ~ 253	T.C64 ~ 111	D64 ~ 95

LATCH Setting Range

(4) Caution for program
To latch the temporary memory, do not use a self-holding circuit but use a set-and-reset circuit. This circuit is used to prevent the latched signal from being cleared, when the power is restored, by the difference of time between the rise of power of programmable controller and the rise of power of input signal.

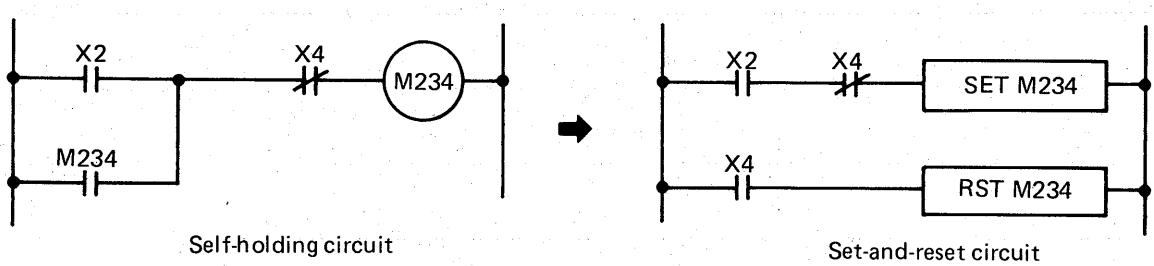


Fig. 7.2 Latch Circuit Example

MEMO

8. HANDLING INSTRUCTIONS

8. HANDLING INSTRUCTIONS

8.1 Programmable Controller Unit

(1) Since the case of this programmable controller is made of plastic, do not drop or give strong shock.

(2) At the time of wiring, take care to prevent the entry of conductive matters, such as wire chips and drill chips, into the unit. If such matters have entered, remove them.

(3) Be sure to mount the front cover.

(4) When the unit for K1 or K2 is used, do not overtighten the unit fixing screws.

(5) Do not overtighten the terminal screws.

8.2 Memory

(1) When loading the memory to the socket, securely press the memory against the socket and lock it with the lever. Check if the memory is lifted from the socket.

(2) In regards to the handling of memory, be sure to follow Section 5.2.2.

(3) If the IC-RAM, which stores program, is unloaded from the socket, the program will be erased immediately. Therefore, never unload the IC-RAM from the socket.

8.3 Battery

(1) Do not let the battery short-circuited.

(2) Do not disassemble the battery.

(3) Do not put the battery into flame.

(4) Do not heat the battery.

(5) Do not solder the poles of battery.

(6) Do not measure voltage with a circuit tester.

