FANUC Robot series

R-30*i*B/R-30*i*B Plus CONTROLLER

Genkotsu Learning Control Function

OPERATOR'S MANUAL

B-83764EN/02

- **Original Instructions**

Thank you very much for purchasing FANUC Robot.
Before using the Robot, be sure to read the "FANUC Robot SAFETY HANDBOOK (B-80687EN)" and understand the content.

The products in this manual are controlled based on Japan's “Foreign Exchange and Foreign Trade Law". The export from Japan may be subject to an export license by the government of Japan. Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government. Should you wish to export or re-export these products, please contact FANUC for advice.

The products in this manual are manufactured under strict quality control. However, when using any of the products in a facility in which a serious accident or loss is predicted due to a failure of the product, install a safety device.

In this manual, we endeavor to include all pertinent matters. There are, however, a very large number of operations that must not or cannot be performed, and if the manual contained them all, it would be enormous in volume. It is, therefore, requested to assume that any operations that are not explicitly described as being possible are "not possible".

SAFETY PRECAUTIONS

This chapter describes the precautions which must be followed to ensure the safe use of the robot.
Before using the robot, be sure to read this chapter thoroughly.

For detailed functions of the robot operation, read the relevant operator's manual to understand fully its specification.

For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral equipment installed in a work cell.
In addition, refer to the “FANUC Robot SAFETY HANDBOOK (B-80687EN)”.

1 DEFINITION OF USER

The user can be defined as follows.

Operator:
- Turns ON/OFF power to the robot
- Starts the robot program from the operator’s panel

Programmer:
- Operates the robot
- Teaches the robot inside the safety fence

Maintenance engineer:
- Operates the robot
- Teaches the robot inside the safety fence
- Performs maintenance (repair, adjustment, replacement)

- Operator is not allowed to work in the safety fence.
- Programmers and maintenance engineers are allowed to work in the safety fence. The work inside the safety fence includes lifting, setting, teaching, adjustment, maintenance, etc.
- To work inside the safety fence, the person must receive a professional training for the robot.

During the operation, programming, and maintenance of your robotic system, the programmer, operator, and maintenance engineer should take additional care of their safety by wearing the following safety items.

- Adequate clothes for the operation
- Safety shoes
- A helmet

2 DEFINITION OF SAFETY NOTATIONS

To ensure the safety of users and prevent damage to the machine, this manual indicates each precaution on safety with "**WARNING**" or "**CAUTION**" according to its severity. Supplementary information is indicated by "**NOTE**". Read the contents of each "**WARNING**", "**CAUTION**" and "**NOTE**" before using the robot.

Symbol	Definitions
⚠ **WARNING**	Used if hazard resulting in the death or serious injury of the user will be expected to occur if he or she fails to follow the approved procedure.
⚠ **CAUTION**	Used if a hazard resulting in the minor or moderate injury of the user, or equipment damage may be expected to occur if he or she fails to follow the approved procedure.
NOTE	Used if a supplementary explanation not related to any of WARNING and CAUTION is to be indicated.

- Check this manual thoroughly, and keep it handy for the future reference.

3 SAFETY OF THE USER

User safety is the primary safety consideration. Because it is very dangerous to enter the operating space of the robot during automatic operation, adequate safety precautions must be observed.
The following lists the general safety precautions. Careful consideration must be made to ensure user safety.

(1) Have the robot system users attend the training courses held by FANUC.

FANUC provides various training courses. Contact our sales office for details.

(2) Even when the robot is stationary, it is possible that the robot is still in a ready to move state, and is waiting for a signal. In this state, the robot is regarded as still in motion. To ensure user safety, provide the system with an alarm to indicate visually or aurally that the robot is in motion.
(3) Install a safety fence with a gate so that no user can enter the work area without passing through the gate. Install an interlocking device, a safety plug, and so forth in the safety gate so that the robot is stopped as the safety gate is opened.

The controller is designed to receive this interlocking signal of the door switch. When the gate is opened and this signal received, the controller stops the robot (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type). For connection, see Fig. 3 (b).

(4) Provide the peripheral equipment with appropriate earth (Class A, Class B, Class C, and Class D).
(5) Try to install the peripheral equipment outside the robot operating space.
(6) Draw an outline on the floor, clearly indicating the range of the robot operating space, including the tools such as a hand.
(7) Install a mat switch or photoelectric switch on the floor with an interlock to a visual or aural alarm that stops the robot when a user enters the work area.
(8) If necessary, install a safety lock so that no one except the user in charge can turn on the power of the robot.

The circuit breaker installed in the controller is designed to disable anyone from turning it on when it is locked with a padlock.

(9) When adjusting each peripheral equipment independently, be sure to turn off the power of the robot.
(10) Operators should be ungloved while manipulating the operator panel or teach pendant. Operation with gloved fingers could cause an operation error.
(11) Programs, system variables, and other information can be saved on memory card or USB memories. Be sure to save the data periodically in case the data is lost in an accident. (refer to Controller OPERATOR'S MANUAL.)
(12) The robot should be transported and installed by accurately following the procedures recommended by FANUC. Wrong transportation or installation may cause the robot to fall, resulting in severe injury to workers.
(13) In the first operation of the robot after installation, the operation should be restricted to low speeds. Then, the speed should be gradually increased to check the operation of the robot.
(14) Before the robot is started, it should be checked that no one is inside the safety fence. At the same time, a check must be made to ensure that there is no risk of hazardous situations. If detected, such a situation should be eliminated before the operation.
(15) When the robot is used, the following precautions should be taken. Otherwise, the robot and peripheral equipment can be adversely affected, or workers can be severely injured.
- Avoid using the robot in a flammable environment.
- Avoid using the robot in an explosive environment.
- Avoid using the robot in an environment full of radiation.
- Avoid using the robot under water or at high humidity.
- Avoid using the robot to carry a person or animal.
- Avoid using the robot as a stepladder. (Never climb up on or hang from the robot.)
- Outdoor

(16) When connecting the peripheral equipment related to stop (safety fence etc.) and each signal (external emergency, fence etc.) of robot, be sure to confirm the stop movement and do not take the wrong connection.
(17) When preparing footstep, please consider security for installation and maintenance work in high place according to Fig. 3 (c). Please consider footstep and safety belt mounting position.

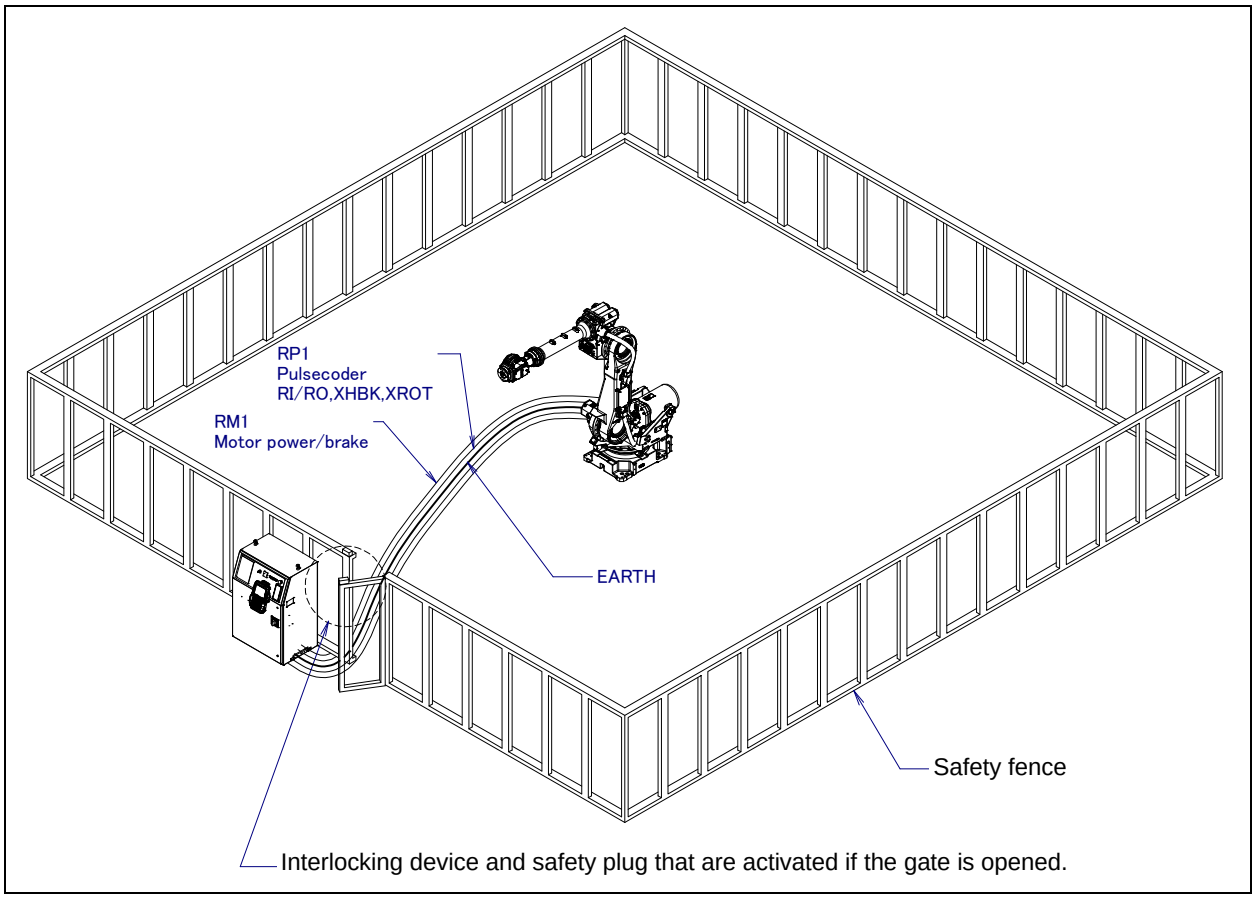

Fig. 3 (a) Safety fence and safety gate

> ⚠ **WARNING**
> When you close a fence, please confirm that there is not a person from all directions of the robot.

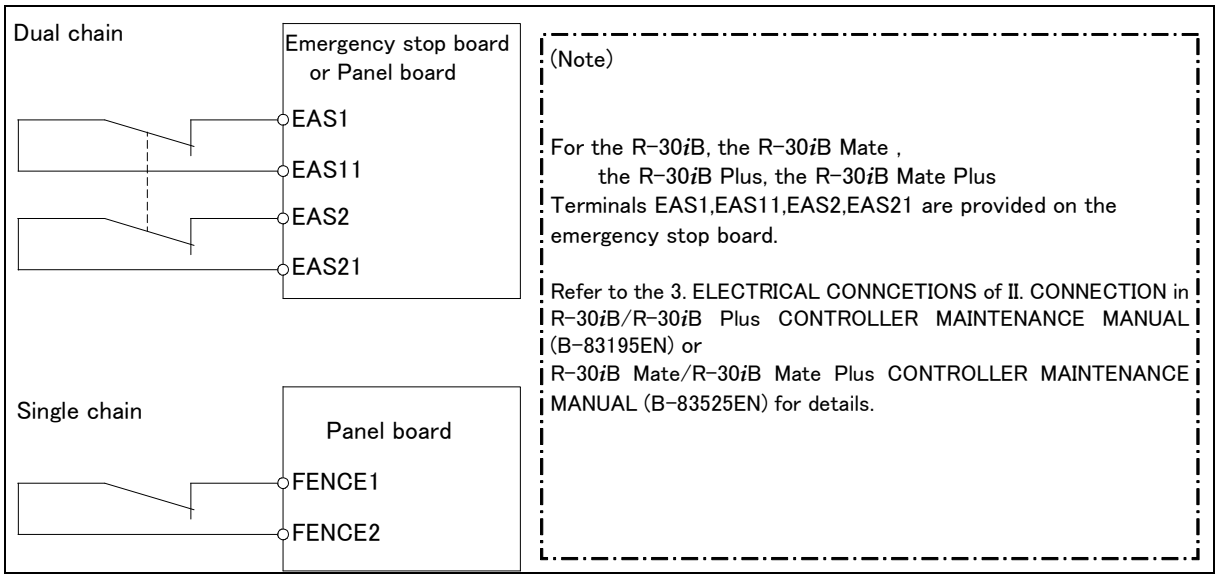

Fig. 3 (b) Connection diagram for the signal of safety fence

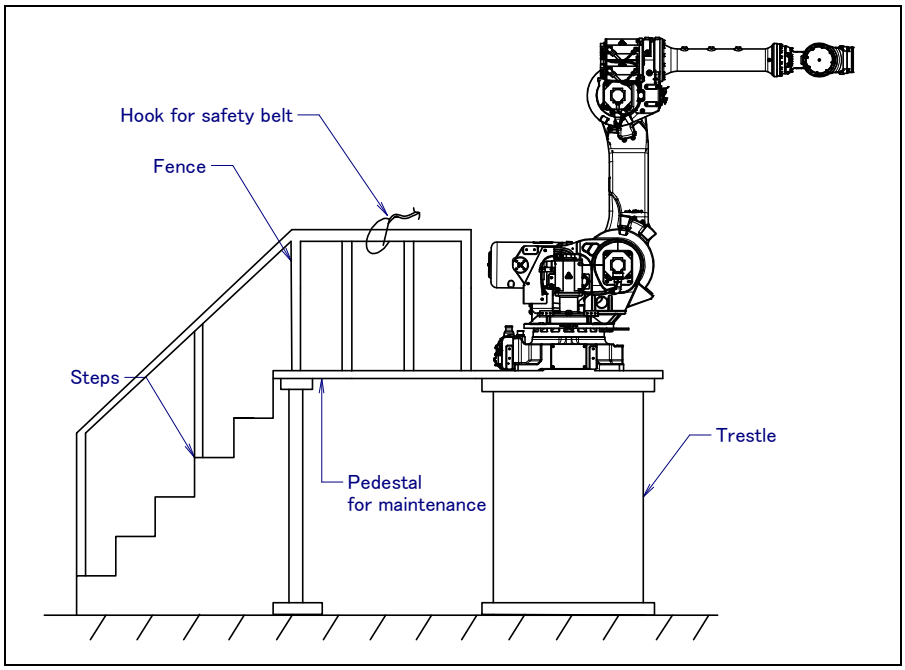

Fig. 3 (c) Pedestal for maintenance

3.1 SAFETY OF THE OPERATOR

An operator refers to a person who turns on and off the robot system and starts a robot program from, for example, the operator panel during daily operation.
Operators cannot work inside of the safety fence.

(1) If the robot does not need to be operated, turn off the robot controller power or press the EMERGENCY STOP button during working.
(2) Operate the robot system outside the operating space of the robot.
(3) Install a safety fence or safety door to avoid the accidental entry of a person other than an operator in charge or keep operator out from the hazardous place.
(4) Install one or more necessary quantity of EMERGENCY STOP button(s) within the operator's reach in appropriate location(s) based on the system layout.

The robot controller is designed to be connected to an external EMERGENCY STOP button. With this connection, the controller stops the robot operation (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type) when the external EMERGENCY STOP button is pressed. See the diagram below for connection.

