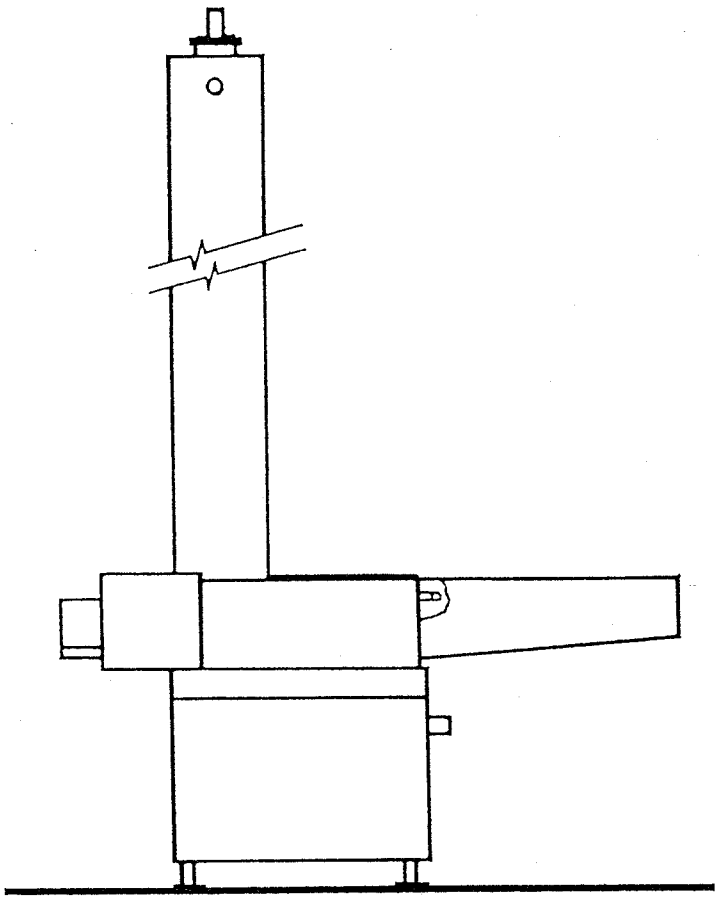

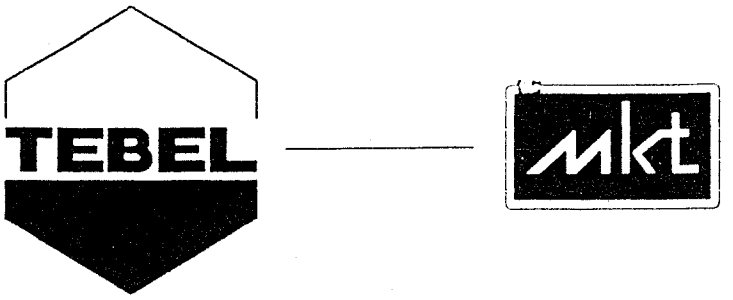

CUSTOMER: Warrnambool Milk Products
Ocean Road
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Victoria
Australia

INSTALLATION DATE: February 1993

MACHINE SERIAL NUMBERS: 001295, 001296, 001297,
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BLOCKFORMER MANUAL

Publication No. BFALLAN9212 Contract No. 1860.000

MANUFACTURER'S REFERENCE: BFALLAN9212

IMPORTANT NOTICE The manual supplied is for a standard Block Former.

TEBEL-MKT will only warrant that the Goods are free from defects resulting from faulty design, construction, materials and workmanship.

Publication No. BFALLAN9212 Contract No. 1860.000

CONTENTS OF MANUAL

SECTION 1

OPERATING INFORMATION

CONTENTS

CHAPTER 1 - GENERAL INFORMATION

1.1 INTRODUCTION

The information contained in this manual is intended to provide the operator with a basic understanding of the construction and function of the Continuous Block Forming Machine (Block Former).

The Block Former provides a continuous system for fusing both milled and stirred types of salted cheese curd into standard 40lb (18kg) blocks without the use of hoops, presses, or similar appliances. The whole operation is carried out under vacuum, and rapidly produces blocks of a uniformly close internal texture which are vacuum bagged upon discharge.

The Block Former is an integral part of the continuous block forming system which has been developed following many years of intensive research. The block forming system consists of the following plant items:

(1) Curd pick-up system

(2) Block Former and control panel

(3) Vacuum sealing machine

(4) Maturation boxes

The block forming system is in turn one component of the Tebel-MKT modular cheese making system, which permits a wide variety of plant configurations to be constructed according to individual customer requirements.

For a fuller understanding of the cheese production process at a particular plant, it is suggested that Chapter 2 in this manual - Technical Information - is read in conjunction with the corresponding Chapters in the other manuals comprising the Plant Operating Manual set.

1.2 APPLICATION

The standard Block Former is designed for the manufacture of Cheddar and similar hard cheeses as a part of a continuous process, although the machine has been successfully employed in batch systems.

Curd remains in the Block Former for approximately 30 minutes. The dimensions of the block are adjustable, and block weights of between 40 and 44lb (18-20kg) can be produced.

Nominal throughput capacity of the Block Former is 1500lb (680kg) per hour.

1.3 BENEFITS AND ADVANTAGES

The Block Former cheese production system offers a number of advantages over conventional systems, and these are outlined below:

(1) Fully mechanised production

(2) Continuous processing

(3) Reduced floor space requirement

(4) No special foundations

(5) No hoops or associated equipment

(6) Effective weight control

(7) Elimination of press room work

(8) Control of all whey discharge from pressing

(9) Minimal curd losses

(10) Consistent moisture content

(11) Improved temperature control

(12) Cleaning in place facilities

CHAPTER 2 - PLANT DESCRIPTION

2.1 PROCESS DESCRIPTION

Milled, salted curd is conveyed to the Block Former via a pipe connected to the tower top. The tower contains a partial vacuum which acts to draw curd along the pipe, and into the tower via a curd feed valve. The curd falls to collect in a continuous mass within the tower, and is contained within perforated screens, forming a column in which pressure increases from top to bottom due to the weight of the curd. Surplus whey is squeezed from the curd by the pressure, and is drawn off through the screen by the surrounding partial vacuum. A sensing probe at the top of the tower causes the curd valve to close when the tower is full.

The bottom of the curd column rests on a horizontally acting guillotine blade, actuated by a pneumatic ram. The blade is withdrawn when a block is required, allowing the column to settle onto an elevator platform immediately below. The platform is lowered, allowing the column to descend a predetermined distance (adjustable), and the guillotine blade then closes to cut the block from the curd column. As the column is lowered, the top probe is exposed, and the curd valve re-opens to admit more curd to 'top up' the tower.

The elevator platform is raised and applies pressure to the block to ensure final consolidation of the cheese; after a predetermined interval, the platform is fully lowered.

When a signal from the operator is received, showing that a bag is in position on the bag loader, an ejector pushes the block into the bag. The ejector then retracts, the door closes, and the cycle is repeated.

Each time the door is opened, whey is drained from the elevator chamber via an automatic drain valve.

After bagging, the block is immediately transported to a vacuum sealing station. The sealed blocks are placed in a maturation box which holds their shape until the cheese is fully cured. If this last step is incorrectly carried out, the cheese blocks may assume unacceptable shapes during the maturation process.

2.2 BLOCK FORMER CONSTRUCTION

2.2.1 Vacuum Pump

The basic principle of operation of the Block Former depends on the use of a partial vacuum to condition the curd, and to assist in the fusion of the curd into blocks of cheese. To ensure reliable and efficient vacuum production, a Rootes type vacuum pump is utilised, and forms a part of a vacuum set comprising pump, electric motor and water injector mounted in a steel frame. Water is injected into the pump intake line to reduce operating temperatures and to effect an efficient seal around the rotors.

2.2.2 Interceptor Vessel

A stainless steel vessel is interposed between the vacuum pump and the Block Former to provide a vacuum reserve which buffers uneven demand from the tower and base units, and prevents any small particles of curd or whey passing through into the vacuum pump.

The vessel has four top ports: two for connection of distribution valves (one each for tower vacuum and chamber vacuum); one for spray ball fitting; one for the main vacuum line to the pump. A bottom port acts as the CIP return. A flanged top cover is fitted which can be removed for inspection and swab tests.

2.2.3 Tower

The Block Former tower comprises a drainage screen mounted inside a fully welded stainless steel jacket of sufficient strength to withstand operation under partial vacuum. The tower assembly is mounted upon the lower chamber and base unit, the junction being sealed by a gasket.

The stainless steel drainage screen has been developed to permit whey to flow through without allowing curd fines to pass or to block the perforations. The design allows drainage between the screen and the jacket throughout the height of the tower, and assists the column of curd to move downward without obstruction.

2.2.4 Lower Chamber and Base Unit

The chamber and tower assemblies are mounted on a frame which is enclosed by stainless steel cover plates and houses solenoid operated pneumatic valves and other control equipment.

The chamber is divided into front and rear sections. The front section, called the forming chamber, contains the elevator, guillotine, door, and ejector. The rear section forms a separate compartment and houses the whey drain and sump.

The elevator is actuated by a compound pneumatic actuator, and the operating stroke can be varied to control the cut-off height of blocks (to adjust block size). Block sizes may be varied in height within the range 160mm to 190mm. The guillotine, door, and ejector are operated by simple pneumatic actuators, and stroke length cannot be adjusted. Operating speed of all pneumatic actuators can be adjusted by means of throttle screws.

2.2.5 Weight Control System

Adjustments to the weight control system are made by moving the "back-off" position of the elevator actuator either up or down via the electric motor. This is done using a pair of pushbuttons acting through a reversing contactor (not supplied) mounted in the MCC.

If required, pushbuttons can be mounted in a remote position, for example by weigh scales, or in supervisor's office for authorised use only.

2.2.6 Bag Loader

The bag loader is mounted immediately in front of the lower chamber door and provides the means of holding a bag in the correct position to receive a newly formed block without handling. This ensures that the possibility of contamination of the cheese before it is sealed is kept to an absolute minimum.

The bag loader consists of upper and lower plates which are moved apart by a pneumatic actuator to tension the bag mouth and hold the bag firmly as a cheese block is ejected into it. The actuator is under manual control, and operation serves to initiate the automatic block forming cycle.

The bag loader is fully shrouded and complies with the most stringent safety requirements.

CHAPTER 3 - OPERATING INSTRUCTIONS

It is important that operating instructions are followed carefully to ensure consistent results of the required quality.

3.1 SAFETY

The following precautions should be observed by the operator:

(1) Do not work in the vicinity of noisy machinery without wearing suitable hearing protection.

(2) Treat all moving machinery as potentially dangerous.

(3) Do not run equipment with guards or covers removed.

(4) Do not put hand into any part of the equipment.

(5) Do not interfere with any control settings or overrides unless fully qualified to do so.

(6) Do not allow the accumulation of any leakages or spillages of curds or whey near the machine.

3.2 PRELIMINARY PROCEDURE (START-UP)

3.2.1 Tower Pre-Heating

It is recommended that prior to commencement of production, the tower should be preheated using warm water or warm sterilising solution (depending on availability and preference) from the CIP plant.

3.2.1 Curd Pick-Up

The operator should check the quality of curd awaiting delivery to the Block Former following milling, salting and mellowing.

Curd should be of even consistency and have medium particle size - oversize curd pieces may block the 63mm diameter curd feed line at the entry to the Block Former.

The production of 'fines' should also be avoided, as this could cause problems with consolidation and moisture content of the cheese.

The temperature of the curd entering the Block Former should be between 28 deg C and 32 deg C (82-90 deg F), and excessive cooling resulting from over-long periods of mellowing is to be avoided.

3.3 BLOCK PRODUCTION

During the production cycle, the operator should periodically monitor the quality of curd being delivered to the Block Former to ensure that the quality remains consistent.

3.3.1 Stoppages

If during a long stoppage the tower cannot be emptied, the curd should be prevented from drying onto the screen by keeping it wet.

This is best achieved by periodically sucking COLD water into the tower via the curd feed line. This will involve temporarily disconnecting the curd feed line and introducing cold water into the pipe (max. 20 litres).

3.4 CLEANING PROCEDURE

Cleaning the Block Former consists of manual cleaning of the lower chamber and CIP cleaning of pipework and enclosed spaces.

3.4.1 Manual Pre-Clean

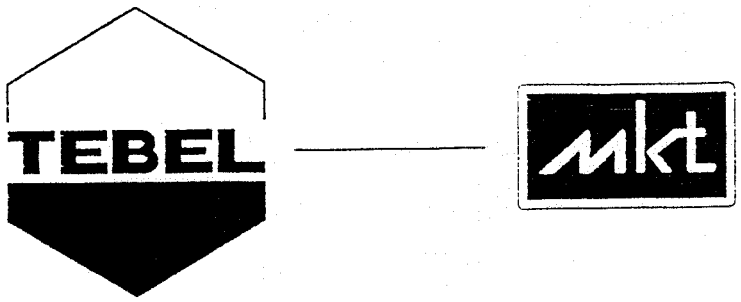
(1) Press EMERGENCY STOP button on control panel.

(2) Remove front guard.

(3) Hand clean door area, bag trays, and guard.

(4) Replace front guard.

(5) Hose out the rear chamber with warm water.



SECTION 2

MAINTENANCE

CONTENTS

CHAPTER 3 - FAULT FINDING

TABLES

CHAPTER 1 - ROUTINE MAINTENANCE

1.1 INTRODUCTION

It is important that the maintenance schedules are carried out fully at the recommended intervals to ensure continued optimum performance of the equipment, and to minimise down time.

By carrying out regular preventative maintenance, any gradual deterioration of components can be noted, and action taken to correct potential problem areas before they result in equipment failure. The plant can also be 'fine tuned' to achieve optimum performance during production, or adjusted to suit curd type/quality variations.

Maintenance checks should be made when plant is idle to avoid loss of production time.

1.2 SAFETY

The following precautions should be observed while carrying out maintenance procedures:

(1) Do not work in the vicinity of noisy machinery without wearing suitable hearing protection.

(2) Do not attempt maintenance work without wearing suitable protective clothing and eye protection.

(3) Treat all moving machinery as potentially dangerous.

(4) Isolate electrical supply before carrying out any adjustments, or removing any protective guards or shrouding.

(5) Do not run equipment with guards removed.

(6) Do not attempt to make any adjustments while machinery is running.

(7) Ensure that vacuum is exhausted before working on evacuated areas.

(8) Ensure that all pressure is exhausted before working on the pneumatic system.

1.3 MAINTENANCE SCHEDULES

Plant should be inspected daily, weekly, quarterly and annually as detailed below. If the Block Former is to be shut down for an extended period, the shut down servicing procedure should be carried out to ensure trouble free restarting following the shut down.

1.3.1 Daily Checks

(1) Check that the Emergency Stop pushbutton functions correctly.

(2) Check that safety guards are fitted correctly.

(3) Check correct operation of all safety switches.

(4) Check that the auto-drain valve in the air supply line is functioning correctly.

1.3.2 Weekly Checks

(1) Check speeds of cylinders and adjust if necessary.

(2) Check for air leaks.

(3) Check sensor settings.

(4) Check for extrusion of door seal (trim if required).

(5) Check bag loader mechanism is correctly aligned.

(6) Check oil level in vacuum pump.

(7) Check guillotine closed clearance.

(8) Check that ejector rod and guide rod are securely fitted to ejector plate.

(9) Check the condition of the filter in the air set. Clean filter if necessary.

1.3.3 Three Monthly Service

(1) Check door, chamber and guillotine seals for wear (replace if necessary).

(2) Check torque of tower to base fixing bolts. These bolts should be tightened to 30 lb/ft.

(3) Check vacuum pump belts for wear and tension.

(4) Replenish grease in vacuum pump and pump motor.

1.3.4 Annual Service

(1) Check operation and correct adjustment of all safety switches and solenoid valves. Annual replacement of main guard and rear cover safety switches is recommended.

(2) Check actuator and valve seals, air lines etc. for signs of wear, damage, contamination, or ageing. Routine annual replacement is recommended.

(3) Strip and clean vacuum pump and replace lubricants (lithium base grease and oil to SAE 40).

1.3.5 Shut-down Service and Maintenance

(1) Ensure that no curd particles are left in the tower or chamber of the Block Former. A second CIP cycle, including an acid rinse, may be advisable.

(2) Move the door, guillotine and bag spread cylinders to a mid-stroke position to ensure that they are not resting on their cushion seals.

(3) Lubricate door open/closed switches with a silicon based grease.

(4) Clean pipeline between vacuum pump and interceptor.

(5) Shut off water supply and drain down suction line.

(6) Strip down vacuum pump and reassemble using new grease and oil (lithium base grease and oil to SAE 40). Blank off inlet and outlet ports.

(7) Rotate pump manually once per week to prevent seizing in position.

(8) Check that the auto-drain valve in the air supply line is functioning correctly.

1.3.6 Start Up Procedure

(1) Carry out all the recommended weekly, 3 monthly and annual checks.

(2) Ensure ease of rotation of vacuum pump by hand before starting.

(3) Thoroughly clean the tower and chamber of the Block Former. A double CIP cycle with acid rinse may be advisable.

(4) Swab test interior of Block Former.

> DO NOT START PRODUCTION UNTIL COMPLETELY SATISFIED WITH CONDITION OF BLOCK FORMER.

Table 2.A - Recommended Speeds and Pressures

Item	Pressure
Min. system pressure	5.5 Bar (80 psig)
Max. system pressure	6.9 Bar (100 psig)
Pressure (top of elevator cylinder)	1.75 Bar (25 psig)
Pressure (bottom of elevator cylinder)	3.5 Bar (50 psig)
Elevator cylinder down speed	2.54 cm/sec (1"/sec)
Elevator up speed	8.0 cm/sec (3"/sec)
Guillotine operating speed (both ways)	8.0 cm/sec (3"/sec).
Ejector operating speed (both ways)	13.0 cm/sec (5"/sec).
Door lock speed (both ways)	5.0 cm/sec (2"/sec).
Back off speed (both ways)	8.0 cm/sec (3"/sec).

CHAPTER 2 - SERVICING

Figure references in this section are to figures in Section 4 of this manual, the Illustrated Parts List.

2.1 GUILLOTINE ACTUATOR

2.1.1 Removal (Refer to Section 4, Figures 4.1 and 4.2)

(1) On control panel, ensure that all H-O-A switches are OFF.

(2) Press EMERGENCY STOP button.

(3) Turn off main air at rear of base unit.

(4) Switch off electrical supply to machine.

(5) Remove chamber cover and rear cover.

(6) Disconnect pneumatic lines from guillotine actuator (4.1-50) after noting orientation.

(7) Loosen adjusting nut (4.1-7) and unscrew piston rod from guillotine (4.1-6).

> NOTE: Care must be taken not to mark the piston rod in any way.

(8) Remove adjusting nut (4.1-7).

(9) Remove reed switches (12-40) from actuator cylinder (4.1-50) after noting orientation.

(10) Remove 4 x M10 x 15 hexagon socket screws to disconnect ejector actuator support brackets from rear of guillotine actuator.

(11) Remove 4 x M12 x 40 bolts (4.1-40), washers (4.1-45), remove actuator from machine, taking care not to damage rod seal (4.1-16).

2.1.2 Dismantling (Refer to Figure 4.2)

With the actuator removed from the machine and placed on a clean bench, proceed as follows:

(1) Remove 4 x cap screws (4.2-27) and remove mounting flange (4.2-26).

(2) Remove 4 x hexagon socket nuts (4.2-17).

(3) Remove both end caps (4.2-2 and 4.2-3) from actuator cylinder.

(4) Using a small screwdriver, remove rod seal (4.2-10).

(5) Remove piston rod bush (4.2-8).

(6) Taking care not to damage housing, remove front and rear cushioning seals (4.2-14).

(7) Unscrew cushioning needle (4.2-24) and remove 'O' ring (4.2-25).

(8) Unscrew cushioning needle housing (4.2-21) and remove both 'O' rings (4.2-22 and 4.2-23).

(9) Remove end cap 'O' rings (4.2-12).

(10) Remove nut (4.2-9) from piston rod (4.2-4).

(11) Remove piston assembly and check for wear on piston cups (4.2-5).

2.1.3 Reassembly (Refer to Figure 4.2)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure.

(1) Clean all components thoroughly.

(2) Fit front cushioning sleeve (4.2-13) to piston rod (4.2-4).

(3) Fit 'O' ring (4.2-20).

(4) Fit front pad (4.2-7) and piston cup (4.2-5).

(5) Fit piston (4.2-6) together with wear ring (4.2-18).

(6) Fit piston cup (4.2-5) and rear piston pad (4.2-7).

(7) Fit 'O' ring (4.2-20), cushioning sleeve (4.2-13) and cushioning sleeve guide (4.2-11) to piston rod (4.2-4).

(8) Apply a small quantity of thermatite or equivalent to piston rod in the region of rear pad (4.2-7) and cushioning sleeve (4.2-13) and fit end nut (4.2-9).

(9) Refit end cap 'O' rings (4.2-12).

(10) Refit 'O' rings (4.2-22 and 4.2-23) to cushioning needle housing (4.2-21) and refit in end covers.

(11) Refit 'O' ring (4.2-25) to cushioning needle (4.2-24) and replace in housing (4.2-21).

(12) Refit cushioning seals (4.2-14) in end caps.

(13) Refit piston rod bush (4.2-8).

(14) Refit piston rod seal (4.2-10).

(15) Replace front and rear end caps (4.2-2 and 4.2-3).

(16) Refit and tighten 4 x hexagon socket nuts (4.2-17).

(17) Refit front mounting flange (4.2-26) using 4 x capscrews (4.2-27).

(20) Connect mains air to inlet port in front cap (4.2-2) and check for leaks past 'O' rings (4.2-12).

(21) Check for leaks past cushion needle housing washer (4.2-22), 'O' ring (4.2-23) and needle 'O' ring (4.2-25).

(22) Check at port in rear cap (4.2-3) for leaks past piston cups (4.2-5) and 'O' ring (4.2-20).

(23) Repeat at 2 Bar and 7 Bar.

(24) Repeat by connecting air to inlet port in rear cap (4.2-3).

(25) Check that actuator cycles smoothly at 0.5 Bar.

(26) With air pressure set to 7 Bar, screw cushioning needles fully in and check that actuator comes to a virtual stop. On reversing actuator, check that there is no excessive jump as motion starts.

2.1.4 Refitting (Refer to Figures 4.1 and 4.2)

(1) Fit thimble onto end of piston rod.

(2) Fit piston rod through seal gland (4.1-16), taking care not to damage seal.

(3) Refit 4 x M12 bolts (4.1-40) and washers (4.1-45) and tighten.

(4) Refit ejector actuator support bracket to rear of guillotine actuator, securing with 4 x M10 x 15 hexagon socket screws.

(5) Fit reed switches (4.2-40) to actuator cylinder, securing with 2 x grubscrews.

(6) Remove thimble. Fit adjusting nut (4.1-7) fully onto piston rod.

(7) Screw piston rod fully into guillotine blade boss (4.1-8).

(8) Connect pneumatic lines to cylinder, noting orientation.

(9) Fit rear chamber cover.

(10) Turn on main air at rear of base unit.

(11) Switch on electrical supply to machine.

(12) Unlatch EMERGENCY STOP button.

(13) Measure gap between front edge of guillotine and chamber.

(14) Press EMERGENCY STOP button.

(15) Remove rear chamber cover.

(16) Adjust piston rod interference in guillotine blade boss to give a maximum 0.127mm, minimum 0.25 mm, clearance between front edge of guillotine and chamber frame. Tighten adjusting nut (4.1-7).

(17) Unlatch EMERGENCY STOP and switch DOOR CLOSE to ON.

(18) Carry out vacuum leak test.

2.1.5 Guillotine Rod Vacuum Seal Removal (Refer to Figure 4.1)

(1) Follow steps 2.1.1 (1) to (8).

(2) Unscrew round nut (4.1-18) with suitable 'C' spanner.

(3) Remove seal gland (4.1-16) and gasket along piston rod.

(4) Remove gasket and 1 x wiper seal from seal gland (4.1-16).

(5) Clean thoroughly in paraffin, dry and inspect all parts for damage or excessive wear.

2.1.6 Guillotine Rod Vacuum Seal Refitting (Refer to Figure 4.1)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Inspect new seals.

(2) Fit new wiper seal into seal gland (4.1-16).

(3) Fit new gasket to seal gland (4.1-16)

(4) Fit thimble to guillotine piston rod.

(5) Slide seal gland (4.1-16) along piston rod and locate in rear plate.

(6) Refit round nut (4.1-18) and tighten fully. Trim any excess gasket material.

(7) Follow steps 2.1.4 (6) to (18).

2.2 EJECTOR ACTUATOR

2.2.1 Removal (Refer to Figures 4.1 and 4.3)

(1) On control panel, ensure all H-O-A switches are OFF.

(2) Press EMERGENCY STOP button.

(3) Turn off main air at rear of base unit.

(4) Remove main guard, chamber cover and rear cover.

(5) Disconnect pneumatic lines to ejector actuator (4.1-51) after noting orientation.

(6) Remove reed switches (4.3-28) from cylinder.

(7) Remove 2 x M6 bolts and washers from actuator support bracket.

(8) Extend ejector manually and unscrew ejector piston rod (4.3-3) and washer (4.1-31) from ejector plate (4.1-9), using flats provided

(9) Remove four M8 x 30 actuator mounting bolts (4.1-37) and washers (4.1-44) and remove actuator from machine, taking care not to damage seal (4.1-17) or piston rod support bearing (4.1-5).

2.2.2 Dismantling (Refer to Figure 4.3)

With the actuator removed from the machine and placed on a clean bench, proceed as follows:

(1) Unscrew and remove end covers (4.3-2, 4.3-3) from cylinder barrel.

(2) Withdraw piston/rod assembly from barrel..

(3) On front end cover, use small screwdriver blade to remove front rod seal (4.3-10) and 'O' ring (4.3-17) and cover gasket (13-12).

(4) Remove front rod bush (4.3-8), by gentle pressure from cylinder side.

(5) Remove 'O' ring (4.3-11) using small screwdriver.

(6) To dismantle piston, remove nut (4.3-9), and remove piston assembly from piston rod (13-4).

(7) Clean all parts thoroughly in paraffin, dry and inspect for damage or excessive wear.

2.2.3 Reassembly (Refer to Figure 4.3)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Clean all components thoroughly.

(2) Fit front pad (4.3-7), piston seal (4.3-5), piston (4.3-6), wear ring (4.3-14), rear piston cup (4.3-5) and rear pad (4.3-7) to piston rod (4.3-4), replacing worn components where necessary.

(3) Apply a small amount of thermatite or equivalent to piston rod (4.3-4) before fitting special locknut (4.3-9). Refit grub screw.

(4) Refit front rod bush (4.3-8).

(5) Replace 'O' Ring (4.3-11).

(6) Replace front rod seal (4.3-10).

(7) Refit and tighten both end covers to cylinder (4.3-1), noting port orientation (4.3-13).

(8) Connect main air to inlet port in front cover (4.3-2).

(9) Check for leaks past 'O' Rings (4.3-11 and 4.3-23).

(10) Check for leaks past seal (4.3-10).

(11) Check at open port in rear cover for leakage past seals (4.3-5 and 4.3-16).

(12) Check for leak at plug (4.3-17) in front cover.

(13) Repeat at 2 Bar and 7 Bar.

(14) Repeat by connecting air to inlet port in rear cover (4.3-3).

(15) Check that actuator operates freely at 0.5 Bar.

2.2.4 Refitting (Refer to Figures 4.1 and 4.3)

(1) Fit thimble to piston rod.

(2) Fit ejector rod through seal gland (4.1-17) and through support bearing (4.1-36), taking care not to damage seal (4.1-33).

