

User's Manual

LG Programmable Logic Controller

MASTER-K K7F – AT4A
K4F – AT3A

LG Industrial Systems

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SAFETY PRECAUTIONS

Be sure to read carefully the safety precautions given in data sheet and user's manual before operating the module and follow them.

The precautions explained here only apply to the K7F-AT4A and K4F-AT3A.

For safety precautions on the PLC system, see the MK200S/300S/1000S User's Manuals.

A precaution is given with a hazard alert triangular symbol to call your attention, and precautions are represented as follows according to the degree of hazard.

 WARNING	⇒	If not provided with proper prevention, it can cause death or fatal injury or considerable loss of property.
 CAUTION	⇒	If not properly observed, it can cause a hazard situation to result in severe or slight injury or a loss of property.

However, a precaution followed with  **CAUTION** can also result in serious conditions.

Both of two symbols indicate that an important content is mentioned, therefore, be sure to observe it.

Keep this manual handy for your quick reference in necessary.

Installation Precautions



CAUTION

- ▶ Operate the PLC in the environment conditions given in the general specifications.
- ▶ If operated in other environment not specified in the general specifications, it can cause an electric shock, a fire, malfunction or damage or degradation of the module
- ▶ Make sure the module fixing projections is inserted into the module fixing hole and fixed.
- ▶ Improper installation of the module can cause malfunction, disorder or falling.

Test Run and Maintenance Precautions



CAUTION

- ▶ Do not separate the module from the printed circuit board(PCB), or do not remodel the module.
They can cause disorder, malfunction, damage of the module or a fire.
When mounting or dismounting the module, perform them after the power has been turned off.
- ▶ Do not perform works while the power is applied, which can cause disorder or malfunction.

Waste Disposal Precautions



CAUTION

- ▶ When disposing the module, do it as an industrial waste.

Chapter 1. INTRODUCTION

These modules are combined and used with the CPU of the MK300S/1000S series. The K7F – AT4A is used in the K1000S series. The K4F – AT3A is used in the K300S series. Hereafter, they are commonly called Analog Timer Module (A/T module).

The A/T module performs On Delay operation for a setting time.

1.1 Features

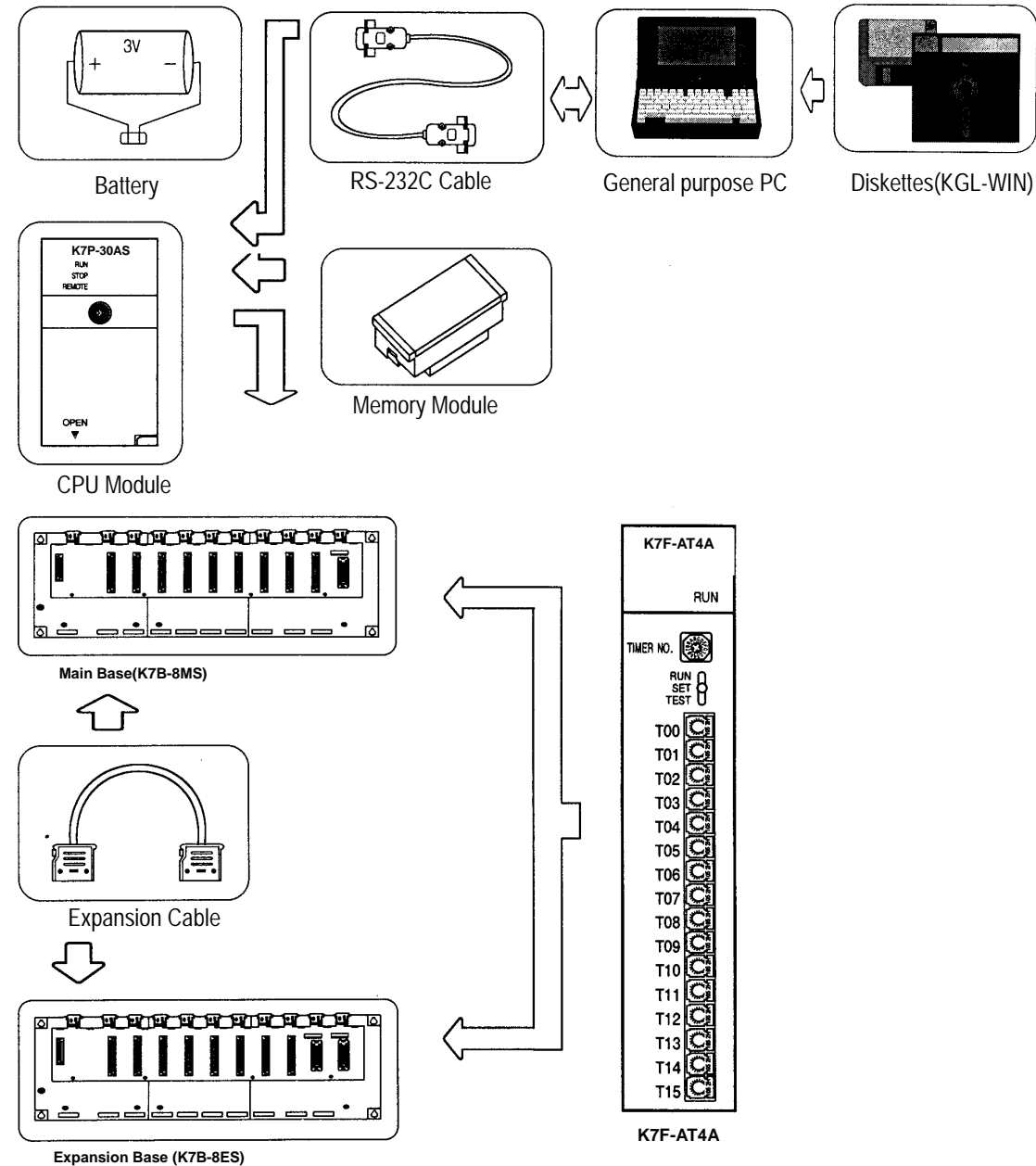
► The A/T module has the following features.

- 1) Up to 16-point (K7F – AT4A) and 8-point (K4F – AT3A) analog timers are applicable.
- 2) The range of setting time is very wide. (0.1 to 600 sec)
- 3) Time adjustment is easy.
- 4) A LED is used to indicate the timer operation status.
- 5) The backup function for setting time is available.

Chapter 2. SYSTEM CONFIGURATION

2.1 Example of System Configuration

The following shows the system configuration of the MK1000S series where the A/T module is mounted.



