DENSO ROBOT

SUPPLEMENT
Main System Software Version 1.95

Preface

DENSO WAVE has updated main system software designed for DENSO robot series from Version 1.9 to Version 1.95.

This book is a supplement to the DENSO robot manuals. It describes newly added and updated functions. Use this supplement together with other robot manuals.

As for the new HM-E series, refer to the "H∗-E SERIES GENERAL INFORMATION ABOUT ROBOT" and "H∗-E SERIES INSTALLATION & MAINTENANCE GUIDE."

Products covered by this manual

RC5 robot controller (Version 1.95 or later)

Contents

1. Selectable I/O Mode Added

1.1 What is a selectable I/O mode?

Version 1.95 has added a selectable I/O mode, a mode that allows you to release system I/O signal lines not used in compatible mode and make them serve as user I/O signal lines.

To extend user I/O signal lines in the selectable I/O mode, you need to choose or set up the following parameters with the teach pendant or in WINCAPSII:

(1) Selectable I/O mode   (0: disable, 1: enable)

(2) Step Stop   (0: enable, 1: change)

(3) Interrupt Skip   (0: enable, 1: new, 2: change)

(4) Program Select   (0: enable, 1: new, 2: change)

(5) Run Ready   (0: enable, 1: new, 2: change)

(6) State Output   (0: enable, 1: new, 2: change)

(7) Run Ready Output   (0: enable, 1: new, 2: change)

(8) Run Program   (0: enable, 1: new, 2: change)

(9) Error Output   (0: enable, 1: new, 2: change)

(10) Start Program No.   (0: enable, 1: new, 2: change)

You may make one of three choices (0: enable, 1: new, 2: change).

0: enable   Enable this signal line as is; that is, as a system I/O signal line.

1: new   Release this signal line and make it serve as a user I/O signal line.

          The user I/O area will be reconfigured so that port addresses and line numbers will be newly assigned--Continuous assignment.

2: change   Release this signal line and make it serve as a user I/O signal line.

          The port address and line number of the released signal line will be used as is and just relocated in the user I/O area--Discrete assignment.

Enable the selectable I/O mode (1) and set up parameters (2) through (10) above as you want. Then reboot the robot controller to make those settings go into effect. In the selectable I/O mode, you may make those released I/O signal lines serve as user I/O signal lines.
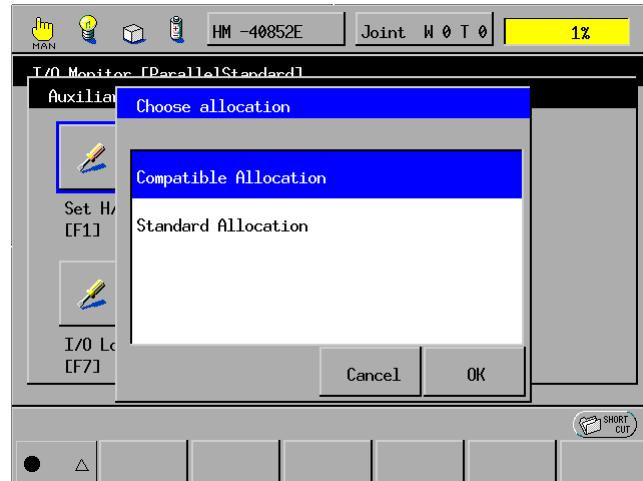
The reconfigured or relocated hardware I/O assignment will be listed in I/O manager of WINCAPSII.

1.2   Setting up the selectable I/O mode
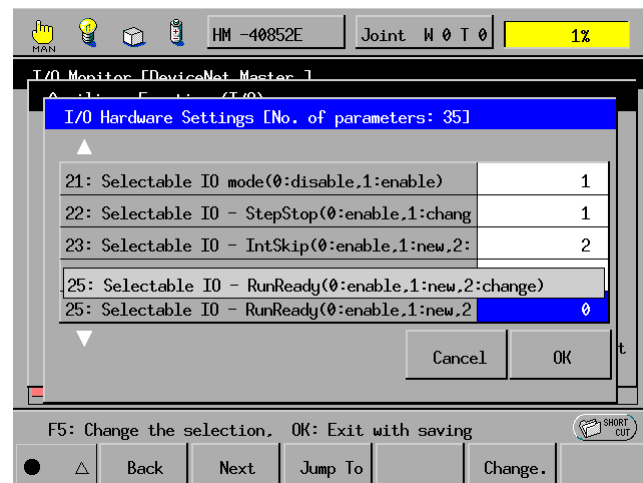
[1]   From the teach pendant

(1)   In the Choose allocation window, choose "Compatible Allocation."

