LOCTITE®

EQUIPMENT OPERATION MANUAL

LOCTITE® SCARA-N ROBOT

S440N Series

Maintenance

Thank you for purchasing this Loctite® SCARA-N Robot.

- **Read this manual thoroughly in order to properly use this robot.**
  Be sure to read "For Your Safety" before you use the robot. It will protect you from possible dangers during operation.

- After having read this manual, keep it in a handy place so that you or the operator can refer to it whenever necessary.

FOR YOUR SAFETY

Safety Precautions

The precautions in this manual are provided for the customer to make the best use of this product safely, and to provide preventive measures against injury to the customer or damage to property.

・・・・・ **Be sure to follow the instructions**・・・・・

Various symbols are used in this manual. Please read the following explanations of what each symbol stands for.

- **Symbols Indicating the Degree of Damage or Danger**

  The following symbols indicate the degree of damage or danger which may be incurred if you neglect the safety notes.

Warnings	These “Warnings” indicate the possibility of death or serious injury.
Cautions	These “Cautions” indicate the possibility of accidental injury or damage to property.

- **Symbols Indicating Type of Danger and Preventive Measures**

  The following symbols indicate the type of safety measure that should be taken.

	Indicates the type of safety measure that should be taken.
	Take care. (General caution)
	Indicates prohibition.
	Never do this. (General prohibition)
	Do not disassemble, modify or repair.
	Do not touch. (Contact prohibition)
	Indicates necessity.
	Be sure to follow instructions.
	Be sure to unplug power cord from wall outlet.
	Be sure to check grounding.

FOR YOUR SAFETY

⚠ Warnings

Be sure to unplug the power cord from the wall outlet if the robot will remain unused for long periods of time. Gathered dust could lead to fire.
Be sure to shut off the power supply before removing the power cord.

Keep the emergency stop switch within reach of an operator while teaching or running the robot.
Failure to do so may cause danger since the robot cannot be stopped immediately and safely.

Regularly check that the I/O-S circuits and emergency stop switch work properly.
Failure to do so may cause danger since the robot cannot be stopped immediately and safely.

Check the mounting screws regularly so that they are always firmly tightened.
Loose screws may cause injury or breakdown.

Power the unit only with the rated voltage.
Excessive voltage can cause fire or malfunction of the unit.

Do not sprinkle water or oil on the robot, operation box, or power cord.
Contact with water or oil can cause electric shock, fire, or malfunction of the unit. IP Protection Rating is “IP20.”

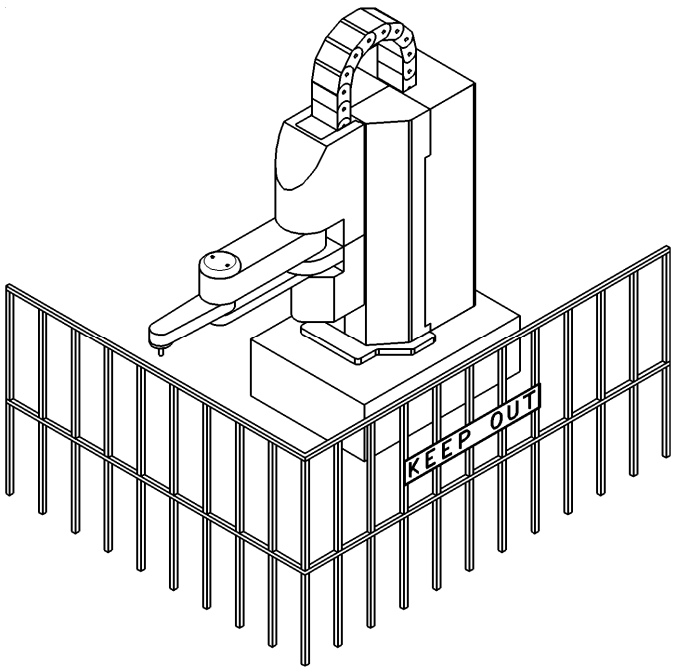
FOR YOUR SAFETY

■ INSTALLATION ■

⚠ Warnings

Always use a safety barrier.
A person entering the robot's maximum operating range may be injured. **Install an interlock that triggers an emergency stop when the gate is opened at the entry gate of the safety barrier, using the I/O-S connector included in package.** Ensure there is no other way of entering the restricted area. Furthermore, **put up a "No Entry" or "No Operating" warning sign** in a clearly visible position.

Example



Install a safety barrier of adequate strength so as to protect the operator from moving tools and flying objects.
Always use protective wear (helmet, protective gloves, protective glasses, and protective footwear) when going inside the safety barrier.

Take adequate precautions against objects the robot is gripping, flying or falling off **taking into account the object's size, weight, temperature and chemical composition.**

FOR YOUR SAFETY

⚠ Warnings

Confirm that the robot is properly grounded before use.
Insufficient grounding can cause electric shock, fire, malfunction, or breakdown.

Plug the power cord into the wall outlet firmly.
Incomplete insertion into the wall outlet makes the plug hot and can cause fire.
Check that the plug is not covered with dust.
Be sure to shut off the power supply before connecting the power cord to the robot.

Install the robot in a place which can endure its weight and conditions while running.
Placing the unit in an insufficient or unstable surface may cause the unit to fall, overturn, or breakdown. This could result in operator injury.

Do not block the air intake on the lower part of the back of the robot (18mm above the floor.) This may cause overheating or fire.

Do not attempt to disassemble or modify the robot.
This may lead to electric shocks or fire.

Be sure to use within the voltage range indicated on the unit.
Failure to do so may cause electric shock or fire.

Do not use the unit where flammable or corrosive gas is present.
Leaked gas accumulated around the unit can cause fire or explosion.

Place the unit in a well-ventilated area for the health and safety of the operator.

Turn off the unit before inserting and removing cables.
Failure to do so may result in electric shock, fire, or malfunction of the unit.

FOR YOUR SAFETY

⚠ Warnings

Be sure to confirm that all the air tubes are connected correctly and firmly.

Use the robot in an environment between 0 to 40 degrees centigrade with a humidity of 20 to 90 percent without condensation.
Failure to do so may result in malfunction. IP Protection Rating is “IP20.”

Use the robot in an environment where no electric noise is present.
Failure to do so may result in malfunction or breakdown.

Be sure to secure the movable parts of the robot before transportation.
Failure to do so may result in injury or breakdown.

Do not bump or jar the unit while it is being transported or installed.
This can cause breakdown.

Use the robot in an environment where it is not exposed to direct sunlight.
Direct sunlight may cause malfunction or breakdown.

Be sure to confirm that tools such as the electric screwdriver unit, etc. are properly connected.
Failure to do so may result in injury or breakdown.

Be sure to check the wiring to the main unit.
Improper wiring may result in malfunction or breakdown.

Keep the emergency stop switch within reach of an operator.
Failure to do so may cause danger since the robot cannot be stopped immediately and safely.

Be sure to shut off the power supply before plugging in the power cord.

FOR YOUR SAFETY

⚠ Cautions

Place the operation box on a flat surface more than 80 cm above the floor so that it is easier to operate it.

Use the unit in an environment that is not dusty or damp.
Dust and dampness may lead to breakdown or malfunction.
IP Protection Rating is “IP20.”

FOR YOUR SAFETY

■ WORKING ENVIRONMENT ■

⚠ Warnings

When you lubricate or inspect the unit, unplug the power cord from the robot.
Failure to do so may result in electric shock or injury.
Be sure to shut off the power supply before removing the power cord from the robot.

When going inside the safety barrier, **place a "Do Not Operate" sign** on the start switch.

Keep the emergency stop switch within reach of an operator while teaching and running the robot.
Failure to do so may cause danger since the robot cannot be stopped immediately and safely.

Install a safety barrier of adequate strength so as to protect the operator from moving tools and flying objects.
Always use protective wear (helmet, protective gloves, protective glasses, and protective footwear) when going inside the safety barrier.

