

TOSHIBA MACHINE Corporation
Robot Controller
TS3000/TSL3000/TS3100

Manual



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• For TS3000/TSL3000/TS3100 configuration details and operations, refer to the TS3000/TSL3000/TS3100 instruction manual.

1.Overview

This is a sample project connection with the Robot Controller, TS3000/TSL3000/TS3100 manufactured by TOSHIBA MACHINE Corporation.

When using the Scara Robot, we provide the following features to help improve understanding.

- Robot Controller status can be checked on a GP unit.
- Batch monitoring of the state of signals being communicated between the robot and TCmini (interface relay state). Bits can also be forcibly set and reset.
- Acquire and display the robot's current position via TCmini.
- Details of current alarm and alarm history can be viewed on a GP unit.
- The alarm history can be checked using the alarm history function on the HMI.
- "Alarm reset", "program reset", and "signal reset" instructions can be output to the controller.
- As maintenance functions, device monitor, I/O monitor time chart, and data transfer to connected device screens have been prepared.

2.Restrictions and Notes

1) Restrictions

- This product has been manufactured as a general-purpose part for general industries, and has not been designed or manufactured to be incorporated in a device or system used in purposes related to human life.
- Before using the product for special purposes such as nuclear power, electric power, aerospace, medicine or passenger movement vehicles, please consult with Pro-face.
- This product has been manufactured under strict quality control. However, when installing the product where major accidents or losses could occur if the product fails, install appropriate backup or failsafe functions in the system.

2) Notes

- Pro-face shall retain all intellectual property rights in the files that Pro-face provides.
- Please acknowledge that the downloaded files and any data extracted from such files provide no guarantee for the specs of Pro-face products.
- Please use this service at your own risk.
- Operation of a system using this data is not guaranteed in any circumstances.
- This program supports only the ST3301S (QVGA:320×240 256 colors), GP3300T (QVGA:320×240 65,536 colors) and GP4301TW (QVGA:320×240 65,536 colors).
- You can remodel the program by yourself and use the program at your own risk.
- Please acknowledge that Pro-face cannot respond to any inquiries when you are planning to remodel.

- This instruction guide is subject to change without notice.

3.How to use this project file

When using this project file (henceforth known as "the file"), be sure to confirm the following details:

1. How to confirm communication settings.

Connection: refer to the section "5. Device Configuration"

Networking cables: refer to the section "5.5. Connection Cable"

Communication setting: refer to the section "5.6. Communication settings"

2. How to combine with other files

In GP-Pro EX, select [Project] → [Utilities] → [Copy from Another Project].For further details, refer to "Chapter 5 From Startup to Shutdown" in our reference manual. However, there are issues to be aware of, such as overlapping screen numbers, so also refer to section 3) and later.

3. Screen numbers when combining

There may be times when things get overwritten, such as when there are duplicate screen numbers.When combining the file with a file currently being created, be aware of the screen numbers.Refer to section "6.1. Base Screens" for screen numbers that are being used by the file.When combining with 2, it is possible to designate a copy destination screen number before starting to copy. Before combining, be sure to either designate a screen number when copying, or change the screen number in advance.

When changing a screen number, be sure to also change the screen number for the screen replacement switch. Be aware that if no changes are made to the screen replacement destination screen number, unexpected operations may occur.

For the screen transitions, see "6.2 Screen transitions".

4. Changing addresses

When changes are made to the address of a connection device that has been configured on the screen, it will not operate properly.Do not make changes to these addresses.

5. Alarms settings when combining

This file uses the alarm function.

When alarm settings are configured in the file currently being created, if the settings are duplicated, they may be overwritten, so check to ensure the settings are not duplicated.

This file uses "Block 3: word monitor No. 1 to 702".

6. Sampling settings when combining

This file uses the sampling function. When sampling settings are configured in the file currently being created, if the settings are duplicated, they may be overwritten, so check to ensure the settings are not duplicated.

This file uses "Block 1".

7. Screen handling

This file uses the call screen function. Check the screen titles on the screen list window and do not delete screens that include the word "background".

4.Target HMI Devices

4.1. Target Touch Panel HMI Devices

The following shows the display device types for use with this sample project file.

Table 4-1 Target Touch Panel HMI Devices

Device	Target Project Device	Target Device
GP	GP-32**	
	GP-33**B	
	GP-33**L	
	GP-33**H	
	GP-3300T	OK
	GP-33**S	OK
	GP-33**T	OK
	GP-34**	
	GP-35**	
	GP-36**	
	GP-37**	
	GP-4201TW	OK
	GP-4301TW	OK
	GP-4401WW	
	GP-4501TW	
	GP-4***M	
	GP-41**	
	GP-4201T	OK
	GP-4301T	OK
	GP-4401T	
	GP-4501T	
	GP-4601T	
ST	ST-32**	
	ST-3301S	OK
	ST-34**	
	ST-35**	
LT	LT-32**	
	LT-33**L	
	LT-33**S	

NOTE: Items marked with "OK" are usable by making changes to the device type without Convert Resolution.

However, this project was created with GP-Pro EX Ver3.01.202. When this project is used on devices that are not "OK", use the project by converting the type with the latest version of GP-Pro EX.

5. Device configuration

5.1. System configuration

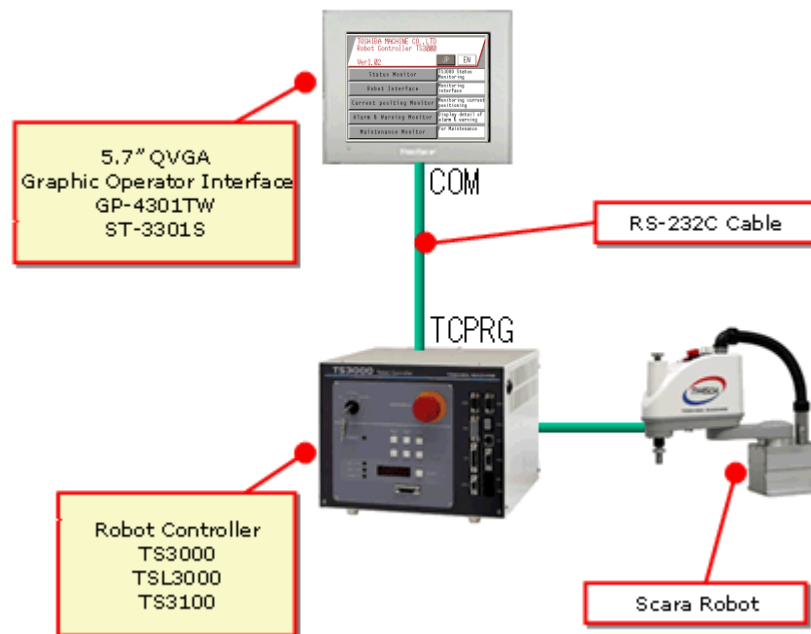


Figure 5-1 System Configuration

Note: The power source specifications for GP and ST differ depending on the device type. For further details, check the catalogs or hardware manuals.

Note: When you use this screen sample, special logic program should be required for the controller.

5.2. Corresponding Display Model

Table 5-2 Digital Electronics Corporation Touch Panel

No	Manufacturer	Series	Model	Comments
1	Digital Electronics Corporation	ST	ST-3301S	QVGA 256 colors
2	Digital Electronics Corporation	GP	GP-4301TW	QVGA 65536 colors

5.3. Connection devices

Tabel 5-3 Connection Devices

No	Manufacturer	Product Name	Series	Model	Comments
1	TOSHIBA MACHINE	Robot Controller		TS3000	
2	TOSHIBA MACHINE	Robot Controller		TSL3000	
3	TOSHIBA MACHINE	Robot Controller		TS3100	

5.4. Software

Table 5-4 Software

No	Manufacturer	Product Name	Series	Model	Comments
1	Digital Electronics Corporation	GP-PRO EX		PFXEXEDV30	Ver3.01.202
2	TOSHIBA MACHINE	Programming Tool		TCPRGOS	

The sample project file was created using GP-Pro EX Ver3.01.202, therefore if using an earlier version than GP-Pro EX Ver3.01.202, an updated is necessary.

