CHAPTER1　Automatic Exhaust Control System

1-1　Automatic Exhaust Control System Gener-1300（Code No.M11-5146-0)------ 1set

OPERATION MANUAL

For

Automatic Exhaust Control System

Model: GENER-1300

（G1726&G1727）

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CONTENTS

Introduction

This manual contains the important instructions and cautions when you operate the Vacuum Coating System (Model: GENER-1300 (G1726&G1727)).

■ **Readers of this manual include the personnel who:**

- Operates GENER-1300
- Checks and maintenances GENER-1300
- Manages GENER-1300

■ **Manual Management**

This manual contains the important instructions for operating coating system. Please read this manual carefully and fully understand the contents before using GENER-1300. For future use, keep this manual at hand.

Safety Precautions

For safety, please read this section carefully before using the machine.

■ **Warning and Caution**

The following is a description of the warning or caution label.

⚠ Warning	Failure to follow this warning may result in injury or death.

⚠ Caution	Failure to follow this caution may result in bodily injury or damage to surrounding areas.

※ Damage: Damage to not only the machine but also to production facilities, other products, buildings, or other objects.

Important Safety Cautions

⚠ Warning
Turn off the power before you inspect the control panel or inside the frame. Failure to do this may result in electrocution.

⚠ Warning
While the power is on, do not touch the control panel or inside the frame. Failure to do this may result in electrocution.

Terminology

The following is a list of terminology/definitions used in this document.

Pump start: Enables the diffusion pump so that it can be started.

Pump stop: Disables the diffusion pump so that it can be stopped.

Exhaust system: Pumps and valves that comprise the system to exhaust the air from the chamber.

Evaporation system: Devices and mechanisms required for the coating process.

DP :	Diffusion Pump
MV :	Main Valve(High Vacuum Valve)
RV :	Rough Valve
FV :	Fore Valve(Auxiliary Valve)
LV :	Leak Valve
SRV :	Slow Rough Valve
SLV :	Slow Leak Valve
PLV :	Pump Leak Valve
RP :	Rotary Pump
MBP :	Machine Booster Pump
EB :	Electron Beam or Electron Beam Gun
APC :	Automatic Pressure Controller
SV :	Set Value
PV :	Present Value
AT :	Automatic Tuning
P.I.D :	P(Propotional)、I(Integral)、D(Differential)

Revision History

Revision	Date	Description
-	SEPTEMBER 2011	Ver.1.0

Programmable Terminal

A programmable terminal allows the operator to operate the machine and displays the machine status.

1.1 Operations

The programmable terminal displays several screens according to the function being utilized. You can display a particular screen, and press a button on that screen to perform an operation.

■ Switching screens

Pressing the Screen Selection button at the bottom of the screen changes to a particular screen. You can also switch from the Main Menu screen.

1.2 Screen Configuration

The system consists of 12 screens and several auxiliary screens. These are configured by functions. The screens are listed below.

■MAIN MENU

Lists the functions.

■PUMP DOWN／AUTO STOP

Starts/stops the pump.

■EXHAUST CONTROL

Exhausts／leaks air from/in the chamber.

■EVAPORATION CONTROL

Controls the evaporation process (operating the hearth or shutter).

■HEATER MANAGEMENT

Controls the heater, defines the heater parameters, and checks the heater operations.

■RESISTANCE HEATER MANAGEMENT

Controls the evaporation heater, checks the coating operations.

■TOGGLE SWITCH

Switches the operation mode in each mechanism in the machine.

■TIMER SET

Sets the timers.

■ALARM INDICATION

Displays a warning or caution. If an alarm occurs, the red pilot lamp lights on to indicate the error item.

■ALARM HISTORY

Displays the alarm history.

■ALARM DETAIL

Displays the alarm details.

1.3 Details of Each Screen

MAIN MENU

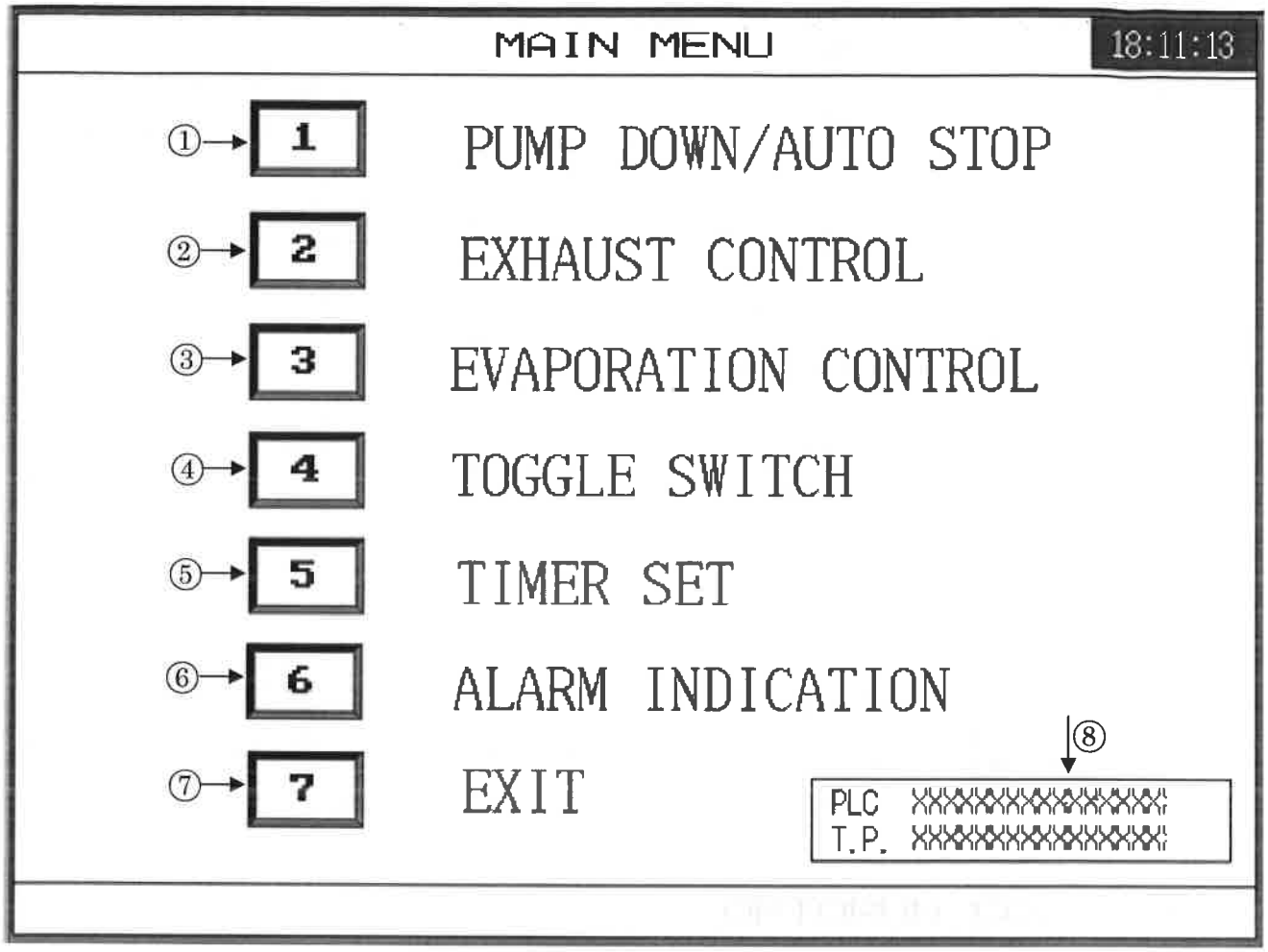

Figure 1. MAIN MENU

① Press this button to display the "PUMP DOWN / AUTO STOP" screen.
② Press this button to display the "EXHAUST CONTROL" screen.
③ Press this button to display the "EVAPORATION CONTROL" screen.
④ Press this button to display the "TOGGLE SWITCH" screen.
⑤ Press this button to display the "TIMER SET" screen.
⑥ Press this button to display the "ALARM INDICATION" screen.
⑦ Press this button to display the "EXIT" screen.
⑧ Display the PLC and T.P. software version

PUMP DOWN / AUTO STOP

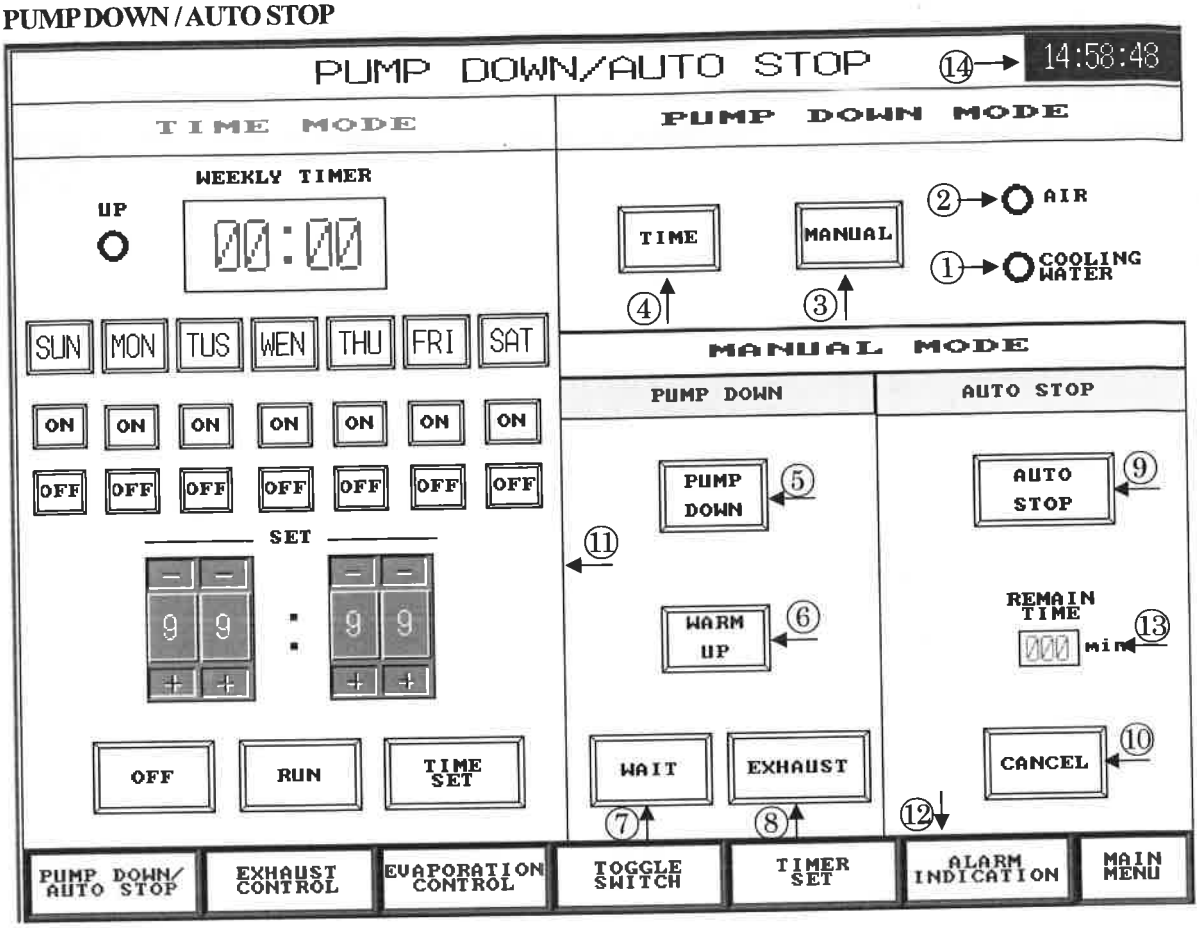

Figure 2. PUMP DOWN/AUTO STOP

① Lights on when the cooling water is flowing in the machine.
② Lights on when the compressed air provided to this machine exceeds the specified pressure.
③ Switches the pump start mode to manual. The lamp lights on when the start mode is MANUAL.
④ Switches the pump start mode to automatic. The lamp lights on when the start mode is AUTO.
⑤ Manually starts the pump. The lamp lights on when the operation is accepted.
⑥ This lamp lights on when the diffusion pump is ready.
⑦ This button is enabled after the diffusion pump is ready. Maintains the diffusion pump ready state and waits for the next operation when ready.
⑧ This button is enabled after the diffusion pump is ready. Automatically exhausts the air from the chamber when ready.
⑨ Automatically stops the pump. This lamp blinks while the system is leaking the air in the chamber and lights on after the air leaking is completed and the diffusion pump is OFF.
⑩ Cancels the pump automatic stop. While this button is blinking, the system accepts the operation.
⑪ Sets the pump start time.
(For details, refer to 2.1 Week Timer.)
⑫ Screen switching buttons.
⑬ Indicates the progress time after the pump automatically stops.
⑭ Display the time of day.

