

System Settings

Arc Welding System /M2001

504 874-102 Revision, 2003-09



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1 Safety



Read the information about safety in the manual *System Manual*, section *Introduction and safety*.

Safety

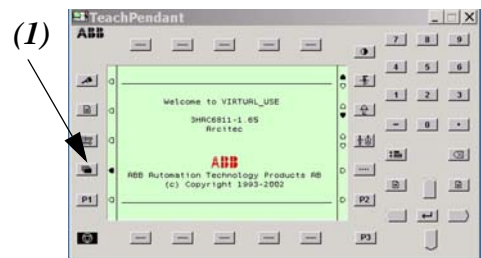
2 Calibrating the robot and the external axes


2.1 Manual setting of the calibration values

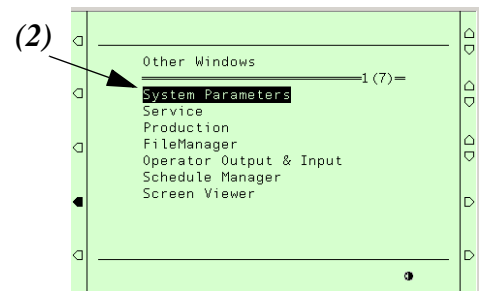
The measure is only necessary if the system has lost the calibration values (resolver values).


The chapter describes the procedure for all robot and positioner axes where there are calibration values available

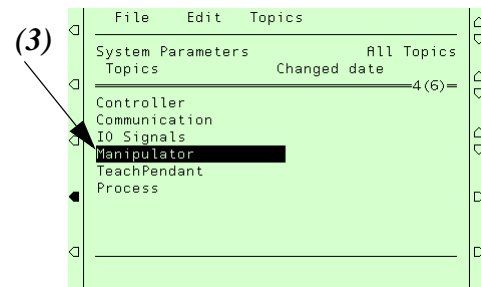
- 1 Press  **Misc.**




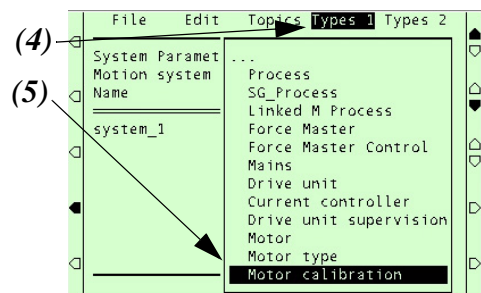
- 2 Move the cursor to **System Parameters.**
 - Press  **Enter.**



- 3 Move the cursor to **Manipulator.**
 - Press  **Enter.**



- 4 Press the menu key **Types 1** or **Types 2.**
- 5 Move cursor to **Motor calibration.**
 - Press  **Enter.**



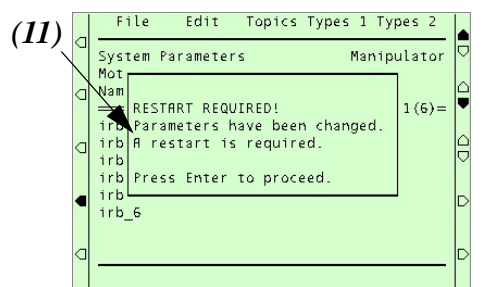
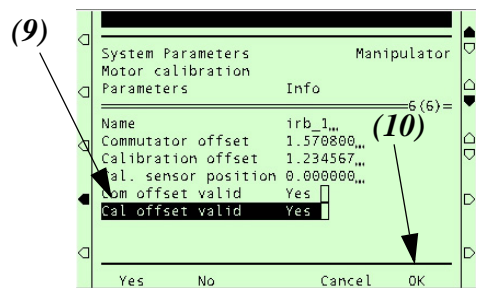
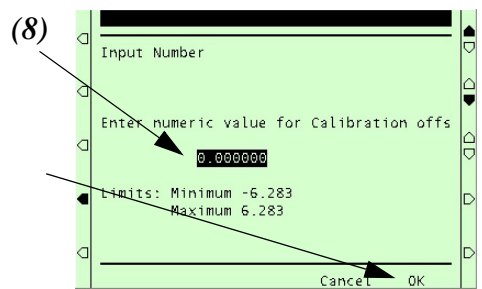
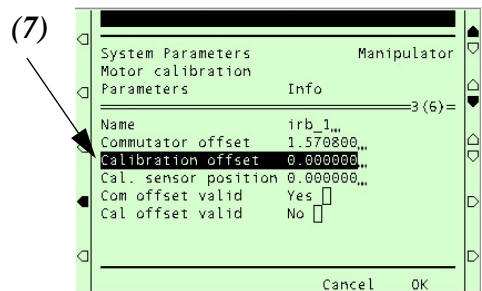
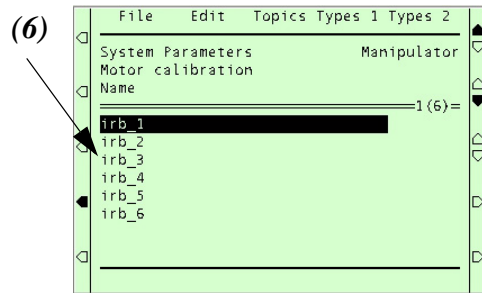
Calibrating the robot and the external axes

- 6 Move cursor to the axis to be calibrated.
 - Press **Enter**.

- 7 Move the cursor to **Calibration offset**.
 - Press **Enter**.

- 8 Type the motor's calibration value. The value can be found on the plate inside the cabinet door. Values for IRB also on the manipulator.
 - Press the function key **OK**.

- 9 Move the cursor to **Cal_offset_valid**.
 - Check whether **Yes** is defined.
 - If not:
Press the function key **Yes**.
- 10 Press the function key **OK**.
- 11 The system responds with: **Restart required!** Parameters have been changed.
 - Press **Enter** to proceed.
- 12 Repeat the procedure from point 6 above until the calibration has been updated for all motors.



Calibrating the robot and the external axes

13 When calibration has been updated for all motors:

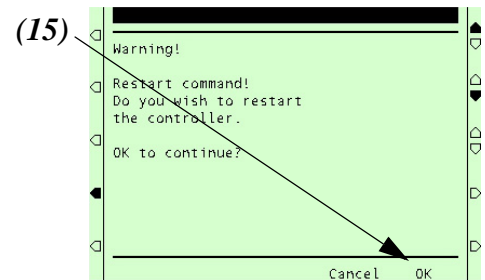
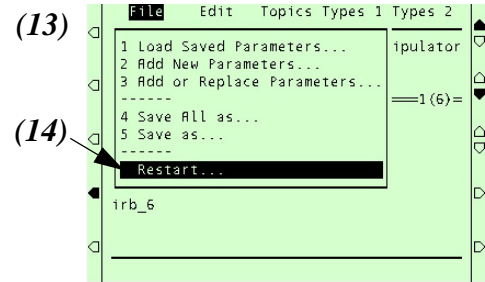
- Press the menu key **File**.

14 Move the cursor to **Restart**.

- Press  **Enter**.

15 Press the function key **OK** to restart controller.

- When the window **Welcome...** is displayed the system is ready for use.



2.2 Updating the revolution counter

This measure is necessary when you have entered the calibration values manually or for some reason need to update one or more of the axes' revolution counters (resolver) against the synchronization position.

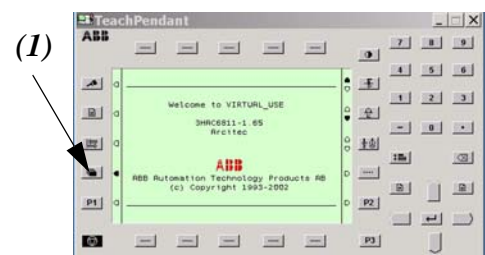
Usually the programmed positions are not affected by an update. If this happens the entered values may be incorrect or the axis has been updated before programming at an incorrect position i.e. not by the synchronization markings.

1 Move the robot's and positioner's axes to their respective zero positions (synchronization marking).


NOTE!

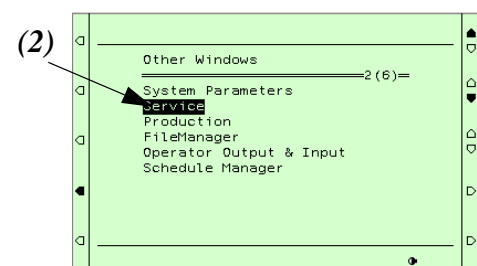
- If the system has a positioner of the type **B, C, D, K or R** the zero positions should be updated with the unit's position 1 (side 1) against the robot.

1 Press  **Misc**.



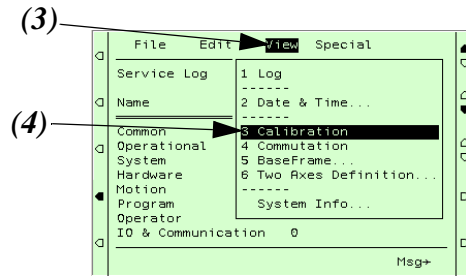
2 Move the cursor to **Service**.

- Press  **Enter**.

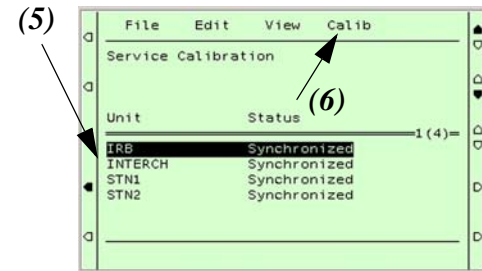


Calibrating the robot and the external axes

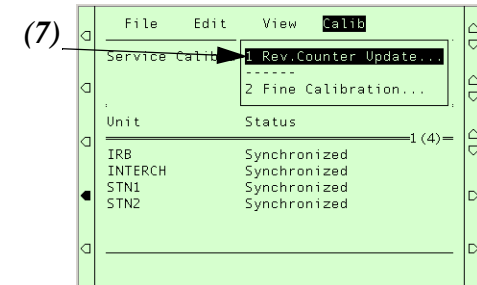
- 3 Press the menu key **View**.
- 4 Select **Calibration** using the cursor or number key.
 - Press **Enter**.



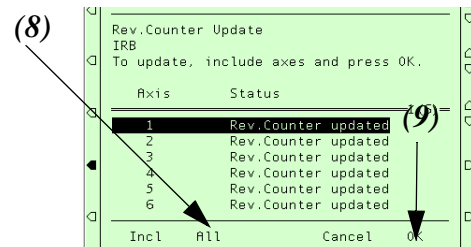
- 5 Move the cursor to the mechanical unit to be calibrated.
- 6 Press the menu key **Calib**.



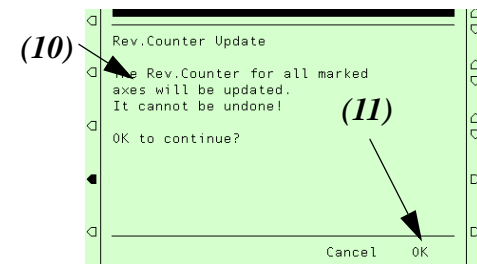
- 7 Select **Rev. Counter Update** using the cursor or number key.
 - Press **Enter**.



- 8 Press the function key **All** to include all the mechanical unit's axes.
- 9 Press the function key **OK**.



- 10 The system responds with: **“Unit name” synchronized.**
- 11 Press the function key **OK**.



2.3 Recalibrating the axes

This measure is necessary when the external axes lack calibration values or you wish to recalibrate the axes.



NOTE! This procedure should **not** be used if calibration values already exist for the axis in question.

You should be aware that the **programmed positions can change** depending on whether the new calibrated position differs from the previous position.

The chapter describes the procedure for the positioner, not for the robot. (Specialist know-how, which is not described here, and equipment are required to calibrate the robot's axes.)


Calibration of the external axes is performed in different ways depending on the type of positioner in question.

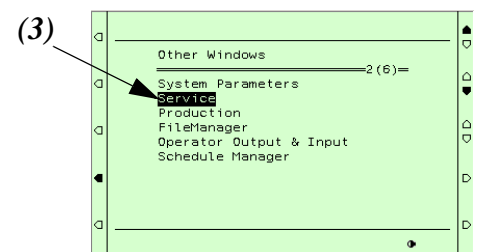
2.3.1 Positioners of the types A and L

- 1 Move the positioner's axes (axis) to respective zero positions (synchronization marking).
 - Be precise when adjusting the position of the axis so that it lies in the centre of marking.
The marking is made up of a machined groove or a machined notch on the gearbox respective faceplates.


- 2 Press  **Misc**

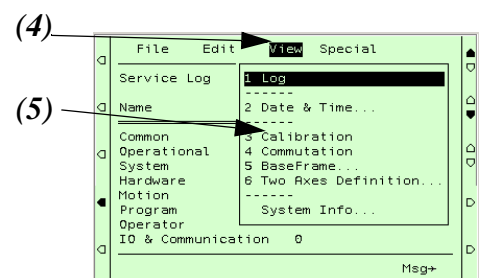


- 3 Move the cursor to **Service**
 - Press  **Enter**.



- 4 Press the menu key **View**.

- 5 Select **Calibration** using the cursor or number key
 - Press  **Enter**.

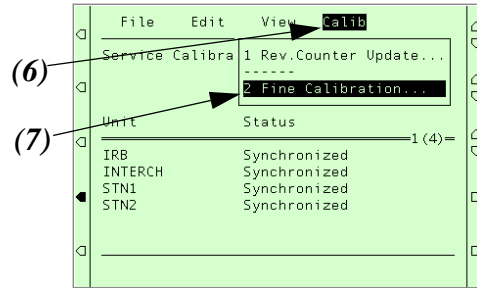


Calibrating the robot and the external axes

6 Press the menu key **Calib**.

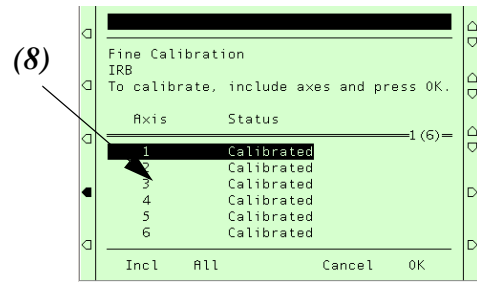
7 Select **Fine Calibrate** using the cursor or number key

- Press **Enter**.



