e*DART*® Shuttle Control Software

Applications & Reference

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Rev0

Introduction

The *eDART*® Shuttle Control software tool organizes data in shuttle and rotary molding applications. The software tool enables the e*DART* to determine which mold base position input is active, allowing the e*DART* to determine sensor and alarms that are in use.

The e*DART* Shuttle Control software tool accepts input position from the machine or table and automatically determines which cavity pressure sensors are active in each position; the e*DART* then activates only the alarms for those values computed from currently active sensors. In addition, the e*DART* saves summary and cycle data for the active sensors, separates set points for mold halves, and delays diverters by cycle(s) for rotary applications.

Sensor Placement in Mold Halves: Fixed vs. Moving Functionality

Sensors in the fixed half detect pressure on every cycle. Sensors in the moving half detect pressure only during cycles in which that mold half is under the fixed half.

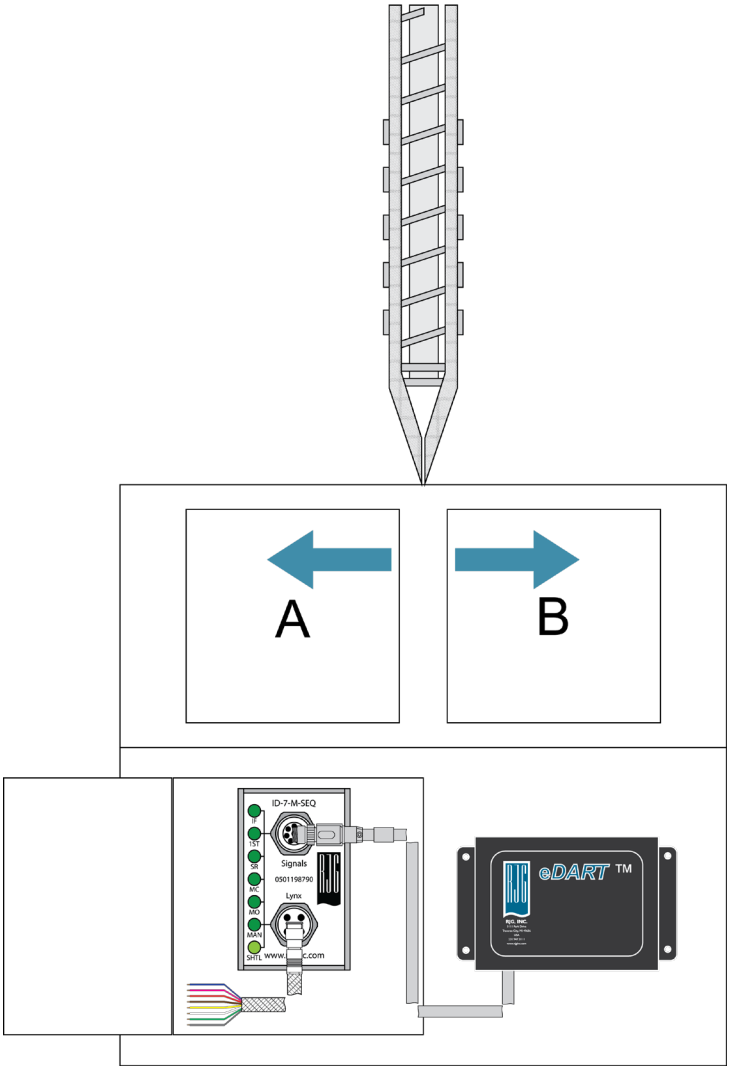
Function	Fixed Half Sensors	Moving Half Sensors
Set Points	Single set point for each half	Separate control set points for each half or use w/valve gate control option.
		Single control set point using high curve
Alarm Levels	Single alarm level for each half	Separate alarms for each half
		Single alarms for both halves using high and low values
Summary Curves	Single summary curve for value in both halves—points on curve alternate between halves	Separate summary curves for each sensor in each half

Hardware Installation

There are three wiring options when wiring for two positions.

Wiring for Two Positions—Preferred Method

Wire the machine shuttle signal from the A ***OR*** B half to the ID7-M-SEQ sequence module. The signal must be ON at the start of the cycle for the mold in the first position and OFF at the start of the cycle for the second position. For example, if the A half shuttle signal is wired to the ID7-M-SEQ, the shuttle signal indicator is ON at the start of the A half cycle and OFF at the start of the B half cycle.

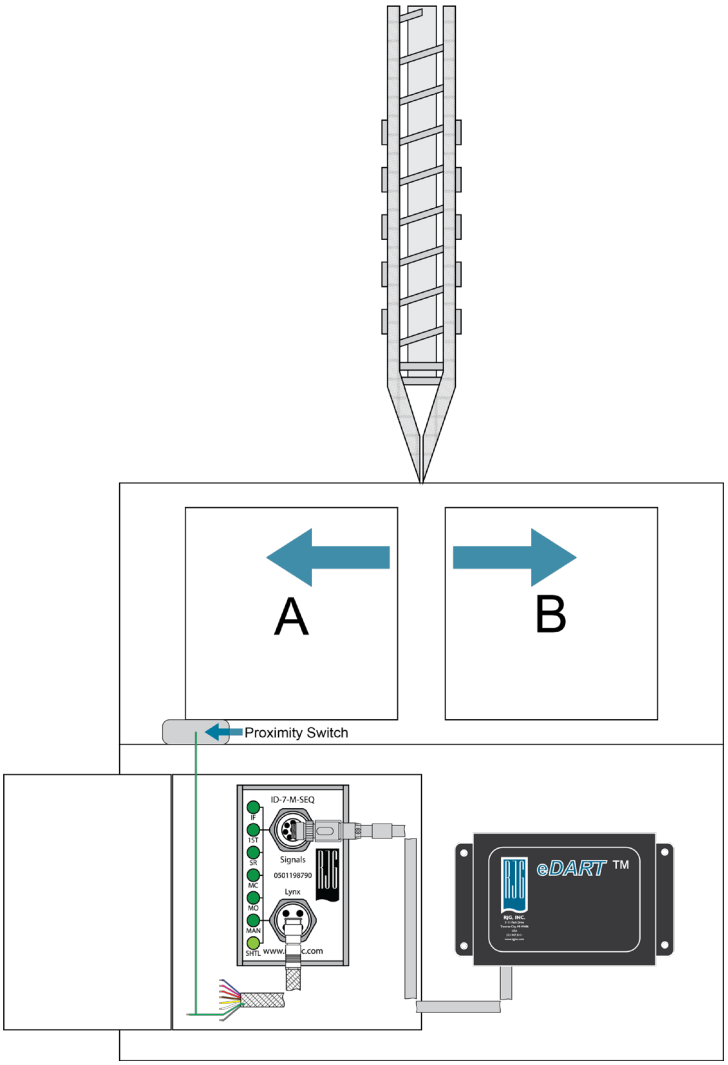


ID7-M-SEQ Wiring

INPUT	FUNCTION	COLOR	
24 V ON; 0 V OFF	Injection Forward		Blue
24 V ON; 0 V OFF	1st Stage		Pink
24 V ON; 0 V OFF	Screw Run		Red
24 V ON; 0 V OFF	Mold Clamped		Brown
24 V ON; 0 V OFF	Mold Opening		Yellow
24 V ON; 0 V OFF	Manual		White
24 V ON; 0 V OFF	Shuttle Position		Green
24 V ON; 0 V OFF	Input Common		Grey
Max. Input Voltage 36 V; Min. Trigger on Voltage 18 V			

Wiring for Two Positions—Alternate Option 1

Wire the machine shuttle signal to the ID7-M-SEQ sequence module; wire a limit or proximity switch in conjunction with the sequence module to the e*DART* to indicate shuttle position.

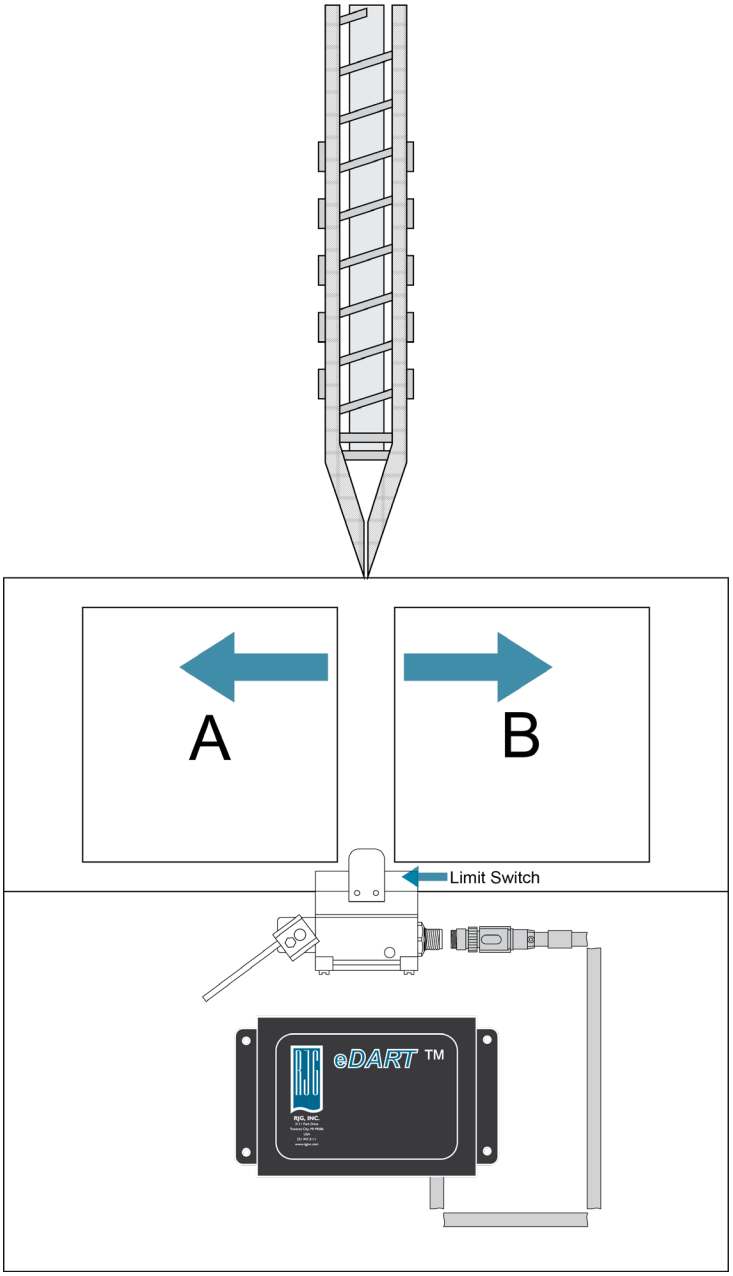


ID7-M-SEQ Wiring

INPUT	FUNCTION	COLOR	
24 V ON; 0 V OFF	Injection Forward		Blue
24 V ON; 0 V OFF	1st Stage		Pink
24 V ON; 0 V OFF	Screw Run		Red
24 V ON; 0 V OFF	Mold Clamped		Brown
24 V ON; 0 V OFF	Mold Opening		Yellow
24 V ON; 0 V OFF	Manual		White
24 V ON; 0 V OFF	Shuttle Position		Green
24 V ON; 0 V OFF	Input Common		Grey
Max. Input Voltage 36 V; Min. Trigger on Voltage 18 V			

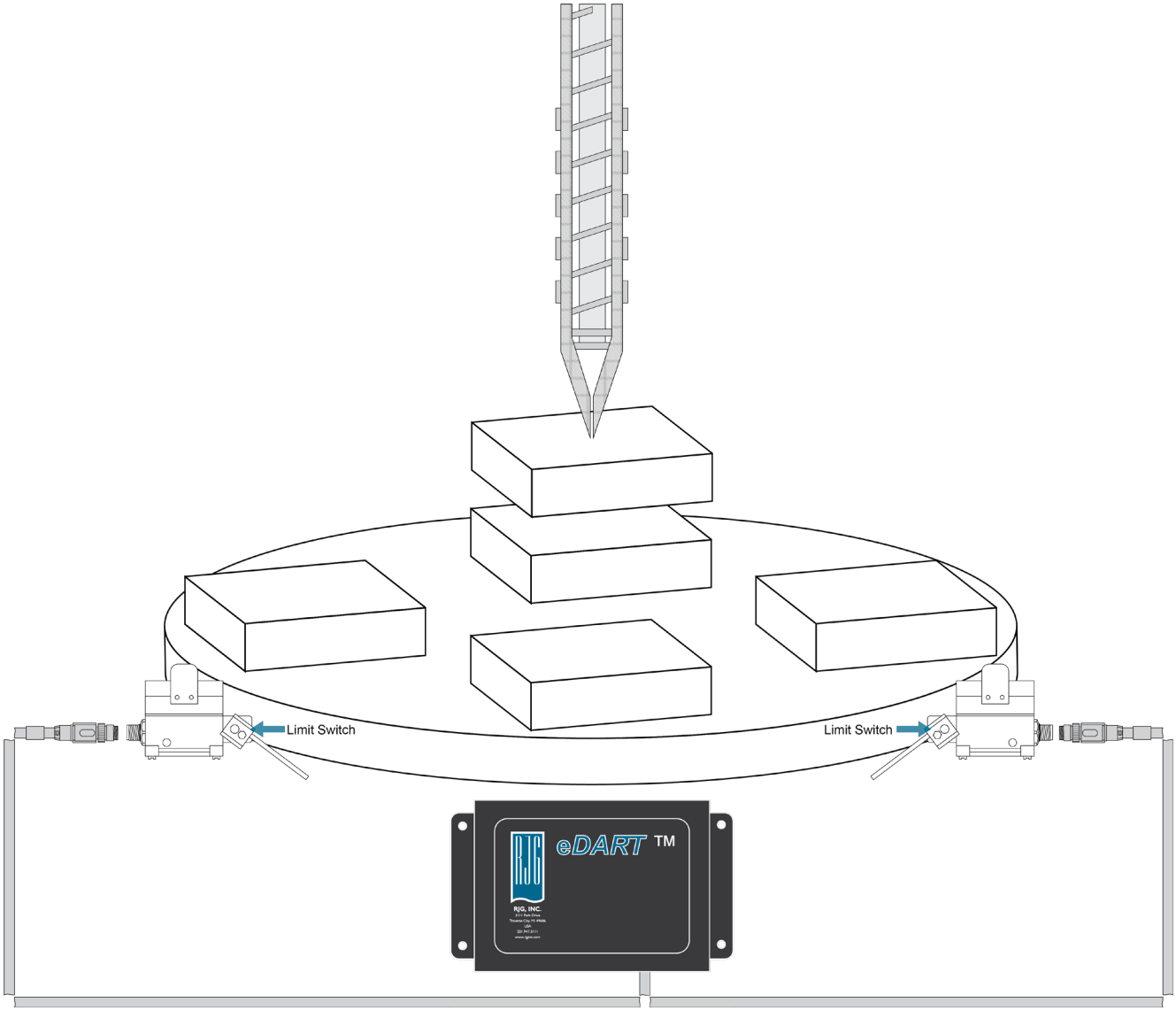
Wiring for Two Positions—Alternate Option 2

Mount a Lynx™ L-LS limit switch on the shuttle table and wire it to the e*DART* to indicate shuttle position.



