Reference: http://forum.robotsinarchitecture.org/index.php?action=dlattach;topic=20.0;attach=11

KUKA KR 16-2

User Manual

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Outline

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

Outline

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

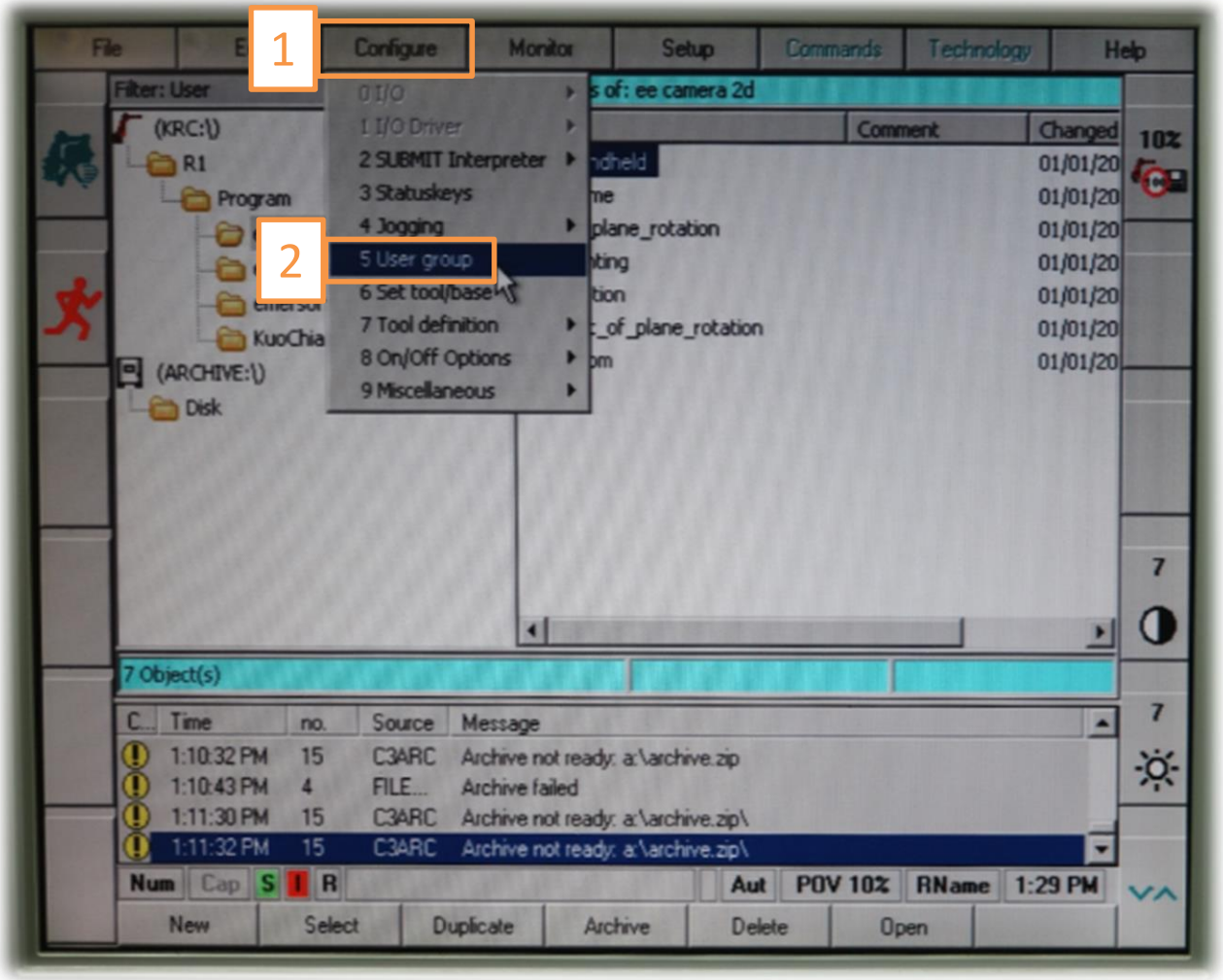
Outline

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

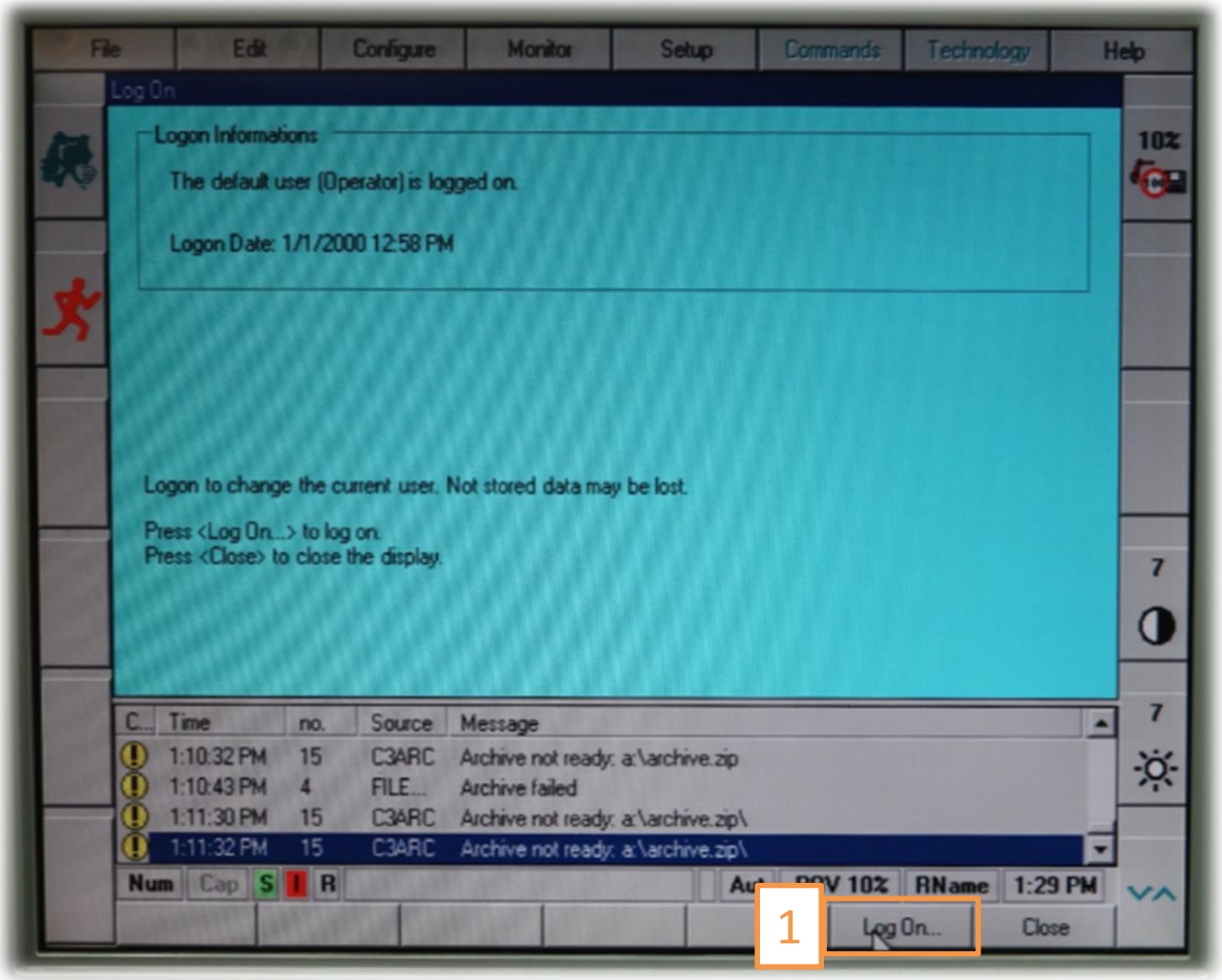
Log On (1/6)

- 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

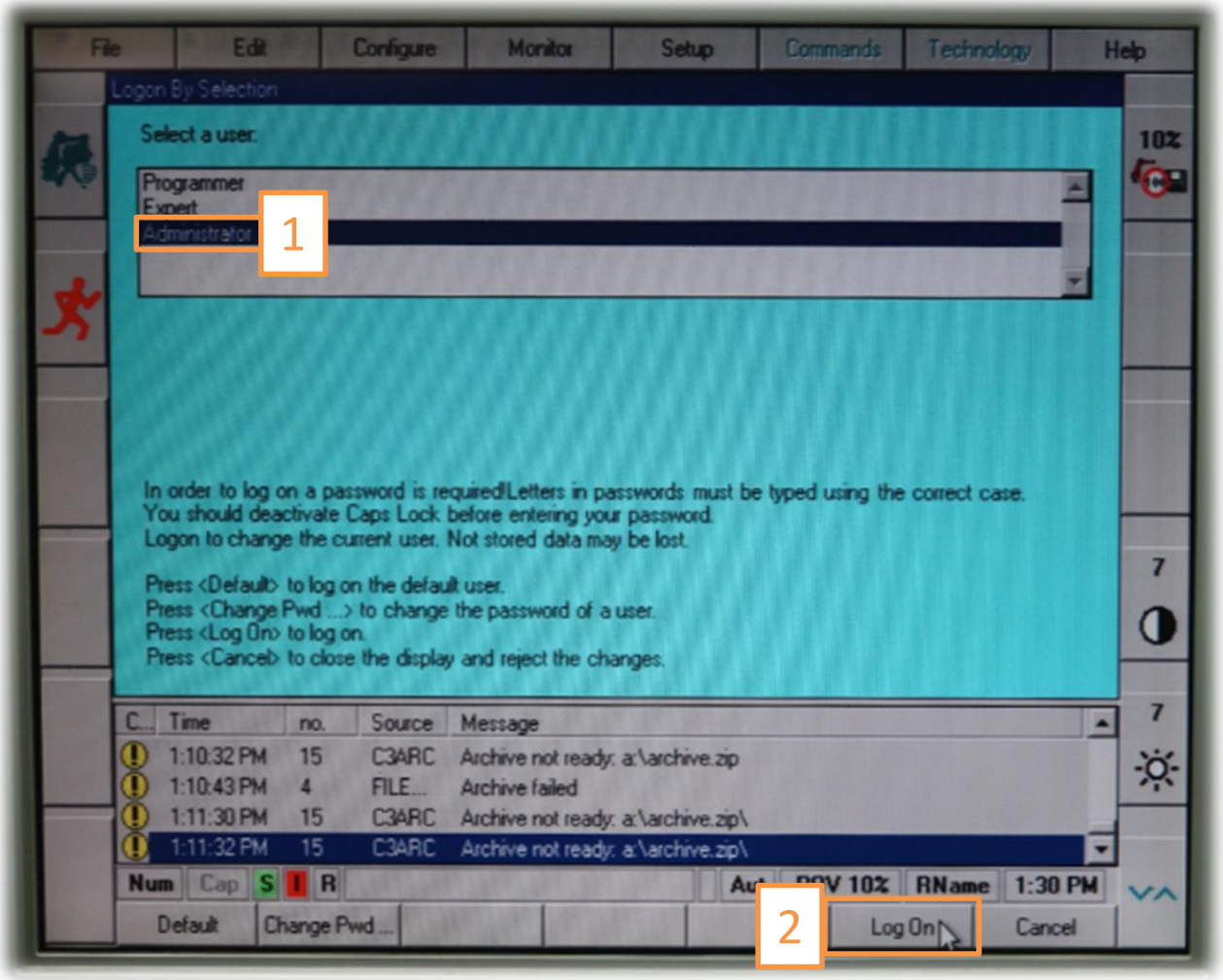
Log On (2/6)


1
2
File
Configure
Monitor
Setup
Commands
Technology
Help
Filter: User
(KRC:\)
R1
Program
KuoChia
(ARCHIVE:\)
Disk
0 I/O
1 I/O Driver
2 SUBMIT Interpreter
3 Statuskeys
4 Jogging
5 User group
6 Set tool/base
7 Tool definition
8 On/Off Options
9 Miscellaneous
Comment
Changed
01/01/20
7 Object(s)
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%
RName
1:29 PM
New
Select
Duplicate
Archive
Delete
Open

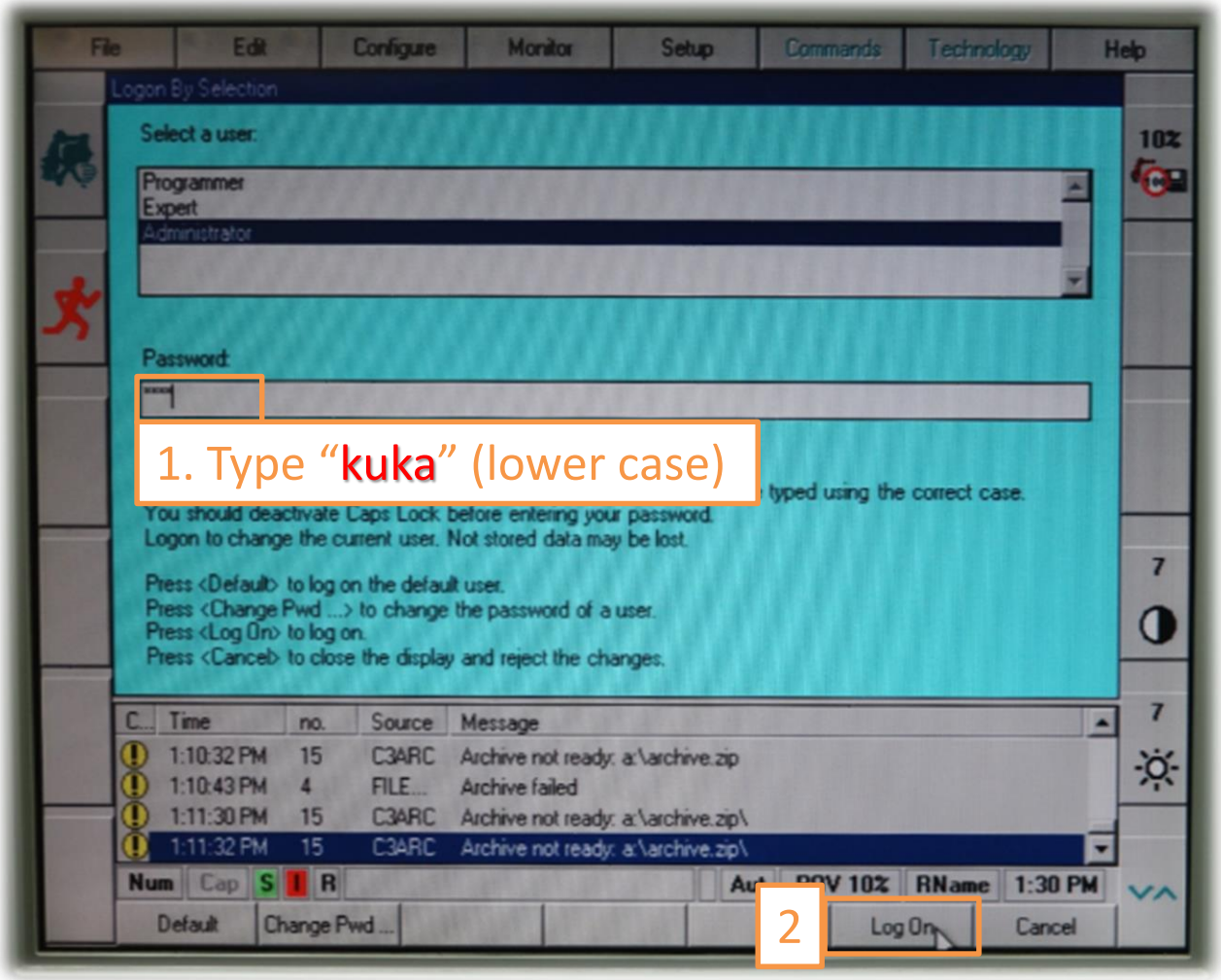
Log On (3/6)


File
Edit
Configure
Monitor
Setup
Commands
Technology
Help
Log On
Logon Informations
The default user (Operator) is logged on.
Logon Date: 1/1/2000 12:58 PM
Logon to change the current user. Not stored data may be lost.
Press <Log On...> to log on.
Press <Close> to close the display.
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
RName
1:29 PM
1
Log On...
Close

Log On (4/6)

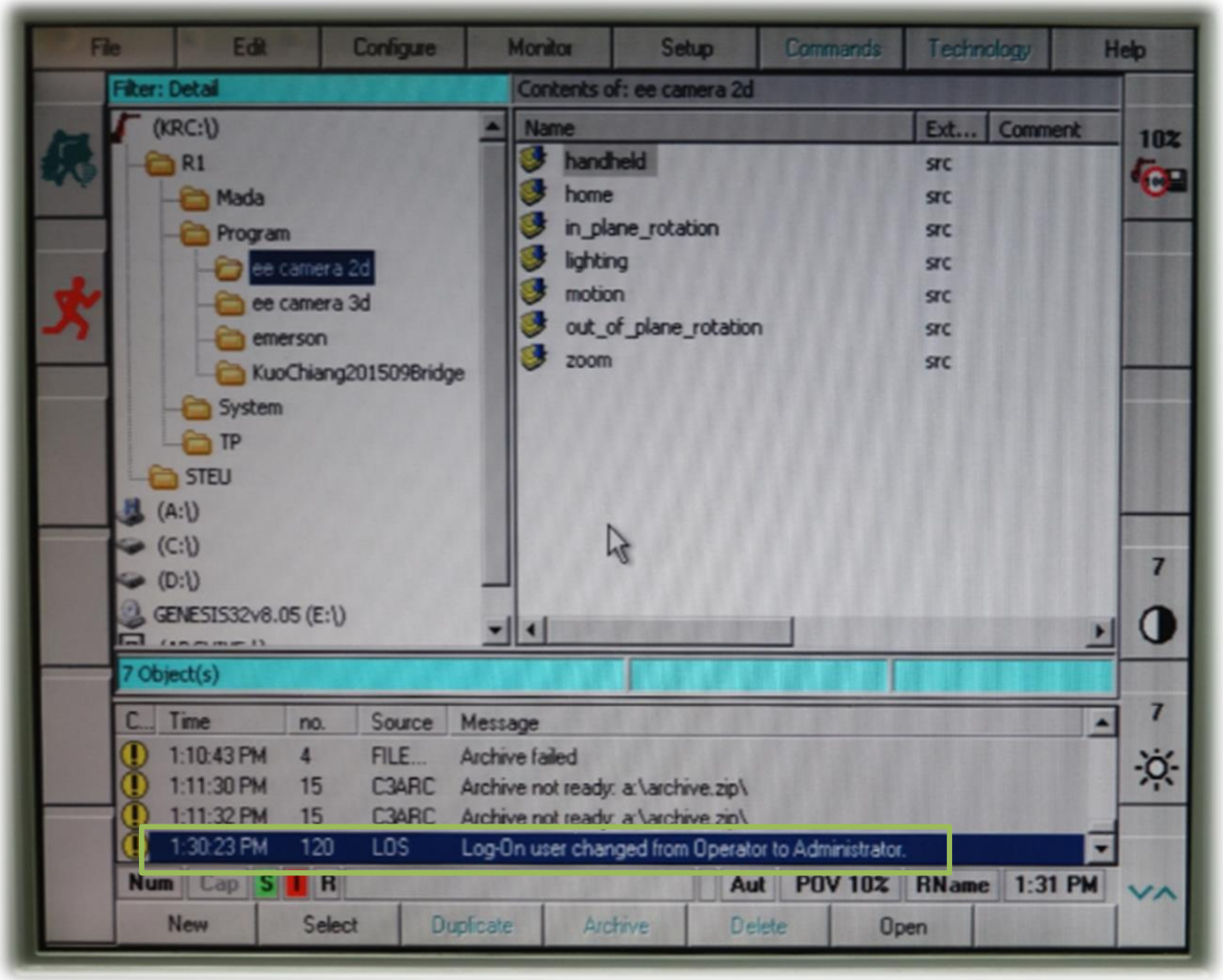

File
Edit
Configure
Monitor
Setup
Commands
Technology
Help
Logon By Selection
Select a user:
Programmer
Expert
Administrator
1
In order to log on a password is required!Letters in passwords must be typed using the correct case.
You should deactivate Caps Lock before entering your password.
Logon to change the current user. Not stored data may be lost.
Press <Default> to log on the default user.
Press <Change Pwd ...> to change the password of a user.
Press <Log On> to log on.
Press <Cancel> to close the display and reject the changes.
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
RName
1:30 PM
Default
Change Pwd ...
2
Log On
Cancel

Log On (5/6)