EXHAUST CONTROL

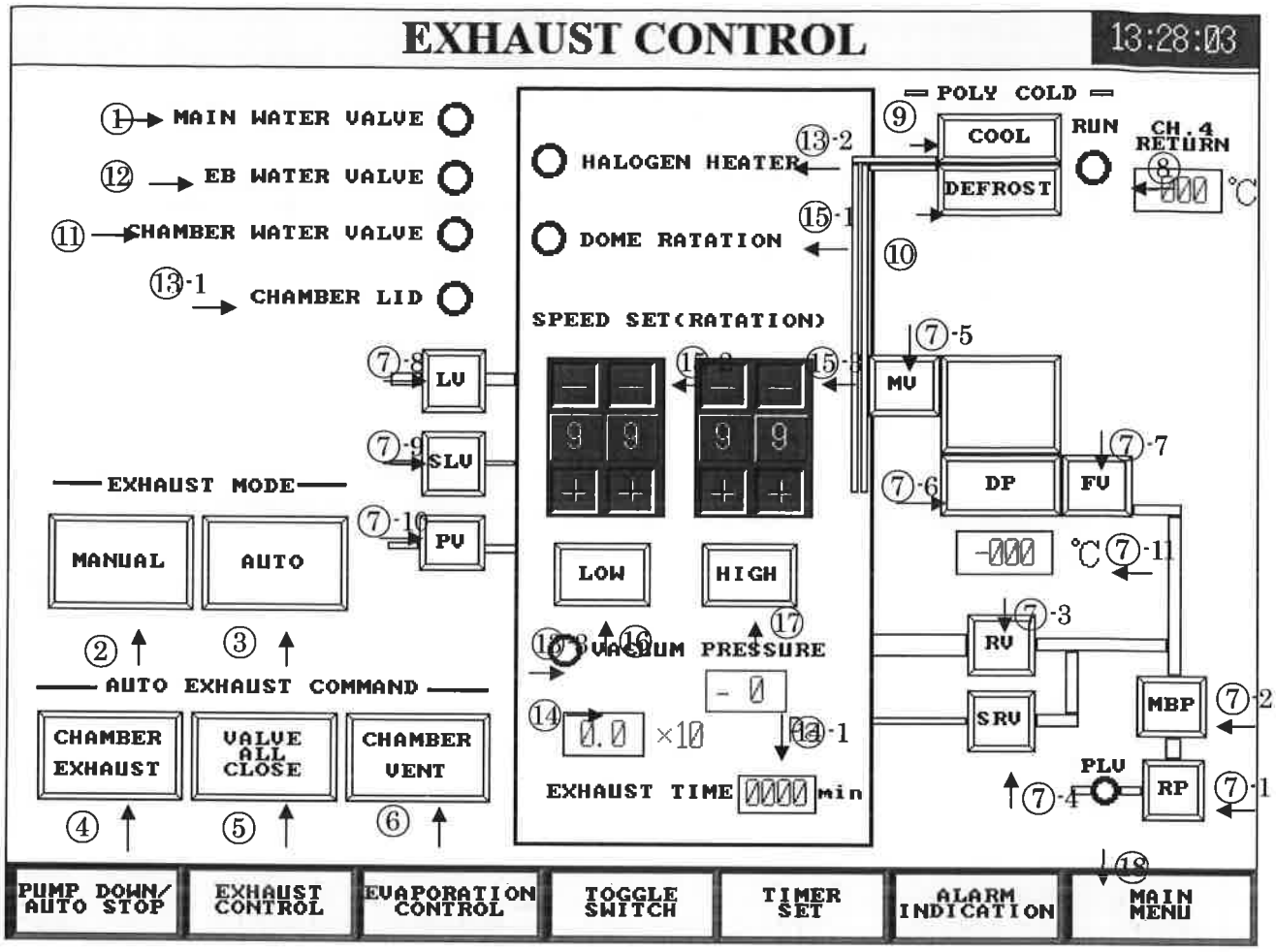

Figure 3. EXHAUST CONTROL

① Lights on when the main water valve (MWV) is open.
② Changes the exhaust control mode to manual. This lamp lights on when the control mode "MANUAL"
③ Changes the exhaust control mode to automatic. This lamp lights on when the control mode is "AUTO".
④ Exhausts the air from the chamber. This lamp lights on while the air is exhausting
⑤ Close all the valves of the exhaust system. This lamp lights on while all of the valves are closed.
⑥ Leak the air into the chamber. This lamp lights on while leaking air.
⑦-1 Manually turns on/off the rotary pump. The lamp lights on when the rotary pump is turned on.
⑦-2 Manually turns on/off the mechanical booster pump. The lamp lights on when the machine booster pump is turned on.
⑦-3 Manually opens/closes the rough valve. The lamp lights on when the rough valve is open.
⑦-4 Manually opens/closes the slow rough valve. The lamp lights on when the slow rough valve is open.
⑦-5 Manually opens/closes the high vacuum valve. The lamp lights on when the high vacuum valve is open.
⑦-6 Manually opens/closes the diffusion pump. The lamp lights on when the diffusion pump is open.
⑦-7 Manually opens/closes the fore valve. The lamp lights on when the fore valve is open.
⑦-8 Manually opens/closes the leak valve. The lamp lights on when the leak valve is open.
⑦-9 Manually opens/closes the slow leak valve. The lamp lights on when the slow leak valve is open.
⑦-10 Lights on when the chamber leak valve is open.
⑦-11 The number shows DP temperature.

⑧ Lights on when the polycold1 chiller is ON.
⑨ Lights on when manually COOL the polycold1 chiller.
⑩ Lights on when manually DEFROST thc polycold1 chiller.
⑪ Lights on when the chamber cooling water valve is open.
⑫ Lights on when the EB gun cooling water valve is open.
⑬-1 Lights on when the chamber door is closed.
⑬-2 Lights on when the vacuum pressure in the chamber decreases below the specified pressure.
⑬-3 Lights on when the halogen heater is turned on.
⑭ Displays the chamber pressure.
⑭-1 The number shows time that chamber exhausted.
⑮-1 Lights on when the dome is rotating.
⑮-2 Sets the dome rotation slow speed.
⑮-3 Sets the dome rotation high speed.
⑯ Change dome rotation to slow speed, lights on when the dome is slow speed rotating.
⑰ Change dome rotation to high speed , lights on when the dome is high speed rotating.
⑱ Screen switching buttons.

EVAPORATION CONTROL (Hearth Control Mode: 12 Point)

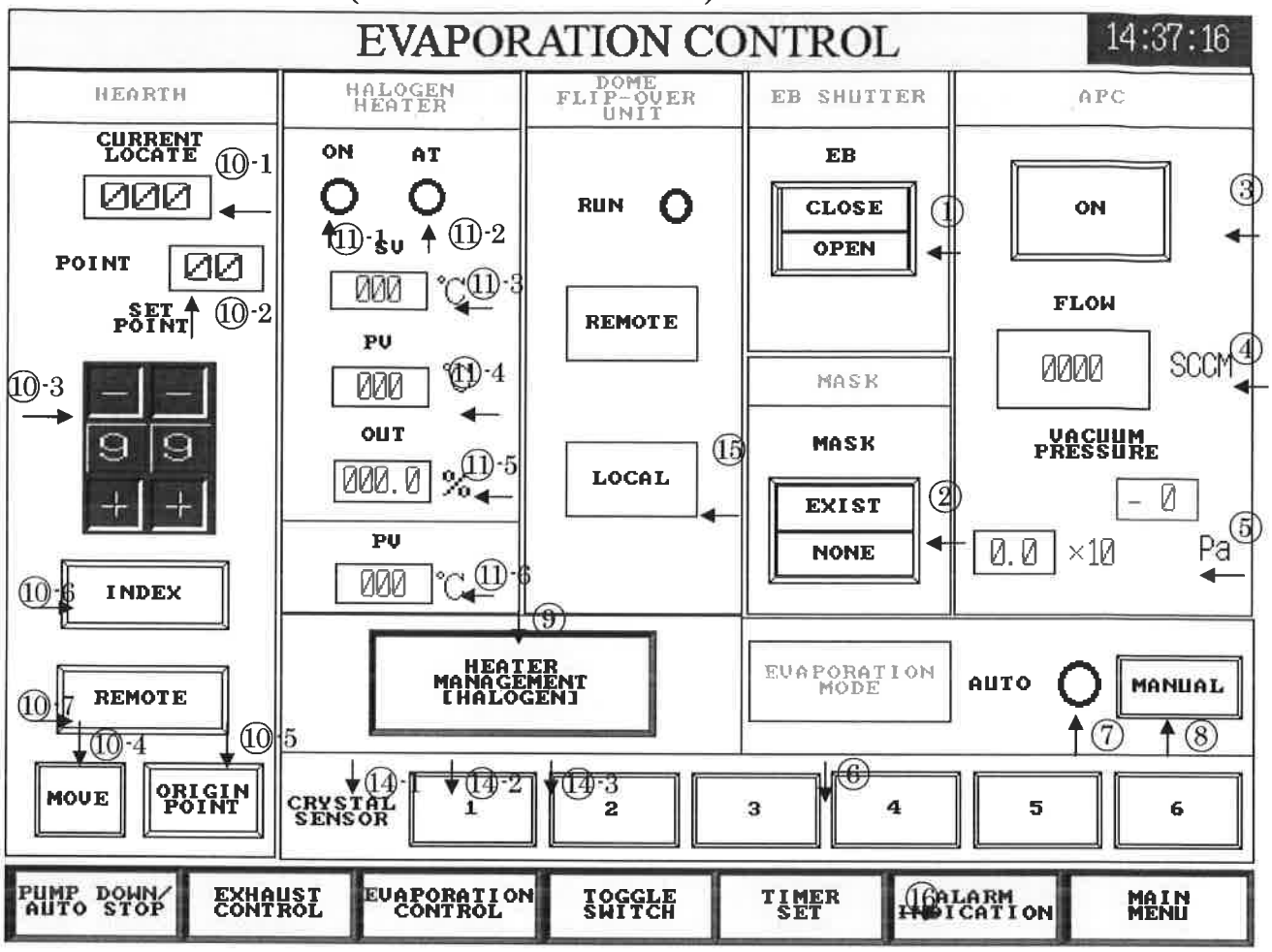

Figure 4. EVAPORATION CONTROL

① Opens/closes the EB gun shutter. When the shutter is open, the OPEN lamp lights on. When the shutter is closed, the CLOSE lamp lights on.

② Displays the mask(on the left)'s condition. If exist, the EXIST lamp lights on. If not exist, the NONE Lamp lights on.

③ Manually turns on/off the APC. The lamp lights on when the APC is turned on.

④ Displays the flow of APC.

⑤ Displays the pressure of inside chamber.

