

CT2

Collating Table for Tray Packing User Guide

PLASTECH
CONTROL SYSTEMS



www.plastech-controls.com

Covers Model Numbers

CT2

SAFETY WARNING

Electrical machinery contains hazardous voltages. Installation, servicing and adjustment is only to be performed by qualified personnel.

Do not tamper with this device.

Contents

1	Overview	5
	•Features	
2	Specification	8
1	General Machine Operation	9
2	Quick Set Guide	10
3	Displays and Settings	11
	•Displays •Settings	
4	General Touchscreen Operation	13
	•Displays •I/O Page	
5	Detailed Machine Operation	18
	•Operator Controls •Startup •Operation •Emergency Stop / Guards Open •Emergency Stop Release / Guards Closed •Start •Reset •Shutdown	
6	Installation	22
	•Initial Specification of Equipment •Location •Installation Layout •Supplies •Photoswitches •Testing	
7	Component Numbering Scheme	25
8	Input / Output Listing	26
9	Variable Speed Drive	29

10 Maintenance 30

•*Periodic Maintenance*

11 Parts List 31

12 Fallen Bottle Ejection 33

•*Fallen Bottle Sensing Installation and Setting Up*

1 Overview

1.1 Features

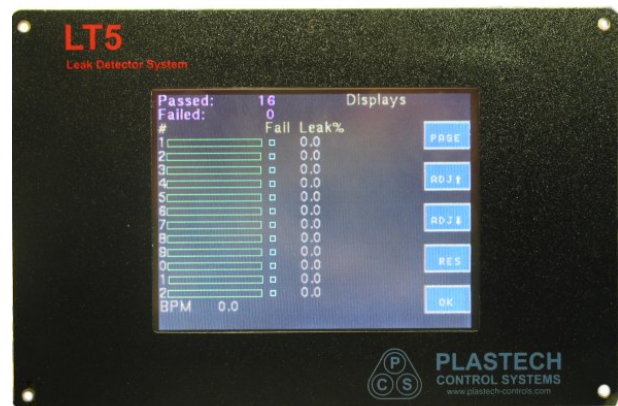
The CT2 series of collating tables have many advanced features:

- Flexible bottle transport system

Timings can be easily adjusted to optimize bottle transport, where required, without sacrificing cycle time.

1.1.1 Touch-Screen Microprocessor control system

It is now cost effective to use a modern touch-screen operator interface, rather than a simple digital readout. This has many advantages:



- Extremely flexible design. Extra features and customizations can be easily integrated into existing systems.
- All parameters, displays and counts are displayed together on the main displays page. This enables evaluation of the status of the system at a glance.
- All settings are displayed together on a settings page, allowing easy inspection and modification.
- All input and output states are displayed together on a diagnostics page. This allows quick faultfinding.

- The graphics based nature of the screen allows descriptive text and graphics to appear identifying all settings, results and warnings.
- Setting changes can be locked out if required.
- International - Since all information is presented on the touch screen display, it is easy to change the program to use another language (where the system is to be used in a non - English speaking country).

1.1.2 High Reliability

This is possible due to technology improvement, reduced component count, integration of all electrical functions onto the PCB, and an in-depth understanding of failure mechanisms.

1.1.3 Modular pneumatic system



Easily Customized Modular Pneumatics System

- Allows quick customization for special needs.
- Allows easy expansion of system to include extra facilities even after installation.

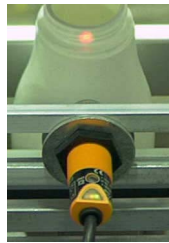
1.1.4 Cost Effective

The circuit cards have been designed and programmed specifically for this application. Great care has been taken to ensure that the system is easily re-programmable,

expandable and reliable. This means that the performance and cost limitations of using a bought-in Programmable Logic Controller are avoided.

1.1.5 Wide Range of Options

The leak tester design is highly flexible with respect to software, electronics, pneumatics and mechanics. This allows a wide range of options (see following page) to be added at any time, even after installation.



Auto-tuned Photoswitch with Visible Spot



CT2 Main Cabinet

2 Specification

Power Supply	110-120 or 220-240VAC single phase
Power Consumption	50 VA maximum ¹
Air Supply	60-150 psi (4-10 bar)
Air Consumption	1 litre per minute typical

¹ excludes conveyor

1 General Machine Operation



The machine is semi-automatic in operation.

To switch on Proceed as follows:

Check air applied (pressure gauge on air inlet above 4 bar).

