FANUC Robot series

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

Dispense Function

OPERATOR'S MANUAL

B-83284EN-5/03

- **Original Instructions**

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

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Further, re-export to another country may be subject to the license of the government of the country from where the product is re-exported. Furthermore, the product may also be controlled by re-export regulations of the United States government.
Should you wish to export or re-export these products, please contact FANUC for advice.

In this manual we have tried as much as possible to describe all the various matters.
However, we cannot describe all the matters which must not be done, or which cannot be done, because there are so many possibilities.
Therefore, matters which are not especially described as possible in this manual should be regarded as "impossible".

SAFETY PRECAUTIONS

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

For detailed functions of the robot operation, read the relevant operator's manual to understand fully its specification.
For the safety of the operator and the system, follow all safety precautions when operating a robot and its peripheral equipment installed in a work cell.
In addition, refer to the "FANUC Robot SAFETY HANDBOOK (**B-80687EN)**".

1 DEFINITION OF USER

The user can be defined as follows.

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

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

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

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

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

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

2 DEFINITION OF SAFETY NOTATIONS

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

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

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

3 SAFETY OF THE USER

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

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

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

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

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

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

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

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

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

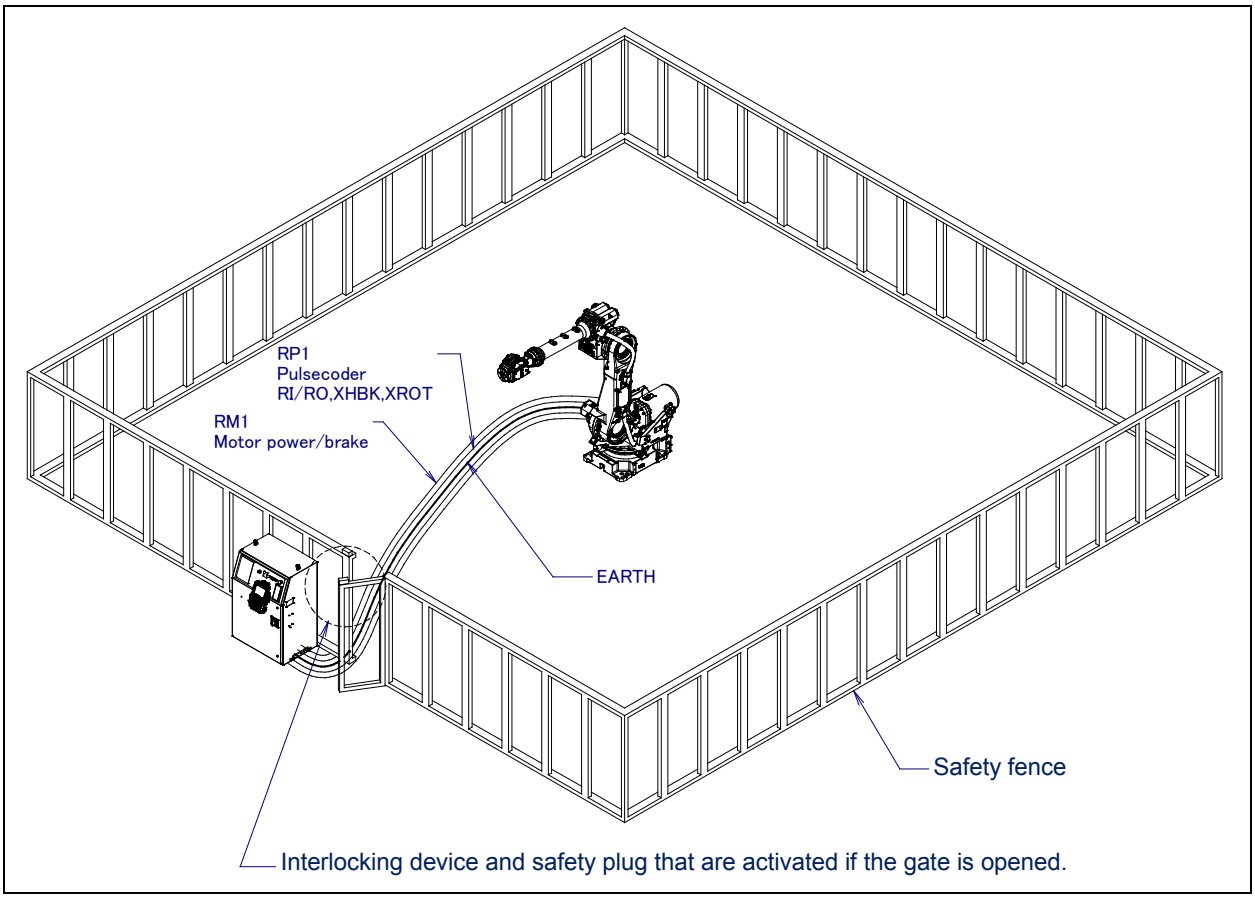

Fig. 3 (a) Safety fence and safety gate

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

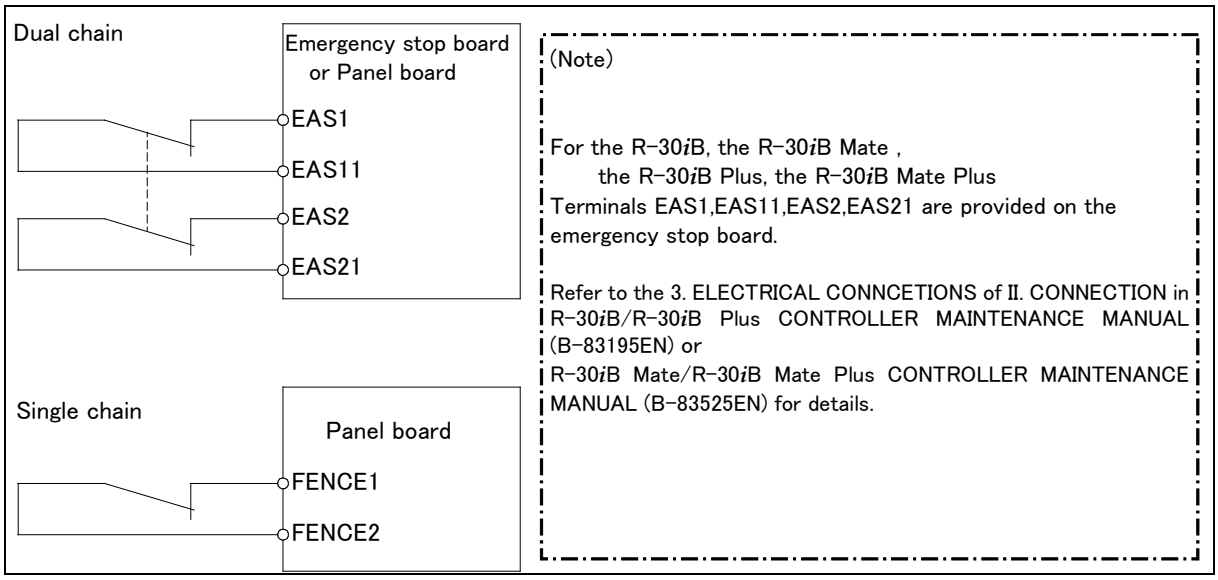

Fig. 3 (b) Connection diagram for the signal of safety fence

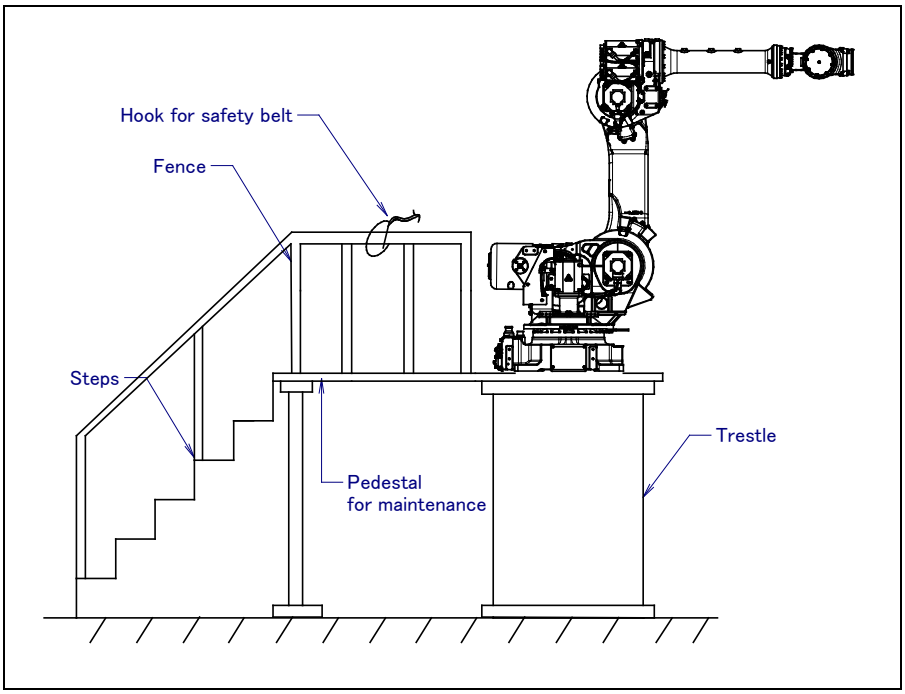

Fig. 3 (c) Pedestal for maintenance

3.1 SAFETY OF THE OPERATOR

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

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

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

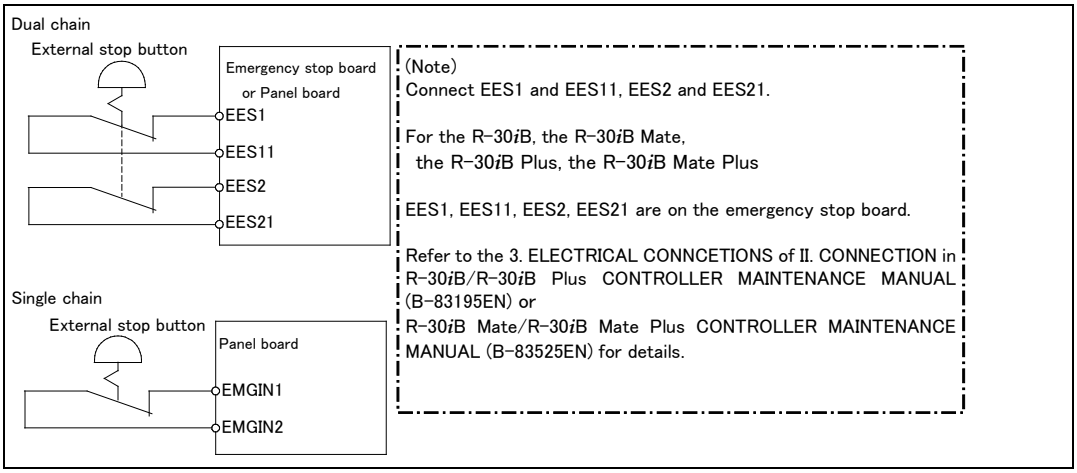

Fig. 3.1 Connection diagram for external emergency stop button

3.2 SAFETY OF THE PROGRAMMER

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

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

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

Our teach pendant is provided with a DEADMAN switch as well as an emergency stop button. These button and switch function as follows:

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

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

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

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

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

T1,T2 mode: DEADMAN switch is effective.

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

3.3 SAFETY OF THE MAINTENANCE ENGINEER

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

(1) During operation, never enter the robot operating space.
(2) A hazardous situation may arise when the robot or the system, are kept with their power-on during maintenance operations. Therefore, for any maintenance operation, the robot and the system should be put into the power-off state. If necessary, a lock should be in place in order to prevent any other person from turning on the robot and/or the system. In case maintenance needs to be executed in the power-on state, the emergency stop button must be pressed as far as possible.
(3) If it becomes necessary to enter the robot operating space while the power is on, press the emergency stop button on the operator box or operator panel, or the teach pendant before entering the range. The maintenance worker must indicate that maintenance work is in progress and be careful not to allow other people to operate the robot carelessly.
(4) When entering the area enclosed by the safety fence, the worker must check the whole robot system in order to make sure no dangerous situations exist. In case the worker needs to enter the safety area whilst a dangerous situation exists, extreme care must be taken, and whole robot system status must be carefully monitored.
(5) Before the maintenance of the pneumatic system is started, the supply pressure should be shut off and the pressure in the piping should be reduced to zero.
(6) Before the start of maintenance work, check that the robot and its peripheral equipment are all in the normal operating condition.
(7) Do not operate the robot in the automatic operation while anybody is in the robot operating space.
(8) When you maintain the robot alongside a wall or instrument, or when multiple users are working nearby, make certain that their escape path is not obstructed.
(9) When a tool is mounted on the robot, or when any movable device other than the robot is installed, such as belt conveyor, pay careful attention to its motion.
(10) If necessary, have a user who is familiar with the robot system stand beside the operator panel and observe the work being performed. If any danger arises, the user should be ready to press the EMERGENCY STOP button at any time.
(11) When replacing a part, please contact your local FANUC representative. If a wrong procedure is followed, an accident may occur, causing damage to the robot and injury to the user.
(12) When replacing or reinstalling components, take care to prevent foreign material from entering the system.
(13) When handling each unit or printed circuit board in the controller during inspection, turn off the circuit breaker to protect against electric shock.
If there are two cabinets, turn off the both circuit breaker.
(14) A part should be replaced with a part recommended by FANUC. If other parts are used, malfunction or damage would occur. Especially, a fuse that is not recommended by FANUC should not be used. Such a fuse may cause a fire.
(15) When restarting the robot system after completing maintenance work, make sure in advance that there is no person in the operating space and that the robot and the peripheral equipment are not abnormal.
(16) When a motor or brake is removed, the robot arm should be supported with a crane or other equipment beforehand so that the arm would not fall during the removal.
(17) Whenever grease is spilled on the floor, it should be removed as quickly as possible to prevent dangerous falls.
(18) The following parts are heated. If a maintenance user needs to touch such a part in the heated state, the user should wear heat-resistant gloves or use other protective tools.
- Servo motor
- Inside the controller
- Reducer
- Gearbox

- Wrist unit

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

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

4 SAFETY OF THE TOOLS AND PERIPHERAL EQUIPMENT

4.1 PRECAUTIONS IN PROGRAMMING

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

4.2 PRECAUTIONS FOR MECHANISM

(1) Keep the component cells of the robot system clean, operate the robot where insulated from the influence of oil, water, and dust.
(2) Don't use unconfirmed liquid for cutting fluid and cleaning fluid.
(3) Adopt limit switches or mechanical stoppers to limit the robot motion, and avoid the robot from collisions against peripheral equipment or tools.
(4) Observe the following precautions about the mechanical unit cables. Failure to follow precautions may cause problems.
- Use mechanical unit cable that have required user interface.

- Do not add user cable or hose to inside of the mechanical unit.
- Please do not obstruct the movement of the mechanical unit when cables are added to outside of mechanical unit.
- In the case of the model that a cable is exposed, please do not perform remodeling (Adding a protective cover and fix an outside cable more) obstructing the behavior of the outcrop of the cable.
- When installing user peripheral equipment on the robot mechanical unit, please pay attention that the device does not interfere with the robot itself.

(5) The frequent power-off stop for the robot during operation causes the trouble of the robot. Please avoid the system construction that power-off stop would be operated routinely. (Refer to bad case example.) Please perform power-off stop after reducing the speed of the robot and stopping it by hold stop or cycle stop when it is not urgent. (Please refer to "STOP TYPE OF ROBOT" in "SAFETY PRECAUTIONS" for detail of stop type.)
(Bad case example)

- Whenever poor product is generated, a line stops by emergency stop and power-off of the robot is incurred.
- When alteration is necessary, safety switch is operated by opening safety fence and power-off stop is incurred for the robot during operation.
- An operator pushes the emergency stop button frequently, and a line stops.
- An area sensor or a mat switch connected to safety signal operates routinely and power-off stop is incurred for the robot.
- Power-off stop is regularly incurred due to an inappropriate setting for Dual Check Safety (DCS).

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

5 SAFETY OF THE ROBOT MECHANICAL UNIT

5.1 PRECAUTIONS IN OPERATION

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

5.2 PRECAUTIONS IN PROGRAMMING

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

5.3 PRECAUTIONS FOR MECHANISMS

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

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

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

6 SAFETY OF THE END EFFECTOR

6.1 PRECAUTIONS IN PROGRAMMING

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

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

There are following four types of Stopping Robot.

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

Servo power is turned off, and the robot stops immediately. Servo power is turned off when the robot is moving, and the motion path of the deceleration is uncontrolled.
"**Power-Off stop**" performs following processing.

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

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

Controlled stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.
"**Controlled stop**" performs following processing.

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

Smooth stop (Category 1 following IEC 60204-1)

The robot is decelerated until it stops, and servo power is turned off.
"**Smooth stop**" performs following processing.

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

Hold (Category 2 following IEC 60204-1)

The robot is decelerated until it stops, and servo power remains on.
"**Hold**" performs following processing.

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

⚠ WARNING

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

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

There are the following 3 Stop patterns.

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

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

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

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

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

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

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

"Controlled stop by E-Stop" option

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

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

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

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

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

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

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

"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.

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

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

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

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

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

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

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

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

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

There are following three types of Stop Category.

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

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

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

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

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

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

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

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

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

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

Stop Category 2 following IEC 60204-1 (Hold)

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

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

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

⚠ WARNING

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

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

There are the following 3 Stop patterns.

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

Category 0: Stop Category 0
Category 1: Stop Category 1
-: Disable
(*) The stop pattern of NTED input is same as Deadman switch.

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

Option	R-30*i*B Plus/ R-30*i*B Mate Plus
Standard	C(**)
Old Stop Function (A05B-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 chapter explains the manual plan.

Contents of this chapter

1.1 MANUAL PLAN

About this manual

FANUC Robot series (R-30*i*B CONTROLLER) Operator's Manual.

This manual describes how to operate the FANUC Robot for sealing. It is controlled by the FANUC R-30*i*B controller (called the robot controller hereinafter) containing SpotTool+ software. (Note that DispenseTool is a partial function of SpotTool+ software on R-30*i*B.)

Using this manual

Each chapter of the manual describes a single operation of the robot. The user can select and read chapters describing required operations.

Chapter 1 Introduction	Describes how to use this manual.
Chapter 2 Overview	Describes feature of DispenseTool.
Chapter 3 DispenseTool Common setup	Describes common setup for sealing.
Chapter 4 Setting Up The Cell	Describes cell setup for sealing.
Chapter 5 Program Structure	Describes how to construct sealing programs.
Chapter 6 Executing A Program	Describes execution conditions of sealing programs.
Chapter 7 Status Display	Describes sealing status screen.
Chapter 8 Nemo Pump	Describes how to seal with Nemo Pump function.
Chapter 9 ISD Gear Meter	Describes how to seal with ISD Gear Meter function.
Chapter 10 ISD Single Acting Meter	Describes how to seal with ISD Single Acting Meter function.
Chapter 11 Pump Only Motion	Describes how to move pump axis independently.

Related manuals

The following manuals are available:

Robot controller	OPERATOR'S MANUAL (This manual) B-83284EN-5	Intended readers: Operators responsible for designing, introducing, operating, and adjusting the robot system at the work site. Topics: Description of the setting and operation for sealing application software. Use: Guide to teaching, introducing, and adjusting the robot at the work site, and application designing.
	OPERATOR'S MANUAL (Basic Operation) B-83284EN	Intended readers: Operators responsible for designing, introducing, operating, and adjusting the robot system at the work site. Topics: Functions, operations and the procedure for operating the robot. Programming procedure, interface and alarm. Use: Guide to teaching, introducing, and adjusting the robot at the work site, and application designing.
	OPERATOR'S MANUAL (Alarm code list) B-83284EN-1	Topics: Error code listings, causes, and remedies. Use: Installing and activating the system, connecting the mechanical unit to the peripheral device and maintenance the robot.
	Optional Function OPERATOR'S MANUAL B-83284EN-2	Intended readers: Operators responsible for designing, introducing, operating, and adjusting the robot system at the work site. Topics: Description of the software optional functions. Use: Guide to teaching, introducing, and adjusting the robot at the work site, and application designing.
	Arc welding Function OPERATOR'S MANUAL B-83284EN-3	Intended readers: Operators responsible for designing, introducing, operating, and adjusting the robot system at the work site. Topics: Description of the setting and operation for arc welding application software. Use: Guide to teaching, introducing, and adjusting the robot at the work site, and application designing.
	Spot welding Function OPERATOR'S MANUAL B-83284EN-4	Intended readers: Operators responsible for designing, introducing, operating, and adjusting the robot system at the work site. Topics: Description of the setting and operation for spot welding application software. Use: Guide to teaching, introducing, and adjusting the robot at the work site, and application designing.
	MAINTENANCE MANUAL B-83195EN	Topics: Installing and activating the system, connecting the mechanical unit to the peripheral device and maintenance the robot.

Mechanical unit	OPERATOR'S MANUAL	Topics: Installing and activating the robot, connecting the mechanical unit to the controller, maintaining the robot. Use: Guide to installation, activation, connection, and maintenance.

2 OVERVIEW

2.1 SOFTWARE OPTIONS FOR DISPENSE TOOL

This section describes software options for DispenseTool.

Default Dispense
On R-30iB, DispenseTool is integrated to SpotTool+. By selecting this function with SpotTool+, you can use the function as same as conventional DispenseTool. For example if you would like to use both Spot Welding function and Dispense function together, you can use DispenseTool without Default Dispense option. (In this case, please refer to Section 3.11 for setting method. Note that cell settings would be defferent from existing DispenseTool. (Please refer to Chapter 4.))

Advanced Constant Path
Corner Region (CR) of this function minimizes the amount of deceleration of robot motion around corners. It is recommended to use this function for bead application.

NEMO Pump
This function controls the NEMO Pump by using the FANUC motor. This function contains the Process Axes Control (pump axes control). In this manual, the system which contains the Process Axis Control is called ISD(Integral Servo Dispenser) system.

ISD Gear Meter
This function controls the gear meter by using the FANUC motor. This function contains the Process Axes Control (pump axes control).

ISD Single Acting Meter
This function controls the shot meter by using the FANUC motor. This function contains the Process Axes Control (pump axes control).

Pump only motion
This function prevents non-pump axes from moving and allows only pump axes to move, when a dispensing program is executed. This function can be used to measure the material volume dispensed. This function is available for the NEMO Pump, ISD Gear Meter and ISD Single Acting Meter systems.

2.2 BASIC FLOW OF SETTING UP

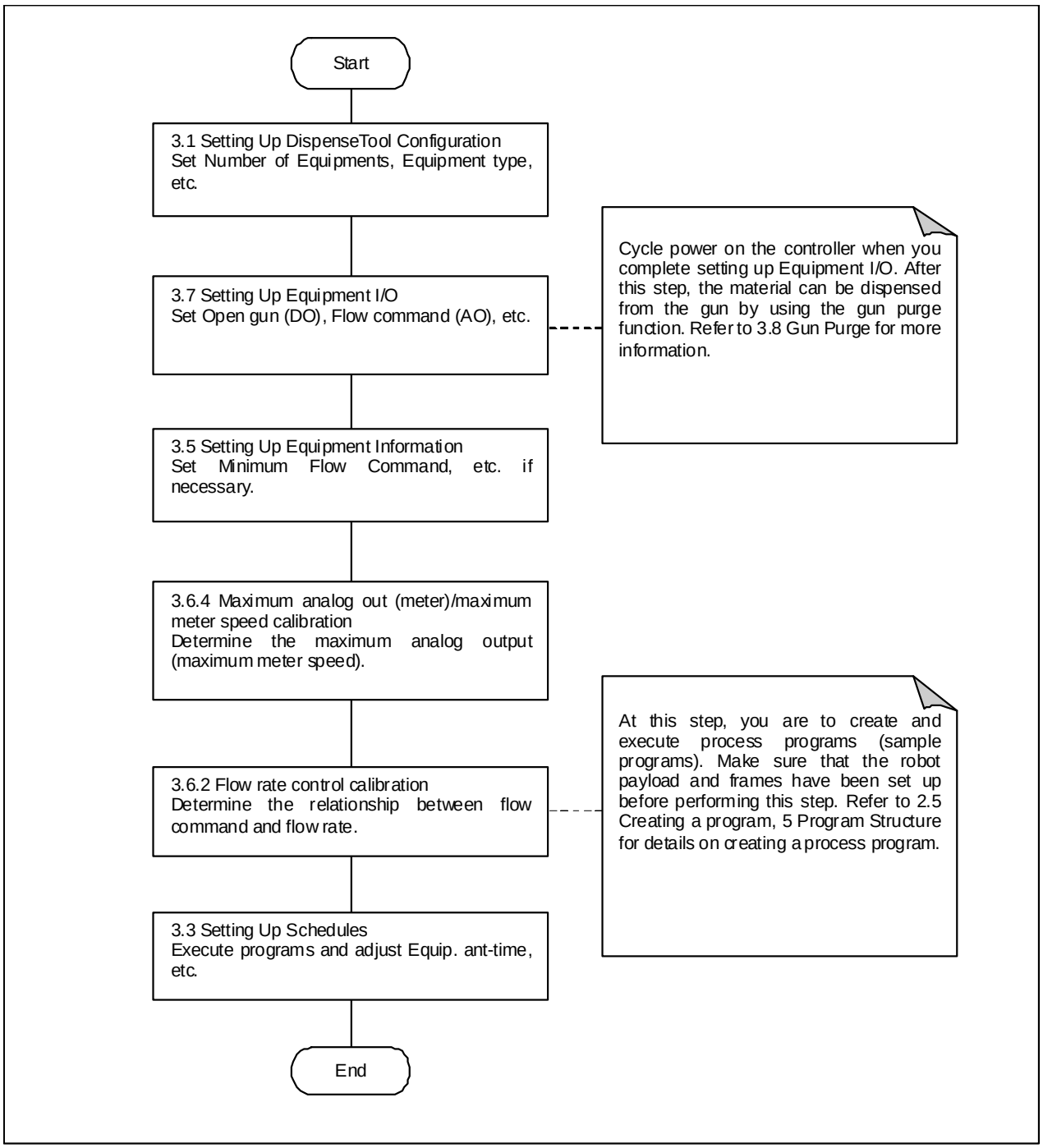


Fig. 2.2 Basic flow of setting up

NOTE

If the parameters of dispensing equipment are known, it may be easier to skip certain steps listed on Fig. 2.2 and set values directly. In such cases, please make sure that AO is decided by the following formula, and please set values on system variables.

AOUT = Flow rate * S_FACTORn * Robot speed[mm/s] / 1000[mm/s] * CONV_FACTOR1
where:
S_FACTORn – Scale factor for each flow type. Please refer to Table 3.2 for system variables.
CONV_FACTOR1 – Counts per volt. Please refer to Section 2.6 for system variables.

2.3 BASIC FLOW OF SETTING UP NEMO PUMP

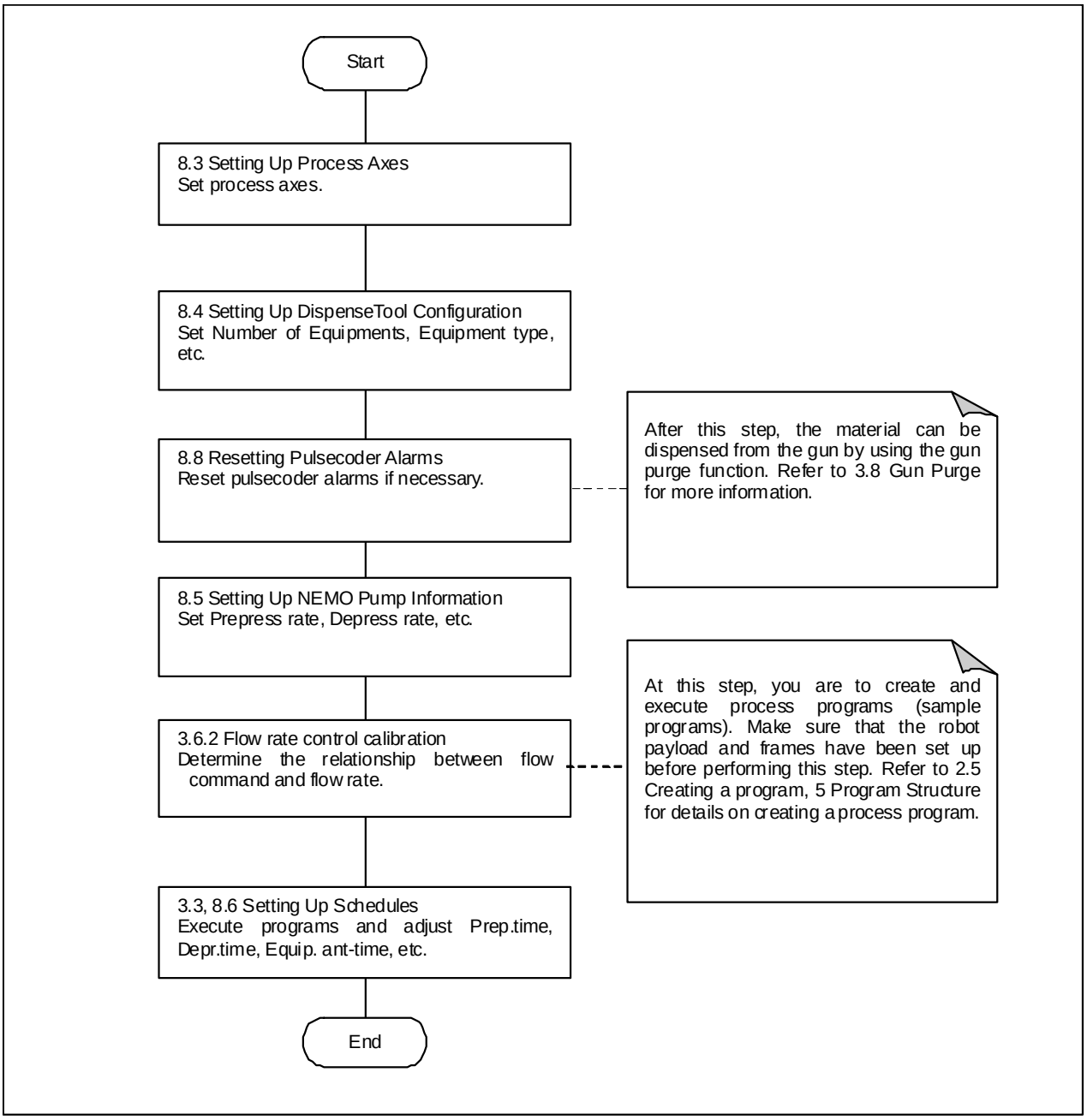


Fig 2.3 Basic flow of setting up NEMO pump

2.4 BASIC FLOW OF SETTING UP ISD

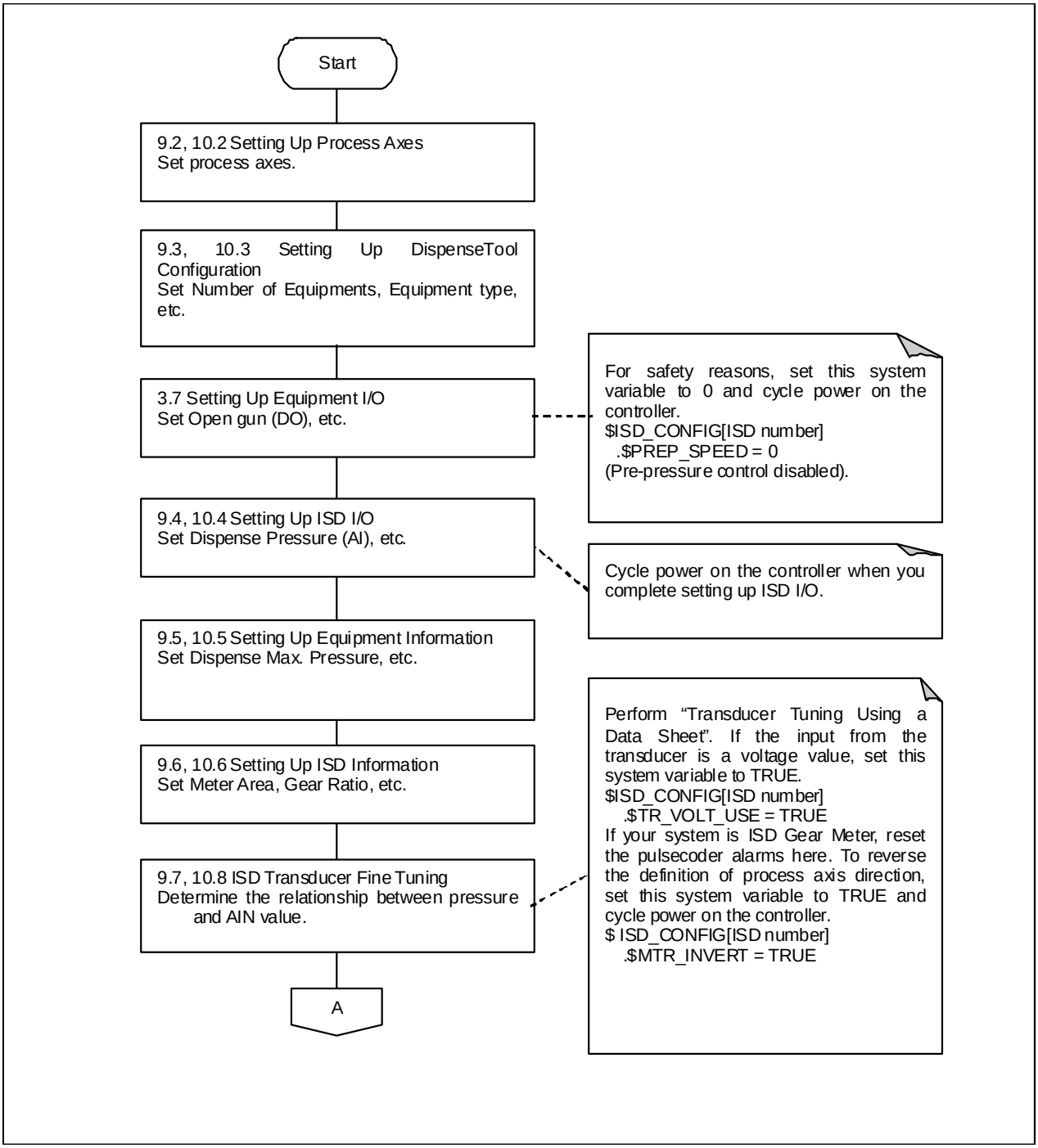


Fig 2.4(a) Basic flow 1 of setting up ISD

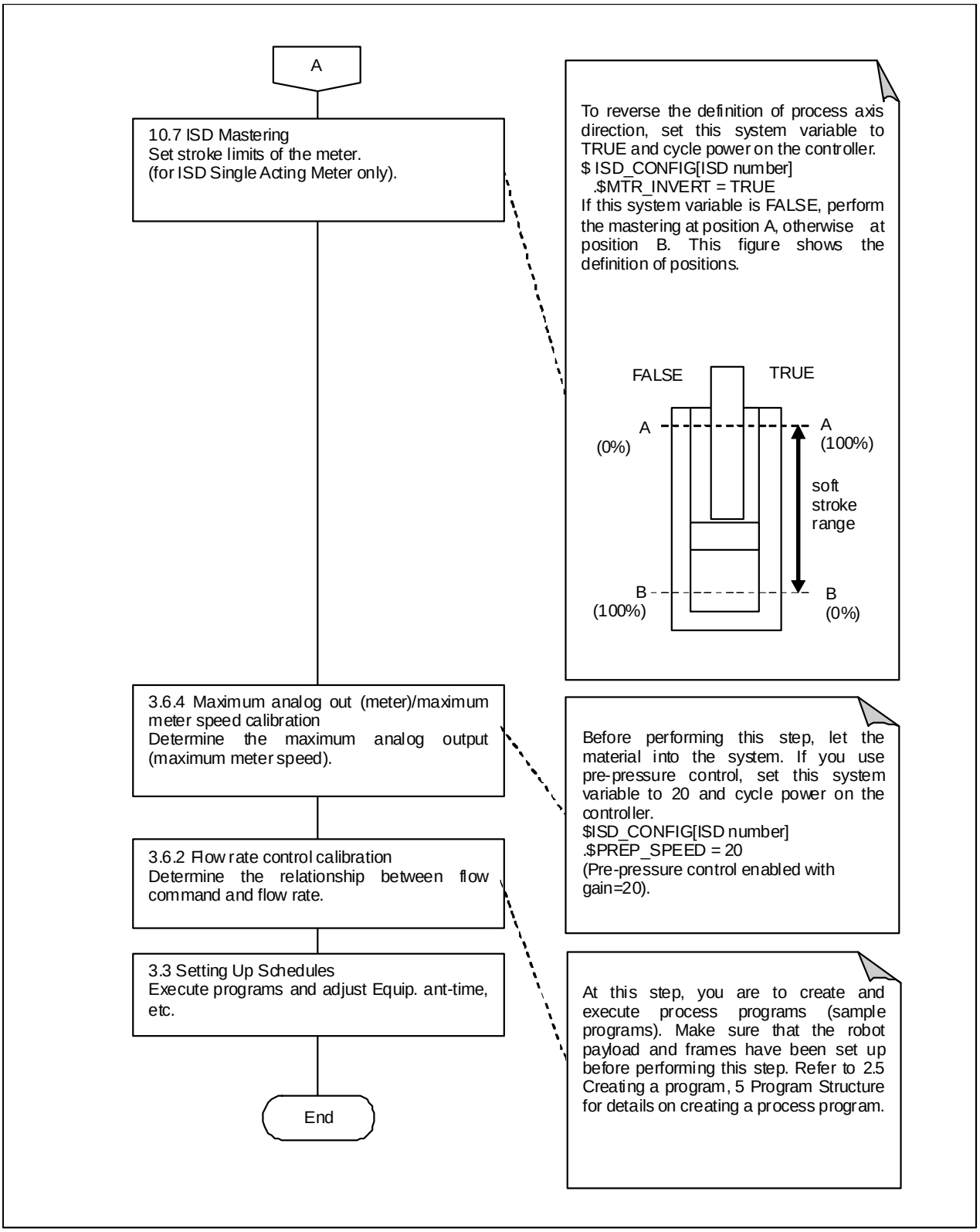


Fig. 2.4(b) Basic flow 2 of setting up ISD

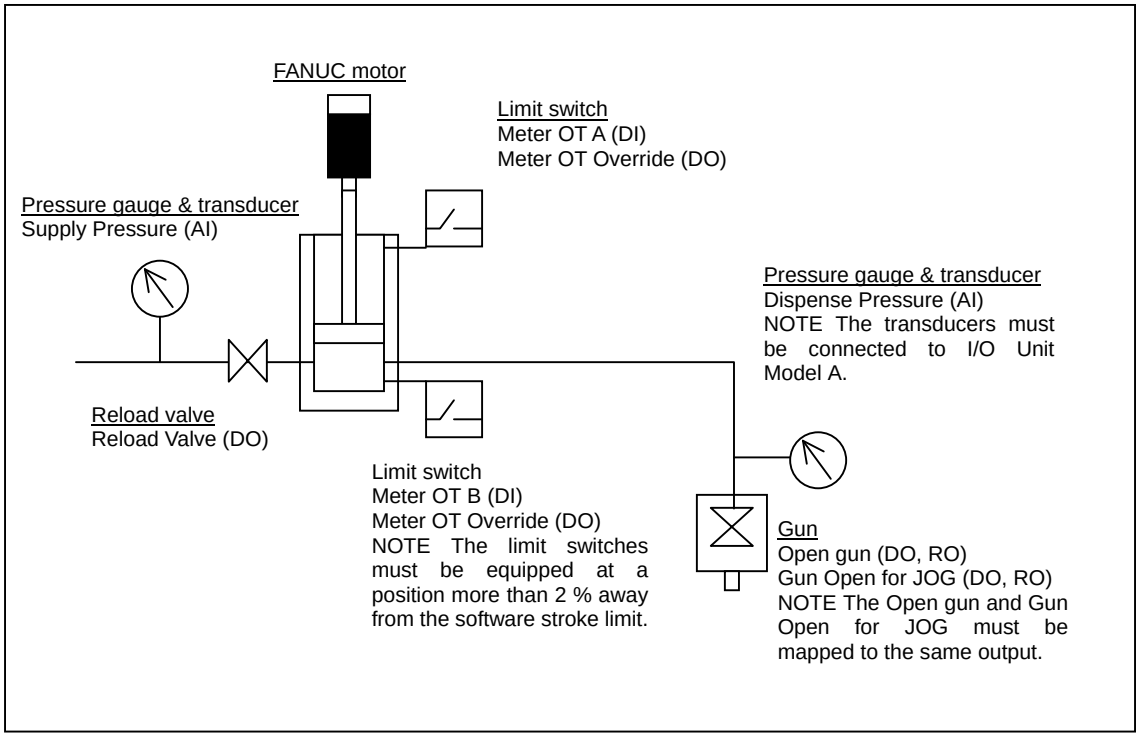


Fig. 2.4(c) Example of ISD system

Table 2.4 ISD macro commands

MACRO COMMAND	DESCRIPTION
RELIEVE PRESS	When you execute this macro, the ISD moves to RELIEVE mode. In this mode, the process axis does not move.
METER SLEEP	When you execute this macro, the ISD moves to SLEEP mode. In this mode, the process axis is machinelocked.
SET PRESS VAL	When you execute this macro, the pressure setpoint for PREPRESSURE mode is set to the specified value. The arguments are used as follows: SET PRESS VAL (Dispense pressure (psi), Equipment number (optional, 1 is used if omitted)) If the specified Dispense pressure is not a positive integer or zero, each value of R[21], R[22] is used for equipment 1, 2.
PREPRESSURE	When you execute this macro, the ISD moves to PREPRESSURE mode. In this mode the process axis moves to control the dispense pressure.
WAIT ISD RELOAD	When you execute this macro and the ISD reload is completed, the execution proceeds to the next instruction, otherwise it waits until the ISD reload is completed.
RELOAD ISD	When you execute this macro, the ISD moves to REPOSITION mode. In this mode, the Reload Valve output is on and the process axis moves toward the Reload offset position. When it reaches the Reload offset position, the ISD moves to WAIT RELOAD mode. In this mode, the process axis does not move. When the dispense pressure goes over the Min. Reload Pressure, the ISD moves to PREPRESSURE mode.

