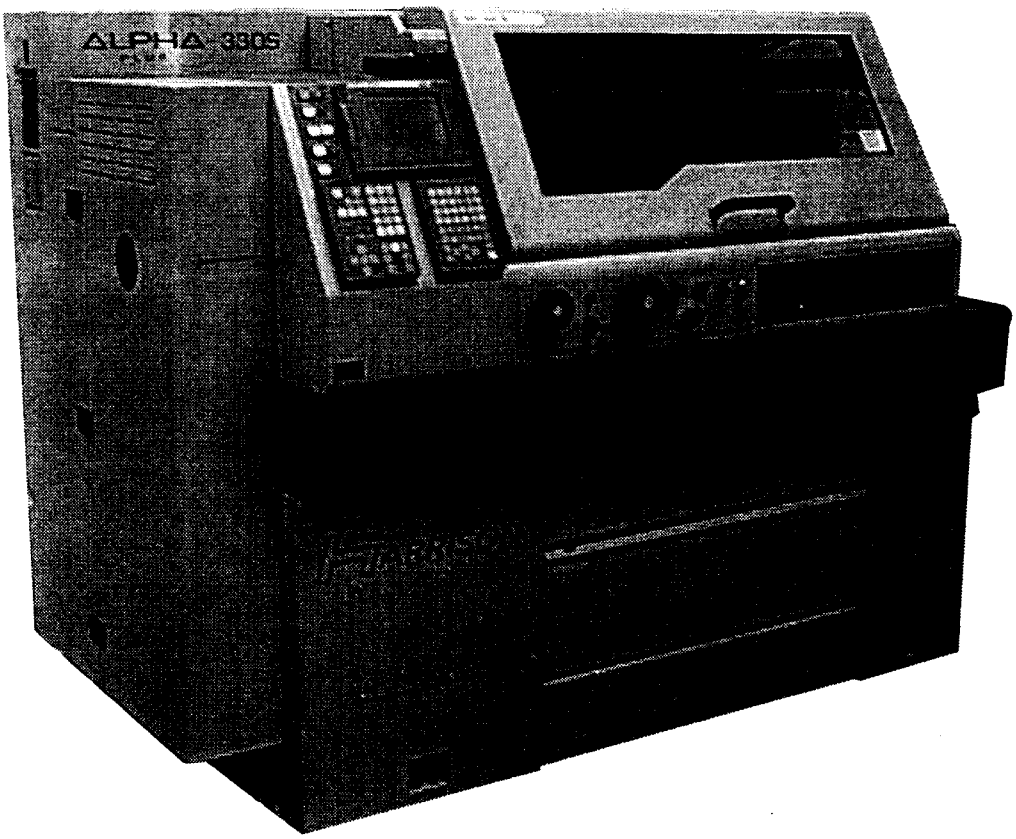
600 SERIES

HARRISON

ALPHA 3 3OS

PLUS



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

Machine Serial Number

Year of Manufacture

1999

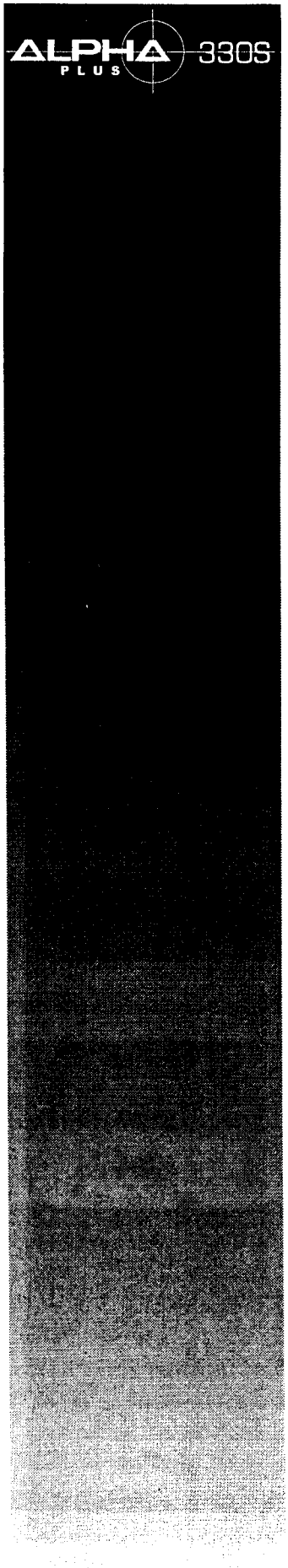
HARRISON ALPHA PLUS 330S

Manufactured at 600 LATHES

BS EN ISO 9002
FM 12345

THE 600 GROUP

S3P-E01-MAY/1999



S3P-E01-MAY/1999

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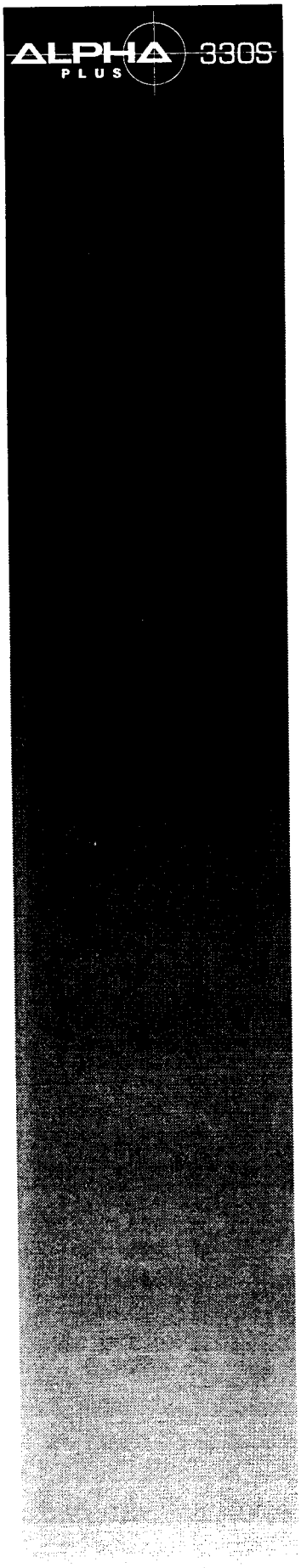

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MACHINE SPECIFICATION

INTRODUCTION

MACHINE SPECIFICATION

0

0.2

S3P-E01-MAY/1999

Machine Specification

ALPHA PLUS 330S

Swing over bed	330mm (13")
Swing over cross slide	210mm (8 9/32")
Distance between centres	1000mm (40")
'X' axis [Cross slide] travel	180mm (7 3/32")
'Z' axis [Saddle] travel	1016mm (40")
Spindle centre height, from floor	1080mm (42 1/2")
Spindle nose [camlock]	D1-4
Spindle bore	42mm (1 21/32")
Spindle front bearing internal diameter	70mm
Spindle motor	7.5kW
Spindle speeds	
Range 1	Infinitely Variable 0-3500
Range 2	Infinitely Variable 0-2000
'X' axis rapid traverse rate	6m/min
'Z' axis rapid traverse rate	6m/min

Rapid traverse rates quoted above are with guards closed with guards open traverse rate is limited to 4m/min

Maximum feed rate	5m/min
'X' axis ballscrew, diameter x pitch	16 x 4mm
'X' axis thrust [@ constant stall torque]	1.9kN [447lb]
'Z' axis ballscrew, diameter x pitch	25 x 4mm
'Z' axis thrust [@ constant stall torque]	4.2kN [944lb]
Tailstock quill taper	No. 3 MT
Tailstock quill diameter and travel	42/110mm (1 21/32/4 11/32)
Cross slide width	140mm (5 33/64")
Bedway width	205mm (8 5/64")
Turning tool section [quick change toolpost]	20 x 20mm
Coolant tank capacity	25 Litre

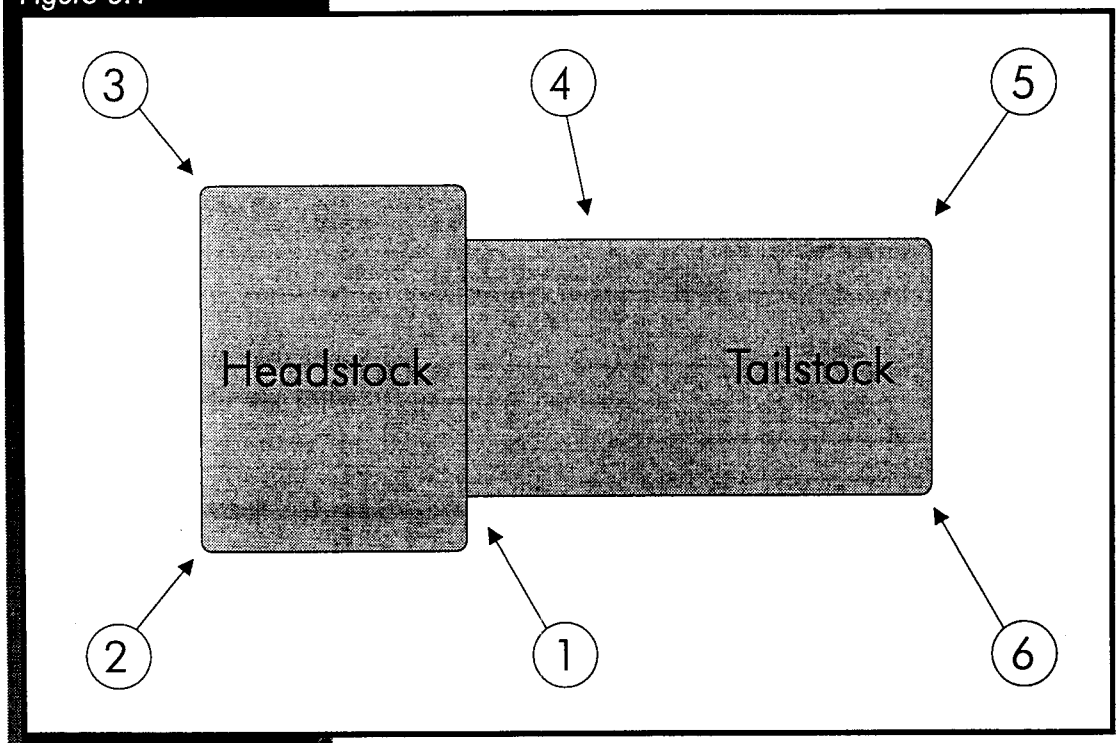
Optional Equipment

Blank toolpost raiser blocks	
3 jaw manual chuck	Ø160 (6 1/4")
3 jaw manual chuck	Ø200 (7 7/8")
4 jaw chuck	Ø205 (8")
Faceplate	Ø300 (12")
Travelling steady [plain or roller pads]	Ø10 - Ø50mm capacity
Stationary steady [plain or roller pads]	Ø10 - Ø100mm capacity

Noise Level

The maximum noise level at the operators position is within 83 dB(A) and the maximum mean noise level is within 83 dB(A.

Figure 0.1



Note:
The operators position is position 1 and the mean is taken from readings at all 6 positions, as shown in figure 0.1.

The conditions of measurement are the spindle running at top speed, with a standard chuck fitted.

These measurements are in accordance with BS4813 : 1972

Contents

PLEASE READ THIS SECTION CAREFULLY
BEFORE OPERATING YOUR LATHE

LATHE SAFETY

SECTION: ONE

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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 & Safety at Work act 1974

In accordance with the requirements of the Health and Safety at Work 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.

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 workpiece 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 compatibility with 600 Lathes 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 actual gripping power being used for any given application is not known by the chuck manufacturer.

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 Hazards

There is the possibility of the workpiece becoming insecurely gripped due to the influence of centrifugal force under certain conditions.

The factors involved include:-

1. Too high a speed for a particular application.
2. Weight and type of gripping jaws if non-standard.
3. Radius at which gripping jaws are operating.
4. Condition of chuck - inadequate lubrication.
5. State of balance.
6. The gripping force applied to the workpiece in the static condition.
7. Magnitude of the cutting forces involved.
8. 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

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.

General Principles - continued

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 a 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 some time.

25. Allow chuck to stop before operating it.

General Principles - continued

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

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

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

    Do not operate lathe whilst talking.

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

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

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

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

33. Always attend to filing and deburring operations.

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

    Files and deburring tools may catch on chuck.

34. Beware of clutch position (where applicable) 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.

General Principles - continued

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 any thing.

    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.

General Principles - continued

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.

