CONTENTS

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MANUAL CHANGE REQUEST FORM

No.	

CUSTOMER USE			
COMPANY:			
ORIGINATOR:		DATE:	
MACHINE:	TYPE:	SER No:	SOFTWARE:
MANUAL CHAPTER/FIGURE REF:			
RECOMMENDATION:			
ENCLOSURES:			

INTERNAL USE ONLY	
MANUAL CHANGE:	ACCEPTED. REJECTED (State Reason)
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CHANGE DETAILS:	
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COMPLETED AMENDMENT:	MANUAL/CHAPTER ISSUE DATE.

MANUAL AMENDMENT STATE

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Chapter 5	30	6. 12/98
Chapter 6	14	5. 3/97
Chapter 7	22	7. 9/01
Chapter 8	6	6. 12/98

In line with DEK Policy of continual improvement, this manual is periodically up-issued to reflect the latest machine enhancements and provided with a date of issue which is displayed at the bottom of each hardcopy page.

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A DOVER TECHNOLOGIES COMPANY

CHAPTER 1 - INTRODUCTION

INTRODUCTION

INTRODUCTION

The DEK 248CE screen printing machine is a flexible, semi auto, surface mount screen printer, which can be configured to accept the DEKAlign vision system.

The DEK 248CE screen printer has the following advanced features:

- Micro-controlled menu driven operation
- Programmable machine parameters
- Storage of up to 35 different menu files
- Programmable separation speed
- RS232 Interface Link Capability
- DEKLink Menu Management System (chargeable option)

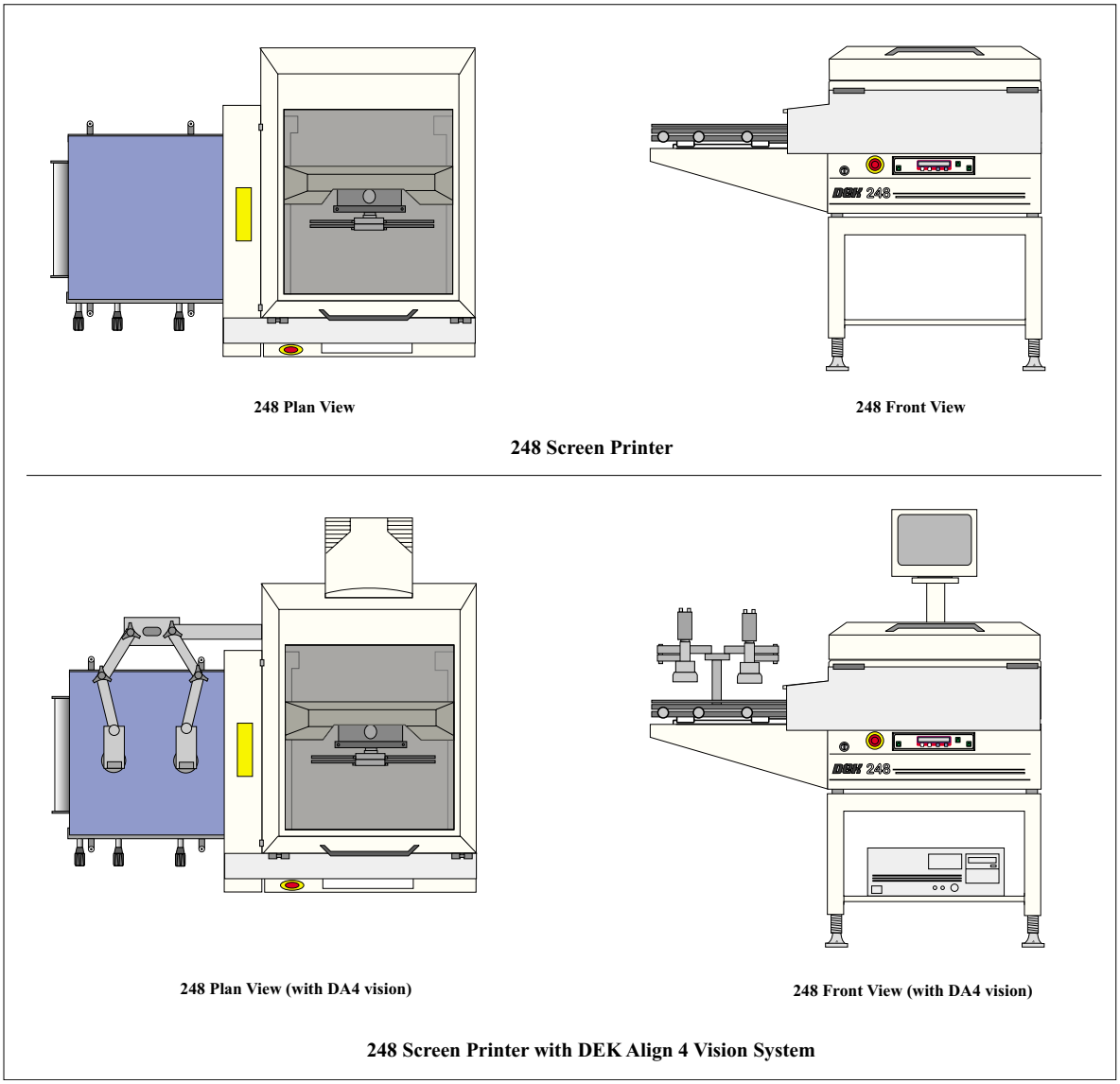


Figure 1 - The 248 Screen Printer

SCOPE OF MANUAL

Chapter 1 - Introduction

Including general technical specifications.

Chapter 2 - Safety Features

Electrical and mechanical safety features of the printer system.

Chapter 3 - Preventive Maintenance

Routine Maintenance schedules

Chapter 4 - Diagnostics

Extent of diagnostic features incorporated into the control system.

Chapter 5 - Description

Includes description and function of the sub-assemblies that comprise the 248CE machine. References are made to Chapter 7 Calibrations and Settings Procedures.

Chapter 6 - Error Messages

Origin and the likely causes of the various error messages together with suggested remedial action.

Chapter 7 - Calibrations And Settings

Calibration of mechanisms and settings for switches used for error detection.

Chapter 8 - Sensor Listing

Sensor listing and location diagrams.

TECHNICAL SPECIFICATION

A General Parameters	
Screen frame Size:	508 x 508 mm (20" x 20" internal)
Programmable:	
Print Stroke	Maximum 450 mm (17.7")
Print speed	Standard machine: 10-70 mm/s (0.4-2.95 in/s) Independent forward and reverse in 1 mm/s increments
Print Gap	0-3 mm (0-0.125") in 0.1mm increments
Squeegee delay	0-10 sec
Hop-over delay	0-10 sec
Squeegee Hop-over	10-50 mm (0.394-2.0 in)
Speed of Separation	10-100% of descent speed, in 1% intervals
Menu Storage	35 separate programmes, recalled alphanumerically
Squeegee pressure	0-15 kg (0-33 lbs)
Squeegee type	Double Squeegee, Single Diamond or Trailing Edge, various types including bonded polyurethane, metal
Workable X,Y adjustment	+/-10 mm (+/-0.393)
Max Radial adjustment	+/- 2 degrees.
Operational Modes	Double Squeegee, print/print with hop-over, print/flood, flood/print, on-contact, 1 or 2 deposits.
Solder Paste/Replenish	Operator initiated.
B Print/Board Parameters	
Print Area - Single and double Squeegee	432 x 405.5mm (17" x 15.9")
Maximum Board Size	500 x 450mm (19.5" x 17.5")
Minimum Board Size	100 x 50mm (4" x 2") 75mm min between diagonal fiducial centres for DA4 alignment
Board Thickness	0.5 to 5.0mm maximum
Alignment Accuracy	1.33 cpk @ 25µm
Board Pallet Weight	5 Kg maximum
C Tooling	
	Adjustable magnetic type fitted as standard, underside component clearance of 19mm. Edge clamp tooling available.

D Services	
Power Supply	220V or 110V single phase (factory set)
Power Consumption	Less than 1.0 kW.
Air Supply	Compressed air to quality class 2.4.3. 2 = Dirt 1 Micron 4 = Water + 3 C PDP 3 = Oil 1 mg/m
Air Pressure	Recommended 60 - 70 psi
Air Flow Rate	220 ltr/min (7.2cf/min) for typical 20 second print cycle
Vacuum Supply	Integral Vacuum Ejector
E Weight	
Base Machine (including stand)	355kg (780lbs)
F Dimensions	
Overall	1200mm (W) x 1130mm (D) x 1140mm (H) nominal

CHAPTER 2 - SAFETY FEATURES

INTRODUCTION

INTRODUCTION

The DEK 248CE printer is fitted with safety features that ensure safe operation for the personnel and equipment during operation.

ELECTRICAL Electrical power outside of the service tray is low voltage, 24V dc, only. The mains supply input lead is shrouded at the connection end to protect against inadvertent contact with the live conductor.

MECHANICAL The machine structure is fitted with safety covers, where there are moving mechanisms that would be exposed. When the top or front cover is opened an interlock switch cuts the machine power to all mechanisms.

Emergency Stop Pressing the emergency stop push-button fitted to the front panel cuts power to the machine mechanisms. Stored energy within pneumatic devices is released by venting the controlling valves to atmosphere.

The button mechanically latches and requires turn-release to mechanically reset.

Services Tray The service tray houses the mains supply to the machine, which is protected by a safety cover guard, and warning label is shown to identify the mains area.

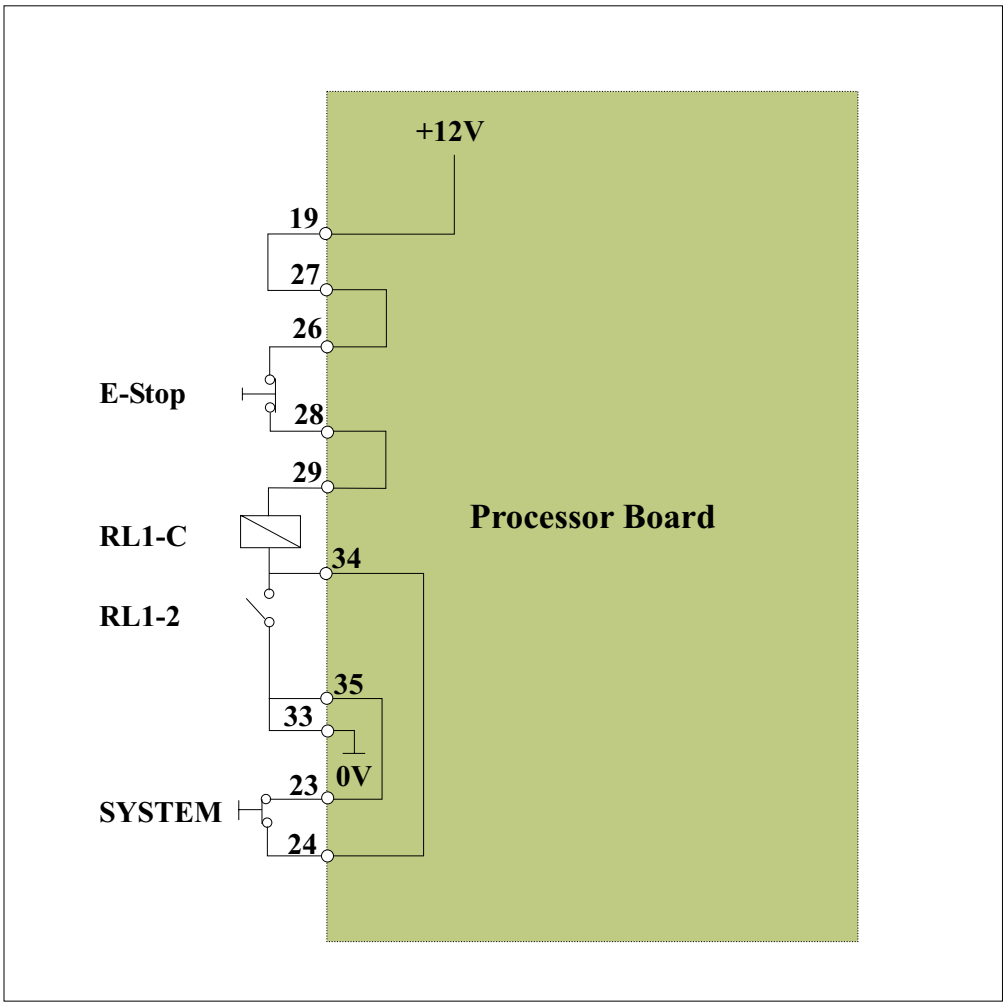


Figure 1E Stop Detail

SAFETY NOTICES

Warning and Caution notices direct attention to a machine or operator function that has the potential to cause harm, either to personnel or to the machine. Warnings and Cautions are placed throughout the manual at appropriate points where they should be observed. Typical examples are shown below.

WARNING. ELECTRICAL HAZARD.

Lethal Voltages Present. Isolate the Main Supply before removing the Machine Covers.

CAUTION. X, Y& THETA (Ø) ADJUSTERS.

Ensure that the table clamps are released (table is floating) before adjusting the X, Y or Ø adjusters. Failure to release the clamps may result in equipment damage.

CHAPTER 3 PREVENTIVE MAINTENANCE

248CE MAINTENANCE

CUSTOMER MAINTENANCE

DEK CUSTOMER SUPPORT GROUP MAINTENANCE

248CE MAINTENANCE

INTRODUCTION To contribute to smooth production runs, systematic checks and prescribed maintenance procedures are to be carried out at regular intervals on the 248CE Machine.

Preventive maintenance tasks include:

- **Inspections -** Visual inspections.
- **Replacement -** Replace defective or worn components.
- **Calibrations -** Check the calibration in accordance with the procedure detailed in the Technical Reference Manual.
- **Cleaning -** Remove contamination with recommended cleaning materials.
- **Lubricating -** Grease using the recommended lubricants.

The frequency with which the maintenance checks and procedures are carried out is determined with reference to a production record either kept by the machine operator or immediate production supervisor. This varies from customer to customer but this record should give an approximation of the number of print cycles the machine has performed.

A useful aid to the monitoring of machine performance is a machine fault log. The log should be filled in by the operator or on-site technician to enable the maintenance engineer to see, at a glance, the problem areas that may require immediate attention.

The machine build state is indicated on the modification record plate located at the rear of the machine.

View on Rear of Machine

Figure 1 248CE Record Plate

Cleanliness

It cannot be stressed strongly enough that cleanliness is the most important part of preventive maintenance. It is essential that operators take extreme care when loading or removing paste and removing squeegees.

Paste is the main cause of serious machine damage as the paste solvents can remove protective lubricants from bearing slides and dried paste can damage seals causing seizure of the bearings.

Periodicities

Throughout the life of the 248CE Machine, preventive maintenance tasks are to be performed at either the stated time intervals or after the stipulated number of machine cycles. The maintenance must be carried out on a 'whichever is the soonest' basis.

The tasks are presented in an ascending order of periodicity, ie Weekly, Monthly, 6 Monthly and Yearly.

PERSONNEL CLASSIFICATION

Daily,Weekly, Monthly and 6 Monthly customer maintenance tasks are to be carried out by the On-site Technician (DEK 248 maintenance course trained).

Yearly tasks and other tasks which are carried out on an 'as required' basis, are to be carried out by a DEK Customer Support Engineer.

The approximate man hours required to carry out each of the preventive maintenance schedules are as follows:

- Daily - 15 minutes.
- Weekly - 20 minutes.
- Monthly - 45 minutes.
- 6 Monthly - 100 minutes.

LUBRICANTS

Recommended oils and greases are as follows:

- THK AFB Grease (141146).
- Light machine grease - Castrol LM (120011).

Cleaning Materials

Recommended cleaning materials are as follows:

- Isopropyl Alcohol (IPA) Cleaning Cloth (141150).

APPLICATIONS FOR LUBRICANTS

Location	THK AFB Grease	Light Machine Grease
Print Carriage Rails	Yes	
Table Rails	Yes	
Squeegee Rails	Yes	
Table Actuator Pivots		Yes
Table Buffers		Yes
Roller Bearings		Yes