Wiring for Three or More Positions

On a rotary table with three (3) or more positions, mount one (1) limit switch on the machine for each two (2) positions. For example, a rotary table with four (4) positions requires two (2) limit switches.

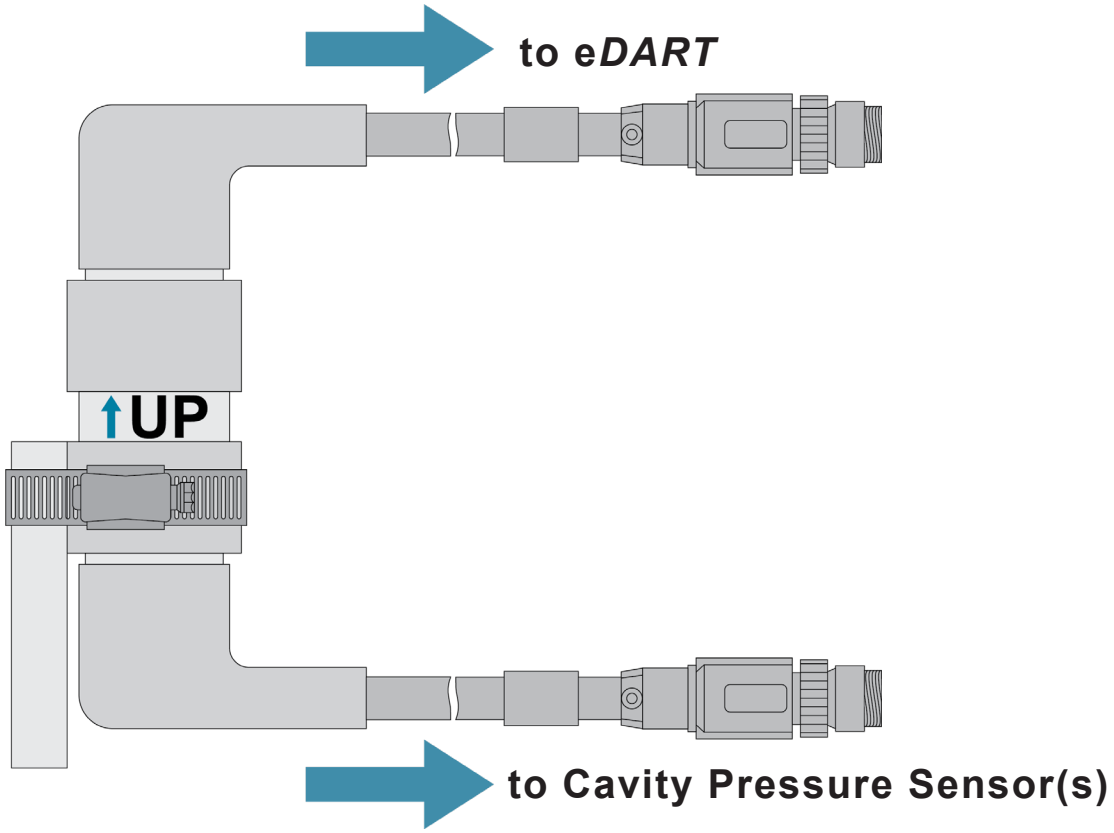


Slip Ring Connector for Cavity Pressure Sensors

The RJG Lynx™ slip ring connector assembly (C-LX/SR-2M-M90) mounts directly on the rotary table and allows a full 360 degrees of rotation for continuous information from Lynx sensors that are mounted on rotary table molds.

- The slip ring assembly is not designed to carry mechanical loads.
- Contacts of the slip ring assembly are filled with mercury. The slip ring assembly must be shipped, stored, and installed with the arrow on the assembly pointing up.

1. Determine the best location for the slip ring assembly—closest to the center of rotation of the rotary table.
2. Mount the slip ring assembly on a post with a clamp attached to the lower plastic collar; the top half should rotate freely. In environments with excessive vibration, rubber tubing can be used.
3. Connect the top slip ring assembly cable to the e*DART,* and the bottom slip ring assembly cable to lynx devices.



Software Installation

Read and perform all instructions to install the Shuttle Control tool onto the e*DART*.

Requirements

The following are required to install the Shuttle Control tool:

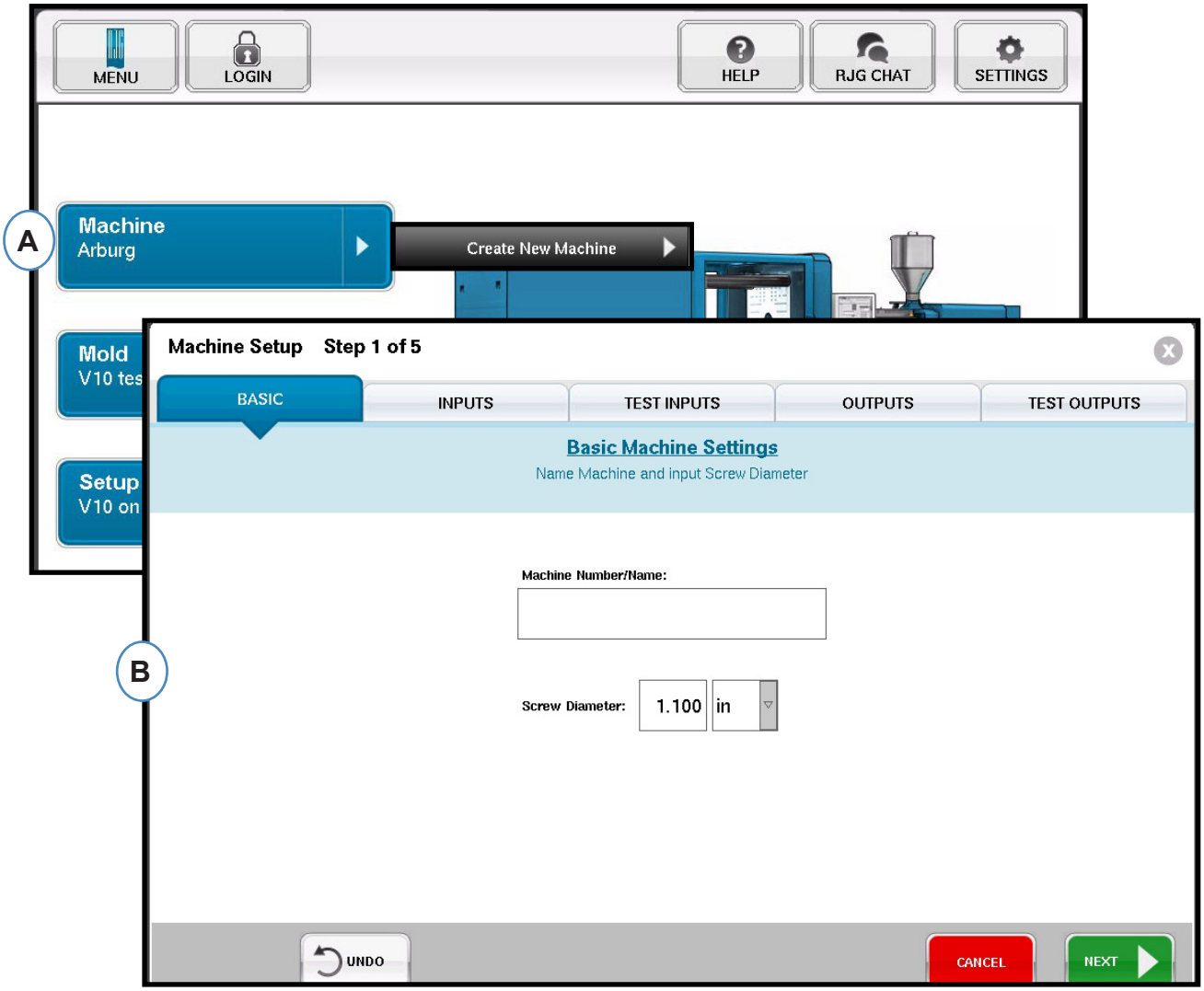
- e*DART* software version 10.6 or newer
- Phindows installed on a Microsoft® Windows-based computer
- Shuttle Control software (disk or downloaded file)
- e*DART*'s IP address which tool will be installed (Note: The e*DART* on which the Shuttle Control tool will be installed must be idle (not currently running a job).

1. On a Windows-based Computer begin a Phindows session with the e*DART* on which the Shuttle Control tool will be installed.
2. Insert the Shuttle Control software disk into the computer's disk drive ***OR*** double-click the installer file.
3. Click the Start Menu button.
4. Enter "run" using the keyboard and then enter/return.
5. Enter the disk drive name followed by "\load_edart <eDART IP address>". For example, with the D: drive and e*DART* IP address of 192.168.1.1, the command to enter would be **D:\load_eDART 192.168.1.1**. (Note: There must be a space between "eDART" and the IP address.)
6. Restart the e*DART*.

Shuttle Control Setup

Machine Setup

The e*DART* Shuttle Control tool enables the selection of shuttle positions and limit switches for sequence input and during a job setup. Read and follow all instructions to setup and assign shuttle positions in the e*DART* software.



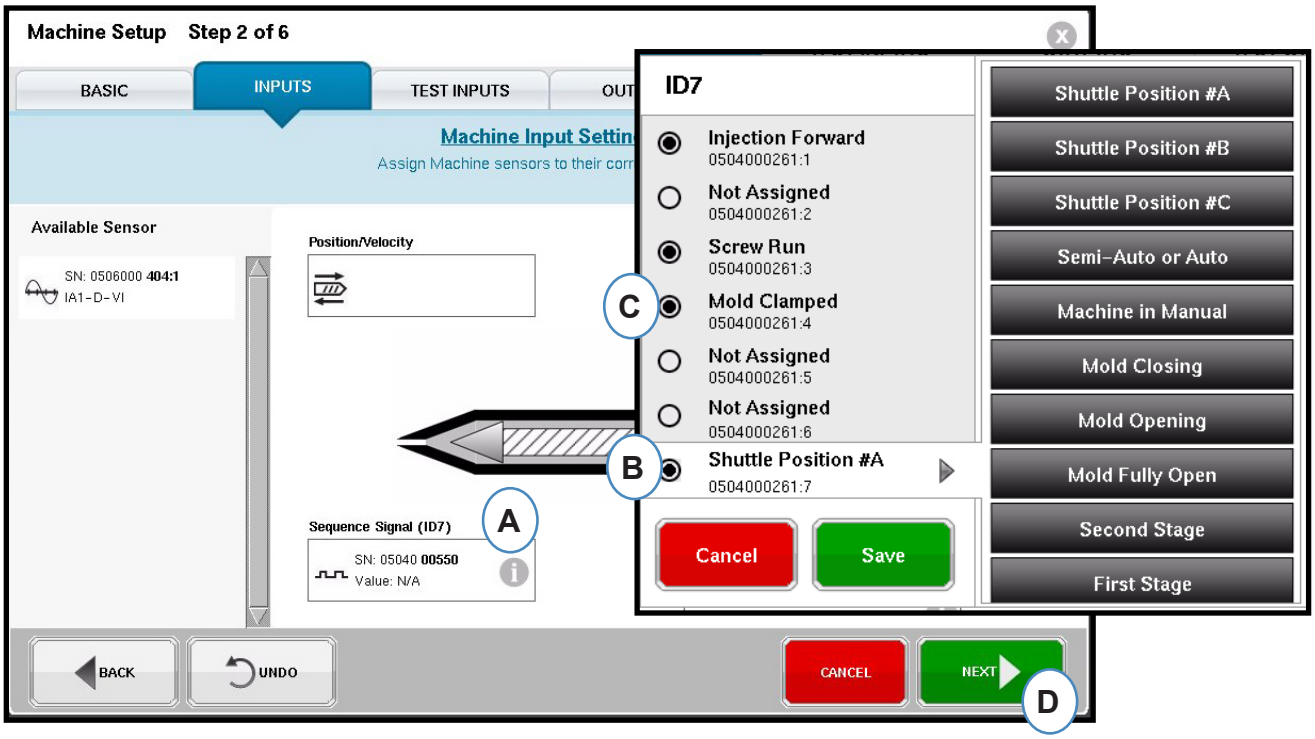
A: Select the Machine button on the e*DART* Home page, then select the Creat New Machine button.