8 Move the cursor using the arrow keys to the mechanical unit to be calibrated.

- Answer **OK** when asked whether you have put the mechanical unit in the right position.

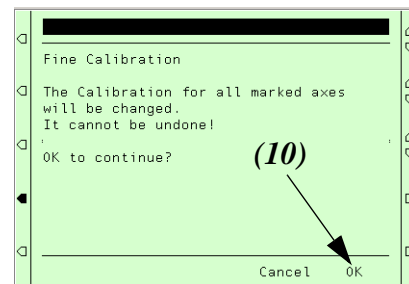


9 Select the axis to be calibrated using **Incl**.

(Select all axes with **All**.)

- Press **OK**

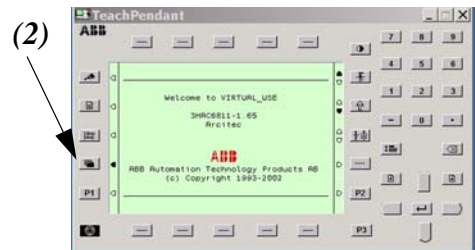
10 Answer **OK** again to the new question if you really want to perform the calibration. The axes should now be synchronized.



2.3.2 Positioners with two position units of the types B, C, D, K or R

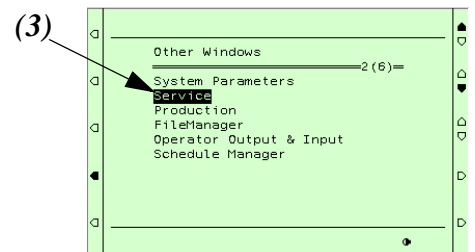
- 1 Move the positioner's axes (axis) to their respective zero positions (synchronization marking).
 - Be precise when adjusting the position of the axis so that it lies in the centre of marking.
 - The marking is made up of a machined groove or a machined notch on the gearbox respective faceplate.

- 2 Press  **Misc**



- 3 Move the cursor to **Service**

- Press  **Enter**.



- 4 Press the menu key **View**.

- 5 Select **Calibration** using the cursor or number key

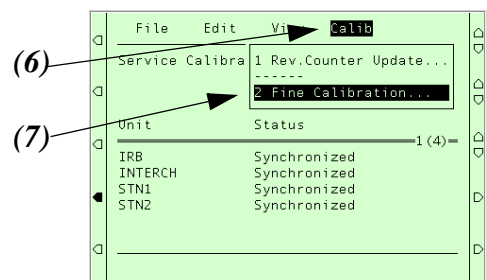
- Press  **Enter**.



- 6 Press the menu key **Calib**.

- 7 Select **Fine Calibrate** using the cursor or number key

- Press  **Enter**.



Calibrating the robot and the external axes

8 Move the cursor using the arrow keys to the mechanical unit to be calibrated.

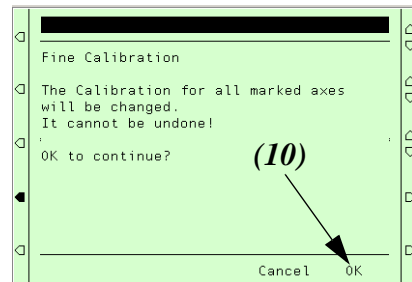
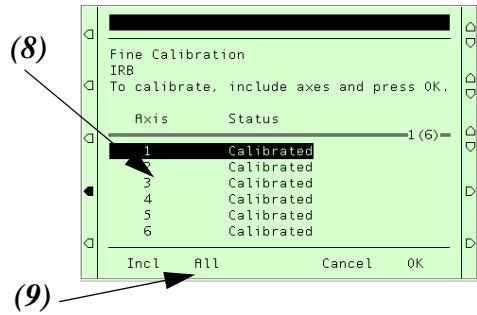
- Answer **OK** when asked whether you have put the mechanical unit in the right position.

9 Select the axis to be calibrated using **Incl**.

(Select all axes with **All**.)

- Press **OK**

10 Answer **OK** again to the new question if you really want to perform the calibration. The axes should now be synchronized.



11 A program must now be run in order to accurately set the position of the table switching axis.

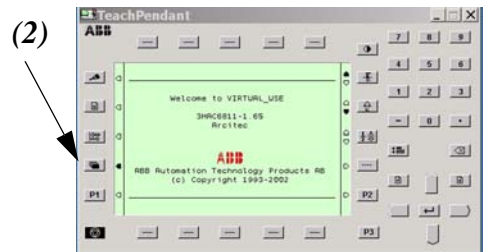
IRBP Calibration, see *IRBP Driver Documentation*

- Run the program to set the calibration position.
- The synchronizing positions of the remaining axes are not affected by this program.

2.3.3 Positioners of the types C Index

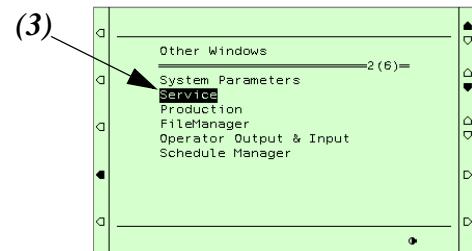
- 1 Move the positioner's axes (axis) to their respective zero positions (synchronization marking).
 - Be precise when adjusting the position of the axis so that it lies in the centre of marking.
 The marking is made up of a machined groove or a machined notch on the gearbox respective faceplate.

- 2 Press  **Misc**



- 3 Move the cursor to **Service**

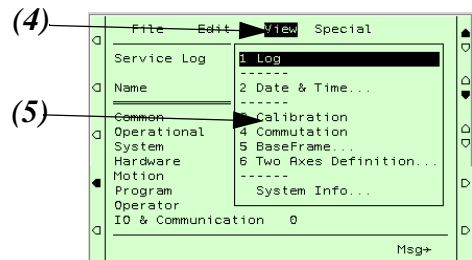
- Press  **Enter**.



- 4 Press the menu key **View**.

- 5 Select **Calibration** using the cursor or number key

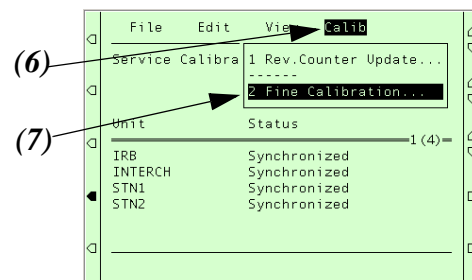
- Press  **Enter**.



- 6 Press the menu key **Calib**.

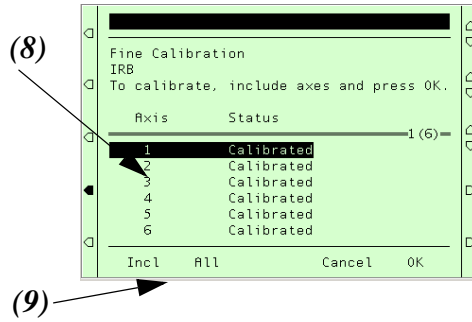
- 7 Select **Fine Calibrate** using the cursor or number key

- Press  **Enter**.

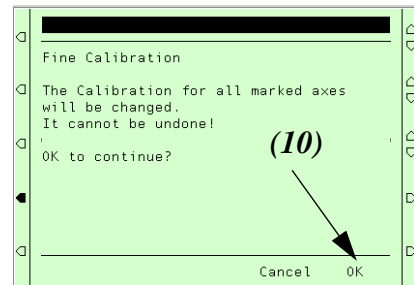


Calibrating the robot and the external axes

- 8 Move the cursor using the arrow keys to the mechanical unit to be calibrated.
 - Answer **OK** when asked whether you have put the mechanical unit in the right position.
- 9 Select the axis to be calibrated using **Incl.**
(Select all axes with **All.**)
 - Press **OK**



- 10 Answer **OK** again to the new question if you really want to perform the calibration.
The axes should now be synchronized.



- 11 A program must now be run in order to accurately set the position of the table switching axis.
 - Run the program to set the limit switches.

3 Definition of the tool data (tload)

These are the movement related data that should be defined first. All movement is dependent on this definition.



When using the *Collision Detection* functionality it is most important to have the right tool load in your tool data.

Recommended data components for the tool:

robhold: true

tframe: **5-point TCP&Z** is normally used with weaving during **MIG/MAG** welding.

Without weaving **4-point TCP is sufficient.**

TCP is defined according to the description in section 4, *S4C User's Guide, Calibration, Defining tools.*

tload: Values for the supplied standard welding guns and guns with a swan neck:

Welding gun type	Swan neck	Weight kg	X mm	Y mm	Z mm
ESAB PSF 315R	22 degrees	3.3	-60	0	57
ESAB PSF 500R	22 degrees	3,3	-60	0	57
Dinse PKI 500	22 degrees	3,3	-35	0	90
Binzel WH 455	22 degrees	3,3	-35	0	55
Dinse PP ALU	22 degrees	4,4	-20	0	120

The five standard welding gun types above are predefined with the right *tload* in the module *Tooldata.sys*.

- Always use one of these tools when you are using a standard welding gun.
- Duplicate and change the name of the tool data if you want to make your own tool.
- If you use a non-standard welding gun it is necessary to run the `load_identify` service routine.

3.1 Setup welding gun without BullsEye®II

The position of the robot and its movements are always related to its tool coordinate system, i.e. the TCP and tool orientation. To get the best performance, it is important to define the tool coordinate system as correctly as possible. For more information, see the User's guide, Chapter "7 Defining Tools"

3.2 Setup welding gun when using BullsEye®II (option)

BullsEye® II provides completely automated Tool Center Point (TCP) definition.

Choose the right tool before starting the *SetupBullseye* routine.


- 1 Select  (Program)

(1)



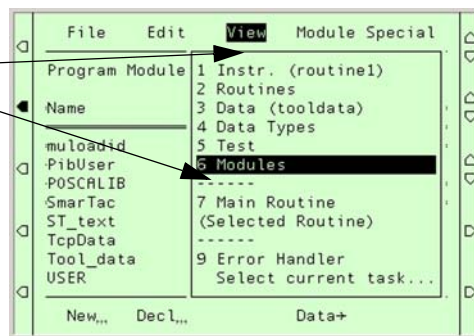
- 2 Select *View*

- 3 Select **6 (Modules)**

- Press  **Enter**.

(2)

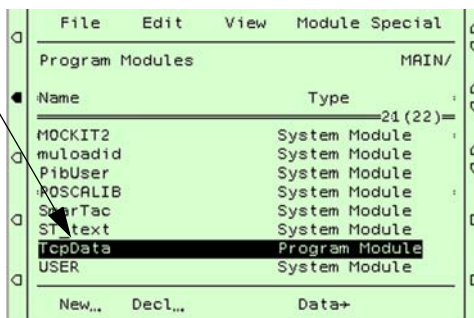
(3)



- 4 Select *Tcpdata*

- Press  **Enter**.

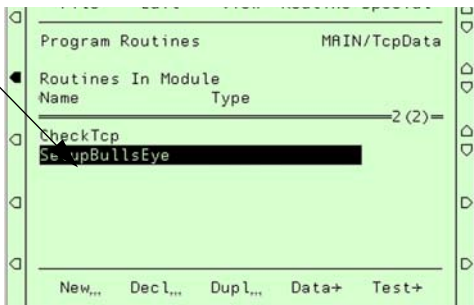
(4)



- 5 Select *SetupBullsEye*

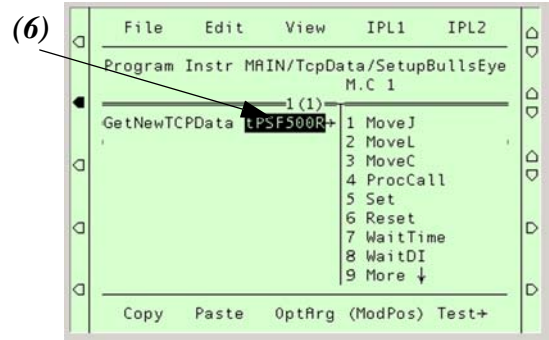
- Press  **Enter**.

(5)

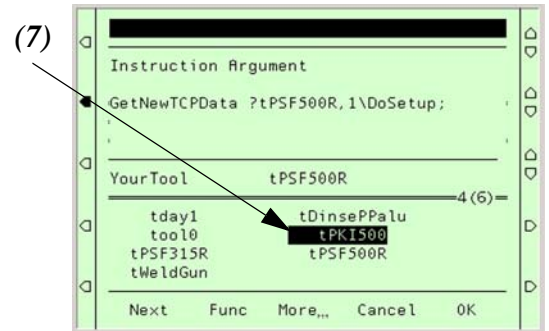


Definition of the tool data (tload)

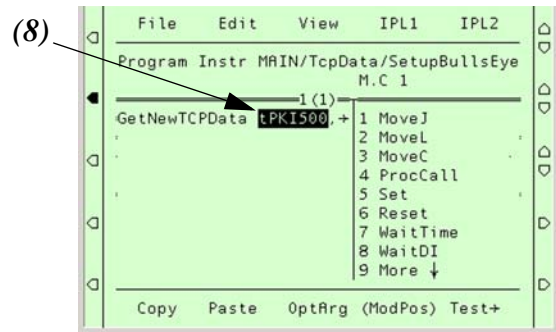
- 6 To change tool (welding gun):
- Move cursor to selected tool (welding gun).
 - Press **Enter**.



- 7 Select tool (welding gun) from list.
- Press **OK**.



- 8 Right type of welding gun is selected.



System settings

Definition of the tool data (tload)


4 Definition of the user co-ordinate system & work object

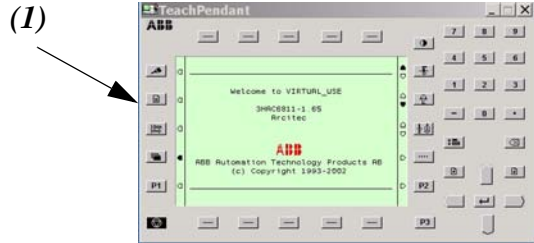
Some measures must be taken before the definition.