Be sure to confirm that all the air tubes are connected correctly and firmly.

Always be aware of the robot's movement, even in the teaching mode.
Careful attention will protect the operator from injury.

FOR YOUR SAFETY

■ DURING OPERATION ■

⚠ Warnings

When operations are taking place within the safety barrier, **ensure no one enters the robot's maximum operating range.**

If you must go inside the safety barrier, be certain to **push the emergency stop switch** and **put a "Do Not Operate" sign** on the start switch.

When starting the robot, check that, **no one is within the safety barrier and no object will interfere with the robot operating.**

Under no circumstances should you go inside the safety barrier or place your hands or head inside the safety barrier while the robot is operating.

If anything unusual (e.g. a burning smell or abnormal sound) occurs, stop operation and unplug the cable immediately. Contact the dealer from which you purchased the robot or the office listed on the last page of this manual.
Continuous use without repair can cause electric shock, fire, or breakdown of the unit.

Keep the emergency stop switch within reach of an operator while teaching and running the robot.
Failure to do so may cause danger since the robot cannot be stopped immediately and safely.

PREFACE

The Loctite® SCARA-N Robot S440N Series is a new low cost, high performance robot. The combined use of pulse motors and special micro step driving circuits saves you energy and space.

There are several manuals pertaining to this robot.

Setup	This manual explains how to set up the robot. ● Be sure to read this manual.
Maintenance	This manual explains how to maintain the robot. ● Be sure to read this manual.
Basic Instructions	This manual provides safety precautions, part names, and the basic knowledge necessary to operate the robot.
Quick Start	This manual explains the actual operation of the robot with simple running samples.
Teaching Pendant Operation	This manual explains how to operate the robot via the teaching pendant.
PC Operation	This manual explains how to operate the robot from a computer (LR C-Points.)
Features I	This manual explains point teaching.
Features II	This manual explains commands, variables, and functions.
Features III	This manual explains features such as run mode parameters, sequencer program, etc.
External Control I (I/O-SYS)	This manual explains the I/O-SYS control.
External Control II (COM Communication)	This manual explains the COM communication control system (COM1 – COM3.)
Specifications	This manual provides comprehensive specifications, including mechanical or electrical requirements.

Note: The product specifications in these manuals may differ from those of the robot you have received due to product improvement.

Please be sure to follow the instructions described in these manuals. Proper use of the robot will ensure continued functionality and high performance.
The contents described in this manual are based on the standard application. Menu items may vary depending on models.

"For Your Safety" is also provided so that the operator can make the best use of this robot safely. This book includes preventive measures that can be taken against injury to the operator or damage to property. Please be sure to read "For Your Safety" before using the robot.

Be sure to shut off the power supply before plugging in the power cord.

BE SURE TO MAKE A PROPER GROUNDING WHEN YOU INSTALL THE ROBOT.

Be sure to save data whenever it is added or modified. **Otherwise, changes will not be saved if the power to the robot is cut off.**

CONTENTS

Maintenance

CHECKING BEFORE ACTIVATION

Check the following items before you register data or operate the robot.

- **Obstacles**

  Check that there is no obstacle in or around the robot's maximum operating range.

- **Emergency Stop Function**

  Check that the I/O-S circuit (Interlock) and emergency stop switch work properly.
  Failure to do so is dangerous because the robot cannot be stopped quickly and safely.

  Turn the power to the robot on and press the power ON switch on the operation box (Motor Power ON.) Then follow the instructions bellow.

  - Press the emergency stop switch on the operation box.
  - Press the emergency stop switch on the teaching pendant.
  - Turn the interlock function to OPEN. (e.g. Open the entry gate of the safety barrier.)

  If the interlock function is activated or the emergency stop switch is pressed, the motor power (power to the motor) is turned off. Turn the emergency stop switch clockwise while it is pressed down to release the emergency stop. If the interlock function is turned on, turn it off. (e.g. close the entrance gate of the safety barrier.)

Confirm that no person or object is inside the safety barrier, and then press the start switch. If the Teaching mode is selected, switch the JOG mode and check that the robot is standing still. The robot cannot be started when the power to the motor is turned off.

- To turn the motor power on when the operation box is not connected, follow the procedure below.

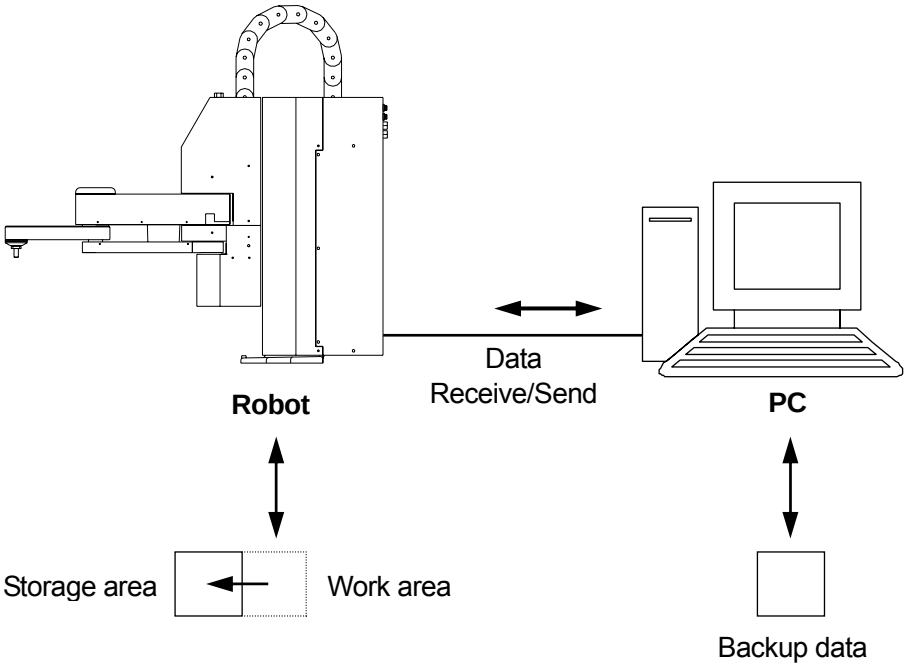
  TP Press the [SERVO] key.

  PC [Robot] → [Motor ON]

C & T DATA BACKUP

Back up data in case of accident.
To create backup data, start up the “LR C-Points Limited Edition” software (included in the operation manual CD-ROM), retrieve data from the robot, and then save the retrieved data in a file.

The teaching data in combination with the customizing data is sent and received between the robot and PC as a unit of data. This unit of data is called “C & T data.” You cannot send or receive one particular program only.



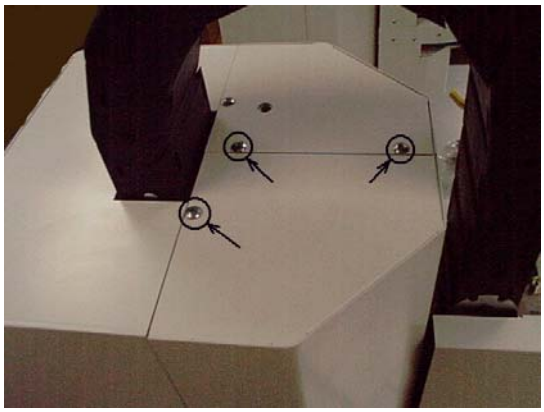
The robot has a data storage area and work area. When you start up the robot, the C & T data in the storage area is copied to the work area. The copied data is used for running and teaching. The data in the work area is deleted if the power to the robot is turned off.
The robot receives data from the work area. After sending data from the PC to the robot, the sent data is saved in the storage area automatically, via the work area.