2.5 CREATING A PROGRAM

You must create programs for DispenseTool according to the following guidelines.

- Main program must be a “job program”.
- Dispensing program must be a “process program”.

The available program instructions vary depending on the program sub-type. Table 2.5 summarizes the difference in available program instructions. Where x indicates that the instruction is available.

Table 2.5 Difference in available program instructions

PROGRAM INSTRUCTION	JOB	PROCESS	NONE
Dispensing (SS[], SE)		X	X
Offset, Frames		X	X
Call, End	X		X
Skip	X		X
Multiple Control	X		X

Fig. 2.5(a) shows how to set up the job program header information.

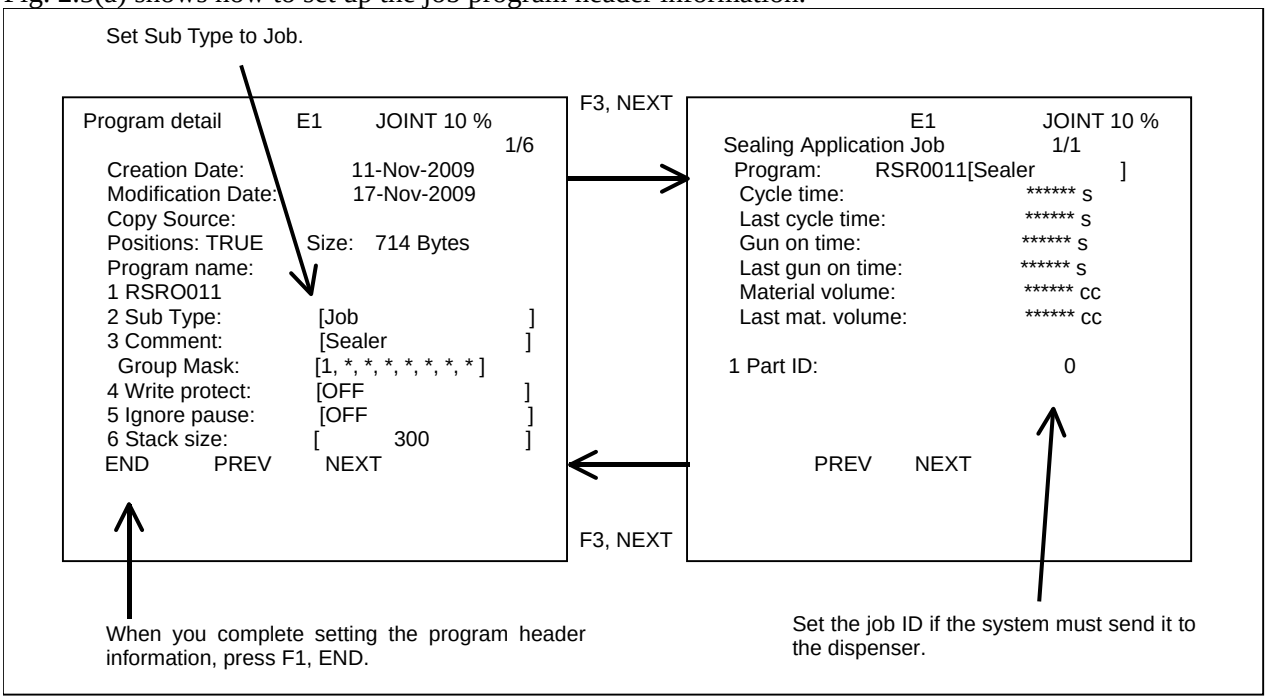


Fig. 2.5(a) Job program header information

You must set the Default user frame, Default tool frame, and Equipment number in the process program header information.

NOTE
- A single user frame is available per process program.
- A single tool frame is available per process program.
- A single equipment is available per process program.
- Even when it's multiple motion group system, Group Mask of process program should be set as [1,*,*,*,*,*,*,*]. (Please refer to Basic Operation manual's (B-83284EN) Subsection 5.3.1 for the setting of Group Mask.)

The frame numbers are automatically switched to the Default user frame, Default tool frame each, when:
- you open the process program on the edit screen on the teach pendant.
- you run the process program.
- a job program calls the process program.

Fig. 2.5(b) shows how to set up the process program header information.

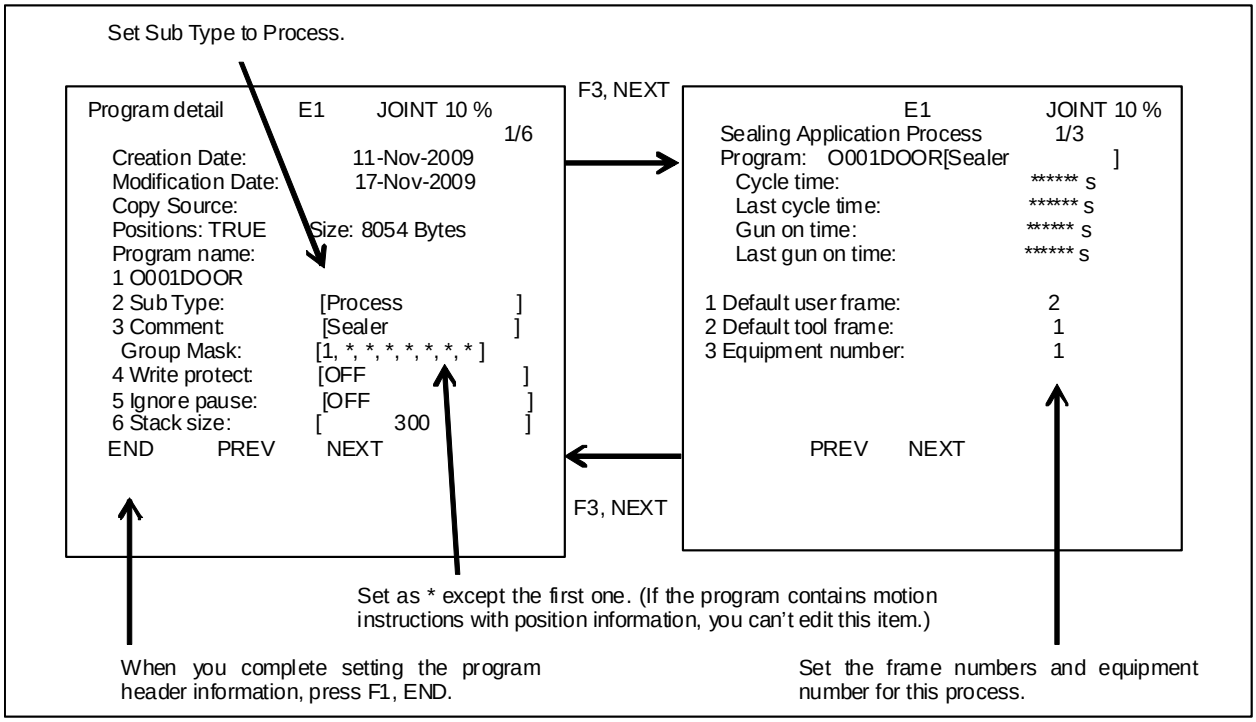


Fig. 2.5(b) Process program header information

Please refer to Chapter 5 for more information about sealing program.

2.6 LIMITATIONS

- DispenseTool does not support multiple motion group system in all cases. Only when the group number of Dispense Robot (Robot that performs sealing job) is set as 1, DispenseTool is available under the multiple group system.
- DispenseTool can control up to 5 pieces of equipment, but it cannot dispense concurrently using multiple equipment.

NOTE
The NEMO Pump function can control up to 2 NEMO Pumps. The ISD function can control up to 4 ISDs. (NEMO Pump is ISD equipment, but it's not controlled by ISD function but by NEMO Pump function. You cannot use ISD equipment and NEMO Pump together. Also refer to Section 8.2 for the limitations of NEMO Pump.)

- Main program must be a "job program". You cannot use the dispensing instructions (SS[], SE) in the job program.
- Dispensing program must be a "process program".
- The last defined position in the home program, MOV_HOME, is automatically copied to the reference position 1.

NOTE
Do not add any instructions to the MOV_HOME, if you would like to set the reference position 1 directly.

- The DispenseTool specific setup information is backed up as the following files:
  SYSSEAL.SV: contains equipment information
  SYSSLIO.SV: contains equipment I/O information
  SYSSLSCH.SV: contains schedule information
- You must set the following system variables, if you use the Flow command (AO) or Bead shaping cmd (AO) with I/O devices except I/O Unit Model A.
  $SLSETUP[equipment number].conv_factor1 (counts per volt)
  $SLSETUP[equipment number].conv_factor2 (counts per volt)
  $SLSETUP[equipment number].max_io_count (counts equal to 10 volts)
- If you would like the robot to move back from the stop position at the resumption of dispensing, please use Resume Offset function. DispenseTool automatically calculates the offset based on the deceleration time etc., but it cannot prevent all the faults in the bead. To specify the offset directly, please set the following system variables.
  $SLSETUP[equipment number].enb_autoffst = FALSE (default: TRUE)
  $SLSETUP[equipment number].rsm_offset = offset for equipment (default: 0.0)
  $SLSCHEDequipment number[schedule number].rsm_offset = offset for schedule (default: 0.0)

NOTE
The offset for equipment is used if the offset for schedule is 0.0 (default).

NOTE
When you use Resume Offset function, please enable the function on the Resume Offset Menu screen. For more information, please refer to the description about Resume Offset in Basic Operation Manual's (B-83284EN) Section 9.12 "ORIGINAL PATH RESUME".
DispenseTool doesn't support Resume Offset for non-sealing motion. Only on sealing motion, Resume Offset function is valid.

3 DISPENSETOOL COMMON SETUP

3.1 SETTING UP DISPENSETOOL CONFIGURATION

You must set up the DispenseTool configuration before you use DispenseTool. Table 3.1 lists and describes each configuration item you can set. You set up these items only during Controlled start of the controller. Refer to Basic Operation manual's (B-83284EN) Subsection B.1.3 for information on performing a Controlled start. Use Procedure 3-1 to set up DispenseTool configuration.

Table 3.1 dispensetool configuration item

Item	Description
F Number	This item is the robot's F-Number.
Number of Equipments default:: 1 range: 1 to 5	This item defines the maximum number of equipments to be set up and controlled by DispenseTool.
Number of Guns default: 1 range: 1 to 6	This item defines the number of guns to be set up and controlled by DispenseTool.
Equipment type: default: Var iable Orifice	This item defines the type of equipment you are using. (press F4, [CHOICE], to display the alternatives.) Valid alternatives are: • ISD Servo Dispenser** • Shot Meter • Gear Meter • Variable Orifice • Pressure Regulator • Urethane Glass * • Clear Black * • IRD Dispenser** • NEMO Pump**
Bead shaping Air(Atomizing Air) default: DISABLE	This item defines whether the dispensing system uses Beadshaping Air (Atomizing Air) in the dispensing material.
Remote Start default: DISABLE	This item defines whether the dispensing system uses the Remote Start feature.
Automatic Purge default: DISABLE	This item defines whether the dispensing system uses the Automatic Purge feature.
Bubble Detect default: DISABLE	This item defines whether the dispensing system uses the Bubble Detected feature.
Linear 2P Calibration default: DISABLE	This item defines whether or not the Two Point Calibration feature is used.
Channel 2 Analog Output default: DISABLE	This item defines whether or not the Channel 2 Analog Output feature is used.
TCPP Square Control default: DISABLE	This item defines whether or not the TCPP Square Flow Rate Control is used.
AccuSeal Advanced Feature default: DISABLE	This item defines whether or not the Adaptive Closed-Loop Flowrate Control (ACFC) is used. (AccuSeal features)

* These types of equipment require additional customization.

** These types of equipment require additional specific options to be loaded.

NOTE

The controller interface for Shot Meter, Gear Meter, Variable Orifice, Pressure Regulator, Urethane Glass and Clear Black dispensers integrates well with the interface requirements for many dispense manufactures. However, it is strongly recommended that you verify the interface requirements before making your selection.

Procedure 3-1 Setting Up DispenseTool Configuration

Steps

1 Perform a Controlled Start.
   a If the controller is turned on, turn it off.
   b Turn on the disconnect.
   c On the teach pendant, press and hold the PREV and NEXT keys.
   d While still pressing PREV and NEXT on the teach pendant, press the ON button on the operator panel. You will see a screen similar to the following.

```
---------- CONFIGURATION MENU --------—
1 Hot start
2 Cold start
3 Controlled start
4 Maintenance
Select >
```

2 Select 3, Controlled start, and press ENTER.
The DispenseTool Application Configuration Setup screen is displayed. You will see a screen similar to the following.

```
Seal Config CONTROLLED START MENUS
DispenseTool Application Configuration
1 F Number:                    F00000
2 Number of equipments:        1
3 Number of guns:              1
4 Equipment type:      Variable Orifice
5 Beadshaping air:             DISABLE
6 Remote start:                DISABLE
7 Automatic purge:             DISABLE
8 Bubble detect:               DISABLE
9 Linear 2P calibration:       DISABLE
10 Channel 2 analog output:    DISABLE
11 TCPP Square Control:        DISABLE
12 AccuSeal advanced feature: DISABLE
```

3 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
4 Move the cursor to the appropriate item and set it as desired.
5 If you would like to change the number of equipment, move the cursor to Number of equipments and type in the appropriate value. You will see a prompt box similar to the following.

```
You have changed the number
of equipment. Press YES to
confirm your change and
wait for new sysvar
reallocation.
   YES        NO
```

NOTE
You can configure multiple equipment of different types if you type a value larger than 1.

6 If you are sure that you would like to change the number of equipments, select YES and press ENTER.
7 To select a specific piece of equipment, press F3, EQUIP, and type the number of the piece of equipment. You will see a screen similar to the following.

```
Seal Config CONTROLLED START MENUS
                    E3
DispenseTool Application Configuration
1 Number of guns:              1
2 Equipment type:      Variable Orifice
3 Beadshaping air:             DISABLE
4 Remote start:                DISABLE
5 Automatic purge:             DISABLE
6 Bubble detect:               DISABLE
7 Linear 2P calibration:       DISABLE
8 Channel 2 analog output:     DISABLE
9 TCPP Square Control:         DISABLE
10 AccuSeal advanced feature:  DISABLE
```

NOTE
You can select different equipment types for different pieces of equipment.

8 When you are finished setting the DispenseTool configuration items, press FCTN.
9 Select START (COLD). The controller will perform a Cold start. When it is finished, the UTILITIES Hints screen will be displayed.

3.2 FLOW RATE CONTROL

DispenseTool calculates the flow command by using the following model.

Flow command = Flow rate * Scale factor * Material factor * Correction factor + Flow rate bias

Flow command
This item represents a command to the dispenser. The command is converted to an analog output or a motor speed.
Flow rate
This item is located in the schedule screen. You can set it by the bead width (mm), volume per meter (cc/m), percentage (%), voltage (V) or pressure (psi, bar).
Scale factor
This factor is determined through the flow rate control calibration. This factor exists per flow type.
Material factor
This item is located in the dispenser setup screen.
Correction factor
This item is located in the schedule screen.
Flow rate bias
This item is located in the dispenser setup screen.

Fig. 3.2 (a) Flow rate control model

DispenseTool calculates the flow command for bead application by using the following model.

Flow command = Flow rate * Scale factor * Material factor * Correction factor * Robot speed
+ 2PNT bias + Flow rate bias

Robot speed
DispenseTool uses a predicted robot speed to compensate delays in the dispenser. You can select one from the followings:
TCP predicted speed
Predicted speed of tool center point. This speed reflects both the acceleration and deceleration of robot.
Predicted programmed speed
Programmed speed of predicted motion. This speed does not reflect the acceleration or deceleration of robot.
2PNT bias
This bias is determined through the two-point flow rate calibration, and is used only when the two-point flow calibration is enabled. This bias exists per flow type.

Fig. 3.2 (b) Flow rate control model for bead application

NOTE
Refer to Section 3.10 for details on the nonlinear flow model.

The flow type allows you to select the unit of flow rate and the prediction method of robot speed.

Table 3.2 Flow type

Flow Type	Description
TCPP Bead Width	This is used to specify a bead width (mm). The flow command is calculated according to the robot speed. The TCP predicted speed is employed for the robot speed. The bead thickness is assumed to be constant. Scale factor: $SLSETUP[equipment number].s_factor1
PROG Bead Width	This is used to specify a bead width (mm). The flow command is calculated according to the robot speed. The predicted programmed speed is employed for the robot speed. The bead thickness is assumed to be constant. Scale factor: $SLSETUP[equipment number].s_factor2
CONST Bead Width	This is used to specify a bead width (mm). The flow command does not depend on the robot speed. Scale factor: $SLSETUP[equipment number].s_factor3
Percentage	This is used to specify a percentage (%) of the maximum flow command. This flow type does not require the flow rate control calibration. Scale factor: $SLSETUP[equipment number].s_factor4
TCPP Volume	This is used to specify a volume per meter (cc/m). The flow command is calculated according to the robot speed. The TCP predicted speed is employed for the robot speed. Scale factor: $SLSETUP[equipment number].s_factor5
PROG Volume	This is used to specify a volume per meter (cc/m). The flow command is calculated according to the robot speed. The predicted programmed speed is employed for the robot speed. Scale factor: $SLSETUP[equipment number].s_factor6
CONST Volume	This is used to specify a volume flow (cc/sec) for dot application or a volume per meter (cc/m) for bead application. The flow command does not depend on the robot speed (The robot speed is assumed to be constant). Scale factor: $SLSETUP[equipment number].s_factor7
Volts	This is used to specify a voltage (V). This flow type does not require the flow rate control calibration. Scale factor: $SLSETUP[equipment number].s_factor8
Pressure (psi)	This is used to specify a pressure (PSI). Scale factor: $SLSETUP[equipment number].s_factor9
Pressure (bar)	This is used to specify a pressure (BAR). Scale factor: $SLSETUP[equipment number].s_factor10

Flow Type	Description
Gum Drop (%)	This flow type enables a running robot to dispense a certain amount of material with robot running. For details, please refer to Section 3.12. Scale factor: $SLSETUP[equipment number].s_factor11

3.3 SETTING UP SCHEDULES

A dispensing sealing schedule is a list of items that specifies how you would like the robot to dispense material for a specific situation. In a schedule, you specify items such as bead width, volume, atomizing air, and gun on delay. When you specify that the robot should dispense material using a particular schedule, the robot will dispense material using the information you defined in the schedule.

You can access schedules from the DATA menu. There are two screens associated with schedules: the Seal Sched LISTING screen and the Seal Sched DETAIL screen.
The LISTING screen displays limited information for all schedules in the robot (100 is the default number of schedules); information for only nine schedules can be displayed on one screen. The DETAIL screen allows you to display and change the complete information for a single schedule. You can switch between the display of each screen by pressing F2.

NOTE
The selections on these screens vary depending on the type of equipment and how you configured it during the Controlled start.

Table 3.3 lists and describes each schedule item for all types of dispensing equipment.
Use Procedure 3-2 to display and modify a DispenseTool schedule.
Refer to Section 3.4 for timing diagrams. Also refer to Section 3.1.

Table 3.3 Schedule items

Item	Description
Schedule# default: 1 min: 1 default max: 100	This item indicates the sealing schedule number. This information is displayed on both the LISTING and DETAIL screens.
Comment	This item describes the type of seal. The comment is displayed as part of the sealing instruction. This information is displayed on both the LISTING and DETAIL screens.
Flow type	This item defines how the flow of material will be measured. The following flow types are available: • TCPP Bead Width - Bead width (mm), using TCP speed prediction • PROG Bead Width - Bead width (mm), using programmed speed prediction • CONST Bead Width - Bead width (mm), using no speed prediction • Percentage • TCPP Volume - Volume (cc/min), using TCP speed prediction • PROG Volume - Volume (cc/min), using programmed speed prediction • CONST Volume - Volume (cc/min), using no speed prediction • Volts • Pressure (psi) • Pressure (bar) This information is displayed on both the LISTING and DETAIL screens.
Flow Model	This item specifies the kind of flow model applied on the current schedule. Linear and Square flow models are available. If AccuSeal is enabled, the AccuFlow model will be available also.
Flow rate	This item specifies the desired rate of material flow. The units used correspond to the flow type you have selected. This information is displayed on the DETAIL screen as "Flow Rate" and on the LISTING screen as "Value."

Item	Description
Guns used	This item specifies the guns that DispenseTool will use for dispensing. Up to six guns can be used. Guns can be used only if they have been defined during DispenseTool configuration. The Guns used item displays the status of the six possible guns using a six-character expression. The first character represents gun 1, the second character represents gun 2, the third character represents gun 3, and so forth. If a gun has not been defined, it is represented by a *. If a gun has been defined, the following symbols specify whether it will be used during calibration: • The gun number indicates that the gun will be used. • The minus symbol, "- ", indicates that the gun will not be used. This information is displayed only on the DETAIL screen.
Equip. ant-time*** default: 0 ms min: 0 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the taught position and when material is dispensed from the gun. This information is displayed only on the DETAIL screen.
Eq. additn ant-time***	This item indicates the additional anticipation time of the equipment. Additional anticipation times might be required when equipment receives a decreasing flow rate command signal. This item only applies to the flow type of TCPP or PROG.
Gun on ant-time*** default: 0 ms min: -1000 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned on. If you would like the gun to turn on before the robot reaches the destination position, set Gun on ant-time to a positive number. If you would like the gun to turn on after the robot reaches the destination position, set Gun on ant-time to a negative number. This information is displayed only on the DETAIL screen.
Gun off ant-time*** default: 0 ms min: -1000 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned off. If you would like the gun to turn off before the robot reaches the destination position, set Gun off ant-time to a positive number. If you would like the gun to turn off after the robot reaches the destination position, set Gun off ant-time to a negative number. This information is displayed only on the DETAIL screen.
Bead shaping (BS)* default: 0 psi min: 0 psi max: 999 psi	This item indicates the amount of Bead shaping air (atomizing air) used. This information is displayed only on the DETAIL screen.
BS on ant-time *,*** default: 0 ms min: -1000 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the destination position and when the atomizing air is turned on. If you would like the atomizing air to turn on before the robot reaches the destination position, set BS on ant-time to a positive number. If you would like the atomizing air to turn on after the robot reaches the destination position, set BS on ant-time to a negative number. This information is displayed only on the DETAIL screen.
BS off ant-time *,*** default: 0 ms min: -1000 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the destination position and when the atomizing air is turned OFF. If you would like the atomizing air to turn OFF before the robot reaches the destination position, set BS off ant-time to a positive number. If you would like the atomizing air to turn OFF after the robot reaches the destination position, set BS off ant-time to a negative number. This information is displayed only on the DETAIL screen.
Pre-pressure time*** default: 0 ms	This item is used to adjust the invoking time of the pre-pressure signal.
De-pressure time default: 0 ms	This item is used to adjust the invoking time of the de-pressure signal.
Correction factor default: 1.0 min: 0.1 max: 10.0	This item allows you to fine tune material flow. This is especially useful when dispensing material around corners. This information is displayed only on the DETAIL screen.

Item	Description
Correction bias default: 0.0 min: -100 max: 100	This item allows you to adjust the bead width of corners which reside within the seal segment. This value does not affect the bead width of any straight line paths. When the Square flow model is enabled, this item is used to adjust the bead width of whole seal segment.
SS time offset***	This item allows you to adjust the time interval between the gun on signal and the flow rate signal.
SE time offset***	This item allows you to adjust the time interval between the gun off signal and flow rate signal.
Ch2 type **	This item defines how the Analog 2 (A2) will be measured. The following A2 types are available: • TCPP Bead Width - Bead width (mm), using TCP speed prediction • PROG Bead Width - Bead width (mm), using programmed speed prediction • CONST Bead Width - Bead width (mm), using no speed prediction • Percentage • TCPP Volume - Volume (cc/min), using TCP speed prediction • PROG Volume - Volume (cc/min), using programmed speed prediction • CONST Volume - Volume (cc/min), using no speed prediction • Volts • Pressure (psi) • Pressure (bar) • TCPP Volts • TCPP percentage • PROG volts • PROG percentage
Ch2 amount **	This item specifies the desired rate of Analog 2. The units used correspond to the A2 type you have selected.
Ch2 equip ant-time * *default: 0 ms min: 0 ms max: 1000 ms	This item indicates the anticipation time between when the robot reaches the taught position and when material is dispensed from the gun. A larger value of equipment delay will cause the gun to turn on earlier. This information is displayed only on the DETAIL screen.
Ch2 additn ant-time **	This item indicates the additional anticipation time of the equipment. Additional delays might be required when equipment receives a decreasing flow rate command signal. This item only applies to the flow type of TCPP or PROG.
Ch2 correction factor **	This item allows you to fine tune material flow. This is especially useful when dispensing material around corners. This information is displayed only on the DETAIL screen.
Ch2 correction bias **	This item allows you to adjust the bead width of corners which reside within the seal segment. This value does not affect the bead width of any straight line paths.

* Displayed if Beadshaping air (atomizing air) is used.
** Displayed if Channel 2 Analog is enabled.
*** This item is also a Process Signal timing parameter .

Procedure 3-2 Using Schedules

NOTE
If you have multiple equipments, you must set up schedules for each one.

Steps

1 Press DATA.
2 Press F1, [TYPE].
3 Select Seal Sched. If the following screen is not displayed, press F2, LISTING. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.

```
DATA Seal Sched E1
Variable Orifice System
Schd  Value  Flow Type  Comment
 1   10.0 mm   BW TCPP  FOUR DOOR LR
 2    0.0 mm   BW TCPP
 3    0.0 mm   BW TCPP
 4    0.0 mm   BW TCPP
 5    0.0 mm   BW TCPP
 6    0.0 mm   BW TCPP
 7    0.0 mm   BW TCPP
 8    0.0 mm   BW TCPP
 9    0.0 mm   BW TCPP
```

4 Set the values for each schedule as appropriate.
5 To display more information about a single schedule, press F2, DETAIL. You will see a screen similar to the following.

```
DATA Seal Sched E1
Variable Orifice System
1 Schedule # 1
2 Flow type:         TCPP Bead Width
3 Flow model:              LINEAR
4 Flow rate:               0.00 mm
5 Guns used:               1--***
6 Equip. ant-time:         0 ms
7 Eq. additn. ant-time:    0 ms
8 Gun on ant-time:         0 ms
9 Gun off ant-time:        0 ms
10 Bead shaping (BS):      0.0 psi
11 BS on ant-time:         0 ms
12 BS off ant-time:        0 ms
13 Pre-pressure time:      0 ms
14 De-pressure time:       0 ms
15 Correction factor:      1.0
16 Correction bias:        0.0
17 SS time offset:         0 ms
18 SE time offset:         0 ms
Channel 2 Analog Properties
19 Ch2 type:          TCPP Bead Width
20 Ch2 amount:             0.00 mm
21 Ch2 equip. ant-time:    0 ms
22 Ch2 additn. ant-time:   0 ms
23 Ch2 correction factor:  1.0
24 Ch2 correction bias:    0.0
```

6 To return to the LISTING screen , press F2, LISTING.

3.4 PROCESS TIMING PROTOCOLS

3.4.1 Generic Dispense System Response Time at A Corner

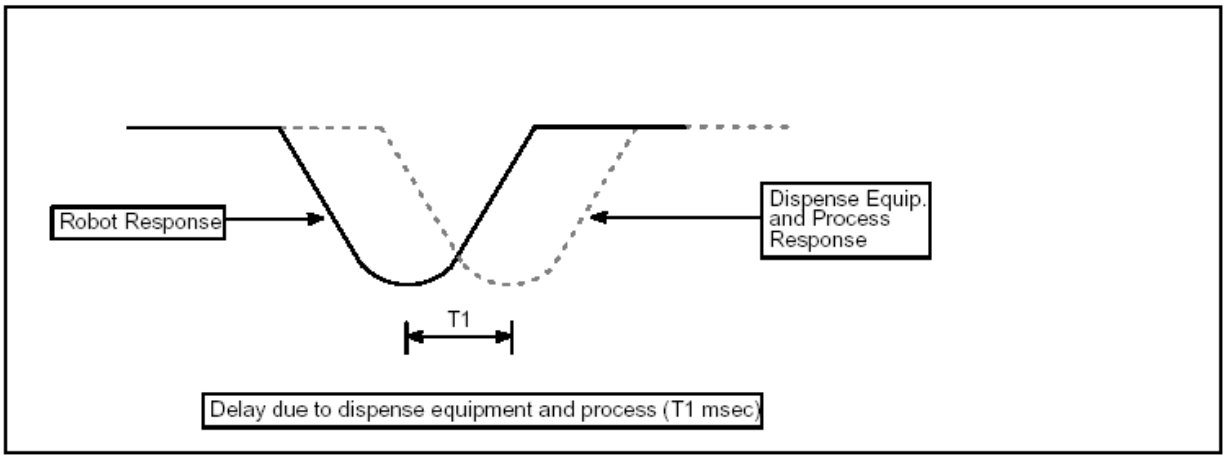


Fig. 3.4.1 Generic dispense system response time at a corner

3.4.2 Equipment Ant-Time and Additional Ant-Time

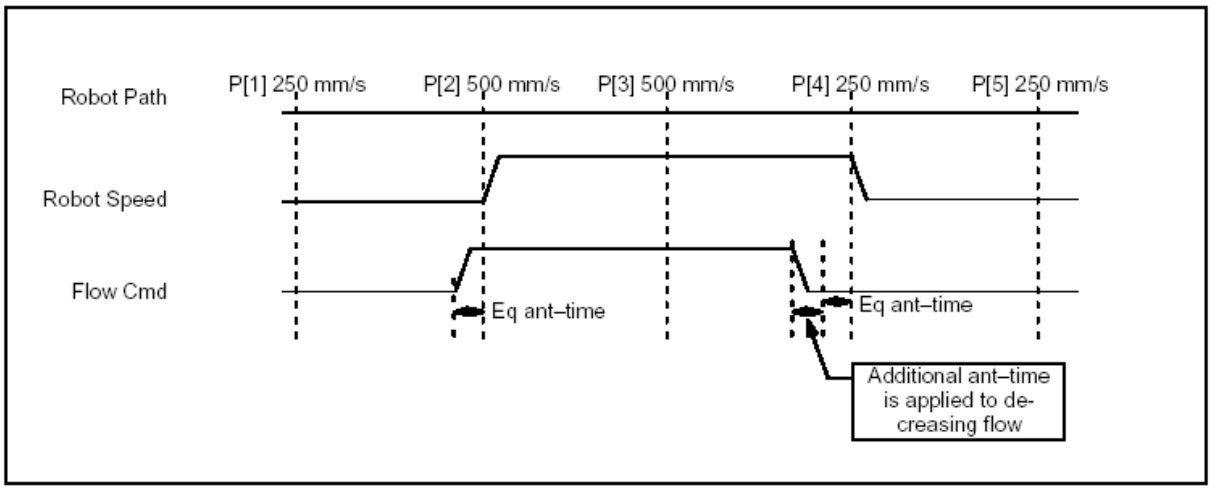


Fig. 3.4.2 Equipment ant-time and additional ant-time

3.4.3 Corner Adjustment

If the flow type is TCPP or PROG, the flow rate output will change in proportion to the robot speed change. Around corners of a path, the robot will usually slow down and the flow rate will decrease.
The correction bias provides a means to offset the corner flow rate only.

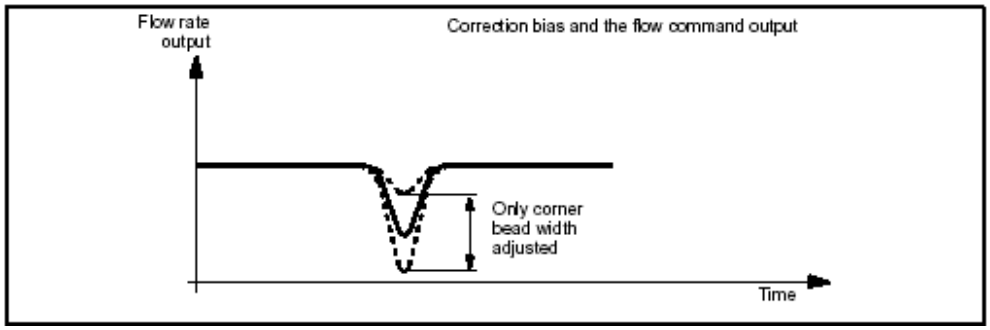


Fig. 3.4.3 Corner adjustment

3.4.4 Generic Dispense Process Signal Timing Protocols

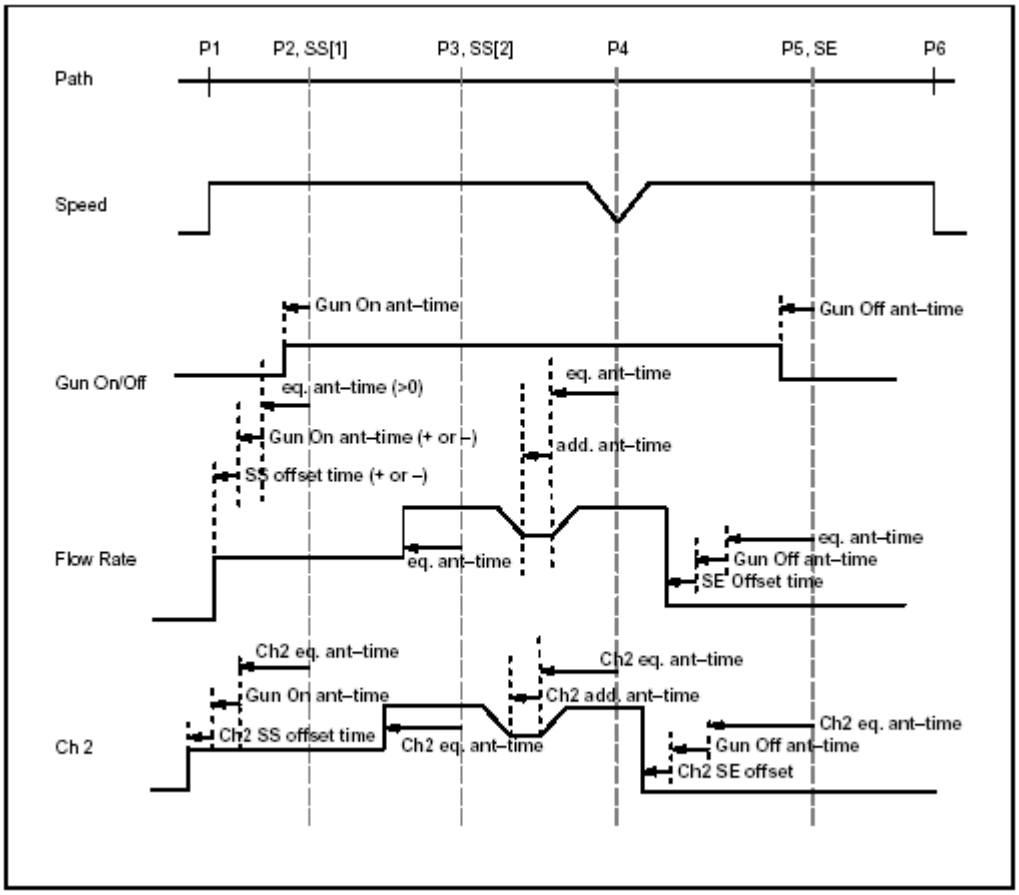


Fig. 3.4.4 Generic dispense process signal timing protocols

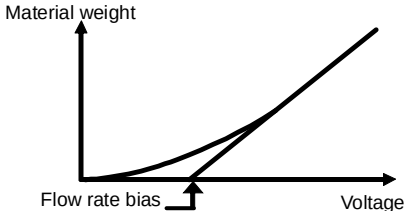
3.5 SETTING UP EQUIPMENT INFORMATION

You must set up specific information about the dispensing equipment before you can use it. Equipment setup requires you to set up specific items and to perform specific calibration procedures. Table 3.5 lists and describes each equipment setup item. The equipment setup items vary depending on the way your system is configured.
You might also need to perform the following calibration procedures to set up your dispensing equipment, depending on the way your system is configured:

- Maximum analog out calibration - Subsection 3.6.4
- Flow rate control calibration - Subsection 3.6.2

Table 3.5 Equipment setup items

Item	Description
Material Factor default: 1.00 min: 0.10 max: 10.00	This specifies the scale factor used in computing flow control (analog output). It can be changed as material viscosity and temperature changes.

Item	Description
Flow Rate Bias default: 0.00 V min: -9.99 V max: 10.00 V	This value will be added to the flow rate voltage while sealing. Most sealing equipment respond only in a linear fashion to voltages within a limited range, often 3 to 8 volts. Use Flow Rate Bias to help compensate for non-linearity in the sealing equipment flow rate response. Typical values of Flow Rate Bias are between 0.0 and 2.0 volts. To determine the appropriate value for your dispensing equipment, contact your dispensing equipment supplier or determine the value yourself by generating a voltage-in to sealant-out chart. Use the chart to find the flow rate bias by drawing a line through the region of the chart that has the most linear response. The point where this line crosses the voltage axis is the flow rate bias. 
Minimum Flow Command default: 0.00 V min: 0.00 V max: 10.00 V	This specifies the minimum flow command voltage that will be sent to the dispensing equipment while sealing. If the requested flow rate specified in the current Seal Schedule ever goes below the Minimum Flow Command, the Minimum Flow Command will be sent to the dispensing equipment.
Flow Command AOUT Type values: Volts, Current default: Volts	This selects the type of analog output: Volts - Type II output - range 0-10 volts Current - Type III output - range 1-5 volts
Style ID ack time-out default: 0 ms min: 0 max: 30,000	An error "SEAL-246 Style ID communication timeout (E%s)" will be posted if the dispenser does not raise the IN_PROCESS signal within the time specified by this item after Style_strobe output is turned on by the robot.
Dispense Complete time-out default: 0 ms min: 0 max: 30,000	"SEAL-305 Dispense complete timeout (E%s)" will be posted if the dispenser does not turn off the IN_PROCESS signal with the time specified by this item after Dispense_Complete output is turned on by the robot.
Fault Reset pulse width default: 300 ms min: 0 max: 3,000	This item specifies the pulse width of the "fault reset" signal from the robot to the dispenser. Fault reset will be automatically attempted when the robot detects themajor fault signal on or the dispenser ready signal off before sending t he style ID or before resuming a paused program.
Fault Reset time-out default: 2000 ms min: 0 max:30,000	"SEAL-308 Fault Reset Timeout (E%s)" will be posted if the dispenser does not turn on the dispenser ready signal or if the dispenser does not turn off the major fault signal within the time specified by this item after the fault reset signal is asserted by the robot. **NOTE** The time-out error will not be posted if the robot is running dry (dispensing disabled).
Rmt Start/Purge time-out default: 10,000 ms: min: 0 max: 30,000	At the beginning of a job, if dispenser ready DI is not ON, the robot initiates a remote start sequence by setting the Remote start digital output. If the dispenser ready input does not turn ON within this time, the following error is posted:“SEAL-314 Rmt Strt/Purge Request Timeout”
Set Task OK upon recovery values: ENABLE,DISABLE default: ENABLE	If enabled, the robot sets the Task OK signal on when you select one of the following error recovery options: Continue Weld/Wet or FastFaultRecovery.