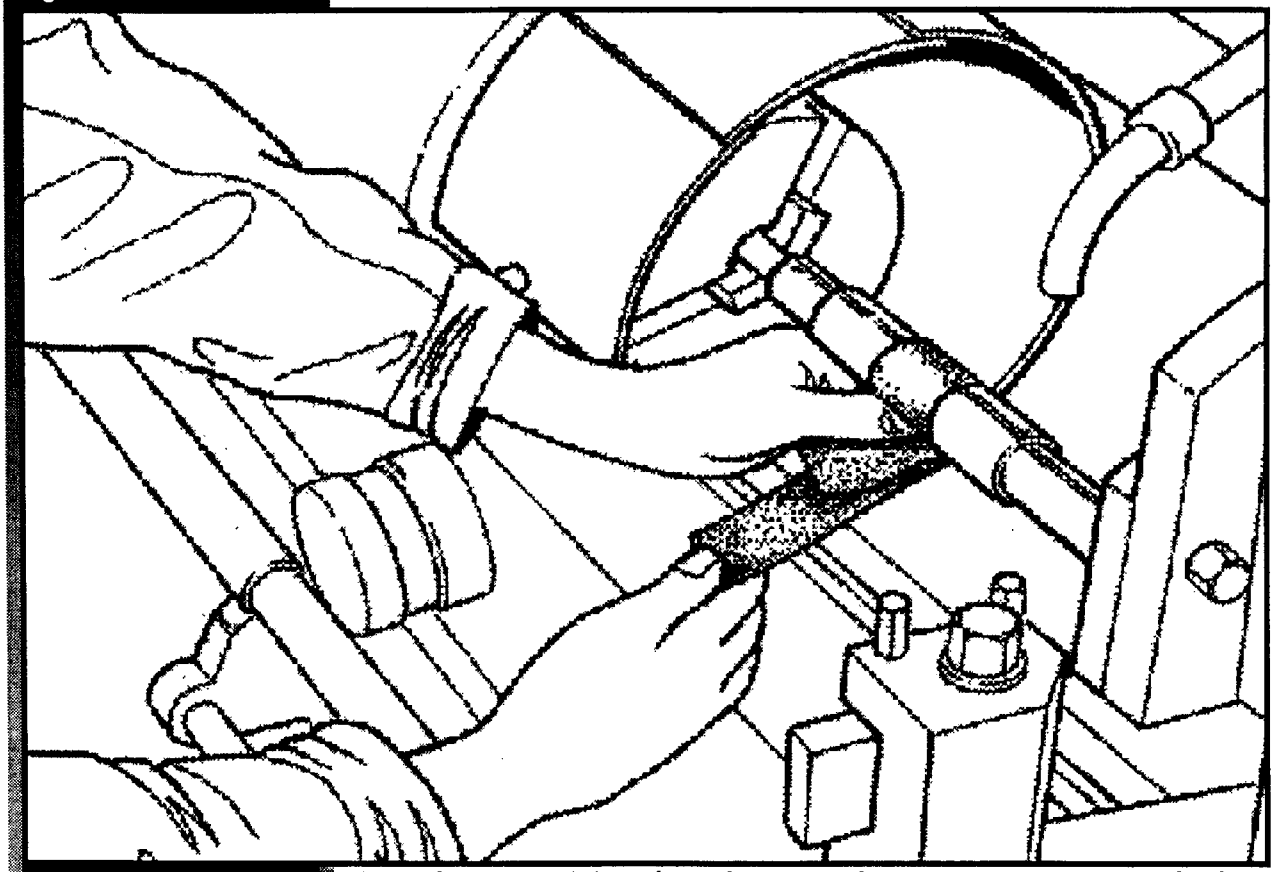
LATHE SAFETY

1

Chuck Guards with Disc Type Turrets.

The chuck guards are designed to be a close fit around the perimeter of each chuck in order to minimise intrference problems with adjacent tools.
When using manual 3 jaw chucks it may be necessary to to remove the chuck guard extension piece in order to remove / change the jaws. This guard extension must always be replaced and its postion adjusted to give the maximum degree of protection.

Figure 1.1



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

Accidents at Metalworking Lathes using Emery Cloth

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.

Accidents at Metalworking Lathes using Emery Cloth

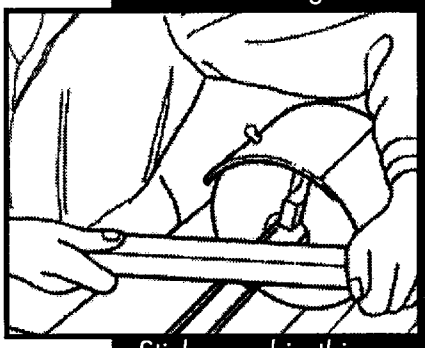
Precautions

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.

Figure 1.2

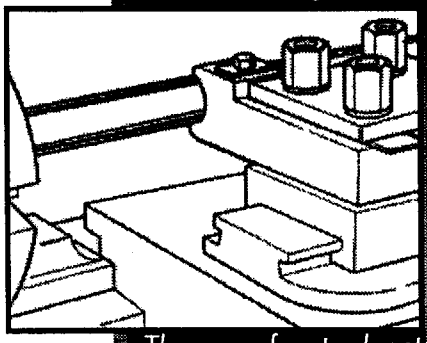


Sticks used in this way must be strong and of good material.

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 encompass the surface to be linished;
or
d) hand-held, abrasive-impregnated wire brushes.

Figure 1.3



The use of a toolpost completely removes all risk of injury to the hands.

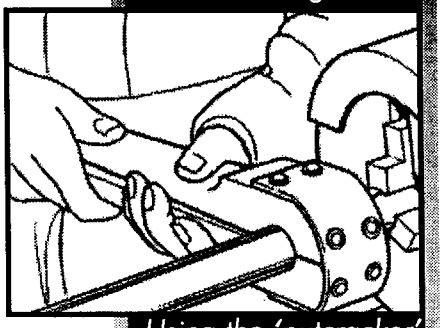
Where none of the above methods is reasonably practicable and it is necessary to use emery cloth for polishing the outside diameters of components, the emery cloth should be used in long strips with one end passed beneath the component.

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 operators 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.

Figure 1.4



Using the 'nutcracker' method a much better way of polishing.

(Taken from the United Kingdom, Health and safety executive Engineering Information Sheet No. 2)

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Contents

OPERATION

SECTION: TWO

OPERATION 2

2.2

S3P-E01-JUL/1999

Lathe Safety

Before attempting to start the machine carefully read the following "Operation" pages of this manual.

In the interests of safety please read the Operator Health and Safety Guidance Notes at the beginning of this manual.

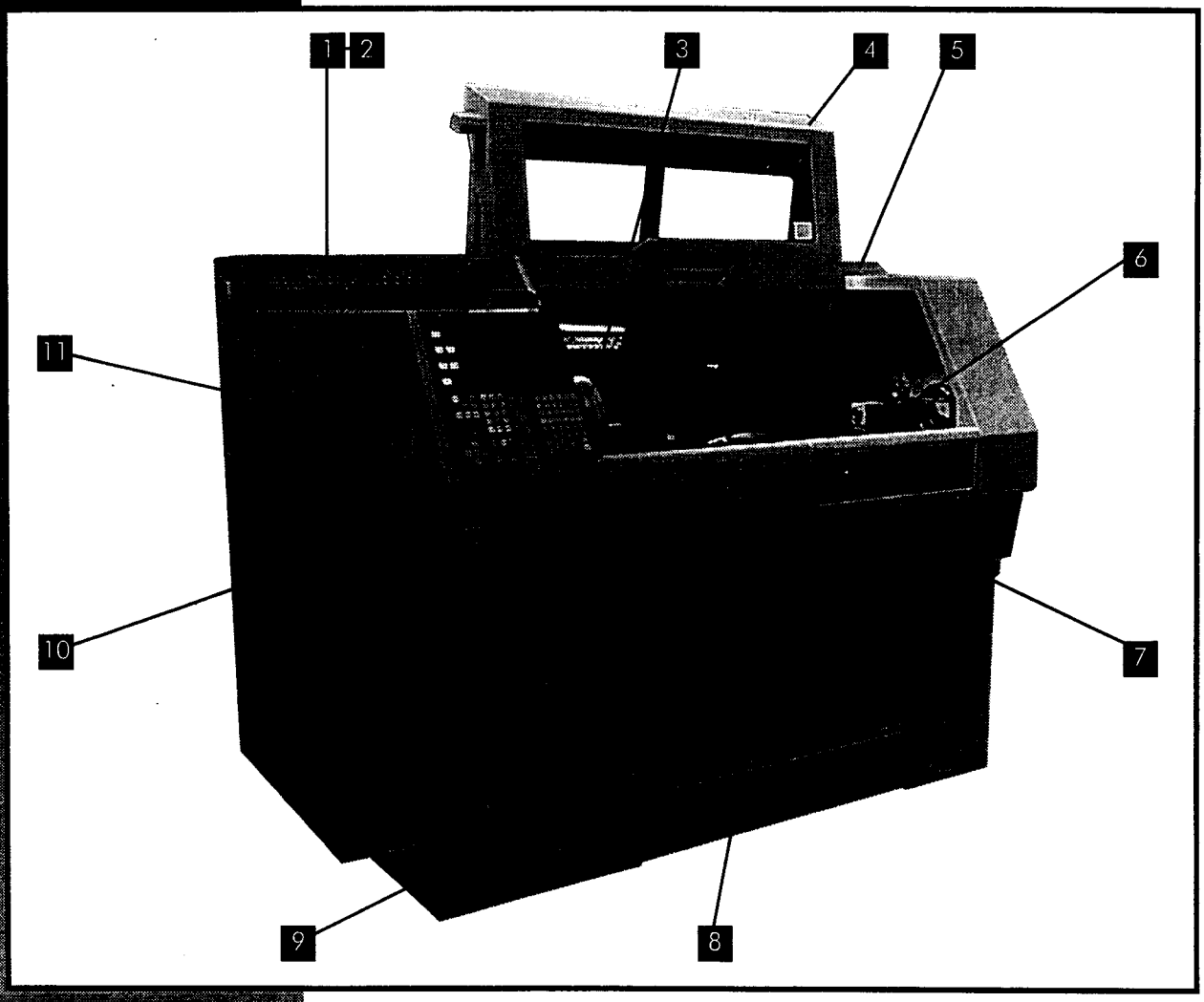
Some of the key points are:-

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.

Additionally for the Alpha Lathe:

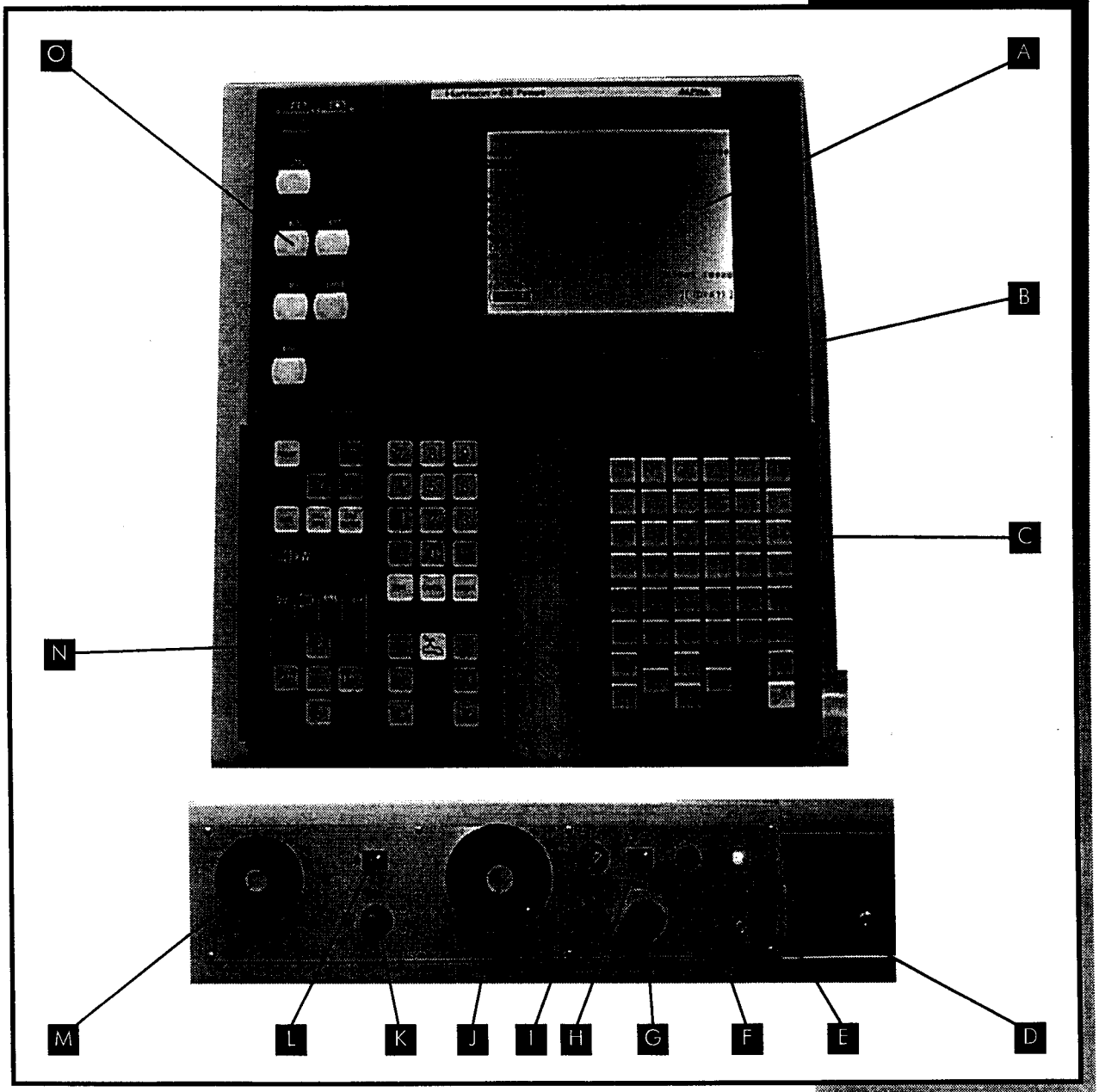
Always open the electrically interlocked chuck guard before handling the spindle nose, chuck or a workpiece mounted in the lathe. This action will electrically isolate the main spindle drive to give a completely safe condition.

Machine Layout



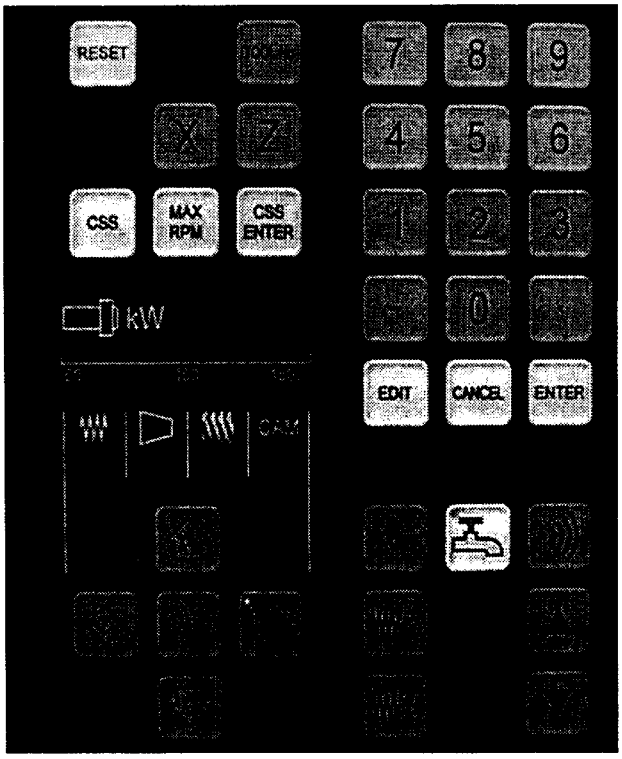
1. Electrical cabinet
2. Mains Isolator (Rear of Electrical Cabinet)
3. Chuck Guard (Electrically Interlocked)
4. Lift Up Work Guard (Electrically Interlocked)
5. Rear Splash Guard
6. Tailstock
7. Front Chip Guard
8. Pull Down Swarf Bin Door
9. Machine Base
10. End Guard Door (Electrically Interlocked)
11. Operator Control Station

Operator Control Station



A. CRT Screen
B. Screen Softkeys
C. CNC Keypad
D. Spindle Start/Stop lever
E. System ON/OFF buttons
F. Feed overide switch
G. Emergency stop button
H. Spindle Forward/Reverse switch
I. Spindle speed control
J. 'Z' Axis handwheel
K. Feed engage lever
L. Handwheel increment select switch
M. 'X' Axis handwheel
N. MDI operators keypad
O.

