Harrison

Harrison V390

15" swing centre lathe

machine manual

V390 15-3/4"x50" Variable-speed Center Lathes ***The Ultimate Turning Machines***

Improved operator comfort and confidence is achieved by the excellent ergonomic control layout. The increased benefit of improved machine performance guarantees customer satisfaction in a complete range of production, maintenance and toolroom applications.

Features

All Harrison V Machines Feature:

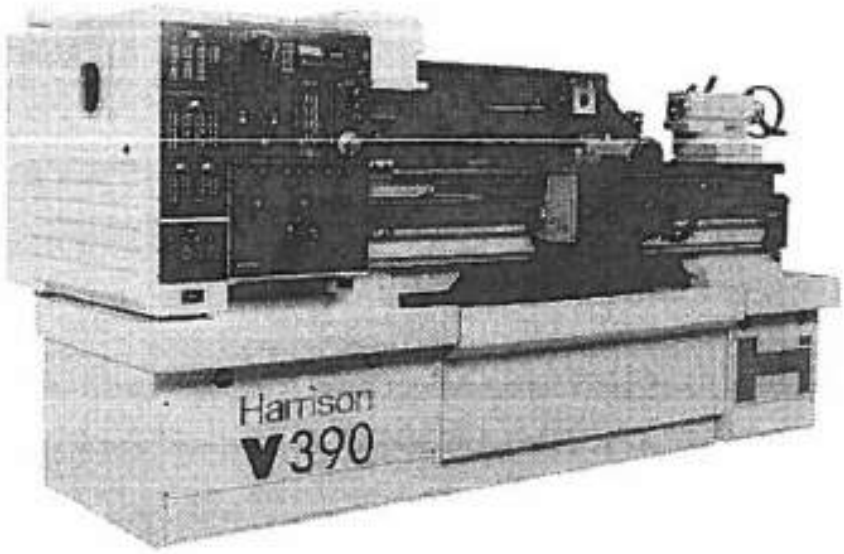
- Cast iron triangular webbed bed for optimum rigidity and swarf clearance
- Infinitely variable spindle speeds with digital display
- Camlock spindle nose for fast chuck changeover
- Leadscrew reversing box
- Standard constant surface speed (CSS) cutting with DRO
- Comprehensive range of imperial and metric screw thread cutting

Specifications

		V390
Centers	Height	195mm (7-5/8")
	Admit Between	1250mm (50")
Swing	Over Bed	400mm (15-3/4")
	Over Cross Slide	246mm (9-5/8")
	In Gap Diameter	585mm (23")
	Length	165mm (6-1/2")
Spindle	Bore	54mm (2-1/8")
	Nose	D1-6 Camlock
	Morse Taper in Nose	4 MT
Speeds	Number	3 infinitely variable
	Range	14 to 2500rpm
Motor		7.5kW
Leadscrew	Diameter	32mm (1-1/4")
	Thread	6mm pitch or 4 TPI
Threads	Metric Pitches	51 from 0.2 to 14mm
	Imperial Pitches	56 from 2 to 56 TPI
	Module Pitches	20 from 0.2 to 3.5 MOD
	Diametral Pitches	20 from 8 to 56 DP
Feeds	Metric	42 from .036 to .4mm/rev
	Imperial	42 from .0014 to .096in/rev
Cross Slide	Width	180mm (7")
	Travel	250mm (9-7/8")
Top Slide	Width	100mm (4")
	Travel	130mm (5-1/8")
Tailstock	Quill Diameter	63mm (2-1/4")
	Travel	145mm (5-11/16")
	Morse Taper	5 MT
Weight		1400kg (3080lbs)
Dimensions	L x W x H	2.72x1.35x1.65m (107x53x65")

V390
VARIABLE SPEED CENTRE LATHE

Manufactured at 600 Lathes



This manual applies only to the machine having the serial number shown; this is stamped on the front of the lathe bed at the tailstock end and **MUST** be quoted in all communications.

Machine Serial Number

Year of Manufacture

CE

BS EN ISO 9001
FM 12345

ISSUE 4

1/1/99

INDEX

OPERATING SAFETY

HEALTH AND SAFETY

GUIDANCE NOTES

PLEASE READ CAREFULLY BEFORE OPERATION OF YOUR LATHE

OPERATOR SAFETY

These Lathes are fast, powerful machines which can be dangerous if used under improper circumstances.
Read the following Health and Safety Guidance Notes and observe before and during the use of the machine.

HEALTH AND SAFETY AT WORK ACT 1974 (U.K. ONLY)

In accordance with the requirements of the Health and Safety at Work etc. Act 1974 this manual contains the necessary information to ensure that the machine tool can be operated properly and with safety. It is assumed that the operator has been properly trained, has the requisite skill and is authorised to operate the machine, or, if undergoing training, is under the close supervision of a skilled and authorised person.

Attention is drawn to the importance of compliance with the various statutory regulations which may be applicable, such as "The Protection of Eyes Regulations". It is further stressed that good housekeeping, common sense and the maintenance of good established work shop practice is essential.

Adequate information is also provided to enable the machine to be properly serviced and maintained by persons with the necessary skills and authority.

ON MACHINES WITH VARIABLE SPEED DRIVE.

NOTE THAT THESE MACHINES ARE DESIGNED TO ALLOW FAST AND EASY CHANGE OF THE SPINDLE SPEED. TAKE CARE TO ENSURE THAT THE WORK PIECE IS SECURE AND THE MAXIMUM SAFE SPEED FOR ANY OPERATION IS NOT EXCEEDED.

ALL MACHINES

BECAUSE OF THE POSSIBILITY OF BODILY CONTACT AND WHIPPING, ESPECIALLY WHEN SMALL DIAMETERS OF MATERIAL ARE USED, BAR STOCK MUST NOT, UNDER ANY CIRCUMSTANCES, BE ALLOWED TO EXTEND BEYOND THE END OF THE HEADSTOCK SPINDLE WITHOUT THE USE OF SPECIAL GUARDING AND ADEQUATE SUPPORT.

OPERATING SAFETY PRECAUTIONS

1. Keep the machine and work area neat, clean and orderly.
2. Keep all guards and cover plates in place and all machine cabinet doors closed.
3. Never lay anything on the working surfaces of the machine, where it may foul with rotating or moving parts.
4. Do not touch or reach over moving or rotating machine parts.
5. ENSURE YOU KNOW HOW TO STOP THE MACHINE BEFORE STARTING IT.
6. Do not operate the machine in excess of its rated capacity.
7. Do not wear rings, watches, ties or loose sleeved clothing.
8. STOP MACHINE IMMEDIATELY ANYTHING UNEXPECTED HAPPENS.
9. DO NOT interchange chucks or other spindle mounting items without checking for correct locking.
10. Do not use other workholding devices without checking for compatability with 600 Lathes Ltd. and workholding manufacturer.
11. Check load capacity of revolving centres for current application.
12. Isolate machine when leaving it unattended.

OPERATING HAZARDS

When using the machine be FULLY AWARE of the following operating hazards detailed under the following instructions:

a) METAL CUTTING FLUIDS

Cancer of the skin may be produced by continuous contact with oil; particularly with straight cutting oils, but also with soluble oils. The following precautions should be taken:

1. Avoid unnecessary contact with oil.
2. Wear Protective clothing.
3. Use protective shields and guards.
4. Do not wear oil soaked or contaminated clothing
5. After work thoroughly wash all parts of the body that have come into contact with oils.
6. Avoid mixing different types of oils.
7. Change oils regularly.
8. Dispose of oils CORRECTLY.

b) SAFE OPERATION OF LATHE CHUCKS

All workholding devices must be clearly marked indicating the maximum safe RPM. This must not be exceeded. It must be noted that the maximum RPM marking usually assumes ideal working conditions. Lower maximum speeds should be used typically for the following reasons.

They apply only to chucks in sound condition.

If a chuck has sustained damage, high speeds may be dangerous. This applies particularly to chucks with grey cast iron bodies wherein fractures may occur.

The gripping power required for any given application is not known in advance.

The strength of the component being gripped, the area of the grip, the balance of the workpiece etc. will all have a major effect on the safe maximum RPM that can be used

There is the possibility of the workpiece becoming insecurely gripped due to the influence of centrifugal force under certain conditions. The factors involved include:-

(a) Too high a speed for a particular application.

(b) Weight and type of gripping jaws if non-standard.

(c) Radius at which gripping jaws are operating.

(d) Condition of chuck - inadequate lubrication.

(e) State of balance.

(f) The gripping force applied to the workpiece in the static condition.

(g) Magnitude of the cutting forces involved.

(h) Whether the workpiece is gripping externally or internally.

Careful attention must be paid to these factors. As they vary with each particular application, a manufacturer cannot provide specific figures for general use, the factors involved being outside his control.

GENERAL PRINCIPLES CONCERNING OPERATOR SAFETY FOR ALL TURNING MACHINES

(1) Do not grip a component with grease or oil on it.

Grip all components firmly.

Do not attempt to hold components that are too awkward or too difficult to hold. Do not hold components that are too heavy for the machine.

Know how to hold components properly when lifting.

(2) Be sure to clean oil or grease from hand tools, levers and handles.

Be sure there is enough texture on the surface of the hand tool or lever handle for proper safe hand contact.

(3) Grip hand tools and lever handles firmly.

Always choose the proper hand tool and appropriate grip position on the lever handle.

Do not use hand tools or lever handles in an awkward position.

Do not apply excessive force.

(4) Always use the recommended gripping position to grasp hand tools and lever handles.

(5) Do not allow turning or hand tools to be caught in the chuck or other holding device.

(6) Do not use broken, chipped or defective tools.

(7) Be sure work piece cannot move in chuck or other holding device.

(8) Beware of irregular shaped work pieces.

(9) Beware of large burrs on work pieces.

(10) Always select the correct tool for the job.

(11) Do not run the machine unattended.

(12) Do not use tools without handles.

(13) Always support the work piece as necessary using chucks, steadies and centres.

(14) Correctly locate tool in socket heads and screw slots.

(15) Beware of obstructions that prevent complete tightening of screws - ensure screw is tight.

(16) Do not rush work.

(17) Never substitute the wrong size tools if the correct sized tool is not available or cannot be located in the shop.

(18) Do not move guards while lathe is under power.

(19) Do not place hand or body in path of moving objects.

Beware of moving lathe parts that can fall.

Be aware of where you are moving your hand or body in relationship to the lathe.

Beware of holding a tool or other parts inserted in or attached to the chuck or work piece.

Be aware of hands or other parts of the body that may in position to be hit by a chuck or work piece.

(20) Beware of accidentally moving levers, clutches (where applicable) or turning the power on.

(21) Know the function of each and every control.

(22) Never place hand on chuck or work piece to stop rotation of the spindle.

(23) On machines with clutch drive make sure clutch is completely disengaged on stopping, and kept properly adjusted.

(24) Make sure power has been turned off when lathe is unused for sometime.

(25) Allow chuck to stop before operating it.

(26) Always check chuck area for chuck keys and loose items.

(27) Never start spindle with chuck key in the chuck.

(28) Do not allow distractions to interfere with lathe operations.

Do not operate lathe whilst talking.

(29) Beware of lathe dangers when attending to other aspects of lathe operation. eg. whilst operating tailstock.

(30) Beware of loose clothing near the rotating parts of the lathe.

(31) Beware of loose hair near the rotating parts of the lathe.

(32) Beware of performing another operation while in close proximity to rotating parts on the lathe.

(33) Always attend to filing and deburring operations.

Always pay attention to file or deburring tools close to the chuck.

Files and deburring tools may catch on chuck.

(34) Beware of clutch (where applicable) position when jogging the spindle to different positions for gauging .

(35) Beware of hands resting on clutch levers.

(36) Be sure lathe is in neutral position when placing gauges on components gripped in the chuck.

(37) Be sure motor (on machines with clutches) is not running when using gauges on the machine.

(38) Always wear protection before operating the lathe.

Always wear the correct protection before operating the lathe.

Never remove protection for even a short time when operating the lathe.

Wear protective devices correctly.

Know the correct way to wear protective devices.

(39) Beware of material flying from the lathes.

(40) Keep protective guards at the point of operation.

Know how to set or attach protective guards properly.

Never use the wrong protective guard.

Know how to select the proper guards.

(41) a) When the chuck and workpiece are in motion never reach over, under or around a work piece to make an adjustment.

b) Never reach over, under or around a work piece to retrieve anything.

c) Beware of where you leave your tools during set up.

d) Never reach over, under or around work piece to move hand tool/lathe to another position.

e) Never reach over, under or around the work piece to tighten a lathe part.

f) Never reach over, under or around work piece to remove swarf.

(42) Know the proper procedure for applying loads.

Never apply force from an awkward position.

(43) Never mount a work piece too large for the lathe.

(44) Never mount a workpiece too large for the operator to handle.

(45) Use the equipment necessary for handling workpieces.

(46) Never apply undue force on the accessory or control lever.

(47) Secure all work pieces.

(48) Secure all jaws, nuts, bolts and locks.

(49) Always use the correct equipment.

(50) Never take cuts beyond machine's capability.

(51) Never use excessive force in polishing, filling and deburring.

(52) Always use the proper hand tool to remove swarf.

Never hurry to remove swarf.

Beware of swarf wrapped around the chuck or workpiece.

(53) Never change gears by moving them with your hands.

(54) Beware of tools/lathe parts falling on controls.

CHUCK GUARDS

The lathe is supplied with a fully interlocked chuck guard which is suitable only for use with the standard chucks normally supplied with the machine.
This chuck guard must be in the fully closed position before the spindle is permitted to run.

a) In the event of larger chucks being fitted to the machine an alternative chuck guard must be used which is appropriate to the chuck diameter.

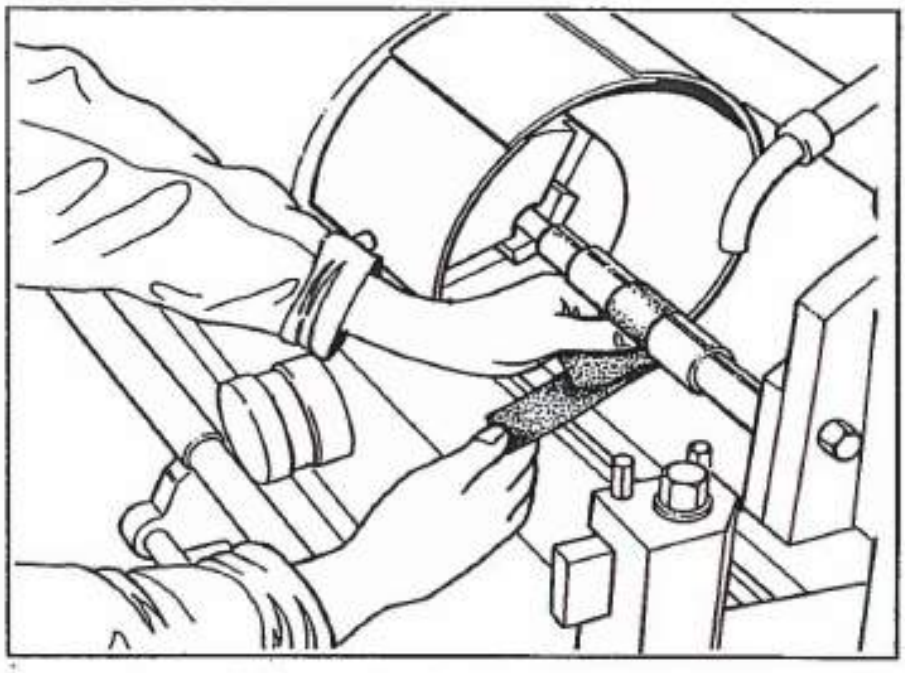
Note:
It is not recommended that chuck jaws extend beyond the outside diameter of the chuck and in these cases interference with chuck guards may occur.

For safe operating practices always ensure that chuck jaws do not extend beyond the outside diameter of the chuck.

b) In the event of a faceplate being used on the machine the normal chuck guard must be removed from it's mounting and if deemed necessary by the user alternative safe guarding facilities provided which are appropriate to the particular situation.

This can only be determined on a case by case basis when using faceplates and is therefore the responsibility of the user.

Accidents at Metalworking Lathes using Emery Cloth



Danger: *Even with long strips of cloth there is a danger of trapping.*

Hazards

A high proportion of all accidents at metalworking lathes involve the use of emery cloth and result in injuries such as broken and, occasionally, amputated fingers.

Emery cloth is used to deburr, polish or size a wide range of cylindrical, tapered and threaded metal components while they are rotating in lathes.

Most accidents happen when each end of a strip of emery cloth is held in separate hands and passed around the back of the component being linished. If the cloth is wrapped around the fingers and/or becomes snagged on the component while it is tightly gripped, then a serious injury is the likely result.

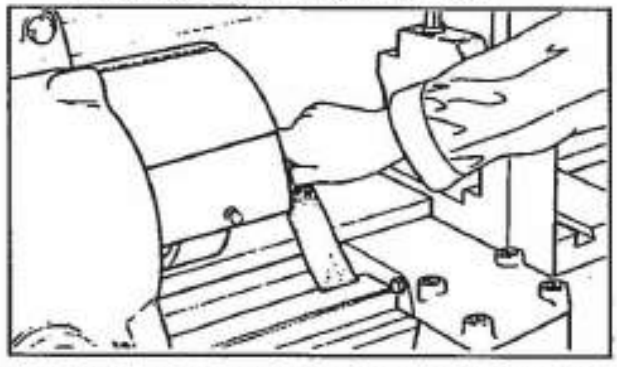
Precautions

Emery cloth should NEVER be used at CNC lathes. Employers should assess the need to use emery cloth on components rotating in a lathe.

Such operations may not be necessary if :-

(a) the finish being sought is only cosmetic. For such finishes the component may be held in one hand and polished by emery cloth held in the other. Alternatively a linishing belt or machine may be used;

(b) a sizing operation can be successfully performed either by turning or by further operations in a dedicated polishing, linishing or grinding machine.



Danger : *Emery cloth should never be held loose in the hand.*

If the required tolerance is only achievable by the use of emery cloth against rotating components, then the emery cloth should be applied using either:

(a) a backing board of good quality wood;

or

(b) a tool post onto which the emery cloth may be placed;

or

(c) a 'nutcracker' consisting of two backing boards which are lined with emery cloth and joined at end and shaped so that they may encom pass the surface to be linished;

or

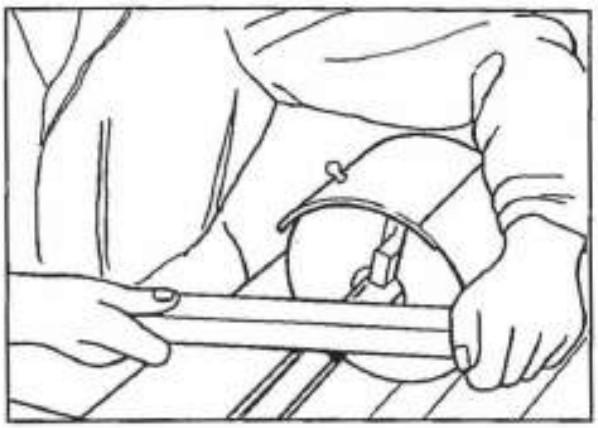
(d) hand-held, abrasive-impregnated wire brushes.

Where none of the above methods is reasonably practicable and it is necessary to use emery cloth for polishing the outside diameters of components, the emery cloth should be used in long strips with one end passed beneath the component.

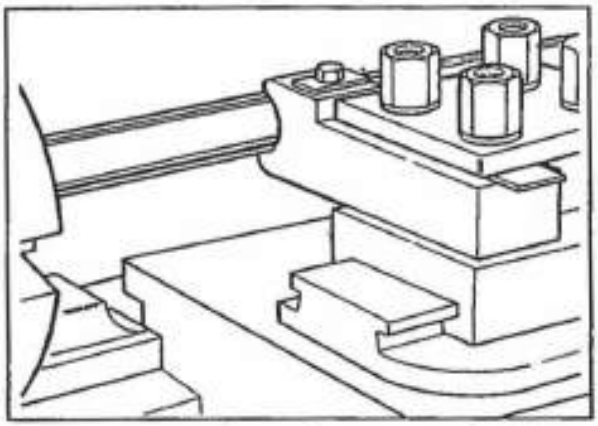
Force should be applied by pulling both ends of the cloth upwards, never allowing the cloth to go slack or to wrap around either the operator's finger or the components.

For polishing the ends of components, only very short lengths or pads of cloth should be used which are incapable of causing entanglements.

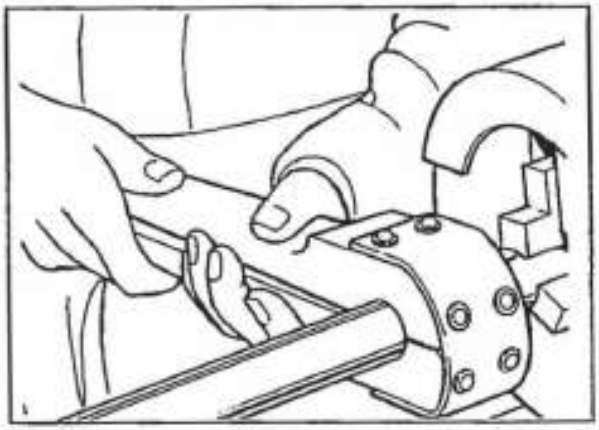
Gloves should never be worn when polishing is being carried out.



(a) *Sticks used in this way must be strong and of good material.*



(b) *The use of a toolpost completely removes all risk of injury to the hands.*



(c) *Using the 'nutcracker' method - a much better way of polishing.*

From the United Kingdom, health & safety executive Engineering Information Sheet No. 2

Centres	
Height	195mm (7.68")
Admits between	650mm (25") 1250mm (50")

Swing	
Over bed (saddle wings)	400mm (15.7")
Over cross-slide	246mm (9.7")
In gap	585mm (23")
Width in front of faceplate	165mm (6.5")

Spindle	
Bored to pass	54mm (2.125")
Nose Type	D1-6" Camlock
Morse taper in bush	No.4 MT

Spindle Speeds	
Selected in three ranges of	15 - 300
	35 - 830
	110 - 2500 rev/min

Motor (main)	7.5Kw (10HP)

Bed	
Width of ways	318mm (12.5")
Type of ways	Vee and flat

Cross-Slide	
Width and length	180mm (7") - 850mm (33.5")
Travel	250mm (9.8")

Top-Slide	
Width	100mm (4")
Travel	130mm (5.1")
Tool section	25 x 25 (1" x 1")
Quick change tooling	Dickson No.2B E

Tailstock	
Quill diameter (nominal)	73mm (2.8")
Travel	140mm (5.5")
Morse taper	No.4 MT
Set over	± 10mm (0.4")

Leadscrew	
Diameter	32mm (1.25")
Thread	6mm pitch or 4 T.P.I.

Threads	
Metric pitches	0.2 - 14mm (51)
Imperial T.P.I.	2 - 56 (56)
Module pitches	0.2 - 3.5 (20)
Diametral pitches	8 - 56 (20)

Feeds	
Metric (R10) Series)	0.036 - 1.2mm/rev
Imperial (R10 Series)	0.0014 - 0.048 in/rev

Cross feeds = half longitudinal values (approx)

Height of Machine	
Floor to spindle centre	1050mm (41.2")

Overall Length	
650mm (25") machine	1900mm (74.8")
1250mm (50") machine	2500mm (98.4")

Overall Width	1100mm (43.3")

Overall Height	1300mm (51.2")

Weight	
650mm (25") between centres	1400kg (3080lb)
1250mm (50") between centres	1500kg (3300lb)

For other dimensions see foundation plan

Coolant Pump Unit	
Flow	25 Litre/min @ 2 Metre Head

Headstock Lubrication Pump	
Type	Interlube 3 Phase 27662-131

NOISE LEVEL

The maximum noise level at the operators position (**Fig.1**) is within **80 dB(A)** and the maximum mean noise level is within **80 dB(A)**.

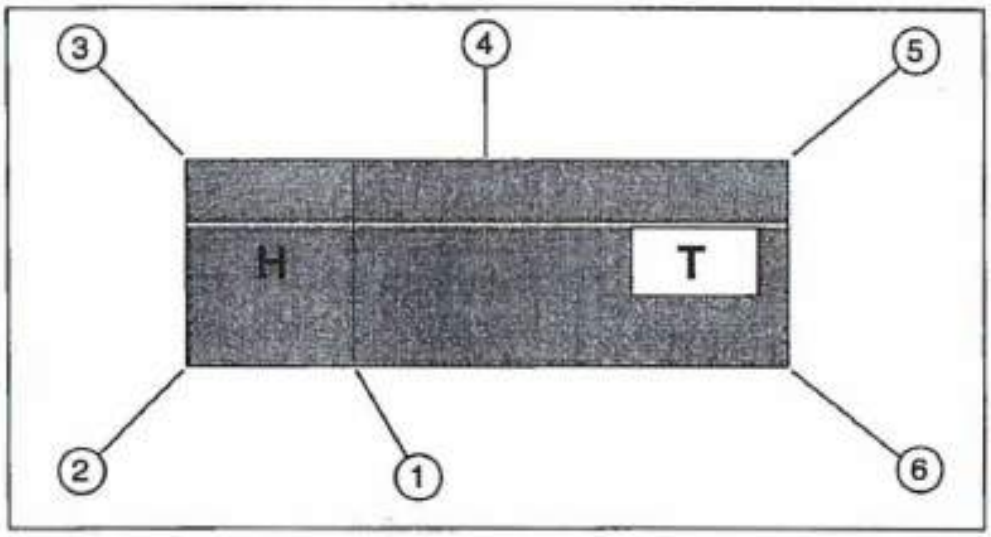


Fig.1

NOTE:
The operators position is position 1 and the mean is taken from the readings at all 6 positions.

The conditions of measurement are with the spindle running at top speed, with a standard chuck fitted, with no feed engagement.

These measurements are in accordance with **BS4813 : 1972**

MACHINE WEIGHT

The approximate weight of the machine is -

650mm-25" between centres 1400 Kg - 3080 lb

1250mm-50" between centres 1500Kg - 3300 lb

Always ensure capacity of equipment is adequate before attempting lift.

PREPARATION AND SAFETY CHECKS

1. Remove all items of loose equipment.
2. Clamp tailstock securely at the tailend of the bed.
3. Clamp saddle to bed.
4. Ensure eyebolts, shackle pins and securing screws of lifting equipment are correctly tightened.
5. Only use the correct equipment.
6. **DO NOT SLING AROUND BED. Leadscrew and splineshaft may be bent or damaged.**

LIFTING

A) Long Bed Machines.
1250mm (50in) between centres.

1. Position sling complete with protective sleeve into cutaway at the bottom of the first angled web nearest to the headstock. (Fig.1A)
   To ensure better balance the sling should be away from the front of the machine.
2. Carefully lift the lathe clear of ground and if necessary reposition the saddle to achieve better balance before lifting further.

B) Short Bed Machines.
650mm (25in) between centres.

1. With rod P removed insert the lifting tackle into the swarf removal port nearest to the headstock from the underside of the bed. Ensure that the round section locates securely into the two cast recesses on the inside of the bed (Fig.1B).
   To prevent lifting tackle dropping refit rod P and secure using the spring clips provided.
2. Fit shackle.
3. Carefully lift the lathe clear of ground and if necessary reposition the saddle to achieve better balance before lifting further.

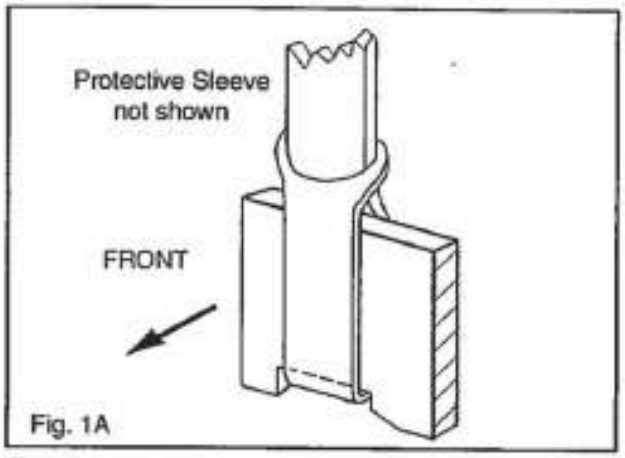


Fig. 1A

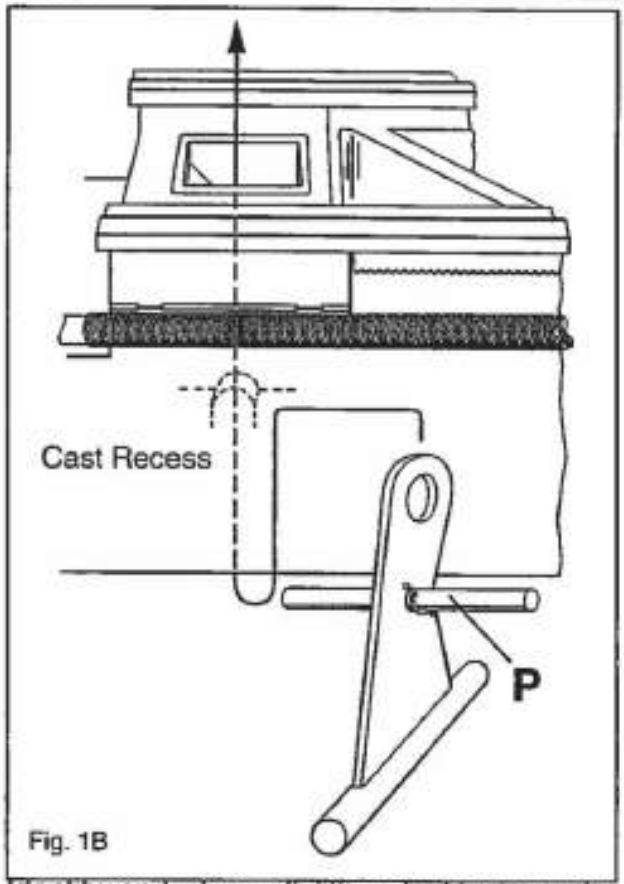


Fig. 1B

Identify and store all lifting tackle in a dry location, protected from damage for future use.

TEN RULES FOR SAFE LIFTING

1. Never overload the equipment.
2. Never use damaged slings.
3. Position the sling correctly.The sling must not be placed round sharp edges, donot let it slide over corners or along edges.
4. Do not drag goods in the sling.
5. Position sling correctly to ensure easy removal after use.
6. Use smooth-rounded hooks having an inside radius of not less than 50mm.
7. Avoid placing more than one sling on the same hook.
8. Keep away from alkalis and acids.
9. When lifting heavy loads with more than one sling,remember that the total weight may not be evenly distributed.
10. Remember that vibration during transport can cause friction between sling and machine - use protective sleeves.

Sling are made from 100% polyester.

Each sling is clearly labelled with the safe working load and the safety factor is 6 : 1.

All slings are coloured coded for increased safety.

For lifting rough or sharp edged loads we recommend the use of protective sleeves.

Webbing slings are manufactured to BS 348:2.

Round slings are manufactured to National Board of Industrial Safety IKM 5.52.01 and to BS 6668:2 (1987).

SAFETY REQUIRES PERMANENT SUPERVISION

We recommmend the following procedure

1. All equipment should be examined by one person only.
2. Lay sling on a flat surface in a well lit area.
3. Examine both sides of the sling.
4. Slings must be examined over the whole length and in the eyes.

CLEANING

Before operating the machine remove the anti-corrosion coating, from all slideways, the leadscrew feed shaft and the end train gear. See Fig. 2; using only white spirit or paraffin .

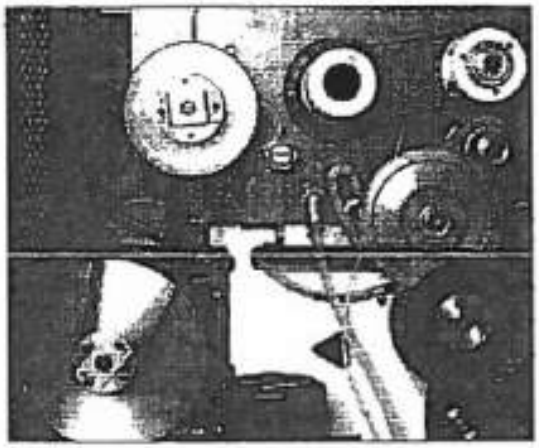


Fig. 2

DO **NOT** use non-approved solvents i.e. Cellulose solvents or petrol; as they are hazardous and will damage the paint finish.
Oil all bright, machined surfaces immediately after cleaning; use heavy oil or grease on the end-train gears.
Operate the slideways lubrication pump, mounted on the front of the apron several times to ensure that the last traces of anti-corrosion coating are removed from under the bedway wipers and slide edges.

INSTALLATION

Locate the machine on a flat, level solid foundation, allowing sufficient area for easy working and maintenance. The lathe may be used when free standing but for maximum performance it should be bolted to the foundation.

FOUNDATION PLATES

Whether the machine is to be a free standing or fixed installation the eight jacking bolts MUST BE POSITIONED on eight steel plates.
The dimensions of the plates should be 15mm (5/8") depth and of approximately 50mm (2") diameter.

FREE STANDING

Position the lathe on the foundation and adjust each of the eight jacking bolts in the plinths to take an equal share of the load. Then level the machine using a precision level.

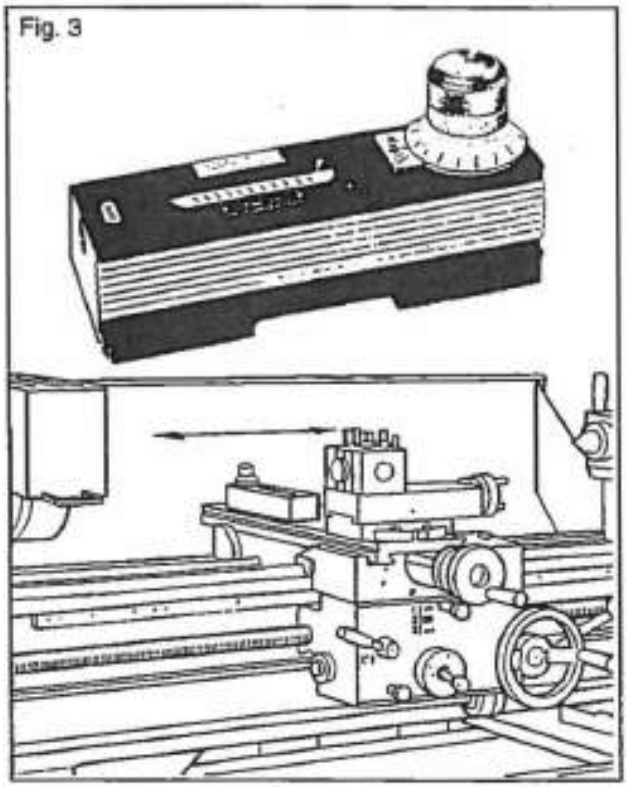
FIXED INSTALLATION

Position the lathe over eight bolts (5/8" or 16mm dia) set into the foundation corresponding to the dimensions in the plinths shown on the foundation plan Fig.5.
Adjust each of the jacking bolts to take an equal share of the load, level the machine then tighten onto the holding down bolts. Recheck the bed level.

LEVELLING

Using an engineers precision level (typical sensitivity 0.05mm/m mounted on the cross slide(Fig. 3) level the machine end-to-end and front-to-back by adjusting the relevant jacking bolts.
Align transversly as shown in **Test No. G1** in the accuracy chart in order to eliminate "twist".

Fig. 3



ELECTRIC SUPPLY CONNECTIONS

INPUT VOLTAGES

Three phase 230 volts AC±10% and, three phase 460 volts AC±10% and optional transformer

Recommended Fuses:

230 volts supply	**35amps**
460 volts supply	**25amps**

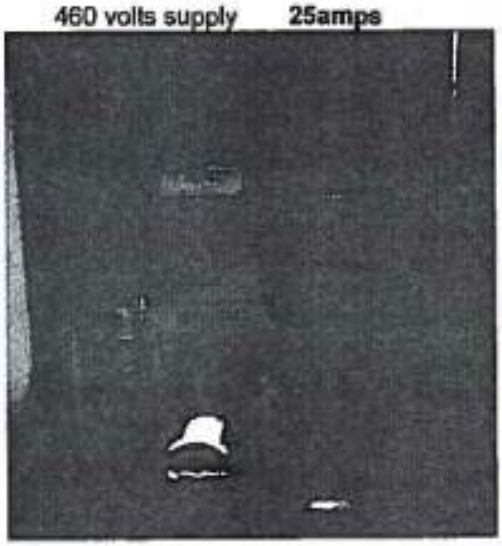


Fig. 8

Power should be supplied from a separate fused isolator, the line entering the electrical cabinet through a cable entry connecting to the input terminals of the machine isolator (Fig. 8) or the free standing transformer in the case of 200 to 220 volt and 460 to 575 volt supplies.
An earth lead must be used.
To comply with 'EMC' requirements see page No.11, showing routing for incoming cable.
It is not necessary to change phases to alter the direction of the main motor as the spindle will always turn in the selected direction of rotation.

However, the headstock lubrication pump MUST run in the correct direction. MARKED ⇦ ON MOTOR.

This may be checked by observing the direction of rotation of the pump(clockwise when viewed from above) on rundown, after the electrically interlocked endguard has been opened.

If this is not the case the input phases should be changed. Ensure that oil then flows in the oilsight located close to the main spindle.

FAILURE to do this could result in **DAMAGE** to the ma spindle bearings.
The coolant motor is left electrically disconnected for transportation. This must be re-connected into the terminals marked U3, V3 and W3 in the electrical cabinet.

PRIMARY START UP PROCEDURE

1) Switch Main Isolator ON.

The following equipment; where applicable, will become **LIVE.**

Motor fan, cabinet fan, speed display, DRO, Lo-Vo ligh and Hydraulic Copy Unit.

2) Release Emergency Stop.

Drive disabled warning light (red) illuminates.
Headstock Lubrication pump runs.

LUBRICATION CHECKS.

Ensure that both the headstock lubrication system and gearbox are filled with Shell Tellus **T32 (ISO HV32)** oil, correct level and that the apron reservoir is filled to the level of the sight window with Shell Tonna TX68 (ISO VGT 68) oil.
Oil compound slide and tailstock through the appropris oil nipples.
Before each working shift, operate the manual lubrication pump in the apron to ensure adequate lubrication of carriage slideways.
Refer to Lubrication Chart in Service and Maintenace Section for further information.

OIL CAPACITIES

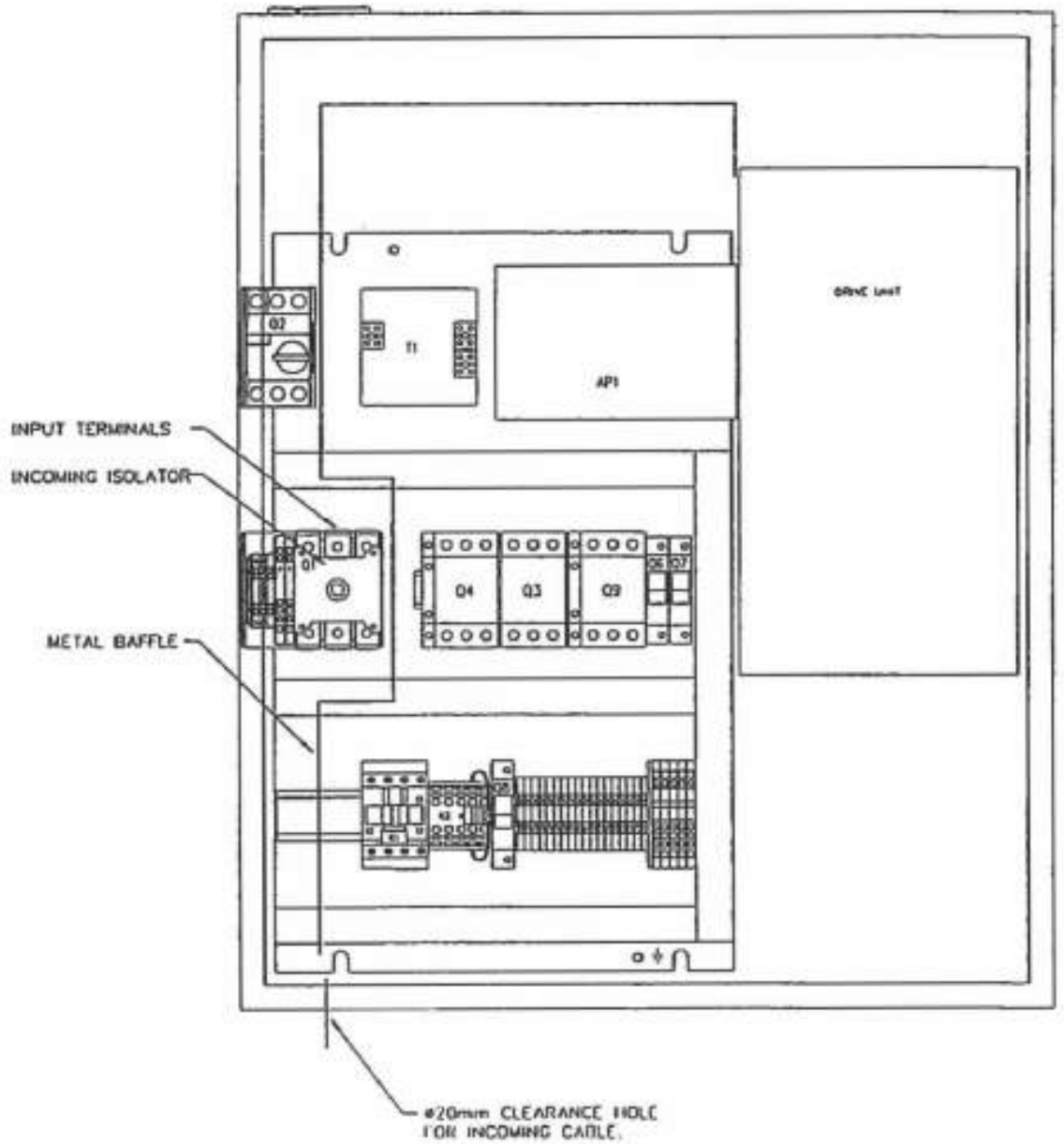
Headstock	4.5 litres (8 pints)
Gearbox	2.6 litres (4.5 pints)
Apron	1.2 litres (2.1 pints)

HEADSTOCK SPINDLE BEARINGS

All headstock spindles have been submitted to a running in procedure during assembly. It is however recommended that further running in is performed of tl headstock bearings before any prolonged high speed rotation is undertaken.
Recommended speeds and duration:-
15% of Maximum Speed for 1 hour.
50% of Maximum Speed for 30 Minutes.
80% of Maximum Speed for 30 Minutes.

ELECTRICAL CABINET

NOTE: - TO COMPLY WITH 'EMC' REQUIREMENTS THE INCOMING CABLE MUST BE RUN WITHIN THE METAL BAFFLE AND BE AS SHORT AS PRACTICAL



FOUNDATION PLAN

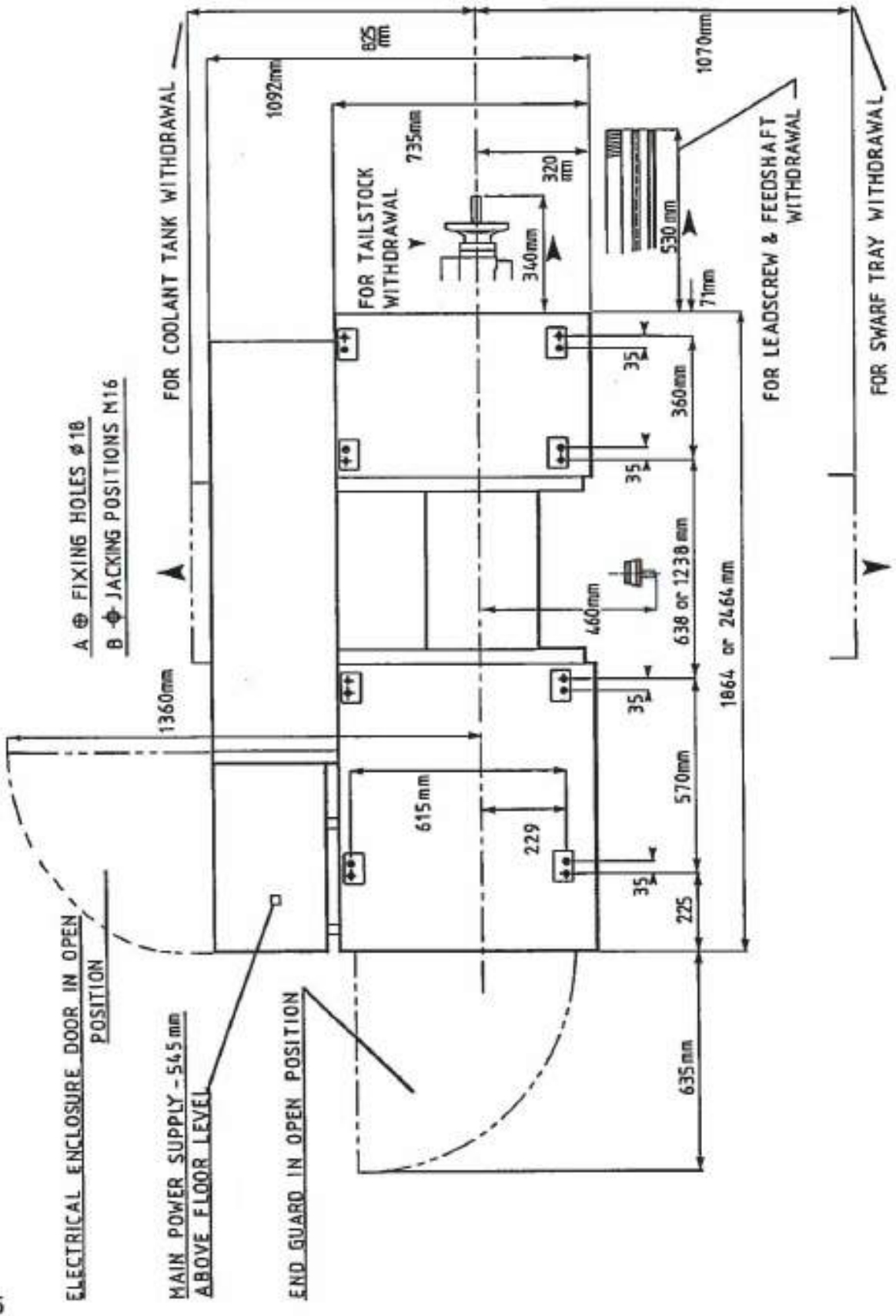


Fig. 5

SK 2375 SHT 6 3.3.89

CHUCKS AND CHUCK MOUNTING

When fitting chucks or faceplates, first ensure that the spindle nose and chuck tapers are clean; mount the chuck and ascertain that the cams lock in the correct position. When mounting a new chuck it may be necessary to reset the camlock studs (A).To do this ,remove the caphead locking screws (B) and set each stud so that the scribed ring (C) is flush with the rear face of the chuck and with the circular scallop in line with the locking screw hole (see inset).

Now remount the chuck or faceplate on the spindle nose and tighten the three cams in turn.When correctly tightened the camlock line on each cam should be between the two "V" marks on the spindle nose.

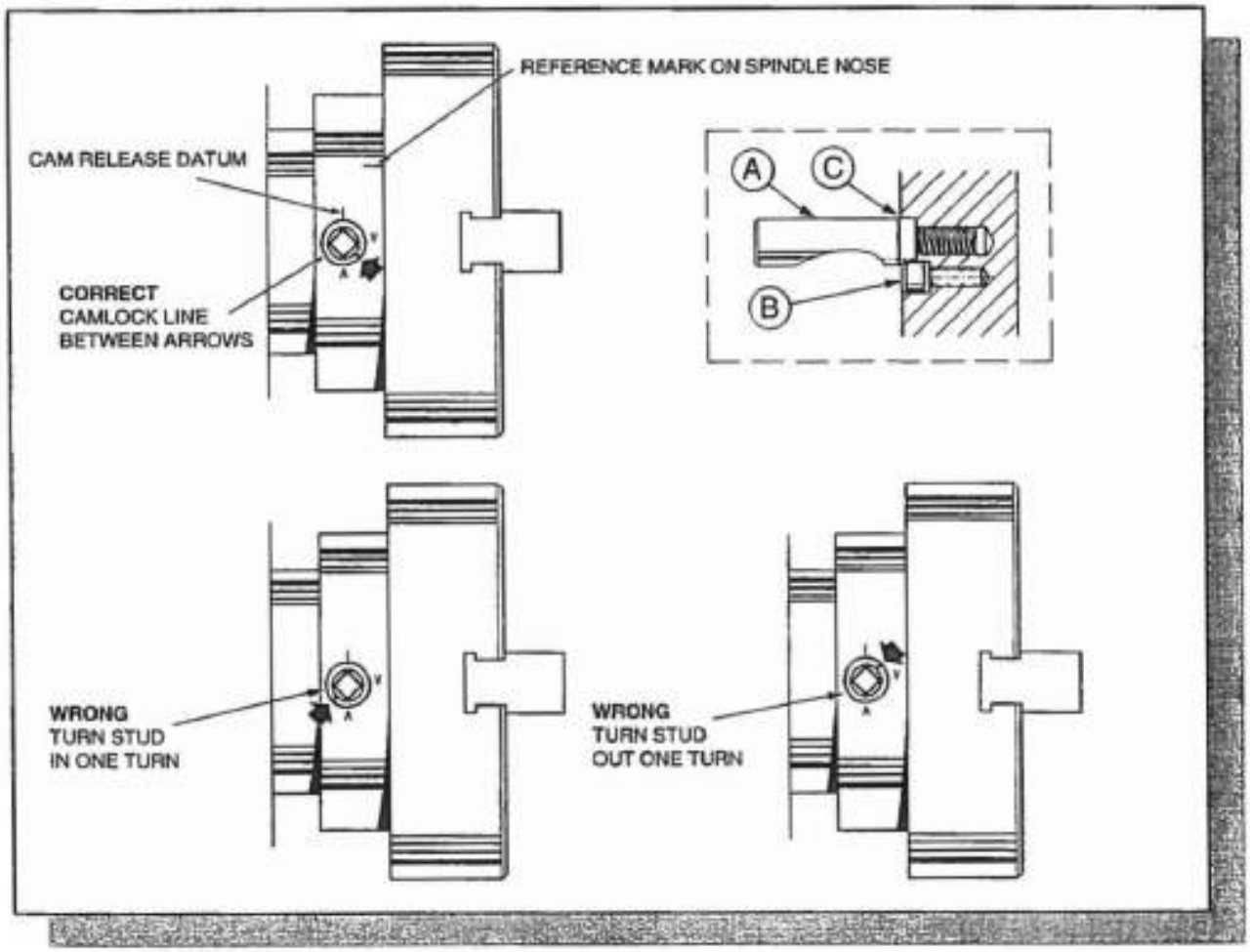
If any of the cams do not tighten fully within these marks,remove the chuck or faceplate and re-adjust the stud as indicated in the diagram.

Once a chuck has been correctly fitted it may be stamped to align with the spindle reference mark for subsequent remounting in the same position.

WARNING

Only high speed chucks to be used with this machine.

Take careful note of **speed limitations** when using face-plates. The 534mm (21") diameter face plate for gap bed machines and the 356mm (14") diameter faceplate must **NOT** be used in the high spindle speed range.



NOTES

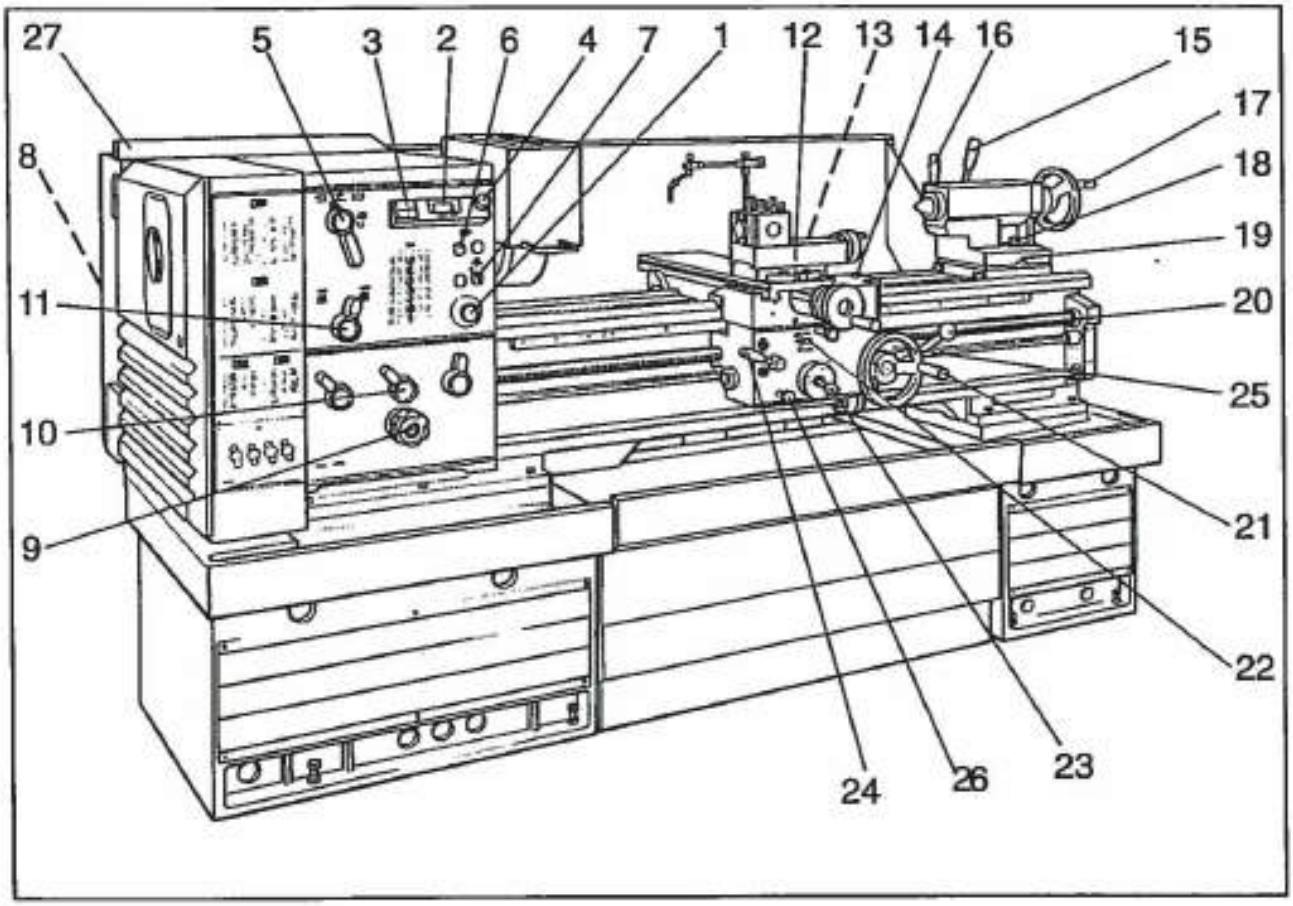
Before attempting to start the machine read carefully the lathe operating instructions on pages 11 to 20 of this manual.