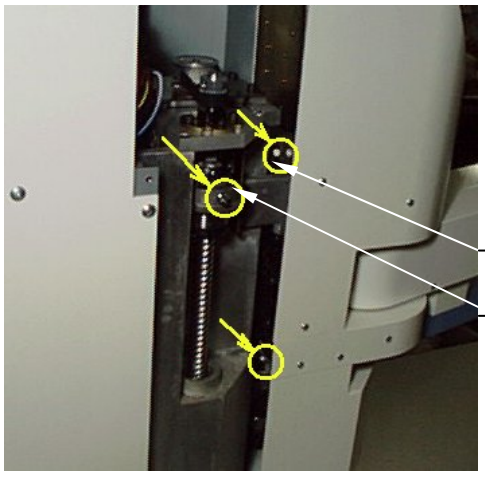
- The above operation is easily executed if you are using the “LR C-Points” software (option.) Select [Receive C & T Data] from the robot pull-down menu.

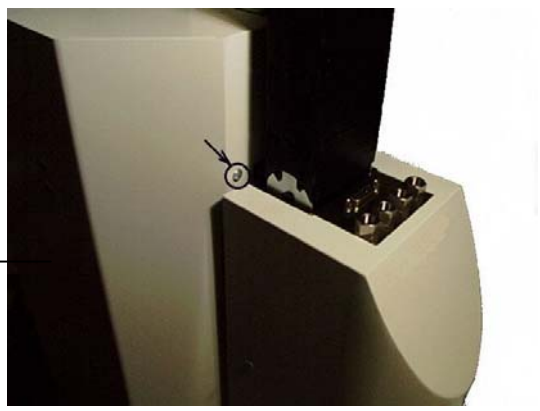
GREASE UP

For smooth operation and long life of the robot, grease it regularly (approximately every six months.)

Warning Be sure to shut off the power supply and unplug the power cord before removing the cover.







1. Remove the seven screws indicated by arrows to remove the right side cover.

2. Apply grease to the grease nipple of the ball screw. When grease is applied, old grease comes out. Wipe away the old grease.

3. Apply grease to the two grease nipples of the LM guide. When grease is applied, old grease comes out. Wipe away the old grease.
   If the robot is not equipped with a grease gun, wipe away old grease from the ball screw and both sides of the LM guide rail, and then apply new grease.

4. Attach the right side cover.

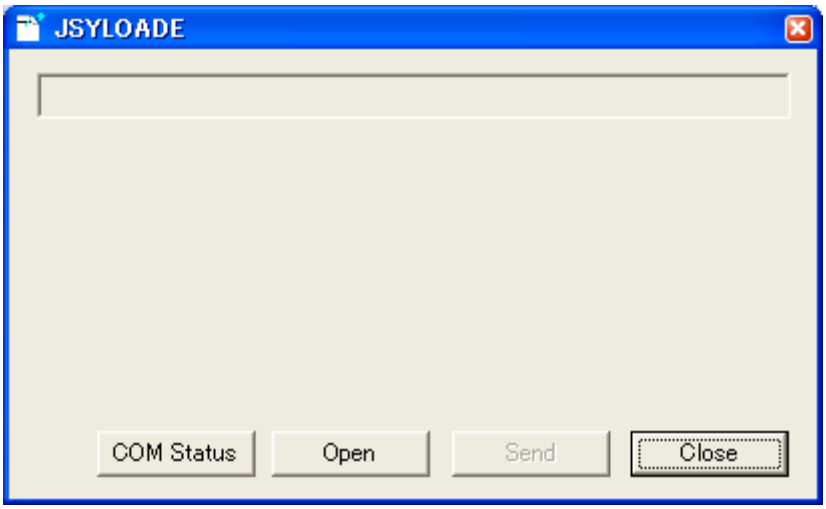
Use recommended grease to prevent malfunction of the robot.

Recommended grease: AFC Grease (Manufactured by THK Co., Ltd.)

HOW TO INSTALL ROBOT SYSTEM SOFTWARE

This robot is controlled by built-in “robot system software.” To upgrade the robot system software, follow the instructions below. (Be sure to connect the robot to PC before you start this operation.)
“Robot system software” is included in the operation manual CD-ROM with the file name,
JSYLOADE.exe.

1. Turn off the robot, and then turn ON the **special mode switch**.
2. Turn on the robot again, copy the “JSYLOADE” software included in operation manual CD-ROM to the local disk on the PC and start it up.
3. Select the communication port status of your PC which is connected to the robot and then click [OK.]
4. Select [Open] on the dialog box and specify the robot system software to be downloaded. Then click [Send.]



5. After data sending is complete, turn off the robot, turn OFF the special mode switch, and then attach the cover again.

- If you are using “LR C-Points”, the robot system software can also be upgraded by selecting [Send System Software] from the [Robot] pull-down menu.

WHEN ERRORS OCCUR

Self-Diagnosis

When an error occurs during operation or teaching, the error number and error message are displayed on the LCD of the teaching pendant. When an error has occurs during operation, the robot stops running. Refer to the error message to fix the problem.

If the teaching pendant is not connected, turn off the power briefly, and then connect the teaching pendant. Turn on the power again, and then the error message is displayed on the teaching pendant LCD.
For details of error contents and how to fix the problem, refer to the “ERROR TABLE” on the end of this manual.

Failure Diagnosis

If you are unsure if the robot is functioning properly, execute “failure diagnosis” on each part.
The failure diagnosis menu contains the following items.

Diagnostic Mode (1/2)
Key of Teaching Pendant
Teaching Pendant
Operation Box
Switch Buzzer
State of Sensor
Z-Phase of Motor Driver
Z-Phase of Encoder
J1/J2 Axis Motor
ZR Axis Motor
Position of Sensor
External I/O
Emergency

Diagnostic Mode Menu, Page 1

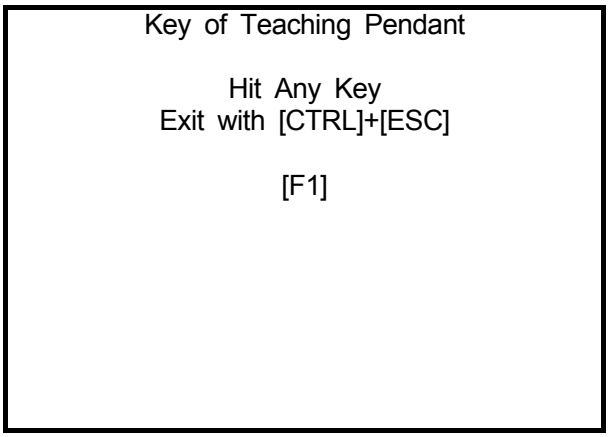
Diagnostic Mode (2/2)
COM1 Communication
COM2 Communication
COM3 Communication

Diagnostic Mode Menu, Page 2

Turn the select key switch on the operation box to “TEACH” and start up the Teaching mode.
Select [Administration] from the Teaching Mode menu, and then select [Diagnostic Mode] from the Administration menu to enter the Diagnostic mode.
Select the item you want to check from the Diagnostic Mode menu (See above.) When the Diagnostic Mode menu appears, the motor power goes off.

Key of Teaching Pendant

When a key is pressed, that character will appear on the teaching pendant LCD.



- Press the [CTRL] + [ESC] keys to return to the Diagnostic Mode menu.
  Press the [SHIFT] + [ESC] keys to return to the Administration menu.

Teaching Pendant

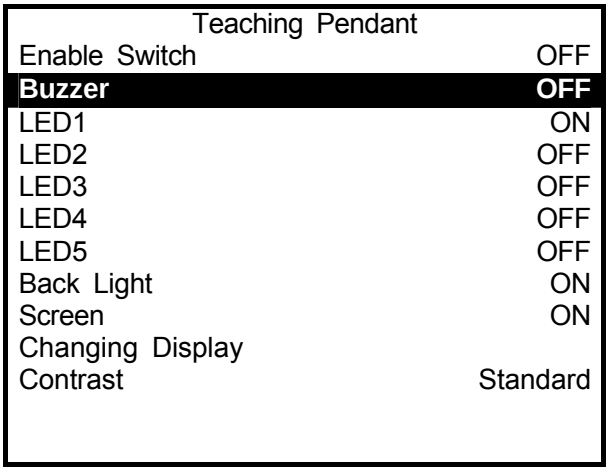
Select the item you want to check between the enable switch, buzzer, LED, and LCD.

