



L-CAT-EVO4330
L-CAT-EVO4430
L-CAT-EVO4540

Operation and Maintenance Manual

Thank you for purchasing the L-CAT-EVO.
Read these instructions thoroughly for proper use of this machine.
Make sure to read "Safety Notes" before you use machine. This information protects you
from possible dangers during use.

Apollo Seiko Ltd.

Rev. VER-3.39

Safety Notes

- This manual includes the important information to use machine safely. This also includes useful information to prevent avoiding injury or damaging property. Please read this manual carefully prior to connecting or operating the L-CAT-EVO.
- Keep this manual nearby the machine all the time.

Supply only specified voltage

- Do not connect to a power supply greater than the specified voltage. If not, electrical shock and /or damage to the unit may occur.
- Make sure that the electrical outlet is properly grounded. If the outlet is not properly grounded, electrical shock and/or damage to the unit may occur.

Working ambient temperature and relative humidity

- This machine has been designed to use between 0°C-40°C、 10%-90%. Do not use this machine under the condition exceeding here-in.

Handle with care

- This machine is designed to use solder feeder and heating iron for soldering. If you touch a heated soldering iron, it will burn yourself. So, make sure the iron is cool down before you are touching it for replacing the iron cartridge.
- Please handle this machine with care. If you drop or make a big impact / vibration, it may cause malfunction.

If you do not use the machine for a long time

- Please turn off the power, remove the power cable and keep it in dry and cool place.

If you note malfunction on machine

- If the machine becomes a malfunction, turn off the power immediately and contact a dealer you purchased machine from.

Immunity from responsibility

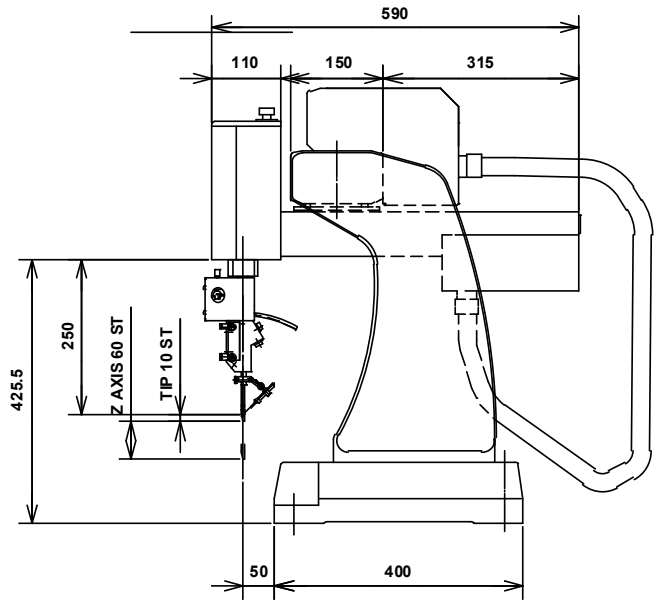
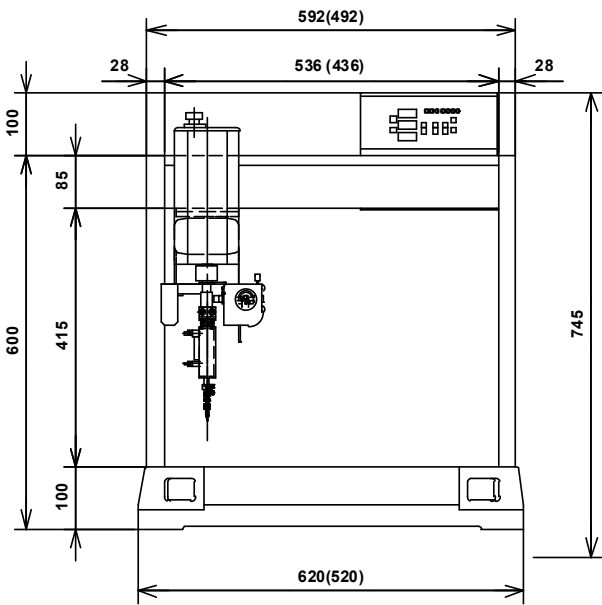
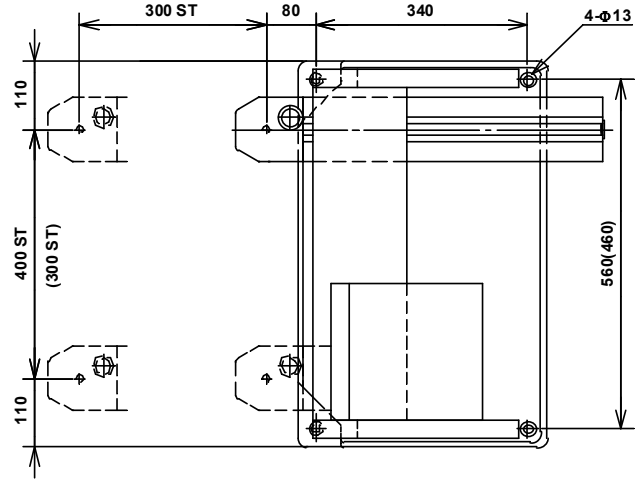
- We do take NO responsibility on a damage caused by misuse, mistake, accident, uses in abnormal condition or natural disaster such as an earthquake, a fire etc.
- We do take NO responsibility on contingency loss (Business loss、 Business stop) caused by machine stop.
- We do take NO responsibility on a loss caused by the operation not mentioning on this manual.
- We do take NO responsibility on a loss caused by a wrong connection with other equipment.
- If for any reason the internal circuitry is tampered with altered or repaired without written consent of Apollo Seiko, the warranty is null and void. The customer is allowed to make necessary tooling adjustment, replace solder iron tips and make any necessary adjustments to the temperature controller.

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1. L-CAT-EVO 4330/4430 Dimensions

**L-CAT-EVO
4330/4430**

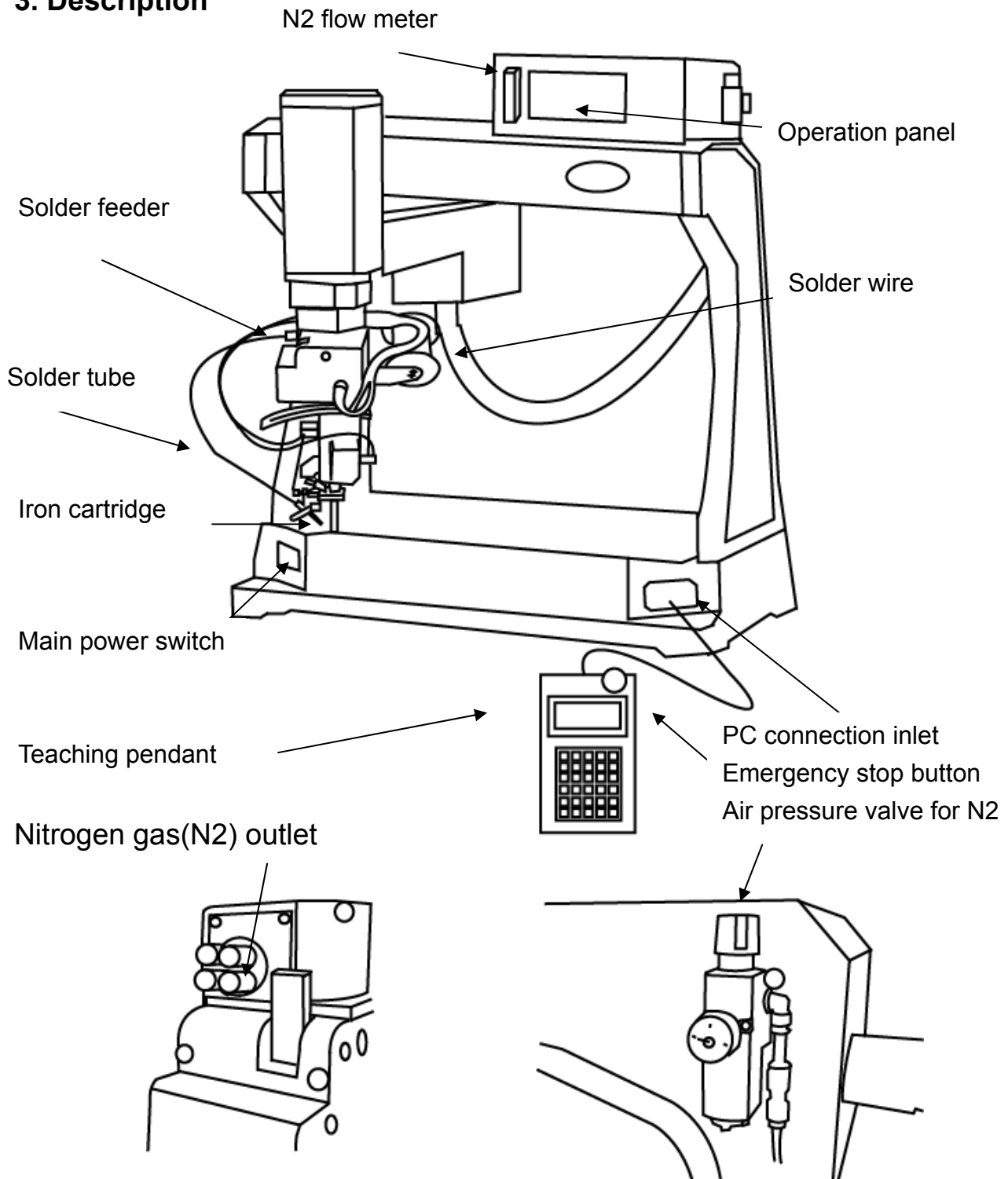


2. Summary of L-CAT-EVO

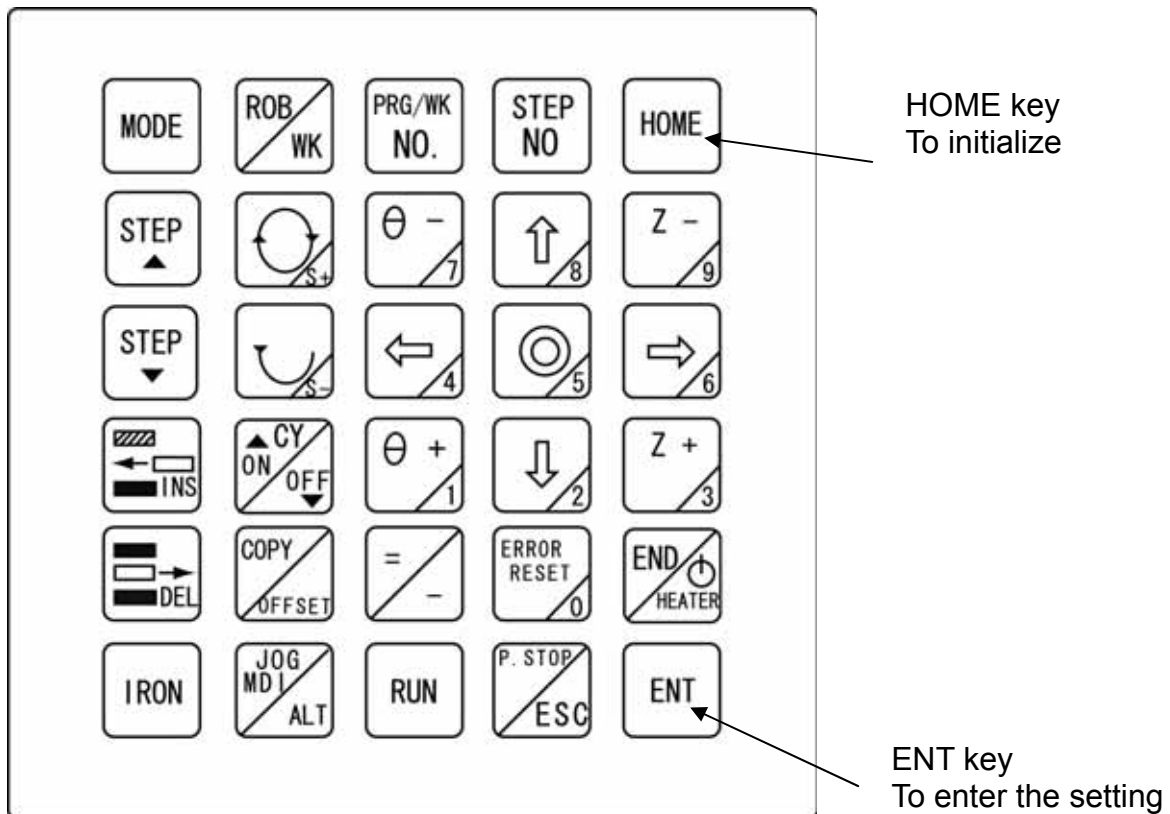
The L-CAT-EVO has evolved into a highly flexible and innovative selective soldering system. This EVO model incorporated of the unique features of the original L-CAT which includes both point and slide soldering, solder feed and temperature control as well as programming ease. A large selection of iron tip profile is available to address virtually all applications.

The high resolution rotary encoders are built-in for X, Y motor to ensure high accuracy.

3. Description



A) Teaching pendant



Color Explanation

- Yellow : Manual and jog axis movement
- Blue : To enter command or number.
- Red : Error reset
- Orange : Automatic operation, Mode selection
- White : Other

Robot mode – Keypad Explanation

Key Label Explanation



To "home" the robot for initialization.



To select any of the modes listed below.
 [AUTO] for running production with the teaching pendant connected.
 [PROG] for programming and editing solder points. S+,S- keys can be used.
 [STEP] for soldering each point one step including WK at a time.
 [MANU] to move the robots (x, y, z and theta axis). The setting temperature can be entered by using number key. Press ENT to confirm. Press "Heater" key to turn on the iron cartridge heater.



To select WK mode. The solder parameter can be programmed in the WK mode. Press this key to save a WK setting.



To select the desired program and WK number.



Scroll through the program forward one step at a time.



Scroll through the program backwards one step at a time.



To delete/erase programmed points. Press twice to delete.



To insert a point into a program. Press once to enter the mode and press



Scroll through the WK parameter forward one step at a time. Solder forward S+ key in ROB(PROG)(MANU) mode.



Scroll through the WK parameter backwards one step at a time. Solder reverse S- key in ROB(PROG)(MANU) mode.

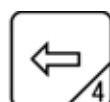


To select iron cylinder on or off (down and up).



To select copy, offset or delete function in ROB(AUTO) mode.

JOG keys to move the iron unit to the desired position and orientation.



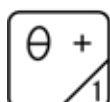
To move X axis. In MDI,WK mode, used to enter number.



To move Y axis. In MDI, WK mode, used to enter number.



To move Z axis. In MDI, WK mode, used to enter number.



To move theta axis. In MDI,WK mode, used to enter number.



The alternative key to select the axes speed high or low in the machine is ROB (PROG) mode. The selected Jog speed is display L or H at the end of Z axis coordinate.(Z:00.0L, Z:00.0H). In MDI, WK mode, used to enter number.



To reset an error. In MDI mode, used to enter number.



To extend/retract the iron tip. Pneumatic iron stroke is 10 mm.



Jog and MDI (manual data input) selection. In WK mode, WK command group can be altered. Refer to the page 12.



Partial Stop. This will stop the robot before executing the next step. Enter [RUN] to start again. ESC key to escape the selection backward.



To enter the command to do simultaneous WK step. Minus key to enter offset amount.



To start the robot in AUTO mode. To move axes to the selected step number.



To enter the END mark at the each end of PROG. Press the END key at the end of step after entering WK number.

