Harrison

Harrison V350

Variable Speed Centre Lathe

machine manual

V350 13-3/4"x25-1/4" Variable-speed Lathes ***The Ultimate Turning Machines***

The V350's cast iron base provides maximum support for the torsionally stiffened bed and prevents swarf accumulation. The bed is epoxy resin bonded to the base and provides excellent structural damping and resistance to vibration. The universal gearbox adds to the machines overall ability to handle the small to mid-range turning requirements of many toolrooms, production workshops and educational establishments.

Features:

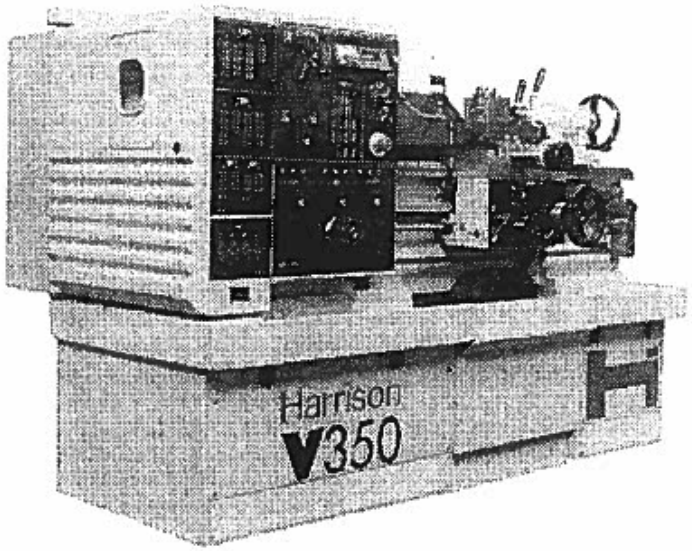
- All Harrison V Machines Feature:
- Cast iron triangular webbed bed for optimum rigidity and swarf clearance
- Infinitely variable spindle speeds with digital display
- Camlock spindle nose for fast chuck changeover
- Leadscrew reversing box
- Standard constant surface speed (CSS) cutting with DRO
-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

Specifications

		V350
Centers	Height	170mm (6-11/16")
	Admit Between	650mm (25-1/4")
Swing	Over Bed	350mm (13-3/4")
	Over Cross Slide	196mm (7-3/4")
	In Gap Diameter	535mm (21")
	Length	165mm (6-1/2")
Spindle	Bore	42mm (1-5/8")
	Nose	D1-4 Camlock
	Morse Taper in Nose	4 MT
Speeds	Number	3 infinitely variable
	Range	17 to 3250rpm
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	100mm (4")
Tailstock	Quill Diameter	63mm (2-1/4")
	Travel	145mm (5-11/16")
	Morse Taper	4 MT
Weight		1350kg (2970lbs)
Dimensions	L x W x H	2.03x1.35x1.65m (80x53x65")

V350
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 **2009**

CE

BS EN ISO 9002
FM 12345

ISSUE 4

1/1/98

EC Declaration of Conformity

The Responsible Person:	Mr Jonathan Shaw
Business Name:	600 Lathes (A trading name of 600 UK Ltd)
Address:	Union Street Heckmondwike West Yorkshire WF16 0HN England
Declares that the machinery described:	
1. Make:	T. S. HARRISON & SONS
2. Model:	V350
3. Serial Number:	
Conforms to the following directives:	SAFETY OF MACHINERY DIRECTIVE 98/37/EC PREVIOUSLY 89/392/EEC, 91/368/EEC, 93/44/EEC. CE MARKING DIRECTIVE 93/68/EEC ELECTROMAGNETIC COMPATIBILITY DIRECTIVE 89/336/EEC AS AMENDED BY DIRECTIVE 92/31/EEC AND 98/13/EEC. LOW VOLTAGE DIRECTIVE 73/23/EEC AS AMENDED BY DIRECTIVE 93/68/EEC
And complies with:	The relevant essential health and safety requirements of the Machinery Directive, the protection requirements of Directive 89/336/EEC (as amended) on the approximation of the laws of the member states relating to electromagnetic compatibility and the specifications and safety provisions of harmonised standard EN60204:1:1997 - *Safety of Machinery. Electrical equipment of machines.*
Signature	(If not signed by the responsible person, state here the name of the person signing the declaration).
Managing Director Position	
Signed at:	600 Lathes Union Street Heckmondwike West Yorkshire WF16 0HN England
Date:	

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 iitems.

(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.

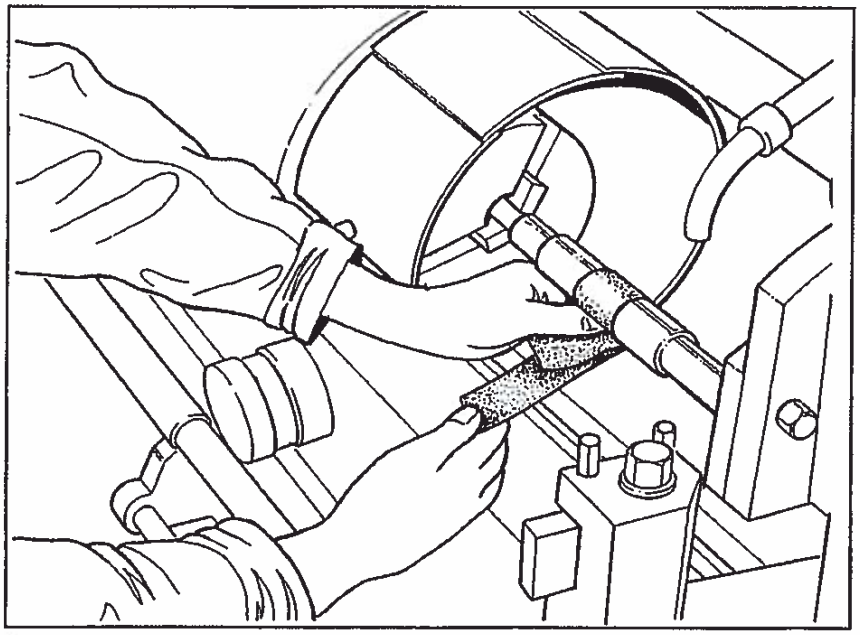
Note:
It is not recommended that chuck jaws extend beyond the outside diameter of the chuck and in these cases interference with chuck guards may occur.

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.

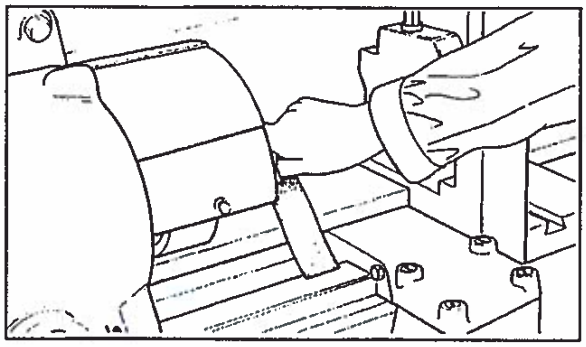
Precautions

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

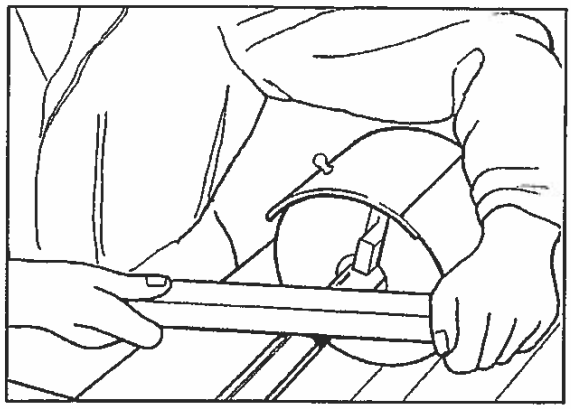
(d) hand-held, abrasive-impregnated wire brushes.

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.

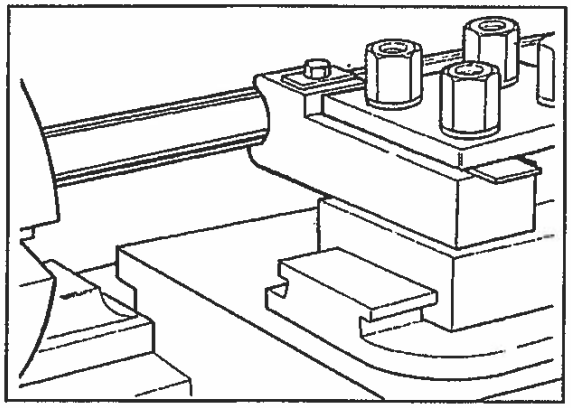
Force should be applied by pulling both ends of the cloth upwards, never allowing the cloth to go slack or to wrap around either the operator's finger or the components.

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

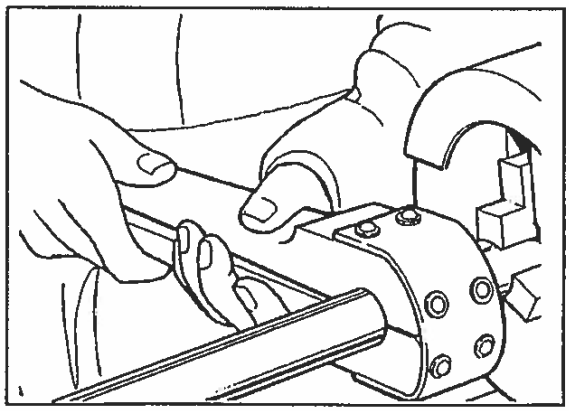
Gloves should never be worn when polishing is being carried out.



(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

MACHINE SPECIFICATION

Centres	
Height	170mm (6.7")
Admits between	650mm (25") 1250mm (50")

Swing	
Over bed (saddle wings)	350mm (13.7")
Over cross-slide	196mm (7.7")
In gap	535mm (21")
Width in front of faceplate	165mm (6.5")

Spindle	
Bored to pass	42mm (1.6")
Nose Type	D1-4" Camlock
Morse taper in bush	No.3 MT

Spindle Speeds	
Selected in three ranges of	15 - 340
	45 - 1010
	150 - 3250 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	90mm (3.5")
Travel	140mm (5.5")
Tool section	20 x 20 (.75" x .75")
Quick change tooling	Dickson No.2

Tailstock	
Quill diameter (nominal)	63mm (2.5")
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	1350kg (2970lb)
1250mm (50") between centres	1450kg (3190lb)

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

MACHINE SPECIFICATION

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)**.

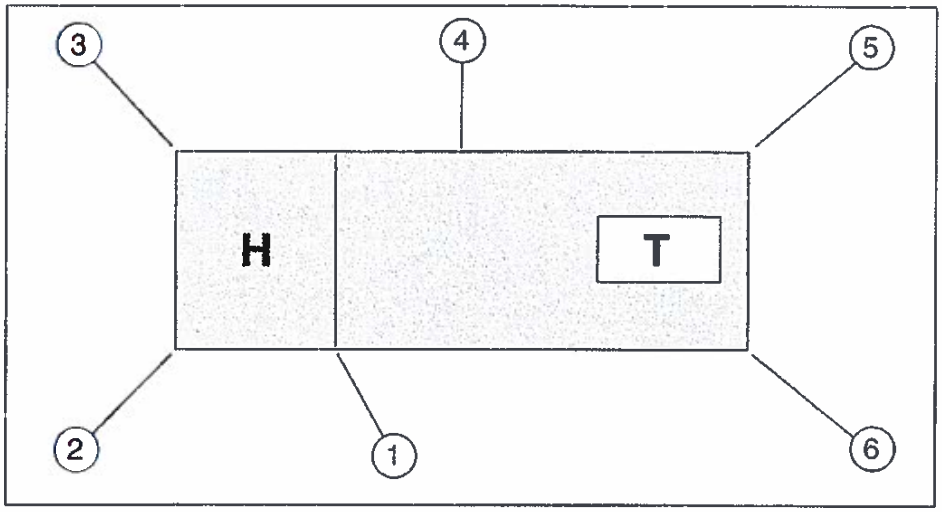


Fig.1

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 1350 Kg - 2970 lb

1250mm-50" between centres 1450Kg - 3190 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.

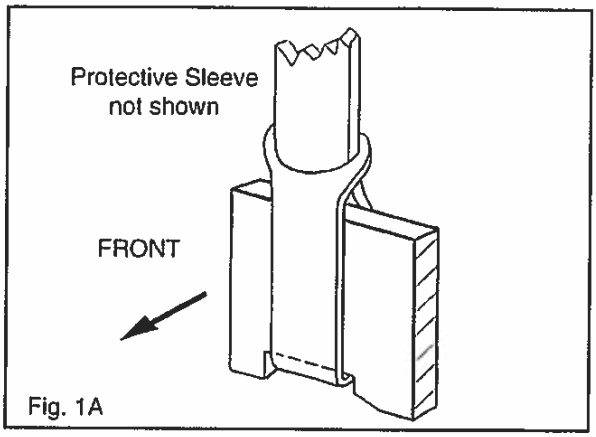


Fig. 1A

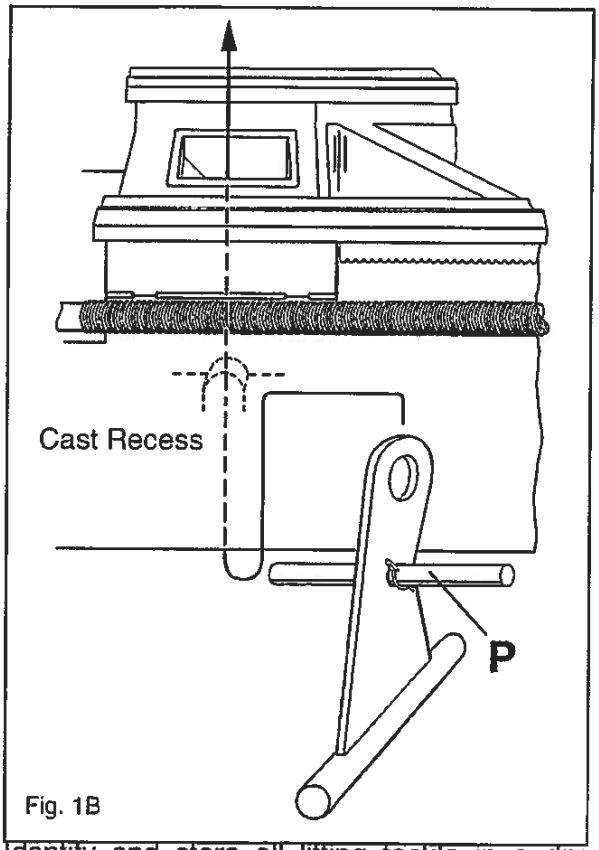


Fig. 1B

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

INSTALLATION

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 .

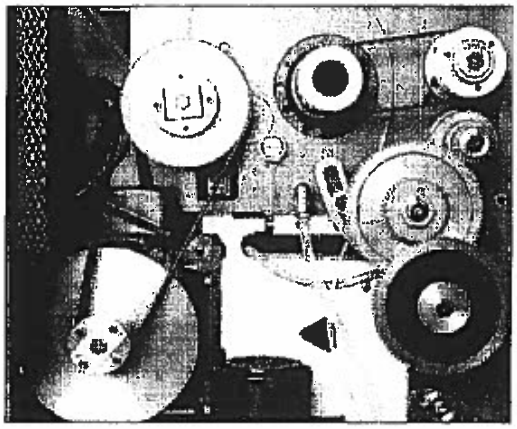


Fig. 2

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.

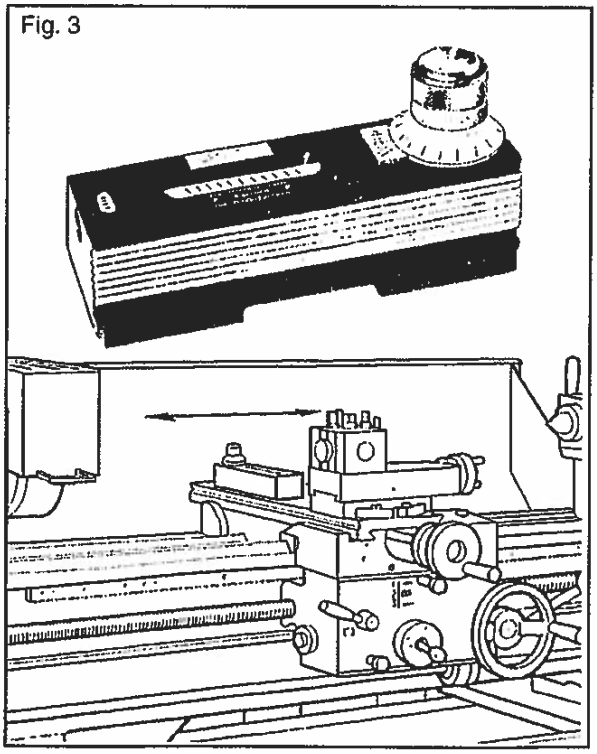
FIXED INSTALLATION

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 220/460 vAC±10% (with transformer supplied) and 380/415vAC ±10% 50/60 Hz.

Recommended Fuses:
220 volts supply-**35 amps**
380/415/460 volts supply-**25 amps**

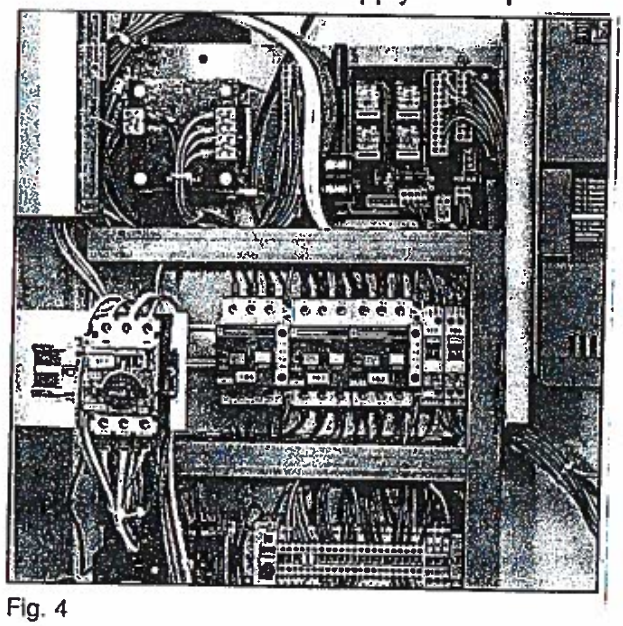


Fig. 4

Power should be supplied from a separate fused isolator, the line entering the electrical cabinet at the base of the cabinet and connected to the input terminals of the machine isolator (Fig. 4). or transformer in the case of 220, 460 or 575 volt supply.An earth lead must be used. To comply with 'EMC' requirements see page 7 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. ⇐ 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 end guard 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 main 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,D.R.O., Lo-Vo light and profiler.
2) Release Emergency Stop.
DriveDisabled Warning Light (red)Illuminates.
Headstock Lubrication Pump runs.

LUBRICATION CHECKS

Ensure that the headstock lubrication system and gearbox are filled with Shell T37 (ISO VG 37) oils respectively, to correct level and the apron reservoir is filled to the level of the sight window with Shell Tonna TX 68 (ISO VGT 68) oil.
Oil compound slide and tailstock through oilers furnished.
Before each working shift, operate the manual lubrication pump to ensure adequate lubrication of carriage slideways.

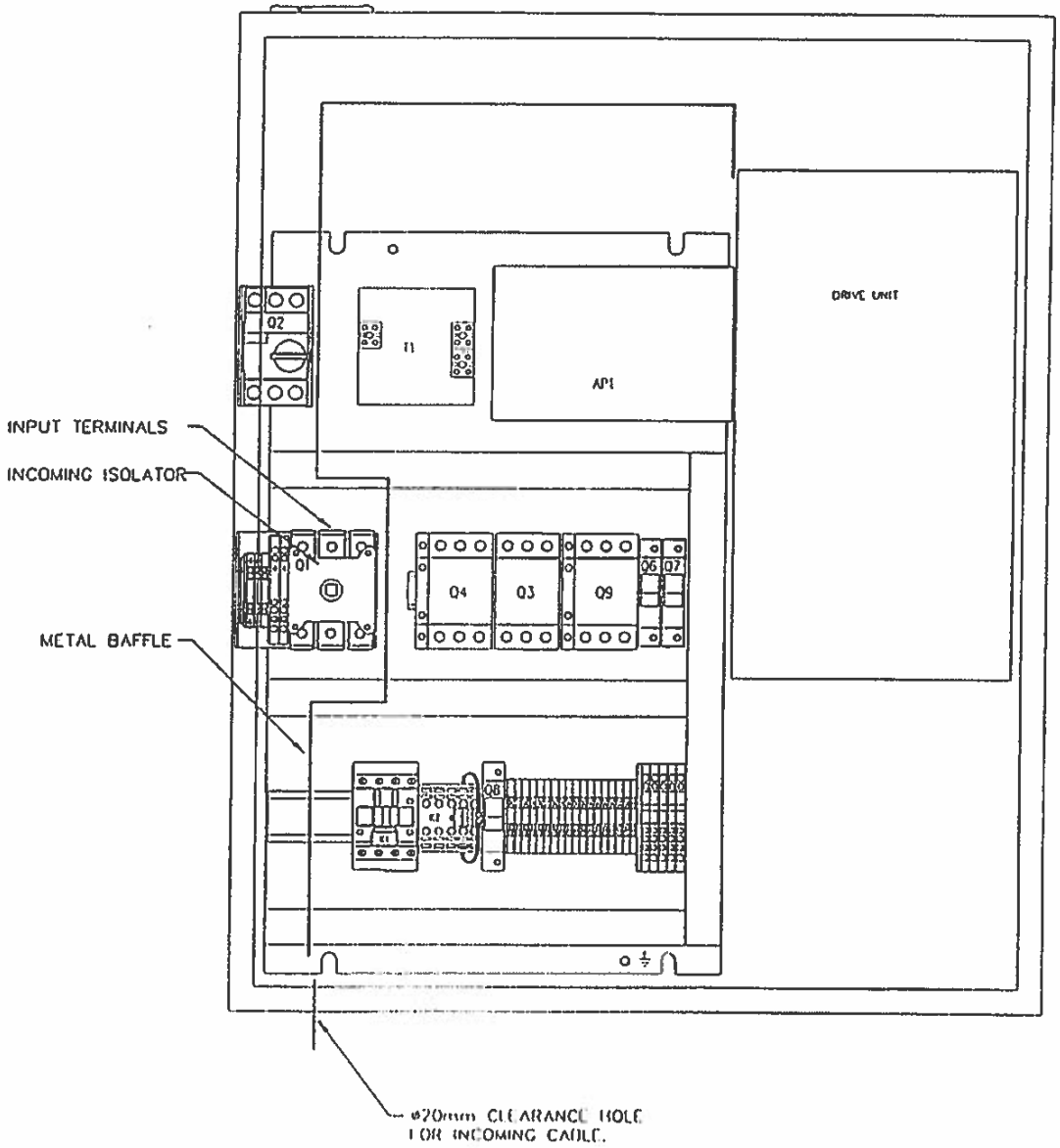
Refer to Lubrication Chart in Service and Maintenance Section for further information.

OIL CAPACITIES

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

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

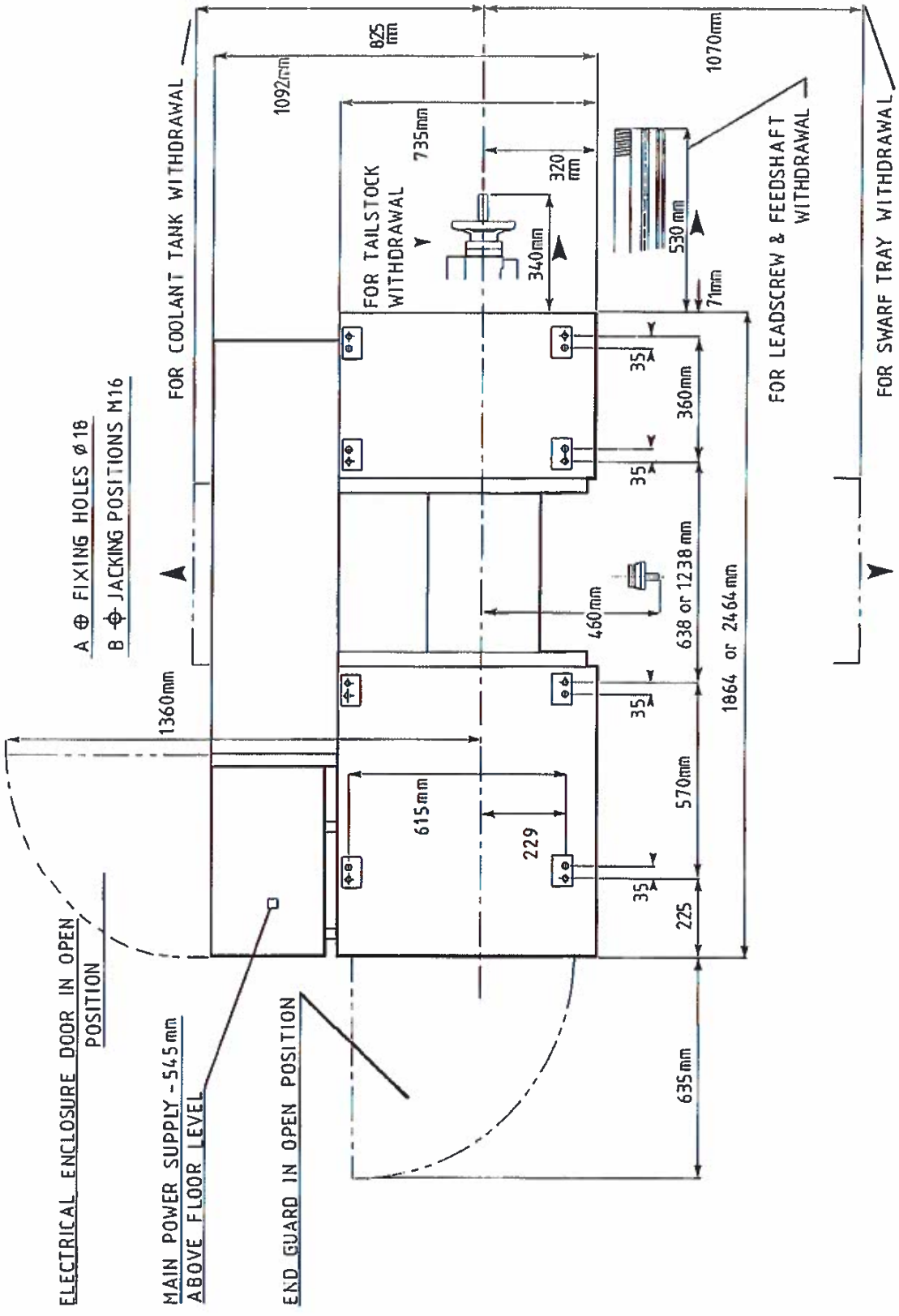


Fig. 5

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.

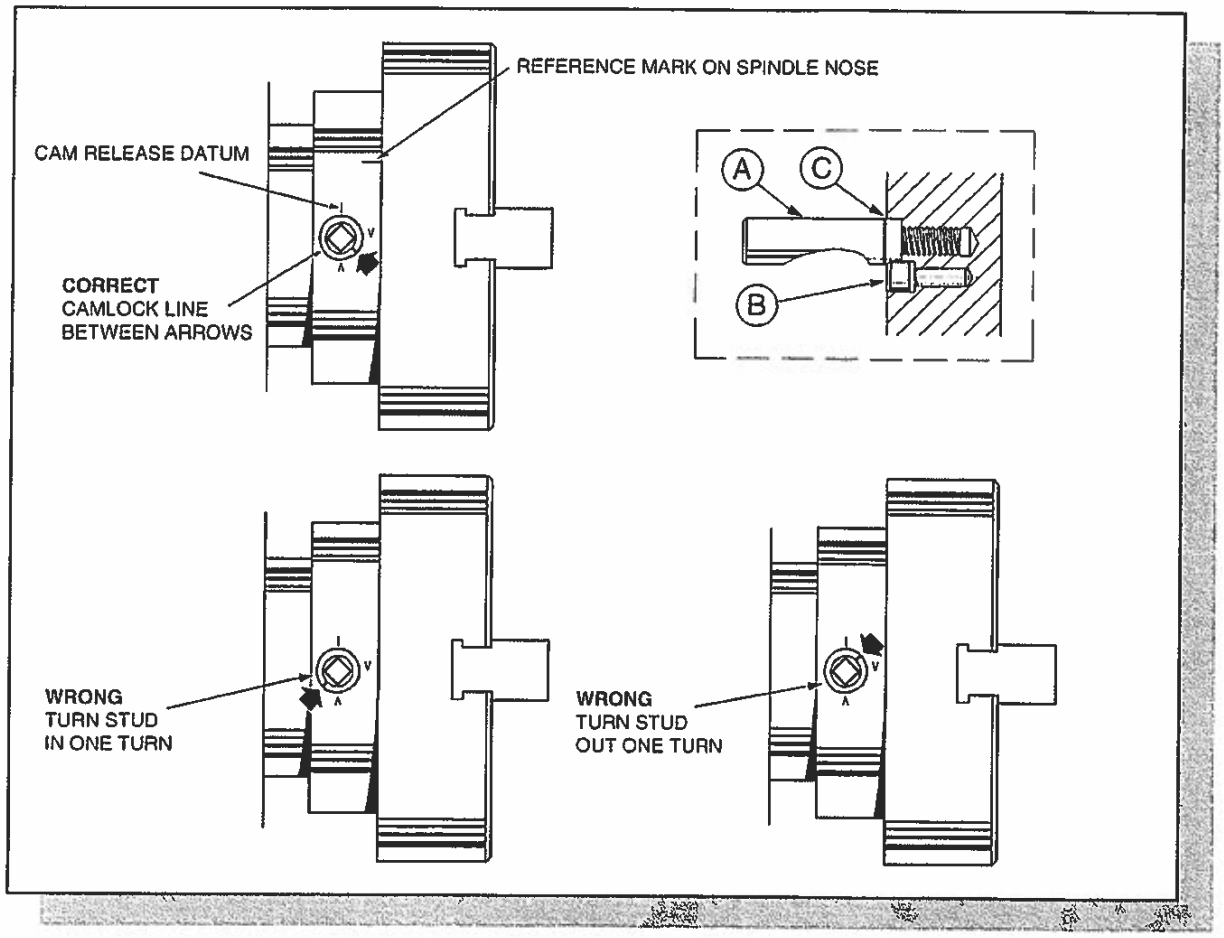
If any of the cams do not tighten fully withIn these marks,remove the chuck or faceplate and re-adjust the stud as indicated in the diagram.

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.



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 the 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.

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.

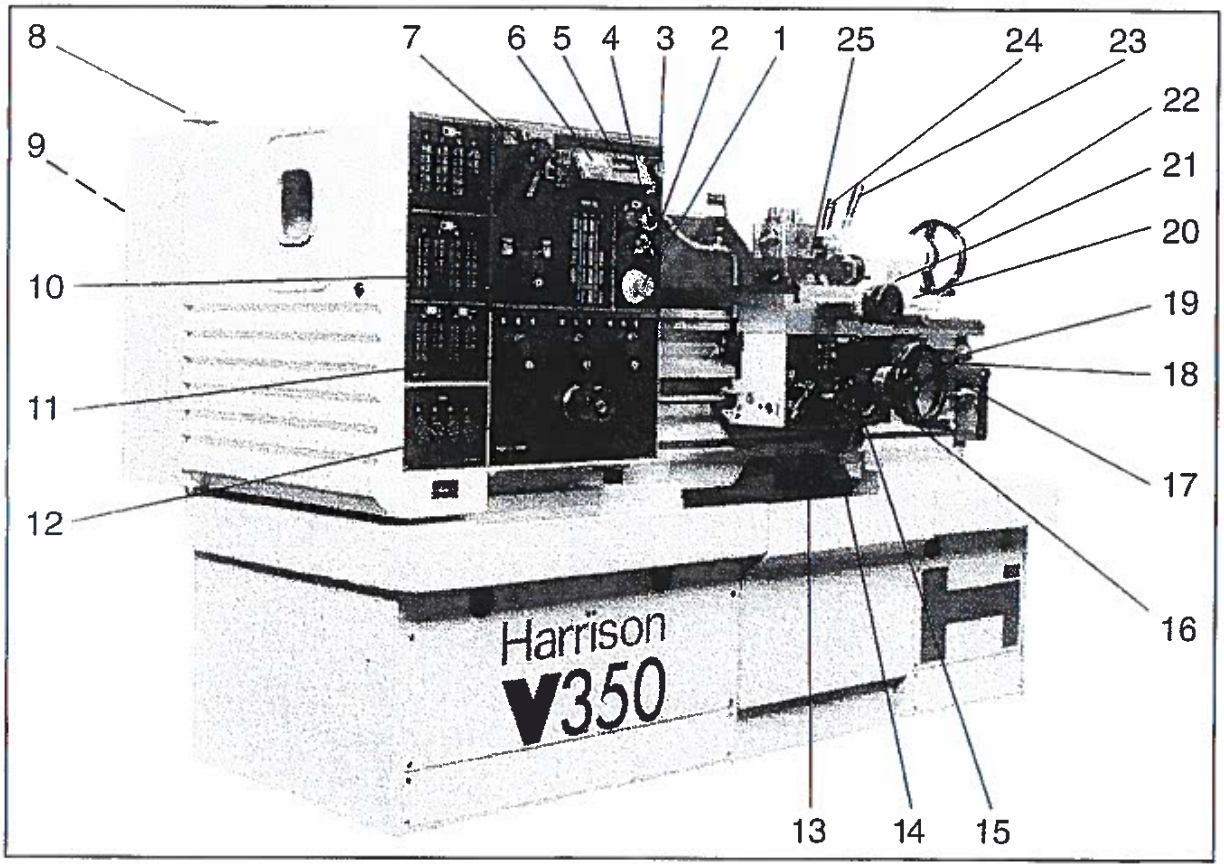
2. Stop machine immediately anything unexpected happens.

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

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:-

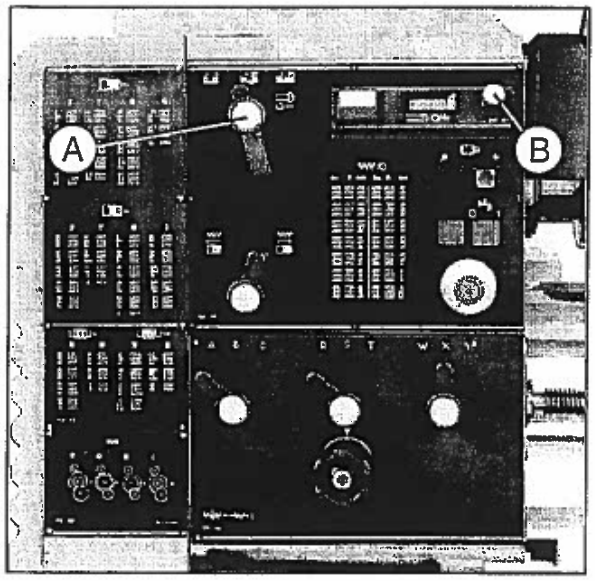


Fig. 6

Low **15 - 340** rev/min with constant power above 150 rev/min.

Medium **45 - 1010** rev/min with constant power above 445 rev/min.

High **150-3250** rev/min with constant power above 1430 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.

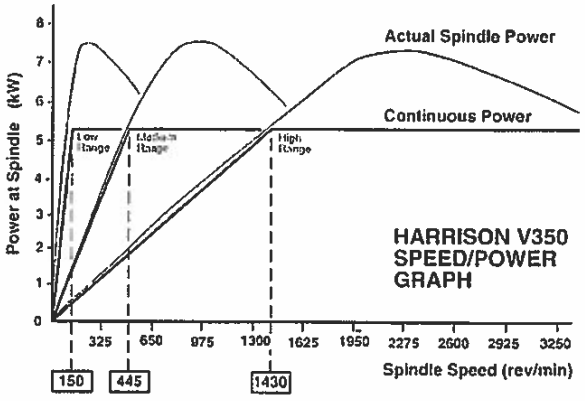
1) $N = \dfrac{S \times 1000}{\pi \times D}$ (METRIC)

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

2) $N = \dfrac{S \times 12}{\pi \times D}$ (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.

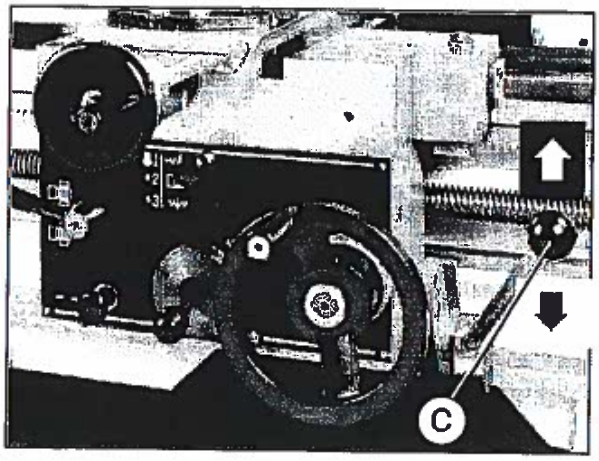


Fig. 7

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.

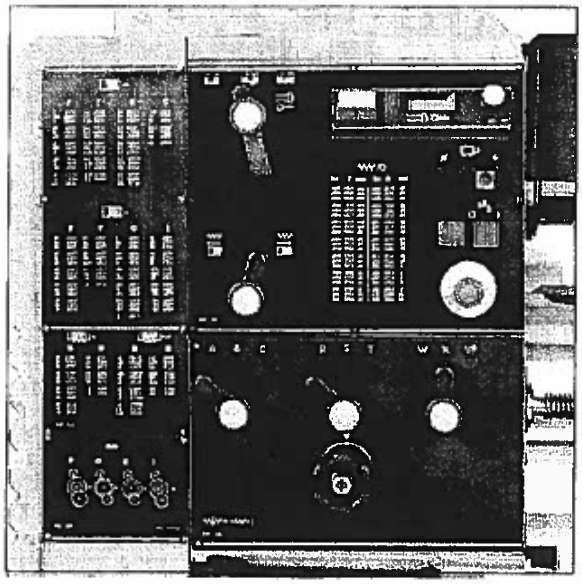


Fig.8

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. 9) 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.

Fig.9

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.

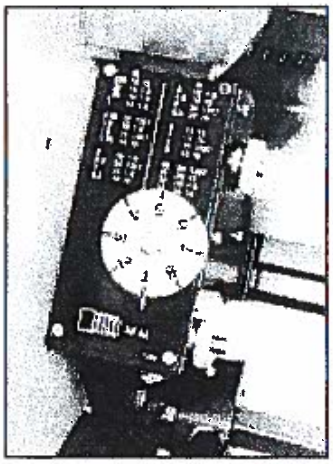


Fig.11

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.

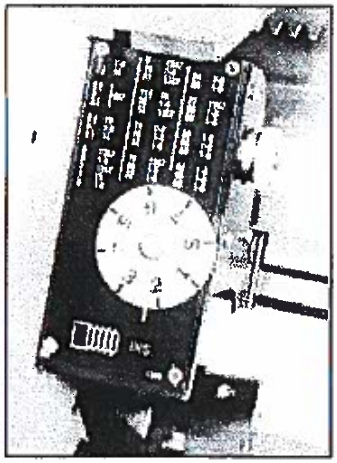


Fig.12

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.

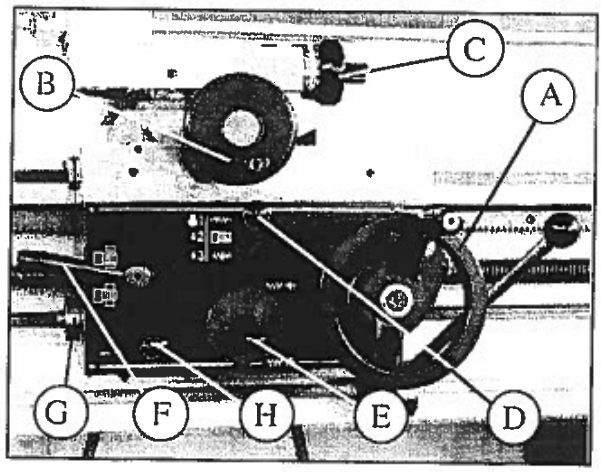


Fig. 13

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).

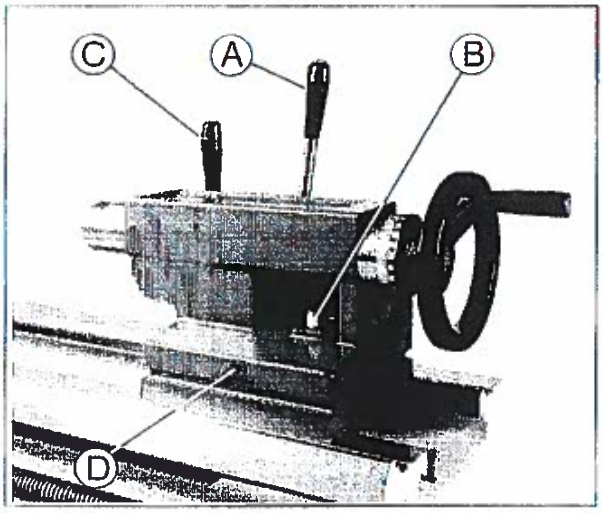


Fig. 14

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.

