FANUC Robot series

R-30iA/R-30iB/R-30iB Plus CONTROLLER

Integrated Weld Control Interface (DENGENSHA Specifications)

OPERATOR'S MANUAL

B-82624EN/03

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│                    ●   Original Instructions                       │
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Before using the Robot, be sure to read the "FANUC Robot Safety Manual (B-80687EN)" and understand the content.

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.
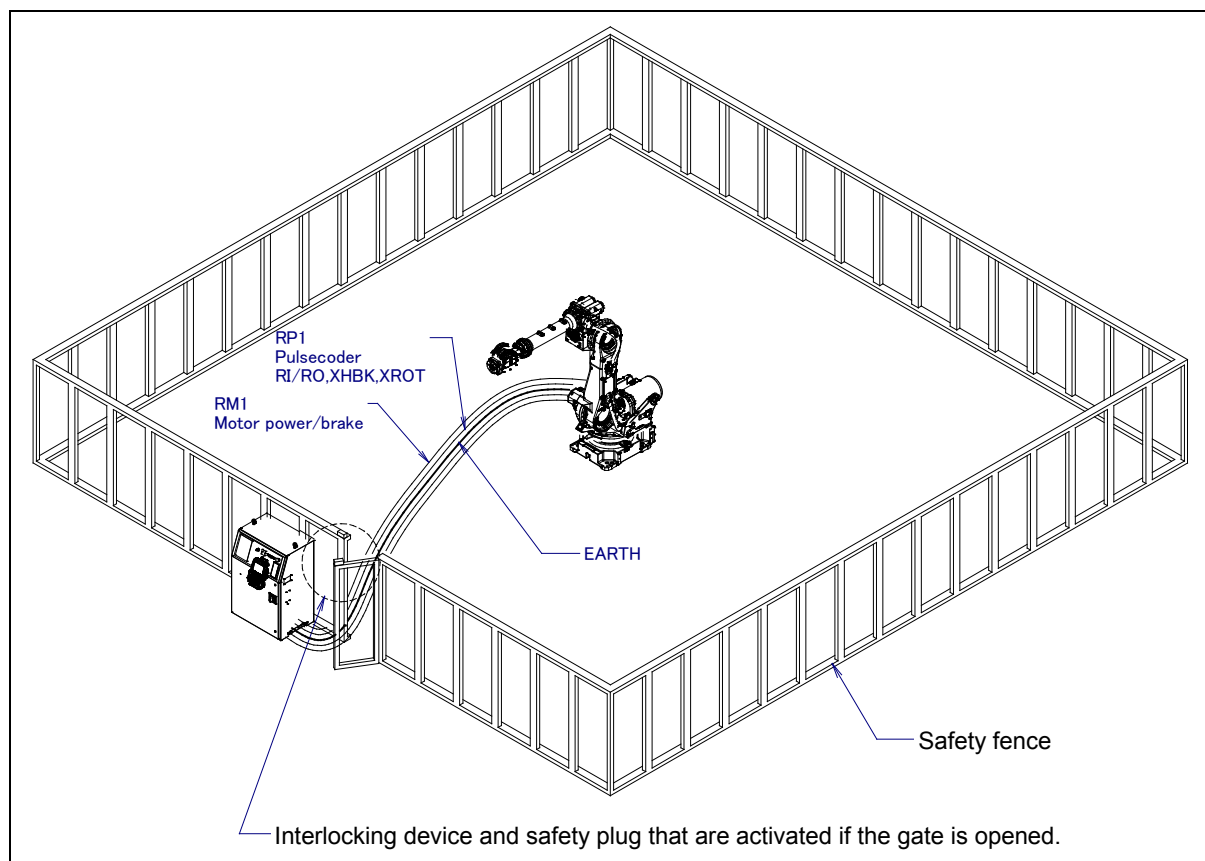
Fig. 3 (a) Safety fence and safety gate

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

Dual chain

Emergency stop board
or Panel board

EAS1

EAS11

EAS2

EAS21

Single chain

Panel board

FENCE1

FENCE2

(Note)

For the R-30*i*B, the R-30*i*B Mate, the R-30*i*B Plus,
the R-30*i*B Mate Plus
Terminals EAS1, EAS11, EAS2, EAS21 are provided on the
emergency stop board.

For the R-30*i*A
Terminals EAS1, EAS11, EAS2, EAS21 or FENCE1, FENCE2
are provided on the emergency stop board or connector panel.

For the R-30*i*A Mate
Terminals EAS1, EAS11, EAS2, EAS21 or FENCE1,FENCE2
are provided on the emergency stop board or in the connector
panel of CRMA64 (Open air type).

Refer to the ELECTRICAL CONNCETIONS Chapter
of CONNECTION of controller maintenance manual for details.

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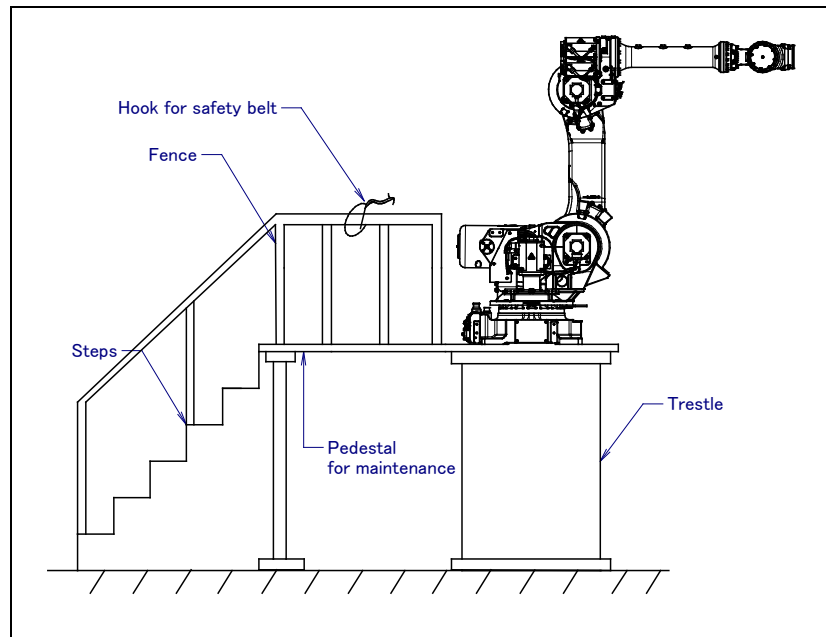
Fig. 3 (c) Pedestal for maintenance

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 the EMERGENCY STOP button within the operator's reach.

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.
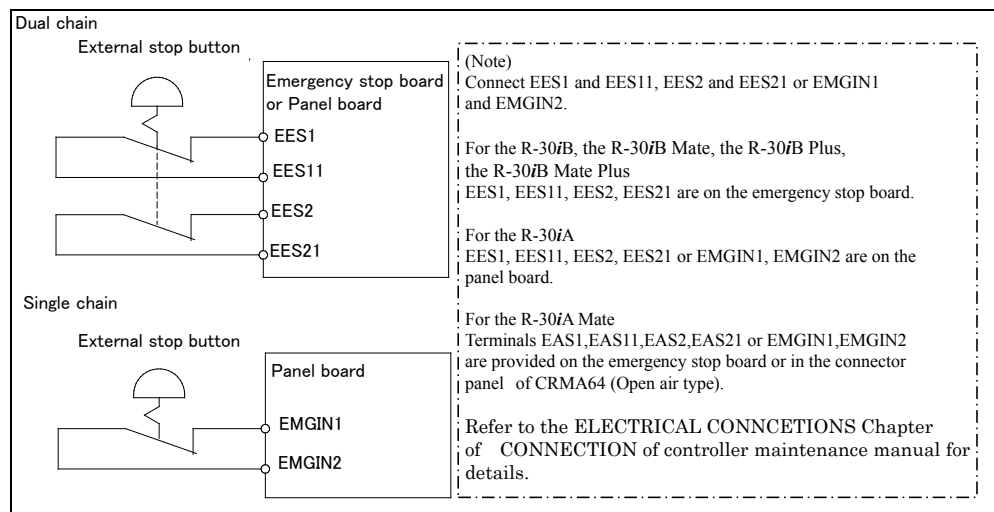
Fig. 3.1 Connection diagram for external emergency stop button

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 mode (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 mode 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.

Teach pendant is provided with a switch to enable/disable robot operation from teach pendant and DEADMAN switch as well as 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 are different depending on the teach pendant enable/disable switch setting status.
   (a)   Enable: Servo power is turned off and robot stops 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-30iB Plus/R-30iB Mate Plus /R-30iB/R-30iB Mate/R-30iA/R-30iA Mate 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 switch should not exceed about 10000 times per year.

The teach pendant, operator panel, and peripheral device 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.

**For the R-30*i*B Plus/R-30*i*B Mate Plus/R-30*i*B/R-30*i*B Mate/R-30*i*A Controller
or CE or RIA specification of the R-30*i*A Mate Controller**

Mode	Teach pendant enable switch	Software remote condition	Teach pendant	Operator panel	Peripheral device
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.

For the standard specification of R-30*i*A Mate Controller

Teach pendant enable switch	Software remote condition	Teach pendant	Peripheral device
On	Ignored	Allowed to start	Not allowed
Off	Local	Not allowed	Not allowed
	Remote	Not allowed	Allowed to start

(6) (Only when R-30*i*B Plus/R-30*i*B Mate Plus/R-30*i*B/R-30*i*B Mate /R-30*i*A Controller or CE or RIA specification of R-30*i*A Mate controller is selected.) To start the system using the operator panel, make certain that nobody is in the robot operating space and that there are no abnormal conditions in the robot operating space.

(7) When a program is completed, be sure to carry out the 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 the continuous operation mode at low speed.
    (c) Run the program for one operation cycle in the continuous operation mode 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 the continuous operation mode 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 mode.

(8) While operating the system in the automatic operation mode, the teach pendant operator must 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.
(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

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*A, R-30*i*A Mate)

The following three robot stop types exist:

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.
The following processing is performed at Power-Off stop.
- An alarm is generated and servo power is turned off.
- The robot operation is stopped immediately. 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.
The following processing is performed at Controlled stop.
- The alarm "SRVO-199 Controlled stop" occurs along with a decelerated stop. Execution of the program is paused.
- An alarm is generated and servo power is turned off.

Hold (Category 2 following IEC 60204-1)

The robot is decelerated until it stops, and servo power remains on.
The following processing is performed at Hold.
- The robot operation is decelerated until it stops. Execution of the program is paused.