- The tool data for the particular welding gun must be defined, See "Definition of the tool data (tload)" on page 17.
- The right tool with the correct TCP must be activated in the jogging menu.
- The mechanical unit for which the user co-ordinate system and work object are to be defined must be activated.
- The mechanical unit's axis (axes) should be set to zero degrees (zero position).

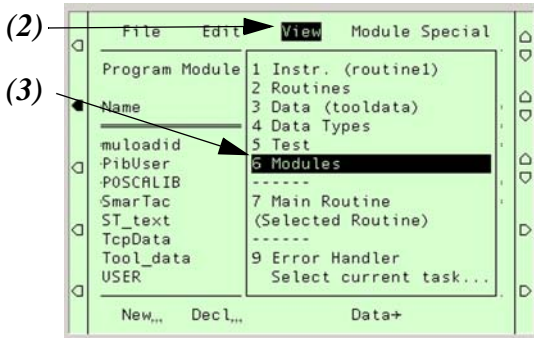
4.1 Pick a name for the work object


The work object should be sorted into a module with a suitable name, preferably a system module.

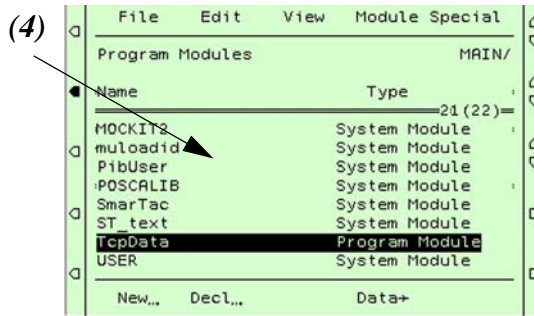
- 1 Select  (Program)
If no program is displayed:
 - create a new program or
 - load a program.




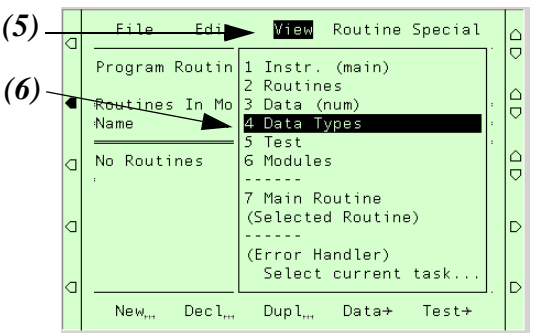
- 2 Select **View**
- 3 Select **6 (Modules)** using the cursor or number key
 - Press  **Enter**.



- 4 Move the cursor to the **System module** where the work object is to be saved.
(If there is no appropriate module one must be created.)
 - Press  **Enter**.



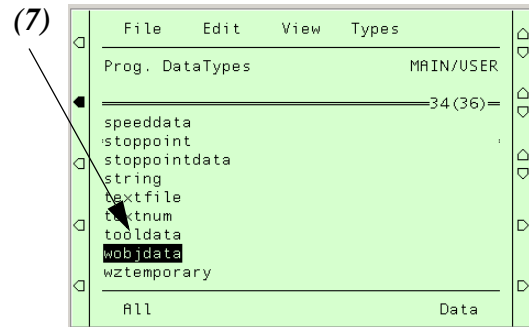
- 5 Press the menu key **View**.
- 6 Select **Data Types** using the cursor or number key.
 - Press  **Enter**.



Definition of the user co-ordinate system & work object

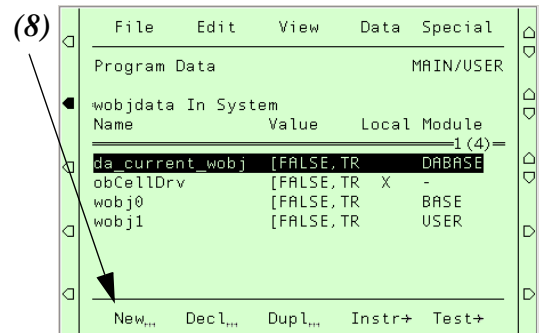
- 7 Move the cursor to **wobjdata** (work object data).

- Press **↵** **Enter**.



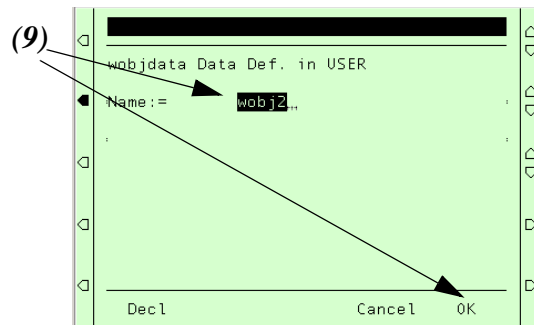
- 8 Press the function key **New**.

- Press **↵** **Enter** to change the name.



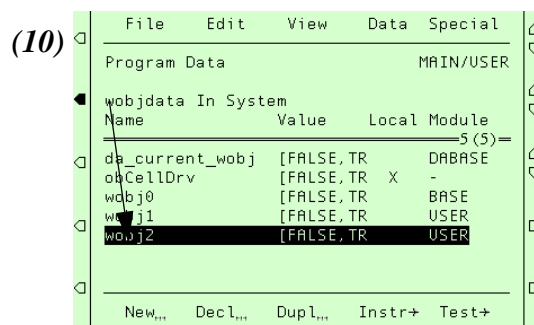
- 9 Enter the name to be given to the work object.

- Press **OK**.



- 10 Select right work object

- Press **↵** **Enter**

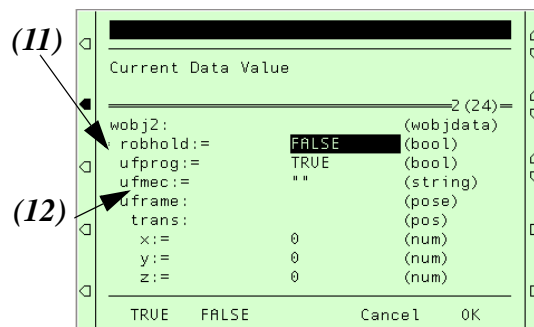


- 11 Set **ufprog:=** to **TRUE** while defining. Once the definition is complete it should be changed to **FALSE**, see chapter 4.4

- 12 To change mechanical unit.

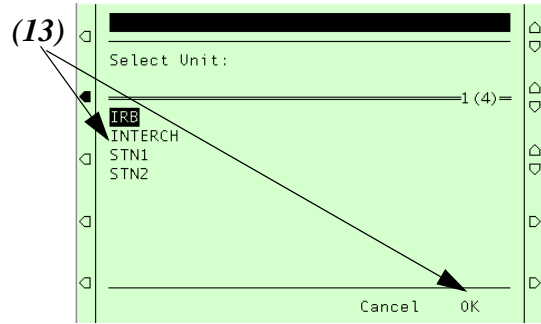
- Select **ufmec**

- Press **↵** **Enter** to change the mechanical unit.

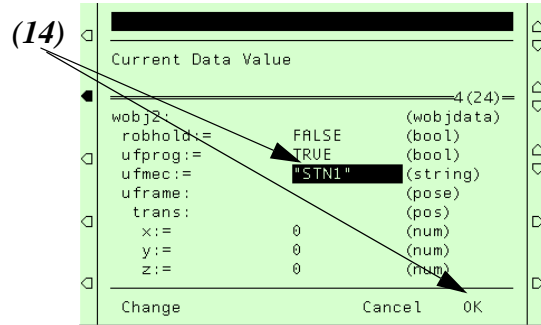


Definition of the user co-ordinate system & work object

- 13** Select the mechanical unit.
- Press **OK**.



- 14** Press **OK**.



4.2 Definition of the user co-ordinate system

- The definition should be performed using a 4-point method.
- Make sure that the positioner's axes are synchronized and set at 0 degrees.
- Select a point on the mechanical unit's faceplate **by the plate's synchronization mark.**
You will always get a more accurate measurement if you measure as far out on the plate as possible, alternatively extend the plate's radius so that you can measure at a point on the outer edge of the area of movement. (You can easily make a bar that is bolted to the faceplate.)

4.2.1 Positioner IRBP types L / K / R

Uses a **single axis** user co-ordinate definition, see *the robot's User's Manual chap. 10.6.2*

4.2.2 Positioner IRBP types A / B / D

Use **double axes** user co-ordination definition Method 2, see *the robot's User's Manual chap 10.6.4*


4.2.3 Positioner IRBP types C / C Index as well as fixed table, S (Stationary).

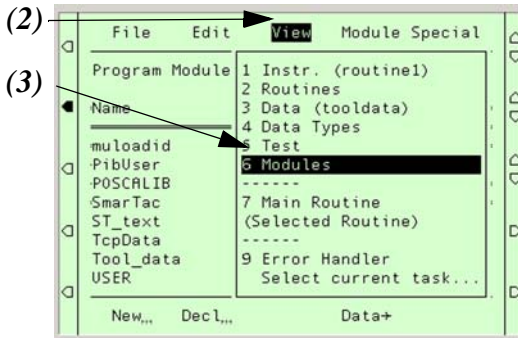
No rotating user co-ordinate system is used here. Measure the object according to the methods for Work object, see *the robot's User's Manual chap. 10.8*


4.3 Changing the work object to a moving work object

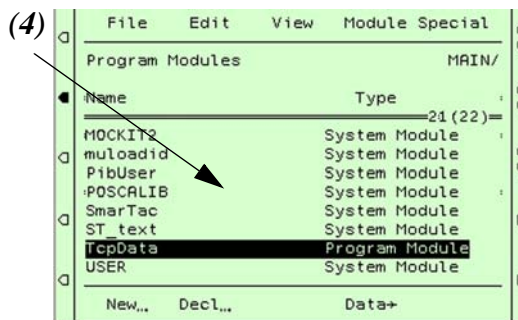
- 1 Select  (Program)




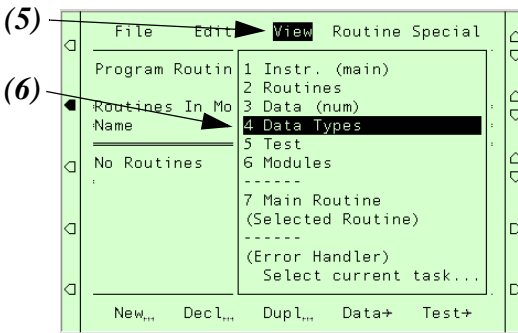
- 2 Select **View**
- 3 Select **6 (Modules)** using the cursor or number key
- Press  **Enter**.




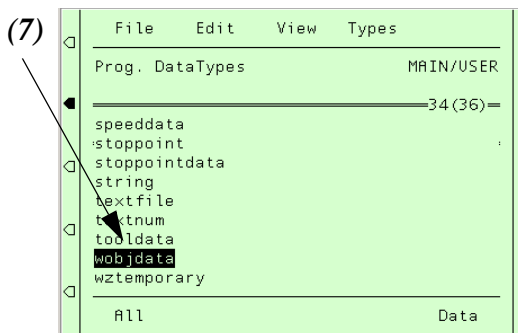
- 4 Move the cursor to the **System module** that contains **Work Object**.
- Press  **Enter**.



- 5 Press the menu key **View**.
- 6 Select **Data Types** using the cursor or number key
- Press  **Enter**.



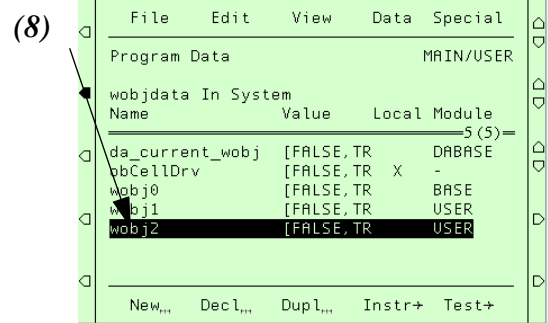
- 7 Move the cursor to **wobjdata** (work object data)
- Press  **Enter**.



Definition of the user co-ordinate system & work object

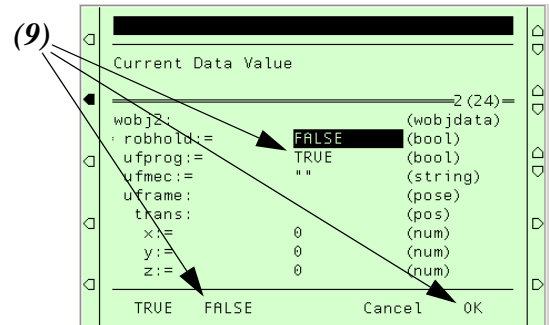
8 Move the cursor to data to be edited.

- Press **↵** **Enter**.




9 Move the cursor to **ufprog:=**

- Select state **FALSE**
- Press the function key **OK**.

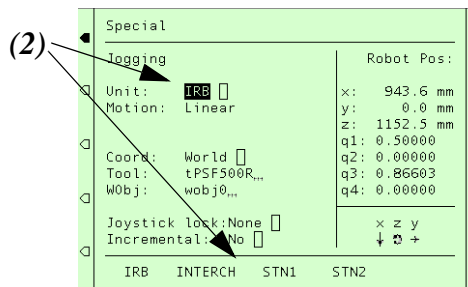


4.4 Activating the work object

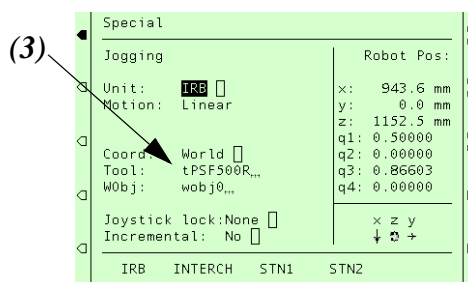
- 1 Press  to open the jogging window.



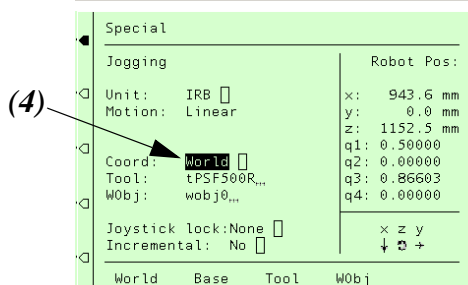
- 2 Activate the mechanical unit.
 - Select mechanical unit



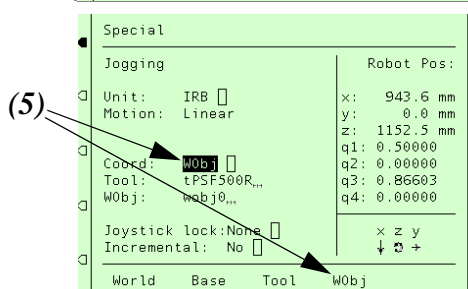
- 3 Check that the right tool is active.