LATHE SAFETY

In the interests of safety please read the Operator Safety Health and Safety Guidance Notes at the beginning of this manual.
Some of the key points are:-

1. Ensure you know how to stop the machine before starting it.
2. Stop machine immediately anything unexpected happens.
3. Ensure speeds, feeds and depths of cut are compatible with the component and the holding devices.
4. Do not touch tooling, chuck or workpiece when spindle is revolving.
5. Wear and utilise suitable protective clothing and equipment.

CONTROL LAYOUT



1. Emergency Stop Button
2. Spindle Speed Display
3. Load Meter
4. Variable Speed Control Knob
5. Speed Range Selector
6. Drive Disable/Enable Buttons
7. Coolant Pump ON/OFFSwitch
8. Main Isolator (at rear of machine)
9. Feed Selector Dial
10. Feed Selector Levers
11. Leadscrew/Feedshaft Reversing Lever
12. Top -Slide Locking Screw
13. Cross-Slide Locking Screw
14. Carriage Locking Bolt
15. Tailstock Locking Handle
16. Tailstock Barrel Locking Handle
17. Tailstock Handwheel
18. Tailstock Clamp Bolt
19. Tailstock Set Over Screws
20. Spindle Control Lever
21. Saddle Traverse Handwheel
22. Feed Direction (Axis) Selector
23. Feed Engagement Lever
24. Leadscrew Nut Engagement Lever
25. Thread Dial Indicator
26. Manual Centralised Lubrication System
27. End Guard Interlock Switch

SPEED SELECTION

Spindle Drive is from the main motor using an AC invertor variable speed drive and through three manually selected sliding gear ranges. The speed range required is first selected by means of lever A (Fig. 6) into one of three positions:-

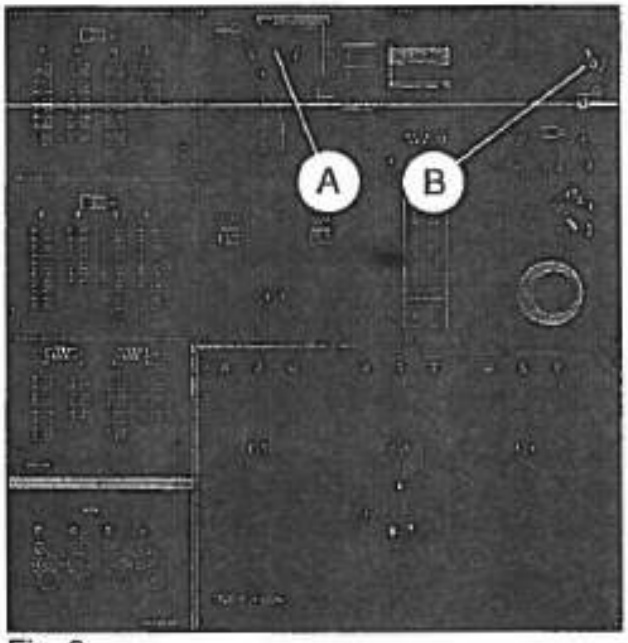


Fig. 6

Low **15 - 300** rev/min with constant power above 125 rev/min.

Medium **35 - 830** rev/min with constant power above 350 rev/min.

High **110-2500** rev/min with constant power above 1050 rev/min.

Caution :
Do not move speed range selector lever whilst the spindle is rotating.

SPINDLE SPEED CALCULATIONS

As a three range variable speed drive is available to the spindle it is possible to machine a particular material at its optimum surface speed, hence spindle speed in rev/min and at the optimum power available.

The optimum spindle speed is calculated from the formulae shown below.

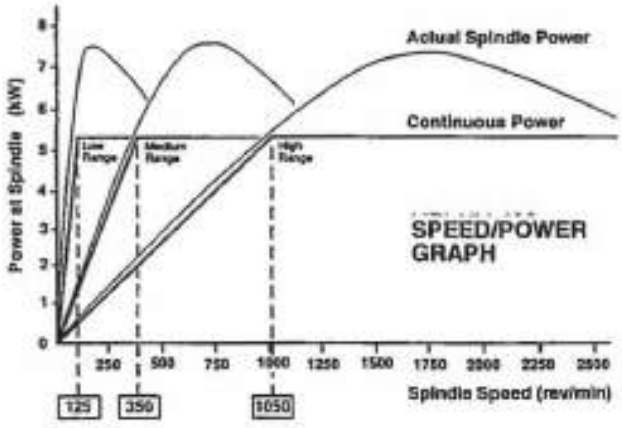
1) $N = \frac{S \times 1000}{\pi \times D}$ (METRIC)

Where D = diameter in mm
S = cutting speed in Metres/min
and N = spindle rev/min

2) $N = \frac{S \times 12}{\pi \times D}$ (INCH)

Where D = diameter in inches
S = cutting speed in feet/min
and N = spindle rev/min

The power available at the spindle can be seen from the graph below.



Example of spindle speed calculation.

It is required to rough turn a diameter of 150 mm in mild steel.
What spindle speed is required, and in which speed range should it be used?

$$\text{Using } N = \frac{S \times 1000}{\Pi \times D}$$

where S = 200 Meters/Min (typically)

therefore

$$N = \frac{200 \times 1000}{\Pi \times 150}$$

$$= 424 \text{ rev/min}$$

This speed is obtainable in both the mid and high spindle speed ranges, but as only 2.5 kW spindle power is available in the high-range and a full 5.5 kW is available in the mid-range the mid-range should be used.

SPINDLE ROTATION

To start spindle switch on the main isolator at the rear of the machine and release the emergency stop button.Drive Disable warning light (red) illuminates.Ensure that the third rod lever (C) is in the NEUTRAL (mid) position (Fig. 7) and press the drive enable button. Green light illuminates. Ensure Speed Control Knob(B) is in low (fully anticlockwise).
With the lever down the spindle will run in the forward direction and with the lever up the spindle will run in reverse.
The required spindle speed is then achieved by adjusting the Speed Control knob clockwise to increase spindle speed and anti-clockwise to decrease spindle speed

.

Returning the third rod lever to neutral will stop the spindle.

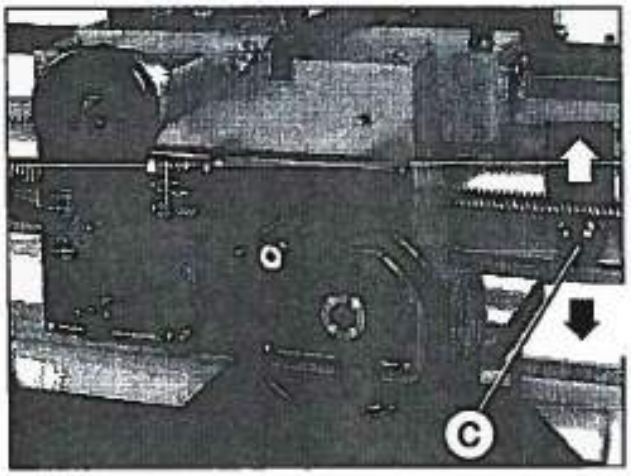


Fig. 7

FORWARD

REVERSE

WARNING

When attempting to start the spindle with large or out of balance workpieces and when using face plates ensure that the range selector lever is **NOT ON HIGH**.and that the speed control knob is in low (i.e. anticlockwise) position.
NOTE. The drive may cut out if large workpieces are accelerated to high speeds in the top spindle speed range. If this occurs select the middle speed range and restart the machine using the procedure above.

The motor braking system functions automatically when the apron lever is in the neutral position or the emergency stop button is pressed.

THREAD AND FEED SELECTION

All threads and feeds directly available from the gearbox are shown on the data plates fitted to the headstock and change gear cover (Fig. 8) together with the relevant end gear train combinations and lever settings.

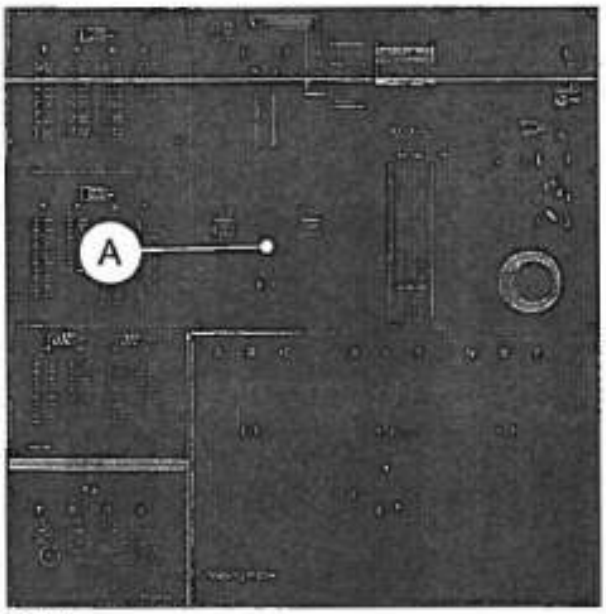


Fig.8

CAUTION

The coarse ranges H and I should not be selected in the high spindle speed range.

The end gear trains should be arranged as in the diagrams shown on the data plate.

For any other threads or pitches our Technical Department is available to specify the most convenient change gearing required.

LEADSCREW REVERSING BOX

Using lever A on the headstock (Fig. 8) the direction of rotation of both leadscrew and feedshaft may be reversed.
This allows the leadscrew nut to be permanently engaged during screw cutting and the direction of both feed and threads to be reversed whilst the spindle is running.

CAUTION. When using the reversing lever the spindle speed should not exceed 175 Rev/Min.

THREAD DIAL INDICATORS

METRIC THREAD DIAL INDICATOR -
This is supplied when the machine is fitted with a metric leadscrew and allows the majority of metric pitches shown on the data plate to be cut by engaging and disengaging the leadscrew nut for each pass.

The correct pinion must be meshed with the leadscrew and engagement of the leadscrew is made at the dial number to suit the pitch of thread to be cut. Chart (Fig. 11) shows:-

1. Pitch to be cut in mm.
2. The number of teeth on the pinion gear which engages with the leadscrew.
3. The dial lines at which the leadscrew may be engaged.

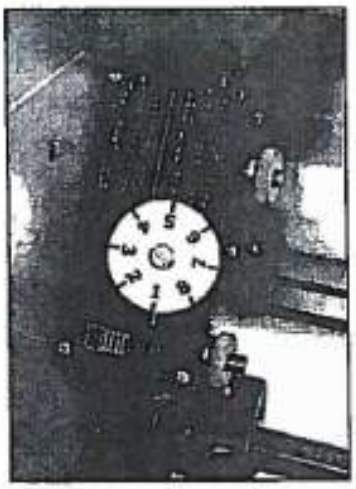


Fig.11

Metric pitches not divisible into the pinions supplied, D.P., module and inch threads must be cut with the leadscrew permanently engaged and reversing direction by reversing the main spindle or the leadscrew.

INCH THREAD DIAL INDICATOR
This is supplied when the machine is fitted with an imperial leadscrew.
Chart (Fig. 12) shows the T.P.I. to be cut and the dial lines at which the leadscrew may be engaged.

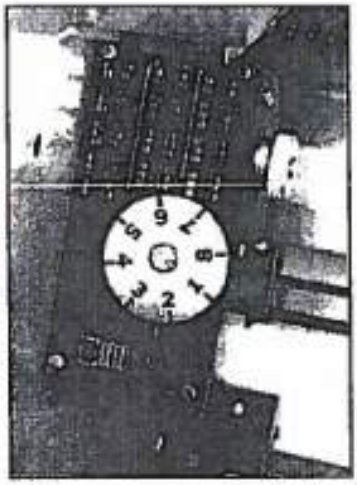


Fig.12

For metric threads, D.P., module and certain fractional inch threads the dial cannot be used. These threads must be cut with the leadscrew permanently engaged and reversing direction by reversing the main spindle or by reversing the leadscrew. See previous section.

MULTI-START THREADS

A multistart thread can be cut on a lathe in three basic ways.
1.By repositioning the compound (top) slide one pitch forward for each start. Note the slide is normally set at 90 degrees to the axis of the cross-slide. The accuracy of this method depends on the skill of the operator
2.By using an accurately divided driver plate and turning the workpiece one division for each start.
With camlock mounted chucks two three and six start threads may be cut by indexing the chuck on the camlock studs.

3. By advancing the driver gear a calculated amount to advance the spindle by one pitch of the thread to be cut.
In the case of machines with metric leadscrews the 44 tooth driver gear is divisible by 2 and 4. For machines with imperial leadscrews the 36 tooth driver gear is divisible by 2, 3 and 4. These number of starts may therefore be cut.

APRON AND SLIDE CONTROLS

Apron and slide controls (Fig. 13) in addition to the manual operation of the saddle by rotating apron handwheel (A), the cross-slide handwheel (B) and the topslide by handwheel (C) power feed is available to the saddle and cross-slide.

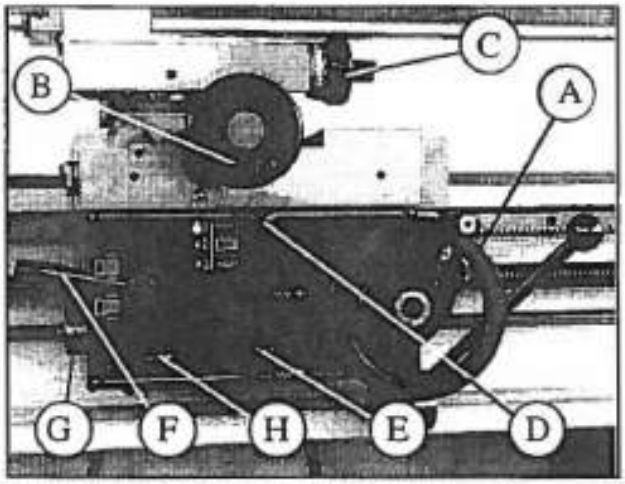


Fig. 13

1.Push pull knob (D) selects surfacing or sliding feeds. Push in for surfacing and pull out for sliding feeds.
2.Feed engage lever (E) is raised to engage whichever direction of feed is selected.
3.Lever (F) is used to engage the leadscrew nut for screw cutting.
4.For reversal of feed and thread directions there is a lever mounted on the lathe headstock.

FEED TRIP ADJUSTMENT
A trip mechanism (G) is incorporated in the apron enabling the saddle to power feed up to fixed stops.The loading at which the apron trips out has been pre-set during construction and should not be altered. It is permissable to reduce force if knocking off against a stop.To reset back to original setting engage feed lever (E) Fig. 13. With a screwdriver push in the adjuster rod against the light spring load and slowly turn clockwise until the dog is felt to engage the associate nut. Continue to turn until the required setting is reached.
DO NOT OVER ADJUST.

It is recommended that the automatic feed trip mechanism is **NOT** used below spindle speeds of 500RPM.

The apron handwheel can be disengaged from its gearing during power operation or when screwcutting by pulling the hand wheel out.

SADDLE LUBRICATION
Knob H operates the apron and slideways lubrication pump, which ensures that the bedways, cross-slide ways and nut are adequately lubricated.
To ensure that the system is primed operate the pump until oil can be seen on the bedways. Under normal use the pump should be operated twice before commencing work.

CROSS-SLIDE AND TOPSLIDE

The handwheels carry dials graduated in either inch or metric dimensions. The cross-slide dial is graduated to indicate changes in workpiece diameter and topslide is graduated to indicate actual movement.

SADDLE LOCK SCREW
This enables the saddle to be locked to the bed for facing or parting off operations.

TOP-SLIDE LOCK SCREW
This enables the top-slide to be locked in position.

TAILSTOCK. (Fig. 14)

The tailstock may be clamped to the bed by means of clamp lever (A) additional clamping may be obtained by tightening nut (B) located in the tailstock casting. This clamping nut should be released before attempting to move the tailstock and after the need for additional clamping.
The tailstock barrel is locked by means of lever (C).

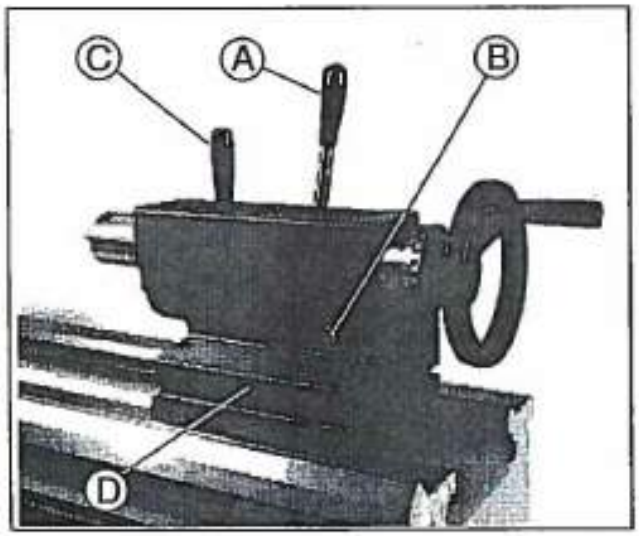


Fig. 14

The tailstock can be set over for the production of shallow tapers or for re-alignment.
Set over adjustment is achieved by unclamping tailstock lever (A) and nut. Slacken rear location screw (E) one turn (Fig. 15). Adjust screws (D) at each side of base by slackening one and tightening the other to laterally move tailstock across the base. . Re-tighten the rear location screw.
The barrel is graduated in inch and metric dimensions.
The dial on the tailstock handwheel is graduated in either inch or metric dimensions.

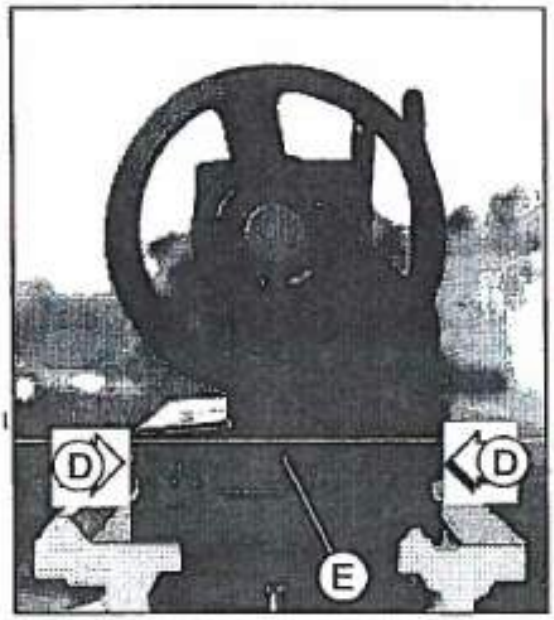
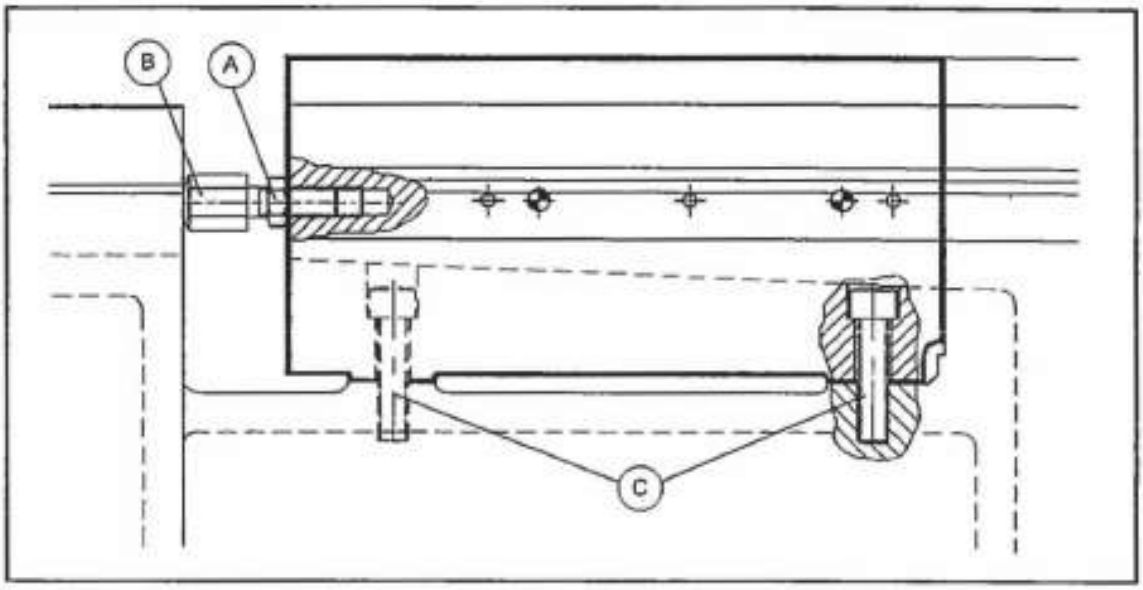


Fig. 15

COOLANT

The coolant pump is operated by the on and off buttons located on the headstock. The flow of coolant is controlled by means of the tap fitted to the standpipe.
The coolant tank is located at the back of the machine and has a capacity of 32 litres (7 gallons).
Any commercially available coolant may be used - suitable for the tooling and type of material being cut.

GAP PIECE REMOVAL



(Fig. 16)

REMOVAL PROCEDURE

1. Clean area around gap.
2. Remove chuck or any work holding device.
3. Release alignment bolt locknuts (A).
4. Fully Retract alignment bolts (B).
5. Release holding down bolts (C).
6. Protect leadscrew.
7. Carefully remove the gap piece avoiding damaging the leadscrew and gap piece mating surfaces.

REFITTING PROCEDURE

1. Clean area around gap.
2. Ensure machine is level.
3. Ensure all mating surfaces are clean.
4. Carefully slide gap piece back into position.
5. Lightly bolt into position, aligning the ways by hand and lightly tapping the gap with a hide hammer.
6. Finally position the gap by means of the alignment bolts (B), being careful not to overtighten (maximum torque 5 ft-pounds or 7NM).
7. Tighten holding down bolts (C).

NOTE:
The two soft taper dowels included in the gap piece are provided to give an initial location only when refitting the gap piece.
They should be only 'lightly' fitted into their holes when the refitting procedure is undertaken, as detailed above. Only after re-machining of the holes using a taper reamer should the pins be tapped home firmly into postion. (This is an optional process when refitting the gap piece and under normal circumstances it is not necessary).

NOTES

LATHE ALIGNMENT

With the lathe installed and running we recommend a check on machine alignments before commencing work. Check alignment and leveling at regular periods to assure continued accuracy.

HEADSTOCK CHECK– (Fig. 16)
(Only to be carried out after checking machine level).
Take a light cut over a 150mm (6") length of 50mm (2") diameter steel bar held in a chuck (but not supported at the free end). Micrometer readings at each end of the turned bar A and B should be within 0.01 mm.(0.0004").

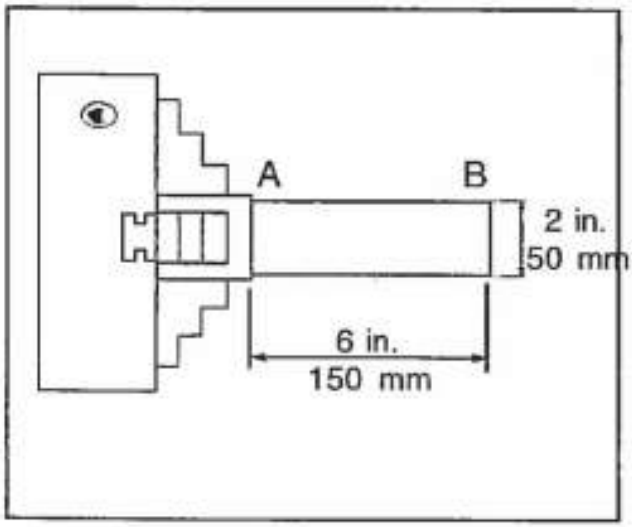


Fig. 16

To correct a greater difference in readings loosen the four headstock screws (A) shown in Fig. 17 then adjust the set over pad C to pivot the headstock about the dowel B. Tighten all securing screws after each adjustment. Repeat the test cut and alignment check until the micrometer readings are within tolerancel.

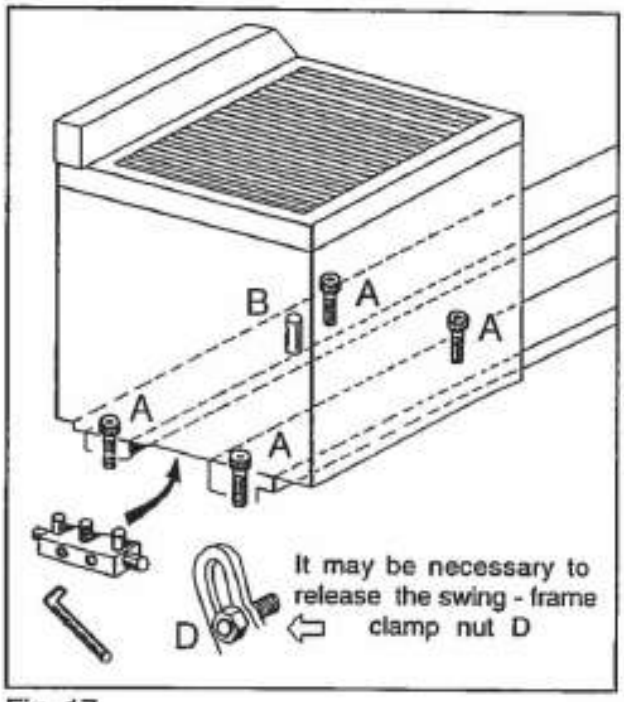


Fig. 17

TAILSTOCK CHECK-(Fig.18)
Using a 300mm (12") ground steel bar between centres, check the alignment by traversing a dial test indicator along the centre line of the bar. To correct error release tailstock clamp lever slacken rear locating screw (R)and adjust the two screws (S) on each side of the base.

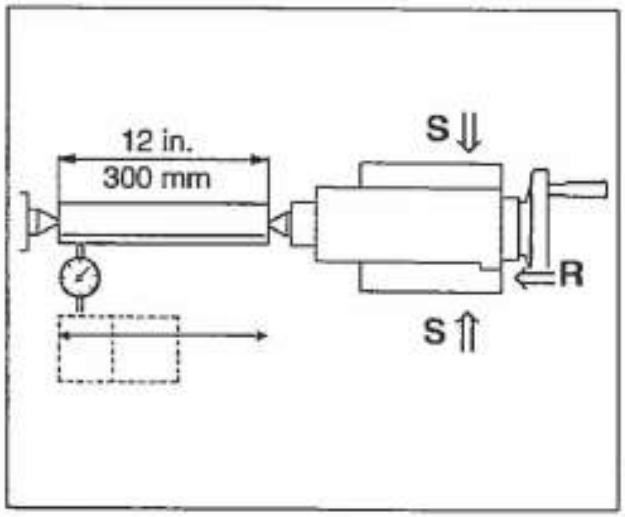


Fig. 18

END GEAR TRAIN (Fig. 19)

Drive from the headstock to the gearbox is transmitted through a gear train enclosed by the headstock end guard.

Intermediate gears are carried on the adjustable swing frame A.

Gears must be thoroughly cleaned before fitting and backlash should be maintained at 0.127mm (0.005 in.) for correct mesh.

Lubricate gears regularly with thick machine oil and apply oil can to the intermediate gear spindle.

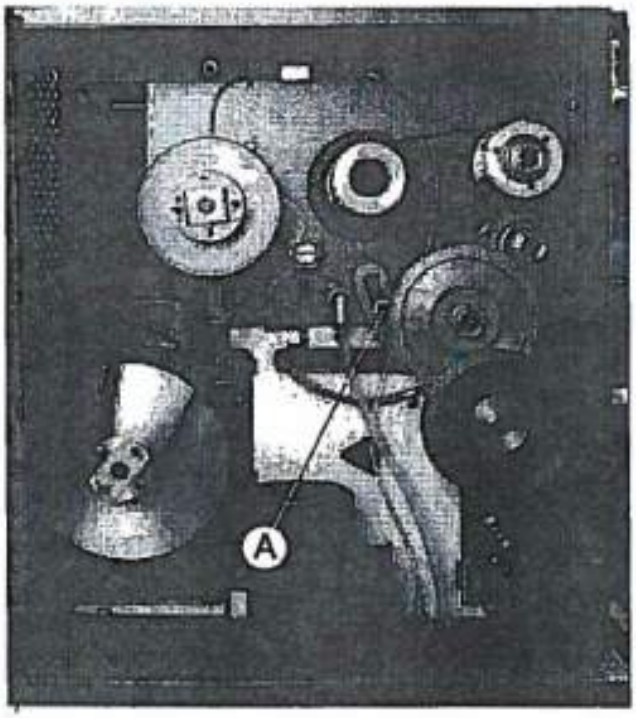


Fig. 19

DRIVING BELT (Fig. 19)

To alter the tension of the poly-vee drive belt four bolts on the slotted motor plate may be loosened and the plate moved. Under correct tension a pressure of 8 Kg. (17 lbs) at a point mid way between the motor and headstock pulleys should produce approximately 5mm. (0.2 in.) movement on the belt.

LEADSCREW TORQUE LIMITING DEVICE

The transmission is protected against severe overload by a torque limiting device fitted to the left hand end of the leadscrew (Fig. 20). This is set to a pre-determined slipping torque before the machine leaves our works.

In normal usage the user is advised not to alter this setting but to to consult our Service Department in case of a problem.

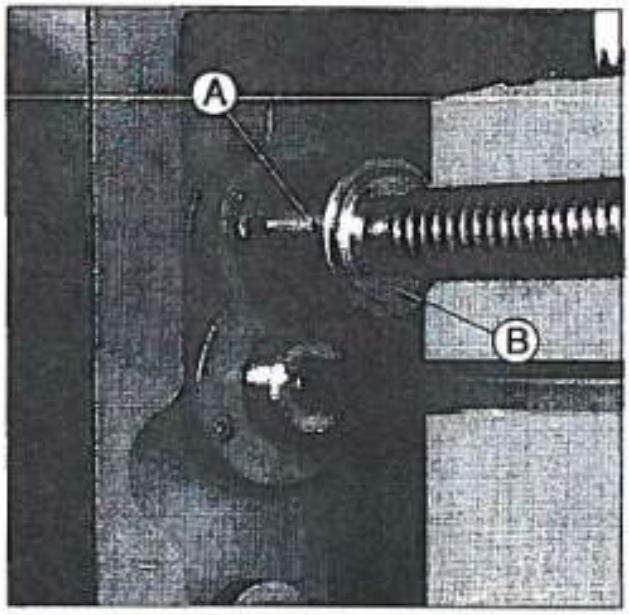


Fig. 20

Adjustment may be achieved by:

1. Loosening the two locking screws (A) on the O.D. of the device.
2. Turning the inner adjusting ring (B) (by means of the two holes in the R.H.faceof the unit) clockwise to increase slipping torque.
3. Re-tightening the two locking screws.

To "feel" the slipping torque hold the apron handwheel to stop saddle movement whilst the leadscrew is engaged.

CAUTION :

Keep cutting tool well clear of workpiece and spindle at a low number of rev/min, when making adjustments.

CHANGE GEAR SHEAR PIN (Fig.21)
Additional protection is provided by means of a shear pin fitted between the final driven change gear and the gearbox input shaft.
To replace shear pin isolate electrical supply and open end guard. Remove driven gear A exposing bushes B andC. Withdraw pin head and push remainder of shear pin through bush C Replace bush B insert new pin and refit driven gear.
Caution:- use only replacement shear pins of 3.175mm(1/8") dia.mild steel, 45kg/ ² mm. (30 tons / ² in.) tensile strength.

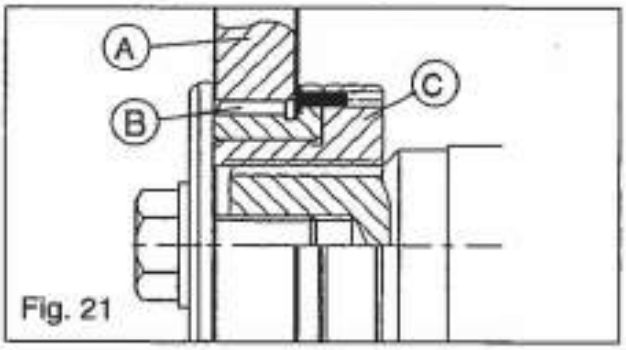


Fig. 21

SLIDEWAYS (Fig.22)
Tapered gib strips are fitted to the slideways of the cross and compound slides to eliminate the effects of wear.
To adjust the cross-slide, slacken the rear screw and then tighten the front screw A, making only slight alterations at a time, and constantly check for a smooth action. Finally re-tighten rear screw. The topslide is adjusted by means of a single screw B.

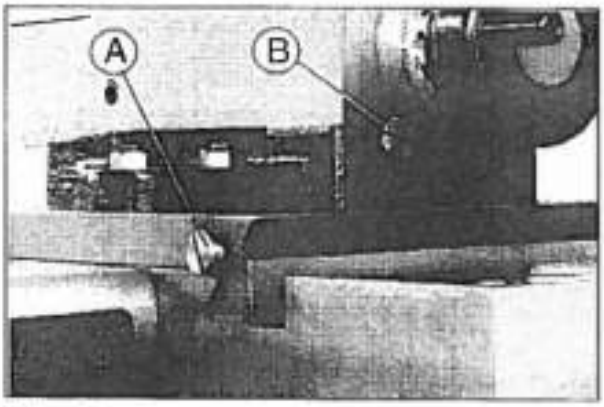


Fig. 22

Tapered gibs are fitted to each wing of the saddle and are adjusted by means of the single screws front and back.
Ensure that the slideways are cleaned and lubricated before making any adjustment. Turn screws clockwise to take up any play avoiding over adjustment, which will result in stiff jerky action on the slide.

CROSS-SLIDE NUT (Fig. 23)

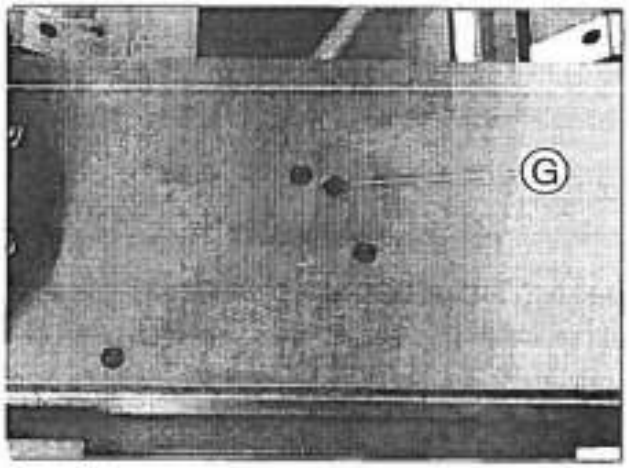


Fig. 23

The cross-slide nut is of the backlash eliminator type.
To remove undue slackness or backlash in the nut assembly first remove the socket head grubscrew G adjacent to the nut fixing screws on the top face of the slide. Insert a strong screwdriver through the grubscrew hole and carefully turn the nut adjusting worm in a clockwise direction until tight.
Slacken back slightly, and operate the cross-slide repeatedly through full travel, making small adjustments until smooth action is obtained.
Replace grubscrew into top of cross-slide to prevent ingress of dirt and swarf.

SPINDLE BRAKE
The variable spindle speed drive package provides automatic controlled braking of the spindle and requires no maintenance.

LUBRICATION

HEADSTOCK (Fig. 24)

Spindle bearings, headstock gearing and shafts are lubricated continuously from a distributor box located beneath the headstock top cover. This is supplied by an independently driven gear pump, and is not related to spindle speed. Evidence of supply is shown in an oil sight glass located on the headstock front face.

N.B. The lathe should not be operated unless oil can be seen to be flowing.

A pipe returns oil from the bottom of the headstock to the oil pump. Ensure that the oil level in the system is kept topped up, through the filler in the headstock cover, to the required level in oil sight (A).

Check oil level weekly and change the oil every year using Shell Tellus T37(ISO VG 37).

Oil may be drained by disconnecting the pipe at (B).

System capacity is approximately 4.5 litres (8 pints).

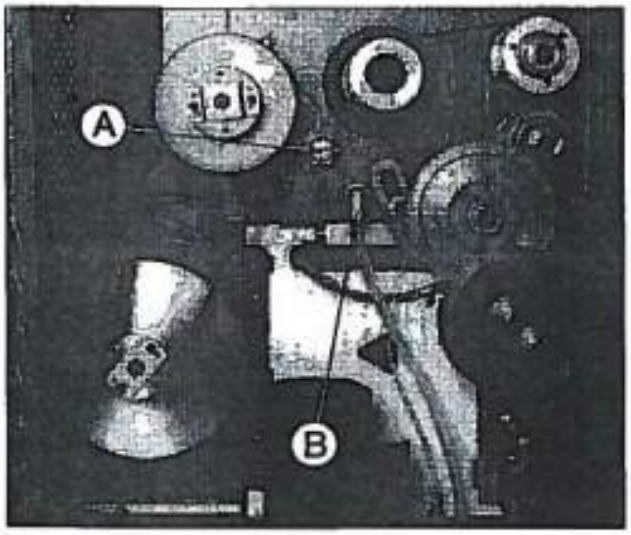


Fig. 24

GEARBOX (Fig 25)

All gears are splash lubricated from an integral oil bath. An oil sight window is situated on the right hand end face of the gearbox. Top up or refill gearbox with Shell Tellus T37 (ISO VG 37) through filler elbow on L.H. side of gearbox casting

To drain the gearbox unscrew drain plug C in the gearbox casting. The capacity of the gearbox is approximately 2.6 litres (4.5 pints).

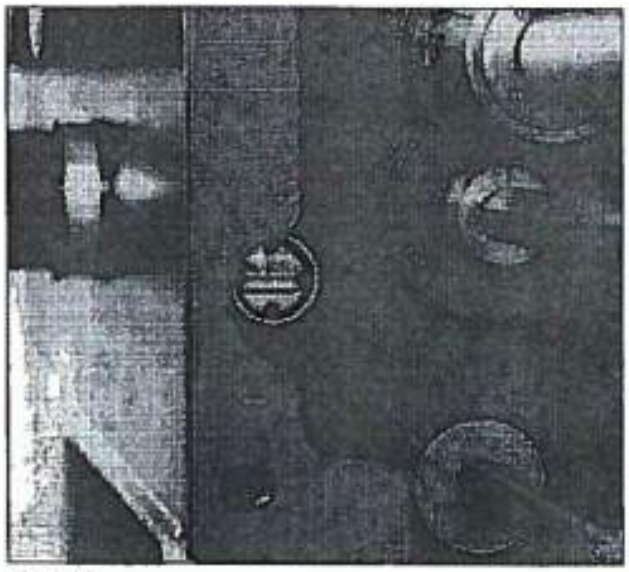


Fig. 25

APRON (Fig.26)

The apron gears are splash lubricated from an integral oil bath. The apron also acts as a reservoir for the oil for the manually operated pump, which lubricates the bedways, cross-slide ways and nut.

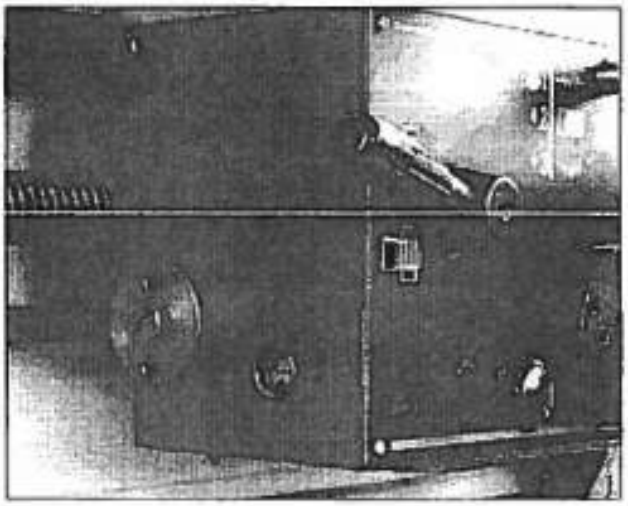


Fig. 26

When the oil level falls below the mark on the oil sight glass the system should be topped up through the filler plug in the saddle with Shell Tonna TX68 (ISO VGT 68). The capacity is approximately 1.2 litres (2.8 pints).

A drain plug is provided underneath the apron casting.

SLIDEWAYS

The apron acts as a reservoir for the saddle and cross-slide lubrication oil.

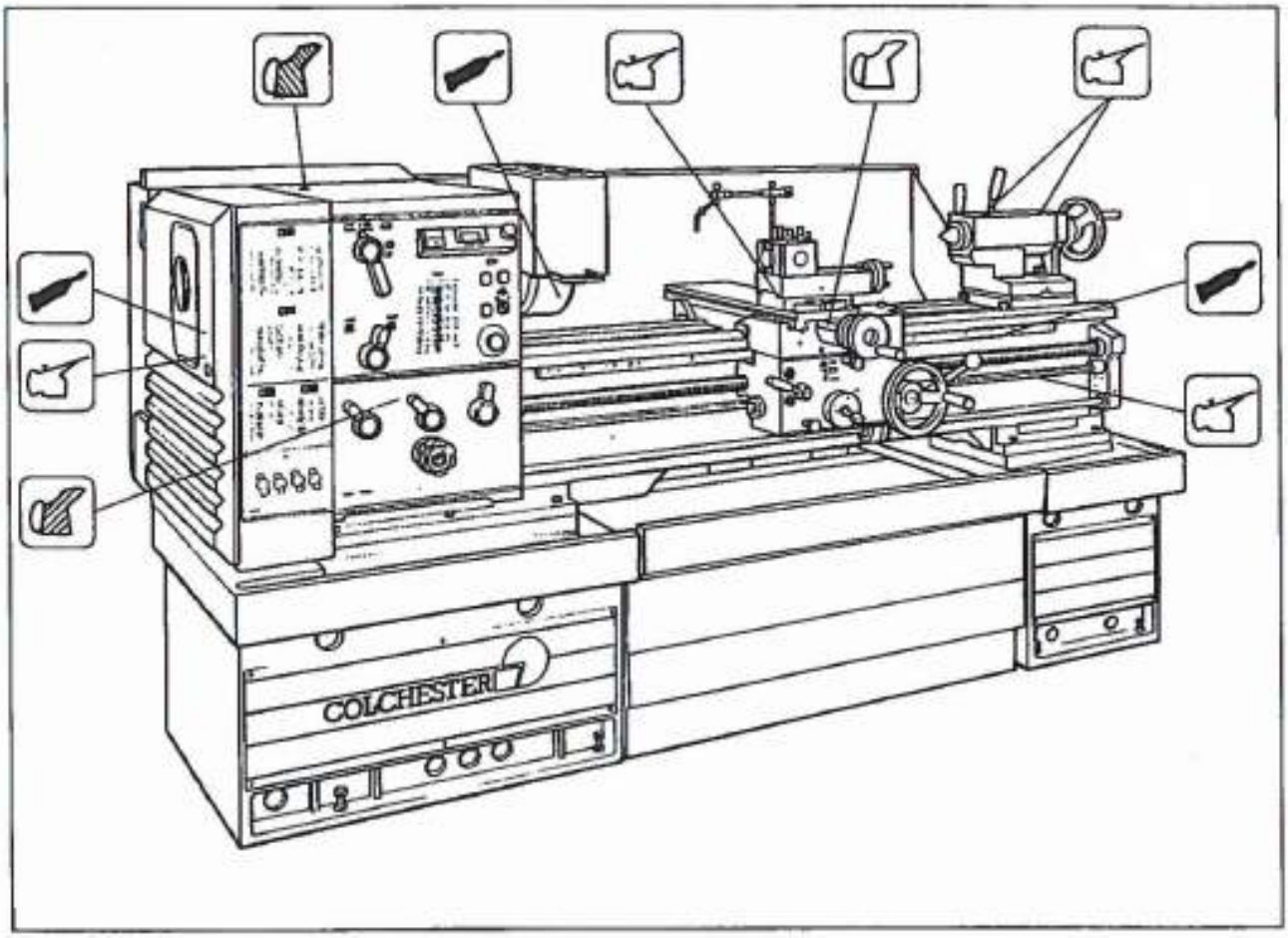
Slideways are lubricated by pulling the lube plunger located on the lower left hand end of the apron assembly.

This plunger will slowly withdraw and distribute lube oil to the saddle, cross-slide and cross-slide screw. In order to check that the lube system is operating fully and correctly a vent hole is provided at the end of the lubrication circuit and during each operation a small discharge of oil should be witnessed.

The discharge hole is located on the right hand side of the saddle assembly mid way across the bed section.

In normal usage it is recommended that twice daily operation of slideway lube system is required.

LUBRICATION CHART



Grease Each Week	Rack and End train gears (Change wheels).Shell Alvania RA. Chuck (manual). Molycote "D"
Oil Each Week	Tailstock, Leadscrew, and Topslide.Shell Tellus T37 (ISO VG 37)
Apron. Check Level and top up Each Week	- Shell Tonna TX68 (ISO VGT 68) Total Capacity 1.2 litres.
Headstock.Check Level and top up Each Week	- Shell Tellus T 37 (ISO VG 37) Total Capacity 4.5 litres.
Gearbox. Check Level and top up Each Week	- Shell Tellus T 37 (ISO VG 37) Total Capacity 2.6 litres.

REGULAR ATTENTION

For trouble free operation keep the lathe clean and regularly maintained. Where grease and oil nipples are provided lubrication should be carried out as indicated on the lubrication chart.

DO NOT MIX LUBRICANTS.–

When alternative lubricants are to be used, the system or reservoir should be drained and flushed out before refilling with the equivalent grade

WIRING DIAGRAM - A.C. SPINDLE DRIVE

NOTES

110V a.c. CONTROL CIRCUIT WIRING 1.0 mm². RED.

ALL SIGNAL WIRING TO AND FROM DRIVE UNIT IN SCREENED MULTI-CORE CABLES

FOR 60Hz MACHINE, THE UPPER FIXED LINK (⌐¬) ON THE BACK OF THE TACHO DISPLAY BOARD; MOUNTED BEHIND THE SPINDLE SPEED CONTROL AT THE FRONT OF THE HEADSTOCK, IS MOVED FROM THE RIGHT TO LEFT POSITION.

CONNECTION OF ELECTRICAL ACCESSORIES

LO-VO LIGHT

SCREW THE LO-VO LIGHT TRANSFORMER MOUNTING PLATE TO THE BOTTOM RIGHT HAND SIDE OF THE CABINET.
WIRE BETWEEN THE FUSED TERMINALS (R3 AND S3) ON THE TRANSFORMER MOUNTING PLATE AND TERMINALS R2 AND S2 ON THE MAGNETICS PANEL.(1 .5mm 2 BLACK CABLE) THE MOUNTING PLATE MUST BE EARTHED.
LINK BETWEEN THE EARTH STUD ON THE MAGNETICS PANEL,
(1.5mm. GREEN /YELLOW CABLE).

PROFILER

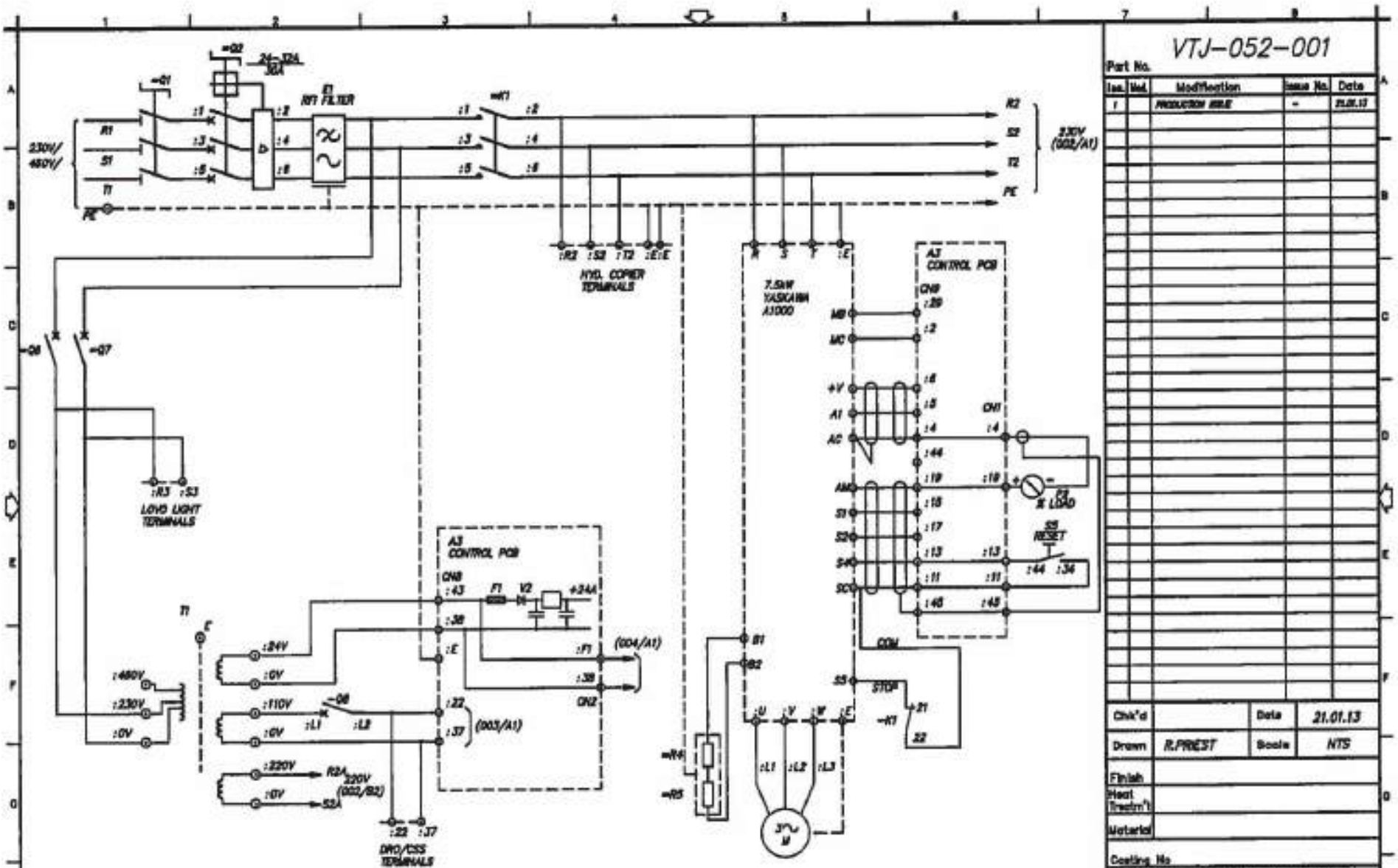
CONNECT CONDUIT THROUGH 22.5 DIA. HOLE IN THE BASE OF THE ELECTRICAL CABINET. WIRE INTO TERMINALS R2, S2, T2 AND EARTH, ON THE MAGNETICS PANEL.

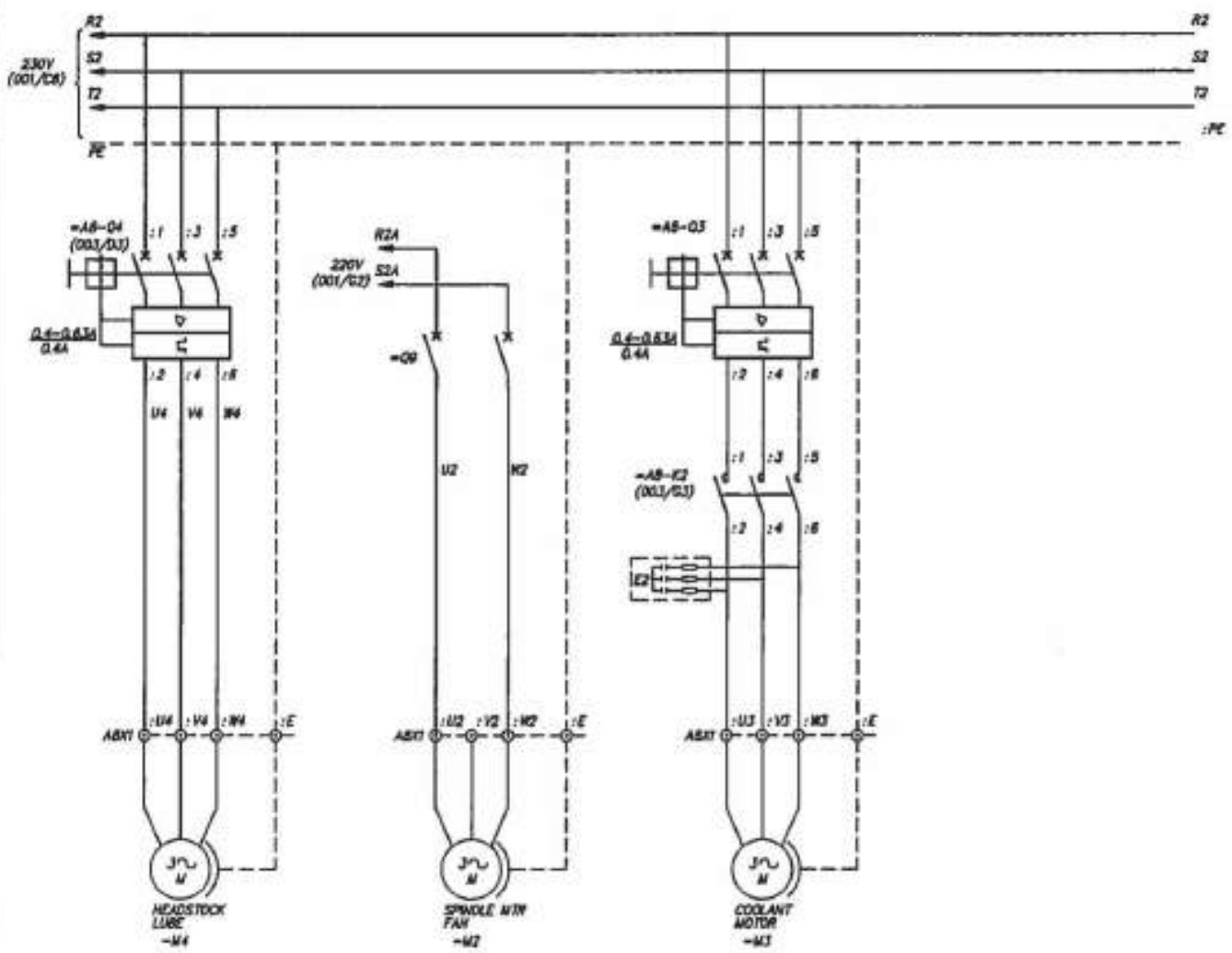
DIGITAL READOUT

WIRE INTO TERMINALS 22 AND 37 ON THE MAGNETICS PANEL.