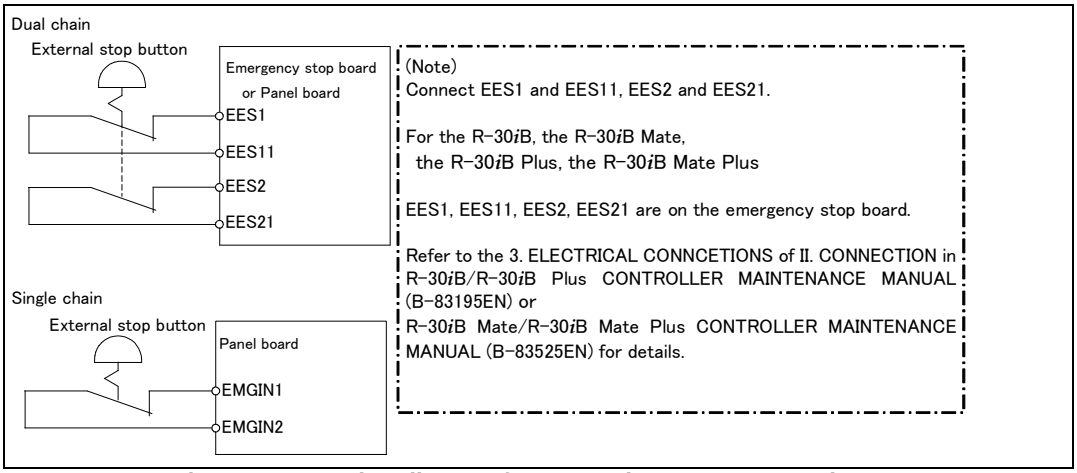

Fig. 3.1 Connection diagram for external emergency stop button

3.2 SAFETY OF THE PROGRAMMER

While teaching the robot, the operator may need to enter the robot operation area. The programmer must ensure the safety especially.

(1) Unless it is specifically necessary to enter the robot operating space, carry out all tasks outside the operating space.
(2) Before teaching the robot, check that the robot and its peripheral equipment are all in the normal operating condition.
(3) If it is inevitable to enter the robot operating space to teach the robot, check the locations, settings, and other conditions of the safety devices (such as the EMERGENCY STOP button, the DEADMAN switch on the teach pendant) before entering the area.
(4) The programmer must be extremely careful not to let anyone else enter the robot operating space.
(5) Programming should be done outside the area of the safety fence as far as possible. If programming needs to be done inside the safety fence, the programmer should take the following precautions:
   - Before entering the area of the safety fence, ensure that there is no risk of dangerous situations in the area.
   - Be prepared to press the emergency stop button whenever necessary.
   - Robot motions should be made at low speeds.
   - Before starting programming, check the whole robot system status to ensure that no remote instruction to the peripheral equipment or motion would be dangerous to the user.

Our operator panel is provided with an emergency stop button and a key switch (mode switch) for selecting the automatic operation (AUTO) and the teach modes (T1 and T2). Before entering the inside of the safety fence for the purpose of teaching, set the switch to a teach mode, remove the key from the mode switch to prevent other people from changing the operation mode carelessly, then open the safety gate. If the safety gate is opened with the automatic operation set, the robot stops (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type). After the switch is set to a teach mode, the safety gate is disabled. The programmer should understand that the safety gate is disabled and is responsible for keeping other people from entering the inside of the safety fence.

Our teach pendant is provided with a DEADMAN switch as well as an emergency stop button. These button and switch function as follows:
(1) Emergency stop button: Causes the stop of the robot (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type) when pressed.
(2) DEADMAN switch: Functions differently depending on the teach pendant enable/disable switch setting status.
   (a) Enable: Servo power is turned off when the operator releases the DEADMAN switch or when the operator presses the switch strongly.
   (b) Disable: The DEADMAN switch is disabled.
   (Note) The DEADMAN switch is provided to stop the robot when the operator releases the teach pendant or presses the pendant strongly in case of emergency. The R-30*i*B/R-30*i*B Mate/R-30*i*B Plus/R-30*i*B Mate Plus employs a 3-position DEADMAN switch, which allows the robot to operate when the 3-position DEADMAN switch is pressed to its intermediate point. When the operator releases the DEADMAN switch or presses the switch strongly, the robot stops immediately.

The operator's intention of starting teaching is determined by the controller through the dual operation of setting the teach pendant enable/disable switch to the enable position and pressing the DEADMAN switch. The operator should make sure that the robot could operate in such conditions and be responsible in carrying out tasks safely.

Based on the risk assessment by FANUC, number of operation of DEADMAN SW should not exceed about 10000 times per year.

The teach pendant, operator panel, and peripheral equipment interface send each robot start signal. However the validity of each signal changes as follows depending on the mode switch and the DEADMAN switch of the operator panel, the teach pendant enable switch and the remote condition on the software.

Mode	Teach pendant enable switch	Software remote condition	Teach pendant	Operator panel	Peripheral equipment
AUTO mode	On	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed
	Off	Local	Not allowed	Allowed to start	Not allowed
		Remote	Not allowed	Not allowed	Allowed to start
T1, T2 mode	On	Local	Allowed to start	Not allowed	Not allowed
		Remote	Allowed to start	Not allowed	Not allowed
	Off	Local	Not allowed	Not allowed	Not allowed
		Remote	Not allowed	Not allowed	Not allowed

T1,T2 mode: DEADMAN switch is effective.

(6) To start the system using the operator box or operator panel, make certain that nobody is the robot operating space area and that there are no abnormalities in the robot operating space.
(7) When a program is completed, be sure to carry out a test operation according to the following procedure.
  (a) Run the program for at least one operation cycle in the single step mode at low speed.
  (b) Run the program for at least one operation cycle in continuous operation at low speed.
  (c) Run the program for one operation cycle in continuous operation at the intermediate speed and check that no abnormalities occur due to a delay in timing.
  (d) Run the program for one operation cycle in continuous operation at the normal operating speed and check that the system operates automatically without trouble.
  (e) After checking the completeness of the program through the test operation above, execute it in the automatic operation.
(8) While operating the system in the automatic operation, the programmer should leave the safety fence.

3.3 SAFETY OF THE MAINTENANCE ENGINEER

For the safety of maintenance engineer personnel, pay utmost attention to the following.

(1) During operation, never enter the robot operating space.
(2) A hazardous situation may arise when the robot or the system, are kept with their power-on during maintenance operations. Therefore, for any maintenance operation, the robot and the system should be put into the power-off state. If necessary, a lock should be in place in order to prevent any other person from turning on the robot and/or the system. In case maintenance needs to be executed in the power-on state, the emergency stop button must be pressed as far as possible.
(3) If it becomes necessary to enter the robot operating space while the power is on, press the emergency stop button on the operator box or operator panel, or the teach pendant before entering the range. The maintenance worker must indicate that maintenance work is in progress and be careful not to allow other people to operate the robot carelessly.
(4) When entering the area enclosed by the safety fence, the worker must check the whole robot system in order to make sure no dangerous situations exist. In case the worker needs to enter the safety area whilst a dangerous situation exists, extreme care must be taken, and whole robot system status must be carefully monitored.
(5) Before the maintenance of the pneumatic system is started, the supply pressure should be shut off and the pressure in the piping should be reduced to zero.
(6) Before the start of maintenance work, check that the robot and its peripheral equipment are all in the normal operating condition.
(7) Do not operate the robot in the automatic operation while anybody is in the robot operating space.

(8) When you maintain the robot alongside a wall or instrument, or when multiple users are working nearby, make certain that their escape path is not obstructed.
(9) When a tool is mounted on the robot, or when any movable device other than the robot is installed, such as belt conveyor, pay careful attention to its motion.
(10) If necessary, have a user who is familiar with the robot system stand beside the operator panel and observe the work being performed. If any danger arises, the user should be ready to press the EMERGENCY STOP button at any time.
(11) When replacing a part, please contact your local FANUC representative. If a wrong procedure is followed, an accident may occur, causing damage to the robot and injury to the user.
(12) When replacing or reinstalling components, take care to prevent foreign material from entering the system.
(13) When handling each unit or printed circuit board in the controller during inspection, turn off the circuit breaker to protect against electric shock.
If there are two cabinets, turn off the both circuit breaker.
(14) A part should be replaced with a part recommended by FANUC. If other parts are used, malfunction or damage would occur. Especially, a fuse that is not recommended by FANUC should not be used. Such a fuse may cause a fire.
(15) When restarting the robot system after completing maintenance work, make sure in advance that there is no person in the operating space and that the robot and the peripheral equipment are not abnormal.
(16) When a motor or brake is removed, the robot arm should be supported with a crane or other equipment beforehand so that the arm would not fall during the removal.
(17) Whenever grease is spilled on the floor, it should be removed as quickly as possible to prevent dangerous falls.
(18) The following parts are heated. If a maintenance user needs to touch such a part in the heated state, the user should wear heat-resistant gloves or use other protective tools.
- Servo motor
- Inside the controller
- Reducer
- Gearbox
- Wrist unit

(19) Maintenance should be done under suitable light. Care must be taken that the light would not cause any danger.
(20) When a motor, reducer, or other heavy load is handled, a crane or other equipment should be used to protect maintenance workers from excessive load. Otherwise, the maintenance workers would be severely injured.
(21) The robot should not be stepped on or climbed up during maintenance. If it is attempted, the robot would be adversely affected. In addition, a misstep can cause injury to the worker.
(22) When performing maintenance work in high place, secure a footstep and wear safety belt.
(23) After the maintenance is completed, spilled oil or water and metal chips should be removed from the floor around the robot and within the safety fence.
(24) When a part is replaced, all bolts and other related components should put back into their original places. A careful check must be given to ensure that no components are missing or left not mounted.
(25) In case robot motion is required during maintenance, the following precautions should be taken :
- Foresee an escape route. And during the maintenance motion itself, monitor continuously the whole robot system so that your escape route will not become blocked by the robot, or by peripheral equipment.
- Always pay attention to potentially dangerous situations, and be prepared to press the emergency stop button whenever necessary.

(26) The robot should be periodically inspected. (Refer to the robot mechanical manual and controller maintenance manual.) A failure to do the periodical inspection can adversely affect the performance or service life of the robot and may cause an accident
(27) After a part is replaced, a test execution should be given for the robot according to a predetermined method. (See TESTING section of “Controller operator’s manual”.) During the test execution, the maintenance worker should work outside the safety fence.

4 SAFETY OF THE TOOLS AND PERIPHERAL EQUIPMENT

4.1 PRECAUTIONS IN PROGRAMMING

(1) Use a limit switch or other sensor to detect a dangerous condition and, if necessary, design the program to stop the robot when the sensor signal is received.
(2) Design the program to stop the robot when an abnormality occurs in any other robots or peripheral equipment, even though the robot itself is normal.
(3) For a system in which the robot and its peripheral equipment are in synchronous motion, particular care must be taken in programming so that they do not interfere with each other.
(4) Provide a suitable interface between the robot and its peripheral equipment so that the robot can detect the states of all devices in the system and can be stopped according to the states.

4.2 PRECAUTIONS FOR MECHANISM

(1) Keep the component cells of the robot system clean, operate the robot where insulated from the influence of oil, water, and dust.
(2) Don’t use unconfirmed liquid for cutting fluid and cleaning fluid.
(3) Adopt limit switches or mechanical stoppers to limit the robot motion, and avoid the robot from collisions against peripheral equipment or tools.
(4) Observe the following precautions about the mechanical unit cables. Failure to follow precautions may cause problems.
- Use mechanical unit cable that have required user interface.
- Do not add user cable or hose to inside of the mechanical unit.
- Please do not obstruct the movement of the mechanical unit when cables are added to outside of mechanical unit.
- In the case of the model that a cable is exposed, please do not perform remodeling (Adding a protective cover and fix an outside cable more) obstructing the behavior of the outcrop of the cable.
- When installing user peripheral equipment on the robot mechanical unit, please pay attention that the device does not interfere with the robot itself.

(5) The frequent power-off stop for the robot during operation causes the trouble of the robot. Please avoid the system construction that power-off stop would be operated routinely. (Refer to bad case example.) Please perform power-off stop after reducing the speed of the robot and stopping it by hold stop or cycle stop when it is not urgent. (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type.)
(Bad case example)
- Whenever poor product is generated, a line stops by emergency stop and power-off of the robot is incurred.
- When alteration is necessary, safety switch is operated by opening safety fence and power-off stop is incurred for the robot during operation.
- An operator pushes the emergency stop button frequently, and a line stops.
- An area sensor or a mat switch connected to safety signal operates routinely and power-off stop is incurred for the robot.
- Power-off stop is regularly incurred due to an inappropriate setting for Dual Check Safety (DCS).

(6) Power-off stop of Robot is executed when collision detection alarm (SRVO-050) etc. occurs. Please try to avoid unnecessary power-off stops. It may cause the trouble of the robot, too. So remove the causes of the alarm.

5 SAFETY OF THE ROBOT MECHANICAL UNIT

5.1 PRECAUTIONS IN OPERATION

(1) When operating the robot in the jog mode, set it at an appropriate speed so that the operator can manage the robot in any eventuality.
(2) Before pressing the jog key, be sure you know in advance what motion the robot will perform in the jog mode.

5.2 PRECAUTIONS IN PROGRAMMING

(1) When the operating spaces of robots overlap, make certain that the motions of the robots do not interfere with each other.
(2) Be sure to specify the predetermined work origin in a motion program for the robot and program the motion so that it starts from the origin and terminates at the origin. Make it possible for the operator to easily distinguish at a glance that the robot motion has terminated.

5.3 PRECAUTIONS FOR MECHANISMS

(1) Keep the robot operation area clean, and operate the robot in an environment free of grease, water, and dust.

5.4 PROCEDURE TO MOVE ARM WITHOUT DRIVE POWER IN EMERGENCY OR ABNORMAL SITUATIONS

For emergency or abnormal situations (e.g. persons trapped in or pinched by the robot), brake release unit can be used to move the robot axes without drive power.
Please refer to controller maintenance manual and mechanical unit operator’s manual for using method of brake release unit and method of supporting robot.

6 SAFETY OF THE END EFFECTOR

6.1 PRECAUTIONS IN PROGRAMMING

(1) To control the pneumatic, hydraulic and electric actuators, carefully consider the necessary time delay after issuing each control command up to actual motion and ensure safe control.
(2) Provide the end effector with a limit switch, and control the robot system by monitoring the state of the end effector.

7 STOP TYPE OF ROBOT (R-30*i*B, R-30*i*B Mate)

There are following four types of Stopping Robot.

Power-Off Stop (Category 0 following IEC 60204-1)

Servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.

"**Power-Off stop**" performs following processing.

- An alarm is generated, and then the servo power turns off. Instantly the robot stops.
- Execution of the program is paused.

Frequent Power-Off stop of the robot during operation can cause mechanical problems of the robot.
Avoid system designs that require routine or frequent Power-Off stop conditions.

Controlled stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.

"**Controlled stop**" performs following processing.

- The alarm "**SRVO-199 Controlled stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.

Smooth stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.

"**Smooth stop**" performs following processing.

- The alarm "**SRVO-289 Smooth Stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.
- In Smooth stop, the robot decelerates until it stops with the deceleration time shorter than Controlled stop.

Hold (Category 2 following IEC 60204-1)

The robot is decelerated until it stops, and servo power remains on.

"**Hold**" performs following processing.

- The robot operation is decelerated until it stops. Execution of the program is paused.

