

DENSO ROBOT

Configuration topics and data back up



DENSO
robotics

1 Configuration of the robot system

1.1 Configurators

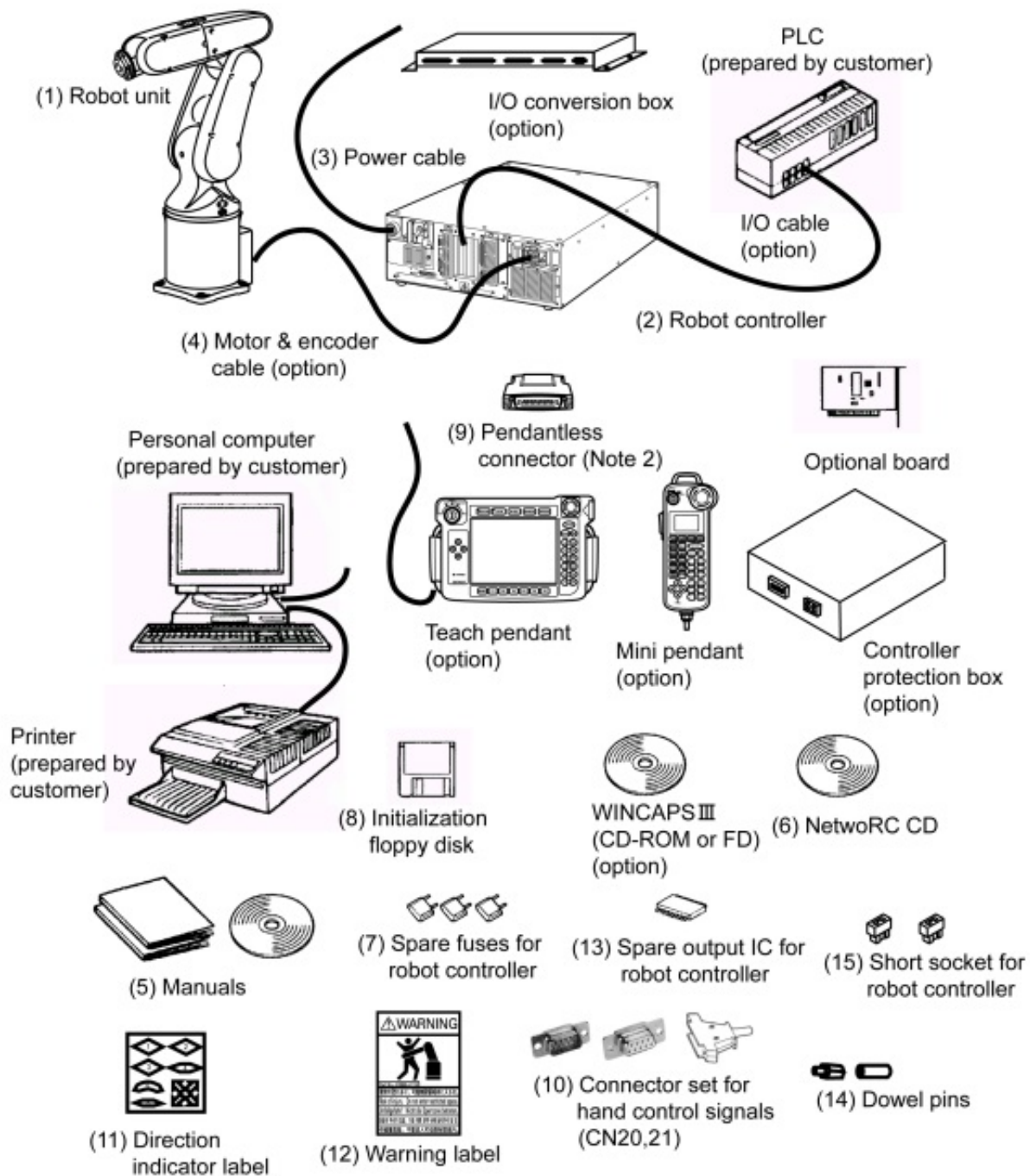


Figure 1: Configurators of the Robot System (VP-G series)