Access: [F4 I/O.]—[F6 Aux.]—[F2 AlocMode]

(2)   In the I/O Hardware Settings window, modify parameters as you want.
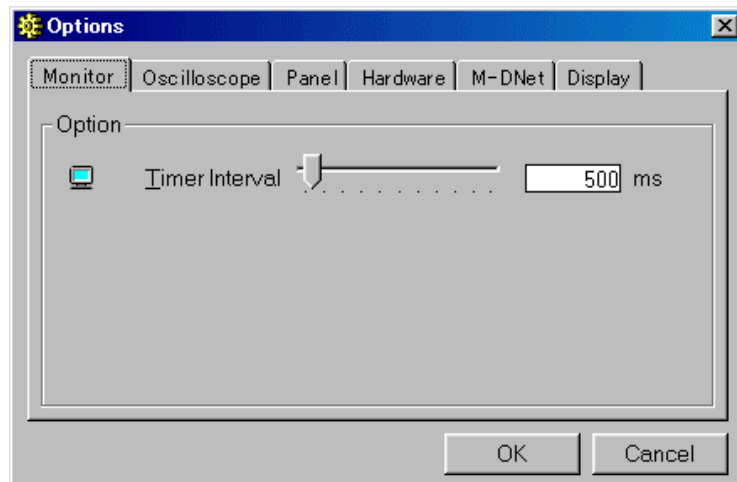
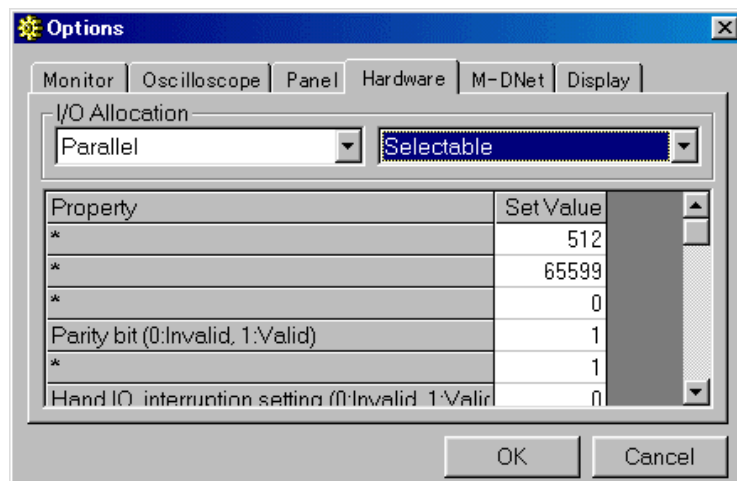**Access: [F4 I/O.]—[F6 Aux.]—[F1 Set H/W]**

(3)   Reboot the robot controller to make new settings go into effect.
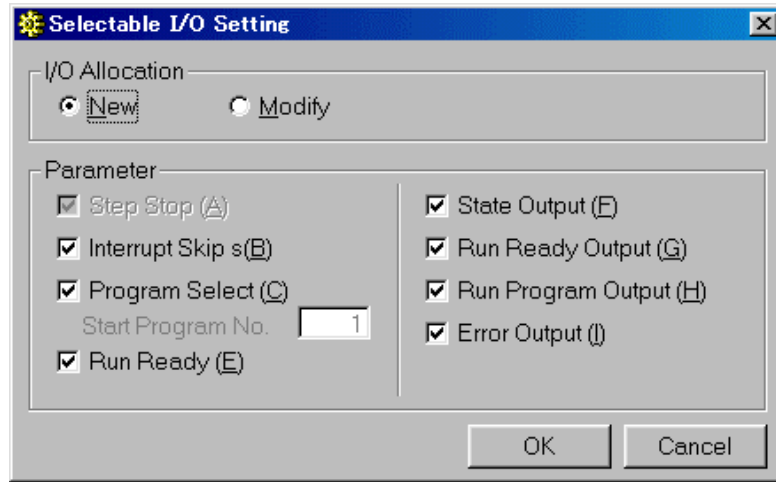
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[2]   In WINCAPSII