⚠ WARNING

1 The stopping distance and time of Controlled stop and Smooth stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Controlled stop or Smooth Stop is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.
2 In multi arm system, the longest stopping distance and time of Controlled Stop or Smooth Stop among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.
3 In the system which has extended axis, the longer stopping distance and time of Controlled Stop or Smooth Stop among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.
4 When Smooth stop occurs during deceleration by Controlled stop, the stop type of robot is changed to Power-Off Stop.
When Smooth stop occurs during deceleration by Hold, the stop type of robot is changed to Power-Off Stop.
5 In case of Controlled stop or Smooth Stop, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Power-Off stop, Controlled stop, or Smooth stop. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Deadman switch (*)
A	AUTO	P-Stop	P-Stop	C-Stop	C-Stop	-
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
C	AUTO	C-Stop	C-Stop	C-Stop	C-Stop	-
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
D	AUTO	S-Stop	S-Stop	C-Stop	C-Stop	-
	T1	S-Stop	S-Stop	-	C-Stop	S-Stop
	T2	S-Stop	S-Stop	-	C-Stop	S-Stop

P-Stop: Power-Off stop
C-Stop: Controlled stop
S-Stop: Smooth stop
-: Disable

(*) The stop pattern of NTED input is same as Deadman switch.

The following table indicates the Stop pattern according to the controller type or option configuration.

Option	R-30*i*B/ R-30*i*B Mate
Standard	A(**)
Controlled stop by E-Stop (A05B-2600-J570)	C(**)
All Smooth Stop (A05B-2600-J651)	D(**)

(**) R-30*i*B Mate does not have SVOFF input.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Controlled stop by E-Stop" option

When "**Controlled stop by E-Stop**" (A05B-2600-J570) option is specified, the stop type of the following alarms become Controlled stop but only in AUTO mode. In T1 or T2 mode, the stop type is Power-Off stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Controlled stop is different from **Power-Off stop** as follows:

- In Controlled stop, the robot is stopped on the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Controlled stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and time of Controlled stop is longer than those of Power-Off stop, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Controlled stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

"All Smooth Stop Function" option

When "**All Smooth Stop Function**" (A05B-2600-J651) option is specified, the stop type of the following alarms becomes Smooth stop in all operation modes (AUTO, T1 and T2 mode).

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-003 Deadman switch released	Both deadman switches on Teach pendant are released.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-037 IMSTP input (Group: %d)	IMSTP input (*IMSTP signal for a peripheral device interface) is OFF.
SRVO-232 NTED input	NTED input (NTED1-NTED11, NTED2-NTED21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.
SRVO-410 DCS SSO NTED input	In DCS Safe I/O connect function, SSO[5] is OFF.
SRVO-419 DCS PROFIsafe comm. error	PROFINET Safety communication error occurs.

Smooth stop is different from **Power-Off stop** as follows:

- In Smooth stop, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Smooth stop, physical impact is less than Power-Off stop. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End Of Arm Tool) should be minimized.
- The stopping distance and time of Smooth stop is longer than those of Power-Off stop, depending on the robot model and axis.

Smooth stop is different from **Controlled stop** as follows:

- The stopping distance and time of Smooth stop is normally shorter than those of Controlled stop, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Smooth stop are longer than those of Power-Off stop. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

8 STOP TYPE OF ROBOT (R-30*i*B Plus, R-30*i*B Mate Plus)

There are following three types of Stop Category.

Stop Category 0 following IEC 60204-1 (Power-off Stop)

Servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.

"**Stop Category 0**" performs following processing.

- An alarm is generated, and then the servo power turns off. Instantly the robot stops.
- Execution of the program is paused.

Frequent Category 0 Stop of the robot during operation can cause mechanical problems of the robot. Avoid system designs that require routine or frequent Category 0 Stop conditions.

Stop Category 1 following IEC 60204-1 (Controlled Stop, Smooth Stop)

The robot is decelerated until it stops, and servo power is turned off.

"**Stop Category 1**" performs following processing.

- The alarm "**SRVO-199 Controlled stop**" or "**SRVO-289 Smooth Stop**" occurs along with a decelerated stop. The program execution is paused.
- An alarm is generated, and then the servo power turns off.

In Smooth stop, the robot decelerates until it stops with the deceleration time shorter than Controlled stop. The stop type of Stop Category 1 is different according to the robot model or option configuration. Please refer to the operator's manual of a particular robot model.

Stop Category 2 following IEC 60204-1 (Hold)

The robot is decelerated until it stops, and servo power remains on.

"**Stop Category 2**" performs following processing.

- The robot operation is decelerated until it stops. Execution of the program is paused.

⚠ WARNING

1 The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time is necessary when Stop Category 1 is used. Please refer to the operator's manual of a particular robot model for the data of stopping distance and time.
2 In multi arm system, the longest stopping distance and time of Stop Category 1 among each robot are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the multi arm system.
3 In the system which has extended axis, the longer stopping distance and time of Stop Category 1 among robot and extended axis are adopted as those for the system. A risk assessment for the whole robot system which takes into consideration a possibility that the stopping distance and time increase, is necessary on the system which has extended axis. Please refer to the extended axis setup procedure of the controller operator's manual for considering the stopping distance and time of the extended axis.
4 When Stop Category 1 occurs during deceleration by Stop Category 2, the stop type of robot is changed to Stop Category 0.
5 In case of Stop Category 1, motor power shutdown is delayed for a maximum of 2 seconds. In this case, a risk assessment for the whole robot system is necessary, including the 2 seconds delay.

When the emergency stop button is pressed or the FENCE is open, the stop type of robot is Stop Category 0 or Stop Category 1. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Deadman switch (*)
A	AUTO	Category 0	Category 0	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
C	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 0	Category 0	-	Category 1	Category 0
	T2	Category 0	Category 0	-	Category 1	Category 0
D	AUTO	Category 1	Category 1	Category 1	Category 1	-
	T1	Category 1	Category 1	-	Category 1	Category 1
	T2	Category 1	Category 1	-	Category 1	Category 1

Category 0: Stop Category 0
Category 1: Stop Category 1
-: Disable

(*) The stop pattern of NTED input is same as Deadman switch.

The following table indicates the Stop pattern according to the controller type or option configuration.
The case R651 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	C(**)
Old Stop Function (A05B-2600-J680)	A(**)
All Smooth Stop Function (A05B-2600-J651)	D(**)

The case R650 is specified.

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	A(**)
Stop Category 1 by E-Stop (A05B-2600-J521)	C(**)
All Smooth Stop Function (A05B-2600-J651)	D(**)

(**) R-30*i*B Mate Plus does not have SVOFF input.

The stop pattern of the controller is displayed in "Stop pattern" line in software version screen. Please refer to "Software version" in operator's manual of controller for the detail of software version screen.

"Old Stop Function" option

When "**Old Stop Function**" (A05B-2600-J680) option is specified, the stop type of the following alarms becomes Stop Category 0 in AUTO mode.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Stop Category 0 is different from **Stop Category 1** as follows:

- In Stop Category 0, servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.
- The stopping distance and time of Stop Category 0 is shorter than those of Stop Category 1, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

"All Smooth Stop Function" option

When "**All Smooth Stop Function**" (A05B-2600-J651) option is specified, the stop type of the following alarms becomes Stop Category 1 in all operation modes (AUTO, T1 and T2 mode).

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-003 Deadman switch released	Both deadman switches on Teach pendant are released.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-037 IMSTP input (Group: %d)	IMSTP input (*IMSTP signal for a peripheral device interface) is ON.
SRVO-232 NTED input	NTED input (NTED1-NTED11, NTED2-NTED21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.
SRVO-410 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[5] is OFF.
SRVO-419 DCS PROFIsafe comm. error	PROFINET Safety communication error occurs.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Stop Category 1, physical impact is less than Stop Category 0. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End of Arm Tool) should be minimized.
- The stopping distance and time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

"Stop Category 1 by E-Stop" option

When "**Stop Category 1 by E-Stop**" (A05B-2600-J521) option is specified, the stop type of the following alarms become Category 1 Stop but only in AUTO mode. In T1 or T2 mode, the stop type is Category 0 Stop which is the normal operation of the system.

Alarm	Condition
SRVO-001 Operator panel E-stop	Operator panel emergency stop is pressed.
SRVO-002 Teach pendant E-stop	Teach pendant emergency stop is pressed.
SRVO-007 External emergency stops	External emergency stop input (EES1-EES11, EES2-EES21) is open.
SRVO-408 DCS SSO Ext Emergency Stop	In DCS Safe I/O connect function, SSO[3] is OFF.
SRVO-409 DCS SSO Servo Disconnect	In DCS Safe I/O connect function, SSO[4] is OFF.

Stop Category 1 is different from **Stop Category 0** as follows:

- In Stop Category 1, the robot is stopped along the program path. This function is effective for a system where the robot can interfere with other devices if it deviates from the program path.
- In Stop Category 1, physical impact is less than Stop Category 0. This function is effective for systems where the physical impact to the mechanical unit or EOAT (End of Arm Tool) should be minimized.
- The stopping distance and time of Stop Category 1 is longer than those of Stop Category 0, depending on the robot model and axis.

When this option is loaded, this function cannot be disabled.

The stop type of DCS Position and Speed Check functions is not affected by the loading of this option.

> ⚠ **WARNING**
> The stopping distance and time of Stop Category 1 are longer than those of Stop Category 0. A risk assessment for the whole robot system which takes into consideration the increased stopping distance and stopping time, is necessary when this option is loaded.

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TABLE OF CONTENTS

1 GENERAL

1.1 OVERVIEW

GLC (Genkotsu Learning Control) is a function to improve throughput of Genkotsu robot via repeating learning motion.
Processing capacity of Genkotsu robot can be improved by GLC.

GLC has mainly 2 configurations as follows:

Learning method	Configuration of software
1. GLC *i*RPick	GLC(R815) + *i*RPickTool Basic(J944) GLC(R815) + *i*RPickTool(J945)
2. GLC Handling	GLC(R815)

In GLC, different learning methods are designed suitable for each configuration, to optimize motion parameters of robot.

- GLC *i*RPick
  It is a learning method for all TP programs created by *i*RPickTool.
  It is a general learning method with the easiest procedure and availability for most applications.
  Use actual workpieces on actual production lines to learn.
  This learning method allows the robot to run at the maximum possible speed without causing joint load excess errors.
- GLC Handling
  It is a learning method mainly for non-tracking 2D vision system.
  It analyzes TP program used for learning and automatically generates motions that cover specified operation workspace.
  It learns without using workpieces.

Settings and procedure of each learning method will be explained in Chapter 4 to 5.

GLC is an optional function. Using this function requires the GLC option (R815).

NOTE
Please contact your local FANUC representative for the specific robot model support list.

1.2 TERMINOLOGY

In this section, terminology for this function will be explained. Please understand the terminology before setting up this function.

Learning percentage

This is the parameter for learning percentage, which ranges from 0-100%. 100% means learning process is completed. The current learning process can be confirmed on the page displayed from [Menu] – "Setup" – "Learning".

Learning process, Learned data, Learning mode, Learning motion

Learning process starts by pressing F2 "Learn" in the setup screen displayed from "Setup"-"Learning". In learning process, robot monitors the load on the mechanism while learning an adequate high-speed motion. Information of speedup learned in each motion is called learned data. GLC is in learning mode when learning percentage is between 0% - 99%. The motion in the learning mode is defined as learning motion.

Playback mode, Playback motion

Playback mode is defined as program execution when the learning percentage is 100%.
The motion in playback mode is defined as playback motion.
In playback motion, load limitation of mechanism is respected and motion is speeded up by learned data.

1.3 PROCEDURE

In order to use this function, please follow the procedure below to set the software parameters and teach the programs.

1. Please understand the necessary hardware, software, and function limitations. (Please refer to Chapter 2 for more details)
2. Please prepare the TP program for learning. (Please refer to the manual of *i*RPickTool and *i*RVision)
3. Please setup this function and execute learning process. (Please refer to Chapter 4 to 5 for more details)
4. After learning, motion will be speeded up. Please tune the timing of holding workpieces if it is necessary. (Please refer to Chapter 4 to 5 for more details.)

Learning Mode	Chapter Number
1. GLC *i*RPick	1, 2, 3, 4
2. GLC Handling	1, 2, 3, 5

2 HARDWARE AND SOFTWARE

In this chapter, necessary hardware, software and limitations related to GLC will be explained.

2.1 HARDWARE

GLC requires the following hardware.

- 64MB (or more) D-RAM is necessary. GLC requires at least 4.0MB available in D-RAM.
- 64MB (or more) F-ROM is recommended. GLC requires at least 0.9MB available memory in F-ROM.

2.2 SOFTWARE

2.2.1 Software Option

GLC (R815) can be used in the R-30*i*B controller with version 7DC3/03 or later.

2.2.2 Configuration of Software and Applicable Models

Currently as of version 7DC3/21, configuration of GLC software and applicable models are as follows.

Learning mode	Configuration of GLC Software	Applicable Models
1. GLC *i*RPick	GLC(R815) + *i*RPickTool Basic (J944) GLC(R815) + *i*RPickTool(J945)	M-3*i*A/6S, M-3*i*A/6A, M-3*i*A/12H
2. GLC Handling	GLC(R815)	M-1*i*A/0.5S, M-3*i*A/6S, M-3*i*A/6A, M-3*i*A/12H

NOTE
Please contact your local FANUC representative for the specific robot model support list.

2.2.3 Common Limitations for All Learning Modes

- Available application is Handling Tool only.
- Learning and playback are only available when the robot is in Group 1 and not doing synchronous operation with other groups.
  *GLC Handling cannot be supported if another group other than Group 1 exists.
- Only linear motion can be learned and played back. Joint motion cannot be learned and speeded up.
- Rail tracking and circular tracking are not supported.
- GLC can be installed with Continuous Turn (J613) but GLC is set to be disabled. Because Continuous Turn disables Constant Path option though GLC need the condition that Constant Path option is enabled.
- In this function, motions are speeded up with the load settled below the tolerance of robot mechanism. So, if motions before learning have already been close to the load tolerance, the effect of speedup will probably be small. It is recommended to use ROBOGUIDE for simulation in advance.
- Limitations of each learning mode can be found in each Section 2 of Chapter 4-5.

3 ZONE

In this chapter, the common concept of the zone in each learning mode of GLC will be explained.

3.1 LEARNING IN ZONES

GLC separates the workspace into cubic zones, and generates the path information going through zones as well as the Learned data when learning motions.

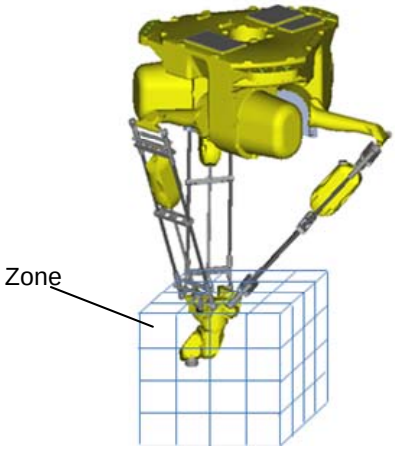


Fig. 3.1(a) Learning in zones

When executing a motion, it will check whether the zone where the motion passes through has been learned. If learned, the speed up ratio will be calculated based on the information of learned data and then the high-speed motion will be performed.