Chapter 3. SPECIFICATIONS

3.1 General Specifications

Table 2.1 shows general specifications of the GLOFA GM/GK series.

No	Items	Specifications						Standard	
1	Operating ambient temperature	0 ~ 55℃							
2	Storage ambient temperature	-25 ~ 70℃							
3	Operating ambient humidity	5 ~ 95%RH, non-condensing							
4	Storage ambient humidity	5 ~ 95%RH, non-condensing							
5	Vibration	Occasional vibration						IEC 1131-2	
		Frequency		Acceleration		Amplitude			Sweep count
		10≤f∠ 57 Hz		-		0.075 mm			10 times in each direction for X, Y, Z
		57 ≤f≤ 150 Hz		9.8 m/s² {1G}		-			
		Continuous vibration							
		Frequency		Acceleration		Amplitude			
		10≤f∠ 57 Hz		-		0.035 mm			
		57≤f≤ 150 Hz		4.9 m/s² {0.5G}		-			
6	Shocks	*Maximum shock acceleration: 147 m/s² {15G} *Duration time :11 ms *Pulse wave: half sine wave pulse(3 times in each of X, Y and Z directions)						IEC 1131-2	
7	Noise immunity	Square wave impulse noise		± 1,500 V					
		Electrostatic discharge		Voltage :4 kV(contact discharge)				IEC 1131-2 IEC 801-2	
		Radiated electromagnetic field		27 ~ 500 MHz, 10 V/m				IEC 1131-2 IEC 801-3	
		Fast transient burst noise		Severity Level	All power modules	Digital I/Os (Ue ≥ 24 V)	Digital I/Os (Ue < 24 V) Analog I/Os communication I/Os	IEC 1131-2 IEC 801-4	
				Voltage	2 kV	1 kV	0.25 kV		
8	Operating atmosphere	Free from corrosive gases and excessive dust							
9	Altitude for use	Up to 2,000m							
10	Pollution degree	2 or lower							
11	Cooling method	Self-cooling							

[Table 2.1] General specifications

REMARK

- 1) IEC(International Electrotechnical Commission)
: The international civilian organization which produces standards for electrical and electronics industry.
- 2) Pollution degree
: It indicates a standard of operating ambient pollution level.
The pollution degree 2 means the condition in which normally, only non-conductive pollution occurs.
Occasionally, however, a temporary conductivity caused by condensation shall be expected.

3.2 Performance Specifications

Table 3.2 shows the performance specifications of the A/T module.

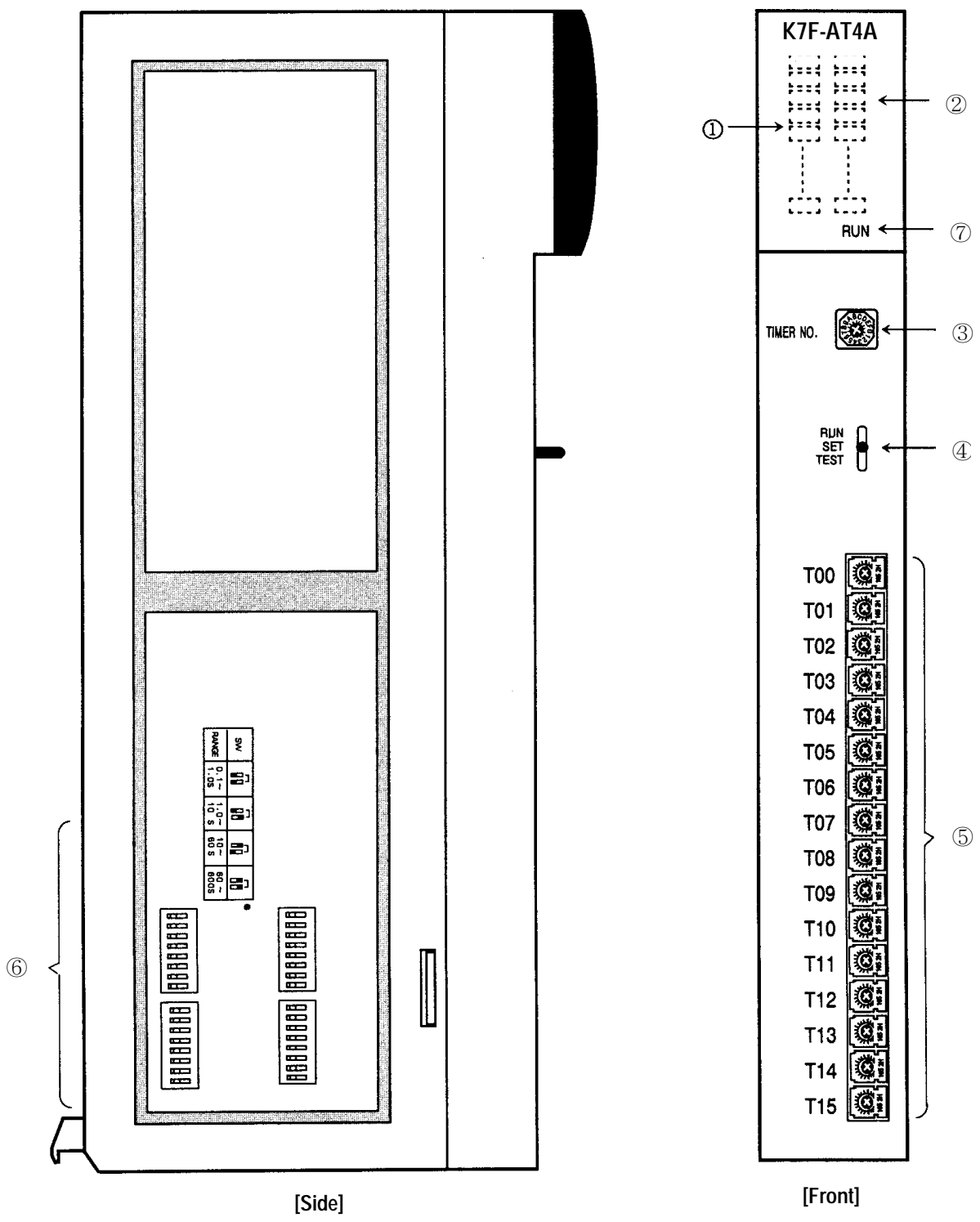
Items	Specifications	
	K7F – AT4A	K4F – AT3A
Timer point	16 points	8 points
Timer setting value range	0.1 to 1.0 sec 1 to 10 sec 10 to 60 sec 60 to 600 sec Setting can be done for each individual point	
Backup Method	For backup, set the operation mode selection switch to the TEST side.	
Setting Method	Setting by the adjustment volume.	
Timer Accuracy	$\pm 2.0\%$ (For maximum value)	
Operating Indicator	Timer Operation indication LED : 16 pts	Timer Operation indication LED : 8 pts
	Timer Contact indication LED : 16 pts	Timer Contact indication LED : 8 pts
Current consumption	0.3 A (5 VDC)	0.2 A (5VDC)
Weight	390 g	200 g