1.2 Names of Robot Unit Components

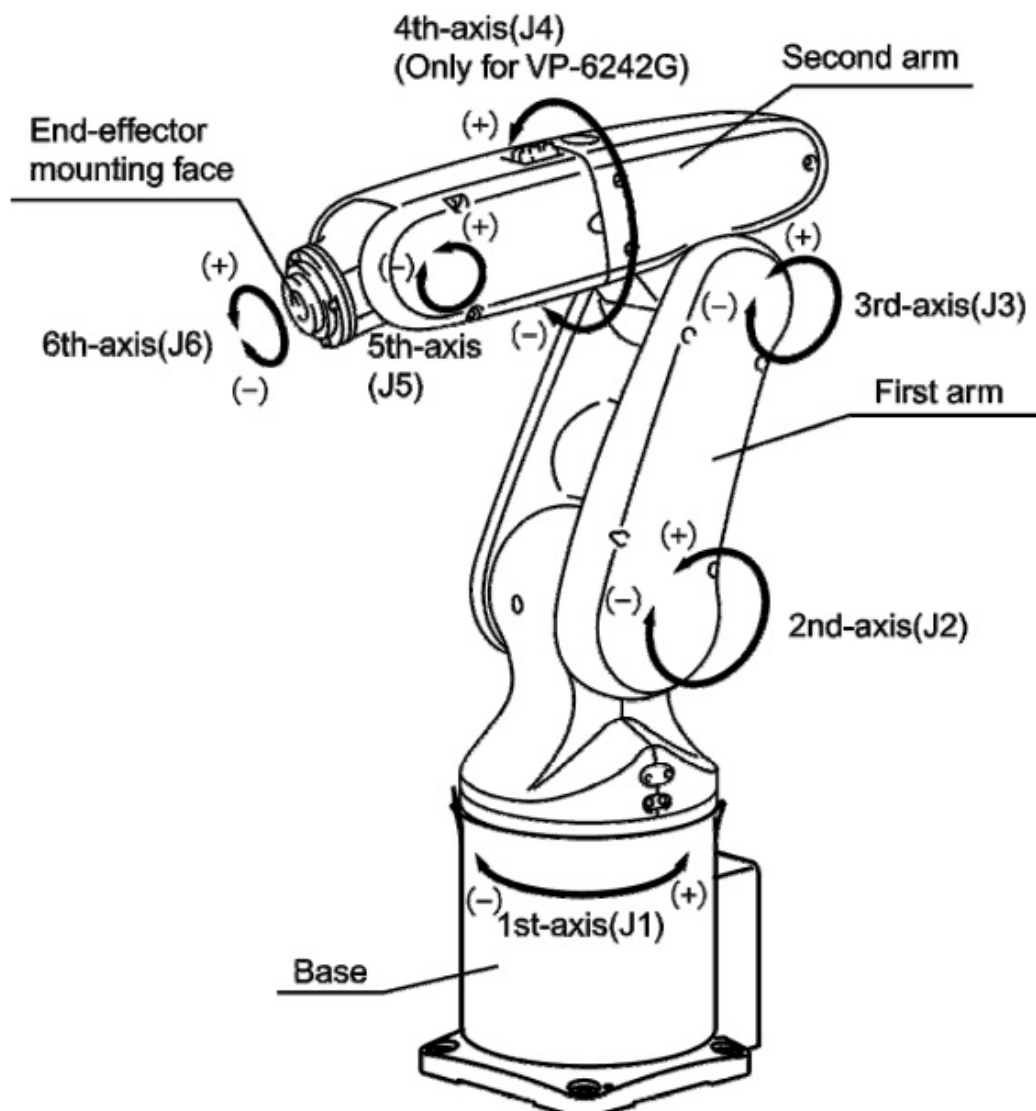
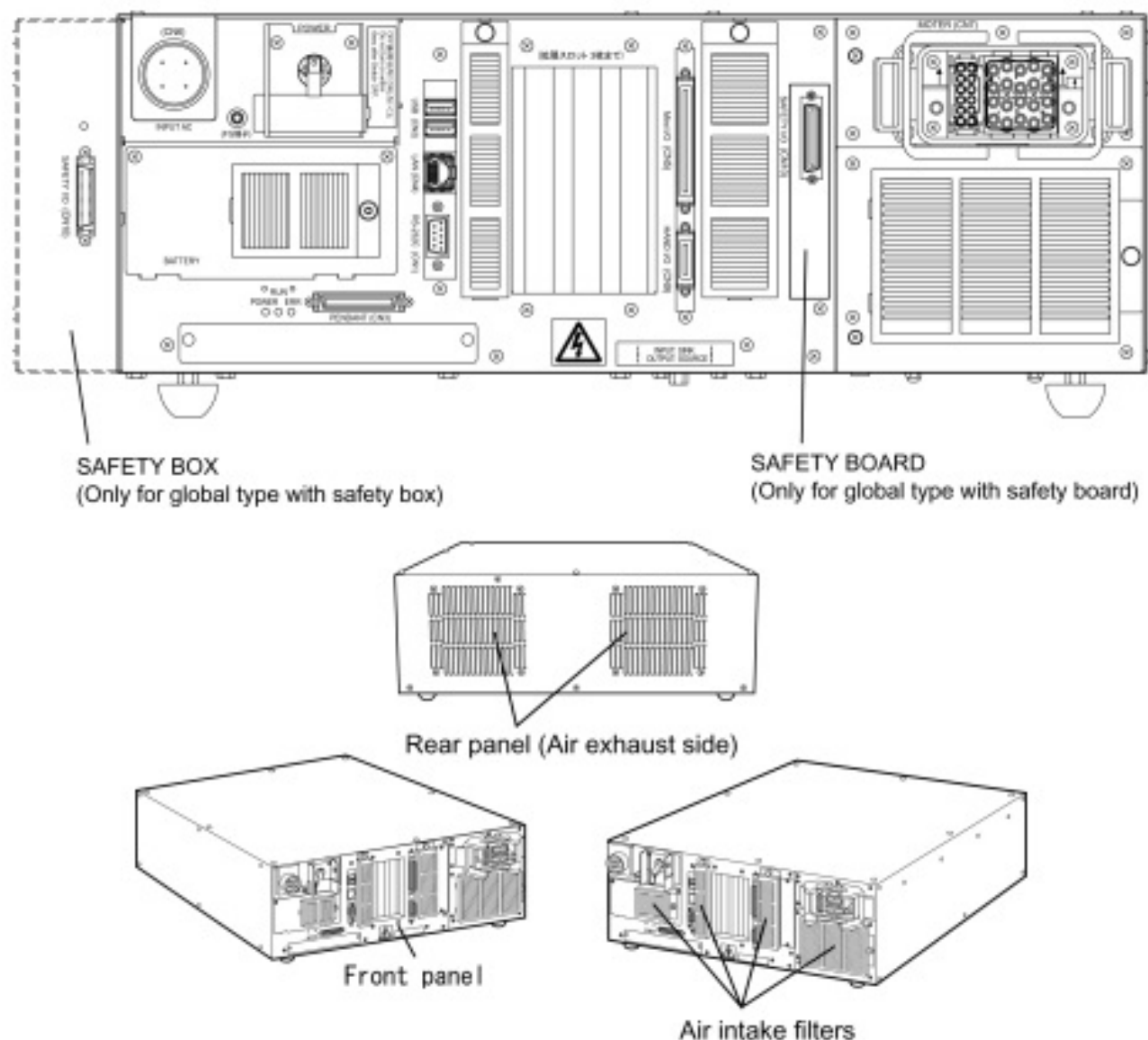


Figure 2: Names of Components (VP-G series)

1.3 Names of the Robot Controller Components



Connectors for the VP-G series (Encoders connected via bus)

Connector No.	Marking	Name
CN1	RS-232C	Serial interface connector
CN2	USB	USB connector (2 lines)
CN3	PENDANT	Teach pendant connector
CN4	LAN	Ethernet connector
CN5	Mini I/O	I/O connector
CN6	INPUT AC	Power supply connector
CN7	MOTOR	Motor/encoder connector
CN9	HAND I/O	HAND I/O connector
CN10	SAFETY I/O	SAFETY I/O connector (Only for global type)

Figure 3: Names of Robot Controller Components

2 Modifying Software Motion Limits to Define New Motion Space

2.1 What Is a Software Motion Limit?

A limit to the operation range of the robot defined by the software is called a software motion limit. Software motion limits become valid after CAL of the robot has been completed and the robot has entered the range set by the limits. A mechanical operation limit is called a mechanical end and set by a mechanical stop. To prevent the robot from striking against a mechanical stop, each software motion limit is set slightly in front of the mechanical end as shown in the figure below. Although there is no mechanical stop for the 6th axis, a software motion limit is set. If the robot reaches a software motion limit during manual or automatic operation, an error message will be displayed (error code starting from 6070; the first digit represents the axis number) and the robot will come to a stop. The power to the motor is also turned OFF in such a case during automatic operation.

All axes are assigned a software motion limit in both the positive and negative direction of the operation range. The software motion limit in the positive direction is called the positive-direction software motion limit and that in the negative direction is called the negative-direction software motion limit.

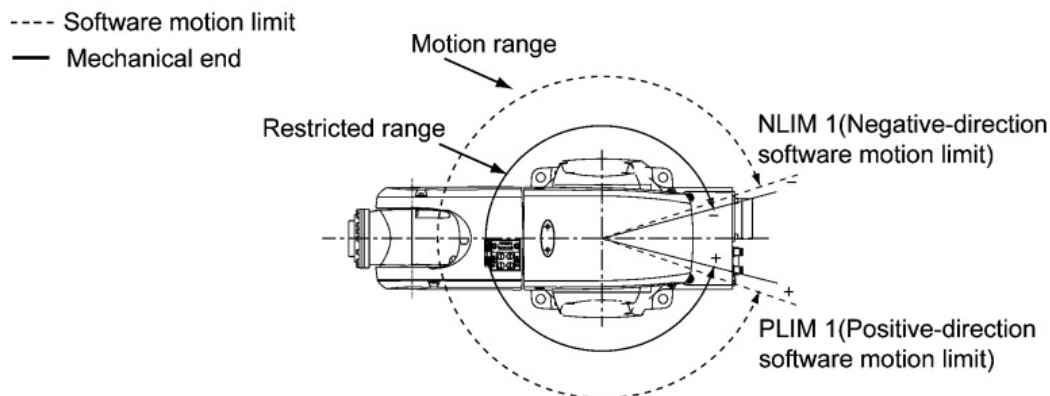


Figure 4: Software Motion Limits and Mechanical Ends

Robot model		1st axis	2nd axis	3rd axis	4th axis	5th axis	6th axis
VP-6242G	Positive direction	160°	120°	160°	160°	120°	360°
	Negative direction	-160°	-120°	19°	-160°	-120°	-360°
VP-5243G	Positive direction	160°	120°	136°		120°	360°
	Negative direction	-160°	-120°	-128°		-120°	-360°

Figure 5: Factory Defaults of Software Motion Limits (VP-G series)

2.2 Changing Software Motion Limits

If the robot interferes with any other device, change the software motion limits to make the motion space smaller as shown in the upper figure on this page. If the air piping or wiring of the end-effector becomes taut as the robot runs, then change the software motion limits to make the motion space smaller as shown in the lower figure on this page.