OVERLOAD SETTINGS

OVERLOAD	FUNCTION	SETTING
Q9	DRIVE MOTOR FAN	0.1 Amp
Q3	COOLANTPUMP	0.19 Amp
Q4	HEAD LUBE PUMP	0.3 Amp


VTJ-052-001
Part No.
Iss. Mod. Modification Issue No. Date
1 PRODUCTION ISSUE - 21.01.13
230V/ 460V/
R1
S1
T1
PE
-Q1
-Q2
24-125A 32A
E1 RFI FILTER
-K1
R2
S2
T2
PE
3.3KW (002/A1)
:R2 :S2 :T2 :E1 :E
HYD. COVER TERMINALS
7.5kW YASKAWA A1000
A3 CONTROL PCB
CN8
CN1
MB
MC
+V
A1
AC
AM
S1
S2
S4C
SC
-Q6
-Q7
:R3 :S3
LOVD LIGHT TERMINALS
:24V
:0V
:110V
:220V
:460V
:230V
R2A 220V (002/B2)
52A
:L1 :L3
(003/A1)
+24A
F1
V2
CN2
(004/A1)
:22 :37
DRO/CSS TERMINALS
B1
B2
:U :V :W :E
:L1 :L2 :L3
=R4
=R5
3~ M
S5 RESET
:44 :34
COM
S5
STOP
-K7
+21
22
E2 X LOAD
Chk'd
Drawn R.PRIEST
Date 21.01.13
Scale NTS
Finish
Heat Treatm't
Material
Casting No
VARIABLE SPEED TRIUMPH (YASKAWA)
3 PHASE SUPPLY
Title
Part No. VTJ-052-001
This drawing is confidential and reproduction or communication of its contents in whole or part is prohibited without written authority
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish (μ CLA)
3-Decimal Places ±.025, 2 Decimal Places ±0.25



Part No.		VTJ-052-002		
Iss.	Mod.	Modification	Issue No.	Date
1		PRODUCTION ISSUE	-	21.01.13

Chk'd		Date	21.01.13
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Costing No			
Title	VARIABLE SPEED TRIUMPH (TARGARA) 230/460V LOADS		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

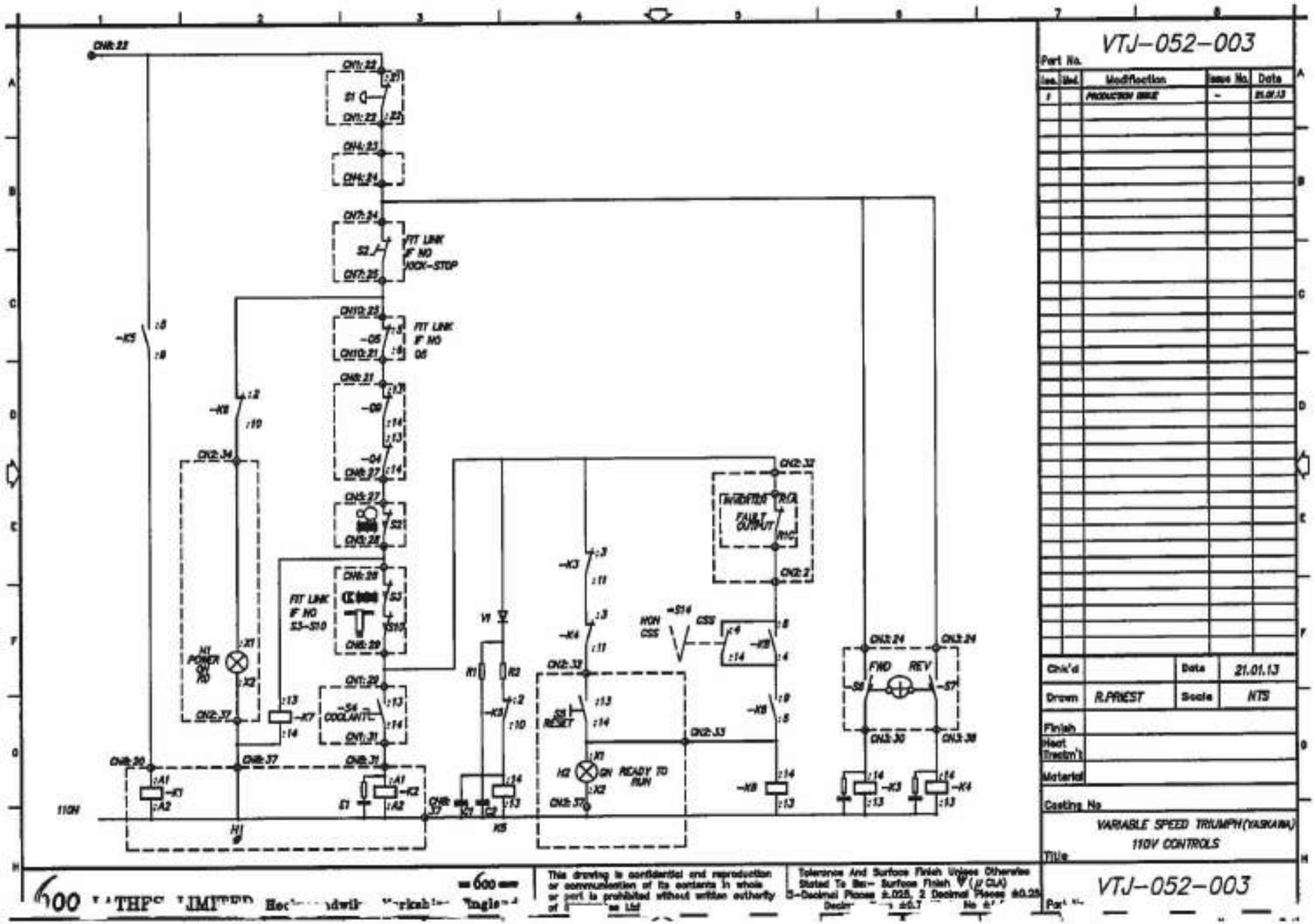
= 600 mm

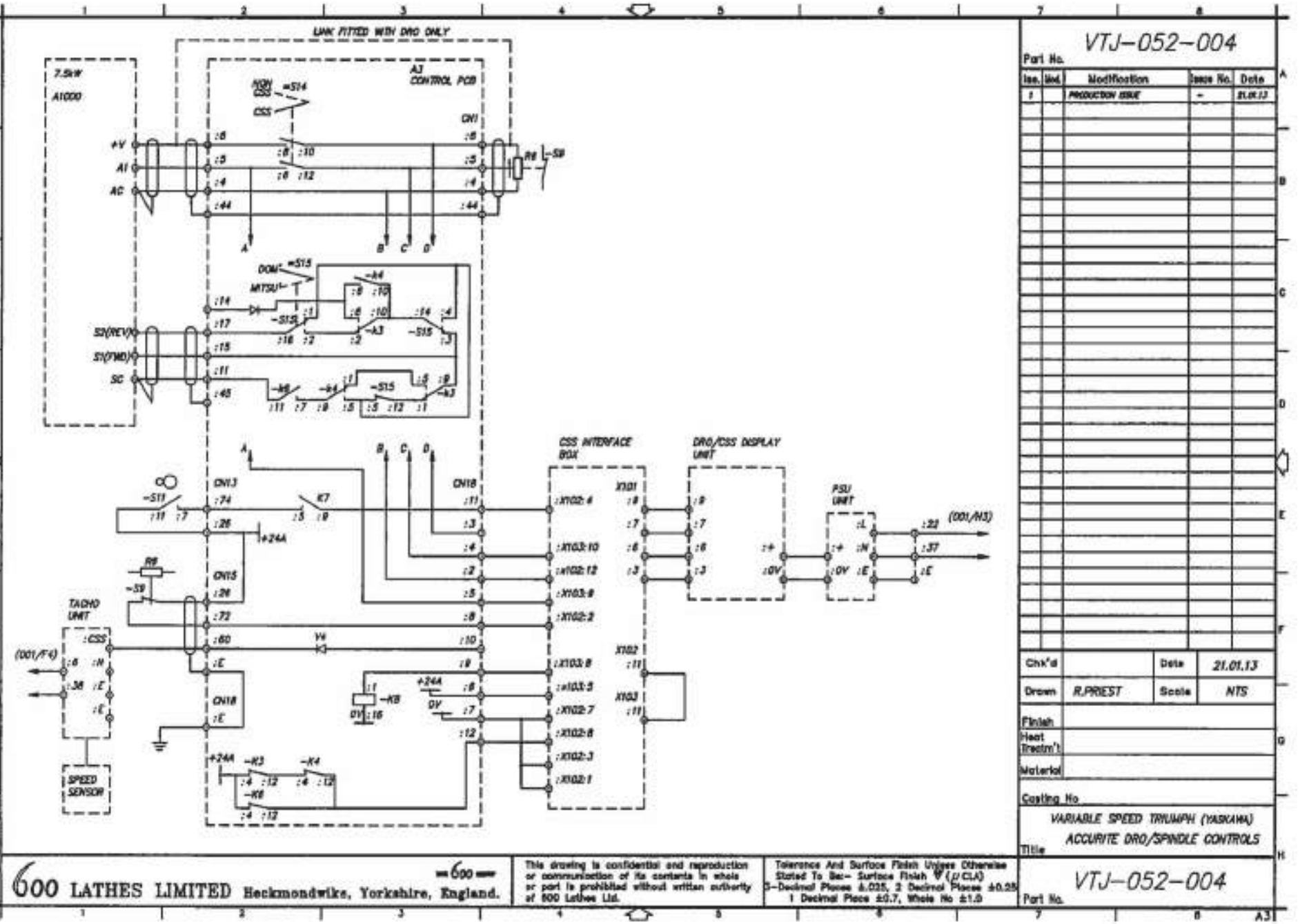
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish $\sqrt{}$ (U CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

VTJ-052-002

Part No.

A3


VTJ-052-003
Part No.
Iss. Mod. Modification Issue No. Date
1 PRODUCTION ISSUE - 21.01.13
Chk'd Date 21.01.13
Drawn R.FOREST Scale NTS
Finish
Heat Treatm't
Material
Casting No
VARIABLE SPEED TRIUMPH(YAMAHA)
110V CONTROLS
Title
VTJ-052-003
This drawing is confidential and reproduction or communication of its contents in whole or part is prohibited without written authority
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish
3-Decimal Places ±.025, 2 Decimal Places ±0.25
FIT LINK IF NO XOCK-STOP
FIT LINK IF NO -05
FIT LINK IF NO S3-S10
-K5
-K8
-K7
-K3
-K4
-K9
-K1
-K2
-S4 COOLANT
S1
S2
S3
S10
S21
-S5
-S6
-S7
-S14
-05
-09
-04
H1 POWER ON
H2 ON READY TO RUN
S3 RESET
INVERTER FAULT OUTPUT
FWD
REV
110H
H1
K5



Part No.				
VTJ-052-004				
Iss.	Ltr.	Modification	Issue No.	Date
1		PRODUCTION ISSUE	-	21.01.13

Chk'd		Date	21.01.13
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No.			

Title: VARIABLE SPEED TRIUMPH (YASKAWA) ACCURITE DRO/SPINDLE CONTROLS

Part No. VTJ-052-004

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish 63 (1.6 CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

A3

FAULT FINDING ON THE MASCOT/ MASTIFF VS SPINDLE DRIVE

The AC Inverter Spindle Drive fitted to the Colchester VS machines is generally very reliable but under certain circumstances problems can arise which may be related to customer mains supply condition, application problems or service failure of the drive.

The drive will display alarm messages to indicate certain fault conditions. These are shown on the LED display on the spindle drive which is situated in the electrical cabinet.

TO GAIN VISUAL ACCESS IT WILL BE NECESSARY TO ISOLATE THE MACHINE USING THE ELECTRICAL CABINET ISOLATOR SWITCH. ONCE SWITCHED OFF, THE LED DISPLAY WILL ONLY SHOW THE ALARM MESSAGE FOR 10 SECONDS. SO BEFORE SWITCHING OFF, UNLOCK THE TWO ELECTRICAL CABINET LOCKS AND FAMILIARIZE YOURSELF WITH THE RANGE OF ALARM MESSAGES AVAILABLE. THEN THE MACHINE CAN BE ISOLATED, THE CABINET DOOR OPENED AND THE ALARM MESSGE CAN BE READ. IF THE ISOLATOR IS SWITCHED AGAIN THE DRIVE WILL RESET ITSELF, SO THERE IS NO REASON TO SWITCH THE ISOLATOR ON WITH THE CABINET DOOR OPEN.

EXTREME CARE MUST BE TAKEN NOT TO TOUCH ANY COMPONENTS OR WIRING WITHIN THE CABINET, WHEN THE DRIVE IS POWERING DOWN OR WITH THE ISOLATOR ON.

Alarm Codes

Alarms are drive protection functions that do not necessarily cause the drive to stop. Once the cause of an alarm is removed, the drive will return to the same status is was before the alarm occurred.
When an alarm has been triggered, the ALM light on the digital operator display blinks and the alarm code display flashes If a multi-function output is set for an alarm (H2-□□=10), that output terminal will be triggered.

Note: if a multi-function output is set to close when an alarm occurs ((H2-□□=10), it will also close when maintenance periods are reached, triggering alarms LT-1 through LT-4 (triggered only if H2-□□=2F).

Digital operator display	Minor Fault Name
AEr	Communication Option Station Number Setting Error (CC-Link, CANopen, MECHATROLINK-II)
	Option card node address is outside the acceptable setting range.
bb	Baseblock
	Drive output interrupted as indicated by an external baseblock signal.
boL	Braking Transistor Overload Fault
	The braking transistor in the drive has been overloaded.
bUS	Option Communication Error
	- After initial communication was established, the connection was lost. - Assign a Run command frequency reference to the option card.
CALL	Serial communication Transmission Error
	Communication has not yet been established.
CE	MEMOBUS/Modbus Communication Error
	Control data was not received correctly for two seconds.
dEv	Speed Deviation (when using a PG option card)
	The deviation between the speed reference and speed feedback is greater than the setting in F1-10 for longer than the time in F1-11.
EF	Forward/Reverse Run Command Input Error
	Both forward run and reverse run closed simultaneously for over 0.5 s.
Hbb	Safe Disable Signal Input
	Both safe Disable Input

HbbF	Safe Disable Signal Input
	One Safe Disable channel is open while the other one is closed.
HCA	Current Alarm
	Drive current exceeded overcurrent warning level (150% of the rated current.)
LT-1	Cooling Fan Maintenance Time
	The cooling fan has reached its expected maintenance period and may need to be replaced. Note: An alarm output (H2-□□=10)will only be triggered if both (H2-□□=2F and H2-□□=10) are set.
LT-2	Capacitor Maintenance Time
	The main circuit and control circuit capacitors are nearing the end of their expected performance life. Note: An alarm output (H2-□□=10)will only be triggered if H2-□□=2F)
LT-3	Soft Chare Bypass Relay Maintenance Time
	The DC bus soft charge relay is nearing the end of its expected performance life. Note.: An alarm output (H2-□□=10)will only be triggered if H2-□□=2F
LT-4	IGBT Maintenance Time (50%)
	IGBTs have reached 50% of their expected performance life. Note.: An alarm output (H2-□□=10)will only be triggered if H2-□□=2F
oH	Heatsink Overheat
	The temperature of the heatsink exceeded the overheat pre-alarm level set to L8-02 (90-100°C). Default value for L8-02 is determined by drive capacity (o2-04).
oH2	Drive overheat Warning
	"Drive Overheat Warning" was input to a multi-function input terminal, S1 through S8 (H1-□□=B)
oH3	Motor Overheat
	The motor overheat signal entered to a multi-function analog input terminal exceeded the alarm level (H3-02, H3-06 or H3-10 = E)
oH5	Motor overheat (NTC Input)
	The motor temperature exceeded the level set in L1-16 (or L1-18 for motor 2)
oL3	Overtorque 1
	Drive output current (or torque in OLV, CLV, AOLV/PM, CLV/PM) was greater than L6-02 for longer than the time set in L6-03
oL4	Overtorque 2
	Drive output current (or torque in OLV, CLV, AOLV/PM, CLV/PM) was greater than L6-05 for longer than the time set in L6-06
oL5	Mechanical Weakening Detection 1
	Overtorque occurred, matching the conditions specified in L6-08.
oS	Overspeed (for Control Mode with PG)
	The Motor speed feedback exceeded the F1-058 setting.

ov	DC Bus overvoltage
	The DC bus voltage exceeded the trip point. For 200V class: approximately 410V For 400V class: approximately 820V
PGo	PG Disconnect (for Control Mode with PG)
	Detected when no PG pulses are received for a time longer than setting in F1-14
PGoH	PG Hardware Fault (detected when using a PG-X3 option card)
	PG cable has become disconnected.
rUn	Motor Switch during Run
	A command to switch motors was entered during run.
SE	MEMOBUS/Modbus Communication Test Mode Error Note: This alarm will not trigger a multi-function output terminal that is set for alarm output (H2-□□=10)
THo	Thermistor Disconnect
	The thermistor that detects motor temperature has become disconnected.
TrpC	IGBT Mainteance Time (90%)
	IGBTs have reached 90%of their expected performance life.
UL3	Undertorque Detection 1
	Drive output current(or torque in OLV, CLV, AOLV/PM, CLV/PM)less than L6-02 for longer than L6-03 time
UL4	Undertorque Detection 2
	Drive output current(or torque in OLV, CLV, AOLV/PM, CLV/PM)less than L6-05 for longer than L6-06 time
Uv	Undervoltage
	One of the following conditions was true when the drive was stopped and a Run command was entered: - DC bus voltage dropped below the level specified in L2-05. - Contactor to suppress inrush current in the drive was opened. - Low voltage in the control drive input power. This alarm outputs only if L2-01 is not 0 and DC bus voltage is under L2-05.
voF	Output Voltage Detection Fault
	There is a problem with the output voltage.

APPLICATION CONSIDERATIONS WHEN USING T.S.HARRISON VS CENTRE LATHES

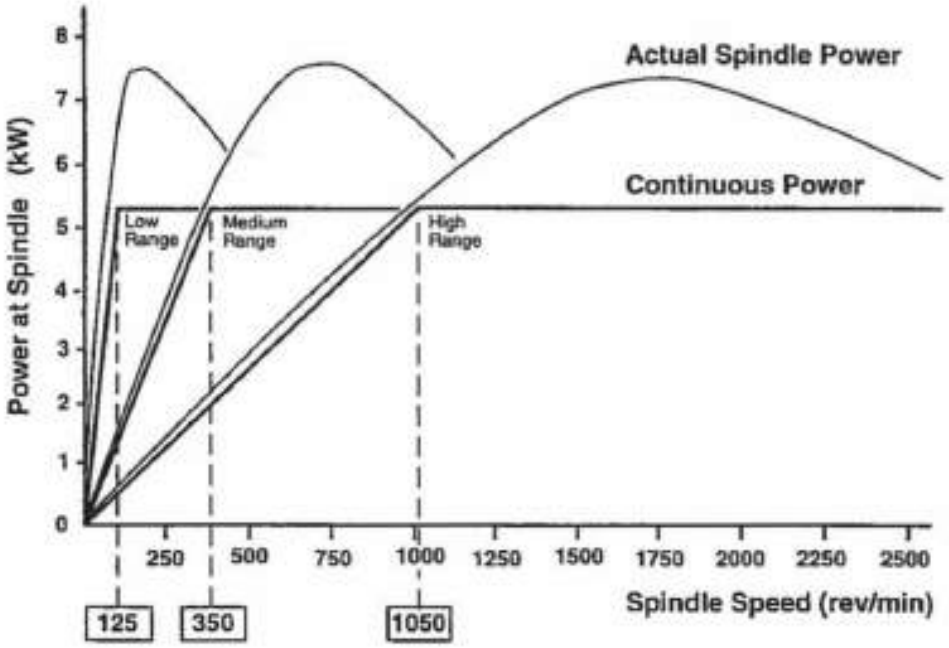
1. Screwcutting:-

The ability to be able to stop the spindle quickly is essential during Screwcutting. In the top range it takes approximately 5 seconds (depending upon the size of the workpiece) to stop from maximum speed.
The deceleration time is also the same in the middle and bottom ranges, so therefore use the top range which will give faster deceleration times when running at the lower speed part of this range.

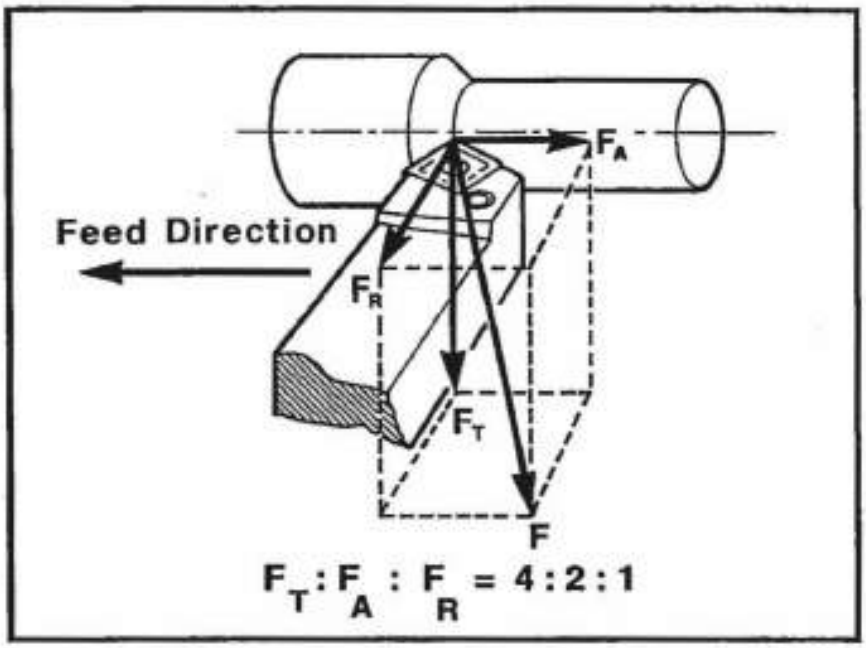
2. Power Consumption:-

The availability of power at the spindle for cutting is shown below. In the bottom range below 60 rev/min power is pro-rata to speed on a constant torque basis, giving 2.5kw available for cutting at 20 rev/min approximately.
To calculate the power consumption at the spindle to see if it is being overloaded, follow the information given according to the material and tooling being used and check the availability of power according to the graph with the resulting calculation. If the availability is exceeded then either reduce the feed and or depth of cut. Alternatively increasing the cutting speed if the application is running in the constant torque range may assist the situation as more power will be available.

If in doubt contact T.S.Harrison for additional information.



CUTTING FORCES AND SPECIFIC CUTTING FORCE



$$F_T = k_S \times a \times s \text{ Newtons}$$

k_S	=	specific cutting force N/mm
a	=	depth of cut
s	=	feed mm/rev

k_S = CONSTANT FOR A GIVEN MATERIAL

$$k_S = \frac{F_T}{A} \left(\frac{\text{TANGENTIAL CUTTING FORCE}}{\text{CHIP CROSS SECTION}} \right) \text{N/mm}^2$$

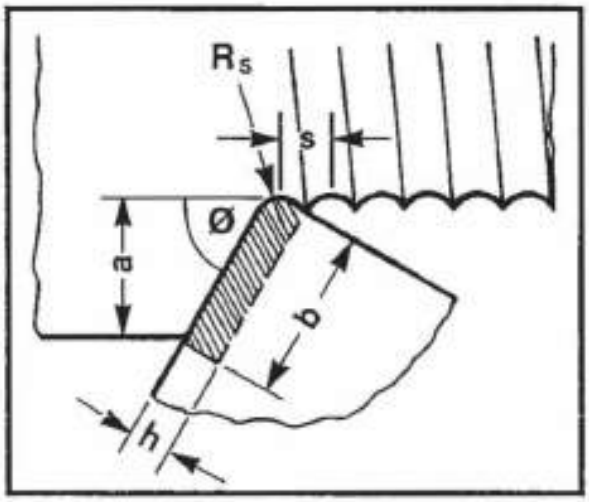
k_S VARIES ALSO WITH THE FOLLOWING FACTORS

CUTTING TOOL GEOMETRY

ENTERING ANGLE OF TOOL

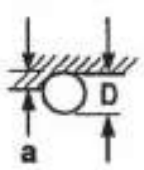
FEED RATE

TOOL AND ANGLE CHIP SECTION



s	=	Feedrate
h	=	Chip thickness
a	=	Depth of cut
R_S	=	Tool nose radius
b	=	Chip width
Ø	=	Tool entering angle

k_S CORRECTION FACTORS FOR TOOL GEOMETRIES					
Top Rake Angle	0	+7°	+12° to +15°	+18°	+20°
Correction Factor	1.1	1.0	0.95	0.85	0.8

k_S CORRECTION FACTORS FOR ENTERING ANGLES								
	90°	75°	72°	60°	45°	93°	ROUND	
Entering Angle ➡								
Correction Factor ➡	1.0	0.96	0.94	0.86	0.70	1.0		

a/D	Factor
.05	.22
.10	.32
.20	.43
.30	.52
.40	.59
.50	.63

k_S CORRECTION FACTORS FOR FEED RATES							
Feed Rate ➡	0.1	0.15	0.2	0.25	0.3	0.35	0.4
Correction Factor ➡	1.49	1.32	1.22	1.14	1.08	1.03	1.00
Feed Rate ➡	0.5	0.6	0.7	0.8	1.0	1.02	1.4
Correction Factor ➡	0.94	0.89	0.85	0.82	0.77	0.72	0.69

POWER CONSUMPTION IN CUTTING

$$P = \frac{V \times a \times s \times k_s}{60 \times 1000}$$

KILOWATTS

V = Cutting Speed (metres/min)

a = Depth of Cut (mm)

s = Feedrate (mm/revolution)

k_s = Specific Cutting Force (Corrected) (Newtons/mm^2)

P = Spindle Motor Power Consumption

Technological Data - 1

Operation:- 1. Rough Turning Steels

MATERIAL	CUTTING SPEED (m/min)	FEEDRATE (mm/rev)	DEPTH OF CUT (mm)	K VALUE (N/mm)
Carbon Steel				
C = 0.15%	365 - 320	0.4 - 0.8	2 - 6	1900
C = 0.35%	315 - 230	0.4 - 0.8	2 - 6	2100
C = 0.7%	300 - 220	0.4 - 0.8	2 - 6	2000
Low Alloy Steel	270 - 200	0.4 - 0.8	2 - 6	2100

Operation:- 2. Finish Turning Steels

MATERIAL	CUTTING SPEED (m/min)	FEEDRATE (mm/rev)	DEPTH OF CUT (mm)	K VALUE (N/mm)
Carbon Steel				
C = 0.15%	440 - 270	0.1 - 0.4	0.1 - 0.4	1900
C = 0.35%	380 - 235	0.1 - 0.4	0.1 - 0.4	2100
C = 0.7%	355 - 230	0.1 - 0.4	0.1 - 0.4	2000
Low Alloy Steel	270 - 200	0.1 - 0.4	0.1 - 0.4	2100

NOTES:
1. Minimum depth of cut for finishing should be greater than nose radius value.
2. Feedrate for roughing should not exceed 2/3 nose radius value.
3. Reduce surface speeds by a factor of 0.66 to 0.5 for thread cutting, part off and grooving.

Technological Data - 2

Operation:- 3. Roughing and Finishing Cast Irons

MATERIAL	CUTTING SPEED (m/min)	FEEDRATE (mm/rev)	DEPTH OF CUT (mm)	K VALUE (N/mm)
Malleable C.I. (Ferritic)	230 - 300	0.5 - 0.1	Finishing < 2 Roughing > 2	1100
Malleable C.I. (Pearlitic)	210 - 125	0.1 - 0.5	Finishing < 2 Roughing > 2	1000
Grey C.I. (Low Tensile)	395 - 23	0.1 - 0.5	Finishing < 2 Roughing > 2	1100
Grey C.I. (High Tensile)	280 - 155	0.1 - 0.5	Finishing < 2 Roughing > 2	1500
Nodular C.I. (Ferritic)	285 - 180	0.1 - 0.5	Finishing < 2 Roughing > 2	1100
Nodular C.I. (Pearlitic)	250 - 165	0.1 - 0.5	Finishing < 2 Roughing > 2	1800

Operation:- 4. Roughing and Finishing Non Ferrous Alloys

MATERIAL	CUTTING SPEED (m/min)	FEEDRATE (mm/rev)	DEPTH OF CUT (mm)	K VALUE (N/mm)
Alluminium Alloy				
Wrought & Cold Drawn	1000 - 2000	0.1 - 0.8	Finishing 0.25 - 2 Roughing 1 - 5 for most non ferrous materials	500
Solution Treated	580 - 290	0.1 - 0.8		700
Cast	630 - 220	0.1 - 0.8		750
Cast-Solution Treated	390 - 135	0.1 - 0.8		900
Copper Alloys				
Brass & Leaded Bronze	350 - 215	0.1 - 0.8		–
Bronze & Copper	270 - 135	0.1 - 0.8		–

NOTES: 1. Non ferrous alloys require high top rake tools with non coated inserts.

2. As high a feedrate as possible should be used in roughing with a large nose radius to promote chipping action.

SPARE PARTS

SPARE PARTS SECTION

IMPORTANT WHEN ORDERING -

1. Quote component's Part Number and description, against each parts illustrationfor all component parts required.

2. Some parts are standard items which can generally be purchased locally - e.g. nuts, bolts, screws, washers, etc.

   In such instances, the component description can be used to provide a suitable replacement.

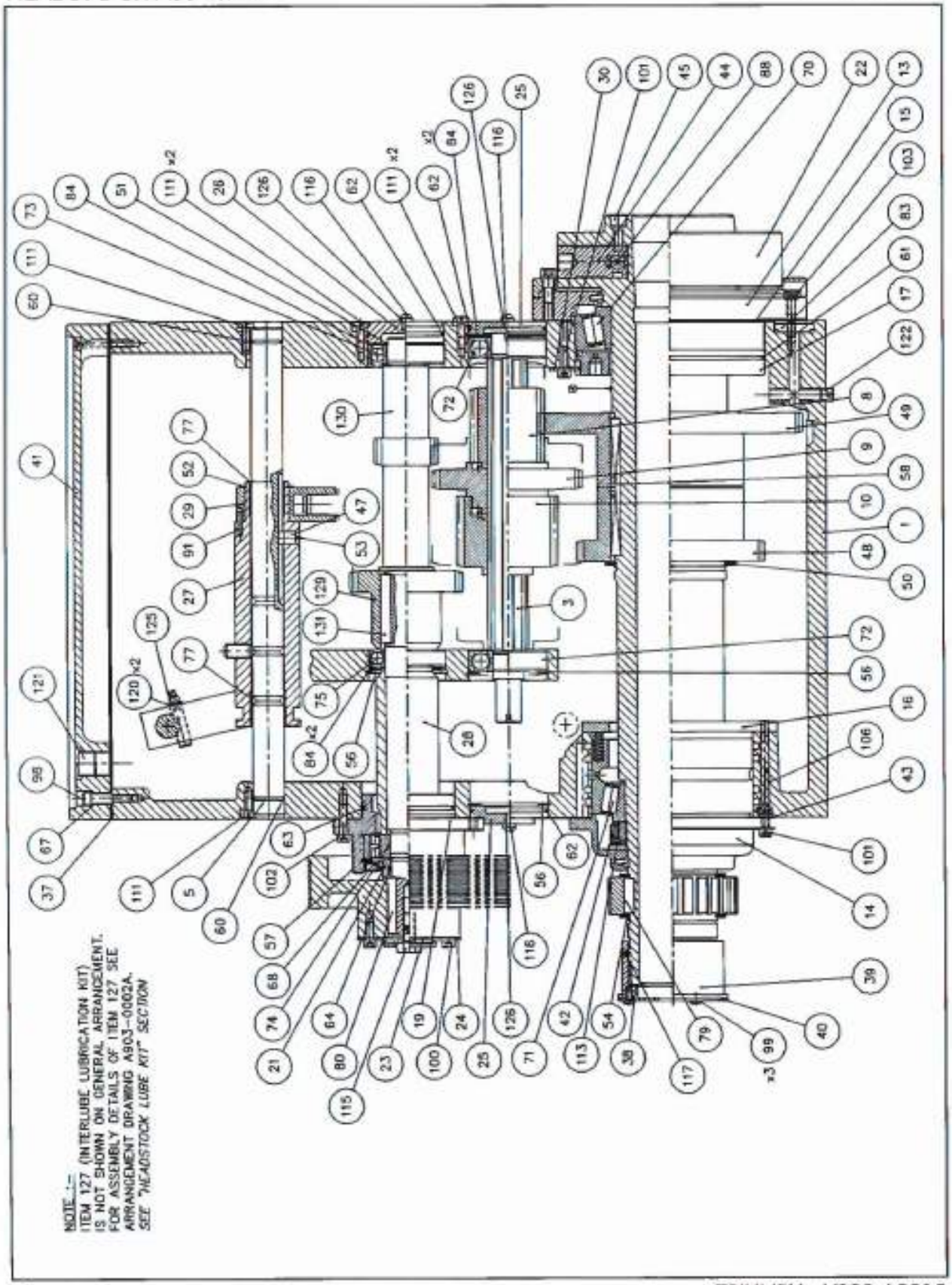
3. Always quote the Lathe Serial Number in all parts orders or technical enquiries. This number is stamped into the lathe bed at the tailstock end.

NOTE : Part Numbers do not run consecutively in the Spare Parts section.

INDEX

HEADSTOCK ASSEMBLY

A100-0508E

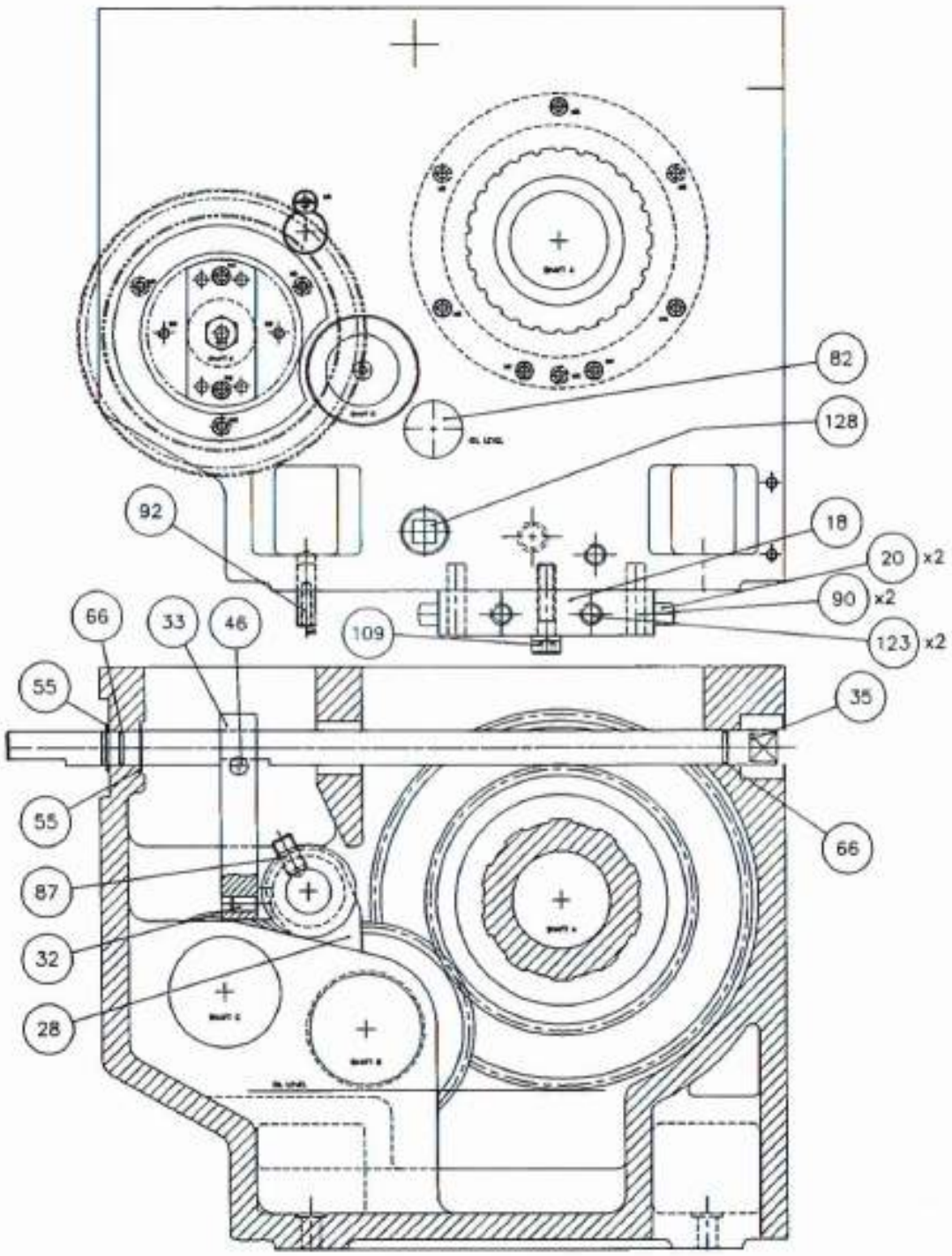


A100-0508E HEADSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
1	D384-0051	HEADSTOCK CASTING TRI V/S	1
3	D699-0783	SHAFT H/STK TRIUMPH V/S	1
5	D041-0231	SUPPORT BAR H/STK TRI V/S	1
8	D344-1261	GEAR 21T HEADSTOCK	1
9	D344-1262	GEAR 46T H/STK TRIUMPH VS	1
10	D344-1263	GEAR 30T H/STK TRIUMPH VS	1
13	D132-0833	COVER FRONT BRG - TRI V/S	1
14	D132-0610	BACK BRG COVER 2000L-VS	1
15	D343-0177	GASKET FRONT BRG COVER	1
16	D132-0691	COVER INNER BACK BRG	1
17	D132-0692	COVER INNER FRONT BRG	1
18	D557-0142	SET OVER PAD	1
19	D388-0125	HOUSING DRIVE SHAFT BRG	1
20	D560-0297	SET OVER PIN	1
21	D708-0462	SPACER H/STK PULLEY	1
22	D709-0096	SPINDLE TRIUMPH V/S	1
23	D708-0464	SPACER H/STK PULLEY	1
24	D931-0342	TAB WASHER H/STK PULLEY	1
25	D566-0185	PLUG HEADSTOCK	2
26	D566-0220	PLUG INPUT SHAFT TRI/MAST.HEADSTOCK	1
27	D834-0028	SHIFTER TUBE HEADSTOCK	1
28	D708-0600	SPACER INPUT SHAFT TRI. V/S H/STOCK	1
29	D299-0071	FORK - GEAR SHIFTER	1
30	D931-0343	WASHER	1
32	D299-0068	SHIFTER FORK H/STK TRI	1
33	D047-0093	BLOCK GEAR SHIFTER	1
35	D699-0785	SHAFT GEARSHIFT ROTATION	1
37	D343-0184J	GASKET HEADSTOCK COVER	1
38	D343-0269	GASKET-SPINDLE COOLANT-TRIUMPH	1
39	D646-0054	COOLANT THROWER	1
40	D565-1492	PLATE COOLANT THROWER TRIUMPH / A400.	1
41	D132-0782	PLASTIC HEADSTOCK COVER	1
42	D133-0251	COLLAR REAR LOCKING	1
43	D343-0164	GASKET REAR BRG COVER VS	1
44	CE-0090	D702H041.1 CAM	6
45	FS-0254	D702H042.1 3/8" UNC X 3/4" CAP SCREW	6
46	D560-0288	COTTER PIN VS H/STOCKS	1
47	D441-0076	KEY-SHIFTER TUBE	1
48	D344-1415	GEAR 58T SPINDLE H/STK-TRIUMPH VS	1

HEADSTOCK ASSEMBLY

A100-0508E

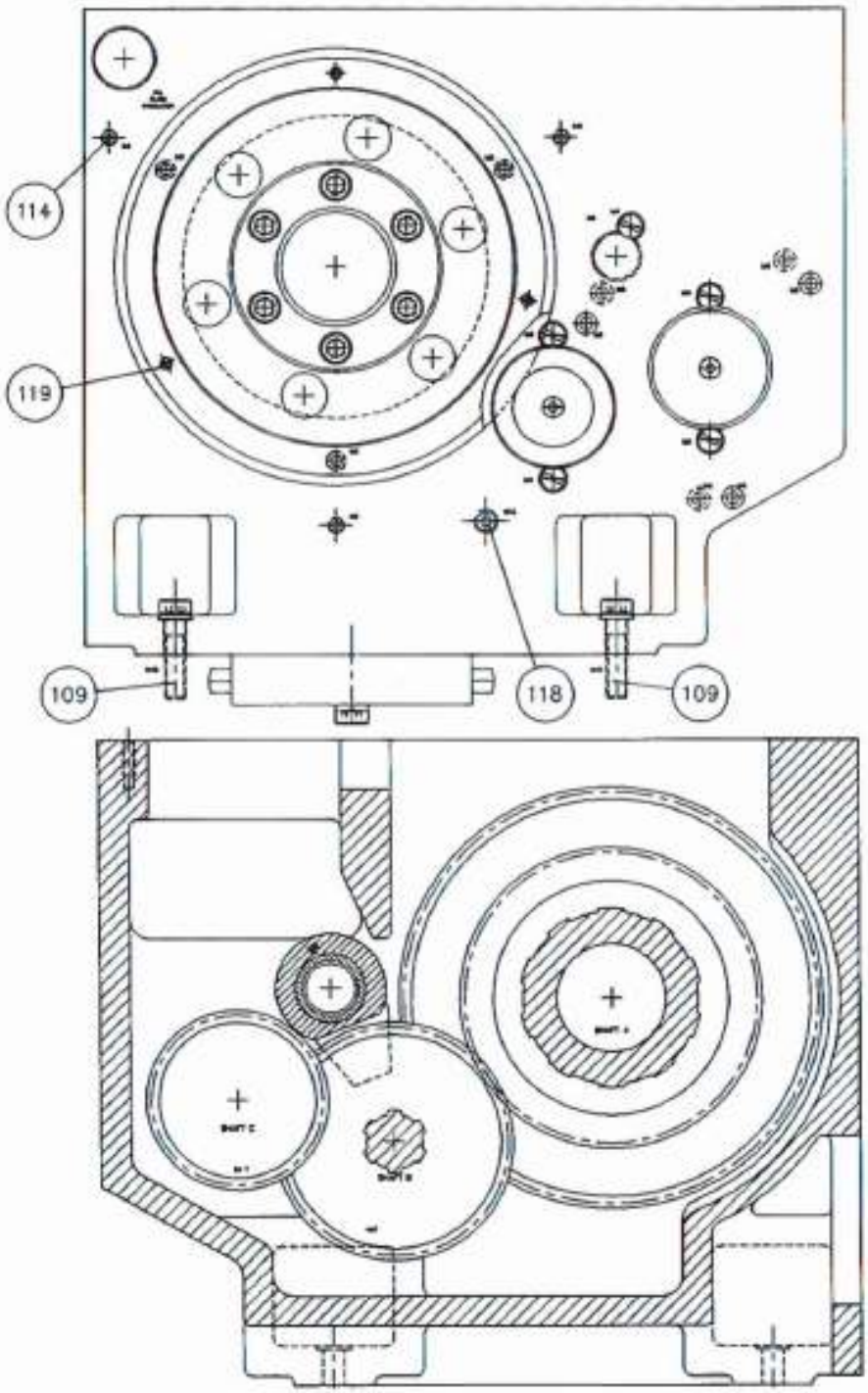


A100-0508E HEADSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
49	D344-1414	GEAR 83T SPINDLE H/STK-TRIUMPH VS	1
50	B362-5070	CIRCLIP EXTERNAL D1400-0900	1
51	RA-0190	CIRCLIP EXTERNAL D1400 0300	1
52	RA-0260	CIRCLIP EXTERNAL D1300-0350	1
53	B362-1027	M2400-0500 ANDERTON RETAINING RING	1
54	B363-0072	CIRCLIP EXTERNAL D1400-0072	2
55	RA-0130	CIRCLIP EXTERNAL D1400-0190	2
56	B361-5052	CIRCLIP INTERNAL D1300-0620	3
57	RA-0280	CIRCLIP INTERNAL D1300-0720	1
58	D441-0095	12x8x110 KEY ROUND ENDS TRIUMPH VS	1
60	OA-0130	RM0221-16 'O' RING GRADE P5	2
61	B412-0234	O RING DOWTY 1/8" SECTION	1
62	OA-0240	RM0576-24 'O' RING	3
63	B413-0695	O RING DOWTY REF 202-739	1
64	OA-0160	RM0276-24 'O' RING GRADE P5	1
66	B413-0161	O RING DOWTY REF 202-518	2
67	B412-0011	O RING 200/011/4460	8
68	B414-3221	OIL SEAL M42X72X8-R42	1
70	B336-1228	BRG 131093X/131152XC	1
71	B336-1322	BRG 133075/133130P X1162A	1
72	BG-0080	6305 BALL BEARING 25MM X 62MM X 17	2
73	BG-0090	6206 BEARING (BALL)	1
74	B325-7501	ROLLER BRG SKF 21306CC	1
75	B313-0418	BEARING 6007 RIGID BALL	1
77	BF-0150	MB25 25 DU GLACIER BUSH	2
79	B343-5130	REC KEY 12MM X 8MM X 28MM	1
80	KA-0075	8 X 7 X 45 KEY	1
82	WA-0010	DW4064A 7/8" OIL WINDOWS	1
83	B454-1001	OIL SIGHT IC4611	1
84	FR-0200	DISC SPRING 61.5 X 40.5 X 0.7 (6007)	5
87	FS-0050	SP996 (M12 DETENT) BALL DETENT SCREW	1
88	FR-0300	SG300 CAM SPRING.(SEE DRAWING)	6
90	B111-5160	SPIROL PIN 10 DIA X 40	2
91	FT-0150	M4 X 20 MBK SPIROL PIN	1
92	B111Y7060	DOWEL 10 DIA X 35	1
98	FS-0018	M6 X 8 X 16 SHOULDER SCREW	8
99	FS-0284	M5 X 10 BUTTON HEAD CAP SCREW	3

HEADSTOCK ASSEMBLY

A100-0508E

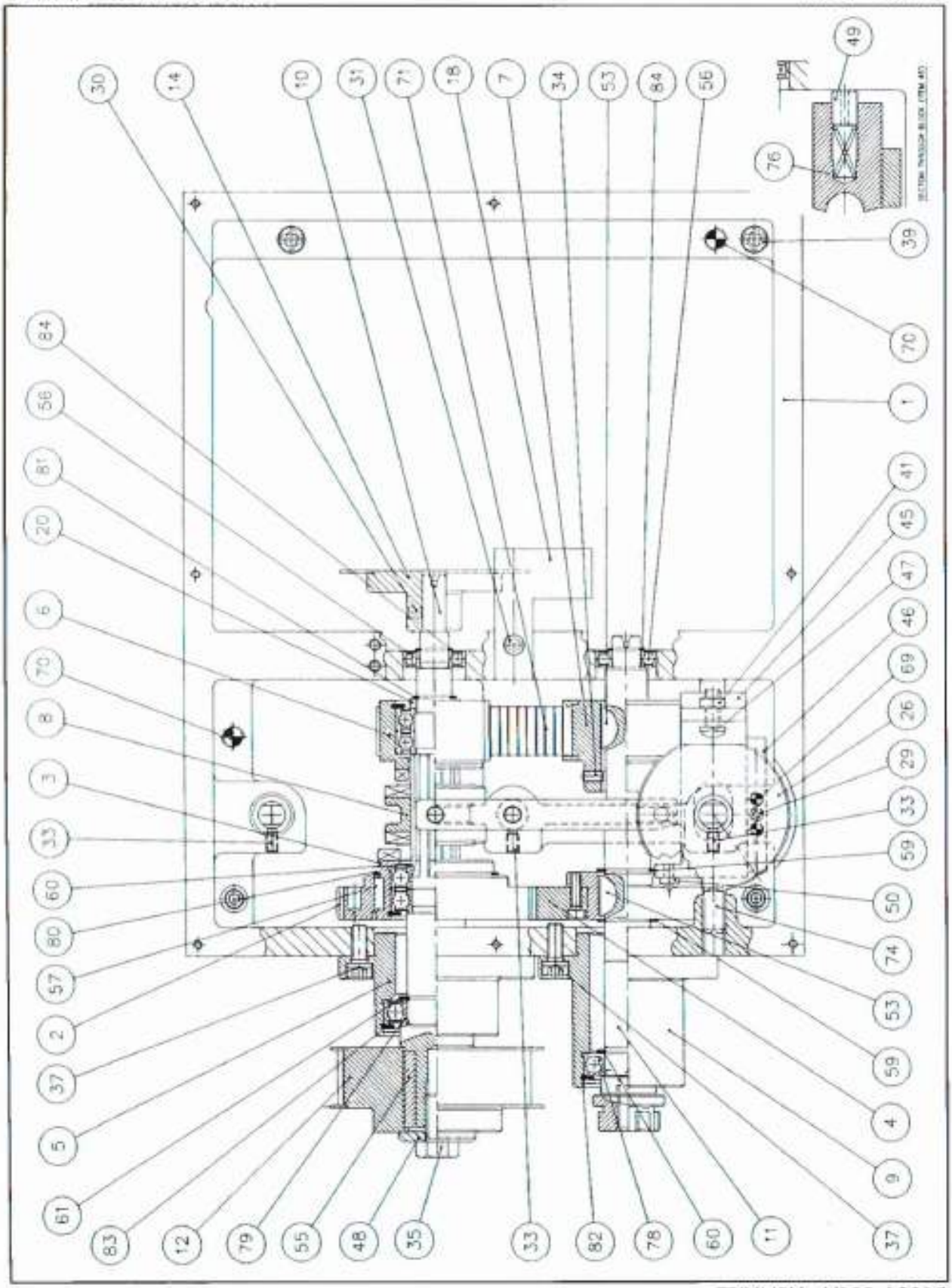


A100-0508E HEADSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
100	FS-0134	M6 x 16 SOCKET HEAD CAP SCREW	2
101	FS-0136	M6 x 20 SOCKET HEAD CAP SCREW	6
102	FS-0138	M6 x 25 SOCKET HEAD CAP SCREW	3
103	FS-0140	M6 X 30 SOCKET HEAD CAP SCREW	3
106	FS-0148	M6 X 55 SOCKET HEAD CAP SCREW	3
109	FS-0190	M10 X 40 SOCKET HEAD CAP SCREW	
111	B163-0133	SLOTTED PAN HD SCR M6 X12	5
113	FS-0436	M5 X 12 SOCKET SCREW COUNTERSUNK	2
114	FS-0516	M8 X 12 CUP POINT SOCKET SET SCREW.	3
115	FS-0600	M12 X 25 H.T HEX HEAD SCW	1
116	FS-0291	M6 X 8 BUTTON HEAD CAP SCREW	3
117	B163-1642	SET SCREW M5 X 6 LG	3
118	FS-0378	M12 X 12 DOG POINT SCREW	1
119	FS-0502	M6 X 12 CUP POINT SOCKET SET SCREW	5
120	FP-0025	M5 WASHER (LARGE HEAVY FORM C)	2
121	PB-0110	1/2" BSPT SOCKET PLUG	1
122	B424-3200	1/8 BSPT HEX SKT PLUG	2
123	B164-0170	SET SCREW WEDGELOK M12 X 20	2
125	FS-0974	M5 HEX. SELF LOCKING NUT	1
126	B117-0151	WASHER FIBRE 11 ODX6 IDX2	4
127	A903-0002A	HEADSTOCK LUBE KIT TRI	1
128	PB-0030	3/4" BSPT MAG. DRAIN PLUG	1
129	D344-1404	34T. HEADSTOCK GEAR TRI/MASTER VS.	1
130	D699-0893	INPUT SHAFT HEADSTOCK TRI/MASTER VS.	1
131	KA-0370	10 X 8 X 55 RECTANGULAR KEY	1

REVERSE BOX ASSEMBLY

A109-0001A

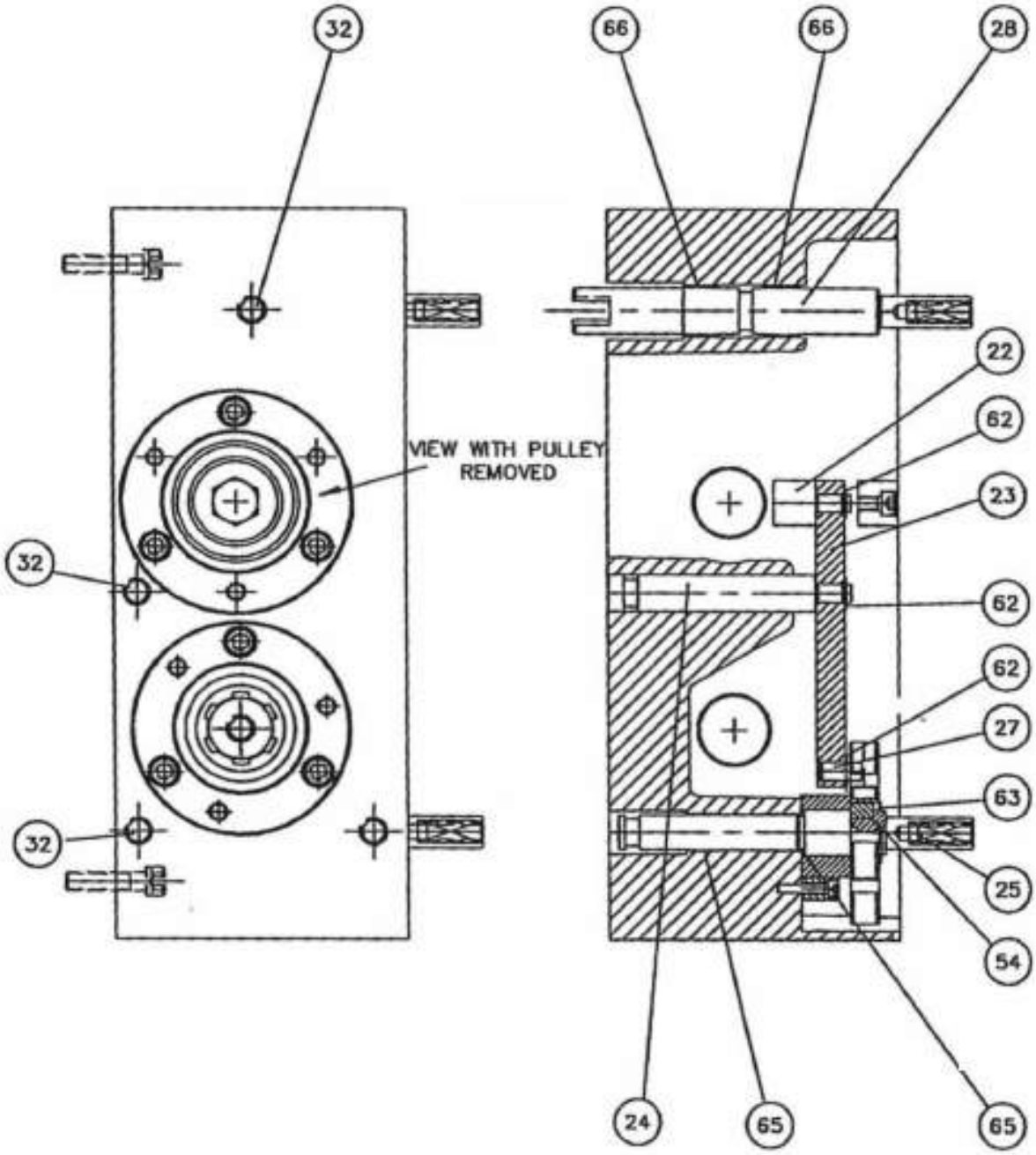


REVERSE BOX ASSEMBLY

A109-0001

ITEM	DESCRIPTION	PART No.
1	REVERSE BOX	D053 - 0080
2	REVERSE BOX GEAR	D344 - 1257
3	SPACER SUB ASSY	A806-0558A
4	GEAR SUB ASSY	A806-0560A
5	REVERSE BOX HOUSING	D388 - 0123
6	HOUSING ASSY	A806-0559A
7	19T PULLEY S/ASSY	A824-0031A
8	CLUTCH BOBBIN	D051 - 0006
9	HOUSING	D388 - 0124
10	INPUT SHAFT	D699 - 0777
11	OUTPUT SHAFT	D699 - 0778
14	SENSOR MOUNTING SPIGOT ASSY	A806-0561A
18	SENSOR MOUNTING BRACKET	D050 - 0677
20	SPACER SHAFT A	D708 - 0459
22	SHIFTER PAD	D299 - 0067
23	SHIFTER BAR	D041 - 0230
24	PIVOT SHAFT SHIFTER	D699 - 0779
25	REVERSE LEVER SHIFTER	D699 - 0781
26	SHIFTER DISC	D233 - 0023
27	SHIFTER PIN	D560 - 0295
28	RANGE CHANGE SHAFT	D699 - 0780
29	HEXAGON SOCKET CAP HEAD SCREW M4 X 20	FS - 0098
30	HEXAGON SOCKET SET SCREW M6 X 6	B163 - 1560
31	HEXAGON SOCKET CAP HEAD SCREW M6 X 12	FS - 0132
32	HEXAGON SOCKET SET SCREW M12 X 16	B163 - 1781
33	HEXAGON SOCKET DOG POINT SCREW M6 X 8	FS - 0346
34	HEXAGON SOCKET CUP POINT SCREW M6 X 10	FS - 0500
35	HEXAGON SOCKET CAP HEAD SCREW M12 X 25	FS - 0600
37	HEXAGON SOCKET CAP HEAD SCREW M8 X 20	FS - 0162
38	HEXAGON SOCKET CAP HEAD SCREW M4 X 10	FS - 0092
39	HEXAGON SOCKET CAP HEAD SCREW M8 X 25	FS - 0164
41	HEXAGON LOCK NUT M8	FS - 1040
45	BLOCK	D047 - 0104
46	BLOCK	D047 - 0105
47	ADJUSTING SCREW	D697 - 0360