    (1)   From the Tool menu of DIO Manager, select the Options command.

    (2)   Click on the Hardware tab in the Options window.

    (3)   In the I/O Allocation, choose the Parallel and Selectable.

(4) In the Selectable I/O Setting window, select the I/O allocation type (New or Modify) and check off the check boxes as you want.

(5) To fix your settings, click on the OK button.

(6) Transmit the hardware allocation to the robot controller.

(7) Reboot the robot controller to make new settings go into effect.

1.3 System input signal lines that can serve as user I/O signal lines

In the selectable I/O mode, you may modify the following parameters to make system input signal lines serve as user I/O signal lines.

Parameters	Signal lines that can serve as user ones
Step Stop	Step Stop (All tasks)
Interrupt Skip	Interrupt Skip
Program Select	Program No. select bit 0
	Program No. select bit 1
	Program No. select bit 2
	Program No. select bit 3
	Program No. select bit 4
	Program No. select bit 5
	Program No. select bit 6
	Program No. select odd parity bit
Run Ready	Motor power ON
	CAL execution
	SP100
	Switch to Ext Mode

Parameter details

No.	Parameters	Function
1	Step Stop	If you will not use the Step Stop function in running your robot, you may set this parameter to any choice other than "enable." Then the Step Stop input port may serve as a user I/O port. Note that this parameter provides no "new" choice, so port addresses or line numbers in the user I/O area will not be continuously assigned.
2	Interrupt Skip	If you will not use the Interrupt Skip function in running your robot, you may set this parameter to any choice other than "enable." Then the Interrupt Skip input port may serve as a user I/O port.
3	Program Select	If you will predetermine a particular program to be driven by external equipment and run your robot with the single program, then you may set this parameter to any choice other than "enable." Then the Program Select input port may serve as a user I/O port. If initiated by the Program Start signal, the particular program you have predetermined with the Start Program No. will run.
4	Run Ready	If it is possible to set up all of these four functions--Motor power ON, CAL execution, SP100, and Switch to Ext Mode--at one time (not to set them individually), then you may set this parameter to any choice other than "enable." Those input ports may serve as user I/O ports. When those ports serve as user I/O ports, receiving the Operation preparation start signal will carry out the above four functions independently of the current input states. Note that when the robot is in machine lock, no Motor power ON or CAL execution will be carried out.
5	Start Program No.	If the Program Select parameter is set to any choice other than "enable," a program specified by this Start Program No. parameter will be initiated by the Program Start signal.

1.4 System output signal lines that can serve as user I/O signal lines

In the selectable I/O mode, you may modify the following parameters to make system output signal lines serve as user I/O signal lines.

Parameters	Signal lines that can serve as user ones
State Output	Robot power ON complete
Run Ready Output	External mode
	CAL complete
	Teaching
Run Program Output	Program start reset
	Single-cycle complete
	Continue start permit
Error Output	Error units bit 0
	Error units bit 1
	Error units bit 2
	Error units bit 3
	Error tens bit 0
	Error tens bit 1
	Error tens bit 2
	Error tens bit 3
	Error hundreds bit 0
	Error hundreds bit 1
	Error hundreds bit 2
	Error hundreds bit 3

