Harrison V460/V550

V460 18" Swing Vari-speed Lathe
V550 21" Swing Vari-speed Lathe

ORIGINAL INSTRUCTIONS
AND
SPARE PARTS MANUAL

MACHINE MANUAL PART # 1 OF 2

V460 18" Swing & **V550** 21" Swing Harrison Vari-speed Center Lathes

The Ultimate Turning Machines

The V460's and V550's feature packed design offers the advantage of infinitely variable spindle speeds whilst maintaining equal capabilities for high rates of metal removal or fine precision finishing. On production, maintenance work or in the toolroom the V460 or V550 represents an outstanding investment with operators immediately responding to its easy positive and comfortable controls.

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

		V460	V550
Centers	Height	230mm (9")	280mm (11")
	Admit Between	1500mm (60")	2000/3000mm (80/120")
Swing	Over Bed	460mm (18")	554mm (21-7/8")
	Over Cross Slide	270mm (10-5/8")	370mm (14-1/2")
	In Gap Diameter	730mm (28-3/4")	830mm (32-3/4")
	Length	216mm (8-1/2")	216mm (8-1/2")
Spindle	Bore	76mm (3")	90mm (4.1")
	Nose	D1-8 Camlock	D1-11 Camlock
	Morse Taper in Nose	5 MT	5 MT
Speeds	Number	3 infinitely variable	3 infinitely variable
	Range	20 to 2000rpm	18 to 1800rpm
Motor		11kW	11kW
Leadscrew	Diameter	38mm (1-1/2")	38mm (1-1/2")
	Thread	6mm pitch or 4 TPI	6mm pitch or 4 TPI
Threads	Metric Pitches	78 from 0.2 to 14mm	78 from 0.2 to 14mm
	Imperial Pitches	79 from 2 to 84 TPI	79 from 2 to 84 TPI
	Module Pitches	47 from 0.2 to 3.5 MOD	47 from 0.2 to 3.5 MOD
	Diametral Pitches	47 from 8 to 72 DP	47 from 8 to 72 DP
Feeds	Metric	38 from .04 to .84mm/rev	38 from .04 to .84mm/rev
	Imperial	38 from .0016 to .110in/rev	38 from .0016 to .110in/rev
Cross Slide	Width	203mm (8")	203mm (8")
	Travel	300mm (11-7/8")	300mm (11-7/8")
Top Slide	Width	133mm (5-1/4")	133mm (5-1/4")
	Travel	150mm (6")	175mm (6-7/8")
Tailstock	Quill Diameter	95mm (3-1/4")	95mm (3-1/4")
	Travel	145mm (5-11/16")	178mm (7")
	Morse Taper	6 MT	6 MT
Weight		2615kg (5753lbs)	2850/3610kg (6270/7942lbs)
Dimensions	L x W x H	3.25x1.70x2.05m (128x67x81")	3.75x1.70x2.10m (147x67x81") 4.75x1.70x2.10m (187x67x81")

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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

OPERATING SAFETY

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.

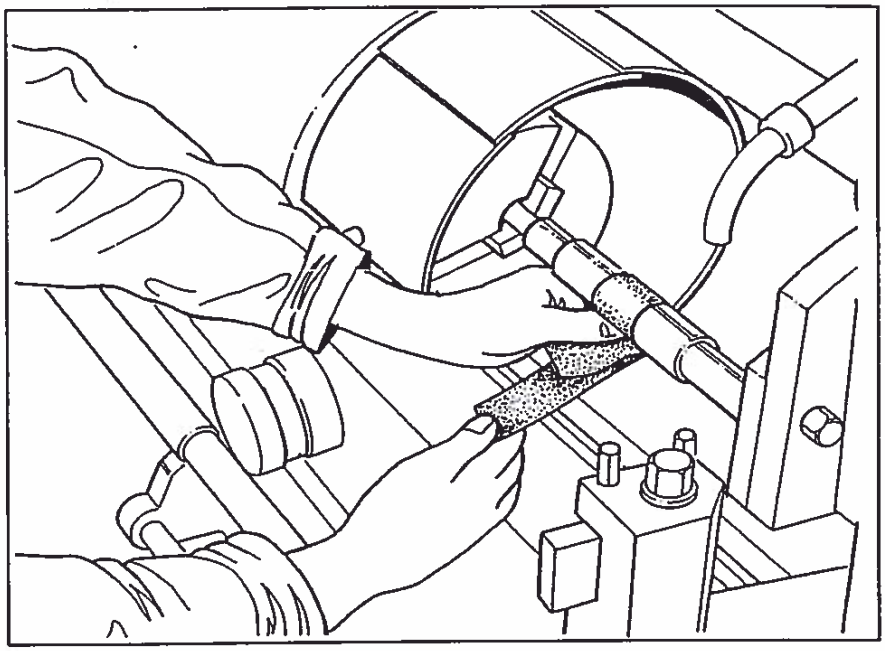
Note:
It is not recommended that chuck jaws extend beyond the outside diameter of the chuck and in these cases interference with chuck guards may occur.

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.

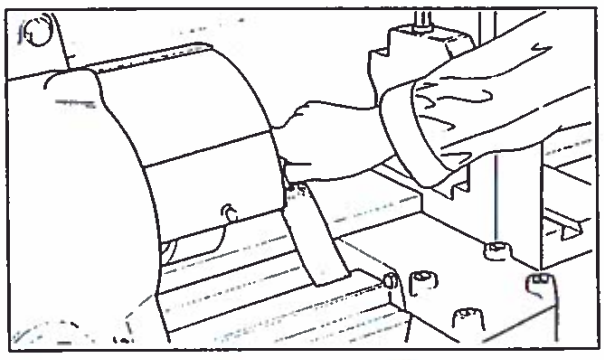
Precautions

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

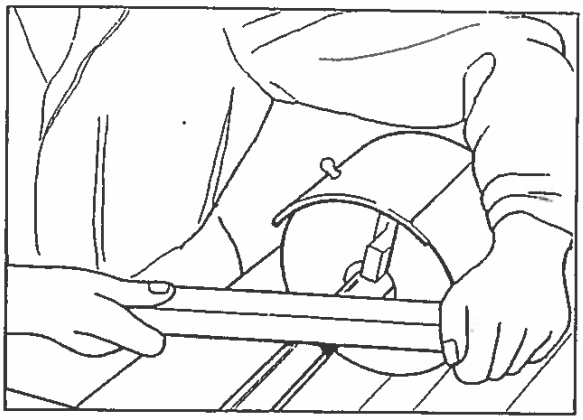
(d) hand-held, abrasive-impregnated wire brushes.

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.

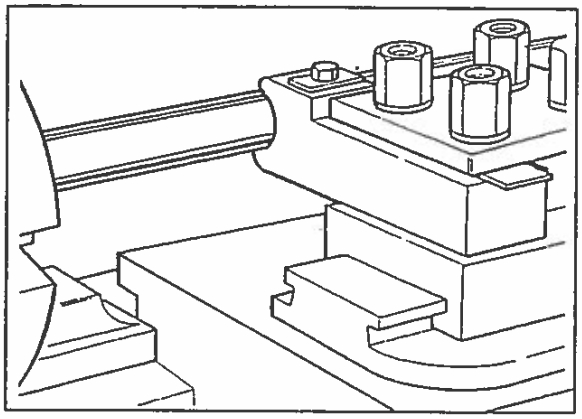
Force should be applied by pulling both ends of the cloth upwards, never allowing the cloth to go slack or to wrap around either the operator's finger or the components.

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

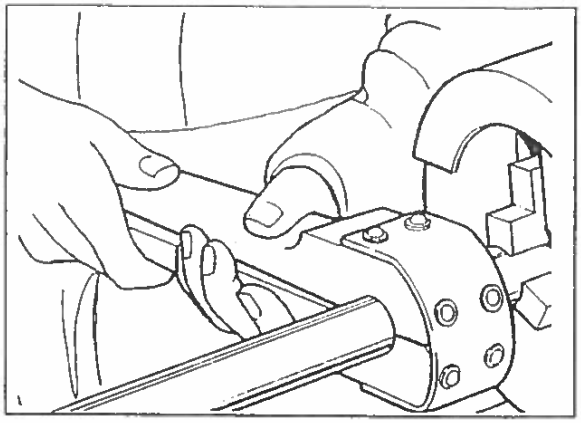
Gloves should never be worn when polishing is being carried out.



(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 SPECIFICATIONS

	MASCOT	MASTIFF
Centres		
Height	230mm (9.0")	280mm (14.5")
Distance	1000mm (40")	1000mm (40")
between	1500mm (60")	1500mm (60")
	2000mm (80")	2000mm (80")
		3000mm (120")
Floor to Centre	1125mm (44")	1175mm (46")
Swing		
Over bed	460mm (18.1")	554mm (21.8")
Over cross-slide	270mm (10.6")	370mm (14.5")
In gap	730mm (28.7")	830mm (32.7")
Width in front of faceplate	216mm (8.5")	216mm (8.5")
Spindle		
Bored to pass	76mm (3.0")	90mm (3.5")
Nose Type	D1-8" Camlock	D1-11" Camlock
Morse taper in bush	No.5 M.T.	No.5 M.T
Spindle Speeds		
Selected in three ranges of : - (rev/min)	20 - 225 55 - 670 155 - 2000	15 - 200 50 - 605 140 - 1800
Motor (main)	11kw (14.5 HP)	11kw (14.5 HP)
Bed		
Width of ways	400mm (15.7")	400mm (15.7")
Type of ways	Vee and flat	Vee and flat
Top Slide		
Width	100mm (4")	100mm (4")
Travel	190mm (7.5")	190mm (7.5")
Tool section	32 x 32mm (1.25" x 1.25")	
Cross-Slide		
Width and length	203mm (8") and	850mm (33.5")
Travel	300mm (11.8")	300mm (11.8")

ALL MACHINES	
Tailstock	
Barrel diameter (nominal)	95mm (3.7")
Travel	145mm (5.7")
Morse taper	No.6 M.T.
Set over	±10mm (0.4")
Leadscrew	
Diameter	38mm (1.5")
Thread	6mm pitch or 4 TP I
Threads	
Metric pitches	0.2 - 14mm
Imperial T.P.I.	2 - 84 tpi
Module pitches	0.2 - 3.5 module
Diametral pitches	8 - 72 dp
Feeds	
Metric (R10) Series)	0.04 - 2.8mm/rev
Imperial (R10 Series)	0.0016 - 0.110 in/rev
Cross feeds =	Approximatly half longitudinal values
Overall Length	
1.0m (40") machine	2545mm (100")
1.5m (60") machine	3045mm (120")
2.0m (80") machine	3545mm (140")
3.0m (120")machine	4545mm (180")
Overall Width	1100mm (43.3")
Overall Height	1300mm (51.2")

Weight	Mascot	Mastiff
1.0m (40") m/c	2425 kg (5346lb)	2490 kg (5490lb)
1.5m (60") m/c	2615 kg (5765lb)	2670 kg (5886lb)
2.0m (80") m/c	2800 kg (6170lb)	2850 kg (6283lb)
3.0m (120") m/c	Not Available	3610 kg (7960lb)

For other dimensions see foundation plan.

NOISE LEVEL

The maximum noise level at the operators position (Fig.0) is within **82 dB(A)** and the maximum mean noise level is within **82 dB(A)**.

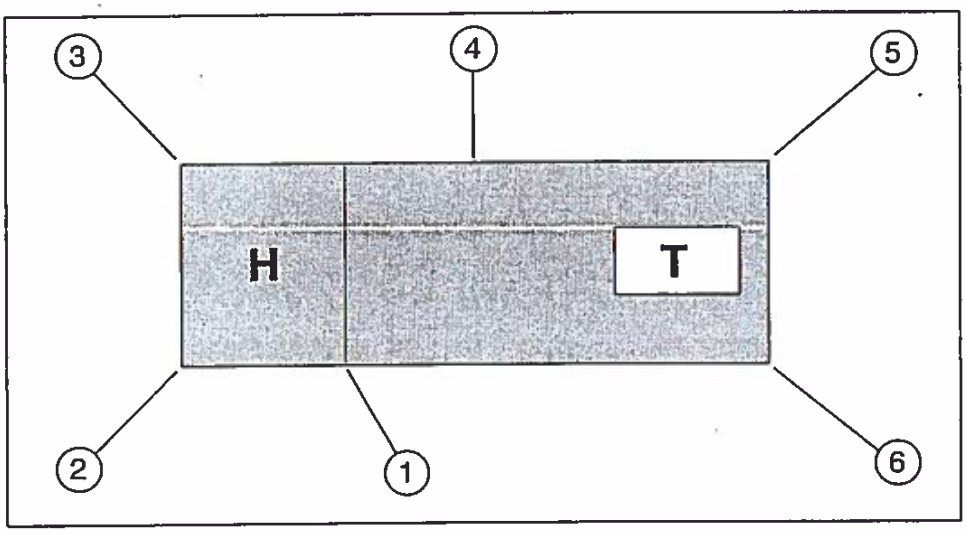


Fig.0

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**

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, do not 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.

Slings 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 recommend 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.

MACHINE WEIGHT

The approximate weight of the machine is :-

1.0 m (40") between centres 2500 kg (5510 lb)	2.0 m (80") between centres 2900 kg (6400 lb)
1.5 m (60") between centres 2700 kg (5950 lb)	3.0 m (120") between centres 3800 kg (8380 lb)

Always ensure that the capacity of lifting equipment is adequate before attempting lift.

INSTALLATION

PREPARATION AND SAFETY CHECKS

1. Remove all items of loose equipment including swarf tray.
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 supplied.
6. **DO NOT SLING AROUND BED. Leadscrew and splineshaft may be bent or damaged.**

LIFTING.

A) 1.0m (40") between centres machine.

1. Locate lifter assembly (Fig. 1) under the lip beneath the gap-piece location face as near to the front of the machine as possible.

2. Carefully lift the lathe clear of ground and if necessary reposition the saddle to achieve balance before lifting further.
3. **Note** : Lifter will not remain in position once all of the load has been removed.

B) 1.5 m (60") between centres machine

1. Remove lower bolt from the lifting plate assembly (Fig. 2) and locate the complete unit over the angled web adjacent to the gap piece. (It may be necessary to slacken the upper bolt).

2. Replace the lower bolt through the two halves of the assembly and locate it into the cutaway or between the two pegs on the underside of the web. (Fig. 3). Raise the assembly so that the bolt is bearing on the underside of the web. Tighten both upper and lower bolts.

3. Carefully lift the lathe clear of ground and if necessary reposition the saddle to achieve balance before lifting further.

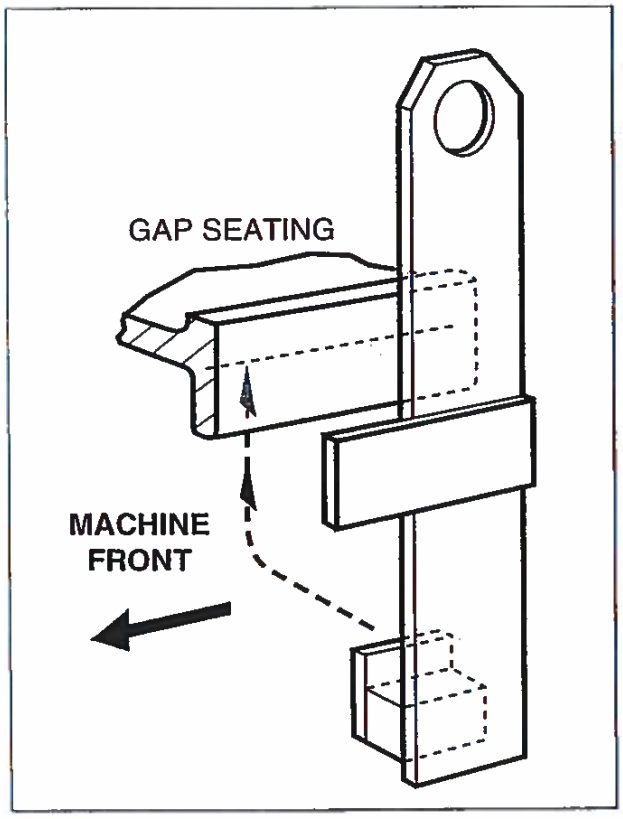


Fig. 1

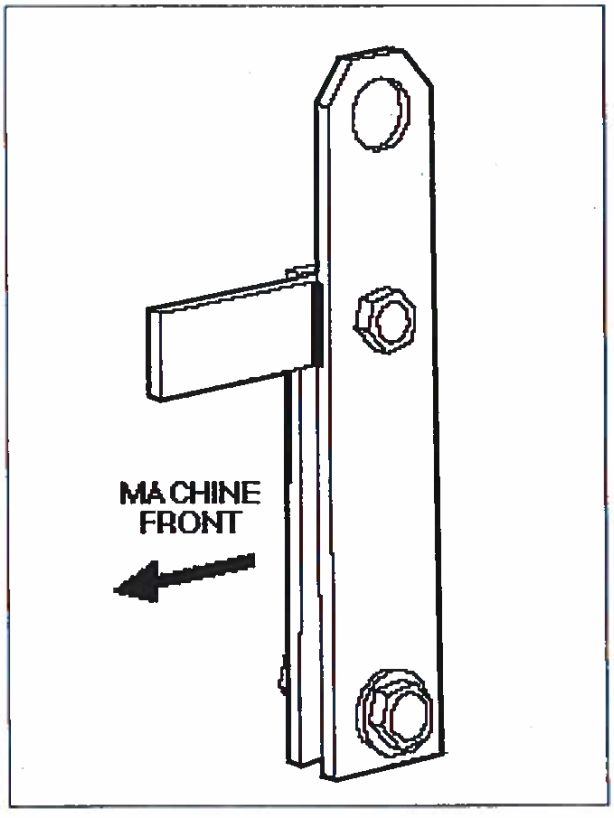


Fig. 2

C) 2.0 m (80") between centres machine

1. Remove lower bolt from the lifting plate assembly (Fig. 2) and locate the complete unit over the second angled web away from the gap piece. (It may be necessary to slacken the upper bolt).

2. Replace the lower bolt through the two halves of the assembly and locate it into the cutaway or between the two pegs on the underside of the web. (Fig. 3). Raise the assembly so that the bolt is bearing on the underside of the web. Tighten both upper and lower bolts.

3. Carefully lift the lathe clear of ground and if necessary reposition the saddle to achieve balance before lifting further.

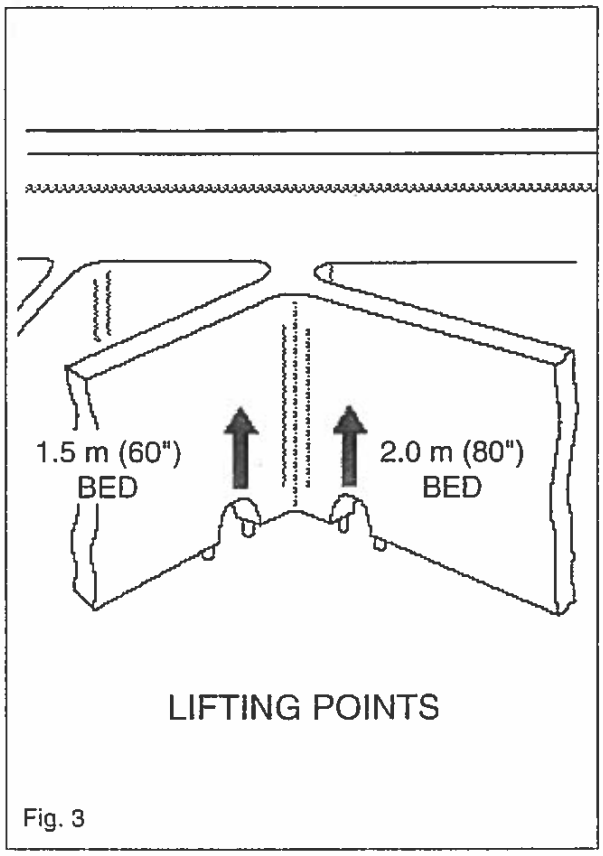
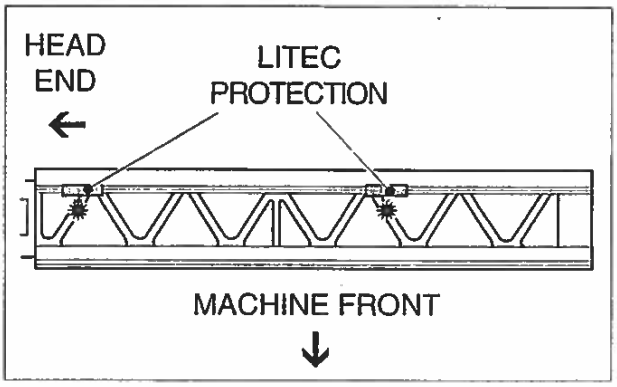


Fig. 3

D) 3.0 m (120") between centres machine

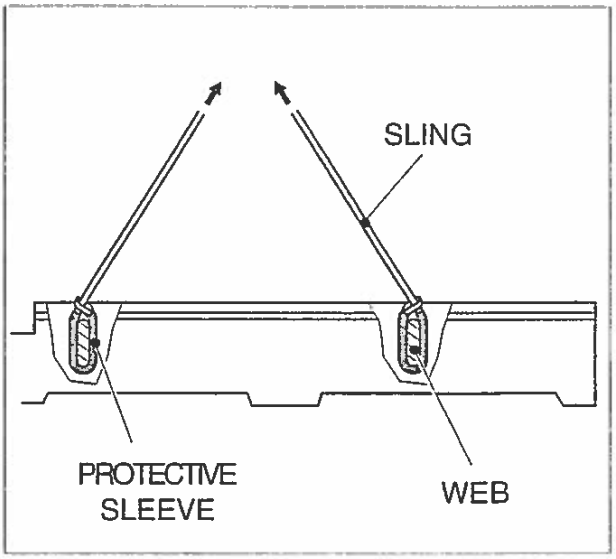
1. Wind saddle to middle of the bed.

2. Place Litec protection, (25mm x 25 mm L section x 150mm long) on the rear bedway in the positions shown in plan view of bed below.



3. Wrap the two slings (3 ton x 2 m) around the two angled webs marked ✱ above as near to the rear as possible.

4. The protection sleeves should be wrapped around the webs, as shown below.



5. Carefully lift the lathe clear of ground and if necessary reposition slings to achieve balance before lifting further.

CLEANING

Before operating the machine remove the anti-corrosion coating, from all slideways, the leadscrew, feed shaft and the end train gear, (See Fig. 4) using only white spirit or paraffin.

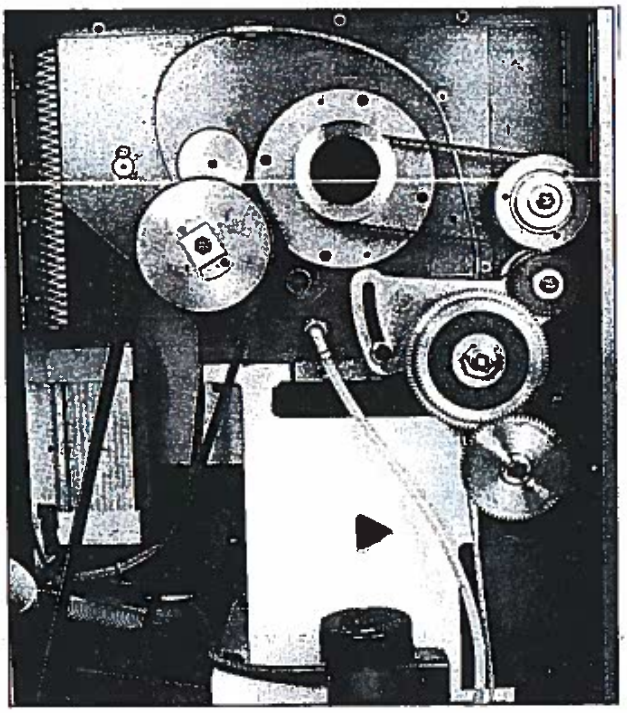


Fig. 4

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 at least 100mm (4") in depth, allowing sufficient area for easy operation and for maintenance work to be carried out.

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 ten jacking bolts MUST BE POSITIONED over ten steel plates.(Twelve in the case of the Mastiff 3.0 metre between centres machine).

The dimensions of the plates should be at least 15mm (5/8") in depth and of approximately 60mm (2 1/2") diameter.

FREE STANDING

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

FIXED INSTALLATION

Position the lathe over ten 20mm (3/4") diameter bolts set into the foundation corresponding to the dimensions shown on the foundation plan Figs. 6 and 7.

Adjust each of the jacking bolts to take an equal share of the load, level the machine as shown below and then tighten onto the holding down bolts. Re-check the bed level.

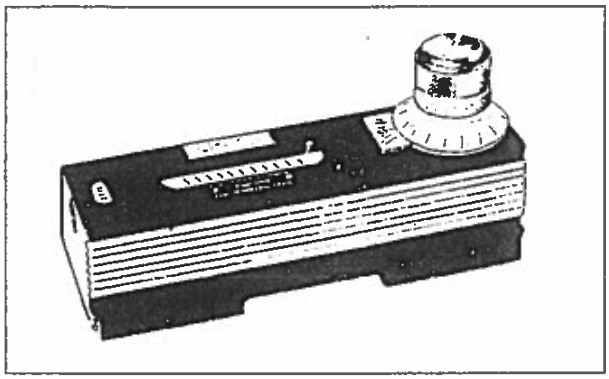
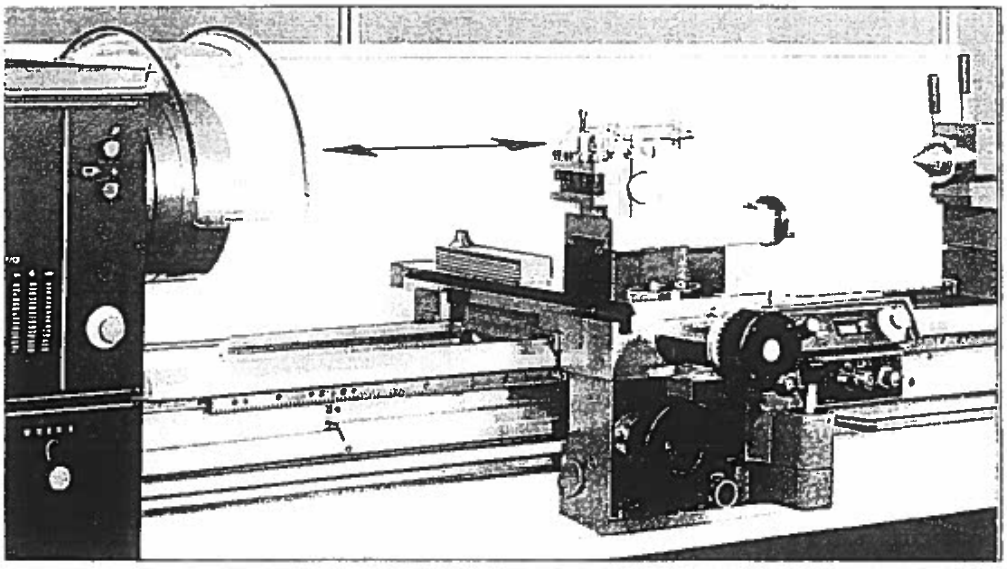


Fig. 5



LEVELLING

1.0, 1.5 AND 2.0 METRES BETWEEN CENTRES MACHINES

Adjust the two inner jacking bolts of each plinth to take all of the load.Using an engineers precision level, (typical sensitivity 0.05mm/m), mounted on the cross-slide (Fig. 5) level the machine end-to-end and front-to-back by adjusting these inner jacking bolts only.Align transversly as shown in **Test No. G1** in the accuracy chart in order to eliminate "twist". When alignement is achieved, carefully adjust the remaining jacking bolts to take some loading and then recheck the level.
Re-adjust as necessary.

3.0 METRE BETWEEN CENTRES MACHINE

Adjust the two inner jacking bolts of the outer plinths and the jacking bolts of the central plinth to take all of the loading and then proceed as before.

FOUNDATION PLAN

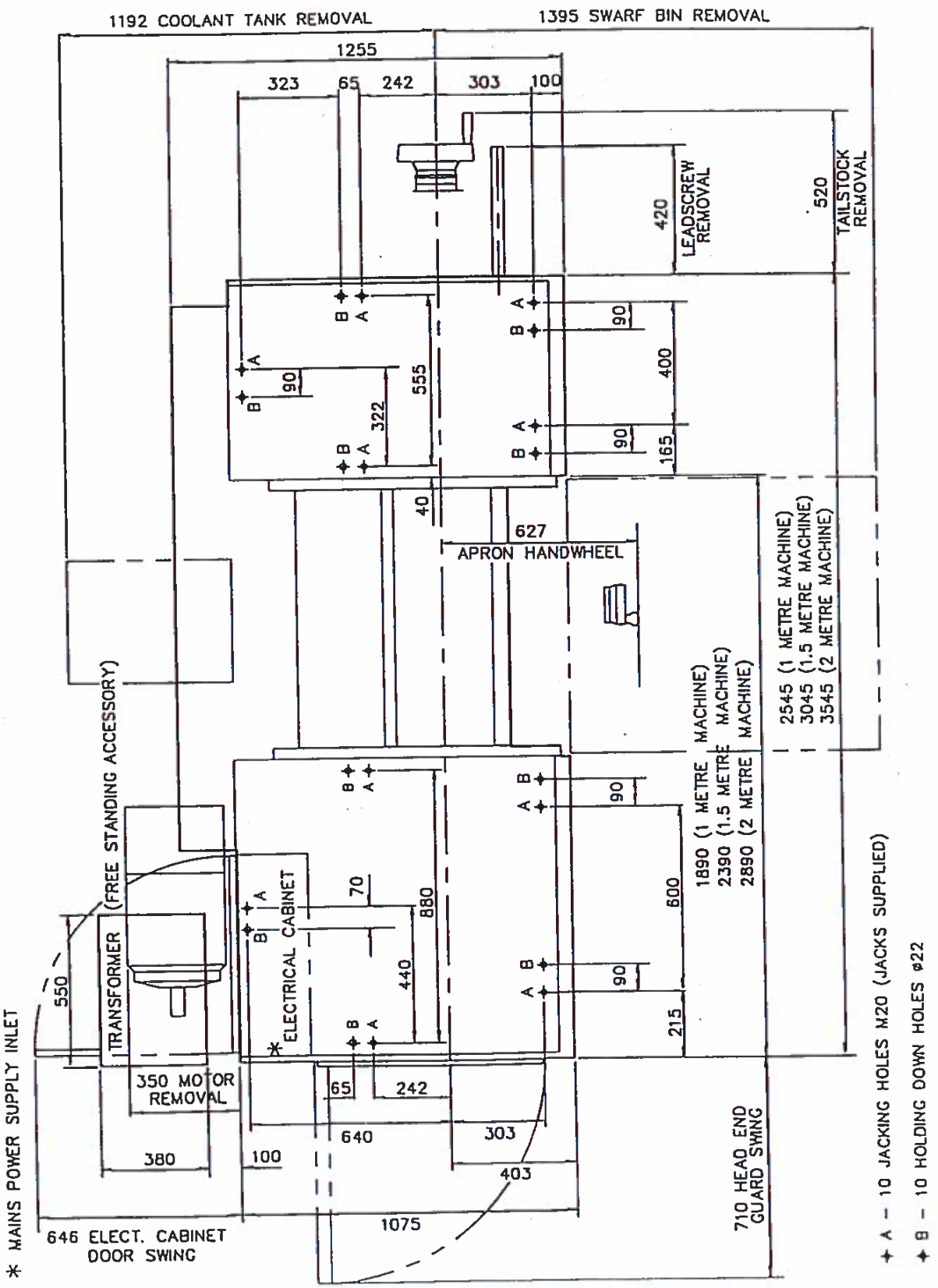


Fig. 6

FOUNDATION PLAN (MASTIFF 3.0 METRE MACHINE)

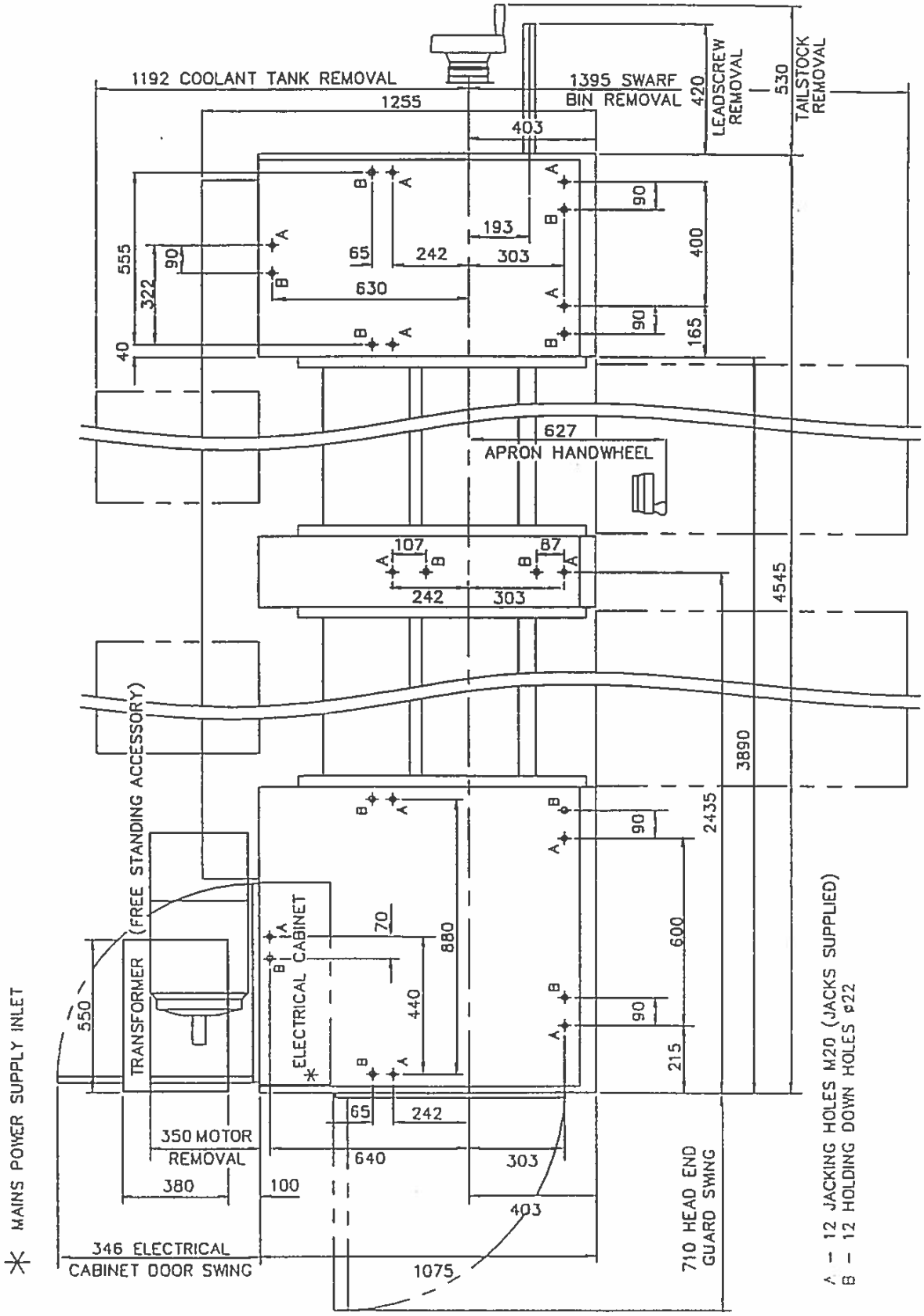


Fig. 7

INPUT VOLTAGES
Three phase 200/208/220/230 volts AC±10% and optional transformer (order code 14610A),three phase 460/575 volts AC± 10% and optional transformer (order code 14690A) or 380/415 volts AC±10%, 50/60 Hz.
Recommended Fuses:-

200 - 230 volts supply	**50 amps**
380 - 415 volts supply	**35 amps**
460 - 575 volts supply	**25 amps**

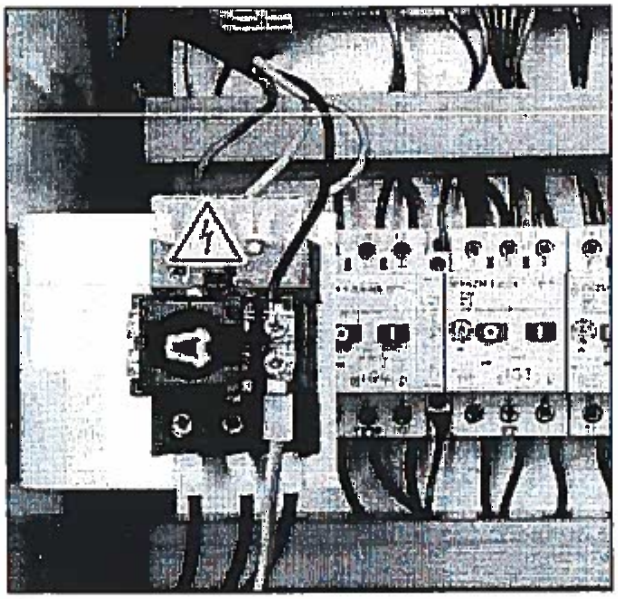


Fig. 8

Power should be supplied from a separate fused isolator, the line entering the electrical cabinet through a cable entry connecting to the input terminals of the machine isolator (Fig. 8), or the free standing transformer in the case of 200 to 220 volt and 460 to 575 volt supplies.
An earth lead must be used.
To comply with 'EMC' requirements see page No.11, showing routing for incoming cable.
It is not necessary to change phases to alter the direction of the main motor as the spindle will always turn in the selected direction of rotation.
However the headstock lubrication pump MUST run in the correct direction. MARKED ⇐ ON MOTOR.
This may be checked by observing the direction of rotation of the pump (clockwise when viewed from above) on rundown, after the electrically interlocked endguard has been opened.
If this is not the case the input phases should be changed. Ensure that oil then flows in the oilsight located close to the main spindle.
FAILURE to do this could result in **DAMAGE** to the 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, DRO, Lo-Vo light and Hydraulic Copy Unit.
2) **Release Emergency Stop.**
Drive disabled warning light (red) illuminates.
Headstock lubrication pump runs.

LUBRICATION CHECKS
Ensure that both the headstock lubrication system and gearbox are filled with Shell Tellus T32 (ISO HV32) oil, to correct level and that 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 the appropriate oil nipples.
Before each working shift, operate the manual lubrication pump in the apron to ensure adequate lubrication of carriage slideways.
Refer to Lubrication Chart in Service and Maintenance Section for further information.

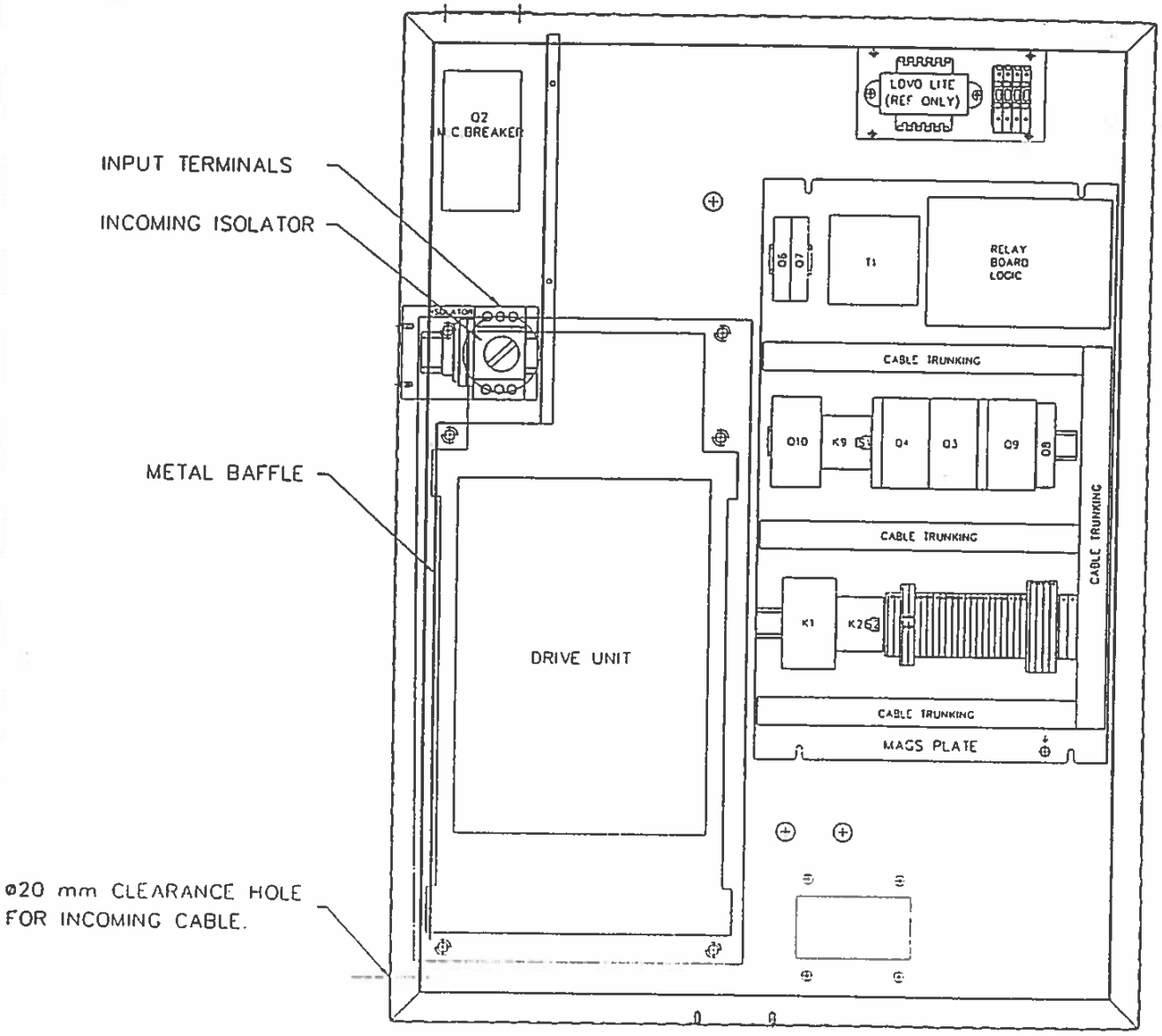
OIL CAPACITIES

Headstock	6.2 litres (11 pints)
Gearbox	2.8 litres (5 pints)
Apron	1.6 litres (2.8 pints)

HEADSTOCK SPINDLE BEARINGS
All headstock spindles have been submitted to a running in procedure during assembly. It is however recommended that further running in is performed of 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.

ELECTRICAL CABINET

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



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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 six 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.

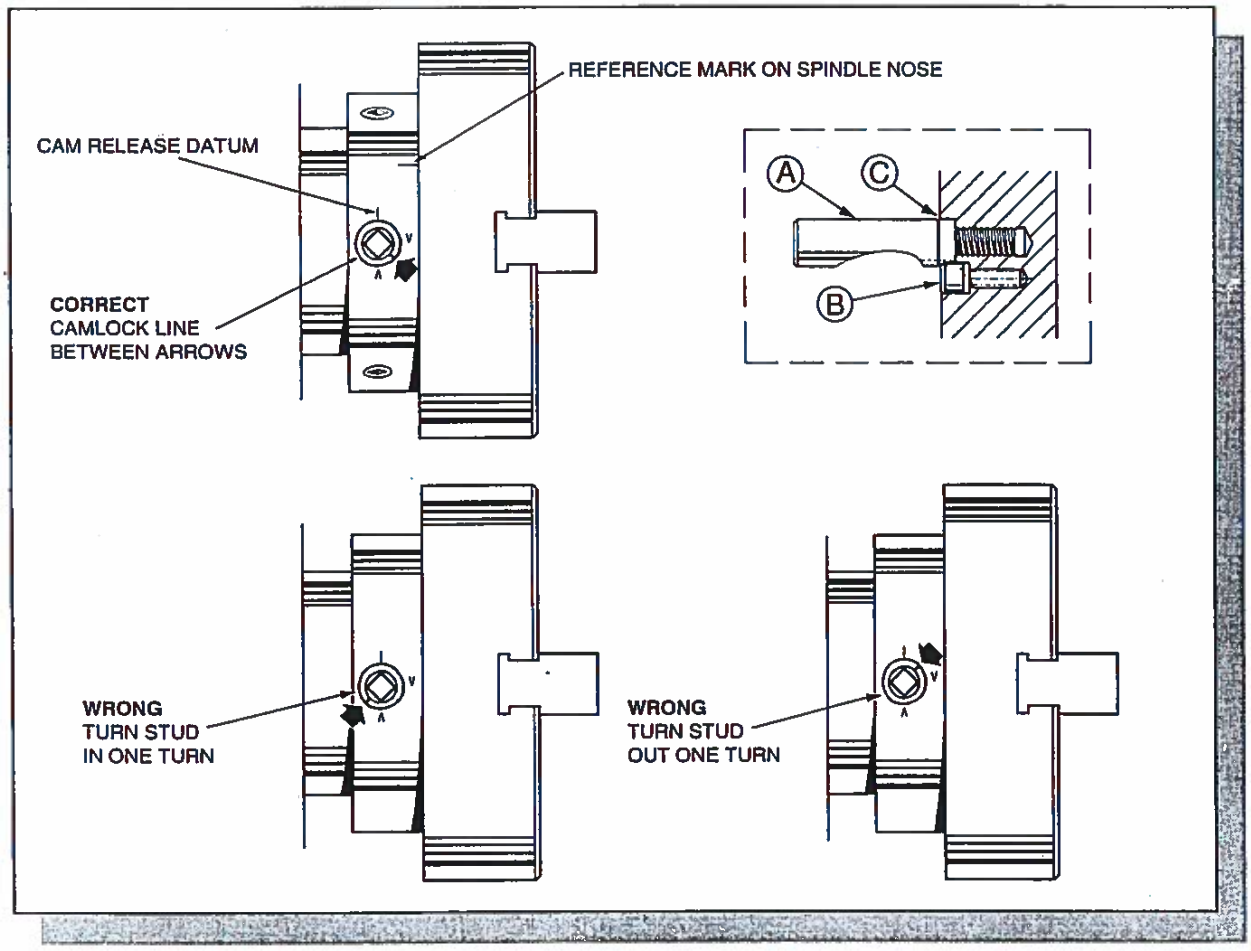
Once a chuck has been correctly fitted it may be stamped to align with the spindle reference mark for subsequent re-mounting in the same position.