(3) Refit 4 x M8 bolts (4.1-37) and washers (4.1-44) and tighten.

(4) Fit ejector rod complete with washer to ejector plate (4.1-9) using flats provided. Care must be taken not to damage ejector rod in any way.

(5) Refit 2 x M6 bolts and washers to secure ejector actuator to support bracket.

(6) Push ejector plate fully into chamber.

(7) Refit reed switches (4.3-28) securing with 2 off grubscrews.

(8) Reconnect pneumatic lines to actuator, noting orientation.

(9) Refit main guard and rear chamber cover.

(10) Turn on air at rear of base unit.

(11) Switch on electrical supply to controller.

(12) Unlatch EMERGENCY STOP button.

(13) Check operation of ejector by switching on controller and then turning EJECT to ON and OFF.

(14) Refit rear cover.

2.2.5 Ejector Rod Vacuum Seals - Removal (Refer to Figure 4.1)

(1) Follow steps 2.2.1 (1) to (9).

(2) Unscrew round nut (Figure 4.1-18) with suitable 'C' spanner.

(3) Remove seal gland complete with gasket.

(4) Remove gasket and wiper seal from seal gland (4.1-17).

(5) Clean thoroughly in paraffin, dry and inspect all parts for excessive wear.

2.2.6 Ejector Rod Vacuum Seals - Refitting (Refer to Figure 4.1)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Inspect new seal.

(2) Fit seal into seal gland (4.1-17).

(3) Fit new gasket to seal gland.

(4) Refit seal gland (4.1-17) and tighten round nut (4.1-18).

(5) Trim any excess gasket material.

(6) Follow steps 2.2.4 (1) to (14).

2.3 DOOR ACTUATOR

2.3.1 Removal (Refer to Figure 4.4)

(1) On controller, ensure all H-O-A switches are OFF.

(2) Press EMERGENCY STOP button.

(3) Turn off main air at rear of base unit.

(4) Switch off electricity supply to machine.

(5) Remove main guard.

(6) Disconnect air lines to cylinder after noting orientation.

(7) With door open, measure distance from rear edge of clevis to nose of cylinder.

(8) Loosen grub screw and remove pivot pin (4.4-14).

(9) Loosen grub screw and remove pivot pin (4.4-13).

The actuator can now be removed from the machine for seal replacement.

2.3.2 Dismantling (Refer to Figure 4.5)

With the actuator removed from the machine and placed on a clean bench, proceed as follows:

(1) Remove lock nut and clevis.

(2) Remove end covers and piston rod from cylinder.

(3) To remove front rod seal (4.5-10), insert small screwdriver blade under polyester wiper seal front section and lever seal out of groove.

(4) Extract rod bush (4.5-8).

(5) Remove cushioning seal (4.5-17) as described in Step (3) for front rod seal.

(6) To change cushioning needle 'O' ring (4.5-15), unscrew needle (4.5-18) and change 'O' ring.

(7) Change end cover 'O' ring (4.5-17), cushioning seal (4.5-17), needle'O' ring (4.5-15) and end cover 'O' ring (4.5-17) in rear cover as described in Steps (3) to (6).

(8) Remove locking grubscrew (4.5-11), then unscrew special locknut (4.5-9).

The piston unit can now be broken down and the worn seals removed.

2.3.3 Reassembly (Refer to Figure 4.5)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Fit front cushioning sleeve (4.5-13), 'O' ring (4.5-14), front pad (4.5-7), piston (4.5-6) complete with wear ring (4.5-8) and both piston cups (4.5-5) to piston rod.

(2) Fit rear pad (4.5-7) and rear cushioning sleeve (4.5-13), making sure that 'O' ring (4.5-14) is in position.

(3) Screw special locknut (4.5-9) to secure piston unit and finally fit locking grubscrew (4.5-11).

(4) Refit cushioning seals (4.5-17) in end caps.

(5) Refit rod bush (4.5-8) in front cap.

(6) Refit front rod seal.

(7) Refit wiper seal and front rod seal (4.5-10).

(8) Refit end caps to barrel.

(9) Refit locknut and clevis.

(10) Connect mains air to inlet port in front end cap (4.5-2).

(11) Check for leaks past seals (4.5-10, 4.5-12), also check open rear cap port for leaks past seals (4.5-5, 4.5-14).

(12) Repeat at 2 Bar and 7 Bar.

(13) Repeat using inlet port in rear cap (4.5-3).

(14) Check that actuator operates freely at 0.5 Bar.

(15) With air pressure at 7 Bar, screw cushioning screws (4.5-18) fully in. This should give a hard cushion and bring actuator to a virtual stop.

(16) On reversing actuator, check that there is no excessive jump as motion starts.

2.3.4 Refitting to Machine (Refer to Figure 4.4)

(1) Replace locknut (4.4-15) and clevis to piston rod, using previous measurement made between rear edge of clevis to cylinder nose at Step 2.3.1 (7).

(2) Place actuator in position on door and fit pivot pin (4.4-13). Locate dimple on pivot pin and tighten grubscrew.

(3) Fit pivot pin (4.4-14). Locate dimple on pivot pin and tighten grubscrew.

(4) Reconnect air lines to actuator.

(5) Turn on main air at rear of base unit.

(6) Switch on electricity supply to machine.

(7) Unlatch EMERGENCY STOP button and test door for correct operation by switching DOOR CLOSE to ON and OFF.

2.4 BAG SPREAD ACTUATOR

2.4.1 Removal (Refer to Figure 4.6)

(1) On control panel, ensure all H-O-A switches are OFF. Press EMERGENCY STOP button.

(2) Turn off main air at rear of base unit.

(3) Switch off electricity supply to machine.

(4) Remove main guard (4.6-13) and lower guard (4.6-18).

(5) Disconnect air lines to actuator after noting orientation.

(6) With upper tray in down position, measure distance from rear edge of clevis to nose of cylinder.

(7) Loosen locknut (4.6-4) and unscrew piston rod from beam (4.6-7).

(8) Remove 2 screws (4.6-5) and washers (4.6-6).

The actuator can now be removed from the machine for seal replacement.

2.4.2 Dismantling (Refer to Figure 4.7)

With the actuator removed from the machine and placed on a clean bench, proceed as follows:

(1) Remove locknut (4.7-19).

(2) Unscrew end caps (4.7-2, 4.7-3) and remove from cylinder barrel (4.7-1).

(3) Remove piston assembly from cylinder barrel (4.7-1).

(4) To remove front rod seal (4.7-10), insert small screwdriver blade under polyester wiper seal front section and lever seal out of groove.

(5) Extract rod bushes (4.7-8) and end cover washers (4.7-12) from both end caps.

(6) Remove cushioning seal (4.7-17) as described for front rod seal in Step (4).

(7) To change cushioning needle 'O' ring (4.7-15), unscrew needle (4.7-18) and change 'O' ring.

(8) Change cushioning seal (4.7-17), and needle 'O' ring (4.7-15) from rear end cap as described in Steps (6) and (7).

(9) Remove locking grubscrew (4.7-11), then unscrew special locknut (4.7-9).

The piston unit can now be broken down and the worn seals removed.

2.4.3 Reassembly (Refer to Figure 4.7)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Fit cushioning sleeve (4.7-13), 'O' ring (4.7-14), front pad (4.7-7), piston (4.7-6) complete with wear ring (4.7-8) and both piston cups (4.7-5) to piston rod.

(2) Fit rear pad (4.7-7) and rear cushioning sleeve (4.7-13), making sure that 'O' ring (4.7-14) is in position.

(3) Screw special locknut (4.7-9) to secure piston unit and finally fit locking grubscrew (4.7-11).

(4) Refit cushioning seals (4.7-17) in end caps.

(5) Refit rod bush (4.7-8) in front cap.

(6) Refit front rod seal (Figure 17-10).

(7) Refit end caps (4.7-2, 4.7-3) to cylinder barrel (4.7-1).

(9) Refit locknut and clevis.

(10) Connect mains air to inlet port in front cap (4.7-2).

(11) Check for leaks past seals (4.7-10, 4.7-12), also check open rear cap port for leaks past seals (4.7-5, 4.7-14).

(12) Repeat at 2 Bar and 7 Bar.

(13) Repeat using inlet port in rear cap (4.7-3).

(16) Check that actuator cycles at 0.5 Bar.

(17) With air pressure at 7 Bar, screw cushioning screws (4.7-18) fully in. This should give a hard cushion and bring actuator to a virtual stop.

(18) On reversing actuator, check that there is no excessive jump as motion starts.

2.4.4 Refitting to Machine (Refer to Figures 4.6 and 4.7)

(1) Replace locknut (4.7-19).

(2) Refit cylinder to frame and tighten 2 bolts (4.6-5) and washer (4.6-6).

(3) Refit piston rod to beam using previous measurement made between rear edge of clevis to cylinder nose at Step 2.4.1 (6). Tighten locknut.

(4) Reconnect air lines to actuator.

(5) Turn on main air at rear of base unit.

(6) Switch on electricity supply to machine.

(7) Unlatch EMERGENCY STOP button and test upper tray for correct operation by pressing BAG SPREAD, then BAG RELEASE.

2.4.5 Bag Tray Adjustment (Refer to Figure 4.6)

(1) On control panel, ensure all H-O-A switches are OFF. Press EMERGENCY STOP button.

(2) Slacken locknut (4.6-4).

(3) Screw piston rod into beam (4.6-7) to lower upper tray (4.6-1) or screw piston rod out of beam to raise upper tray.

(4) Tighten locknut (4.6-4).

(5) Refit lower guard (4.6-18) and main guard (4.6-13).

(6) Unlatch EMERGENCY STOP button.

(7) On control panel, press BAG SPREAD and BAG RELEASE buttons to check trays for correct operation.

2.5 ELEVATOR ACTUATOR

2.5.1 Removal (Refer to Figure 4.8)

(1) On control panel, ensure all switches are set to OFF.

(2) On control panel, set DOOR CLOSE switch to ON and RAISE ELEVATOR switch to ON. Wait for ELEVATOR UP indicator LED to illuminate, then set DOOR CLOSE switch to OFF.

(3) Support platform on wooden blocks approximately 180 mm long and press EMERGENCY STOP button. This will allow elevator cylinder to exhaust and platform to rest on support blocks.

(4) Set RAISE ELEVATOR switch to OFF.

(5) Turn off main air supply at rear of base unit.

(6) Switch off electricity supplies to control panel and weight control motor.

(7) Remove main guard.

(8) Remove right and left hand side covers.

(9) Disconnect 3 pneumatic lines, noting orientation.

(10) Unscrew piston rod from platform (4.8-7) using flats provided. Care must be taken not to damage piston rod.

(11) Support the elevator cylinder on a jack placed under protruding piston rod NOT enclosure.

(12) Remove any cable ties which may prevent assembly being lowered.

(13) Mark positions of 3 off switches mounted on cylinder tie rod, and note their orientation. Remove switches.

(14) Check that jack is supporting cylinder. Remove 4 x M16 x 35 bolts (4.8-9) and washers (4.8-10).

(15) Lower cylinder slowly using jack. Do not move cylinder out of vertical position until piston rod is clear of seal gland (4.8-4).

2.5.2 Dismantling Adjustable Stop Assembly (Refer to Figure 4.9)

With the actuator assembly removed from the machine and placed on a clean bench, proceed as follows:

(1) Unscrew 4 screws securing pulley enclosure cover and loosen jubilee clip (4.9-64). Remove lid and gaiter.

(2) Unscrew 4 dome nuts (4.9-59) and remove 4 capscrews (4.9-18), bonded washers (4.9-63), retaining ring (4.9-56), and gaiter (4.9-47) from cover.

(3) Unscrew 4 grub screws (4.9-79) and withdraw small pulley (4.9-45) and pulley belt (4.9-46).

(4) Unscrew cap head screw (4.9-86) and remove limit switch and plate (4.9-84, 4.9-85).

(5) Unscrew 4 cap head screws (4.9-75) and lift motor assembly clear of cylinder.

(6) Unscrew cap head screws (4.9-71), remove retaining plate (4.9-72) and tap out bearing (4.9-73).

(7) Unscrew 4 cap head screws (4.9-61) and withdraw enclosure plate assembly (4.9-54, 4.9-52) from cylinder.

(8) Remove spacer tube (4.9-49) and 'O' ring (4.9-50).

(9) Unscrew 2 cap head screws (4.9-48) and remove stop ring (4.9-47).

(10) Unscrew 6 cap head screws (4.9-57) and slide stop assembly off piston rod. Remove 2 bearing strips (4.9-35) and 'O' ring (4.9-51).

(11) Unscrew 2 button head screws (4.9-89) and remove anti-rotation collars (4.9-36) and adjustable stop (4.9-34).

(12) Unscrew retaining nut (4.9-43) and remove washer (4.9-42).

> NOTE: Nut is fitted using thread locking compound.

(13) Using a soft hammer, tap adjuster nut (4.9-38) until pulley (4.9-44) can be removed; care must be taken to avoid losing drive pins (4.9-41). Remove bearing bush (4.9-39).

2.5.3 Dismantling Actuator (Refer to Figure 4.9)

(1) Unscrew grub screws and remove reed switch assemblies (4.9-92, 4.9-93, 4.9-94, 4.9-95).

(2) Remove the 4 tie rod nuts (4.9-25) and withdraw tie rods (4.9-24) from air cylinder.

(3) Pull rear cover (4.9-3) from cylinder barrel (4.9-1) and slide off piston rod (4.9-28).

(4) Remove 'O' rings (4.9-13) and washer (4.9-12).

(5) Unscrew 4 cap head screws (4.9-33) and withdraw retaining plate and bush carrier assembly (4.9-30, 4.9-32) from rear cover (4.9-3).

(6) Remove rod seal (4.9-29) and bearing strip (4.9-31).

(7) Remove rear piston and rod assembly from cylinder barrel and unscrew piston rod nut (4.9-9).

(8) Slide piston off rod (4.9-28) and remove piston cups (4.9-5), wear ring (4.9-22) and 'O' ring (4.9-21).

(9) Pull front cover (4.9-2) out of cylinder barrel (4.9-1) and slide off piston rod (4.9-4). Remove 'O' ring (4.9-13) and washer (4.9-12).

(10) Unscrew 3 cap head screws (4.9-18) and remove locators (4.9-27).

(11) Withdraw bush seal housing (4.9-11) from front cover and remove cushioning seal (4.9-15), bearing strip (4.9-8), rod seal (4.9-14), wiper seal (4.9-10), and 'O' rings (4.9-16, 4.9-17).

> NOTE: Wiper seal (4.9-10) will require levering out using a screwdriver. Care must be taken not to damage the seal housing.

(12) Withdraw front piston and rod assembly from cylinder.

(13) Unscrew piston rod nut (4.9-9), separate piston halves (4.9-7) and rod, and remove piston cups (4.9-5), wear ring (4.9-22), and 'O' ring (4.9-21).

(14) Wash all parts in paraffin, dry off and blow out all holes with compressed air.

(15) Inspect all parts for damage. Replace seals etc. as required.

2.5.4 Reassembly (Refer to Figure 4.9)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Reassemble front piston halves (4.9-7), piston cups (4.9-5), wear ring (4.9-22), and 'O' ring (4.9-21) and refit to piston rod (4.9-4).

(2) Refit washer (4.9-20) and tighten nut (4.9-9).

(3) Refit piston and rod assembly to cylinder bore taking care not to damage piston seals.

(4) Fit wiper seal (4.9-10), cushioning seal (4.9-15), rod seal (4.9-14) and bearing strip (4.9-8) to seal housing (4.9-11), fit 'O' rings (4.9-16, 4.9-17) to housing and refit housing to front cover.

(5) Refit locators (4.9-27) and 3 cap head screws (4.9-18) to front cover and tighten fully. Fit 'O' ring (4.9-13) and washer (4.9-12) to cover rebate.

(6) Slide front cover assembly onto piston rod and refit front cover assembly to cylinder barrel (4.9-1).

(7) Reassemble rear piston halves (4.9-7), piston cups (4.9-5), wear ring (4.9-22), 'O' ring (4.9-21) and piston rod (4.9-28). Refit and tighten nut (4.9-9) and washer (4.9-20).

(8) Carefully reassemble piston and rod assembly to cylinder barrel taking care not to damage piston seals.

(9) Refit rod seal (4.9-29) and bearing strip (4.9-31) to rear end cover (4.9-3).

(10) Refit retaining plate and bush carrier assembly (4.9-30, 4.9-32) to rear cover.

(11) Fit 'O' rings (4.9-13) and washer (4.9-12) to cover, and slide cover assembly onto piston rod.

(12) Refit end cover to cylinder barrel, refit and tighten 4 cap head screws (4.9-33).

(13) Refit tie rods (4.9-24) to cylinder, fit and tighten 4 tie rod nuts (4.9-25).

(14) Refit reed switch assemblies (4.9-92, 4.9-93, 4.9-94, 4.9-95) and clamp in position by tightening grub screws.

(15) Fit drive pins (4.9-41) and bearing strip (4.9-39) to pulley (4.9-44) and refit pulley assembly, locating drive pins in drive collar.

(16) Smear threads with locking compound, refit washer (4.9-42) and retaining nut (4.9-43) hand tight only.

(17) Refit anti-rotation collars (4.9-36) and adjustable stop (4.9-34), fit and tighten 2 button head screws (4.9-89).

(18) Refit 2 bearing strips (4.9-35) and 'O' ring (4.9-51) to stop assembly, slide assembly onto piston rod. Refit and tighten 6 cap head screws (4.9-57).

(19) Replace stop ring (4.9-47), fit and tighten 2 cap head screws (4.9-48).

(20) Replace spacer tube (4.9-49) and 'O' ring (4.9-50).

(21) Insert enclosure plate assembly (4.9-54, 4.9-52) into cylinder, fit and tighten 4 cap head screws (4.9-61).

(22) Fit new bearing (4.9-73) to bearer plate (4.9-72) and refit to end cover. Refit and tighten cap head screws (4.9-71).

(23) Refit motor assembly, fit and tighten 4 cap head screws (4.9-75).

(24) Refit limit switch and plate (4.9-84, 4.9-85), secure with cap head screw (4.9-86) hand tight only.

(25) Adjust limit switch position and fully tighten screws.

(26) Refit small pulley (4.9-45) and pulley belt (4.9-46), fit and tighten 4 grub screws (4.9-79).

(27) Adjust nut (4.9-38) and retaining nut (4.9-43) to align pulleys so that belt runs dead straight.

(28) Refit 4 capscrews (4.9-18) and bonded washers (4.9-63) to end cover, refit retaining ring (4.9-56), and gaiter (4.9-47). Refit and tighten 4 dome nuts (4.9-59).

(29) Refit end cover and gaiter, fit and tighten 4 screws.

(30) Refit and tighten jubilee clip (4.9-64) so that end of gaiter is aligned with end of piston rod (4.9-28).

2.5.4 Refitting (Refer to Figure 4.8)

(1) Fit thimble to piston rod.

(2) Raise cylinder using jack making sure that it passes squarely through seal gland (4.8-4).

(3) Refit and tighten 4 x M16 bolts (4.8-9) and washers (4.8-10).

(4) Refit 3 off reed switches in original position and orientation (4.8-16).

(5) Replace cable ties.

(6) Remove jack.

(7) Fit new washer (4.8-8) to piston rod before screwing into platform (4.8-7). Tighten using flats provided.

(8) Lift platform (4.8-7) and remove wooden supports. Allow platform to lower and check for any unevenness of descent.

(9) Reconnect pneumatic lines, noting their orientation.

(10) On the control panel, ensure all switches are set to OFF.

(11) Fit main guard.

(12) Switch on main air at rear of base unit.

(13) Switch on electrical supplies to weight control motor and to control panel.

(14) Unlatch EMERGENCY STOP button.

(15) Press SAFETY OVERRIDE pushbutton and set RAISE ELEVATOR switch to ON. Check correct functioning.

(16) Set RAISE ELEVATOR switch to OFF and ensure correct functioning.

(17) Carry out vacuum leak test.

(18) Refit side covers.

2.5.5 Piston Rod Vacuum Seals - Removal (Refer to Figure 4.8)

(1) Follow steps 2.5.1 (1) to (9).

(2) Using suitable 'C' spanner, unscrew round nut (4.8-3).

(3) Remove the seal gland (4.8-4) and gasket (4.8-5) by sliding gland up piston rod.

(4) Remove gasket (4.8-5) and seal (4.8-6) from seal gland (4.8-4).

(5) Clean seal gland thoroughly in paraffin, dry and inspect all parts for damage and excessive wear.

2.5.6 Piston Rod Vacuum Seals - Refitting (Refer to Figure 4.8)

All rubbing parts, replacement seals etc. should be smeared with Rocol white food grease (or equivalent) before reassembly. Strictest cleanliness should be observed throughout the following procedure:

(1) Inspect new seal (4.8-6).

(2) Fit wiper seal (4.8-6) into seal gland (4.8-4).

(3) Fit new gasket (4.8-5) to seal gland.

(4) Fit thimble to piston rod.

(5) Fit seal gland (4.8-4) over end of piston rod and push down into housing, taking care not to damage seal (4.8-6).

(6) Tighten round nut (4.8-3) fully before trimming excess gasket material (4.8-5).

(7) Follow steps 2.5.4 (9) to (19).

2.6 AUTOMATIC DRAIN FILTER

An automatic drain filter is provided in the compressed air line to collect and discharge water droplets present in the compressed air supply as a result of condensation. The filter is located at the rear of the base unit and is an integral part of the shut-off/bleed valve assembly.

Care should be taken when first turning on the main air supply - it should be turned on slowly to avoid a possible inrush of trapped water which the filter cannot handle.

Periodic cleaning of the filter element is necessary for continued efficient operation.

2.6.1 Dismantling (Refer to Figure 4.11).

(1) Shut off air supply.

(2) Grip filter body and twist anti-clockwise to disengage from air unit.

(3) Unscrew and remove filter bowl anti-clockwise from connector body.

(4) Unscrew baffle and withdraw element and filter shield from guide rod.

(5) On filter bowl, unscrew retaining ring and withdraw automatic drain valve/screen assembly from bowl.

(6) Unclip plastic cap from strainer and remove float and drain valve. Items are non-repairable.

(7) To disassemble regulator, turn adjusting knob anti-clockwise to release spring compression.

(8) Unscrew the bonnet assembly using the spanner flats.

(9) Remove the spring, slip ring and diaphragm assembly.

2.6.2 Cleaning

(1) Wash filter element in paraffin and blow out thoroughly with compressed air.

(2) Clean the strainer using compressed air.

(3) Clean plastic bowl and all small parts in soapy water. Do not use solvents, as these may damage plastic parts.

(4) Inspect 'O' ring and gaskets for nicks and cuts.

2.6.3 Reassembly

Renew any 'O' rings and gaskets showing signs of damage. Lightly smear all gaskets with grease prior to reassembly. Ensure that gaskets do not become twisted during reassembly.

(1) Reassemble spring, slip ring and diaphragm assembly.

(2) Replace bonnet, and tighten using spanner flats.

(3) Set required pressure by turning adjusting knob clockwise as required.

(4) Replace float on drain valve, replace assembly in strainer and clip plastic cap onto strainer.

(5) Refit drain valve assembly into bowl.

(6) Screw retaining ring onto threaded protruding part of drain valve and lightly tighten.

(7) Refit filter element and louvre deflector complete with 'O' ring and gasket and screw baffle onto guide. Do not over tighten baffle as this could damage filter element.

(8) Engage bowl onto filter body and rotate until indicator mark on bowl is aligned between] [marks on filter bowl.

(9) Insert filter body into air unit, and twist clockwise to engage fully.

2.7 VACUUM PUMP SET

2.7.1 Maintenance

(1) The oil level must be checked after every 100 hours of continuous running. Oil level should be to the oil level plug - do not overfill. Ensure that the vacuum set cannot be started while pump is being checked or topped up. Oil should be SAE 40 mineral oil.

(2) Replenish grease in the drive end bearings after every 500 hours of operation. A grease nipple is fitted in the bearing cover - add further grease until grease emerging from the escape vents is clean (vents must be kept free of solidified grease or damage to seals could result).

(3) After 1500 hours of operation (or earlier if indicated by oil condition), drain, flush and refill pump with fresh oil.

2.7.2 Vacuum Pump (Exhauster) Removal (Refer to Figure 4.16)

(1) Isolate pump set electrically and ensure that no vacuum remains in system.

(2) Remove acoustic baffles if fitted to vacuum set.

(3) Turn off water supply at inlet stopcock and drain water from outlet side by opening drain valve (16-12) on silencer assembly.

(4) Drain oil from vacuum pump (16-4) gear case.

(5) Release motor slide bolts (16-11), move motor assembly vertically and remove drive belts (16-14).

(6) Remove 4 off bolts, nuts and washers securing vacuum pump (16-4) to base frame assembly (16-8).

(7) Unscrew and remove probe of high temperature thermo-stat (16-6) from outlet pipework.

(8) Disconnect outlet pipework at flange connection to silencer assembly (16-7).

(9) Holding inlet pipework securely, disconnect and remove pump unit from main inlet pipe.

2.7.3 Motor Removal

(1) Carry out steps (1), (2), (3), and (5) in paragraph 2.10.2.

(2) Disconnect electrical wiring at motor terminal box.

(3) Unscrew and remove motor retaining bolts, nuts and washers and remove motor unit.

2.7.4 Repair

Repairs to the major components of the vacuum pump set require specialised facilities, and repair will normally be by replacement of faulty components.

2.7.5 Vacuum Pump Replacement

(1) Clean threads of inlet pipework and vacuum pump, apply sealing compound.

(2) Holding inlet pipework securely, connect pump unit onto main inlet pipe, tightening fully with pump in correct orientation.

(3) Reconnect outlet pipework at flange connection to silencer assembly (16-7) using jointing compound.

(4) Refit probe of high temperature thermo-stat (16-6) to elbow of outlet pipework.

(5) Refit 4 off bolts, nuts and washers securing vacuum pump (16-4) to base frame assembly (16-8) and tighten fully.

(6) Move motor assembly vertically and refit drive belts (16-14). Tighten securing bolts so that motor can be moved but is not loose.

(7) Remove the level and filler plugs and fill to the required level with SAE 40 mineral oil. Replace plugs.

(8) Pump fresh grease into the drive end bearing housing (via grease nipple) until clean grease emerges from the escape vents.

(9) Turn the pump over by hand to ensure that there is no binding or excessive friction.

(10) NEW PUMP UNITS ONLY. With the motor running, introduce small quantities of a solvent such as white spirit into the inlet port. Stop the pump and check that the internal coating of rust preventative has been removed. Repeat as required.

> **CAUTION: Ensure adequate ventilation during this procedure and ensure that no source of ignition is present - do not allow build up of solvent vapour.**

(11) NEW PUMP UNITS ONLY. Run the pump for 15 minutes without load. Check for hot spots or other indications of interference. If minor hot spots occur, introduce a small quantity of lubricating oil into the inlet while the pump is running. Repeat until hot spots disappear.

> **NOTE: It is unnecessary to repeat this procedure once hot spots have been removed in this way.**

(12) Close drain valve (16-12) on silencer assembly. Turn on water supply at inlet stopcock.

(13) Replace acoustic baffles if fitted to vacuum set.

2.7.6 Motor Replacement

(1) Offer up motor unit and refit loosely retaining bolts, nuts and washers.

(2) Move motor assembly vertically and refit drive belts (16-14). Tighten securing bolts so that motor can be moved but is not loose.

(3) Reconnect electrical wiring at motor terminal box.

2.7.7 Drive Belt Adjustment

(1) Check the alignment of the drive belts. Use a straight edge along the sides of the pulley flanges to ensure correct alignment. Move motor mounts to obtain correct alignment.