Parameter details

No.	Parameters	Function
1	State Output	If you do not need to confirm the Robot power ON complete signal with the external equipment (e.g., when using the robot controller standalone in running your robot), then you may set this parameter to any choice other than "enable." The Robot power ON complete port may serve as a user I/O port.
2	Run Ready Output	You may set this parameter to any choice other than "enable" if: - it is possible to set up all of the Motor power ON, CAL execution, SP100, and Switch to Ext Mode functions at one time so that you do not need to manage those signal lines individually or - if the system can treat the Auto mode output being OFF as a condition required for teaching. The External mode, CAL complete, and Teaching signal lines may serve as user I/O signal lines. When those signal lines serve as user I/O signal lines, the ON conditions of the Servo ON output signal (displayed as Run Ready) are: Servo ON + CAL complete + External mode. If one or more of those three signal lines are turned OFF, the Servo ON output signal goes OFF. And when the Auto mode output signal is OFF, the system will interpret it as in teaching.
3	Run Program Output	If you will not run more than one programs concurrently or use the Continue function, then you may set this parameter to any choice other than "enable." The Program start reset, Single-cycle complete, and Continue start permit ports may serve as user I/O ports. When those ports serve as user I/O ports, the system may use the Robot running signal instead of Program start reset signal for starting a program from the external equipment. And the system may use the Robot running signal being OFF instead of a Single-cycle complete signal. Note that the above signal substitution may be allowed only when you will not run programs concurrently.
4	Error Output	If you do not need to get error codes from the external equipment (e.g., when using the robot controller standalone in running your robot), then you may set this parameter to any choice other than "enable." The error code output ports may serve as user I/O ports.

1.5   Sample usage of selectable I/O mode

The sample below gives instructions on how to add user I/O signal lines.

(1)   From the teach pendant, choose "Compatible Allocation" in the Choose allocation window.

Access: [F4 I/O.]—[F6 Aux.]—[F2 AlocMode]

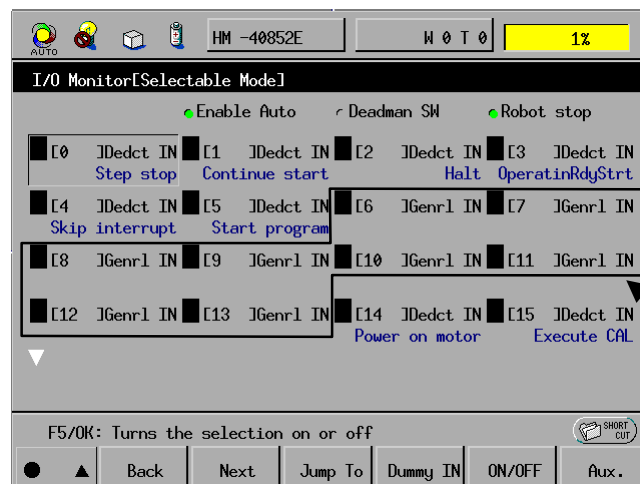(2)   In the I/O Hardware Settings window, modify parameters as shown below.

Access: [F4 I/O.]—[F6 Aux.]—[F1 Set H/W]

21: Selectable IO mode   1
24: Selectable IO--Program Select   2

(3)   Reboot the robot controller to make new settings go into effect.

You may check that #6 through #13 signal lines may serve as user input signal lines as shown below.

User I/O signal lines reconfigured

2. Supervisory task extension

Conventional supervisory tasks supported by the main system software version 1.7 or later are designed to terminate if Level 4 error or higher one occurs.

Main system software version 1.95 newly supports the supervisory task extension that prevents supervisory tasks from terminating if Level 4 error occurs except memory errors (errors 7000s).

2.1 What is a supervisory task extension?

On some occasions, e.g., when the robot controller is controlled by external equipment in RS232C communication, the robot controller is required to operate independently to some extent.

The solution is to use a supervisory task. However, current supervisory tasks will terminate if Level 4 error or higher one occurs so that the communication will stop and the external equipment will no longer monitor the controller status.

To prevent it, the supervisory task extension limits termination to essential occasions only. If the extension is enabled, supervisory tasks will no longer terminate even if Level 4 error such as a servo error, operation error, or I/O error occurs. They will terminate only if a memory error (error 7000s) occurs.

