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1. - OPERATION DESCRIPTION

1.1 Overview

The 2D Profiling Dud Detector collects a 2-dimensional trace of the height profile of the top of a package as that package travels underneath the scanning sensor. It applies up to four different tests on the collected trace. If any of the tests fails, the package is declared defective and the rejecter is operated to remove the package from the production flow.

For the 2D-LASER, the sensor used to collect the profile trace is a laser triangulation sensor. It accurately measures the distance from the face of the sensor to whatever surface is under it. The surface must be within a defined range of the sensor face, which is approximately 1 to 1.5 inches. The laser sensor has a very small field of view, which means it makes its measurement over a small dot of surface area. The laser sensor works for plastic as well as metal caps.

The laser sensor is a Class 1 device, and no special safety procedures are required when working with or near it. However, it is always good practice to never look directly into the laser beam. The beam emanates from the face of the sensor, and is visible red.

For the 2D-PROX, the sensor used to collect the profile trace is an inductive proximity sensor. This sensor measures the distance from the face of the sensor to the surface of a metal cap. This sensor will not see any materials other than metal. Plastic, water, and other non-metal materials are invisible to the prox sensor. The field of view of this sensor is much larger than the laser, and so the profile trace collected is much less precisely defined with the prox, as compared with the laser profiles. The prox sensor works well for larger diameter caps, and with smaller diameter button caps down to 38mm.

For both LASER and PROX units, a second optical sensor looks across the path of the package. It looks for all packages, whether or not a cap is present to be seen by the profile sensor.
1.2 Inspections

There are four inspections. Each are visible on the **RUN MONITOR** screen. It is advised to leave this screen active and visible while the unit is inspecting (*Figure 1*). The four inspections are:

- **Panel Deflection** — This inspection measures the inward/outward deflection of the center of the cap. It determines whether or not the package is a dud; has low vacuum.

- **Missing Cap** — This inspection determines if a cap is present on the package.

- **Slanted Cap** — This inspection measures how much slant there is in the trace. Too much slant indicates the cap may not be properly applied to the package.

- **High Cap** — This inspection measures the overall height of the trace; which may indicate improper cap application.

*Figure 1: RUN MONITOR Screen*
1.2.1 Panel Deflection Inspection

Once the trace is collected, three values are arrived at, which will determine the inspection values (Figure 2).

1. **Leading Edge Window** These two vertical dotted lines define the *Leading Edge Window*. The average of the sampled values within this window is used as a reference value in the inspection, and is displayed in numeric form under the trace.

2. **Trailing Edge Window** These two vertical dotted lines define the *Trailing Edge Window*. The average of the sampled values within this window is used as a reference value in the inspection, and is displayed in numeric form under the trace.

3. **Panel Window** These two vertical dotted lines define the *Panel Window*. The average of the sampled values within this window is used in the inspection, and is displayed in numeric form under the trace.

4. **Panel Deflection** The *Panel Deflection* value is calculated from the values above, and is displayed here. An inward deflection shows as a positive number indicating the button is down. An outward deflection shows as a negative number indicating the button has popped up. The calculated *Panel Deflection* value is normalized for any overall slant in the trace, meaning any overall slant is ignored.

5. **Limit Setpoint** The *Limit Setpoint* value is shown here. It is adjusted as required. Any *Panel Deflection* value greater than this limit is declared a good package. Any value less than this limit is declared a dud.

*Figure 2: Panel Deflection Inspection*
1.2.2 Missing Cap Inspection

There are two tests the inspection performs to determine if there is a missing cap. These tests are Missing Cap Trace Average and Limit Setpoint (Figure 3). Two numeric values are displayed pertaining to these tests.

1. **Missing Cap Trace Average**  This value is the average of all samples in the panel window.

2. **Limit Setpoint**  This value is adjusted as required. Any Missing Cap value less than this limit is declared as having a missing cap.

Most of the time, a package without a cap will not be seen by the laser sensor, or most of the samples in the trace will be out of reading range. If more than half of the trace samples for any package is out of range, then the package is declared as having a missing cap. The beginning of the trace is started when the optical sensor’s thru-beam is interrupted.

When a trace is declared as having a Missing Cap, the actual samples in the trace are replaced by two blips; one at the cap’s leading edge and one at the cap’s trailing edge. This is done to avoid visual confusion.

![Figure 3: Missing Cap Inspection](image)
1.2.3 Slanted Cap Inspection

There are two values displayed. They are pertinent to the Slanted Cap inspection (Figure 4).

1. **Slanted Cap**  This value is the difference between the sample average in the leading window, and the sample average in the trailing window. The absolute value is taken, so the displayed value will always be a positive number.

2. **Limit Setpoint**  This value is adjusted as required. Any Slanted Cap value less than this limit is declared a good package. Any Slanted Cap value greater than this limit is declared as a bad package.

*Note:* This inspection is not meant to pick out all occurrences of slanted caps. The rotational orientation of the package determines how much slant will be seen by the profile sensor trace. This inspection can be disabled, if desired. Or it can be used to pick out whatever misapplied caps it can detect.

---

**Figure 4: Slanted Cap Inspection**
1.2.4 High Cap Inspection

There are two values displayed. They are pertinent to the High Cap inspection (Figure 5).

1. **High Cap** This value is the average value of all samples in the leading and trailing windows.

2. **Limit Setpoint** This value is adjusted as required. Any High Cap value less than this limit is declared a good package. Any High Cap value greater than this limit is declared as a bad package.

Note: While the other inspections are mostly insensitive to the exact height adjustment of the sensor head, the High Cap inspection is very sensitive the sensor head position. If a previously run job is recalled, and if the sensor head height is not put back to the exact same position, the High Cap Limit Setpoint may need adjustment.

![Figure 5: High Cap Inspection](image-url)
1.2.5 Profile Update Display

A number of display screens will display the profile trace. They will have three buttons along the right hand side. These buttons allow the user to choose how to view the Trace Profile Updates (Figure 6).

1. **Continuous Update**  This button will select a new trace as soon as the HMI can accommodate it. In normal production, packages are inspected at a high level throughput. Due to the update rate limitations on the HMI, not every package trace will make it to the display screen. Inspection processing is the priority. Display update processing is secondary.

2. **Single Update**  This button will capture and hold the profile trace for the next inspected package. This trace will continue to hold until another button is pressed.

3. **Last Reject**  This button recalls the profile trace of the last rejected package. During production, it can be useful to view the trace of a rejected package. This may assist in determining the cause of the reject.

![Figure 6: Trace Profile Update Choices](image-url)
1.3 Rejector Control

The 2D Dud Detector has a provision for operating a wide variety of rejector arrangements. This ranges from direct operation of common rejector devices, to triggering of more complex rejectors with their own control systems. Four output points are provided. Each are fully electrically isolated, solid state, and able to switch from 4-24 VDC up to 3.5 amps max.