(8) Adjust belt tension by moving motor along slide rails. Tension is correct when a force of 25 to 35 Newtons (2.5 to 3.6 kgf) applied mid span produces belt deflection of 15 mm. New drive belts should be tensioned to a higher value to allow for normal drop in tension during running-in period. New belts must be re-tensioned after the 1st, 3rd and 7th hour of service.

2.7.8 Relief Valve Adjustment

> **Note: The vacuum relief valve is factory set to operate at a vacuum of 20"Hg. The relief valve MUST NOT be adjusted to allow an operating vacuum greater than 20" Hg.**

(1) On relief valve unit (16-2), remove screws from nameplate.

(2) Remove nameplate.

(3) Adjust pressure to required value by screwing in top cover to increase, or screwing out top cover to decrease setting.

(4) Refit nameplate and screws ensuring that screws enter slots on periphery of top cover.

(5) Fit new wire seal to top cover.

CHAPTER 3 - FAULT FINDING

3.1 VACUUM PUMP SET

The most common causes of problems are likely to be overheating and lubrication failure. Fault finding should, in the first instance, be carried out symptomatically, i.e. by observation of failure symptoms.

The following paragraphs list the most likely fault conditions, together with possible causes and suggested actions to rectify the problem.

Symptom	Para.
Knocking	3.2.1
Overheating	3.2.2
Excessive drag	3.2.3
Poor vacuum	3.2.4
Excessive wear (bearings, rotor, shafts, gears)	3.2.5
Loss of oil	3.2.6

3.1.1 Knocking

(1) Check rotor timing, return pump to supplier for re-timing if necessary.

(2) Check mountings and pipe connections, secure if loose.

(3) Check vacuum level, decrease operating level if vacuum excessive.

(4) Check gears, bearings and rotor shaft for wear. Replace as required. If wear is rapid, suspect lubrication failure - replace oil and bearing grease.

3.1.2 Overheating

(1) Check water availability/flow. Check solenoid valve and 24Vdc signal at solenoid. Rectify as required (absence of signal may indicate logic controller fault, or wiring discontinuity)

(2) Check ambient temperature at pump. Increase ventilation if ambient exceeds 38 deg C (100 deg F).

(3) Check oil level in gear case or drive cover. Reduce level if above level plugs.

(4) Check vacuum level, decrease operating level if vacuum excessive.

(5) Check rotor clearances. Return pump to supplier for adjustment if required.

3.1.3 Excessive Drag

(1) Check rotor clearances. Return pump to supplier for adjustment if required.

(2) Check ambient temperature at pump. Increase ventilation if ambient exceeds 38 deg C (100 deg F).

(3) Check vacuum level, decrease operating level if vacuum excessive.

3.1.4 Poor Vacuum

(1) Check drive belt tension, tighten if required.

(2) Check pipework joints and security of pump headplate bolts. Make good any leaks.

(3) Check rotor clearances. Return pump to supplier for adjustment if required.

3.1.5 Excessive Wear

(1) Check level and condition of oil, and replace drive end bearing grease. Top up or replace oil as required.

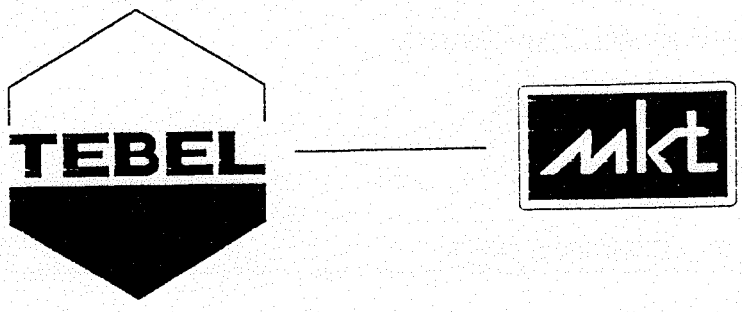
(2) Check rotor clearances. Return pump to supplier for adjustment if required.

(3) Check alignment and tension of drive belt if motor or pump bearings wear heavily or fail.

3.1.6 Loss of Oil

(1) Check headplate, gear case and drive cover vents. Clean out if blocked.

(2) Check condition of gaskets and seals, replace as necessary.



SECTION 3

INSTALLATION

CONTENTS

CHAPTER 5 - CIP

ILLUSTRATIONS

TABLES

CHAPTER 1 - GENERAL INFORMATION

1.1 STANDARD COMPONENTS

The basic machine comprises the following items:

(1) Base unit with integral manual bag loader and protective guarding.

(2) Tower with high level probe.

(3) Interceptor vessel.

(4) Vacuum pump set.

(5) All CIP/product connections, plain ended, suitable for welding fittings of the customer's choice.

1.2 OPTIONAL EXTRAS

(1) Vat identity.

(2) Interceptor silencers.

(3) Acoustic hood for vacuum pump.

(4) Vacuum pump exhaust silencer.

(5) Tower top pipework.

1.3 MATERIALS

The machine and interceptor vessels are constructed throughout of stainless steel to AISI 304. The controls and switches are internationally approved for dairy applications and rated to IP65.

The Company reserves the right to alter the specification and/or material to a similar or superior standard if necessary.

CHAPTER 2 - TECHNICAL DATA

2.1 SHIPPING DATA

	Net Weight kg	Gross Weight kg	Volume cu m
Base Unit	540	578	3.1
Tower	645	698	2.2
Interceptor	98	118	1.0
Vacuum Set	275	375	2.1

> Note that these figures are for guidance only.

2.2 POWER REQUIREMENTS

Vacuum Pump:	460v 60Hz 15 kW, 3 phase, 25 Amp.
Weight Control System:	0.1 kW, 3 phase, 50 Hz, Voltage and frequency to suit customer's requirements (via reversing contactor)

2.3 COMPRESSED AIR SUPPLY

A reliable supply of clean, moisture-free air is required, at an operating pressure of 100 lbs per square inch (7 bar) for a consumption rate of 13 cubic feet per minute (0.34 cubic metres per minute).

2.4 CIP PLANT

The entire Block Former, including the interceptor, is cleanable to dairy standards by circulation of cleaning fluids supplied by an external CIP plant.

Cleaning programs, either manually operated or linked to automated control systems, can be incorporated in each individual installation to meet customer requirements.

Recommended cleaning fluid flowrate is 2,500 Imperial gallons per hour (190 litres per minute) per machine at a maximum temperature of 70 deg C. Circuits for automatic and manual CIP are shown in Figs. 3.15 and 3.16.

CHAPTER 3 - INSTALLATION

No special foundations are required for the Block Former, but a firm level surface is necessary, with sufficient overhead clearance to allow for erection of the tower and pipework. Block Former dimensions are shown in Figure 3.1.

For suggested pipework layouts, see Figure 3.15 (automatic CIP), and Figure 3.16 (manual CIP).

* **The following instructions should be read through fully by all personnel involved before installation proceeds.**

3.1 BASE UNIT

Location of levelling screws is shown in Figure 3.2.

(1) Place the base unit in the required position, with the four pads supplied under the adjustable feet.

(2) Adjust the four threaded feet to level the unit. Levels can be placed on the machine top surface of the rear chamber (ie after removal of rear chamber cover), or on the top surface of the machined platform plate inside the forward chamber area.

(3) Check that the platform is at its lowest level by checking that the studs on the chamber walls are in contact with the underside of the platform (look through rear chamber with guillotine in the closed position). This top surface of the platform, at its lowest level, is the height of the discharge of the block.

3.2 TOWER

Having ensured that the base unit is in the correct position, and level, the tower can be prepared for hoisting into position. When manoeuvring the tower, it should be noted that the word 'FRONT' is marked on the tower top, and the tower should be positioned so that it will be correctly orientated when lifted.

The tower should be lifted by means of the lifting lugs. The preferred method of lifting is to build a suitable girder into the roof capable of supporting the 720 kg weight of the tower, and then to use pulley blocks or a powered hoist. Alternatively, two scaffolding towers can be erected on either side of the base unit with a temporary girder bridging the top, or a crane can be used to lower the tower through a temporary hole in the roof, if space permits.

Tower to base unit assembly is illustrated in Figure 3.2, and tower top pipework is shown in Figure 3.3.

(1) Remove the rear chamber cover and retract the guillotine into the rear of the chamber, to expose the whole of the forming and pressing area.

(2) Screw the four taper-ended dowels into the threaded holes on top of the forming chamber (two guide dowels on each side in number 2 and 4 holes

viewed from the front of the machine). These dowels are for locating purposes only whilst the tower is being lowered onto the base unit .

(3) Lift the tower into a vertical position, and then just clear of the ground, ensuring that all attachments are secure, and that the lifting arrangement and equipment are not overloaded.

(4) Check that the word 'FRONT' stamped on the tower top is at the front.

(5) Lift the tower clear of, and over, the base unit, then lower with great caution until the tapered parts of the guide dowels are just protruding through the tops of the holes in the flange.

The tower should be suspended vertically above the base unit.

(6) Lower the tower fully onto the chamber.

> NOTE: A gasket is fitted to the base unit. This should NOT have any form of jointing sealant applied to it.

(7) With the tower sitting squarely on the base unit, bolt both units together hand tight only.

(8) Remove the four guide dowels and replace with bolts. Tighten all bolts to 30 lb/ft.

> NOTE: Because of gasket compression, this torque setting should be checked after 2 hours and again after the first 12 hours of production.

(9) Anchor the tower securely at the top to a rigid part of the building by constructing suitable permanent brackets or straps.

(10) Remove shackles from the tower, and dismantle the lifting gear unless required for access to the tower top, or to erect another tower.

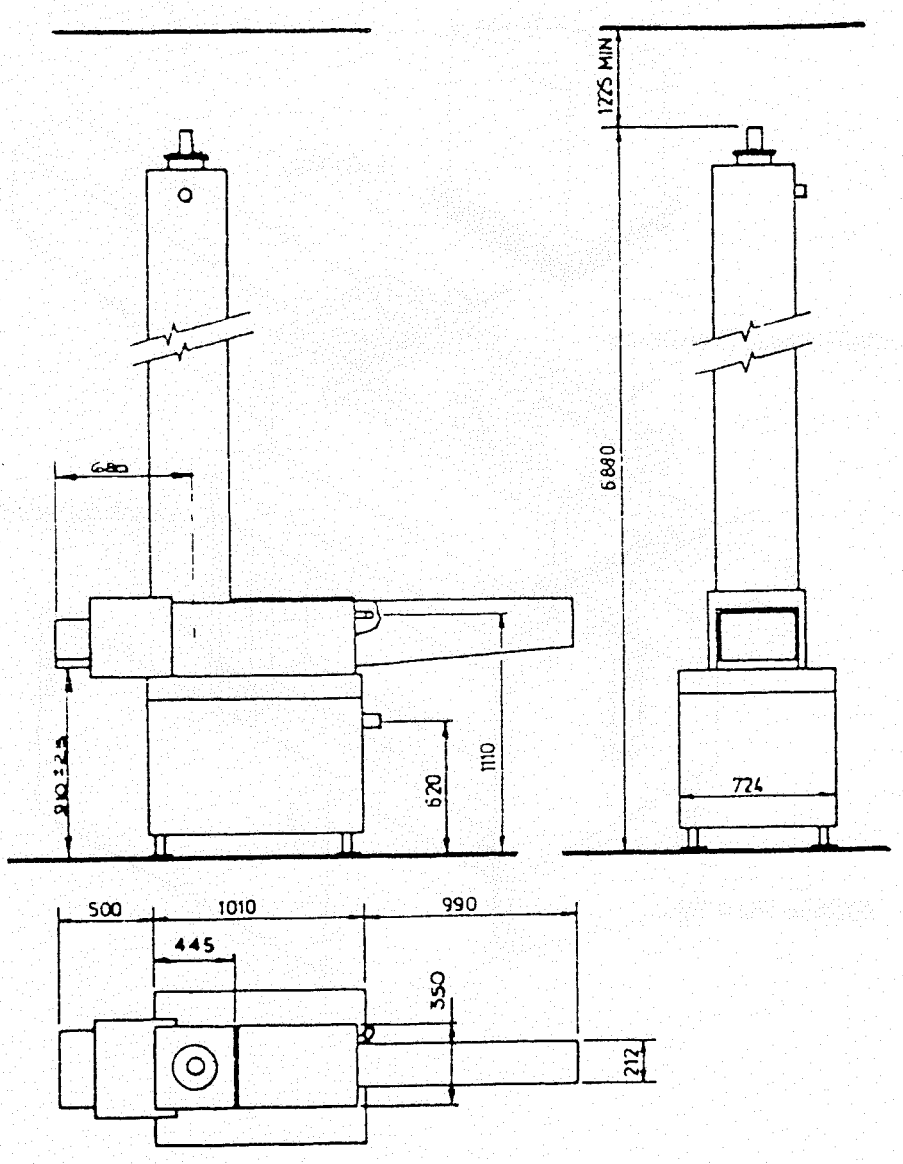


Figure 3.1 Block Former Dimensions

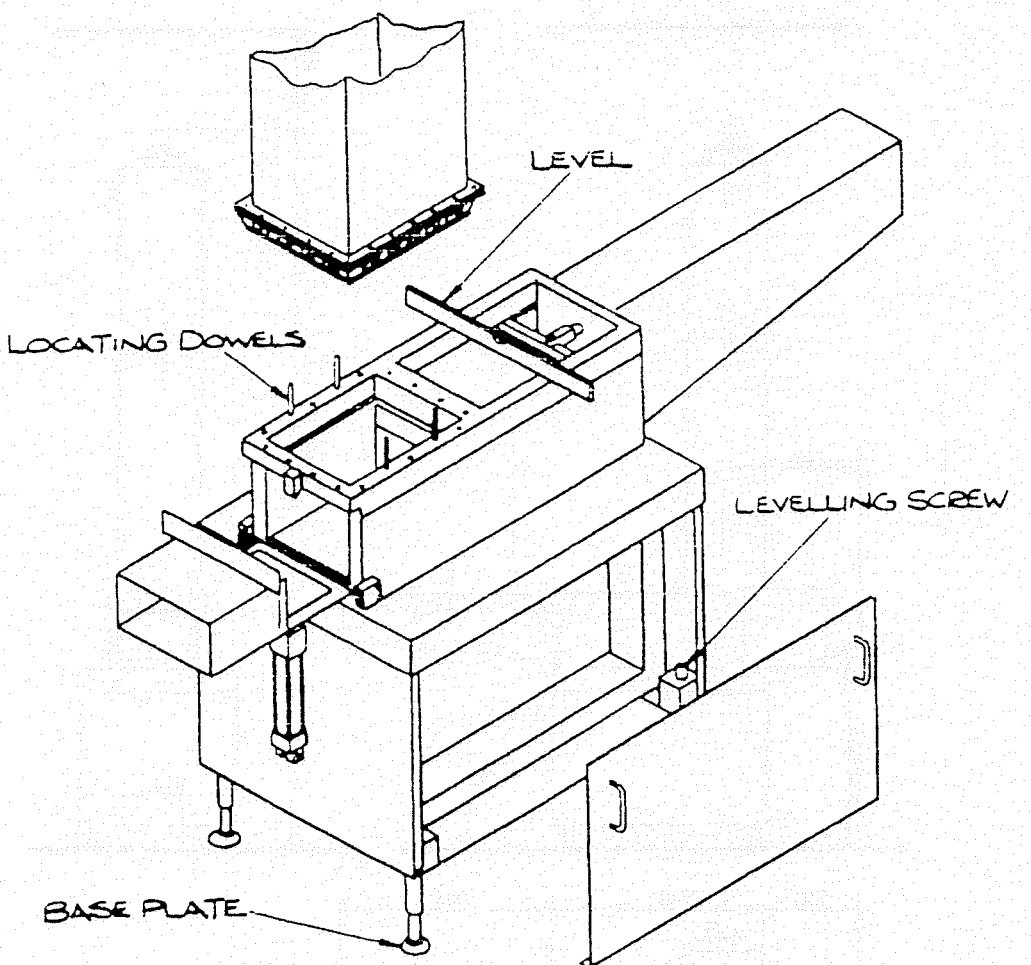


Figure 3.2 Tower to Base Unit Assembly

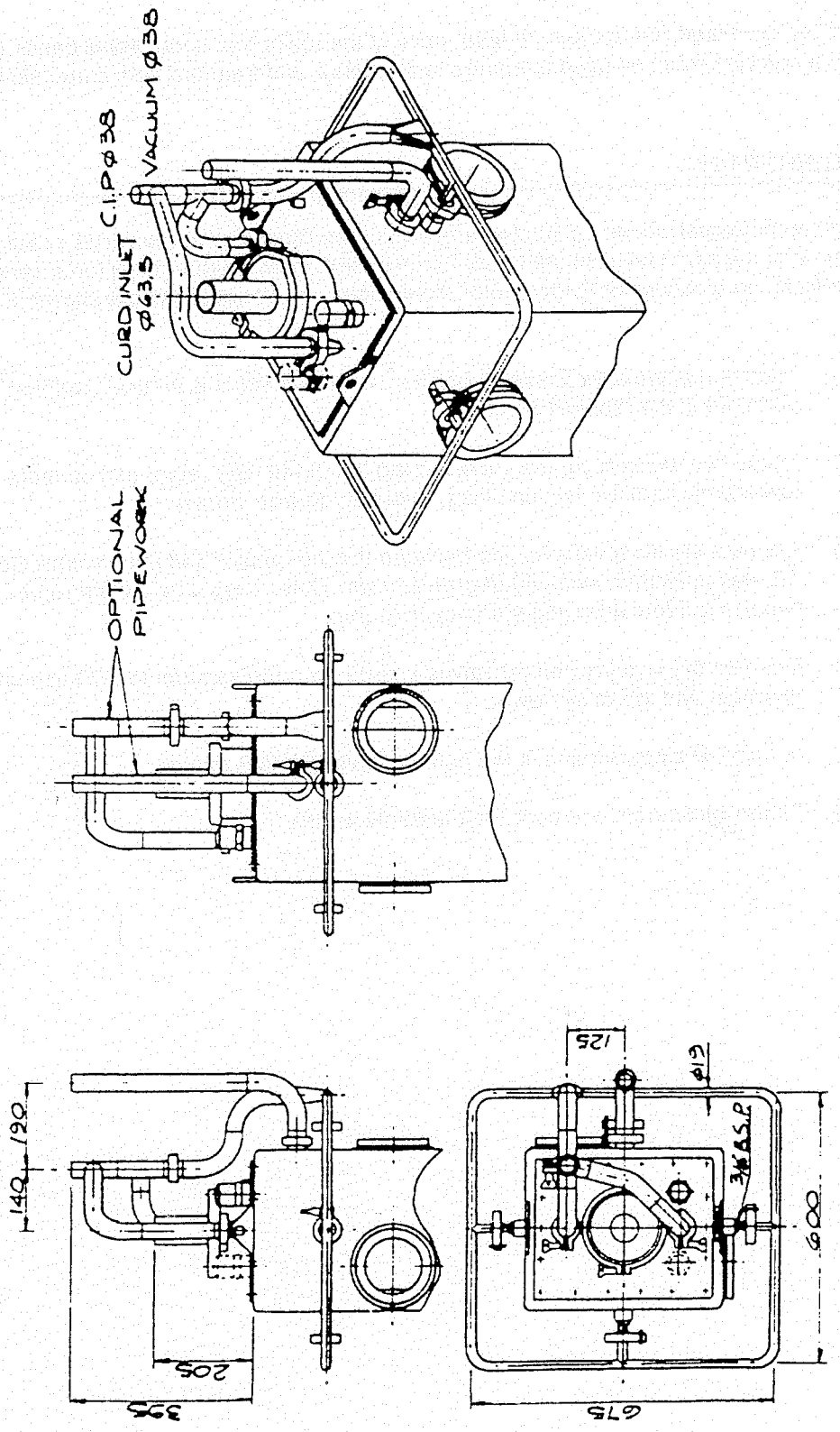


Figure 3.3 Tower Top Pipework

3.2.1 External Connections

Connect the curd feed line to the curd feed valve at the tower top. Long radius bends (minimum 1,000 mm radius) should be used to ensure smooth flow and freedom from curd chip blockages.

3.3 INTERCEPTOR

The interceptor vessel should be located as close to the Block Former tower as practicable. This can be at the same level as the Block Former itself, or at a higher level (on a service platform) if this is more convenient. Interceptor dimensions and connections are shown in Figure 3.4.

(1) Place the interceptor vessel in position, ensuring that it is vertical, and that the ports are in the required position.

(2) Fit the two vacuum control valves to the top of the interceptor and connect tower and chamber vacuum lines. Avoid 90 degree elbows.

(3) Connect the main vacuum line between the interceptor and the vacuum pump. To reduce friction, avoid 90 degree elbows. There should be a clear run between the interceptor and the vacuum pump.

(4) Connect the vacuum control valves in order to route vacuum to the base unit chamber and top of the tower.

(5) Install CIP pipework and fit the control valves for CIP routing.

(6) Fit the whey drain and curd feed butterfly valves.

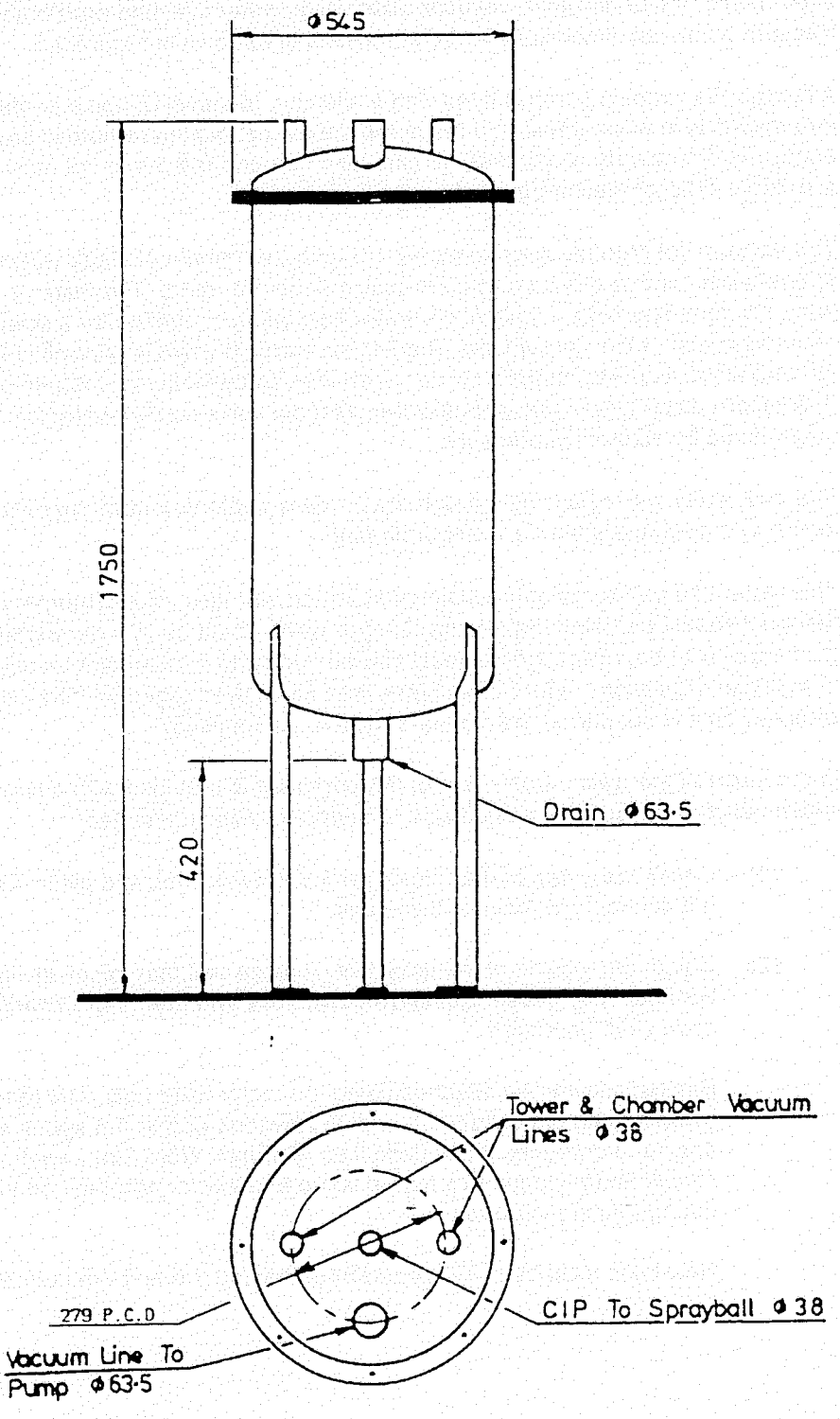


Figure 3.4 Interceptor dimensions and Connections

3.4 VACUUM PUMP

The vacuum set is a self-contained unit constructed around a base frame, and comprises vacuum pump, motor, silencer, vacuum relief valve, water injection nozzle and control solenoid. Vacuum pump set dimensions and connections are shown in Figure 3.5.

Although the vacuum pump is fitted with a silencer, the level of noise produced by the pump is unacceptable in work areas, and the pump should be located remotely, preferably in a suitable enclosure or separate room. Free air circulation around the pump set must be maintained, and a suitable exhaust discharge point must be provided.

The vacuum set requires approximately 1.5 litres per minute of clean water to reduce operating temperatures and to effect an efficient seal around the rotors. The water is normally supplied from a cistern fitted with a float valve, water flow being controlled by a solenoid valve which is an integral part of the vacuum set. The 24Vdc solenoid valve is controlled by the digital controller, and when actuated, supplies water to an inlet spray jet in the vacuum pipe above the pump. The cistern water level must be below the solenoid valve so that water is drawn into the vacuum pump by differential pressure.

The bulk of the water passing through the pump is separated from the exhaust air in the silencer and discharges from a water drain pipe.

This water can be filtered and reclaimed in a recovery tank, or discharged direct to drain, although it should be noted that the discharged water could be at a temperature of up to 60 deg C. If water is to be recirculated, it must first be cooled to a maximum temperature of 20 deg C. In multiple installations, water drain pipes may be ganged together. The cistern arrangement or recovery tank is not part of the standard system as supplied.

In the event of the water supply failing, the pump set is provided with a temperature probe which will stop the pump if a significant temperature rise is detected.

(1) Check the pump and all piping for foreign material, and clean if required. Do not connect pipework at this stage.

(2) Check the tension of the drive belt. A loose belt may result in slipping, an over tight belt may cause excessive power loss and premature bearing failure or drive shaft breakage.

Belt tension can be adjusted using the motor slide rails. The tension is correct when a force of between 25 and 35 Newtons (2.5 to 3.6 kgf) is applied mid span and produces a belt deflection of 15mm. Note that new drive belts should be tensioned to a higher value to allow for normal drop in tension during running-in period.

New belts must be re-tensioned after the 1st, 3rd and 7th hour of service.