WARNING

Only high speed chucks to be used with this machine.

Take careful note of **speed limitations** when using face-plates.

The small and large diameter face plates (available as accessories) **MUST NOT** be used in the high spindle speed range.



OPERATION

Before attempting to start the machine read carefully the lathe operating instructions on pages 13 to 23 of this manual.

LATHE SAFETY

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

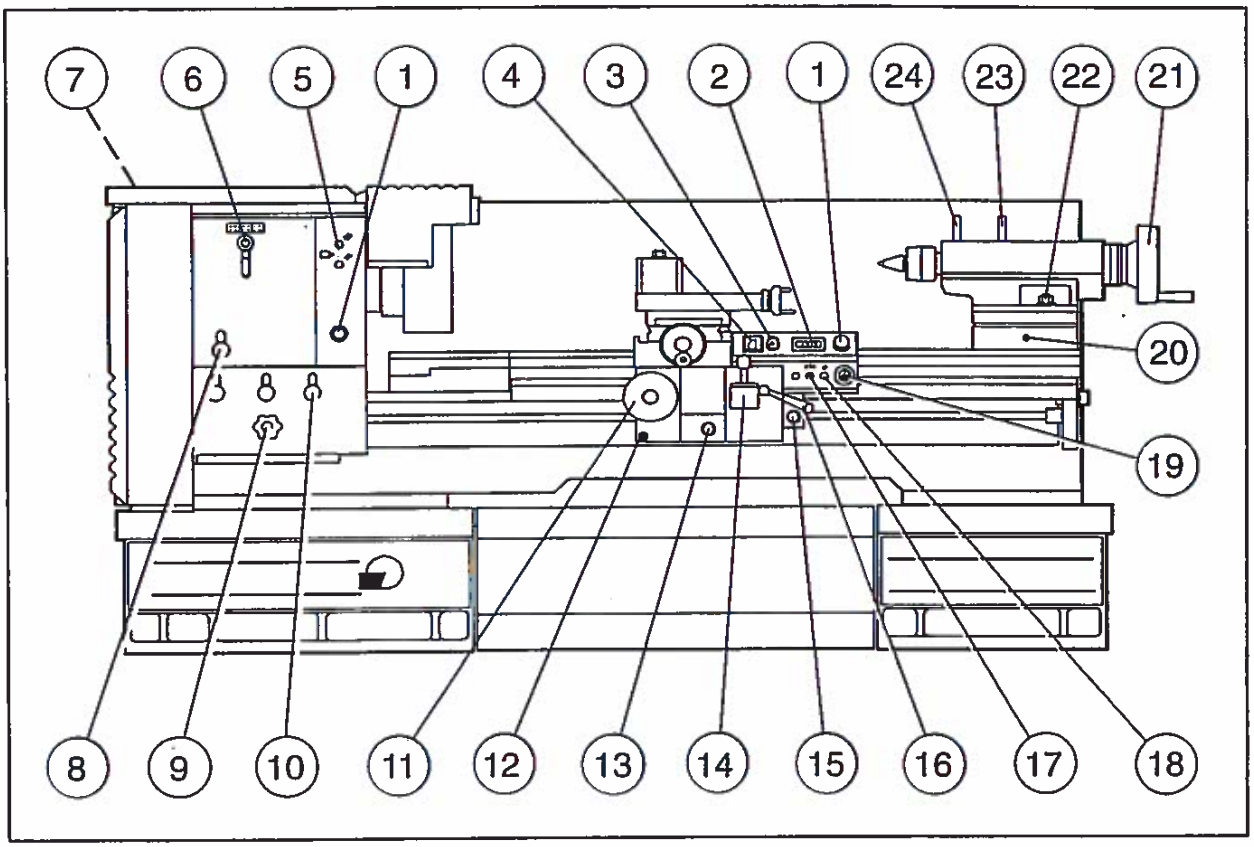
1. Ensure you know how to stop the machine before starting it.

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 Buttons
2. Spindle Speed Display
3. Spindle Speed Control Knob
4. Load Meter
5. Drive Disable/Enable Indicator Lights
6. Speed Range Selector
7. Main Isolator (at rear of machine)
8. Leadscrew/Feedshaft Reversing Lever
9. Feed Selector Dial
10. Feed Selector Levers
11. Saddle Traverse Handwheel
12. Manual Centralised Lubrication System
13. Apron Knock-Off Pressure Adjustment
14. Feed Engagement and Rapid Traverse Lever
15. Thread Dial Indicator
16. Leadscrew Nut Engagement Lever
17. Coolant Pump ON/OFF Switch
18. Drive Enable Button.
19. Spindle Forward/Reverse Lever
20. Tailstock Set Over Screws
21. Tailstock Handwheel
22. Tailstock Clamp Bolt
23. Tailstock Locking Handle
24. Tailstock Barrel Locking Handle

SPEED SELECTION

Spindle Drive is from the main motor using an AC inverter variable speed drive and through three manually selected sliding gear ranges. The correct speed range is first selected by means of lever A (Fig. 9) into one of three positions:-

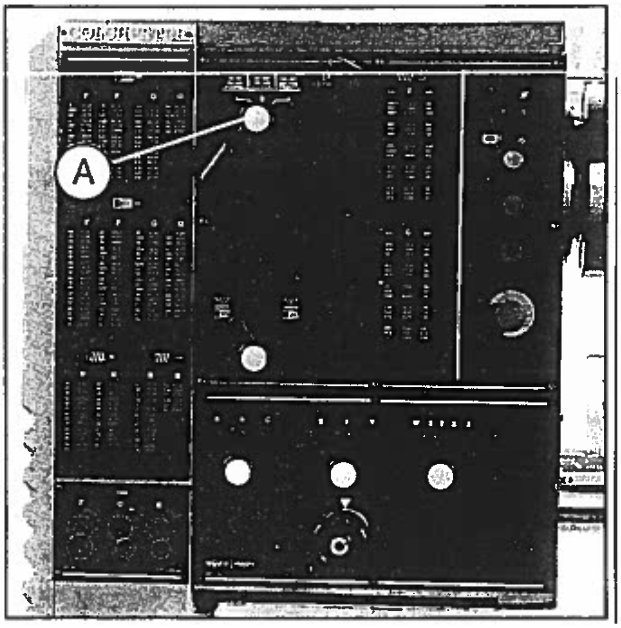


Fig. 9

On the **Mascot** lathe the ranges are:-

Low	**20 - 225** rev/min with constant power above 70 rev/min.
Medium	**55 - 670** rev/min with constant power above 215 rev/min.
High	**155 - 2000** rev/min with constant power above 640 rev/min.

On the **Mastiff** lathe the ranges are:-

Low	**15 - 200** rev/min with constant power above 65 rev/min.
Medium	**50 - 605** rev/min with constant power above 190 rev/min.
High	**140 - 1800** rev/min with constant power above 575 rev/min.

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

SPINDLE SPEED CALCULATIONS

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

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

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

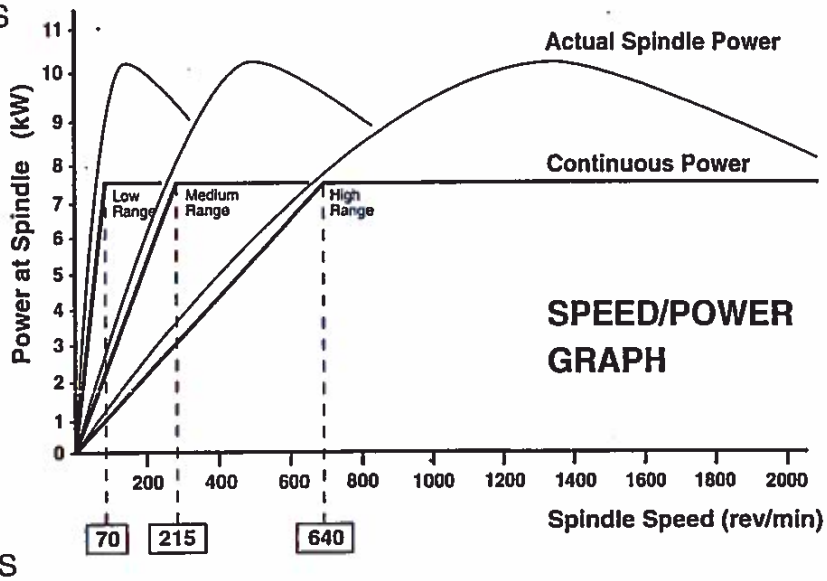
Where D = diameter in mm
S = cutting speed in Metres/min
and N = spindle rev/min

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

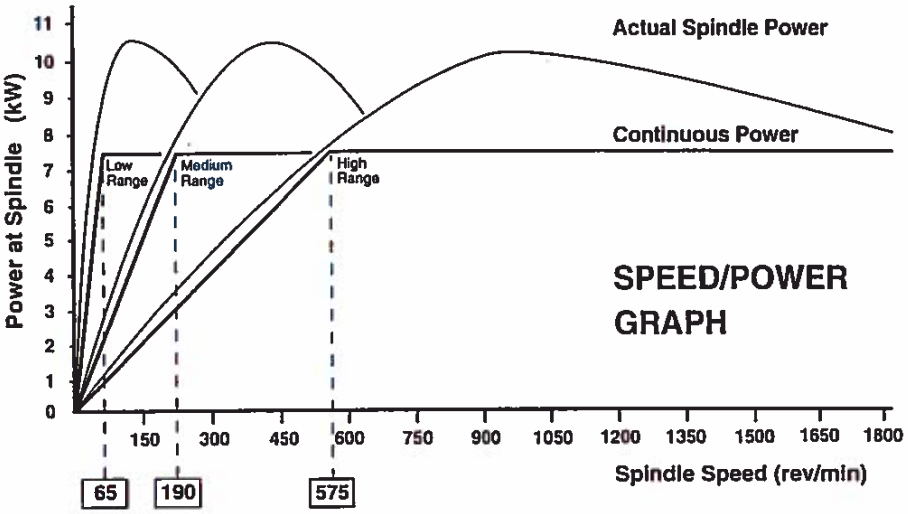
Where D = diameter in inches
S = cutting speed in feet/min
and N = spindle rev/min

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

Mascot 2000 VS



Mastiff 1800 VS



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?

Using $N = \frac{S \times 1000}{\pi \times D}$ where S = 200 Metres/Min (typically)

therefore $N = \frac{200 \times 1000}{\pi \times 150}$ = 424 rev/min

functions automatically when the emergency

This speed is obtainable in both the mid and high spindle speed ranges, but as approximatly only 5.5 kW spindle power is available in the high-range and a full 10.5 kw is available when the mid-range is selected, the mid-range should be used.

SPINDLE ROTATION (Fig.10)

To start the machine.

1) Switch on the main isolator located at the rear of the machine.

2) Release the emergency stop button on the front of the headstock and the emergency stop button (A) on the apron panel.
The drive disable warning light (red) on the headstock illuminates.

3) Press the drive enable button located on the apron (B).
The green drive enable lights on both the headstock and apron illuminate.

4) Select one of the three spindle speed range using the lever located on the headstock. (See previous section).

Ensure that the Spindle Speed Control Knob (C) is in LOW (fully anticlockwise) position.

5) Move the Spindle Control Lever (D) downwards (the latched safety interlock must be pulled out before the lever can move) and the spindle will rotate in an anti-clockwise direction.
Return the Spindle Control Lever to the neutral position and the spindle will stop.
Moving the lever upwards runs the spindle in the opposite direction.
NOTE. On Clausing Machines (US market only) the above spindle rotation directions are reversed.

The required spindle speed is then achieved by adjusting the Speed Control knob (C) clockwise to increase spindle speed and anti-clockwise to decrease spindle speed.
The actual spindle speed is shown on the display (E).
Returning the Spindle Control Lever to the neutral position will automatically apply the spindle brake.The motor braking system also

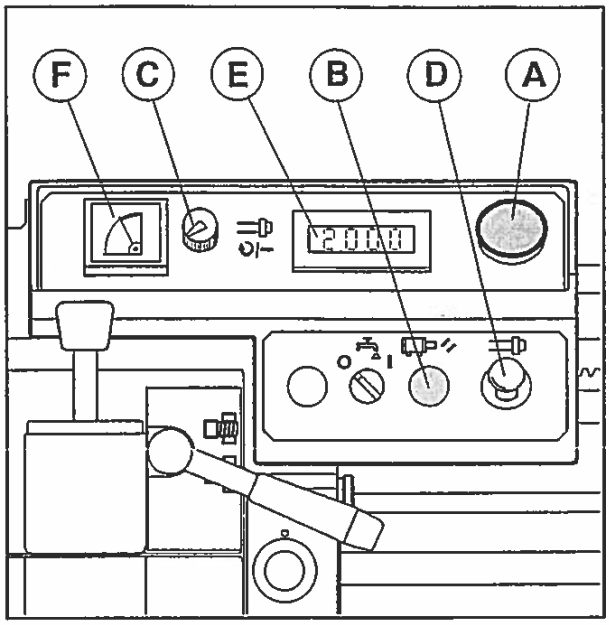


Fig. 10

functions automatically when the emergency stop button (A) is pressed.
Load Meter (F) gives an indication of the loading on the spindle motor and under normal conditions loading would be in the yellow zone. Peak loading into the red zone is acceptable for short periods only.

WARNING - LARGE COMPONENTS

It is important to select the correct speed range when turning large components - either **MEDIUM** or **LOW**.
If the range or speed (set on the control knob) is set too high the spindle drive may cut out on acceleration. Reset and use a lower range of speeds.
If the speed is increased incrementally, using the speed control knob, the drive may cut out on deceleration and coast to rest. Reset and use a lower range of speeds.

WARNING - UNBALANCED WORKPIECES

Always start unbalanced workpieces slowly and progressively increase the spindle speed to ensure that a safe working speed is not exceeded.

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. 11) together with the relevant end gear train combinations and lever settings.

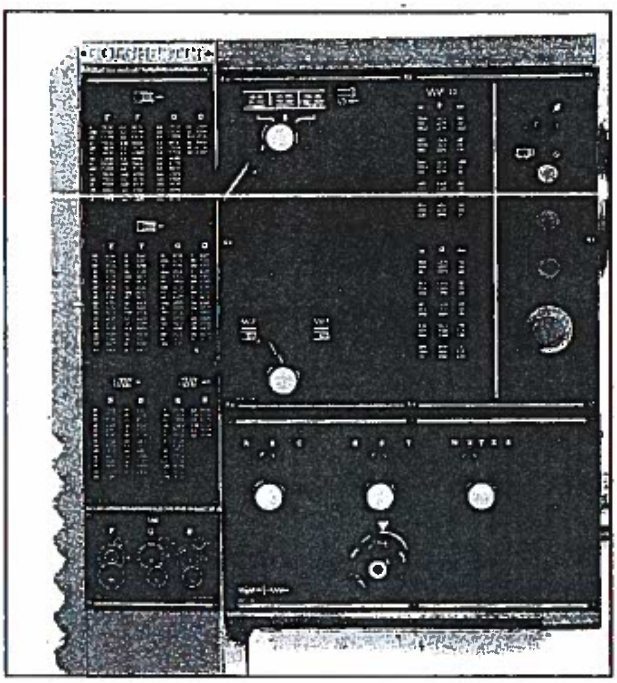


Fig.11

Module and Diametral Pitches (DP) are used when cutting worms to mesh with worm wheels of a specified module or DP in metric or inch systems respectively.

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

CAUTION.
The coarse thread range of G should **not** be selected when using the high spindle speed range.

For any other threads or pitches not shown on the data plate our Technical Department is available to specify the most convenient change gearing required.

LEADSCREW REVERSING BOX

Using lever A on the headstock (Fig.12) 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.

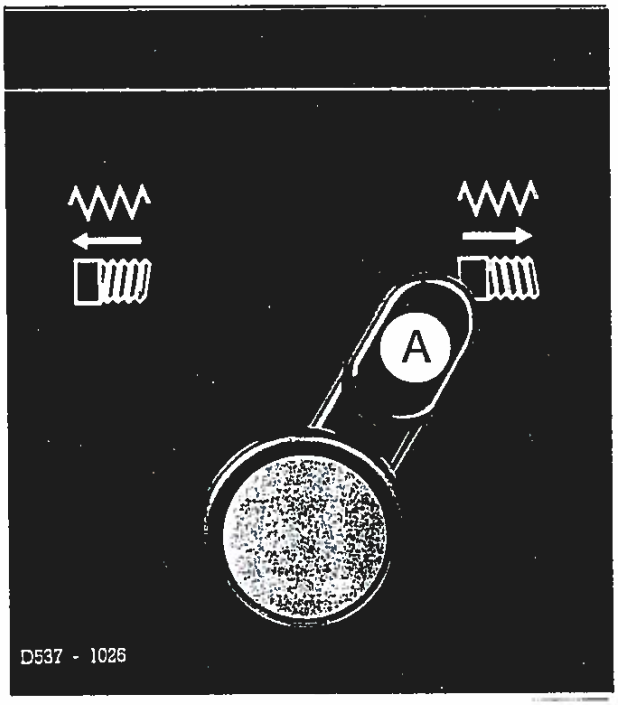


Fig.12

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

THREAD DIAL INDICATORS (FIG. 13)

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.

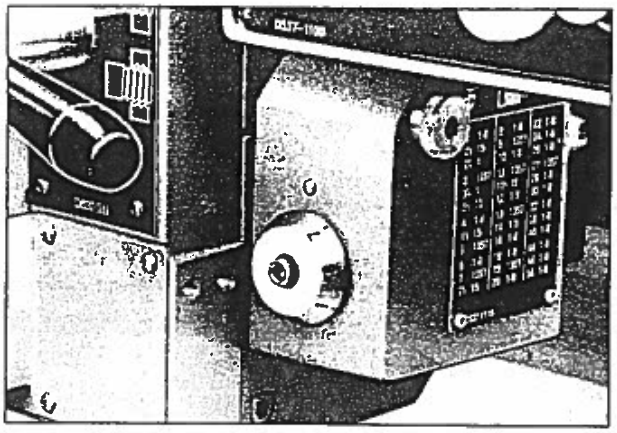


Fig.13

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. 14) 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.

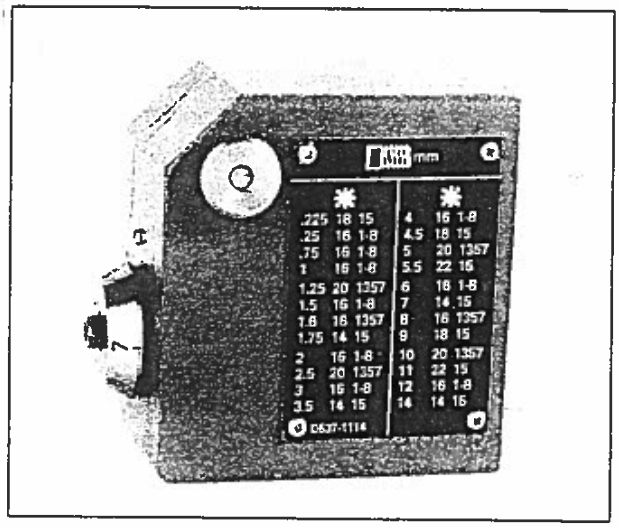


Fig. 14

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

INCH THREAD DIAL INDICATOR

This is supplied when the machine is fitted with an imperial leadscrew.

Chart (Fig. 15) shows the T.P.I. to be cut and the dial lines at which the leadscrew may be engaged.

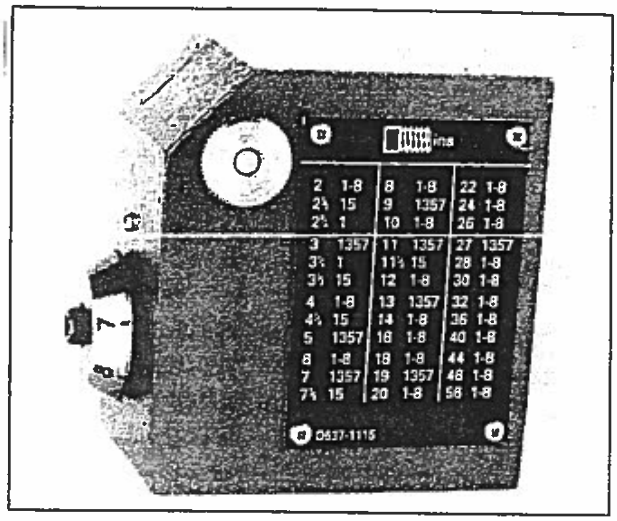


Fig. 15

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 changing directions by reversing the main spindle or by reversing the leadscrew.

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, in G range, the 44 tooth driver gear is divisible by 2 and 4, so two and four start threads may be cut.
For machines with imperial leadscrews in G range the 36 tooth driver gear is divisible by 2, 3 and 4. These number of starts may therefore be cut.

APRON AND SLIDE CONTROLS (Fig. 16)

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, by engaging lever (D).

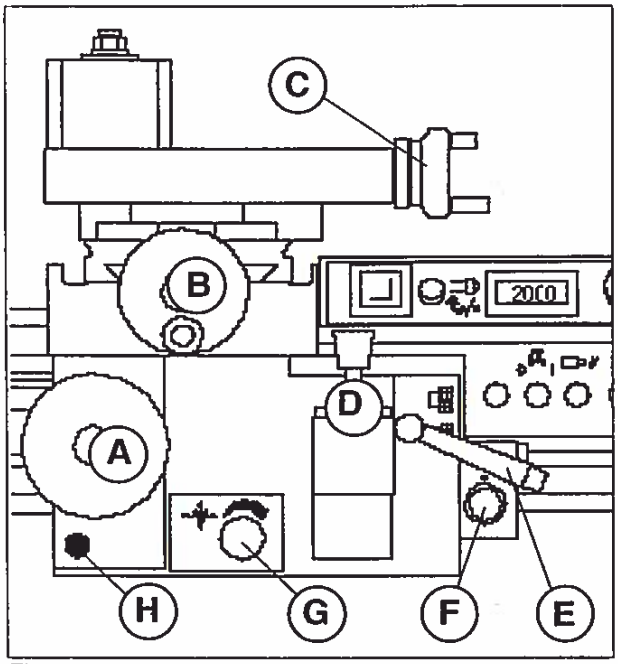


Fig. 16

With the spindle running and a feed rate selected, lever (D) is pushed forwards or pulled backwards to engage cross feeds in either respective direction and moved to the left or right to engage longitudinal feeds in both directions.

Lever (E) is used to engage the leadscrew nut for screw cutting in conjunction with the thread dial indicator (F).

RAPID POWER TRAVERSE

Rapid traverse is obtained by first engaging a feed direction.using lever (D) (The spindle need not be turning) and then pressing the recessed button located in the top of lever (D).

FEED TRIP ADJUSTMENT

An overload trip mechanism is incorporated into the apron enabling the saddle to power feed up to fixed stops and to prevent excessive loading on the cutting tool. The pressure at which the apron or the cross-slide trips out may be adjusted by means of knob (G).
The knock-off pressure may be increased by turning the knob clockwise or reduced by turning it anti-clockwise.

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

The saddle handwheel (A) is engaged by pushing in and may be disengaged by pulling out.
The cross-slide handwheel (B) is spring loaded to be permanently disengaged but may be engaged for manual operations by pulling it **out** towards the operator.

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 and small tell-tale hole on the right hand side of the saddle.
Under normal use the pump should be operated twice before commencing work.
The apron should be kept topped up with Shell Tonna TX68 or equivalent oil.

CROSS-SLIDE AND TOPSLIDE (Fig. 17)

The handwheels carry dials graduated in either inch or metric dimensions.

The cross-slide dial is graduated to indicate changes in workpiece diameter. One revolution of the handwheel is 5mm or .250" change of diameter but only 2.5mm or .125" cross-slide movement.

The topslide dial is graduated to indicate actual movement.

SADDLE LOCKING SCREW (A)
This enables the saddle to be locked to the bed for facing or parting off operations.

CROSS-SLIDE LOCKING SCREW (B)
This locks the cross-slide in position.

TOP-SLIDE LOCKING SCREW (C)
This enables the top-slide to be locked in position.

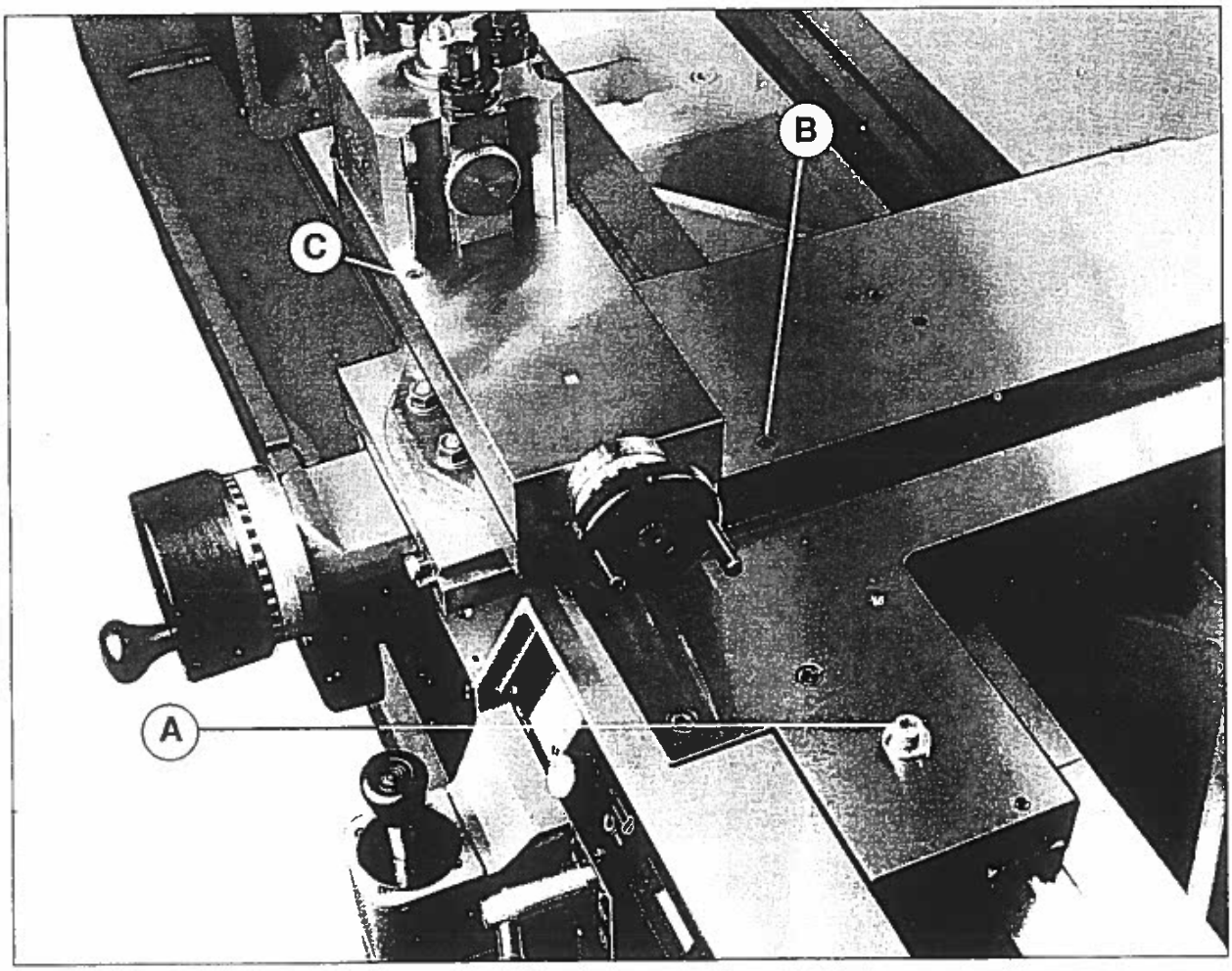


Fig. 17

TAILSTOCK (Fig. 18)

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 additional clamping is no longer required.
The tailstock barrel is locked by means of lever (C).

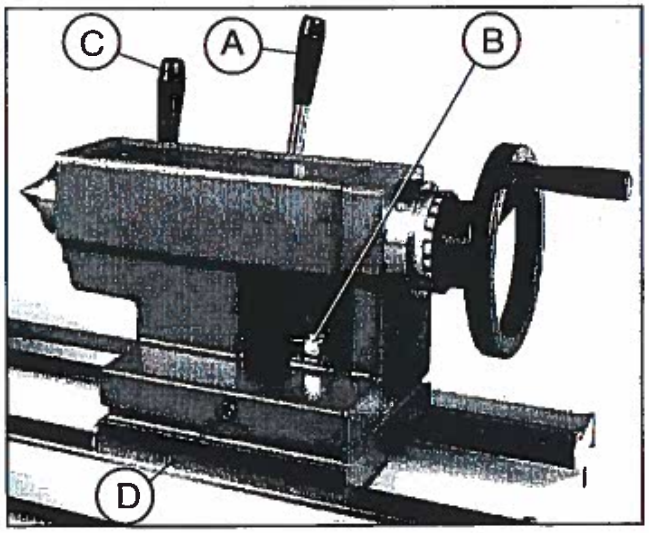


Fig. 18

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 ensuring nut. (B) is released. Undo rear location screw (E) one turn (Fig. 19). 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 both inch and metric dimensions.

The dial on the tailstock handwheel is graduated in either inch or metric dimensions.

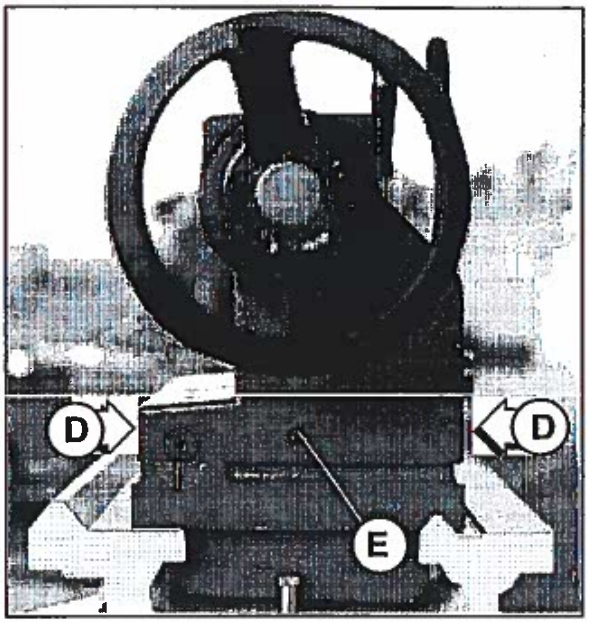


Fig. 19

COOLANT

The coolant pump fitted to the coolant tank and is operated by the on/off switch located on the apron control panel.
The flow of coolant is controlled by means of the tap fitted to the standpipe and may be suitably directed onto the workpiece.

The coolant tank is located at the back of the machine and has a capacity of 32 litres (7 Imperial gallons) on the 1.0, 1.5 and 2.0 metre between centres Mascot and Mastiff machines. On the 3.0 metre Mastiff machine the capacity is doubled to 64 litres (14 Imperial gallons).

Any commercially available coolant may be used - suitable for the tooling and type of material being cut.

GAP PIECE REMOVAL (Fig. 20)

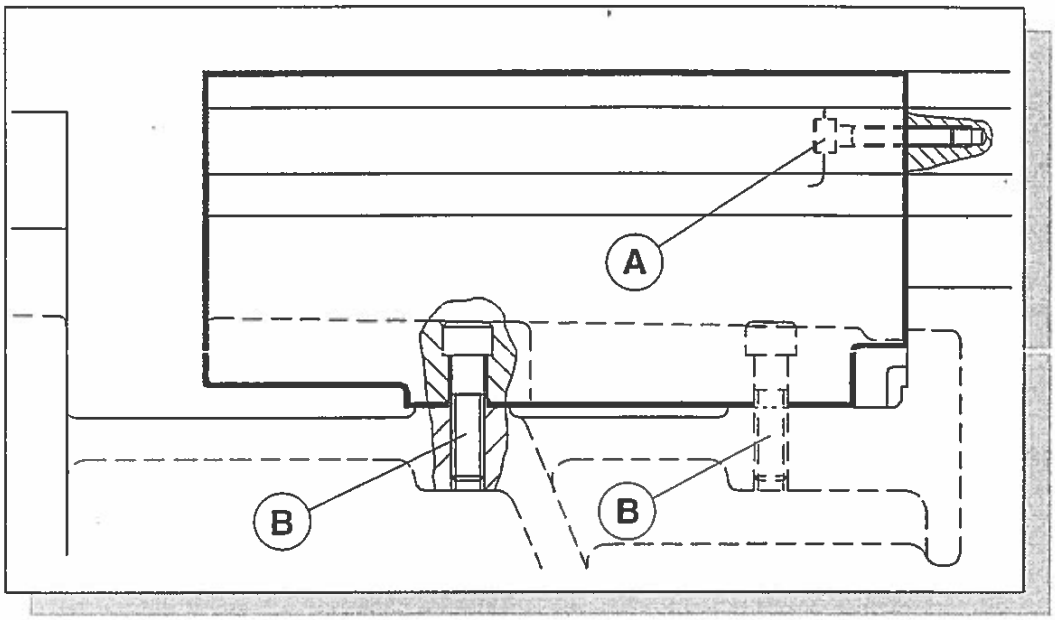


Fig. 20

REMOVAL PROCEDURE

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

REFITTING PROCEDURE

1) Ensure machine is level.
2) Clean area around gap.
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, lightly tapping the gap with a hide hammer.
6) Finally position the gap by means of the alignment bolts (A), being careful not to overtighten (maximum torque 5 ft-pounds or 7 NM).
7) Tighten holding down bolts (B).

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

LATHE ALIGNMENT

With the lathe installed and running we recommend a check on machine alignments before commencing work.
Periodically check alignments and levelling to ensure continued accuracy.

HEADSTOCK CHECK– (Fig. 21)
Note. Ascertain that the machine is level before carrying out this and tailstock check.

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").

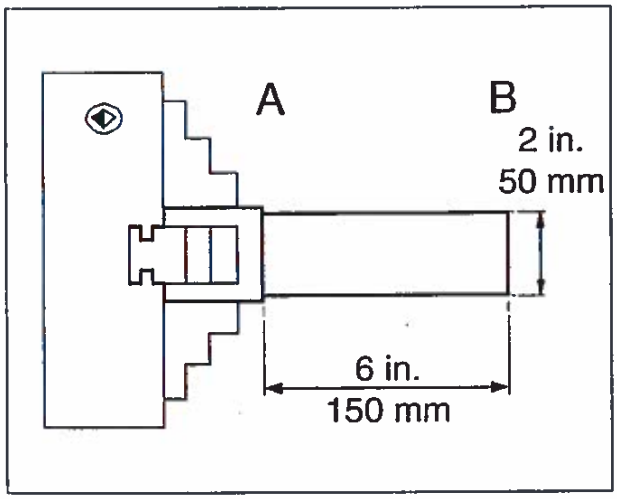


Fig. 21

To correct a greater difference in readings,first open the end guard and loosen the four headstock screws (A) shown in Fig. 22 .
Adjust the set over pad C to pivot the headstock about the dowel B.
Retighten all securing screws after each adjustment. Repeat the test cut and alignment check until the micrometer readings are within tolerance.

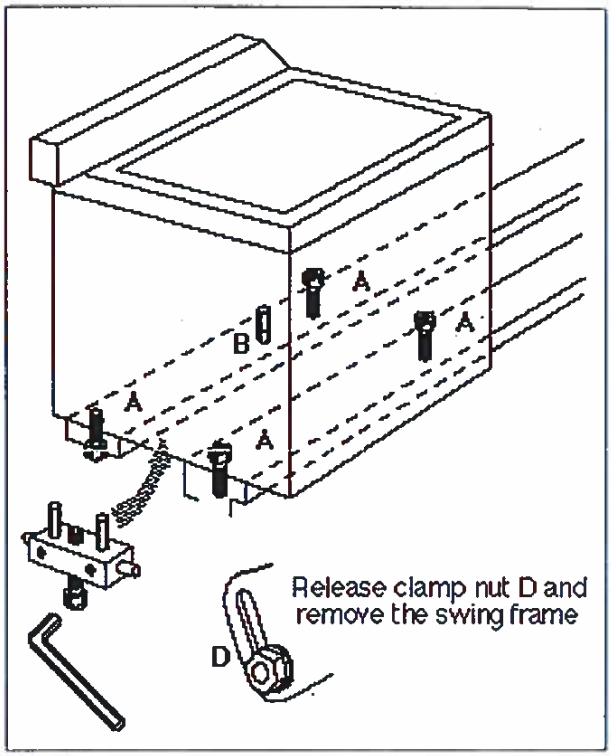


Fig. 22

TAILSTOCK CHECK-(Fig 23)
Using a 300mm (12") long ground steel bar mounted between centres, check the alignment by traversing a dial test indicator along the centre line of the bar.
To correct any error first release the tailstock clamp lever, slacken the rear locating screw (R)and then adjust the screws (S) on each side of the tailstock base to move the tailstock bodylaterally. Recheck alignment.

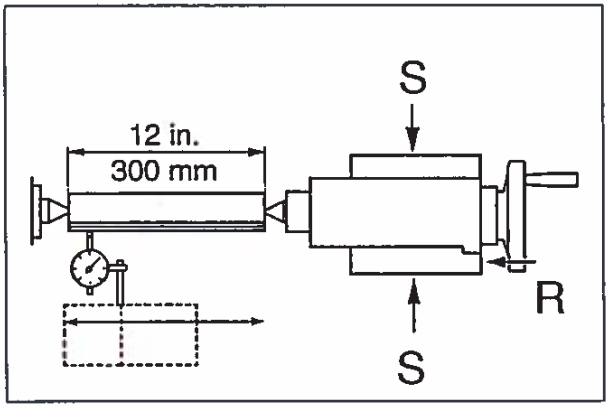


Fig. 23

END GEAR TRAIN (Fig. 24)

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 0.15mm (0.005 in.) for correct mesh.

Lubricate gears regularly with grease and apply oil can to the intermediate gear spindle through the oiler B.

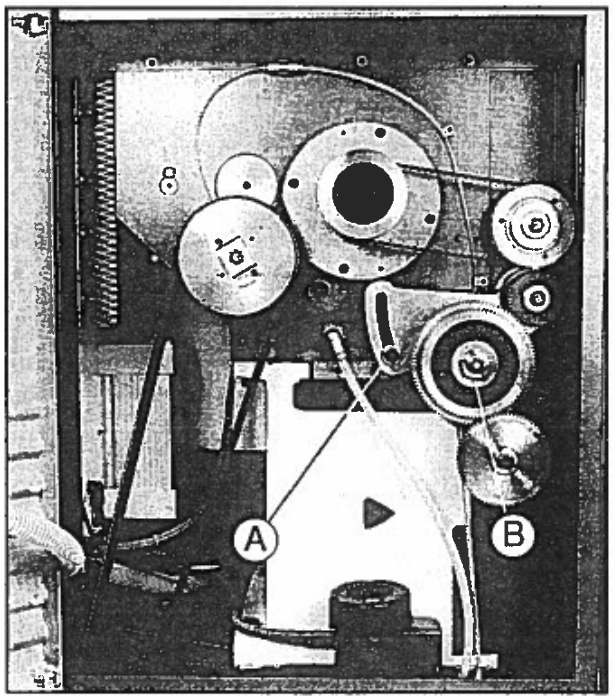


Fig. 24

DRIVING BELT (Fig.24)

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 55-81 Newtons (12-18 lb force) at a point mid way between the motor and headstock pulleys should produce 12.5mm. (0.5 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. 25). 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.

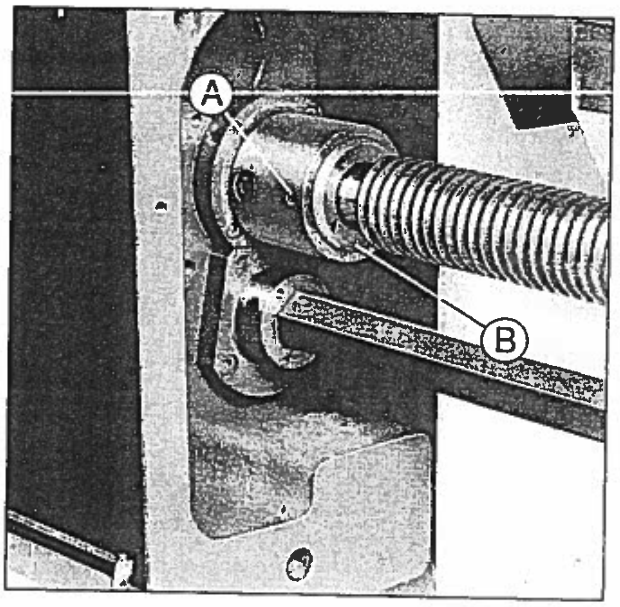


Fig. 25

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.

SLIDEWAYS (Fig. 26)

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.

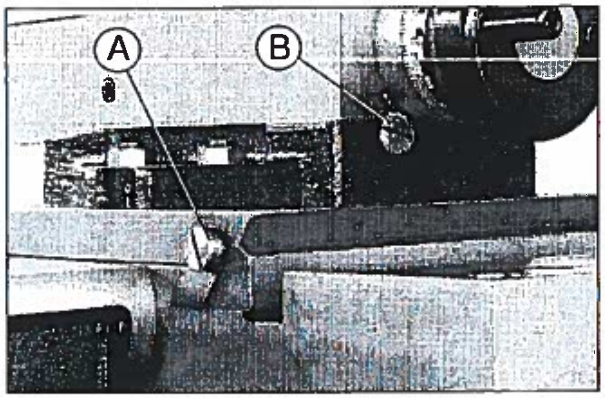


Fig. 26
Tapered gibs are fitted to each wing of the saddle and are adjusted by means of the single screws front and back.
Ensure that the slideways are cleaned and lubricated before making any adjustment. Turn screws clockwise to take up any play avoiding over adjustment, which will result in stiff jerky action on the slide.

CROSS-SLIDE NUT (Fig. 27)

The cross-slide nut is of the backlash eliminator type.

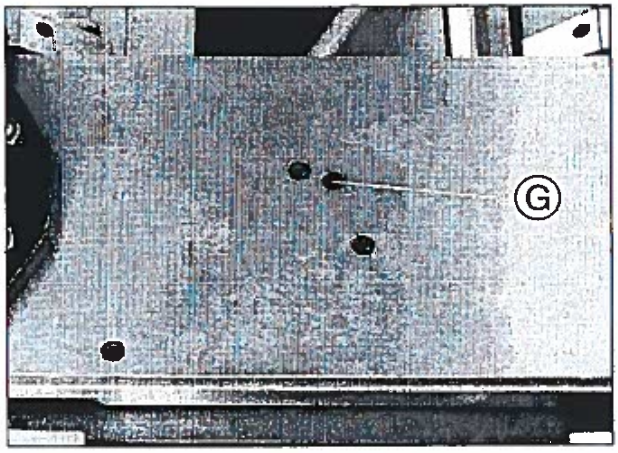


Fig. 27

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. 28)

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

Oil may be drained by disconnecting the pipe at (B).
System capacity is approximately 6.2 litres (11 pints).

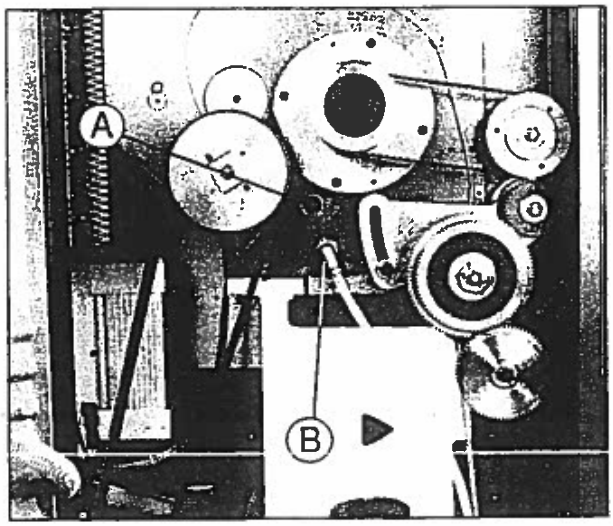


Fig. 28

GEARBOX (Fig 29)

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 behind the endguard on the left hand side side of gearbox casting. To drain the gearbox unscrew drain plug C in the gearbox casting. The capacity of the gearbox is approximately 2.8 litres (5 pints).