Item	Description
Bead shaping factor* default: 1.00 min: 0.01 max: 10.00	This specifies the global scale factor used in computing atomizing air. Changing this factor has an effect on all atomizing air values specified in sealing schedules.
Bead shaping AOUT type* values: Volts, Current default: Volts	This selects the type of the analog output: • Volts - Type II output - range 0-10 volts • Current - Type III output - range 1-5 volts
Bead shaping max out* default: 10.00 V min: 0.00 V max: 10.00 V	This sets the maximum analog voltage for atomizing air for the dispensing equipment. If the intended analog voltage exceeds this value, then an alarm will occur. Maximum voltage will not exceed this value.
Use default ACC values: ENABLE, DISABLE default: DISABLE	This item enables/disables the Default Acc feature.
Default ACC default: 20 min: max:	If Default Acc is enabled, the valued specified in this item will be used as Acc (acceleration) value for all motions that do not have the Acc modifier. If the Acc modifier is specified in the teach pendant program, the specified Acc value is used instead of the default Acc value. This feature allows the dispenser with slower response time to follow the flow command changes due to robot speed variation.
User def recvry delay default: 0.00 ms min: max:	This item adjusts the gun open timing when the gun is reopened after fast fault recovery. A positive value will open the gun earlier by the specified amount of time.
Guns Used in Calibration default: INCOMPLETE min: 1 max: 6	This specifies the guns that DispenseTool will use in equipment calibrations. Up to six guns can be used. Guns can be used only if they have been defined during DispenseTool configuration. The Gun Selection for Calibrations item displays the status of the six possible guns using a six-character expression. The first character represents gun 1, the second character represents gun 2, the third character represents gun 3, and so on. If a gun has not been defined, it is represented by a*. You cannot change the value of a gun that has not been defined. If a gun has been defined, you can specify whether it will be used during calibration: • Thegun number indicates that the gun will be used. • Theminus symbol, "- ", indicates that the gun will not be used. To change the value of a gun that has been defined, use the appropriate function keys.
Meter Max Speed default: INCOMPLETE	Refer to the Channel 2 Analog Control section of the application-specific *Setup and Operations Manual* for information on how to calibrate the meter maximum speed.
Flow Rate Control	Refer to the Maximum Analog Out (Meter)/Maximum Meter Speed Calibration section of the application-specific *Setup and Operations Manual* for information on how to calibrate the flow rate control.
Channel 2 Analog	Refer to the Channel 2 Analog Control section of the application-specific *Setup and Operations Manual* for information on how to calibrate the channel 2 analog.
Bead shaping command * default: INCOMPLETE	Refer to the Bead Shaping Air (Atomizing AIr) Calibration section of the application-specific Setup and Operations Manual for information on how to calibrate the bead shaping air pressure.

* Displayed if beadshaping air is used.

Use Procedure 3-3 to set up equipment items.

Procedure 3-3 Setting Up Equipment Items

NOTE
If you have multiple equipments, you must set up equipment items for each one.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select Dispenser. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
Gear Meter Disp. System 1/19
  1 Material factor:            ¥1.00
  2 Flow rate bias:              0.00 v
  3 Minimum flow command:        0.00 v
  4 Flow command AOUT type:     Volts
  5 StyleID ack time-out:           0 msec
  6 DispenseComplete time-out:      0 msec
  7 Fault Reset pulse width:      300 msec
  8 Fault Reset time-out:        2000 msec
  9 Rmt Start/Purge time-out:   10000 msec
  10 Set TaskOK upon Recovery:  DISABLE
  11 Bead shaping factor:        1.00
  12 Bead shaping AOUT type:    Volts
  13 Bead shaping max out:      10.00 v
  14 Use default ACC:           DISABLE
  15 Default ACC:                  20
  16 User def recvry delay:      0.00 msec
Calibrations:
  17 Max Analog out:            INCOMPLETE
  18 Flow rate control
  19 Bead shaping cmd:          INCOMPLETE
```

5 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
6 To select the number of the equipment you would like to set up
  a Check the currently selected equipment number. The equipment number is displayed to the right of the screen name as E# , where # is the equipment number. If the number displayed is the desirable equipment number, go to Step 7.
  b Press NEXT, >.
  c Press F3, EQUIP.
  d Type the number of the equipment and press ENTER.
7 To select which guns will be used during calibration,
  a Move the cursor to Guns used in calib.
  b Use the right and left arrow keys to move the cursor to the position that corresponds to the gun number.
  c Press the function key that corresponds to the value to be changed:
  • To select a gun to be used during calibration, press F4, #, where # corresponds to the number of the gun.
  • To specify that a gun will not be usedduring calibration, press F5, - .
8 Select items 1 through 8 and set them as desired.

9 To display detailed information about acalibration, move the cursor to the calibration and press F2, DETAIL.

3.6 EQUIPMENT CALIBRATION

3.6.1 Overview

You must perform calibration procedures for the equipment you use. The calibration procedures you perform depend on the kind of equipment you have and the way your system is configured.
This section contains calibration procedures that are used by all or most kinds of dispensing equipment. Perform only those calibration procedures that apply to your dispensing equipment.

- Maximum analog output (meter) calibration - Subsection 3.6.4
- Material pressure calibration - only if material pressure monitoring is used - Subsection 3.6.5
- Bead shaping air (Atomizing air) calibration - only if beadshaping air is used - Subsection 3.6.3
  Refer to Subsection 3.6.2 for flow rate control calibration.

3.6.2 Flow Rate Control Calibration

The flow rate control calibration sequence provides a way for the robot to translate the flow rate you specify in each sealing schedule (units of mm, %, cc/m, volts, PSI, or bar) into volts that are output to the dispensing controller. In default configuration, linear flow rate control calibration based on linear flow model is executed. But when TCPP Square control is enabled, square flow rate control based on square flow model is also selectable. (Refer to Section 3.10, “Nonlinear Flow Model” for more information.) As explained in Subsection 3.2.4, the robot translates the flow rate specified in the sealing schedule into volts by multiplying the flow rate you specify by the scale factor for that flow type.

Scale Factors

There are ten scale factors, one for each of the following possible flow rate types:

- Bead width with TCP speed predicted
- Bead width with programmed speed predicted
- Bead width with no speed compensation
- Percentage with no speed compensation
- Volume with TCP speed predicted
- Volume with programmed speed predicted
- Volume with no speed compensation
- Volts with no speed compensation
- Pressure (PSI) with no speed compensation
- Pressure (bar) with no speed compensation

All of the scale factors have a default value of 1.0 for linear flow model and 0.1 for square flow model when robot software is loaded. However, the default value is not typical for most sealing equipment. Therefore, you must perform a flow rate control calibration sequence for each flow type you plan to use on the robot if you would like the flow rate specified in each sealing schedule to be accurately reflected by the dispensing equipment.

Calibration Sequence

Flow rate control calibration will lead you through a sequence of operations that will set up a scale factor for the current flow rate type. This calibration runs a sample program (MOV_SEAM, by default) and asks you to measure and enter the actual sealant dispensed. The robot uses this information to calculate the scale factor for the flow rate type.

Table 3.6.2 lists and describes each flow rate control calibration item.

Table 3.6.2 Flow rate control calibration items

Item	Description
Calibration Status	This item displays the calibration completion status for the selected flow rate type. • DEFAULT indicates that calibration has not been performed for the selected flow rate type and that the scale factor for the selected flow rate type is still 1.0. • COMPLETE indicates that calibration has been performed successfully for the selected flow rate type and that the scale factor for the selected flow rate type probably is not 1.0.
Seal Schedule in MOV_SEAM value: 30	This item indicates the sealing schedule that must be used in the current sample program, which is MOV_SEAM in this case. The information in this sealing schedule will be used to calculate the scale factor for the flow rate type in the specified schedule.
Flow Rate Type	This item indicates the flow rate type that will be used in this calibration. You must set this to the flow rate type you are using in the calibration. Editing this item is the same as editing Flow rate type in the specified sealing schedule, which is sealing schedule 30 by default.
Desired Flow Rate	This item indicates the target flow rate that will be used for this calibration. Set this to the flow rate that will be used most often in your process. Editing this item is the same as editing Flow rate type in the specified sealing schedule, which is sealing schedule 30 by default.
Sample Program default: MOV_SEAM	This item indicates the program that will be run as part of this calibration. The sample program should dispense a simple seam at a steady speed so that you can measure the dispensing rate manually and enter the results into the robot. The sample program must use only SS[30] (where 30 is the number defined in the Seal sched used in MOV_SEAM item) to start sealing. No other SS should be used in this program. A default MOV_SEAM program is provided that includes the appropriate instructions. To use the default program, touch up the positions.
Home Program default: MOV_HOME	This item indicates the name of a program that moves the robot to the home position. When you perform this calibration, you have the option of running this program before and after you run the sample program, to ensure that the robot starts and ends the calibration at the home position.
TCPP BW Scale Factor	This item shows the result of the linear flow rate calibration.
TCPP BW Sqr-scale Factor	This item shows the result of the square flow rate calibration.

Calibration Procedure
Use Procedure 3-4 to perform flow rate control calibration.

Procedure 3-4 Performing Flow Rate Control Calibration

NOTE
1 You should perform this calibration for each flow rate type you would like to use on this robot. The example below is for TCPP Bead Width.
2 If you have multiple equipments, you must perform flow rate control calibration for each one.

Before Running the Calibration

- A home program has been defined.
- A seal schedule SS[30] has been defined. (Section 3.3)
- A sample program has been defined. It must dispense a simple, measurable bead using SS[30].
- All dispenser I/O has been properly defined. (Section 3.7)
- The Robot motion test cycle parameter is set to ENABLE.
- The WET RUN test cycle parameter is ENABLED.

Steps

NOTE
If you would like to perform square flow rate control calibration, you should set up TCPP square control as ENABLED during Controlled start of the controller. (Refer to Section 3.1 “Setting Up DispenseTool Configuration” for more information.)

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select the equipment you would like to calibrate.
5 Move the cursor to Linear Flow rate control or Square Flow rate control.
6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
SETUP Equipment E1
Dispensing Equipment
Flow Rate Calibration
Calibration status:       DEFAULT
Seal sched in MOV_SEAM:      30
1 Flow rate type:   TCPP Bead Width
2 Desired flow rate:        0.0 mm
3 Sample program:          [MOV_SEAM]
4 Home program:            [MOV_HOME]
TCPP BW scale factor:      1.000
```

7 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the flow rate type as follows:
  a Move the cursor to Flow rate type.
  b Press F4, [CHOICE].
  c Move the cursor to the desirable flow rate type and press ENTER.
9 Move the cursor to Desired flow rate, type the desired flow rate, and press ENTER.
10 Specify the name of the sample program and the name of the home program as follows:
  a Move the cursor to Sample program or Home program.
  b Press F4, [CHOICE].
  c Move the cursor to the desirable program name and press ENTER.
11 Make sure all items on this screen are correct and that you have satisfied all of the conditions listed in the "Before Running the Calibration Section" at the beginning of this procedure.
12 When you are ready to start the calibration , press F3, START.
13 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME pos.
OK to continue?
     YES   NO
```

  a Select YES and press ENTER.
  b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.

c Adjust the speed override to an appropriate value for the conditions.
d To move the robot, press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

14 To move the robot along the sample seam defined by the program MOV_SEAM, you will see a screen similar to the following.

```
Robot will move along the
ample program.
aterial will be dispensed.
tart calibration?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to 100%.

NOTE
Make sure the speed override is set to 100%. Although you do not have to do this to continue, best results are obtained when running the sample seam at 100% of the programmed speed.

d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

The robot will move through the positions in the sample program, turning the gun on and off when the SS[30] and SE instructions are executed. After the program has finished executing, you must measure the flow rate dispensed and enter it when prompted. You will see a screen similar to the following.

```
SETUP Equipment E1
  Dispensing Equipment
    Flow Rate Calibration
      Calibration status:     COMPLETE
      Seal sched in MOV_SEAM:     30
      Flow rate type: TCPP Bead Width
      Desired flow rate:         5.0 mm
      Sample program:          [MOV_SEAM]
      Home program:            [MOV_HOME]
      TCPP BW scale factor:     1.00
Enter measured bead width (mm):
```

NOTE
If your flow rate type is one of the volume flow rates (TCPP volume, PROG volume, or CONST volume), you will be prompted for both seam volume and seam length.

15 Measure the bead width, type it in millimeters, and press ENTER. The measured bead width can be zero. If it is zero, you will see the following screen.

```
Measured bead width was
zero. Check dispensing
equipment.
OK to increment local scale
factor by 1.0?
  YES    NO
```

16 If the measured bead width is zero, decide whether to increment the local scale factor.
- To increment the local scale factor, **select YES and press ENTER.**
- To keep the local scale factor the **same, select NO and press ENTER.**

17 After entering the information at the end of the calibration, the new scale factor will be calculated and you will be prompted to approve the new scale factor. If you enable the new scale factor, this value will be used in calculating the flow rate for the currently selected flow rate type.

NOTE
While running if a “SEAL-270 Flow command above maximum" error was posted, then instead of “Enable new value?” a different prompt will appear stating “WARN:SEAL-270 POSTED! Enable new value?”. This is an indication that the maximum flow command was exceeded and therefore the proposed new scaling factor may not be valid.

```
SETUP Equipment E1
  Dispensing Equipment
    Flow Rate Calibration
      Calibration status:      COMPLETE
      Seal sched in MOV_SEAM:    30
      Flow rate type: TCPP Bead Width
      Desired flow rate:        5.0 mm
      Sample program:          [MOV_SEAM]
      Home program:            [MOV_HOME]
      TCPP BW scale factor:    1.00

      New TCPP BW scale factor: 0.500
Enable new value?
                YES   NO
```

18 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
     YES    NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to an appropriate value for the conditions.
d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.6.3 Bead Shaping Air (Atomizing Air) Calibration

Bead Shaping air (Atomizing air) calibration establishes a global air scaling factor. This factor is used in conjunction with programmed path speeds and tool center point speeds to provide the analog air commands that are sent to the dispenser.

NOTE
You must perform bead shaping calibration only if your system is configured to use bead shaping air.

Description

Many dispensing applications require the use of bead shaping air to be delivered along with the material to modify the bead characteristics. The pressure at which the air is mixed with the material will greatly affect the resulting seam. For this reason, the scaling schedules allow you to alter the bead shaping air pressure. All bead shaping air pressure programming is done in units of psi. Since no sensory feedback is given for bead shaping air pressure, the only information available is from the bead shaping air pressure gauge.

Through the execution of bead shaping air calibration, a scaling factor is calculated that enables the conversion of bead shaping air commands into the analog command signals which will result in the desired air pressure.

Bead shaping air calibration involves setting the bead shaping air port to a specific value, while you enter the resulting air pressure. This process is performed twice. The "Pressure per Count" scaling factor is then computed using the data you supply.

Table 3.6.3 lists and describes each bead shaping air calibration item.

Table 3.6.3 Bead shaping air calibration items

Item	Description
Calibration Status	This item indicates whether the beadshaping air calibration has been completed successfully.
Home Program default: MOV_HOME	This item indicates the program used to move the robot to the home position. You can specify the name of the home program.
Purge Program default: MOV_PURG	This item indicates the program used to move the robot to the purge position. You can specify the name of the purge program.
Pressure Per Count default: 0.0000 psi min: 0.0000 psi max: 9.9999 psi	This item indicates the air pressure per analog count, in psi.

Use Procedure 3-5 to perform beadshaping air calibration.

Procedure 3-5 Performing Bead Shaping Air (Atomizing Air) Calibration

NOTE
If you have dual equipment, you must perform bead shaping air calibration for each one.

Before Running the Calibration

- A home program has been defined.
- A purge program has been defined.
- All dispenser I/O has been properly defined. (Section 3.7)
- The Robot motion test cycle parameter is set to ENABLE.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select Micro ProFlo.
5 Move the cursor to Beadshaping air.
6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
SETUP Sealing E1
Dispensing Equipment
Beadshaping Air Calibration
  Calibration status:  INCOMPLETE
1 Home program:       [ MOV_HOME ]
2 Purge program:      [ MOV_PURG ]
  Pressure per count:  0.0000 psi
```

7 To display help information, press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the name of the home program and the name of the purge program as follows:
   a Move the cursor to Home program or Purge program.
   b Press F4, [CHOICE].
   c Move the cursor to the desirable program name and press ENTER.
9 Press F3, START, to start calibration.
10 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Set the speed override to an appropriate value for the conditions.
   d To move the robot , press and hold SHIFT and press F5, MOVE.
11 If the robot is at the home position, you are prompted to move the robot to the purge position, as shown in the following screen.

```
Robot will move to PURGE
pos. OK to continue?
     YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Set the speed override to an appropriate value for the conditions.
   d To move the robot , press and hold SHIFT and press F5, MOVE.
   e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.
12 To start calibration, select YES on the following screen and press ENTER.

```
Robot will NOT move.
No material will be
dispensed. Beadshaping air
will be applied.
Start calibration?
   YES  NO
```

The analog output port for atomizing air is set to ¼ of the maximum value. You will see a screen similar to the following.

NOTE
Press F3, QUIT, at any time to stop beadshaping air and abort calibration.

```
SETUP Sealing
  Dispensing Equipment
  Beadshaping Air Calibration
    Calibration status: INCOMPLETE
    Home program:          MOV_HOME
    Purge program:         MOV_PURG
    Pressure per count: 0.0000 psi
  1 Pressure value 1:        0 psi
Enter first pressure gauge value.
```

13 Read the value on the atomizing air pressure gauge, type it and press ENTER.
14 Press F5, CONTINUE.

The analog output port for atomizing air is set to ¾ of the maximum value. You will see a screen similar to the following.

```
SETUP Sealing E1
  Dispensing Equipment
  Beadshaping Air Calibration
    Calibration status: INCOMPLETE
    Home program:          MOV_HOME
    Purge program:         MOV_PURG
    Pressure per count: 0.0000 psi
    Pressure value 1:        0 psi
    Pressure value 2:        0 psi
Enter second pressure gauge value.
```

15 Read the value on the beadshaping air pressure gauge, type it and press ENTER, and press F5, CONTINUE.

A new pressure per count scaling factor is calculated and is updated to the screen. You will see a screen similar to the following.

```
SETUP Sealing E1
New pressure per count:  .0097 psi
Old pressure per count: 0.0000 psi
Enable new value?
```

16 Decide whether the new pressure per count value is acceptable.
- If it is acceptable, press F4, YES. The scaling factor is updated and the calibration status is set to COMPLETE.
- If it is not acceptable, press F5, NO. Repeat the calibration procedure until you are satisfied with the results.

17 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME pos.
OK to continue?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Set the speed override to an appropriate value for the conditions.

d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.6.4 Maximum Analog out (Meter)/Maximum Meter Speed Calibration

Maximum analog out (meter)/maximum meter speed calibration allows you to define the maximum operating flow rate that can be used without exceeding the maximum system pressure.

NOTE
If you have the Integral Servo Dispenser equipment, you will see the "Max Meter Speed Calibration" screen. For all other kinds of equipment, you will see the "Max Analog Out" screen.

Description

For each dispensing system configuration, there exists a maximum operating material pressure. If this pressure is exceeded, you risk serious equipment damage and possible personal injury. Maximum analog out (meter)/maximum meter speed calibration determines the maximal "Meter Speed" that corresponds to the maximum system material pressure. This calibration involves dispensing at various flow rates while observing system pressure.

⚠ WARNING
Do not exceed the maximum operating material pressure; otherwise, you could injure personnel and damage equipment.

Maximum analog out (meter)/maximum meter speed calibration should be executed several times with different speed steps. It is recommended to start with a very coarse voltage step (0.50 volts or 5%) and to establish a preliminary maximum speed. After each calibration execution, the last maximum speed value that does not result in a system overpressure should be enabled. For the next execution, the speed step should be decreased, increasing the accuracy of the maximum speed value. Typically, the best results can be attained when a maximum voltage has been established for a 0.01 V voltage step or 0.1% step.

Table 3.6.4 lists and describes each maximum analog out (meter)/maximum meter speed calibration item.

Table 3.6.4 Maximum analog out (meter)/maximum meter speed calibration items

Item	Description
Calibration Status	This item indicates whether maximum analog out (meter)/maximum meter speed calibration has been completed successfully.
Home Program default: MOV_HOME	This item indicates the program used to move the robot to the home position. You can specify the name of the home program.
Purge Program default: MOV_PURG	This item indicates the program used to move the robot to the purge position. You can specify the name of the purge program.
Maximum Voltage/ Maximum Speed default: 4.0 V/40 min: 0.0 V/0 % max: 10.0 V/100 %	This item indicates the maximum voltage allowed from the analog output device. MaximumVoltage/Maximum Speed is set indirectly through the execution of this calibration procedure.
Voltage Step/Speed Step default: 0.1 V/1 % min: 0.0 V/0 % max: 0.5 V/5 %	This item indicates the voltage step to be used in the calibration. Refer to the beginning of this section for guidelines in setting the voltage step/speed step.

Item	Description
Maximum Pressure* default: 2300 psi min: 0 psi max: 6000 psi	This item indicates the maximum pressure that can be used when dispensing material. This item is set on the SETUP Equipment screen.
Last Pressure* default: N/A min: 0 psi max: N/A	This item indicates the material pressure the last time material was dispensed.

* Displayed if material pressure is monitored.

Use Procedure 3-6 to perform maximum analog out (meter)/maximum meter speed calibration.

Procedure 3-6 Performing Maximum Analog Out (Meter)/Maximum Meter Speed Calibration

Before Running theCalibration

- A home program has been defined.
- A purge program has been defined.
- Material pressure calibration is COMPLETE, if material pressure is monitored.
- All dispenser I/O has been properly defined. (Section 3.7)
- The Robot motion test cycle parameter is set to ENABLE.
- For Integral Servo Dispenser equipmentsystems only, the ISD meter motion test cycle parameter is set to ENABLE.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select Shot Meter.
5 Move the cursor to Max analog out (meter)/Max meter speed.

NOTE
The screens in this procedure are for DispenseTool systems in which material pressure is monitored. For DispenseTool systems in which material pressure is not monitored, the items pertaining to pressure will not be displayed.

6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
If you are using an ISD system, you will see "Max Meter Speed Calibration" instead of "Maximum Analog Out (meter) Calibration."

```
SETUP Sealing E1
Dispensing Equipment
Maximum Analog Out (meter) Calibration
  Calibration status: INCOMPLETE
1 Home program:     [ MOV_HOME ]
2 Purge program:    [ MOV_PURG ]
  Maximum voltage:   4.00 V
3 Voltage step:      0.00 V
  Maximum pressure:  2300 psi
  Last pressure:     2000 psi
```

7 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the name of the home program and the name of the purge program as follows:
   a. Move the cursor to Home program or Purge program.
   b. Press F4, [CHOICE].
   c. Move the cursor to the desirable program name and press ENTER.
9 Select Voltage step and enter a value between 0.0 and 0.5 volts. The voltage step cannot be zero.
10 Press F3, START, to start the calibration.
11 If the robot is not at the home position , you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

   a. Select YES and press ENTER.
   b. Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c. Set the speed override to an appropriate value for the conditions.
   d. To move the robot , press and hold SHIFT and press F5, MOVE.
12 If the robot is at the home position , you are prompted to move the robot to the purge position, as shown in the following screen.

```
Robot will move to PURGE
pos. OK to continue?
   YES   NO
```

   a. Select YES and press ENTER.
   b. Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c. Set the speed override to an appropriate value for the conditions.
   D To move the robot , press and hold SHIFT and press F5, MOVE.
   e. Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.
13 To start calibration, select YES and press ENTER in the following screen.

```
Robot will NOT move.
Shotmeter will be reloaded.
Start calibration?
   YES   NO
```

The shot meter will be reloaded. You will see a screen similar to the following.

```
SETUP Sealing E1
  Maximum voltage:       4.00 V
  Voltage step:          0.03 V
  Maximum pressure:      2300 psi
  Last pressure:         2200 psi
Select an fkey below.
```

14 Increase or decrease the maximum voltage by the voltage step.
   • To increase the maximum voltage, press F1, INCREASE.
   • To decrease the maximum voltage, press F2, DECREASE.

> ⚠ **WARNING**
> If your system does not monitor material pressure, watch the dispensing pressure gauges for overpressures while dispensing; otherwise, you could damage the equipment.

15 Test the increase or decrease by dispensing material at the maximum voltage shown.
   a. To dispense, continuously press F4, DISPENSE.
   b. Watch the Last pressure on the screen. As you dispense, this will be continually updated.
   c. Release F4, DISPENSE.
   d Repeat Step 14 through Step 15c until the maximum voltage is attained while the last pressure does not exceed the maximum pressure. Use the guidelines in Fig. 3.6.4 to test and tune the voltage step.

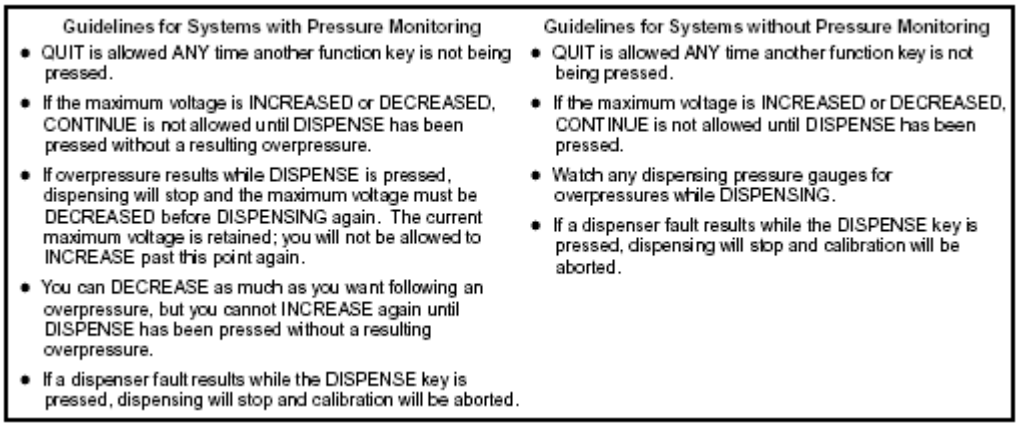


Fig. 3.6.4 Voltage step adjustment guidelines

16 Press F5, CONTINUE. You will see a screen similar to the following.

```
SETUP Sealing E1
  New maximum voltage:    4.03 V
  Old maximum voltage:    4.00 V
  Maximum pressure:       2300 psi
  Last pressure:          2200 psi
Enable new value?
```

17 Decide whether the Last pressure is as close as you would like it to be to the Maximum pressure:
   • If the Last pressure is as close as you would like it to be to the Maximum pressure, press F2, YES to update the maximum voltage.
     Maximum voltage will be updated and calibration status set to COMPLETE. For a more precise maximum voltage, this calibration should be repeated with a smaller voltage step.
   • If you would not like to enable the new Maximum voltage, press F4, NO. Repeat the calibration until you are satisfied with the results.

18 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Set the speed override to an appropriate value for the conditions.
   d To move the robot , press and hold SHIFT and press F5, MOVE.
   e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.6.5 Material Pressure Calibration

Material pressure calibration calibrates the analog signal of the pressure transducer that is connected to the material supply.

NOTE
You must perform material pressure calibration only if your system is configured to monitor material pressure.

Description

For systems equipped with pressure monitoring capabilities, a pressure transducer, which is located on the material supply line, provides a "Material Pressure" analog output signal to the robot controller.The level of this signal is proportional to the current material supply pressure. The purpose of material pressure calibration is to establish the scaling parameters that DispenseTool needs to convert this signal into pressure units.

Material pressure calibration involves cutting off the material supply and dispensing until the supply line pressure is zero. This is followed by opening the supply valve and allowing the material supply pressure to rise to its normal level. The material pressure gauge is monitored and you enter the material pressure value when prompted. The "Material Pressure" signal is also monitored during this time. The scaling parameters are then computed from these two inputs.

Table 3.6.5 lists and describes material pressure calibration items.

Table 3.6.5 Material pressure calibration items

Item	Description
Calibration Status	This item indicates whether the material pressure calibration has been completed successfully.
Home Program default: MOV_HOME	This item indicates the program used to move the robot to the home position. You can specify the name of the home program.
Purge Program default: MOV_PURG	This item indicates the program used to move the robot to the purge position. You can specify the name of the purge program.
Maximum Pressure default: 2300 psi min: 500 psi max: 3000 psi	This item sets the maximum pressure of the material allowed. This item is set on the main SETUP Equipment screen.
Minimum Pressure default: 500 psi min: 500 psi max: 3000 psi	This item sets the minimum pressure of the material allowed. This item is set on the main SETUP Equipment screen.
Count Offset default: 0 min: 0 max: 8192	This item indicates the bias computed by the controller for the analog signal. Before calibration, this is zero. If there is no bias, Count Offset remains zero; otherwise, it is set to a value when calibration has been completed.
Pressure per Count default: 0.0000 psi min: -9.9999 psi max: +9.9999 psi	This item indicates the amount of material pressure, in psi, used with each analog input count. Pressure per Count can be positive or negative, depending upon the I/O used and the input polarity.

Use Procedure 3-7 to perform material pressure calibration.

Procedure 3-7 Performing Material Pressure Calibration

NOTE
If you have dual equipment, you must perform material pressure calibration for each one.

Before Running the Calibration

- A home program has been defined.
- A purge program has been defined.
- All dispenser I/O has been properly defined. (Section 3.7)
- The Robot motion test cycle parameter is set to ENABLE.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select Dispenser.
5 Move the cursor to Material pressure.
6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
SETUP Sealing E1
Dispensing Equipment
Material Pressure Calibration
1 Home program:       [ MOV_HOME ]
2 Purge program:      [ MOV_PURG ]
  Maximum pressure:    2300 psi
  Minimum pressure:     500 psi
  Count offset:           0
  Pressure per count: 0.00 psi
```

7 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the name of the home program and the name of the purge program as follows:
   a. Move the cursor to Home program or Purge program.
   b. Press F4, [CHOICE].
   c. Move the cursor to the desirable program name and press ENTER.
9 Press F3, START, to start calibration.
10 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Set the speed override to an appropriate value for the conditions.
   d To move the robot, press and hold SHIFT and press F5, MOVE.

11 If the robot is at the home position, you are prompted to move the robot to the purge position, as shown in the following screen.

```
Robot will move to PURGE
pos. OK to continue?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Set the speed override to an appropriate value for the conditions.
d To move the robot, press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

12 To start calibration, close the supply valve, select YES, and press ENTER, from the following screen.

```
CLOSE supply valve NOW!
Robot will NOT move.
Material will be dispensed.
Start calibration?
   YES   NO
```

The gun is turned on and begins to purge.

NOTE
While dispensing, press F3, QUIT, at any time to stop material flow and abort calibration.

13 Watch the material pressure gauge.When it reaches zero , press F5, CONTINUE, from the following screen.

```
Press CONTINUE when gauge
is at zero.
   QUIT   CONTINUE
```

The analog zero pressure input is recorded and the gun is turned OFF.

14 To continue calibration , open the supply valve, select YES, and press ENTER, from the following screen.

```
OPEN supply valve NOW!
Robot will NOT move.
NO material will be
dispensed.
Continue calibration?
   YES   NO
```

NOTE
While dispensing, press F3, QUIT, at any time to abort calibration.

15 Watch the material pressure gauge.When the pressure stabilizes , press F5, CONTINUE, from the following screen.

```
Press CONTINUE when
pressure stabilizes.
   QUIT   CONTINUE
```

You will see a screen similar to the following.

```
SETUP Sealing  E1
  Dispensing Equipment
  Material Pressure Calibration
    Calibration status:   INCOMPLETE
    Home program:          MOV_HOME
    Purge program:         MOV_PURG
    Maximum pressure:       2300 psi
    Minimum pressure:        500 psi
    Count offset:              0
    Pressure per count:     50.0 psi
  1 Pressure gauge value: 120.0 psi
Enter pressure gauge value.
```

16 Type the pressure you read on the material pressure gauge and press ENTER.
17 Press F5, CONTINUE.
The new pressure per count scaling factor is calculated. The new count offset and pressure per count scaling factor are updated to the screen. You will see a screen similar to the following.

```
SETUP Sealing E1
    New count offset: 8192
    Old count offset: 8191
    New pressure per count: -.0014 psi
    Old pressure per count: -.0014 psi
Enable new values?
```

18 Decide whether the count offset and pressure per count scaling factors are acceptable.
- If they are acceptable , press F4, YES. The scaling factors are updated and the calibration status will be set to COMPLETE.
- If they are not acceptable , press F5, NO. Repeat the calibration procedure until you are satisfied with the results.

19 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
    YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Set the speed override to an appropriate value for the conditions.
d To move the robot, press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.6.6 Two Point (2PNT) Flow Rate Calibration

The Two Point Flow Rate calibration sequence provides a way to obtain both scale factors and biases for each flow type. This calibration method is usually used to set the scale factor and bias so that the TCP speed change will be more accurately reflected in the flow rate calculation.

The 2PNT calibration is meaningful only to the following four flow types:

- Bead width with TCP speed predicted

- Bead width with programmed speed predicted
- Volume with TCP speed predicted
- Volume with programmed speed predicted

Calibration Sequence

The 2PNT flow rate control calibration will lead you through a sequence of operations that will set up a scale factor and bias for the current flow rate type. This calibration runs a sample program (MOV_2PNT, by default) and asks you to measure and enter the actual sealant dispensed. The robot uses this information to calculate the scale factor and bias for the flow rate type.

Table 3.6.6 lists and describes each flow rate control calibration item.

Table 3.6.6 2PNT flow rate control calibration items (cont'd)

Item	Description
Calibration Status	This item displays the calibration completion status for the selected flow rate type. DEFAULT indicates that calibration has not been performed for the selected flow rate type and that the scale factor for the selected flow rate type is still 1.0 and the bias is 0.0. COMPLETE indicates that calibration has been performed successfully for the selected flow rate type and that the scale factor for the selected flow rate type probably is not 1.0 and the bias might not be 0.0.
Seal Schedule in MOV_2PNT value: 30	his item indicates the sealing schedule that must be used in the current sample program, which is MOV_2PNT in this case. The information in this sealing schedule will be used to calculate the scale factor and bias for the flow rate type in the specified schedule.
Flow Rate Type	This item indicates the flow rate type that will be used in this calibration. You must set this to the flow rate type you are using in the calibration. Editing this item is the same as editing Flow rate type in the specified sealing schedule, which is sealing schedule 30 by default.
Flow Model	This item specifies the kind of flow model applied on the current schedule. Linear and Square flow models are available.
Desired Flow Rate	This item indicates the target flow rate that will be used for this calibration. Set this to the flow rate that will be used most often in your process. Editing this item is the same as editing Flow rate type in the specified sealing schedule, which is sealing schedule 30 by default.
Nominal TCP Speed default: 500 mm/s	This item is the robot TCP speed nominally used for dispensing. The sample program, MOV_2PNT, will use this speed to dispense a sample seam. You will measure its bead width and input it as the first point data for calibration.
Secondary TCP Speed default: 200 mm/s	This item is the lower robot TCP speed which might be used for dispensing. MOV_2PNT will use this speed to dispense a secondary sample seam. You will measure its bead width and input it as the secondary point data for the calibration.
Sample Program default: MOV_2PNT	This item indicates the program that will be run as part of this calibration. The sample program should dispense two simple seams at two different speeds so that you can measure the different dispensing rates manually and enter the results into the robot. The sample program must use only SS[30] (where 30 is the number defined in the Seal sched used in MOV_2PNT item) to start sealing. No other SS should be used in this program. A default MOV_2PNT program is provided that includes the appropriate instructions. To use the default program, touch up the positions. Refer to Chapter 14 PLANNING AND CREATING A PROGRAM for information on how to create a sample program.
Home Program default: MOV_HOME	This item indicates the name of a program that moves the robot to the home position. When you perform this calibration, you have the option of running this program before and after you run the sample program, to ensure that the robot starts and ends the calibration at the home position.

Calibration Procedure

Use Procedure 3-8 to perform 2PNT flow rate control calibration.

Procedure 3-8 Performing 2PNT Flow Rate Control Calibration

NOTE
1 If a 2PNT calibration is enabled, you should perform this calibration for the flow rate type you would like to use on this robot.
2 If you also have multiple equipments, you must perform the 2PNT flow rate control calibration for each one.

Before Running theCalibration

- A home program has been defined.
- A seal schedule SS[30] has been defined. (Section 3.3)
- A sample program has been defined. It must dispense two simple, measurable beads using SS[30].
- All dispenser I/O has been properly defined.
- The Robot motion test cycle parameter is set to ENABLE. (Section 3.7)
- The WET RUN test cycle parameter is ENABLED.
- The "Two_Point Calibration" feature is enabled on the Controlled start menu.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select the equipment you would like to calibrate.
5 Move the cursor to Flow rate control.
6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
SETUP Equipment E1
Dispensing Equipment
Flow Rate Calibration
  Calibration status:    DEFAULT
  Seal sched in MOV_SEAM:   30
1 Flow rate type: TCPP Bead Width
2 Desired flow rate:      0.0 mm
3 Nominal TCP speed:      500 mm/s
4 Secondary TCP speed:    200 mm/s
5 Sample program:     [MOV_2PNT]
6 Home program:       [MOV_HOME]
  TCPP BW scale factor: 1.000
  TCPP BW bias:          0.000
Enter the first measured bead width (mm):
```

7 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the flow rate type as follows:
  a Move the cursor to Flow rate type.
  b Press F4, [CHOICE].

c Move the cursor to the desirable flow rate type and press ENTER.

NOTE
Only the TCPP or PROG related flow types are valid for this calibration.

9 Move the cursor to Desired flow rate, type the desired flow rate, and press ENTER.
10 Move the cursor to Nominal TCP speed, type the speed value, and press ENTER.
11 Move the cursor to Secondary TCP speed, type the speed value, and press ENTER.
12 Specify the name of the sample program and the name of the home program as follows:
   a Move the cursor to Sample program or Home program.
   b Press F4, [CHOICE].
   c Move the cursor to the desirable program name and press ENTER.
13 Make sure all items on this screen are correct and that you have satisfied all of the conditions listed in the "Before Running the Calibration Section" at the beginning of this procedure.
14 When you are ready to start the calibration , press F3, START.
15 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Adjust the speed override to an appropriate value for the conditions.
   d To move the robot , press and hold SHIFT and press F5, MOVE.
   e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.
16 To move the robot along the sample seam defined by the program MOV_2PNT,

```
Robot will move along the
sample program.
Material will be dispensed.
Start calibration?
   YES   NO
```

   a Select YES and press ENTER.
   b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
   c Adjust the speed override to 100%.

NOTE
Make sure the speed override is set to 100%. Although you do not have to do this to continue, best results are obtained when running the sample seam at 100% of the programmed speed.

   d To move the robot , press and hold SHIFT and press F5, MOVE.
   e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch. The robot will move through the positions in the sample program, turning the gun on and off when the SS[30] and SE instructions are executed. After the program has finished executing, you must measure the two flow rates dispensed and enter them when prompted. You will see a screen similar to the following.

