

KUKA KR 16-2

User Manual



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Outline

- Introduction
- How to Edit Codes
- How to Control the Robot Arm
- Others

Outline


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- Others

Introduction to KR 16-2

- Payload
 - 16 kg
- Number of Axes
 - 6 axes
- Control Method
 - Manual
 - Program



Begin to Use

1. Boot the computer
2. Press  to continue (windows bug)
3. Wait for minutes



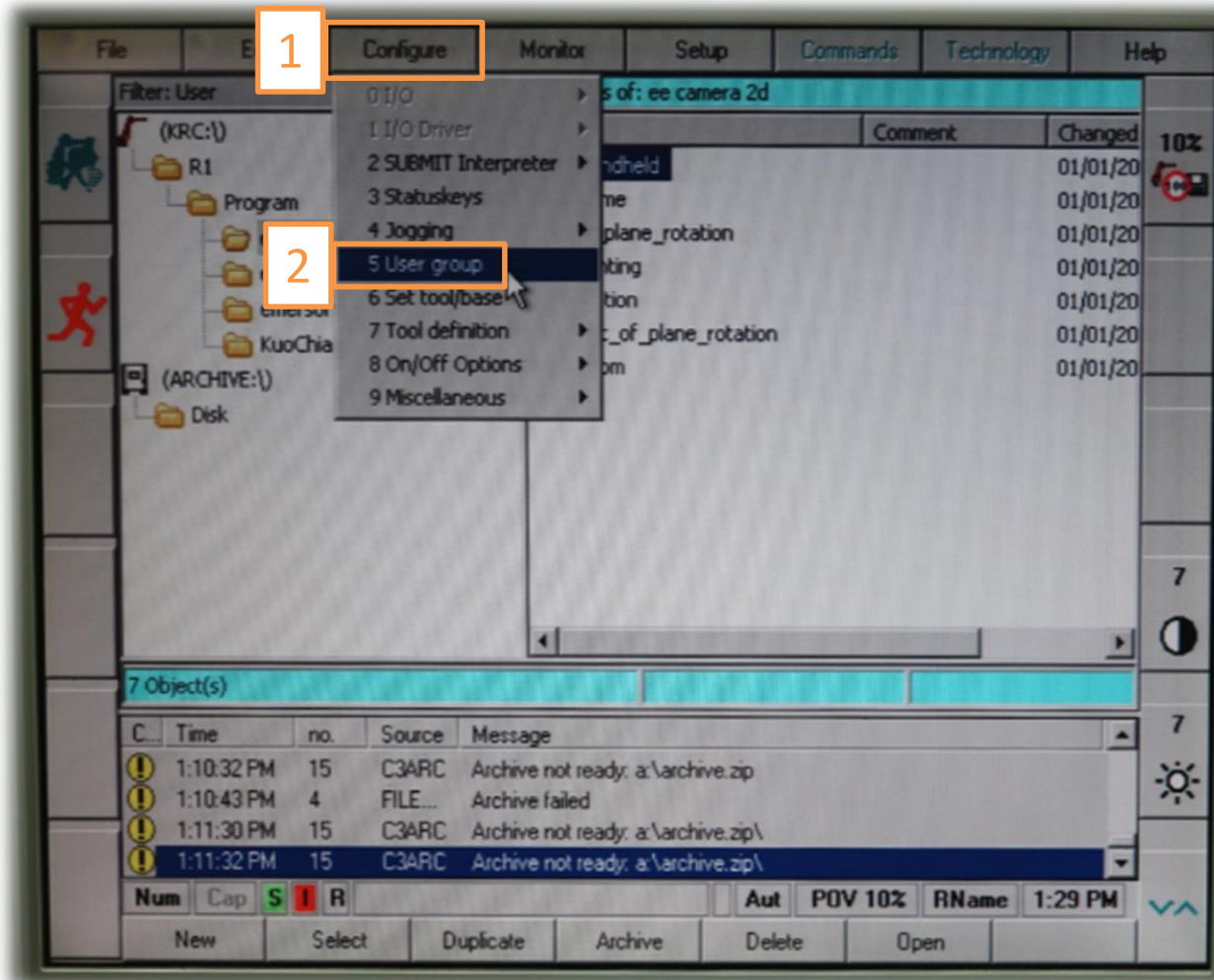
Outline

- Introduction
- **How to Edit Codes**
- How to Control the Robot Arm
- Others

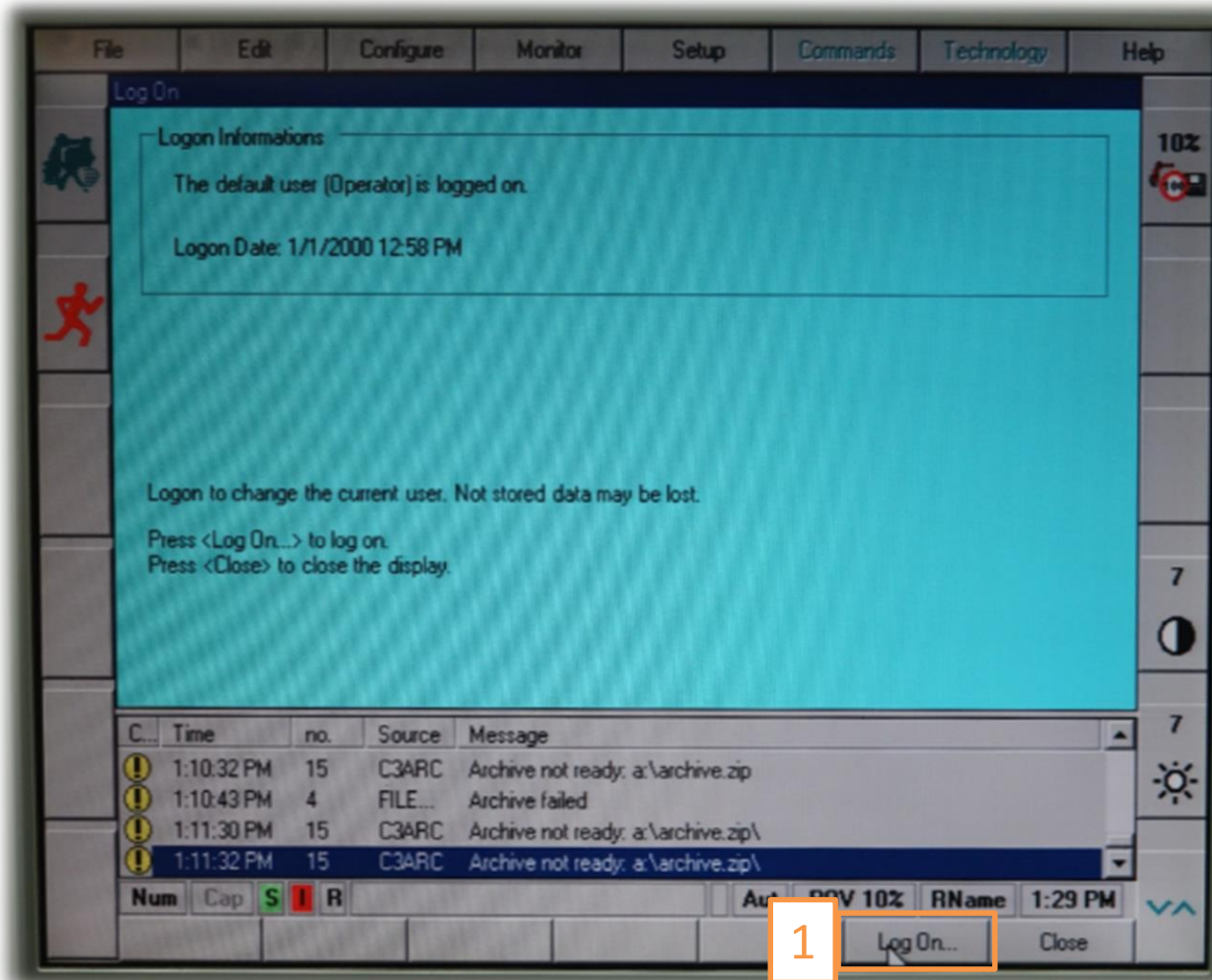
Log On (1/6)

- We have to **log on** to edit codes
 - It will be **logged out automatically** when turning from manual mode to program mode
 - Be sure to **log on** again

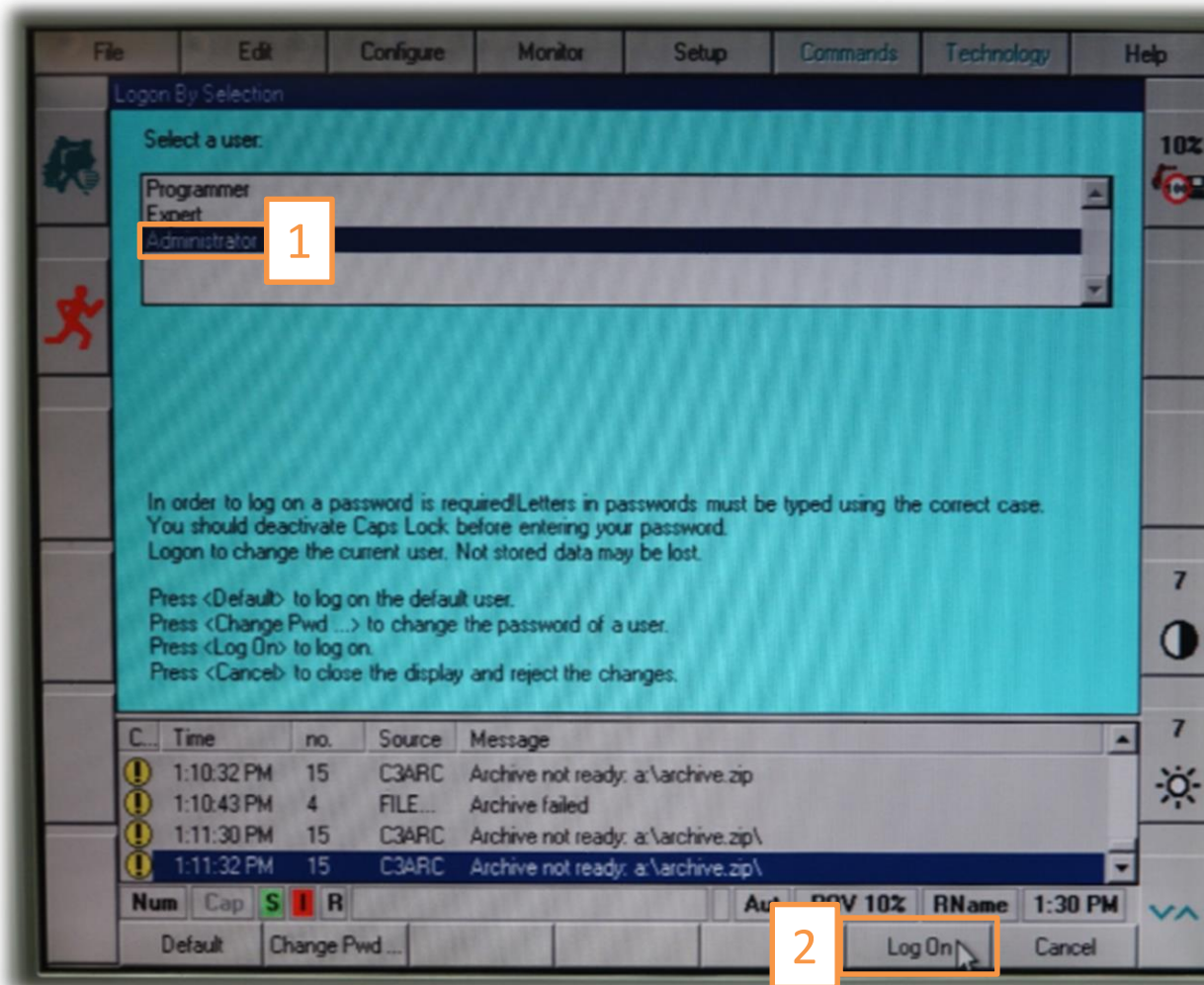
Log On (2/6)



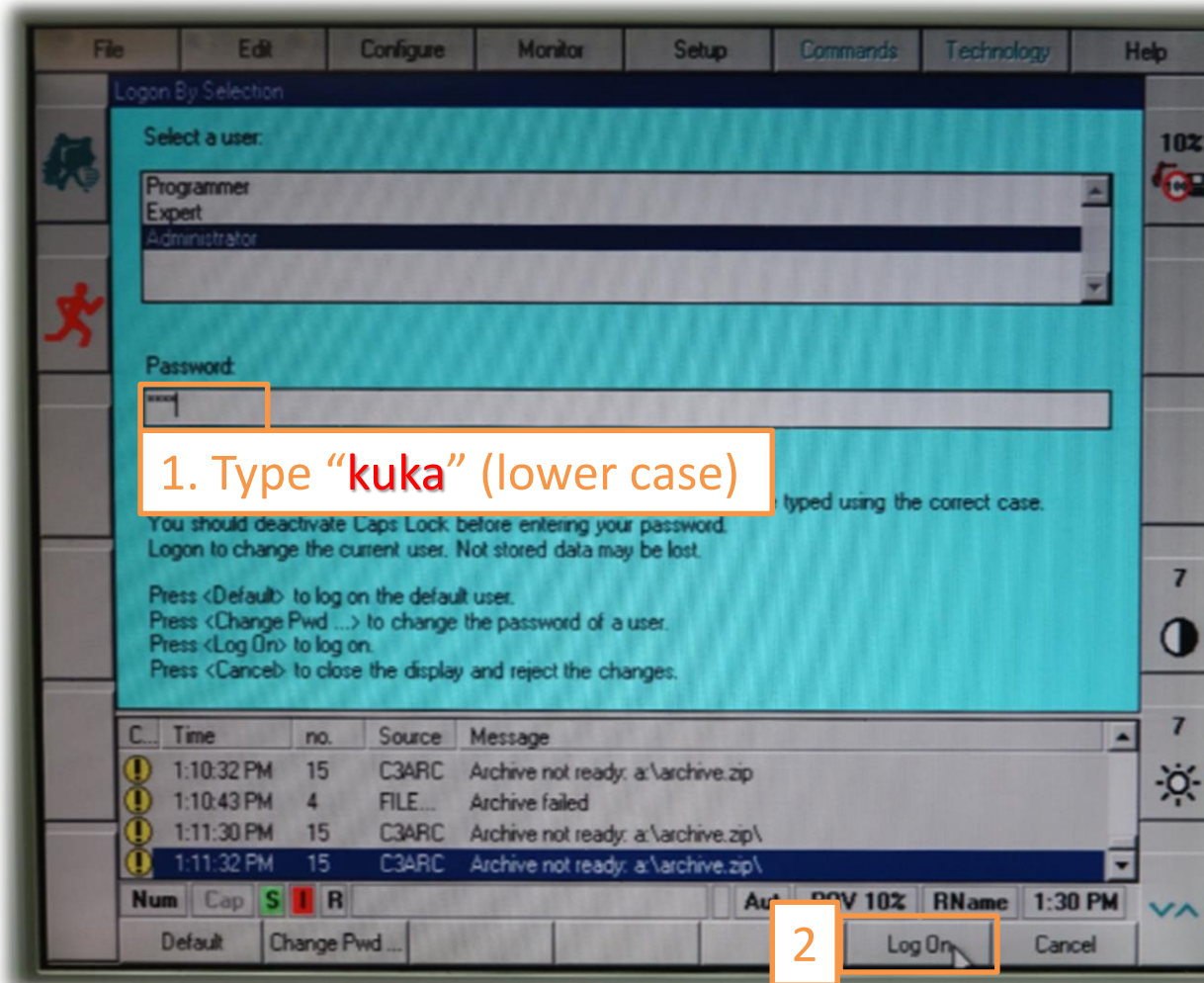
Log On (3/6)