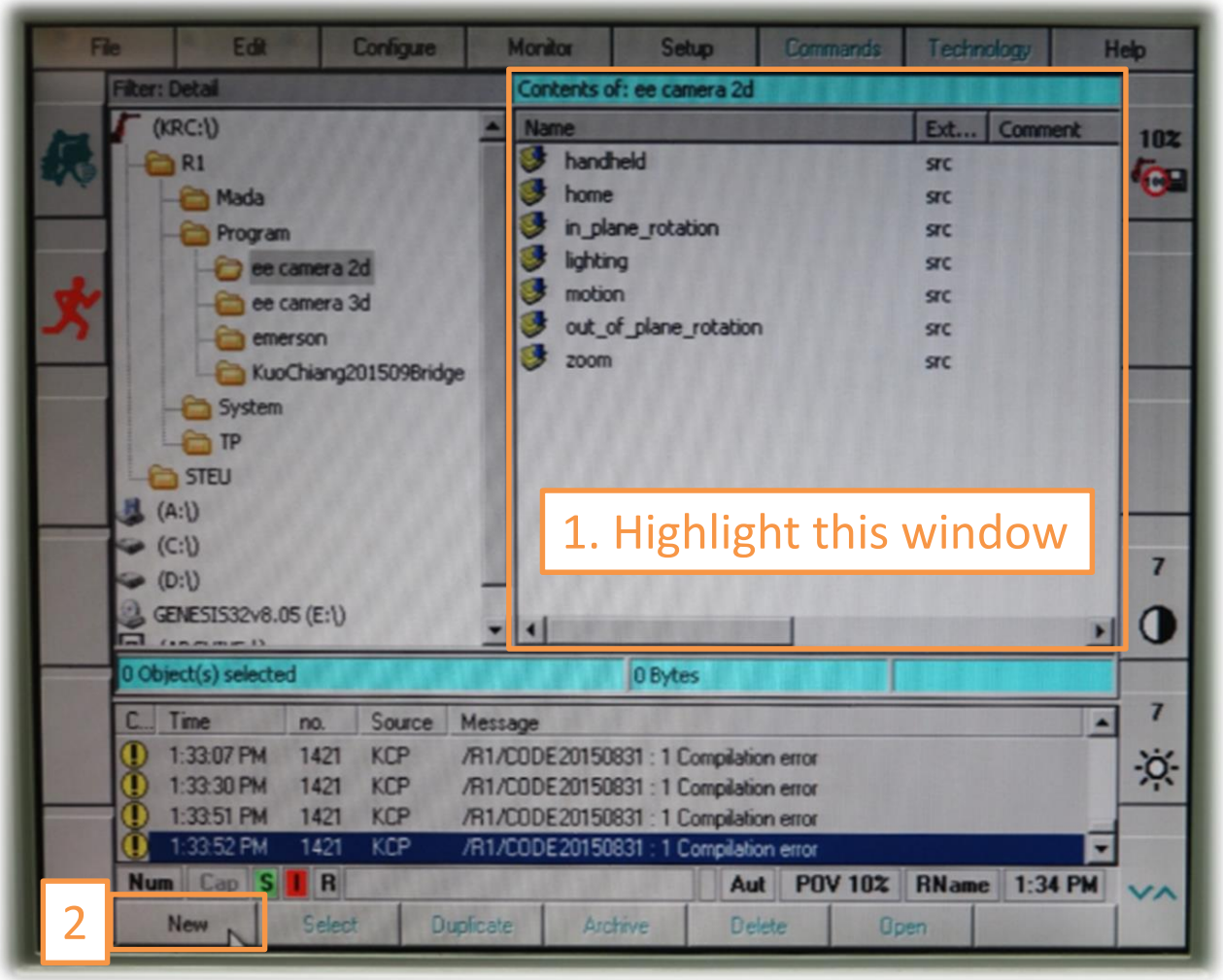


(or just press **enter**)

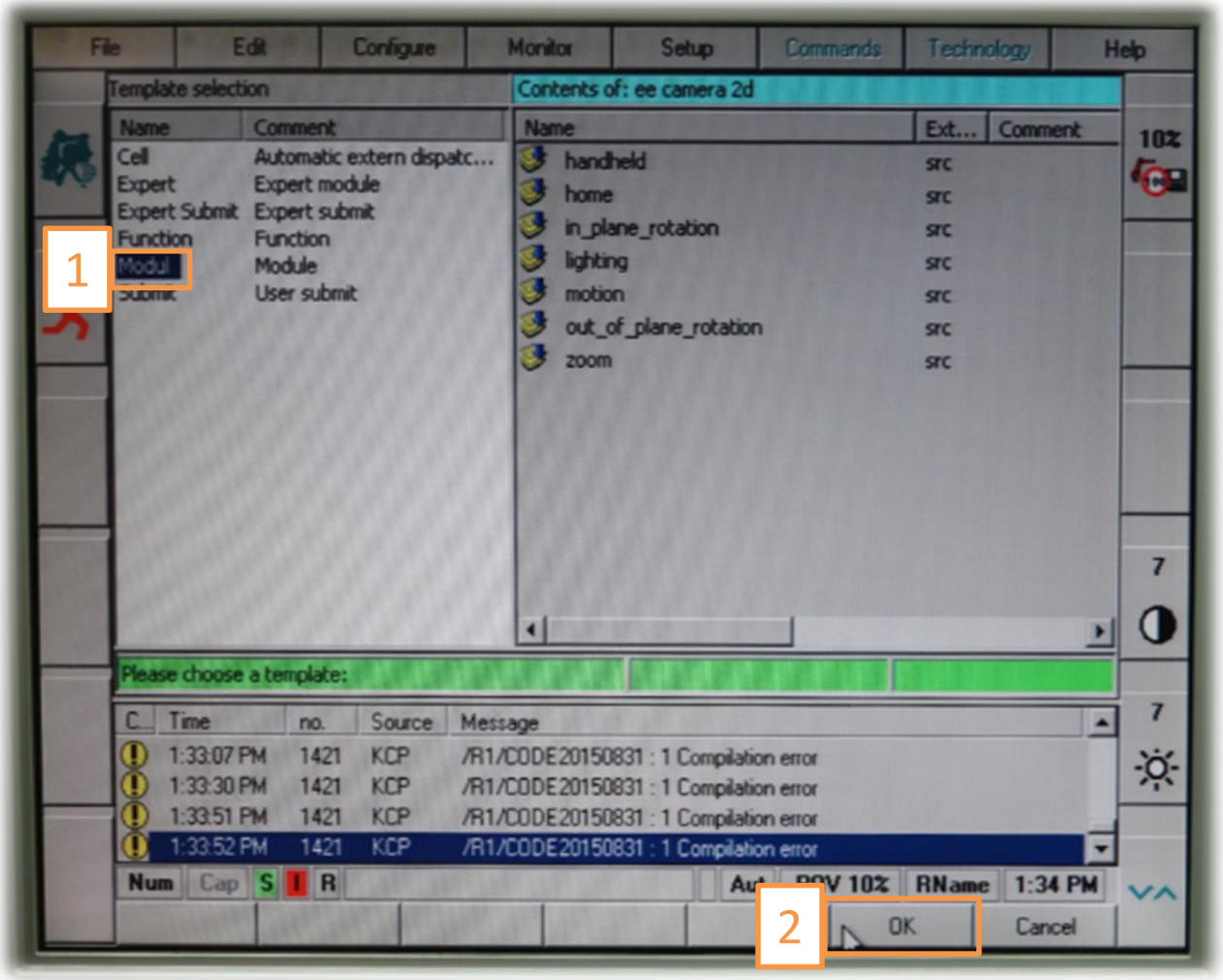
Log On (6/6)


File
Edit
Configure
Monitor
Setup
Commands
Technology
Help
Filter: Detail
Contents of: ee camera 2d
(KRC:\)
R1
Mada
Program
ee camera 2d
ee camera 3d
emerson
KuoChiang201509Bridge
System
TP
STEU
(A:\)
(C:\)
(D:\)
GENESIS32v8.05 (E:\)
Name
Ext...
Comment
handheld
home
in_plane_rotation
lighting
motion
out_of_plane_rotation
zoom
src
7 Object(s)
C...
Time
no.
Source
Message
1:10:43 PM 4 FILE... Archive failed
1:11:30 PM 15 C3ARC Archive not ready: a:\archive.zip\
1:30:23 PM 120 LOS Log-On user changed from Operator to Administrator.
Num
Cap
S
T
R
Aut
POV 10%
RName
1:31 PM
New
Select
Duplicate
Archive
Delete
Open

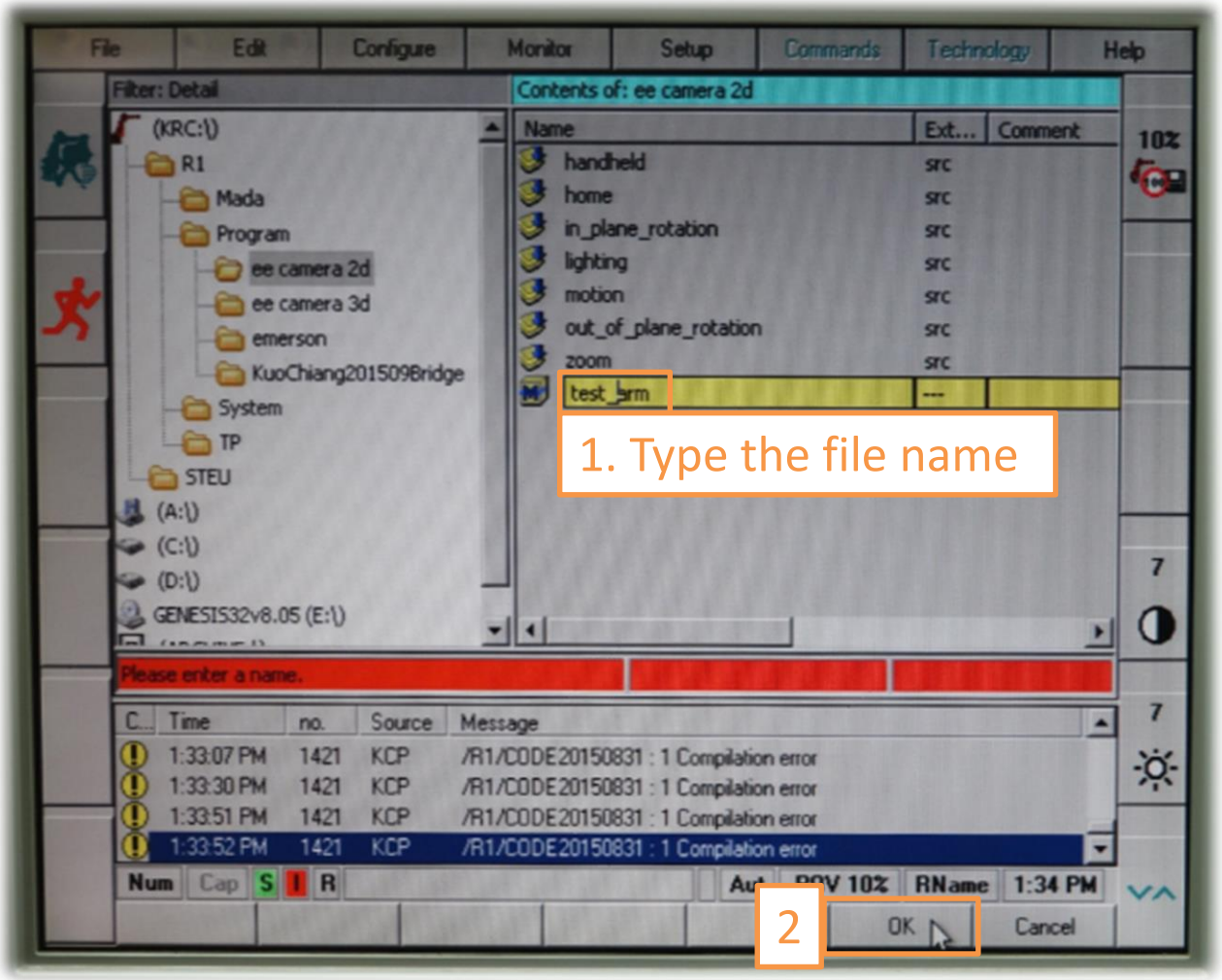
Create a New Code File (1/3)



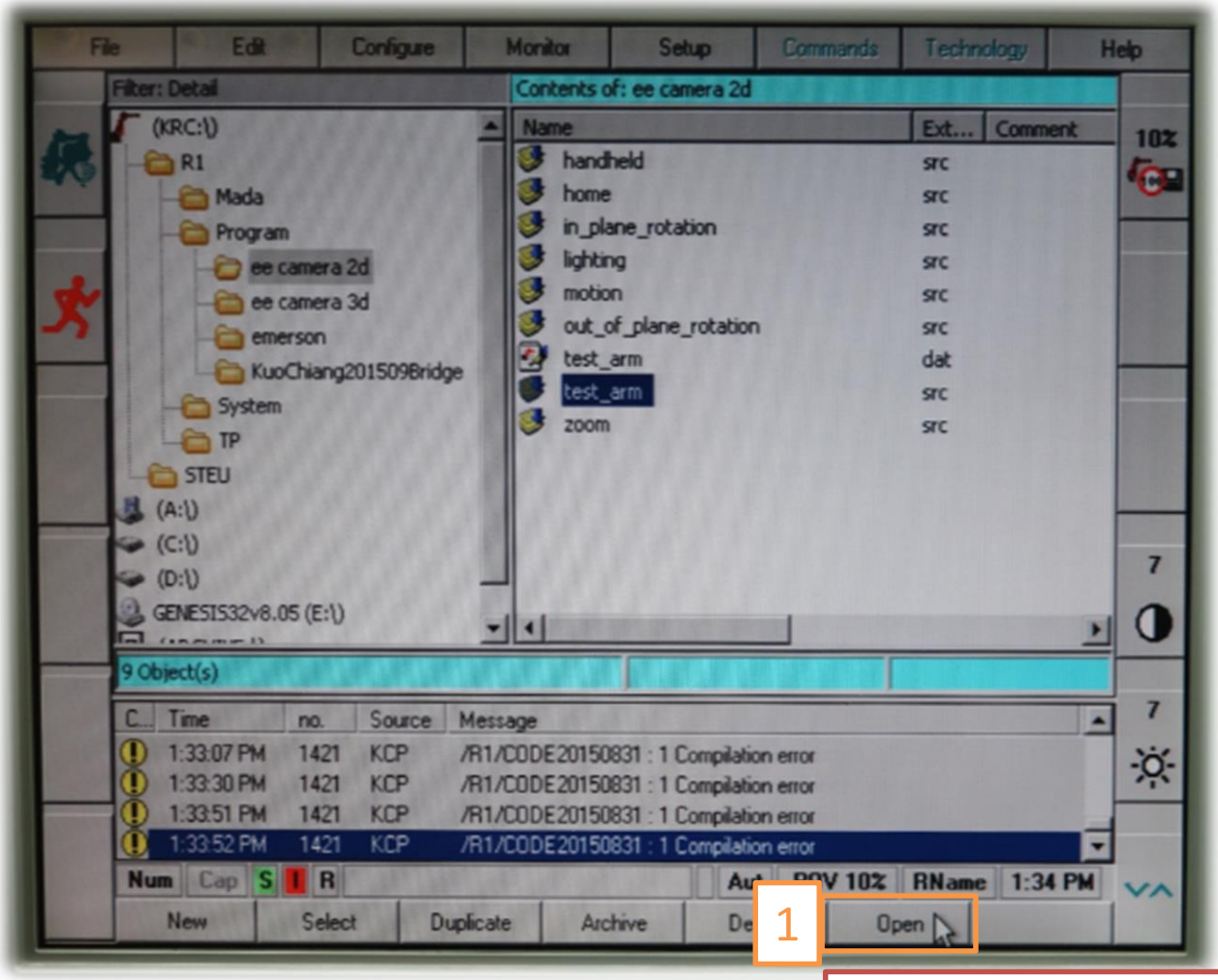
Create a New Code File (2/3)



Create a New Code File (3/3)

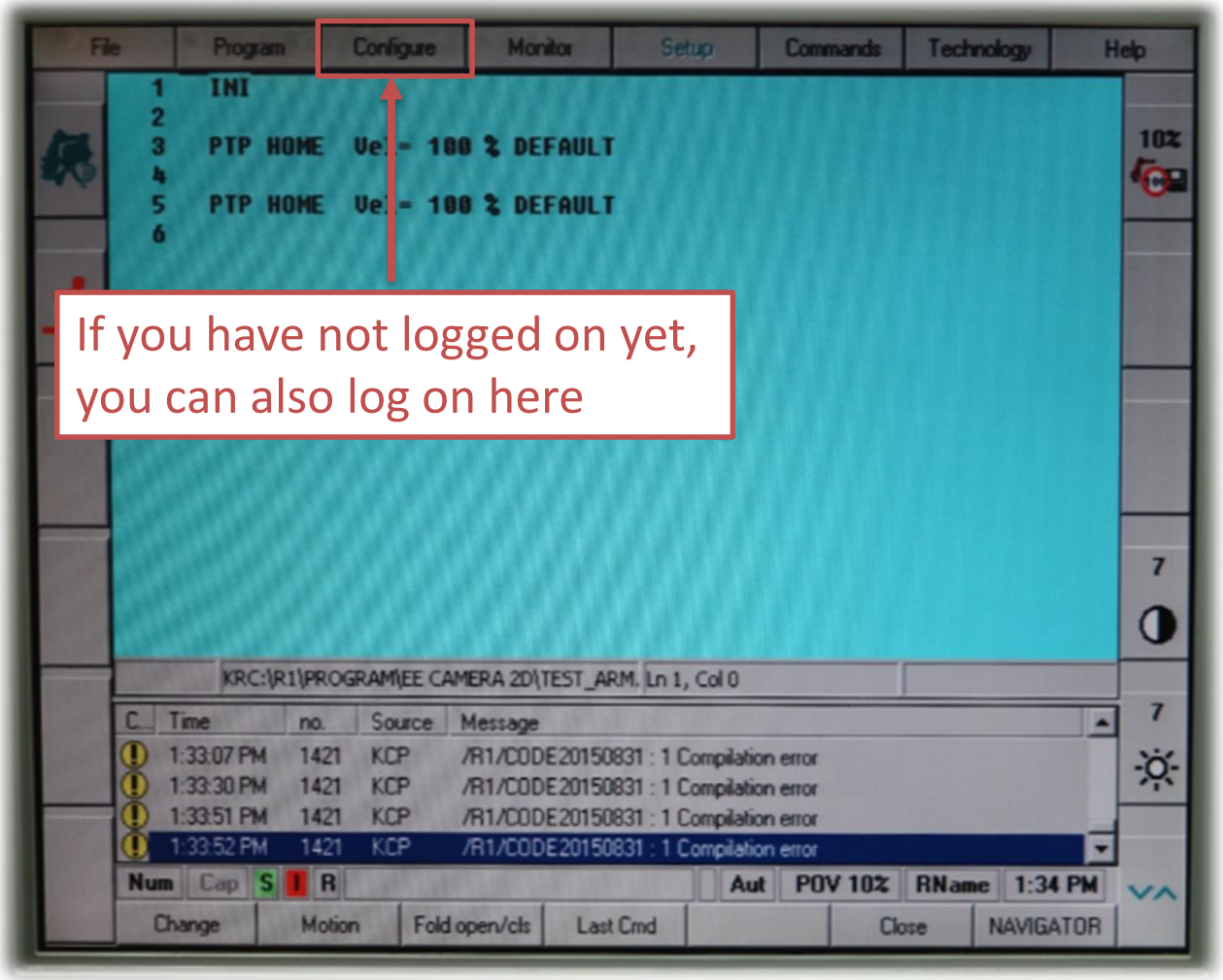


Edit a Code File (1/4)

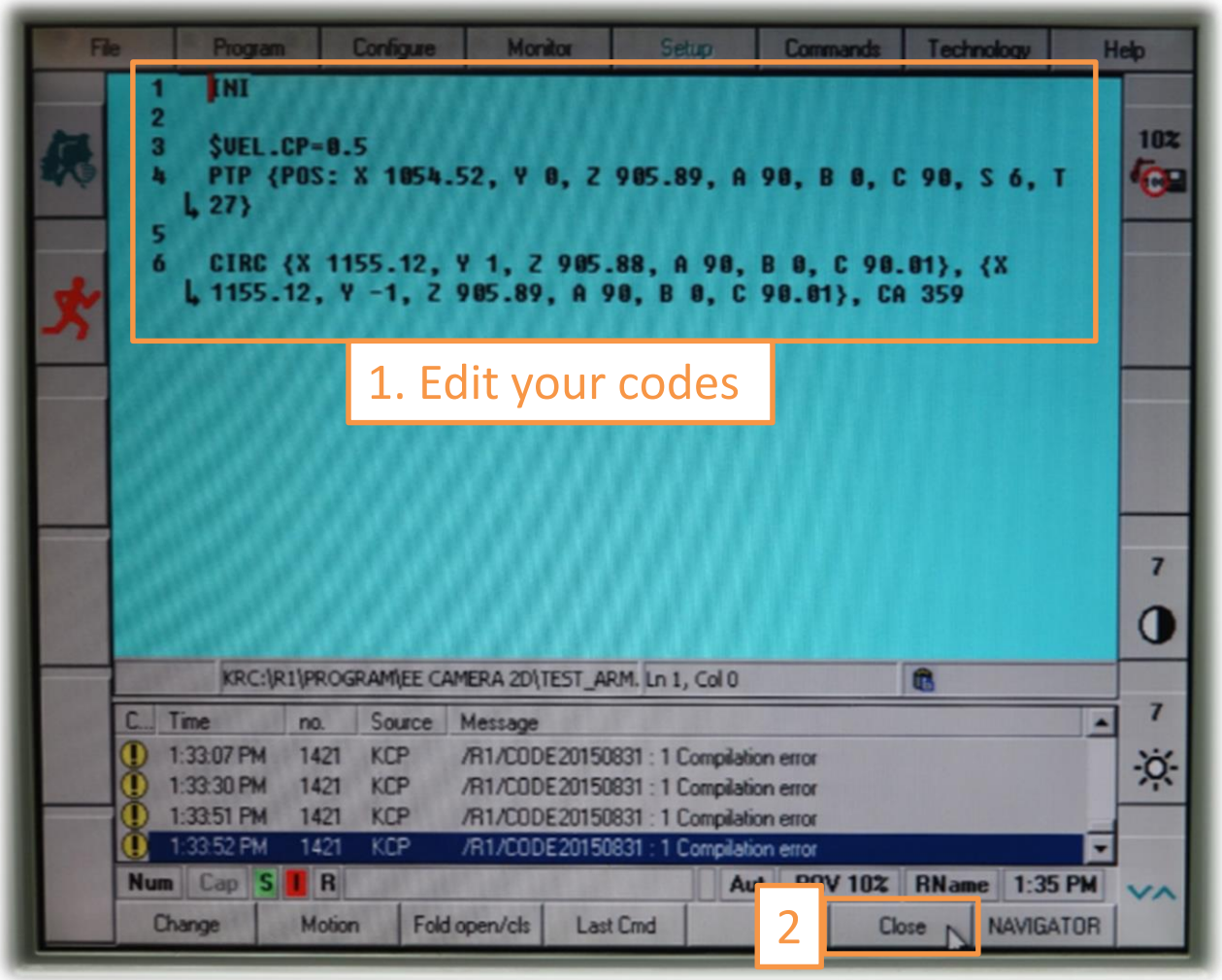


Be sure you have logged on!