5.5. Connection Cable

The connection cable indicates the cable to connect the GP3300/ST3301/GP4301TW and the TS3000/TSL3000/TS3100.

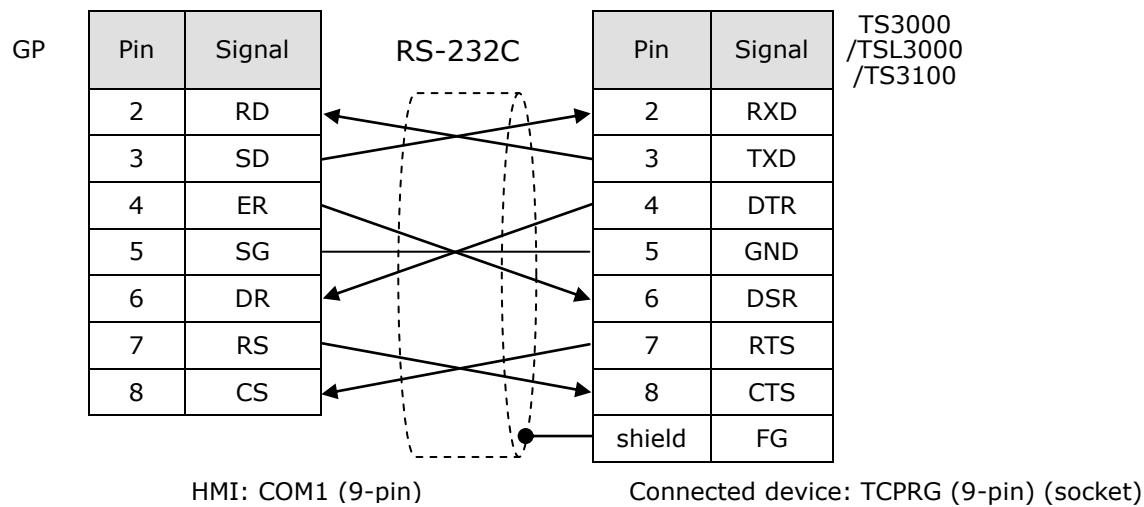


Figure5-5 Cable Diagram

5.6. Communication settings

5.6.1. Pro-EX communication settings

Figure 5-6-1 Pro-EX Communication settings

Table 5-6-1 communication settings

Entry Name	Range	Default
	Japanese	Japanese
port	RS232C	RS232C
communication speed	19,200	9,600
data length	8	8
parity bit	None	None
stop bit	2	2
flow control	ER(DTR/CTS)	ER(DTR/CTS)
Time out	3	3
Retry	2	2
transmittal weight	0	0

5.6.2. Communication settings for connected devices

TS3000/TSL3000/TS3100 settings are automatically detected, so communication settings are not required.

6.Screen Structure

The content below is an explanation based on the "TOSHIBA

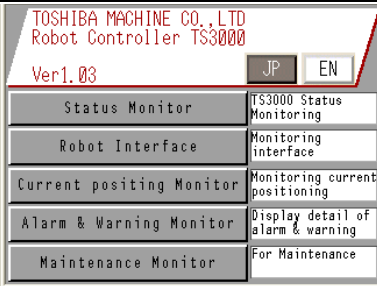
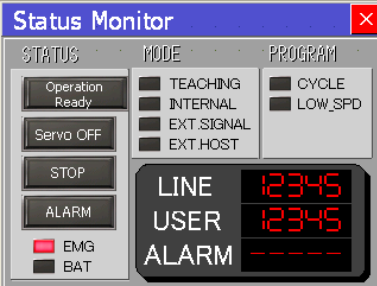
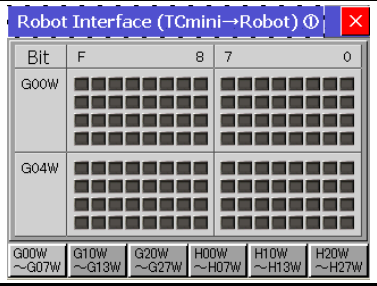
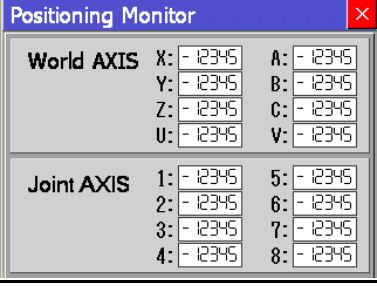
MACHINE_TS3000_GP4301TW.prx " project data. (The displayed screen content is

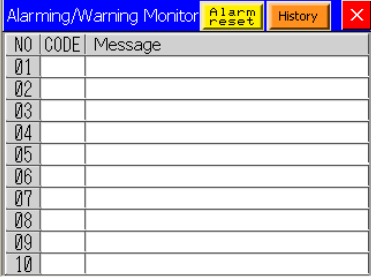
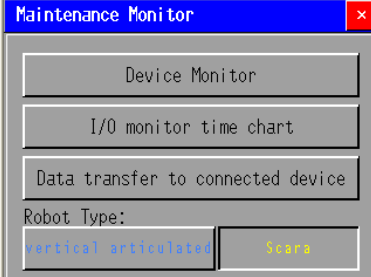
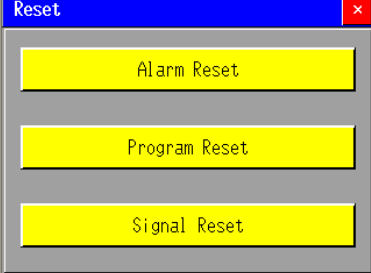
the same regardless of GP Series type)

6.1. Base Screens

These cockpit parts provide the following 7 types of function screens.

Table 6-1 Base Screens

Screen Title	Screen Image	Function
Main Interface		<ul style="list-style-type: none"> Initial screen
Status Monitor		<ul style="list-style-type: none"> TS3000 status monitor
Robot Interface		<ul style="list-style-type: none"> Robot (main section) and TCmini signal communications
Positioning Monitor		<ul style="list-style-type: none"> Current position monitor screen

Screen Title	Screen Image	Function
Alarm/ Warning		<ul style="list-style-type: none"> • Monitor for alarms and warnings occurring on the TS3000 • Alarm/warning details display • History display for alarms and warnings that occurred on the TS3000
Maintenance		<ul style="list-style-type: none"> • Device monitor • I/O monitor time chart • Data transfer to connected device function • Robot type
Reset		<ul style="list-style-type: none"> • Alarm reset • Program reset • Signal reset