```
SETUP Equipment E1
Dispensing Equipment
Flow Rate Calibration
  Calibration status:     DEFAULT
  Seal sched in MOV_SEAM:  30
1 Flow rate type:  TCPP Bead Width
2 Desired flow rate:      0.0 mm
3 Flow model: LINEAR
4 Nominal TCP speed:      500 mm/s
5 Secondary TCP speed:    200 mm/s
6 Sample program:      [MOV_2PNT]
7 Home program:        [MOV_HOME]
  TCPP BW scale factor: 1.000
  TCPP BW bias:          0.000
```

NOTE
If your flow rate type is one of the volume flow rates (TCPP volume, or PROG volume), you will be prompted for both seam volume and seam length.

17 Measure the first bead width, type it in millimeters, and press ENTER. The measured bead width can be zero.
18 Measure the second bead width, type it in millimeters, and press ENTER.

NOTE
When the MOV_2PNT program has completed, the calibration menu will ask for the actual measured bead width of both seams. Measure them in an area at least 25mm off the starting point of the seam, where the bead width has stabilized, and enter the data in the correct order. Each seam must be more than 35mm long.

19 If the measured bead width is zero, decide whether to increment the local scale factor, as shown on the following screen.

```
Measured bead width was
zero. Check dispensing
equipment.
OK to increment local scale
factor by 1.0?
   YES   NO
```

- To increment the local scale factor, select YES and press ENTER.
- To keep the local scale factor the same, select NO and press ENTER.
  After entering the information at the end of the calibration, the new scale factor and bias will be calculated and you will be prompted to approve them. If you enable the new scale factor and bias, these values will be used in calculating the 2PNT flow rate for the currently selected flow rate type.

20 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
YES NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to an appropriate value for the conditions.
d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.7 SETTING UP EQUIPMENT I/O

You must set up I/O for Gear Meter dispensing equipment. Inputs are listed in Table 3.7 (a). Outputs are listed in Table 3.7 (b).
Note For safety reasons, the default I/O port index value is set to zero. Be sure to set the indexes to the appropriate values before using the system.
You can set up and configure dispenser I/O from the I/O Sealing screen.

Table 3.7 (a) Dispenser inputs

Item	Description
Dispenser ready Digital input	This signal indicates that the dispenser is functioning properly with no faults that prevent a normal dispense cycle (for example, the signal might indicate that all mechanical and physical devices are active and ready to dispense). This signal requires the dispenser to be in the automatic mode and at the proper temperature if applicable.
In-process Digital input	This signal indicates that the dispense system has received a valid style in the dispensing process. This is the period of time between the “style strobe“ and “dispense complete“ signals from the robot. During this time, all dispense monitoring functions will be able to operate.
Volume OK Digital input	This signal indicates that the volume dispensed for the given style was completed within the predefined limits. When valid, this signal is sent within 50 ms of receiving the "dispense complete" signal from the robot. This signal can be asserted in conjunction with a minor fault. If this signal is asserted, the part and job will be released.
Major fault Digital input	This signal indicates that an error has occurred within the dispensing equipment. This error will halt robot motion and require manual intervention. At the dispenser user interface panel, determination of a major and minor fault will be programmable. This signal will be sent within 50 ms of a fault occurrence. The "major fault" signal will be monitored continuously by the robot.
Minor fault Digital input	This signal indicates that an error has occurred. These errors cause an alert, but they do not stop the processing of the current or next job. At the dispenser user interface panel, determination of a major and minor fault will be programmable. Minor faults will be tracked by the dispenser, and they might result in a major fault after a specified number of occurrences. This signal will be sent within 50 ms of a fault occurrence. The robot will check only minor faults after the "dispense complete" signal has been asserted.
Automatic mode Digital input	This signal indicates that the dispenser is in the automatic mode. This mode is set manually at the dispenser.
Manual mode Digital input	This signal indicates that the dispenser is in the automatic mode. This mode is set manually at the dispenser.
Depressurized Digital input	This signal indicates that the dispense equipment has achieved a de-pressurized state as determined by a pressure-sensing device. As the pressure exceeds the de-pressurized value, this signal will drop low.
Drum empty Digital input	This signal indicates that one or both material supply drums are empty. In a single material supply pump system, a "drum empty" signal is followed by a "major fault signal. In a dual material supply pump system with cross over, a "drum empty" signal alone is used if only one drum is empty. However, if both drums are empty, a "drum empty" signal is followed by a "major fault" signal.
Flow meas. bypas Digital input	This signal indicates that the dispense controller is operating without flow measurement capability. If this input is ON, the states of input signals Dispenser Ready, Major Fault, and Volume OK are ignored.

Item	Description
Vol. Dispensed Group input	This signal shows 12 bits of data representing the total volume dispensed for the style that is processed.
Dispense fault data Group input	This signal shows 8 bits of data representing the fault status of the dispensingsystem.
Rmt strt in proc Digital input (for option Remote Start)	This signal indicates that the remote start has been initiated by the dispense controller. This signal will remain asserted until the dispense equipment is capable of dispensing. The remote start process will include achieving the proper temperature set point, if applicable.
Bubble detected Digital input (for option Bubble Detect)	This signal indicates that the dispense controller has detected a bubble (material gap) in the bead while dispensing.
Meter full Digital input (for type Shot Meter)	This signal indicates that the shotmeter is full. The signal drops low as the shotmeter piston clears the sensor.
Meter empty Digital input (for type Shot Meter)	This signal indicates that the shotmeter is empty or nearly empty as identified by a sensor. (The positioning of the sensor for this signal is adjustable.) This signal can be used in systems that perform multiple styles within a single refill or a single style that requires a greater volume than available from a single shot. This signal will remain asserted until the piston’s sensor is above the previously set position.
Meter near empty Digital input (for Shot Meter)	This signal indicates that the shotmeter is nearly empty as identified by a sensor. This signal will remain asserted until the piston’s sensor is above the previously set position.
Mtr pressurized Digital input (for type Shot Meter)	This signal indicates that the shotmeter is at the specified pressure. The pressure is specified by using the "pre-pressurize shotmeter" signal and an analog input voltage that is proportional to the desired pressure. This signal drops when the dispensing is initiated by the robot.
Prim. chk passed Digital input (for type Urethane Glass System)	This signal indicates that the primer check passed.
Prim. Chk failed Digital input (for type Urethane Glass System)	This signal indicates that the primer check failed.
Felt advanced Digital input (for type Clear and Black)	This signal indicates that the indexing of the felt is complete.
Change brush Digital input (for type Clear and Black)	This signal indicates that the robot has been initiated to change the primer brsh.
Purge request Digital input (for option Auto Purge)	This signal is from the dispenser and requests a purge due to dispense inactivity (based on a user-definable time). If the robot is not at the purge position, the robot will request the move from the PLC using the appropriate style and option bits. The purge and home positions can be the same.
Purge in process Digital input	(for option Auto Purge) This signal is from the dispenser and indicates that the purge operation is in process. This signal will reset after the purge operation is complete. The "purge in process" signal should be sent within 50 ms of the "OK to purge" signal.

Table 3.7 (b) Dispenser outputs

Item	Description
Open gun Digital output	This signal, when asserted, tells the dispenser to turn on guns one through five.Any combination of the guns can be "on" at any given time.
Flow command Analog output	This analog signal is used to control the dispense flow rate. Output of this signal starts simultaneously with sealing start, and this signal becomes 0 when sealing ends or stops. This signal covers up to 16 bit output.
Bead shaping cmd Analog output * (for option Atom Air)	This analog signal, 0 to 10 V, is comprised of 12 bits that controls the bead shaping of the dispensed material.
Style Bits Group output	This is a five-bit group (binary number) output signal that is used to relay the style information to the dispenser. If program subtype is “Job”, “Parts ID” can be assigned from program detailed screen. If “Process” program which contains sealing instructions was called by “Job” program, Parts ID goes to Style Bit GO when the program starts. After sealing start, when In-process DI signal = ON was received from dispenser, Style Bit GO turns off.
Style strobe Digital output	This signal indicates that the style bits are set, per body style, in order for the dispenser to read them. This output remains ON until volume and fault information is read at the end of the dispense cycle. If “Process” program which contains sealing instructions was called by “Job” program, Style strobe is outputted when the program starts. After sealing end, when In-process DI signal = ON was received from dispenser, Style strobe GO turns off.
Fault reset	This output signal goes to the dispenser to reset the fault at the dispenser. Fault reset output is automatically asserted just before sending the style strobe is sent to the dispenser, or just before resuming a paused program.
Dispenser Fault	This output signal is always updated to reflect the status of "Major fault" input from the dispenser. This signal can be used by the PLC to monitor the status of the dispenser.
Dispenser Alert	This output signal is always updated to reflect the status of "Minor fault" input from the dispenser. This signal can be used by the PLC to monitor the status of the dispenser.
Dispense complete Digital output	This signal is asserted when the dispense cycle is complete. This signal will initiate the dispenser to perform the volume calculations for the current job. Based on the volume dispensed, the "volume OK" signal with or without a minor fault can be asserted. Moreover, a major fault will be asserted based upon the volume dispensed. The "dispense complete" signal shall be pulsed for 50 ms. This signal will be sent from the robot to the dispenser regardless of the result of the previous cycle. The "dispense complete" signal will also be sent as a precautionary measure from the robot to the dispenser when the robot is first turned on.
Remote start Digital output (for option Remote Start)	This signal restarts the dispense system from a de-pressurized state. After the de-pressurization, the dispenser will be restored to its previous mode. However,this mode restoration will be possible only if no other manual functions have been selected to change the mode.
Prepressurize Mtr Digital output (for type Shot Meter)	This signal is used to pre-set the pressure of a shotmeter after a refill. This signal will be preceded by the analog "material flow command" signal. Both signals will drop low when the "meter pressurized" signal is received from the dispenser.
Reload meter Digital output (for type Shot Meter)	This signal is used to prompt a shotmeter to reload or refill. The shotmeter will only refill while the signal is high in order to allow partial refills. This signal will drop low after a preset time following a partial refill or when the "meter full" signal is received from the dispenser. The dispense controller will de-assert the "dispense ready" signal while the reload operation is in progress. If the reload operation is not done properly or a fault occurs during the operation, the dispenser will assert the "major fault" signal.
Depressurize Digital output (for type Shot Meter)	This signal is used to relieve pressure from the shotmeter. This signal can be used in conjunction with the analog "material flow command" signal to reduce the pressure to a specific value. Without an analog signal, the pressure will be reduced to a user-predefined value. This signal will remain low until the "de-pressuriz ed" signal is set by the dispense equipment.

Item	Description
Wait Primer Data Digital output (for type Urethane Glass System)	This signal informs the dispense controller and PLC that the robot is waiting for a primer check passed of failed input signals before processing with the Urethane operation.
Clear complete: Digital output (for type Urethane Glass System)	This signal indicates that the robot has complete the clear primer application.
Black complete: Digital output (for type Urethane Glass System)	This signal indicates that the robot has completed the black primer application.
Urethane complete: Digital output (for type Urethane Glass System)	This signal indicates that the robot has completed the urethane application.
Advance felt Digital output (for type Clear and Black)	This signal informs the dispense controller and PLC to perform an index of the felt.
Brush change complete Digital output	(for type Clear and Black) This signal indicates that the brush change has been successfully completed.
OK to purge Digital output (for option Auto Purge)	This signal indicates to the dispenser that it is OK to purge. This signal can be received from either the robot or a mechanical device that indicates the robot is at the purge position. The dispenser will drop the "dispense ready" signal during the purge process.
Channel 2 analog **	This is an output signal that provides secondary TCPP-controlled analog output.

* Displayed if beadshaping is used.
** Displayed if Channel 2 Analog is enabled.
You can set up and configure dispenser I/O from the I/O Sealing DETAIL screen.

Table 3.7 (c) I/O sealing detail screen items

Item	Description
Digital Inputs/Outputs	This item indicates the range of digital inputs and outputs.
Rack Number	This item is the physical location on which the I/O board or module is mounted. To change the rack number value, 1. Move the cursor to the Rack Number field. 2. Type the new value. 3. Press ENTER.
Slot Number	This item is the space on the rack where the I/O module is connected. To change the slot number value, 1. Move the cursor to the Slot Number field. 2. Type the new value. 3. Press ENTER.
Starting Point	This item is the port number within the sequence of ports on the board or module.
Comment	This item is a text field into which you can type a descriptive comment. To type a comment, 1. Move your cursor to the appropriate line. 2. Press ENTER. 3. Type the comment. 4. Press ENTER.

Item	Description
Polarity	This item is indicates whether signals are of NORMAL or INVERSE polarity. To set the polarity, 1. Move the cursor to the Polarity field. 2. Press F4, INVERSE, or F5, NORMAL.
Complementary	This item indicates whether signals are controlled as complementary pairs. To set complementary pairs, 1. Move the cursor to the Complementary field. 2. Press F4, TRUE, or F5, FALSE.

The timing diagram in Fig. 3.7 indicates the I/O handshaking between the robot and the dispenser at the beginning of a job (when the StyleID is sent to the dispenser) as well as at the end of the job (when VolumeOK, Major Fault, or Minor Fault are sent to the dispenser).

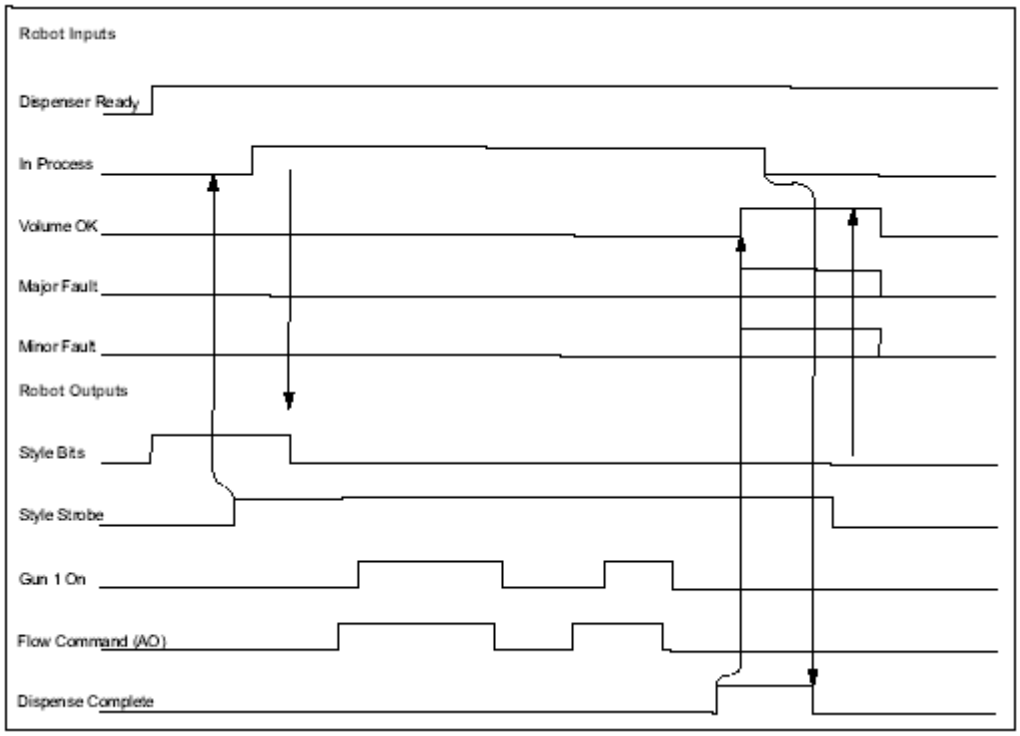


Fig. 3.7 Style ID - In process - dispensecomplete I/O handshaking

Setting up Equipment I/O

Procedure 3-9 contains information about setting up equipment I/O only. For information about configuring, forcing, verifying, and simulating analog, digital, and group signals, please refer to Basic Operation manual's (B-83284EN) Chapter 3.

NOTE
1 If you have multiple equipments, you must set up equipment I/O for each one.
2 If you have a multiple gun configuration, you must set up the I/O index for all guns of all equipment.

Procedure 3-9 Setting Up Equipment I/O

NOTE
Refer to Section 3.7 for details on setting up equipment I/O.

Steps

1 Press MENUS.
2 Select I/O.
3 Press F1, [TYPE].
4 Select Dispenser. You will see either the input or output screen for the currently selected equipment. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.

```
I/O Sealing In E1
Dispensing Equipment
   NAME                OUT PT   SIM VALUE
Gear Meter Disp. System        1/11
1  Dispenser ready:     DI[¥¥1] U   OFF
2  In-process:          DI[ 2]  U   OFF
3  Volume OK:           DI[ 3]  U   OFF
4  Major fault:         DI[ 4]  U   OFF
5  Minor fault:         DI[ 5]  U   OFF
6  Automatic mode:      DI[ 6]  U   OFF
7  Manual mode:         DI[ 7]  U   OFF
8  Depressurized:       DI[ 8]  U   OFF
9  Drum empty:          DI[ 9]  U   OFF
10 Flow meas. bypas:    DI[ 10] U   OFF
11 Vol. dispensed:      GI[ 1]  *   ****
12 Disp fault data:     GI[¥¥2] *   ****
13 Rmt strt in proc:    DI[ 0]  *   ***
14 Bubble detected:     DI[ 0]  *   ***
15 Purge request:       DI[ 0]  *   ***
16 Purge in process:    DI[ 0]  *   ***
```

5 To change between the input and outputscreens , press F3, IN/OUT. You will see a screen similar to the following.

```
I/O Sealing Out E1
Dispensing Equipment
   NAME              OUT PT   SIM VALUE
1  Open gun 1:         DO[ 1] U     OFF
2  Open gun 2:         DO[ 0] *     ***
3  Open gun 3:         DO[ 0] *     ***
4  Flow command:       AO[ 1] U     0
5  Style Bits:         GO[ 1] U     0
6  Style strobe:       DO[ 2] U     OFF
7  Fault reset:        DO[ 3] U     OFF
8  Dispenser Fault:    DO[ 4] U     OFF
9  Dispenser Alert:    DO[ 5] U     OFF
10 Channel 2 analog:   AO[ 0] U     0
11 Atomizing air:      AO[ 2] U     0
```

3.8 GUN PURGE

You can purge material from the dispensing gun to remove material prior to using new material or prior to gun cleaning.

Table 3.8 MNFCTN: PURGE screen items

Item	Descripton
Purge rate	This item is the flow rate during the purge process.
Guns used	This item allows you to select the guns to be used during purging. This item is displayed only if the number of guns selected (at CTRL start) is greater than 1

Use Procedure 3-10 to purge the gun.

Procedure 3-10 Purging the Gun

Conditions

- The SEAL ENBL LED is on. (Please refer to Subsection 6.1.2 for more information.)

Steps

1 Press MAN FCTNS.
2 Press F1, [TYPE].
3 Select Purge. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.

```
MANFCTN: PURGE E1
Sealing Equipment 1/2
To purge: Press SHIFT and F2 (PURGE)
To stop purging: Press F3 (STOP)
Set to WET run and enable TP
  1 Purge rate:      0.0 V
  2 Guns used:       1-----
```

4 To display help information , press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
5 To select the equipment number ,
  a Check the currently selected equipment number. The equipment number is displayed to the right of the screen name as E#, where # is the equipment number. If the number displayed is the desirable equipment number, go to Step 6.
  b Press NEXT, >.
  c Press F3, EQUIP.
  d Type the number of the equipment and press ENTER.
6 To set the purge rate, move the cursor to Purge rate, enter the purge rate voltage and press ENTER.
7 To select which guns will be used during the purge,
  a Move the cursor to Guns used.
  b Move the cursor to the position that corresponds to the gun number.
  c Press the function key that corresponds to the value to be changed:
    • To select a gun to be used during the purge, press F4, #, where # corresponds to the number of the gun.
    • To specify that a gun will not be used during the purge, press F5, - .
8 Place a container under the dispensing tool to catch the dispensed material.

9 Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
10 To purge, press and hold SHIFT and press F2, PURGE.
11 To stop purging, press F3, STOP.

3.9 CHANNEL 2 ANALOG CONTROL SETUP

The dispensing process might require a secondary analog signal which could be used by Fan Air to control the bead shape or other items. This signal is called the Channel 2 Analog signal. The portion of this signal that provides the Channel 2 signal at the correct value and at the proper time is called the Channel 2 (Ch2) control.

This section contains the following information about Channel 2 control:
- Concepts
- Calibration
- Timing

3.9.1 Concepts

This section contains a description of the concepts involved in Channel 2 control:
- Speed compensation
- Channel 2 type
- Channel 2 calculation

Speed Compensation

The rate at which material flows from the nozzle is usually proportional to robot speed. In general,
- When the robot is moving slowly, the flow rate should be low.
- When the robot is moving quickly, the flow rate should be high.

DispenseTool uses three methods to compensate for robot speed while dispensing material:
- Tool center point speed prediction (TCPP)
- Programmed speed prediction (PROG)
- No robot speed compensation (CONST)

Tool center point speed prediction is the most accurate speed compensation method. This method is recommended for all applications in which it is critical that the flow rate be proportional to the robot speed.

In TCP speed prediction, the robot looks ahead an amount of time equal to the EQUIPMENT ANT-TIME (specified in the current sealing schedule) to check what the robot speed will be. DispenseTool then adjusts the analog flow command signal to be proportional to what the robot speed will be after the EQUIPMENT ANT-TIME has elapsed.
Programmed speed prediction is similar to TCP speed prediction in operation, but is partially accurate. In programmed speed prediction, the theoretical robot speed - the speed programmed in the PROCESS teach pendant program - is used to adjust the analog flow command signal. Programmed speed prediction is accurate when the robot is not accelerating, decelerating, going around corners, changing direction, or changing orientation.

Theno robot speed compensation method uses neither TCP nor programmed speed prediction. This is appropriate only for the very few applications in which the analog signal does not have to be proportional to the robot speed.

Table 3.9.1 (a) lists each method and when to use it. Refer to the sections that follow for a description of each speed compensation method.

Table 3.9.1 (a) Speed compensation methods

Method	Is it Proportional to Robot Speed?	Is it Accurate?	Use this Method When...
Tool center point speed prediction (TCPP)	Yes	Yes, most accurate of the three methods.	It is important for the flow rate to be proportional to the robot speed.
Programmed speed prediction (PROG)	Yes	Only when the robot is not accelerating, decelerating, going around corners, changing direction, or changing orientation.	Only when the robot is not accelerating, decelerating, going around corners, changing direction, or changing orientation.
No robot speed compensation (CONST)	No.	Yes.	It is not important for the flow rate to be proportional to the robot speed.

NOTE
The proper selection and usage of speed compensation methods depends upon the application process.

Channel 2 Type

Channel 2 type defines how the Channel 2 controlled variable will be measured. DispenseTool offers the following Channel 2 types:

- Bead width - measured in millimeters
- Percentage - of flow rate range
- Volume - measured in cc/meter
- Voltage - measured in a direct voltage to be applied to the analog output signal that controls the flow rate
- Pressure - measured in PSI or BAR

Table 3.9.1 (b) lists the speed compensation methods that can be used for each flow type.

Table 3.9.1 (b) Speed compensation methods for each flow type

Flow Type	Speed Compensation Method
Bead width (mm)	TCP speed prediction
	Programmed speed prediction
	No speed compensation
Percentage (%))	TCP speed prediction
	Programmed speed prediction
	No speed compensation
Volume (cc/m)	TCP speed prediction
	Programmed speed prediction
	No speed compensation
Voltage (v)	TCP speed prediction
	Programmed speed prediction
	No speed compensation
Pressure (PSI)	No speed compensation
Pressure (BAR)	No speed compensation

You set the flow types in each Seal Schedule. Refer to Section 3.3.

Channel 2 Analog Calculation(Traditional Method)

The Channel 2 output is calculated based on the kind of speed compensation that is used. There is a separate Channel 2 calculation for Channel 2 types that use TCP speed prediction, programmed speed prediction, and no speed compensation.

The equations for each kind of speed compensation are described as follows. Table 3.9.1 (c) contains a description of each item used in these equations.

Any Channel 2 type that uses TCP speed prediction uses the equation in Fig. 3.9.1 (a) to determine the Channel 2 output.

$$AOUT(volts) = (Ch2\_Amount\_in\_Seal\_Schedule \times Scale\_Factor\_for\_this\_Ch2\_Type \times Ch2\_Correction\_Factor\_in\_Seal\_Schedule \times Tool\_Center\_Point\_Predicted\_Speed) + Ch2\_Bias\_for\_this\_Equipment$$

Fig. 3.9.1 (a) Channel 2 equation with TCP speed prediction

Any Channel 2 type that usesprogrammed speedprediction uses the equation in Fig. 3.9.1 (b) to determine the Channel 2 output.

$$AOUT(volts) = (Ch2\_Amount\_in\_Seal\_Schedule \times Scale\_Factor\_for\_this\_Ch2\_Type \times Correction\_Factor\_in\_Seal\_Schedule \times Predicted\_Programmed\_Speed) + Ch2\_Bias\_for\_this\_Equipment$$

Fig. 3.9.1 (b) Channel 2 Equation with programmed speed prediction

Any Channel 2 type that uses no speed compensation uses the equation in Fig. 3.9.1 (c) to determine the Channel 2 output.

$$AOUT(volts) = (Ch2\_Amount\_in\_Seal\_Schedule \times Scale\_Factor\_for\_this\_Ch2\_Type \times Correction\_Factor\_in\_Seal\_Schedule) + Ch2\_Bias\_for\_this\_Equipment$$

Fig. 3.9.1 (c) Channel 2 Equation with no speed compensation

NOTE
To convert volts to ticks (which appear on I/O menus), multiply volts by 200.0.

Table 3.9.1 (c) Items used in channel 2 output calculation equations (traditional method)

Item	Description
Ch2_Amount_in_Seal_Schedule	This item obtains the desired Channel 2 amount in each sealing schedule. The units used correspond to the Channel 2 type you have selected in that schedule.
Scale_Factor_for_this_Ch2_Type	This item is the scaling factor that is set up for each Channel 2 type during the Channel 2 control calibration procedure. There is a separate scale factor kept for each Channel 2 type. This factor is designed to convert the Channel 2 amount specified in each sealing schedule to a more useful internal designation for Channel 2 output.
Ch2_Correction_Factor_in_Seal_Schedule	This item is the Channel 2 Correction Factor that appears in each Seal Schedule. Adjust this value when you would like to change the analog flow command used when one Seal Schedule is active, but would not like to change the Channel 2 item on that schedule. This value is usually kept between 0.5 and 2.0.

Item	Description
Tool_Center_Point_Predicted_Speed	his item is determined by looking at what the robot speed will be fter the the Equipment Delay has elapsed. The Equipment Delay is specified in each Seal Schedule. This value is very accurate and under normal circumstances, the best choice for the application. The only time this information is not accurate is when the TCP speed prediction system goes into error mode, such as from a "Speed Limit" error.
Predicted_Programmed_Speed	his item is the programmed speed (speed specified in your teach pendant program) that will predict the Equipment Delay. This value is not accurate when the robot is accelerating, decelerating, going around corners, changing direction, or changing orientation. TCP speed prediction is usually a better solution.
Ch2_Bias_for_this_Equipment	This item is the Channel 2 Bias item that appears as a system variable in volts. This item is always added to the flow rate analog output. This item is 0.0 by default, and the normal range of values is between0.0 and 3.0.

Channel 2 Calculation: 2PNT (Two Point Calibrated Calculation Method)

Similar to flow rate, the 2PNT (two point) Channel 2 Analog is calculated based on the two point calibration.

The 2PNT equations for each kind of speed compensation are described as follows. Table 3.9.1 (d) contains a description of each item used in these equations.

Any 2PNT Channel 2 type that uses TCP speed prediction uses the equation in Fig. 3.9.1 (d) to determine the Channel 2 output.

$$AOUT(volts) = (Ch2\_Amount\_in\_Seal\_Schedule \times Scale\_Factor\_for\_this\_Ch2\_Type \times Ch2\_Correction\_Factor\_in\_Seal\_Schedule \times Tool\_Center\_Point\_Predicted\_Speed) + 2PNT\_Bias\_Ch2 + Ch2\_Bias\_for\_this\_Equipment$$

Fig. 3.9.1 (d) 2PNT channel 2 equation with TCP speed prediction

Any Channel 2 type that uses programmed speed prediction uses the equation in Fig. 3.9.1 (e) to determine the Channel 2 output.

$$AOUT(volts) = (Ch2\_Amount\_in\_Seal\_Schedule \times Scale\_Factor\_for\_this\_Ch2\_Type \times Ch2\_Correction\_Factor\_in\_Seal\_Schedule \times Predicted\_Programmed\_Speed) + 2PNT\_Bias\_Ch2 + Ch2\_Bias\_for\_this\_Equipment$$

Fig. 3.9.1 (e) 2PNT channel 2 flow rate equation with programmed speed prediction

NOTE
1 To convert volts to ticks (which appear on I/O menus), multiply volts by 200.0.
2 If you select this method, you must enable this in the CTRL start configuration menu, and perform the 2PNT calibration. Refer to Subsection 3.6.6.

Table 3.9.1 (d) Items used in channel 2 output calculation equations (2pnt calibrated method)

Item	Description
Ch2_Amount_in_Seal_Schedule	This item obtains the desired Channel 2 amount in each sealing schedule. The units used correspond to the Channel 2 type you have selected in that schedule.
Scale_Factor_for_this_Ch2_Type	This item is the scaling factor that is set up for each Channel 2 type during the Channel 2 control calibration procedure. There is a separate scale factor kept for each Channel 2 type. This factor is designed to convert the Channel 2 amount specified in each sealing schedule to a more useful internal designation for Channel 2 output.
Ch2_Correction_Factor_in_Seal_Schedule	This item is the Channel 2 Correction Factor that appears in each Seal Schedule. Adjust this value when you would like to change the analog flow command used when one Seal Schedule is active, but would not like to change the Channel 2 item on that schedule. This value is usually kept between 0.5 and 2.0.
Tool_Center_Point_Predicted_Speed	This item is determined by looking at what the robot speed will be after the the Equipment Delay has elapsed. The Equipment Delay is specified in each Seal Schedule. This value is very accurate and under normal circumstances, the best choice for the application. The only time this information is not accurate is when the TCP speed prediction system goes into error mode, such as from a "Speed Limit" error.
Predicted_Programmed_Speed	This item is the programmed speed (speed specified in your teach pendant program) that will predict the Equipment Delay. This value is not accurate when the robot is accelerating, decelerating, going around corners, changing direction, or changing orientation. TCP speed prediction is usually a better solution.
Ch2_Bias_for_this_Equipment	This item is the Channel 2 Bias item that appears as a system variable in volts. This item is always added to the flow rate analog output. This item is 0.0 by default, and the normal range of values is between0.0 and 3.0.
2PNT_Bias_Ch2	This item is a voltage bias obtained through 2PNT calibration. If the calibration is complete, the 2PNT_bias_Ch2 will be automatically added to the calculation equation.

3.9.2 Setup and Calibration

The Channel 2 control calibration sequence provides a way for the robot to translate the Channel 2 amount you specify in each sealing schedule (units of mm, %, cc/m, volts, PSI, or bar) into volts that are output to the dispensing controller. As explained in Section 3.9, the robot translates the Channel 2 amount specified in the sealing schedule into volts by multiplying the Channel 2 amount you specify by the scale factor for that Channel 2 type.

Scale Factors

There are fourteen scale factors, one for each of the following possible Channel 2 types:

- Bead width with TCP speed predicted
- Bead width with programmed speed predicted
- Bead width with no speed compensation
- Percentage with no speed compensation
- Volume with TCP speed predicted
- Volume with programmed speed predicted
- Volume with no speed compensation
- Volts with no speed compensation
- Pressure (PSI) with no speed compensation
- Pressure (bar) with no speed compensation
- Volts with TCPP speed predicted

- Percentage with TCPP speed predicted
- Volts with PROG speed predicted
- Percentage with PROG speed predicted

All of the scale factors have a default value of 1.0 when robot software is loaded. The default value of 1.0, however, is not typical for most Channel 2 equipment. Therefore, you must perform a Channel 2 control calibration sequence for each Channel 2 type you plan to use on the robot if you would like the Channel 2 amount specified in each sealing schedule to be accurately reflected by the dispensing equipment.

Calibration Sequence

The Channel 2 control calibration will lead you through a sequence of operations that will set up a scale factor for the current Channel 2 type. This calibration runs a sample program (MOV_SEAM, by default) and asks you to measure and enter the actual Channel 2 output. The robot uses this information to calculate the scale factor for the Channel 2 type. Table 3.9.2 lists and describes each Channel 2 control calibration item.

Table 3.9.2 Channel 2 analog control calibration items

Item	Description
DESCRIPTION	This item displays the calibration completion status for the selected Channel 2 type. • DEFAULT indicates that calibration has not been performed for the selected Channel 2 type and that the scale factor for the selected Channel 2 type is still 1.0. • COMPLETE indicates that calibration has been performed successfully for the selected Channel 2 type and that the scale factor for the selected Channel 2 type probably is not 1.0.
Seal Schedule in MOV_SEAM value: 30	This item indicates the sealing schedule that must be used in the current sample program, which is MOV_SEAM in this case. The information in this sealing schedule will be used to calculate the scale factor for the Channel 2 type in the specified schedule.
Ch2 Type	This item indicates the Channel 2 type that will be used in this calibration. You must set this to the Channel 2 type you are using in the calibration. Editing this item is the same as editing Channel 2 type in the specified sealing schedule, which is sealing schedule 30 by default.
Desired Ch2 Amount	This item indicates the target Channel 2 that will be used for this calibration. Set this to the Channel 2 amount that will be used most often in your process. Editing this item is the same as editing Channel 2 type in the specified sealing schedule, which is sealing schedule 30 by default.
Sample Program default: MOV_SEAM	This item indicates the program that will be run as part of this calibration. The sample program should produce a sample Channel 2 output at a steady speed so that you can measure the sample output manually and enter the results into the robot. The sample program must use only SS[30] (where 30 is the number defined in the Seal sched used in MOV_SEAM item) to start sealing. No other SS should be used in this program. A default MOV_SEAM program is provided that includes the appropriate instructions. To use the default program, touch up the positions.
Home Program default: MOV_HOME	This item indicates the name of a program that moves the robot to the home position. When you perform this calibration, you have the option of running this program before and after you run the sample program, to ensure that the robot starts and ends the calibration at the home position.

Calibration Procedure

Use Procedure 3-11 to perform channel 2 control calibration.

Procedure 3-11 Performing Channel 2 Control Calibration

NOTE
1 The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.
2 If you have multiple equipments, you must perform flow rate control calibration for each one.

Before Running the Calibration

- A home program has been defined.
- A seal schedule SS[30] has been defined. (Section 3.2)
- A sample program has been defined. It must dispense a simple, measurable bead using SS[30].
- All dispenser I/O has been properly defined. (Section 3.7)
- The Robot motion test cycle parameter is set to ENABLE.
- The WET RUN test cycle parameter is ENABLED.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select the equipment you would like to calibrate.
5 Move the cursor to Channel 2 Analog.
6 Press F2, DETAIL. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screen in this procedure is equipment 1, E1.

```
SETUP Equipment E1
Dispensing Equipment
Flow Rate Calibration
  Calibration status:     DEFAULT
  Seal sched in MOV_SEAM: 30
1 Ch2 type:               TCPP Bead Width
2 Desired Ch2 amount:     0.0 mm
3 Sample program:         [MOV_SEAM]
4 Home program:           [MOV_HOME]
  TCPP BW scale factor:   1.000
```

7 To display help information, press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
8 Specify the flow rate type as follows:
  a Move the cursor to Ch2 type.
  b Press F4, [CHOICE].
  c Move the cursor to the desirable flow rate type and press ENTER.
9 Move the cursor to desired flow rate, type the desired flow rate, and press ENTER.
10 Specify the name of the sample program and the name of the home program as follows:
  a Move the cursor to Sample program or Home program.
  b Press F4, [CHOICE].
  c Move the cursor to the desirable program name and press ENTER.
11 Make sure all items on this screen are correct and that you have satisfied all of the conditions listed in the "Before Running the Calibration Section" at the beginning of this procedure.
12 When you are ready to start the calibration, press F3, START.

13 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to an appropriate value for the conditions.
d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

14 To move the robot along the sample seam defined by the program MOV_SEAM,

```
Robot will move along the
sample program.
Material will be dispensed.
Start calibration?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to 100%.

NOTE
Make sure the speed override is set to 100%. Although you do not have to do this to continue, best results are obtained when running the sample seam at 100% of the programmed speed.

d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch. The robot will move through the positions in the sample program, turning the gun ON and OFF when the SS[30] and SE instructions are executed. After the program has finished executing, you must measure the flow rate dispensed and enter it when prompted. You will see a screen similar to the following.

```
SETUP Equipment E1
Dispensing Equipment
  Flow Rate Calibration
    Calibration status:     COMPLETE
    Seal sched in MOV_SEAM: 30
    Desired Ch2 rate:       5.0 mm
    Sample program:         [MOV_SEAM]
    Home program:           [MOV_HOME]
    TCPP BW scale factor:   1.00
Enter measured bead width (mm):
```

NOTE
If your flow rate type is one of the volume flow rates (TCPP volume, PROG volume, or CONST volume), you will be prompted for both seam volume and seam length.

15 Measure the bead width, type it in millimeters, and press ENTER. The measured bead width can be zero.

16 If the measured bead width is zero, decide whether to increment the local scale factor on the following screen.

```
Measured bead width was
zero. Check dispensing
equipment.
OK to increment local scale
factor by 1.0?
   YES   NO
```

- To increment the local scale factor, select YES and press ENTER.
- To keep the local scale factor the same, select NO and press ENTER.
  After entering the information at the end of the calibration, the new scale factor will be calculated and you will be prompted to approve the new scale factor. If you enable the new scale factor, this value will be used in calculating the flow rate for the currently selected flow rate type.

17 If the robot is not at the home position, you are prompted to move the robot to the home position, as shown in the following screen.

```
Robot will move to HOME
pos. OK to continue?
   YES   NO
```

a Select YES and press ENTER.
b Continuously press the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
c Adjust the speed override to an appropriate value for the conditions.
d To move the robot , press and hold SHIFT and press F5, MOVE.
e Turn the teach pendant ON/OFF switch to OFF and release the DEADMAN switch.

3.9.3 Timing Diagram

The timing diagrams in this section show the timing for the relationship between Flow rate output and the Channel 2 output.

NOTE
The system variables $SLSETUP[1].$a2_ss_ofst and $SLSETUP[1].$a2_se_ofst can be used to adjust the ON/OFF time of Channel 2 Analog.

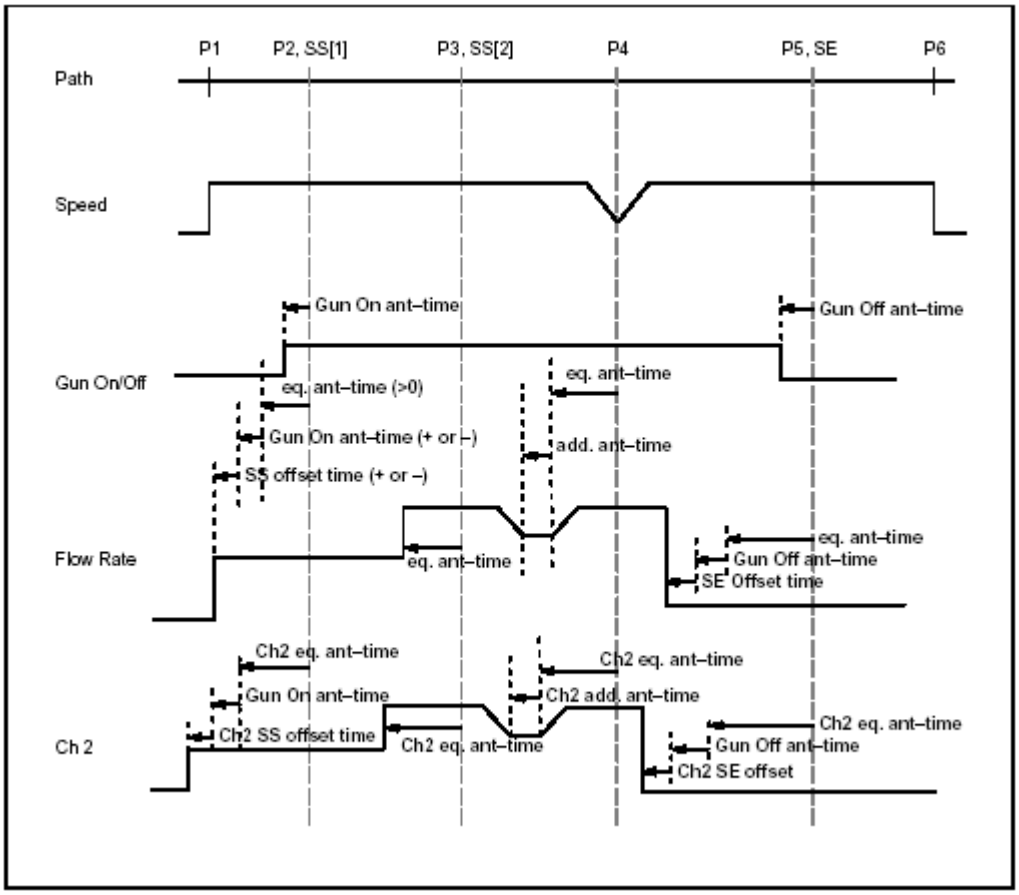


Fig. 3.9.3 Generic dispense process signal timing protocols

3.10 NONLINEAR FLOW MODEL

DispenseTool can use the Square Flow type of nonlinear flow model. This flow model may be effective for the dispense system on which pump axis speed isn't proportional to flow rate. When TCPP square control is ENABLED, the square flow model uses the square function on desired bead width and TCP predicted speed to calculate the flow rate output based on the following 2 formulas:
(Please refer to Section 3.1 for the setting of TCPP square control.)