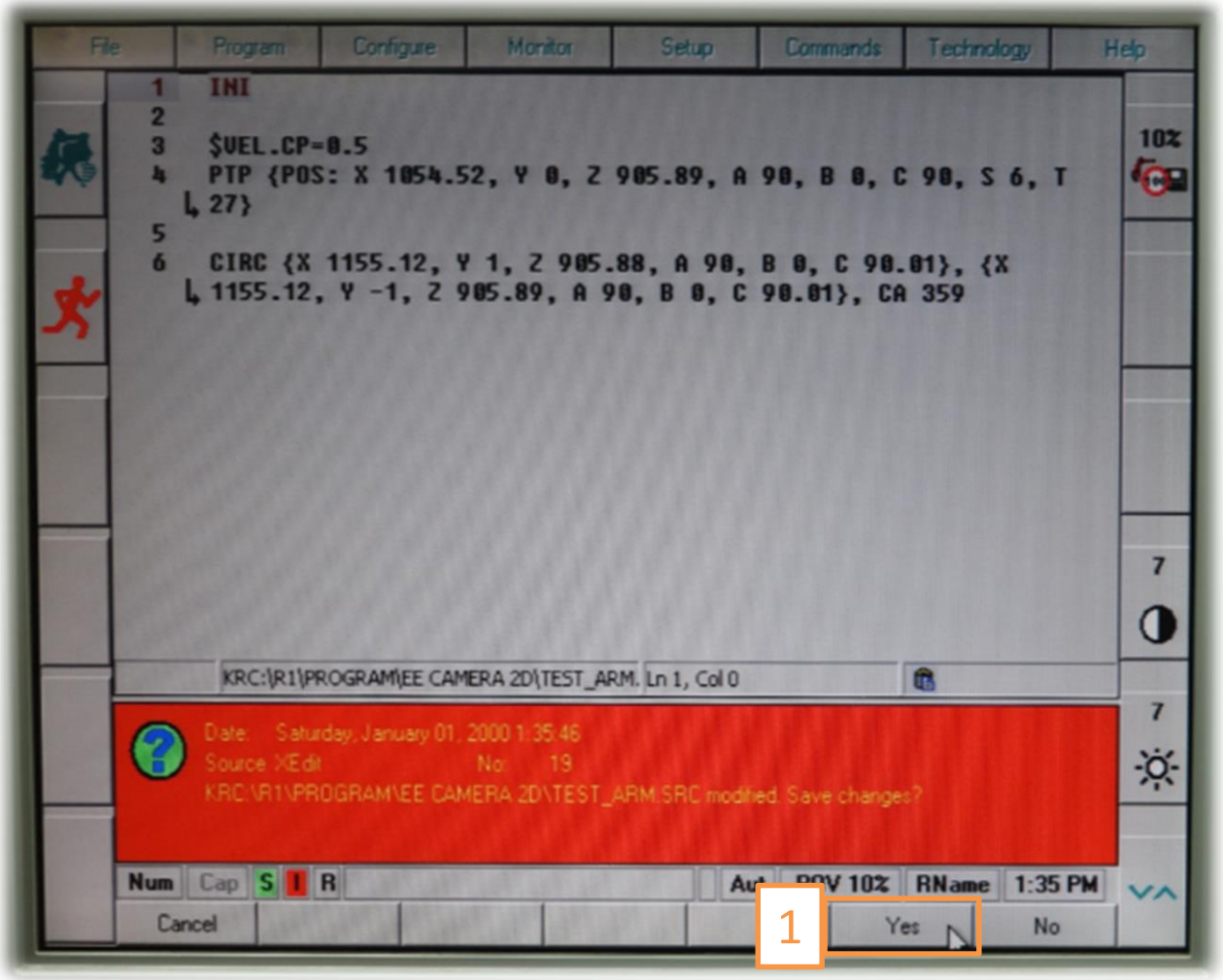
Edit a Code File (2/4)



Edit a Code File (3/4)



Edit a Code File (4/4)



Tips for Editting

- "**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
$VEL.CP = 0.5
PTP {POS: X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00, S 6, T 50}
```

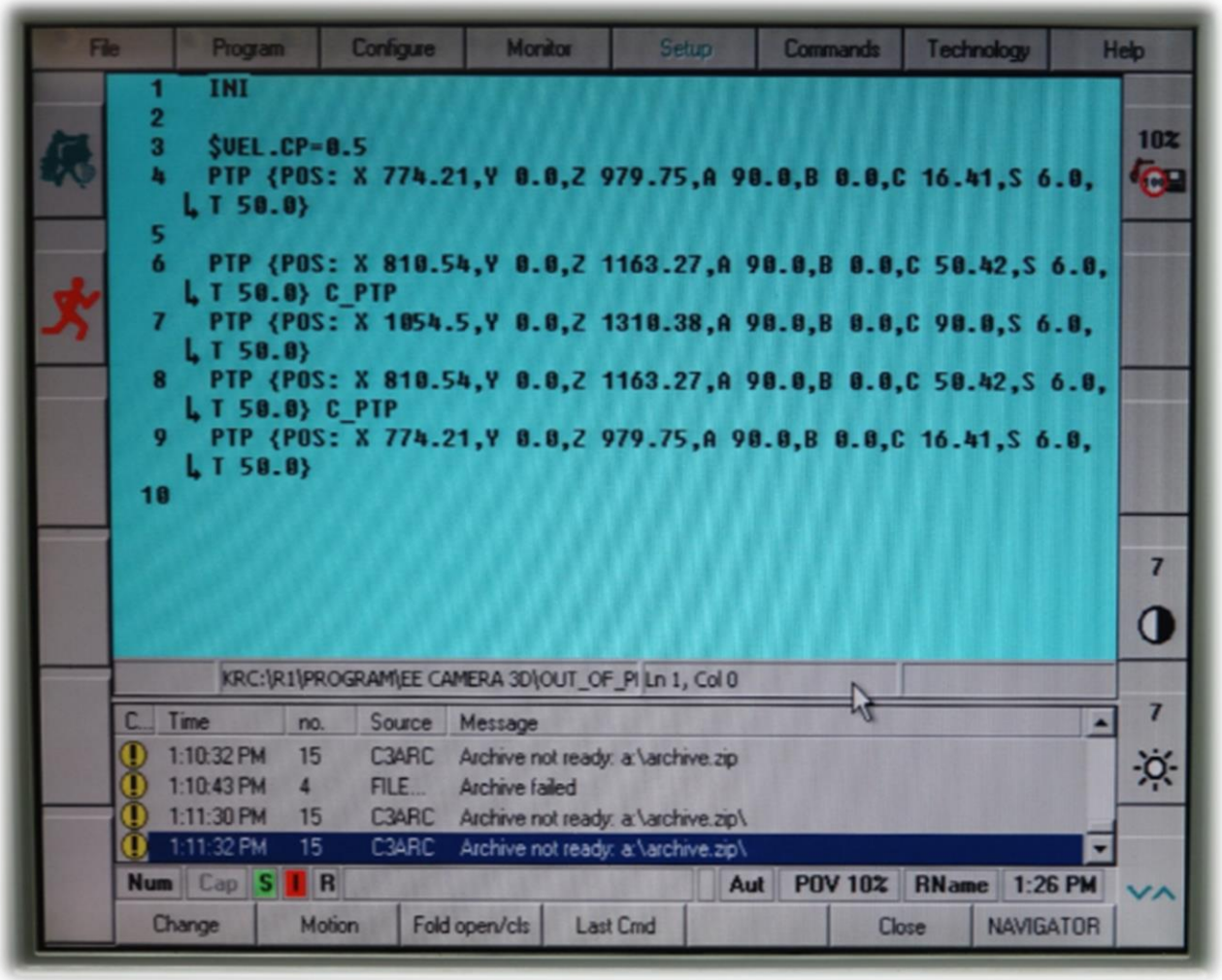
Part 2. Set the Initial Position

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

```
;Motion Part
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
…
```

Part 3. Motion Part (will be executed continuously)

Example Codes



Basic Motion Types

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

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

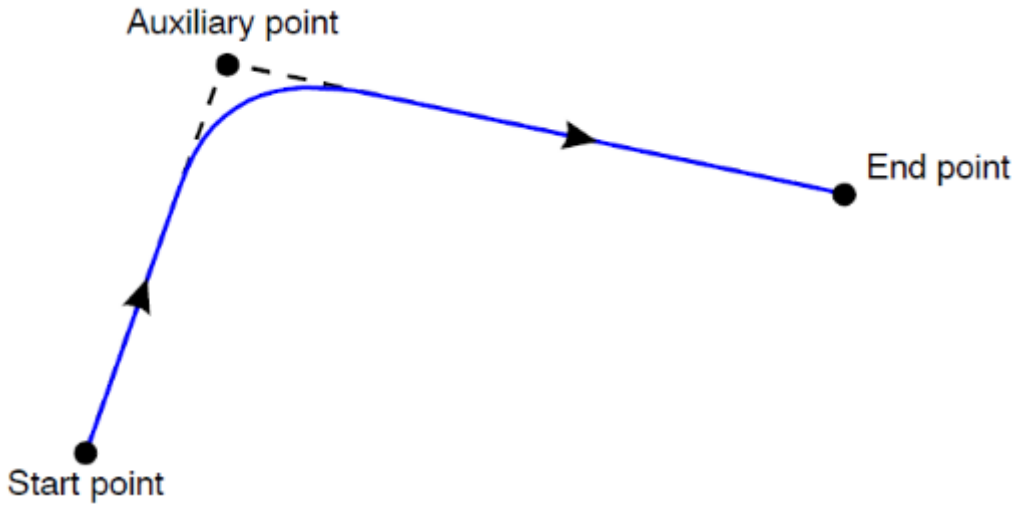
```
PTP {POS: X 1000.00, Y 0.00, Z 1000.00, A 90.00, B 0.00, C 90.00, S 6, T 50}
```

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



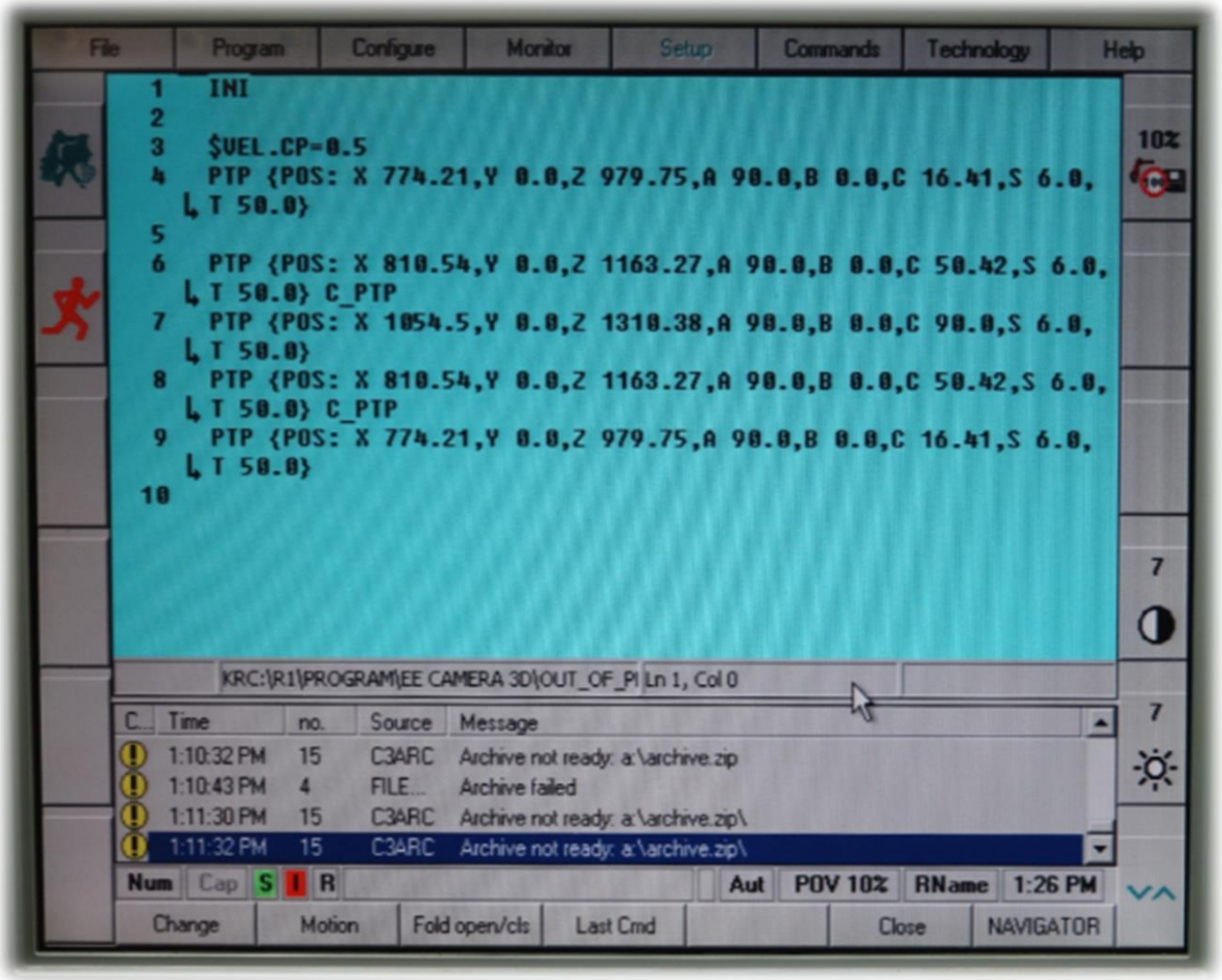
Pseudo Code

```
INI

$VEL.CP = 0.5
PTP Start point

PTP Auxiliary point C_PTP
PTP End point
```

PTP Motion (3/3)



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}
```

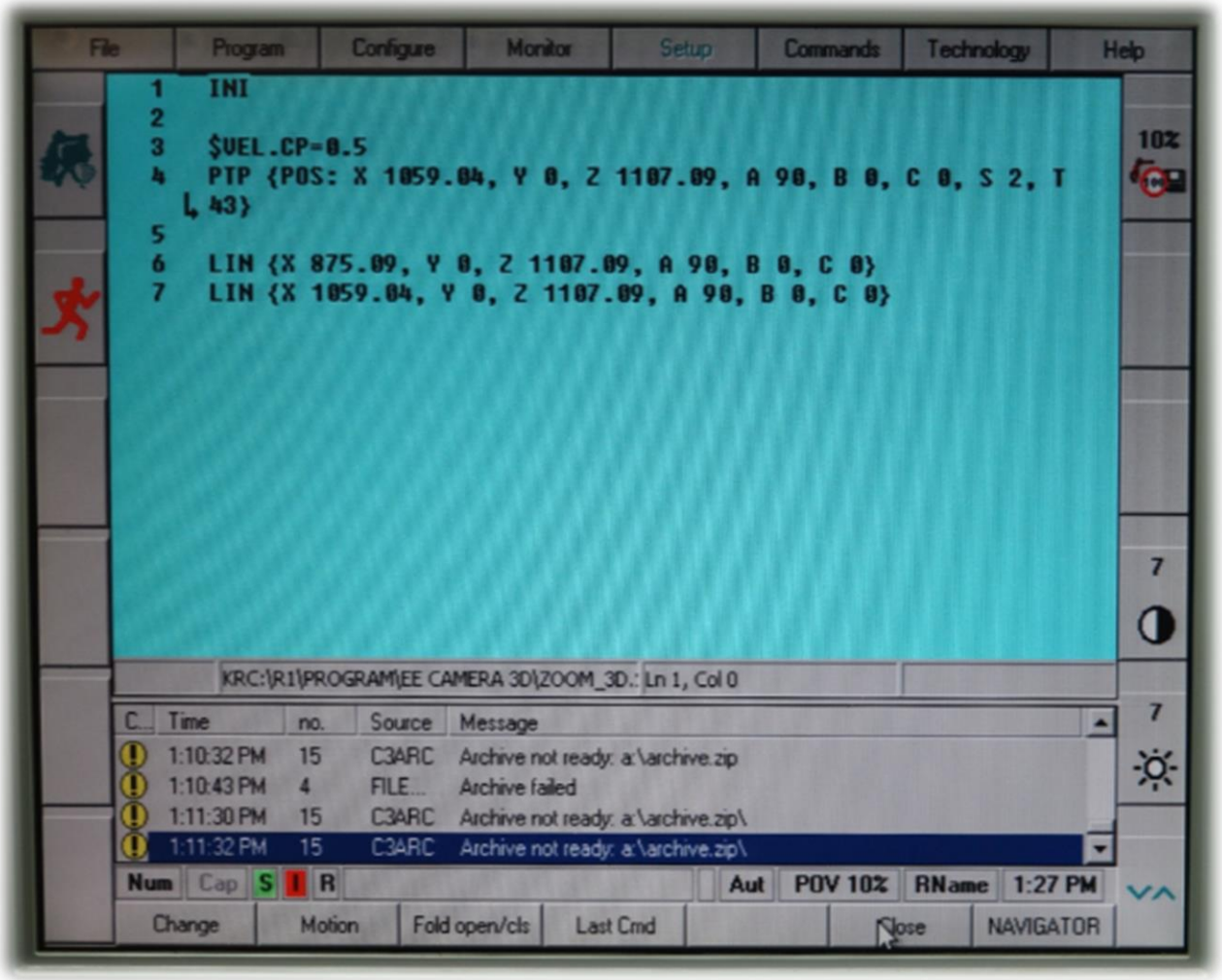
Pseudo Code

```
INI

$VEL.CP = 0.5
PTP Start point

LIN End point
```

Linear Motion (2/2)



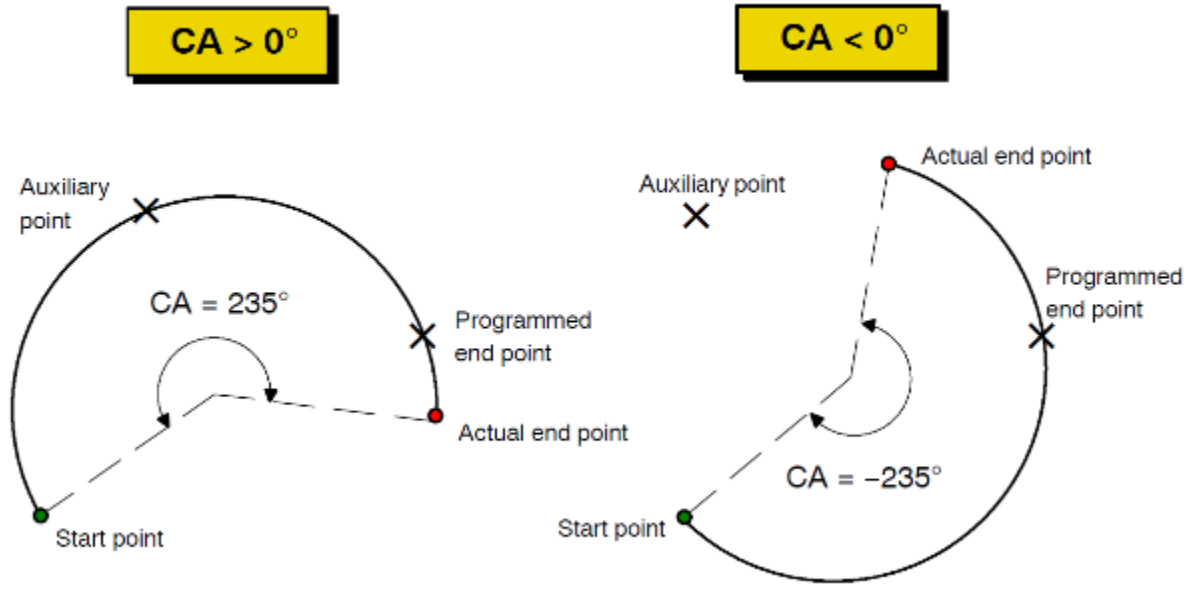
Circular Motion (1/3)

- 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).