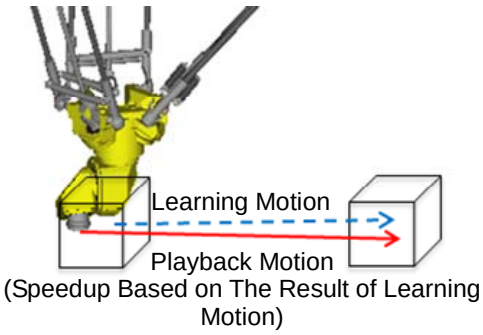


Fig. 3.1(b) Learning motion and Playback motion

3.2 ZONE SIZE

In GLC, you can set the length of the zone side in the “Zone Size (mm)” item in the Learning menu.

- Normally default value is recommended.
- Speedup performance can be better when the zone size is smaller. This can improve learning accuracy when limitations in mechanism of robot are taken into account. However, small zone sizes can exponentially increase the memory and the time required for learning.
- When the zone size becomes bigger, the memory and the time required for learning will reduce. However, since the performance of learning motion becomes worse, learning accuracy considering limitations in robot mechanism will decrease and overload will more likely happen on some joints.

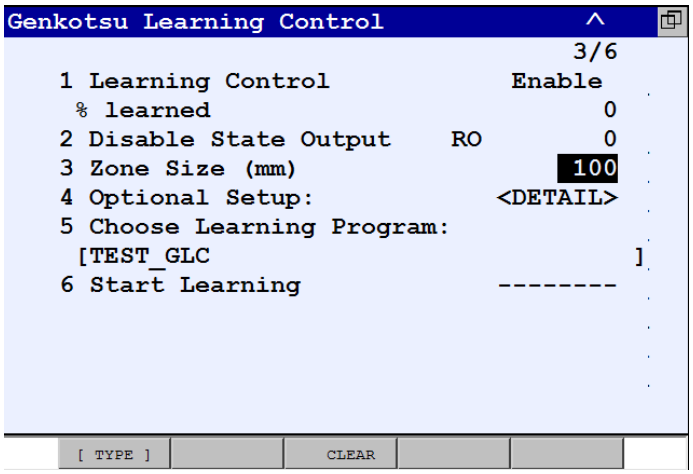


Fig. 3.2 Setup Screen of GLC *i*RPick

4 GLC *i*RPICK

In this chapter, the concept and procedure of GLC *i*RPick will be explained.
Please refer to Ch. 5 for the instruction of GLC Handling.

4.1 LEARNING MOTION

In a system of *i*RPickTool, TP programs which move workpieces on a conveyor in a specified tracking area are taught by the operator.
GLC *i*RPick will execute the user's TP program to start learning. But in order to learn various motions in this tracking area, it changes the upstream boundary automatically "in an area from upstream boundary to the discard line set in *i*RPickTool", and operates robot during the learning process.

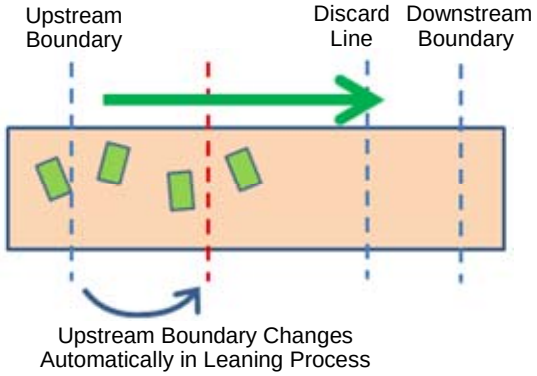


Fig. 4.1 Learning motion of GLC *i*RPick

In learning process, the robot monitors the load on the mechanism while learning an adequate high-speed motion. In addition, GLC *i*RPick support "Reduce Excess Joint Load" function. This function learns not only the speedup of the movement but also the motion parameter to reduce the load to robot joint. So it is able to reduce the excessive load to robot joint and prevent a stop of the production by the alarm of "Joint load excess"

> ⚠ **WARNING**
> The learning process changes the upstream boundary automatically in an area from upstream boundary to the discard line set in *i*RPickTool and operates robot. In order to avoid interference, please set the upstream boundary, discard line and downstream boundary properly.

4.2 LIMITATIONS

- A system which is composed of a conveyor and more than one robot to handle workpieces is not supported.
  (Ex. A system which lets Robot B to handle workpieces missed by Robot A.)
- As for the common limitations in each learning method, please refer to Section 2.2.3.

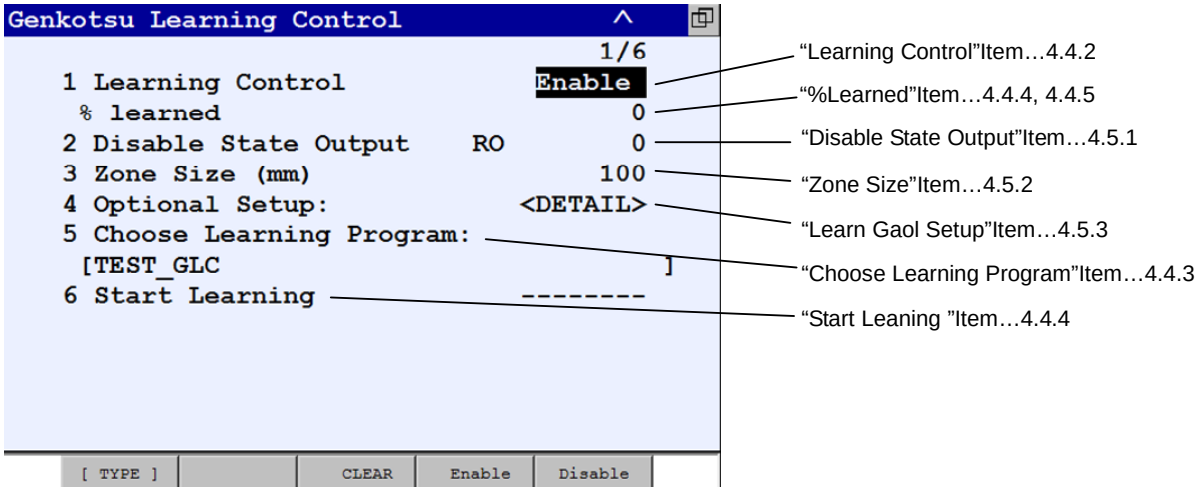
4.3 GLC SETUP MENU

Setup and learning about GLC can be operated in GLC setup menu.
In order to display GLC setup menu, follow the following procedure.

1 Press the [MENU] key.
2 Select 6 “Setup”
3 Press F1 to display menu, and select “Learning”.
4 The GLC setup menu screen is displayed.

Items in setup menu and corresponding content in this chapter are shown in the following figure.

- Items of basic procedure will be explained in Section 4.4.
- Please refer to Section 4.5 for other setting items.



4.4 LEARNING PROCEDURE

The basic learning procedure in GLC *i*RPick is explained as in the following flowchart.

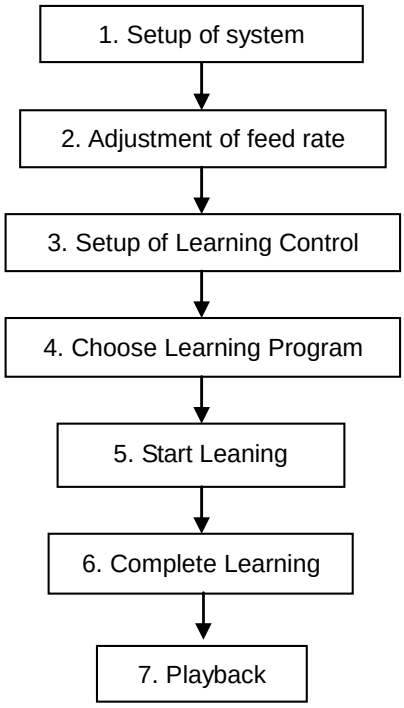


Fig. 4.4 Learning procedure in GLC *i*RPick

4.4.1 Setup of System

- Teach the TP program for learning, and complete the setup of system. Payload for workpiece and tool need to set up correctly.
- Before learning, make sure this TP program can be executed. Robot actually pickup/drop part to conveyor.

> ⚠ **WARNING**
> The learning process changes upstream boundary automatically in an area from upstream boundary to the discard line set in *i*RPickTool and operates robot.
> In order to avoid interference, please set upstream boundary, discard line and downstream boundary properly.

> **NOTE**
> During the learning process, the motion of taking workpieces will be operated near the discard line. If the distance between discard line and downstream boundary is not enough, once the robot passes downstream line, alarm"TRAK-005 Track destination gone error" may occur and learning may be interrupted.
> Therefore, please set discard line properly.

4.4.2 Adjustment of Feed Rate

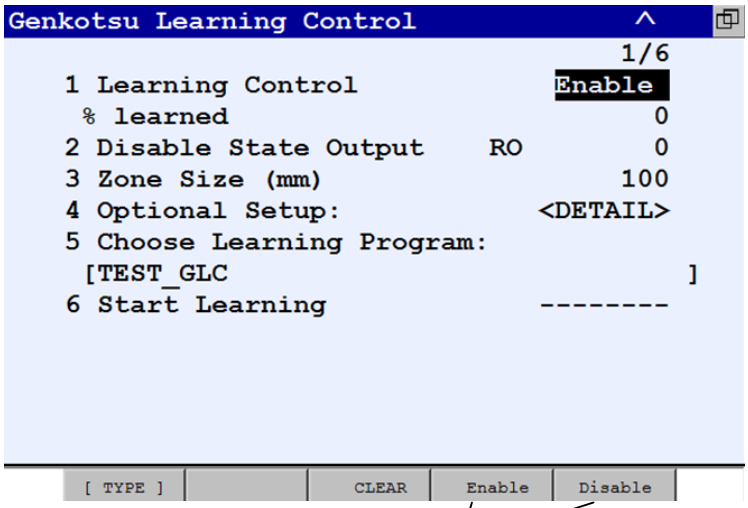
Before starting learning, please adjust the supply of the workpieces to become less than 80% of the default rate.

NOTE

"Reduce Excess Joint Load" function of the optional setting window is enabled in the initial setting of GLC *i*RPick.
The robot moves by about 80% of normal speed when the function is enabled and learning start. If the robot cannot catch up with supply of the work, GLC may not learn the zones of upstream side. Therefore it is necessary to adjust the feed rate of the workpieces to become less than 80% of the default rate before learning.

4.4.3 Setup of GLC

In the GLC setup menu, enable Item 1 “Learning Control”.
In order to change set Enable/Disable, move the cursor to the item, and press function key to select “Enable” or “Disable”



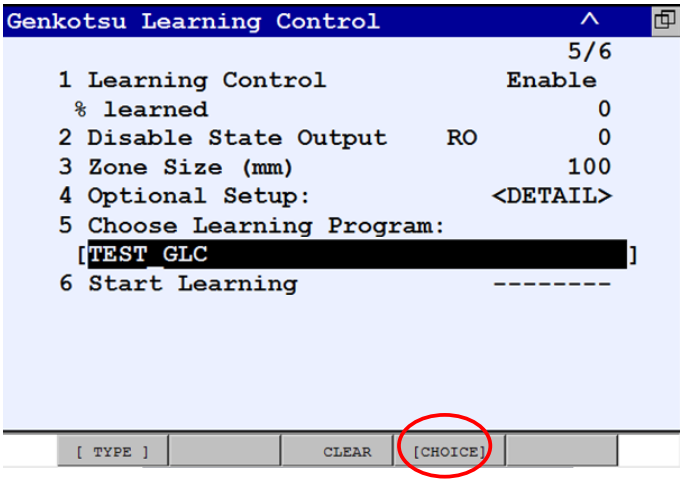
Function Key of Enable/Disable “Learning Control”

NOTE

- When this item is set to “Enable”, the GLC function is enabled. The speed of the learned motion is controlled by GLC so that not to exceed the limitation of the robot mechanism.
- When this item is set to “Disable”, the GLC function is disabled. General motion will be executed without using learned data.
- In the following situations, GLC cannot be set to “Enable”.
  - ➢ When the capacity of D-RAM is not enough to execute this function,
    - ✧ Alarm “MOTN-573” may occur at power-up.
      As for the “MOTN-573”, please refer to Appendix A.
  - ➢ When the configuration of system is not supported. (Refer to Chapter 2)

4.4.4 Selection of Learning Programs

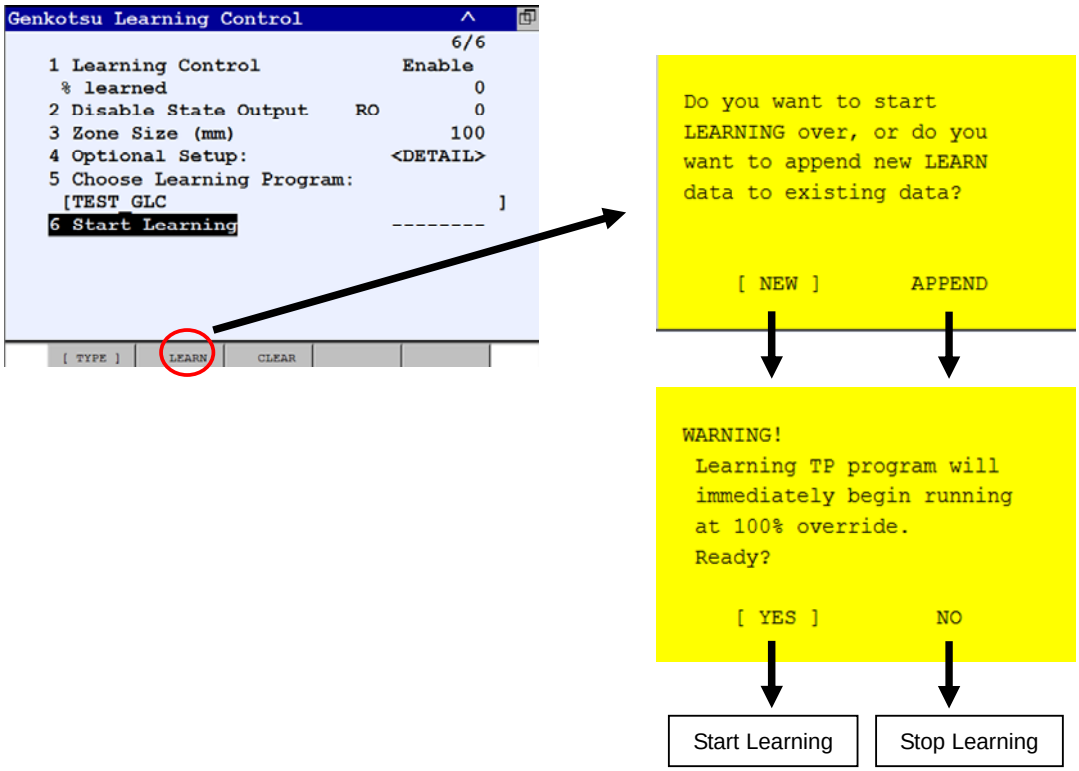
In the GLC setup menu, move the cursor to Item 5 “Choose Learning Program”, press F4 “CHOICE”. The list of TP programs will be displayed. Select a learning program.
In case of J945 *i*RPickTool options is loaded, learning program will be set to PK_MAIN1 automatically as default.