⑥ Replaces the crystal. The selected number button lights on.

⑦ This lamp lights on when the evaporation control mode is AUTO.

⑧ This lamp lights on when the evaporation control mode is MANUAL.

⑨ Screen buttons. Switches to the "HALOGEN HEATER MANAGEMENT" screen.

⑩-1 Shows the present position of hearth (0-359).

⑩-2 Shows the present No. of hearth.(1-12).

⑩-3 Specifies the forward No. of hearth.(1-12).

⑩-4 Displays the hearth moving condition. If in moving condition, the button lamp blinks.

⑩-5 Blinks while one hearth is moving to next one position.

⑩-6 Switches the control mode of hearth2 to manual. Hearth 2 switches change to manual mode while the button is held down.

⑩-7 Moves hearth2 to origin point. Blinks while hearth is moving and lights up while hearth2 is placed at origin point.

⑪-1 This lamp lights on when the halogen heater is turned on.
⑪-2 This lamp lights on when the halogen heater is being automatically tuned.
⑪-3 Display the halogen heater setting.
⑪-4 Displays the measured value of the halogen heater thermocouple.
⑪-5 Displays the halogen heater control output.
⑪-6 Displays the measured value of the halogen heater monitor thermocouple.
⑮ Display dome flip-over unit select remote or local, the lamp lights on.
⑯ Screen switching buttons.

HEATER MANAGEMENT

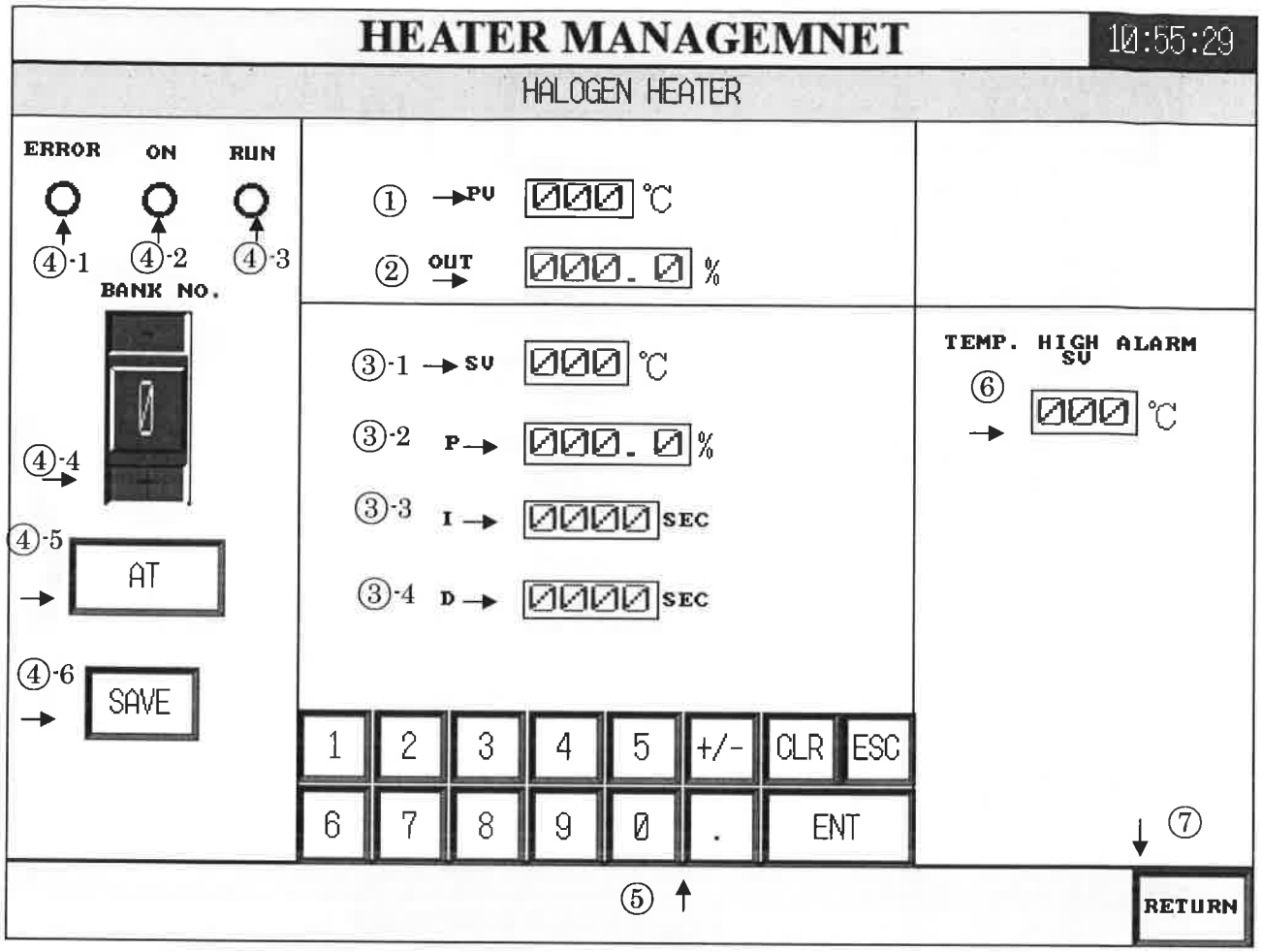

Figure 7. HEATER MANAGEMENT

① Displays the measured value of the halogen heater thermocouple.
② Displays the halogen heater control output.
③-1 Displays the set temperature of the selected bank No.
③-2 Displays the proportional band of the selected bank No.
③-3 Displays the integral time of the selected bank No.
③-4 Displays the differentiation time of the selected bank No.
④-1 This lamp lights on when the sensor input is not connected, disconnected, or connected in reverse.
④-2 This lamp lights on when the heater turns on.
④-3 This lamp lights on when the heater is being controlled.
④-4 Selects the bank No. where the heater control data has been defined, 9 bank can be set.
④-5 Writes the defined control data into the EEP-ROM.
④-6 Runs the AT (automatic tuning). The lamp lights on when the automatic tuning is done.
⑤ Keys to enter values (SV, P, I, D).
⑥ Show the halogen control temperature alarm
⑦Screen button. Returns to the EVAPORATION CONTROL screen.

DOME FLIP-OVER UNIT

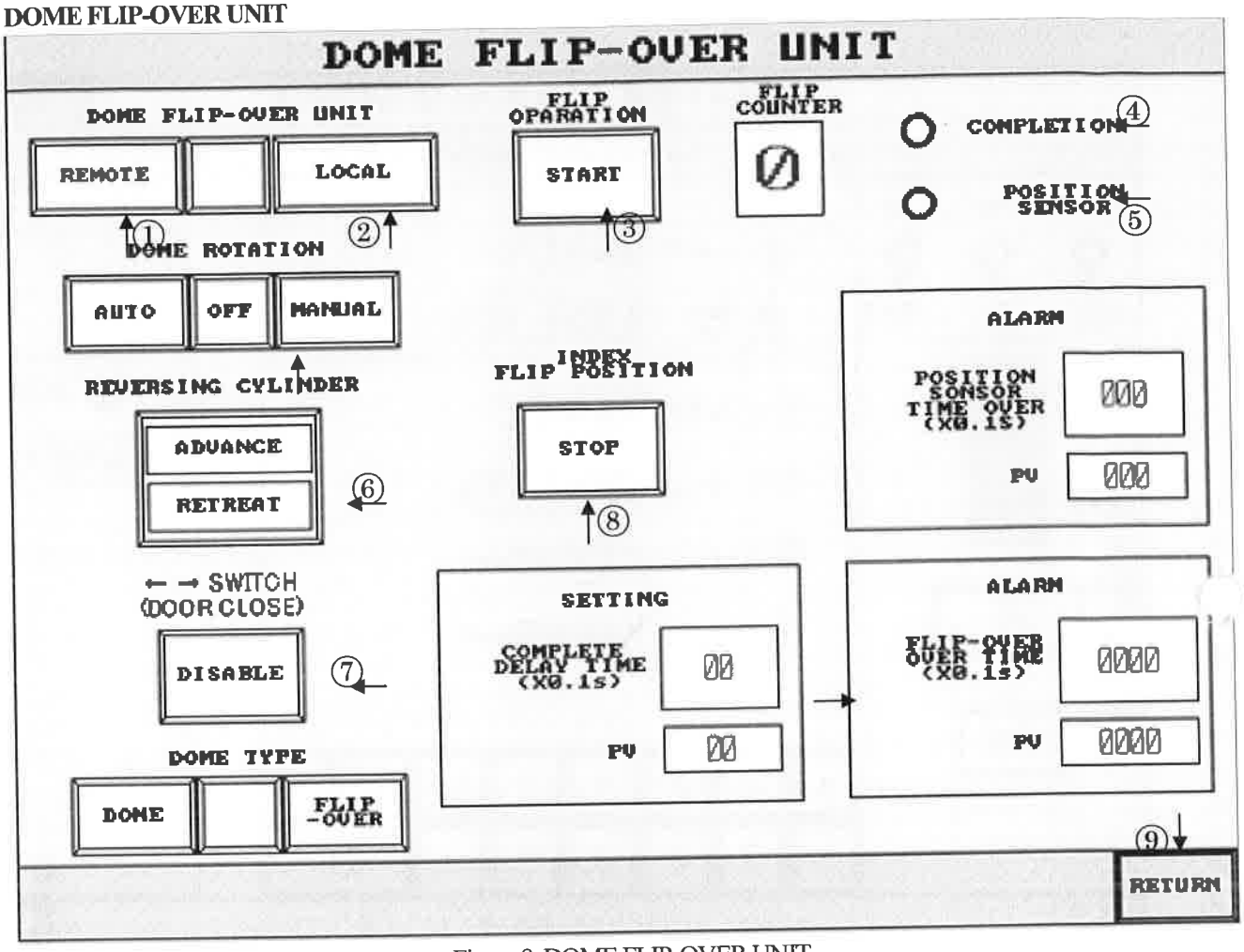

Figure 8. DOME FLIP-OVER UNIT

① Set dome flip-over unit to "REMOTE" mode.
② Set dome flip-over unit to "LOCAL" mode.
③ Button for manually turning on/off dome flip to start.
④ The lamp lights on when the dome rotation to position sensor.
⑤ The lamp lights on when the dome flip to complete
⑥ Advance/retreat the DF reversing cylinder. When the reversing cylinder is advanced, the advance lamp lights on. When the shutter is retreated, the retreat lamp lights on.
⑦ Button for manually turning on/off remote switch to disable.
⑧ Button for manually turning on/off dome flip to stop.
⑨Screen switching buttons.