Keypad Buttons



RESET System Reset

Tool No. Input

X Axis Reference Input

Z Axis Reference Input

CSS CSS Mode Select

MAX RPM CSS Maximum RPM Input

CSS ENTER CSS 'Start Point' Enter

EDIT Edit Screen Access

CANCEL Cancel Data Input

ENTER Data Enter/Select

Units Select

Keypad Buttons


Feed Per/Rev Select


Feed Overide Switch


Touch Sensor


Coolant On/Off



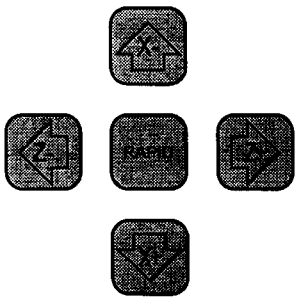
Cursor keys used with Feed/Rev, Feed Overide and for scrolling through on screen data tables.

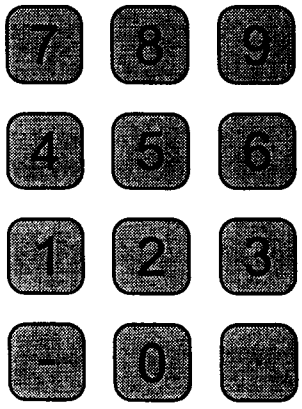

Feed Engage Indicator


Taper Mode Indicator

CAM Mode Indicator


Thread Mode Indicator


Feed Direction selection keys and Rapid Traverse Engage button

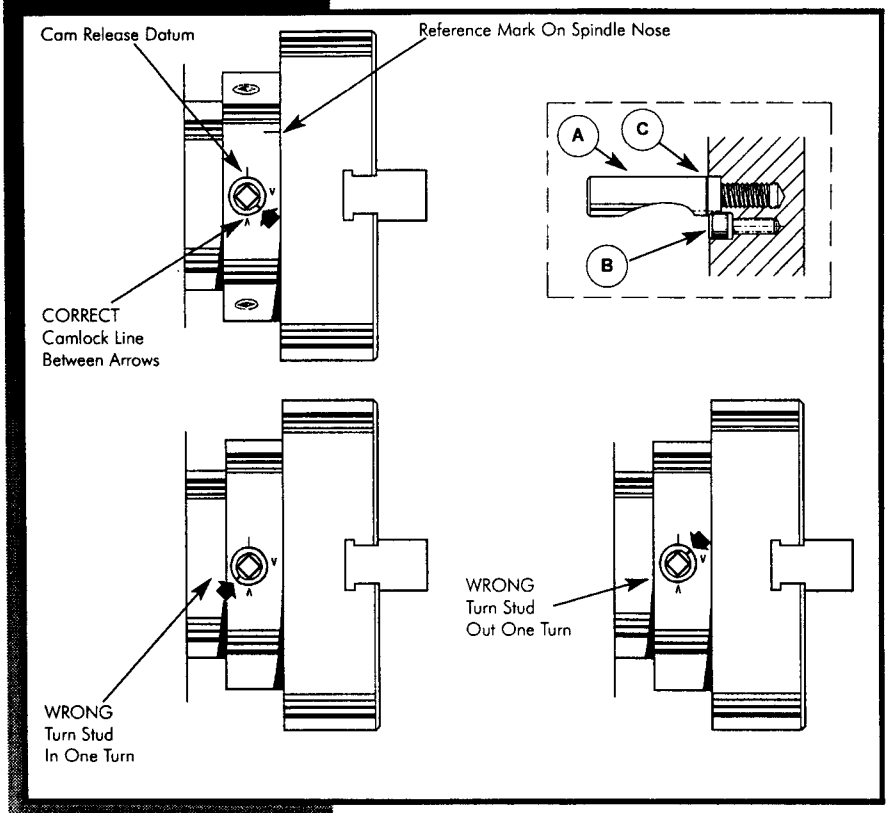

Data Input Keypad

OPERATION

2

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 cap-head 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 chucks and faceplates.

The 300 mm (11 13/16") diameter face plate should not be run at more than 2500 RPM.

The 205m m (7 7/8") diameter 4 jaw chuck should not be run at more than 2300 RPM.

The 160mm (6 16/64") diameter 3 jaw chuck should not be run at more than 3500 RPM.

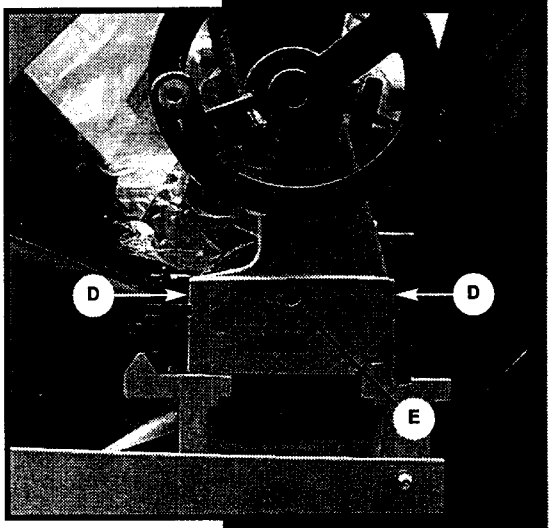
Tailstock

The tailstock may be clamped to the bed by means of clamp lever (A). The angular lock position of lever (A) is adjusted by means of a self-locking hexagon headed bolt (B) located on the underside of the tailstock and between the bedways. The tailstock barrel is locked by means of lever (C).

The tailstock can be set over for the production of shallow tapers or for re-alignment. Set over adjustment is achieved by unclamping tailstock lever (A) and nut (B). Slacken rear location screw (E) one turn. 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 (E).

The barrel is graduated in imperial and metric dimensions.

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



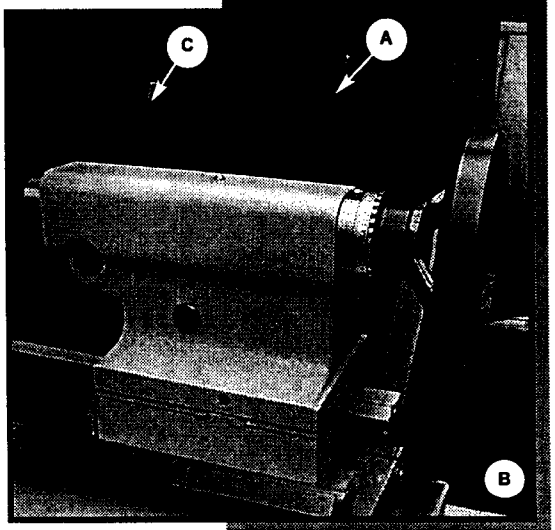
Coolant

The coolant pump is switched ON and OFF from the operator keypad.

The flow of coolant is controlled by means of the tap fitted to the standpipe.

The coolant tank is located at the back of the machine and has a capacity of 25 litres.

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



OPERATION

2

Speed Range Selection

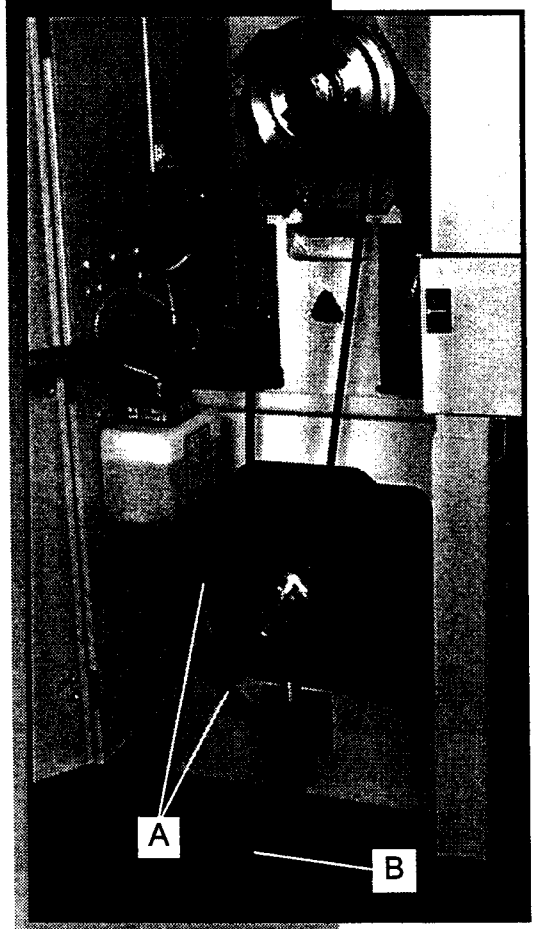
Spindle drive is from the main motor using an AC invertor variable speed drive.

The spindle has two infinitely variable speed ranges:

Range 1 - 0-3500 RPM with constant power above 1500 RPM.

Range 2 - 0-2000 RPM with constant power above 856 RPM.

Speed range selection is by means of changing the drive belt over between the two sets of pulleys with different torque ratios. The change method is designed to allow production runs in each range, but it is not intended as a frequent use, quick change range selector as on other machines.



Belt Change Over Procedure

1. Release motor fixing clamps using handles (A).
2. Lift handle (B) causing motor to rotate upwards.
3. Change belt on to required pulley range.
4. Release handle (B) and lower motor.
5. Tighten handles (A) to lock motor into place.

Spindle Speed Calculations

As a two 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) $$N = \frac{S \times 12}{\pi \times D}$$ (IMPERIAL)

Where

D = diameter in inches
S = cutting speed in feet/min

and

N = spindle rev/min

Example of Spindle Speed Calculation.

It is required to rough turn a diameter of 150mm 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

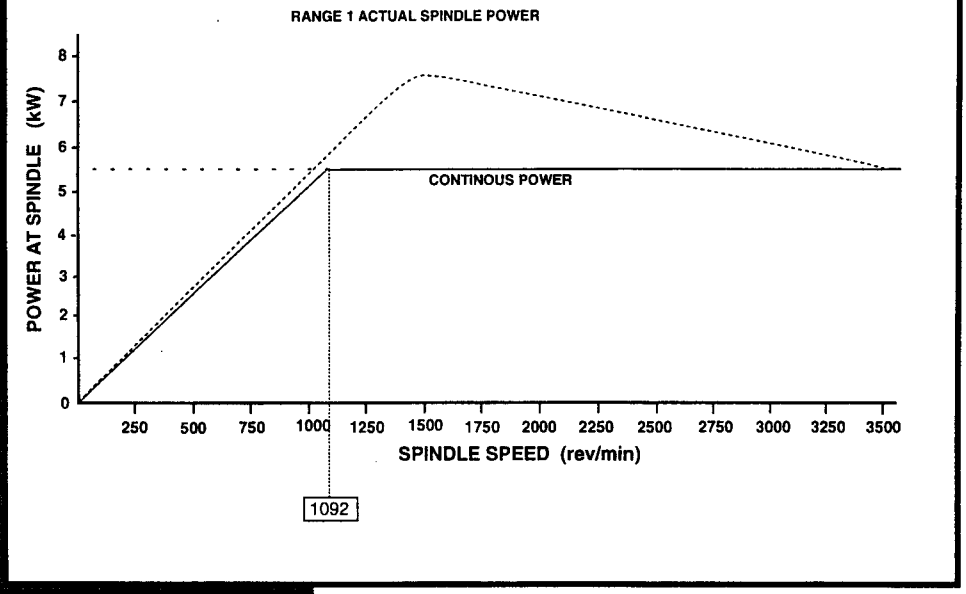
therefore:

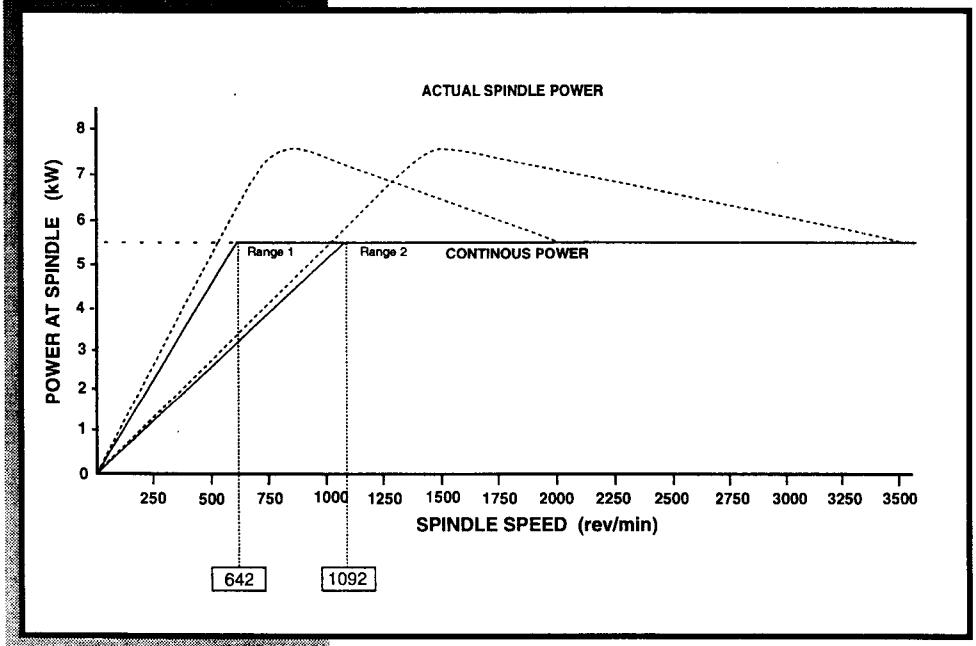
$$N = \frac{200 \times 1000}{\pi \times 150} = 424 \text{ rev/min}$$

This speed is obtainable in both spindle speed ranges, but as only 2.1 kW spindle power available in range 1 and 4.3 kW is available in range 2, range 2 should be used.