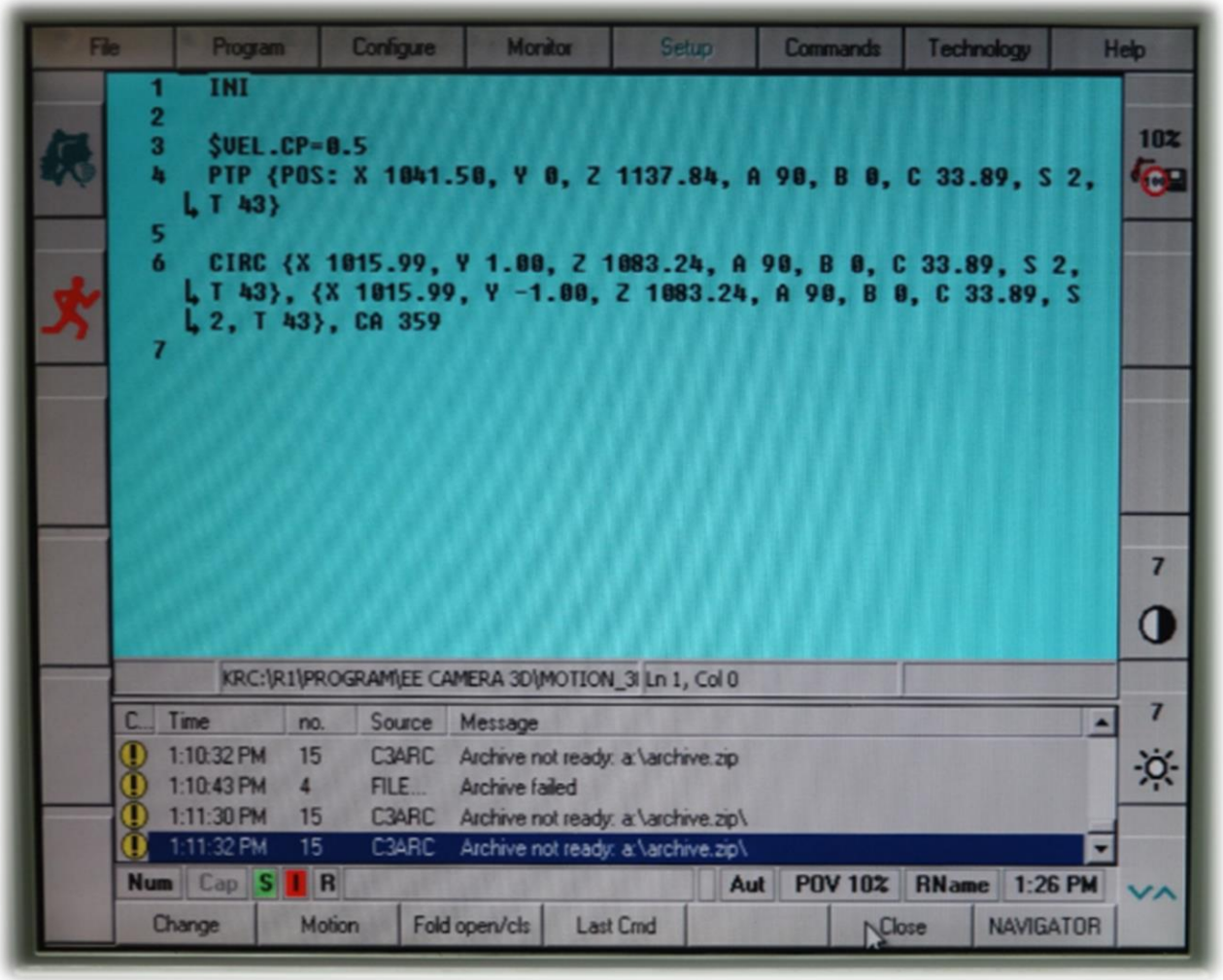
INI

Pseudo Code

$VEL.CP = 0.5
PTP Start point

CIRC Auxiliary point , End point, CA Angle

Circular Motion (3/3)



Halt

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

```
HALT
```

Outline

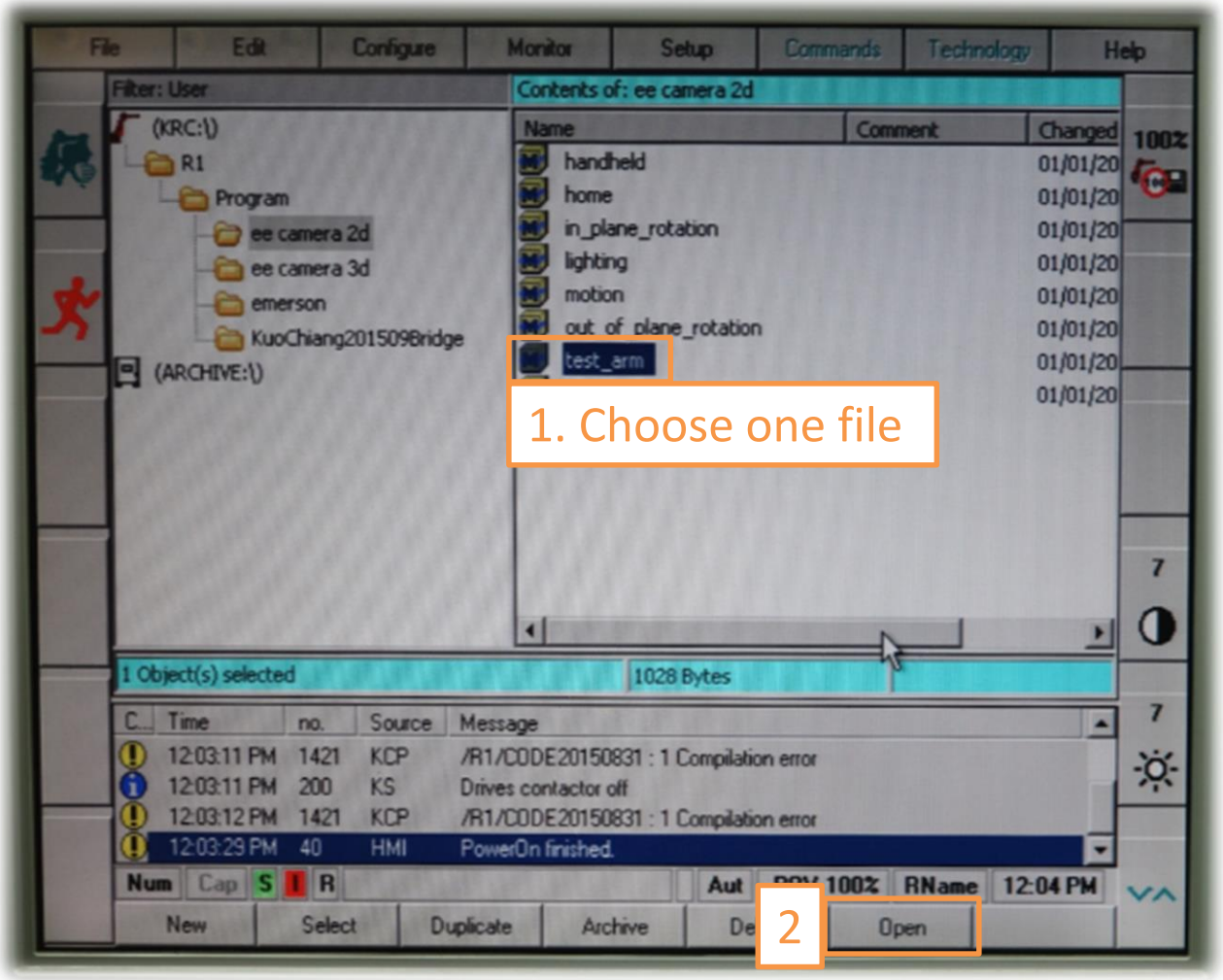
- Introduction
- How to Edit Codes
- How to Control the Robot Arm
- Others

Two Way to Control

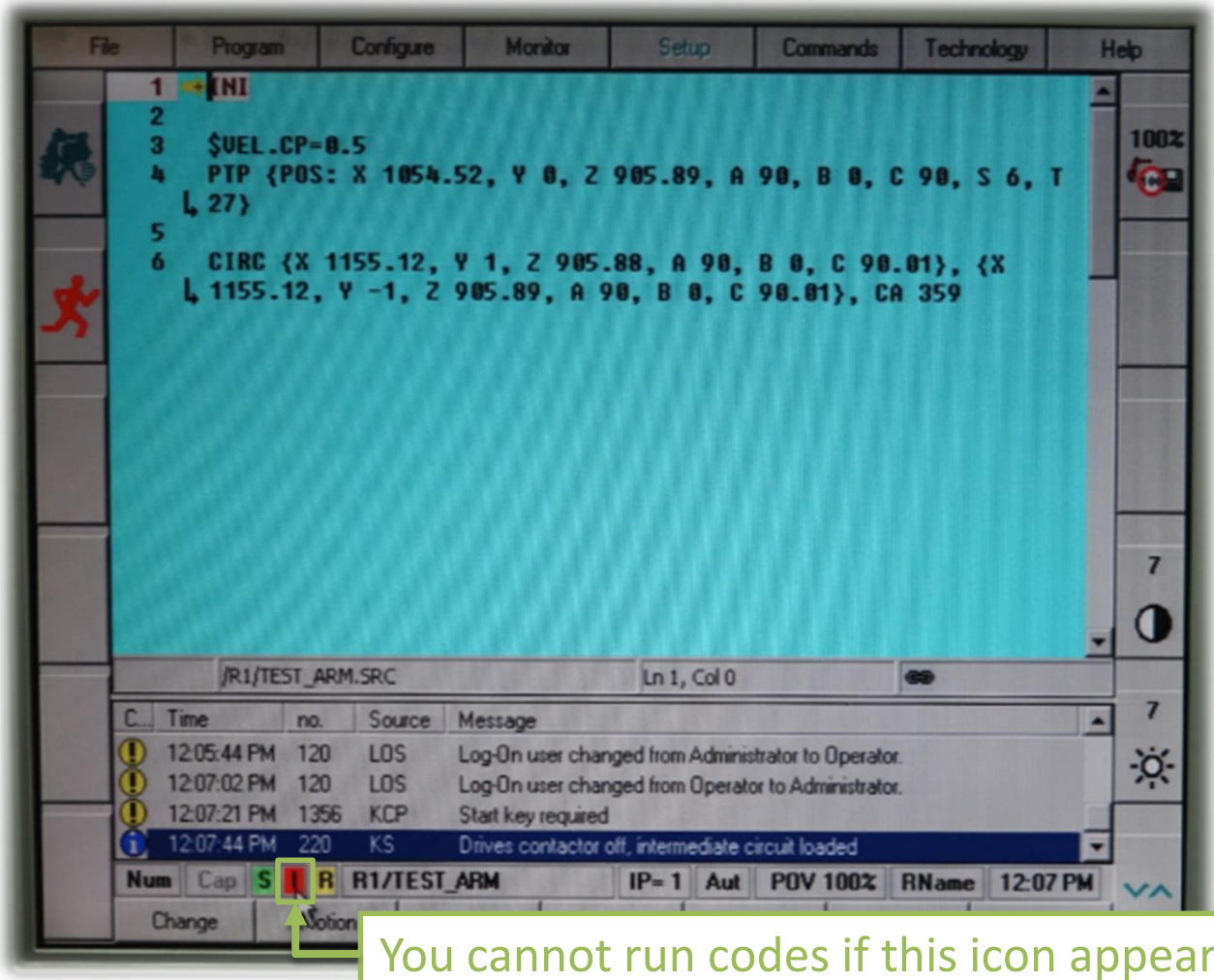
- Program Control
  - Execute program codes
  - Have to write your codes first
  - Just like running script
- Manuel Control
  - Control the robot arm manually
  - Just like playing game with joystick

Program Control (1/9)

Program Control (2/9)



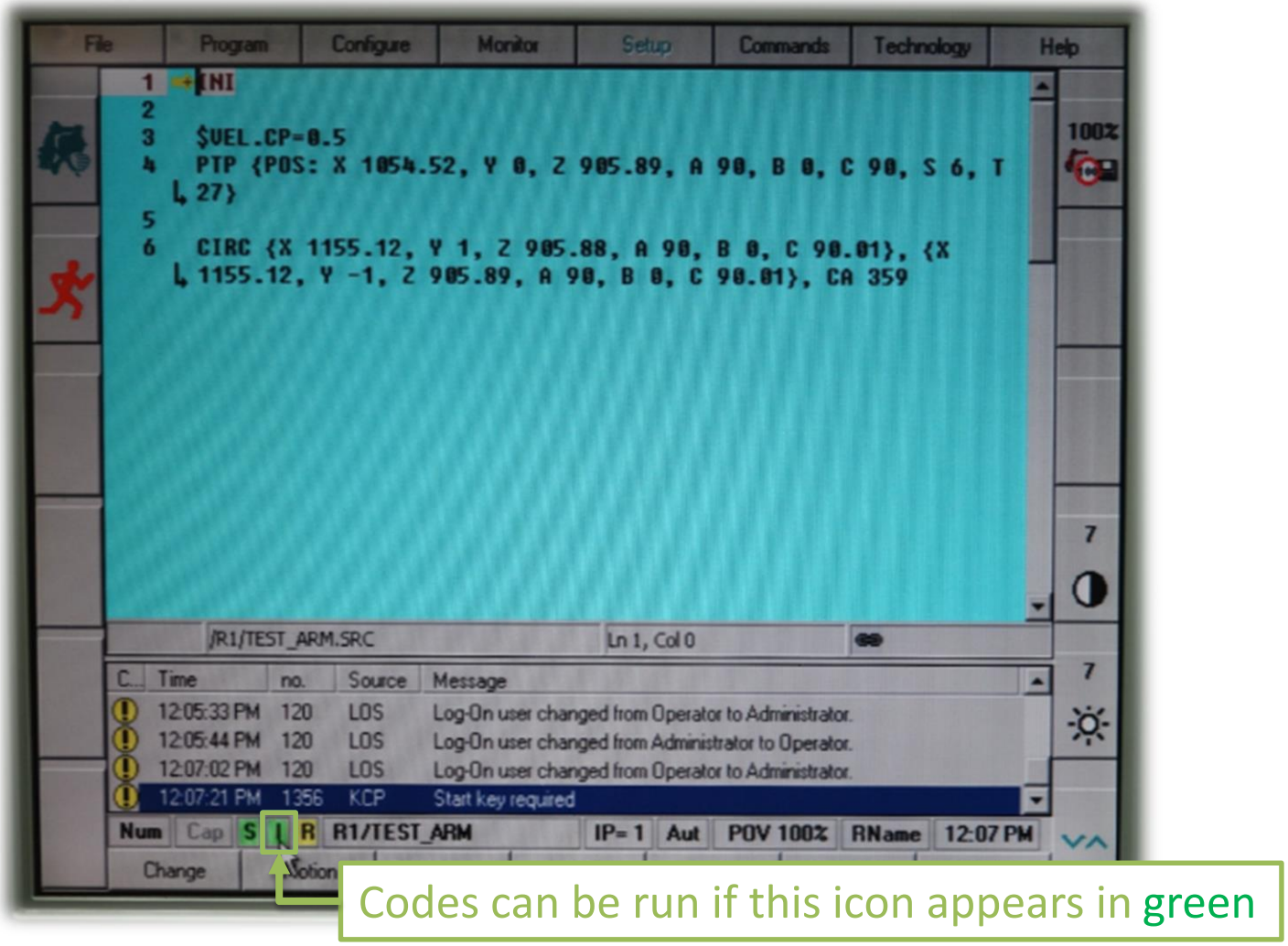
Program Control (3/9)



You cannot run codes if this icon appears in red

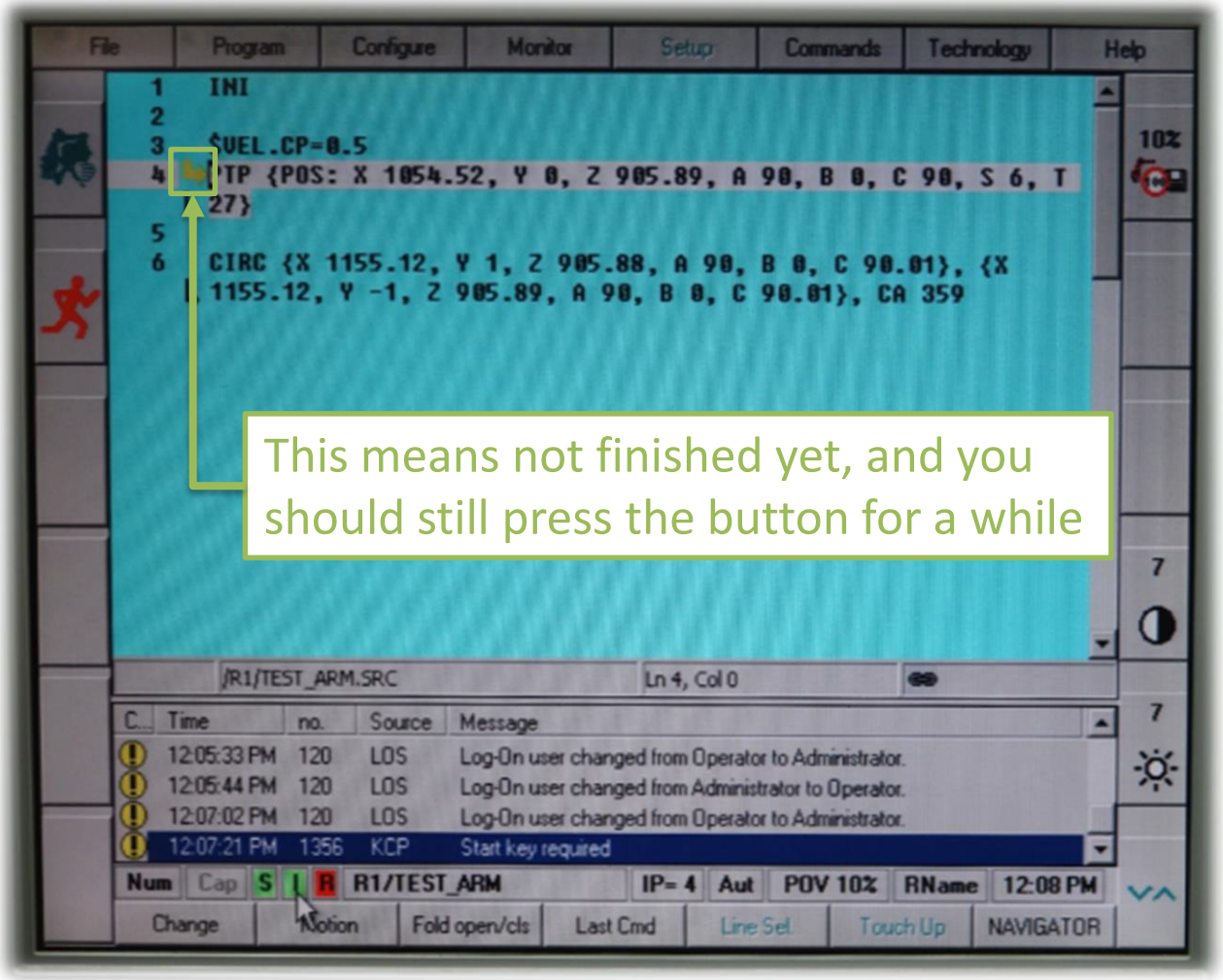
Program Control (4/9)

Program Control (5/9)