If Level 5 error occurs, supervisory tasks will terminate as they have been.

The table below lists whether supervisory tasks will terminate or not if the following level errors occur.

Error code		7***	6***	5***	4***	3***	2***	1***
Error level	Level 5	T	T	T			T	T
	Level 4	T	T/R	T/R			T/R	T/R
	Level 3 or lower	R	R	R	R	R	R	R

T: Terminate.
T/R: Keep running if the supervisory task extension is enabled.
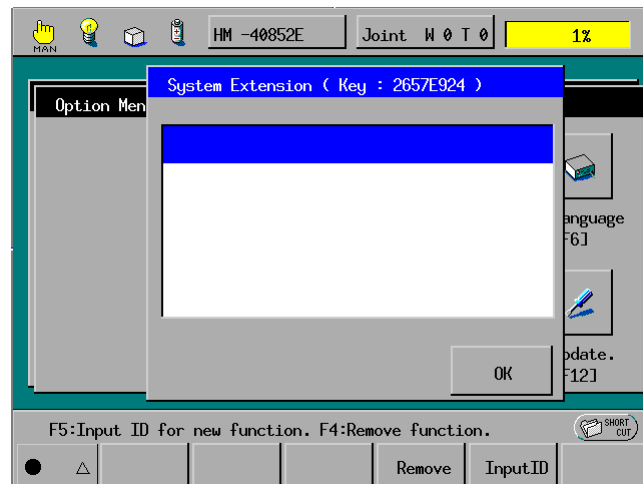R: Keep running.
/: Not applicable.

2.2   Enabling the supervisory task extension

The supervisory task extension is optionally provided. You need to enable the extension from the top screen of the teach pendant according to the steps given below.
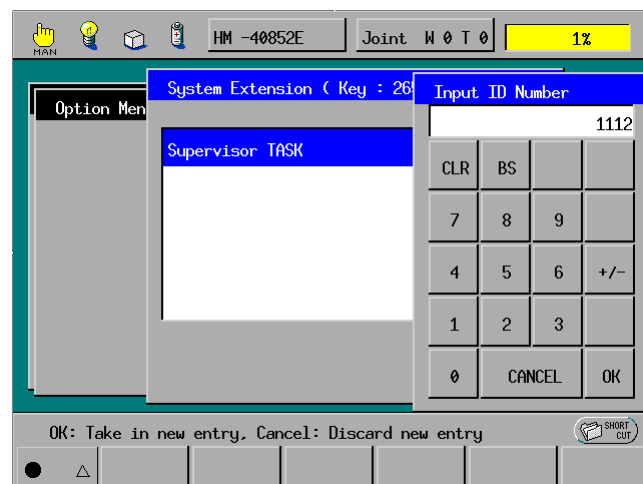
(1)   Call up the System Extension window.
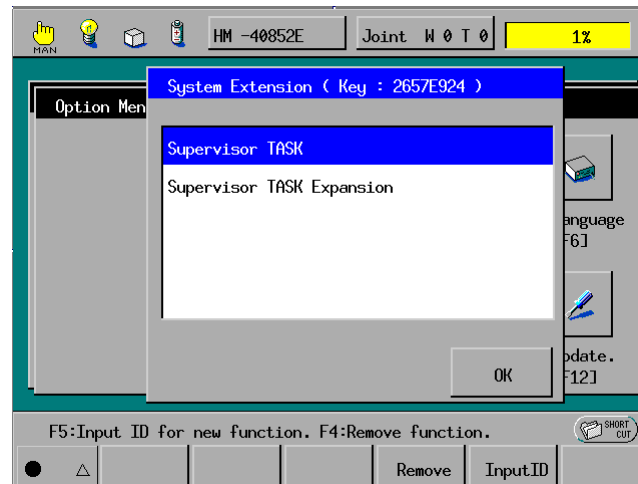
Access: [F6 Set]—[F7 Options.]—[F8 Extnsion]

F5

(2)   Press [F5 Input ID].

The numeric keypad will appear where you enter the necessary ID code--1111 for conventional supervisory task or 1112 for supervisory task extension.