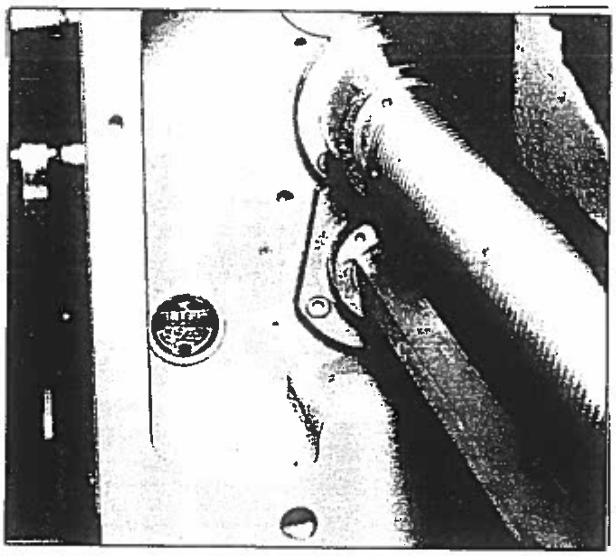


Fig. 29

APRON (Fig.30)

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.

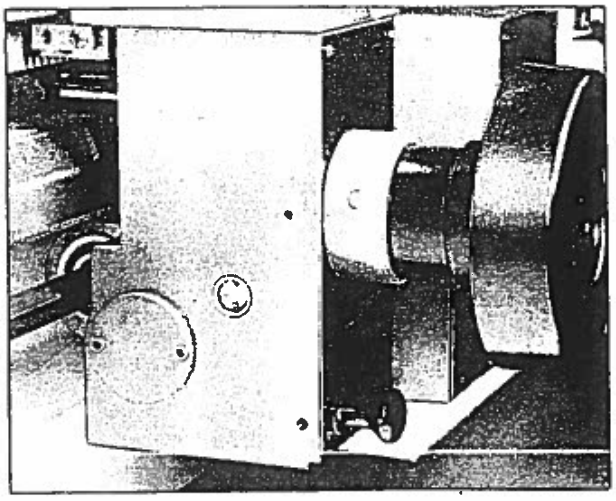


Fig. 30

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 cross-slide way with Shell Tonna TX68 (ISO VGT 68). The capacity is approximately 1.6 litres (2.8 pints). A drain plug is provided underneath the apron casting.

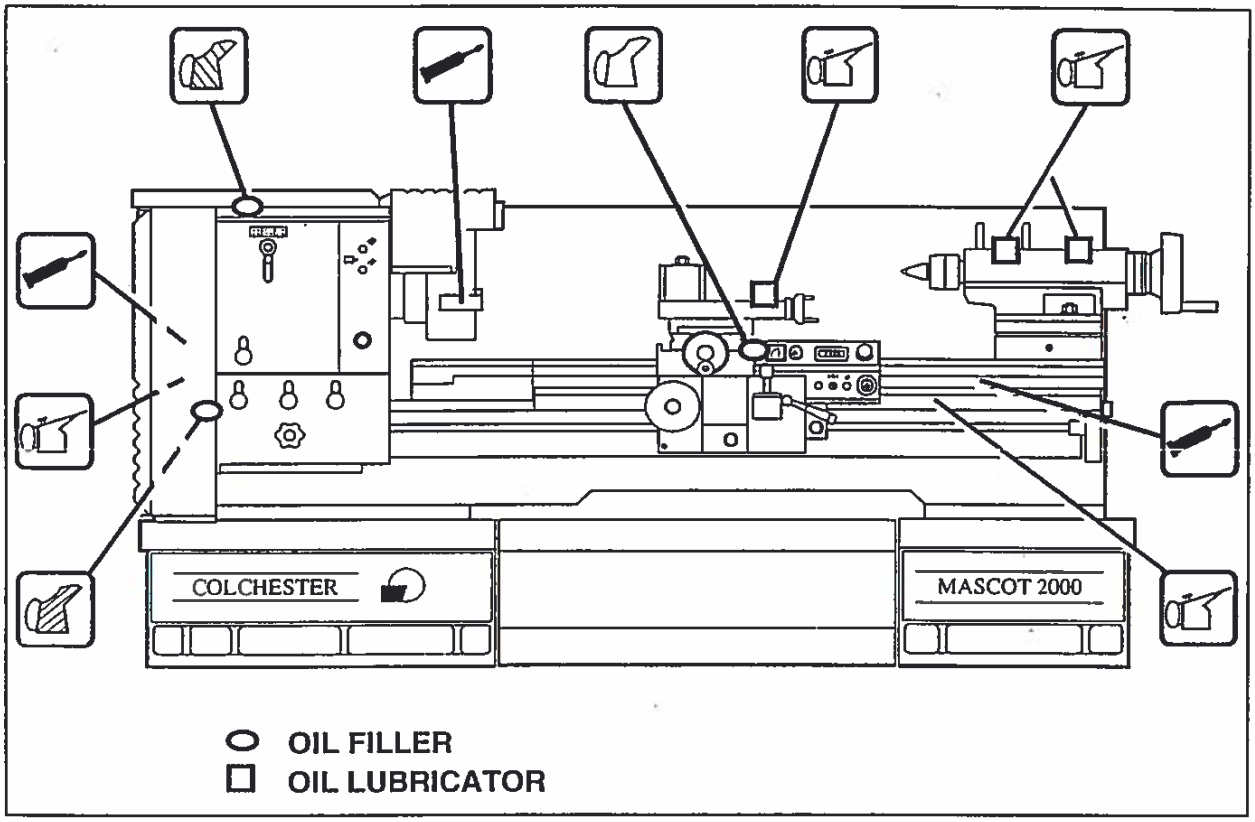
REGULAR ATTENTION

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.

SLIDEWAYS (Fig. 30)

The apron acts as a reservoir for the saddle and cross-slide lubrication oil. (see Fig.30)
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.
Manual Chuck. Molycote "D"

Oil each week - Tailstock, Leadscrew,Endtrain gear s and Topslide. Shell Tellus T32 (ISO HV32).

Apron. Check level and top up each week - Shell Tonna TX68 (ISO VGT 68). Total Capacity 1.6 litres.

Headstock.Check level and top up each week - Shell Tellus T32 (ISO HV 32). Total Capacity 6.2 litres.

Gearbox. Check level and top up each week - Shell Tellus T32 (ISO HV 32). Total Capacity 2.8 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 $mm.^2$ 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.

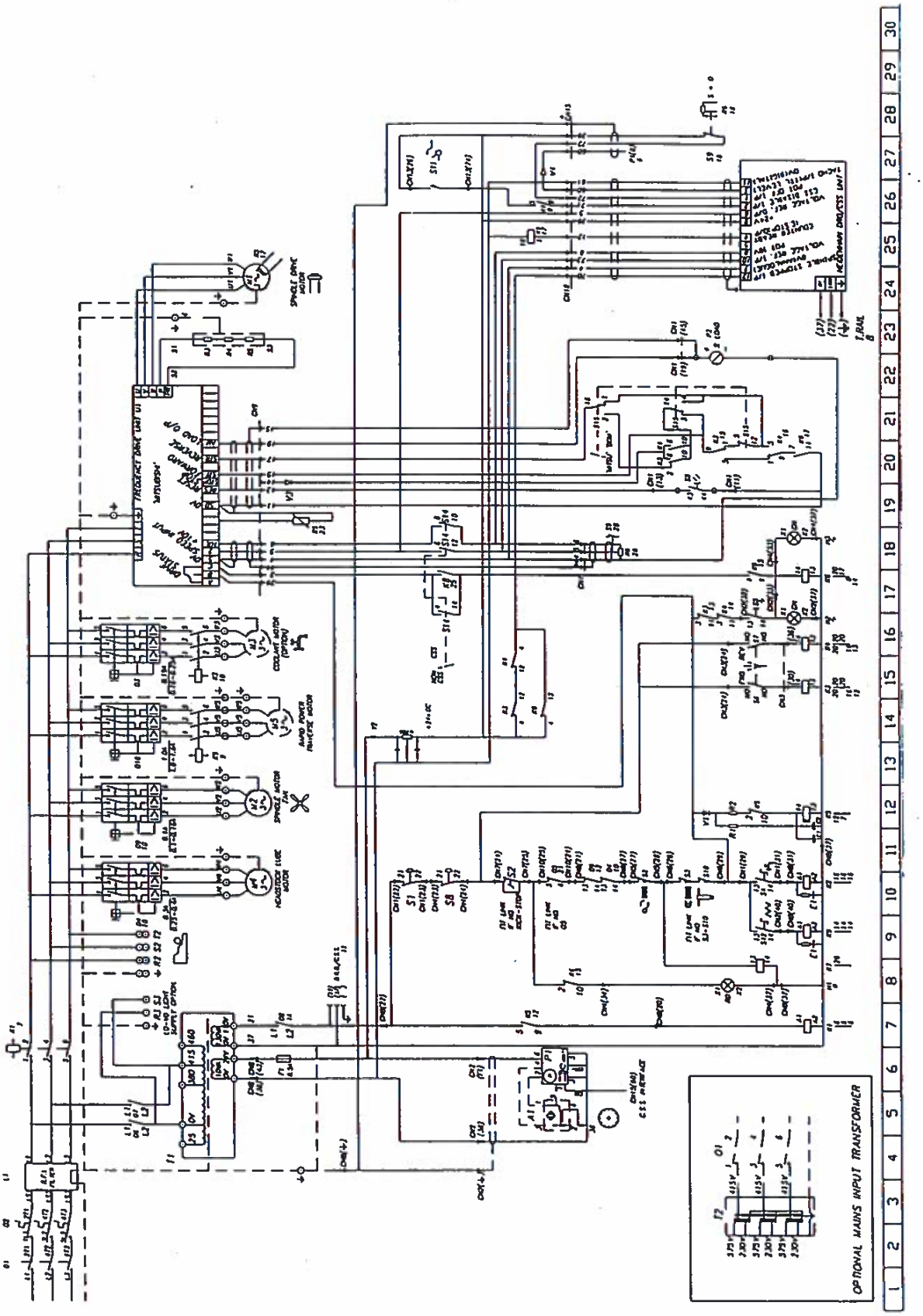
DIGITAL READOUT

WIRE INTO TERMINALS 22 AND 37 ON THE MAGNETICS PANEL.

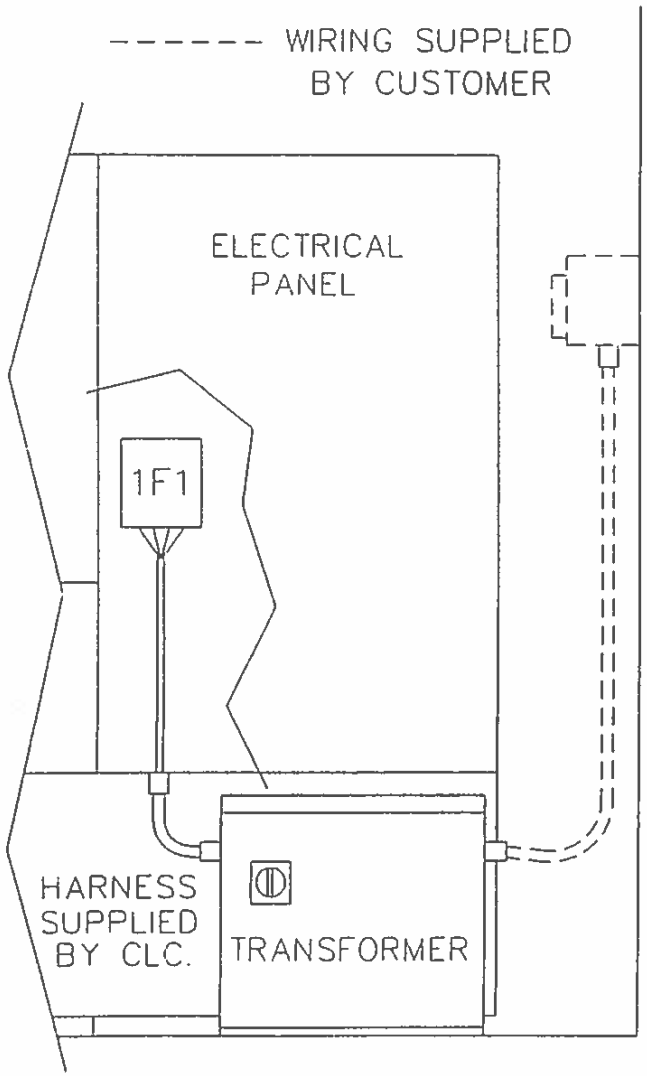
OVERLOAD SETTINGS

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

ELECTRICAL WIRING DIAGRAM

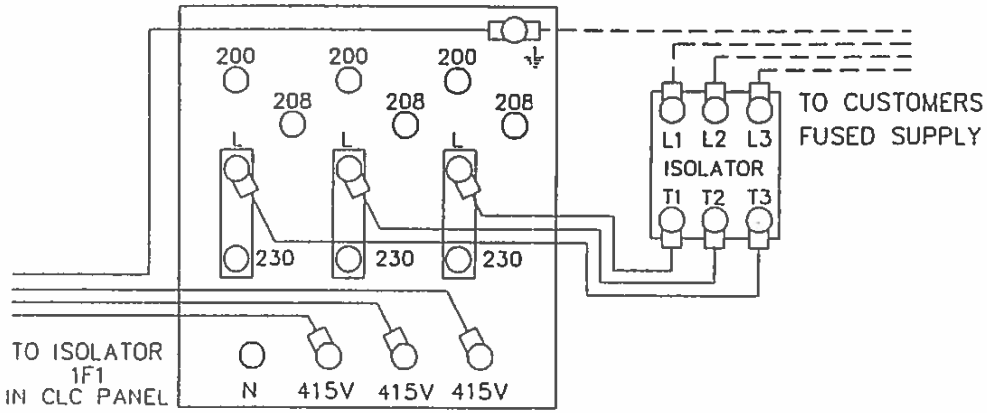


DCIN - 22291	MCC/MSC	Serial No.		Drawing - EP766	Issue 1	11.01.96



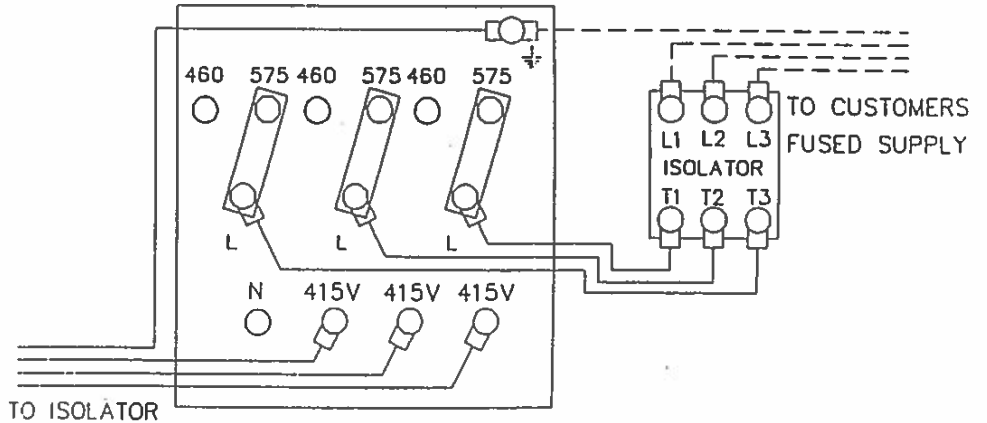
TRANSFORMER CONNECTIONS

CONNECTION FOR LOW VOLTAGE TRANSFORMER B772 – 3025



CONNECTION FOR 230V SUPPLY

CONNECTION FOR HIGH VOLTAGE TRANSFORMER B772 – 3026



CONNECTION FOR 575V SUPPLY

FAULT FINDING ON THE MASCOT / MASTIFF VS SPINDLE DRIVE

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

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

TO GAIN VISUAL ACCESS IT WILL BE NECESSARY TO ISOLATE THE MACHINE USING THE ELECTRICAL CABINET ISOLATOR SWITCH. ONCE SWITCHED OFF, THE LED DISPLAY WILL ONLY SHOW THE ALARM MESSAGE FOR 10 SECONDS. SO BEFORE SWITCHING OFF, UNLOCK THE TWO ELECTRICAL CABINET LOCKS AND FAMILIARIZE YOURSELF WITH THE RANGE OF ALARM MESSAGES AVAILABLE. THEN THE MACHINE CAN BE ISOLATED, THE CABINET DOOR OPENED AND THE ALARM 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 The Colchester Lathe Company should be contacted for further diagnostic information.

APPLICATION CONSIDERATIONS WHEN USING COLCHESTER VS CENTRE LATHES

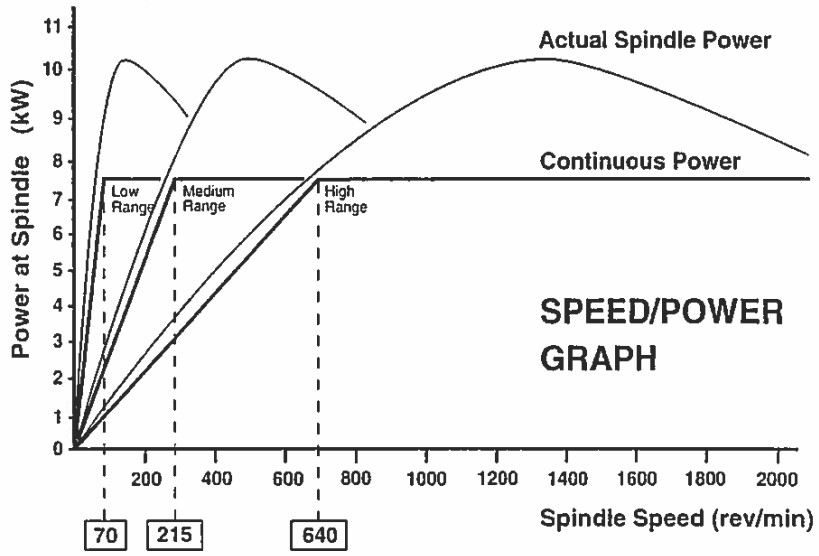
1. Screwcutting:-

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 70 rev/min (65 rev/min Mastiff) 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 Colchester for additional information.



3. Spindle Drive Efficiency At Low Speed

At the bottom of each speed range the efficiency of the drive reduces considerably if the spindle is allowed to run under a **no load condition or idle.**

After **prolonged** running in this condition the drive may cut out and indicate an Oh Alarm.

The drive, however will not cut out if it is fully loaded.

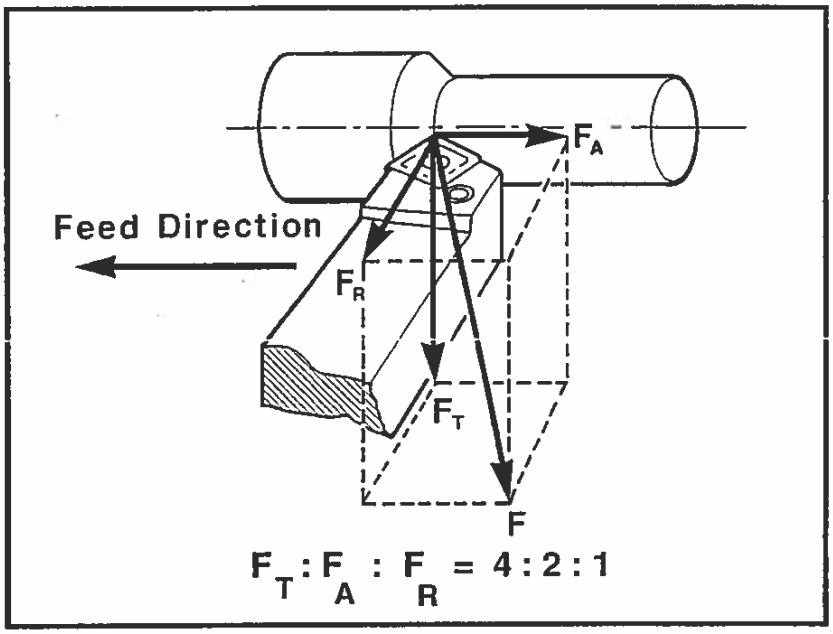
This applies at an ambient temperature of 20°C and is derated at higher temperatures.

In some circumstances the drive will be neither fully loaded or idling, depending on the application, before an intermittent cut out situation may be experienced at differing time intervals. This situation may occur at spindle speeds at or just above the minimum spindle speed in each range.

If the Oh Alarm does occur under these circumstances then it can be overcome by:-

1. Changing to a lower gear range.
2. Increasing the spindle speed to a slightly faster figure compatable to the application.
3. Increasing the continuous load on the drive.

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

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

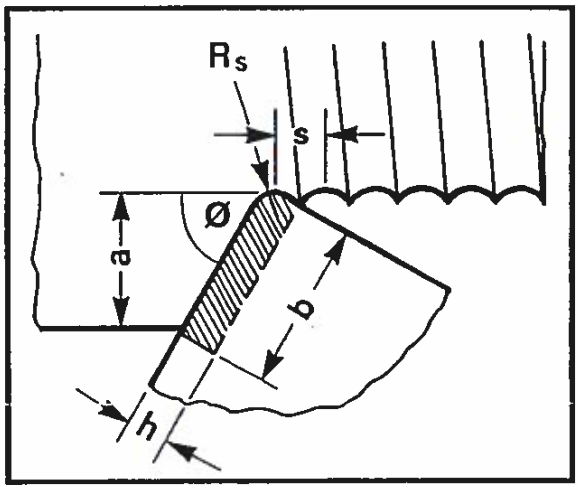
k_S VARIES ALSO WITH THE FOLLOWING FACTORS

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	a/D	Factor
Entering Angle ➡								.05	.22
								.10	.32
								.20	.43
								.30	.52
								.40	.59
Correction Factor ➡	1.0	0.96	0.94	0.86	0.70	1.0		.50	.63

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

POWER CONSUMPTION IN CUTTING

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

KILOWATTS

V = Cutting Speed (metres/min)

a = Depth of Cut (mm)

s = Feedrate (mm/revolution)

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

P = Spindle Motor Power Consumption

Technological Data - 1

Operation:- 1. Rough Turning Steels

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

Operation:- 2. Finish Turning Steels

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

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

Technological Data - 2

Operation:- 3. Roughing and Finishing Cast Irons

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

Operation:- 4. Roughing and Finishing Non Ferrous Alloys

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

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

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

SPARE PARTS SECTION

IMPORTANT WHEN ORDERING -

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

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

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

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

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

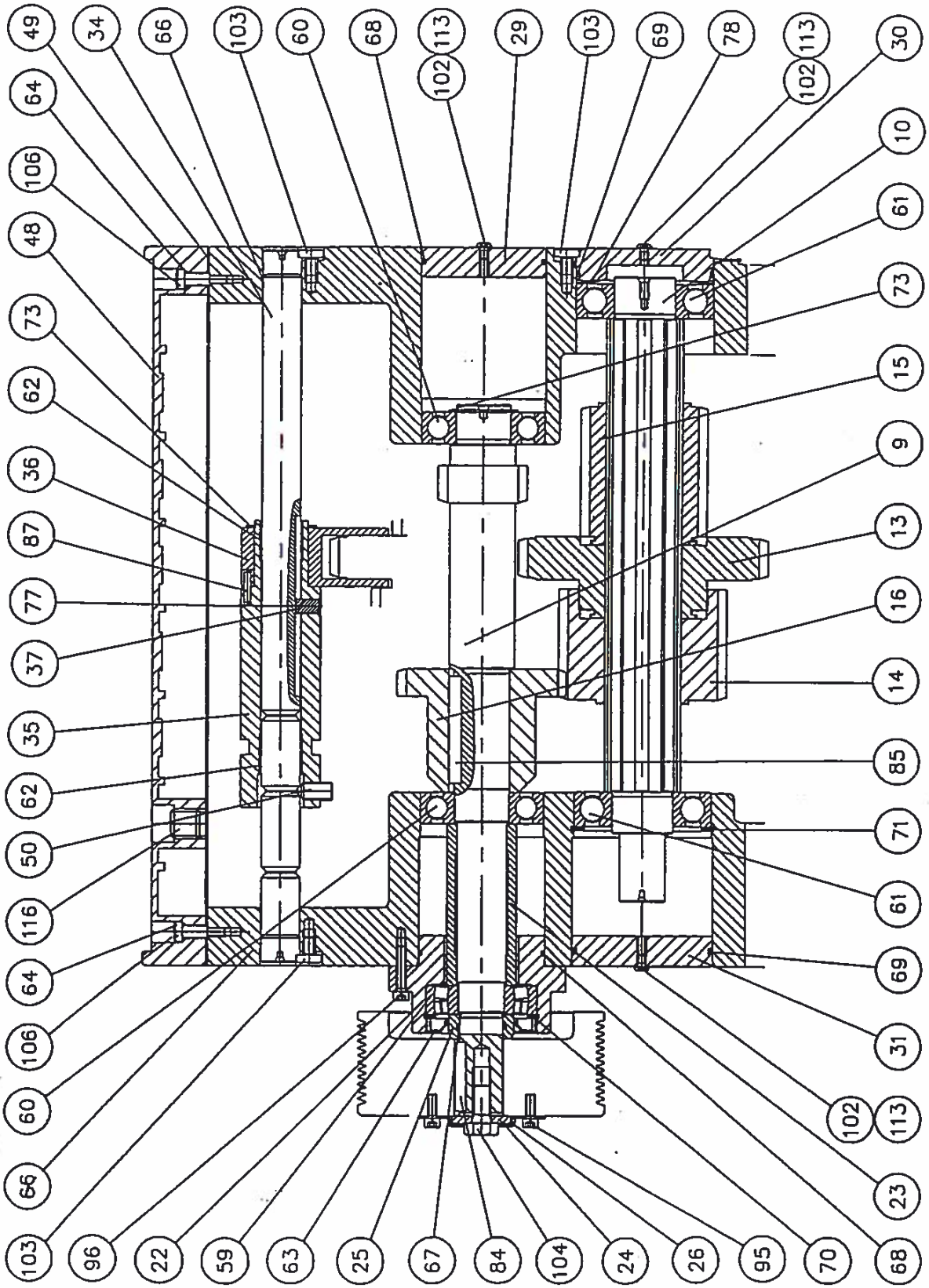
INDEX

MASCOT PARTS
PARTS COMMON TO BOTH MASCOT AND MASTIFF

INDEX

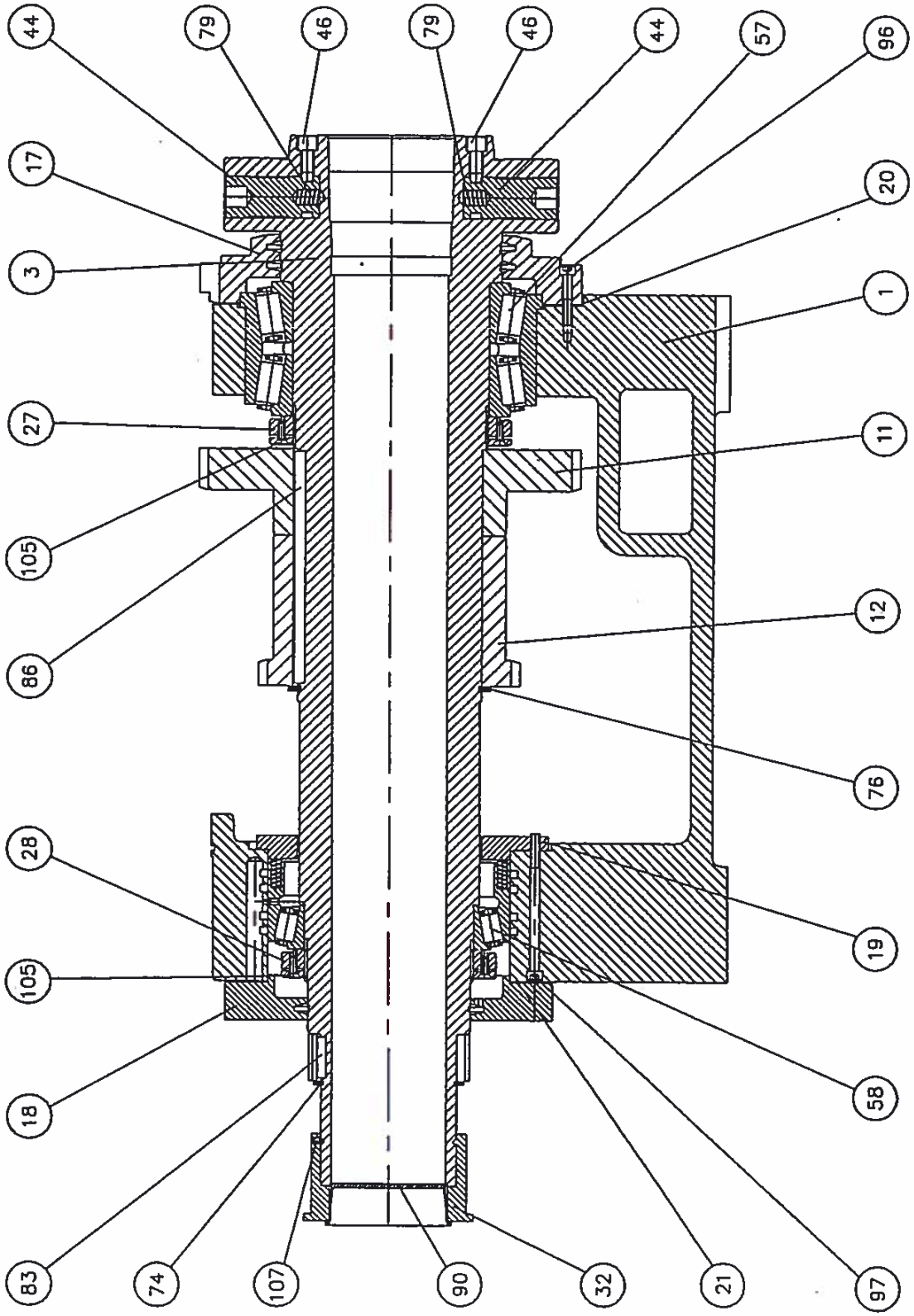
HEADSTOCK

HEADSTOCK ASSEMBLY (1)



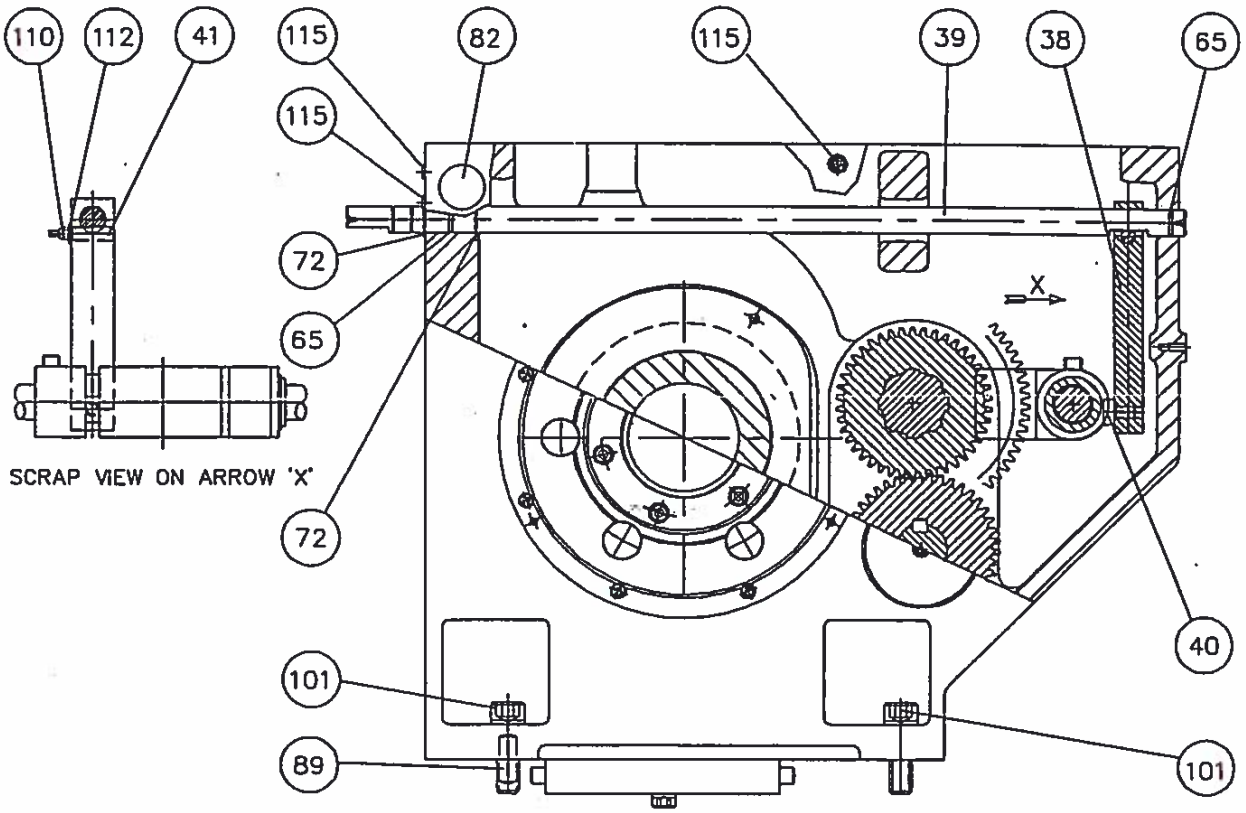
Item No.	Description	Part No.
1	HEADSTOCK CASTING	D384 - 0060
3	MAIN SPINDLE	D709 - 0052
9	INPUT SHAFT	D699 - 0804
10	SPLINE SHAFT	D699 - 0805
11	101T GEAR	D344 - 1291
12	69T GEAR	D344 - 1292
13	63T GEAR	D344 - 1293
14	42T GEAR	D344 - 1294
15	31T GEAR	D344 - 1295
16	42T GEAR	D344 - 1296
17	FRONT BEARING COVER	D132 - 0799
18	BACK BEARING OUTER COVER	D132 - 0800
19	BACK BEARING INNER COVER	D132 - 0809
20	FRONT BEARING COVER GASKET	D343 - 0186
21	BACK BEARING COVER GASKET	D343 - 0187
22	INPUT SHAFT HOUSING	D388 - 0138
23	INPUT SHAFT BEARING SPACER	D708 - 0512
24	HEADSTOCK PULLEY SPACER	D708 - 0464
25	HEADSTOCK PULLEY SPACER	D708 - 0462
26	HEADSTOCK PULLEY TAB WASHER	D931 - 0342
27	FRONT BEARING NUT	D536 - 0328
28	BACK BEARING NUT	D536 - 0330
29	INPUT SHAFT PLUG	D566 - 0198
30	SPLINE SHAFT PLUG	D566 - 0199
31	SPLINE SHAFT PLUG	D566 - 0200
32	COOLANT THROWER	D646 - 0058
34	BAR-SHIFT SUPPORT	D041 - 0247
35	SHIFTER TUBE	D834 - 0040
36	GEAR SHIFTER FORK	D299 - 0073
37	KEY-SHIFTER TUBE	D441 - 0076
38	GEAR SHIFT BLOCK	D047 - 0130
39	GEAR SHIFT SHAFT	D699 - 0810
40	SHIFTER FORK	D299 - 0068
41	COTTER PIN	D560 - 0288
42	SET OVER PAD	D557 - 0154
43	SET OVER PIN	D560 - 0297
44	SPINDLE NOSE CAM	D123 - 0034
46	CAM SCREW	D697 - 0134
48	HEADSTOCK COVER	D132 - 0805
49	HEADSTOCK COVER GASKET	D343 - 0185
50	ESLOK SPRING PLUNGER	D567 - 0058
57	FRONT BEARING (SPECIAL GAMET BASED ON 164.133X/164.196XHS)	B336 - 1787
58	REAR BEARING (SPECIAL GAMET BASED ON 105.115X/105.165)	B336 - 1353
59	ROLLER BEARING (SKF 21306CC)	B325 - 7501
60	FAG BEARING 6307	B313 - 2417
61	FAG BEARING 6308	B313 - 2420

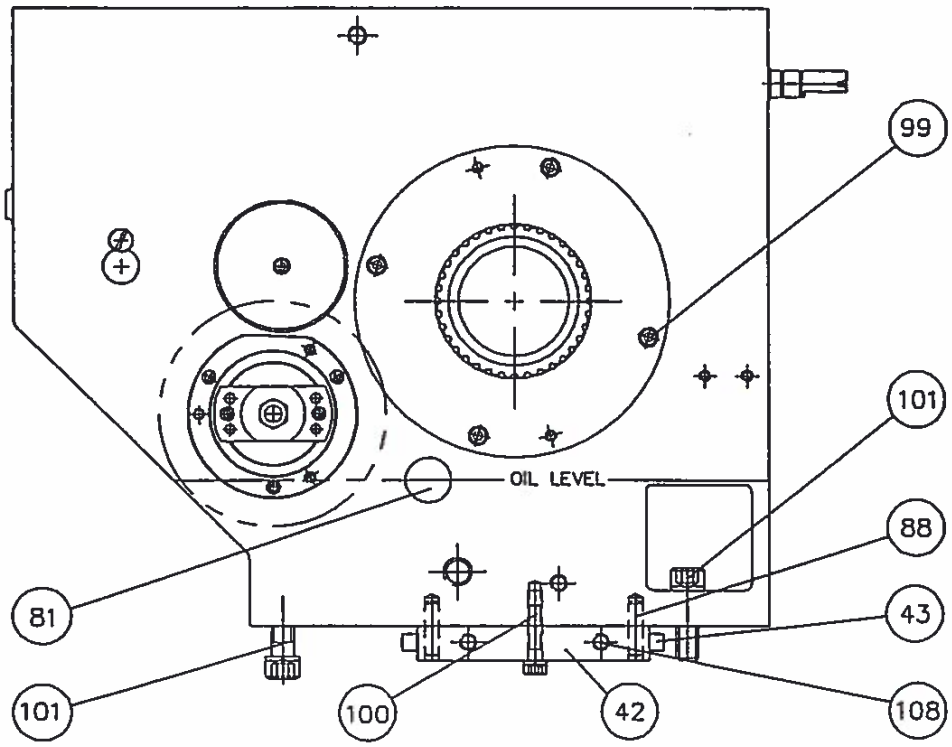
HEADSTOCK ASSEMBLY (2)



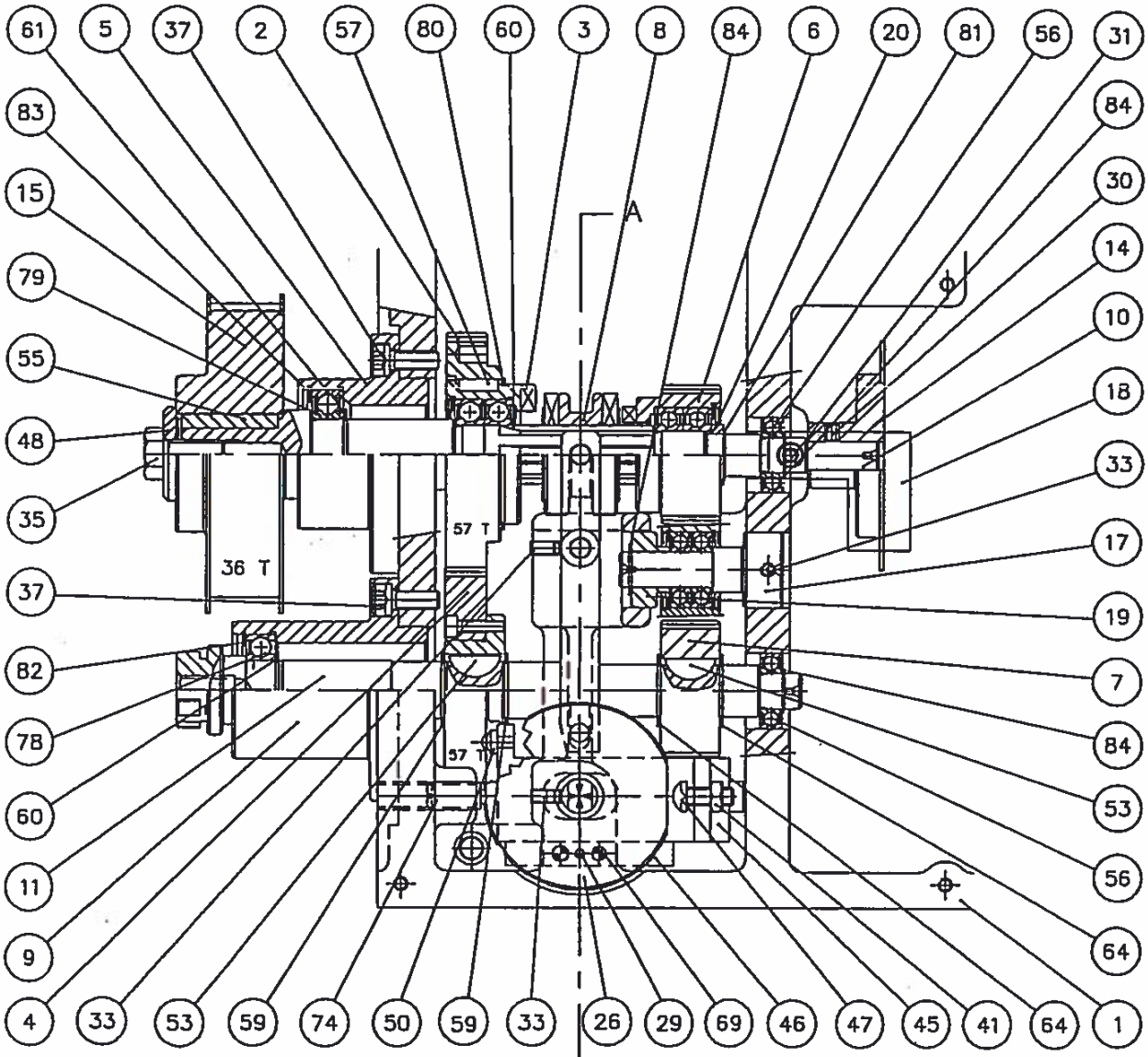
Item No.	Description	Part No.
62	GLACIER BUSH MB2525DU	B311 - 1564
63	OIL SEAL M42X72x8-42	B414 - 3221
64	O RING 200/011/4460	B412 - 0011
65	O RING DOWTY REF 202-518	B413 - 0161
66	O RING DOWTY REF 202-524	B413 - 0221
67	O RING DOWTY REF 202-649	B413 - 0276
68	O RING DOWTY REF 202-740	B413 - 0745
69	O RING DOWTY REF 202-742	B413Y0800
70	CIRCLIP ANDERTON 1300-72	B363 - 0472
71	CIRCLIP ANDERTON 1300-90	B363 - 0490
72	CIRCLIP ANDERTON 1400-19	B363 - 0019
73	CIRCLIP ANDERTON 1400-35	B363 - 0035
74	CIRCLIP ANDERTON 1400-92	B363 - 0092
76	CIRCLIP ANDERTON 1400-125	B363 - 0125
77	PLAIN WIRE RING 1000-200	B362 - 1027
78	SCHNORR DISC SPRING 6308	B365 - 6432
79	SPRING FLEXO REF113207	B365 - 1154
81	OIL SIGHT SK 1185 C4610	B454 - 1002
82	OIL SIGHT IC 4611	B454 - 1001
83	KEY 6x6x28	B343 - 5049
84	KEY 8x7x45	B343Y5108
85	KEY 10x8x70	B343 - 5117
86	SPINDLE KEY	D441 - 0083
87	SPIROL PIN 4x20	B111 - 5076
88	SPIROL PIN 10x40	B111 - 5160
89	DOWEL 12x36	B111Y7093
90	PLASTIC PLUG MOSS 11023	B224 - 2310
95	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
96	HEXAGON SOCKET CAP HEAD SCREW M6x30	B163 - 0040
97	HEXAGON SOCKET CAP HEAD SCREW M8x95	B163 - 0151
99	HEXAGON SOCKET CAP HEAD SCREW M8x30	B163 - 0055
100	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163 - 0071
101	HEXAGON SOCKET CAP HEAD SCREW M16x50	B163 - 0102
102	HEXAGON SOCKET BUTTON HEAD SCREW M6x10	B163 - 1813
103	SLOTTED PAN HEAD SCREW M8x12	B165 - 0147
104	HEXAGON HEAD SCREW M12x25	B166 - 0097
105	HEXAGON SOCKET C/SK SCREW M5x16	B163 - 1016
106	SHOULDER SCREW M8x16	B163 - 1856
107	SET SCREW M5x6	B163 - 1642
108	WEDGLOK SET SCREW M12x20	B164 - 0170
110	NYLOC NUT M5	B147 - 9002
112	WASHER M5	B117 - 0032
113	FIBRE WASHER 11ODx6 ID	B117 - 0151
115	HEXAGON SOCKET PLUG 1/8" BSPT	B424 - 3200
116	HEXAGON SOCKET PLUG 1/2" BSPT	B424 - 3210