REVERSING BOX AND CHANGEWHEEL ASSEMBLY (2)



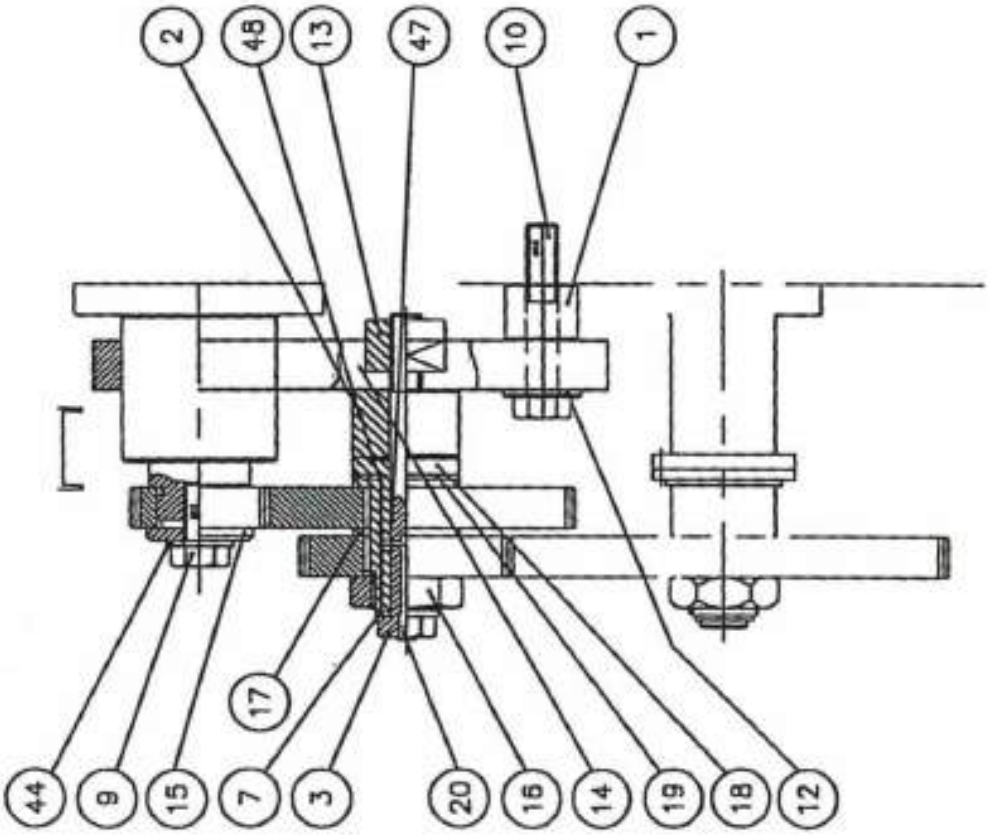
REVERSE BOX ASSEMBLY A109 - 0001

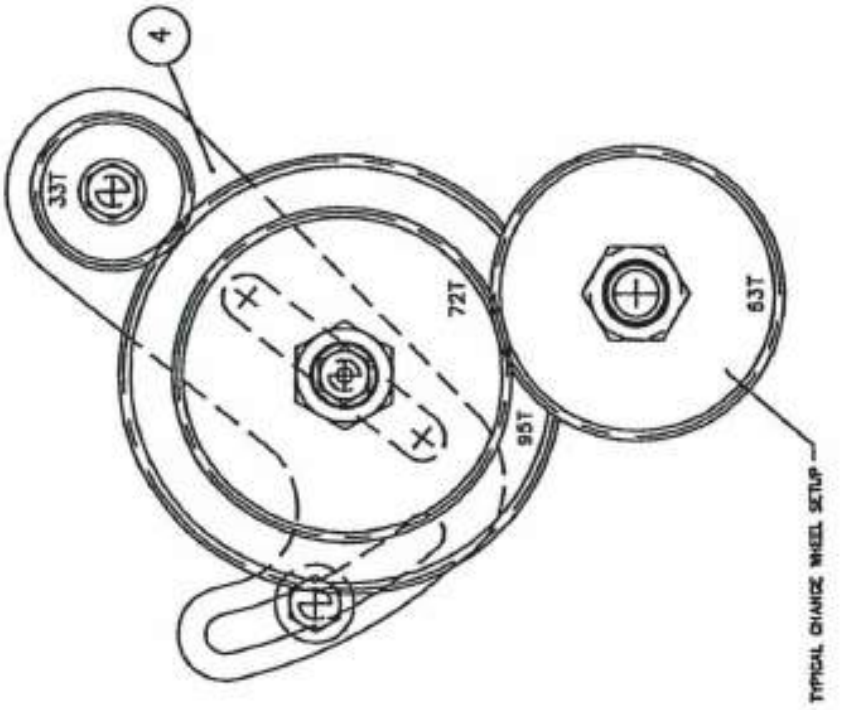
ITEM	DESCRIPTION	PART No.
48	SPACER	D708 - 0468
49	PIN	D560 - 0303
50	PIN	D560 - 0304
53	WOODRUFF KEY 6 X 9 X 22	KA - 0190
54	KEY 6 X 6 X 10	B343 - 5041
55	RECTANG KEY 8 X 7 X 40	B343 - 5107
56	BALL BEARING 6002 2Z	BG - 0275
57	KEY - 5 X 5 X 16 ROUND ENDS	B343 - 5031
59	CIRCLIP EXTERNAL DIN 1400 - 24	RA - 0160
60	CIRCLIP EXTERNAL DIN 1400 - 25	RA - 0170
61	CIRCLIP EXTERNAL DIN 1400 - 30	RA - 0190
62	CIRCLIP EXTERNAL DIN 1400 - 8	RA - 0070
63	CIRCLIP EXTERNAL DIN 1400 - 20	RA - 0140
65	GLACIER BUSH MB14 20 DU	BF - 0010
66	GLACIER BEARING	BF - 0130
69	SPIROL PIN 6 DIA X 30	FT - 0374
70	DOWEL PIN 10 DIA X 25	B111 - 7054
71	TIMING BELT REF 150L100	B346 - 1337
74	BALL DETENT SCREW M12 SP996	FS - 0050
76	COMPRESSION SPRING	FR - 0520
78	BALL BEARING 6005 2Z	BG - 0465
79	BALL BEARING 6006 2Z	BG - 0470
80	CIRCLIP EXTERNAL DIN 1400 - 60	B363 - 0060
81	CIRCLIP EXTERNAL DIN 1400 - 18	RA - 0125
82	CIRCLIP INTERNAL 1300-47	B363 Y0447
83	CIRCLIP TYPE 1300-55	B363 - 0455
84	CIRCLIP EXTERNAL DIN 1400 - 15	RA - 0110

REVERSE BOX SUB ASSEMBLIES

ITEM	DESCRIPTION	PART No.
	19T PULLEY SUB ASSEMBLY	A824-0031
1	PULLEY 19T	D570-0326
2	SIDE PLATES	D565-0926
	SPACER SUB ASSEMBLY	A806-0558
1	DRIVING SPACER	D708-0460
2	BALL BEARING 6005 2Z	B315-0413
3	CIRCLIP 1300-47 (INTERNAL)	B363Y0447
	HOUSING ASSEMBLY	A806-0559
1	PULLEY 19T	D570-0318
2	BRG 6004ZZ BALL 2 SHIELD	B315-0412
3	CIRCLIP TYPE 1300-42 INT	B363-0442
	SENSOR MOUNTING SPIGOT ASSEMBLY	A806-0561
1	SPIGOT	D702-0023
2	SERRATED DISC	D233-0017
	57T GEAR SUB ASSEMBLY	A806-0560
1	57T TUFNOL GEAR	D344-1256
2	SLEEVE GEAR HUB	D391-0063
3	HEXAGON SOCKET CAP HEAD SCREW M6 X 16	B163-0037

CHANGEWHEEL ASSEMBLY



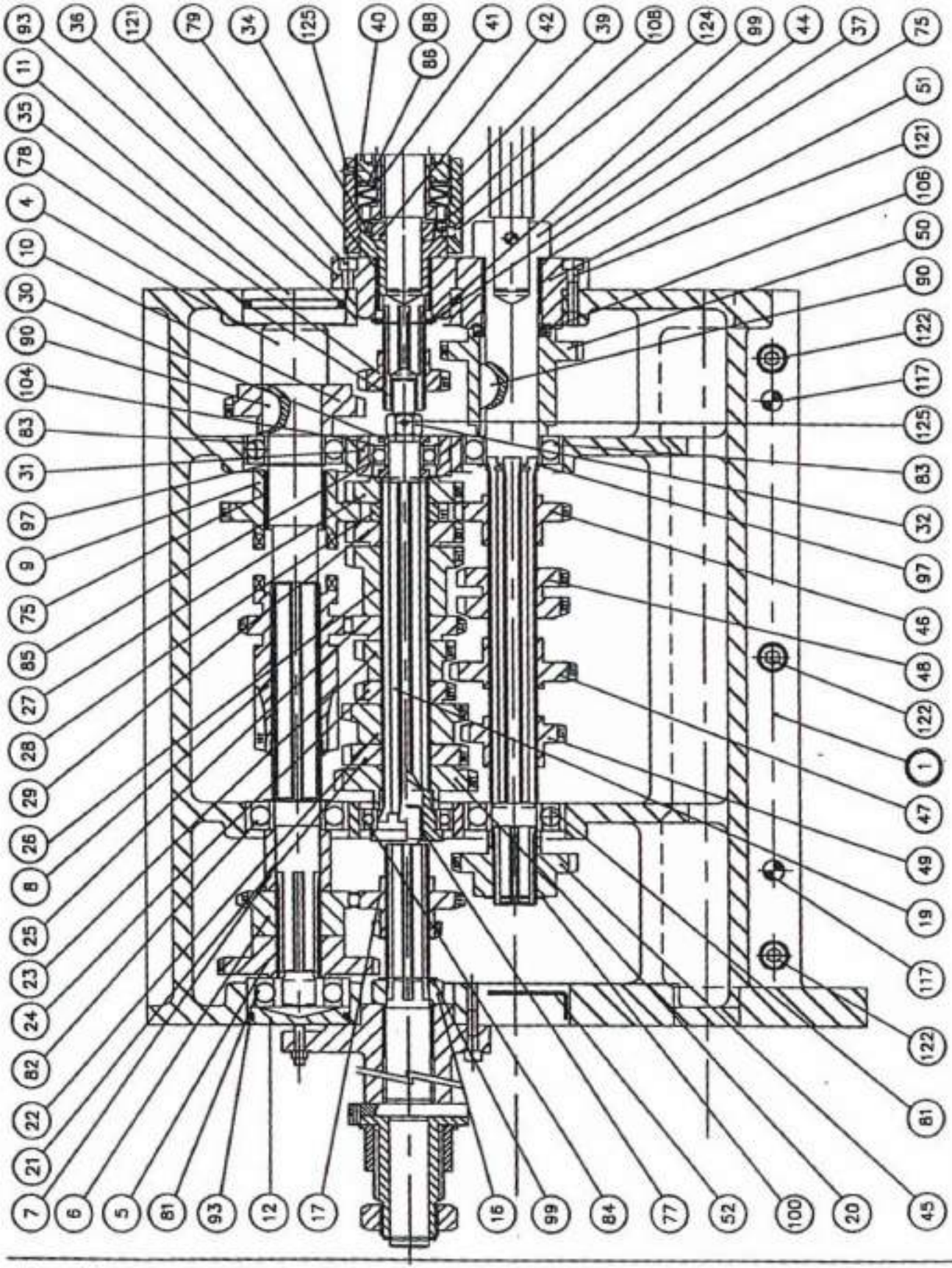


CHANGE WHEEL ASSEMBLY

A155 - 0504

ITEM	DESCRIPTION		PART No.
1	SPACER		D708 - 0473
2	SPACER		D708 - 0474
3	STUD		D048 - 0157
4	SWING FRAME		D720 - 0025
7	WASHER M12		FP - 0070
9	HEXAGON HEADED SCREW M12 x 25		FS - 0600
10	HEXAGON HEADED SCREW M12 x 65		B166 - 0221
12	WASHER		D708H008.1
13	TEE NUT		D408H006.1
14	CHANGE WHEEL SHAFT SLEEVE		D699 - 0793
15	WASHER		D408H010.1
16	NUT (D408H007.1)		FA - 0010
17	SPACER		D408H008.1
18	SLEEVE CHANGE WHEELS		D704 - 0123
19	WASHER CHANGE WHEELS		D931 - 0349
20	OIL NIPPLE 6mm		OC - 0010
22	28T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1287
23	33T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1284
24	36T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1285
25	44T 1.75 MOD. CHANGE WHEEL	(METRIC/IMP SET)	D344 - 1286
27	66T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1250
28	72T 1.75 MOD. CHANGE WHEEL	(METRIC/IMP SET)	D344 - 1251
29	84T 1.75 MOD. CHANGE WHEEL	(METRIC/IMP SET)	D344 - 1252
31	95T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1254
32	96T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1255
34	63T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1334
35	72T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1335
37	99T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1305
44	LOCK WASHER		B116 - 2228
47	O RING DOWTY202-511		B413 - 0091
48	GLACIER BUSH MB1820DU		BF - 0120

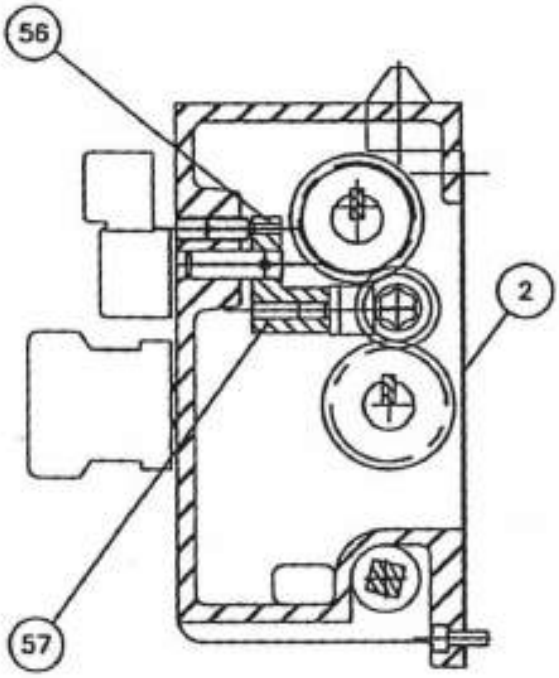
GEARBOX ASSEMBLY (1)

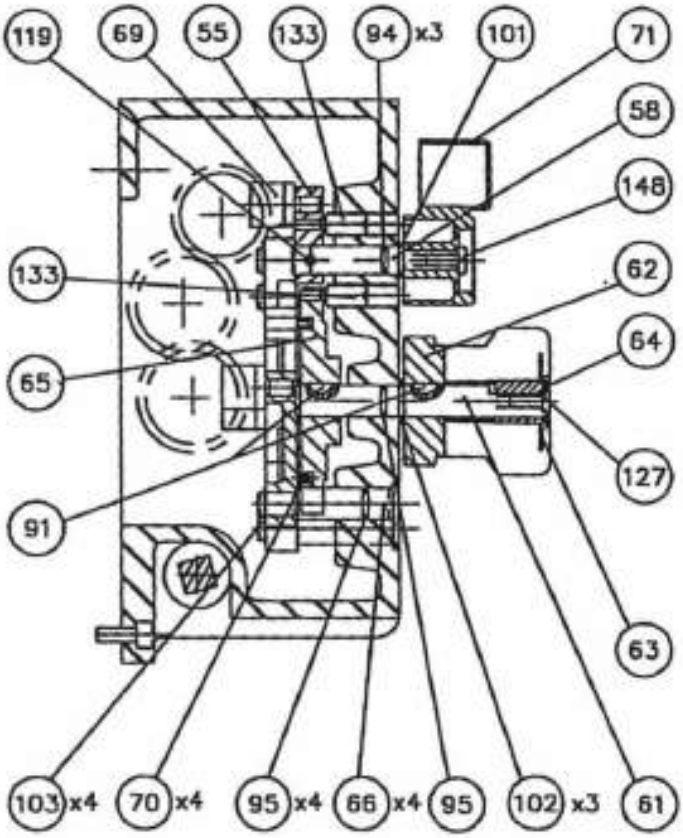


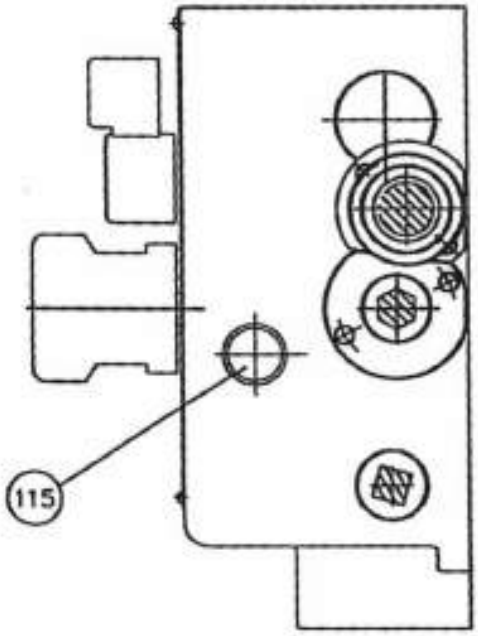
GEARBOX ASSEMBLY — A703 - 0001

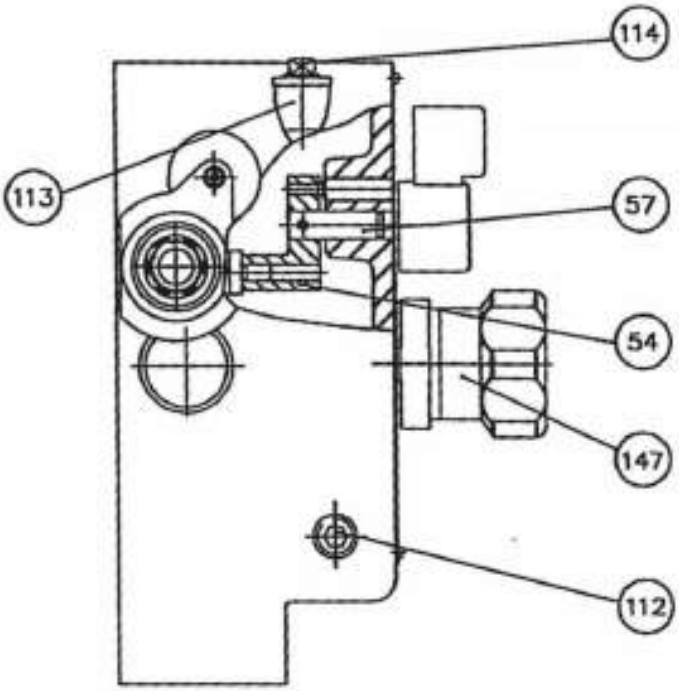
ITEM	DESCRIPTION	PART No.
1	GEARBOX CASTING	D703H001.2
2	GEARBOX GASKET (D703H002.2)	GA - 0670
4	TOP SHAFT	D703H017.1
5	50T GEAR - TOP SHAFT	D703H022.1
6	19T GEAR - TOP SHAFT	D703H021.1
7	SPACER - TOP SHAFT	D703H023.1
8	16T/23T GEAR - TOP SHAFT	D703H020.1
9	32T GEAR - TOP SHAFT	D703H019.1
10	35T GEAR - TOP SHAFT	D703H018.1
11	PLUG	D703H047.1
12	LOCATING BUSH BEARING	D403H011.1
14	INPUT SHAFT	D703H048.1
15	HOUSING	D703H049.1
16	SPACER - INPUT SHAFT	D703H034.1
17	19T/20T GEAR	D703H035.1
19	MIDDLE SHAFT	D703H003.1
20	32T GEAR - MID SHAFT	D703H006.1
21	39T GEAR - MID SHAFT	D703H004.1
22	42T GEAR - MID SHAFT	D703H005.1
23	24T GEAR - MID SHAFT	D703H007.1
24	27T GEAR - MID SHAFT	D703H008.1
25	23T GEAR - MID SHAFT	D703H009.1
26	24T GEAR - MID SHAFT	D703H010.1
27	20T GEAR - MID SHAFT	D703H011.1
28	16T GEAR - MID SHAFT	D703H012.1
29	22T GEAR - MID SHAFT	D703H013.1
30	SPACER - MID SHAFT	D703H015.1
31	BEARING HOUSING	D703H014.1
32	ADJUSTING NUT	D703H016.1
34	OUTPUT SHAFT	D703H036.1
35	21T GEAR - OUTPUT SHAFT	D703H038.1
37	SPACER	D001H2-081
39	HOUSING	D403H033.1
40	ADJUSTING NUT	D403H034.1
41	FRICTION SLEEVE	D403H035.1
42	INNER RING	D403H036.1
44	BOTTOM SHAFT	D703H024.1
45	22T GEAR - BOTTOM SHAFT	D703H029.1
46	22T SLIDING GEAR - BOTTOM SHAFT	D703H027.1
47	33T SLIDING GEAR - BOTTOM SHAFT	D703H025.1
48	22T/22T SLIDING GEAR - BOTTOM SHAFT	D703H028.1
49	33T SLIDING GEAR - BOTTOM SHAFT	D703H026.1
50	36T GEAR - BOTTOM SHAFT	D703H030.1
51	BEARING HOUSING	D703H031.1

GEARBOX ASSEMBLY (2)





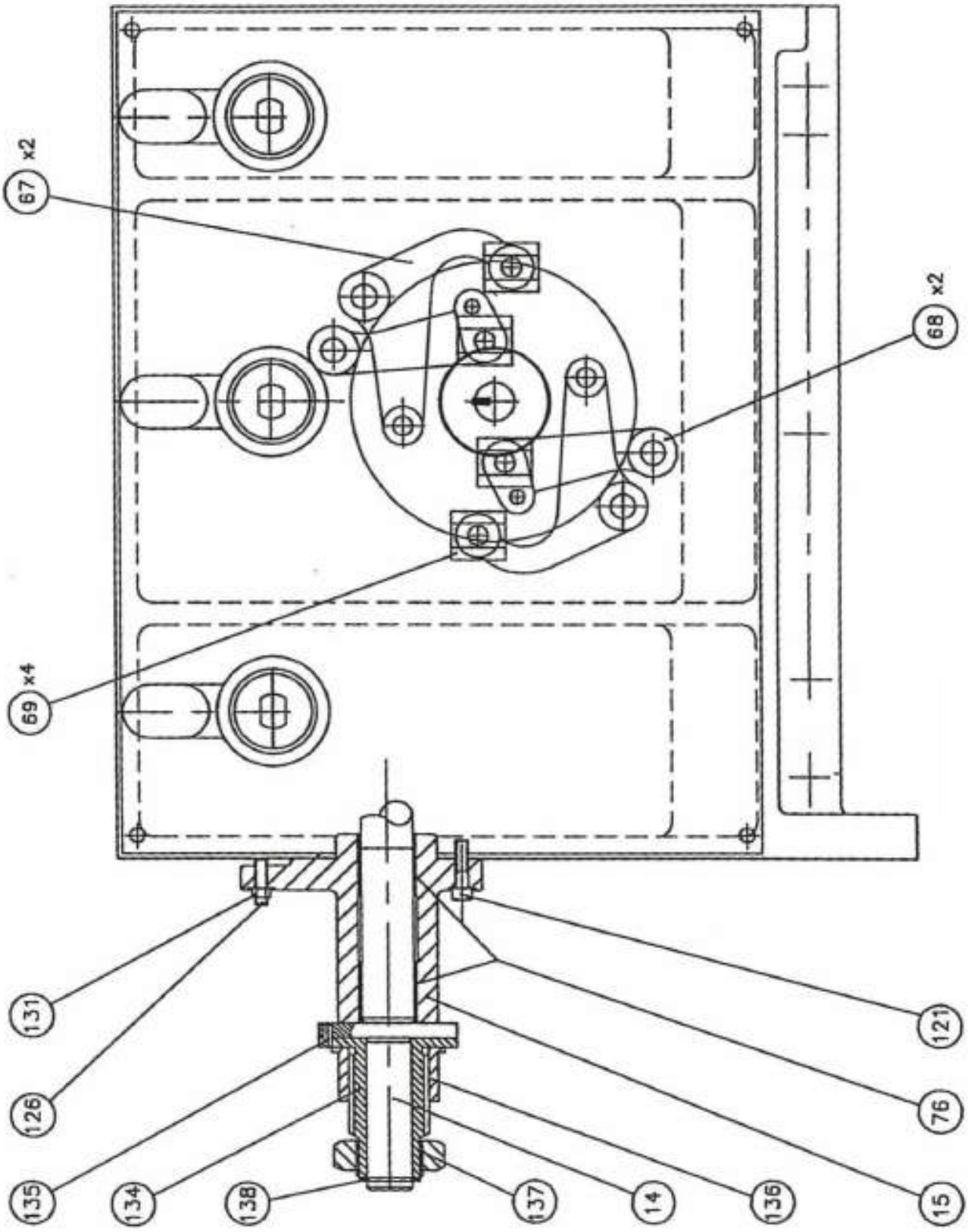




GEARBOX ASSEMBLY — A703 - 0001

ITEM	DESCRIPTION	PART No.
52	PLUG (D403H037.1)	PB - 0060
54	SELECTOR LEVER	D703H042..1
55	SELECTOR LEVER	D703H043.1
56	SELECTOR LEVER	D703H044.1
57	SELECTOR SHAFT	D703H041.1
58	SELECTOR SHAFT	D703H045.1
61	CAM SHAFT	D703H039.1
62	INNER RING	D403H064.1
63	SELECTOR DIAL	D702H090.1
64	WASHER	D402H111.1
65	SELECTOR CAM	D403H058.1
66	SELECTOR SHAFT	D703H040.1
67	SELECTOR LEVER (CAM)	D403H060.1
68	SELECTOR LEVER (CAM)	D403H061.1
69	GEAR SHIFTER	D403H052.1
70	CAM SELECTOR PIN (D403H062..1)	FT - 0620
75	GLACIER BUSH MB-25-30-DU	BF - 0160
76	GLACIER BUSH MB-20-25-DU	BF - 0140
77	GLACIER BUSH MB-12-15-DU	BF - 0070
78	GLACIER BUSH MB-10-15-DU	BF - 0060
79	GLACIER BUSH MB-22-25-DU	BF - 0145
81	MJ17(6303) BEARING	BG - 0020
82	LJ20(6204) BEARING	BG - 0060
83	XXLJ25(6005) BEARING	BG - 0050
84	BALL BEARING INA 61905	BG - 0260
85	DEEP GROOVE BEARING 6002	BG - 0270
86	THRUST NEEDLE BEARING AXK 2542	BC - 0130
88	THRUST WASHER INA AS2542	BC - 0120
90	WOODRUFF KEY 6 x 9 x 22	KA - 0190
91	WOODRUFF KEY 3 x 5 x 13	KA - 0170
93	'O' RING RM 0415-30	OA - 0220
94	'O' RING RM 0111-16	OA - 0040
95	'O' RING RM 0131-16 '	OA - 0060
97	EXTERNAL CIRCLIP 5103-100	RA - 0370
98	EXTERNAL CIRCLIP 1400-20	RA - 0140
99	EXTERNAL CIRCLIP 1400-19	RA - 0130
100	EXTERNAL CIRCLIP 1400-15	RA - 0110
101	EXTERNAL CIRCLIP 1400-14	RA - 0100
102	EXTERNAL CIRCLIP 1400-16	RA - 0120
103	EXTERNAL CIRCLIP 1400-12	RA - 0090
104	INTERNAL CIRCLIP INA BR 32	RA - 0440

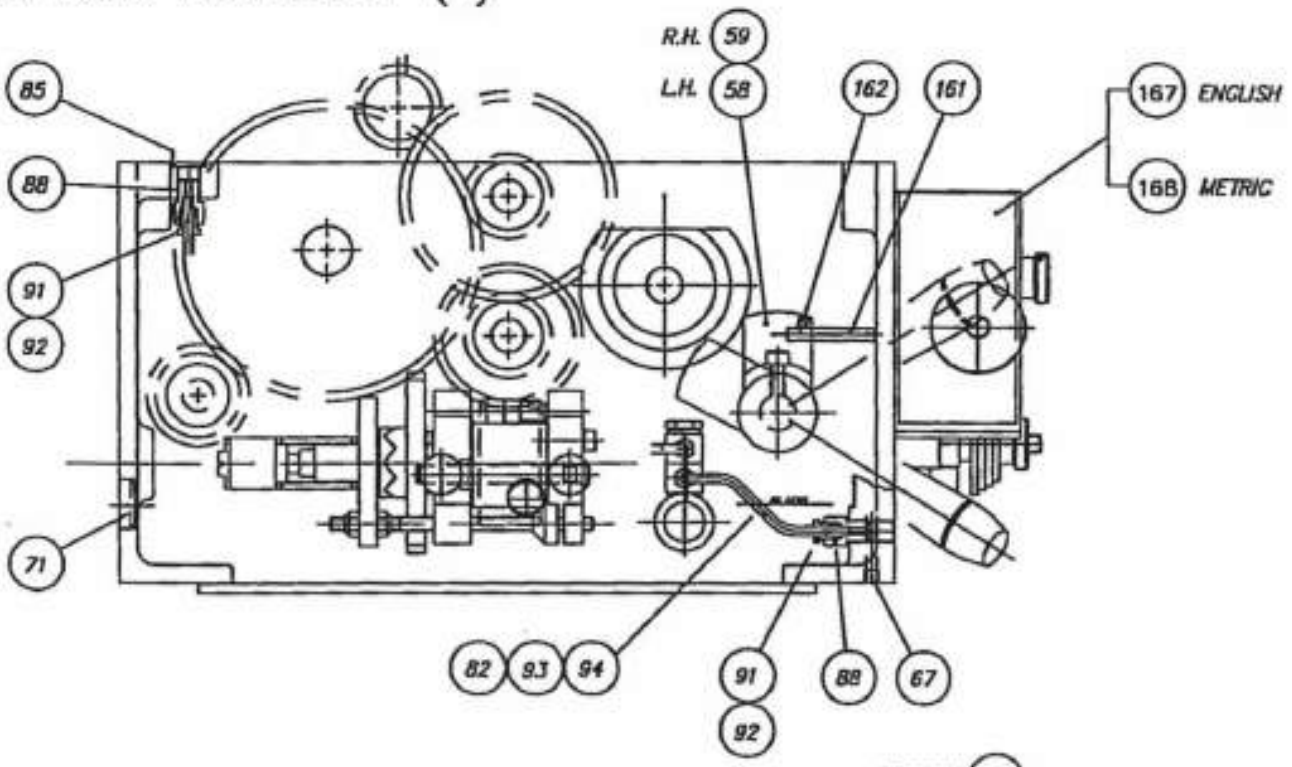
GEARBOX ASSEMBLY (3)

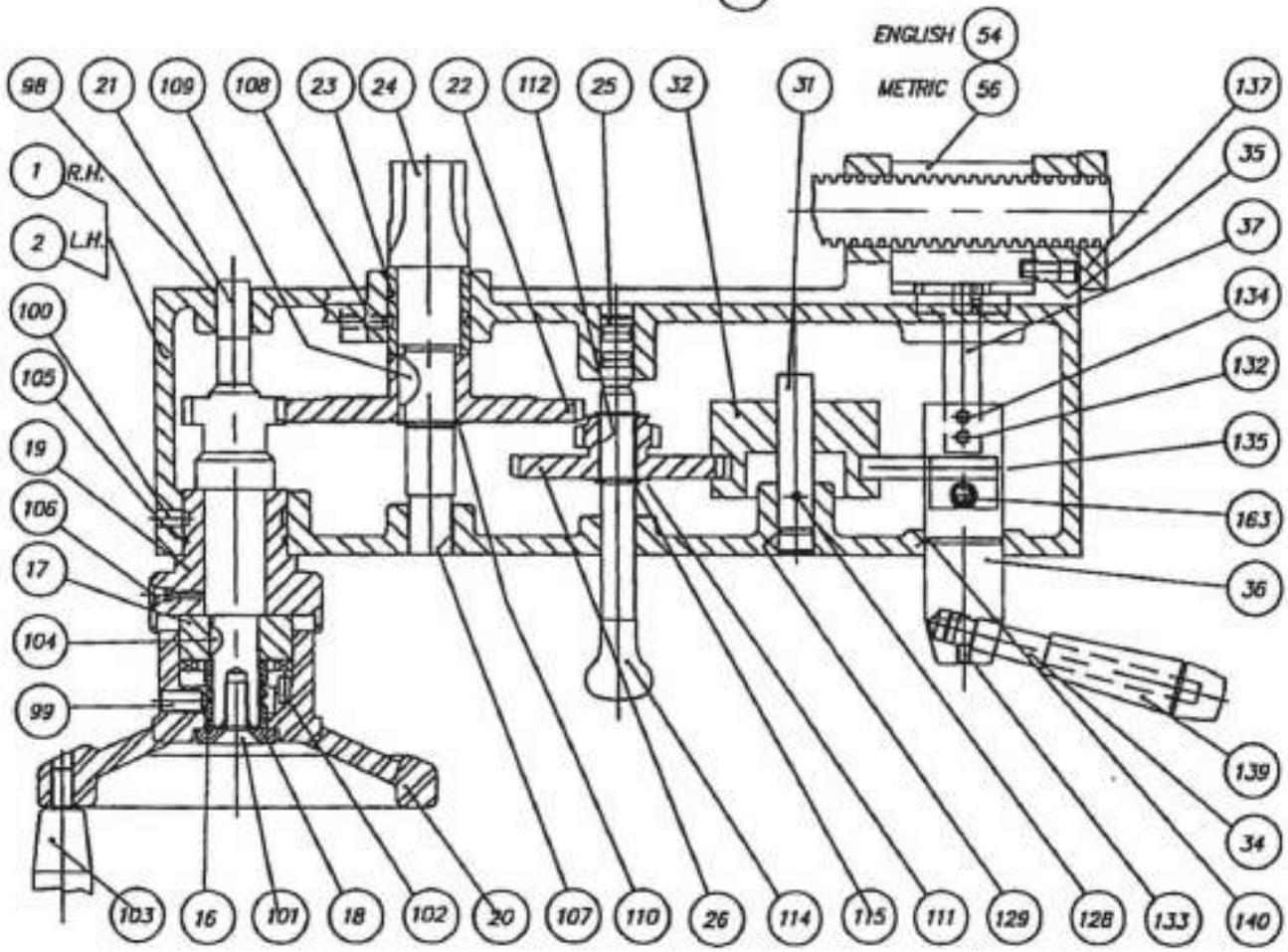


GEARBOX ASSEMBLY A703 - 0001

ITEM	DESCRIPTION	PART No.
106	OIL SEAL V-25	OB - 0030
108	STEEL BALL 7.0	UB - 0007
110	SCHNORR DISC SPRING E5532	FR - 0170
112	1/2" BSPT DRAIN PLUG	PB - 0010
115	OIL WINDOW IC4610 (DW4061A)	WA - 0020
118	SPIROL PIN 6 x 35	FT - 0730
119	SPIROL PIN 5 x 24	FT - 0230
121	HEXAGON SOCKET CAP HEAD SCREW M5 x 20	FS - 0116
124	HEXAGON SOCKET C/SUNK SCREW M5 x 12	FS - 0436
125	HEXAGON SOCKET CUP POINT SET SCREW M4 x 4	FS - 0486
126	HEXAGON SOCKET CUP POINT SET SCREW M5 x 20	FS - 0536
127	HEXAGON SOCKET C/SUNK SCREW M6 x 16	FS - 0442
129	HEXAGON SOCKET DOG POINT SET SCREW M8 x 8	FS - 0362
131	M5 NUT	FS - 0914
133	BALL DETENT SCREW M12 (SP 996)	FS - 0050
134	CHANGE WHEEL BUSH	D708H009.1
135	MILD STEEL SHEAR PIN 5/32" x 3/8" LONG	D560 - 0137
136	SPACER	D708H010.1
137	NUT (D408H007.1)	FA - 0010
138	EXTERNAL CIRCLIP 1400-18	RA - 0125

APRON ASSEMBLY (1)



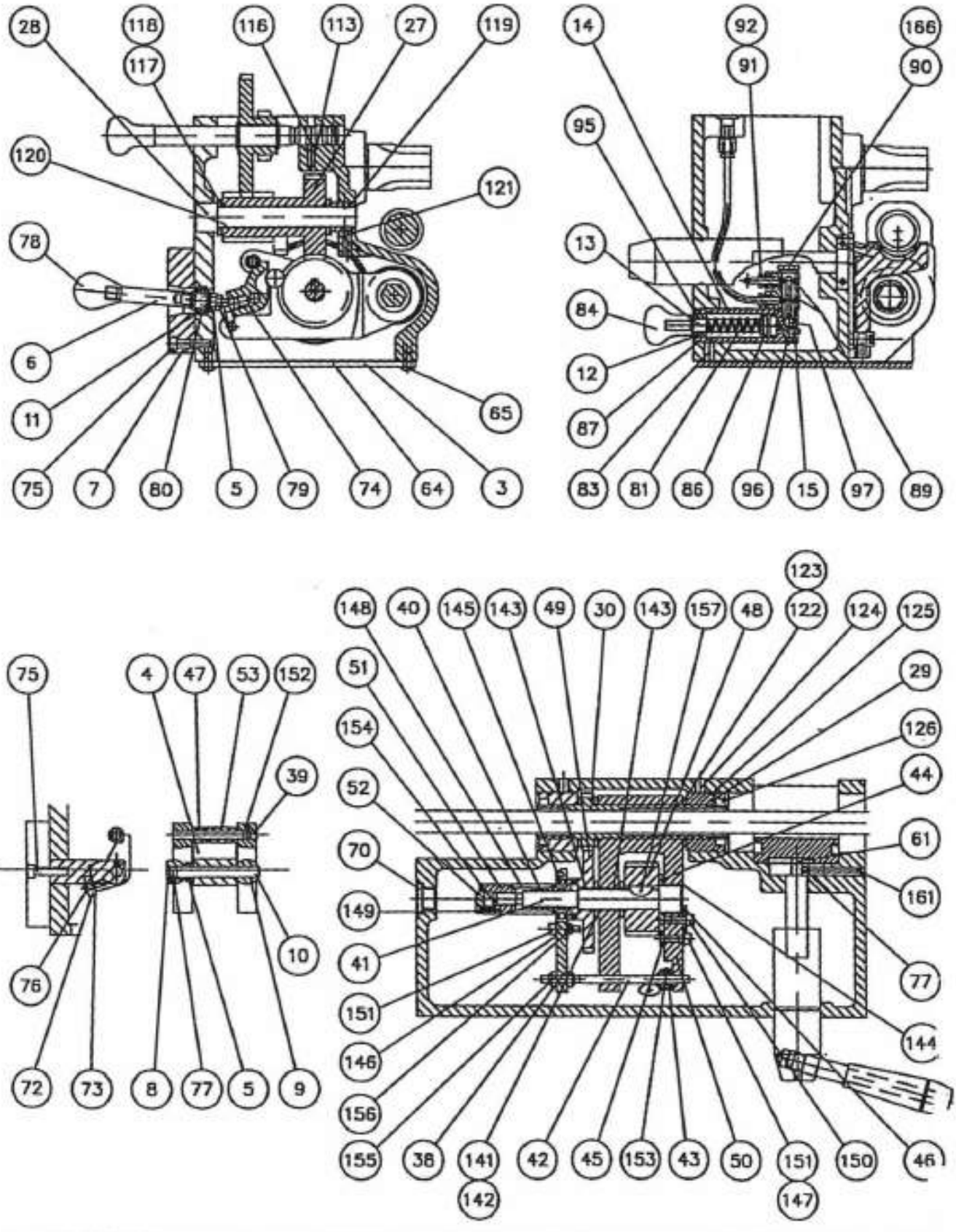


APRON ASSEMBLY

A704 - 0001

ITEM	DESCRIPTION	PART No.
1	APRON CASTING (RIGHT HAND)	D704H052.1
2	APRON CASTING (LEFT HAND)	D704H051.1
3	COVER PLATE	D704H053.1
4	WORM BOX CLIP	D704H003.1
5	SPACER	D704H009.1
6	WORM BOX LEVER	D704H018.1
7	LEVER BEARING COVER	D704H059.1
8	CLIP HINGE PILLAR	D704H061.1
9	CLIP HINGE PILLAR	D704H062.1
10	HINGE PIN CLIP	D704H063.1
11	SPACER	D704H075.1
12	END CAP	D001H1-010
13	PISTON	D230H1-015
14	PUMP BODY	D231H2-001
15	PIN	D404H039.1
16	HANDWHEEL DETENT SPACER	D404H057.1
17	APRON HANDWHEEL SPIGOT	D404H063.1
18	WASHER	D407H012.1
19	HOUSING	D704H033.1
20	APRON HANDWHEEL	D704H043.2
21	HANDWHEEL PINION SHAFT	D704H071.1
22	66T GEAR	D704H025.2
23	BUSH	D704H026.1
24	RACK PINION	D704H072.1
25	SLIDING PINION SHAFT	D704H028.1
26	16T/45T SLIDING GEAR	D704H029.1
27	PINION GEAR	D704H056.1
28	WORM GEAR SHAFT	D704H076.1
29	END BEARING	D704H088.1
30	FEED SHAFT GEAR	D704H.057.1
31	BOBBIN SHAFT	D404H014.1
32	BOBBIN INTERLOCK	D704H031.2
34	OPERATING SHAFT STEM	D704H037.1
35	RETAINER PIN	D704H068.1
36	LEADSCREW NUT OPERATING SHAFT	D704H089.1
37	LEADSCREW NUT ENGAGE SHAFT	D704H084.1
38	TRIP PLATE	D704H094.1
39	LOCATION BUSH PIN	D704H008.1
40	CLUTCH	D704H011.1
41	WORMBOX SHAFT	D704H012.1
42	STUD	D704H016.1
43	COLLAR	D704H017.1
44	SPACER	D704H044.1
45	TRIP WASHER	D704H045.1
46	WASHER	D704H046.1
47	SPACER	D704H047.1
48	15T HELICAL GEAR	D704H055.1
49	43T CLUTCH GEAR	D704H058.1
50	WORM BOX CASTING	D704H060.1
51	NUT	D704H064.1
52	ADJUSTER CAP	D704H065.1
53	LOCATION BUSH CLIP	D904H025.1
54	IMPERIAL LEADSCREW NUT	D704H067.1
55	LEFT HAND LEADSCREW SUPPORT	D704H069.1
56	METRIC LEADSCREW NUT	D704H066.1

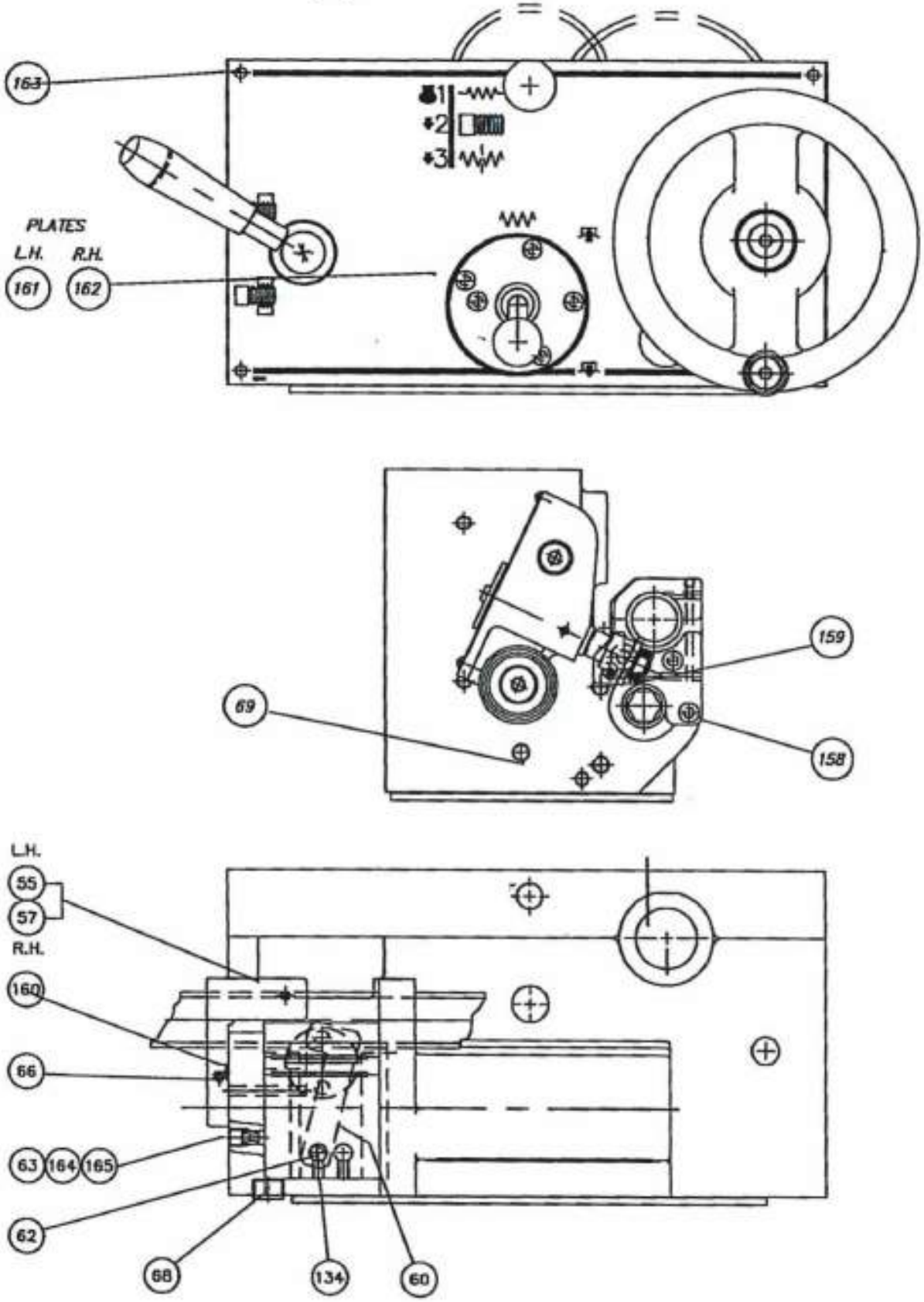
APRON ASSEMBLY (2)



APRON ASSEMBLY A704- 0001

ITEM	DESCRIPTION	PART No.
57	RIGHT HAND LEADSCREW SUPPORT	D704H070.1
58	INTERLOCK FINGER	D704H087.1
59	INTERLOCK FINGER	D704H091.1
60	LEADSCREW NUT FINGER	D704H085.1
61	PIVOT PIN	D704H090.1
62	ECCENTRIC PIN	D704H086.1
63	FRICTION PIN	D704H093.1
64	GASKET	GA - 0660
65	HEXAGON SOCKET BUTTON HEAD SCREW M5x12	FS - 0286
66	HEXAGON SOCKET CUP POINT SET SCREW M5x6	FS - 0490
67	HEXAGON SOCKET CUP POINT SET SCREW M6x6	FS - 0496
68	3/8" BSPT PRESSURE PLUG	PB - 0090
69	1/8" BSPT PLUG	PB - 0170
70	3/8" BSP PLUG FESTO-3570	PB - 0240
71	OIL WINDOW (7/8") DW4064A	WA- 0010
72	BEARING FAG62527	BG - 0290
73	WASHER M5 FORM C	FP - 0030
74	COMPRESSION SPRING SG 416	FR - 0185
75	HEXAGON SOCKET CAP HEAD SCREW M6x25	FS - 0138
76	HEXAGON SOCKET BUTTON HEAD SCREW M5x12	FS - 0286
77	HEXAGON SOCKET CUP POINT SET SCREW M4x4	FS - 0486
78	KNOB No. 3229 M10 THREAD	HA - 0050
79	BALL STUD M8	YN - 0005
80	RAD BALL JOINT INA GE12DO	YN - 0015
81	COMPRESSION SPRING SG 342	FR - 0003
82	HEXAGON SOCKET BUTTON HEAD SCREW M5x8	FS - 0283
83	HEXAGON SOCKET DOG POINT SET SCREW M8x16	FS - 0386
84	KNOB (BLACK)	HA - 0040
86	O RING RM0136-24	OA - 0070
87	O RING RM0216-24	OA - 0120
88	ADAPTOR ENOTS 36-0530-02	PA - 0050
89	ENOTS 36-0384 02K	PA - 0185
90	BANJO BOLT	D304H039.1
91	4mm TUBE SLEEVE ENOTS 36-0501-02	PA - 0220
92	4mm TUBE NUT ENOTS 36-0500-02	PA - 0230
94	4mm NYLON TUBE	PF - 0010
95	INTERNAL CIRCLIP 1300x18	RA - 0270
96	STEEL BALL 5.0 DIA.	UB - 0005
97	STEEL BALL 7.0 DIA.	UB - 0007
98	GLACIER BUSH MB1420DU	BF - 0010
99	BALL DETENT SCREW SP1208	FS -0048
100	HEXAGON SOCKET DOG POINT SET SCREW M8x12	FS - 0366
101	HEXAGON SOCKET COUNTERSUNK SCREW M10x25	FS - 0454
102	DOWEL PIN M5x12	FT - 0520
103	M10 HANDLE	HA - 0160
104	WOODRUFF KEY 13x5x3	KA - 0170
105	O RING RMO416-24	OA - 0280
106	CONICAL DRIVE NIPP;LE	OC - 0010
107	GLACIER BUSH MB1820DU	BF - 0120
108	HEXAGON SOCKET DOG POINT SET SCREW M6x12	FS - 0352
109	WOODRUFF KEY 6x9x22	KA - 0190
110	EXTERNAL CIRCLIP DIN1400/22	RA - 0150
111	THRUST WASHER INA AS1528	BC - 0090
112	GLACIER BUSH MB1525DU	BF - 0100

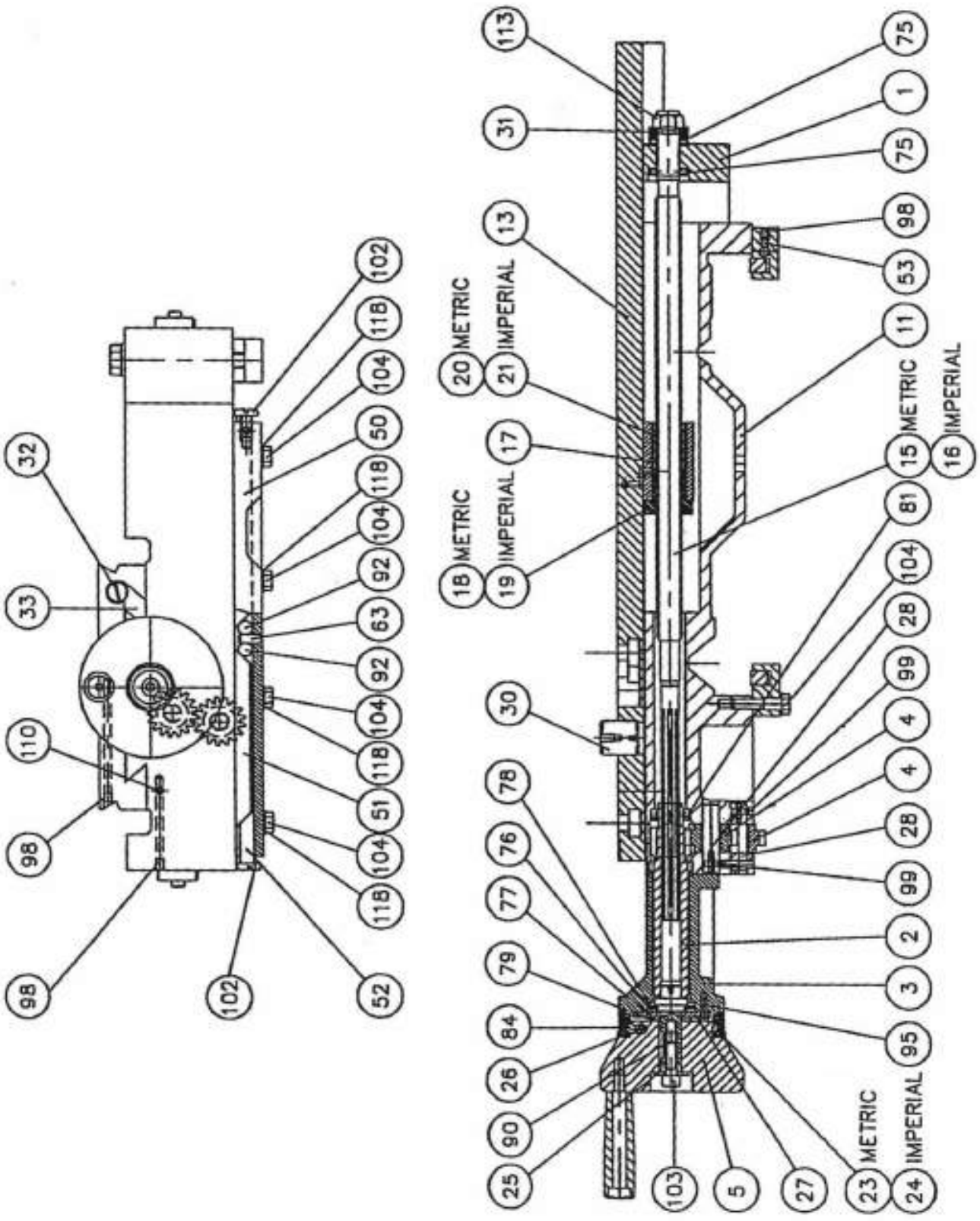
APRON ASSEMBLY (3)