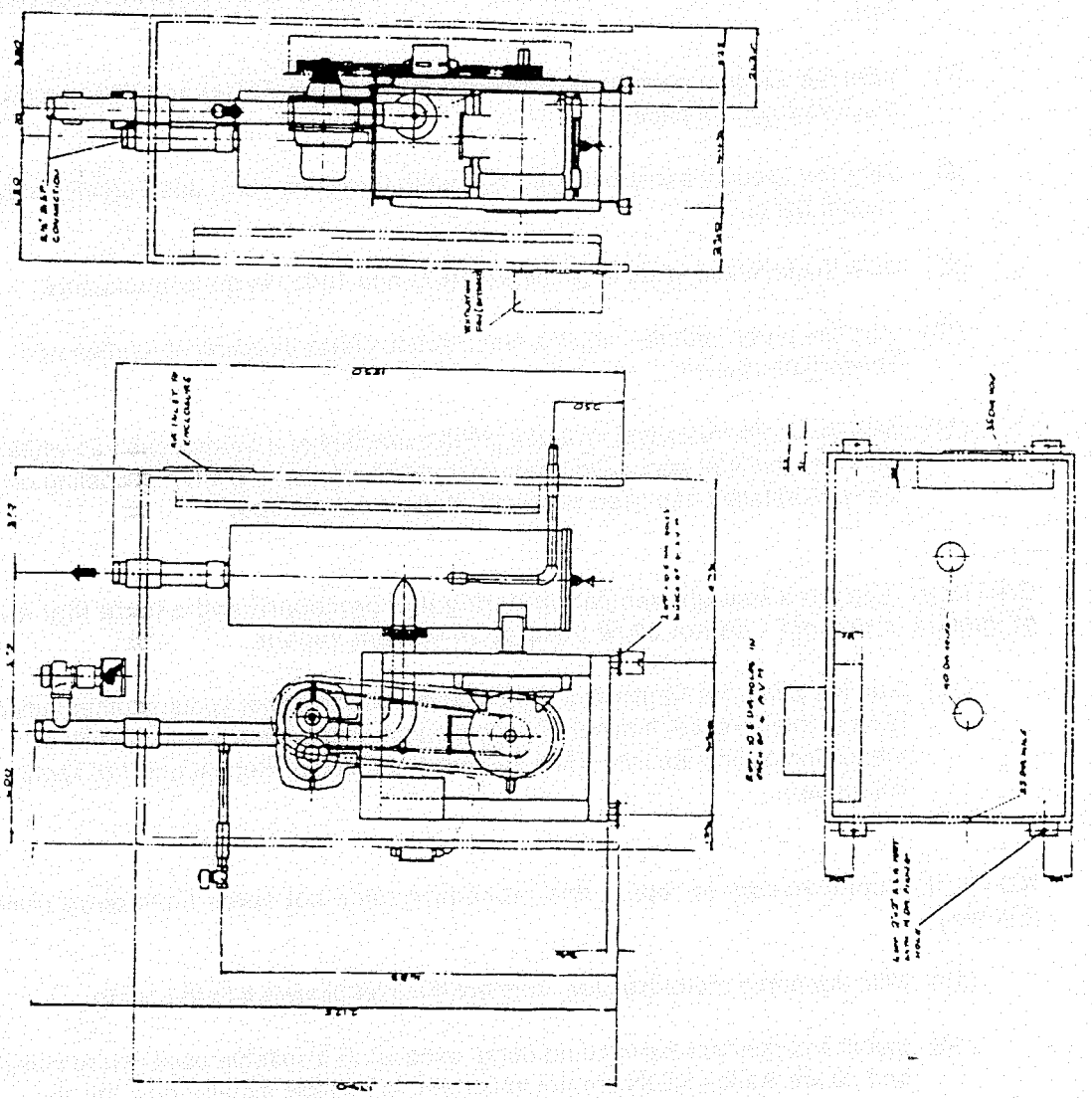


Figure 3.5 Vacuum Pump Dimensions and Connections

(3) Check the alignment of the drive belt. Use a straight edge along the sides of the pulley flanges to ensure correct alignment.

(4) Remove the level and filler plugs and fill to the required level with SAE 20 mineral oil. Replace plugs.

(5) Pump fresh medium soft NLGI.2 grease into the drive end bearing housing (via the grease nipple) until clean grease emerges from the escape vents.

(6) Turn the pump over by hand to ensure that there is no binding or excessive friction.

(7) Wire the vacuum pump motor contactor to terminals T11(+) and T12(-) in the electronic control panel.

(8) Wire the vacuum pump overload cut-out to terminals T5(+) and T6(O/P) in the control panel.

(9) Wire the solenoid valve to terminals T9(+) and T10(-) in the control panel.

(10) 'Jog' the pump with the motor a few times to check direction of rotation and freedom of rotation.

(11) With the motor running, introduce small quantities of a solvent such as white spirit into the inlet port. Stop the pump and check that the internal coating of rust preventative has been removed. Repeat as required.

* CAUTION: Ensure adequate ventilation during this procedure and ensure that no source of ignition is present - do not allow build up of solvent vapour.

(12) Run the pump for 15 minutes without load. Check for hot spots or other indications of interference. If minor hot spots occur, introduce a small quantity of lubricating oil into the inlet while the pump is running. Repeat until hot spots disappear.

> NOTE: It is unnecessary to repeat this procedure once hot spots have been removed in this way.

(13) With the pump motor isolated, connect the inlet pipework to the pump.

(14) Install and connect the vacuum pump exhaust to a suitable point where noise and condensation levels are not important. In multiple installations, the silencer outputs may be ganged together.

(15) Install the water supply cistern and drain or recovery tank (as required) and connect pipework to the water inlet and outlet connections.

(16) Check that all guards and covers are securely fitted.

3.5 FIELD CONNECTIONS TO BASE UNIT

Each of the five outlets in the base terminates in a 6mm (1/4") tube fitting. Above these outlets are electrical bulkhead adaptors. Twin core wires from the positional microswitch on the tower and chamber vacuum valves (short circuit indicates venting) should be led through these adaptors. Twin core wires from the curd level probe and the vat identity probe (if fitted) should be similarly routed.

The signals from the microswitches in the Block Former are pre-connected to screw terminals in the terminal box, placed at the rear side of the Block Former base unit (see Figure 3.9).

The terminal box also serves as the collecting point for three signals originating outside the Block Former, i.e. tower venting microswitch, tower full probe, and chamber venting microswitch.

Pneumatic connections are shown in Figure 3.12 and connection sizes are listed in Table 3.B.

(1) Connect the tower venting microswitch leads to terminals 78 and 79 in the terminal box.

(2) Connect the tower full probe leads to terminals 46 and 47 in the terminal box.

(3) Connect the chamber venting microswitch leads to terminals 10 and 12 in the terminal box.

(4) Connect the curd feed valve pneumatic pipe.

(5) Connect the chamber vacuum control valve pneumatic pipe.

(6) Connect the tower vacuum valve pneumatic pipe.

(7) Connect the whey drain valve pneumatic pipe.

(8) Connect the vat identity probe wiring if probe fitted.

(9) Connect the tower vacuum gauge (from tower top) pneumatic pipe.

(10) Connect the main air feed line to the base unit.

The line should terminate in a 12mm OD tube or a 1/2" BSP fitting.

Table 3.B - Pneumatic Connections

TUBE	DESCRIPTION	CONNECTION SIZE
1	Curd Feed Valve	1/8" BSP/6mm push-in fitting
2	Tower Vacuum Gauge	1/8" BSP/6mm push-in fitting
3	Tower Vacuum Valve	1/8" BSP/6mm push-in fitting
4	Chamber Vacuum Valve	1/8" BSP/6mm push-in fitting
5	Main Air Connection	12mm x 1/2" BSP
6	Chamber Vacuum Gauge	Pre-connected
8	Whey drain Valve	1/8" BSP/6mm push-in fitting

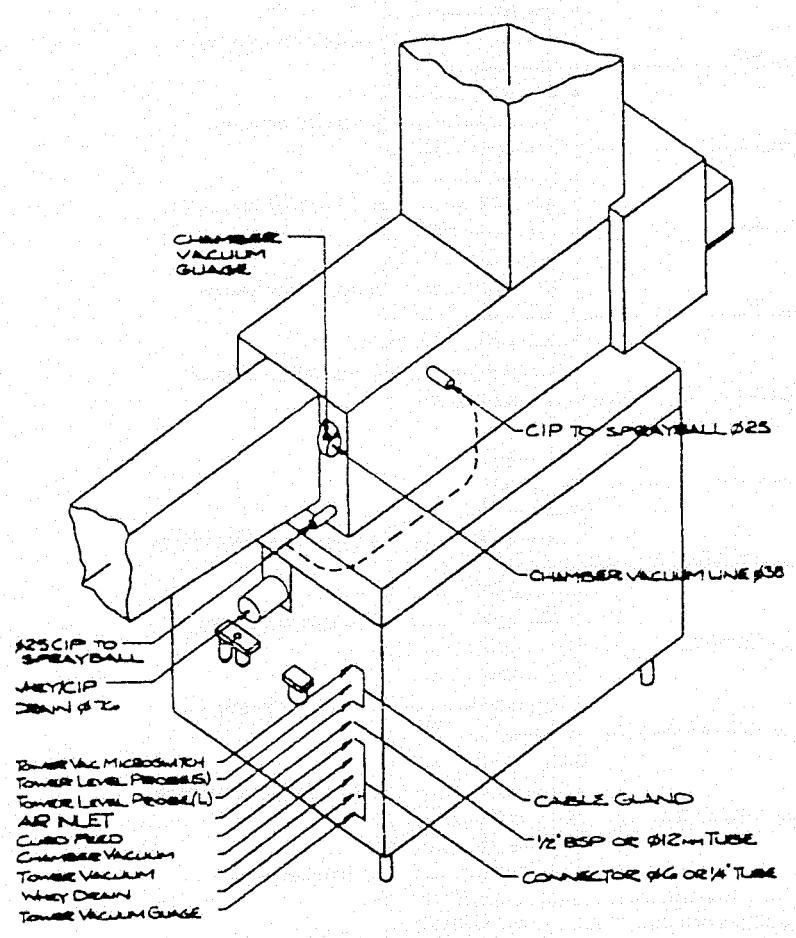


Figure 3.10 Block Former Base Connections

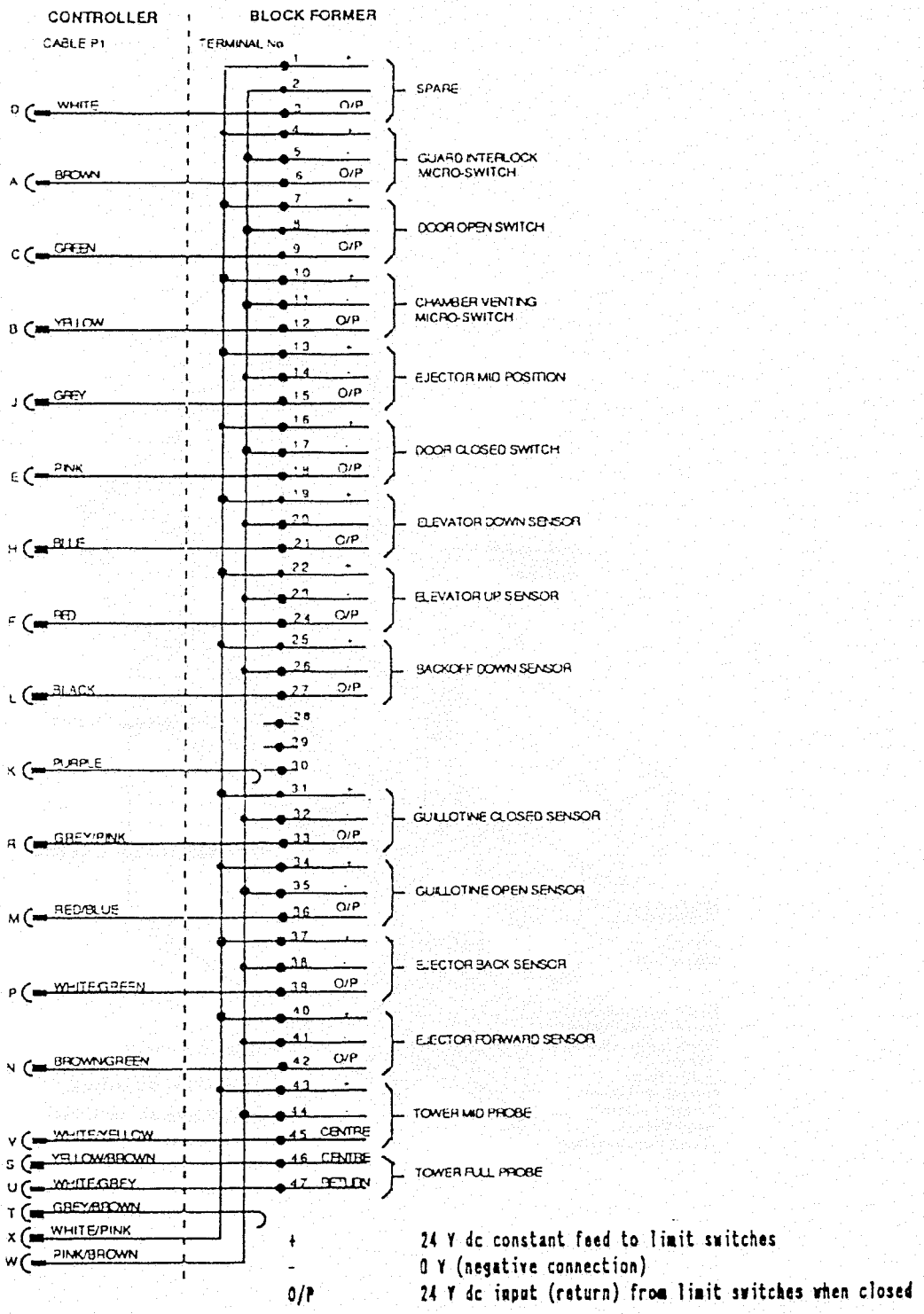
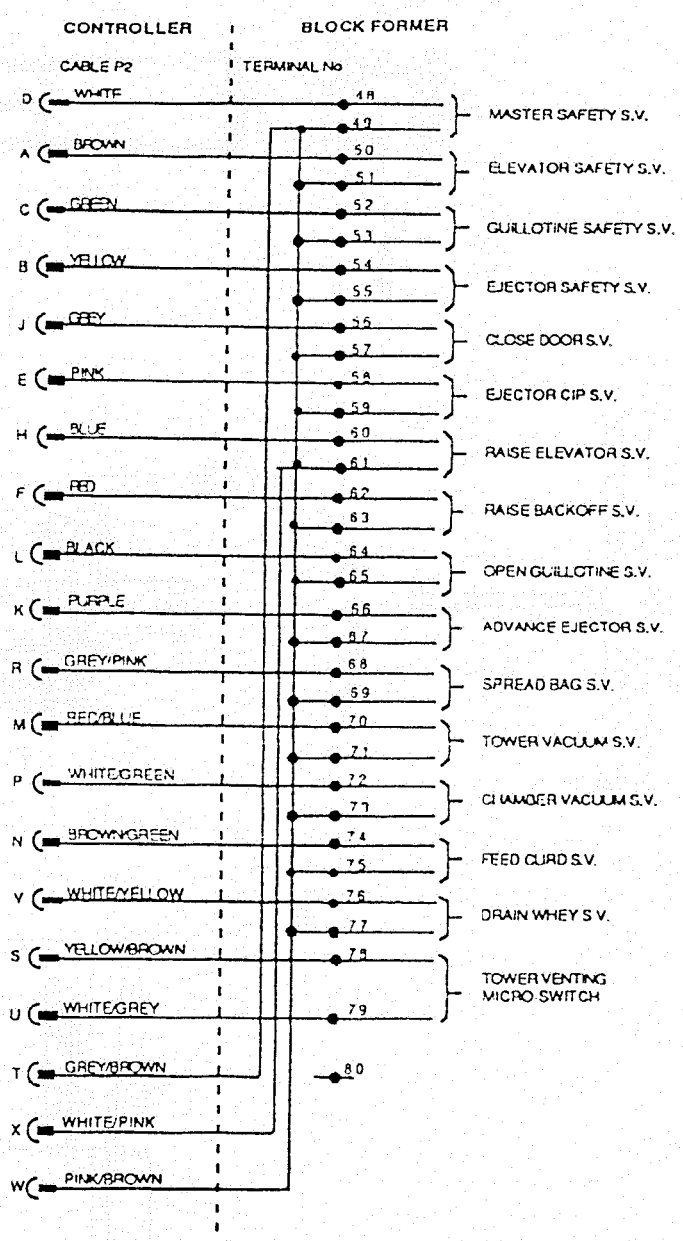


Figure 3.11 Junction Box Input Connections



+	24 V dc constant feed to limit switches
-	0 V (negative connection)
O/P	24 V dc input (return) from limit switches when closed

Figure 3.12 Base Junction Box Output Connections

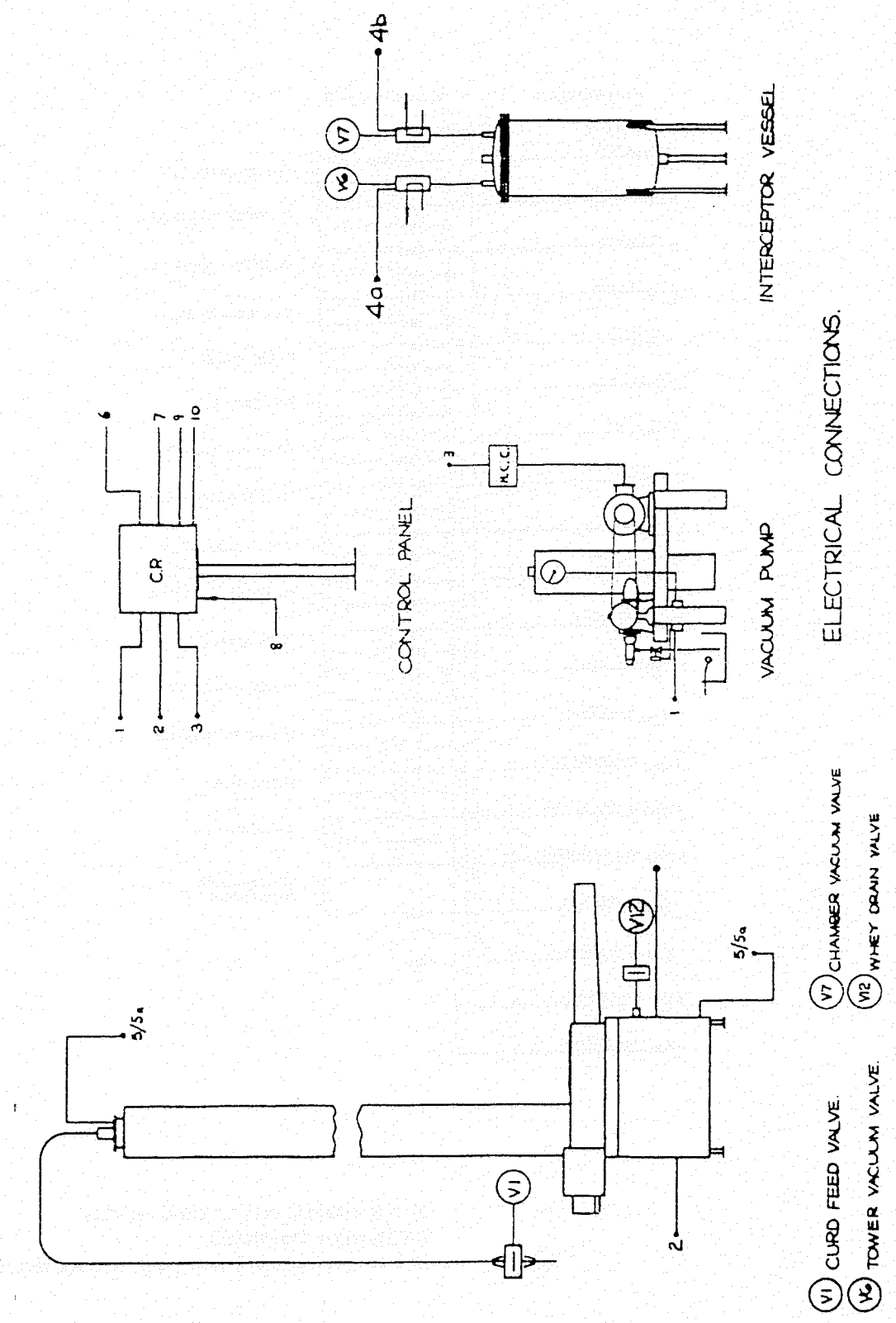


Figure 3.14 Electrical Connections

Table 3.C - Electrical Connections

CABLE NO	DESCRIPTION
1	Water Solenoid Temperature cut-out
2	P1 and P2 Connections
3	Vacuum Pump Control
4a	Tower Vacuum Valve Microswitch
4b	Chamber Vacuum Valve Microswitch
5	High Level Probe
6	Conveyor Connections (option)
7	CIP/Production Control
8	Power Supply
9	Weight Adjusting System Cable

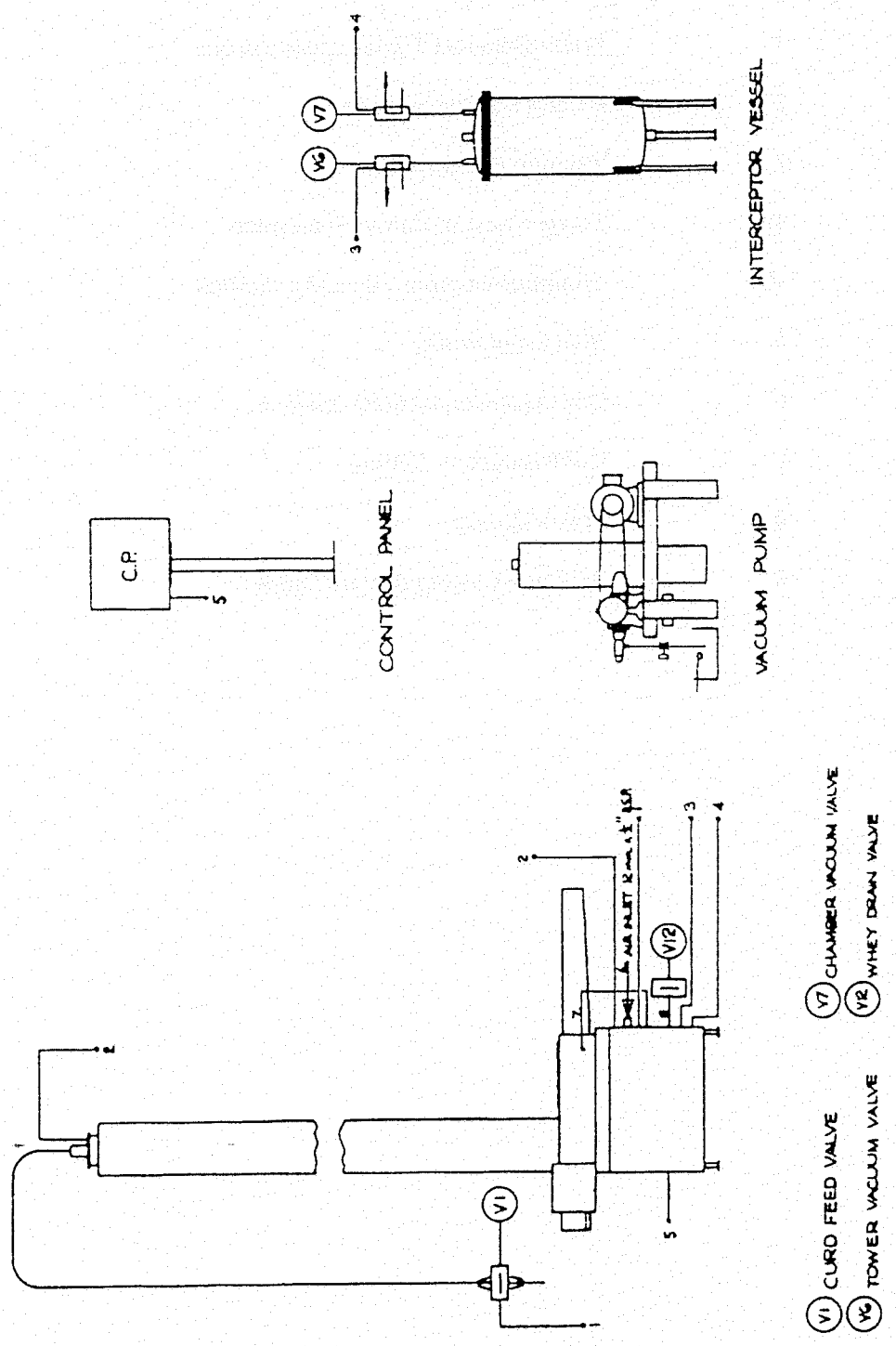


Figure 3.13 Pneumatic Connections

3.B - Pneumatic Connections

TUBE	DESCRIPTION	CONNECTION SIZE
1	Curd Feed Valve	1/8" BSP/6mm push-in fitting
2	Tower Vacuum Gauge	1/8" BSP/6mm push-in fitting
3	Tower Vacuum Valve	1/8" BSP/6mm push-in fitting
4	Chamber Vacuum Valve	1/8" BSP/6mm push-in fitting
5	Main Air Connection	12mm x 1/2" BSP
6	Chamber Vacuum Gauge	Pre-connected
8	Whey drain Valve	1/8" BSP/6mm push-in fitting

CHAPTER 4 - COMMISSIONING

4.1 SAFETY

The following precautions should be observed by the installer:

(1) Do not work in the vicinity of noisy machinery without wearing suitable hearing protection.

(2) Do not work on the equipment without wearing suitable protective clothing and eye protection.

(3) Isolate electrical supply before removing any protective guards or shrouding.

(5) Do not run equipment with belt guards removed.

(6) Do not attempt to tension vee belts or make any other adjustments while machinery is running.

(7) Ensure that vacuum is exhausted before working on evacuated areas.

(8) Ensure that all pressure is exhausted before working on the pneumatic system.

4.2 SYSTEM CHECK

Before attempting to run the Block Former the checks and inspections detailed in the following paragraphs must be carried out.

4.2.1 Inspection of Mechanical System

(1) At the interceptor, check that the vacuum pipe running from the top of the tower is connected to the tower vacuum valve at the top of the interceptor.

(2) Check that, when the tower venting valve is de-energised, the pipe to the tower is open to atmosphere.

(3) Check that the vacuum pipe running to the rear of the discharge chamber on the Block Former base is connected to the chamber vacuum valve at the top of the interceptor.

(4) Check that the vacuum relief valve is fixed in position on the inlet side of the vacuum pump and set to relieve at 0.68 Bar (20"Hg)

(5) Check that the outlet pipe at the bottom of the interceptor is closed using a blank or valve.

(6) Ensure that the top plate covering the rear of the vacuum chamber is correctly positioned and secured, and that the main guard is correctly fixed to the machine.

(7) Ensure that the bag loader is correctly aligned to the discharge chamber.

(8) Check that the vacuum set water cistern is full and that water supply is available (depress float valve).

4.2.2 Inspection of Electrical Connections

Refer to Figures 3.10 and 3.11 to confirm correct wiring connections to the Block Former junction box.

(1) Check that wiring is connected from the Control Panel terminals to:

a) Vacuum pump contactor, thermal overload probe, and solenoid valve.

b) Stop conveyor solenoid or contactor (as applicable).

c) Eject path clear (or ready to receive cheese, as applicable) signal (or short out if not applicable).

d) Raise rollers signal.

e) External CIP set if applicable.

(4) Check that vacuum pump thermal overload lead is connected (contacts should be wired normally open).

(5) Check wiring to the rear of the base unit from the tower vacuum valve microswitch and from the chamber vacuum valve microswitch.

4.2.3 Functional Checks

(1) Ensure that all HAND-O-AUTO switches are in the O position and the Emergency Stop switch is released.

(2) Ensure that the air supply is off.

(3) Switch on the mains switch. Check that no fuses are blown.

(4) Turn the TOWER VACUUM switch to HAND and check that the tower vacuum solenoid valve energises.

(5) Remove GUILLOTINE CLOSED condition by momentarily loosening terminal 33 in the junction box on the Block Former and check that the tower vacuum solenoid valve de-energises.

(6) Return the TOWER VACUUM switch to O.

(7) Turn the CHAMBER VACUUM switch to HAND and check that the chamber vacuum solenoid valve energises.

(8) Return the CHAMBER VACUUM switch to the O position.

(9) Turn the CURD FEED switch to HAND and check that the curd feed solenoid valve energises.