⚠ **WARNING**
1 The stopping distance and time of Controlled stop is 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 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 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 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 In case of Controlled 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 or Controlled stop. The configuration of stop type for each situation is called *stop pattern*. The stop pattern is different according to the controller type or option configuration.

There are the following 3 Stop patterns.

Stop pattern	Mode	Emergency stop button	External Emergency stop	FENCE open	SVOFF input	Servo disconnect
A	AUTO	P-Stop	P-Stop	C-Stop	C-Stop	P-Stop
	T1	P-Stop	P-Stop	-	C-Stop	P-Stop
	T2	P-Stop	P-Stop	-	C-Stop	P-Stop
B	AUTO	P-Stop	P-Stop	P-Stop	P-Stop	P-Stop
	T1	P-Stop	P-Stop	-	P-Stop	P-Stop
	T2	P-Stop	P-Stop	-	P-Stop	P-Stop
C	AUTO	C-Stop	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

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

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

Option	R-30iA				R-30iA Mate		
	Standard (Single)	Standard (Dual)	RIA type	CE type	Standard	RIA type	CE type
Standard	B (*)	A	A	A	A (**)	A	A
Stop type set (Stop pattern C) (A05B-2500-J570)	N/A	N/A	C	C	N/A	C	C

 (*) R-30iA standard (single) does not have servo disconnect.
(**) R-30iA Mate Standard does not have servo disconnect, and the stop type of SVOFF input is Power-Off stop.

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 "Stop type set (Stop pattern C) (A05B-2500-J570) option is specified, the stop type of the following alarms becomes 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. (R-30iA controller)
SRVO-194 Servo disconnect	Servo disconnect input (SD4-SD41, SD5-SD51) is open. (R-30iA controller)
SRVO-218 Ext.E-stop/Servo Disconnect	External emergency stop input (EES1-EES11, EES2-EES21) is open. (R-30iA Mate controller)
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 stopping time of Controlled stop is longer than the stopping distance and stopping time of Power-Off stop, depending on the robot model and axis. Please refer to the operator's manual of a particular robot model for the data of stopping distance and stopping time.

For the R-30*i*A or R-30*i*A Mate, this function is available only in CE or RIA type hardware.

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 stopping time of Controlled stop are longer than the stopping distance and stopping time 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, 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**

5 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.

6 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.

7 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.

8 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.

9 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-30iB/ R-30iB Mate
Standard	A(**)
Controlled stop by E-Stop (A05B-2600-J570)	C(**)
Smooth E-Stop (A05B-2600-J651)	D(**)

 (**)R-30iB 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.

"Smooth E-Stop Function" option

When "**Smooth E-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.

9 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-2670-J680)	A(**)
All Smooth Stop Function (A05B-2670-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-2670-J521)	C(**)
All Smooth Stop Function (A05B-2670-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-2670-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-2670-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-2670-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   INTRODUCTION

This manual primarily describes the operation on the robot teach pendant for the Integrated Welding Controller.

For installation, timer functions, and timer error troubleshooting, of the timer control board, refer to the Robot Integrated Weld Control for Fanuc R-30iA/R-30iB, issued by DENGENSHA MFG. CO., LTD.

> **NOTE**
> · In this manual, the timer control board for the above integrated welding controller will be referred to as the timer board or the integrated timer board.
> · This feature is an option.

2   SETUP

2.1   SETTING UP WELD INTERFACE

A weld interface (Digital or Integral) can be confirmed and/or changed on the Spot Config screen. The default value of a weld interface is "Integral" if your robot has this software option.
When changing a weld interface, or when increasing the number of equipment, there is a need to change items on this screen

Operation
MENUS → SETUP → F1 [TYPE] → Spot Config

The actual screen is different form each equipment type (air gun or servo gun). The following is servo gun example.

```
┌──────────────────────────────────────────────────┐
│ SPOT CONFIG                                        │
│                                         6/34       │
│       1 F Number:                 F00000           │
│       2 Load Spottool Macros:     DISABLED         │
│       3 Number of equipments:     1                │
│       4 Number of weld controllers: 1              │
│       5 Current equipment, gun:   1, 1             │
│       6   Weld interface:         INTEGRAL         │
│       7   Number of guns:         SINGLE           │
│       :                           :                │
│      13   Weld cntler num for gun: 1               │
│        Current weld controller:   1                │
│       :                           :                │
│       :                           :                │
│                                                    │
├──────────────────────────────────────────────────┤
│    [TYPE]              [CHOICE]          >         │
└──────────────────────────────────────────────────┘
```

In the case of one integrated timer board

Item name	Setting value
Number of equipments	1 (default)
Number of weld controllers	1 (default)
Current equipment, gun	1,1 (*1)
Weld interface	INTEGRAL (*2)
Number of guns	1 (default)
Weld cntler num for gun	1 (default)

*1) When you want to set items for equipment 1 and gun 1, set this item 1,1.
*2) When your robot software does not have integrated weld controller option, you can not change this to INTEGRAL. If your robot software has integrated weld controller but you want to change to the un-integrated weld controller, change this item to DIGITAL.

In the case of two integrated timer boards

Item name	Setting value	
Number of equipments	2	
Number of weld controllers	2	
Current equipment, gun	1,1	2,1
Weld interface	INTEGRAL	INTEGRAL
Number of guns	1	1
Weld cntler num for gun	1	2

```
┌──────────────────────────────────────────────────────────────────────┐
│ NOTE                                                                   │
│  ·  If one timer board is installed, set both T0 and T1 of the DIP     │
│     switch [SEL] on the timer board to 0.                              │
│  ·  If two timer boards are installed, set T0 and T1 to 0 on the first │
│     timer board, and set T0 to 1 and T1 to 0 on the second timer board.│
│  ·  Refer to the Robot Integrated Weld Control for Fanuc R-30iA/       │
│     R-30iB, issued by DENGENSHA MFG. CO., LTD. for more details.       │
└──────────────────────────────────────────────────────────────────────┘
```

2.2 SETTING UP SIGNALS

You must assign the following signals according to the actual wiring. About the necessity of setup and signal number, it is dependent on the contactor specification and user PLC specification.

2.2.1 Weld Interface Signals

Operation
MENUS → I/O → F1 [TYPE] → Weld interface

Output signals (OUT)

```
┌──────────────────────────────────────────────────┐
│ I/O Weld Out                                       │
│ WC: 1                                       1/4    │
│                                                    │
│        NAME              OUT PT   SIM   STATUS     │
│     1 Iso contactor:    DO[ 0]   U     ***         │
│     2 Shunt trip:       DO[ 0]   U     ***         │
│     3 Alarm code:       GO[ 0]   U     ***         │
│     4 Tip stick timing: DO[ 0]   U     ***         │
│                                                    │
│  ┌──────┬──────┬────────┬──────┬──────┬───┐        │
│  │[TYPE]│      │IN/OUT  │ ON   │ OFF  │ > │        │
│  └──────┴──────┴────────┴──────┴──────┴───┘        │
└──────────────────────────────────────────────────┘
```

Press F3 to switch between IN and OUT

Input signals (IN)

```
┌──────────────────────────────────────────────────┐
│ I/O Weld IN                                        │
│ WC: 1                                       1/3    │
│                                                    │
│        NAME              IN PT   SIM   STATUS      │
│     1 Iso contactor:    DI[ 0]   U     ***         │
│     2 Leak input:       DI[ 0]   U     ***         │
│     3 Tip stick detect: DI[ 0]   U     ***         │
│                                                    │
│  ┌──────┬──────┬────────┬──────┬──────┬───┐        │
│  │[TYPE]│      │IN/OUT  │ ON   │ OFF  │ > │        │
│  └──────┴──────┴────────┴──────┴──────┴───┘        │
└──────────────────────────────────────────────────┘
```

```
┌──────────────────────────────────────────────────────────────────────┐
│ NOTE                                                                   │
│    After changing any settings, turn the power off, then on again.     │
└──────────────────────────────────────────────────────────────────────┘
```

Each signal is described below.

Output signals (OUT)

Item	Description
1.Iso contactor (IC close signal)	Sets the number of the output signal to the IC close signal on the contactor unit. Note) Install wiring so that the contactor is closed when this signal is on.

Item	Description
2.Shunt trip (CB shunt trip)	Sets the number of the output signal to the CB shunt trip signal on the contactor unit. This signal is depend on the actual contactor specification. This signal is output by a shunt trip request from the timer board. The circuit breaker on the contactor unit is tripped by the pulse output. A directive for tripping the circuit breaker is transferred from the timer board to the robot, then to the contactor unit.
3.Alarm code	Signal for outputting a timer board alarm I/O code to peripherals. Set a GO (group output) 4 bits. The signals to be used additionally require group output (GO) assignment.
4.Tip stick timing	In servo gun system, this signal can be used to inform the PLC when the tip stick check was performed. Each time the gun opens from the weld spot, the tip stick timing output is turned on when the gun reaches the opening specified by the Tip Stick Detect Distance. This output turns on regardless of whether the tips are stuck or not.

Input signals (IN)

Item	Description
1.Iso contactor (IC auxiliary contact output signal)	Signal for detecting the contactor open/close status. Set this signal so that it is on when the contactor is closed or off when the contactor is open.
2.Leak Input	Signal for detecting a leakage of current. When this signal is turned on, 'SPOT-384 IWC(DG) leak input' occurs in the robot.
3.Tip stick detect	In servo gun system, this signal is used for tip stick detection by weld controller. Robot reads this input at gun open after welding, and if this signal is on at tip stick detect distance, robot stops and post the tip stick detection alarm.

NOTE
   Whether signal setup is required or not depends on the specifications of the
   contactor. When a signal need not be wired, set its signal number to 0.
   Also when direct control from the robot controller is not required, set signal
   numbers to 0.

When the contactor signals are to be used, check the following after completing wiring and setting.

Check 1   Turn on contactor DO.
                 The contactor(MC) of the contactor unit closes.
                 Contactor DI is turned on.

Check 2   Turn off contactor DO.
                 The contactor(MC) opens.
                 Contactor DI is turned off.

NOTE
   The conditions for turning the contactor output signal on and off can be changed
   by setting the contactor control type on the spot config screen. For details, refer
   to the R-30*i*A Controller Spot Tool+ operator's manual (B-83124EN-1) or R-30*i*B
   Controller Spot Welding Function operator's manual (B-83284EN-4). When
   DENGENSHA's integrated timer is specified, the contactor output signal is
   synchronized with the on/off setting of the Weld/NOWELD input signal of cell I/O.