B: Enter the Machine Number/Name in the provided field in the Machine Setup BASIC tab; enter the screw diameter and select the unit of measurement from the drop-down menu in the BASIC tab. Select the NEXT button.

Placing Machine Sensors and Assigning Sequences

All sensors connected to the machine and e*DART* will display in the Available Sensors list on the INPUTS tab. Drag and drop sensors from the Available Sensor list into the corresponding locations. When a sensor is held over a location, a window will open and allow placement of sensor within that location.

The connected Sequence Module ID7-M-SEQ will automatically assign to the Sequence Signal (ID7) box. The shuttle control sequence signals must be assigned within the Sequence signal box.



A: Select the ”i” icon in the Sequence box to assign sequence signals.

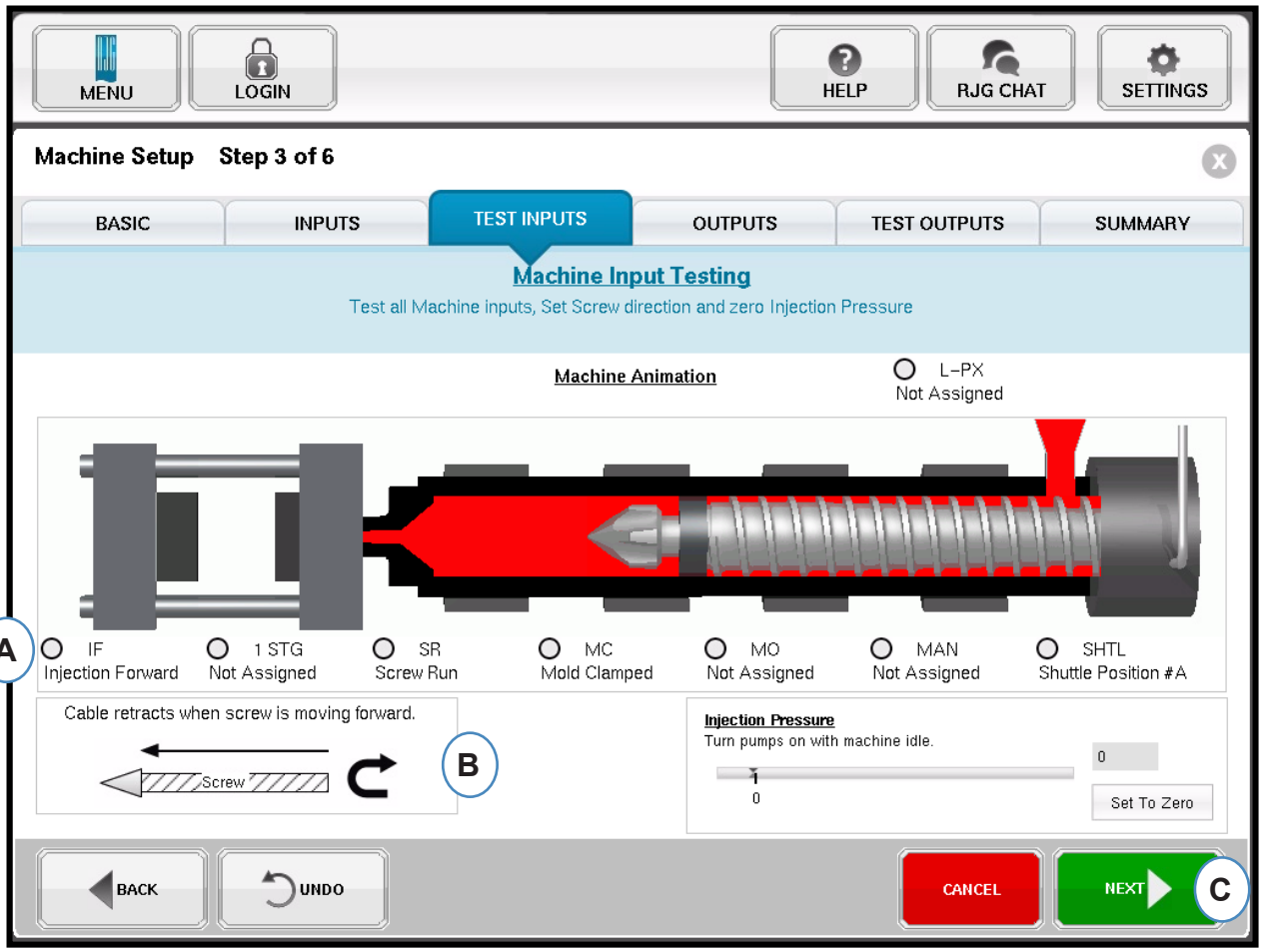
B: Select channel 5, 6, or 7, then select Shuttle Position #A, Shuttle Position #B, or Shuttle Position #C to assign the signal to the channel (if selecting only Shuttle Position #A, use channel 7 only). Select the SAVE button.

C: To unassign a previously assigned signal from a channel, select the radio button on the channel. Sequence signals must be assigned correctly—leave signals as “Not Assigned” if unsure of channel.

D: Select the NEXT button to continue.

Testing Machine Sequence Signal Inputs

The TEST INPUTS tab provides an animation of the machine that mimics the sequence signals for assignment verification.



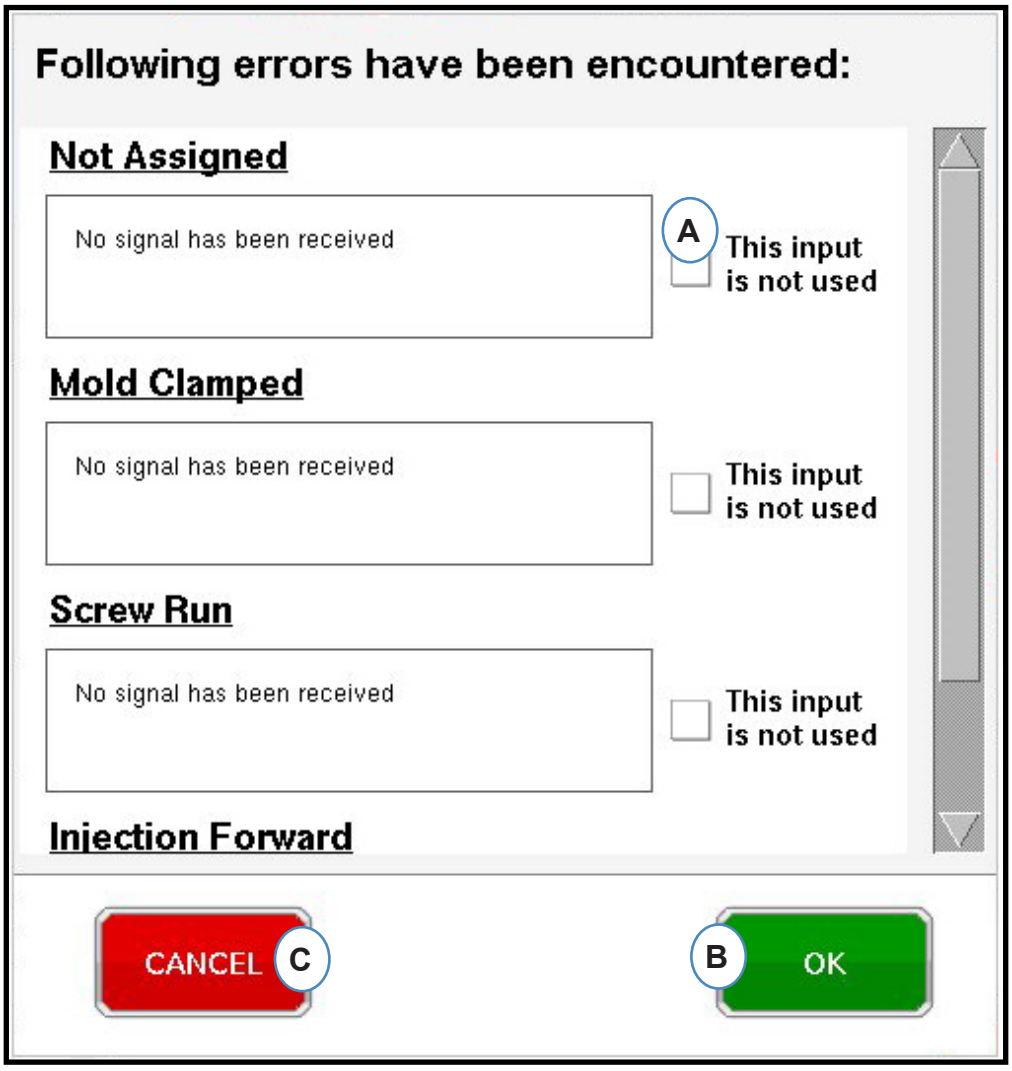
A: To verify sequence signals, observe the corresponding labeled lights to ensure that the signals function at the correct times. If the corresponding sequence light is not triggered as expected (lights up at the wrong time, does not light up), correct wiring to module.

B: Set Screw Direction and Zero Injection Pressure (hydraulic machines) to complete inputs.

C: Select the NEXT button to continue.

Testing Machine Sequence Signal Inputs (continued)

An error window will appear after completing the TEST INPUTS tab. If the sequence signals are incorrect, an error message will appear once the job is started.



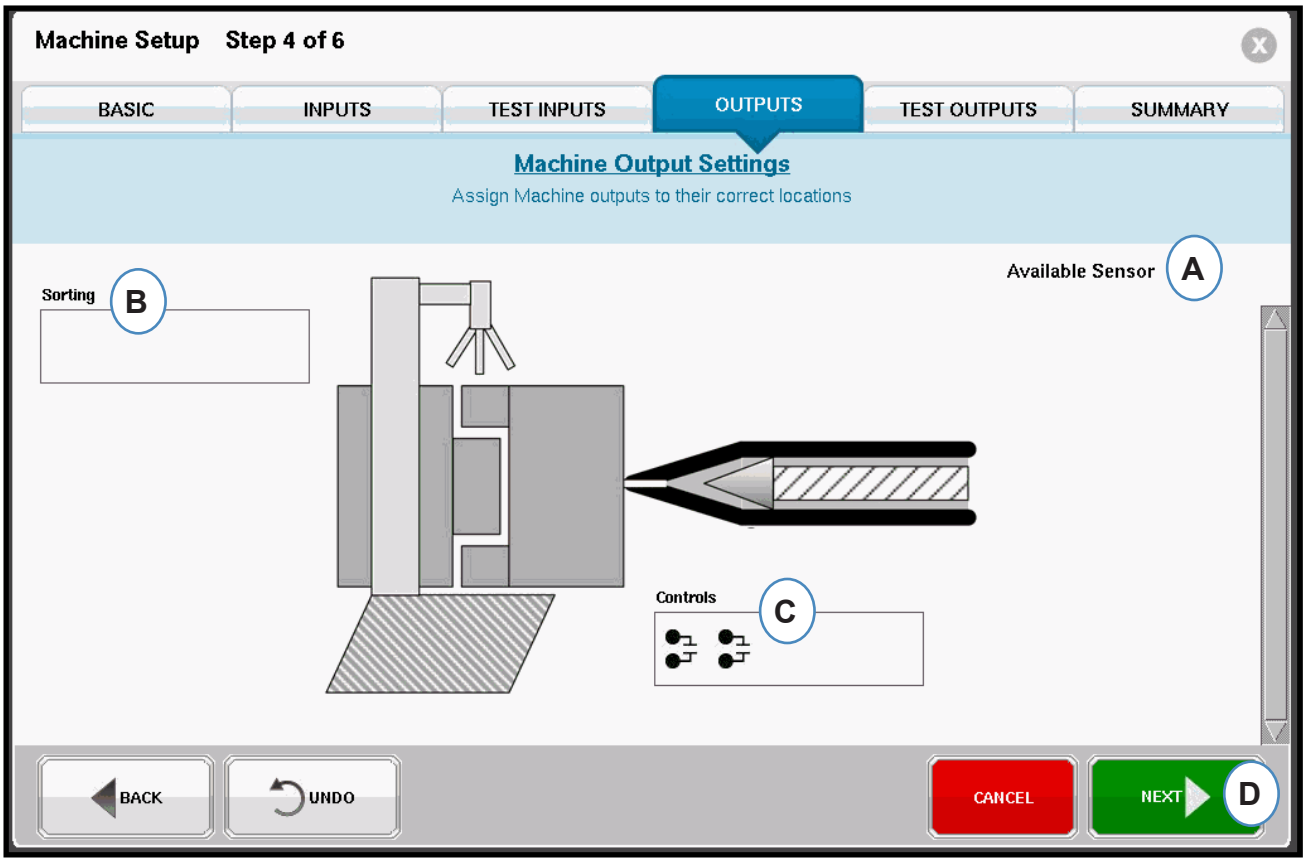
A: Select the “This input is not used” box if the sequence signal is not used, or if the signal is not correct.

B: Select “OK” to proceed without correcting the errors.

C: Select “Cancel” to return to the TEST INPUTS tab to correct the errors.

Configure Machine Outputs

Configure connected output modules in the OUTPUTS tab.