- Check power applied (Red light on control panel)
- Ensure all emergency stops are off (pulled out).
- Press the green start button on the control cabinet. Green lamp within control cabinet should come on.
- Press RESET button on operator control panel.
- Allow bottles into the machine.

To Switch off

- Press the Stop button on the control cabinet.

To Clear a Bottle Jam

- Open the gates.
- Clear the infeed area of bottles.
- Close the gates.
- Press START button on operator control panel.

2 Quick Set Guide

If the required settings for the job have not yet been established, start as follows.

These are the "factory set" values and are intended as a starting point. They can be quickly reached by pressing the "RESET" button as each setting is displayed.

3 Displays and Settings

Most information is presented on the graphical touchscreen control panel. The information is organized into several pages. Other pages can be stepped through by pressing the PAGE button. The pages specific to leak detector operation are explained in this section; other pages may be available depending on the options installed. These are discussed in the relevant sections of the manual.

3.1 Displays

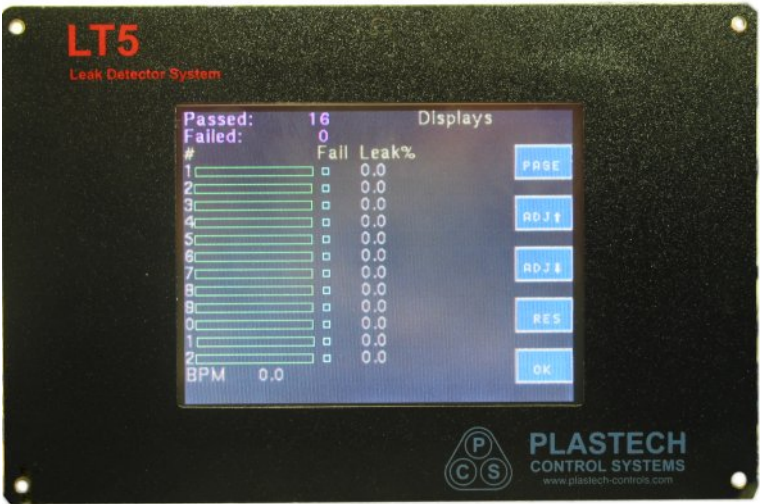


Figure 3.1 The main page displayed during operation

This is the main page displayed during normal running. The system will always show this page after power-on.

This page displays the following information:

3.1.1 Counts

These are counts of the number of bottles that have passed and failed the test.

A count can be reset to zero as follows:

- Touch the count value. It should become highlighted.
- Press the "R" (Reset) button.
- The count value will change to zero.

3.1.2 BPM

This shows the throughput of the leak tester in Bottles Per Minute. This is updated every cycle. The value is accurate as of the start of the last cycle, and is calculated from the interval between the last two cycles.

3.2 Settings

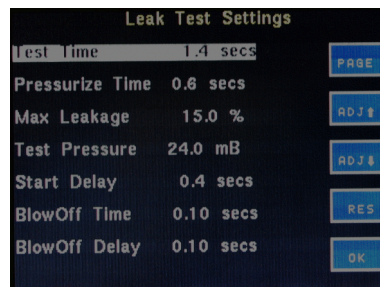


Figure 3.2 Settings

To change a setting, first highlight by touching it. Use the ``up`` and ``down`` arrows to adjust. Press ``OK`` when done.

4 General Touchscreen Operation

The system is provided with a graphical touchscreen display. This allows an operator to see the state of the machine at a glance. The surface of the screen is touch sensitive allowing an operator to reset counts, view other pages and alter settings if required.