Log On (4/6)

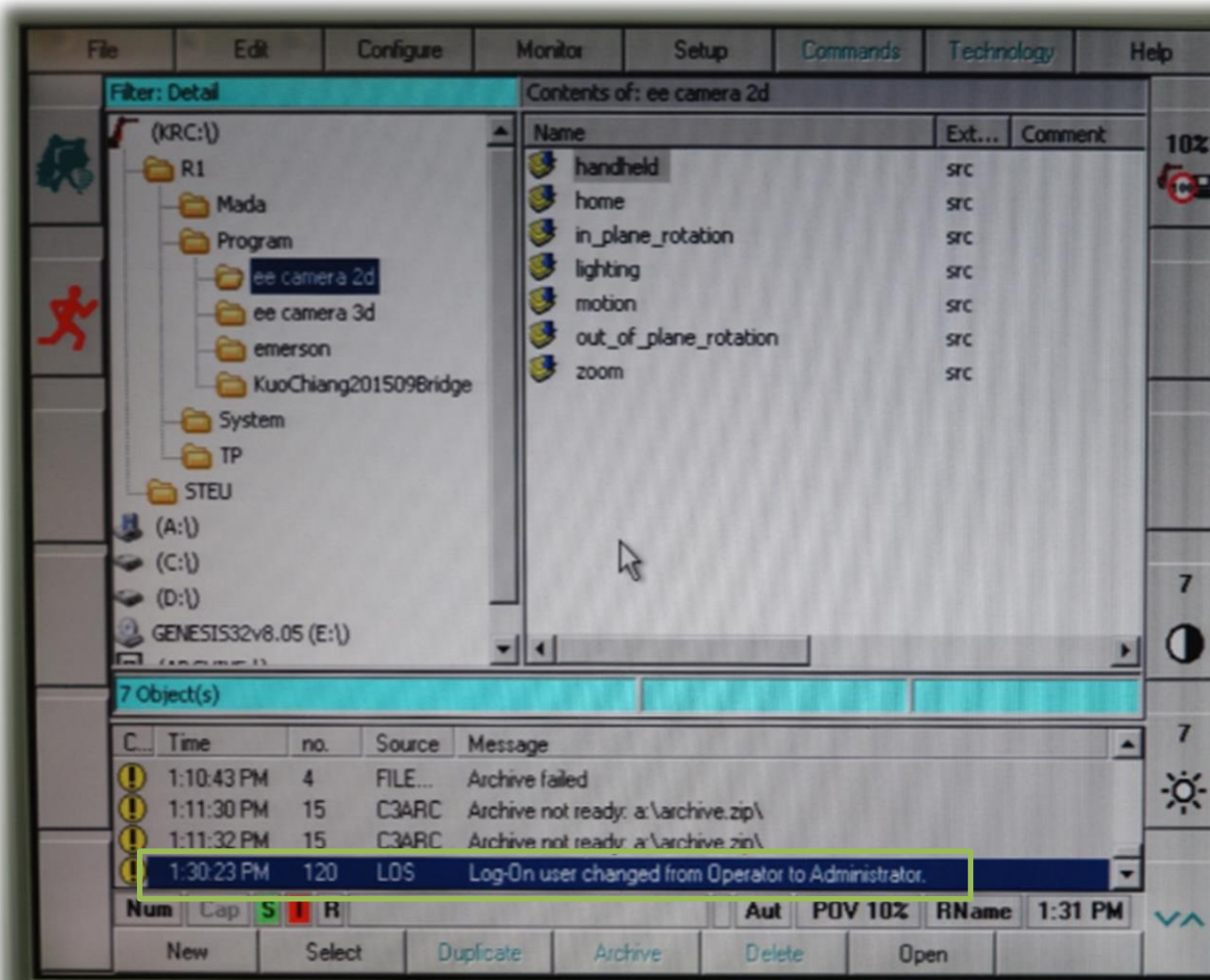


Log On (5/6)

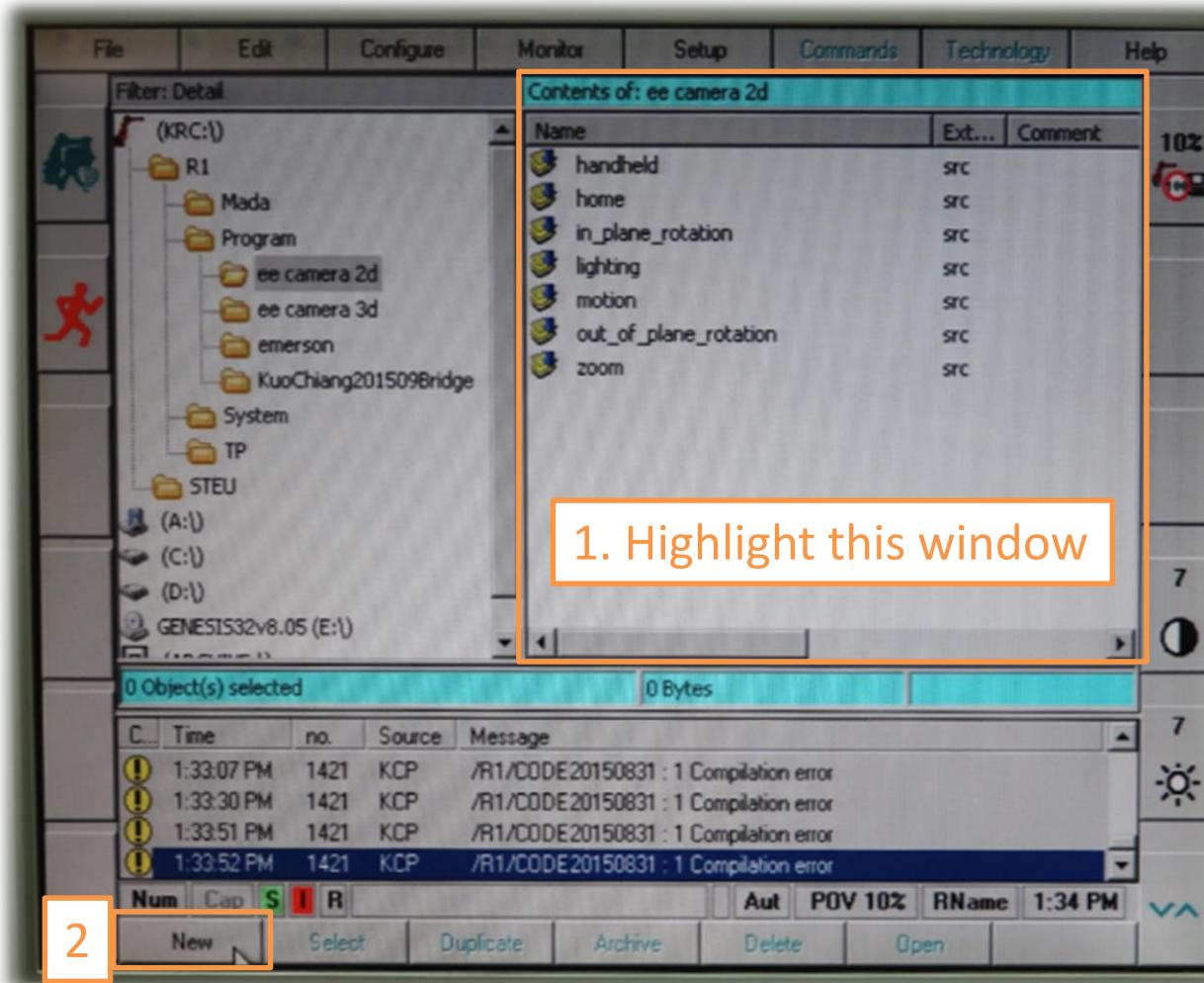


(or just press **enter**)

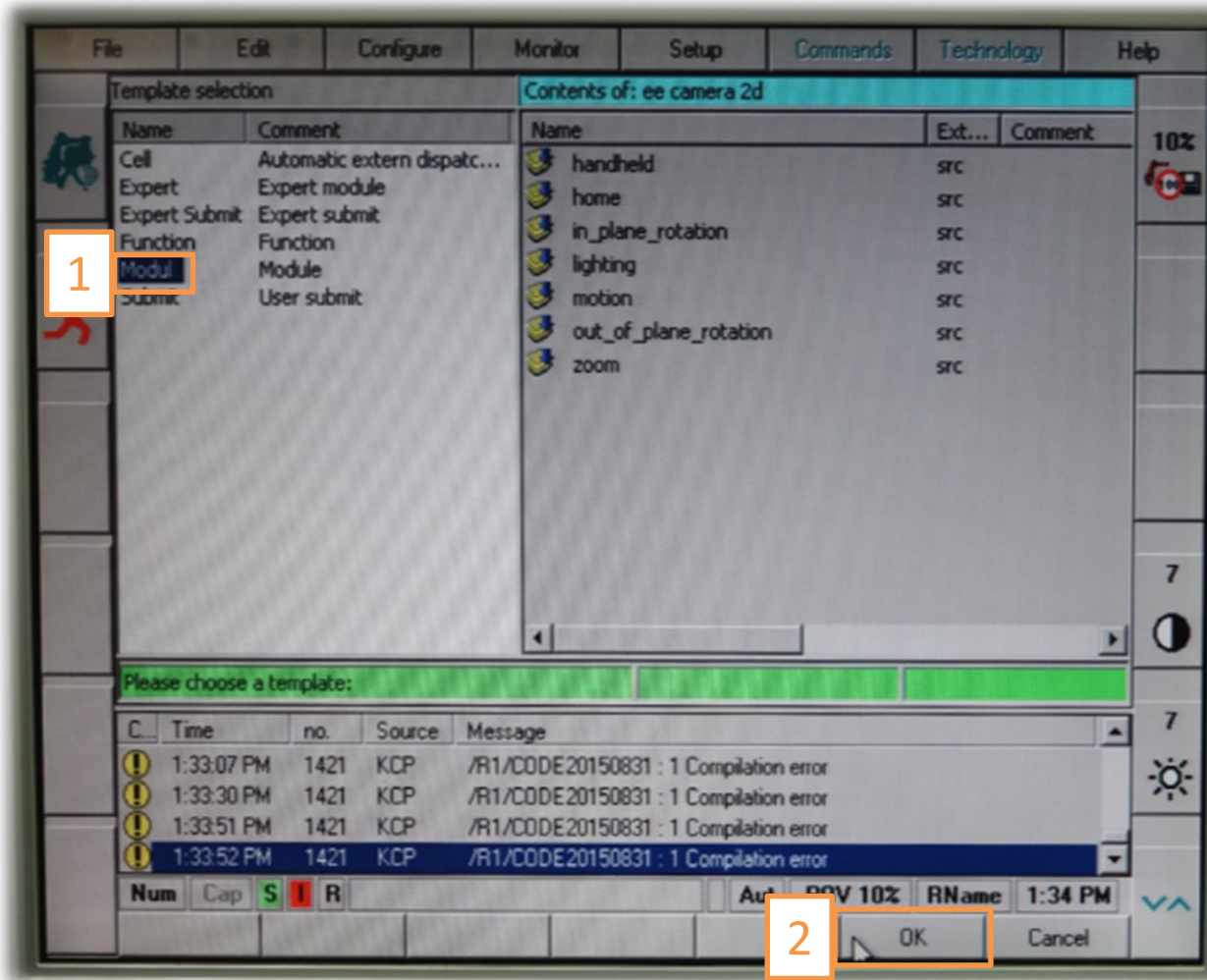
Log On (6/6)



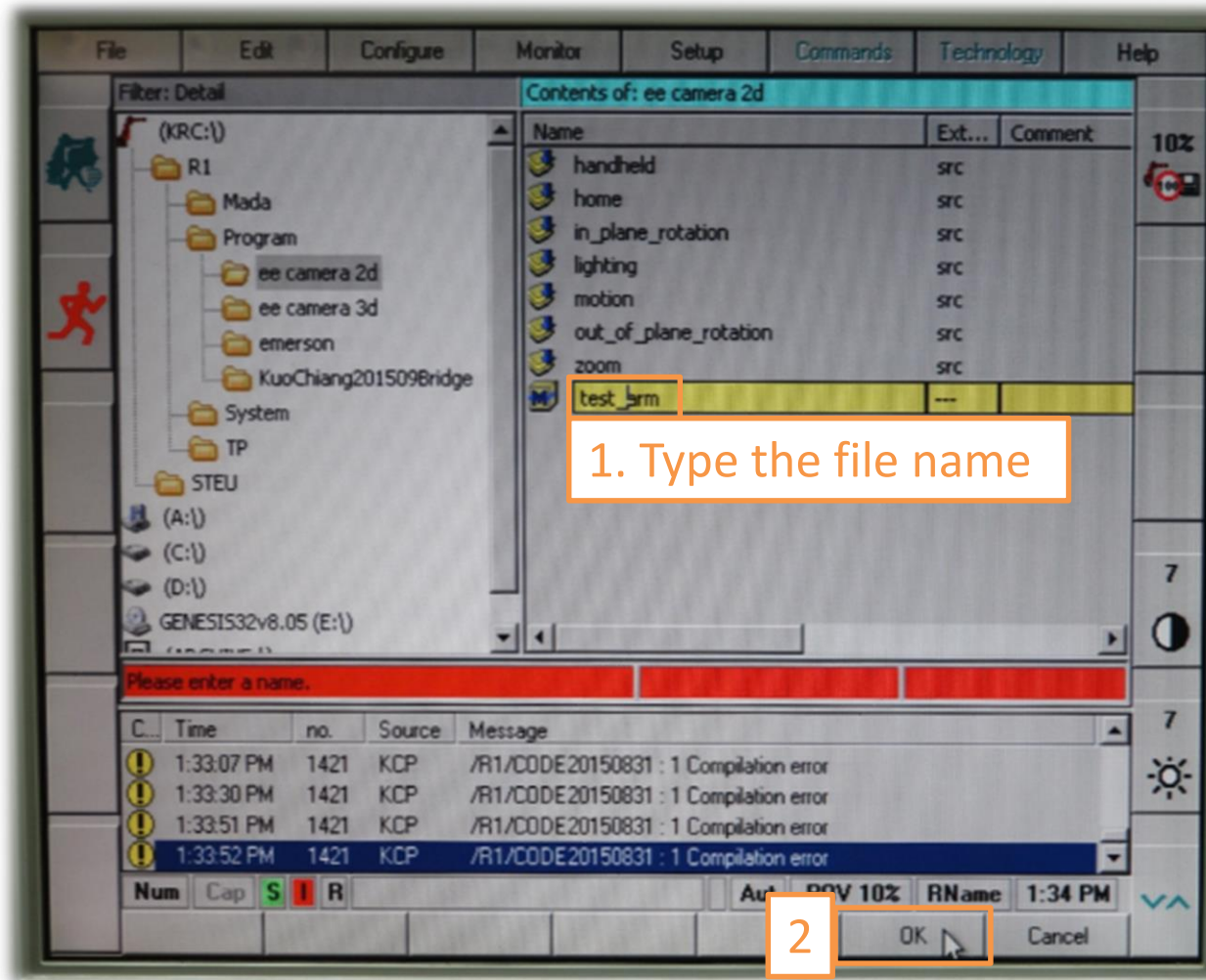
Create a New Code File (1/3)



