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ABB Automation Technology Products AB

Arc Welding & Application Equipment

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Sweden
# System settings

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1 Safety

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

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 are 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.
System settings

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.
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.
System settings

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.
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.
**System settings**

*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 \( \text{Misc} \)

3. Move the cursor to \textit{Service}
   - Press \( \text{Enter} \).

4. Press the menu key \textit{View}.

5. Select \textit{Calibration} using the cursor or number key
   - Press \( \text{Enter} \).

6. Press the menu key \textit{Calib}.

7. Select \textit{Fine Calibrate} using the cursor or number key
   - Press \( \text{Enter} \).
**System settings**

**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:

<table>
<thead>
<tr>
<th>Welding gun type</th>
<th>Swan neck</th>
<th>Weight kg</th>
<th>X mm</th>
<th>Y mm</th>
<th>Z mm</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESAB PSF 315R</td>
<td>22 degrees</td>
<td>3.3</td>
<td>-60</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>ESAB PSF 500R</td>
<td>22 degrees</td>
<td>3.3</td>
<td>-60</td>
<td>0</td>
<td>57</td>
</tr>
<tr>
<td>Dinse PKI 500</td>
<td>22 degrees</td>
<td>3.3</td>
<td>-35</td>
<td>0</td>
<td>90</td>
</tr>
<tr>
<td>Binzel WH 455</td>
<td>22 degrees</td>
<td>3.3</td>
<td>-35</td>
<td>0</td>
<td>55</td>
</tr>
<tr>
<td>Dinse PP ALU</td>
<td>22 degrees</td>
<td>4.4</td>
<td>-20</td>
<td>0</td>
<td>120</td>
</tr>
</tbody>
</table>

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)

2. Select View

3. Select 6 (Modules)
   - Press Enter.

4. Select Tcpdata
   - Press Enter.

5. Select SetupBullsEye
   - Press Enter.
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.
7 Move the cursor to \textit{wobjdata} (work object data).
   - Press \texttt{Enter}.

8 Press the function key \texttt{New}.
   - Press \texttt{Enter} to change the name.

9 Enter the name to be given to the work object.
   - Press \texttt{OK}.

10 Select right work object
   - Press \texttt{Enter}

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

12 To change mechanical unit.
   - Select \texttt{ufmec}
   - Press \texttt{Enter} to change the mechanical unit.
System settings

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.
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.
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**.

7  Select the right **WorkObject** and
   - Press ➪ **Enter**.
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.
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 preform 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:

```
hda:backup/bakmmdd   (mmdd=month day)
```

Otherwise the folder will be erased.
System settings

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**

<table>
<thead>
<tr>
<th>Model</th>
<th>Speed (degrees/s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>MTC250</td>
<td>180</td>
</tr>
<tr>
<td>MTC750</td>
<td>150</td>
</tr>
<tr>
<td>MTC2000</td>
<td>90</td>
</tr>
<tr>
<td>MTC5000</td>
<td>39</td>
</tr>
<tr>
<td>MIC1.1</td>
<td>90</td>
</tr>
<tr>
<td>MIC1.2</td>
<td>90</td>
</tr>
<tr>
<td>MIC2.1</td>
<td>90</td>
</tr>
<tr>
<td>MIC2.2</td>
<td>90</td>
</tr>
</tbody>
</table>
System settings

Speed data for external axes
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 were you can put programs for each mechanical unit.

The \textit{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.

\begin{itemize}
  \item For more information, see \textit{IRBP Driver Documentation}
\end{itemize}

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.

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>to select IRBP service</td>
</tr>
<tr>
<td>F2</td>
<td>to select language Swedish or English</td>
</tr>
<tr>
<td>F3</td>
<td>to exit</td>
</tr>
</tbody>
</table>

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.

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>to run IRBP Service</td>
</tr>
<tr>
<td>F2</td>
<td>to see information about IRBP Driver version</td>
</tr>
</tbody>
</table>

Menu for Select Language

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>to select language Swedish</td>
</tr>
<tr>
<td>F2</td>
<td>to select language English</td>
</tr>
</tbody>
</table>
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

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Setup safe position</td>
</tr>
<tr>
<td>F2</td>
<td>Station 1</td>
</tr>
<tr>
<td>F3</td>
<td>Station 2</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>Key</th>
<th>Function</th>
</tr>
</thead>
<tbody>
<tr>
<td>F1</td>
<td>Load identify</td>
</tr>
<tr>
<td>F2</td>
<td>Process position</td>
</tr>
<tr>
<td>F3</td>
<td>Load position</td>
</tr>
<tr>
<td>F3</td>
<td>Service position</td>
</tr>
</tbody>
</table>
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
System settings

Drivers
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

<table>
<thead>
<tr>
<th>Key</th>
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<tr>
<td>F3</td>
<td>Load position</td>
</tr>
<tr>
<td>F3</td>
<td>Service position</td>
</tr>
</tbody>
</table>

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*
System settings

Drivers
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.

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.
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.
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.](image)

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.

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.](image)

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
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.
System settings

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.
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.

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.

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.

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](image.png)

*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.
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.*
**System settings**

*MechUnitLoad* Defines a payload for a mechanical unit

---

**Example**

![Diagram of a mechanical unit with three axes](image)

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

```plaintext
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

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<td></td>
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