Dud Inspection Operation Manual

Can and Bottle Inspection

for the FT-50 and FT-70

Document 40378-0502

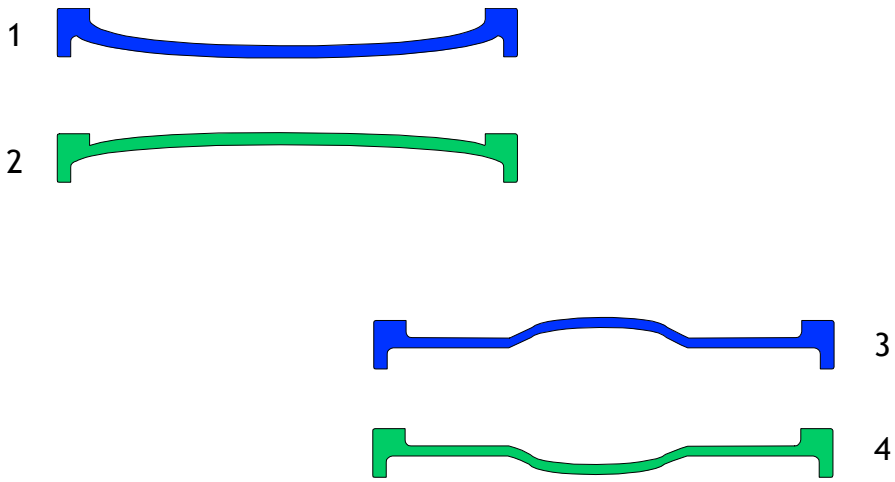
Industrial Dynamics Company, Ltd.

Contact Information

Corporate Headquarters:	3100 Fujita Street, Torrance, California 90505-4007 U.S.A. Telephone:(310) 325-5633 FAX: (310) 530-1000 Internet: www.filtec.com
Mailing Address:	P.O. Box 2945, Torrance, California 90509-2945 U.S.A.
Shipping Address:	3100 Fujita Street, Torrance, California 90505-4007 U.S.A.
Customer Service:	(800) 733-5173

Dud Inspection Overview

Dud inspection detects improperly sealed vacuum or pressure sealed containers. If the container is not sealed properly, the container shape is distorted and the dimensions at the inspection reference point will deviate from a correctly sealed container. When inspecting cans the reference point is the lid and when inspecting bottles the reference point is the cap seal button.



No.	Description
1	Vacuum seal good as lid is indented. Pressure seal bad as lid is indented (dud).
2	Vacuum seal bad as lid is raised (dud). Pressure seal good as lid is raised.
3	Vacuum seal bad as cap button is raised (dud). Pressure seal good as cap button is raised.
4	Vacuum seal good as cap button is indented. Pressure seal bad as cap button is indented (dud).

Figure 1. Lid and cap characteristics of vacuum and pressure sealed containers.

If a container is pressurized properly and the seal is intact, the pressure will distort the lid or cap by raising it (pressurized) or indenting it (vacuumed). If the container is not pressurized properly, or the seal is not intact, the cap is not raised or indented as there is low pressure or indented as there is over pressure.

As the container passes under the proximity sensor the sensor determines if the seal is intact based on the distance between the sensor and the top surface of the lid or cap. If the lid or cap is too far from the sensor, the pressure seal is not intact because the cap is not raised high enough by the container pressure.