APPENDIX

APPENDIX

1. COMPARISON BETWEEN K0J1, K0J1H and K0J2, K0J2P

1.1 Comparison of Specifications

		K0J1		K0J2	
		K0J1	K0J1H	K0J2	K0J2P
Instruction	Number of standard Instructions	26 types (18 types of sequence instructions + 8 types of data instructions) *1			
	Number of application instructions	15 types		19 types *2	
	Word length	16 bits (two bytes)/step, 1-, 2-, 3-step instruction			
Program capacity		Maximum 2048 steps		Maximum 4096 steps	
Sequence instruction execution time		30μs/step on average	5.6μs/step*3		30μs/step on average
Data instruction execution time		100 ~ 500μs/instruction (one instruction consists of three steps.)			
Program memory	IC-RAM	1024 steps – standard-equipment 2048 steps		1024 steps – standard-equipped 4096 steps	
	EP-ROM	1024 steps / 2048 steps } Selectively loaded		2048 steps / 4096 steps } Selectively loaded	
Number of I/O points		Maximum 184 points		Maximum 280 points	
Number of temporary memories		254 points (M0 ~ 253)			250 points (M0 ~ 249)
Shift register	Number of usable points	253 bits (M1 ~ M253) excluding those used for temporary memory.			249 bits (M1 ~ 249)
	Specifications	Constructed by temporary memories combined in units of one bit combined Used for SFT instruction and application instruction.			
Power failure latch (latched range) (Power failure latch is possible by LATCH key switch of basic unit.)		M128 ~ 253 T.C64 ~ 111 D64 ~ 95			M128 ~ 249 T.C64 ~ 111 D64 ~ 95
Watchdog timer		100mS		170mS	200mS
10mS timer program		Inserted into high-speed processing program which is operated per 10ms	Possible by the same method as 100mS timer program.		
Data link function		Not provided			Provided (Optical data link, slave channel of local programmable controller system, slave channel of remote I/O system)
Type of RUN, LATCH and RESET switches		Toggle switch		Key switch	
Extension	Number of extended stage of 32-points (E32) and 56-points (E56) extension units	Two stages		Four stages (When K0J2-E56 extension units are used. For other units, see Section 1, 2 of APPENDIX.)	
	Usability of K65BN and K68BN extension bases	Usable			Not usable
	Requirement of extension adaptor	Required for extension K0J1-EX1 (for E32 and E56 extension units) K0J1-EX2 (for K65BN and K68BN extension bases)		Required for extension K0J2-EX1 K0J2-EX2	Not required Adaptor equivalent to EX1 is incorporated.
Usability of special units (High-speed counter – KD61 Positioning – KD71 Analog I/O – KA62A, KA63A)		Usable (loaded into K65BN or K68BN extension bases)			Not usable

Note:

1. *(*1) S and D combinations of data instructions have been greatly increased.*

K0J1, K0J1H

S \ D	K	D	T	C	X	Y	M
K		○ ●					
D		○ ● ▲ △	○	○		○	○
T		○ △					
C		○ △					
X		○ ▲					
Y							
M		○					

MOV ..... ○
BCD ..... △
BIN ..... ▲
>, <, =, +, – ..... ●

K0J2, K0J2P

S \ D	K	D	T	C	X	Y	M
K	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
D	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
T	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
C	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
X	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
Y	●	○ ●	○ ●	○ ●	●	○ ●	○ ●
M	●	○ ●	○ ●	○ ●	●	○ ●	○ ●

MOV, BCD, BIN, +, – } ..... ○
>, <, = ... ●

Note that when programming is performed by use of PU or GPP with a legend plate which does not indicate "DATE" as shown below, the S and D combinations of data instructions are the same as those of K0J1 and K0J1H.