AOUT = sf * mf * cf * (bw)^2+ bf

where:
AOUT - analog output
sf - square scale factor
mf - material factor
cf - correction factor
bw - desired bead width
bf - linear flow rate bias

FOUT = AOUT * (vt / 1000)^2

where:
FOUT - Final flow output
vt - TCP predicted speed (mm/s)

When TCPP square control is DISABLED, the square flow model uses the square function only on desired bead width to calculate the flow rate output based on the following 2 formulas:

AOUT = sf * mf * cf * (bw)^2+ bf

FOUT = AOUT * (vt / 1000)

NOTE
The flow model item appears in each sealing schedule with a default value set to LINEAR. If you change this value to SQUARE FLOW, the DispenseTool software automatically calculates the flow rate output based on the formula above. Refer to Section 3.3, "Setting Up Schedules," for more information.

3.11 SETUP DISPENSETOOL WITHOUT DEFAULT DISPENSE

Normally, when using DispenseTool on R-30iB, SpotTool+ is customized by Default Dispense. (Please refer to Section 2.1.) In this section, setting method to use DispenseTool without ordering Default Dispense is explained in Procedure 3-12 and 3-13.

Settings explained in this section are applied in particular cases such as the following.

- Utilizing Spot Welding function and Dispense function together is required. (Procedure 3-12) (Please refer to Spot Welding manual (B-83284EN-4) for Spot Welding function. And please refer to Subsection 5.3.2 for program settings to use both functions.)
- Spot Welding robot should be remodeled for Dispense robot. (Procedure 3-13)
- For some reason Default Dispense is not ordered, but Dispense robot is required. (Please refer to Procedure 3-13 step 8~)
- Dispense robot should be remodeled for Spot Welding robot. (Procedure 3-14)

Procedure 3-12 Utilize Spot Welding and Dispense function together

NOTE
It is required that Default Dispense is not ordered.

Steps

1 Perform a Controlled Start. (Please refer to Procedure 3-1 for Controlled Start.)
2 Press MENUS.
3 Select Appl-select. You will see a screen similar to the following.

```
Appl selection       CTRL START MENU

  1 Spot Welding                 TRUE
  2 Handling                     FALSE
  3 Dispense                     FALSE

[ TYPE ]                  TRUE   FALSE
```

4 Move the cursor to Spot Welding and Dispense, and set both F4, [TRUE].
5 Set up configuration of DispenseTool according to Procedure 3-1.
6 Also set up configuration of SpotTool as necessary. (Please refer to Spot Welding manual's (B-83284EN-4) Section 3.2.)

7 After cold start and before the dispensing equipment is driven, please turn off the controller and then turn it on again.

Procedure 3-13 Convert Spot Welding robot into Dispense robot

Steps

1 Perform a Controlled Start. (Please refer to Procedure 3-1 for Controlled Start.)
2 Press MENUS.
3 Select Appl-select. You will see a screen similar to the following.

```
Appl selection       CTRL START MENU

  1 Spot Welding                TRUE
  2 Handling                    FALSE
  3 Dispense                    FALSE

[ TYPE ]                 TRUE   FALSE
```

4 Move the cursor to Dispense, and press F4, [TRUE]. (Here, Spot Welding is still [TRUE].)
5 Press FCTN key, and select START (COLD). Then the controller performs Cold start, and then you will see UTILITIES Hints screen.
6 Delete I/O assignments used for Spot welding. (Please refer to Spot Welding manual's (B-83284EN-4) Chapter 4 for Spot Welding I/O. And please refer to Basic Operation manual's (B-83284EN) Subsection 3.5.3 for clearing I/O assignments.)
7 If you continue to use TP programs used on Spot Welding robot, change the application used in the program.
   a. Press SELECT. You will see Program Selection Screen.
   b. Move the cursor to the program to change the attributed application.
   c. Press NEXT to display the next page, and press F2, [DETAIL]. You will see the program detailed screen.
   d. Press F3, [NEXT]. You will see the application setting screen similar to the following.

```
Appl process

  1 Spot Welding                TRUE
  2 Handling                    FALSE
  3 Dispense                    FALSE

        PREV   NEXT   TRUE   FALSE
```

   e. Set Spot Welding [FALSE], and set Dispense [TRUE].

8 Perform a Controlled start again.
9 Press MENUS.
10 Select Appl-select. You will see a screen similar to the following.

```
Appl selection       CTRL START MENU

  1 Spot Welding                TRUE
  2 Handling                    FALSE
  3 Dispense                    TRUE

[ TYPE ]                 TRUE   FALSE
```

11 Move the cursor to Spot Welding, and press F5, [FALSE]. (Here, Dispense is [TRUE].)
12 Set up configuration of DispenseTool according to Procedure 3-1.
13 After cold start and before the dispensing equipment is driven, please turn off the controller and then turn it on again.

Procedure 3-14 Convert Dispense robot into Spot Welding robot

Steps

1 Perform a Controlled Start. (Please refer to Procedure 3-1 for Controlled Start.)
2 Press MENUS.
3 Select Appl-select. You will see a screen similar to the following.

```
Appl selection       CTRL START MENU

  1 Spot Welding                FALSE
  2 Handling                    FALSE
  3 Dispense                    TRUE

[ TYPE ]                 TRUE   FALSE
```

4 Move the cursor to Spot Welding, and press F4, [TRUE]. (Here, Dispense is still [TRUE].)
5 Press FCTN key, and select START (COLD). Then the controller performs Cold start, and then you will see UTILITIES Hints screen.
6 Delete I/O assignments used for Dispense. (Please refer to Chapter 4 for Diepense I/O. And please refer to Basic Operation manual's (B-83284EN) Subsection 3.5.3 for clearing I/O assignments.)
7 If you continue to use TP programs used on Dispense robot, change the application used in the program.
   a. Press SELECT. You will see Program Selection Screen.
   b. Move the cursor to the program to change the attributed application.
   c. Press NEXT to display the next page, and press F2, [DETAIL]. You will see the program detailed screen.
   d. Press F3, [NEXT]. You will see the application setting screen similar to the following.

```
Appl process

  1 Spot Welding                FALSE
  2 Handling                    FALSE
  3 Dispense                    TRUE

       PREV   NEXT   TRUE   FALSE
```

   e. Set Spot Welding [TRUE], and set Dispense [FALSE].

8 Perform a Controlled start again.
9 Press MENUS.
10 Select Appl-select. You will see a screen similar to the following.

```
Appl selection       CTRL START MENU

  1 Spot Welding                  TRUE
  2 Handling                      FALSE
  3 Dispense                      TRUE

[ TYPE ]                  TRUE   FALSE
```

11 Move the cursor to Dispense, and press F5, [FALSE]. (Here, Spot Welding is [TRUE].)
12 Set the system variable $TCPPIR.$ENABLE_TCPP = FALSE.
13 Set up configuration of SpotTool according to Spot Welding manual (B-83284EN-4).

3.12 GUM DROP SEALING FUNCTION

3.12.1 Overview

Gum Drop Sealing Function enables a running robot to dispense a certain amount of material with by pulse-controlling dispensing equipment. Fig. 3.12.1 shows that by teaching SS instructions consecutively on motion instructions, continuous pulsed sealing can be performed without stopping robot motion.

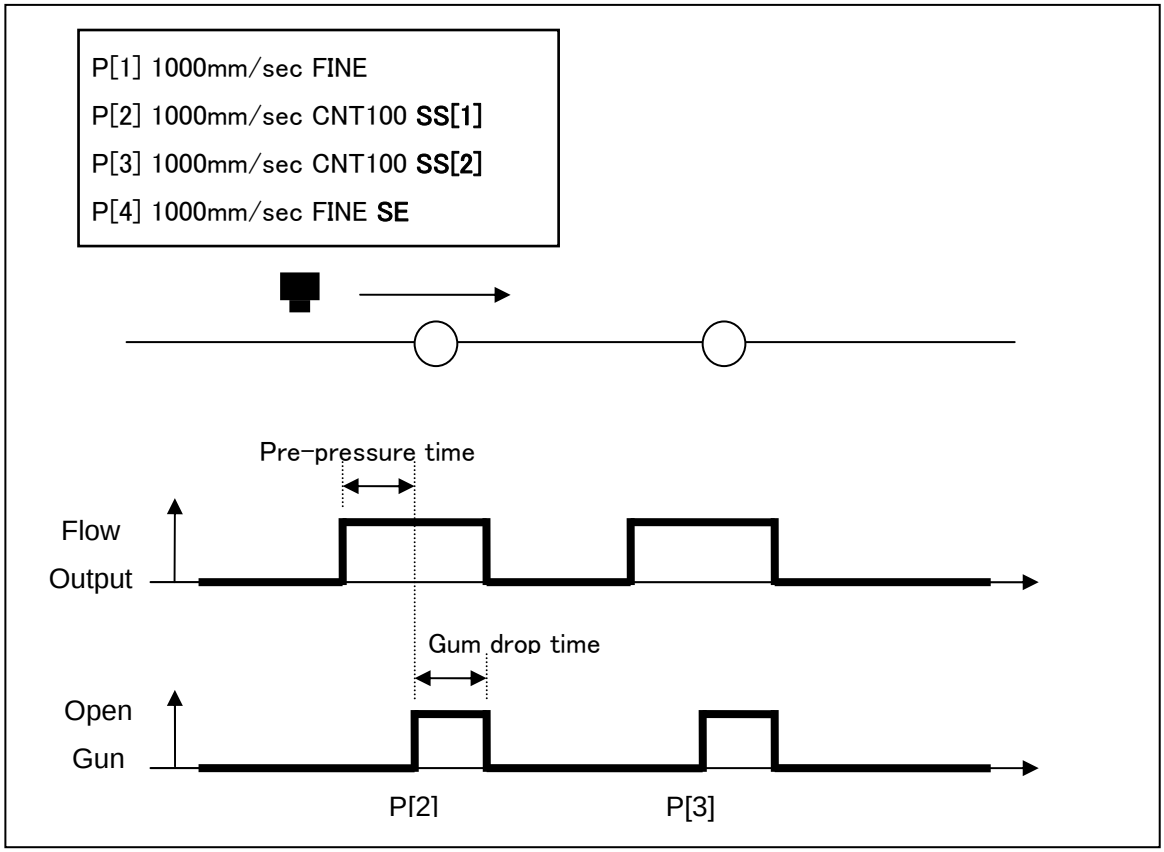


Fig. 3.12.1 Overview of Gum Drop Sealing

NOTE
Nemo Pump function does not support this function.

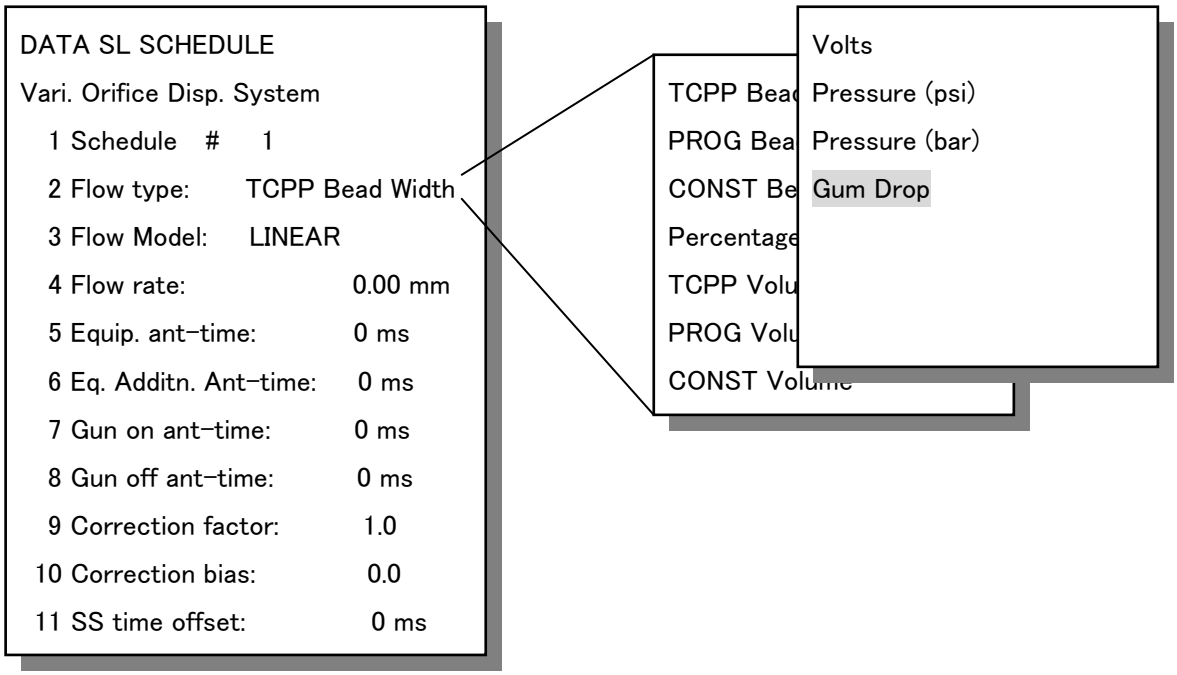
3.12.2 Settings

It can be configured for each schedule whether gum drop sealing is applied or not.
Please use Procedure 3-15 to change Flow type to Gum Drop from other types, and use Procedure 3-16 to change Flow type to other types from Gum Drop. Table 3.12.2 lists and describes each configuration item of Gum Drop Sealing.

Procedure 3-15 In case of setting as Gum Drop Sealing

Steps

1 Set Flow type as “Gum Drop” in data schedule screen.



2 Then, the screen turns as following.

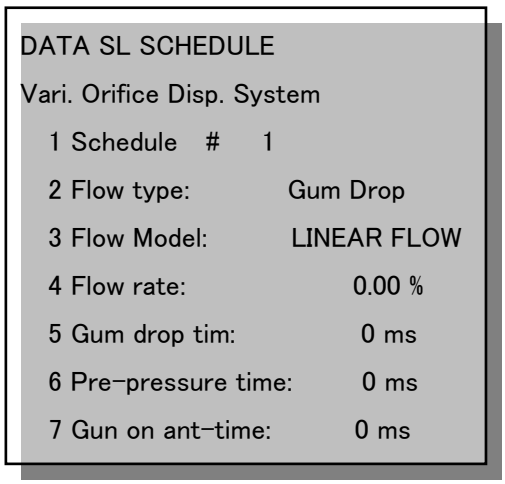


Table 3.12.2 Configuration item of Gum Drop Sealing Function

Schedule item	Description
Flow rate	This is used to specify a percentage (%) of the maximum flow command. This flow type does not require the flow rate calibration. Scale factor: $SLSETUP[equipment number].s_factor11
Gum drop tim (msec)	This item indicates the length of sealing time for one SS instruction. If this value is less than 0, flow output lasts until sealing condition changes or sealing ends. (This is same specification as other Flow types.)
Pre-pressure time default:0 ms	This item is used to adjust the invoking time at which anticipatory flow output signal is sent out for pre-pressure.
Gun on ant-time default: 0 msec min: -1000 msec max: 1000 msec	This item indicates the anticipation time between when the robot reaches the destination position and when the gun is turned on. If you would like the gun to turn on before the robot reaches the destination position, set Gun on ant-time to a positive number. If you would like the gun to turn on after the robot reaches the destination position, set Gun on ant-time to a negative number. This information is displayed only on the DETAIL screen.

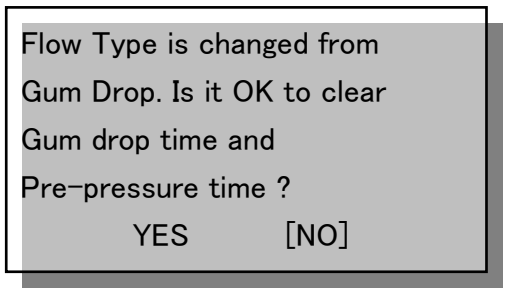
Procedure 3-16 In case of setting from Gum Drop Sealing to other types

Steps

1 Set Gum Drop time and Pre-pressure time as 0.
2 Set Flow type other than “Gum Drop” in data schedule screen.

NOTE

When Flow type is changed from Gum Drop to other type in data schedule screen, if Gum drop time or Pre-pressure time isn’t set to 0, sealing like Gum Drop is performed even if Flow type isn’t Gum Drop. To prevent this, following warning text is displayed on the screen, so please select “YES” and clear those values.



3.12.3 Output flow

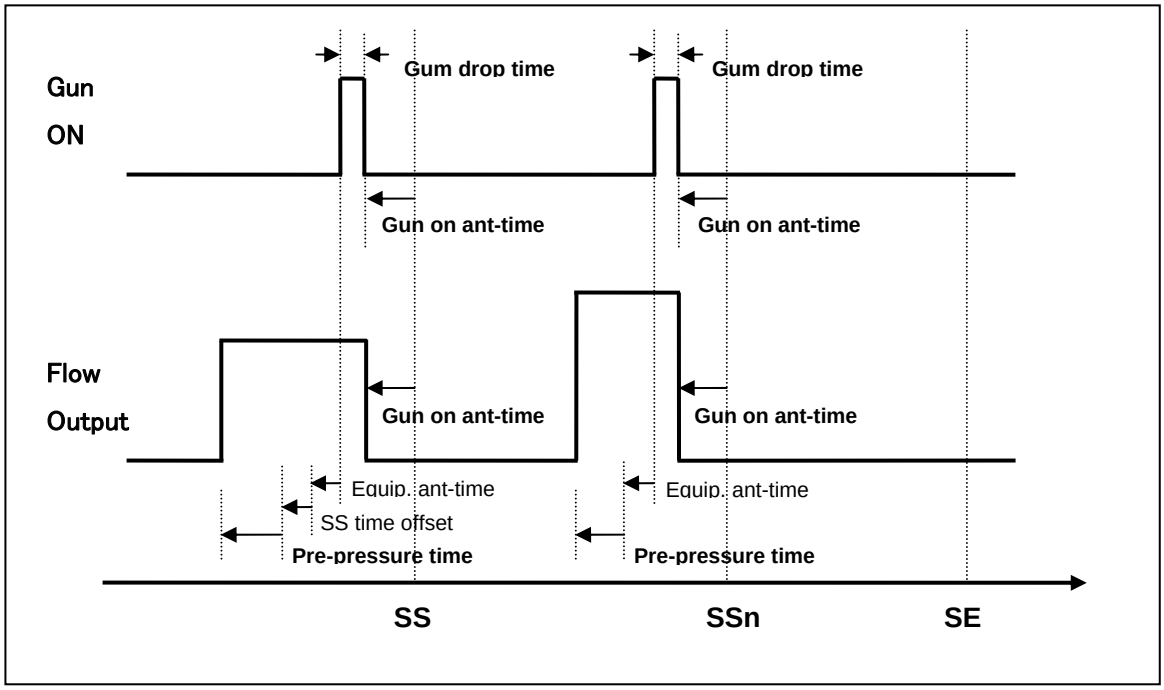


Fig. 3.12.3 Gum Drop Sealing process signal timing protocols

NOTE
In the same way as other Flow type, SE instruction should be taught in the program.

NOTE
Normally, ”Equip. ant-time” and “SS time offset” aren’t used for Gum Drop Sealing, so they aren’t displayed on schedule screen. But the value of system variables $SLSCHEDn[x].EQUIP_DELAY and $SLSCHEDn[x].SS_TIME_OFST (n: equip number, x: schedule number) are reflected respectively.

4 SETTING UP THE CELL

4.1 DISPENSETOOL CELL COMMUNICATION SETUP

Production operation is defined as running a dispensing job at full speed while all production conditions are enabled. Before you run production, you must set up the method for communicating the information required to run production between the robot and cell controller. This is called cell communication setup.

The Cell Communication SETUP screen provides a way of setting up the general features of the cell interface. Most items on this screen require their own I/O signals. Only the signals required for the current Cell Communication SETUP screen will appear on the Cell I/O screen. This means that if there is a change in the Cell Communication SETUP screen there will also probably be a change in the Cell I/O screen.

> ⚠ **CAUTION**
> You must perform a Cold start after making any change to the Cell Communication SETUP screen or Cell I/O screen in order for those changes to take effect.

Table 4.1 lists and describes the Cell Communication SETUP screen items.

Table 4.1 Cell communication SETUP items

Cell communication setup item	Description
Home I/O macro name default: None	This item specifies name of TP program SpotTool+ executes whenever the robot returns to home.
Shell polling default: ENABLED	This I/O is for Spot Welding. Please refer to Spot Welding manual's (B-83284EN-4) Section 3.3 for detail.
NOWELD default: DISABLED	This I/O is for Spot Welding. Please refer to Spot Welding manual's (B-83284EN-4) Section 3.3 for detail.
NOSTROKE default: DISABLED	This I/O is for Spot Welding. Please refer to Spot Welding manual's (B-83284EN-4) Section 3.3 for detail.
Production run speed default: 0 min: 0 max: 100	This item allows you to specify the general override value (displayed in the upper right hand corner of the teach pendant screen) SpotTool+ should use automatically when a production start signal is received. SpotTool+ will display a prompt box (if speed override < 100 is ENABLED) and then run the style at the specified override value. A value of zero indicates that the current general override value will be used.
Production resume speed default: 0 min: 0 max: 100	This item allows you to specify the general override value (displayed in the upper right hand corner of the teach pendant screen) SpotTool+ should use automatically when a production start signal is received to resume a paused style. SpotTool+ will display a prompt box (if speed override < 100 is ENABLED) and then resume the style at the specified override value. A value of zero indicates that the current general override value will be used.
Dispense calib. refpos default: None	This item specifies name of program executed to calibrate the dispenser.
At PURGE refpos Default: None	This item specifies name of program executed to purge the dispenser.

Use Procedure 4-1 to set up general cell communication information.

Procedure 4-1 Cell Communication Setup

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select Cell. See the following screen for an example of the default cell communications setup.

```
SETUP              E1
Cell Communication
1 Home I/O macro name:
2 Shell polling:            ENABLED
Production prompt boxes:
3 NOWELD:                   ENABLE
4 NOSTROKE:                 ENABLE
Production run speed:       0 %
Production resume speed:    0 %
Dispense calib. refpos:
At PURGE refpos:
Please cold start after setting data.
```

5 To display help information, press NEXT, >, and then press F1, HELP. When you finished displaying help information, press PREV.
6 Select each item and set it as desired.

> ⚠ **CAUTION**
> You must perform a Cold start after making any change to the SETUP Cell Communication screen or Cell I/O screen in order for those changes to take effect.

7 When you are finished setting items, Cold start the controller.

4.2 DISPENSETOOL CELL INTERFACE I/O SIGNALS

Contents of Cell Interface I/O screen differ depending on application settings and the presence or absence of Default Dispense. (Please refer to Section 2.1 and Section 3.11.) Fig. 4.2(a) and Fig. 4.2(b) show the example of screen difference. And please refer to Subsection 4.2.1 and Subsection 4.2.2 for the detail of Input/Output screen items.

In case of Default Dispense: ENABLED.

```
I/O Cell Inputs
INPUT SIGNAL          TYPE # SIM
STATUS
1 Wet/dry mode:       DI[ 0] U   ***
2 Continue wet:       DI[ 0] U   ***
3 Continue dry:       DI[ 0] U   ***
4 Cancel this job:    DI[ 0] U   ***
5 Run resume prog:    DI[ 0] U   ***
6 Tryout Mode:        DI[ 0] U   ***

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

In case of Default Dispense: DISABLED, and Spot Welding: TRUE, Dispense: TRUE

```
I/O Cell Inputs
INPUT SIGNAL          TYPE # SIM
STATUS
1 Weld/NO WELD:       DI[ 0] U   ***
2 Stroke/NO STROKE:   DI[ 0] U   ***
3 Rmt wtr svr reset:  DI[ 0] U   ***
4 Ret home frm poun:  DI[ 0] U   ***
5 Wet/dry mode:       DI[ 0] U   ***
6 Tryout Mode:        DI[ 0] U   ***

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

Fig. 4.2(a) Example of cell Input screen

In case of Default Dispense: ENABLED.

```
I/O Cell Outputs
OUTPUT SIGNAL          TYPE # 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  Wet/dry Mode:       DO[ 0] U  ***
9  Proc complt seal:   DO[ 0] U  ***
10 Waiting cncl/cnt:   DO[ 0] U  ***
11 Power on:           DO[ 0] U  ***
12 Cell reset reqst:   DO[ 0] U  ***
13 Clear of transfr:   DO[ 0] U  ***
14 Cycle complete:     DO[ 0] U  ***
15 Robot ready:        DO[ 0] U  ***
16 No SOP E-stop:      DO[ 0] U  ***
17 No TP E-stop:       DO[ 0] U  ***
18 No STEP mode:       DO[ 0] U  ***
19 In REMOTE mode:     DO[ 0] U  ***
20 Tryout Mode:        DO[ 0] U  ***
21 Heartbeat:          DO[ 0] U  ***
22 Robot motion G1:    DO[ 0] U  ***

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

In case of Default Dispense: DISABLED, and Spot Welding: TRUE, Dispense: TRUE

```
I/O Cell Inputs
OUTPUT SIGNAL          TYPE # 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 Wet/dry Mode:       DO[ 0] U  ***
18 Proc complt seal:   DO[ 0] U  ***
19 Tryout Mode:        DO[ 0] U  ***
20 Heartbeat:          DO[ 0] U  ***
21 Robot motion G1:    DO[ 0] U  ***

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

Fig. 4.2(b) Example of cell output screen

4.2.1 Dispensetool Cell Interface Input Signals

Table 4.2.1 Cell input signals

Input Signal	Description
WET/DRY MODE **Digital Input**	This input is checked when a program is run by an external input. If this signal is OFF at that time, the robot will be placed into DRY RUN mode when the program is executed. If this signal is ON, the robot will be placed in WET run. If a Job Queue is used, the state of this signal will be recorded with each Job Queue entry. This input will function differently based on whether or not the “Default Dispense” option is loaded. (Please refer to Section 2.1 for this option.) If the “R719 Default Dispense” option IS loaded then this input is periodically scanned. If the input is OFF then the wet/dry state (Dispense controller mode) will be continuously set to DRY.If an OFF to ON transition is detected then the wet/dry state (Dispense controller mode) will be set to WET only once upon the transition. If the “R719 Default Dispense” option is NOT loaded, WET/DRY state can be switched during the program exection under all following conditions at the time of power-on. • Remote/Local status is Remote (SI[REMOTE]=ON) • Teach pendant is DISABLE • 3 mode switch is AUTO • WET/DRY MODE DI of Cell input signal is assigned • WET/DRY MODE DO of Cell output signal is assigned • The application process has NOT been disabled as in the case of running FFR (Fast Fault Recovery) (Please refer to Optional Function manual (B-83284EN-2) for FFR.)

Input Signal	Description
CONTINUE WET **Digital Input**	If the current fault is recoverable, this input can be strobed by the cell controller to request that the robot continue the job in WET mode (with dispensing material enabled). This item appears on the Cell I/O screen if PLC Error Recovery is ENABLED.
CONTINUE DRY **Digital Input**	This input causes the robot to continue the job in DRY mode (without dispensing material) if possible. This item appears on the Cell I/O screen if PLC Error Recovery is ENABLED.
CANCEL THIS JOB **Digital Input**	This input should be pulsed by the cell controller to request that the current job be aborted. Note: Be careful not to abort a job in the middle of a restrictive work environment (such as a car body), as it will be difficult to return to the HOME position. The robot will stop wherever it is and inform the cell controller that the cycle is complete. This item appears on the Cell I/O screen if PLC Error Recovery is ENABLED.
Run resume prog **Digital Input**	When the robot is in recovery mode and is waiting for feedback from the cell controller then if this signal is set to ON, and if certain qualifications are met and a valid RESUME_PROG has been assigned then the main program will remain paused while the RESUME_PROG is executed.
Tryout Mode **Digital Input**	These I/O are used for Spot Welding, and Dispense function doesn't need these inputs. For example, when both Spot Welding and Dispense function are enabled, these I/O appear. (Please refer to Section 3.11.) Please refer to Spot Welding manual's (B-83284EN-4) Subsection 4.1.2 for detail of these.
Weld/NO WELD **Digital Input**	
Stroke/NO STROKE **Digital Input**	
Rmt wtr svr reset **Digital Input**	
Ret home frm pounce **Digital Input**	

4.2.2 Dispensetool Cell Interface Output Signals

Table 4.2.2 Cell output signals

Output Signal	Description
Input Simulated **Digital Output**	This output indicates to the cell controller (PLC) that simulated input signal exists on the controller.
Output Simulated **Digital Output**	This output indicates to the cell controller (PLC) that simulated output signal exists on the controller.
OVERRIDE = 100 **Digital Output**	This output indicates to the cell controller (PLC) that override of Teach Pendant is 100%.
In cycle **Digital Output**	This item is on at all times the start of a job until the job completes or is aborted.
Prog Aborted **Digital Output**	This output will be turned ON if the teach pendant program was aborted before reaching the end of the program. This is usually caused by a fatal error or by selecting the ABORT (ALL) item on the FCTN menu of the teach pendant. This signal only appears on the Cell I/O screen if PLC Fault Recovery has been ENABLED.

Output Signal	Description
Wet/dry Mode **Digital Output**	This signal reflects the current DRY RUN status of the robot. This input will function differently based on whether or not the “Default Dispense” option is loaded. (Please refer to Section 2.1 for this option.) If the “R719 Default Dispense” option IS loaded then this input is periodically scanned. The output will be set to match the current wet/dry state (Dispense controller mode): ON=WET / OFF=DRY. If the “R719 Default Dispense” option is NOT loaded then this input will function as follows. It will only be updated if the Wet/dry mode output is assigned and the Wet/dry mode input is assigned. This output is set to ON if ALL of the following conditions are met: • Wet/dry mode Digital Output is OFF, and the current wet/dry state is WET. • All assigned “Dispenser ready” input signals from all dispense controllers are ON. This output is set to OFF if EITHER of the following conditions are met: • Wet/dry mode Digital Output is ON and the current wet/dry state is DRY. • All assigned “Dispenser ready” input signals are not ON.
Proc complt seal **Digital Output**	This output only appears on the Cell I/O screen if the option, "Robot state reporting," has been enabled on the Cell Setup screen. This signal is set to OFF only at the start of a JOB. This signal is set to ON at the end of a JOB only if the JOB completed without aborting early and no sealing was interrupted or skipped due to being in DRY RUN mode.
Waiting cncl/cnt **Digital Output**	This output is set to ON when the robot is in recovery mode and is waiting for feedback from the cell controller. Otherwise this output is set to OFF.
Power on **Digital Output**	This output only appears on the Cell I/O screen if the option, "Robot state reporting," has been enabled on the Cell Setup screen. This output is turned ON when the controller has successfully turned on and DispenseTool has started running and is never turned off.
Cell reset reqst **Digital Output**	Upon a rising edge of either the TP (Teach Pendant) reset or SOP (Standard Operator Panel) reset this output is pulsed for 100ms to the cell controller in order to request a reset for the cell.
Clear of transfr **Digital Output**	This output only appears on the Cell I/O screen if the option, "Robot state reporting," has been enabled in the Cell Setup screen. This signal is intended to be used as an indication that the robot has moved far enough away from the transfer line that the workpiece can be indexed. This output is set to ON by the DispenseTool macro CLEAR OF TRANSFER, which is called in a user teach pendant program. It is automatically set to OFF when the next JOB begins.
Cycle complete **Digital Output**	This signal goes high each time a job completes or is aborted. This signal is always pulled low when the next job begins. If the option, "Hold cycle complete high," is enabled, this signal will stay on from the completion of one job to the start of the next. Otherwise, the length of time the signal is ON is specified by the menu item in the Cell Communication Setup screen. Refer to Section 4.1.
Robot ready **Digital Output**	This output only appears on the Cell I/O screen if the option, "Robot state reporting," has been enabled in the Cell Setup screen. This output is high only when all of the following conditions are TRUE: • The cell controller has control of the robot (the operator panel REMOTE LED is ON). • A JOB is NOT running. • The robot is NOT in single step mode. • No faults currently exist and the robot is not in fault recovery mode. • The servo drives are turned on. • A HOME position has been set up and the robot is currently at the HOME position. This output is intended for use in determining when the robot is ready to start the next JOB. This output is updated every 3.5 seconds.
No SOP E-stop **Digital Output**	This output echoes the state of NO SOP E-stop. If the SOP (Standard Operator Panel) Estop is NOT pressed then the output is set ON, otherwise it is set OFF.

Output Signal	Description
No TP E-stop **Digital Output**	This output echoes the state of NO TP E-stop. If the TP (Teach Pendant) E-stop is NOT pressed then the output is set ON, otherwise it is set OFF.
No STEP mode **Digital Output**	This output echoes the state of NOT in STEP mode. If NOT in STEP mode then the output is set ON, otherwise it is set OFF.
In REMOTE mode **Digital Output**	This output reflects the state of $REMOTE. If $REMOTE = 1 then the output is set ON, otherwise it is set OFF.
Power on **Digital Output**	This output only appears on the Cell I/O screen if the option, "Robot state reporting," has been enabled on the Cell Setup screen. This output is turned ON when the controller has successfully turned on and DispenseTool has started running and is never turned off.
Heartbeat **Digital Output**	This signal alternates between the ON and OFF state approximately every 640 milliseconds (ms). The signal is intended to verify the link between the robot and the cell controller, since a remote I/O link will keep the last state if the robot is turned off. It is recommended that the cell controller E-stop the robot and transfer lines if the signal does not change at least every 1000ms.
Robot motion G# **Digital Output**	This item indicates the robot motion status of the motion group# (#=1-5). ON = Group# motion is enabled. OFF = Group# motion is disabled (=Machine locked).
Process fault **Digital Output**	These I/O are used for Spot Welding, and Dispense function doesn't need these inputs. For example, when both Spot Welding and Dispense function are enabled, these I/O appear. (Please refer to Section 3.11.) Please refer to Spot Welding manual's (B-83284EN-4) Subsection 4.1.2 for detail of these.
Process alert **Digital Output**	
Process complete **Digital Output**	
Weld enabled **Digital Output**	
Stroke enabled **Digital Output**	
Proc *n* tip rep re *n* = 1 to 2 **Digital Output**	
Apprch tip repla **Digital Output**	
Proc *n* tip mnt re *n* = 1 to 2 **Digital Output**	
One Spot Welded **Digital Output**	

4.2.3 Setting up Dispensetool Cell Interface I/O Signals

Use Procedure 4-2 to set specific cell input and output signals.