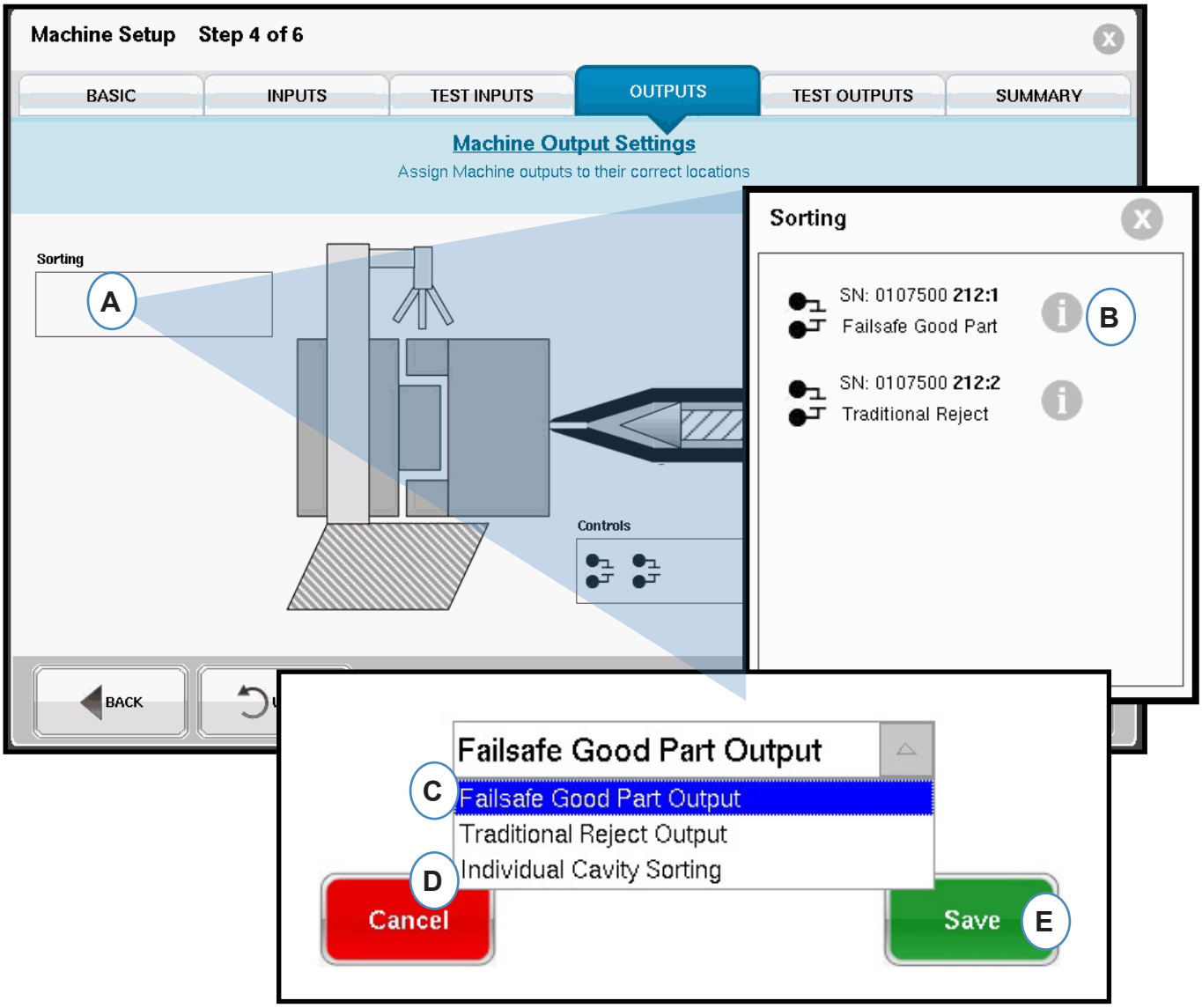
A: Drag Output Modules from the Available Sensor list into the correct location.

B: If a module is attached to a robot or part diverter drop it into the Sorting box.

C: If a module is connected for V→P transfer of the machine drop it into the Controls box.

D: Select the NEXT button to Continue.

Machine Sorting



A: Drag a sorting output from the Available Sensor list to the Sorting box, and drop in the correct location in the pop-up window.

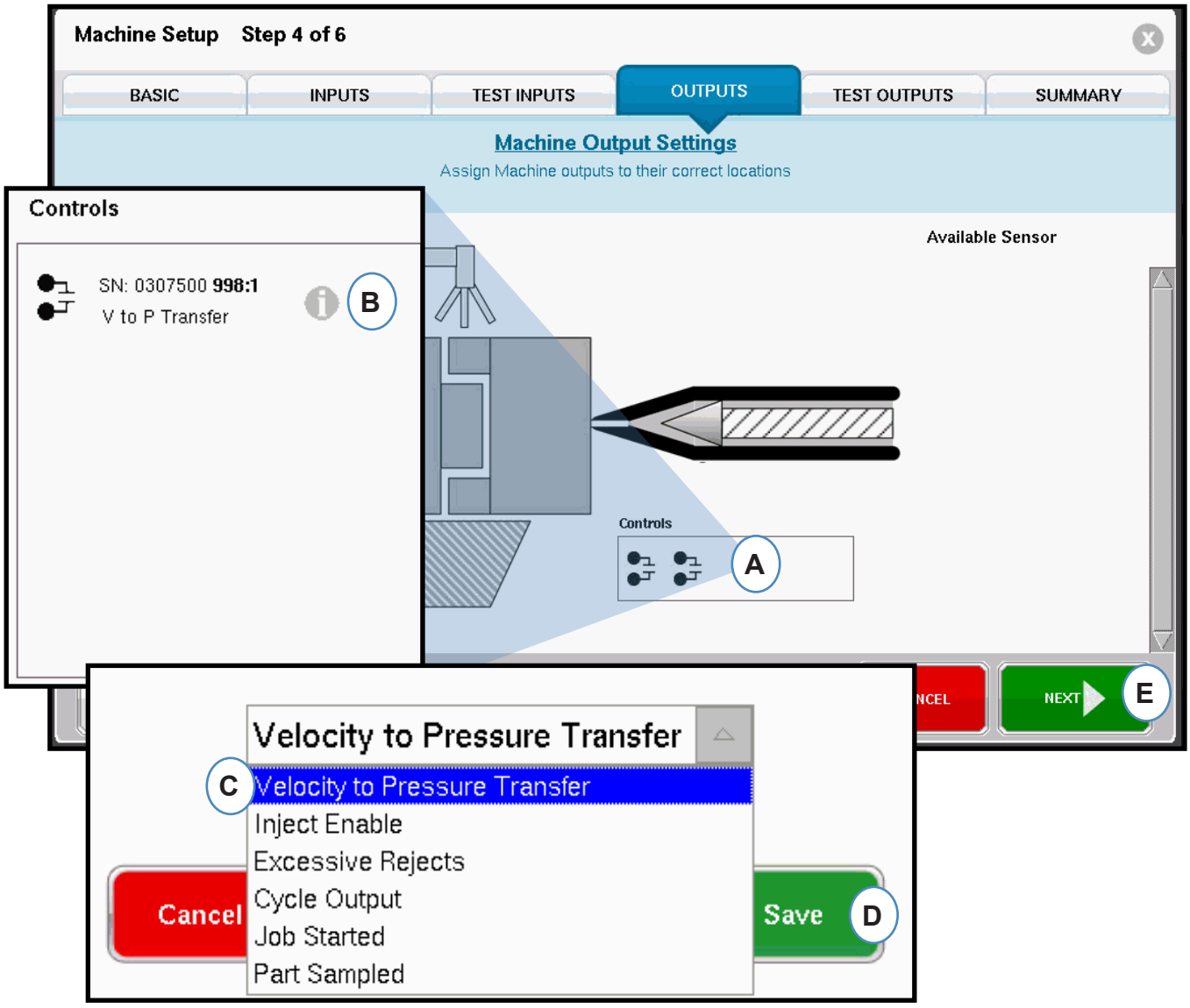
B: Select the “i” in the Sorting box to configure the sorting output.

C: One side of a Lynx Relay Module OR2-M wired to a robot or part diverter is required if shot containment is desired (selects an entire shot for segregation and inspection). Select “Failsafe Good Part Output” for this containment type.

D: One side of a Lynx Relay Module OR2-M wired to a robot or part diverter is required for each cavity if individual cavities are to be segregated for inspection. Select “Individual Cavity Sorting” for each module. The cavity identification for each module will be set in the Mold setup screen.

E: Select the SAVE button, and then the CONTINUE button to continue.

Machine Control Velocity to Pressure Transfer



A: Drag a module from the Available Sensor list to the Control box, and drop in the correct location.

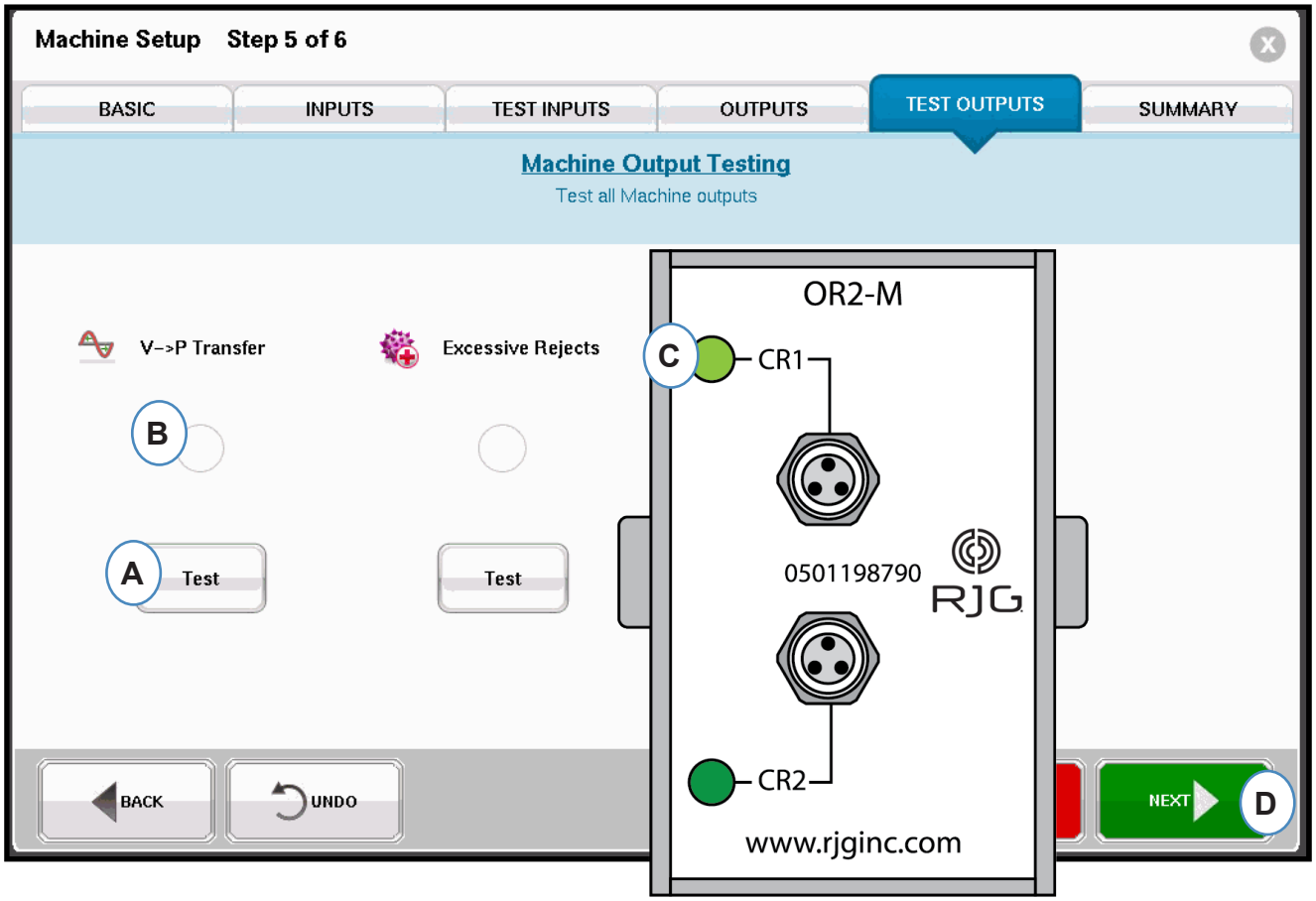
B: Select the “i” button in the Controls box to configure the control output type for each module.

C: Choose the desired setting from the drop down.

D: Select the SAVE button.

E: Select the NEXT button to continue.