2.2.2   IWC Communication Status Signal

Operation
MENUS → I/O → F1 [TYPE] → Cell Intface

Press F3, IN/OUT to open the Cell outputs screen.

```
I/O Cell Outputs
                                        1/21

         NAME              OUT PT   SIM   STATUS
      1 Input Simulated    DO[  0]   U    ***
      2 Output Simulated   DO[  0]   U    ***
      3 OVERRIDE = 100     DO[  0]   U    ***
      4 In cycle           DO[  0]   U    ***
      5 Prog Aborted       DO[  0]   U    ***
      6 Process fault      DO[  0]   U    ***
      7 Process alert      DO[  0]   U    ***
      8 Process complete   DO[  0]   U    ***
      9 Weld enabled       DO[  0]   U    ***
     10 Stroke enabled     DO[  0]   U    ***
     11 Proc1 tip rep re   DO[  0]   U    ***
     12 Proc2 tip rep re   DO[  0]   U    ***
     13 Apprch tip repla   DO[  0]   U    ***
     14 Proc1 tip mnt re   DO[  0]   U    ***
     15 Proc2 tip mnt re   DO[  0]   U    ***
     16 One Spot Welded    DO[  0]   U    ***
     17 Tryout Status      DO[  0]   U    ***
     18 Heartbeat          DO[  0]   U    ***
     19 IWC COMM Stat      DO[  0]   U    ***
     20 Robot motion G1    DO[  0]   U    ***
     21 Robot motion G2    DO[  0]   U    ***


    [TYPE]          IN/OUT    SIM     UNSIM  >
```

NOTE
The actual item number is different from each system configuration.
If you can not see the IWC COMM stat, check the weld interface in the SETUP
Spot Config screen, and after that enter the function key REDO on this screen.

Item	Description
IWC COMM stat	When this signal is set to ON, communication with the timer board has been established. When the signal is OFF, communication with the timer board is not established. If you install two timer boards, this signal is ON if and only if the system is in communication with both boards.

2.2.3   Output Signal to External Equipment

A part of the communication data between timer board and robot can be output to external equipment by using digital I/O (DOUT or GOUT). The data that can be output are Weld Complete, Weld Schedule, Weld Sequence in Progress, and Weld in Progress. Follow the following procedures when you want to output these data to external equipment (PLC etc.).

Operation
MENUS → SYSTEM → F1 [TYPE] → Variables

Change the following system variable to TRUE.

    $IWCPCFG.$EXTEND_ENB2[#] = TRUE   ENABLED
    $IWCPCFG.$EXTEND_ENB2[#] = FALSE   DISABLED (Default)
    # : Weld controller number

NOTE
Re-restore power supply after changing the above-mentioned system variable.

Set each signal by the following system variables.

Name	System variable	Description
Weld Complete	$IWCPCFG.$EXTEND2[#].$OT_IDX[1] # : Weld controller number	Specify port number of DOUT for this system variable. When weld sequence is completed, pulse of 0.5msec is output. When weld sequence ends on the way, this is not output. Change $IWCPCFG.$EXTEND2[#].$TIME[1] when you want to change width of pulse.
Weld Schedule	$IWCPCFG.$EXTEND2[#].$OT_IDX[2] # : Weld controller number	Specify port number of GOUT for this system variable. Weld schedule is output while executing the weld sequence.
Weld Sequence in Progress	$IWCPCFG.$EXTEND2[#].$OT_IDX[3] # : Weld controller number	Specify port number of DOUT for this system variable. This signal is turned on while executing the weld sequence.
Weld in Progress	$IWCPCFG.$EXTEND2[#].$OT_IDX[4] # : Weld controller number	Specify port number of DOUT for this system variable. This signal is turned on when energizing while executing the weld sequence.

> **NOTE**
> Re-restore power supply after changing the above-mentioned system variables.

> **NOTE**
> 1 Weld Complete, Weld Schedule, and Weld Sequence in Progress are output irrespective of weld mode (Weld/No weld). Observe Weld in Progress also when you observe energizing.
> 2 Weld in Progress is turned on with WELD in the welding sequence, and turned off with HOLD. This is not turned off in COOL etc.
> 3 Even if next spot instruction is executed while the pulse of Weld Complete has been turned on, the pulse of Weld Complete is not turned off.

> **NOTE**
> This function has been supported since software version 7DC1P06.

2.3   SETTING UP THE INTEGRATED TIMER PARAMETERS

Settings for the integrated timer board can be made and confirmed from the robot teach pendant.

> **NOTE**
> For the items on this setting screen, be sure to refer to the manual issued by DENGENSHA MFG. CO., LTD. to make settings correctly.

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup

```
DEP Setup
                                        1/5
      WC:                          1
  1 Common                    <*DETAIL*>
  2 Schedule                  <*DETAIL*>
  3 Gun                       <*DETAIL*>
  4 Function                  <*DETAIL*>
  5 Hardware                  <*DETAIL*>
```

```
|      | [TYPE] |      |      |      |      |      |      |  >  |
```

Move the cursor on <*DETAIL*> and press the ENTER key to display the detail setup screen for the corresponding item.
The screen display is returned from each detail setup screen to the above screen by pressing the PREV key.

These screens correspond to the following welding parameters.

   Common ... Sequence C (Common sequence)
   Schedule ... Schedule 1-255 (Weld Schedules)
   Gun   ... Sequence G1-4
   Function ... Sequence S (Special Function)
   Hardware ... Sequence H (Hardware, Gain)

When two timer boards are used, switching to it by using F3 WC_NUM on each screen. If your system has only a timer board, F3 WC_NUM is not displayed.

NOTE
 Do not change any value on each screen during welding execution.

2.3.1 COMMON (Common)

Operation
MENUS → 0 NEXT → DEP(DG) → F1[TYPE] → Setup → 1 common

```
DEP COMMON
WC: 1                                           1/8

     1 WELD TIME COMP (CYC)              0
     2 WELD TIME SHORT (CYC)             0
     3 WELD TIME LIMIT (CYC)          1000
     4 REF LINE VOLT (V)               400
     5 LINE VOLT LOW LIMIT(%)           20
     6 LINE VOLT HIGH LIMIT(%)          20
     7 W-CUR FAULT LIMIT (%)            30
     8 OVER CURRENT LIMIT (%)          120

     [TYPE]           WC_NUM                     >
```

To change a setting, move the cursor on the target item, enter the setting value, then press the ENTER key.
For the meanings and input ranges of the displayed items, refer to the manual issued by DENGENSHA MFG. CO., LTD.

Function key

F3 WC_NUM	Changes the target weld controller number for display. This function key is displayed when more than one timer board is installed.

2.3.2 WELD SCHEDULE

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup → 2 Schedule

```
DEP SCHEDULE
WC: 1 Schedule: 1                         1/34

        1 SQUEEZE (CYC)                   50
        2 UP-SLOPE (CYC)                   3
        3 WELD 1 (CYC)                     0
        4 COOL1 (CYC)                      0
        5 WELD 2 (CYC)                     0
        6 COOL2 (CYC)                      0
        7 WELD 3 (CYC)                     0
        8 DOWN-SLOPE (CYC)                 0
        9 HOLD (CYC)                      20
       10 MULTI IMPULSE                    1
       11 CURRENT 1 (A)                 2000
       12 CURRENT 2 (A)                 2000
       13 CURRENT 3 (A)                 2000
       14 HEAT 1 (%)                      20
       15 HEAT 2 (%)                      20
       16 HEAT 3 (%)                      20
       17 CURRENT HIGH LIMIT (%)          20
       18 CURRENT LOW LIMIT (%)           20
       19 HEAT HIGH LIMIT (%)            100
       20 HEAT LOW LIMIT (%)              10
       21 TRANS TURNS                  200.0
       22 CTRL(VC=0,CC,CP,TWCP)            1
       23 MAX CURRENT (A)              60000
       24 STEP 1 CURRENT (%)             100
       25 STEP 2 CURRENT (%)             100
       26 STEP 3 CURRENT (%)             100
       27 STEP 4 CURRENT (%)             100
       28 STEP 5 CURRENT (%)             100
       29 STEP 6 CURRENT (%)             100
       30 STEP 7 CURRENT (%)             100
       31 STEP 8 CURRENT (%)             100
       32 STEP 9 CURRENT (%)             100
       33 GUN No (1-4)                     1
       34 MONITOR IMPULSE (1-3)            1


    [TYPE]   SCHE_NUM   WC_NUM    PREV    NEXT    >
    SAVE     LOAD      PRINT     COPY
```

WC:
Target weld controller
(= timer board) number.

Schedule:
Target welding schedule number.

The screen is displayed based on the information from the timer board. To change displayed data, move the cursor on the target item, enter the setting value, then press the ENTER key.

For the meanings and input ranges of the displayed items, refer to the manual issued by DENGENSHA MFG. CO., LTD.

Function keys

Page 1

F2 SCHE_NUM	Changes the weld schedule number.
F3 WC_NUM	Changes the weld controller number. The weld controller number is the number of a timer board. This function key is displayed when more than one timer board is installed.
F4 PREV	Displays the previous weld schedule.
F5 NEXT	Displays the next weld schedule.

Page 2

F1 SAVE	Saves a schedule in text form.
	The file name is "weld-controller-number"sch"weld-schedule-number".dt.
	For example, in the case of weld controller 1 and weld schedule 10, the file name is 1sch10.dt.
	For details, see section 5.2.
	For how to save and load data using the File screen, see Section 5.1.

F2 LOAD	Loads the weld schedule in a file named as described above.
	For details, see section 5.2.
F3 PRINT	Outputs the displayed schedule in text form just as displayed on the screen.
	The file name is "weld controller-number"sch "weld schedule-number".ls.
	For example, in the case of weld controller 1 and weld schedule 5, the file name is
	1sch5.ls.
	You cannot upload or download data via FTP.
F4 COPY	You can copy the currently displayed weld schedule to another weld schedule number.

2.3.3   COUNT/STEP (Gun)

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup → 3 Gun

```
DEP COUNT
WC: 1 GUN: 1                               1/12

     1 TIP DRESS COUNT                      0
     2 TIP CHANGE COUNT                     0
     3 STEPPER STEP 0 COUNT                 0
     4 STEPPER STEP 1 COUNT                 0
     5 STEPPER STEP 2 COUNT                 0
     6 STEPPER STEP 3 COUNT                 0
     7 STEPPER STEP 4 COUNT                 0
     8 STEPPER STEP 5 COUNT                 0
     9 STEPPER STEP 6 COUNT                 0
    10 STEPPER STEP 7 COUNT                 0
    11 STEPPER STEP 8 COUNT                 0
    12 STEPPER STEP 9 COUNT                 0


   [TYPE]    GUN_NUM   WC_NUM    PREV    NEXT    >
```

The screen is displayed based on the information from the timer board. To change displayed data, move the cursor on the target item, enter a value, then press the ENTER key.
For the meanings and input ranges of the displayed items, refer to the manual issued by DENGENSHA MFG. CO., LTD.