TOGGLE SWITCH

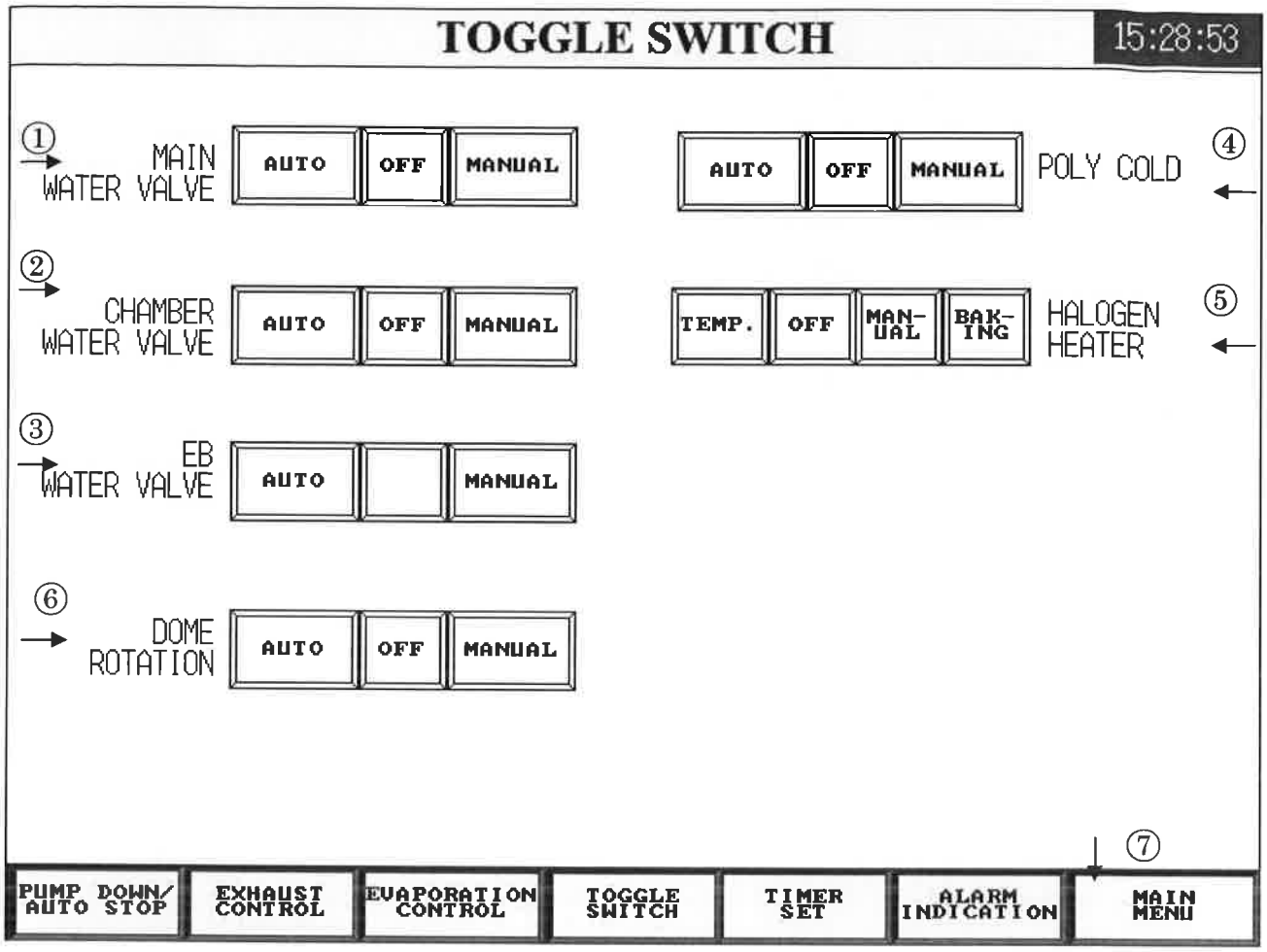

Figure 9. TOGGLE SWITCH

① Switches the control mode of the main cooling water valve.

"AUTO": Automatically opens/closes the valve.
(Main power ON: Opens the valve. Main power OFF: Closes the valve.)

"OFF": Manually closes the valve.

"MANUAL": Manually opens the valve.

② Switches the control mode of the chamber cooling water valve.

"AUTO": Automatically opens/closes the valve.
(The chamber cooling water valve open when the process time of CHAMBER WATER (Figure 12-③-1 is over.)
(The chamber cooling water valve close when vent mode in exhaust system.)

"OFF": Manually closes the valve.

"MANUAL": Manually opens the valve.

③ Switches the control mode of the EB gun cooling water valve.

AUTO: Automatically opens/closes the valve.
(Vacuum in the chamber: Opens the valve. Atmospheric in the chamber: Closes the valve.)

MANUAL: Manually opens the valve.

④ Switches the control mode of the polycold1 chiller.

"AUTO": Automatically turns on/off the polycold1 chiller.
(If pump starts, it also be ON, if main power off, it also be OFF.)
"OFF": Manually turns off the polycold1 chiller.
"MANUAL": Manually turns on the polycold1 chiller.

⑤ Switches the control mode of the halogen heater.
"AUTO": Automatically turns on/off the heater
(Exhaust mode in exhaust system)/Vacuum in the chamber: Heater ON, Vent mode in exhaust system: Heater OFF)
"OFF": Manually turns off the heater.
"MANUAL": Manually turns on the heater.
"BAKING" Switches to baking mode. Turns off when baking complet.

⑥ Switches the control mode of the dome rotation.
"AUTO": Automatically turns on/off the rotation.
(Exhaust mode in exhaust system: Rotation ON, Vent mode in exhaust system: Rotation OFF)
"OFF": Manually turns off rotation.
"MANUAL": Manually turns on rotation.

⑦ Screen buttons. Switches

TIMER SET

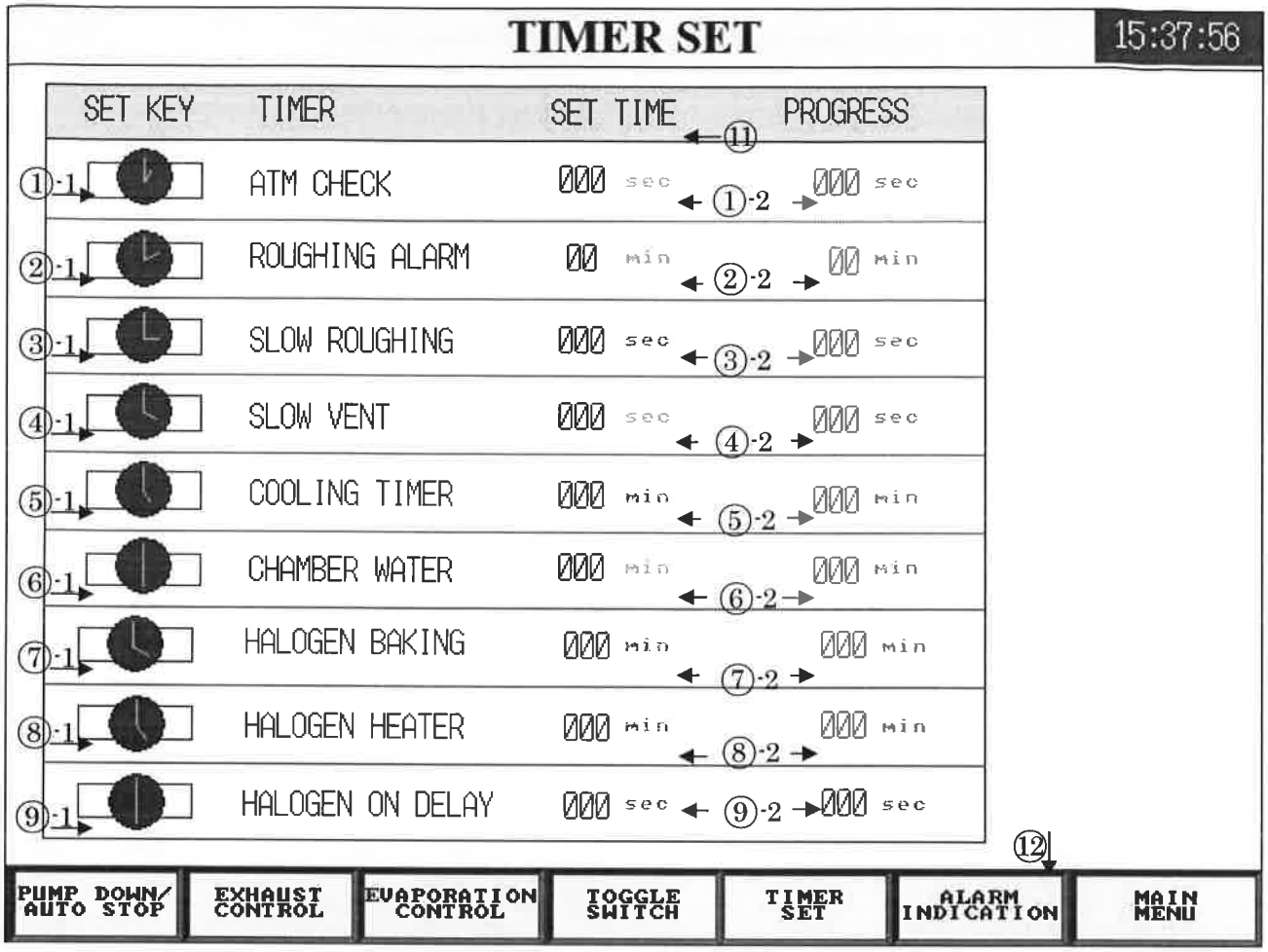

Figure 10. TIMER SET

①-1 Sets the atmospheric check timer. The LV and SLV valve be closed when process time up. Pressing this button displays the atmospheric check timer setup screen.

①-2 Displays the atmospheric check timer of setup (time) and the elapsed time.

②-1 Sets the roughing alarm timer. The alarm of chamber roughing time will occur when process time over. Pressing this button displays the roughing alarm timer setup screen.

②-2 Displays the roughing alarm timer of setup (time) and the elapsed time.

③-1 Sets the slow roughing valve (SRV) open timer before roughing valve (RV) open. When process time over roughing valve (RV) open. Pressing this button displays the slow roughing valve (SRV) open timer setup screen.

③-2 Displays the SRV open timer of setup (time) and the elapsed time before RV open.

④-1 Sets the slow leak valve (SLV) timer before leak valve open. When process time over leak valve (LV) open. Pressing this button displays the slow leak timer setup screen.

④-2 Displays the slow leak timer of setup (time) and the elapsed time before LV open.

⑤-1 Sets the cooling time from automatically evaporation end and dome heater off to the chamber be vented automatically. The chamber be vented automatically when the process time over in automatically evaporation mode. Pressing this button displays the cooling timer setup screen.

⑤-2 Displays the setup cooling timer and the elapsed time.

⑥-1 Sets the chamber cooling water timer. Pressing this button displays the cooling water timer setup screen. Timer begins while the dome heater temperature reaches the setting value. The timer over

while the chamber water valve is opened.

⑥-2 Displays the chamber cooling water setup (time) and the elapsed time.

⑦-1 Sets the dome heater timer. This setup timer is heating time of dome heater before evaporation. Pressing this button displays setup of dome heater heating timer.

⑦-2 Displays halogen heater heating timer of setup(time) and elapsed time.

⑧-1 Sets the halogen heater temperature keeping timer. This setup timer is keeping temperature of halogen heater after halongen heater. Pressing this button displays setup of keeping dome heater temperature timer.

⑧-2 Displays halongen heater temperature keeping time and the elapsed time.

⑨-1 Set the delay time for tuning on the halogen heater on after automatic exhaust becomes start. (halogen heater toggle switchAutomatic operation" setting)

⑨-2 Displays halongen heater temperature keeping time and the elapsed time.

⑪ Switch to get back to factory time of every parts setting time.

⑫ Screen switching buttons.