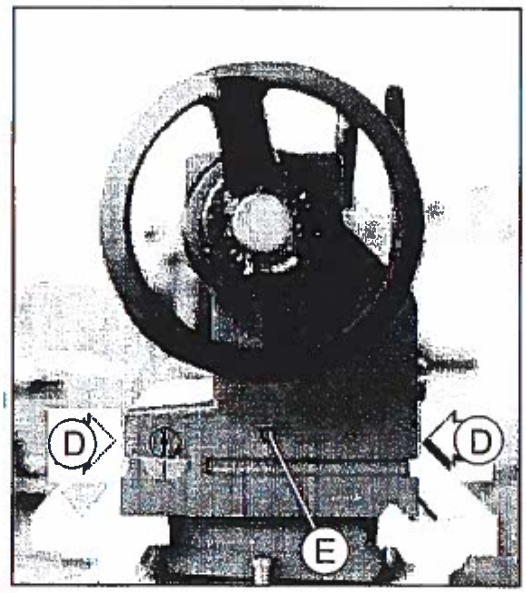


Fig. 15

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)

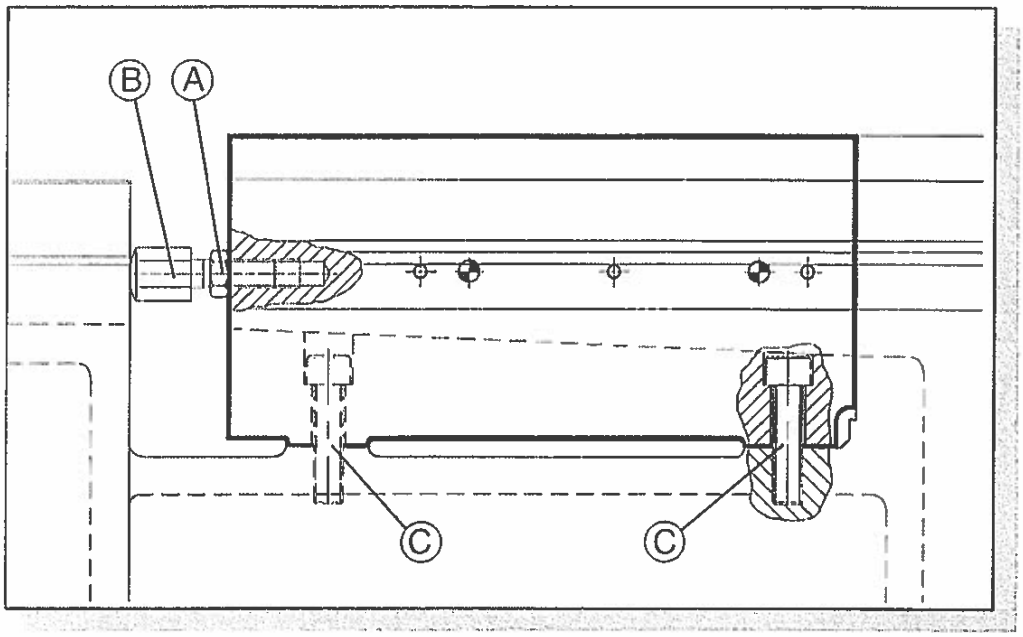


Fig. 16

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 7 NM).

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").

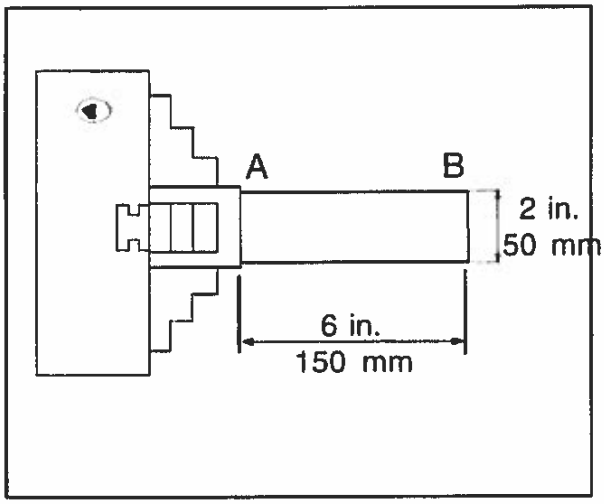


Fig. 16

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.

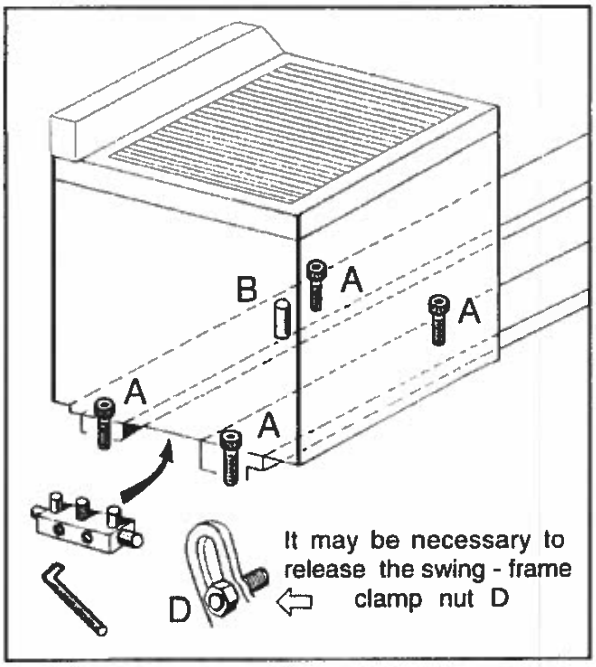


Fig. 17

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.

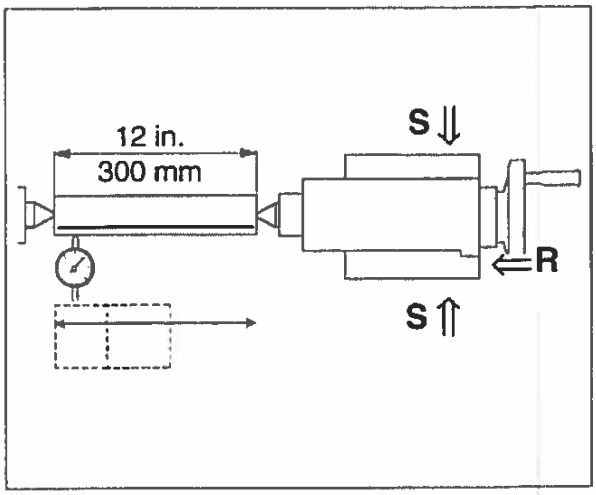


Fig. 18

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.

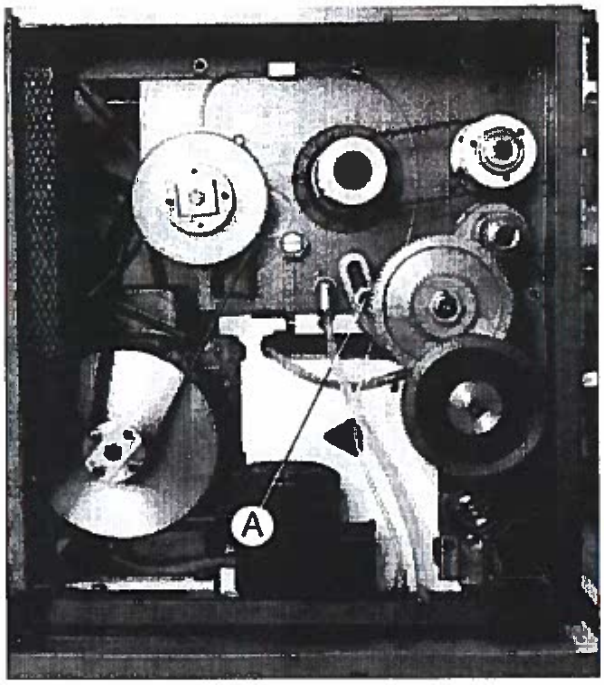


Fig. 19

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.

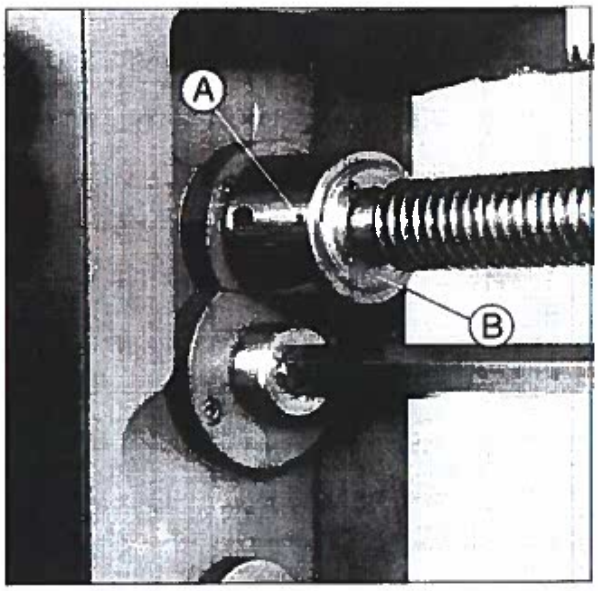


Fig. 20

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.

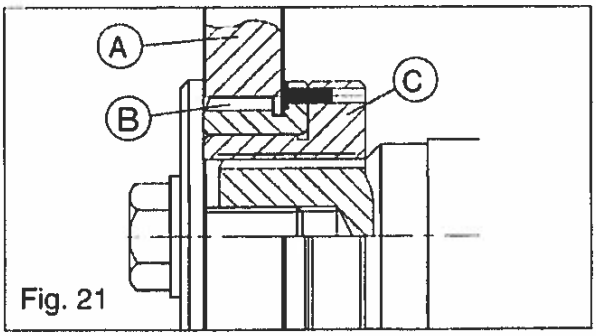


Fig. 21

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.

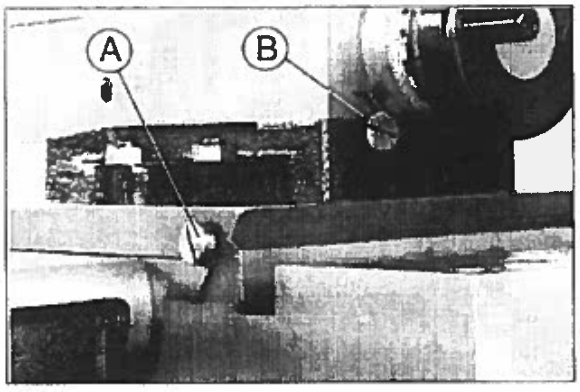


Fig. 22

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)

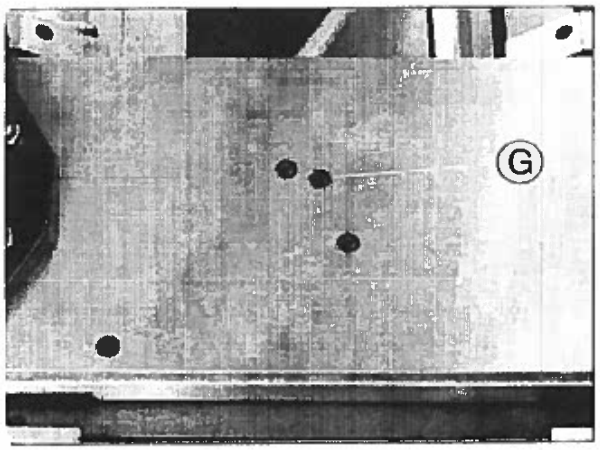


Fig. 23

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).

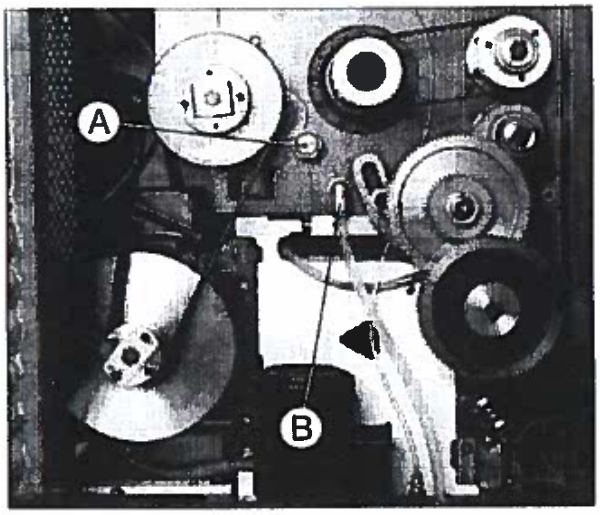


Fig. 24

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).

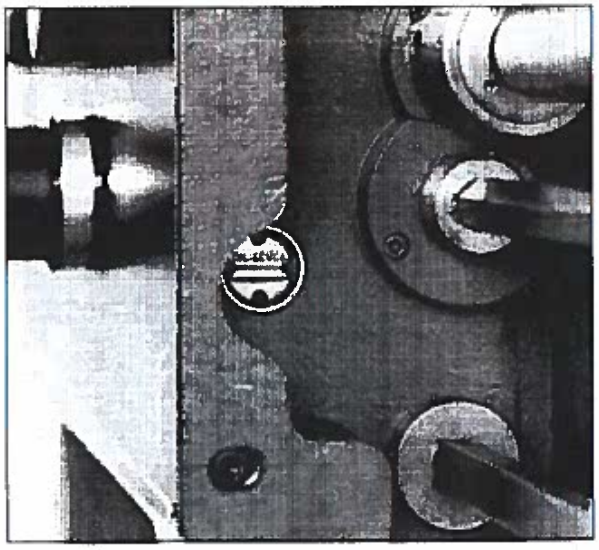


Fig. 25

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.

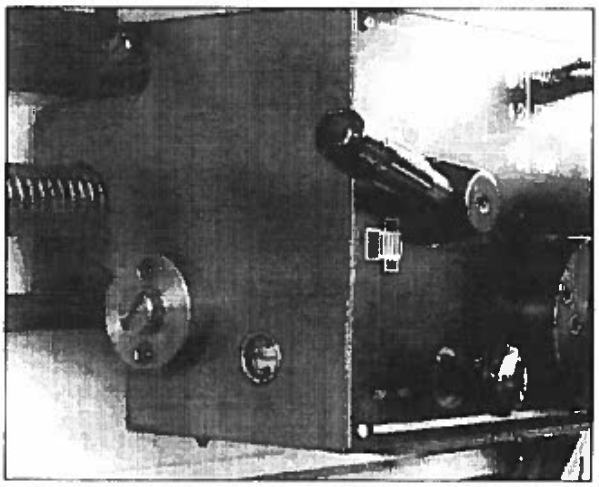


Fig. 26

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.

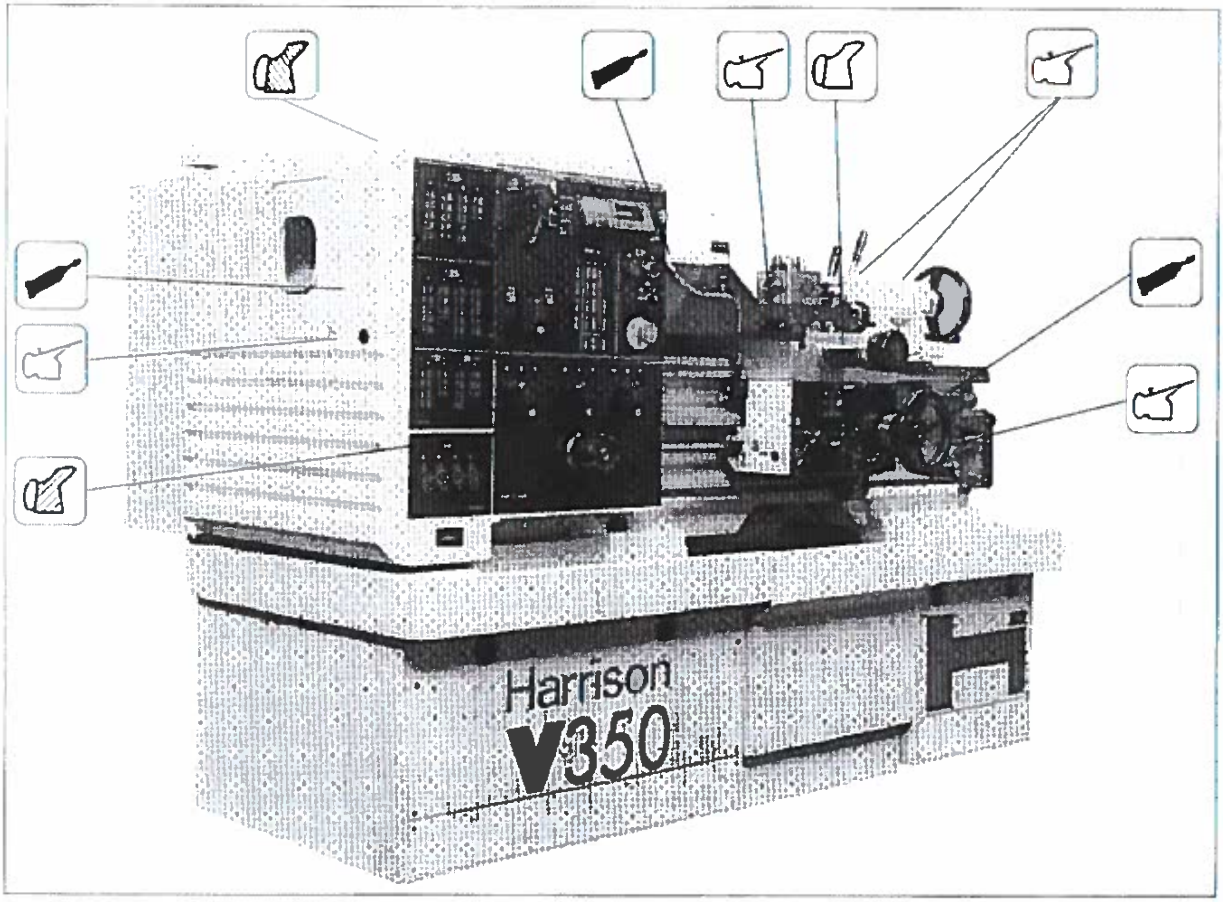
Slideways are lubricated by pulling the lube plunger located on the lower left hand end of the apron assembly.

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

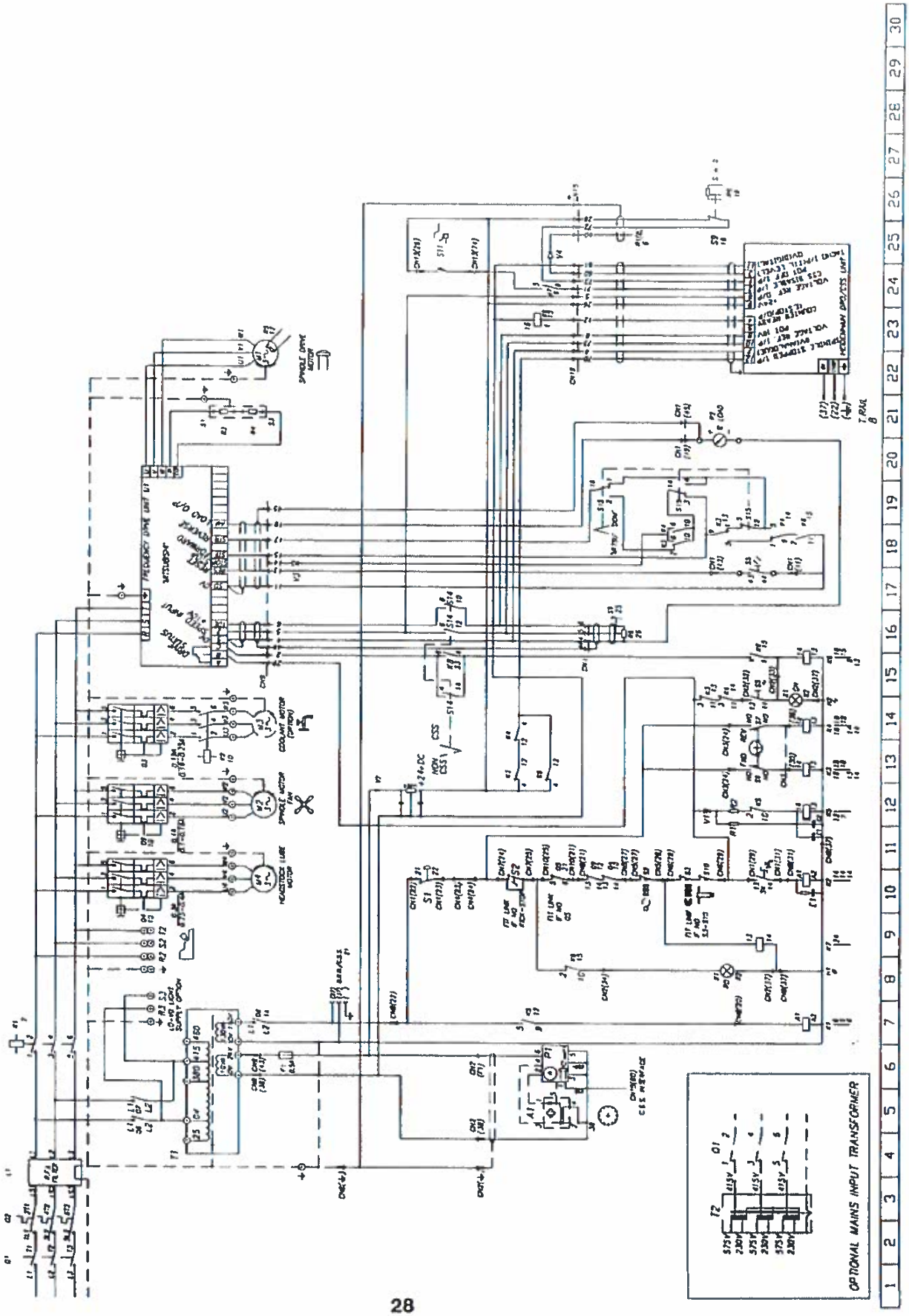
CONNECT CONDUIT THROUGH 22.5 DIA. HOLE IN THE BASE OF THE ELECTRICAL CABINET. WIRE INTO TERMINALS R2, S2, T2 AND EARTH, ON THE MAGNETICS PANEL.

DIGITAL READOUT

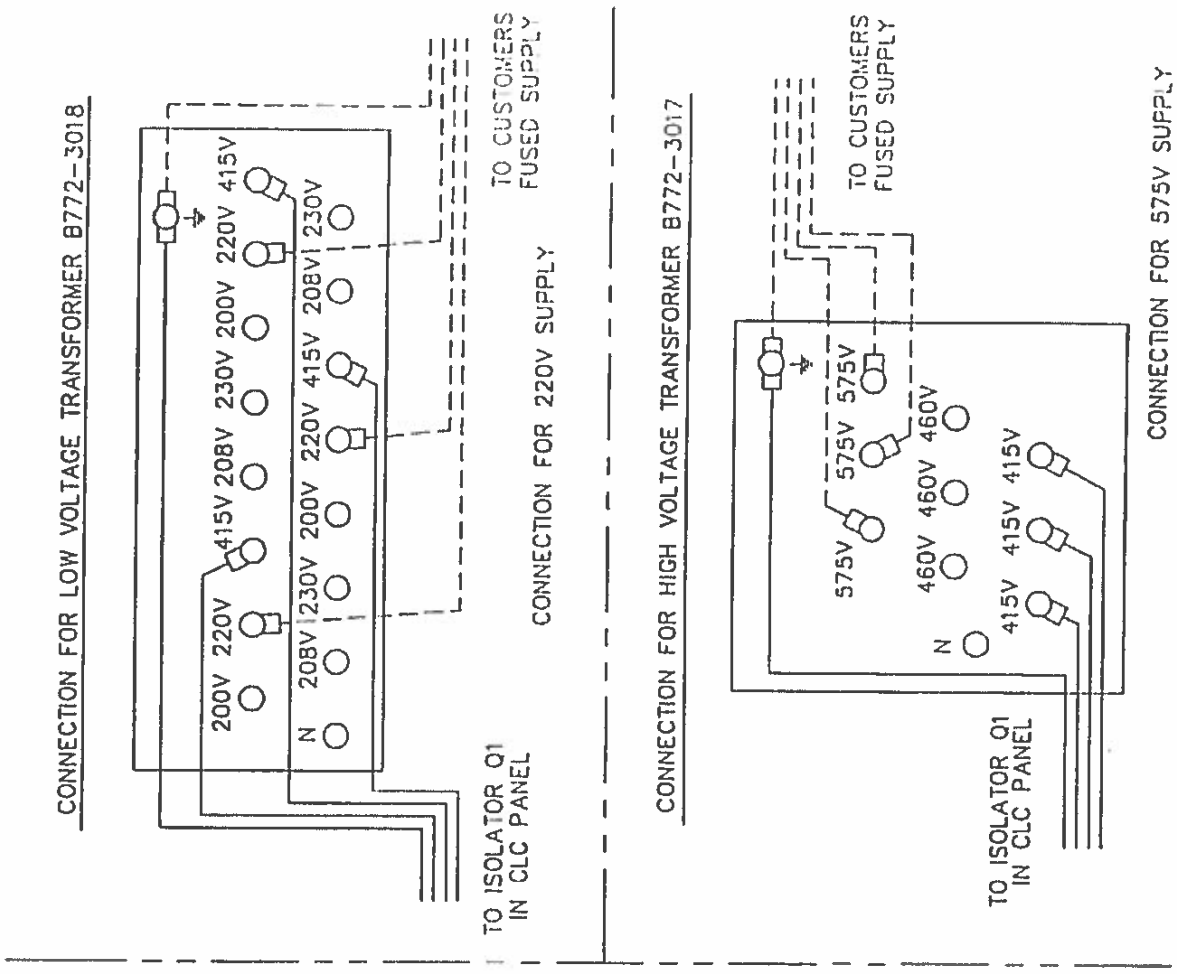
WIRE INTO TERMINALS 22 AND 37 ON THE MAGNETICS PANEL.

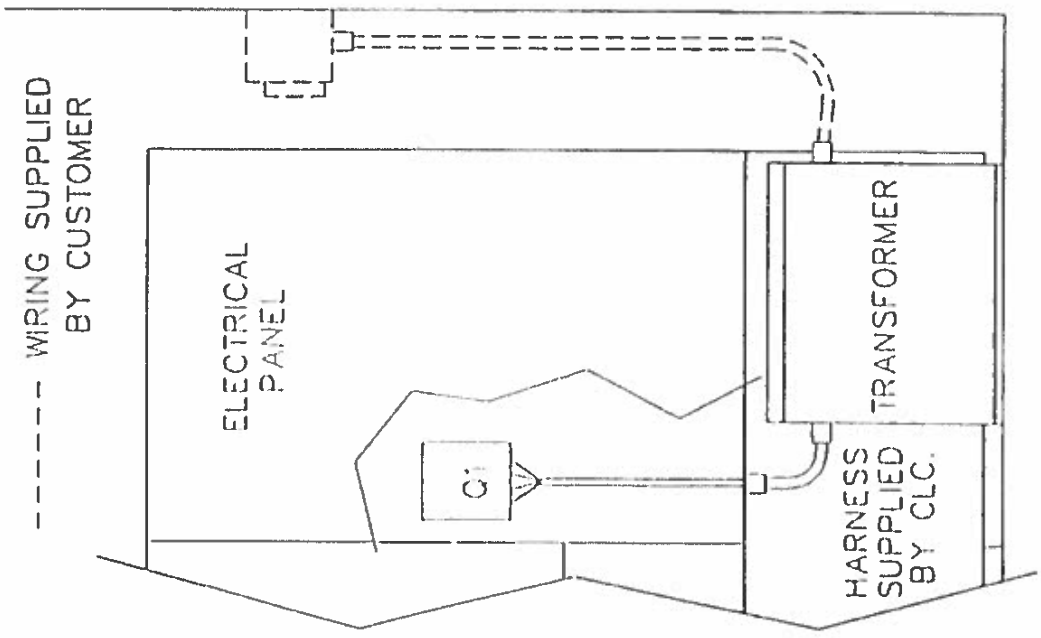
OVERLOAD SETTINGS

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


OPTIONAL MAINS INPUT TRANSFORMER

TRANSFORMER CONNECTIONS





FAULT FINDING ON THE VS SPINDLE DRIVE

The AC Inverter Spindle Drive fitted to the T.S.Harrison 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 MESSAGE 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.

FAULT MESSAGES

NOTE: The display normally indicates (0,00), if in a ready (to run) state, or motor frequency, if running.
The possible causes of these faults are described as follows:-

1. **EOLT - (Indicates a stop due to the activation of the function for a long time during constant-speed operation)**

EOLT - In-acceleration/constant-speed stall prevention current limit

If a current not less than 150%* of the rated inverter current flows in the motor during acceleration by the inverter, this function stops the increase in frequency until the load current reduces to prevent the inverter from resulting in overcurrent tripping. If a current not less than 150% of the rated current flows during steady (constant-speed) operation, this function also lowers the frequency until the load current reduces to prevent the inverter from resulting in overcurrent tripping. When the load current has reduced below 150%, this function increase the frequency again and accelerates up to the set speed or continues operation.

1. **EOLT - In-deceleration stall prevention**

If the brake operating amount has exceeded the specified value due to excessive regenerative energy during motor deceleration, this function stops the decrease in frequency to prevent the inverter from resulting in overvoltage tripping. As soon as the regenerative energy has reduced, this function reduces the frequency again and continues deceleration.

2. **EOC1 - Overcurrent shut-off During acceleration**

3. **EOC2 - Overcurrent shut-off During constant-speed operation**

4. **EOC3 - Overcurrent shut-off During deceleration**

When the inverter output current has reached or exceeded 200% of the rated current, the protective circuit is activated to stop the inverter.
Overcurrent is caused by the drive being overloaded. This can exist under the following circumstances:-

i. **Instantaneous Shock Load**
Tool crashes into workpiece, the tool is trapped under a chuck jaw etc, sudden mechanical seizure of the machine

ii. **Missing Input Mains Phase**
Check the supply for 3 phases

iii. **Earth Fault**
This can exist on the motor side between motor and drive.
Check for a fault.

iv. **Short Circuit or Bad Connections between the motor and Inverter**
Check the wiring between the motor and inverter for overheating / insulation damage. Also check security of phase connections in motor terminal box and on inverter drive (UVW Terminals).
Pay particular attention to the presence of arcing.

5. **EOV1 - Regenerative overvoltage shut-off During acceleration**

6. **EOV2 - Regenerative overvoltage shut-off During constant-speed operation**

7. **EOV3 - Regenerative overvoltage shut-off During deceleration**

When the converter output overvoltage is caused by regenerative energy from the motor, the protective circuit is activated to stop the transistor output and keep it stopped.

8. **EUVT - Undervoltage protection**

If the inverter power supply voltage has reduced, the control circuit cannot operate properly, resulting in the decrease in motor torque and/or the increase in heat generation. To prevent this, if the power supply voltage reduces below about 300V, this function stops the inverter output.

9. **EBE - Brake transistor alarm detection**

If the brake transistor fault has occurred due to extremely large regenerative brake amount, etc., this function detects that fault and stops the inverter output.

10. ETHM - Overload shut-off (electronic overcurrent Motor protection)

11. ETHT - Overload shut-off (electronic overcurrent Inverter protection)

The electronic overcurrent protector in the inverter detects motor overload during rated operation of motor overheat during low-speed operation, activates the protective circuit, and stops the inverter output and keeps it stopped. When, for example, a multi-pole motor or more than one motor are driven, the motor(s) cannot be protected by the electronic overcurrent protector. Provide a thermal relay in the inverter output circuit. In this case, setting the electronic overcurrent protector value to OA activates the inverter protection only. (Activated at a current 150% or more of the rated current.)

12. EGF - Output side ground fault overcurrent protection

If a ground fault current has flown due to a ground falt occurring in the output (load) side of the inverter, this function stops the inverter output. A ground fault occurring at low ground resistance may activate the overcurrent protection (OC1 to OC3).

13. EPE - Parameter storage device alarm

Stops the output if the specified number of write times (100,000 times) to EEPROM, which stores the function set values, has been exceeded or a device fault has occurred.

14. ECPU - CPU error

If the operation of the built in CPU does not end within a predetermined period of time, the inverter self-determines it as alarm and stops the output.

If the drive fails and the cause cannot be discerned from any of the above fault codes then either your Distributor or T.S.Harrison should be contacted for further diagnostic information.

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

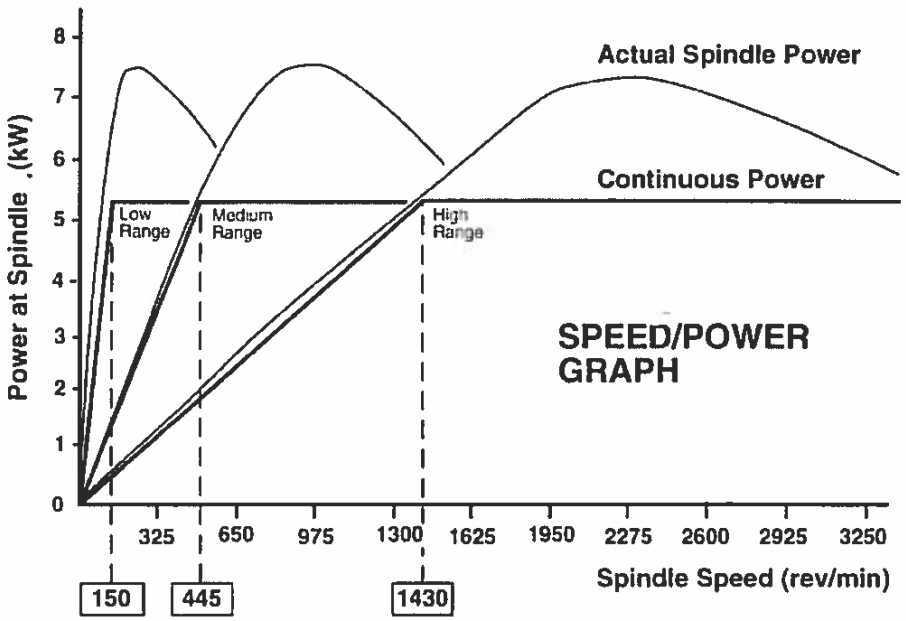
1. Screwcutting:-

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.

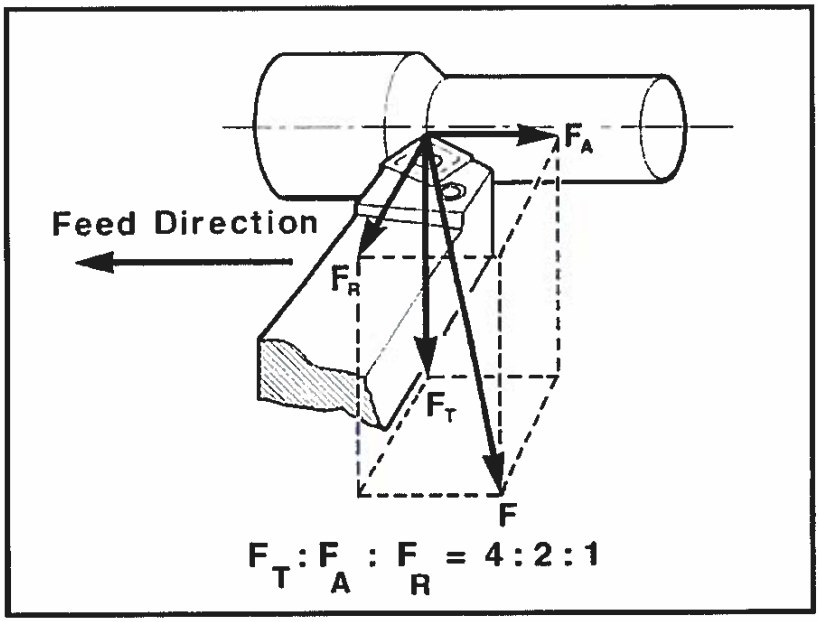
2. Power Consumption:-

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

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

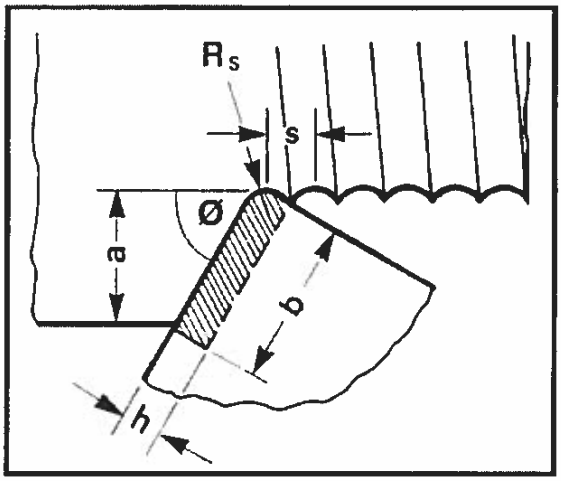
k_S VARIES ALSO WITH THE FOLLOWING FACTORS

CUTTING TOOL GEOMETRY

ENTERING ANGLE OF TOOL

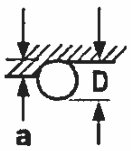
FEED RATE

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		–

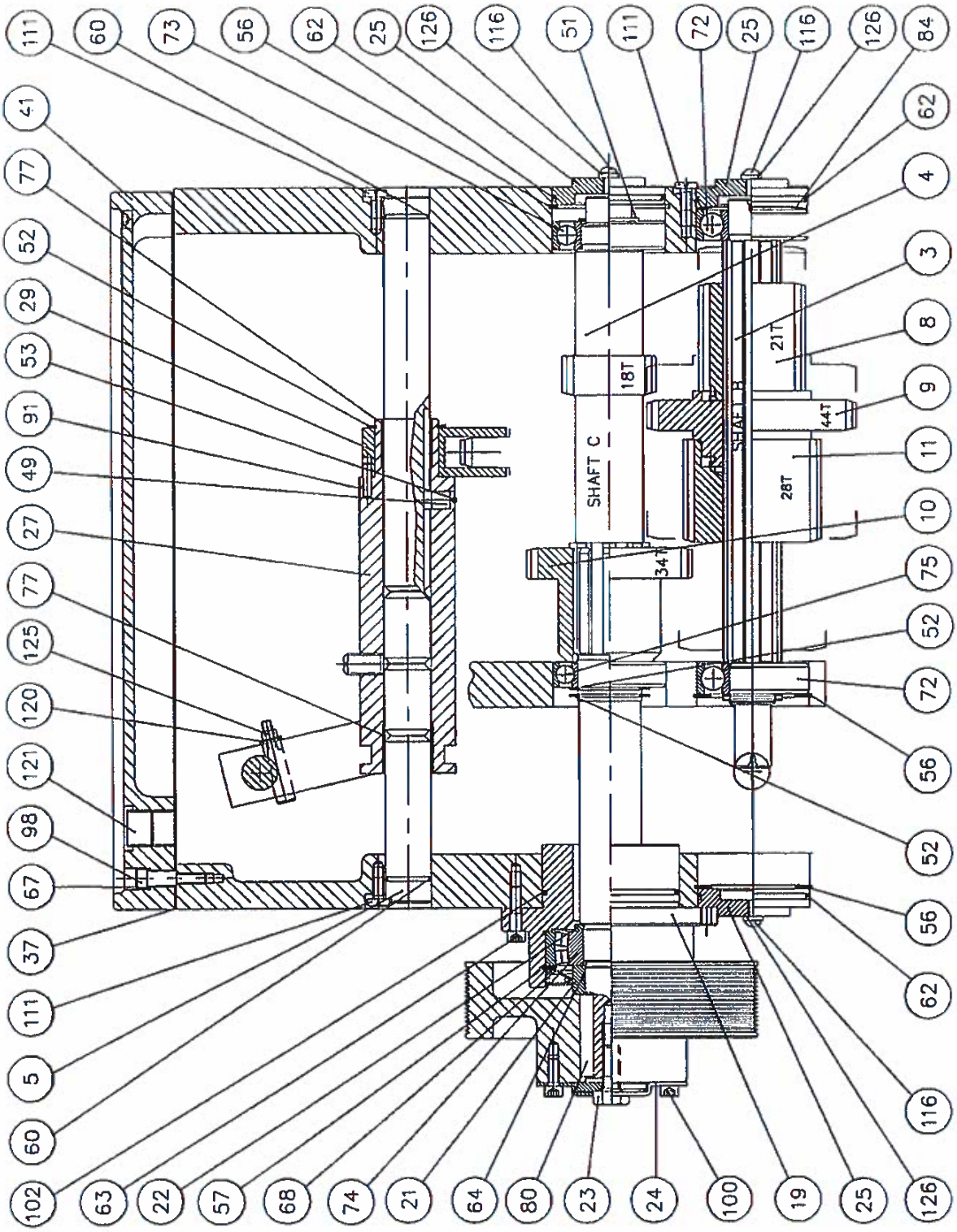
NOTES: 1. Non ferrous alloys require high top rake tools with non coated inserts.