Each output can be configured to operate various rejector types. These types are an air cylinder or solenoid operated push-off rejector (Pulsed Output), a sweep-off diverter rejector (Toggled Output).

Each output can be configured with its own set of trigger events (inspection failures). Two inputs are provided to accept reject signals from other sources. These other sources may include other inspection units, Vision systems, machine PLC controls, or process monitors.

This robust combination of configurations allow many types of rejection arrangements. These are some examples:

- The use of Silgan’s diverters such as the Tap Touch, Air Touch, or a Soft Touch.
- The use of rejector units from other manufacturers.
- The use of a single rejector
- The use of multiple rejectors, each operating from different inspection failures. This can be done to sort rejected packages according to defect type.
- Having the 2D accept reject signals from another inspection device, to reject the defective packages found by that other inspection device.
1.4 PackML Compliant Control

PackML refers to a standardized format for controlling production equipment in the packaging industry. It is meant to provide a common look and feel for equipment integration, operation, and maintenance. It is defined by the ANSI/ISA standard TR88.00.02.

1.4.1 Operating States

The HMI display shows the Operating States the 2D can be in at any point in time (Figure 7). These states govern whether the inspection and rejecting functions are operating. The current active state is highlighted on the screen.

- In the Execute state, the 2D is actively ready to inspect and reject packages, according to the active operating mode and 2D configuration.

- In the Stopped state, the 2D is not inspecting or rejecting. It is initiated when the Stop (2) button is pressed.

- In the Idle state, the 2D is not inspecting or rejecting, but is ready to enter Execute when the Start (1) button is pressed. Enter Idle from the Stopped state by pressing the Reset/Clear (3) button. When in the Idle state, the Start button flashes green.

- The Held state is entered from Execute when the operator presses the Hold (4) button. Go back to Execute by pressing the Start (1) button.
1. - OPERATION DESCRIPTION

- The **Suspend** state is entered from **Execute** when line conditions external to the 2D halt its operation. **Execute** is re-entered when the halting conditions cease.

- The **Aborted** state would only be entered if a rejector being used has an **Emergency Stop** that is activated. Press **Reset/Clear** (3) to move to **Stopped**, then **Idle** states.

- All other states are transitional. They are passed through on the way to one of the above listed states. The 2D may hang up in one of these transitional states if an internal condition must be fulfilled and has not yet completed.

*Figure 7: Operating States Screen*
1. - OPERATION DESCRIPTION

1.4.2 Operating Modes

The HMI display shows the Operating Modes the 2D can be in at any point in time (Figure 8). These states govern whether the inspection and rejecting functions are operating. The button for the current active mode will be lit on the screen.

- **Maintenance Mode**  In the Maintenance mode, the 2D is not inspecting or rejecting. It can only be entered if the operating state is stopped.

- **Setup/Adjust Mode**  The 2D must be in the Setup/Adjust Mode in order for any configuration parameters to be changed. Inspections and rejections will occur in Setup Mode.

- **Production Mode**  In Production mode inspections/rejections are performed as configured and any parameter changes are disallowed.

- **Reject None Mode**  In the Reject None Mode inspections occur as configured, but no packages will be rejected.

- **Normal Reject Mode**  Normal Reject Mode will operate the rejectors, as configured.

- **Reject All Mode**  In the Reject All Mode inspections occur as configured, but all packages will be rejected.

*Note:* The three buttons (4-6) select how the rejector will operate in either the Setup or Production modes.

*Figure 8: Operating Modes Screen*
2. - EQUIPMENT SETUP

2.1 Equipment Setup

A properly set up system will ensure an easier experience setting up and following Operation Procedures (Section 3). The information in this section will provide the information and instructions necessary to set up the 2D Profiling Dud Detector system.

2.1.1 Install The Sensor Head Stand

The sensor head stand is to be attached to the side of a customer-supplied conveyor. The bottom foot must be firmly seated, or fastened to the floor. Choose a point of inspection on the conveyor. A well-chosen inspection point will obtain the best results. Select a point of inspection that is free of excessive vibration, shaking, or inconsistent travel. These adverse conditions will affect the quality of the profile trace collected. They will also impair the accuracy of the inspection.

The point of inspection should meet these requirements:

- The conveyor should be single file. Packages must travel smoothly and well-guided through the center of the sensor head. Side-to-side package path variation must be kept to a 1/4” maximum.
- The conveyor should be a straight path. Bends in the belt path can produce vibrations in the belt motion. These vibrations can affect accuracy of the inspection.
- The packages must be on a straight path, and settled on the conveyor. Packages should have at least three feet of straight conveyor before going under the inspection head. This allows packages to settle after coming out of turns or transitions from another conveyor. Packages sliding on the conveyor while being inspected will cause variation in profile trace length. It can cause problems with the inspection.
- Packages should not back up to the point of inspection or rejection in routine production. Backed up conveyors will cause the encoder to loose track of packages. Inspections and rejections may have no accuracy or validity during backed up situations.
- Package spacing should allow a minimum of 1/4”. This is the space between the end of one cap, and the start of the next cap. Many jar and bottle geometries guarantee this spacing. Increased spacing may be needed at higher production speeds.
The sensor head can accept package travel in either direction. The stand post can be attached to either side of the conveyor. Positioning the stand post on the back side of the conveyor, away from the operator, provides for the most unobstructed access and the cleanest look.

**Bolt the sensor head stand to the side of the conveyor:**

- Ensure the head height adjustment has enough room to travel. This will allow height adjustments for a range of package heights. The sensor head typically needs to be adjusted one to two inches higher than the top of the package.
- Ensure the head is centered across the width of the conveyor. The head has a sliding adjustment for centering. Loosen the two bolts at top of the sensor head, that hold the head to the angle bracket. Also, spacers are provided to mount between the stand and the side of the conveyor, if needed to provide correct centering.

When the stand is attached to the side of the conveyor, extend the mounting foot down to the floor. Tighten all adjustment nuts. Bolt the foot to the floor for the most secure placement. The mounting foot is provided with a coupling nut, and 12” threaded rod to reach the floor. This hardware covers most installations. If a shorter conveyor height is used, the threaded rod extension can be removed.

For the 2D-LASER units, water pools or drops sitting on the caps at the point of inspection can cause inaccuracies. Water sitting on the cap will be measured by the laser sensor as part of the cap surface. If there is a possibility of water on the packages, install air nozzles on the line. Ensure all water is blown off before the inspection.

### 2.1.2 Install The Control Box Stand

Locate the most convenient position for the HMI control box. Position the control box stand in this area. It should allow the connections to reach the sensor head. Extending these cables is not recommended. The control box must be in a position where the operator has line-of-sight visibility of the entire system. If it is too far away from the rest of the system, inspection adjustments become difficult.