Procedure 4-2 Setting Cell I/O

Steps

1 Press MENUS.
2 Select I/O.
3 Press F1, [TYPE].
4 Select Cell. You will see either the input or output screen. You will see a screen similar to the following.

```
I/O Cell Inputs
INPUT SIGNAL          TYPE # SIM STATUS
1 Wet/dry mode:       DI[ 0] U   ***
2 Continue wet:       DI[ 0] U   ***
3 Continue dry:       DI[ 0] U   ***
4 Cancel this job:    DI[ 0] U   ***
5 Run resume prog:    DI[ 0] U   ***
6 Tryout Mode:        DI[ 0] U   ***

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

5 To change between the input and output screens, press F3, IN/OUT.
6 To display more detailed information about the I/O signal, press F2, DETAIL.
7 Select each item and set as desired.
8 When you are finished setting items, Cold start the controller.

5 PROGRAM STRUCTURE

5.1 DISPENSING INSTRUCTIONS

5.1.1 Overview

Dispensing instructions tell the robot when to dispense material. There are two kinds of dispensing instructions:

- Dispense start instructions
- Dispense end instructions

These instructions can be used only in a process program.

Dependent and Independent Dispensing Instructions

Dispense instructions are either dependent or independent.

Dependent dispensing instructions include the dispense start and dispense end instructions. These instructions are motion options attached to a motion instruction.

The following is an example of using dependent dispensing instructions:

```
5: L P[2] 500mm/sec CNT10 SS[1]
6: L P[3] 500mm/sec CNT10 SE
```

Independent dispensing instructions include the dispense start and dispense end instructions. These instructions appear on a separate line and are not associated with any motion instruction.

The following is an example of using independent dispensing instructions:

```
10: SS[1]
11: SE
```

5.1.2 Dispense (Seal) Start Instructions

The dispense (seal) start instruction tells the robot to begin dispensing material. The dependent and independent dispense start instructions are the same.

SS[x]

The SS[x] instruction initiates the dispensing of material using the specified dispensing schedule. See Fig. 5.1.2 for the dependent dispense start motion option or the independent dispense start instruction.

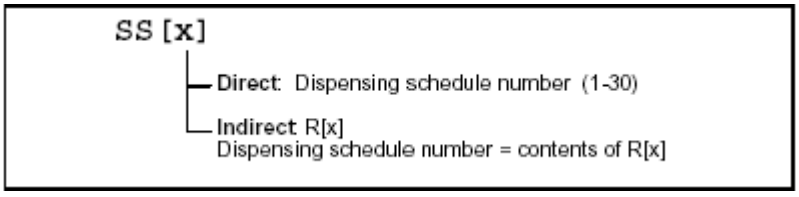


Fig. 5.1.2 Dispense start SS[x]

5.1.3 Dispense (Seal) End Instructions

The dispense (seal) end instruction tells the robot to stop dispensing material.

SE

The SE instruction finishes the dispensing of material using the active dispensing schedule. See Fig. 5.1.3 for the dispense end instruction.

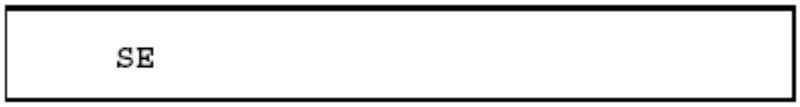


Fig. 5.1.3 Dispense end SE

5.2 PROGRAM CONTROL INSTRUCTIONS

5.2.1 Error Program Instruction for Dispensetool

ERROR_PROG = program

The error program instruction defines the program name that will be stored in the system variable $ERROR_PROG. The error program is intended to provide the robot with instructions to move the dispensing gun away from the workpiece and to a service area when an error occurs. When the robot reaches the service area, the dispensing gun can be inspected and maintenance performed. You must create the error program you would like to execute when there is an error. See Fig. 5.2.1.

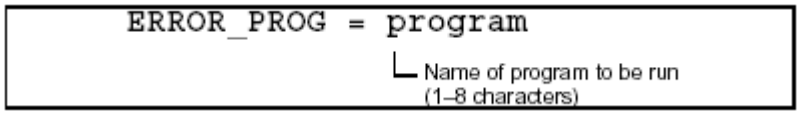


Fig. 5.2.1 Error program

The ERROR_PROG can be any program, job, process or macro.

> ⚠ **CAUTION**
> Do not use any SS[ ] or SE instruction in an ERROR_PROG, otherwise, unexpected events will occur.

5.3 APPLICATION SETTING OF PROGRAM

5.3.1 Setting of Loaded Program

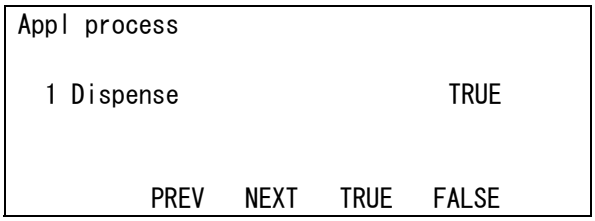
When the sealing program made on R-30iA or older controller was loaded to R-30iB, the program may not be executed and occur alarms because the program doesn't have proper application setting. Please set dispense application to the program according to Procedure 5-1.

Procedure 5-1 Application setting of loaded program

Steps

1 Press SELECT key. The program selection screen is displayed.
2 Move cursor to the program.
3 Press NEXT, > and press F2, DETAIL in the next page. The program detail screen is displayed.

4 Press F3, NEXT. The application tool change screen is displayed.



5 Move cursor to Dispense, and Press F4, TRUE. Then the application tool is set as Dispense.

5.3.2 Combine Use of Spot Welding Program and Dispense Program

In this section, application setting method when Spot Welding function and Dispense function are used together is explained. (Please refer to Section 3.11 for the method of enabling Spot Welding function and Dispense function.)

Application setting is done according to the following and Procedure 5-1.

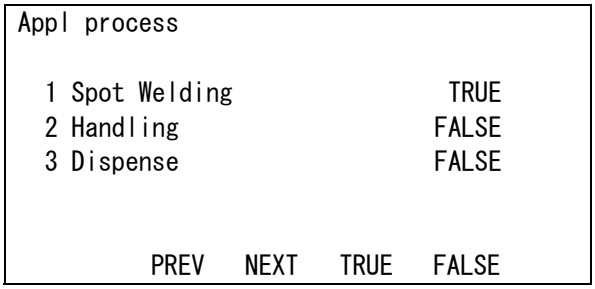
- Spot Welding program should be set Spot Welding as TRUE, and other application should be set as FALSE.
- Dispense program should be set Dispense as TRUE, and other application should be set as FALSE.
- The program that calls Spot Welding program or Dispense program should be set every application as FALSE.

Procedure 5-1 Application setting of combine use

Steps

1 Press SELECT key. The program selection screen is displayed.
2 Move cursor to the program to configure application setting.
3 Press NEXT, > and press F2, DETAIL in the next page. The program detail screen is displayed.
4 Press F3, NEXT. The application tool change screen is displayed.

NOTE
The displayed screen is different by the usage condition of multiple application.



5 Move cursor to the application used in the program, and Press F4, TRUE. And move cursor to the application not used in the program, and Press F5, FALSE.

NOTE
About the detail of Handling and Dispense, refer to each application manual.

Combine use of Spot Welding program and Dispense program is summarized as the example of Fig. 5.3.2.

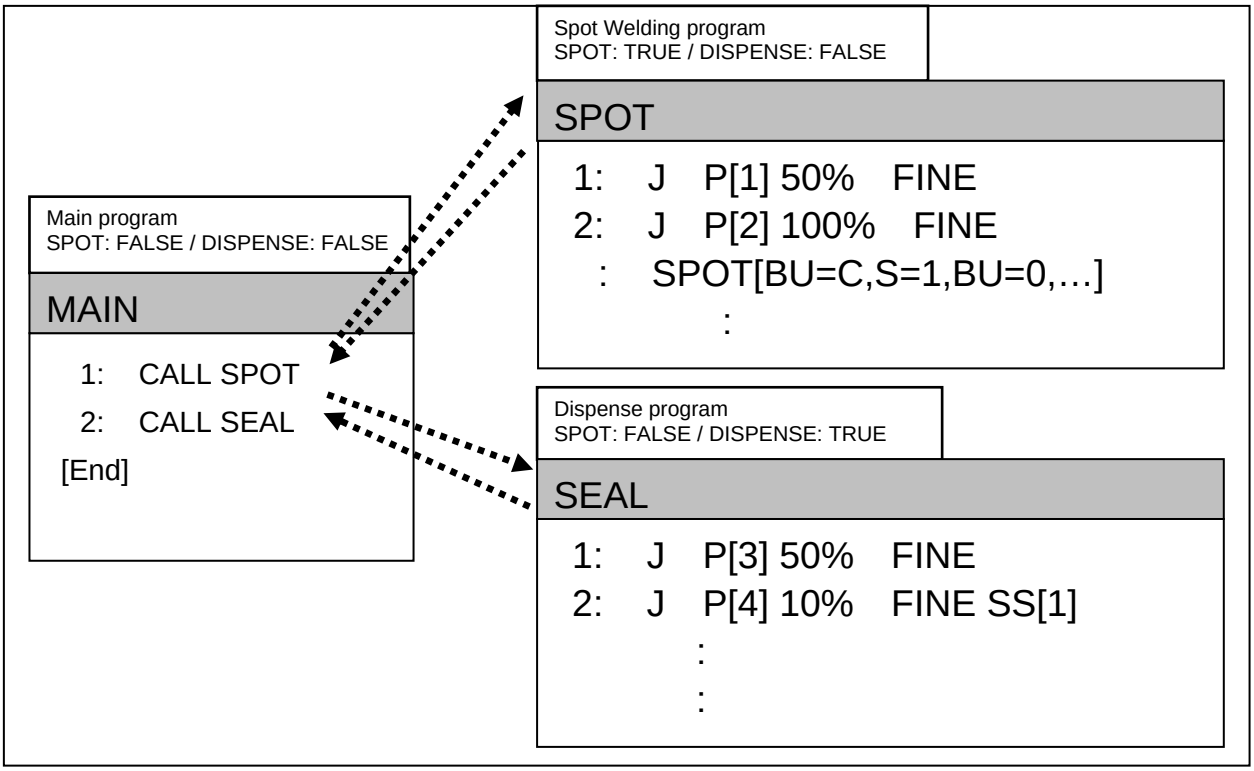


Fig. 5.3.2 Example of using spot welding and dispense together

6 EXECUTING A PROGRAM

6.1 TEST CYCLE

6.1.1 Test Cycle Setup

Setting up the test cycle allows you to control the conditions for test running a program. These conditions are in effect any time a program is run until you change the conditions.

Table 6.1.1 Test cycle conditions

Test Cycle Condition	Description
Dispense Controller Mode	Allows you to set the WET/DRY status of the robot controller dispensing functions: •When in WET mode, the controller will send the correct gun open and analog flow commands to the dispensing equipment at the programmed times. •When in DRY mode, the controller will not send any gun open or analog flow control commands to the dispensing equipment.
Force Process Complete	Force Process Complete will turn on the PROCESS COMPLETE digital output signal. The PROCESS COMPLETE digital output signal will stay ON until the next style is run. Force Process Complete will remain set to ENABLED while the PROCESS COMPLETE digital output is ON. Setting Force Process Complete to DISABLED will turn OFF the PROCESS COMPLETE digital output, if it is ON, and allow DispenseTool to determine whether to turn on the PROCESS COMPLETE signal automatically.
ISD Meter Motion (for ISD systems only)	This item determines whether the meter will move during operation. • When set to ENABLE, the meter will move, and the material will be dispensed. All dispenser-related errors will be detected. • When set to DISABLE, the meter will simulate performing its motion (dispensing, repositioning) internally, but will not move the meter or supply power to the servo amplifiers. The meter is not affected by any EMERGENCY STOP faults while in this mode. In normal mode (not in Bypass mode) the gun will not open for SS/SE instructions. In Bypass mode, however, the gun will open so that the material dispensed using the supply pressure. Refer to the ISD Bypass description below.
ISD Bypass (for ISD systems only)	This item determines whether the meter is bypassed or not. • When set to YES, all the meter valves are opened and meter motion will be prohibited. Therefore, the meter is bypassed. In this mode, the material could be dispensed (using the SS/SE instructions) from the material supply pressure. In this mode of operation, calculated volume dispensed is not accurate. This mode could be used to run production in an emergency situation where the dispenser system has severe problems (such as a broken cable, and so forth) by dispensing material from the supply pressure. In this case, you would need to disable the ISD meter motion. All ISD related operations (change dir, reposition, prepressure, and so forth) are ignored. This mode of operation can be used with the ISD meter motion enabled or disabled. • When set to NO, the system operates normally.

Procedure 6-1 Setting Up Test Cycle Conditions

Steps

1 Press MENUS.
2 Select TEST CYCLE.
3 Press F1, [TYPE].
4 Select Dispense. You will see a screen similar to the following.

```
TEST CYCLE Setup

1 Dispense controller mode:  DRY
2 Force process complete:    ENABLE
```

5 To display help information, press NEXT,>, and then press F1, HELP. When you are finished displaying help information, press PREV.
6 Set Test Cycle conditions as desired.

6.1.2 Controlling WET/DRY Mode Manually

You can control wet/dry mode manually at any time without using the TEST CYCLE screen. You control WET/DRY mode using the FUNCTIONS menu. Use Procedure 6-2 to control WET/DRY mode manually.

Procedure 6-2 Controlling WET/DRY Mode Manually

Steps

1 Press FCTN and then select -- NEXT --. You will see a screen similar to the following.

```
FUNCTIONS
1 QUICK/FULL MENUS
2 SAVE
3 PRINT SCREEN
4 PRINT
5
6 UNSIM ALL I/O
7 TOGGLE WET/DRY
8 CYCLE POWER
9
0 -- NEXT --
```

2 To change WET to DRY, or DRY to WET, select TOGGLE WET/DRY.
- When changing from WET to DRY, the SEAL ENBL LED on the teach pendant will turn off.
- When changing from DRY to WET, the SEAL ENBL LED on the teach pendant will turn on.

The next time you execute a sealing instruction, the dry or wet setting you made will be in effect.

7 STATUS DISPLAY

7.1 DISPENSE TOOL STATUS

The Dispense Tool status screen displays information about the current job or process. Table 7.1 lists and describes each Dispense Tool status item.

Table 7.1 Dispense tool status items

Item	Description
Cycle Time units: seconds	This item displays the duration of the selected job or process.
Last Cycle Time units: seconds	This item displays the duration of the selected job or process, for the last time the job or process was executed.
Gun On Time units: seconds	This item displays the amount of time the gun is on for the selected job or process.
Last Gun On Time units: seconds	This item displays the amount of time the gun was on the last time the job or process was executed.
Volume Used* units: cc	This item displays the volume of material used in the selected job.
Last Volume Used* units: cc	This item displays the volume of material used in the selected job, the last time the job or process was executed.
Gun Efficiency units: %	This item is the percentage of time that the gun was on during the JOB.
Last Gun Efficiency units: %	This item is the percentage of time that the gun was on during the previous JOB.
Gun On Screen	
Gun On (ms) Units: milliseconds	This item is the cumulative gun on time for the current job, or the gun on time from when the currently selected program was most recently executed. The gun on time for each equipment is displayed, if multiple equipment is used. This item is updated dynamically as the robot dispenses material.
Last Gun On (ms) Units: milliseconds	This item is the gun on time from the time before the most recent execution of the currently selected program. The gun on time for each equipment is displayed, if multiple equipment is used. This item is updated dynamically as the robot dispenses material.
Eq.	This item is the number of the dispensing equipment.
Total Units: milliseconds	This item shows the total Gun On Time for all equipment and the total Last Gun On Time for all equipment. This item is updated dynamically as the robot dispenses material.
Volume	
Volume* Units: cc	This item is the total material volume used in the most recent execution of the currently selected program. The Volume value is shifted into the Last Volume column at the start of each job and the Volume value is updated at the end of each job.
Last Volume* Units: cc	This item is the total material volume used the time before the most recent execution of the currently selected program.
Eq.	This item is the number of the dispensing equipment.
Total Units: cc	This item shows the total Volume for all equipment and the total Last Volume for all equipment.

* Displayed only if a JOB is currently selected and volume reporting option is used.

NOTE
To enable jobs and processes for standard Spot Tool+, set the system variable $JOBPROC_ENB = 1.

Use Procedure 7-1 to display DispenseTool status.

Procedure 7-1 Displaying DispenseTool Status

Steps

1 Press STATUS.
2 Press F1, [TYPE].
3 Select Seal Data. You will see a screen similar to the following.

```
STATUS
 Seal Data
  Cycle time:            58.4   s
  Last cycle time:       58.6   s
  Gun on time:           31.0   s
  Last gun on time:      30.9   s
  Gun efficiency         0.0    %
  Last gun efficiency    0.0    %
```

4 To display help information, press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
5 To display the dynamic gun on time for the dispensing equipment you selected, press F2, GUN ON. You will see a screen similar to the following.

```
STATUS
 Seal Data: Last two jobs run
     Gun On (ms)  Last Gun On (ms)
  Eq. 1:   23800           23700
  Eq. 2:    4000            4000
  Eq. 3:    3200            3200
  ------   -------         -------
  Total:   31000           30900
```

To return to the previous screen, press F2, LISTING.
6 To display the volume at the end of the job for the dispensing equipment you selected, press F3, VOLUME. You will see a screen similar to the following.

```
STATUS
 Seal Data: Last two jobs run
     Volume (cc) Last Volume (cc)
  Eq. 1:   100.0             97.0
  Eq. 2:   200.0            200.0
  Eq. 3:    51.0             51.0
  ------   -------         -------
  Total:   351.0            348.0
```

To return to the previous screen, press F2, LISTING.

8 NEMO PUMP

8.1 OVERVIEW

You must set up Dispense Tool configuration, schedules, and equipment information for the kind of dispensing equipment you are using. This section describes how to set up this information for the NEMO® Pump.
NEMO® is a registered trademark of HEISHIN Ltd.

Dispense Tool manipulates the NEMO Pump as follows,

- When the robot starts dispensing, the NEMO Pump rotates at a high rate to increase the material pressure.
- When the robot stops dispensing, the NEMO Pump rotates in reverse at a high rate to decrease the material pressure.

Fig. 8.1 shows an example of NEMO Pump operation.

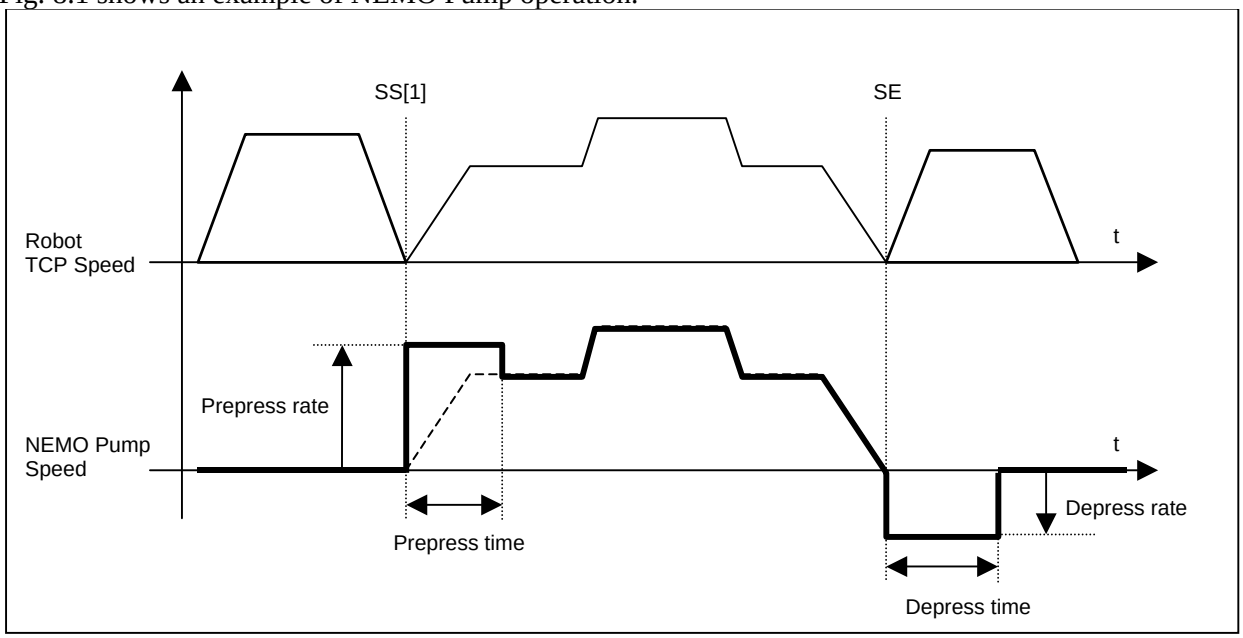


Fig. 8.1 NEMO pump operation

8.2 LIMITATIONS

- If you would like to use the functionalities described in this section, you must install the "NEMO Pump function" software option.
- You cannot use other ISD equipment in the NEMO Pump system.
- If you would like to use the robot brakes to control the NEMO Pump, you must set the brake number to 2 or larger.
- One robot can manipulate up to two NEMO Pumps.
  If the robot manipulates only one NEMO Pump, it will operate as equipment 1.
  If the robot manipulates two NEMO Pumps, the pump connected to Process axis 1 will operate as equipment 1, and another pump connected to Process axis 2 will operate as equipment 2. While one of the pumps is operating, another cannot operate.
- If you would like to perform dispensing with the NEMO Pump, you must use the sealing schedules 1 to 50.

- If you would like to perform dispensing with the NEMO Pump, you must use a program of the Process sub type.

8.3 SETTING UP PROCESS AXES

You must set up specific information about the hardware before you can use the NEMO Pump. The "Process axis" is used to control the NEMO Pump.

Procedure 8-1 Setting Up Process Axes

Steps

1 Perform a controlled start.
2 Press MENUS.
3 Select MAINTENANCE. You will see a screen similar to the following.

```
ROBOT MAINTENANCE CONTROLLED START
  Setup Robot System Variables
  Group  Robot Library/Option Ext Axes
  1     M-710iC/70         0
  0     IS Driver          1

[ TYPE ] ORD NO   AUTO   MANUAL
```

4 Move the cursor to IS Driver.
5 Press F4, MANUAL.

```
Enter the total number of ISDT
axes to be installed (max 8):
```

6 Enter the number of process axes. To use only one NEMO Pump, enter 1. To use two NEMO Pumps, enter 2.

```
Enter the FSSB number (from 1 to 3)
on which ISDT axis 1 is installed:
```

7 Enter the FSSB number.

```
Enter the hardware axis number
For ISDT axis 1:
```

8 Enter the hardware axis number.

```
Save ISDTCFG.DT?
Enter (1:Yes, 0:No)
```

9 Enter 1.

NOTE
If you would like to use two NEMO Pumps, you must set the FSSB number and hardware axis number for each process axis.

```
*** Group 0 Proc Axis Installation ***
1. Display/Modify Proc axis 1~1
2. Add Proc axes
3. Delete Proc axes
4. EXIT
```

10 Select Add Proc axes.
11 Set each item. Table 8.3 shows an example of Process Axes Setup.

Table 8.3 Process axes setup items

Item	Description
MOTOR SIZE	149. ACbM1
MOTOR TYPE	11. /4000
CURRENT LIMIT FOR AMPLIFIER	10. 20A
CURRENT LIMIT FOR MOTOR	10. 20A
AMPLIFIER NUMBER	2
AMPLIFIER TYPE	2. A06B-xxxx series Alpha I amp. or …
GEAR RATIO	1 *
MAX JOINT SPEED SETTING	2. Change, -> 4000 (rpm)
MOTOR DIRECTION	1. TRUE **
EXP_ACCEL TIME	1. Change, -> 10 (ms)
LOAD RATIO	5
BRAKE SETTING	2 ***

* GEAR RATIO must be set to 1.
** MOTOR DIRECTION must be set to 1:TRUE.
*** If you would like to use the robot brakes to control the NEMO Pump, you must set BRAKE SETTING to 2 or larger.

8.4 SETTING UP DISPENSE TOOL CONFIGURATION

You must set up Dispense Tool configuration before you can use the NEMO Pump.

Table 8.4 lists and describes each configuration item.

Table 8.4 Dispense tool configuration setup items

Item	Description
Number of Equipments default: 1 range: 1 to 5	This item defines the maximum number of equipments to be set up and controlled by Dispense Tool.
Equipment type: default: Var[iable] Orifice	This item defines the type of equipment you are using.

Procedure 8-2 Setting Up Dispense Tool Configuration

Steps

1 Perform a controlled start. The Dispense Tool Application Configuration Setup screen is displayed. You will see a screen similar to the following.

```
Seal Config CONTROLLED START MENUS
Dispense Tool Application Configuration
1 F Number:                    F00000
2 Number of equipments:            1
```

```
3 Number of guns:                1
4 Equipment type:      Variable Orifice
5 Bead shaping air:              DISABLE
6 Remote start:                  DISABLE
7 Automatic purge:               DISABLE
8 Bubble detect:                 DISABLE
9 Linear 2P calibration:         DISABLE
10 Channel 2 analog output:      DISABLE
11 AccuSeal advanced feature:    DISABLE
```

2 If you would like to change the number of equipment, move the cursor to Number of equipments and type in the appropriate value. You will see a prompt box similar to the following.

```
You have changed the number
of equipment. Press YES to
confirm your change and
wait for new sysvar reallocation.
    YES     NO
```

NOTE
You can configure multiple equipment of different types if you type a value larger than 1.

3 If you are sure that you would like to change the number of equipments, select YES and press ENTER.
4 To select a specific piece of equipment, press F3, EQUIP, and type the number of the piece of equipment. You will see a screen similar to the following.

```
Seal Config CONTROLLED START MENUS
Dispense Tool Application Configuration
1 F Number:                      F00000
2 Number of equipments:              1
3 Number of guns:                    1
4 Equipment type:      Variable Orifice
5 Bead shaping air:              DISABLE
6 Remote start:                  DISABLE
7 Automatic purge:               DISABLE
8 Bubble detect:                 DISABLE
9 Linear 2P calibration:         DISABLE
10 Channel 2 analog output:      DISABLE
11 AccuSeal advanced feature:    DISABLE
```

5 Move the cursor to the appropriate item and set it as desired. To use NEMO Pump, set Equipment type to NEMO Pump. You will see a screen similar to the following.

```
Seal Config CONTROLLED START MENUS
Dispense Tool Application Configuration
1 F Number:                      F00000
2 Number of equipments:              1
3 Number of guns:                    1
4 Equipment type:              NEMO PUMP
5 Bead shaping air:              DISABLE
6 Remote start:                  DISABLE
7 Automatic purge:               DISABLE
8 Bubble detect:                 DISABLE
9 Linear 2P calibration:         DISABLE
10 Channel 2 analog output:      DISABLE
11 AccuSeal advanced feature:    DISABLE
```

6 Perform a cold start.

8.5 SETTING UP NEMO PUMP INFORMATION

You must set up specific information about the NEMO Pump before you can use it. Table 8.5 lists and describes each NEMO Pump setup item.

Table 8.5 NEMO pump setup items

ITEM	DESCRIPTION
NEMO Pump motion*	ENABLE- The NEMO Pump will move during execution of dispensing instructions, SS, SE, or purging. DISABLE- The NEMO Pump will not move.
Prepress rate (%) default: 0.0 min: 0.0 max: 100.0	This item specifies the NEMO Pump speed during prepressure motion. This value is a percentage of the maximum motor speed.
Depress rate (%) default: 0.0 min: 0.0 max: 100.0	This item specifies the NEMO Pump speed during depressure motion. This value is a percentage of the maximum motor speed.
Volume per rev. (cc/rev) default: 0.0 min: 0.0 max: 99999.999	This item specifies the volume per one NEMO Pump revolution. This value is used to calculate the volume of dispensed material.
Gear ratio default: 0.0 min: 0.0 max: 99999.999	This item specifies the NEMO Pump revolution per motor revolution. This value is used to calculate the volume of dispensed material.
SS during depressure default: DISPENSE	This item specifies the NEMO Pump behavior when the dispense start instruction (SS) is executed during depressure motion. DISPENSE- The NEMO Pump will start dispensing. DEPR(STOP)- The NEMO Pump will continue depressure motion. SEAL-037 Depressure over SS (E#) will be posted and the robot will stop at the end of depressure motion. DEPR(WARN)- The NEMO Pump will continue depressure motion. SEAL-037 Depressure over SS (E#) (WARN) will be posted at the end of depressure motion.
OVR check for TCPP	ENABLE- If the continuous operation mode is selected, and if override isn't 100%, and if sealing program starts in wet mode with flow type of TCPP, then the alarm "SEAL-325 Override less than 100%" occur and execution of the program will be stopped. DISABLE- Override check isn't executed.
Controlled stop Disp.	ENABLE- The NEMO Pump will perform sealing during controlled stop section. (Refer to Section 8.10, "Sealing during controlled stop" for more information.) DISABLE- The NEMO Pump will not perform sealing during controlled stop section.

* To define a digital output for the machinelock status of the NEMO Pump, set $ISDVRCFG[n].$MLOCK_IO_I (n: equipment number) to a port number. This output is ON while the NEMO Pump is machinelocked.
To define a digital output for the ready status of the NEMO Pump, set $ISDVRCFG[n].$READY_IO_I (n: equipment number) to a port number. This output is ON while the NEMO Pump servo is ready or NEMO Pump motion is disabled.

Procedure 8-3 Setting Up NEMO Pump Information

> **NOTE**
> 1 If you have multiple equipment, you must set up equipment items for each one.
> 2 The values of all items except NEMO Pump motion and OVR check for TCPP will be backed up to a file, NEMOPUMP.VR.

Steps

1. Press MENUS.
2. Select SETUP**.**
3. Press F1, TYPE**.**
4. Select NEMO Pump. You will see a screen similar to the following.

> **NOTE**
> The equipment number displayed in this screen as EQ# may not correspond with E# on the title line.

```
SETUP NEMO Pump        E1        JOINT 100% EQ: 1                    1/8
1  NEMO Pump motion:        ENABLE
2  Prepress rate:          15.00 %
3  Depress rate:           10.00 %
4  Volume per rev.:        20.000 cc/rev
5  Gear ratio:              6.500
6  SS during depressure:    DISPENSE
7  OVR check for TCPP:      DISABLE
8  Controlled stop Disp.:   DISABLE
[TYPE]   DATA     STATUS                    >
                  EQUIP                     >
```

5. To select the number of the equipment you would like to set up
   a. Press NEXT, >.
   b. Press F3, EQUIP.
   c. Type the number of the equipment and press ENTER.
6. Select items and set them as desired.

8.6 SETTING UP SCHEDULE

You must set up the schedules before you can use the NEMO Pump.

Dispense Tool manipulates the NEMO Pump as follows,

- When the robot starts dispensing, the NEMO Pump rotates at the specified Prepress rate until the specified Prepress time expires.
- When the robot stops dispensing, the NEMO Pump rotates in reverse at the specified Depress rate until the specified Depress time expires.

Fig. 8.6 shows an example of the effects of Prepress time and Depress time.

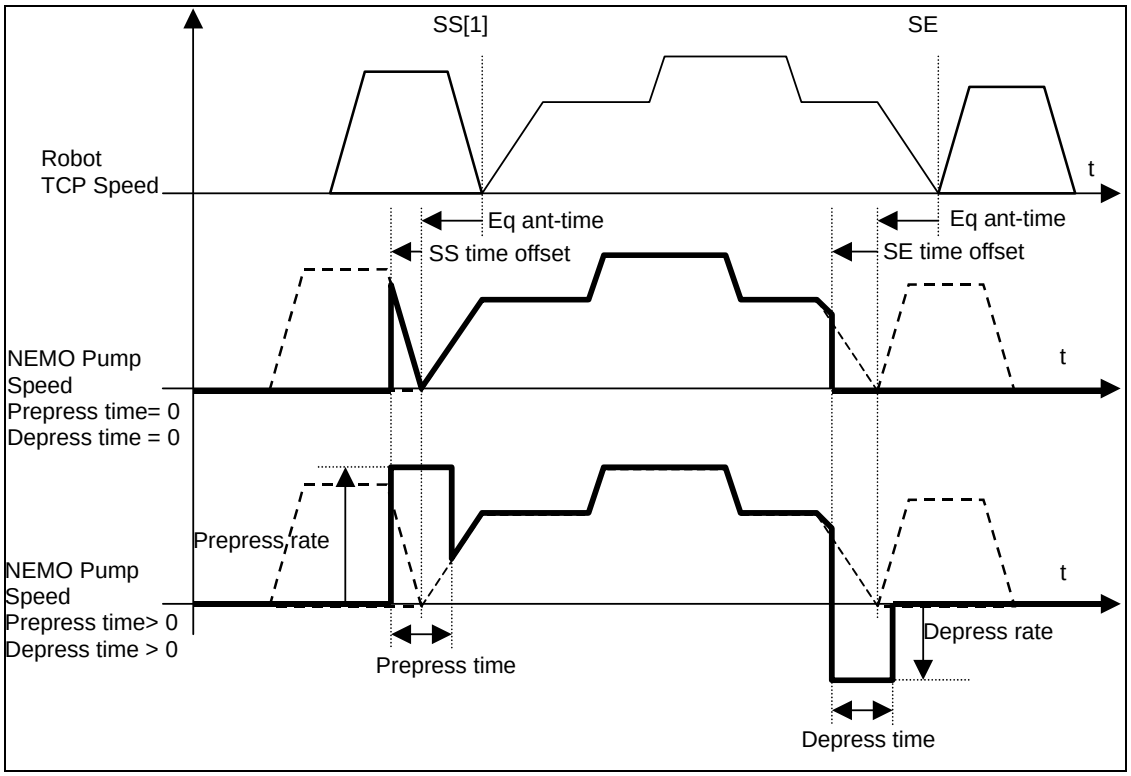


Fig.8.6 Effects of using prepress time and depress time

Table 8.6 lists and describes each schedule item.

Table 8.6 Schedule items

ITEM	DESCRIPTION
Prep.time (ms) default: 0 min: 0 max: 5000	This item specifies the time for prepressure motion of the NEMO Pump. When the robot starts dispensing, the NEMO Pump rotates at the specified Prepress rate until the specified Prep.time expires.
Depr.time (ms) default: 0 min: 0 max: 5000	This item specifies the time for depressure motion of the NEMO Pump. When the robot stops dispensing, the NEMO Pump rotates in reverse at the specified Depress rate until the specified Depr.time expires.

NOTE

1 The timing of NEMO Pump's movement is adjusted by "Equipment ant-time", "SS offset time", and "SE offset time". Please refer to Section 3.4 "Process Timing Protocols" for the effect of these items.

2 NEMO Pump's movement during controlled stop section is adjusted by "Controlled stop factor", "Controlled stop bias", and "Controlled stop min flow". Please refer to Section 8.10 "Sealing during controlled stop" for the effect of these items.

Procedure 8-4 Setting Up Schedules

NOTE
1 If you have multiple equipment, you must set up equipment items for each one.
2 The values of Prepressure time and Depressure time will be backed up to a file, NEMOPUMP.VR.

Steps

1. Press DATA.
2. Press F1, TYPE**.**
3. Select Seal Sched. You will see a screen similar to the following.

```
DATA Seal Sched       E1
NEMO Pump
Schd Vlue          Flow Type   Comment
1    10.0   mm    BW TCPP    FOUR DOOR LR
2      0.0   mm    BW TCPP
3      0.0   mm    BW TCPP
4      0.0   mm    BW TCPP
5      0.0   mm    BW TCPP
6      0.0   mm    BW TCPP
7      0.0   mm    BW TCPP
8      0.0   mm    BW TCPP
9      0.0   mm    BW TCPP
[TYPE]    DETAIL                          >
```

4. Press F2, DETAIL. You will see a screen similar to the following.

```
DATA Seal Sched       E1
NEMO Pump
1 Schedule #   1
2 Flow type:                TCPP Bead Width
3 Flow Model:                     LINEAR
4 Flow rate:                      0.00 mm
5 Equip. ant-time:                 0 ms
6 Eq. Additn ant-time:             0 ms
7 Prepressure time:                0 ms
8 Depressure time:                 0 ms
9 Correction factor:               1.0
10 Correction bias:                0.0
11 SS time offset:                 0 ms
12 SE time offset:                 0 ms
13 Controlled stop factor          1.00
14 Controlled stop bias            0.0 %
15 Controlled stop min flow        0.0%
[TYPE]   LISTING   SCHED                    >
```

5. Select items and set them as desired.
6. To return to the LISTING screen, press F2, LISTING.

8.7 NEMO PUMP STATUS

The NEMO Pump status screen displays the volume of dispensed material.

Table 8.7 lists and describes each status item.

Table 8.7 Status items

Item	Description
Volume dispensed (cc)	This item indicates the volume of dispensed material. The value is calculated using the following equation. Volume dispensed (cc) = Volume per rev. (cc/rev) * Gear ratio * Motor revolution (rev) Motor revolution is read from $ISDVR[n].$REV_COUNT (n: equipment number). To reset Volume dispensed, set $ISDVR[n].$ REV_COUNT to 0.
Volume per cycle (cc/cyc)	This item indicates the volume of dispensed material during the cycle. When UPDATEn.PC (n: equipment number) is executed, the value is updated using the following equiation. Volume per cycle (cc/cyc) = Volume dispensed (cc) at present − Volume dispensed (cc) at the previous UPDATEn.PC execution To measure the volume per cycle, insert a CALL instruction that calls UPDATEn.PC into the program.

Procedure 8-5 Displaying Status

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, TYPE.
4 Select NEMO Pump. You will see a screen similar to the following.

```
SETUP NEMO Pump      E1      JOINT 100%
 EQ: 1                                1/5
1  NEMO Pump motion:   ENABLE
2  Prepress rate:      15.00 %
3  Depress rate:       10.00 %
4  Volume per rev.:    20.000 cc/rev
5  Gear ratio:         6.500

[TYPE]   DATA   STATUS            >
                EQUIP             >
```

5 Press F3, STATUS. You will see a screen similar to the following.

NOTE
The equipment number displayed in this screen as EQ# may not correspond with E# on the title line.

```
SETUP NEMO Pump      E1      JOINT 100%
 EQ: 1

1 Volume dispensed:        572.01 cc
2 Volume per cycle:        124.02 cc/cyc

[TYPE]          SETUP              >
                EQUIP              >
```

6 To select the number of the equipment you would like to display
  a Press NEXT, >.
  b Press F3, EQUIP.
  c Type the number of the equipment and press ENTER.

8.8 RESETTING PULSECODER ALARMS

When you turn on the controller after disconnecting and reconnecting a process axis motor, you need to reset the serial pulsecoder. When this occurs, you will see a SRVO-062 BZAL (Group:0 Axis:n) and SRV0-075 Pulse not established (G:0 A:n) alarm, where "n" indicates the number of the process axis. Use Procedure 8-6 to reset these alarms

Procedure 8-6 Resetting Pulsecoder Alarms

Steps

1 Replace the ISD batteries with four new 1.5 volt alkaline batteries, size D. Observe the direction arrows in the battery box for proper orientation of the batteries.
2 Press MENUS.
3 Select SYSTEM.
4 Press F1, [TYPE].
5 Select Variables.
6 Move the cursor to $IS_MCR and press ENTER.
7 Move the cursor to $spc_reset.
8 Press the F4, TRUE, once.
The value will quickly go back to FALSE.

> ⚠ **CAUTION**
> Do not press RESET at this point. Otherwise, you will have to restart this procedure from Step 1.

9 Turn off the controller and then turn it on so that the new value can take effect.
10 If the SRVO-062 alarm is still present; there is a battery, cable or pulsecoder problem. Refer to FANUC Robot series R-30iA CONTROLLER MAINTENANCE MANUAL for further information.
11 If a SRVO-075 alarm is present, rotate each axis that lost battery power by at least one motor revolution using the gun purge procedure. Refer to Section 3.8 for information on the gun purge.

8.9 ERROR STATUS SUMMARY

This section describes the error status of the NEMO Pump.

The sequence of conditions that are monitored at all times is shown in Fig. 8.9 (a).

The following conditions are monitored at all times:
If the process axis is not machinelocked
  If the servo of the process axis is in error status
    Post error number 95007:
    "ISDT-007 Servo not READY (G:0 A:%d)" with WARN severity
  If the speed command to the process axis is exceeding the limit
    Post error number 95002:
    "ISDT-002 Motor speed limit (G:0 A:%d)" with WARN severity

Fig. 8.9 (a) Sequence of conditions that are monitored at all times

The sequence of conditions that are checked at each SS[] instruction is shown in Fig. 8.9 (b).

The following conditions are monitored at each SS[] instruction:
If the 1st SS is executed
  If the process axis is not machinelocked
    If the servo of the process axis is in error status
      Post error number 51056:
      "SEAL-056 Dispenser not ready (E%s)" with PAUSE severity

The schdule number used is larger than 50.
  Post error number 51038:
  "SEAL-038 Schedule number > 50 (E%d)" with WARN severity

Fig. 8.9 (b) Sequence of conditions that are checked at each SS[] instruction

8.10 SEALING DURING CONTROLLED STOP

If the program is paused during sealing, flow command is stopped at once and sealant supply is cut off. On the other hand, robot performs controlled stop motion, that is, robot drops its speed slowly and stops. So the point sealant supply stops and the point robot stops won't be the same, and sealant discontinuity occurs when program is restarted. To prevent this phenomenon, flow command according to controlled stop motion can be assigned by setting "Controlled stop Disp." as ENABLE. Table 8.10 lists and describes each configuration item to adjust sealing quality during controlled stop section.

Table 8.10 Status Items of sealing during controlled stop

Item	Description
Controlled stop factor default: 1.0 min: 0.01 max: 10.0	This item indicates the factor multiplied by flow command based on controlled stop motion. Please adjust this value when the flow during controlled stop section is not constant.
Controlled stop bias (%) default: 0 min: -99.9 max: 100.0	This item indicates the bias added to flow command based on controlled stop motion. Please adjust this value when you would like to totally increase or decrease the flow rate during controlled stop section.
Controlled stop min flow (%) default: 0 min: 0 max: 100.0	This item indicates the minimum flow rate during controlled stop section. Please adjust this value when you would like to secure minimal flow during controlled stop section.

Fig 8.10(a) shows flow rate when sealing during controlled stop isn't executed.

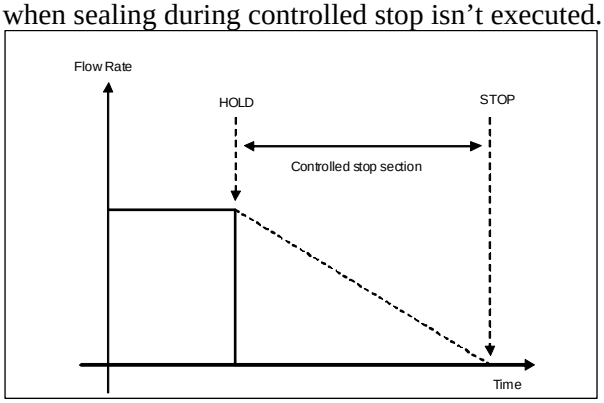


Fig. 8.10 (a) controlled stop section's flow rate when sealing during controlled stop is disabled

Fig 8.10(b) shows an example of effect of sealing during controlled stop parameters.

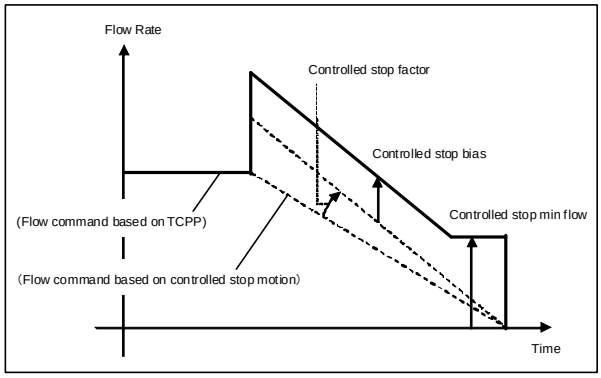


Fig. 8.10 (b) controlled stop section's flow rate when sealing during controlled stop is enabled

Procedure 8-7 Setting Up Sealing During Controlled Stop

Steps

1. Press MENUS.
2. Select SETUP.
3. Press F1, TYPE.
4. Select NEMO Pump. You will see a screen similar to the following.

```
SETUP NEMO Pump        E1        JOINT 100%
EQ: 1                                    1/8
1  NEMO Pump motion:          ENABLE
2  Prepress rate:               15.00 %
3  Depress rate:                10.00 %
4  Volume per rev.:          20.000 cc/rev
5  Gear ratio:                   6.500
6  SS during depressure:     DISPENSE
7  OVR check for TCPP:       DISABLE
8  Controlled stop Disp.:    DISABLE
[TYPE]   DATA     STATUS                  >
                  EQUIP                   >
```

5. Move the cursor to Controlled stop Disp. and press ENTER.
6. Press the F4, ENABLE.
7. Press DATA.
8. Press F1, TYPE.
9. Select Seal Sched. You will see a screen similar to the following.