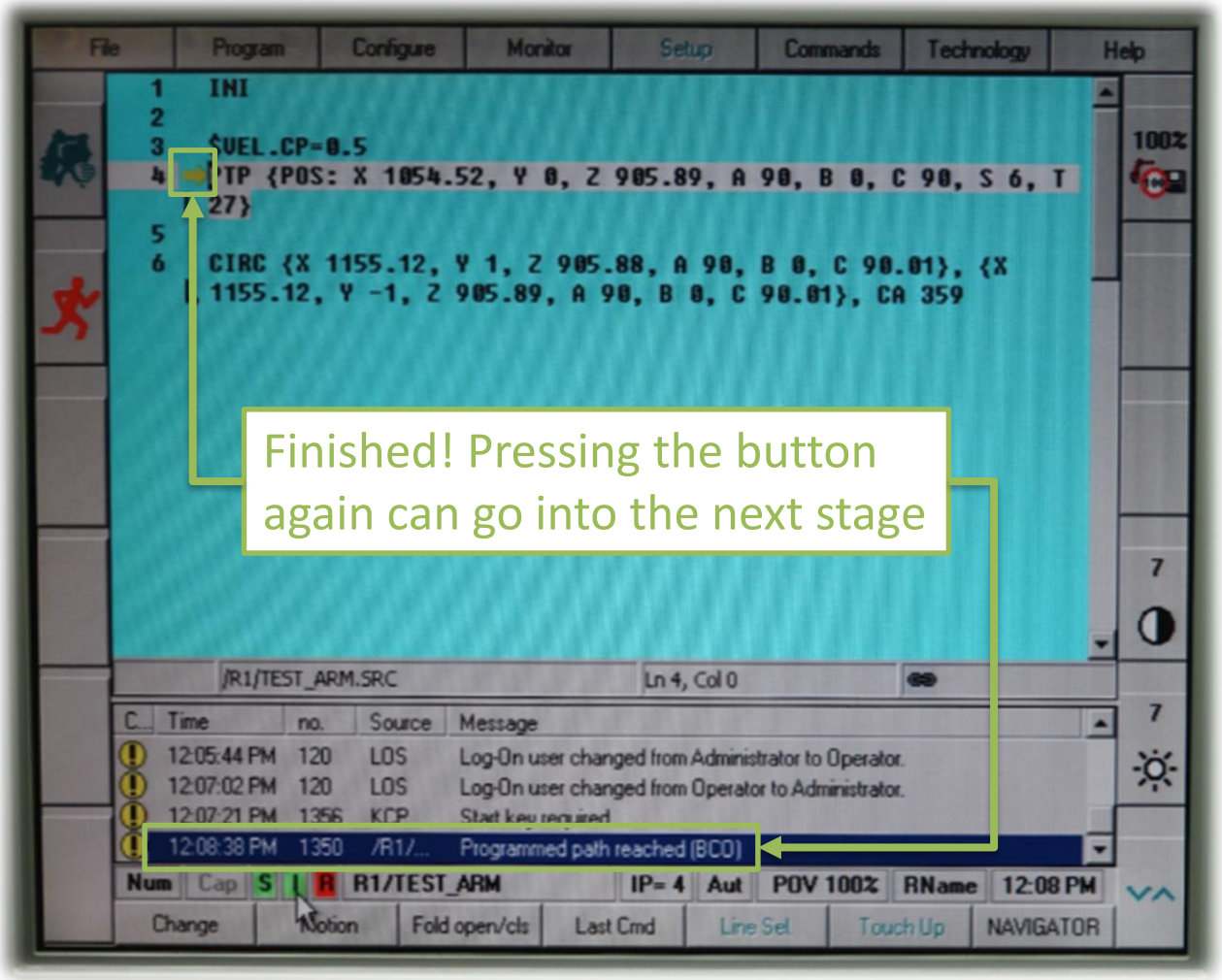


Program Control (6/9)

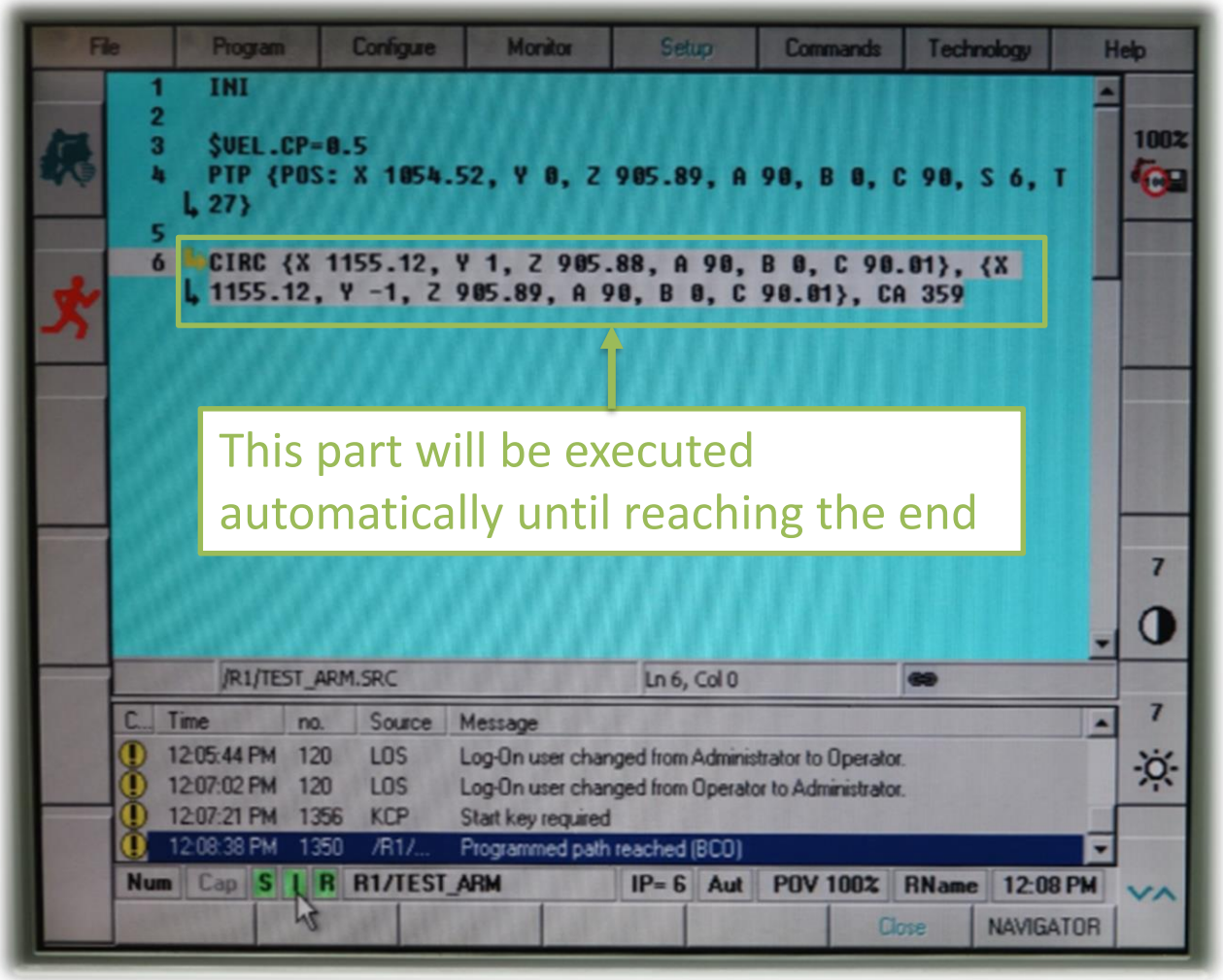
Program Control (7/9)



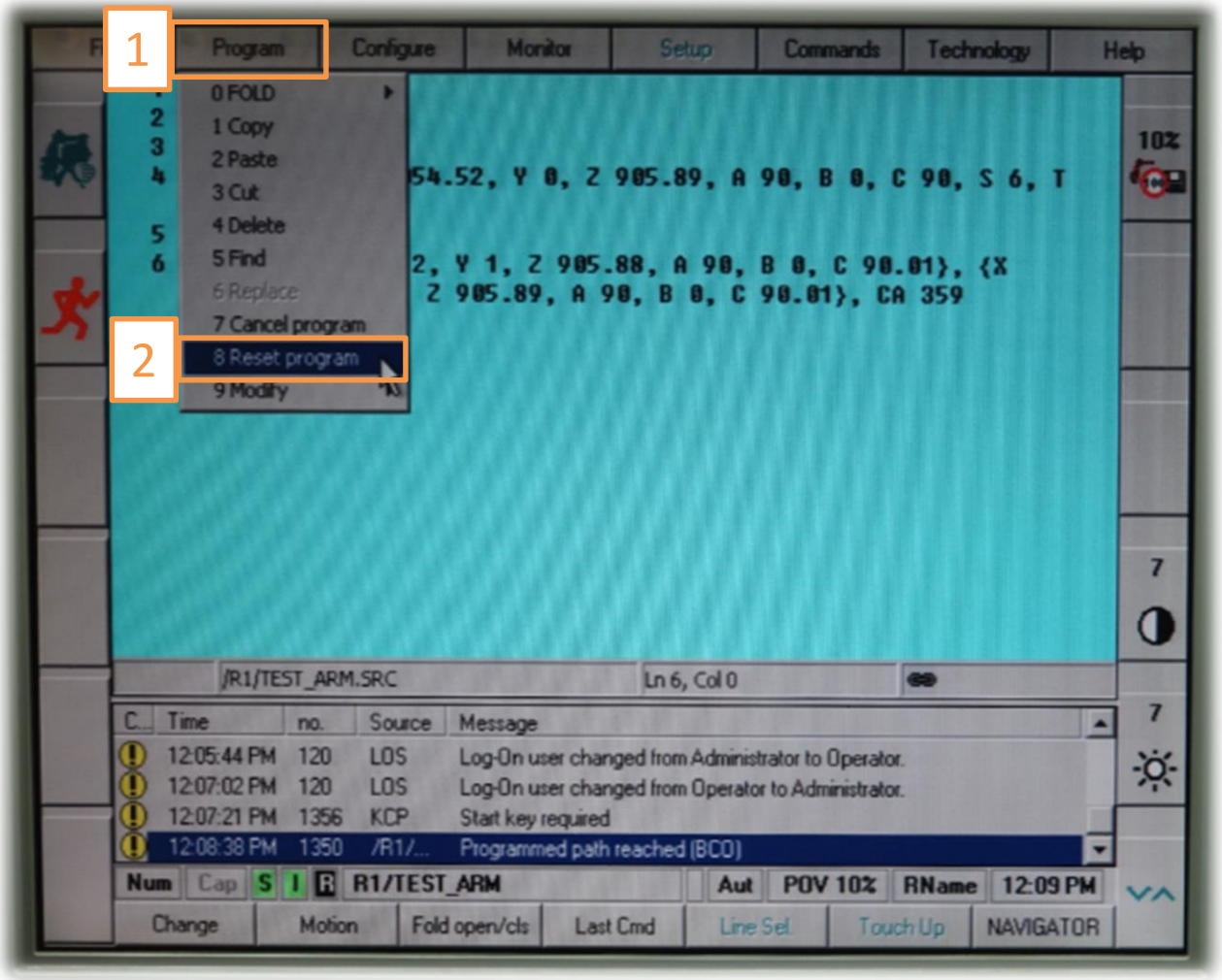
Program Control (8/9)



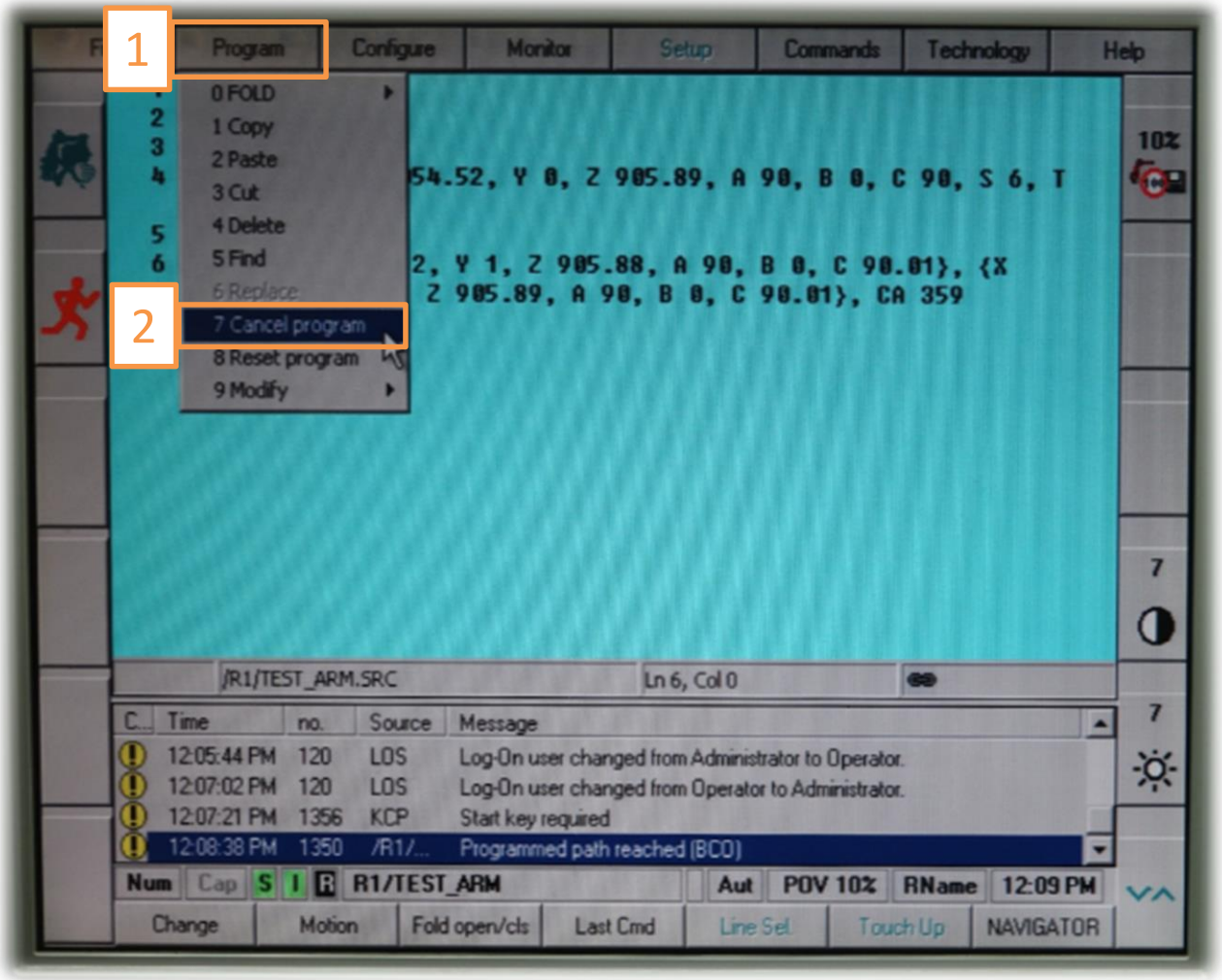
Program Control (9/9)



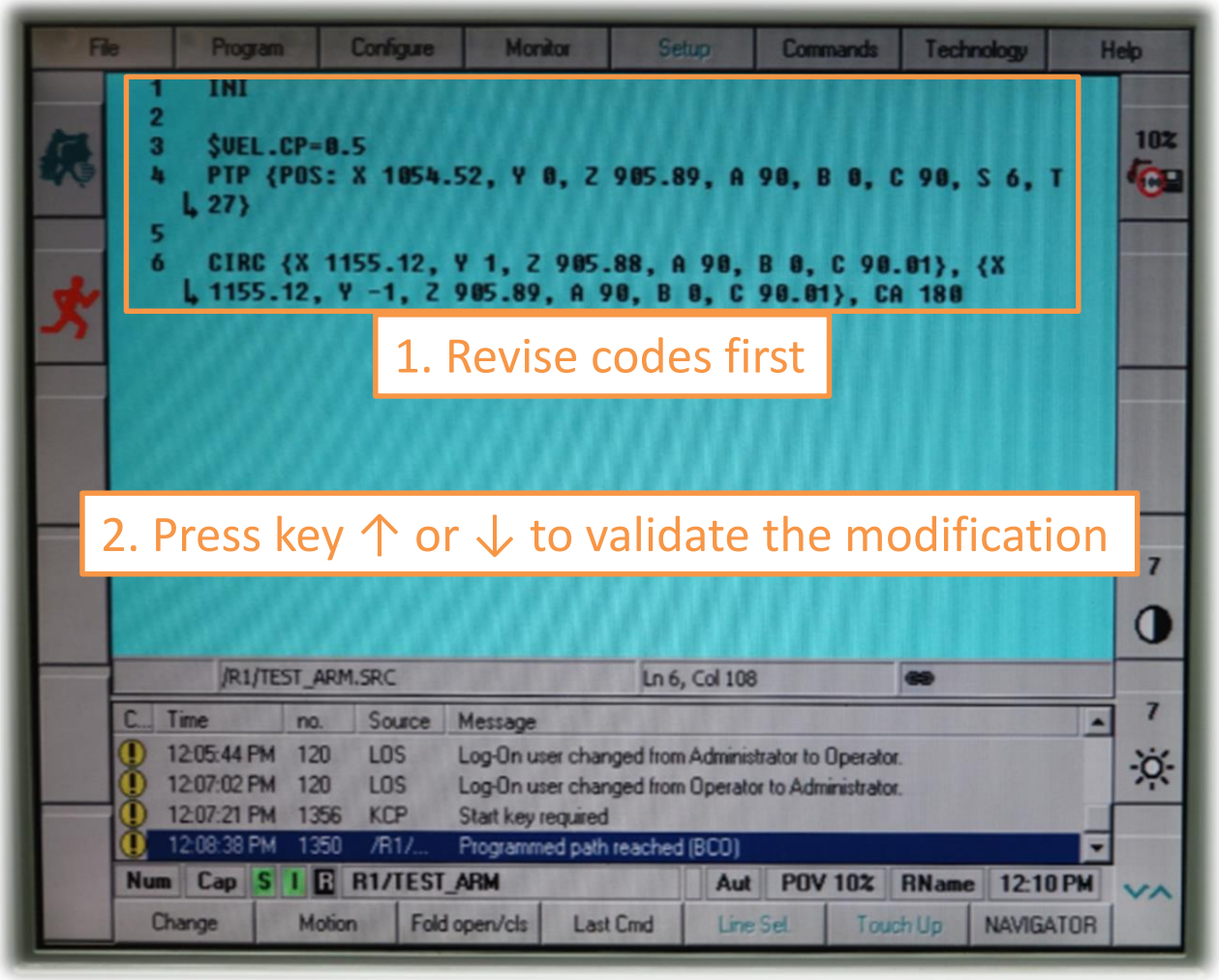
Reset Pointer to Run Again



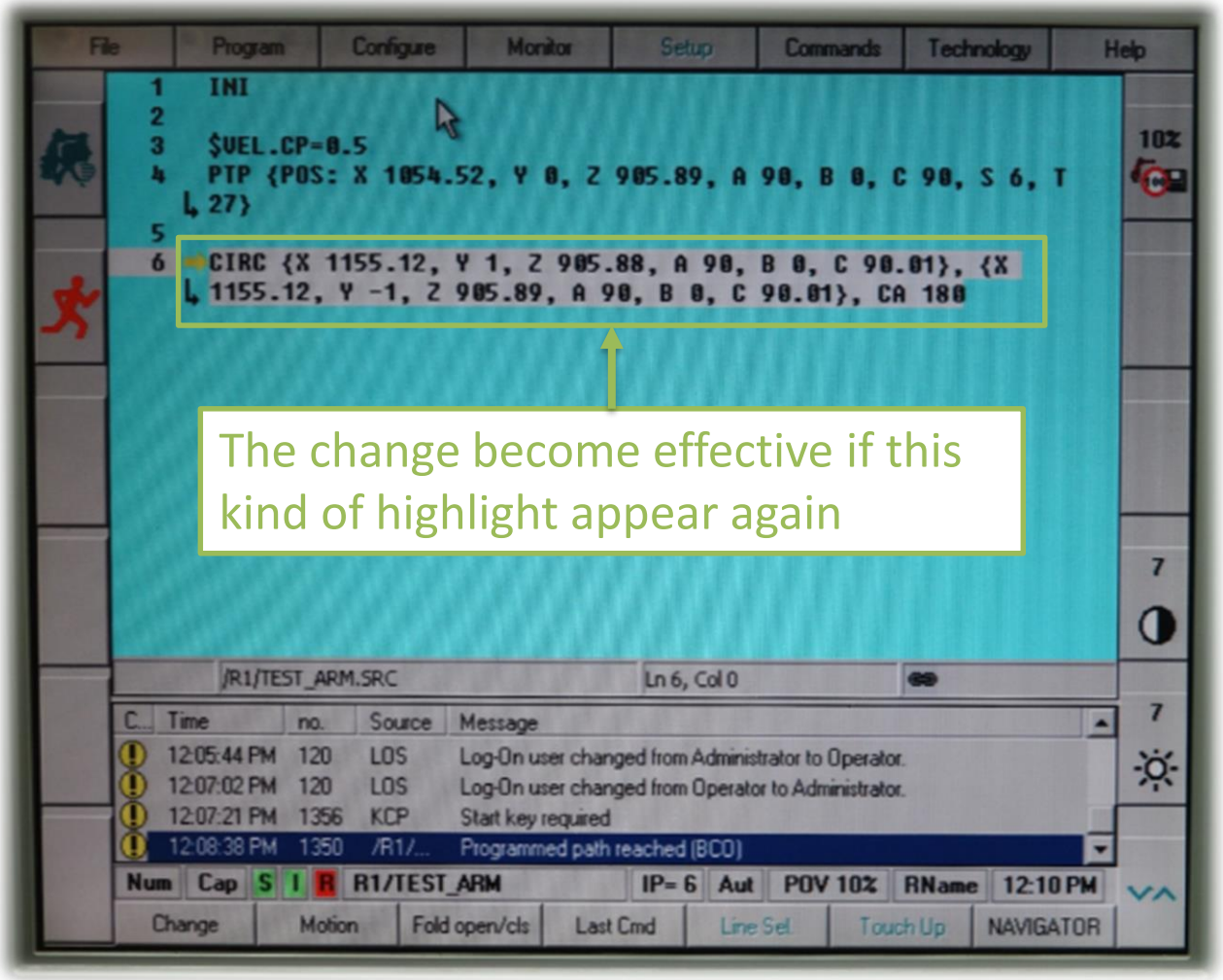
Exit


1
2
Program
Configure
Monitor
Setup
Commands
Technology
Help
0 FOLD
1 Copy
2 Paste
3 Cut
4 Delete
5 Find
6 Replace
7 Cancel program
8 Reset program
9 Modify
54.52, Y 0, Z 905.89, A 90, B 0, C 90, S 6, T
2, Y 1, Z 905.88, A 90, B 0, C 90.01}, {X
Z 905.89, A 90, B 0, C 90.01}, CA 359
/R1/TEST_ARM.SRC
Ln 6, Col 0
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)
Num Cap S I R R1/TEST_ARM Aut POV 10% RName 12:09 PM
Change Motion Fold open/cls Last Cmd Line Sel. Touch Up NAVIGATOR