The height and angle of the control box is based on customer preference. There are a few tips to help select the best position. To avoid glare from overhead lighting, try positioning the control box at higher elevation and downward angle. To achieve a better view of other equipment or to allow the operator to reach over the conveyor, try lowering the elevation. Lowering the elevation can be achieved by cutting the post as needed.
Bolting the tripod feet to the floor can prevent the control box from tipping. Additional anti-tipping measures include the post stabilizing attachment. This is included for optional use. The post stabilizing attachment attaches the post to the side of the conveyor.

### 2.1.3 Install The Encoder

The encoder must be attached to the conveyor pulley shaft or another part of the conveyor’s drive mechanism. Ensure the shaft or drive mechanism selected is one that drives the same conveyor to which the sensor head is mounted. Do not attach the encoder to another conveyor.

The encoder attaches to a 5/16” diameter shaft. Smooth shafts are preferred, but threaded shafts can be used. For longer encoder life, try using a precisely machined smaller shaft extending from the larger conveyor shaft.

To achieve an easier solution, a single-ended threaded shaft is included with a 5/16-24 thread. In most cases the best option includes, attaching a 5/16 shaft to the center of the conveyor chain/belt pulley shaft. This can be either on the drive or takeup side. A hole can be drilled and tapped into the center of the shaft to attach the single ended threaded shaft. Carefully drill squarely down the center of the shaft. For best results, remove the pulley shaft and use a lathe to drill and tap down the center. It is ok for the encoder to have some wobble while running. But excessive wobble can reduce the life of the encoder. Ensure any wobbling doesn’t cause the anti-rotation attachment to stress the encoder bearing. Verify the cable is not stressed or flexing. Install an anti-rotation attachment appropriate for the wobble of the encoder.

The encoder is moisture resistant. However, wet environments can reduce the lifespan of the encoder. If it is positioned in an area subject to water, frequently falling or sprayed on it, then it should be guarded to reduce the chance of water ingress.

### 2.1.4 Install The Rejector

Install the rejecting device per manufacturer’s specification. It is best to keep the rejector as near to the exit of the sensor head as possible. Ensure it is installed on the same conveyor. The tracking operation of the reject signals depend on steady packages. Verify they are not sliding around on the conveyor as they travel. Longer travel distance means more chance for travel errors, and maybe missed rejects. The 2D Dud Detector controls allow for best operation when rejector is at a distance of about five feet or less. Longer distances can be accommodated, but resolution accuracy will be reduced. To allow for the longer reject distances, increase the value of the Reject Increment Setpoint on the HMI screen (Section 3).
2.1.5 Make The Electrical Connections

Sensor Head Cables

For 2D-LASER Units

Two sensor cables are pre-connected at the control box. These are the Laser Sensor Cable (black) and the Optical Package Sensor Cable (yellow). Attach the two sensor cables to the sensor head. Hand tighten the connections. The laser sensor uses a specialty, small format, connector. The optical package sensor uses a standard format M12 micro connector. It is not recommended to extend the length of these sensor cables.

Note: The connections in the 2D control box shown below are pre-connected at the factory (Figure 9).

![Diagram of sensor cable connections to control box](image)

Figure 9: Package Sensor Cable connection to the Control Box

For 2D-PROX Units

The Optical Package Sensor Cable (yellow) is pre-connected at the control box. Attach this cable to the sensor head. Hand tighten. The prox cable is attached to the sensor, and must be run to the control box. Feed the cable through an open cord grip. Connect the lugs to the terminals on the prox sensor controller as shown on Figure 10 (next page).
2. - EQUIPMENT SETUP

For 2D-PROX Units

The **Optical Package Sensor Cable** (yellow) is pre-connected at the control box. Attach this cable to the sensor head. Hand tighten. The **Prox Cable** (gray) is attached to the sensor, and must be run to the control box. Feed the cable through an open cord grip. Connect the lugs to the terminals on the prox sensor controller as shown on Figure 10. It is not recommended to extend the length of these cables. When connections are made, tighten the cord grip around the cable.

![Figure 10: Prox Sensor Cable Connections](image)

**SIGNAL (RED)**

**SHIELD (BLUE)**

**Encoder Connections**

Attach the encoder cable from the control box to the encoder (*Figure 11*). Contact Silgan if a longer cable extension is needed. Extension cables should be shielded.

*Note: The encoder cable is pre-connected to the control box at the factory (*Figure 11*).*

The 2D Dud Detector encoder input is optically isolated. The encoder provided operates with 24VDC push/pull quadrature signals. The inputs can also handle encoder signals at 5V and 12V levels. This can be configured with jumper positions on CFG1 (*Figure 12*). Single-Ended or quadrature signals can be chosen by making the appropriate jumper settings on CFG1. Only change jumper settings when the power is off. A variety of alternative encoders can be used when needed, due to special installation requirements.
2. - EQUIPMENT SETUP

Note: If substituting encoders, there are requirements to the encoder specs. It is recommended to contact Silgan tech support for help in specifying the correct encoder.

Using a quadrature encoder signal increases the tracking resolution by a factor of four. This is usually a good thing. It also distinguishes between forward and backward rotation. If your conveyor ends up rotating the encoder in the reverse direction, the White (A) and Black (B) wires will need to be swapped (Section 2.2.3).

Figure 11: Encoder Cable Connections
The **CFG1** jumpers will only need to be changed from the factory default positions if an alternate encoder is used. The factory default are **24VDC** and **Quadrature**.

Encoder outputs are available on CON12. These are repeated signals coming in from the encoder inputs on CON11. These outputs can be useful when using a rejector device that needs an encoder. Instead of mounting two separate encoders to the same conveyor shaft, this encoder output can be connected to the rejector encoder inputs. The encoder output is push/pull, electrically isolated from the 2D Dud Detector internal power, and can operate with a voltage range of 15 to 32VDC. Typically, encoder inputs from the other equipment will provide the supply power, intending that the encoder needs power to function. When this is the case, do not make any connections to CON12 terminals +24V and 0V.

### Encoder Settings on CFG1 Jumper

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<th>Signal Type</th>
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<td><img src="image" alt="24VDC Setting" /></td>
<td>Use Quadrature Encoder Signal</td>
</tr>
<tr>
<td>12VDC</td>
<td><img src="image" alt="12VDC Setting" /></td>
<td>Use Single-Ended Encoder Signal</td>
</tr>
<tr>
<td>5VDC</td>
<td><img src="image" alt="5VDC Setting" /></td>
<td>Note: When single-ended encoder signal is used, disconnect any wires from CON11 terminals +A and -A. Connect encoder signal to terminals +B and -B.</td>
</tr>
</tbody>
</table>

*Figure 12: CFG1 Jumper Settings*

### Encoder Output Connections

Encoder outputs are optoisolated, push-pull, 15-32VDC. TYPICAL CONNECTIONS TO ENCODER INPUT OF OTHER EQUIPMENT, WHERE POWER IS SUPPLIED TO ENCODER FROM THE OTHER EQUIPMENT.