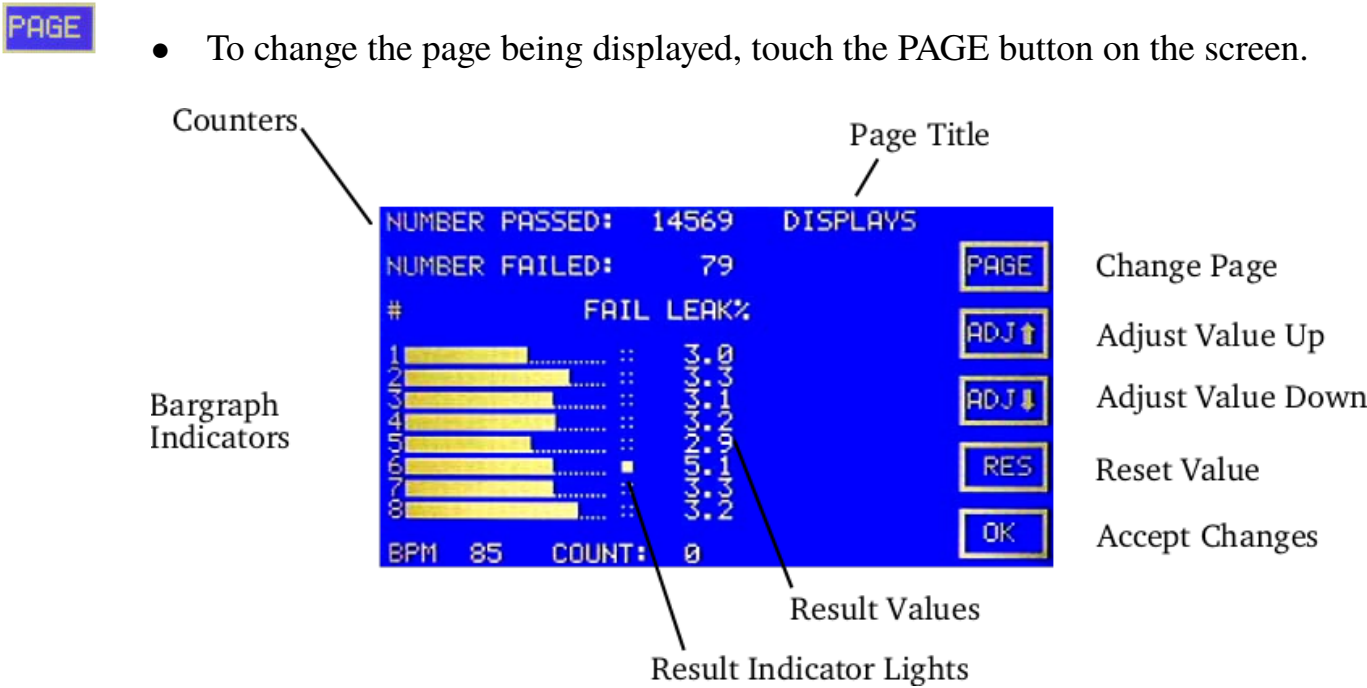
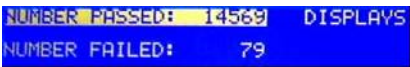


Figure 4.1 Touchscreen Display

4.1 Displays

This is a typical page displayed during normal machine operation; in this case the machine is an 8-channel leak detector. The system will always show this page after power-on. It has been designed to display all the information routinely needed by operators or quality control staff, i.e. bottle counts and test results. This example page displays the following types of information:

4.1.1 Counts



The system provides counters of various items. A count can be reset to zero as follows:



- Touch the counter value. It will become ``high-lighted``.
- Press the ``RES`` (Reset) button.
- The count value will change to zero.

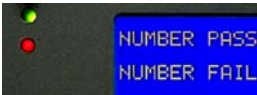
4.1.2 Indicators

On Screen Indicators



These are turned on and off as required, and can be used to indicate ON/OFF, ENABLED/DISABLED, PASS/FAIL type conditions. In the example the FAIL indicator turns on when a bottle fails the test.

LED Indicators



Also provided are red and green LED indicators, separate from the graphical touchscreen. These are under software control and can be used for various functions depending on the machine. For a leak detector, they would typically be used to indicate passes and failures during a test.

4.1.3 Settings Pages

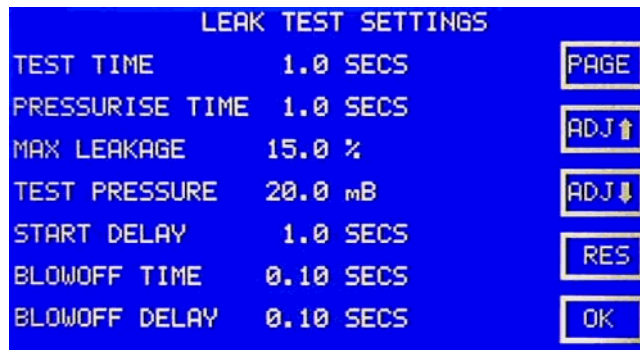


Figure 4.2 A ``Settings'' Page

Machine settings are usually grouped onto separate pages from the main display screen, so that operators do not accidentally make changes. There are two types of setting: numerical and on/off. The number displayed indicates a value of a numerical setting. The value of an on/off setting (i.e. whether it is on or off) is indicated by an indicator box. To alter a setting, proceed as follows:

- Touch the displayed setting value. The value should become highlighted.
- To increase, touch the ``Adjust Up'' button.
- To decrease, touch ``Adjust Down''.
- Alternatively, the setting can be returned to its factory set value by pressing ``Reset''.
- Press ``OK'' to retain the new value.