ALARM INDICATION

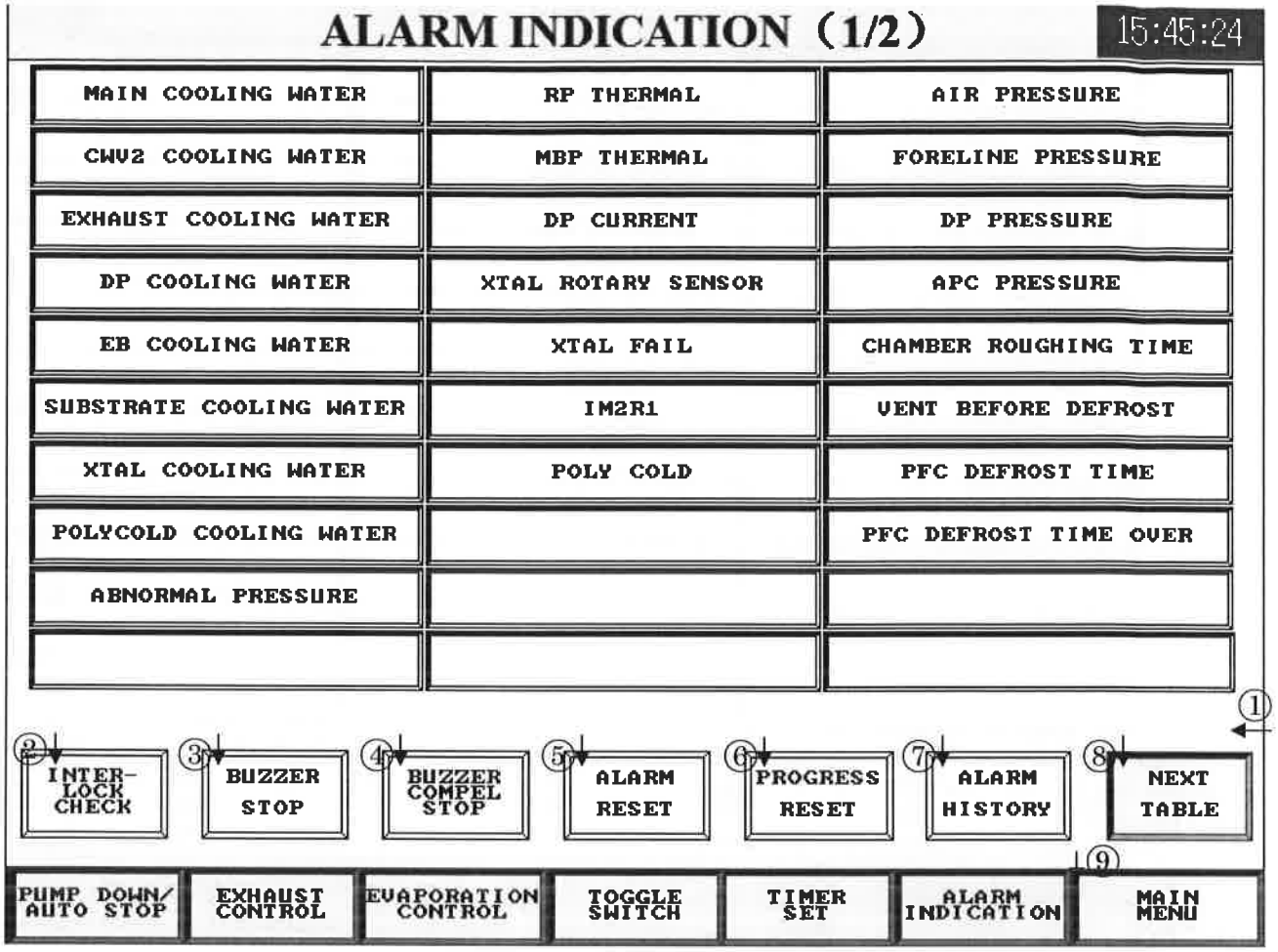

Figure12. ALARM INDICATION

① If an error occurs, the appropriate pilot lamp (red) lights on. Pressing a button displays the alarm cause(s).

② Pressing the button displays the "INTERLOCK CHECK" screen.

③ Stop the alarm buzzer sound.

④ Disables the alarm buzzer.

⑤ Resets the error.

⑥ If the system cannot receive the evaporation process completion signal from the host computer, the PLC can terminate the evaporation process.

⑦ Pressing this button displays the "ALARM HISTORY" screen.

⑧ Screen switching button.

⑨ Screen switching button

ALARM INDICATION

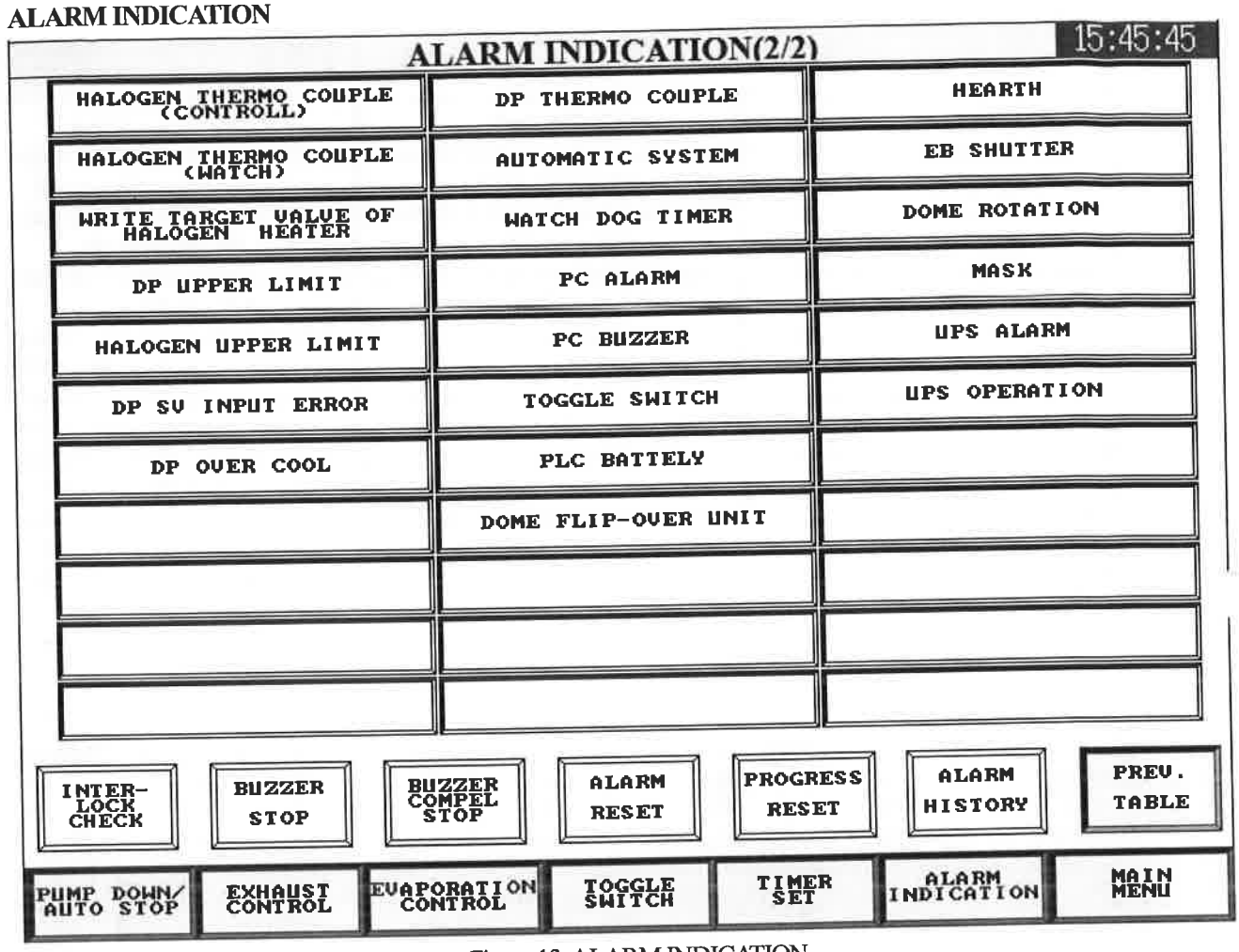

Figure 13. ALARM INDICATION

Refer to figure12. alarm indication

ALARM DETAIL

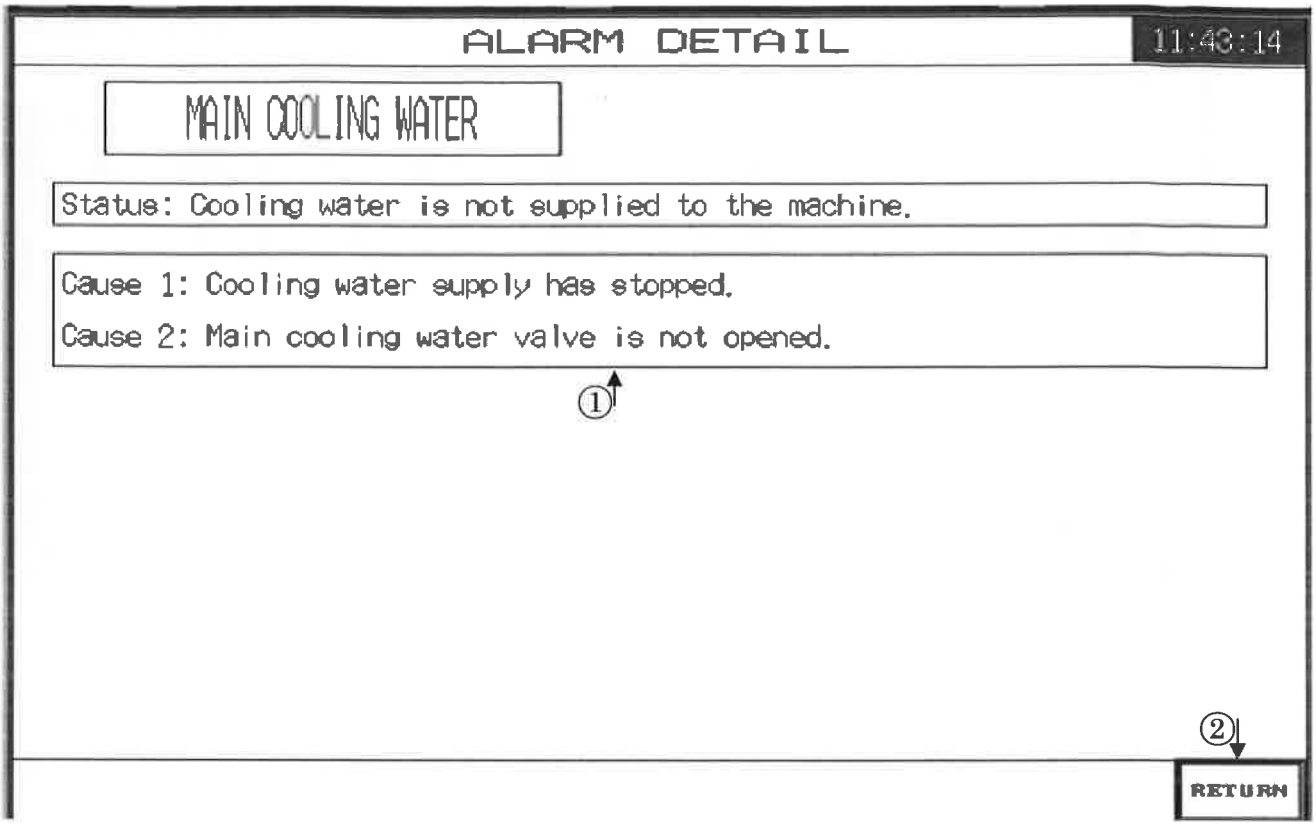

Figure 14. ALARM DETAILS

① Pressing a button (pilot lamp) in the "ALARM INDICATION" screen to displays the alarm cause(s).
② Screen switching button.