[Table 3.3] Performance specifications

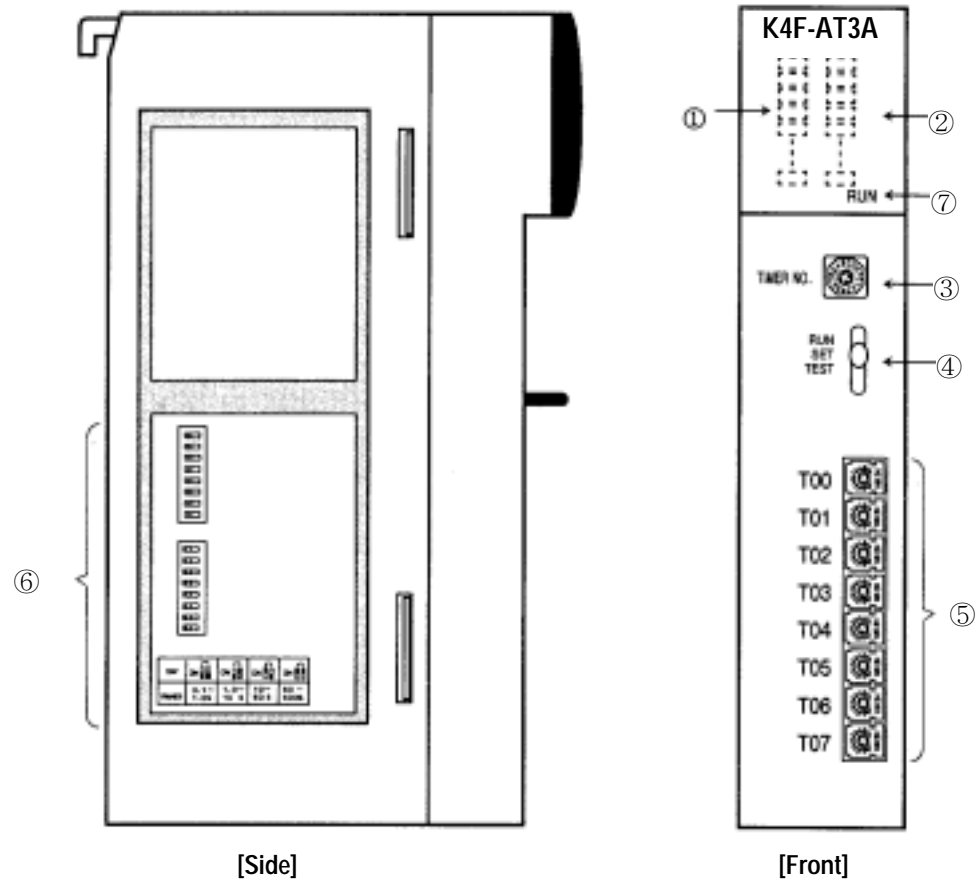
3.3 Names of Parts and Functions

The following gives the names of parts of the A/T module.

3.3.1 K7F – AT4A



3.3.2 K4F – AT3A



3.3.3 Names of Parts and Functions

The following gives names and function of parts of the A/T module.

No.	Name	Descriptions			
①	Timer contact indication LED	Indicates the On/Off state of the contact of Analog timers (T00 to T15) (On state : turn on, Off state : turn off)			
		LED	Contents	LED	Contents
		00	Contact of the Analog Timer T00	08	Contact of the Analog Timer T08
		01	Contact of the Analog Timer T01	09	Contact of the Analog Timer T09
		02	Contact of the Analog Timer T02	10	Contact of the Analog Timer T10
		03	Contact of the Analog Timer T03	11	Contact of the Analog Timer T11
		04	Contact of the Analog Timer T04	12	Contact of the Analog Timer T12
		05	Contact of the Analog Timer T05	13	Contact of the Analog Timer T13
		06	Contact of the Analog Timer T06	14	Contact of the Analog Timer T14
		07	Contact of the Analog Timer T07	15	Contact of the Analog Timer T15
②	Timer operation indication LED	Indicates the On/Off state of the contact of Analog timers (T00 to T15) (On state : turn on, Off state : turn off)			
		LED	Contents	LED	Contents
		16	Coil of the Analog Timer T00	24	Coil of the Analog Timer T08
		17	Coil of the Analog Timer T01	25	Coil of the Analog Timer T09
		18	Coil of the Analog Timer T02	26	Coil of the Analog Timer T10
		19	Coil of the Analog Timer T03	27	Coil of the Analog Timer T11
		20	Coil of the Analog Timer T04	28	Coil of the Analog Timer T12
		21	Coil of the Analog Timer T05	29	Coil of the Analog Timer T13
		22	Coil of the Analog Timer T06	30	Coil of the Analog Timer T14
		23	Coil of the Analog Timer T07	31	Coil of the Analog Timer T15

No.	Name	Descriptions			
③	Timer number selection switch	Used to select an analog timer (T00 to T15) whose time will be adjusted.			
		Timer No.	Selected Timer	Timer No.	Selected Timer
		0	T00	8	T08
		1	T01	9	T09
		2	T02	A	T10
		3	T03	B	T11
		4	T04	C	T12
		5	T05	D	T13
		6	T06	E	T14
		7	T07	F	T15
④	Operation mode selection switch	Used to adjust and backup the timer value, check the adjusted value and select the operation mode for each timer. . RUN :Position for normal operation . SET :Position for adjustment of the timer value of the timer selected by③. . TEST : Position for manual check and backup of the adjusted timer value.			
⑤	Adjustment Volume	Used to adjust the timer value of an analog timer.			
⑥	Setting range selection switch	Used to select the setting range for each analog timer.			
⑦	RUN LED	Indicates the operation status of the A/T module. • On : Normal operation • Off : 5 VDC line disconnection or A/T module defect.			

REMARK

Only T00 to T07 are available in the K4F – AT3A. T08 to T15 are not processed.