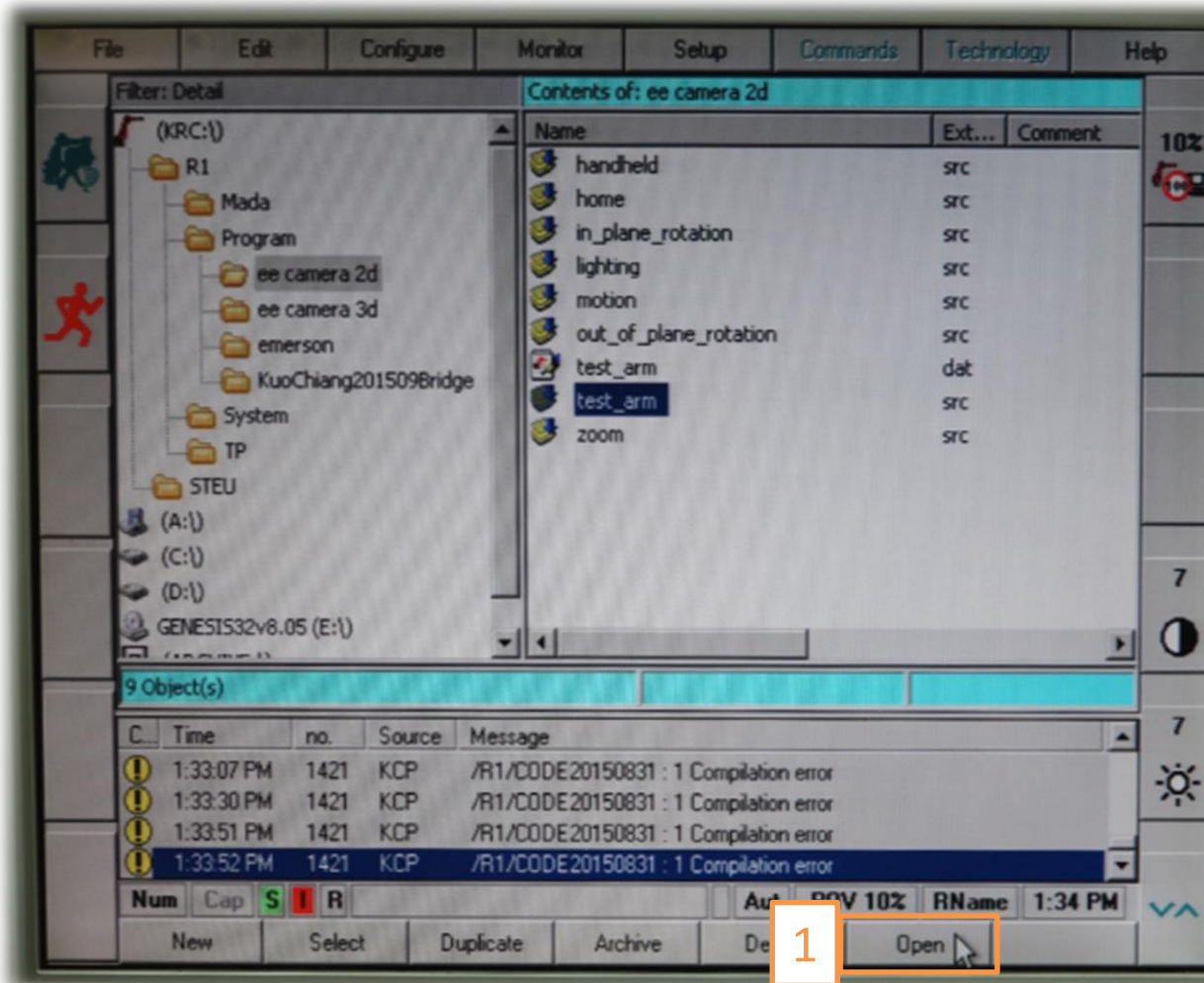
Create a New Code File (2/3)



Create a New Code File (3/3)

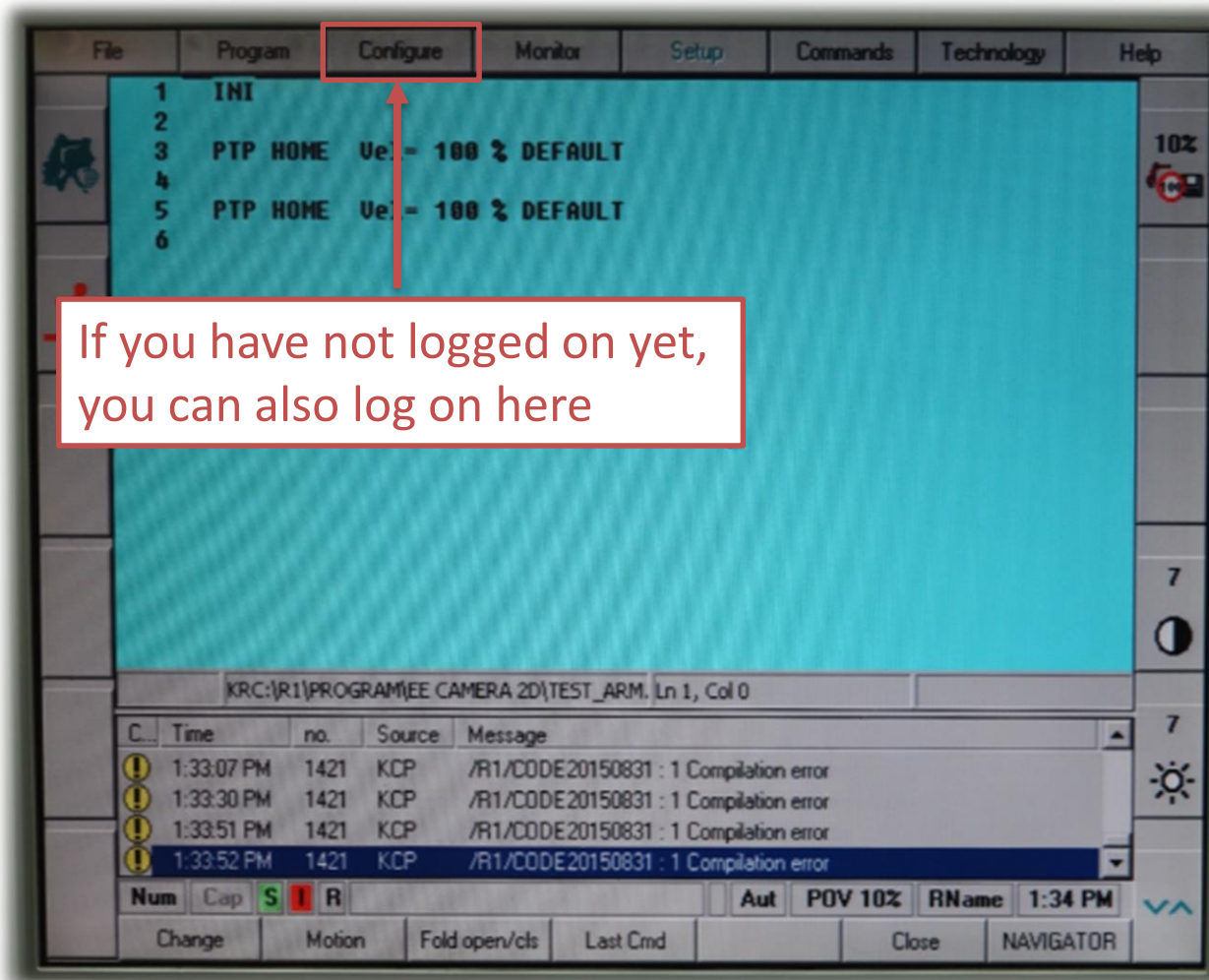


Edit a Code File (1/4)



Be sure you have logged on!

Edit a Code File (2/4)



Edit a Code File (3/4)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main area is a teal-colored editor showing code lines 1 through 6. Line 1 is highlighted with a red cursor. An orange box highlights the code editor area, and another orange box highlights the text '1. Edit your codes' below it. The code is as follows:

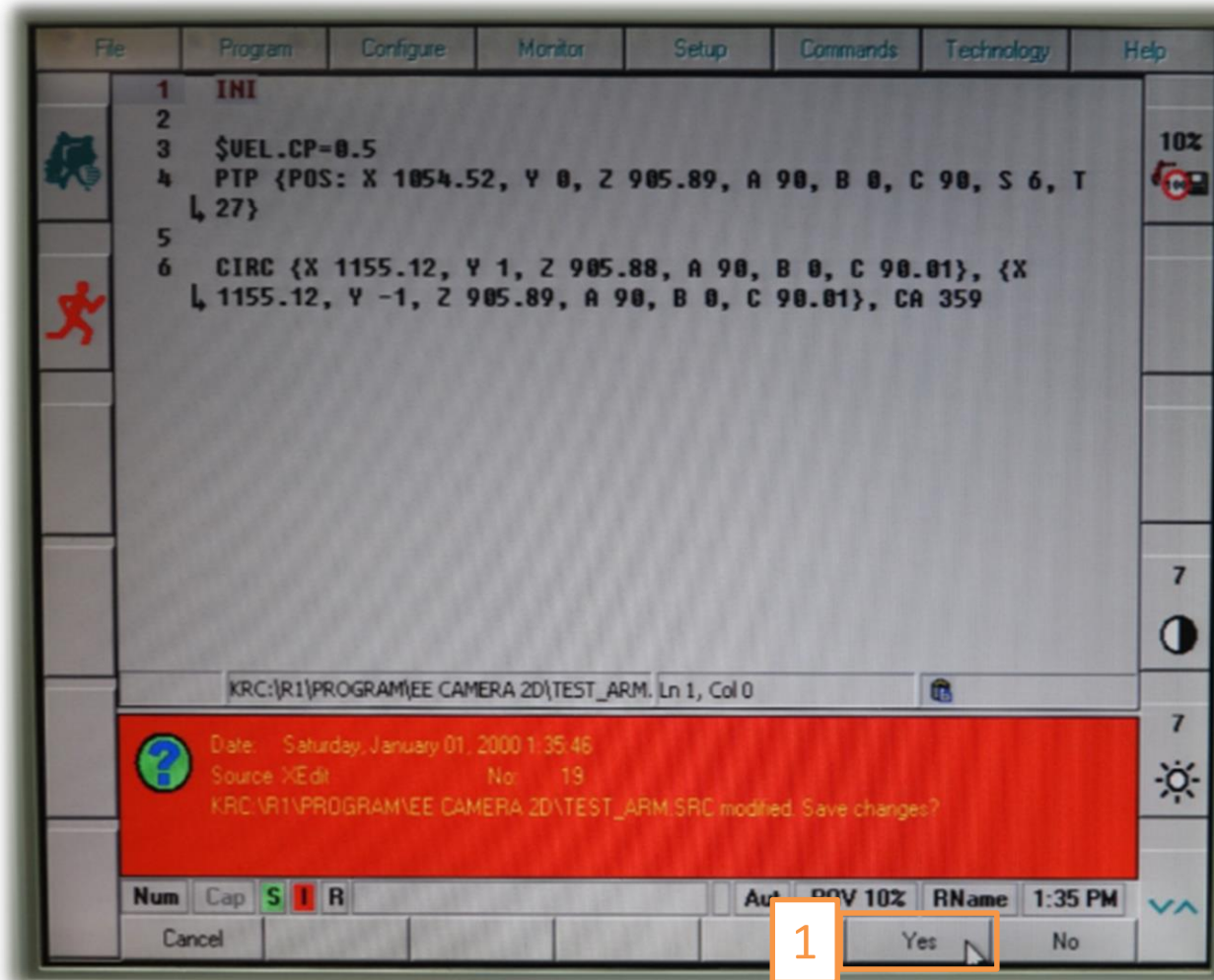
```
1 NI  
2  
3 $VEL_CP=0.5  
4 PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T  
  L 27}  
5  
6 CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X  
  L 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

Below the editor, a status bar shows 'KRC:R1\PROGRAM\EE CAMERA 2D\TEST_ARM. Ln 1, Col 0'. At the bottom, a message log table is visible:

C.	Time	no.	Source	Message
!	1:33:07 PM	1421	KCP	/R1/CODE20150831 : 1 Compilation error
!	1:33:30 PM	1421	KCP	/R1/CODE20150831 : 1 Compilation error
!	1:33:51 PM	1421	KCP	/R1/CODE20150831 : 1 Compilation error
!	1:33:52 PM	1421	KCP	/R1/CODE20150831 : 1 Compilation error

At the bottom right, a 'Close' button is highlighted with an orange box and the number '2'. Other interface elements include a 'NAVIGATOR' button, a 'Close' button, and various status indicators like 'Num', 'Cap', 'S', 'I', 'R', 'Aut', 'POV 10%', 'RName', and '1:35 PM'.

Edit a Code File (4/4)



Tips for Editing

- “**Delete**” key will delete one whole line
 - Use “**Backspace**” to revise characters instead.
- Shortcut key
 - Ctrl + X (cut)
 - Ctrl + C (copy)
 - Ctrl + V (paste)

Coding Guideline

INI

Part 1. Just type INI"

;Initial Position

Part 2. Set the Initial Position

\$VEL.CP = 0.5

(';' is the comment character; **VEL.CP** is set for velocity m/s)

PTP {POS: X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00, S 6, T 50}

;Motion Part

Part 3. Motion Part (will be executed continuously)

PTP {POS: X 500.00, Y 500.00, Z 500.00, A 90.00, B 0.00, C 90.00, S 6, T 50}

PTP {POS: X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00, S 6, T 50}

C_PTPT

PTP {POS: X 500, Y 500, Z 500, A 90, B 0, C 90, S 6, T 50}

LIN {X 1000, Y 0, Z 1000, A 90, B 90, C -180, S 6, T 50}

CIRC {X 1000.00, Y 1.00, Z 1000.00, A 90.00, B 0.00, C 90.00}, {X 1000.00, Y -1.00, Z 1000.00, A 90.00, B 0.00, C 90.00 }, CA 180

...

Example Codes

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, and Help. The main window shows a program with the following code:

```
1  INI
2
3  $VEL_CP=0.5
4  PTP {POS: X 774.21,Y 0.0,Z 979.75,A 90.0,B 0.0,C 16.41,S 6.0,
   ↵ T 50.0}
5
6  PTP {POS: X 810.54,Y 0.0,Z 1163.27,A 90.0,B 0.0,C 50.42,S 6.0,
   ↵ T 50.0} C_PTP
7  PTP {POS: X 1054.5,Y 0.0,Z 1310.38,A 90.0,B 0.0,C 90.0,S 6.0,
   ↵ T 50.0}
8  PTP {POS: X 810.54,Y 0.0,Z 1163.27,A 90.0,B 0.0,C 50.42,S 6.0,
   ↵ T 50.0} C_PTP
9  PTP {POS: X 774.21,Y 0.0,Z 979.75,A 90.0,B 0.0,C 16.41,S 6.0,
   ↵ T 50.0}
10
```

Below the code, the status bar shows: KRC:|R1|PROGRAM|EE CAMERA 3D|OUT_OF_PI Ln 1, Col 0. At the bottom, a message log displays the following entries:

C	Time	no.	Source	Message
!	1:10:32 PM	15	C3ARC	Archive not ready: a:\archive.zip
!	1:10:43 PM	4	FILE...	Archive failed
!	1:11:30 PM	15	C3ARC	Archive not ready: a:\archive.zip\
!	1:11:32 PM	15	C3ARC	Archive not ready: a:\archive.zip\

The interface also includes a status bar at the bottom with fields for Num, Cap, S, I, R, Aut, POV 10%, RName, and 1:26 PM. Navigation buttons like Change, Motion, Fold open/cls, Last Cmd, Close, and NAVIGATOR are also visible.

Basic Motion Types

- PTP
 - Point-to-point motion
- LIN
 - Linear motion
- CIRC
 - Circular motion
- HALT
 - Halt the moving process

PTP Motion (1/3)

- The point-to-point motion (PTP) is the quickest way of moving the tip of the tool (Tool Center Point: TCP) from the current position to a programmed end position.
- To do this, the controller calculates the necessary angle differences for each axis.
- Syntax

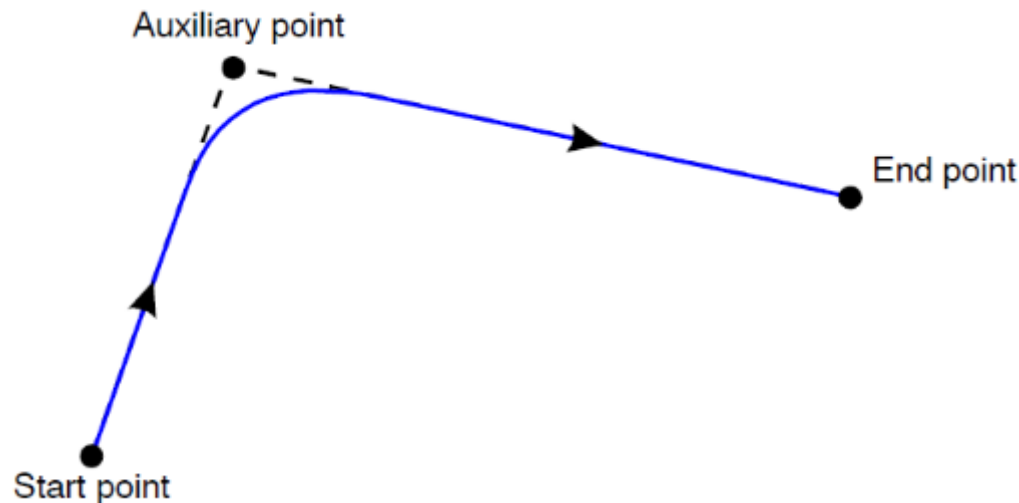
```
PTP {POS: X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00, S 6, T 50}
```

or

```
PTP {AXIS: A1 0, A2 -90, A3 90, A4 90, A5 0, A6 -180}
```


PTP Motion (2/3)

- In order to increase velocity, points for which exact positioning is not necessary can be approximated. The robot takes a shortcut as illustrated below



INI

Pseudo Code

\$VEL.CP = 0.5

PTP Start point

PTP Auxiliary point C_PTP

PTP End point

PTP Motion (3/3)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main window shows a program with the following lines:

```
1  INI
2
3  $VEL_CP=0.5
4  PTP {POS: X 774.21,Y 0.0,Z 979.75,A 90.0,B 0.0,C 16.41,S 6.0,
   ↵ T 50.0}
5
6  PTP {POS: X 810.54,Y 0.0,Z 1163.27,A 90.0,B 0.0,C 50.42,S 6.0,
   ↵ T 50.0} C_PTP
7  PTP {POS: X 1054.5,Y 0.0,Z 1310.38,A 90.0,B 0.0,C 90.0,S 6.0,
   ↵ T 50.0}
8  PTP {POS: X 810.54,Y 0.0,Z 1163.27,A 90.0,B 0.0,C 50.42,S 6.0,
   ↵ T 50.0} C_PTP
9  PTP {POS: X 774.21,Y 0.0,Z 979.75,A 90.0,B 0.0,C 16.41,S 6.0,
   ↵ T 50.0}
10
```

Below the program text, the status bar shows: KRC:|R1|PROGRAM|EE CAMERA 3D|OUT_OF_PI Ln 1, Col 0. A message log at the bottom contains the following entries:

C	Time	no.	Source	Message
!	1:10:32 PM	15	C3ARC	Archive not ready: a:\archive.zip
!	1:10:43 PM	4	FILE...	Archive failed
!	1:11:30 PM	15	C3ARC	Archive not ready: a:\archive.zip\
!	1:11:32 PM	15	C3ARC	Archive not ready: a:\archive.zip\

The interface also features a status bar at the bottom with fields for Num, Cap, S, I, R, Aut, POV 10%, RName, and 1:26 PM. Navigation buttons include Change, Motion, Fold open/cls, Last Cmd, Close, and NAVIGATOR.

Linear Motion (1/2)

- In the case of a linear motion, the server calculates a **straight line** from the current position (the last point programmed in the program) to the position specified in the motion command.
- Syntax

```
LIN {X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00}
```

INI **Pseudo Code**

\$VEL.CP = 0.5

PTP Start point

LIN End point

Linear Motion (2/2)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, and Help. The main window shows a program with the following lines:

```
1  INI
2
3  $VEL_CP=0.5
4  PTP {POS: X 1059.04, Y 0, Z 1107.09, A 90, B 0, C 0, S 2, T
   L 43}
5
6  LIN {X 875.09, Y 0, Z 1107.09, A 90, B 0, C 0}
7  LIN {X 1059.04, Y 0, Z 1107.09, A 90, B 0, C 0}
```

Below the program text, a status bar indicates the current position: KRC:|R1|PROGRAM|EE CAMERA 3D|ZOOM_3D.: Ln 1, Col 0.

A message log at the bottom shows the following entries:

C.	Time	no.	Source	Message
!	1:10:32 PM	15	C3ARC	Archive not ready: a:\archive.zip
!	1:10:43 PM	4	FILE...	Archive failed
!	1:11:30 PM	15	C3ARC	Archive not ready: a:\archive.zip\
!	1:11:32 PM	15	C3ARC	Archive not ready: a:\archive.zip\

At the bottom of the interface, there are several control buttons: Num, Cap, S, I, R, Aut, POV 10%, RName, 1:27 PM, Change, Motion, Fold open/cfs, Last Cmd, Close, and NAVIGATOR. The interface also features a zoom level indicator (10%) and a sun icon on the right side.

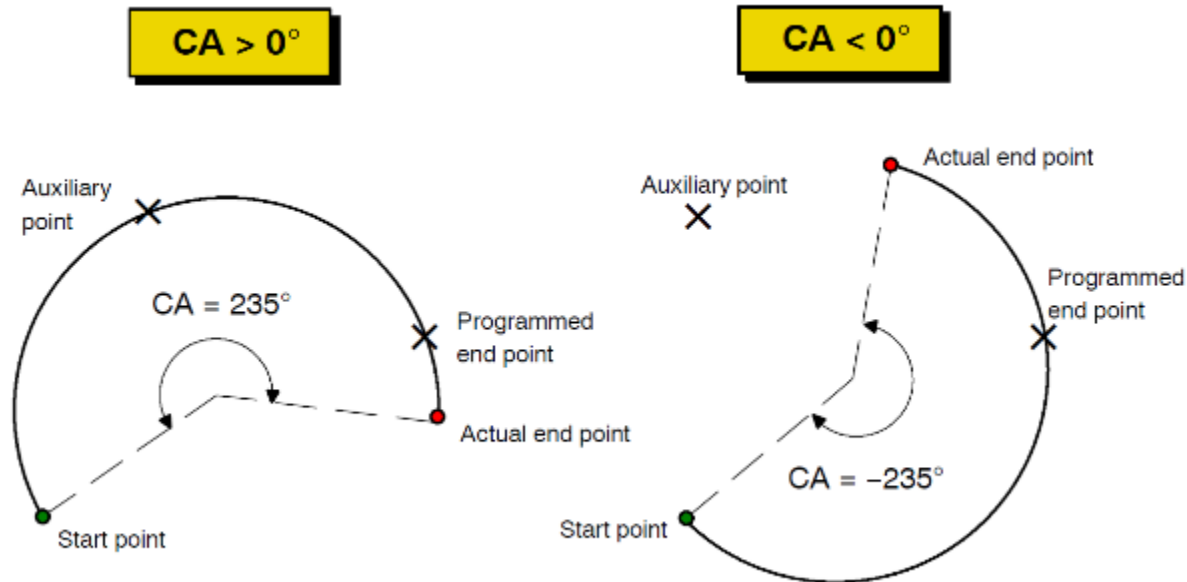
Circular Motion (1/3)

- To define a circle or arc in space unambiguously, three points are needed which are different from one another and do not lie on a straight line.
- The start point of a circular motion is again formed, as with PTP or LIN, by the current position.
- Syntax

```
CIRC {X 1000.00, Y 1.00, Z 1000.00, A 90.00, B 0.00, C 90.00},  
{X 1000.00, Y -1.00, Z 1000.00, A 90.00, B 0.00, C 90.00 }, CA  
180
```

Circular Motion (2/3)

- In addition to the auxiliary and end positions it is also possible to program a circular angle using the option **CA** (Circular Angle).



INI **Pseudo Code**

```
$VEL.CP = 0.5  
PTP Start point  
  
CIRC Auxiliary point , End point , CA Angle
```

Circular Motion (3/3)

File Program Configure Monitor Setup Commands Technology Help

```
1 INI
2
3 $VEL.CP=0.5
4 PTP {POS: X 1041.50, Y 0, Z 1137.84, A 90, B 0, C 33.89, S 2,
  L T 43}
5
6 CIRC {X 1015.99, Y 1.00, Z 1083.24, A 90, B 0, C 33.89, S 2,
  L T 43}, {X 1015.99, Y -1.00, Z 1083.24, A 90, B 0, C 33.89, S
  L 2, T 43}, CA 359
7
```


KRC:|R1|PROGRAM|EE CAMERA 3D|MOTION_3|Ln 1, Col 0

C	Time	no.	Source	Message
!	1:10:32 PM	15	C3ARC	Archive not ready: a:\archive.zip
!	1:10:43 PM	4	FILE...	Archive failed
!	1:11:30 PM	15	C3ARC	Archive not ready: a:\archive.zip\
!	1:11:32 PM	15	C3ARC	Archive not ready: a:\archive.zip\

Num Cap S I R Aut POV 10% RNamc 1:26 PM

Change Motion Fold open/cls Last Cmd Close NAVIGATOR

Halt

- Pause the moving process.
- Resume the motion by pressing  .
- Syntax

HALT

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- **How to Control the Robot Arm**
- Others

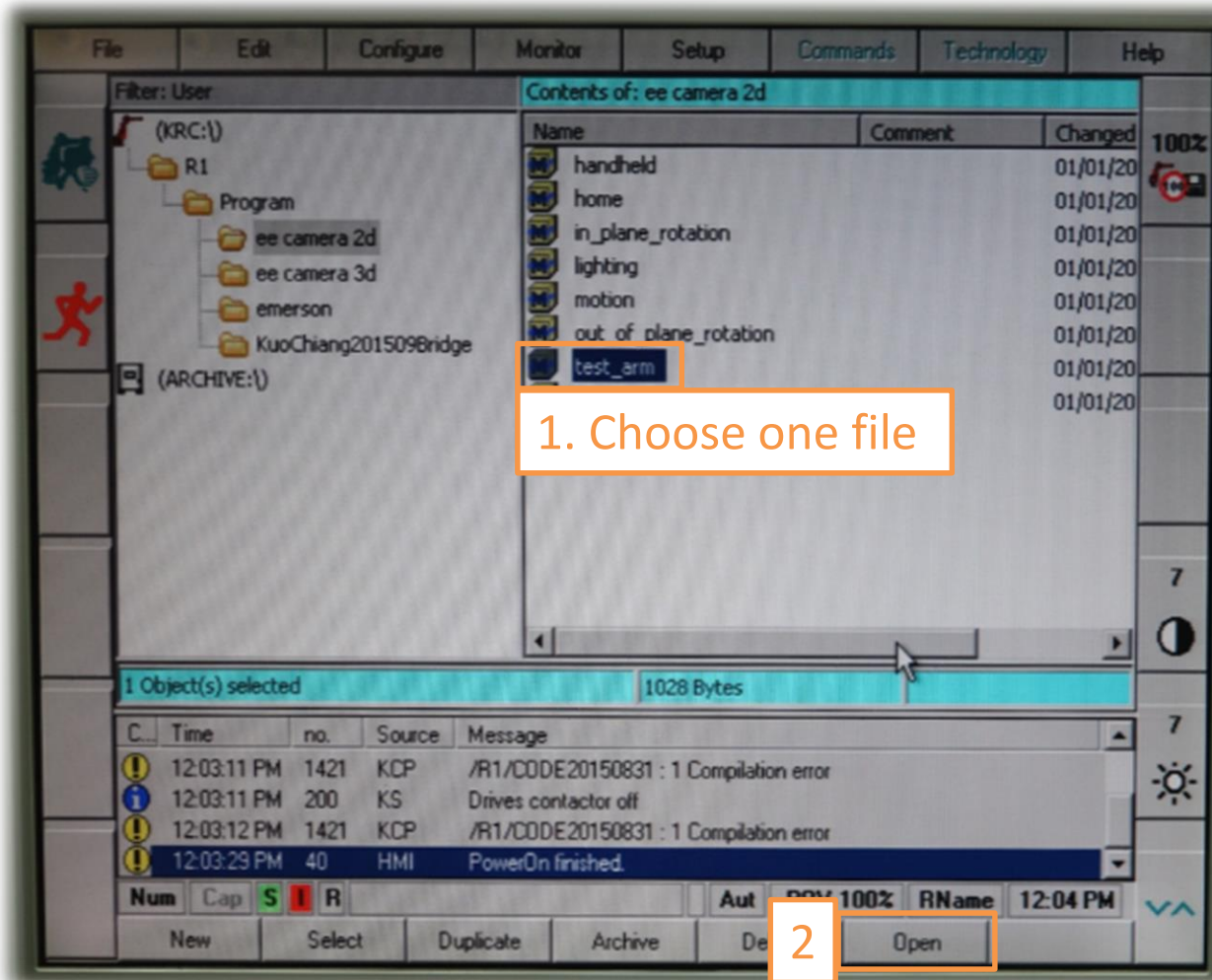
Two Way to Control

- Program Control
 - Execute program codes
 - Have to write your codes first
 - Just like **running script**
- Manuel Control
 - Control the robot arm manually
 - Just like **playing game with joystick**

Program Control (1/9)



Program Control (2/9)



Program Control (3/9)

The screenshot shows a CNC control interface with a menu bar (File, Program, Configure, Monitor, Setup, Commands, Technology, Help) and a main display area. The main display shows a program with the following lines:

```
1  → [NI]
2
3  $VEL_CP=0.5
4  PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
   ↓ 27}
5
6  CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
   ↓ 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

Below the main display, there is a status bar showing the file path `/R1/TEST_ARM.SRC` and the current line and column `Ln 1, Col 0`. Below the status bar is a log window with the following entries:

C.	Time	no.	Source	Message
!	12:05:44 PM	120	LOS	Log-On user changed from Administrator to Operator.
!	12:07:02 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:07:21 PM	1356	KCP	Start key required
i	12:07:44 PM	220	KS	Drives contactor off, intermediate circuit loaded

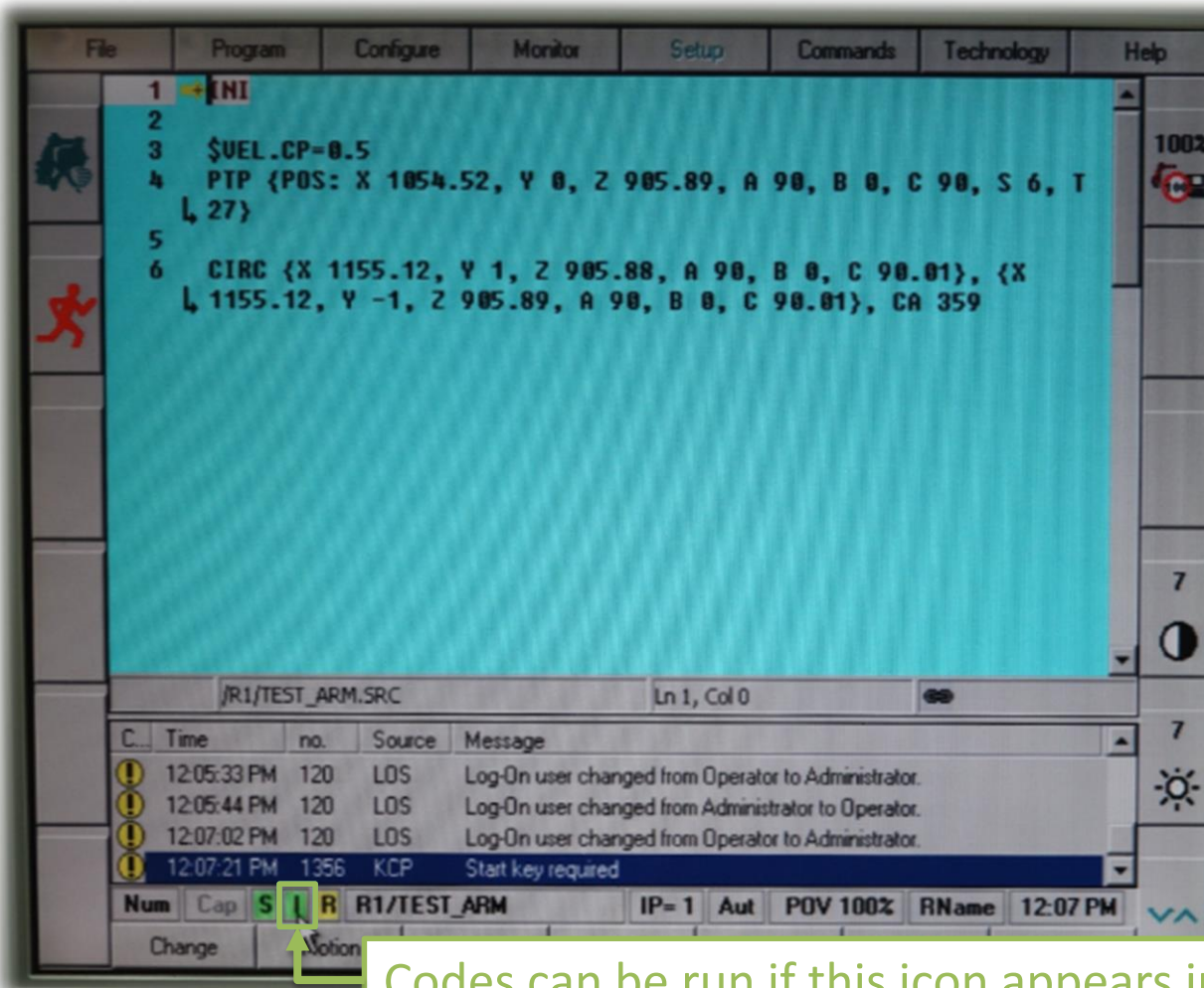
At the bottom of the interface, there is a control bar with the following fields: `Num`, `Cap`, `S`, `R`, `R1/TEST_ARM`, `IP= 1`, `Aut`, `POV 100%`, `RName`, `12:07 PM`. A red stop icon is visible in the `R` field, and a green arrow points to it from a text box below.

You cannot run codes if this icon appears in red

Program Control (4/9)



Program Control (5/9)



The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, and Help. The main window shows a program with the following code:

```
1 → [NI]
2
3 $VEL_CP=0.5
4 PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
  ↳ 27}
5
6 CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
  ↳ 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

Below the code, the status bar shows the file path `J/R1/TEST_ARM.SRC` and the current line and column `Ln 1, Col 0`. A log window at the bottom displays the following messages:

C...	Time	no.	Source	Message
!	12:05:33 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:05:44 PM	120	LOS	Log-On user changed from Administrator to Operator.
!	12:07:02 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:07:21 PM	1356	KCP	Start key required

The status bar also includes fields for `Num`, `Cap`, `S`, `R`, `R1/TEST_ARM`, `IP= 1`, `Aut`, `POV 100%`, `RName`, and `12:07 PM`. A green box highlights the `S` and `R` icons, with an arrow pointing to the `R` icon.

Codes can be run if this icon appears in green

Program Control (6/9)



Program Control (7/9)

The screenshot shows a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main display area shows a program with the following lines:

```
1  INI
2
3  $VEL_CP=0.5
4  GTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
5  27}
6  GIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
   1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

A yellow box highlights the start of line 4, and a yellow arrow points from a callout box to this box. The callout box contains the text: "This means not finished yet, and you should still press the button for a while".

Below the program display, the status bar shows: /R1/TEST_ARM.SRC Ln 4, Col 0. Below that is a message log:

C...	Time	no.	Source	Message
!	12:05:33 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:05:44 PM	120	LOS	Log-On user changed from Administrator to Operator.
!	12:07:02 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:07:21 PM	1356	KCP	Start key required

At the bottom, there is a status bar with fields: Num, Cap, S, L, R, R1/TEST_ARM, IP= 4, Aut, POV 10%, RName, 12:08 PM. Below this are buttons: Change, Motion, Fold open/cfs, Last Cmd, Line Sel, Touch Up, NAVIGATOR.

Program Control (8/9)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main window shows a program with the following lines:

```
1  INI
2
3  $VEL_CP=0.5
4  GTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
5  27}
6  GIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
   1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

A yellow box highlights line 4, and a yellow arrow points to it from a text box that says: "Finished! Pressing the button again can go into the next stage".

At the bottom, a status bar shows the file path `/R1/TEST_ARM.SRC` and the current line and column `Ln 4, Col 0`. Below this is a message log with the following entries:

C...	Time	no.	Source	Message
!	12:05:44 PM	120	LOS	Log-On user changed from Administrator to Operator.
!	12:07:02 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:07:21 PM	1356	KCP	Start key received
!	12:08:38 PM	1350	/R1/...	Programmed path reached (BCO)

The status bar also shows: Num Cap S R R1/TEST_ARM IP= 4 Aut POV 100% RName 12:08 PM. At the bottom, there are buttons for Change, Motion, Fold open/cfs, Last Cmd, Line Sel, Touch Up, and NAVIGATOR.

Program Control (9/9)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main window shows a program listing with the following lines:

```
1  INI
2
3  $VEL.CP=0.5
4  PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
   ↳ 27}
5
6  CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
   ↳ 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 359
```

A yellow box highlights line 6, and a yellow arrow points from a text box below to this line. The text box contains the following text:

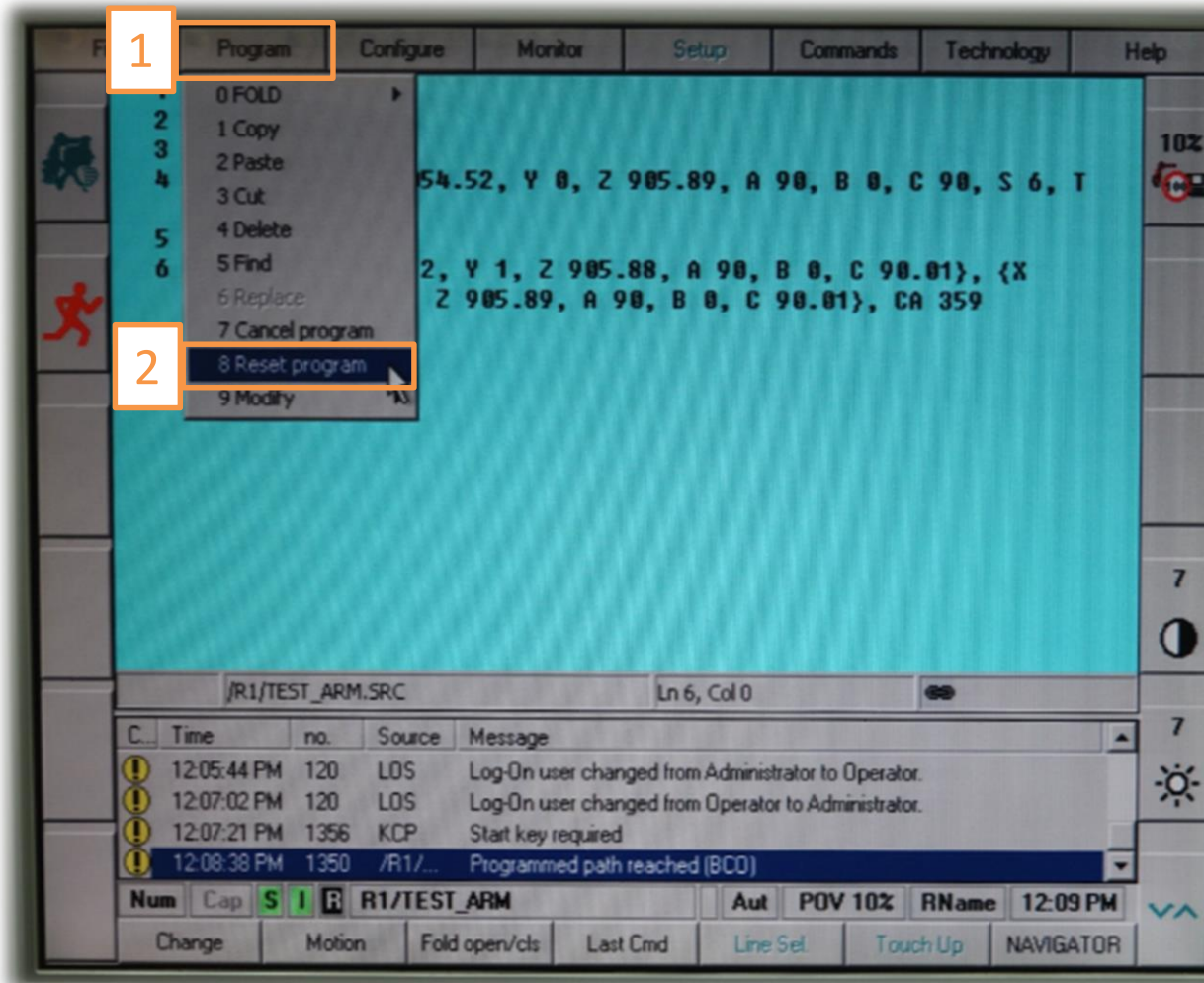
This part will be executed automatically until reaching the end

Below the program listing, the status bar shows the file path `/R1/TEST_ARM.SRC` and the current line and column `Ln 6, Col 0`. A message log at the bottom displays the following entries:

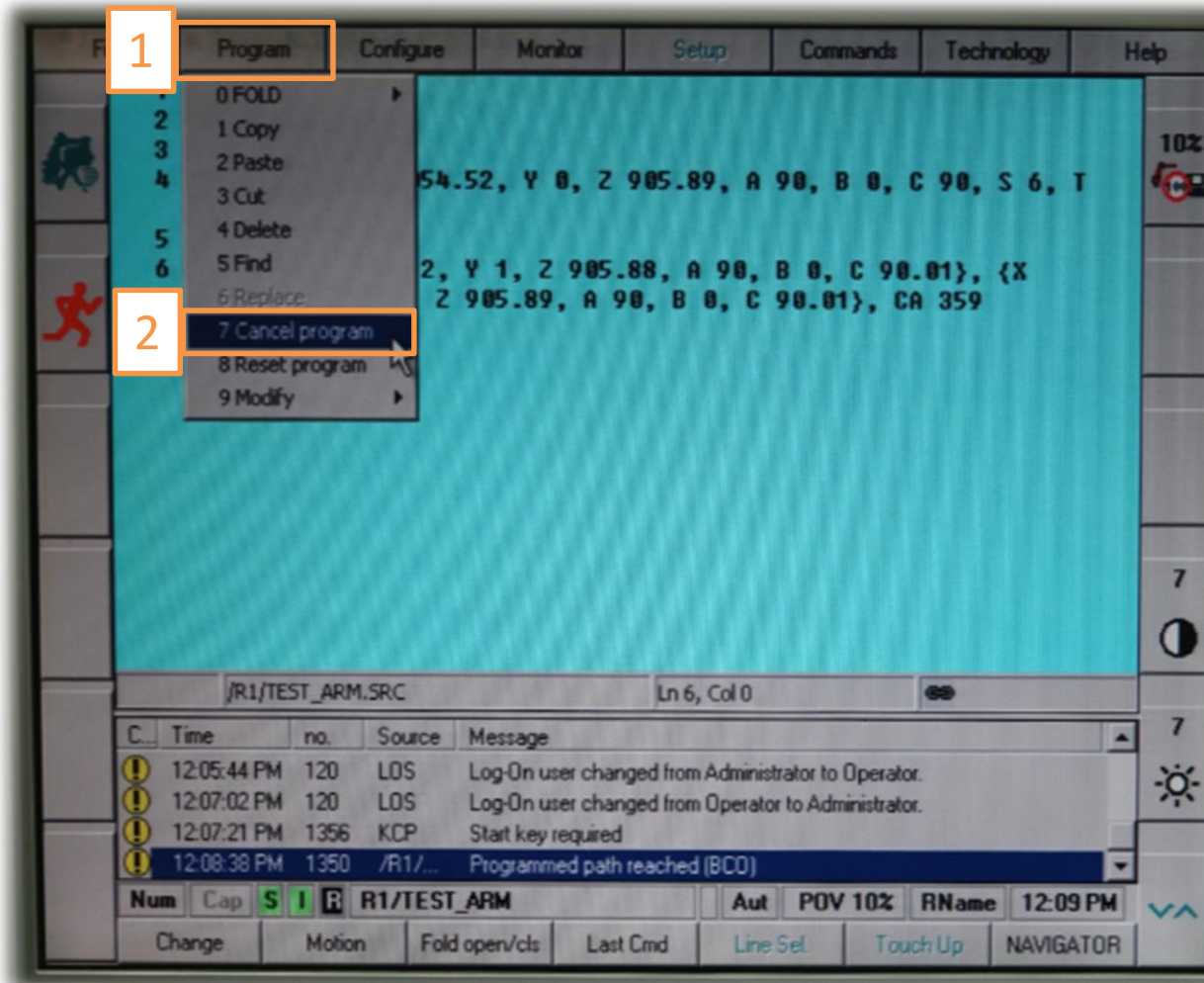
C...	Time	no.	Source	Message
!	12:05:44 PM	120	LOS	Log-On user changed from Administrator to Operator.
!	12:07:02 PM	120	LOS	Log-On user changed from Operator to Administrator.
!	12:07:21 PM	1356	KCP	Start key required
!	12:08:38 PM	1350	/R1/...	Programmed path reached (BCO)

The status bar also shows the following information: Num, Cap, S, I, R, R1/TEST_ARM, IP= 6, Aut, POV 100%, RName, 12:08 PM, Close, NAVIGATOR.

Reset Pointer to Run Again

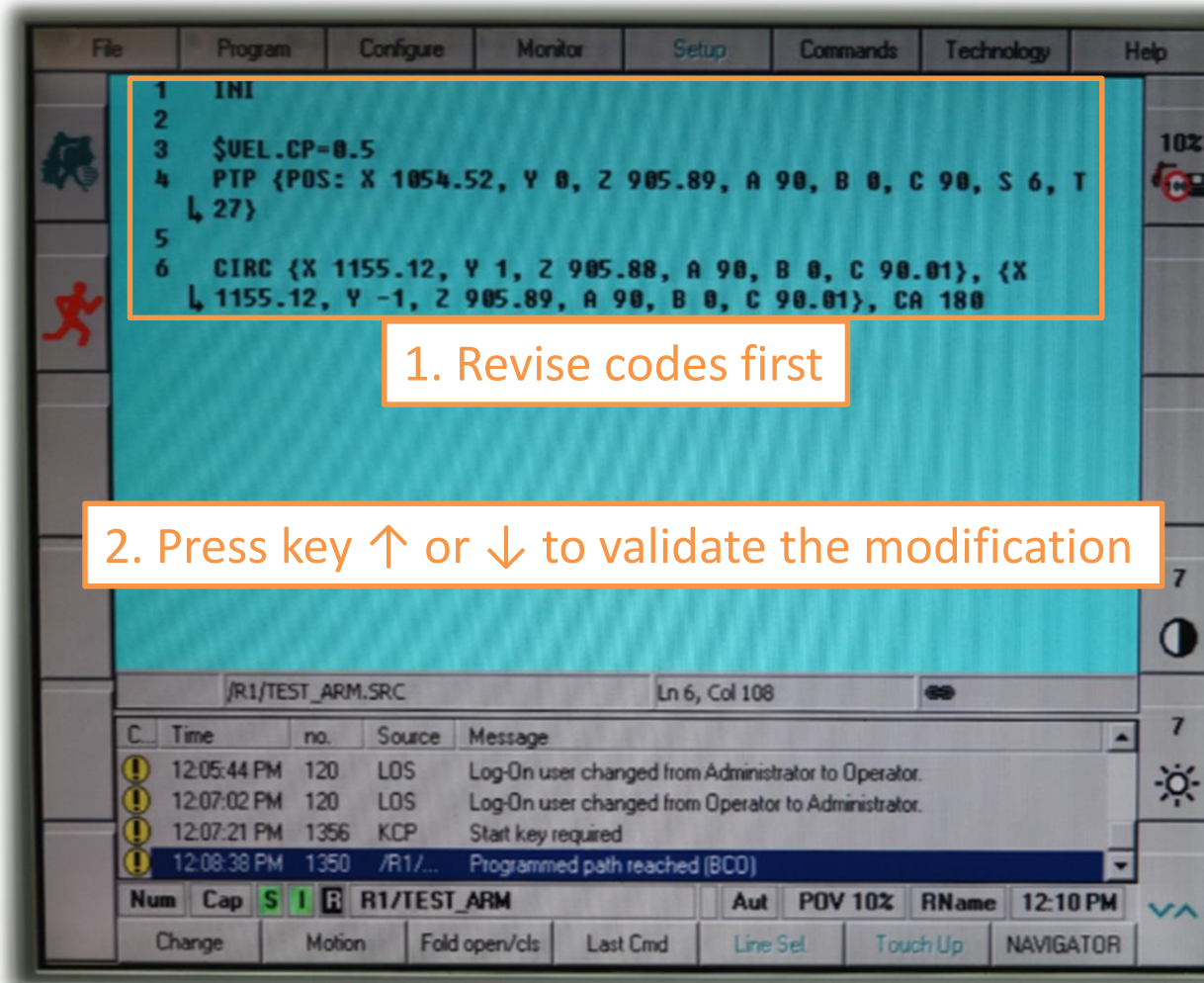


Exit



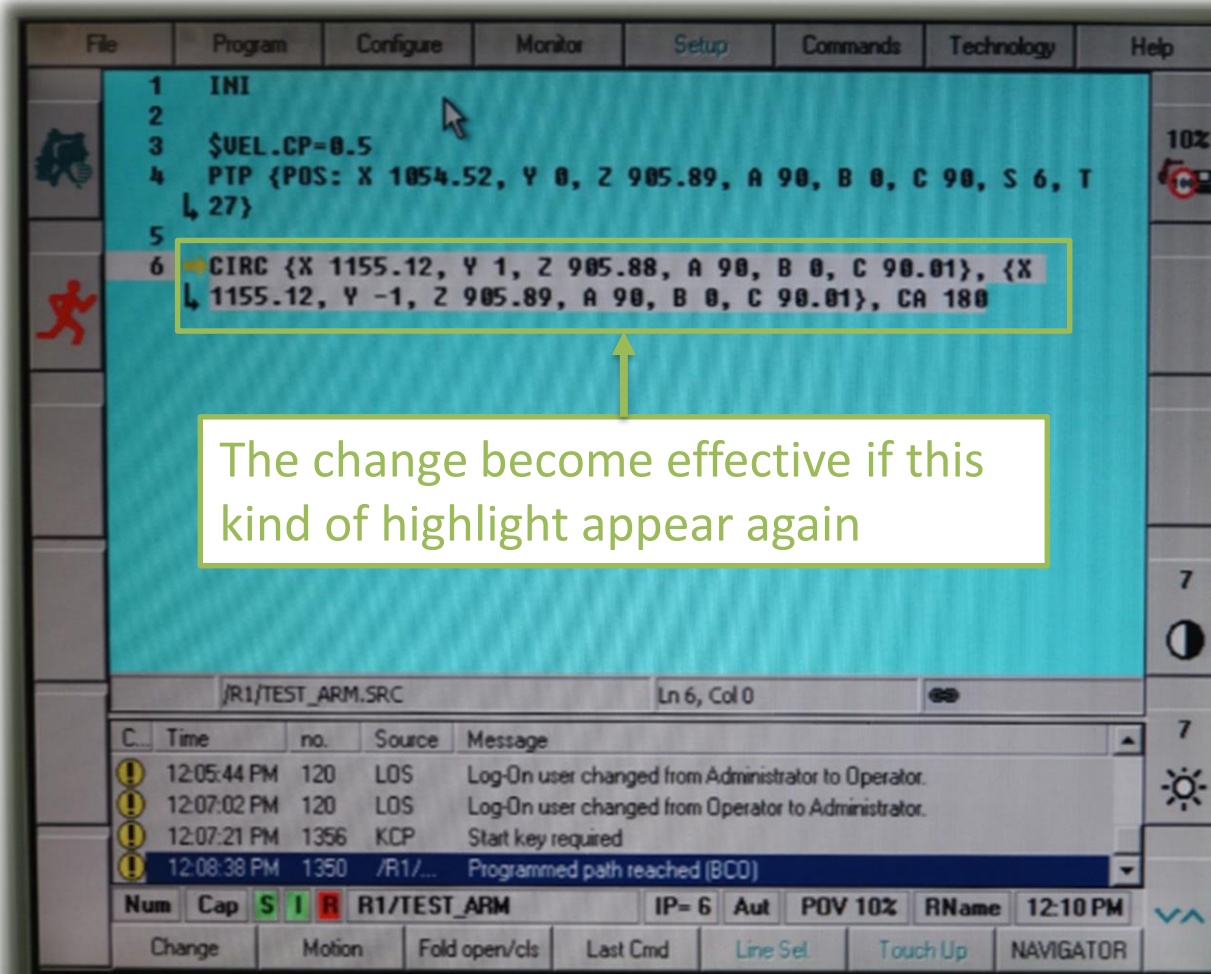
Revise Codes in Running Mode

(1/2)

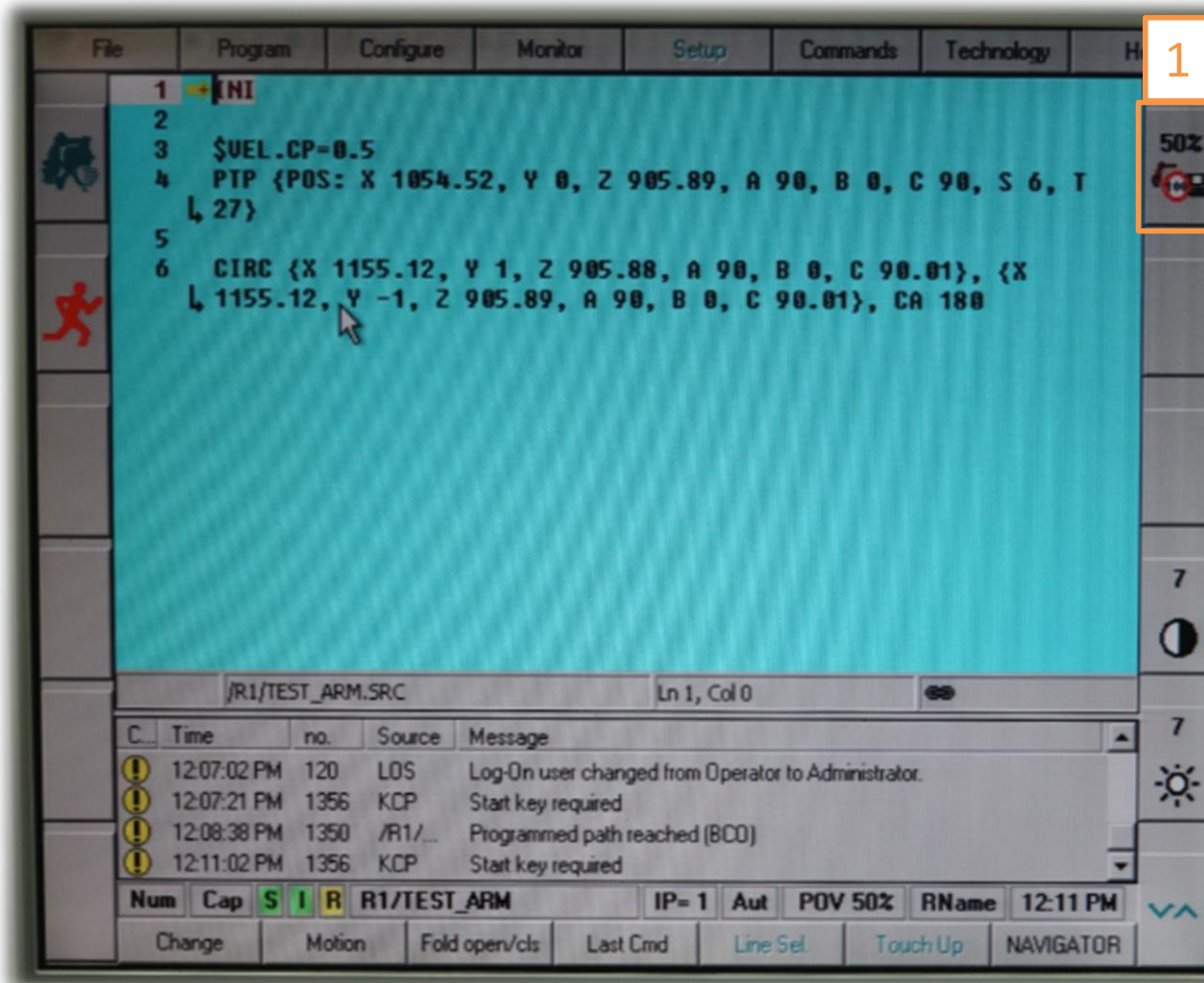


Revise Codes in Running Mode

(2/2)



Change the Moving Speed (1/3)

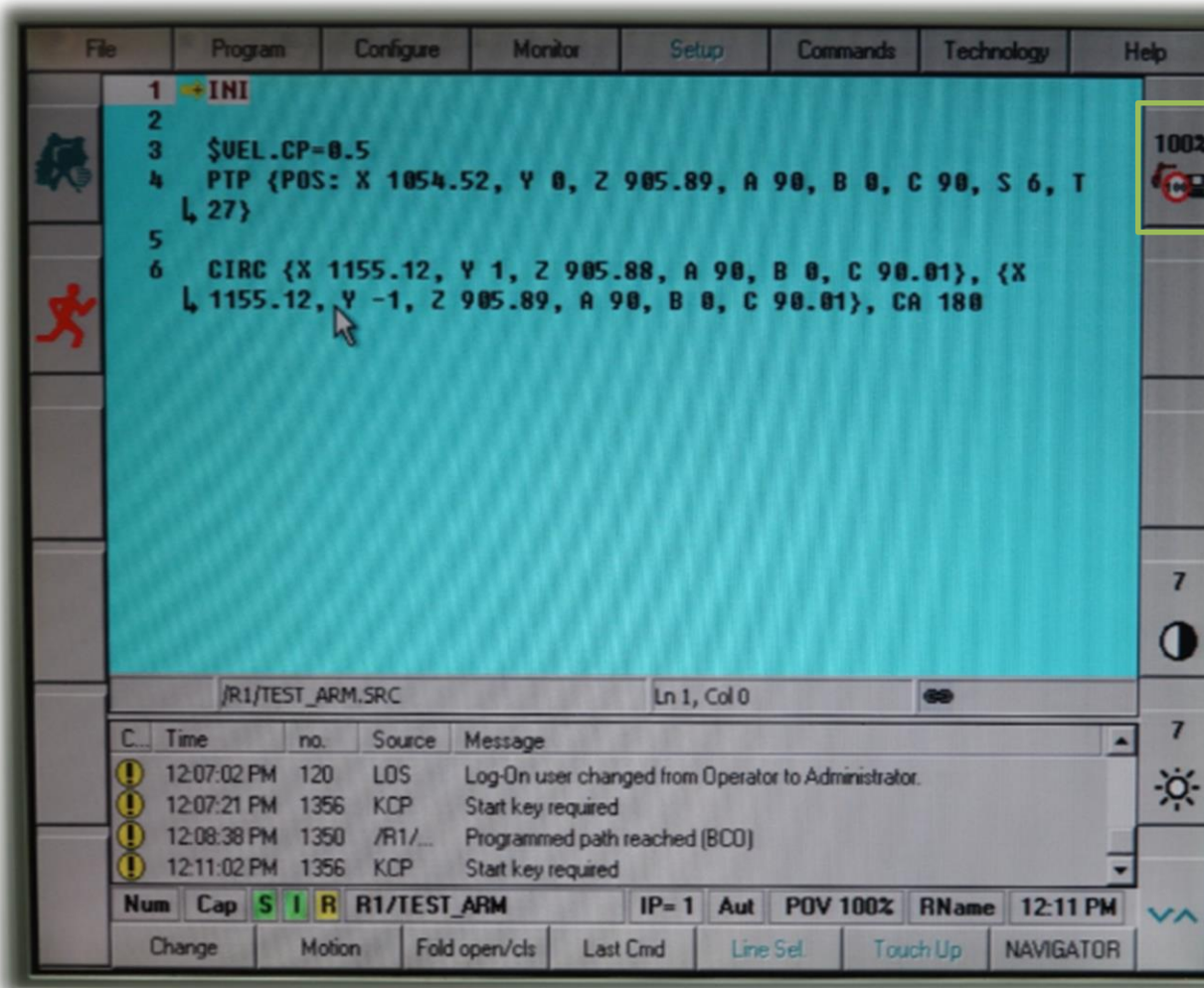


Change the Moving Speed (2/3)

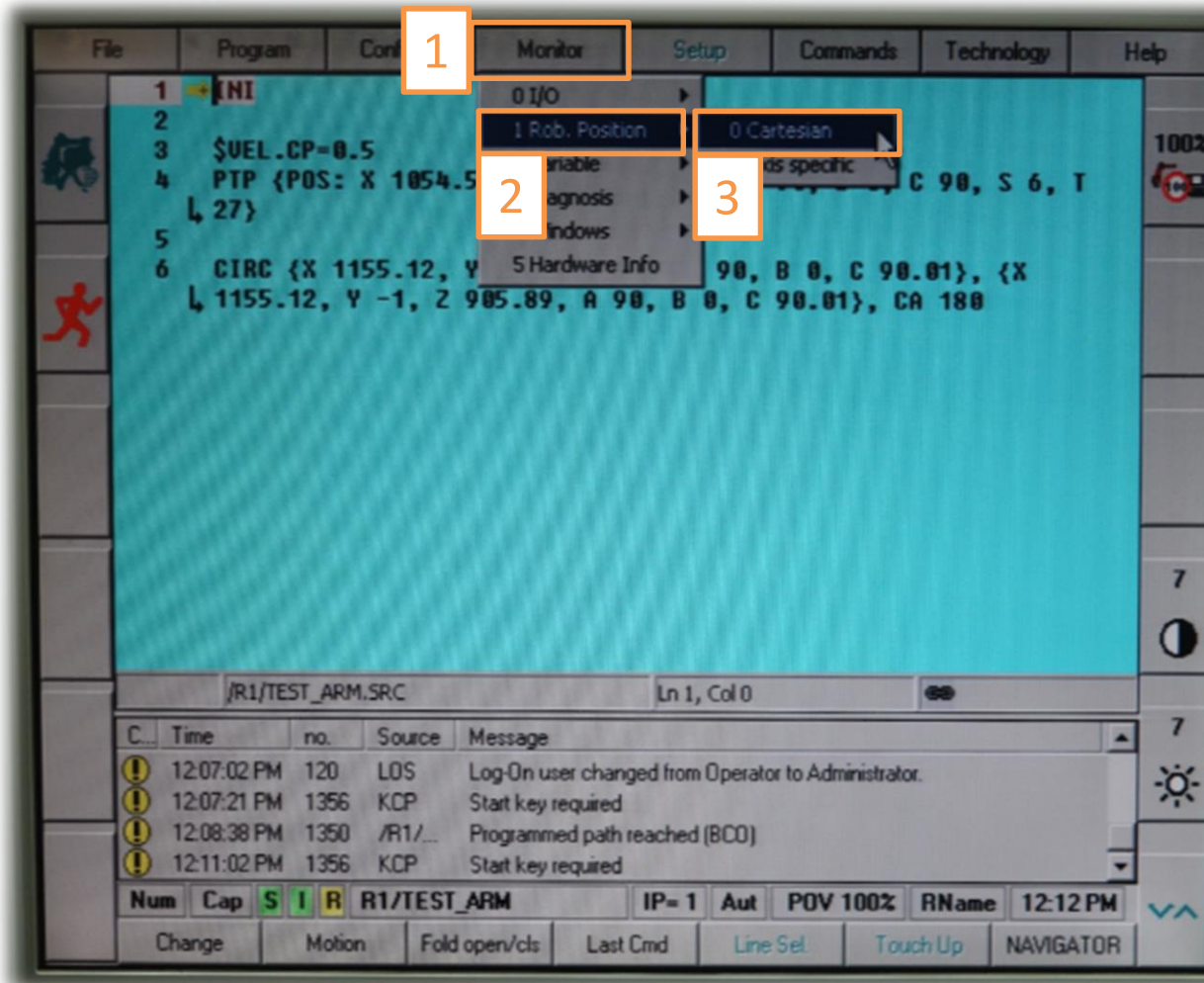


Pressing these buttons also works

Change the Moving Speed (3/3)



Monitor the Robot Position Under Cartesian System (1/2)



Monitor the Robot Position Under Cartesian System (2/2)

The screenshot displays a robot control interface with a menu bar at the top (File, Program, Configure, Monitor, Setup, Commands, Technology, Help) and a main window divided into several sections. The left section shows a program listing with line numbers 1 through 6, including commands like `INI`, `$VEL.CP=0.5`, `PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T 27}`, and `CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 180`. The right section, titled "Robot Position", contains a table with columns "Name", "Value", and "Unit". The table lists parameters for Tool/Base, Position (X, Y, Z), Orientation (A, B, C), and Robot Position (S, T). A green box highlights the Position and Orientation rows. Below the table, there are radio buttons for "Cartesian" (selected) and "Axis Specific". At the bottom, a message log shows several entries with yellow warning icons, including "Start key", "Program", and "Programmed path reached (PLC)". The status bar at the very bottom shows "Num Cap S I R R1/TEST_ARM IP= 4 Aut POV 100% RName 12:12 PM" and a "Close" button.

Name	Value	Unit
Tool/Base		
(1)	#NONE	Tool
-	#NONE	Base
Position		
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin

You can monitor the value of each dimension here

Monitor the Robot Position Under Axis System (1/2)

The screenshot shows a robot control interface with a menu system. The 'Monitor' menu is open, and the '1 Axis specific' option is selected. The position data is displayed in a table format.

	Value	Unit
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin

At the bottom of the interface, there is a status bar with a 'Cartesian' button and an 'Axis Specific' button. A red arrow points to the 'Axis Specific' button with the text 'Pressing here also works'.

Monitor the Robot Position Under Axis System (2/2)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, and Help. The main window is divided into several sections:

- Program Editor:** Shows a program with the following code:

```
1  INI
2
3  $VEL_CP=0.5
4  PTP {POS: X 1054.52, Y 0,
    L Z 905.89, A 90, B 0, C 90,
    L S 6, T 27}
5
6  CIRC {X 1155.12, Y 1, Z
    L 905.88, A 90, B 0, C
    L 90.01}, {X 1155.12, Y -1,
    L Z 905.89, A 90, B 0, C
    L 90.01}, CA 180
```
- Robot Position Table:** A table with columns 'Axis', 'Pos. [deg. mm]', and 'Increments'. It is currently set to 'Axis Specific' mode. The data is as follows:

Axis	Pos. [deg. mm]	Increments
A1	0.00	0
A2	-79.19	-450525
A3	116.85	664763
A4	0.00	1
A5	-37.66	-97646
A6	-90.00	-84109
- Message Log:** A table with columns 'C.', 'Time', 'no.', 'Source', and 'Message'. It contains four entries:

C.	Time	no.	Source	Message
!	12:07:21 PM	1356	KCP	Start key required
!	12:08:38 PM	1350	/R1/...	Programmed path reached (BCO)
!	12:11:02 PM	1356	KCP	Start key required
!	12:12:15 PM	1350	/R1/...	Programmed path reached (BCO)
- Status Bar:** Shows 'Num Cap S I R R1/TEST_ARM', 'IP= 4 Aut', 'POV 100%', 'RName', and '12:12 PM'. There are also 'Cartesian' and 'Close' buttons.

Emergency Stop



Manuel Control (1/6)



Manual Control (2/6)

The screenshot displays a CNC control interface with a menu bar at the top: File, Program, Configure, Monitor, Setup, Commands, Technology, Help. The main window is divided into several sections:

- Program Editor:** Shows a program with lines 1-6. Line 6 is highlighted: `CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 180`. A red running person icon is visible on the left.
- Robot Position Table:** A table with columns 'Axis', 'Pos. [deg. mm]', and 'Increments'. It lists axes A1 through A6 with their current positions and increments.
- Control Mode:** A box with a red robot icon and a text box containing the instruction: "1. Change to [+] [-] mode". Below this are radio buttons for 'Cartesian' and 'Axis Specific'.
- Message Log:** A list of system messages with timestamps and sources.
- Status Bar:** Displays 'R1/TEST_ARM', 'IP= 4 T2', 'POV 10%', 'RName', and '12:12 PM'.

Axis	Pos. [deg. mm]	Increments
A1	0.00	0
A2	-79.19	-450525
A3	116.85	664763
A4	0.00	1
A5	-37.66	-97646
A6	-90.00	-84109

Manuel Control (3/6)



Manuel Control (4/6)

The screenshot displays a robot control interface with several key elements:

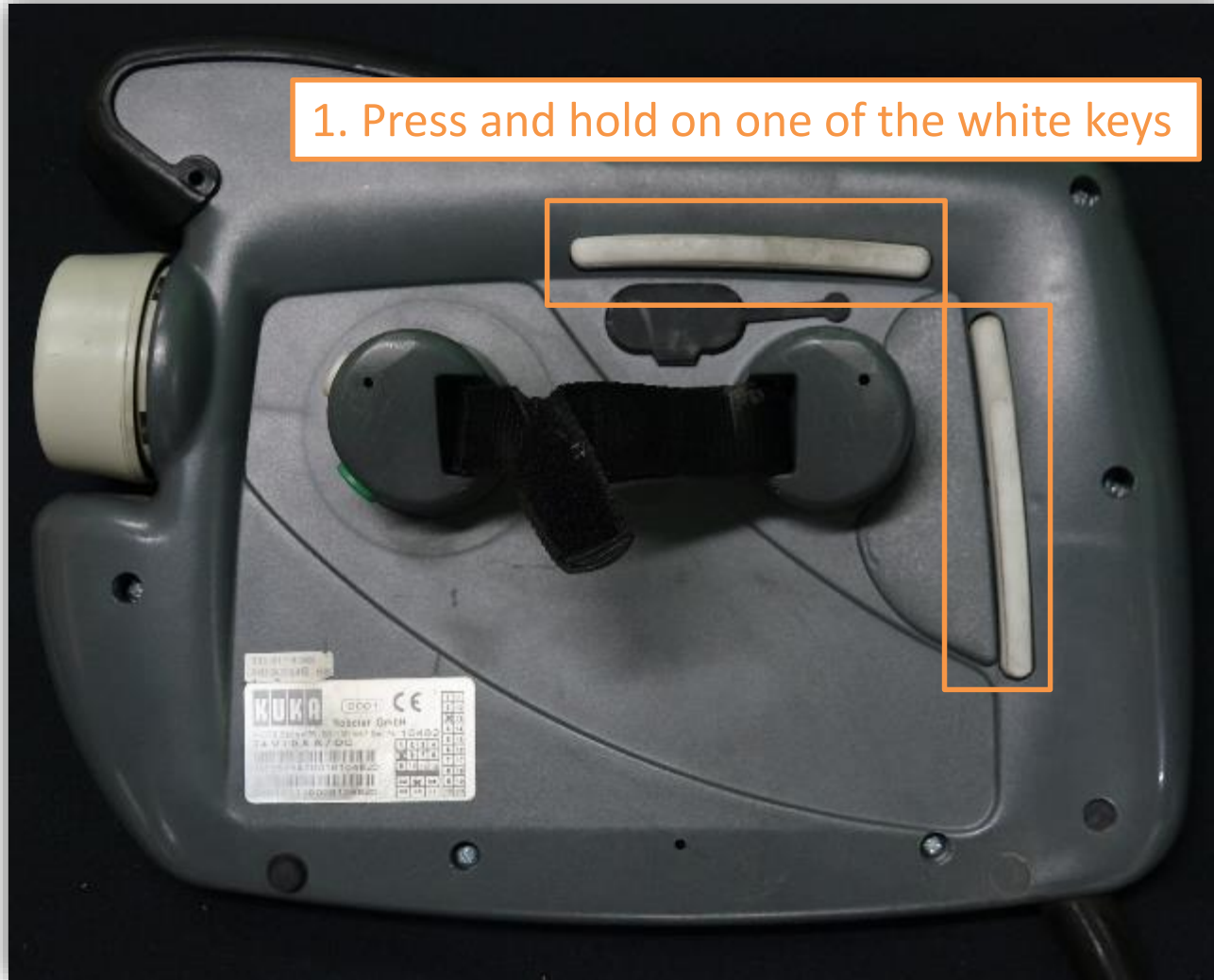
- Program Editor:** Shows a sequence of commands including `INI`, `$VEL_CP=0.5`, `PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T 27}`, and `CIRC {X 1155.12, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X 1155.12, Y -1, Z 905.89, A 90, B 0, C 90.01}, CA 180`.
- Robot Position Panel:** A table showing current coordinates and orientations.
- Status Bar:** Includes a speed indicator set to 10% and a status icon.
- Message Log:** Displays system messages such as "Programmed path reached (BCO)", "Start key required", and "Drives contactor off, intermediate circuit loaded".
- Control Panel:** Features buttons for `Num`, `Cap`, `S`, `I`, and `R`. The `I` button is highlighted in red.

Annotations on the image:

- A red box highlights the `I` button in the control panel, with a callout: "You cannot control the arm if this icon appears in red".
- A red box highlights the speed indicator, with a callout: "Speed (manual)".
- A red box highlights the status icon, with a callout: "Axis Mode".

Manuel Control (5/6)

1. Press and hold on one of the white keys



Manuel Control (6/6)

Now you can modify values under axis system

The screenshot displays a CNC control interface with several panels. The main panel shows a program with the following code:

```
1 INI
2
3 $VEL_CP=0.5
4 PTP {POS: X 1054.52, Y 0,
  Z 905.89, A 90, B 0, C 90,
  S 6, T 27}
5
6 CIRC {X 1155.12, Y 1, Z
  905.88, A 90, B 0, C
  90.01}, {X 1155.12, Y -1,
  Z 905.89, A 90, B 0, C
  90.01}, CA 180
```

The right-hand panel, titled "Robot Position", shows the following data:

Name	Value	Unit
Tool/Base		
(1)	#NONE	Tool
-	#NONE	Base
Position		
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin

The status bar at the bottom shows the following information:

Num	Cap	S	I	R	R1/TEST_ARM	IP= 4	T2	HOV 10%	RName	12:13 PM
			I							

The "I" icon in the status bar is highlighted with a green box and an arrow pointing to it.

The arm can be controlled if this icon appears in green

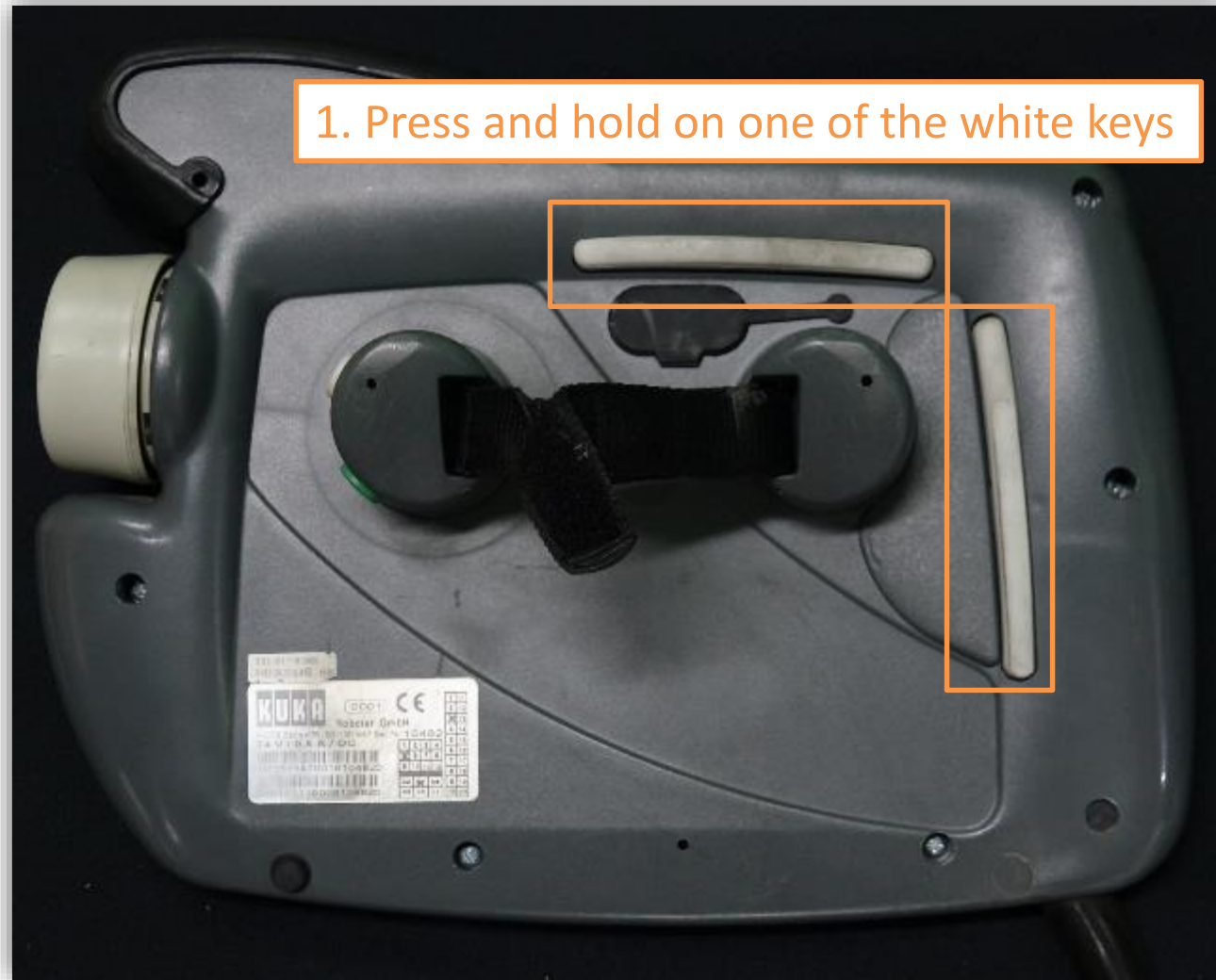
Change Values Under Cartesian System (1/3)

The screenshot shows a CNC control interface with a 'Setup' menu open. The 'Robot Position' table is visible, showing parameters for Tool/Base, Position (X, Y, Z), Orientation (A, B, C), and Robot Position (S, T). The 'Cartesian' mode is selected, and a callout box highlights the 'Cartesian' button.

Name	Value	Unit
Tool/Base		
(1)	#NONE	Tool
-	#NONE	Base
Position		
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin

1. Change to Cartesian Mode

Change Values Under Cartesian System (2/3)



Change Values Under Cartesian System (3/3)

Now you can modify values under Cartesian system

The screenshot displays a CNC control interface with a 'Setup' tab. The main window shows a 'Robot Position' table with the following data:

Name	Value	Unit
Tool/Base		
(1)	#NONE	Tool
-	#NONE	Base
Position		
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin

Below the table, there are radio buttons for 'Cartesian' (selected) and 'Axis Specific'. On the right side of the table, there are vertical axis controls for X, Y, Z, A, B, and C, each with a '-+' button. At the bottom of the interface, a status bar shows 'R1/TEST_ARM' with a green 'I' icon highlighted by a green box and an arrow.

The arm can be controlled if this icon appears in green

Change the Moving Speed in Manual Mode

The screenshot shows a CNC control interface with the following components:

- Menu Bar:** File, Program, Configure, Monitor, Setup, Commands, Technology, Help.
- Main Window:** Displays a program with lines 1-6. Line 4 is highlighted: `PTP {POS: X 1054.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T 27}`.
- Setup Tab:** Shows 'Robot Position' parameters in a table:

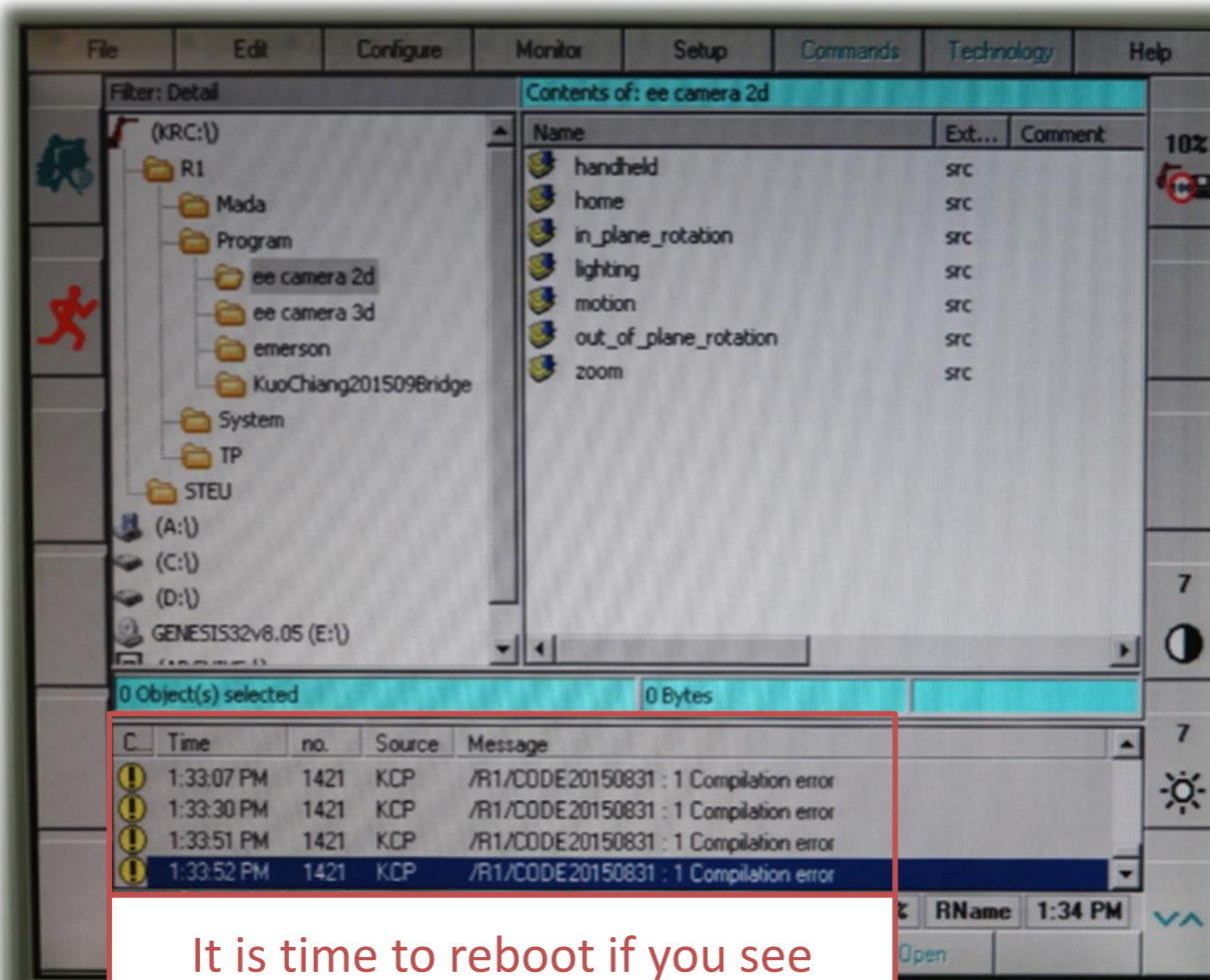
Name	Value	Unit
Tool/Base		
(1)	#NONE	Tool
-	#NONE	Base
Position		
X	1054.52	mm
Y	0.00	mm
Z	905.89	mm
Orientation		
A	90.00	deg
B	0.00	deg
C	90.00	deg
Robot Position		
S	110	bin
T	110010	bin
- Right Side:** A vertical toolbar with icons for zoom (100%), home, and manual mode. An orange box highlights the '100%' zoom setting.
- Bottom Panel:** Shows a status bar with 'R1/TEST_ARM', 'IP= 4', 'T2', and 'HOV'. Below it is a message log with entries like 'Programmed path reached (BCD)' and 'Start key required'.

1. Change the moving speed

Outline

- Introduction
- How to Edit Codes
- How to Control the Robot Arm
- **Others**


Reboot Timing



Further Reading

- If you want to write fancier codes, please refer to [Expert Programming Manual](#).

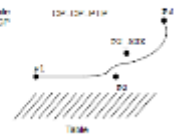
3 Make programming conditions



In order to create functions, while creating each program, an additional CP model file, `ncp`, must be created.

```

Program
***
sub #1
GSP #2 C_P2P
LIN #3 C_P2P
END #1
***
    
```



CP → PTP approximate positioning

Through the operation of the program conditions in the CP block, while located in `TABLE`, the error rate for the PTP block.

An instruction sequence could thus look like this:

```

GSP #2 P2P1
LIN #3 P2P1
END #2
    
```


CP → PTP approximate positioning can only be ensured, however, if none of the robot axes (X, Y, Z, W, U, V) in the CP block and P block is changed, because these positions always cannot be predicted when the approximate positioning routine is planned. If such a change is made, it is not possible to approximate positioning in the CP block (change in G or T), the path block is executed as an individual block to the programmed end point and the error message "CP/PTP approximation not possible" which must be acknowledged, is displayed. The user should then make up the CP block into several individual blocks, so that the end of a block before the CP → PTP approximate positioning routine enough to be able to predict, for all robot axes, a change in G or T.

Further information can be found in the chapter "Robot programming" section (Robot programming).

In the following example, PTP-LIN, LIN-GSP and GSP-PTP approximate positioning have been programmed.

KUKA

Expert Programming



DEF USER P ()

```

----- User-written section -----
LET DEF USER_PROGRAM TABLE LIN 1
DOCS KEEP END

2 Initialization
PAC (P2P1,P2) ; initialization of variables
RDEF (P2P1 A1 0,0 0,0,0,0,0,0,0,0,0,0)
----- User-written section -----
PDP GSP1 1000 P2P
PDP (PDP1 2 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)

var (point 1 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)
var (C_P2P_C_P2P)
LIN (S 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)

GSP1,LINE 25
LIN (S 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)
var (point 2 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)
LIN (S 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)
PDP (PDP1 2 1000,0,0 1000,0,0 1000,0,0 1000,0,0 1000,0,0)
END
    
```

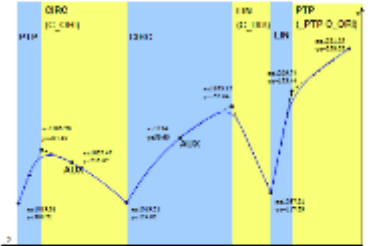


Fig. 37 PTP, GSP and CP-PTP approximate positioning