Spindle Power

The power available at the spindle in each of the two ranges can be seen from the graphs below.





Power On

Switch on mains isolator (this is situated behind the lathe at the head-stock end), red system off pushbutton (at the operators control panel) will illuminate, confirm emergency stop button(s) are un-latched (twist to release).

Press green 'SYSTEM ON' pushbutton and wait for screen display to appear.

Machine is now ready for use in manual operation mode.

Power ON/OFF

A time interval of more than 20 seconds is required between power switch off and on at the mains isolator to allow the machine interval self checking circuits to fully re-set.

To Run Spindle in Forward Direction at Say 1000RPM

As can be seen from the graphs on page 2.10 1000 RPM is available in both speed ranges so it is not necessary to change speed range.

Select forward spindle direction at the control panel switch.

Turn speed control knob to minimum.

Lift spindle START/STOP lever to run spindle at minimum RPM and wait approx. 2 seconds for screen message to clear.

Then turn speed control Knob up to give 1000RPM. (speed will be dis-played on screen).

To stop spindle move the START/STOP lever down again.

For subsequent spindle starts use START/STOP lever only - spindle will start at the RPM previously set by the speed control knob.

Feed movements

Feed rates are mm (or inches) per rev. and are inhibited when spindle is stationary.

Stopping the spindle during a feed movement will disengage the feed.

OPERATION 2

2.14

S3P-E01-JUL/1999

Contents

OP GUIDE

SECTION: THREE

OP GUIDE

3

Automatic "Pull-Off"

The Alpha Lathe has an automatic 45° "Pull-Off" feature which retracts the tool approximately 0.2mm at the end of any "Feed to a Stop" movement; so as to avoid tool rubbing conditions at such a point.

It should be noted that this feature inhibits the use of power feed movement to stops set for Grooving operations, however Grooving operations using stop settings can be carried out using the manual feed handwheels.

Alternatively Grooving operations can be carried out using Automatic Feed where stop settings are not used.

Spindle Monitoring

The Alpha Lathe has in-built spindle monitoring circuits which detect excessive spindle speeds and un-wanted spindle movements. It should be noted that if the spindle is rotated manually whilst in Run status. i.e. whilst the chuck guard is closed then the main spindle drive will be electrically isolated and the message "Spindle Fault Detected" will be displayed at the operator control station. To clear this condition switch off the mains isolator (situated behind the lathe at the headstock end). The machine can be restarted after approximately 20 seconds.

Should the message appear at any other time, then a qualified electrical engineer is required to investigate the cause. Various error codes are displayed on the spindle monitoring board but these can only be seen if the machine is powered up with rear door open. The table on the left shows some of the codes, any other code needs to be referred to the machine tool service agent.

Spindle Codes

1	Overspeed during CSS or threading.
2	No spindle motion detected.
3	Maximum speed of machine has been exceeded.
9	Illegal spindle movement detected.
[	Safety relay failure.
]	Control switched off.

Touch On Tool Sensor

This facility operates by sensing pressure build up between the turning tool tip and stationary workpiece, but it is also necessary for the machine to provide adequate force to overcome the variable slideway frictional resistance. It is inevitable that some tool indent into the workpiece will occur during this operation and considerable pressure will be applied to the tool tip. We recommend that this process is avoided where marking of the workpiece can not be accepted or where relatively delicate tool tips are involved.

Saddle Guard Operation

The spindle can be started in manual mode irrespective of the saddle guard position. If the spindle is moved by hand with the chuck guard closed, this movement will be detected and the machine will alarm with the message "Spindle fault detected". This is independent of the saddle guard position.

Keypad Controls

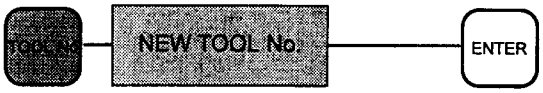
RESET

System Reset Button

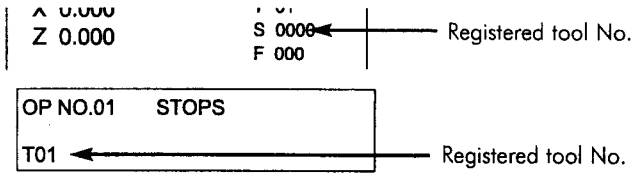
Used to 'RESET' system after an end of travel or solid stop condition. Press RESET and manually wind slide away from stop. Positional display will be maintained.

Tool Number Input Button

Used to register a tool. It is the operators responsibility to register all physical tool changes via the keypad buttons as follows:



Always ensure that the actual tool presented to the workpiece corresponds to the tool number registered on the screen and that the tool number called for in an operation block corresponds to then tool number.



Execution of an operation will be inhibited if registered tool and operation block tool number are not the same (in such a case the operation block tool number will be highlighted in reverse video)

X

X Axis Reference Input Button

Z

Z Axis Reference Input Button

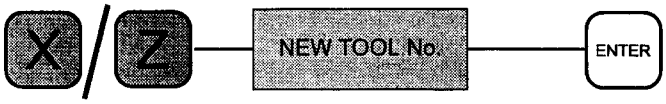
Used i) To reference tools (see tool referencing)

And ii) For 'IN PROCESS' calibration (offset) of axis position read-out values with respect to achieved workpiece dimensions in any specific cutting situation.

Keypad Controls

Procedure

Make typical sizing at or near workpiece final size "DO NOT MOVE TOOL IN AXIS TO BE OFFSET".
Measure component and enter measured value to replace displayed value.



Note - 'X' VALUES ARE DIAMETERS.

Z = Zero Secondary Reference Points.

Used to create a new Z axis 'ZERO' point (at any time during the machining cycle).

Position tool at required 'Z' axis point.

'ZERO' Z Axis read-out display.

Now Z Axis movements will be measured from this point positive towards spindle, negative towards tailstock.

Touch on Sensor Mode

Used "ONLY WITH STATIONARY SPINDLE".

i) To reference or re-reference tools to a prior machined length or diameter, e.g. where cut and measure would spoil a component - (see tool referencing).

ii) To position a tool prior making a cut, say in a bore where sight the tool is restricted.

Procedure

Position tool near to proposed contact point and select sensor mode via keypad button.

Move tool manually towards workpiece until contact is made when a 'BLEEPER' will sound and axis handwheel will 'SLIP' if any further positive movement is attempted.

Make a note of the appropriate displayed read-out figure at contact point and move tool off workpiece when 'BLEEPER' will stop.

Cancel Touch on Mode via keypad button.

Minimum traverse increment is automatically selected and spindle rotation is inhibited whilst 'TOUCH ON' mode is active.

Keypad Controls

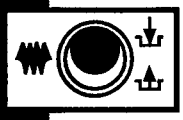
Feed Direction Select Buttons

Press appropriate button, associated light will highlight selected direction.

Press again to cancel selection.

Note: An operation run-block called up on the screen will not become active until an appropriate feed direction is selected.

'X' Axis feeds are inhibited during taper or threading operations.



Feed Engage Lever

Note - Spindle must be running for powered feed movements.

Used

i) To start (or stop) feed movement in direction selected.

ii) To start feed in taper operation (Z Axis only permitted).

iii) To start cycle when threading operation is selected.

v) To start cycle when CAM operations are in use.

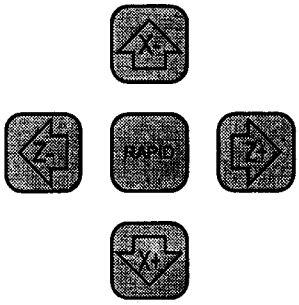
Feed Engaged Indicator Lamp

Indicates feed or cycle running.

CAM Taper/Thread/CAM mode active Indicator Lamps

Indicate mode of operation called for by an active on-screen "OPERATION RUN BLOCK"

Keypad Controls



Rapid Traverse Engage Button

Used only in conjunction with one of the feed direction buttons, i.e. by two finger to run operation only.

Rapid will overrun feed in 'Z' minus direction but feed will be disengaged at end of rapid movement.

Rapid will not overrun feed in any other direction or operate in any other direction whilst any feed is engaged.

'X' Axis rapid movements are inhibited during THREADING or CAM operations.

Units Select Button

Used to select inch or metric units in manual mode.

Press button to convert display values from metric to inch or viceversa.

Operation block units selection will override manual selection. Active selection will be displayed on screen.

Coolant On/Off Button

Used to start (or stop) coolant pump - lamp on indicates pump running.

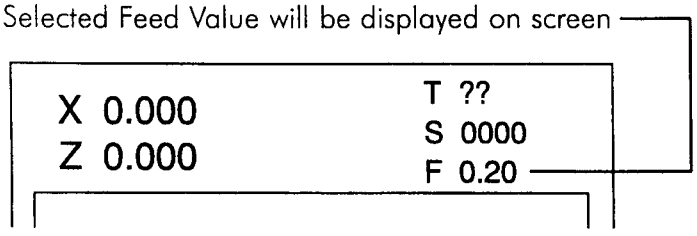
Feed Per Rev Select Button

Used in conjunction with cursor buttons to scroll up or down feed range.

Feeds Available

.05	.08	.10	.12	.15	.18	.20	.25	.30	.35	.40	.60	MM/Rev
.002	.003	.004	.005	.006	.007	.008	.010	.012	.014	.016	.024	*Inch/Rev*

Selected Feed Value will be displayed on screen



Feed select is inhibited during feed movements (See Feed % Override)

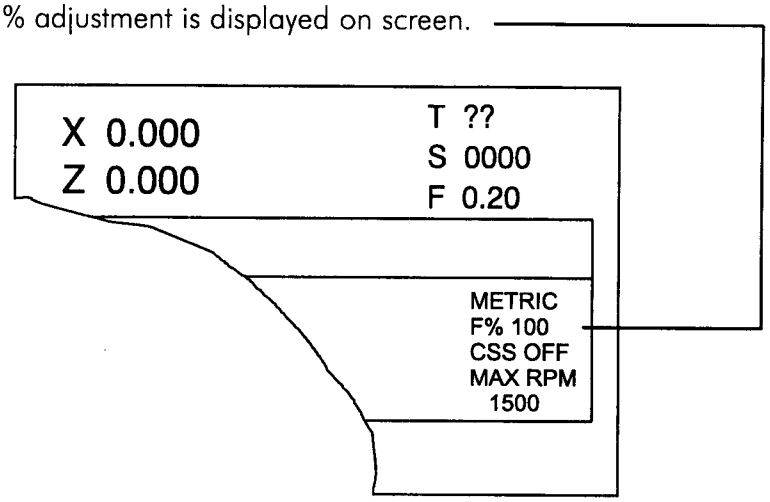
Keypad Controls

Feed Override Adjust Button

Used in conjunction with cursor buttons to trim feed under cut or set intermediate feed values.

Adjusts from 50% to 150% of displayed feed rate in 5% increments.

% adjustment is displayed on screen.



CSS Maximum RPM Input Button

Used to set maximum spindle speed for CSS operation.

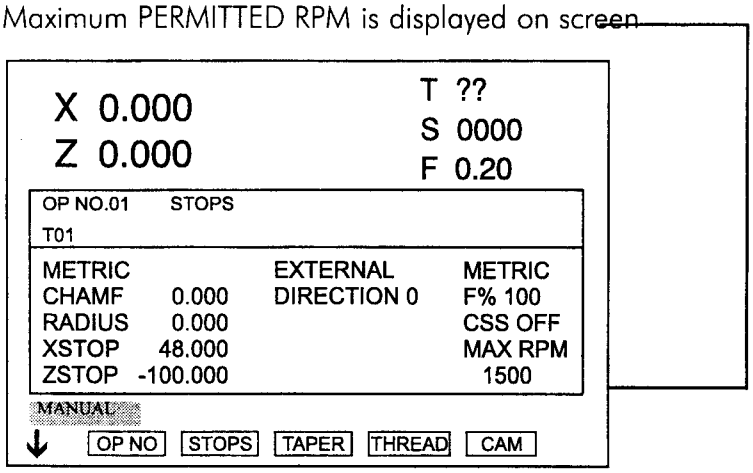
NOTE: To prevent unintentionally high (thus UNSAFE) spindle speeds, C.S.S. cutting must ALWAYS be preceded by a physical 'run and speed capping' process for the particular workpiece/work-holding and tool combination under consideration.

1. Mount the workpiece in the machine as required for the intended C.S.S. cutting.
2. Select the appropriate speed range (at the operator control panel) to the minimum speed setting
3. Select spindle direction (at the operator control switch).
4. Start the spindle (at minimum R.P.M.) then increase the speed (using the speed control knob) up to an ACCEPTABLE maximum for this particular workpiece/work-holding combination.
5. Press the 'MAX. RPM' button. TO SET THIS SPEED AS A MAXIMUM FOR THESE CONDITIONS. - Permitted C.S.S. RPM will be displayed on screen.

Keypad Controls

CSS Maximum RPM Input Button

Maximum PERMITTED RPM is displayed on screen



CSS 'Start Point' Enter Button

Used to register spindle speed at CSS-reference diameter or current tool.

Procedure

Position tool near to start point of cut, adjust spindle speed for correct cutting at this diameter (using speed control knob). and press CSS ENTER button.

CSS mode will now be active and spindle speed will respond to 'X' axis movement upto maximum rpm displayed.

Turn speed control knob to minimum.

(This is good practice to facilitate easy CSS CANCEL when required)

To cancel CSS turn speed control knob to minimum and press CSS button whilst the spindle is still running.

Keypad Controls

CSS Mode Select Button

Used to switch CSS mode ON or OFF once maximum rpm, tool CSS start position and related speed have been entered.

To activate CSS mode Press CSS button.

To cancel CSS mode.

Turn spindle speed control knob to minimum and press CSS button again.

Note

If spindle is stationary when CSS mode is selected then speed will change to the appropriate CSS rpm for active tool 'X' axis position.