4.1.4 Other Settings Page

This page is used to group miscellaneous settings that may not be present on all machines. It also allows seldom-used screen pages to be switched on and off, to avoid confusion. In the example, the operator simply touches the light for ``Splitter Enabled'' to switch between the enabled and disabled states of the ``Splitter'' (shown by the indicator being on and off respectively).



Figure 4.3 ``Other Settings'' Page

The last two lines control whether the I/O Page and the Diagnostics page (see below) are displayed. Again, to enable or disable display of a page², simply touch the indicator box.

4.2 I/O Page

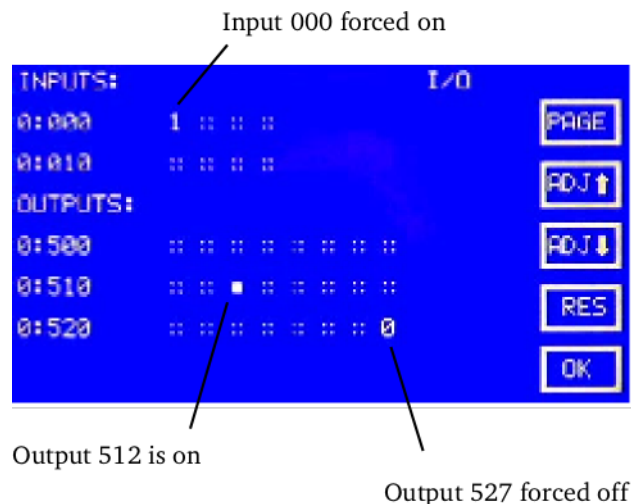


Figure 4.4

See the Machine Input / Output Sheet for details of the function of each input and output.

² Once a page has been switched on; it will not be removed from the display until the next power-up of the system.

The state of each I/O is shown by an indicator box being lit (for on) and unlit (for off).

The state of an output or input can be over-ridden from this page as follows:

- Touch the indicator box corresponding to the input or output which requires forcing.



- To force on, press ``Adjust Up``. . The indicator will change to ``1`` to show it is forced on.



- To force off, press ``Adjust Down``. . The indicator will change to ``0`` to show it is forced off.



- To reset to normal operation, press ``RES``.

Ensure that no I/O's are left forced to 0 or 1 when normal operation is to be resumed. If in doubt, power-off and on to reset the system.

5 Detailed Machine Operation

The CT2 collating table takes bottles from an infeed conveyor and collates them on a static table, ready for manual packing by an operator.

5.1 Operator Controls

There are three buttons, mounted on the operator control panel, intended for operator use.

- **START/RESUME**

Resumes operation after gate open or Emergency Stop. Bottle counts are not reset, the machine should resume operation from where it stopped.

- **RESET**

Abort cycle, reset back to home position. Then press start. Resets counts.

- **E-STOP**

This operates the emergency stop circuit as described below. It is equivalent to opening the gates and is wired in series with the gate circuit. This is distinct from the cabinet E-STOP button which additionally turns off power to the control system.

General operation of the machine is as follows:

5.2 Startup

Press the RESET and then the START buttons. Operation proceeds as detailed below.