NOTE

Lubricate components shown **BOLD** *in the following figures.*

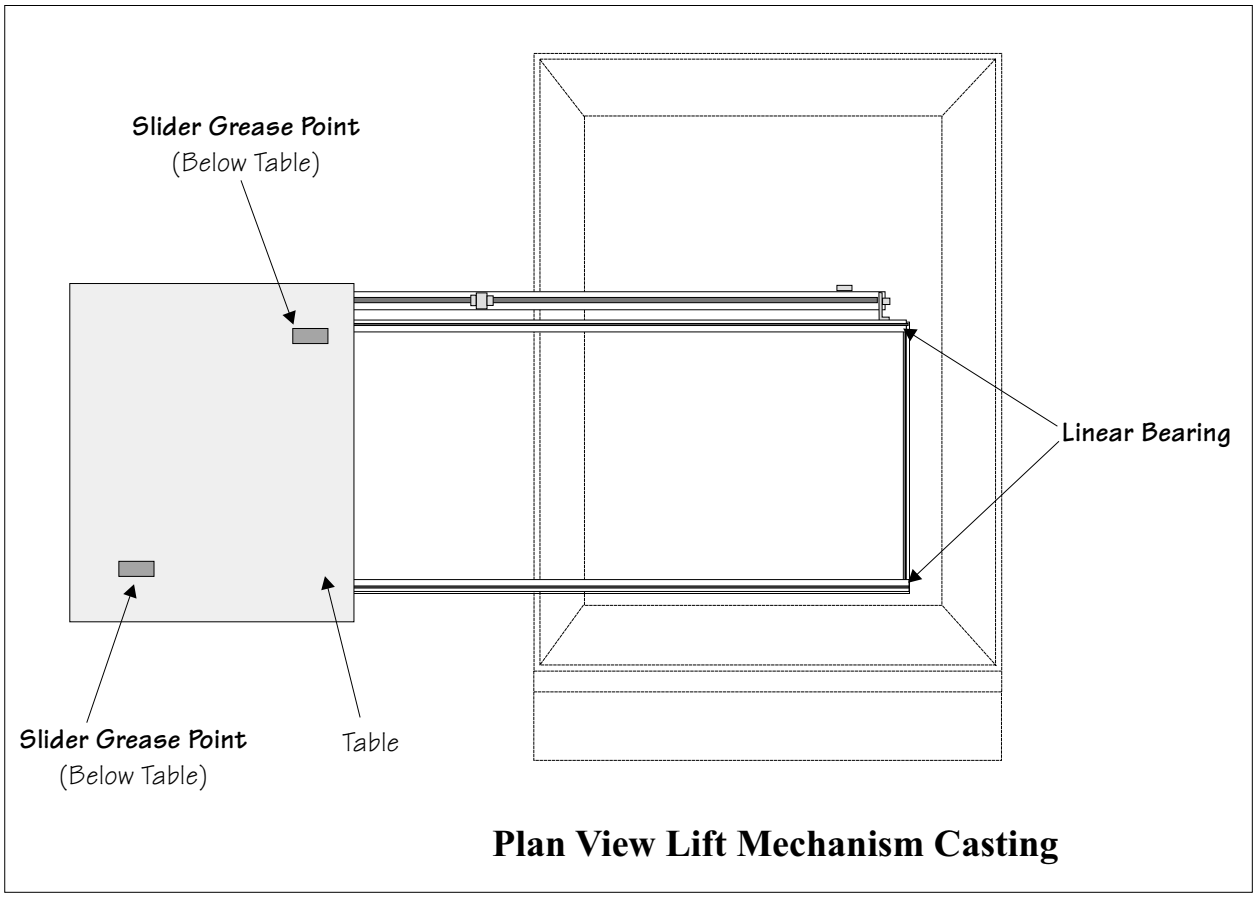


Figure 2 Lift Mechanism Lubrication Points

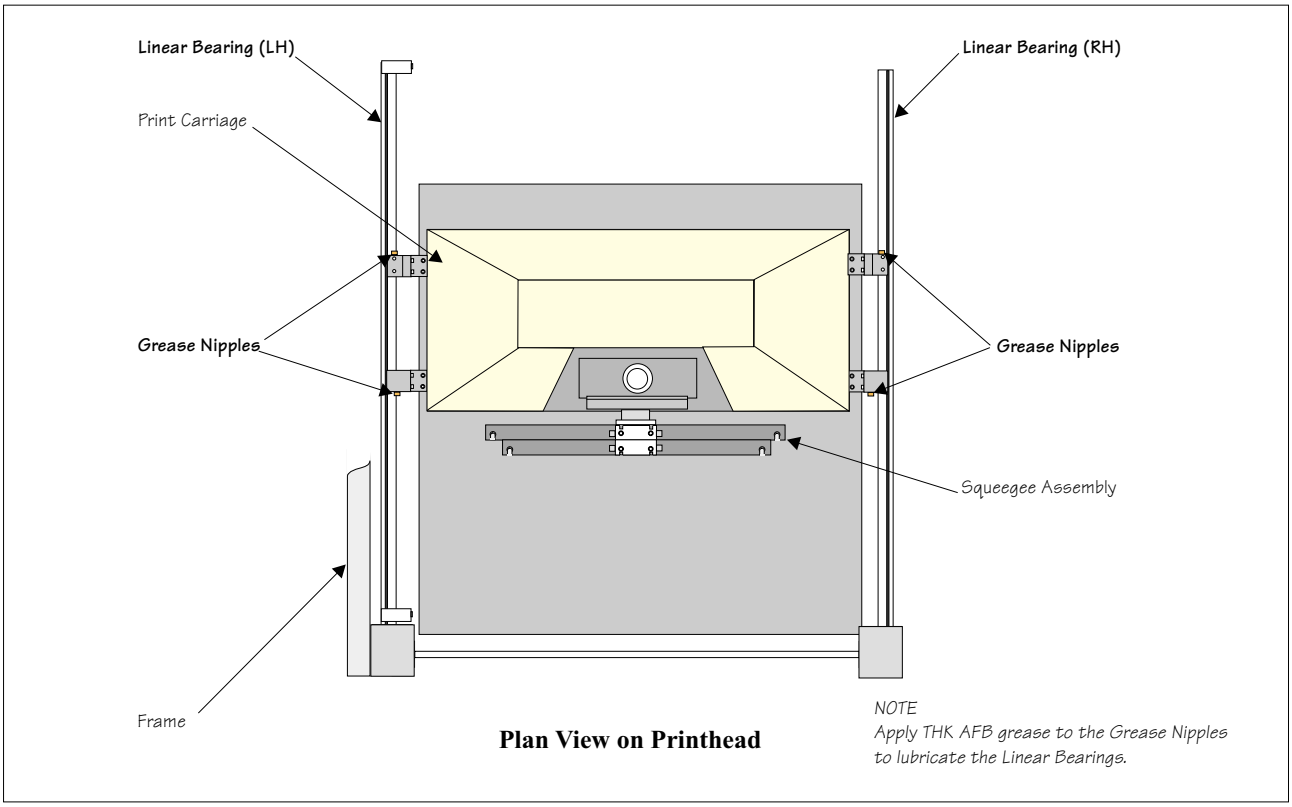


Figure 3 Print Carriage Lubrication Points

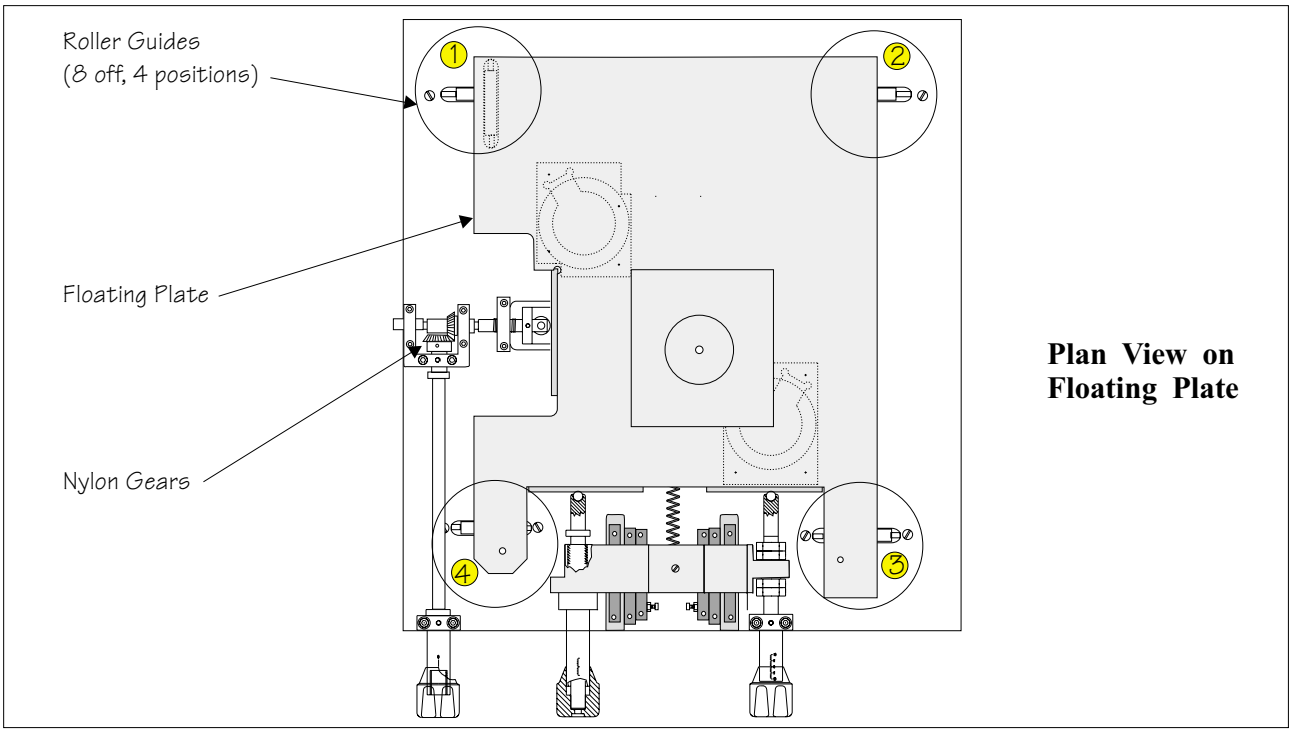


Figure 4 Floating Plate Lubrication Points

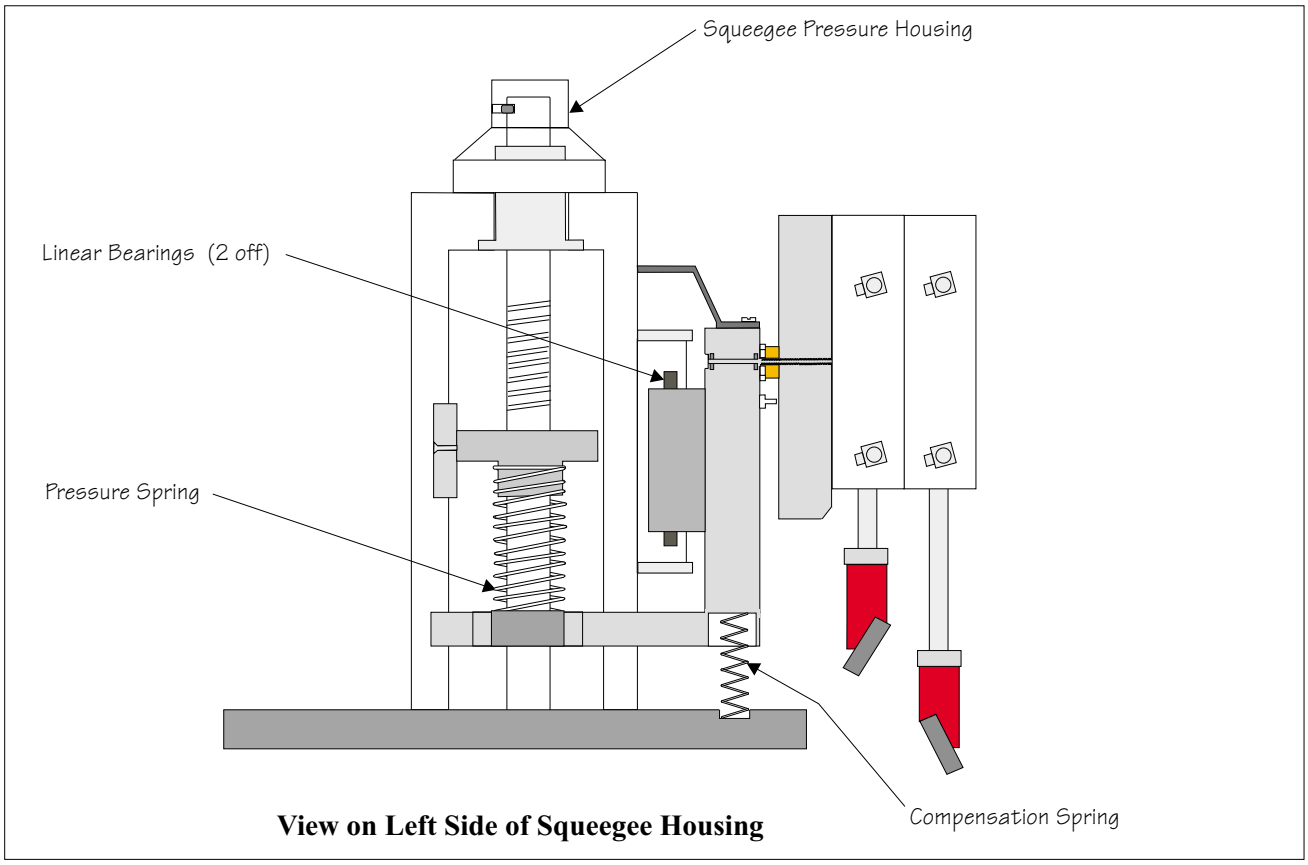


Figure 5 Squeegee Lubrication Points

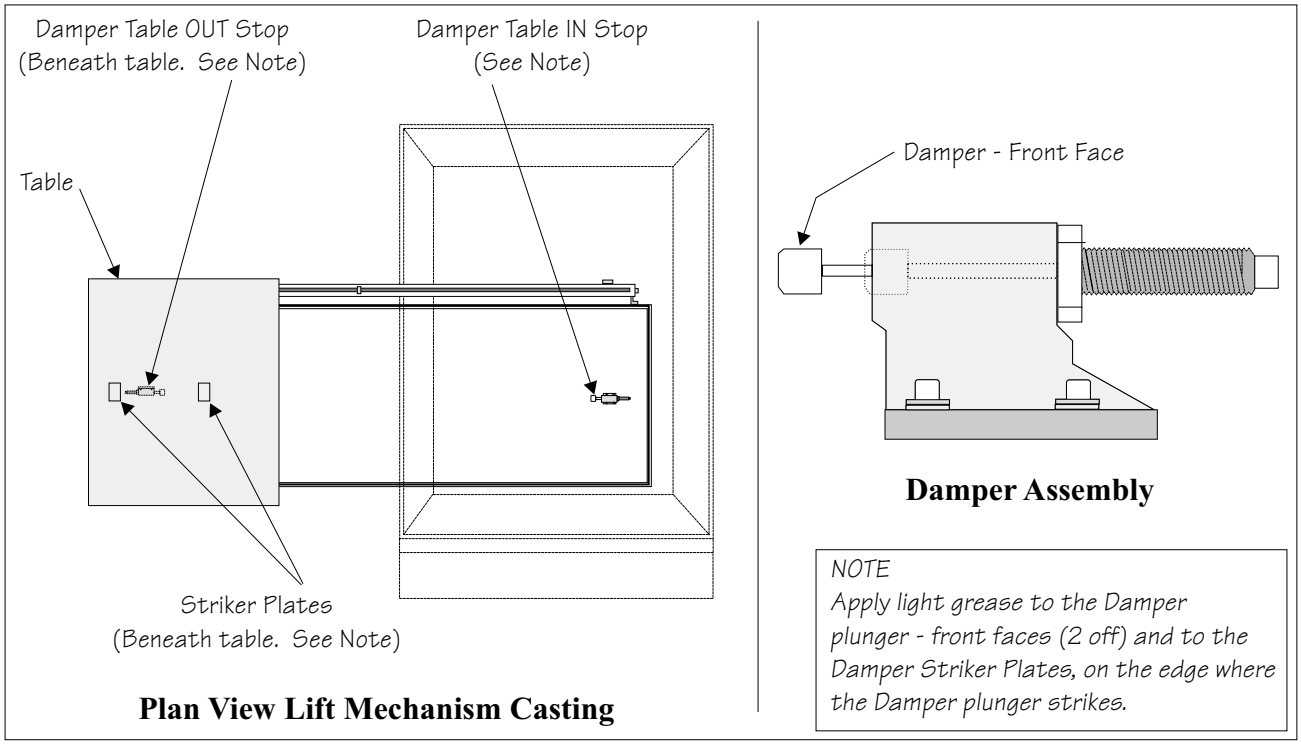


Figure 6 Damper Lubrication Points

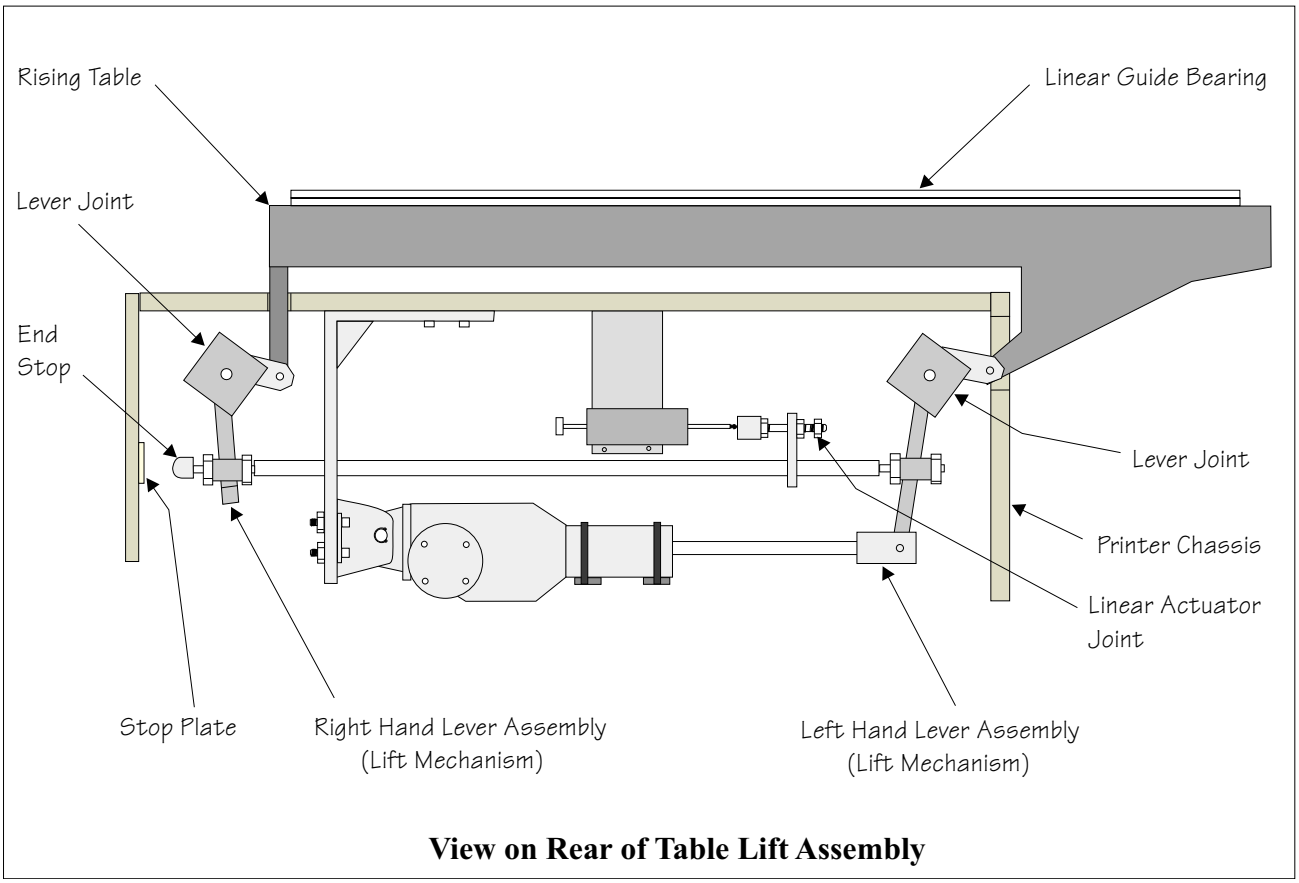


Figure 7 Table Lift Lubrication Points

APPLICATIONS FOR CLEANING MATERIALS

	IPA Cleaning Cloth
Print Carriage Rails	
Table Rails	
Squeegee Rails	
Table Actuator Pivots	
Table Buffers	
Roller Bearings	

CUSTOMER MAINTENANCE

DAILY OR 1,000 MACHINE CYCLES

WARNING

HEALTH AND SAFETY. It is recommended that personnel involved in cleaning operations wear gloves, protective clothing and a face mask or goggles.

ESTIMATED COMPLETION TIME: **15 MINUTES**

COMPETENCE LEVEL: **OPERATOR**

General

Remove any build up of dust, solder paste, or other debris from the following areas of the machine:

No.	Maintenance Task	Completed
1	Print Carriage.	
2	Squeegee Assembly.	
3	Rising Table Tooling Plate.	

WEEKLY OR 5,000 MACHINE CYCLES

ESTIMATED COMPLETION TIME: **20 MINUTES**

COMPETENCE LEVEL: **DEK MAINTENANCE COURSE**

General

Remove any build up of dust, solder paste, or other debris from the following areas of the machine:

No.	Maintenance Task	Completed
1	Print Carriage.	
2	Squeegee Assembly.	
3	Rising Table Tooling Plate.	

Machine Covers and External Connections

No.	Maintenance Task	Completed
1	Remove any build up of dust, solder paste, or other debris from the covers and machine panels.	
2	Check correct operation of E Stop and cover switches.	
3	Check condition of all external cables (including air pipe), ensuring no cables are damaged or tight.	

MONTHLY OR 20,000 MACHINE CYCLES

ESTIMATED COMPLETION TIME: **45 MINUTES**

COMPETENCE LEVEL: **DEK MAINTENANCE COURSE**

Print Carriage

No.	Maintenance Task	Completed
1	Clean the bearings to remove any solder paste or debris.	
2	Lubricate the bearings.	
3	Cycle the print carriage to check for smooth running.	
4	Check drag chain and cables for chaffing or wear.	

Squeegee System

No.	Maintenance Task	Completed
1	Clean the squeegee cylinders to remove any solder paste or debris.	
2	Cycle the squeegees to ensure smooth running with no sticking.	

Table Assembly

No.	Maintenance Task	Completed
1	Clean the bearings to remove any solder paste or debris.	
2	Lubricate the bearings.	
3	Lubricate the pivot pins.	
4	Cycle the rising table ensuring smooth running.	

SIX MONTHLY OR 125,000 MACHINE CYCLES

ESTIMATED COMPLETION TIME: **100 MINUTES**
COMPETENCE LEVEL: **DEK MAINTENANCE COURSE**

Print Carriage

No.	Maintenance Task	Completed
1	Clean the bearings to remove any solder paste or debris.	
2	Lubricate the bearings.	
3	Cycle the print carriage to check for smooth running.	
4	Check drag chain and cables for chaffing or wear.	
5	Check and if necessary calibrate the print carriage stroke length.	

Squeegee System

No	Maintenance Task	Completed
1	Clean the squeegee cylinders to remove any solder paste or debris.	
2	Cycle the squeegees to ensure smooth running with no sticking.	
3	Check the condition of the squeegee thrust bearings and adjust the pin at the rear of the squeegee to remove any slackness.	

Table Assembly

No	Maintenance Task	Completed
1	Clean the bearings to remove any solder paste or debris.	
2	Lubricate the bearings.	
3	Lubricate the pivot pins.	
4	Cycle the rising table ensuring smooth running.	
5	Remove table top and check for wear or scoring of the roller-track bearing. Replace if necessary	
6	Lubricate the roller bearings.	

DEK CUSTOMER SUPPORT GROUP MAINTENANCE

YEARLY OR 250,000 MACHINE CYCLES

The yearly service programme should be carried out by DEK authorised personnel. To contact your DEK service department, see the DEK Worldwide page at the front of this manual. Prior to the arrival of the DEK service engineer, the 6 monthly Customer Preventive Maintenance detailed should have been completed.

CHAPTER 4 DIAGNOSTICS

INTRODUCTION

INTRODUCTION

The DEK 248CE printer can be selected for operation in diagnostic mode. Diagnostic mode comprises a numbered series of independent machine tests. Tests appear on pages of the operator panel display.

Pages are selected using the function keys. The functions of the diagnostic mode are as follows:

- Language selection of the display.
- Units of measurement to be selected.
- Protected menus. Select 'Yes' to protect the existing menu parameter values from alteration.
- Input Tests.

The present state of a sensor input may be inspected. For example, the present state of the input sensors that return an 'on' or an 'off' signal, can be inspected at the input test sub-menu page.

- Output Tests

Exercises are known as Output Tests. Mechanisms of the machine may be selected for independent exercising, or the present status of the analogue sensors fitted to the machine may be inspected.

The ability to perform such tests may be used as an aid to fault diagnosis. For example the squeegee blade mechanism may be raised or lowered, independent of the print cycle, to prove the efficiency of the switch setting following switch replacement or repair.

As a safeguard, the control system automatically prevents selection of movements that could damage the mechanisms. For example, the table cannot be selected to be raised whilst in the table-out position. This prevents subsequent collision with the printhead structure should the next selected action be table-in.

DIAGNOSTIC MODE

Features of the diagnostic function are as follows:

Selection

To select the diagnostic mode on the machine, carry out the following:

At the front operator panel, turn the 3 position keyswitch to the three o'clock position (Diagnostic mode position 3), figure below refers.

To leave the diagnostics mode, select the switch position 1 or 2 according to the required GO key mode. Position 1= normal 2 GO button operation , position 2 = 1 GO key for one hand free operation. Press [CLEAR] to return to the Diagnostic Heading page, press [CLEAR] again to return to Printer Ready-Step Mode Page, with key selected for normal operating mode.

Menu Pages

Menu pages are offered in sequence and can be accessed by scrolling through to the required page. Arrival at the page is denoted by the heading number, for example "1. Language", denotes the Language options page, "2. Display", denotes the units of measurement used on the display.

In general, when an output function test is selected, the action is performed on pressing the [ENTER] key. An alternate action offered at the display, for example 'Squeegee UP/DOWN' is performed on again pressing the [ENTER] key, known as 'toggling' the [ENTER] key.

Where no apparent option to stop the test is offered, for example for the test "Cycle RS Table", the test ceases when the next, or another function is selected. Use this to stop a mechanism at a particular point of the cycle, as required.

The following Menu Sheets are presented in the form of flow charts for easy reference.

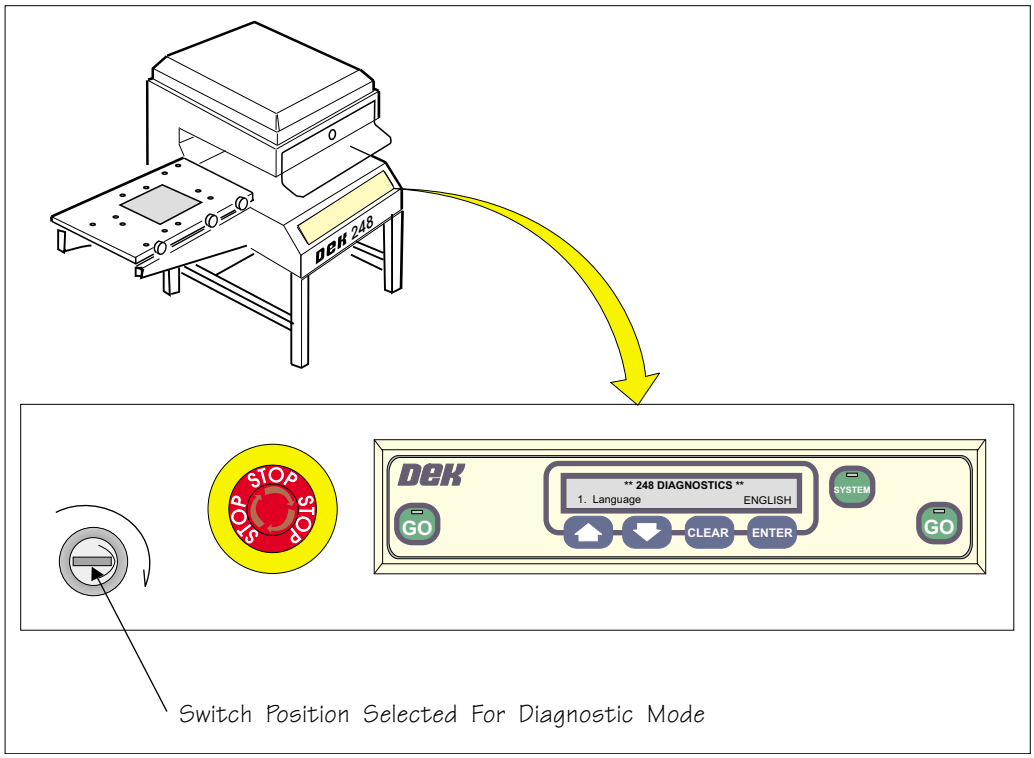
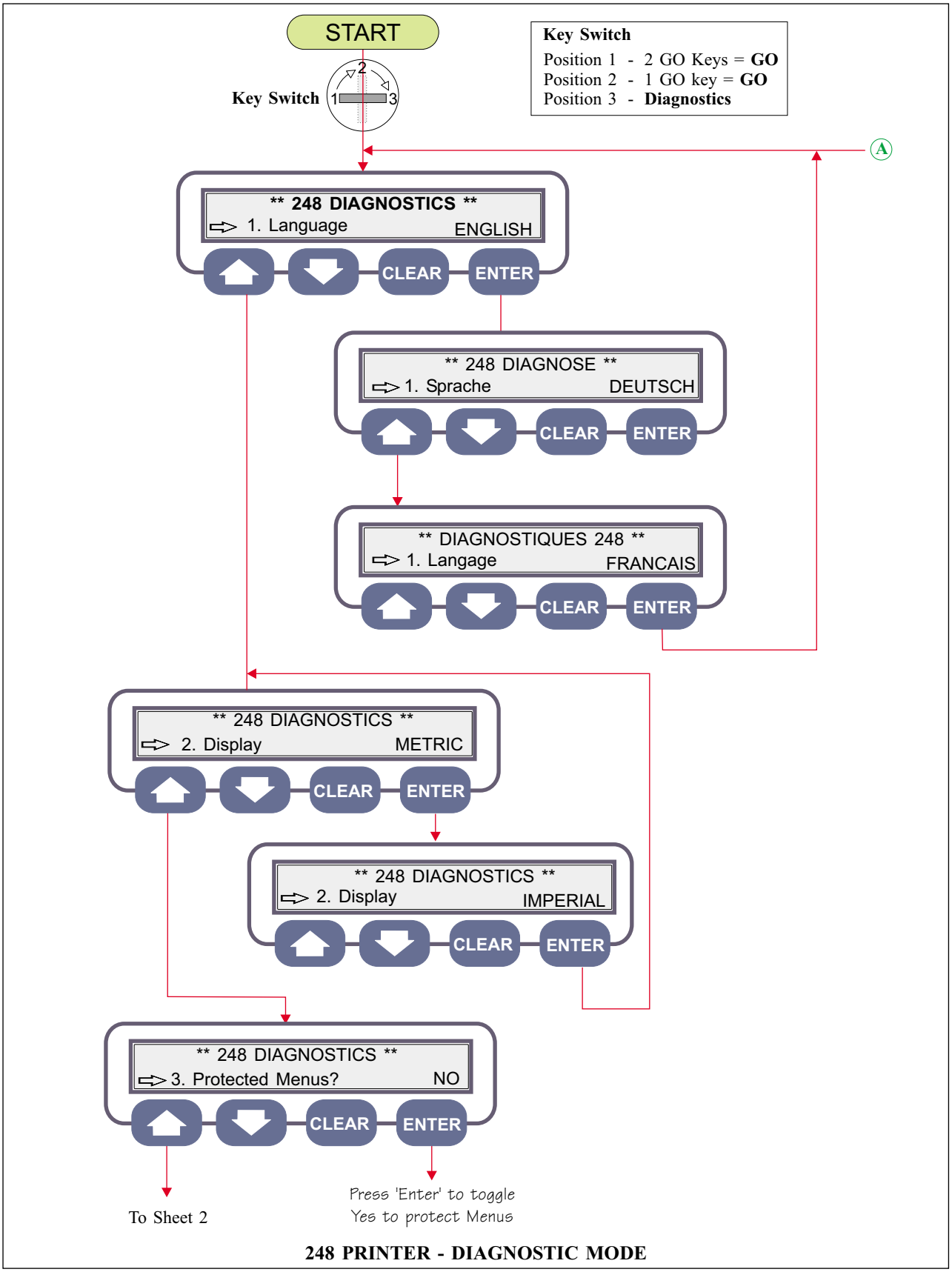
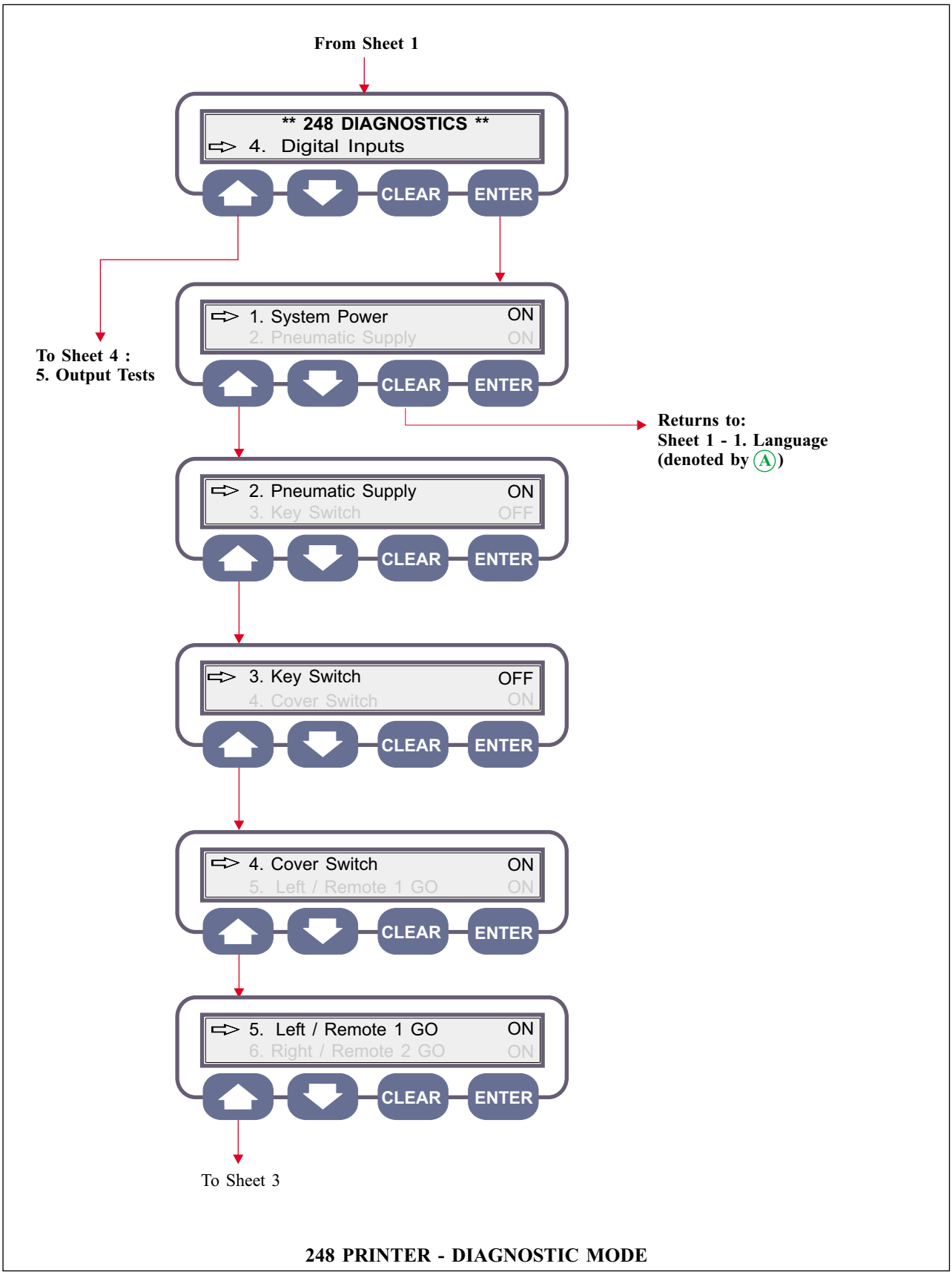