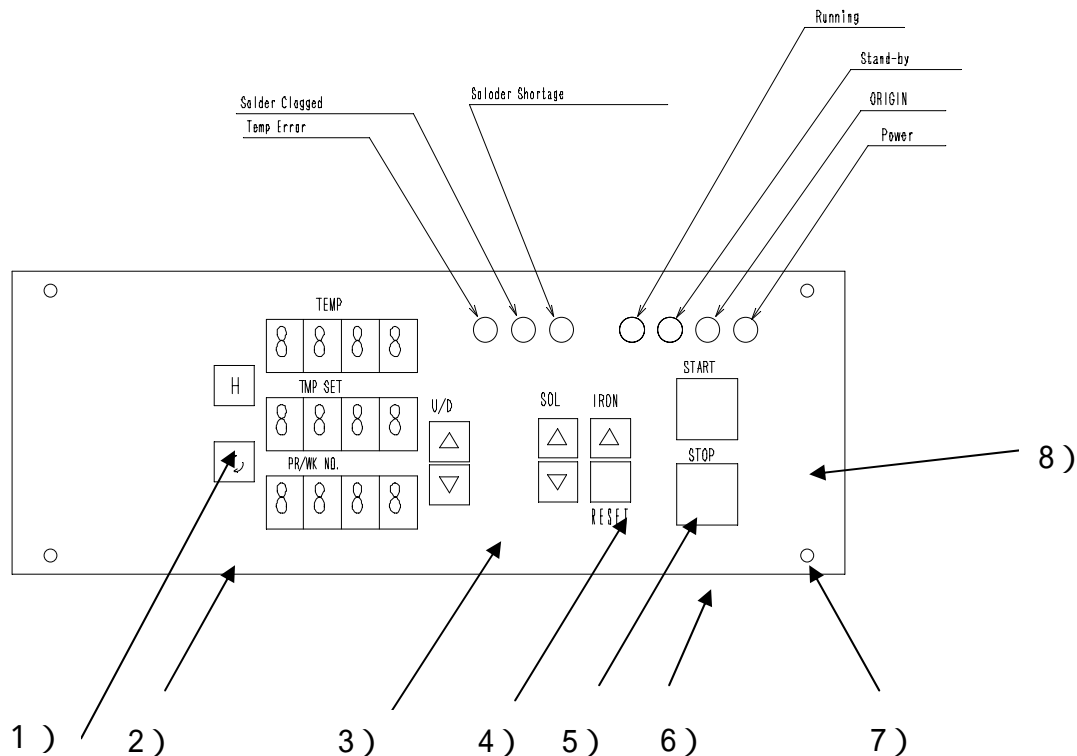


Enter key to register each setting.



To press these two keys together in the same time, the setting is saved into the memory immediately.

B) Operation panel



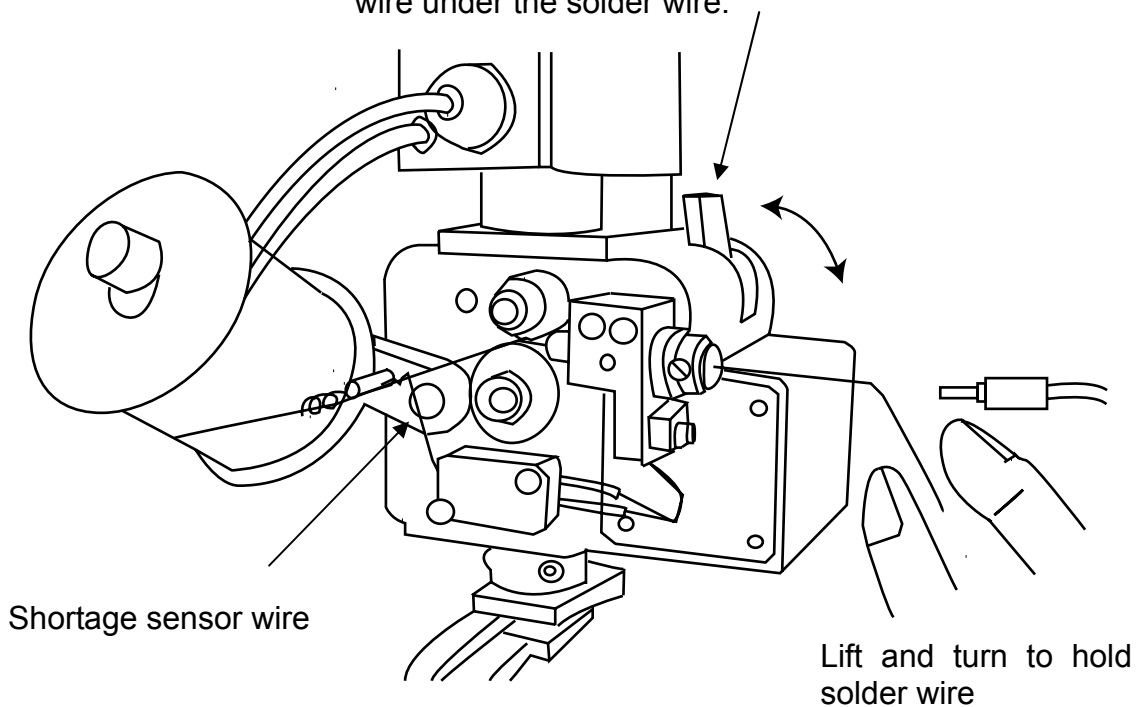
Please note that operation panel keys works only while the teaching pendant is disconnected.

- 1) Heater
The iron heater main switch. If the TEMP display is flashing, the heater is OFF. Press this key once to turn on the heater.
- 2) Program, temperature
The right hand side bottom dot indicate which one is selected on the display. To change the selection, press once.
- 3) Up down
The selected program or set temperature can be up-down by keys.
- 4) Solder wire
The solder wire motor forward or reverse turn when the key are pressed.
- 5) Iron
To extend/retract the iron tip. Pneumatic iron stroke is 10 mm.
- 6) Reset
If an error occurs, press Reset key once after repairing and press the start key to resume.
- 7) Stop
If an program is running in loop, press STOP key once.
- 8) Start
When the power in turned on, press once to move to the home position. Press again to start the programmed points automatically.

4. Preparation, Initial setting

4.1 How to set solder wire

Lift the lever and push through solder wire to the solder feeding motor. Make sure to set the shortage sensor wire under the solder wire.

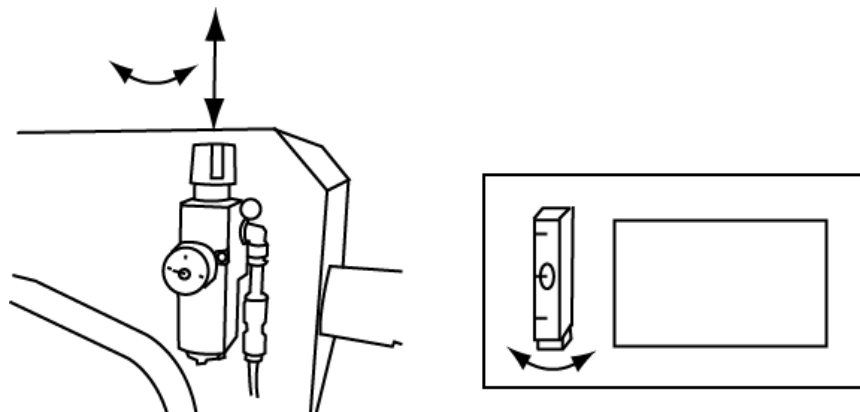


4.2. Preparation

- Iron cartridge
Make sure the iron cartridge is suitable for soldering application.
- Air supply
Supply an clean dry air (4-5kg/.cm2) from the back of the machine.
- Power cable
Plug in the power cable to the back of the machine.
- Teaching
Attach the teaching pendant plug to the machine while the power is OFF.
- N2 (nitrogen gas) pressure and flow adjust

Set the air pressure 5 (0.5MPa). To change the pressure, pull the knob up and turn. Then, push it down to lock.

N2 flow should be 0.5L/minutes. So, adjust the red flow ball at the middle.



4.3. Turning on the power

- a. Turn on the main switch of the front left hand side.
- b. Press the home key of the teaching pedant or Start key of the operation panel.
- c. To program the machine, Refer to **5. How to program**. To operate the programmed point, **6. Operation**. To do the initial setting.

4.4. Initial setting for user parameter

Initial setting for the machine can be entered.

[Teaching pendant screen]

Initial Screen

```

ROB
SET HOME POSITION
      PUSH [HOME] Key
  
```

- 1) Press HOME key on the teaching pendant or press the Start button on the operation panel.

```

ROB [AUTO]  PRO.No : 00
STP X : 000 . 00Y : 000 . 00
      Θ : 000 . 0  Z : 000 . 00 L
      S : 000 WK : 000  END
  
```

- 2) Press ROB/WK key to change the screen, then press Mode key once. Enter WK number 0 and press Enter, then the following screen appears.

```

[PROG] WK : 000  RDY
01 TIP      1
02 T. CAL  -10
  
```

The factory setting is entered before shipping out. They can be changed according to your requirements. Refer to the next page for the changing.

Using **STEP▲**, **STEP▼** keys to select the parameter.

The factory setting for WK 000 is :

WK step	WK Display	WK data	Setting range	Description
01	TIP	1	1,2	Tip type selection
02	T.CAL	-30	±100	Temperature calibration
03	T.ALH	10	0 - 200	Alarm high range
04	T.ALL	10	0 - 200	Alarm low range
05	FEED	ON	ON,OFF	Feeder checking on/off
06	HEAT	1	0, 1, 2, 3,4	Heater checking 0=No heater 1=Heater, 2=LD Laser mode 3=Heater and LD laser 4=Vision calibration
07	H.UD	ON	ON,OFF	Iron sensor checking on/off
08	AXIS	OFF	ON,OFF	An extra axis selection On/Off
09	X+Li	3000/4000	1 - 5000	X axis max moving, 300/400mm
10	Y+Li	3000	1 - 4000	Y axis max moving, 300 mm
11	Z+Li	600	1 - 600	Z axis max moving, 60 mm
12	R+Li	3400	1 - 3600	R(Theta) axis max moving, 350°
13	XMAX	750	0 - 999	X axis max speed (mm/s)
14	YMAX	750	0 - 999	Y axis max speed (mm/s)
15	ZMAX	150	70 - 199	Z axis max speed (mm/s)
16	RMAX	360	1 - 420	R(Theta) axis max speed (°/s)
17	Msol	50	1- 100	Manual solder feeding speed
18	Fcal	80	1- 200	Solder feeding amount calibration
19	EMG	ON	ON,OFF	Homing on/off after EMR. stop
20	T1PG	30	1 - 200	Tip 1 proportion gain
21	T1IG	100	1 - 200	Tip 1 integration time
22	T2PG	40	1 - 200	Tip 2 proportion gain
23	T2IG	100	1 - 200	Tip 2 integration time
24	PPST	OFF	ON,OFF	P. Stop selection On/Off for point WK
25	SPST	OFF	ON,OFF	P. Stop selection On/Off for slide WK
26	TINT	OFF	ON,OFF	Temperature Error interlock
27	I.OT	OFF	ON,OFF	AUX IN over timer On/Off
28	OT.V	300	1 – 999(100ms)	Input signal maximum wait time
29	Rchk	0	0.1.2.3.	R(Theta) axis homing selection 0:None 1: PROG 2: AUTO, 3: Both
30	RunM	OFF	ON,OFF	Continues mode On/Off

Using **STEP▲**, **STEP▼** keys to select the parameter. The selected step number blinks. Then, press ENTER for changing the setting.

Press number key or On/off to input and press Enter key to confirm.

After entering, press ROB/WK to get out the mode. The message “Writing ■■■■” appears on the bottom LCD screen and the mode become ROB [PROG].

Turn off the main switch and turn back on again since the WK 000 is memorized when only the main switch is turned on.

5. How to program

5.1 WK parameter entering

Refer to the attached WK command list and enter the WK operation.

Parallel WK	Command list	WK data	WK data parameter	Description
Group #1 parameter				
	S+	***.*	SP***	Solder feeding forward, feeding amount ***.mm, feeding speed ***mm/s
	S-	***.*	SP***	Solder feed reverse, feeding amount ***.mm, feeding speed ***mm/s
	CY1	ON	TM***	Iron down and waiting time***sec..
	CY1	OFF	TM***	Iron up and waiting time*** sec..
	TIM	***.*		Time delay *** sec.
	END			WK step end
	AIR	**.*		Air blow *** sec.
	ACK			When sliding, ACK(acknowledge) signal gives the machine the slide stating timing
	TEM	***		Temperature setting with a waiting. The command turns on heater power.
=				WK command to do the step in the same time
Group #2 parameter (Press the ALT key to change the parameter group. (#1-#2 & #2-#1))				
	OUT	*	TM***	External I/O output signal *** sec.
	IN	*		External I/O input signal waiting
	SET	*		Turn on output signal
	RST	*		Turn off output signal
	WST			Wait the start signal
	JMP			Jump to other program to run multi programs without stopping. (Max. 8 programs can be run continuously)
	TE2	***		Temperature setting without waiting "temperature alarm off".
	LDS	***		Start (turn off) LD with ***A (5-42A).
	LDR			Reset (turn off) the LD.

5.2 WK number entering

Refer to the attached Wk command and enter the WK operation.

Soldering WK number in ROB mode

The soldering WK number must be entered in three (3) digits after WK: XXX as follows:

No work (dummy point) ROB	---	000
Point solder	---	101 ~ 197
Wait time	---	198
Air blow point	---	199
Slide end point	---	200
Slide solder	---	201 ~ 299
Wait time	---	301 ~ 309
Output signal	---	401 ~ 407 (OUT 7)
Input signal waiting	---	501 ~ 505 (IN 5)

Contents of WK except 000 or 200 can be changed in WK(PORG) mode.

An example to enter WK 101 for point soldering

Parallel WK	Command list	WK data 1	WK data 2	Description
	S+	5.0	SP50.0	5.0mm, feeding speed 50mm/s
	S-	3.0	SP50.0	3.0mm, feeding speed 50mm/s
=	CY1	ON	TM0.5	Iron down and 0.5 sec time delay
	S+	10.0	SP10	10.0mm, feeding speed 10mm/s
	S-	3.0	SP50.0	3.0mm reverse feeding, Speed 50mm/s
	TIM	1.0		Heating time 1.0 sec.
	CY1	OFF	TM0.0	Iron up Wait time 0.0 sec.
	END			WK step end

An example to enter WK 201 for slide soldering

Parallel WK	Command list	WK data 1	WK data 2	Description
	S+	5.0	SP50.0	5.0mm, feeding speed 50mm/s
	S-	3.0	SP50.0	3.0mm, reverse speed 50mm/s
=	CY1	ON	TM0.5	Iron down and 0.5 sec time delay
=	ACK			ACK signal to slide start
	S+	20.0	SP5.0	20.0mm, feeding speed 5 mm/s
	S-	3.0	SP50.0	3.0mm reverse feeding, Speed 50mm/s
	TIM	0.5		Time delay 0.5 sec.
	CY1	OFF	TM0.0	Iron up
	END			WK step end

WK 198 for wait time

	TIM	1.0		1.0 sec wait time
	END			WK step end

WK 199 for air blow time

	AIR	0.5		0.5 sec. air blow time
	END			

5.3 Creating a program for point soldering

Step 01 : Getting started
Power on the robot (switch, left side) and press the HOME key to move the robot to the home position. And power on the temperature controller using the teaching pendant. Press MODE key to select MANU. Then press HEATER key to turn it on. When the heater is on, the top temperature display stops flashing.,

Step 02 : Selecting the programming mode
The teaching pendant should be in the ROB (robot) mode. Once inside the ROB mode, press MODE key until the display show [PROG].

Step 03 : Selecting the programming number
3a) Press the PROG.NO key. Select the desired program number by press the numeric keypad. Press ENT to accept this program.

The displayed should now red "ROB [PROG] PRO NO. XX" (XX being the program no. you selected). You will see this on the top line of the display.

The robot move the following step number sequence.

Step	001	Tip cleaning point
Step	002	Dummy evasion point
Step	003	Soldering point
Step	XXX	End
Step	000	Work waiting point (Step 000)

Step 04 : Programming the initial cleaning step and select Jog key speed
4a) At the HOME position, lower the iron unit into the cleaning station by at the proper position. JOG can be changed by pressing " " key. Z : 00.0L indicate the low speed and Z : 00.0H indicate high speed.

4a) At the HOME position, lower the iron unit into the cleaning station by at the proper position.

4b) Press the ENT key to teach this location.

4c) Select the travel speed desired for the iron unit to move from point point (1-750), 500 is a good starting speed). When complete, press the ENTER to accept.

4d) The cursor is now flashing in the "WK: " field. Enter WK no. 199 to teach cleaning. The robot reserve WK no 199 to teach an air blow cleaning. "WK" represents the work profile to be executed. Press ENTER to accept.

Enter block no. 198 to teach cleaning of sponge roller cleaner. The robot will hold at the cleaning point for 1.0 second. Your first point is now complete. The step number should now be 002 automatically.

Step 05 : Programming an "EMPTY or Dummy" Point When Necessary
 There is a time when you may need to program an empty point. This may be for component clearance or for any other reason. Normal, while programming a "Dummy" point, there will be no need for any soldering to take place.

5a) Raise the iron unit to the desired height to clear any potential obstruction. Press the ENT key once in position to teach this "Dummy" location.

5b) The cursor will now be flashing at the "S: _____". Enter a value from 001-750 for the desired a speed of iron travel (500 is a good starting speed).

5c) Use the directional keys to position the iron unit past and the above the obstruction.

Press ENT once in position to teach the second "Dummy" location.