6.2. Screen transitions

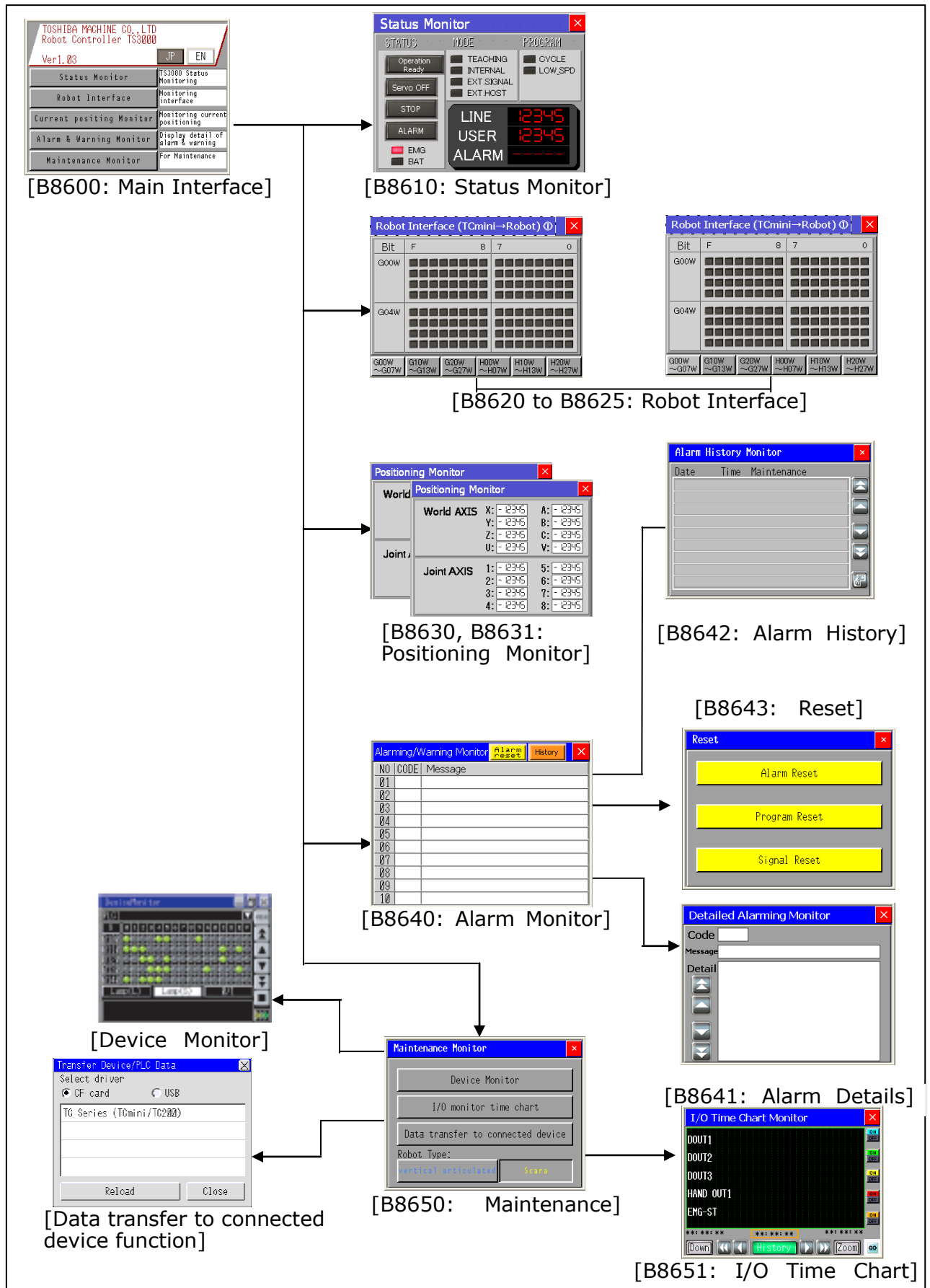


Figure 6-2 Screen transitions

7.Detailed screen explanation

7.1. Main Interface(B8600)

7.1.1. Screen overview

This screen is the initial cockpit parts screen. This screen only switches between the screens.

7.1.2. Screen image

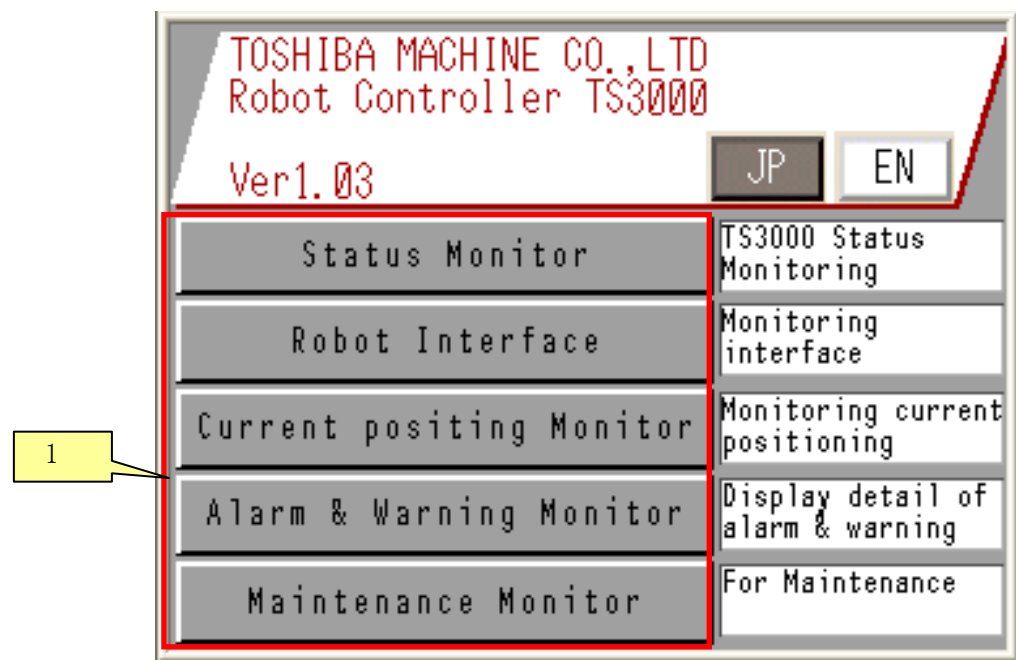


Figure 7-1 Main Interface

Table 7-1 Main Interface

No.	Part	Description
1	Switch	Switches to the monitor screens

7.2. Status Monitor (B8610)

7.2.1. Screen overview

This screen monitors the status.

The content is nearly the same as the TS3000 control panel, however, you can check the status and issue servo ON/OFF and RUN/STOP instructions.

7.2.2. Screen image

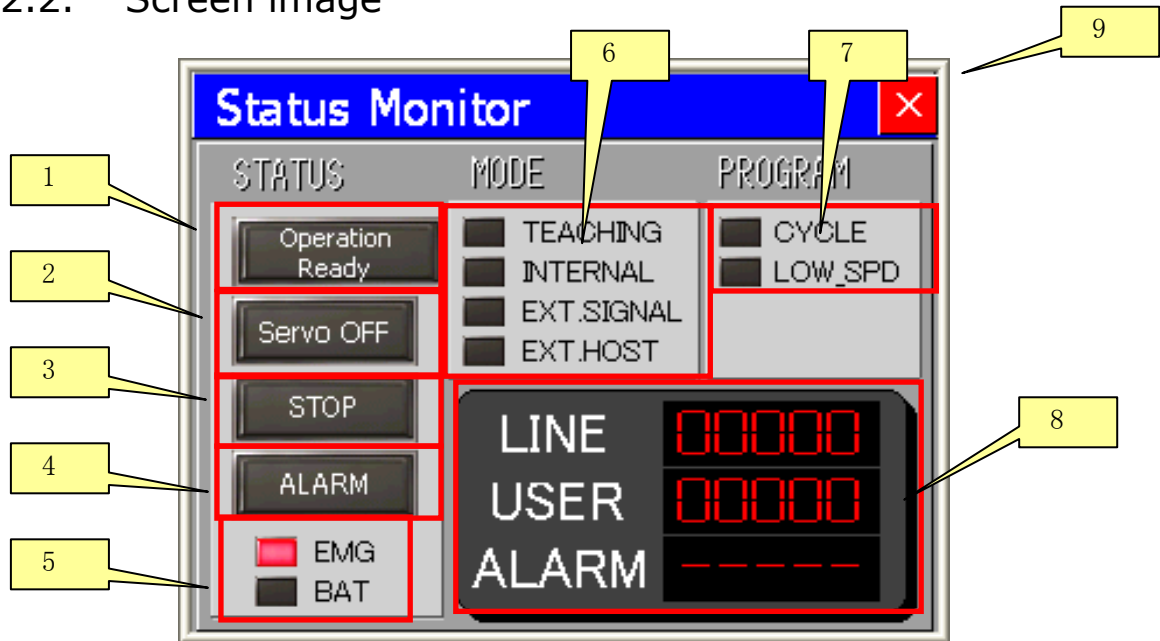


Figure 7-2 Status Monitor

Table 7-2 Status Monitor

No.	Part	Description
1	Switch/lamp	Issues the servo ON/OFF instruction and displays the status in the lamp.
2	Switch/lamp	Issues the program run/stop instruction and displays the status in the lamp.
3	Lamp	Turns on when the controller has finished preparing.
4	Lamp	Turns on when an alarm occurs.
5	Lamp	EMG turns on during an emergency stop and BAT turns on when a battery alarm is occurring.
6	Lamp	The lamp for the selected operation master mode turns on.
7	Lamp	CYCLE turns on during cycle operation mode and LOW_SPD turns on during low speed mode.
8	Numerical display	LINE shows the program execution step count, USER shows the value configured by the program's PLCDATAW, and ALARM shows the currently occurring alarm code. Values cannot be entered.
9	Switch	Switches to the initial screen.