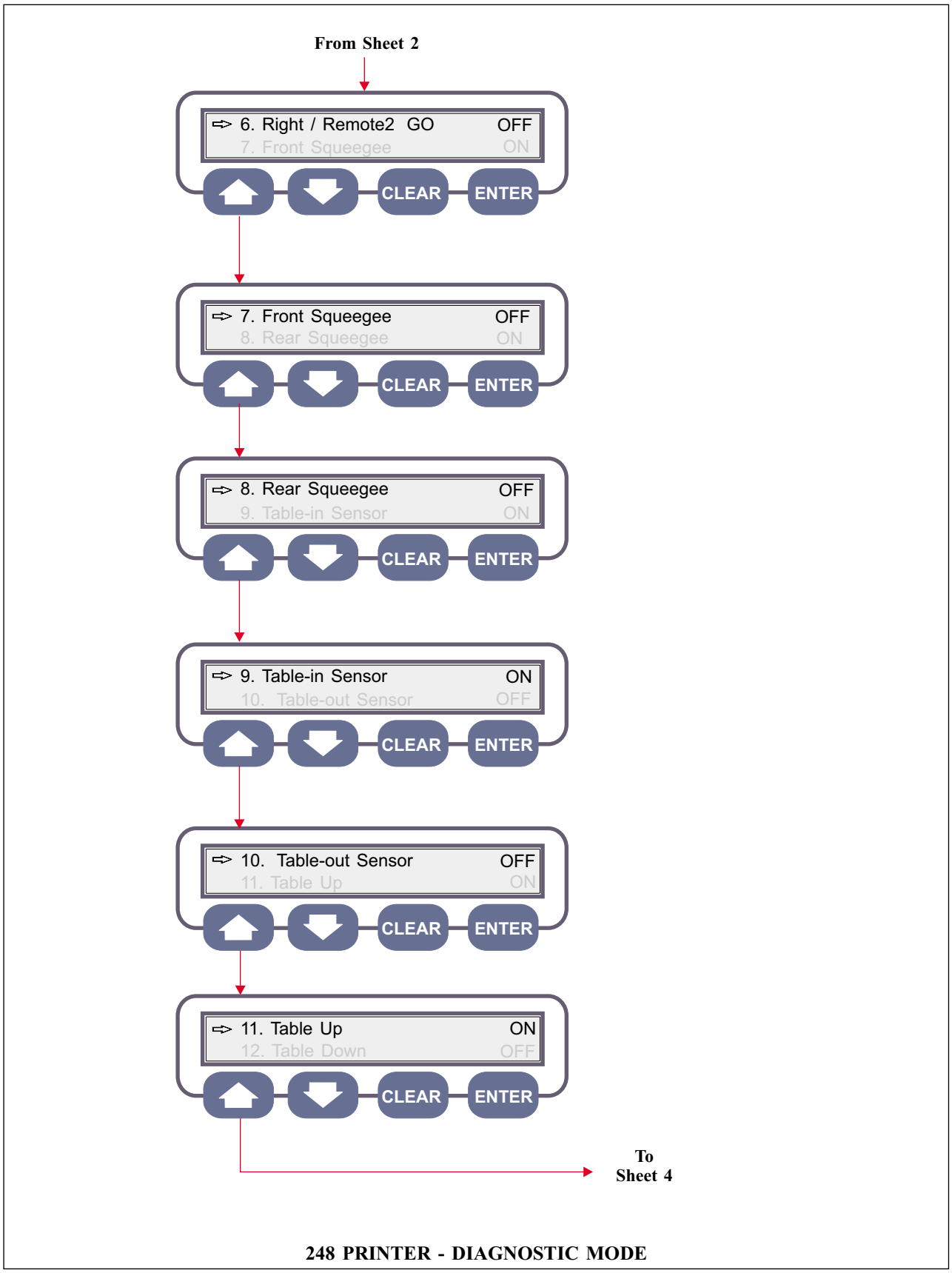
Figure 1 Selection Diagnostic Mode



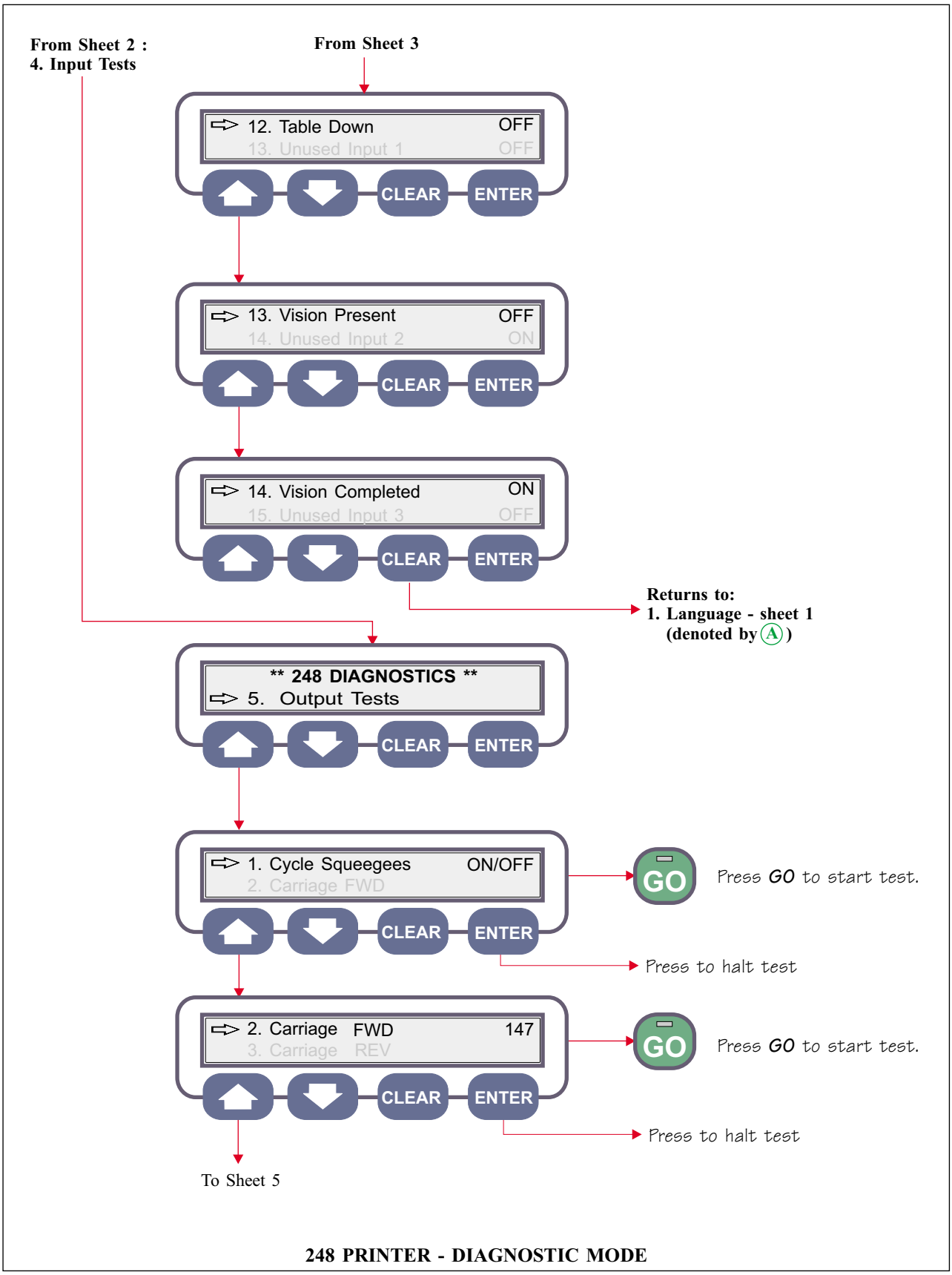
Diagnostics Menu Sheet 1



Diagnostic Menu Sheet 2

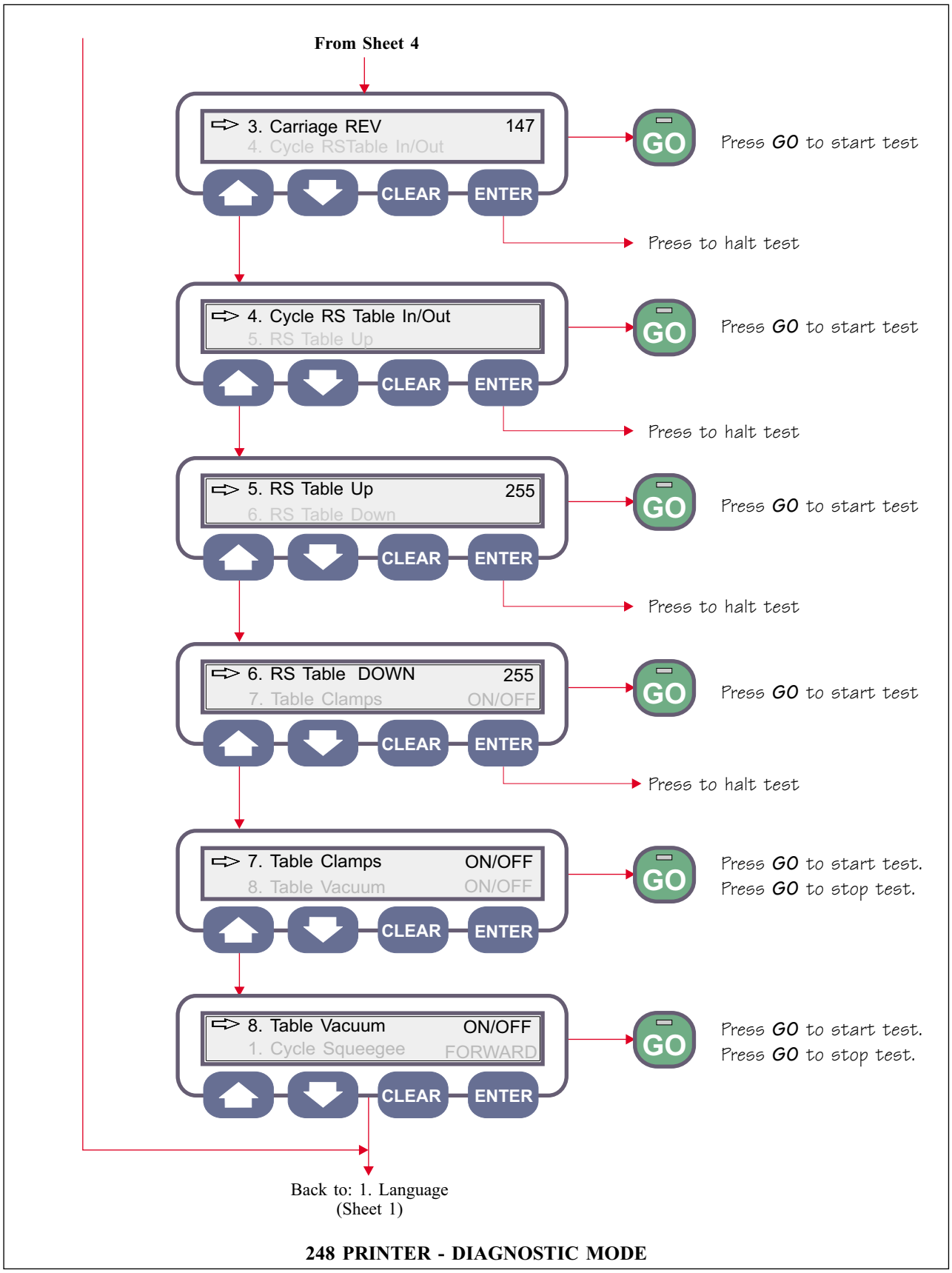


Diagnostic Menu Sheet 3



248 PRINTER - DIAGNOSTIC MODE

Diagnostic Menu Sheet 4



248 PRINTER - DIAGNOSTIC MODE

Diagnostic Menu Sheet 5

DIAGNOSTIC MENU

	Refer to the Diagnostics Menu Sheets 1 to 5 for the diagnostic menu pages.
	Scroll through to numbered pages of the diagnostic menu using the up arrow key. The active test is denoted by a filled arrow, and is usually the upper line of the two-line display.
Language	Press [ENTER] key to select language for the operating system display from English, German, and French.
Display	Press [ENTER] key to select units presented by the operating system display from metric, imperial.
Protected Menus	Select 'YES' to prevent menu changes to parameter values of any menu. At the printer panel, entry to 'Edit Parameters' page is no longer possible. At the DEKLink menu edit facility, when used, the parameter values may be changed but the 'transmit' command which could pass the changes to the printer is now disabled.
	Select 'NO' to allow normal function of the edit parameters page at the operator panel, or transmission of edit changes made at the DEKLink menu edit facility.
Digital Inputs	Sensors that can have two possible states, return the current state of the sensor at the display.
System Power	ON indicates +24V system power is applied.
Pneumatic Supply	ON indicates that air pressure at the pressure switch is sufficient to activate the pressure switch (approx. 3.5 bar).
Key Switch	OFF indicates the key is in the 12 o'clock position (position 2) or the 3 o'clock position (position 3) . ON indicates key is in position 1. (9 o'clock).
Cover Switch	OFF indicates that one or more cover switch is not activated, or one of the machine covers is open.
	ON indicates that all cover switches are activated, i.e. that all the covers are closed.
Left/Remote Go	ON indicates that the left front panel or the left remote start GO switch is activated. Press to test.
Right/Remote Go	ON indicates that the left front panel or the left remote start GO switch is activated. Press to test.

Front Squeegee	ON indicates that the squeegee down reed switch is activated. The squeegee is down. OFF indicates that the squeegee is up.
Rear Squeegee	ON indicates that the squeegee down reed switch is activated. The squeegee is down. OFF indicates that the squeegee is up.
Table-in Sensor	ON indicates that the inboard switch on the X,Y table pneumatic drive assembly is activated; the X,Y table has reached the table-in position.
Table-out Sensor	ON indicates that the outboard switch on the X,Y table pneumatic drive assembly is activated; the X,Y table has reached the table-out position.
Table -up Sensor	ON indicates that the X,Y table lift upper switch is activated. The table is not fully up but the table is at least as high as the limit switch position. OFF indicates that the table is not at the upper limit.
Table Down Sensor	ON indicates that the detector for the X,Y table lowest position is activated; the table is fully down. OFF indicates that the table is not fully down.
Output Tests	Output tests exercise mechanisms. Select 'GO' to start the test. Select 'ENTER' to stop the test.
Cycle Squeegees	Squeegees cycle continuously.
Carriage Forward	Print carriage drives from rear to front of the machine. Current position shown in Range 0 -225.
Carriage Reverse	Print carriage drives from front to rear of the machine. Current position shown.
Cycle RS Table In/Out	Reciprocating Sliding table cycles continuously from table-in to table -out position.
RS Table Up	Press [GO] to drive RS table, also known as the X,Y table assembly, to upper limit position. Current table-position indicated in range 0 to 255. (This is a diagnostic number only, related to, but not a directly measurable, item. See Chap 5 Description, Table Lift Assembly).
RS Table Down	Press [GO] to drive RS table to lower limit position. Select [ENTER] to stop in intermediate position. Current table-position indicated in range 0 to 255. (This is a diagnostic number only, related to, but not a directly measurable item). See Chap 5 Description, Table Lift Assembly).
Table Clamps On/Off	Press [GO] to toggle the table clamps on/off. Momentarily pressing the switch alternates the current state. When clamps are 'on' attempts to move the table using the table positioners are rendered ineffective.
Table Vacuum On/Off	Press [GO] to toggle the table vacuum on/off. Momentarily pressing the [GO] switch alternates the current state.

CHAPTER 5 DESCRIPTION

MACHINE DESCRIPTION

MACHINE DESCRIPTION

INTRODUCTION This chapter describes the DEK 248CE Printer assemblies according to their function.

Where appropriate, a schematic block diagram shows the function of the mechanism.

OPERATOR PANEL

Purpose The operator panel provides the control interface of the machine for the operator. Operator information is presented at the 24 x 2 line Liquid Crystal Display panel. At the panel, the set of parameter values related to a given product board can be stored (saved) or retrieved for later re-use.

Pressing the relevant function button alters the current value of a parameter, or scrolls up the next page of the display of the current menu.

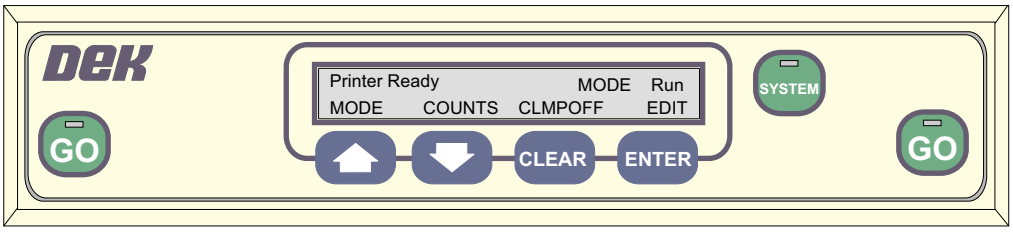
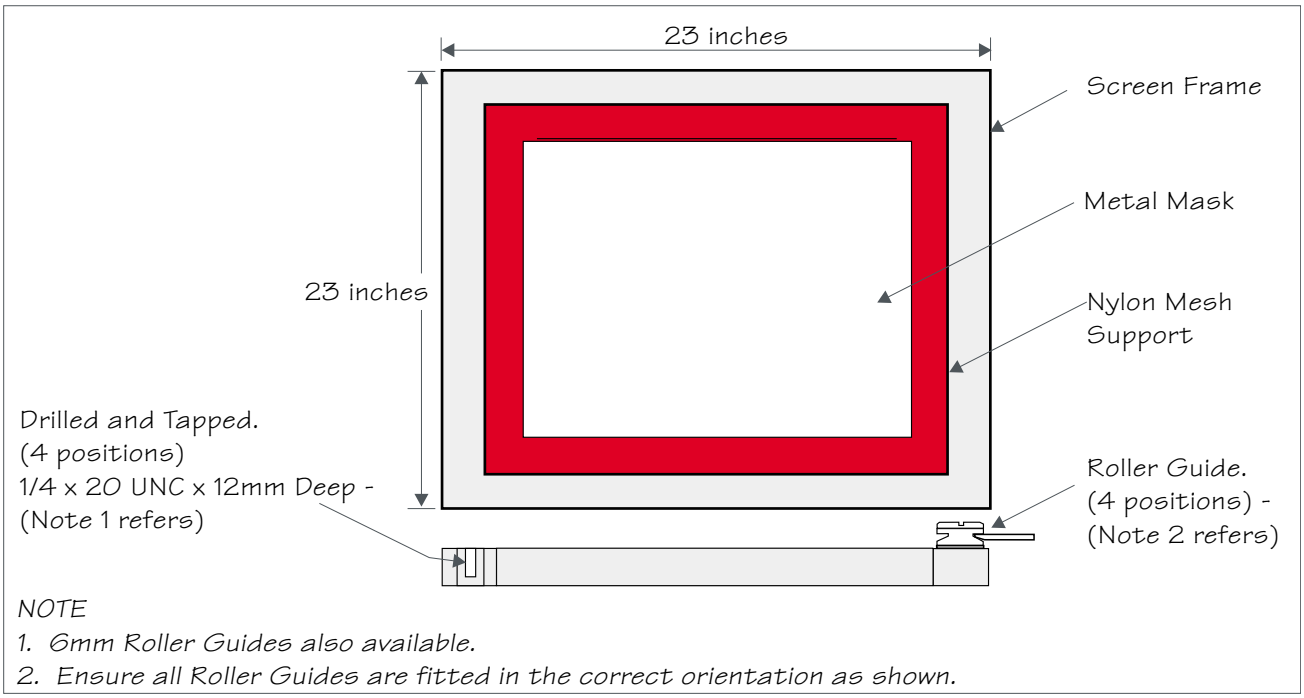


Figure 1 Operator Panel

Additional buttons, associated with the panel, ‘GO’ and ‘SYSTEM’ and E Stop, perform the functions specified by their legends.



NOTE
1. 6mm Roller Guides also available.
2. Ensure all Roller Guides are fitted in the correct orientation as shown.

Figure 2 Printhead Chase and Frame

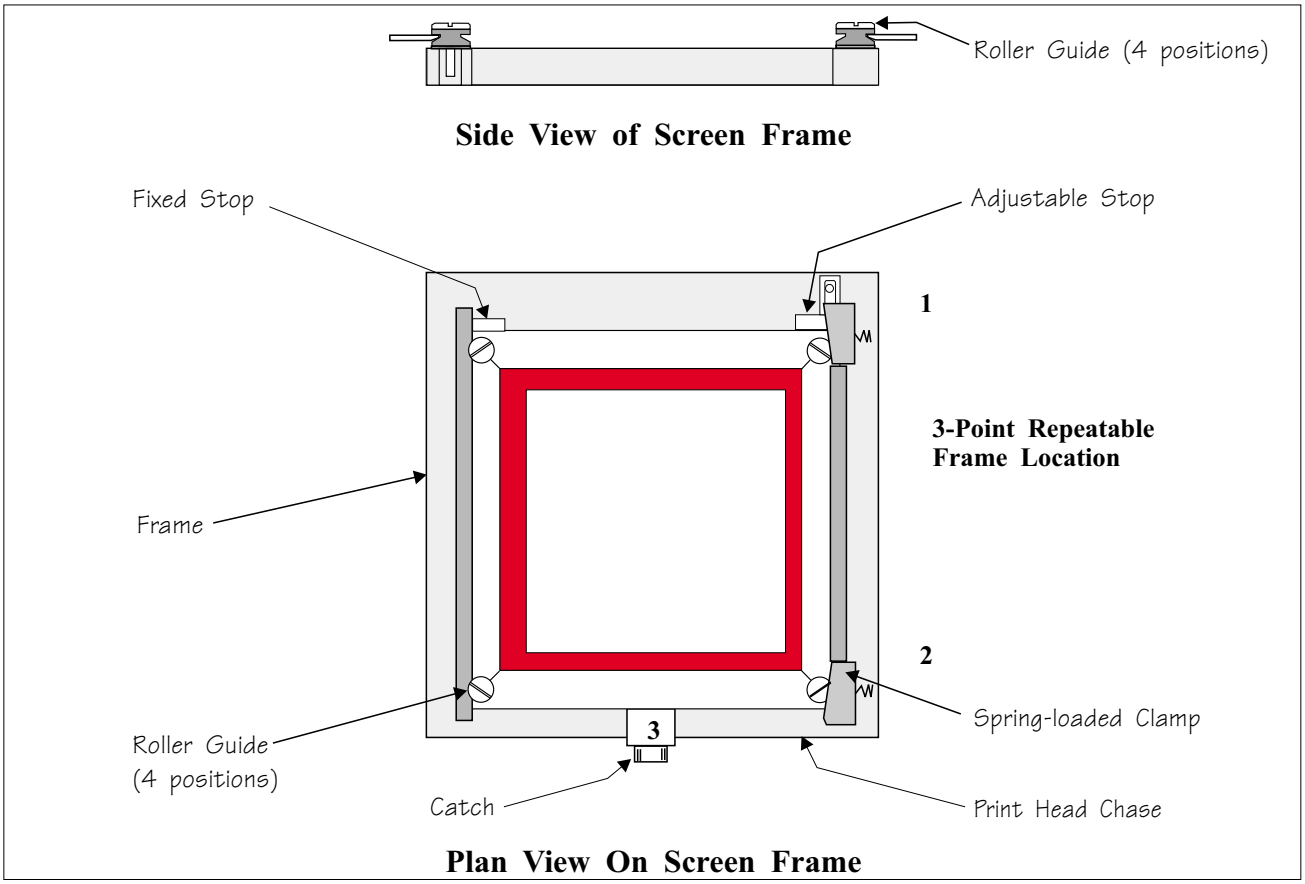


Figure 3 Frame Location at Printhead

PRINTHEAD ASSEMBLIES

Introduction

The Printhead comprises the following sub-assemblies:

- Print Head Chase and Print Frame
- Print Carriage
- Squeegee Assembly

Chase and Frame

The frame provides support for the screen stencil. The 23"square frame is fabricated from square-section aluminium alloy tube and the stencil is affixed to the underside of the frame.

Skimming Depth

The frame depth at manufacture includes a skimming allowance of 1.5 mm. The depth of the frame may be skimmed by up to 1.5 mm when the frame is renovated prior to fitting a new screen stencil.

Stencil Attachment

Metal mask type:

For metal-mask type frame assemblies, the mask is first glued by using an epoxy adhesive to a nylon fabric border material. The mask is perforated around the edge to provide a good gluing surface for the double-side attachment of the border.

The border material is then pre-tensioned and glued on to the frame. When the adhesive cures, the pre-tension in the fabric is sustained across the mask, holding the stencil flat across the plane of the frame.

Solvent Resistance

NOTE
The adhesive is solvent-resistant but the screen should not be cleaned by prolonged immersion of the frame in solvent. Instead the stencil should be wiped clean with a lint-free cloth moistened with a suitable paste solvent.

Repeatable Location of the Frame

The frame fits within the printhead chase. Features of the mechanism of the chase which supports the removable frame ensure repeatable location of the frame.

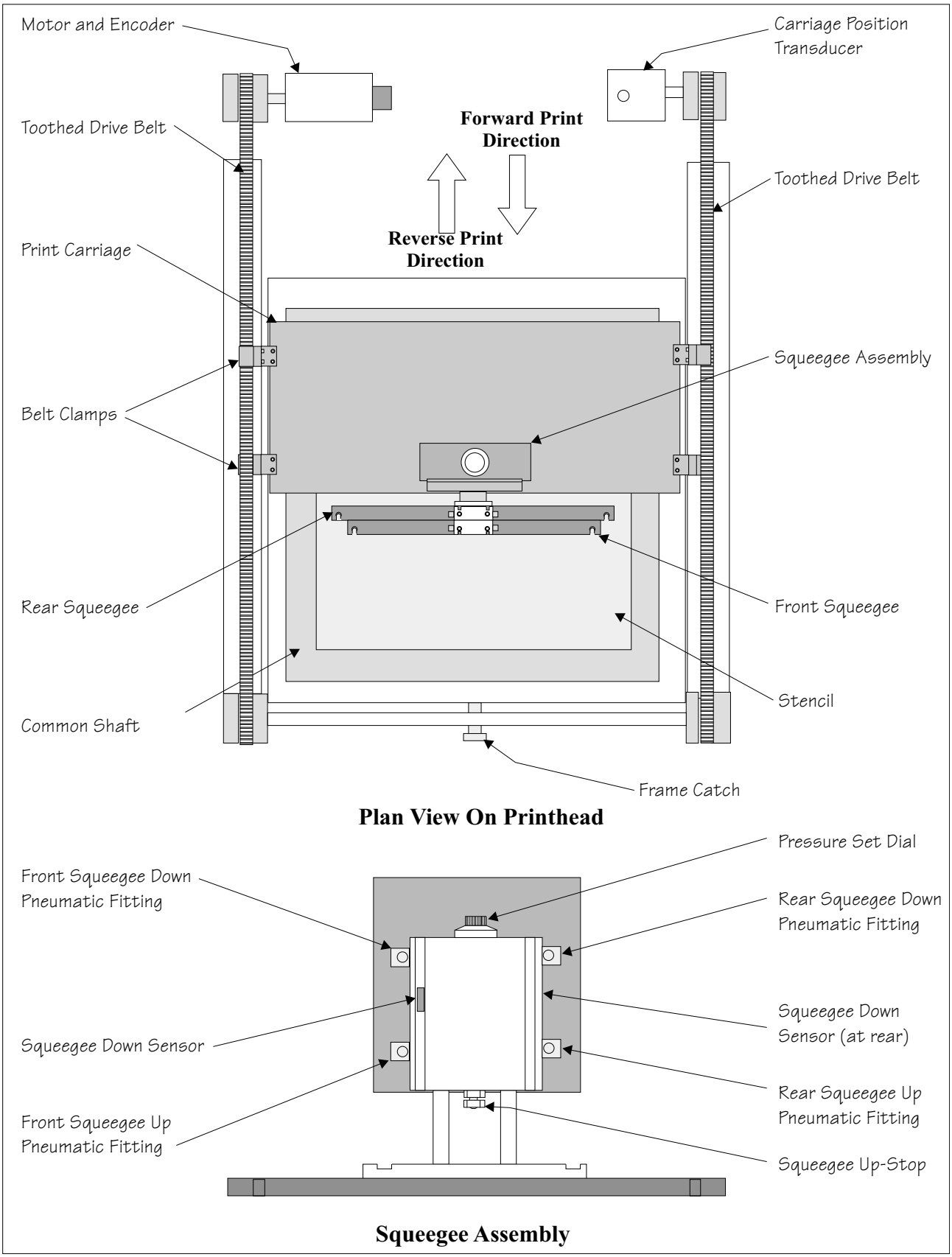


Figure 4 Printhead Carriage Drive

PRINT CARRIAGE ASSEMBLY

Purpose

Provides the print stroke and the forward and reverse carriage speed.
The printhead carriage traverses the screen by the selected print stroke distance, at the selected forward or reverse speed.

The printhead carriage also provides the mounting for the Squeegee Assembly.

Parameter Value

Print carriage function affects the following parameters:

- Forward Carriage Speed
- Reverse Carriage Speed
- Front Print Limit
- Rear Print Limit
- Hop Over Distance/Hop Over delay

Mechanism

The print carriage runs on precision guide bars in the forward and reverse directions. A toothed-belt attached to the left side of the carriage provides the carriage drive. The right drive transfers the carriage position to the position transducer.

Hop-over is active when print/print mode is selected. For hop-over, fitment of a single type squeegee at the rear squeegee position is appropriate.

Hop-over occurs at the end of each print stroke and is the selected extra distance beyond the selected stroke limit. The carriage pauses at the end of the stroke, the squeegee lifts and moves to the other side of the paste roll and the hop-over is completed. The paste is now on the correct side of the squeegee blade, ready for the return stroke.
The hop over delay (1sec to 10sec) may be set to allow time for paste to fall from the blade.

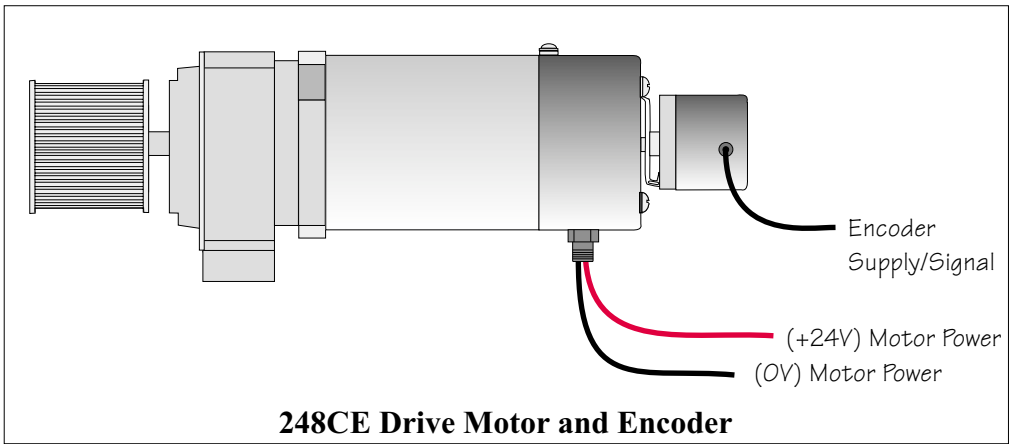


Figure 5 Motor and Encoder

Drive

A bi-directional dc motor directly coupled through a stub shaft and clutch, drives the left-hand carriage belt. A common shaft mounted to the front of the machine, couples left and right hand carriage drive belts. The torque limiting clutch protects the motor and integral gearbox drive. The clutch is adjustable, and access to the clutch adjuster is by a cover plate to the left rear side of the printhead.

Print Stroke Transducer

A rotary potentiometer type transducer measures the extent of the print stroke. The transducer is attached to a stub shaft extension to the carriage drive through a reduction gearing and provides the absolute position of the carriage relative to the front position datum.

See Chapter 7, Calibration and Settings for the print stroke calibration procedure.