Machine Output Testing



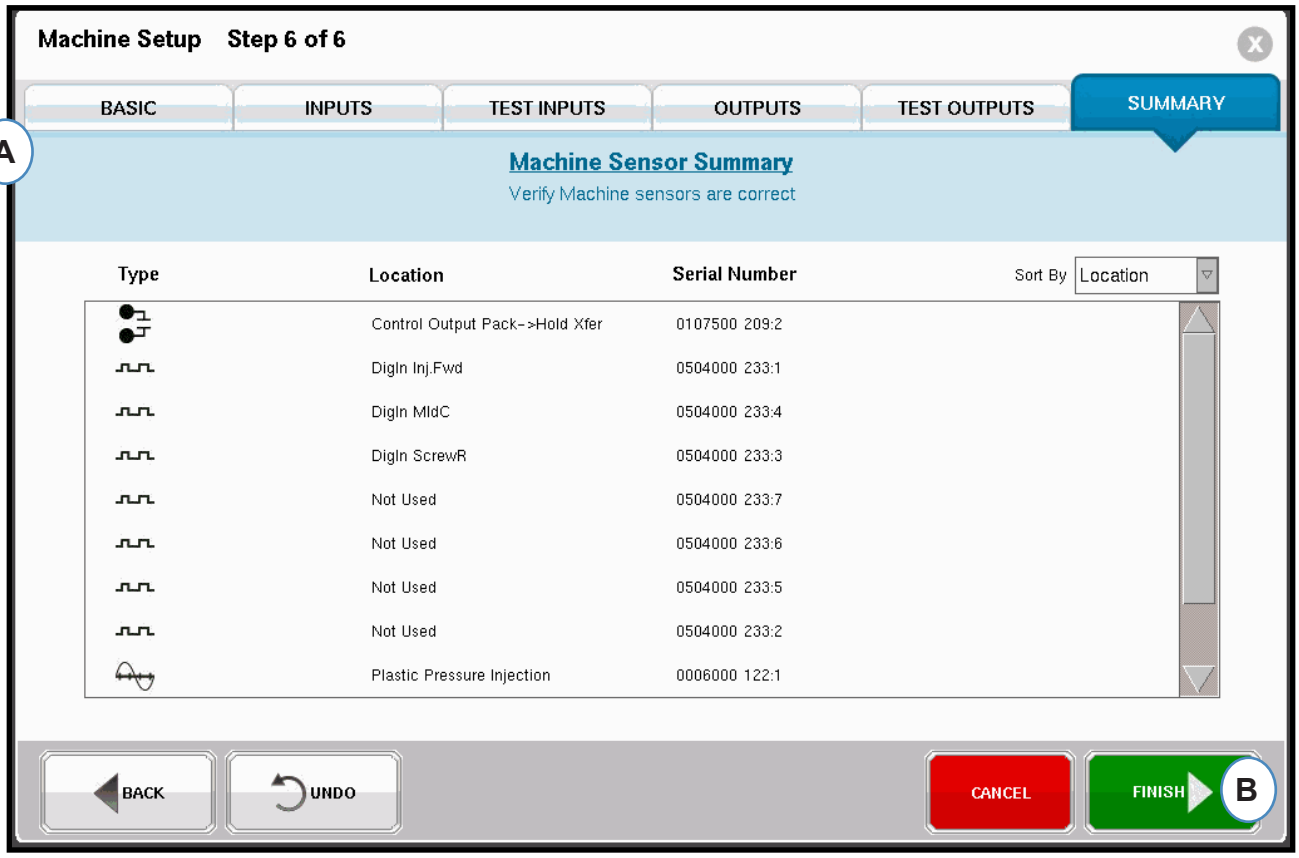
A: Select the Test button to individually test each available output.

B: Verify that the corresponding light on the TEST OUTPUTS tab turns green.

C: Verify that the LED on the corresponding output module turns green. Verify that the device alternates correctly on the machine, robot, or diverter.

D: Select the NEXT button to continue.

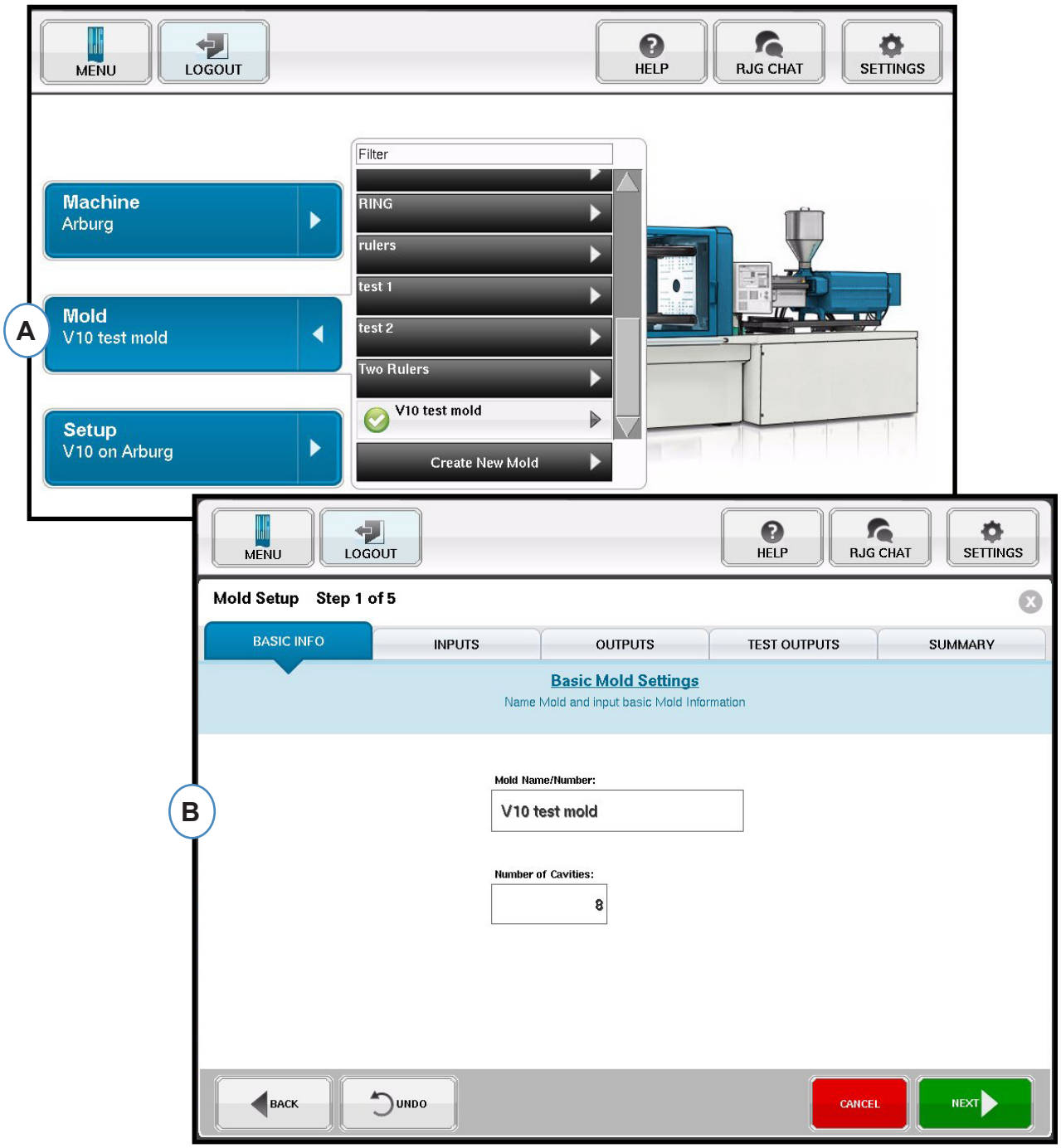
Machine Summary Tab



A: The SUMMARY tab shows the type, location, and serial number of every connected Machine Sensor, whether in use or not.

B: Select the FINISH button to complete setup.

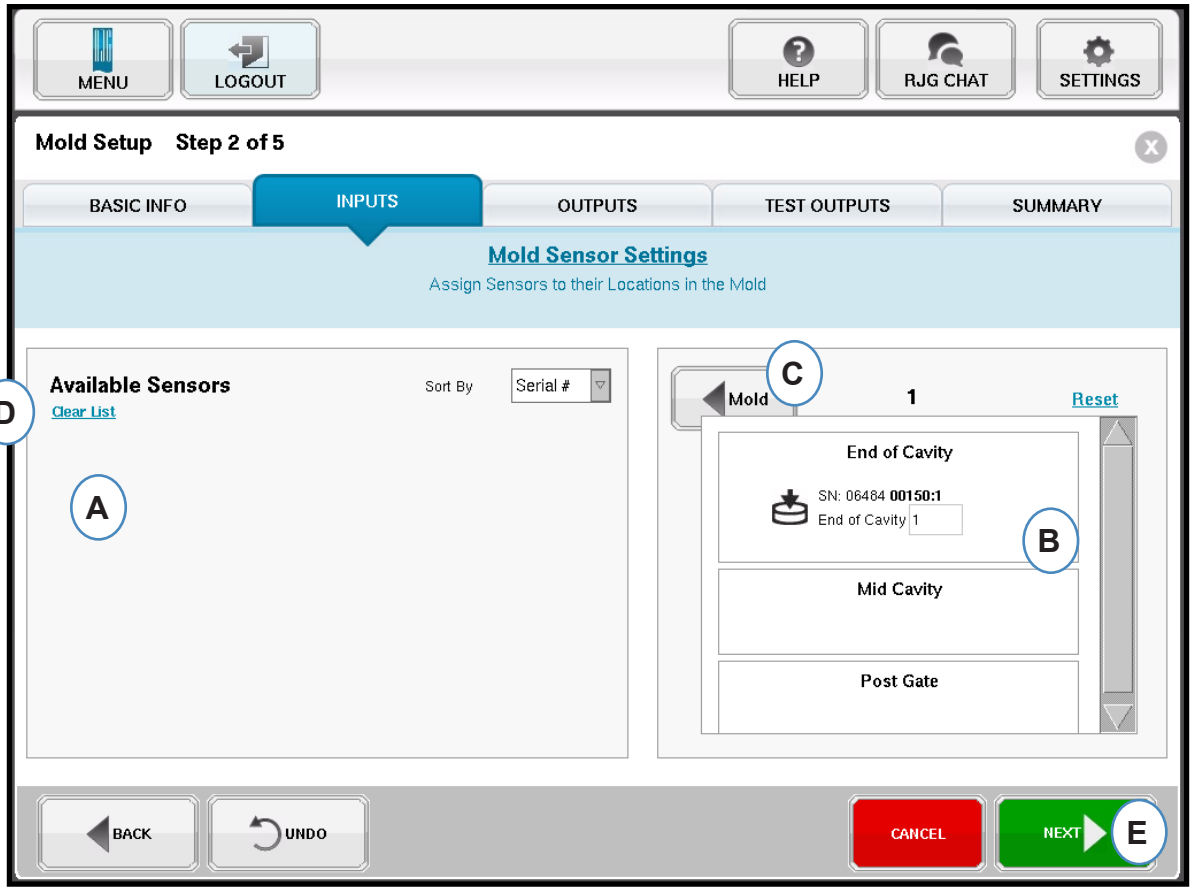
Mold Setup



A: Select the Mold button on the e*DART* Home page, then select the Create New Mold button.

B: Enter the Mold Number/Name in the provided field in the Mold Setup BASIC INFO tab; enter the number of cavities. Select the NEXT button to continue.

Mold Sensor Assignment



For known sensor locations:

A: Drag a sensor from the Available Sensors list and drop into the correct cavity number on the right. The Individual Cavity Window will appear when a sensor is held over a cavity in the mold window.

B: There may be multiple sensors in each cavity (Post Gate, End of Cavity, Mid Cavity).

C: Select the Mold button to go back to all cavities.

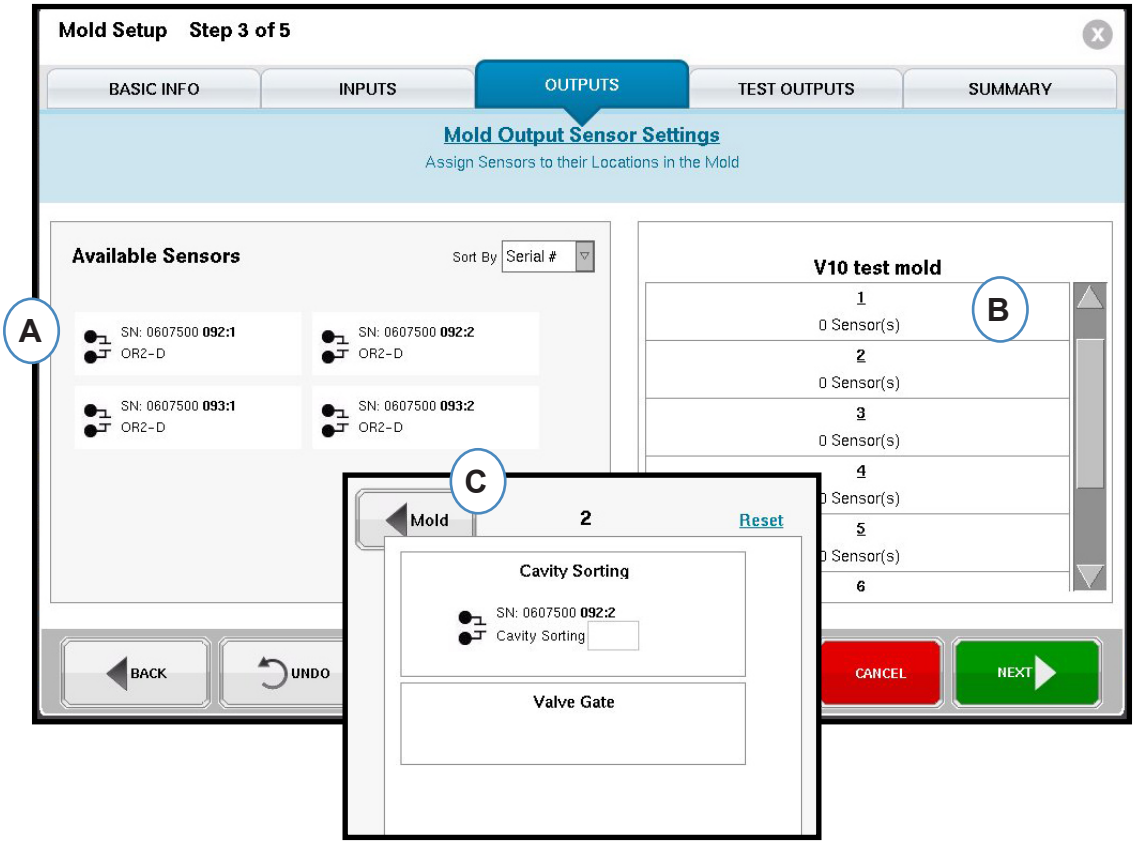
For unknown sensor locations:

D: To determine placement of sensors within the mold and cavities, select “Clear List” in the Available Sensors list. Manually apply pressure to each sensor or pin. Sensors will appear in the “Available Sensor” list when pressure is applied to them. (Indirect Sensors: Open mold, extend ejector pins, push on pins one at a time, and note the order that pins were loaded; Direct Sensors: Apply pressure to sensors and note the order that sensors were loaded.)