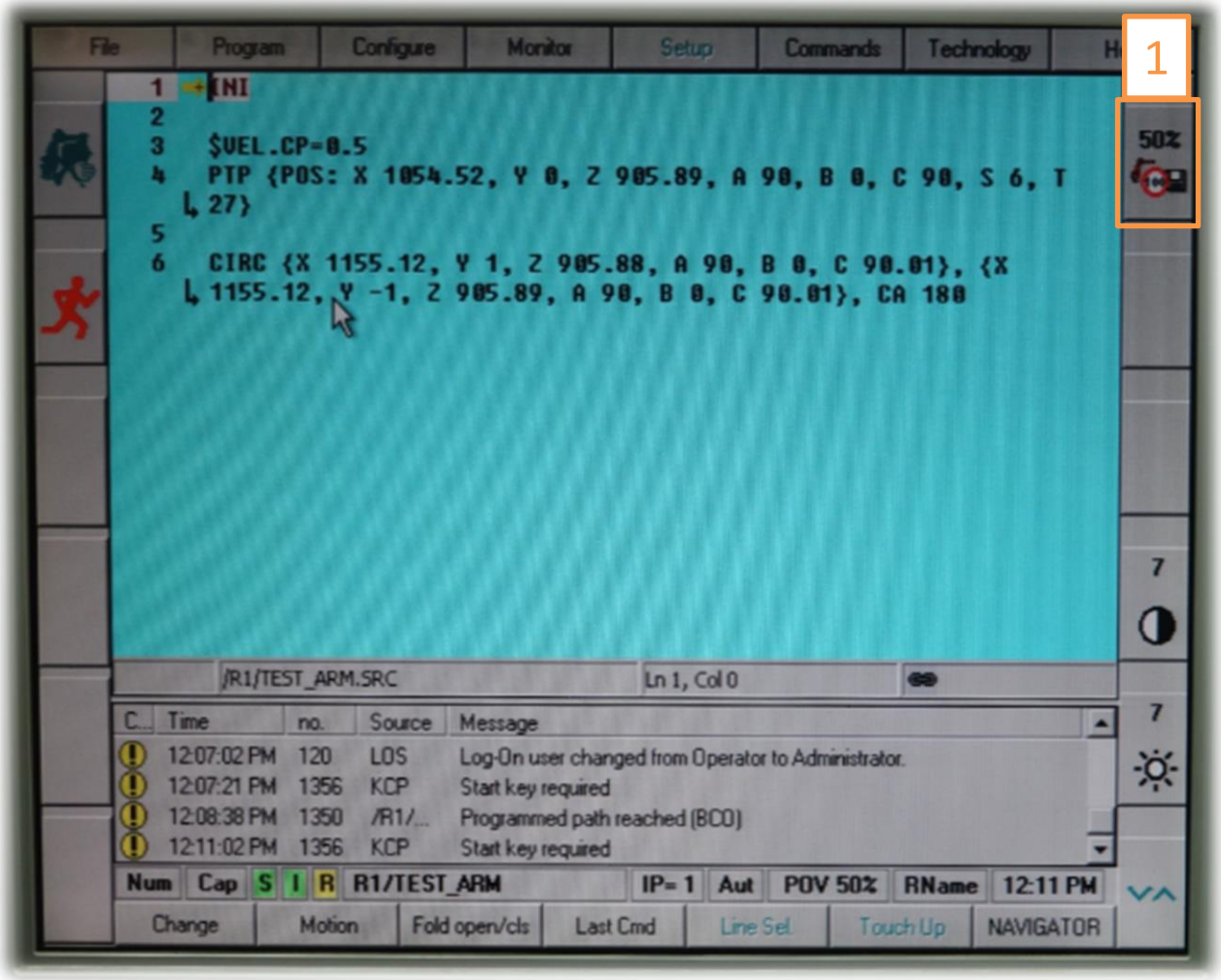
Revise Codes in Running Mode
(1/2)



Revise Codes in Running Mode
(2/2)

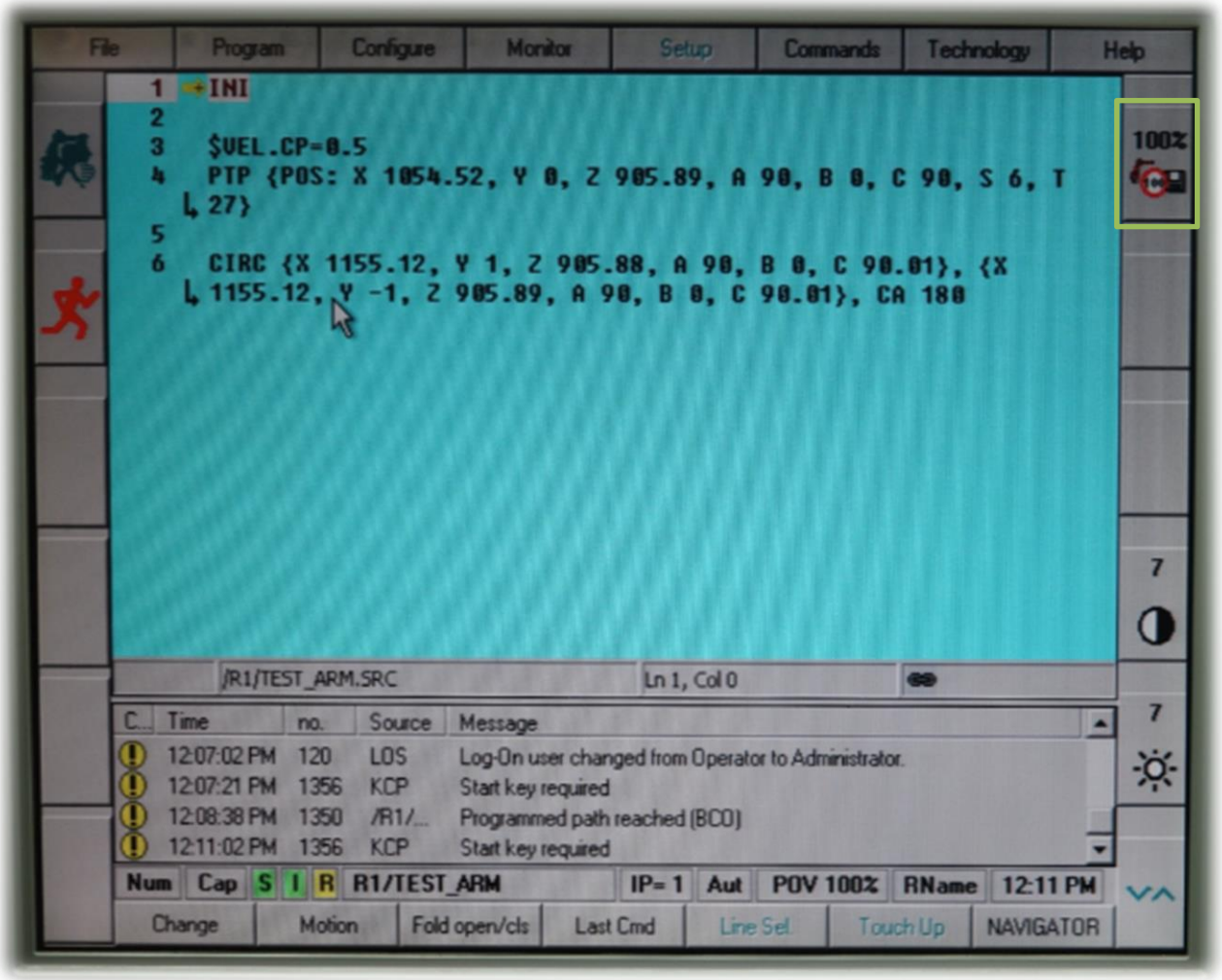


Change the Moving Speed (1/3)

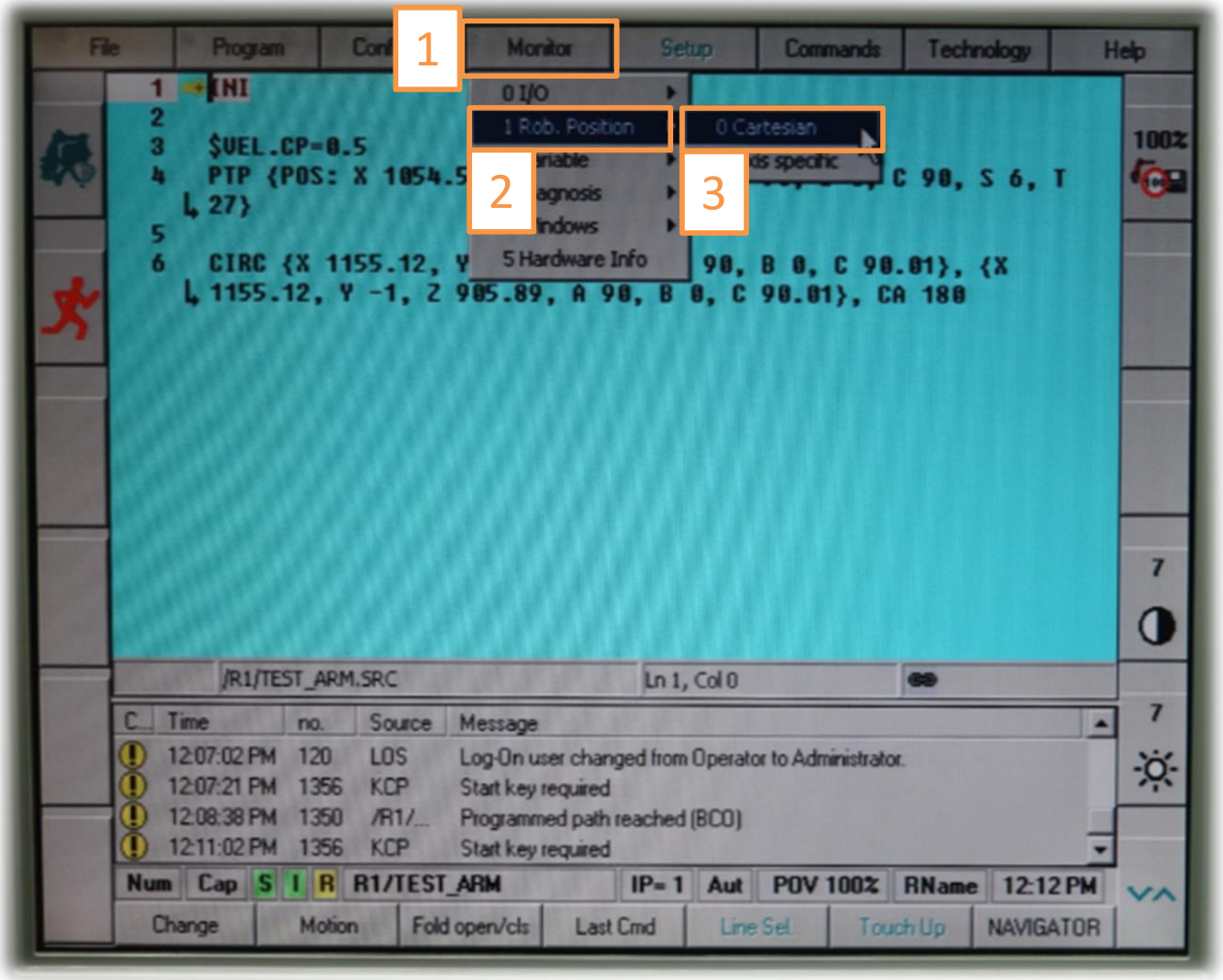


Change the Moving Speed (2/3)

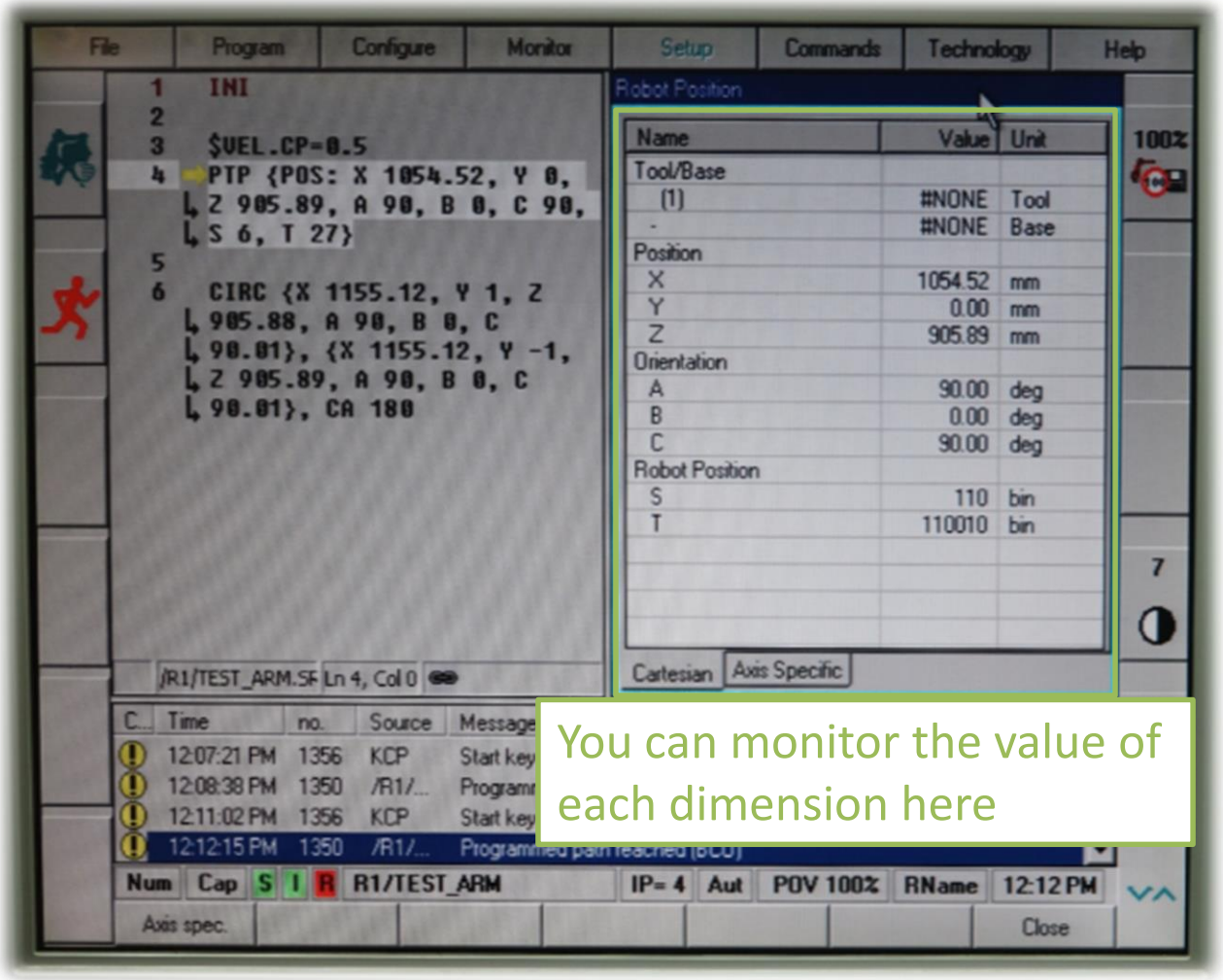
Change the Moving Speed (3/3)



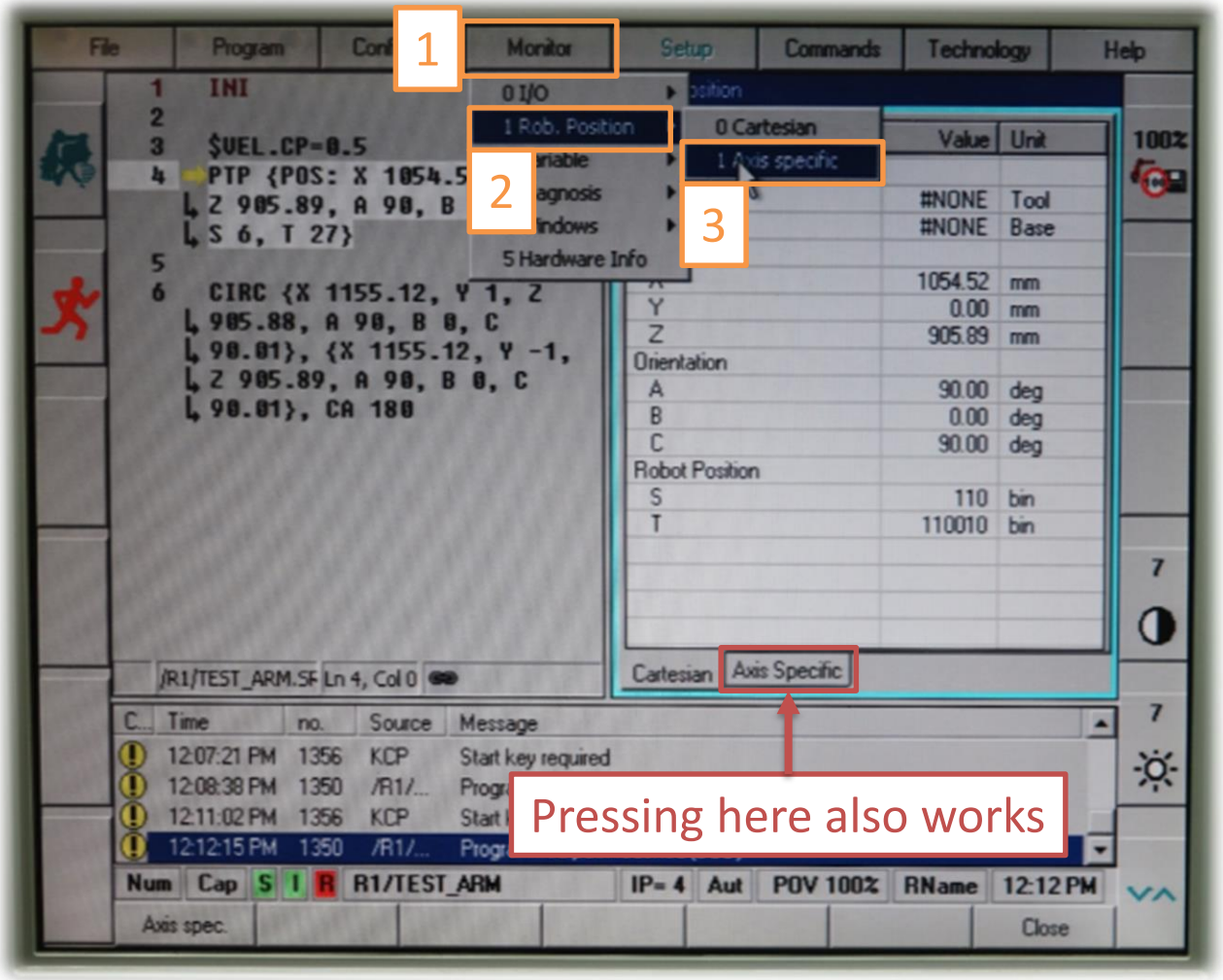
Monitor the Robot Position Under Cartesian System (1/2)