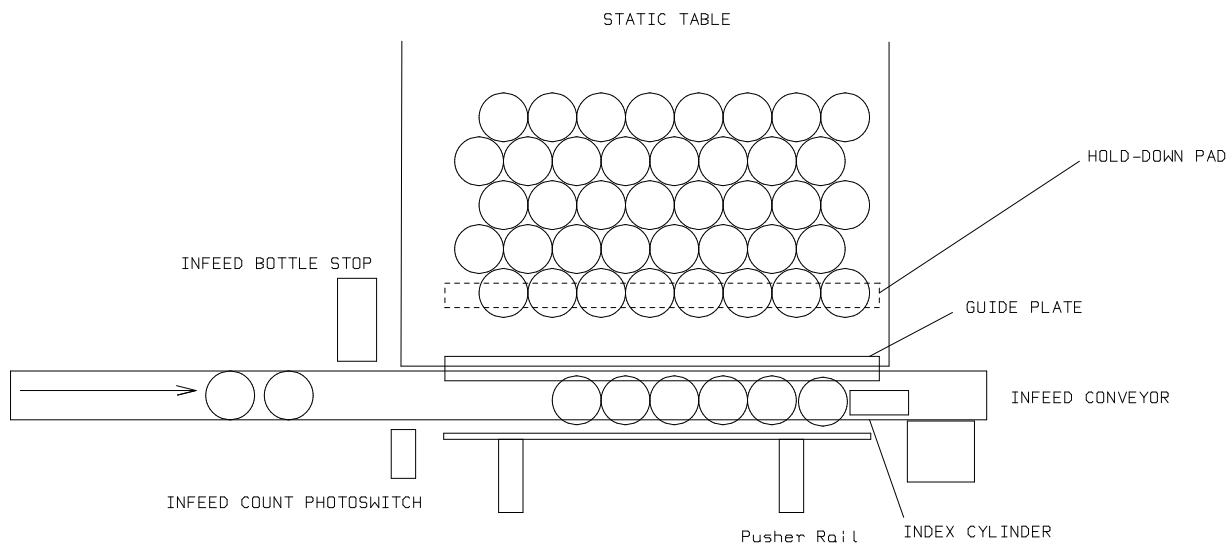


Figure 5.1 General Layout

5.3 Operation

- A bottle Row accumulates on the infeed conveyor, counted in by the Count photoswitch.
- There is an articulated bottle guide plate which comes up between the infeed conveyor and the static collating table. This is in the raised position during accumulation, helping to stabilise the bottle row on the moving conveyor.
- There is also a bottle hold down pad which presses down on the tops of the first row of bottles of the pack already on the table, stabilising these.
- When a full row is achieved, the infeed stop operates, preventing entry of any more bottles.
- The guide plate is lowered.
- The hold down pad is raised.
- The Pusher operates, pushing the accumulated bottle row from the moving conveyor onto the static table. The entire pack of bottles is pushed forward one row (towards the operator).
- The hold down pad is lowered, holding down the new row of bottles on the table.
- The bottle pusher is retracted ready to accumulate another row.

- The infeed bottle stop is retracted, letting in further bottles into the accumulation area.
- The Index cylinder optionally operates, as required to determine the selected index pattern (odd,even,off).

5.4 Emergency Stop / Guards Open

The emergency stop circuit comprises the Emergency Stop button and the gate Safety switches. When either of these operate the effect is as follows:

- All solenoid valve coils are turned off, including the Dump Valve coil
- All solenoid valves are returned to their neutral position by internal springs, stopping any powered motion of the machine.
- This vents both sides of all air cylinders to atmosphere, removing any force applied to the machine parts.
- The machine parts are then free to be moved by hand, allowing recovery from Jams etc.
- The Infeed conveyor is turned off.

5.5 Emergency Stop Release / Guards Closed

When the Emergency Stop buttons are released, or the Guards closed, the effect is as follows:

- The Dump valve is energised, turning on the Air supply to the pneumatics.
- However the solenoid valves remain de-energized, there is no machine movement.
- The conveyor remains halted.
- The machine is ready to be Reset/Started
- This requires the operator to press the Reset and/or Start buttons

5.6 Start

This is used when resuming operation after a controlled machine stop (gates open or operator panel e-stop)

- The Infeed conveyor is restarted.
- Any in-progress machine movement is completed.
- Bottle counts are retained.³
- Bottle counting resumes

5.7 Reset

This is used in the event of a jam which requires the accumulation are to be cleared. It may also be used after a power-down or main control panel e-stop. The machine goes through its reset cycle as follows:

- Infeed bottle stop operates
- Hold down pad is raised
- After a delay, the pusher rail operates, pushing any remaining accumulated bottles on to the table.
- The hold-down pad is lowered
- the Pusher Rail is retracted
- counts are reset
- The Infeed bottle stop is retracted, allowing bottles into the machine

5.8 Shutdown

The machine can be shut down at any point by pressing the red stop button on the main control cabinet front panel.

- The count of bottles in the accumulation area is lost; the area will need to be cleared prior to restarting.

³ If bottles have been added or removed from the accumulation are then the counts will be wrong.

6 Installation

Plastech Control Systems, or our representatives normally perform installation. However, some guidelines are here provided for customers who wish to do this themselves. Contact us (or our representatives) directly for more detailed information and advice.

We assume here an installation on a pre-existing conveyor system; this is the typical case.