1. Enable Switch

When the enable switch is pressed, "ON" is displayed. When it is released, "OFF" is displayed.

2. Buzzer

When the [ENTR] key is pressed, "ON" is displayed and a buzzer beeps. When it is pressed again, the beep stops and "OFF" is displayed.



Teaching Pendant Diagnosis Screen

3. LED 1 – 5

Pressing the [ENTR] key toggles between "ON" and "OFF", and the relevant LED switches on and off.

- This test is only for the teaching pendant and has no effect on the robot. For example, the motor power is not turned off if [M.POWER] LED switches off ([OFF].)

4. Back Light

Pressing the [ENTR] key toggles between "ON" and "OFF", and the backlight of the teaching pendant switches on and off.

5. Screen

When the ENTR key is pressed, ”ON” and “”OFF” on the “Screen” line switches. When it is turned [OFF], the teaching pendant LCD will be blank.

6. Changing Display

Each time the ENTR key is pressed, the teaching pendant LCD changes in the following order;

“Checkered pattern” → “Highlighted checkered pattern” → “Blank” → “White” → “Teaching pendant diagnosis screen”

7. Contrast

Each time the ENTR key is pressed, items on the [Contrast] line changes in the following order;

“Standard” → “High” → “Low” → “Standard”

Operation Box

The current conditions of items on the operation box are displayed.

1. Select Switch

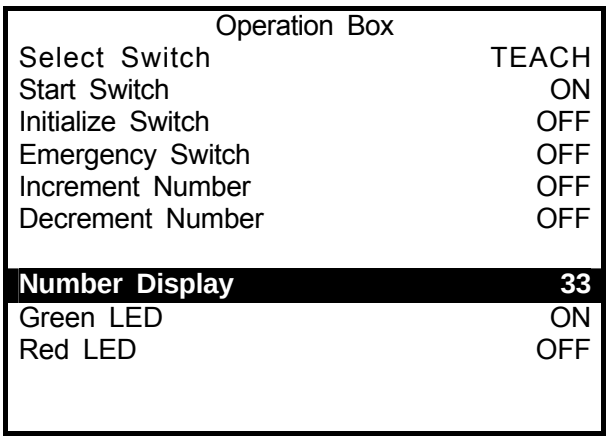
The current condition of the select key switch on the operation box is displayed.

2. Start Switch

When the start switch is held down, "ON" is displayed.

3. Initialize Switch

When the initialize switch is held down, "ON" is displayed.



4. Emergency Switch

When the emergency stop switch on the operation box is held down, "ON" is displayed.

5. Increment Number

When the increment number switch is held down, "ON" is displayed.

6. Decrement Number

When the decrement number switch is held down, "ON" is displayed.

7. Number Display

Each time the ENTR key is pressed, items on the [Number Display] line changes in the following order;

"00" → "11" → "22" → (snip) → "99" → "st" → (blank)

8. Green LED

Pressing the ENTR key toggles between "ON" and "OFF", and the LED is turned on and off.

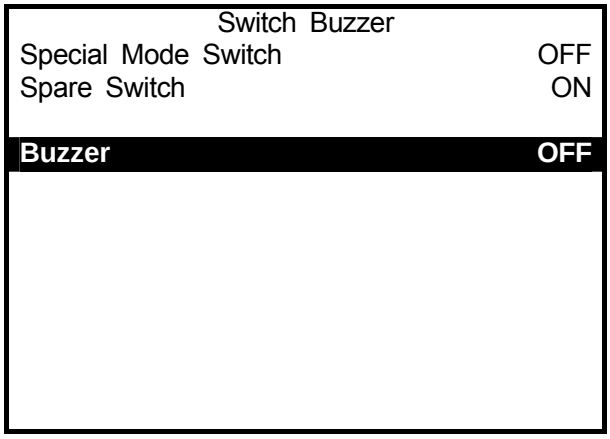
9. Red LED

Pressing the ENTR key toggles between "ON" and "OFF", and the LED is turned on and off.

Switch Buzzer

1. Special Mode Switch

The current condition of the special mode switch on the back of the robot is displayed.



2. Spare Switch

The current condition of the spare switch on the back of the robot is displayed.

- Conditions of I/O-SYS and I/O-1 power selection switches are not displayed.

3. Buzzer

Pressing the ENTR key toggles between “ON” and “OFF”, and the buzzer beeps and stops.

State of Sensor

The current states of each Axis initialization sensor are displayed.

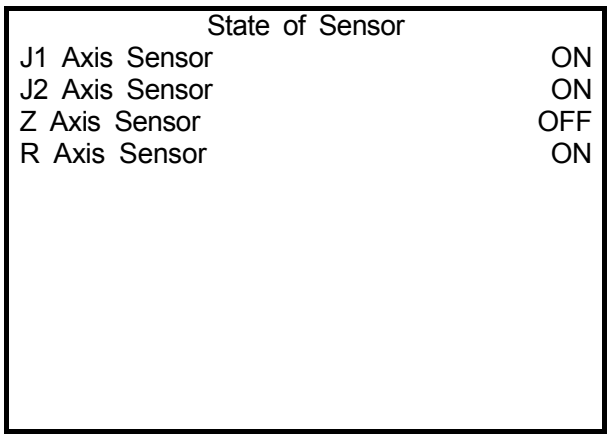
Move each Axis manually and check that the sensor turns on and off.

Rotate the J1, J2, and R-Axes in the plus and minus directions by the maximum angle.

If they are functioning properly, “ON” and “OFF” switches as follows.

Max. angle in the plus direction: ON

Max. angle in the minus direction: OFF



Move the Z-Axis from Z=0 (start position) to the maximum position in the plus direction.

If it is functioning properly, “ON” and “OFF” switches as follows.

Z=0: ON

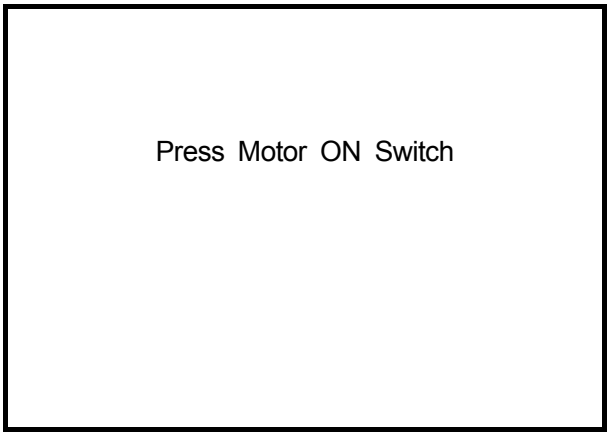
Max. position in the plus direction: OFF

Press the ESC key to return to the Diagnostic Mode menu.

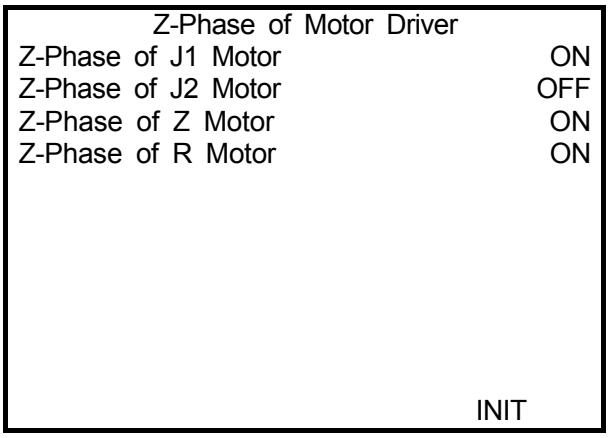
Z-Phase of Motor Driver

Check each Axis motor drive.

When the power is off, the screen to the right appears. (The power is turned off when the Diagnostic Mode menu appears.)
Press the power ON switch.