3.4 Setting Procedure for Each Function

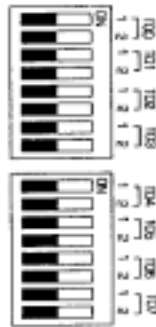
3.4.1 Setting the Setting Range Selection Switch

1) Setting Range Selection Switch

(1) K7F – AT4A



(2) K4F – AT3A



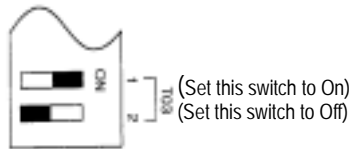
2) Setting Range Selection

Set the time range for each analog timer (T00 to T15) by the setting range selection switch

Time range Switch name	Time range			
	0.1 to 1.0 sec	1 to 10 sec	10 to 60 sec	60 to 600 sec
Txx 1	Off	On	Off	On
Txx 2	Off	Off	On	On

xx : Means the number of an analog timer (00 to 15)

[Example] When setting the time range of the analog timer T03 to “1 to 10 sec”

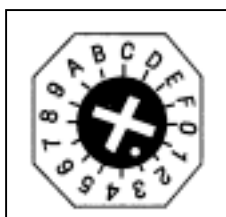


3) Factory Setting is “0.1 to 1.0 sec” for All Analog Timers.

3.4.2 Adjusting the Volume

- 1) Apply the power after the CPU module and the A/T module are set to the following conditions.
 - . Set the key switch of the CPU module to 'STOP'.
 - . Set the operation mode selection switch of the A/T module to 'SET'.
- 2) Select the numbers of the analog timers (T00 to T15) whose timer time will be adjusted by the timer number selection switch.

[Example] When selecting the analog timer T03

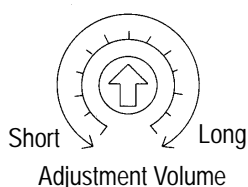


Set the timer number selection switch to 3

REMARK

If set the timer number selection switch of the K4F – AT3A to '8 to F', nothing will be processed.

- 3) Set the adjustment volume to the timer time, which will be used as a goal, within the timer time range set in the selection 3.4.1.



- 4) Set the operation mode selection switch to "TEST" and check the time from turning-on of the timer operation indication LED to turn-on of the timer contact indication LED.
- 5) After checking the on time of the timer contact indication LED, set the operation mode selection switch to 'SET'.
- 6) To micro-adjust the timer time to the goal time, repeat 3) to 5).
- 7) Set the timer time for each analog timer as the procedure shown by 2) to 6).
- 8) After every timer time for every analog timer has been set, Set the operation mode selection switch to 'RUN' and execute the user program.
- 9) To backup the timer time set, set the operation mode selection switch to 'TEST'. Then, the setting time will be stored to the memory.

REMARK

If an analog timer has been adjusted during the RUN state of the CPU module, the analog timer starts its operation by the prior one of the start signals by the operation mode selection switch of the A/T module and by the user program.

Chapter 4. PROGRAMMING

4.1 I/O Signals

The followings explain the I/O signals for the A/T module used in the MK series.

The K7F-AT4A occupies 32 I/O points and the K4F-AT3A occupies 16 I/O points.

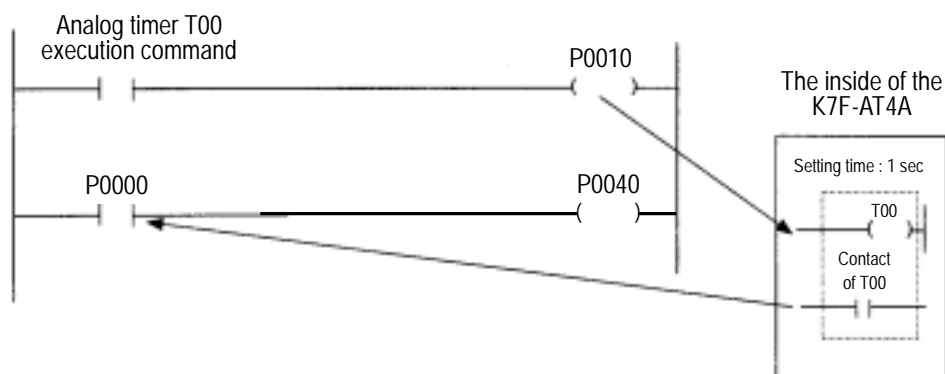
4.2.1 K7F-AT4A (N means the I/O Word No. of the A/T module)

Input Signal	Contents	Output Signal	Contents
P(N)0	Contact of the analog timer T00	P(N+1)0	Coil of the analog timer T00
P(N)1	Contact of the analog timer T01	P(N+1)1	Coil of the analog timer T01
P(N)2	Contact of the analog timer T02	P(N+1)2	Coil of the analog timer T02
P(N)3	Contact of the analog timer T03	P(N+1)3	Coil of the analog timer T03
P(N)4	Contact of the analog timer T04	P(N+1)4	Coil of the analog timer T04
P(N)5	Contact of the analog timer T05	P(N+1)5	Coil of the analog timer T05
P(N)6	Contact of the analog timer T06	P(N+1)6	Coil of the analog timer T06
P(N)7	Contact of the analog timer T07	P(N+1)7	Coil of the analog timer T07
P(N)8	Contact of the analog timer T08	P(N+1)8	Coil of the analog timer T08
P(N)9	Contact of the analog timer T09	P(N+1)9	Coil of the analog timer T09
P(N)A	Contact of the analog timer T10	P(N+1)A	Coil of the analog timer T10
P(N)B	Contact of the analog timer T11	P(N+1)B	Coil of the analog timer T11
P(N)C	Contact of the analog timer T12	P(N+1)C	Coil of the analog timer T12
P(N)D	Contact of the analog timer T13	P(N+1)D	Coil of the analog timer T13
P(N)E	Contact of the analog timer T14	P(N+1)E	Coil of the analog timer T14
P(N)F	Contact of the analog timer T15	P(N+1)F	Coil of the analog timer T15

4.2.2 K4F-AT3A (N means the I/O Word No. of the A/T module)

Input Signal	Contents	Output Signal	Contents
P(N)0	Contact of the analog timer T00	P(N)8	Coil of the analog timer T00
P(N)1	Contact of the analog timer T01	P(N)9	Coil of the analog timer T01
P(N)2	Contact of the analog timer T02	P(N)A	Coil of the analog timer T02
P(N)3	Contact of the analog timer T03	P(N)B	Coil of the analog timer T03
P(N)4	Contact of the analog timer T04	P(N)C	Coil of the analog timer T04
P(N)5	Contact of the analog timer T05	P(N)D	Coil of the analog timer T05
P(N)6	Contact of the analog timer T06	P(N)E	Coil of the analog timer T06
P(N)7	Contact of the analog timer T07	P(N)F	Coil of the analog timer T07

4.2.3 Example for Executing the Analog Timer T00 by Program. (The A/T Module is mounted onto the Slot 0)



- 1) If the output P0010 is turned On, the coil of the analog timer T00 turns On and it starts its operation.
- 2) After one second from the turning-on of the output P0010, the contact of the analog timer T00 will turns On and the input contact turns On.