Enter the desired speed "(S: _____) for iron travel speed.
 Press ENT to accept.

5d) Enter "000" for the WK No. "(WK:000) to allow for no soldering execution. Press ENT to accept.

5e) Follow the step 06 instructions for all of the remaining points to solder. Once complete, proceed to Step 09, completing and saving the program.

Step 06: Teaching a Point Soldering Location

6a) Use the directional keys to locate the iron unit at the first soldering location. Once in position, press the ENT key to teach this location.

6b) The cursor will now be flashing at the "S: ____". Enter a value from 01-750 for the desired speed of iron travel(500 is a good starting speed). Press ENT to accept.

6c) The cursor should be flashing at the "WK:____" field. Enter a value from 101 –199 to select point soldering WK number. Press ENT to accept.

Step 07 : Programming the Final or End Step of the Program

Once All solder points have been programmed, you must save the program.

7a) At the "WK:____" field of the last point soldering position press END key to save the program.
 DO NOT PRESS THE ENT KEY.

7c) The axes move to the step "000" and the "Writing ■■■■" message appears and the program has been saved. The display should show an "END" under the next Step No display.

Note: If the END step was programmed properly, you can press Mode key to save the program. When press MODE key, the "Writing ■■■" message appears and the program has been saved.

5.4. Slide soldering:

- Step 01-05 : Follow the page 13 and 14 for the preparation and register the cleaning point.
- Step 06 : Teaching the First Slide Soldering Location
- 6a) Use the directional keys to locate the iron unit at the first soldering location. Once in position, Press the ENT key to teaching this location.
- 6b) The cursor will now be flashing at the "S: _____" . Enter a value from 01-750 for the desired a speed of iron travel (500 is a good starting speed).
Press ENT to accept.
- 6c) The cursor should be flashing at the "WK: _____) field.
When slide soldering you must enter a value from 201 – 299 for sliding WK number.
- Step 07: Teaching the Second or Last Point of the Slide
- Note: The second point of the slide needs to be entered. Regardless of how many points are in the row, there will only be two points for the entire row. One start point and one end point.
- 7a) Use the X, Y, Z keys to position the iron unit approximately .050" - .100" past the last pin to be soldered. Be sure to program the slide so it finishes away from any components close to the pins. Press ENT to accept.
- 7b) The cursor will now be flashing at the "S:____" field. Set the speed at 004. This represents 4 mm/sec. The vast majority of slide soldering applications use 4 mm/sec., however, this can be altered if necessary. Press ENT to accept.
- 7c) The cursor should be flashing at the "WK:____" field. "200" should automatically appear in that field. The "200" represents that this is the last point of the slide. Press ENT to accept.
- Step 08: Programming the Remaining Slide Solder Points
Repeat steps 6 & 7 for all remain rows to slide solder.
Once complete, proceed to the step 9.
- Step 09 : Programming the Final or End Step of the Program
Once All solder points have been programmed, you must save the program in the same procedure of the previous page Step 07.

5.5. MDI mode

The teaching pendant should be in the ROB (PROG) mode . Once inside the ROB (PROG) mode, press MDI key. Then X, Y, Z and Theta coordinate flash. Enter the desired value one by one to change. Press ENTER 3 times. Press Mode key to confirm. "Writing ■■■■" , message appears and the program has been saved.

5.6. Copy function

Press "Copy" key in ROB (AUTO) until the copy display appears.

1	Copy Step
2	Copy Wk
3	Copy Prog.
Select number ___	

Key in "1" to copy step, "2" " to copy WK, "3" " to copy program. Press ENT to confirm.

Copy step first display

Copy Step
Start : 00__ End : 00__
Paste Top : ___
Copy Count : ___ Next >

Input the desired first and last step number to copy. Then enter the top step number to paste. Key in desired copy number and press ENT. Then press ENT at Next >, the second display appears.

Copy step second display

Offset
X : 000 . 00Y : 000 . 00
Θ : 000.0 Z : 00 . 00

Enter X , Y、 Θ 、Z offset amount. If the copy number is more than (2) two, the offser amout is increased multipully.

Press ENT key to confirm and "Copying ■■■■ " message appears and the program has been saved.

Copy WK display

Copy Wk
Copy WK No : ___
Paste WK No : ___

Input desired copy and paste Wk number to copy. Press ENT key to confirm and "Copying ■■■■ " message appears and the program has been saved.

Copy program display

Copy Prog,. Copy Prog, No : __ Paste Prog,No : __

Input desired copy and paste program number to execute. Press ENT key to confirm and "Copying ■■■■ " message appears and the program has been saved.

5.7. Offset function

Press "Offset" key in ROB (AUTO) mode until the offset display appears.

1 Offset Step 2 Offset Prog. 3 Offset All Prog. Select number __

Enter "1" to offset step, "2" to offset program "3" to offset all program. Press ENT to confirm.

Offset step first display

Offset Step Start : 00__ End : 00__ Next >
--

Offset step second display

Offset X : 000 . 00Y : 000 . 00 Θ : 000.0 Z : 00 . 00

Press ENT key to confirm and "Writing ■■■■ " message appears and the program has been saved.

Offset program first display

Offset Prog. Program No __ Next >

Offset program second display

Offset X : 000 . 00Y : 000 . 00 Θ : 000.0 Z : 00 . 00

Press ENT key to confirm and "Writing ■■■■ " message appears and the program has been saved.

Offset All program first display

```

Offset All Prog.
All Program No  0-99

Next >

```

Offset All program second display

```

Offset
X : 000 . 00Y : 000 . 00
Θ : 000.0  Z : 00 . 00

```

Press ENT key to confirm and “Writing ■■■■ “ message appears and the program has been saved.

Note : Offset All program function take a long time to save and write. So, do not use unless absolutely necessary.

5.8. Delete function

Press “Offset” key in ROB(AUTO) mode until the delete display appears.

```

1  Delete Prog
2  Delete WK

Select number  ___

```

Enter “1” to delete program、 ”2” ” to WK. Press ENT to confirm.

Delete program display

```

Delete program
From Program No. 00__
To   Program No. 01__

```

Enter program number and press ENT to confirm the deleting.

Delete WK display

```

Delete WK
From WK   No. 00__
To   WK   No. 01__

```

Enter WK number and press ENT to confirm the deleting.

6. Operation

[Teaching pendant screen]

Initial Screen

```

ROB
SET HOME POSITION
PUSH [HOME] Key
  
```



- 1) Press HOME key on the teaching pendant or press the Start button on the operation panel.



```

ROB [AUTO]   PRO .No : 00
STP  X : 000 . 00 Y : 000 . 00
001  Θ : 000 . 0  Z : 00 . 0
      S : 000 WK : 000  END
  
```

- 2) Press HOME key on the teaching pendant or press the Start button on the operation panel.
- 3) Set a soldering temperature and press "Heater" key on the teaching pendant to turn on the heater. Make sure the top temperature display stops flashing.
- 3) Select the desired program number.
- 4) Set the solder wire refer to the page 9.
- 5) Check the error and stand-by LED. If any error, remove the error causing and press "Error Reset" key. Make sure the error LED is turned off and the stand-by LED is turned on.
- 6) Press the "RUN" key to start.

NOTE: The START key on operation panel can be used after plug off the teaching pendant.

7. PC software

* **Please prepare a USB communication cable with AB type connector.**

7.1 How to install the PC software for L-CAT-EVO

a) Insert the CD ROM to PC. Then, wait until the following message box will appear automatically.

b) Windows XP

Click the "Windows XP" button.

c) Windows 98

Click the "Windows 98" button.

d) Install Template to My Documents folder

Click the "Copy Template file" .

The template is copied to the My Documents holder.

e) Install USB driver

Click the "Install USB file".

f) To close, click the last bottom "X" button.



g) Set up the USB driver file.

Open hard disc "C" and open as follows:

Cygnal → CP2101 → WIN → Setup.exe

Double click the "Setup.exe" to install the USB driver.

7.2 Preparation and how to use

a) Connect L-CAT-Evo and PC using the USB AB cable.

b) Check which COM port have been used to communicate in the Device manager under the SYSTEM, CONTROL PANEL.

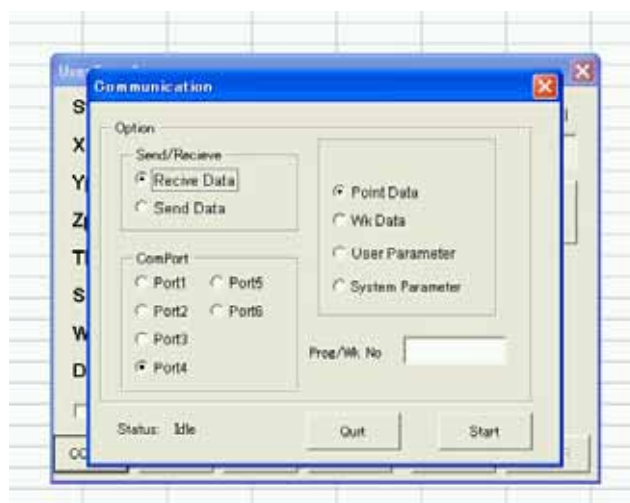
c) Click the Enable Macro → System code → Select the Model No. → and press ESC key to start the software. Press Newbook to open the template.

1) Open the EXCEL file, New_lcatevo.xls support software in program file.

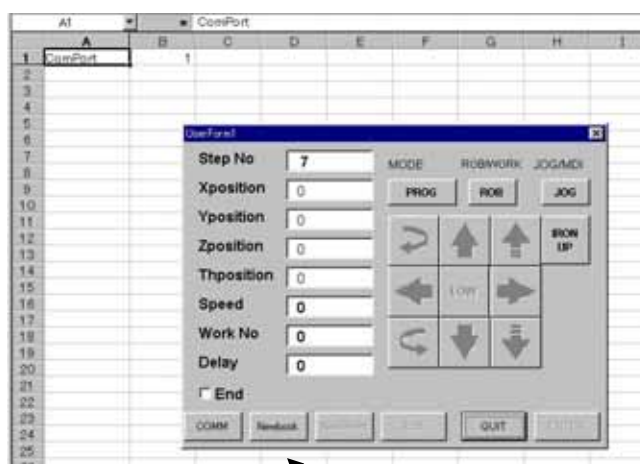


2) Enter the pass word "**5555**" and select the model, then press OK.

- 3) When the EXCEL file is opened, check which COM port is opened. If any difference, open COMM and open the communication window. Select the port 1-6 and save the change in New_lcatevo.xls.



- 4) Press Newbook to open template. Press COMM key to communicate the machine and the PC.



← New book key

Note : If any communication error occur, close the window and re-start "New_lcatevo.xls" again.

8.Input/Output

Pin Assignment

25	24	23	22	21	5	4	3	2	1
50	49	48	47	46	30	29	28	27	26

Cable side DDK 57-30500

PIN	PIN No.		PIN
N/C	1	26	N/C
Prog Sel 1	2	27	0V _(GND)
Prog Sel 2	3	28	0V _(GND)
Prog Sel 4	4	29	0V _(GND)
Prog Sel 8	5	30	0V _(GND)
N/C	6	31	READY
HOME	7	32	RUNNING
START	8	33	END
P.STOP	9	34	ERROR
RESET	10	35	N/C
AUX IN 1	11	36	AUX OUT 1
AUX IN 2	12	37	AUX OUT 2
AUX IN 3	13	38	AUX OUT 3
AUX IN 4	14	39	AUX OUT 4
AUX IN 5	15	40	AUX OUT 5
Prog Sel 16	16	41	AUX OUT 6
Prog Sel 32	17	42	AUX OUT 7
Prog Sel 64	18	43	N/C
0V COM _(Aux Out)	19	44	0V _(System Out)
0V COM _(Aux Out)	20	45	0V _(System Out)
+V COM _(Input)	21	46	DC +24V
+V COM _(Input)	22	47	DC +24V
N/C	23	48	N/C
DC +12V	24	49	EMERGENCY
DC +12V	25	50	EMERGENCY

“N/C”:Not Connected.

“EMERGENCY” Have to be no voltage “B” contact.

Input signal/Output signal

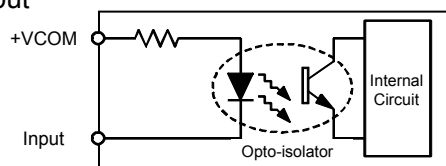
	Pin No.	Pin Name	Function
System Input	2	PROG SEL 1	Select the program No. Set the program No. in binary. It is set in ON. Configuration examples; Program No. "001" SEL1 Program No. "099" SEL4, SEL32, SEL64
	3	PROG SEL 2	
	4	PROG SEL 4	
	5	PROG SEL 8	
	7	HOME	return to origin
	8	START	Robot runs the Automatic Working. The signal is input from the sensor and the switch, etc. "READY" output is ON when input is accepted.
	9	P.STOP	"Partial stop" The robot is stopped before running next steps. Axis is stopped immediately. But the robot does not stop temporarily while soldering. The robot stops after soldering.
	10	RESET	It returns from the emergency stop or the error situation. Input it after the cause of the emergency stop or the error removes. (The minimum pulse width is more than 100ms.)
Aux Input	11	AUX IN 1	This pin is Aux input terminals. Input it from a sensor and a switch, a PLC. When you program, set to the WK Parameter.
	12	AUX IN 2	
	13	AUX IN 3	
	14	AUX IN 4	
	15	AUX IN 5	
	16	PROG SEL 16	Select the program No. Use it when PROG SEL 1 ~ 16 is insufficient.
	17	PROG SEL 32	
	18	PROG SEL 64	
System Output	31	READY	It becomes turning on when is in the state that the main body can be driven automatically.
	32	RUNNING	It becomes turning on while an automatic driving is operating.
	33	END	When an automatic driving ends, it becomes turning on. (100ms)
	34	ERROR	When the error occurs, it becomes turning on. It becomes turning off when returning by the RESET signal and the HOME signal.
Aux Output	36	AUX OUT 1	It is a general-purpose, outside output. It outputs it to the relay, the pilot light, and the sequencer. Please set it from the WK parameter at the teaching.
	37	AUX OUT 2	
	38	AUX OUT 3	
	39	AUX OUT 4	
	40	AUX OUT 5	
	41	AUX OUT 6	
	42	AUX OUT 7	

Power Source · Emergency Stop

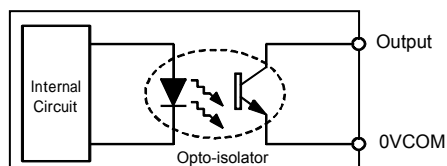
	PinNo.	Pin Name	Signal Name	Function
Power source	19	0V COM	For AUX OUT Common 0V	It is commonness 0V for AUXOUT. When an internal power supply is used, either of GND 27, 28, and 29 the 30th is connected with one pin. When the external power source is used, it connects it with the (-) terminal in the external source.
	20			
	21	+V COM	Common power supply input	It is a common power supply to input each signal input. When 12V in an internal power supply is used, either the 24th or the 25th is connected. When 24V in an internal power supply is used, either the 46th or the 47th is connected. When the external source is used, it connects it with (+) terminal in the external source.
	22			
	24	DC+12V	+12V output	It is +12V of robot internal power supply output. 0.5A can be driven in the maximum.
	25			
	27	0V	GND	It is GND for an internal power supply. It is connected with the frame.
	28			
	29			
	30			
	44	0V COM	For system output Common 0V	It is common 0V for the system output. When an internal power supply is used, either GND 27th, the 28th, the 29th or the 30th is connected with one pin. When the external source is used, it connects it with the (-) terminal in the external source.
	45			
	46	DC+24V	+24V output	It is +24V of robot internal power supply output. 0.5A can be driven in the maximum.
	47			
Emergency stop	49	EMERGENCY	Emergency stop	The device is stopped in the emergency. It uses it with the state of the wireless pressure turned on. All the operation related to soldering becomes a halt condition when this terminal liberates it, and the heater is turned off, too. Please input the reset signal to return the device after short-circuited of the terminal.
	50			

Internal circuit diagram (schematic diagram)