Hold down the F.4 key while pressing the enable switch to execute mechanical initialization.
Z-Phase of each Axis is turned “ON.”



Press any JOG key (← J1/X+ key, etc.) while holding down the enable switch. Each Axis motor rotates by 1 Step (equal to 1 frequency dividing) and the Z-Phase is turned “OFF.”
The Z-Phase of each motor is turned “ON” every 10 Steps.
Check that “ON” and ”OFF” switch properly when the motor rotates.
Press the ESC key to return to the Diagnostic Mode menu.

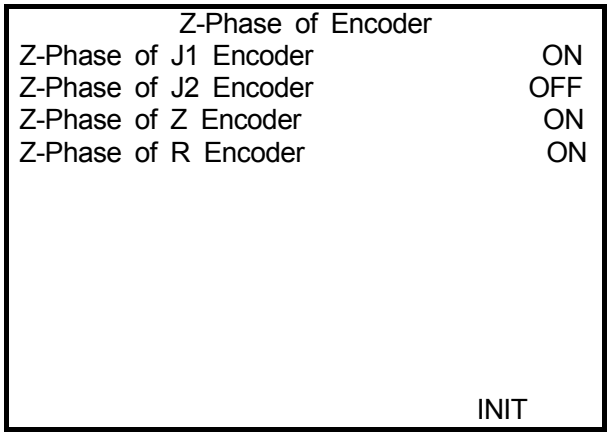
Warning **Under no circumstances should you go inside the safety barrier or place your hands or head inside the safety barrier while the robot is operating.**

Z-Phase of Encoder

If the power to the motor is turned off, press the Power ON switch.

Hold down [F.4] key while pressing the enable switch to execute the mechanical initialization. Z-Phase of each Axis encoder is turned "OFF."

Press any JOG key ([← J1/X+] key, etc.) except the [Z↑] key while holding down the enable switch to rotate each Axis motor by 360 degrees. If the encoder Z-Phase is turned "ON" before the motor rotates by 360 degrees, the motor stops on the spot.



If it is functioning properly, the encoder Z-Phase is turned "ON" before the motor rotates by 360degrees.

- Do not press the [Z↑] key in this diagnosis because the Z coordinate becomes "0" after the mechanical initialization.
- Keep pressing the enable switch while the motor rotates. The motor stops if the enable switch is released.

J1/J2 Axis Motor

If the motor power is off, press the Power ON switch. Enter the numbers of [Number of Output Pulse] and [Rate of Output Pulse], and then hold down the JOG keys corresponding to the Axis you want to check while pressing the enable switch.

J1 Axis: [← J1/X+] key

J2 Axis: [↑ J2/Y-] key

Check that the [Encoder Value] is within plus or minus 40 % of [Number of Output Pulse.]
The following items 3 – 6 can be switched between ON and OFF using the [ENTR] key.

Caution

Once you switch ON and OFF, the change is not restored even if you exit the Diagnostic mode. **After executing the failure diagnosis, be sure to turn off the power to the robot, and then start up the robot again.**

1. Number of Output Pulse

The Number of pulse to be output. When 10,000 pulses are output, the motor rotates by 360 degrees. When the motor rotates by 360 degrees, the encoder increases or decreases by 10,000.

2. Rate of Output Pulse

Designate the speed of pulse output here.

1000=1,000 pulse/sec

J1/J2 Axis Motor	
Number of Output Pulse	**10000**
Rate of Output Pulse	1000
J1 Axis Hold	ON
J1 Axis Half	OFF
J2 Axis Hold	ON
J2 Axis Half	OFF
J1 Axis Encoder	10000
J2 Axis Encoder	10000
	INIT

J1/J2 Axis Motor Diagnosis Screen

3. J1 Axis Hold

ON: Hold (Cannot be moved manually.)

OFF: Can be moved manually.

4. J1 Axis Half

ON: Hold (with a half of electric current for J1 Axis Hold.)

5. J2 Axis Hold

ON: Hold (Cannot be moved manually.)

OFF: Can be moved manually.

6. J2 Axis Half

ON: Hold (with a half of electric current for J2 Axis Hold.)

7. J1 Axis Encoder

It is functioning properly if the value is within plus or minus 40 % of [Number of Output Pulse.]

8. J2 Axis Encoder

It is functioning properly if the value is within plus or minus 40 % of [Number of Output Pulse.]

ZR Axis Motor

If the motor power is off, press the Power ON switch. Enter the numbers of [Number of Output Pulse] and [Rate of Output Pulse], and then hold down the JOG keys corresponding to the Axis you want to check while pressing the enable switch.

Z-Axis: [↓ Z] key

R-Axis: [R+] key

Check that the [Encoder Value] is within plus or minus 40 % of [Number of Output Pulse.]

The following items 3 – 6 can be switched between ON and OFF using the [ENTR] key.

Caution

Once you switch ON and OFF, the change is not restored even if you exit the Diagnostic mode. **After executing the failure diagnosis, be sure to turn off the power to the robot, and then start up the robot again.**

1. Number of Output Pulse

The Number of pulse to be output. When 10,000 pulses are output, the motor rotates by 360 degrees. When the motor rotates by 360degrees, the encoder increases or decreases by 10,000.

2. Rate of Output Pulse

Designate the speed of pulse output here.

1000=1,000 pulse/sec

ZR Axis Motor	
Number of Output Pulse	**10000**
Rate of Output Pulse	1000
Z Axis Hold	ON
Z Axis Half	OFF
R Axis Hold	ON
R Axis Half	OFF
Z Axis Encoder	10000
R Axis Encoder	10000
	INIT

ZR Axis Motor Diagnosis Screen

3. Z Axis Hold

ON: Hold (Cannot be moved manually.)

OFF: Can be moved manually.

4. Z Axis Half

ON: Hold (with a half of electric current for J1 Axis Hold.)

5. R Axis Hold

ON: Hold (Cannot be moved manually.)

OFF: Can be moved manually.

6. R Axis Half

ON: Hold (with a half of electric current for J2 Axis Hold.)

7. Z Axis Encoder

It is functioning properly if the value is within plus or minus 40 % of [Number of Output Pulse.]

8. R Axis Encoder

It is functioning properly if the value is within plus or minus 40 % of [Number of Output Pulse.]

Warning

Under no circumstances should you go inside the safety barrier or place your hands or head inside the safety barrier while the robot is operating.

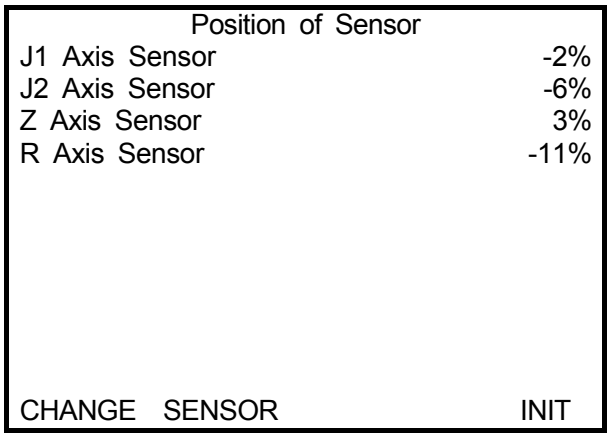
Position of Sensor

If the power to the motor is turned off, press the Power ON switch.

Hold down the [F.4] key while pressing the enable switch to execute mechanical initialization. The phase differences between the initialization sensor and Z-Phase of each Axis are displayed. (J1 and J2 Axes: Z-Phase of Encoder, Z- and R-Axes: Z-Phase of Motor)

Press the [F.0] key to change the percentage to OK/NG display. (OK is plus or minus 25% difference.)

Press the [F.1] key to display the state of initialization sensor ON or OFF.



Press the [ESC] key to return to the Diagnostic Mode menu.