7.3. Robot Interface (B8620 to B8625)

7.3.1. Screen overview

This screen monitors the state of the interface relays communicating signals between the robot (main section) and TCmini.

7.3.2. Screen image

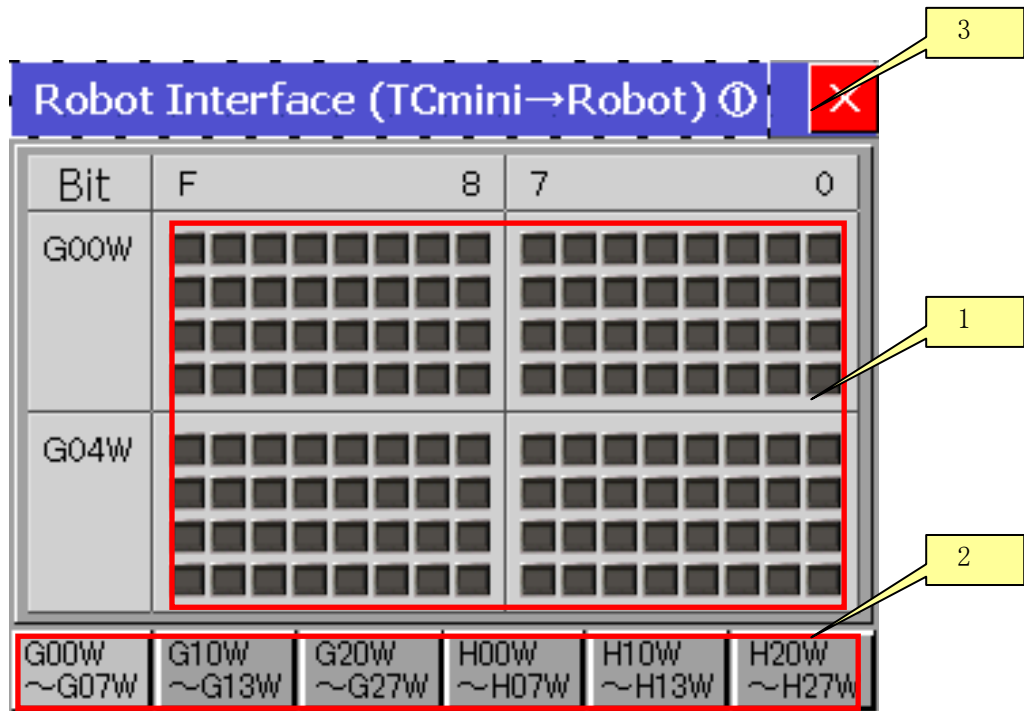


Figure 7-3-1 Robot Interface

Table 7-3: Robot Interface

No.	Part	Description
1	Switch/lamp	When the bit of the corresponding address turns on, the lamp turns on. The bit can be forcibly set by touching it.
2	Switch	Changes the addresses to monitor.
3	Switch	Switches to the initial screen.

7.4. Positioning Monitor (B8630, B8631)

7.4.1. Screen overview

This screen acquires the robot's current position via TCmini.

The values are integers between -32768 and 32767 mm (deg). Values after the decimal point are discarded.

The screen that is displayed corresponds to the robot type selected on the maintenance screen.

7.4.2. Screen image

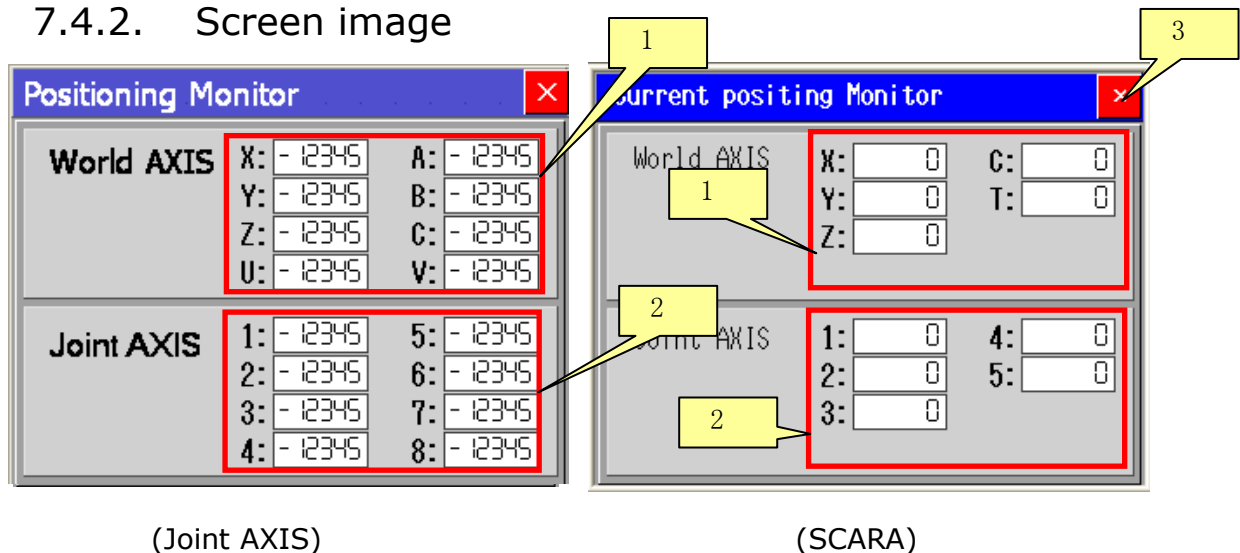


Figure 7-4-1 Positioning Monitor

Table 7-4: Positioning Monitor

No.	Part	Description
1	Numerical display	Displays the current position in the world coordinate system.
2	Numerical display	Displays the current position in the joint coordinate system.
3	Switch	Switches to the initial screen.

7.4.3. D Script

D Script is used to display the screen that corresponds to the robot type.

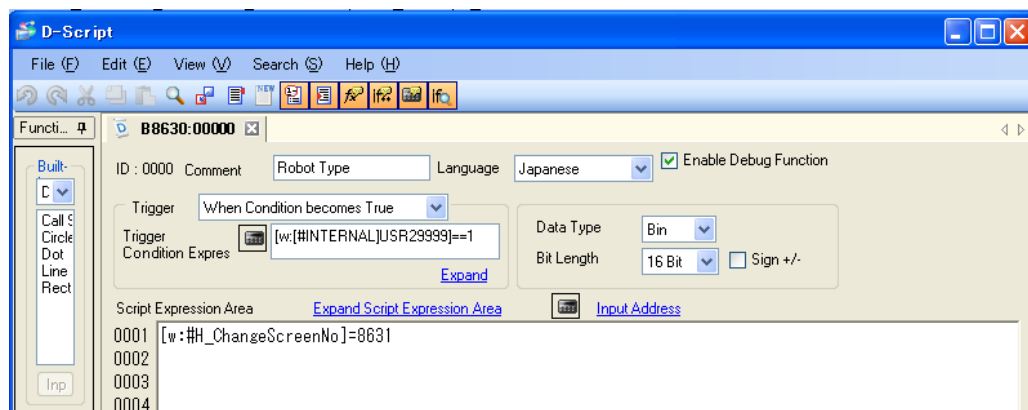


Figure 7-4-2 Positioning Monitor D Script

7.5. Alarming/Warning Monitor (B8640)

7.5.1. Screen overview

This screen displays the currently occurring alarms and warnings.