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

INDEX

HEADSTOCK

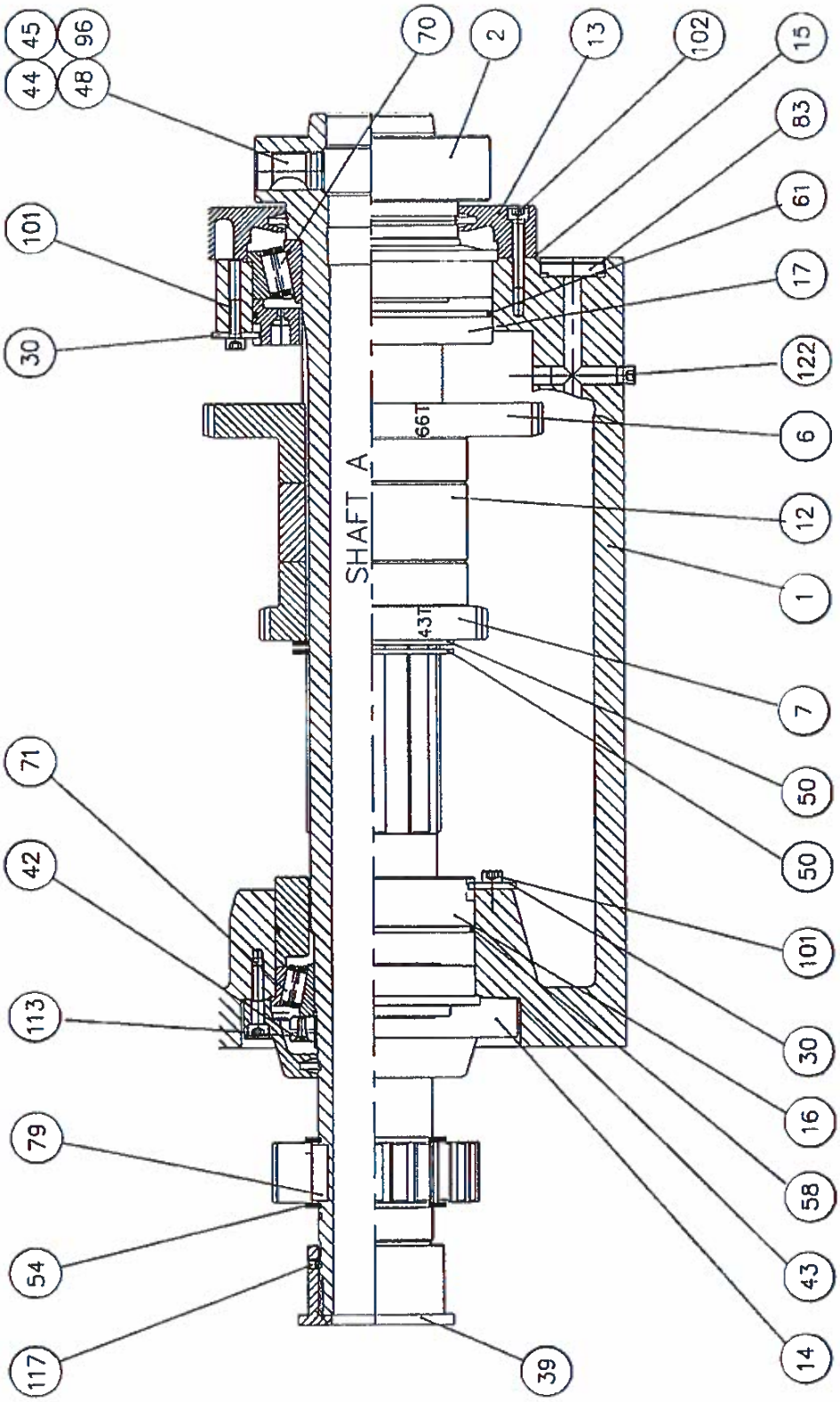
HEADSTOCK ASSEMBLY (1)



HEADSTOCK ASSEMBLY No. A100-0408

Item No.	Description	Part No.
1	HEADSTOCK CASTING	D384-0052
2	SPINDLE	D709-0047
3	SHAFT	D699-0783
4	DRIVE SHAFT	D699-0784
5	SUPPORT BAR	D041-0231
6	GEAR 66T	D344-1265
7	GEAR 43T	D344-1266
8	GEAR 21T	D344-1261
9	GEAR 44T	D344-1267
10	GEAR 34T	D344-1264
11	GEAR 28T	D344-1268
12	SPINDLE SPACER	D708-0465
13	FRONT BEARING COVER	D132-0693
14	BACK BEARING COVER	D132-0694
15	FRONT BEARING COVER GASKET	D343-0178
16	INNER COVER, BACK BEARING	D132-0695
17	INNER COVER, FRONT BEARING	D132-0696
18	SET OVER PAD	D557-0142
19	DRIVE SHAFT BEARING HOUSING	D388-0125
20	SET OVER PIN	D560-0297
21	HEADSTOCK PULLEY SPACER	D708-0462
22	SUPPORT SPACER BEARING	D708-0463
23	HEADSTOCK PULLEY SPACER	D708-0464
24	HEADSTOCK PULLEY TAB WASHER	D931-0342
25	PLUG	D566-0185
27	SHIFTER TUBE	D834-0028
29	GEAR SHIFTER FORK	D299 -0071
30	WASHER	D931-0343
32	SHIFTER FORK	D299-0068
33	GEAR SHIFTER BLOCKBLOCK	D047-0093
35	GEARSHIFT ROTATING SHAFT	D699-0785
37	GASKET HEADSTOCK COVER	D343 -0184
39	COOLANT THROWER	D646-0055
40	STOP PIN	D560-0298
41	PLASTIC HEADSTOCK COVER	D132-0782
42	BACK BEARING NUT	D536-0235
43	GASKET, REAR BEARING COVER	D343-0179
44	SPINDLE NOSE CAM	D123-0040
45	CAM DETENT PLUNGER	D567-0001

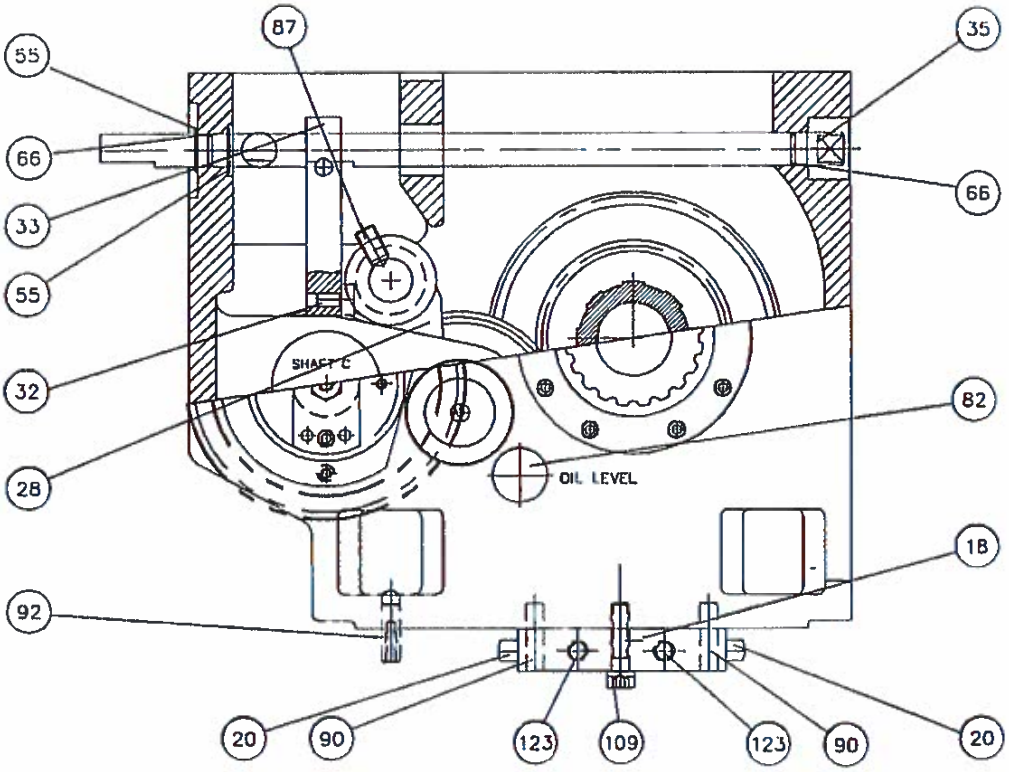
HEADSTOCK ASSEMBLY (2) Main Spindle

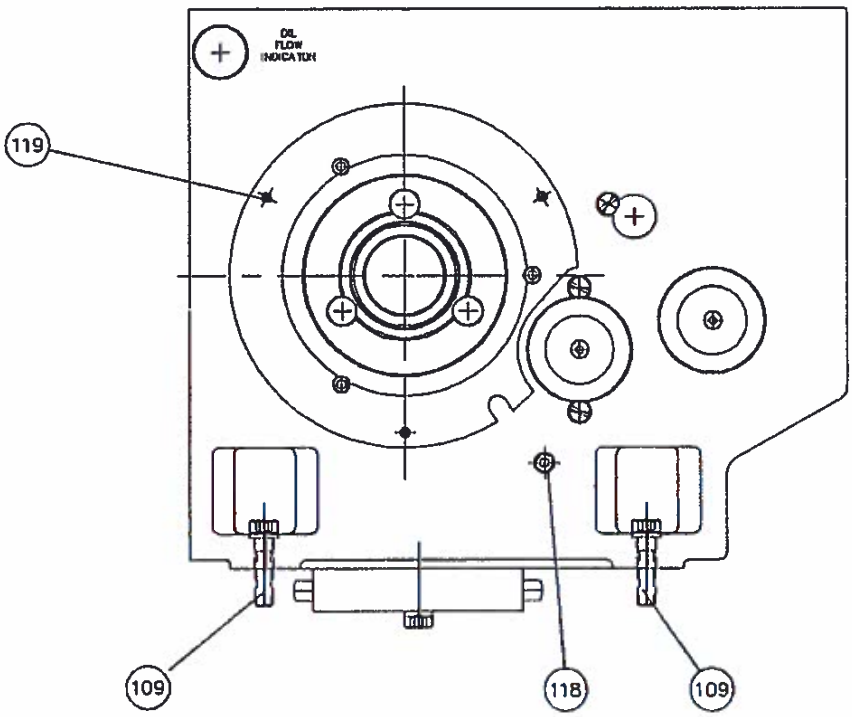


HEADSTOCK ASSEMBLY — No. A100-0408

Item No.	Description	Part No.
46	COTTER PIN	D560-0288
48	SPRING 5/16"	D707-0005
49	KEY	D441-0076
50	CIRCLIP 2 5/8" DIA.1400	B362-0048
51	CIRCLIP DIN 1400-30	B363-0030
52	35MM ANDERTON CIRCLIP 1400	B363-0035
53	PLAIN WIRE RING 1000-200	B362-1027
54	CIRCLIP 1400E	B363-0056
55	CIRCLIP EXTERNAL 1400-19	B363-0019
56	CIRCLIP INTERNAL 62MM BORE	B361-5052
57	CIRCLIP ANDERTON 1300-72MM	B363-0472
58	O RING DOWTY REF 202-744	B413-0945
60	O RING DOWTY REF 202-524	B413-0221
61	O RING DOWTY REF 202-748	B413-0894
62	O RING DOWTY 202-661	B413Y0576
63	O RING DOWTY REF 202-739	B413-0695
64	O RING DOWTY REF 202-649	B413-0276
66	O RING DOWTY REF 202-518	B413-0161
67	O RING, 200/011/4460	B412-0011
68	OIL SEAL M42x72x8-R42	B414-3221
70	FRONT SPINDLE BEARING	B336-1219
71	REAR SPINDLE BEARING 113060X/113100C	B336-1318
72	BALL BEARING REF 6305	B313-2406
73	RIGID BALL BEARING 6206	B313-1416
74	ROLLER BEARING SKF 21306CC	B325-7501
75	RIGID BALL BEARING 6007	B313-0418
77	GLACIER BUSH MB2525DU	B311-1564
79	KEY 8 x7x 28MM	B343Y5104
80	KEY 8x7x45MM	B343Y5108
82	OIL SIGHT SK1185 C4610	B454-1002
83	OIL SIGHT IC4611	B454-1001
84	SCHNORR DISC SPRING 6305	B365-6431
87	SPRING PLUNGER, ESLOK COAT	D567-0058
90	SPIROL PIN 10 DIA x 40	B111-5160
91	SPIROL PIN 4DIA x20	B111-5076
92	DOWEL 10MM DIA x 36MM	B111Y7060

HEADSTOCK ASSEMBLY (3)

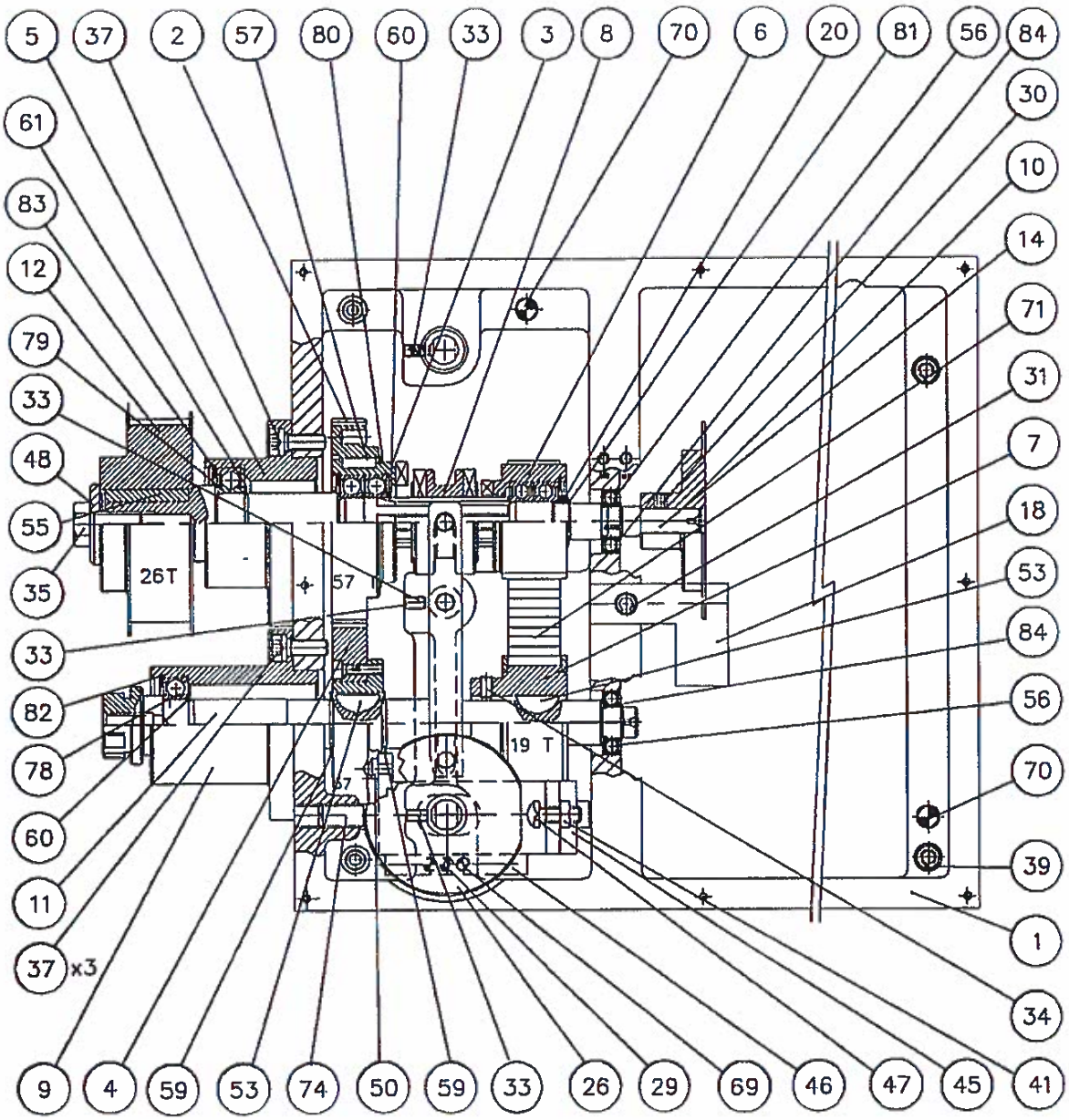




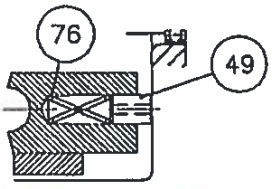
HEADSTOCK ASSEMBLY — No. A100-0408

Item No.	Description	Part No.
96	CAP SCREW 5/16"UNCx3/4"	B143-7045
98	SHOULDER SCREW 8DIA.x16	B163-1856
100	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163-0037
101	HEXAGON SOCKET CAP HEAD SCREW M6x20	B163-0038
102	HEXAGON SOCKET CAP HEAD SCREW M6x25	B163-0039
103	HEXAGON SOCKET CAP HEAD SCREW M6x30	B163-0040
109	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163-0071
111	SLOTTED PAN HEAD SCREW M6 x12	B163-0133
113	C/SUNK SCREW 10-24UNC x 3/8"	B143-7402
115	HEXAGON HEAD SCREW M12x25	B166-0097
116	HEXAGON SOCKET BUTTON HEAD SCREW M6x8	B163Y1841
117	SET SCREW M5 x 6	B163-1642
118	DOG POINT SCREW M12 Xx12	B163-1780
119	SET SCREW CUP POINT M6 x12	B163-1517
120	WASHER, M5 FORM C	B117-0032
121	1/2" BSP TAPER HEXAGON SOCKET PLUG	B424-3210
122	1/8" BSP TAPER PLUG	B424-3200
123	WEDGLOK SET SCREW M12 x 20	B164-0170
125	NYLOC NUT M5	B147-9002
126	FIBRE WASHER 11 ODX6 IDx2	B117-0151
127	HEADSTOCK LUBRICATION KIT	A903-0002B
128	BLANKING PLUG RM.12429 RED	B224-2306

REVERSING BOX AND CHANGEWHEEL ASSEMBLY (1)



NOTE
GEAR TEETH TO BE LIGHTLY LUBRICATED WITH:-
KLUBER ISOFLEX LD518-PART No. R766-0011

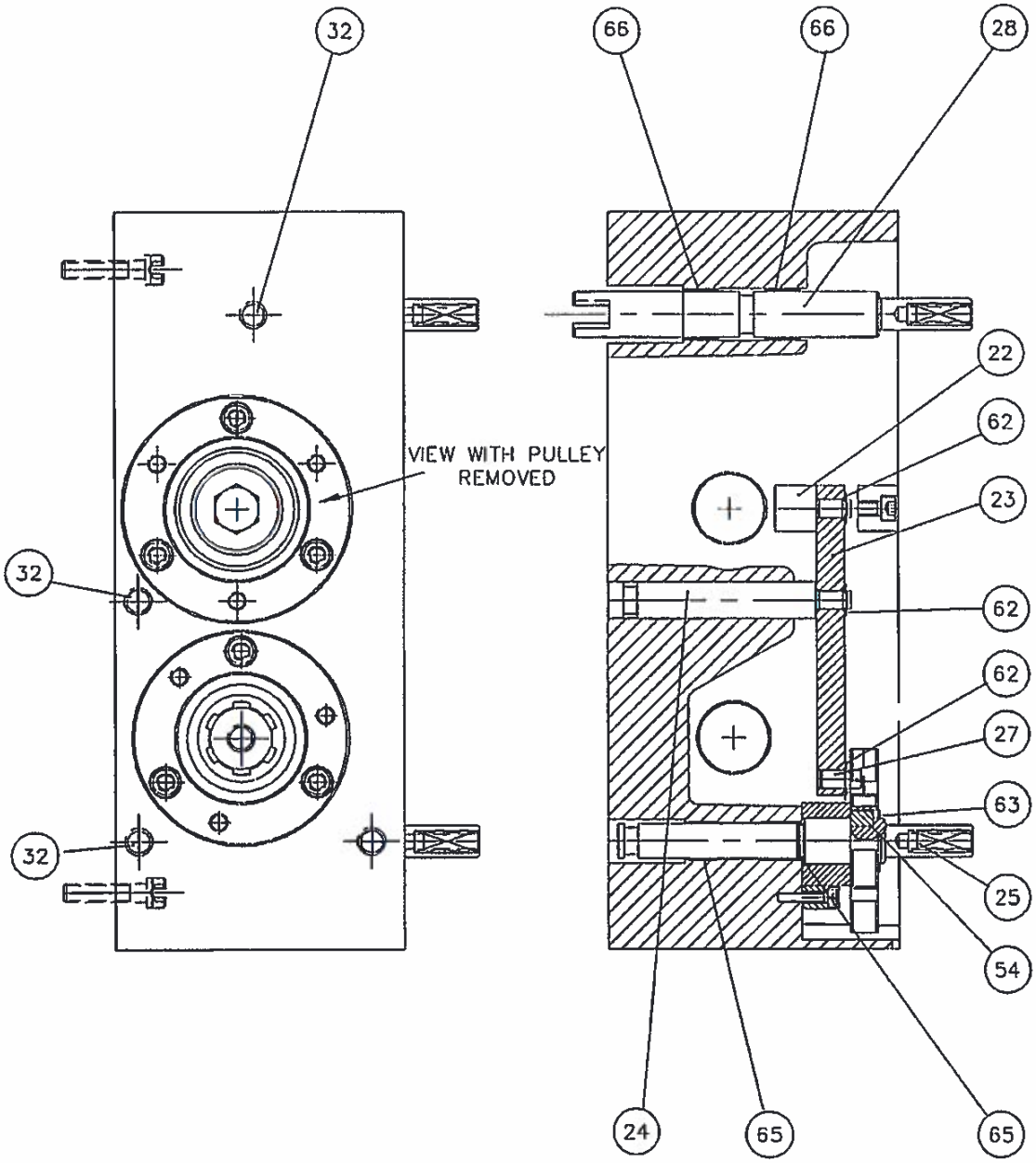


SECTION THROUGH BLOCK (ITEM 45)

REVERSE BOX ASSEMBLY A109-0001

Item No.	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
12	26T PULLEY SUB S/ASSY	A824-0028A
14	SENSOR MOUNTING SPIGOT ASSY	A806-0561A
18	SENSOR MOUNTING BRACKET	D050-0677
20	SHAFT A SPACER	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	B163Y0017
30	HEXAGON SOCKET SET SCREW M6 X 6	B163-1560
31	HEXAGON SOCKET CAP HEAD SCREW M6 X 12	B163-0036
32	HEXAGON SOCKET SET SCREW M12 X 16	B163-1781
33	HEXAGON SOCKET SET SCREW M6 X 8	B163-1740
34	HEXAGON SOCKET CUP POINT SCREW	B163-1562
35	HEXAGON SOCKET CAP HEAD SCREW M12 X 25	B166 - 0097
37	HEXAGON SOCKET CAP HEAD SCREW M8 X 20	B163 -0053
38	HEXAGON SOCKET CAP HEAD SCREW M4 X 10	B16Y0014
39	HEXAGON SOCKET CAP HEAD SCREW M8 X 25	B163-0054
41	HEXAGON LOCK NUT M8	B147-9170

REVERSING BOX AND CHANGEWHEEL ASSEMBLY (2)



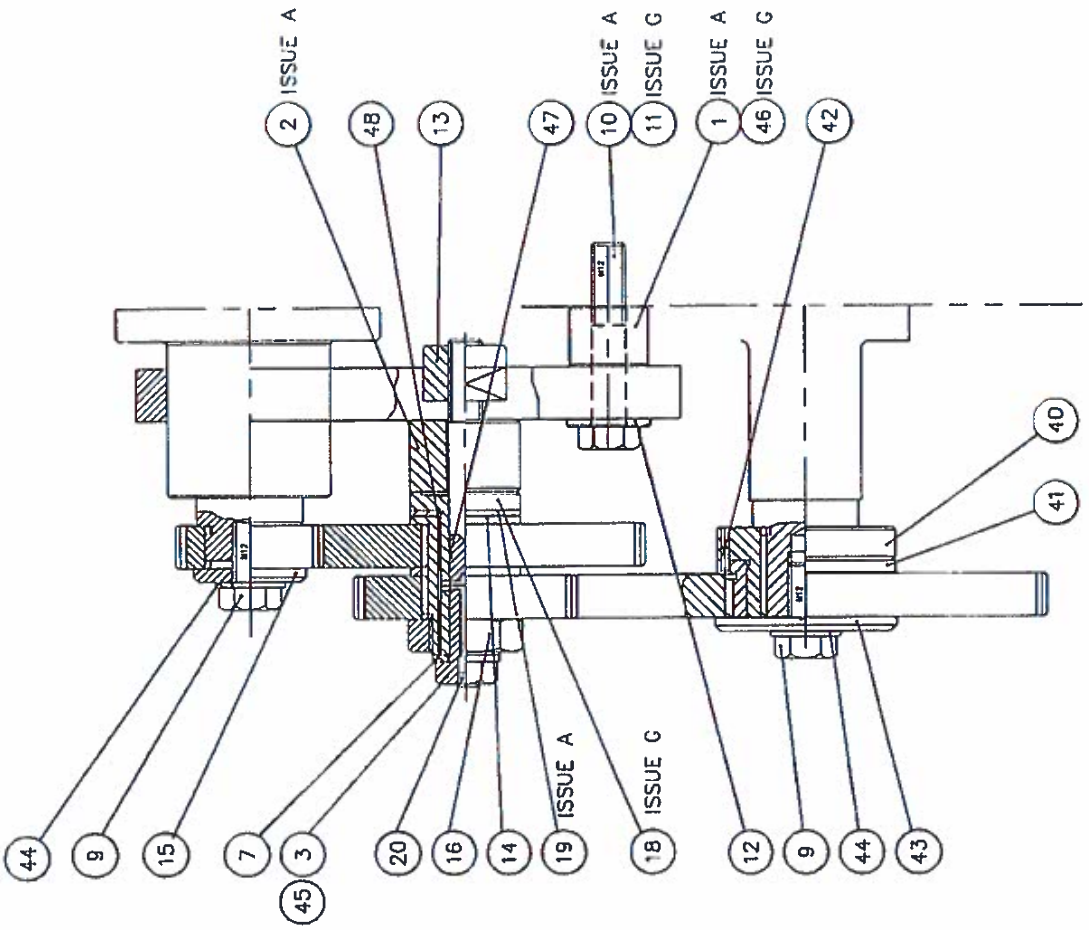
REVERSE BOX ASSEMBLY A109 - 0001

Item No.	Description	Part No.
45	BLOCK	D047-0104
46	BLOCK	D047-0105
47	ADJUSTING SCREW	D697-0360
48	SPACER	D708-0468
49	PIN	D560-0303
50	PIN	D560-0304
53	WOODRUFF KEY 6 X 9 X 22	B343-2009
54	KEY 6 X 6 X 10	B343-5041
55	RECTANG KEY 8 X 7 X 40	B343-5107
56	BALL BEARING 6002 2Z	B315-0410
57	KEY - 5 X 5 X 16 ROUND ENDS	B343-5031
59	CIRCLIP EXTERNAL 1400-24	B363-0024
60	CIRCLIP DIN 1400-25	B363-0025
61	CIRCLIP DIN 1400-30	B363-0030
62	CIRCLIP 1400-8 (EXTERNAL)	B363Y0008
63	ANDERTON CLIP 1400-20 EXT	B363-0020
65	GLACIER BUSH MB1420DU	B311-1532
66	DU BUSH 20MM 10 X 23	B311-1547
69	SPIROL PIN 6 DIA X 30	B111-5114
70	DOWEL PIN 10 DIA X 25	B111-7054
71	TIMING BELT REF 150L100	B346-1337
74	SPRING PLUNGER ESLOK	D567-0058
76	SPRING FLEXO M246208	B366-0350
78	BALL BEARING 6005 2Z	B315-0413
79	BALL BRG 6006 2Z	B315-0414
80	CIRCLIP EXTERNAL 1400-60	B363-0060
81	ANDERTON CIRCLIP 1400 E	B363-0018
82	CIRCLIP 1300-47 (INTERNAL)	B363Y0447
83	CIRCLIP TYPE 1300-55	B363-0455
84	CIRCLIP EXTERNAL 1400-15	B363-0015

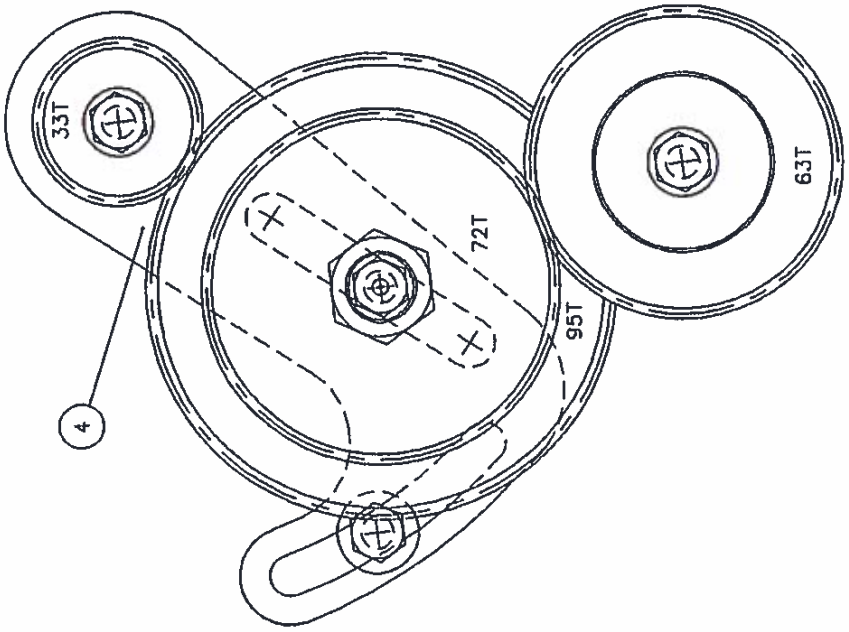
REVERSE BOX SUB ASSEMBLIES

Item No.	Description	Part No.
	26T PULLEY SUB ASSEMBLY	A824-0028
1	26T PULLEY	D570-0319
2	BELT RETAINING RING	D565-0912
3	HEXAGON SOCKET BUTTON HEAD SCREW M4 X12	B163Y1805
	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



ISSUE A = COMMON PARTS V/S MACHINES
ISSUE B = METRIC CHANGE WHEEL
ISSUE C = IMPERIAL CHANGE WHEELS
ISSUE G = COMMON PARTS GEARED HEAD MACHINE



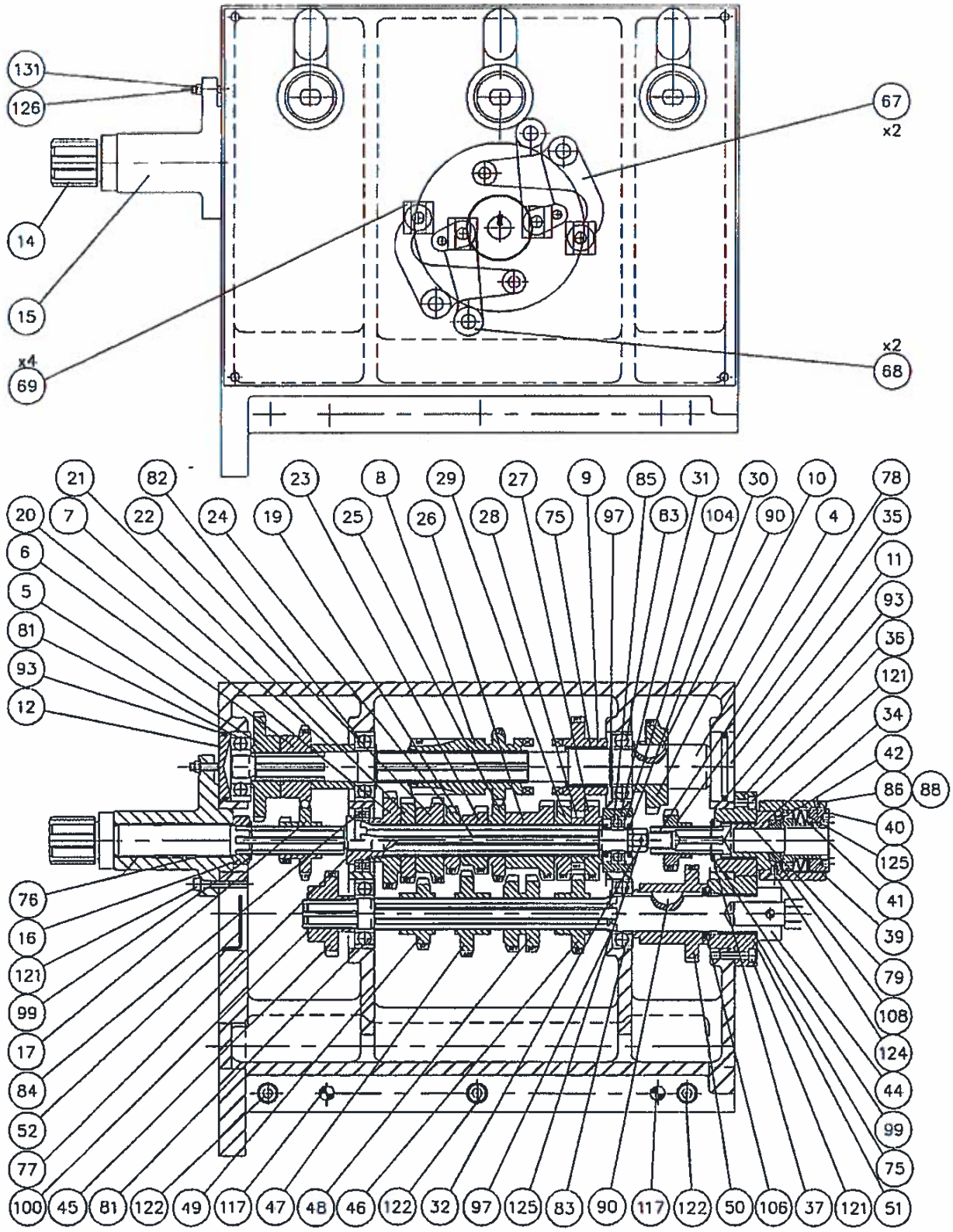
TYPICAL CHANGEWHEEL ARRANGEMENT

CHANGE WHEEL ASSEMBLY

A155 - 0503

Item No.	Description		Part No.
1	SPACER		D708 - 0473
2	SPACER		D708 - 0474
3	STUD		D048 - 0157
4	SWING FRAME		D720 - 0025
7	WASHER M12		B117 - 0012
9	HEXAGON HEADED SCREW M12x25		B166 - 0097
10	HEXAGON HEADED SCREW M12x65		B166 - 0221
11	HEXAGON HEADED BOLT M12x90		B166 - 0205
12	WASHER		D708H0008
13	TEE NUT		D408H0006
14	CHANGE WHEEL SHAFT SLEEVE		D699 - 0793
15	WASHER		D408H0010
16	NUT		D408H0007
18	SLEEVE CHANGE WHEELS		D704 - 0123
19	WASHER CHANGE WHEELS		D931 - 0349
20	SPRINGWELL OIL NIPPLE 6mm		B454 - 2004
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 - 1279
35	72T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1281
36	96T 1.75 MOD. CHANGE WHEEL	(METRIC SET)	D344 - 1282
37	99T 1.75 MOD. CHANGE WHEEL	(IMP SET)	D344 - 1283
40	CHANGE WHEEL SLEEVE		D704 - 0127
41	CHANGE WHEEL SLEEVE		D704 - 0128
42	SHEAR PIN 5/32"x3/8"		D560 - 0137
43	CHANGE WHEEL WASHER		D931 - 0350
44	LOCK WASHER		B116 - 2228
47	O RING DOWTY202-511		B413 - 0091
48	GLACIER BUSH MB1820DU		B311 - 1544

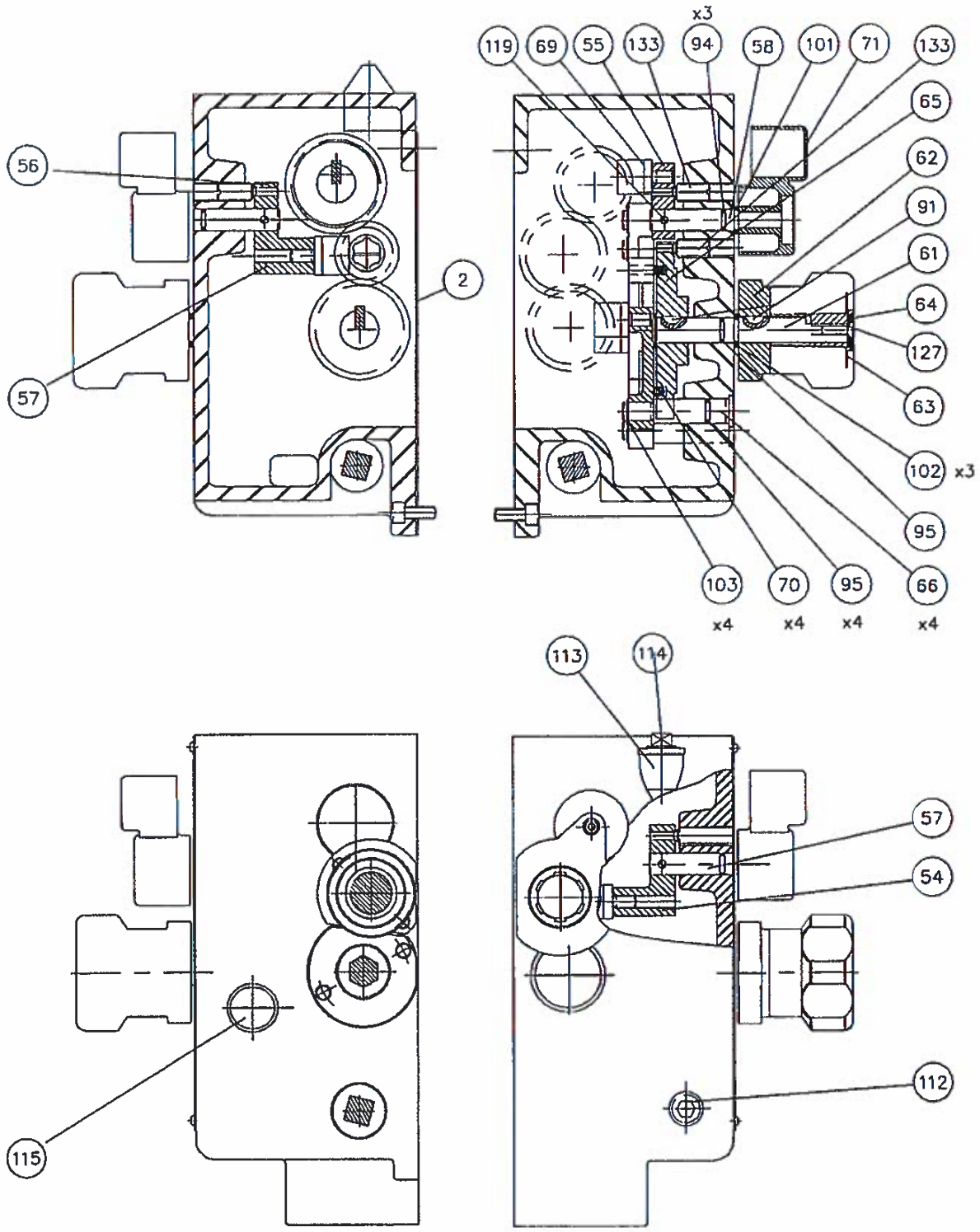
GEARBOX ASSEMBLY (1)



GEARBOX ASSEMBLY A108 - 0502

Item No.	Description	Part No.
1	GEARBOX CASTING	B505 - 00054
2	GEARBOX GASKET	B511 - 0001
4	TOP SHAFT	B535 - 0008
5	50T GEAR	B508 - 0007
6	19T GEAR	B508 - 0008
7	SPACER	B538 - 0006
8	16T/23T GEAR	B508 - 0009
9	32T GEAR	B508 - 0010
10	35T GEAR	B508 - 0011
11	PLUG	B224 - 6152
12	BEARING LOCK BUSH	B501 - 0003
14	INPUT SHAFT	B535 - 0009
15	HOUSING	B350 - 0054
16	SPACER	B538 - 000
17	19T/20T GEAR	B508 - 0012
19	MIDDLE SHAFT	B535 - 0010
20	32T GEAR	B508 - 0013
21	39T GEAR	B508 - 0014
22	42T GEAR	B508 - 0015
23	24T GEAR	B508 - 0016
24	27T GEAR	B508 - 0017
25	23T GEAR	B508 - 0018
26	24T GEAR	B508 - 0019
27	20T GEAR	B508 - 0020
28	16T GEAR	B508 - 0021
29	22T GEAR	B508 - 0022
30	SPACER	B538 - 0008
31	BEARING HOUSING	B350 - 0055
32	ADJUSTING NUT	B147 - 9584
34	OUTPUT SHAFT	B535 - 0011
35	21T GEAR	B508 - 0023
36	BEARING HOUSING	B350 - 0056
37	SPACER	B538 - 0009
39	HOUSING	B350 - 0057
40	ADJUSTING NUT	B147 - 9582
41	FRICTION SLEEVE	B537 - 0001
42	INNER RING	B531 - 0002
44	BOTTOM SHAFT	B535 - 0012
45	22T GEAR	B508 - 0024
46	22T SLIDING GEAR	B508 - 0025
47	33T SLIDING GEAR	B508 - 0026
48	22T/22T SLIDING GEAR	B508 - 0027
49	33T SLIDING GEAR	B508 - 0028
50	36T GEAR	B508 - 0025
51	BEARING HOUSING	B350 - 0058

GEARBOX ASSEMBLY (2)