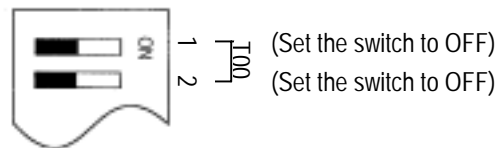
4.3 Program for Comparing and Outputting the Setting Times of Analog Timers.

4.3.1 System Configuration

Slot 0		Slot 1	
K4S-122S	K4P-15AS	K4F-AT3A	K4Y-203S

4.3.2 Initial Settings

- 1) Time setting range : 0.1 to 1.0 sec
- 2) Used timer : T00

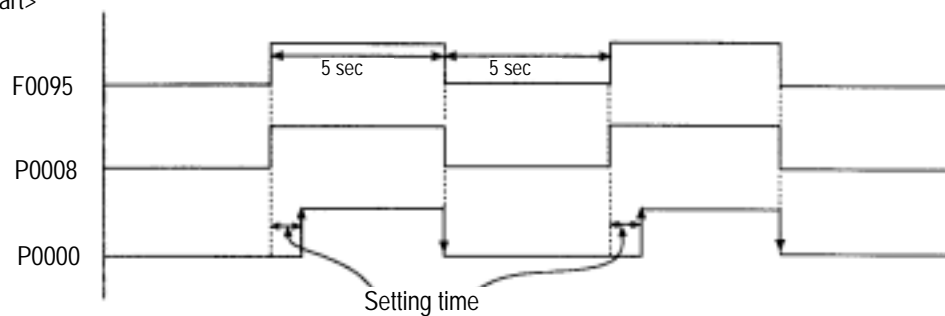


4.3.3 Program Description

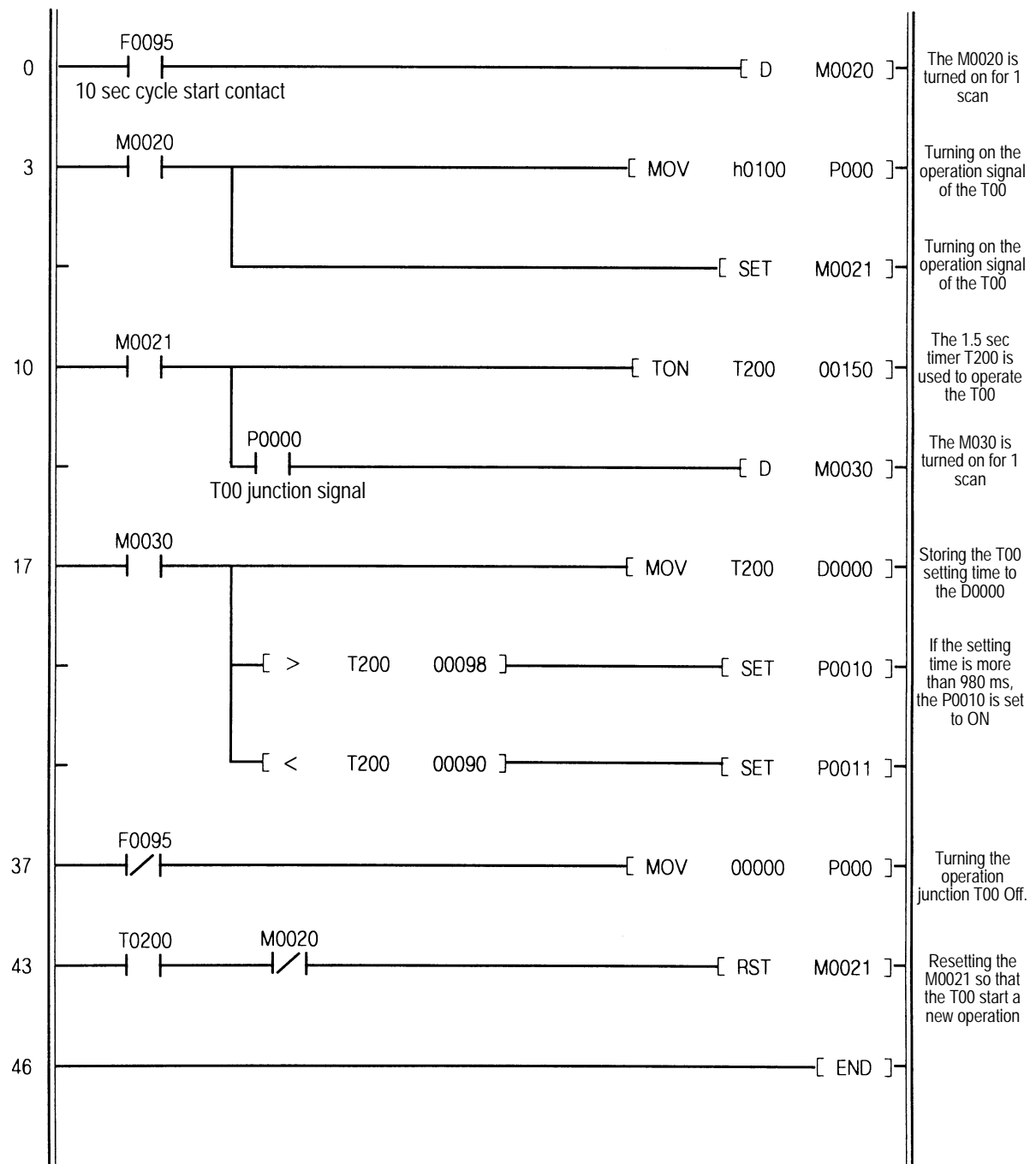
The setting times can be adjusted by the adjustment volume of the A/T module without changes of the program even in the RUN state of the CPU Module.

- (1) The coil of the timer T00 turns off and on with 10 sec cycle. (P0008)
- (2) When the F0095 turns on, the CPU Module timer T200 starts its operation. When the signal of contact P0000 turns on after setting time, the current time of the T200 is stored to the D0000.
- (3) If the T200 is more than 980 msec the P0010 is set to On. If less, the P0011 is set to On.
- (4) If the T200 is set to On, the M0021 will be reset in order that the T200 starts a new operation.