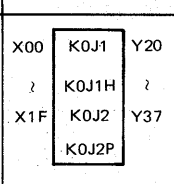
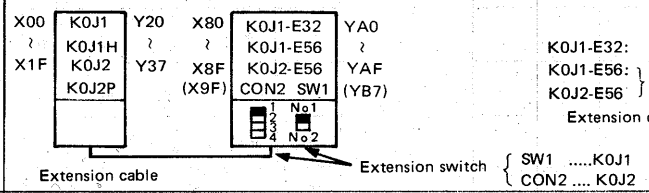
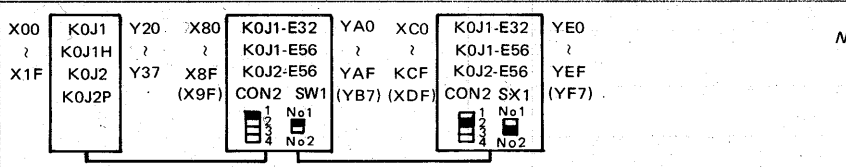
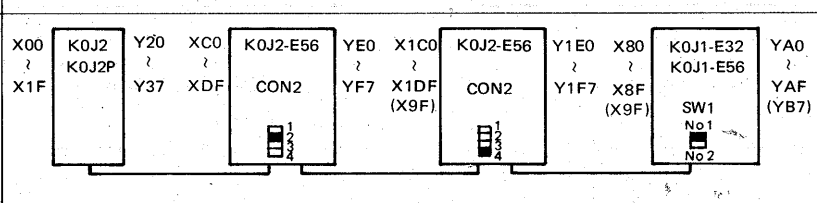
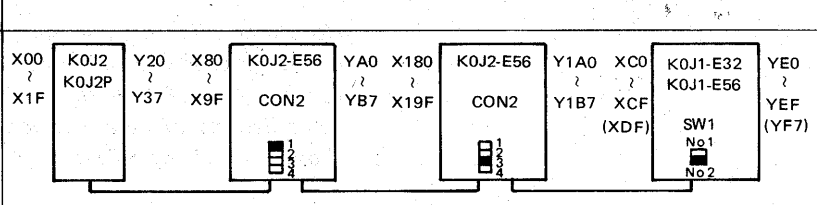
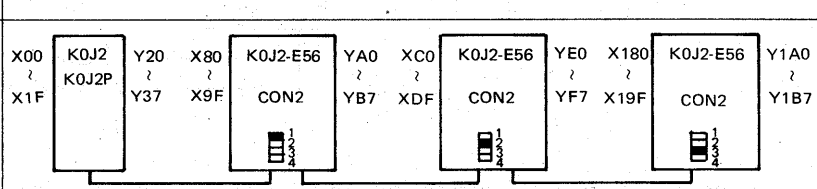
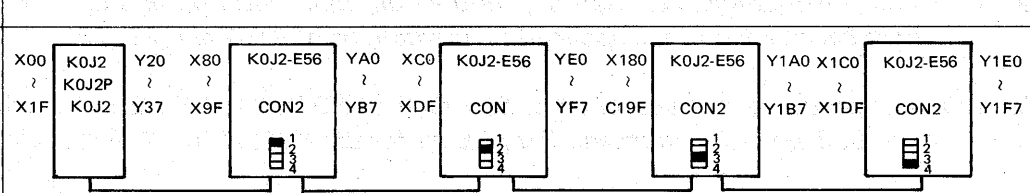
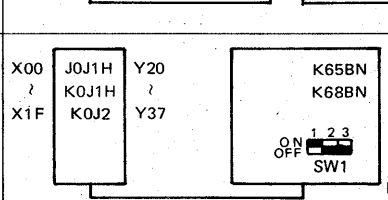
□□ K3 □
→ Version
→ Year and month of manufacture

2. *(*2) Four instructions, i.e. addition, subtraction, multiplication and division of BCD six digits, have been added to the application instructions of K0J2 and K0J2P.*

3. *(*3) The sequence instruction execution time of K0J1H and K0J2 is 5.6 μS/step for the E32 and E56 extension units and 7.0 μS/step for the K65BN and K68BN extension bases.*

9

1.2 Comparison of System Configurations

	Number of I/O Points	Basic and Extension Units and I/O Numbers
1	Input: 32 points Output: 24 points Total: 56 points	
2	(Maximum number of points) Input: 64 points Output: 48 points Total: 112 points	
3	(Maximum number of points) Input: 96 points Output: 72 points Total: 168 points	
4	(Maximum number of points) Input: 128 points Output: 96 points Total: 224 points	
5	(Maximum number of points) Input: 128 points Output: 96 points Total: 224 points	
6	Input: 128 points Output: 96 points Total: 224 points	
7	Input: 160 points Output: 120 points Total: 280 points	
8	Input: 32+16m points Output: 24+16n points (m+n = 8) Total: 184 points	

IMPORTANT

In extension systems 4 and 5 in above table, the setting of extension switches and the allotment of I/O numbers differ depending on extension order. Therefore, caution should be exercised.