ALARM HISTORY

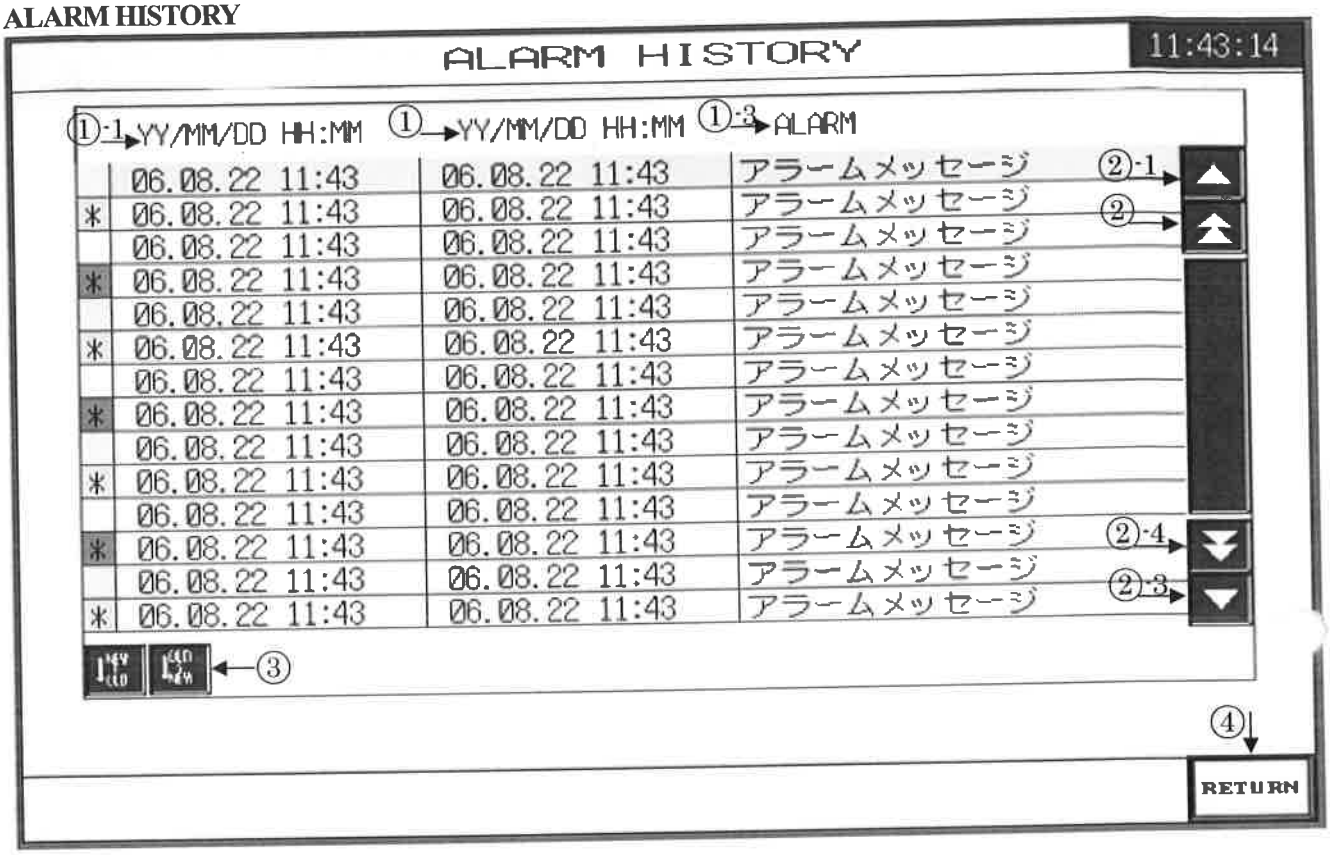

Figure 15. ALARM HISTORY

①-1 Displays the time when the alarm occurred.
①-2 Displays the alarm release time.
①-3 Displays the alarm history.
②-1 Returns to the previous line.
②-2 Returns to the previous page.
②-3 Goes to the next line.
②-4 Goes to the next page.
③ Displays the alarm history date in order of time have occurred.
④ Screen switching button.

■HEARTH OFFSET ADJUST

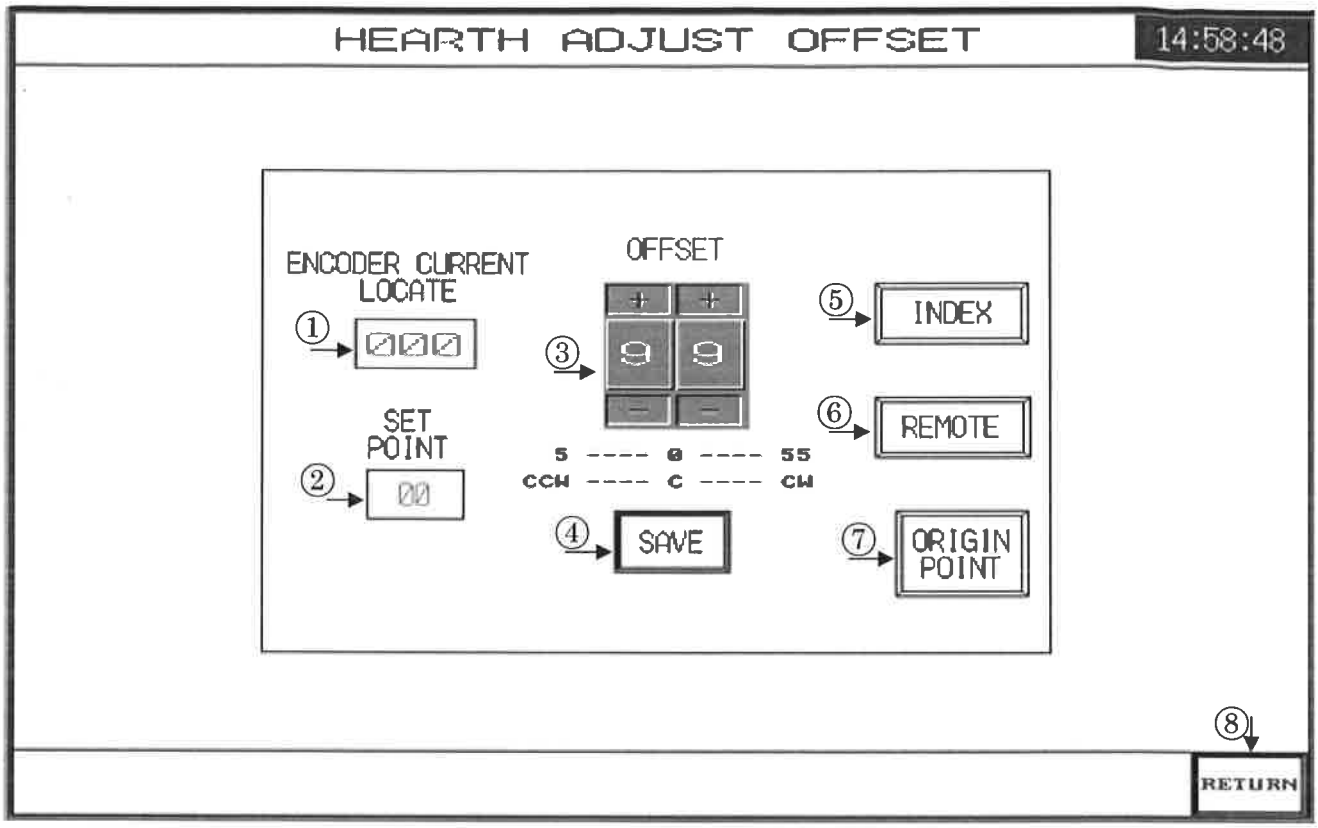

Figure 16 HEARTH OFFSET ADJUST

① Displays the encoder current locate of hearth2 (0-359).
② Displays the current member of hearth2. (1-12)
③ Sets the offset of hearth2. (5-0-55)
④ Save the offset which set by step ③. After pressing this button, please press the "ORIGIN POINT" button to back to origin point.
⑤ Blinks while hearth2 is moving to next one place.
⑥ Switches the control mode of hearth2 to manual. Hearth2 switches change to manual mode while the button is held down.
⑦ Back to origin point.
⑧ Screen switching button.

Section 2. Pump Start and Stop

To activate the system, start the pump first. After starting the pump and the pump is in the ready state, you can exhaust the air from the chamber.

2.1 Weekly Timer

You can set the start time in the weekly timer to automatically start the pump. The weekly timer is the "PUMP DOWN/AUTO STOP" screen in the Programmable Terminal.

■ **Display and Buttons**

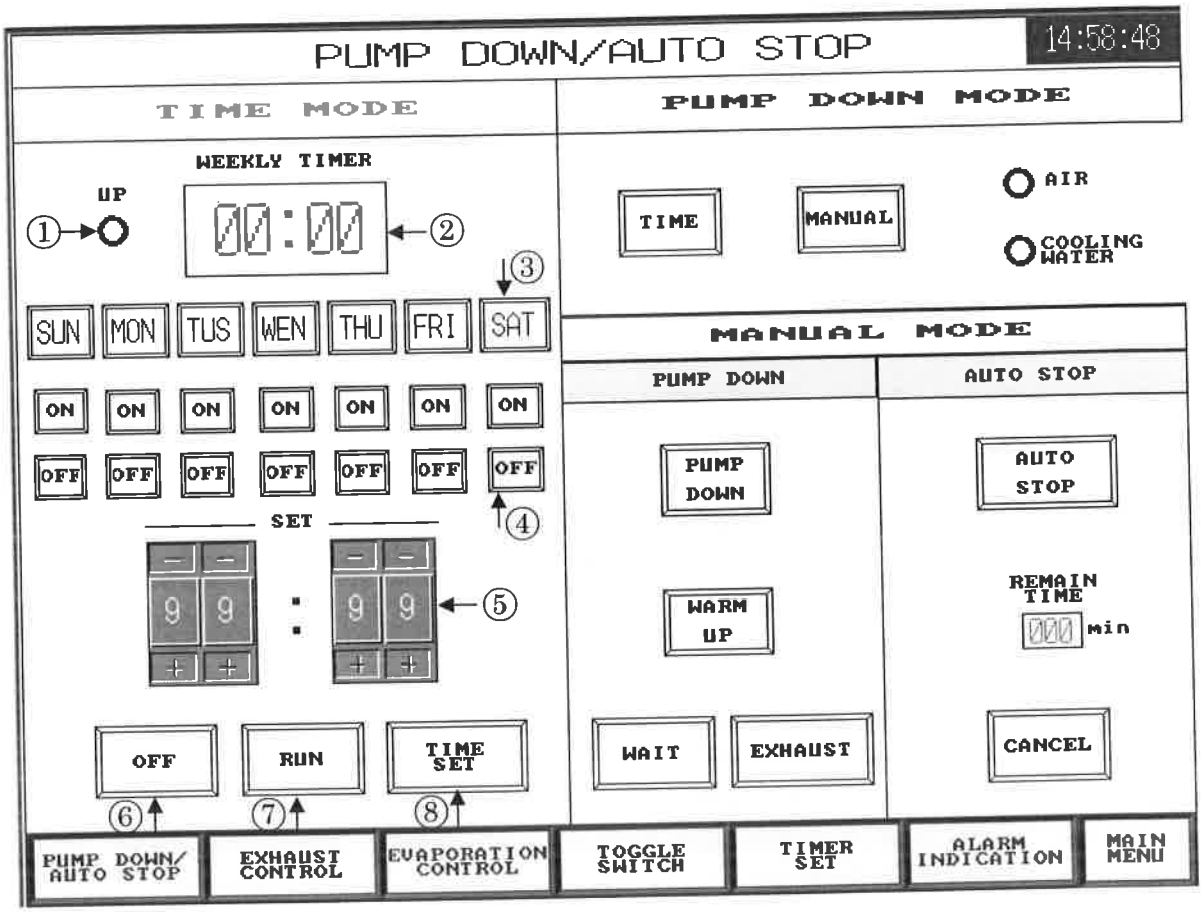

Figure 18. WEEKLY TIMER

① Displays the current time.
② Lights on if the weekly timer has been enabled.
③ The current day (button) of the week lights on.
④ Day of the week "ON/OFF" button. Turn "ON" the day of the week to start the pump. Turn "OFF" the day so the pump does not start.
⑤ Sets the start time. The left 2 digits specify the hour; the right 2 digits specify the minute.
⑥ Turns off the weekly timer operation mode.
⑦ Sets the weekly timer operation mode to "RUN".
⑧ Sets the weekly timer operation mode to "TIME SET"

■ **Setting the start time**

Set the start time as follows:

Procedure

Step 1: Set the start time switch (Figure 18-⑤).