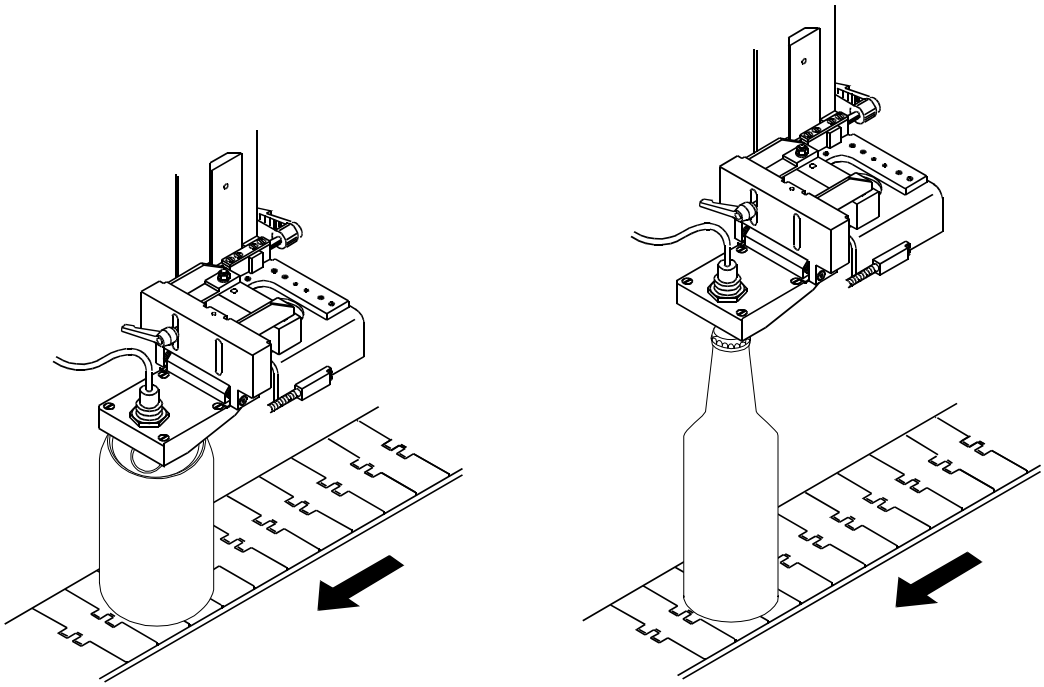


Figure 2. Containers passing under the dud inspection sensor.

When configuring dud inspection you must pass both good and bad containers through the inspection tunnel to perform the automatic calibration procedure. This determines the threshold settings for good and bad containers. During inspection each container is compared to these thresholds and non-conforming containers are rejected.

Note: Low threshold defines the low pressure or over vacuum and high threshold defines the over pressure or low vacuum.

For proper inspection, the overall variation in can height should be no more than 1/16 inch (1.5 mm). The containers must flow smoothly under the exact center of the dud sensor as they travel on the conveyor.

Container Changeover

When changing to a container type that does not require dud inspection:

1. Press Key 5 until Dud Status appears and press the Arrow Key to turn dud inspection off.

2. Perform the container fill level changeover as explained in the inspection unit Operation Guide.

3. Verify the dud sensor is raised out of the way, so that it is not will not be struck by the containers.

When changing to a container type that requires dud Inspection:

1. Perform the container fill level changeover as explained in the inspection unit Operation Guide. This places the proximity sensor at the correct height above the can.

2. Repeat the dud sensor alignment procedure. For more information see Dud Inspection Sensor Alignment on page 4.

Dud Inspection Sensor Alignment

Before you align the dud sensor you must configure the inspection head and inspection trigger to the proper height for fill level inspection and calibrate the fill level inspection. Align the dud sensor immediately after all fill level inspection adjustments are complete. For more information refer to the service manual provided with you inspection unit.

Also, verify the following:

- The containers are centered on the conveyor so they pass directly under the center of the dud sensor.
- The dud sensor face is parallel with the top of the containers.

Note: Aligning the dud sensor can change the height of the inspection trigger. After you align the dud sensor, verify the inspection trigger height has not changed.

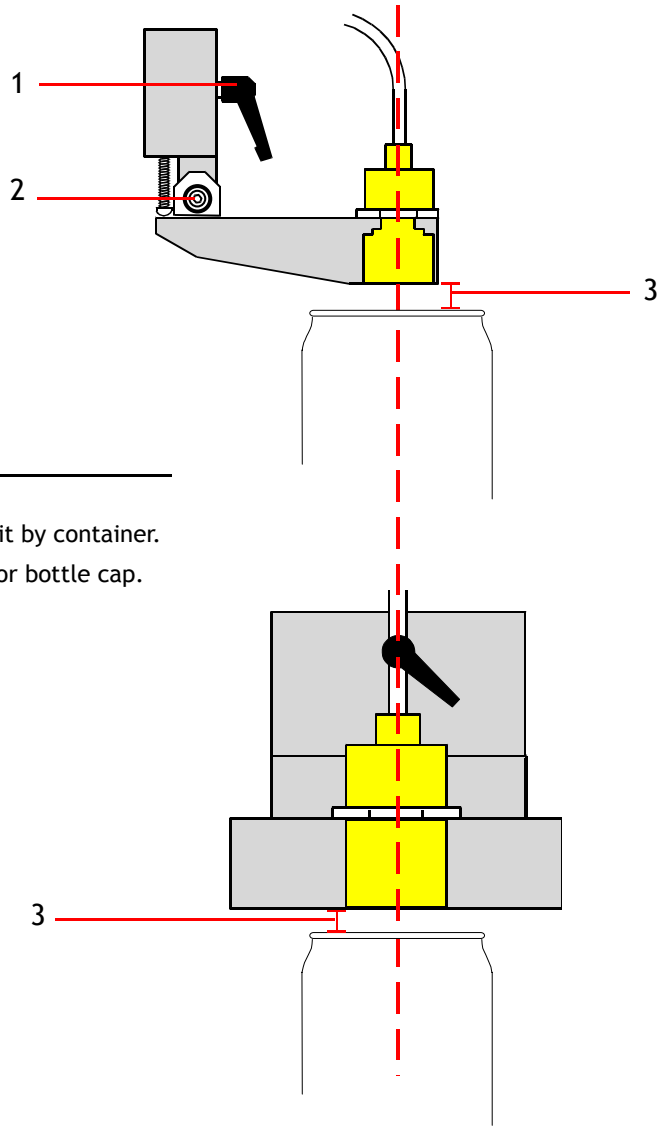
1. Locate several good production containers. These should be containers that pass all inspections. If the height of the containers varies slightly, select the container that is the shortest.