*Figure 13: Encoder Output Connections*
Rejection Connections

Make connections to the rejector. There are four reject outputs available. Each one is optically isolated with a solid state relay output. The simple and most common rejector setups will use reject output B. The output can drive a pneumatic solenoid valve directly at any DC voltage up to 24V, or can drive electronic inputs in a sourcing or sinking configuration (Figure 14). Power to supply the output can come from either the 2D Dud Detector internal power supply (about 1.5 amps available), or from an external power supply using any DC voltage up to 24V (Figure 15).

---

**Figure 14: Rejector Output Connections**

---

**Figure 15: Sourcing/Sinking Outputs**
Interface Input Connections

There are six inputs available to interface with other equipment. All inputs are electrically isolated from the 2D power (Figure 16). They can be driven from sourcing or sinking outputs. Power can be sourced from either the 2D Dud Detector internal power supply (about 1.5 amps available), or from an external power supply using any DC voltage from 9 to 30VDC. The +24V and 0V terminals on the connector are DC power from the 2D.

**IN_REJ1 & IN_REJ2**  
These are inputs that can trigger rejector operation (Section 3.1.3). Trigger action is on the rising edge.

**IN_REJ_NONE**  
This input, when on, will stop any packages from being rejected.

**IN_REJ_ALL**  
This input, when on, will cause all packages to be rejected.

**IN_SPARE2 & IN_SPARE3**  
These are spare inputs available for future expansion applications.

![Diagram of Interface Input Connections](image)

*Figure 16: Interface Input Connections*
Interface Output Connections

There are thirteen outputs available to interface with other equipment. All outputs are push/pull, totem pole, and electrically isolated from the 2D power (Figure 17). They can be used to drive either PNP or NPN inputs. Switching power can be sourced from either the 2D Dud Detector internal power supply, about 1.5 amps available, or from an external power supply using any DC voltage from 10 to 30VDC. The +24V and 0V terminals on the connector are DC power from the 2D.

**OUT-READY**  This output is HIGH when the 2D is operating and ready to inspect any package it may see.

**OUT-INSPECTING**  This output is HIGH when the 2D is in the process of inspecting a package.

**OUT-GOOD**  This output pulses HIGH for 20 msec. when an inspected package passes all inspections.

**OUT-DUD**  This output pulses HIGH for 20 msec. when an inspected package fails the dud inspection.

**OUT-MISSING**  This output pulses HIGH for 20 msec. when an inspected package fails the missing cap inspection.

**OUT-SLANT**  This output pulses HIGH for 20 msec. when an inspected package fails the slanted cap inspection.

**OUT-HIGH**  This output pulses HIGH for 20 msec. when an inspected package fails the high trace inspection.

**OUT-DISP5**  This output pulses HIGH for 20 msec. when an inspected package fails the “disposition 5” inspection (for future definition).

**OUT-DISP6**  This output pulses HIGH for 20 msec. when an inspected package fails the “disposition 6” inspection (for future definition).

![Figure 17: Interface Output Connections](image-url)
Analog Input Connections

The analog input connections exist for future function expansion and are not for current use. Do not make any connections to these terminal points.

2.2 Turning The Unit On For The First Time

The 2D Dud Detector is shipped with two power switch keys tied to a cable inside the control box. Remove one of the keys and insert it into the power switch. Keep the other key stored inside the control box as a backup. Close the cover of the control box. Plug the power cord into a 120VAC GFI protected outlet. Turn on the power switch.

2.2.1 Verify The Profile Sensor Operation

If a laser sensor, place a target surface below the sensor head approximately 1.5 inches. Use a jar, your hand, any object that fits. This is just a test to ensure the laser sensor is working. When the laser sensor sees a target within its range of view, the green profile sensor LED on the front panel will light.

If a prox sensor, place a metal target (a cap, for example) below the sensor. When the prox sensor sees a target within its range of view, typically about 1/2” or closer, the green profile sensor LED on the front panel will light.

2.2.2 Verify The package sensor operation

Place a finger in front of one of the optical sensor lenses. They are located on either side, inside, of the sensor head. When the beam is blocked, the green package sensor led will light.

2.2.3 Verify The encoder operation

Turn on the conveyor. This will cause the encoder to rotate. The green encoder led should light up when pulses are coming in from the encoder. If quadrature signals are being used, direction of rotation matters. If the led does not light when the encoder is rotating, swap the wires connected to encoder. These are inputs CON11 terminals A+ and B+, white and black wires. This will reverse the perceived direction of encoder rotation. Ensure that the led now lights when the conveyor is running.

Place the unit in setup mode via the HMI screen. From the Reject Setup menu, select the Reject Increment Setpoint adjust screen. Start the 1FT flash mode. With the conveyor running as slow as possible, make adjustments to the Reject Increment Setpoint. Adjust until the signal light changes state approximately every 1 foot of conveyor travel. Fine accuracy is not required here. Plus or minus 20%~30% accuracy is acceptable. This adjustment sets up the tracking resolution of the reject control.
2.2.4 Set The Reject Increment Setpoint

The **Reject Increment Setpoint** defines the tracking resolution of the reject control shift registers. Specifically, the setpoint is the number of encoder counts that will occur before the shift register advances one space (bit). The optimal resolution is when the shift register advances every approx. 1/10\(^{th}\) inch of conveyor travel. This setpoint only needs to be adjusted once, as long as the physical encoder arrangement does not change. If the encoder is replaced with a different one, or if it is relocated, the **Reject Increment Setpoint** should be adjusted again. To adjust, follow this procedure (Figures 18~21):

1. Navigate to **Operating Mode Control** via **Control Main Menu > Operation Control Screen**.
2. Put unit in the **Setup Mode using the Setup/Adjust Mode** button.
3. Return to the Main Menu via the **Main Menu** button.

---

**Figure 18: Main Menu screen**

**Figure 19: Operating Control screen**
4. From the Main Menu, select Setup Mode Reject Configure.

5. Select Reject Increment Setpoint Adjust.

Figure 20: Main Menu screen

Figure 21: Reject Setup Menu screen
6. Run the conveyor at a slow speed. At the Adjust Reject Increment Setpoint screen, select **Press To Start 1ft Flash Mode**.

7. Select **Reject Increment Setpoint 1234** to change the setpoint. Adjust the setpoint until the signal light changes state, approximately 1 ft of conveyor travel. Fine accuracy is not required here. ±20%~30% is acceptable.