(10) Simulate TOWER FULL condition by momentarily bridging terminals 46 and 47 in the junction box and check that the curd feed valve solenoid de-energises.

(11) Return the TOWER FULL switch to the O position.

(12) Turn the DRAIN WHEY switch to HAND and check that the drain whey solenoid valve energises.

(13) Return the DRAIN WHEY switch to the O position.

(14) Turn the CLOSE DOOR switch to HAND and check that the close door solenoid valve energises.

(15) Remove EJECTOR BACK condition by momentarily loosening terminal 39 in the junction box and check that the signal goes out.

(16) Return the CLOSE DOOR switch to the O position.

(17) Turn the RAISE ELEVATOR switch to the HAND position and check that the raise elevator solenoid valve energises.

(18) Check that the RAISE ELEVATOR INTERLOCK will prevent the elevator from raising. This can be achieved for example by momentarily loosening terminal 33 in the junction box, the GUILLOTINE CLOSED sensor. (Condition to operate is EJECTOR BACK and either GUILLOTINE CLOSED or ELEVATOR UP).

(19) Return the RAISE ELEVATOR switch to the O position.

(20) Turn the RAISE BACK-OFF switch to HAND and check that the raise back-off solenoid valve energises.

(21) Remove the condition (EJECTOR BACK and either GUILLOTINE CLOSED or BACK-OFF UP) by momentarily loosening terminal 33 in the junction box, and check that the raise back-off solenoid valve de-energises.

(22) Return the RAISE BACK-OFF switch to O position.

(23) Turn the OPEN GUILLOTINE switch to HAND (with either the door closed or SAFETY OVERRIDE switch ON) and check that the open guillotine solenoid valve energises.

(24) Momentarily remove the condition (EJECTOR BACK sensor and TOWER VACUUM valve microswitch and DOOR CLOSED). Adjust the microswitch and simulate EJECTOR BACK (bridge terminals 37 and 39 in the junction box) if necessary.

(25) Return the OPEN GUILLOTINE switch to O position.

(26) Turn the EJECT switch to HAND and check that the advance ejector solenoid valve is energised.

(27) Momentarily remove condition (GUILLOTINE CLOSED or DOOR OPEN or BACK-OFF DOWN) by loosening terminals 33 and/or 9 and/or 27 and check that the solenoid valve de-energises.

(28) Set the EJECT switch to OFF.

(29) Turn the WATER SEAL switch to HAND and check that the water seal solenoid valve energises. Check that the applied voltage is 24Vdc.

Leave the switch set to HAND.

(30) Temporarily isolate the vacuum pump supply.

(31) Turn the VACUUM PUMP switch to HAND and check that the vacuum pump contactor energises. Check that the voltage at the contactor solenoid is 24V DC.

(32) Switch on the pump at the isolator and run for 1 hour under normal load. Check for leaks, examine pump frequently for signs of overheating.

If malfunctions occur, stop the pump immediately. Minor problems such as knocking may cause major damage if the pump is operated for extended periods without correction.

(33) Turn off the water supply and allow the pump to overheat. Check that the thermal overload operates before heat build-up becomes excessive.

If the pump cuts out prematurely or too late, adjust the thermostat setting on the thermal overload switch (located on the vacuum pump) and recheck.

(34) Return the VACUUM PUMP and WATER SEAL switches to the O position and reconnect the water supply to the pump.

(35) Check the function of the EMERGENCY STOP

(36) Release the EMERGENCY STOP pushbutton and switch DOOR CLOSE to HAND

(38) Simulate DOOR CLOSED condition by first loosening terminal 9 and then bridging terminals 16 and 18. The solenoid valve should de-energise.

(40) Simulate guillotine not closed by disconnecting sensor output lead (terminal 33) in the base unit. The DOOR INTERLOCK should be lost and the door close solenoid valve de-energise

(41) Operate the SAFETY OVERRIDE switch and check that the solenoid valve is energised.

(42) Re-connect the door open sensor.

(43) Simulate back-off not down by loosening terminal 27 in the junction box, and check that the elevator safety and ejector safety interlocks are lost.

(44) Ensure that the guillotine is closed and check that the legend GUILLOTINE SAFETY on the OP45 display is not flashing and that the guillotine safety valve is energised.

(45) Check the bag spread solenoid by operating the BAG SPREAD/RELEASE buttons.

(46) Check direction of rotation of the weight adjustment motor by momentarily operating each of the panel mounted pushbuttons while observing the adjuster motor. The motor should rotate clockwise to reduce the block size and vice-versa.

(47) Ensure that any metal objects or terminal bridges used in simulating operating conditions have been removed and that all switches are in the O position.

(48) Remove all tools and apparatus from the vicinity of the machine.

4.2.4 Valve and Feedback Checks

(1) Switch on the compressor and allow air pressure to reach operating pressure of 7-10 Bar. Check that the regulator gauge indicates 6 Bar (80 p.s.i.).

(2) Adjust the regulator to 3 Bar (40 p.s.i.), for initial checks.

(3) Check the following:

a) The door is open.

b) Elevator is down.

c) Back-off is down.

d) Guillotine is closed (i.e. tower base is sealed).

e) Ejector is back.

(4) Adjust the BACK-OFF DOWN and EJECT BACK sensors.

(5) Check that the DOOR OPEN and GUILLOTINE CLOSED LEDs are lit.

(6) Operate the SAFETY OVERRIDE switch and turn the RAISE ELEVATOR switch to HAND. The elevator should rise smoothly to its fully up position. Adjust the regulator and/or exhaust restrictor if required.

(7) Adjust the ELEVATOR UP sensor until LED is lit.

(8) Return the ELEVATOR UP switch to O position. The elevator should lower smoothly to its down position. Adjust the regulator and/or exhaust restrictor if required.

(9) Release the SAFETY OVERRIDE switch.

(10) Turn the RAISE BACK-OFF switch to HAND. The elevator should rise to its ELEVATOR DOWN (BACK-OFF UP) position.

(11) Adjust the ELEVATOR DOWN (BACK-OFF UP) sensor

(12) Return the switch to O position.

(13) Operate the SAFETY OVERRIDE switch and turn the OPEN GUILLOTINE switch to HAND. The guillotine should open.

(14) Check the GUILLOTINE OPEN sensor.

(15) Return the switch to O position. The guillotine should close.

(16) Release the SAFETY OVERRIDE switch.

(17) Turn the EJECT switch to HAND. The ejector should advance.

(18) Adjust the EJECTOR FORWARD sensor so that LED is lit.

(19) Return the switch to O position.

(20) Turn the CLOSE DOOR switch to HAND. The door should close.

(21) Check that the corresponding LED is lit.

(22) Return the switch to OFF.

(23) Check the operation of the TOWER VACUUM (and feedback), CHAMBER VACUUM (and feedback), FEED CURD (no feedback), DRAIN WHEY (no feedback), and WATER SEAL (no feedback) valves by temporarily turning the associated switch to HAND then back to O position.

(24) Operate the SAFETY OVERRIDE switch, then turn the TOWER VACUUM switch to HAND and turn the GUILLOTINE OPEN switch to HAND. Check that the guillotine does not open.

(25) Turn the TOWER VACUUM switch to O position and check that the guillotine opens 3 seconds after the TOWER VENTING signal is activated.

(26) Turn the STOP CONVEYOR switch to HAND position. The cross conveyor should stop. The rollers will raise and fall by manually operating the eject path clear device. With the rollers up, the rollers should run and stop by pressing the bag spread button if applicable.

(27) Readjust the air pressure regulator to normal operating pressure of 6 Bar (80 p.s.i.).

4.3 TEST RUN

(1) Turn all HAND/AUTO switches to the AUTO position.

(2) Set the MODE switch to RUN.

(3) Press the START button and then the HOLD button. The step indicator should indicate Step 1. Check that the vacuum pump starts, the door closes, and

tower vacuum valve is energised. The front panel gauge will indicate the vacuum in the tower.

(4) Press the START button again to release the HOLD function.

(5) Press the HOLD button again. The step indicator should indicate Step 2. Check that the elevator raises.

(6) Simulate TOWER FULL by bridging terminals 46 and 47 in the terminal box.

(7) Press START and then HOLD. The sequence should step to Step 3.

(8) Remove the bridge across terminals 46 and 47.

(9) Press the BAG SPREAD pushbutton and check that the upper tray lifts smoothly and remains in this position until Step 13.

(10) Press the BAG RELEASE pushbutton followed by the BAG SPREAD pushbutton to confirm bag spreader function. Adjust actuator restrictor valves if necessary to obtain correct operating speed.

(11) Check operation of valves and solenoids on each step by holding the sequence at each step by operation of the HOLD pushbutton. Progress the sequence by pressing the START pushbutton.

(12) Turn the selector switch to EMPTY. The sequence should continue to repeat providing the BAG SPREAD pushbutton is operated before Step 10.

(13) Turn the selector switch to END. The sequence should now complete the current cycle and then execute a final cycle in which it remains in Step 16 for 20 seconds, to dry the vacuum pump.

(14) Turn the selector switch to CIP. Check CIP communication.

CHAPTER 5 - CIP

5.1 INTRODUCTION

The entire Block Former, including the interceptor, can be cleaned to dairy standards. It is not possible to specify an optimum cleaning programme for use in all situations, due to differences in CIP methods, and to varying requirements of cheese makers and applicable local legislation.

CIP circulating times may be controlled by manual operation of valves, but pre-programmed CIP plant will normally be found to be more reliable and convenient. The following are suggested starting points, based on past experience, which can be used as a basis for development by the customer into optimised programmes for a particular set of circumstances:

5.1.1 General Requirements

Flow rates should be approximately 190 litres per minute (2,500 Imperial gallons per hour) at 1.4 Bar (20 psi) at the tower top.

Total cleaning time should be approximately 50 minutes. During all cycles in the cleaning phase, the guillotine, elevator platform and ejector plate are oscillated to ensure good coverage of all hidden surfaces.

It is recommended that a filter be included in the main CIP line to prevent fines from being re-introduced during the circulation cycles.

5.1.2 Basic CIP Cycle

Step 1: Pre-rinsing water at 40 deg C for 8 minutes.

Step 2: Circulation with detergent, caustic 1% or non-caustic based fluid at 60-70 deg C for 30 minutes.

Step 3: Post-rinsing with cold water for 7 minutes.

Step 4: Sterilising with hypochlorite solution (100 ppm available chlorine), or acidified rinse 0.1% nitric or phosphoric acid, for 7 minutes.

Step 5: (Recommended). Acid clean at least once a week using 0.5% nitric acid.

5.2 AUTOMATIC CIP

Figure 3.15 shows a typical Block Former CIP circuit using remote logic control. The programmable process controller directly operates the appropriate valves to open the cleaning circuits, and also controls the CIP unit, ie rinse, detergent, sterilant (if necessary), and returns, to provide the most economical operation. Some suggested times for the automatic CIP cycle are given in Table 3.D. These times have proved adequate at several installations, but conditions may vary from location to location.

It is possible to clean several towers with parallel circuits, thus reducing the overall cleaning time. Certain parts, ie door and the machine's exterior, must be hand cleaned.

Table 3.D - Automatic CIP Times

CIRCUIT	RINSE	NaOH	RINSE	STERILANT
Curd Feed (1)	3	5	2	2
Tower Vacuum Line (2)	1	3	1	1
Behind Tower Screen Spray Balls and Spray Jets (3)	1	10	2	1
Vacuum Pump to Interceptor (4) (optional)	1	3	1	1
Chamber Vacuum Line (5) (pulsing V11 on 20 secs, off 40 secs)	1	3	1	1
Chamber Spray Balls and Interceptor Spray Ball (6)	1	3	1	1

Circuit 1 CIP source at curd feed for this circuit only. Orifice plates should be used to ensure even flow in parallel circuits, and to control the flowrate from the unrestricted curd line.

Circuit 2 Activate V3, V10.

Circuit 3 Activate V3, V2, V8, V10

Circuit 4 Activate V13, V10

Circuit 5 Activate V5, V10, V11 (oscillate)

Circuit 6 Activate V5, V9, V11, V10, V4

Table 3.E - Valve List (Automatic CIP Circuit)

VALVE	TYPE
V1	101.6 dia LKBA Butterfly (See Note 1)
V2	38 dia SRC Type 21
V3	38 dia LKBA Butterfly
V4	38 dia LKBA Butterfly
V5	38 dia LKBA Butterfly
V6	38 dia SRC Type 21 (See Note 1)
V7	38 dia SRC Type 21 (See Note 1)
V8	38 dia LKBA Butterfly
V9	38 dia LKBA Butterfly
V10	63.5 dia LKBA Butterfly
V11	38 dia SRC Type 21
V12	76 dia LKBA Butterfly (See Note 1)
V13	63.5 dia SRC Type 21
V14	Vacuum relief valve (See Note 2)
V15	Water solenoid valve (See Note 2)

> Note 1: Valves V1, V6, V7 and V12 may be operated by Block Former control panel.

Note 2: Valves V14 and V15 supplied with vacuum pump. V15 solenoid is operated by the Block Former control panel.

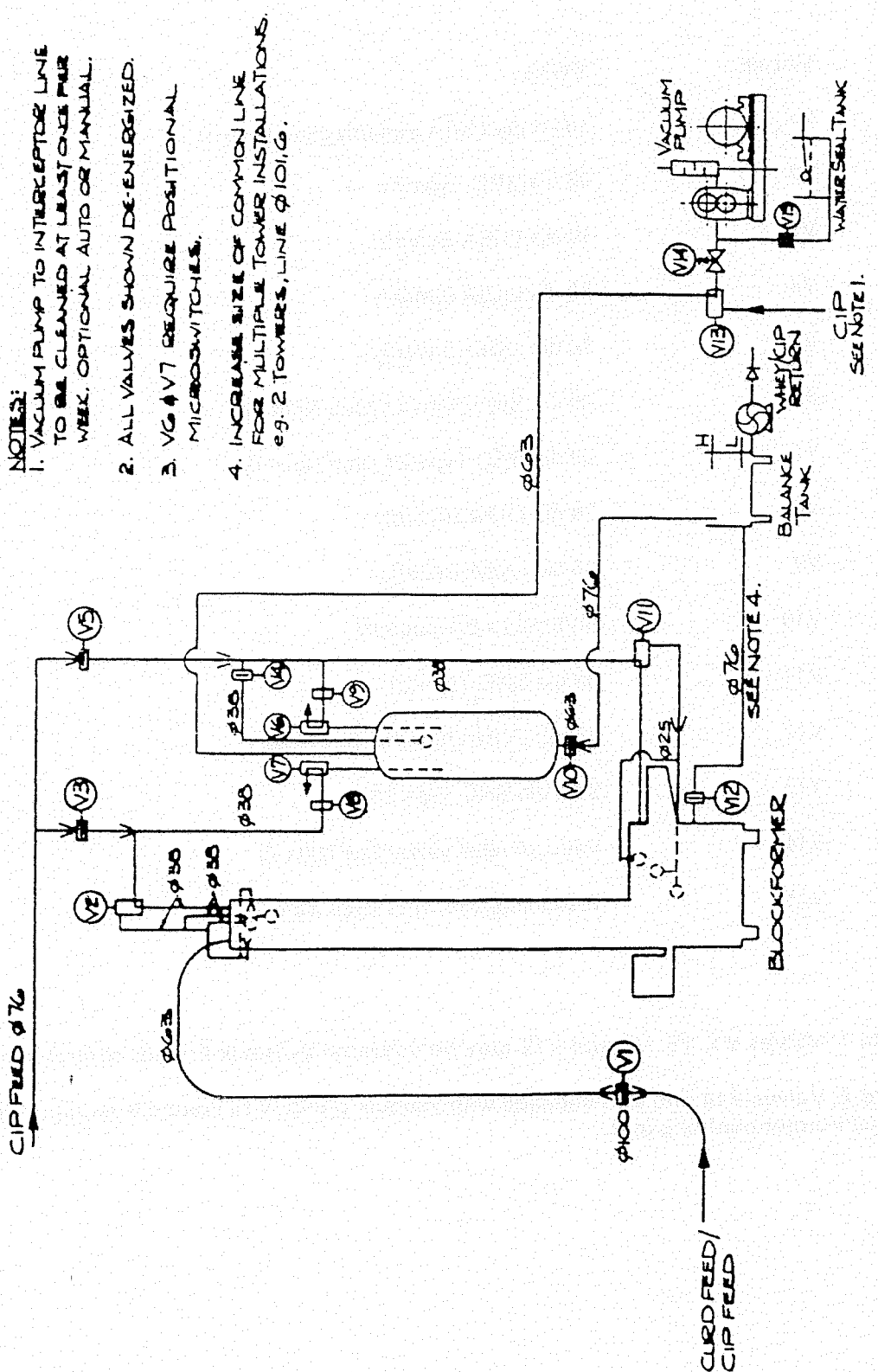


Figure 3.15 Automatic CIP Circuit

5.3 MANUAL CIP SYSTEM

A typical manual CIP system is shown in schematic form in Figure 3.16

This basic system can be modified as required to suit individual customers' requirements.

The CIP source must be capable of supplying the various solutions at the required temperatures and flow rates. Some suggested times for the manual CIP cycle are given in Table 3.F. These times have proved adequate at several installations, but conditions may vary from location to location.

It is possible to clean several towers with parallel circuits, thus reducing the overall cleaning time. Certain parts of the machine, ie door and the machine's exterior, must be hand cleaned.

Table 3.F - Manual CIP Times

CIRCUIT	RINSE	CAUSTIC	RINSE	STERILANT
Curd Feed Line (1)	3	5	2	2
Tower Vacuum Line (2)	1	3	1	1
Behind Tower Screen Spray Balls and Spray Jets (3)	1	10	2	1
Vacuum Pump to Interceptor (4) (optional)	1	3	1	1
Tower Vacuum Pipe to Interceptor (5)	1	3	1	1
Chamber Vacuum Pipe to Interceptor (6)	1	3	1	1
Spray Ball - Interceptor (7)	1	3	1	1
Chamber Spray Balls	1	3	1	1

Table 3.G - Valve List (Manual CIP Circuit)

VALVE	TYPE
V1	101.6 dia Auto-Butterfly (See Note 1)
V2	38 dia SRC Type 21
V3	76 dia Auto-Butterfly (See Note 1)
V4	38 dia manual plug cock, 3-way
V5	38 dia SRC Type 21 (See Note 1)
V6	38 dia SRC Type 21 (See Note 1)
V7	38 dia manual plug cock, 3-way
V8	38 dia manual plug cock, 3-way
V9	38 dia manual butterfly
V10	63.5 dia optional manual or auto 3-way
V11	Water solenoid valve (See Note 2)
V12	Vacuum relief valve (See Note 2).

> Note 1: Valves V1, V3, V5 and V6 operated by Block Former control panel.

Note 2: Valves V11 and V12 supplied with vacuum pump. Operated by Block Former control panel.

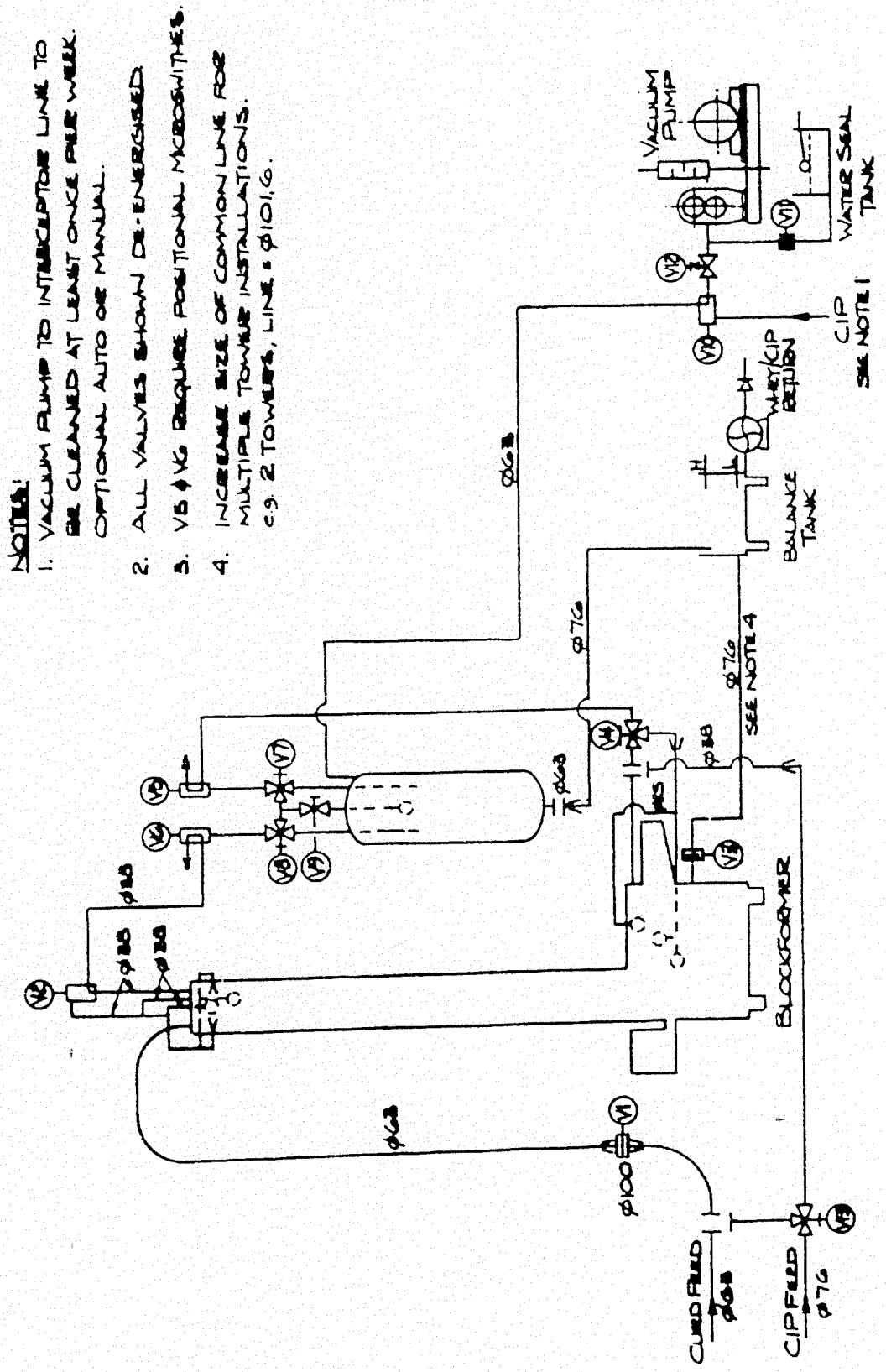


Figure 3.16 Manual CIP Circuit

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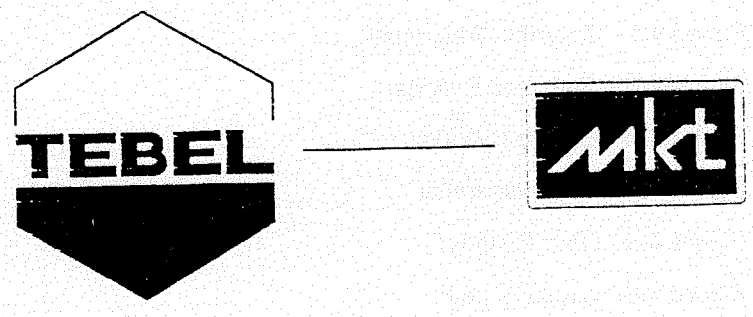


SECTION 4

ILLUSTRATED PARTS LIST

CONTENTS

ILLUSTRATIONS

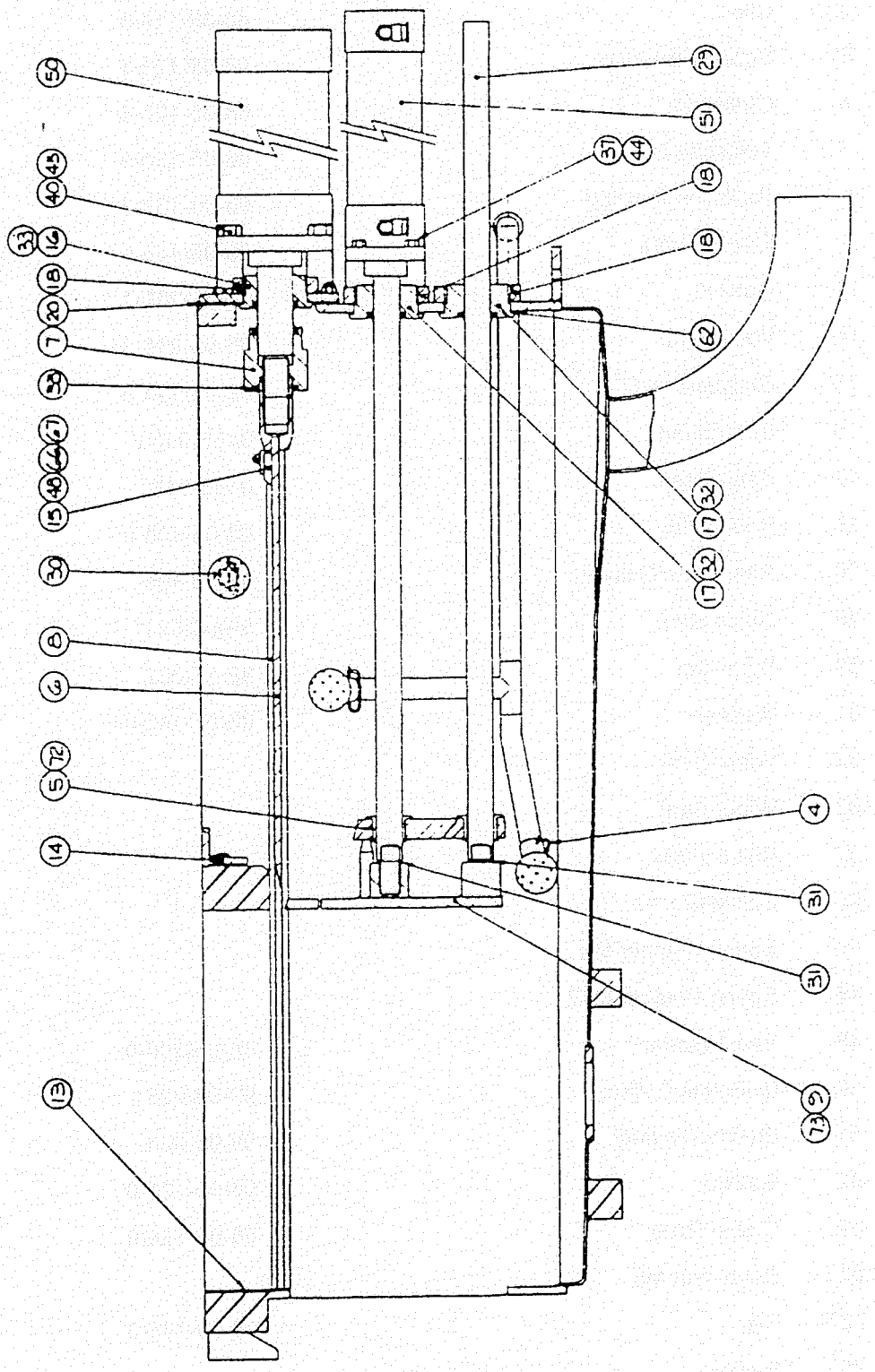


Figure 4.1 Chamber Assembly

4.1 - CHAMBER ASSEMBLY

ITEM	DESCRIPTION	PART NO
4	Clip	08-05-118-0
5	Support Bearing	08-05-123-1
6	Guillotine	08-05-127-3
7	Adjusting Nut	08-05-130-0
8	Guillotine Bearing	08-05-132-3
9	Ejector Plate	08-05-146-5
13	Gasket	08-05-208-1
14	Valve Seal	08-05-216-3
15	Guillotine Seal	08-05-124-0
16	Seal Gland	0166-0188
17	Seal Gland	0166-0187
18	Round Nut	08-05-403-0
20	Rear Plate Gasket	08-05-406-1
29	Guide Rod	99-08-021
30	Sprayball	99-17-002
31	Washer	08-05-145-0
32	Wiper Seal	
33	Wiper Seal	
37	Bolt 8 x 30	
40	Bolt M12 x 45	
44	Spring Washer M8	
45	Spring Washer M12	
48	Seal Washer	08-05-209-0
50	Guillotine Cylinder	99-08-025
51	Ejector Cylinder	99-08-026
62	Gasket	08-05-125-0
66	Clamp Plate	08-05-126-0
67	Dome Nut M5	
72	Clip	08-05-135-0
73	Loctite	