2. With the conveyor moving slowly and no production containers present, place the good container on the conveyor upstream of the inspection head.

3. Watch the container as it passes under the dud sensor and verify the container is centered directly under the dud sensor as it passes under the sensor.

4. Stop the conveyor and place the center the good container directly underneath the dud sensor.

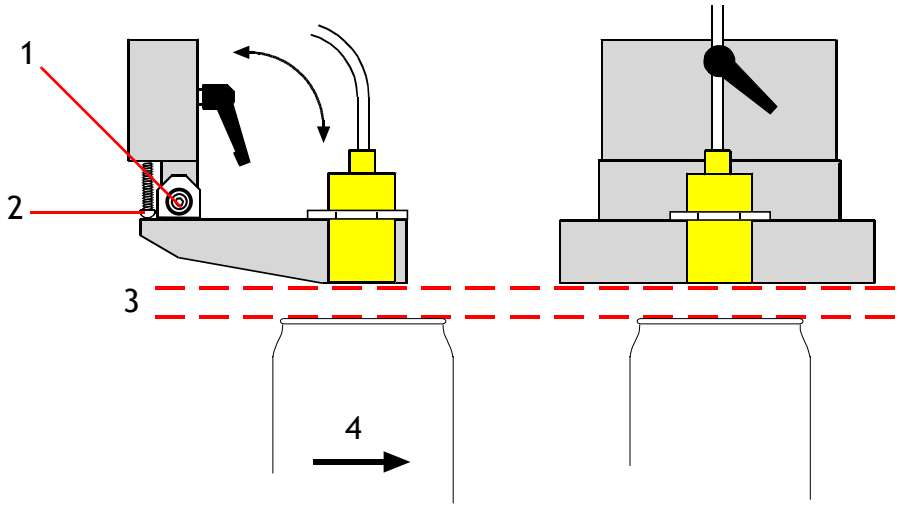
5. Unlock the dud sensor height adjustment mechanism and adjust the height of the sensor so the sensor's face is 3/32 ±1/32 inch [3 ±1 mm] above the container.



No.	Description
1	Height Adjustment Locking Lever
2	Bracket Pivot Hinge allows deflection if hit by container.
3	3/32 inch [3mm] space between can rim or bottle cap.

Figure 3. Centering a container under the sensor and adjusting the height of the sensor.

6. Verify the dud sensor face is parallel to the top of the can. If necessary, use the adjusting screw to change the angle. When complete, tighten the adjusting screw and its locknut securely.



No.	Description
1	Bracket Pivot Hinge
2	Bracket Leveling Adjustment Screw
3	Bracket is parallel with lid or cap
4	Direction of container flow

Figure 4. Level the sensor bracket parallel to the container top.

7. Press Key 5 until System Display appears.

8. Press the Arrow Key until Calibrate appears in the bottom line of the display, and if prompted, enter the password to access the Calibrate Mode.