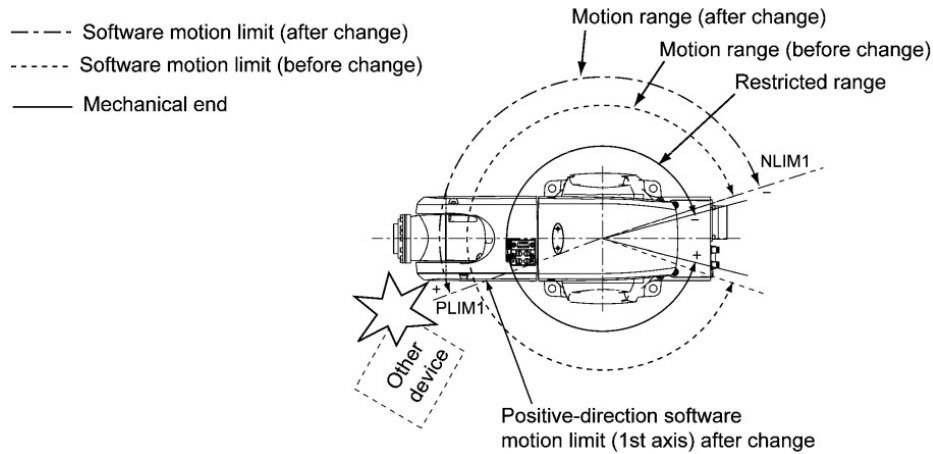
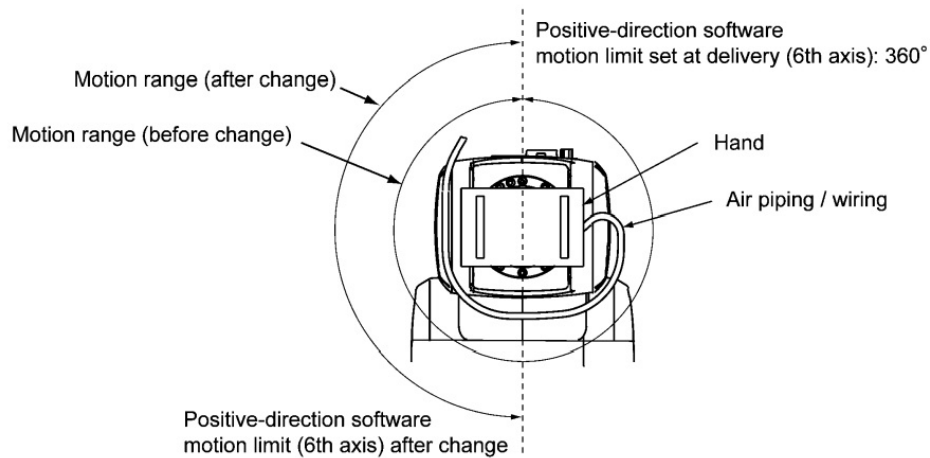


Figure 6: Changing Software Motion Limits



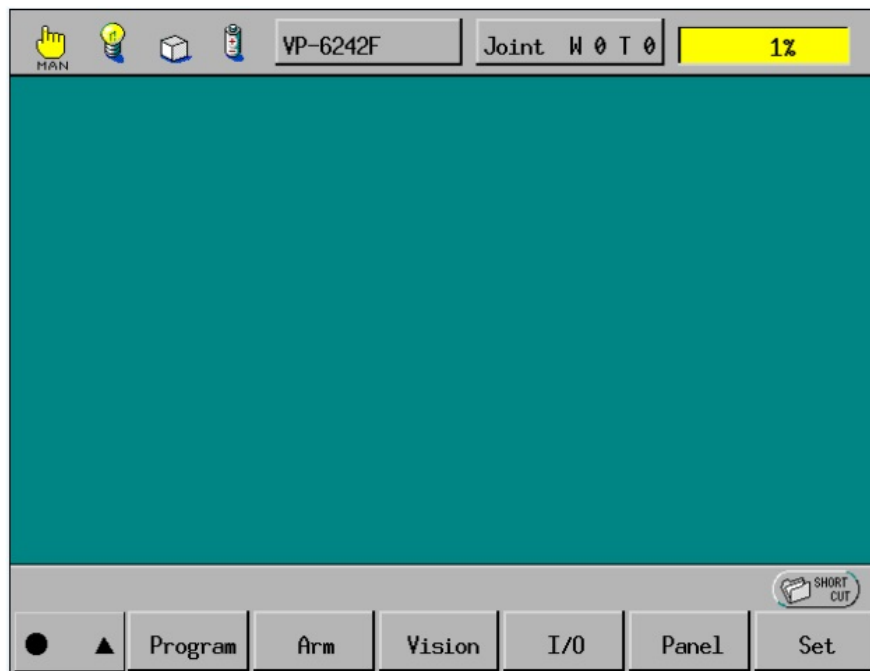
Note: The figure shows the hand turning 180 degrees.

Figure 7: Changing Software Motion Limits

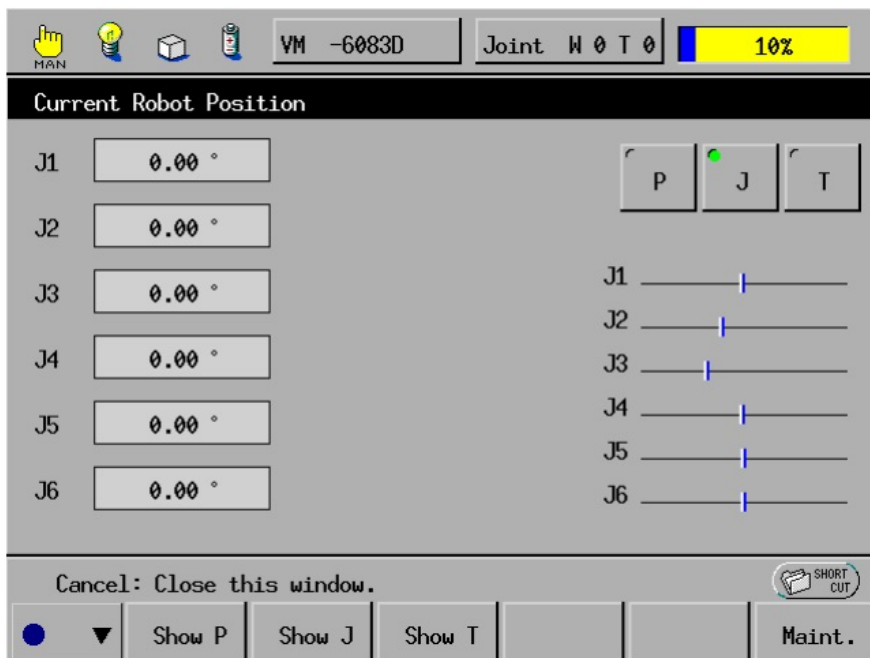
2.3 Procedure for Changing the Software Motion Limits