```
DATA Seal Sched       E1
NEMO Pump
Schd Vlue          Flow Type   Comment
1     10.0   mm    BW TCPP     FOUR DOOR LR
2      0.0   mm    BW TCPP
3      0.0   mm    BW TCPP
4      0.0   mm    BW TCPP
5      0.0   mm    BW TCPP
6      0.0   mm    BW TCPP
7      0.0   mm    BW TCPP
8      0.0   mm    BW TCPP
9      0.0   mm    BW TCPP
[TYPE]   DETAIL                          >
```

10. Press F2, DETAIL. You will see a screen similar to the following.

```
DATA Seal Sched       E1
NEMO Pump
1 Schedule #   1
2 Flow type:                TCPP Bead Width
3 Flow Model:                     LINEAR
4 Flow rate:                    0.00 mm
5 Equip. ant-time:               0 ms
6 Eq. Additn ant-time:           0 ms
7 Prepressure time:              0 ms
8 Depressure time:               0 ms
9 Correction factor:             1.0
10 Correction bias:              0.0
11 SS time offset:               0 ms
12 SE time offset:               0 ms
13 Controlled stop factor:       1.00
14 Controlled stop bias:         0.0 %
15 Controlled stop min flow:     0.0 %
[TYPE]  LISTING  SCHED                    >
```

11. Select items and set them as desired.
12. To return to the LISTING screen, press F2, LISTING.

8.11 PROCEDURE TO ADJUST BEAD

In order to improve the quality of the bead dispensed by NEMO Pump, sealing schedule parameters should be adjusted. In this section, the way to adjust the parameter is explained according to Procedure 8-8. (Please refer to Section 3.3 and Section 8.6 for the setting method of each parameter.)

Procedure 8-8 Bead adjustment

NOTE
1 Robot's trajectory should be correct.
2 Calibration should be finished.
3 Preliminary pressure on sealing equipment should be correct.

Steps

1. Increase/decrease "flow rate" and adjust the bead width in the straight line section. When bead like Fig. 8.11(a) was got, increase "flow rate".

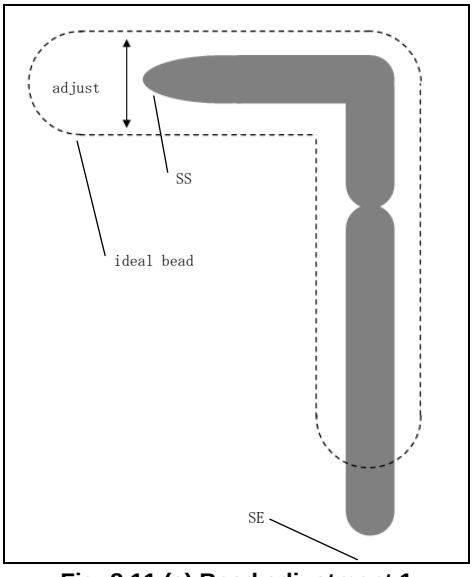


Fig. 8.11 (a) Bead adjustment 1

2. Increase/decrease “equip. ant-time” and adjust the position that corresponds to the curve section. When bead like Fig. 8.11(b) was got, increase “equip. ant-time”. (You can judge “the position that corresponds to the curve section” by checking unnatural bead around the curve.)

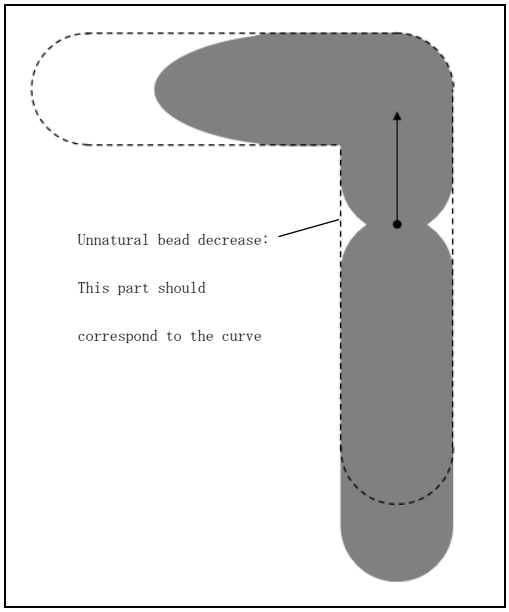


Fig. 8.11 (b) Bead adjustment 2

3. Increase/decrease “correction bias” and adjust the flow rate on the curve section. When bead like Fig. 8.11(c) was got, increase “correction bias”. (This value can be set to negative value.)

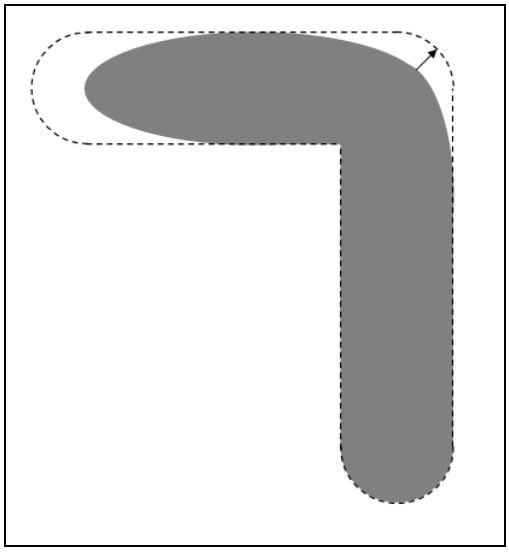


Fig. 8.11 (c) Bead adjustment 3

4. Increase/decrease “SS/SE time offset” and adjust the position of SS/SE. When bead like Fig. 8.11(d) was got, increase “SS time offset”.

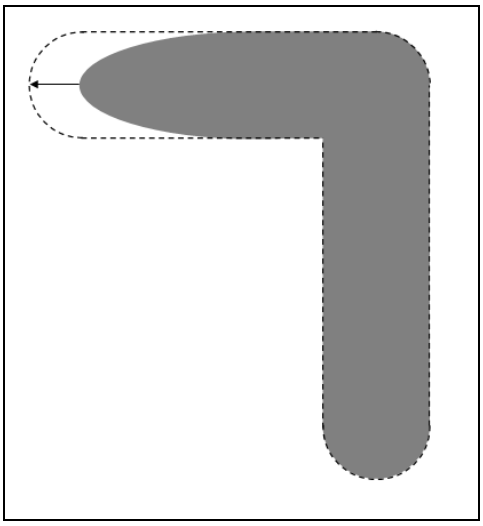


Fig. 8.11 (d) Bead adjustment 4

5. Increase/decrease “pre-pressure/de-pressure time” and adjust the flow rate on SS/SE. When bead like Fig. 8.11(d) was got, increase “pre-pressure time”.

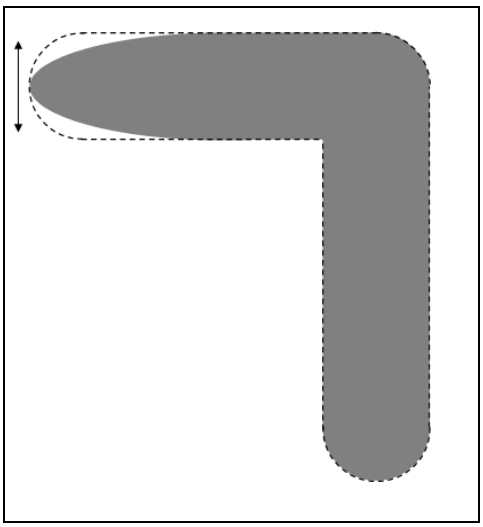


Fig. 8.11 (e) Bead adjustment 5

6. Please repeat the Step 1-5 until you can get the ideal bead like Fig. 8.11(f).

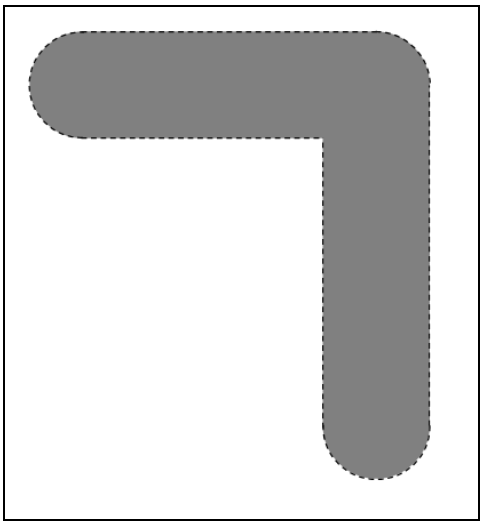


Fig. 8.11 (f) Bead adjustment 6

9 ISD GEAR METER

9.1 OVERVIEW

You must set up DispenseTool configuration, I/O, schedules, and equipment information for the kind of dispensing equipment you are using. After you have set up the equipment, you can perform manual functions.

NOTE
Chapter 3 “DISPENSETOOL COMMON SETUP” contains setup information and procedures you must perform to set up this equipment. Perform the setup procedures in Chapter 3 “DISPENSETOOL COMMON SETUP” in addition to the setup procedures in this chapter.

9.2 SETTING UP PROCESS AXES

Procedure 9-1 Setting Up Process Axes

You must set up specific information about the hardware before you can use the ISD equipment. The “Process axis” is used to control the ISD equipment.

Steps

1 Perform a controlled start.
2 Press MENUS.
3 Select MAINTENANCE. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
     ROBOT MAINTENANCE

2/10 Setup Robot System Variables
Group   Robot Library/Option        Ext Axes
     1      R-2000iB/165F               0
     0      Process Axis Control        0

[ TYPE ]    ORD NO    AUTO      MANUAL
```

4 Move the cursor to Process Axis Control.
5 Press F4, MANUAL.
.

```
Enter the total number of ISDT
axes to be installed (max 8):
```

6 Enter the number of process axes.

```
Enter the FSSB number (from 1 to 3)
on which ISDT axis 1 is installed:
```

7 Enter the FSSB number.

```
Valid Hardware axis number are
from 1 to 16

Enter the hardware axis number
for ISDT axis 1:
```

8 Enter the hardware axis number.

```
Save ISDTCFG.DT?
Enter (1:Yes, 0:No)
```

9 Enter 1.

NOTE
To set up multiple process axes, please set up FSSB number and hardware axis number for each process axis.

```
*** Group 0 Proc Axis Installation ***

1. Display/Modify Proc axis 1~1
2. Add Proc axes
3. Delete Proc axes
4. EXIT
```

10 Select Add Proc axes.
11 Set each item. Table 9.2(a) shows an example of Process Axes Setup.

Table 9.2(a) Example of process axes setup

ITEM	DESCRIPTION
Enter axes to add?	Process Axis Number to add
MOTOR SIZE	84: β is1 (See the specification of the motor.)
MOTOR TYPE	13: 6000 (See the specification of the motor.)
CURRENT LIMIT FOR AMPLIFIER	10: 20A (See the specification of the amplifier.)
CURRENT LIMIT FOR MOTOR	10: 20A (See the specification of the motor.)
AMPLIFIRE NUMBER	2
AMPLIFIRE TYPE	2
GEAR RATIO	1 *
MAX JOINT SPEED SETTING	1: Default
MOTOR DIRECTION	1: TRUE **
EXP_ACCEL TIME	2: No Change
LOAD RATIO	1
Brake Number	2 ***

* GEAR RATIO must be set to 1.

** MOTOR DIRECTION must be set to 1:TRUE.
*** If you would like to use the robot brakes to control the ISD equipment, you must set BRAKE SETTING to 2 or larger.

NOTE
To use multiple ISD Equipments, repeat procedure from Step10 to Step11.

12 After setting Process axes, select EXIT. You will see a screen similar to the following.

```
Save ISDT.DT?

Enter (1:Yes, 0:No)
```

13 Enter 1.
14 Press MENUS.
15 Select Seal Config. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
                                          4/13
 DispenseTool Application Configuration
                    EQ: 1
  1 F Number:                      F00000
  2 Number of equipment:             1
  3 Number of guns:                  1
  4 Equipment type: ISD SERVO DISPENSER
        - ISD type: GEAR METER
  5     - ISD Number:                1
  6 Beadshaping/Atomizing Air: DISABLE
  7 Remote start:                  DISABLE
  8 Automatic purge:               DISABLE
Press FCTN then START (COLD) when done.
[ TYPE ]            EQUIP [CHOICE]          >
```

16 Press NEXT.
17 Press F2, ProcCFG. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
 Multiple Process Axes Mapping       1/9
 Total available proc-axis number: 1

Proc Number      Servo Type     Servo Number
=======================================
  1 Axis #1:    N/A                  0
  2 Axis #2:    N/A                  0
  3 Axis #3:    N/A                  0
  4 Axis #4:    N/A                  0
  5 Axis #5:    N/A                  0
  6 Axis #6:    N/A                  0
  7 Axis #7:    N/A                  0

[ TYPE ]                  [CHOICE]   DONE >
```

18 Move the cursor to the process axis number that was set at Step 11.

19 Press F4 [CHOICE].
20 Select ELECTRIC.
21 Press F5, DONE. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
 Setting up number information        1/4


  1 F Number:                        F00000
  2 Max equipment number:             1
  3 Total ISD number:                  1
  4 of which # of Dual ISD:           0


[ TYPE ]                                DONE
```

22 Set each item following the Table 9.2(b).

Table 9.2(b) Setting up number information

ITEM	DESCRIPTION
Max equipment number	Enter Total equipment number including both ISD and other equipments.
Total ISD number	Enter Total ISD equipment number.
of which # of Dual ISD	This item is for ISD Dual meter option.

23 Press F5, DONE.
24 Press MENUS.
25 Select ISD Config. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
ISD Config
Integral Servo Dispenser Config      1/16
      Total number of ISD:           1

  1 ISD #1 Dispenser Type: UNINIT
  2          Servo Type:        UNINIT
  3          Axis Number:       0
  4          Use 2K:             NO
  5 ISD #2 Dispenser Type: UNINIT
  6          Servo Type:        UNINIT
  7          Axis Number:       0
  8          Use 2K:             NO


[ TYPE ]                    [CHOICE]
```

26 Set up the ISD Configuration following Table 9.2(c).

Table 9.2(c) Setting up ISD configuration

ITEM	DESCRIPTION
Dispenser Type	The type of ISD equipment. Select GEAR METER
Servo Type	Select ELECTRIC.

ITEM	DESCRIPTION
Axis Number	Enter the value set at Step 11.
Use 2k (*)	If you enable Use 2k, select YES.

* Use 2k is applied for the system whose 1 process axes drive 2 meter. Usually, 2 different type of material are supplied for those 2 meters and they are mixed at dispense. If Use 2k is enabled, You must set additional items for Setting up Dispense Information (Section 9.5).

9.3 SETTING UP DISPENSE CONFIGURATION

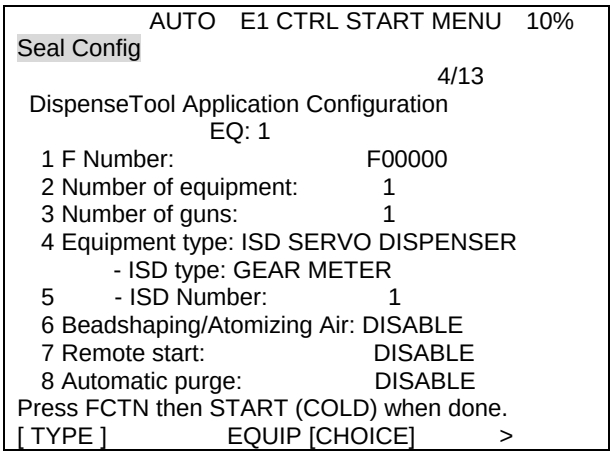
You must set up the configuration of DispenseTool to use ISD Gear Meter as Table 9.3.

Table 9.3 Setting up dispense configuration

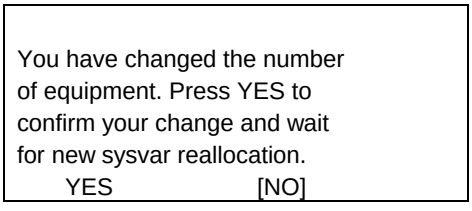
ITEM	DESCRIPTION
Number of equipment Default:1 Min: 1 Max: 5	The total number of Dispense equipments
Equipment type Default: Vari[able]Orifice	The type of equipments.

Procedure 9-2 Setting up DispenseTool Configuration

1 Perform a controlled start.
2 Press MENU key.
3 Select [Seal Config] and you will see Dispense Configuration screen as below.



4 Move the cursor to the appropriate item and set it as desired.
5 To change the number of equipments, move the cursor to “Number of Equipment.”
6 Press ENTER key and following message is displayed.



7 If you are sure that you would like to change the number of equipments, move the cursor to “YES” and press ENTER key.

NOTE
You can configure multiple equipment of different types if you type a value larger than 1.

8 To select a specific piece of equipment, press F3, [EQUIP], and type the number of the piece of equipment. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
SealConfig
                                          1/9
 DispenseTool Application Configuration
                    Eq: 2
  1 Number of guns:              1
  2 Equipment type: VARI ORIFICE
        - ISD type: N/A
  3     - ISD Number:            0
  4 Beadshaping/Atomizing Air: DISABLE
  5 Remote start:              DISABLE
  6 Automatic purge:           DISABLE
  7 Bubble detected:           DISABLE
  8 Linear 2P calibration:     DISABLE

[ TYPE ]          EQUIP                 >
```

9 Move the cursor to the appropriate item and set it as desired. To use ISD, set Equipment type to ISD SERVO DISPENSER.

9.4 SETTING UP ISD I/O

You must set up I/O to enable the dispensing equipment in your system to work with the Integral Servo Dispenser system. The Integral Servo Dispenser uses I/O unit Model A. Table 9.4 (a) lists and describes the ISD inputs you can set. Table 9.4 (b) lists and describes the ISD outputs you can set.

NOTE
1 The initial I/O setup you see on the I/O screens is the default I/O setup. To minimize installation setup, use this default I/O setup.
2 For safety reasons, the default values for the indexes of all I/O ports are zero. Be sure to set the indexes to the appropriate values before using the system.

Use Procedure 9-3 to set up DispenseTool equipment I/O.

Table 9.4 (a) Integral servo dispenser inputs

ITEM	DESCRIPTION
Dispense Pressure Analog Input	This input is connected to the pressure transducer that measures the dispensing pressure.
Supply Pressure Analog Input	This input is connected to the pressure transducer that measures the supply pressure.

Table 9.4 (b) Integral servo dispenser outputs

ITEM	DESCRIPTION
ISD Valve A Digital output	This output is used to control the valves for the metering device. This output is controlled by the system according to the current meter operation mode.
ISD Valve B Digital output	This output is used to control the valves for the metering device. This output is controlled by the system according to the current meter operation mode.
ISD Status Group output	16 bit output indicates the status of the ISD system. The bits in this group output are defined as follows: • Bit 0 DISPENSER READY (1:READY TO DISPENSE) • Bit 1 METER EMPTY (1: METER REACHED STROKE LIMIT) • Bit 2 PREPRESSURE (1: PREPRESSURE IS IN PROGRESS, 0:COMPLETE) • Bit 3 SUPPLY HIGH PRESSURE (1: HIGH PRESSURE, 0: NORMAL) • Bit 4 SUPPLY LOW PRESSURE (1:LOW PRESSURE, 0: NORMAL) • Bit 5 DISPENSE HIGH PRESSURE (1: HIGH PRESSURE, 0: NORMAL) • Bit 6 DISPENSE LOW PRESSURE (1: LOW PRESSURE, 0: NORMAL) • Bit 7 METER DIRECTION (1: POSITIVE, 0: NEGATIVE) • Bit 8 VALVE1 (1: ON, 0: OFF) • Bit 9 VALVE2 (1: ON, 0: OFF) • Bit 10 VALVE3 (1: ON, 0: OFF) • Bit 11 VALVE4 (1: ON, 0: OFF) • Bit 12 OTA (1: OT, 0: NORMAL) • Bit 13 OTB (1: OT, 0: NORMAL) • Bit 14 ISD LOCKED (1:LOCKED, 0:NORMAL) • Bit 15 RESERVED
ISD Mode Group output	4 bit output indicates the current ISD operation mode as its binary value. The values are defined as follows: 1. Error mode 2. Relieve mode 3. Pre-pressure mode 4. Dispensing mode 5. Bypass mode 6. Jog mode 7. Wait for reload complete (single acting meter only) 8. Sleep mode
Meter Position Group output Default: 0	Reserved. Please set to 0.
Dispense Pressure Group output Units: psi	This output indicates the current dispense pressure value.
Supply Pressure Group output Units: psi	This output indicates the current supply pressure value.
Volume Dispensed Group output Units: cc	16bit output indicates the accumulative material volume dispensed. Units are in cc. This output reflects the value of the system variable $ISD_WORK[eq_n].$volume_disp, and the value can be set to zero by clearing the system variable.

ITEM	DESCRIPTION
ALC Bypass Digital output	The system continuously copies the value of $isd_work[#].$alc_bypass system variable into this output (where # indicates the equipment number) while ISD meter motion is DISABLED in the test cycle menu. This feature is to be used for customization purposes.

Procedure 9-3 Setting Up ISD I/O

Note this procedure contains information about setting up ISD I/O only. For information about configuring, forcing, verifying, and simulating analog, digital, and group signals, refer to Basic Operation manual's (B-83284EN) Chapter 3.

Steps

1 Press MENU key.
2 Select [I/O].
3 Press F1, [TYPE].
4 Select ISD. You will see either the input or output screen. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.

```
                          AUTO   E1 JOINT 10%
ISD INPUT          E1
ISD GEAR METER
NAME            IN PT   SIM VALUE
1 Dispense Pressure: AI[ 0]   *     ***
2 Supply Pressure:   AI[ 0]   *     ***




[ TYPE ] DETAIL   IN/OUT   [CHOICE]     >
```

5 To change between the input and output screens, press F3, [IN/OUT]. You will see a screen similar to the following.

```
                          AUTO   E1 JOINT 10%
ISD OUTPUT
ISD GEAR METER
NAME                  OUT PT SIM VALUE
1 ISD valve A:          DO[ 2] *     ***
2 ISD valve B:          DO[ 0] *     ***
3 ISD status:           GO[ 0] *     ***
4 ISD mode:               GO[ 0] *     ***
5 Meter Position:       GO[ 0] *     ***
6 Dispense Pressure: GO[ 0] *     ***
7 Supply Pressure:    GO[ 0] *     ***
8 Volume Dispensed:   GO[ 0] *     ***
9 ALC bypass:           DO[ 0] *     ***

[ TYPE ] DETAIL   IN/OUT   [CHOICE]     >
```

6 Select each item and set it as desired.

9.5 SETTING UP EQUIPMENT INFORMATION

You must set up specific information about the dispensing equipment before you can use it. Equipment setup requires you to set up specific items and to perform specific calibration procedures. Table 9.5 lists and describes each equipment setup item. The items you must set up might vary depending on the way your system is set up.

NOTE
Use Procedure 3-3 to set up equipment items.

You might also need to perform the following calibration procedures to set up your dispensing equipment, depending on the way your system is set up:

- Maximum meter speed calibration
- Bead shaping air calibration - only if bead shaping air is used
- Flow rate control calibration

Table 9.5 Equipment setup items

ITEM	DESCRIPTION
Material Factor default: 1.00 min: 0.01 max: 10.00	This item is the scale factor used in computing flow control (analog output). It can be changed as material viscosity and temperature changes.
Minimum Flow Rate default: 0 % min: 0 % max: 100 %	This item is the minimum flow command voltage that will be sent to the dispensing equipment while sealing. If the requested flow rate specified in the current Seal Schedule ever goes below the Minimum Flow Rate, the Minimum Flow Rate will be sent to the dispensing equipment.
Bead Shaping Factor* default: 1.00 min: 0.01 max: 10.00	This item is the scale factor used in computing the bead shaping air signal.
Bead Shaping Air AOUT Type* values: Volts, Current default: Volts	This item is the type of analog output: — Volts - Type II output - range 0-10 volts — Current - Type III output - range 1-5 volts
Bead Shaping Max Out* default: 10.00 V range: 0.00 V to 10.00 V	This item sets the maximum analog voltage for bead shaping for the dispensing equipment. If the intended analog voltage exceeds this value, then an alarm will occur. Maximum voltage will not exceed this value.
Supply Max. Pressure default: 1500 psi min: 0 psi max: 9000 psi	This item sets the maximum supply A pressure for the dispensing equipment. If the pressure exceeds this value, an alarm will occur. If two-part material is used, this item is indicated as Supply Max. Press. (Mat - 1).
Supply Min. Pressure default: 0 psi min: 0 psi max: 4000 psi	This item sets the minimum supply A pressure for the dispensing equipment. If the pressure falls below this value, an alarm will occur. If two-part material is used, this item is indicated as Supply Min. Press. (Mat - 1).
Supply Max. Press (Mat- 2) ** default: 2000 psi min: 0 psi max: 9000 psi	This sets the maximum supply pressure for the material number 2. If the pressure exceeds this value, an alarm will occur. This item is effective only when two-part material is used

ITEM	DESCRIPTION
Supply Min. Press (Mat- 2) ** default: 0 psi min: 0 psi max: 4000 psi	This sets the minimum supply pressure for the material number 2. If the pressure falls below this value, an alarm will occur. This item is effective only when two-part material is used.
Dispense Max. Pressure default: 1500 psi min: 0 psi max: 9000 psi	This item sets the maximum dispense A pressure for the dispensing equipment. If the pressure exceeds this value, an alarm will occur. If two-part material is used, this item is indicated as Dispense Max. Press. (Mat - 1).
Dispense Min. Pressure default: 0 psi min: 0 psi max: 4000 psi	This item sets the minimum dispense A pressure for the dispensing equipment. If the pressure falls below this value, an alarm will occur. If two-part material is used, this item is indicated as Dispense Min. Press. (Mat - 1).
High Pressure Time Out default: 0 ms min: 0 ms max: 90000 ms	This item specifies the amount of time high pressure can be sustained before an alarm occurs.
Low Pressure Time Out default: 0 ms min: 0 ms max: 90000 ms	This item specifies the amount of time low pressure can be sustained before an alarm occurs.
Maximum Analog Output(Air)* default: 10.0 V min: 0.0 V max: 10.0 V	This item sets the maximum analog voltage for atomizing air for the dispensing equipment. If the intended analog voltage exceeds this value, an alarm will occur. Maximum voltage will not exceed this value.
Power Up Pressure default: 500 psi min: 0 psi max: 9000 psi	This item sets the pre-pressure value after the controller is turned on.
Use default ACC default: DISABLE	This item enables and disables the use of the Default ACC feature. If enabled, all motion instructions without the explicit ACC clause will use the De fault ACC value.
Default ACC default: 20 range: 0 – 150	This item is the value used for all motion instructions that do not have an explicit ACC clause specified when enabled.
Guns Used in Calibration default: INCOMPLETE min: 1 max: 6	This item specifies the guns that Dispense Tool will use in equipment calibrations. Up to six guns can be used. Guns can be used only if they have been defined during Dispense Tool configuration. Refer to Section 3.1. The Gun Selection for Calibrations item displays the status of the six possible guns using a six-character expression. The first character represents gun 1, the second character represents gun 2, the third character represents gun 3, and so on. If a gun has not been defined, it is represented by a *. You cannot change the value of a gun that has not been defined. To define the gun, refer to Section 3.1. If a gun has been defined, you can specify whether it will be used during calibration: — The gun number indicates that the gun will be used. — The minus symbol, "- ", indicates that the gun will not be used. To change the value of a gun that has been defined, use the appropriate function keys.
Meter Max Speed	Refer to Section 3.6.4 for information on how to calibrate the meter maximum speed.

ITEM	DESCRIPTION
Flow Rate Control	Refer to Section 3.6.2 for information on how to calibrate the flow rate control.
Beadshaping cmd.	Refer to Section 3.6.3 for information on how to calibrate the bead shaping air pressure.

* Displayed if bead shaping air is used.
** Displayed if two part material is used. Two part material is set at Setting Up Process Axes (Section 9.2)

9.6 SETTING UP ISD INFORMATION

You must set up specific information about the Integral Servo Dispenser (ISD) in addition to the equipment setup. ISD setup requires you to set up specific items and to perform specific calibration procedures. Table 9.6 lists and describes each ISD setup item. The items you must set up vary depending on the way your system is configured. You might also need to perform the following calibration procedure to set up the ISD, depending on the way your system is set up.

Table 9.6 Equipment setup items

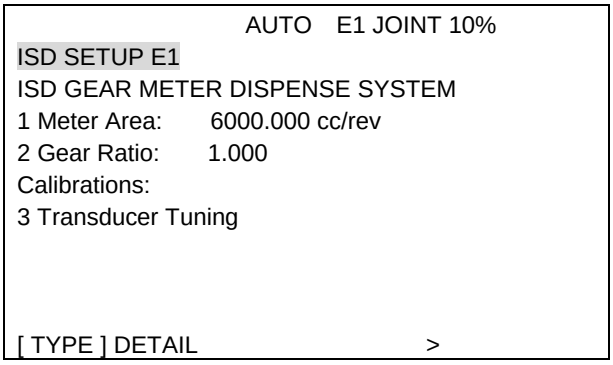
ITEM	DESCRIPTION
Meter Area default: 600 000cc/rev min: -6000 000cc/rev max: 6000.000 cc/rev	This item is used to calculate the volume of dispensed material. The definition of this value is volume (cc) per one gear pump revolution.
Gear Ratio default: 2.431 min: -6000.000 max: 6000.000	This item specifies the motor-to-pump reduction ratio. This indicates the gear pump revolution per motor revolution. This value is used to calculate the volume of dispensed material.
Transducer Tuning	Refer to Section 9.7 for information on fine tuning pressure transducers.

Use Procedure 9-4 to set up equipment items.

Procedure 9-4 Setting Up Integral Servo Dispenser Items

Steps

1 Press MENU key.
2 Select [SETUP].
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.



5 To select the equipment number,
   a Check the currently selected equipment number. The equipment number is displayed to the right of the screen name as E# , where # is the equipment number. If the number displayed is the desirable equipment number, go to Step 6.
   b Press NEXT, >.
   c Press F3, [EQUIP].
   d Type the number of the equipment and press ENTER key.
6 Select each of the items and set them as desired.
7 To display detailed information about calibration, move the cursor to the calibration and press F2, [DETAIL]. Refer to Section 9.7 for information on fine tuning pressure transducers.
8 After all items have been set, turn off the controller and then turn it on again.

9.7 ISD TRANSDUCER FINE TUNING

Transducer tuning is a procedure used by the ISD system to identify the relationship between the analog input reading from the transducers and the material pressure value. You need to set the current and pressure values at both a high and a low point. The system will then calculate the material pressure value based on the transducer current reading. Sometimes, fine tuning the transducers is necessary due to tolerances in the data sheet, changes due to age, and so forth. The ISD Transducer Tuning menu also allows you to further adjust the transducer characteristics based on actual gauge readings. Refer to Table 9.7 (a) for information on ISD transducer tuning methods.

Table 9.7 (a) ISD transducer tuning methods

If you would like to	Use	Description
Use the transducer data sheet provided by the manufacturer to tune the transducer	Procedure 9-5	Use this method when the system is installed initially, where transducer characteristics are known and stable.
Use the actual pressure and current readings to tune the transducer	Procedure 9-6	Use this method when a transducer has been used for a long time and you believe its characteristics have drifted away from the original settings.

Table 9.7 (b) lists and describes the ISD transducer tuning items that you must set up for each transducer in your system.

Table 9.7 (b) ISD Transducer tuning setup items

ITEM	DESCRIPTION
Pressure Setpoint units: psi	This item displays the current pressure setpoint value.
Current ISD Mode	This item indicates the current operation mode of the ISD: • ERROR • RELIEVE • PREPRESSURE • REPOSITION • DISPENSE • BYPASS • JOG

ITEM	DESCRIPTION
Analog Input Status units: mA and psi	This item displays the current value and the measured psi value for each transducer. Use this item to make sure that you are looking at the correct transducer and that the calculated psi value matches that of the pressure gauge reading after tuning.
Calib (Low) units: mA at psi default: 7.00 mA at 1000 psi	This item displays the transducer current value in mA at a known low pressure value. By linearly interpolating and extrapolating, the system measures the material pressure value from the transducer reading.
Calib (High) units: mA at psi default: 10.00 mA at 2000 psi	This item displays the transducer current value in mA at a known high pressure value. By linearly interpolating and extrapolating, the system measures the material pressure value from the transducer reading.

Procedure 9-5 Transducer Tuning Using a Data Sheet

Conditions

- You have the transducer data sheet provided by your transducer manufacturer.
- The system is equipped with a pressure gauge.
- The "Pressure A" and "Pressure B" items on the ISD INPUT screen have been set correctly. (Procedure 9-3)

Steps

1 Press MENU key.
2 Select [SETUP].
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.

```
                                AUTO   E1 JOINT 10%
ISD SETUP         E1
ISD GEAR METER DISPENSE SYSTEM
1 Meter Area:          600.000 cc/rev
2 Gear Ratio:            1.200
Calibrations:
3 Transducer Tuning



[ TYPE ]   DETAIL                              >
```

5 Move the cursor to Transducer Tuning and press F2, [DETAIL]. You will see a screen similar to the following.

```
                                AUTO   E1 JOINT 10%
ISD SETUP E1
ISD TRANSDUCER TUNING
  1 Pressure setpoint: 1000.00psi
  Current ISD mode: PREPRESSUR
Transducer A
  (AI[1] = 7.32mA,     1100 psi measured)
  2 Calib (Low):         7.00mA at 1000psi
  3 Calib (High):       10.00mA at 2000psi
Transducer B
  (AI[2] = 10.13mA,     2050psi measured)
  4 Calib (Low):         7.00mA at 1000psi
  5 Calib (High):       10.00mA at 2000psi

[ TYPE ] LISTING                    USE Ain >
```

6 Move the cursor to Calib (Low) for the appropriate kind of transducer (either Transducer A or B).
   a Move the cursor over to mA and type in the mA value according to your data sheet.
   b Move the cursor over to psi and type in the psi value according to your data sheet.
7 Move the cursor to Calib (High) for the appropriate kind of transducer (either Transducer A or B).
   a Move the cursor over to mA and type in the mA value according to your data sheet.
   b Move the cursor over to psi and type in the psi value according to your data sheet.
8 Repeat Step 6 and Step 7 for all transducers in your system. The transducer characteristics are now updated and become effective immediately.

Procedure 9-6 Transducer Tuning Using Actual Pressure and Current Readings

Conditions

- The system is equipped with a pressure gauge.
- The "Pressure A" and "Pressure B" items on the ISD INPUT screen have been set correctly. (Procedure 9-3)
- You have reset any pulse coder alarms. (Procedure 9-7)

Steps

1 Press MENU key.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.

```
                                AUTO   E1 JOINT 10%
ISD SETUP E1
ISD GEAR METER DISPENSE SYSTEM
1 Meter Area:          600.000 cc/rev
2 Gear Ratio:            1.200
Calibrations:
3 Transducer Tuning



[ TYPE ]   DETAIL                              >
```

5 Move the cursor to Transducer Tuning and press F2,[DETAIL]. You will see a screen similar to the following.

```
                                AUTO   E1 JOINT 10%
ISD SETUP E1
ISD TRANSDUCER TUNING
1 Pressure setpoint: 1000.00psi
Current ISD mode: PREPRESSUR
Transducer A
(AI[1] = 7.32mA, 1100 psi measured)
2 Calib (Low): 7.00mA at 1000psi
3 Calib (High): 10.00mA at 2000psi
Transducer B
(AI[2] = 10.13mA, 2050psi measured)
4 Calib (Low): 7.00mA at 1000psi
5 Calib (High): 10.00mA at 2000psi

[ TYPE ] LISTING                    USE Ain >
```

6 Set the material pressure to a low pressure value, close to the lowest pressure range:
   • If it is a supply pressure, adjust it at the supply pump.

- If it is a dispense pressure, adjust it by moving the cursor to Pressure setpoint, type in a low value, and press ENTER.

NOTE
If you are adjusting the dispense pressure, make sure that Current ISD mode is set to PREPRESSUR. If it is not set to PREPRESSUR, you can change it by executing the PREPRESSURE macro.

7 Measure the actual pressure value from the pressure gauge.
8 Move the cursor to Calib (Low) for the appropriate transducer (either Transducer A or B).
  a Move the cursor over to psi and type in the actual psi value that you just measured.
  b Move the cursor over to mA. Press and hold the SHIFT key and press F5, [Use AIN], to obtain the current mA value from the analog input.
9 Set the material pressure to a high value:
  - If it is a supply pressure, adjust it at the supply pump.
  - If it is a dispense pressure, adjust it by moving the cursor to Pressure setpoint, type in a high value, and press ENTER key.

NOTE
If you are adjusting the dispense pressure, make sure that Current ISD mode is set to PREPRESSUR.

10 Measure the actual pressure value from the pressure gauge.
11 Move the cursor to Calib (High) for the appropriate transducer (either Transducer A or B).
  a Move the cursor over to psi and type in the actual psi value that you just measured.
  b Move the cursor over to mA. Press and hold the SHIFT key and press F5, [Use AIN], to obtain the current mA value from the analog input.
12 Repeat Step 6 through Step 11 for all transducers in your system.
  The transducer characteristics are now calibrated and become effective immediately.

Resetting ISD Pulsecoder Alarms

When you turn on the ISD after disconnecting and reconnecting a process axis motor, you need to reset the serial pulsecoder. When this occurs, you will see a SRVO-062 BZAL (Group:0 Axis:n) and SRV0-075 Pulse not established (G:0 A:n) alarm, where "n" indicates the number of the process axis.
Use Procedure 9-7 to reset these alarms and prepare the ISD for mastering.

Procedure 9-7 Resetting ISD Pulsecoder Alarms

Conditions

- You see a SRVO-062 BZAL (Group:0 Axis:n) and SRVO-075 Pulse not established (G:0 A:n) alarm.

Steps

1 Replace the ISD batteries with four new 1.5 volt alkaline batteries, size D. Observe the direction arrows in the battery box for proper orientation of the batteries.
2 Press MENU key.
3 Select SYSTEM.
4 Press F1, [TYPE].
5 Select Variables.
6 Move the cursor to $IS_MCR and press ENTER.
7 Move the cursor to $spc_reset.
8 Press the F4, [TRUE], once.

The value will quickly go back to FALSE.

⚠CAUTION
Do not press RESET at this point. Otherwise, you will have to restart this procedure from Step 1.

9 Turn off the controller and then turn it on so that the new value can take effect.
10 If the SRVO-062 alarm is still present, there is a battery, cable or pulse coder problem. Refer to the FANUC Robotics SYSTEM R-30iA Controller Series Electrical Connection and Maintenance Manual for further information.
11 If a SRVO-075 alarm is present, reset it as follows. It is not necessary to perform a Cold start after resetting the alarm.

NOTE
Rotate each axis that lost battery power by at least one motor revolution in either direction.

10 ISD SINGLE ACTING METER

10.1 OVERVIEW

You must set up DispenseTool configuration, I/O, schedules, and equipment information for the kind of dispensing equipment you are using. This chapter describes how to set up this information for ISD Single Acting Shot Meter dispensing equipment. After you have set up the equipment, you can perform manual functions.

NOTE
Perform the setup procedures Chapter 3 DISPENSETOOL COMMON SETUP in addition to the setup procedures in this chapter.

10.2 SETTING UP PROCESS AXES

Procedure 10-1 Setting Up Process Axes

You must set up specific information about the hardware before you can use the ISD equipment. The "Process axis" is used to control the ISD equipment.

Steps

1 Perform a controlled start.
2 Press MENUS.
3 Select MAINTENANCE. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
     ROBOT MAINTENANCE

2/10 Setup Robot System Variables
Group   Robot Library/Option       Ext Axes
    1     R-2000iB/165F               0
    0     Process Axis Control        0

[ TYPE ]   ORD NO    AUTO     MANUAL
```

4 Move the cursor to Process Axis Control.
5 Press F4, MANUAL.

```
Enter the total number of ISDT
axes to be installed (max 8):
```

6 Enter the number of process axes.

```
Enter the FSSB number (from 1 to 3)
on which ISDT axis 1 is installed:
```

7 Enter the FSSB number.

```
Valid Hardware axis number are
from 1 to 16

Enter the hardware axis number
for ISDT axis 1:
```

8 Enter the hardware axis number.

```
Save ISDTCFG.DT?
Enter (1:Yes, 0:No)
```

9 Enter 1.

NOTE
To set up multiple process axes, please set up FSSB number and hardware axis number for each process axis.

```
*** Group 0 Proc Axis Installation ***

1. Display/Modify Proc axis 1~1
2. Add Proc axes
3. Delete Proc axes
4. EXIT
```

10 Select Add Proc axes.
11 Set each item. Table 10.2(a) shows an example of Process Axes Setup.

Table 10.2(a) Example of process axes setup

ITEM	DESCRIPTION
Enter axes to add?	Process Axis Number to add
MOTOR SIZE	84: β is1 (See the specification of the Motor.)
MOTOR TYPE	13: 6000 (See the specification of the Motor.)
CURRENT LIMIT FOR AMPLIFIER	10: 20A (See the specification of the Amplifier.)
CURRENT LIMIT FOR MOTOR	10: 20A (See the specification of the Motor.)
AMPLIFIRE NUMBER	2
AMPLIFIRE TYPE	2
GEAR RATIO	1 *
MAX JOINT SPEED SETTING	1: Default
MOTOR DIRECTION	1: TRUE **
EXP_ACCEL TIME	2: No Change
LOAD RATIO	1
Brake Number	2 ***

* GEAR RATIO must be set to 1.
** MOTOR DIRECTION must be set to 1:TRUE.