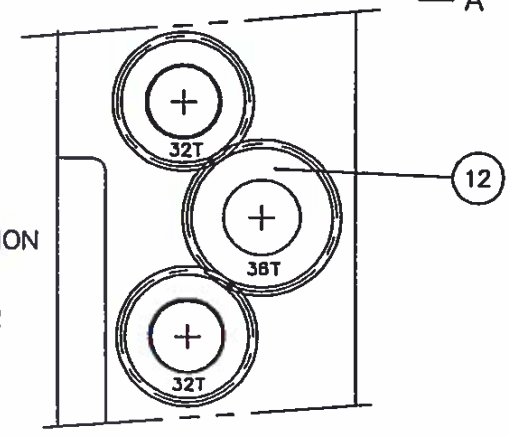
HEADSTOCK ASSEMBLY (3)



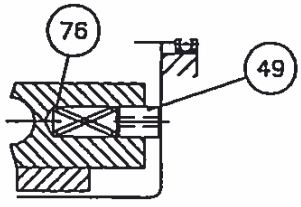


REVERSING BOX ASSEMBLY (1)





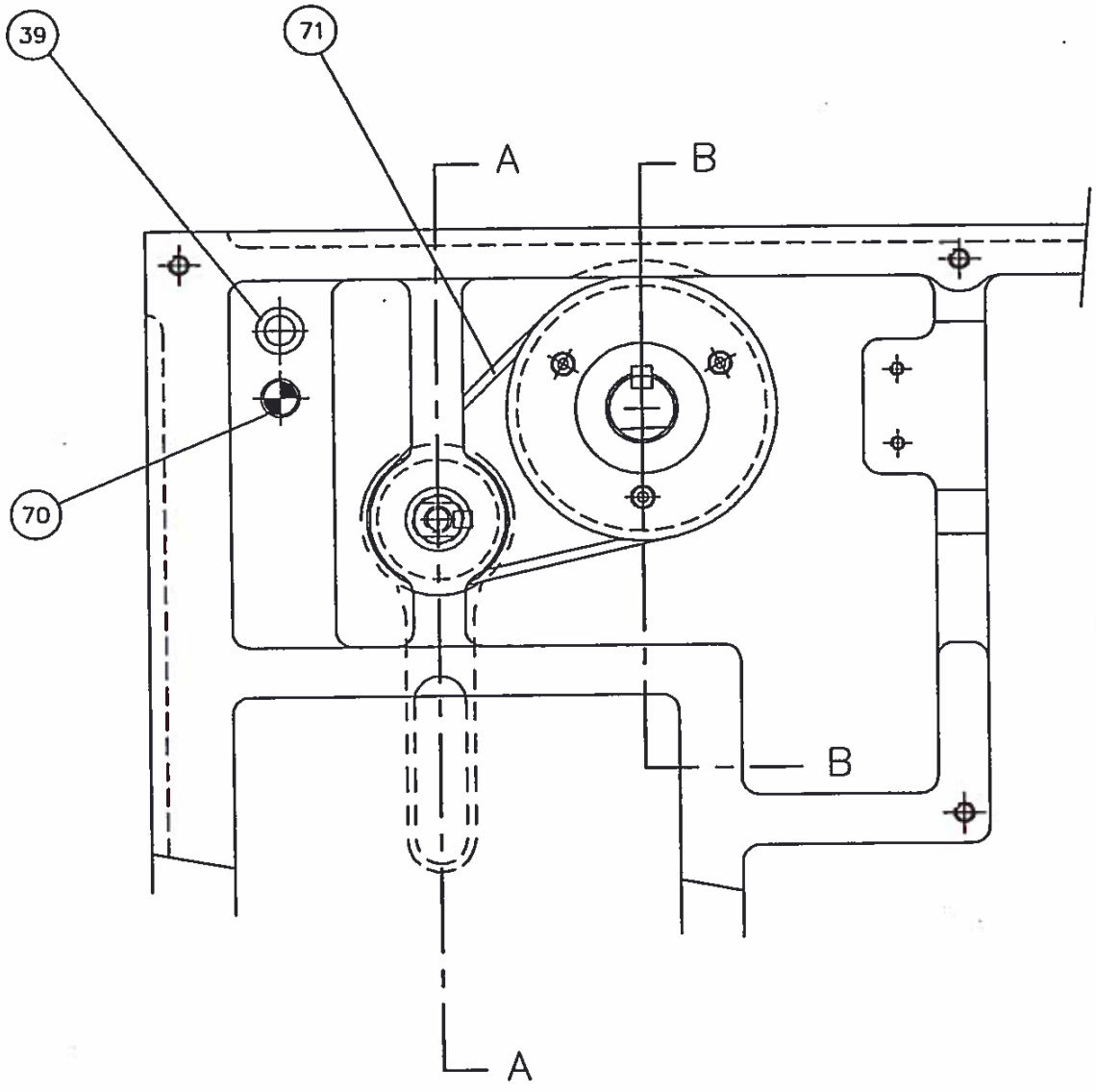
SCRAP SECTION SHOWING IDLER GEAR



SECTION THROUGH BLOCK (ITEM 45)

Item No.	Description	Part No.
1	REVERSING BOX	D053 - 0085
2	GEAR	D344 - 1257
3	SPACER SUB-ASSEMBLY	A806 - 0558
4	GEAR SUB-ASSEMBLY	A806 - 0560
5	INPUT SHAFT HOUSING	D388 - 0123
6	32T GEAR SUB-ASSEMBLY	A806 - 0576
7	32T GEAR	D344 - 1317
8	CLUTCH BOBBIN	D051 - 0006
9	OUTPUT SHAFT HOUSING	D388 - 0124
10	INPUT SHAFT	D699 - 0777
11	OUTPUT SHAFT	D699 - 0778
12	36T GEAR SUB-ASSEMBLY	A806 - 0577
14	SENSOR MOUNTING SPIGOT SUB-ASSEMBLY	A806 - 0561
15	36T PULLEY SUB-ASSEMBLY	A824 - 0035
17	IDLER SHAFT	D699 - 0816
18	SENSOR MOUNTING BRACKET	D050 - 0677
19	IDLER SHAFT SPACER	D708 - 0521
20	INPUT SHAFT SPACER	D708 - 0459
21	PLUG	D566 - 0202
22	SHIFTER PAD	D299 - 0067
23	SHIFTER BAR	D041 - 0230
24	SHIFTER PIVOT SHAFT	D699 - 0779
25	REVERSE LEVER SHAFT	D699 - 0781
26	SHIFTER DISC	D233 - 0023
27	SHIFTER PIN	D560 - 0295
29	HEXAGON SOCKET CAP HEAD SCREW M4x20	B163Y0017
30	HEXAGON SOCKET SET SCREW M6x6	B163 - 1560
31	HEXAGON SOCKET CAP HEAD SCREW M6x12	B163 - 0036
32	HEXAGON SOCKETSET SCREW M12x16	B163 - 1781
33	HEXAGON SOCKETSET SCREW M6x8	B163 - 1740
35	HEXAGON SOCKET CAP HEAD SCREW M4x20	B163Y0017
37	HEXAGON SOCKET CAP HEAD SCREW M8x20	B163 - 0053
38	HEXAGON SOCKET CAP HEAD SCREW M4x10	B163Y0014
39	HEXAGON SOCKET CAP HEAD SCREW M8x25	B163 - 0054
41	LOCK NUT M6	B147 - 9170
45	BLOCK	D047 - 0104
46	BLOCK	D047 - 0105
48	INPUT PULLEY SPACER	D708 - 0468
49	PIN	D560 - 0303
50	PIN	D560 - 0304
53	WOODRUFF KEY 6x9x22	B343 - 2009
54	KEY 6x6x10	B343 - 5041
55	KEY 8x7x40	B343 - 5107
56	BALL BEARING 6002 2Z	B315 - 0410
57	KEY (ROUNDED ENDS) 5x5x16	B343 - 5031

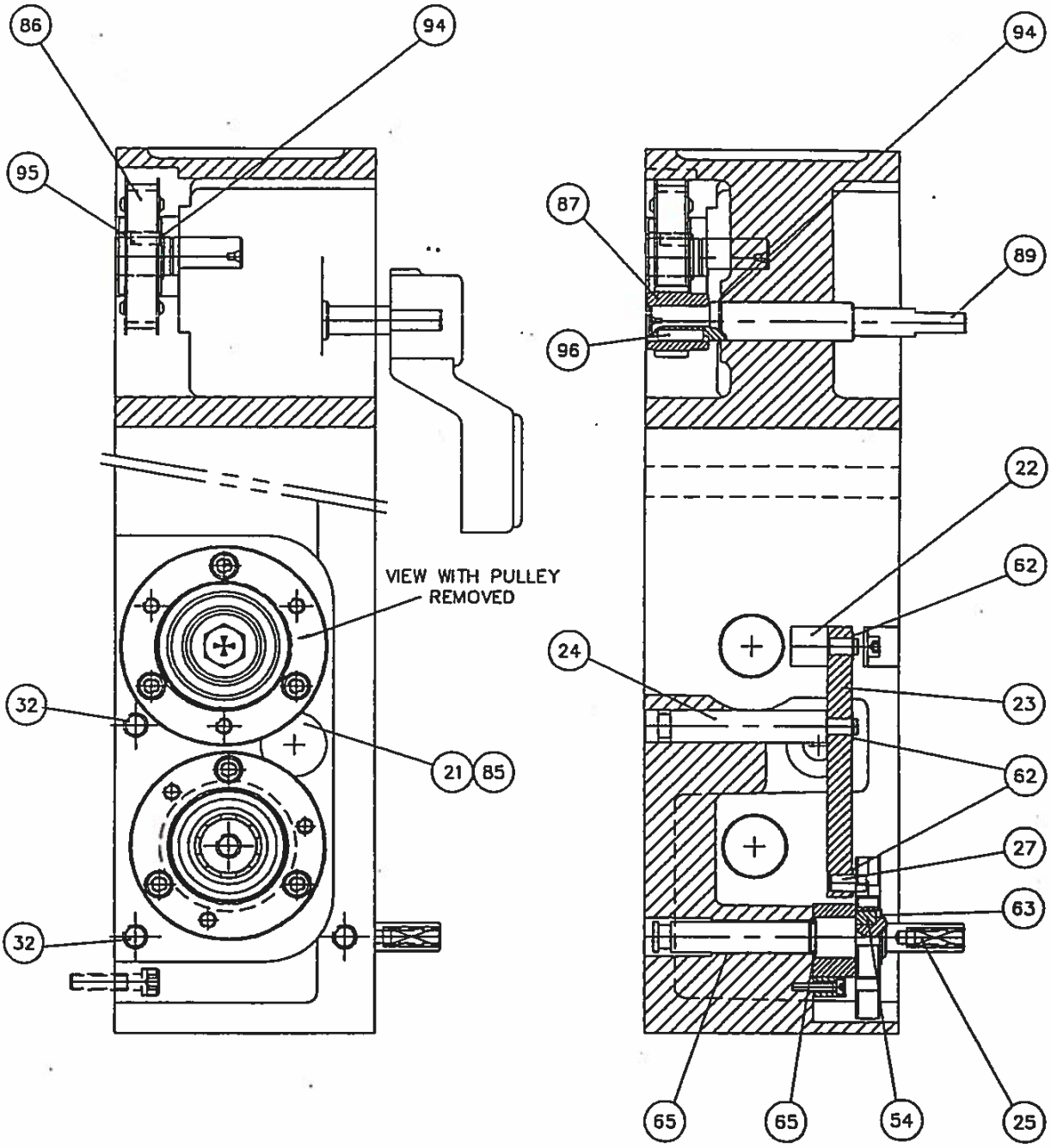
RANGE CHANGE (REVERSING BOX ASSEMBLY 2)



REVERSING BOX ASSEMBLY A109 - 0002

Item No.	Description	Part No.
53	WOODRUFF KEY 6x9x22	B343 - 2009
54	KEY 6x6x10	B343 - 5041
55	KEY 8x7x40	B343 - 5107
56	BALL BEARING 6002 2Z	B315 - 0410
57	KEY (ROUNDED ENDS) 5x5x16	B343 - 5031
59	CIRCLIP 1400-24	B363 - 0024
60	CIRCLIP 1400-25	B363 - 0025
61	CIRCLIP 1400-30	B363 - 0030
62	CIRCLIP 1400-8	B363Y0008
63	CIRCLIP 1400-20	B363 - 0020
64	CIRCLIP 1400-22	B363 - 0022
65	GLACIER BUSH MB1420DU	B311 - 1532
69	SPIROL PIN 6mm	B111 - 5114
70	DOWEL PIN 10x25	B111 - 7054
71	TIMING BELT 124L050	B346 - 1222
74	SPRING PLUNGER	D567 - 0058
76	FLEXO SPRING\ M246208	B366 - 0350
78	BALL BEARING 6005 2Z	B315 - 0413
79	BALL BEARING 6006 2Z	B315 - 0414
80	CIRCLIP 1400-60	B363 - 0060
81	CIRCLIP 1400	B363 - 0018
82	CIRCLIP 1300-47	B363Y0447
83	CIRCLIP 1300-55	B363 - 0455
84	CIRCLIP 1400 - 15	B363 - 0015
85	'O 'RING DOWTY REF. 202-649	B413 - 0276
86	24T PULLEY SUB-ASSEMBLY	A824 - 0038
87	12T TIMING BELT PULLEY	D570 - 0366
89	RANGE CHANGE HANDLE SHAFT	D699 - 0812
94	CIRCLIP 1400-19	B363 - 0019
95	SQUARE KEY (RAD. ENDS) 6x6x14	B343 - 5043
96	SQUARE KEY (RAD. ENDS) 5x5x22	B343Y5034

REVERSING BOX ASSEMBLY (3)

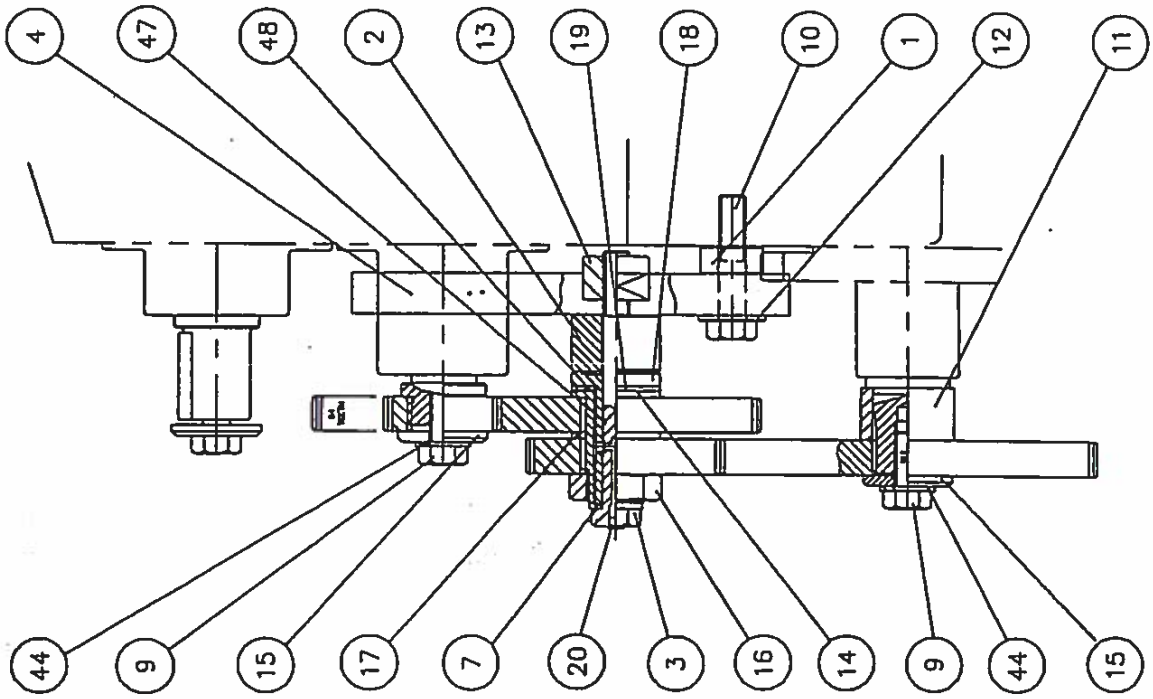


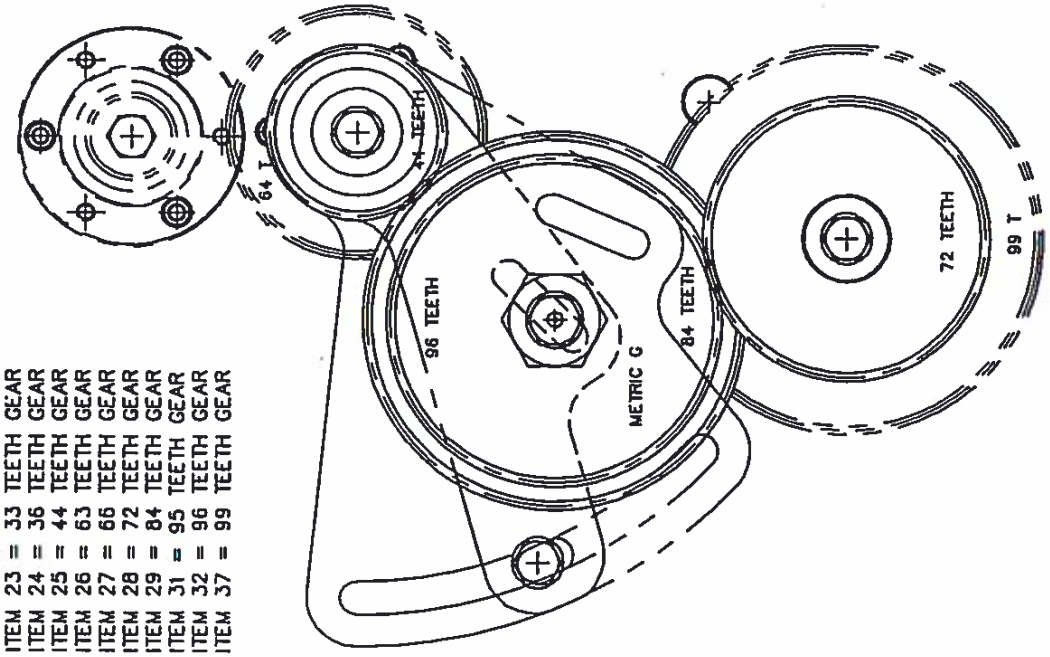
SCRAP SECTION ON B – B

SECTION ON A – A

Item No.	Description	Part No.
	26T PULLEY SUB-ASSEMBLY A824 - 0028	
1	PULLEY REVERSING BOX	D570 - 0319
2	BELT RETAINING RING	D565 - 0912
3	HEXAGON SOCKET BUTTON HEAD SCREW M4x12	B163Y1805
	24T PULLEY SUB-ASSEMBLY A824 - 0038	
1	24T RANGE CHANGE PULLEY	D570 - 0367
2	SIDE PLATE	D565 - 1075
3	HEXAGON SOCKET SCREW M4x8	B163 - 1803
	SPACER SUB-ASSEMBLY A806 - 0558	
1	DRIVE SHAFT SPACER	D708 - 0460
2	BALL BEARING 6005 2Z	B315 - 0413
3	CIRCLIP 1300-47	B363Y0447
	32T GEAR SUB-ASSEMBLY A806 - 0576	
1	32T GEAR	D344 - 1316
2	BALL BEARING 6004 2Z	B315 - 0412
3	CIRCLIP 1300-42	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 - 1258
2	GEAR HUB SLEEVE	D391 - 0063
3	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
	36T GEAR SUB-ASSEMBLY A806 - 0577	
1	36T GEAR	D344 - 1318
2	BALL BEARING 6002 2Z	B315 - 0410
3	CIRCLIP 1300-32	B363 - 0432

CHANGEWHEEL ASSEMBLY





CHANGE GEARS

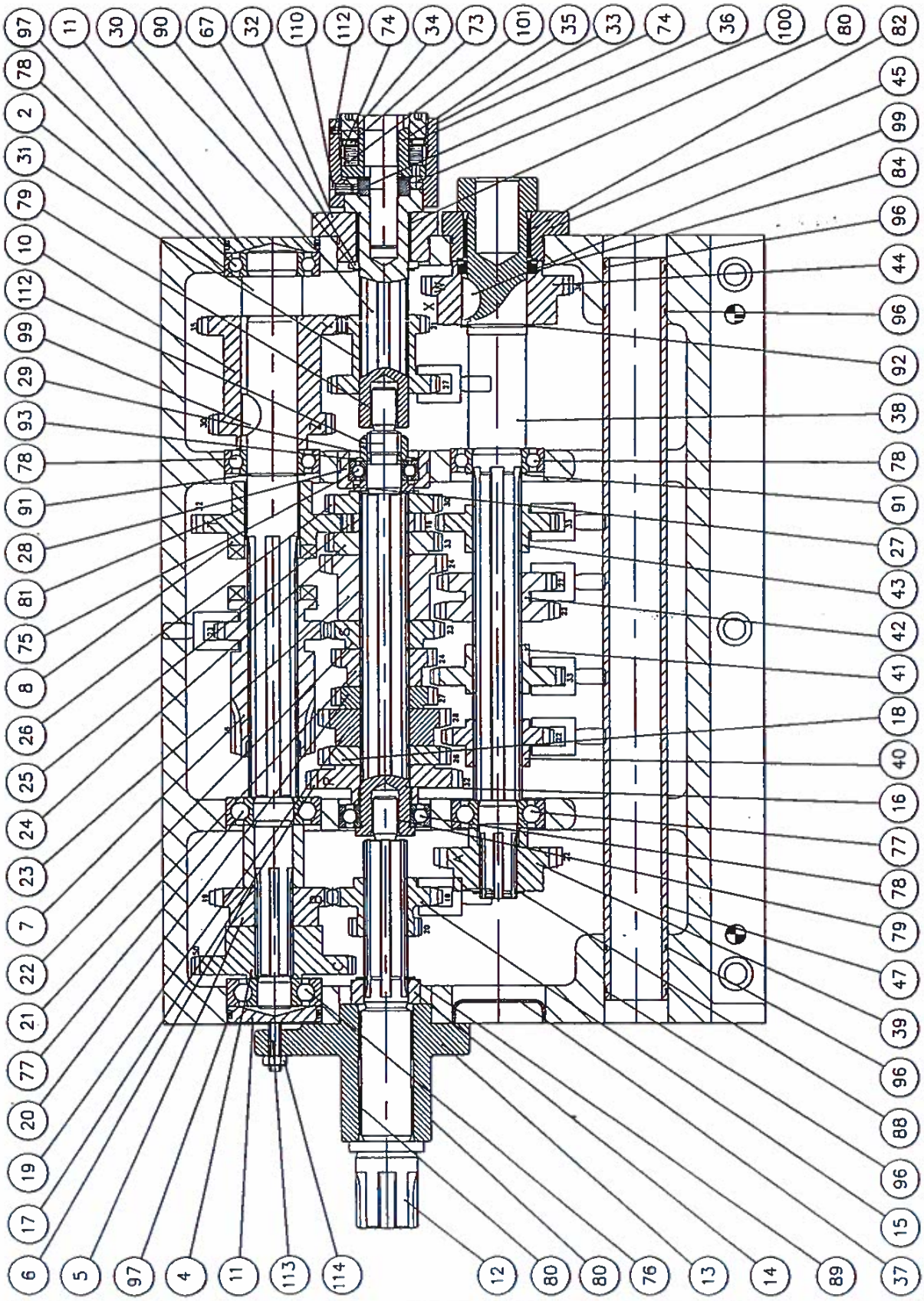
ITEM 22 = 28 TEETH GEAR
ITEM 23 = 33 TEETH GEAR
ITEM 24 = 36 TEETH GEAR
ITEM 25 = 44 TEETH GEAR
ITEM 26 = 63 TEETH GEAR
ITEM 27 = 66 TEETH GEAR
ITEM 28 = 72 TEETH GEAR
ITEM 29 = 84 TEETH GEAR
ITEM 31 = 95 TEETH GEAR
ITEM 32 = 96 TEETH GEAR
ITEM 37 = 99 TEETH GEAR

CHANGE WHEEL ASSEMBLY

A155 - 0603

Item No.	Description	Part No.
1	SWING FRAME SPACER	D708 - 0515
2	SPACER	D708 - 0474
3	STUD	D048 - 0157
4	SWING FRAME	D720 - 0027
7	WASHER M12	B117 - 0012
9	HEXAGON HEADED SCREW M12x25	B166 - 0097
10	HEXAGON HEADED SCREW M12x60	B166 - 0103
11	SWING FRAME SPACER	D708 - 0516
12	WASHER	D708H0008
13	'T' NUT	D408H0006
14	CHANGE WHEEL SHAFT SLEEVE	D699 - 0793
15	WASHER	D408H0010
16	NUT	D408H0007
17	SPACER	D408H0008
18	CHANG WHEEL SLEEVE	D704 - 0123
19	CHANGE WHEEL WASHER	D931 - 0349
20	CONCAVE LUBRICATOR 6mm	B454 - 2004
22	28T 1.75 MOD. CHANGE WHEEL	D344 - 1287
23	33T 1.75 MOD. CHANGE WHEEL	D344 - 1284
24	36T 1.75 MOD. CHANGE WHEEL	D344 - 1285
25	44T 1.75 MOD. CHANGE WHEEL	D344 - 1286
26	63T 1.75 MOD. CHANGE WHEEL	D344 - 1249
27	66T 1.75 MOD. CHANGE WHEEL	D344 - 1250
28	72T 1.75 MOD. CHANGE WHEEL	D344 - 1251
29	84T 1.75 MOD. CHANGE WHEEL	D344 - 1252
31	95T 1.75 MOD. CHANGE WHEEL	D344 - 1254
32	96T 1.75 MOD. CHANGE WHEEL	D344 - 1255
37	99T 1.75 MOD. CHANGE WHEEL	D344 - 1256
44	LOCK WASHER 1/2"	B116 - 2228
47	O RING DOWTY 202-511	B413 - 0091
48	GLACIER BUSH MB1820DU	B311 - 1544

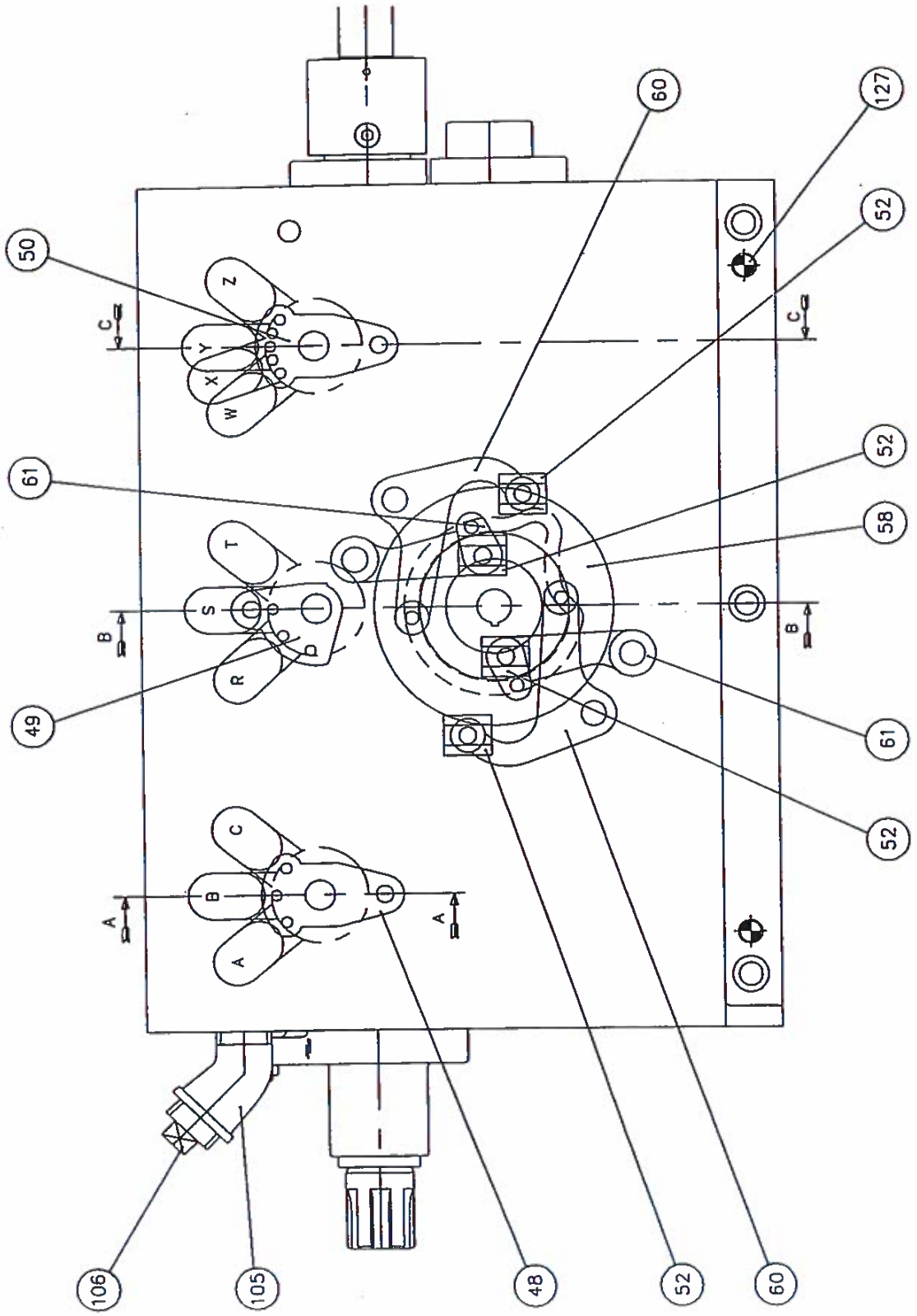
GEARBOX ASSEMBLY



GEARBOX ASSEMBLY

Item No.	Description	Part No.
1	GEARBOX CASTING	D403H001.1
2	TOP SHAFT	D403H002.1
3	GEARBOX GASKET	GA - 0050
4	50T GEAR (TOP SHAFT)	D403H004.1
5	19T GEAR (TOP SHAFT)	D403H005.1
6	SPACER (TOP SHAFT)	D403H006.1
7	23/16T GEAR (TOP SHAFT)	D403H007.1
8	32T GEAR (TOP SHAFT)	D403H008.1
10	30/35T GEAR (TOP SHAFT)	D403H010.1
11	BEARING LOCK BUSH	D403H011.1
12	INPUT SHAFT	D403H012.1
13	HOUSING (INPUT SHAFT)	D403H013.1
14	SPACER (INPUT SHAFT)	D403H014.1
15	20/19T GEAR (INPUT SHAFT)	D403H015.1
16	MIDDLE SHAFT	D403H016.1
17	32T GEAR (MIDDLE SHAFT)	D403H017.1
18	26T GEAR (MIDDLE SHAFT)	D403H018.1
19	28T GEAR (MIDDLE SHAFT)	D403H019.1
20	27T GEAR (MIDDLE SHAFT)	D403H020.1
21	24T GEAR (MIDDLE SHAFT)	D403H021.1
22	23T GEAR (MIDDLE SHAFT)	D403H022.1
23	24T GEAR (MIDDLE SHAFT)	D403H023.1
24	33T GEAR (MIDDLE SHAFT)	D403H024.1
25	16T GEAR (MIDDLE SHAFT)	D403H025.1
26	30T GEAR (MIDDLE SHAFT)	D403H026.1
27	SPACER (MIDDLE SHAFT)	D403H027.1
28	BEARING HOUSING (MIDDLE SHAFT)	D403H028.1
29	ADJUSTING NUT (MIDDLE SHAFT)	D403H029.1
30	OUTPUT SHAFT	D403H030.1
31	27/21T GEAR (OUTPUT SHAFT)	D403H031.1
32	BEARING HOUSING (OUTPUT SHAFT)	D403H032.1
33	HOUSING (TORQUE LIMITER)	D403H033.1
34	ADJUSTING NUT (TORQUE LIMITER)	D403H034.1
35	FRICTION SLEEVE (TORQUE LIMITER)	D403H035.1
36	INNER RING (TORQUE LIMITER)	D403H036.1
37	PLUG	PB - 0060
38	BOTTOM SHAFT	D403H038.1
39	22T GEAR (BOTTOM SHAFT)	D403H039.1
40	22T GEAR (BOTTOM SHAFT)	D403H040.1
41	33T GEAR (BOTTOM SHAFT)	D403H041.1
42	22/22T GEAR (BOTTOM SHAFT)	D403H042.1
43	33T GEAR (BOTTOM SHAFT)	D403H043.1
44	36T GEAR (BOTTOM SHAFT)	D403H044.1
45	BEARING HOUSING (BOTTOM SHAFT)	D403H045.1
47	SEALING TUBE	D403H047.1
48	SELECTOR LEVER (A,B,C)	D403H048.1
49	SELECTOR LEVER (R,S,T)	D403H049.1
50	SELECTOR LEVER (W,X,Y,Z)	D403H050.1
51	SELECTOR SHAFT	D403H051.1
52	GEAR SHIFTER	D403H052.1

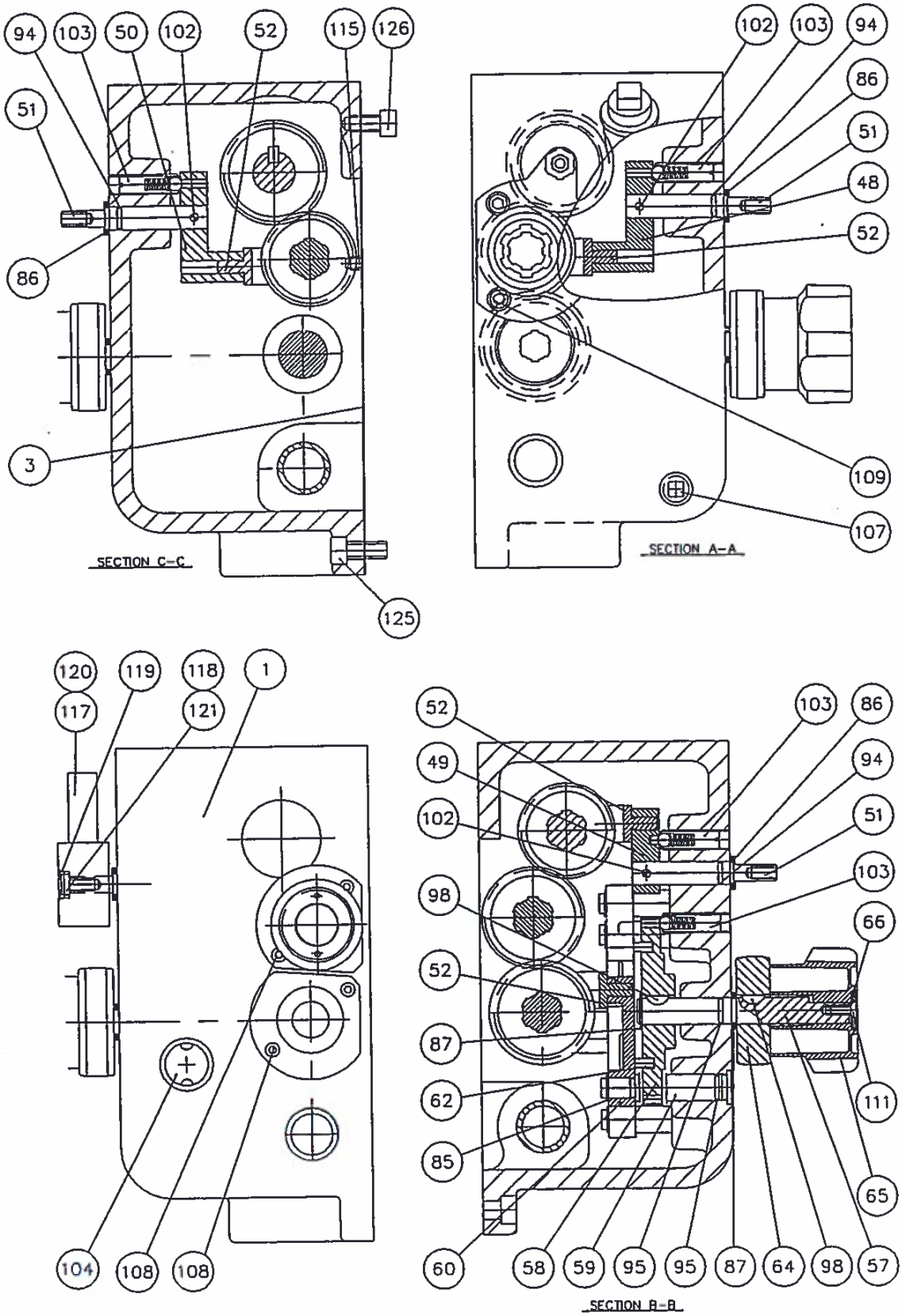
GEARBOX ASSEMBLY



GEARBOX ASSEMBLY

Item No.	Description	Part No.
57	SHAFT (SELECTOR DIAL)	D403H057.2
58	SELECTOR CAM	D403H058.1
59	SELECTOR SHAFT	D403H059.1
60	SELECTOR LEVER (CAM)	D403H060.1
61	SELECTOR LEVER (CAM)	D403H061.1
62	GROOVED PIN (CAM SELECTOR) D403H062.1	FT - 0620
64	DIAL INNER RING	D403H064.1
65	SELECTOR DIAL	D702H090.1
66	WASHER	D402H111.1
67	WASHER	D001H2075
73	BEARING INA AXK 2542	BC - 0130
74	THRUST WASHER AS 2542	BC - 0120
75	BEARING FAG 6003	BG - 0100
76	BEARING FAG 6303	BG - 0020
77	BEARING FAG 6204	BG - 0060
78	BEARING FAG 6005	BG - 0050
79	GLACIER BUSH MB 1215 DU	BF - 0070
80	GLACIER BUSH MB 2525 DU	BF - 0150
81	GLACIER BUSH MB 2530 DU	BF - 0160
82	GLACIER BUSH MB 3020 DU	BF - 0040
84	HEADLAND V - RING SEAL	OB - 0060
85	ANDERTON CIRCLIP REF. D1400 - 0120	RA - 0090
86	ANDERTON CIRCLIP REF. D1400 - 0140	RA - 0100
87	ANDERTON CIRCLIP REF. D1400 - 0160	RA - 0120
88	ANDERTON CIRCLIP REF. D1400 - 0190	RA - 0130
89	ANDERTON CIRCLIP REF. D1400 - 0220	RA - 0150
90	ANDERTON CIRCLIP REF. D1400 - 0250	RA - 0170
91	SALTERFIX REF. 5103 - 0100	RA - 0370
92	SALTERFIX REF. 5103 - 0118	RA - 0380
93	INTERNAL SNAP RING INA REF BR35	RA - 0020
94	'O' RING RM0111 - 16	OA - 0040
95	'O' RING RM0131 - 16	OA - 0060
96	'O' RING RM0291 - 16	OA - 0170
97	'O' RING RM0415 - 30	OA - 0220
98	WOODRUFF KEY 3x5x13 DIA.	KA - 0170
99	WOODRUFF KEY 6x9x22DIA.	KA - 0190
100	STEEL BALL 7 DIA.	UB - 0007
101	ANDERTON DISC SPRING 39.6x25.5x1	FR - 0170
102	SPIROL PIN 24x5 HBK	FT - 0230
103	LECSHORN BALL DETENT SCREW REF SP996	FS - 0050
104	OILSIGHT TELCAN IC 4810	WA - 0020
105	45° 3/4" BSP MALE/FEMALE ELBOW	PB - 0050
106	3/4" BSP PLUG	PB - 0020
107	1/2" BSP PLUG	PB - 0010
108	HEXAGON SOCKET CAP HEAD SCREW M5x16	FS - 0114
109	HEXAGON SOCKET CAP HEAD SCREW M8x30	FS - 0166
110	HEXAGON SOCKET C/SUNK SCREW M5x12	FS - 0436
111	HEXAGON SOCKET C/SUNK SCREW M6x16	FS - 0442
112	HEXAGON SOCKETCUP POINT SET SCREW M4x4	FS - 0486
113	HEXAGON SOCKETCUP POINT SET SCREW M6x25	FS - 0508
114	NUT M6	FS - 0918

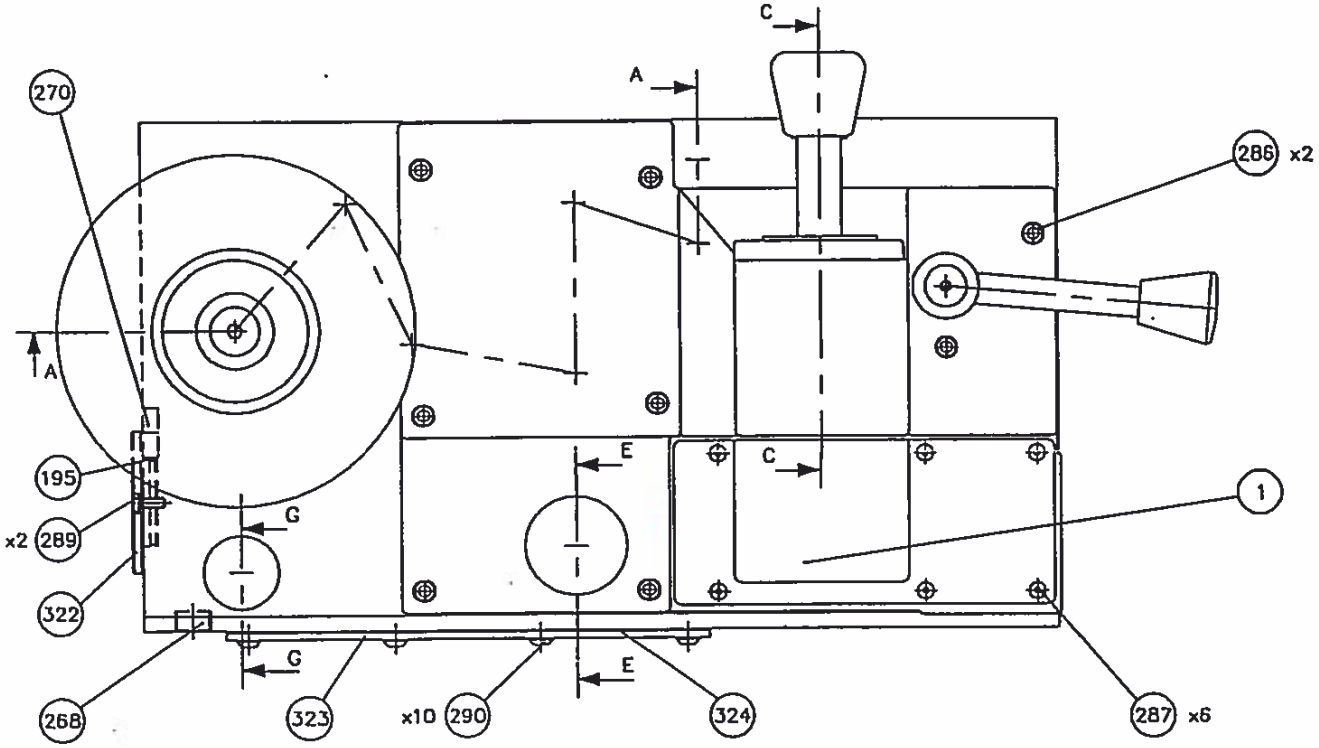
GEARBOX ASSEMBLY

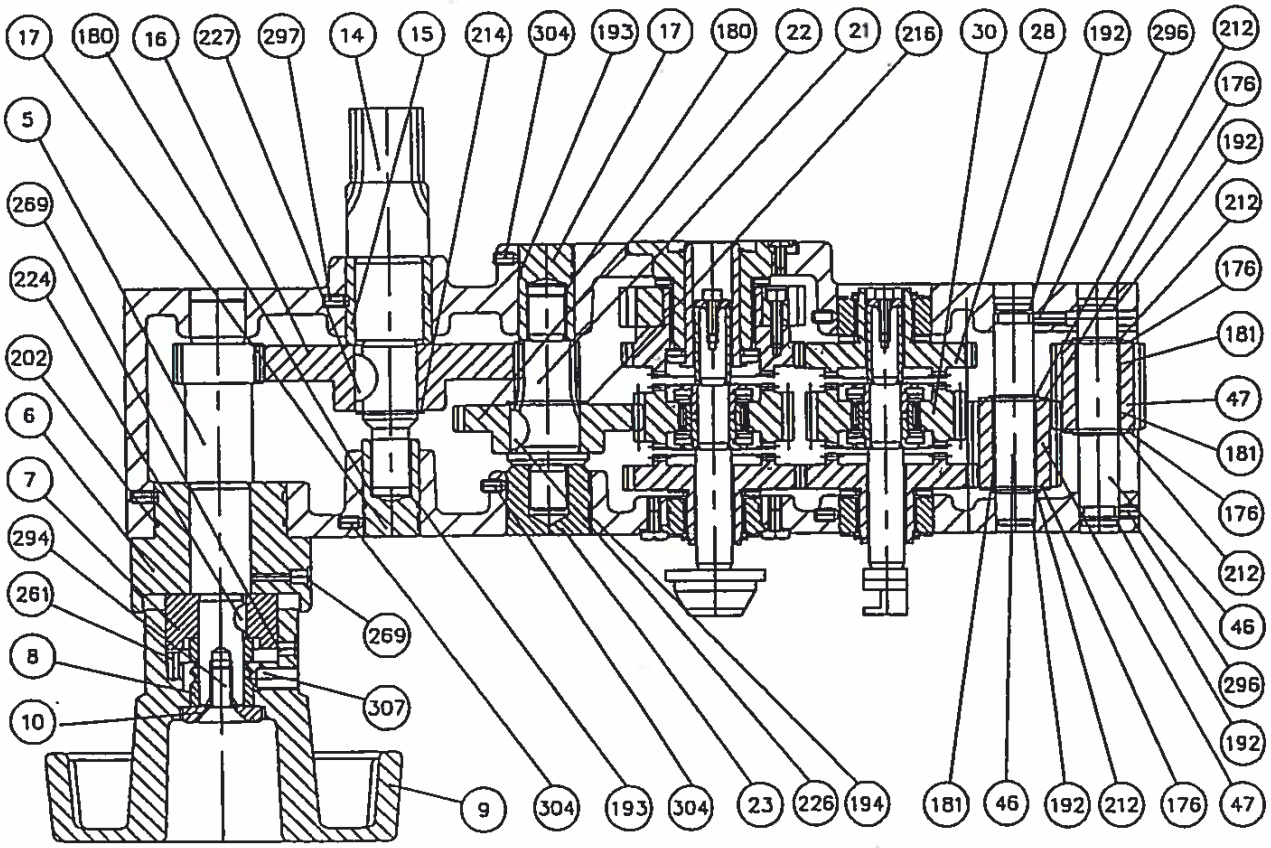


GEARBOX ASSEMBLY

Item No.	Description	Part No.
115	HEXAGON SOCKET DOG POINT SET SCREW M8x10	FS - 0790
117	HANDLE	D382 - 0137
118	NYLOC PAN HEAD SCREW M8 x 16	FS - 0723
119	C380 CAP BLUE	ED - 1550
120	HANDLE	D403H053.2
121	HEXAGON SOCKET PAN HEAD SCREW M8 X 16 (D403H054.1)	FS - 0714
125	HEXAGON SOCKET CAP HEAD SCREW M10 X 25	FS - 0184
126	HEXAGON SOCKET CAP HEAD SCREW M10 X 45	FS - 0192
127	SPIROL PIN M10 X 30 HBK	FT - 0470