1. Turn the power switch of the robot controller to ON.
2. Set the mode selector switch of the teach pendant to MANUAL.

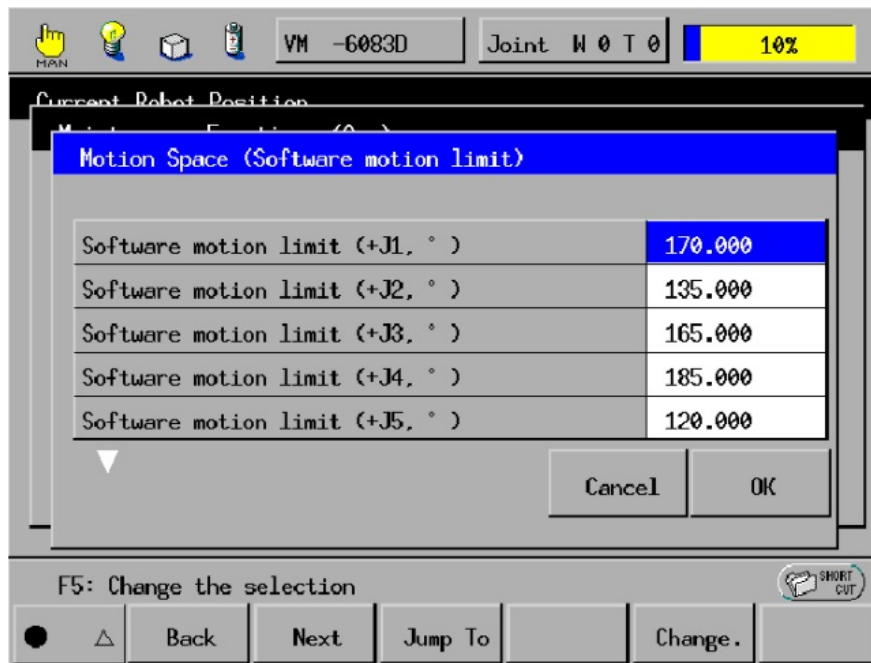
3. Press [F2 Arm] on the top screen of the teach pendant.



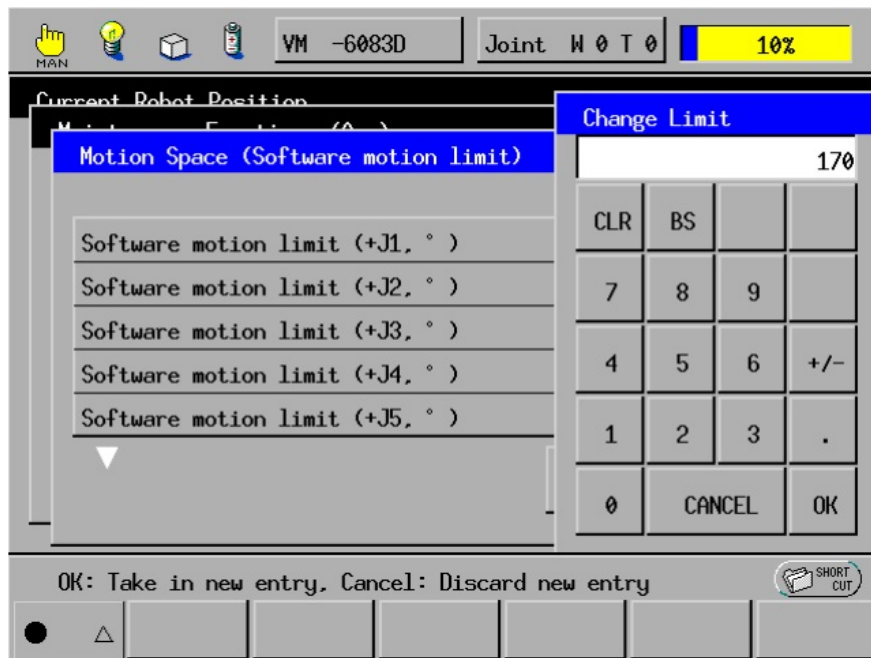
4. Press the SHIFT key and then press [F12 Maint.].



- Press [F1 M Space] on the Maintenance Functions (Arm) window.



- Select the item to be modified, then press [F5 Change].



- Enter a desired value using the numeric keys, then press OK.

The new value will be set on the line of the item selected in the Motion Space window. If two or more items must be changed, repeat Steps 5 and 6.

- Press OK in the Motion Space (Software motion limit) window.

9. Turn OFF the power to the robot controller.

Caution: The new software motion limit(s) specified for the motion space will take effect after the robot controller restarts and CAL is completed.

3 CALSET

3.1 What Is CALSET?

Calibrating the relationship between position-related information recognized by the robot controller and the actual position of the robot unit is called CALSET. CALSET must be performed when the motor is replaced or when the encoder backup battery goes dead and the position-related data retained in the encoder is lost as a result. After CALSET is completed, the calibrated data of the robot unit will be stored in the robot controller. This data is called CALSET data which is different on each robot. Back up the CALSET data periodically, referring to "Backing Up Projects."

3.2 Cautions at CALSET

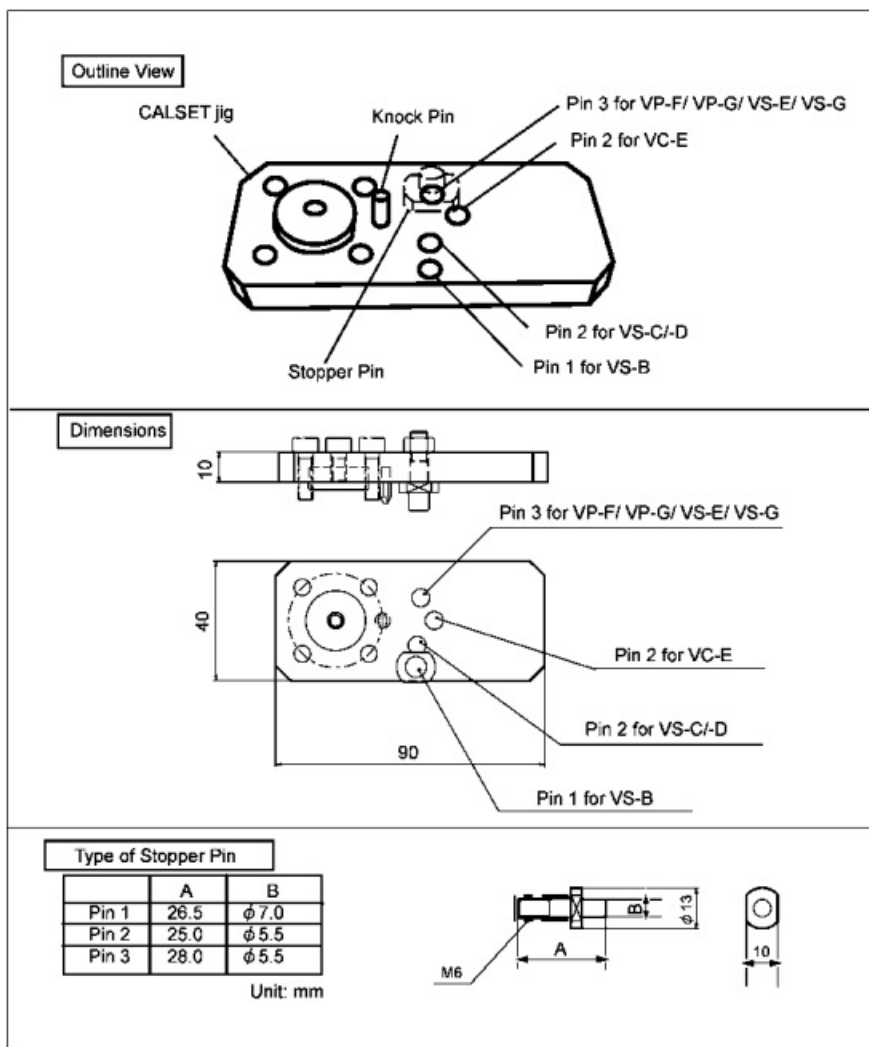
CALSET requires some space for bringing each axis into contact with the mechanical end.