Function keys

F2 GUN_NUM	Changes the number of the gun to be displayed.
F3 WC_NUM	Changes the weld controller number.
	The weld controller number is the number of a timer board. This function key is
	displayed when more than one timer board is installed.
F4 PREV	Changes to the previous gun.
F5 NEXT	Changes to the next gun.

2.3.4   FUNCTION (Special)

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup → 4 Function

```
┌─────────────────────────────────────────────────┐
│ DEP FUNCTION                                      │
│ WC: 1                               1/7           │
│                                                   │
│     1 REWELD                   OFF                │
│     2 FAULT RESET BY PILOT     OFF                │
│     3 ALARM LEVEL              ALARM              │
│     4 STEPPER                  OFF                │
│     5 TOROID SENSITIVITY       STD                │
│     6 PWM FREQUENCY            600                │
│     7 INV CAPACITY             400                │
│                                                   │
│                                                   │
│  [TYPE]        WC_NUM  [CHOICE]        >          │
└─────────────────────────────────────────────────┘
```

The screen is displayed based on the information from the timer board. To change displayed data, move the cursor on the target item, and press F4 [CHOICE] key.

For the meanings and input ranges of the displayed items, refer to the manual issued by DENGENSHA MFG. CO., LTD.

Function key

F3 WC_NUM	Changes the weld controller number. The weld controller number is the number of a timer board. This function key is displayed when more than one timer board is installed.

2.3.5 HARD (Hardware)

Operation

MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup → 5 Hardware

```
┌─────────────────────────────────────────────────┐
│ DEP HARD                                          │
│ WC: 1                               1/6           │
│                                                   │
│     1 PRIM-CT GAIN              10000             │
│     2 2ND TOROID GAIN           10000             │
│     3 LINE VOLT GAIN            10000             │
│     4 TIP RESISTANCE GAIN       10000             │
│     5 FIXED ARM GAIN            10000             │
│     6 MOVABLE ARM GAIN          10000             │
│                                                   │
│                                                   │
│  [TYPE]        WC_NUM  UPDATE          >          │
└─────────────────────────────────────────────────┘
```

The screen is displayed based on the information from the timer board. To change displayed data, move the cursor on the target item, enter the setting value, then press the ENTER key.

To make the new value effective, press F4, UPDATE.

For the meanings and input ranges of the displayed items, refer to the manual issued by DENGENSHA MFG. CO., LTD.

Function keys

F3 WC_NUM	Changes the weld controller number. The weld controller number is the number of a timer board. This function key is displayed when more than one timer board is installed.
F4 UPDATE	Writes a new value into the timer board.

NOTE
This hardware data is the timer board circuit compensation data. And it is factory-set by DENGENSHA. You need not change any setting normally. The data is retained not on the robot memory, but only is in the timer board memory.

---

3   PROGRAM INSTRUCTIONS

3.1   SPOT INSTRUCTION

The SPOT instruction directs the timer board to start welding according to the specified weld schedule. After completion of welding, the next line in the program is executed:

SPOT [...S=1...] ("..." is different with equipment type)

S: Weld schedule number

3.2   RESET STEPPER INSTRUCTION

The RESET STEPPER instruction resets stepper counters, tip dress counter, and tip replace counter to 0.

RESET STEPPER [WC=1, SN=1, SV=0]

WC : Timer board number (1 or 2)
SN   : G1-4 series (1 to 4)
SV   : Option
0:   Clears the "stepper counters" and "stepper step counts" for the gun specified by SN to 0.
1:   Clears the "tip dress counter" for the gun specified by SN to 0.
2:   Clears the "tip replace counter" for the gun specified by SN to 0.

3.3   RESET WELDER INSTRUCTION

The RESET WELDER instruction is used to reset a welding error on the welding timer board from the robot controller.

RESET WELDER [WC=weld controller-number]

> **NOTE**
> This instruction resets error only on the timer board. If you enable "Reset WC with Robot" on the spot config screen, the timer board alarms are reset by reset operations (teach pendant reset, UI[reset], or SI[reset]).

4   **ALARM/RESET**

You can check timer board alarms on the following two screens:
- Alarm/Hist screen
- DEP/Alarm

- Alarm/Hist screen
  You can check timer board alarms together with other alarms. See section 4.1 for details

- DEP/Alarm screen, Alarm/Hist screen
  You can check alarm messages posted only from the timer board and an alarm history for each alarm level. See section 4.2 for details.

For resetting alarms of the timer board, see section 4.4.

4.1   **ALARM/HIST SCREEN**

Operation
MENUS → Alarm → F3 HIST

(Display example)

```
Alarm : Hist
     DETAIL Alarm
     spot-010 Major alarm detected

     STOP.G   12-MAY-06  23:58
     ALARM : HIST
      1 spot-010 Major alarm detected
      2 spot-064 CURRENT LOW
      3 spot-064 TOTAL W-TIME LONG
      4 RESET


     [TYPE]   [VIEW]   ACTIVE   CLEAR   DETAIL
```

More than one alarm message may be issued just by one spot welding.
In the above example, current low and total w-time long are posted.

- **SPOT-010   Major alarm detected   <robot stopped>**
  If any faults (fault or error) are included in an alarm message posted during welding, this alarm is issued, and the robot is stopped.

- **SPOT-011   Minor alarm detected   <warn, not stopped>**
  If no fault (fault or error) is included in an alarm message posted during welding and the alarm message is just a warning (alarm), this warning alarm is issued.

- Posted alarm messages can be checked with the alarm history.
  SPOT-063 "alarm-message"   ...... stopped
  SPOT-064 "alarm-message"   ...... stopped or warning

- On the DEP(DG)/alarm screen (see Section 4.2), alarm messages issued only from the timer can be checked.

> **NOTE**
> For cause and action against alarm messages from the timer board, refer to the manual issued by DENGENSHA MFG. CO., LTD.
> When shell polling is enabled and program start from TP, if alarm is received from timer board, spot-010 or spot-011 is posted twice.

Relation with alarm level of timer board and robot stop

Timer board alarm level	Robot
ERROR level FAULT level	Pause (STOP.G)
ALARM level	None pause (WARN)

Alarm message, I/O code, alarm level

Alarm message	I/O code (*1)	Alarm level (*2)
CURRENT LOW	1	Alarm
CURRENT HIGH	2	Alarm
HEAT %LOW	3	Alarm
HEAT %HIGH	4	Alarm
LINE VOLT LOW	5	Alarm
LINE VOLT HIGH	6	Alarm
STEP END		Alarm
TIP DRESS END	7	Alarm
TIP CHANGE END		Alarm
LINE CLOCK	8	Fault
NO CURRENT	9	Fault
CURRENT FAULT		Fault
TIME FAULT	10	Fault
I/O FAULT		Fault
TRANS OVER TEMP	11	Fault
SCR OVER TEMP		Fault
SCR SHORT	12	Fault
SCR HALF CYCLE		Fault
MEMORY ERROR		Error
W-CUR PROGRAM LOW		Error
W-CUR PROGRAM HIGH	15	Error
TOTAL W-TIME LONG		Error
PARAMETER OUT LIMIT		Error

> **NOTE**
> The information on an alarm message, an I/O code, and an alarm level is associated with the timer board to be used. Refer to the manual issued by DENGENSHA MFG. CO., LTD.

(*1) The I/O code can be output to the group signal output. For how to set the signal, see Section 2.2 "SETTING UP SIGNALS.". The above I/O code indicates the value output for the corresponding alarm.

(*2) Some alarm levels can be changed into a FAULT level by the DEP / setup / special function screen.

4.2 INTEGRATED TIMER ALARM SCREEN

Operation

MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Alarm

```
┌─────────────────────────────────────────────────────┐
│ Fault                                                 │
│ WC: 1                                                 │
│                                                       │
│          Message                    LEVEL             │
│        1 CURRENT LOW                Alarm             │
│        2 TOTAL W-TIME LONG          Error             │
│                                                       │
├──────┬─────────┬─────────┬─────────┬──────┬───────────┤
│      │ [TYPE]  │ RESET   │ WC_NUM  │ HIST │      │ >  │
└──────┴─────────┴─────────┴─────────┴──────┴───────────┘
```

This screen displays the latest alarms on timer board.
This screen displays max four alarms that have not been reset.

Function keys

F2 RESET	Resets the timer board to release timer board alarms. This function key does not reset robot alarms.
F3 WC_NUM	Changes the weld controller number. The weld controller number is the number of a timer board. This function key is displayed when more than one timer board is installed.
F4 HIST	Shows past alarms issued from the timer board and the number of times such alarms were issued. (See Section 4.3)

After the timer board alarms are reset, the following screen is displayed:

```
┌─────────────────────────────────────────────────────┐
│ Fault                                                 │
│ WC: 1                                                 │
│                                                       │
│          Message                    LEVEL             │
│          NO ACTIVE ALARM                              │
│                                                       │
├──────┬─────────┬─────────┬─────────┬──────┬───────────┤
│      │ [TYPE]  │ RESET   │ WC_NUM  │ HIST │      │ >  │
└──────┴─────────┴─────────┴─────────┴──────┴───────────┘
```

The PREV key returns the screen display to the above screen when you enter the history screen by using F4, HIST.

4.3 INTEGRATED TIMER/ ALARM HIST SCREEN

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Alarm → F4 HIST

```
┌─────────────────────────────────────────────────────┐
│ Fault Frequency                                       │
│ ALL/ALL                                    1/4        │
│          Fault                   # of Occur           │
│        1 CURRENT LOW                      2           │
│        2 LINE VOLT HIGH                   3           │
│        3 TIME FAULT                       1           │
│        4 W-CUR PROGRAM LOW                1           │
│                                                       │
├──────┬─────────┬─────────┬─────────┬──────┬───────────┤
│      │ [TYPE]  │         │ PART_ID │ SAVE │      │ >  │
└──────┴─────────┴─────────┴─────────┴──────┴───────────┘
```

This screen displays alarm history which is issued during previous welding. From this screen, you can display the number of alarms for each program or position and details of each alarm.

Press F3, PART_ID. The following screen appears:

```
Part Fault Freq.
ALL/ALL                                      1/2
          PART ID/ Program name  # of Faults
      1 AA_01                               6
      2 AA_02                               3
```
[TYPE]		WELD_ID	SAVE		>

You can check the number of alarms for each program.