All of the currently occurring alarms are displayed on the alarm monitor screen. The alarm details are displayed by touching the alarm portion.

7.5.2. Screen image

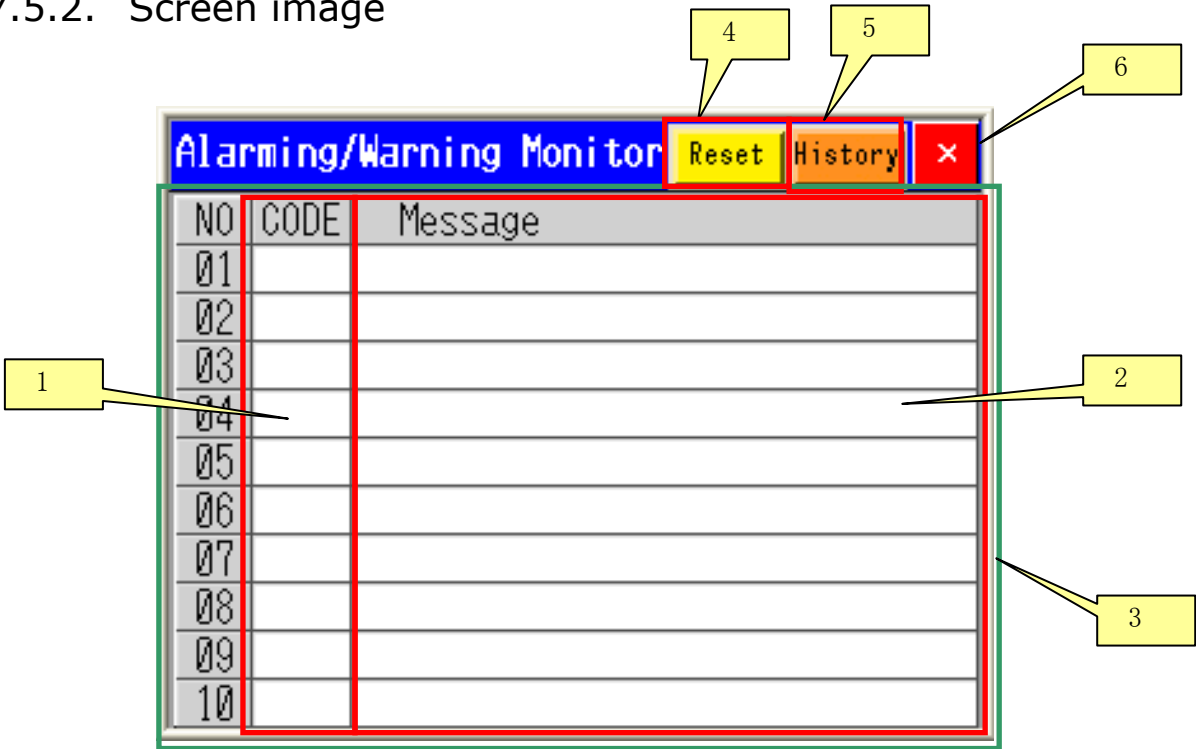


Figure 7-5 Alarming/Warning Monitor

Table 7-5 Alarming/Warning Monitor

No.	Part	Description
1	Numerical display	Displays the code for the alarm that is occurring.
2	Message display	Displays the details for the alarm that is occurring.
3	Switch	When line 01 through 10 is pressed, switches to a screen that displays the details of that alarm.
4	Switch	Switches to the Alarm Reset screen.
5	Switch	Switches to the Alarm History screen.
6	Switch	Switches to the initial screen.

7.6. Detailed Alarming Monitor (B8641)

7.6.1. Screen overview

Displays the details of Alarm.

7.6.2. Screen image

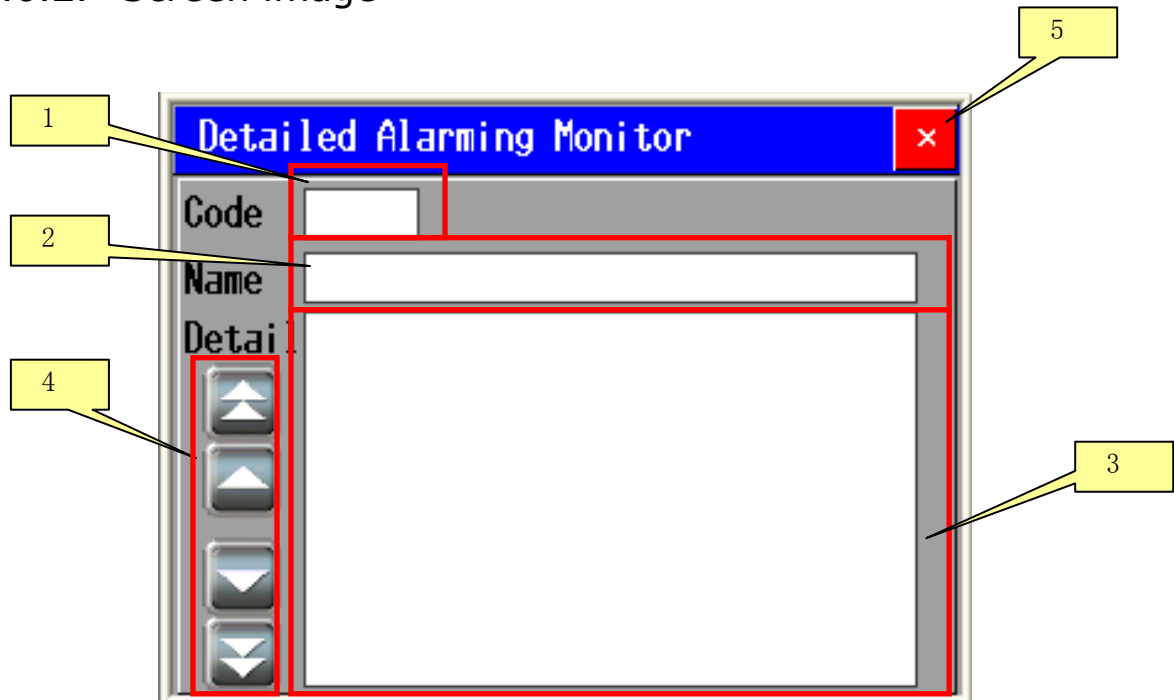


Figure 7-6 Detailed Alarming Monitor

Table 7-6: Detailed Alarming Monitor

No.	Part	Description
1	Numerical display	Displays the code for the alarm that is occurring.
2	Message display	Displays the details for the alarm that is occurring.
3	Message display	Displays the details (alarm content, cause, action, comment).
4	Switch	Scrolls the details display screen.
5	Switch	Switches to the Alarm Monitor screen.

7.7. Alarm History Monitor (B8642)

7.7.1. Screen overview

This screen displays the history of alarms being monitored by the HMI.

This screen is a history display. (Configured by the common settings/alarm settings.)

The content registered as text is displayed in detail by pressing the message display.