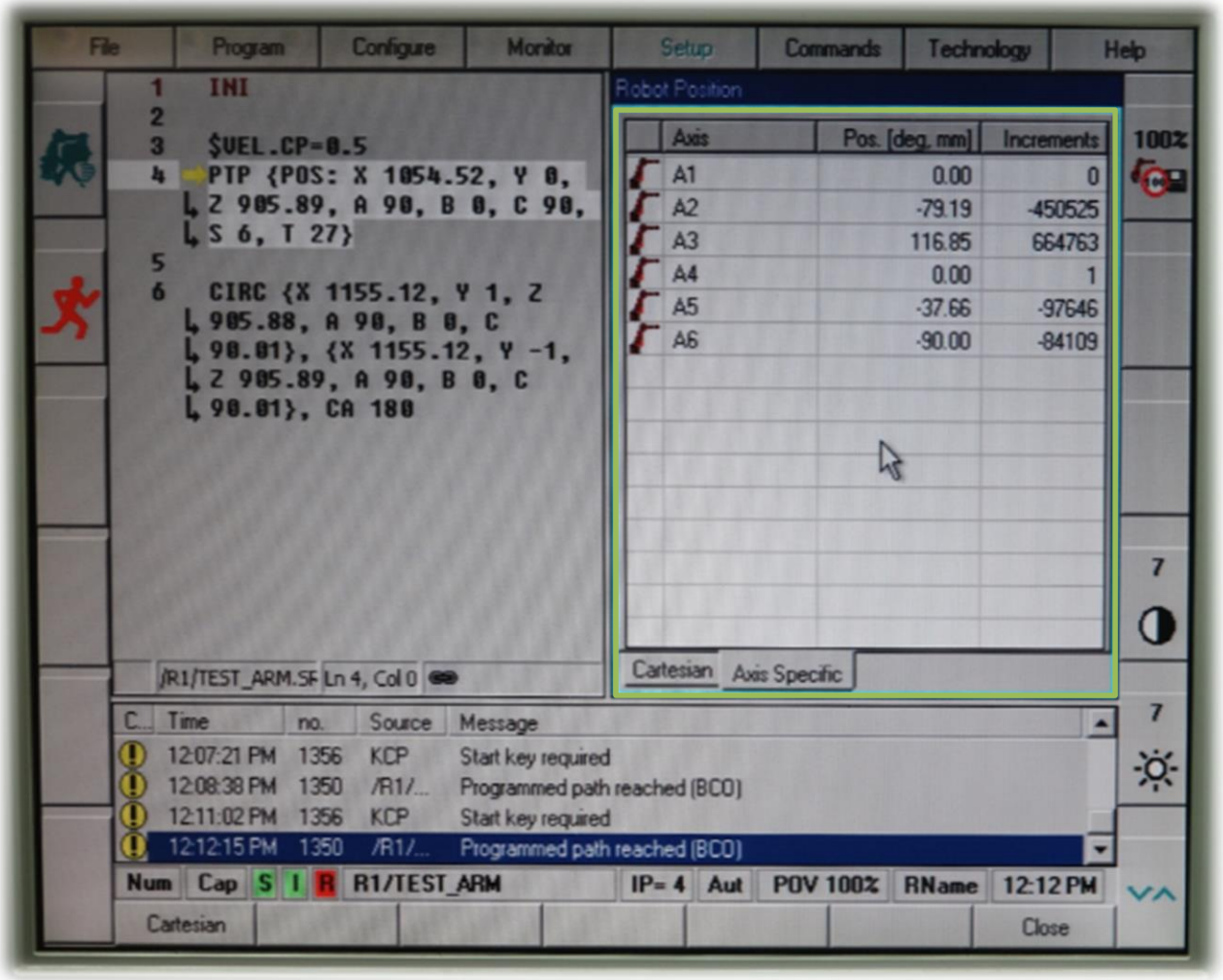
Monitor the Robot Position Under Cartesian System (2/2)



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



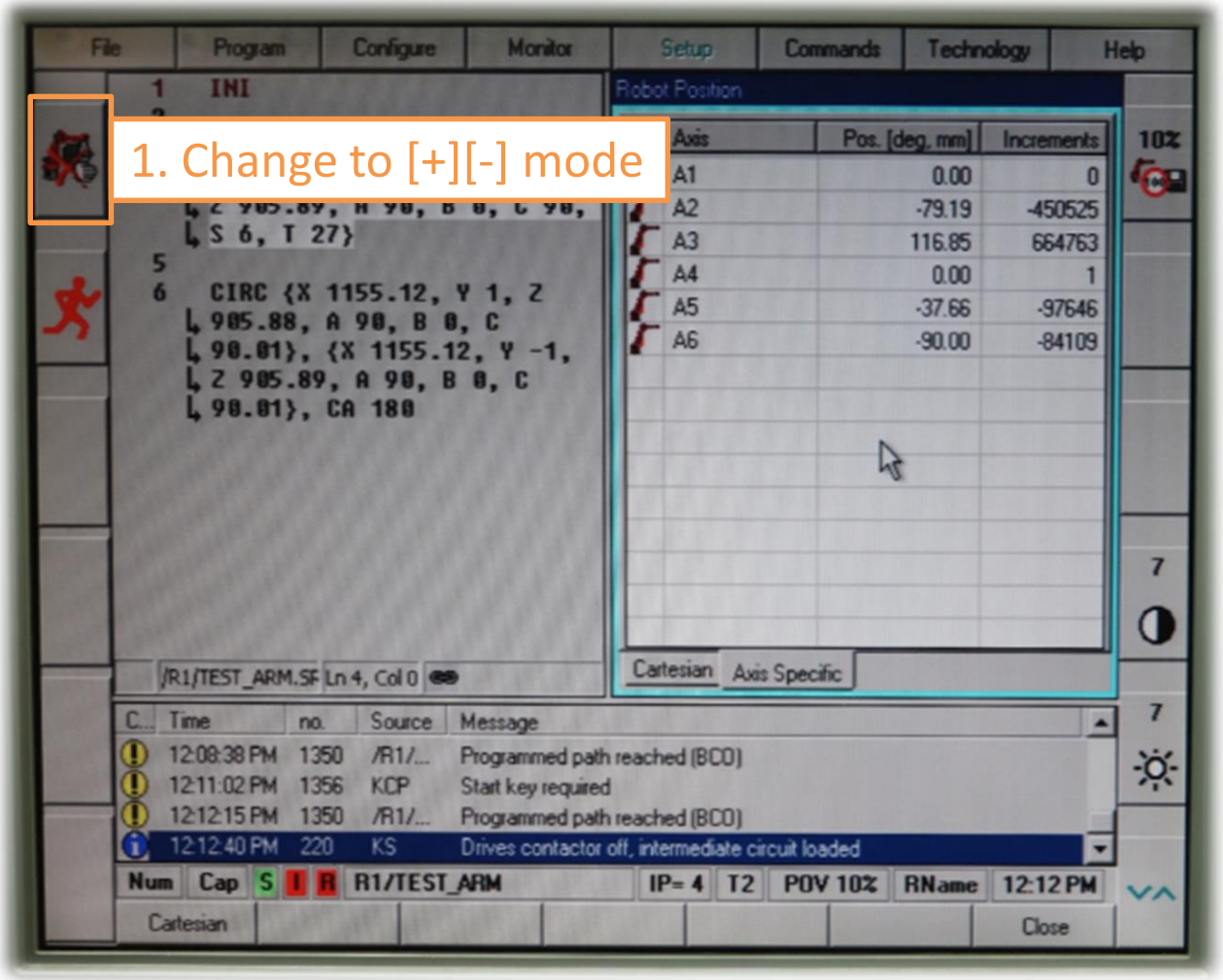
Monitor the Robot Position Under Axis System (2/2)



Emergency Stop

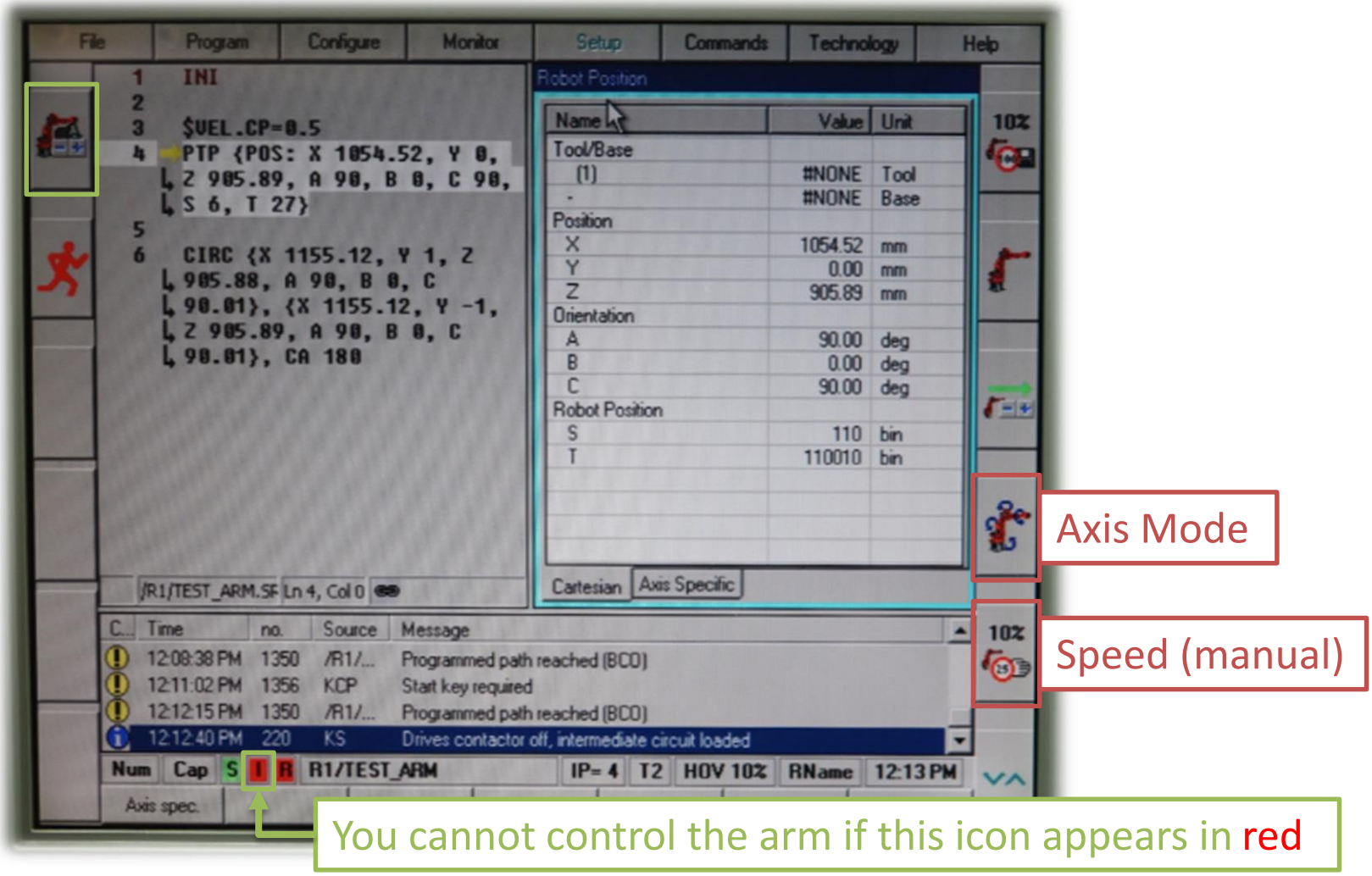
Manuel Control (1/6)

Manuel Control (2/6)

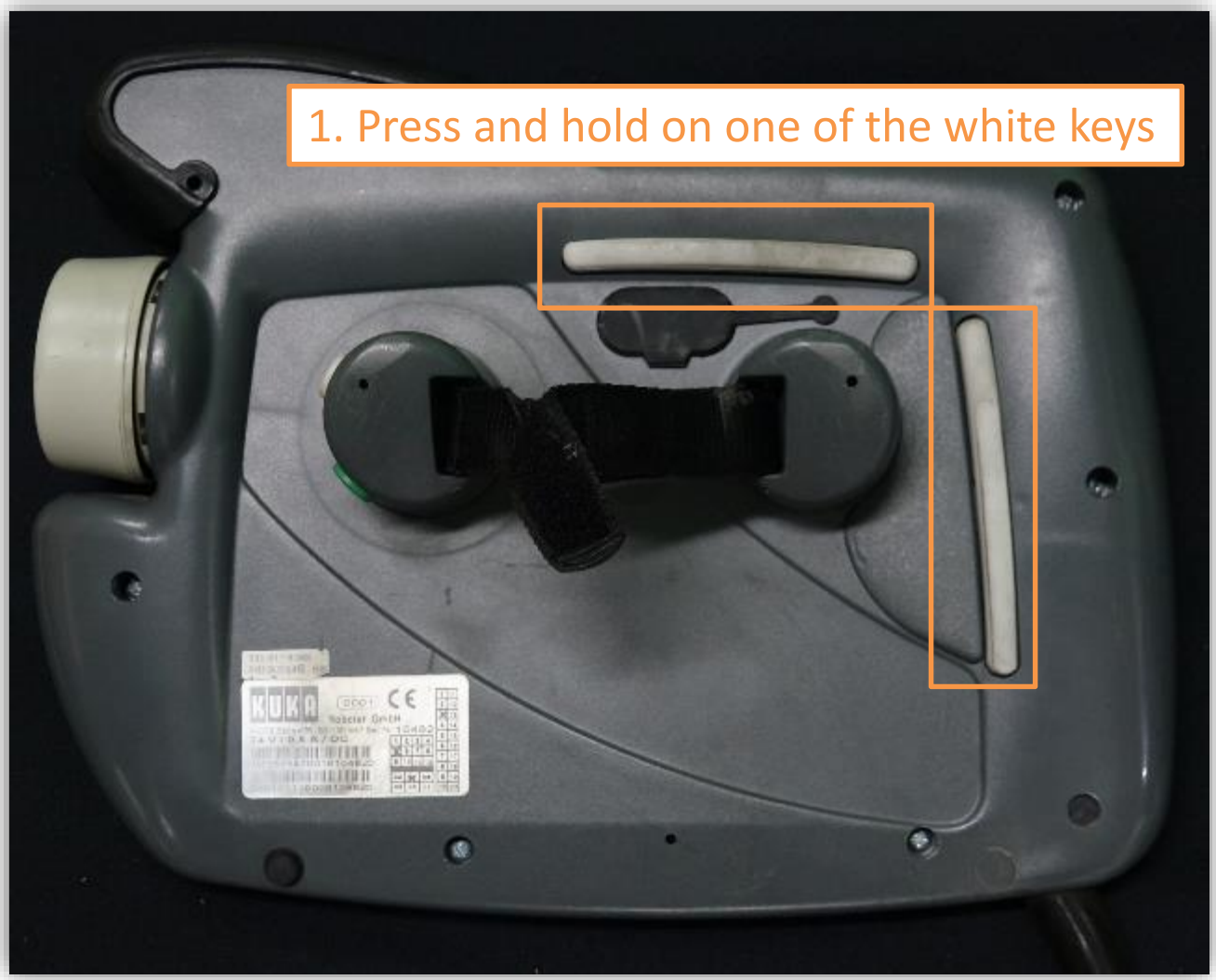


Manuel Control (3/6)

Manuel Control (4/6)

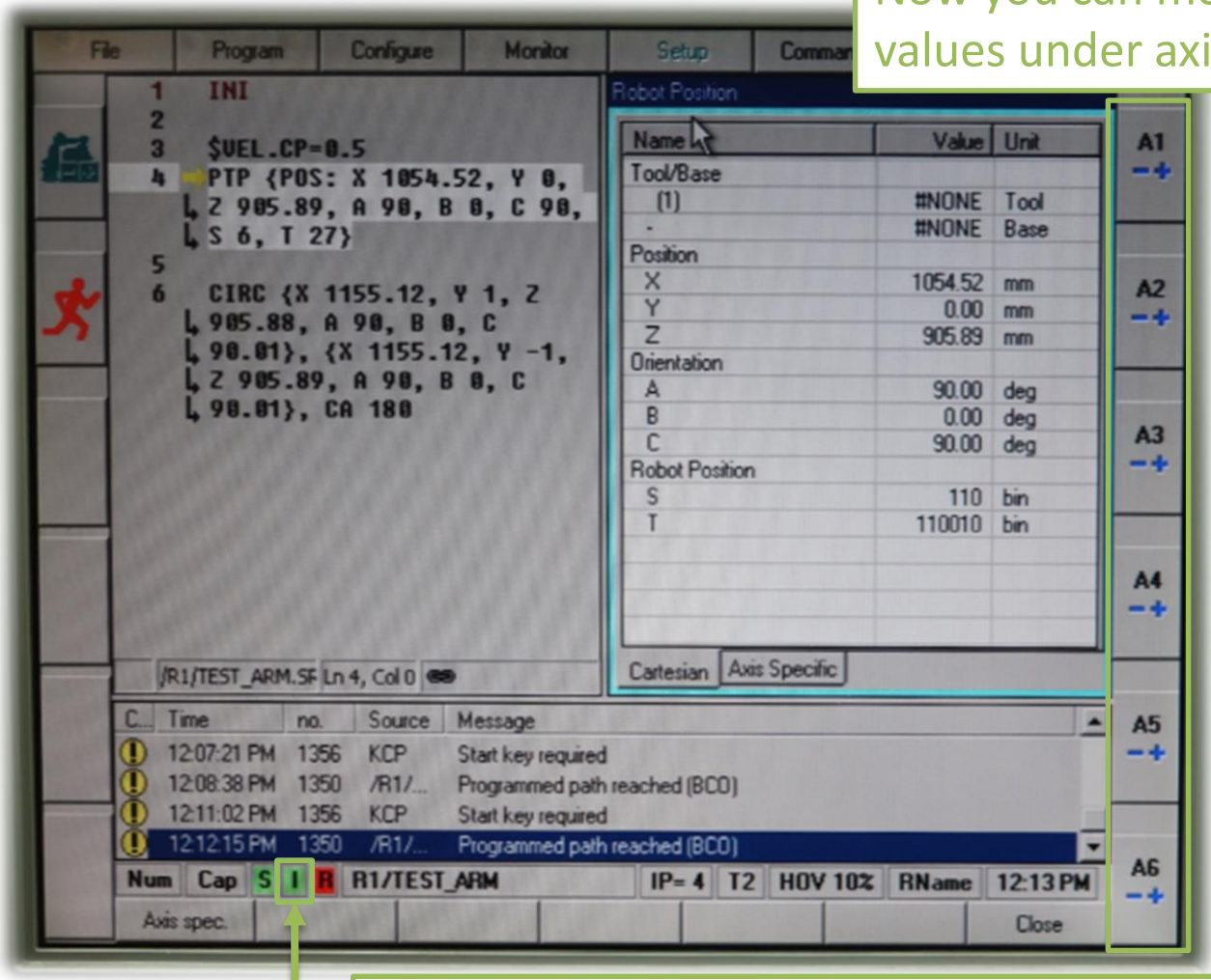


Manuel Control (5/6)