1. To CALSET the 6th axis having no mechanical stop, you need to mount the CALSET jig on the axis.
2. When CALSETing, move the axis to be CALSET in the vicinity of the mechanical stop, release the brake, and bring the axis into contact with the mechanical stop. In the VP-G series, each of all axes has a brake.
3. When performing CALSET, be careful with the robot motion. The execution of the CALSET command releases motor brakes so that the robot arms will move by its own weight.
4. After CALSET, confirm in the manual mode that each axis stops at the software motion limit before coming into contact with the mechanical end.
5. In automatic operation, start to run the robot at low speed. Ensuring safety, gradually increase the speed. It makes adjustment easy.
6. Position-related data in some programs made before CALSET may vary somewhat after CALSET.
7. If the RANG values have not been changed after a mechanical end change, remove the changed mechanical end(s) before performing CALSET.

3.3 Mounting the CALSET Jig

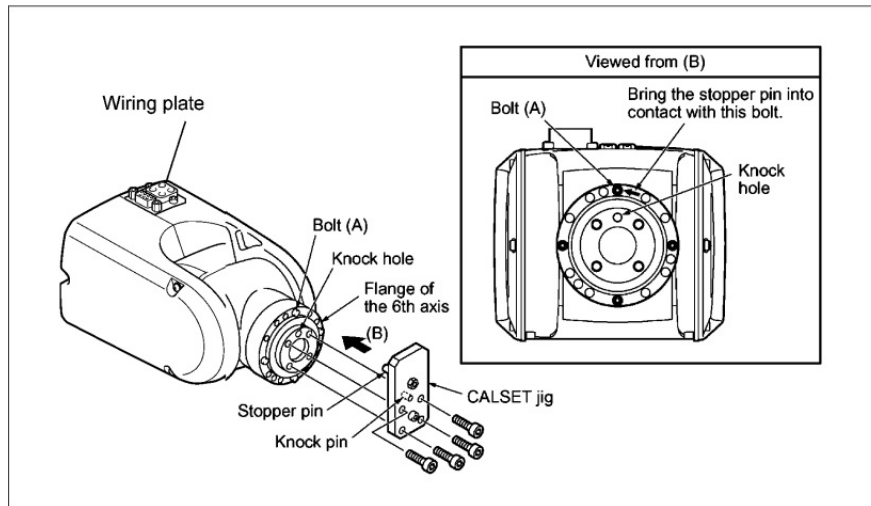
To CALSET the 6th axis having no mechanical stop, you need to mount the CALSET jig on the axis.

1. Fit a stopper pin in the CALSET jig.



2. Release the brake of the 6th axis.

3. Install the CALSET jig on the 6th axis flange as shown in the figure below.



3.4 What Is a CALSET Position?

The limit position of an arm to be CALSET is called a CALSET position. Each axis has a mechanical end in each of the positive and negative directions. The mechanical ends shown in the figure below are the CALSET positions.

Axis		CALSET position
Position	1st axis	Turning end in the positive direction (counterclockwise end when viewed from top)
	2nd axis	Turning end in the negative direction
	3rd axis	Turning end in the positive direction
	5th axis	Turning end in the negative direction
	6th axis	Turning end in the positive direction, which is set by a CALSET jig.

Figure 8: CALSET Positions (VP-5243G)

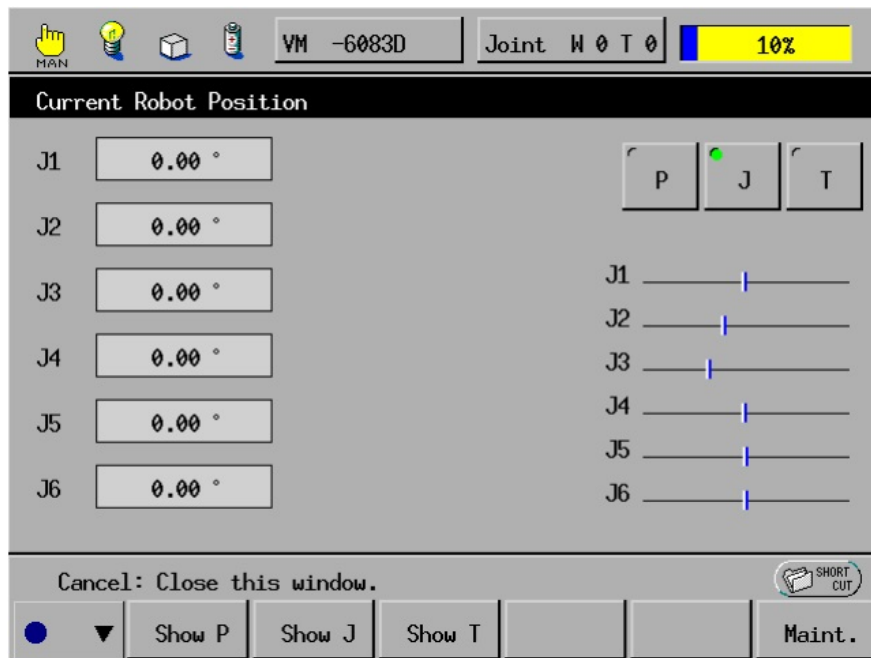
Caution for using customized mechanical ends:

If the RANG values have not been changed after a mechanical end change, remove the changed mechanical end(s) before performing CALSET. (Refer to the "Precautions When Changing the Mechanical Ends".)