7.7.2. Screen image

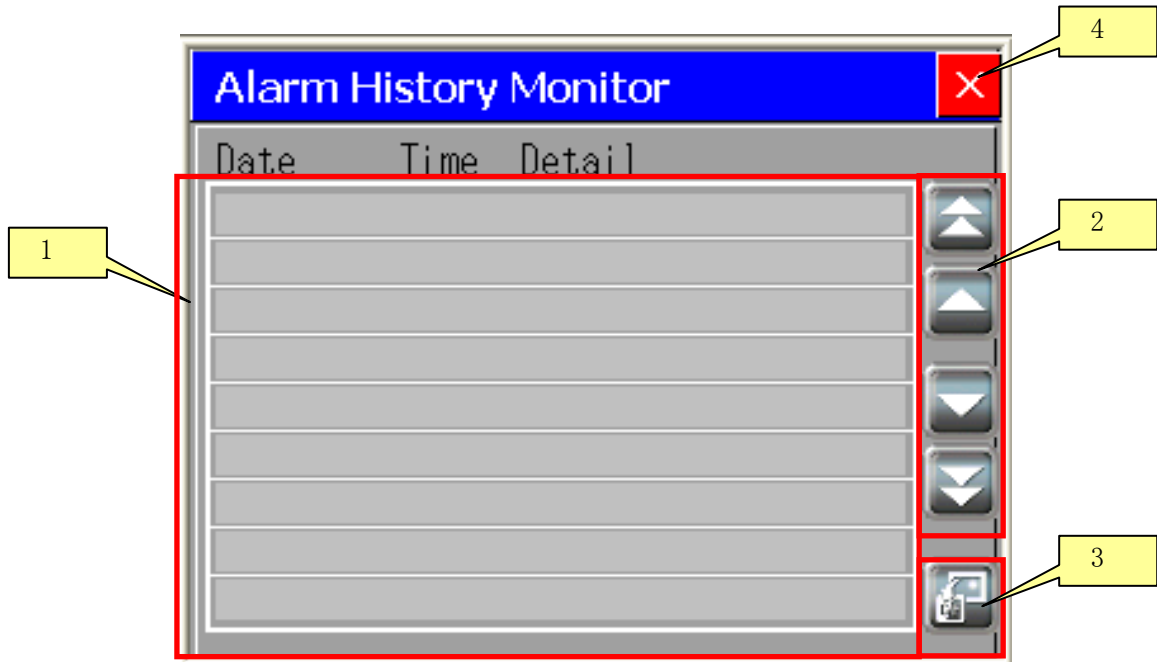


Figure 7-7-1 Alarm History Monitor

Table 7-7: Alarm History Monitor

No.	Part	Description
1	Alarm part	Displays the history for alarms that occurred. When multiple alarms occur simultaneously, the alarms are acquired up to the 3rd alarm. * Registered to acquire up to the 3rd alarm in block 3 of the alarm settings. If you wish to acquire the 4th alarm onward, add the registration.
2	Alarm history scroll switch	When the alarms that occurred cannot be entirely displayed, the display can be scrolled with these switches.
3	Switch	Saves the alarm history information recorded on the touch panel to USB memory as a CSV file. The file name when saved is generated based on the date. Example: If saved on January 1st, the file name is: \ALARM\Z300101.csv
4	Switch	Switches to the Alarm Monitor screen.

7.7.3. Global D Script (ID: 8000)

Global D Script is used to add the date to the file name when saving the alarm history to a CSV file.

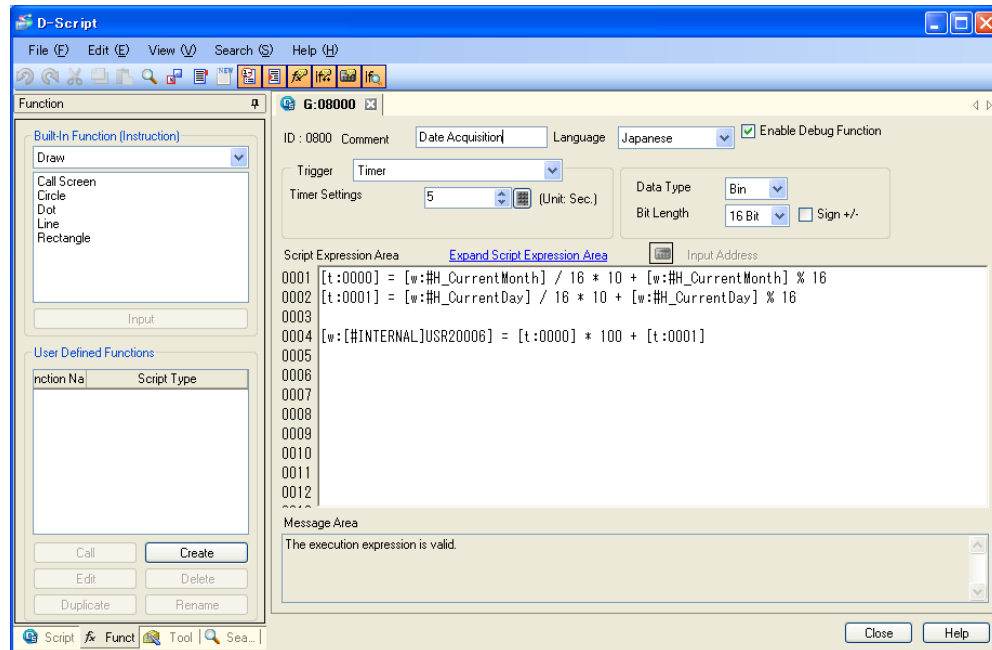


Figure 7-7-2 Date Acquisition

7.8. Reset Monitor (B8643)

7.8.1. Screen overview

This screen outputs the "Alarm Reset", "Program Reset", and "Signal Reset" instructions to the controller.

The three switches on this screen are configured as momentary operations.

If the time the switch is pressed is short, the reset instruction may not be received on the controller.

7.8.2. Screen image

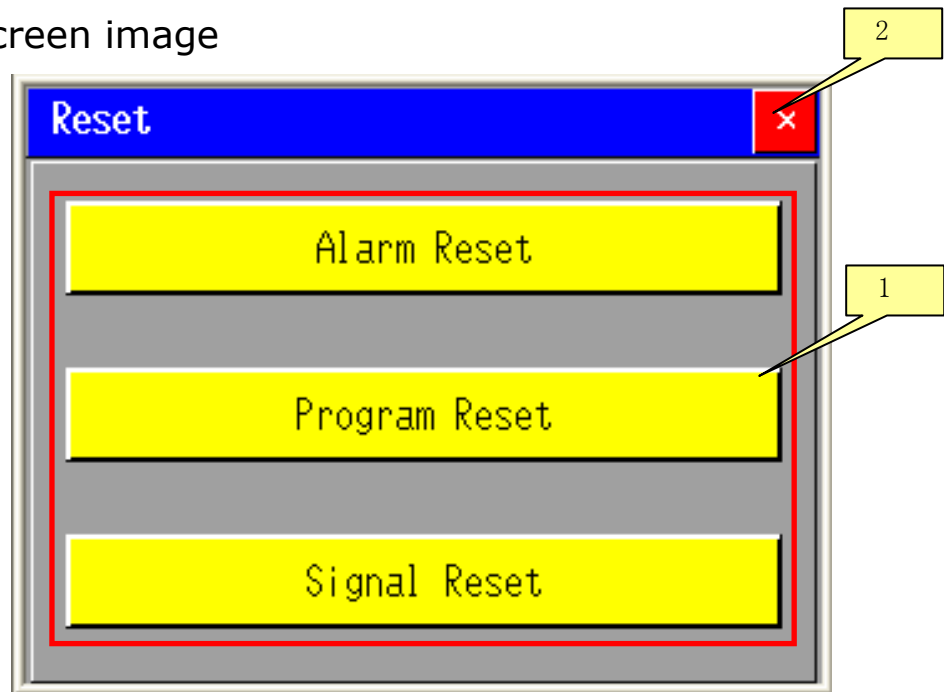


Figure 7-8-1 Reset Monitor

Table 7-8: Reset Monitor

No.	Part	Description
1	Switch	Outputs the "Alarm Reset", "Program Reset", and "Signal Reset" instructions.
2	Switch	Switches to the Alarm Monitor screen.

7.9. Maintenance Monitor (B8650)

7.9.1. Screen overview

This screen is the maintenance function selection screen.

At this time, three types of maintenance functions are provided: the device monitor function, I/O monitor time chart, and data transfer to connected device.