If no tool number or CSS values are available active tool when CSS mode is selected spindle rpm will default to minimum.

General Note for CSS Operation

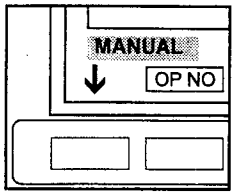
All stored CSS data will be cancelled when spindle speed range is changed (at the headstock lever) or machine is powered down.

Machine Power Up

At first spindle start, turn spindle speed control knob to minimum and wait (approx. 2 seconds to allow selected speed range to be registered) then turn knob to give required speed.

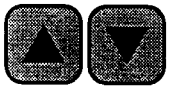
Operation Number (OP. NO.)

If machine is in manual mode press [OP.NO.] pushbutton to display first operation run block.



Example.

OP NO.01	STOPS
T01	EXT

Use  keys to scroll through any other existing run blocks or to the next available blank operation number.

Any block currently on the screen can be made active by pressing the appropriate feed direction select button.

In this Example

And OP.NO. in block will be highlighted in reverse video.

OP NO.01	STOPS	XSTOP	48.000
T01	EXT	ZSTOP	-100.000

Use feed engage lever to start an active operation.

To de-activate a current operation press the illuminated feed direction select button.

To delete operations use 'EDIT' facility (see separate instructions)

The machine has capacity for 24 manually input operations.

Edit Functions

EDIT

Edit Function Select Button

Used to call up the EDIT function options to allow the removal of unwanted operation blocks and to SAVE or LOAD operations at an external P.C.

To Delete Operations

When operations are deleted by the following method, automatic re-numbering will take place and new operations can not be inserted between the re-numbered ones. (An alternative might be to overwrite some existing operations.)

First select operations at the screen push button (Edit is only available in operation mode)

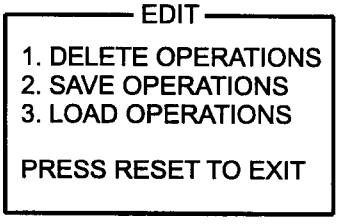
EDIT

Select Edit Function

At key pad push button

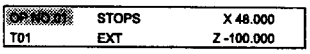
Select Delete Operation

1 2 Or 3 and ENTER at keypad



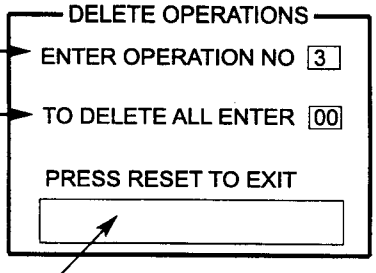
Set Block to be Deleted

Scroll



Or use Keypad No. Button

3



To call up operation to be deleted, or alternatively

0 0

to select 'Delete All'

Edit Functions

Then Press

ENTER to acvtivate Delete function

And

RESET to exit Edit function

Edit Lock/Unlock

Pressing these two keypad buttons together will prevent changes to existing operation set up data blocks and lock out the edit page delete functions.Press same buttons again to remove lock.

Save and Load Options

Operations written at the machine can be stored and recalled to and from an external P.C. using the 'AlphaLink' software pack and interconnecting cable assembly supplied with your lathe.

These operations are selected from the Edit options page illus trated above, but the external P.C. must be connected and the instructions included in the seperate 'AlphaLink' manual should be followed.

REF. 1. "Save form Alpha"

REF.2. "Load to Alpha"

Stops

1. Call up OP.NO. required (see OP.NO. guide note)
2. Press screen pushbutton [STOPS] to display stops data set-up table.

   Example ..

OP NO.02	STOPS		T 01
T01	EXT		S 000
			F 0.20
METRIC		EXTERNAL	METRIC
CHAMF	0.000	DIRECTION 0	F% 100
RADIUS	0.000		CSS OFF
XSTOP	00.000		MAX RPM
ZSTOP	00.000		000

3. Use 

   To fill out data table :

   Registered tool No. and set-up block tool No. should correspond.

   'X' Stop is a diameter value.

   'X' Stop approach direction is determined by external or internal cut selection.

   'Z' Stop is effective when approached from either direction, thus tool must be positioned to approach from the appropriate side before block is activated.

   Set radius, chamfer and direction values at zero for 'STOPS ONLY' set-up. (otherwise see separate instructions).

   Automatic pull-off is restricted to 'X' direction if only X stop is set, and 'Z' direction if only Z stop is set.

4. Press [OP.NO.] pushbutton to display STOPS OP. run block.

   Example ..

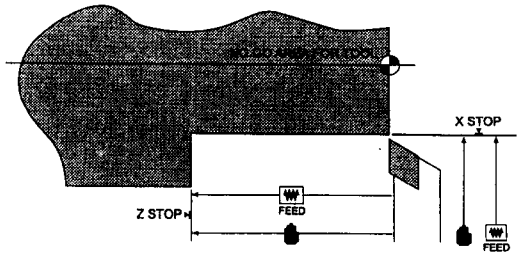
OP	NO.01	STOPS	X	48.000
T01		EXT	Z	-100.000

5. Select feed direction  In this case.

   This will activate run block, operation will be highlighted (in reverse video) in the operation run block itself.

OP	NO.01	STOPS	X	48.000
T01		EXT	Z	-100.000

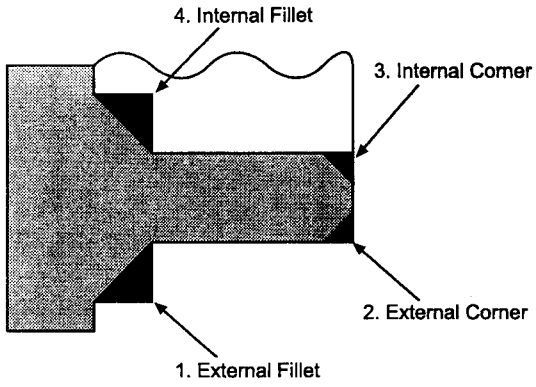
6. Feed and manual (handwheel) movements will now be restricted to the area outside the stop values.



Radii and 45° Chamfers

RADII or CHAMFERS can be generated using the 'Z' axis feed movement if the required radius or 45° chamfer value and direction are entered in an appropriate 'STOPS' operation.

RADIUS and CHAMFER direction code numbers



Note: Both X and Z stops must be set. Automatic pull-off will take place at the end point of a radius or chamfer Manual movement (by hand-wheels) will only be registered by stop values and not the radius or chamfer line.

Example 1: Turn Ø30 X 40 long with R3 fillet and skim shoulder

OP NO.02	STOPS		T 01 S 000 F 0.20
T01	EXT		
METRIC		EXTERNAL	METRIC
CHAMF	0.000	DIRECTION 1	F% 100
RADIUS	3.000		CSS OFF
XSTOP	30.000		MAX RPM
ZSTOP	-40.000		000

OP	NO.02	STOPS	X	48.000	RADIUS 1	
T01		EXT	Z	-100.000	R	3.000

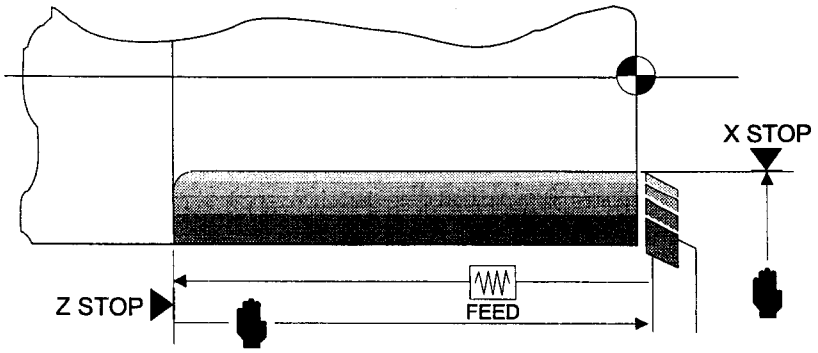
Start points :-

Pass No.1 - X (Ø)42 : Z (+)3 - 3mm Roughing cut

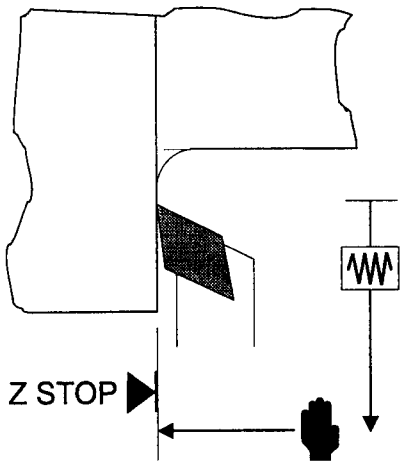
Pass No.2 - X (Ø)36 : Z (+)3 - 3mm Roughing cut

Pass No.3 - X (Ø)31 : Z (+)3 - 2.5mm Roughing cut

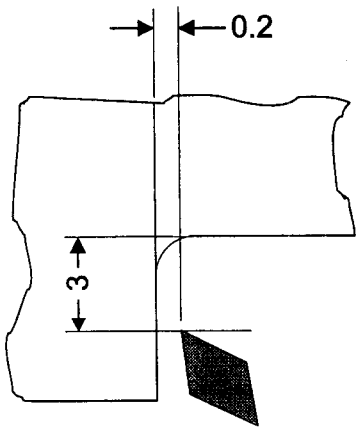
Pass No.4 - X-Stop (Ø)30 : Z (+)3 - 0.5mm Finish cut



Radii and 45° Chamfers



Manually move the tool onto Z stop and feed out to skim shoulder



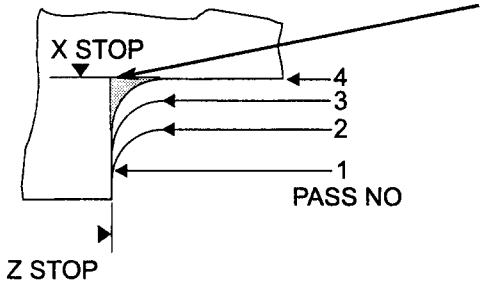
Finish point Pass No. 4 (with auto pull off) at the end of fillet rad.

Radii and 45° Chamfers

Radius Detail

Manual (Handwheel) Tool movements are permitted in this area.

Arrows show tool path in feed.

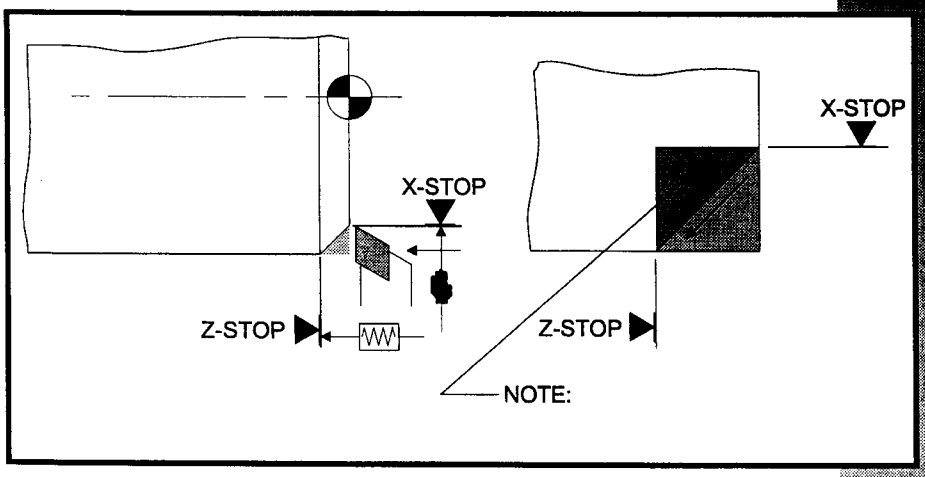


Example 2 : Turn 1.5mm External Chamfer

OP NO.04	STOPS			T 01
T01	EXT			S 000
				F 0.20
METRIC		EXTERNAL	METRIC	
CHAMF	1.500	DIRECTION 2	F% 100	
RADIUS	0.000		CSS OFF	
XSTOP	28.000		MAX RPM	
ZSTOP	-1.500		000	

OP NO.01	STOPS	XSTOP	28.000	CHAMFER 1
T01	EXT	ZSTOP	-1.500	C 1.500

START POINT X - STOP (Ø)28
Z - 0



Manually move tool onto 'X' stop and tough end face, then engage feed in direction shown.

X-Axis feed movement not applicable for chamfer operations.

Radii and 45° Chamfers

Example 3 : Turn Ø30 Half Ball End

OP NO.02	STOPS			T 01
T01	EXT			S 000
				F 0.20
METRIC		EXTERNAL	METRIC	
CHAMF	0.000	DIRECTION 1	F% 100	
RADIUS	3.000		CSS OFF	
XSTOP	30.000		MAX RPM	
ZSTOP	-40.000		000	

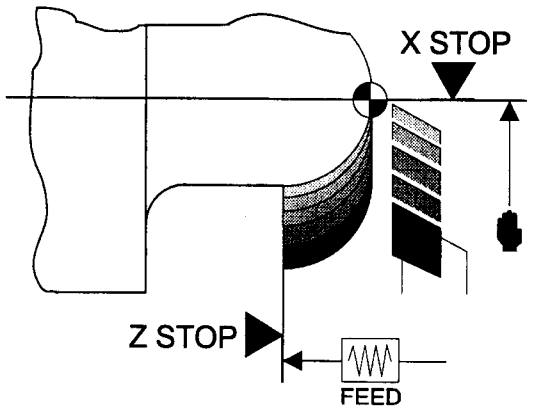
Note: 0.8 mm tool nose radius allowance is included in the above set up figure.

On screen run block

OP NO.08	STOPS	XSTOP	0.000	RADIUS 2
T01	EXT	ZSTOP	-15.00	R 15.00

RUN SPINDLE AT 1500 RPM

Note: Manual (Handwheel) tool movements are permitted in this area.



START POINTS

X(Ø)20	Z(+)3
X(Ø)12	Z(+)3
X(Ø)6	Z(+)3
X(Ø)2	Z(+)3
X(STOP)-0.8	Z(+)3

Note: Tool will always travel 1 full quadrant from start point. To save time feed may be disengaged when tool clears workpiece.