Input

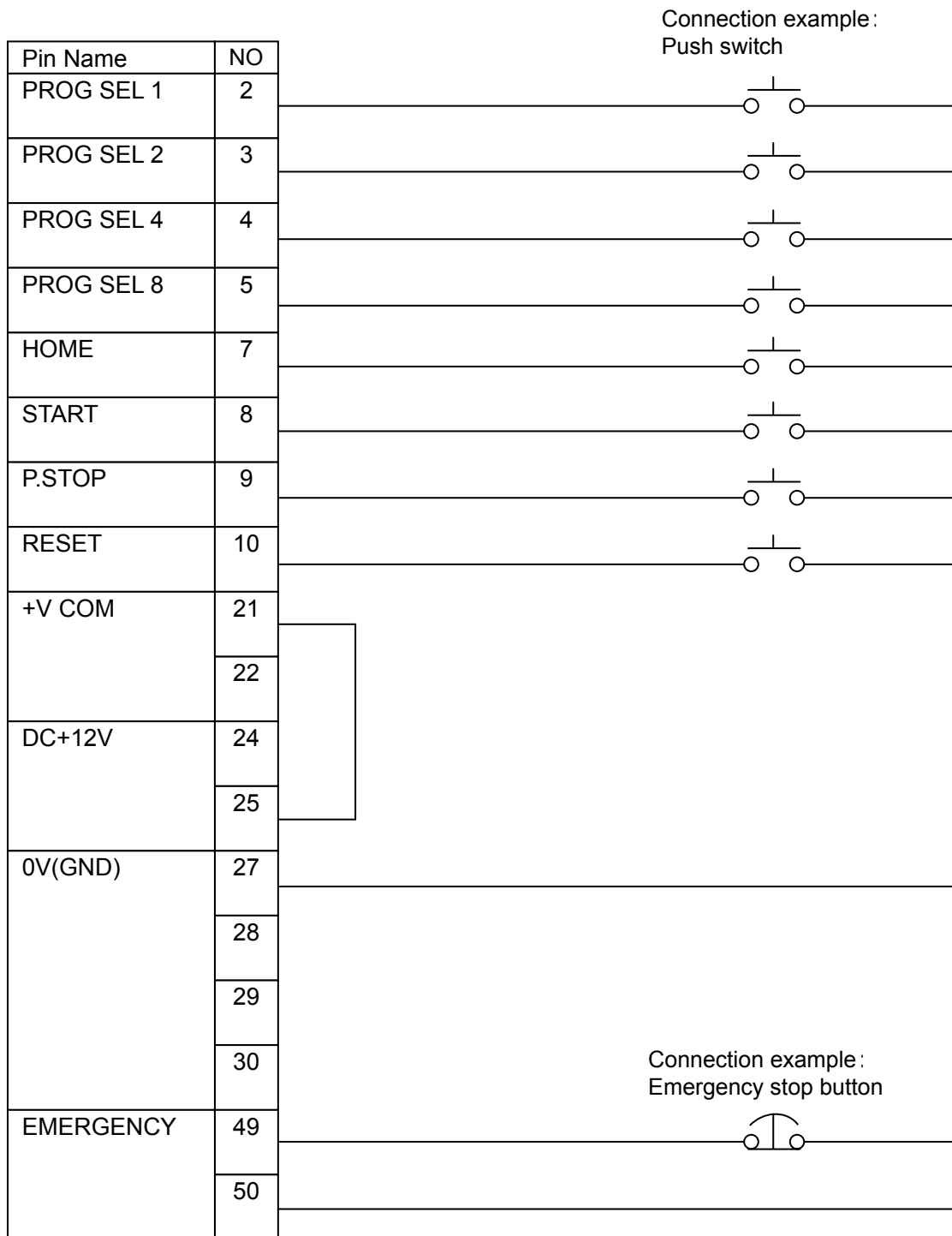


Output



Use 100mA or less in voltage DC24V
current.

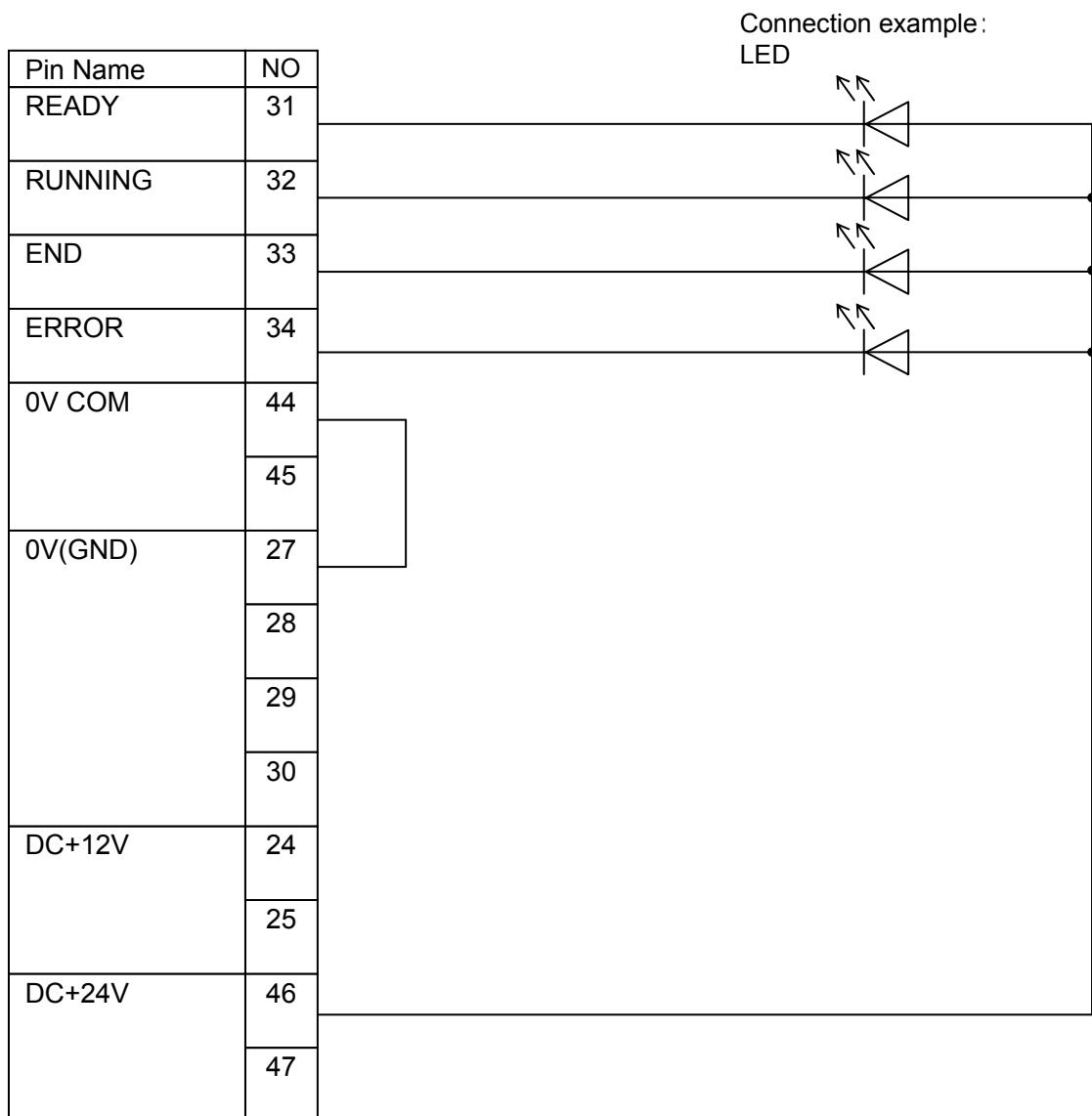
I/O wiring some example
System Input Wiring (Internal Power Use)



Note:

1. External input should be no voltage “A” contact or an open collector.
2. EMERGENCY have to be no voltage “B” contact.
3. When no emergency stop function is required, please short-circuit between 49-50 pins.(Factory setting)

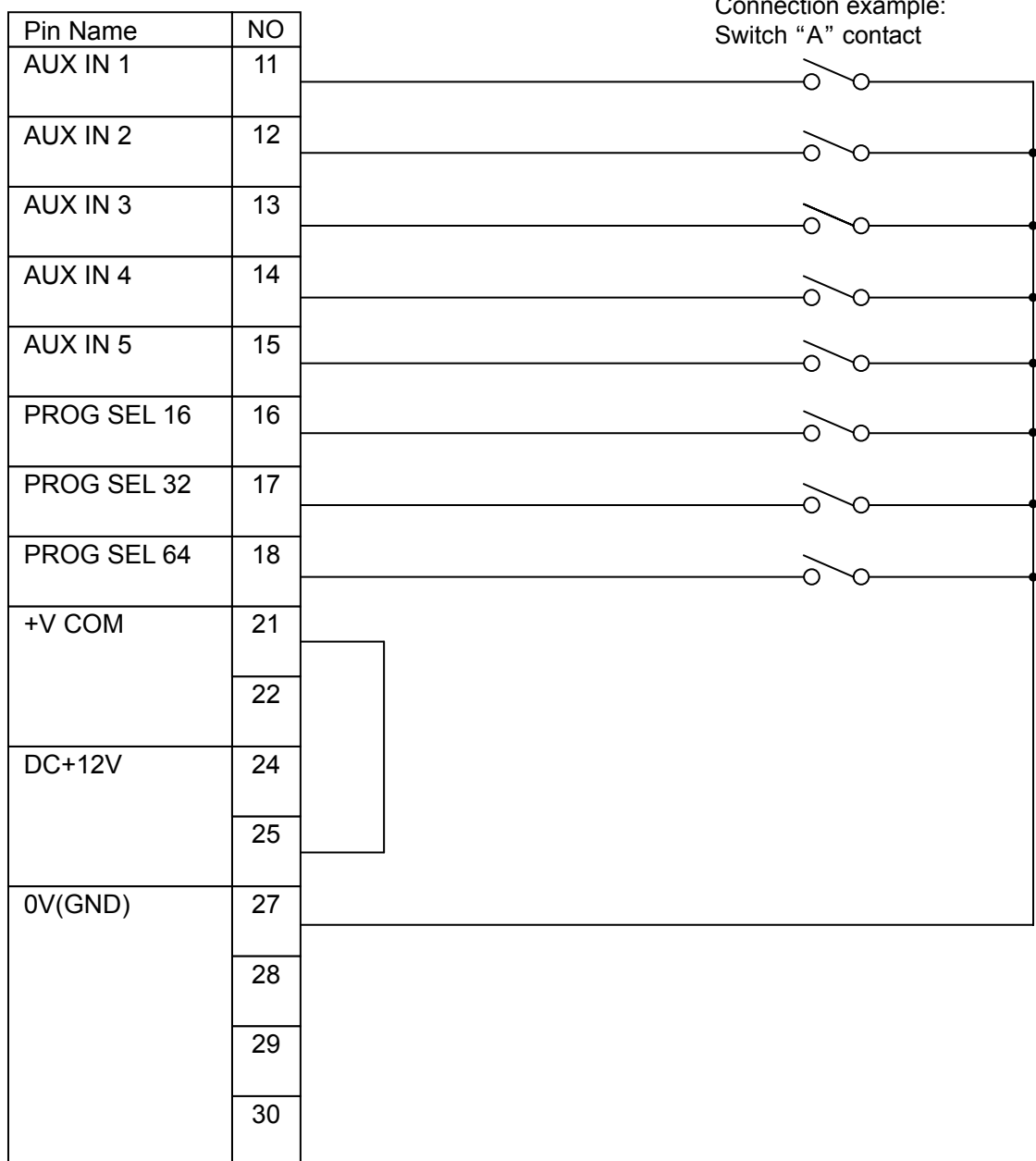
System Output Wiring (Internal Power Use)



Note:

1. In order to avoid the output photo-coupler damage, please use a surge killer built-in parts or add a diode as per the above diagram when the induction load such as relay coil etc. were connected to the output.
2. In case the connecting load was 12V rating, make connection 24, 25.
3. Note that the output maximum is 0.1A each.

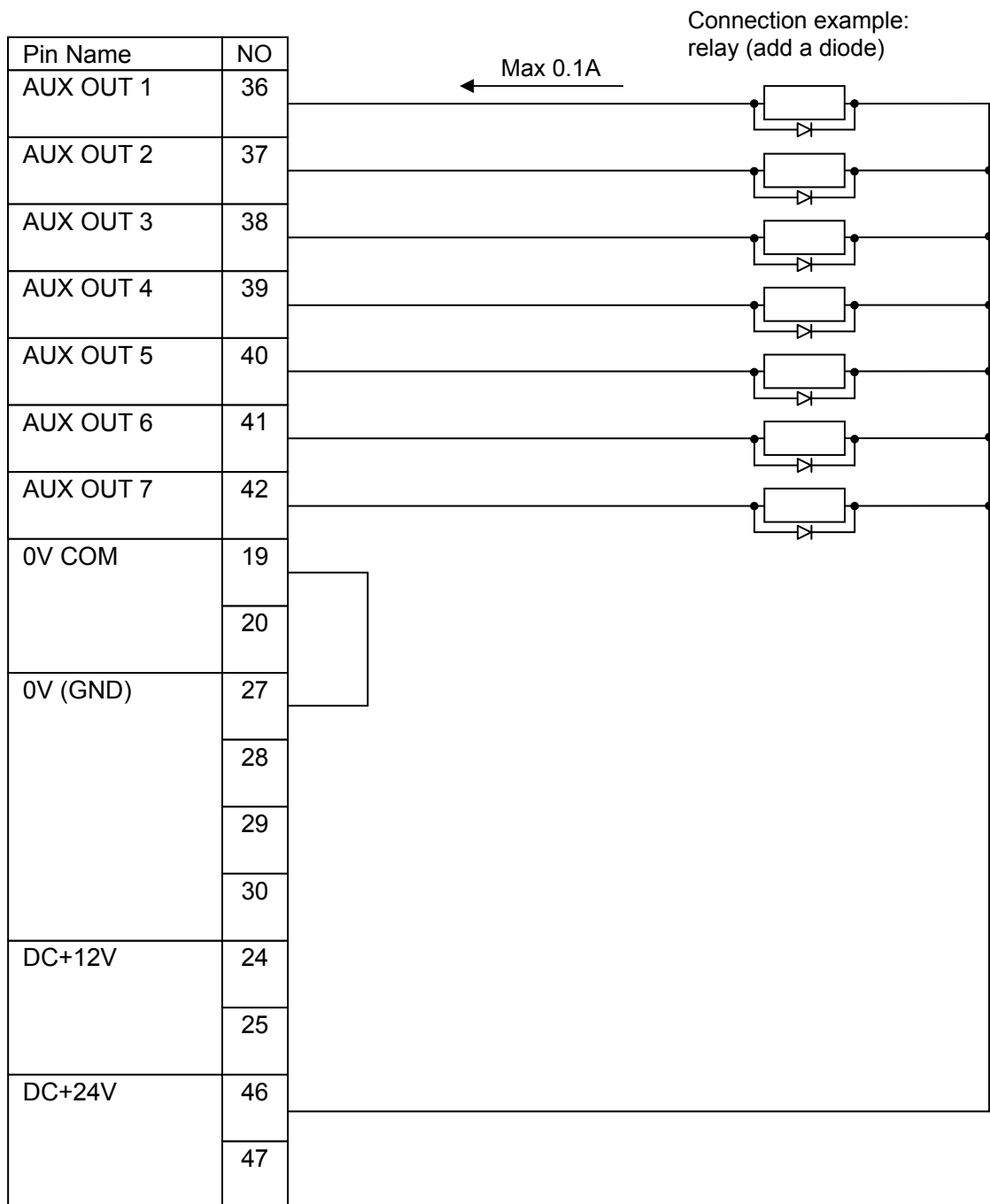
Aux Input Wiring (Internal Power Use)



Note:

1. External input should be no voltage "A" contact or an open collector.

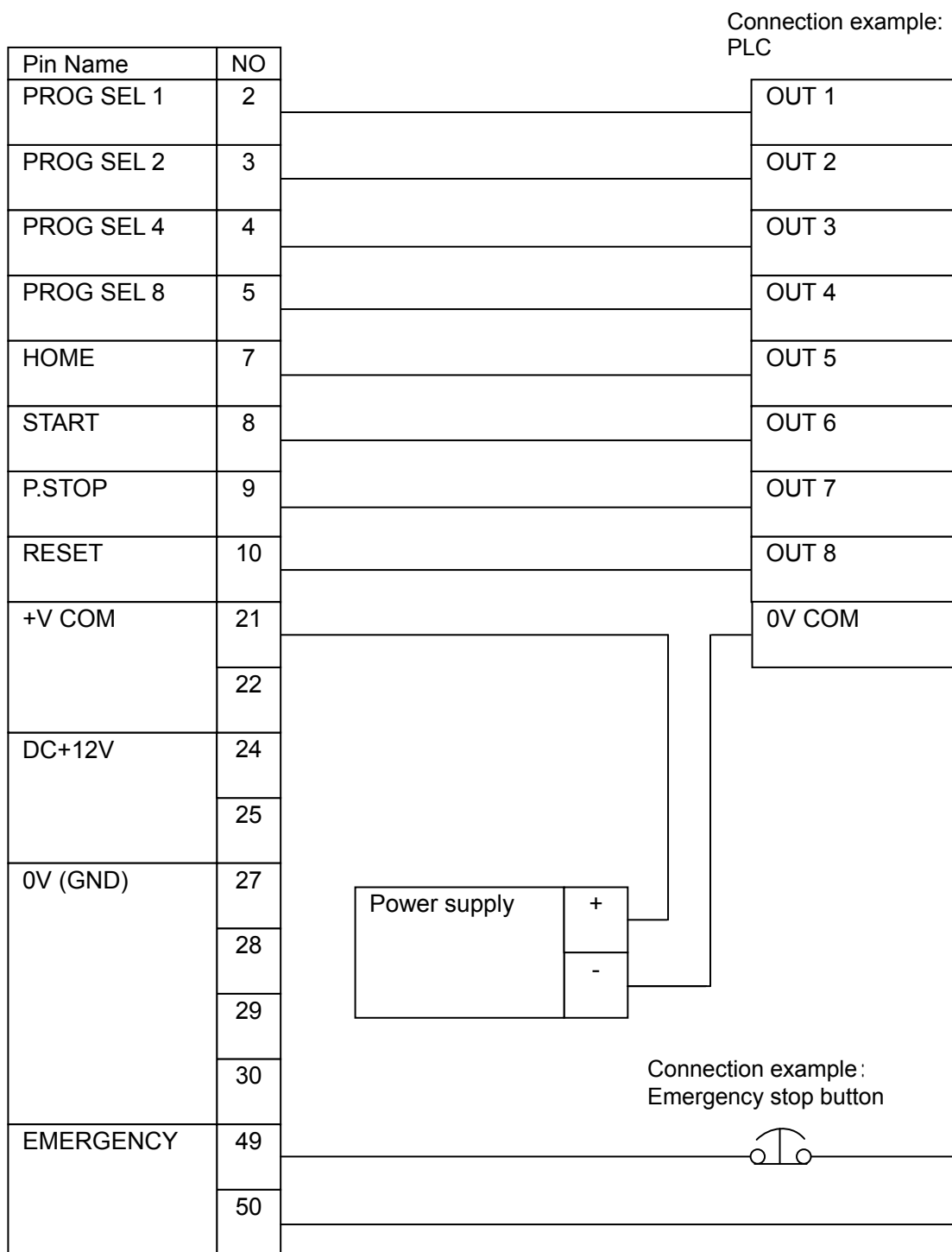
Aux Output Wiring (Internal Power Use)



Note:

- In order to avoid the output photo-coupler damage, please use a surge killer built-in parts or add a diode as per the above diagram when the induction load such as relay coil etc. were connected to the output.
- In case the connecting load was 12V rating, make connection 24, 25.
- Note that the output maximum is 0.1A each.

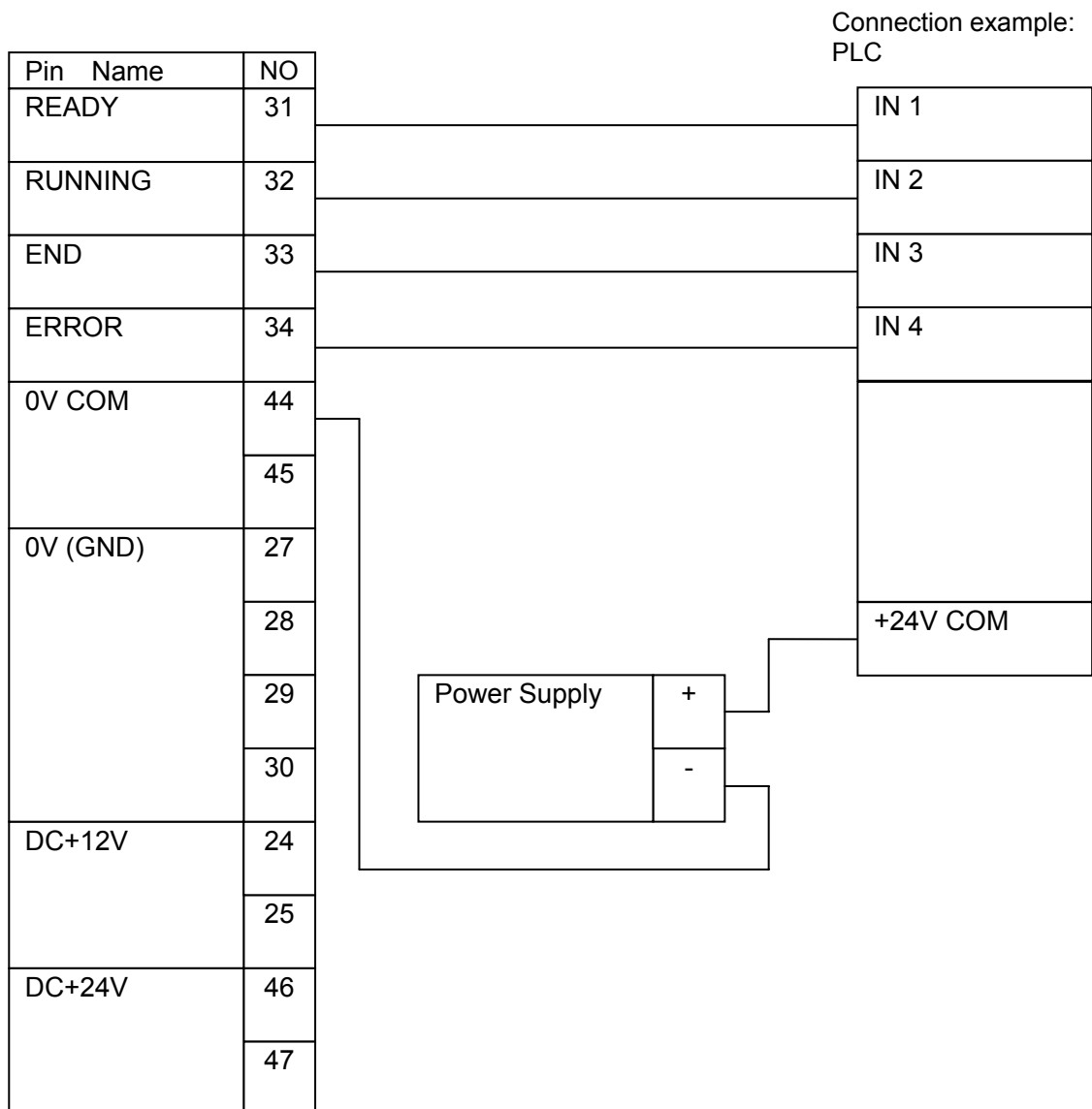
System Input Wiring (External Power Use)



Note:

5. External input should be no voltage “A” contact or an open collector.
6. EMERGENCY have to be no voltage “B” contact.
7. When no emergency stop function is required, please short-circuit between 49-50 pins.(Factory setting)

System Output Wiring (External power Use)

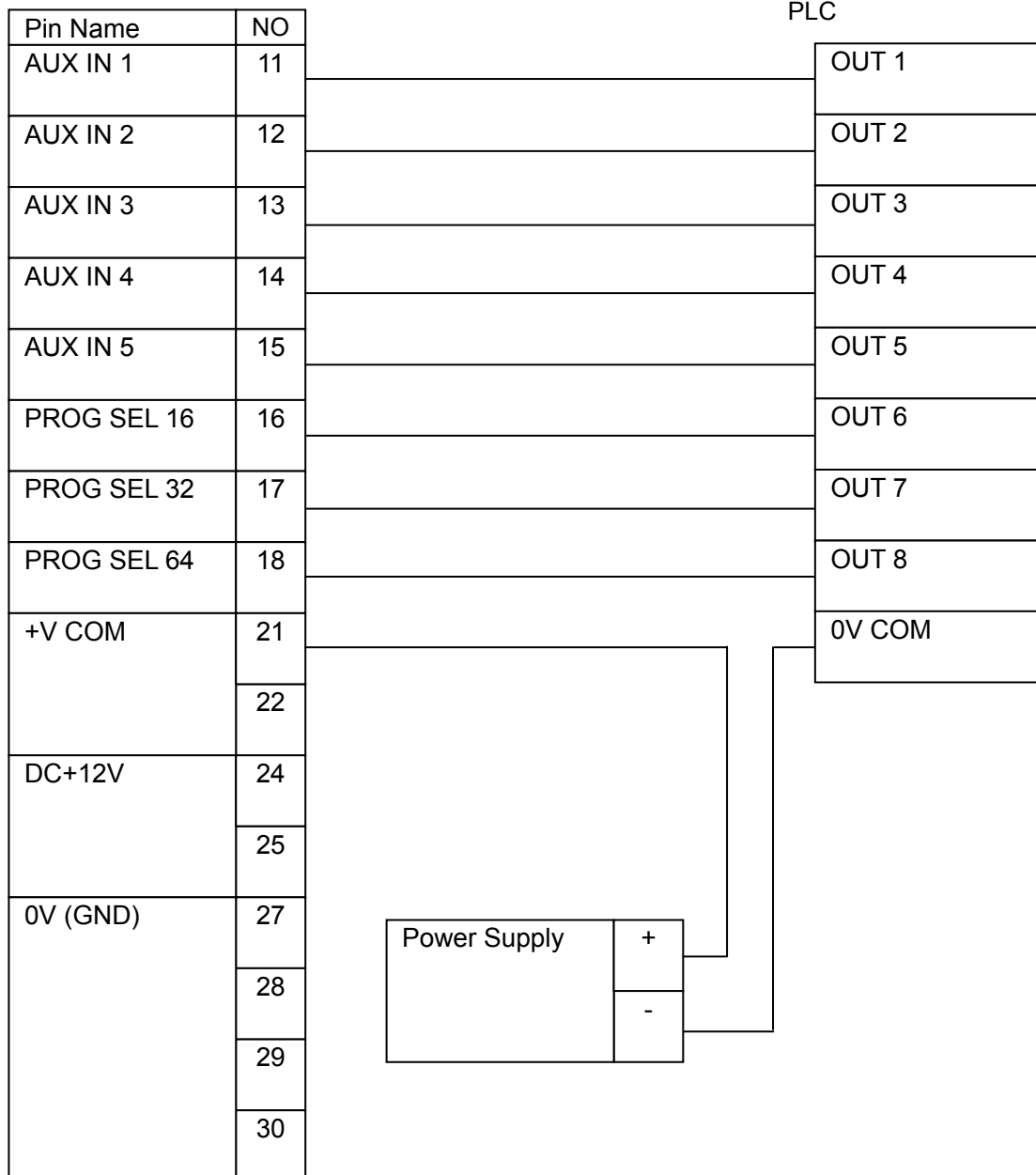


Note

1. Note that the output maximum is 0.1A each.

Aux Input Wiring (External Power Use)

Connection example:
PLC

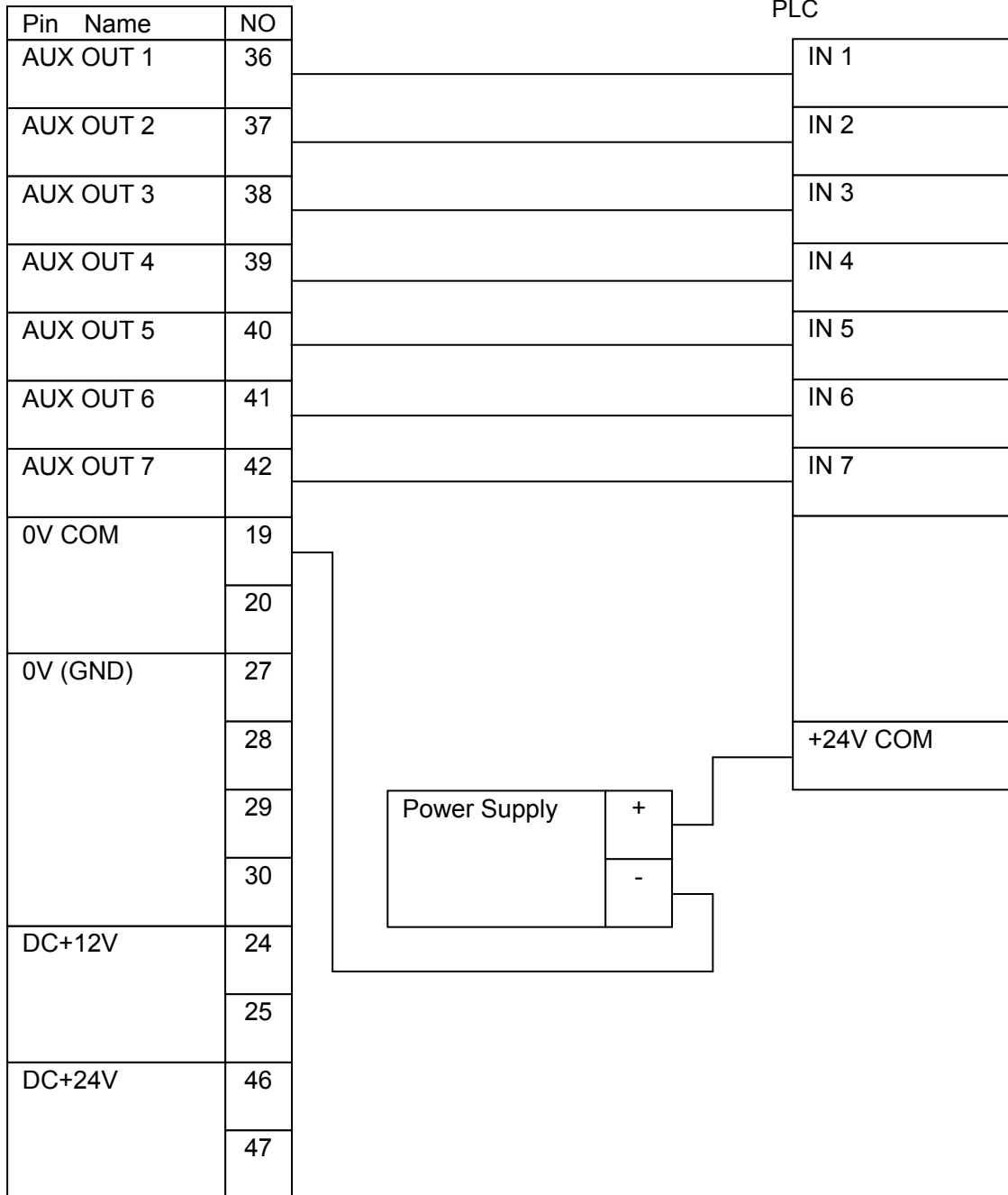


Note:

2. External input should be no voltage “A” contact or an open collector.

Aux Output Wiring (External Power Use)