■ **Setting the start day of the week.**

Set the start day of the week as follows:

Procedure

Step 1: Turn "ON" the days of the week you want to start the pump. Turn OFF the days of the week you don't want to start the pump. (Figure 18-④)

■ **Setting the current time**

Set the time as follows:

Procedure

Step 1: Press the "TIME SET" button in operation mode (Figure 18-⑧)

Step 2: Set the start time switch (Figure 18-⑤ and set the current time.

Step 3: Press the "RUN" button in operation mode (Figure 18-⑦) or the OFF button in operation mode (Figure 18-⑥). When either button is pressed, the time is changed.

2.2 Starting the Pump

You can start the pump manually or automatically. The pump is automatically started with the weekly timer.

■ **Manually starting the pump**

Procedure

Step 1: Press the main power "ON" button (Control panel/Main operation panel).

Step 2: Press the PUMP DOWN MODE "MANUAL" button (Figure 2-③). The start mode is changed to MANUAL.

Step 3: Press the "PUMP DOWN" button (Figure 2-⑤).

■ **Automatically starting the pump with the weekly timer**

Procedure

Step 1: Set the start time and day.
(Refer to 2.1. Weekly Timer.)

Step 2: Press the "RUN" button (weekly timer) (Figure 18-⑦). The weekly timer operation mode is changed to RUN.

Step 3: Press the PUMP DOWN MODE – "TIME" button (Figure 2-④). The start mode is changed to AUTO.

The pump is automatically started on the day of the week and time set above.

■ **Pump ready**

In about 45 minutes after the pump has started, the "COOL DOWN" button (Figure 2-⑥) turns on and the pump is ready.

■ **Restarting the pump**

When the diffusion pump is warmed up, restart the pump as follows:

Procedure

Step 1: Press the main power "ON" button (Control panel/Main operation panel).

Step 2: Press the PUMP DOWN MODE "MANUAL" button (Figure 2-③). The start mode is changed to MANUAL.

Step 3: Press the "PUMP DOWN" button (Figure 2-⑤).

Step 4: After the pump has started, make sure that the "DP" button (Figure 3-⑦-6) in the EXHAUST CONTROL screen has turned on. Press the "WARM UP" button (Figure 2-⑥). The pump is

in the ready mode.

2.3 Stopping the Pump

■ Automatic stop

Machine can be stopped automatically after exhaust air inside chamber at set time.

Procedure

Step 1: Press the "AUTO STOP" button (Figure 2-⑨). The confirmation screen appears.

Step 2: Press the "YES" button, then exhaust air from the chamber. And when the exhaust procedure is finished, meissner coil defrost starts. After the defrost procedure, the instrument will stop 90 minutes later.

■ Canceling the automatic stop

During automatic stop, you can press the blink "AUTO STOP" button (Figure 2-⑨) to cancel the automatic stop.

Procedure

Step 1: Press the "CANCEL" button (Figure 2-⑩).

Section 3. Exhaust System

The three buttons automatically exhaust the air from the chamber, input the atmospheric air and regenerate the pump.

3.1 Exhausting Air from the Chamber

When the pump is ready, you can exhaust the air from the chamber.

■ **Exhaust by pressing the buttons.**

Procedure

Step 1: Make sure that the "CHAMBER LID" LED (Figure 3-⑬-1) has been lit on.
The "CHAMBER LID" LED will light after you close the chamber lid.

Step 2: Press the "CHAMBER EXHAUST" button (Figure 3-④). The quick exhaust and high vacuum exhaust are done automatically.

■ **Automatically exhaust the air from the chamber**

After starting the pump and when the pump is ready, you can exhaust the air from the chamber.

Procedure

Step 1: Make sure that the "CHAMBER LID" LED (Figure 3-⑬-1) has been lit on.
The "CHAMBER LID" LED will light after you close the chamber lid.

Step 2: Select the operation before the pump is ready. Press the "EXHAUST" button (Figure 2-⑧).

Step 3: Press the "PUMP DOWN" button (Figure 2-⑤).

Then automatically start to exhaust the air from the chamber when pump is ready.

3.2 Input Air into the Chamber

The operation to input the air into the chamber differs depending on the pump ready completed or before ready state.

■ **Before the pump ready state**

Procedure

Step 1: Press the CHAMBER EXHAUST button (Figure 3-④). The "CHAMBER EXHAUST" button flashes.

Step 2: Press the "CHAMBER VENT" button (Figure 3-⑥). The air is automatically input into the chamber.

■ **After pump ready state**

Procedure

Step 1: Press the "CHAMBER VENT" button (Figure 3-⑥). The air is automatically input into the chamber.

If the exhaust system is in the waiting mode (the "CHAMBER VENT" button is turned on), to do the steps for before the pump ready state.

3.3 Idle state of exhaust system

The idle state of exhaust system means the exhaust system is not in the condition of air exhaust or air introduction. (The pump stops and only the fore valve opens.)

Procedure

Step 1: Press the "VALVE ALL CLOSE" button(figure3-⑤) and then all valve of exhaust system is closed.

Step 2: Press the "CHAMBER VENT" button(figure3-⑥) and then the fore valve open.

3.4 Exhaust System – Manual Operation

You can manually operate the valves and pump in the exhaust system.

Procedure

Step 1: Press the EXHAUST MODE "MANUAL" button (Figure 3-②). The exhaust system control mode is changed to MANUAL. You can operate the buttons (Figure 3-⑦-1 to 10) for the valve and pump.

To change the exhaust system control mode to AUTO, press the EXHAUST MODE "AUTO" button (Figure 3-③). The mode is changed to AUTO.

Section 4. Evaporation System

Normally the computer automatically controls the evaporation system units but you can control them manually. The main power must be turned on to control the evaporation system units.

4.1 Dome Rotation

■ **Automatically turn on/off the dome**

By linking to the automatic exhaust operation, you can automatically turn on/off the rotation.

Procedure

Step 1: Press the DOME ROTATION – "AUTO" button (Figure 9-⑥).

■ **Manually turn on/off the dome**

Procedure

Step 1: Press the DOME ROTATION "MANUAL" button (Figure 9-⑥). The dome starts rotating.

Step 2: To stop the rotation, press the DOME ROTATION "OFF" button (Figure 9-⑥).

■ **Setting the dome rotation speed**

In the automatic evaporation, the dome rotates at the speed set here.

Procedure

Step 1: Set the dome rotation speed by selecting the LOW/HIGH switch (Figure 3-⑯& Figure 3-⑰).
(Range: 10 to 30 (High)/10 to 15 (Slow))

The relationship between setting and the number of revolutions is as follows:

Setting: 5 to 30

Number of revolutions: About 5 to About 30 [r.p.m]

■ **Dome rotation, stop and changing the speed**

The dome gradually starts and stops to avoid shocks caused by sudden speed changes.

4.2 Heater

4.2.1 Operation with halogen heater

■ **Automatically turning on/off the eater**

By linking to the automatic exhaust operation, you can automatically turn on/off the halogen heater.

Procedure

Step 1: Press the HALOGEN HEATER "AUTO" button (Figure 9-④).

■ **Turning on/off the halogen heater by set timer**

By linking to the set timer, you can turn on/off the halogen heater.

Procedure

Step 1: Press the HALOGEN HEATER "BAKING" button (Fig. 9-④).

■ **Manually turning on/off the monitor heater**

Procedure

Step 1: Press the HALOGEN HEATER " MANUAL" button (Fig. 9-④). Halogen heater turns on.

Step 1: Press the HALOGEN HEATER "OFF" button (Fig. 9-④). Halogen heater turns off.

■ **Set the halogen heater heating timer.**

Procedure

Step1: Press the "HALOGEN HEATER" button (Fig. 10- ⑨-1). Displays heater timer setting screen.

Step2: Input the setting time of heater timer, then press "RETURN" button.

■ **Selecting the heating temperature of the halogen heater**

You can set up to 9 sets of monitor temperature control data. You can select a temperature setting from these three data sets.

Procedure

Step 1: Press the "BANK NO" switch (Figure 7-⑧-4). Select a bank No. (1 to 9).

4.3 Shutter

■ **Opening and closing the EB shutter**

Procedure

Step 1: Press the destination shutter button (Figure 4-①). If the shutter has been open, it closes. If the shutter has been closed, it opens.

4.4 Automatic Pressure Control (APC)

■ **Turning on/off the APC**

Procedure

Step 1: Press the APC "ON" button (Figure 4-③). The APC valve controller turns on.
After turning on the APC and pressing the APC "ON" button again, you can turn off the APC.
You can operate the APC only when the high vacuum valve in the exhaust system is open.

4.5 Mask

Procedure

Step 1: Press the expected mask button (Fig.4- ②). If exist, the EXIST lamp lights on. If not exist, the NONE lamp lights on. Mask can't be existed simultaneously.

4.6 Hearth

4.6.1 Operation of Hearth (12point)

■ **Make Hearth move one point (30 degrees)**

Operation

Step 1: Push "REMOTE" button (Figure4 -⑩-6) and then push "INDEX" button (Figure4 - ⑩-5). The hearth can move one position (18 degrees).

■ **Make hearth move to the set point (1-12)**

Operation

Step 1: Adjust the "POINT" switch (Figure 4-⑩-3) to set the target point No..

Step 2: Press the "REMOTE" button (figure 4-⑩-6) and then the "MOVE" button (figure 4-⑩-4). The hearth moves to the set point

■ **Make the hearth move to the origin point**

There are 360 (0-359) addresses on hearth. "0" means origin position. (For point is "1")

Operation

Step 1: Press the "REMOTE" button (Figure 4-⑩-6) and then "ORIGIN POINT" button (Figure 4-⑩ -7). The hearth moves to the origin (For point is "1") point.

■ **Set the hearth to the origin point**

It is necessary to reset the origin point of the hearth2 when the rotation axis has shifted by some reasons.

Operation

Step 1: Press the "ORIGIN POINT" button (Figure 4-⑩-7) over 10 seconds. The "HEARTH OFFSET ADJUST" screen can be displayed.

Step 2: Set the "OFFSET" switch (0 to 55) (Figure 13-③).

Step 3: Push the "SAVE" switch (Figure 16-④). Save the value.

Step 4: Push the "INDEX" button (Figure 16-⑤) while push the "REMOTE" button (Figure 16-⑥).
Step 5:Make sure the hearth is on the origin point. If shifted, correct once more.

4.7 Crystal Rotary Sensor

■ **Replacing the crystal**

Procedure

Step 1: Press the desired number of "CRYSTAL ROTARY SENSOR." (Figure 4-⑥) Selected crystal can be replaced. Replacement of crystal can be performed during rate control.

■ **Automatically replacing the crystal**

If a crystal failure error occurs in crystal coating thickness gauge, the crystal is automatically replaced. However, Crystal No.6 will not be replaced automatically even if CRYSTAL FAILURE is found.

4.8 Dome flip-over unit

■ **Automatically substrate change to another side**

By linking to the automatic coating operation, you can automatically change to substrate's another side.

Procedure

Step 1: Press the DOME FLIP-OVER UNIT "REMOTE" button (Figure 8-①).

■ **Manually substrate change to another side**

Procedure

Step 1: Press the DOME FLIP-OVER UNIT "LOCAL" button (Figure 8-②)
Step 2: Press the DOME ROTATION "MANUAL" button (Figure 9-⑥)
Step 3: Press the DOME FLIP-OVER UNIT "START" button (Figure 8-③), Then automatically substrate change to another side.

Section 5. Troubleshooting

5.1 Error Recovery

If the system detects an error, the appropriate warning lamp (red) lights on and a buzzer is output. You can recover the error as follows:

Procedure

Step 1: Press the "BUZZER STOP" button (Figure 9-③). The buzzer stops.

Step 2: Check the error on the "ALARM INDICATION" screen.

Step 3: Check the alarm pilot lamp and follow the appropriate error recovery procedure shown in 5.2.