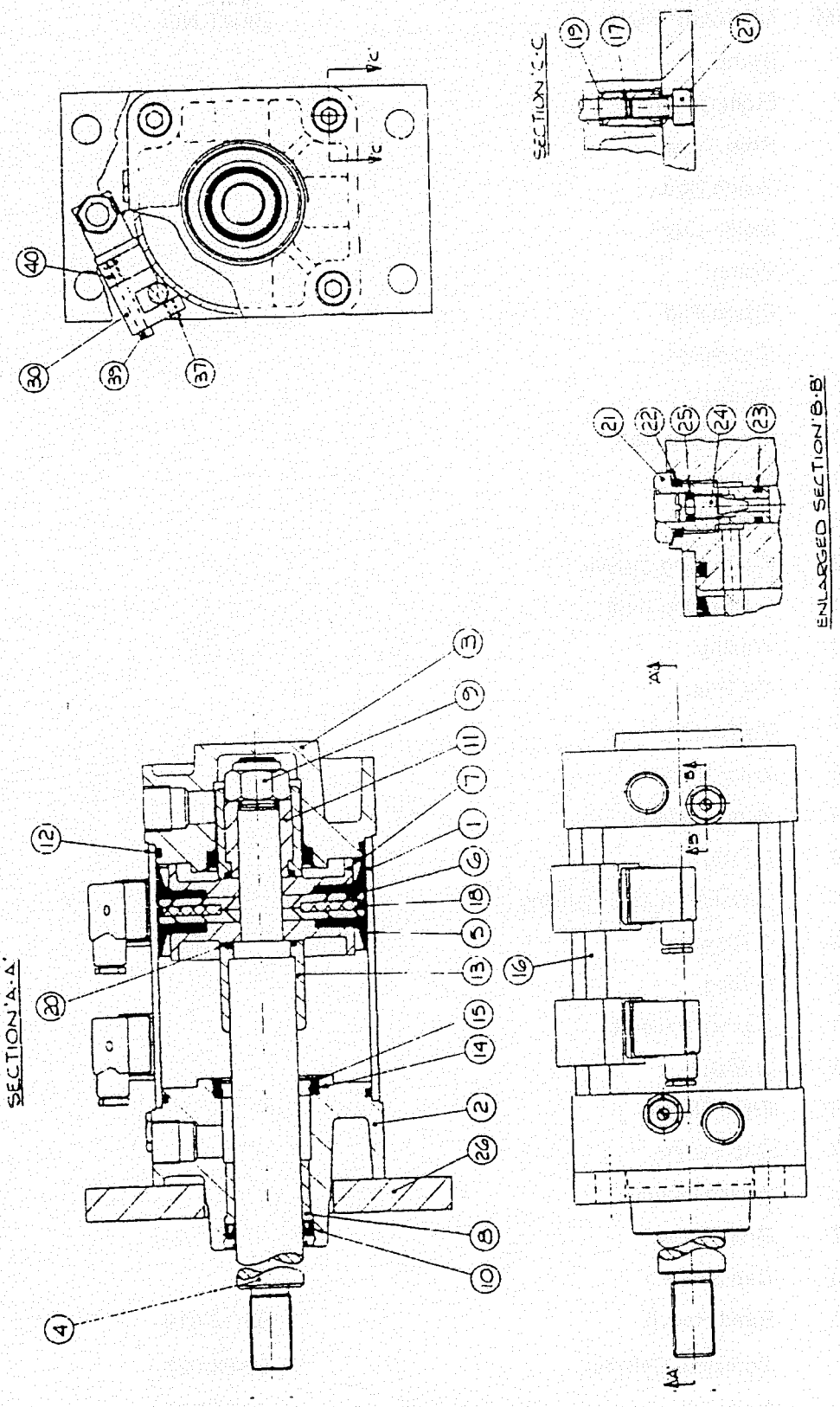


Figure 4.2 Guillotine Cylinder

4.2 - GUILLOTINE CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston	
7	Piston Pad	
8	Rod Bush *	
9	Rod Nut	
10	Wiper/Rod Seal *	
11	Sleeve	
12	O Ring	
13	Cushioning Sleeve	
14	Cushioning Seal *	
15	Washer	
16	Tie Rod	
17	Tie Rod Nut	
18	Wear Ring *	
19	Spring Washer *	
20	O Ring *	
21	Cushion Needle Housing	
22	O Ring *	
23	O Ring *	
24	Cushion Needle	
25	O Ring *	
26	Front Flange	
27	Cap Screw	
30	Switch Mount	
37	Grub Screw	
39	Cap Screw	
40	Reed Switch	99-12-019
	Complete Cylinder	99-08-025
	Repair Kit (Includes items marked *)	99-09-025

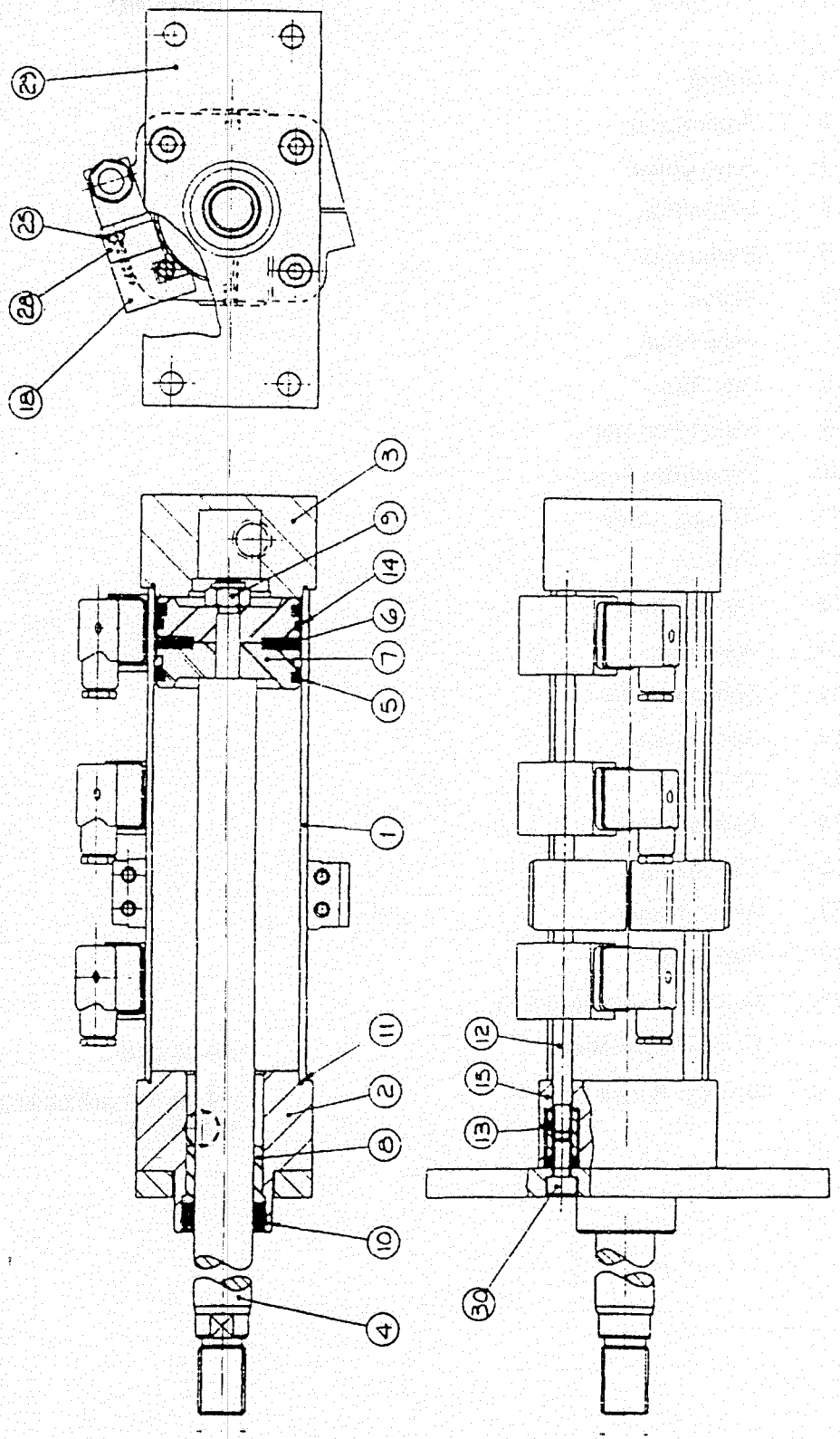


Figure 4.3 Ejector Cylinder

4.3 - EJECTOR CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston	
7	Piston Pad	
8	Rod Bush *	
9	Piston Rod Nut	
10	Wiper/Rod Seal *	
11	'O' Ring, Cover *	
12	Tie Rod	
13	Tie Rod Nut	
14	Wear Ring	
15	Spring Washer *	
16	Switch Block	
17	'O' Ring *	
18	Switch Block	
25	Cap Screw	
29	Front Flange	
30	Cap Screw	
31	Washer, Piston Rod End	
	Complete Cylinder	99-08-026
	Cylinder Repair Kit	99-09-026 (Includes items marked *)

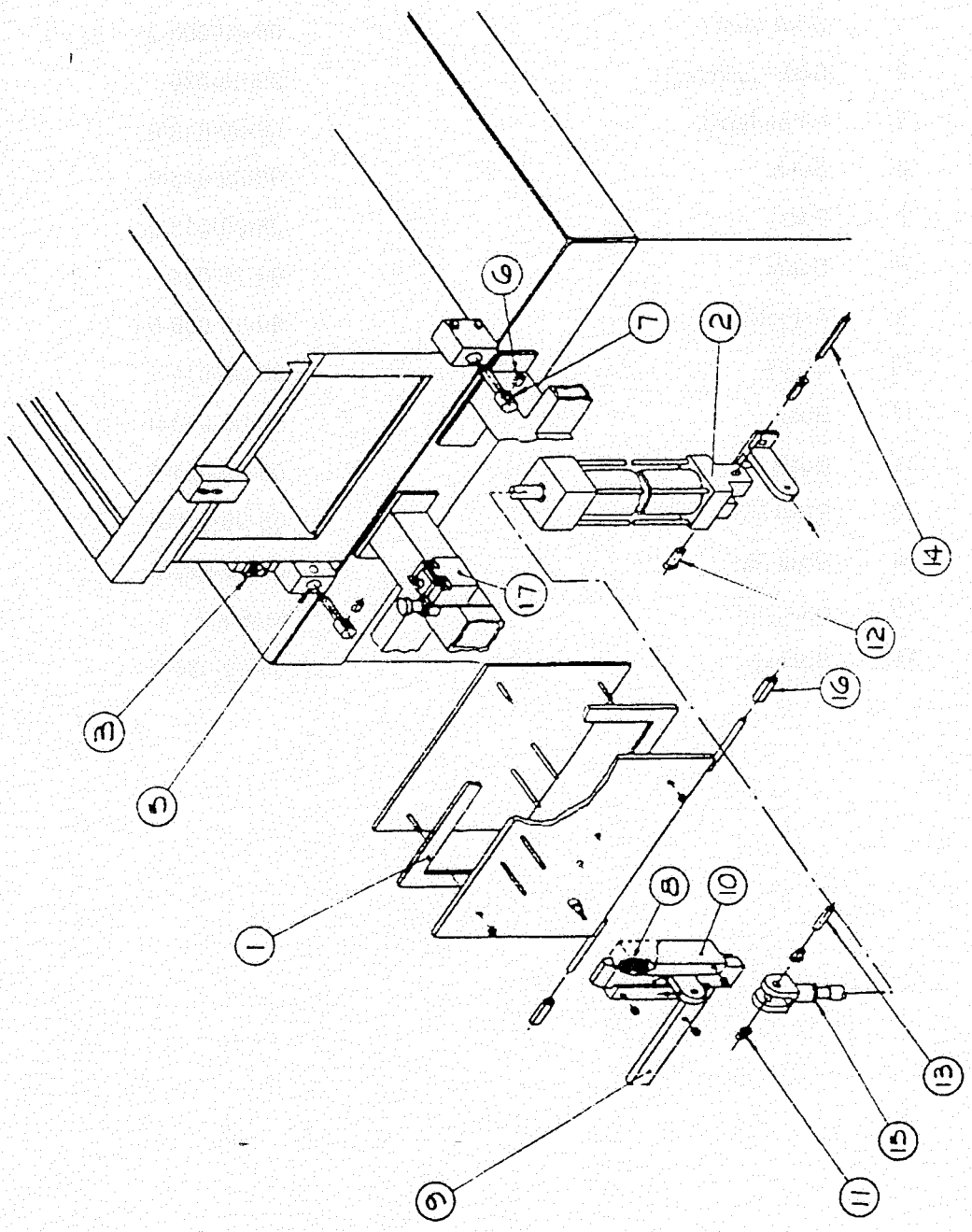


Figure 4.4 Door Assembly

4.4 - DOOR ASSEMBLY

ITEM	DESCRIPTION	PART NO
1	Door Seal	08-09-003-2
2	Door Cylinder	99-08-030
5	Hinge Block	08-09-013-0
6	Bush	08-09-016-0
7	Pilot	08-09-015-0
8	Spring	99-15-001
9	Actuator	99-09-006-0
10	Guide	99-09-011-1
11	Bush	08-09-018-0
12	Bush	08-09-021-0
13	Pivot Pin	08-09-019-0
14	Pivot Pin	08-09-022-0
15	Lock Nut	M16 x 2
16	Spacer	08-09-036-0

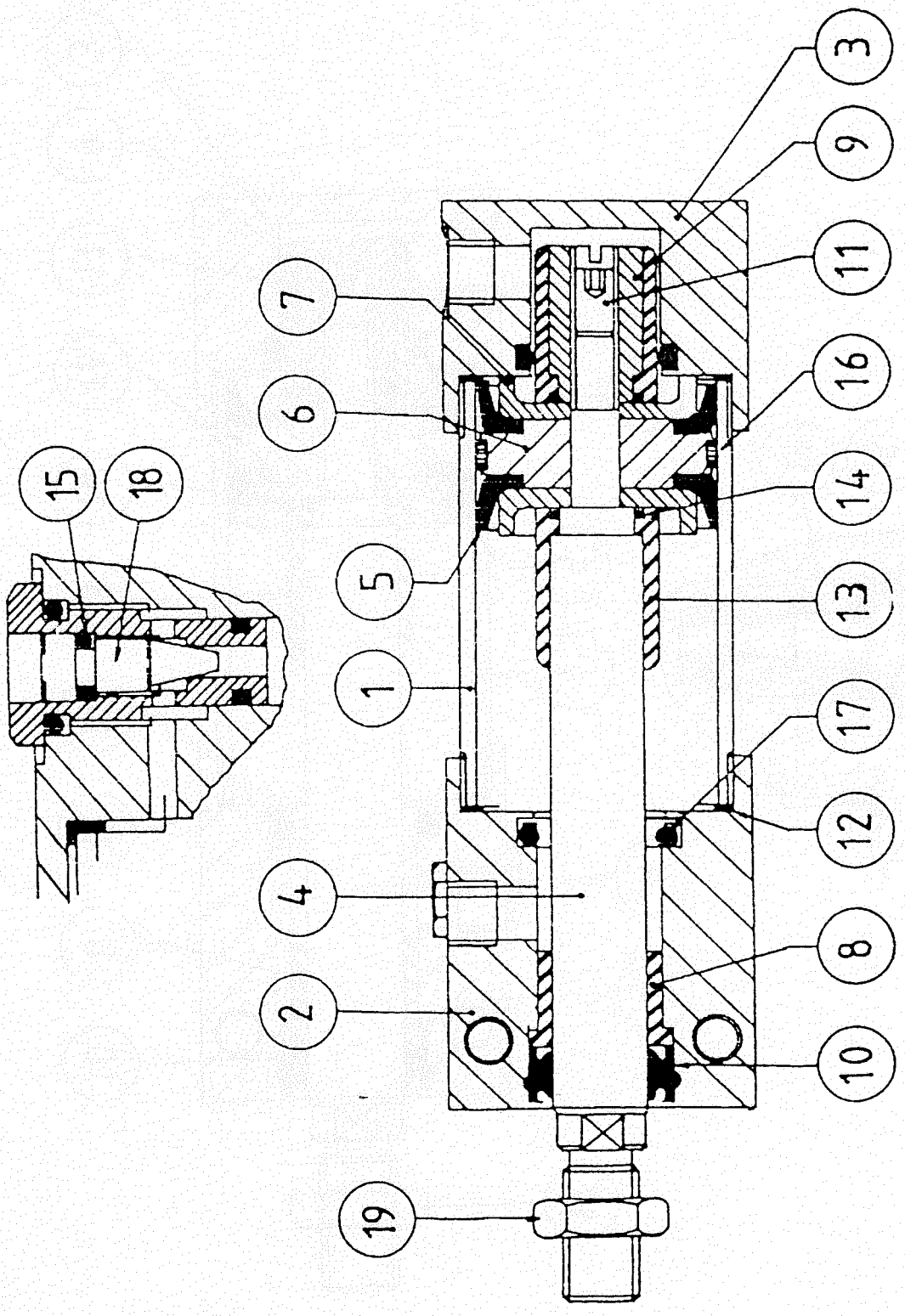


Figure 4.5 Door Cylinder

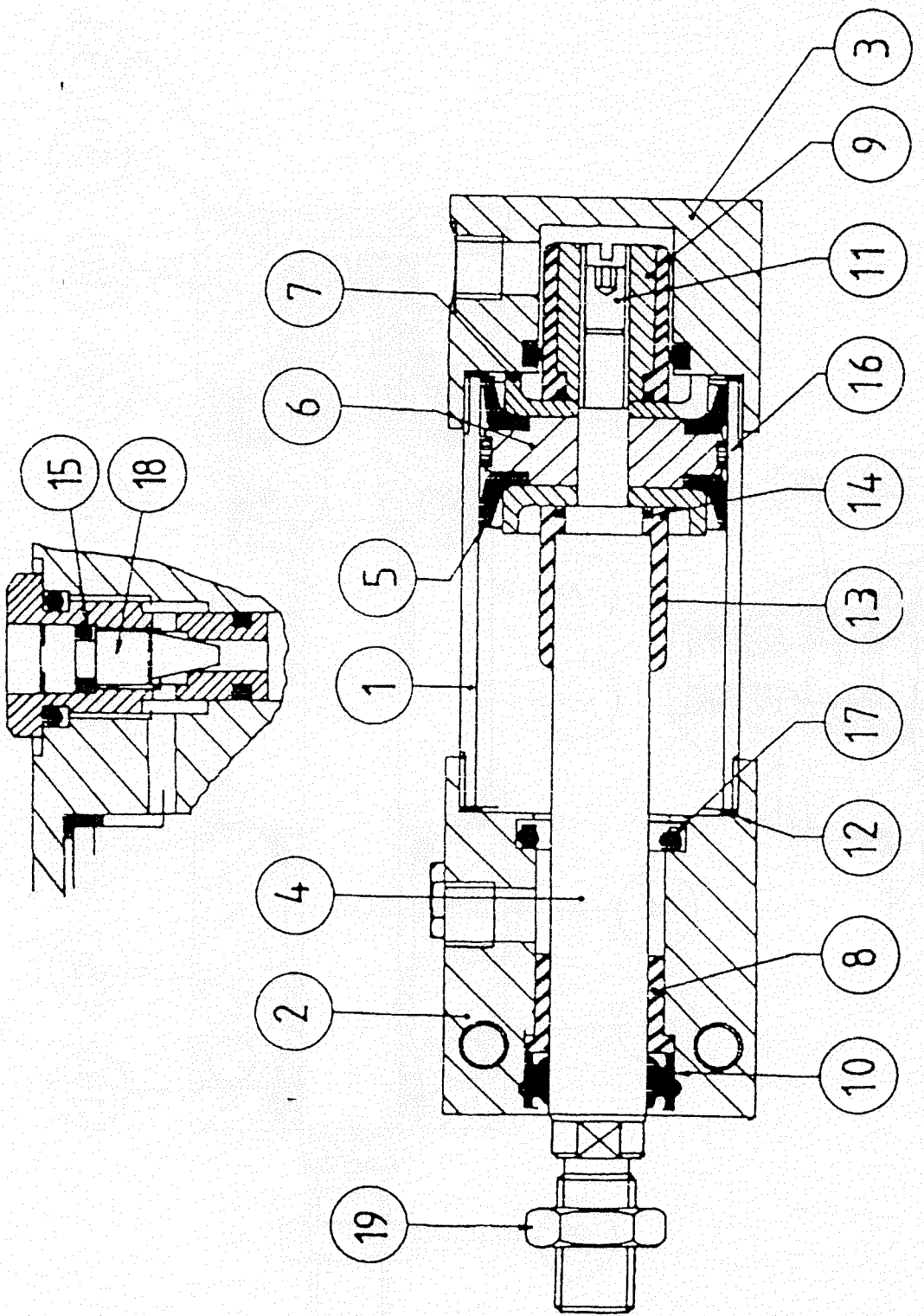


Figure 4.5 Door Cylinder

4.5 - DOOR CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston - Magnetic	
7	Piston Pad	
8	Piston Rod Bush *	
9	Piston Rod Nut	
10	Wiper/Rod Seal *	
11	Grubscrew	
12	Cover Sealing Washer *	
13	Cushioning Sleeve	
14	'O' Ring *	
15	'O' Ring	
16	Wear Ring *	
17	Cushioning Seal *	
18	Cushioning Needle *	
	Complete Cylinder	99-08-030
	Repair Kit (Includes items marked *)	99-09-030

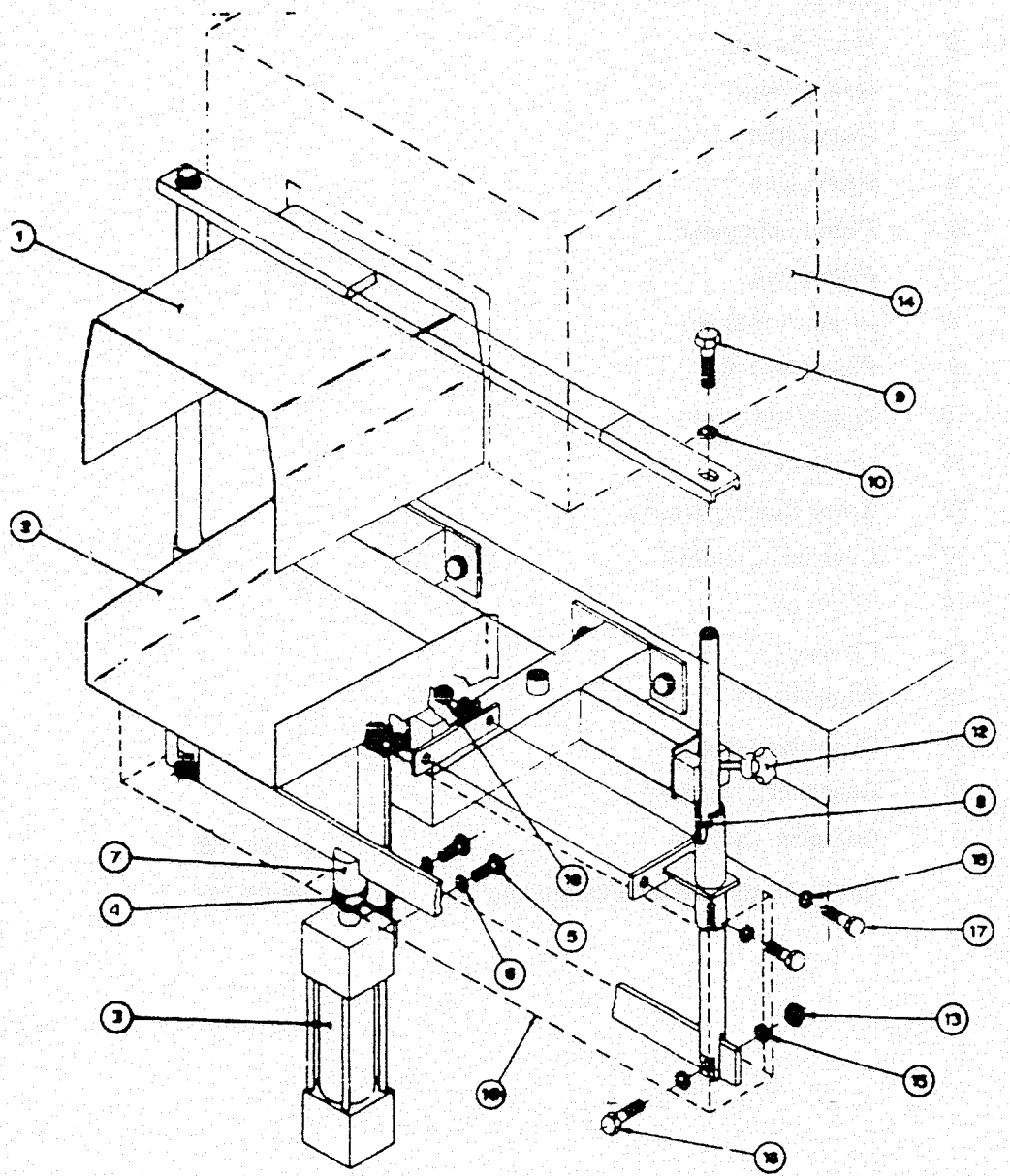


Figure 4.6 Bagging Unit

4.6 - BAGGING UNIT ASSEMBLY

ITEM	DESCRIPTION	PART NO
1	Upper Bag Tray	08-09-103-1
2	Lower Bag Tray	08-09-104-0
3	Bag Cylinder	99-08-029
4	Lock Nut, M16 x 2	
5	Setscrew, M10 x 35	
6	Spring Washer M10	
7	Beam Assembly	08-09-108-0
8	Bush	08-09-118-0
9	Bolt, M10 x 35	
10	Washer 10	
11	Knob	99-16-001
12	Nut 10	
13	Main Guard	08-10-000-8
14	Washer10	
15	Bolt M10 x 35	
16	Bolt M10 x 35	
17	Washer M10	
18	Finger Guard	08-09-121-3