- 4 Change Coordinates to Wobj.
 - Move the cursor to Coord



- 5 Press the function key Wobj.

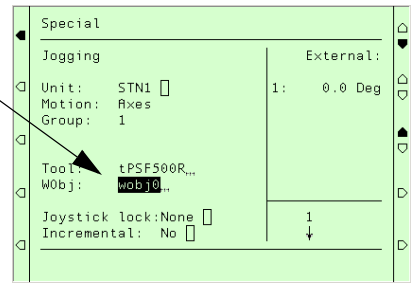


Definition of the user co-ordinate system & work object

- 6** Change **Work Object** to the **WorkObject** that is to be defined for the mechanical unit in question.

- Move the cursor to **Wobj**
- Press **↵** **Enter**.

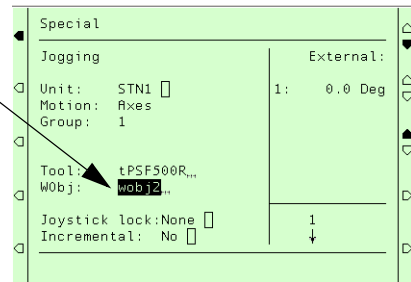
(6)




- 7** Select the right **WorkObject** and

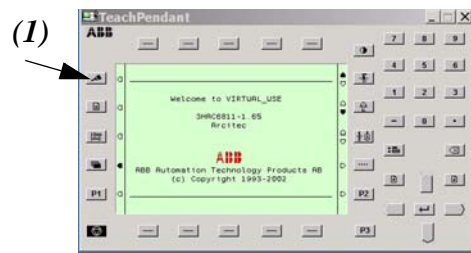
- Press **↵** **Enter**.


(7)

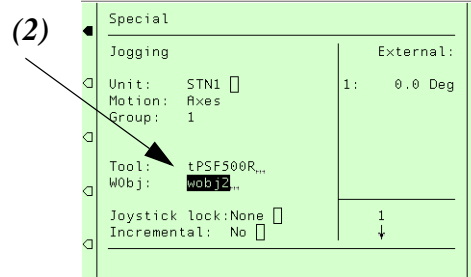



4.5 Deactivate Work object

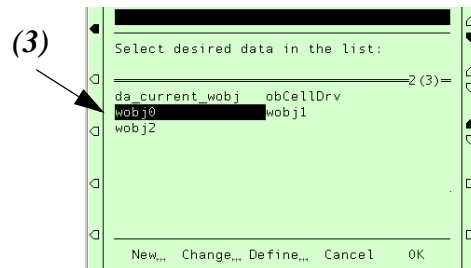
- 1 Press  to open the jogging window.



- 2 Move the cursor to **Wobj** and
- Press  **Enter**.

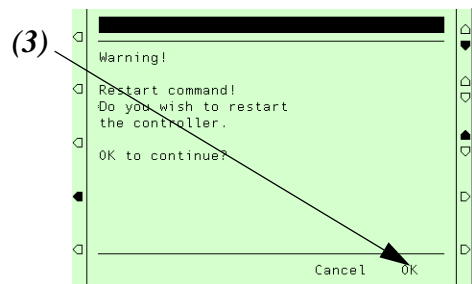
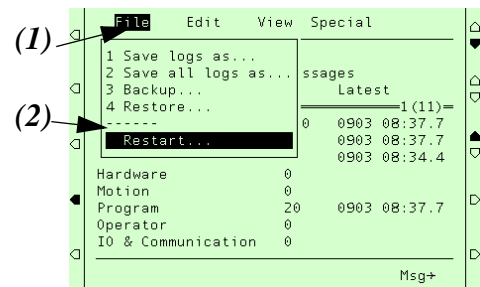


- 3 Select **wobj0** and
- Press  **Enter**.



5 Restart

- 1 Press the menu key **File**.
- 2 Move the cursor to **Restart**
 - Press **Enter**.
- 3 Press the function key **OK**.
- 4 When the window **Welcome...** is displayed the system is ready for use.



System settings

Restart

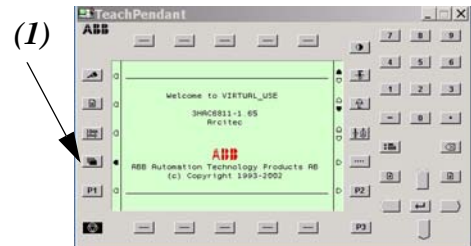
6 Backing up the system

The backup function saves all system parameters, system modules and program modules in a context. If desired, all logs are also saved. The data will be saved in a directory specified by the user.

Note Backup can not be performed during execution of the main task or if there are a lot of background tasks currently in action.

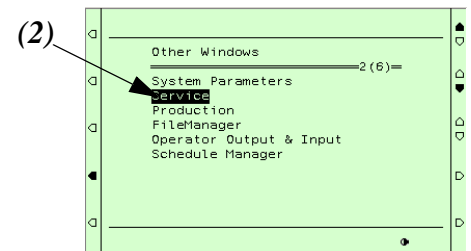
6.1 To perform a Backup

1 Press  **Misc**




2 Move the cursor to **Service**

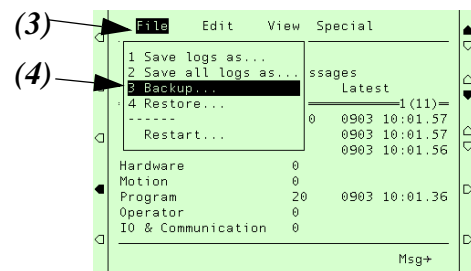
- Press  **Enter**.



3 Press the menu key **File**.


4 Select **Backup** using the cursor or number key.

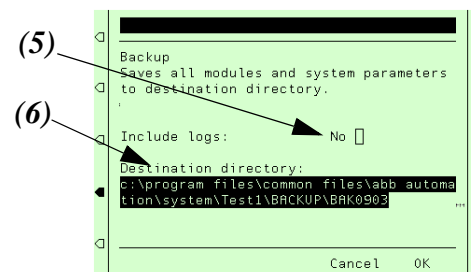
- Press  **Enter**.



5 Choose whether or not all logs are to be saved by selecting the **Include logs** field.

6 Check that the right destination directory is selected

- Press  **Enter** to select destination.





If a cold start is performed, the backup need to be saved in a separate directory on the robot unit:

hd0a:\backup\bakmmdd (mmdd=month day)

Otherwise the folder will be erased.

Backing up the system

- 7** Select a backup directory.
A default directory is suggested, consisting of a prefix and current date, BAKmmdd.
If you want to change directory:
 - Press  Enter
 - Select, or create a new, directory.
 - Press **Unit** to change massmemory unit.
 - Press **OK** to start the backup.
- 8** Press the function key **OK**.
- 9** Move the cursor to the directory the system parameters are to be saved in.
- 10** Press the function key **OK** to save all parameters in the selected directory.
- 11** When the system parameters have been saved.
 - Press  **Enter**.

7 Speed data for external axes

Use the following max. speed data for IRBP-axis:

IRBP-positioner

MTC250	180 degrees/s
MTC750	150 degrees/s
MTC2000	90 degrees/s
MTC5000	39 degrees/s
MIC1.1	90 degrees/s
MIC1.2	90 degrees/s
MIC2.1	90 degrees/s
MIC2.2	90 degrees/s

8 Drivers

In order to ensure the function of the IRBP positioner while operating a number of drivers are supplied.

The main program is the easiest and fastest way to get started. It includes routines where you can put programs for each mechanical unit.

The *IrbpMoveToStn* driver is used to give, on IRBP positioner of the types B, C, D, K and R, unit rotation and shift the mechanical units towards the robot side/operator side. Use of this driver ensures that the right load and interchange position is used.

- For more information, see *IRBP Driver Documentation*

8.1 Driver set-up

When you start the main program for the first time you will be guided through a setup.



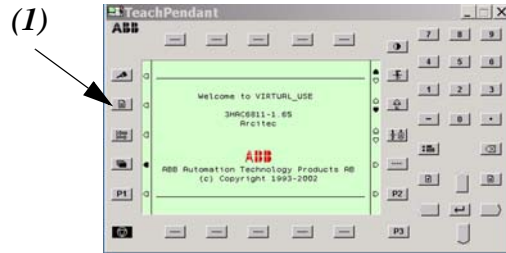
If you have an IRBP positioner of type B, C, D, K or R it is important that STN1 is synchronized against the robot near the mechanical stop. Otherwise the setup will not work accurately.


8.1.1 Run IRBP Service routine

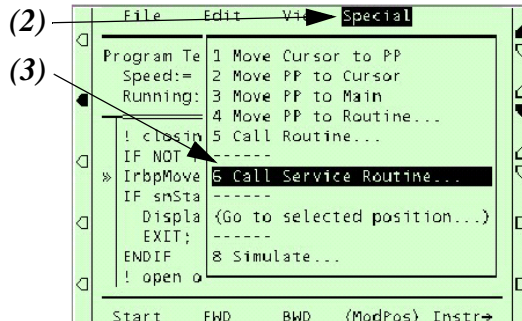
The IRBP_Service Routine is used to set up the drivers and to perform manual operations. It is also an example of how you can use the IRBP drivers in your own program.

For a complete documentation of the IRBP driver functionality, please refer to the *IRBP Driver Reference Manual*.

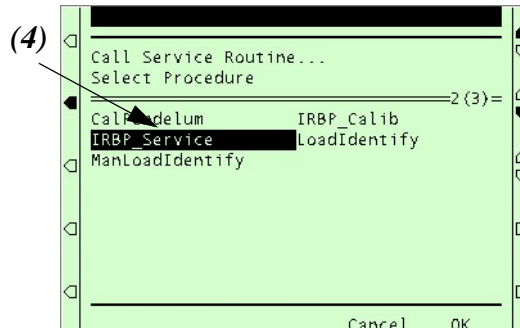
- 1 Select  (Program)



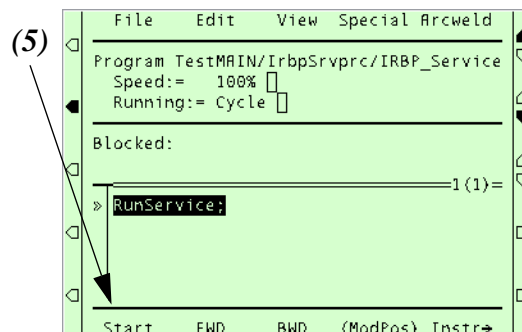
- 2 Select *Special*
- 3 Select **6 (Call Service Routine)**
- Press  **Enter**.



- 4 Select *IRBP Service*
- Press **OK** to continue



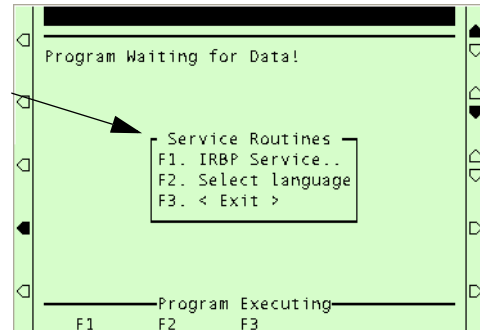
- 5 Start program (*Run Service*)
- Press **Start** to continue



8.1.2 Main menu for *Service Routine*

The IRBP_Service Routine is used to set up the drivers and to perform manual operations. It is also an example of how you can use the IRBP drivers in your own program.

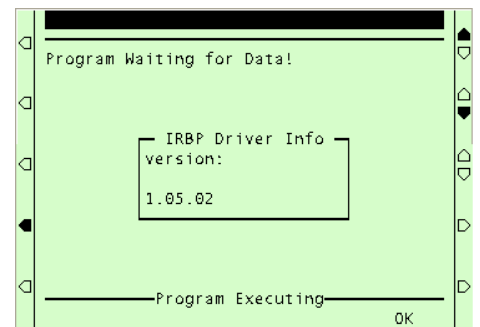
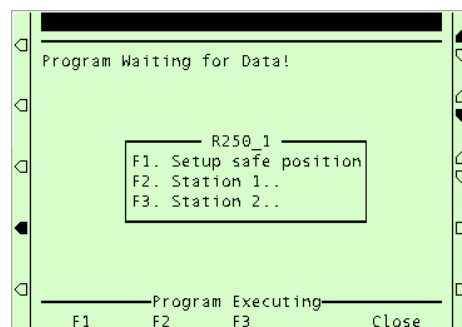
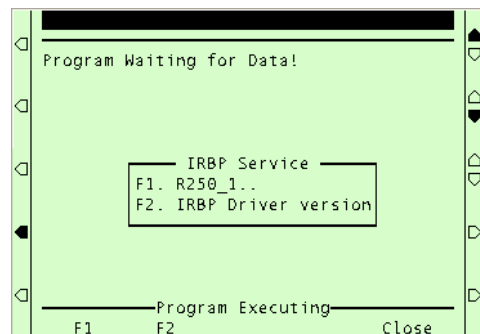
<i>Key</i>	<i>Function</i>
F1	to select IRBP service
F2	to select language Swedish or English
F3	to exit



Menu for *IRBP Service*

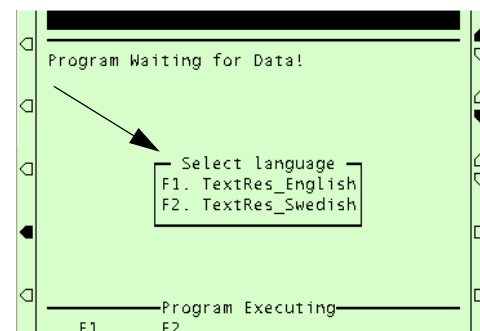
Here is *IRBP Service* selected, which brings up the screen where the user can select positioner or view IRBP driver version information.