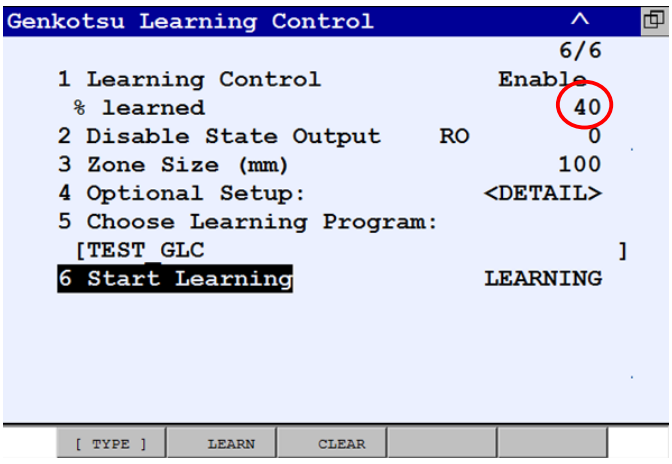
4.4.5 Start Learning

- Move the cursor to Item 6 “Start Learning”.
- Turn mode switch to AUTO mode and switch teach pendant off.
- Hold down the [SHIFT] key and press F2 “LEARN”, the message “Do you want to start LEARNING over, or do you want to append new LEARN data to existing data?” will be posted.
  - ➢ If you select NEW, Learned data will be cleared and start learning.
  - ➢ If you select APPEND, Learned data will be retained and start learning.
    - ✧ To retain learned data of A.TP after learning it then learn B.TP, please select APPEND.
    - ✧ If you have more than one recipe with different approach height or boundaries, you will want to append data.
    - ✧ When learned data increases, the use of memory and processing time of CPU will increase. If it is not necessary to retain learned data, please select NEW.
    - ✧ To relearn, select NEW.
- Then, a message “WARNING! Learning TP program will immediately begin running at 100% override. Ready?” will be displayed.
  - ➢ If you select YES, the TP program will be run automatically with 100% override to start learning.
  - ➢ If you select NO, learning will stop.

> ⚠ **WARNING**
> If you select YES, TP program will be run automatically with 100% override to start learning.
> Please confirm the surrounding safety then select it.



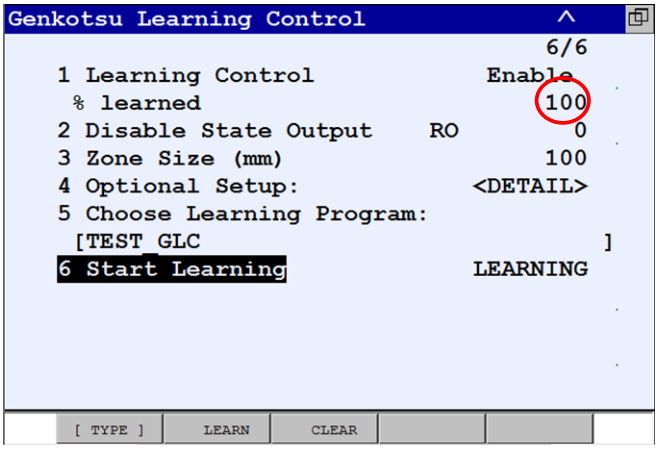
- During the learning process, the robot moves while upstream boundary is changed automatically.
- The learning percentage is 0-100%, and displayed in Item “% learned”.



4.4.6 Learning Completed

- If the learning percentage becomes 100%, it means learning is completed.
  After that, please halt or end TP program at any time.
- After halt or end program, learned data will be saved in F-ROM automatically.

NOTE
When the learning percentage is less than 100%, if you halt or end program, the Learned data will not be saved in F-ROM. In this case, if you restart controller, the Learned data will be lost.



4.4.7 Playback

- When TP program is running, GLC will control the speed of the learned motion within the speed that does not exceed the limitation of the robot mechanism.
- You can now run the parts at actual production rate. Because the learned motion speed has changed, you may need to adjust grip delays or time before values.
- When programs are executed in the following situations, learned motion will not be applied.
  - Override is less than100%
  - Single step
  - T1 mode
  - Backward mode

4.5 OTHER CONFIGURATIONS

The basic GLC procedure has been explained up to Section 4.4. Please follow the setting in this section if necessary.

- 4.5.1: When you would like to output signal while GLC is disabled.
- 4.5.2: When you would like to change learning zone size.
- 4.5.3: When the motion speed is too fast in playback so that the vibration will occur, or the grip of workpieces is not stable.
- 4.5.3: When overheat alarm occurs in playback.
- 4.5.3: When you checked that the alarm of "Joint load excess" does not occur.

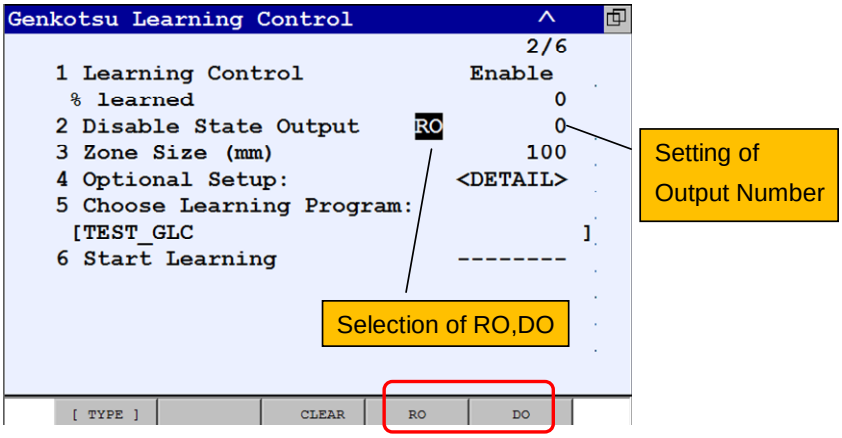
4.5.1 “Disable State Output” Item

When you use Item 2 “Disable State Output”, you can inform external units that GLC is disabled.

- When GLC is enabled, the disable state output turns off.
- When GLC is disabled, the disable state output turns on.

To use the “Disable State Output”, set as follows.

- Move the cursor to the output signal type (“DO” or “RO”) of “Disable State Out”, and select “DO” or “RO” by function key.
- Move the cursor to the number of “Disable State Output”, set the number of output signal. If you do not use signal, set the number as 0.

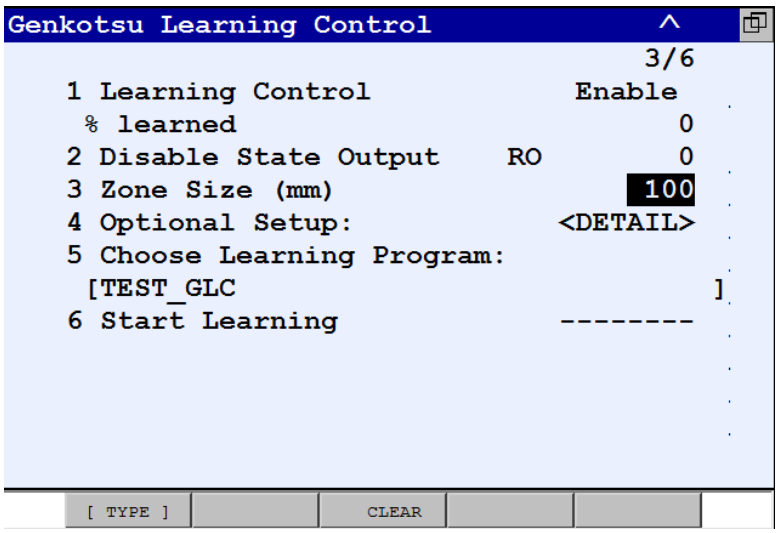


4.5.2 “Zone Size” Item

Set the zone size which is described in Chapter 3.

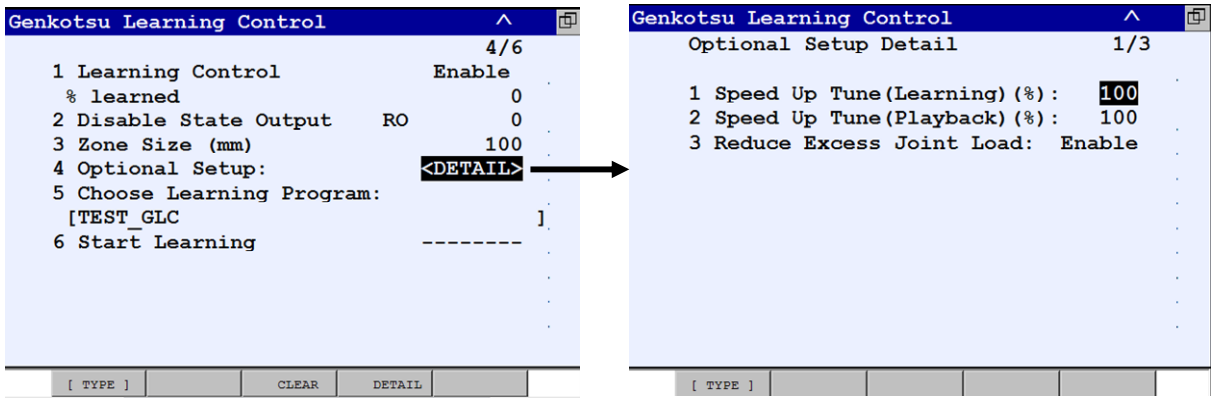
- Normally the default value is recommended.
- When the zone size is smaller, the learning accuracy considering limitations in robot mechanism will be improved. However, small zone sizes can exponentially increase the memory and the time required for learning.
- When the zone size becomes bigger, the memory and the time required for learning will reduce. However, learning accuracy considering limitations in robot mechanism will decrease and overload will more likely happen on some joints.

NOTE
To change zone size, it is necessary to clear the Learned data as the procedure in “4.7 clearing Learned data”.



4.5.3 Optional Setup

Move the cursor to “Optional Setup” and press ENTER to enter to the “Optional Setup Detail” screen. In the screen of “Optional Setup Detail”, speed up tune of learning and playback can be changed.



4.5.3.1 Speed up tune (learning)

"Speed Up Tune (Learning)" is the upper limit value of speed up tune during learning.
In the learning process, motion speeds up gradually. But it is possible that speedup of motion may cause an instable system which will miss workpieces in learning.
Please change the speed up tune in this situation.

Speed up tune can be set between 0-100%.
Motions will not speed up at 0%.
The upper limit of speed up tune is max at 100%.

- Setting Method
  - End TP program if it is during learning.
  - Change the value of "Speed Up Tune (Learning)" item between 0-100%, then learn again.

4.5.3.2 Speed up tune (playback)

"Speed Up Tune (Playback)" is the value of speed up tune during playback.
In order to decrease vibration and overheat, you can set the value of speed up tune smaller.
In this situation, please change the speed up tune (playback).

Speed up tune can be set between 0-100%.
It will not speed up at 0%.
The ratio of speed up tune is max at 100%.

- Setting Method
  - It can be set during playback.
  - Change the value of "Speed Up Tune (Playback)" item between 0-100%.

4.5.3.3 Reduce excess joint load

"Reduce Excess Joint Load" is the function to reduce the excessive load of robot joint.
This function learns the motion parameter to reduce the load to robot joint. So it is able to reduce the excessive load to robot joint and prevent a stop of the production by the alarm of "Joint load excess"

This function is enabled in the initial setting.

- When this function is enabled and learning start, the robot moves by about 80% of normal speed. If the robot cannot catch up with supply of the work, GLC may not learn the zones of upstream side. Therefore it is necessary to adjust the feed rate of the workpieces to become less than 80% of the default rate before learning.
- When this function is disabled and learning start, the robot moves by normal speed. When you checked that the alarm of "Joint load excess" does not occur. It is possible to change this function disable and start learning by default feed rate.

4.6 RE-LEARNING

The Learned data is valid only when the production conditions are similar to the learning conditions. GLC re-learning is necessary when the conditions of system are changed significantly.

Examples that require re-learning are:

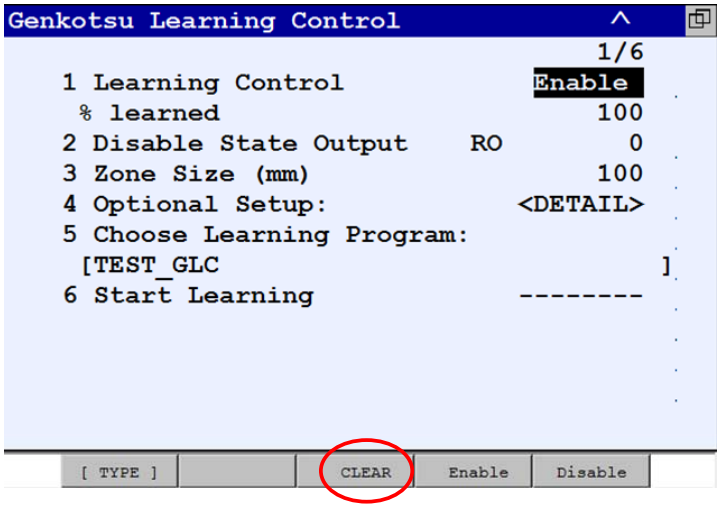
- Payload setting is changed.
- Tool coordinate system is changed.
- Motion of playback does not pass through learned zone, because of the change of tracking boundary and teaching position.
- Motion format of motion instruction, positioning type and/or teaching speed are changed.
- The conditions of AP_LD, RT_LD, WCLIN, FPLIN and WJNT added to motion instruction are changed.
- The zone size is changed.
- Different recipes may have different approach heights or tracking boundaries.

In these situations, please relearn.

4.7 CLEARING LEARNED DATA

Learned data can be cleared by Function F3 “CLEAR”.
When holding down [SHIFT] and press F3 “CLEAR”, the message “Previous learned data will be cleared, Are you sure?” will be posted. Select YES to clear it, select NO to keep it.

NOTE
If learned data has been cleared, learned motion cannot be played back.



5 GLC HANDLING

This chapter explains the general and the procedure to perform GLC Handling.
Please refer to Chapter 4 for the instruction of GLC *i*RPick

5.1 LEARNING MOTION

GLC Handling specifies the work area of vision in the setting menu.

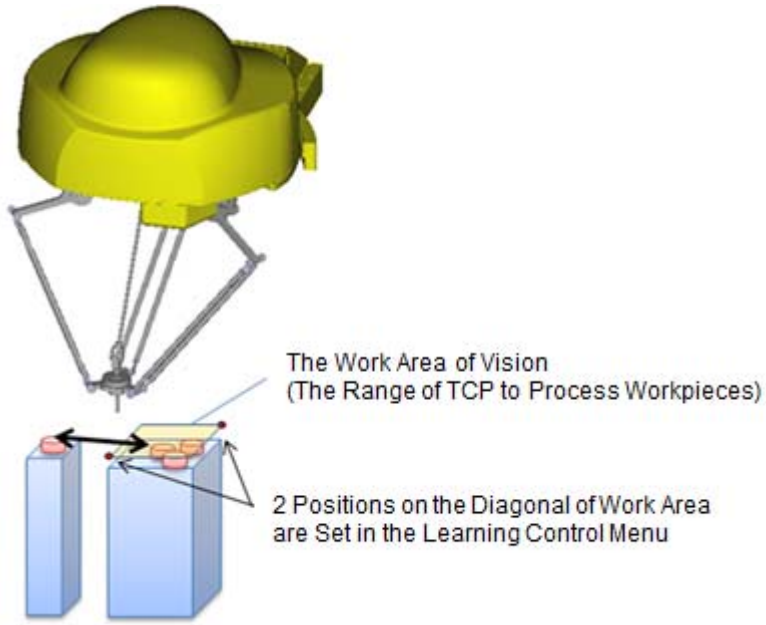
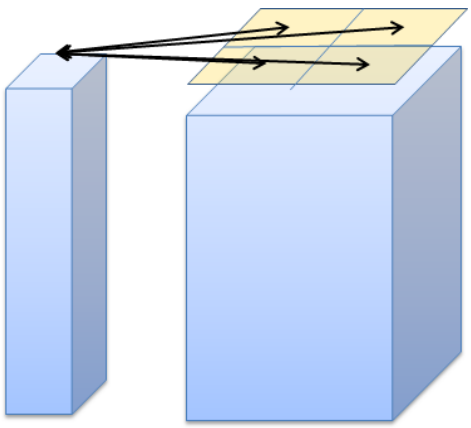


Fig. 5.1 Work Area of Vision

Based on the motion information recorded by this setting and motion analysis,

- Moving motions are generated in each zone divided from work area.