APRON ASSEMBLY — A704 - 0001

ITEM	DESCRIPTION	PART No.
113	COMPRESSION SPRING SG 347	FR - 0008
114	BLACK KNOB	HA - 0040
115	E CIRCLIP DIN 1500/12	RA - 0305
116	STEEL BALL 6.0 DIA.	UB - 0006
117	NEEDLE ROLLER BEARING AK1528	BC - 0080
118	THRUST WASHER AS1528	BC - 0090
119	BUSH	D704H092.1
120	GLACIER BUSH MB1525DU	BF - 0100
121	HEXAGON SOCKET DOG POINT SET SCREW M8x16	FS - 0368
122	NEEDLE ROLLER BEARING NTA-1625	BC - 0250
123	THRUST WASHER TRA-1625	BS - 0260
124	HEXAGON SOCKET DOG POINT SET SCREW M8x10	FS - 0790
125	O RING GRMO396-24	OA - 0380
126	OIL SEAL25x35x7	OB - 0190
127	HEXAGON SOCKET NYLOCK DOG POINT SET SCREW M6x20	FS - 0788
128	SPIROL PIN M4x30	FT - 0190
129	O RING GACO RM131-16	OA - 0060
131	HEXAGON SOCKET CAP HEAD SCREW M6x16	FS - 0134
132	HEXAGON SOCKET FULL DOG POINT SET SCREW M6x12	FS - 0352
133	HEXAGON SOCKET CUP POINT SET SCREW M6x8	FS - 0498
134	HEXAGON SOCKET CUP POINT SET SCREW M6x10	FS - 0500
135	HEXAGON SOCKET CUP POINT SET SCREW M10x10	FS - 0524
137	NYLOCK FULL POINT SCREW M10x8	FS - 0809
139	KNOB HANDLE KB6/1305	HA - 0180
140	O RING RMO321-16	OA - 0190
141	THRUST RACE AXK1528	BC - 0080
142	THRUST WASHER AS1528	BC - 0090
143	GLACIER BUSH MB1512DU	BF - 0095
144	GLACIER BUSH MB2015DU	BF - 0130
145	BALL BEARING 16003	BG - 0280
146	WASHER FORM C M5	FP - 0025
147	BRIGHT WASHER M5	FP - 0030
148	SG 430 SPRING	FR - 0322
149	HEXAGON SOCKET CAP HEAD SCREW M3x10	FS - 0086
150	HEXAGON SOCKET CAP HEAD SCREW M5x12	FS - 0112
151	HEXAGON SOCKET CAP HEAD SCREW M5x20	FS - 0116
152	HEXAGON SOCKET CUP POINT SET SCREW M5x6	FS - 0490
153	HEXAGON SOCKET CUP POINT SET SCREW M5x5	FS - 0530
154	PAN HEAD SLOTTED SCREW M5x10	FS - 0704
155	BRIGHT LOCK NUT M6	FS - 0944
156	SYMMONDS LOCK NUT M5	FS - 0974
157	WOODRUFF KEY 5x7.5x19	KA - 0180
158	HEXAGON SOCKET CAP HEAD SCREW M6x20	FS - 0136
159	HEXAGON SOCKET CAP HEAD SCREW M8x20	FS - 0162
160	O RING RM0036-24	OA - 0008
161	HEXAGON SOCKET CUP POINT SET SCREW M6x40	FS - 0510
162	HEXAGON SOCKET CUP POINT SET SCREW M4x6	FS - 0489
163	HEXAGON SOCKET CUP POINT SET SCREW M6x12	FS - 0132
164	COMPRESSION SPRING SG428	FR - 0310
166	BANJO WASHER 48-0231-01	PA - 0200
168	CLIP 34-0218-02	PA - 0280
170	FELT PLUG	PB - 0070

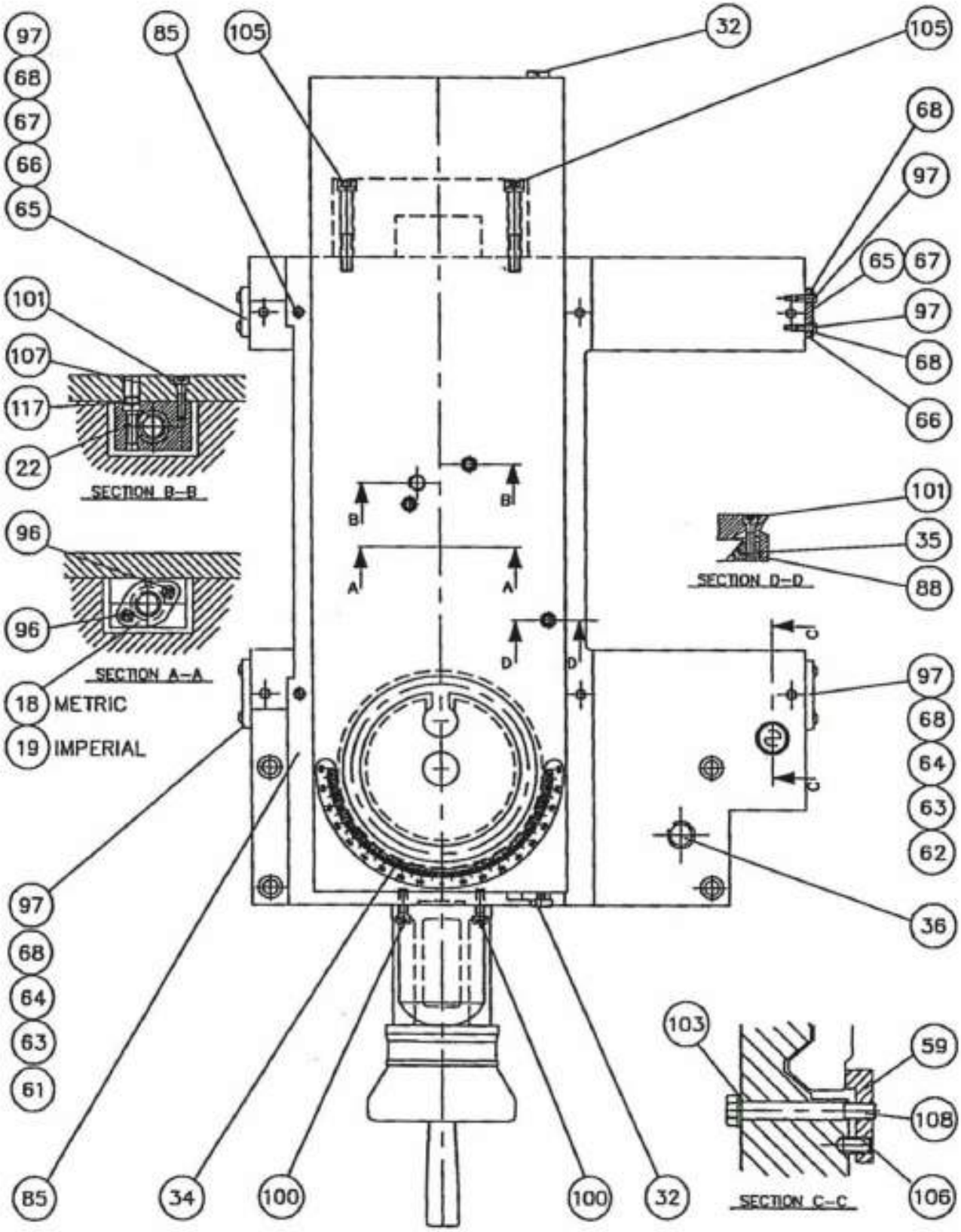
SADDLE ASSEMBLY (1)



SADDLE AND CROSS SLIDE ASSEMBLY A119 - 0510

ITEM	DESCRIPTION	PART No.
1	BRACKET SUB ASSEMBLY	A806 - 0564A
2	PINION SUB ASSEMBLY	A834 - 0024A
3	KEEP SUB ASSEMBLY	A806 - 0583A
4	17T GEAR SUB ASSEMBLY	A806 - 0566A
5	HAND WHEEL ASSEMBLY (REF. ONLY)	A842 - 0024A
11	SADDLE	D696 - 0046
13	CROSS SLIDE	D705 - 0112
15	SADDLE SCREW (METRIC)	D697 - 0343
16	SADDLE SCREW (ENGLISH)	D697 - 0344
17	CROSS SLIDE NUT BODY	D388 - 0126
18	FIXED CROSS SLIDE NUT (METRIC)	D405H019.1
19	FIXED CROSS SLIDE NUT (ENGLISH)	D405H020.1
20	ADJUSTABLE CROSS SLIDE NUT (METRIC)	D405H021.1
21	ADJUSTABLE CROSS SLIDE NUT (ENGLISH)	D405H022.1
22	CROSSS SLIDE NUT ADJUSTING SCREW	D405H025.1
23	CROSS SLIDE INDEX RING (METRIC)	D424 - 0136
25	CROSS SLIDE INDEX RING (IMPERIAL)	D424 - 0135
26	COMPRESSION SPRING	D707 - 0021
27	CROSS SLIDE THRUST PLATE	D565 - 0918
28	IDLER SHAFT	D699 - 0786
30	SWIVEL PEG	D572 - 0023
31	SPACER	D708 - 0251
32	GIB ADJUSTING SCREW	D697 - 0345
33	CROSS SLIDE GIB STRIP	D345 - 0084
34	GRADUATION PLATE	D537 - 1038
35	LOCK PAD	D557 - 0144
36	SADDLE OIL FILLER PLUG	D566 - 0191
37	FELT PAD 1/4"x1/2"x6"	D557 - 0106
50	SADDLE STRIP MOUNTING	D345 - 0083
51	SADDLE STRIP	D705 H 011
52	SHORT STRIP ADJUSTER	D715 - 0192
53	LOCK PAD	D557 - 0143
59	SADDLE CLAMP	D715 - 0172
61	BED VEE WIPER (HEAD END)	D937 - 0034
62	BED VEE WIPER (TAIL END)	D937 - 0033
63	BEDWAY VEE WIPER SHIELD	D725 - 0014
64	LEAF SPRING	D707 - 0051
65	BEDWAY FLAT WIPER	D937 - 0010
66	BEDWAY FLAT WIPER SHIELD	D725 - 0013
67	WIPER SPRING	D707 - 0068
68	SPACER	D708 - 0087
69	SOCKET SET SCREW M6 X 6	D697 - 0369
70	SOCKET SET SCREW M8 X 8	D697 - 0370

SADDLE ASSEMBLY (2)



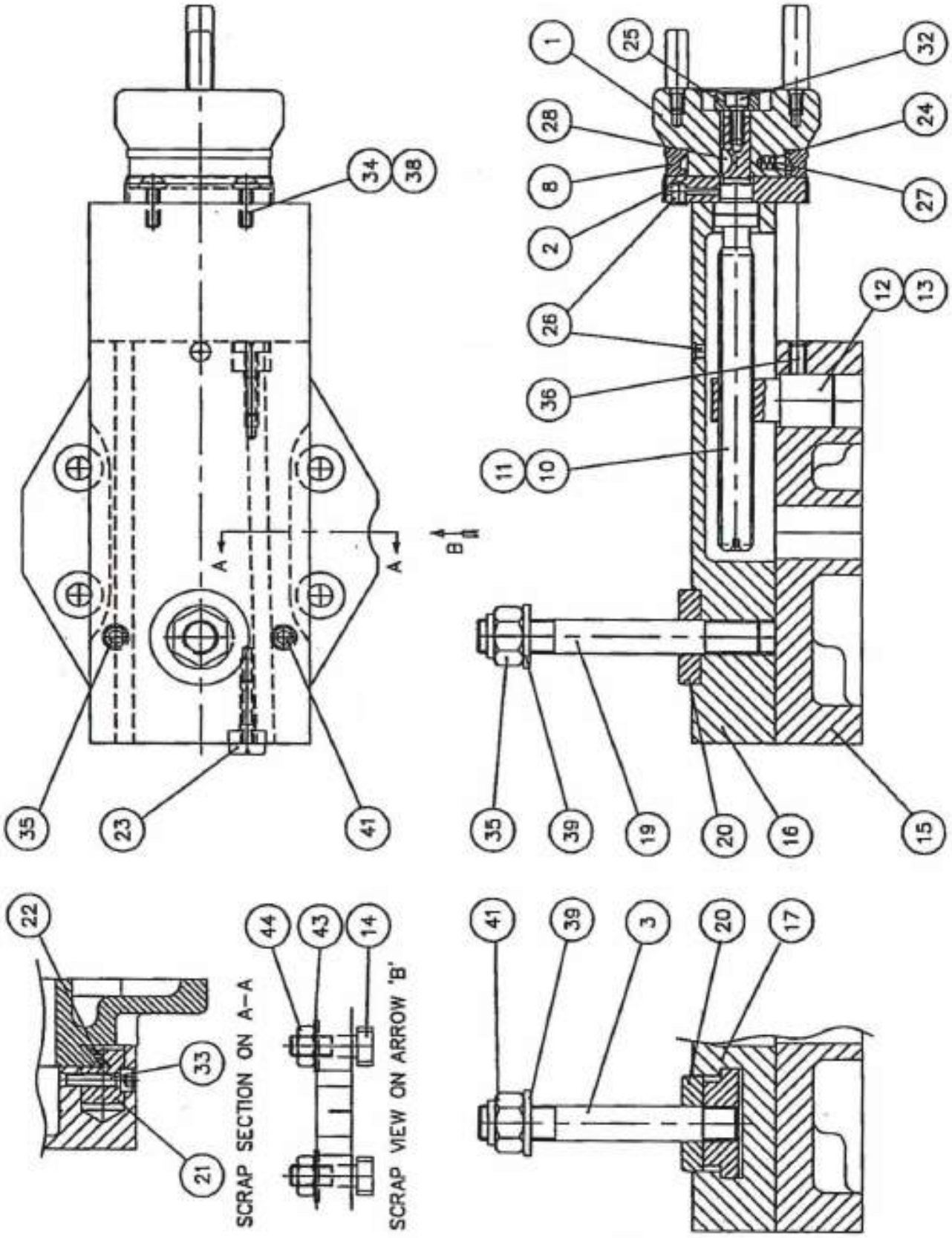
SADDLE AND CROSS SLIDE ASSEMBLY A119 - 0510

ITEM	DESCRIPTION	PART No.
75	NEEDLE THRUST BEARING AXZ 6.15.28.4.	BC - 0020
76	NEEDLE THRUST BEARING AXK2035	BC - 0110
78	THRUST WASHER INA WS81104	B337 - 5014
79	THRUST WASHER AS1528	B337 - 5014
81	OIL SEAL W11807027	B414 - 3051
82	FIBRE WASHER	B411 - 0020
88	'O' RING DOWTY 202-519	B413 - 0171
90	SQUARE KEY	B343 - 5008
92	STEEL ROLLER 10x10	B326 - 9020
93	SPIROL PIN 6x16	B111 - 5107
95	HEXAGON SOCKET BUTTON HEAD SCREW M4 x 12	FS - 0278
96	HEXAGON SOCKET CAP HEAD SCREW M5 x 12	FS - 0112
99	HEXAGON SOCKET DOG HEAD SET SCREW M4 x 5	B163 - 1721
100	HEXAGON SOCKET CAP HEAD SCREW M6 x 20	FS - 0136
101	HEXAGON SOCKET CAP HEAD SCREW M6 x 25	FS - 0138
104	HEXAGON SOCKET CAP HEAD SET SCREW M8 x 35	FS - 0578
105	HEXAGON SOCKET CAP HEAD SCREW M8 x 60	FS - 0178
107	HEXAGON SOCKET DOG POINT SCREW M12 X 25	B163 - 1783
113	NYLOC NUT M12	FS - 0973
116	FIBRE WASHER 1/2" x 3/4"	B411 - 0016
117	CRINKLE WASHER M6	FP - 0010
120	NEOPRENE SPONGE 1/4" X 1/8"	R812 - 0261
121	NEOPRENE SPONGE 3/8" X 1/8"	R812 - 0186
122	MOGLICE FL/P 200G PACKET	R741 - 0207
123	DKM INJECT TUBE ML150	R741 Y0204
124	DKM CLEANER DEGREASER	R741 - 0208
125	DKM SEPERATOR W10 1.5K TIN	R741 Y0206
126	CLEAR PVC TUBE REF. M5/8 CNC	R827 - 7321
130	NEOPRENE SPONGE 100 X 3MM	R821 - 0262
131	NEOPRENE SPONGE 6MM	R812 - 0006

SADDLE AND CROSS SLIDE SUB - ASSEMBLIES

ITEM	DESCRIPTION		PART No.
	BRACKET SUB-ASSEMBLY	A806 - 0564	
1	SADDLE SCREW BRACKET		D050 - 0753
2	GLACIER BUSH MB15 15 DU		B311 - 1535
	PINION SUB-ASSEMBLY	A834 - 0024	
1	CROSS SLIDE PINION		D564 - 0105
2	PINION SHAFT EXTENSION		D699 - 0787
	KEEP SUB-ASSEMBLY	A806 - 0583	
1	KEEP - C/SLIDE		D442 - 0089
2	GLACIER BUSH MB25 25 DU		BF - 0150
	17T GEAR SUB-ASSEMBLY	A806 - 0566	
1	17T IDLER GEAR		D344 - 1269
2	GLACIER BUSH MB12 20 DU		BF - 0080
	SADDLE HANDWHEEL KIT	A950 - 0015	
1	HANDWHEEL SUB ASSEMBLY		A842 - 0024
4	CROSS SLIDE PINION WASHER		D931 - 0344
5	COMPRESSION SPRING		D707 - 0021
6	NEEDLE ROLLER BEARING		B337 - 5001
7	THRUST WASHER		B337 - 5002
8	CYCLE BALL BEARING 1/4" DIA.		B326 - 8107
9	SQUARE KEY		B343 - 5008
10	HEXAGON SOCKET WEDGLOK CAP HEAD SCREW M8x25		B164 - 0054
	HANDWHEEL SUB-ASSEMBLY	A842 - 0024A	
1	HANDWHEEL		D383 - 0106
4	HANDLE		D382 - 0138
7	SHIM WASHER		D701 - 0034
10	SHOULDER SCREW		B163 - 1868

TOPSLIDE ASSEMBLY

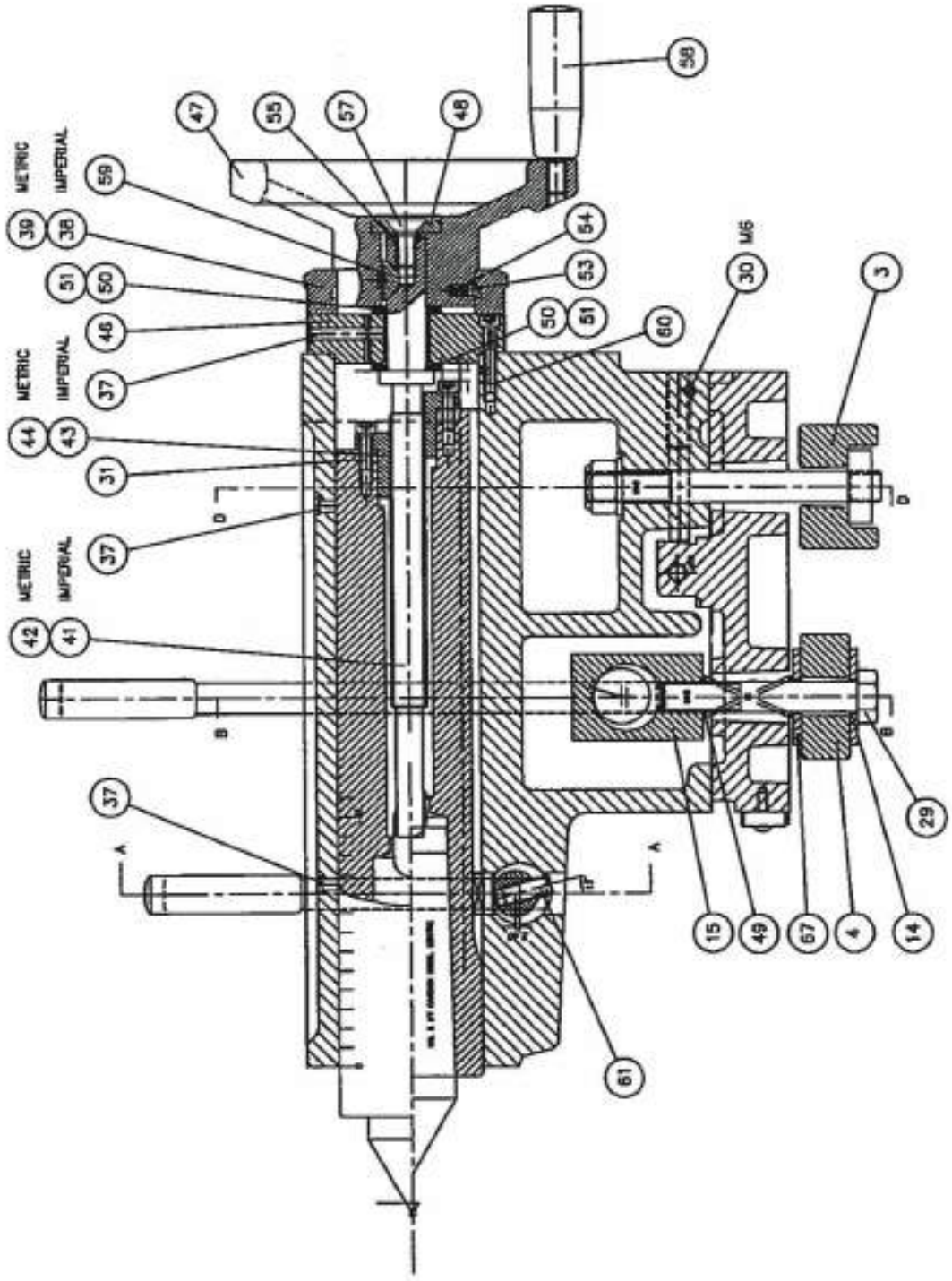


TOP SLIDE ASSEMBLY A125 - 0504

ITEM	DESCRIPTION	PART No.
1	HAND WHEEL SUB ASSEMBLY	A842 - 0025A
2	KEEP SUB ASSSEMBLY	A806 - 0584A
3	METRIC TOOLHOLDER BOLT	D005 - 0453
8	METRIC INDEX RING	D424 - 0158
9	IMPERIAL INDEX RING	D424 - 0143
10	METRIC SCREW	D697 - 0364
11	IMPERIAL SCREW	D697 - 0365
12	METRIC NUT	D536 - 0313
13	IMPERIAL NUT	D536 - 0314
14	SWIVEL SLIDE BOLT	D048 - 0156
15	SWIVEL SLIDE	D705 - 0113
16	SOLID TOPSLIDE	D705 - 0115
17	SLOTTED TOPSLIDE	D705 - 0116
19	TOOLHOLDER STUD	D711 - 0190
20	TOOLHOLDER COLLAR	D133 - 0247
21	TOPSLIDE LOCK PAD	D557 - 0145
22	GIB STRIP	D345 - 0085
23	GIB ADJUSTING SCREW	D697 - 0345
24	MULTI COMPRESSSION SPRING	D707 - 0021
25	LOCATION PIN	D560 - 0296
26	6mm DIA. CONCAVE LUBRICATOR	OC - 0010
27	CYCLE BALL BEARING 1/4" DIA.	B326 - 8107
28	WOOODRUFF KEY 13 x 5 x 3	KA - 0170
32	HEXAGON SOCKET CAP HEAD SCREW" WEDGLOK" M6 x 16	B164 - 0037
33	HEXAGON SOCKET CAP HEAD SCREW M6 x 25	FS - 0138
34	HEXAGON SOCKET BUTTON HEAD SCREW M6 x 20	FS - 0312
35	HEXAGON SOCKET CUP POINT SET SCREW M12 X 12	FS - 0526
36	HEXAGON SOCKET DOG POINT SET SCREW M8 x 20	FS - 0372
38	WASHER M6	FP - 0040
39	WASHER M16	FP - 0090
41	NYLOC NUT M16	FS - 0978
43	WASHER M10	FP - 0165
44	FULL NUT M10	FS - 0922
	HANDWHEEL SUB-ASSEMBLY A842 - 0025A	
1	HANDWHEEL	D383 - 0110
3	LONG HANDLE	D382 - 0140
4	SHORT HANDLE	D382 - 0141
	KEEP SUB-ASSEMBLY A806 - 0584	
1	KEEP	D442 - 0087
2	6mm DIA. LUBRICATOR	B454 - 2004

TAILSTOCK ASSEMBLY

A149-0514C & D



194 OLD SPEC
234 NEW SPEC D697-04447

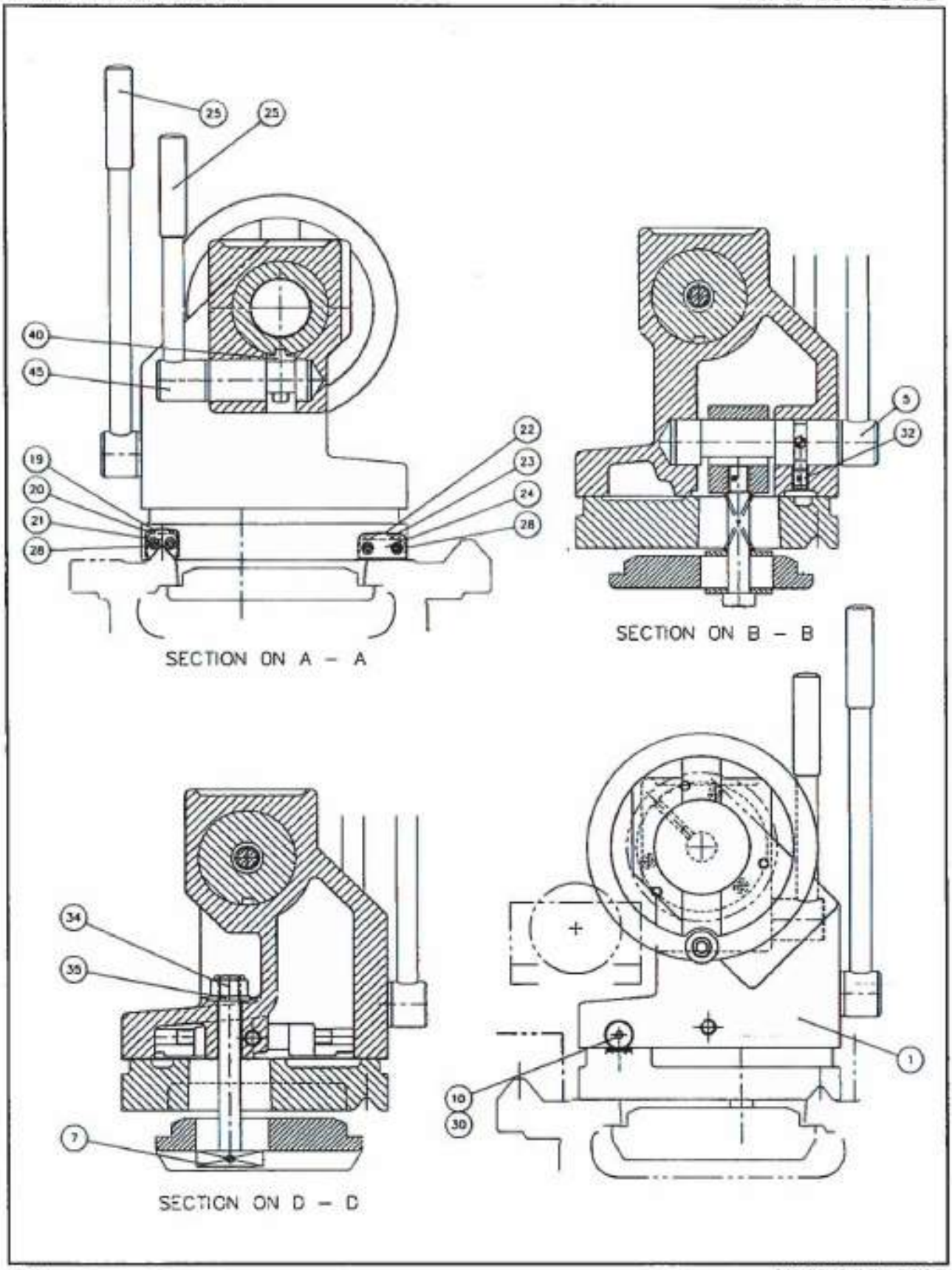
QUILL EXTENDED SOW

A149-0514C & D — TAILSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
1	A890-0033C	BODY/BARREL SUB ASSEMBLY	1
3	D131-0038	CLAMP PLATE REAR	1
4	D131-0039	CLAMP PLATE FRONT	1
5	A840-0041A	CLAMPING LEVER SUB ASSEMBLY	1
7	A840-0043A	CLAMP STUD SUB ASSEMBLY	1
10	D699-0782	SHAFT DHOBI MARK	1
14	D931-0355	CLAMP WASHER	1
15	D047-0091	BLOCK CLAMP	1
19	D725-0019	VEE SHIELD	1
20	D707-0067	SPRING	1
21	D937-0013	VEE WIPER	1
22	D725-0020	BEDWAY SHIELD FLAT	1
23	D707-0068	SPRING	1
24	D937-0014	FLAT WIPER	1
25	D382-0064	HANDLE	2
28	FS-0282	M4 X 16 BUTTON HEAD CAP SCREW	4
29	FS-0756	M16 X 100 HEX HEAD BOLT	1
30	FS-0354	M6 X 16 HALF DOG POINT SCREW	2
31	FS-0136	M6 X 20 SOCKET HEAD CAP SCREW	3
32	FS-0380	M12 X 20 DOG POINT SCREW	1
34	FS-0978	M16 HEXAGON 'NYLOC' NUT	1
35	FP-0090	M16 BRIGHT WASHER	1
37	OC-0010	6MM DRIVE IN CONCAVE OIL NIPPLES 6 DIA	3
38	D424-0170	INDEX RING - IMPERIAL	1
39	D424-0171	INDEX RING - METRIC	1
40	D441-0078	BARREL KEY TAILSTOCK	1
41	D697-0448	TAILSTOCK SCREW - IMPERIAL	1
42	D697-0447	TAILSTOCK SCREW - METRIC	1
43	D536-0311	BARREL NUT - IMPERIAL	1
44	D536-0312	BARREL NUT - METRIC	1
45	A840-0046A	BARREL CLAMP SUB ASSEMBLY	1
46	A806-0562A	KEEP SUB ASSEMBLY	1
47	D383-0104	HANDWHEEL	1
48	D931-0340	WASHER HANDWHEEL SECURING	1
49	B365-1677	SPRING	1
50	BC-0100	THRUST WASHER	4
51	BC-0110	NEEDLE THRUST BEARING	2

TAILSTOCK ASSEMBLY

A149-0514C & D



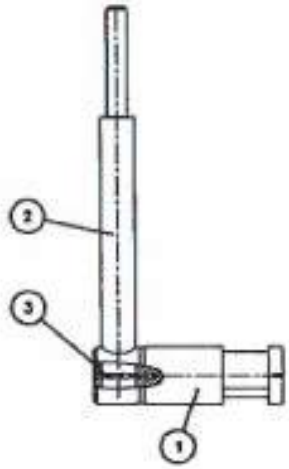
A149-0514C & D

TAILSTOCK ASSEMBLY

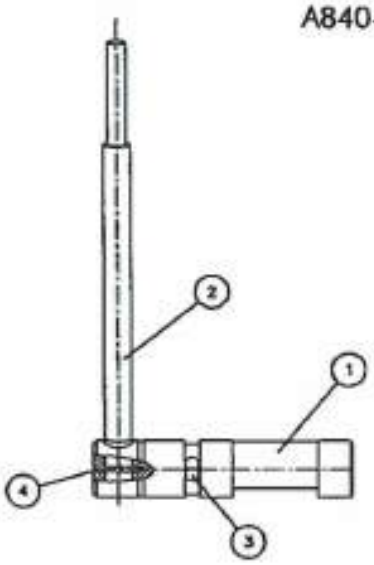
Item No.	Part Number	Description	Qty
53	UB-0006	6MM STEEL BALL	3
54	FR-0005	SPRING	3
55	FR-0180	SPRING	2
57	FS-0454	M10 X 25 COUNTERSUNK SOCKET	1
58	HA-0160	M10 REVOLVING HANDLE	1
59	KA-0190	6.0 X 9.0 X 22MM WOODRUFF KEYS	1
60	FS-0138	M6 x 25 SOCKET HEAD CAP SCREW	3
61	FS-0810	M10 X 25 CUP POINT NYLOCK SCREW	1
67	B116-0050	WASHER 5/8"ID	1

TAILSTOCK SUB ASSEMBLIES

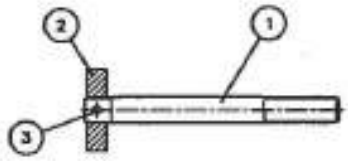
A840-0046A



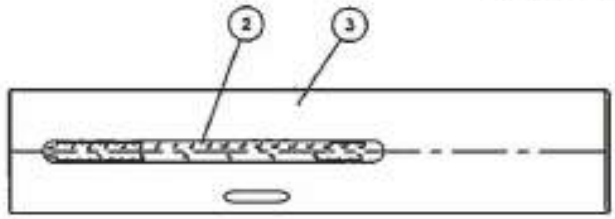
A840-0041A



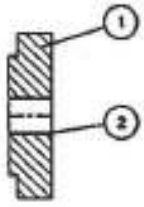
A840-0043A



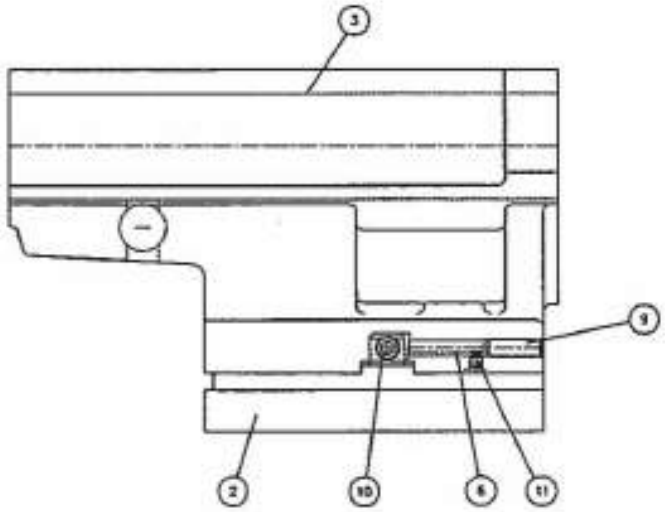
A890-0034B



A806-0562A



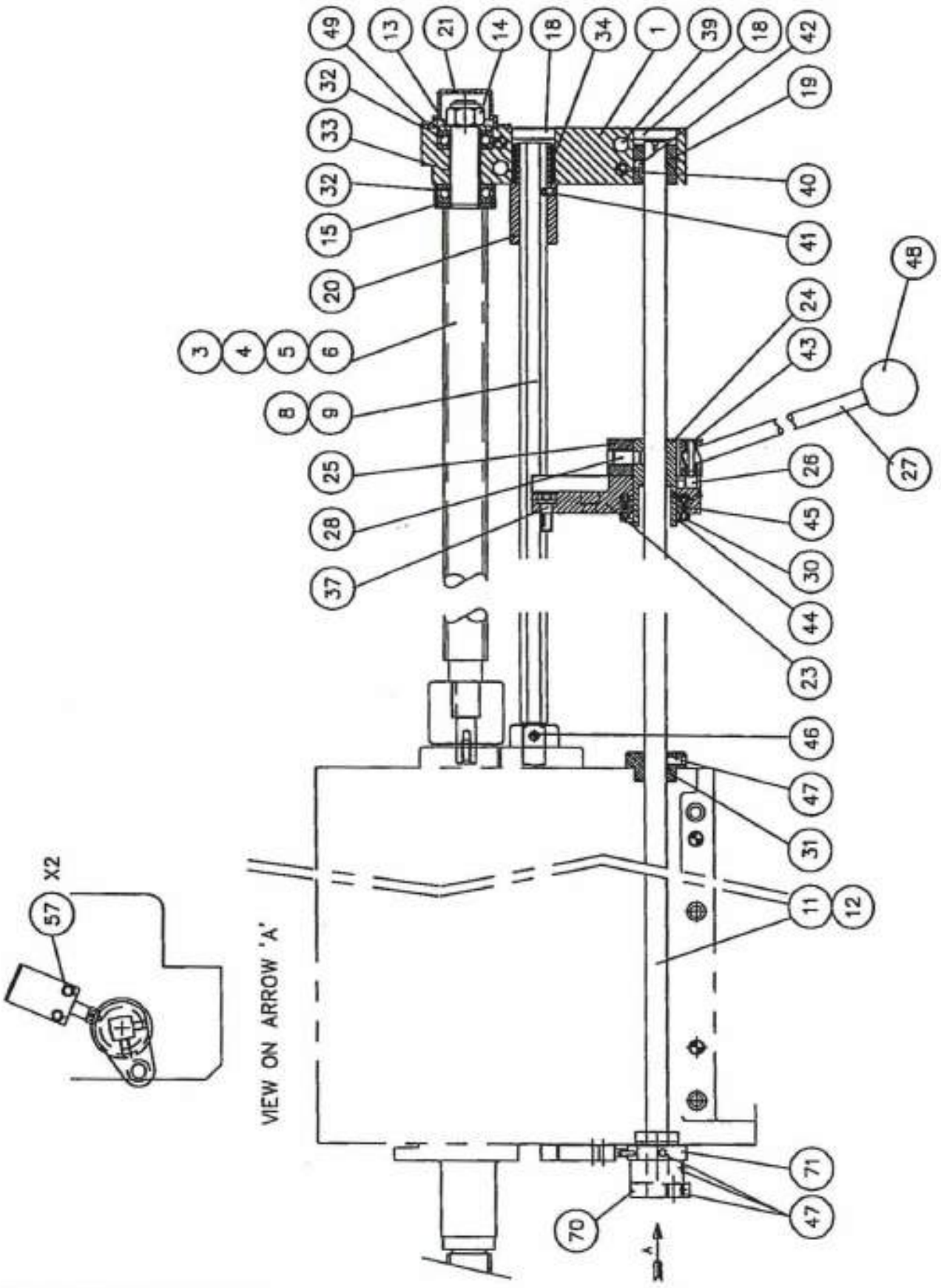
A890-0032B



TAILSTOCK SUB ASSEMBLIES

Item No.	Part Number	Description	Qty
	A806-0562A	KEEP SUB ASSEMBLY	
1	D442-0078	KEEP TAILSTOCK	1
2	BF-0140	MB20 25 DU GLACIER BUSH	1
	A840-0041A	CLAMPING LEVER SUB ASSEMBLY	
1	D123-0114	ECCENTRIC STUD	1
2	D717-0114	CLAMP LEVER	1
3	FT-0550	M8 X 30 H&G DOWEL PIN	1
4	B111-5065	SPIROL PIN 3 DIA X 30 LG	1
	A840-0043A	CLAMP STUD SUB ASSEMBLY	
1	D711-0187	AUXILLARY CLAMP STUD	1
2	D565-0913	STUD PLATE	1
3	B111-5099	SPIROL PIN 5 DIA X 35 LG MBK	1
	A840-0046A	BARREL CLAMP SUB ASSEMBLY	
1	D123-0115	ECCENTRIC SHAFT	1
2	D717-0115	STEM - BARREL CLAMP	1
3	B111-5065	SPIROL PIN 3 DIA X 30 LG	1
	A890-0033C	BODY/BARREL SUB ASSEMBLY COMPRISING OF:	
	A890-0032B	*T/STOCK BODY/BASE SUB ASSEMBLY*	
2	*D827-0062*	*TAILSTOCK BASE*	*1*
3	*D827-0135*	*TAILSTOCK BODY*	*1*
6	*D560-0302*	*PIN TAILSTOCK TO BASE*	*1*
9	*FS-0382*	*M12 X 35 DOG POINT SCREW*	*1*
10	*FS-0194*	*M10 x 65 SOCKET HEAD CAP SCREW*	*2*
11	*FS-0790*	*M8 X 10 DOG POINT NYL SCW*	*1*
	A890-0034B	*BARREL/SCALE SUB ASSEMBLY*	
2	*D537-0896*	*GRADUATED PLATE*	*1*
3	*D044-0056*	*BARREL TRIUMPH*	*1*

LEADSCREW/FEEDSHAFT ASSEMBLY



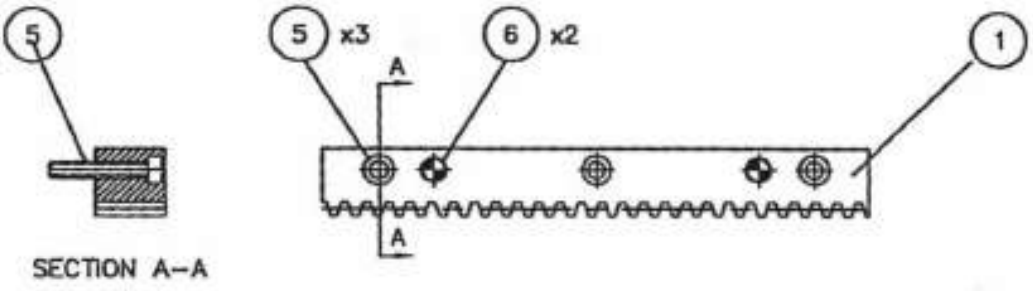
LEADSCREW AND SPLINE SHAFT ASSEMBLY A106-0524

ITEM	DESCRIPTION	PART No.
1	TAIL END BRACKET	D706H001.2
3	LEADSCREW METRIC 650MM	D456 - 0083
4	LEADSCREW IMPERIAL 650MM	D456 - 0085
5	LEADSCREW METRIC 1250MM	D456 - 0084
6	LEADSCREW IMPERIAL 1250MM	D456 - 0086
8	SPLINE SHAFT 650MM M/C	D699 - 0773
9	SPLINE SHAFT 1250MM M/C	D699 - 0774
11	THIRD ROD 650 M/C	D699 - 0775
12	LEVER SUB-ASSEMBLY	A406H001.1
13	COLLAR	D133 - 0249
14	NYLOC NUT M16 (MODIFIED)	FS - 0978
15	LEADSCREW BEARNG COVER	D132 - 0717
16	STOP SLEEVE	D706H016.1
17	STOP BUSH	D706H002.1
18	TAILEND BRACKET PLUG	D566 - 0189
19	THIRD ROD SLEEVE	D704 - 0126
20	STOP BUSH	D049 - 0331
21	TAILEND LEADSCREW COVER	D132 - 0430
22	SWITCH SECURING PLATE	D565 - 1052
23	THIRD ROD BOSS	D706H011.1
24	CENTRE BUSH	D406H018.2
26	LEVER BOSS PLUG	D406H020.1
28	SOCKET SET SCREW	D406H034.1
29	THIRD CAM ROD SWITCH	D123 - 0110
30	THRUST WASHER	BC - 0180
31	SLEEVE	D403H046.2
32	BEARING SKF 51204	BD - 0010
33	GLACIER BUSH MB 20 25 DU	BF - 0140
34	OILITE BUSH 8 M1 X 30	BE - 0270
37	HEXAGON SOCKET CAP HEAD SCREW M8 X 20	FS - 0162
39	HEXAGON SOCKET CAP HEAD SCREW M10 X 65	FS - 0194
40	GROUND DOWEL	B111 - 7046
41	CUP POINT SET SCREW M6 X 8	FS - 0498
42	HEXAGON SOCKET SET SCREW M6 X 6	FS - 0496
43	SPIROL PIN 4 X 24	FT - 0180
44	CIRCLIP ANDERTON 1400-32	RA - 0200
45	SPRING	FR - 0004
46	SPIROL PIN 6 X 35	B111 - 5115
47	CUP POINT SET SCREW M6 X 12	FS - 0502
48	RED BALL HANDLE PH006	HA - 0030
49	SELF TAPPING SCREW NO. 6 X 3/8	B123 - 6026
50	PLUNGER MOUNTING BLOCK	D047 - 0108
52	LIMIT SWITCH MOUNTING BLOCK	D047 - 0106
53	CAM THIRD ROD SWITCH	D123 - 0124
55	M4 WASHER	FP - 0170
56	HEXAGON SOCKET CAP HEAD SCREW M4 X 25MM LONG	FS - 0100

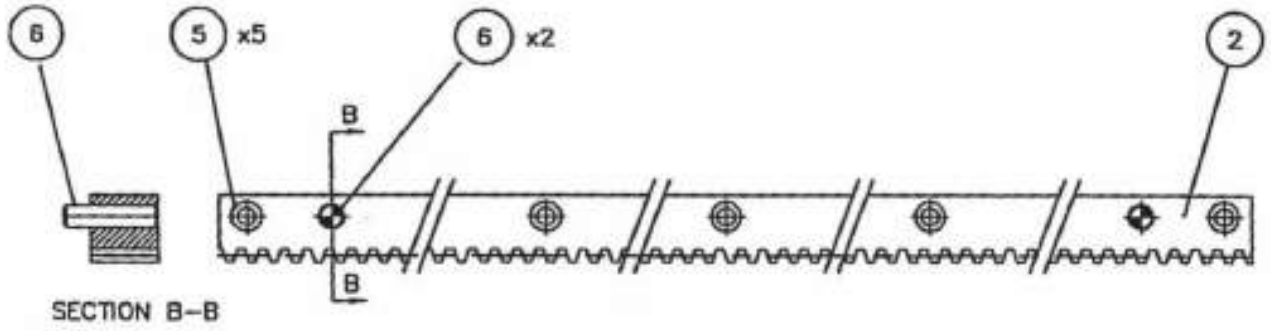
LEADSCREW AND SPLINE SHAFT ASSEMBLY A106-0524

ITEM	DESCRIPTION	PART No.
58	STEEL BALL 22MM DIAMETER	UB - 0022
59	HEXAGON SOCKET CAP HEAD SCREW M8 X 25	FS - 0164
60	HEXAGON SOCKET SCREW CAP HEAD M4 X 50MM	B163 Y0023
61	SPRING FLEXO M446910	FR - 0450
	THIRD SHAFT LEVER SUB ASSEMBLY A406H001.1	
1	LEVER - THIRD SHAFT	D406H021.1
2	LEVER BOSS	D406H019.1
3	SPIROL PIN M4 X 24 MBK	FT - 0180

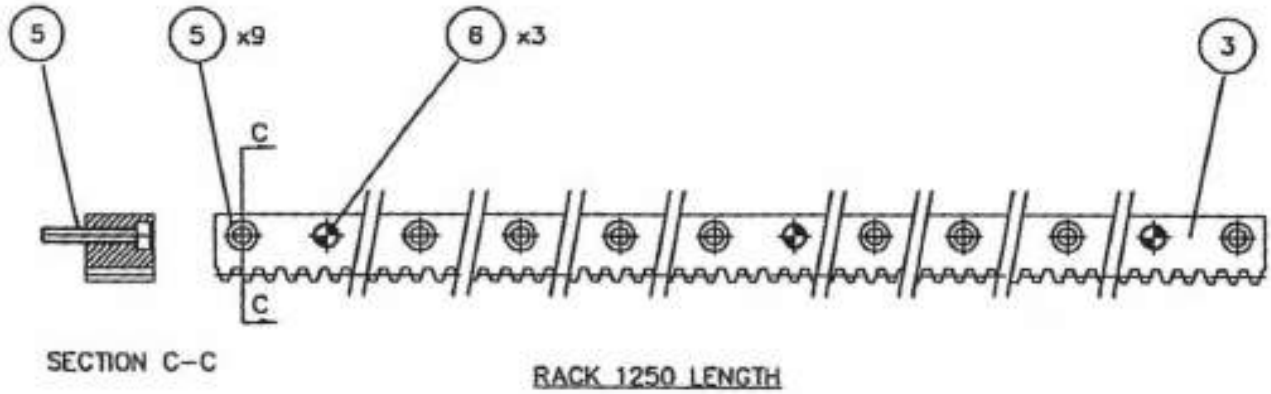
RACK ASSEMBLY



RACK GAP PIECE



RACK 650 LENGTH



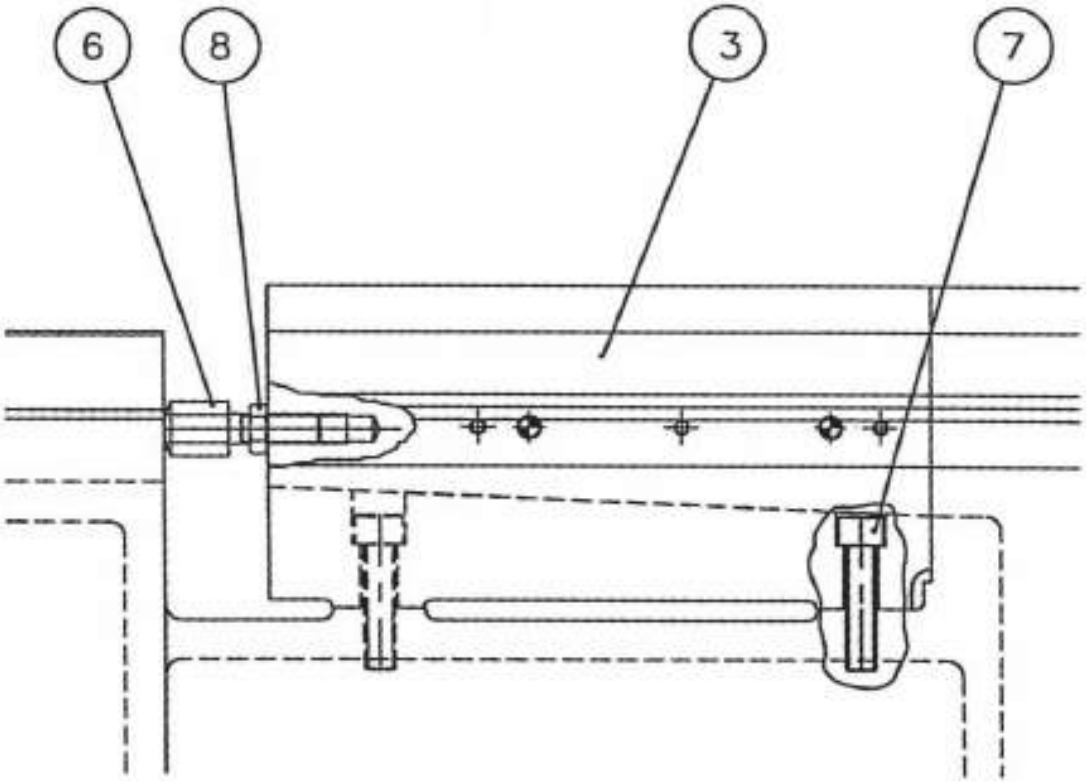
RACK 1250 LENGTH

RACK ASSEMBLY

A106 - 0520

ITEM	DESCRIPTION	PART No.
1	RACK 200mm LONG	D641 - 0061
2	RACK 650mm MACHINE	D641 - 0057
3	RACK 1250mm MACHINE	D641 - 0058
5	HEXAGON SOCKET CAP HEAD SCREW M6 x 35	FS - 0142
6	8mm DIA. DOWEL	B111Y7043

BED TO GAP ASSEMBLY

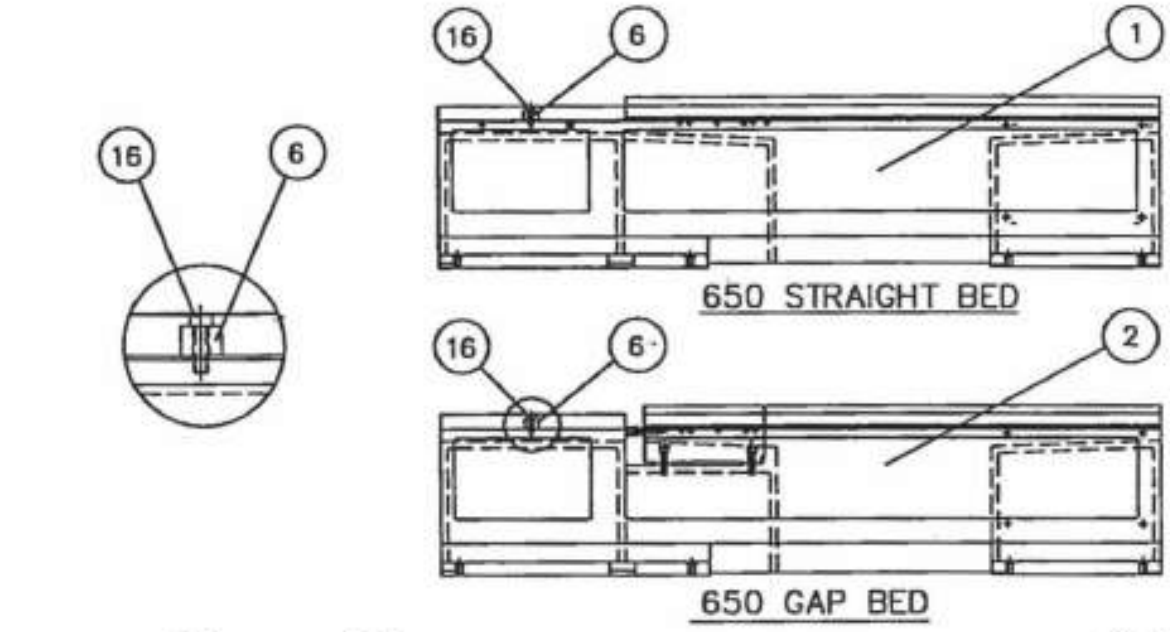


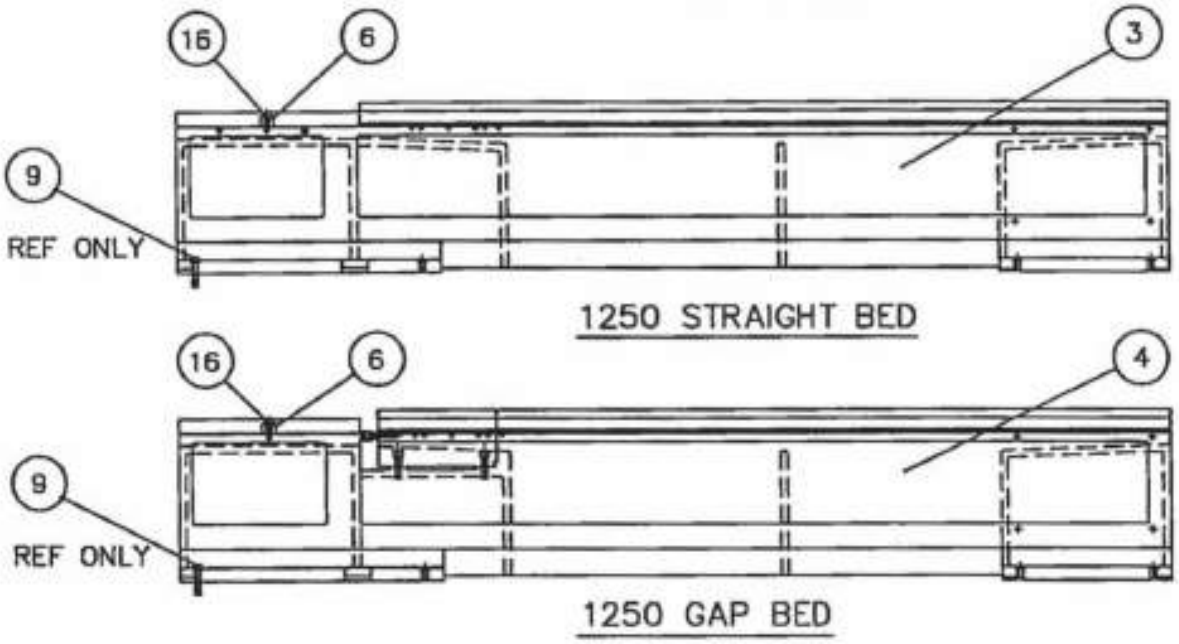
DETAILS OF GAP PIECE
TO BED FIXINGS

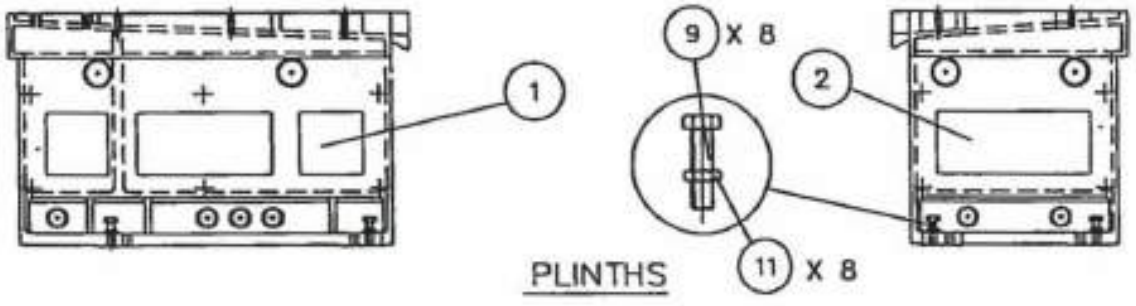
GAP AND BED ASSEMBLY — A803 - 0013

ITEM	DESCRIPTION	PART No.
1	GAP BED 650mm	C045 - 0124
2	GAP BED 1250mm	C045 - 0125
3	GAP PIECE	D348 - 0015
6	JACKING SCREW	D697 - 0340
7	HEXAGON SOCKET CAP HEAD SCREW M12x50	B163 - 0086
8	HEXAGON BRIGHT NUT M10	FS - 0922