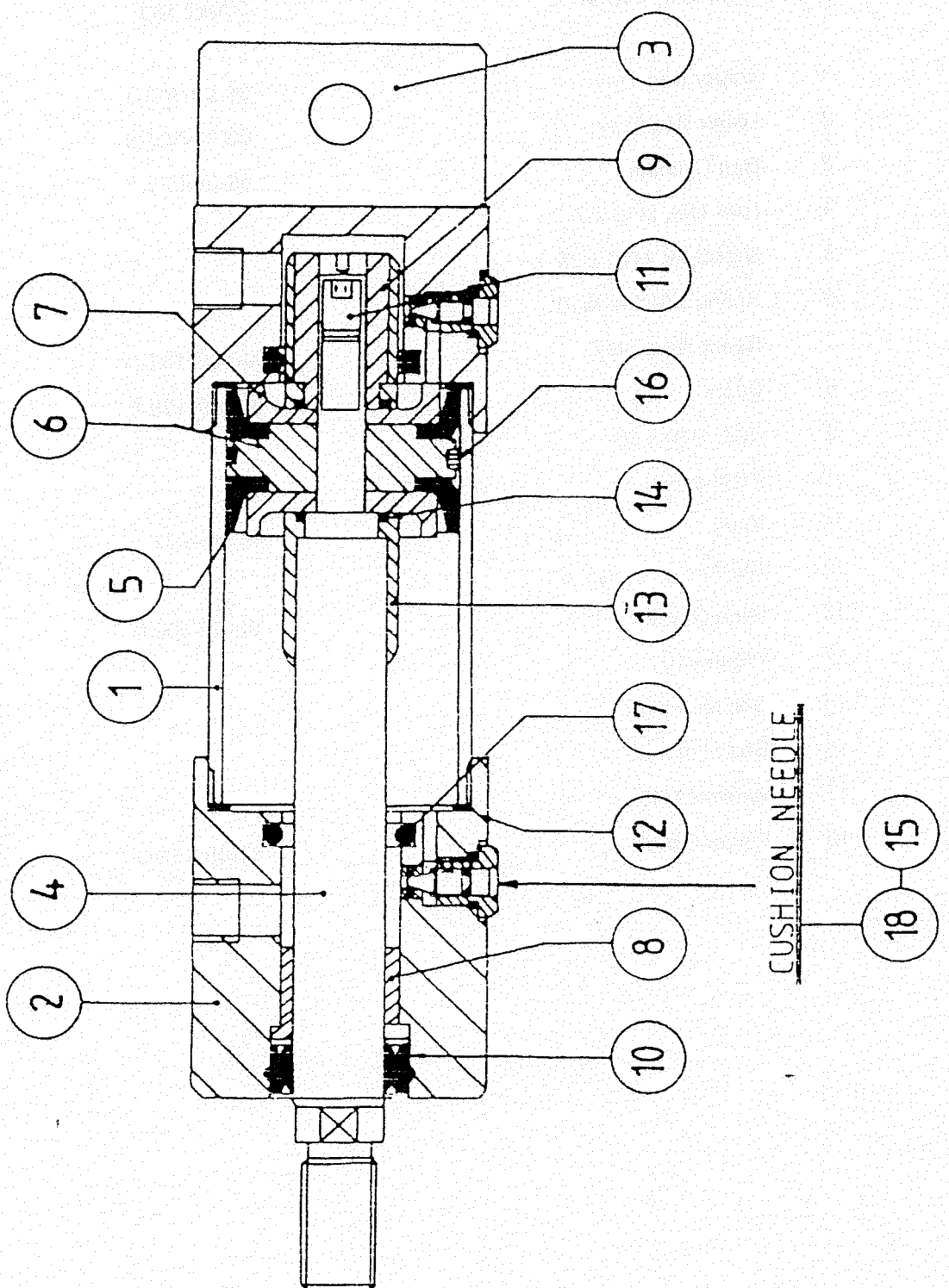


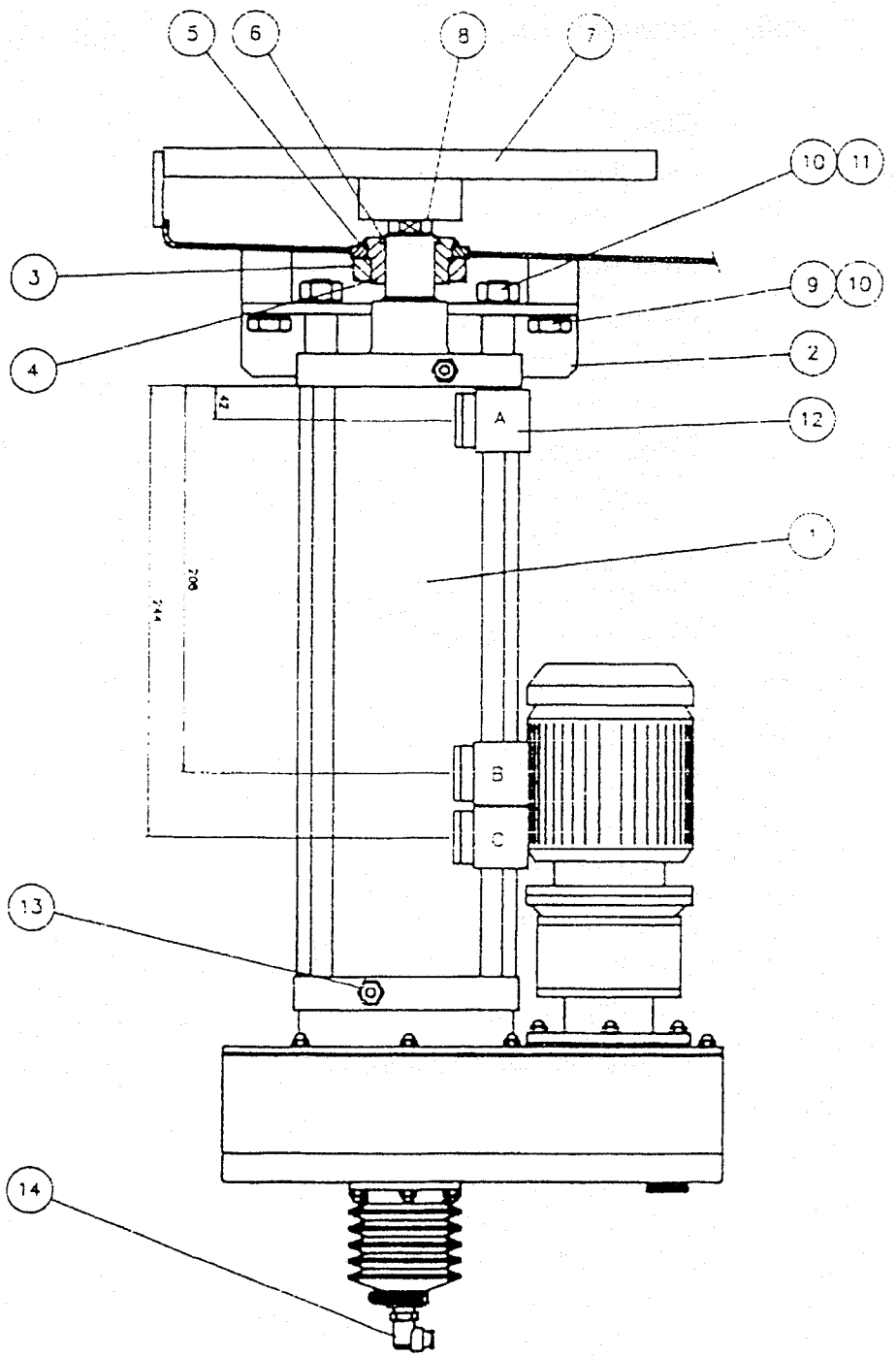
Figure 4.7 Bag Spread Cylinder

4.7 - BAG SPREAD CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston - Magnetic	
7	Piston Pad	
8	Piston Rod Bush *	
9	Piston Rod Nut	
10	Wiper/Rod Seal *	
11	Grubscrew	
12	Cover Sealing Washer *	
13	Cushioning Sleeve	
14	'O' Ring *	
15	'O' Ring	
16	Wear Ring *	
17	Cushioning Seal *	
18	Cushion Needle *	
19	Locknut	
	Complete Cylinder	99-08-029
	Repair Kit (Includes items marked *)	99-09-029

4.7 - BAG SPREAD CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston - Magnetic	
7	Piston Pad	
8	Piston Rod Bush *	
9	Piston Rod Nut	
10	Wiper/Rod Seal *	
11	Grubscrew	
12	Cover Sealing Washer *	
13	Cushioning Sleeve	
14	'O' Ring *	
15	'O' Ring	
16	Wear Ring *	
17	Cushioning Seal *	
18	Cushion Needle *	
19	Locknut	
	Complete Cylinder	99-08-029
	Repair Kit (Includes items marked *)	99-09-029



A = ELEVATOR UP
B = ELEVATOR DOWN
C = ELEVATOR FULLY DOWN

Figure 4.8 Elevator Asssembly

4.8 - ELEVATOR ASSEMBLY

ITEM	DESCRIPTION	PART NO
1	Elevator Cylinder	99-08-028
3	Round Nut	08-05-403-0
4	Seal Gland	0166-0120
5	O Ring	
6	Seal	
7	Lowering Plate	08-07-008-4
8	Washer	08-07-010-0
9	Set Screw, M16 x 35	
10	Spring Washer, M16	
11	Mounting Angle	08-07-006-1
12	Nut, M16	
13	Spring Washer, M16	
21	Tie Rod Nut	
22	Pressure Regulator	99-01-004
23	Pressure Gauge	99-01-005

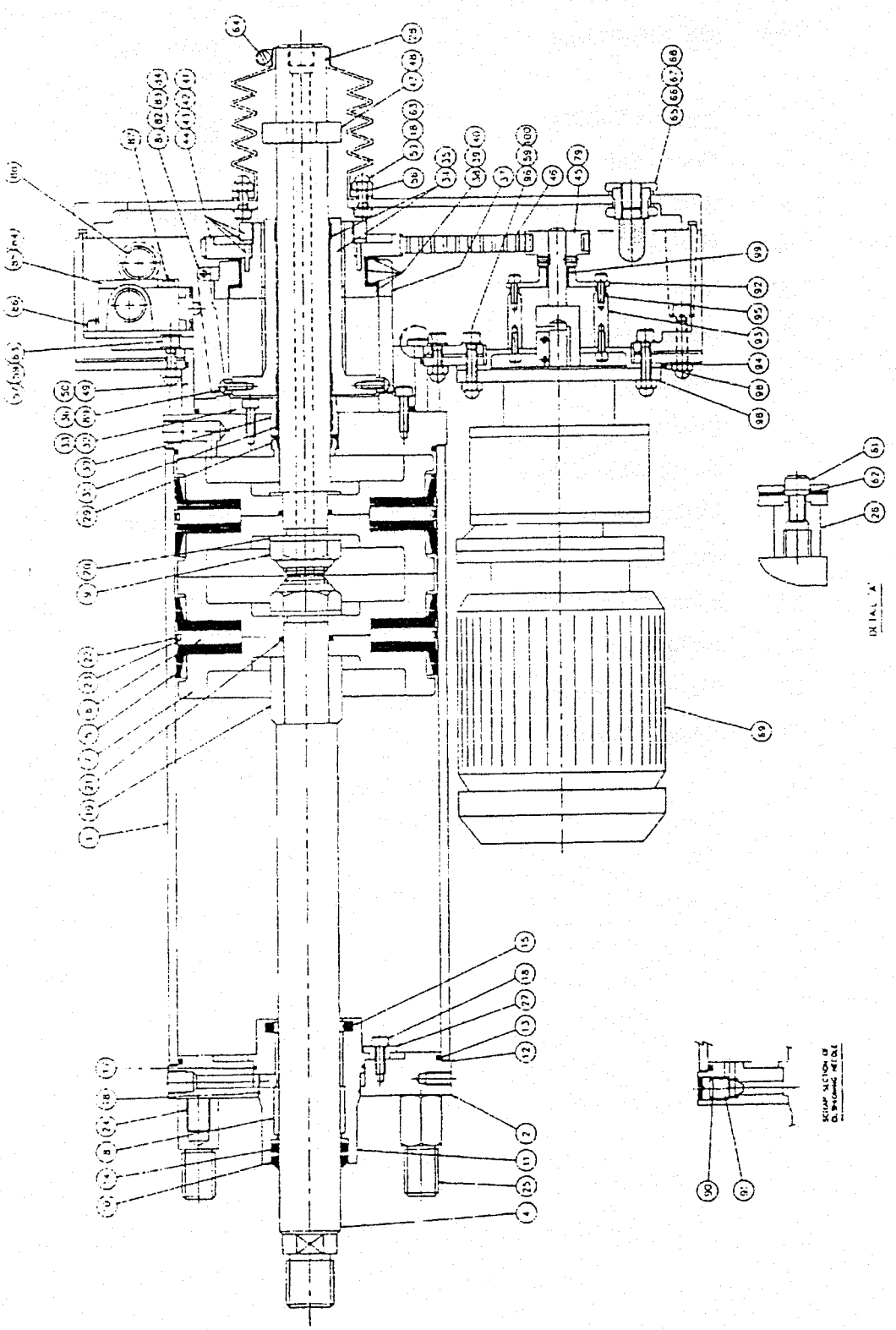


Figure 4.9 Elevator Cylinder

4.9 - ELEVATOR CYLINDER

ITEM	DESCRIPTION	PART NO
1	Barrel	
2	Front Cover	
3	Rear Cover	
4	Piston Rod	
5	Piston Cup *	
6	Piston	
7	Piston Pad	
8	Rod Bearing *	
9	Piston Rod Nut	
10	Wiper Seal *	
11	Bush/Sealing Housing	
12	Cover Seal Washer *	
13	'O' Ring, Cover *	
14	Rod Seal *	
15	Cushioning Seal *	
16	'O' Ring, Seal Housing *	
17	'O' Ring, Seal Housing *	
18	Cap Head Screw	
19	Cushioning Sleeve	
20	Thrust Washer	
21	'O' Ring, Piston *	
22	Wear Ring, Piston *	
23	Sensing Strip	
24	Tie Rod	
25	Tie Rod Nut	
26	Mounting Pillar	
27	Housing Locator	
28	Piston Rod (Adj Stop)	
29	Rod Seal, Rear Cover *	
30	Rod Bush Carrier	
31	Rod Bush, Rear Cover *	

4.9 - ELEVATOR CYLINDER CONTINUED

ITEM	DESCRIPTION	PART NO
32	Bush Retaining Plate	
33	Cap Head Screw	
34	Adjustable Stop	
35	Rod Bush, Adjuster Stop *	
36	Anti-Rotation Collar	
37	Adjuster Housing	
38	Adjuster Nut	
39	Adjuster Nut Bush *	
40	Thrust Washer	
41	Drive Pin	
42	Washer	
43	Retaining Nut	
44	Pulley (72 Tooth)	
45	Pulley (18 Tooth)	
46	Timing Belt	
47	Stop Ring	
48	Cap Head Screw	
49	Spacer Tube	
50	O Ring, Spacer Tube *	
51	O Ring, Adjuster Housing *	
52	Enclosure Plate	
53	Enclosure Gasket	
54	Enclosure	
55	Gaiter	
56	Flange Plate (Gaiter)	
57	Cap Head Screw	
58	Cap Head Screw	
59	Dome Nut	

4.9 - ELEVATOR CYLINDER CONTINUED

ITEM	DESCRIPTION	PART NO
60	Washer (Type B)	
61	Cap Head Screw	
62	Dowty Bonded Washer *	
63	Dowty Bonded Washer *	
64	Jubilee Clip	
65	Bulkhead Body	
66	Bulkhead Locknut	
67	Washer, Fibre *	
68	Breather *	
69	Motor and Gearbox	
70	Drive Coupling	
71	Cap Screw	
72	Drive Coupling Driven Flange	
73	Washer	
74	Cover Plate	
75	Cap screw	
76	Drive Coupling Boss	
77	Key	
78	Cap Head Screw	
79	Grub Screw	
80	Pivot Block	
82	Pivot Pin	
83	Switch Cam	
84	Switch Plate	
85	Limit Switch	
86	Cap Screw (Switch Plate)	
87	Cap Screw (Switch)	
88	Cable Entry	
89	Button Head Screw	

4.9 - ELEVATOR CYLINDER CONTINUED

ITEM	DESCRIPTION	PART NO
90	Cushioning Needle	
91	'O' Ring, Cushioning Needle *	
92	Bearing Housing	
93	Spacer	
94	Flange	
95	Cap Head Screw	
96	Cap Head Screw	
97	Liquid Gasket	
98	Nut Lock Sealant	
99	Bush	
100	Washer, Motor Nose *	
101	Bearing (not illustrated)*	
	Complete Cylinder	99-08-028
	Repair Kit (Items marked * only)	99-09-028

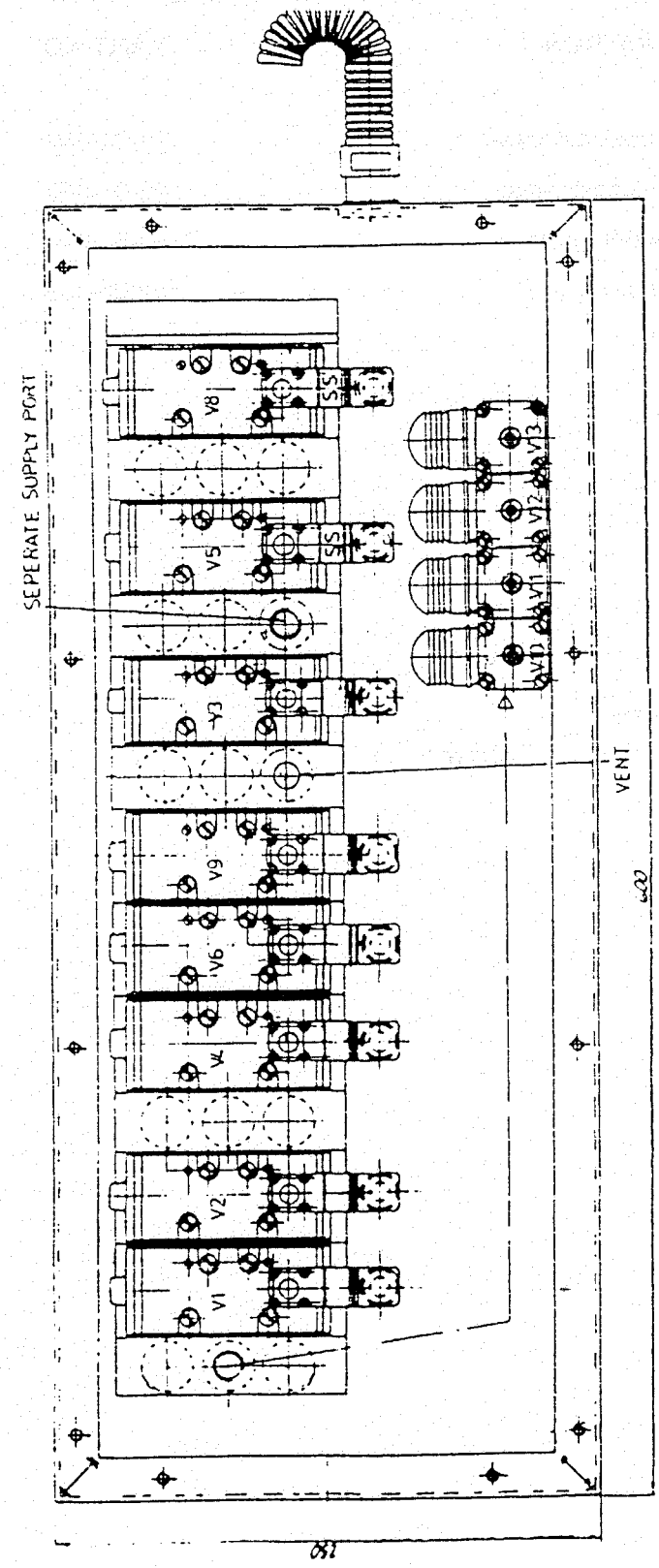


Figure 4.10 Pneumatic Manifold

4.10 - PNEUMATIC VALVE MANIFOLD

ITEM	DESCRIPTION	PART NO
1	5 Port Solenoid Valve	99-01-039
2	Pilot Solenoid Valve	99-01-040
3	Pressure Regulator	99-01-004
4	Pressure Gauge	99-01-005

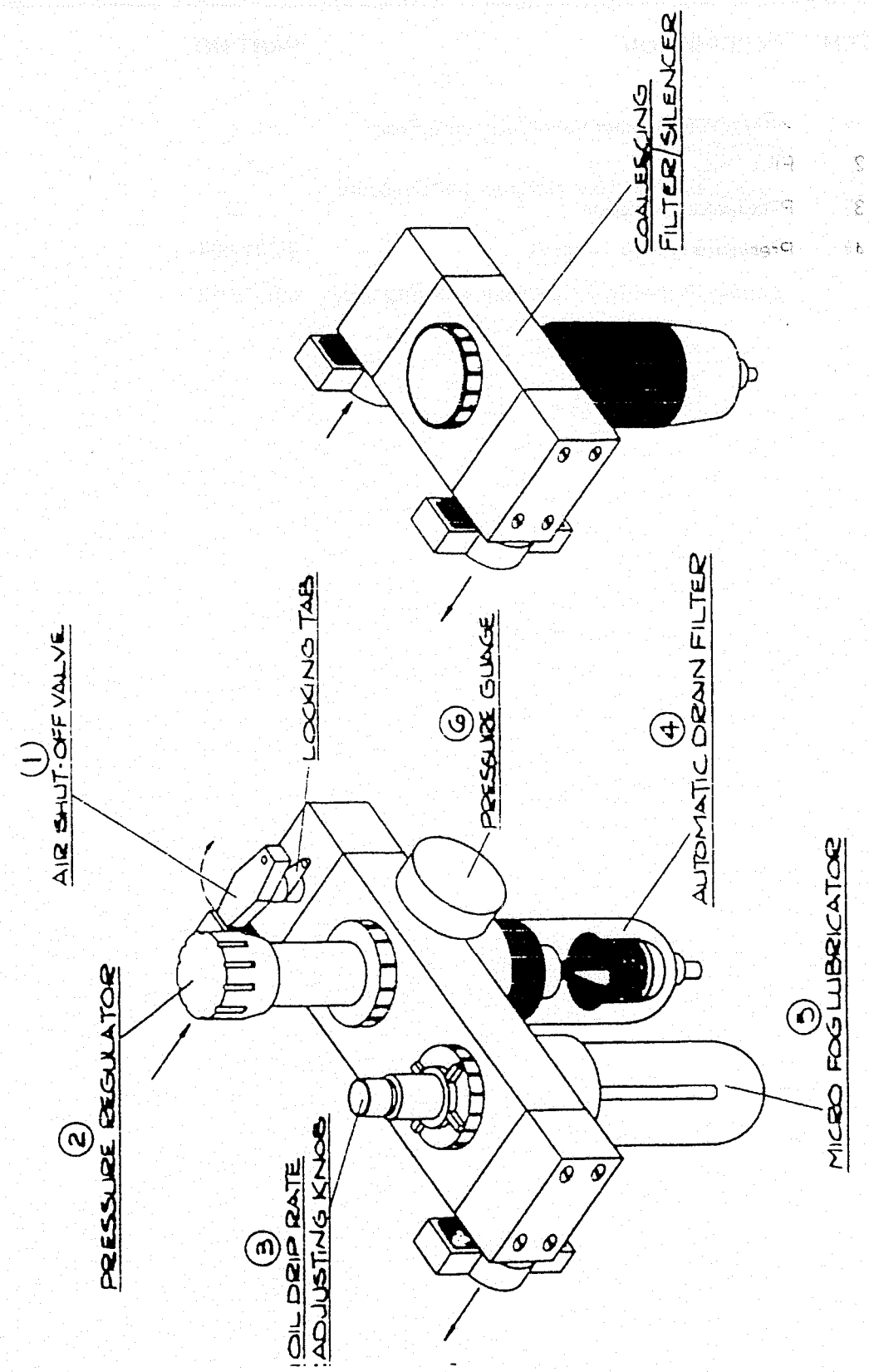
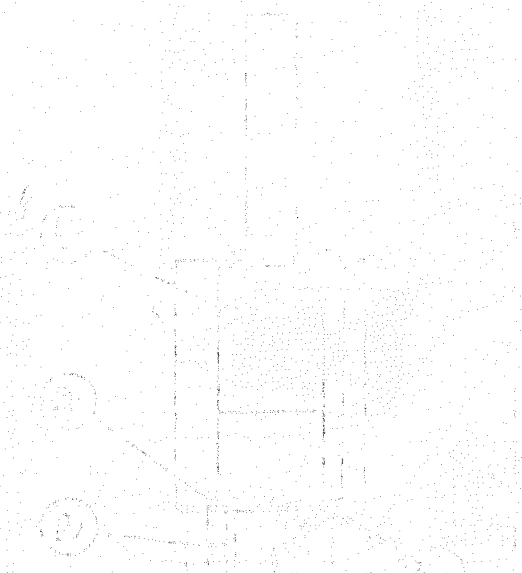


Figure 4.11 Air Treatment Equipment

4.11 - AIR TREATMENT EQUIPMENT

ITEM	DESCRIPTION	PART NO
1	Shut-Off/Exhauster Valve Assy. and Rear Entry Bracket	
2,3	Auto-Drain Filter Unit, Norgren, with Pressure Regulator, Complete	
4	Pressure Gauge, Norgren	99-01-004
	Bracket, Rear Entry Filter/Regulator Repair Kit	99-01-012



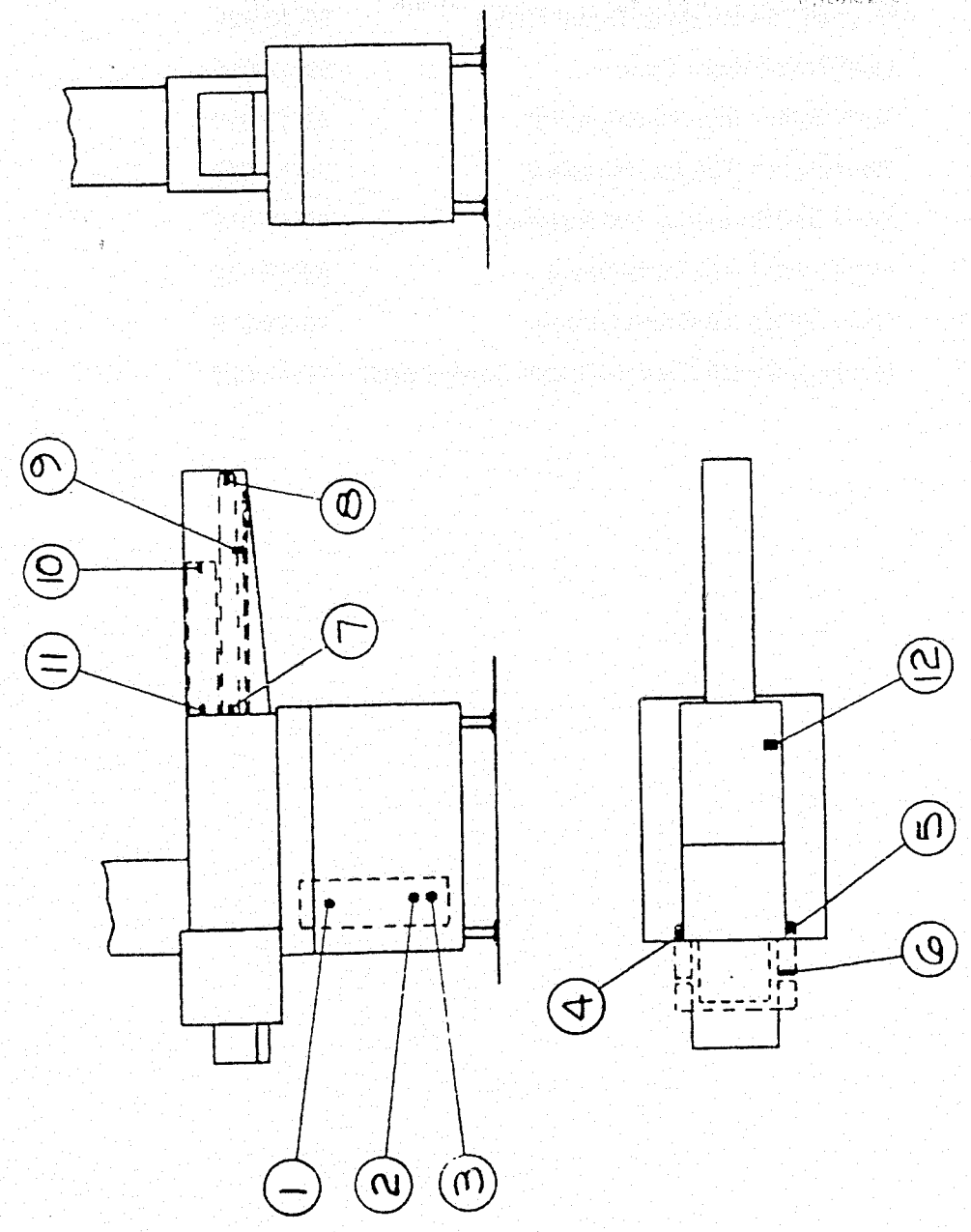
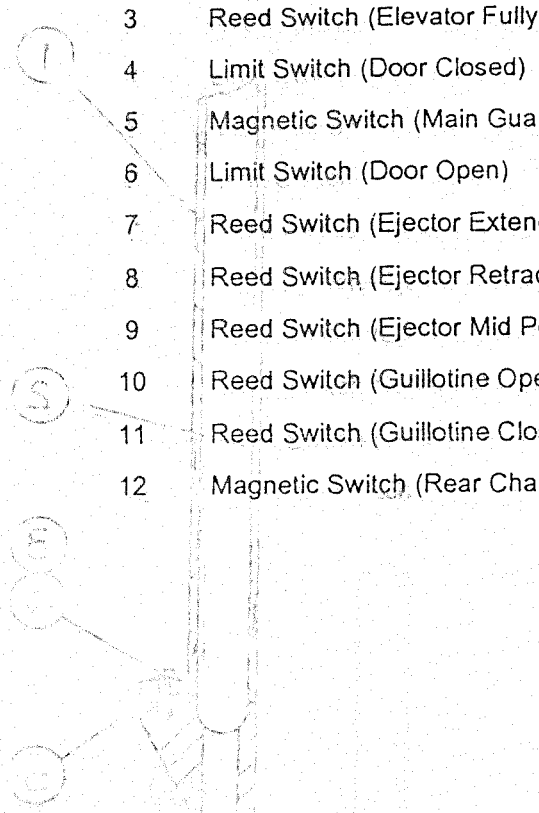