E: Select the NEXT button to continue.

Individual Mold Cavity Part Containment Configuration

Individual cavity containment requires one relay from an Analog Output Module OR2-D to be assigned to each cavity. (Assigned during Machine Setup in OUTPUTS tab as “Individual Cavity Good Part Sorting”—relays labeled as such will appear in the “Available Sensor” list.)



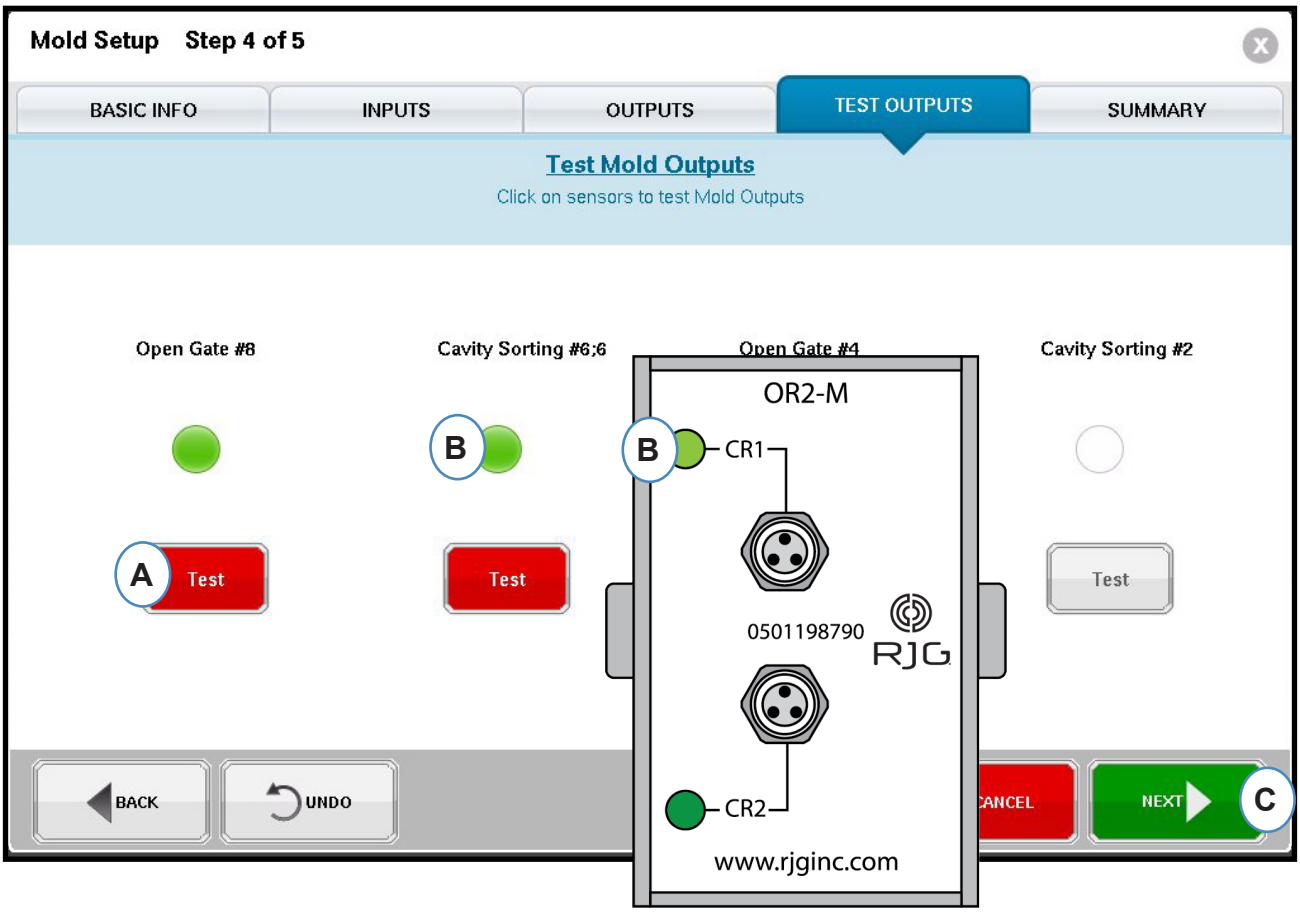
A: Drag a sensor from the Available Sensor list on the left and drop into the correct cavity on the right.

B: Drop the sensor into the correct location within the cavity.

C: Select the Mold button to return to all cavities.

D: Select the NEXT button to continue.

Testing Mold Outputs

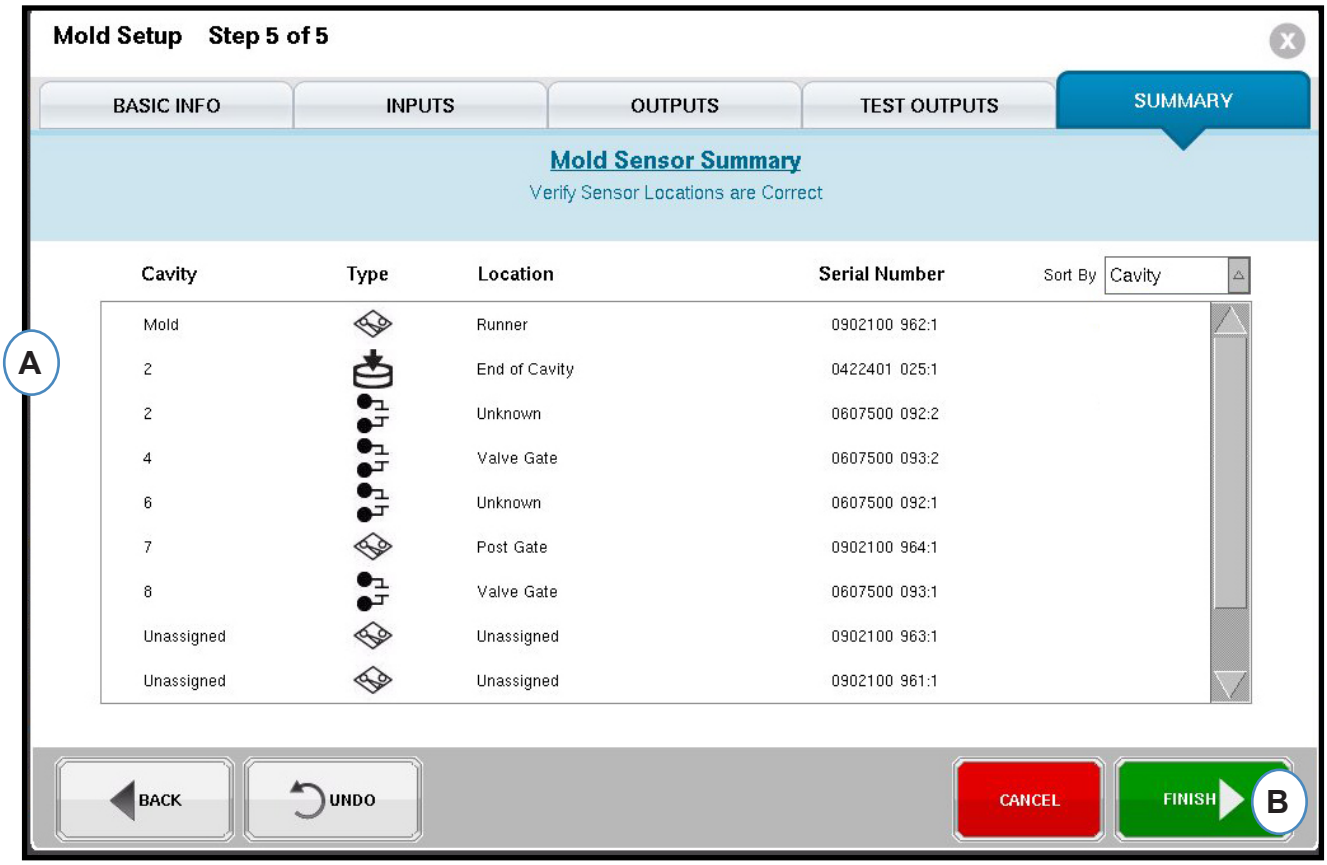


A: Select the Test button to individually test each available output.

B: Verify that the LED on the TEST OUTPUTS tab and corresponding output module turns green.

C: Select the NEXT button to continue.

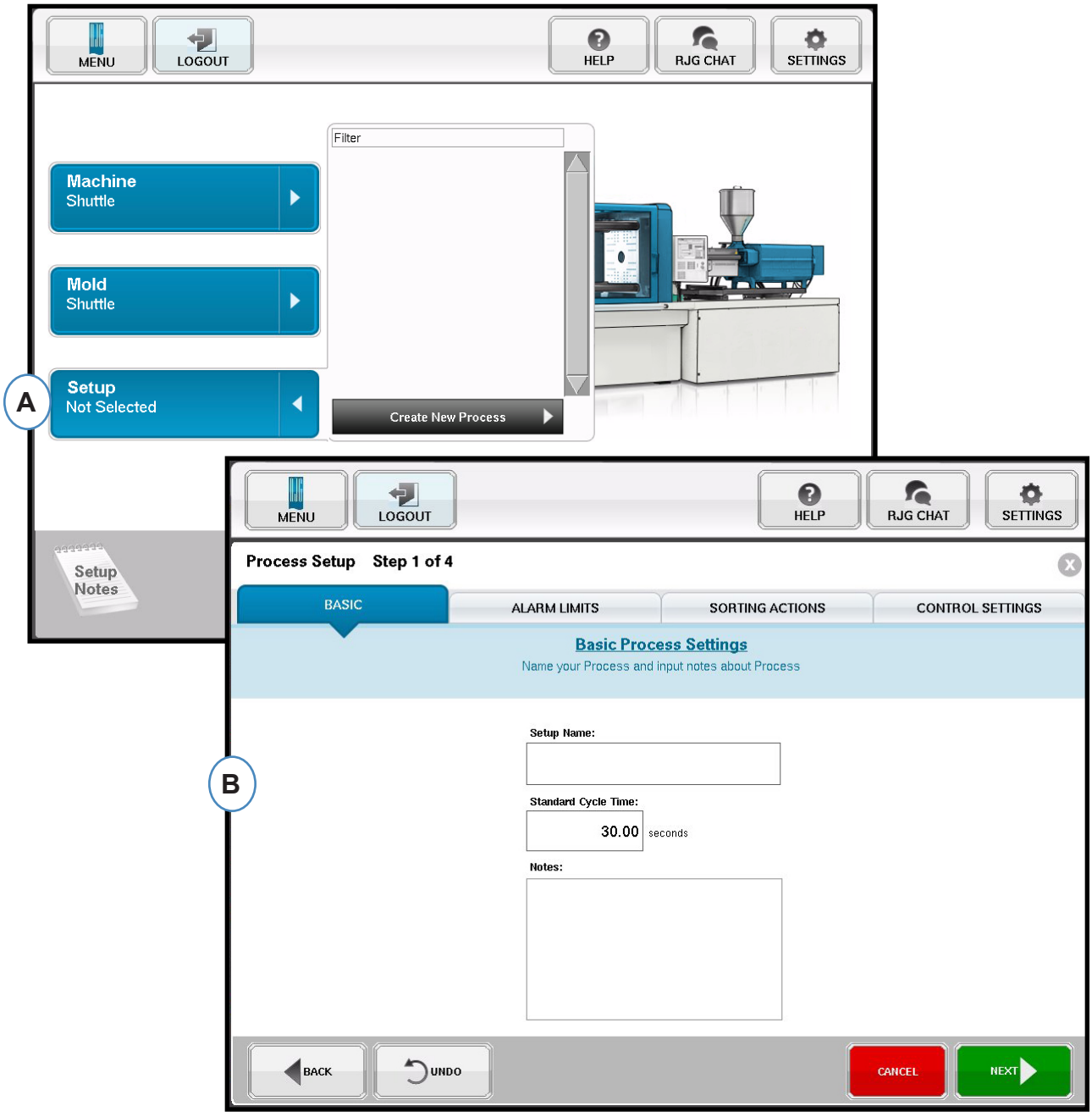
Mold Summary



A: The SUMMARY tab shows the type, location, and serial number of every connected Mold Sensor, whether in use or not.

B: Select the FINISH button to complete setup.