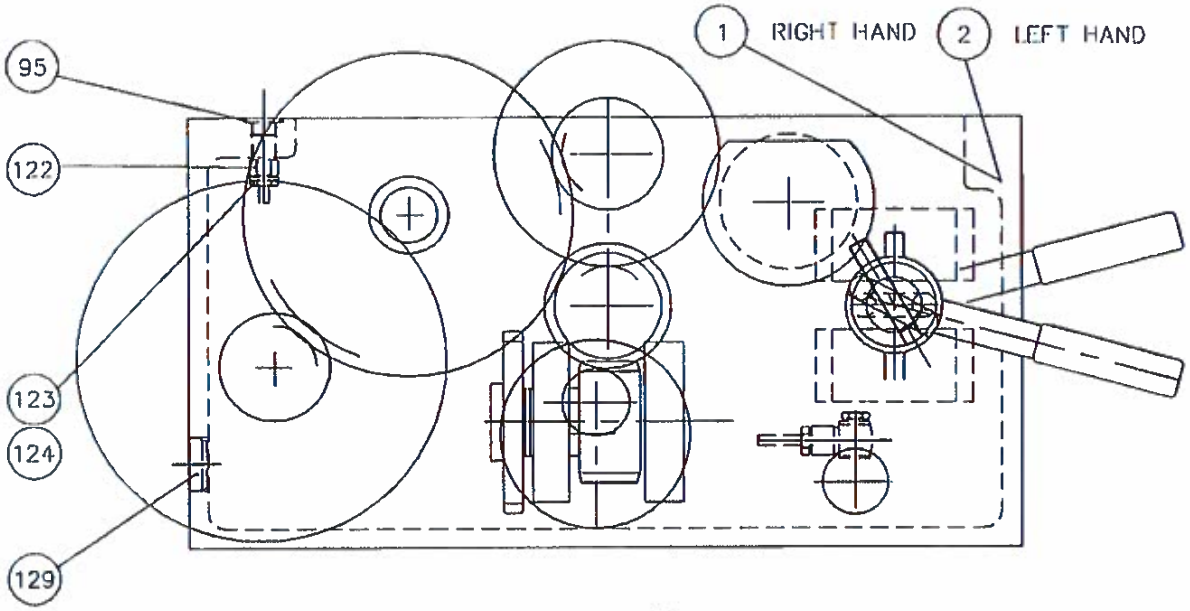
GEARBOX ASSEMBLY A108 - 0502

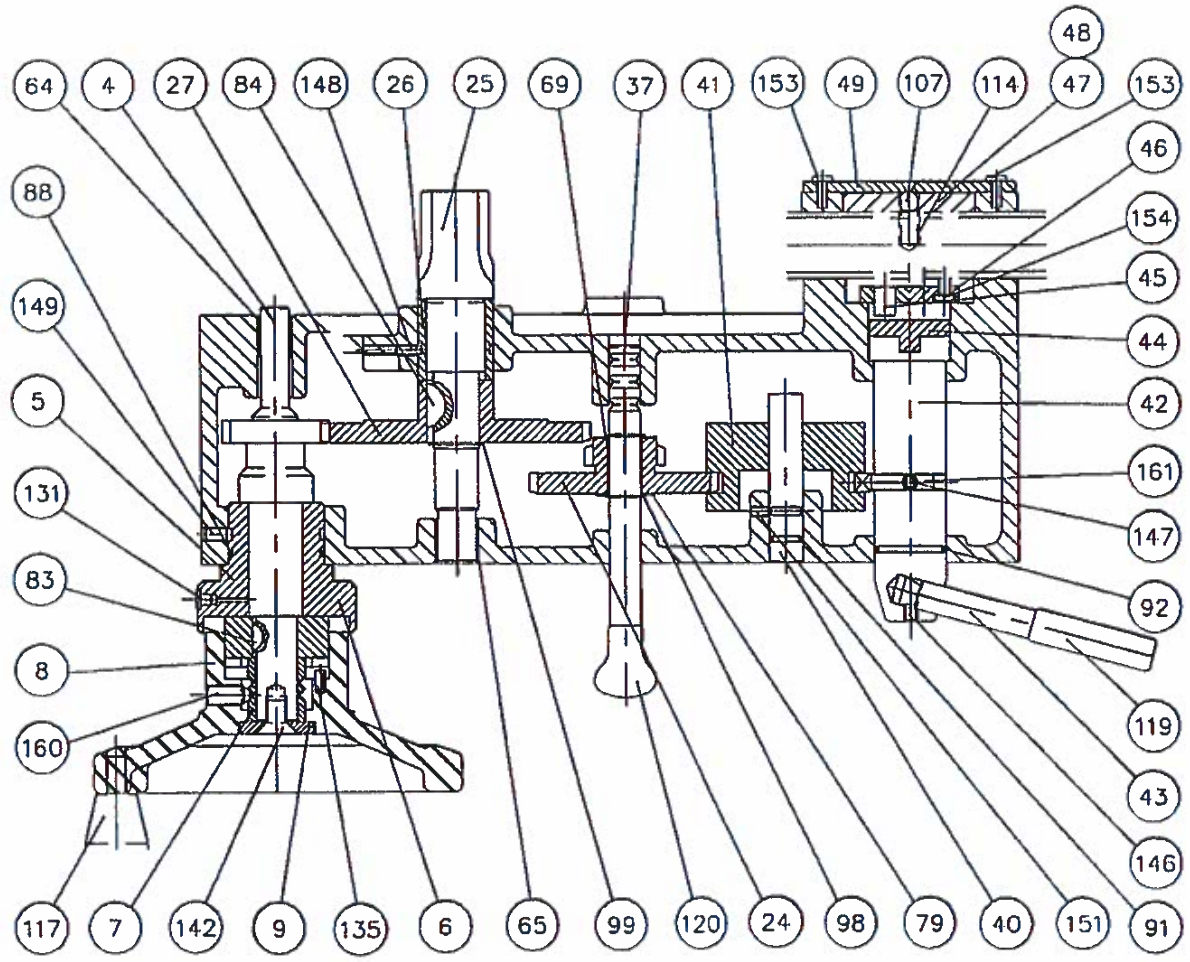
Item No.	Description	Part No.
52	PLUG	B224 - 6153
54	SELECTOR LEVER	B515 - 0002
55	SELECTORLEVER	B515 - 0003
56	SELECTOR LEVER	B515 - 0004
57	SELECTOR SHAFT	B535 - 0013
58	SELECTOR SHAFT	B535 - 0014
61	CAM SHAFT	B535 - 0015
62	INNER RING	B531 - 0001
63	SELECTOR DIAL	B973 - 2150
64	WASHER	B117 - 0254
65	SELECTOR CAM	B503 - 0001
66	SELECTOR SHAFT (CAM)	B535 - 0016
67	SELECTOR LEVER (CAM)	B515 - 0005
68	SELECTOR LEVER (CAM)	B515 - 0006
69	GEAR SHIFTER	B536 - 0001
70	CAM SELECTOR PIN	B111 - 7304
71	HANDLE	D382 - 0137
75	GLACIER BUSH MB-25-30-DU	B311 - 1565
76	GLACIER BUSH MB-20-25-DU	B311 - 1549
77	GLACIER BUSH MB-12-15-DU	B311 - 1529
78	GLACIER BUSH MB-10-15-DU	B311 - 1522
79	GLACIER BUSH MB-22-25-DU	B311 - 1554
81	BALL BEARING FAG6303	B313 - 2404
82	BALL BEARING FAG6204	B313 - 1462
83	BALL BEARING FAG6005	B313 - 0414
84	BALL BEARING INA 61905	B313 - 6130
85	DEEP GROOVE BEARING 6002	B313 - 0410
86	THRUST NEEDLE BEARING AXK 2542	B337 - 5016
88	THRUST WASHER INA AS2542	B311 - 7008
90	WOODRUFF KEY6x9x22	B343 - 2009
91	WOODRUFF KEY 13x5x3	B343 - 2002
93	'O' RING DOWTY 202-786	B413 - 0415
94	'O' RING GACO RM0111-16	B413 - 0111
95	'O' RING GACO RM131-16	B413 - 0131
97	EXTERNAL CIRCLIP 5103-100	B363 - 0381
98	EXTERNAL CIRCLIP 1400-20	B363 - 0020
99	EXTERNAL CIRCLIP 1400-19	B363 - 0019
100	EXTERNAL CIRCLIP 1400-15	B363 - 0015
101	EXTERNAL CIRCLIP 1400-14	B363 - 0014
102	EXTERNAL CIRCLIP 1400-16	B363 - 0016
103	EXTERNAL CIRCLIP 1400-12	B363 - 0012
104	INTERNAL CIRCLIP INA BR 32	B361 - 7026

GEARBOX ASSEMBLY A108 - 0502

Item No.	Description	Part No.
106	V RING SEAL V-25	B414 -3363
108	STEEL BALL 7.0	B326 - 9007
110	DISC SPRING E5532	B365 - 6317
112	1/2" BSPT DRAIN PLUG	B224 - 6101
113	1/2" BSP M& F ELBOW 45°	B424 - 2254
114	1/2" BSP PLUG	B424 - 2814
115	OIL SIGHT 1.25"	B454 - 1011
117	SPIROL PIN 10x30	B111 - 5282
118	SPIROL PIN 6x34	B111 - 5283
119	SPIROL PIN 5x24	B111 - 5284
121	HEXAGON SOCKET CAP HEAD SCREW M5x20	B163Y0028
122	HEXAGON SOCKET CAP HEAD SCREW M8x20	B163 - 0053
123	HEXAGON SOCKET CAP HEAD SCREW M8x40	B163 - 0057
124	HEXAGON SOCKET C/SUNK SCREW M5x12	B163 - 1015
125	HEXAGON SOCKET CUP POINT SET SCREW M4x4	B163 -1508
126	HEXAGON SOCKET CUP POINT SET SCREW M5x20	B163 -1548
127	HEXAGON SOCKET C/SUNK SCREW M6x16	B163 -1023
129	HEXAGON SOCKET DOG POINT SET SCREW M8x8	B163 - 1750
131	M5 NUT	B147Y9151
133	BALL DETENT SCREW M12	B169 - 0002

APRON ASSEMBLY (LEFT AND RIGHT HAND) (1)



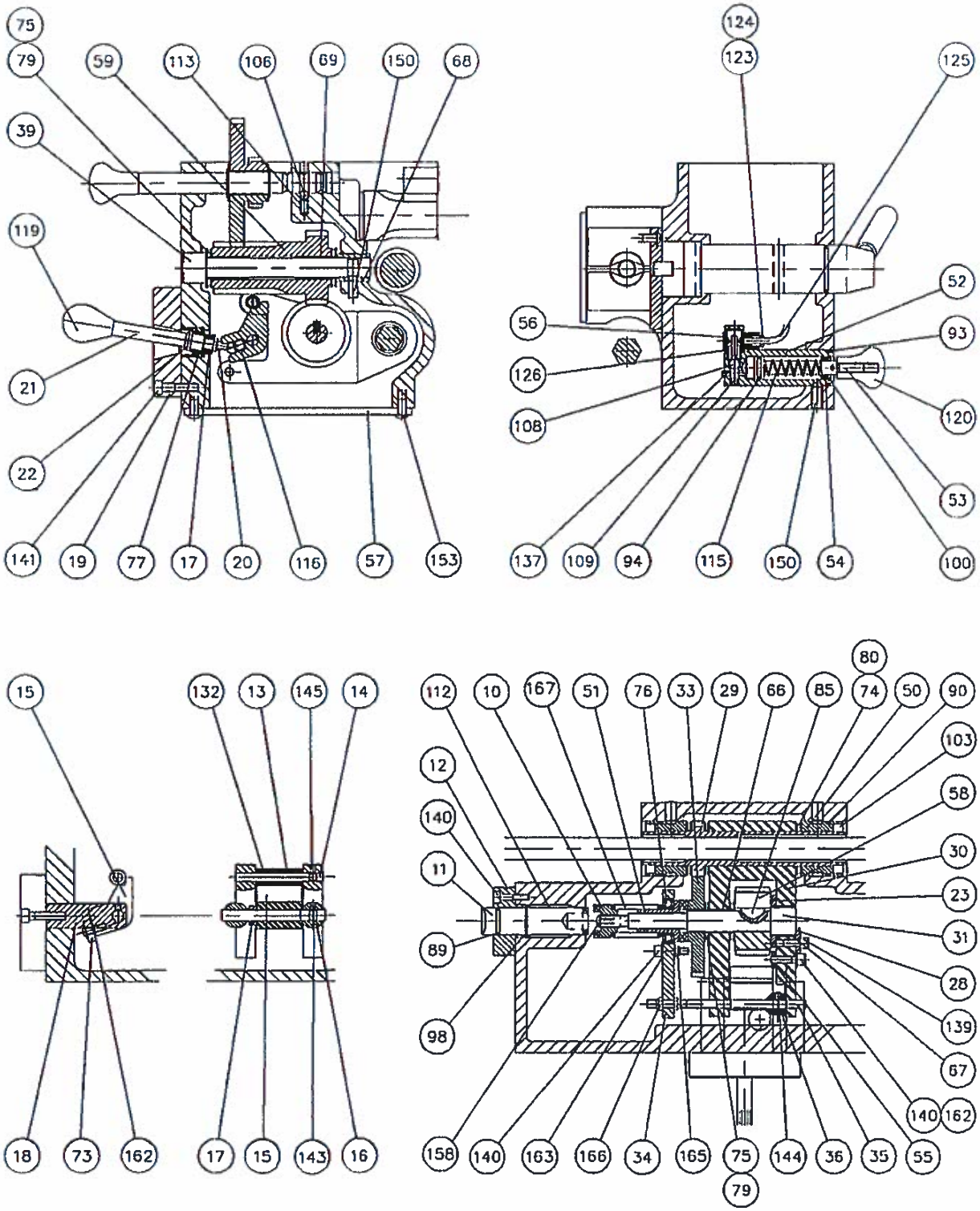


APRON ASSEMBLY

A131 - 0506

Item No.	Description	Part No.
1	APRON CASTING RIGHT HAND	B505 - 0001
2	APRON CASTING LEFT HAND	B505 - 0002
4	PINION SHAFT HANDWHEEL	B535 - 0001
5	HOUSING (NO APRON DIAL)	B350 - 0051
6	APRON HANDWHEEL SPIGOT	B539 - 0001
7	HANDWHEEL DETENT SPACER	B538 - 0001
8	APRON HANDWHEEL	B510 - 0001
9	WASHER	B117 - 0251
10	NUT	B147 - 9580
11	ADJUSTER SHAFT	B535 - 0003
12	HOUSING	B350 - 0052
13	LOCATION BUSH (CLIP)	B501 - 0002
14	LOCATION BUSH PIN	B111 - 7301
15	WORM BOX CLIP	B506 - 0001
16	HINGE PIN CLIP	B506 - 0002
17	SPACER	B538 - 0002
18	HINGE CLIP PILAR	B524 - 0001
19	LEVER BEARING COVER	B509 - 0001
20	BALL STUD	B326 - 9060
21	WORM BOX LEVER	B515 - 0001
22	LEVER BEARING SPACER	B538 - 0003
23	SPACER	B538 - 0004
24	16T/45T SLIDING GEAR	B508 - 0005
25	10T RACK PINION	B530 - 0001
26	OILITE BUSH	B501 - 0001
27	66T GEAR	B508 - 0001
28	WASHER	B117 - 0252
29	FEED SHAFT GEAR	B508 - 0002
30	WORM BOX CASTING	B505 - 0003
31	WORM BOX SHAFT	B535 - 0002
33	39T CLUTCH GEAR	B508 - 0004
34	TRIP PLATE	B528 - 0002
35	STUD	B451 - 0001
36	COLLAR	B507 - 0001
37	SLIDING PINION SHAFT	B535 - 0004
39	WWORM GEAR SHAFT	B535 - 0005
40	INTERLOCK BOBBIN SHAFT	B535 - 0006
41	INTERLOCK BOBBIN	B502 - 0001
42	LEADSCREW NUT OPERATING SHAFT	B535 - 0007
43	OPERATING LEVER STEM	B542 - 0001
44	COUPLING	B347 - 0050
45	FOLLOWER PIN	B111 - 7302
46	STRIP	B540 - 0001
47	**METRIC** LEADSCREW NUT	B147 - 9581
48	**IMPERIAL** LEADSCREW NUT	B147 - 9582
49	COVER PLATE	B528 - 0003
50	END BEARING (SEAL HSG)	B350 - 0053

APRON ASSEMBLY (2)



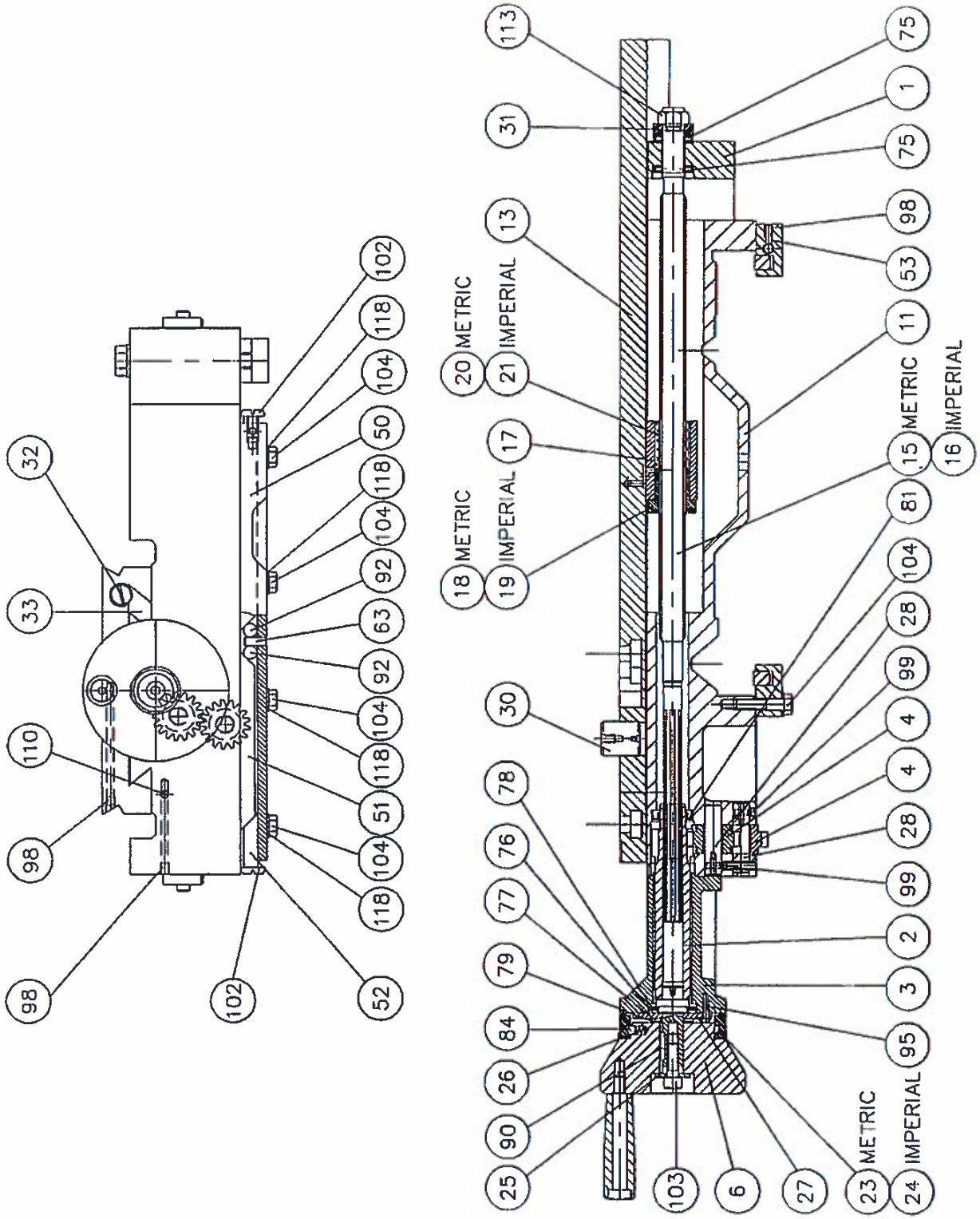
APRON ASSEMBLY A131 - 0506

Item No.	Description	Part No.
51	CLUTCH	B344 - 9051
52	PUMP BODY	B473 - 3010
53	PISTON	B526 - 0001
54	END CAP	B504 - 0001
55	TRIP WASHER	B117 - 0253
56	BANJO ELBOW	B435 - 0565
57	OIL RESERVOIR COVER	B528 - 0001
58	14T WORM WHEEL	B508 - 0033
59	28T PINION	B508 - 0034
64	GLACIER BUSH MB1420DU	B311 - 1532
65	GLACIER BUSH MB1820DU	B311 - 1544
66	GLACIER BUSH MB1512DU	B311 - 1534
67	DU BUSH 20x23	B311 - 1544
68	OILITE BUSH 15x21x25	B311 - 2008
69	GLACIER BUSH MB1525DU	B311 - 1537
73	BEARING FAG62527	B315 - 0203
74	NEEDLE ROLLER BEARING NTA-1625	B315 - 5300
75	NEEDLE ROLLER BEARING AXK1528	B337 - 5001
76	BEARING FAG160 03 17	B313 - 0211
77	RAD BALL JOINT INA GE12DO	B344 - 3153
79	THRUST WASHER INA AS1528	B311 - 7007
80	THRUST WASHER TRA - 1625	B311 - 8133
83	WOODRUFF KEY 13x5x3	B343 - 2002
84	WOODRUFF KEY 6x9x22	B343 - 2009
85	WOODRUFF KEY 5x7.5x19	B343 - 2007
88	O RING GACO RMO376-24	B413 - 0376
89	O RING DOWTY 202-642	B413Y0156
90	O RING GACO RMO371-16	B413 - 0371
91	O RING GACO RM131-16	B413 - 0131
92	O RING GACO RMO321-16	B413 - 0321
93	O RING DOWTY 202-648	B413 - 0216
94	O RING DOWTY 202-640-4480	B413 - 0136
95	RING BS REF.0116-24	B413 - 0136
98	EXTERNAL CIRCLIP DIN 1500/12	B363 - 0370
99	EXTERNAL CIRCLIP DIN1400/22	B363 - 0022
100	CIRCLIP 1300/18	B363 - 0418
103	OIL SEAL25x35x7	B414 - 3111
106	STEEL BALL 6.0 DIA.	B326 - 9003
107	STEEL BALL 10.0 DIA.	B326 - 9005
108	STEEL BALL 7.0 DIA.	B326 - 9007
109	STEEL BALL 5.0 DIA.	B326 - 9002
112	COMPRESSION SPRING FLEXO 23612	B366 - 0421
113	COMPRESSION SPRING SG 347	B365 - 1572

APRON ASSEMBLY A131 - 0506

Item No.	Description	Part No.
114	COMPRESSION SPRING SG 279	B365 - 1575
115	COMPRESSION SPRING SG 342	B365 - 1576
116	COMPRESSION SPRING SG 416	B365 - 1118
117	BLACK HANDLE	B223 - 1022
118	KNOB (BLACK)	B222 - 3200
119	HANDLE	D382 - 0078
120	KNOB	B223 - 1031
122	ADAPTOR ENOTS 36-0530-02	B435Y0251
123	4mm TUBE NUT ENOTS 36-0500-02	B435 Y0011
124	4mm TUBE SLEEVE ENOTS 36-0501-02	B435Y0001
125	4mm NYLON TUBE	R827 - 4211
126	BANJO WASHER 48-0231-01	B435 - 0564
129	OILSIGHT (7/8")	B454 - 1010
130	3/8" BSPT PRESSURE PLUG	B435 - 0110
131	LUBRICATOR 6mm DIA.	B454 - 2004
132	BUTTITE SPACER	B538 - 0005
135	DOWEL PIN 5x12	B111 - 6032
137	GROOVED PIN 4x10	B111 - 7303
139	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163 - 0026
140	HEXAGON SOCKET CAP HEAD SCREW M5x20	B163Y0028
141	HEXAGON SOCKET CAP HEAD SCREW M6x25	B163 - 0039
142	HEXAGON SOCKET COUNTERSUNK SCREW M10x25	B163 - 1041
143	HEXAGON SOCKET CUP POINT SET SCREW M4x4	B163 - 1508
144	HEXAGON SOCKET CUP POINT SET SCREW M5x5	B163 - 1547
145	HEXAGON SOCKET CUP POINT SET SCREW M5x6	B163 - 1516
146	HEXAGON SOCKET CUP POINT SET SCREW M6x8	B163 - 1519
147	HEXAGON SOCKET CUP POINT SET SCREW M8x8	B163 - 1521
148	HEXAGON SOCKET DOG POINT SET SCREW M6x12	B163Y1742
149	HEXAGON SOCKET DOG POINT SET SCREW M8x12	B163Y1752
150	HEXAGON SOCKET DOG POINT SET SCREW M8x16	B163Y1753
151	HEXAGON SOCKET DOG POINT SET SCREW M6x10	B163 - 1741
153	HEXAGON SOCKET BUTTON HEAD SCREW M5x12	B163 - 1808
154	HEXAGON SOCKET BUTTON HEAD SCREW M6x10	B163 - 1813
155	HEXAGON SOCKET BUTTON HEAD SCREW M5x16	B163 - 1809
158	PAN HEAD SLOTTED SCREW M5x10	B165 - 0122
160	BALL DETENT SCREW M10	B169 - 0006
161	SQUARE HEAD SET SCREW M8x40	B170 - 0001
162	WASHER M5	B117 - 0008
163	WASHER M5 FORM C	B117 - 0032
165	NYLOC NUT M5	B147 - 9002
166	NYLOC NUT M6	B147Y9003
167	FLEXO SPRING 344014	B366 - 0422

SADDLE ASSEMBLY (1)

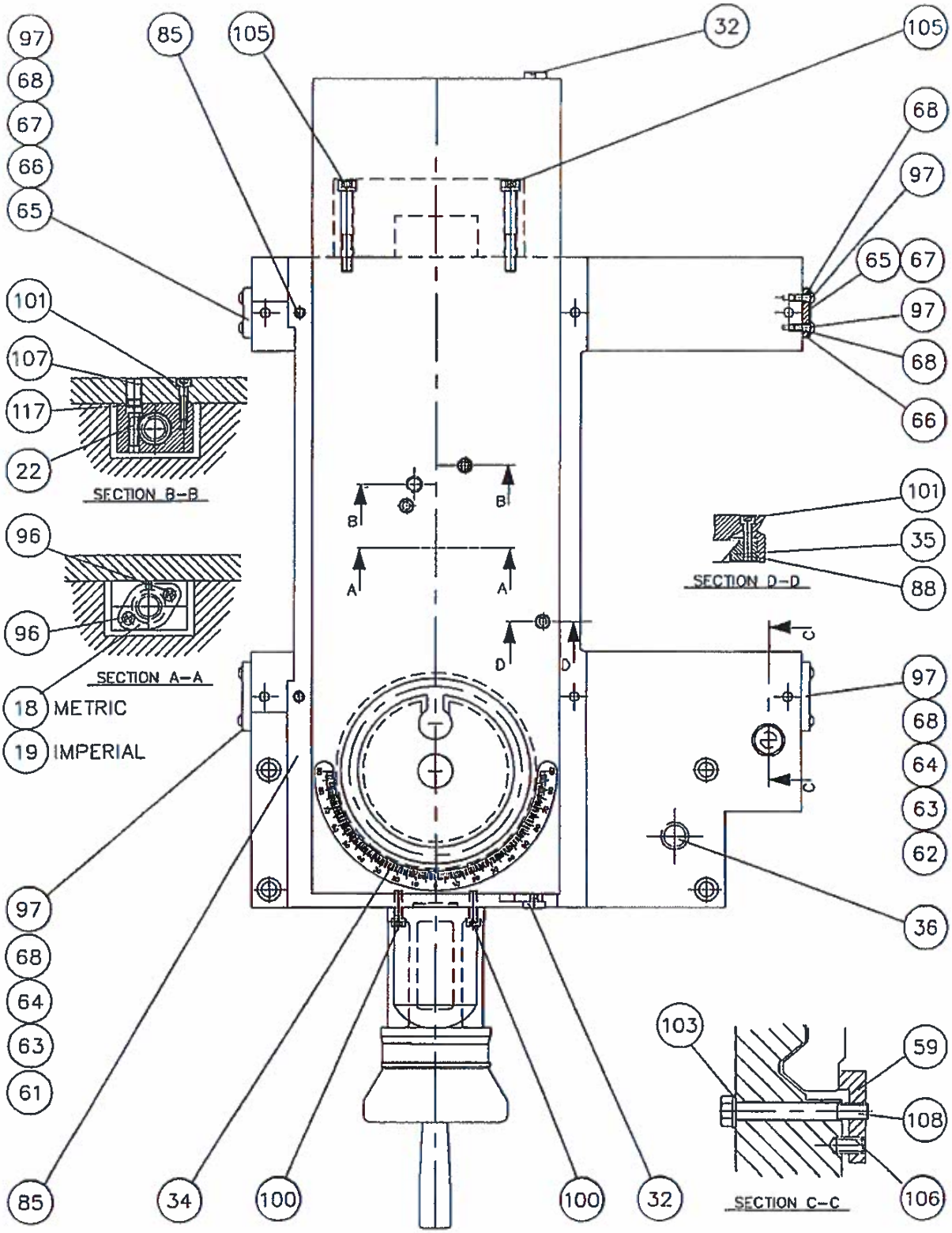


SADDLE AND CROSS SLIDE ASSEMBLY

A119 - 0510

Item No.	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
6	HAND WHEEL ASSEMBLY	A842 - 0024B
11	SADDLE	D696 - 0046
13	CROSS SLIDE	D705 - 0112
15	SADDLE SCREW (METRIC)	D697 - 0343
16	SADDLE SCREW (IMPERIAL)	D697 - 0344
17	CROSS SLIDE NUT BODY	D388 - 0126
18	FIXED CROSS SLIDE NUT (METRIC)	D536 - 0324
19	FIXED CROSS SLIDE NUT (IMPERIAL)	D536 - 0322
20	ADJUSTABLE CROSS SLIDE NUT (METRIC)	D536 - 0325
21	ADJUSTABLE CROSS SLIDE NUT (IMPERIAL)	D536 - 0323
22	CROSSS SLIDE NUT ADJUSTING SCREW	D697 - 0359
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	D690 - 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 (HEAD 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 M6x6	D697 - 0369
70	SOCKET SET SCREW M8x8	D697 - 0370

SADDLE ASSEMBLY (2)



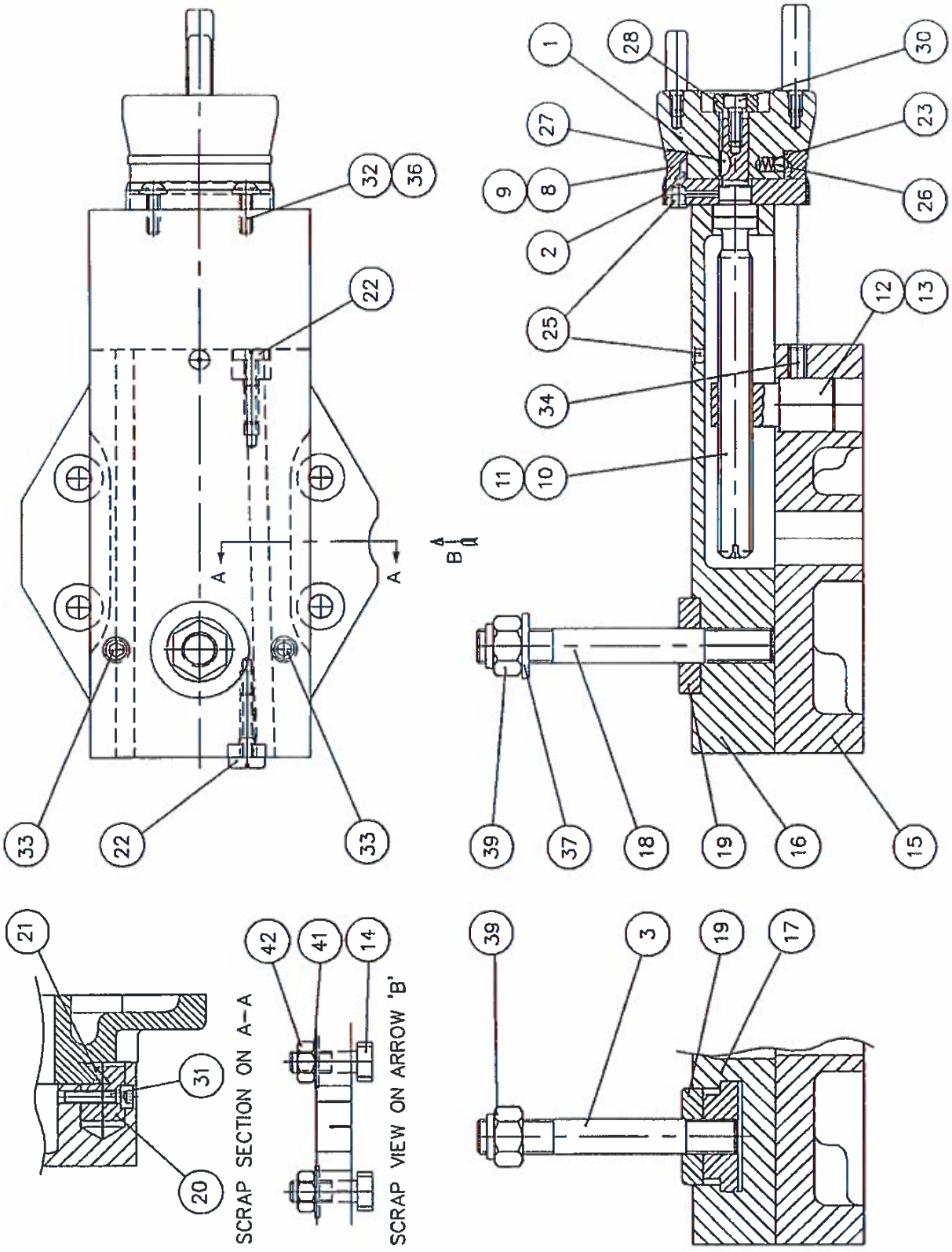
SADDLE AND CROSS SLIDE ASSEMBLY A119 - 0510

Item No.	Description	Part No.
75	NEEDLE BEARING AXZ 6.15.28.4.	B337 - 5210
76	NEEDLE ROLLER BEARING AXK2035	B337 - 5011
77	NEEDLE ROLLER BEARING AXK 1528	B337 - 5001
78	THRUST WASHER INA WS81104	B337 - 5014
79	THRUST WASHER AS1528	B337 - 5014
81	OIL SEAL W11807027	B414 - 3051
82	FIBRE WASHER	B411 - 0020
84	CYCLE BALL BEARING 1/4"	B326 - 8107
85	CONCAVE LUBRICATOR 6mm	B454 - 2004
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 M4x12	B163Y1805
96	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163 - 0026
97	HEXAGON SOCKET BUTTON HEAD SCREW M6x16	B163 - 1815
98	HEXAGON SOCKET SET SCREW W POINT M6x8	B163Y1561
99	HEXAGON SOCKET DOG HEAD SET SCREW M4x5	B163 - 1721
100	HEXAGON SOCKET CAP HEAD SCREW M6x20	B163 - 0038
101	HEXAGON SOCKET CAP HEAD SCREW M6x25	B163 - 0039
102	SLOTTED PAN HEAD SCREW M8x16	B163 - 0143
103	HEXAGON SOCKET CAP HEAD SCREW, WEDGLOK M8x25	B164 - 0054
104	HEXAGON SOCKET CAP HEAD SET SCREW M8x35	B166 - 006
105	HEXAGON SOCKET CAP HEAD SCREW M8x60	B163 Y0061
106	WEDGE LOK SET SCREW M12x20	B164 - 0170
107	DOG POINT SET SCREW M12x25	B163 - 1783
108	HEXAGON HEADE BOLT M12x100	B166 - 0206
113	NYLOC NUT M12	B147Y9006
116	FIBRE WASHER1/2"x3/4"	B411 - 0016
117	CRINKLE WASHER M6	B117 - 0107
118	WASHER M8	B117 - 0034

SADDLE AND CROSS SLIDE SUB - ASSEMBLIES

Item No.	Description		Part No.
	BRACKET SUB-ASSEMBLY	A806 - 0564	
1	SADDLE SCREW BRACKET		D050 - 0753
2	GLACIER BUSH MB1515DU		B311 - 1535
	PINION SUB-ASSEMBLY	A834 - 0024	
1	CROSS SLIDE PINION		D564 - 0105
2	PINION SHAFT EXTENSION		D699 - 0787
	KEEP SUB-ASSEMBLY	A806 - 0583	
2	GLACIER BUSH MB2525DU		B311 - 1564
	17T GEAR SUB-ASSEMBLY	A806 - 0566	
1	17T IDLER GEAR		D344 - 1269
2	GLACIER BUSH MB1220DU		B311 - 1530
	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 - 0024B	
2	HANDWHEEL		D383 - 0107
5	HANDLE		D382 - 0139
7	SHIM WASHER		D701 - 0034
9	SHOULDER SCREW		B163 - 1867

TOPSLIDE ASSEMBLY

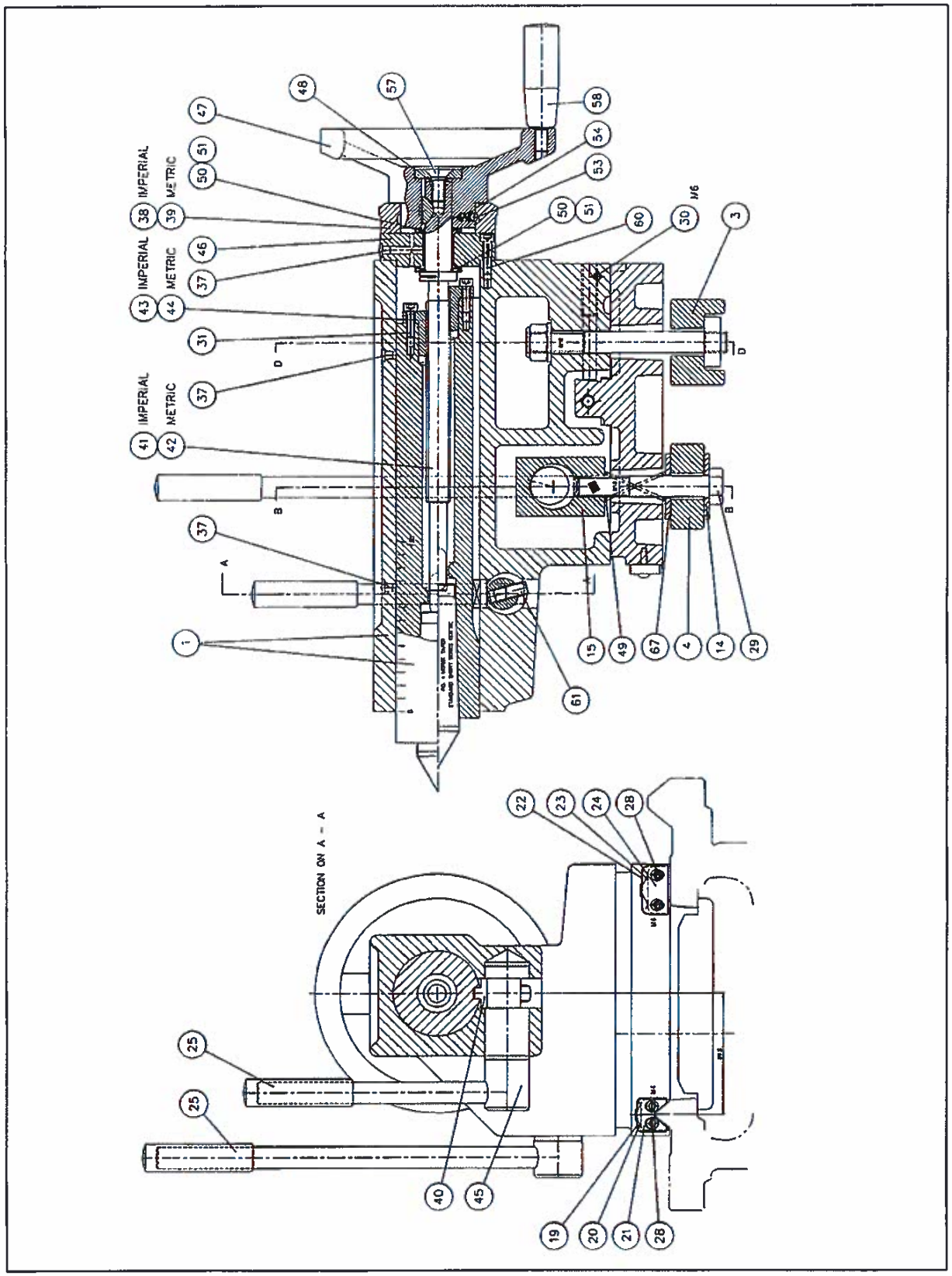


TOP SLIDE ASSEMBLY A125 - 0404

Item No.	Description	Part No.
1	HAND WHEEL SUB ASSEMBLY	A842 - 0025B
2	KEEP SUB ASSSEMBLY	A806 - 0584A
3	TOOLHOLDER BOLT ASSY	A812 - 0007
8	METRIC INDEX RING	D424 - 0158
9	IMPERIAL INDEX RING	D424 - 0143
10	METRIC SCREW	D697 - 0366
11	IMPERIAL SCREW	D697 - 0367
12	METRIC NUT	D536 - 0315
13	IMPERIAL NUT	D536 - 0316
14	SWIVEL SLIDE BOLT	D048 - 0161
15	SWIVEL SLIDE	D705 - 0114
16	SOLID TOPSLIDE	D705 - 0117
17	SLOTTED TOPSLIDE	D705 - 0118
18	TOOLHOLDER STUD	D711 - 0190
19	TOOLHOLDER COLLAR	D133 - 0247
20	TOPSLIDE LOCK PAD	D557 - 0146
21	GIB STRIP	D345 - 0085
22	GIB ADJUSTING SCREW	D697 - 0345
23	MULTI COMPRESSSION SPRING	D707 - 0021
25	6mm DIA. CONCAVE LUBRICATOR	B454 - 2004
26	CYCLE BALL BEARING 1/4" DIA.	B326 - 8107
27	WOOODRUFF KEY 13x5x3	B343 - 2002
28	MOTOR PLATE LOCATION PIN	D560 - 0296
30	HEXAGON SOCKET CAP HEAD SCREW" WEDGLOK" M6x16	B164 - 0037
31	HEXAGON SOCKET CAP HEAD SCREW M6x25	B163 - 0039
32	HEXAGON SOCKET BUTTON HEAD SCREW M6x20	B163 - 1816
33	HEXAGON SOCKET 'W' POINT SET SCREW M10x10	B163 Y1583
34	HEXAGON SOCKET DOG POINT SET SCREW M8x20	B163 - 1754
36	WASHER M6	B117 - 0009
37	WASHER M16	B117 - 0013
39	NYLOC NUT M16	B147 - 9008
41	WASHER M10	B117 - 0035
42	FULL NUT M10	B147 - 9154
	HANDWHEEL SUB-ASSEMBLY A842 - 0025B	
2	HANDWHEEL	D383 - 0111
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
	BOLT ASSEMBLY A812 - 0007	
1	STUD	D711 - 0132
2	PLATE	D565 - 0432
5	SPIROL PIN 3/16"x7/16"	B111 - 2482