MASCOT/MASTIFF VS APRON ASSEMBLY (1)

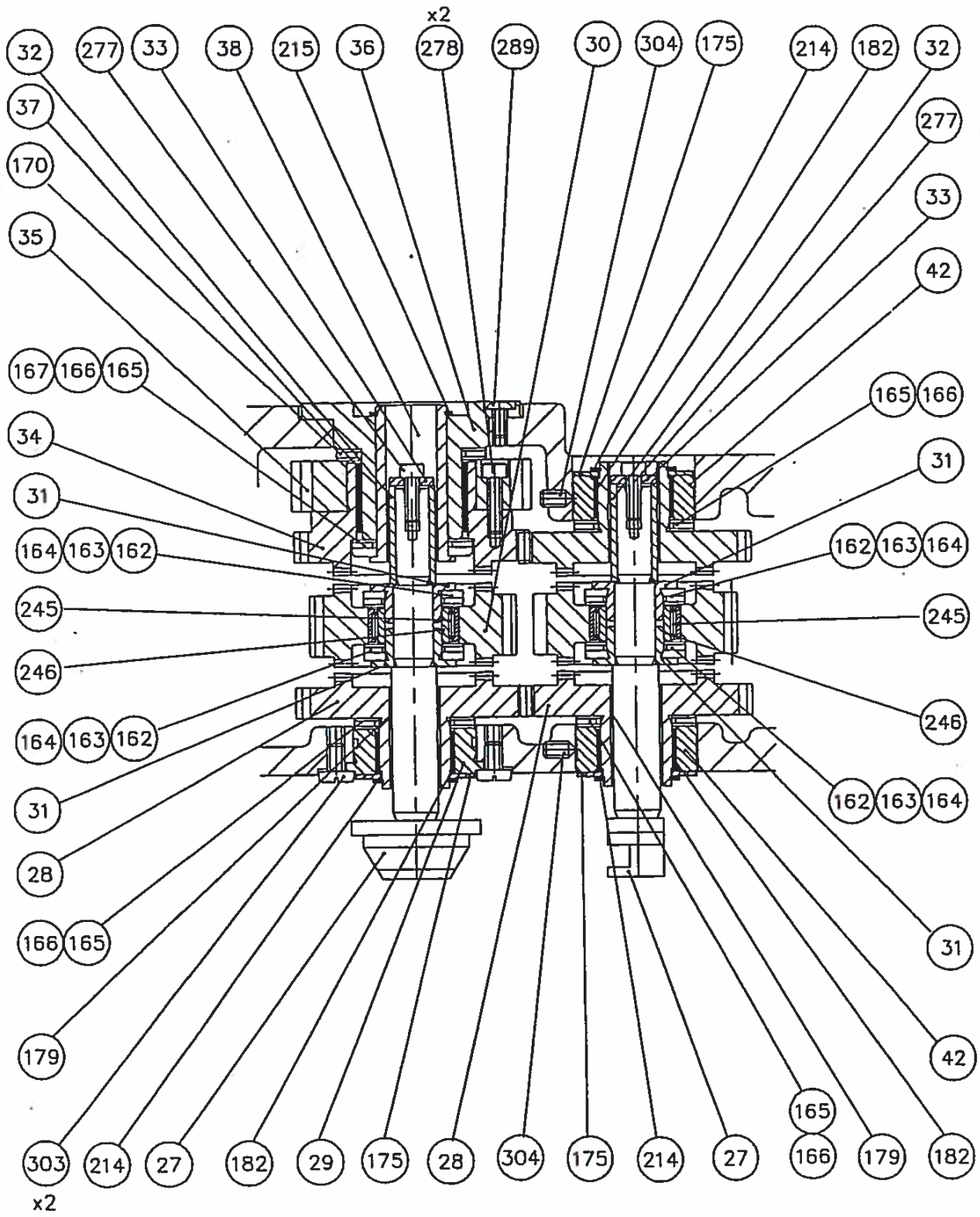




SECTION A-A WITH FRONT COVER REMOVED

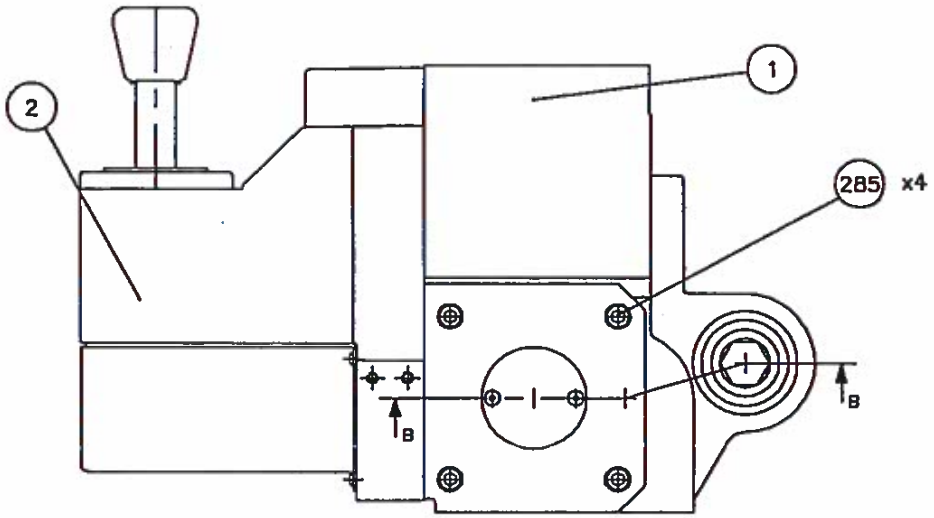
Item No.	Description	Part No.
1	APRON CASTING	D404H200.1
2	FRONT COVER AND LEVER HOUSING	D404H201.1
3	CLC APRON KIT	A950 - 0024A
5	21T GEAR SHAFT	D404H156.1
6	ARRON DIAL KEEP	D404H061.1
7	HANDWHEEL SPIGOT	D404H068.1
8	DETENT SPACER	D404H057.1
9	HANDWHEEL	D383 - 0115
10	WASHER	D407H012.1
14	10T RACK PINION	D404H172.1
15	BUSH (BM5x40 MODIFIED)	D404H171.1
16	66T GEAR	D404H161.1
17	SUPPORT BUSH	D404H153.1
21	14T GEAR SHAFT	D404H168.1
22	40T GEAR	D404H167.1
23	SUPPORT BUSH	D404H154.1
27	CLUTCH SHAFT	D404H160.1
28	39T CLUTCH GEAR	D404H158.1
29	SUPPORT BUSH	D404H151.1
30	39T CLUTCH GEAR	D404H157.1
31	FLANGED BUSH	D404H169.1
32	SPACER	D404H165.1
33	WASHER	D404H170.1
34	39T CLUTCH GEAR	D404H159.1
35	WORM WHEEL	D404H166.1
36	HOUSING	D404H162.1
37	BEARING (MODIFY MB3530DU)	D404H191.1
38	SLEEVE	D404H164.1
42	SUPPORT BUSH	D404H152.1
46	19T GEAR SHAFT	D404H163.1
47	19T GEAR	D404H155.1
51	FEED SHAFT PINION	D404H254.1
52	SUPPORT BUSH	D404H187.1
56	OUTPUT SHAFT	D404H185.1
57	OUTER SUPPORT BUSH	D404H181.1
58	WORM GEAR SPACER	D404H182.1
59	WORM GEAR	D404H173.1
60	INNER SUPPORT BUSH	D404H183.1
61	29T CLUTCH GEAR	D404H179.1
62	MODIFIED OILITE BUSH	D404H190.1
63	SPRAG CLUTCH SPACER	D404H189.1
64	42T SPRAG GEAR	D404H180.1
65	DOG CLUTCH	D404H184.1

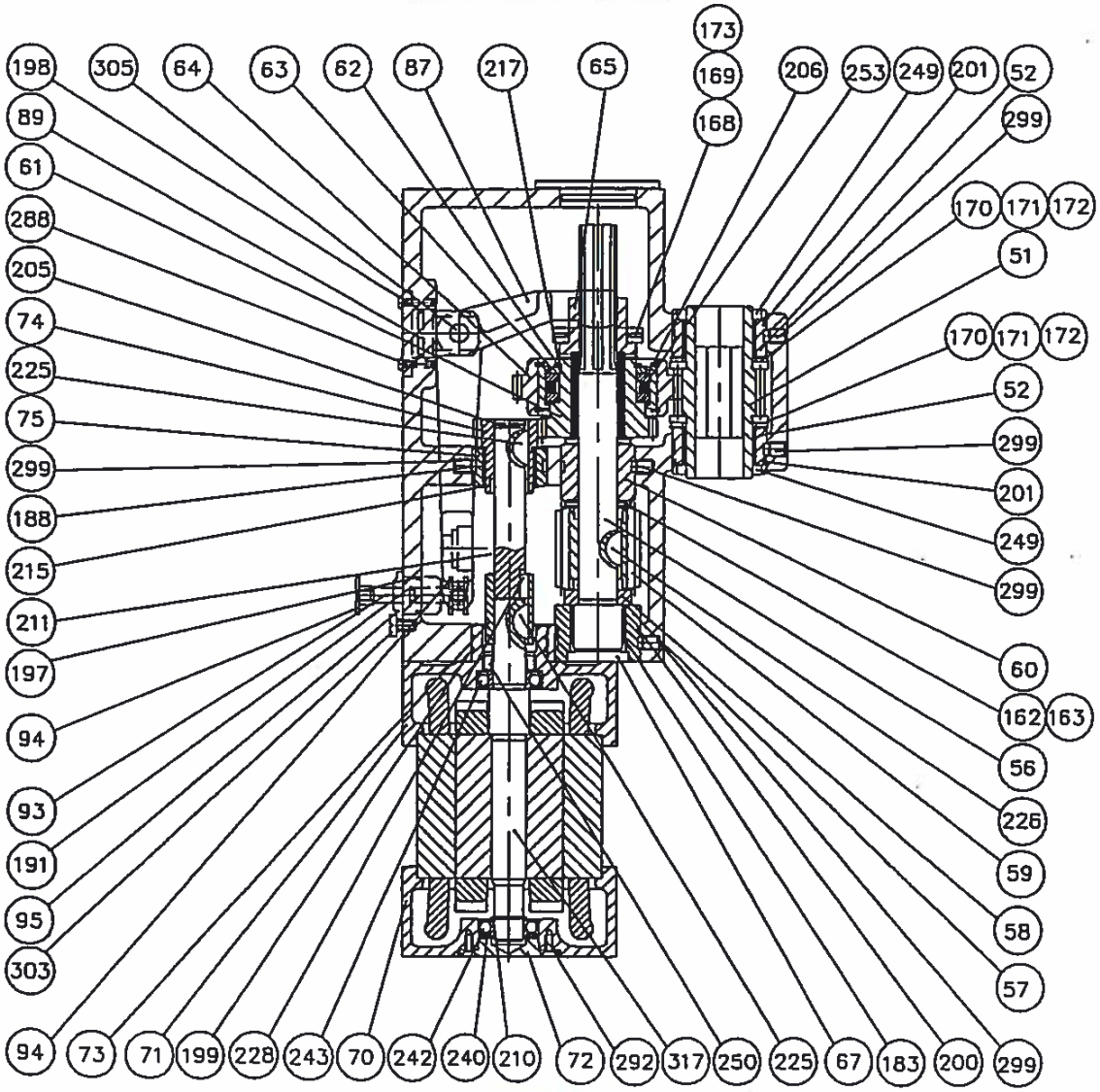
MASCOT/MASTIFF VS APRON ASSEMBLY (2)



Item No.	Description	Part No.
67	PLUG	D404H188.1
70	OUTER MOTOR END CAP	D404H257.1
71	INNER MOTOR END CAP	D404H256.1
72	END CAP FLANGE	D404H174.1
73	LOCATING COLLAR	D404H175.1
74	17T GEAR	D404H177.1
75	SUPPORT BUSH	D404H178.1
79	APRON KNOCK OFF SHAFT	D404H247.1
80	ADJUSTING KNOB	D404H052.1
81	FLANGED BUSH	D404H248.1
82	GUIDE ROD NUT	D404H250.1
83	ADJUSTER NUT	D404H249.1
84	DISC	D404H053.1
85	SPACER	D404H199.1
87	KNOCK OFF LEVER	D404H216.1
88	TRIP LEVER PIN	D404H238.1
89	KNOCK OFF LEVER MOUNTING SPIGOT	D404H234.1
93	SHAFT	D404H243.1
94	BOBBIN	D404H245.1
95	LOCATION BUSH	D404H242.1
97	TRIP LEVER PIN	D404H238.1
98	TRIP LATCH LEVER	D404H235.1
99	TRIP LEVER MOUNTING BLOCK	D404H237.1
100	TRIP LEVER PIVOT	D404H236.1
101	LOCKING PIECE	D404H065.1
102	PIN	D404H054.1
103	ROLLER	D404H056.1
104	LEVER SPRING	D404H048.1
105	PIVOT	D404H066.1
106	PLUNGER	D404H222.1
107	LEVER SPRING PIVOT	D404H224.1
108	LEVER MOUNTING B;LOCK	D404H223.1
109	LEVER PIN LATCH	D404H226.1
110	WASHER 21 ODx8 ID	D404H193.1
111	LATCH LEVER BUSH	D404H225.1
112	SURFACING FEED LEVER LATCH	D404H221.1
113	SLIDING FEED LEVER LATCH	D404H220.1
114	FLAT SPRING	D404H196.1
117	KNOB	D443 - 0038
118	COVER DISC	D233 - 0016
119	JOYSTICK GUIDE BUSH	D404H246.1
120	JOYSTICK STEM	D404H240.1
121	JOYSTICK COVER	D404H239.1
122	JOYSTICK BUSH	D404H241.1

MASCOT/MASTIFF VS APRON ASSEMBLY (3)

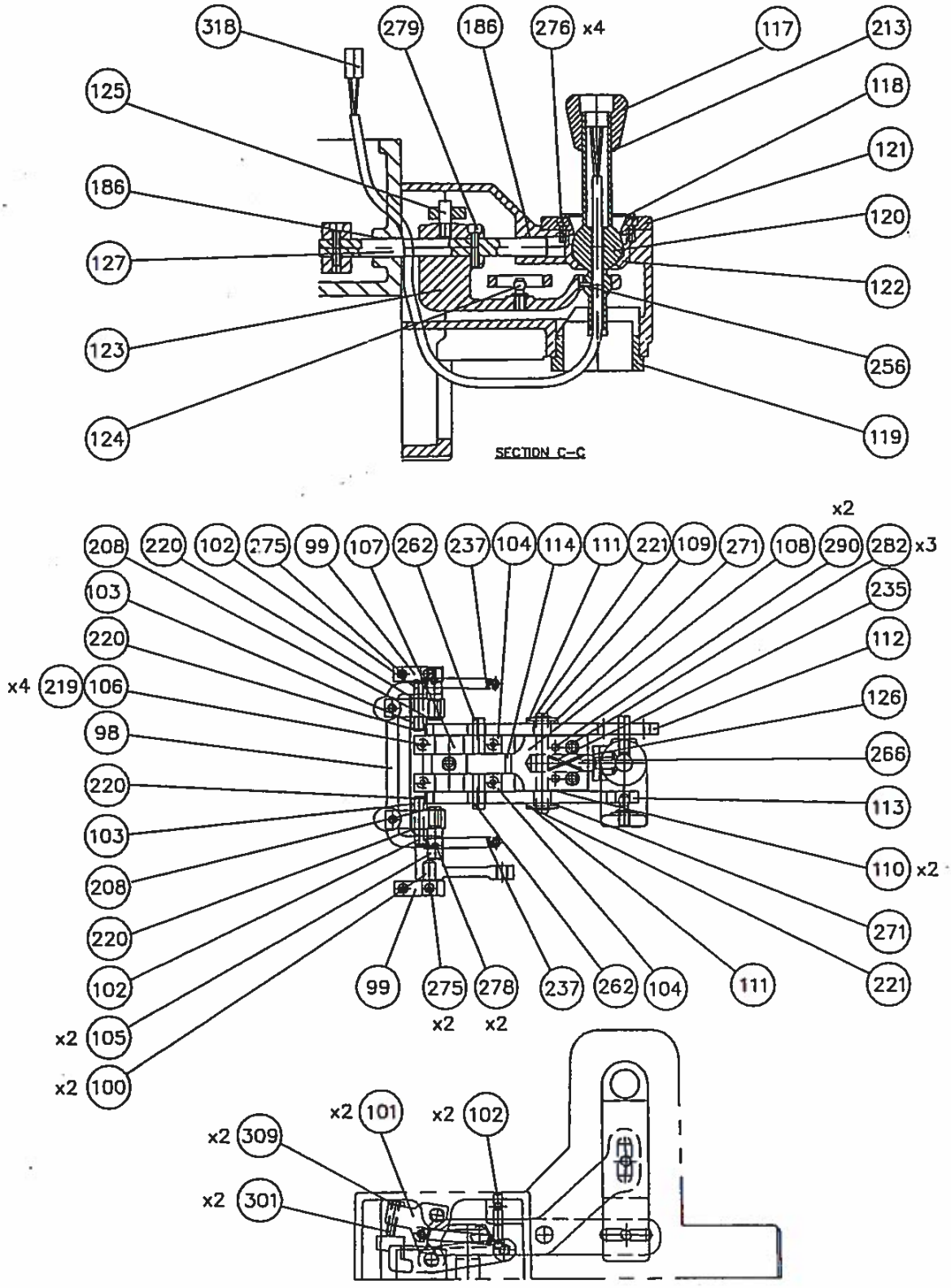




SECTION B-B

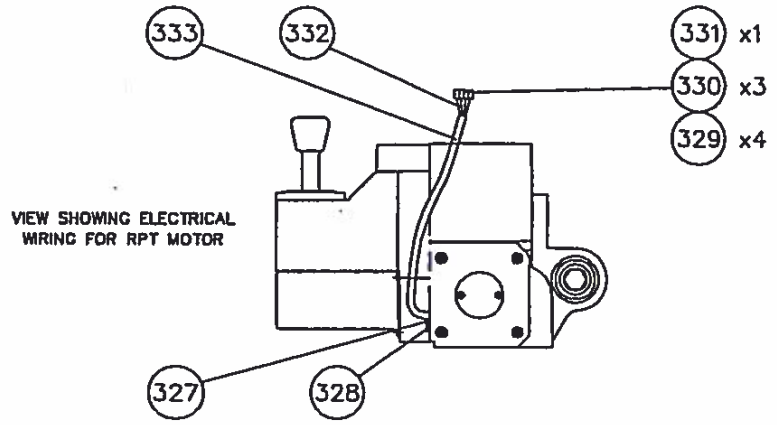
Item No.	Description	Part No.
123	GEAR SELECTOR	D404H215.1
124	LATCH LEVER SHIFTER PEG	D404H219.1
125	LATCH LEVER SHIFTER PEG	D404H218.1
126	CENTRALISING BUSH	D404H227.1
127	GEAR SELECTOR SHAFT	D404H228.1
128	INTERLOCK HUB	D404H229.1
129	INTERLOCK PIN	D404H230.1
133	SPIGOT	D404H231.1
134	INTERLOCK	D404H232.1
138	OPERATING SHAFT	D404H233.1
139	OPERATING LEVER STEM	D404H013.1
140	SPACER	D404H082.1
141	LEADNUT HOUSING	D404H202.1
142	SHORT STRIP	D404H209.1
143	LONG STRIP	D404H208.1
144	SPRING HOUSING	D404H210.1
145	TRANSFER BLOCK	D404H213.1
146	STOP PIECE	D404H214.1
147	BACK PLATE	D404H211.1
148	**METRIC** LEAD NUT	D404H203.1
149	**IMPERIAL** LEAD NUT	D404H204.1
150	REAR STRIP	D404H207.1
151	SHIFTER PEG	D404H212.1
154	COVER PLATE	D404H251.1
155	GASKET	D404H252.1
156	PLUG	D404H192.1
157	TERMINAL RAIL COVER	D404H253.1
162	THRUST BEARING AXK 2035	B337 - 5011
163	BEARING WASHER AS 2035	B337 - 5012
164	BEARING WASHER LS 2035	B337 - 5013
165	THRUST BEARING AXK 2542	B337 - 5016
166	BEARING WASHER AS 2542	B337 - 5017
167	BEARING WASHER LS 2542	B337 - 5020
168	THRUST BEARING AXK 3047	B337 - 5021
169	BEARING WASHERLS 3047	B337 - 5023
170	THRUST BEARING AXK 3552	B337 - 5026
171	BEARING WASHER AS3552	B337 - 5027
172	BEARING WASHER LS 3552	B337 - 5029
173	BEARING WASHER	B337 - 5022
175	THRUST WASHER WC22DU	B311 - 8134
176	THRUST WASHER WC16DU	B311 - 8132
179	GLACIER BUSH MB16x15DU	B311 - 2209
180	GLACIER BUSH MB16x25DU	B311 - 1540
181	GLACIER BUSH MB18x15DU	B311 - 1543
182	GLACIER BUSH MB25x15DU	B311 - 1562
183	GLACIER BUSH MB25x20DU	B311 - 1563
184	GLACIER BUSH MB35x20DU	B311 - 2210

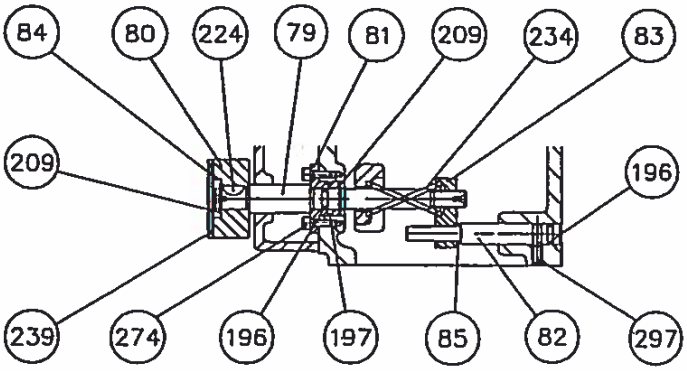
MASCOT/MASTIFF VS APRON ASSEMBLY (4)



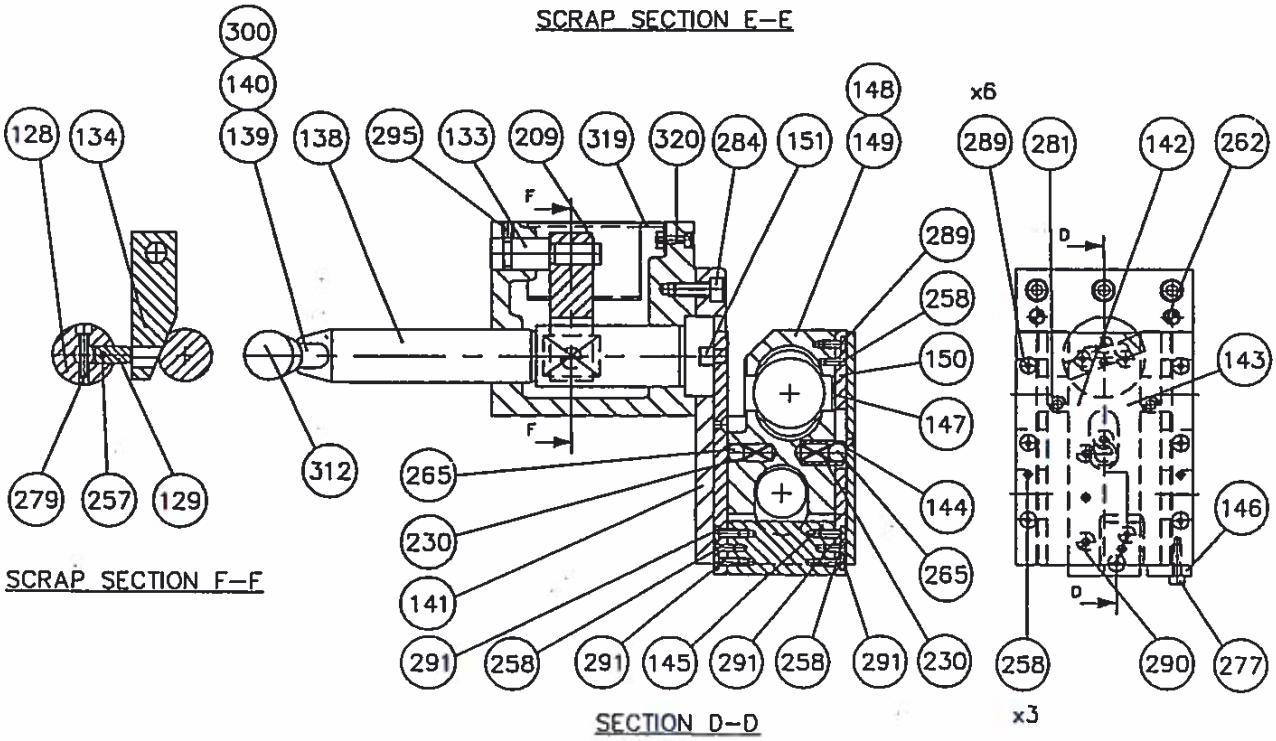
Item No.	Description	Part No.
186	GLACIER BUSH PM12x20 DX	B311 - 1690
188	GLACIER FLANGED BUSH F MB25x215 DU	B311 - 2251
191	'O' RING GACO RM0051-16	B413 - 0051
192	'O' RING GACO RM0151-16	B413 - 0151
193	'O' RING GACO RM0221-16	B413 - 0221
194	'O' RING GACO RM0351-16	B413 - 0351
195	'O' RING GACO RM0371-16	B413 - 0371
196	'O' RING GACO RM0076-24	B413 - 0076
197	'O' RING GACO RM0156-24	B413 - 0156
198	'O' RING GACO RM0216-24	B413 - 0216
199	'O' RING GACO RM0376-24	B413 - 0376
200	'O' RING GACO RM0396-24	B413 - 0396
201	'O' RING GACO RM0446-24	B413 - 0446
202	'O' RING GACO RM0546-24	B413 - 0546
205	INTERNAL CIRCLIP D1300-0160	B363 - 0416
206	INTERNAL CIRCLIP D1300-0620	B361 - 5052
208	EXTERNAL CIRCLIP D1400-0080	B363Y0008
209	EXTERNAL CIRCLIP D1400-0120	B363 - 0012
210	EXTERNAL CIRCLIP D1400-0150	B363 - 0015
211	EXTERNAL CIRCLIP D1400-0160	B363 - 0016
212	EXTERNAL CIRCLIP D1400-0180	B363 - 0018
213	EXTERNAL CIRCLIP D1400-0200	B363 - 0020
214	EXTERNAL CIRCLIP D1400-0240	B363 - 0024
215	EXTERNAL CIRCLIP D1400-0250	B363 - 0025
216	EXTERNAL CIRCLIP D1400-0290	B363 - 0029
217	EXTERNAL CIRCLIP D1400-0400	B363 - 0040
219	EXTERNAL CIRCLIP D1500-0032	B363 - 0304
220	EXTERNAL CIRCLIP D1500-0040	B363 - 0303
221	EXTERNAL CIRCLIP D1500-0060	B363 - 0305
224	WOODRUFF KEY 3x5x13	B343 - 2002
225	WOODRUFF KEY 4x7.5x19	B343 - 2005
226	WOODRUFF KEY 5x7.5x19	B343 - 2007
227	WOODRUFF KEY 8x9x22	B343 - 2013
228	RECTANGULAR KEY 4x4x12	B343 - 5016
230	COMPRESSION SPRING SG279	B365 - 1575
231	COMPRESSION SPRING SG379	B365 - 1578
232	COMPRESSION SPRING SG384	B365 - 1577
234	COMPRESSION SPRING FLEXO M407110	B366 - 0423
235	COMPRESSION SPRING FLEXO M226005	B366 - 0424
237	TENSION SPRING SG 380	B365 - 4402
239	SPRING CLIP	B236 - 6030
240	DISC SPRING ANDERTON AL 31.7x20.4x0.4	B365 - 6311

MASCOT / MASTIFF VS APRON ASSEMBLY (5)





SCRAP SECTION E–E

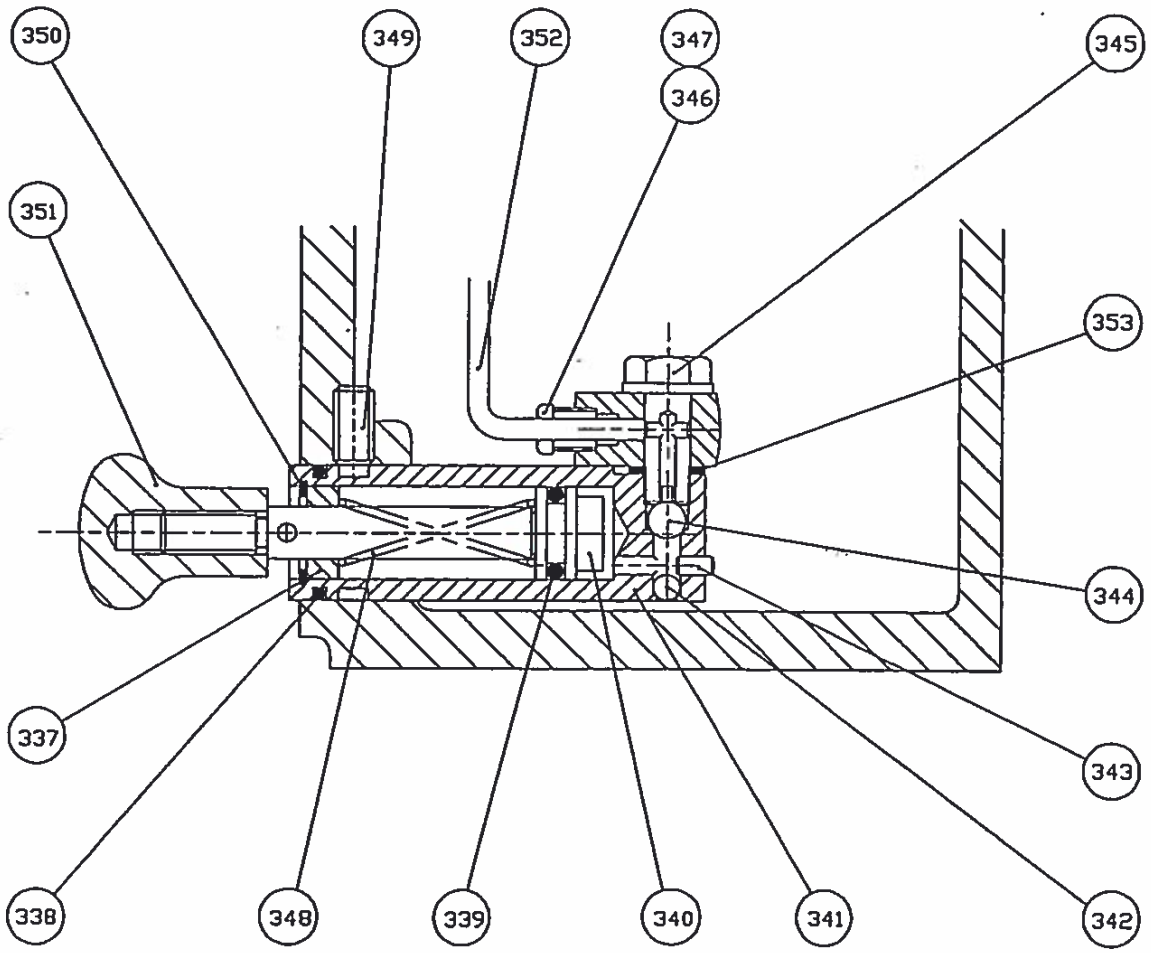


SCRAP SECTION F–F

SECTION D–D

Item No.	Description	Part No.
242	BALL BEARING 6002-2Z	B315 - 0410
243	BALL BEARING 6003-2Z	B315 - 0411
245	NEEDLE ROLLER BEARING (DRAWN CUP) HK2512	B337 - 1118
246	INA INNER RING LR 20x25x12.5	B337 - 2411
249	OIL SEAL INA G35x45x4	B414 - 3196
250	GACO DPSM 17287	B414 - 3019
253	SPRAG CLUTCH FD40	B344 - 8852
256	3 DIA. x8 SPIROL PIN	B111 - 5054
257	3 DIA. x16 SPIROL PIN	B111 - 5058
258	4 DIA. x12 SPIROL PIN	B111 - 5072
259	6 DIA. x16 SPIROL PIN	B111 - 5107
260	4 DIA. x12 SPIROL PIN	B111 - 5287
261	5 DIA. x12 SPIROL PIN	B111 - 6032
262	8 DIA. x25 SPIROL PIN	B111 Y6048
265	10 DIA. STEEL BALL	B326 - 9005
266	12 DIA. STEEL BALL	B326 - 9006
268	3/8" BSP PLUG	B424 - 2813
269	6 DIA. OIL NIPPLE	B454 - 2004
270	OIL WINDOW	B454 - 1012
271	12 DIA. CRINKLE WASHER	B117 - 0110
274	HEXAGON SOCKET CAP HEAD SCREW M4x12	B163 - 0015
275	HEXAGON SOCKET CAP HEAD SCREW M4x25	B163Y0018
276	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163 - 0026
277	HEXAGON SOCKET CAP HEAD SCREW M5x16	B163 - 0027
278	HEXAGON SOCKET CAP HEAD SCREW M5x20	B163 - 0028
279	HEXAGON SOCKET CAP HEAD SCREW M5x25	B163 - 0029
281	HEXAGON SOCKET CAP HEAD SCREW M6x20	B163 - 0038
282	HEXAGON SOCKET CAP HEAD SCREW M6x50	B163 - 0044
283	HEXAGON SOCKET CAP HEAD SCREW M6x60	B163 - 0046
284	HEXAGON SOCKET CAP HEAD SCREW M8x20	B163 - 0053
285	HEXAGON SOCKET CAP HEAD SCREW M8x160	B163 - 0161
286	HEXAGON SOCKET CAP HEAD SCREW M6x35	B163 - 0041
287	HEXAGON SOCKET BUTTON HEAD SCREW M4x8	B163 - 1803
288	HEXAGON SOCKET BUTTON HEAD SCREW M4x12	B163 Y1805
289	HEXAGON SOCKET BUTTON HEAD SCREW M5x10	B163 - 1807
290	HEXAGON SOCKET BUTTON HEAD SCREW M6x12	B163 - 1814
291	HEXAGON SOCKET BUTTON HEAD SCREW M5x12	B163 - 1808
292	HEXAGON SOCKET C/SUNK SCREW M4x8	B163 - 1006
294	HEXAGON SOCKET C/SUNK SCREW M10x25	B163 - 1041
295	HEXAGON SOCKET DOG POINT SET SCREW M6x8	B163 - 1740
296	HEXAGON SOCKET DOG POINT SET SCREW M6x10	B163 - 1741
297	HEXAGON SOCKET DOG POINT SET SCREW M6x12	B163 - 1742

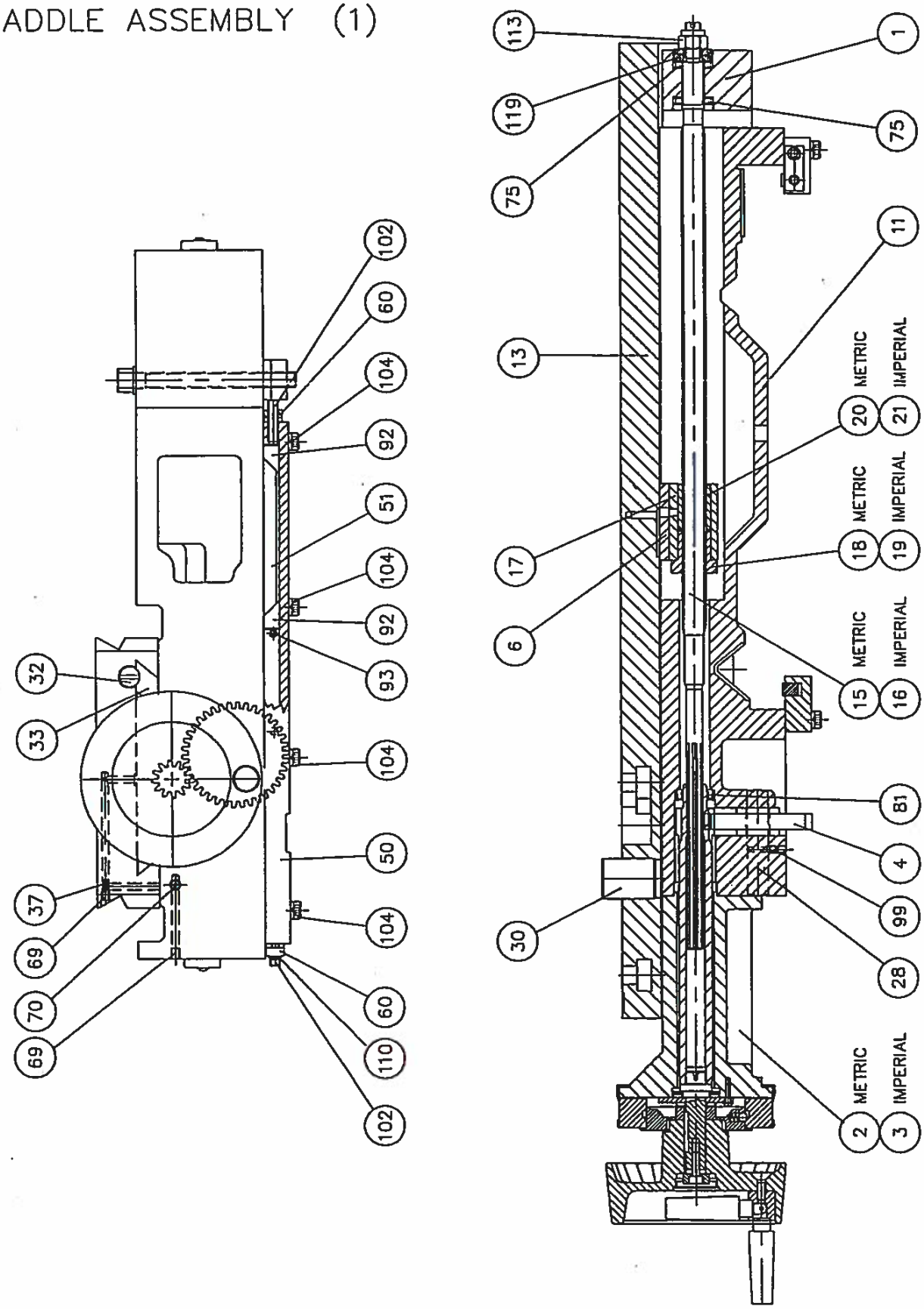
MASCOT/MASTIFF VS APRON ASSEMBLY (6)



SECTION G – G

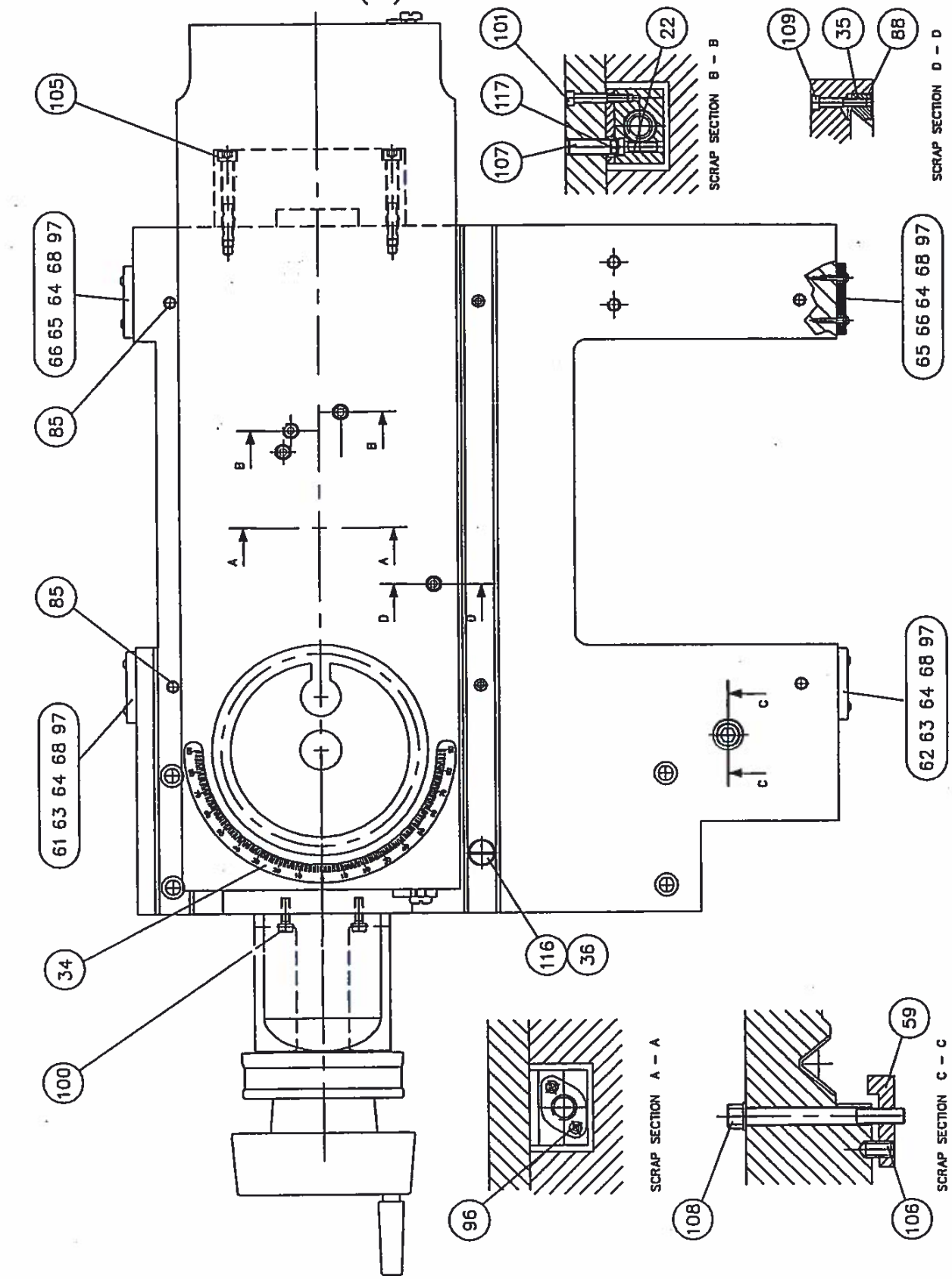
Item No.	Description	Part No.
299	HEXAGON SOCKET DOG POINT SET SCREW M8x12	B163 - 1751
300	HEXAGON SOCKET CUP POINT SET SCREW M6x8	B163 - 1519
301	HEXAGON SOCKET CUP POINT SET SCREW M6x25	B163 - 1523
303	HEXAGON SOCKET PAN HEAD SCREW (STAINLESS) M6x8	B165 - 0132
304	HEXAGON SOCKET CONE POINT SET SCREW M6x10	B163 - 1650
305	SHOULDER SCREW M8x10x40	B163 - 1865
307	BALL DETENT SCREW M10 SP1208	B169 - 0001
309	M6 LOCKNUT	B147 - 9169
311	ROUND INSERT SR1560-50717	B715 - 1090
312	KNOB RENCOL PATTERN No.1032xM10 (BLACK)	B222 - 3201
317	MOTOR TO SHAFT SUB ASSEMBLY	B700 - 0068
318	RAPID POWER TRAVERSE HARNESS ASSEMBLY	A826 - 1084A
319	PLATE	D565 - 1093
320	HEXAGON SOCKET CAP HEAD SCREW M4x16	B163Y0016
322	PLUG	D404H192.1
323	COVER PLATE	D404H251.1
324	COVER PLATE GASKET	D404H252.1
327	BLUE RING TAG M4	B711 - 3346
328	BRASS CHEESE HEAD SCREW M4x8	B161 - 5725
329	CONTACTS RS534-963	B711 - 3551
330	BLACK HOUSING RS 534-979	B711 - 3553
331	GREEN HOUSING RS 534-991	B711 - 3552
332	1.5mm YELLOW/GREEN CABLE	R512 - 5755
333	SPYRAWRAP 6mm	R827Y4550
337	END CAP	D001H1010
338	'O' RING DOWTY 202-648	B413 - 0216
339	'O' RING DOWTY 202-640-4480	B413 - 0136
340	PISTON	D230H1015
341	PUMP BODY	D231H2001
342	5.0mm STEEL BALL	B326 - 9002
343	GROOVED PIN 4x10	B111 - 7303
344	7.0mm STEEL BALL	B326 - 9007
345	BANJO FITTING	D404H092.1
346	TUBE NUT 36-0501-02	B435Y0001
347	TUBE NUT 3/16"	B433 - 0803
348	COMPRESSION SPRING	B365 - 1576
349	HEXAGON SOCKET DOG POINT SET SCREW M8x16	B163 - 1753
350	ANDERTON CIRCLIP 1300-18	B363 - 0418
351	BLACK PLASTIC HANDLE	B223 - 1031
352	NYLON TUBE 4Ø	R827 -4211
353	SEAL ENOTS 48-0213-0	B435 - 0590