(3) Press the OK button. Your selection will be saved.

(4) Reboot your robot controller to make the new setting go into effect.

3.   Resizing the Communications Buffers

Main system software version 1.95 newly supports communications buffer resizing function. It allows you to resize the communications buffer of each port on the RS-232C serial interface.

Usually it is not necessary to modify the factory default of the communications buffer sizes. If you need to resize the communications buffers for your applications, use this function.

NOTE: Resizing a communications buffer will discard the data that has not been read out from the buffer or saved into the memory. According to your needs, first use I/O control commands for the RS-232C or serial-binary communications to save the data stored in the buffer, and then resize the communications buffer.

Operating procedure

Access: [F6 Set]—[F5 Set Com.]—[F12 Comm. buff]

(1)   In the Communications Setting Menu, press [F12 Comm. buff].
        The Set Communication Buffer Size window will appear as shown below.
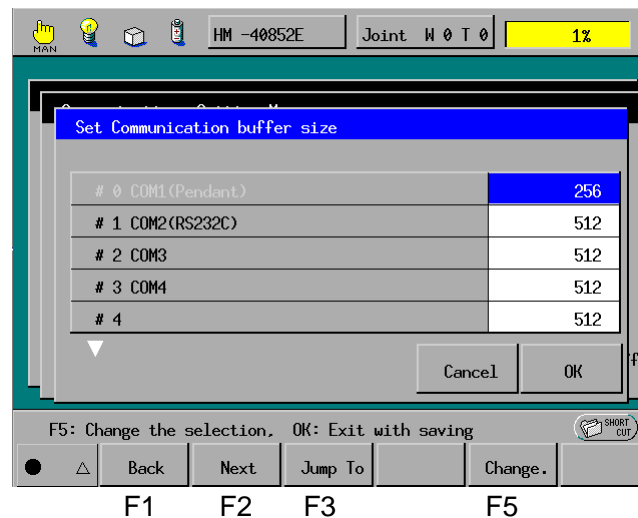
NOTE: In the Set Communication Buffer Size window, #0 through #15 COM ports are assigned as shown below.

#0 COM1: Used for communication with the teach pendant. No access is allowed.

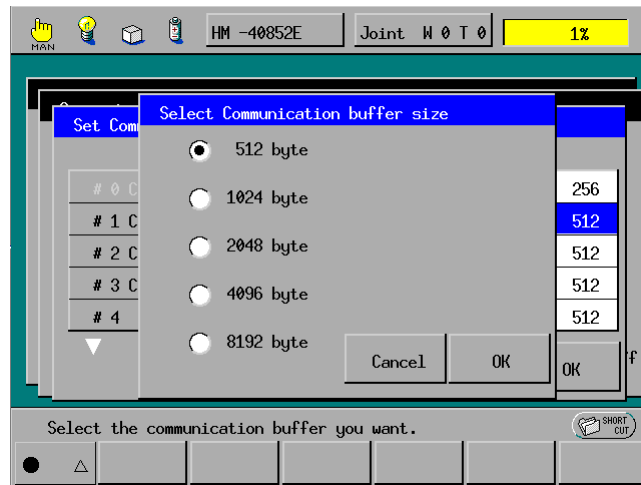#1 COM2: Used for communication with WINCAPSII.

#2 COM3 and #3 COM4: Reserved for function extension.

#4 through #7: For servers.

#8 through #15: For clients.

(2) Select the desired port and press [F5 Change.].

The Select Communications Buffer Size window will appear as shown below.

(3) Select the desired buffer size and press the OK button. The Select Communications Buffer Size window will be closed.

(4) Confirm the new setting value and then press the OK button. The new setting will go into effect.

If you press the Cancel button instead of the OK button, the new setting value will be canceled.

NOTE: Pressing the OK button to make the new setting go into effect will discard the buffer data.

# 4. Object Tree Display Enhanced in WINCAPSII

WINCAPSII version 1.95 adds five types of icon objects to the "Object Tree" dialog box on the Detailed Arm Object Display.