X AXIS FEED NOT APPLICABLE FOR RADII OPERATION

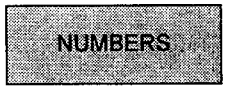
Tapers

1. Call up OP.NO. required (see OP.NO. guide note)

2. Press screen pushbutton [TAPER] to display taper data set-up table.

   Example..

OP NO.03 TAPER				T 01 S 000 F 0.20
T01				
METRIC				METRIC
ANGLE	10.500	XPOS1	0.500	F% 100
XSTOP	40.000	XPOS1	0.000	CSS OFF
ZSTOP		XPOS2	0.000	MAX RPM
EXT XPOS2	0.000	XPOS2	0.000	000

3. Use    and 

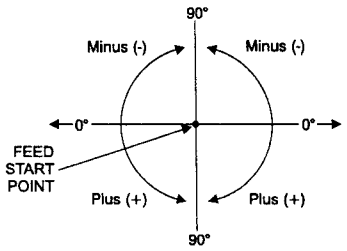
   To fill out data table :-

   Registered tool No. and setup block tool No. should correspond.

   ANGLE - is angle to 'Z' axis value and this can be generated automatically by entering X1 : Z1 AND X2 : Z2 values only.

   All 'X' values are diameters.

   Angle sign convention :-



4. Press [OP. NO.] pushbutton to display TAPER OP. run block.

   Example

OP NO.03	TAPER	X40.000	
T01	EXT		DEG 10.000

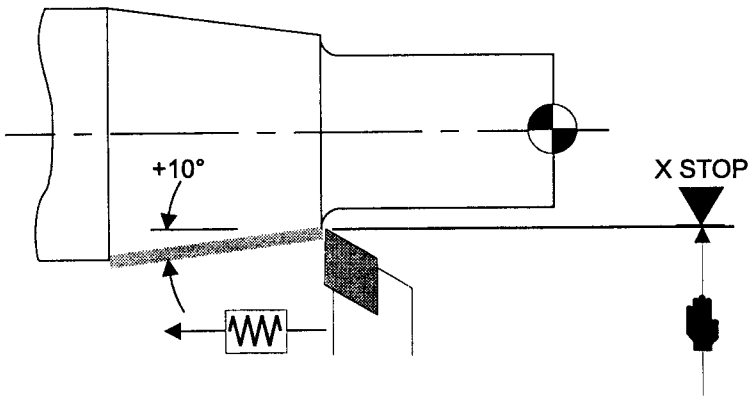
5. Select 'Z' feed direction.

   This will activate run block and taper mode, indicator lamp will illuminate.

Tapers

6. Manually position tool at start point for cut.

Example .....



7. Use feed engage lever to start cut.

Notes:
'X' and/or 'Z' stops can be set as required in taper operation block. (see stops operation). Taper angle is unre stricted (upto 90° in each quadrant) but Z- OR Z+ feeds are always used. CSS spindle control can be used with taper operations. 'AUTOMATIC PULL-OFF' is restricted to 'X' axis only for -(minus) direction external tapers and +(plus) direction internal tapers.

Threading

1. Call up OP.NO. required (see OP.NO. guide notes)
2. Press screen pushbutton [THREAD] to display thread data setup table.

   Example...

OP NO.03 TAPER				T 01
T01				S 000
				F 0.20
METRIC				METRIC
ANGLE	10.500	XPOS1	0.500	F% 100
XSTOP	40.000	XPOS1	0.000	CSS OFF
ZSTOP		XPOS2	0.000	MAX RPM
EXT XPOS2	0.000	XPOS2	0.000	000

3. Registered tool number and setup block tool number should correspond.

   DIAM. Is nominal outside diameter of thread (at small end for taper threads)

   X STOP Is thread core diameter (at small end for taper threads)

   NO.PASSES Is determined by user (more rather than less are recommended). Constant volume cutting + finishing passes will be calculated by control.

   LENGTH Is component thread length.

   Z STOP Is thread finish point on component.

   Z START Is required tool start point in 'Z' (calculated by control to give approximately 3 x pick up length).

   ANGLE Is "Angle to 'Z' axis" when thread is tapered.

   PITCH Is lead of thread usually specified as pitch X number of starts.

   Note: X. start point is nom thread o/d. (shown as diam on screen).

4. Press [OP. NO.] pushbutton to display thread OP. run block

   Example...

OP NO.05	THREAD	D 30.000	P1.500	X 28.380
T02 AUTO	EXT 1S	Z 4.500	-DEG 0.000	Z - 25.000

Threading

5.i) If this is a new threading operation:-

Then at this point it is necessary to start the spindle in the direction required and set the speed required to cut the thread.

* and Select Z Feed direction  (in this Example)

Then turn the spindle speed control Knob to it's minimum value setting.

Note the speed set will be adopted for this threading operation and be retained until either of the following actions takes place:

a) Manual Mode is Selected.

b) Reset Button is Pressed.

c) Machine is Powered Down.

d) Move to next Op.

ii) If this is a Re-run of an existing threading operation:-

Then it is necessary to have the spindle speed control knob set at the minimum speed position, then the spindle can be started using the spindle Start/Stop lever but note that it will start at the previously addopted speed for this threading operation [See note 5 (i)]

6. Select Z Feed direction  (in this Example)

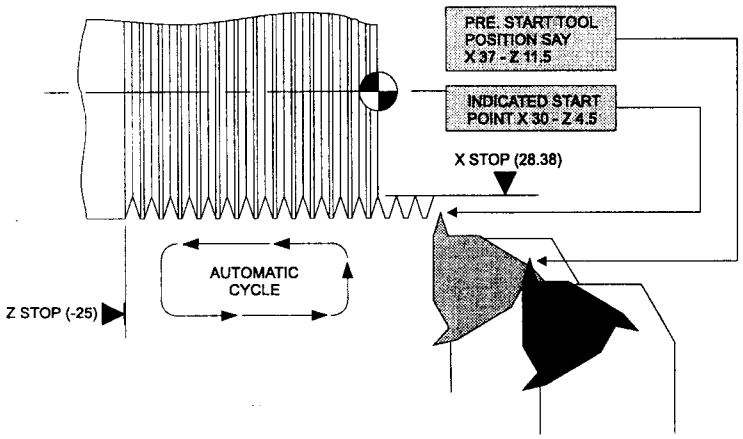
This will activate block and thread mode indicator lamp which will illuminate.

* See the appropriate user guide notes on how to perform this action.

Threading

7. Manually position tool at Pre-start position.

   i.e. More than +5mm on diam, in X and more than +5mm in Z say X37, Z+11.5 in this case.



8. Manually move tool towards indicated start point until both handwheels disengage

   (This will be as the tool approaches within 5mm on diam. in X and within 5mm in Z of the indicated start point).

9. Use feed engage lever to start cycle.

10. For additional 'Spring out Passes' re-set number of passes to one and or repeat cycle as required.

    Cancel threading mode as follows:-

    i) Stop Spindle with lever.

    ii) Ensure Speed control knob is at minimum.

    Notes: For thread lengths less than 100mm, cycle will be fully automatic. For threads longer than 100mm tool will pull out and stop at 'Z' stop position for each pass - press and hold rapid and 'Z' + buttons together, to return tool to start point for each pass.

    Start each successive pass using feed engage lever.

    Always set spindle RPM (CSS OFF) to give a thread pass traverse rate less than 3m/min.

    i.e. Pass rate (m/min) = $\frac{\text{(thread lead mm)} \times \text{RPM}}{1000}$

    Run-out undercuts are not a requirement - Tool will "Pull Out" automatically.

    Feed stop controls are inhibited during threading cycle (or passes) - To stop cycle use spindle start/stop lever or emergency stop button.

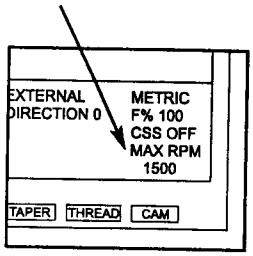
    If the nmber of passes is 1 or change to 1(one) the flank angle must be 0 (zero)

CSS (Constant Surface Speed Cutting)

1. Maximum (safe) spindle speed for job in hand must first be entered:

   With workpiece mounted in machine. Run spindle upto a suitable maximum (safe) spindle speed.

   Press [MAX RPM] button to set this maximum and register it on the screen.

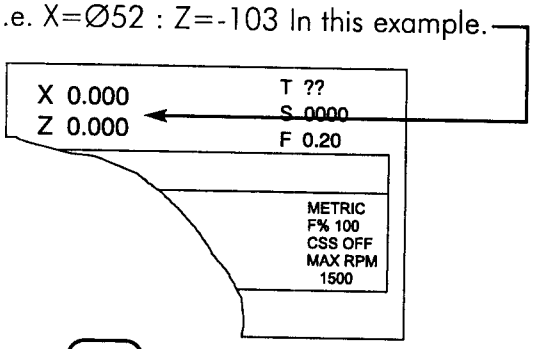


2. Adjust spindle RPM (using speed control knob) to give correct cutting speed at workpiece start of cut diameter.

   Example - 500 RPM at workpiece diameter 50.

3. Move tool to start of cut point, (just outside workpiece diameter.)

   i.e. X=Ø52 : Z=-103 In this example.



4. Press [CSS ENTER] button

   Now CSS will be active and spindle speed will respond to 'X' axis movements.

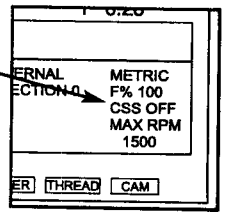
5. To cancel CSS mode.

   Turn speed control knob to minimum setting.

   and press [CSS] button

   To switch CSS off

   Notes: Maximum spindle speed relates to workpiece set up not cutting tool.



CSS (Constant Surface Speed Cutting)

6. Use [css] button to switch CSS mode ON or OFF

If no CSS data is registered for active tool number then spindle speed will default to minimum.

CSS data will be cancelled when spindle speed range is changed or machine is powered down.

If spindle is running when CSS mode is switched on, speed will change to the appropriate CSS rpm for 'X' axis tool position.

If spindle is stationary when CSS mode is selected then at start up, speed will be the appropriate CSS rpm for the tool & 'X' axis tool position.

ALPHALINK Software Pack

Contents

3 1/2" Floppy Disk, PC Connecting Cable and Instruction Manual:

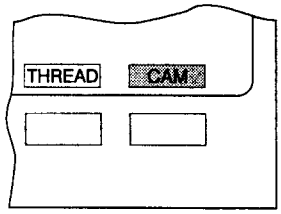
This pack is supplied with each Alpha Lathe and provides off line computer aided generation of machine moves, so that either individual contours or complete workpiece files (with the exception of thread cutting operations) can be prepared at a remote PC and downloaded to the Lathe.

The ALPHALINK Software manual deals with all aspects of work at the external PC and the following notes are provided to cover the running of "ALPHALINK" files at the Lathe.

To download an ALPHALINK file (from a remote PC to the Lathe) or call up an existing ALPHALINK file already stored in the Lathe control memory

Note: For downloading, follow the instructions in the ALPHALINK Software manual to connect the PC and send the required file to the Lathe.

Select CAM operation mode.



Select Option

or  as required

and 

selected option

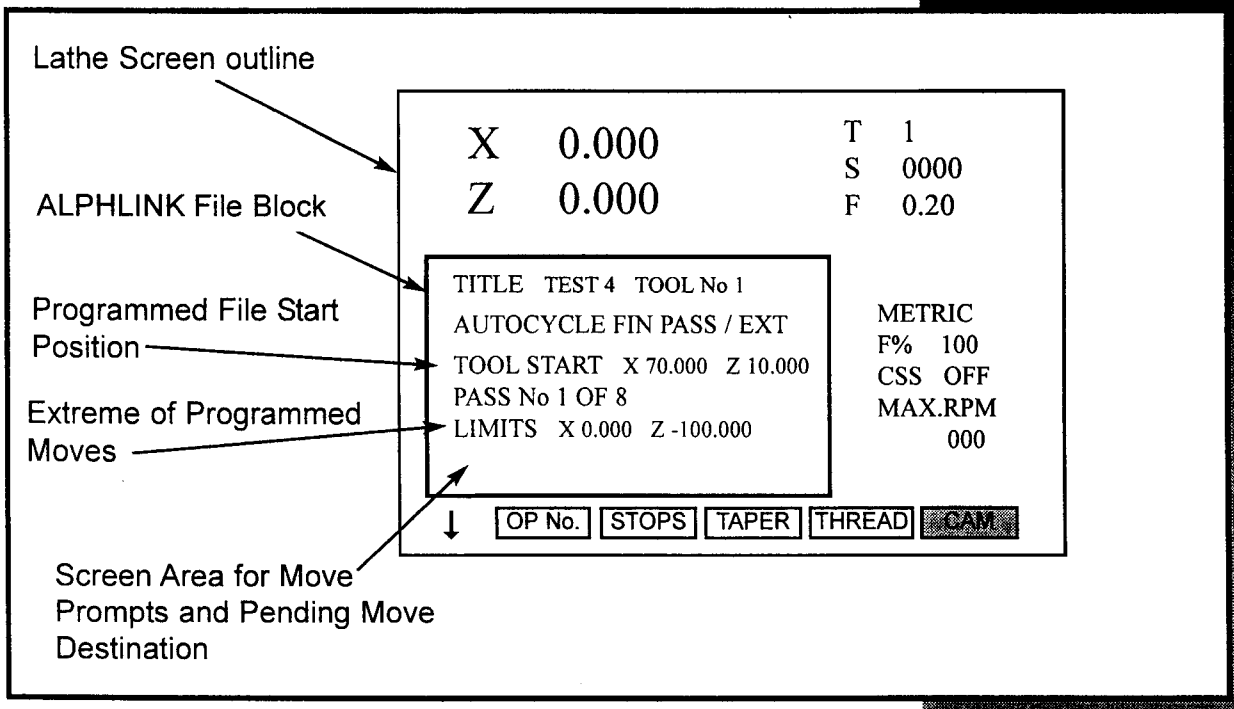
ALPHALINK Software Pack

To Run an ALPHALINK file loaded to the lathe obtain a paper print out of the file details and tool path diagram from the PC (This is essential as a reference for the move or moves required at the lathe to complete the file).