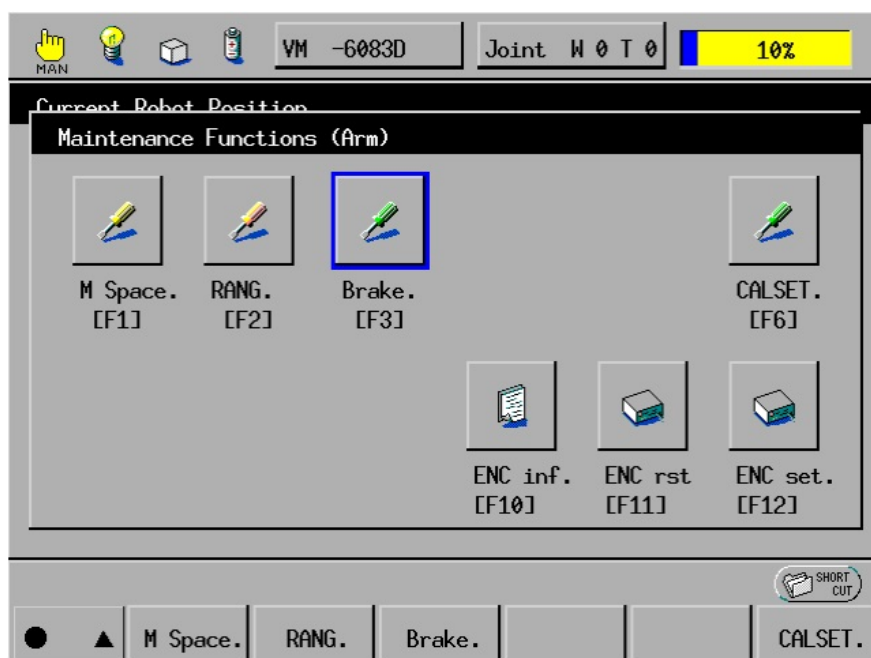
3.5 CALSET Procedure

1. Turn the power switch of the robot controller to ON.
2. Set the mode selector switch of the teach pendant to MANUAL.

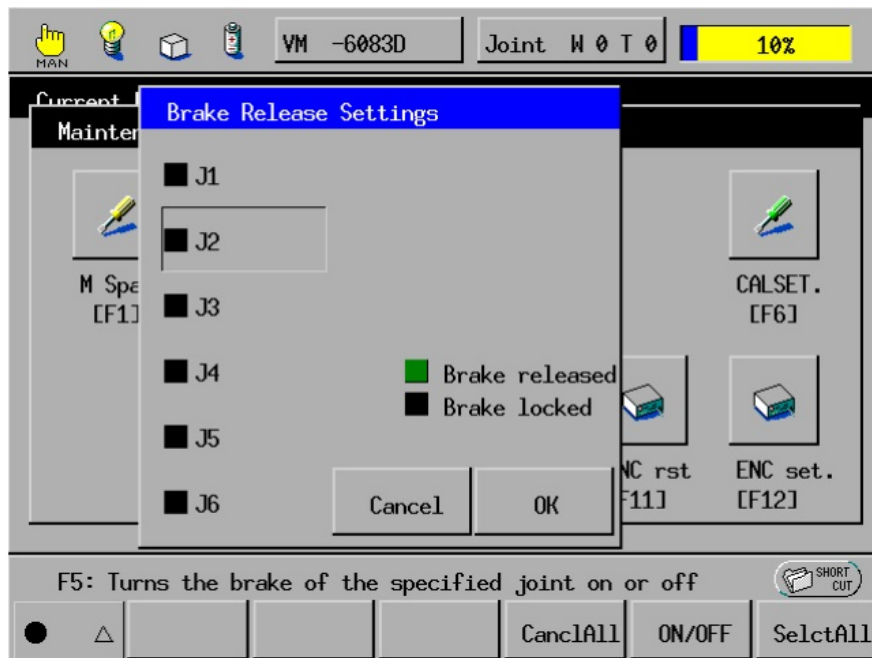
3. Press MOTOR to turn ON the power to the motor.
4. Move the axis to be CALSET in the vicinity of the mechanical stop via the manual operation from the teach pendant.
5. Press the MOTOR key on the teach pendant to turn OFF the power to the motor.
6. Press [F2 Arm] on the teach pendant.
7. Press the SHIFT key and [F12 Maint.].



8. Press [F3 Brake.].



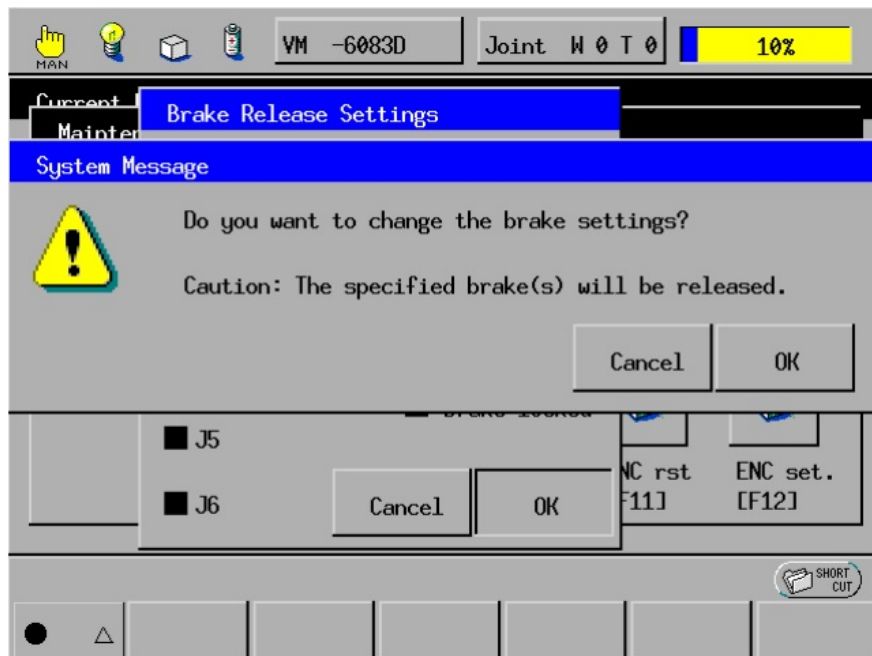
9. Touch the axis number to be CALSET to select "Brake released" (green display).



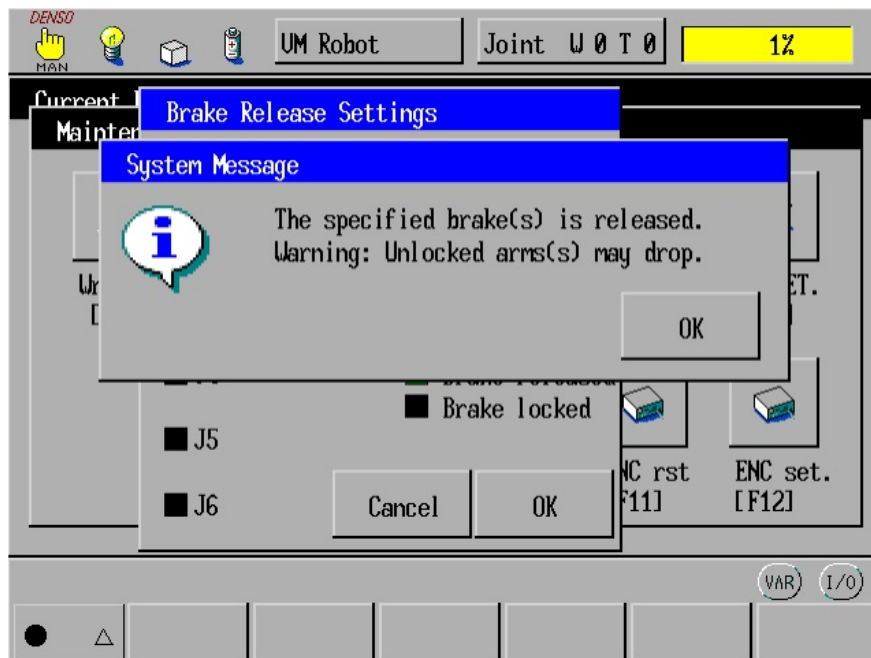
10. Confirm that there is no danger even if the arms fall as a result of released brakes.

CAUTION: In the VP-G series, the brake of the specified axis is released.