Figure 4.12 Sensors and Limit Switches

4.12 - SENSOR AND LIMIT SWITCHES



ITEM	DESCRIPTION	PART NO
1	Reed Switch (Elevator Up)	99-12-019
2	Reed Switch (Elevator Down)	99-12-019
3	Reed Switch (Elevator Fully Down)	99-12-019
4	Limit Switch (Door Closed)	99-12-016
5	Magnetic Switch (Main Guard Fitted)	99-12-020
6	Limit Switch (Door Open)	99-12-015
7	Reed Switch (Ejector Extended)	99-12-019
8	Reed Switch (Ejector Retracted)	99-12-019
9	Reed Switch (Ejector Mid Position)	99-12-019
10	Reed Switch (Guillotine Open)	99-12-019
11	Reed Switch (Guillotine Closed)	99-12-019
12	Magnetic Switch (Rear Chamber Cover Fitted)	99-12-020

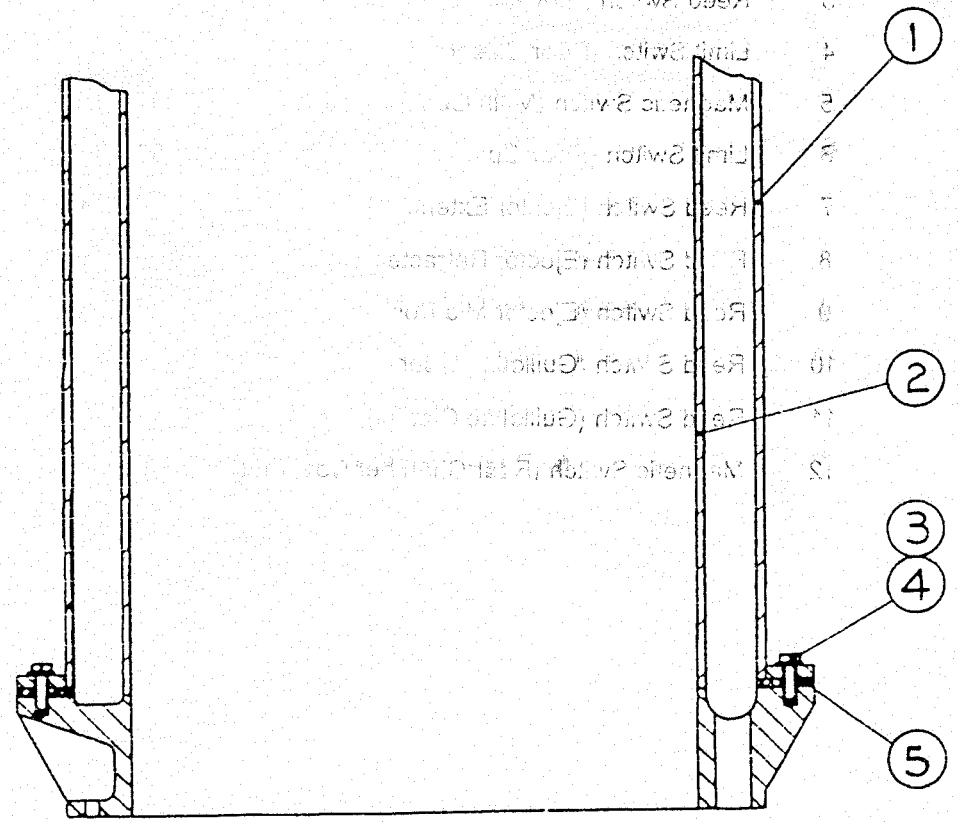
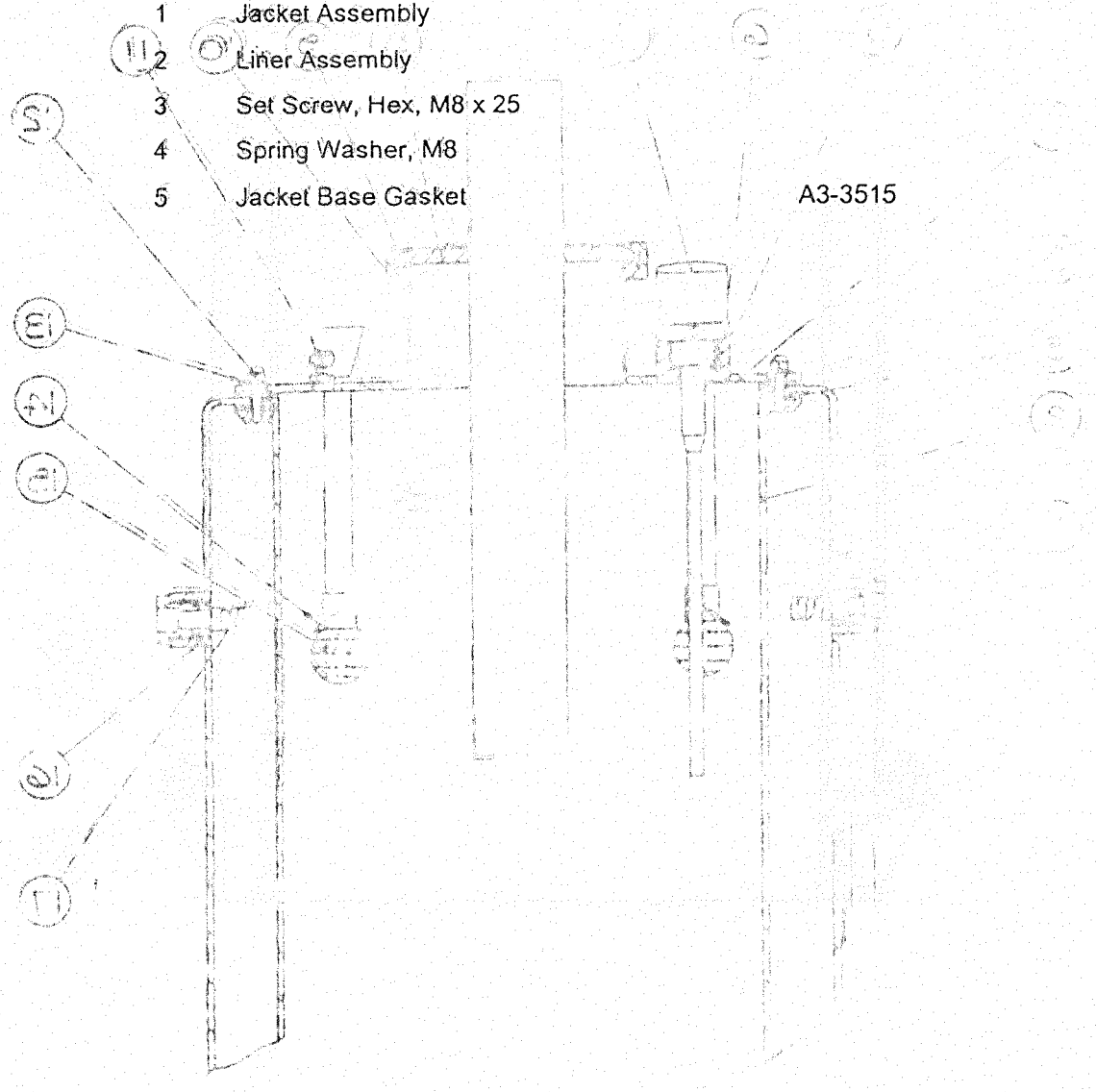


Figure 4.13 Tower Base Assembly

4.13 - TOWER BASE ASSEMBLY

ITEM	DESCRIPTION	PART NO
1	Jacket Assembly	
2	Liner Assembly	
3	Set Screw, Hex, M8 x 25	
4	Spring Washer, M8	
5	Jacket Base Gasket	A3-3515



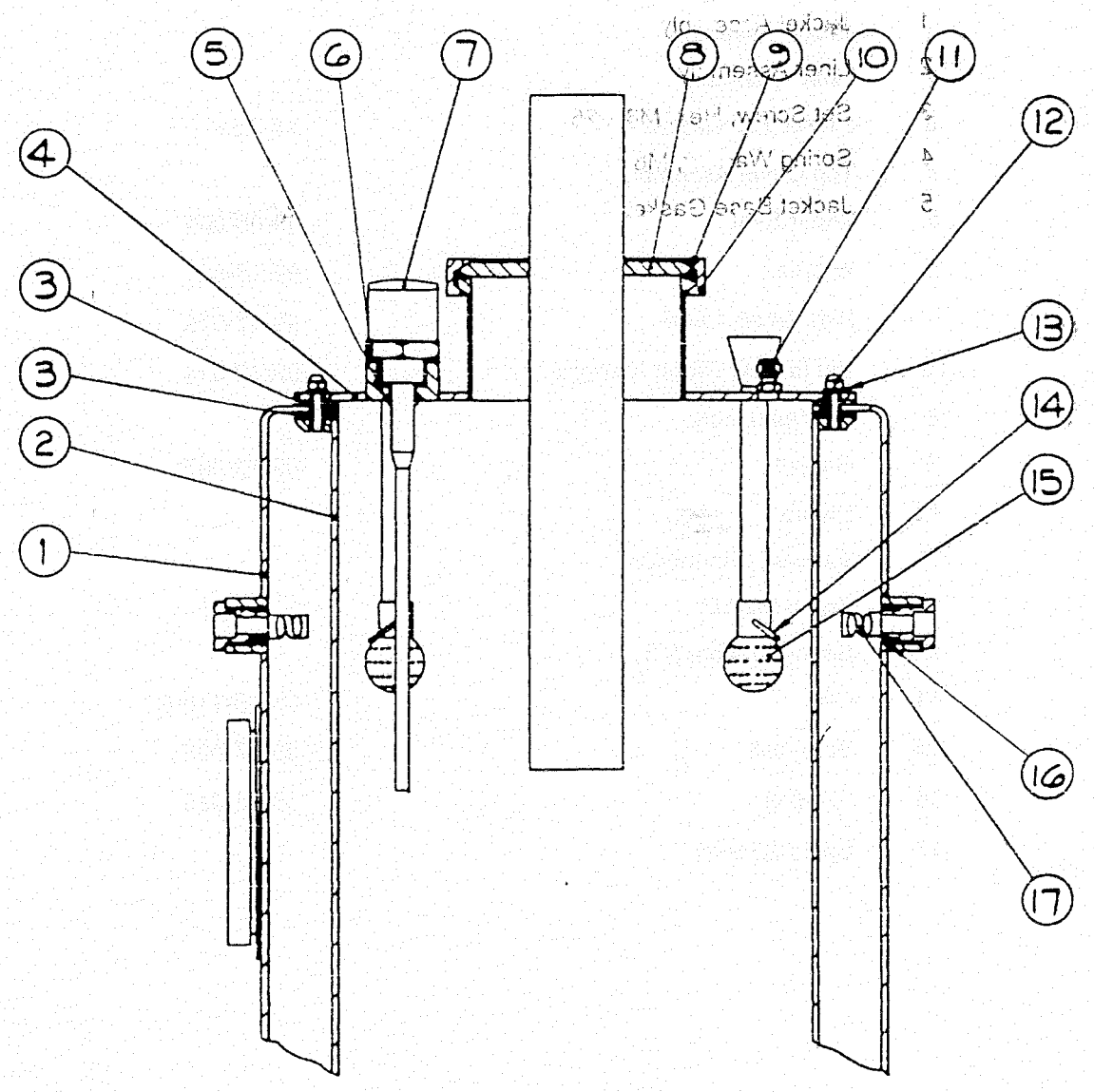
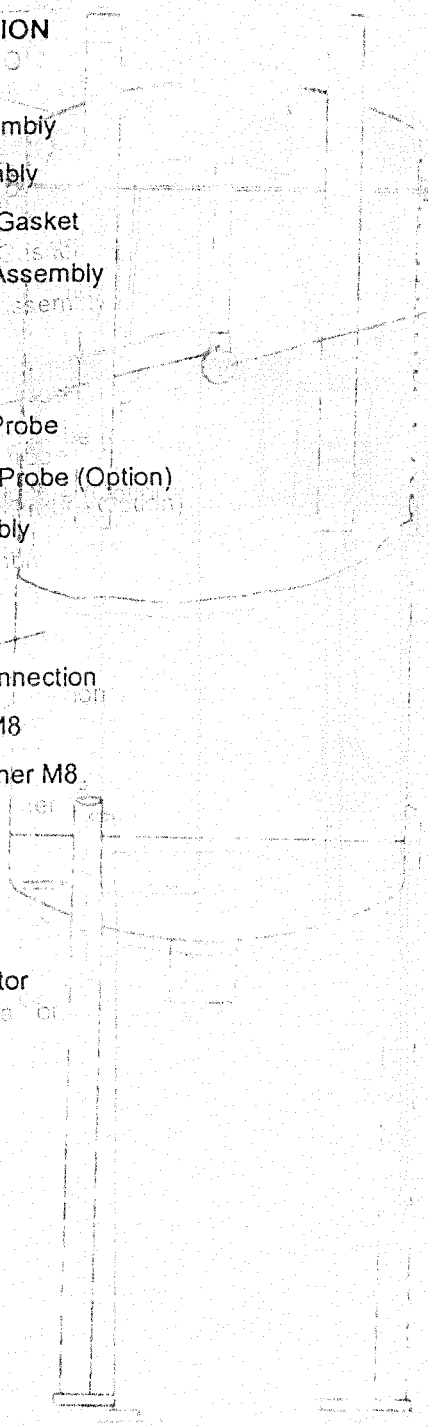


Figure 4.14 Tower Top Assembly

4.14 - TOWER TOP ASSEMBLY



ITEM	DESCRIPTION	PART NO
1	Jacket Assembly	
2	Liner Assembly	
3	Jacket Top Gasket	A3-3514
4	Top Cover Assembly	
5	Wiper Seal	99-05-009
6	Washer	99-18-001
7	High Level Probe	99-12-010
7a	Vat Identity Probe (Option)	99-12-014
8	Inlet Assembly	
9	Gasket	99-13-007
10	Clamp	
11	Vacuum Connection	
12	Dome Nut M8	
13	Spring Washer M8	
14	Clip	08-05-118-0
15	Sprayball	99-17-002
16	'O' Ring	99-06-015
17	Spray Adaptor	

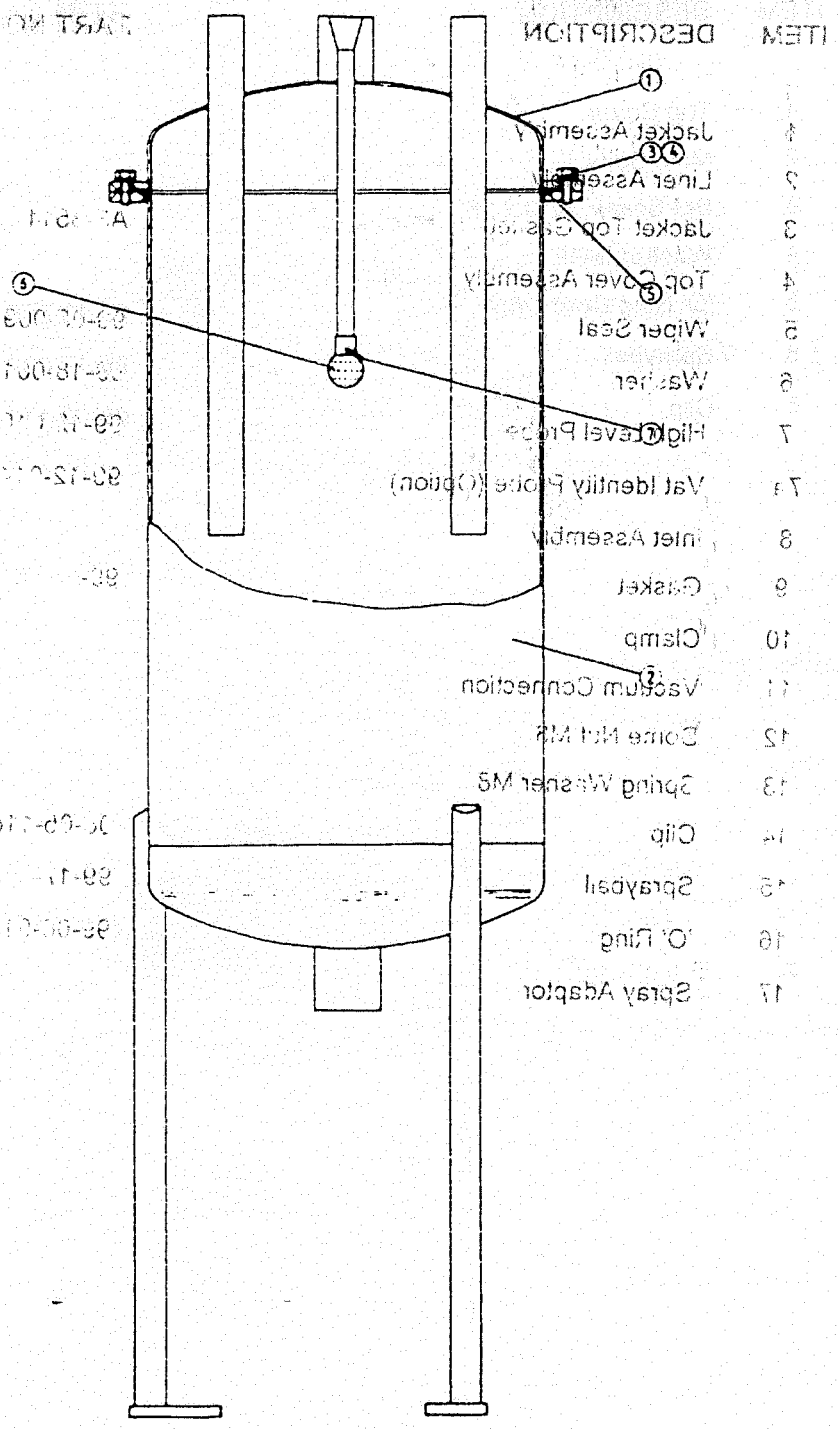
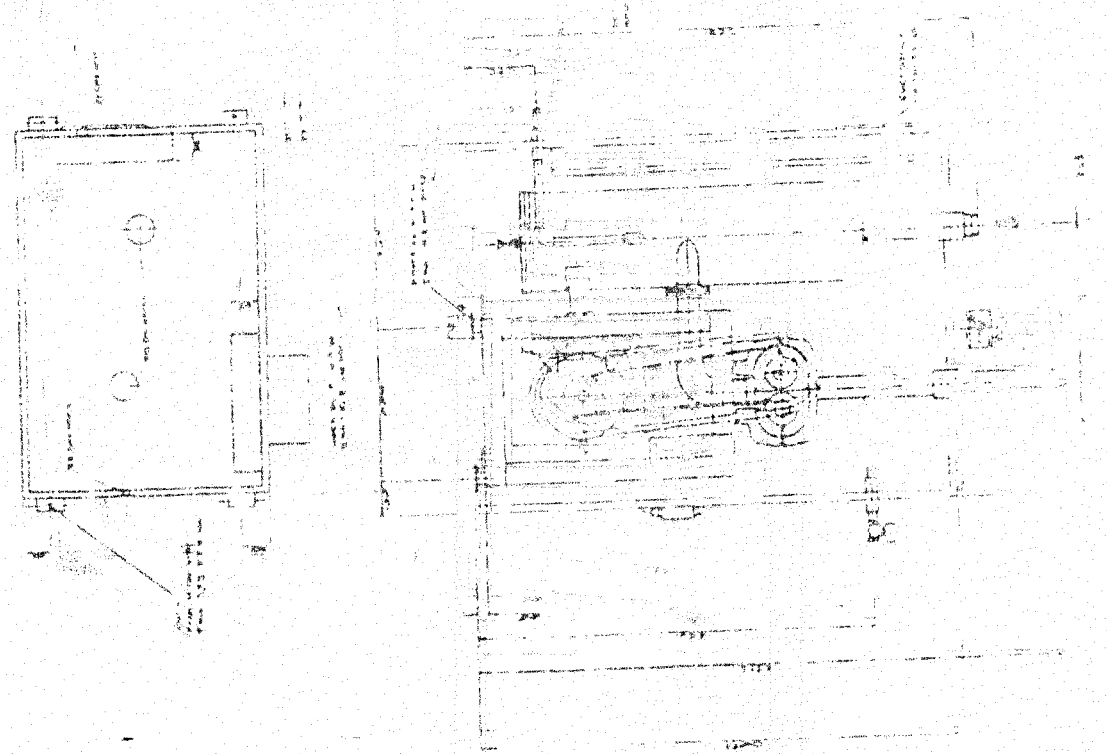


Figure 4.15 Interceptor Assembly

4.15 - INTERCEPTOR ASSEMBLY

ITEM	DESCRIPTION	PART NO
1	Top Cover	
2	Main Body	
3	Set Screw, M10 x 25	
4	Washer, M10	
5	'O' Ring Cord 1.6M	99-13-005
6	Sprayball	99-17-002
7	Clip	08-05-118-0



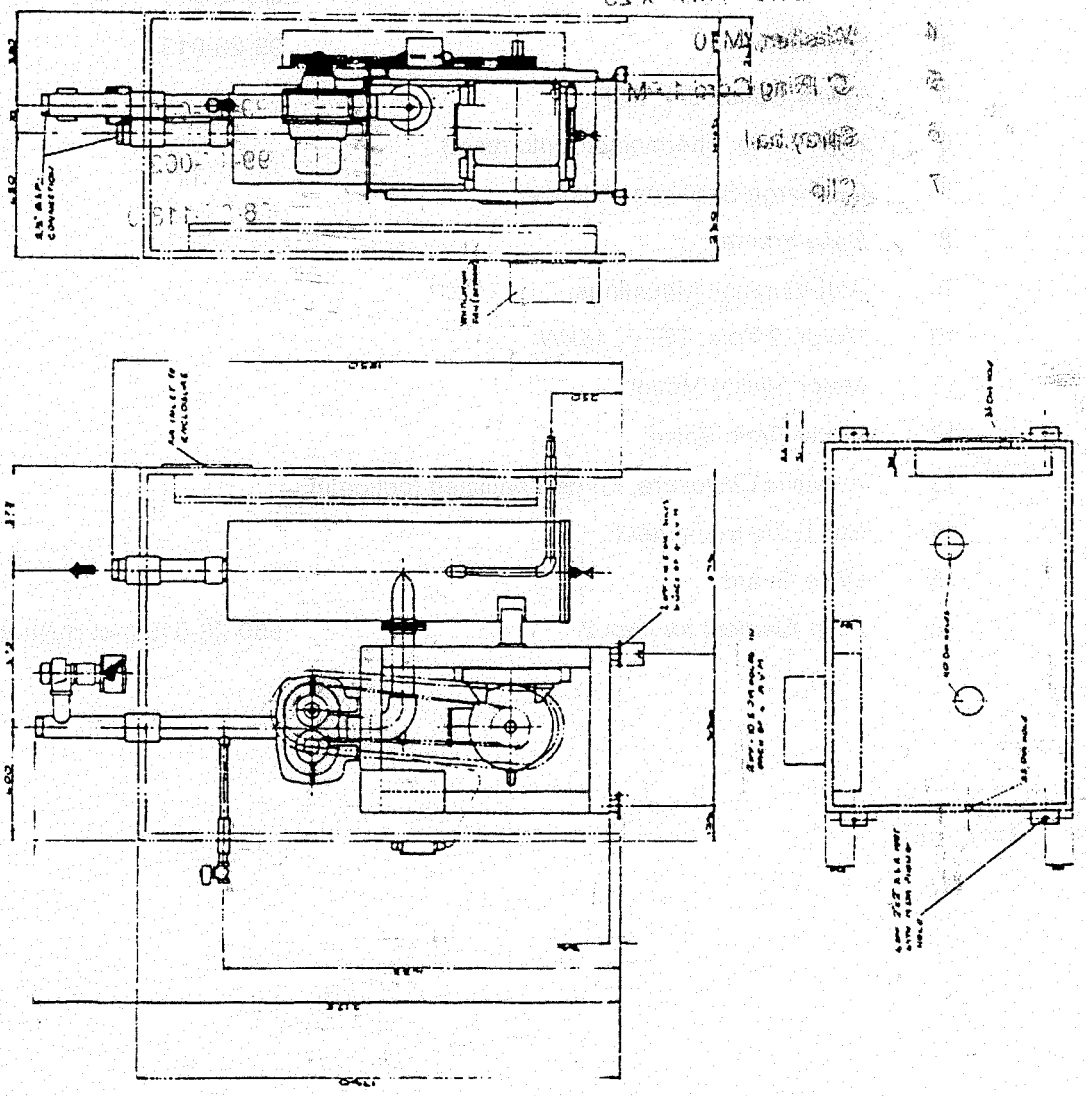


Figure 4.16 Vacuum Pump

4.16 - VACUUM PUMP

ITEM	DESCRIPTION	PART NO
1	Flexible Connections	
2	Vacuum Relief Valve c/w Air Filter	99-26-018
3	Solenoid Valve, Water Supply	99-26-009 (normally closed) 3/8" BSP
4	Exhauster	99-26-013
5	Water Outlet, 3/4" BSP	
6	High Temp. Thermostat (auto reset)	
7	Discharge Separater/Silencer	
8	Base Frame	
9	Anti-Vibration Mountings	
10	Motor, 2 Pole, TEFC, 15kW	
11	Motor Sliding Mount	
12	Water Drain Valve	
13	Acoustic Enclosure, Force Ventilated (optional)	
14	Belt Drive Equipment	
15	Drive Guard	
16	Filter Element for Item 2	990-26-015 (not illustrated)