Process Setup

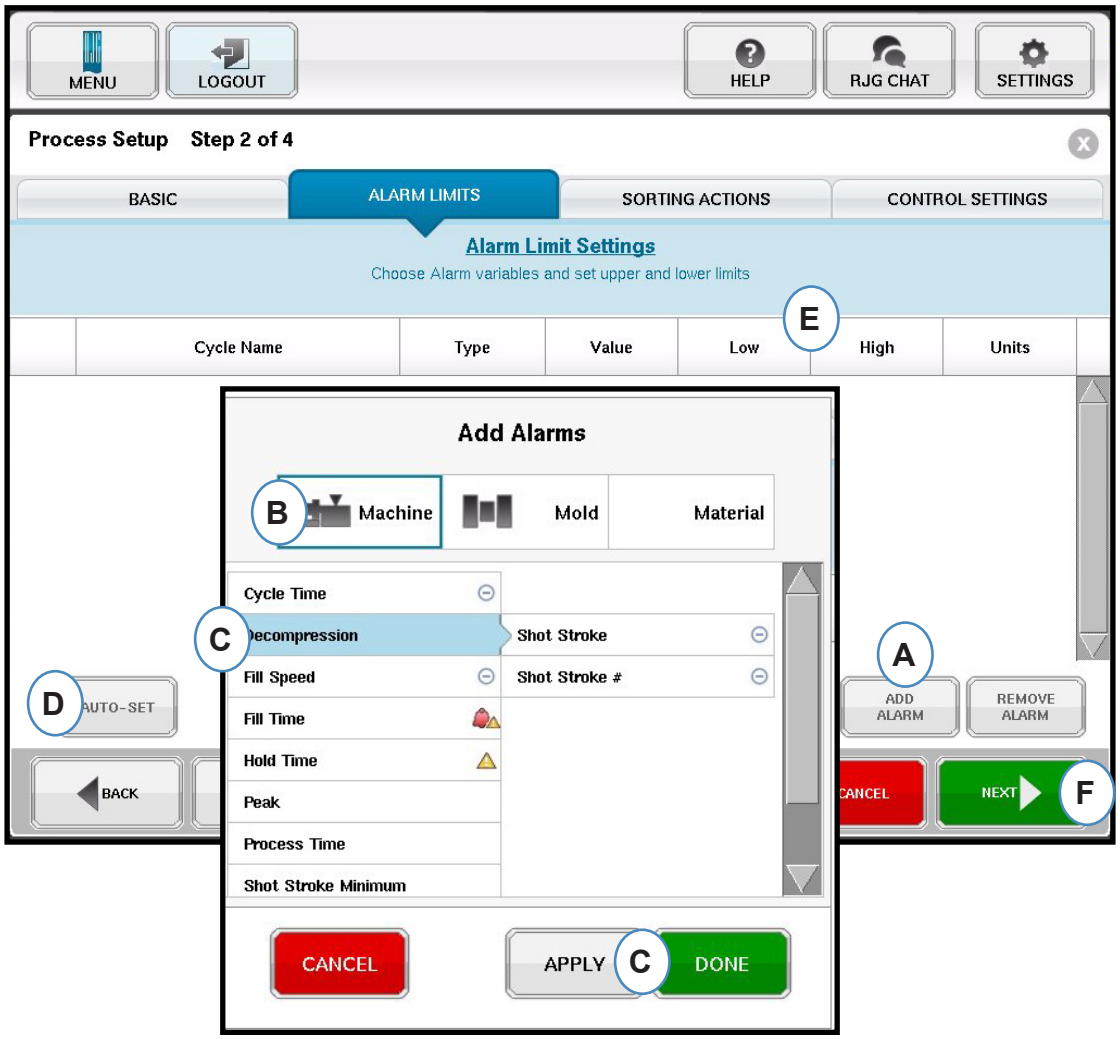


A: Select the Setup button on the e*DART* Home page, then select the Create New Process button.

B: Enter the Setup Name in the provided field in the Process Setup BASIC tab; enter the standard cycle time and any notes (if desired, but not required). Select the NEXT button to continue.

Process Warning & Alarm Limits

A process warning or alarm can be set automatically or manually based on actual part characteristics.



A: Select the Add Alarm button—the list of variables for available warnings or alarms will display.

B: Select Machine, Mold, or Material, and then select the variable for which the warning or alarms will be set. One click creates a warning, designated by the ⚠ symbol; two clicks creates an alarm, designated by the 🔔 symbol; and three clicks creates both a warning and alarm, designated by the 🔔⚠ symbol.

C: Select the APPLY button to apply warnings and alarms; select the DONE button when finished creating warnings and alarms.

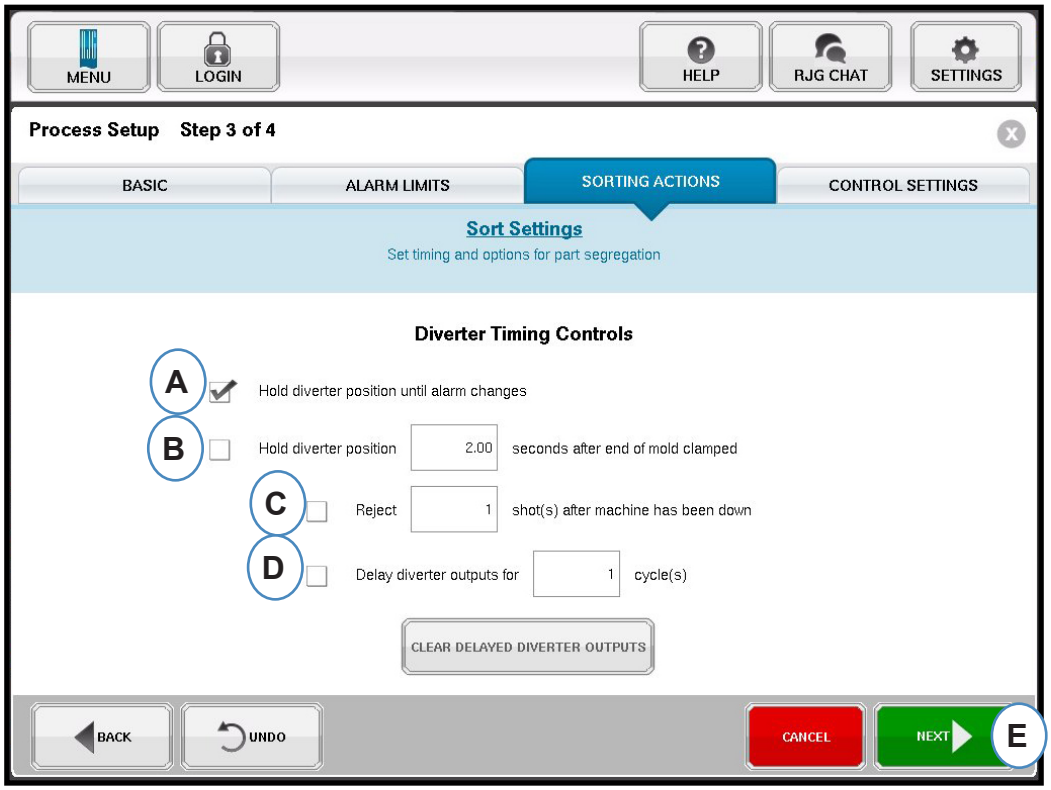
D: Select the AUTO-SET button, then select the SET button to accept the suggested alarm levels ***OR*** adjust alarm levels as desired.

E: To manually set warning and alarms, enter the desired LOW and HIGH values in the provided fields.

F: Select the NEXT button to continue.

Process Sorting Actions

Set timing and options for part segregation in the SORTING ACTIONS tab.



A: Select the check box to enable the a hold of the part diverter in one position until a change in the alarm state occurs.

B: Select the check box to enable a contact to be held closed when a good part signal is generated; enter the desired time interval.

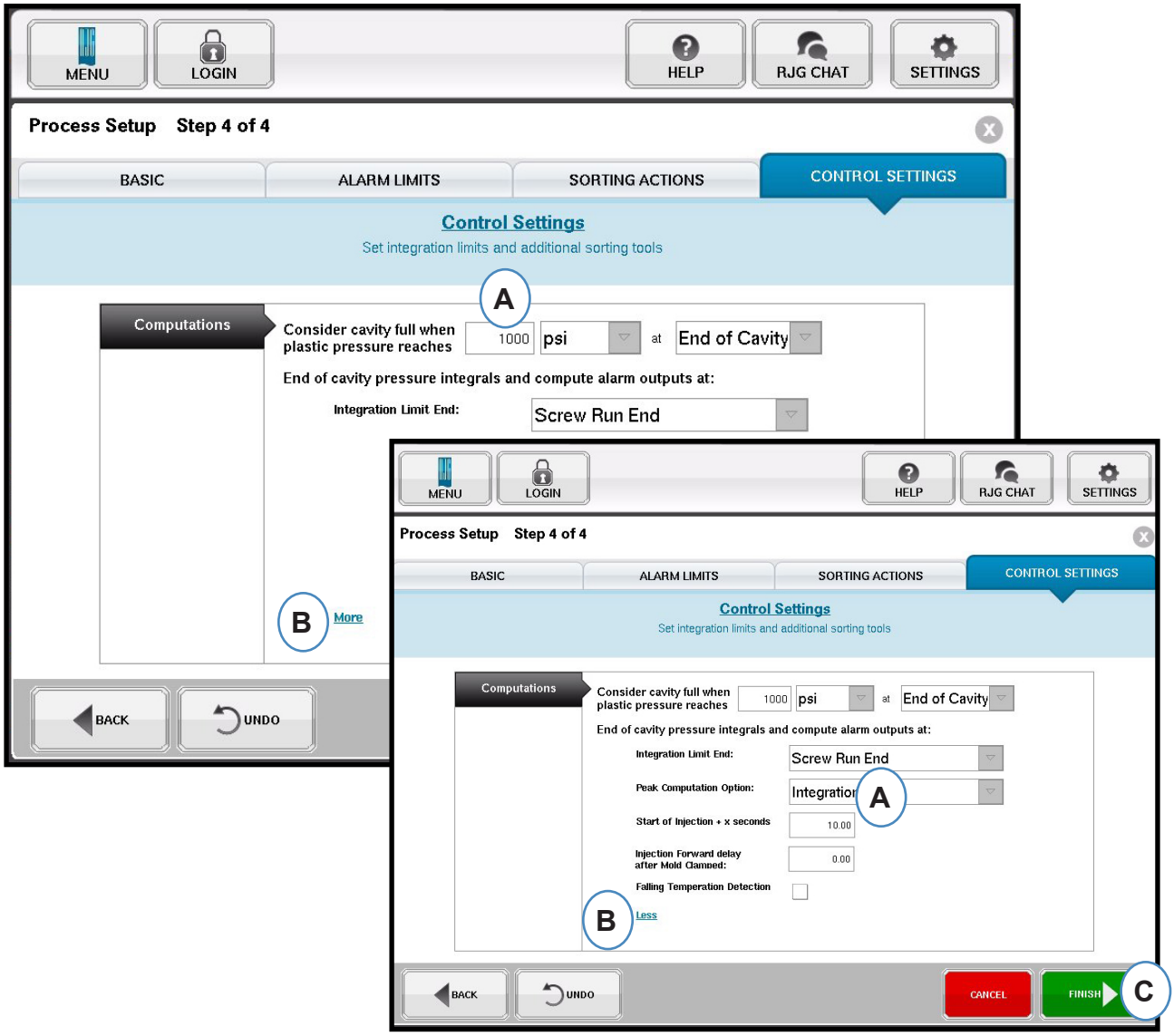
C: Select the check box to enable the “Reject After Down” feature and enter the number of parts to be rejected after a Machine down state occurs.

D: Select the check box to enable the “Diverter Delay” feature and enter the number of cycles to delay the output. This feature is used for conveyers (or rotary tables) that hold numerous parts prior to the connected diverter device or over-mold processes encounter alarms on the first shot.

E: Select the NEXT button to continue.

Process Control Settings

Configure how alarms are calculated and set up additional control output configurations in the CONTROL SETTINGS tab. This page allows for the modification of Integration limits and for configuration to view temperature drop instead of temperature rise in Liquid Silicone Rubber or other thermoset materials.



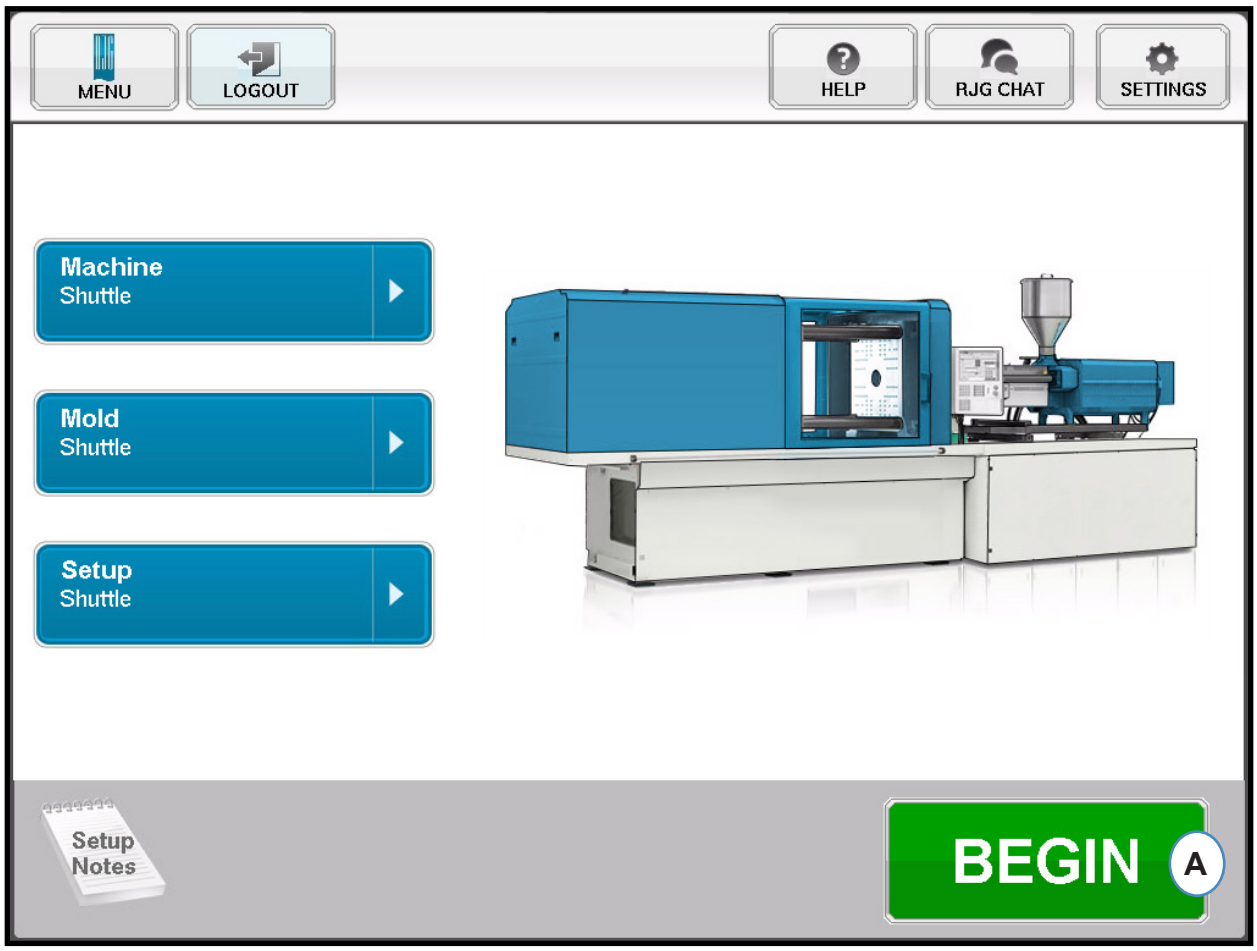
A: Enter information in the provided field(s) and select the appropriate unit of measurement/location.