Connection example:
PLC

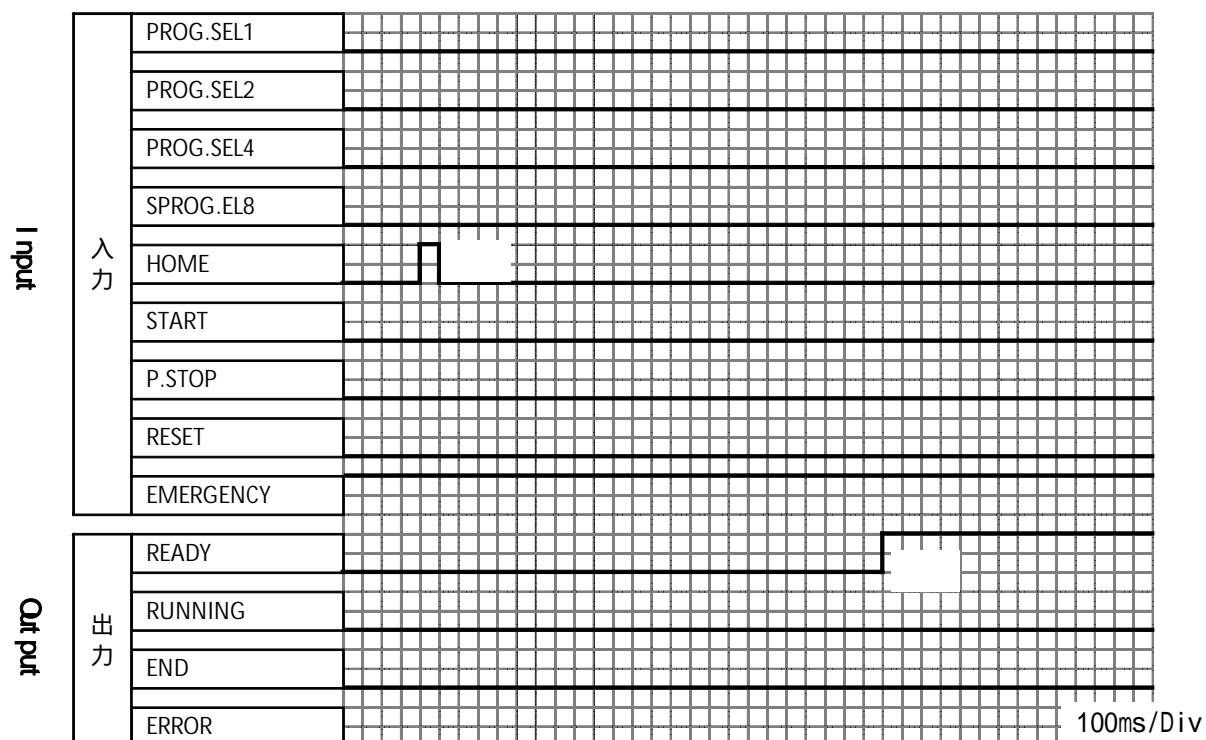


Note

2. Note that the output maximum is 0.1A each.

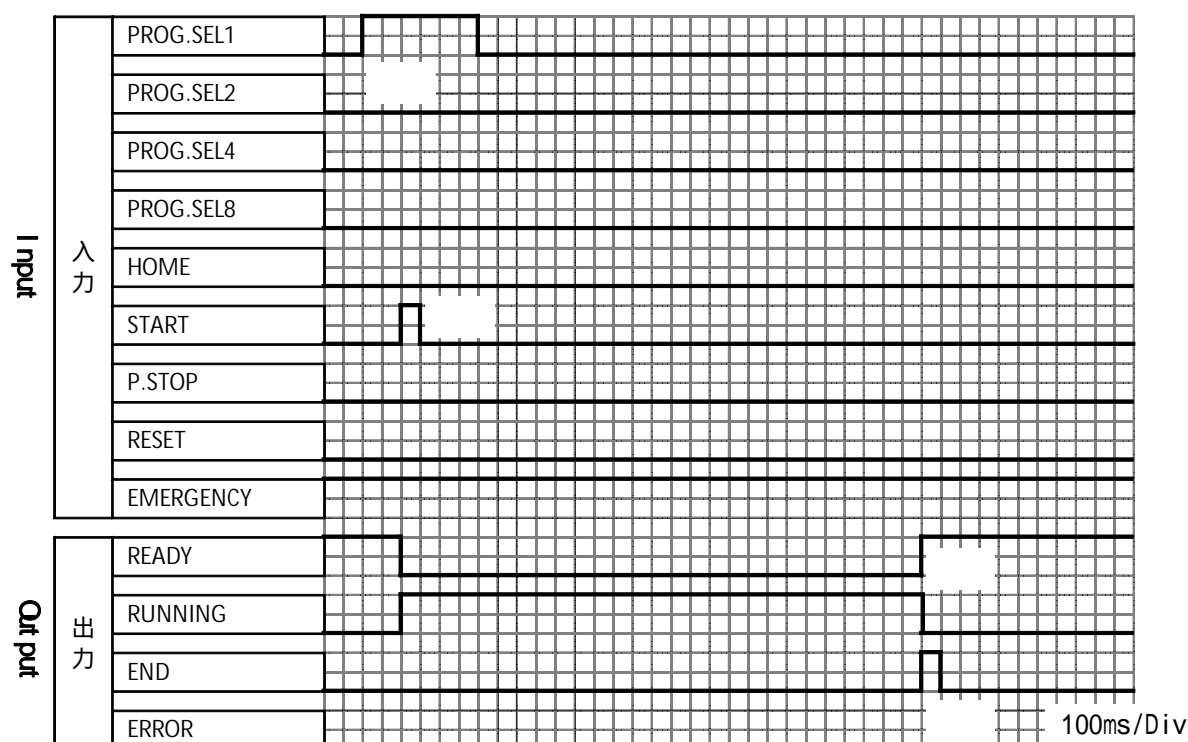
Timing Chart

Initialize



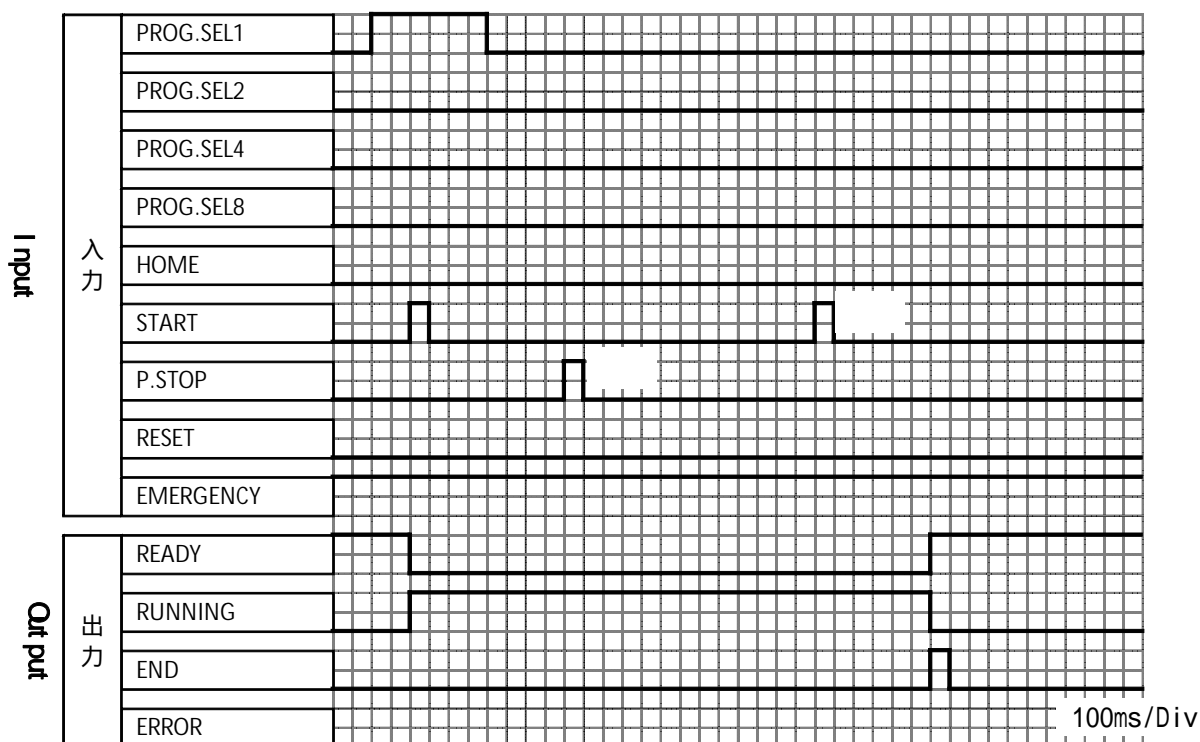
1. The starting point return begins when the HOME signal is turned on. First of all, the starting point return begins from Z axis. The starting point return of X, Y and the θ axis starts after Z axis reaches the starting point position.
2. The temperature of the heater rises with each axial origin return movement, too. Each axle arrives at the origin position, and an READY signal does ON when temperature of the iron tip arrives at it in a setting range.

Normal Working



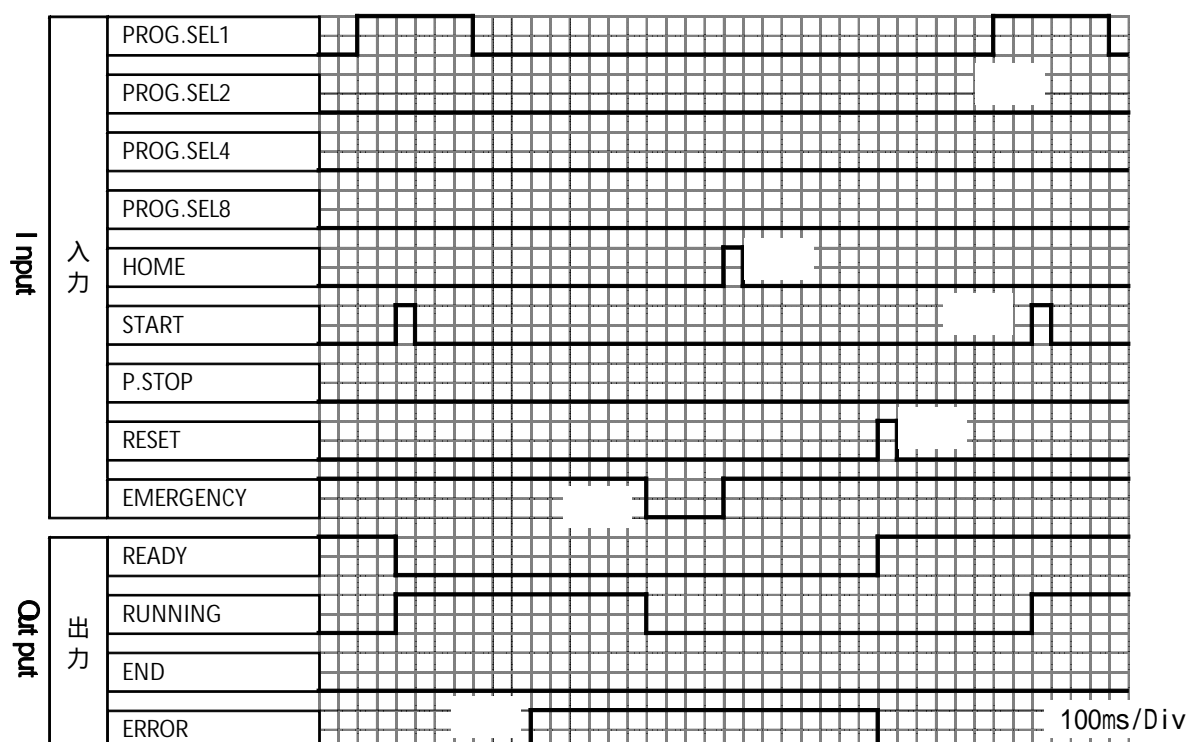
1. The program number that operates is specified with PROG.SEL. Please turn on the PROG.SEL signal before inputting the START signal. After turning on the RUNNING signal, you may turn it off.
2. The READY signal is turned off, and when the START signal is input, the RUNNING signal becomes turning on and begins an automatic driving on the program number set with PROG.SEL.
3. The READY signal is turned on when an automatic driving ends normally and the RUNNING signal is turned off.
4. The END signal is turned on simultaneously at the time of end an automatic driving.

Partial Stop Working



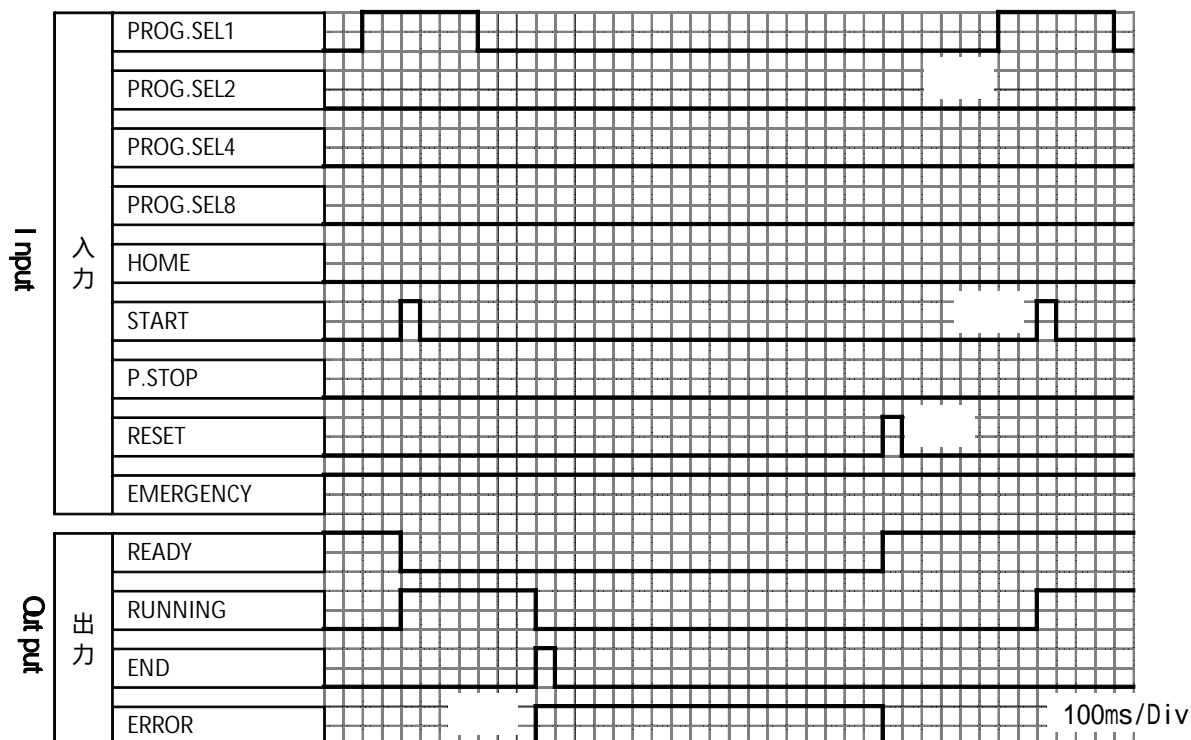
1. The axis operation stops in the place when the P.STOP signal is input while driving automatically. After operation is completed, it stops if soldering is operating.(does not stop temporarily while soldering)
2. The robot restarts operations from the stopping place when the START signal is input.

E02 Position Detection Error



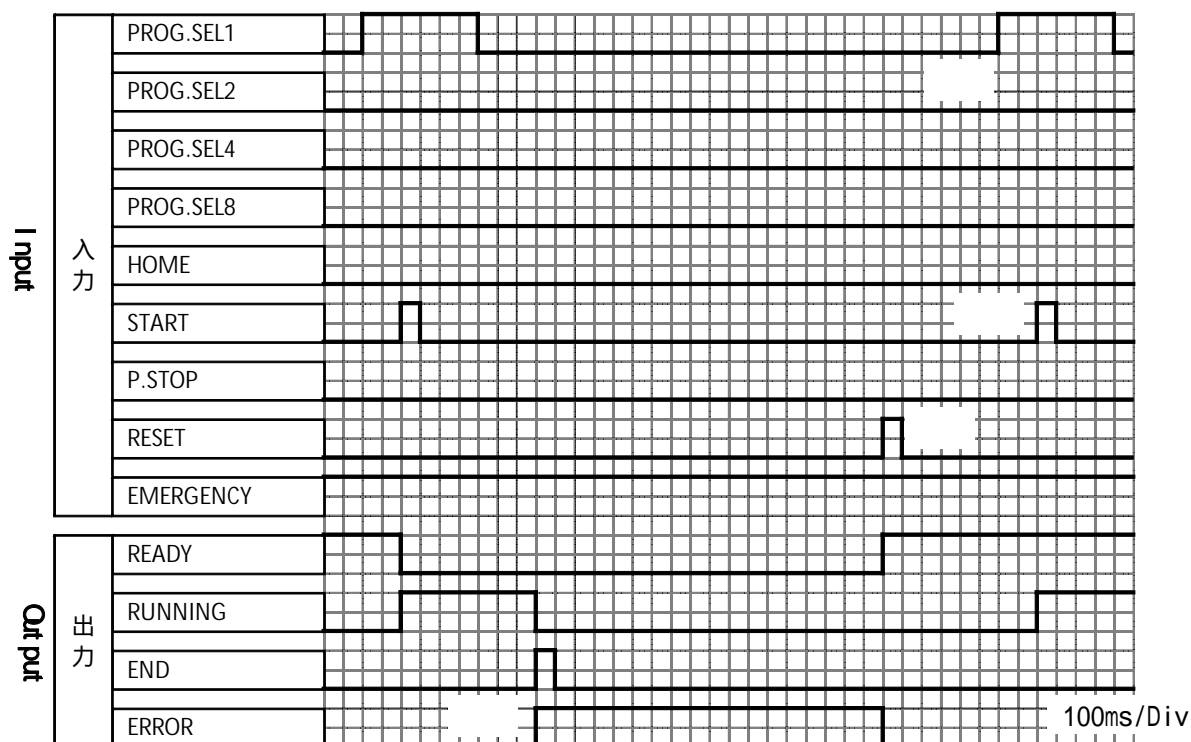
1. When an axis positional gap (step out of the motor) is generated while driving automatically, the ERROR signal is turned on. It is displayed in the operation panel as E02.
2. EMERGENCY is turned off to restore it, and it turns it on.
3. HOME is turned on and the starting point returns when EMG is turning on with WK000. (After the power supply is turned on again, HOME is turned on at the time of turning off. The factory setting is turning on.)
4. If the starting point returns, and abnormality is not found, the READY signal is turned on.
5. The program number is set again.
6. An automatic driving can begin by turning on the START signal if the READY signal is turning on.