8. After setpoint adjustments are made, return to the Main Menu.

**NOTE:** If setup normally to the 1FT FLASH MODE, the maximum reject tracking distance is 8.5 ft. from the point of inspection. At this resolution, the rejector will track to an accuracy of ±1/10th inch. Farther tracking distances can be achieved by adjusting to a less accurate resolution. For example, if the **Reject Increment Setpoint** is adjusted to flash every 2.5 ft. instead of every 1 ft., the reject will track at an accuracy of ±1/4 inch, and will extend to a maximum of 21.3 ft. Keep in mind the longer the distance before rejecting a package, the less sure you are that it has not shifted on the conveyor, and can be “missed” when the rejector operates to get it off the line.

---

**ADJUST REJECT INCREMENT SETPOINT**

THE REJECT INCREMENT SETPOINT DETERMINES HOW MANY ENCODER PULSES EQUAL 1 REJECT DISTANCE INCREMENT. IT MAY ONLY NEED TO BE SET ONCE, ONLY NEEDING CHANGE IF THE ENCODER IS MOVED AND REINSTALLED ON DIFFERENT EQUIPMENT.

AN EASY WAY TO CORRECTLY SET THIS VALUE IS AS FOLLOWS: PRESS THE BUTTON BELOW TO ACTIVATE THE "1 FT. FLASH MODE". ADJUST THE SETPOINT VALUE UNTIL YOU SEE THE FLASHING LIGHTS CHANGE COLOR APPROX EVERY 1 FOOT (12 INCHES). HIGH ACCURACY IS NOT REQUIRED WITH THIS SETTING.

---

**Figure 22: Adjust Reject Increment Setpoint screen**
3. - OPERATION PROCEDURES

3.1 Operation Procedures

Power up the system. The machine will initialize. The intro logo screen will appear on the HMI. Touch anywhere on this screen and the Main Menu will appear. Ensure the 2D is running in the Execute operating state. This means it will perform inspections and rejections. Once it is in this state, the operating mode can be set.

3.1.1 Operating States

Identify the current state by viewing the screen diagram. The current state should be highlighted and active (Figure 21).

- **Current State Execute**: Press Stop to change the state to Stopped (Item 2).
- **Current State Stopped**: Press Reset/Clear then Start. The state will change to Execute (Items 1 & 3).
- **Current State EXECUTE**: Press HOLD. The state will change to HELD (Item 4).
- **Current State HELD**: Press START. The state will change to EXECUTE (Item 1).
- **Press Back to return to the Main Menu (Item 5).**

![Figure 21: High Trace Inspection Adjustments](image-url)
3.1.2 Operating Modes

The HMI display shows the 2D Operating Modes. These states govern whether the inspection and rejecting functions are operating. The currently active mode will have their buttons lit on the screen (Figure 22).

- **Maintenance Mode**  
  In this mode, the 2D is not inspecting or rejecting. It can only be entered if the operating state is Stopped.

- **Setup/Adjust Mode**  
  The 2D must be in this mode to allow changes to configuration parameters. Inspections and rejections will occur in Setup mode.

- **Production Mode**  
  In this mode, inspections and rejections are performed as configured. Parameter changes are not allowed in this mode.

- **Reject None Mode**  
  In this mode, inspections occur as configured, but packages will be rejected.

- **Normal Reject Mode**  
  In this mode, the 2D will operated the rejector(s) as configured.

- **Reject All Mode**  
  In this mode, inspections occur as configured, but packages will be rejected.

*Note: The three buttons, at the bottom, select how the rejector will operate in either the Setup or Production modes (Items 4~6).*

![Operating Control screen and operating modes](image)
3.1.3 Setting Up A New Inspection

This guide should assist you in setting up a new inspection. Ensure the 2D is running in the **Execute** operating state. If it isn’t, the inspection processes will not run. If the **Start** button is not lit, bright green, press the **Reset/Clear** button. The **Start** button should now flash. Press the **Start** button. It should stop flashing and light up solid. The 2D is now in the **Execute** operating state.

**Head Height Adjustment Procedure**

1. The green button should be lit up solid, not flashing (*Figure 23*).
2. Put the 2D unit in **Setup** and **Normal Reject** mode (*Figure 23*).
3. Navigate to the **Main Menu** (*Figure 23*).
4. Select the **Setup Mode Inspection Adjust** (*Figure 24*).
5. Select the **Head Height Adjust** screen (*Figure 25*).
6. Loosen the head height clamping lever. Select a jar/bottle from your forthcoming production run that is properly sealed with the cap center panel deflected downward. Place it under the sensor head, centered underneath the laser or prox sensor. Using the handwheel on top of the sensor head stand, adjust the height of the head. Adjust the height until the bar graph reads about 35% when the clamping lever is tightened (*Figure 26*).
7. Slide the uncapped package back and forth under the sensor head. Verify the package sensor can see the package. It should see the leading and trailing edges (Figure 26).

8. Select **Next** to proceed to the next setup parameter, **Adjust Trace Length** (Figure 26).
3. - OPERATION PROCEDURES

Adjust Trace Length Procedure

1. Select the Trace Length Reset button. This will ensure the next packages will be properly scanned (Figure 27).

2. Run a package with a cap under the sensor head. Do this using a running conveyor. Ensure the laser is scanning down the center of the cap. Make adjustments to the head position or side guide, if needed. Read the Trace Length of the scanned package (Figure 27).

3. The Trace Length is the number of data samples in the trace, which has a maximum of 64. Adjust the Sample Increment Setpoint until a nominal Trace Length is achieved. This is a value of approximately 50. To increase the Trace Length, reduce the value of the Sample Increment Setpoint. To decrease the Trace Length, increase the value of the Sample Increment Setpoint. It is normal to have a small variation in Trace Length from scan to scan (Figure 27).

4. A good trace will have a value between 40 and 52. When a good trace is achieved, select the Accept This Trace And Proceed button (Figure 27).

![Figure 27: Adjust Trace Length](image-url)
5. Enable/Disable the inspections as desired on the Enable/Disable Inspections screen (Figure 28).

6. When inspecting metal-paneled caps, you will normally need to select Vacuum Deflection. If inspecting plastic caps, and you are inspecting for upward panel deflection, select Doming Detection (Figure 28).

7. Select Next to proceed to the next setup parameter, Adjust Dud Inspection (Figure 28).
3. - OPERATION PROCEDURES

Adjust Dud Inspection Procedure

1. Adjust the width of the leading and trailing reference windows. Samples are averaged within these windows and used for all four inspections. When a field is widened or narrowed, the other field follows the same command(s). This ensures symmetry. The two digit numbers displayed above each set of arrows show the start and end sample numbers of each field. The four digit number above that shows the average of the sampled values within that window. Some cap colors or finishes may be prone to an occasional invalid sensor sample. This usually occurs when the surface height changes rapidly. This can be remedied by positioning the leading and trailing reference fields to look where invalid samples are not occurring (Figure 29).