BED AND PLINTHS



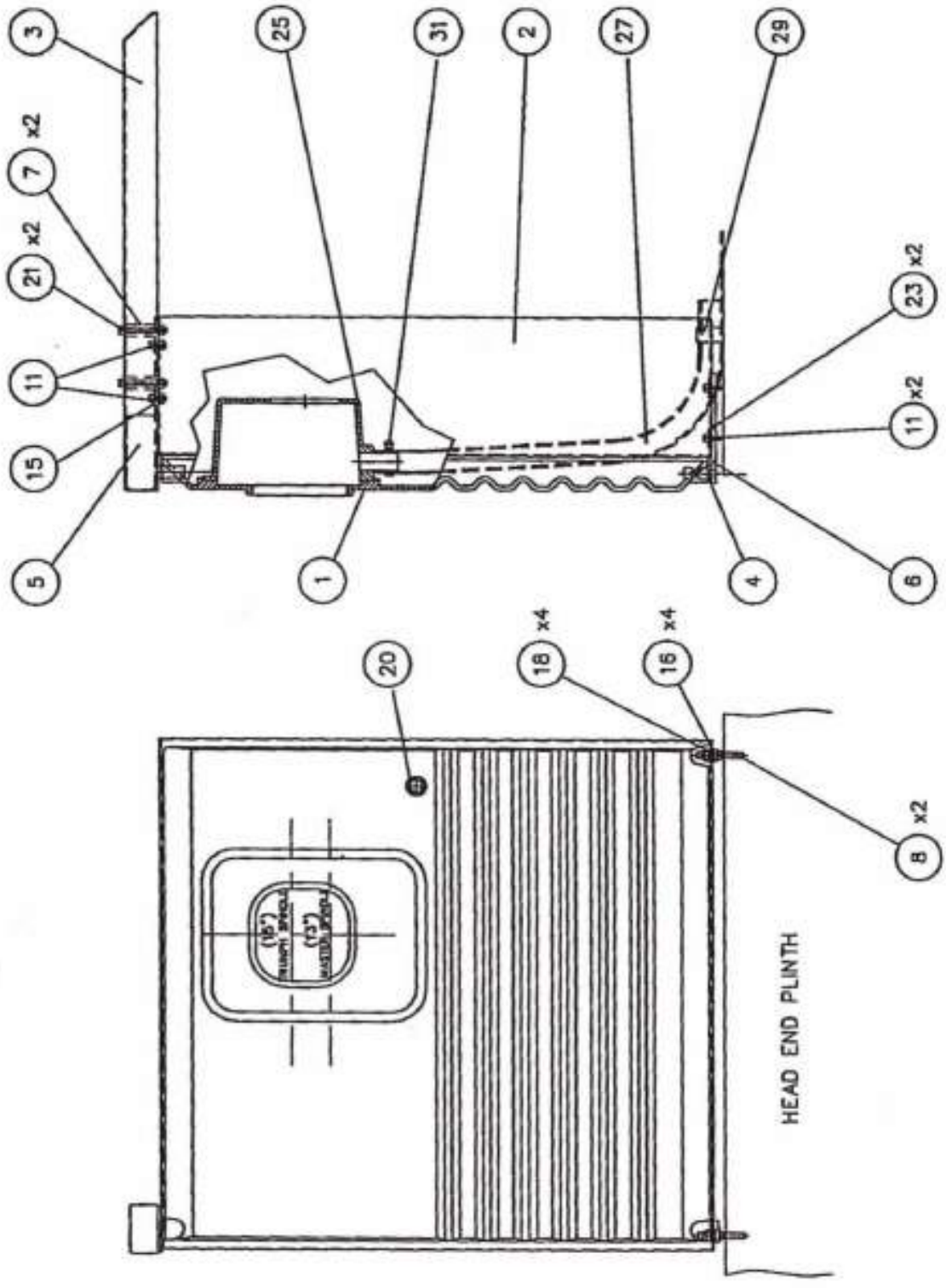




BED AND PLINTH ASSEMBLY A106 - 0523 / A865 - 0031

ITEM	DESCRIPTION	PART No.
	BED ASSEMBLY A106 - 0523	
1	STRAIGHT BED - 650mm MACHINE	D045 - 0122
2	BED AND GAP ASSEMBLY 650mm MACHINE	A803-0013A
3	STRAIGHT BED - 1250mm MACHINE	D045 - 0123
4	BED AND GAP ASSEMBLY 1250mm MACHINE	A803-0013A
6	STOP BLOCK - SWARF / COOLANT	D047 - 0119
9	HEXAGON SOCKET CAP HEAD SCREW M12x55	B166 - 0136
10	WASHER M12	FP - 0070
12	INFILL PLATE STRAIGHT BED	D565 - 0917
13	INFILL PLATE GAP BED	D565 - 0994
14	INFILL SUPPORT PLATE	D565 - 0995
15	HEXAGON SOCKET BUTTON HEAD SCREW M6 x 12	FS - 0294
16	HEXAGON SOCKET CAP HEAD SCREW M10 x 35	FS - 0188
	PLINTH ASSEMBLY A865 - 0031	
1	HEAD END PLINTH	D125 - 0102
2	TAILEND PLINTH	D125 - 0103
9	HEXAGON HEAD SCREW M16 X 60	FS - 0622
11	LOCKNUT M16	FS - 0976

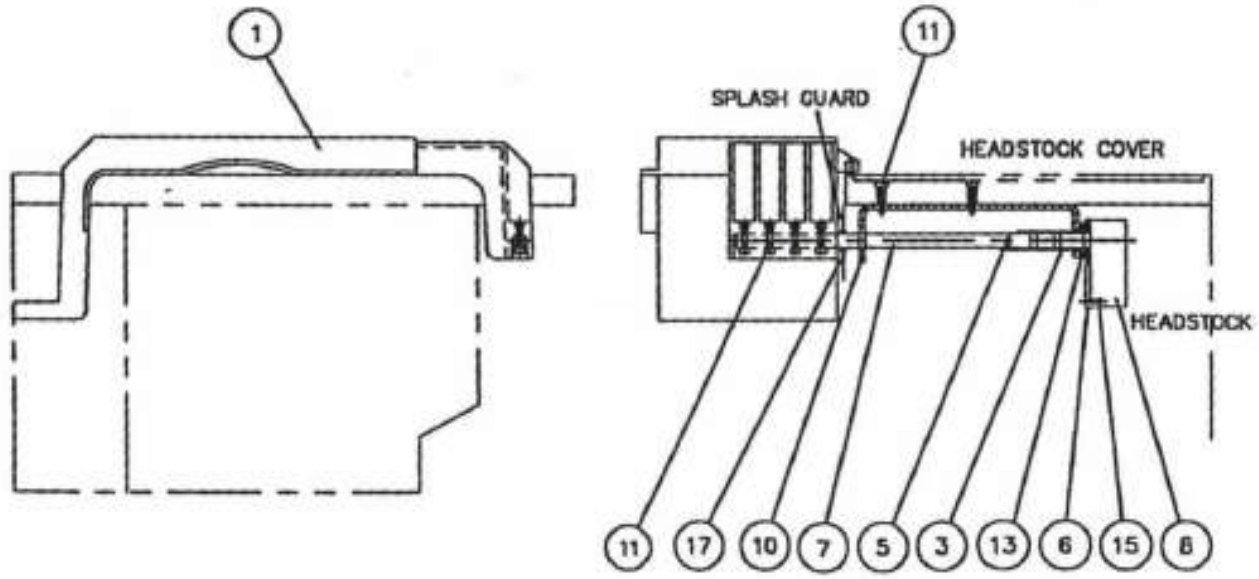
HEADEND GUARDING ASSEMBLY



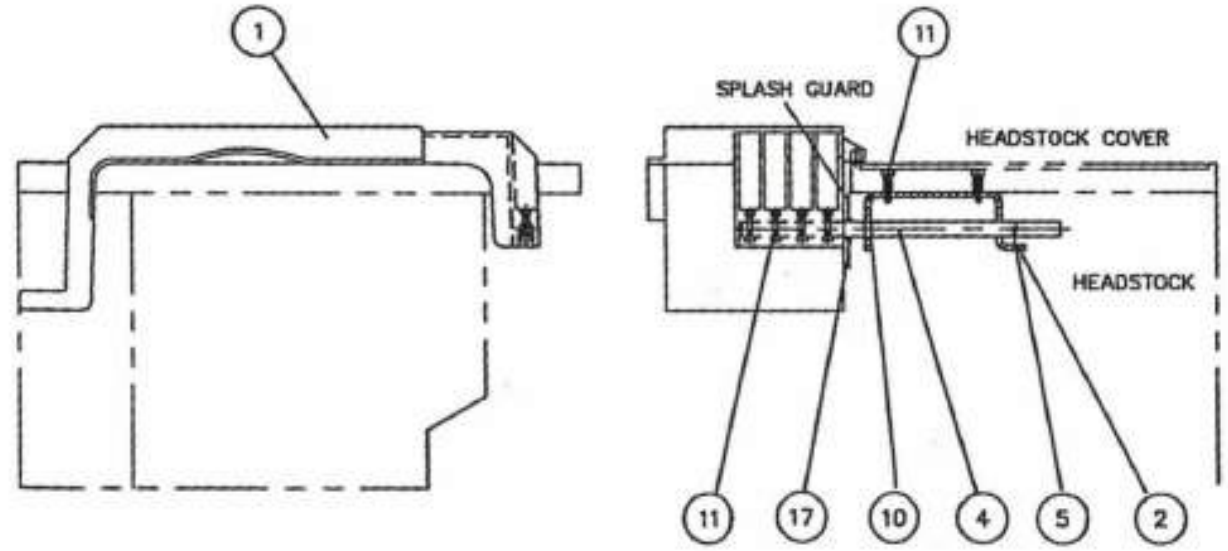
HEAD END GUARD ASSEMBLY — A137 - 0514

ITEM	DESCRIPTION	PART No.
1	END GUARD	D346 - 0396
2	HEAD END COVER	D132 - 0697
3	TRUNKING	D132 - 0698
4	SPACER	D708 - 0466
5	ROTACAM SWITCH ASSEMBLY	A826 - 0722A
6	HINGE PLATE	D565 - 0916
7	TRUNKING MOUNTING SPACER	D708 - 0469
8	END GUARD MOUNTING STUD	D711 - 0189
10	HEXAGON SOCKET CAP HEAD SCREW M4 x 10	FS - 0092
11	HEXAGON SOCKET CAP HEAD SCREW M6 x 16	FS - 0134
15	TAB WASHER 1/4" I.D.	FP - 0250
16	WASHER M8	FP - 0140
18	LOCK NUT M8	FS - 1040
20	LOCK SOUTHCO	YU - 0020
21	HEXAGON SOCKET CAP HEAD SCREW M6 x 55	FS - 0148
23	WASHER M6	B117 - 0051
26	COOLANT COLLECTOR	D132 - 0772
27	HOSE 25mm BORE	PF - 0140
29	PIPE RETAINING CLIP	D130 - 0020
31	ZINC HOSE CLIP 1"x1 3/8"	FU - 0025
	ROTACAM SWITCH ASSEMBLY **A826 - 0722**	
1	MOUNTING PLATE	D565 - 0923
2	HEXAGON SOCKET CAP HEAD SCREW M4 x 10	FS - 0092
4	GROMMET A1157	B715 - 1076
5	ROTACAM SWITCH HARNESS	A826 - 0753A

CHUCK GUARD ASSEMBLY



WITH ROTOCAM SAFETY SWITCH A137 – 0520B

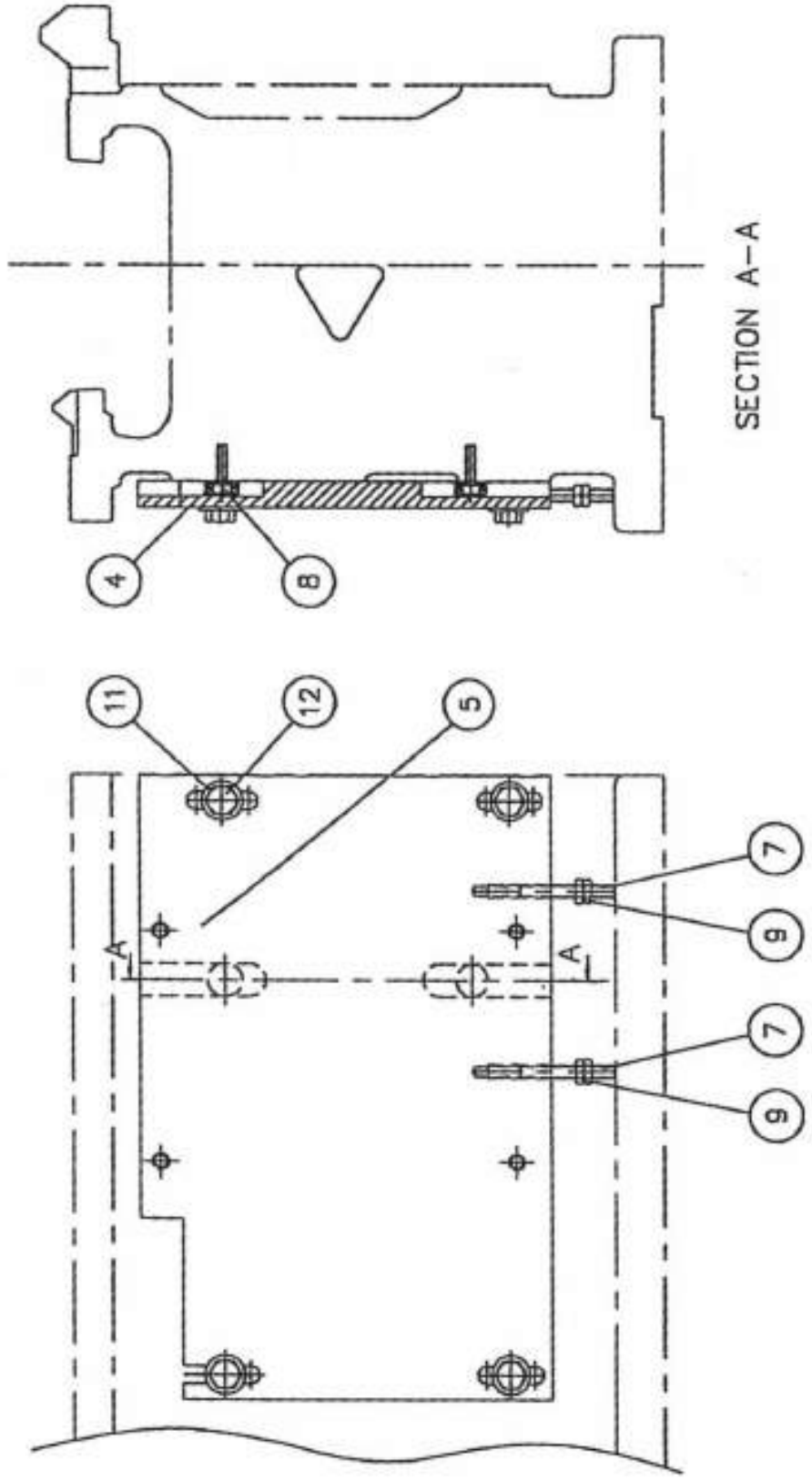


WITHOUT ROTOCAM SAFETY SWITCH A137 – 0520A

CHUCK GUARD ASSEMBLY — A137 - 0520A/B

ITEM	DESCRIPTION	PART No.
1	CHUCK GUARD	D346 - 0395
	MOUNTING KIT A950 - 0019A/B	
2	MOUNTING BRACKET	D050 - 0725
3	MOUNTING BRACKET - INTERLOCKED CHUCKGUARD	D050 - 0784
4	CHUCKGUARD SUPPORT SHAFT	D699 - 0827
5	CHUCK GUARD STOP PIN	D560 - 0310
6	CHUCKGUARD SWITCH MOUNTING PLATE	D565 - 1026
7	CHUCKGUARD SUPPORT SHAFT - INTELOCKED CHUCKGUARD	D699 - 0828
8	ROTOCAM SWITCH ASSEMBLY	A826 - 0753B
10	CIRCLIP DIN 1400-16	RA - 0120
11	HEXAGON SOCKET CAP HEAD SCREW M6 x 30	FS - 0140
13	HEXAGON SOCKET BUTTON HEAD SCREW M4 x 8	FS - 0272
15	HEXAGON SOCKET CAP HEAD SCREW M4x12	FS - 0094
17	GROMMET R.MOSS REF15093	B715 - 1086

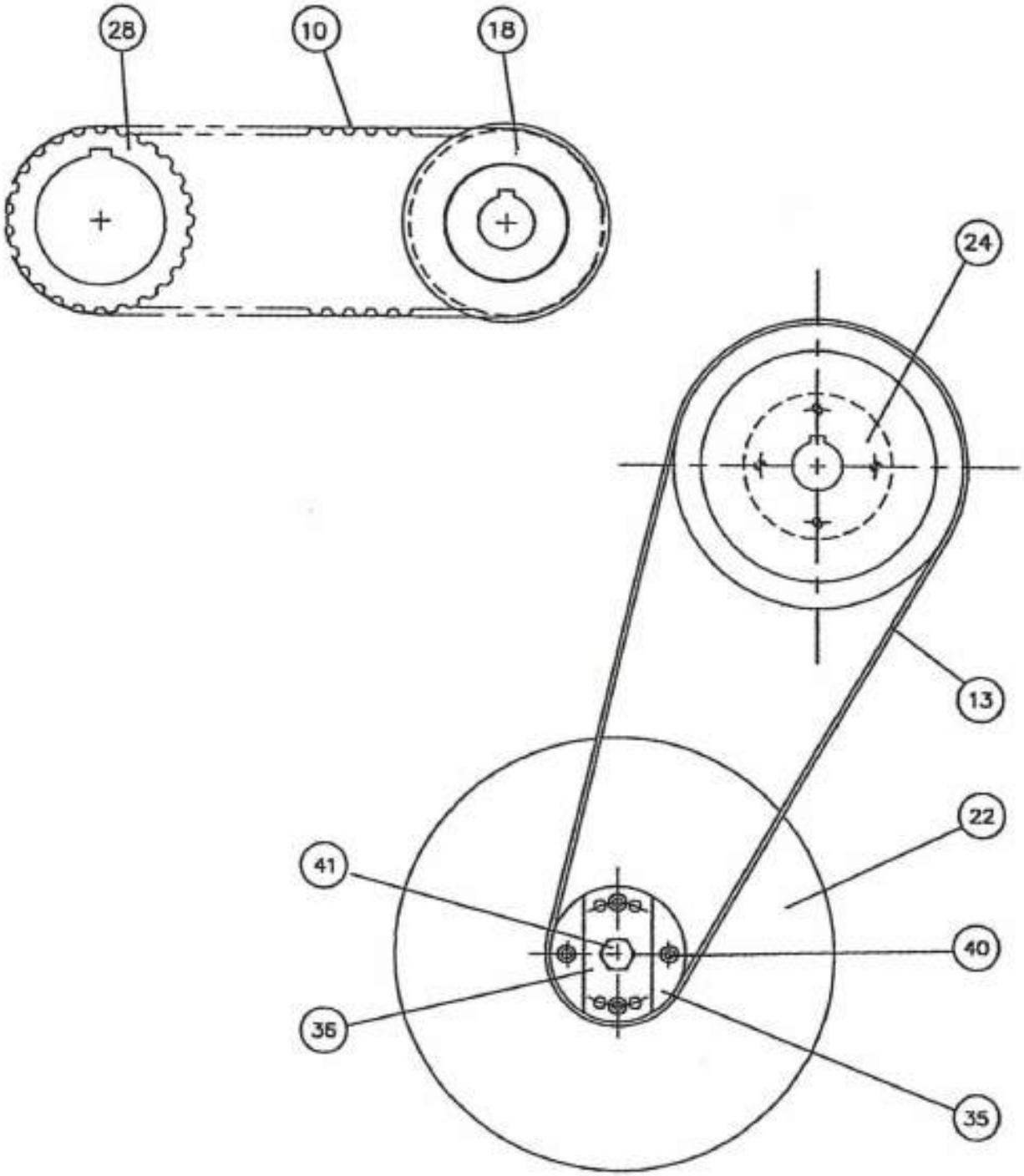
MOTOR MOUNTING ASSEMBLY



MOTOR MOUNTING ASSEMBLY A175 - 0501

ITEM	DESCRIPTION	PART No.
4	MOTOR PLATE LOCATION PIN	D560 - 0296
5	MOTOR MOUNTING PLATE	D565 - 0942
7	STUDDING H8 X 60	B245 - 0009
8	HEXAGON SOCKET CAP HEAD SCREW M6 X 25	FS - 0138
9	LOCK NUT M8	FS - 1040
11	WASHER M10	FP - 0165
13	HEXAGON HEAD SCREW M10 X 30MM LONG	FS - 0586

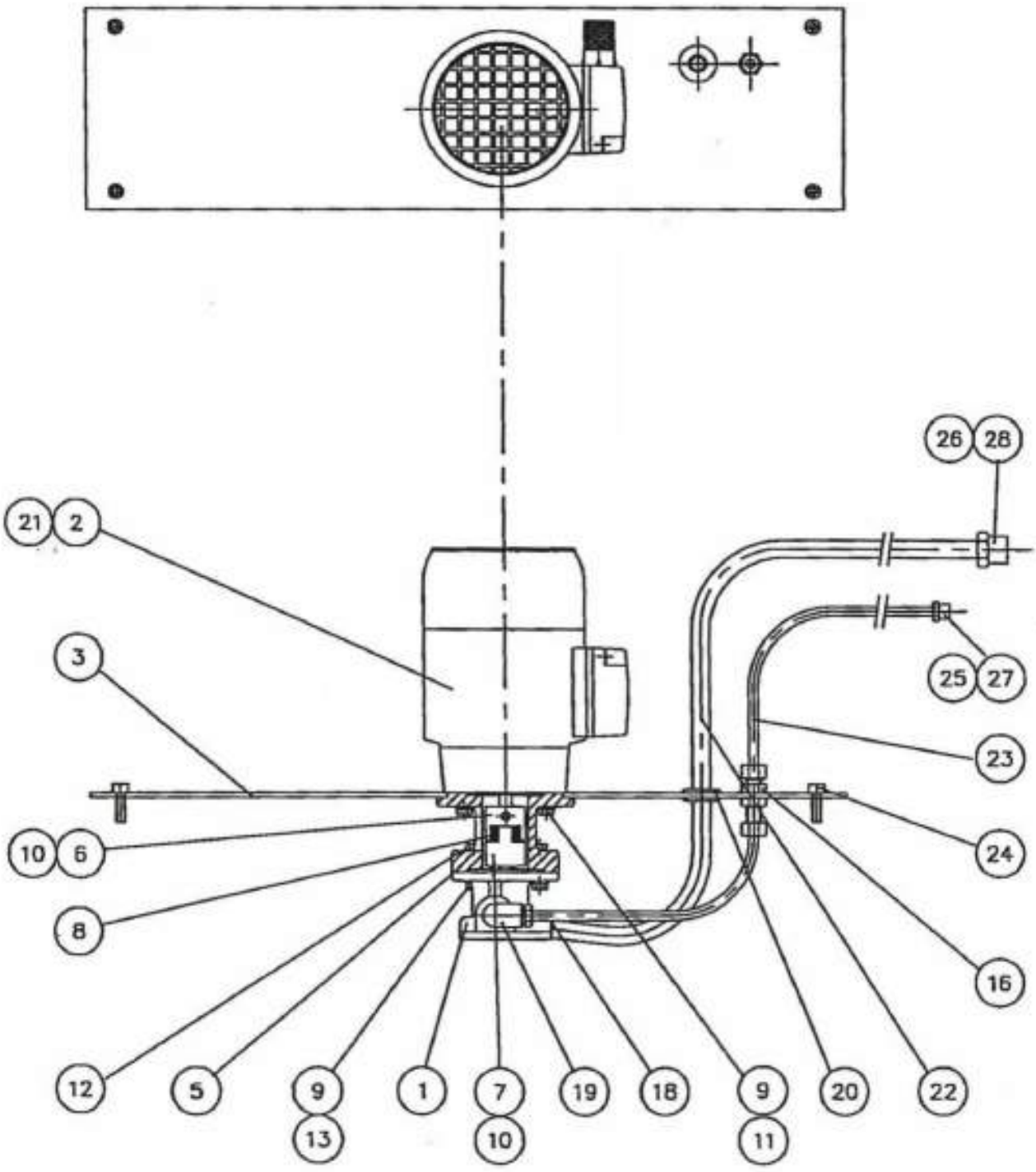
BELTS AND PULLEYS ASSEMBLY



BELTS & PULLEYS ASSEMBLY A107 - 0001

ITEM	DESCRIPTION	PART No.
10	TIMING BELT REF 270M100	B346-1338
13	POLY 'V' BELT 400J16	B345-5430
18	26T PULLEY SUB-ASSEMBLY	A824-0028
20	MOTOR PULLEY	D570-0320
24	HEADSTOCK INPUT PULLEY	D570-0321
28	26T PULLEY	D570-0323
35	RETAINING PLATE 112 mm DIA.	D565-0915
36	MOTOR PULLEY TAB WASHER	D931-0345
40	HEXAGON SOCKET CAP HEAD SCREW M6 x 20	FS - 0136
41	HEXAGON SOCKET CAP HEAD SCREW M12 x 25	FS - 0600
	26T PULLEY SUB - ASSEMBLY A824 - 0028	
1	REVERSING BOX PULLEY	D570 - 0319
2	BELT RETAINING RING	D565 - 0912
3	HEXAGON SOCKET BUTTON HEAD SCREW M4x12	FS - 0278

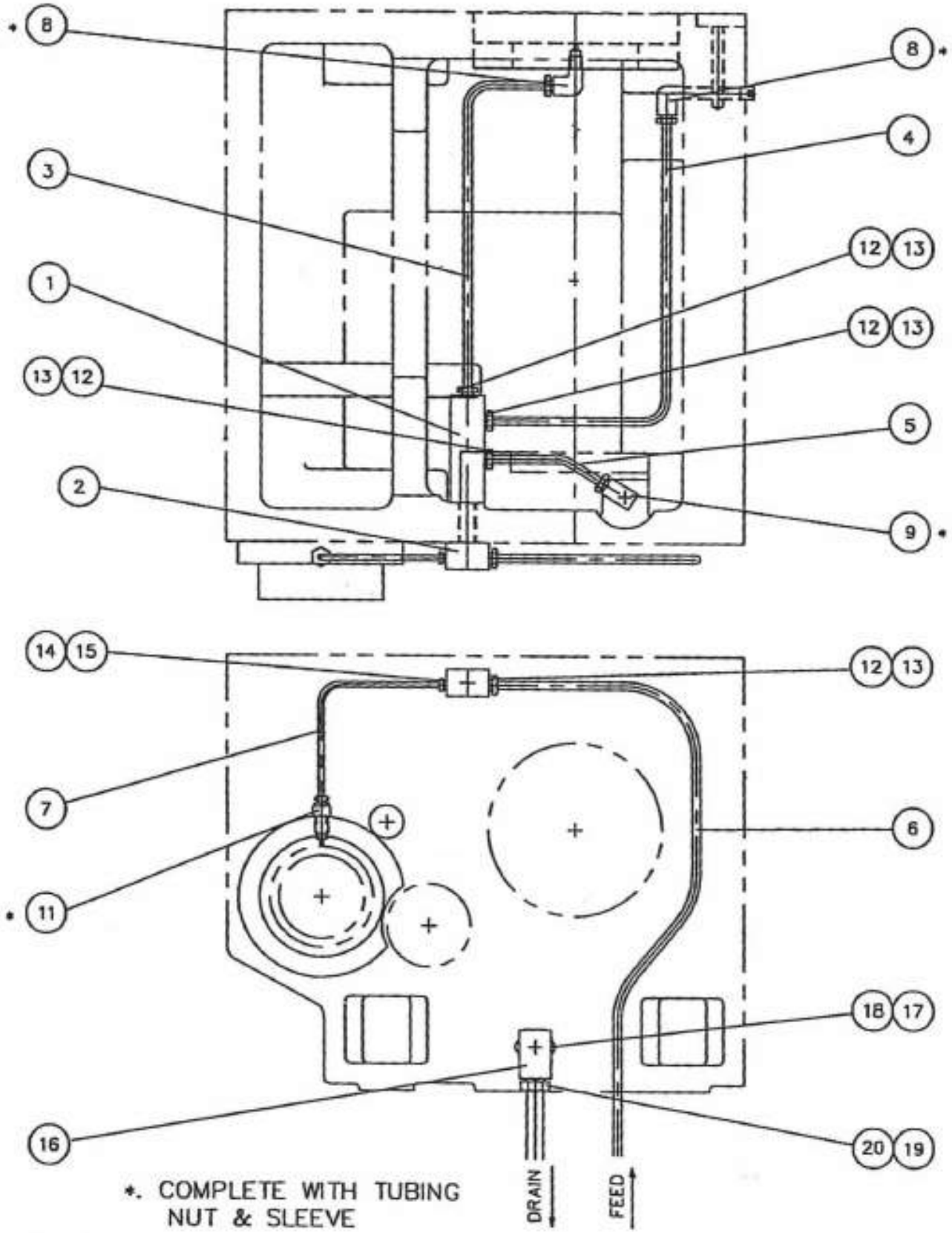
HEADSTOCK LUBRICATION ASSEMBLY



HEADSTOCK LUBRICATION PUMP ASSEMBLY A173-0501A

ITEM	DESCRIPTION		PART No.
1	GEAR PUMP		B473 - 3002
2	MOTOR 380/440V SPH .12KW	INTERLUBE REF 27662-193	B613 - 9009
3	BASE PLATE	INTERLUBE REF 35167-610-3	B528 - 0005
5	COUPLING HOUSING	INTERLUBE REF. 372-53-231-2	B350 - 0001
6	DRIVE COUPLING	INTERLUBE REF. 32865-621-2	B347 - 0051
7	DRIVE COUPLING	INTERLUBE REF. 32865-618-1	B347 - 0049
8	COUPLING ELEMENT	INTERLUBE REF. 23315-401	B349 - 0001
9	M5 SPRING WASHER M5		B117 - 0179
10	HEXAGON SOCKET SET SCREW CUP POINT M5 X 6		B163 - 1516
11	HEXAGON HEAD SET SCREW M5 x 20		B166 - 0029
12	HEXAGON HEAD SET SCREW M5 x 25		B166 - 0032
13	M5 BRIGHT NUT		FS - 0914
14	LABEL	INTERLUBE REF. 31833-349-1	B780 - 0057
15	LABEL	INTERLUBE REF. 31813-404-1	B780 - 0060
16	6MM O. D. BULKHEAD PIPE CONNECTOR	REF25477-775	B435 - 0566
17	CONDUIT ENTRY ADAPTOR 38586-606-1		B435 - 0567
18	ELBOW - 1/4" BSPT x 1/2" OUTSIDE DIAMETER	REF 25477-751	B433 - 3232
19	ELBOW - 1/4" BSPT x 6MM OUTSIDE DIAMETER 25477-770		B435 - 0562
20	GROMMET REF 27175-639		B715 - 9141
21	LABEL REF 31816-259-1		B780 - 0061
22	1/2" OUTSIDE DIAMETER PLASTIC TUBE	REF 135226/1000	R827 - 4116
23	PLASTIC TUBE OUTSIDE DIAMETER 6MM	REF 136812/240	R827 - 4213
24	HEXAGON SOCKET CAP HEAD SCREW M6 X 16		FS - 0134

HEADSTOCK LUBRICATION KIT

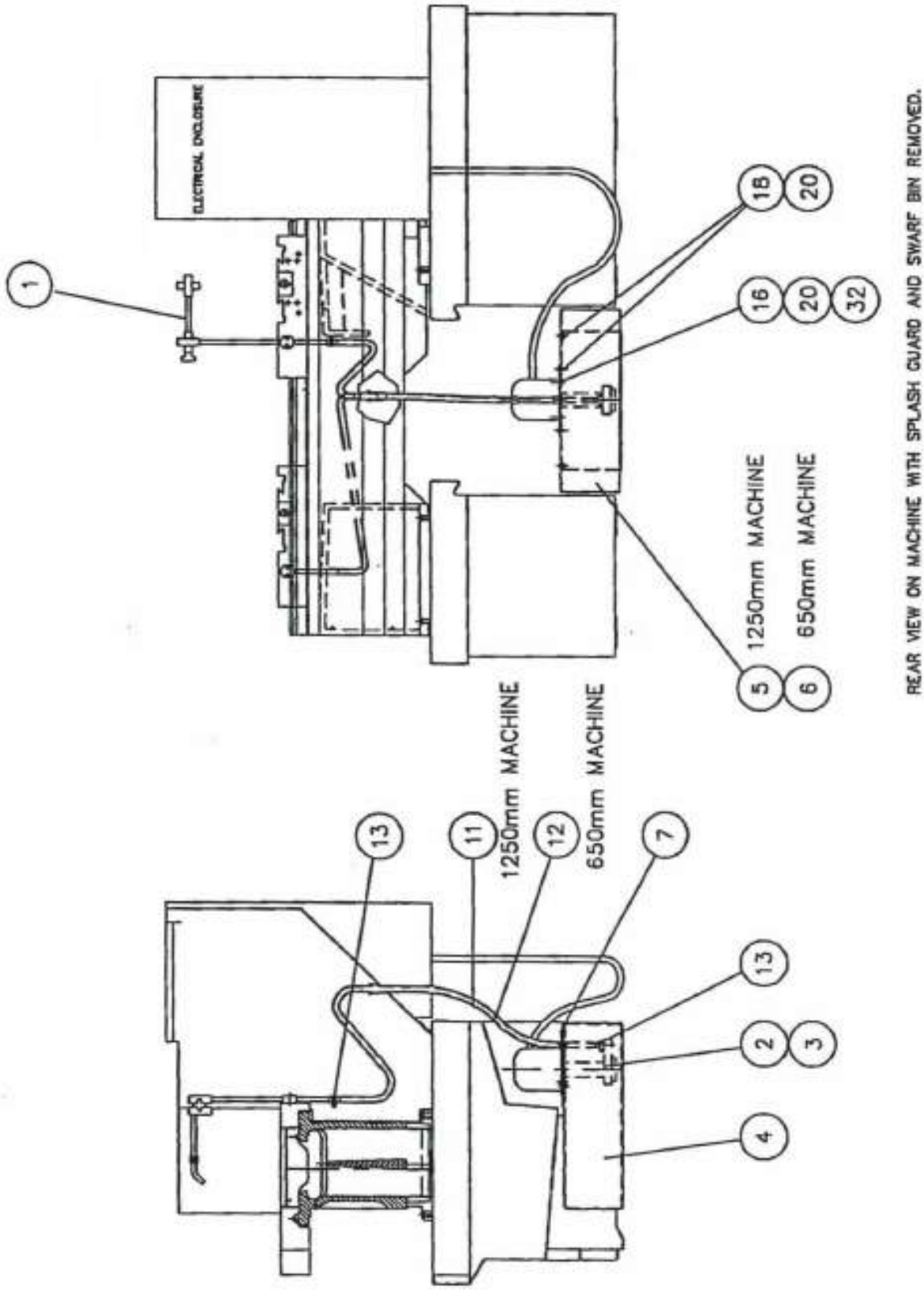


*. COMPLETE WITH TUBING NUT & SLEEVE

HEADSTOCK LUBE KIT ASSEMBLY A903-0002

ITEM	DESCRIPTION	PART No.
1	4 WAY ADAPTOR	D004 - 0087
2	3 WAY ADAPTOR	D004 - 0092
3	FRONT BEARING PIPE ADAPTOR	D562 - 0169
4	OILSIGHT PIPE ADAPTOR	D562 - 0170
5	REAR BEARING PIPE ADAPTOR	D562 - 0171
6	6MM O/DPLASTIC TUBE	R827 - 4213
7	NYLON TUBE ENOTS 4MM DIAMETER	R827 - 4211
8	1/8" BSPT / 6MM ELBOW	B435 - 0132
9	6mm OD PIPE/1/4" BSPT ELBOW	B435 - 0127
11	STRAIGHT CONNECTOR - 1/8" BSPT / 4MM	B435 - 0134
12	6MM SLEEVE NUT	B435 - 0022
13	6MM CONE (OLIVE)	B435 - 0011
14	TUBING NUT 4MM	B435 - 0021
15	TUBING SLEEVE 4MM O.D. PIPE	B435 - 0010
16	HOBBS ELBOW - 1/2" BSP - 1/2"	B433 - 2257
17	HOBBS LOCKNUT - 1/2" BSP	B433 - 0893
18	HOBBS SEAL - 1/2" BSP SIZE	B433 - 3241
19	TUBING NUT - 1/2" OD PIPE	B433 - 0811
20	TUBING SLEEVE - 1/2" OD PIPE	B433 - 0851

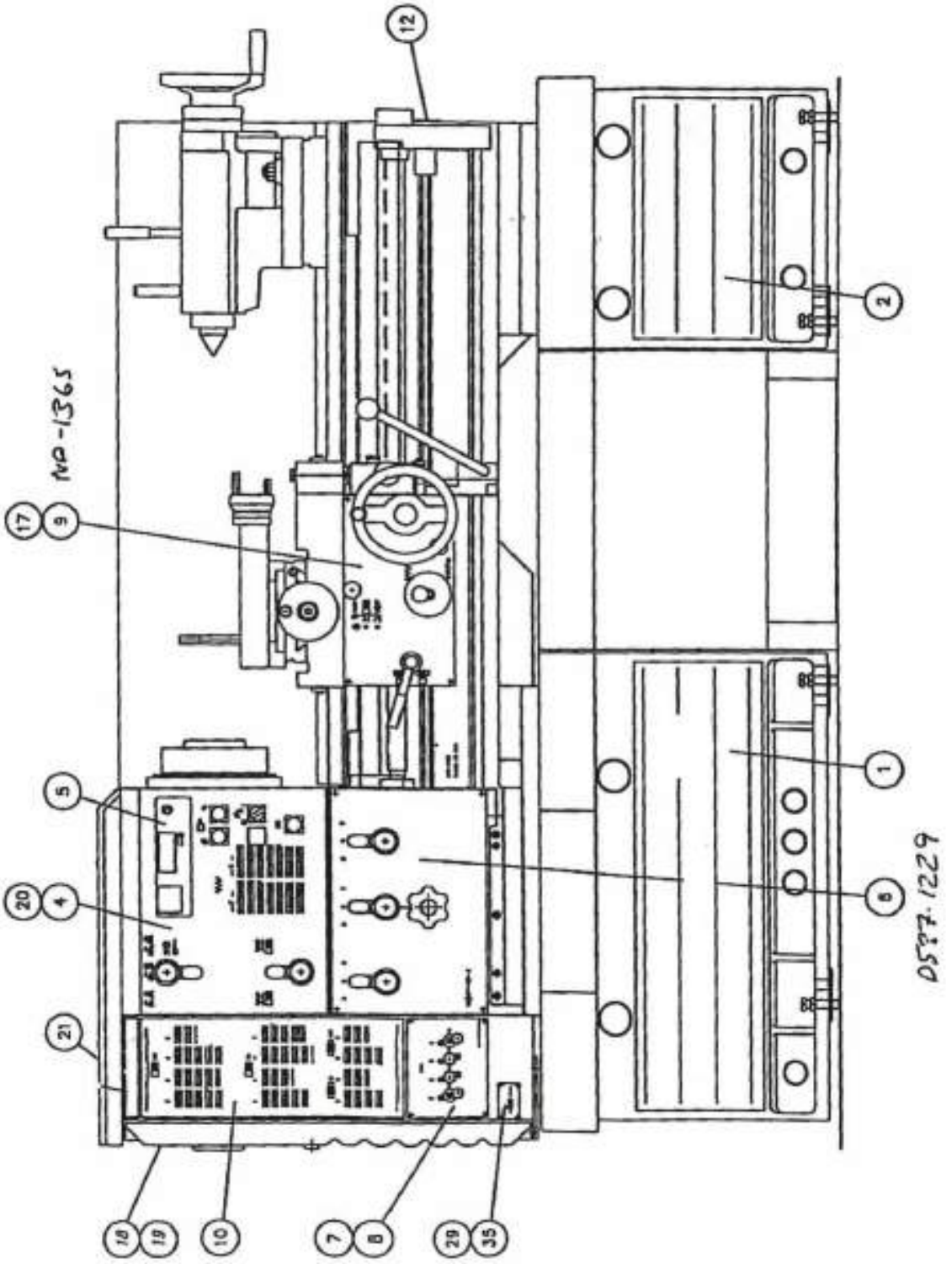
COOLANT ARRANGEMENT



COOLANT ASSEMBLY A167-0510A

ITEM	DESCRIPTION	PART No.
1	STANDPIPE ASSEMBLY	AH - 0040
2	COOLANT PUMP ASSEMBLY (M.G.)	A867-0046A
3	COOLANT PUMP ASSEMBLY (NON M.G.)	A867-0049A
4	COOLANT TANK	D828 - 0061
5	COOLANT TANK COVER 1250MM	D132 - 0700
6	COOLANT TANK COVER 650MM	D132 - 0699
7	PUMP MOUNTING PLATE	D565 - 0943
8	PLASTIC SLEEVE	D704 - 0048
11	PLASTIC HOSE 1/2" BORE 1200MM	R827 - 6127
12	PLASTIC HOSE 1/2" BORE 650MM	R827 - 6127
13	HOSE CLIP SIZE 0	FU - 0040
14	TUBE CLIP ENOTS 3/4" DIA	B233 - 1109
16	HEXAGON SOCKET BUTTON HEAD SCREW M6 X 10	FS - 0292
18	HEXAGON SOCKET BUTTON HEAD SCREW M6 X 12	FS - 0294
20	WASHER M6	FP - 0040
	COOLANT PUMP ASSEMBLY (M.G.) A867-0046A	
1	MG PUMP AQ3/2/Q/SS POS F	MC - 0050
2	PUMP HARNESS ASSEMBLY	A826-0768
	COOLANT PUMP ASSEMBLY (NON M.G.) A867-0049	
1	COOLANT PUMP (NON M.G.)	B473-0320
	PUMP HARNESS ASSEMBLY (NON M.G.)	A826-1072

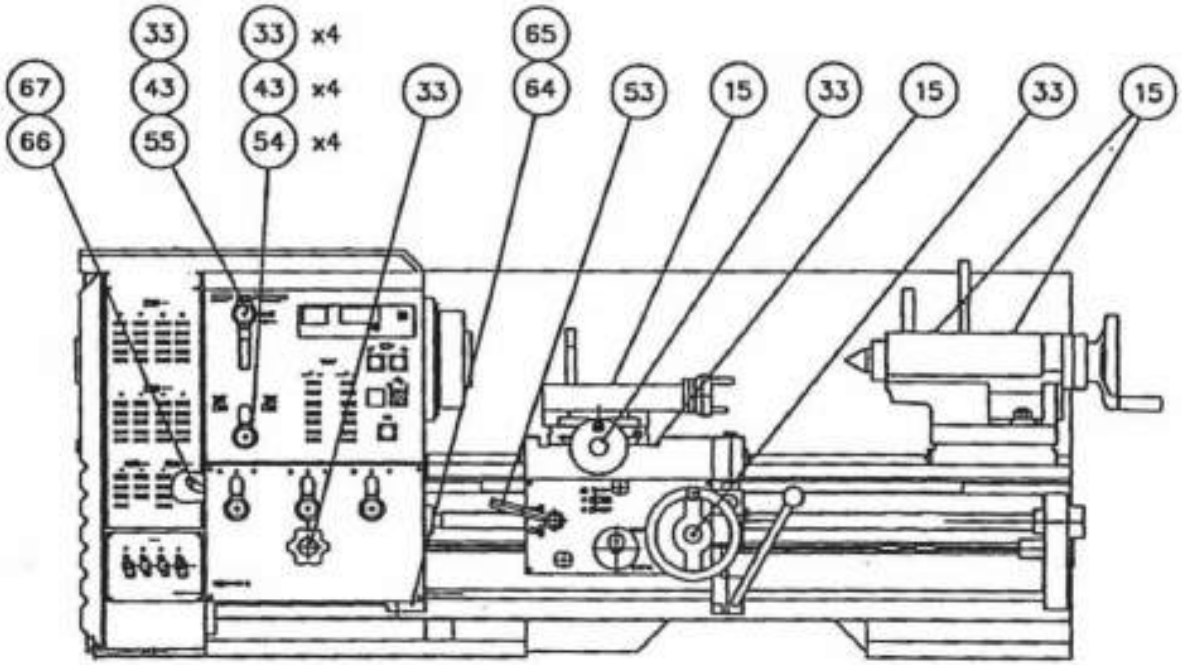
NAMEPLATES ASSEMBLY



NAMEPLATES ASSEMBLY (STANDARD) A161 - 0512

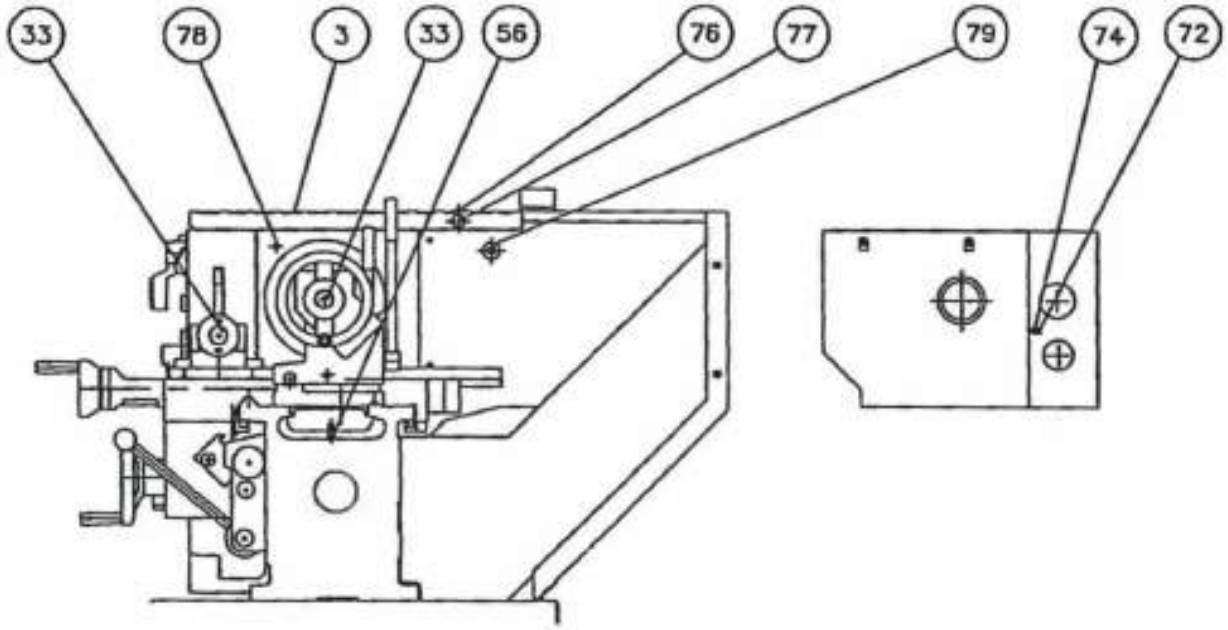
ITEM	DESCRIPTION	PART No.
1	'H' NAMEPLATE - TAILEND	D537 - 1214
3	'T.S.H. V390' NAMEPLATE - HEADEND	D537 - 1245
4	PUSHBUTTON NAMEPLATE	D537 - 1233
5	SPEED CONTROL NAMEPLATE	D537 - 1088
7	CHANGEWHEEL NAMEPLATE - METRIC	D537 - 1124
8	CHANGEWHEEL NAMEPLATE - ENGLISH	D537 - 1123
12	"H" LEGEND NAMEPLATE	D537 - 1169
18	CONFORMITY NAMEPLATE (CE MARKING)	D537 - 1213
19	ELECTRICAL WARNING FLASH PLATE	D565 Y0406
21	DESIGN REGISTRATION NAMEPLATE	D537 - 1165
25	CLIUTCH ADJUSTING NAMEPLATE	D537 - 0848
28	LABEL RED ARROW - LUB PUMP	D537 - 1039
29	'THE 600 GROUP' LOGO NAMEPLATE	D537 - 1071
30	CHUCK WARNING NAMEPLATE	D537 - 1082
32	WARNING TIE ON LABEL	D537 - 1093
35	SCREW TAPTITE M3 X 5 LG	B123 - 6065
37	BUTTON HEAD SOCKET SCREW M4 X 10	FS - 0274

TRIMMINGS ASSEMBLY (1)



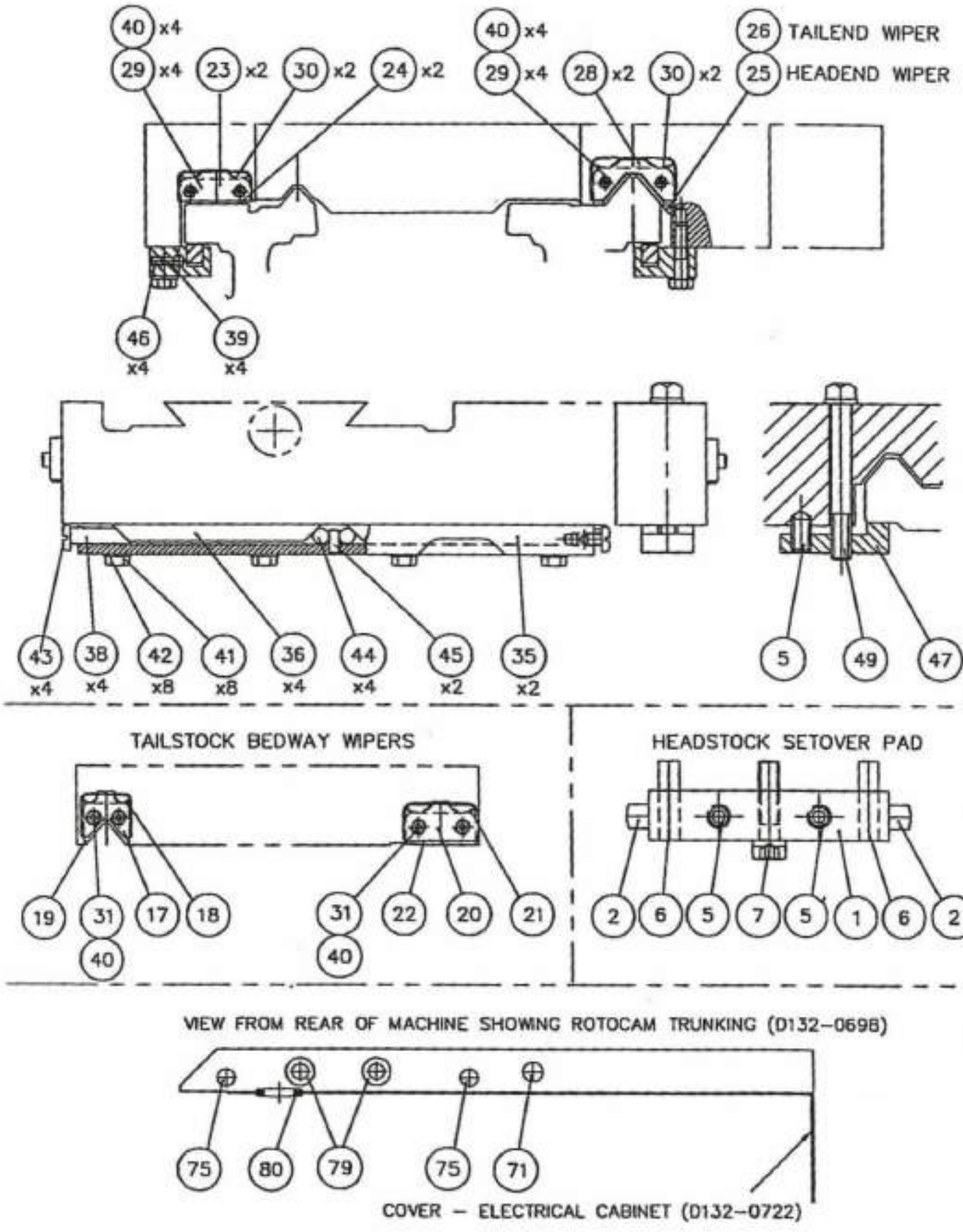
ITEM 78 TO BE FITTED ON MASTER MACHINES NOT REQUIRING A CHUCK GUARD ONLY.