SADDLE ASSEMBLY (1)



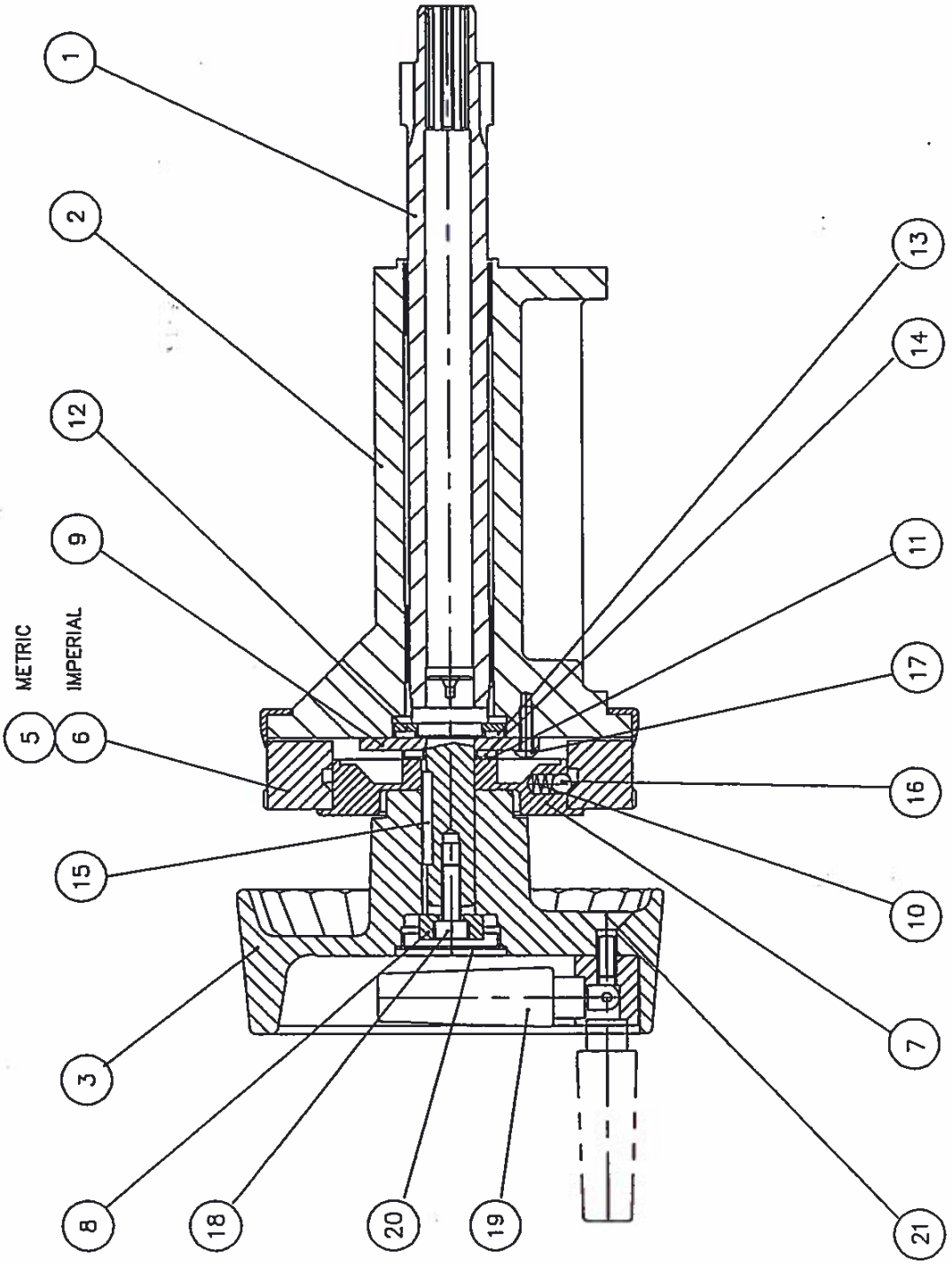
Item No.	Description	Part No.
1	SADDLE BRACKET SUB-ASSEMBLY	A806 - 0572A
2	CROSS SLIDE SUB-ASSEMBLY METRIC	A842 - 0028A
3	CROSS SLIDE SUB-ASSEMBLY IMPERIAL	A842 - 0028B
4	38T GEAR SUB-ASSEMBLY	A806 - 0574A
6	CROSS SLIDE NUT PACKING PLATE	D565 - 1068
11	SADDLE	D696 - 0049
13	CROSS SLIDE	D705 - 0127
15	**METRIC** SADDLE SCREW	D697 - 0386
16	**IMPERIAL** SADDLE SCREW	D697 - 0387
17	CROSS SLIDE NUT BODY	D388 - 0126
18	**METRIC** FIXED CROSS SLIDE NUT	D536 - 0324
19	**IMPERIAL** FIXED CROSS SLIDE NUT	D536 - 0322
20	**METRIC** ADJUSTABLE CROSS SLIDE NUT	D536 - 0325
21	**IMPERIAL** ADJUSTABLE CROSS SLIDE NUT	D536 - 0323
22	CROSS SLIDE NUT ADJUSTING SCREW	D697 - 0359
28	SADDLE IDLER SHAFT	D699 - 0814
30	SWIVEL PEG	D572 - 0028
32	GIB ADJUSTING SCREW	D697 - 0345
33	GIB STRIP	D345 - 0091
34	GRADUATED PLATE	D537 - 1094
35	CROSS SLIDE LOCK PAD	D557 - 0144
36	OIL FILLER PLUG	D566 - 0191
37	FELT PAD	R671 - 1002
50	SADDLE STRIP MOUNT	D345 - 0090
51	SADDLE STRIP	D715 - 0197
59	SADDLE CLAMP	D715 - 0172
60	LOCKING PLATE	D565 - 1078
61	BED VEE WIPER	D937 - 0011
62	BED VEE WIPER	D937 - 0012
63	BEDWAY WIPER VEE SHIELD	D725 - 0014
64	LEAF SPRING	D707 - 0051
65	BED FLAT WIPER	D937 - 0010
66	WIPER FLAT SHIELD	D725 - 0013
68	BEDWAY WIPER SPACER	D708 - 0087
69	HEXAGON SOCKET ESLOK SET SCREW M6x6	D697 - 0369
70	HEXAGON SOCKET ESLOK SET SCREW M8x8	D697 - 0370
75	NEEDLE BEARING AXZ 6.15.28.4	B337 - 5210
81	OIL SEAL W11807027	B414 - 3051
85	CONCAVE LUBRICATOR	B454 - 2004

SADDLE ASSEMBLY (2)



Item No.	Description	Part No.
88	DOWTY 'O' RING 202-519	B413 - 0171
92	STRIP ADJUSTER	D715 - 0198
93	SPIROL PIN 6x22	B111 - 5110
96	HEXAGON SOCKET CAP HEAD SCREW M5x12	B163 - 0026
97	HEXAGON SOCKET BUTTON HEAD SCREW M4x16	B163 - 1806
99	HEXAGON SOCKE SETSCREW M5x12	B163 - 1704
100	HEXAGON SOCKET CAP HEAD SCREW M6x20	B163 - 0038
101	HEXAGON SOCKET CAP HEAD SCREW M6x40	B163 - 0042
102	HEXAGON SOCKET SETSCREW M5x12	B163 - 1757
104	HEXAGON SOCKET CAP HEAD SCREW M8x35	B163 - 0056
105	HEXAGON SOCKET CAP HEAD SCREW M8x60	B163Y0061
106	HEXAGON SOCKET WEDGELOK SET SCREW M5x12	B164 - 0170
107	HEXAGON SOCKET DOG POINT SETSCREW M12x35	B163 - 1793
108	SADDLE CLAMP BOLT	D697 - 0391
109	HEXAGON SOCKET CAP HEAD SCREW M6x35	B163 - 0041
110	HEXAGON SOCKET BUTTON HEAD SCREW M6x16	B163 - 1815
113	NYLOC NUT M12	B147Y9006
114	HEXAGON SOCKET CAP HEAD SCREW M10x55	B163 - 0074
116	FIBRE WASHER 1/2"x3/4"	B411 - 0016
117	CRINKLE WASHER M6	B117 - 0107
119	SPHERICAL SEATING WASHER WDS401-204	B117 - 0191
	SADDLE BRACKET SUB-ASSEMBLY A806 - 0572	
1	SADDLE SCREW BRACKET	D050 - 0743
2	GLACIER BUSH MB1520DU	B311 - 2206
	38T GEAR SUB-ASSEMBLY A806 - 0574	
1	38T IDLER GEAR	D344 - 1315
2	GLACIER BUSH MB1620DU	B311 - 1539

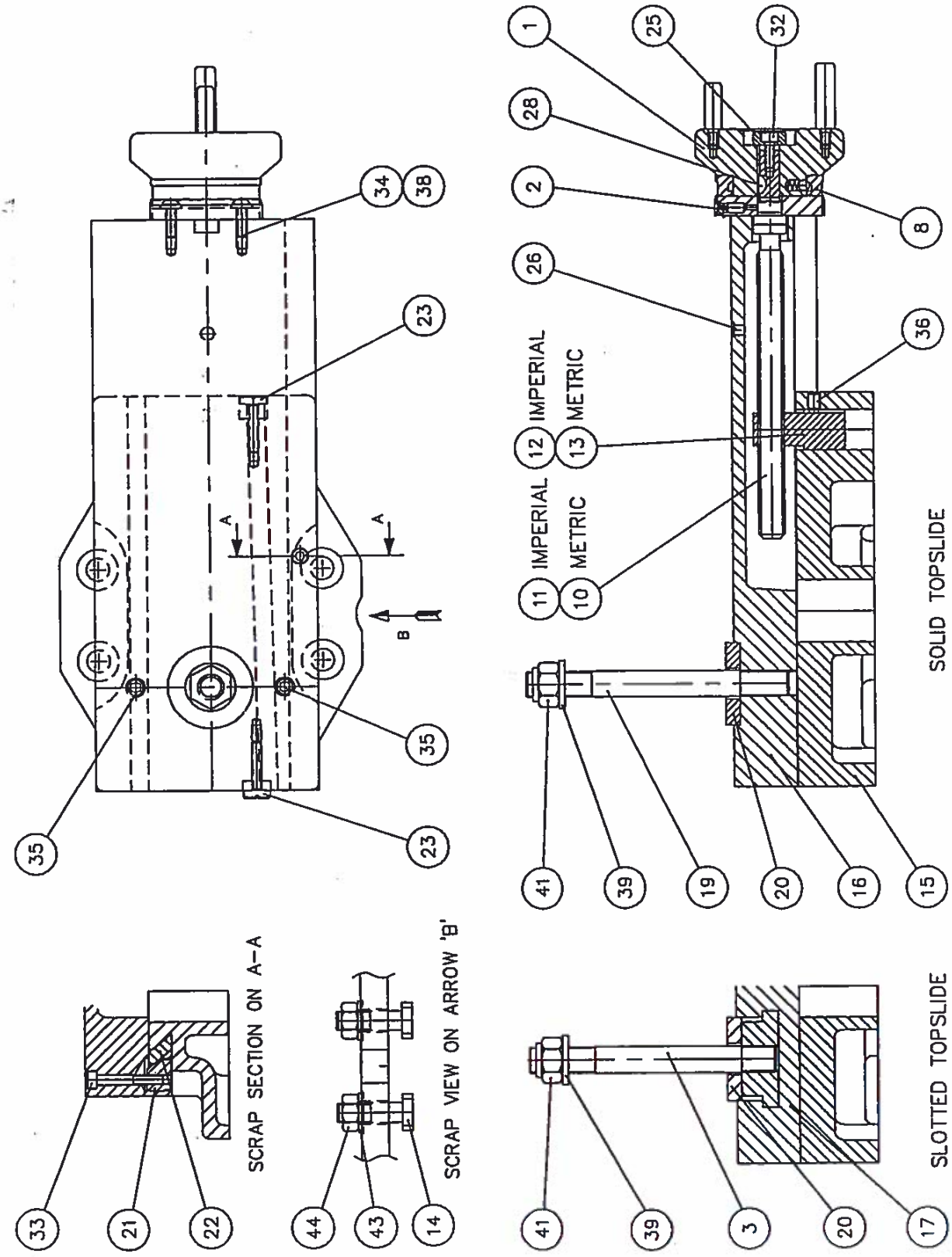
CROSS SLIDE HANDWHEEL ASSEMBLY



CROSS SLIDE HANDWHEEL SUB - ASSEMBLY A842 - 0028

Item No.	Description	Part No.
1	PINION SUB-ASSEMBLY	A834 - 0025A
2	SADDLE KEEP SUB-ASSEMBLY	A806 - 0582A
3	CROSS SLIDE HAND WHEEL	D383 - 0116
5	**METRIC** INDEX RING	D424 - 0176
6	**IMPERIAL** INDEX RING	D424 - 0177
7	INDEX RING MOUNTING SPACER	D708 - 0530
8	PIN	D560 - 0296
9	THRUST PLATE	D565 - 0918
10	MULTI COMPRESSION SPRING	D707 - 0021
11	THRUST WASHER A51528	B337 - 5002
12	INA THRUST WASHER WS81104	B337 - 5014
13	NEEDLE ROLLER BEARING AXK 2035	B337 - 5011
14	NEEDLE ROLLER BEARING AXK 1528	B337 - 5001
15	SQUARE KEY 4x4x36 ROUND ENDS	B343 - 5025
16	CYCLE BALL BEARING 1/4"	B326 - 8107
17	HEXAGON SOCKET BUTTON HEAD SCREW M4x10	B163 - 1804
18	HEXAGON SOCKETWEDGELOK CAP HEAD SCREW M6x20	B164 - 0039
19	HANDLE BERGER REF GN 598.7	B223 - 1037
20	BLUE PLASTIC DISC	B224 - 2143
21	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 1023
	PINION SUB-ASSEMBLY A834 - 0025	
1	CROSS SLIDE PINION	D564 - 0106
2	PINION SHAFT EXTENSION	D699 - 0813
	SADDLE KEEP SUB-ASSEMBLY A806 - 0582A	
2	GLACIER BUSH MB2525DU	B311 - 1564

TOPSLIDE ASSEMBLY

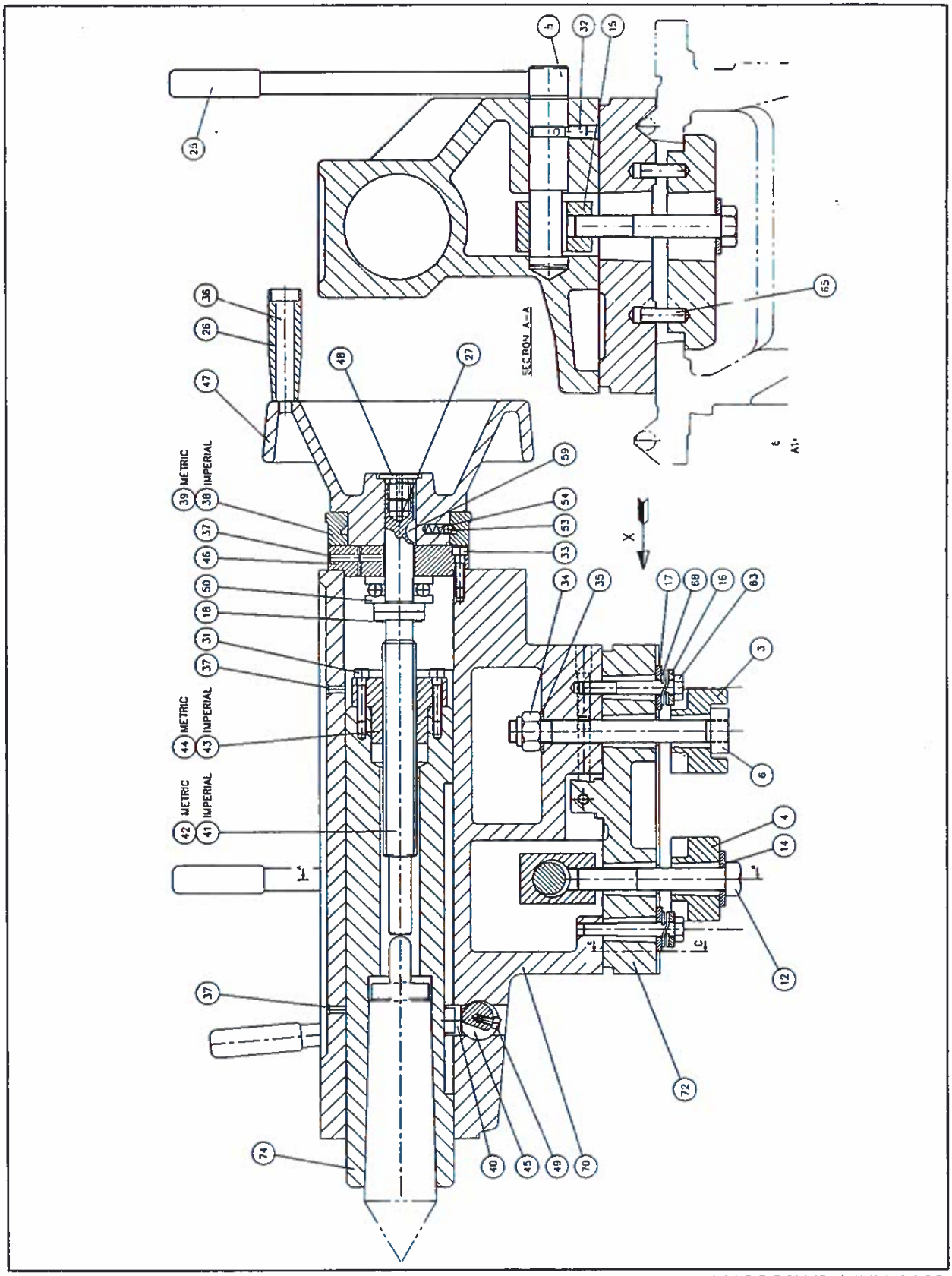


Item No.	Description	Part No.
1	TOPSLIDE HANDWHEEELSUB-ASSEMBLY	A842 - 0027
2	TOPSLIDE KEEP SUB-ASSEMBLY	A806 - 0584A
3	CLAMP BOLT SUB-ASSEMBLY	A812 - 0013
8	**METRIC** INDEX RING	D424 - 0158
9	**IMPERIAL** INDEX RING	D424 - 0143
10	**METRIC** TOPSLIDE SCREW	D697 - 0372
11	**IMPERIAL** TOPSLIDE SCREW	D697 - 0373
12	**METRIC** TOPSLIDE NUT	D536 - 0313
13	**IMPERIAL** TOPSLIDE NUT	D536 - 0314
14	SWIVEL SLIDE BOLT	D048 - 0163
15	SWIVEL SLIDE	D705 - 0124
16	SOLID TOPSLIDE	D705 - 0125
17	SLOTTED TOPSLIDE	D705 - 0126
19	TOOLHOLDER STUD	D711 - 0200
20	COLLAR	D133 - 0124
21	LOCK PAD	D557 - 0144
22	GIB STRIP	D345 - 0089
23	GIB ADJUSTING SCREW	D697 - 0345
24	COMPRESSION SPRING	D707 - 0021
25	PIN	D560 - 0296
26	CONCAVE LUBRICATOR 6mm	B454 - 2004
27	BALL BEARING 1/4"	B326 - 8107
28	WOODRUFF KEY 13x5x3	B343 - 2002
32	HEXAGON SOCKET WEGLOK CAP HEAD SCREW M6x16	B164 - 0037
33	HEXAGON SOCKET CAP HEAD SCREW M6x40	B163 - 0042
34	HEXAGON SOCKET BUTTON HEAD SCREW M6x20	B163 - 1816
35	HEXAGON SOCKET CUP SET SCREW M12	B163 - 1594
36	HEXAGON SOCKET DOG POINT SET SCREW M8x12	B163Y1752
38	WASHER M6	B117 - 0009
39	WASHER M16	FP - 0090
41	NYLOC NUT M16	B147 - 9008
43	WASHER M12	FP - 0070
44	NUT M12	B147 - 9155

Item No.	Description	Part No.
	HANDWHEEL SUB-ASSEMBLY A842 - 0027	
1	HANDWHEEL	D383 - 0113
2	LONG HANDLE	D382 - 0140
3	SHORT HANDLE	D382 - 0141
	KEEP SUB-ASSEMBLY A806 - 0584	
1	KEEP	D442 - 0087
2	RING	D646 - 0013
3	CONCAVE LUBRICATOR 6mm	B454 - 2004
	CLAMP BOLT SUB-ASSEMBLY A812 - 0013	
1	TOOLHOLDER STUD FLANGE	D296 - 0019
2	STUD	D711 - 0201

TAILSTOCK ASSEMBLY

A149-0708A & B

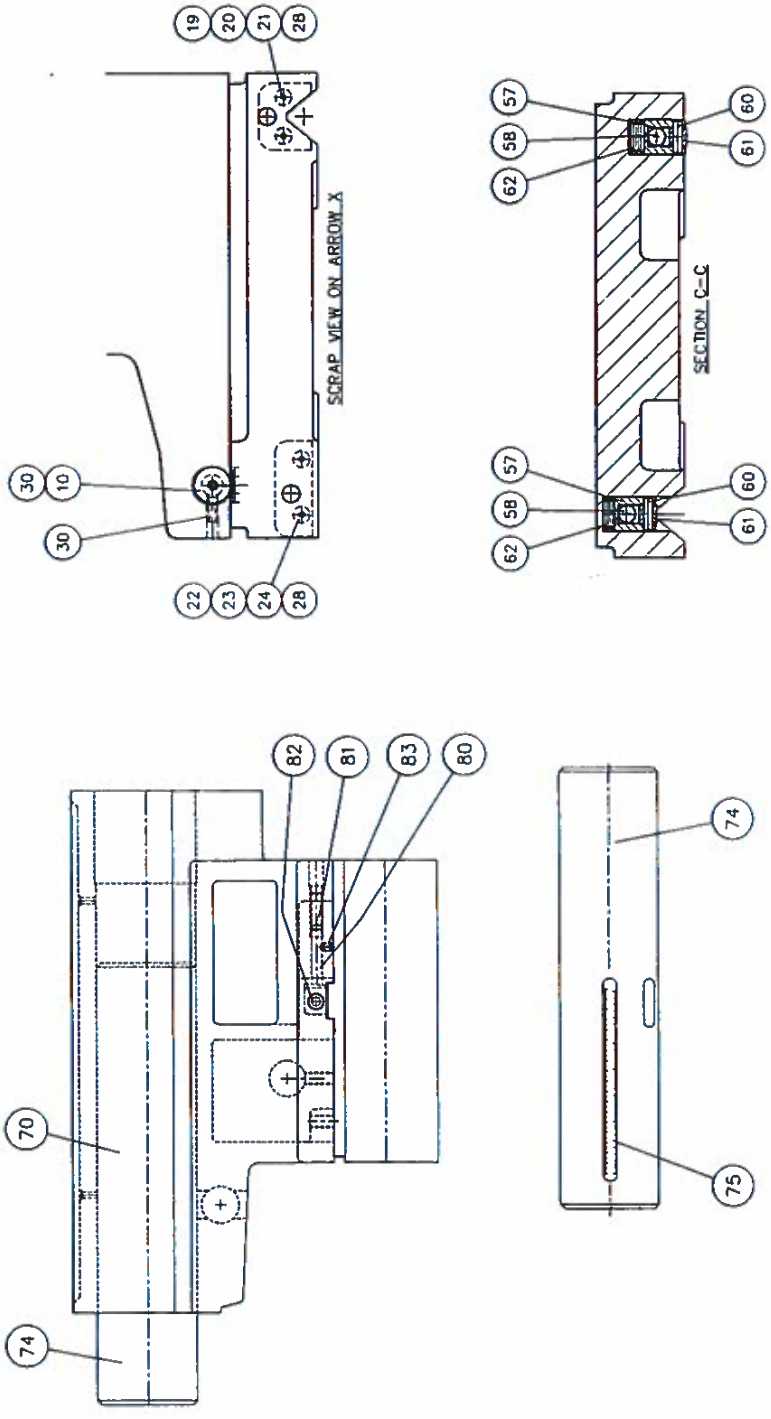


A149-0708A & B TAILSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
3	D131-0043	CLAMP PLATE REAR TAILSTOCK	1
4	D131-0044	CLAMP PLATE FRONT TAILSTOCK	1
*5**	*A840-0050A*	*CLAMP LEVER TAILSTOCK SUB-ASSEMBLY*	*1*
*6**	*A840-0051A*	*CLAMP STUD SUB-ASSEMBLY*	*1*
10	D699-0782	SHAFT DHOBI MARK	1
12	FS-0830	M20 X 130 HEXAGON BOLT NYLOC	1
14	D931-0359	WASHER- TAILSTOCK CLAMP PLATE	1
15	D047-0131	BLOCK CLAMP TAILSTOCK	1
16	D931-0358	WASHER-TAILSTOCK CLAMPING	2
17	D931-0360	WASHER-TAILSTOCK CLAMPING	2
18	D931-0315	NYLON 66 OR EQUIV WASHER	1
19	D725-0027	VEE SHIELD	1
20	D707-0068	SPRING 6,7,8&10 IN M/CS	1
21	D937-0018	BED VEE WIPER	1
22	D725-0013	WIPER FLAT SHIELD	1
23	D707-0051	LEAF SPRING	1
24	D937-0010	BED FLAT WIPER	1
25	D382-0107	HANDLE	2
26	D382-0127	HANDLE TAILSTOCK	1
27	B163-1657	SET SCREW CONE PT.M 6X 40 HEXAGON	1
28	FS-0290	M5 X 16 BUTTON HEAD CAP SCREW	4
30	FS-0354	M6X16 HALF DOG POINT SCREW	2
31	FS-0170	M8 X 40 SOCKET HEAD CAP SCREW	4
32	FS-0380	M12 X 20 DOG POINT SCREW	2
33	FS-0166	M8 X 30 SOCKET HEAD CAP SCREW	4
34	FS-0979	M20 NYLOC NUT	1
35	FP-0100	M20 BRIGHT WASHER	1
36	B163-1884	SHOULDER SCREW 16 DIA X 90 LG	1
37	OC-0010	6MM DRIVE IN CONCAVE OIL NIPPLES 6 DIA	3
38	D424-0163	INDEX RING - IMPERIAL	1
39	D424-0162	INDEX RING - METRIC	1
40	D441-0081	BARREL KEY TAILSTOCK	1
41	D697-0446	TAILSTOCK SCREW IMPERIAL	1
42	D697-0445	TAILSTOCK SCREW METRIC	1
43	D536-0332	NUT TAILSTOCK BRL IMPERIAL	1
44	D536-0331	NUT TAILSTOCK BRL METRIC	1
*45**	*A840-0049A*	*BARREL CLAMP SUB-ASSEMBLY*	*1*
*46**	*A806-0571A*	*KEEP SUB ASY TAILSTOCK SUB-ASSEMBLY*	*1*
47	D383-0083	HANDWHEEL TAILSTOCK	1
48	D566-0120	PLUG TAILSTOCK HANDWHEEL	1
49	FS-0130	M6 X 10 SOCKET HEAD CAP SCREW	1
50	B325-0250	THRUST BEARING FAG 51405 25X6	1

TAILSTOCK ASSEMBLY

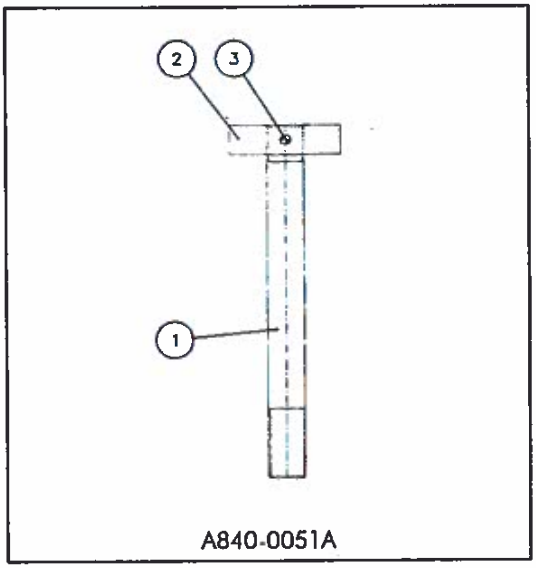
A149-0708A & B



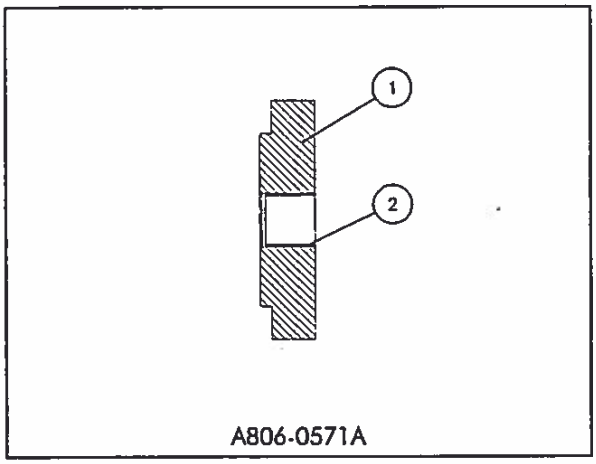
A149-0708A & B TAILSTOCK ASSEMBLY

Item No.	Part Number	Description	Qty
53	UB-0008	8MM STEEL BALL	3
54	B365-1154	SPRING FLEXO REF 113207	3
57	D388-0143	ROLLER HOUSING STD.	4
58	D560-0248	PIN DOWEL T/STOCK	4
59	KA-0190	6.0 X 9.0 X 22MM WOODRUFF KEYS	1
60	D560-0178	PIN ROLLER	4
61	B337-2001	INA NEEDLE BRGS NK 5/10	4
62	B365-6040	ANDERTON DISC SPRING	24
63	B166-0243	M12 X 80 LG HEXAGON HEAD BOLT	2
65	B111-5167	SPIROL PIN 12 DIA X 40 MBK	4
68	B116-2212	WASHER DOUBLE COIL 3/4"	2
70	D827-0133	BODY	1
72	D827-0069	BASE	1
74	D044-0054	BARREL	1
75	D537-0896	STAINLESS STEEL GRADUATION PLATE	1
80	D560-0302	PIN	1
81	FS-0382	M12 X 35 DOG POINT SCREW	1
82	FS-0195	M10 X 70 SOCKET HEAD CAP SCREW	2
83	FS-0790	M8 X 10 DOG POINT NYLON SCREW	1

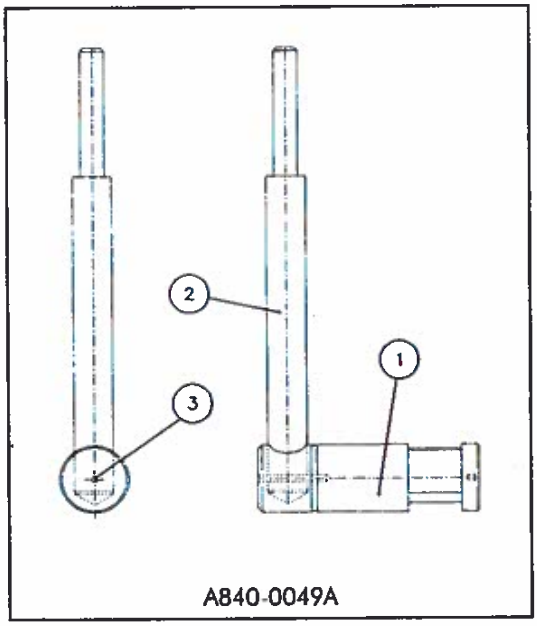
TAILSTOCK SUB ASSEMBLIES



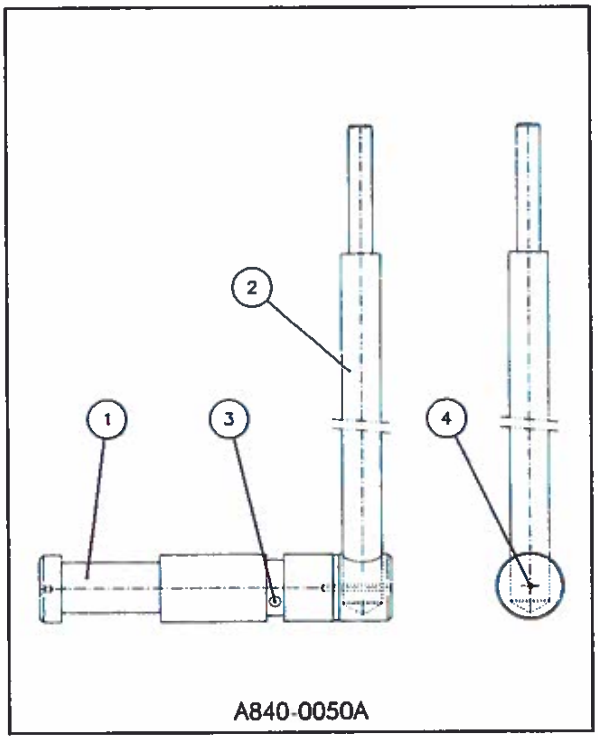
A840-0051A



A806-0571A



A840-0049A

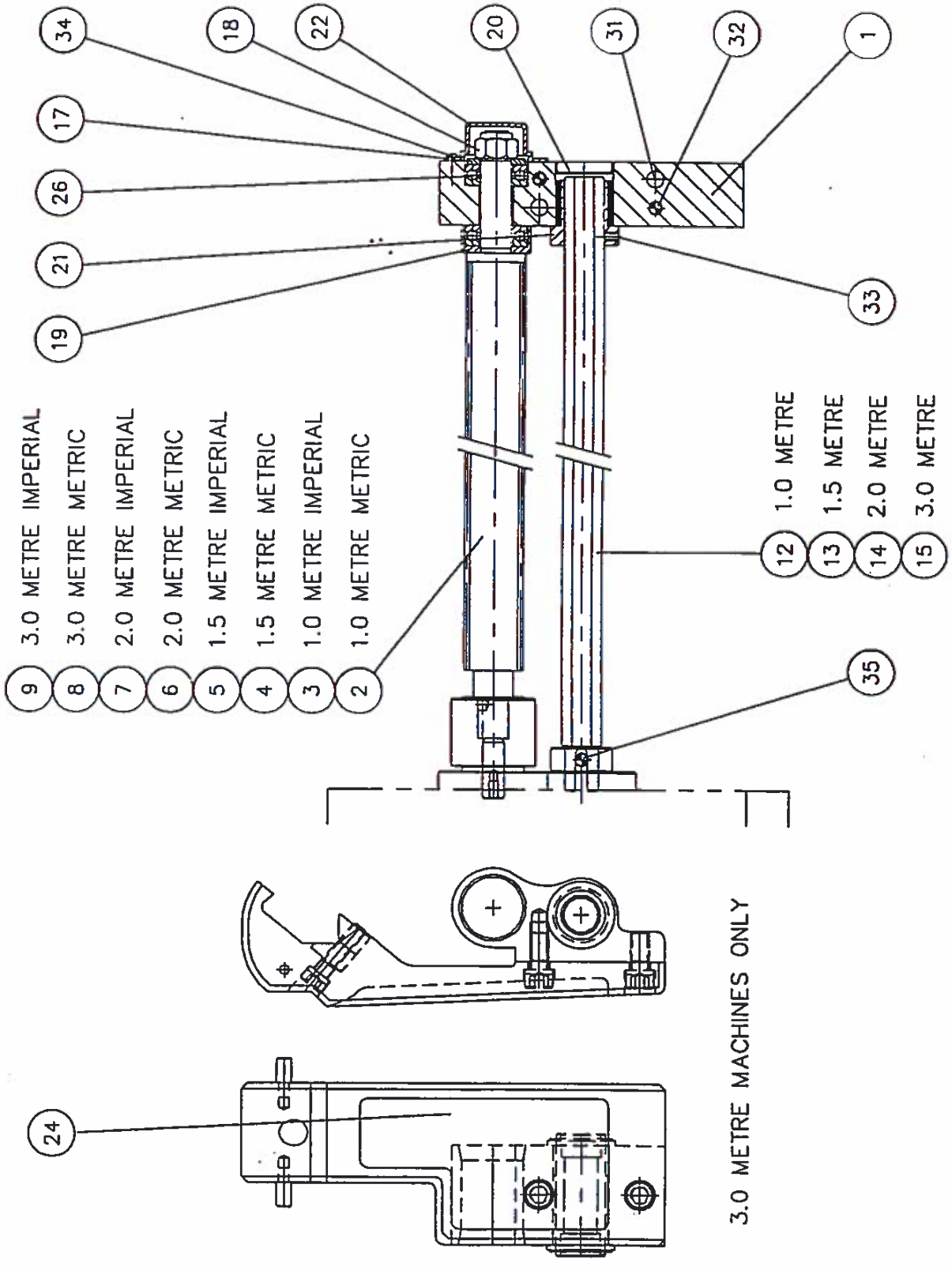


A840-0050A

TAILSTOCK SUB ASSEMBLIES

Item No.	Part Number	Description	Qty
	A806-0571A	KEEP SUB ASSEMBLY	
1	D442-0085	KEEP	1
2	B311-1665	GLACIER BUSH	1
	A840-0050A	CLAMPING LEVER SUB ASSEMBLY	
1	D123-0118	ECCENTRIC STUD	1
2	D717-0118	CLAMP LEVER	1
3	B111Y6039	DOWEL PIN 6 DIA X 16	1
4	B111-5065	SPIROL PIN 3 DIA X 30	1
	A840-0051A	CLAMP STUD SUB ASSEMBLY	
1	D711-0199	STUD	1
2	D565-1056	STUD PLATE	1
3	B111-5099	SPIROL PIN 5 DIA X 35	1
	A840-0047A	BARREL CLAMP SUB ASSEMBLY	
1	D123-0117	ECCENTRIC STUD	1
2	D717-0104	STEM	1
3	B111-5065	SPIROL PIN 3 DIA X 30	1

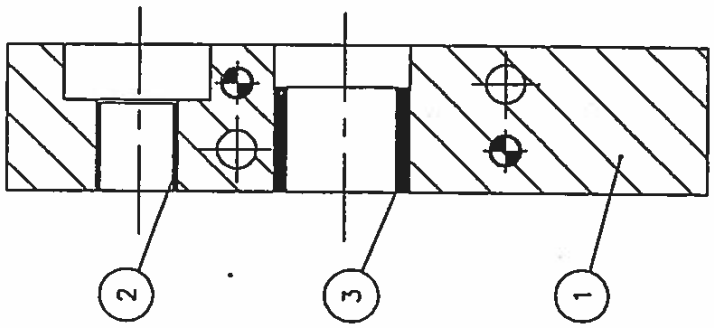
LEADSCREW AND FEEDSHAFT ASSEMBLY



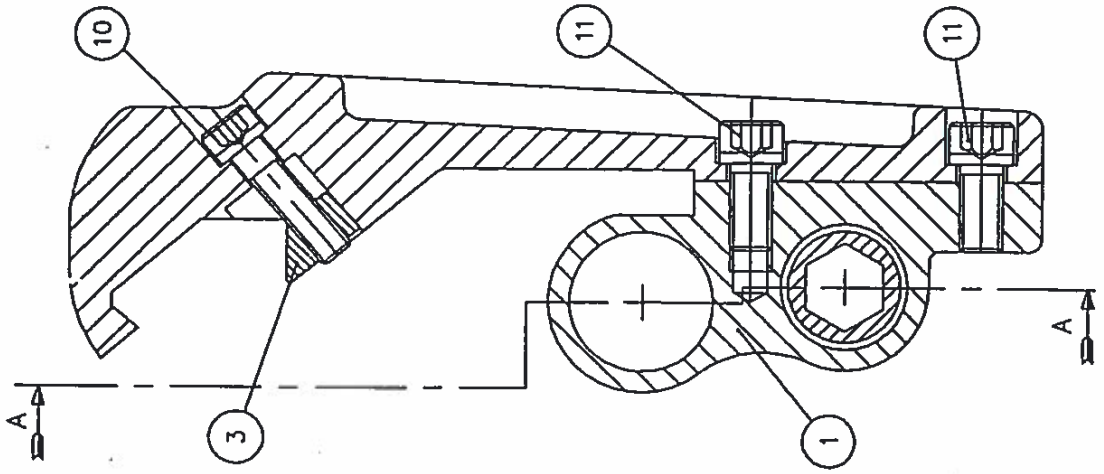
LEADSCREW AND FEEDSHAFT ASSSEMBLY A106 - 0634

Item No.	Description	Part No.
1	TAILEND BRACKET ASSEMBLY	A806 - 0578
2	1.0 METRE LEADSCREW **METRIC**	D456 - 0087
3	1.0 METRE LEADSCREW **IMPERIAL**	D456 - 0088
4	1.5 METRE LEADSCREW **METRIC**	D456 - 0089
5	1.5 METRE LEADSCREW **IMPERIAL**	D456 - 0090
6	2.0 METRE LEADSCREW **METRIC**	D456 - 0091
7	2.0 METRE LEADSCREW **IMPERIAL**	D456 - 0092
8	3.0 METRE LEADSCREw **METRIC**	D456 - 0093
9	3.0 METRE LEADSCREW **IMPERIAL**	D456 - 0094
12	1.0 METRE FEEDSHAFT	D699 - 0806
13	1.5 METRE FEEDSHAFT	D699 - 0807
14	2.0 METRE FEEDSHAFT	D699 - 0808
15	3.0 METRE FEEDSHAFT	D699 - 0809
17	COLLAR	D133 - 0249
18	NYLOC NUT M16	D536 - 0321
19	LEADSCREW BEARING COVER	D132 - 0717
20	TAILEND BRACKET PLUG	D566 - 0197
21	TAILEND BRACKET STOP BUSH	D049 - 0345
22	TAILEND LEADSCREW COVER	D132 - 0430
24	LEADSCREW SUPPORT ASSEMBLY	A882 - 0067
26	BEARING SKF 51204	B325 - 0213
31	HEXAGON SOCKET CAP HEAD SCREW M10x90	B163 - 0076
32	GROUND DOWEL 8x45	B111 - 7046
33	CUP POINT SET SCREW M6x8	B163 - 1519
34	SELF TAPPING SCREW No.6x3/8"	B123 - 6026
35	HEAVY DUTY SPIROL PIN 8mm	B111 - 5286