<i>Key</i>	<i>Function</i>
F1	to run IRBP Service
F2	to see information about IRBP Driver version



Menu for *Select Language*

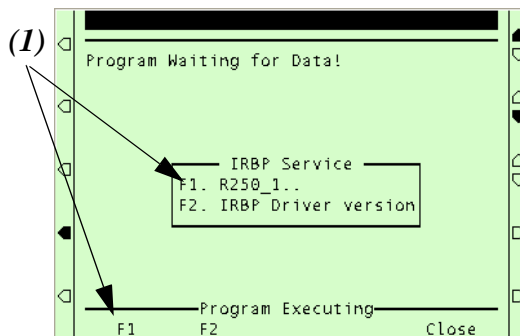
<i>Key</i>	<i>Function</i>
F1	to select language Swedish
F2	to select language English



Positioner menu

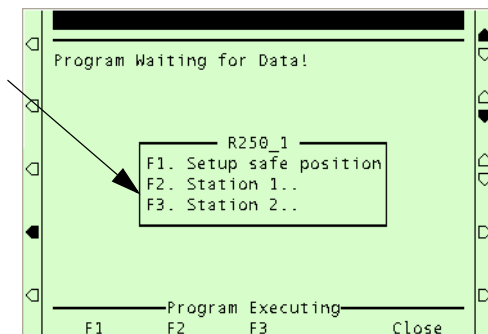
On the positioner screen you can select which station you want to work with or you can setup the Safe Position for this positioner.

- 1 Select **F1** on **IRBP Service menu**.



Positioner screen

Key	Function
F1	Setup safe position
F2	Station 1
F3	Station 2



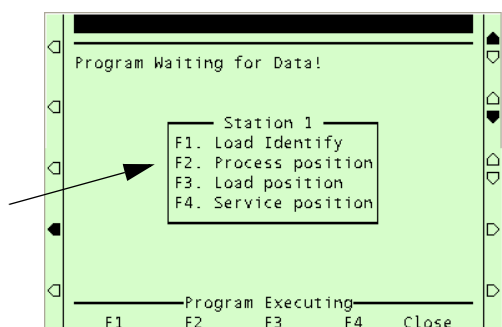
Station menu

On the station menu you will find:

- The load identification procedure, see Load identification procedure on page 62.
- Setup of working positions for each one of your mechanical units, see Working positions on page 49.

Station menu

Key	Function
F1	Load identify
F2	Process position
F3	Load position
F3	Service position

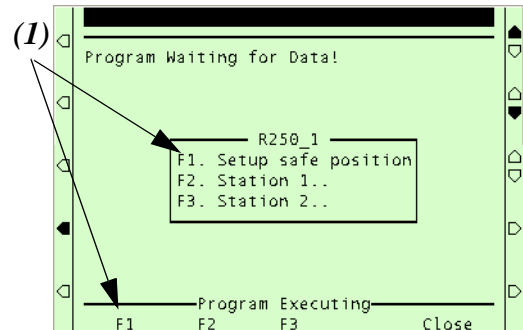


8.2 Safe position



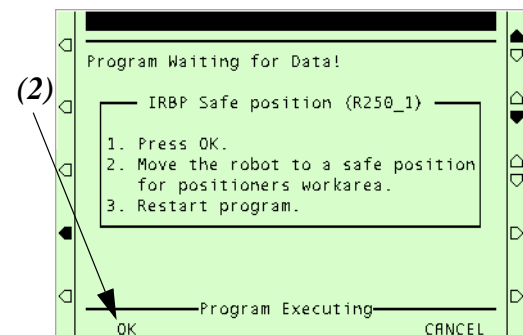
This should be a position where the robot is free from the IRBP positioner working area.

- 1 Select **F1** on **Positioner Screen** to setup the **Safe Position** for this positioner.

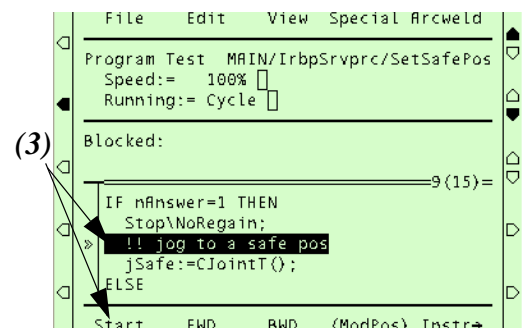


- 2 Press **OK**

First, the Robot Safe Position is taught. The driver requires this position to safely perform a station interchange.



- 3 Move the robot to a safe position for positioners work area.
 - Press Start



8.3 IRBP positioner Interchange calibration

8.3.1 IRBP positioner with mechanical stops

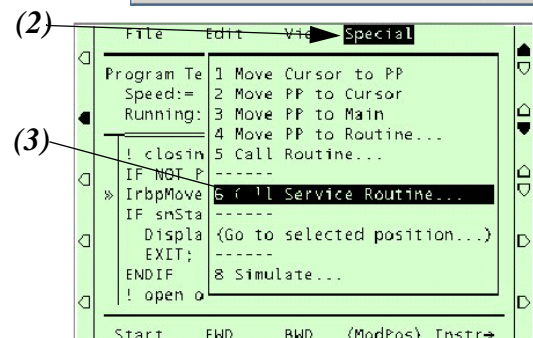
If your IRBP positioner is of type B, C, D, K or R and has mechanical stops.

In order to get the right torque against the stop you must calibrate the positions for side 1 and side 2. The driver setup will guide you through this calibration.

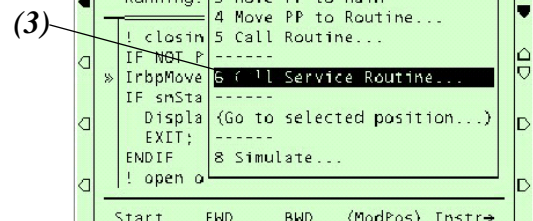
- 1 Select  (Program)



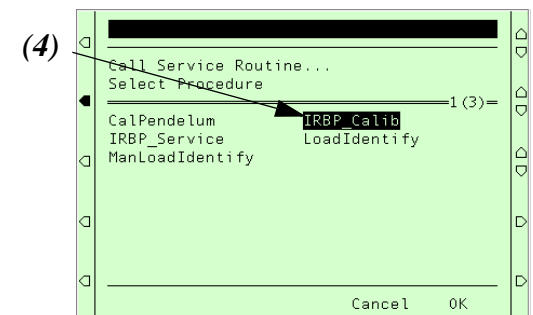
- 2 Select *Special*



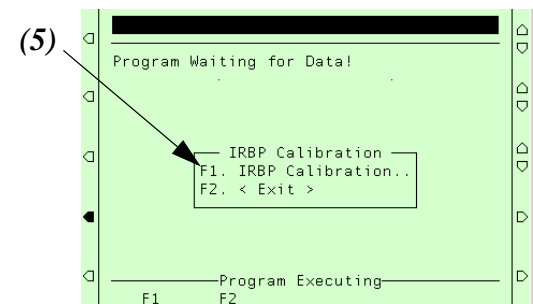
- 3 Select **6 (Call Service Routine)**
- Press  **Enter**.



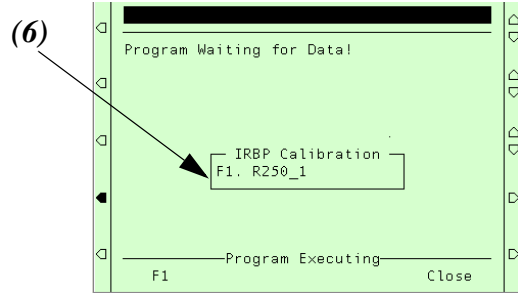
- 4 Select *IRBP Calib*
- Press **OK** to continue



- 5 Select *F1- IRBP Calibration*

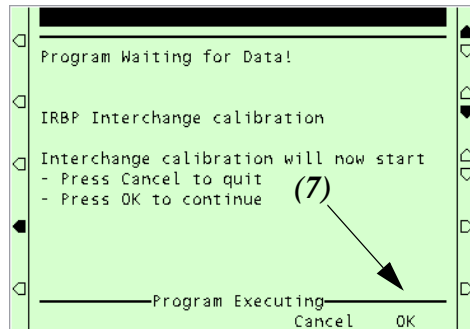


6 Select **F1- IRBP** positioner



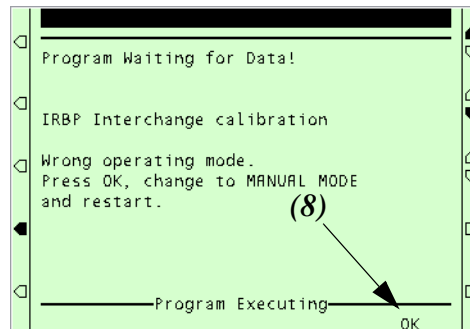
7 Start of interchange calibration

- Press **OK** to continue



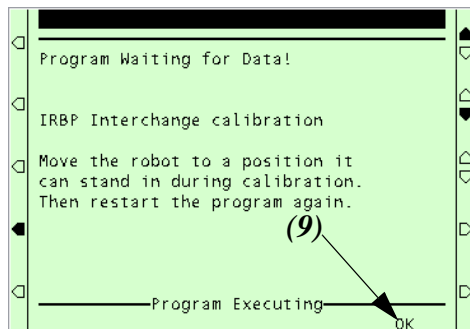
8 Change operating mode to manual

- Press **OK** to continue
- Change to **MANUAL MODE**
- Restart



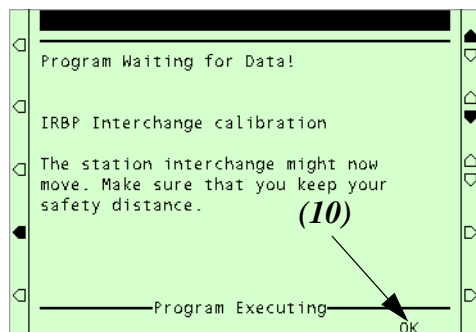
9 Move robot to a safe position outside positioners working area

- Press **OK** to continue



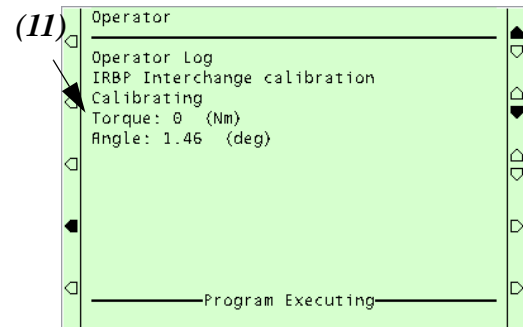
10 Warn user before indexing positioner. The station interchange might now move. Make sure that you keep your safety distance.

- Press **OK** to continue



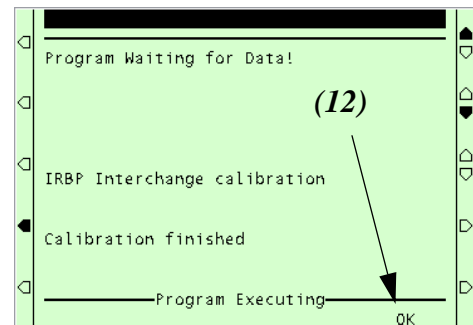
11 Searching for interchange position

For positioners with mechanical stop, the interchange positions are found by measuring the torque against the stop.



12 Calibration finished

- When the calibration is finished, the screen indicated that the positioner passed the calibration.
- Press **OK** to continue.



13 After the calibration, it is time to program the Process positions, see Process position on page 49.

A process position is the position the side towards the **robot** will be in after the interchange. Program it to be in a good starting position for the first weld to reduce cycle time.

8.3.2 IRBP positioner without mechanical stops

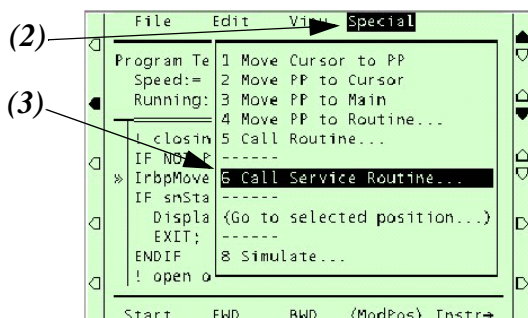
IRBP positioner of type B, C, D, K or R.

In order to get the right position you must calibrate the positions for side 1 and side 2. The driver setup will guide you through this calibration.

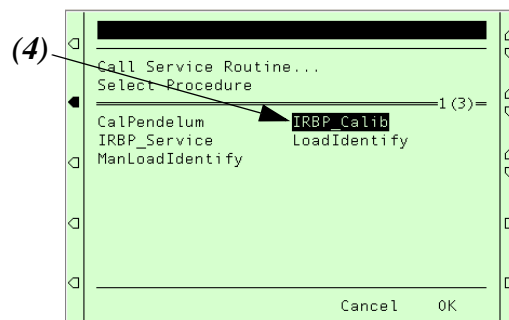
- 1 Select  (Program)



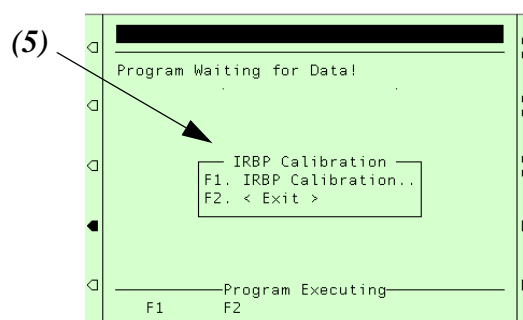
- 2 Select *Special*
- 3 Select **6 (Call Service Routine)**
- Press **Enter**.