ITEMS 76 & 77 TO BE FITTED TO ALL MACHINES NOT REQUIRING A CHUCK GUARD.



ITEM	DESCRIPTION	PART No.
1	SET OVER PAD	D557 - 0142
2	PIN SET OVER	D560 - 0297
3	HEADSTOCK MAT	D132 - 0797
5	WEDGLOK SET SCREW M12 X 20	B164 - 0170
6	SPIROL PIN 10 DIA X 40	B111 - 5160
7	CAP HEAD SOCKET SCREW M10 X 40	FS -0190
8	CAP HEAD SOCKET SCREW M8 X 40	FS - 0170
9	HEX HEAD SOCKET SCREW M12 X 55 LG	B166 - 0136
10	CAP HEAD SOCKET SCREW M8 X 20	FS - 0162
12	BED STOP PIN	D560 - 0307
13	DOWEL PIN I0 DIA X 36MM LG.	B111 Y7060
14	DOWEL PIN 10 DIA X 30 LG	B111 - 7057
15	OIL NIPPLE 6MM DRIVE IN CONCAVE	OC - 0010
17	VEE SHIELD	D725 - 0019
18	SPRING	D707 - 0067
19	VEE WIPER	D937 - 0013
20	BEDWAY SHIELD FLAT.	D725 - 0020
21	SPRING 6 7 8 & 10 IN MCS	D707 - 0068
22	FLAT WIPER	D937 - 0014
23	WIPER FLAT SHIELD	D725 - 0013
24	BED FLAT WIPER	D937 - 0010
25	VEE WIPER HEAD-END	D937 - 0034
26	VEE WIPER TAIL-END	D937 - 0033
28	BEDWAY WIPER VEE SHIELD	D725 - 0014
29	SPACER BED 800	D708 - 0087
30	LEAF SPRING	D707 - 0051
31	R SPACER 1/40DXI/2 760	D708 - 0143
34	BLACK CAP C380	ED - 1425
35	SADDLE STRIP MOUNT STD	D345 - 0083
36	SADDLE STRIP STD	D715 - 0173
38	STRIP ADJUSTER-SHORT	D715 - 0192
39	LOCK PAD STD	D557 - 0143
40	BUTTON HEAD SOCKET SCREW M4 X 12	FS - 0278
41	H.T. HEX HEAD SOCKET SCREW M8 X 35	FS - 0578
42	M8 TYPE A WASHER	FP - 0140
43	SLOTTED PAN HEAD SCREW WITH NYLOC M8 X 16	FS - 0723
44	CYLINDRICAL ROLLER I0MM DIA. X 10	BD - 0080
45	SPIROL PIN M6 X 16 MBK	FT - 0330
46	SOCKET SET SCREW W POINT M6X8MM	B163 Y1561
47	SADDLE CLAMP	D715 - 0209
49	SADDLE LOCKING SCREW	D697 - 0393
50	M12 BRIGHT WASHER LIGHT STEEL FORM A	FP - 0070
51	DISC	D402H102.1
52	SPRING SG371	FR - 0010
55	HANDLE - RANGE CHANGE	D382 - 0146

TRIMMINGS ASSEMBLY (2)



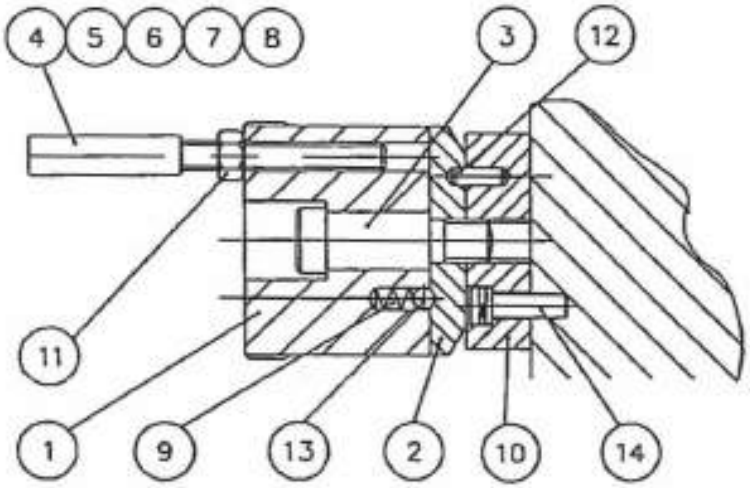
ITEM	DESCRIPTION	PART No.
56	STOP PIN TAILSTOCK	D560 - 0298
57	HANDLE	D403H053.2
58	BUTTON HEAD SOCKET SCREW M6 X 16	FS - 0296
61	ROCOL MOULD RELEAS AGENT	R741 - 0110
62	TIPONEX 6-KILO TIN	YF - 0210
64	GEARBOX EXTENSION BRACKET	D050 - 0790
65	CAP HEAD SOCKET SET SCREW M8 X 50	FS - 0174
66	12 BSP 45 M&F ELBOW	B424 - 2254
67	PLUG 12IN BSP 43774	B424 - 2814
68	BUTTON HEAD SOCKET SCREW M6 X 12	FS - 0294
69	WASHER M6 FORM C PLATED	B117 - 0048
70	M6 NYLOCK NUT	FS - 0930
71	PLUG R.MOSS 15159 16MMDIA	B715 - 1077
72	TUBING CLIP - ENOTS 34021803	B233 - 1103
74	HEXAGON SOCKET BUTTON HEAD SCREW M4 X 10	FS - 0274
75	PLUG - ROBERT MOSS 10502	B224 - 2244
76	PVC BLANKING PLUG A101	B224 - 2209
77	PLUG ROBERT MOSS 10755	B224 - 2304
78	CUP POINT SCREW M12 X 12	FS - 0526
79	BLANK PLUG 25 DIA MOSS10705	B224 - 2240
80	GROMMET - ROBERT MOSS 10446	B715 - 1085
81	BLANKING PLUG - REF. 2694	B224 - 2308

SHEET METAL PACK A137 - 0525

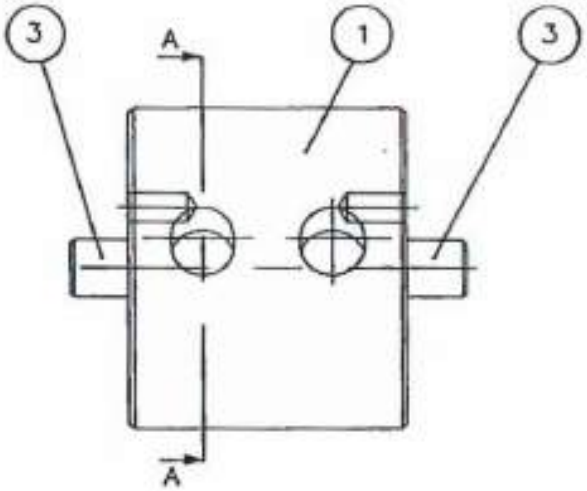
ITEM	DESCRIPTION	PART No.
3	HEAD END COVER	D132 - 0697
4	TRUNKING	D132 - 0698
9	SWARF BIN 650 mm	D832 - 0154
10	SWARF BIN 1250mm	D832 - 0155
16	SPLASH GUARD SUPPORT BRACKET TAIL END	D050 - 0656
17	SPLASH GUARD 650 mm	D346 - 0376
18	SPLASH GUARD 1250 mm	D346 - 0377
22	SPLASH GUARD INFILL PLATE	D565 - 0960
25	COOLANT TANK	D828 - 0061
26	PUMP MOUNTING PLATE	D565 - 0943
27	COOLANT TANK COVER 650 mm	D132 - 0699
28	COOLANT TANK COVER 1250 mm	D132 - 0700
29	INFILL SUPPORT PLATE	D565 - 0995
30	INFILL PLATE STRAIGHT BED	D565 - 0917
31	INFILLPLATE GAP BED	D565 - 0994
32	SPLASHGUARD INFILL PLATE	D565 - 1043
33	COVER - TORQUE LIMITER	D132 - 0876

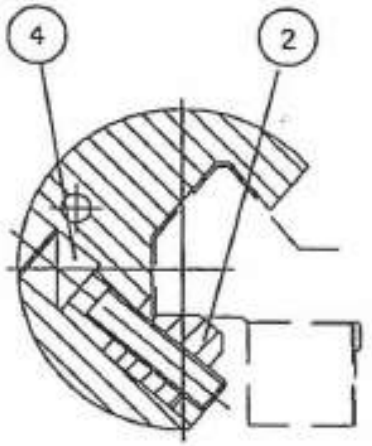
ACCESSORIES INDEX

TURRET STOP ASSEMBLY A184 – 0516



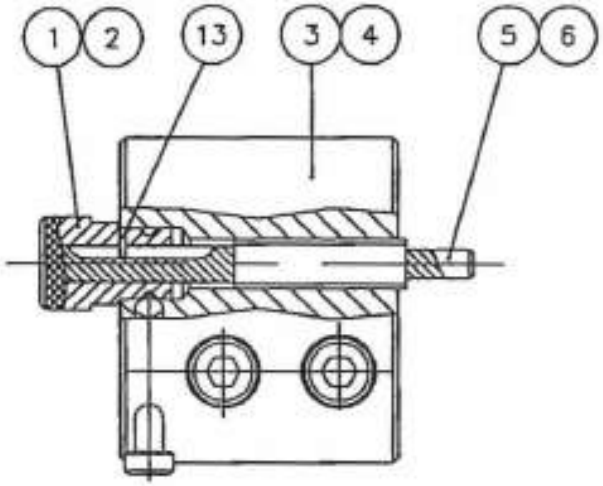
SINGLE BED STOP A184 – 0514

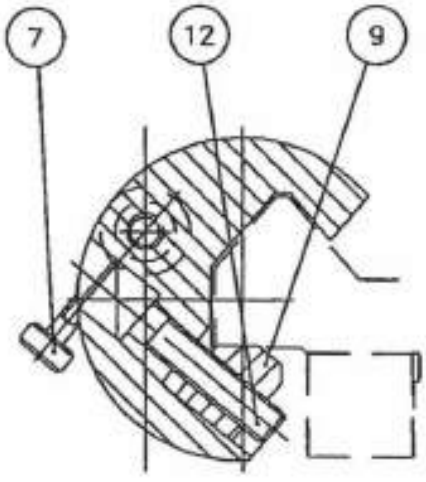




SECTION A–A

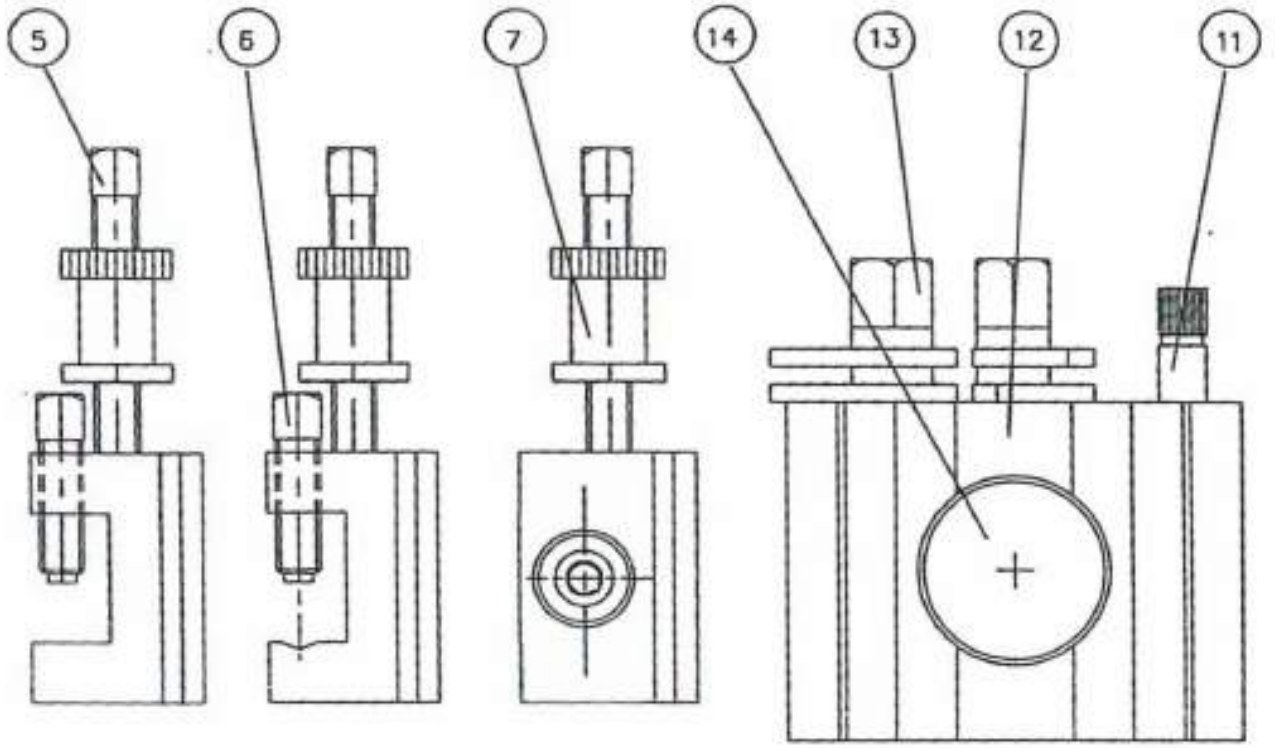
MICROMETER BED STOP A184 – 0515



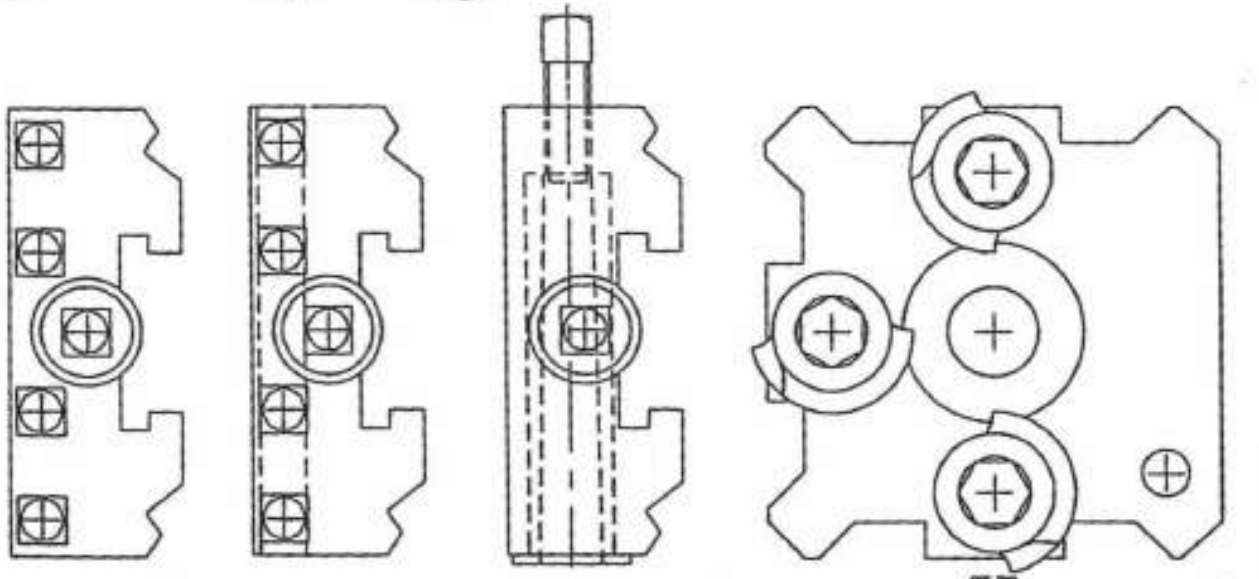


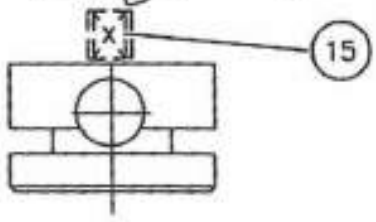
Item No.	Description	Part No.
	FIVE POSITION TURRET STOP ASSEMBLY	A184-0516
1	TURRET - 5 POSITION STOP	D835-0016
2	TURRET PLATE	D565-0930
3	TURRET SPINDLE	D709-0049
4	STOP SCREW	D697-0351
5	STOP SCREW	D697-0352
6	STOP SCREW	D697-0353
7	STOP SCREW	D697-0354
8	STOP SCREW	D697-0355
9	MULTI-COMPRESSION SPRING	D707-0033
10	SUB PLATE	D565-0931
11	HEXAGON LOCK NUT M8	B147-9170
12	SPIROL PIN 5 X 12 MBK	B111-5089
13	CYCLE BALL BEARING 1/4 INDI	B326-8107
14	HEXAGON SOCKET CAP HEAD SCREW M6 X 20	B163-0038
	SINGLE BED STOP ASSEMBLY	A184-0514
1	BED STOP BODY	D712-0069
2	CLAMP - BED STOP	D131-0040
3	PAD - BED STOP	D557-0149
4	HEXAGON SOCKET CAP HEAD SCREW M10 X 45	B163-0072
	MICROMETER BED STOP ASSEMBLY	A184-0515
1	THIMBLE IMPERIAL	D382-0142
2	THIMBLE METRIC	D382-0143
3	MICROMETER BED STOP IMPERIAL	D712-0070
4	MICROMETER BED STOP MM	D712-0071
5	STOP ROD IMPERIAL	D648-0091
6	STOP ROD METRIC	D648-0092
7	CLAMP SCREW - BED STOP	D697-0350
9	CLAMP - BED STOP	D131-0040
12	HEXAGON SOCKET CAP HEAD SCREW M10 X 45	B163-0072
13	DOWEL PIN 1/8" X 1/4"	B111-1041

QUICK CHANGE TOOLPOST



(4) STANDARD (16) VEE (3) 2 MORSE TAPER





ADDITIONAL TOOLHOLDERS

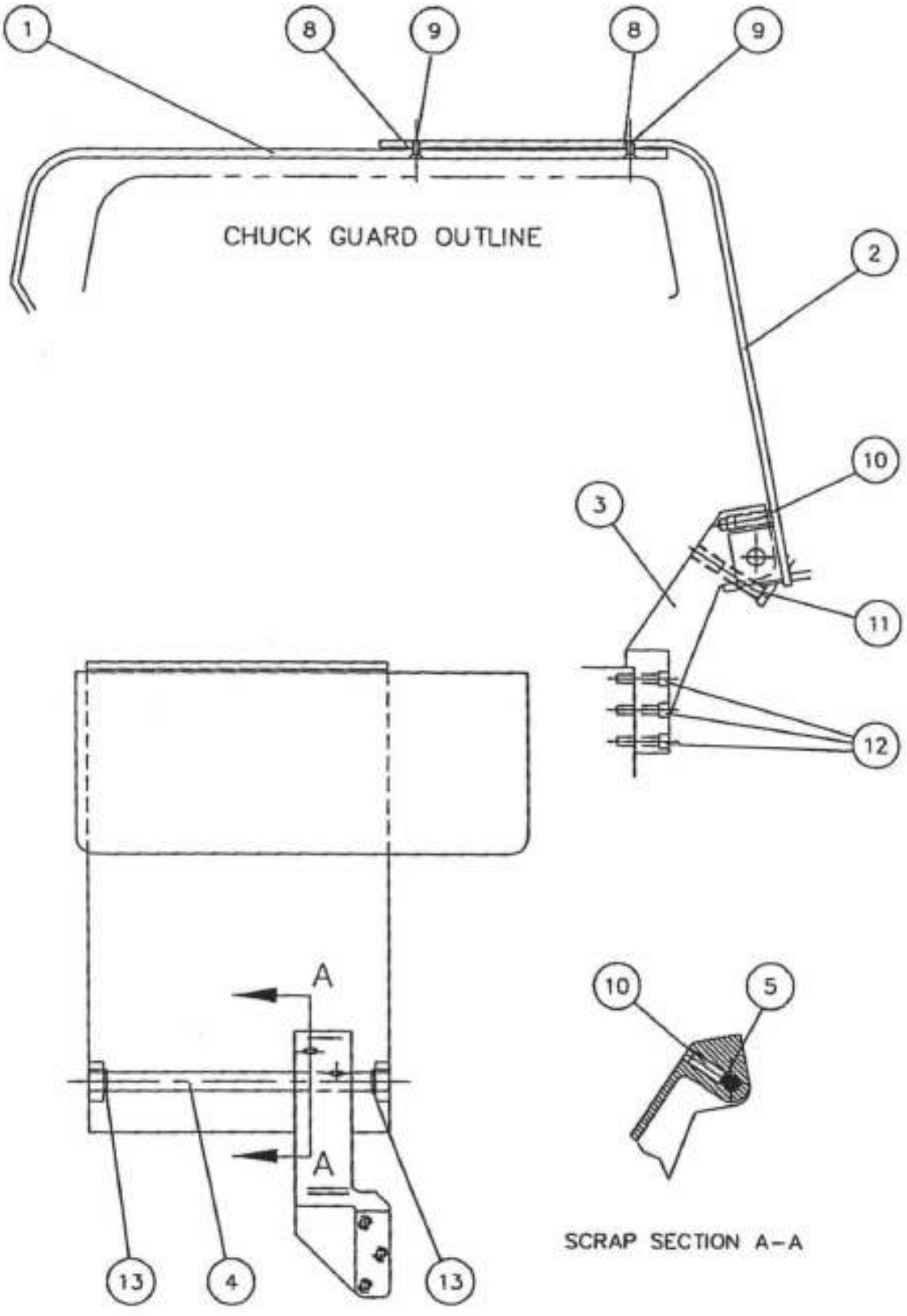
(1) PARTING OFF TOOLHOLDER
(2) Parting Off Blade
(8) BORING TOOLHOLDER

WRENCHES

(9) TOOL CLAMP SCREW
(10) CAM CLAMP

TR.10.90

CHIP GUARD ASSEMBLY

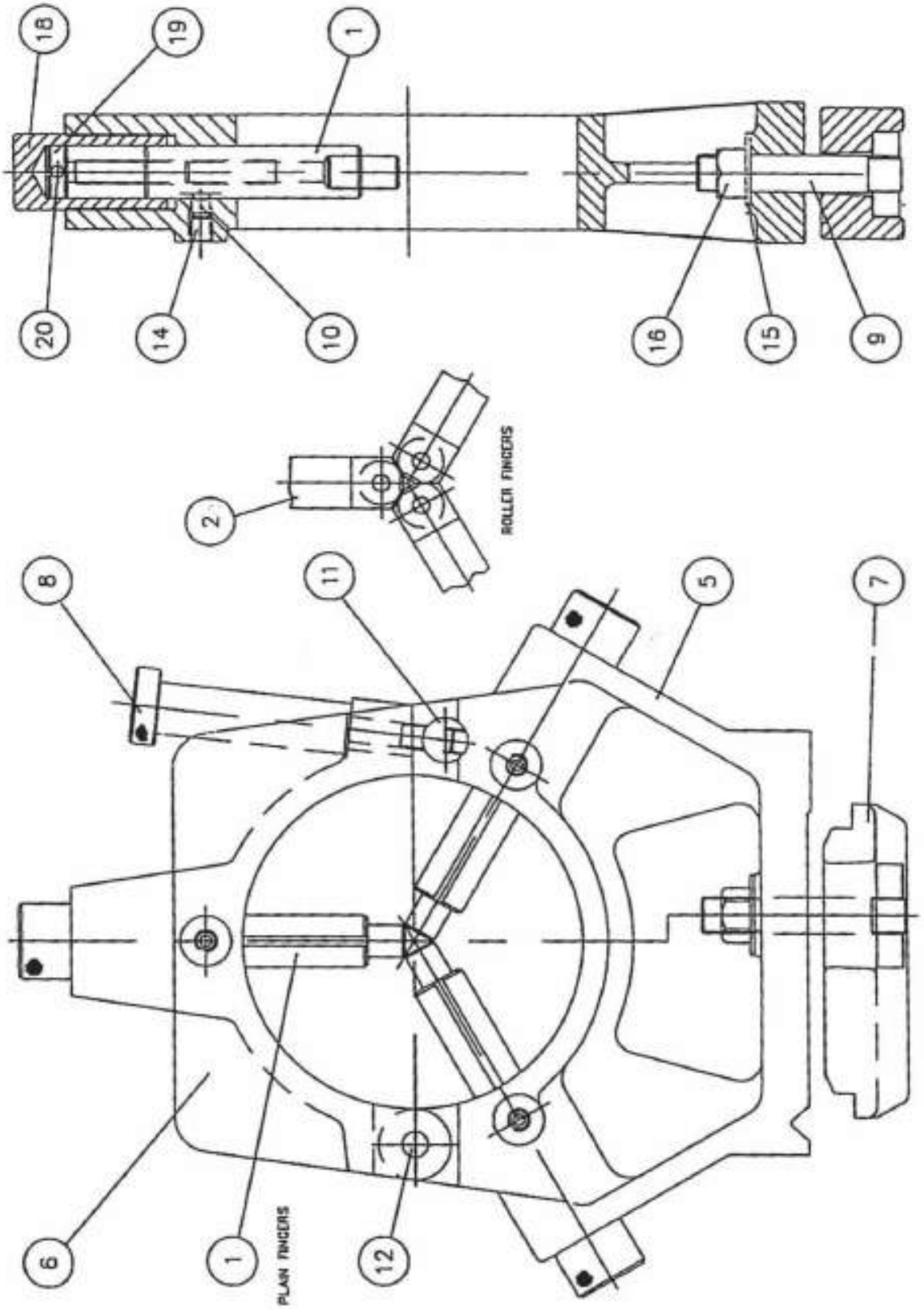


CHIP GUARD ASSEMBLY

A137 - 0518

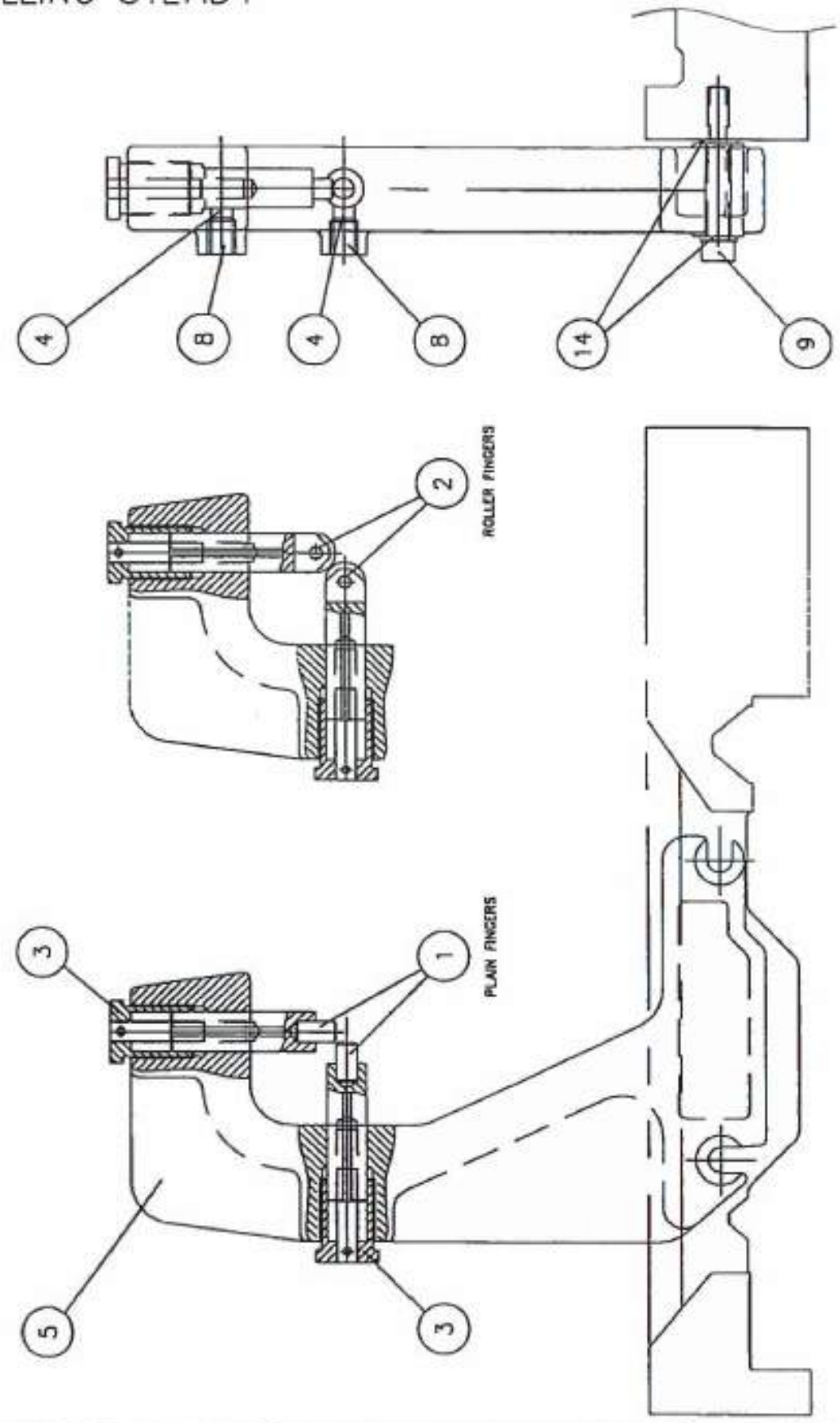
Item No.	Description	Part No.
1	CHIP GUARD	D346 - 0111
2	SUPPORT	D718 - 0035
3	BRACKET	D050 - 0176
4	SHAFT	D699 - 0485
5	PLUG	D566 - 0089
8	FIBRE WASHER 1/4" ID 1/2" OD	B411 - 0006
9	COUNTERSUNK SCREW 10-24 UNCx1/2"	B143 - 7403
10	CUP POINT SET SCREW 1/4"x1"	B143 - 5069
11	OVAL POINT SET SCREW 1/4"x11/4"	B143 - 5672
12	HEXAGON SOCKET CAP HEAD SCREW M6x30	B163 - 0040
13	EXTERNAL CIRCLIP 1/2" ID	B362 - 0013

STATIONARY STEADY ASSEMBLY



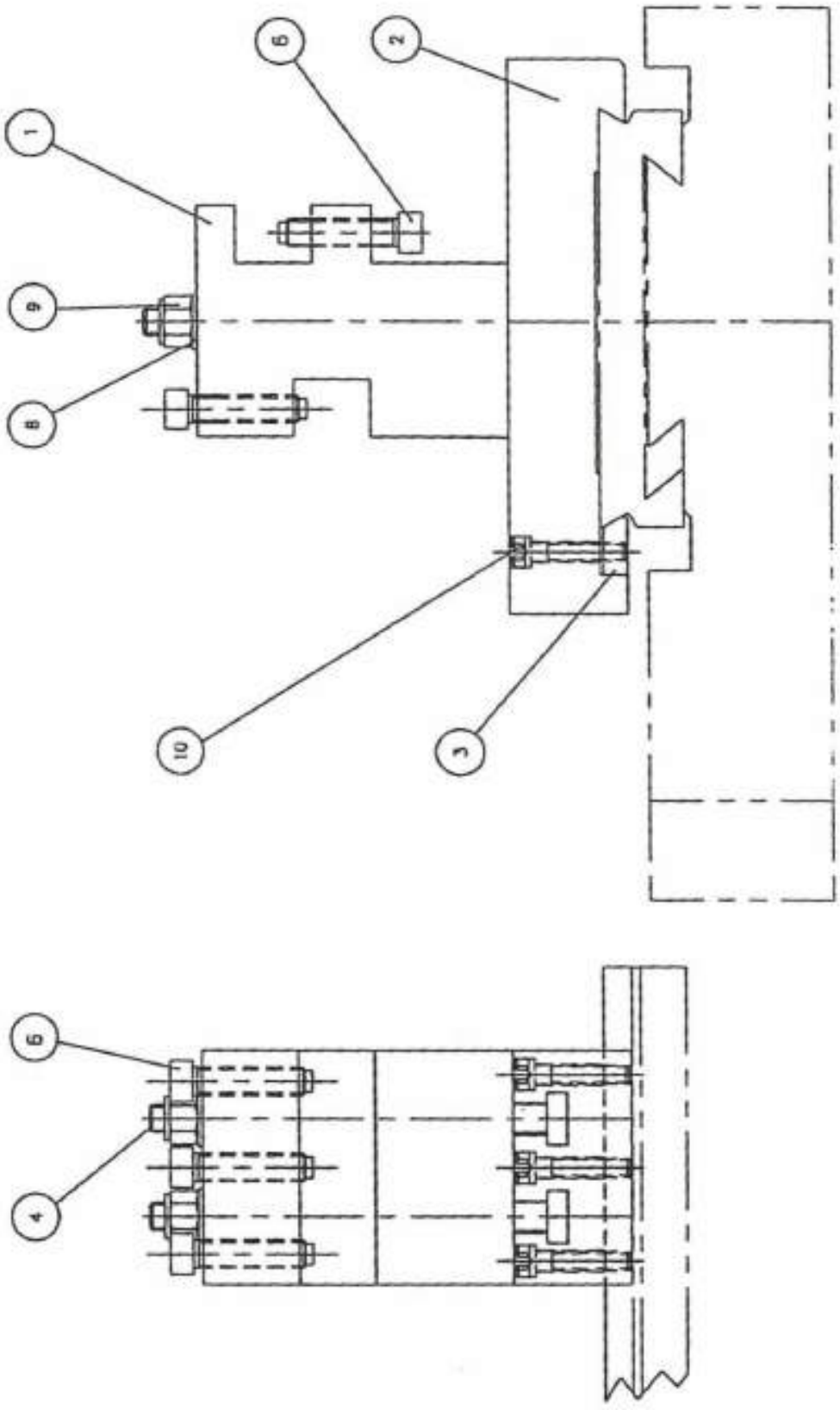
Item No.	Description	Part No.
1	PAD TYPE FINGER SUB-ASSEMBLY	A882 - 0018
2	ROLLER FINGER SUB-ASSEMBLY	A882 - 0014
5	STEADY BOTTOM	D722 - 0057
6	STEADY TOP	D722 - 0061
7	CLAMP PLATE	D131 - 0036
8	LOCKING PIN	D697 - 0177
9	CLAMP STUD SUB-ASSEMBLY	A840 - 0045
10	KEY	D441 - 0043
11	PIN	D560 - 0161
12	HINGE PIN	D560 - 0162
14	DOG POINT SCREW M12x12	B163 - 1780
15	WASHER M16	B117 - 0013
16	NYLOC NUT M16	B147 - 9008
18	COLLAR	D133 - 0196
19	STEADY SCREW	D697 - 0222
20	SPIROL PIN	B111 - 2494
	SUB - ASSEMBLIES	
	PAD TYPE FINGER SUB - ASSMBLY	A882 - 0018
1	FINGER	D300 - 0024
2	PAD INSERT	D421 - 0021
	ROLLER FINGER SUB-ASSEMBLY	A882 - 0014
1	ROLLER FINGER	D300 - 0014
2	PIN	D560 - 0163
5	BEARING FAG 6082 Z or NTN608ZZ	B315 - 0208
7	SET SCREW 10-24 UNCx3/16"	B143 - 5002
	CLAMP STUD SUB-ASSEMBLY	A840 - 0045
1	STUD	D711 - 0191
2	STUD PLATE	D565 - 0913
3	SPIROL PIN 5 DIA.x36	B111 - 5099

TRAVELLING STEADY



Item No.	Description	Part No.
1	PAD TYPE FINGER SUB-ASSEMBLY	A882 - 0019
2	ROLLER TYPE FINGER SUB-ASSEMBLY	A882 - 0015
3	COLLAR	D005 - 0482
4	KEY	D441 - 0043
5	STEADY	D722 - 0058
8	DOG POINT SCREW M12x12	B163 - 0076
9	HEXAGON SOCKET CAP HEAD SCREW M10x65	B163 - 0076
14	WASHER	D931 - 0217
	SUB - ASSEMBLIES	
	PAD TYPE FINGER SUB - ASSMBLY	A882 - 0019
1	FINGER	D300 - 0017
2	PAD INSERT	D421 - 0004
	ROLLER FINGER SUB-ASSEMBLY	A882 - 0015
1	ROLLER FINGER	D300 - 0016
2	PIN	D560 - 0164
5	BEARING FAG 6252 Z or NTN625ZZ	B315 - 0203
7	SOCKET HEAD SET SCREW 4 BAx3/16"	B133 - 0062

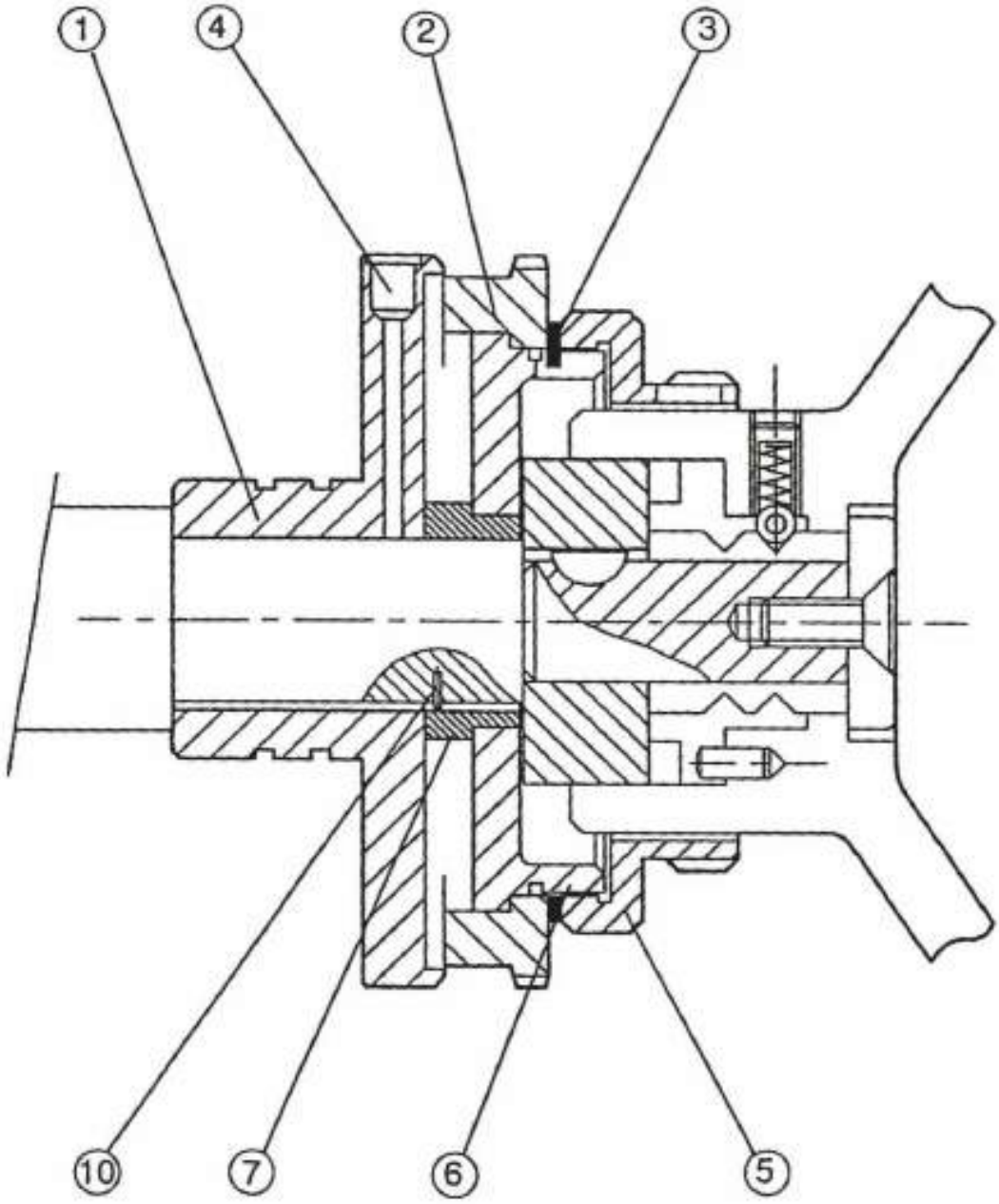
REAR TOOLPOST ARRANGEMENT



REAR TOOLPOST ASSEMBLY

A182 - 0515A

Item No.	Description	Part No.
1	REAR TOOLPOST BODY	D831 - 0062
2	BASE PLATE	D565 - 0937
3	GIB STRIP	D345 - 0087
4	TEE BOLT	D048 - 0158
6	SQUARE HEAD SET SCREW M12x50	B170 - 0005
8	WASHER M12	B117 - 0012
9	NYLOC NUT M12	B147Y9025
10	HEXAGON SOCKET CAP HEAD SCREW M8x40	B163 - 0057


1
4
2
3
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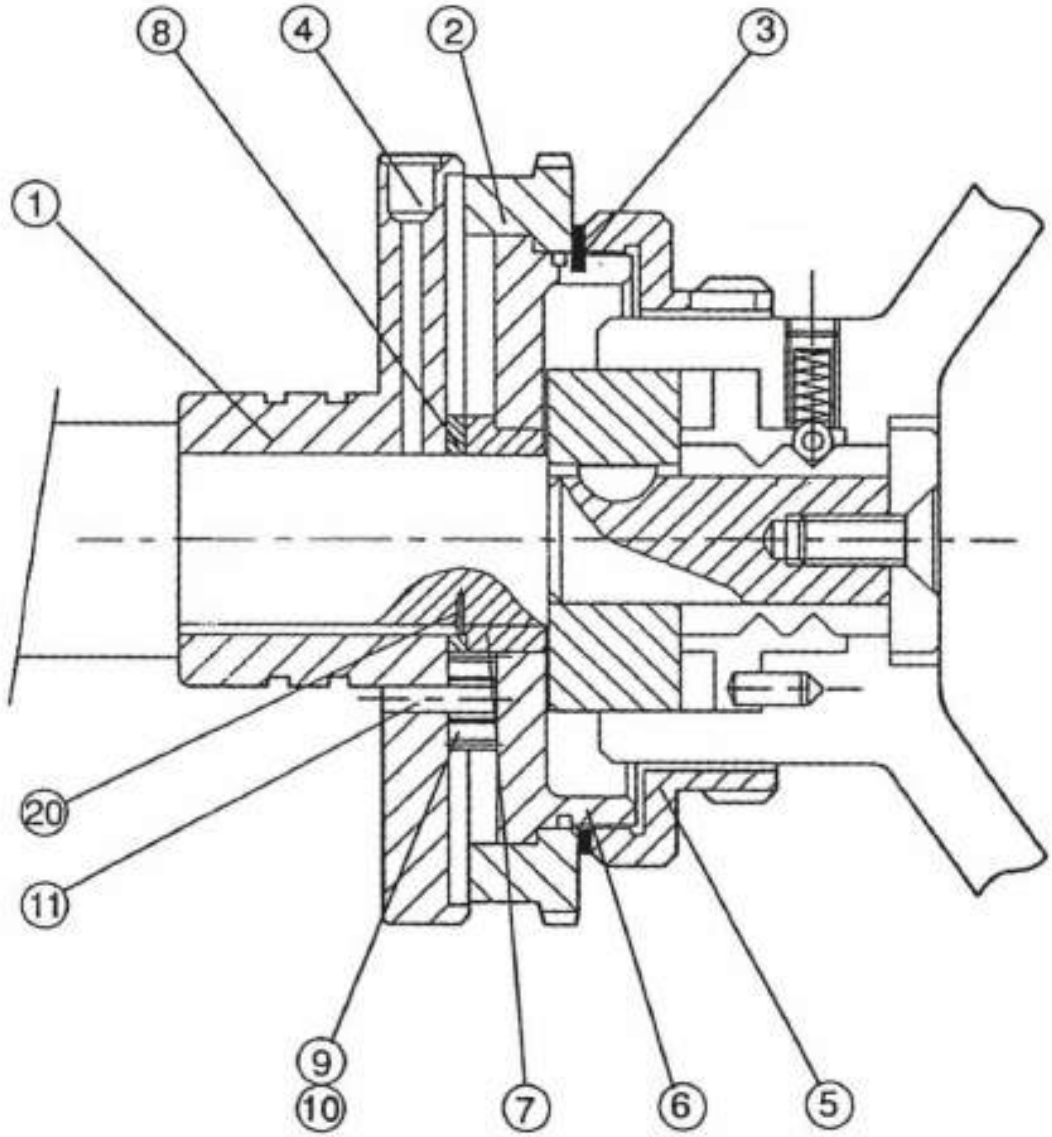
APRON DIAL ASSEMBLY (METRIC)

B973 - 2130

Item No.	Description	Part No.
1	Keep	B340 - 0001
2	Dial - Metric	B973 - 2070
3	Tab Washer	B117 - 0181
4	Grease Nipple	B416 - 0001
5	Index Lock Ring	B520 - 0001
6	Bearing Spigot	B539 - 0002
7	Sleeve	B537 - 0002


8
4
2
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1
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11
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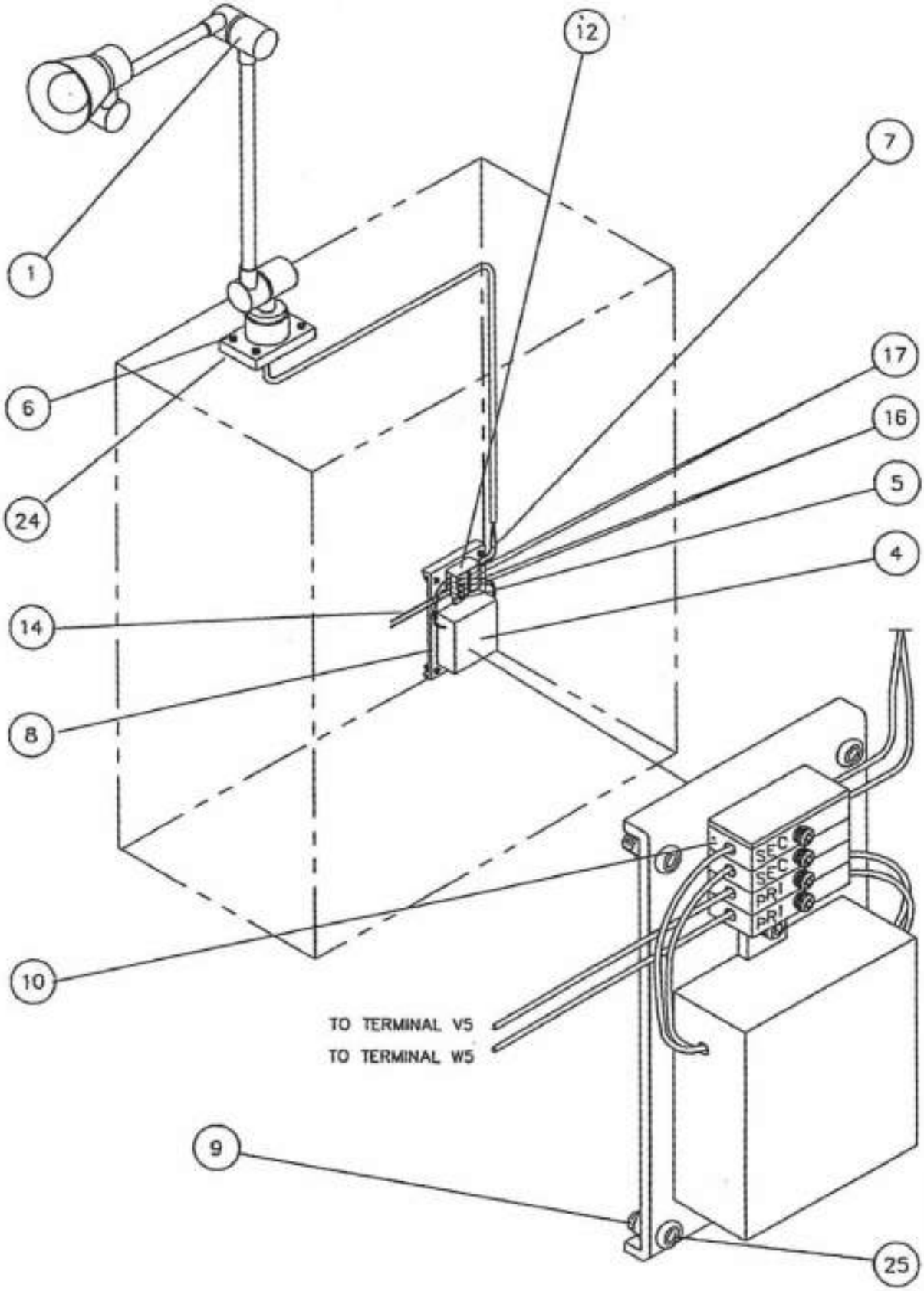
10
7
6
5

APRON DIAL ASSEMBLY (INCH)

B973 - 2129

Item No.	Description	Part No.
1	Keep	B340 - 0001
2	Dial - Imperial	B973 - 2071
3	Tab	B117 - 0181
4	Grease Nipple	B416 - 0001
5	Index Lock Ring	B520 - 0001
6	Bearing Spigot	B539 - 0002
7	64T Gear	B508 - 0030
8	63T Gear	B508 - 0031
9	15T Idler Gear	B508 - 0032
10	Bearing INA K4X7X7	B337 - 9053
11	Solid Dowel 4x15 long	B111 - 6028
20	Spirol Dowel 2x6 long	B111 - 5285

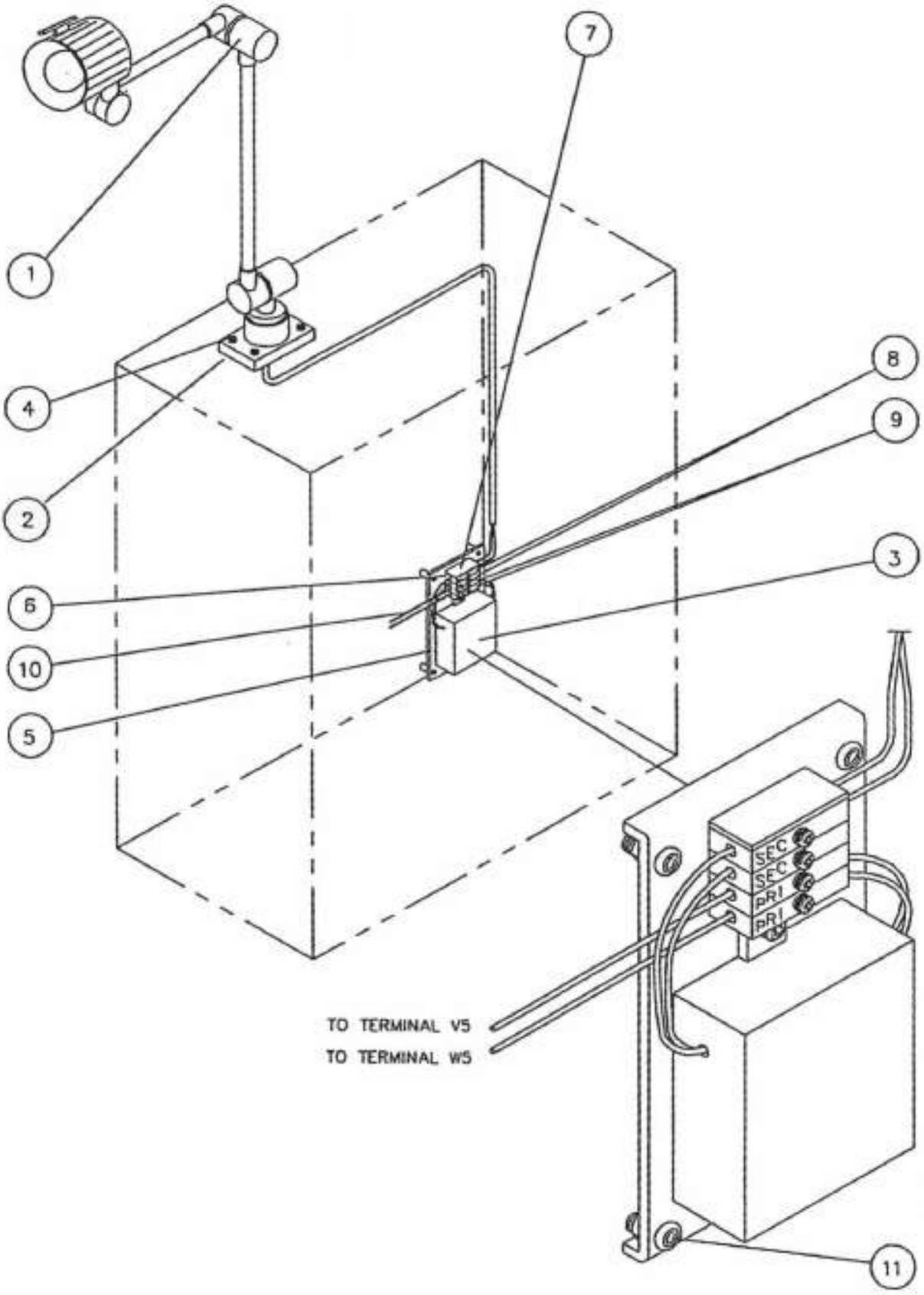
LO-VO LIGHT ASSEMBLY



LO-VO LIGHT ASSEMBLY A170-0-0505

Item No.	Description	Part No.
1	LO-VO LITE	B784 - 1140
4	TRANSFORMER 415v PRIMARY 50v SECONDARY	B772 - 3019
5	HEXAGON SOCKET CAP HEAD SCREW M4x8	B163 - 1803
6	HEXAGON SOCKET CAP HEAD SCREW M5x20	B163 Y0028
7	HEXAGON SOCKET CAP HEAD SCREW M3x8	B163Y0003
8	PLATE	D565 - 0920
9	NYLOC NUT M4	B147Y9001
10	FUSE BLOCK KLIPPON ASK 1	B718 - 2047
12	END PLATE KLIPPON AP(1.5)	B718 - 2048
14	PVC 1.0mm SQ. WIRE RED	R512 - 6002
16	FUSE R.S. 413-973 20mm 2A	B752 - 1237
17	FUSE R.S. 413-967 20mm 1A	B752 - 1235
24	NYLOC NUT M5	B147 - 9002
25	HEXAGON SOCKET BUTTON HEAD SCREW M4x16	B163 - 1806