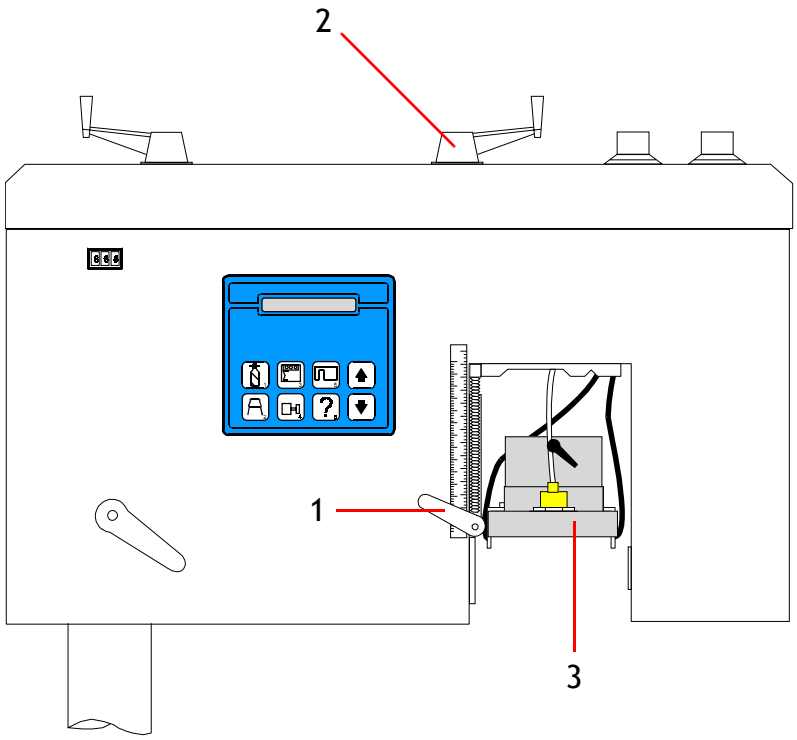
9. Press Key 2 until Dud Status appears and verify the status is turned on. If not, press the Arrow Key until ON appears. Dud inspection is now activated.

10. Press Key 2 until Dud Readings appears. Four (4) readings are listed on the bottom line. The reading marked C= is the current dud sensor reading.

11. Unlock the inspection (centerline) trigger adjustment mechanism and raise or lower the sensor very slightly until the C= reading is between:

    - 120-140 for cans
    - 70-90 for bottles

    Record the position of the trigger on the trigger height scale for ease of future container changeovers.



No.	Description
1	Centerline Bracket Height Locking Lever
2	Centerline Bracket Positioning Lever
3	Dud Sensor Bracket attached to Centerline Bracket

Figure 5. Fine tuning the sensor position.

12. Lock the inspection (centerline) trigger adjustment mechanism.

13. Press the Key 5 until Container Width At Trigger appears and verify the width of the container at the point where it intersects the trigger is correct. For more information refer to the Service Manual provided with your inspection system

Dud Inspection Software Setup

Note: Turning the Beacon Status is on while setting up the dud inspection enables low priority diagnostic messages, that can help provide feedback about errors that can occur during the setup procedure.

1. Align the dud sensor. For more information see Dud Inspection Sensor Alignment on page 4.

2. Prepare five good containers and four bad containers to use during the calibration procedure.

   - The good containers should be containers you are certain will pass dud inspection and any other inspection enabled on the inspection unit.
   - The bad containers should be containers that you are certain will fail only dud inspection, but pass all other enabled inspection processes. For more information see How to Create a Dud Container on page 12.

3. Press the Key 2 until Reject Undefined appears and press the Arrow Key to turn the function On. The Reject Undefined function enables rejection of any containers that give faulty dud readings. These readings can be caused by:

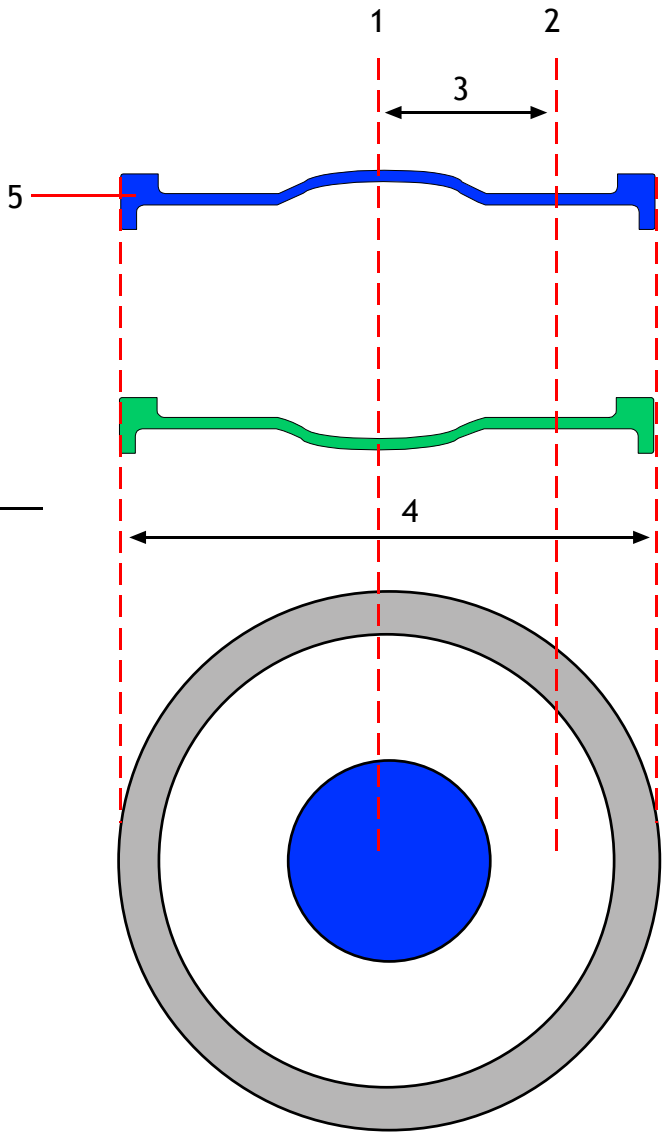
   - off-centered containers.
   - containers with bulged, missing, deformed or abnormal lids.
   - bulged lid containers which struck the dud sensor bracket and passed under the sensor before the bracket returned to position.
   - the sensor being too close to or too far away from the container.

   A low priority diagnostic will be generated for each undefined reject to explain the cause of the reject.

4. Depending on the type of container you are inspecting, proceed as follows:

   - If you are inspecting bottles, proceed to step 5 on page 9 to determine the dud reference points for cap inspection. When finished proceed to step 9 on page 10.
   - If you are inspecting cans, proceed to step 5 on page 9 to determine the dud reference points for cap inspection. When finished proceed to step 9 on page 10.

5. Determine the Dud Reference Points by measuring (in millimeters) from the center of the dud button outward to the middle of the flat portion of the cap.



No.	Description
1	Center of Cap or Dud Button
2	Center of outer flat area.
3	Distance between 1 and 2.
4	Diameter of cap or lid.
5	Lip or Rim of Cap.

Figure 6. Measure the dud reference points.

6. Multiply the measurement from step 5 on page 9 by two (2) to calculate the Diameter of Dud Reference Points.

   Measurement (mm) x 2 = Diameter of Dud Ref. Points

7. Press Key 2 until Diameter of Dud Reference Points appears and use the Arrow Key to enter the value you calculate in step 6 on page 10. When complete, proceed to step 9 on page 10.

8. Press Key 2 until Dud Insp. Method appears and use the Arrow Key to select a can inspection method from the list below. When you have selected an inspection method proceed to step 9 on page 10.

Method	Description
Necked-in 3p	Necked-in centering and 3-point inspection point calculation. Default method used for standard aluminum cans.
Necked-in Abs	Necked-in centering an absolute inspection point calculation. Can be used for standard aluminum cans.
Chines 3p	Chines centering and 3-point inspection point calculation. Preferred method for standard steel 3-piece cans.
Chines Abs	Chines centering and absolute inspection point calculation. Can be used for standard steel 3-piece cans.
Distance Abs	Distance or encoder based centering and absolute inspection point calculation.
Distance 3p	Distance or encoder based centering and 3-point inspection point calculation.
Necked-In Weighted	Similar to Necked-in Abs and Necked-in 3P with added logic to improve inspection margins. Consult IDC Technical Support before using this a method.

9. Press Key 2 until Calibrate Dud appears and a flashing execute message also appears.

10. Press the Arrow Key and a message instructing you to Run 5 Good Containers appears.

11. With the conveyor running, place a good container on the conveyor upstream of the inspection head. As the container passes under the dud sensor, verify the beacon does not light.

    - If there are no errors, pass 4 more good containers through the inspection head. The display will count down until the run is complete.
    - If the beacon lights or the message Aborted appears, press Key 6 to determine the cause of the fault. Correct the error before proceeding.

12. You are now prompted to Run 4 Bad Containers through the inspection head. When the data from the last can is processed, Completed appears. Verify that the Beacon does not light, indicating problems.