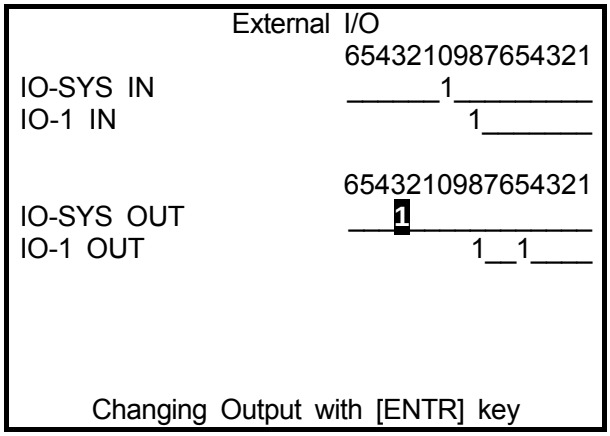
External I/O

Input-Output Statuses of I/O-SYS and I/O-1 are displayed on LCD.

Connect an external I/O test device (to check the input switch and output status) to the terminal of the external I/O and press the [ENTR] key.

Statuses of I/O-SYS and I/O-1 are displayed. (ON: 1. OFF, _)

It is functioning properly if the input-output statuses are displayed correctly.



Press the [ESC] key to return the Diagnostic Mode menu.

Emergency

In this diagnosis, the function of safety circuits such as the emergency stop and I/O-S are diagnosed.

There are six signals to be used and they are categorized into the three groups as below. (The items A – F are displayed on the screen.)

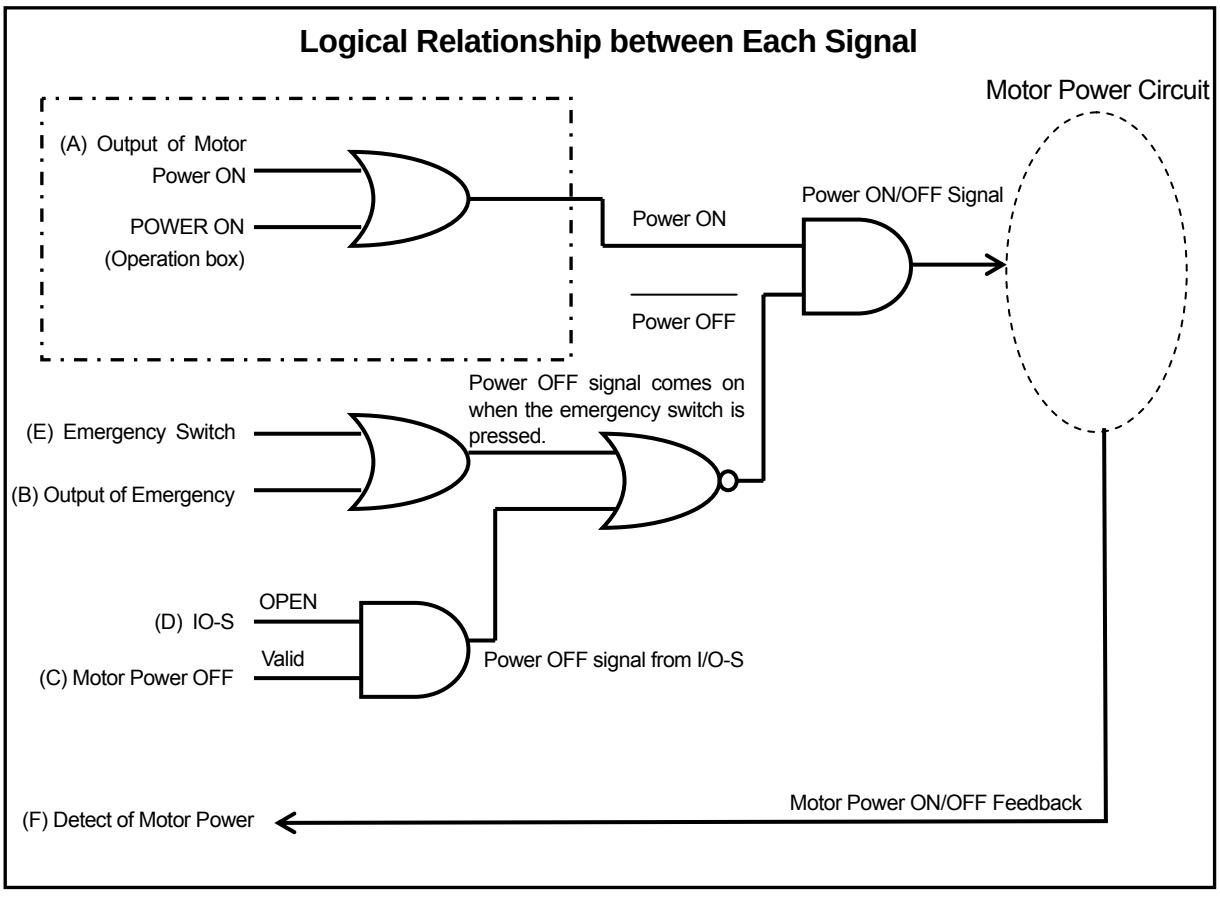
1. Motor Power ON Signal
   (A) Output of Motor Power ON

2. Motor Power OFF Signal
   (B) Output of Emergency
   (C) Motor Power OFF (Valid/Invalid)
   (D) IO-S (OPEN/CLOSE)
   (E) Emergency Switch

3. Motor Power Feedback Signal
   (F) Detect of Motor Power

Emergency	
Output of Motor Power ON	**ON**
Output of Emergency	OFF
Motor Power OFF	Valid
IO-S	CLOSE
Emergency Switch	OFF
Detect of Motor Power	ON

The following diagram shows the logical relationship between each signal.



After the diagnosis, be sure to check the following two results.

1. Input Signal

   Check the display to confirm that the “B” (Emergency Switch) and “D” (IO-S) signals are input normally.

Emergency Switch

Status of Switch	Display
The emergency switch is pressed in.	ON
The emergency switch is not pressed in.	OFF

IO-S

Status of I/O-S	Display
The connector is short-circuited.	CLOSE
The connector is not short-circuited.	OPEN

2. Emergency Stop Sequence

   Check the “F” (Detect of Motor Power) signal ON or OFF display and corresponding “A” – “E” input signals to confirm that the emergency stop sequence is functioning normally.

   Refer to the following chart indicating the logical relationship between the signals.

   As shown in the diagram on the previous page, the power ON signal remains turned on whether the “A” (Output of Motor Power ON) signal is ON or OFF.

   Accordingly, if it is functioning normally, the “F” (Detect of Motor Power) signal ON or OFF display does not change regardless of whether the “A” (Output of Motor Power ON) signal is turned ON or OFF.

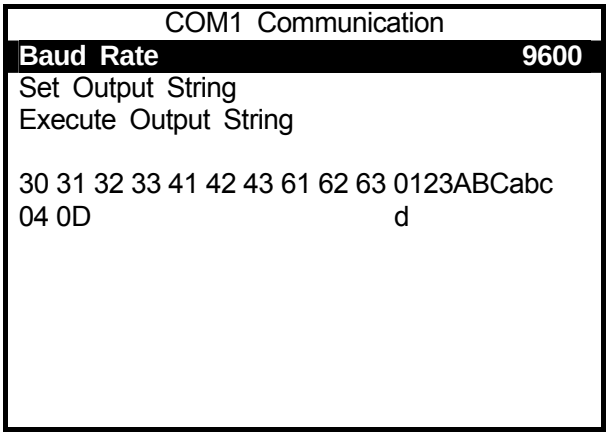
Input	A: Output of Motor Power ON	OFF	OFF	OFF	OFF	OFF
	B: Output of Emergency	OFF	ON	OFF	OFF	OFF
	C: Motor Power OFF	Valid	Valid	Valid	Valid	Invalid
	D: IO-S	CLOSE	CLOSE	CLOSE	OPEN	OPEN
	E: Emergency Switch	OFF	OFF	ON	OFF	OFF
Output	F: Detect of Motor Power	ON	OFF	OFF	OFF	ON

COM 1 – 3 Communication

Select [Set Output Strings.]