In the learning process, executing the automatically generated motions can cover motions of various patterns without workpieces (i.e., do not depend on workpieces) to learn.

5.2 LIMITATIONS

- Not available for system of 2 groups or more.
- Not for multiple picking.
- Work area should be in the xy plane.
- Only support 2D vision.
- It does not support 2 or more offset instructions (Vision offset, position offset, tool offset) taught in the motion instruction of pick/place. This limitation is not related to approach motion.
- It does not support incremental command or palletizing command.
- It does not support vision supporting tool Karel of OFS_RJ3.PC, MERGE3D2.PC, STVS1.PC, ADJ_OFS.PC.
- It does not support position offset instruction, tool offset instruction and vision offset instruction.
- As for the common limitations in each learning method, refer to Subsection 2.2.3.

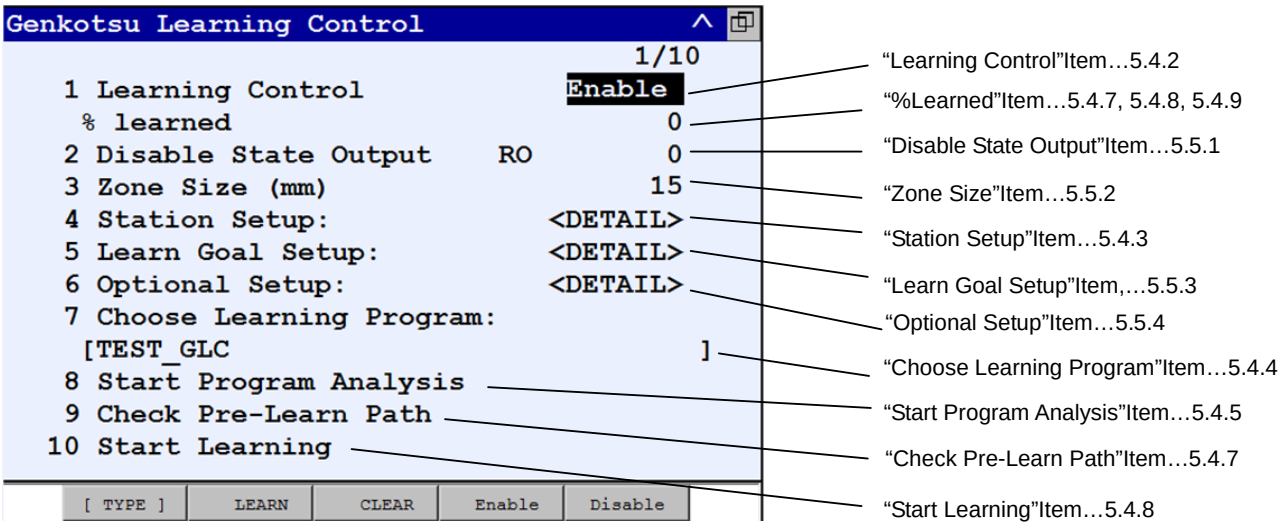
5.3 GLC SETUP MENU

GLC Setup and learning are operated in the setup menu of this function.
To display the GLC setup menu, follow the following procedure.

1 Press the [MENU] key to display the menu.
2 Select 6 “Setup”.
3 Press F1 “TYPE” to display the screen and select “Learning”.
4 The GLC setup menu is displayed.

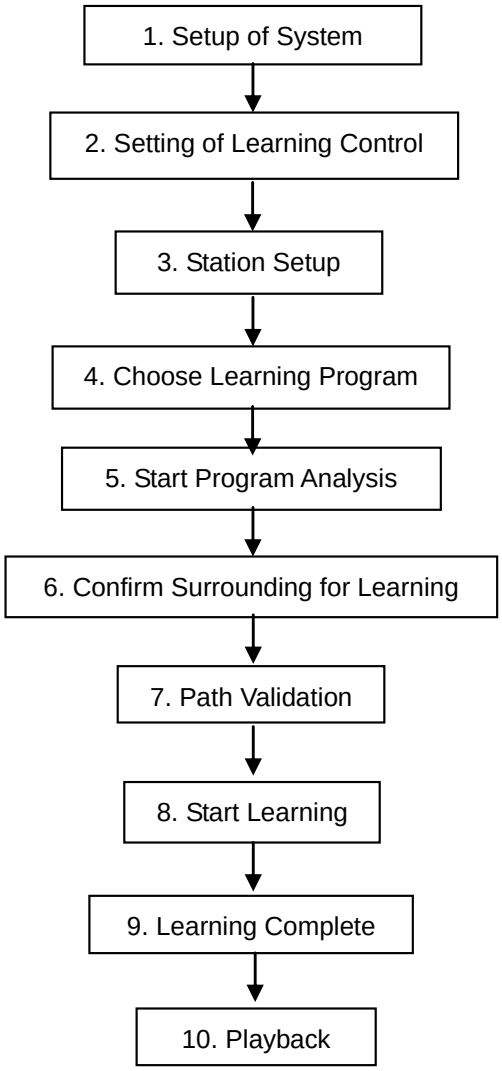
Items in setup menu and corresponding content in this chapter are shown in the following figure.

- Items in basic learning procedure will be explained in Section 5.4.
- As for other items, please refer to Section 5.5.



5.4 LEARNING PROCEDURE

The basic procedure of GLC Handling is explained as in the following flowchart.



5.4.1 Setup of System

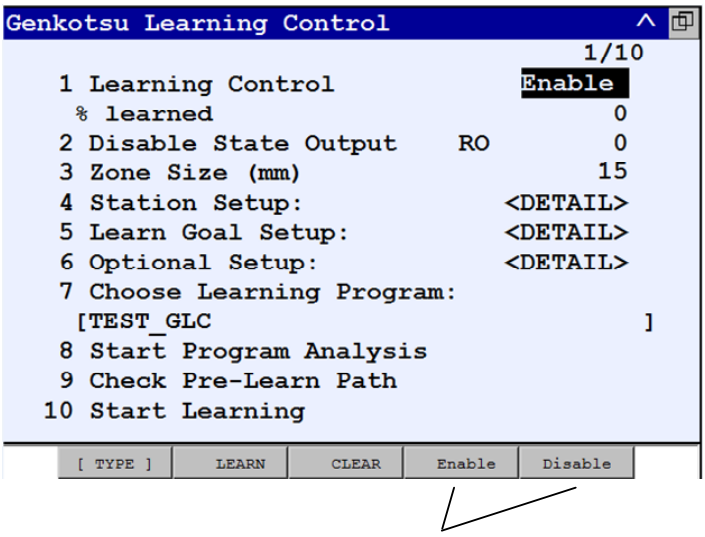
Teach TP programs for learning to complete the setup of robot system.

NOTE

- At the program analysis of Section 5.4.5, GLC recognizes the relationship between vision offset motion and the work area. For this recognition, please set “FINE or CNT less than 5“ to the Pick/Place motions which move to vision detected position. And set “CNT more than 6“ to the approach/retract motions.
- In order to execute learning TP programs without using workpieces, when wait instruction and condition instruction are related to gripping workpieces, comment out them and then execute the TP programs. After learning, these gripping related wait instruction and condition instruction can be used.

5.4.2 Learning Control

In the GLC setup menu, enable Item 1 “Learning Control”.
In order to change setting Enable/Disable, move the cursor to the item, and press function key to select “Enable” or “Disable”.



Function Key to Enable/Disable “Learning Control”

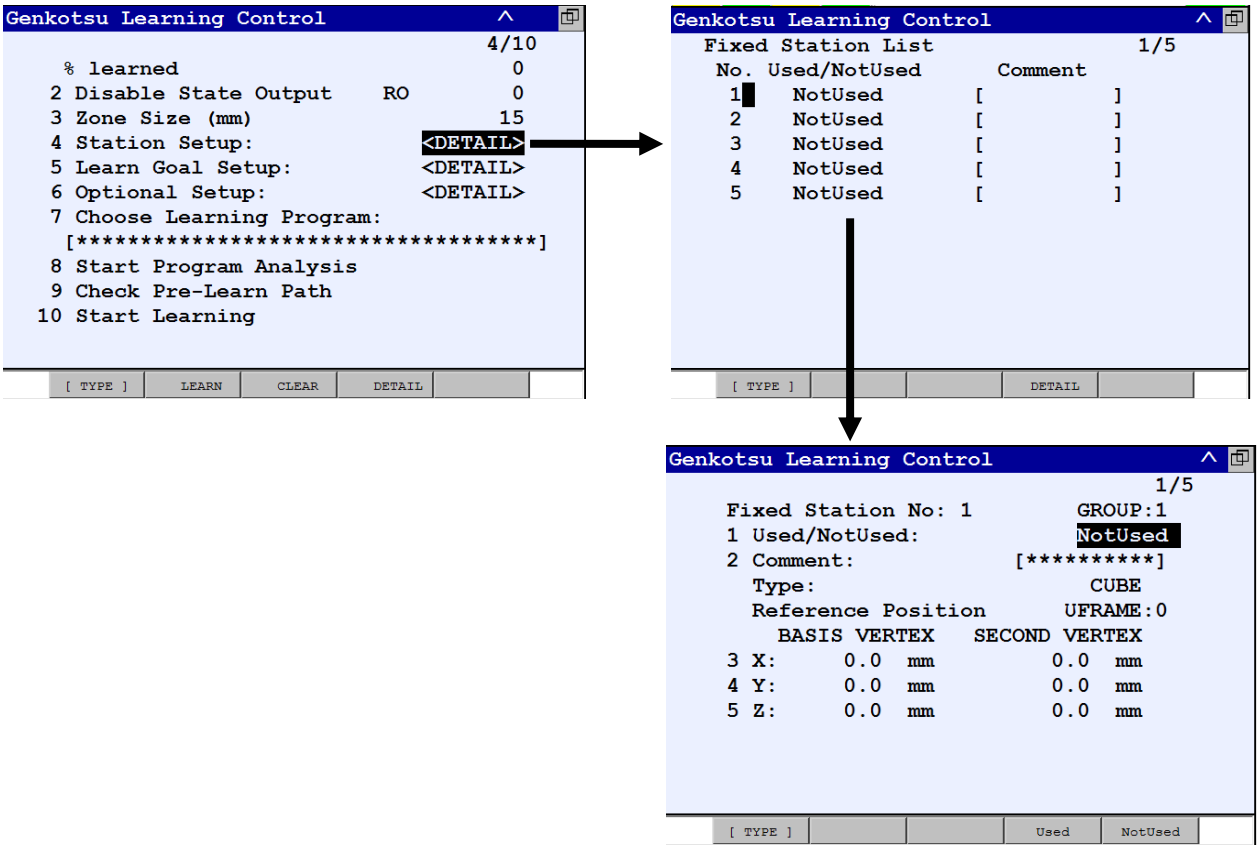
NOTE

- When this item is set to “Enable”, the GLC function is enabled. Learning and speeding up of learned motion can be executed.
- When this item is set to “Disable”, the GLC function is disabled. Normal motion is performed without using the learned data.
- In the following situations, GLC cannot be set to “Enable”.
  - ➢ When the capacity of D-RAM is not enough to execute this function,
    - ✧ Alarm “MOTN-573” may occur at power-up.
      As for the “MOTN-573”, please refer to Appendix A.
  - ➢ When the configuration of system is not supported. (Refer to Chapter 2)

5.4.3 Station Setup

Configure work area (Station Setup) using vision.

- Move the cursor to “DETAIL” of item 4 “Station Setup” in the main screen of GLC, and press F4 “DETAIL”, fixed station list will be displayed.
  Fixed station can be set as most of 5. Move to the number you would like to set, and press F4 “DETAIL”, the fixed station setup screen will be displayed.



- Input as follows in the fixed station setup screen.
  - 1 Select F4 “USED” to enable this fixed station and F5 “NotUsed” to disable this fixed station.
  - 2 Input comments related to work station.
  - Items 3-5 about reference point are to input the position in the world coordinate system of 2 diagonals in the work station. Use one of the following methods to input.
    - Input directly numerical value.
    - Move robot to the 2 diagonal points by jog, hold down [SHIFT] and press F5 “Record” to teach the position (as shown in the fig. 5.1).

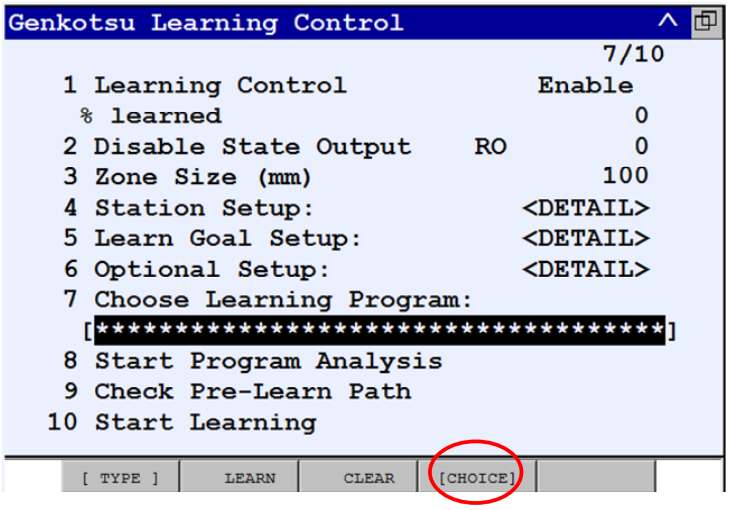
NOTE

For the motion (like picking) that sets the object detected by vision as the target position, the work station needs to be specified to include the target position. The specified work station does not need to include the passing position of approach motion.

5.4.4 Choose Learning Program

Setup robot and prepare for TP learning programs of learning object.