Before loading file data to the Lathe (see previous notes on how to do this) ensure that all the tools to be used are "referenced" and the tool to be used is in a position well clear (on the approach side) of the programmed workpiece start position.

When the file is loaded to the lathe ensure thatthe tool number registered (at the top R.H. corner of the lathe screen) corresponds to that called for in the file and to the actual tool presented at the workpiece.

Example

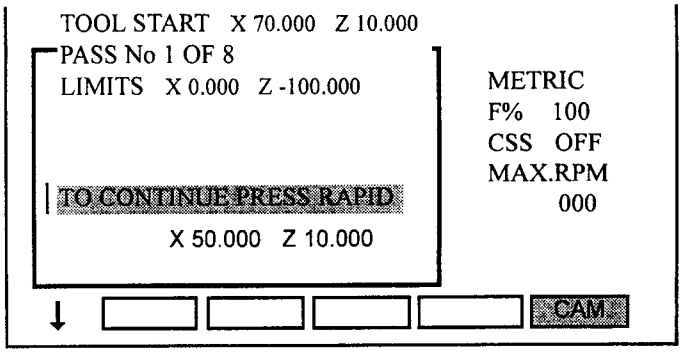


*First set a suitable feed rate for this "ALPHALINK" file.

Using the Z axis handwheel, move the tool to a point within 5mm of the Z axis programme start position, then using the X axis handwheel move the tool towards the programmed X start position until it disengages (this will be a point 10mm [on diameter] short of the start position and th Z axis handwheel will also disengage at this point. The loaded "ALPHALINK" file block will then show the first move prompt message and pending move destination.

ALPHALINK Software Pack

Example:



And in this case the rapid button indicator light will flash

*At this point start spindle, in the direction and at the speed required for the initial cut.

*See the appropiate user guide notes on how to perform these actions

ALPHALINK Software Pack

To complete the intial move.

Press (and hold) RAPID keypad button.

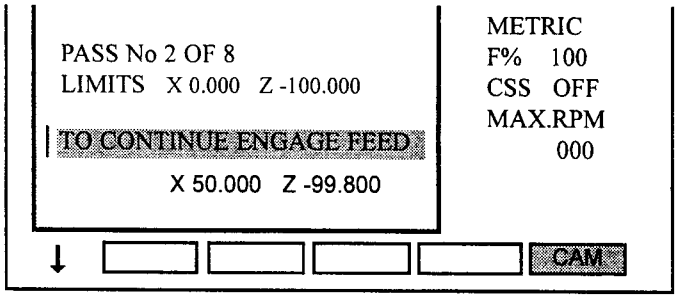
Tool will move at Rapid rate to indicated destination point and stop.

Note: Rapid speed will be goverened by the position of the traverse rate select switch (i.e. 1/10 or 1/100)

On completion of this move a new prompt message will be displayed with the associated destinaton point values.

Example:-

In this case the feed engaged indicator lamp will flash.

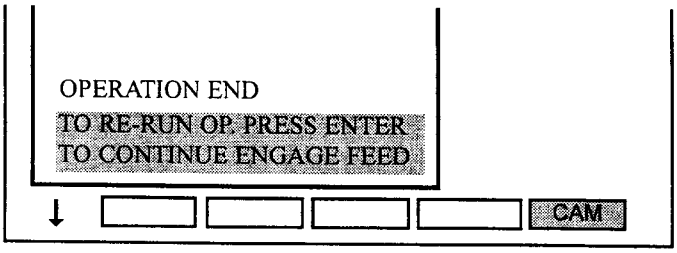


To complete this move, engage the Feed lever.

Tool will move at the displayed feed rate to the indicated destination point then pull off approx 1mm (to avoid a rubbing condition) and stop. A status message "feeding to position" will be displayed in the destination point during line move.

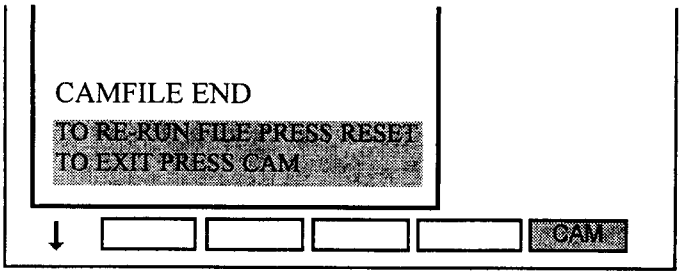
Further moves (either rapid and/or feed) will then be successively prompted with the associated destination points until an"ALPHALINK" operation is completed.

On completion of an operation the following prompt will be displayed:



ALPHALINK Software Pack

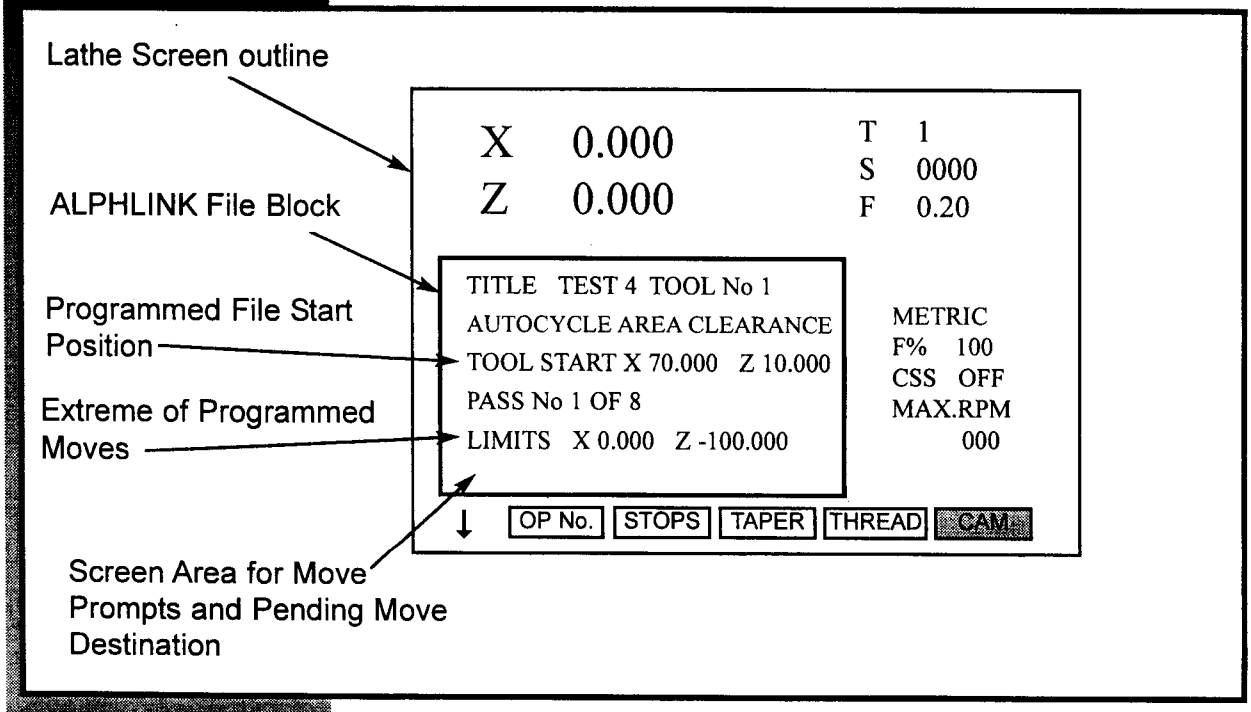
If the file consists of on;y one operation or all the operations in a file have been completed then when the "To Continue" prompt is followed followed, then the following will be displayed :-



Alternatively press [RESET] to reset the whole ALPHALINK file.

To run an ALPHALINK file when Auto Cycle option has been selected.

Example :-



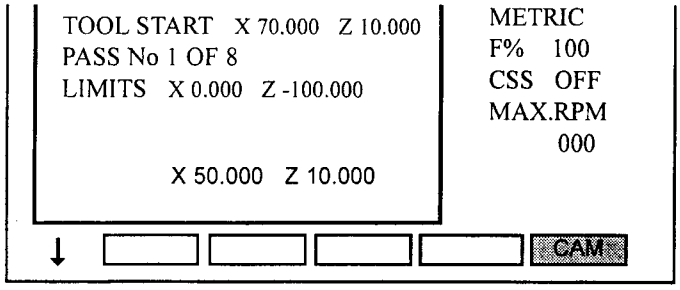
*First set a suitable feed rate for this "ALPHALINK" file.

Using the Z axis handwheel, move the tool to a point within 5mm of the Z axis programme start position, then using the X axis handwheel move the tool towards the programmed X start position until it disengages (this will be a point 10mm [on diameter] short of the start position and th Z axis handwheel will also disengage at this point. The loaded "ALPHALINK" file block will then show the first move prompt message and pending move destination.

*See the appropiate user guide notes on how to perform these actions

ALPHALINK Software Pack

Example:-



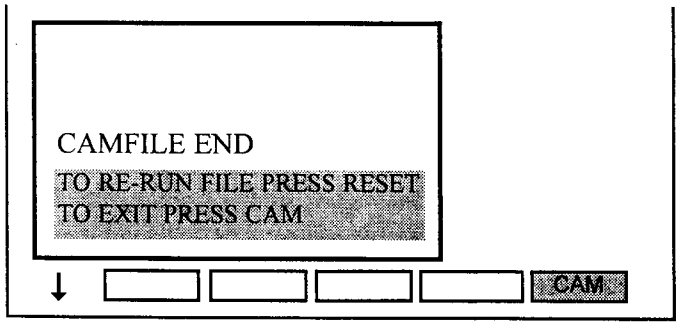
*At this point start spindle, in the direction and at the speed required for the initial cut.

To start the Auto Cycle, engage the feed lever.

To stop the Auto Cycle, disengage the feed lever.

To Abort the Auto Cycle press the CAM button at the lathe screen.

On completion of the ALPHALINK file the following prompt will be shown on screen.



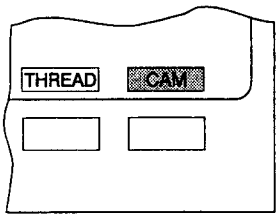
*See the appropiate user guide notes on how to perform these actions

To Restart a Program MidCycle

The cam operation has the facility to break out of the cylcle and re-enter the program at any specific line and/or sub routine. Using the following method.

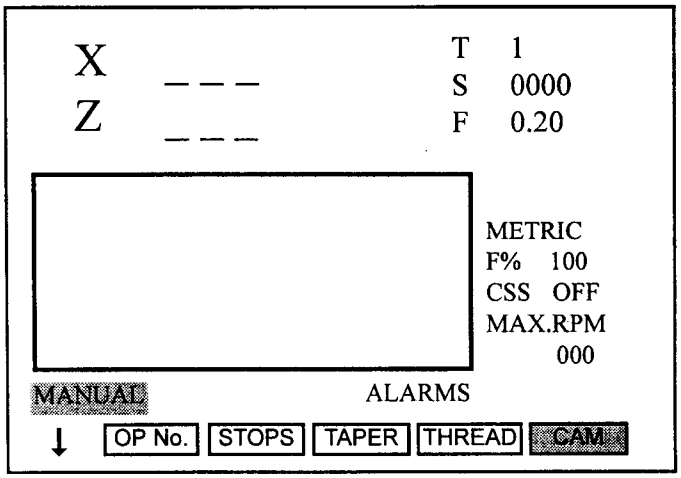
DISENGAGE THE FEEDLEVER TO INTERRUPT THE CYCLE.

STOP THE SPINDLE



Press the 'CAM' pushbutton.

To display the manual screen

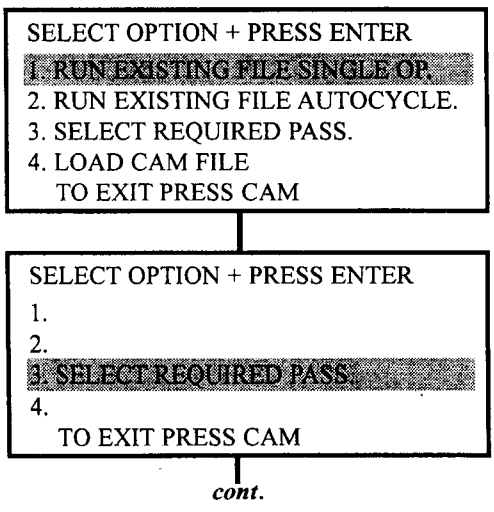


At this point the slides can be moved in X and Z using the handwheels, The "Tool offsets" can be altered. Reset at this point if required.

WIND THE TOOL AWAY FROM THE WORKPIECE.

Press the 'CAM' pushbutton,

To display:



Cursor  to

cont.

To Restart a Program MidCycle

Press ENTER to select the option

```
SELECT OPTION + PRESS ENTER
1.
2.
3. SELECT REQUIRED PASS.
4.
   TO EXIT PRESS CAM
```

Cursor ▲ ▼ to

```
SELECT OPTION + PRESS ENTER
1. RUN EXISTING FILE SINGLE OP.
2. RUN EXISTING FILE AUTOCYCLE.
3. *SELECT REQUIRED PASS.
4. LOAD CAM FILE
   TO EXIT PRESS CAM
```

Press ENTER to display the program

```
TITLE  TEST 4              TOOL No 1
AUTOCYCLE FIN  PASS / EXT
TOOL START  X 70.000   Z10.000
PASS No 1 OF 9
LIMITS  X 0.000   Z -100.000
```

Cursor ▲ ▼ to required pass or line

```
TITLE  TEST 4              TOOL No 1
AUTOCYCLE FIN  PASS / EXT
TOOL START  X 70.000   Z10.000
PASS No 4 OF 9
LIMITS  X 0.000   Z -100.000
```

To display the instructions

WIND TOOL TO START POSITION

PRESS RAPID TO CONTINUE

ENGAGE FEED LEVER TO CONTINUE

Altering Tool Offset in 'CAM'

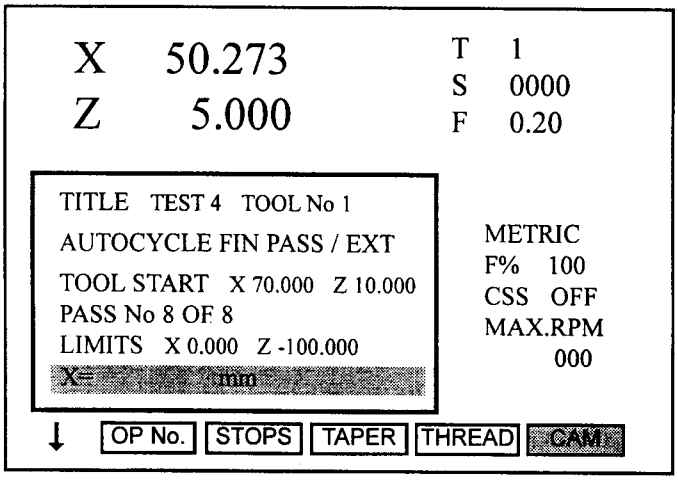
There are two methods of altering a "Tool Offset" in the CAM mode.