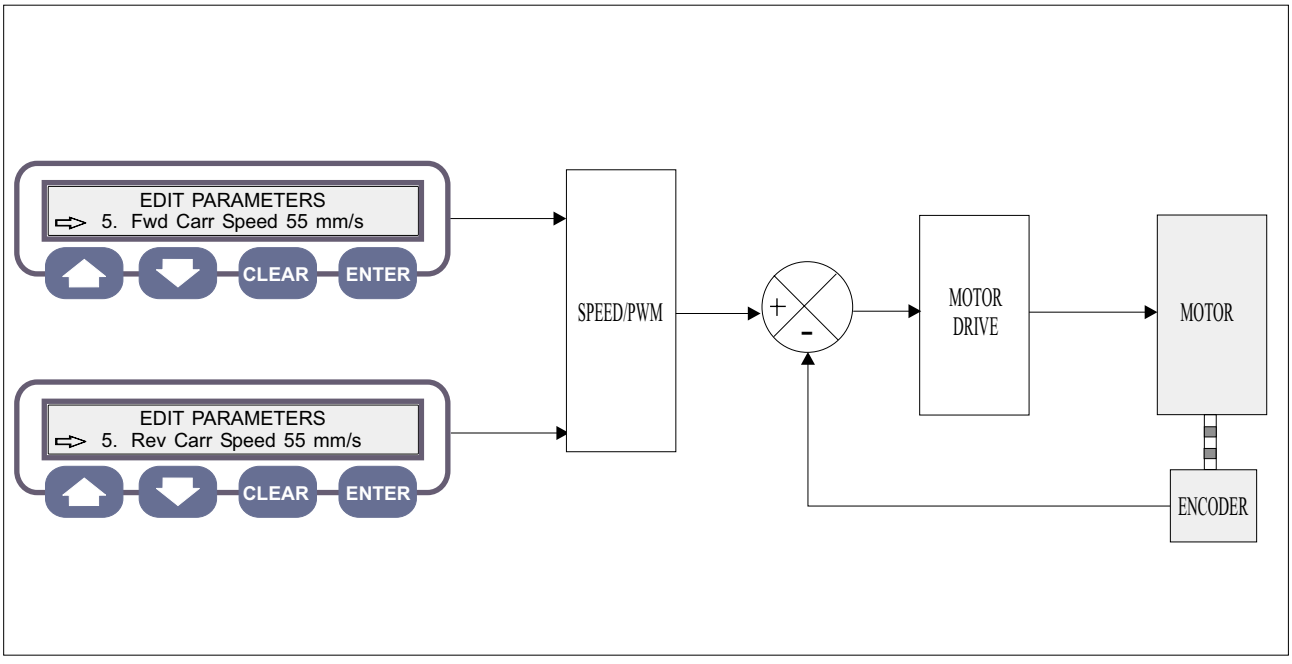


Figure 6 Carriage Speed Block Diagram

Carriage Control

The carriage speed control uses Pulse Width Modulation (PWM) technique to set carriage speed. Error correction is achieved by closed loop control utilising the tacho generator (encoder) signal. Forward or reverse carriage speed can be set by the machine operator details can be found in the Operator Manual, Chapter 5 - Setting Print Speed.

Sequence

The sequence for the print carriage is as follows:

The continuous stream of pwm pulses is applied to the enable-input of device IC4 - Processor Board. This regulates the power supplied to the motor. Direction is selected forward or reverse.

Print Carriage Initialisation and Abort

Although the position of the carriage is known at all times, the direction of travel is not sensed continuously; it is inferred from the last known point of departure, either front or rear.

On selecting the 'Abort' function, the system loses the knowledge of the last point of departure, if the carriage was in motion.

Therefore, on recovery from abort function, the carriage restarts at the rear limit of the stroke of the carriage.

The squeegee blade may now require to be cleaned, as paste accumulation could be on the wrong side of the blade or it has moved, when the print sequence restarts.

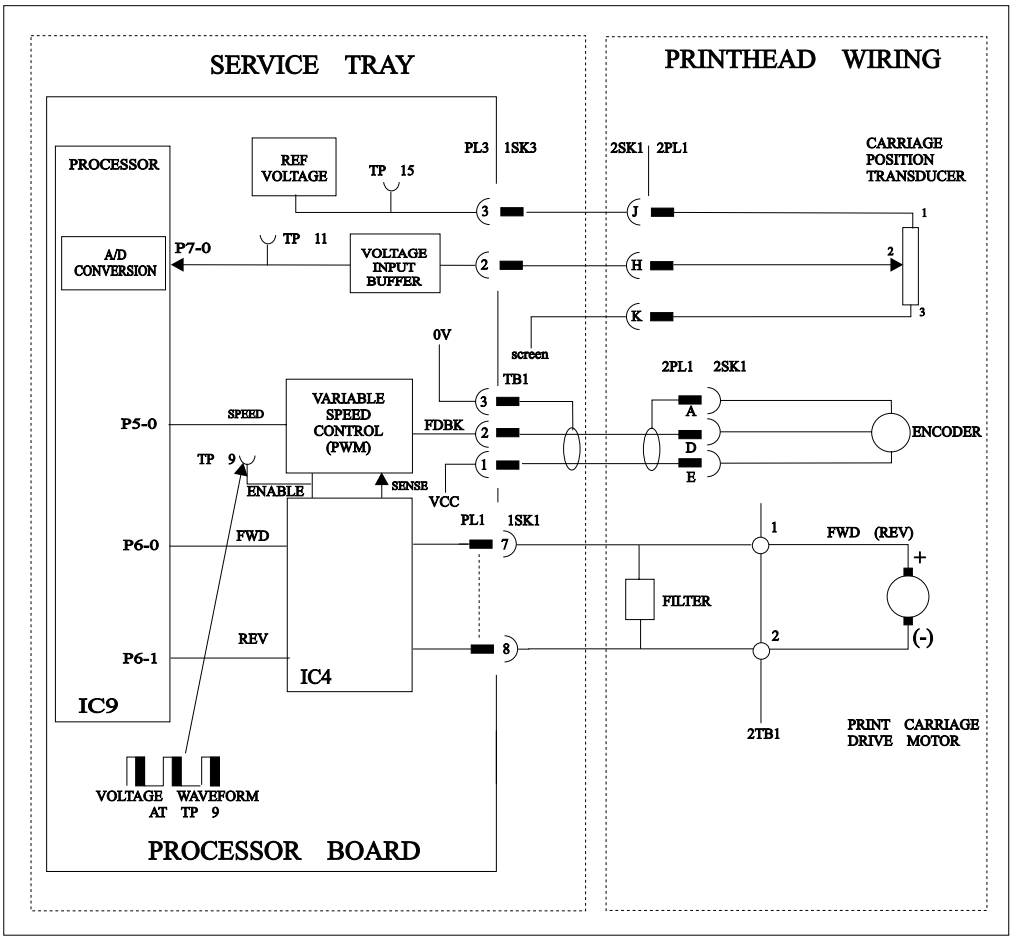


Figure 7 Carriage Drive Control

SQUEEGEE ASSEMBLY

Purpose

The squeegee blade provides the means to evenly distribute paste over the surface of the screen. As the stroke proceeds, apertures in the stencil collect paste ahead of the blade to form a print of the stencil image. The function of the squeegee carriage is to provide:

- Squeegee up/down movement
- Squeegee pressure adjustment

The pressure of the contact between squeegee blade and screen is an important print parameter. Print pressure is provided by a compression-spring load applied through the squeegee carriage to the blade holder.

Parameter Values

The print mode parameter values are as follows:

- Double Squeegee
- Print/Print
- Print/Flood
- Flood/Print

Associated parameter values

- Squeegee delay
- Hop-over delay
- Pressure value

Introduction

The squeegee assembly mechanism activates the front or rear squeegee according to the print mode selected at the panel. The mechanism then applies the selected print pressure throughout the print stroke. At the end of each print stroke the squeegee retracts and automatically performs a hop-over function if the selected print mode requires this action (hop-over controls the flow of paste medium ahead of the squeegee blade and is required only in print/print mode).

Squeegee Assembly

The squeegee assembly comprises of two sub-assemblies, the spring housing and squeegee carriage assembly separated by a single compression spring.

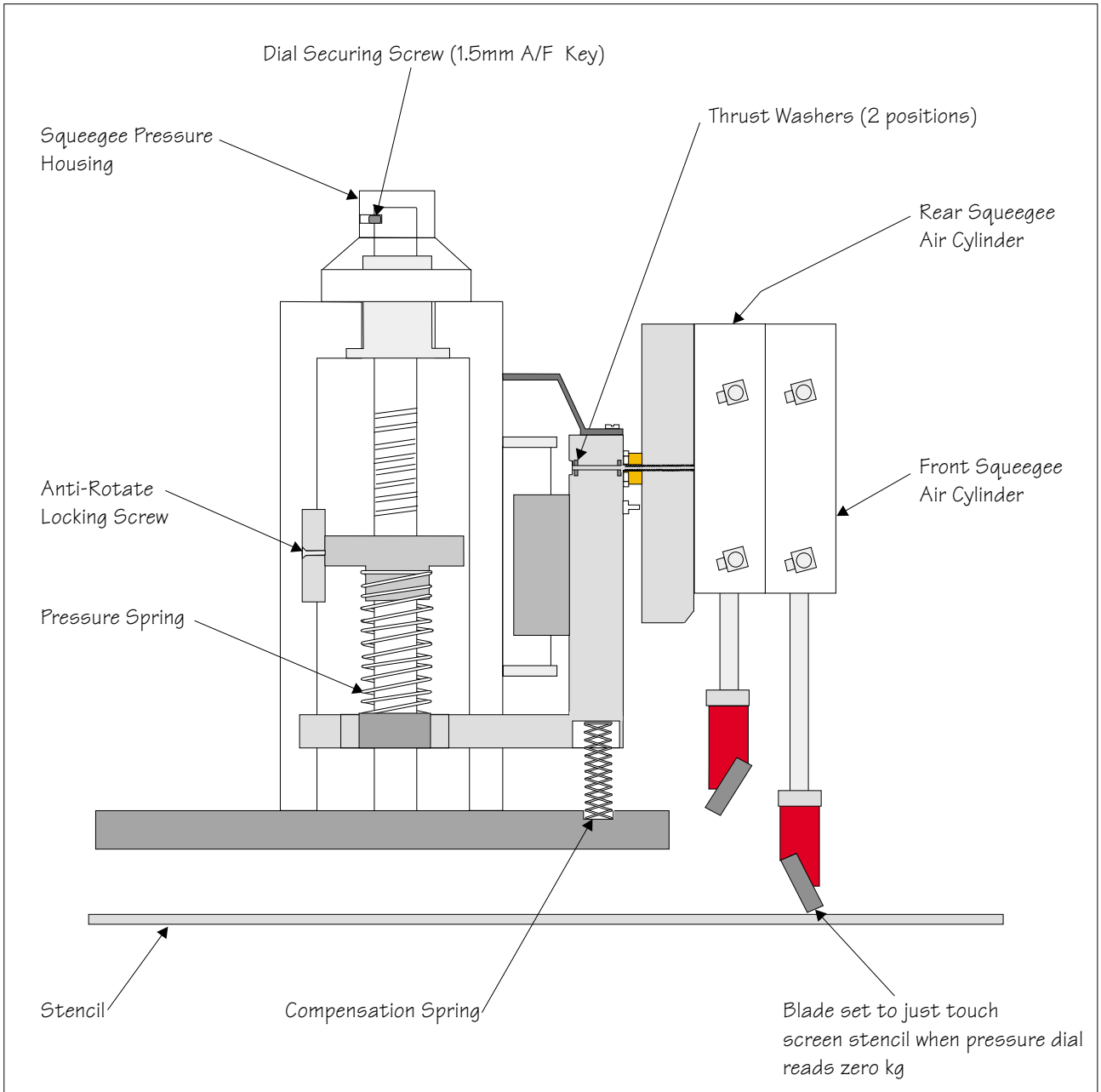
Spring Housing

The spring housing is fixed to the printhead carriage and comprises the hand wheel and main compression spring. The fixed end of the spring abuts an adjuster nut controlled by the hand wheel adjuster which may be set to a value between 0 and 15. The free end of the spring abuts the squeegee carriage and drives the carriage vertically downwards.

Squeegee Carriage

The second sub-assembly comprises the carriage and actuator mounting, which is free to move on vertical slide.

The motion of the second assembly follows that of the first assembly downward and the main spring interposed between, remains uncompressed until the squeegee blade makes contact with the screen. On contact of blade and screen, further progress of the blade is prevented, and spring compression begins, applying pressure to the blade. Pressure onto the squeegee blade continues to increase until the spring housing reaches the fully down position.



View on Left Side of Squeegee Housing

Figure 8 Squeegee Pressure Mechanism

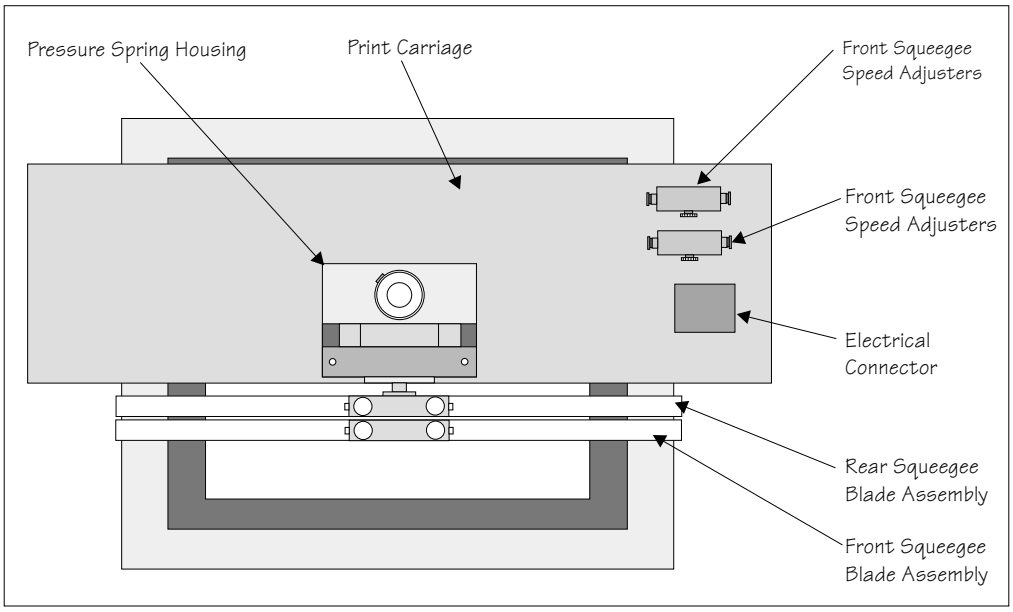


Figure 9 Squeegee Pressure Adjuster

Squeegee Mechanism

The twin cylinder drive to the front and rear squeegee holder assembly runs on a freely suspended vertical carriage supported in an upward direction by a compensating compression spring. The spring rate has been selected to balance the weight of the cylinder assembly and the heaviest weight of squeegee (440 mm). The choice of spring allows pressures of around zero to be applied.
Compression of the Pressure spring by clockwise rotation of the hand wheel applies pressure to overcome the resistance of the compensating spring, forcing the active squeegee down into contact with screen stencil. If the stencil is correctly supported from below by the work piece table then increasing pressure is applied to the stencil through the squeegee blade. The active squeegee, front or rear, is independently controllable by extension of the corresponding pneumatic actuator. The speed of ascent and descent is set by meter-out restrictors fitted to the line.

Equal Squeegee Blade Depth

It is important that the setting of the squeegee blade in the holder results in the same overall blade depth for forward and reverse blades. If the blade depths are not equal then pressure on forward and reverse stroke will differ. If the difference is small, the unequal pressure can be compensated by adjusting the speed in the forward or reverse direction, remembering that increasing speed is equivalent to a reduction in pressure. See also Operator Manual Chapter 3 - Print Quality.

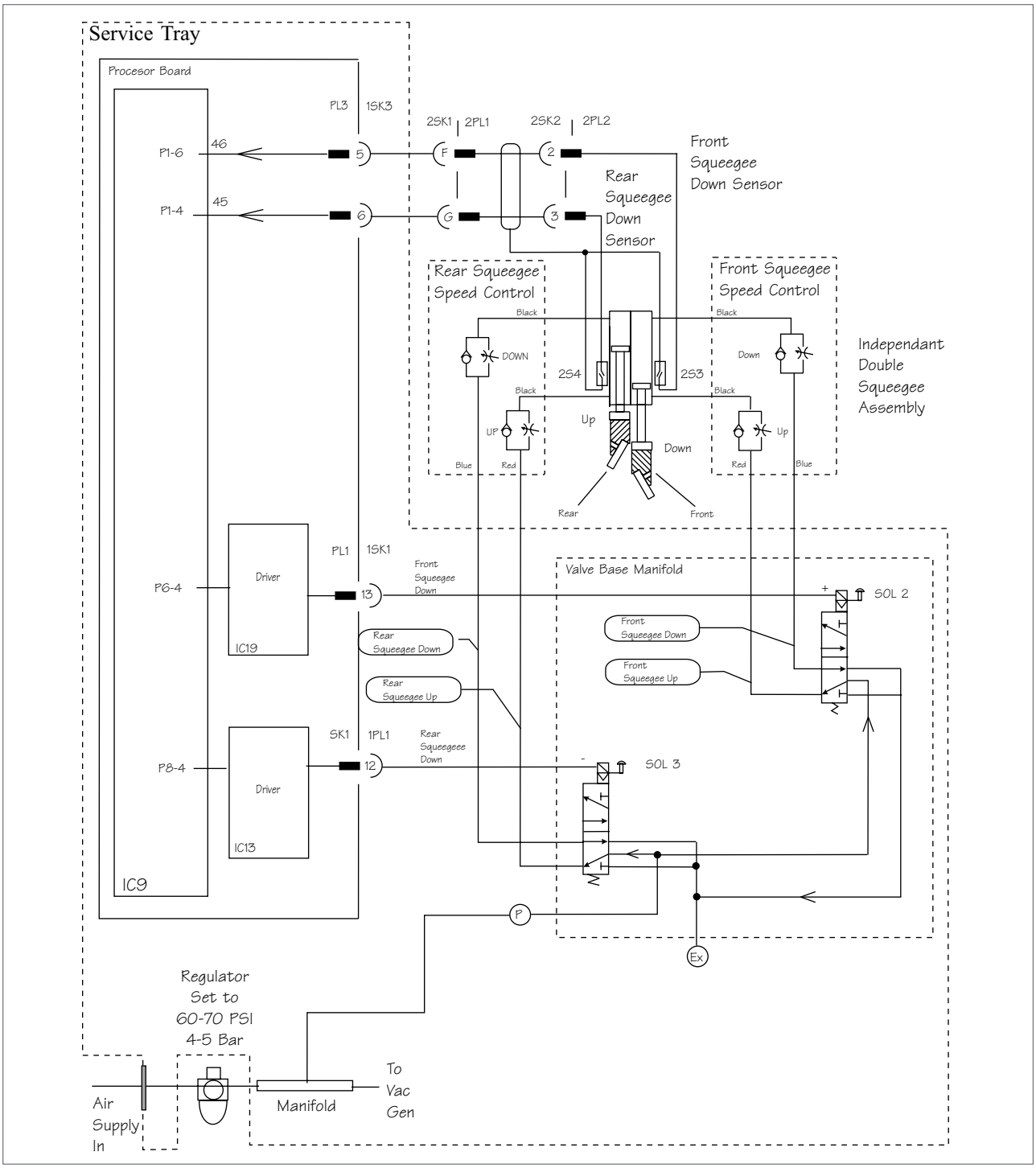


Figure 10 Squeegee Up/down Control

Flood Blade Mechanism

The flood blade mechanism comprises two sub-assemblies. A common holder subassembly attaches to the rear squeegee position. A blade of length suited to the squeegee comprises the second subassembly and this is fitted to the flood blade holder to complete the flood blade assembly.
Screw adjustment to the height of the blade above the stencil is provided.

Squeegee Up/Down Drive Control

Introduction

The independently acting front/rear double squeegee assembly raises or lowers the front or rear squeegee blades.

Pneumatic actuators mounted on the squeegee carriage perform the required squeegee up/down movements.

Switches fitted to each actuator detect the fully-down position of each squeegee.

A flood blade may be substituted for the rear squeegee.

Operation

In operation, a signal from the processor activates the solenoid of the front/rear pneumatic actuator valve to drive the squeegee down. An indicator lamp at the control valve signals activation. The squeegee blade moves downward into contact with the screen. The pneumatic pressure is sufficient to fully extend the actuator piston rod and no subsequent change in length occurs up to maximum squeegee pressure.

Speed of ascent and descent for each actuator is controlled by meter-out restrictor valves fitted to the carriage to the right of the squeegee assembly.

An orange coloured button at the valve actuator may be triggered manually to activate the spool valve for test purposes.

Squeegee Pressure Adjustment

Squeegee pressure is applied by the compression of the spring following first contact of the squeegee blade onto the stencil. The setting on a graduated scale mounted on the spring housing determines the squeegee pressure.

Print Mode

Operating sequence of the squeegee drive depends on the selected print mode.

Double Squeegee Mode

For double squeegee print option, front and rear actuators automatically operate in double squeegee mode. Alternate front and rear squeegees activate at the end of each print stroke to maintain control of the paste ahead of the active blade.

Print/Print Mode

The rear squeegee only is fitted and the operation automatically applies the Hop-over at the end of the each stroke. This is an alternative print mode to double squeegee and may provide more precise control of print pressure in both print directions by virtue of the single blade assembly. Otherwise for diamond section blade usage, the two modes are similar.

Print/Flood
Flood/Print

In print/flood flood/print mode the flood blade is fitted to the rear squeegee position and the mode defines the first stroke, either print or flood.
For flood/print print/flood mode, print direction is always front to rear.

TABLE LIFT ASSEMBLY

Purpose

The table lift raises the tool-plate towards the underside of the screen stencil to set the required print gap, also known as the snap-off. See Operator Manual, Chapter 3 - Print Quality for further details.

The point of contact of the board with the underside of the screen is the contact height of the table and is used to set the zero datum for print gap measurement. (Contact height must be set for each frame and board thickness. The value is held within a given menu but cannot be displayed).

Table fully-down position ensures that the work piece clears the printhead structure assembly prior to return of the table to the out position. The table descends to the down position at the end of the print stroke automatically during normal operation.

The initial speed of descent of the table following printing is a controllable parameter, known as the separation speed and may be used to control the speed of release of the board from the screen.

Parameter Value

Associated settings in Step mode:
Contact height and Print height (4. Print Gap) and 13. Separation speed

Mechanism

The lift mechanism is mounted to the rear of the front display panel, beneath the printhead structure.

The table assembly is freely supported at the four corners by the table lift assembly. The table mounting legs, which are an integral part of the table casting, pass through apertures in the machine structure for direct attachment to the cranks of the lift assembly.

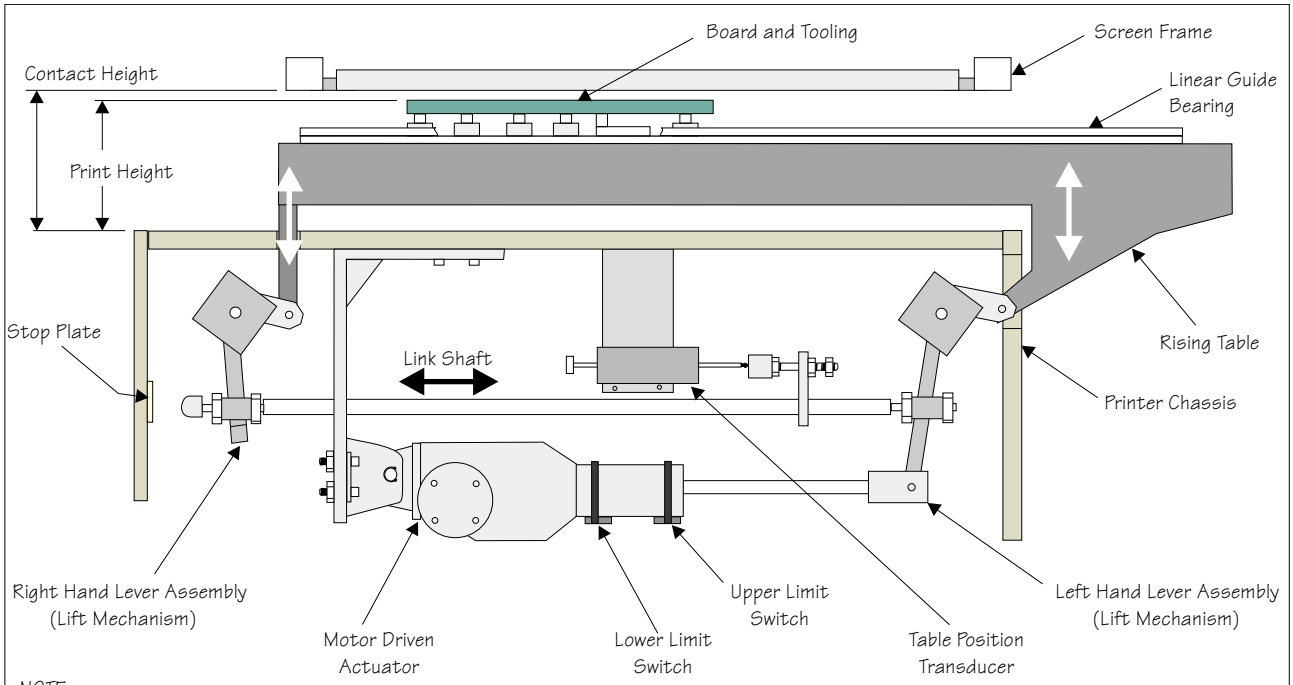


Figure 11 Table Lift Structure

Motor drive The table lift is effected by a bi-directional electric actuator.

Limit Switches Upper and lower limit switches are used for table position error control.

Position Transducer A resistive transducer attached to the table link bar mechanism records the displacement of the mechanism from a calibrated zero datum. See Chapter 7 Calibration and Settings for calibration details.

RS Table Actuator The table lift mechanism does not provide the true vertical lift required to effect the change in print gap. The additional horizontal displacement that would occur due to the arc of movement of the link mechanism alone, is countered by a horizontal displacement of the table carriage towards the carriage stop. The RS Cylinder holds the table position in continuous contact with the Striker Plate when the table is in the table-in position. As the table lifts the movement arc is counteracted by the fixed table in the horizontal plane and vertical lift is maintained.