B: Select More to view more options; select Less to hide additional options.

C: Select the FINISH button to complete the process setup and return to the main window.

Shuttle Control Operation

Start-Up

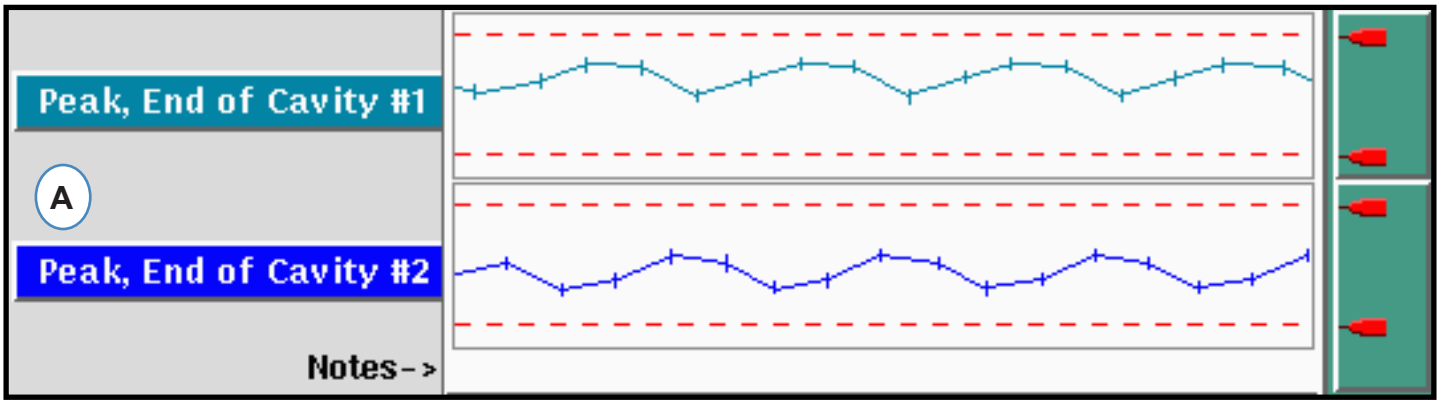


A: Once the machine, mold, and process are set up, select the BEGIN button to start the job.

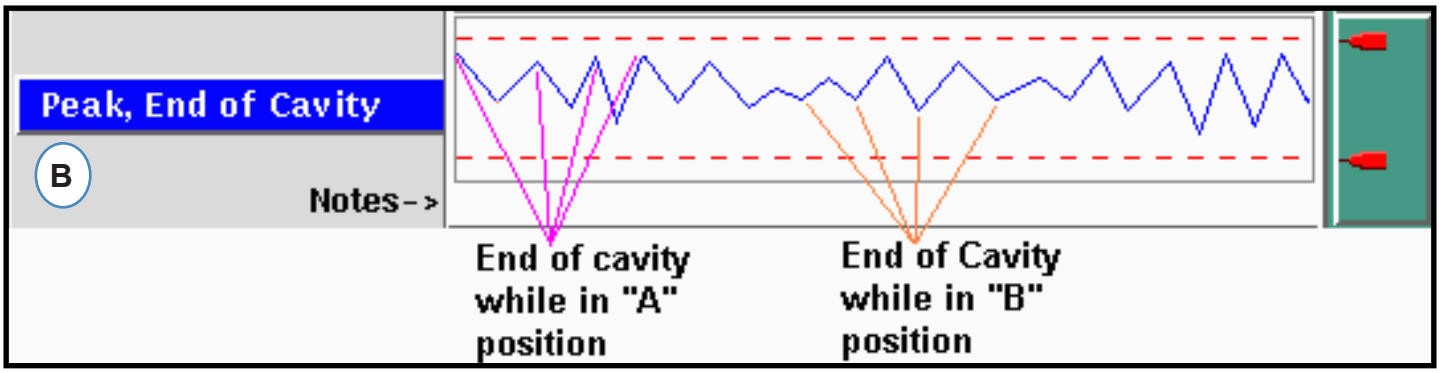
Job Summary Data

The e*DART* Shuttle Control tool software monitors and automatically creates summary data of four "phantom" curves for multiple sensors in the same location. The four curves are a cumulation of all sensors in that location at that time. For example, sensors placed at the Post Gate location will be divided into Post Gate #High (sensor with the highest reading), Post Gate #Avg (average of all sensor readings), Post Gate #Low (sensor with the lowest reading), and Post Gate #Rng (range or difference at each point between the highest and lowest sensor reading) curves.

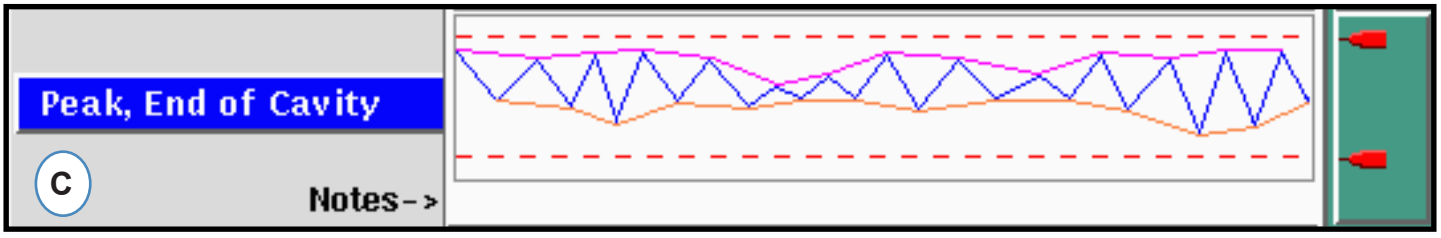
The Shuttle Control will only show sensors that are in the active mold half—once pressure is applied to a sensor, it is included in the summary data. Sensors in the inactive mold half are not included in the #High, #Avg, #Low, and #Rng curves.



A: Moving Half Sensors—One sensor is active while one sensor is inactive; data points therefore will atlernate for each mold half.



B: Fixed Half Sensors—Fixed half sensors plot a data point on every shot. If the mold shuttles from shot to shot, it is possible to see the alternate data between two halves.

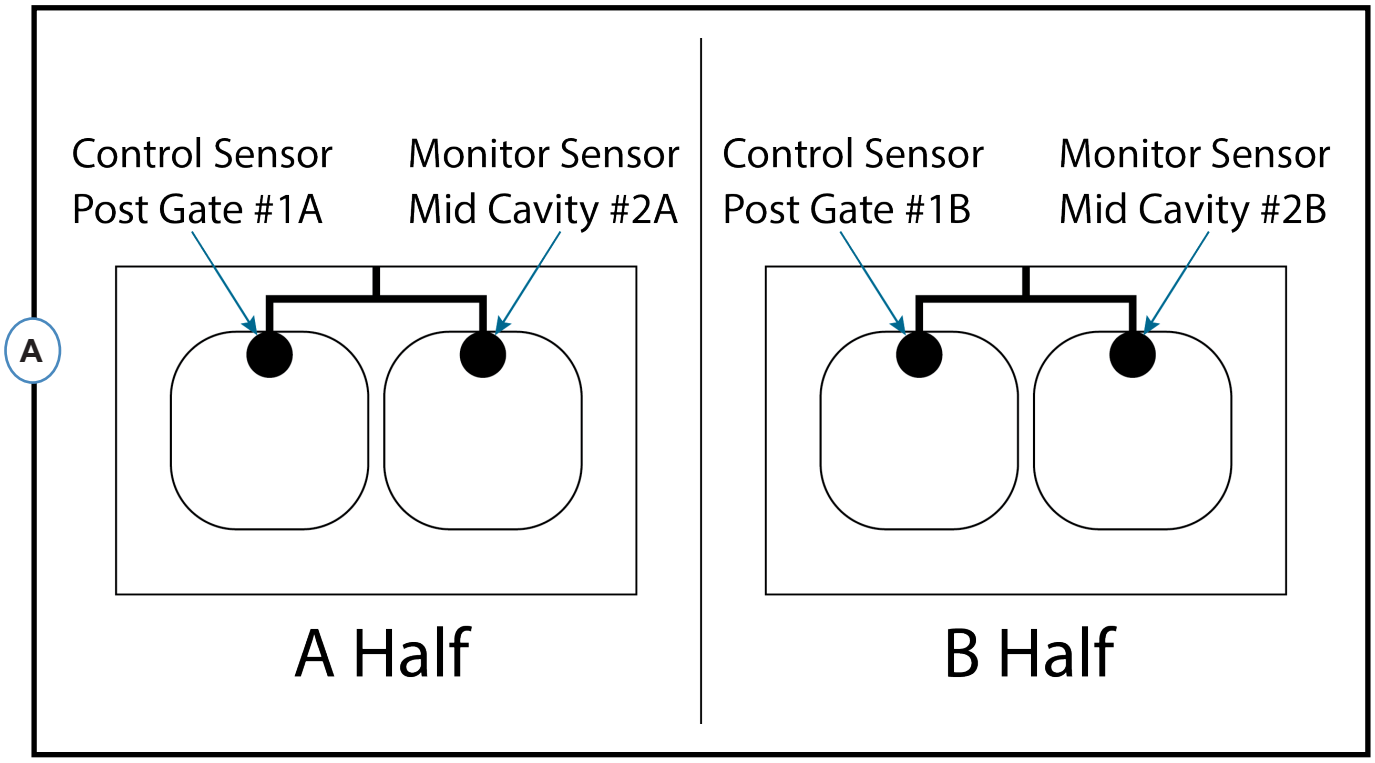


C: Fixed Half Sensors—The upper and lower lines show the data trend for each mold half (these lines are for illustration only— lines are not plotted by the e*DART*).

V→P Transfer Control

Moving Half Sensors—When sensors are placed in the moving half, and each moving mold half is assigned a control sensor, the #High sensor is used to control cavity pressure transfer. If each mold half has more than one cavity with multiple sensors in the same location, the designated V→P control is based on the first sensor that reaches the pressure set point. For example, in a two-cavity mold with two Post Gate sensors (one for each cavity), the Post Gate sensor which reaches the V→P pressure set point first will cause the control to transfer, even though the other sensor has not reached the pressure set point. This arrangement is ideal if pressures are intended to never exceed the designated set point.

CAUTION: When using the generated summary data points #High, #Avg, #Low, or #Rng for V→P control, the sensors MUST be assigned to the correct mold half. If the sensor is assigned to the incorrect half, the signal will not be included in the data and the machine will not transfer. Failure to comply will result in damage to equipment.



A: To set up V→P control from a specific sensor in a multi-cavity mold with multiple sensors in the same location, the non-control sensors must be designated as a different location than the controlling sensor. For example, the control sensor is designated as Post Gate; the remaining sensors are designated as Mid Cavity—even if the non-control sensors are located Post Gate.

NOTE: Sensors are generated at 250 samples per second, giving them a 4 mS response time—even if the input sensors run faster.

Fixed Half Sensors—Sensors in the fixed half will have pressure applied during both shuttle positions, therefore, only one sensor and one set point can be used for V→P control. The single cavity pressure set point will control parts made in both halves.

Shuttle Control Tool

The Shuttle Control tool is designed to work based on the inputs made during normal machine, mold, and process setup in the *eDART* software, without manipulation to the Shuttle Control tool itself. However, in the event that automatic assignment generates incorrect settings, the tool can be manually adjusted.

NOTE: A job must be running to access the Shuttle Control tool.

A: Select Options, then select Process Settings.

B: Select the CONTROL SETTINGS tab, then select the Shuttle Setup tab.

C: Enter the pressure at which sensors will be detected. The sensor will be considered active during the cycle if it exceeds the set value for at least 0.25 seconds.

D: Select reset & re-assign to reset the shuttle positions and locks for all sensors, and to restart auto-detection.

E: Select the Active Position or Sorting Output for a sensor. The Active Position may be assigned to 1, 2, All, or detect. All indicates that it is active in both positions; All is automatically set if pressure over the threshold is applied for longer than 0.25 seconds in both positions. Detect indicates that the sensor is not yet assigned.

F: Select a check box to lock a sensor; locking a sensor prevents auto-detection by the software; a lock is also set automatically after a sensor is determined to have the same position for three consecutive parts made in that position.

G: Select SAVE to confirm changes.

NOTE: Changes made on this page are NOT saved when the job stops. The pressure detect set point is saved as a system and network default only.

Data Storage

The e*DART* stores data for both mold halves in a single “phlat” file. Sensors that are not assigned or are located in the fixed half will have a data point for each shot. Summary values from inactive sensors—sensors in the moving half—will not exist in the file. Also, the Shuttle Control tool creates a summary value named “Timing Signal, Shuttle Position”; this value is a number beginning at one (1) that can be plotted on the summary graph, and allows the determination of shuttle position at the start of each shot.