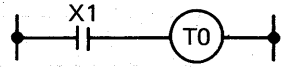
2. Process Time

(unit : μs)

Instruction	Condition				Process time
LD	X, Y				5.6
	M, T, C, F				5.6
LDI	X, Y				5.6
	M, T, C, F				5.6
AND	X, Y				5.6
	M, T, C, F				5.6
ANI	X, Y				5.6
	M, T, C, F				5.6
OR	X, Y				5.6
	M, T, C, F				5.6
ORI	X, Y				5.6
	M, T, C, F				5.6
ANB	–				5.6
ORB	–				5.6
OUT	Y				5.6
	M				5.6
	T	Non execution *1			85
		Before time-up *2			90
		Execution	After time-up		75
			Per 0.1 second	K	95
				D	90
	C	Non execution			75
		Execution	Non-count		75
			After count-up		75
			Count	K	80
				D	80
	F	Non execution			70
		Execution			190

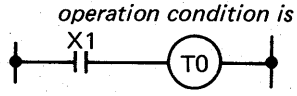
Instruction	Condition			Process time
MC	–			75
MCR	–			70
SET	Y	Non execution		5.6
		Execution		5.6
	M	Non execution		5.6
		Execution		5.6
	F	Non execution		75
		Execution		195
RST	Y	Non execution		65
		Execution		80
	M, F	Non execution		65
		Execution		70
	C	Non execution		65
		Execution		85
SFT	M	Non execution		70
		Execution		85
CJ	K	Non execution		65
		Execution		105
PLS	M	Non execution		70
		Execution	ON	80
			OFF	75
NOP	–			5.6
END	–			170

*Note 1: *1 Non execution means that arithmetic operation condition is off.*



(When X1 is off)

*Note 2: *2 Execution means that arithmetic operation condition is on.*



(When X1 is on)

9

(Unit: μs)

	S \ D	K	D	T	C	X	Y	M
Process Time of MOV Instruction	K	–	170	170	170	–	410	360
	D	–	190	190	190	–	430	370
	T	–	190	190	190	–	430	370
	C	–	190	190	190	–	430	370
	X	–	440	440	440	–	670	630
	Y	–	440	440	440	–	670	630
	M	–	390	390	390	–	630	590
Process Time of > Instruction	K	190	200	200	200	480	480	430
	D	200	220	220	220	490	490	440
	T	200	220	220	220	490	490	440
	C	200	220	220	220	490	490	440
	X	450	470	470	470	760	760	710
	Y	450	470	470	470	760	760	710
	M	400	420	420	420	690	690	640
Process Time of = Instruction	K	190	200	200	200	480	480	430
	D	200	220	220	220	490	490	440
	T	200	220	220	220	490	490	440
	C	200	220	220	220	490	490	440
	X	450	470	470	470	760	760	710
	Y	450	470	470	470	760	760	710
	M	400	420	420	420	690	690	640
Process Time of + Instruction	K	–	210	210	210	–	730	640
	D	–	230	230	230	–	740	650
	T	–	230	230	230	–	740	650
	C	–	230	230	230	–	740	650
	X	–	470	470	470	–	1000	900
	Y	–	470	470	470	–	1000	900
	M	–	420	420	420	–	920	840

(Unit: μs)

	S \ D	K	D	T	C	X	Y	M
Process Time of − Instruction	K	−	210	210	210	−	730	640
	D	−	230	230	230	−	740	650
	T	−	230	230	230	−	740	650
	C	−	230	230	230	−	740	650
	X	−	470	470	470	−	1000	900
	Y	−	470	470	470	−	1000	900
	M	−	420	420	420	−	920	850
Process Time of < Instruction	K	190	200	200	200	480	480	430
	D	210	220	220	220	490	490	440
	T	210	220	220	220	490	490	440
	C	210	220	220	220	490	490	440
	X	450	470	470	470	760	760	710
	Y	450	470	470	470	760	760	710
	M	400	420	420	420	690	690	640
Process Time of BIN Instruction	K	−	340	340	340	−	610	560
	D	−	360	360	360	−	620	570
	T	−	360	360	360	−	620	570
	C	−	360	360	360	−	620	570
	X	−	610	610	610	−	870	820
	Y	−	610	610	610	−	870	820
	M	−	560	560	560	−	830	780
Process Time of BCD Instruction	K	−	350	350	350	−	610	570
	D	−	260	260	260	−	530	480
	T	−	260	260	260	−	530	480
	C	−	260	260	260	−	530	480
	X	−	510	510	510	−	780	730
	Y	−	510	510	510	−	780	730
	M	−	470	470	470	−	740	690