6.1 Initial Specification of Equipment

The customer should have specified the following information

- Supply voltage

6.2 Location

In general, for a variety of reasons, the equipment should be situated as far downstream as possible, away from the blow-molding machine. This is so that the operator has the maximum amount of time to clear any problems (jams, etc.), before the infeed queue backs up into the blow molder.

6.3 Installation Layout

An optional brake can be fitted upstream of the equipment. Its function is to allow reliable operation even when there is a large line pressure due to an extended infeed queue (for example, after a jam, or failure of downstream equipment).

6.4 Supplies

6.4.1 Electrical

6.4.2 Pneumatic

The system requires clean, dry air at 4-10 bar. We provide a 1/4 inch BSP air inlet for the connection.

6.5 Photoswitches

The usual sensors supplied are visible light, diffuse reflective, self tuning, background suppression types. Connect these according to the wiring diagram and I/O list for your machine (Page26). The two most important ones are shown in Table 6.1.

<i>Terminal</i>	<i>Name</i>	<i>Colour</i>	<i>Sensor</i>	<i>Function Number</i>
000+	+24V	Brown		
000	Signal	Black	START	10
000-	0V	Blue		
001+	+24V	Brown		
001	Signal	Black	REJECT	15
001-	0V	Blue		

Table 6.1 Photosensor Wiring

The START photoswitch is mounted so that it sees the last bottle to enter the test area, before cycle start. Cycle start is triggered by the start photoswitch being on for longer than the set Start Delay.

The REJECT photoswitch is mounted just before the reject blower.

An optional downstream queue photoswitch is mounted downstream of the test area. If it is blocked at the end of the test, then the bottles are not released and the leak tester will halt until it is clear.

All these photoswitches should be positioned so as to see the gaps between the bottle necks, even when the bottles are touching.

6.6 Testing

Correct installation should be checked, not initially by processing bottles but instead by systematically going through the I/O list and checking each function. This is important because some piping mistakes can result in apparently correct operation that is in fact unreliable.

Go through the I/O list for your machine (see table 8.1 on page 26). From the front panel, force each one on and off in turn, and check that the correct machine function operates.

When I/O testing is finished, power off the leak tester for a few seconds, to release any forced outputs.

6.6.1 Function Valves

Check the other fitted functions as per the I/O table.

7 Component Numbering Scheme

The drawings following show the layout and interconnections of the various components, electrically, pneumatically and mechanically. The component numbering system is not obvious and requires explanation.

The heart of the machine is an electronic control system with various inputs and outputs (I/O's). There are a fixed number of these for any given installation (although extra I/O's can be added). These I/O's are connected to various devices (photoswitches, valves, cylinders motors etc), which make the machine work. A controller program reads the inputs and controls the outputs according to its program. The controller card I/Os have a fixed numbering system, with inputs starting at 0000, 0001, 0002 etc and outputs starting at 0500,0501,0502 etc. The I/O's are labeled in this way on the circuit card LED's, also on the I/O page of the machine display. The function of a particular I/O number may be different depending on the configuration of machine supplied. There are so many options and configurations that it would be very wasteful to dedicate an I/O for the same function on all machines. Instead, the controller program for a particular machine configuration allocates I/O's, more or less sequentially.

To avoid having to make individual electrical, pneumatic and layout drawings for each machine combination, Universal Function Numbers have been defined. I/O numbers are related to Function Numbers by a single table in the product manual. Function specific parts (e.g. the Test Head Cylinder) are given a number according to that function (in this case, Cylinder 10). This will be the same in any PCS product that has a Test Head Cylinder; it will always be Cylinder 10, CYL10 etc. The photoswitch that actuates the test head could also be called Photoswitch 10, PS10, etc. The actual I/O number can vary between machine types (although will be the same for two machines of the same model)

8 Input / Output Listing

Table 8.1 shows the input and output allocations for the CT2. This can be used to trace the operation when fault finding or installing the system.