![Figure 29: Adjust Dud Inspection](image)

2. Use the arrow buttons to change the width of the panel window. Samples are averaged within this window and used for the dud inspection. The two digit numbers displayed above the arrows show the start and end sample numbers of each window. The four digit number above that is the average of the sampled values within the panel window (Figure 30).
3. These arrow buttons allow you to move all windows together to the left or right (Figure 31).

4. These arrow buttons allow you to move the leading and trailing reference windows toward or away from the center panel window. Both windows move in symmetry (Figure 31).

Note: There are limits to the window adjustments. Windows are not allowed to overlap.
5. The reset windows button moves all three windows back to the default position. This can be a good starting point. However, the default position may not be the best window positions for your current run configuration (Figure 32).

6. Run both good packages and duds through the inspection. Observe the panel deflection measurements. When Vacuum Deflection is selected, downward deflections appear as position number measurements. This indicates a vacuum is present and the button is down. Upward deflections appear as negative numbers. This indicates no vacuum is present and the button is up (Figure 32). When Doming Detection is selected, the direction of the numbers are reversed. Upward doming is a positive number, and downward deflection is negative.

7. Use the panel deflection measurements to determine the Setpoint. The Setpoint should distinguish packages with good vacuum from packages with no, or low vacuum. Press the Setpoint button to change the Setpoint (Figure 32).

   Note: A deflection measurement of zero indicates a flat cap panel surface. A Setpoint of zero is likely to work well for button caps.

8. When the dud inspection is adjusted and working properly, press Next to advance to Missing Cap Inspection Adjustment screen (Figure 32).
3. - OPERATION PROCEDURES

Missing Cap Inspection Adjustment Procedure

1. Missing caps are detected when either more than half of the trace samples are invalid, out of sensing range, or the panel window value is less than the **Setpoint**. Most of the time, a missing cap will be caught by the invalid traces test. But in a case where product in the jar rides high, and can be seen by the laser sensor when a cap is missing, the **Setpoint** will need to catch the missing caps. The range of sample values is from 0 to 4000. A sufficiently low **Setpoint** works well for most setups. An example of a low **Setpoint** is 200. Verify packages with missing caps are detected by the inspection (*Figure 33*).

2. When the Missing Cap Inspection is adjusted and working properly, press **Next** to advance to Slant Cap Inspection Adjustment screen (*Figure 33*).

*Figure 33: Missing Cap Inspection Adjustments*
Slanted Cap Inspection Adjustment Procedure

1. The Slanted Cap Inspection measurement is derived from the difference between the leading and trailing window average values. This is always a positive number. The inspection can assist in identifying misapplied caps where the cap ends up cocked or slanted. The slant will only be apparent in the trace if the package runs under the sensor in a certain orientation. Therefore, the inspection should be considered supplemental. It cannot be relied upon to reject all cocked caps off the line. Most cocked, or misapplied caps will be rejected by the dud inspection anyway. The Setpoint should be set to a value higher than the range of properly applied caps (Figure 34).

2. When the Slanted Cap Inspection Adjustment is adjusted and working properly, press Next to advance to High Trace Inspection Adjustment screen (Figure 34).

![Figure 34: Slanted Cap Inspection Adjustments](image-url)
High Trace Inspection Adjustment Procedure

1. The High Trace Inspection measurement is derived from average sample values in the leading and trailing windows. This inspection can assist in identifying misapplied caps where the cap ends up higher than normal. This inspection should also be considered supplemental. Most high, or misapplied caps will be rejected by the dud inspection. The Setpoint should be set to a value higher than the range of properly applied caps. This is the only inspection that is not on a relative scale. This means the measured height values will change according to the precise position of the sensor head height. If the quick changeover procedure is used, the head height will not end up in exactly the same place as the last time that package size was run. Therefore, it may be desirable to disable the high trace inspection (Figure 35).

2. When the High Trace Inspection Adjustment is adjusted and working properly, press Next to advance to Reject Setup Menu screen (Figure 35).

Figure 35: High Trace Inspection Adjustments
3. - OPERATION PROCEDURES

Basic Rejector Configuration Selections

1. Press the **Configure Rejects Operation** button *(Figure 36)*.

2. If the rejector is a common air piston or air blow-off style rejector, the output should operate in a pulsed manner. Select the **Simple Push Or blow-Off - Output B** button *(Figure 37)*.

3. The **Distance Setpoint** represents the number of encoder increments, or conveyor travel distance, that is required before the reject output will operate. Press this button to adjust the **Setpoint** until the rejector triggers at the correct point *(Figure 38)*.

4. The **Duration Setpoint** represents the time in milliseconds that the output pulse will operate. Press this button to adjust the **Setpoint**. A shorter duration can give a softer push with a shorter stroke. A longer duration can give a harder push with a longer stroke *(Figure 38)*.

![Figure 36: Reject Setup Menu](image1)

![Figure 37: Rejection Setup Configuration](image2)

![Figure 38: Simple Push / Blow-Off](image3)
3. - OPERATION PROCEDURES

Basic Rejector Configuration Selections

1. If the rejector is a common sweep-arm style, the output should operate in a toggled manner. Select **Simple Sweep Arm - Output B** (Figure 39).

2. The **Distance Setpoint** represents the number of encoder increments, or conveyor travel distance, that is required before the reject output will operate. Press this button to adjust the **Setpoint** until the rejector triggers at the correct point. When a bad package gets rejected, the sweep arm will remain in the diverted position until the next good package comes through (Figure 40).

3. If a Silgan Soft Touch diverter is used, select **Simple Soft Touch Outputs - Output C / D**. No further configurations are needed on the 2D. Configure the correct operation on the Soft Touch system. Output C will connect to the Soft Touch good package signal. Output D will connect to the bad package signal (Figure 41).

4. To configure any other rejector arrangement, select **Advanced Setup** (Figure 42).
Configure Output Operations

There are two distance tracking shift registers. These are SRA and SRB. The end of SRA feeds into Output A. The end of SRB feeds into Output B. Output C and Output D can only operate in an instantaneous manner. They react as soon as the inspection process is complete.

1. Each of the four outputs can be setup for either pulsed or toggled operation. Select the operation using the rectangular button fields along the left side of screen. Select Disable Output if output will not be used. If pulsed operation is selected, enter the pulse duration in milliseconds (Figure 43).

2. Press Next to make selections for the remaining outputs (Figure 43).

3. Select A/B Toggled Outputs. This causes the two outputs to work together. This is required for the Silgan Soft Touch diverter. The same is true for C/D Toggled Outputs. Select SRA/SRB Merge. This causes the ends of both shift registers to trigger outputs A and B the same. Press Next (Figure 44).