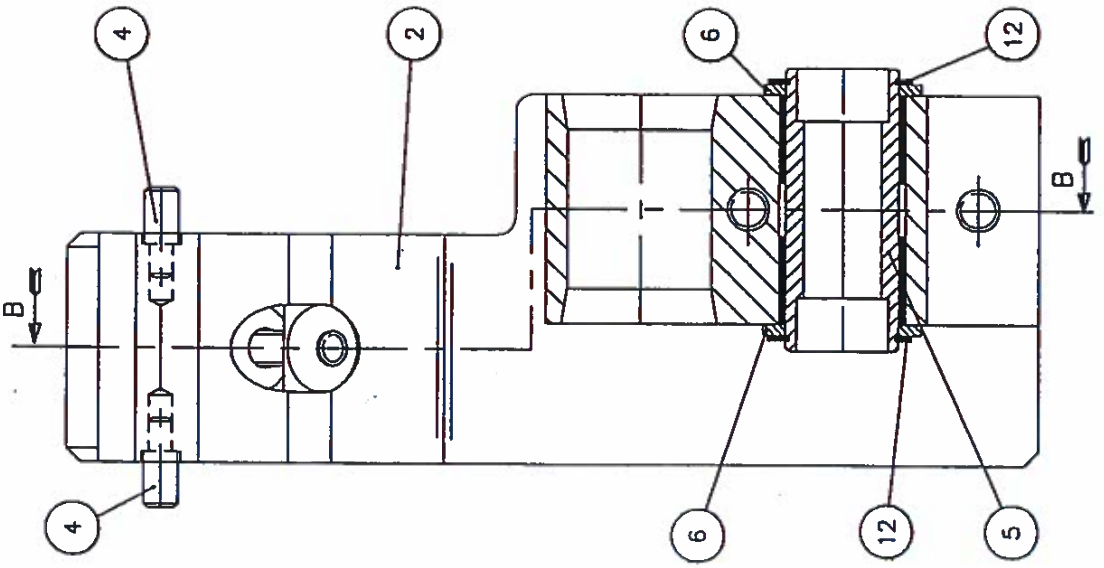
LEADSCREW AND FEEDSHAFT SUB–ASSEMBLIES



TAILEND BRACKET ASSEMBLY
A806–0578A



SECTION B–B



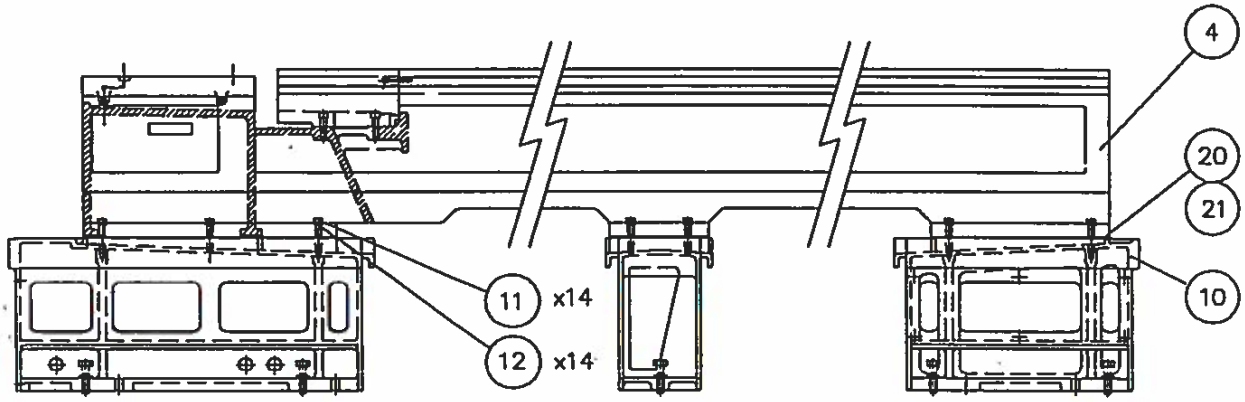
SECTION A–A

LEADSCREW SUPPORT ASSEMBLY
A882–0067A

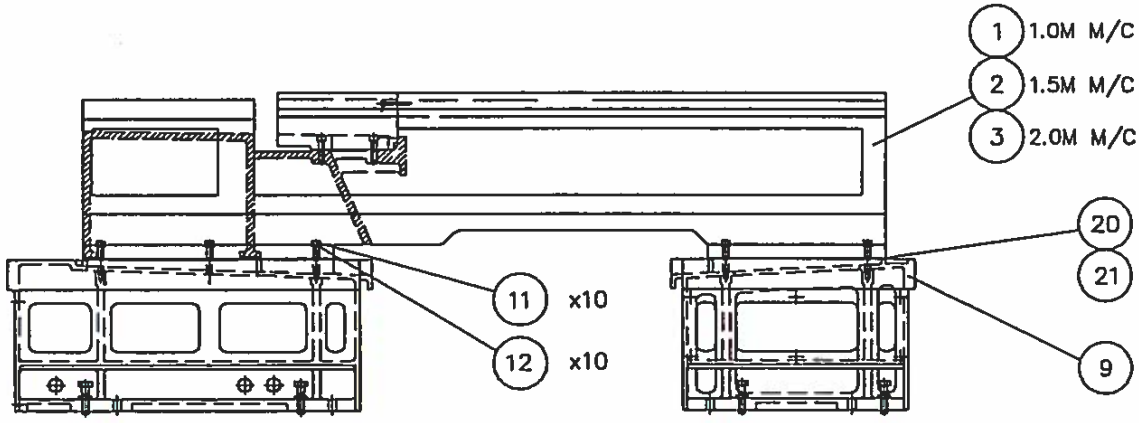
Item No.	Description	Part No.
	TAILEND BRACKET ASSEMBLY A806 - 0578	
1	TAILEND BRACKET	D050 - 0742
2	GLACIER BUSH MB2025DU	B311 - 1549
3	OILITE BUSH BM5x30	B311 - 2016
	LEADSCREW SUPPORT ASSEMBLY A882 - 0067	
1	LEADSCREW SUPPORT BLOCK SUB-ASSEMBLY	A806 - 0575
2	SUPPORT BRACKET	D050 - 0747
3	BEDSTOP CLAMP	D131 - 0045
4	STOP PIN	D557 - 0082
5	SLEEVE	D704 - 0134
6	WASHER	D931 - 0357
10	HEXAGON SOCKET CAP HEAD SCREW M10x40	B163 - 0083
11	HEXAGON SOCKET CAP HEAD SCREW M12x25	B163 - 0083
12	CIRCLIP ANDERTON 1400-32	B363 - 0031
	LEADSCREW SUPPORT BLOCK SUB-ASSEMBLY A806 - 0575	
1	LEADSCREW SUPPORT BLOCK	D047 - 0137
2	GLACIER BUSH PM3220DX	B311 - 1689

BED AND PLINTH ASSEMBLIES

A106 – 0636

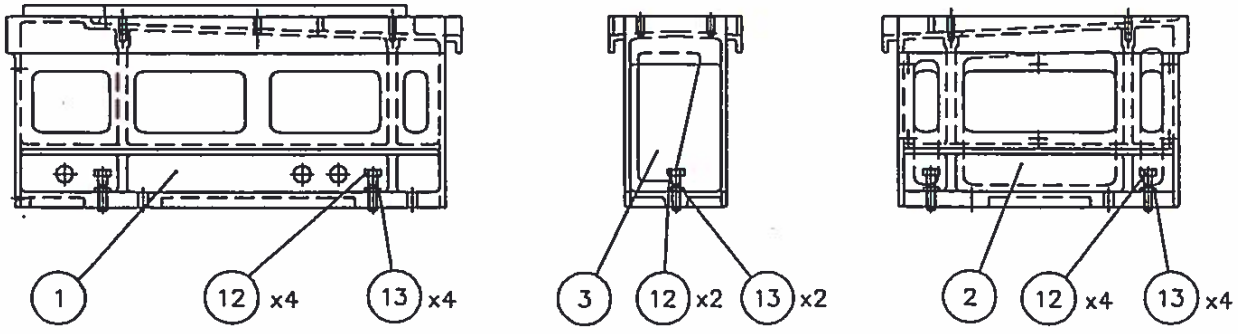


3.0 METRE MACHINE



1.0, 1.5, and 2.0 METRE MACHINES

A865 – 0039

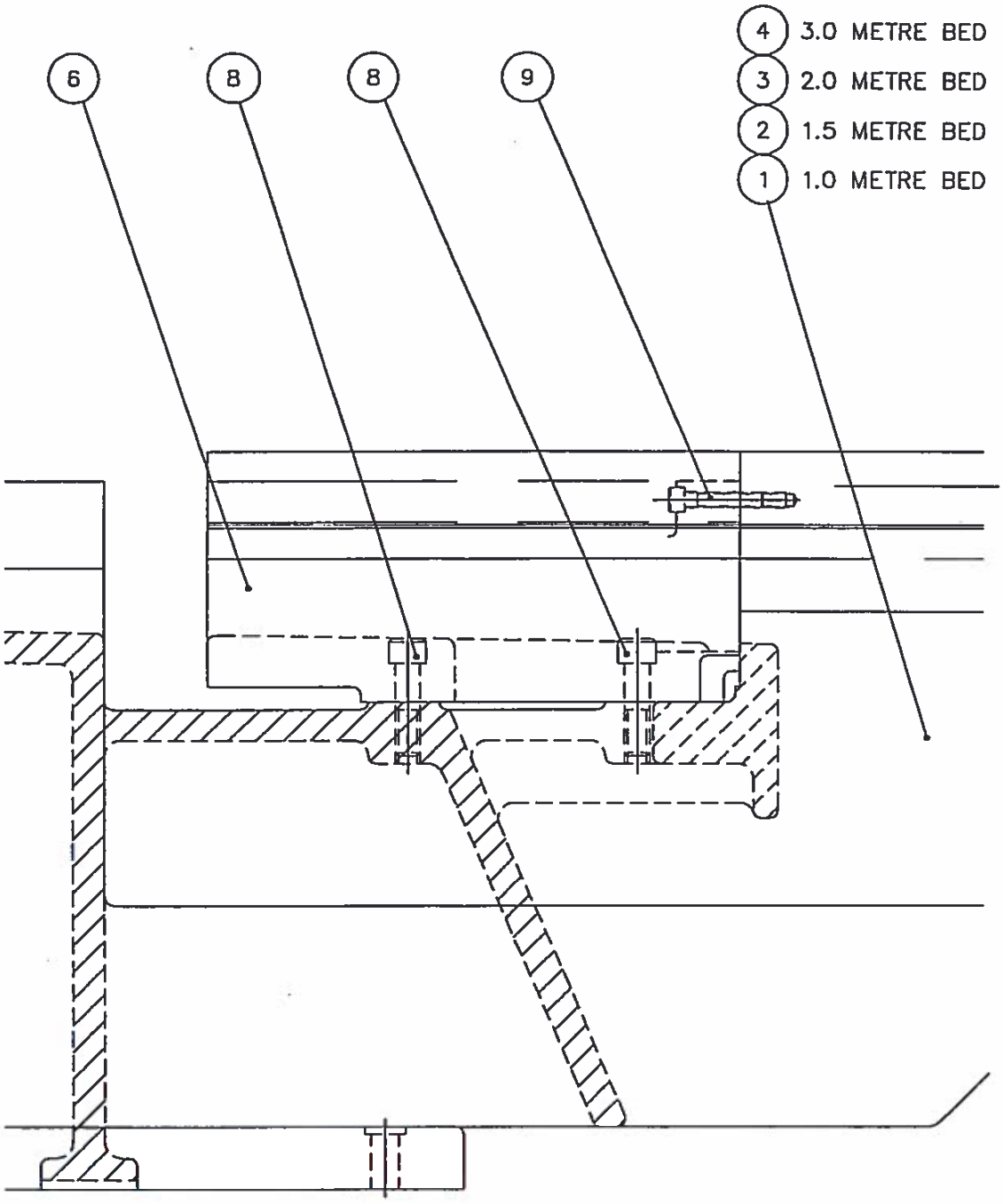


CENTRE PLINTH USED ON
3.0 METRE M/C ONLY

BED AND PLINTH ASSEMBLIES

Item No.	Description	Part No.
	BED ASSEMBLY **A106 - 0636**	
1	1.0M BED AND GAP ASSEMBLY	A803 - 0012A
2	1.5M BED AND GAP ASSEMBLY	A803 - 0012B
3	2.0M BED AND GAP ASSEMBLY	A803 - 0012C
4	3.0M BED AND GAP ASSEMBLY	A803 - 0012D
9	STANDARD PLINTH ASSEMBLY	A865 - 0039A
10	3.0M PLINTH ASSEMBLY	A865 - 0039B
11	HEXAGON HEAD SET SCREW M16x70	B166 - 0114
12	M16 WASHER	B117 - 0013
15	GAP INFILL PLATE	B565 - 1061
18	HEXAGON SOCKET BUTTON HEAD SCREW M6x12	B163 - 1814
	PLINTH ASSEMBLY **A865 - 0039**	
1	HEADEND PLINTH	D125 - 0119
2	TAILEND PLINTH	D125 - 0120
3	CENTRE PLINTH	D125 - 0121
12	HEXAGON HEADE BOLT M20x80	B166 - 0122
13	THIN HEXAGON NUT M20	B147 - 9174
14	HEXAGON HEADED BOLT M20x70	B166 - 0121

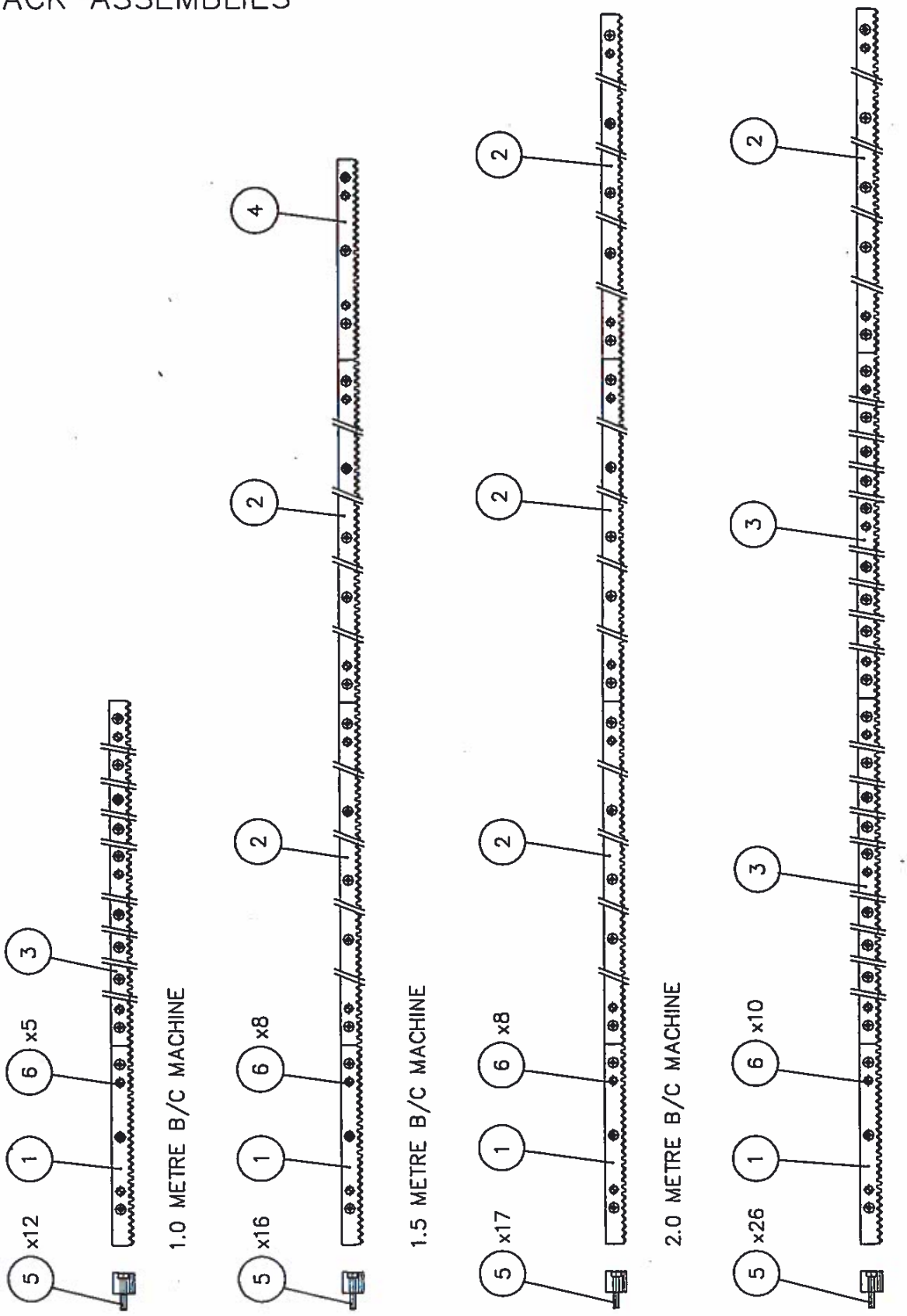
GAP ASSEMBLY



BED AND GAP ASSEMBLY A803 - 0012

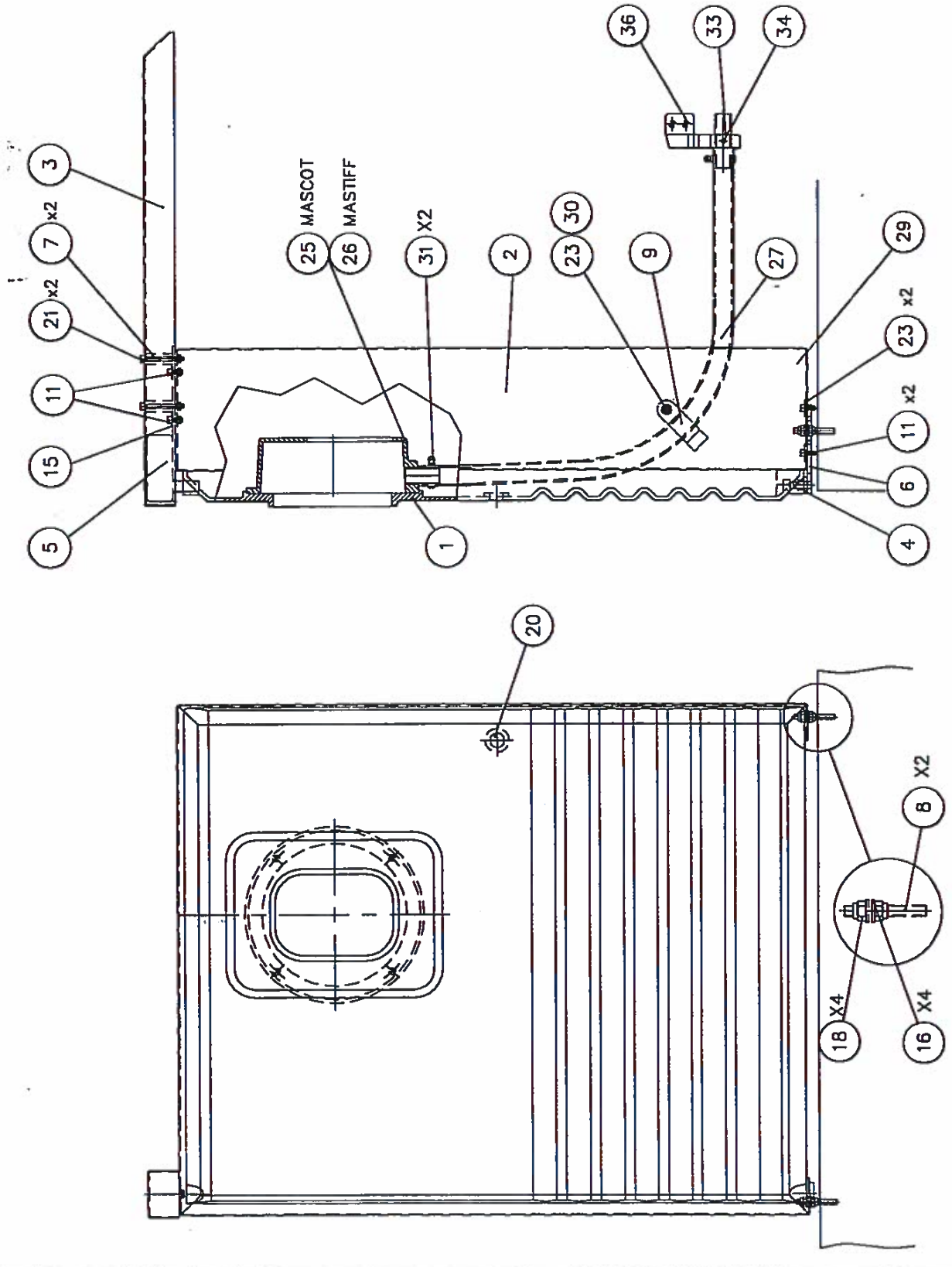
Item No.	Description	Part No.
1	1.0M GAP BED CASTING	C045 - 0113
2	1.5M GAP BED CASTING	C045 - 0115
3	2.0M GAP BED CASTING	C045 - 0117
4	3.0M GAP BED CASTING	C045 - 0119
6	GAP PIECE	D348 - 0016
8	HEXAGON SOCKET CAP HEAD SCREW M16x60	B163 - 0073
9	HEXAGON SOCKET CAP HEAD SCREW M10x50	B163 - 0073

RACK ASSEMBLIES



Item No.	Description	Part No.
1	GAP PIECE RACK	D641 - 0062
2	680mm LONG RACK	D641 - 0057
3	1280mm LONG RACK	D641 - 0058
4	TAILEND SHORT RACK (1.5 M MACHINE ONLY)	D641 - 0061
5	HEXAGON SOCKET CAP HEAD SCREW M6x35	B163 - 0041
6	DOWEL 8x36	B111Y7043

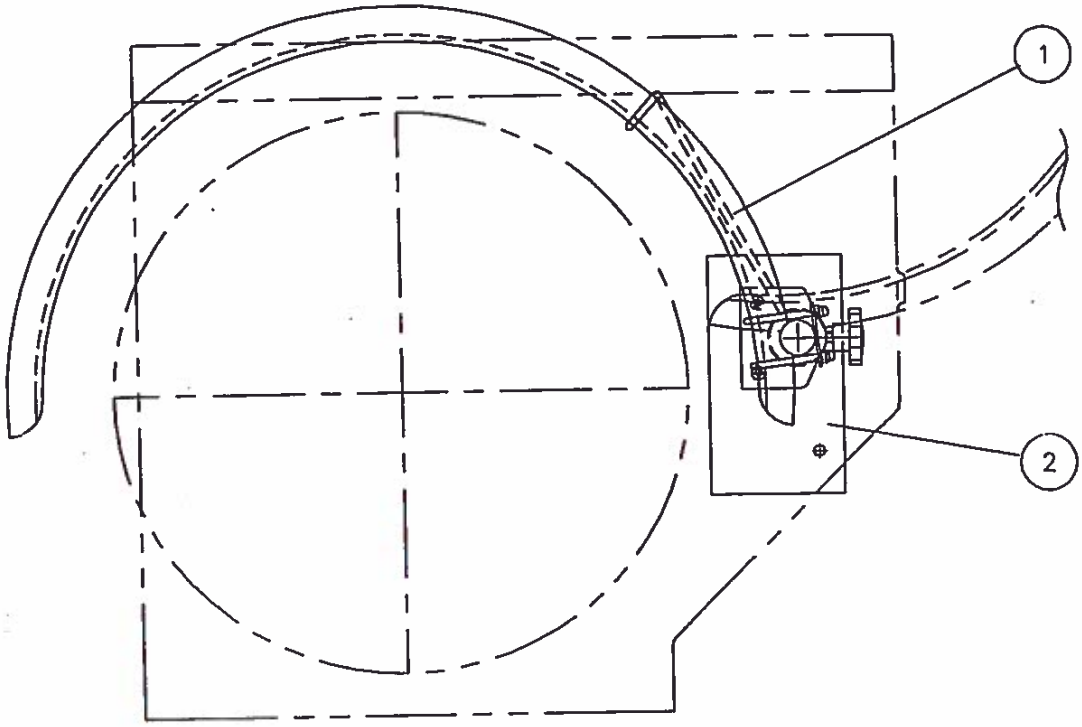
HEADEND GUARD

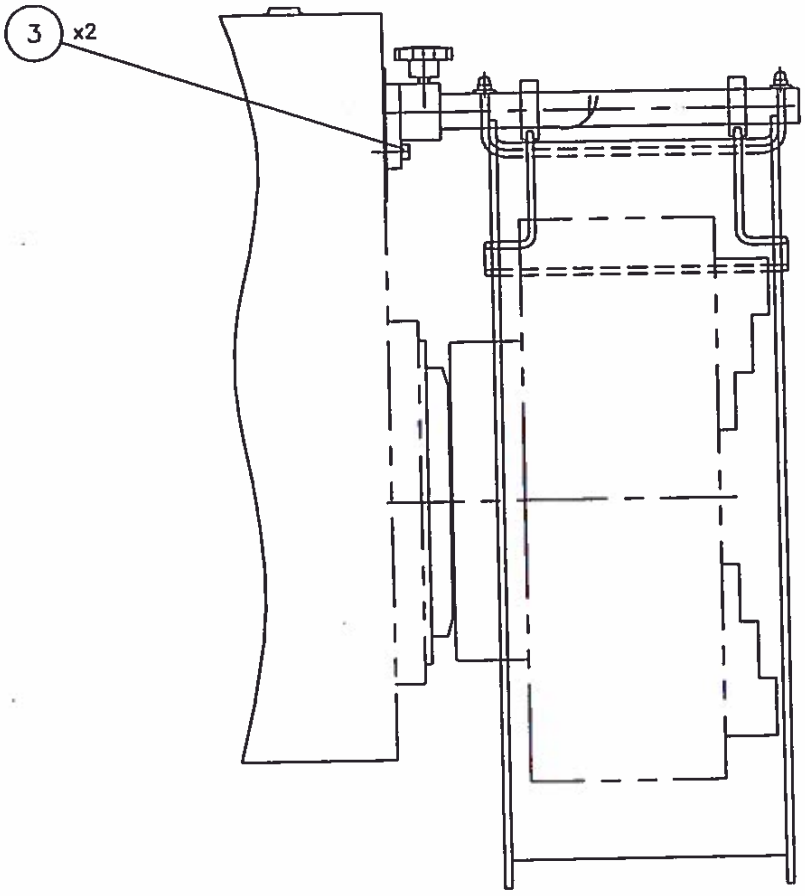


HEADEND GUARD A137 - 0620

Item No.	Description	Part No.
1	END GUARD	D346 - 0398
2	HEAD END COVER	D132 - 0812
3	TRUNKING	D132 - 0835
4	SPACER	D708 - 0466
5	ROTACAM SWITCH ASSEMBLY	A826 -1 088A
6	HINGE PLATE	D565 - 1092
7	TRUNKING MOUNTING SPACER	D708 - 0486
8	ENDGUARD MOUNTING STUD	D711 - 0189
9	CLIP	D130 - 0020
11	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
15	TAB WASHER 1/4" ID	B116 - 0124
16	WASHER M8	B117 - 0010
18	LOCK NUT M8	B147 - 9170
20	SOUTHCO LOCK E3-56-715-50	B236 - 6005
21	HEXAGON SOCKET CAP HEAD SCREW M6x55	B163 - 0045
23	WASHER M6	B117 - 0051
25	COOLANT COLLECTOR (MASCOT)	D132 - 0802
26	COOLANT COLLECTOR (MASTIFF)	D132 - 0803
27	25mm BORE HOSE	R827 - 7328
29	PIPE RETAINING CLIP	D130 - 0020
30	HEXAGON SOCKET CAP HEAD SCREW M6x8	B163 - 0034
31	ZINC HOSE CLIP 1"x13/8"	B233 - 4006
	ROTACAM SWITCH ASSEMBLY A826 - 1088A	
1	SWITCH MOUNTING PLATE	D565 - 0923
3	HEXAGON SOCKET CAP HEAD SCREW M4x10	B163Y 0014
4	GROMMET A1157	B715 - 1076
5	ROTACAM SWITCH HARNESS	A826 - 1085A

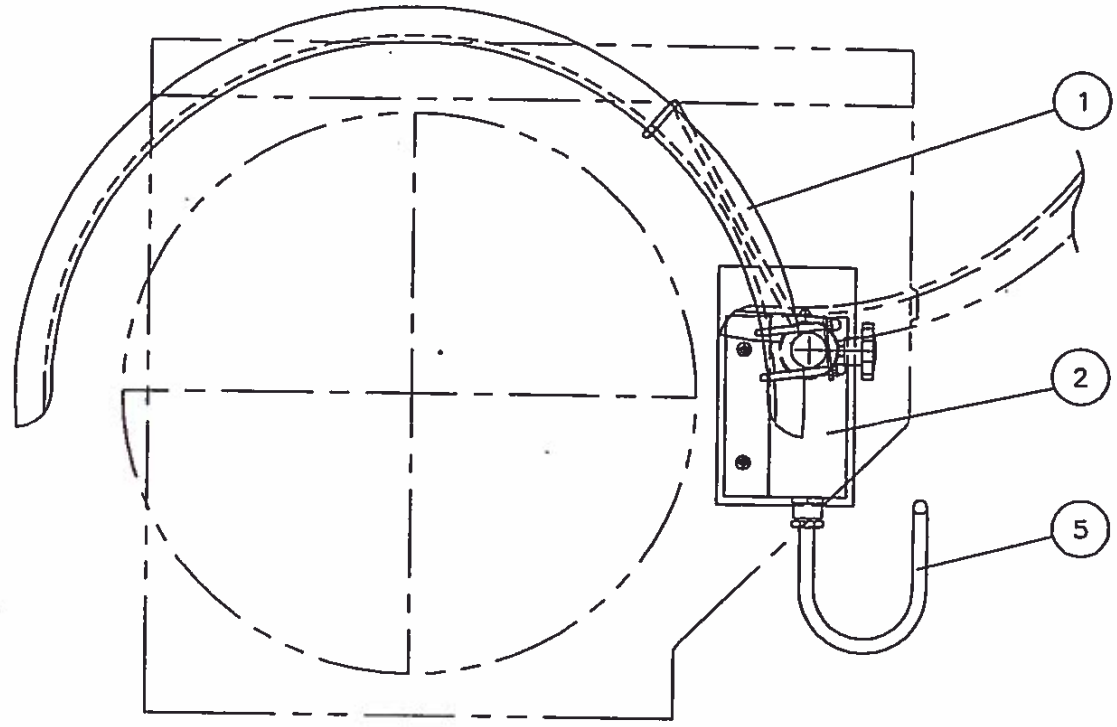
CHUCK GUARD ASSEMBLY

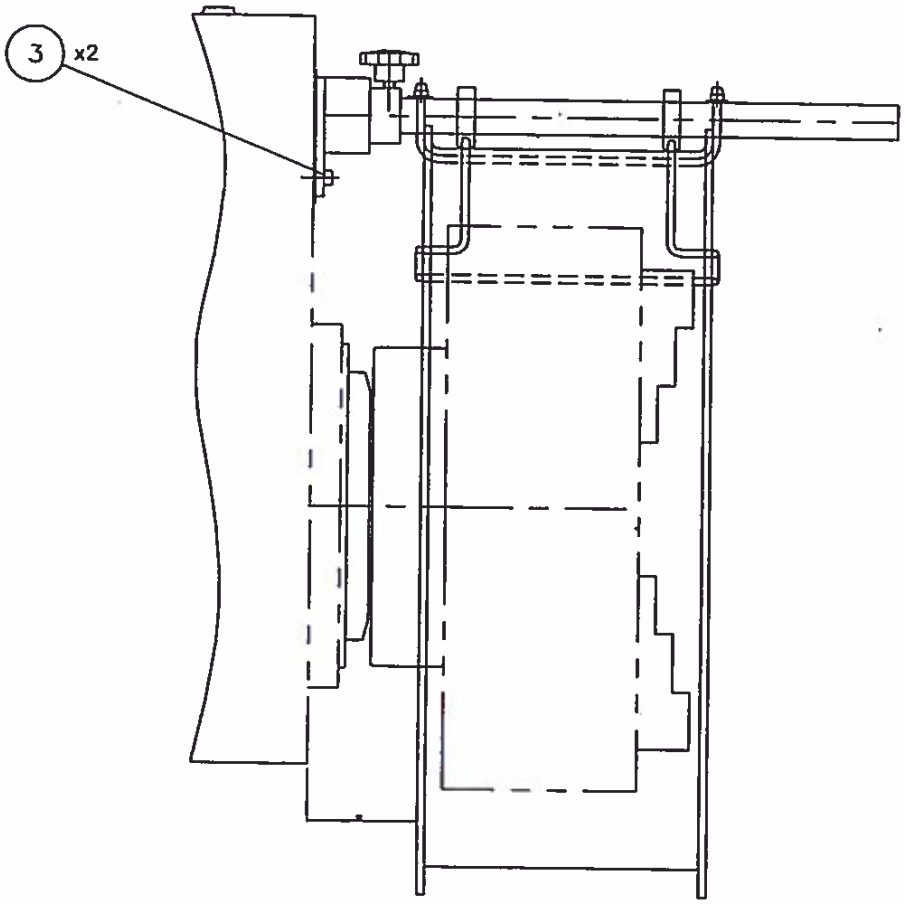




Item No.	Description	Part No.
1	NELSA CHUCK GUARDLXS-500	B976 - 1057
2	CHUCK GUARD MOUNTING PLATE	B565 - 1089
3	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037

CHUCK GUARD ASSEMBLY (INTERLOCKED.)

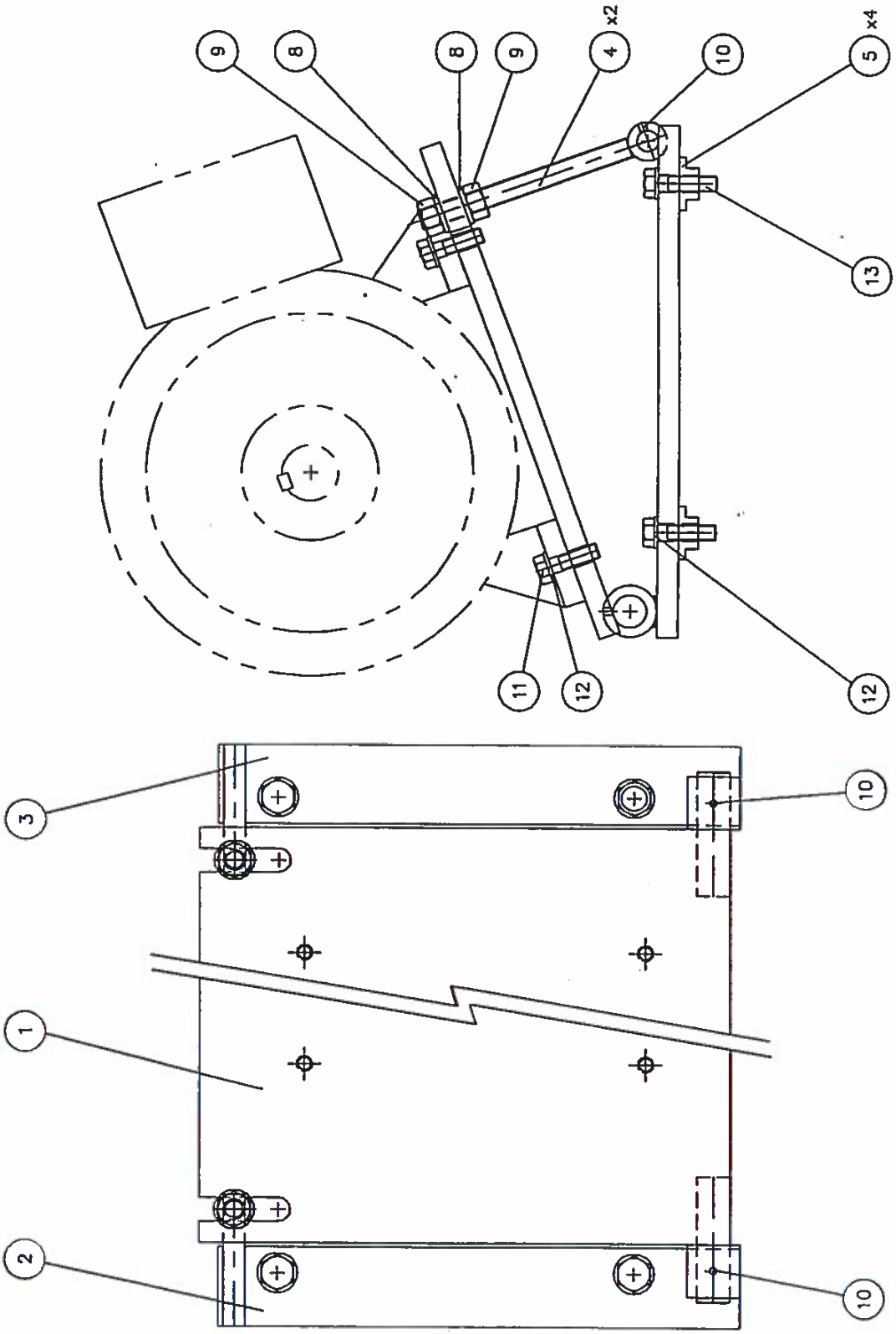




INTERLOCKED CHUCK GUARD ASSEMBLY (MASCOT/MASTIFF) A137 - 0624

Item No.	Description	Part No.
1	NELSA INTERLOCKING CHUCK GUARD	B976 - 1058
2	CHUCK GUARD MOUNTING PLATE	B565 - 1089
3	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
5	INTERLOCKING CHUCK GUARD HARNESS	A826 - 1076A

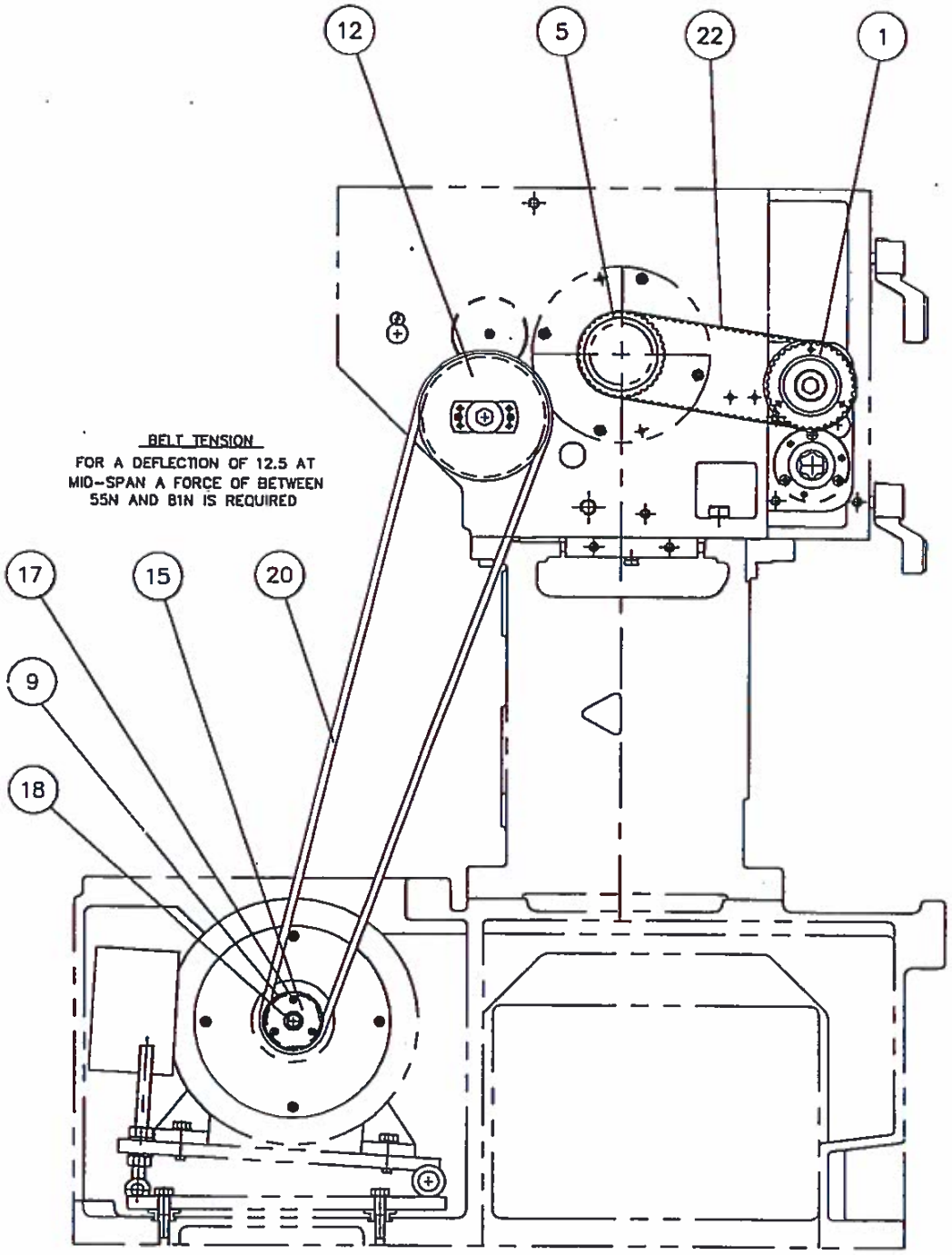
MOTOR MOUNTING ASSEMBLY



MOTOR MOUNTING ASSEMBLY A175 - 0601

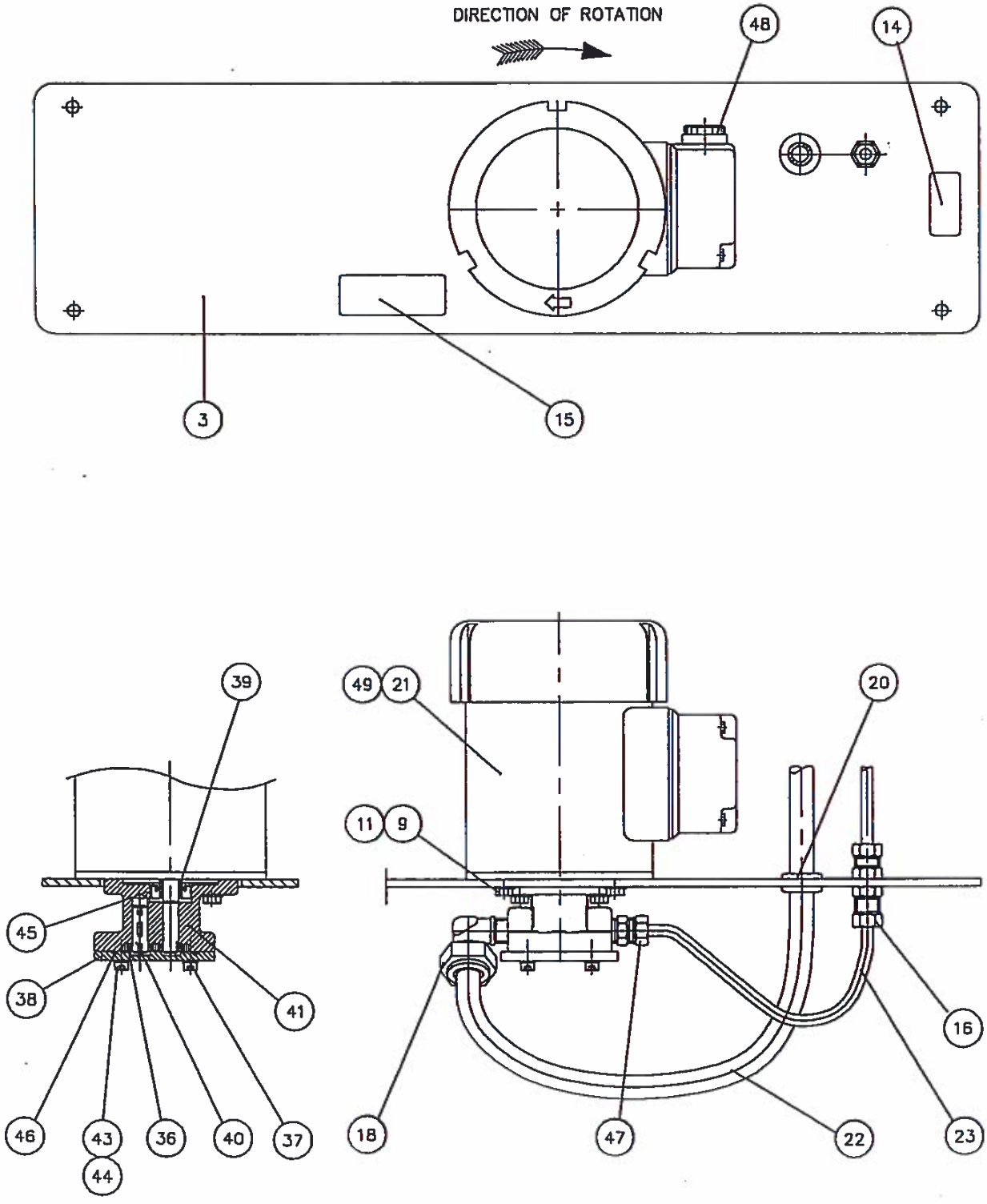
Item No.	Description	Part No.
1	MOTOR MOUNTING PLATE	D565 - 1057
2	HEAD END MOTOR MOUNTING PLATE	D565 - 1058
3	TAIL END MOTOR MOUNTING PLATE	D565 - 1059
4	MOTOR MOUNT ADJUSTING SCREW	D697 - 0383
5	MOTOR MOUNT SPACER	D708 - 0513
8	WASHER M16	B117 - 0013
9	HEXAGON NUT M16	B147 - 9156
10	SET SCREW M6x8	B163 - 1649
11	HEXAGON HEADED BOLT M12x40	B166Y0202
12	WASHER M12	B117 - 0012
13	HEXAGON HEADED BOLT M12x55	B166 - 0204