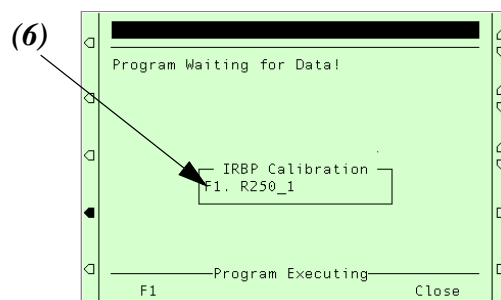
- 4 Select *IRBP Calib*
- Press **OK** to continue



- 5 Select *F1- IRBP Calibration*

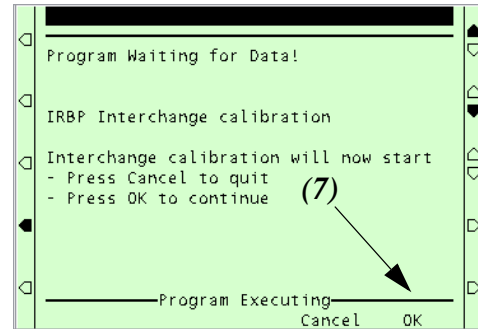


- 6 Select *F1- IRBP* positioner



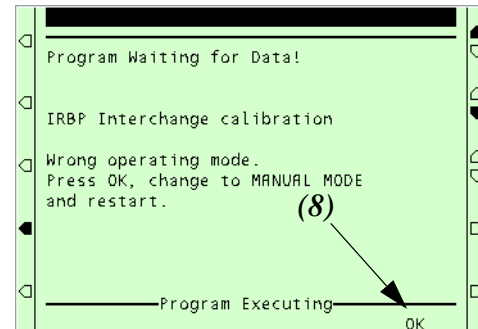
7 Start of interchange calibration

- Press **OK** to continue



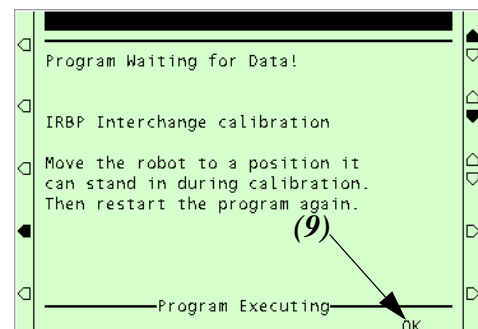
8 Change operating mode to manual

- Press **OK** to continue
- Change to **MANUAL MODE**
- Restart



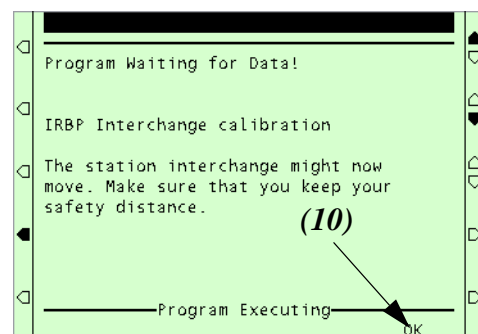
9 Move robot to a safe position outside positioners working area

- Press **OK** to continue



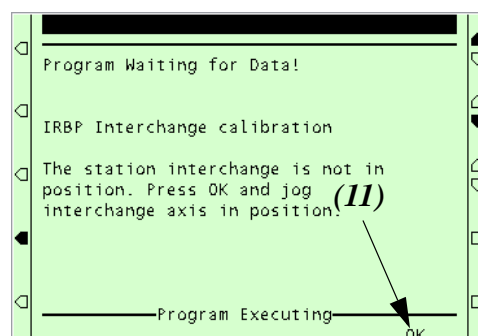
10 Warn user before indexing positioner. The station interchange might now move. Make sure that you keep your safety distance.

- Press **OK** to continue.

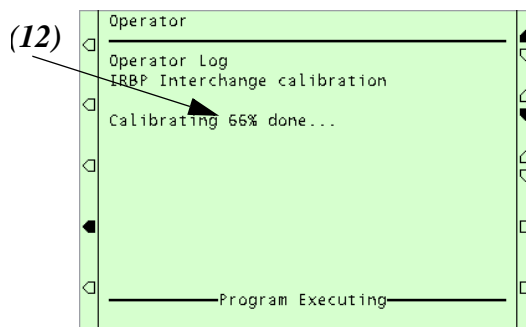


11 After interchange and no limit switch signal is *high*, the user is prompted to jog in position.

- Press **OK** to continue.
- Jog interchange axis in position

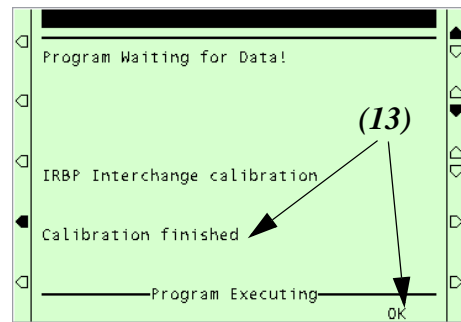


- 12** It is normal that the calibration takes a few minutes. The counter on the screen will show the progress of the calibration process.

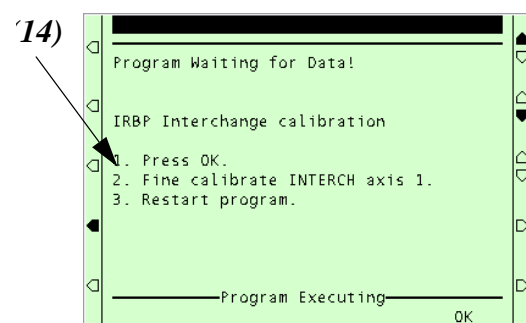


- 13** Calibration finished
- When the calibration is finished, the screen indicated that the positioner passed the calibration.
 - Press **OK** to continue.

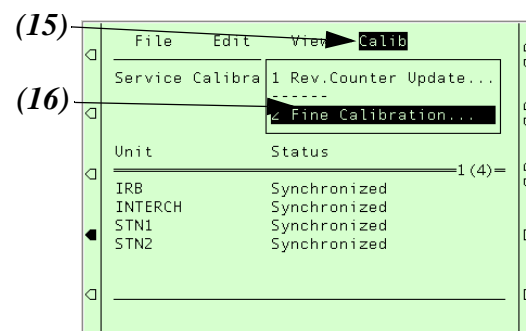
After the calibration procedure is run, the positioner is resting in the Home position (0 degrees). You have now reached the point where you should do the Fine Calibrate, just as on the robot.



- 14** Fine calibrate axis 1 when positioner is without mechanical stop.
- Press **OK** to continue.




- 15** Fine calibrate *INTERCH axis1*, see Recalibrating the axes on page 11.
- Press the menu key **Calib**.



- 16** Select **Fine Calibrate** using the cursor or number key
- Press **Enter**.

- 17** Select mechanical unit *INTERCH*.
- 18** Select the *axis1* to be calibrated
- Press **Enter**.

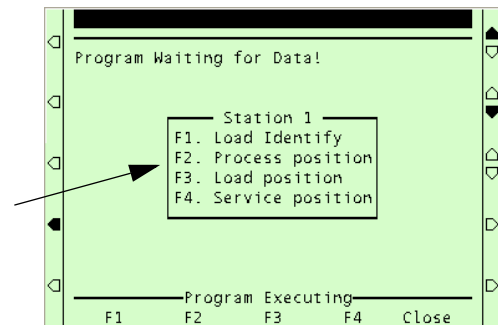
- 19** Start the program.
- Select  (Program)
 - Press the function key **START**.

8.4 Working positions

These positions will speed up and simplify your process. You will be guided through a setup of load position, process position and service position for each one of your mechanical units.

Station menu

Key	Function
F1	Load identify
F2	Process position
F3	Load position
F3	Service position

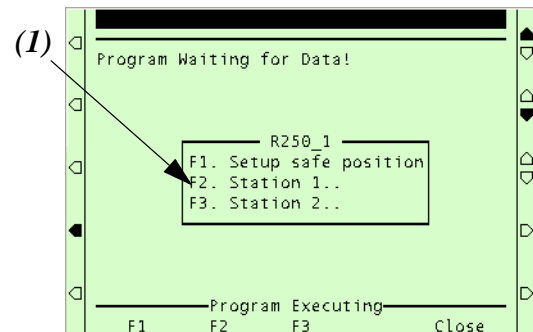


If you would like to change these values just run the IRBP Service routine. See “Run IRBP Service routine” on page 38.

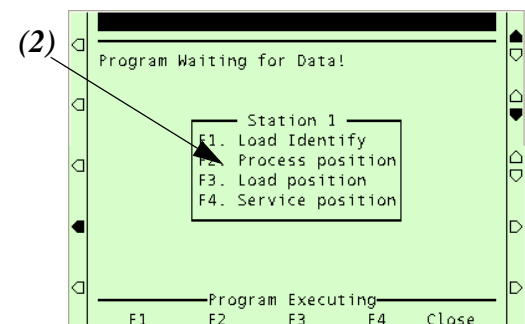
8.4.1 Process position

A process position is the position the side towards the **robot** will be in after the interchange. Program it to be in a good starting position for the first weld to reduce cycle time.

- 1 Positioner screen**
Select which station you want to work with.

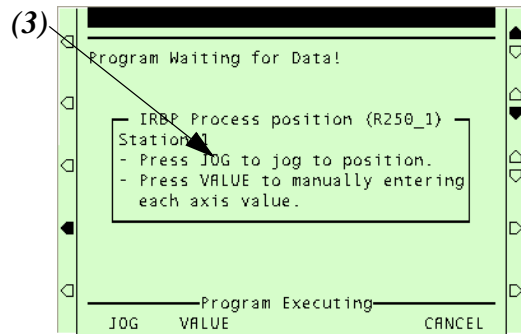


- 2 Station menu**
Press **F2** for setup of **Process position**



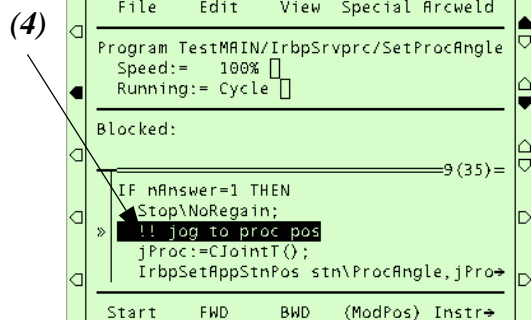
3 IRBP Process position

- Press **JOG** to jog to position
- Press **VALUE** to manually entering each axis value



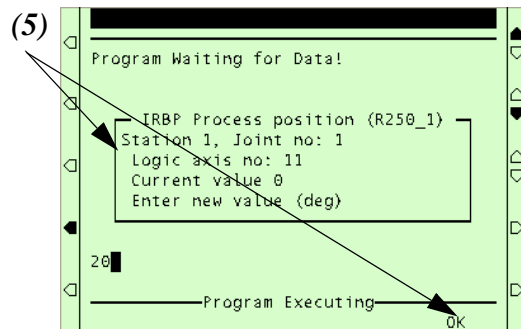
4 Jog to process position

- Press **Start**



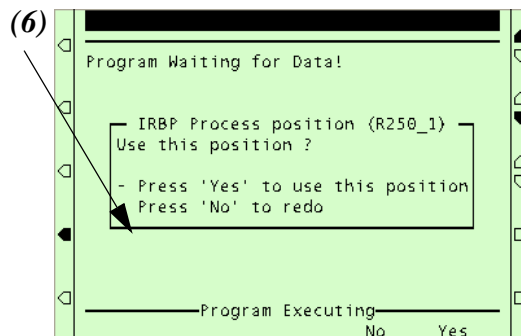
5 Showing the current value for process position.

- Enter new value
 - Press **OK**
- Now the positioner moves to its new process position.



6 Use this process position?

- Press **“Yes”** to use this position.
- Press **“No”** to redo

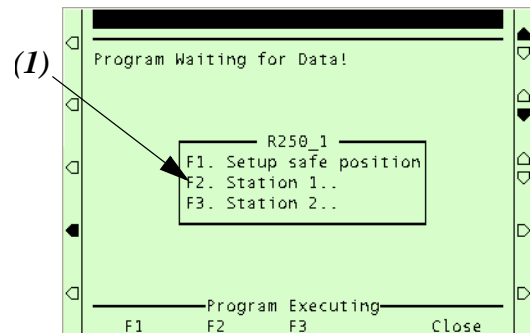


8.4.2 Load position

A load position is the position the side towards the **operator** will be in after the interchange. Program it in a good position for the operator to load/unload parts.

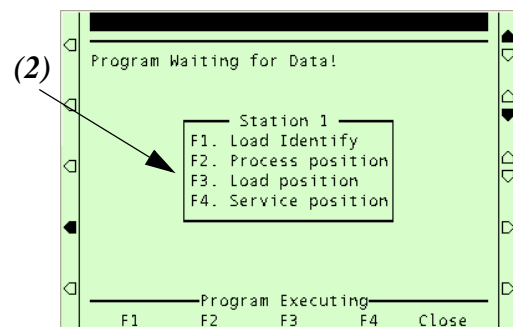
1 Positioner screen

Select which station you want to work with.



2 Station menu

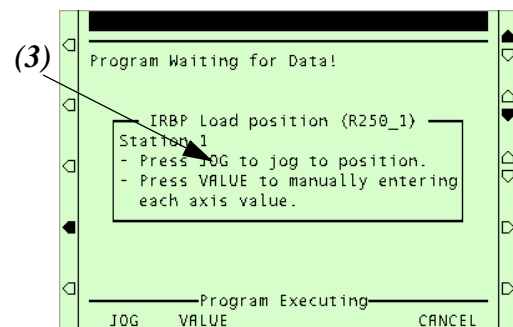
Press **F3** for setup of **Load position**



3 IRBP Load position

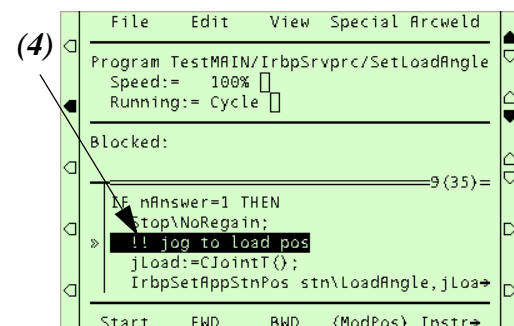
You can set up the Load position either by choosing a value or by jogging the station to the right position.