Step 4: Press the ALARM RESET button (Figure 9-⑤).

WARNING: Be careful of the rotating and moving units. They may rotate/move suddenly when you recover the error.

5.2 Warning Lamps and Possible Causes

When an alarm pilot lamp comes on the "ALARM INDICATION" screen, follow the appropriate error recovery procedure listed below.

■Display: MAIN COOLING WATER
Error: No cooling water to the system.
Cause 1: Cooling water system failure.
Cause 2: Main cooling water valve – Not open.

■Display: CWV2 COOLING WATER
Error: No cooling water to the system.
Cause 1: Cooling water system failure.
Cause 2: Main cooling water valve – Not open.

■Display: EXHAUST COOLING WATER
Error: Cooling water flow to the rotary pump system is low.
Cause 1: The cooling water flow to the system is low.
Cause 2: The float in the cooling water flow switch cannot move properly due to dirt.
Cause 3: Cooling water pipe failure.
Cause 4: Cooling water pipe – Clogged.
Cause 5: Ball valve: Not open.

■Display: DP COOLING WATER
Error: Cooling water flow to the diffusion pump system is low.
Cause 1: The cooling water flow to the system is low.
Cause 2: The float in the cooling water flow switch cannot move properly due to dirt.
Cause 3: Cooling water pipe failure.
Cause 4: Cooling water pipe – Clogged.
Cause 5: Ball valve: Not open.

■Display: EB COOLING WATER
Error: Cooling water flow to the EB Gun and the hearth is low.
Cause 1: The cooling water flow to the system is low.
Cause 2: The float in the cooling water flow switch cannot move properly due to dirt.
Cause 3: Cooling water pipe failure.

Cause 4: Cooling water pipe – Clogged.
Cause 5: Ball valve: Not open.

■Display: XTAL COOLING WATER
Error: Cooling water flow to the crystal rotary sensor is low.
Cause 1: The cooling water flow to the system is low.
Cause 2: The float in the cooling water flow switch cannot move properly due to dirt.
Cause 3: Cooling water pipe failure.
Cause 4: Cooling water pipe – Clogged.
Cause 5: Ball valve: Not open.

■Display: POLYCOLD COOLING WATER
Error: Cooling water flow to the polycold chiller is low.
Cause 1: The cooling water flow to the system is low.
Cause 2: The float in the cooling water flow switch cannot move properly due to dirt.
Cause 3: Cooling water pipe failure.
Cause 4: Cooling water pipe – Clogged.
Cause 5: Ball valve: Not open.

■Display: TOGGLE SWITCH
Error: The toggle switch is not set (automatic side).
Cause 1: The toggle switch is not set (automatic side).

■Display: PLC BATTERY
Error: Alarm lamp for PLC program backup battery: Low.
Cause 1: Alarm lamp for PLC battery failure signal ON.

■Display: UPS ALARM
Error: Alarm signal ON from UPS.
Cause1: UPS occurs error.

■Display: UPS OPERATION
Error: UPS is operated.
Cause1: Power blackout is occurred.

■Display: ABNORMAL PRESSURE
Error: The pressure of the chamber is abnormal.
Cause 1: Chamber leak
Cause 2: The exhaust of the rotary pump is low.
Cause 3: The exhaust of the mechanical booster pump is low.
Cause 4: The exhaust of the diffusion pump1,2 is low.

■Display: RP THERMAL
Error: Tripping (Rotary pump thermal: overloaded or missing phase)
Cause 1: Chamber lid – Not closed.
Cause 2: Chamber lid – The packing surface has something on it.
Cause 3: Chamber or Pipe: Leak.
Cause 4: Cooling water pipe failure.
Cause 5: Cooling water pipe – Clogged.
Cause 6: Ball valve: Not open.

■Display: MBP THERMAL
Error: Tripping (Machine booster pump thermal: overloaded or missing phase).
Cause 1: Chamber lid - Not closed.
Cause 2: Chamber lid – The packing surface has something on it.
Cause 3: Chamber or Pipe: Leak.

■Display: DP CURRENT
Error: The current in the diffusion pump's heater is lower than the required current.
Cause 1: The diffusion pump's heater failure.
Cause 2: the diffusion pump's circuit protector is not ON.

■Display: EB SHUTTER
Error: EB shutter failure.
Cause 1: Object within the EB2 shutter moving range.

■Display: XTAL ROTARY SENSOR
Error: The crystal replacement did not complete within the set time.
Cause 1: Rotary sensor driver failure.

■Display: POLYCOLD
Error: The abnormal signal of polycold chiller is ON.
Cause 1: Polycold chiller failure.

■Display: Defrost InputGas Pressure
Error: There was not gas input when defrost is performed from rough exhaust.
Cause 1: Setting of PV gas induction is not properly input.

■Display: Polycold1 Defrost Completion Time
Error: Defrost was completed within 1 minute from defrost start.
Cause 1: Incorrect judgment of defrost completion by polycold, and little water vapor had been successfully absorbed.

■Display: Polycold1 Defrost Completion Timeout
Error: Defrost has yet not been completed within 3 minutes from defrost start.
Cause 1: Loose connection, circuit cutoff, or too much absorption water vapor.

■Display: IM2R1
Error: No ready signal from IM2R1
Cause 1: IM2R1 sensor failure (cable disconnection).
Cause 2: sensor cable failure.
Cause 3: The power of vacuum meter: Not on.

■Display: HALONGEN UPPER LIMIT
Error: Dome heater temperature is over 135℃.

■Display: DOME THERMO COUPLE
Error: Thermo couple is no input.
Cause: Connector or screw is not driven tightly, loosen, or broken.

■Display: WRITE TARGET VALVE OF HALONGEN HEATER
Error: Setting value can not be inputted.
Cause: Looseness of the connector and the screw, disconnection, breakage, trouble.

■Display: DP THERMO COUPLE
Error: Thermo couple is no input.
Cause: Connector or screw is not driven tightly, loosen, or broken.

■Display: AIR PRESSURE
Error: Pressure of compressed air is dropped below regular value.
Cause1: Compressed air supply failure.
Cause2: Compressed air pipe failure

■Display: FORELINE PRESSURE
Error: After specified period of pump starts, the pipe pressure can't drop below the specified value.
Cause 1: Pipe leak.
Cause 2: Something wrong of rotary pump's exhaust ability.

■Display: DP PRESSURE
Error: After specified period of pump starts, the diffusion pump pressure can't drop below the specified value.
Cause 1: Diffusion pump leak.
Cause 2: Something wrong of rotary pump's exhaust ability.

■Display: APC PRESSURE
Error: When the APC is in operation, the chamber pressure becomes higher than specified value.
Cause 1: APC is set too high.
Cause 2: APC failure

■Display: HEARTH
Error: Hearth does not rotate.
Cause 1: Hearth motor – Overloaded.
Cause 2: Hearth circuit protector: Not on

■Display: CHAMBER ROUGHING TIME
Error: Quick exhaust overtime
Cause 1: Chamber lid – Not closed.
Cause 2: Chamber lid: There is an object on the packing surface.
Cause 3: Chamber failure: Leak.
Cause 4: Rotary pump exhaustion failure.

■Display: XTAL FAIL
Error: Crystal coating thickness over limit – Crystal fail signal ON.
Cause 1: Crystal failure (crystal coating thickness over limit).

■Display: DOME ROTATION
Error: The dome does not rotate within the set time.
Cause 1: Driving system: Overloaded.
Cause 2: Dome rotation breaker: Not on.

■Display: MONITOR ROTATION
Error: The monitor does not rotate within the set time.
Cause 1: Driving system: Overloaded.
Cause 2: Monitor rotation breaker: Not on.

■Display: DOME FLIP-OVER UNIT

Error: The substrate revering operation was not completed.
Cause 1: There is an obstacle around the reversing cylinder.
Cause 2: Defective operation of reversing cylinder.
Cause 3: Breakdown and disconnection of positional detection, advancement edge and retreat edge sensor.
Cause 4: The dome doesn't rotate

■Display: MASK
Error: Mask failure.
Cause 1: Object within the mask1 moving range.

■Display: AUTOMATIC SYSTEM
Error: The computer detected an error during automatic evaporation.
Cause 1: RH or EB2 controller failure.
Cause 2: RH or EB2 remote controller failure.
Cause 3: Evaporation time – completed.
Cause 4: Automatic pressure controller failure.
Cause 5: Chamber box open.
Cause 6: The computer detected an error during automatic evaporation.

■Display: WATCHING DOG TIMER
Error: Watch dog timer exceeded (automatic evaporation).
Cause 1: Computer failure during automatic evaporation.
Cause 2: Interface failure between the host computer and PLC, XTC/2, or Lock-in.

■Display: PC ALARM
Error: The system received an alarm signal from the host computer.
Cause 1: The host computer detected an error during the evaporation, or the system requires the operator intervention to continue the evaporation.

■Display: PC BUZZER
Error: The system received a buzzer signal from the host computer.
Cause 1: The system hints the operator.

5.3 Hardware Errors

If a hardware error occurs, follow the appropriate error recovery procedure listed below.

■ Symptom: Pressing the "CHAMBER EXHAUST" button (Figure 3-④) does not start the exhaustion process.

Cause 1: The pump is not ready.

Recovery 1: When the pump is ready, press the "CHAMBER EXHAUST" button (Figure 3-④) again.

Cause 2: The chamber lid is not completely closed.

Recovery 2: Tighten the lid tightening metal fixture until the "CHAMBER LID" LED (Figure 3-⑬-1) lights on.

Cause 3: The fore valve close signal is not ON.

Recovery 3: Make sure that the fore valve is closed. Make sure that the auxiliary close switch LED has lighted on. If the LED has not lighted on, adjust the close switch by moving it up/down.

■ Symptom: Pressing "CHAMBER VENT" button (Figure 3-⑥) does not start inputting the air to the chamber.

Cause 1: High vacuum valve close signal – Not on.

Recovery 1: Make sure that the high vacuum valve is closed. Make sure that the high vacuum valve close switch LED has lighted on. If the LED has not lighted on, adjust the switch position by moving it up/down.

Section 6. Maintenance

6.1 PLC Maintenance

■ Replacing the battery

Replace the program backup battery every 3 to 5 years. When the battery is low, the "PLC BATTERY" warning lamp is turned on the "ALARM INDICATION" screen.

* Battery
  Name: Battery set
  Model: CS1W-BAT01

6.2 Programmable Terminal Maintenance

■ Replacing the backlight

When the brightness of the display backlight is low, replace the backlight. (Normally, every 50,000 hours.)

* Backlight
  Ask to the customer service.

■ Replacing the battery

Replace the memory backup battery every 3 – 5 years. When the battery power is low, the RUN LED warning lamp in the programmable terminal will turns on (orange) during operation.

* Battery
  Model: CJ1W-BAT01

6.3 Inspection

To use the system in an optimal condition, inspect the control panel regularly.

⚠ Warning

Turn off the power before you inspect the control panel. Failure to do so may result in electrical shock.

■ Inspection frequency

Inspect the control panel every 6 months to 1 year.

■ Inspection tools

Use the following tools for inspection.

- Spanner
- Screwdrivers (Plus, Minus)

■ Preparation

Make sure to turn off the power before inspection.

- Turn off the control panel breaker.

■ Inspection items

① Control panel fan filter - Dust
  Criteria: Not clogged with dust
  Inspection method: Visual

② Terminal unit: Dust

Criteria: No dust accumulation
Inspection method: Visual

③ Terminal unit: Loose screws
Criteria: No loose screws
Inspection method: Spanner/screwdrivers

④ Cables: Connection
Criteria: Properly connected and locked. No loose connection.
Inspection method:

⑤ Cables
Criteria: Not pulled.
Inspection method: Visual

6.4 Other Devices and Parts Maintenance

■ **Please read relational devices and parts manual carefully.**