Application Instruction

(Unit: μs)

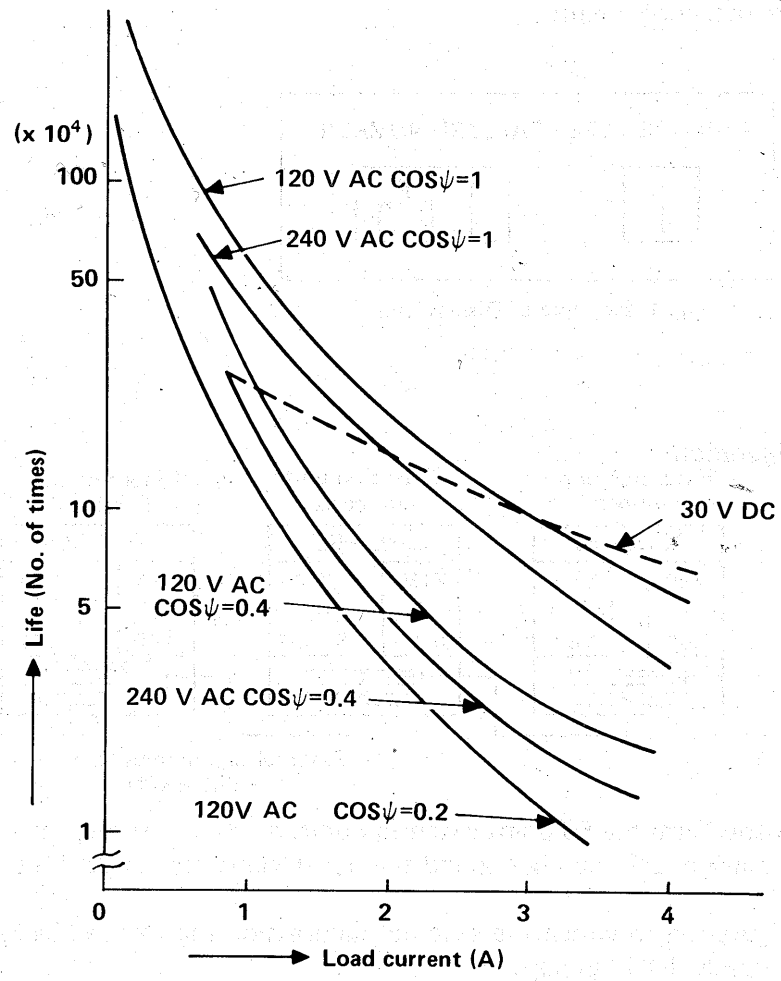
Instruction	Condition		Process Time
OUT F100			135
OUT F101	6 digits + 6 digits		310
	4 digits + 4 digits		270
	2 digits + 2 digits		310
OUT F102	6 digits – 6 digits		2700
	4 digits – 4 digits		700
	2 digits – 2 digits		600
OUT F103	6 digits x 6 digits		5700
	4 digits x 4 digits		4200
	2 digits x 2 digits		2600
OUT F104	6 digits ÷ 6 digits		2800
	4 digits ÷ 4 digits		1600
	2 digits ÷ 2 digits		1800
OUT F108	4 ↔ 16	Decode	180
		Encode	320
OUT F109			320
OUT F110			170
OUT F111			185
OUT F112			195

Instruction	Condition	Process Time
OUT F113		205
OUT F114	10bit	240
	100bits	1140
	200bits	2110
OUT F115	5 data	270
	10 data	340
	50 data	960
OUT F116	10 data	320
	30 data	550
	90 data	1230
OUT F117		250
OUT F118		240
OUT F119		580

9

3. CONTACT LIFE OF RELAY CONTACT OUTPUT

The following chart shows the life curve of output relay used for Type DR and AR.
If a high-capacity DC load is driven by relay contact, the contact will be extremely worn and its life will be shortened.