> **NOTE**
> If you select STYLE program select mode, this screen displays the number of alarms for each style id.

Press F3, WELD_ID. The following screen appears:

```
Weld Fault Freq.
AA_02 /ALL                                   1/2
          Weld ID              # of Faults
      1 Pos.1                               2
      2 Pos.2(Body side2)                   1
```
[TYPE]		FLTS	SAVE		>

You can check the number of alarms for each position with the specified program.

> **NOTE**
> This screen does not display the number of alarms for a position numbered 1000 or greater.

Press F3, FLTS. The following screen appears:

```
Weld Faults
AA_02/1                                      1/2
          Weld ID              # of Occur
      1 CURRENT LOW                         1
      2 LINE VOLT HIGH                      1
```
[TYPE]			SAVE		>

You can check the number of alarms and type of each alarm for the specified program and position.

Press F4, SAVE to save the welding results and welding alarm history. (See section 7.3)

4.4   ALARM RESET FOR INTEGRATED TIMER

If you enable "Reset WC with Robot" on the spot config screen, the timer board alarms are reset by reset operations (teach pendant reset, UI[reset], or SI[reset]).

Reset WC with Robot on SETUP/Spot Config
ENABLED : The timer board alarms are reset by reset operations of robot (TP, UI, or SI). (default)
DISABLED: The timer board alarms are not reset by reset operations of robot (TP, UI, or SI).

When the above setting is disabled, you can reset the timer board using the methods listed below:

1. Function key(F2) RESET of DEP(DG)/Alarm (See section 4.2)
2. Program instruction (RESET WELDER) (See section 3.3)

NOTE
    When Reset WC with Robot is disabled, both reset operation of a timer board
    and reset operation of a robot may be needed.

5   SAVING AND LOADING

5.1   SAVING SCHEDULE AND SETUP DATA

The data listed below is saved into the following SV files. The files are saved by [all of above] or [System files] on the File screen. To load the files, use the controlled start screen.

Operation
MENUS → File → F4 [BACKUP] → [All of above] or [System files]

IWDGSCHE.SV
Weld Schedule (all weld schedules)
Number of weld schedule ($IWCDGSNUM)

IWDGCONF.SV
COMMON (Common)
COUNT/STEP (Gun)
FUNCTION (Special)
Current values for the tip dress counter, stepper counter (You cannot set the screen.)

SYSSPOT.SV
Spot-related settings other than the above

NOTE
    The settings on the HARD (Hardware) cannot be saved.

5.2   SAVE/LOAD WELD SCHEDULE WITH TEXT FORM

This section explains how to save/load a schedule to/from the file device with text form.

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Setup → 2 Schedule

```
DEP SCHEDULE
WC: 1 GUN: 1                                    1/34


    1 SQUEEZE (CYC)                            50
    2 UP-SLOPE (CYC)                            3
    3 WELD 1 (CYC)                              0
    :                                           :
    :                                           :
   32 STEP 9 CURRENT (%)                      100
   33 GUN No (1-4)                              1
   34 MONITOR IMPULSE (1-3)                     1


   [TYPE]   SCHE_NUM   WC_NUM   PREV    NEXT   >
    SAVE      LOAD     PRINT    COPY
```

Press -> and F1 SAVE to save weld schedules with text form.
Press -> and F2 LOAD to load the text form's weld schedules.

```
DEP SCHEDULE
WC: 1 GUN: 1                                  1/34

         1 SQUEEZE (CYC)                      50
         2 UP-SLOPE (CYC)                      3
         3 WELD 1 (CYC)                        0
         4 COOL1 (CYC)                         0
         5 WELD 2 (CYC)                        0
         6 COOL2 (CYC)                         0
         7 WELD 3 (CYC)                        0
         8 DOWN-SLOPE (CYC)                    0
         9 HOLD (CYC)                         20
        10 MULTI IMPULSE                       1
Select range (prev to exit)
```

	This sch	ALL	SPECIFY			>

Press one of F1 to F3.
F1 This Sch.   : Saves(or loads) a currently selected weld schedule.
F2 ALL   : Saves(or loads) all schedules. Each schedule is saved in a different file name.
F3 SPECIFY   : Specifies the weld schedule range.
After pressing F3, specify the range as follows.

```
Input card number (0 is all):
```

You can specify the weld timer board number for target data.
When you use one weld timer board, this message does not appear.
Enter 0 to save(or load) schedules for all weld timer boards.
Enter 1 to save(or load) schedules for timer board 1.
Enter 2 to save(or load) schedules for timer board 2.

```
from (0 is all):
```

You can specify the target range of the weld schedule for the specified weld controller.
Specify the starting number for the save/load schedules.
Enter 0 to save/load all weld schedules.

```
to(0 for all after "from" ):
```

Specify the number of the last weld schedule number you want to save or load.
Enter 0 to save (or load) all the subsequent weld schedules.
Enter a value greater than or equal to the starting number.

Examples (Total timer boards: 2, Total weld schedules: 255)

Specified range			Save/load range
Card	From	To	
1	2	5	Weld schedules 2 to 5 for timer board 1
2	8	0	Weld schedules 8 to 255 for timer board 2
1	7	7	Weld schedule 7 for weld controller 1
1	0	Not required	Weld schedules 1 to 255 for timer board 1
0	0	Not required	All weld schedules for timer board 1 and 2
0	8	0	Weld schedules 8 to 255 for timer board 1 and 2
0	2	5	Weld schedules 2 to 5 for timer board 1 and 2

When ALL or SPECIFY is selected, multiple files are saved or loaded. If a load or save error occurs during operation, processing stops at that point.   The remaining files are not saved or loaded.

Example of a saved single weld schedule

```
This file was created on 22-OCT-05 17:54  from SpotTool+     V8.10xx

Robot F-Number:F00000

FILE:1sch32.dt

Robot Hostname:ROBOT

50,3,0,0,0,0,0,0,20,1,2000,2000,2000,
```

6 MONITORING WELDING RESULTS

You can check the welding results with the DEP(DG) Monitor screen.

6.1 MONITOR SCREEN

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Monitor

```
DEP MONITOR
WC: 1                                    1/21

     1 PART ID                      AA_01
     2 WELD ID                      0
     3 SCHEDULE No.                     1
     4 WELD CURRENT (A)              2000
     5 WELD TIME (CYC)                  0
     6 HEAT (%)                        50
     7 POWER FACTOR (%)                60
     8 LINE VOLT (V)                  400
     9 GUN No                          1
    10 TIP DRESS COUNT                 0
    11 TIP CHANGE COUNT                0
    12 STEP No                         0
    13 WELDS COUNT                     0
    14 TIP RESISTANCE (m-ohm)          0
    15 EXPANSION                       0
    16 FIXED ARM STRAIN                0
    17 MOVABLE ARM STRAIN              0
    18 Fault 1                         0
    19 Fault 2                         0
    20 Fault 3                         0
    21 Fault 4                         0


     [TYPE]              WC_NUM   LOG           >
```

The results of welding at the latest spot are displayed.
The displayed items differ depending on the option configuration of the timer board.
Press F4 LOG to display the DEP(DG) Data Log (previous data) screen.

NOTE
   This screen does not display WELD ID for a position numbered 1000 or greater.

NOTE
   For details of each item, refer to the manual issued by DENGENSHA MFG. CO.,
   LTD.

6.2 DATA LOG

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Monitor → F4 [Log]

```
┌──────────────────────────────────────────────┐
│ DEP Data Log                                   │
│                                        1/3     │
│      WC:                           1           │
│    1 PART ID(Program):      (ALL    )          │
│    2 WELD ID:      0                            │
│    3 SCHEDULE:     0                            │
│    PARAM     Avg           Std         Var      │
│    V   :     400.00        0.00        0.00     │
│    I   :    2000.00        0.00        0.00     │
│    PF  :      60.00        0.00        0.00     │
│    HEAT:      50.00        0.00        0.00     │
│                                                 │
│  │[TYPE]│        │WC_NUM│[CHOICE]│ALL_PRG│ >    │
└──────────────────────────────────────────────┘
```

The results of previous welding at the latest 100 spots are recorded.
For voltage (V), current (I), power factor (PF), and heat ratio (HEAT), the average (Avg), standard deviation (std), and variance (var) are displayed.
Statistical data is displayed for the specified program and position.
(average, standard deviation, and variance)
When you specify WELD ID and SCHEDULE, the relevant data recorded for the 100 spots is used for statistical data processing and the resultant data is displayed. When you specify 0 for an item, the item is ignored
Program is selected from the sub window opened by pressing F4, [CHOICE]. When you press F5, ALL_PRG, the statistical data for all programs is displayed.

NOTE
   This screen does not display a result for a position numbered 1000 or greater.

When you select STYLE program select mode, the following screen appears.

```
┌──────────────────────────────────────────────┐
│ DEP Data Log                                   │
│                                        1/3     │
│      WC:                           1           │
│    1 PART ID(Program):  0    (* ALL *)         │
│    2 WELD ID:      0                            │
│    3 SCHEDULE:     0                            │
│    PARAM     Avg           Std         Var      │
│    V   :     400.00        0.00        0.00     │
│    I   :    2000.00        0.00        0.00     │
│    PF  :      60.00        0.00        0.00     │
│    HEAT:      50.00        0.00        0.00     │
│                                                 │
│  │[TYPE]│PART_ID│WC_NUM│MONITOR│       │ >     │
└──────────────────────────────────────────────┘
```

Statistical data is displayed for a PART_ID and position number.
When you specify PART ID, WELD ID and SCHEDULE, the relevant data recorded for the 100 spots is used for statistical data processing and the resultant data is displayed. When you specify 0 for an item, the item is ignored. When you specify 0 for all items, statistical data for the 100 spots is processed and displayed.