*** If you would like to use the robot brakes to control the ISD equipment, you must set BRAKE SETTING to 2 or larger.

NOTE
To use multiple ISD Equipments, repeat procedure from Step10 to Step11.

12 After setting Process axes, select EXIT. You will see a screen similar to the following.

```
Save ISDT.DT?

Enter (1:Yes, 0:No)
```

13 Enter 1.
14 Press MENUS.
15 Select Seal Config. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
                                            4/13
 DispenseTool Application Configuration
                    EQ: 1
  1 F Number:                      F00000
  2 Number of equipment:             1
  3 Number of guns:                  1
  4 Equipment type: ISD SERVO DISPENSER
          - ISD type: GEAR METER
  5       - ISD Number:              1
  6 Beadshaping/Atomizing Air: DISABLE
  7 Remote start:                  DISABLE
  8 Automatic purge:               DISABLE
Press FCTN then START (COLD) when done.
[ TYPE ]              EQUIP [CHOICE]          >
```

16 Press NEXT.
17 Press F2, ProcCFG. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
 Multiple Process Axes Mapping       1/9
 Total available proc-axis number: 1

Proc Number      Servo Type     Servo Number
=======================================
  1 Axis #1:    N/A                  0
  2 Axis #2:    N/A                  0
  3 Axis #3:    N/A                  0
  4 Axis #4:    N/A                  0
  5 Axis #5:    N/A                  0
  6 Axis #6:    N/A                  0
  7 Axis #7:    N/A                  0

[ TYPE ]                    [CHOICE]   DONE >
```

18 Move the cursor to the process axis number that was set at Step 11.
19 Press F4 [CHOICE].

20 Select ELECTRIC.
21 Press F5, DONE. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
Seal Config
 Setting up number information        1/4


  1 F Number:                      F00000
  2 Max equipment number:            1
  3 Total ISD number:                 1
  4 of which # of Dual ISD:          0


[ TYPE ]                                DONE
```

22 Set each item following the Table 10.2(b).

Table 10.2(b) Setting up number information

ITEM	DESCRIPTION
Max equipment number	Enter Total equipment number including both ISD and other equipments.
Total ISD number	Enter Total ISD equipment number.
of which # of Dual ISD	This item is for ISD Dual meter option.

23 Press F5, DONE.
24 Press MENUS.
25 Select ISD Config. You will see a screen similar to the following.

```
                AUTO   E1 CTRL START MENU   10%
ISD Config
Integral Servo Dispenser Config      1/16
      Total number of ISD:          1

  1 ISD #1 Dispenser Type: UNINIT
  2          Servo Type:        UNINIT
  3          Axis Number:       0
  4          Use 2K:             NO
  5 ISD #2 Dispenser Type: UNINIT
  6          Servo Type:        UNINIT
  7          Axis Number:       0
  8          Use 2K:             NO


[ TYPE ]                    [CHOICE]
```

26 Set up the ISD Configuration following Table 10.2(c).

Table10.2(c) Setting up ISD configuration

ITEM	DESCRIPTION
Dispenser Type	The type of ISD equipment. Select SINGLE ACTING.
Servo Type	Select ELECTRIC.

ITEM	DESCRIPTION
Axis Number	Enter the same value set at Step 11.
Use 2k (*)	If you enable Use 2k, select YES.

* Use 2k is applied for the system whose 1 process axes drive 2 meter. Usually, 2 different type of material are supplied for those 2 meters and they are mixed at dispense. If Use 2k is enabled, You must set additional items for Setting up Dispense Information (Section 10.5).

10.3 SETTING UP DISPENSE CONFIGURATION

You must set up the configuration of Dispense Tool to use ISD Single Acting Meter as Table 10.3.

Table 10.3 Setting up dispense configuration

ITEM	DESCRIPTION
Number of equipment Default:1 Min: 1 Max: 5	The total number of Dispense equipments
Equipment type Default: Vari[able]Orifice	The type of equipments.

Procedure 10-2 Setting up DispenseTool Configuration

1 Perform a controlled start.
2 Press MENU key.
3 Select [Seal Config] and you will see Dispense Configuration screen as below.

```
                AUTO    E1 CTRL START MENU    10%
Seal Config
                                              4/13
 DispenseTool Application Configuration
                    EQ: 1
   1 F Number:                        F00000
   2 Number of equipment:               1
   3 Number of guns:                    1
   4 Equipment type: ISD SERVO DISPENSER
           - ISD type: SINGLE ACTING METER
   5       - ISD Number:                1
   6 Beadshaping/Atomizing Air: DISABLE
   7 Remote start:                    DISABLE
   8 Automatic purge:                 DISABLE
Press FCTN then START (COLD) when done.
[ TYPE ]              EQUIP [CHOICE]          >
```

4 Move the cursor to the appropriate item and set it as desired.
5 To change the number of equipments, move the cursor to “Number of Equipment.”
6 Press ENTER key and following message is displayed.

```
You have changed the number
of equipment. Press YES to
confirm your change and wait
for new sysvar reallocation.
     YES          [NO]
```

7 If you are sure that you would like to change the number of equipments, move the cursor to “YES” and press ENTER key.

NOTE
You can configure multiple equipment of different types if you type a value larger than 1.

8 To select a specific piece of equipment, press F3,[EQUIP], and type the number of the piece of equipment. You will see a screen similar to the following.

```
              AUTO   E1 CTRL START MENU   10%
SealConfig
                                          1/9
 Dispense Tool Application Configuration
                  Eq: 2
  1 Number of guns:              1
  2 Equipment type: VARI ORIFICE
        - ISD type: N/A
  3     - ISD Number:            0
  4 Beadshaping/Atomizing Air: DISABLE
  5 Remote start:              DISABLE
  6 Automatic purge:           DISABLE
  7 Bubble detected:           DISABLE
  8 Linear 2P calibration:     DISABLE

[ TYPE ]          EQUIP                 >
```

9 Move the cursor to the appropriate item and set it as desired. To use ISD, set Equipment type to ISD SERVO DISPENSER.

10.4 SETTING UP ISD I/O

You must set up I/O to enable the dispensing equipment in your system to work with the Integral Servo Dispenser system. The Integral Servo Dispenser uses I/O unit Model A. Table 10.4(a) lists and describes the ISD inputs you can set. Table 10.4(b) lists and describes the ISD outputs you can set.

NOTE
1 The initial I/O setup you see on the I/O screens is the default I/O setup. To minimize installation setup, use this default I/O setup.
2 For safety reasons, the default values for the indexes of all I/O ports are zero. Be sure to set the indexes to the appropriate values before using the system.

Use Procedure 3-9 and Procedure 10-3 to set up Dispense Tool equipment I/O.

Table 10.4 (a) Integral servo dispenser inputs

ITEM	DESCRIPTION
Dispense Pressure Analog Input	This input is connected to the pressure transducer that measures the dispensing pressure.
Supply Pressure Analog Input	This input is connected to the pressure transducer that measures the supply pressure.
Meter OT A Digital Input	This input should be connected to the "Meter Overtravel" input on the dispensing meter. It is assumed that when Meter OT A is OFF, the meter has hit the overtravel limit switch on the A side. If Meter OT A makes an ON to OFF transition at any time, the error, "ISD-007 Meter OverTravel A (E%d)," will be displayed with the severity defined in the error table for this error (39007). When you encounter this message, use Procedure 10-9 to recover. If both Meter OT A and Meter OT B are OFF, the Meter OT A input has precedence, and only "ISD-007" is displayed. If you would not like to use Meter OT A, set the index number to zero.
Meter OT B Digital Input	This input should be connected to the "Meter Overtravel" input on the dispensing meter. It is assumed that when Meter OT B is OFF, the meter has hit the overtravel limit switch on the B side. If Meter OT B makes an ON to OFF transition at any time, the error, "ISD-008 Meter OverTravel B (E%d)," will be displayed with the severity defined in the error table for this error (39008). When you encounter this message, use Procedure 10-9 to recover from the error. If you would not like to use Meter OT B , set the index number to zero.

Table 10.4 (b) Integral servo dispenser outputs

ITEM	DESCRIPTION
Reload Valve Digital output	This output is used to control the reload valve for the metering device. This is the valve that turns ON when the meter is reloading. This output port is controlled by the system according to the current meter direction and its operating mode.
Gun Open for JOG Digital output	This output is used to control a gun output when a jog operation is performed. This output will be turned ON when the meter is jogged in the direction in which the material is dispensed.
ISD Status Group output	This output indicates the status of the ISD system. The bits in this group output are defined as follows: • Bit 0 DISPENSER READY (1:READY TO DISPENSE) • Bit 1 METER EMPTY (1: METER REACHED STROKE LIMIT) • Bit 2 PREPRESSURE (1: PREPRESSURE IS IN PROGRESS, 0: COMPLETE) • Bit 3 RESERVED • Bit 4 RESERVED • Bit 5 DISPENSE HIGH PRESSURE (1: HIGH PRESSURE, 0: NORMAL) • Bit 6 DISPENSE LOW PRESSURE (1: LOW PRESSURE, 0: NORMAL) • Bit 7 METER DIRECTION (1: POSITIVE, 0: NEGATIVE) • Bit 8 RELOAD VALVE (1: ON, 0: OFF) • Bit 9 GUN VALVE FOR JOG (1: ON, 0: OFF) • Bit 10 VALVE3 (1: ON, 0: OFF) • Bit 11 VALVE4 (1: ON, 0: OFF) • Bit 12 OTA (1: OT, 0: NORMAL) • Bit 13 OTB (1: OT, 0: NORMAL) • Bit 14 ISD LOCKED (1:LOCKED, 0:NORMAL) • Bit 15 RESERVED

ITEM	DESCRIPTION
ISD Mode Group output	This output indicates the current ISD operation mode as its binary value. The values are defined as follows: • 0 Error mode • 1 Relieve mode • 2 Pre-pressure mode • 3 Reposition mode • 4 Dispensing mode • 5 Bypass mode • 6 Jog mode • 7 Wait for reload complete (single acting meter only) • 8 Sleep mode
Meter Position Group output	This output indicates the position of the meter piston within its stroke range. Units are percent (%). You must allocate 7 bits for this output.
Dispense Pressure Group output	This output indicates the current value of dispense pressure. Units are psi.
Supply Pressure Group output	This output indicates the current value of the supply pressure. Units are psi.
Volume Dispensed Group output	This output indicates the accumulative material volume dispensed. Units are in cc. This output reflects the value of the system variable $ISD_WORK[eq_n].$volume_disp, and the value can be set to zero by clearing the system variable.
Meter OT Override Digital output	This output is connected to the ISD OT bypass relay. This relay is used to bypass the ISD overtravel circuit so that the meter can be jogged in order to recover from the overtravel condition. This output value must be OFF for normal operation to ensure the proper functioning of the overtravel limit switches.
ALC Bypass Digital output	The system continuously copies the value of $isd_work[#].$alc_bypass system variable into this output (where # indicates the equipment number) while ISD meter motion is DISABLED in the test cycle menu. This feature is to be used for customization purposes.

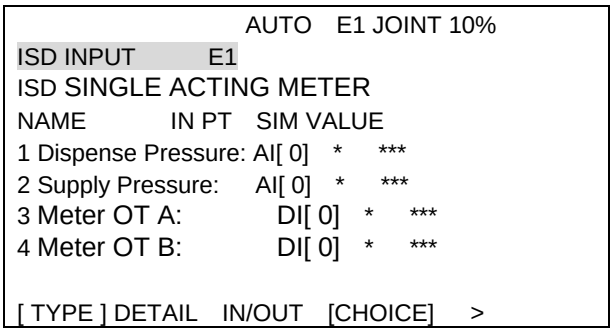
Procedure 10-3 Setting Up ISD I/O

Note this procedure contains information about setting up ISD I/O only. For information about configuring, forcing, verifying, and simulating analog, digital, and group signals, refer to Basic Operation manual's (B-83284EN) Chapter 3.

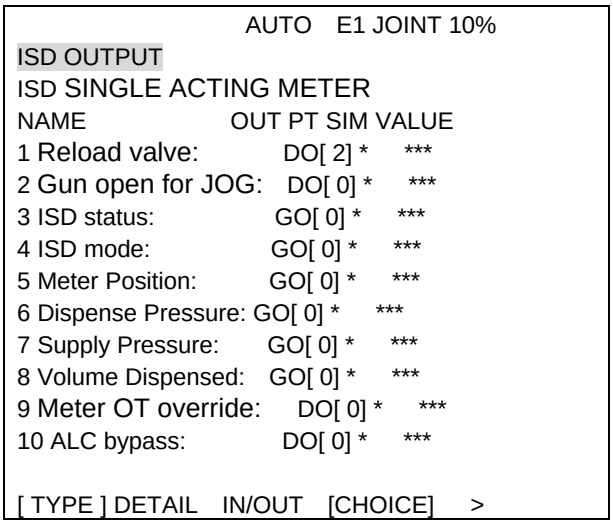
Steps

1 Press MENU key.
2 Select [I/O].
3 Press F1, [TYPE].
4 Select ISD. You will see either the input or output screen. You will see a screen similar to the following.

NOTE
The number of the currently selected equipment is displayed in the middle of the title line on every screen. The currently selected equipment for the screens in this procedure is equipment 1, E1.



5 To change between the input and output screens, press F3, [IN/OUT]. You will see a screen similar to the following.



6 Select each item and set it as desired.

10.5 SETTING UP EQUIPMENT INFORMATION

You must set up specific information about the dispensing equipment before you can use it. Equipment setup requires you to set up specific items and to perform specific calibration procedures. Table 10.5 lists and describes each equipment setup item. The items you must set up might vary depending on the way your system is set up.

NOTE
Use Procedure 3-3 to set up equipment items.

You might also need to perform the following calibration procedures to set up your dispensing equipment, depending on the way your system is set up:

- Maximum meter speed calibration
- Bead shaping air calibration - only if bead shaping air is used
- Flow rate control calibration

Table 10.5 Equipment setup items

ITEM	DESCRIPTION
Material Factor default: 1.00 min: 0.01 max: 10.00	This item is the scale factor used in computing flow control (analog output). It can be changed as material viscosity and temperature changes.
Minimum Flow Rate default: 0 % min: 0 % max: 100 %	This item is the minimum flow command voltage that will be sent to the dispensing equipment while sealing. If the requested flow rate specified in the current Seal Schedule ever goes below the Minimum Flow Rate, the Minimum Flow Rate will be sent to the dispensing equipment.
Bead Shaping Factor* default: 1.00 min: 0.01 max: 10.00	This item is the scale factor used in computing the bead shaping air signal.
Bead Shaping AOUT Type* values: Volts, Current default: Volts	This item is the type of analog output: — Volts - Type II output - range 0-10 volts — Current - Type III output - range 1-5 volts
Bead Shaping Max Out* default: 10.00 V range: 0.00 V to 10.00 V	This item sets the maximum analog voltage for bead shaping for the dispensing equipment. If the intended analog voltage exceeds this value, then an alarm will occur. Maximum voltage will not exceed this value.
Power Up Pressure default: 500 psi min: 0 psi max: 9000 psi	This item sets the pre-pressure value after the controller is turned on.
High Pressure Time Out default: 0 msec min: 0 msec max: 90000 msec	This item specifies the amount of time high pressure can be sustained before an alarm occurs.
Low Pressure Time Out default: 0 msec min: 0 msec max: 90000 msec	This item specifies the amount of time low pressure can be sustained before an alarm occurs.
Min. Reload Pressure default: 2000 psi min: -2000 psi max: 4000 psi	When performing a reload operation, the system will position the meter at the end of the stroke, and waits for the material pressure to become higher than this value. After the material pressure becomes higher than this value, the system finishes the reload operation, and starts prepressurizing the material for the next dispensing operation.
Reload Time Out default: 4000 ms min: 0 ms max: 90000 ms	When performing a reload operation, if the pressure does not reach the minimum reload pressure within this value, the system will display the error message "ISD-017 Reload time-out (E1)."
Dispense Max. Pressure default: 1500 psi min: 0 psi max: 9000 psi	This sets the maximum dispense pressure for the dispensing equipment. If the pressure exceeds this value, an alarm will occur.
Dispense Min. Pressure default: 0 psi min: 0 psi max: 4000 psi	This sets the minimum dispense pressure for the dispensing equipment. If the pressure falls below this value, an alarm will occur.

ITEM	DESCRIPTION
Use default ACC default: DISABLE	This item enables and disables the use of the Default ACC feature. If enabled, all motion instructions without the explicit ACC clause will use the De fault ACC value.
Default ACC default: 20 range: 0 – 150	This item is the value used for all motion instructions that do not have an explicit ACC clause specified when enabled.
Maximum Analog Output (Air)* default: 10.0 V min: 0.0 max: 10.0 V	This sets the maximum analog voltage for atomizing air for the dispensing equipment. If the intended analog voltage exceeds this value, an alarm will occur. Maximum voltage will not exceed this value.
Meter Max Speed	Refer to Section 3.6.4 for information on how to calibrate the meter maximum speed.
Flow Rate Control	Refer to Section 3.6.2 for information on how to calibrate the flow rate control.
Beadshaping cmd.	Refer to Section 3.6.3 for information on how to calibrate the bead shaping air pressure.
Channel 2 Analog Cal.*	Refer to Section 3.9.2 for information on how to calibrate the Channel 2 analog control.

* Displayed if bead shaping air is used.

10.6 SETTING UP ISD INFORMATION

You must set up specific information about the Integral Servo Dispenser (ISD) in addition to the equipment setup. ISD setup requires you to set up specific items and to perform specific calibration procedures. Table 10.6 lists and describes each ISD setup item.

Table 10.6 Equipment setup items

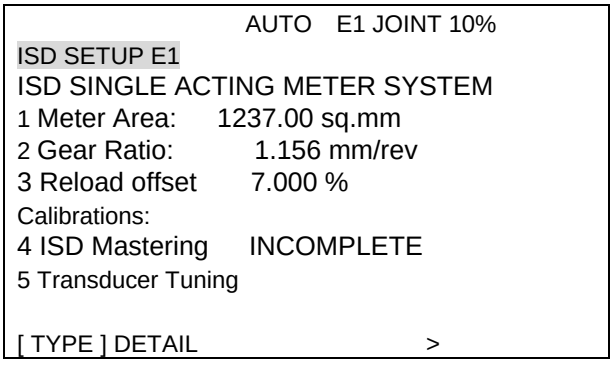
ITEM	DESCRIPTION
Meter Area default: 1237.00 square mm min: 0.00 square mm max: 6000.00 square mm	This item specifies the sectional area of the meter piston. This value is used to calculate the volume of dispensed material.
Gear Ratio default: 1.156 mm/rev min: 0.000 mm/rev max: 6000.000 mm/rev	This item specifies the motor-to-piston reduction ratio. This indicates the travel distance of the meter piston per motor revolution. This value is used to calculate the volume of dispensed material.
Reload Offset default: 7.0% min: 0.0% max: 6000.0%	This item specifies the positional margin from the stroke limit when the meter stops after a reload operation. Unit is percent (%).
ISD Mastering	Refer to Section 10.7 for information on mastering the ISD.
Transducer Tuning	Refer to Section 10.8 for information on fine tuning pressure transducers.

Use Procedure 10-4 to set up equipment items.

Procedure 10-4 Setting Up Integral Servo Dispenser Items

Steps

1 Press MENU key.
2 Select [SETUP].
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.



5 To select the equipment number,
   a Check the currently selected equipment number. The equipment number is displayed to the right of the screen name as E# , where # is the equipment number. If the number displayed is the desirable equipment number, go to Step 6.
   b Press NEXT, >.
   c Press F3, [EQUIP].
   d Type the number of the equipment and press ENTER key.
6 Select each of the items and set them as desired.
7 To display detailed information about calibration, move the cursor to the calibration and press F2, DETAIL.
8 After all items have been set, turn off the controller and then turn it on again.

10.7 ISD MASTERING

ISD mastering establishes the software stroke limit of the metering device. The integral servo dispensing (ISD) system monitors the meter position at all times so that the meter should stop before it exceeds the stroke limit and hits the overtravel limit. The purpose of ISD mastering is to establish the stroke limit that the ISD system can use to enable monitoring of the meter position.

ISD mastering involves setting the stroke length, jogging the meter to its stroke end position, and recording the meter position at its stroke end.

Use Procedure 10-5 and Procedure 10-6 to perform ISD mastering.

Table 10.7 lists and describes each ISD mastering item.

Table 10.7 ISD mastering items

ITEM	DESCRIPTION
Mastering Status	This item indicates the mastering completion status. The value is either INCOMPLETE or COMPLETE.

ITEM	DESCRIPTION
Master Position	This item indicates whether the master position has been recorded. The master position is the location of the meter indicated on the meter unit, and is usually a stroke limit position with a lower pulse count. The value for this item is either UNINIT (not recorded) or RECORDED. To record the current meter position value and calculate both the stroke limit positions, move the cursor to this item, press and hold the SHIFT key, and press F5, RECORD.
Meter Stroke default: 70.00 mm min: 0.00 mm max: 6000.00 mm	This item indicates the stroke length of the meter. This value is used to calculate the stroke limit positions based on the recorded master position and the gear ratio of the meter. Changing the value of this item will modify the calculated stroke limits, provided that the master position is already recorded.
Jog Speed Override default: 0.00 % min: 0.00 max: 100.00 %	This item specifies the meter motion speed when the MoveA or MoveB function keys are pressed. This value is further multiplied by the $ISD_CONFIG[eqn].$max_jog_spd system variable (default value: 30%), and that becomes the actual motor speed.
Clear Mastering?	When this item is selected, you can clear the previous mastering data by pressing F5, CLEAR, with the SHIFT key. This operation is required to re-record the master position.

Preparing for ISD Mastering
When you turn on the ISD after disconnecting and reconnecting a process axis motor, you need to reset the serial pulse coder. When this occurs, you will see a SRVO-062 BZAL (Group:0 Axis:n) and SRV0-075 Pulse not established (G:0 A:n) alarm, where "n" indicates the number of the process axis.
Before mastering the ISD, you must reset the alarm and rotate the motor of each axis that lost battery power to prepare the ISD for mastering.

Use Procedure 10-5 to reset these alarms and prepare the ISD for mastering.

Procedure 10-5 Preparing for ISD Mastering

Conditions

•You see a SRVO-062 BZAL (Group:0 Axis:n) and SRVO-075 Pulse not established (G:0 A:n) alarm.

Steps

1 Replace the ISD batteries with four new 1.5 volt alkaline batteries, size D. Observe the direction arrows in the battery box for proper orientation of the batteries.
2 Press MENUS.
3 Select SYSTEM.
4 Press F1, [TYPE].
5 Select Variables.
6 Move the cursor to $IS_MCR and press ENTER.
7 Move the cursor to $spc_reset.
8 Press the F4, TRUE, once.
The value will quickly go back to FALSE.

⚠CAUTION
Do not press RESET at this point. Otherwise, you will have to restart this procedure from Step 1 .

9 Turn off the controller and then turn it on so that the new value can take effect.
10 If the SRVO-062 alarm is still present; there is a battery, cable or pulse coder problem. Refer to the Controller Maintenance Manual for further information.

11 If a SRVO-075 alarm is present, reset it as follows. It is not necessary to cold start the robot after resetting to clear this alarm.
   • Rotate each axis that lost battery power by at least one motor revolution in either direction.
12 Perform any of the mastering procedures from the ISD SETUP screen.

Procedure 10-6 Performing ISD Mastering

Conditions

- The Integral Servo Dispenser items (1-5) on the ISD SETUP screen have been set correctly.
- The "Reload valve" and "Gun open for JOG" items on the ISD OUTPUT screen have been set correctly.
- The "Meter pressure" item on the ISD INPUT screen have been set correctly.
- You have reset any pulse coder alarms.

> **⚠ CAUTION**
> Be sure to set up the "Reload valve" and "Gun open for JOG" outputs and the "Meter Pressure" input before you perform ISD mastering. Otherwise, excessive pressure might be applied to the equipment and damage it.

Steps

1 Press MENUS.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select ISD. See the following screen for an example.

```
                              AUTO   E1 JOINT 10%
ISD SETUP E1
ISD SINGLE ACTING METER SYSTEM
1 Meter Area:     1237.00 sq.mm
2 Gear Ratio:        1.156 mm/rev
3 Reload offset      7.000 %
Calibrations:
4 ISD Mastering     INCOMPLETE
5 Transducer Tuning

[ TYPE ] DETAIL                          >
```

5 To display help information, press NEXT, >, and then press F1, HELP. When you are finished displaying help information, press PREV.
6 To select the equipment number,
   a. Check the currently selected equipment number. The equipment number is displayed to the right of the screen name as E#, where # is the equipment number. If the number displayed is the desirable equipment number, go to Step 7.
   b. Press NEXT, >.
   c. Press F3, EQUIP.
   d. Type the number of the equipment and press ENTER.
7 Move the cursor to ISD mastering and press F2, DETAIL. See the following screen for an example.

```
                              AUTO   E1 JOINT 10%
ISD SETUP E1
ISD SINGLE ACTING METER MASTERING
Mastering Status:       INCOMPLETE
1 Master Position:       UNINIT
2 Meter Stroke:           70.00 mm
3 Jog Speed Override:    0.00 %
You can press SHIFT+MoveA/B keys to jog
```

8 If the meter has been mastered previously and needs to be remastered, you must first CLEAR the mastering, as follows:
   a. Move the cursor to Clear Mastering?
   b. Press and hold SHIFT and press F5, CLEAR.
   The mastering status will change to INCOMPLETE.
9 Set the stroke length value by selecting Meter Stroke and entering the appropriate value.
10 Jog the meter to the master position as follows:

NOTE
The master position is usually a stroke limit position with a lower pulse count.

   a. Set the Jog speed override value to a low value, such as 5%.
   b. Press and hold SHIFT and press F3, MoveB, or F4, MoveA.
   c. To stop jogging , release the F3 or F4 key.
11 After the meter has been positioned precisely at its master position:
   a. Move the cursor to Master position.
   b. Press and hold SHIFT and press F5, Record.
   The mastering status will change to COMPLETE.
12 Jog the meter toward the other stroke limit, and make sure the meter stops before the stroke limit.
13 Jog the meter in the other direction, and make sure the meter stops before the stroke limit.

10.8 ISD TRANSDUCER FINE TUNING

Transducer tuning is a procedure used by the ISD system to identify the relationship between the analog input reading from the transducers and the material pressure value. You need to set the current and pressure values at both a high and a low point. The system will then calculate the material pressure value based on the transducer current reading. Sometimes, fine tuning the transducers is necessary due to tolerances in the data sheet, changes due to age, and so forth. The ISD Transducer Tuning menu also allows you to further adjust the transducer characteristics based on actual gauge readings. Refer to Table 10.8 (a) for information on ISD transducer tuning methods.

Table 10.8 (a) ISD transducer tuning methods

If you would like to	Use	Description
Use the transducer data sheet provided by the manufacturer to tune the transducer	Procedure 10-7	Use this method when the system is installed initially, where transducer characteristics are known and stable.
Use the actual pressure and current readings to tune the transducer	Procedure 10-8	Use this method when a transducer has been used for a long time and you believe its characteristics have drifted away from the original settings.

Table 10.8 (b) lists and describes the ISD transducer tuning items that you must set up for each transducer in your system.

Table 10.8 (b) ISD transducer tuning setup items

ITEM	DESCRIPTION
Pressure Setpoint units: psi	This item displays the current pressure setpoint value.

ITEM	DESCRIPTION
Current ISD Mode	This item indicates the current operation mode of the ISD: • ERROR • RELIEVE • PREPRESSURE • REPOSITION • DISPENSE • BYPASS • JOG
Analog Input Status units: mA and psi	This item displays the current value and the measured psi value for each transducer. Use this item to make sure that you are looking at the correct transducer and that the calculated psi value matches that of the pressure gauge reading after tuning.
Calib (Low) units: mA at psi default: 7.00 mA at 1000 psi	This item displays the transducer current value in mA at a known low pressure value. By linearly interpolating and extrapolating, the system measures the material pressure value from the transducer reading.
Calib (High) units: mA at psi default: 10.00 mA at 2000 psi	This item displays the transducer current value in mA at a known high pressure value. By linearly interpolating and extrapolating, the system measures the material pressure value from the transducer reading.

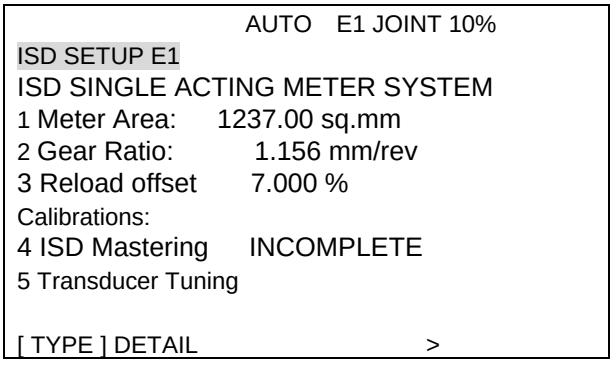
Procedure 10-7 Transducer Tuning Using a Data Sheet

Conditions

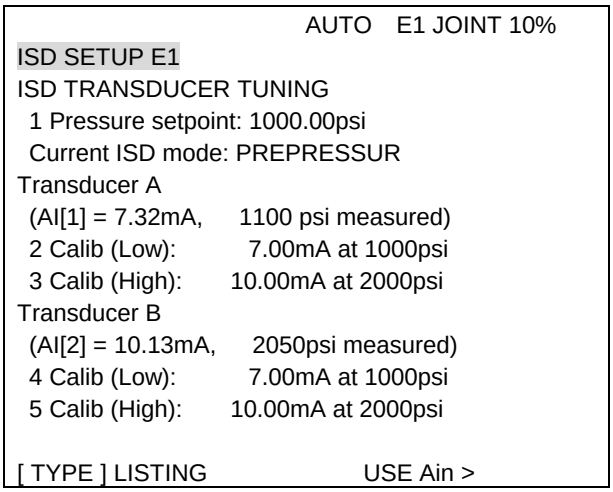
- You have the transducer data sheet provided by your transducer manufacturer.
- The system is equipped with a pressure gauge.
- The "Pressure A" and "Pressure B" items on the ISD INPUT screen have been set correctly. (Procedure 10-3)

Steps

1 Press MENU key.
2 Select [SETUP].
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.



5 Move the cursor to Transducer Tuning and press F2, [DETAIL]. You will see a screen similar to the following.



6 Move the cursor to Calib (Low) for the appropriate kind of transducer (either Transducer A or B).
   a Move the cursor over to mA and type in the mA value according to your data sheet.
   b Move the cursor over to psi and type in the psi value according to your data sheet.
7 Move the cursor to Calib (High) for the appropriate kind of transducer (either Transducer A or B).
   a Move the cursor over to mA and type in the mA value according to your data sheet.
   b Move the cursor over to psi and type in the psi value according to your data sheet.
8 Repeat Step 6 and Step 7 for all transducers in your system. The transducer characteristics are now updated and become effective immediately.

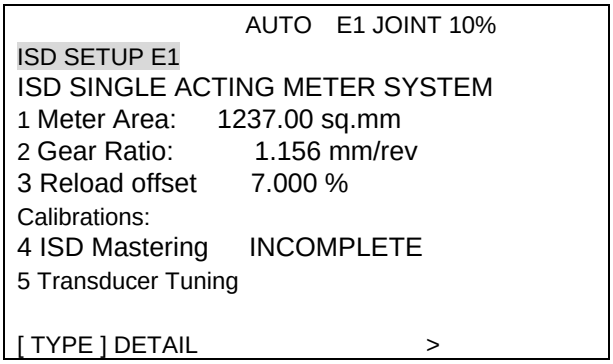
Procedure 10-8 Transducer Tuning Using Actual Pressure and Current Readings

Conditions

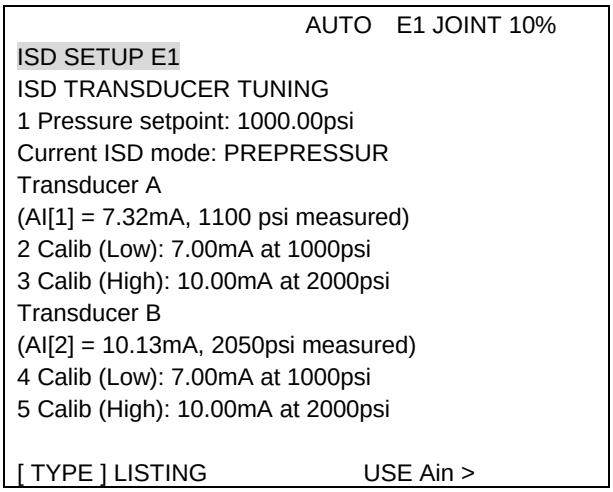
- The system is equipped with a pressure gauge.
- The "Pressure A" and "Pressure B" items on the ISD INPUT screen have been set correctly. (Procedure 10-3)
- You have reset any pulse coder alarms. (Procedure 10-5)

Steps

1 Press MENU key.
2 Select SETUP.
3 Press F1, [TYPE].
4 Select ISD. You will see a screen similar to the following.



5 Move the cursor to Transducer Tuning and press F2,[DETAIL]. You will see a screen similar to the following.



6 Set the material pressure to a low pressure value, close to the lowest pressure range:
- If it is a supply pressure, adjust it at the supply pump.
- If it is a dispense pressure, adjust it by moving the cursor to Pressure setpoint, type in a low value, and press ENTER.

NOTE
If you are adjusting the dispense pressure, make sure that Current ISD mode is set to PREPRESSUR. If it is not set to PREPRESSUR, you can change it by executing the PREPRESSURE macro.

7 Measure the actual pressure value from the pressure gauge.
8 Move the cursor to Calib (Low) for the appropriate transducer (either Transducer A or B).
   a Move the cursor over to psi and type in the actual psi value that you just measured.
   b Move the cursor over to mA. Press and hold the SHIFT key and press F5, [Use AIN], to obtain the current mA value from the analog input.
9 Set the material pressure to a high value:
- If it is a supply pressure, adjust it at the supply pump.
- If it is a dispense pressure, adjust it by moving the cursor to Pressure setpoint, type in a high value, and press ENTER key.

NOTE
If you are adjusting the dispense pressure, make sure that Current ISD mode is set to PREPRESSUR.

10 Measure the actual pressure value from the pressure gauge.
11 Move the cursor to Calib (High) for the appropriate transducer (either Transducer A or B).
   a Move the cursor over to psi and type in the actual psi value that you just measured.
   b Move the cursor over to mA. Press and hold the SHIFT key and press F5, [Use AIN], to obtain the current mA value from the analog input.
12 Repeat Step 6 through Step 11 for all transducers in your system.
   The transducer characteristics are now calibrated and become effective immediately.

10.9 ISD OVERTRAVEL RECOVERY

During ISD operation, it is possible to trip the stroke limit proximity switch accidentally. When this happens, power to the servo amplifier is disconnected and a robot error message is displayed. This condition is called an ISD overtravel condition.

You must perform a specific sequence of steps to recover from an ISD overtravel condition. If you do not perform proper recovery, the meter can be moved in the wrong direction, causing it to stop moving when the seal retainer bottoms out on the end cap. This movement can damage the meter.

If the servomotor is commanded to move after the meter hits the mechanical limit, a motor overcurrent condition can result. The robot must be turned off to clear this fault.

Procedure 10-9 describes the steps required to re-apply power to the servo amplifier and move the meter away from the overtravel condition.

Procedure 10-9 Recovering from a Meter (ISD) Overtravel Condition

NOTE
As necessary, please remove the drive belt cover from the meter servomotor so that motor movement can be observed easily.

Steps

1 Press MENUS.
2 Continuously press and hold the DEADMAN switch and turn the teach pendant ON/OFF switch to ON.
3 Select SETUP.
4 Press F1, [TYPE].
5 Select ISD. See the following screen for an example.

```
                              AUTO   E1 JOINT 10%
ISD SETUP E1
ISD SINGLE ACTING METER SYSTEM
1 Meter Area:     1237.00 sq.mm
2 Gear Ratio:      1.156 mm/rev
3 Reload offset    7.000 %
Calibrations:
4 ISD Mastering    INCOMPLETE
5 Transducer Tuning

[ TYPE ] DETAIL                          >
```

6 Move the cursor to ISD Mastering.
7 Press F2, DETAIL. See the following screen for an example.

```
                              AUTO   E1 JOINT 10%
ISD SETUP E1
ISD SINGLE ACTING METER MASTERING
Mastering Status:      INCOMPLETE
1 Master Position:      UNINIT
2 Meter Stroke:        200.00 mm
3 Jog Speed Override:   0.00 %
You can press SHIFT+MoveA/B keys to jog
```

8 Determine the direction of the overtravel condition:
- If the meter is at the A overtravel position (the top position), it must be moved in the B direction to clear the problem.
- If the meter is at the B overtravel position (the bottom position), it must be moved in the A direction to clear the problem.

9 Move the cursor to Jog Speed Override and set the value to a low value, such as 1.0 %.

NOTE
If the overtravel condition was created during the stroke calibration procedure, move the meter away from the overtravel approximately one-quarter of a revolution of the ball's screw pulley after the proximity switch is un-tripped. Stopping the meter at this position will provide adequate distance between the mastering position and the overtravel proximity switch.

10 Press and hold the SHIFT key for more than a half second. Continue pressing SHIFT and press F2, RESET, until the servomotors turn on.

NOTE
If you release the SHIFT key before the meter overtravel condition is cleared, the servo power will be shut off. In order to re-apply the servo power, repeat Step 10 .

11 Jog the meter away from the overtravel condition by pressing the appropriate key, depending on the overtravel position:
a. To start jogging, press and hold SHIFT and press F3, MoveB, or F4,MoveA.
b. To stop jogging, release F3, MoveB, or F4, MoveA.

11 PUMP ONLY MOTION

11.1 OVERVIEW

Pump only motion prevents non-pump axes from moving and allows only pump axes to move, when a dispensing program is executed. This function can be used to measure the material volume dispensed.

> **⚠CAUTION**
> The power is applied to the servo amplifiers for non-pump axes (e.g. robot axes), even while this function is enabled. You must take all necessary steps to guarantee the safety when using this function.

11.2 MEASURING MATERIAL VOLUME DISPENSED

Procedure 11-2 Measuring Material Volume Dispensed

Steps

1 Create a dispensing program.
2 Move the robot to a position above a container.
3 Execute pom_enb.tp to enable this function.
4 Execute the dispensing program and then measure the material volume.
5 Execute pom_dbl.tp to disable this function.

> **NOTE**
> The enabled/disabled state of Pump only motion will not change through power cycle.

INDEX

REVISION RECORD

Edition	Date	Contents
03	Jul., 2013	Added “GUM DROP SEALING FUNCTION” etc.
02	Sep., 2012	Changed descriptions in “LIMITATIONS” etc.
01	Jul., 2012	

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