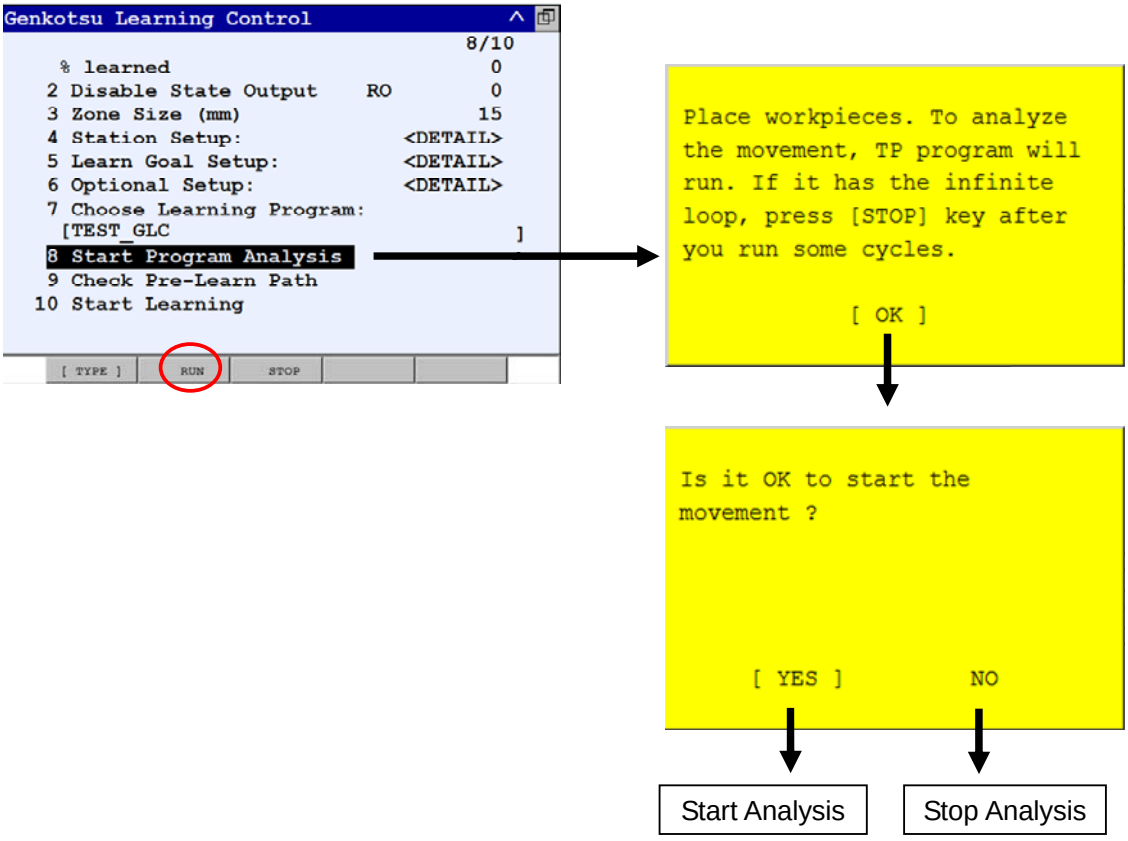
- Press the [PREV] key twice to return to learning control menu.
- Move the cursor to Item 7 “Choose Learning Program”, and press F4 “CHOICE”. TP program list is displayed. Choose a program to learn.



5.4.5 Start Program Analysis

Execute the TP program to be learned to analyze the motions to learn.
* This operation can be executed in all T1, T2 and AUTO mode.

- Put the work piece in work area.
- Move the cursor to Item 8 “Start Program Analysis”,
  Hold down [SHIFT] and press F2 “RUN”.
  “Place workpieces.” message will be posted.
  After confirming workpieces have been placed, press OK.
- To be continued,
  dialog box “Is it OK to start the movement?” will be posted.
  - ➢ Select YES, learning TP programs will be executed automatically.
    Now, GLC recognizes learning motion and work area of vision.
  - ➢ Select NO means stop motion analysis.



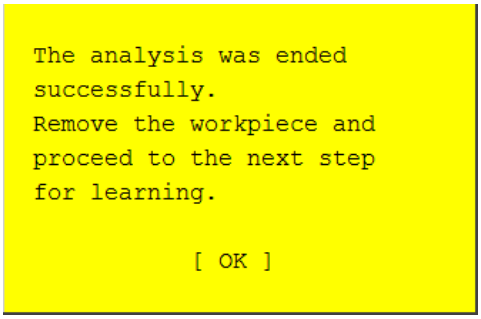
⚠ WARNING
Select YES, robot will start to move.
Please confirm the surrounding safety before selecting.

NOTE
At the program analysis, if the Pick/Place motions with vision offset move outside of the stations set in Section 5.4.3, or the same motion moves to 2 or more stations, the analysis failure will occur.

- When TP program has looping process, press F3 “STOP” after several loops.
  Pressing F3 “STOP” is not necessary when TP program is not looping.

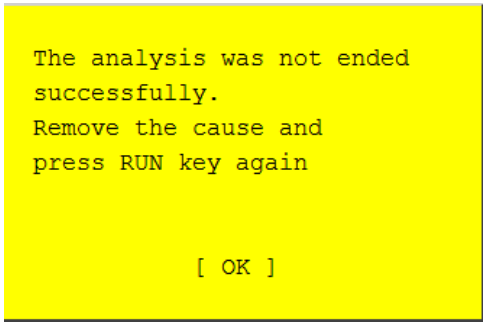
NOTE
When TP program pauses in the motion analysis, motion analysis will be stopped.

- After TP program stopped, if motion analysis is completed successfully, the following message will be posted. Select OK and remove workpiece.



NOTE

- If motion analysis is not completed normally, the following dialog box will be displayed.



Alarm will be displayed at this time, refer to the countermeasures of alarm in Appendix A, eliminate the cause and restart motion analysis.

- If you change the fixed station after motion analysis is completed normally, you need to execute motion analysis again.

⚠ CAUTION

In the motion analysis, learning TP program is generated automatically based on the result of motion analysis, and learning process uses this learning TP program to learn. So if you revise the original TP program to be learned, you need to execute motion analysis again to generate learning TP program.

5.4.6 Confirming Surrounding for Learning

- The following learning process does not use workpiece to learn. Now, make sure that tool such as gripper hand is not gripping the workpiece. And make sure that there are no workpieces in the motion area.
- In the learning process described in Section 5.1, the robot motions cover various transfer moves in the specified area. So make sure that there is no obstacle on the passing path to each station.

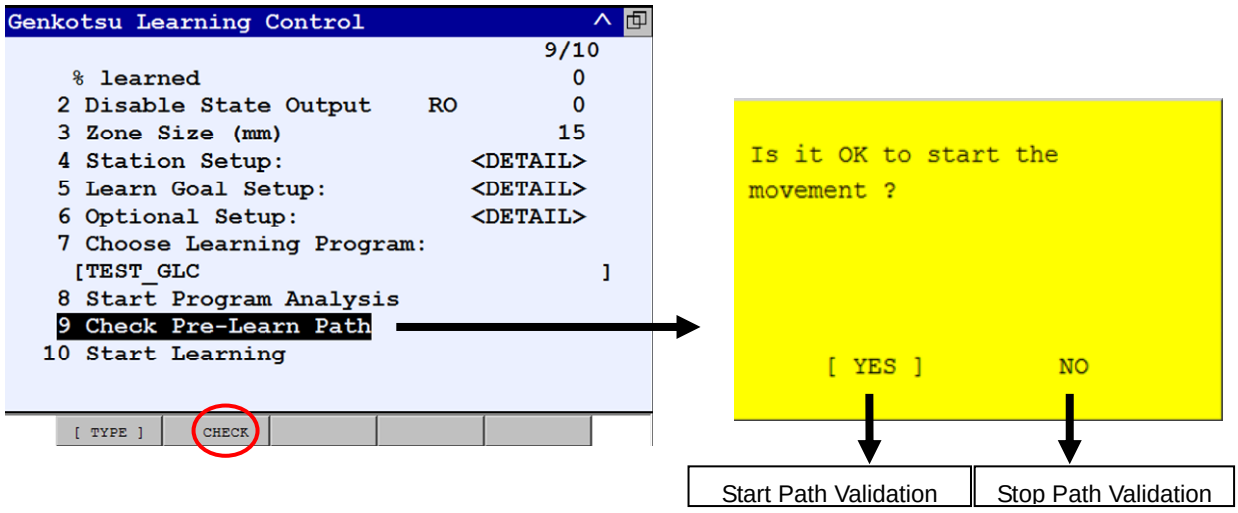
NOTE

By GLC path validation in Section 5.4.7, the learning path can be confirmed with 5% override.

5.4.7 GLC Path Validation

Pre-Learn Path is a function which validates the learning path at low speed to confirm whether configuration is correct and free of collision.

- Move the cursor to “Pre-Learn Path Check” Item.
- Change switch to AUTO mode, and disable teach pendant.
- Hold down [SHIFT] and press F2 “CHECK”,
  The dialog box “Is it OK to start the movement?” will be displayed.
  Select YES, learning motion will be executed with 5% override.
  *As for the learning motion, please refer to Section 5.1.
- While GLC path validation is in progress, the value of “% learned” item is increasing.
  When “% learned” becomes to 100%, validation is completed, APSH-100 “GLC Validation Complete” will be posted.
  Then, “% learned” will be reset to 0%.

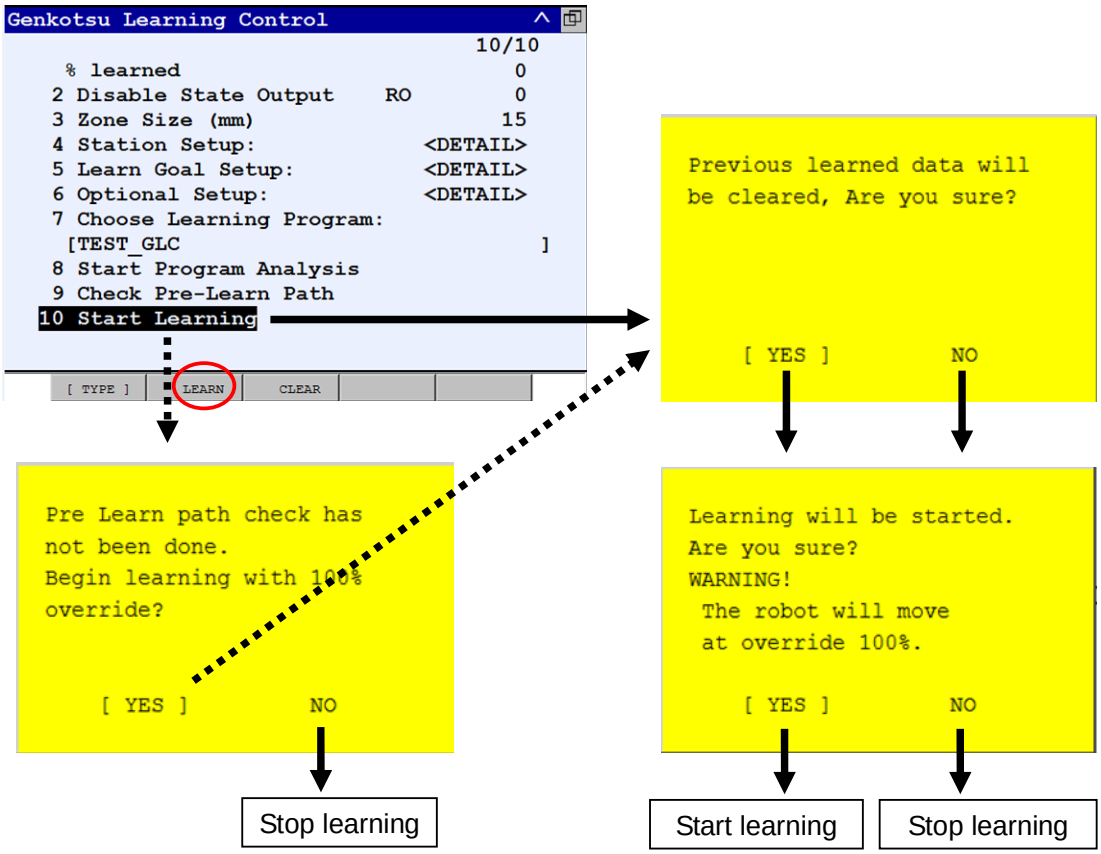


⚠ WARNING

- Hold down [SHIFT] and press F2 “CHECK”, robot will start to move with 5% override.
  Confirm the surrounding safety, then press F2 “CHECK”.
- During GLC path validation, when it seems to collide with obstacles, press HOLD or emergency stop button to stop robot.

5.4.8 Start Learning

- Move the cursor to Item 10 “Start Learning”.
- Switch to AUTO mode, and disable teach pendant.
- Hold down [SHIFT], and press F2 “LEARN”, dialog box will be displayed as follows.
  - ➢ If Check Pre-Learn Path is not completed,
    dialog box “Pre Learn Path check has not been done. Begin learning with 100% override?” will be displayed at first.
    - ✧ When Pre-Learn Path Check is completed, this dialog box will not be displayed and will go to next step.
    - ✧ Select YES to go to next confirmation. (Not recommended)
      * YES is not recommended. It is recommended to execute Pre-Learn Path Check in advance.
    - ✧ Select NO to stop learning. (Recommended)
  - ➢ Dialog box “previous learned data will be cleared, are you sure?” will be displayed.
    - ✧ Select YES, Learned data will be cleared and then start learning.
    - ✧ Select NO, learned data will be retained and then start learning.
      - To learn B.TP after completing learning A.TP, select NO.
      - As learned data increases, the use of memory and the processing time of CPU will increase. Select YES if it does not need to keep learned data.
  - ➢ Then, Dialog box “Learning will be started. Are you sure?” will be displayed.
    - ✧ If you select YES, learning TP program will be executed with 100% override to start learning.
    - ✧ If you select NO, learning will stop.



⚠ WARNING

- Learning TP program will be executed with 100% override when you select YES Confirm the surrounding safety and then select it.
- During learning, robot repeats motion between stop and restart. Do not approach robot workspace even if robot stops.

⚠ CAUTION

Do not disable “Learning Control” during learning.

- During learning, pick/place position changes automatically when robot moves.
- The learning progress is 0-100% displayed in “% learned” item.
- When it is necessary to stop program during learning, you can stop it by “ABORT (ALL)” in the function menu.

NOTE

Learning cannot restart from where learning process is interrupted during learning. Please execute from the beginning of learning process.

5.4.9 Learning Complete

- Learning is completed when learning process becomes 100%.
- Learned data is saved in F-ROM when robot stops.

NOTE

Learned data will not be saved in F-ROM, when learning is interrupted before learning process becomes 100%. Learned data will be lost when rebooting controller before learning is completed.

5.4.10 Playback

- When TP program is executed, learned motion will speed up while respecting the limitations of mechanism.
- Because of the speedup motion, please adjust the supply of workpieces, the speed of conveyor, and the timing to grip workpieces as needed.
- When programs are executed in following situations, learned motion will not be speeded up.
  - Override is less than100%
  - Single step
  - T1 mode
  - Backward mode

5.5 OTHER CONFIGURATIONS

Basic GLC procedure is explained up to Section 5.4. In this section, adjust the settings according to your goal of learning and so on.

- 5.5.1: When you would like to output signal while GLC is disabled.
- 5.5.2: When you would like to change learning zone size.
- 5.5.3: When the motion speed is too fast in playback so that vibration occurs, or the grip of workpieces is not stable
- 5.5.3: When overheat alarm occurs in playback.
- 5.5.4: When you would like to learn at various postures.