TAILSTOCK ASSEMBLY

A149-0406C & D

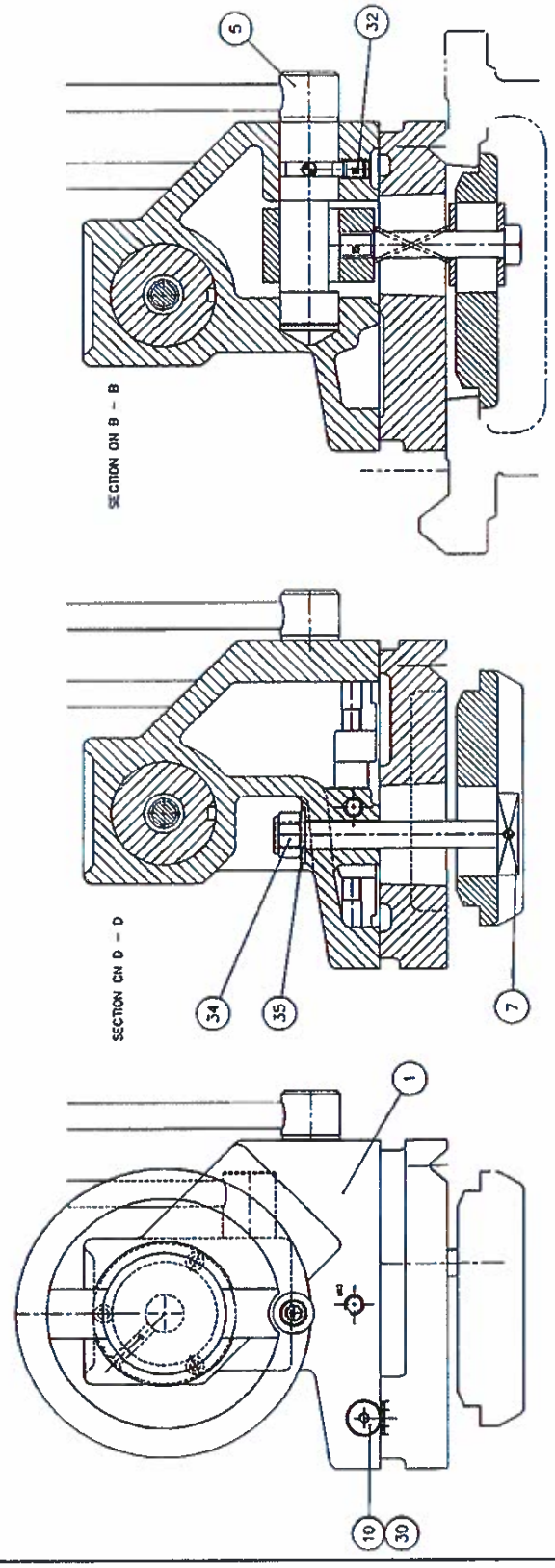


A149-0406C & D — TAILSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
*1**	*A890-0035B*	*BODY/BARREL SUB ASSEMBLY*	*1*
3	D131-0038	CLAMP PLATE REAR	1
4	D131-0039	CLAMP PLATE FRONT	1
*5**	*A840-0041A*	*CLAMPING LEVER 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	'V' SHIELD	1
20	D707-0067	SPRING	1
21	D937-0013	BED 'V' WIPER	1
22	D725-0020	FLAT SHIELD	1
23	D707-0068	LEAF SPRING	1
24	D937-0014	BED FLAT WIPER	1
25	D382-0064	HANDLE	2
28	FS-0282	M4 X 16 BUTTON SCREW	4
29	FS-0756	M16 X 100 HEXAGON HEAD BOLT NYLON	1
30	FS-0354	M6 X16 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 CONCAVE DRIVE NIPPLE	3
38	D424-0180	INDEX RING - IMPERIAL	1
39	D424-0179	INDEX RING - METRIC	1
40	D441-0078	BARREL KEY	1
41	D697-0448	SCREW IMPERIAL	1
42	D697-0447	SCREW METRIC	1
43	D536-0311	BARREL NUT IMPERIAL	1
44	D536-0312	BARREL NUT METRIC	1
*45**	*A840-0047A*	*BARREL CLAMP SUB-ASSEMBLY*	*1*
*46**	*A806-0563A*	*KEEP SUB-ASSEMBLY*	*1*
47	D383-0105	HANDWHEEL	1
48	D931-0340	WASHER HANDWHEEL SECURING	1
49	B365-1677	SPRING-FLEXO COMPN 324016	1
50	BC-0100	AS2035 (INA) THRUST WASHER	4
51	BC-0110	AXK2035 (INA) NEEDLE THRUST BEARING	2

TAILSTOCK ASSEMBLY

A149-0406C & D

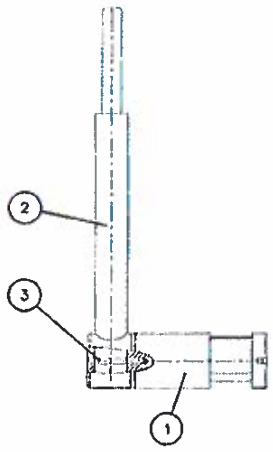


A149-0406C & D — TAILSTOCK ASSEMBLY

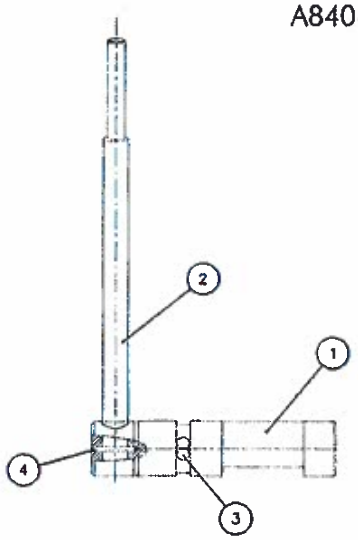
Item No.	Part Number	Description	Qty
53	UB-0006	6MM STEEL BALL	3
54	FR-0005	SG 344 SPRING	3
55	FR-0180	SCHORR SPRING 607	2
57	FS-0454	M10 X 25 COUNTERSUNK SOCKET	1
58	HA-0160	I281/80 + X - M10 REVOLVING HANDLE	1
59	KA-0190	6.0 X 9.0 X 22MM WOODRUFF KEYS	1
60	FS-0142	M6 X 35 SOCKET HEAD CAP SCREW	3
61	FS-0810	M10 X 25 CUP POINT NYLOCK SCREW	1
67	B116-0050	WASHER P/STEEL 5/8"ID TAB	1

TAILSTOCK SUB ASSEMBLIES

A840-0047A

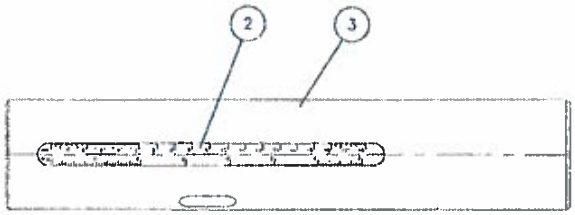


A840-0041A

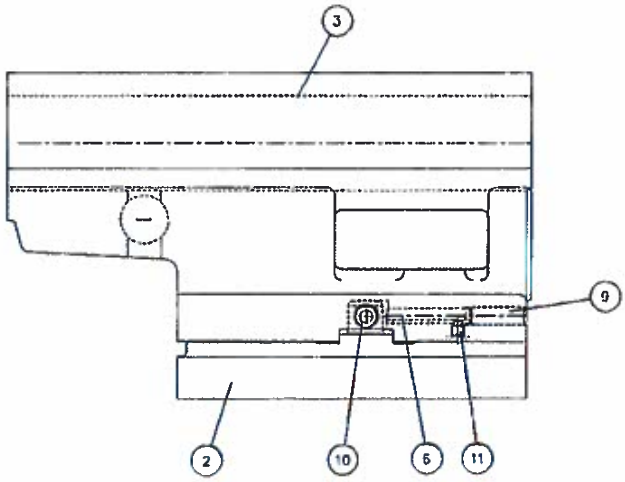


A840-0043A

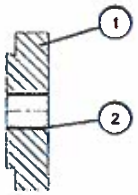
A890-0037B



A890-0035B



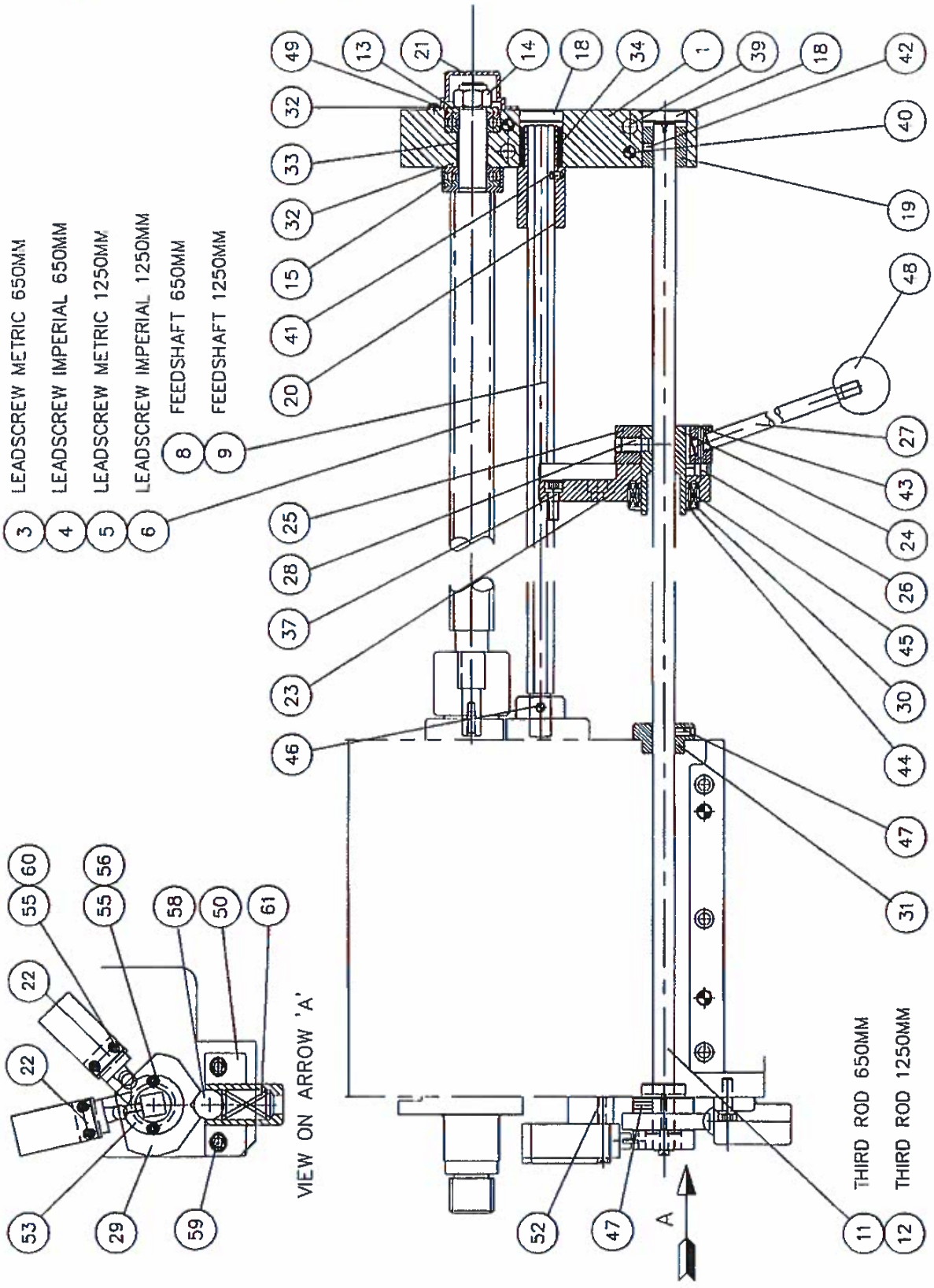
A806-0563A



TAILSTOCK SUB ASSEMBLIES

Item No.	Part Number	Description	Qty
	A806-0563A	KEEP SUB ASSEMBLY	
1	D442-0081	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
	A840-0047A	BARREL CLAMP SUB ASSEMBLY	
1	D123-0116	ECCENTRIC SHAFT	1
2	D717-0115	STEM - BARREL CLAMP	1
3	B111-5065	SPIROL PIN 3 DIA X 30 LG	1
	A890-0033A	BODY/BARREL SUB ASSEMBLY COMPRISING OF:	
	A890-0035B	*T/STOCK BODY/BASE SUB ASSEMBLY*	
2	*D827-0062*	*BASE*	1
3	*D827-0134*	*BODY*	1
6	*D560-0302*	*PIN*	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 NYLON SCREW*	1
	A890-0037B	*BARREL/SCALE SUB ASSEMBLY*	
2	*D537-0896*	*STAINLESS STEEL GRADUATION PLATE*	1
3	*D044-0055*	*BARREL*	1

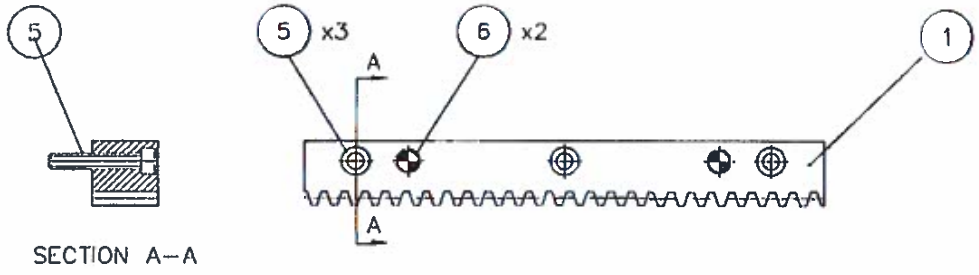
FEEDSHAFT AND THIRD ROD ASSEMBLY



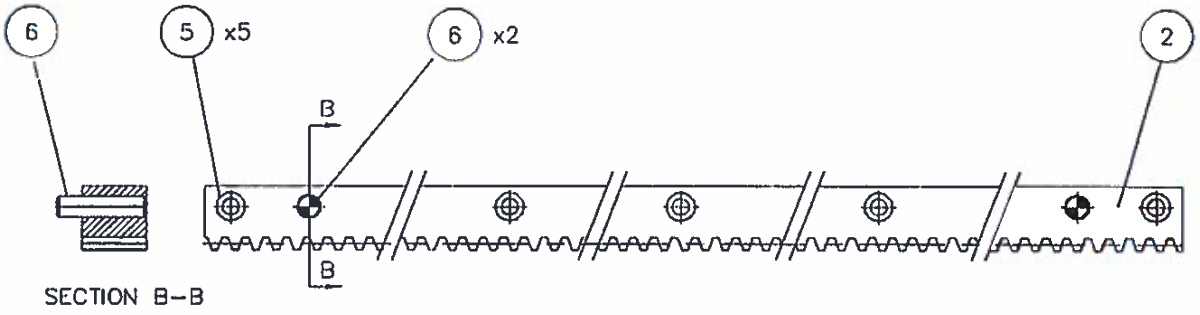
LEADSCREW AND SPLINE SHAFT ASSEMBLY A106-0519

Item No.	Description	Part No.
1	TAIL END BRACKET	D050-0648
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	THIRD ROD 1250MM M/C	D699-0776
13	COLLAR	D133-0249
14	NYLOC NUT M16 (MODIFIED)	D536-0321
15	LEADSCREW BEARNG COVER	D132-0717
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
24	CENTRE BUSH	D406H018
25	LEVER BOSS	D406H019
26	LEVER BOSS PLUG	D406H020
27	THIRD SHAFT LEVER	D406H021
28	SOCKET SET SCREW	D406H034
29	THIRD CAM ROD SWITCH	D123-0110
30	THRUST WASHER	D931-0353
31	SLEEVE	D403H046
32	BEARING SKF 51204	B325-0213
33	GLACIER BUSH M82025DU	B311-1549
34	OILITE BUSH 8 M1 X 30	B311-2015
37	HEXAGON SOCKET CAP HEAD SCREW M8 X 20	B163-0053
39	HEXAGON SOCKET CAP HEAD SCREW M10 X 65	B163-0076
40	GROUND DOWEL	B111-7046
41	CUP POINT SET SCREW M6 X 8	B163-1519
42	HEXAGON SOCKET SET SCREW M6 X 6	B163-1524
43	SPIROL PIN 4 X 24	B111-5078
44	CIRCLIP ANDERTON 1400-32	B363-0031
45	SPRING	B365-1574
46	SPIROL PIN 6 X 35	B111-5115
47	CUP POINTSET SCREW M6 X 12	B163-1517
48	RED KNOB RENCOL REF NO 304	B222-3018
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	THIRD CAM ROD SWITCH	D123-0111
55	M4 WASHER	B117-0007
56	HEXAGON SOCKET CAP HEAD SCREW M4 X 25MM LONG	B163Y0018
58	STEEL BALL 22MM DIAMETER	B326-9018
59	HEXAGON SOCKET CAP HEAD SCREW M8 X 25	B163-0054
60	HEXAGON SOCKET SCREW CAP HEAD M4 X 50MM	B163Y0023
61	FLEXO SPRING	B366-0451

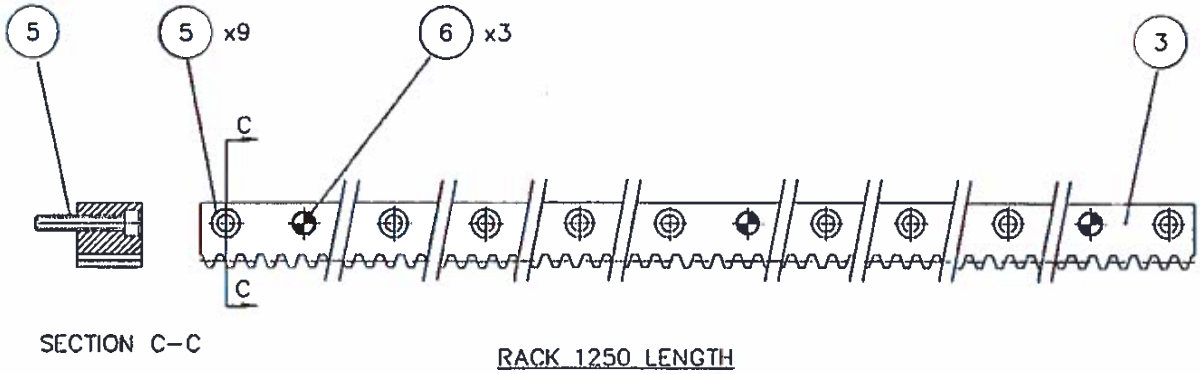
RACK ASSEMBLY



RACK GAP PIECE



RACK 650 LENGTH



RACK 1250 LENGTH

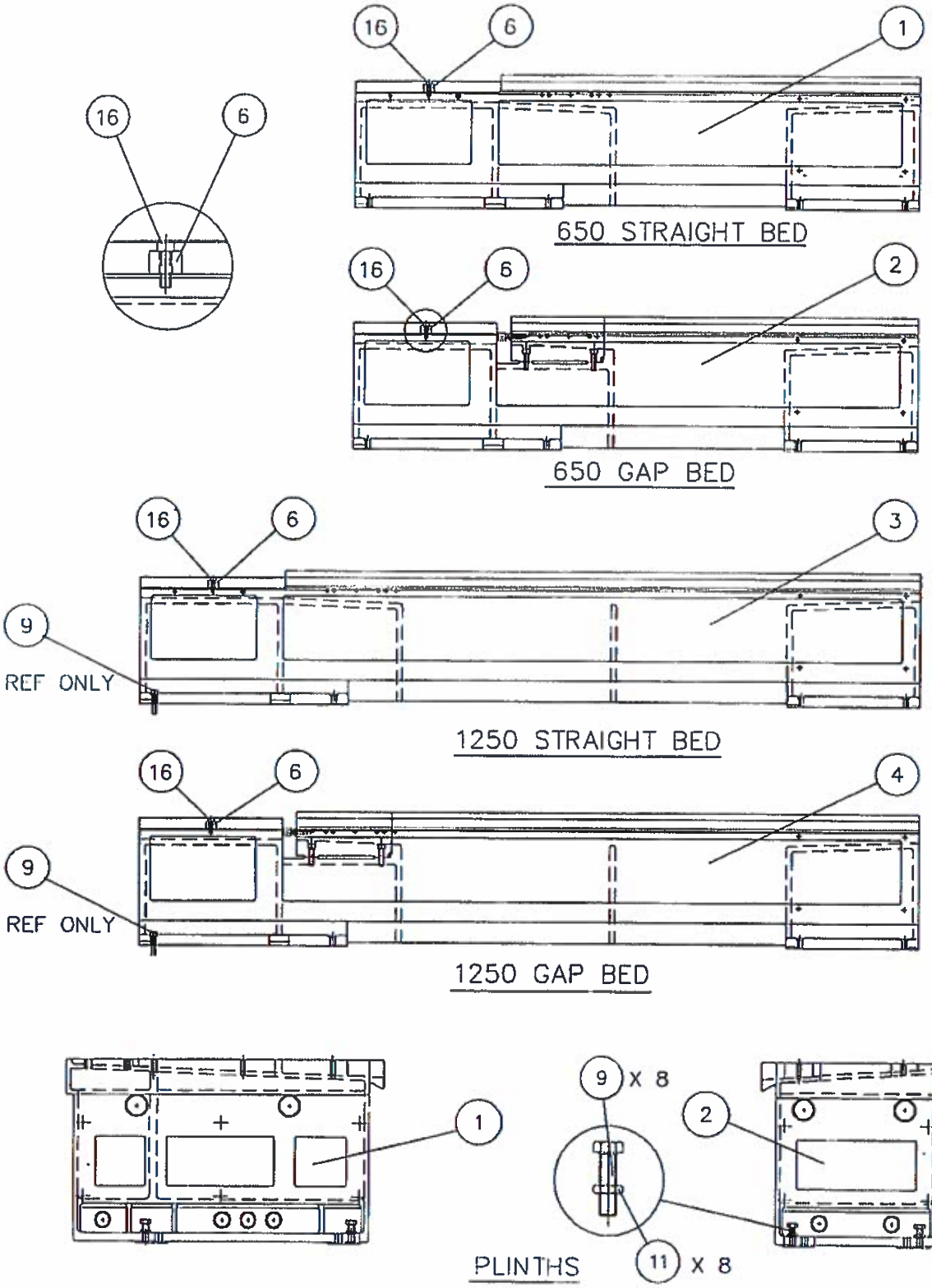
RACK ASSEMBLY A106 - 0520

Item No.	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 M6x35	B163 - 0041
6	8mm DIA. DOWEL	B111Y7043

GAP AND BED ASSEMBLY A803 - 0007

Item No.	Description	Part No.
1	GAP BED 650mm	C045 - 0099
2	GAP BED 1250mm	C045 - 0100
3	GAP PIECE	D348 - 0015
6	JACKING SCREW	D697 - 0340
7	HEXAGON SOCKET CAP HEAD SCREW M12x50	B163 - 0086
8	NUT M10	B147 - 9154

BED AND PLINTHS

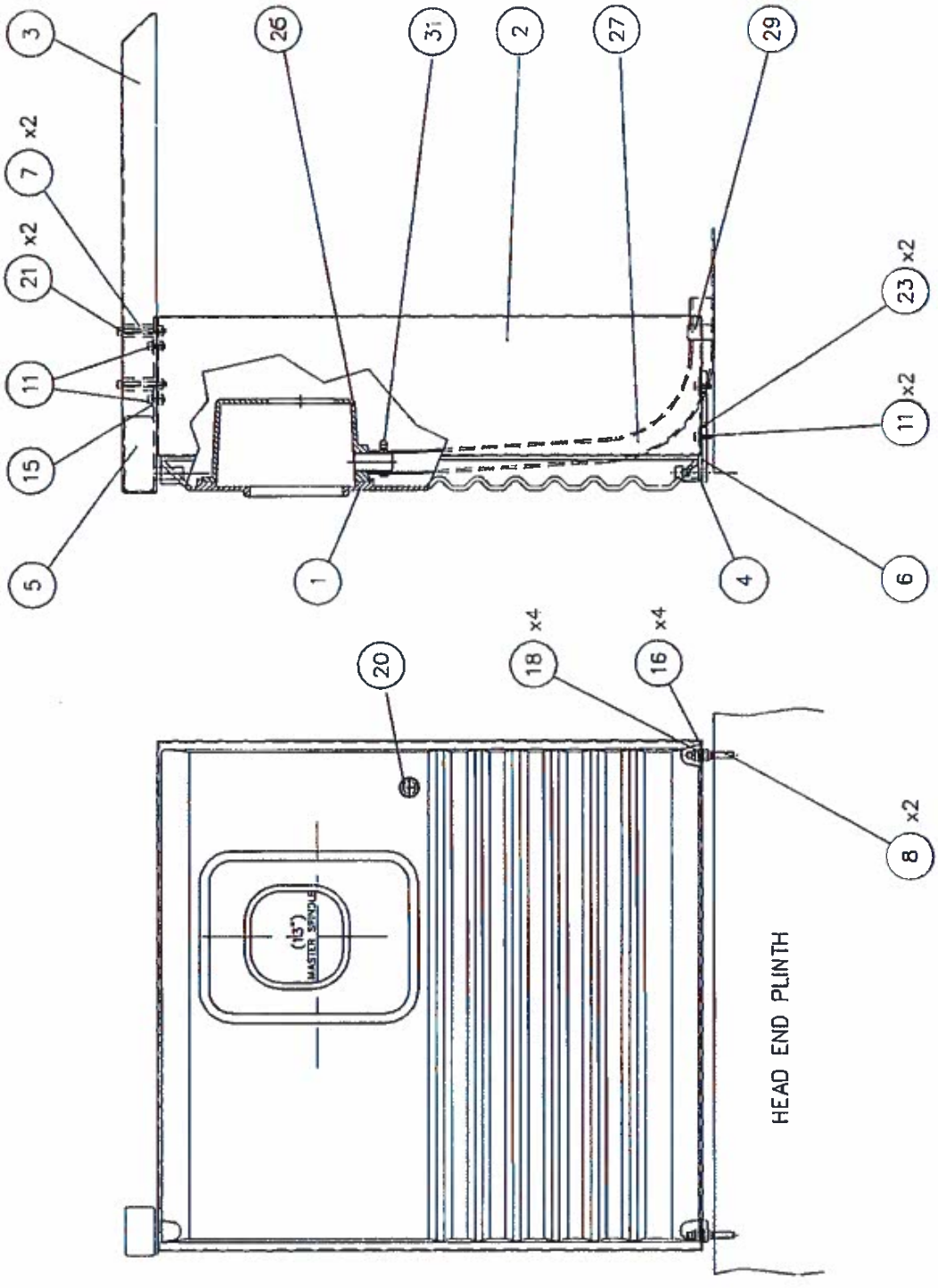


A106 – 0518
A865 – 0031 MR/TR.11.90

BED AND PLINTH ASSEMBLY A106 - 0518 / A865 - 0031

Item No.	Description	Part No.
	BED ASSEMBLY A106 - 0518	
1	STRAIGHT BED - 650mm MACHINE	D045 - 0097
2	BED AND GAP ASSEMBLY 650mm MACHINE	A803 - 0007
3	STRAIGHT BED - 1250mm MACHINE	D045 - 0098
4	BED AND GAP ASSEMBLY 1250mm MACHINE	A803 - 0007
6	SWARF/COOLANT STOP BLOCK	D047 - 0119
9	HEXAGON SOCKET CAP HEAD SCREW M12x55	B166 - 0136
10	WASHER M12	B117 - 0012
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 M6x12	B163 - 1814
16	HEXAGON SOCKET CAP HEAD SCREW M10x35	B163 - 0070
	PLINTH ASSEMBLY A865 - 0031	
1	HEAD END PLINTH	D125 - 0102
2	TAILEND PLINTH	D125 - 0103
9	HEXAGON HEAD SCREW	B166 - 0113
11	LOCKNUT M16	B147 - 9173

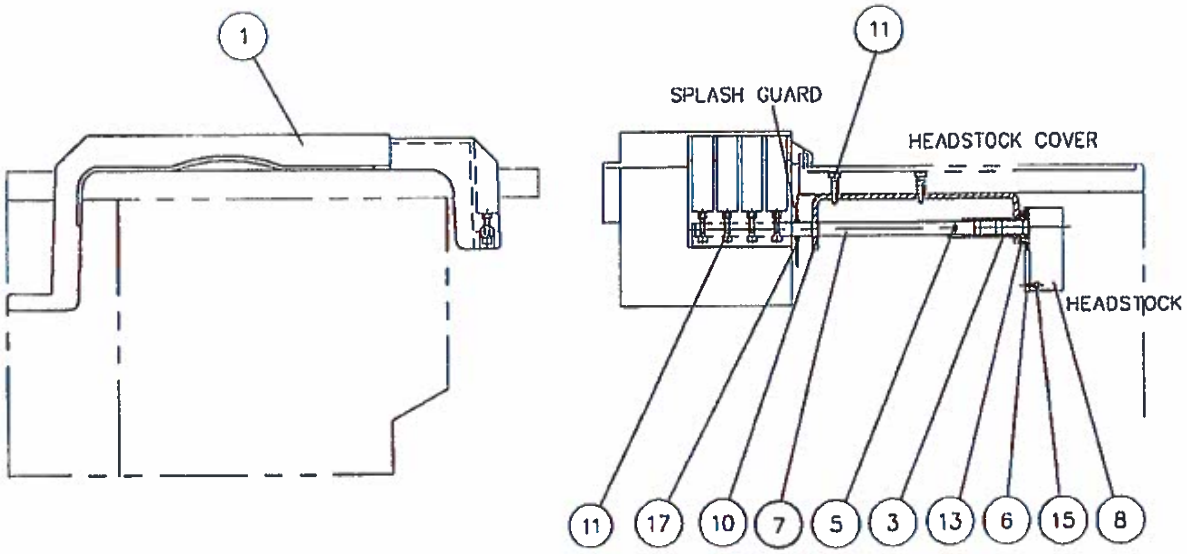
HEADEND GUARDING ASSEMBLY



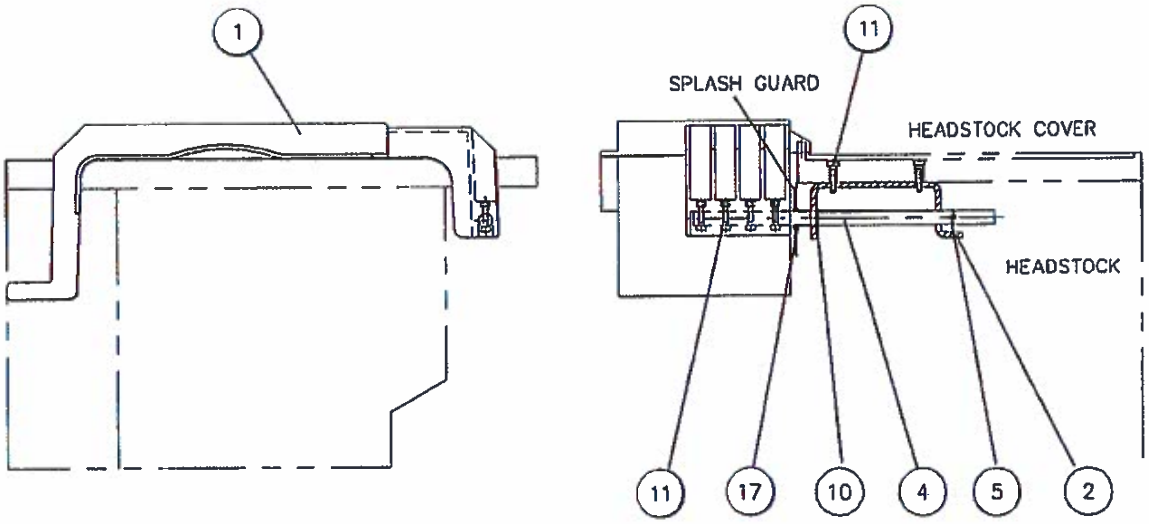
HEAD END GUARD ASSEMBLY A137 - 0514

Item No.	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 - 0722
6	HINGE PLATE	D565 - 0916
7	TRUNKING MOUNTING SPACER	D708 - 0469
8	END GUARD MOUNTING STUD	D711 - 0189
10	HEXAGON SOCKET CAP HEAD SCREW M4x10	B163Y0014
11	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
15	TAB WASHER 1/4" I.D.	B116 - 0124
16	WASHER M8	B117 - 0010
18	LOCK NUT M8	B147 - 9170
20	LOCK ,SOUTHCO E3-56-715-50	B236 - 6005
21	HEXAGON SOCKET CAP HEAD SCREW M6x55	B163 - 0045
23	WASHER M6	B117 - 0051
26	COOLANT COLLECTOR	D132 - 0771
27	HOSE 25mm BORE	R827 - 7328
29	PIPE RETAINING CLIP	D130 - 0020
31	ZINC HOSE CLIP 1"x1 3/8"	B233 - 4006
	ROTACAM SWITCH ASSEMBLY	A826 - 0722
1	MOUNTING PLATE	D565 - 0923
2	HEXAGON SOCKET CAP HEAD SCREW M4x12	B163 - 0015
4	GROMMET A1157	B715 - 1076
5	ROTACAM SWITCH HARNESS	A826 - 0753

CHUCK GUARD ASSEMBLY



WITH ROTOCAM SAFETY SWITCH A137 – 0520B



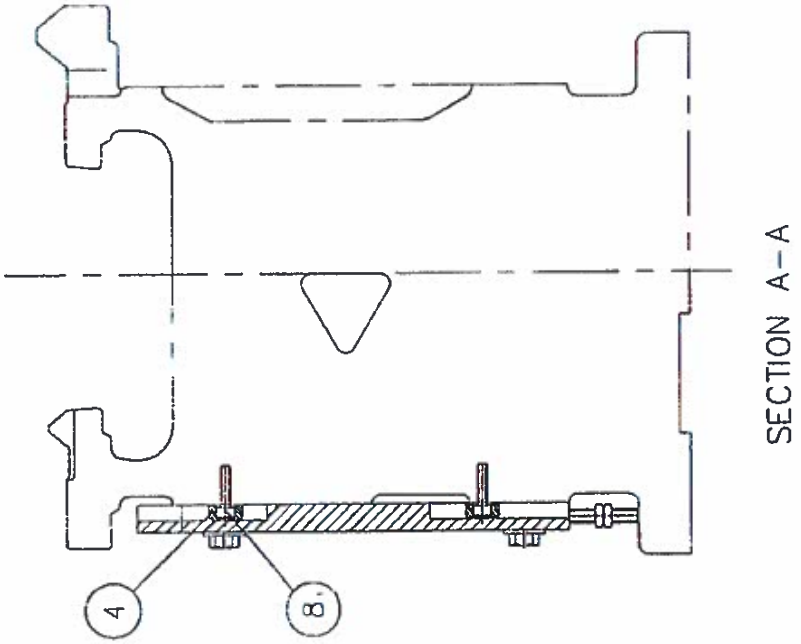
WITHOUT ROTOCAM SAFETY SWITCH A137 – 0520A

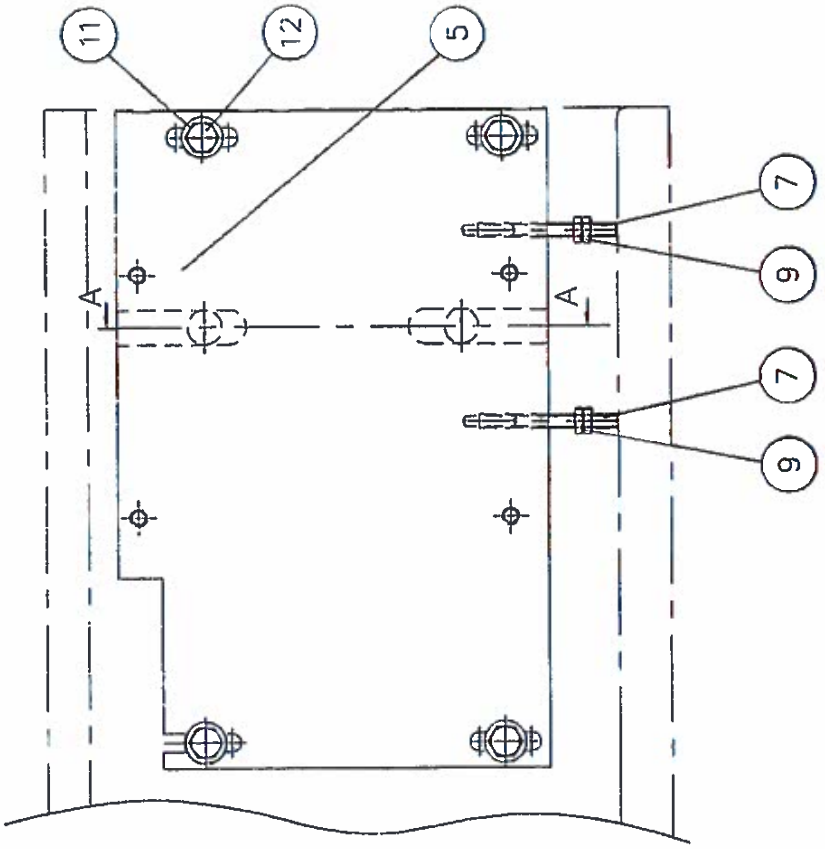
CHUCK GUARD ASSEMBLY

A137 - 0520A/B

Item No.	Description	Part No.
1	CHUCK GUARD	D346 - 0395
	MOUNTING KIT A950 - 0019A/B	
2	MOUNTING BRACKET	D050 - 0726
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	B363 - 0016
11	HEXAGON SOCKET CAP HEAD SCREW M6x30	B163 - 0040
13	HEXAGON SOCKET BUTTON HEAD SCREW M4x8	B163 - 1803
15	HEXAGON SOCKET CAP HEAD SCREW M4x12	B163 - 0015
17	GROMMET R.MOSS REF15093	B715 - 1086

MOTOR MOUNTING ASSEMBLY

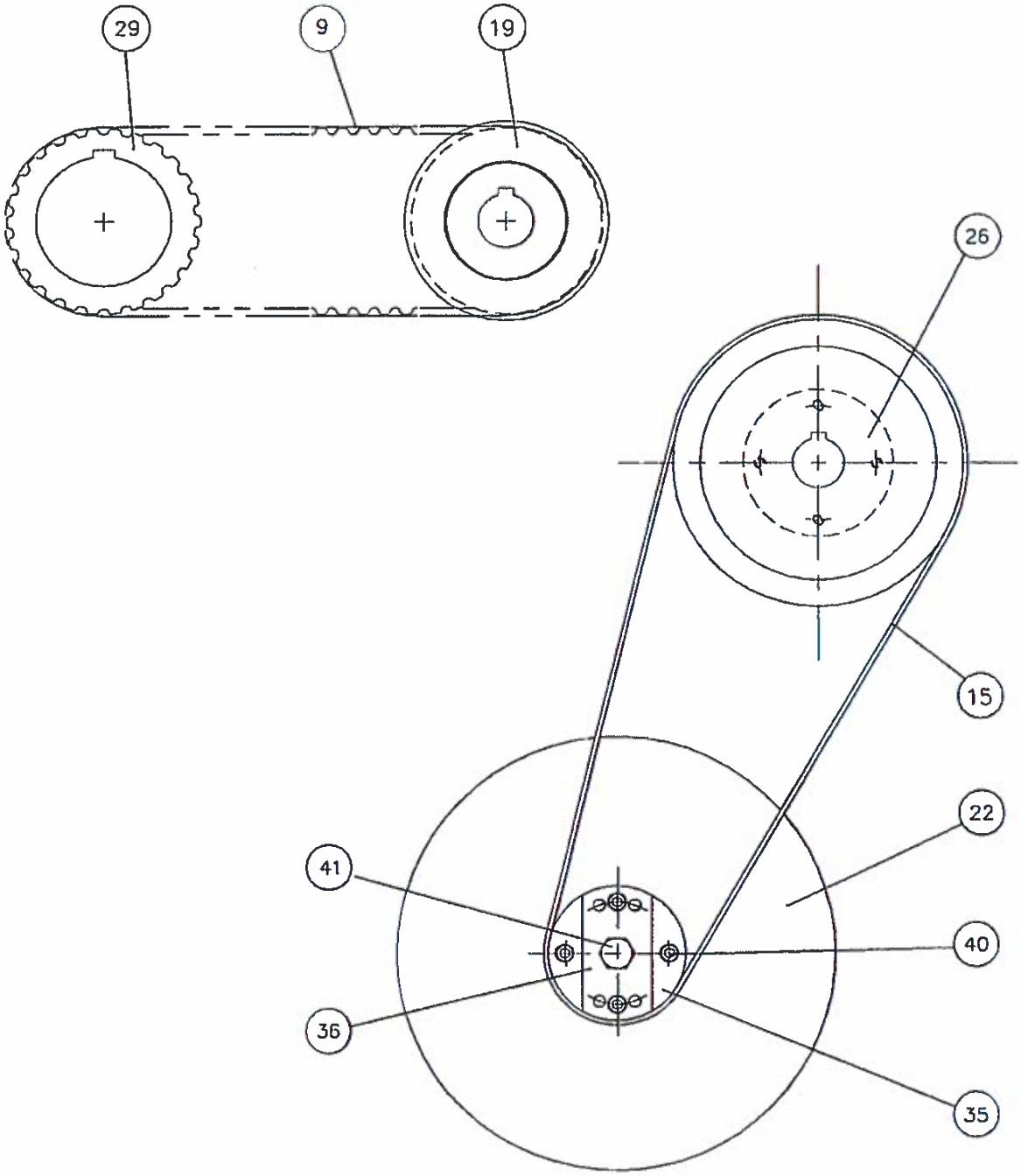




MOTOR MOUNTING ASSEMBLY A175 - 0501

Item No.	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	B163-0039
9	LOCK NUT M8	B147-9170
11	WASHER M10	B117-0035
13	HEXAGON HEAD SCREW M10 X 30MM LONG	B166Y0094