<i>Function</i>	<i>Name</i>	<i>I/O Number</i>
Inputs:		
42	Operator Stop Button / Gate Circuit	000
44	Operator Start Button	001
83	Operator Reset Button	002
27	Infeed Stop Photoswitch	003
30	Pusher Forward Limit Switch	004
31	Pusher Back Limit Switch	005
	Guide Down Limit Switch	006
Outputs:		
28	Pad Up	500
29	Pad Down	501
30	Pusher Forward	502
31	Pusher Back	503
80	Guide Up	504
107	Guide Down	505
27	Infeed Stop Forward	507
27	Infeed Stop Back	507
74	Indexer Forward	510
74	Indexer Back	511
Analog Output:		
23	Infeed Conveyor Speed	700

Table 8.1 CT2 Inputs and Outputs



9 Variable Speed Drive

The variable speed drive for the infeed conveyor is documented in its own user manual. The following settings are changed from the manufacturer defaults:

Parameter	Value	Function
P35	120	Maximum Hz (scaling factor)
P36	3	Start Source
P38	2	Speed Reference
P39	0.5	Deceleration time
P40	0.5	Acceleration time

If it is suspected that other settings have been changed, it is possible to reset the drive back to its factory settings by selecting P041 (reset to defaults parameter). The above settings will then need to be re-entered.

10 Maintenance

10.1 Periodic Maintenance



Every year, or when discolored, replace the air filter in the filter-regulator assembly.

Figure 10.1

Every month, observe the operation of the machine. Note any air cylinders that are showing signs of wear, air leaks or excess "sticktion". Removing the air supply to the machine and moving by hand can check the action of the cylinders. The cylinder pistons should move easily. Replace any that are faulty.

11 Parts List

The following tables comprise a parts list for the machine. Spare parts can be ordered from Plastech Control Systems using the part number listed under "Part ID".

The numbers under "Ref" are the references as they appear on drawings; the numeric part identifies the function as explained earlier.

Ref	Part ID	Description	Function
PR9,10	748	Pressure regulator, 1/4 ported, low pressure	Pressurization
F40-1	73	Trip, 1A, 2 pole, type D	Transducer Piping
9	344	Tubing, Silicone Rubber, 1.6mm wall thickness, ID 3.2	
	120	Tubing, Blue, 4mm O/D, 10m	
PB41	1332	LT5-C Internal Cabinet Stop Switch Assy	
PB44	1334	LT5-C Internal Cabinet Start Switch Assy	
PB41	1335	LT5-C External Cabinet Stop Actuator	
PB44	1336	LT5-C External Cabinet Start Actuator	
L43	1337	LT5-C Power Indicator Assembly	
L44	1338	LT5-C Run Indicator Assembly	
	122	Tubing, Blue, 8mm O/D	
RL44	747	Relay, 40.31 series, SPCO, 10A, 24VAC	
	121	Tubing, Blue, 6mm O/D, 10m	
EX40	968	Muffler, 3/8 ported 3.3 CV	System exhaust
F40-2	151	Trip, Type S, 1 Pole, 2 Amp	Transformer Secondary trip
FLT1	74	Mains Filter, 2A	Mains input filter
G1,2,10	282	Pressure Gauge, panel mount, 40mm dial, 4 bar	Front Panel gauges
G40	62	Pressure Gauge, screw in, 1/8 ported, 0-10 Bar	Mains Air In
PR10	748	Pressure regulator, 1/4 ported, low pressure	Test head force
PR40	281	Filter Regulator, auto drain, 1/4 ported	NR1 Main air in
SW40	76	Isolator, Mains, Interlocked	Mains Isolator
T40	1269	Transformer, 50VA, 24V, 0-115-230V Primary	Control panel transformer

Table 11.1 Control Cabinet Parts List

Ref	Part ID	Description	Function
10	833	Manifold block assy 6mm	Test Head Down
40	839	Manifold supply/exhaust assy (for R)	System Supply
10,9	810	Manifold block disc	Test Head, Pressurization
10,9	831	Supply / Exhaust Block Assy (std)	Test Head, Pressurization
15,17,20	834	Valve, common pilot	Reject, Stop, Separate
15,17,20	832	Manifold block assy 4mm	Reject, Stop, Separate
10	835	Valve, external pilot supply	Test Head Down
9	835	Valve, external pilot supply	Pressurization
40	830	Manifold DIN rail size 18 (323mm)	
40	828	Manifold End Piece U side	
40	829	Manifold End Piece D side	

Table 11.2 Valve Manifold Parts List

Ref	Part ID	Description	Function
17	859	Cylinder, ISO, Non-magnetic, 16mm bore, stroke 80mm	Stop cylinders
20	346	Cylinder, ISO, Non-magnetic, 25mm bore, stroke 25mm	Separator Cylinder
10	346	Cylinder, ISO, Non-magnetic, 25mm bore, stroke 25mm	Test Head Cylinders
15	342	Fitting, Bulkhead, Chromed, push-over, 6mm	Reject Blower
10	341	Fitting, Elbow, 1/8 : 4mm	Test Head Cylinders
9	752	Fitting, Elbow, Push Over, 1/8 : 4mm	Test Head Fitting (fill)
9	753	Fitting, Elbow, Push Over, 1/8 : 6mm	Test Head Fitting (sense)
10	751	Fitting, Manifold, 8mm : 10 x 4mm	Test Head Cylinders
40	120	Tubing, Blue, 4mm O/D	
40	121	Tubing, Blue, 6mm O/D	
40	122	Tubing, Blue, 8mm O/D	