11. Press OK. The system message appears asking you whether you want to change the brake settings.

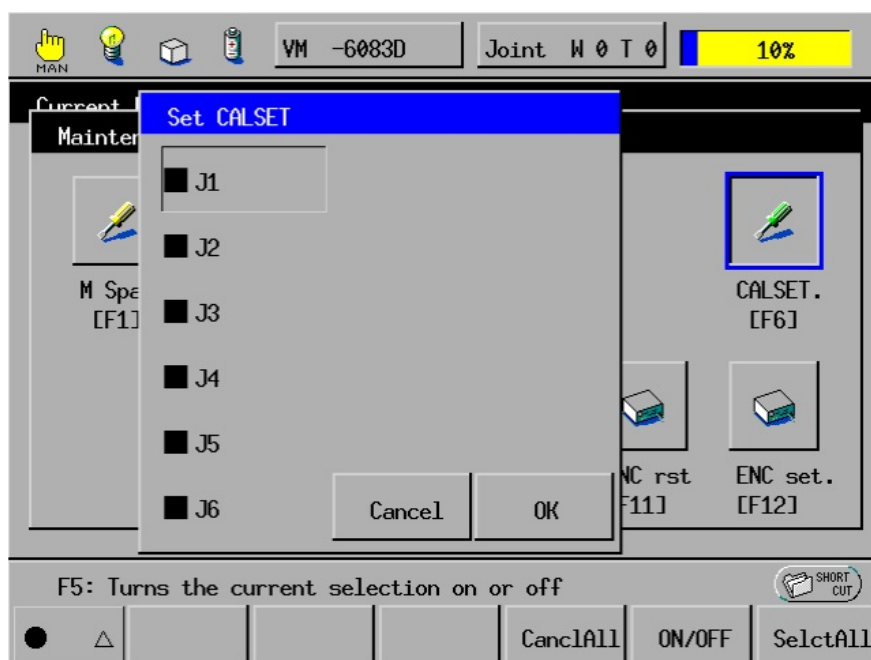


12. Press OK. The system message appears informing that the brake is released and warning against drop of arms.

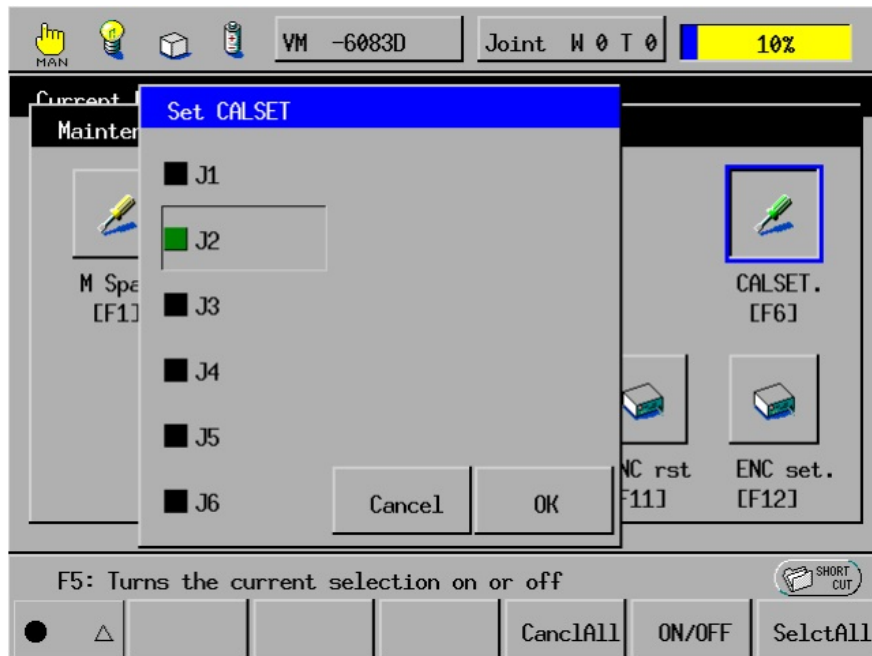


13. Press the axis to be CALSET against the mechanical stop by hand.

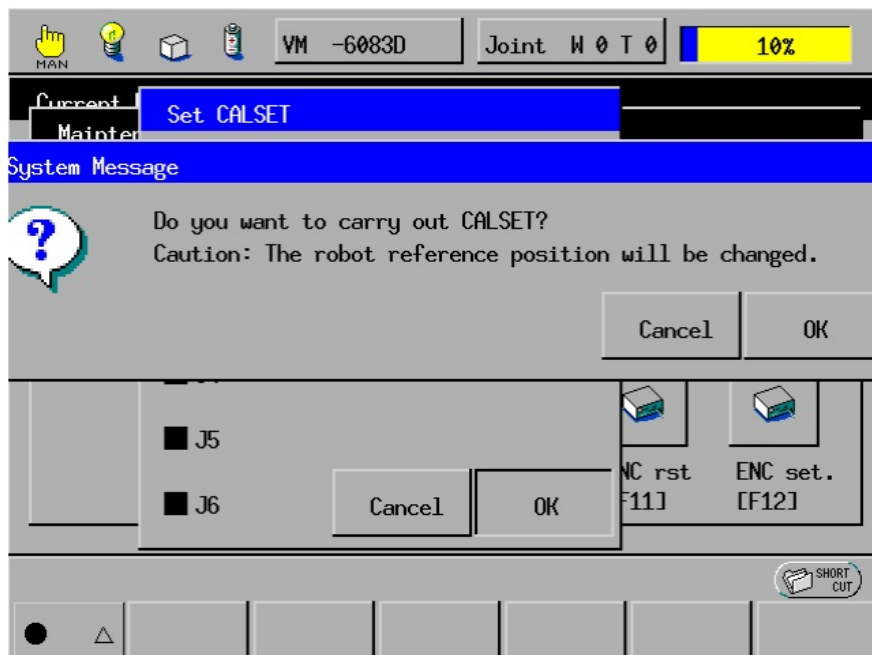
14. Press [F6 CALSET.]. The Set CALSET window appears.



15. Press the axis number to be CALSET to select CALSET (green display). Deselect CALSET (black display) for the other axes that are not required to be CALSET.



16. Press OK. The system message appears asking whether you want to carry out CALSET and showing a caution that the robot reference position will change.



17. Press OK. The system message appears informing that CALSET is completed.
18. Press the EMERGENCY STOP button. The robot brake becomes activated.
19. Turn the EMERGENCY STOP button to cancel robot stop.

20. Press the MOTOR to turn ON the power to the motor.

Caution: A "motor lock overload" error may occur just after the power to the motor is turned ON. In this case, try to turn ON the power several times, or release the brake, move the axis a little in the opposite direction of the mechanical end, and turn ON the power again.

4 Backing up Projects

You should back up project data periodically in WINCAPSIII in order to recover the robot controller smoothly after loss of project data due to unexpected accidents such as expired service life of memory backup batteries.

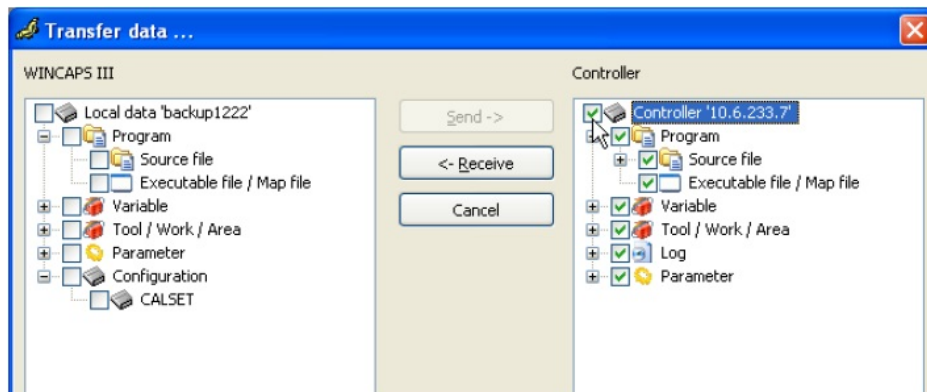
Be sure to back up project data and preserve it, in particular:

- at the time of purchase
- after performing CALSET
- after replacement of a motor

DENSO preserves arm data configured at the time of shipment for 10 years. If your arm data is lost, contact your DENSO representative.

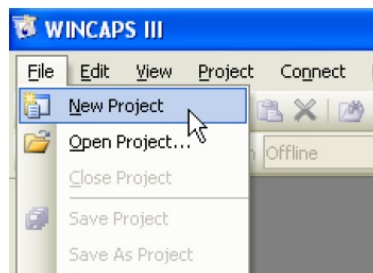
4.1 Back up project data

Use WINCAPSIII to back up project data. When a project has been created in WINCAPSIII Receive all data from the controller and preserve it.

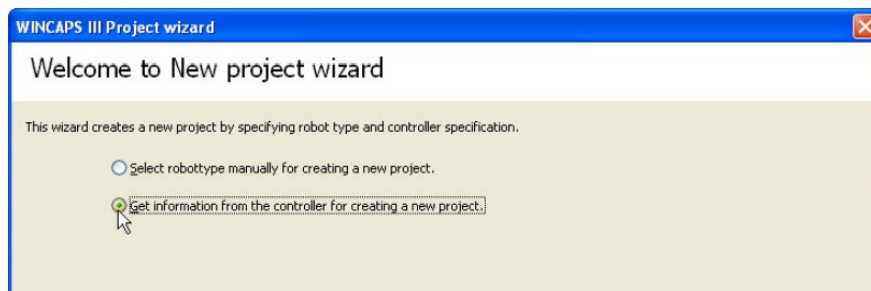


When creating a new project to preserve backup data follow the procedure given below.