Contact life curve

4. USAGE OF EXTERNAL FAILURE MONITOR UNIT (K0J1-EX0N)

4.1 General Description

The external failure monitor unit (K0J1-EX0N) is loaded into the K0J1 56-point extension unit (Type K0J1-E56) located in the last stage of extension units, and has interface with the basic unit and also the output function of failure display.
The K0J1-EX0N outputs display signals for displaying the failure type of external equipment (such as limit switch and solenoid) and the failure number as shown in Fig. 1. It is required for the user to program the failure detecting circuit.

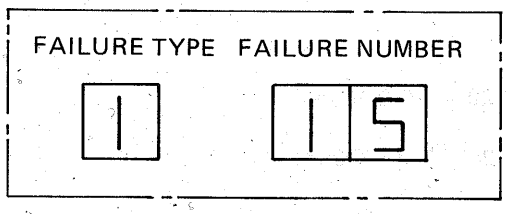
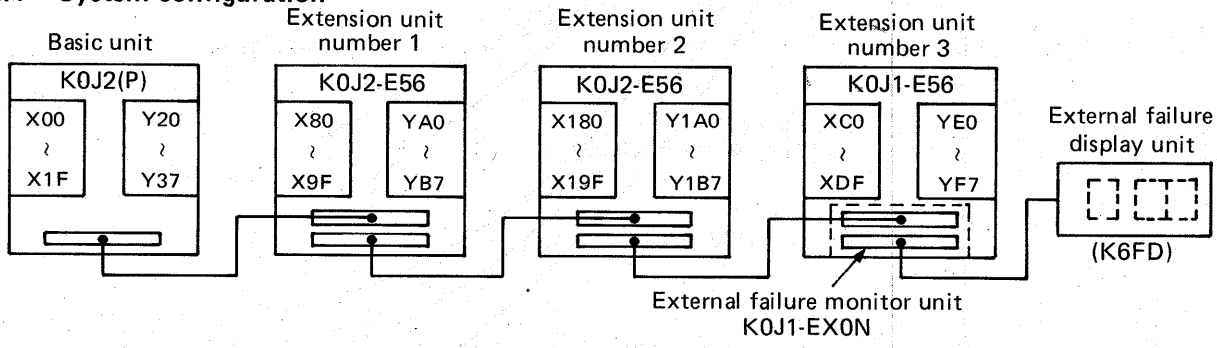


Fig. 1 Example of Display Unit

4.2 Specifications

4.2.1 System configuration



The K0J1-EX0N is loaded into the 56-point extension unit. As shown above, the upper connector is connected to the extension unit number 2 and the lower connector is connected to the external failure display unit.
For the system configuration to which the external failure monitor unit can be loaded, see Section 4 "SYSTEM CONFIGURATION" in page .

4.2.2 Output signals and number of signals

(1) Failure number:	BCD two digits	4 signals x 2 = 8 signals
(2) Failure type:	BCD one digit	4 signals x 1 = 4 signals
(3) Blanking signal:	One point	1 signal
(4) Common wire (— side of 24VDC):		14 signals
	Total:	27 signals

4.2.3 Output signal specifications

Item	Specifications
Insulation system	Photocoupler
Output form	Transistor, open collector output ("L" level of signal is 2V or lower (at rated load).)
Rated load voltage	24VDC
Maximum load current	0.1A

4.2.4 Input signals and number of signals

(1) Reset signal: 1 signal
(2) Common wire (+ side of 24VDC): 2 signal

Total: 3 signals

4.2.5 I/O signal specifications

Item	Specifications
Insulation system	Photocoupler
Rated input voltage	12/24VDC
Rated input current	10mA

4.2.6 Type K6FD failure display unit

(1) The types of failures should be 1 ~ 9 and the failure type "0" cannot be used.

(2) Use active "LOW" for the failure display unit. The failure display unit should be blanked (turned off) when the failure type is "0" and the failure number is "00".
The blanking signal can be used to blank the display unit.
When there is no failure, the blanking signal can be used by switching it to either "L" or "H" by the chip switch in the substrate.