MASCOT BELTS AND PULLEYS ASSEMBLY



Item No.	Description	Part No.
1	36T PULLEY SUB-ASSEMBLY	A824 - 0035A
5	36T PULLEY	D570 - 0351
12	155mm DIA. INPUT PULLEY	D570 - 0349
14	MOTOR PULLEY	D570 - 0373
15	MOTOR RETAINING PLATE	D565 - 1072
17	HEXAGON SOCKET BUTTON HEAD SCREW M6 x 16	FS - 0296
18	HEXAGON SOCKET CAP HEAD SCREW M16 x 40	FS - 0222
20	POLY VEE BELT REF 770L12	B345 - 5441
22	TIMING BELT REF 322L100	B346 - 1220
	36T PULLEY SUB-ASSEMBLY A824 - 0035A	
1	36T REVERSE BOX PULLEY	D570 - 0365
2	BELT RETAINING PLATE	D565 - 1074
3	HEXAGON SOCKET COUNTERSUNK SCREW M4 x 12	FS - 0428

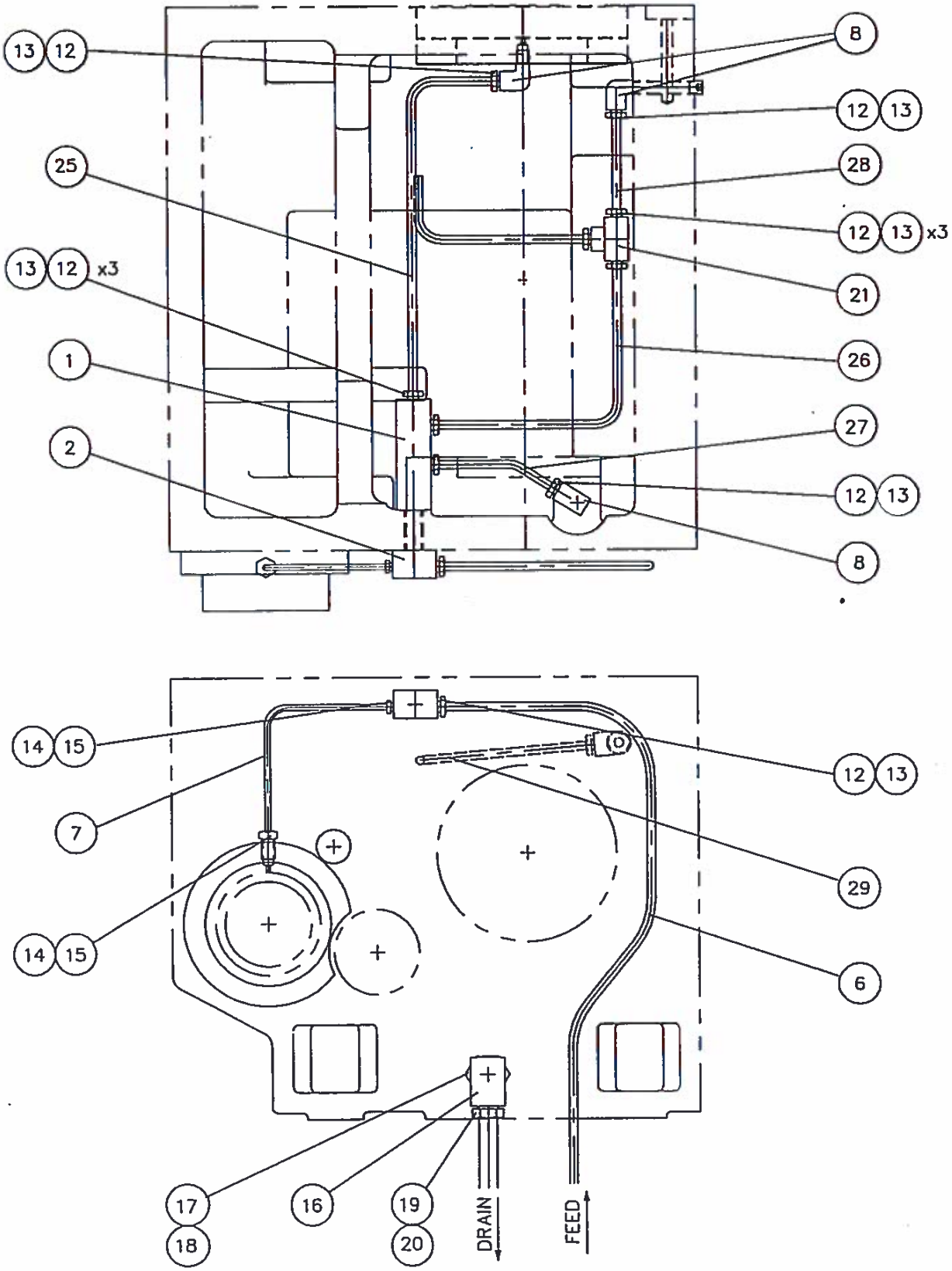
HEADSTOCK LUBRICATION PUMP



HEADSTOCK LUBRICATION ASSEMBLY A173 - 0501C

Item No.	Description		Part No.
3	BASE PLATE	INT. REF35167-610-3	B528 - 0005
9	MS SPRING WASHER	INT. REF 21175-723	B117 - 0179
11	HEXAGON HEAD SOCKET SET SCREW M5x20		B166 - 0029
14	LABEL		B780 - 0067
15	INTERLUBE LABEL	INT.REF 31813-404-1	B780 - 0060
16	6mm OD BULKHEAD PIPE	INT. REF 25477-775	B435 - 0566
18	1/4" BSP Tx1/2"OD	INT .REF 25477-751	B433 - 3232
20	GROMMET	INT. REF 27175-639	B715 - 9141
22	PLASTIC TUBE 1/2" OD	INT. REF 135226/1000	R827 - 4116
23	PLASTIC TUBE 6mm OD	INT. REF 136812/240	R827 - 4213
36	PUMP IDLER GEAR	INT. REF 31631-214-2	B473 - 9000
37	PUMP DRIVE GEAR	INT. REF 31631-215-2	B473 - 9001
38	BASE PLATE	INT. REF 32116-621-2	B473 - 9002
39	SPACER	INT. REF 32355-905-1	B473 - 9003
40	IDLER SHAFT	INT. REF 32612-216-1	B473 - 9004
41	GEAR HOUSING	INT. REF 37438-273-3	B473 - 9005
43	SPRING WASHER M4		B117 - 0178
44	HEXAGON SOCKET CAP HEAD SCREW M4x12		B163 - 0015
45	ROTARY SEAL	INT. REF 25131-602	B473 - 9006
46	'O' RING 40x1.5		B473 - 9007
47	STRAIGHT CONNECTOR 6x1/4" BSPT	INT. REF 25477-767	B435 - 0585
48	REDUCER M20/M16	INT. REF 27315-648	B731 - 6159
49	SPECIAL MOTOR BCPM	INT. REF 27676-001-3	B613 - 9012

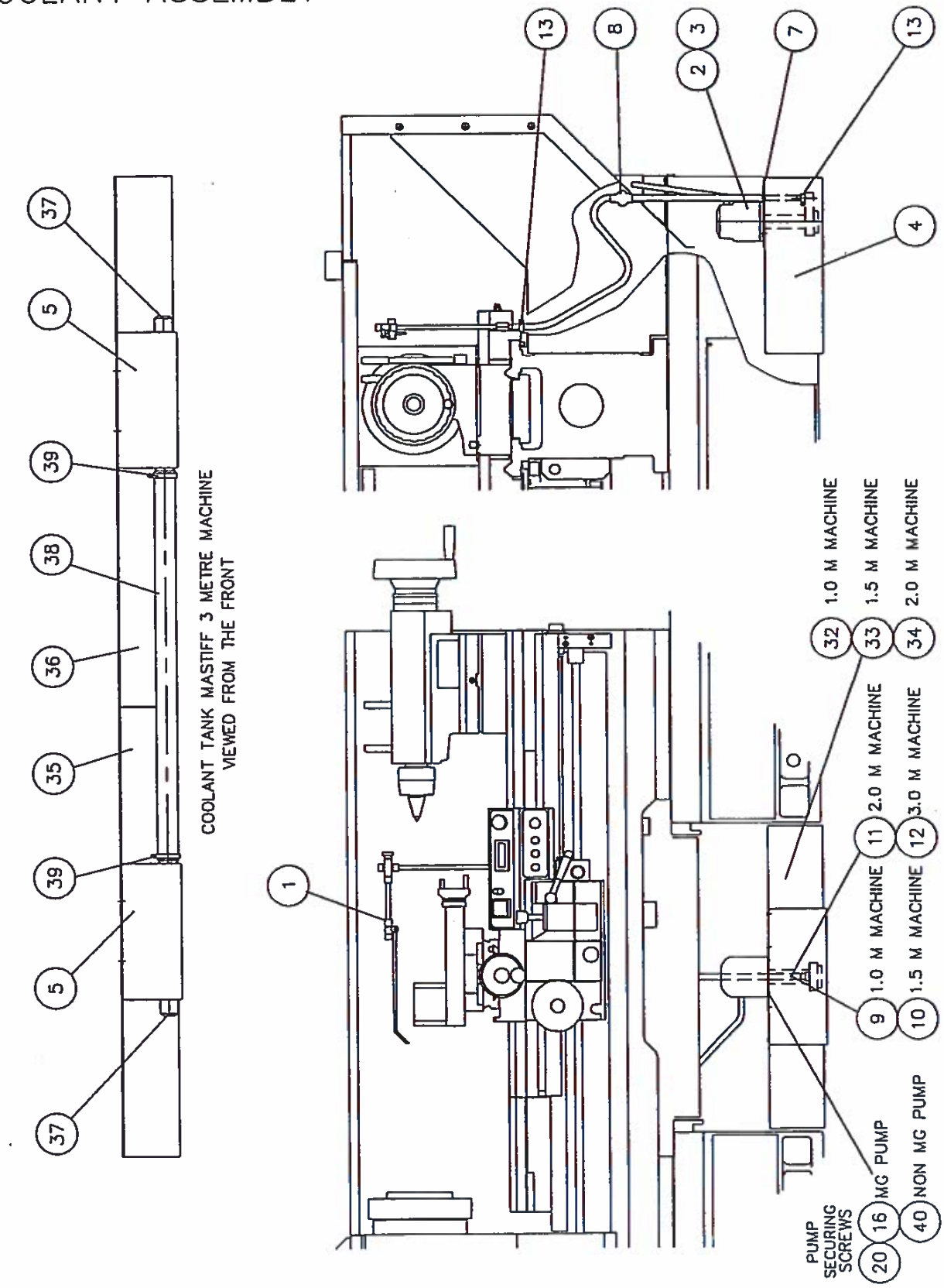
HEADSTOCK LUBRICATION KIT



HEADSTOCK LUBRICATION KIT A903 - 0002D

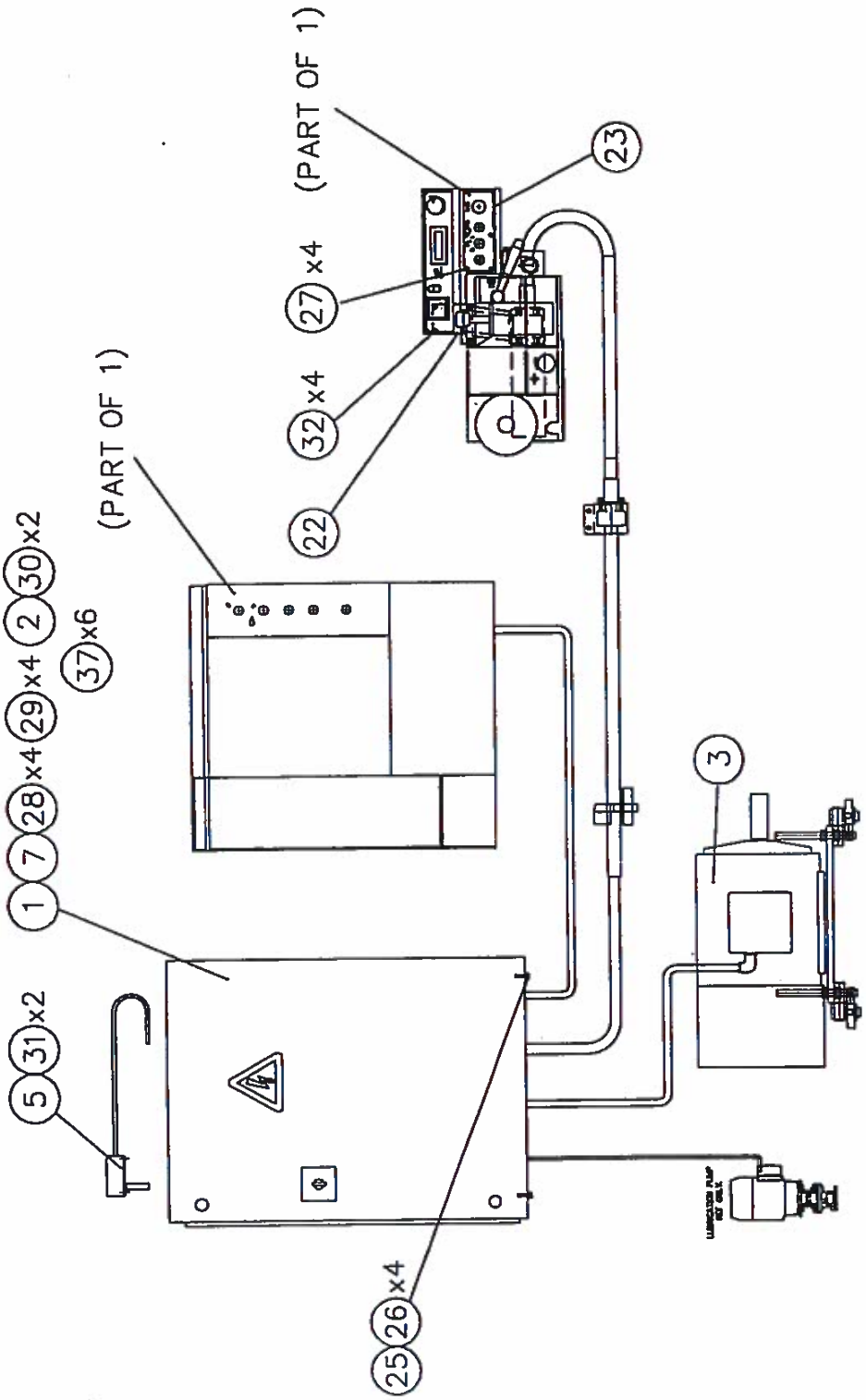
Item No.	Description	Part No.
1	4 WAY ADAPTOR	D004 - 0087
2	3 WAYADAPTOR	D004 - 0092
6	PLASTIC TUBE 6mm DIA.	R827 - 4213
7	NYLON TUBE ENOTS 4mm DIA.	R827 - 4211
8	6mm -1/8" BSPT ELBOW	B435 - 0132
11	4mm - 1/8"BSPT STRAIGHT CONNECTOR	B435 - 0134
12	6mm SLEEVE NUT	B435 - 0022
13	6mm CONE (OLIVE)	B435 - 0011
14	4mmTUBING NUT LM304	B435 - 0021
15	4mm O/D TUBING SLEEVE	B435 - 0010
16	HOBBS ELBOW 1/2"BSP-1/2"	B433 - 2257
17	HOBBS LOCKNUT 1/2" BSP	B433 - 0893
18	HOBBS SEAL 1/2" BSP	B433 - 3241
19	1/2" O/D TUBING NUT	B433 - 0811
20	1/2" O/D TUBING SLEEVE	B433 - 0851
21	'T' PIECE FITTING	B435 - 0448
25	PIPE - ADAPTOR TO FRONT BEARING	D562 - 0198
26	PIPE - ADAPTOR 'T' PIECE	D562 - 0199
27	PIPE - ADAPTOR TO REAR BEARING	D562 - 0200
28	PIPE - 'T' PIECE/OILSIGHT	D562 - 0201
29	PIPE - 'T' PIECE/LARGE GEAR	D562 - 0202

COOLANT ASSEMBLY

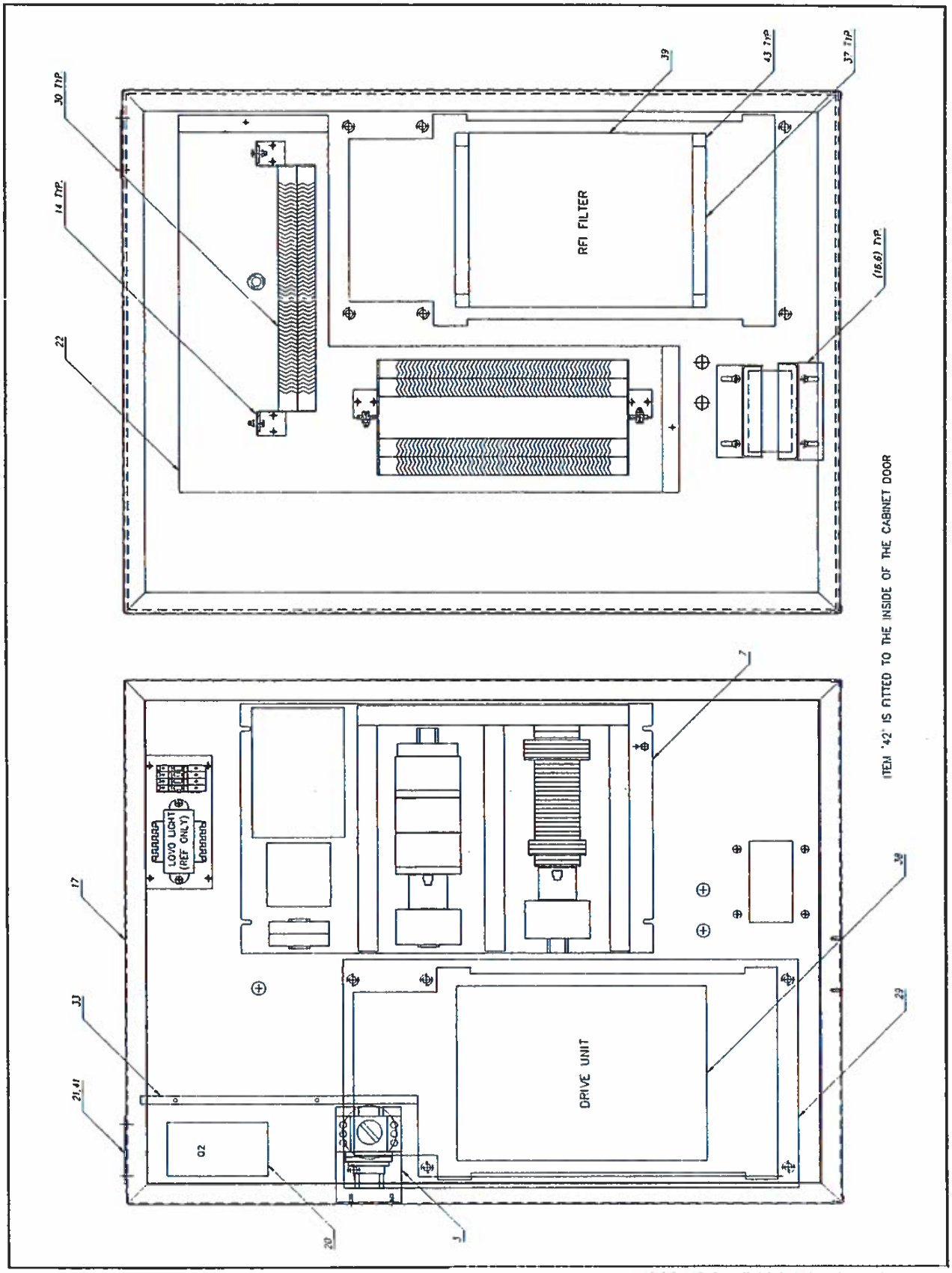


Item No.	Description	Part No.
1	COOLANT STANDPIPE ASSEMBLY (EXTENDED)	B425 - 0038
2	COOLANT PUMP ASSEMBLY (MG PUMP)	A867 - 0047
3	COOLANT PUMP ASSEMBLY (NON MG PUMP)	A867 - 0049
4	STANDARD COOLANT TANK	D828 - 0061
5	3 METRE COOLANT TANK	D828 - 0072
7	PUMP MOUNTING PLATE	D565 - 0943
8	PLASTIC SLEEVE	D704 - 0048
9	PLASTIC HOSE 1/2" BORE (1.0 METRE M/C)	R827 - 6127
10	PLASTIC HOSE 1/2" BORE (1.5 METRE M/C)	R827 - 6127
11	PLASTIC HOSE 1/2" BORE (2.0 METRE M/C)	R827 - 6127
12	PLASTIC HOSE 1/2" BORE (3.0 METRE M/C)	R827 - 6127
13	HOSE CLIP SIZE 0 NO087S	B233 - 4004
16	HEXAGON SOCKET BUTTON HEAD SCREW M6x10 (MG PUMP)	B163 - 1813
20	WASHER M6 (MG PUMP)	B117 - 0009
32	COOLANT TANK COVER (1.0 METRE M/C)	D132 - 0816
33	COOLANT TANK COVER (1.5 METRE M/C)	D132 - 0817
34	COOLANT TANK COVER (2.0 METRE M/C)	D132 - 0818
35	COOLANT TANK COVER (3.0 METRE M/C)	D132 - 0819
36	COOLANT TANK COVER (3.0 METRE EXT. M/C)	D132 - 0820
37	PLUG	B424 - 2817
38	PVC HOSE (1.1m)	R827 - 7325
39	HOSE CLIP	B233 - 0055
40	HEXAGON SOCKET CAP HEAD SCREW M6x16	B163 - 0037
	MG COOLANT PUMP ASSEMBLY **A867 - 0047**	
1	MG PUMP AQ3/2/Q/SS POS 'F'	B473 - 1001
2	COOLANT PUMP HARNESS	A826 - 1008A
	NON MG COOLANT PUMP ASSEMBLY **A867 - 0049**	
1	COOLANT PUMP	B473 - 1320
3	COOLANT PUMP HARNESS	A826 - 1073A

BASIC ELECTRICS (MASCOT/MASTIFF)

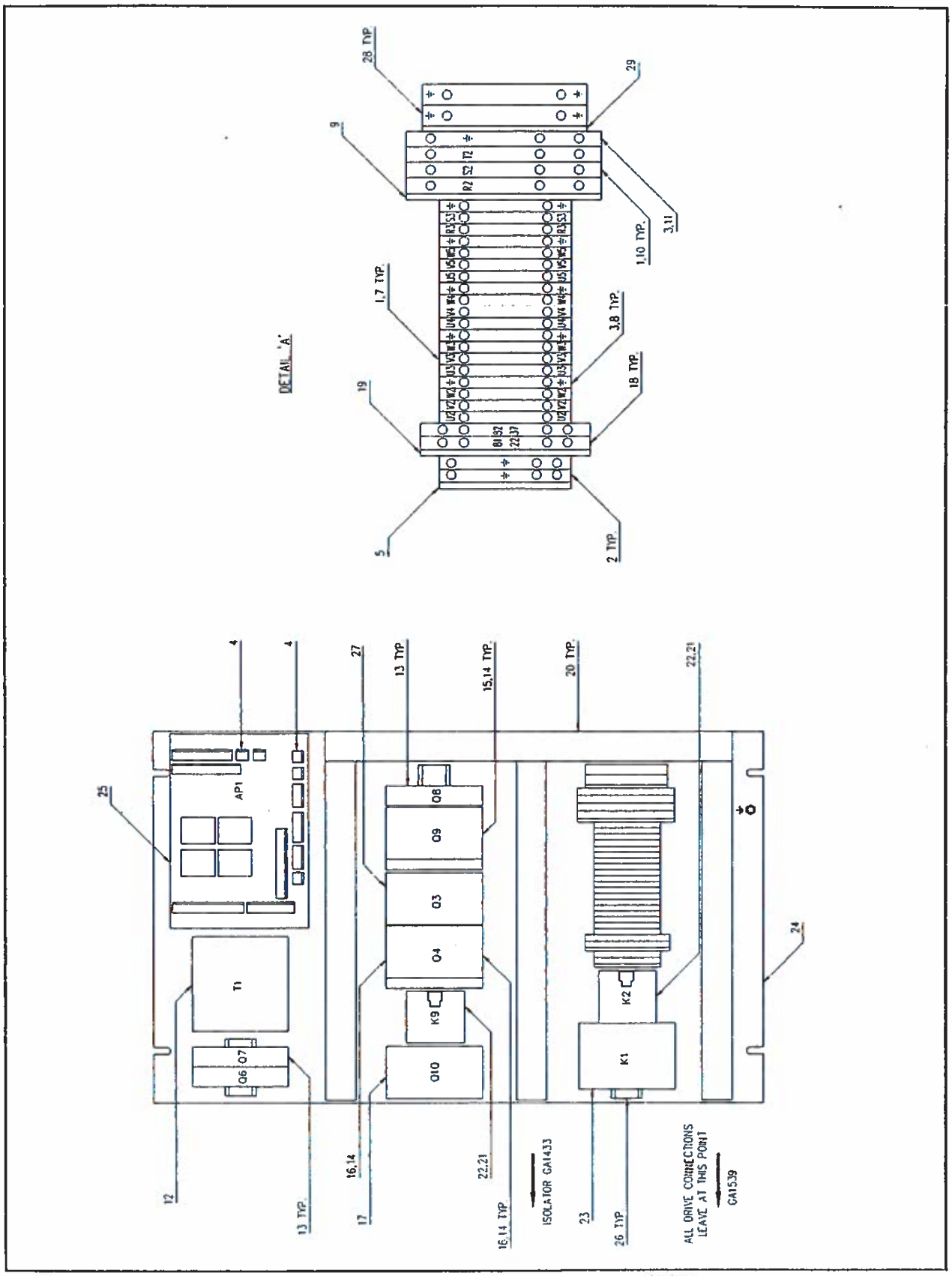


Item No.	Description	Part No.
1	ELECTRICAL ENCLOSURE ASSEMBLY	A191 - 1076A
3	MAIN DRIVE MOTOR 11kW D160M FRAME - VARIABLE SPEED	B613 - 9013
5	ROTACAM SWITCH ASSEMBLY	A826 - 1088A
22	GASKET APRON HARNESS TO SADDLE	D343 - 0189
23	GASKET APRON CONTROL TO SADDLE	D343 - 0190
25	HEXAGON SOCKET CAP HEAD SCREW M8x20	FS - 0162
26	WASHER M8	FP - 0050
27	HEXAGON SOCKET CAP HEAD SCREW M6x20	FS - 0136
28	NYLOC NUT M4	FS - 0930
29	WASHER M6	FP - 0040
30	NYLOC NUT M4	B147Y9001
31	HEXAGON SOCKET CAP HEAD SCREW M4x12	FS - 0094
32	HEXAGON SOCKET CAP HEAD SCREW M6x25	FS - 0138
36	PUMP HARNESS (TAIWAN) 8/10"	A826 - 1073A
37	YELLOW SPADE CRIMP M4	B711 - 3365
40	MAIN MOTOR HARNESS ASSEMBLY	A826 - 1770A
41	HEADSTOCK HARNESS ASSEMBLY 8/10VS	A826 - 1353A
42	APRON AND TACHO SENSOR HARNESS ASSEMBLY	A826 - 1313A
50	ELECTRICAL SCHEMATIC	EP766
	ROTACAM SWITCH ASSEMBLY A826 - 1088A	
1	SWITCH MOUNTING PLATE	D565 - 0923
3	HEXAGON SOCKET CAP HEAD SCREW M4x10	FS - 0092
4	GROMMET A1157	B715 - 1076
5	ROTACAM SWITCH/HARNESS	A826 - 1085A


RFI FILTER
DRIVE UNIT
LOYO LIGHT (REF ONLY)
ITEM '42' IS FITTED TO THE INSIDE OF THE CABINET DOOR

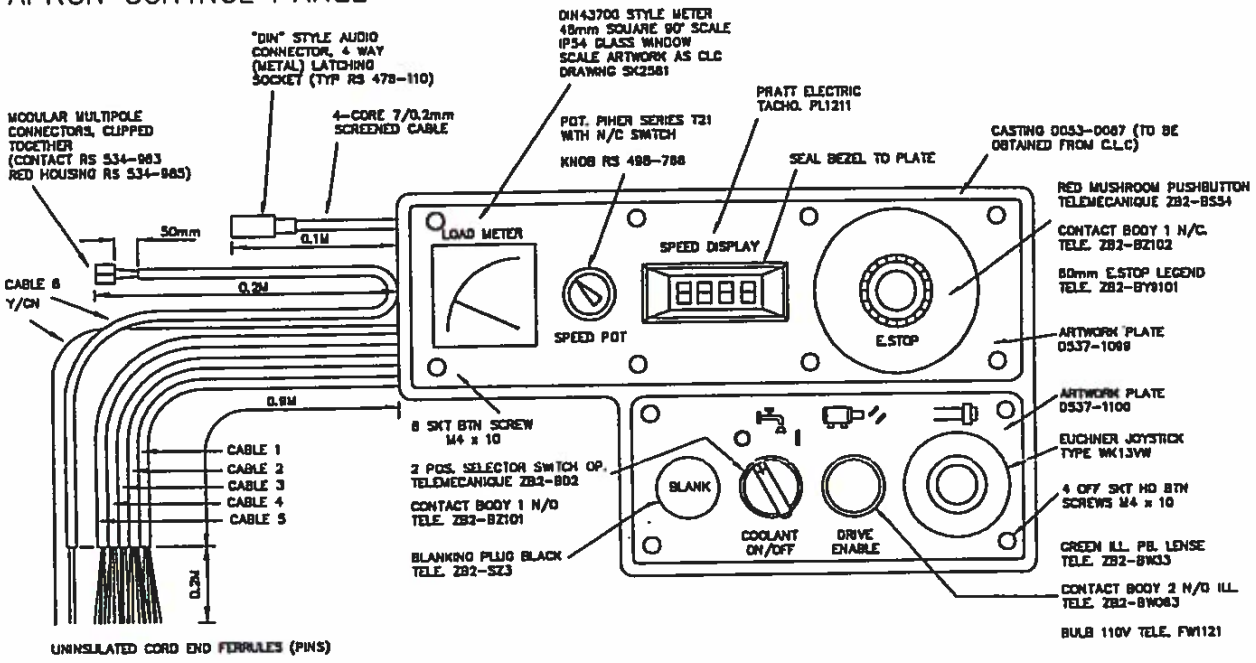
A191-1076A ELECTRICAL ENCLOSURE ASSEMBLY

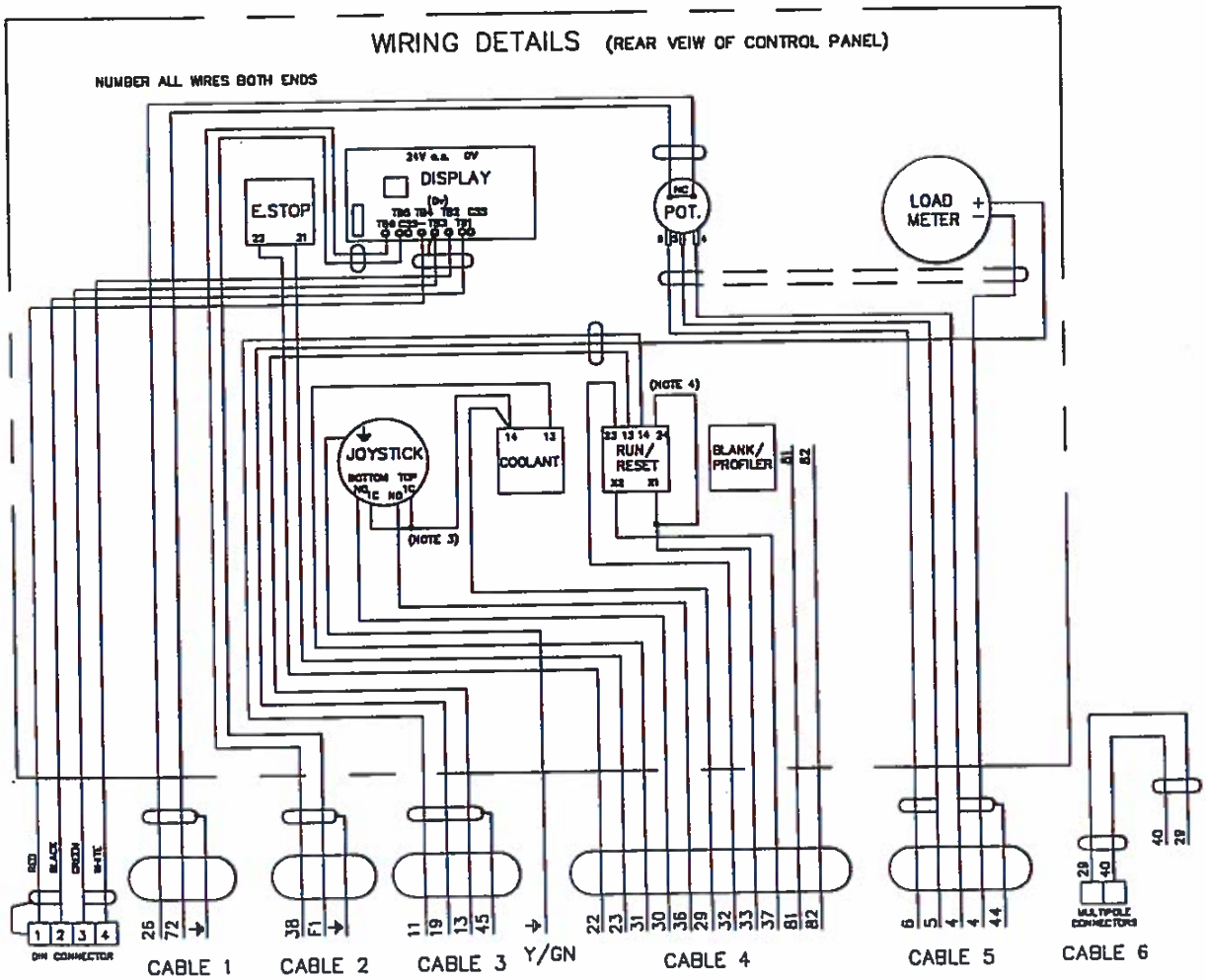
Item No.	Part Number	Description	Qty
1	A826-1004A	HYD MOTOR HARN ASY 8/10	1
2	E097-0007	14MM OPEN RUBBER GROMMET	1
3	GA1438	GA1438 ISOLATOR MOUNTING ASSY	1
4	WS1216	WS1216 M/M VS WIRING GA2210	1
5	GA1965	GA1965 3 POINT LOCK ASSY DEPTH 20mm	2
6	E097-0013	25x25MM NEO NEOPREEN RUBBER SEAL	0.25
7	GA2210	GA2210 M/M V.S MAGS PANEL	1
8	GA1749	GA1749 MAGNETICS/PCB HARNESS	1
9	A826-1842A	M/M PCB TO MITSUBISHI DRIVE	1
14	BK1049	BK1049 RESITOR MOUNTING BKT.	4
16	BK1054	BK1054 CABLE CLAMP BRACKET	2
17	BX1066	BX1066 MASCOT/MASTIFF VS ENC.	1
20	E013-0033	GK3-EF40 3POLE CCT BREAKER	1
21	OT1005	OT1005 D565-0932 LO-VO BLANKING	1
22	OT1179	OT1179 M/M VS RESISTOR COVER	1
28	GA1433	GA1433 ISOLATOR TO OPTIMAL 80	1
29	D565-1753	DRIVE MOUNTING PLATE-MASCOT/MASTIFF VS	1
30	E161-0157	20R RESISTOR PT380H20R	3
31	A826-1783A	EARTH BRAID CONNECTION	1
32	E097-0034	PV 64 QUICK FIT GROMMET	2
33	D132-1047	`EMC' BAFFLE COVER -MASCOT/MASTIFF VS.	1
37	D050-1194	DRIVE MOUNTING BRACKET - MITSUBISHI	2
38	E018-0011	FR-A740-00250-K12 SET FOR 11KW	1
39	E164-0011	F.LL.D3.030A.SN.I4 RFI FILTER	1
41	D343-0248	PLATE GASKET (LOVO LIGHT)	1
42	D537-1338	SERVICE AMENDMENT PLATE	1
43	E091-0089	M5X75 CAP HEAD SCREWS	4
46	E124-0016	20MM GLAND CABLE SIZE 10-14MM	3
47	E092-0021	LRS/M20 LOCKRING STEEL M20	4
48	E094-0027	R30-3001002 SPACER M3 X 10 M/F HEXSTL	4
49	E117-0039	MAT 0032 INSULATING BOOT	6


28 TYP
29
9
3,11
1,10 TYP.
1,7 TYP.
3,8 TYP.
18 TYP.
19
5
2 TYP.
DETAIL 'A'
4
4
27
13 TYP
15,14 TYP
20 TYP
22,21
25
AP1
T1
Q6 Q7
Q8
Q9
Q3
Q4
K9
Q10
K2
K1
24
12
13 TYP.
16,14
17
22,21
16,14 TYP
ISOLATOR GA1433
23
26 TYP
ALL DRIVE CONNECTIONS
LEAVE AT THIS POINT
GA1539

Item No.	Part Number	Description	Qty
1	E116-0008	0013-501 TERMINAL MARKER CARD	0.5
2	E074-0148	280-637 WAGO EARTH TERM	2
3	E116-0022	209-580 EARTH WAGO MARKERS	0.16
4	E074-0010	231-102 WAGO 2 WAY FEM STR.	3
5	E074-0131	280-313 WAGO END PLATE ORANGE	1
7	E074-0144	280-601 WAGO TERMINAL	14
8	E074-0146	280-607 WAGO EARTH TERMINAL	5
9	E074-0155	281-324 WAGO END PLATE	1
10	E074-0163	281-681 WAGO TERMINAL	3
11	E074-0164	281-687 WAGO EARTH TERMINAL	1
12	E061-0022	CX30 125VA 0-460VMULTIPRI	1
13	E013-0018	GB2-CB06 1 AMP S P CIRCUIT BRKR	3
14	E011-0019	GV-AN11 AUXILLARY CONTACT 1NO/NC	2
15	E012-0005	GV2-ME04 MOTOR STARTER 0.4/0.63 A	1
16	E012-0004	GV2-ME03 MOTOR STARTER 0.25/0.4 A	1
17	E012-0007	GV2-ME06 MOTOR STARTER 1.0/1.6 A	1
18	E074-0143	280-519 WAGO DOUBLE TERM 2.5MM	2
19	E074-0137	280-341 END PLATE	1
20	E125-0003	HTS12 25x80 SLOTTED DUCTING	1.3
21	E014-0009	LA4-KA1U SUPPRESSOR (RC)	2
22	E011-0045	LC1-K0601F7 CONTACTOR 110V +NC AUX.	2
23	E011-0063	LC1-D32F7 CONTACTOR 110V	1
24	MT1050	MT1050 MOUNTING PLATE	1
25	A826-3370A	'V' RANGE PCB (CONTROL + CSS)	1
26	E096-0068	TS35 SLOTTED DIN RAIL	1
27	E012-0003	GV2-ME02 MOTOR STARTER 0.16/0.25	1
28	E074-0170	282-607 WAGO EARTH TERMINAL	2
29	E074-0166	282-316 WAGO PARTITION	1
30	E162-0110	RC3/022-400 BU 23050 MOTOR SUPPRESSOR	1

APRON CONTROL PANEL–





CABLE 1	2 CORE 7/0.2mm	SCREENED
WIRE No.	CORE COLOUR	CUT
26	RED	26
72	BLACK	72
N.C.	SCREEN	⏚

CABLE 2	2 CORE 7/0.2mm	SCREENED
WIRE No.	CORE COLOUR	CUT
F1	RED	F1
38	BLACK	38
N.C.	SCREEN	⏚

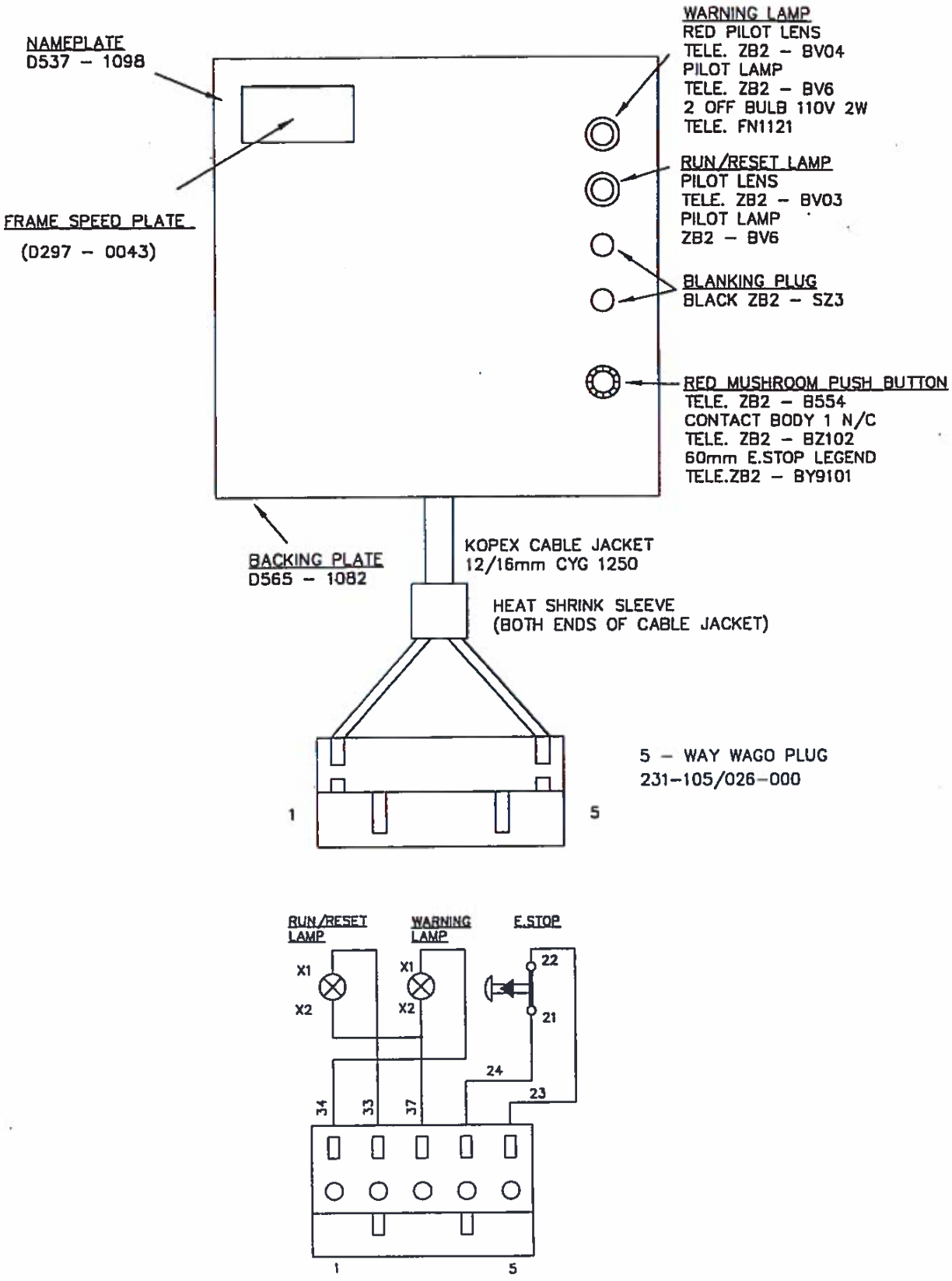
CABLE 3	4 CORE 7/0.2mm	SCREENED
WIRE No.	CORE COLOUR	CUT
11	BLACK	11
19	WHITE	19
13	RED	13
SPARE	GREEN	SPARE
N.C.	SCREEN	45

CABLE 4	12 CORE 16/0.2mm NON-SCREENED	
WIRE No.	CORE COLOUR	CUT
22	RED	22
29	BLUE	29
30	GREEN	30
31	YELLOW	31
32	WHITE	32
33	BLACK	33
36	BROWN	36
37	VIOLET	37
81	ORANGE	81
82	PINK	82
23	TURQUISE	23
SPARE	GREY	SPARE

CABLE 5	4 CORE 7/0.2mm	SCREENED
WIRE No.	CORE COLOUR	CUT
4	BLACK	4
5	WHITE	5
6	RED	6
4	GREEN	4
N.C.	SCREEN	44

CABLE 6	2 CORE 16/0.2mm NON-SCREENED	
Multi Pole	CORE COLOUR	CUT
29	BROWN	29
40	BLUE	40

HEADSTOCK PUSH BUTTON ASSEMBLY



NOTES

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

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