E03 Cylinder Up Down Sensor Error



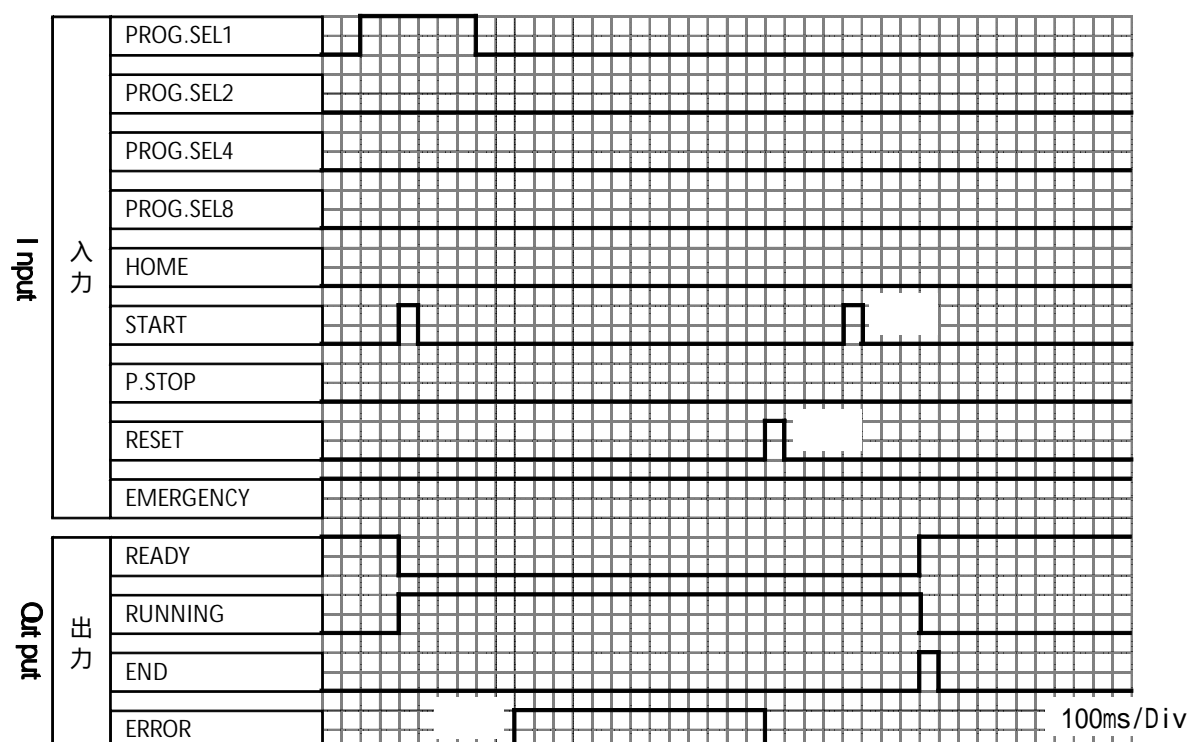
1. When iron doesn't operate when the step where iron descends or is raised while driving automatically is executed, and the limit time is exceeded, the ERROR signal is turned on. It is displayed in the operation panel as E03.
2. To restore it, the RESET signal is turned on. If abnormality is not found, the display of the operation panel disappears, and the READY signal is turned on.
3. The program number is set again.
4. The robot restarts operations from the stopping place when the START signal is turned on.

E04 External Input Waiting Error



1. If an external input is not turned on even if the time set with WK000 OT.V is exceeded in becoming the external input waiting while driving automatically, the ERROR signal is turned on. It is displayed in the operation panel as E03.
2. To restore it, the RESET signal is turned on. If abnormality is not found, the display of the operation panel disappears, and the READY signal is turned on.
3. The program number is set again.
4. When the START signal is turned on, the robot begins driving from the beginning of the program.

E06 Temperature Error



1. When the iron heater disconnections etc. are generated while driving automatically, the ERROR signal is turned on. It is displayed in the operation panel as E06.
2. To restore it, the RESET signal is turned on. If abnormality is not found, the display of the operation panel disappears, and the READY signal is turned on.
3. The robot restarts operations from the stopping place when the START signal is turned on.

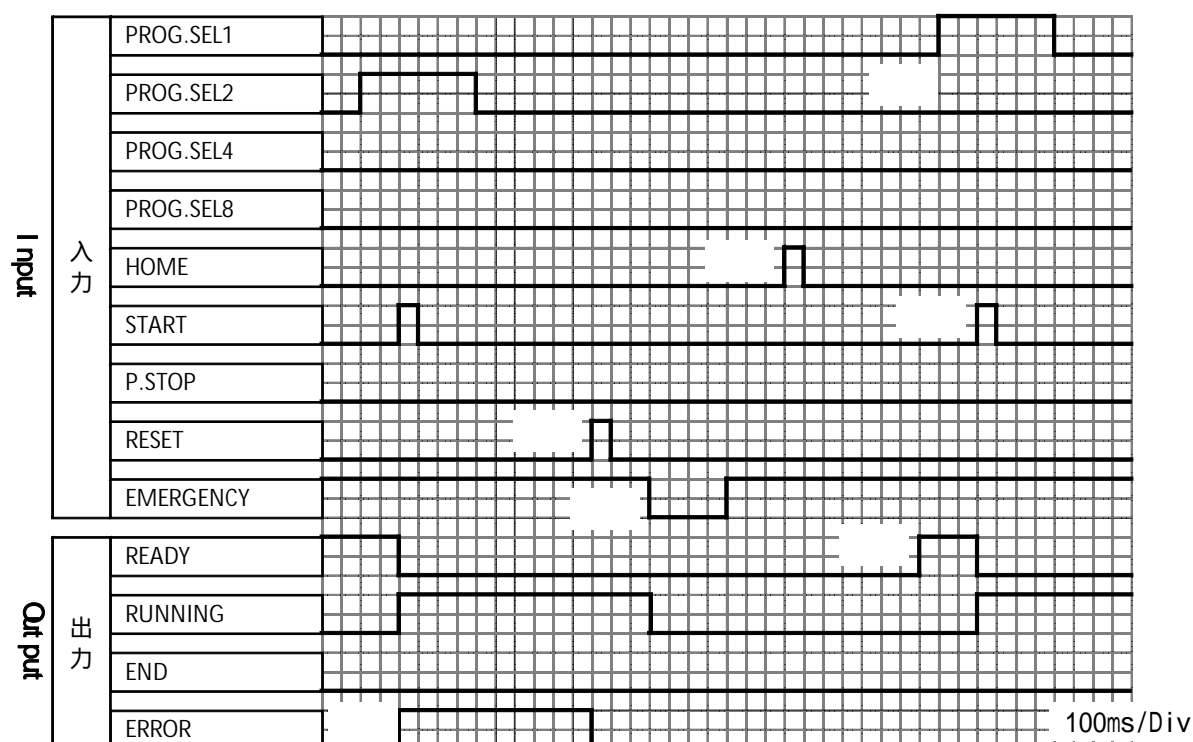
Notes;

Please exchange it after it turns off power when you exchange the iron cartridge and the cable. In that case, please turn on the START signal again after the starting point returns after turning on the power supply again. In that case, it is in the first step of the program.

Operation doesn't stop though the Temp Error lamp of the operation panel lights to the temperature anomaly in the WK step. Moreover, the ERROR signal is not turned on.

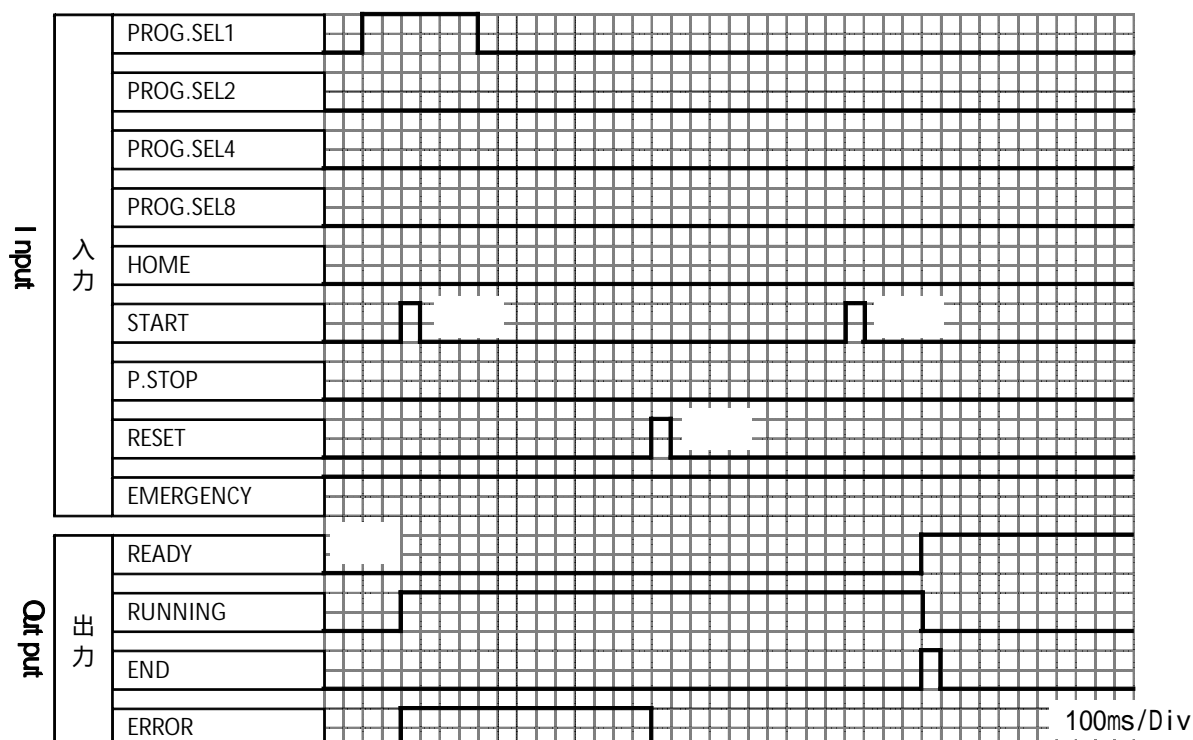
When the error occurs before it drives automatically (Be standing by), E06 displays in the operation panel, and READY is turned off. Driving doesn't begin even if the START signal is turned on in that case.

E08 Data Check Error



1. When START is turned on specifying the program number not made, the ERROR signal is turned on. E08 is displayed in the operation panel.
2. To restore it, the RESET signal is turned on. If abnormality is not found, the display of the operation panel disappears, and the READY signal is turned on.
3. EMERGENCY is turned off, and it turns it on.
4. HOME is turned on and the starting point returns when EMG is turning on with WK000. (After the power supply is turned on again, HOME is turned on at the time of turning off. The factory setting is turning on.)
5. If the starting point returns, and abnormality is not found, the READY signal is turned on.
6. The made program is set again.
7. Driving begins when START is input.

E09 Upper Sensor Limit Error

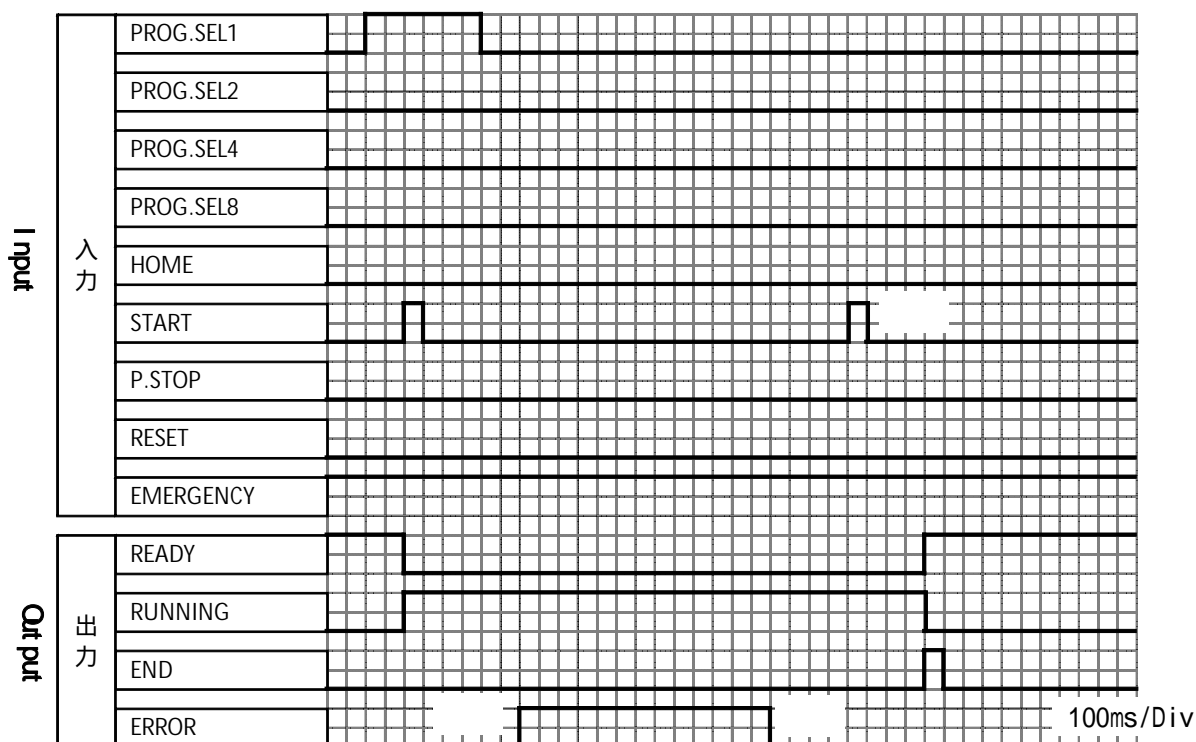


1. When upper sensor of iron unit doesn't detect it in time, READY is turned off.
2. When START is turned on while the sensor doesn't detect it, the ERROR signal is turned on. E09 is displayed in the operation panel.
3. When the RESET signal is turned on after repairing the breakdown cause of the of air shortage, the air leakage or the sensor signal is not detected, the ERROR signal is turned off.
4. It restarts operations when the START signal is input.

Note;

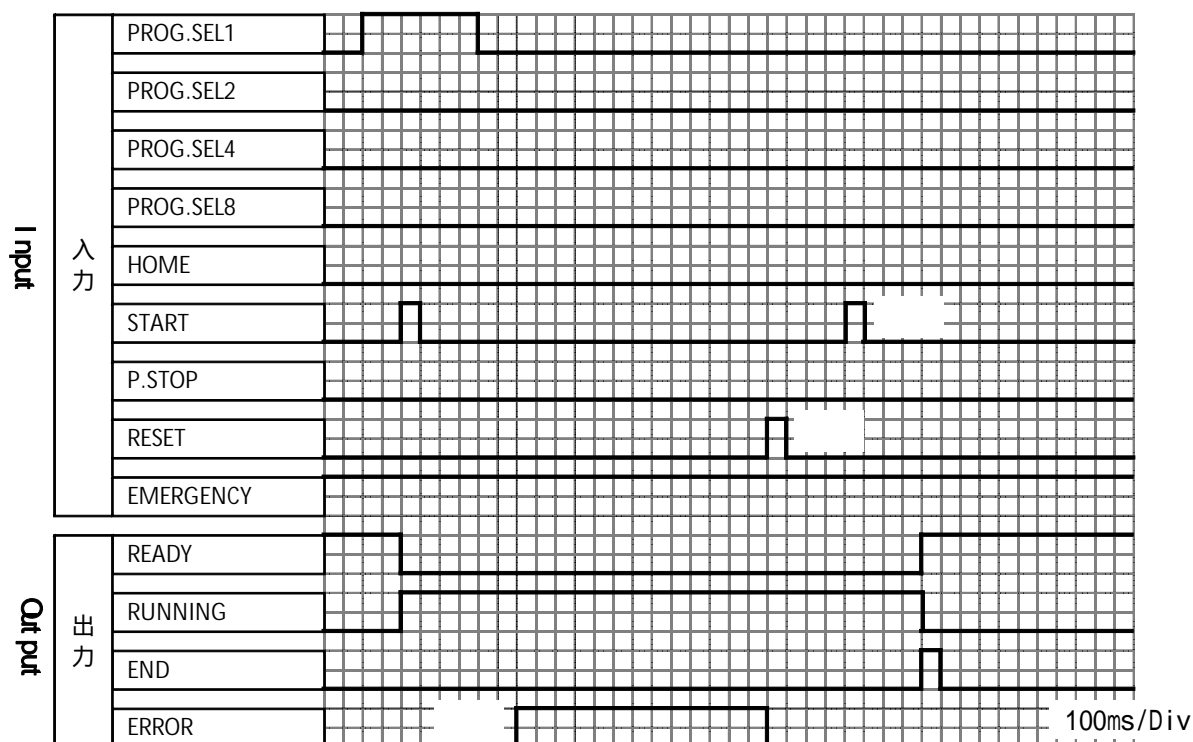
When the stoppage of air supply and the sensor breakdown occurs while driving automatically, it becomes E03, iron sensor time over error.