    If the beacon lights or the message Aborted appears, press Key 6 to determine the cause of the fault. Correct the error before proceeding.

13. Repeat step 11 on page 11 and step 12 on page 11 to verify

14. Press Key 5 until Alarm Low or High Dud appears. Use the Arrow Key to enter the number of consecutive rejects which you want to cause a consecutive rejects alarm. When this number of consecutive rejects occurs, a high priority diagnostic message is activated and the beacon will flash.

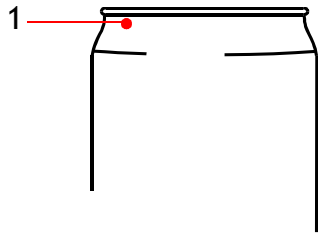
15. Press the Key 5 until Alarm Undefined (Dud) appears. Use the Arrow Key to enter the number of consecutive rejects which you want to cause a consecutive rejects alarm.

How to Create a Dud Container

The calibration and testing procedures used to setup dud inspection require you to create or acquire at least four (4) bad containers. Depending upon the type of container you are inspection you will need to create dud cans or dud bottles.

Creating a Dud Can

To create a dud can puncture the can just below the lid seam and allow the pressure to dissipate. Create as small a puncture hole as possible and be careful not to disfigure the can. Alternatively, you can fill cans with non-carbonated water and then pass them through the seamer.



No.	Description
1	Puncture or drill a hole directly under the lip. Be careful not to dent or alter the shape of the can.

Figure 7. Creating a dud can.

Creating a Dud Bottle

To create a dud bottle, loosen the cap until the seal indiction button pops and then tighten the cap.

Dud Software Advanced Functions

The FT-50/70 includes special advanced functions that enable you to configure the dud inspection parameters. These functions are accessed through the following control panel keys:

Key 2: Can Finish

Dud Status

Enables or disables dud inspection. When disabled all dud inspection functions deactivated and will not appear in the software menus.

Reject Undefined

Enables rejection of any containers that give faulty dud readings caused by:

- bulged can
- raised lid/high cap
- deformed lid/crooked cap
- container not centered under sensor
- sensor too far away from lid
- sensor too close to lid

Errors for undefined Rejects (in order of priority) are:

- Diagnostic Error 94
- Diagnostic Error 108
- Diagnostic Error 109
- Diagnostic Error 113
- Diagnostic Error 114
- Diagnostic Error 116
- Diagnostic Error 93
- Diagnostic Error 100
- Diagnostic Error 95

For more information see Diagnostic Errors on page 18.

This function may also reject the container following a bulged can or high cap that strikes the sensor bracket and the container r passes under the sensor before bracket returns to position.

If your system contains a bulged can, raised can, or high cap inspection, the dud inspection software will not increment the undefined (dud) reject counter.

Dud Low Threshold

If the current dud value falls below the Low Threshold a low dud reject is generated. A low threshold reject can be a low pressure container or an over vacuum container depending on the application.(range 255, default: 0).

Two values are stored under this setting; one for absolute inspection and one for three point inspection. Only one is displayed and adjusted depending on the method selected.

Dud High Threshold

If the current dud value falls above the High Threshold a over pressure reject is generated. A high threshold reject can be a high pressure container or an under vacuum container depending on the application.(range 255, default: 0).

Two values are stored under this setting; one for absolute inspection and one for three point inspection. Only one is displayed and adjusted depending on the method selected.

Diameter of Dud Reference Points

This diameter is used to help find the center of the container for both the necked-in and chines inspection methods. It is automatically calculated in during the calibrate dud procedure. It should only need manual adjustment in special applications.(Range: 1 mm - 90% of Can Width At Trigger, default: 35 mm)

Diameter of Dud Inspection Points

The diameter in millimeters used in the 3 point inspection methods. Used as a flowing reference for inspection. It is automatically calculated in during the calibrate dud procedure. This should only need manual adjustments in special applications.(Range: 1-255 mm)

Calibrate Dud

Automatically calibrates the dud inspection and calculates the reference and inspection diameters, Container Threshold and the Container Inspection Window Threshold.

You need 1 good container and 1 bad container to execute the routine properly. A good container must be run 5 times and the bad container run 4 times. It automatically detects the difference between the good and the bad containers and updates the appropriate threshold (low or high). The process needs to be repeated to setup both the high and low thresholds.

A bad sample of both a high and low reject will be needed. Calibration will abort if differences between good and bad is too small or if more than one container is between the trigger and rejector.