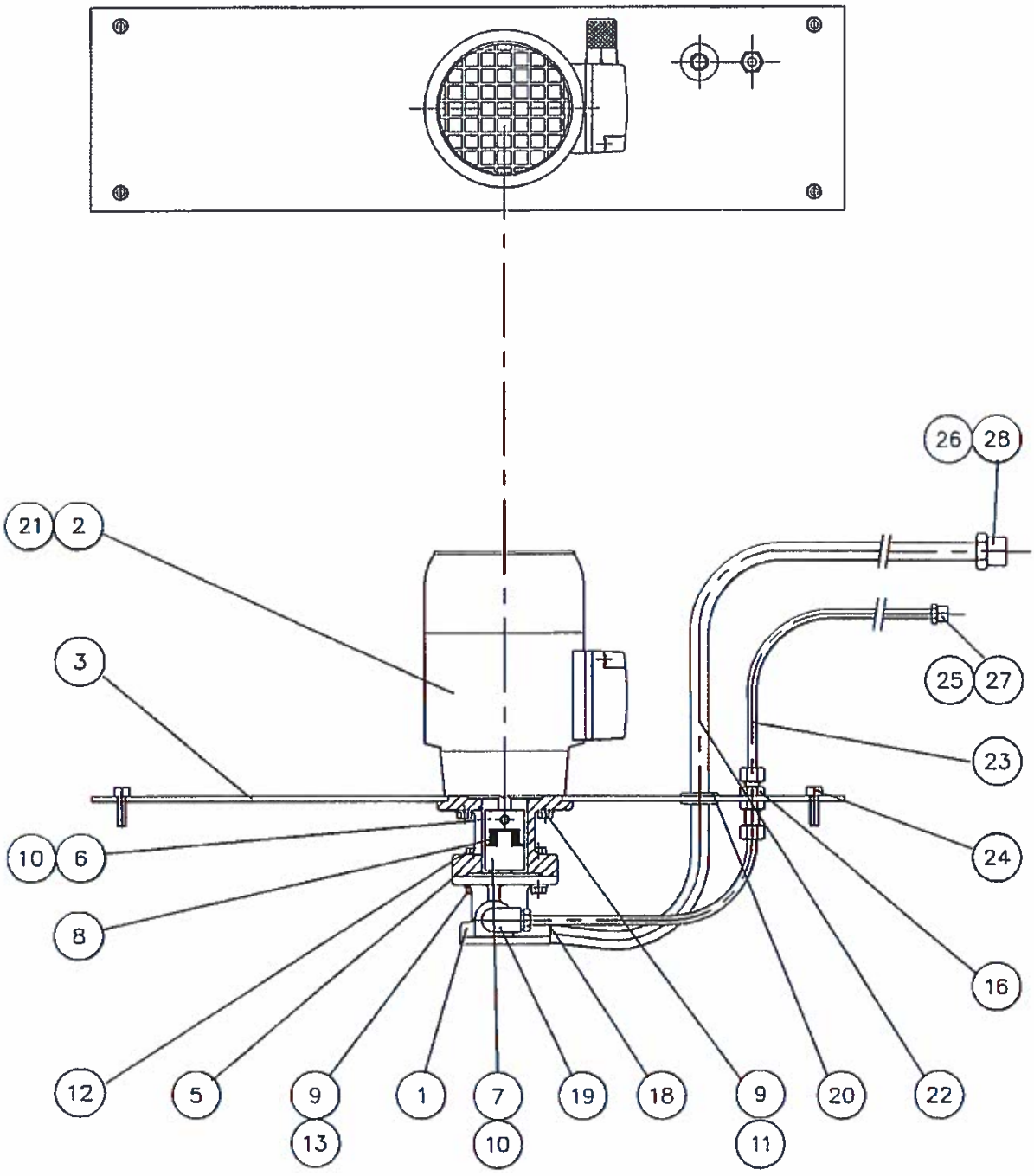
BELTS AND PULLEYS ASSEMBLY



BELTS & PULLEYS ASSEMBLY A107 - 0001

Item No.	Description	Part No.
9	TIMING BELT REF 240M100	B346-1340
15	POLY 'V' BELT 400J16	B345-5435
19	20T PULLEY SUB-ASSEMBLY	A824-0032
22	MOTOR PULLEY / FLYWHEEL SUB-ASSEMBLY	A824-0033
26	HEADSTOCK INPUT PULLEY	D570-0348
29	20T PULLEY	D570-0322
35	RETAINING PLATE 112 mm DIA.	D565-0915
36	MOTOR PULLEY TAB WASHER	D931-0345
40	HEXAGON SOCKET CAP HEAD SCREW M6 x 20	B163-0038
41	HEXAGON SOCKET CAP HEAD SCREW M12 x 25	B166-0097
	20T PULLEY SUB - ASSEMBLY A824 - 00 32	
1	REVERSING BOX PULLEY	D570 - 0327
2	BELT RETAINING RING	D565 - 0927
3	HEXAGON SOCKET BUTTON HEAD SCREW M4x12	B163Y1805
	MOTOR PULLEY/FLYWHEEL ASSEMBLY A824 - 0033	
1	D1325 MOTOR PULLEY	D570-0320
2	FLYWHEEL	D935-0002
5	HEXAGON SOCKET CAP HEAD SCREW M6 X 30	B163-0040
6	WASHER M6	B117-0009
9	SPIROL PIN 6 DIA.x30	B111-5114
15	0.005" THICK M6 SHIM WASHER	B117-0301
16	0.010" THICK M6 SHIM WASHER	B117-0302
17	0.0015" THICK M6 SHIM WASHER	B117-0303
18	0.020" THICK M6 SHIM WASHER	B117-0304

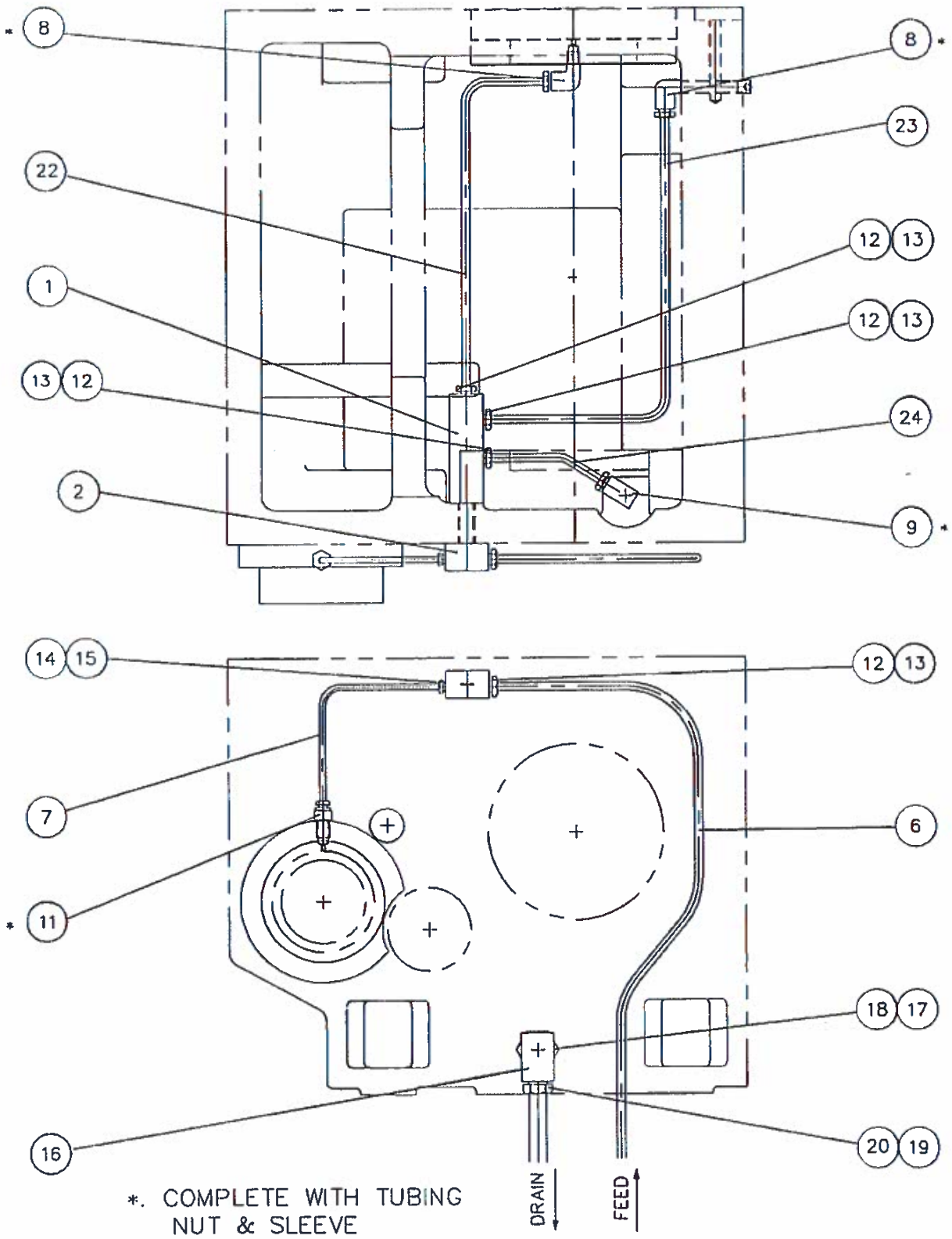
HEADSTOCK LUBRICATION ASSEMBLY



HEADSTOCK LUBRICATION PUMP ASSEMBLY A173-0501

Item No.	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 FULL NUT		B147Y9151
14	LABEL	INTERLUBE 31833-349-1	B780-0057
15	LABEL	INTERLUBE 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		B163-0037
25	TUBING NUT 6MM	ENOTS 36/0500/04	B435-0013
26	TUBING NUT 1/4"	ENOTS 34-0279-04	B433Y0804
27	TUBING SLEEVE 6MM	ENOTS 36/0501/04	B435-0003
28	TUBE SLEEVE 1/2"	ENOTS 34-0278-07	B433Y0828
35	RUBBER COVER 23778-030		B509-0002

HEADSTOCK LUBRICATION KIT

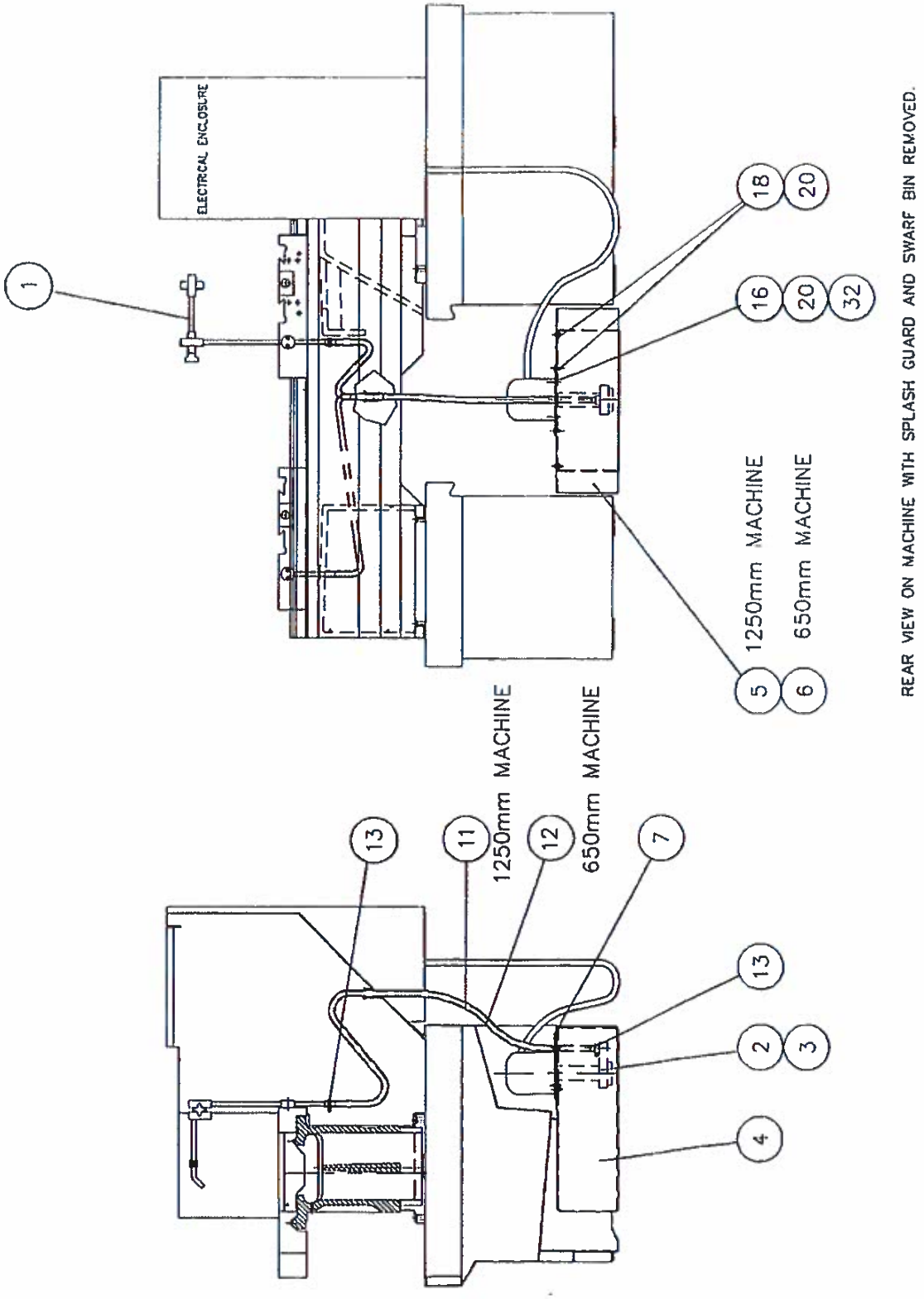


*. COMPLETE WITH TUBING NUT & SLEEVE

HEADSTOCK LUBRICATION KIT — A903 - 0002B

Item No.	Description	Part No.
1	OIL LUBE PIPE ADAPTOR	D004 - 0087
2	3 WAY ADAPTOR	D004 - 0092
6	PLASTIC TUBE 6mm DIA.	R827 - 4213
7	NYLON TUBE 4mm DIA.	R827 - 4211
8	6mm -1/8" BSPT ELBOW	B435 -0132
9	6mm OD PIPE/1/4" BSPT ELBOW	B435 - 0127
11	4mm - 1/8"BSPT STRAIGHT CONNECTOR	B435 - 0134
12	6mm O/D PIPE TUBING NUT	B435 - 0022
13	6mm O/D CONE (OLIVE)	B435 - 0011
14	4mm O/D TUBING NUT	B435 - 0021
15	4mm O/D TUBING SLEEVE	B435 - 0010
16	HOBBS ELBOW 1/2"-1/2"	B433 - 2257
17	HOBBS CONED LOCKNUT 1/2" BSP	B433 - 0893
18	HOBBS SEAL 1/2" BSP	B433 - 3241
19	1/2" O/D TUBING NUT	B433 - 0811
20	1/2" O/D TUBING SLEEVE	B433 - 0851
22	PIPE - ADAPTOR TO FRONT BEARING	D562 - 0173
23	PIPE - ADAPTOR TO OIL SIGHT	D562 - 0174
24	PIPE - ADAPTOR TO REAR BEARING	D562 - 0175

COOLANT ARRANGEMENT



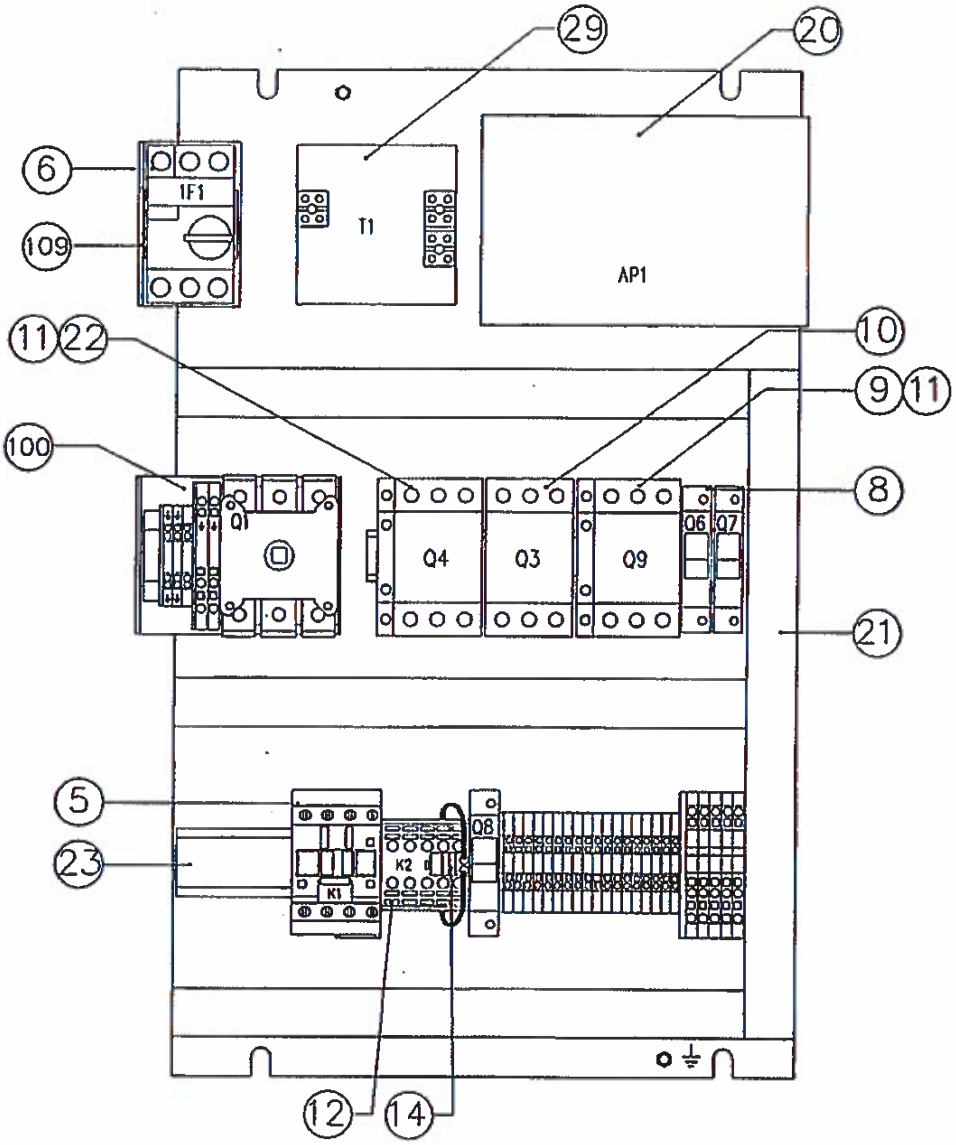
COOLANT ASSEMBLY A167-0510

Item No.	Description	Part No.
1	STANDPIPE ASSEMBLY	B425-0036
2	COOLANT PUMP ASSEMBLY (M.G.)	A867-0046A
3	COOLANT PUMP ASSEMBLY (NON M.G.)	A867-0049
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	B233-4004
14	TUBE CLIP ENOTS 3/4" DIA	B233-1109
16	HEXAGON SOCKET BUTTON HEAD SCREW M6 X 10	B163-1813
20	WASHER M6	B117-0009
29	INFILL SUPPORT PLATE	B565-0995
30	INFILL SUPPORT STRAIGHT BED	D565-0917
31	INFILL PLATE GAP BED	D565-0994
32	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163-0037
	COOLANT PUMP ASSEMBLY (M.G.) A867-0046A	
1	MG PUMP AQ3/2/Q/SS POS F	B473-0001
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

BASIC ELECTRICS ASSEMBLY A191 - 1030K

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
28	D537 - 1087	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 6/7"	1
50	A826 - 1311G	PUSHBUTTON ASSEMBLY	1

PANEL ASSEMBLY

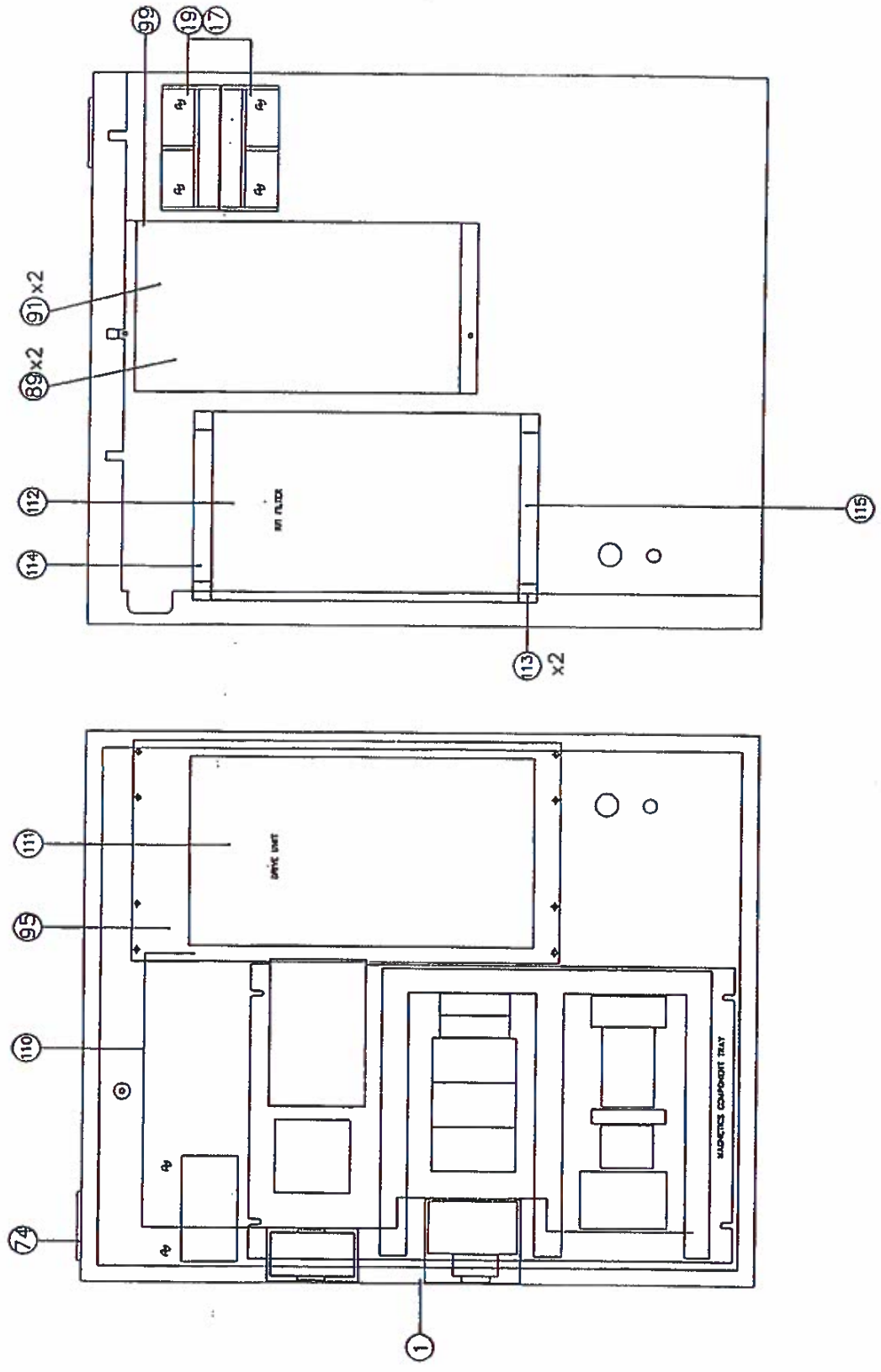


K1	LINE CONTACTOR
K2	COOLANT CONTACTOR
Q1	ISOLATOR
Q2	MAIN CIRCUIT BREAKER
Q3	COOLANT MOTOR CIRCUIT BREAKER
Q4	HYDRAULIC MOTOR CIRCUIT BREAKER
Q6	TRANS.PRIMARY CIRCUIT BREAKER
Q7	HYDRAULIC MOTOR CIRCUIT BREAKER
Q8	CONTROL CCT. BREAKER
Q9	DRIVE MOTOR FAN CIRCUIT BREAKER
T1	CONTROL TRANSFORMER
AP1	RELAY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

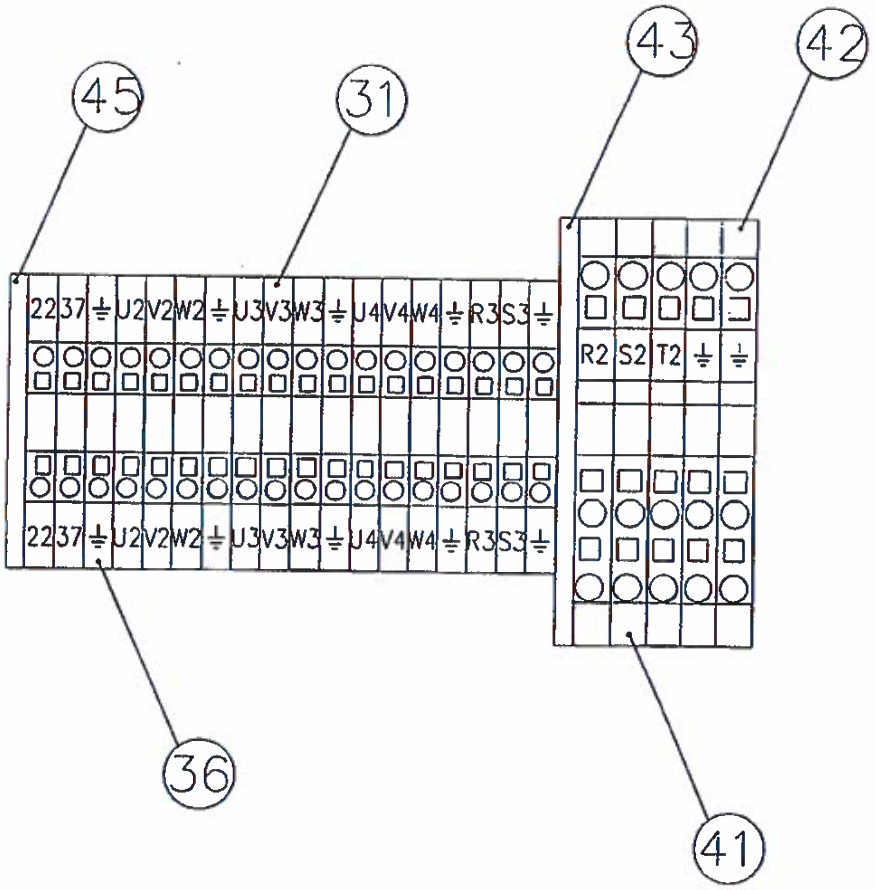


DCIN - 22282	CODE VTC	Serial No.		Assembly - A191 - 1075A	Issue 1	24.01.96

ELECTRICAL ENCLOSURE ASSEMBLY A191-1075A

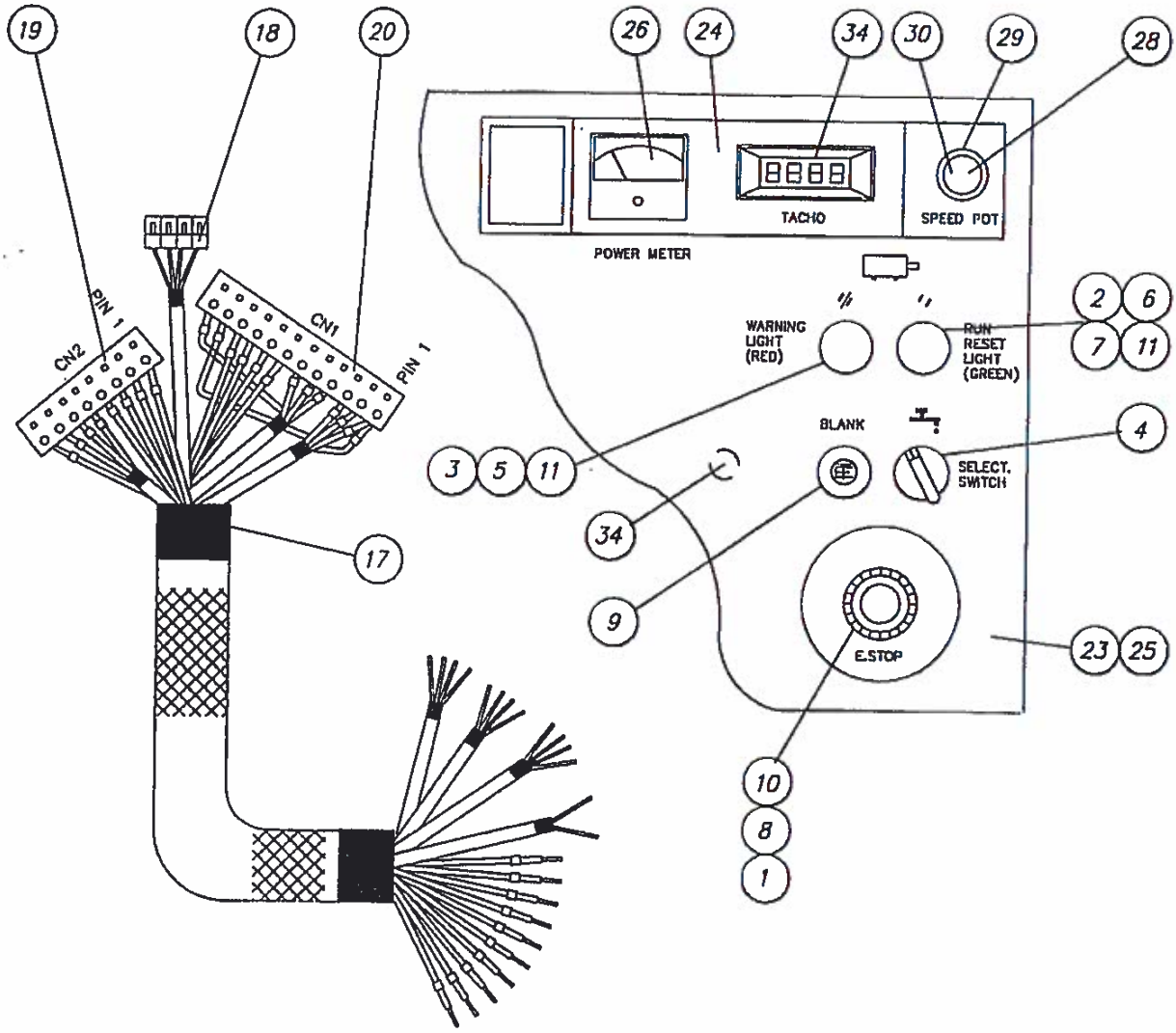
Item	Part Number	Description	Qty
109	D050-0952	'MCB' MOUNTING BRACKET	1
110	D132-1049	'EMC' BAFFLE COVER	1
113	D050-0948	DRIVE MOUNTING BRACKET - MITSUBISHI	2
114	D132-1036	FILTER COVER (TOP)	1
115	D132-1037	FILTER COVER (BTM)	1

TERMINAL RAIL DETAIL



Item	Part Number	Description	Qty

PUSH BUTTON ASSEMBLY



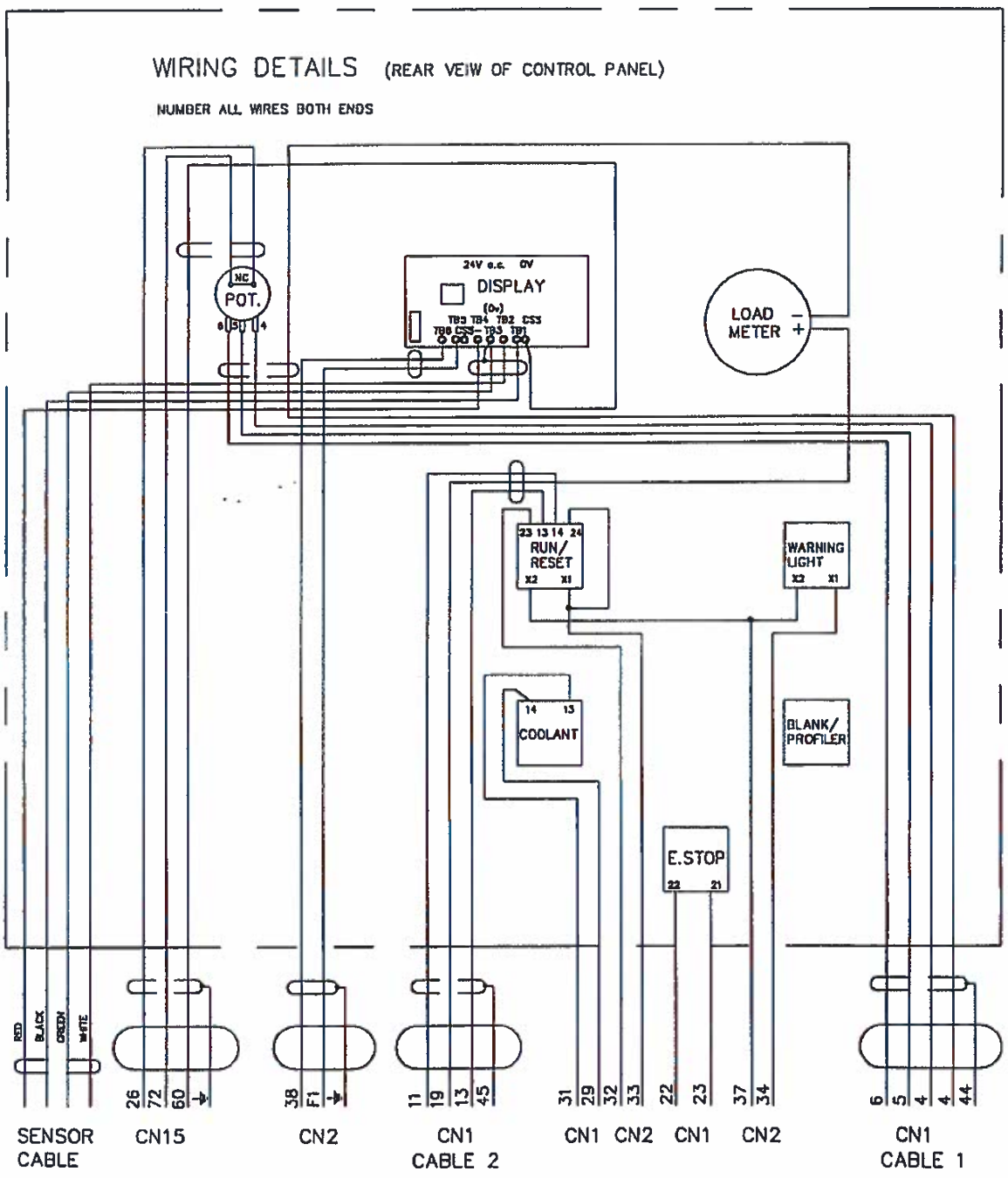
CABLE MARKING DETAILS FOR CN1					
PIN No.	WIRE No.		OPERATORS PANEL		
12	45	SCREEN (CABLE 2)	N.C.		
11	44	SCREEN	N.C.		
1	4	BLACK	4	POT. 0v	(RIGHT)
2	5	WHITE 4-CORE 7/0.2mm SCREENED	5	POT SPEED REF.	(MIDDLE)
3	6	RED (CABLE 1)	6	POT. 10v	(LEFT)
1	4	GREEN	4	POT. 0v	(RIGHT)
4	11	BLACK	11	DRIVE RESET	(BOT 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	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

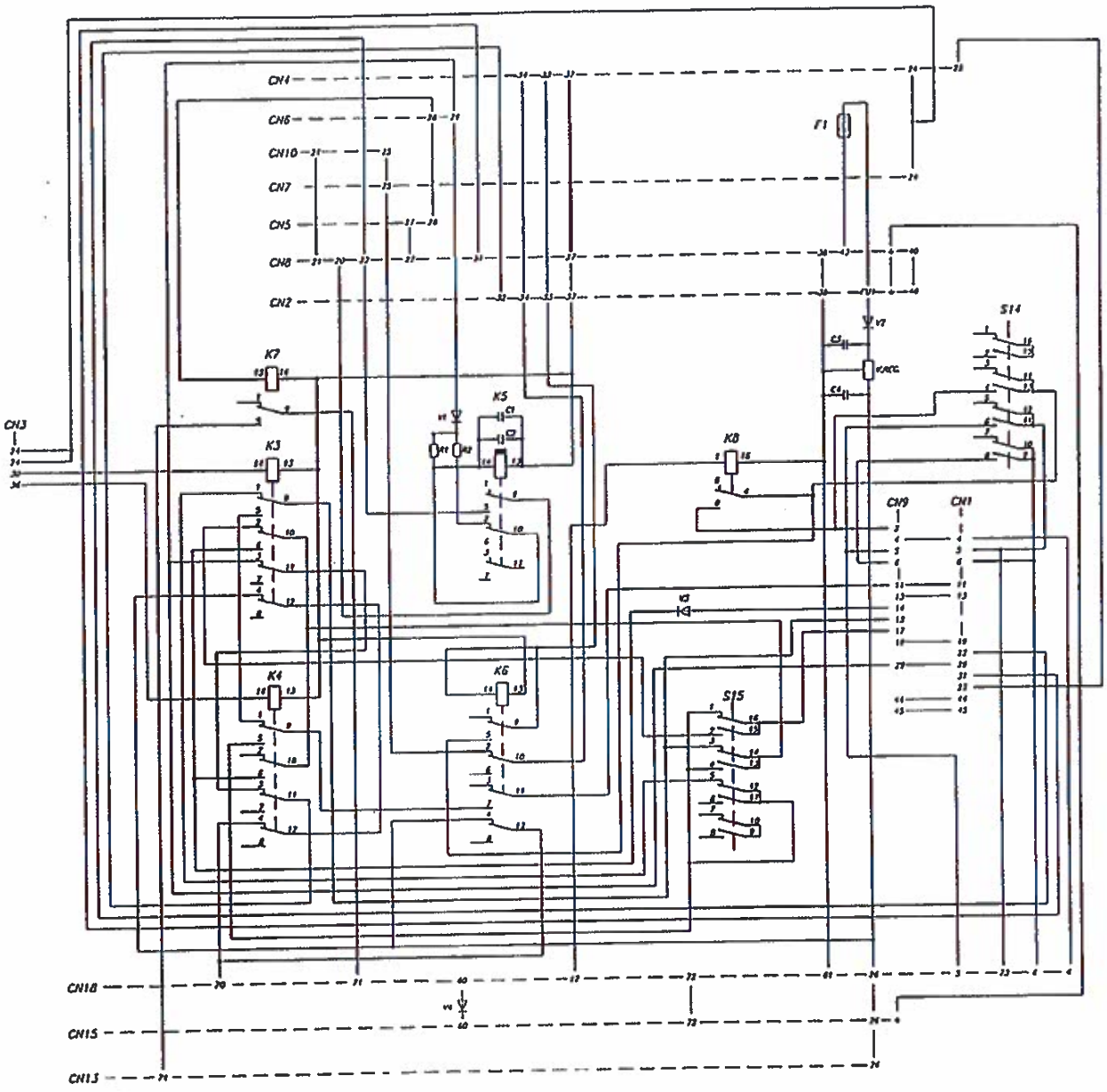
Item	Part Number	Description		Qty
1	B762 - 7001	RED MUSHROOM HEAD P/ BUTTON	ZB2-BS54	1
2	B762 - 7002	ILLUMINATED P/ BUTTON LENS (GREEN)	ZB2-BW33	1
3	B762 - 7003	RED PILOT LENS	ZB2-BV04	1
4	B762 - 7004	2 POSITION SELECTOR	ZB2-BD2	1
5	B762 - 7005	PILOT LAMP	ZB2-BV6	1
6	B762 - 7006	ILLUMINATED PUSH BUTTON	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

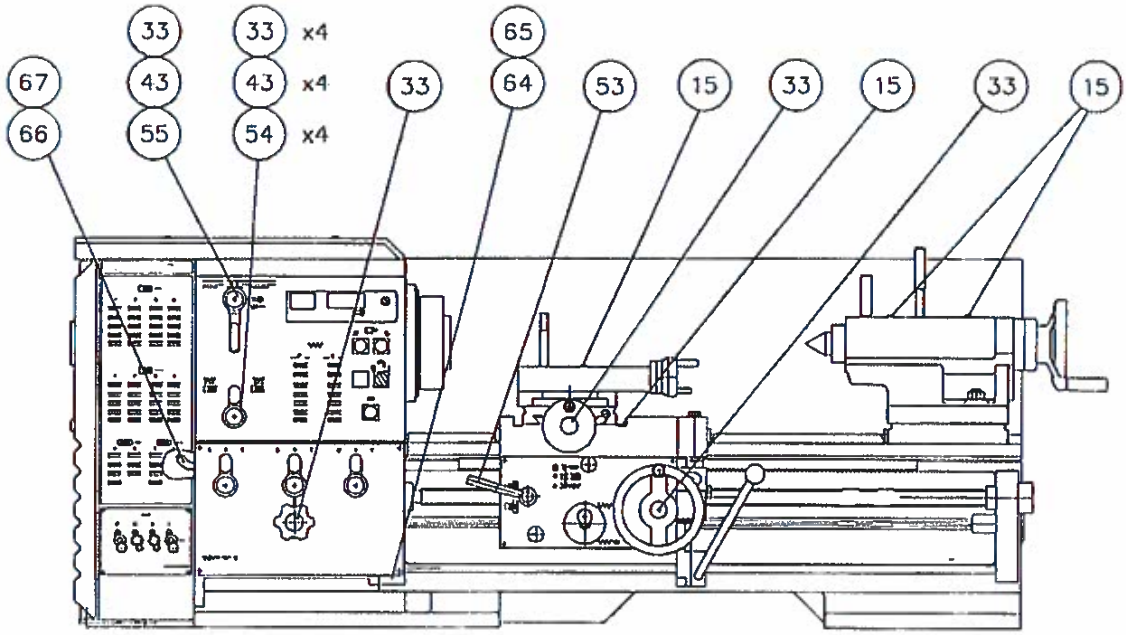


CN1 OPERATOR'S PANEL
CN2 OPERATOR'S PANEL
CN3 HAND SHIFT SWITCH
CN4 AUXILIARY OPERATORS PANEL
CN5 END GUARD
CN6 CHUCK GUARD
CN7 KICK STOP
CN8 MAGNETIC'S PANEL
CN9 SPINDLE DRIVE UNIT
CN10 BRAKE OVERLOAD UNIT
CN11 IN GEAR POSITION
CN13 SPEED DISPLAY/POT. SWITCH
CN16 CPU/ESS UNIT