<Timing Chart>



4.3.4 Program



Chapter 5. INSTALLATION

5.1 Installation

5.1.1 Installation Ambience

This module has high reliability regardless of its installation ambience. But be sure to check the following for system in higher reliability and stability.

1) Ambience Requirements

Avoid installing this module in locations, which are subjected or exposed to:

- Water leakage and dust a large amount of dust, powder and other conductive power, oil mist, salt, of organic solvent exists.
- Mechanical vibrations of impacts are transmitted directly to the module body.
- Direct sunlight.
- Dew condensation due to sudden temperature change.
- High or low temperatures (outside the range of 0-55 °C)

2) Installing and Wiring

- During wiring or other work, do not allow any wire scraps to enter into it.
- Install it on locations that are convenient for operation.
- Make sure that it is not located near high voltage equipment on the same panel.
- Make sure that the distance from the walls of duct and external equipment be 50 mm or more.
- Be sure to be grounded to locations that have good noise immunity.

5.1.2 Handling Precautions

From unpacking to installation, be sure to check the following:

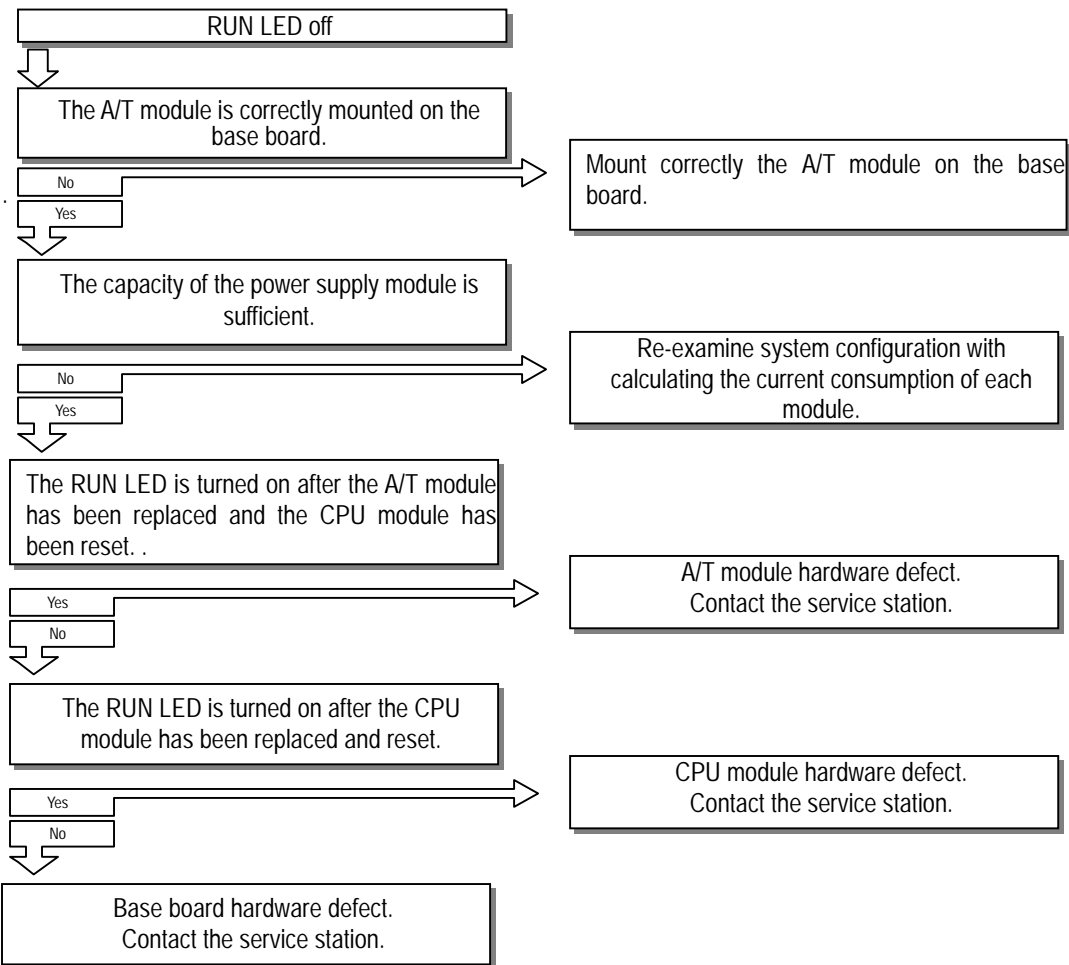
- 1) Do not drop it off, and make sure that strong impacts should not be applied.
- 2) Do not dismount printed circuit boards from the case. It can cause malfunctions.
- 3) During wiring, be sure to check any foreign matter like wire scraps should not enter into the upper side of the PLC, and in the event that foreign matter entered into it, always eliminate it.

Chapter 6. TROUBLESHOOTING

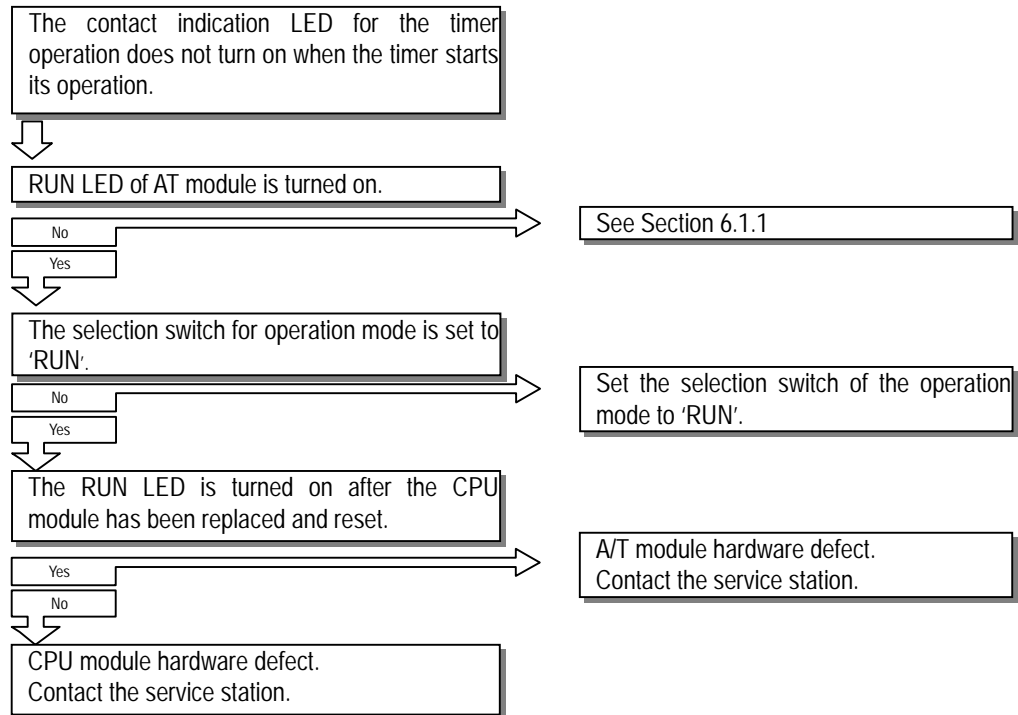
The followings explain errors and corrective action when operating the A/T module.
For the problems relating to the CPU module, refer to the CPU module User's Manual.