If the "Detailed Arm Object Display" is selected, all hierarchies of the robot objects in the object tree from the base to flange will be displayed.

From the Tools menu, choose Object Tree command to call up the Object Tree dialog box.

- Icon add buttons   Used to add icon objects to the lower position of the currently selected object in the specified shape.

- Joint   Used to interlock added icon objects with the motion direction and scale of the robot joints.

You may specify joints, motion direction, and motion scale.

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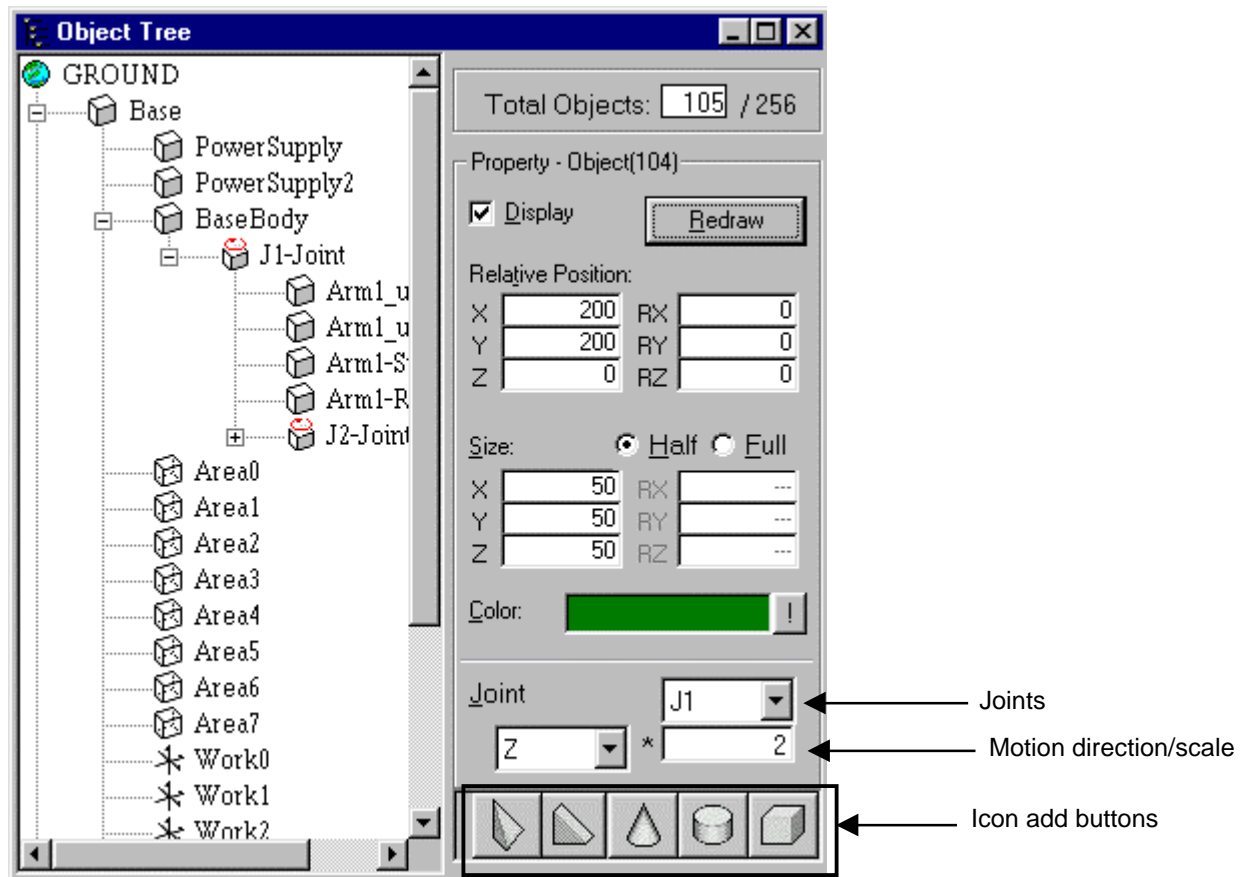
SUPPLEMENT

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