RELAY BOARD (PARTS LIST) EP 767

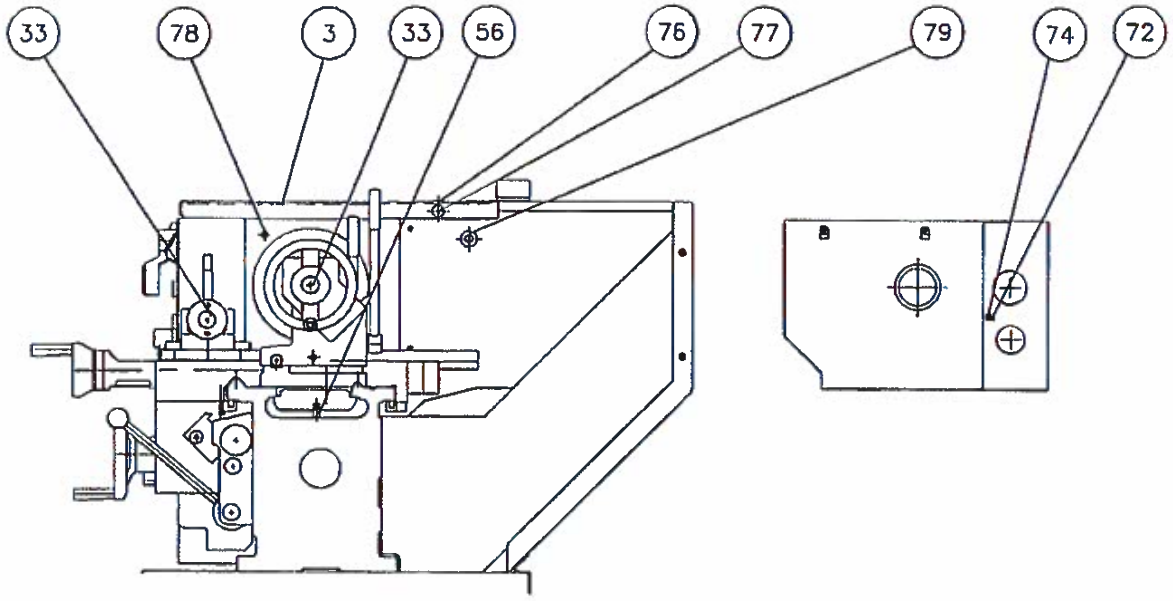
Item	Part Number	Description	Qty
		FUSE CARTRIDGE 20x5mm 500mA	
		FUSE HOLDER 20x5mm (FU1)	
		RESISTOR lk.250mW. 10% (R1)	
		231-132 WAGO SOCKET 2-POLE (CN5/6/7/10/13)	
		231-134 WAGO SOCKET 4-POLE (CN3/15)	
		231-138 WAGO SOCKET 8-POLE (CN2/4)	
		231-140 WAGO SOCKET 10-POLE (CN8)	
		231-142 WAGO SOCKET 12-POLE (CN1/18)	
		231-144 WAGO SOCKET 14-POLE (CN9)	
		MY4-02 SERIES OMRON RELAY 4-POLE C/O 11 0V (K3,4,6)	
		RP410615 SCHRACK RELAY 1-POLE C/O 110V (K7)	
		MY4-02 SERIES OMRON RELAY 4-POLE C/O 24VDC (K5)	
		'RS' RELAY 2-POLE C/O 24VDC STOCK No. 351-847 (K8)	
		RESISTOR 120R. 250mW. 10% (R2)	
		DIODE 1N4004 (V1/2/3)	
		CAPACITOR. ELECTROLYTIC (CI) 220µF.40V	
		CAPACITOR. ELECTROLYTIC (C2) 330µF.40V	
		CAPACITOR 470µF 63V (C3)	
		CAPACITOR l00nF (C4)	
		DIODE. 1N4148(V4)	
		VOLTAGE REGULATOR 24VDC.(V.REG)	
		4-POLE 2-WAY SLIDE SWITCH(S14/15) (DIL. PACKAGE)	
CN1		OPERATOR'S PANEL	
CN2		OPERATOR'S PANEL	
CN3		THIRD SHAFT SWITCH	
CN4		AUXILIARY OPERATOR'S PANEL	
CN5		END GUARD	
CN6		CHUCKGUARD	
CN7		KICKSTOP	
CN8		MAGNETIC'S PANEL	
CN9		SPINDLE DRIVE UNIT	
CN10		BRAKE OVERLOAD UNIT	
CN13		IN GEAR POSITION	
CN15		SPEED DISPLAY Y/POT.SWITCH	
CN18		DRO/CSS UNIT	

TRIMMINGS ASSEMBLY (1)



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

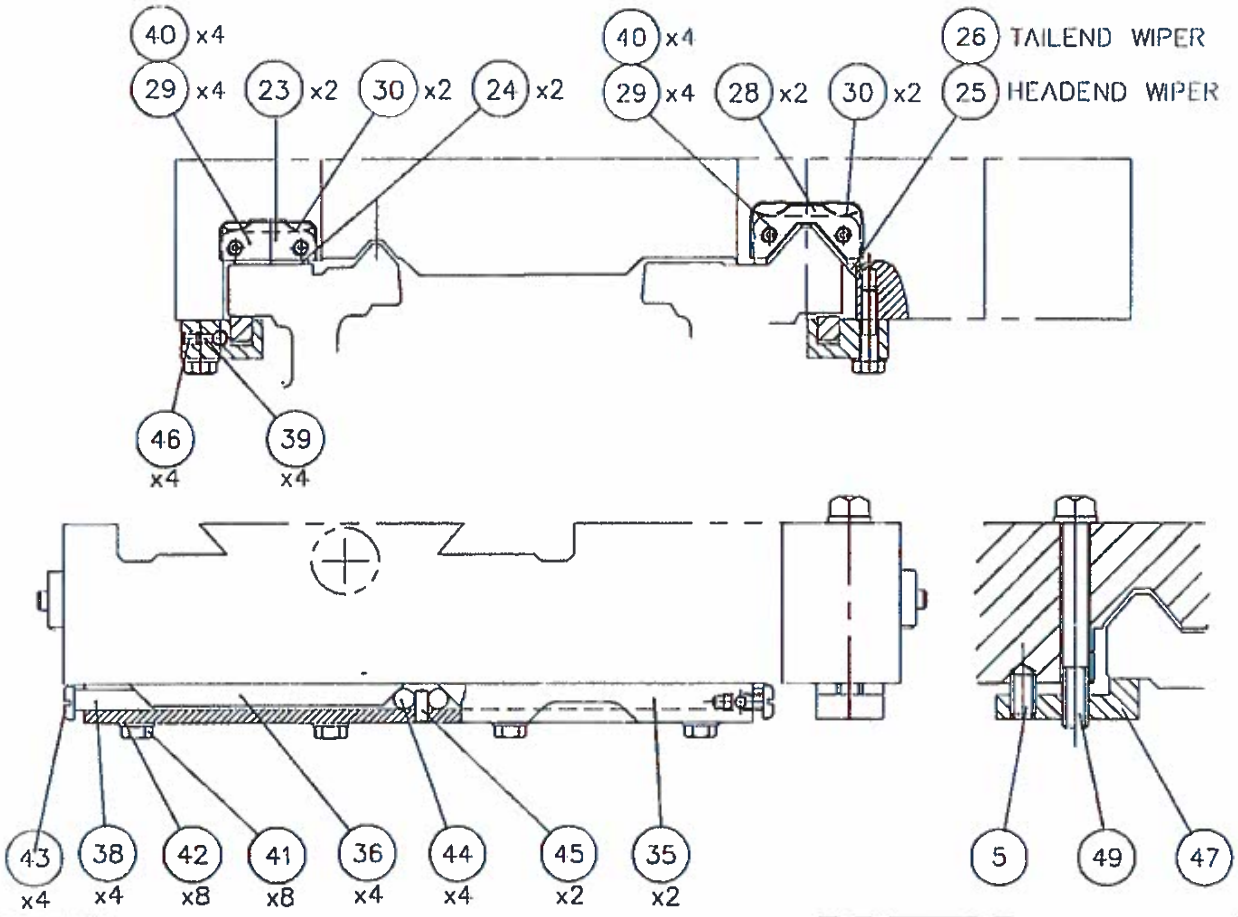
ITEMS 76 & 77 TO BE FITTED TO ALL MACHINES NOT REQUIRING A CHUCK GUARD.



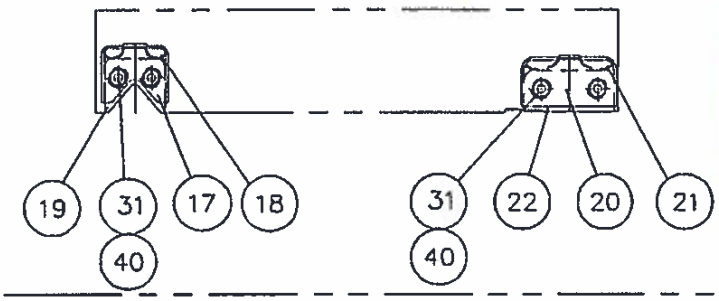
TRIMMINGS ASSEMBLY A176 - 0509

Item No.	Description	Part No.
1	SET OVER PAD	D557 - 0142
2	SET OVER PIN	D560 - 0297
3	HEADSTOCK MAT	D132 - 0797
4	GEARBOX GASKET	D703H002
5	WEDGLOK SET SCREW M12x20	B164 - 0170
6	SPIROL PIN 10x40	B111 - 5160
7	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163 - 0071
8	HEXAGON SOCKET CAP HEAD SCREW M8x40	B163 - 0057
9	HEXAGON SOCKET CAP HEAD SCREW M12x55	B166 - 0136
10	HEXAGON SOCKET CAP HEAD SCREW M8x20	B163 - 0053
12	BED STOP PIN	D560 - 0307
13	DOWEL PIN 10x36	B111Y7060
14	DOWEL PIN 10x30	B111 - 7057
15	CONCAVE LUBRICATOR 6mm	B454 - 2004
17	VEE BEDWAY SHIELD (TAILSTOCK)	D725 - 0019
18	SPRING (TAILSTOCK VEE)	D707 - 0067
19	VEE WIPERS (TAILSTOCK)	D937 - 0013
20	FLAT BEDWAY SHIELD (TAILSTOCK)	D725 - 0020
21	SPRING (TAILSTOCK FLAT)	D707 - 0068
22	FLAT WIPER (TAILSTOCK)	D937 - 0014
23	FLAT BEDWAY SHIELD (SADDLE)	D725 - 0013
24	BED FLAT WIPER (SADDLE)	D937 - 0010
25	VEE WIPER HEAD END (SADDLE)	D937 - 0034
26	VEE WIPER TAIL END (SADDLE)	D937 - 0033
28	BEDWAY WIPER VEE SHIELD (SADDLE)	D725 - 0014
29	WIPER SPACER (SADDLE)	D708 - 0087
30	LEAF SPRING (SADDLE)	D707 - 0051
31	SPACER 1/4"x1/2" (TAILSTOCK)	D708 - 0143
33	BLUE PLASTIC DISC 33mm	B224 - 2143
35	SADDLE STRIP MOUNT	D345 - 0083
36	SADDLE STRIP	D715 - 0173
38	STRIP ADJUSTER SHORT	D715 - 0192
39	LOCK PAD	D557 - 0143
40	HEXAGON SOCKET BUTTON HEAD SCREW M4x12	B163Y1805
41	HEXAGON SOCKET SET SCREW M8x35	B166 - 0068
42	WASHER M8	B117 - 0010
43	SLOTTED PAN HEAD SCREW M8x16	B165 - 0143
44	STEEL ROLLER 10x10	B326 - 9020
45	SPIROL PIN 6x16	B111 - 5107
46	HEXAGON SOCKET CAP HEAD SCREW W POINT M6x8	B163Y1561
47	SADDLE CLAMP	D715 - 0172
49	SADDLE LOCKING SCREW	D697 - 0393
50	WASHER M12	B117 - 0012

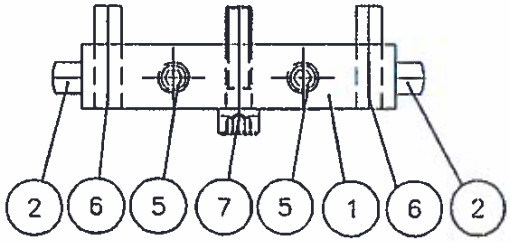
TRIMMINGS ASSEMBLY (2)



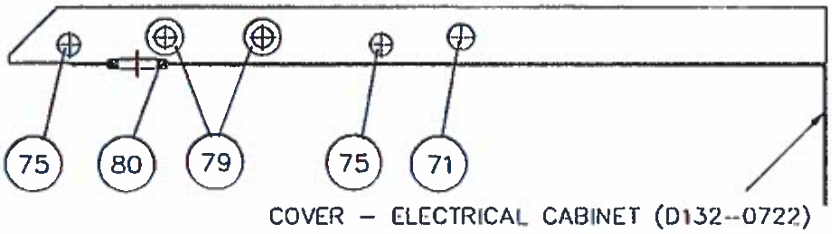
TAILSTOCK BEDWAY WIPERS



HEADSTOCK SETOVER PAD



VIEW FROM REAR OF MACHINE SHOWING ROTOCAM TRUNKING (D132-0698)



TRIMMINGS ASSEMBLY A176 - 0509

Item No.	Description	Part No.
53	HANDLE	D382 - 0078
54	HANDLE	D382 - 0137
55	RANGE CHANGE HANDLE	D382 - 0146
56	TAILSTOCK STOP PIN	D560 - 0296
58	HEXAGON SOCKET BUTTON HEAD SCREW M6x16	B163 - 1815
64	GEAR BOX EXTENSION BRACKET	D050 - 0675
65	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163 - 0059
66	1/2" BSP M & F ELBOW	B424 - 2254
67	PLUG 1/2" BSP	B424 - 2814
68	HEXAGON SOCKET BUTTON HEAD SCREW M6x12 (PLATED)	B163 - 1900
69	WASHER M6 (PLATED)	B117 - 0048
70	NYLOC NUT M6	B147Y9003
71	PLUG 16mm	B715 - 1077
72	TUBING CLIP	B233 - 1103
74	HEXAGON SOCKET BUTTON HEAD SCREW M4x10	B163 - 1804
75	PLUG	B224 - 2244
76	PVC BLANKING PLUG	B224 - 2209
77	PLUG	B224 - 2304
78	HEXAGON SOCKET CUP POINT SET SCREW M12	B163 - 1594
79	BLANKING PLUG	B224 - 2240
80	GROMMET	B715 - 1085
81	BLANKING PLUG HEYCO	B224 - 2308

SHEET METAL PACK A137 - 0515

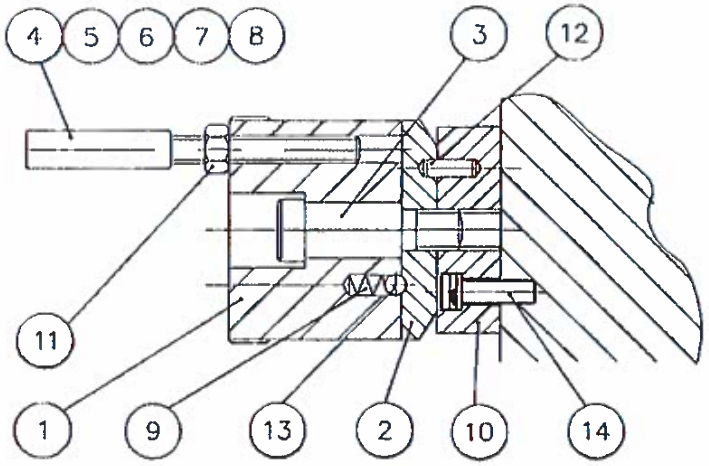
Item No.	Description	Part No.
3	HEAD END COVER	D132 - 0697
4	TRUNKING	D132 - 0698
9	SWARF BIN 650 mm	D832 - 0154
10	SWARF BIN 1250mm	D832 - 0155
16	SPLASH GUARD SUPPORT BRACKET TAIL END	D050 - 0656
17	SPLASH GUARD 650 mm	D346 - 0376
18	SPLASH GUARD 1250 mm	D346 - 0377
22	SPLASH GUARD INFILL PLATE	D565 - 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
50	ASH GREY SPATTER PAINT BS 00A01 AE256/5	R744- 0034
52	STORM GREY SPATTER PAINT BS 00A13 AE256/5	R744- 0035

ACCESSORY INDEX

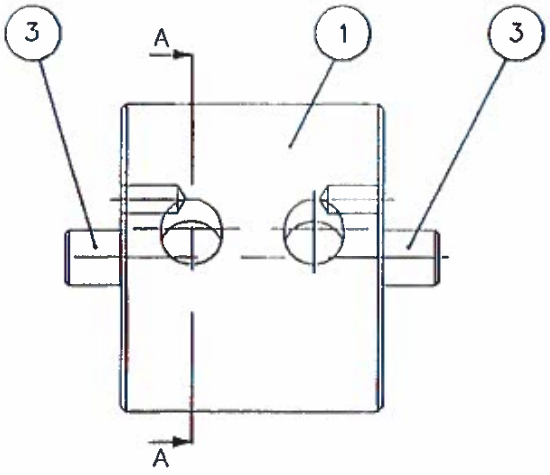
ITEM

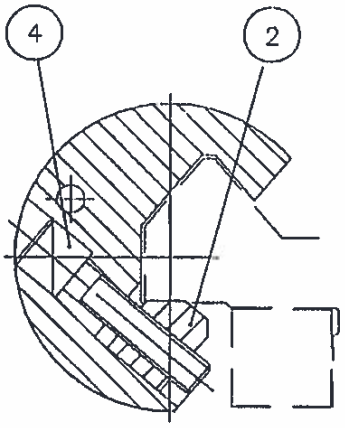
BEDSTOPS

TURRET STOP ASSEMBLY A184 – 0516



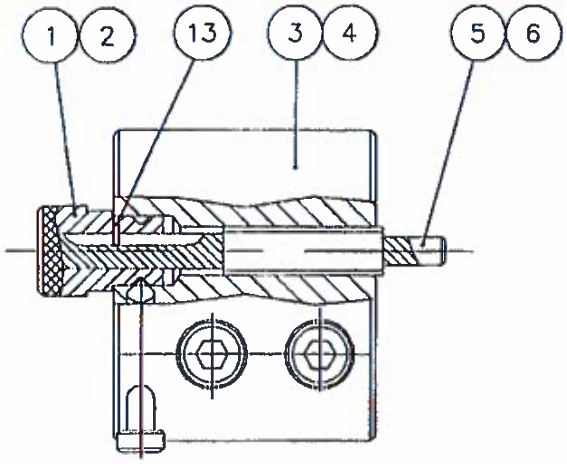
SINGLE BED STOP A184 – 0514

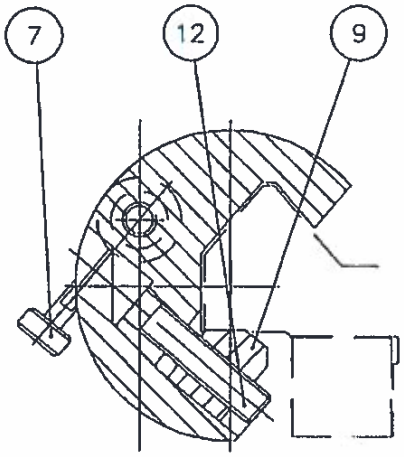




SECTION A–A

MICROMETER BED STOP A184 – 0515

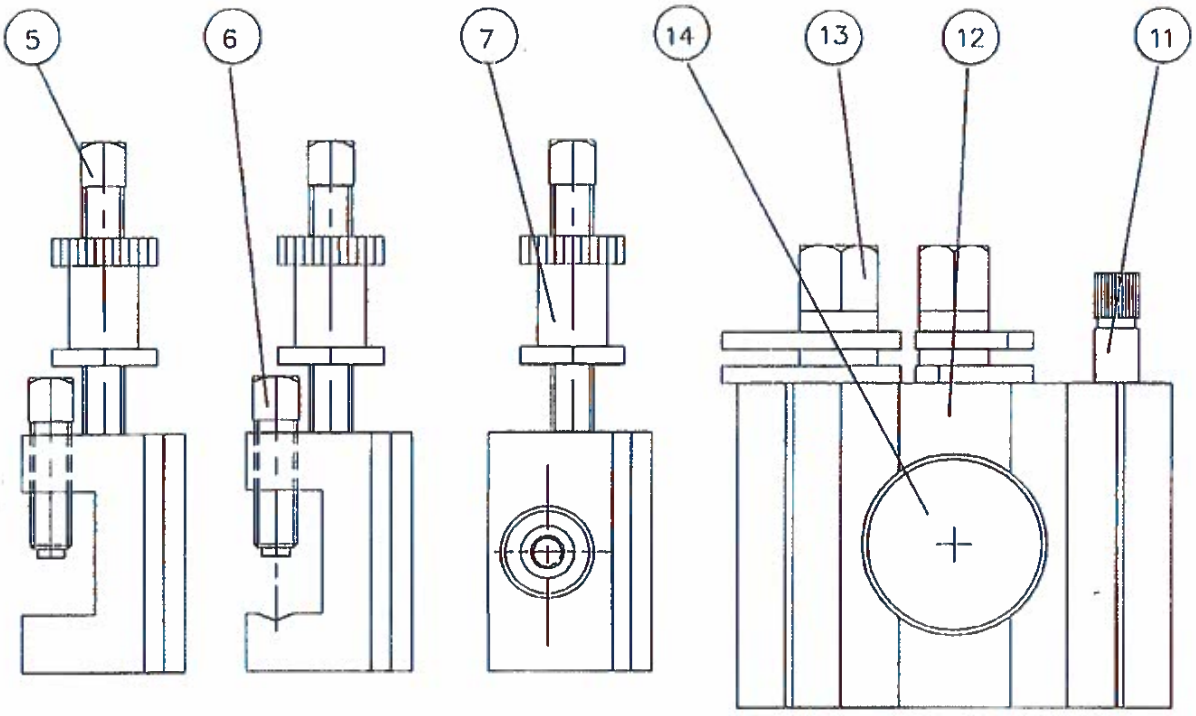




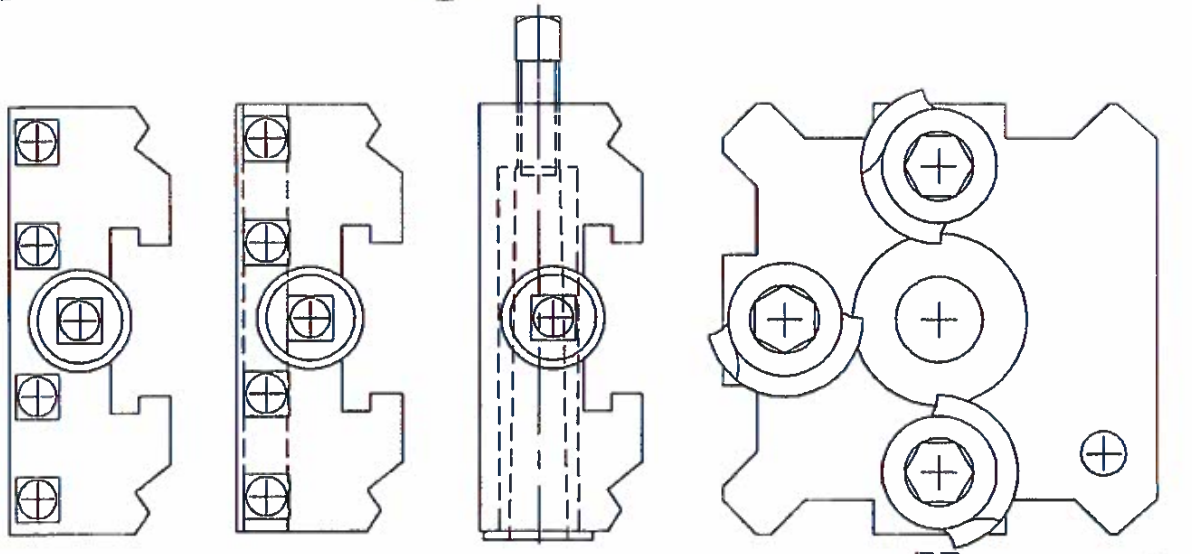
BED STOP ASSEMBLIES A184 - 0514/0515/0516

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

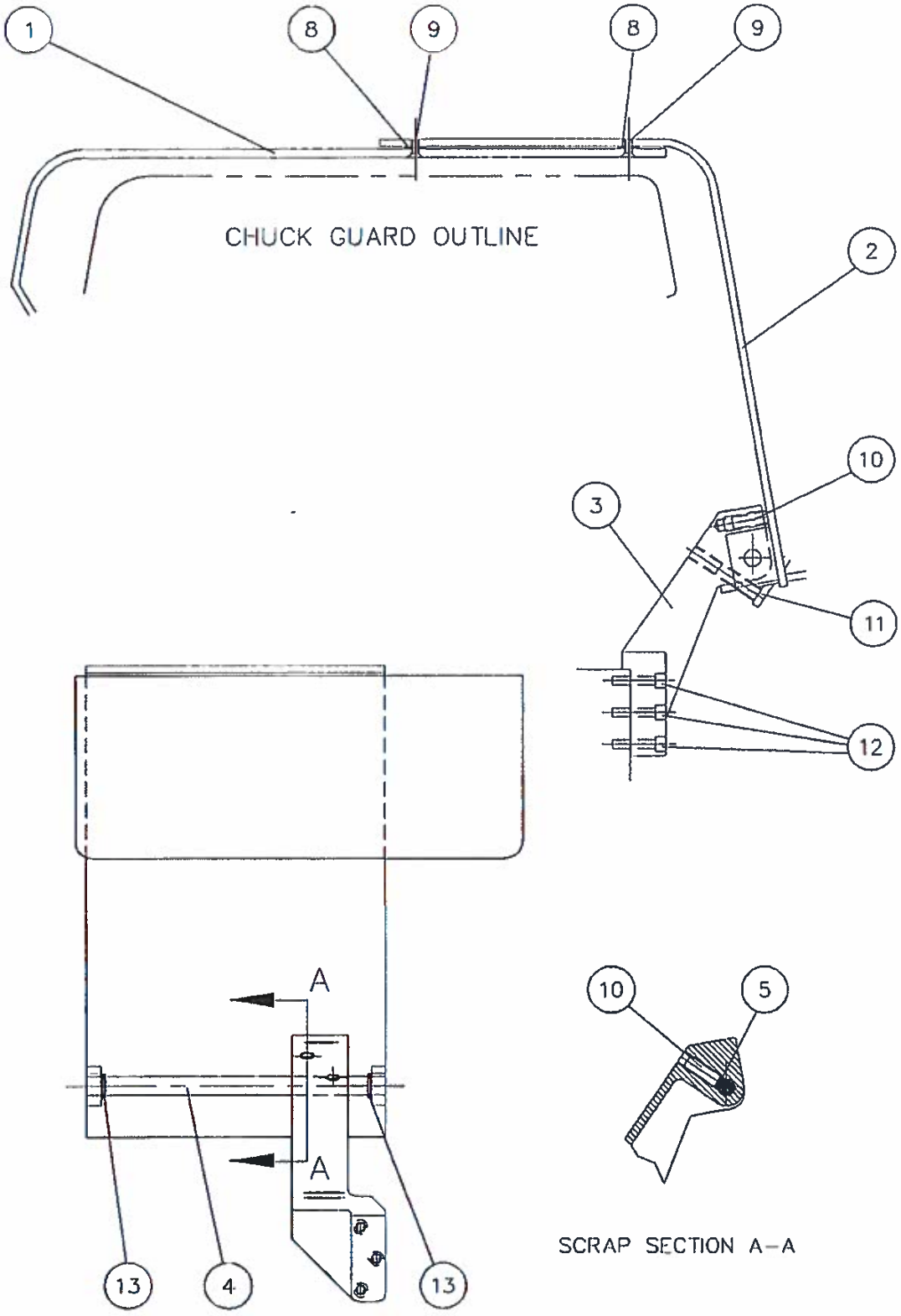
WRENCHES

(9) TOOL CLAMP SCREW
(10) CAM CLAMP

QUICK CHANGE TOOLPOST ASSEMBLIES

Item No.	Description	Part No.
1	RAPIDUE QUICKCHANGE TOOLPOST	B935 - 1364
2	DICKSON QUICKCHANGE TOOLPOST	B935 - 1339

CHIP GUARD ASSEMBLY

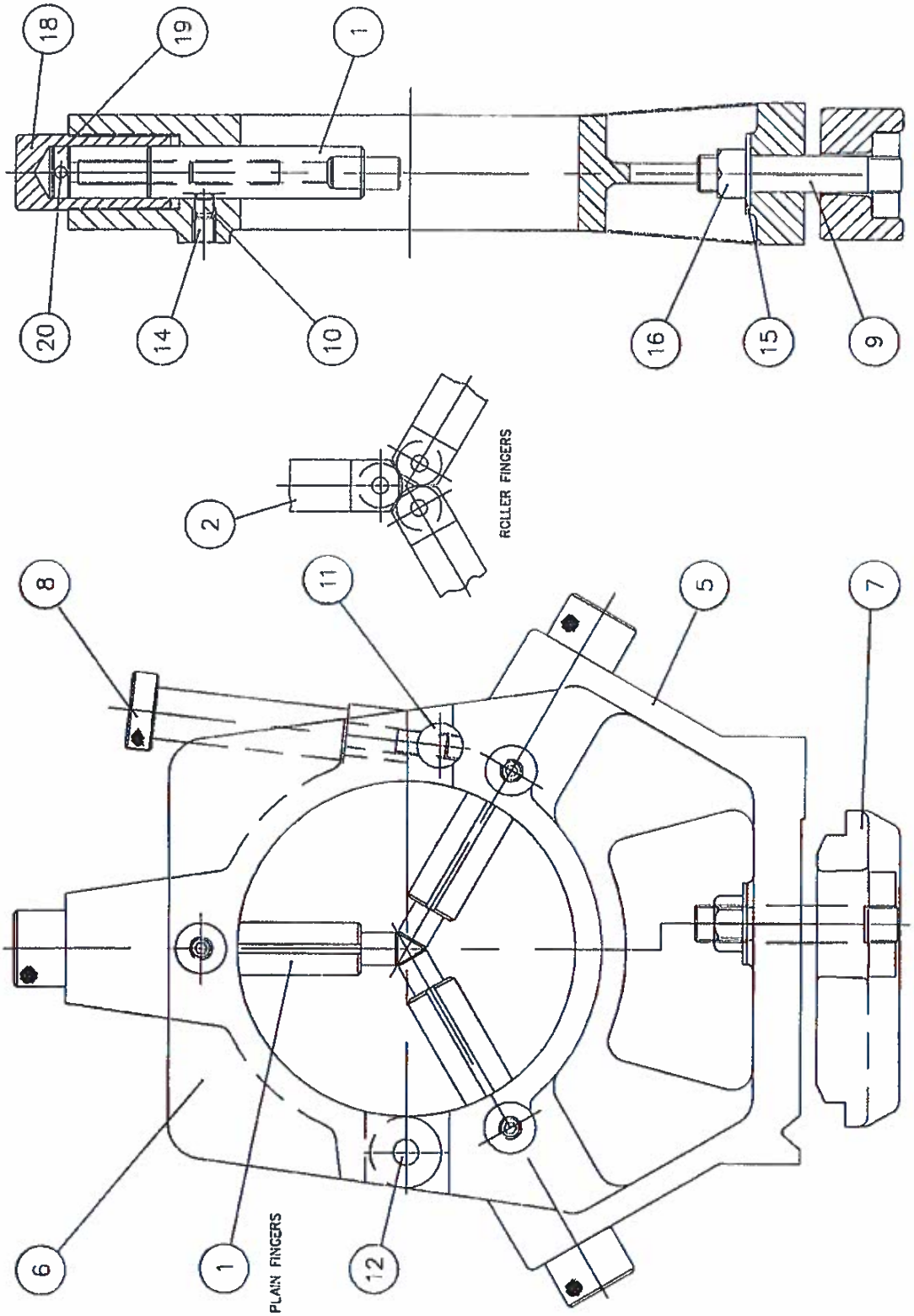


CHIP GUARD ASSEMBLY

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

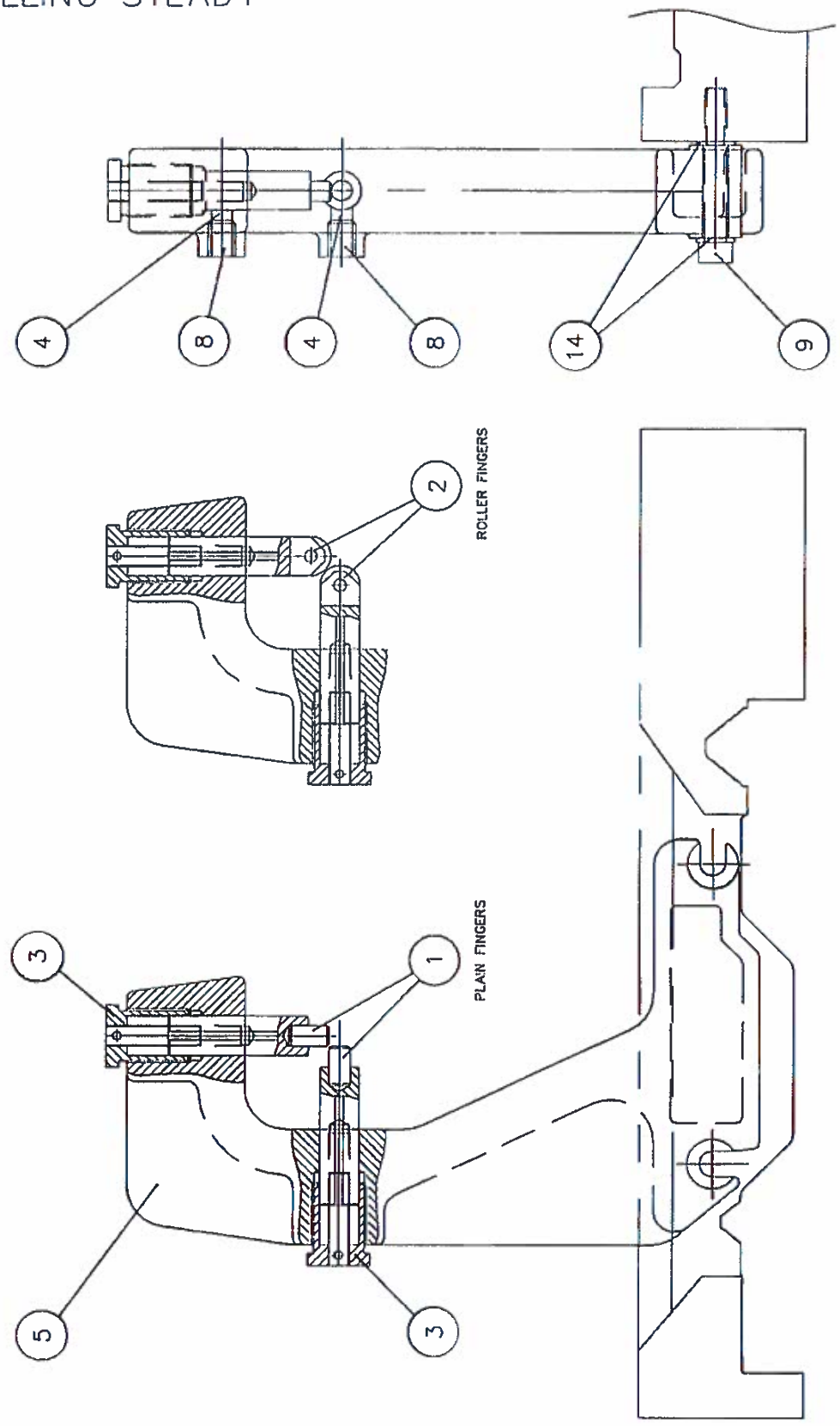
STATIONARY STEADY ASSEMBLY



STATIONARY STEADY ASSEMBLY A178 - 0420

Item No.	Description	Part No.
1	PAD TYPE FINGER SUB-ASSEMBLY	A882 - 0018
2	ROLLER FINGER SUB-ASSEMBLY	A882 - 0014
5	STEADY BOTTOM	D722 - 0059
6	STEADY TOP	D722 - 0061
7	CLAMP PLATE	D131 - 0038
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

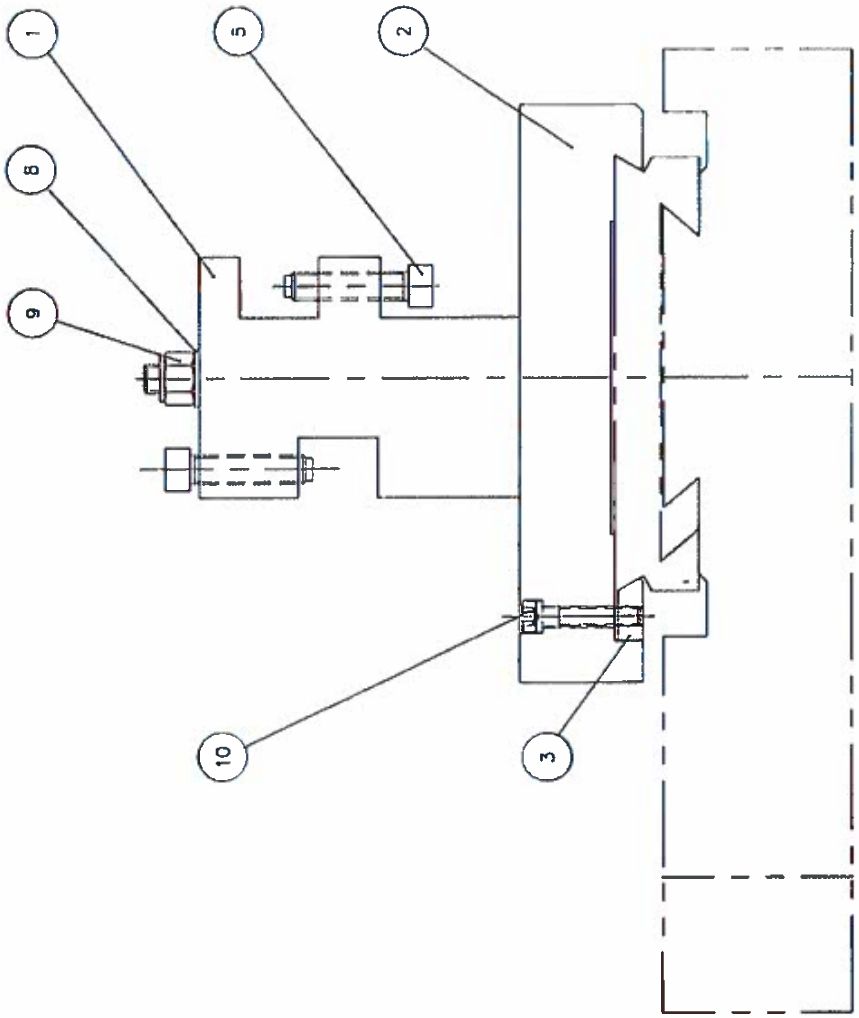
TRAVELLING STEADY

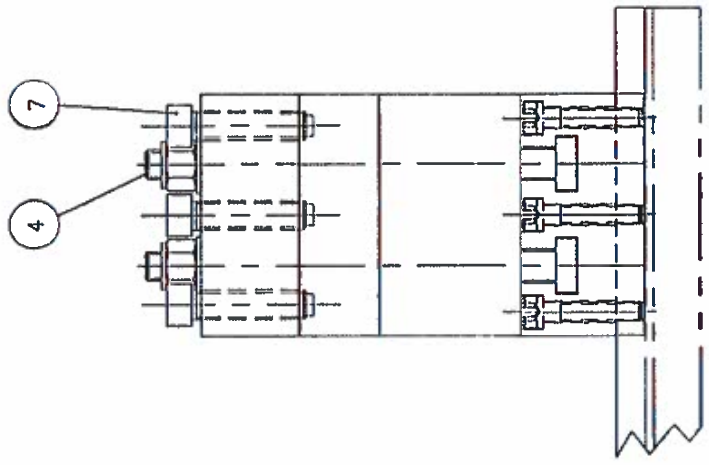


TRAVELLING STEADY A178 - 0419

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 - 0060
8	DOG POINT SCREW M12x12	B163 - 1780
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