7.9.2. Screen image

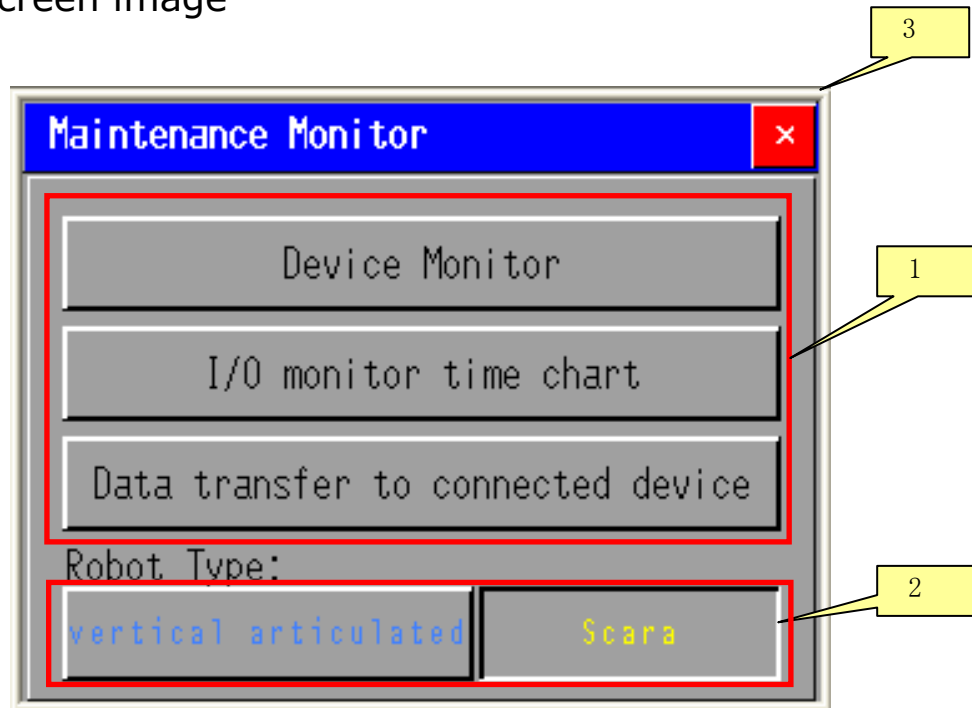


Figure 7-9-1 Maintenance Monitor

Table 7-9: Maintenance Monitor

No.	Part	Description
1	Switch	Switches to the screen for the device monitor function, I/O monitor time chart, or data transfer to connected device.
2	Switch/lamp	Switches the robot type. The default is SCARA.
3	Switch	Switches to the initial screen.

* The device monitor function and the data transfer to connected device function use the standard connection driver functions (Toshiba Machine TC Series). For details, refer to the GP-Pro EX reference manual.

7.9.3. Global D Script

Global D Script is used to set the initial value of the robot type at startup to SCARA.

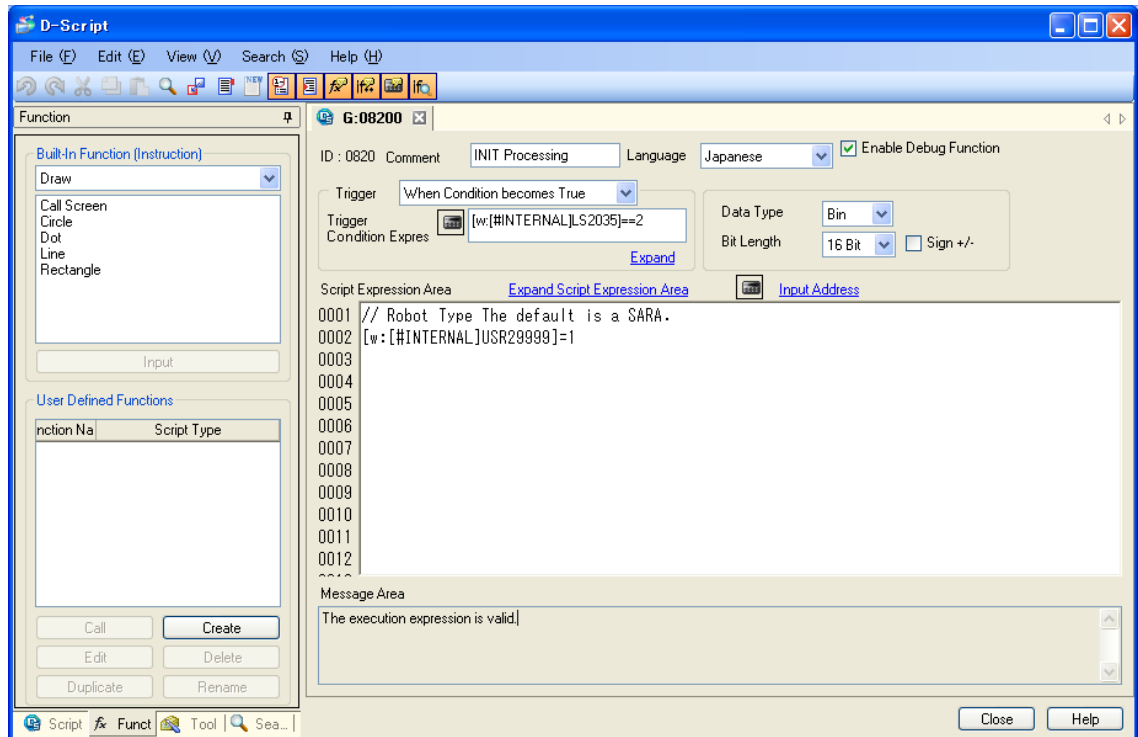


Figure 7-9-2 Global D Script

7.10. I/O Time Chart Monitor (B8651)

7.10.1. Screen overview

This screen displays the I/O time chart.

You can see when each signal turns on or off.

Note: The sampling time is 100 ms. Signals cannot be acquired that turn on and off in less than 100 ms.

7.10.2. Screen image

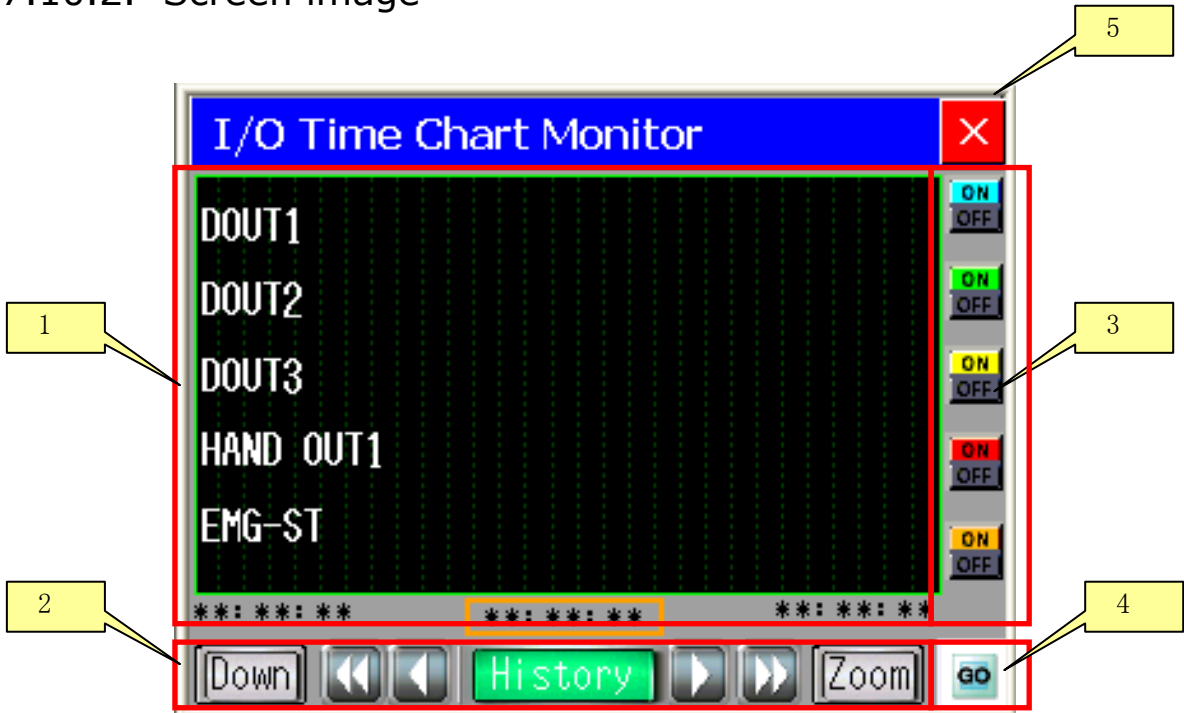


Figure 7-10-1 I/O Time Chart Monitor

Table 7-10: I/O Time Chart Monitor

No.	Part	Description
1	Chart	Signals turning on and off can be checked on the chart.
2	Switch	Changes the display of past data.
3	Switch	Displays or hides the channels.
4	Switch	Starts and stops data acquisition. Enabled when the history button is pressed and held for 1 second or longer.
5	Switch	Switches to the Maintenance screen.