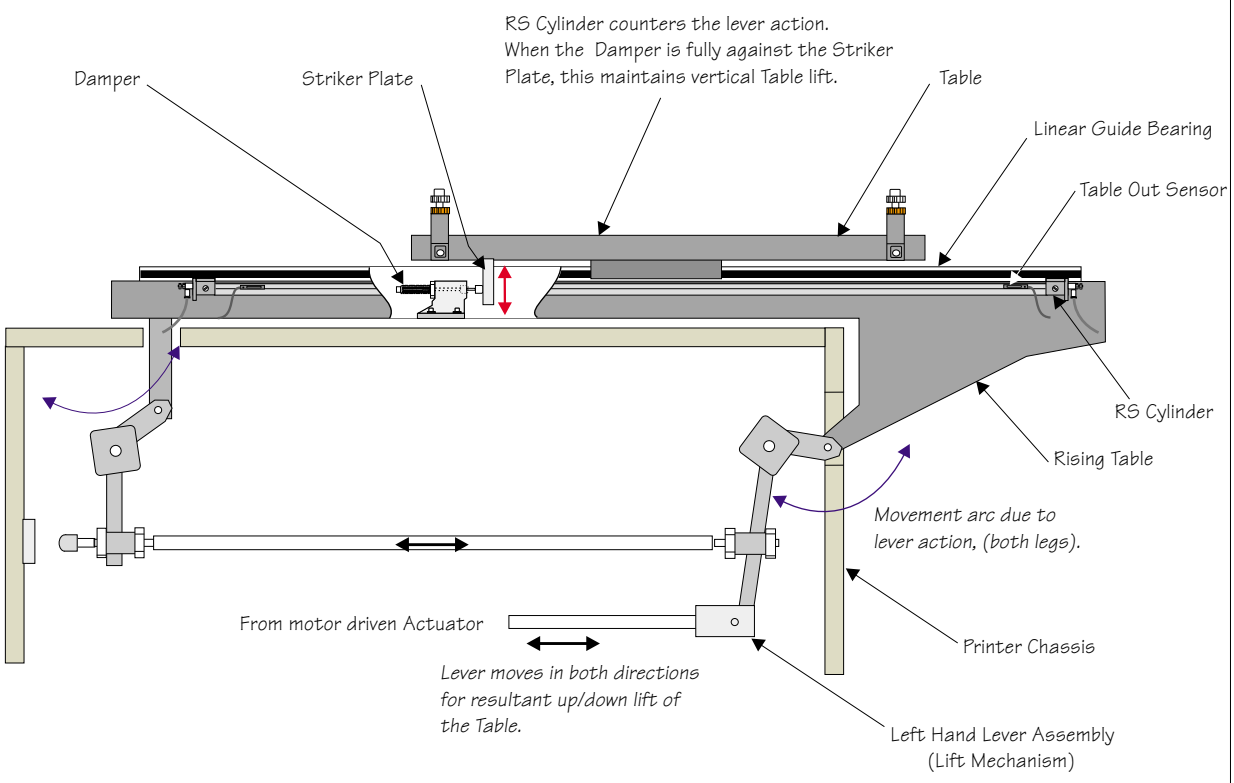


Figure 12 Table Lift Movement Compensation

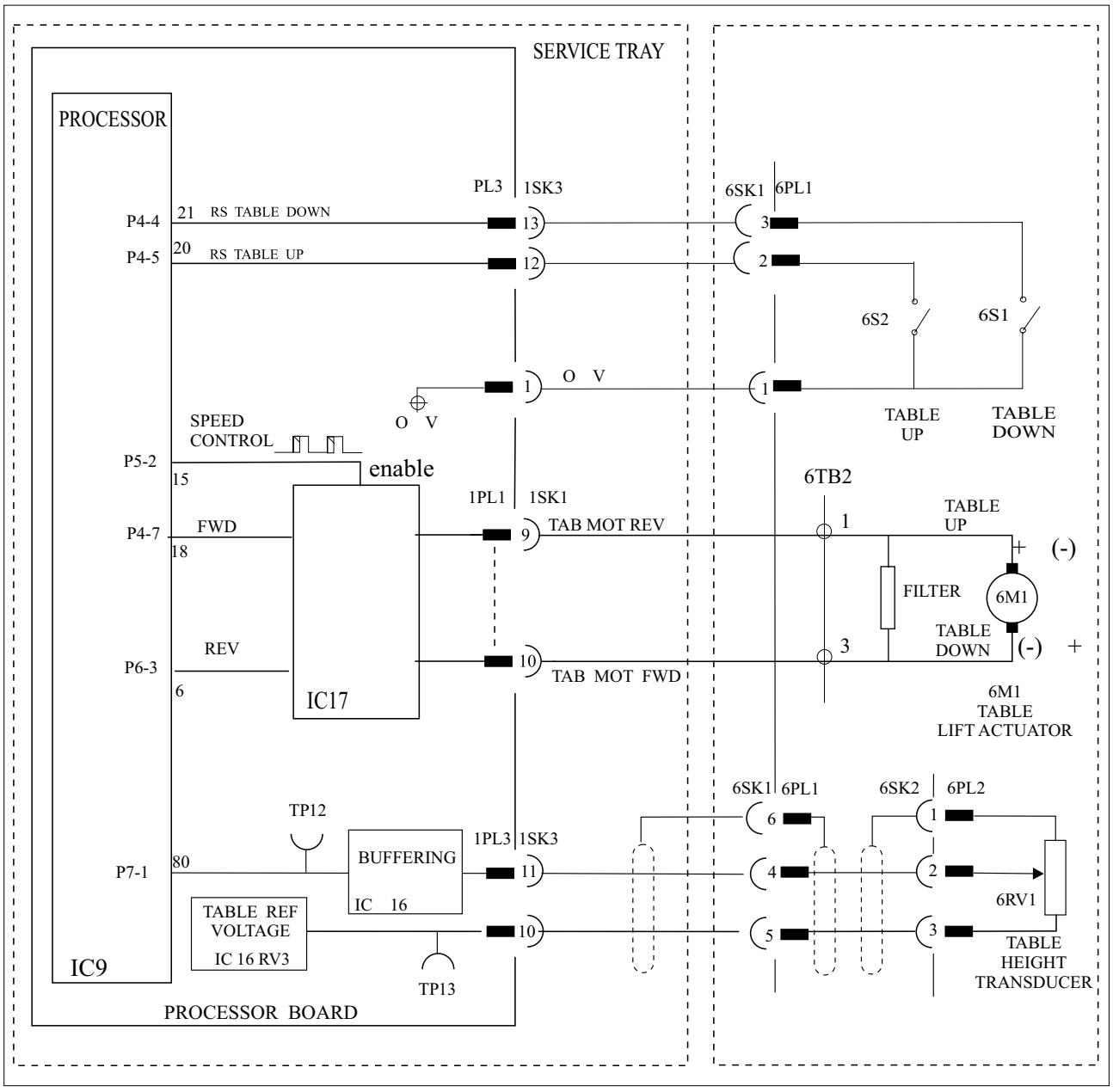


Figure 13 Table Lift Control

Table Lift Control

A bi-directional dc motor-powered actuator drives the table to the required position indicated by the position transducer.

Provision has been made to drive the table down from the contact point of board and screen at slow speed, over the first 3mm of table travel, this is known as the separation speed.

Limit switches are used for error detection and for hardwired confirmation of actuator operation.

Print gap is a derived value. It is the difference in value between the contact height and the print height.

Transducer Mounting

The transducer measures the true horizontal displacement of the link. The 4-bar link in conjunction with the constant table registration against the stop, ensures that vertical lift of the table is directly proportional to the horizontal displacement measurement of the transducer.

The transducer is calibrated to read zero when the table is at the lowest position. See Chapter 7 - Calibration and Settings.

Normal Lowest-position Switch

An external limit switch, fitted to the actuator detects the lowest position of the table. The table lowers to this position following printing. The lowest position ensures that collision of the board and printhead structure cannot occur as the table withdraws to the table-out position.

Absolute Table Lowest Position Switch

A mechanical stop fitted to the link shaft prevents damage to the lift mechanism in the event of continued descent of the table following control system failure. If for any reason the table lowers beyond the normal lowest position setting, the link shaft travels to an absolute limit to abut a stop plate mounted on the structure.

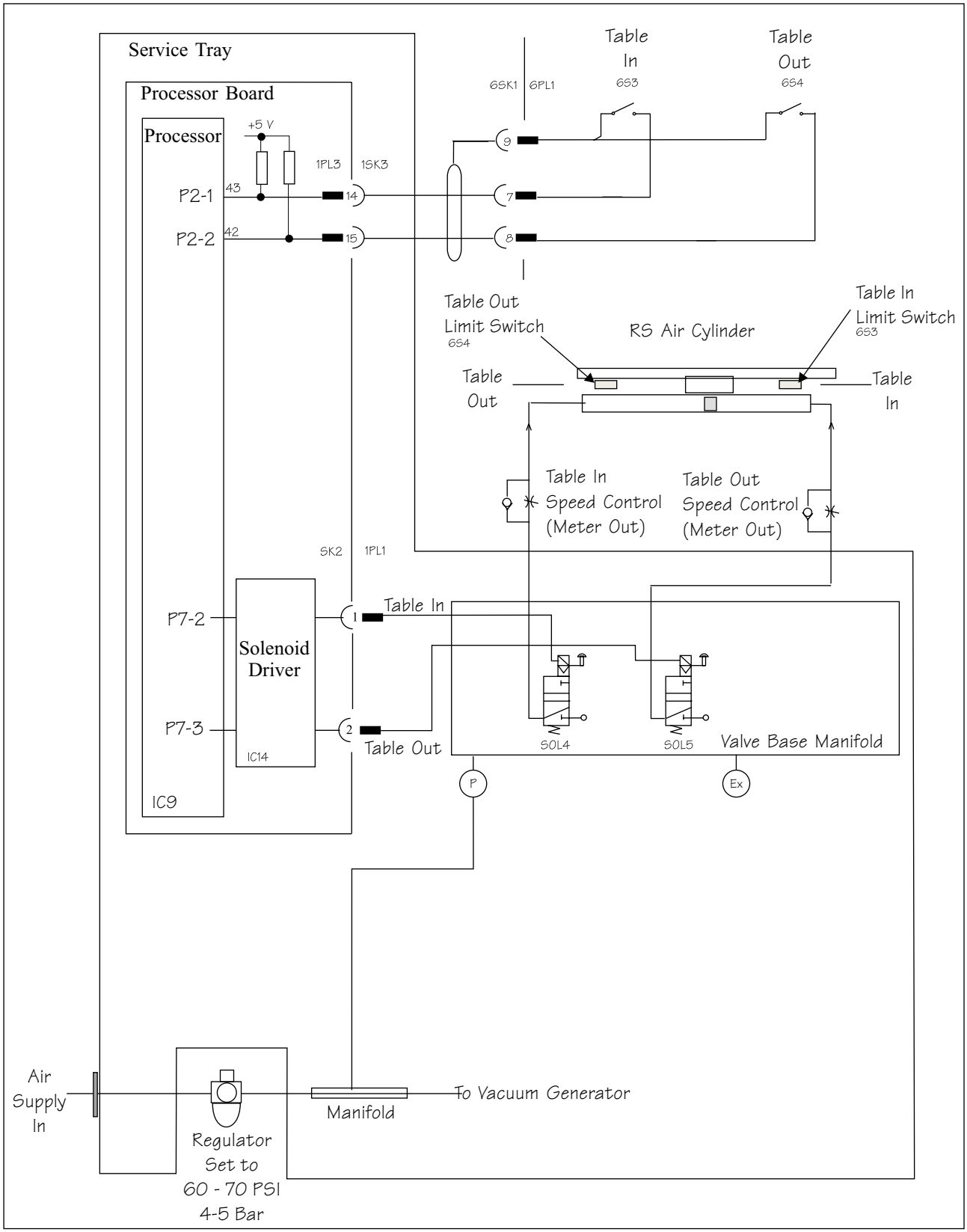


Figure 14 RS Table Drive Control

RS TABLE DRIVE ASSEMBLY

Purpose The table drive assembly ensures repeatable table position at table-in and table-out stops. Table positioning ensures that alignment of stencil and board performed at table-out position, results in an aligned print at table-in position.

Mechanism Action of the table drive cylinder registers the table against either the Table - In or Table - Out stops. Under normal operation, when the table is not in motion, a constant force applied by the rodless cylinder drive, ensures that the table holds registration against the board stops with no position error.

Table Speed The speed of traverse of the RS table in each direction, 2-2.5 sec, stop to stop, is determined by the adjustment of the metered-out valves at either end of the rodless cylinder.
The speed is set at time of manufacture. The setting allows the table to approach the stops smoothly but with reasonable speed.

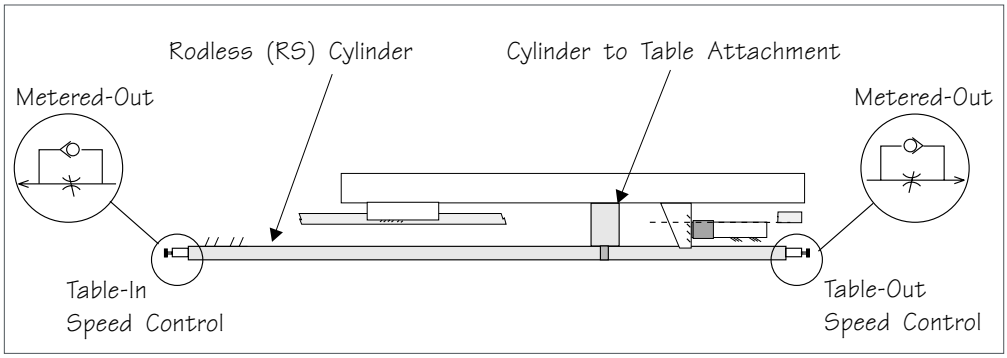


Figure 15 RS Table Speed Mechanism

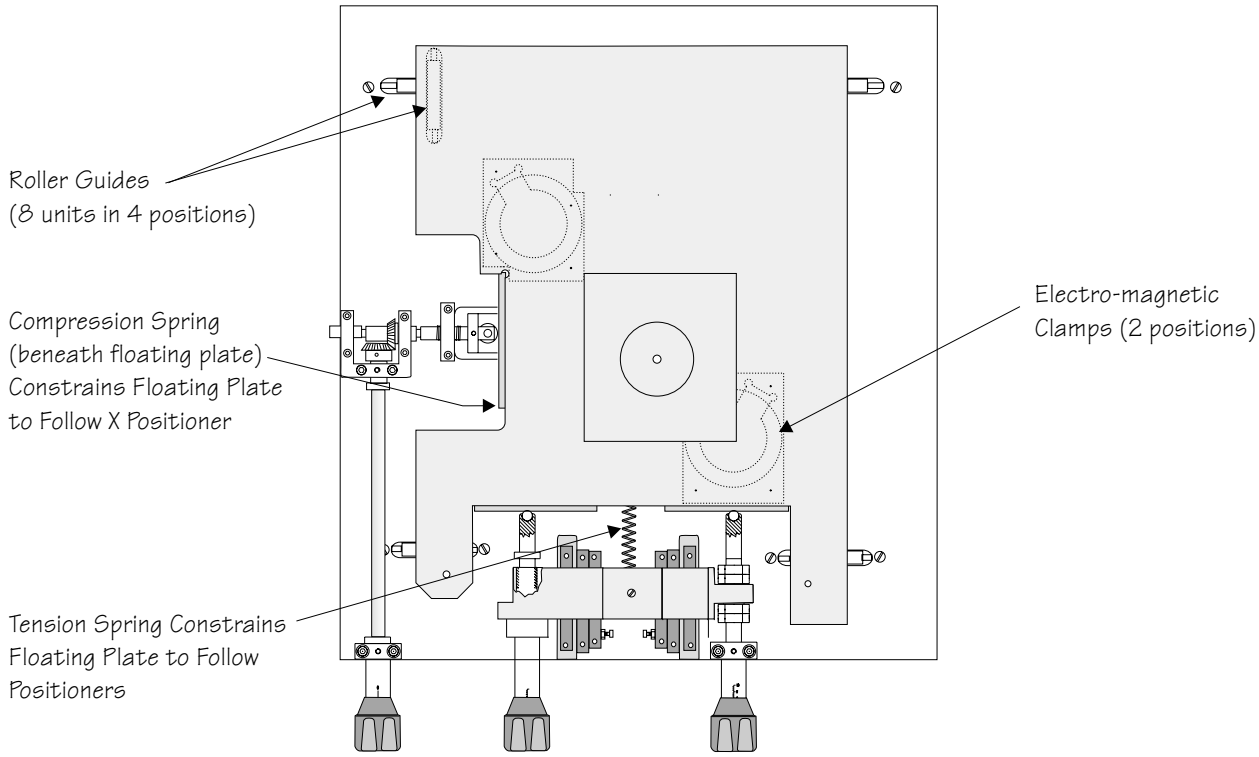
RS Table Drive Control

A rod-less type cylinder attached to the table carriage effects the table-in to table-out movement. Table drive control uses a simple single acting pneumatic valve to control the air flow to each side of the cylinder.
A safety feature of the mechanism is provided by independent control of each direction of movement. This arrangement ensures that in the table remains at the current position in the event of power failure, and all pneumatic energy is automatically vented from the system.

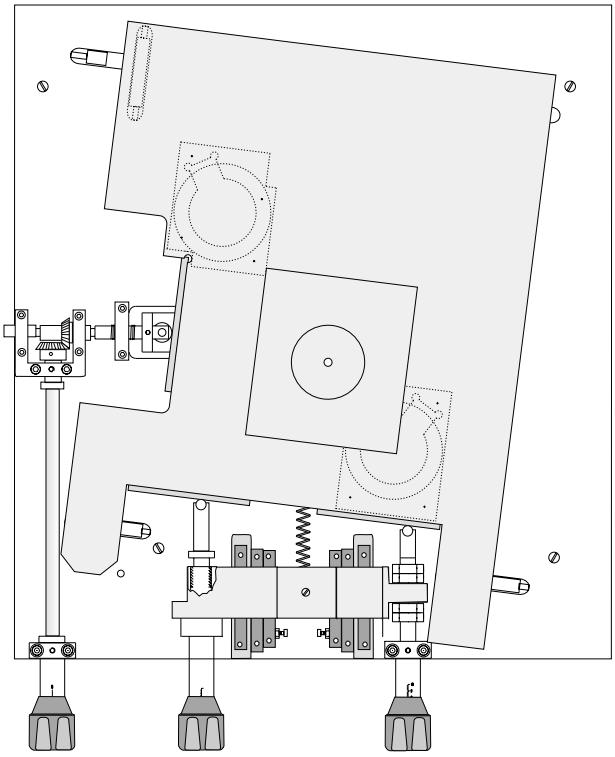
Table-In A signal from the microprocessor activates the solenoid located within the service tray, and air flows at a controlled rate into the cylinder, driving the table inward. A signal lamp at the solenoid indicates activation.

Table-Out A signal from the microprocessor activates the solenoid located within the service tray, and air flows at a controlled rate into the cylinder, driving the table outward. A signal lamp at the solenoid indicates activation.

Manual Override The small orange button at each control valve provides manual override control for test purposes.



Floating Plate in the Zero Position



X, Y and Theta Adjusters Acting Upon the Floating Plate - Aligned

Figure 16 Floating Plate, Positions

Tooling Table (Floating Plate) Assembly

Purpose

The tooling table assembly fulfills the following functions:

- Board Alignment
- Clamping Aligned Position of Board
- Vacuum Board Hold
- Tooling Fixture Plate

Board Alignment

This allows alignment adjustment to each incoming board, by use of the table positioners attached to the carriage base plate. During alignment and printing the float plate 'follows' the current positioner setting to place the board in X, Y, and Theta (Ø) orientation.

Clamping the Aligned Position of the Board

The aligned position of the floating table in abutment to the table positioners is secured by the action of the two electro-magnetic clamps. Activating the clamps ensures that the aligned position cannot be disturbed during board transfer from table-out to table-in. In addition, a solenoid on the X positioner link shaft activates, clamping the X adjuster.

CAUTION. X, Y& Ø ADJUSTERS.

Ensure that the table clamps are released (table is floating) before adjusting the X, Y or Ø adjusters. Failure to release the clamps may result in equipment damage.

Vacuum Board Hold

The vacuum board hold is used to provide a vacuum source that applies the vertical hold-down force required to enable the board to separate from the screen after printing.

Tooling Fixture Plate

The tooling fixture plate is used to provide a general purpose tooling support plate with board mounting fixtures.

Board Registration

Adjustable pins are provided (2 off), to position the board on the tooling table for printing. Three pairs of different diameter pins are provided, special sizes are available as an option. Auto edge clamping and Hi-flow vacuum are also machine options.

Roller Guides

Eight Roller Guides provide the 'floating' facility of the table which therefore follows the influence of tension springs attached to the table. Springs constrain the table to abut the free ends of the positioners. A compression spring constrains the table in the X direction and a tension spring pulls the table into abutment with the Y and Ø positioners.

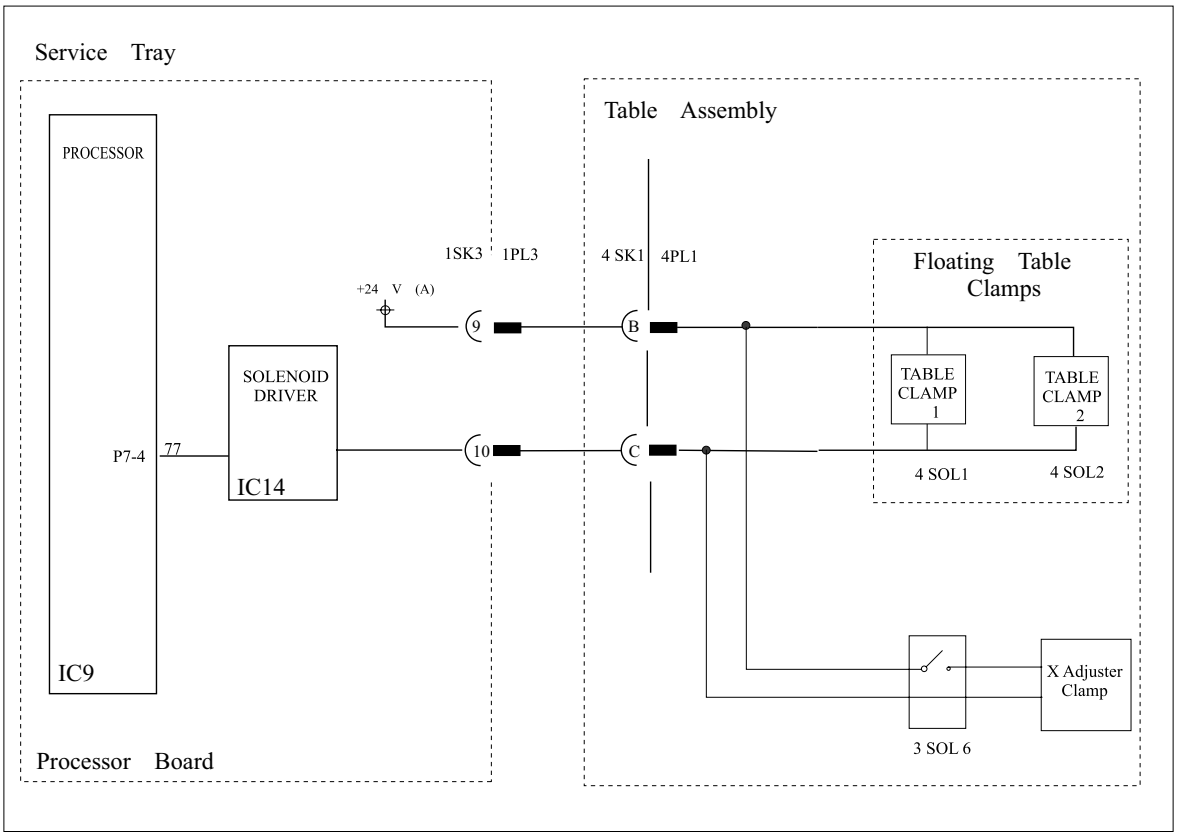


Figure 17 Clamps Control

Clamps Control

The aligned position of the board/floating table is secured by the action of two electromagnetic clamps.

Activating the clamps ensures that the aligned position cannot be disturbed during board transfer by table movement from the table-out to the table-in position.

The coil assembly and plate of each clamp is securely mounted to the table base plate. On activation the steel plates attach to the underside of the floating table and are magnetically held to the clamps, to secure the position of the floating plate.

Panel Activation

Current status of the clamps is displayed on the Operator display panel. Press the soft key to toggle the state of the [CLAMPS] through on and off.

CAUTION. X, Y& THETA (Ø) ADJUSTERS.

Ensure that the table clamps are released (table is floating) before adjusting the X, Y or Ø adjusters. Failure to release the clamps may result in equipment damage.

Table Positioners

The table positioners are three micrometer adjusting screws that act in conjunction with the springs to constrain the position of the floating table.

Each positioner is mounted to the table carriage baseplate, and the spherical end to each micrometer probe makes point contact with the table to allow repeatable re-positioning.

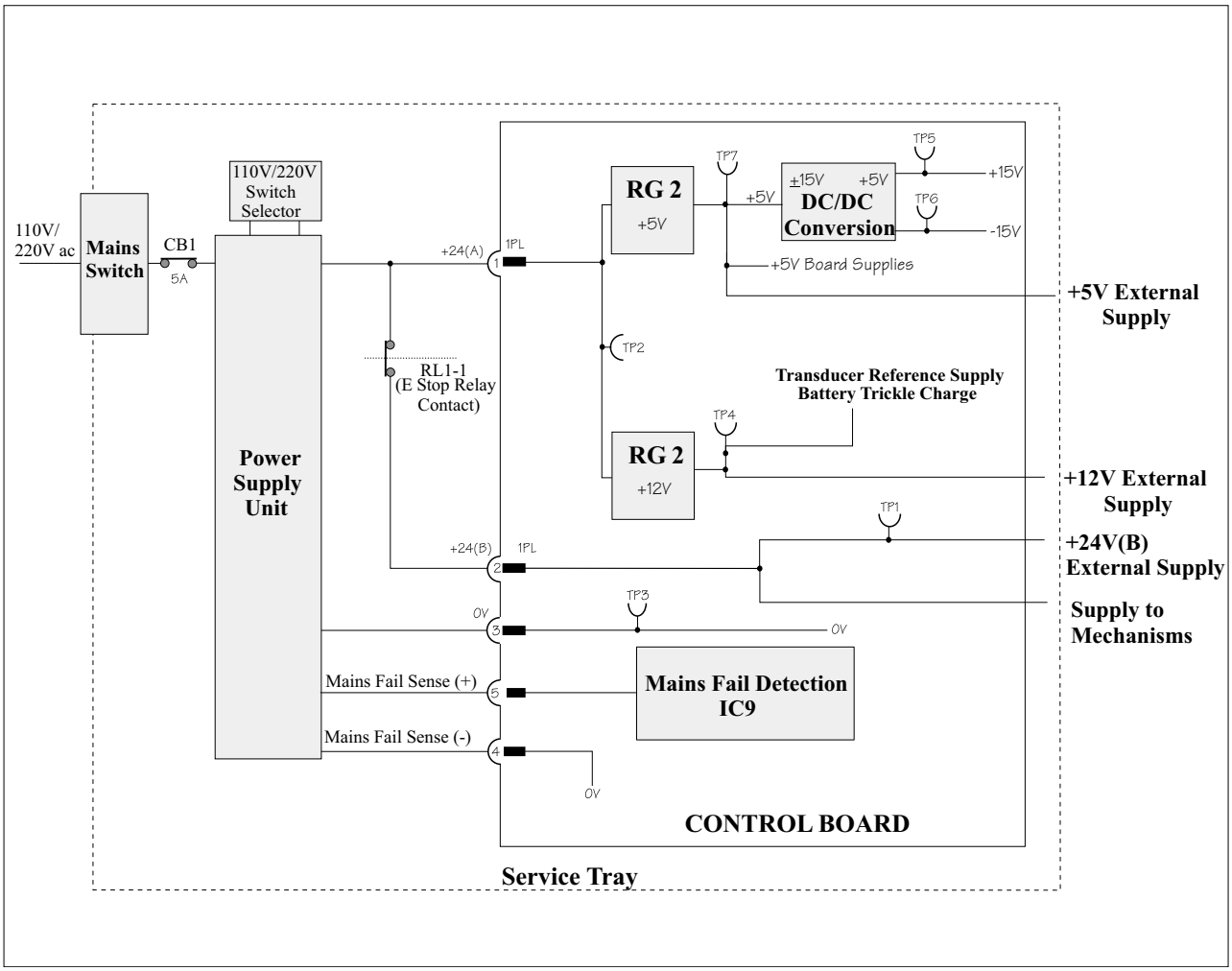


Figure 18 Power Supplies Generation and Distribution

POWER SUPPLIES GENERATION AND DISTRIBUTION

Purpose The DEK 248 printer requires only a single external power source. Other supplies are generated at on-board power supply units.

Primary Supply 220V ac or 110V ac internally selected.

Fuse Location Circuit Breaker SA, rear service crate panel.

Switch Selectable Voltage Supplies are switch selectable (110V or 220V) and are factory set at dispatch.

Mains Supply Sensing Mains supply failure signal generation at PSU1 routed to the processor is sensed at Processor board. The on-board battery continues to provide processor power.

Derived Supplies Derived supplies are generated at the Power supply unit PSU 1. PSU 1 is a module comprising a switched mode power supply fitted with full over current and voltage protection.

NOTE

If for any reason the power supply is switched off at the mains supply switch, wait 5 seconds before re-establishing the supply to allow the protection circuits to stabilise. Failure to do so may result in prolonged apparent shutdown of the supply.

+24 V(A) At the processor board, +24 V(A) supply is for generation of processor supplies and the following:

- +5V
- +12V

Sensing Sense the +24 V (A) generated at PSU1 at Test point (TP 2), 0V, at (TP 3) at the processor board.

+24 V (B) +24 V (B) is routed to the processor board but this supply is also subject to the control by closure of relay contact RL1-1. This arrangement ensures a 'hardwired' control to +24V (B) supply independent of the processor software and is therefore used to control the moving mechanisms of the printer that would require immediate and certain power cessation when the emergency stop function is activated.

Sensing Sense the +24 V (B) at Test Point (TP1), 0V (TP 3) at the processor board.