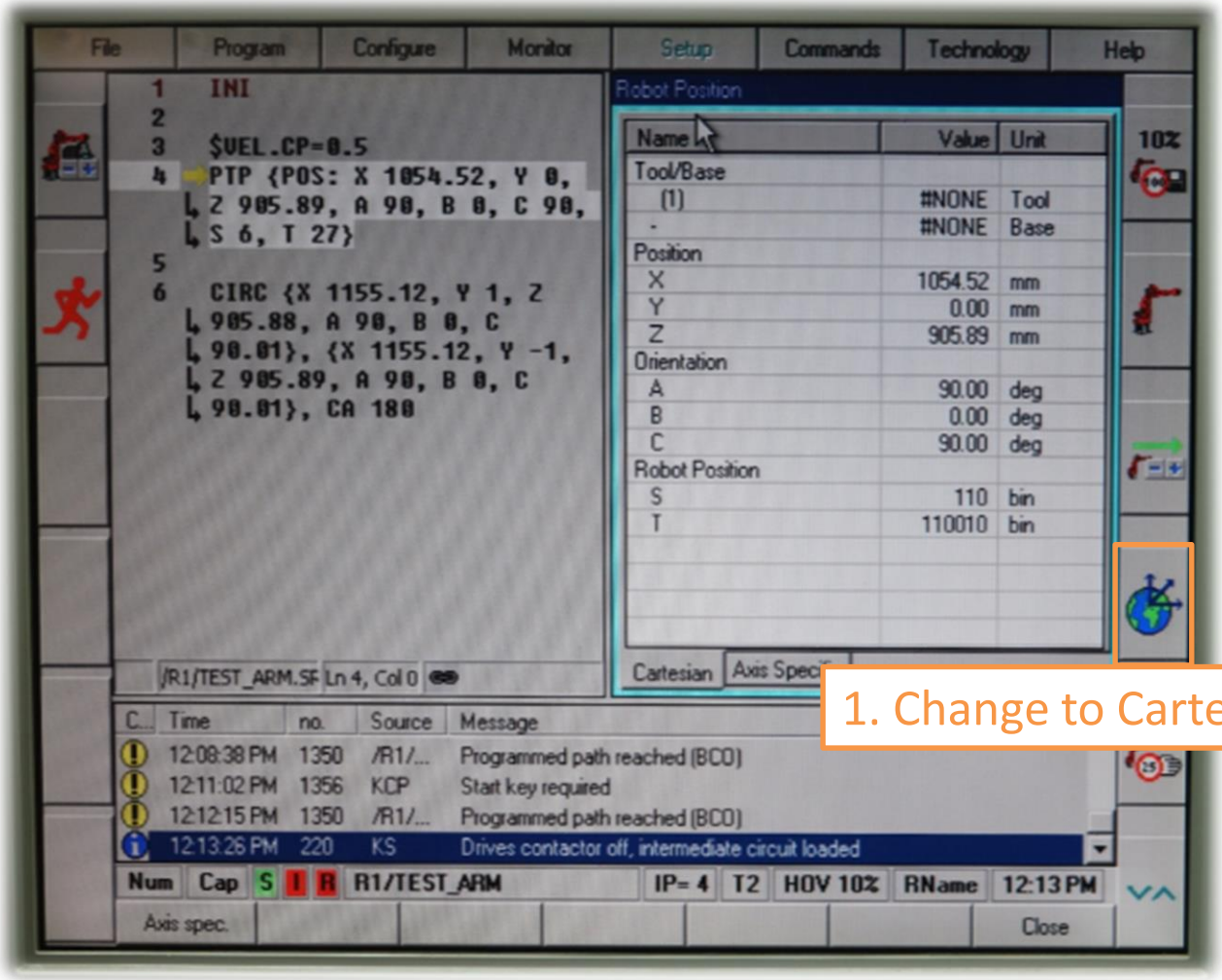
Manuel Control (6/6)

Now you can modify values under axis system

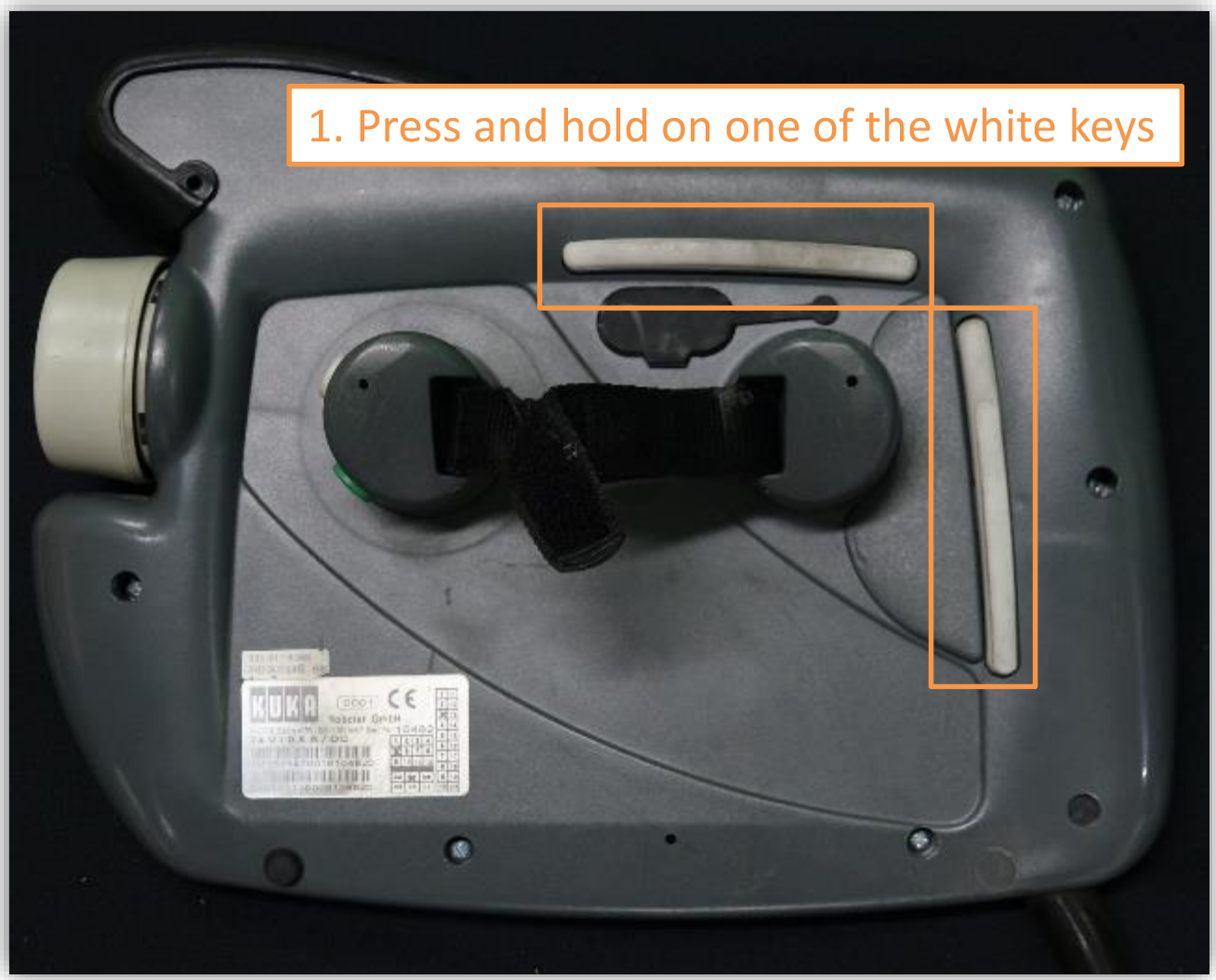


The arm can be controlled if this icon appears in green

Change Values Under Cartesian System (1/3)

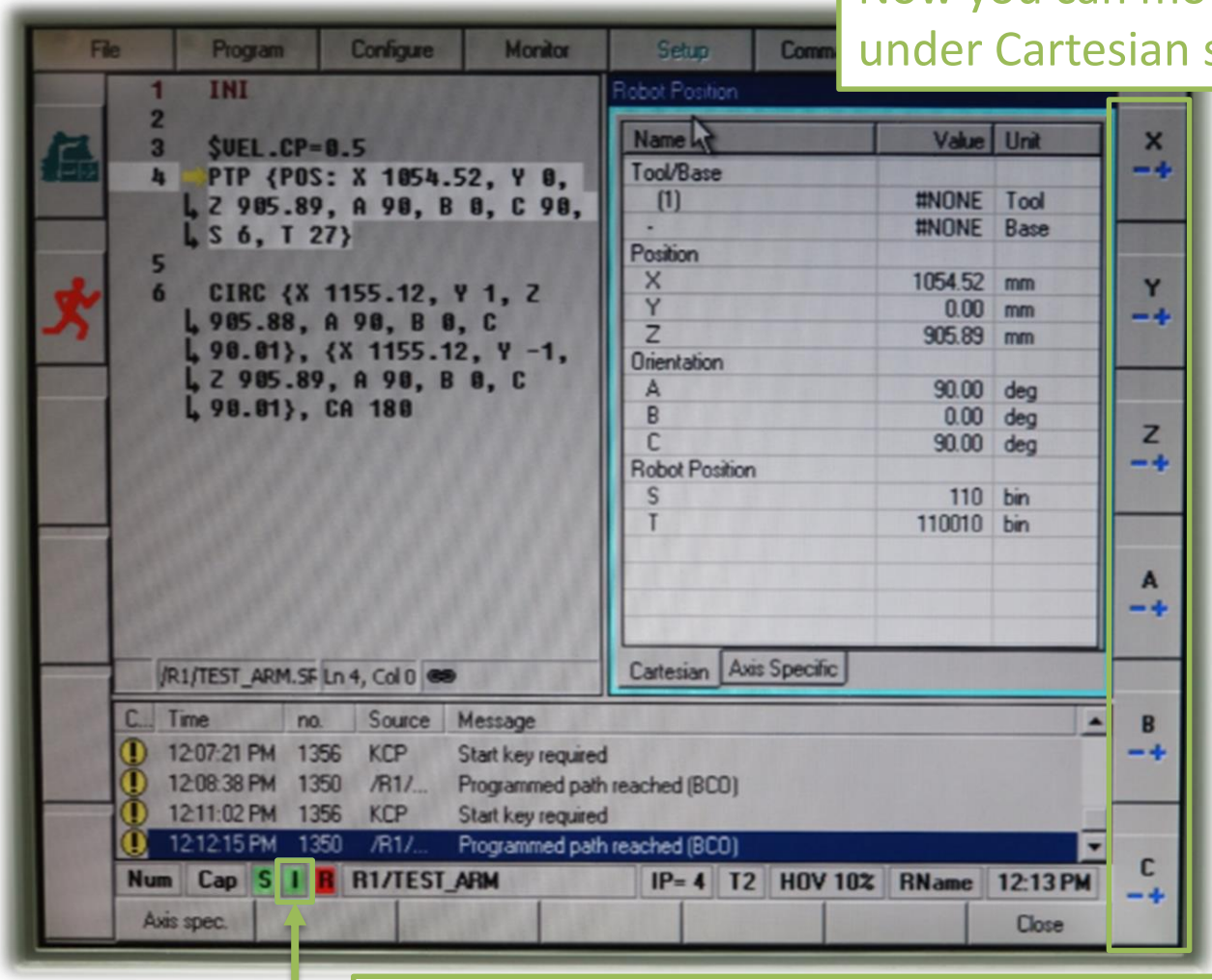


Change Values Under Cartesian System (2/3)



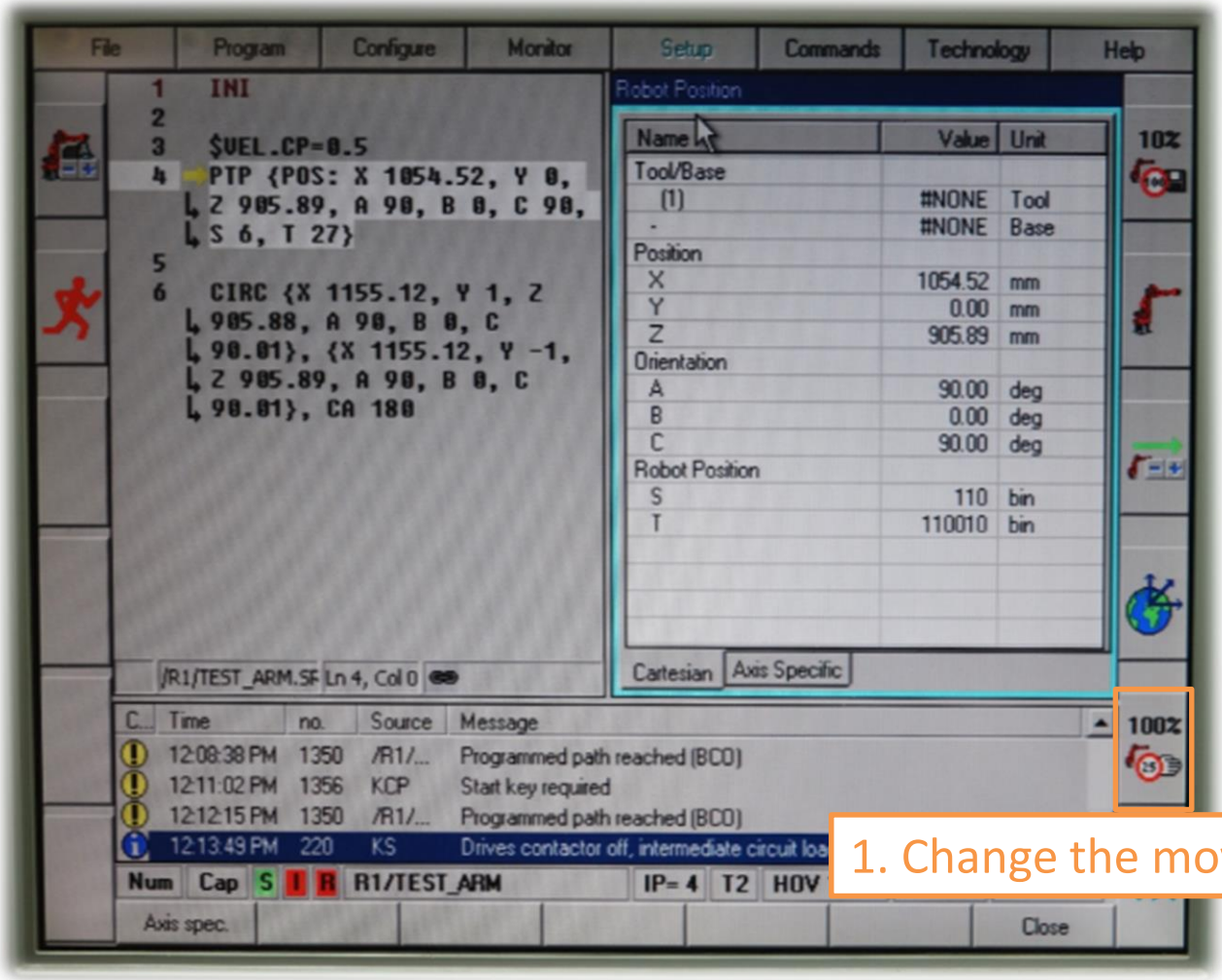
Change Values Under Cartesian System (3/3)

Now you can modify values under Cartesian system



The arm can be controlled if this icon appears in green

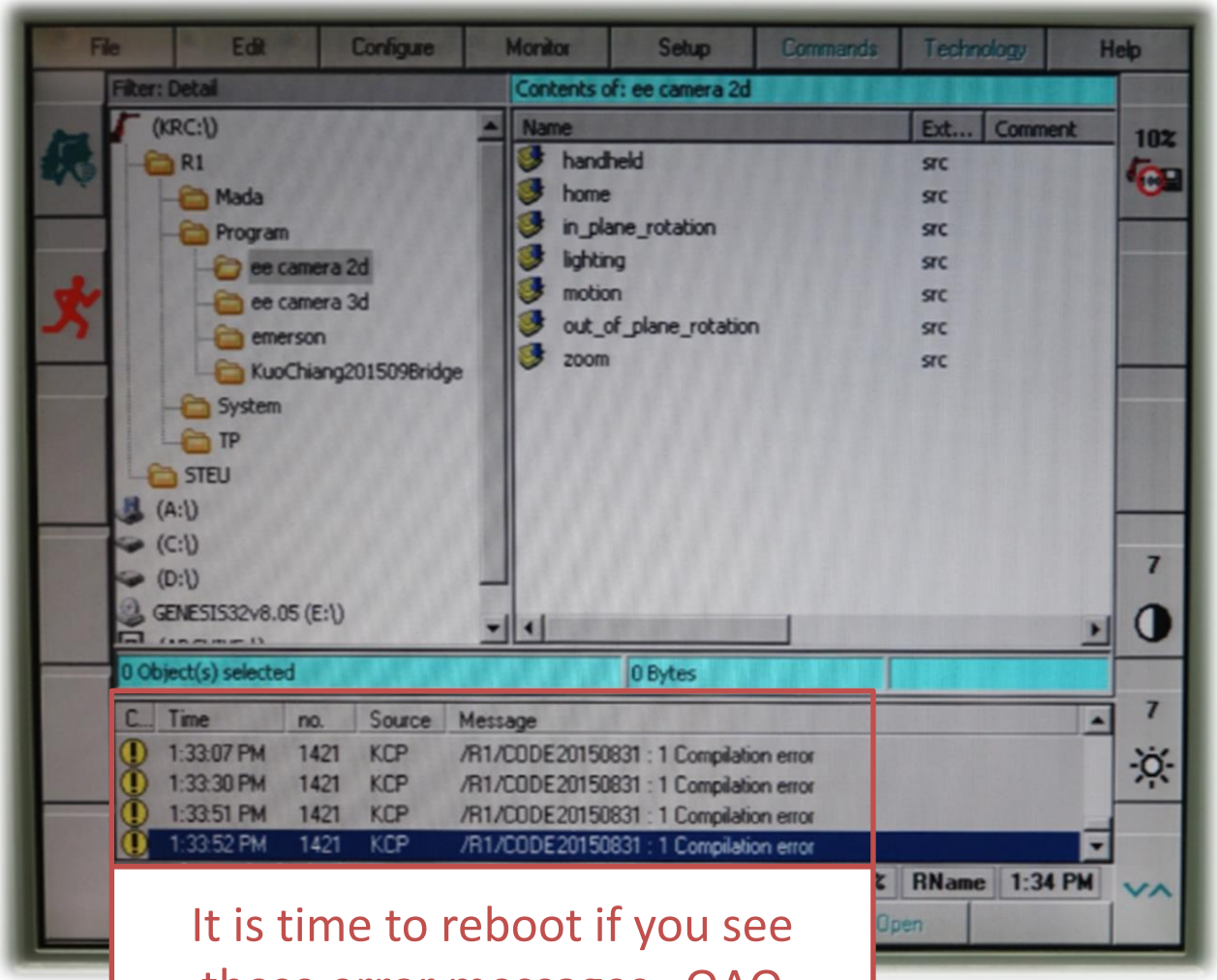
Change the Moving Speed in Manual Mode



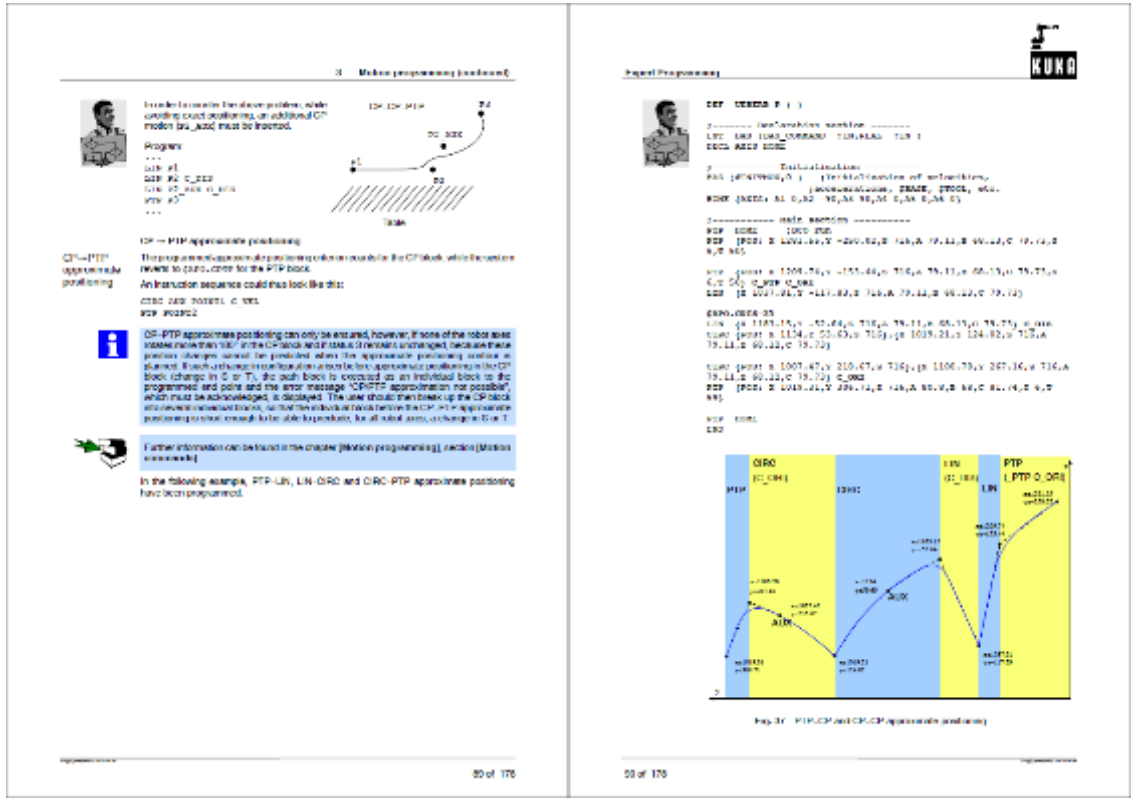
Outline

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

Reboot Timing



It is time to reboot if you see these error messages…QAQ

Further Reading

- If you want to write fancier codes, please refer to Expert Programming Manual.