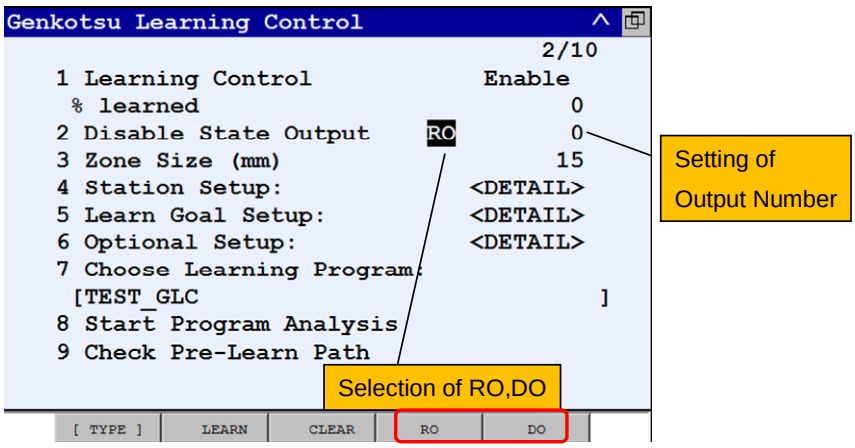
5.5.1 "Disable State Output" Item

When you use Item 2 "Disable State Output", you can inform external unit that GLC is disabled.

- When GLC is enabled, the disable state output turns off.
- When GLC is disabled, the disable state output turns on.

Before using the "Disable State Output", set as follows.

- Move the cursor to the output signal type ("DO" or "RO") of "Disable State Out", and select "DO" or "RO" by function key.
- Move the cursor to the number of "Disable State Output", set the number of output signal. If you do not use signal, set the number as 0.

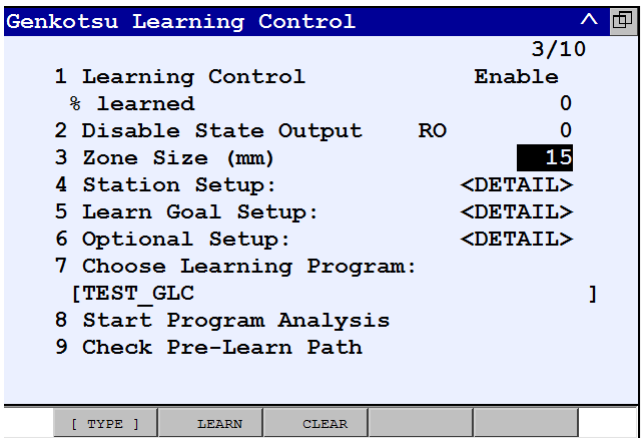


5.5.2 “Zone Size” Item

Set zone size as described in Chapter 3.

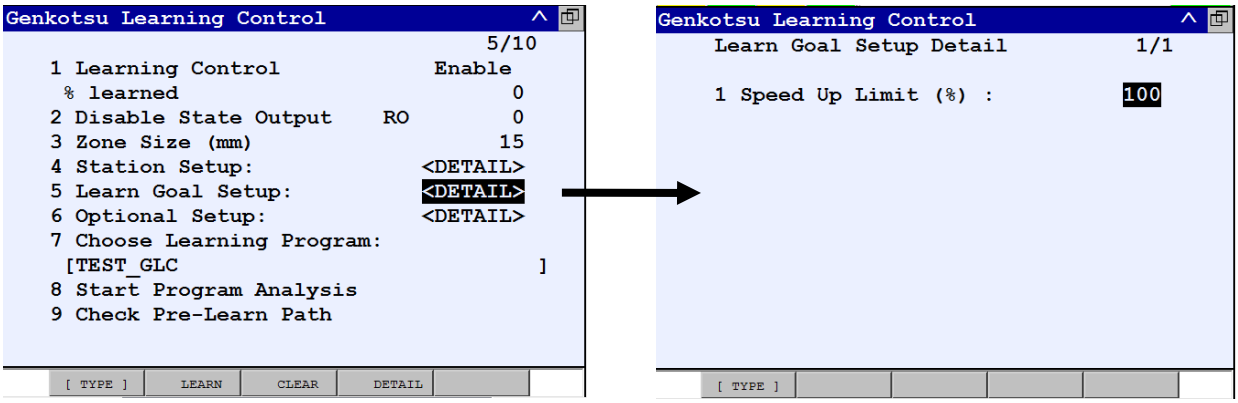
- Normally the default value is recommended.
- Speedup performance can be better when zone size is smaller, since it can improve learning accuracy when limitations in mechanism of robot are taken into account. However, small zone sizes can exponentially increase the memory and the time required for learning.
- When zone size becomes bigger, the memory and the time required for learning will reduce. However, since the performance of learning motion becomes worse, learning accuracy considering limitations in robot mechanism will decrease and overload will more likely happen on some joints.

NOTE
Before changing zone size, clearing the learned data following the procedure in “5.7 clearing learned data” is necessary.



5.5.3 Learn Goal Setup

Move the cursor to “Learn Goal Setup” in leaning control menu and press ENTER to enter “Learn Goal Setup Detail”, and set the speed up tune during learning.



NOTE
When the parameter is changed, re-learning is necessary.

5.5.3.1 Speed up limit

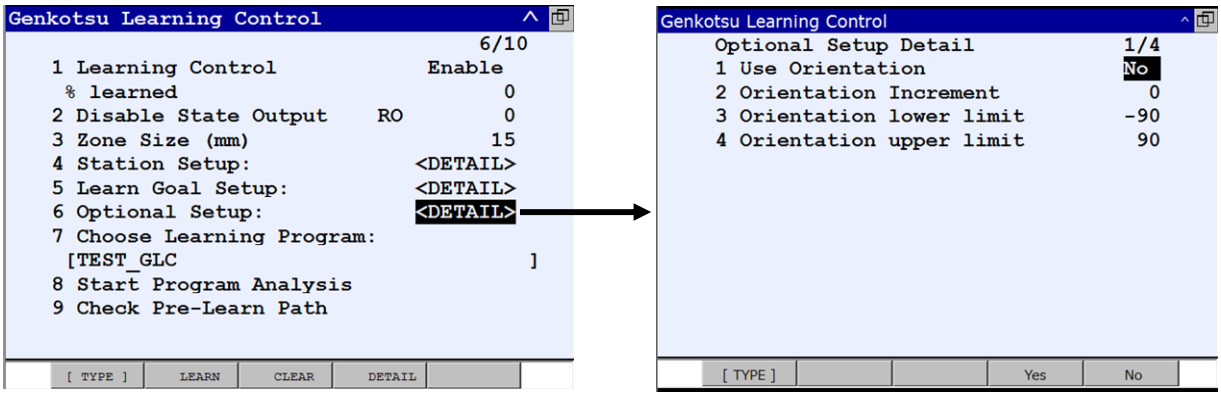
"Speed Up Limit" is the upper limit value of speed up tune during learning.
The speedup of motion may cause an instable system which may miss workpieces in learning.
Please decrease the speed up limit and relearn in this situation.

Speed up limit can be set in a range between 0-100%.
Motion will not speed up at 0%, i.e., motion speed is the same as that of 100% override.
The speed up limit is max at 100%.

- Setting Method
  - End TP program if it is during learning.
  - Change the value of "Speed Up Limit" item in a range between 0-100%, then learn again.

5.5.4 Optional Setup

In "Optional Setup" item, details of optional setup can be changed.
Move the cursor to "DETAIL", and press ENTER, The GLC Optional Setup Detail menu is displayed.
You can execute learning in default values without changing these settings.



NOTE
These parameters have effect only if they are changed before beginning the learning process.

5.5.4.1 "Use Orientation" item

In the "Use Orientation" item, it can select whether changing multiple orientations to learn.

When "Use Orientation" is "No", execute learning only in taught orientation. In this case, "Orientation Increment", "Orientation lower limit" and "Orientation upper limit" are not used during learning.

When "Use Orientation" is "Yes", orientation will be offset by "Orientation Increment" from "Orientation lower limit" to "Orientation upper limit" to learn based on taught orientation. So comparing to the case where "Use Orientation" is "No", the time for learning is longer when "Use Orientation" is "Yes".

Default is "No". Most users do not need to consider orientation changes. "Yes" should be used when orientation change affects robot motion significantly. For example:

- When inertia of payload becomes bigger, the orientation should change more.
- When TCP is far away from the center of flange and orientation needs to change significantly.

To change "Use Orientation", move the cursor to "Use Orientation", select "Yes" or "No" by function keys,

5.5.4.2 "Increment" item

- Unit is Degree.
- Default is 0 deg.
- 0 deg. is the same as the case "Use Orientation" is "No".

5.5.4.3 "Orientation Lower Limit" item

- Unit is Degree.
- Default is -90 deg.
- Lower limit should be less than upper limit.

5.5.4.4 "Orientation Upper Limit" item

- Unit is Degree.
- Default is 90 deg.
- Lower limit should be less than upper limit.

5.6 RE-LEARNING

The GLC learned data is valid when the production conditions are similar to the learning conditions.
GLC re-learning is necessary when the conditions of the work system are changed significantly.

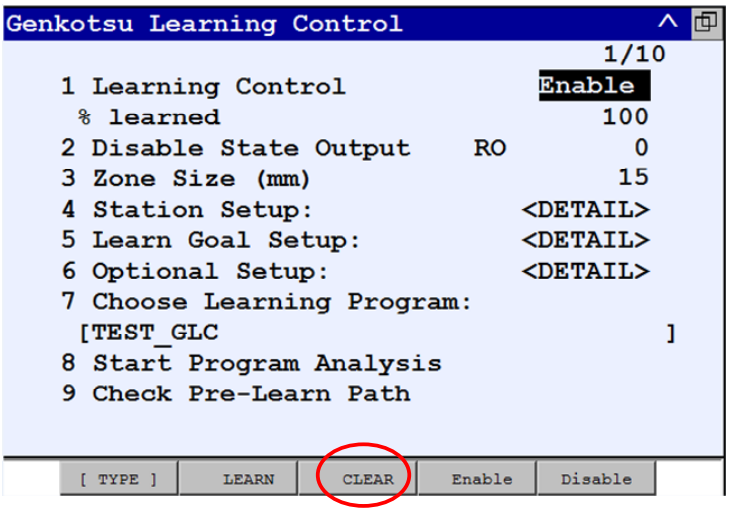
Examples of changes that could require re-learning include:

- Payload setting is changed
- Tool coordinate system is changed.
- Motion of playback does not go through learned zone, because of modification of tracking area or teaching position.
- Motion type, poisoning type, and teaching speed in motion instruction are changed.
- The condition of AP_LD, RT_LD, WCLIN, FPLIN and WJNT added to motion instruction is changed.
- Zone Size is changed.

5.7 CLEARING LEARNED DATA

Learned data can be cleared by Function F3 “CLEAR”.
When Holding down [SHIFT] and press F3 “CLEAR”, dialog box “Previous learned data will be cleared, Are you sure?” will be posted. Select YES to clear it, select NO to keep it.

NOTE
If learned data has been cleared, motion cannot speed up by playback until learning again.



APPENDIX

A ALARM CODES

This chapter contains warnings and alarms that may occur while using GLC.

ATTENTION

When an alarm occurs, saving Diagnostic log is recommended. It is useful for investigating some abnormal status or issues. Please send the saved Diagnostic log to FANUC. More information about saving Diagnostic log, please refer to R-30*i*B/R-30*i*B Mate OPERATOR'S MANUAL (Basic Operation) (B-83284EN) Appendix D.

MOTN-522 STOP.G Joint load excess (G%dJ%dL%d %s)

Cause: Load applied to the joint exceeds threshold. The payload setting may not be correct, or the value of motion load command ACC is too large. (G%dJ%dL%d %s) shows (group number, joint number, line number, program name).

Remedy: Verify payload setting is correct. Set it correctly. If the setting is correct, reduce acceleration (ACC) of the motion that generated this warming.

MOTN-568 WARN GLC Moved out of station (%s, %d)

Cause: Motion “FINE or CNT below 5”which treats object detected by vision as target position cannot get into the motion area set in GLC fixed station setup menu. (%s, %d) shows (program name, ID of causes).

Remedy: Set the motion “FINE or CNT below 5”which treats object detected by vision as target position into the motion area set in GLC fixed station setup menu.

MOTN-569 WARN GLC Stn%d,Stn%d are overlapped

Cause: 2 motion areas set in the GLC fixed station setup menu are overlapped.

Remedy: Set the motion areas not to be overlapped.

MOTN-573 STOP.G GLC out of DRAM memory (Id%d)

Cause: Failed in getting area for learned data from D-RAM. ID shows the type of area for learned data.

Remedy:
1. Confirm that D-RAM is 64MB or more. 64MB or more is necessary in this function.
2. If MOTN-527 is displayed with a 64MB D-RAM available, too many options may be installed in that system. In that situation, in order to use this function, solution like selecting a 128MB D-RAM is necessary.

MOTN-574 STOP.G GLC This isn't allowed (L%d,Id%d)

Cause: A command that cannot be executed at the same time with GLC is taught. L is line number, Id is the ID of the command you would like to execute as the same time as learning.

Remedy: Disable GLC or delete the command that cannot be executed with GLC at the same time. As for the ID number refer to the table following.

ID	Command
1	Synchronization functions with external timer.

MOTN-575 STOP.G GLC Memory Full (Id%x)

Cause: If much motion data is recorded in the learning, the area used for learned data in D-RAM is reduced. ID shows the type of area for learned data.

Remedy: Set zone size bigger, or set the learning area smaller using the following method.
GLC *i*RPick: Set the distance between upstream boundary and discard line of tracking smaller during learning.
GLC Handling: Set specified area smaller in the fixed station setup of GLC.

MOTN-576 STOP.G GLC System error (Id%d)

Cause: System configuration is not supported in GLC or errors occurred in the learning process. ID shows the cause.

Remedy: Please contact your local FANUC representative.

ID	Causes
4,12,23	System and robot are not supported.

MOTN-577 WARN GLC Not stop in station No%d

Cause: The motion "FINE or CNT below 5" which treats object detected by vision as target position, did not enter to the motion area set in GLC fixed station setup menu.

Remedy: Disable the motion areas which are enabled but not in use.
Set the motion area in GLC fixed station setup menu to contain the motion "FINE or CNT below 5" which treats object detected by vision as target position.

MOTN-578 WARN GLC Analysis error (Id%d)

Cause: Failed in motion analysis. ID shows the cause.

Remedy: When MOTN-568,569,577 occurred before this alarm, take countermeasures according to those alarms.

MOTN-579 WARN GLC Unsupported command (%s, %d, %d)

Cause: Teaching is not supported in GLC handling. (%s, %d, %d) shows (program name, line number, ID of causes).

Remedy: Find the cause according to the following table and solve accordingly.

ID	Causes
1	There are too many position offset, tool offset and vision offset commands in a line.
2	The position is taught by position registers, and the values of position registers are the result of vision detection.
4	The type of positioning is neither FINE nor CNT.
5	Incremental command is used.
6	The type of vision offset is neither position offset nor gripping offset.
7	Palletizing command is used.
8	Position offset condition command is used.
9	Tool offset condition command is used.
10	Vision offset condition command is used.
11	Call of OFS_RJ3.PC exists.
12	Call of MERGE3D2.PC exists.
13	Call of STVS1.PC exists.
14	Call of ADJ_OFS.PC exists.
15	Type of position register is neither matrix type nor linear type.
16	Type of teaching position is neither linear type nor joint type.

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REVISION RECORD

Edition	Date	Contents
02	Mar., 2017	• Addition of R-30*i*B Plus Controller. • 4.5.3.3 Add the description of new function. • The description of the learning method has been modified. • Some errors in writing have been corrected.
01	Feb., 2016	

B-83764EN/02