Hardware E Stop Control

This control is the emergency-stop relay. De-energising relay RL1 cuts power to mechanisms that are connected to the +24 V (B) supply.
The following functions are controlled by the +24V (B) supply:

- Printhead Carriage
- Table Lift Mechanism
- Squeegee Solenoids

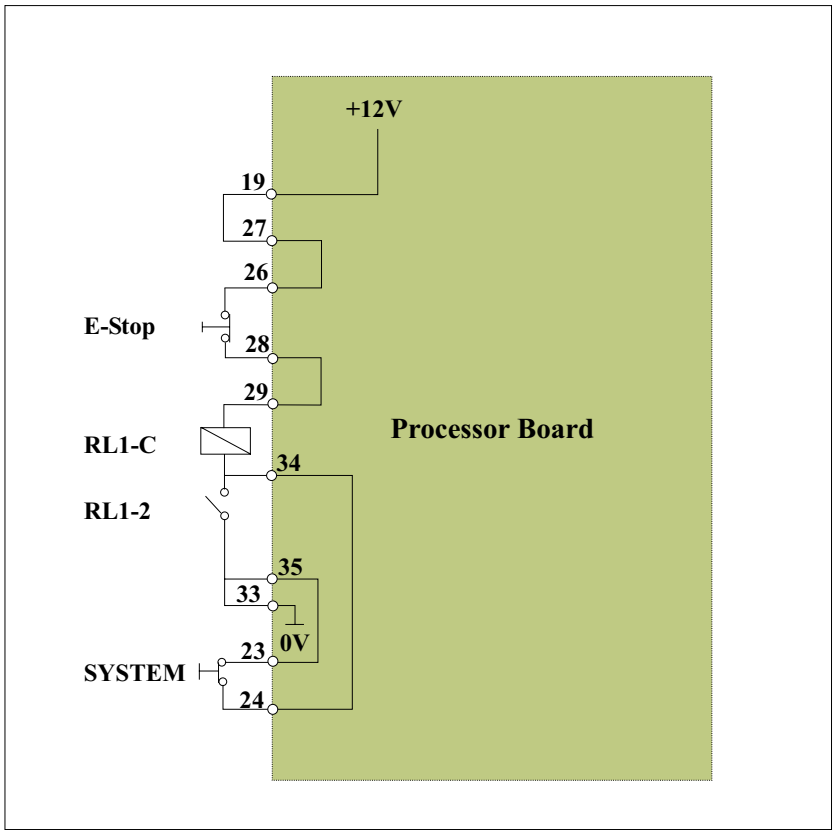


Figure 19E Stop Detail

Software E Stop Control

Software sensing of the +24 V (B) supply (IC9 Port 4-6) is used to provide 'soft' control of the +24 V (A) and (B) supplies to provide controlled response to the E Stop activation.

+12 V supply

+12 V supply generated at the processor board, is used for:-

a) Generation of the reference supplies use for position two variable resistance type transducers used to detect printhead carriage position (stroke) and table lift position (contact height, print height) respectively.

b) Trickle charge of the on-board battery.

Sensing

Sense the +12 V supply generated the processor board at TP3 and TP4.

+5 V supply

+5 V supply generated at the processor board, is used for:-

a) +/- 15 V on board supplies (dc/dc converter DC1).

b) External supplies to panel.

Sensing

Sense the +5V supply generated at the processor board at TP3 (0V) and TP7.

+/- 15 V supply

Supply derived from +5 V, is used for board/external supplies at TP5 (+15V) and TP6 (-15V) both with respect to TP3 .

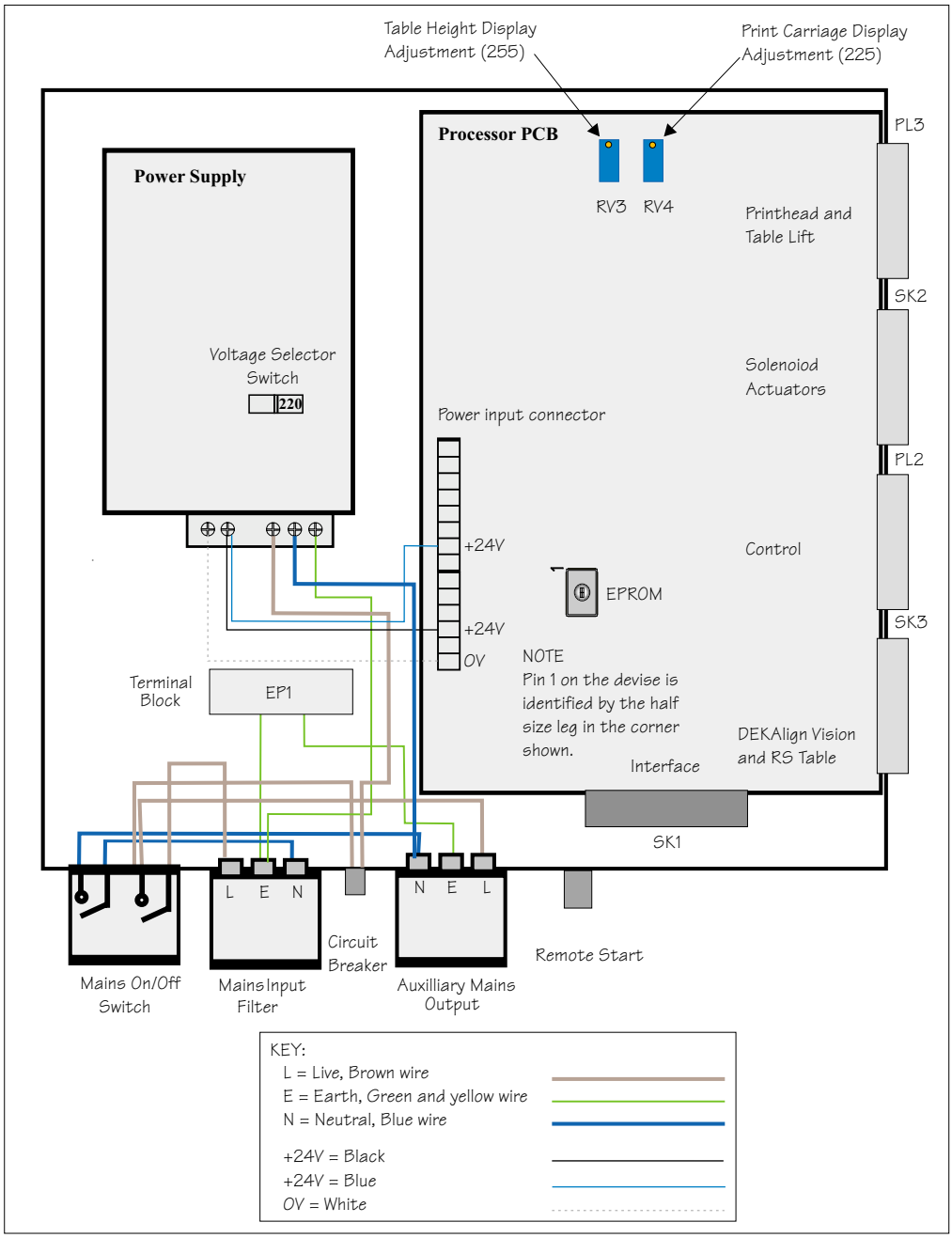


Figure 20 Power Supply Layout

PNEUMATIC SUPPLIES

Purpose Certain mechanisms and vacuum generation are pneumatically powered.

Primary Supplies

Machine shop air supplied at 60 - 70 psi (4 - 5 Bar) is filtered and regulated at the printer.

Pressure sensing An air pressure switch fitted at the outlet of the regulator senses the regulated supply pressure. The switch is break-on-rise and set to make when the pressure falls below 3.5 bar (50 psi). On alarm, a warning air-pressure failure warning message appears at the panel. The alarm state can be cleared at the panel on restoration of air pressure. Action of the switch can be inspected within diagnostics operating mode.

Safety Valve A safety dump valve fitted to the regulated supply immediately before the spool valve base ensuring that in the event of an emergency stop, or power-down air pressure is vented from the pneumatic system.

CHAPTER 6 ERROR MESSAGES

ERROR MESSAGES

ERROR MESSAGES

INTRODUCTION

Incorrect execution of the required movements of the printer or arrival of unexpected input signals to the control system is interpreted to be a machine error condition.

Normal operation is interrupted and an appropriate error message is displayed at the operator display panel.

Messages may be classified as errors or warnings.

The control system usually offers an attempt to recover to normal operation.

This chapter presents the range of possible error messages, their meaning and the possible recovery actions that are appropriate to each error message.

In the pages following the actual message appearing at the panel is listed for the purpose of recognition. The possible cause of error and the internal test that has failed is then given for each error.

Error Types

Messages are categorised according to severity.

Errors

Errors are usually associated with failure of a mechanism to complete an expected task within an allotted time period. For example, a print carriage error message appears if the carriage fails to reach the expected destination position within an allotted time period. It signifies that a failure has occurred within the mechanism.

In such circumstances an opportunity may be given to attempt a retry.

Warnings

Warnings are advisory, and do not indicate a malfunction, but rather that some step of the process is not in the correct state. An example of such a warning would be the cover open warning. If the cover is open the process stops but will continue when the cover is subsequently closed.

Recovery

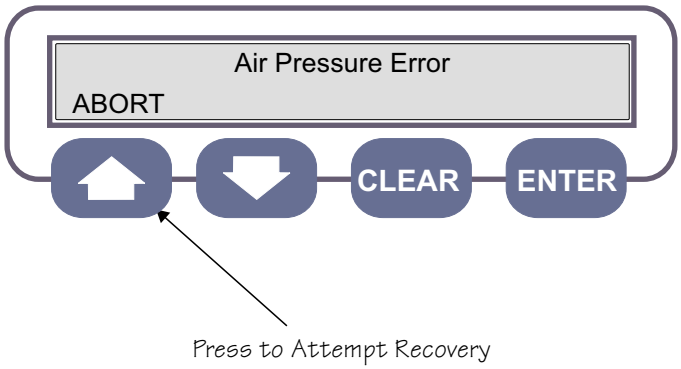
Recovery is the action that can be taken by the operator to remedy the fault condition.

Complex Fault

If the recovery procedure fails the fault is likely to be complex and reference must then be made to the maintenance section of the manual for remedial action.

TABLE 1 - ERROR MESSAGES

ERRORS
Air Pressure
Front/Rear Limit
Motor Power/ E Stop
Print Carriage
RS Table
Squeegee
Table Lift
WARNING
Cover Switch
RECOVERY
'SYSTEM' to Recover



CAUSE

Air Pressure Switch failure. Pressure is below 60 psi (4.5 bar).

INTERPRETATION

Air line not connected.

Pressure low, 60 psi (4.5 Bar) minimum, required at the inlet.

Switch is faulty, or requires calibration.

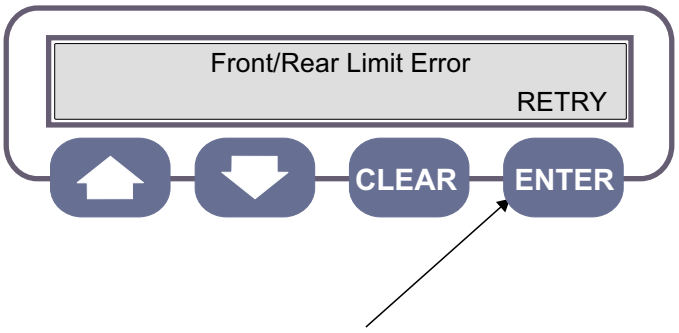
RECOVERY

Restore air pressure.

Replace/Recalibrate air pressure switch.

Press **ABORT** to attempt recovery..

Figure 1 Air Pressure Error



CAUSE

Test for valid limits fails.

INTERPRETATION

Difference between the front and rear limits is less than 90mm. This is an approximate requirement, dependant on print mode and hop-over value.

RECOVERY

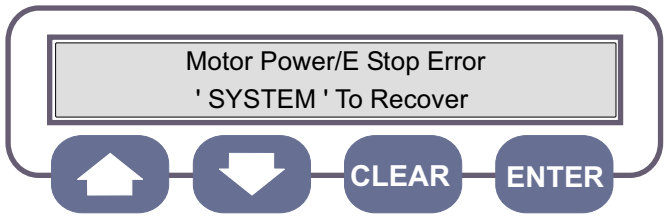
Press **RETRY** to attempt recovery.

On retry, the operating system returns to "Set Front Limit ?" inviting an attempt to reset the front limit position.
On pressing [**ENTER**], the "Set Rear Limit ?" is displayed.
Reset the rear limit.

Press [**ENT**] to re-apply the validty test. If the test succeeds the MODE - ABORT message reappears as a prompt to press [GO].

Press [***GO***] to begin the print cycle.

Figure 2 Front/Rear Limit Error



CAUSE

+24Vsupply to motor has failed.

E-Stop button has been pressed.

INTERPRETATION

+24V supply not available.

+24V supply is available but E-Stop relay is de-energised. Condition is because either the E-Stop button is latched-in, or the continuity of the external E-Stop loop is lost.

RECOVERY

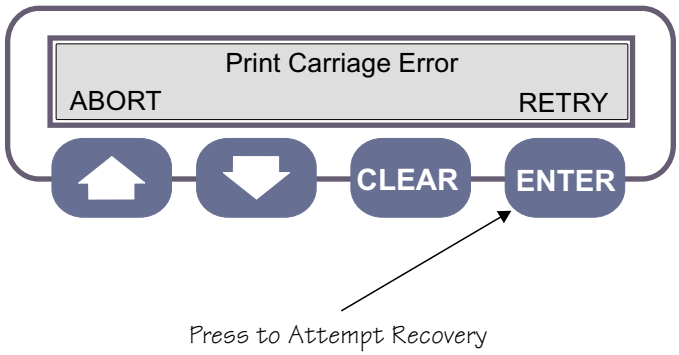
Unlatch E-Stop button.

Check continuity/integrity of the external loop, including +12V extermal loop supplies.

Check 248 local +12V and +24V supplies.

Press "**SYSTEM**" button to attempt reset.

Figure 3Motor Power E Stop Error



CAUSE

Time-out error on Print Carriage drive.

Carriage fails to reach expected position within the allocated time.

INTERPRETATION

Motor drive has failed/faulty.

Motor drive clutch slipping.

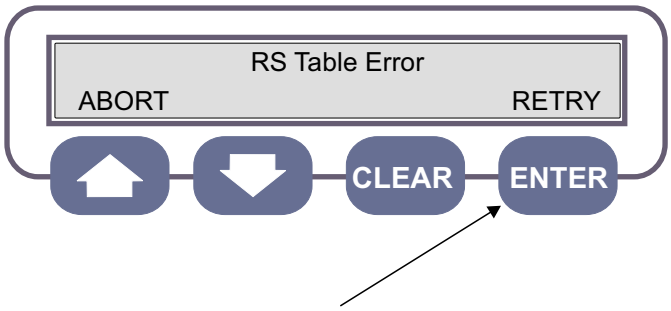
Carriage drive belt or motor drive belt has broken.

Carriage Position Transducer out of position.

RECOVERY

Rectify fault and press **RETRY**, to attempt recovery.
Check break-out torque setting on motor drive clutch.
Repair/replace motor drive or motor drive belt.
Re-calibrate carriage position.
Press **RETRY** to attempt recovery.
Select **ABORT** to attempt to re-initialize the machine.

Figure 4 Print Carriage Error



CAUSE

Time- out error. Reciprocating Slide (RS) table fails to reach either the table-in position or the table-out position within the allocated time.

INTERPRETATION

Table drive mechanism failure. Air flow rate restrictors incorrectly set.

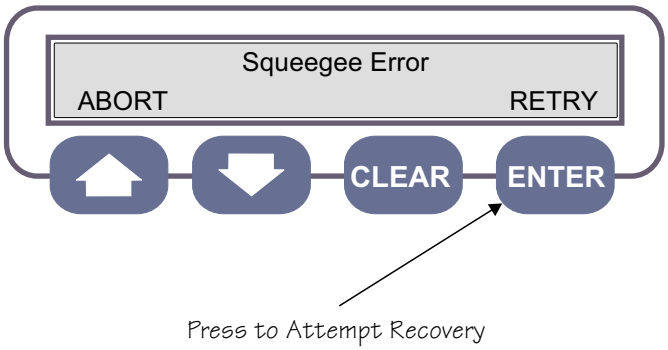
Obstruction to table movement.

Reed switches faulty/incorrectly positioned.

RECOVERY

Check correct position of table-in and table-out Reed Switch.
Check mechanism /air flow restrictor settings and rectify.
Clear any obstruction to table movement.
Replace faulty Reed Switch.
Press **RETRY** to attempt recovery.
Press **ABORT** to re-initialize.

Figure 5 RS Table Error



CAUSE

Time-out error. Either of the two squeege assembly sensors has failed to activate within the allocated time.

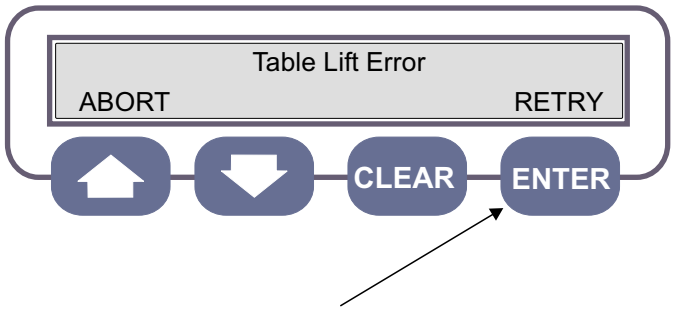
INTERPRETATION

For either front or rear squeegee, UP position detection has failed to activate.
The pneumatic mechanism has failed.
Mechanical failure/obstruction to movement.
Detector failure/faulty.

RECOVERY

Check mechanism and rectify fault.
Clear any obstruction to table movement.
Replace faulty detector/correct position of detector vanes.
Press **RETRY** to attempt recovery.
Press **ABORT** to re-initialize machine.

Figure 6 Squeegee Error



CAUSE

Either the table-lift has failed to reach the target position within the allotted time, or the table has failed to activate the table lowest position (table down) detector Switch within the allotted time.

INTERPRETATION

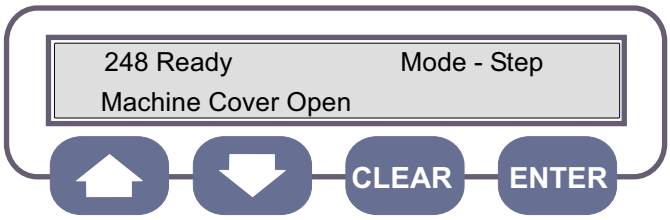
Drive actuator failure. The drive may be obstructed, or the internal drive clutch may be faulty.

Table down datum switch faulty/incorrectly positioned.

RECOVERY

Remove obstruction.
Check actuator drive circuit.
Check lift actuator calibration/settings.
Check down datum switch setting.
Press **RETRY** to attempt recovery.
Press **ABORT** to initialize machine.

Figure 7 Table Lift Error



CAUSE

One of the transparent covers is open.

INTERPRETATION

Continuity of cover switch interlock loop broken.

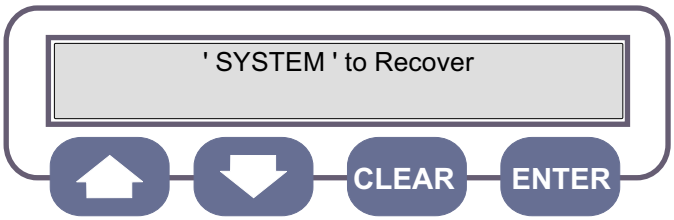
Cover switches/activating magnet faulty/incorrectly positioned.

RECOVERY

Close all covers.

Rectify faulty switch/mechanical setting.

Figure 8 Cover Switch Warning



CAUSE

With the Printer set to Diagnostic mode, an attempt has been made to exercise a mechanism within the 'Outputs' selection, but the +24V power required to drive the mechanism has not yet been made available.

INTERPRETATION

Diagnostic mode has been entered before the Printer has been initialised; i e by powering up with the selector switch selected to position 3 (Diagnostics).

RECOVERY

Press "**SYSTEM**" key to restore +24V supply.
The display returns to the heading 'Outputs' and the required re-selected, as required.

Figure 9 'SYSTEM' to Recover

CHAPTER 7 CALIBRATIONS AND SETTINGS

CALIBRATIONS AND SETTINGS

CALIBRATIONS AND SETTINGS

Introduction

This chapter sets out the electrical calibration procedures and mechanical settings required to maintain continued operation of the machine following component replacement or repair.

Settings and calibration procedures are based on those used at manufacture.

See also Chapter 5, Description, for function description of the assemblies associated with the procedures set out below.

Procedures for calibration and settings are given for the following :

- Printhead Assembly
- X Y Table Drive
- X Y Table
- Table Lift Assembly
- Covers
- Service Tray

PRINTHEAD ASSEMBLY

Calibrations

The printhead assembly calibration is made up of the following elements:

- Frame stop
- Stroke limit calibration
- Belt tension
- Drive clutch
- Pressure spring calibration
- Double squeegee switches

Frame Location

The screen frame is inserted into the printhead chase from the front of the printhead. The frame locates against a single fixed stop at the left rear side of the printhead chase. A frame retaining clutch and knurled handnut secures the screen frame position. No adjustment to the frame position is required. A spring loaded mechanism ensures three-point fixing of the frame. Two spring-loaded guides on the right side of the chase engage the right hand roller-guides of the frame, forcing the two left-side frame roller-guides to maintain contact with the left-guide support. A single stop at the left side provides the third point of contact.
Light pressure applied to the hand-nut secures the position.

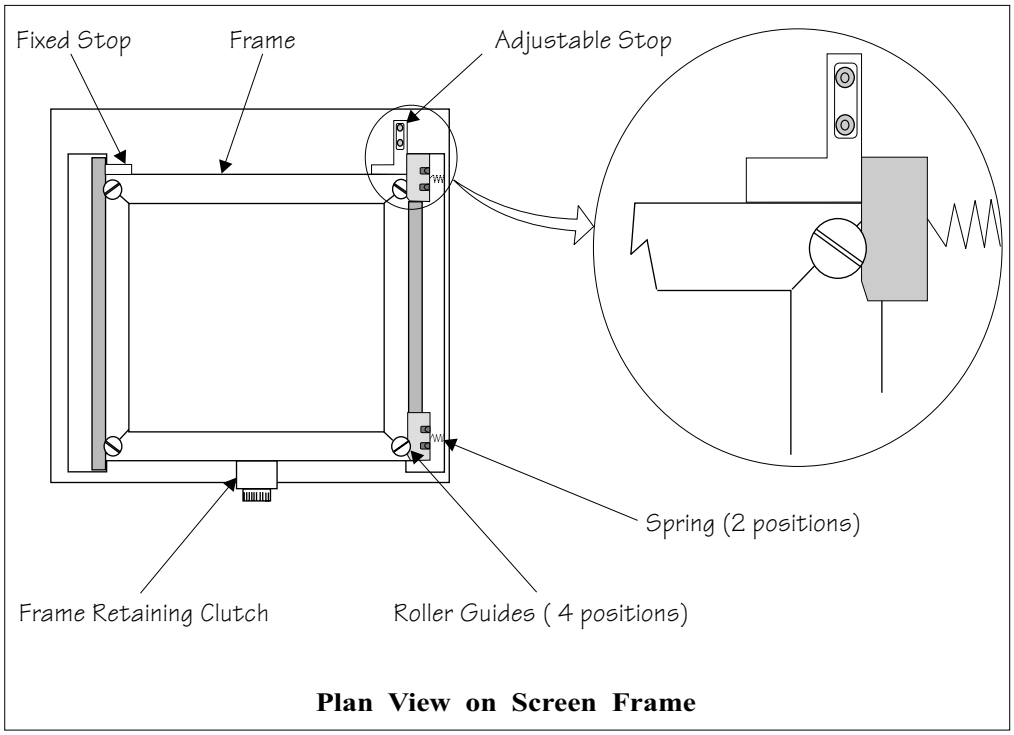


Figure 1 Frame Location

Carriage Speed Print carriage speed is an automatic calibration performed from within diagnostic mode.

Speed Calibration Prepare for speed calibration exercise as follows:

1) Check the stroke length over which the calibration is to be performed as 450mm.

Perform the speed calibration exercise as follows:

a) In diagnostics page, select 'Carriage Speed'.
b) Select [Enter] followed by [SYSTEM] and [Go].
c) At the panel, Calibration Display now reads zero mm/s, until the first rear to front stroke commences. The machine carries out a rear to front and a front to rear stroke at the following speeds, 10, 20, 30, 40, 50, 60 and 70 mm/s and then repeats from 10mm/s.

STROKE CALIBRATION

Introduction

Print carriage movement provides the print stroke. The carriage transducer signals the current position of the carriage. The transducer takes the form of a rotary potentiometer driven by a reduction gear assembly coupled to the right-hand belt of the carriage drive.

The transducer is mounted to the right rear side of the printhead.

Calibration procedure sets zero just prior to the mechanical stop and the slope of the voltage output per unit distance of stroke.

The carriage position is returned as a numerical value at the display in diagnostic mode.

Mechanical Stop Position

If the front stop position is incorrect, if for example the squeegee fouls the printhead, the stop positions needs to be checked. Use the fixed stop front face as the reference point. Set the Rear Stop to 169 mm from this reference and the Front Stop to 463 mm from the reference.

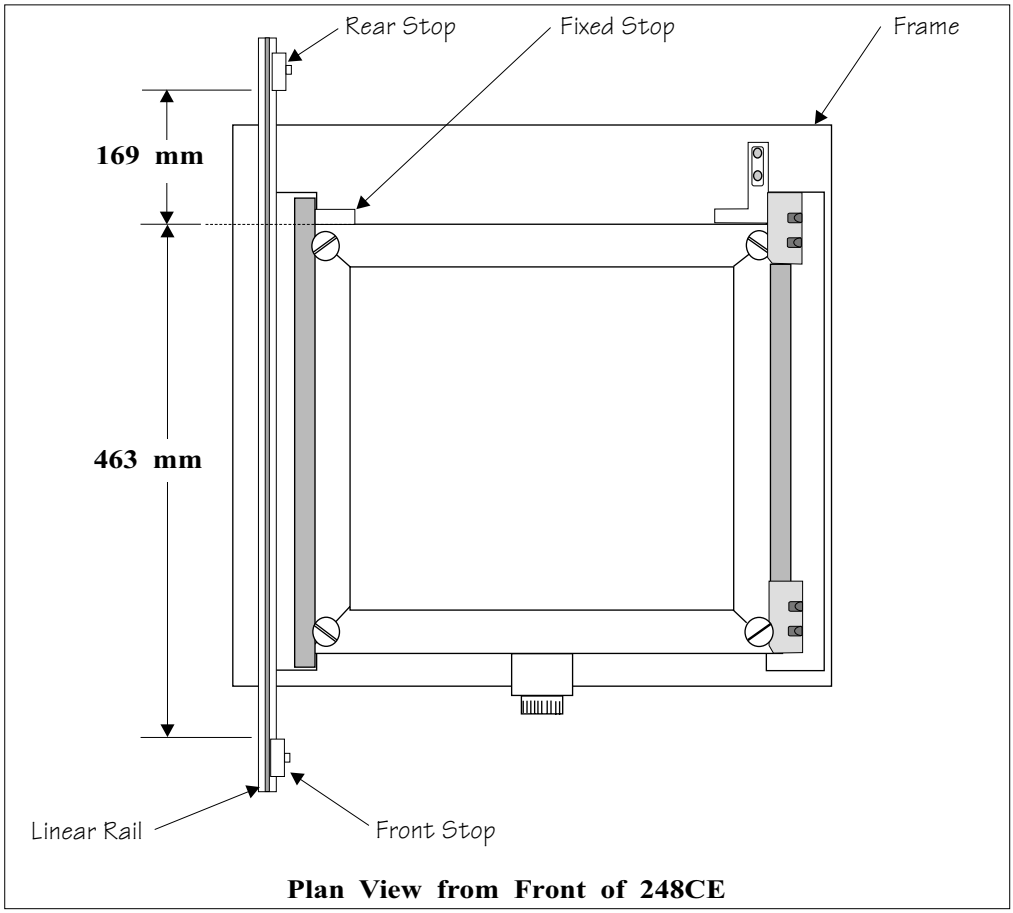


Figure 2 Mechanical Stop Positions

Calibration

The procedure calibrates the mV/mm output of the transducer, performed over 450 mm stroke. Proceed as follows:

1) At Diagnostics, select *Output Tests - Print Carriage Forward.*
Panel display now shows the current transducer output value. This is a number related to the actual print stroke (x2 = print stroke in mm).

2) Manually pull the print carriage forward far enough to just clear the mechanical stop leave approximately 1mm to 2mm gap.

3) Locate the processor board in the service tray assembly.
Adjust RV4 fully counter clockwise.

4) Remove the protective cover of the transducer (potentiometer) assembly. At the transducer, slacken the three clamping screws and rotate the transducer until the stroke value at the display panel reads between
1 and 0.

5) Tighten the fixing screws.

6) Push the Carriage back until it is 1- 2mm from the rear mechanical stop.

7) Adjust RV4 until panel display value reads 225. (display = mm/2).

8) This completes stroke position calibration. Replace the potentiometer cover.