The Output String entry screen will appear. Register output strings and then select [Execute Output String.] The registered output strings are output from the COM port.

Check that the strings are output correctly.



Hidden characters (00H – 1FH, 7FH – FFH) are displayed only in HEX texts.

ASCII texts are not displayed (blank.)

Baud rate is changed as follows.

COM1	9600/19200/38400/57600/115200
COM2	9600/19200/38400/57600/115200
COM3	9600/19200

- If you change the baud rate on this screen, the value is restored when you exit the failure diagnosis.

ERROR MESSAGES

When an error occurrs, the corresponding error number will appear on the program number display on the operation box. You can see the details of errors on the teaching pendant or PC.

TP If an error occurs, the error number and error message will be displayed on the LCD screen of the teaching pendant.
If the teaching pendant is not connected, turn the power OFF briefly and connect the teaching pendant to the robot. After turning the power ON again, the error number and error message will be displayed on the teaching pendant LCD.

PC If the robot is connected to a PC, select “System Error Information” or ”Run Error Information” from the [Robot] pull-down menu of the “LR C-Points” software. All robot error information will be displayed.
If it is not connected to a PC, turn the power to the robot OFF. (If the PC is ON, turn it OFF.) Connect the PC to the robot, start up the PC and follow the above instructions to read error information.

Error No.	Message	Countermeasure
001	Program is Empty.	Enter the number of an existing program.
006	Point Type Error	For example, a CP passing point following a PTP point will return a point type error. Check the point type and enter a proper point type.
007	Position is out of range	In this case, “out of range” means a case in which the tool tip cannot move into the designated move area limit. This error occurs when either a point position or an intermediate path (as in a CP arc movement) falls out of the limit. Check and correct the teaching position coordinates. Also check and correct the move area limit and TCP (tool center point) settings in the tool data.
008	Error on Point Job	Point job errors which are not classified as one of Errors 009 to 013, 016, and 042 to 053 fall into this category. ● A condition command series does not include “ld” or “ldi” corresponding to “anb “or “orb.” ● There are more than 10 “then”/”else”/”timeUp” nests in a single point job routine. ● A “then”/”else”/”endif” command does not have a corresponding “if” command. ● A “timeUp”/”endWait” command does not have a corresponding “waitCondTime” or “waitCond” command. Check the point job command and reenter it.

Error No.	Message	Countermeasure
009	then/else for if doesn't exist	This error includes the following cases. ● When a “then”/”else” corresponding to an “if” is missing. ● When non-condition commands are entered between “if” and “then”/”else.” Check the point job command and reenter it.
010	endIf for if doesn't exist	Check the point job command and reenter it.
011	endWait for waitCond doesn't exist	Check the point job command and reenter it.
012	Label for jump doesn't exist	Check the point job command and reenter it.
013	Point for goPoint doesn't exist	This error occurs when the jump point number of the point job command, “goPoint”, “goRPoint”, or “palletLoop” is larger than the largest point number in a program or when it will be a negative number. (“goRpoint” may cause a negative number.) Check the point job command and reenter it.
016	Error on Pallet Routine Data	This error occurs when the pallet number designated by a point job command does not exist. Check the point job command or the designate pallet routine in the additional function and reenter it.
022	CP Speed Over	Reduce the CP drive speed.
023	CP Righty/Lefty Error	You cannot change the Arm coordinate system while in CP drive.
030	FLROM Erase Error	All C & T data from FLROM should be automatically deleted before saving. If this doesn’t occur, it is probably due to a hardware error.
031	FLROM Write Error	A write error occurs when saving C & T data. This could be a hardware error.
035	Teaching Data SUM Error	When the power to the robot is turned on, the saved C & T data is readout. If the sum of data is incorrect, this error occurs. Delete the C & T data. This error also occurs if the power to the robot is turned off while saving C & T data.
037	Motor Power Supply Error	This message appears when the motor power is not supplied. Check the motor driving power supply. ● A power supply connector or one of the thermal protectors is defective: Check the connection of the parts. ● The power supply unit is defective: Replace the power supply unit.
042	Job for callJob doesn't exist	Correct the point job command.
043	callJob Nesting Error	An error which occurs when the number of callJob, callBase in a nest reaches 30 or more. Correct the point job command.
044	Program for callProg doesn't exist	Correct the point job command.
045	callProg Job Nesting Error	An error which occurs when the number of callProg, callPoints in a nest reaches 30 or more. Correct the point job command.

046	for, do Nesting Error	An error which occurs when the nest reaches 30 or more. Correct the point job command.
047	Points for callPoints doesn't exist	Correct the point job command.
048	for-next, do-loop Error	An error which occurs when the “next” corresponding to “for” or the “loop” corresponding to “do” does not exist, or when “next” or “loop” exist even though “for” or “do” do not. Correct the point job command.
049	Creating Local Variable Error	An error which occurs if extensions are duplicate when trying to generate a local variable using the declare command, or when it is impossible to maintain a variable range. Correct the point job command.
050	Evaluate Expression Error	An error which is detected during expression evaluation. ● No variable or function included in expression An identifier of a variable or a function may be wrong or a variable or a function may not have been defined. ● Wrong bracket ● Wrong operator (+, -, *, /, etc.) ● Wrong number or type (including the number of array element successor) of argument during calling function. Correct the point job command.
051	IO Alias Error	An error which occurs if there is no IO Alias specified. The identifier may be wrong or there may be no definition. Correct the point job command.
052	COM Alias Error	An error which occurs if there is no COM Alias specified. The identifier may be wrong or there may be no definition. Correct the point job command.
053	Parameter value is out of range	An error which occurs if the value of an expression evaluation exceeds the range. Correct the point job command.

Error No.	Message	Countermeasure
081	J2 Adjust Angle Error	J2 Axis adjust angle exceeds plus or minus 15 degrees. Check and adjust the J2 adjust value. (Mechanical initialization error)
082	Emergency Stop	This message appears when the emergency stop button on the teaching pendant or operation box is pressed or the I/O-S emergency stop function is activated. After releasing the emergency stop, press the Motor ON switch on the operation box or the SERVO key on the teaching pendant to turn the motor power ON.
085	Incorrect Use	This message appears when the system program and C & T data are made for different types of applications. For example, if you have registered dispensing programs and setting in the robot's RAM and then write a standard application system program, the robot recognizes an error when the power is turned on. Delete the C & T data or replace the memory card with one for an appropriate application. If the teaching pendant is connected, a message "All Teaching Data, Delete OK?" will appear on the LCD screen. Select "YES" to delete C & T data.
086	Incorrect Data Version	This message appears when the data version number of the system program is lower than that of the teaching data. This means that the program in the system card cannot deal with the newer version of teaching data registered in the robot's RAM. Delete all the teaching data or replace the system card with one with an appropriate version. If the teaching pendant is connected, a message "All Teaching Data, Delete OK?" will appear on the LCD screen. Select "YES" to delete C & T data.
087	Incorrect Data Sub Version	This message appears when the data sub version number is different from that of the teaching data. This means that the program in the system card cannot deal with the newer version of teaching data registered in the robot's RAM. Delete all the teaching data or replace the system card with one for an appropriate version. If the teaching pendant is connected, a message "All Teaching Data, Delete OK?" will appear on the LCD screen. Select "YES" to delete C & T data.