You can also specify a value for PART ID as follows.
Press F2, PART_ID. The following screen appears.

```
┌─────────────────────────────────────────────────────┐
│ DEP PART ID                                           │
│ STYLE: * ALL *                              1/32       │
│  ID    ProgName                                        │
│   1    JOB123                                          │
│   2    2_DOOR                                          │
│   3    J67                                             │
│   4    ********                                        │
│   5    ********                                        │
│   :       :                                            │
│   :       :                                            │
│                                                        │
├──────┬───────┬───────┬────────┬────────┬────────┬─────┤
│      │[TYPE] │select │        │        │        │  >  │
└──────┴───────┴───────┴────────┴────────┴────────┴─────┘
```

Move the cursor on the program for which you want to display data and press F2, SELECT.
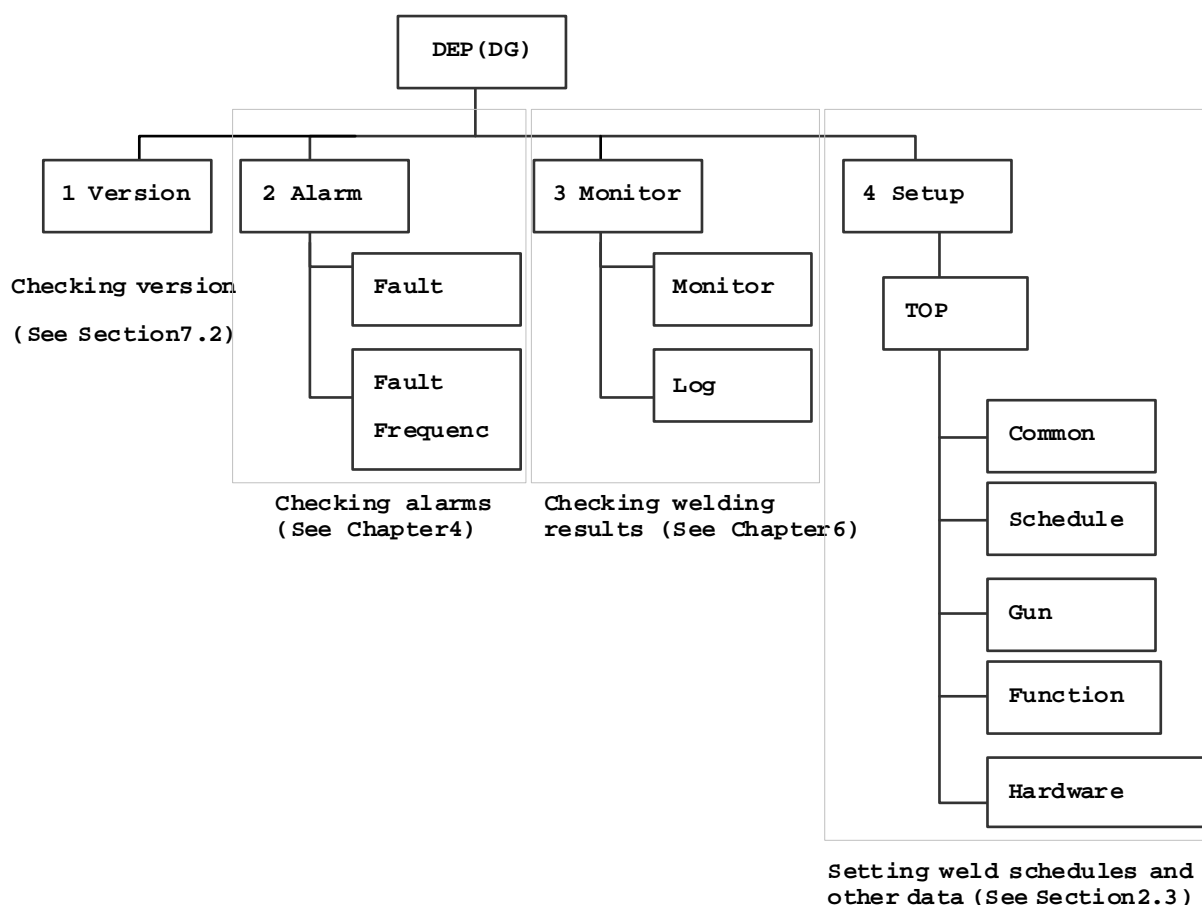The corresponding number is input for PART ID on the DEP Data Log screen.

7   OTHER

7.1   THE SCREEN CONFIGURATION OF DEP(DG) SCREEN

The settings related to the integrated timer are organized under
Operation
MENUS → 0 NEXT → DEP(DG).

Screen map

7.2   TIMER VERSION

You can confirm the version of timer board to following operation.

Operation
MENUS → 0 NEXT → DEP(DG) → F1 [TYPE] → Version

(Example)

```
┌─────────────────────────────────────────────────────┐
│ Data Entry Panel                                      │
│                                                       │
│                                                       │
│              Integrated Dengensha Welder              │
│                                                       │
│                  timer     software                   │
│             WC: 1   RWC2000   1003000200000003        │
│                                                       │
├──────┬──────┬──────┬──────┬──────┬──────┬──────┬──────┤
│      │[TYPE]│      │      │      │      │      │  >   │
└──────┴──────┴──────┴──────┴──────┴──────┴──────┴──────┘
```

The following screens may be displayed immediately after a power cycle. Once change to another screen and display this screen again.

R-30*i*A

```
┌─────────────────────────────────────────────────────┐
│ Data Entry Panel                                      │
│                                                       │
│                                                       │
│              Integrated Dengensha Welder              │
│                                                       │
│                  IWC(DG) is not ready                 │
│                                                       │
├──────┬──────┬──────┬──────┬──────┬──────┬──────┬──────┤
│      │[TYPE]│      │      │      │      │      │  >   │
└──────┴──────┴──────┴──────┴──────┴──────┴──────┴──────┘
```

R-30*i*B

```
┌─────────────────────────────────────────────────────┐
│ Data Entry Panel                                      │
│                                                       │
│                                                       │
│              Integrated Dengensha Welder              │
│                                                       │
│     Waiting for response from timer.                  │
│     SPOT alarm might occurred when there is           │
│     no response even if waiting for a while.          │
│     Confirm SPOT alarm on alarm screen.               │
│                                                       │
├──────┬──────┬──────┬──────┬──────┬──────┬──────┬──────┤
│      │[TYPE]│      │      │      │      │      │  >   │
└──────┴──────┴──────┴──────┴──────┴──────┴──────┴──────┘
```

7.3 WELD RESULT / SAVING WELD ALARMS

The welding results and alarms for the latest 100 spots are output to a text file. The file name is iwdg.dg. You can use the following three methods to save the data.   The data output with the three methods is the same.

·   Save data using the File screen.

     Operation
     MENUS → File → F4 [Backup] → [Select All of above] or [Diagnostic].

·   Save data using the IWC alarm history screen (See section 4.3)
·   Get data to a PC via FTP.

The contents of iwdg.dg are shown below.
Following the header line, parameters are listed in CSV format.

(example)

```
This file was created on 06-DEC-01 10:18   SpotTool+      7Dxx    RWC2000    1001000800000000
Robot F-Number:F00000
FILE:IWDG.DG
Robot Hostname:ROBOT
PART ID              , WELD ID            , SCHEDULE No           , WELD CURRENT(A)        ,
WELD TIME(CYC)          , HEAT(%)             , POWER FACTOR(%)        , LINE VOLT(V)        ,
GUN No              , TIP DRESS COUNT       , TIP CHANGE COUNT       , STEP No             ,
WELDS COUNT            , TIP RESISTANCE(OHM)   , EXPANSION             , FIXED ARM STRAIN      ,
MOVABLE ARM STRAIN     , TIME, CURRENT LOW          , CURRENT HIGH          ,
HEAT% LOW             , HEAT% HIGH           , LINE VOLT LOW          , LINE VOLT HIGH       ,
STEP END             , TIP DRESS END        , TIP CHANGE END         , LINE CLOCK          ,
NO CURRENT            , CURRENT FAULT        , TIME FAULT            , TRANS OVER TEMP      ,
SCR OVER TEMP         , SCR SHORT           , SCR HALF CYCLE         , OVER CURRENT        ,
SPARE               , MEMORY ERROR         , W-CUR PROGRAM LOW      , W-CUR PROGRAM HIGH     ,
TOTAL W-TIME LONG        , PARAMETER OUT LIMIT
0, 1, 1, 2000, 0, 50, 60, 400, 1, 0, 0, 0, 0, 0, 0, 0, 0, 06-DEC-01 09:41 , 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 2, 2, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 06-DEC-01 09:41 , 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0
0, 1, 3, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 06-DEC-01 09:42 , 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0
0, 2, 4, 2000, 0, 50, 60, 400, 1, 0, 0, 0, 0, 0, 0, 0, 06-DEC-01 09:42 , 0, 0, 0, 0, 0, 0, 0, 0, 0, 1, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0, 0
```

For easy to see, you paste this on to a spreadsheet as following.

PART ID	WELD ID	SCHE DULE No	WELD CUR RENT (A)		EXPA NSIO N	FIXE D ARM STRA IN	MOV ABLE ARM STRA IN	TIME	CUR RENT LOW	CUR RENT HIGH	HEAT % LOW	HEAT % HIGH	LINE VOLT LOW		W- CUR PRO GRA M LOW	W- CUR PRO GRA M HIGH	TOT AL W- TIME LON G
0	1	1	2000		0	0	0	06-DEC-01 09:41	0	0	0	0	0		0	0	0
0	2	2	0		0	0	0	06-DEC-01 09:41	0	0	0	0	0		1	0	0
0	1	3	0		0	0	0	06-DEC-01 09:42	0	0	0	0	0		0	0	0
0	2	4	2000		0	0	0	06-DEC-01 09:42	0	0	0	0	0		0	0	0
JOB123	1	5	2000	Omitted	0	0	0	06-DEC-01 09:42	1	0	0	0	0	Omitted	0	0	0
JOB123	pos2	6	2000		0	0	0	06-DEC-01 09:42	0	1	0	0	0		0	0	0
JOB123	1	7	2000		0	0	0	06-DEC-01 09:42	0	0	0	0	1		0	0	0
JOB123	2	8	2000		0	0	0	06-DEC-01 09:42	0	0	1	0	0		0	0	0
JOB123	1	9	2000		0	0	0	06-DEC-01 09:42	0	0	0	1	0		0	0	0
JOB123	2	10	2000		0	0	0	06-DEC-01 09:43	0	0	0	0	0		0	0	0
STYLE2	1	11	2000		0	0	0	06-DEC-01 09:43	0	0	0	0	0		0	0	0
STYLE2	Corner1	12	2000		0	0	0	06-DEC-01 09:43	0	0	0	0	0		0	0	0
STYLE2	1	13	2000		0	0	0	06-DEC-01 09:43	0	0	0	0	0		0	0	0
STYLE2	2	14	2000		0	0	0	06-DEC-01 09:43	0	0	0	0	0		0	0	0

Welding data   **Alarms**

The welding time is recorded for TIME column.

Welding data is shown on the left of TIME.

Welding alarms are shown on the right of TIME. The mark 1 is specified that this alarm had occurred at this welding.