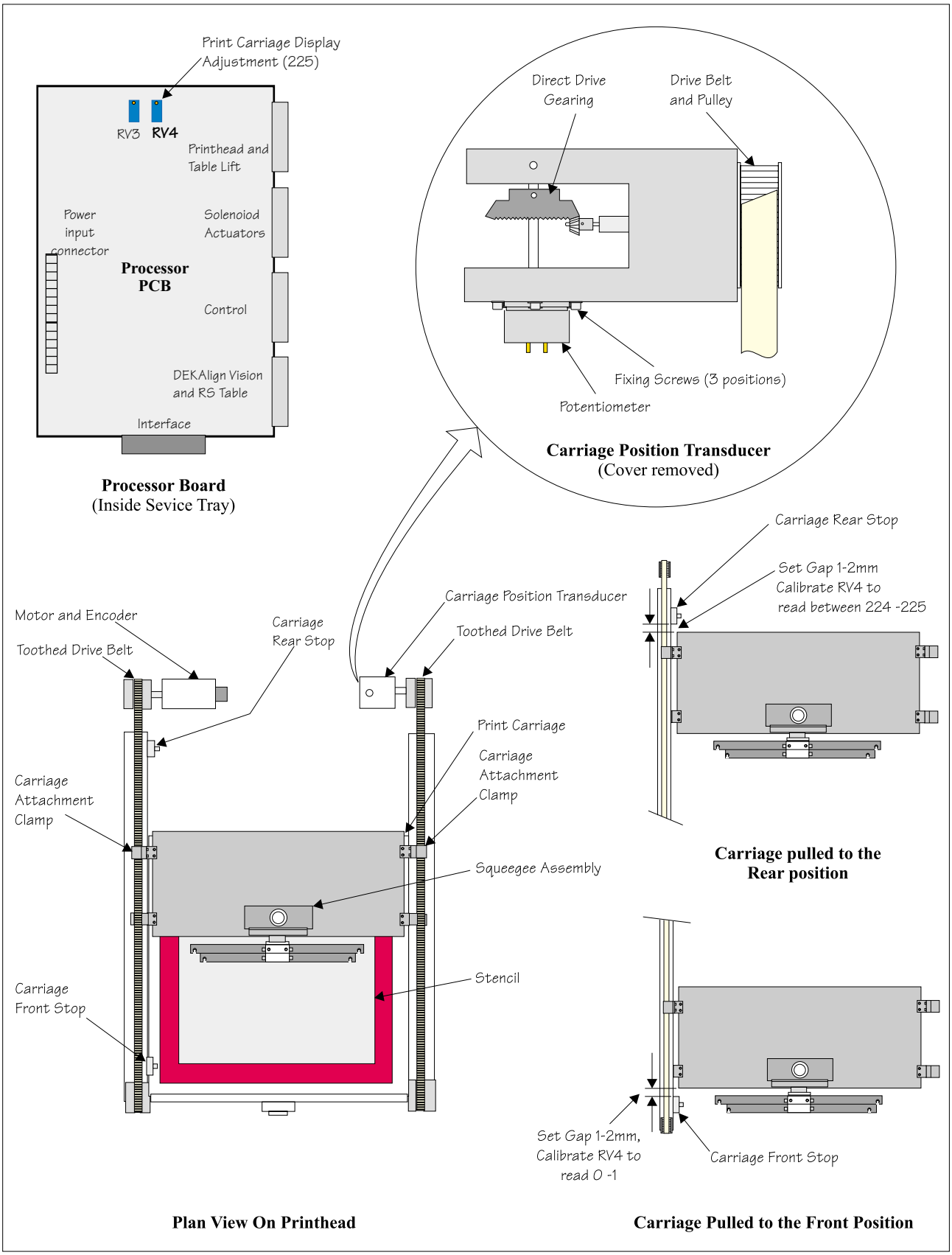


Figure 3 Stroke Calibration

Carriage Belt Tension

Two toothed belts drive the print carriage. Check for correct belt tensions. Place the carriage attachment clamp in the centre of travel, loosen the belt tension adjustment bracket and check and adjust if necessary the tension of the belt (less than 6mm of slack at the points between pulleys).

Tighten the screws to lock the position, check and adjust belt tension on the other side of the carriage.

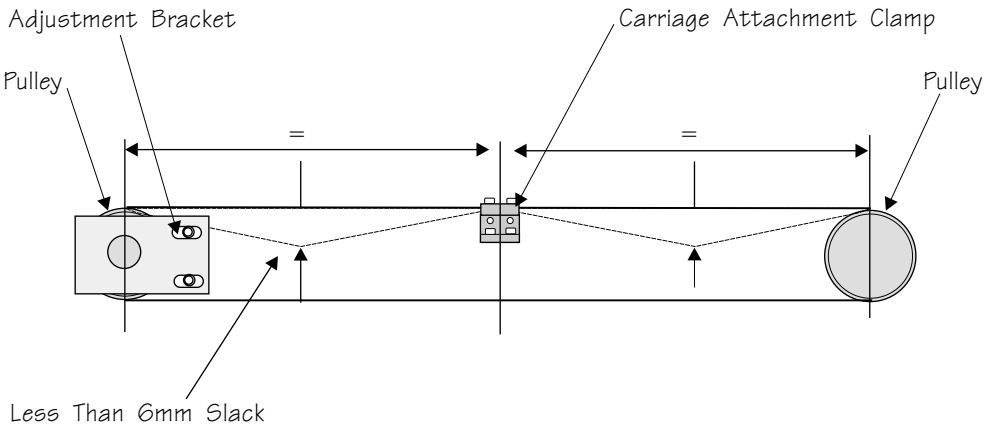


Figure 4 Carriage Belt Tension

Drive Clutch

A torque-limiting clutch protects the carriage drive mechanisms. Breakaway clutch torque is given.

The clutch adjustment test employs a force meter placed between the squeegee pneumatic cylinder and the front of the print frame. The carriage is driven against the meter by the carriage motor. The clutch is adjusted to ensure that the carriage just drives under the load expected at full squeegee pressure.

Perform adjustment to the clutch as follows:-

1) Attach the meter to the print carriage as shown.

2) Remove the Clutch cover plate and slacken off the clutch so that there is just enough pressure to enable drive at a speed of 10mm/s.

3) At diagnostics, select *Output Tests - Print Carriage forward.* Press [GO] to drive the carriage to the front, against the meter.

4) Increase friction at the clutch until the carriage just stalls when driving against the meter giving a reading of approximately 10.5kg.

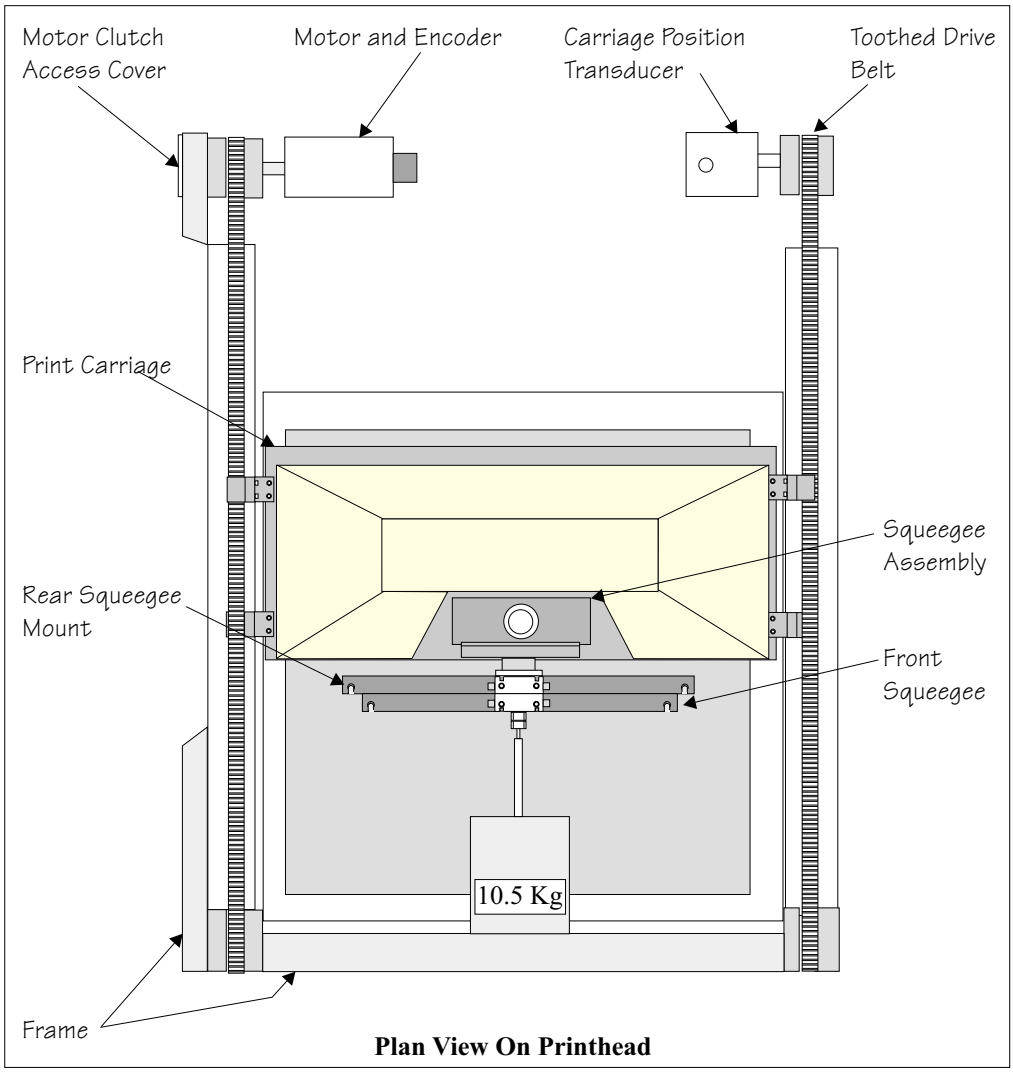


Figure 5 Carriage Drive Clutch Setting

SQUEEGEE CARRIAGE

The Squeegee carriage is mounted on the print carriage and supports the squeegee and pressure assemblies.

Settings required are:

- Zero pressure
- Squeegee-down limit switches.

Zero Pressure

When the heaviest squeegee is fitted zero pressure can still be achieved.

The compensation spring, supports the weight of the largest pair of squeegee holder assemblies (440mm).

Set zero pressure at the dial for any squeegee configuration as follows:-

1) At the panel, select Edit Parameters Page. Select Print Mode/Flood Print to force the rear squeegee down. Skip through step mode to the print cycle stage. Open the cover during the forward or reverse stroke as necessary, to halt the stroke. Alter the pressure handwheel until the squeegee blade just touches the stencil surface.

   This is the zero for this squeegee arrangement.

2) Should the dial calibration be required to read zero for a squeegee arrangement other than 440 mm, then the calibration can be effected by releasing the dial securing clamp screw (1.5mm a/f hex key) and resetting the zero position reading for the dial.

Full Pressure

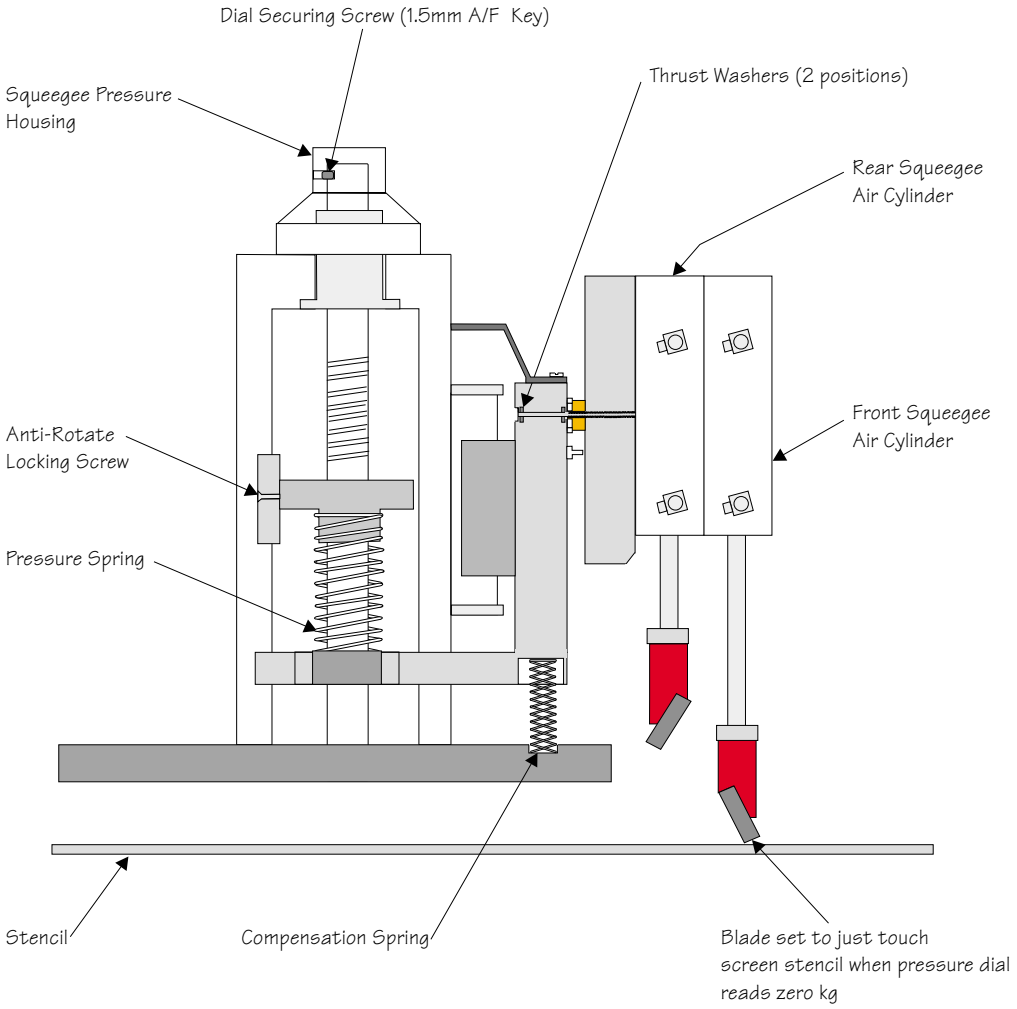
15 divisions selected at the dial, exerts spring pressure of 15kg.

Limit Switches

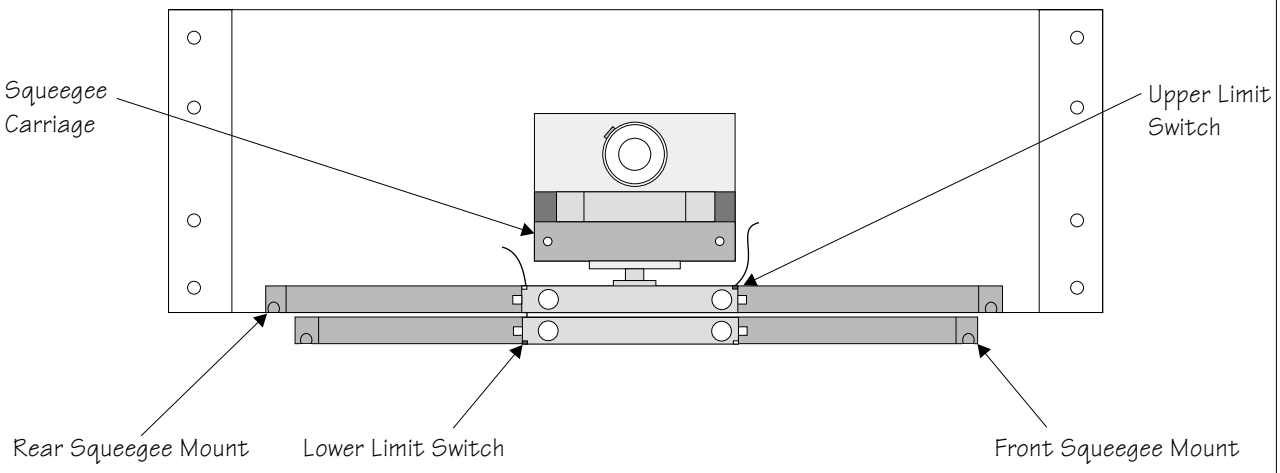
Limit switches are set to detect the squeegee position. Carriage movement during the print cycle does not commence until the front squeegee is detected down. The switch is positioned to activate when the squeegee just reaches the down position.

Select diagnostic page, input tests, to observe the changeover of the switch when the squeegee is fully down (On). Move the switch through the Off/On transition point observed at the panel, then set the switch a further 2.5 mm up.

When the rear squeegee is detected the switch is On when the squeegee is fully up. Observe the transition state from On to Off and set the switch with the rear squeegee fully up, in the On position. The rear squeegee is used for flood blade fitment, in normal operation this should be observed to be in the Up position.



View on Left Side of Squeegee Housing



Plan View of Squeegee Housing

Figure 6 Squeegee Pressure Calibration

X Y TABLE DRIVE

Introduction

The rodless cylinder table drive ensures zero-backlash between table and stop at the table-in and table-out stop positions.

Table Speed

At the cylinder, restrictors fitted to the ends of the cylinder set the speed of travel of the table. Hydraulic dampers fitted to the stops arrest the table motion. In combination, these set the overall stop-to-stop travel time to 2-3 seconds. The adjustment procedure balances best speed of the table travel and smooth arrest of the table against the stops.

Procedure

1) Adjust the table-in and table-out restrictors to give smooth table movement between stops with transition time of approximately 2-3 seconds.

2) In Diagnostics, Output Tests - Cycle RS In/Out. This cycles the table from the table out position to the table in position repeatedly. During the cycle the air restrictors located at the end of the rodless cylinder are adjusted to give the end to end transition time.

3) Check the smooth deceleration of the table and the table touches the stop at the end of the stroke.

Limit Switches

The X Y table drive limit switches are used for error detection (To check that the table is in the ‘home’ or ‘away’ position).

To check the correct position of the switches, in Diagnostics select the Digital Inputs mode. At ‘Table - In’ and ‘Table - Out’, the readout displays either ON or OFF for each switch. Set both switches to ON

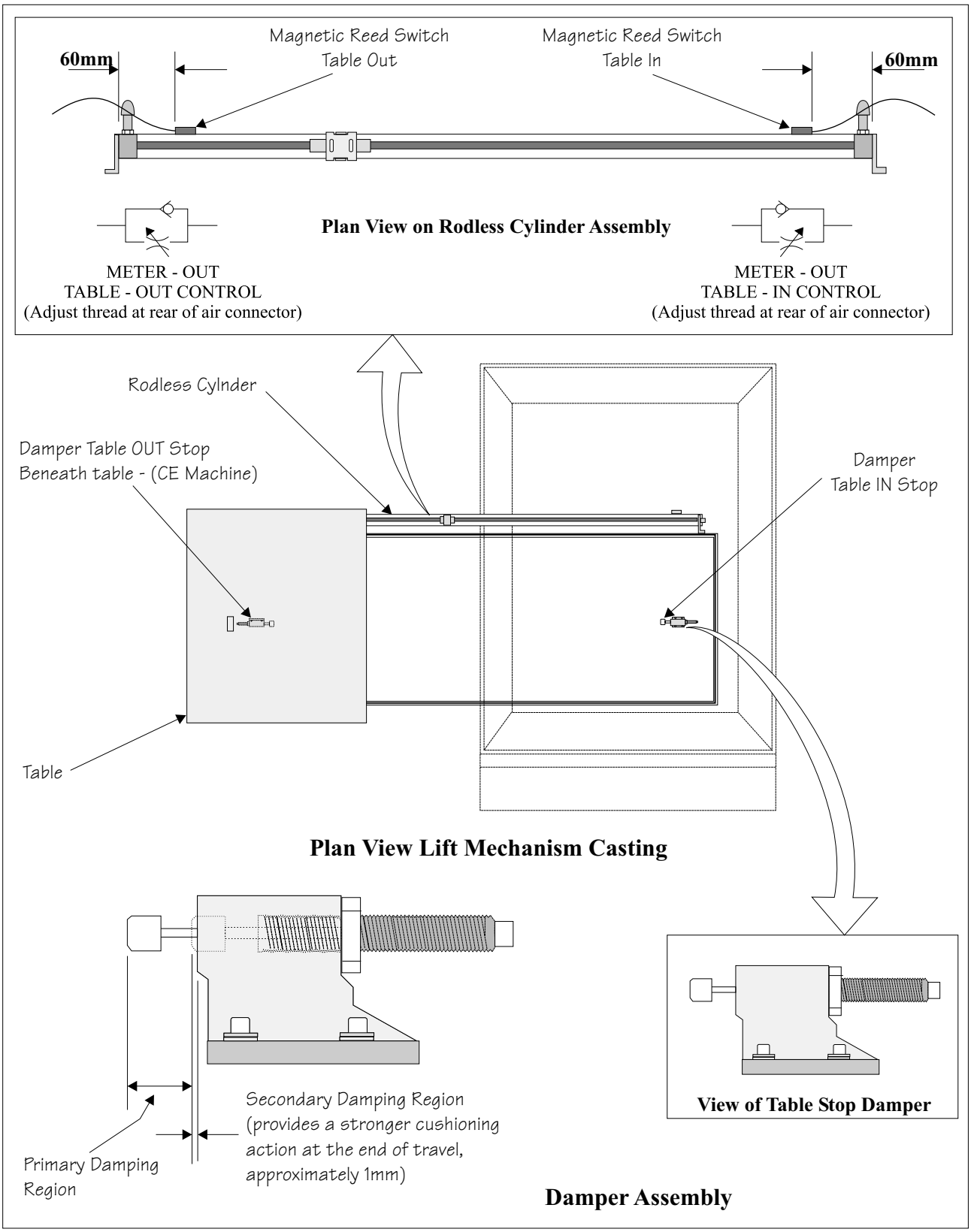


Figure 7 Setting the X Y Table Stop Dampers

X Y TABLE CARRIAGE ASSEMBLY

Introduction The X Y table has no calibration, the setting requirement is detailed below.

Setting The Centre of the X Y Table is set to the centre of the Squeegee cylinders.

Adjustment is made by manually moving the table in until the Damper abuts the Striker Plate with the damper plunger fully in.

Alignment marks are made on the centre of the Table and the Squeegee mounting. The Damper securing screws are slackened off allowing the Damper front face to abut the striker plate when the Table and the Squeegee mounting centres are aligned. This is confirmed by placing the engineers square as shown. When the X Y table and the Squeegee mounting are aligned and the Damper front face abuts the striker plate, the securing screws can be tightened.

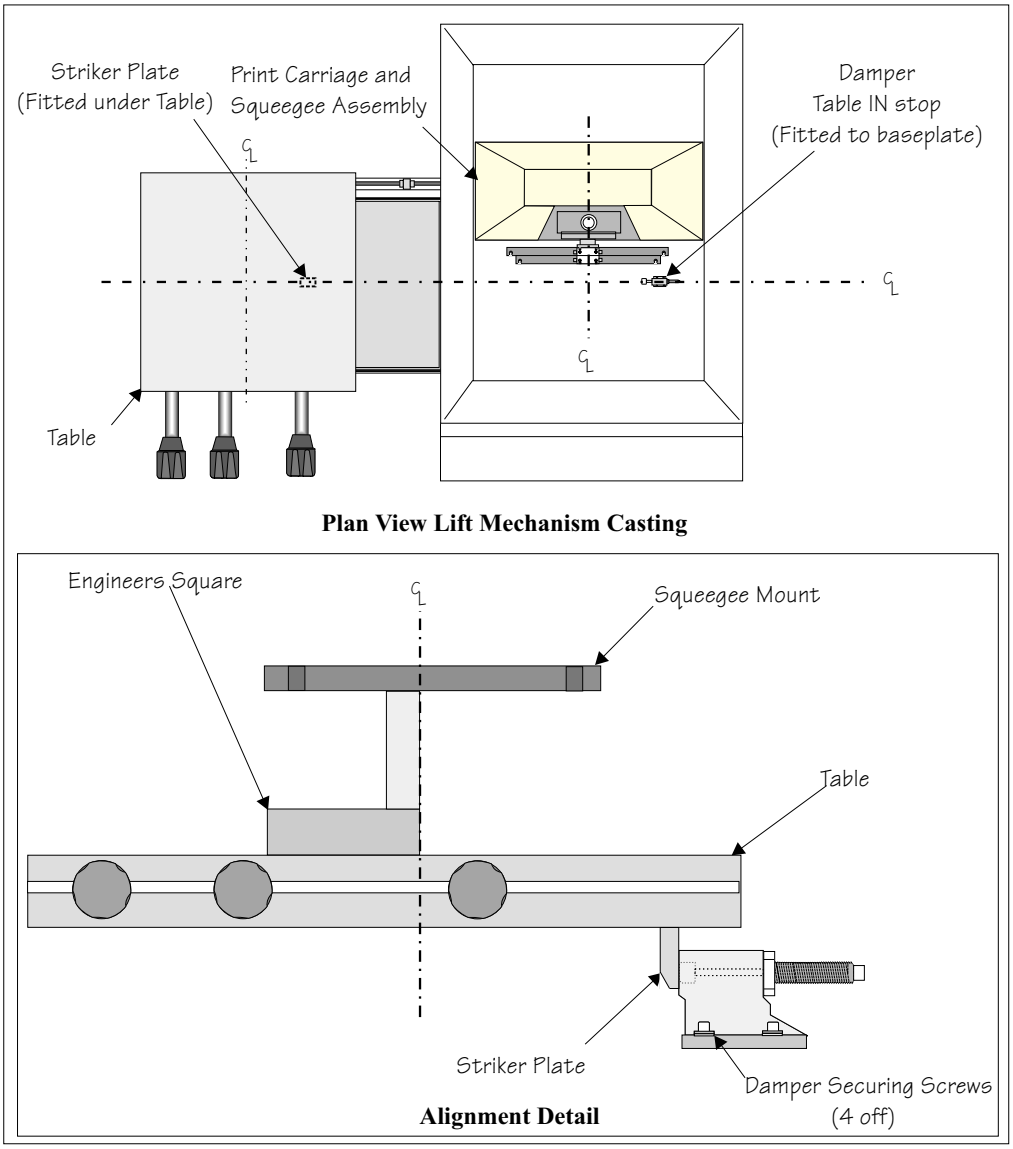


Figure 8 X Y Table Setting

Table Settings Settings required for the components of the table are as follows:-

Table Casting The X Y table assembly comprises the subassemblies listed below.

- X Y tool plate
- Floating Plate
- Base plate

The X Y assembly is carried on the lift mechanism casting, which in turn is mounted from the table lift mechanism located beneath the printhead.

X Y tool plate The X Y tool plate has no requirement for settings.

Base Plate (fixed) The Base-plate is carried on linear bearings attached to the table casting. The base plate carries the mounting for :

1) Positioners. At manufacture, each positioner micrometer screw is mounted so as to centralise the floating plate when the positioners are zeroed and should not require further adjustment.

2) Flap Register Supports. The four flap register support legs have vertical adjustment. Adjustments are made as part of the product set-up procedure.

Floating Plate The floating plate follows the current X Y positioner setting, under tension spring action. This position can be positively secured by energising two electromagnetic clamps.

Clamps Electro-magnetic clamps - Energising the two electromagnetic clamps secures the floating plate to the base-plate.

X Positioner Locking Mechanism The Clamp Actuator is a plunger situated under the table, viewed from the board loading side. This becomes active at the electromagnetic clamp ON state. The plunger locks the X Actuator to prevent possible damage to the X actuator gear when the clamps are on.