Table 11.3 Test Fixture Parts List

Ref	Part ID	Description
40	71	PCB-T1-1 Touch Screen Controller (LT5 Machines)
40	553	PCB-P4-1-4 Display Board, 4 Channel (LT1 Machines)
40	555	PCB-4361-4110 I/O board (1-4 head machines)
40	773	PCB-8361-8330 I/O board (5-8 head machines)

Table 11.4 Circuit Boards

12 Fallen Bottle Ejection

This is very useful on lines where it is possible for a bottle to fall over. When this option is fitted, bottles are ejected off of the conveyor before they get into the leak tester, preventing a bottle jam.

The system works as follows:

The Fallen Sense Top photoswitch monitors the bottles passing by. Whenever the signal disappears, after a short set ``Fallen Sense Delay`` the Fallen Sense Bottom photoswitch signal is checked. If this signal is present, and the Top photoswitch signal is still not present, then a fallen bottle is detected and the Fallen Sense Eject Blower is turned on for the set Fallen Sense Eject Time. This ejects the bottle from the conveyor.

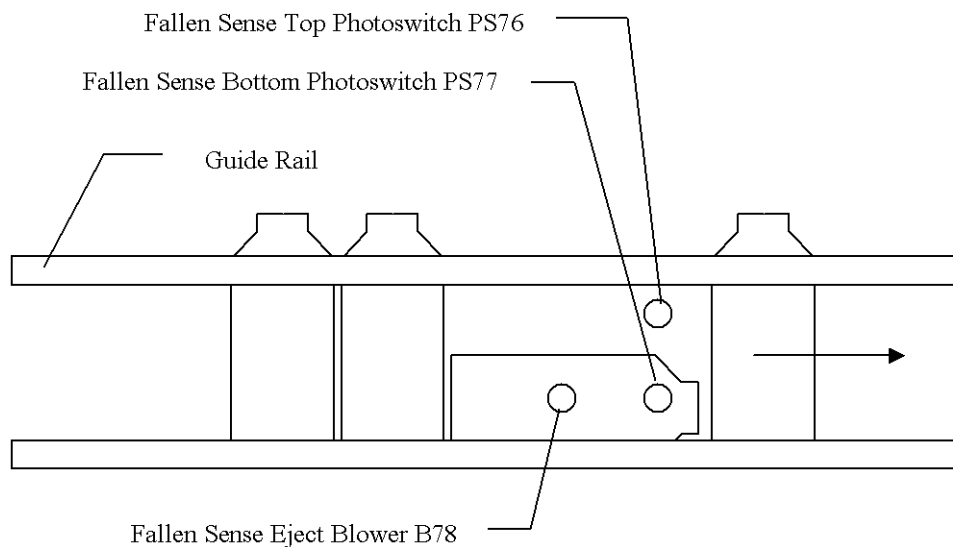


Figure 12.1 Fallen Bottle Sensing System Layout

12.1 Fallen Bottle Sensing Installation and Setting Up

The fallen bottle sensing can be anywhere, but is ideally best located immediately before the leak test area. The guide rails should be prepared so that a fallen bottle

can be ejected, while still allowing bottles to queue in a stable manner. It should normally be possible to provide a continuous lower guide rail, with the fallen bottle being blown over the top.

There are two settings involved, these are located by pressing the PAGE button on the touchscreen controller until they appear on their own page ``OTHER SETTINGS''. Adjust the horizontal position of the two photoswitches shown above so that when a single upright bottle passes, the signals go off at the same time. Adjust the vertical position so that the lower photoswitch sees a bottle in both positions (upright and fallen) while the upper photoswitch can only see upright bottles.

Set ``Fallen Sense Detect Delay'' to 0.1 seconds.

Set ``Fallen Sense Eject Time'' to 1.0 second.

At this point, fallen bottles should be detected and blown off of the conveyor. Adjust the blower as required to efficiently eject the bottle. Adjust the eject time as required to blow the bottle cleanly away without disturbing following containers.