6.1 Troubleshooting Procedure

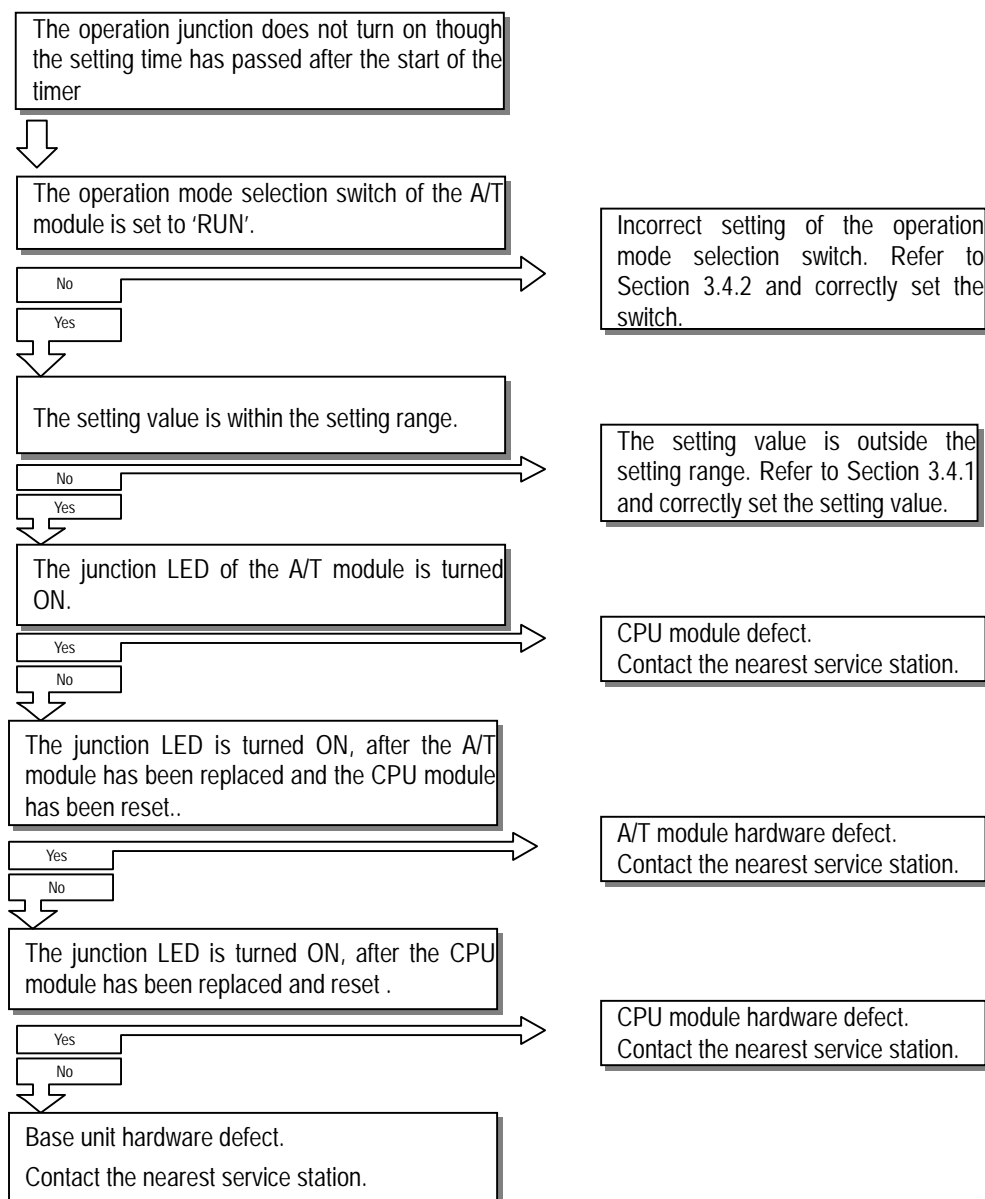
6.1.1 RUN LED off



6.1.2 The Contact Indication LED for the Timer Operation does not Turn On when the Timer Starts its Operation.



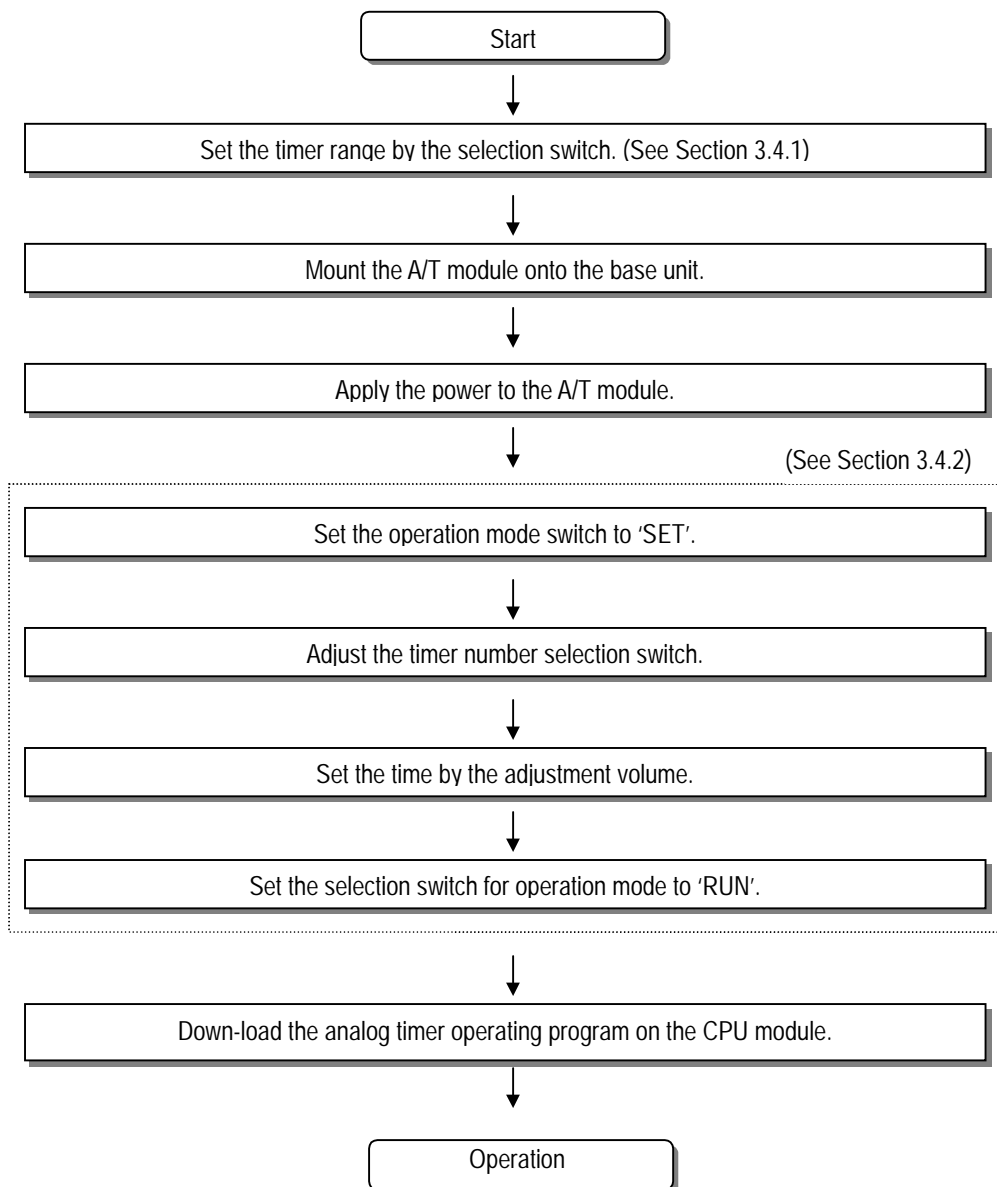
6.1.3 The Operation Junction does not Turn on