4.3 Failure Output Circuit Example

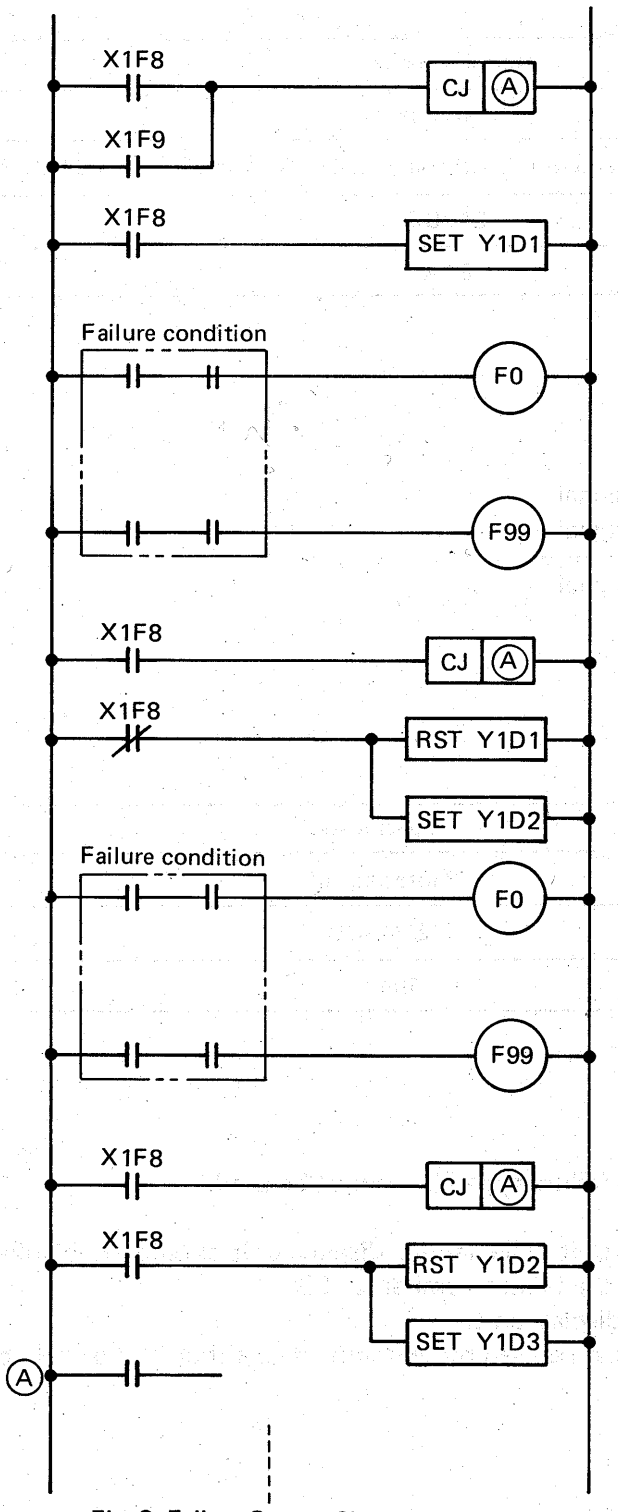


Fig. 2 Failure Output Circuit Example

Note:

1. *X1F8 is a fixed number. This signal turns on when either failure occurs.*
2. *A is a jump destination step number. Set a step number which is located next to the failure output circuit.*
3. *Y1D1 ~ Y1D9 are fixed numbers and indicate failure types.*
4. *X1F9 is a fixed number and turns on when a reset signal is input.*
   When inputting the reset signal, be sure to insert it into the circuit as shown in the example of Fig. 2.

CAUTION

Since the printed icrcuit boards inside the K0J2 are mounted with the electronic parts which will be adversely affected by static electricity, handle the printed circuit boards as described below when they are handled directly.

(1) Ground human body and work bench.

(2) Do not touch directly the conductive area of printed circuit boards and the electrical parts.

MEMO

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