Figure 43: Advanced Rejector Setup

Figure 44: Advanced Rejector Setup
Configure Triggers For Each Output

1. Inspections detecting a failure can trigger any specified output. Select either SRA or SRB to send an inspection failure trigger to a specific shift register. Shift register SRA will trigger output A. It triggers after the specified encoder increments have occurred. These encoder increments were set using the Distance Setpoint (Figure 38). This signifies the package has travelled the specified distance. SRB functions the same way. Select different inspections to trigger different outputs. This can achieve package sorting according to the type of defect (Figure 45).

2. Select a button from this group to have any output triggered immediately upon the inspection failure, with no shift register delay (Figure 45).

3. Press Next. There is a selection screen for each of the four types of inspection (Figure 45).

4. A good package can trigger a rejection if needed for a sortation scheme (Figure 46).

5. Press NEXT (Figure 46).

6. The rising edge of Reject Input 1 can trigger the shift registers, or outputs, as well. This should be used where a different device would trigger the package rejections and is using the same rejector as the 2D. This other device could be an inspection system, a machine monitor, or a process monitor. Enter the Distance Delay needed for proper reject timing (Figure 47).

7. Press NEXT. The same can be done for Reject Input 2 (Figure 47).
3. - OPERATION PROCEDURES

Figure 45: Advanced Rejector Setup

Figure 46: Advanced Rejector Setup

Figure 47: Advanced Rejector Setup
3. - OPERATION PROCEDURES

3.1.4 Save Or Recall A Job File

Successful configured inspections can be saved to a job file. These job files can be recalled at a later date. The next time a certain size and style combination is run, the associated job file can be recalled. This reduces time and effort avoiding set up for each run.

1. Put the unit into Setup/Adjust Mode. At the Main Menu Screen, select Job File Save/Recall.

2. This field will display the name of the current running configuration file. Select this field to enter a new name or edit the existing name (Figure 48).

3. There are forty job file locations available. Select the up or down arrows to step through the file locations. Each filename will appear in the Job File Name field as you scroll. 
   
   Note: Job file memory locations are defined by the Job File Number, and not the Job File Name. Two job files can be given the same name and saved to different file number locations.

4. Select this button to save the current configuration to the displayed Job File Number. A request to confirm the action will be made prior to saving. (Figure 48).

5. Select this button to recall the displayed Job File Number to the current configuration. A request to confirm the action will be made prior to recalling the file (Figure 48).

6. Select this button to return to the main menu. Put the unit back into Production.

Figure 48: Job File Save/Recall Screen
3.1.5 Rejector On/Off Control

The Rejectors On/Off Control screen can be accessed from several different screens (Figures 49~51). The rejectors can be turned on or off while in Production Mode. This feature exists in case a problem develops with the inspection, or rejection, requiring an immediate response.

![Figure 49: Run Monitor](image)

![Figure 50: Main Menu](image)

![Figure 51: Reject Setup Menu](image)
3. - OPERATION PROCEDURES

1. Each of the four rejector outputs can be turned On or Off independently. Press this button to enter the **Rejector On/Off Control** screen (Figure 52).

2. Press **On** or **Off** to control the four rejector outputs (Figure 53).

---

**Figure 52: Reject Setup Menu**

**Figure 53: Rejectors On/Off Control Screen**
3. - OPERATION PROCEDURES

3.1.6 Running History / Statistical Data Display

Data accumulated while running production includes Period Counts and Manually Reset Counts.

1. Access these counts from the Main Menu screen by pressing Running History/Statistics (Figure 54).

2. Period Counts - The Period Counters keep track of inspections and results during over successive periods of time. At the start of every hour (as tracked by the System Clock) the current period ends and the next period begins, accumulating a new set of counts. Counts are retained for the last 168 periods, which covers 7 days of 1 hour periods.

3. Manually Reset Counts - These counters are always accumulating inspection and results. They are only reset manually.
3. - OPERATION PROCEDURES

Period Counts Display Screen

The Period Count screen shows the available data for a single period (Figure 55).

1. The Current Date and Time, read from the System Clock is displayed at the very top of the screen.
2. This line shows the date and time of the start of the period being displayed.
3. These buttons allow you to step through the counts saved from all periods over the past 7 days.

<table>
<thead>
<tr>
<th>PERIOD COUNTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURR DATE-TIME: SUN 12/12/1234 12:12:12</td>
</tr>
<tr>
<td>PERIOD START: DATE 12/12 TIME 12:12</td>
</tr>
<tr>
<td>DURATION: 1 HOUR</td>
</tr>
<tr>
<td>TOTAL</td>
</tr>
<tr>
<td>-------</td>
</tr>
<tr>
<td>GOOD</td>
</tr>
<tr>
<td>BAD</td>
</tr>
<tr>
<td>DUDS</td>
</tr>
<tr>
<td>NO CAPS</td>
</tr>
<tr>
<td>SLANTED</td>
</tr>
<tr>
<td>HIGH</td>
</tr>
</tbody>
</table>

Figure 55: Period Counts Screen

Manually Resettable Counts Display Screen

This screen displays a single group of counters, that can only be reset upon command, by pressing the RESET button on the screen (Figure 56).

<table>
<thead>
<tr>
<th>INSPECTION COUNTERS - MANUAL RESET</th>
</tr>
</thead>
<tbody>
<tr>
<td>CURR DATE-TIME: SUN 12/12/1234 12:12:12</td>
</tr>
<tr>
<td>ALL INSPECTED</td>
</tr>
<tr>
<td>GOOD PKGS</td>
</tr>
<tr>
<td>BAD PKGS</td>
</tr>
<tr>
<td>DUD PKGS</td>
</tr>
<tr>
<td>MISSING CAP PKGS</td>
</tr>
<tr>
<td>SLANT TRACE PKGS</td>
</tr>
<tr>
<td>HIGH TRACE PKGS</td>
</tr>
</tbody>
</table>

Figure 56: Manually Reset Counts Screen
3. - OPERATION PROCEDURES

Set System Clock Screen

If the date or time of the **System Clock** needs to be changed, pull up this screen (Figure 57).

1. Increment or decrement each date/time value.
2. Press the **SET** button.
3. Verify that the **Current Date and Time** display on top line is updated and accurate.

![Set System Clock Screen](image)

*Figure 57: Manually Reset Counts Screen*
3.2 Quick Changeover Procedure

This procedure is useful for setups that have been previously configured, ran, and saved to a job file. The **Quick Changeover Procedure** can be used with test packages prior to production runs, or can be used while running production.