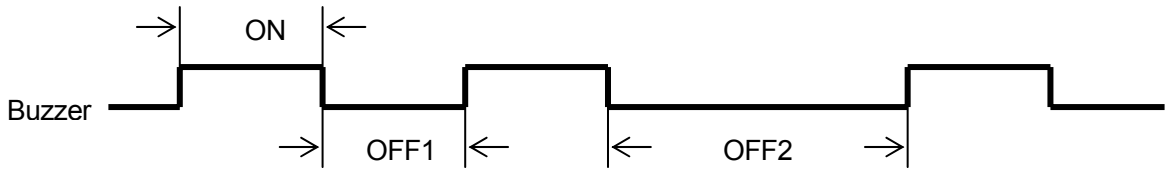
Error No.	Message	Countermeasure
088	Z Motor/Encoder Error	If the Z-Axis motor is rotating, the encoder is damaged. (Check the encoder cable. If OK, replace the encoder.) If the Z-Axis motor is not rotating, the motor is damaged. (Check the motor cable. If OK, replace the motor or motor driver.) Check the movement in the Diagnostic mode. (Mechanical initialization error)
089	Z Sensor Error	This error occurs when the Z sensor doesn't work even though mechanical initialization has been executed. If the Z-Axis motor is working, the error is caused by a sensor malfunction, if not, it is caused by the motor. (Mechanical initialization error)
090	Z Driver 0-Phase Error	This error occurs when the Z Driver 0-Phase signal is not output at all, or is output endlessly when mechanical initialization is executed. (Mechanical initialization error)
091	J1 Motor/Encoder Error	If the J1-Axis motor is rotating, the encoder is damaged. (Check the encoder cable. If OK, replace the encoder.) If the J1-Axis motor is not rotating, the motor is damaged. (Check the motor cable. If OK, replace the motor or motor driver.) Check the movement in the Diagnostic mode. (Mechanical initialization error)
092	J1 Sensor Error	This error occurs when the X sensor doesn't work even though mechanical initialization has been executed. If the X-Axis motor is working, the error is caused by the X sensor, if not, it is caused by the motor. (Mechanical initialization error)
093	J1 Encoder 0-Phaze Error	This error occurs when the Z Driver 0-Phase signal is not output at all, or is output endlessly when mechanical initialization is executed. (Mechanical initialization error)
094	J2 Motor/Encoder Error	If the J2-Axis motor is rotating, the encoder is damaged. (Check the encoder cable. If OK, replace the encoder.) If the J2-Axis motor is not rotating, the motor is damaged. (Check the motor cable. If OK, replace the motor or motor driver.) Check the movement in the Diagnostic mode. (Mechanical initialization error)

Error No.	Message	Countermeasure
095	J2 Sensor Error	This error occurs when the Y sensor doesn't work even though mechanical initialization has been executed. If the Y-Axis motor is working, the error is caused by the Y sensor, if not, it is by the Y motor. (Mechanical initialization error)
096	J2 Encoder 0-Phaze Error	This error occurs when the Z Driver 0-Phase signal is not output at all, or is output endlessly when mechanical initialization is executed.
097	R Motor/Encoder Error	If the R-Axis motor is rotating, the encoder is damaged. (Check the encoder cable. If OK, replace the encoder.) If the R-Axis motor is not rotating, the motor is damaged. (Check the motor cable. If OK, replace the motor or motor driver.) Check the movement in the Diagnostic mode. (Mechanical initialization error)
098	R Sensor Error	This error occurs when the R sensor doesn't work even though mechanical initialization has been made. If the R-Axis motor is working, the error is caused by the R sensor, if not; it is caused by the Y motor. (Mechanical initialization error)
099	R Driver 0-Phaze Error	This error occurs when the Z Driver 0-Phase signal is not output at all, or is output endlessly when mechanical initialization is executed. (Mechanical initialization error)
100	Logical Error XXXXXXX	This error is not displayed on the program number display on the operation box. Turn the power off, then on again. If the error continues to occur, contact the dealer from which you purchased the robot with a detailed description of the error message on the screen.
101	Trap Error	This error is not displayed when it occurs. A beep will briefly sound twice. Turn the power off, then on again. The error message and number will be displayed on the teaching pendant LCD. It is necessary to replace printed Board A. Contact the dealer from which you purchased the robot.

■ Error at Start

No error number or message appears on the screen. Identify the error type by beep sound.

	Buzzer	Description
	One long beep.	Special mode program error Error when Special mode program does not exist or has been corrupted. (Judged by the SUM check.) It is necessary to replace Board A. Contact the dealer from which you purchased the robot.
	Two long beeps.	System program error Error when system program does not exist or has been corrupted. (Judged by the SUM check.) It may be possible to restore it by switching to the special mode and then reinstalling the system program. Contact the dealer from which you purchased the robot.
	Two short beeps.	Trap error Board A could be damaged. Replace Board A. Contact the dealer from which you purchased the robot.
	Beeps for two seconds.	Flash ROM write error Error detected when data has not been written correctly in the special mode program. Replace Board A. Contact the dealer from which you purchased the robot.



	ON	OFF 1	OFF 2
Long	0.6 [sec]	0.6 [sec]	1.2 [sec]
Short	0.2 [sec]	0.2 [sec]	1.2 [sec]

e. g.1: 3 Short Beeps

ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	. . . . .
0.2	0.2	0.2	0.2	0.2	1.2	0.2	0.2	0.2	0.2	0.2	1.2	0.2	[sec]

e. g. 2: 1 Long Beep

ON	OFF	ON	OFF	ON	OFF	. . . . .
0.6	1.2	0.6	1.2	0.6	1.2	[sec]

Warranty

Henkel Corporation warrants, to the original Buyer for a period of one (1) year from date of delivery, that the Loctite® Equipment or System sold by it is free from defects in material and workmanship. Henkel will, at its option, replace or repair said defective parts. This warranty is subject to the following exceptions and limitations.

1. Purchaser Responsibilities – The Purchaser shall be responsible for:
   -Maintenance of the equipment as outlined in the Equipment Manual for the product.
   - Inventory of recommended maintenance parts established by Henkel;
   -Notification to Henkel within 6-8 hours of downtime.
   -Any cost of travel or transportation connected with warranty repair.
   -All cost associated with investigating or correcting any failure caused by the purchaser's misuse, neglect or unauthorized alteration or repair.
   -All costs attributed to accident or other factors beyond Henkel's control.

2. A thirty (30) day warranty will be extended on any items subject to normal wear, such as:
   -Pump Seals -Tubing -Wear Surfaces of Wiping Rollers
   -O-Rings -Hoses

Purchased items used in Loctite® dispensing equipment are covered under warranties of their respective manufacturers and are excluded from coverage under this warranty. Typical purchased items are:

-Solenoids -Electrical Relays -Refrigeration Units
-Timers -Fluid Power Cylinders -Electrical Motors

3. No warranty is extended to perishable items, such as:
   -Fuses -Dispensing Needles -Dispensing Nozzles
   -Light Bulbs -Lamps -Product Barrels

Henkel reserves the right to make changes in design and/or improvements to its equipment without obligation to include these changes in any equipment previously manufactured.

Henkel's warranty herein is in lieu of and excludes all other warranties of Henkel and its affiliated and related companies (hereinafter the "seller companies"), express, implied, statutory, or otherwise created under applicable law including, but not limited to, any warranty or merchantability and/or fitness for a particular purpose of use. In no event shall the seller and/or the seller companies be liable for any direct, indirect, special, incidental or consequential damages, including, but not limited to, loss of profits. In addition, this warranty shall not apply to any products, which have been subjected to abuse, misuse, improper installation, improper maintenance or operation, electrical failure or abnormal conditions; and to products, which have been tampered with, altered, modified, repaired or reworked by anyone not approved by seller. Buyer's sole and exclusive remedy under this warranty shall be limited to, at seller's discretion, the replacement or repair of any defective product or part thereof, or a refund of the purchase price paid by for the product in exchange for buyer's return of the product to seller, free and clear of any and all liens and encumbrances of any nature.

HENKEL CORPORATION

1001 Trout Brook Crossing

Rocky Hill, CT 06067

1-800 LOCTITE

Tel: 800-562.8483

Fax: (860) 571-5465

The specifications of the robot or the contents of this manual may be modified without prior notice to improve its quality.

Manual # 8901156 Maintenance, Dated 09/2007