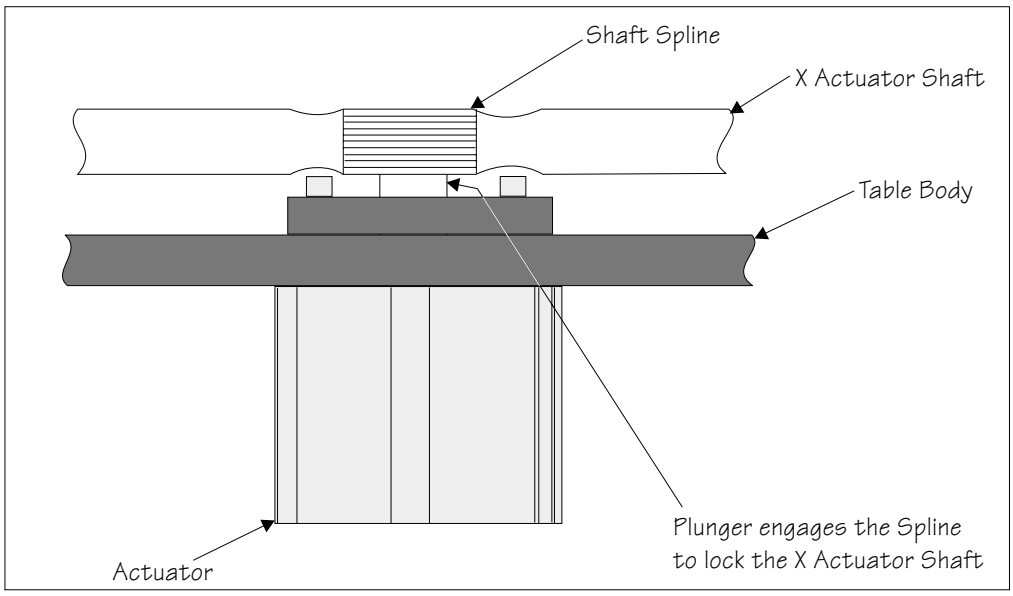


Figure 9 Actuator Clamp

Frame Refurbishment

Frames may be refurbished for re-use and the original flatness of the underside could be affected by the skimming or finishing process. Maintaining level between the table and the printhead carriage bars is particularly important in the direction of printing. Overall difference of +/- 0.002 ins is acceptable.

Clamps Clearance

In the de-energised state, clearance between clamp-face and underside of the floating table is 0.2-0.5 mm (0.004 - 0.006ins) this is set at the time of manufacture. This can be checked by:

- Energising the table clamps.

Use a set of feeler gauges to check the gap between the fixing plate and the adjusting plate. Set to correspond to the above dimensions.

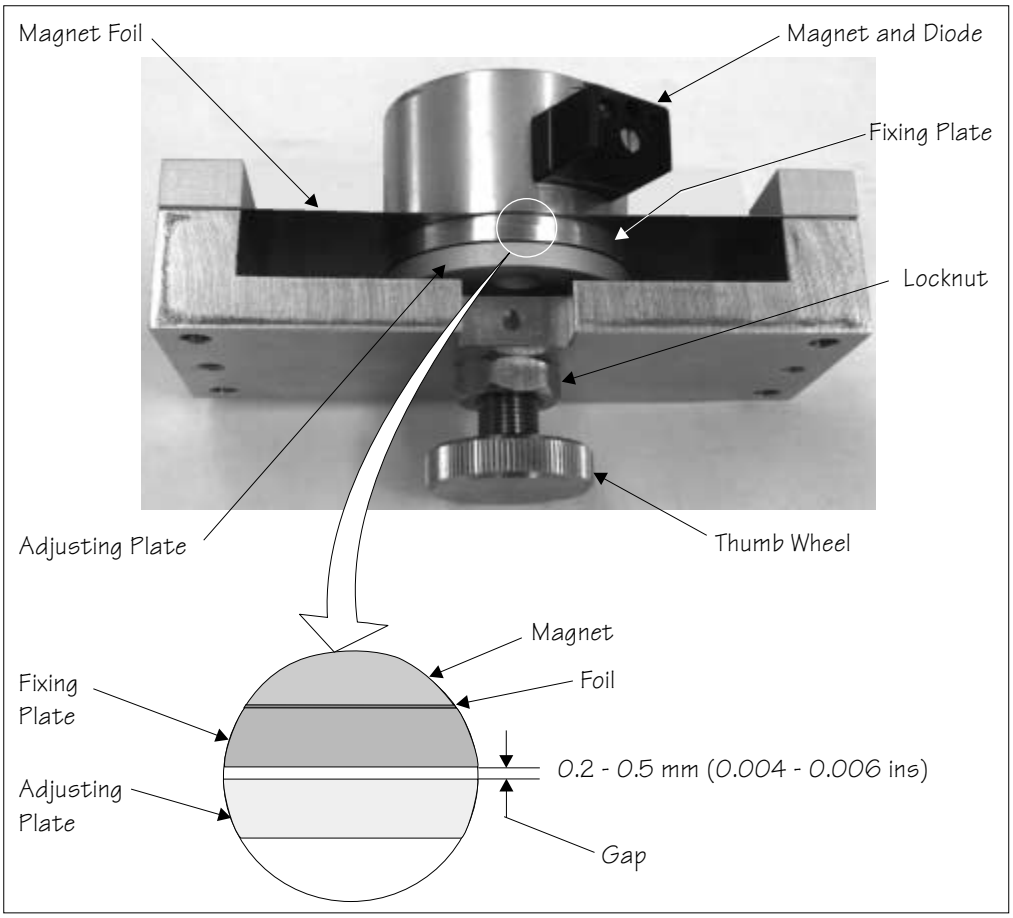


Figure 10 Clamp Setting (gap)

TABLE LIFT ASSEMBLY

Introduction

The table lift mechanism performs the print height function. Table lift is controlled by an electrically driven linear actuator. Absolute position of the table is given by a position transducer attached to the mechanism.

Limit switches serve as hard wired checks for the transducer position.

Total range of table movement is constrained by two considerations:

a) Table lower limit of travel. Table support legs pass through the printhead structure onto the table lift assembly. The table at the lowest point must clear the structure by 2 mm. This sets the lowest allowable limit.

b) Table upper limit of travel. This must be set to prevent damage by collision of the table with the screen.

The limit is set to correspond to 1.5mm penetration of the table into the underside of a screen fitted to a standard frame of 1 inch (25mm) frame depth.

Mechanical Stop

At the table-lift lowest position a mechanical stop setting prevents clash of the table with the printhead structure.

Transducer

The linear resistance type transducer returns an analogue (voltage) signal corresponding to the current table position. The calibration procedure of the transducer sets the zero position and the slope of the output (transducer displacement measured in mm/volt).

Limit Switches

Two limit switches are fitted. Under normal operation the transducer is used to control the table position, the limit switches performing a backup function only, as a protection to the actuator mechanism.

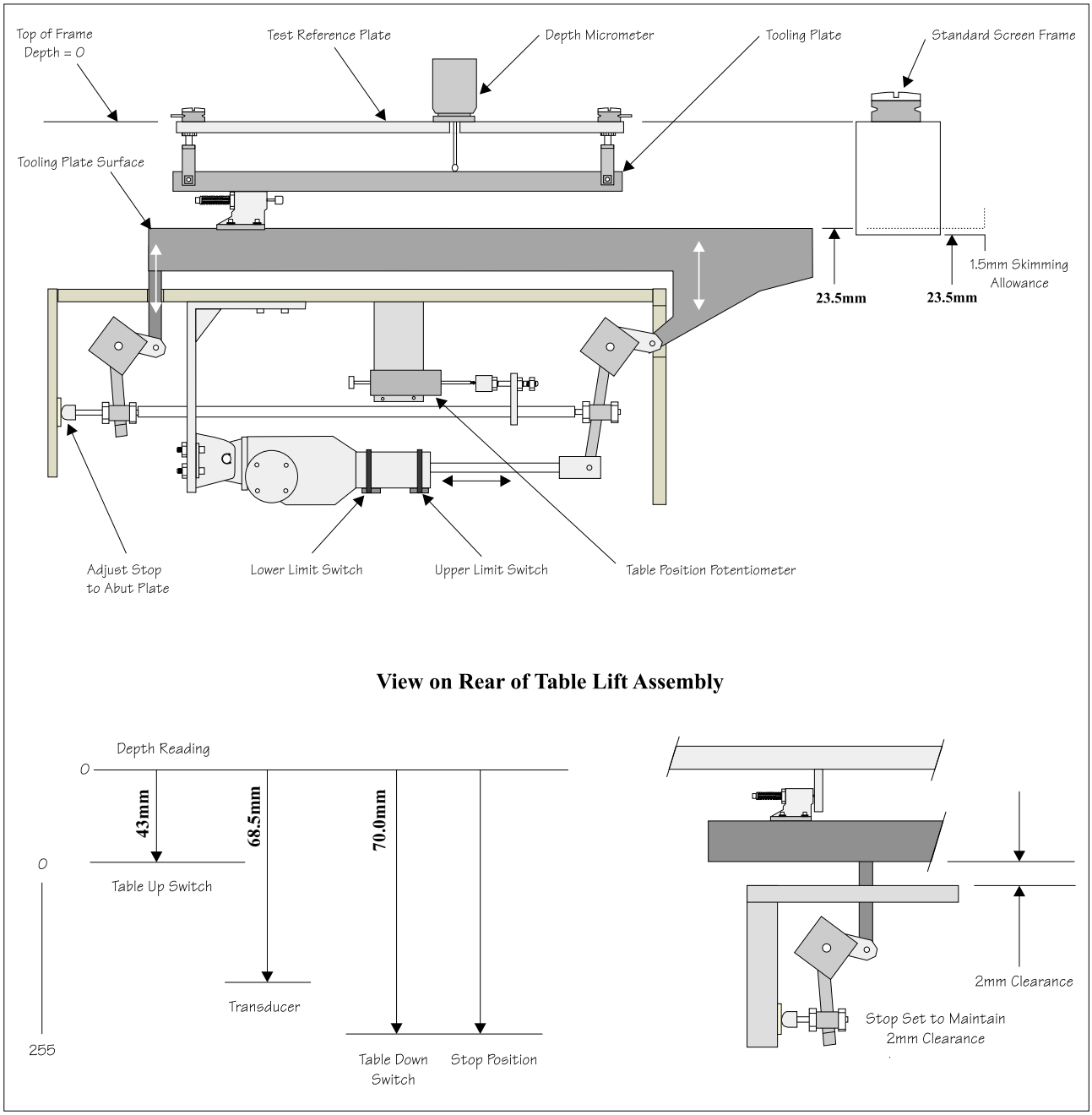


Figure 11 Table Lift Calibration

The Standard Frame

Measurements of table position are made with a depth micrometer, through cut-outs made in the solid base of the test frame. A depth of 25mm from the upper surface of the base corresponds to the lower surface of a standard stencil.

Switch settings are made at each appropriate reading of the depth micrometer as the table is lowered.

PROCEDURE

Calibration procedure of the lift transducer and setting of the associated limit switches used for error detection follows:

Mechanical Stop

The cross-shaft of the 4-bar link assembly is fitted with an adjustable mechanical stop. The presence of the stop affixed to the structure ensures that table casting cannot descend so as to clash with the structure.

Set the Mechanical stop using the procedure following:

1) Locate RV3 potentiometer on the Processor Board in the Service Tray. Set the potentiometer, RV3 (Table Height Display Adjustment) fully anti-clockwise. Ensure that the RS table is under the printhead and on the Table - in Sensor.

2) Drive the table down until there is a gap of 2mm above the chassis. Ensure the mechanical down stop is clear.

3) Adjust the transducer striker plate manually to obtain a display reading of 254-255.

4) Set the Table Down switch on the actuator to just On (Diagnostics display input page).

5) Insert a reference test plate into the screen chase assembly, this plate should be designed to allow a depth micrometer to gauge the depth from the zero reference point at the top of the reference plate surface to the full depth of the tooling plate travel.

6) Drive the table up until the depth gauge reads 43mm. This corresponds to the depth of (19.5mm) tooling on the tooling plate plus the depth of a standard screen of 23.5mm.

7) Manually adjust the transducer striker plate so that the display reads zero (flickering 1).

8) Set the Table Up switch to indicate just Off, on the display.

9) Drive the table down until the depth micrometer reads 68.5mm.

10) Adjust the potentiometer RV3 to give a display of 255 (flickering 254).

11) Drive the table down to display a reading of 70mm on the depth Micrometer.

12) Adjust the Table Down switch to display just On, on the Display Input Page.

13) Make adjustment to the Down Stop on the link shaft until it just abuts the striker plate, secure the adjustable down stop.

REPLACING THE CONTROL BOARD

Procedure

Using the original Control Board, check the following:

1) Select Diagnostics.
2) Select Output Tests and Enter.
3) Manually place the Print Carriage in its centre of travel.
   Note the Print Carriage position as shown on the display.
4) Select Cycle RS In/Out.
5) Select GO. The Table moves in.
6) Select UP arrow followed by GO, the Table rises up.
7) Watch the Table as it rises up. Select Enter to stop the Table rising up as soon as the Table has cleared the down position. Note the reading on the display.
   NOTE
   The printed circuit contains a Lithium battery to back-up system configuration parameters. The information can be downloaded to PC using the DEKLink option prior to removal of the board from the machine.
8) Remove the old Control Board.

Fit the new Control Board.

CAUTION. ANTI-STATIC HANDLING.

Standard precautions must be adhered to when handling electronic cards and configuring and inserting into enclosures.

9)Power up the machine and select Diagnostics.

10) Select Output Tests.
11) Select Up Arrow to locate Carriage Fwd.
12) Adjust RV4 until the display reads the same value as noted in Step 3.
13) Select RS Table up. Adjust RV3 to obtain the reading displayed in Step 7.

Exit Diagnostics and run the 248CE to test.

COVERS

Introduction Covers are fitted with safety switches to provide protection to personnel from mechanisms of the printer.

Switch Setting Each switch is activated by a magnet mounted on the moving part.
Setting requires only that the magnet activator lies exactly over the reed switch housing in the cover closed position.

SERVICE TRAY

Introduction Settings within the service crate are required for:

1) Print carriage stroke calibration.
2) Air pressure switch (Factory set).
3) Vacuum regulation(Factory set).
4) Table Height Calibration.
5) Input Voltage (Factory set)

Stroke Calibration Setting RV4 potentiometer on the processor board, calibrates the display setting of Print Carriage adjustment.

Air Pressure Switch The air pressure switch is set to open when the regulated air pressure drops below to 3.5 bar (50 psi).

Vacuum Regulation A Regulator located within the service crate in the compressed air supply line to the vacuum generator may be used to regulate the vacuum available at the tooling.

The vacuum produced at the tooling is decreased as the air supply flow to the vacuum generator is reduced.

1) Sufficient vacuum to support the board only is required. for dedicated tooling reduction of the vacuum at the board may assist release of the stencil from the board following print (peel-off) where the board has through holes that can allow the vacuum to leak to the underside of the screen.
2) Minimum vacuum level setting reduces the air consumption.

Table Height Calibration Table height display is calibrated by adjusting RV3 on the processor board of the Service Tray.

CHAPTER 8 SENSOR LISTING

SENSOR LISTING

SENSOR LISTING

INTRODUCTION

Sensors provide the control system with the information on the logical state of the mechanism.

Name	Type	Assembly	Circuit Ref	Elect. Drwg	G.A. Drwg
Table-in (RS in)	Reed switch	X Y Table	6S3	131088	
Table-out (RS out)	Reed switch	X Y Table	6S4	131088	
Table-Up	Reed switch	Table Lift	6S2	131088	248067
Table-Down	Reed switch	Table Lift	6S1	131088	248067
Front Squeegee Down	Reed Switch	Print Carriage	2S3	131441	248068
Rear Squeegee Down	Reed Switch	Print Carriage	2S4	131441	248068
Cover	Reed switch	Main Machine GA	2S2	131441	248236
Cover	Reed switch	Main Machine GA	2S1	131441	248236
Air Flow Switch	Microswitch	Service Tray	1S3	144712	248062
Table Position	Lin. Resistance	Table Lift	6RV1	131088	248067
Print Carriage Position	Linear Pot	Printhead	2RV1	131441	248065

List of Sensors

The table above shows the list of sensors used on the 248CE printer. Each sensor has a reference number and a corresponding location diagram where the sensor can be found.

Circuit reference is that of sensor as it appears on the electrical circuit diagram and the electrical circuit diagram drawing number is given, (248 Mechanical and Electrical Drawings Manual refers.)

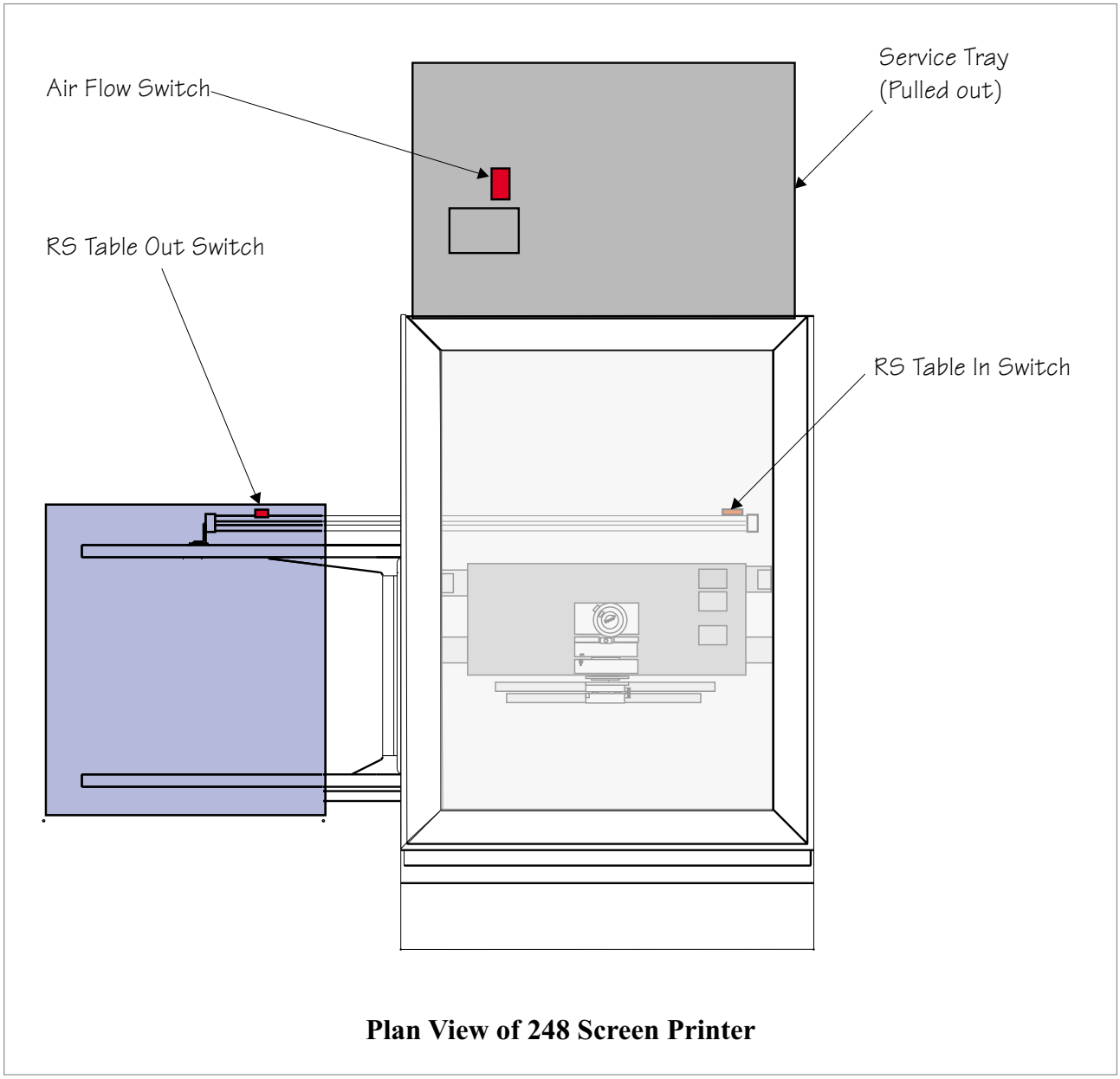
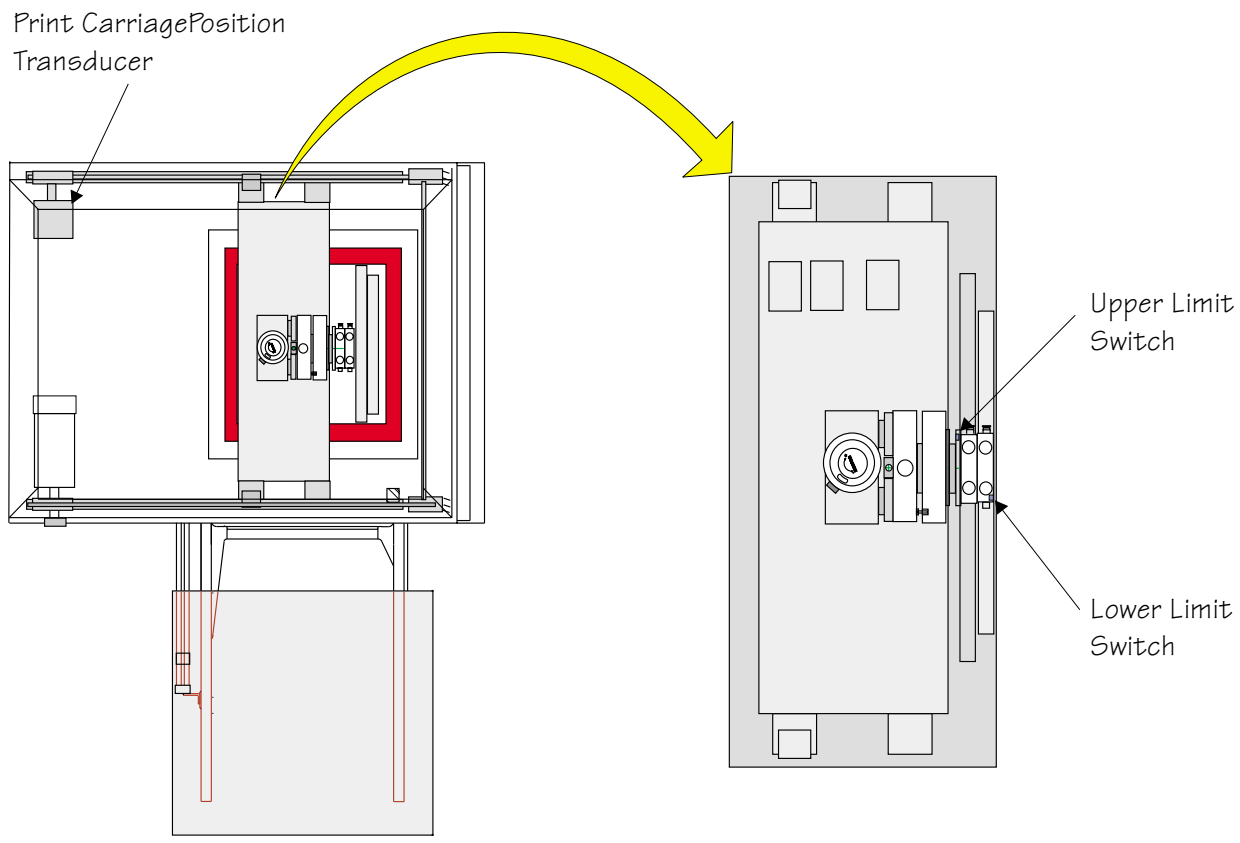
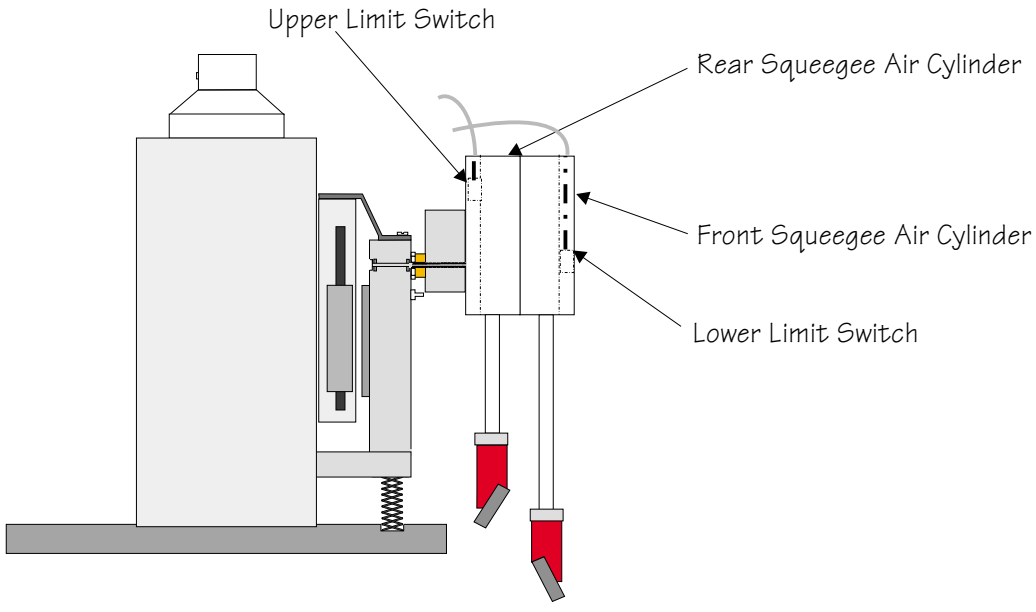


Figure 1 Sensor Location Diagram, Sheet 1

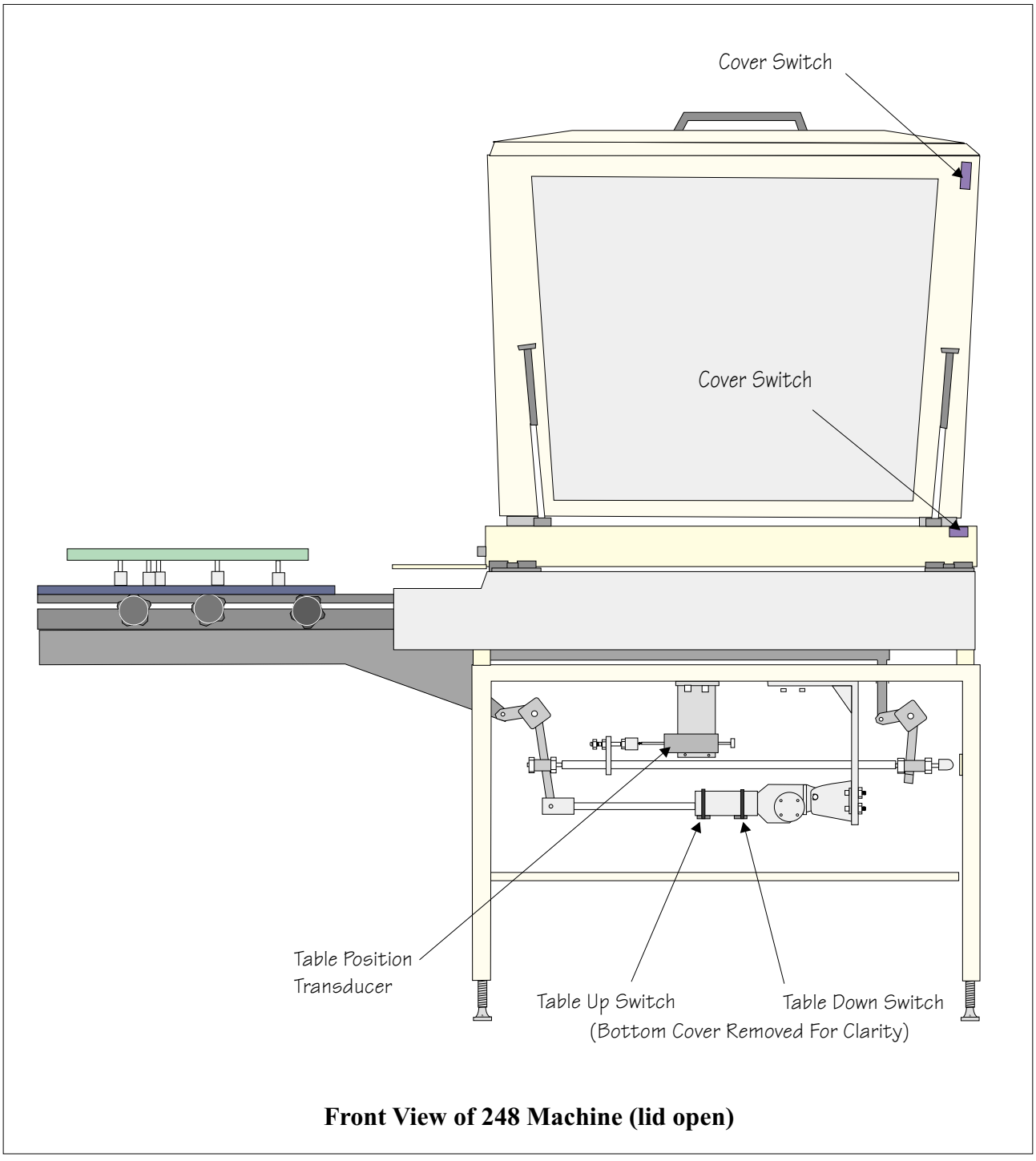


Plan View of Printhead Assembly



View on Left Side of Squeegee Housing

Figure 2 Sensor Location Diagram, Sheet 2



Front View of 248 Machine (lid open)

Figure 3 Sensor Location Diagram, Sheet 3