Solder shortage Error



1. When the solder shortage occurs while driving automatically, the ERROR signal is turned on. The axis operation stops immediately. If soldering WK is operating, it finish WK operation and stops. The Solder Shortage lamp of the operation panel lights.
2. When the solder shortage sensor is turned off after solder is exchanged, the ERROR signal is automatically turned off.
3. The robot restarts operations from the stopping place when the START signal is input.

Solder Clogged Error



1. When the solder clogging occurs while driving automatically, the ERROR signal is turned on. The axis operation stops immediately. The solder clogged lamp of the operation panel lights.
(This ERROR is turned on only while executing soldering.)
2. When the RESET signal is turned on after the solder clogging problem is cleared, the ERROR signal is turned off.
3. The robot restarts operations from the stopping place when the START signal is input.

9. Maintenance

9-1 Daily inspection requirement items are as follows:

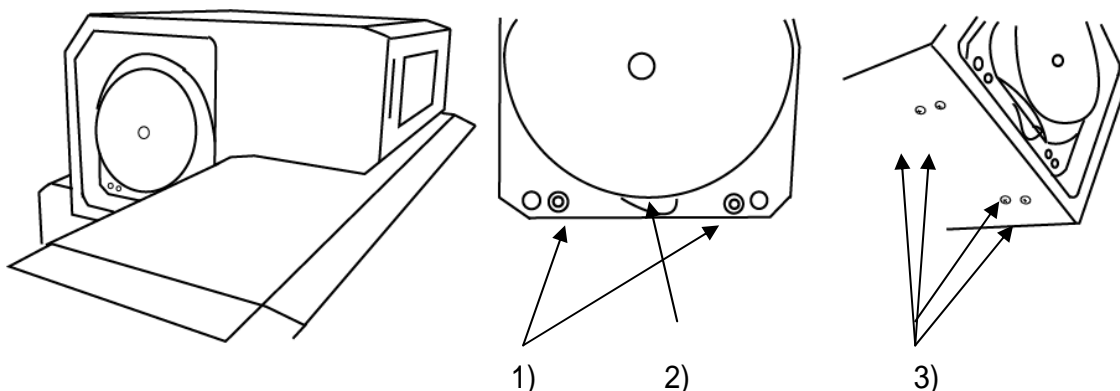
Note: when the inspection, turn off the power and cool down the iron tip.

- 1) Existence of solder wire:
If the solder wire is not sufficient, please change to new one.
- 2) Wear of iron tip
If soldering result become unstable, please change it to new one. The life time of the iron tip is depend on the heating time, the solder feeding point and speed.
- 3) Breaking of heater
The causes of a breaking of heater when the lamp for indication of temperature error is on and the temperature controller is normal are as follows:
(1) The breaking of heater. Change the iron cartridge
(2) The breaking of the relay cord (CC-2F) Change the iron cord.
(3) The iron tip is worn. Change the iron cartridge
- 4) Air pressure
Make sure the air pressure if it is adequate. (4-5kg/cm²)
If the machine is not use, close the air valve to make N2 filter longer life.
- 5) Clog of the tube set
If the top (exit side) of the tube set clog by a flux or solder wire, please get rid of it and clean it with alcohol.
- 6) Up/down movement
Make sure if the up/down movement of iron unit of iron unit is smooth. Also, make sure if there is no flux sticking in moving parts.
- 7) ZSB Cutting blade and pinch roller for solder wire feeding
Make sure flux or solder does not stick to the above parts. If so, clean it with a soft (brass) wire brush and alcohol.

9-2 After every 5,000 points soldering
Check the solder tip temperature with a thermometer. Refer to the page 7 for thermo-controller temperature display calibration.

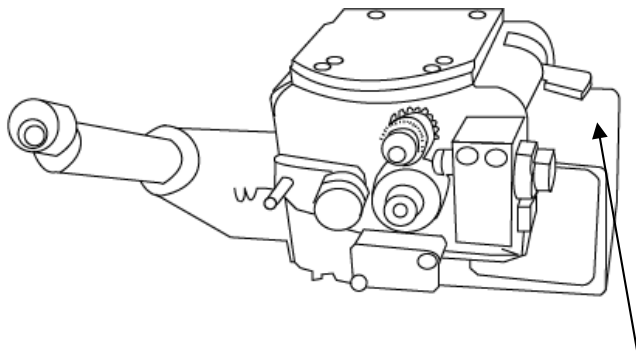
9-3 Every month
Make sure a solder wire run through the solder wire tube. If not, clean the inside tube or replace.

9-4 Every year
Send the thermometer to an authorized agent for the calibration.
Check the N2 filter and replace the cartridge if necessary.
When replace, remove two screws 1) and pull the string 2). If it does not come out, remove four screws 3) and try to replace.



9-5 ZSB feeder adjustment and alignment

If the ZSB (Zero solder ball) feeder is used, the cutting depth and the alignment have to be adjusted properly as follows :



1) Three set screws for ZSB feeder cover

1) Remove the cover after loosening three setting screws.

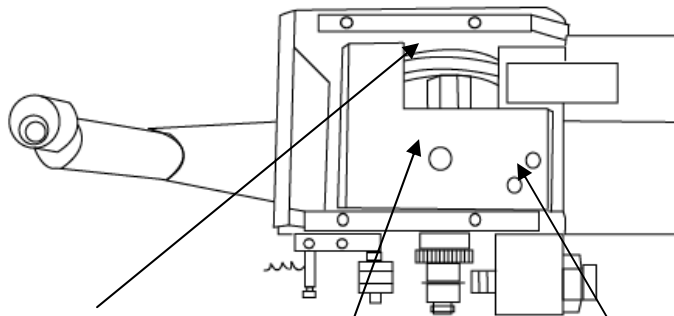
2) Loosen the setting nut.

3) Adjust the screw to make the cutting blade center of the lower roller V groove.

4) Adjust the depth screw the cutting blade to penetrate into flux core.

5) Tighten the setting nut 2).

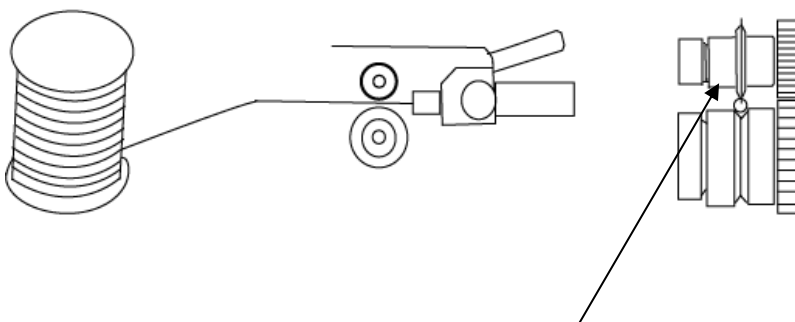
6) Put back the cover and tighten three screws 1).



3) Adjusting screw for alignment

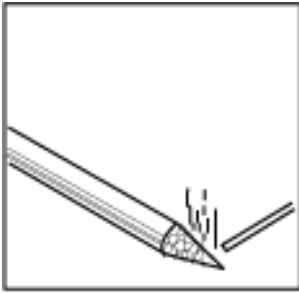
2) Setting nut for the adjusting screw

4) Adjusting screw for the cutting depth.

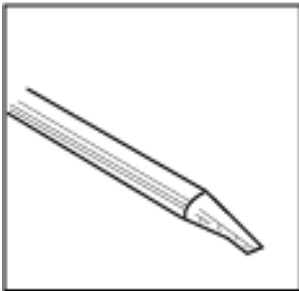


The cutting blade to be the center of the lower roller V groove and the depth should be the center of the solder wire as indicated.

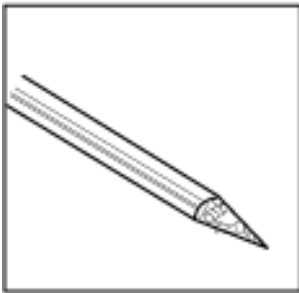
10. HANDLING OF IRON TIP



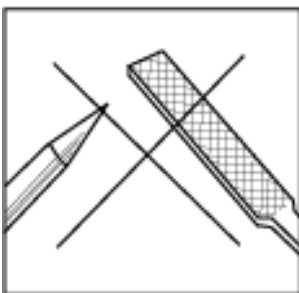
Attach iron tip, then the vinyl resin coating on the iron tip is cracked and peel off during the temperature rising. Please use it after making pre-soldering by solder including flux.



Iron tip should be placed at iron stand after pre-solder on iron tip. If tip is left at the stand without solder after cleaning , the tip cannot be wet with solder.

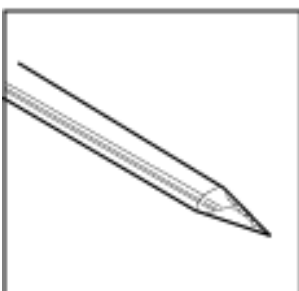


Please remove oxidations of flux lightly by wet sponge with water. If using the dry sponge or wiping too much, tip will not be wetted by solder easily.



Do not file the iron tip because the iron plating under the tip is the very important.

If a tip is not getting wet with solder!!



Remove pre-solder on tip completely.
Remove oxidation by a sand paper after cooling down the iron tip to room temperature.
Turn on the power and make pre-solder on the iron tip during rising the temperature.

The tip will wet with solder by the above process.

11. TROUBLE SHOOTING

This table is designed to help trouble shoot common problems that may occur with the L-CAT-EVO. If you have tried the recommended solution and the problem persists, please contact Apollo Seiko directly for technical support.

Error display on the front panel

Display	Description	Recommended solution
E 01	Home position moving error	Check air supply, sensor position and the connections
E 02	Position detection error	Press RESET key and start. If it happen again, check the mechanical movement. WK000=137 ~ 142, * 1 Turn the power off and remove the CPU board. The clean it carefully to make sure no particle on the PCB.
E 03	Cylinder up down sensor error	Check air supply, sensor position and the connections
E 04	External input waiting error	Check an external equipment and the connections
E 05	Communication error	Turn off the power and turn it on again.
E06	Temperature error	The iron cartridge or the connection faulty. Turn off the power and check the connection or change the iron cartridge.
E07	N/A	N/A
E08	Data check error	The date entered may be out of the moving range.* 3
E09	Upper sensor limit error	Air is not supplied to the machine. Check the air supply.
E10	Communication error between vision system	Check the cable and the connections. The data from vision system may be out of control range or causing recognition error.
E11	Communication data error between vision system	Check vision data of WIN command.
E12	Communication error between Laser system	Check the cable and the connections.
E14	X Position detection error	Press RESET key and start. If it happens again, X motor pulley, belt and encoder etc..
E15	Y Position detection error	Press RESET key and start. If it happens again, Y motor pulley, belt and encoder etc..

* 1 If the WK000=140 (Position Deviation Check in the End) setting is OFF, the restart can not be done during E02 occur.

* 2 When the Wk limit parameter (WK0 = 28) is changed, the setting changing may take for 5 minutes. So, do not turn the machine off for 5minutes after the changing.

* 3 The error check data is the out of the axes soft limit.

Trouble shooting

Problem	Failure reason	Recommended solution
The robot is not receiving power	The power code is disconnected Fuse is blown Control PCB is not working	Check the power cord connection Replace with a new power cord Replace with a 3 Amp fuse Contact Apollo Seiko for repair
The iron tip does not heat properly	Heating element is broken Heater / iron connector is damaged The tip is at end of life The control PCB is damaged	Change the heater and / or iron connector Replace the iron unit cable Replace with an new iron tip Contact Apollo Seiko for repair
Solder is not being properly fed	The release lever becomes opened The solder feeding gear is racing The stepping motor is damaged The control PCB is damaged	Engage the solder release lever Adjust the roller gear lever Contact Apollo Seiko for repair Contact Apollo Seiko for repair
The temperature controller does not allow for adjustment	Heater connection is damaged Iron tip is "dead" The control front switch is damaged	Replace heater and / or cable Replace the iron tip with a new one Replace with a new one
The unit does not display a STANDBY signal (LED)	There is no air supplied to the unit An error condition exists (LED)	Connect the 6mm air inlet tube Check the iron unit up/down movement Replace the tip/heater Fix error problem and reset
Temperature abnormality does not disappear	Values of low or high temperature alarm limit are incorrect.	Check low/high temperature limit and set correct values.

12. CARE OF IRON TIP

Introduction

Soldering is a technique which connects a metal to another metal by alloy reaction.

Solder material melts, but mother material (metal pieces on the work-piece) never melt by soldering.

There are three important factors (Three great factors of soldering) for the alloy reaction as follows:

- Cleaning the metal surface
- Formation of alloy layer which by melting solder and connecting to metal surface
- Heat source which should be maintained in suitable temperature in order to form alloy layer by soldering.

Solder iron tip is related to the formation of alloy layer and the heat source.

So, It is very important for a good care of solder tip to make a stable soldering.

Care of iron unit

Apollo soldering tip, HI-TIP (AS, HQ, TM and TB model) realized the high performance and long life by using oxygen-free copper as a mother material with special iron plating and careful after treatment.

Usually, the life of the tip is about 50,000 points. However, if it is used at more than 400 or if solder with a bad solder feeding position, the life is shorten extremely to approximately 5,000 points caused by "Iron plate Corrosion". Therefore, please use it with suitable condition. If the condition is proper, the life exceeds 100,000 points.

1) Check iron tip by eyes every fixed time

Oxide is left on the iron tip.	Study of the number of air brow cleaning.
"Solder rise" exceed the solder plated area.	A malfunction is occurred by leavening a corrosion by chloride element in flux. Replace the iron tip.
Bad solder flow	Remove pre-soldering on the iron tip completely. Cool it to room temperature and remove oxidation by a sand paper. Then turn it on again and make pre-soldering to the iron tip surface during rising temperature.
Transformation of iron tip	Need to change of iron tip by the corrosion of chloride element in flux and wear phenomenon.

2) Check for soldering defect

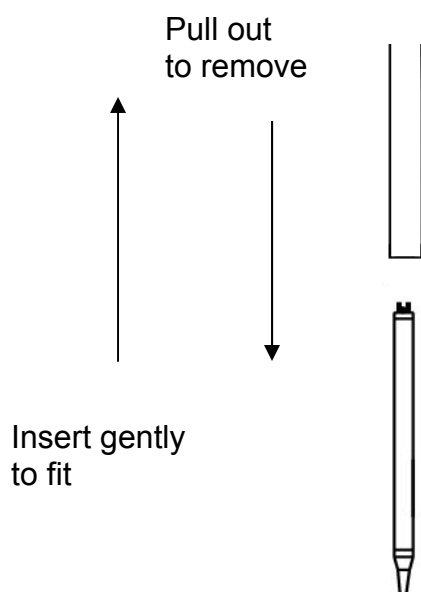
Imperfection of electric connection by of flux membrane	Clean the surface and make iron tip temperature high and heating time longer.
Rough soldering surface	This defect occurs if the heating temperature is high or low. Adjust it to proper temperature.
Soldering removes and comes off because the solder does not melt.	Shortage of heat
Solder flow	The malfunction occurs if the heating temperature is high, the heating time is long or the exceeding solder feed amount is supplied.
Transformation of top of tip	Need to change of iron tip by the corrosion of chloride element in flux and wear phenomenon..

There are many solder defects except the above mentioned as follows:

" Solder shortage", "Icicle", "Solder excess", "Burning film" etc.

Please select suitable condition by seeing through the solder states.

How to change iron cartridge



- 1) Make sure to turn the power off and cool down the iron cartridge room temperature and pull down the iron cartridge to replace a new one. If it does not come out, using silicone ring pull it down strongly. In case flux is jammed, remove it carefully with an alcohol.
- 2) To attach a new one, insert it gently until the holder end. Then turn it until you feel the position key in the position. When you feel a clicking, insert it firmly. Do not turn the iron cartridge while the key is not in the position or the key is damaged.

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