- Press **JOG** to jog to position
- Press **VALUE** to manually entering each axis value



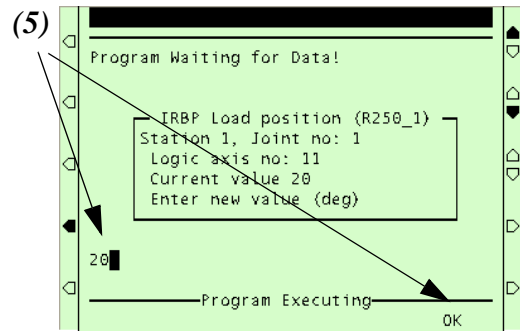
4 Jog to load position

- Press **Start**

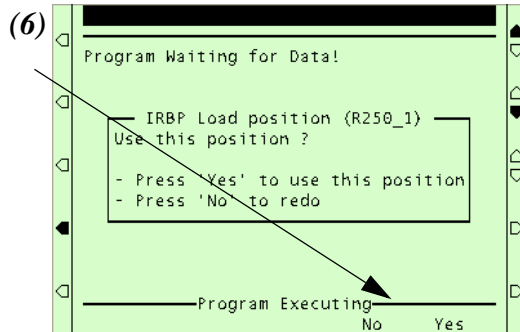




- 5 Showing the current value for load position.
- Enter new value
 - Press **OK**.
- Now the positioner moves to its new load position.



- 6 Use this load position?
- Press **“Yes”** to use this position.
 - Press **“No”** to redo

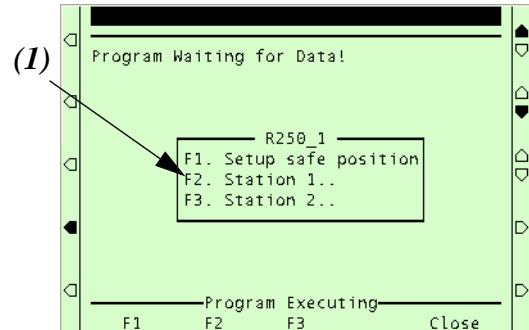


8.4.3 Service position

A service position is a position where the **operator** can inspect or do service on the work piece or fixture.

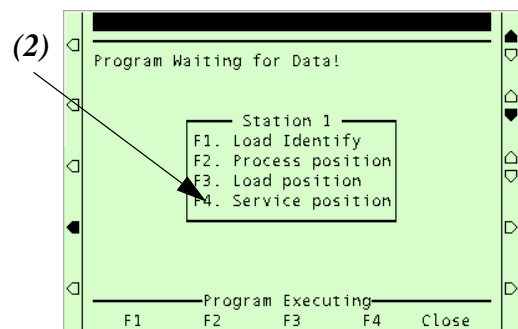
1 Positioner screen

Select which station you want to work with.



2 Station menu

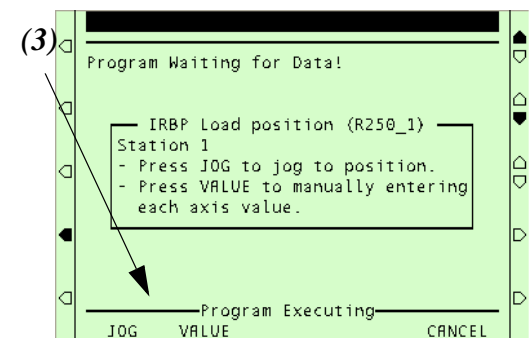
Press **F4** for setup of *Service positions*



3 IRBP Service positions

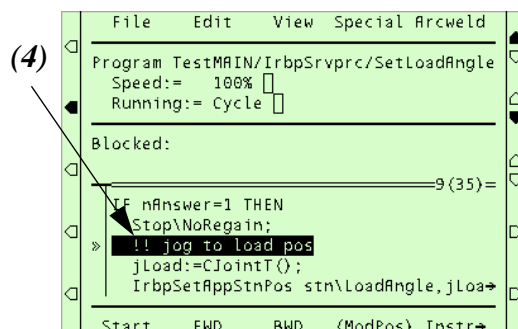
You can set up the Service position either by choosing a value or by jogging the station to the right position.

- Press **JOG** to jog to service position
- Press **VALUE** to manually entering each axis value



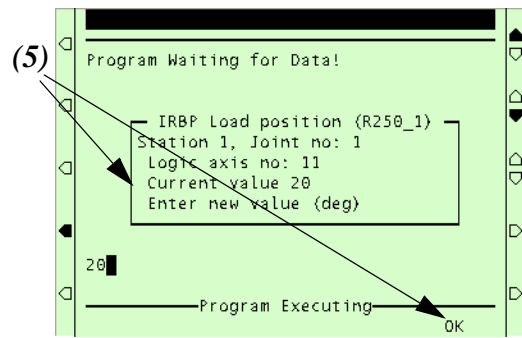
4 Jog to service position

- Press **Start**

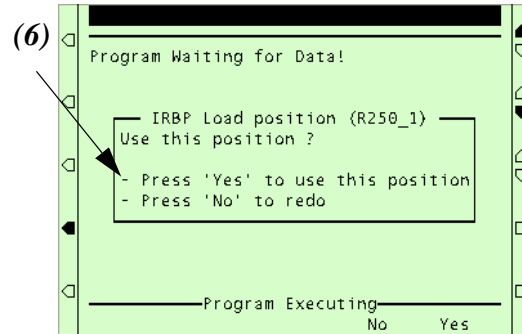




- 5 Showing the current value for service position.
- Enter new value
 - Press **OK**
- Now the positioner moves to its new service position.



- 6 Use this service position?
- Press **“Yes”** to use this position.
 - Press **“No”** to redo



8.5 Activation

The driver *IrbpActMechUnit* is used to activate (switch on) a mechanical unit.

For example STN1.

This driver performs no movement.

- See *IRBP Driver Documentation*

8.6 Deactivation

The driver *IrbpDeactMechUnit* is used to deactivate (switch off) a mechanical unit.

For example STN1.

This driver performs no movement.

- See *IRBP Driver Documentation*

8.7 Operator's panel

Driver to handle the operator's panel and the associated functions. Among others, resetting of safety, any options such as roller doors, etc.

- Program start
- Program stop
- Start of process (Resetting of safety, Operator ready, Cancel operator ready)
- See *OP Driver Documentation*

9 Identification of load data for positioners IRBP

Since the data of the different loads that can be mounted on the external positioner can be quite difficult to compute, there is a load identification procedure which computes the necessary load data by moving the positioner. Here we will describe which parameters are identified with the load identification and then briefly describe the load identification movements.



If you run the load identification for the first time on a specific type of positioner, it is recommended that you first run the procedure in slow test mode to prevent any collisions. See “Load identification procedure” on page 62.

9.1 Load Identification for IRBP L /C

A simplified view of positioner IRBP L is shown in Figure 1.

Load identification can be performed in any position for this positioner.

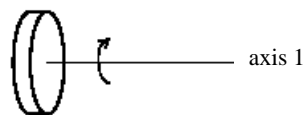


Figure 1 Simplified view of positioner IRBP_L.

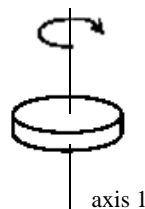


Figure 2 Simplified view of positioner IRBP_C.

The parameters that are identified are: centre of gravity in a plane perpendicular to the axis, and moments of inertia around the axis, see Figure 3.



Note that the mass of the load must be known in advance. The mass data is entered when performing the load identification. See “Load identification procedure” on page 62.

Together with the identified parameters, a measurement accuracy is also given, indicating how successful the identification was.

Identification of load data for positioners IRBP

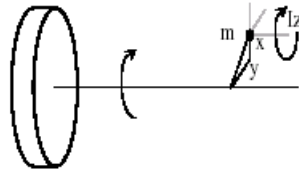


Figure 3 The parameters that can be identified on an IRBP L positioner.

To perform the identification the positioner moves the load and computes the parameters.

The movements for the axis are performed around two configuration points as described in Figure 4. At each configuration, the maximum motion for the axis is approximately 30 degrees up and 30 degrees down. The optimum value for the Configuration angle is 90 degrees.

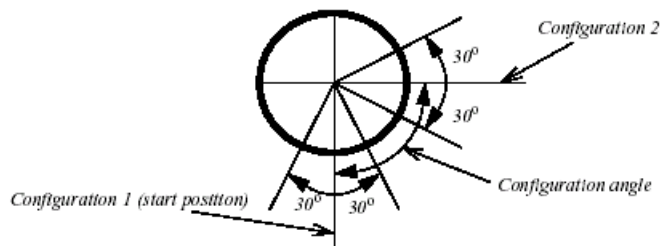


Figure 4 Motion interval for the axis.

9.2 Load Identification for IRBP K

A simplified view of positioner IRBP K is shown in Figure 5. Load identification is allowed on axes 2 and 3 for this positioner.

Load identification can only be performed when axis 1 is in one of its end positions. This is checked by the load identification procedure.

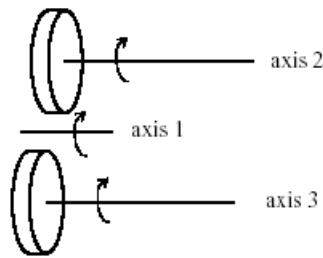


Figure 5 Simplified view of positioner IRBP K.

The identification movements for each axis are the same as for the IRBP L positioner.

The identified parameters are also the same.

9.3 Load Identification for IRBP R

A simplified view of the IRBP R positioner is shown in Figure 6. The parameters that are identified are: centre of gravity in a plane perpendicular to the axis, and three moments of inertia at the centre of gravity. Note that both the mass of the load and the distance z to the centre of gravity must be known in advance.



These data are entered when performing the load identification. See “Load identification procedure” on page 62.

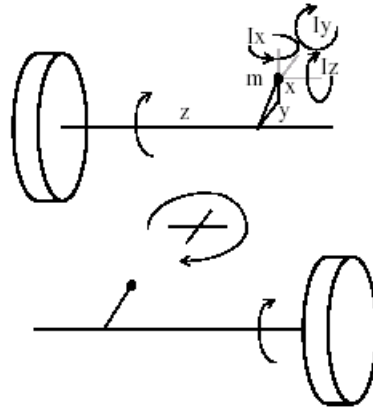


Figure 6 Simplified view of positioner IRBP R.

One part of the identification movements for one axis are the same as for the IRBP L positioner. To find the extra moments of inertia we also move the interchange axis with the load to two different positions.

The movements for the interchange axis are the movements described in Figure 6 but only at one configuration point. It is important to remember that the identification on one axis will be correct only if there is no load mounted on the other axis.

9.4 Load Identification for IRBP A, B and D

A simplified view of positioner IRBP A/ B/ D is shown in Figure 7. When the identification is performed, the positioner must be positioned so that the z-axis is horizontal.

This is checked by the load identification procedure. If axis 1 is too far from this position the load identification procedure will suggest which angle it should be moved to.

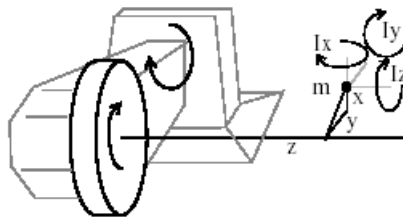


Figure 7 Simplified view of positioner IRBP A.

The parameters that are identified are: centre of gravity and three moments of inertia at the centre of gravity, see Figure 7.



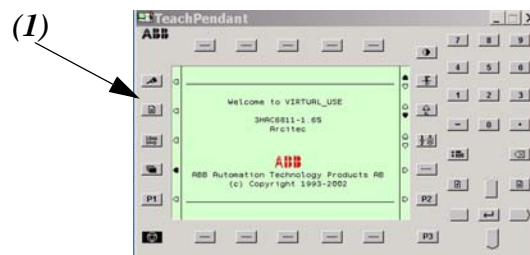
The mass of the load must be known in advance and it is entered when performing the load identification. See “Load identification procedure” on page 62. The motion for each axis is, in principal, the same as for the IRBP L positioner, see Figure 4. However, axis 1 only performs its movements around one configuration point.

It should be noted in the case of this positioner that some of the load calculations are quite complicated, especially for the moments of inertia. Therefore, the level of the load identification accuracy may be lower than for the other positioners. This is generally not a problem since possible errors in the load data are normally very small compared to the combined effect of load and positioner together.

9.5 Load identification procedure

- Make sure that the payload is mounted on the IRBP positioner's end effectors (turntable)
- Make sure that the positioner axes, which will move during the identification, aren't close to their corresponding working range limits.
- Make sure that the mechanical unit is activated.
- Make sure that the speed override is set to 100%.
- The Payload to identify must be defined as a PERS variable (with default data). It is recommended to define the payload in the system module USER.SYS because then the payload is always available in the system.

1 Select  (Program)



2 Select *Special*

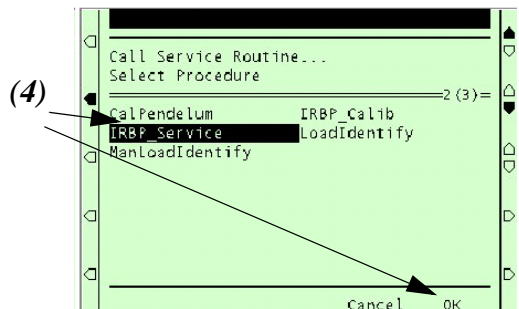
3 Select **6 (Call Service Routine)**

- Press  **Enter**.