In this example, "CURRENT LOW" occurred during welding corresponding to the fifth data item from the top.

PART ID column shows the program name. For a nonexistent program, this column shows the program number or PART ID instead.

WELD ID column shows the position number or comment of position data. For a comment less position, this column shows the position number instead.

The data cannot be saved in the controlled start menu or in the status in which no timer board is installed.

> **NOTE**
>   File messages
> 1   "This file is not available at controlled start."
>   An attempt was made to save data in the controlled start mode. The data is not
>   saved.
> 2   "No IWC(DG) board"
>   An attempt was made to save data in the status in which no timer board was
>   installed. The data is not saved.

7.4   MONITOR OF WELDED

Welded is monitored as described below.
Monitoring for item (3) must be done using the PLC of the user.

(1)   Monitoring by the timer: SPOT-063 NO CURRENT
If the weld current is not more than 5% of the setting, or thyristor ignition control fails, a stop occurs with the above alarm. Refer to alarm code 500 (NO CURRENT) in the manual, issued by DENGENSHA MFG. CO., LTD. for more details.

(2)   Monitoring by the robot: SPOT-063 No Weld Detected
If the timer welding results indicate that the Line volt is 0 although the Weld/NO WELD signal is on, a stop occurs with the above alarm.

(3)   Monitoring by the PLC (No Weld detection signal)
The no weld detection signal can be used by the following settings:

$IWCDGDBG[62]: Pulse width [msec]
(Default   500: signal level held constant by setting 0)
$IWCDGDBG[64]: DO[] signal number
(Default   0: this function is unused)

After the setting is changed, the power must be turned off then back on.

When the Weld/NO WELD cell input signal has been set to off by simulation (the operator has forgotten to change UNSIM the signal), the robot and timer can not check the actual weld mode in PLC. In this case, PLC can check the weld result from timer with using this no weld detection signal.
If the Line volt in the welding results feed back from the timer board is 0, the robot outputs a pulse signal specified as mentioned $IWCDGDBG[64].
When the PLC's weld mode is enable status and the above signal is set to on, the PLC inputs the hold signal to the robot. The hold signal stops the robot.
When the robot is stopped by the hold signal from the PLC, the program execution has gone ahead of the spot instruction. Before restart, it is necessary to change the program start line to the spot instruction line.
If an error in 1 or 2 above occurs, it is not necessary to change the start line.
The user have to design this checking PLC program and set the above signal. Before using this function, set the signals used to off.

7.5   WELD/NO WELD

When teach pendant is enabled, weld mode can be enabled and disabled on the soft panel screen.

Operation
MENUS → TEST CYCLE → F1 [TYPE] → Spot Weld

```
┌──────────────────────────────────────────────────┐
│ SPOT WELD                                          │
│                                         1/9        │
│                                                    │
│     1 Gun operation:                 STROKE        │
│     2 Weld controller mode:          WELD          │
│     3 Tryout mode:                   DISABLED      │
│     4 Weld IO sim:                   DISABLED      │
│     5   Weld Duration (ms):           500   ms     │
│     6   Inform output to plc       DO[  0]         │
│     7 Force process complete:        DISABLED      │
│                                                    │
│       Servo Gun Motion in Single Step              │
│     8   Pressure Motion:              ENABLED      │
│     9   Stop @ Taught Pos:            ENABLED      │
│                                                    │
├──────────────────────────────────────────────────┤
│    [TYPE]              │        WELD  NOWELD    >  │
└──────────────────────────────────────────────────┘
```

Move the cursor on the welding enable/disable indication.

┌──┐
│ **NOTE**   │
│   When the Gun operation is disabled, the Weld controller mode cannot be WELD. │
│   When the ON/OFF key on the teach pendant is set to the OFF position, you │
│   cannot operate any items on the test cycle. In production, the "Weld/NO WELD" │
│   input signal of the cell interface takes priority.   │
│   Refer to the R-30*i*A Controller Spot Tool+ operator's manual (B-83124EN-1) or │
│   R-30*i*B Controller Spot Welding Function operator's manual (B-83284EN-4) for │
│   more details.   │
└──┘

When teach pendant is disabled (at production time), welding can be enabled or disabled by the "welding enable/disable" input signal of the cell interface.   If this signal is set to on, welding is enabled, if the signal is set to off, welding is disabled.

Operation
MENUS → I/O → F1 [TYPE] → Cell Intface

The screen display is changed to the input signal screen by F3, IN/OUT.

```
┌──────────────────────────────────────────────────┐
│ I/O Cell Inputs                                    │
│                                         1/5        │
│                                                    │
│     INPUT SIGNAL        TYPE #  SIM   STATUS       │
│     1 Weld/NO WELD      DI[  0]  U    ON           │
│     2 Stroke/NO STROKE  DI[  0]  U    ***          │
│     3 Rmt wtr svr rese  DI[  0]  U    ***          │
│     4 Ret hom frm poun  DI[  0]  U    ***          │
│     5 Tryout Mode       DI[  0]  U    ***          │
│                                                    │
├──────────────────────────────────────────────────┤
│    [TYPE]        IN/OUT     ON      OFF       >    │
└──────────────────────────────────────────────────┘
```

Simulated welding

To execute a spot instruction in simulation mode when no internal timer board is installed, use the Weld
IO sim on the soft panel screen.

Operation
MENUS → TEST CYCLE → F1 [TYPE] → Spot Weld

```
┌─────────────────────────────────────────────────────┐
│ SPOT WELD                                             │
│                                            1/9        │
│                                                       │
│     1 Gun operation:                   STROKE         │
│     2 Weld controller mode:            NOWELD         │
│     3 Tryout mode:                     DISABLED       │
│     4 Weld IO sim:                     ENABLED        │
│     5   Weld Duration (ms):            500   ms       │
│     6   Inform output to plc           DO[ 0]         │
│     7 Force process complete:          DISABLED       │
│                                                       │
│       Servo Gun Motion in Single Step                 │
│     8   Pressure Motion:               ENABLED        │
│     9   Stop @ Taught Pos:             ENABLED        │
│                                                       │
├──────┬─────────┬───────┬────────┬─────────┬─────────┬───┤
│      │ [TYPE]  │       │        │ ENABLED │ DISABLED│ > │
└──────┴─────────┴───────┴────────┴─────────┴─────────┴───┘
```

Set the Weld controller mode to the NOWELD.
Set the Weld IO sim to the ENABLED. By this setup, the welding machine is not started for welding.
Set the Weld duration. This item specifies the duration of the weld you want to simulate. The robot will
close the gun, and wait for a period of time that is equal to the weld duration. After the robot has
simulated the weld, it will move to the next point in the welding sequence, and simulate another weld,
until the weld sequence has been completed.

NOTE
   When the Weld controller mode is WELD, it is impossible to enable Weld IO sim.
   Refer to the R-30*i*A Controller Spot Tool+ operator's manual (B-83124EN-1) or
   R-30*i*B Controller Spot Welding Function operator's manual (B-83284EN-4) for
   more details.

---

8   RESTRICTIONS

·   This software option can control only integrated timers manufactured by DENGENSHA MFG. CO., LTD.

·   During execution of welding, any weld parameters cannot be written onto the welding timer board. For example, no value can be changed on the DEP(DG) Setup/schedule screen during welding execution.

·   Do not change any system variable related to the integrated timer using a parameter instruction.

·   You cannot use multiple programs simultaneously to perform spot welding.

·   Integrated weld controller and digital weld controller can not be used together in a robot controller.

·   The weld schedules (schedule number) to a integrated timer board cannot inform to digital/group signals.

·   This software option does not support any dual guns. Gun change is supported.

9   OTHER NOTES

·   Be sure to set a value longer than the welding time for "Weld complete time-out" on the spot config screen. After changing the value of the welding parameter, perform actual welding to confirm that the Weld complete time-out setting is sufficiently longer than the actual welding time.
·   The weld schedules and settings can be updated via FTP (iwdgsche.sv and iwdgconf.sv can be put via FTP) only in the controlled start mode.
·   In gun change system, the weld schedule date is needed by each guns because stepper data and trans turns ratio are set for each schedule.
　(Example)
　Schedule 1-50   for Gun1
　Schedule 51-100   for Gun2
·   If there is no need to distinguish stepper and counter and all guns have the same turns ratio, those guns can share the common weld schedules.
·   After changing language, need to power cycle.

10 **ALARMS**

This chapter explains alarms related to the integrated timer.

SPOT-008 PAUSE   Weld complete timeout
[Cause]
A welding completion time-out occurred. An error may occur during welding operation.
If no alarm was issued from the welder, the welding time may be longer than the time-out.
[Remedy]
On the alarm history screen, check whether a welding alarm was issued. If any, remove the cause.
If the time out value (def: 2000ms) is shorten, you can adjust with "Weld complete time-out" on the spot config screen.

SPOT-010 PAUSE   Major alarm detected
[Cause]
A fault-level alarm was issued.
[Remedy]
On the alarm history screen (MENUS → Alarm → F3 HIST), check the alarms issued before this alarm.

SPOT-011 WARN   Minor alarm detected
[Cause]
A warning-level alarm was issued.
[Remedy]
On the alarm history screen (MENUS → Alarm → F3 HIST), check the alarms issued before this alarm.

SPOT-046 WARN   Weld auto retried %s time(s)
[Cause]
An alarm was issued from the welding machine and the indicated number of retries was performed.
[Remedy]
This message notifies you that retries were performed.
When retry is successful, the program does not stop.
Check the alarms issued before retries.

SPOT-061 WARN   Request Failed
[Cause]
A request to the timer board failed.
[Remedy]
This alarm may be issued after a parameter is written.
It may be issued during welding. Retry while no welding is performed.

SPOT-063 STOP.G   "No Weld Detected"
[Cause]
The Line Volt in monitor data was 0 in the welding result from the timer board even though the WELD/No Weld signal from the PLC is on.
[Remedy]
Please contact the weld timer maker for reason of Line Volt is 0.

SPOT-063 STOP.G   "alarm-message"
[Cause]
FAULT alarm message is received from weld timer board.
[Remedy]
Refer to weld timer manual for this message.

SPOT-064 WARN   "Weld request not executed."
[Cause]
A welding request was rejected. The timer board was not ready for start welding.
[Remedy]
Refer to alarms on DEP(DG)/Alarm. Issue reset on this screen.

SPOT-064 WARN   "alarm-message"
[Cause]
ALARM message is received from weld timer board.
[Remedy]
Refer to weld timer manual for this message.