Dud Readings

Displays the dud sensor readings for the current lid. These readings are primarily used for troubleshooting. Pressing either arrow key will toggle the following display modes.(Range: 0 - 255)

1=XXX, M=XXX, 2=XXX, C=XXX (Continuous display mode)

R1=XXX, M-XXX, 2=XXX, C=XXX (Reject Only mode)

It displays the inspection points used to create the current dud value.

- 1 is the reading at inspection point 1,
- M is the reading in the middle of the container,
- 2 is the reading at inspection point 2,
- C is the current reading from the sensor.

Dud Values (Low Vac and Pressure)

The measurement of the dud position for the current can and the measurement of the last rejected can. (Range: 0-255)

CUR=XXX, LAST REJ=XXX displays the last dud inspection reading for current inspection method. It also displays the last reject reading.

Dud Data Length and Values

The inspection buffer length, the inspection points and their positions or offsets in the buffer. This display is used to help determine if the automatic centering methods of necked-in or chines are working. All values range from 0 to 255. This system is set up properly if the average of the positions of reference 1 and 2 are in the middle of the buffer length. Pressing either arrow key will toggle display modes.

XXX 1=XXX, XXX 2=XXX, XXX (continuous display mode)

RXXX 1=XXX,XXX 2=XXX,XXX (reject only mode)

Dud Data Position

The centering offset value, inspection buffer length, and reference diameter calculated. This display is used to help determine if the automatic centering methods of necked-in or chines are working. The offset value should normally be in the single digits (+ or -) or less than 10-15% of the buffer length. The dia value (the difference between the reference positions and 1 and 2)should not vary by more than 10-15%.

Dud Inspection Method

This function allows you to select one of the six dud inspection method. This function applies to can inspection only. For more information see step 8 on page 10

Dud Skew Threshold

This setting is hidden under S1-5 and is used to generate an undefined reject and diagnostic 95.

Key 3: Counters

Total Dud Low Threshold Vac

The total number of containers that were rejected as duds since the last time the counter was reset. This includes the total of all cans that were detected below the dud low threshold. (Range: 0 to 99,999,999)

Total Dud High Threshold

The total number of containers that were rejected as duds since the last time the counter was reset. This includes the total of all cans that were detected above the Dud High Threshold. (Range: 0 To 99,999,999)

Total Undefined (Dud)

The total number of containers that were rejected by dud inspection for undefined faults that interfered with dud inspection since the last time the Counter was reset. This includes missing lids/caps, bulged cans/high caps, sliding containers, down containers. (Range: 0 to 99,999,999)

Note: Lowfilled containers are not included in the dud totals. A container is not counted unless it is properly filled. If it is not properly filled it is counted in the fill level counters.

Reset Dud Low Vac

Resets the Total Dud Low Vac counter. If the previous count value is to be saved, it must be recorded externally as there is no storage for the number in the counter once it is reset.

Reset Dud High

Resets the Total Dud High Vac counter. If the previous count value is to be saved, it must be recorded externally as there is no storage for the number in the counter once it is reset.

Reset Total Undefined

Resets the Total Undefined (Dud) counter. If the previous count value is to be saved, it must be recorded externally as there is no storage for the number in the counter once it is reset.

Last Reject Detect

The classification of the last dud reject; low dud, high dud, or undefined reject

Key 5: System

Alarm Dud Low or High

Defines the number of consecutive dud rejects that will trigger an alarm condition. Rejects must be consecutive. Each good bottle, for this condition, that passes through the FT-50/70 will reset the counter to zero. (Range: OFF, 1-250, Default: OFF)

Alarm Undefined (Dud)

Dud Undefined status turns off rejection of undefined dud inspection and deactivates all undefined dud software functions.

Last Reject Detected

Displays the cause for the last reject which falls into one of the following categories: fill level, missing cap, high cap, dud.

Diagnostic Errors

The amber warning beacon on top of the inspection head signals an alarm or error condition by blinking rapidly. The error condition number can be obtained from the FT-50/70 by pressing the Key 6. Below The diagnostic errors specifically related to the dud inspection are listed below. For other errors, refer to the inspection system Service Manual.

Error Number 92

Too many containers in dud queue.

Error Number 93

Possible sliding container, missing cap, high lid, or dud sensor is positioned too far away from cap. Verify sensor position.

Error Number 94

Container diameter entered is smaller than Dud ref. Diameter setting. Verify Dud ref. Diameter and verify trigger width of container.