- Enter the **Setup/Adjust Mode**.
- Turn off the reject (B) output or turn off the air at the rejector. This prevents any reject operation.
- Navigate to the **Job File Save/Recall** screen.
- Recall the correct job file for the current package.
- Navigate to the **Run Monitor** screen.
- Adjust the head height until the trace occupies mostly the lower half of the trace display area *(Figure 58)*. Ensure the trace does not hit bottom or top except at very start and end.
- Turn on the rejector. Run duds or missing caps through to verify proper rejector operation. Adjust if necessary.
- Enter production mode.
- Display the **Run Monitor** screen.

![Figure 58: Proper Trace Area Based on Head Height Adjustment](image)

Trace in lower half of trace display area
# 4. - TROUBLESHOOTING

## 4.1 Troubleshooting

<table>
<thead>
<tr>
<th>Problem</th>
<th>Possible Cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Top signal light is off and the dud detector is not inspecting</td>
<td>The PLC has stopped running its program.</td>
<td>Open the control box door using either a screwdriver or a penny. If the red fault light on the PLC is lit, move the RUN-REM-PRG switch on the PLC to the PRG position. Do this while the unit is still under power. After a few seconds, move the switch back to RUN. The PLC should initialize and run normally. This procedures may need to be repeated a few times to correct the issue.</td>
</tr>
<tr>
<td>Profile traces have areas where the signal drops out, or they have</td>
<td>Some black-lithographed cap surfaces, and possibly some shiny gold or silver surfaces are not always read well by the laser sensor. Portions of the surface that quickly change in height can also drop out, or spike up, in the trace.</td>
<td>If the areas of bad signal are consistent, try to adjust the inspection windows out of those areas, so the inspection will not be affected. If the areas of bad signal span too much of the trace, and cannot be ignored, try changing the setting for the laser sensor sample rate (Section 4.2). This only applies to Older laser sensors that use the KEYENCE IL-1000 controller module.</td>
</tr>
<tr>
<td>stretches of no signal change, adversely affecting the inspection</td>
<td></td>
<td></td>
</tr>
<tr>
<td>When setting up a new inspection, setting the Trace Length and all</td>
<td>The Missing Cap Setpoint may be set too high.</td>
<td>Advance to the Missing Cap inspection setup screen. Adjust the Setpoint to a low number, like 200.</td>
</tr>
<tr>
<td>packages run through the inspection display show as having a Missing Cap.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Profile traces are inconsistent in length, varying significantly,</td>
<td>1) Encoder may be rotation may be slipping on the conveyor sprocket shaft. 2) Packages may be sliding around on the conveyor as they travel underneath the sensor head.</td>
<td>1) Tighten the 2 set screws on the shaft of the encoder. 2) Take appropriate action to stop packages from sliding on the conveyor. The inspection depends on minimal slippage of the package on the conveyor from the point the inspection starts through the point of rejection by the rejection device.</td>
</tr>
<tr>
<td>preventing good inspection.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Top signal light is white, and no inspection functions work.</td>
<td>1) The unit is not in the EXECUTE state. The unit may be in the MAINTENANCE mode.</td>
<td>1) Go to the PackML screen, and put the unit in EXECUTE state (see section 3.1.1). 2) Go to the OPERATING MODE screen and change to either PRODUCTION mode or SETUP/ADJUST mode (see section 3.1.2).</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
4.2 Change the Laser Sensor Sampling Rate

*Note: This section applies only to 2D-LASER units with the Keyence IL-1000 controller inside the 2D control box. Newer 2D-LASER units use a different laser sensor that is less prone to the problems described below.*

Some lithographed metal cap surfaces colored black, shiny gold, or shiny silver are susceptible to laser signal dropouts. If you experience this with your caps, try changing the laser sensor’s default sample rate. Change the sampling rate from the default of 0.33 millisecond to 1 millisecond. This allows the laser more time to stabilize as each reading is made. This solves the problem in most cases. To perform this adjustment, do the following:

1. Open the 2D control box door. Locate the laser sensor controller on lower right hand side.
2. Swing open the plastic lid on the laser controller. Only operate small buttons on right hand side.
3. Press and hold the MODE button for a couple of seconds. The display will change to read dir.
4. Press the MODE button again. The display will change to read SPd.
5. The green number directly below should read 0.33. Press the UP arrow to change this number to 1.
6. Press the MODE button repeatedly, about nineteen times, until the green letters End appear on the display.
7. Press the MODE button one more time. After a couple of seconds the original display will be shown (Figure 60).

*Figure 60: Laser Sensor*
5.1  **Suggested Routine Maintenance - 2D-LASER and 2D-PROX**

1. Every 3 months, visually inspect the encoder and cable. Wipe clean, if needed. Tighten set screw onto conveyor shaft. Ensure there is no excessive wobble from a degrading mounting situation. Ensure cable is well routed and secured to protect it from damage. Replace cable if signs of damage are present.

2. Every 1 week, inspect the side block lenses for the thru beam optical **PACKAGE SENSOR**. If dirty, wipe clean.

5.2  **Suggested Routine Maintenance - 2D-LASER only**

1. Every 3 months, carefully clean the face of the laser sensor with a soft, clean, lintless cloth dampened with isopropyl alcohol. Do not scratch the glass surface of the laser sensor.
5.3 PROX UNITS - Calibrate the PROX Sensor and Controller

Perform this setup procedure if the 2D-PROX sensor or controller have been replaced, or to ensure best performance.

1. Ensure the face of the proximity sensor protrudes out from the face of its mounting block by a distance of 0.20” (see Figure 70). If twisting the sensor into the threaded block is necessary, be sure not to damage the sensor’s shielded cable. When in the correct position, tighten the locking nut.

![Figure 70: Prox Sensor Position](image)

2. Place a jar/bottle with a properly applied cap, with the proper amount of vacuum (button is down) centered directly underneath the proximity sensor. Adjust the sensor head position (using the top crank adjustment) until the face of the proximity sensor is 0.20” above the surface of the cap (see Figure 71).

![Figure 71: Head Position over Package](image)
3. Turn power on to the 2D control box. On the HMI screen, go to the HEAD HEIGHT ADJUST screen, where the bargraph for the head height is displayed.

4. Open the front door of the 2D control box. Lift the lid on the prox sensor controller (see Figure 58). Make sure the RESPONSE switch is in the HIGH position. Make sure the ZERO switch is in the FREE position.

5. Adjust the SPAN potentiometer until the HMI screen reads 35%.

6. Now lift the jar/bottle until the cap is in contact with the face of the prox sensor. With the cap contacting the prox sensor, press the ZERO button.

7. Now put the jar/bottle back underneath the prox sensor on the conveyor surface. If the bargraph does not display 35% +/- 1%, repeat steps 5 and 6 until it does. It should not take more than 1 or 2 repeats.

Figure 72: Prox Sensor Controller