7.10.3. Global D Script (ID: 8100)

This script converts bit data to word data to be displayed in the chart.

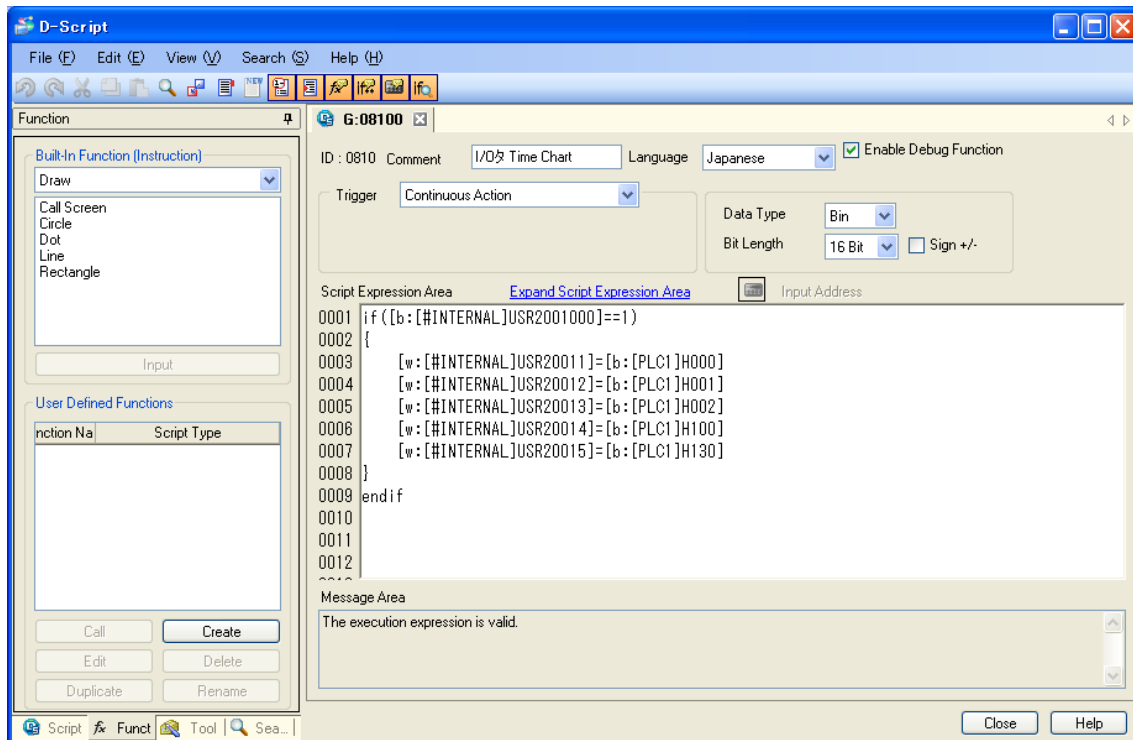


Figure 7-10-2 I/O Time Chart

7.10.4. Sampling (Group1)

Sampling is used to acquire the data.

Address Mode Display/Save in CSV Print Write Data

Address ☒ Sequential ☐ Random

Sampling Start Address [#INTERNAL]USR21

Bit Length ☒ 16 Bit ☐ 32 Bit

Sampling Words 5

Number	Address
1	[#INTERNAL]USR20011
2	[#INTERNAL]USR20012
3	[#INTERNAL]USR20013
4	[#INTERNAL]USR20014
5	[#INTERNAL]USR20015

Figure 7-10-3 Address Setting

Address Mode Display/Save in CSV Print Write Data

Condition

Execution Condition Constant Cycle while Bit is ON

Sampling Permit Bit Address [#INTERNAL]USR2001000

Sampling Frequency

Frequency Constant

1 1 sec 100 ms

Occurrences 6000

☐ Data Full Bit Address

Data Clear Bit Address [#INTERNAL]USR2001001

[Extended](#)

☒ Retain Sampling Data (SRAM)

☒ Back Up Sampling Data

Save in ☐ CF Card ☒ USB Storage

Backup Count 144 Maximum Historical Data 864000

When Exceeding Backup Count Overwrite oldest data

☐ Status Address

Figure 7-10-4 Mode Setting

Address Mode Display/Save in CSV Print Write Data

☒ Display/Save in CSV ☐ CSV Control Word Address

☒ Basic Settings ☐ Custom Settings

Save in ☒ CF Card ☐ USB Storage CSV Date Format

[Destination Folder](#)

Condition for Reading Alarm Values

☒ Always ☐ Bit Change Trigger Bit Address

Date yy/mm/dd Time hh:mm ☐ Refine Search / Sort

Data Display Data Type Status Address

☐ Add Total Totals Format

Item Name Characters 14

Display Color 7 Blink None

Background Color 0 Blink None

	1	2	3	4	5	6	7	8
	Item Name (Vertical)	Date	Time	Data1	Data2	Data3	Data4	Data5
1	Item Name (Horizontal)	Date	Time	[#INT]USR20011	[#INT]USR20012	[#INT]USR20013	[#INT]USR20014	[#INT]USR20015
2	Show Data	yy/mm/dd	hh:mm					

Figure 7-10-5 Display/Save in

8.Address maps

8.1. List of internally-used addresses

- The "Type" column in the table below indicates a bit device or a word device.
 - B: Bit device
 - W: Word device

Table 8-1: Address maps (ST and GP)

Address	Type	Description
USR20000	W	Alarm details display AL01 (D676) to AL10 (D67F) selection offset value
USR20001	W	Alarm details display, alarm code
USR20002	W	Detailed content display start line
USR2000300	B	Detailed content display 4 line scroll up trigger
USR2000301	B	Detailed content display 1 line scroll up trigger
USR2000302	B	Detailed content display 1 line scroll down trigger
USR2000303	B	Detailed content display 4 line scroll down trigger
USR20004	W	Save alarm history CSV, command/status address
USR20005	W	Save alarm history CSV, file number designation address
USR20006	W	Save alarm history CSV, date storage address
USR2001000	B	Sampling allowed bit address
USR2001001	B	Data clear bit address
USR2001003	B	During history display, start disallowed
USR20011	W	Channel No. 1
USR20012	W	Channel No. 2
USR20013	W	Channel No. 3
USR20014	W	Channel No. 4
USR20015	W	Channel No. 5
USR2001900	B	Channel No. 1 chart display on/off
USR2001901	B	Channel No. 2 chart display on/off
USR2001902	B	Channel No. 3 chart display on/off
USR2001903	B	Channel No. 4 chart display on/off
USR2001904	B	Channel No. 5 chart display on/off
USR20020	W	Cursor information storage address, time data (year)
USR20021	W	Cursor information storage address, time data (month/day)
USR20022	W	Cursor information storage address, time data (hour/minute)
USR20023	W	Cursor information storage address, time data (second)
USR20029	W	Cursor information status address
USR29999	W	For robot type recognition