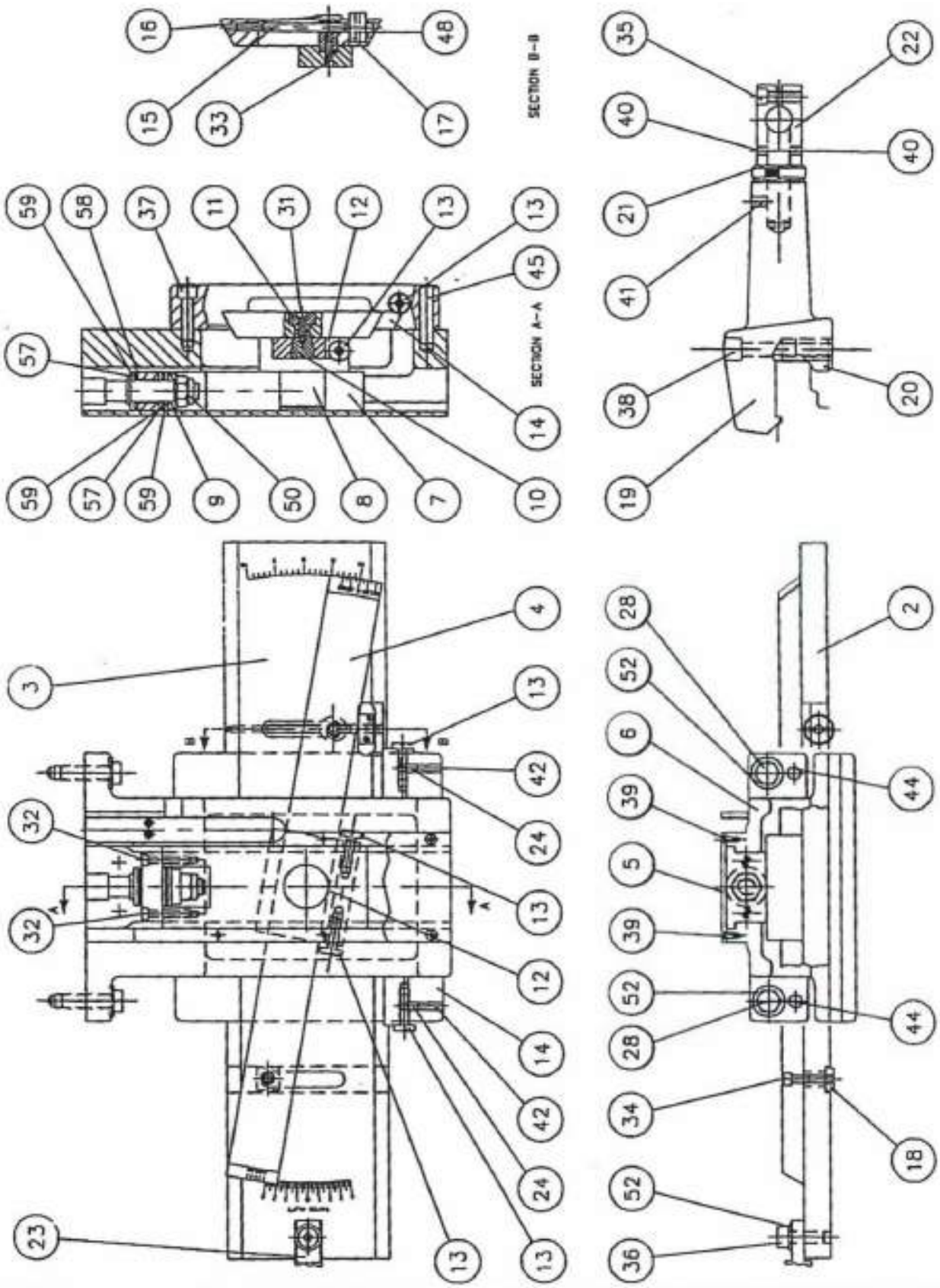
LO–VO LIGHT ASSEMBLY (HALOGEN)



LO - VO LIGHT ASSEMBLY (HALOGEN) A170 - 0506

Item No.	Description	Part No.
1	HALOGEN LIGHT HGW 70-N	B784 - 1226
2	ADAPTOR BLOCK	D047 - 0124
3	TRANSFORMER 63VA.380V/23V	B772 - 3023
4	HEXAGON SOCKET CAP HEAD SCREW M5x16	B163 - 0027
5	PLATE	D565 - 0920
6	FUSE BLOCK KLIPPON ASK 1	B718 - 2047
7	END PLATE KLIPPON AP(1.5)	B718 - 2048
8	FUSE R.S. 413-973 20mm 1A	B752 - 1235
9	FUSE R.S. 413-967 20mm 2A	B752 - 1237
10	PVC 1.0mm SQ. WIRE RED	R512 - 6002
11	HEXAGON SOCKET CAP HEAD SCREW M3x8	B163 Y0003

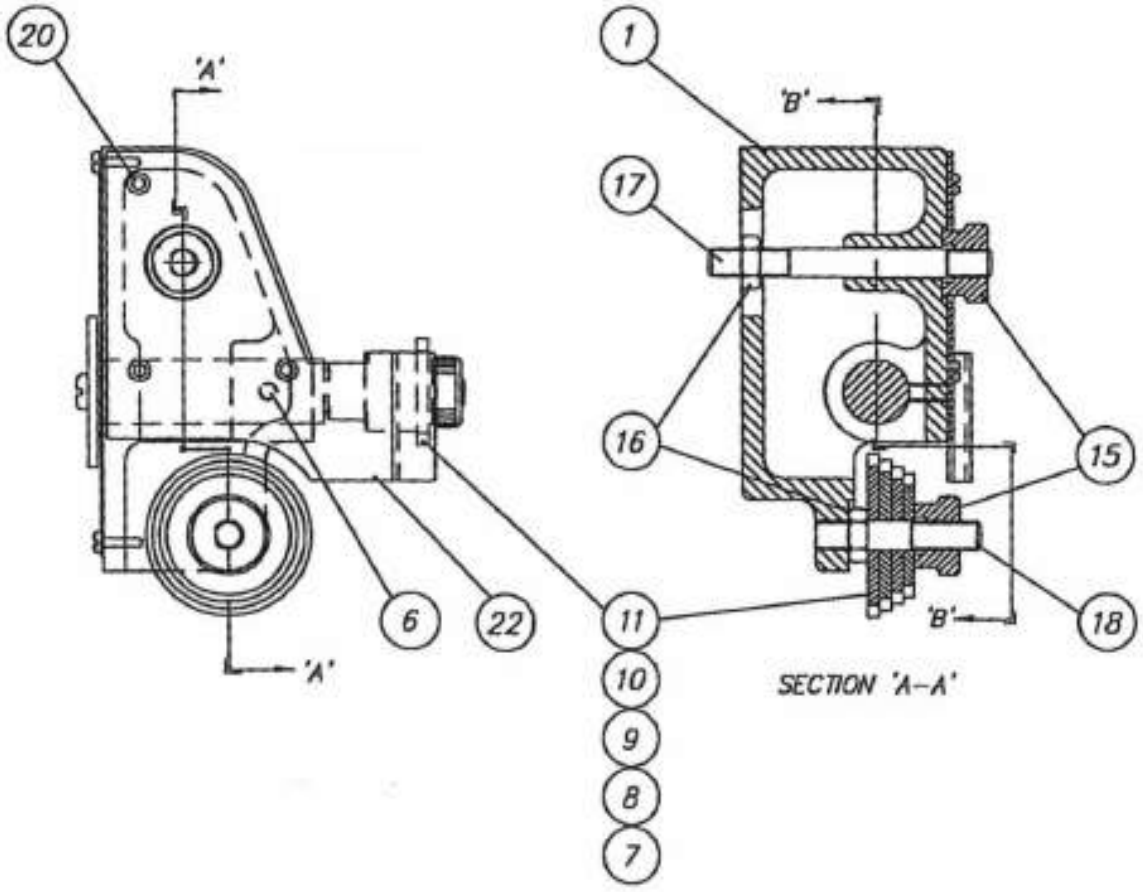
TAPER TURNER ASSEMBLY



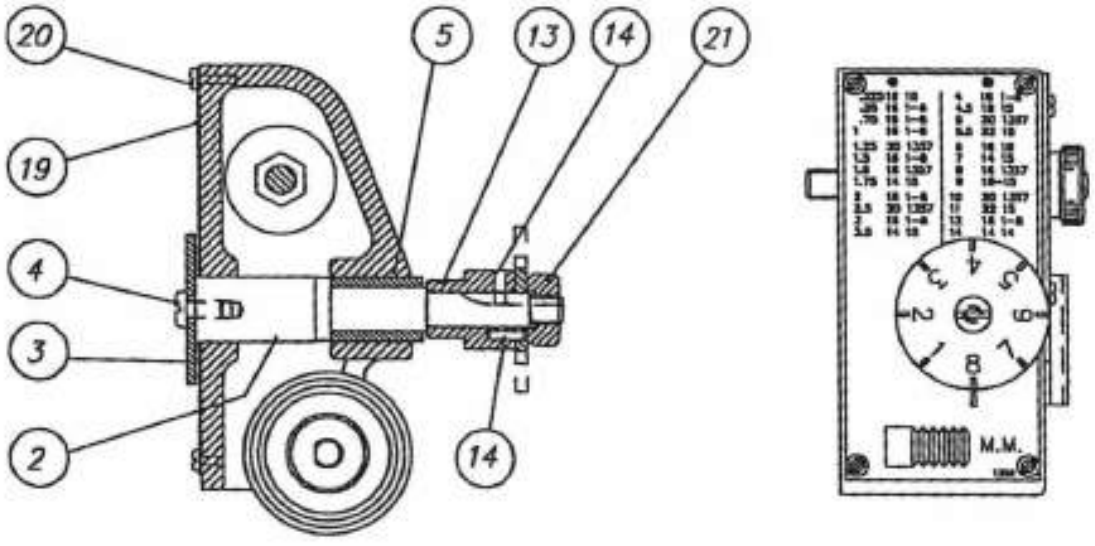
TAPER TURNER ASSEMBLY A186 - 0513

Item No.	Description	Part No.
1	PLATE HOUSING SUB- ASSEMBLY	A806 - 0568
2	BASE PLATE	D505 - 0936
3	GRADUATED PLATE	D565 - 0935
4	GRADUATED SLIDE	D705 - 0120
5	COVER PLATE	D565 - 0934
6	SUPPORT BRACKET	D050 - 0655
7	SLIDE	D705.- 0119
8	SLIDE BLOCK	D047 - 0100
9	SPACER	D708 - 0251
10	PIVOT PEG	D572 - 0024
11	RETAINING WASHER	D931 - 0346
12	GIB STRIP	D715 - 0082
13	GIB ADJUSTING SCREW	D697 - 0357
14	GIB STRIP	D715 - 0083
15	ADJUSTING SCREW	D697 - 0356
16	CLAMP NUT	D536 - 0620
17	ADJUSTING KNOB	D443 - 0044
18	CLAMP NUT	D536 - 0619
19	ANCHOR BRACKET	D050 - 0654
20	CLAMP	D047 - 0099
21	ECCENTRIC PIN	D271 - 0007
22	CLAMP BRACKET	D050 - 0653
23	CONNECTING ROD	D648 - 0093
24	LOCK PAD	D567 - 0143
28	HEXAGON SOCKET CAP HEAD SCREW M10x35	B166- 0086
31	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163- 0026
32	HEXAGON SOCKET CAP HEAD SCREW M5x25	B163Y0029
33	HEXAGON SOCKET CAP HEAD SCREW M6x12	B163- 0036
34	HEXAGON SOCKET CAP HEAD SCREW M6x35	B163- 0041
35	HEXAGON SOCKET CAP HEAD SCREW M8x20	B163- 0053
36	HEXAGON SOCKET CAP HEAD SCREW M10x25	B163- 0068
37	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163- 0071
38	HEXAGON SOCKET CAP HEAD SCREW M10x55	B163- 0074
39	HEXAGON SOCKET COUNTER SUNK SCREW M4x8	B163- 1006
40	HEXAGON SOCKETSET SCREW M6x6	B163- 1560
41	CONE POINT SET SCREW M6x10	B163 - 1659
42	CONE POINT SET SCREW M6x20	B163 - 1565
44	DOWEL PIN10x30	B111 - 7057
45	DOWEL PIN 10x45	B111 - 6310
48	SPIROL PIN 3x20	B111Y5060
50	NYLOC NUT M12	B147Y9006
52	WASHER M10	B117Y0011
57	NEEDLE ROLLER BEARING	B337 - 5001
58	THRUST WASHER	B337 - 5002
59	THRUST WASHER	B337 - 5014
	PLATE HOUSING SUB-ASSEMBLY A806 - 0568	
1	HOUSING PLATE	B565 - 0933
2	GLACIER BUSH MB1515DU	B311 - 1535

THREAD DIAL INDICATOR ASSEMBLY (METRIC)



SECTION 'A-A'



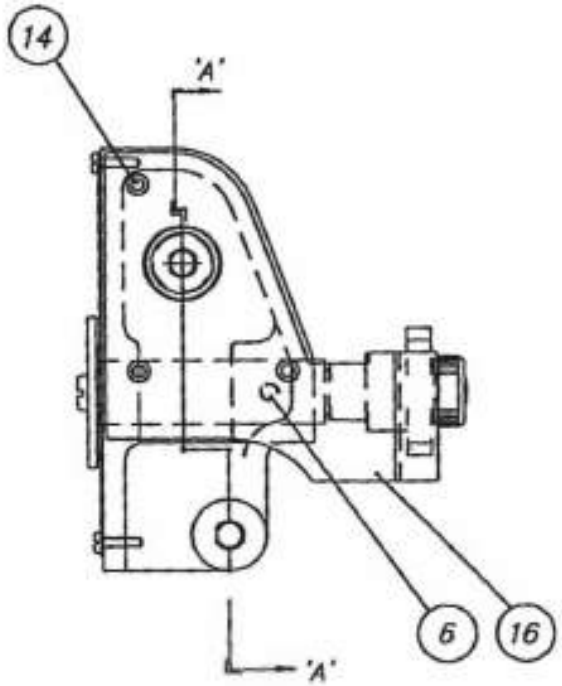
SECTION 'B-B'

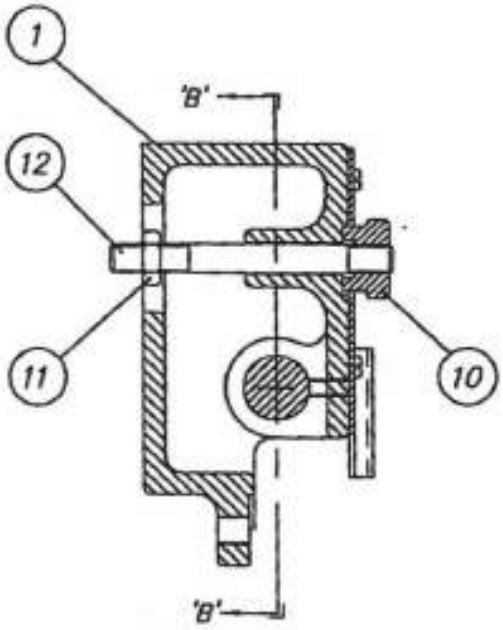
Item No.	Description	Part No.
1	INDCATOR HOUSING	D704H077.1
2	SPINDLE	D704H078.1
3	DIAL	D001H3 - 036
4	PAN HEAD SCREW (STAINLESS STEEL) M5 X 10	FS - 0704
5	OILITE BEARING CM22 X 25	BE - 0080
6	HEXAGON SLOTTED DOG POINT SCREW M5 X 12	FS - 0344
7	GEAR 22T	D301H3 - 026
8	GEAR 20T	D301H3 - 025
9	GEAR 18T	D301H3 - 024
10	GEAR 16T	D301H2 - 016
11	GEAR 14T	D301H2 - 015
13	SPACER - METRIC	D704H080.1
14	MILLS PIN 3 X 10	FT - 0647
15	KNURLED NUT	D112H2 - 008
16	LOCKNUT M8	FS - 1040
17	STUD	D250H0 - 003
18	STUD - THREAD INDICATOR	D704H079.1
19	PLATE - METRIC	NA - 1358
20	PAN HEAD SELF TAPPING SCREW N0.4 X 1/4"	B123 - 6024
21	KNURLED NUT	D704H083.1
22	COVER - INDICATOR GEAR	D704H095.1

THREAD DIAL INDICATOR METRIC A143-0509A

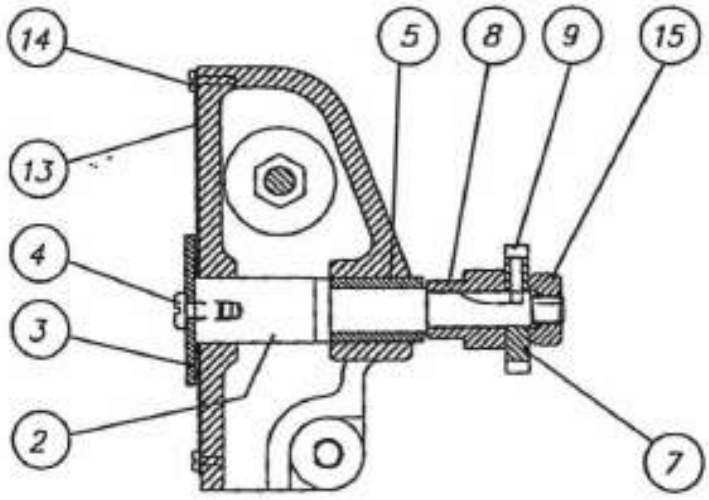
Item No.	Description	Part No.
1	INDCATOR HOUSING	D704H077.1
2	SPINDLE	D704H078.1
3	DIAL	D001H3 - 036
4	PAN HEAD SCREW (STAINLESS STEEL) M5 X 10	FS - 0704
5	OILITE BEARING CM22 X 25	BE - 0080
6	HEXAGON SLOTTED DOG POINT SCREW M5 X 12	FS - 0344
7	GEAR 22T	D301H3 - 026
8	GEAR 20T	D301H3 - 025
9	GEAR 18T	D301H3 - 024
10	GEAR 16T	D301H2 - 016
11	GEAR 14T	D301H2 - 015
13	SPACER - METRIC	D704H080.1
14	MILLS PIN 3 X 10	FT - 0647
15	KNURLED NUT	D112H2 - 008
16	LOCKNUT M8	FS - 1040
17	STUD	D250H0 - 003
18	STUD - THREAD INDICATOR	D704H079.1
19	PLATE - METRIC	NA - 1358
20	PAN HEAD SELF TAPPING SCREW N0.4 X 1/4"	B123 - 6024
21	KNURLED NUT	D704H083.1
22	COVER - INDICATOR GEAR	D704H095.1

THREAD DIAL INDICATOR ASSEMBLY (ENGLISH)

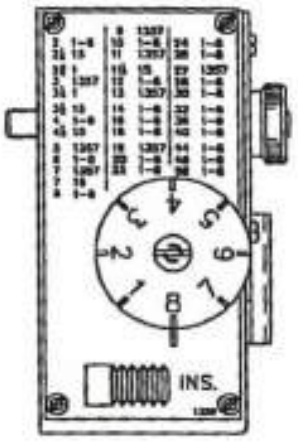




SECTION 'A–A'

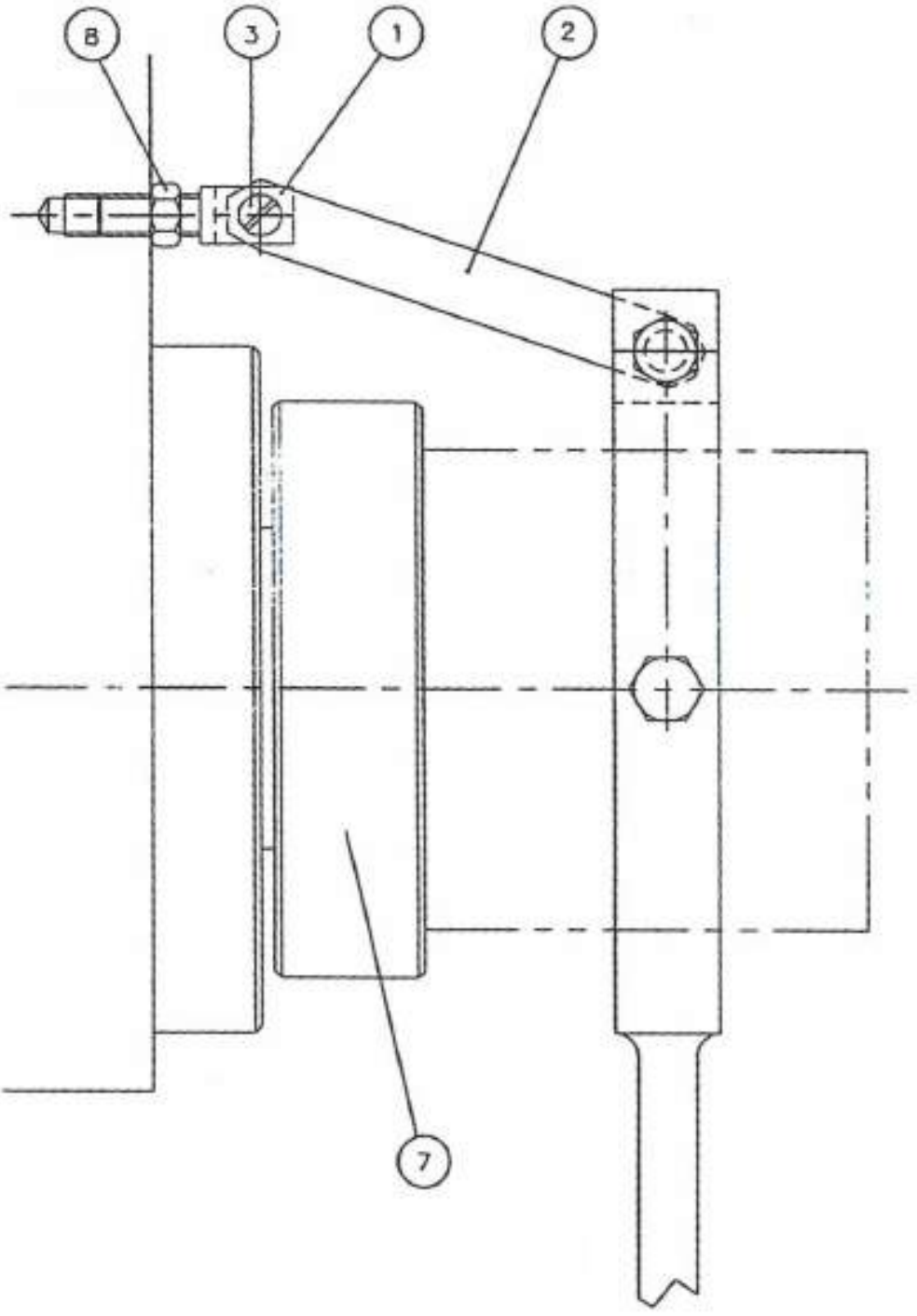


SECTION 'B–B'



Item No.	Description	Part No.
1	INDCATOR HOUSING	D704H077.1
2	SPINDLE	D704H078.1
3	DIAL	D001H3 - 036
4	PAN HEAD SCREW (STAINLESS STEEL) M5 X 10	FS - 0704
5	OILITE BEARING CM22 X 25	BE - 0080
6	HEXAGON SLOTTED DOG POINT SCREW M5 X 12	FS - 0344
7	GEAR 16T	D301H3 - 023
8	SPACER - ENGLISH	D704H081.1
9	MILLS PIN 3 X 12	FT - 0648
10	KNURLED NUT	D112H2 - 008
11	LOCKNUT M8	FS - 1040
12	STUD	D250H0 - 003
13	PLATE - METRIC	NA - 1359
14	PAN HEAD SELF TAPPING SCREW N0.4 X 1/4"	B123 - 6024
15	KNURLED NUT	D704H083.1
16	COVER - INDICATOR GEAR	D704H095.1

LEVER OPERATED COLLET CHUCK LINKAGE



LEVER OPERATED COLLET CHUCK LINKAGE A178 - 0526

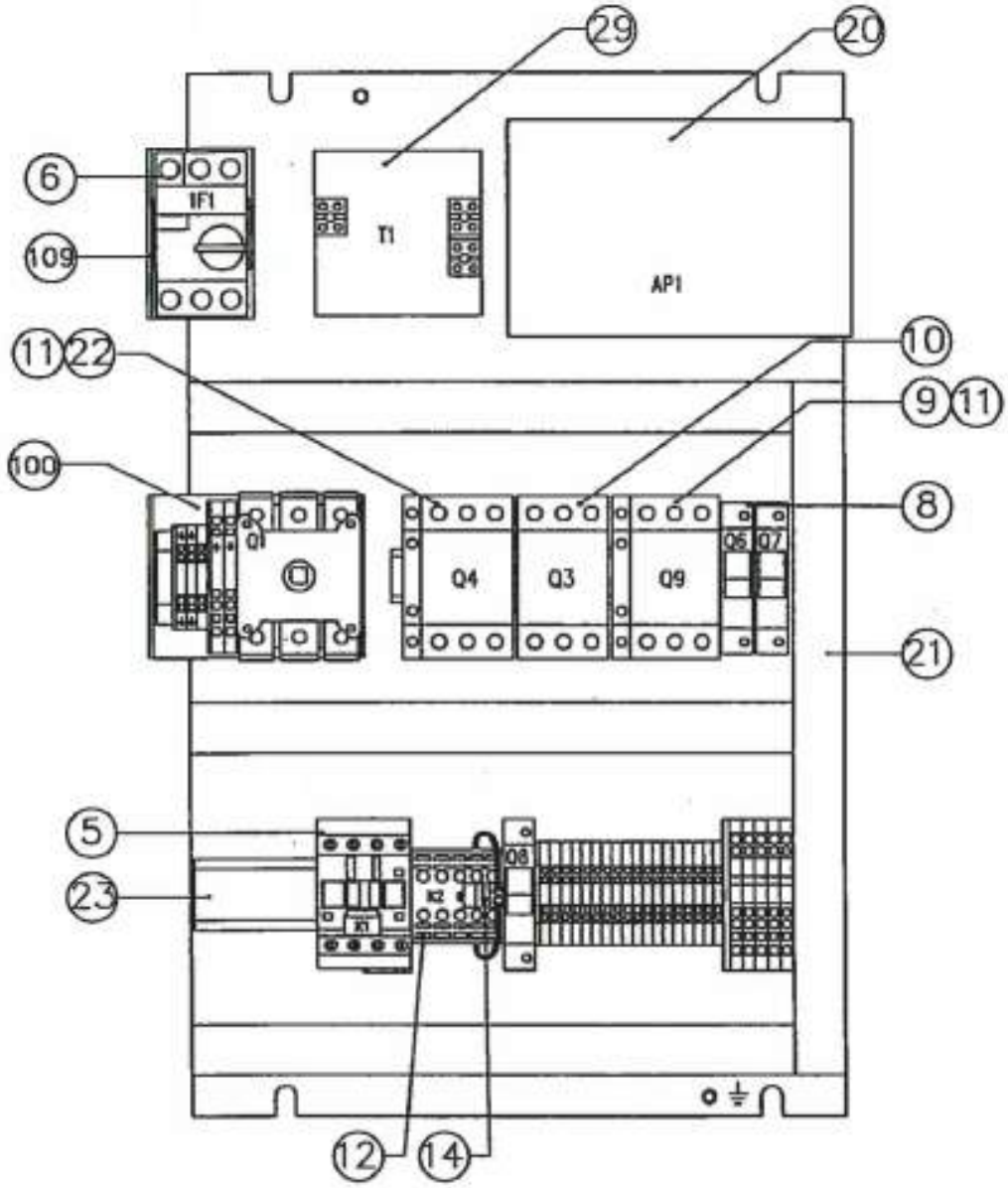
Item No.	Description	Part No.
1	CLAMP FORK	D299 - 0069
2	LINK	D454 - 0027
3	PIN LINK	D560 - 0050
7	11/2" D1-6 COLLET CHUCK	B913 - 1178
8	THIN HEXAGON NUT M12	B147 - 9172

ELECTRICS

BASIC ELECTRICS ASSEMBLY A191 - 1030J

Item	Part Number	Description	Qty
1	A191 - 1075A	ELECTRICAL ENCLOSURE ASSEMBLY	1
4	VS - 0070	DRIVE UNIT MITSUBISHI 7.5kW	1
5	A826 - 0722A	ROTACAM SWITCH ASSEMBLY	1
9	B613 - 9014	MAIN MOTOR 5.5kW VARIABLE SPEED	1
11	D050 - 0652	PANEL MOUNTING BRACKET	2
12	FS - 0208	HEXAGON SOCKET CAP HEAD SCREW M12 x 30	4
13	B163 - 1828	HEXAGON SOCKET BUTTON HEAD SCREW M10 x 25	4
14	FS - 1010	NYLOC NUT M10 x 1.25	4
15	FP - 0060	WASHER M10	8
16	FP - 0070	WASHER M12	4
17	D708 - 0486	ELECTRICAL PANEL SPACER	2
18	B117 - 0051	WASHER M6	4
19	FS - 0930	NYLOC NUT M6	2
20	FS - 0150	HEXAGON SOCKET CAP HEAD SCREW M6 x 60	2
22	B701 - 0046	3 PHASE RFI FILTER (MITSUBISHI)	1
29	D537 - 1086	SPEED PLATE	1
33	A826 - 1772A	MAIN MOTOR HARNESS ASSEMBLY	1
34	A826 - 1733A	FORWARD/REVERSE SWITCH ASSEMBLY	1
35	A826 - 0734A	HYDRAULIC MOTOR HARNESS	1
36	A826 - 1072A	PUMP HARNESS (TAIWAN) 6/7"	1
50	A826 - 1311G	PUSHBUTTON ASSEMBLY	1

PANEL ASSEMBLY

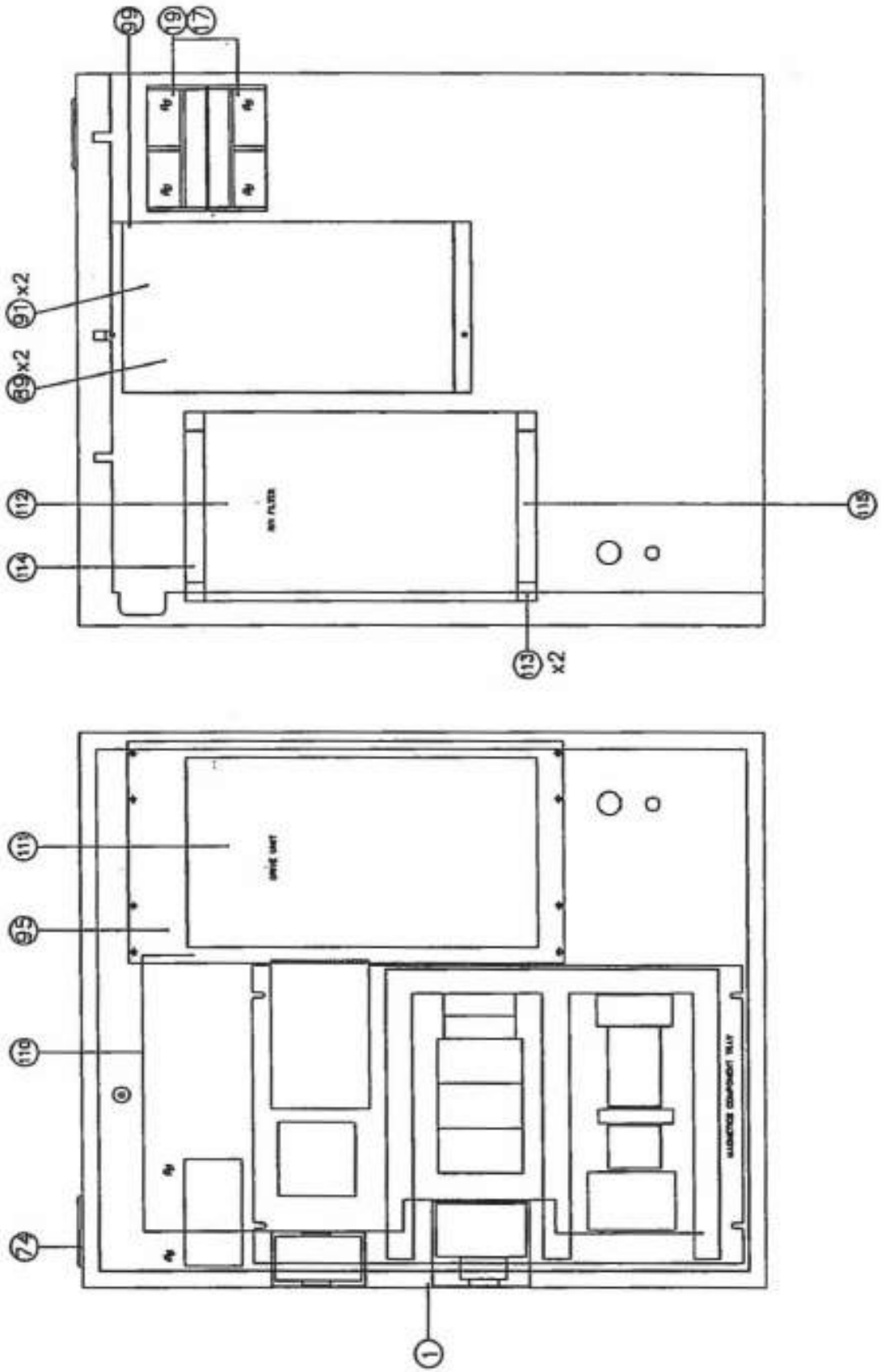


K1	LINE CONTACTOR
K2	COOLANT CONTACTOR
Q1	ISOLATOR
Q2	MAIN CIRCUIT BREAKER
Q3	COOLANT MOTOR CIRCUIT BREAKER
Q4	HYDRAULIC MOTOR CIRCUIT BREAKER
Q6	TRANS.PRIMARY CIRCUIT BREAKER
Q7	HYDRAULIC MOTOR CIRCUIT BREAKER
Q8	CONTROL CCT. BREAKER
Q9	DRIVE MOTOR FAN CIRCUIT BREAKER
T1	CONTROL TRANSFORMER
AP1	RELAY INTERFACE BOARD

ELECTRICAL ENCLOSURE ASSEMBLY A191-1075A

Item	Part Number	Description		Qty
1	SK2635	ELECTRICAL ENCLOSURE		1
5	B763-9200	CONTACTOR 110V	LC1D1810F7	1
6	LF-3130	CIRCUIT BREAKER	GV2-L20	1
8	B762-7205	CIRCUIT BREAKER 1A	GB2-CB06	3
9	LF-1641	MOTOR STARTER 0.1-0.16A	GV2-M01	1
10	LF-1331	MOTOR STARTER 0.16/0.25A	GV2-M02	1
11	LF-1431	AUXILIARY CONTACT 1NO/NC	GV2-AN11	2
12	LF-3150	CONTACTOR 110V	LC1-K0610F7	1
14	LF-3170	SUPPRESSOR (MINI CON.)	LA4-KE1U	1
17	R812Y0255	NEOPRENE STRIP		0.25M
19	D565-0921	CABLE CLAMP BRACKET		1
20	D635-0007	'V'RANGE PCB (CONTROL + CSS)		1
21	B767-0071	TRUNKING	K.M. KL 25/60	1.3M
22	LF-1341	MOTOR STARTER 0.25/.0.4A	GV2-M03	1
23	B700-0054	SLOTTED DIN RAIL	TS35	1.0M
29	B772-3029	125VA TRANSFORMER-MULTI PRIMARY & SEC.		1
31	B718-3242	WAGO TERMINAL BLOCK	280-601	13
36	B718-3246	WAGO EARTH TERMINAL	280-607	5
38	B718-3282	WAGO 2 WAY PLUG	231-102	3
41	B718-3250	WAGO TERMINAL BLOCK	281-681	3
42	B718-3257	ANGLED CONNECTOR 2-WAY	232-102	2
43	B718-3276	WAGO INTER PLATE	281-324	1
45	B718-3243	WAGO END PLATE	280-330	1
52	A826-1028A	DRIVE UNIT HARNESS ASSEMBLY		1
53	EP765	ELECTRICAL SCHEMATIC		1
74	D565-0932	PLATE L/V LIGHT BLANKING		1
89	B705-0488	BRAKING RESISTOR		2
91	D050-0739	RESISTOR MOUNTING BRACKET		2
95	D565-1342	DRIVE MOUNTING PLATE		1
96	FS-0110	M5 X 10 HEXAGON CAP HEAD SCREW		16
97	FP-0120	M5 LOCK WASHER (EXTERNAL)		16
99	SK2641	RESISTOR COVER		1
100	A826-1784A	ISOLATOR MOUNTING ASSEMBLY		1
107	A826-1782A	EARTH BRAID CONNECTION		1
108	B715-1098	QUICK-FIT GROMMET 20 X 16mm	PV 3029	2

CABINET ASSEMBLY

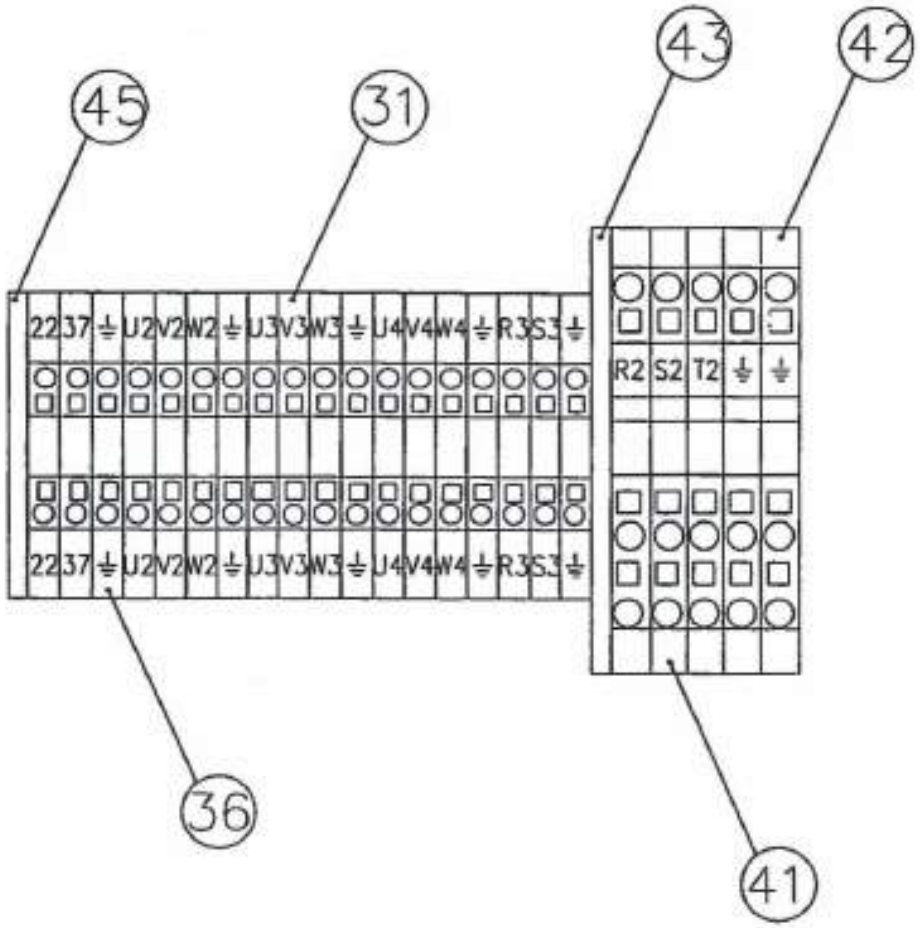


DCIN - 22282	CODE VTC	Serial No.		Assembly - A191 - 1075A	Issue 1	24.01.96

ELECTRICAL ENCLOSURE ASSEMBLY A191-1075A

Item	Part Number	Description	Qty
109	D050-0952	'MCB' MOUNTING BRACKET	1
110	D132-1049	'EMC' BAFFLE COVER	1
113	D050-0948	DRIVE MOUNTING BRACKET - MITSUBISHI	2
114	D132-1036	FILTER COVER (TOP)	1
115	D132-1037	FILTER COVER (BTM)	1

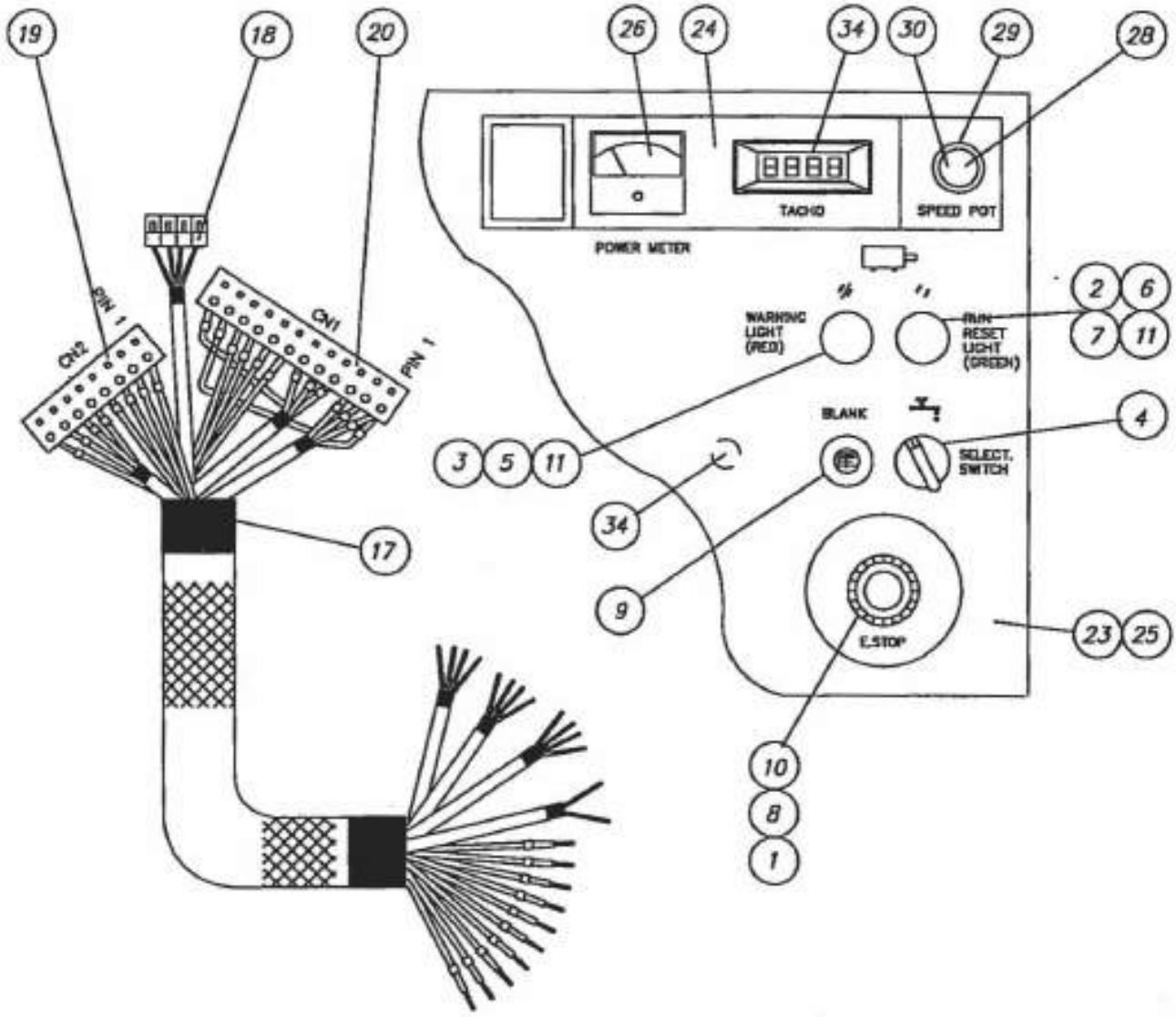
TERMINAL RAIL DETAIL



DCIN - 22282	CODE VTC	Serial No.		Assembly - A191 - 1075A	Issue 1	24.01.96

Item	Part Number	Description	Qty

PUSH BUTTON ASSEMBLY



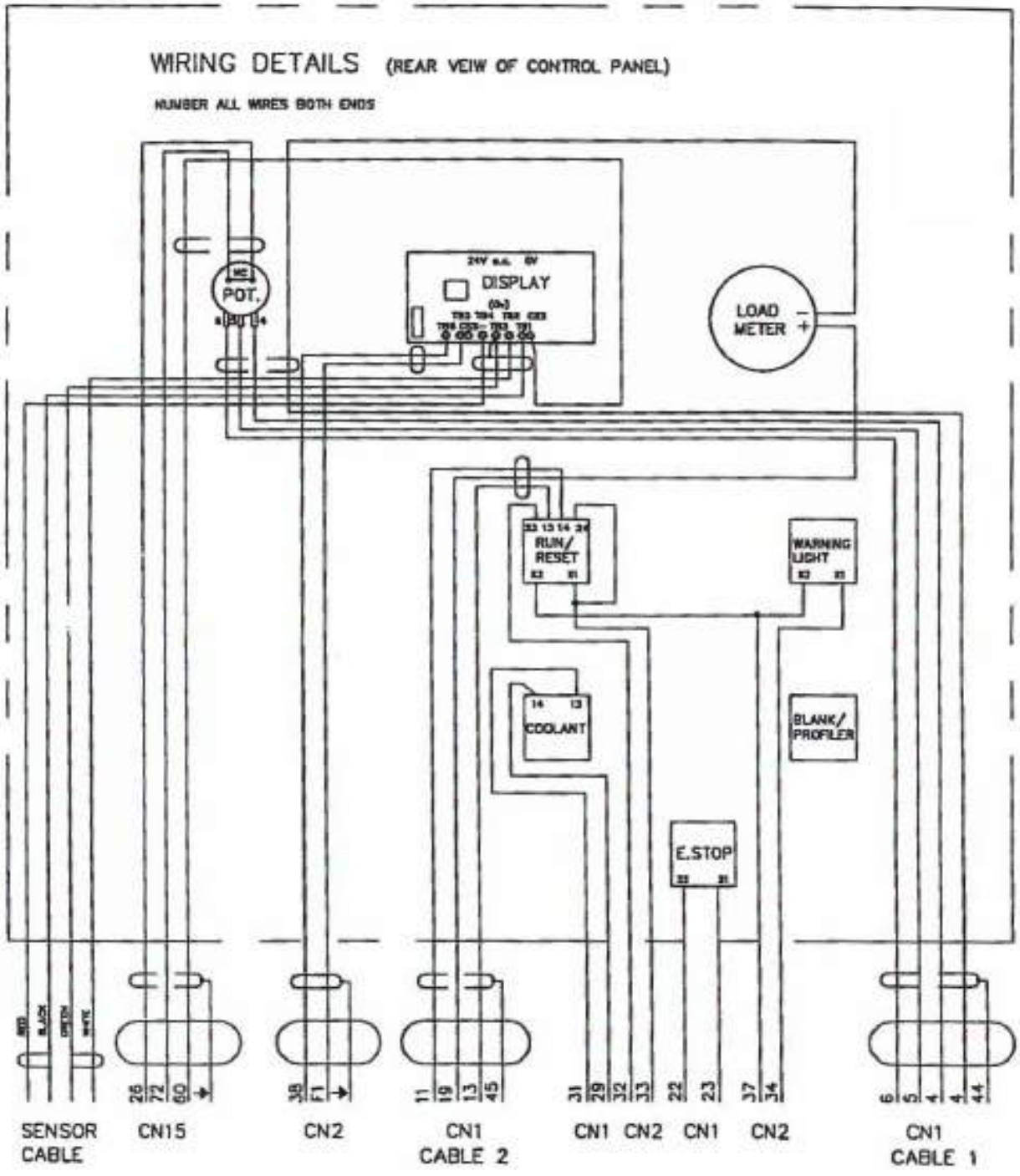
CABLE MARKING DETAILS FOR CN1					
PIN No.	WIRE No.		OPERATORS PANEL		
12	45	SCREEN (CABLE 2)	N.C.		
11	44	SCREEN	N.C.		
1	4	BLACK	4	POT. 0v	(RIGHT)
2	5	WHITE — 4-CORE 7/0.2mm SCREENED	5	POT SPEED REF.	(MIDDLE)
3	6	RED (CABLE 1)	6	POT. 10v	(LEFT)
1	4	GREEN	4	POT. 0v	(RIGHT)
4	11	BLACK	11	DRIVE RESET	(BOT LEFT 4)
5	13	RED — 4-CORE 7/0.2mm SCREENED	13	DRIVE RESET	(TOP LEFT 3)
6	19	WHITE (CABLE 2)	19	LOAD METER +	
SPARE	SPARE	GREEN	SPARE		
7	22	1.0mm RED	22	E.STOP P/B TERM 1	
10	23	1.0mm RED	23	E.STOP P/B TERM 2	
8	29	1.0mm RED	29	COOLANT P/B TERM 3	
9	31	1.0mm RED	31	COOLANT P/B TERM 4	

CABLE MARKING DETAILS FOR CN2				
PIN No.	WIRE No.		OPERATORS PANEL	
1	32	1.0mm RED	32	DRIVE RESET TERM (BOT RIGHT 3)
3	33	1.0mm RED	33	DRIVE RESET TERM (TOP RIGHT 4)
2	34	1.0mm RED	34	WARNING LIGHT TERM. X1
8	SPARE	1.0mm RED	SPARE	
4	37	1.0mm RED	37	RUN/RESET P/B LIGHT TERM. X2
5	38	BLUE — 2-CORE 7/0.2mm SCREENED	38	TACHO. SUPPLY
6	F1	RED — 2-CORE 7/0.2mm SCREENED	F1	TACHO. SUPPLY
7	⏚	SCREEN	N.C.	

PUSH BUTTON AND FRONT FACIA ASSEMBLY (MITSUBISHI) A826 - 1311G

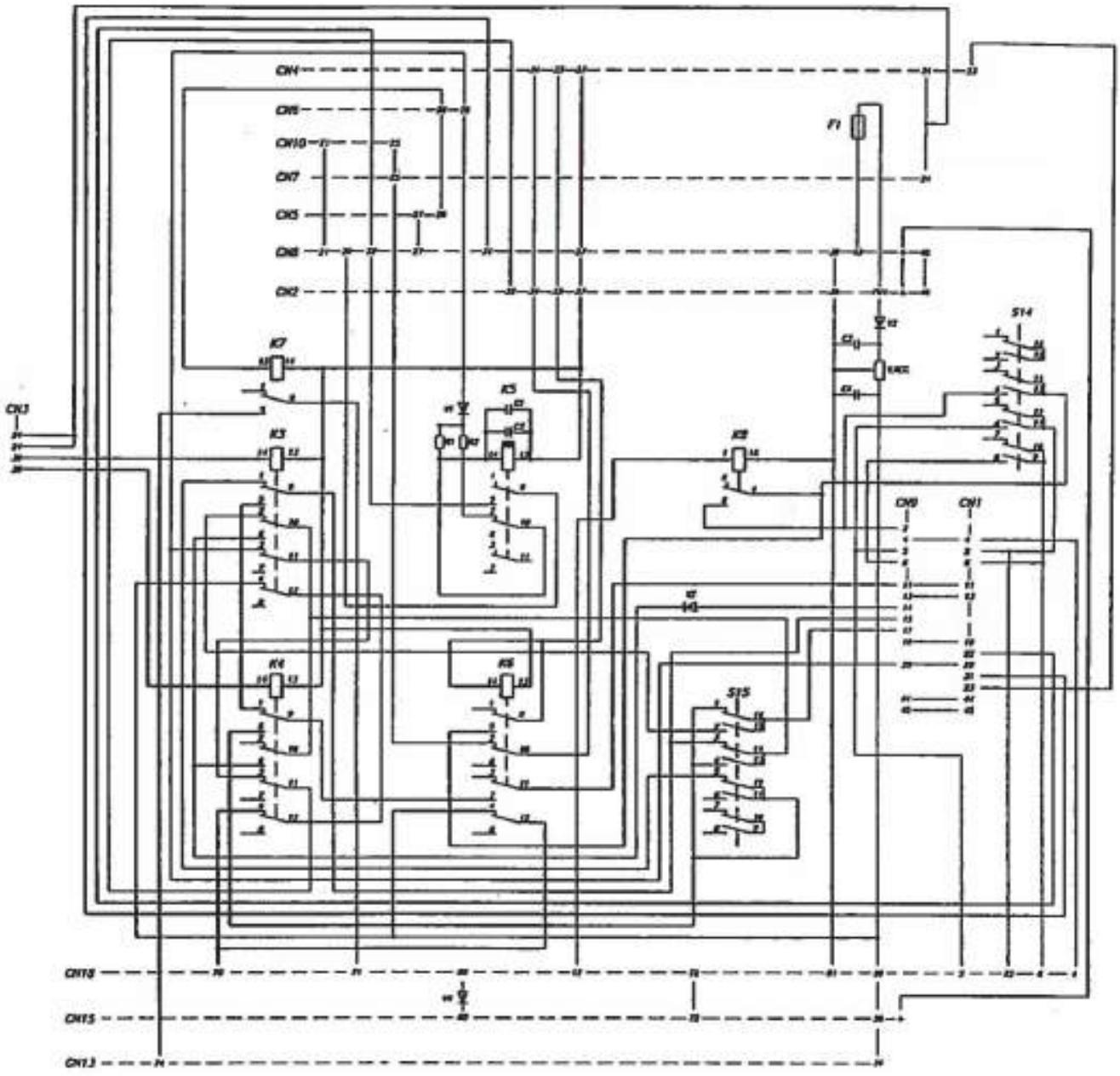
Item	Part Number	Description		Qty
1	B762 - 7001	RED MUSHROOM HEAD P/ BUTTON	ZB2-BS54	1
2	B762 - 7002	ILLUMINATED P/ BUTTON LENS (GREEN)	ZB2-BW33	1
3	B762 - 7003	RED PILOT LENS	ZB2-BV04	1
4	B762 - 7004	2 POSITION SELECTOR	ZB2-BD2	1
5	B762 - 7005	PILOT LAMP	ZB2-BV6	1
6	B762 - 7006	ILLUMINATED PUSH BUTTON	ZB2-BW063	1
7	B762 - 7007	CONTACT BODY	ZB2-BZ101	1
8	B762 - 7008	CONTACT BODY	ZB2-BZ102	1
9	B762 - 7009	BLACK BLANKING PLUG	ZB2-SZ3	1
10	B762 - 6503	EMERGENCY STOP PLATE	SQD Z09	1
11	B762 - 7010	BULB 2W	FW1121	2
17	B700 - 0055	KOPEX CABLE JACKET		1.5
18	LC - 2320	WAGO 4-POLE STRAIGHT CONECTOR	231-104	1
19	B718 - 3286	WAGO 8 WAY PLUG CONNNECTOR	231-108	1
20	B718 - 3281	WAGO 12 WAY PLUG CONNECTOR	231-120	1
23	D565 - 1044	OPERATOR DISPLAY/CONTROL PANEL		1
24	D537 - 1088	SPEED CONTROL NAMEPLATE		1
26	B700 - 0069	COMPTON METER		
27	LC - 6150	POTENTIOMETER	10K OHM LIN	1
29	D708 - 0475	SPACER		1
30	B700 - 0057	BLUE KNOB	RS 498-766	1
34	B770 - 0050	TACHOMETER	TYPE 485	1
35	D537 - 1233	PUSH BUTTON NAMEPLATE		1

PUSH BUTTON ASSEMBLY



Item	Part Number	Description	Qty

RELAY BOARD



	CODE VTC	Serial No.		Drawing - EP767	Issue 1	02.02.96

NOTES

Customer Service, Parts and Sales, call 800-575-2843

info@harrisonlathe.com

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