Error Number 95

Dud reference readings are too dissimilar. Can be caused by High cap or Skewed cap. Verify sensor is parallel and centered over cap.

Error Number 96

Calculated inspection window threshold too small. Readjust dud sensor height and check A/D card configuration.

Error Number 97

Difference between Good and Bad Duds is less than 10. Verify container samples used, dud sensor height, and A/D card configuration.

Error Number 98

Consecutive or Time; No Alarm Series Time Consecutive; ALRMSRTM Dud (Low Vac) Reject Alarm. The number of containers in the series alarm was exceeded.

Error Number 99

The number of containers in the series or consecutive alarm was exceeded.

Error Number 100

Dud sensor signal was too short for specified dud ref. Diameter. Verify dud inspection threshold setting and dud ref. Diameter. This can also be caused by a extremely high cap that hits the dud sensor.

Error Number 108

Dud sensor signal appeared late or container edge not found. Verify that this error repeats by running single containers, then decrease encoder value.

Error Number 109

Dud sensor signal appeared early or container edge not found. Verify that this error repeats by running single containers, then increase encoder value.

Error Number 111

Dud inspection windows length exceeded. Lower the Gamma Sample Cutoff Limit or verify Container Width at Trigger. Then perform Dud Calibrate.

Error Number 112

Dud reference diameter calibrated larger than inspection window. Reduced reference diameter and verify container width at trigger.

Error Number 113

Possible sliding container or high lid. dud inspection missed leading reference. Dud Ref. Diameter may need to be decreased.

Error Number 114

Possible sliding container or high lid. dud inspection missed trailing reference. Dud Ref. Diameter may need to be decreased.

Error Number 116

Dud calculated reference points less then 3/4 of calibrated reference diameter. Possible raised tab, dented can, can off centerline of sensor, or sensor too close to cap.

TB4 Pin Assignments

The following table lists the pin assignments for terminal block 4 located in the FT-50.

Terminal	Description
TB4-1	Ground
TB4-2	High Resolution Encoder Signal
TB4-3	+12 V supply to Encoder
TB4-4	+22 V
TB4-5	Input Signal
TB4-6	Input Signal
TB4-7	Input Signal
TB4-8	Input Signal
TB4-9	Ground
TB4-10	+22V
TB4-11	Ground
TB4-12	Output Signal
TB4-13	Output Signal
TB4-14	Analog signal, Channel A
TB4-15	Analog signal, Channel B
TB4-16	Analog signal, Channel C
TB4-17	Analog signal, Channel D
TB4-18	Analog ground

1. Is the dud inspection activated? Press Key 2 until Dud Status appears and verify the status is turned on. If not, press the Arrow Key until ON appears. Dud inspection is now activated.

2. Run a sample of good and bad containers through the inspection system. Verify that the bad containers were rejected and the good containers were accepted. If the inspection fails refer to the following sections

   - For more information see Dud Inspection Sensor Alignment on page 4.
   - For more information see Dud Inspection Software Setup on page 8.

3. Press the Key 3 until the Total Undefined reject counter appears. Physically check any container rejected as undefined to verify it is faulty and not a false reject. They may be faulty for the following reasons:

   - bulged cans or high cap
   - raised lids/high cap
   - deformed cans
   - missing lid/cap

4. If containers are rejected as undefined but do not have the above problems:

   - the containers may not be centered under the dud sensor as they pass through the inspection station.
   - the container may be too far away from or too close to the sensor (he sensor height is incorrect).
   - this can be caused by an extremely under-height or over-height container.

5. If an excessive number of false rejects occur, press Key 5 until Encoder Pre-scaler Value appears. If possible, lower this value slightly, which will increase the number of samples per container and improve inspection.

Note: Changing the Encoder Prescaler Value can effect other inspection functions. Use this with caution and verify all inspection functions are working properly after any change.

6. If too many false rejects or false accepts still occur, the Container Threshold may be incorrect. This may be caused by calibrating the system with containers which are not representative of the container population. Adjust the value as explained below:

	Excessive False Rejects	Excessive False Accepts
Low	-	+
High	+	-

7. To check the Container Threshold, press the Key 2 until Dud Values appears and then test 10 good containers and 10 bad containers while noting the dud values for each.

   Average the good container values and the bad container values. There should be at least 6 counts (typically 20-50) between the good container average and the bad container average. Then add the averages together and divide by 2. Set this number as the threshold.

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