SPOT-066 WARN   Iwc NOT ready
[Cause]
No timer board is installed.
The software on the integrated timer has not started up.
Communication with the timer board is stopped.
[Remedy]
Check that a timer board is installed.
This alarm may occur for a few seconds after cold start. Wait a while, and you can reset this alarm.
When causes above 2 are removed and this alarm occurs during any operations or instructions, the cause is above 3.
Check the alarm history, and turn the power off, then on again.

SPOT-067 PAUSE   No Shunt Trip output for WC:weld controller-number
[Cause]
Shunt trip DO is not set.
[Remedy]
Check the number set for Shunt trip DO on the Weld Interface I/O screen.
If your contactor does not have shunttrip interface, please change following system variables and power cycle.

$IWCPCFG.$SHUNT_ENABLE[1]＝FALSE   WC:1
$IWCPCFG.$SHUNT_ENABLE[2]＝FALSE   WC:2

SPOT-350 WARN   IWC board not found
[Cause]
No IWC board is installed.
[Remedy]
Install an IWC board

SPOT-381 WARN   IWC(DG) system error(%d)
[Cause]
A problem occurs in communication with the timer board.
[Remedy]
Write down the number and contact a service representative. Possible causes are listed below.

Number(s)	Possible cause
1,2, 13	The temporary pool area may be almost exhausted.
3	The timer board could not be initialized successfully.
4	A parameter could not be written to the timer board successfully.
5,6,7,8,9	A parameter could not be read from the timer board.
12	A counter value could not be written to the timer board successfully.

SPOT-382 PAUSE   IWC(DG) illegal stepper number(%s)

[Cause]
An invalid gun series number (SN) is specified in RESET STEPPER[WC,SN,SV].
[Remedy]
Set 1 to 4.

SPOT-383 PAUSE   IWC(DG) illegal contactor status(%d)
[Cause]
Parameter in CONTACTOR instruction is invalid.
[Remedy]
Enter a correct parameter into the CONTACTOR instruction.

SPOT-384 PAUSE   IWC(DG) leak input (#)
[Cause]
The Leak Input signal is on.
[Remedy]
1. Remove the cause of the leakage.
2. Check that OFF is displayed for Leak input on the Weld Interface I/O screen.
3. Perform a reset.
If the Leak Input signal is still on after action 2 is taken, check wiring.
Check whether the polarity of the input signal is reversed.
To disable this check, set the signal number for Leak input to 0 on the Weld Interface screen, and turn the power off, then on again.

SPOT-385 PAUSE   IWC(DG) illegal counter specified(#)
[Cause]
An invalid counter value (SV) is specified in RESET STEPPER[WC,SN,SV].
[Remedy]
Set a value between 0 and 2.

SPOT-386 PAUSE   Reset stepper timeout %s
[Cause]
RESET STEPPER was executed, but a time-out period had elapsed before response was received from the welding timer board.
[Remedy]
If a SPOT-387 to 390 alarm may is issued, there is a problem in communication with the timer board. Turn the power off, then on again.
The time-out period for RESET STEPPER may be too short.
If a small value is specified for "Rst weld cntler time-out" in SETUP/Spot config, specify a larger value.

SPOT-387 WARN   IWC(DG) timer no response
[Cause]
No response was received from the welding timer board. The requested operation could not be executed.
[Remedy]
Turn the power off, then on again.

SPOT-388 WARN   IWC(DG) timer acc stat err(%d)
[Cause]
Because the access status of the welding timer board remains on, the requested operation cannot be performed.
[Remedy]
Turn the power off, then on again.

SPOT-389 WARN   IWC(DG) timer exe flag err(#)
[Cause]

Because a welding timer board execution flag remains on, the requested operation cannot be performed.

    #
1   The SYSRDY signal is on.
2   The data read flag is on.
3   The data write flag is on.
4   The function name read flag is on.
5   The counter set/reset flag is on.
6   The welding flag is on.
7   The data command execution flag is on.

[Remedy]
Turn the power off, then on again.

SPOT-390 WARN   IWC(DG) timer bad response
[Cause]
An error occurred in the interface with the welding timer board.
[Remedy]
Contact a service representative. Check whether a software or hardware setting of the welding timer board was changed before the error occurred.

SPOT-391 PAUSE   IWC(DG) timer memory error
[Cause]
An error occurred in the hardware system saved in memory in the welding timer board.
[Remedy]
Turn the power off, then on again. The hardware data in timer board is initialized, so readjustment is required. (See Subsection 2.3.5, "HARD (Hardware.)"
For adjustment data, contact DENGENSHA MFG. CO., LTD.

SPOT-392 SYSTEM   IWC(DG) timer not running
[Cause]
An error occurred because the welding timer board had not started.
[Remedy]
*systdy from the timer board is not turned off.
Contact DENGENSHA MFG. CO., LTD.

SPOT-393 PAUSE   IWC(DG) timer support from Gun1 to Gun4
[Cause]
Gun number in RESET STEPPER instruction is invalid.
[Remedy]
Enter a correct gun number into the RESET STEPPER instruction

SPOT-394 WARN   IWC(DG) drv sys error(%d)
[Cause]
A system error occurred during processing of communication with the timer board.
[Remedy]
Check the number at the end of the error message.

Smaller than 500	Write down the number and contact a service representative.
500 or greater	Check the I/O settings such as Shunt trip I/O output and stepper ready I/O output. Check whether a value outside the range is specified as the I/O type or number.

SPOT-395 STOP   IWC(DG) timer now in weld
[Cause]
An attempt was made to start welding during welding.
[Remedy]
The weld time-out period is not sufficiently long as compared with the welding time.

Set a long value for "Weld complete time-out" in SETUP/Spot config as compared with the welding time.

SPOT-396 STOP   IWC(DG) timer com err %d(%x)
[Cause]
The system is unable to communicate with the timer board.
[Remedy]
Check alarms posted with this alarm and do their remedies.
And inform it to a service representative.
When the first number is 100 af following,
SPOT-396 STOP IWC(DG) timer com err 100(Board id)

Check your timer board [SEL] Dip switch T0 T1.
For timer board 1, T0=0 T1=0.
For timer board 2, T0=1 T1=0.

SPOT-481 SYSTEM   IWC(DG) Can't read system_ready(%d)
[Cause]
A system error occurred.
[Remedy]
Turn off and back on the power. If the problem persists, check the mounting state of the internal timer board.

SPOT-482 SYSTEM   IWC(DG) Failed to set Weld Current flag(%d)
[Cause]
A system error occurred.
[Remedy]
Turn the power off and back on. If the problem persists, check the mounting state of the internal timer board. Pull out the timer board and insert it again.

SPOT-483 PAUSE   IWC(DG) Board number duplicated(%d)
[Cause]
The board number of the internal timer board is overlapped.
[Remedy]
Check your timer board [SEL] Dip switch T0 T1.
For timer board 1, T0=0 T1=0.
For timer board 2, T0=1 T1=0.

SPOT-484 WARN   IWC(DG) MB Gun no out of range(%d)
[Cause]
When the monitor box is used, the series number from the timer board is incorrect.
[Remedy]
Contact a service representative with the value in parentheses, the version number of the robot software, and the version number of the timer software.

SPOT-485 SYSTEM   IWC(DG) DPRAM error (%d)
[Cause]
A system error occurred. An error occurred while writing to DPRAM. The timer board may be incorrectly installed.
[Remedy]
Pull out the timer board and insert it again. If the problem persists, a board number is indicated in parentheses after SPOT-485. At the same time, detailed information is indicated after SPOT-486. Write down these values and contact a service representative.

SPOT-486 SYSTEM   %x,%x,%x
[Cause]

This is a status message for SPOT-485.
[Remedy]
N/A

SPOT-487 PAUSE   IWC(DG) shunt trip DO error(%d)
[Cause]
The shunt trip signal is improperly set. A board number is indicated in parentheses.
[Remedy]
Check if the Shunt trip signal number is correct on the SPOT Weld interface I/O output screen. Turn the power off, then on again after changing.

SPOT-488 PAUSE   IWC(DG) stepper cmp DO error(%d)
[Cause]
The stepper completion output DO is improperly set.
[Remedy]
The improper setting number is indicated in parentheses. Check the following system variable.
$IWCPCFG.$STPC_OT_IDX[ ]
Turn the power off, then on again after changing.

SPOT-489 PAUSE   IWC(DG) DPRAM out DO error(%d,%d)
[Cause]
The DO of the DPRAM output function is improperly set.
[Remedy]
The first number in parentheses is the board number of the board on which an error occurred. The second number is the improper setting number. Change the setting with reference to the I/O alarm indicated together. Turn the power off, then on again after changing.

SPOT-490 WARN   IWC(DG) timer now in weld %d
[Cause]
A welding timer board reset was attempted during welding.
[Remedy]
It is not allowed to make a welding timer reset during welding. Make a reset after completion of welding.

SPOT-491 PAUSE   IWC(DG) No Weld detection DO error
[Cause]
DO index ($IWCDGDBG[64]) for No Weld detection signal is except 0 and No Weld detection signal was fails to output.
[Remedy]
Check whether DO index ($IWCDGDBG[64]) is assigned correctly.
Turn the power off, then on again after changing.

SPOT-492 STOP   IWC(DG) PrmWriteErrWC%d S%d %d
[Cause]
The system was not able to write the parameter to the timer board. The first number indicates the weld controller number. The second number indicates the sequence number as follows.
S0: Common, S1-S255: Schedule, S256: Special function, S257-S260: GUN1-4.
The third number indicates the error code number.
[Remedy]
When error code is 2, the value of the parameter is outside the range. Inquire the value of the parameter of the weld controller maker. Set the system variable to a correct value according to the parameter.
    WC1   S0:$IWCDGCON[1].$PARM[Parameter number]
    WC1   S1-S255:$IWCDGS[Schedule number].$PARM[Parameter number]
    WC1   S256:$IWCDGCON[2].$PARM[Parameter number]
    WC1   S257-S260:$IWCDGCON[3-6].$PARM[Parameter number]
    WC2   S0:$IWCDGCON[7].$PARM[Parameter number]

    WC2   S1-S255:$IWCDGS2[Schedule number].$PARM[Parameter number]
    WC2   S256:$IWCDGCON[8].$PARM[Parameter number]
    WC2   S257-S260:$IWCDGCON[9-12].$PARM[Parameter number]
Call your FANUC or FANUC Robotics technical service representative if error code is not 2.

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REVISION RECORD

Edition	Date	Contents
03	Oct.,2012	Output signal to external equipment is added to subsection 2.2.3.
02	Jun,2012	Supported R-30*i*B controller's manual
01	Mar., 2007	

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