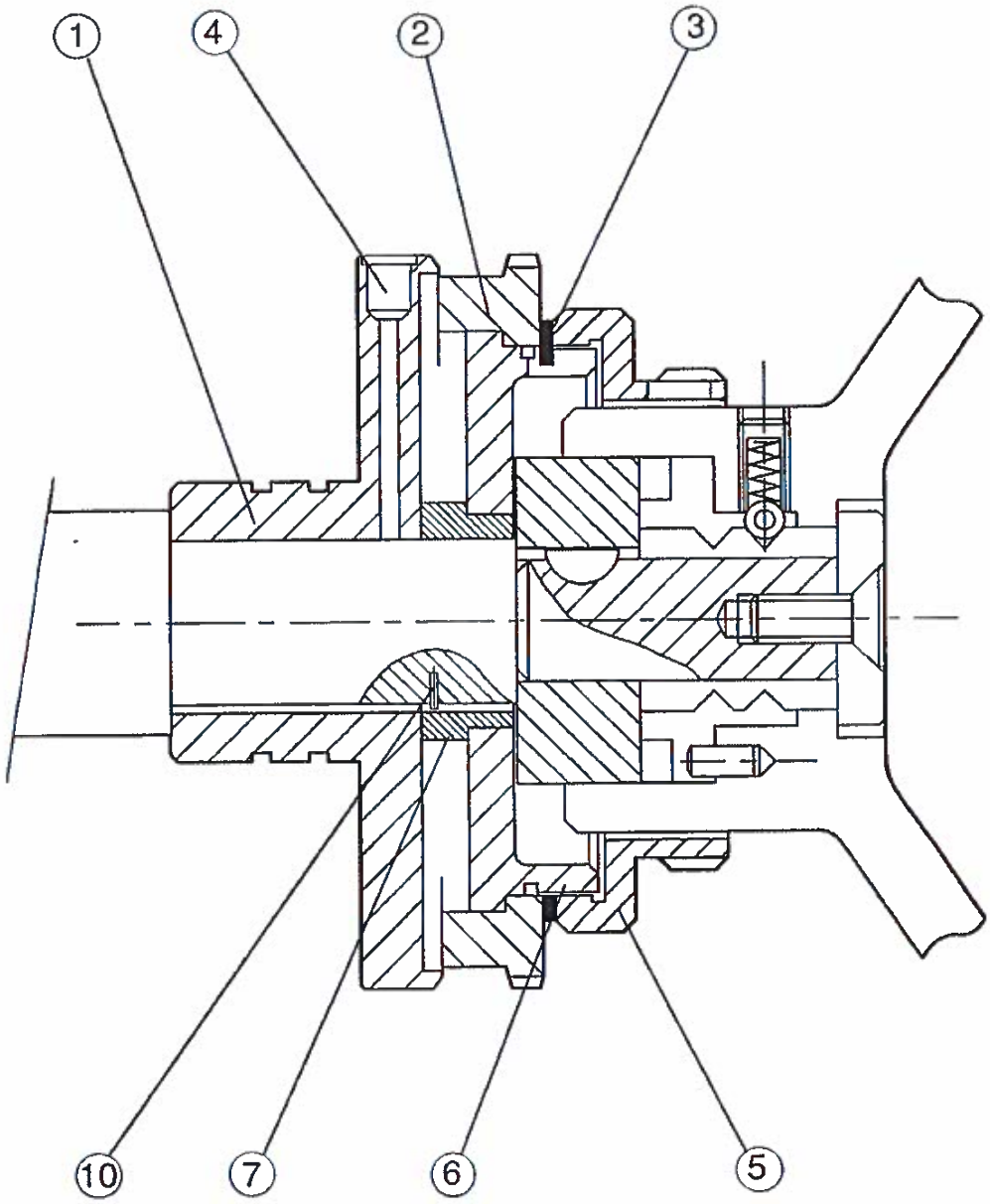
REAR TOOLPOST ARRANGEMENT





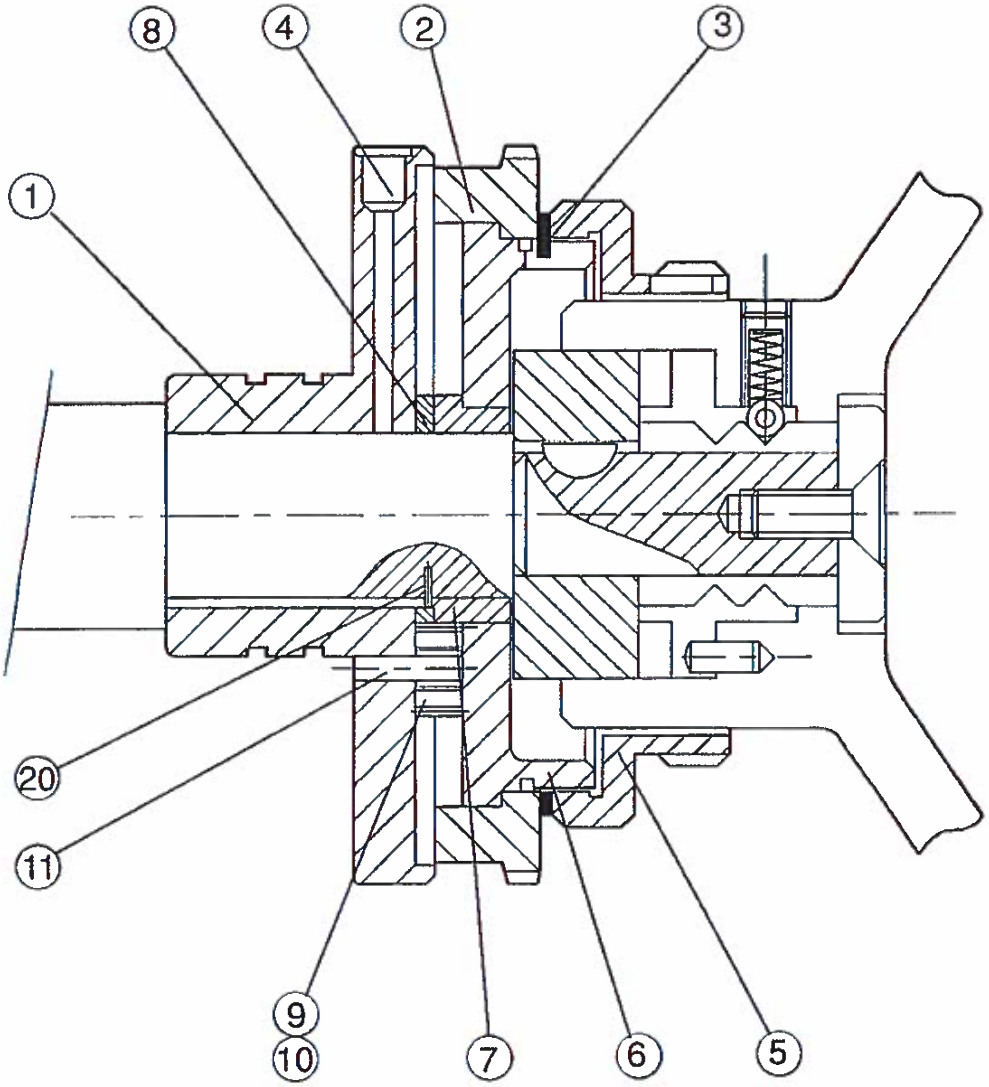
REAR TOOLPOST ASSEMBLY A182 - 0417

Item No.	Description	Part No.
1	REAR TOOLPOST BODY	D831 - 0063
2	BASE PLATE	D565 - 0937
3	GIB STRIP	D345 - 0087
4	TEE BOLT	D048 - 0159
6	SQUARE HEAD SET SCREW M12x40	B170 - 0004
7	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
10
7
6
5

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
3
1
20
11
9
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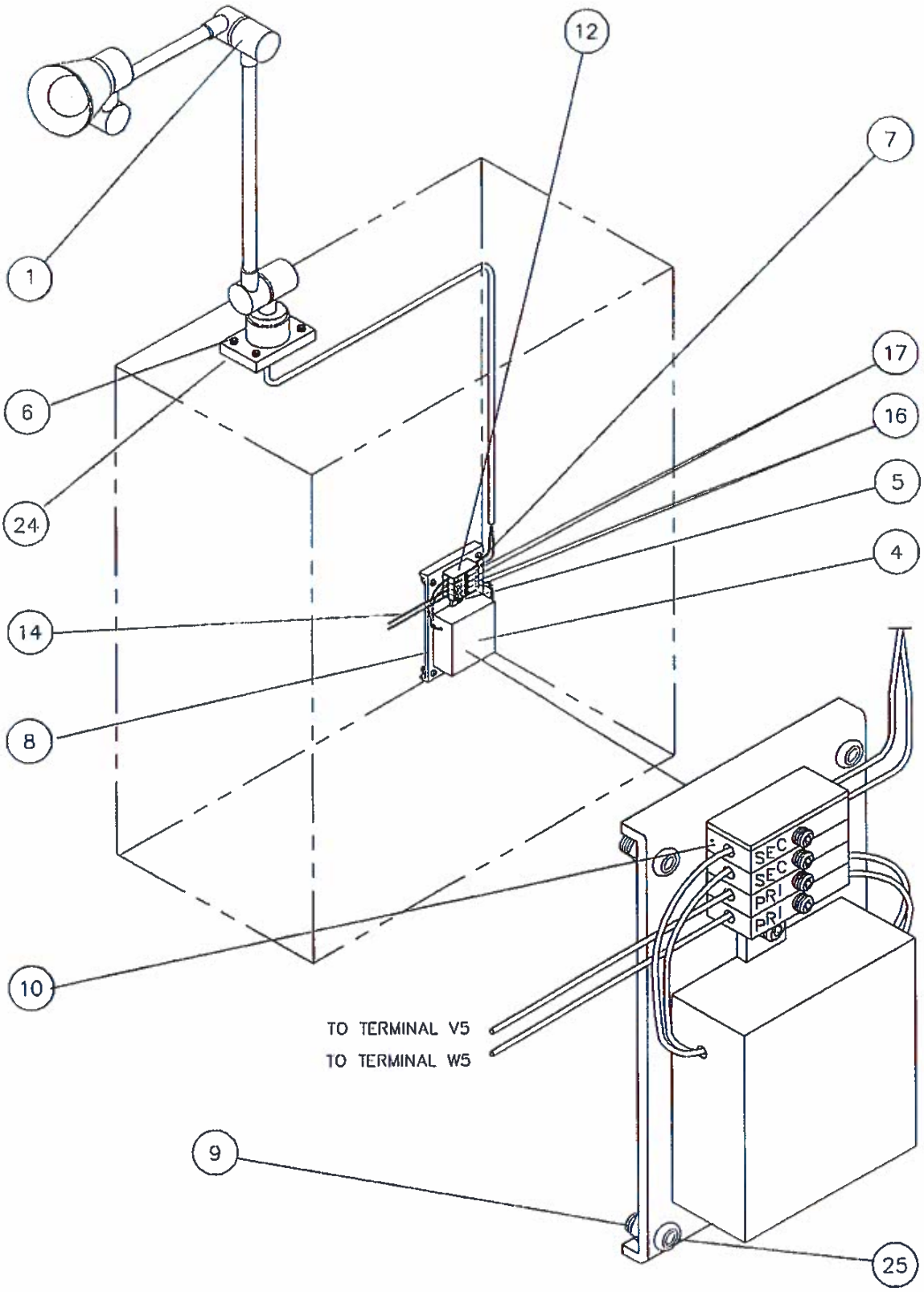
7
6
5

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

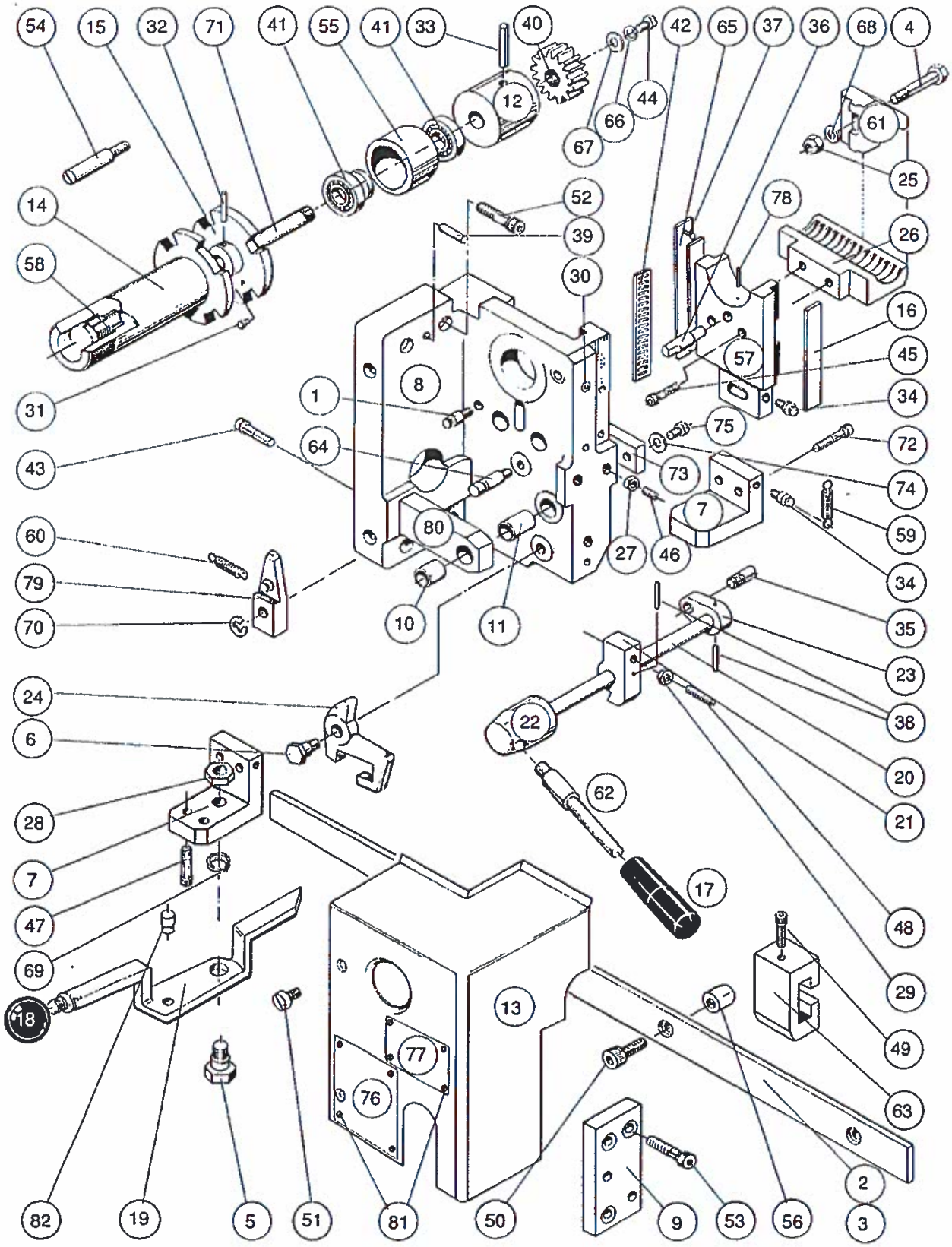


LO-VO LIGHT ASSEMBLY A170-0-0505

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

HIGH SPEED THREADING UNIT (INCH)

Ref. No 253



HIGH SPEED THREADING UNIT (INCH) REF. No. 253

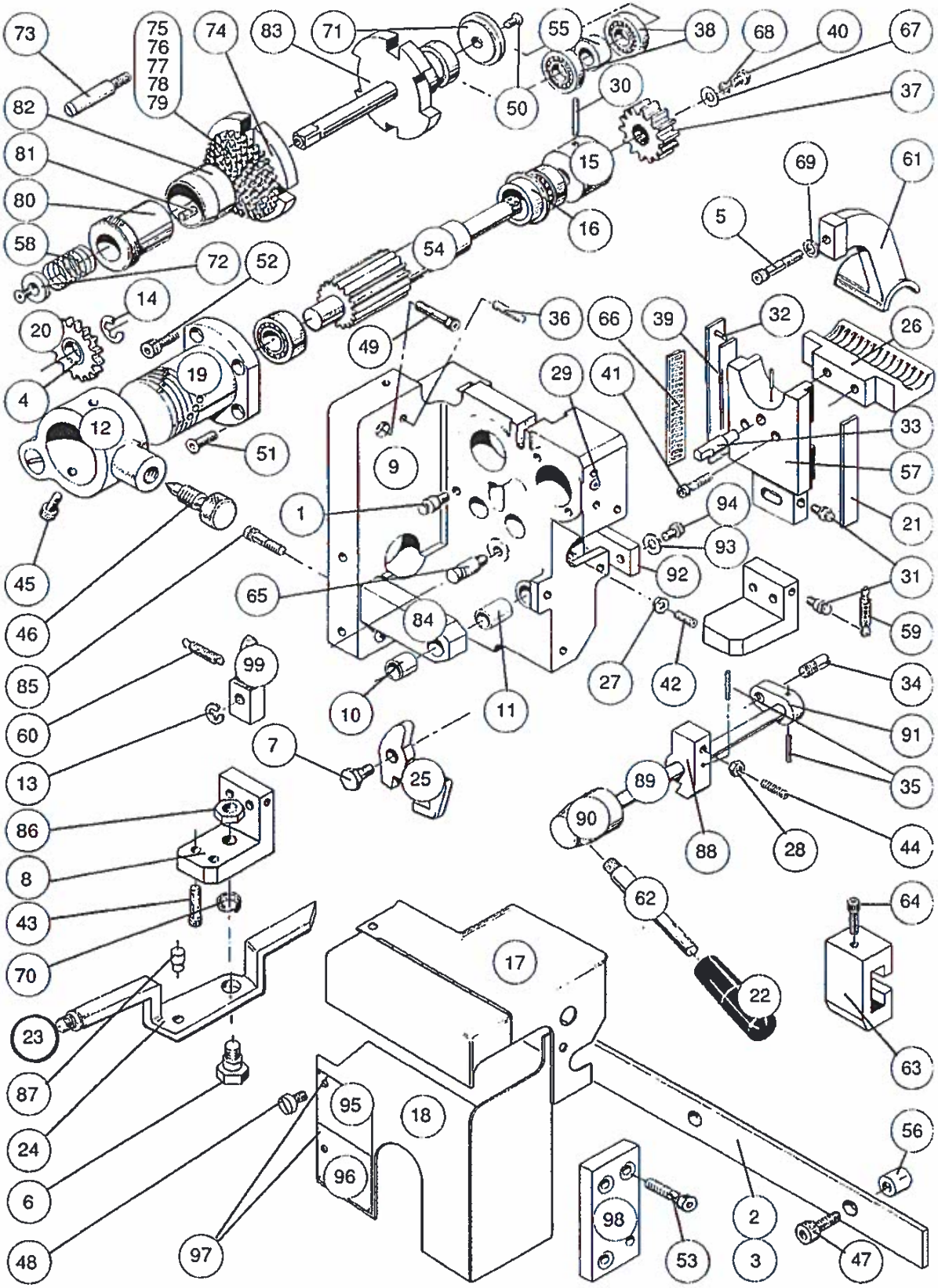
Item No.	Description	Part No.
1	SPRING ANCHOR	415001-0
2	STOP BAR 650mm	415002-0
3	STOP BAR 1250mm	415003-0
4	STEADY BOLT	415004-0
5	KNOCK OFF LEVER PIVOT	415005-0
6	DISENGAGING PIVOT BOLT	415006-0
7	ANCHOR BLOCK ASSEMBLY	415007-0
8	MOUNTING BRACKET ASSEMBLY	415008-0
9	THIRD SHAFT BRACKET	415009-0
10	MOUNTING BRACKET BUSH 1/2" IDx5/8"ODx5/8"	415010-0
11	MOUNTING BRACKET BUSH 1/2" IDx5/8"ODx7/8"	415011-0
12	PINION SPACER	415012-0
13	COVER	415013-0
14	SELECTOR DIAL	415014-0
15	ENGAGING DIAL	415015-0
16	GIB	415016-0
17	HANDLE KNOB	415017-0
18	KNOCK OFF LEVER KNOB	415018-0
19	KNOCK OFF LEVER	415019-0
20	HANDLE SHAFT	415020-0
21	LOCKING LEVER CAM	415021-0
22	HANDLE BOSS	415022-0
23	ENGAGING LEVER	415023-0
24	DISENGAGING LEVER	415024-0
25	STEADY ADJUSTING NUT M6	415025-0
26	HALF NUT	415026-0
27	ADJUSTING SCREW NUT2BA	415027-0
28	LEVER BOLT NUT 3/8" BSF	415028-0
29	LEVER ASSEMBLY NUT 2BA	415029-0
30	OILER 6mm	415030-0
31	DIAL PEG	415031-0
32	DIAL PIN 3/16"x11/2"	415032-0
33	DRIVING COLLAR PIN 7/16"x11/2"	415033-0
34	SPRING ANCHOR	415034-0
35	ENGAGING PIN	415035-0
36	SELECTOR PIN	415036-0
37	ROLLER TRACK PIN 3/16"x3/8"	415037-0
38	LEVER ASSEMBLY PIN	415038-0
39	LOCATING DOWEL PIN 6x30	415039-0
40	PINION	415040-0
41	BEARING 1/2"x11/8"x1/4'	415041-0
42	FLAT CAGE ROLLER INA F2010	415042-0
43	SCREW	415043-0
44	PINION RETAINING SCREW M5x16	415044-0
45	HALF NUT SCREWS M8x20	415045-0
46	GIB ADJUSTING SCREW 2BAx7/8"	415046-0
47	KNOCK OFF LEVER BRACKET SCREW M6x12	415047-0
48	LEVER ASSEMBLY ADJUSTING SCREW2BAx1"	415048-0
49	ADJUSTABLE STOP SCREW M6x12	415049-0

HIGH SPEED THREADING UNIT (INCH) REF. No. 253

Item No.	Description	Part No.
50	STOP BAR SCREW M6x35	415050-0
51	COVER SECURING SCREW	415051-0
52	BRACKET SECURING SCREW M8x30	415052-0
53	THIRD SHAFT BRACKET SCREWS M6x12	415053-0
54	STOP PIN	415054-0
55	BEARING HOUSING	415055-0
56	STOP BAR SPACER	415056-0
57	SLIDE ASSEMBLY	415057-0
58	DIAL SPRING	415058-0
59	MAIN SPRING	415059-0
60	LOCKING LEVER SPRING	415060-0
61	STEADY	415061-0
62	HANDLE	415062-0
63	ADJUSTABLE STOP	415063-0
64	LOCKING LEVER PIVOT	415064-0
65	ROLLER TRACK	415065-0
66	PINION SPRING WASHER	415066-0
67	PINION WASHER	415067-0
68	STEADY BOLT WASHER	415068-0
69	KNOCK OFF LEVER SPRING WASHER	415069-0
70	LOCKING LEVER CIRCLIP 1500 3/8"	415070-0
71	PINION SHAFT	415071-0
72	SCREW	415072-0
73	SLIDE STOP	415073-0
74	SLIDE STOP SPACER	415074-0
75	SLIDE STOP SCREW M6x16	415075-0
76	NAMEPLATE	415076-0
77	NAMEPLATE	415077-0
78	SLIDE TAPER PIN 1/8"x1"	415078-0
79	LOCKING LEVER	415079-0
80	HANDLE SHAFT BRACKET	415080-0
81	RIVETS 1/16"x1/8"	415081-0
82	KNOCK OFF LEVER EXTENSION	415082-0

HIGH SPEED THREADING UNIT (METRIC)

Ref. No 254



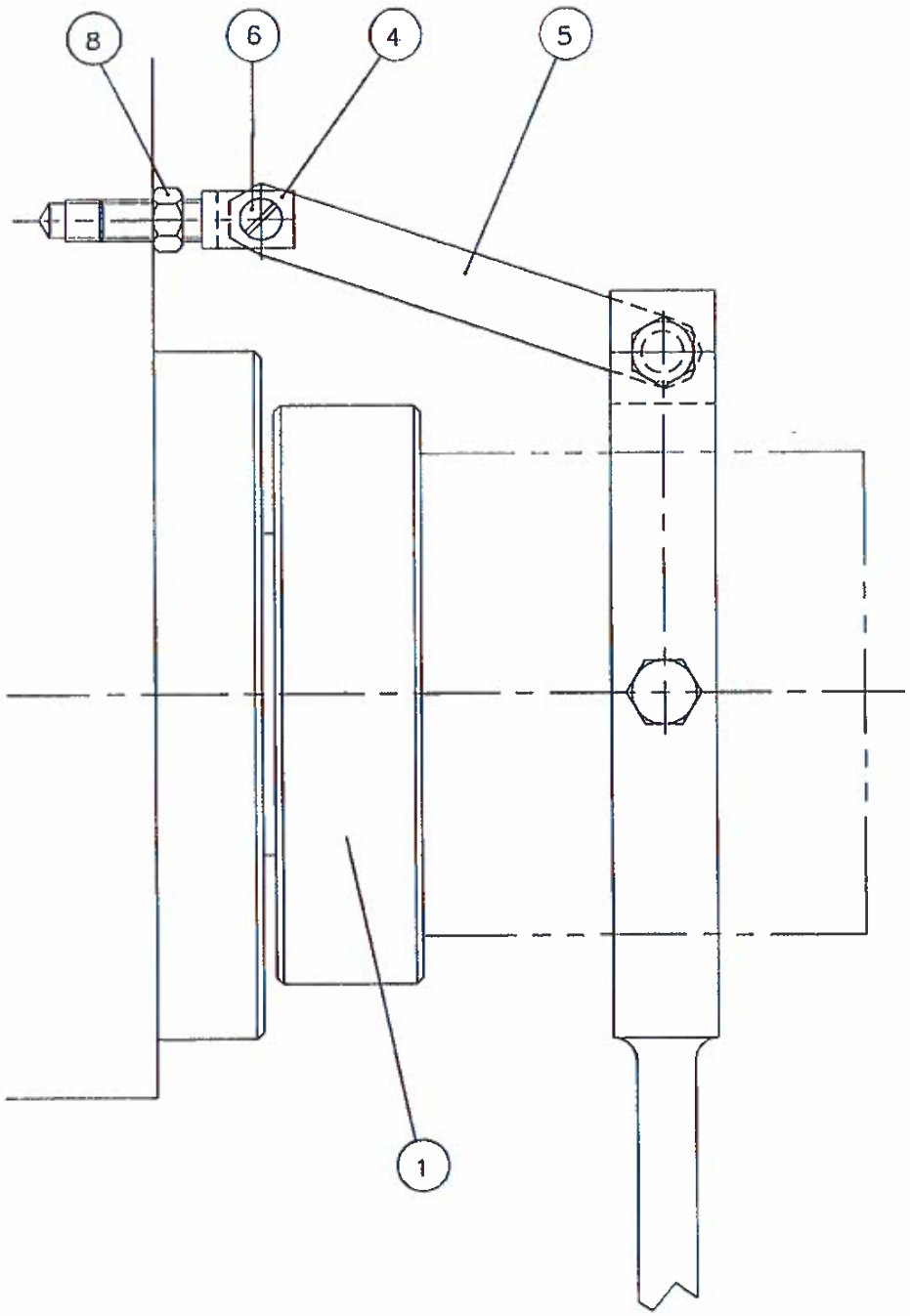
HIGH SPEED THREADING UNIT (METRIC) Ref. No. 254

Item No.	Description	Part No.
1	SPRING ANCHOR	415101-0
2	STOP BAR (650mm)	415102-0
3	STOP BAR (650mm)	415103-0
4	IDLER GEAR BEARING	415104-0
5	STEADY BOLT	415105-0
6	KNOCK OFF LEVER PIVOT	415106-0
7	DISENGAGING LEVER PIVIT	415107-0
8	KNOCK OFF LEVER BRACKET	415108-0
9	MOUNTING BRACKET ASSEMBLY	415109-0
10	BUSH 1/2" IDx5/8"ODx5/8"	415110-0
11	BUSH 1/2" IDx5/8"ODx7/8"	415111-0
12	IDLER CARRIER	415112-0
13	PIVOT STUD CIRCLIP 1500 3/8"	415113-0
14	IDLER GEAR CIRCLIP 1500 3/8"	415114-0
15	PINION SPACER	415115-0
16	GATE LOCATION WASHER	415116-0
17	TOP COVER	415117-0
18	FRONT COVER	415118-0
19	SELECTOR GATE	415119-0
20	IDLER GEAR	415120-0
21	GIB	415121-0
22	HANDLE KNOB	415122-0
23	KNOCK OFF LEVER KNOB	415123-0
24	KNOCK OFF LEVER	415124-0
25	DISENGAGEMENT LEVER	415125-0
26	HALF NUT	415126-0
27	LOCK NUT 2BA	415127-0
28	LOCK NUT 2BA	415128-0
29	OILERS 6mm Dia.	415129-0
30	PINION SPACER PIN	415130-0
31	SPRING ANCHOR	415131-0
32	ROLLER TRACK PIN SPIROL 3/32"x3/8"	415132-0
33	SELECTOR PIN	415133-0
34	ENGAGING PIN	415134-0
35	TAPER PIN 3/16"X11/2"	415135-0
36	DOWEL PIN 6mm DIA.x30	415136-0
37	PINION	415137-0
38	BEARING	415138-0
39	ROLLER TRACK	415139-0
40	PINION RETAINING SCREW M5x16	415140-0
41	HALF NUT SCREW M6x30	415141-0
42	GIB ADJUSTING SCREW 2BAx9/16"	415142-0
43	KNOCK OFF LEVER BRACKET SCREW M6x12	415143-0
44	LEVER ADJUSTING SCREW 2BAx1"	415144-0
45	STOP SCREW 2BAx5/16"	415145-0
46	SELECTOR SCREW	415146-0
47	STOP BAR SCREW M6x35	415147-0
48	COVER SECURING SCREW M5x10	415148-0
49	BRACKET FIXING SCREW M8x30	415149-0
50	SPRING DIAL C/SUNK SCREW M5x12	415150-0
51	SELECTOR GATE SCREW M6x12	415151-0

HIGH SPEED THREADING UNIT (METRIC) Ref. No. 254

Item No.	Description	Part No.
52	SELECTOR GATE SCREW M6x16	415152-0
53	THIRD SHAFT BRACKET SCREW M6x12	415153-0
54	GEAR AND SHAFT	415154-0
55	BEARING SPACER	415155-0
56	STOP BAR SPACER	415156-0
57	SLIDE ASSEMBLY	415157-0
58	DIAL SPRING	415158-0
59	MAIN SPRING	415159-0
60	LOCKING LEVER SPRING	415160-0
61	STEADY	415161-0
62	HANDLE	415162-0
63	ADJUSTABLE STOP	415163-0
64	ADJUSTABLE STOP SCREW	415164-0
65	PIVOT	415165-0
66	ROLLER INA F2010	415166-0
67	PINION WASHER	415167-0
68	PINION SPRING WASHER	415168-0
69	STEADY BOLT WASHER	415169-0
70	KNOCK OFF LEVER SPRING WASHER	415170-0
71	DIAL ASSEMBLY WASHER	415171-0
72	DIAL ASSEMBLY SCREW WASHER	415172-0
73	STOP SCREW	415173-0
74	ENGAGING DIAL	415174-0
75	CONE GEAR	415175-0
76	CONE GEAR	415176-0
77	CONE GEAR	415177-0
78	CONE GEAR	415178-0
79	CONE GEAR	415179-0
80	DIAL CONTROL	415180-0
81	PIN	415181-0
82	DIAL INDICATOR	415182-0
83	SETTING DIAL SHAFT	415183-0
84	HANDLE SHAFT BRACKET	415184-0
85	HANDLE SHAFT BRACKET SCREW	415185-0
86	KNOCK OFF LEVER BRACKET NUT	415186-0
87	KNOCK OFF LEVER EXTENSION	415187-0
88	LOCKING LEVER CAM	415188-0
89	HANDLE SHAFT	415189-0
90	HANDLE BOSS	415190-0
91	ENGAGING LEVER	415191-0
92	SLIDE STOP	415192-0
93	SLIDE STOP SPACER	415193-0
94	SLIDE STOP SCREW	415194-0
95	NAMEPLATE	415195-0
96	NAMEPLATE	415196-0
97	RIVETS 1/16"x1/8"	415197-0
98	THIRD SHAFT BRACKET	415198-0
99	LOCKING LEVER	415199-0

LEVER OPERATED COLLET CHUCK LINKAGE



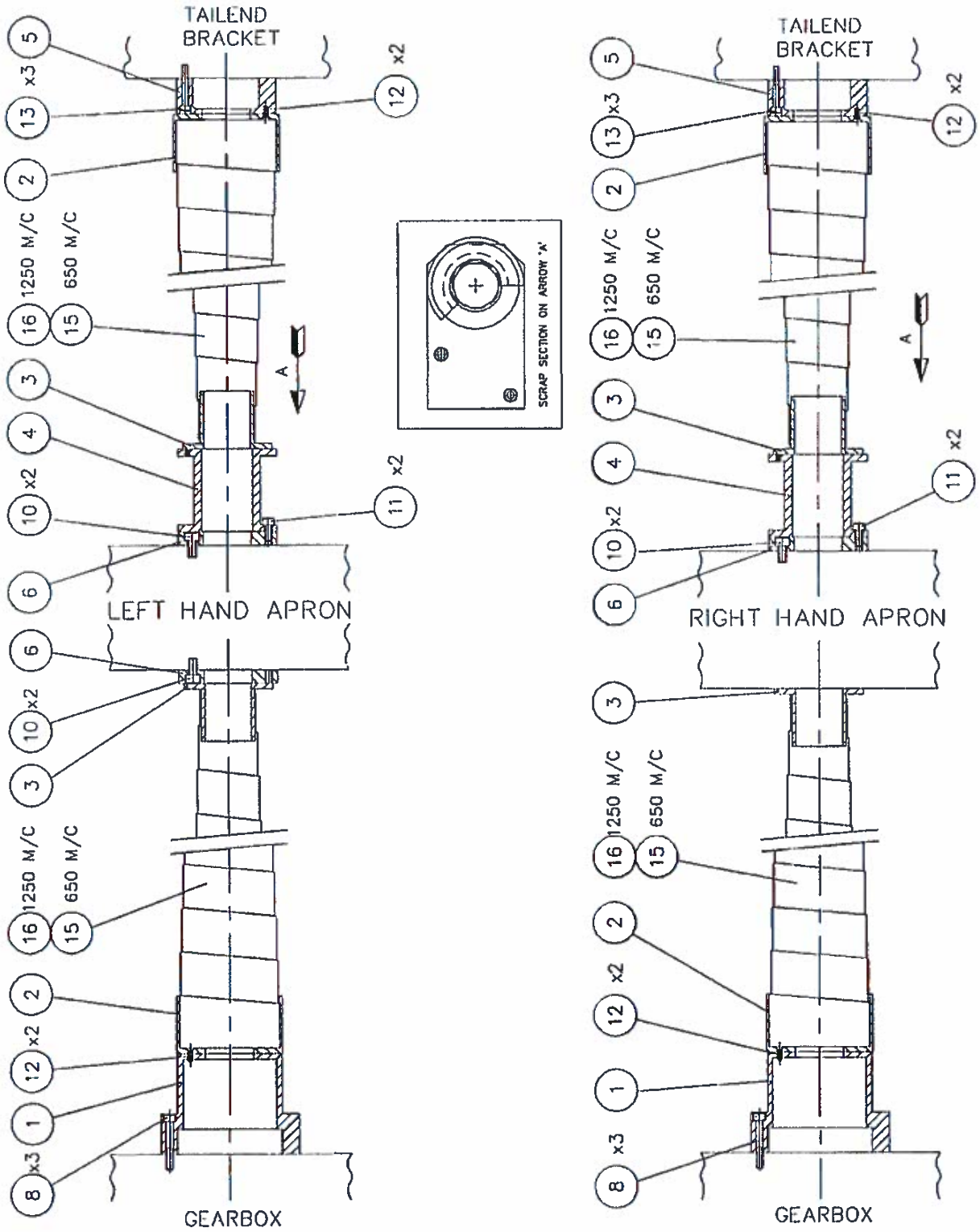
LEVER OPERATED COLLET CHUCK LINKAGE A178 - 0421

Item No.	Description	Part No.
1	11/2" COLLET CHUCK	B913 - 1176
4	CLAMP FORK	D299 - 0070
5	LINK	D454 - 0009
6	PIN LINK	D560 - 0050
8	THIN HEXAGON NUT M12	B147 - 9172

JACOBS DRILL CHUCK 0 - 1/2" A178 - 0422

Item No.	Description	Part No.
1	1/2" JACOBS DRILL CHUCK	B935 - 1905
3	No. 4 MORSE TAPER	B935 - 1906

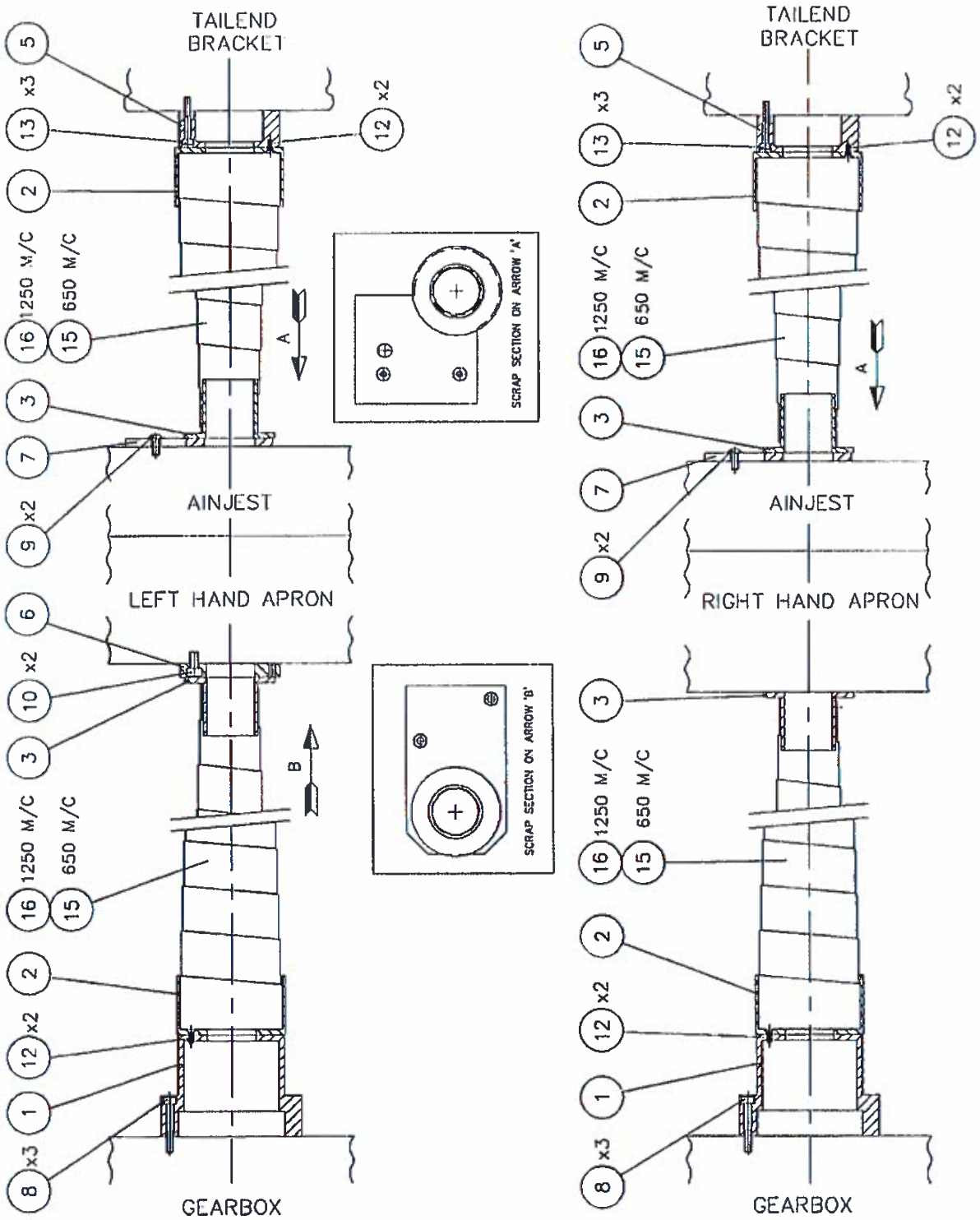
LEADSCREW GUARD ASSEMBLY (LEFT & RIGHT HAND APRONS)



LEADSCREW GUARD ASSEMBLY A137 - 0521

Item No.	Description	Part No.
1	TORQUE LIMITER COVER	D711H058.2
2	CUP	D411H531.2
3	FLANGE	D411H532.2
4	SLEEVE	D411H529.2
5	TAIL END BRACKET COVER	D411H527.2
6	MOUNTING PLATE	D411H528.1
8	HEXAGON SOCKET CAP HEAD SCREW M5x35	B163 - 0031
10	HEXAGON SOCKET CAP HEAD SCREW M6x12	B163 - 0036
11	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163 - 0026
12	HEXAGON SOCKET C/SUNK SCREW M3x8	B163 -1 001
13	HEXAGON SOCKET CAP HEAD SCREW M4x30	B163 - 0019
15	TENSA GUARD A1-0110 (650 mm M/C)	B976 - 1055
16	TENSA GUARD A1-0120 (1250 mm M/C)	B976 - 1056
19	FEED SHAFT STOP BUSH	D049 - 0346
20	CENTRALISING BUSH	SK 2544
21	CENTRALISING BUSH	SK 2545

LEADSCREW GUARD ASSEMBLY WITH AINJEST (LEFT & RIGHT HAND APRONS)



LEADSCREW GUARD ASSEMBLY (AINJEST) A137 - 0521

Item No.	Description	Part No.
1	TORQUE LIMITER COVER	D711H058.2
2	CUP	D411H531.2
3	FLANGE	D411H532.2
5	TAIL END BRACKET COVER	D411H527.2
6	MOUNTING PLATE	D411H528.1
7	MOUNTING PLATE (HIGH SPEED THREADER)	D565 - 1079
8	HEXAGON SOCKET CAP HEAD SCREW M5x35	B163 - 0031
9	HEXAGON SOCKET BUTTON HEAD SCREW M5x12	B163 - 1808
12	HEXAGON SOCKET C/SUNK SCREW M3x8	B163 -1 001
13	HEXAGON SOCKET CAP HEAD SCREW M4x30	B163 - 0019
15	TENSA GUARD A1-0110 (650 mm M/C)	B976 - 1055
16	TENSA GUARD A1-0120 (1250 mm M/C)	B976 - 1056
19	FEED SHAFT STOP BUSH	D049 - 0346
20	CENTRALISING BUSH	SK 2544
21	CENTRALISING BUSH	SK 2545

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