Though the Setting Time has Passed after the Start of the Timer



Chapter 7. TEST RUN

7.1 Run Procedure

The following shows the run procedure for the A/T module.

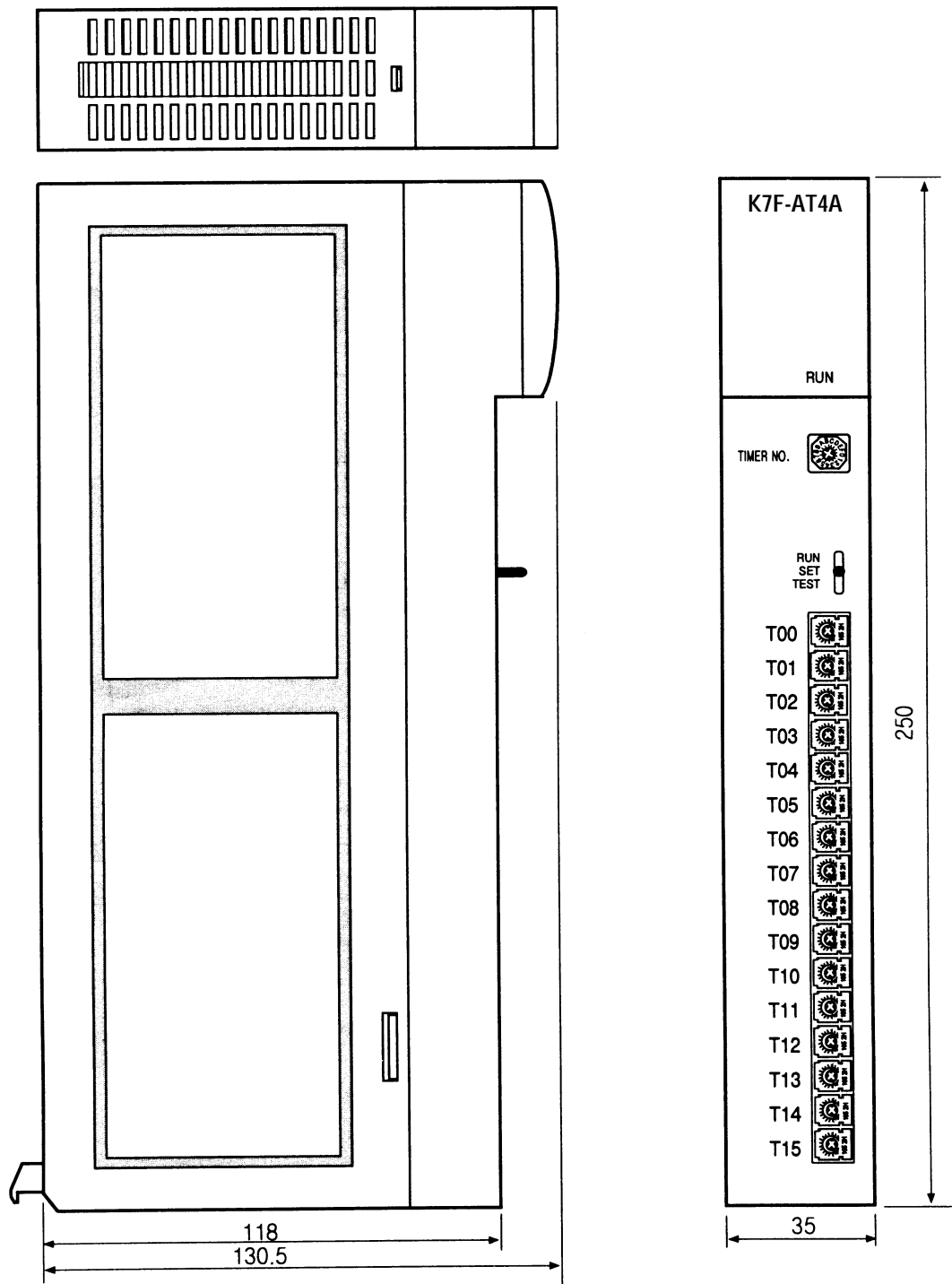


Chapter 8. DIMENSIONS

8.1 Dimensions

8.1.1 K7F-AT4A

Unit : mm



8.1.2 K4F-AT3A