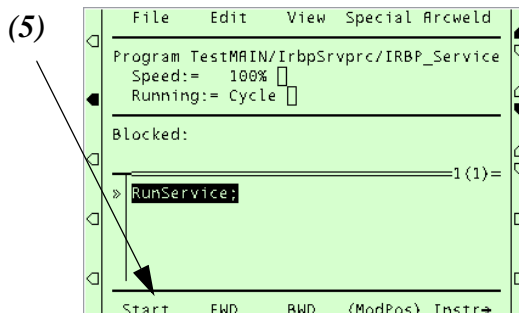
4 Select *IRBP Service*

- Press **OK**



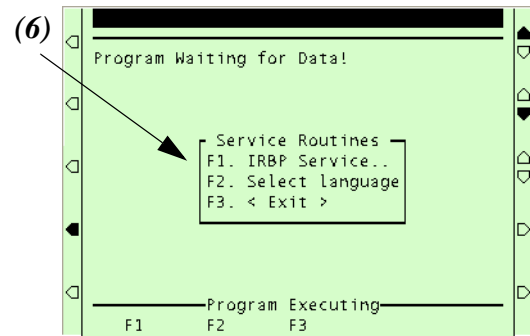
5 Start program *RunService*

- Press **Start**



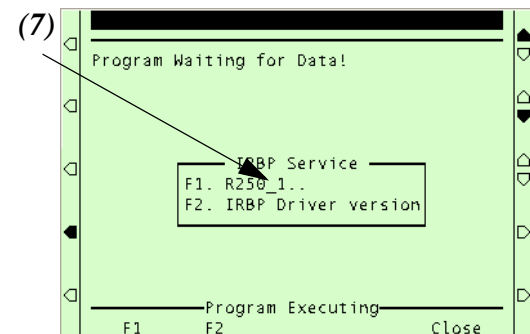
Identification of load data for positioners IRBP

- 6 Main menu for *Service Routine*
- Select **F1 - IRBP Service**



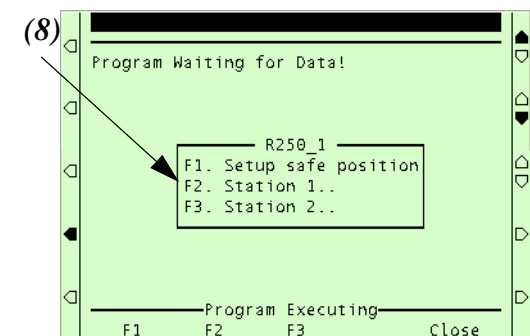
- 7 Here is *IRBP Service* selected, which brings up the screen where the user can select positioner or view IRBP driver version information.

- Select **F1 - positioner**

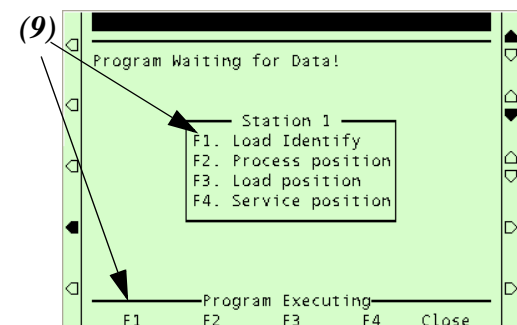
**Positioner screen**

- 8 On the positioner screen you can select which station you want to work with or you can setup the Safe Position for this positioner.

- Select which station you want to work with.
- You will now be guided through the load identification procedure

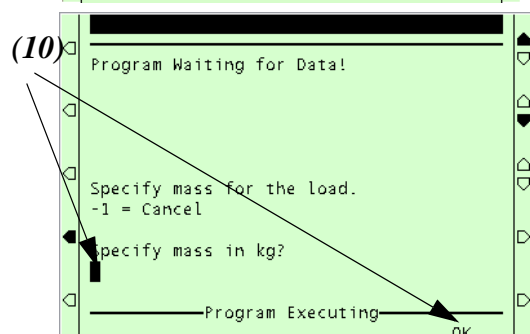
**Station menu Load Identification**

- 9 Press **F1** for *load identification*



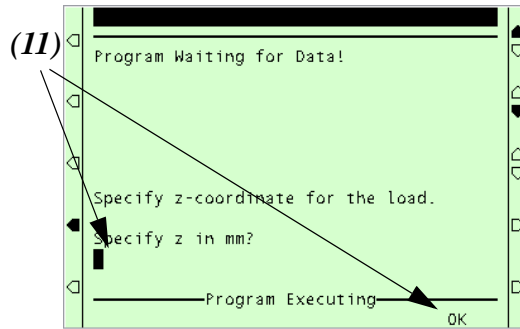
- 10 Enter the total weight in kg of the fixture and work piece together.

- Press **OK** to continue.

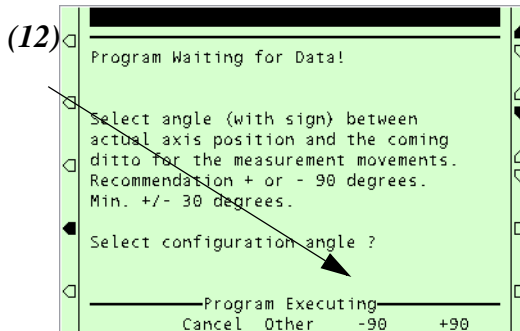


Identification of load data for positioners IRBP

- 11** If the positioner is type R:
- Enter the mass centre for **z-coordinate**.
 - Press **OK** to continue.

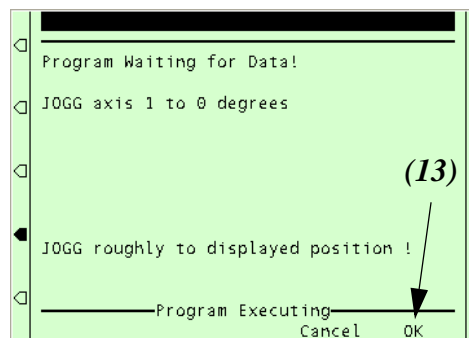


- 12** On the next screen configuration angle is selected, angle +/- degrees to be used for the parameter identification. Optimum is +90 or -90 degrees. If this is impossible, choose Other and input the angle that you want. Minimum is plus or minus 30 degrees.



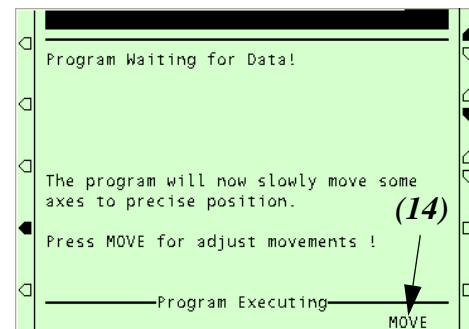
- Select configuration angle

- 13** If the positioner is not in a correct position for load identification, you will be asked to jog the axes roughly to a specified position.



- Jog the axes roughly to displayed position.
- Press **OK** to confirm.

- 14** If the positioner is still not in a correct position for load identification, the positioner will slowly move to a correct position.

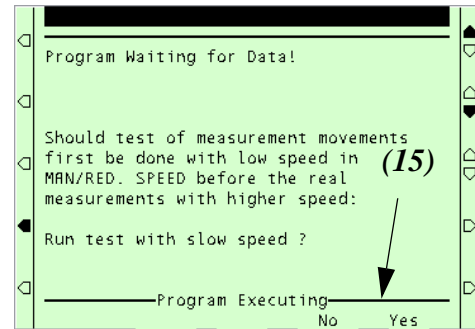


- Press **MOVE** to start the movement.

Identification of load data for positioners IRBP

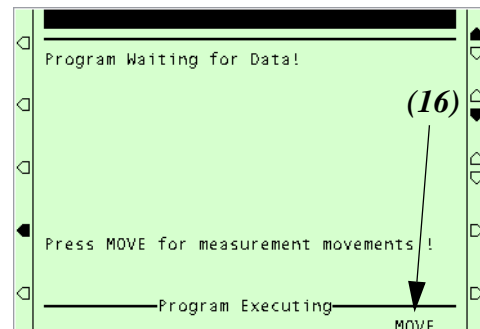
15 Choose if you want the positioner to go through the load identification movements slowly before performing the load identification. This is useful for ensuring that the positioner will not hit anything during the identification.

- Choose **YES** if you want a slow test.
- **NO** otherwise.



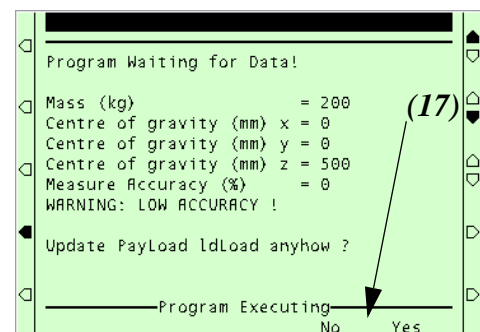
16 The setup for load identification is now complete. To start the motion:

- Change to Automatic mode. **Note that** the load ID has to be run in **AUTO** mode.
- Press **MOVE** to start the load identification movements.



17 The result of the load identification is now presented on the Teach Pendant.

- Choose **YES** if you want to update the selected load data structure with the identified parameters or
- **NO** otherwise.



18 Repeat the load identification procedure for all your mechanical units.

9.5.1 Error handling

If an error should occur during the load identification movements, the procedure must be restarted from the beginning.

- 1 Confirm the error.
- 2 Press **Start**

To interrupt and leave the load identification procedure:

- 1 Stop the program.
- 2 Close the program.

9.5.2 Limitations

If the measurement accuracy is low, i.e. lower than 80%, a significant error may be present in the result of the load identification.

If this is the case, a higher accuracy may be achieved by just repeating the load identification once again.

If this does not work, the torques measured in the identification are probably too small and the tool and/or payload data must be set manually. This is typically the case when the mass of the load is small (10% or less of the maximum load). It can also occur when the load has a particular symmetry property, for example, if the load is symmetrical around the rotating axis.



Note, however, that even if the measurement accuracy is low, some of the identified parameters may still be useful.

If the load identification movements are interrupted by some kind of stop (Program Stop, Emergency Stop, etc.), the load identification must be restarted from the beginning. This is done automatically if you:

- 1 Confirm the error.
- 2 Press **Start**

10 MechUnitLoad Defines a payload for a mechanical unit

MechUnitLoad is used to define a payload for an external mechanical unit. (The payload for the robot is defined with instruction *GripLoad*)

When using the drivers *MechUnitLoad* is built in.

This instruction should be used for all mechanical units with dynamic model in servo to achieve the best motion performance.

The *MechUnitLoad* instruction should always be executed after execution of the instruction *ActUnit*.

The axis closest to the payload should be selected in the *MechUnitLoad* instruction.

When execution of *ActUnit INTERCH* should one *MechUnitLoad* for both axis 2 and axis 3 be executed.

Example

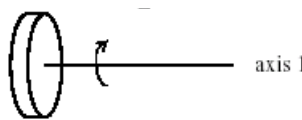


Figure 8 A mechanical unit named *IRBP_L* of type *IRBP L*.

```
ActUnit STN1;
MechUnitLoad STN1, 1, load0;
```

Activate mechanical unit **STN1** and define the payload *load0* corresponding to no load (at all) mounted on axis *1*.

```
ActUnit STN1;
MechUnitLoad STN1, 1, fixture1;
```

Activate mechanical unit **STN1** and define the payload *fixture1* corresponding to fixture *fixture1* mounted on axis *1*.

```
ActUnit STN1;
MechUnitLoad STN1, 1, workpiece1;
```

Activate mechanical unit **STN1** and define the payload *workpiece1* corresponding to fixture and work piece named *workpiece1* mounted on axis *1*.

MechUnitLoad Defines a payload for a mechanical unit

10.1 Arguments

MechUnitLoad MechUnit AxisNo Load

MechUnit (*Mechanical Unit*) Data type: *mecunit*

The name of the mechanical unit.

AxisNo (*Axis Number*) Data type: *num*

The axis number, within the mechanical unit, that holds the load.

Load Data type: *loaddata*

The load data that describes the current payload to be defined.

10.2 Program execution

After execution of *MechUnitLoad*, when the robot and external axes have come to a standstill, the specified load is defined for the specified mechanical unit and axis. This means that the payload is controlled and monitored by the control system.

The default payload at cold start-up, for a certain mechanical unit type, is the predefined maximal payload for this mechanical unit type.

When some other payload is used, the actual payload for the mechanical unit and axis should be redefined with this instruction. This should always be done after activation of the mechanical unit.

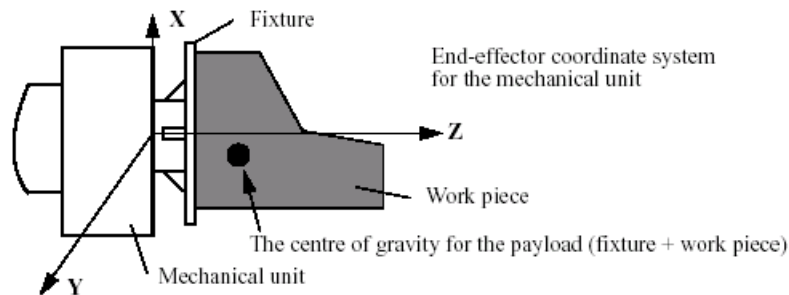


Figure 9 Payload mounted on the end-effector of a mechanical unit.

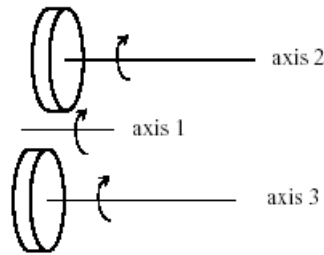
MechUnitLoad Defines a payload for a mechanical unit**Example**

Figure 10 A mechanical unit named *IRBP_K* of type *IRBP K* with three axes.

```
MoveL homeside1, v1000, fine, gun1;
```

....

```
ActUnit INTERCH;
```

The whole mechanical unit *INTERCH_K* is activated.

```
MechUnitLoad INTERCH, 2, workpiece1;
```

Defines payload *workpiece1* on the mechanical unit *INTERCH* axis 2.

```
MechUnitLoad INTERCH, 3, workpiece2;
```

Defines payload *workpiece2* on the mechanical unit *INTERCH* axis 3.

```
MoveL homeside2, v1000, fine, gun1
```

The axes of the mechanical unit *INTERCH* move to the switch position *homeside2* with mounted payload on both axes 2 and 3.

10.3 Limitations

The movement instruction previous to this instruction should be terminated with a stop point in order to make a restart in this instruction possible following a power failure.

10.4 Syntax

MechUnitLoad

```
[MechUnit':='] < variable (VAR) of mecunit >','
```

```
[AxisNo ':='] <expression (IN) of num '>','
```

```
[ Load':='] < persistent (PERS) of loaddata >','
```

10.5 Related information

	<u>Described in:</u>
Identification of payload for external mechanical units	LoadID&CollDetect • Program <i>muloaid.prg</i>
Mechanical units	Data Types- <i>mecunit</i>
Definition of load data Data	Types - <i>loaddata</i>
Definition of payload for the robot	Instructions - <i>GripLoad</i> Data Types - <i>tooldata</i>