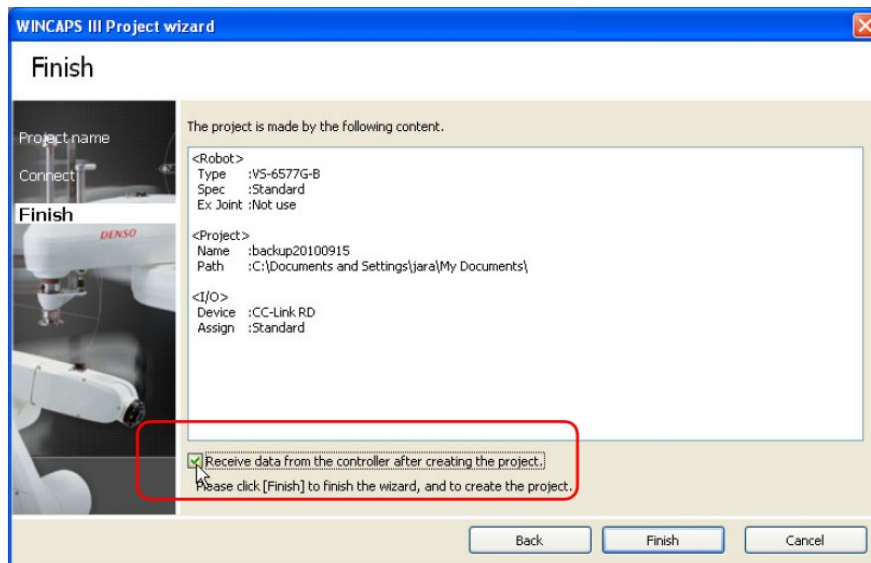
1. Create a new project in WINCAPSIII.



2. Choose "Get information from the controller for creating a new project."



3. Following the project wizard, enter the IP address and the desired backup file name.
4. Select "Receive data from the controller after creating the project."



5. Close the project.

4.2 Transfer arm data

When WincapsIII exchanges project data with the robot controller, arm data unique to individual robots can be transferred only from the robot controller to WincapsIII, but it cannot from WincapsIII to the robot controller. This is to protect arm data in the robot controller from being overwritten accidentally. To transfer arm data from WincapsIII to the robot controller, use the following procedure.

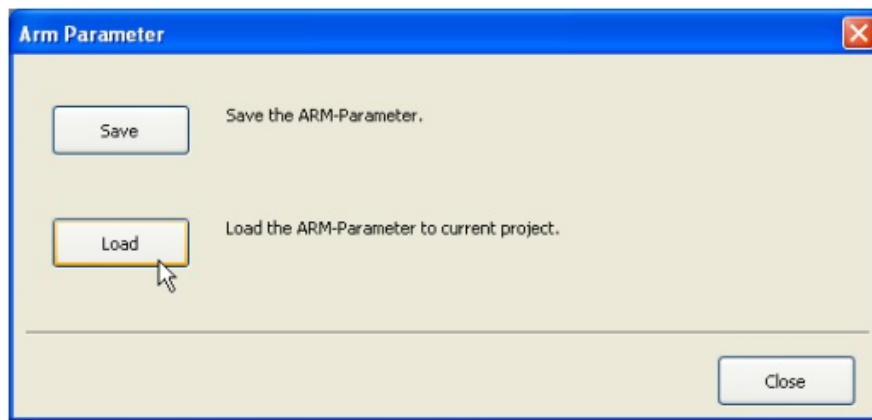
1. Loading the arm data (***.wam) into the WincapsIII project.

This step is necessary when only arm data is supplied by DENSO. When project data has been backed up, open the project data in WincapsIII and proceed to STEP 2.

Start WincapsIII, log on as a Programmer, and create a project suitable for your robot model.

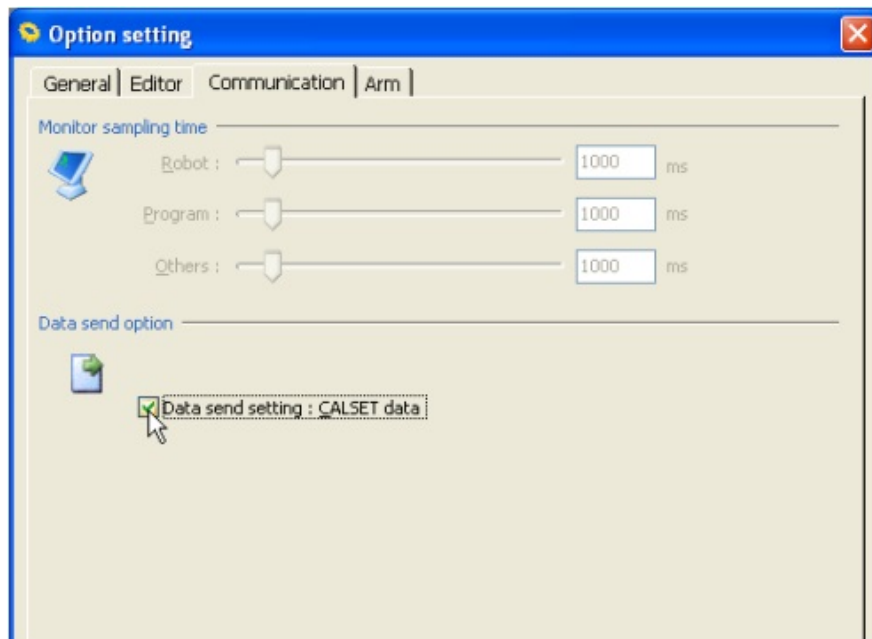
Choose Tool | Arm parameters to display the Arm Parameter window.

Press Load and select the arm data (***.wam) to load



2. Configuring communication options for transfer of arm data from WINCAPSIII to the robot controller

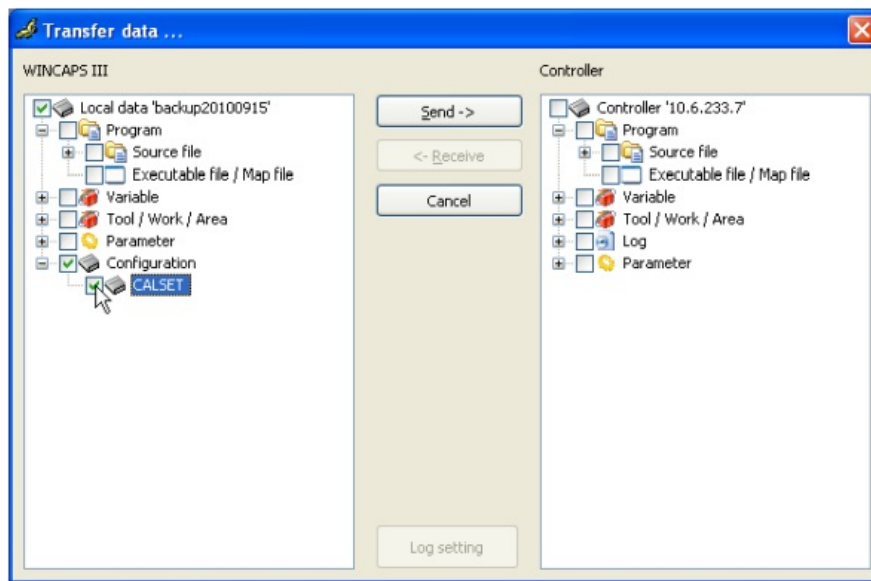
Choose Tool | Option | Communication tab. Select "Data send setting: CALSET data" and press OK.



3. Transferring arm data to the robot controller

Choose Connect | Transfer data to display the Transfer data window.

Select Parameters | Arm parameters and Configuration | CALSET, then press Send.



Upon completion of transfer of the CALSET-related arm data, restart the robot controller.