1. To "Restart Program in Midcycle".
2. A Tool Offset can be changed between subroutines i.e.
   a. Area Clear and Pre-Finish Pass
   b. Pre-Finish Pass and Finish Pass
   c. At the end of the Program

   At the end of the Subroutine the following prompt appears.

TO RERUN PRESS ENTER
TO CONTINUE ENGAGE FEED

Press 'X' or 'Z' to highlight the 'OFFSET'



Input the Offset required X = 50.275

Press ENTER to register X = 50.275

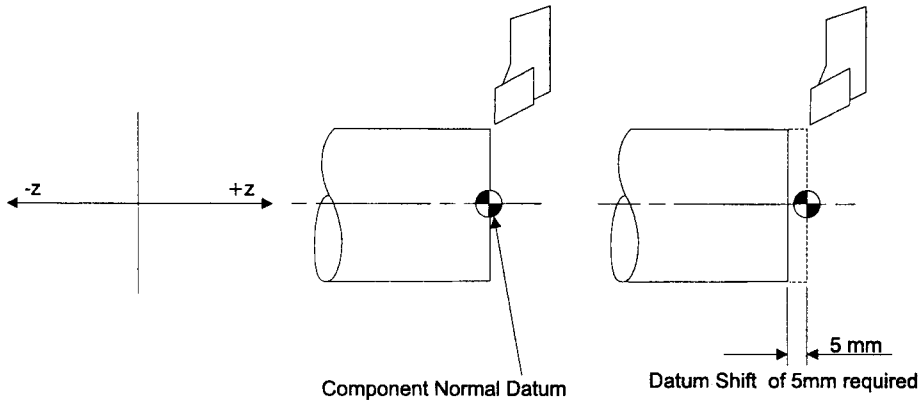
and the screen will return to the program and prompt

TO RERUN PRESS ENTER
TO CONTINUE ENGAGE FEED

Component 'Z' Axis Datum Shift

The 'Z' axis tool offset of tool 99 is used as a component datum shift, by simply adding or subtracting the 'Z' axis tol offset value to "ALL" other tools (T.01 to T.98) 'Z' axis tool offsets.

Example : 5mm 'Z' axis datum shift required.



	Tool 1	Tool 7	Tool 47	Tool 98
Exsiting 'Z' axis Datums	T01 X _._ _ _ Z 75.200	T07 X _._ _ _ Z 73.410	T47 X _._ _ _ Z 79.550	T98 X _._ _ _ Z 10.000

New 'Z' axis Datum Shift required 5mm to ALL tools

T99
X _._ _ _
Z 5.000

New 'Z' axis Datums	T01 X _._ _ _ Z 80.200	T07 X _._ _ _ Z 78.410	T47 X _._ _ _ Z 84.550	T98 X _._ _ _ Z 15.000

Note: Datum shift will only work on the Z Axis

OP GUIDE

3

3.36

ASP-E01-JUL/1999

Contents

APPLICATION NOTES

SECTION: FOUR

APPLICATION NOTES

4

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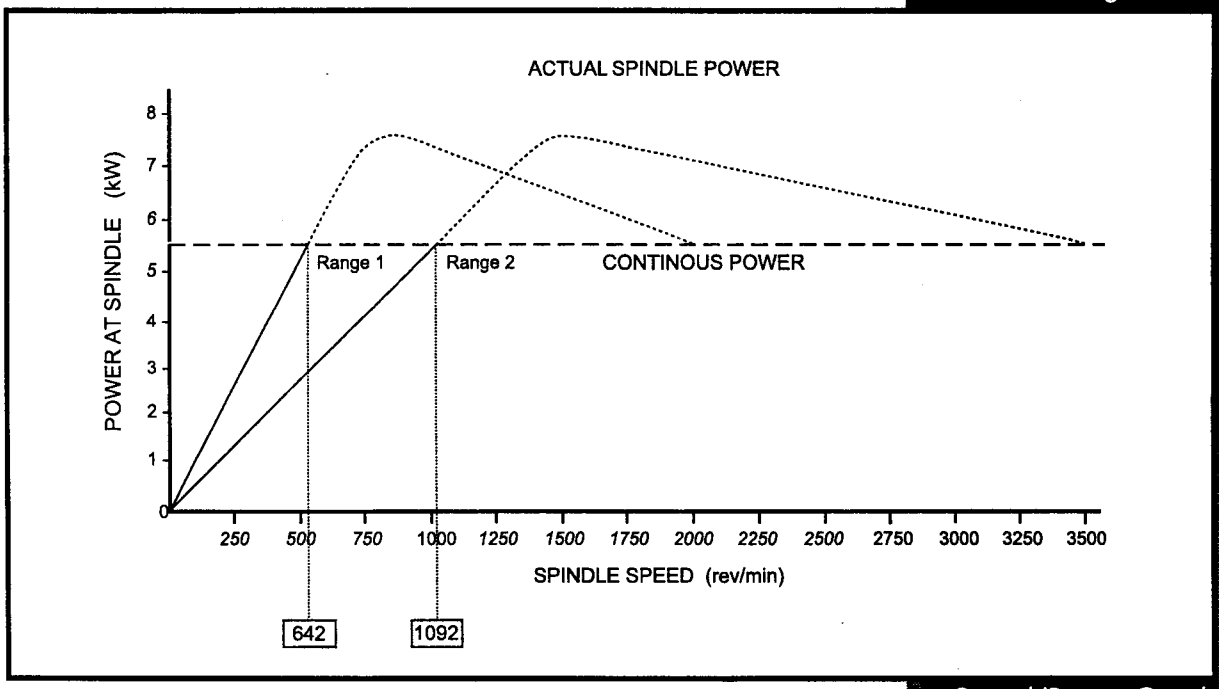
Power Availability

The graph below shows power available at the lathes spindle and it will be noted that each of the three speed ranges has a 5.5kW constant power band down to "Base speed" with a constant torque line from base to minimum speed in that range

Figure 4.1



Speed/Power Graph

Power Requirements

To avoid overload conditions it may be necessary to establish power requirements for a proposed set of cutting conditions and make a check against the above graph for power availability.

Cutting Forces and Power Consumption

The following pages provide the information required to calculate power consumption from workpiece material type, Cutting tool Geometry, Depth of Cut, Feed Rate and Spindle RPM.

If a calculated requirement is in excess of availability then the proposed Depth of Cut or Feed Rate should be reduced proportionately.

Note that in certain circumstances reference to the power curves may show that a change of Spindle RPM or Speed Range will provide a sufficient increase in power availability to meet the proposed demand.

Power Consumption (Calculations)

Watts = Force (Newton) x Distance Moved (Metre) / Second

and

$$\textbf{kW} = \frac{\text{Nm/ S}}{1000}$$

In Turning

$$\textbf{kW} = \frac{[\text{Unit Cutting Force x Chip Area}]}{1000} \times \frac{[\text{Surface Speed /min}]}{60}$$

$$\text{Power (kW)} = \frac{[(Ks \times C1 \times C2) \times a \times s]}{1000} \times \frac{V}{60}$$

Where:

Ks *(Newtons/mm²)* = Specific cutting force for workpiece material
C1 = Correction factor for tool entering angle
C2 = Correction factor for feed rate

Note:-
A correction factor for Tool Tip Top Rake Angle may also be applied (approx. 0.9 for positive Rake Tools, or 1.2 for negative Rake Tools) but this has been omitted for simplicity.

a (mm) = Radial Depth of Cut
S (mm/rev) = Feed Rate
V (m/min) = Surface Cutting Speed

Example

A 100mm diameter carbon steel (0.15%c) workpiece is to be rough turned using a carbide insert turning tool with a 45° entering angle.

Referring to table 1- *page 4.7.*

Proposed Surface Speed = 300m/min
Proposed Feed Rate = 0.3mm/rev
Proposed Depth of Cut = 4mm
Ks (Specific Cutting Force) = 1900 N/mm

From tables 4 & 5 - *page 4.8.*

C1 = 0.70
and C2 = 1.08

From Surface/Spindle Speed Nomogram for Ø100mm@ 300m/min; RPM = 920 - *page 4.6.*
then:-

$$P = \frac{[(1900 \times 0.7 \times 1.08) \times 4 \times 0.3]}{1000} \times \frac{300}{60} = 8.85\text{kW}$$

Reference to the machine power curve shows that at 920 RPM the actual Spindle Power Available is 7.5kW.
Thus our proposed figure is too high!

Power Consumption (Calculations) - continued

Reducing Depth of Cut to 3mm then:-

P (reduced) = 8.85 x 3/4
= 6.4kW Which is now acceptably below the Actual spindle Power Curve.

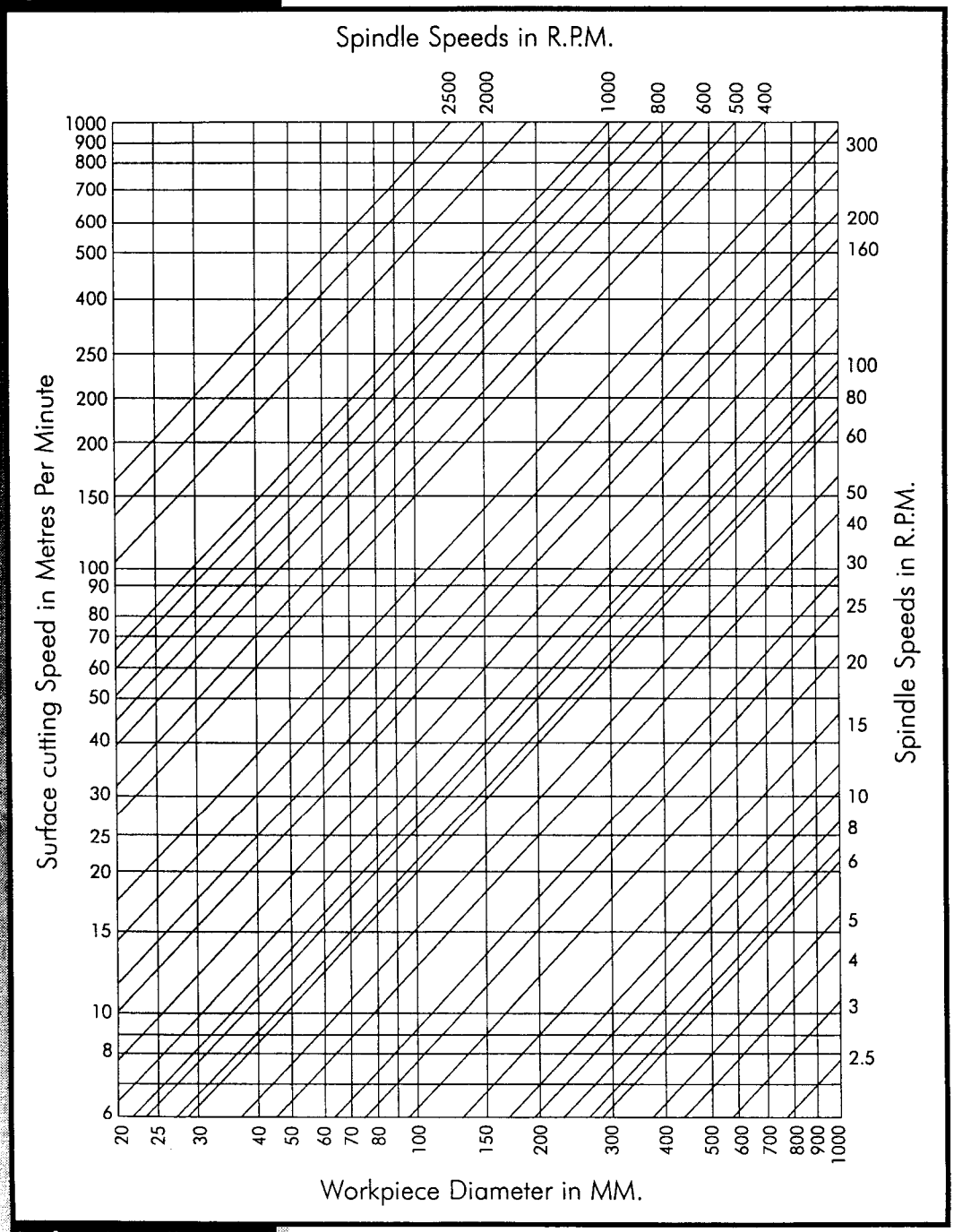
For Constant Surface Speed Cutting power demand will be constant over the Constant Surface Speed Diameter Range, but check for Power Availability at Maximum Workpiece Diameter (i.e. at Minimum RPM).

Surface Cutting Speed Figures

The surface speeds tabulated are our recommendations to give optimum tool life and power utilisation for centre lathe turning, they are somewhat lower than the generally quoted industry standards for C.N.C. lathe turning.

Surface/Spindle Speed Nomogram

Figure 4.2



Surface/Spindle Speed Nomogram

Recommended Speeds, Feeds & Cut Depths

Table 1 - Rough Turning Steel

Figure 4.3

Material	Ks. Value Ks (N/mm²)	Cutting Speed V (m/min)	Feedrate S (mm/rev)	Depth of Cut a (mm)
Carbon Steel				
C = 0.15%	1900	250 to 350	0.2 to 0.5	1 to 4
C = 0.35%	2100	175 to 275	0.2 to 0.5	1 to 4
C = 0.70%	2300	150 to 250	0.2 to 0.5	1 to 4
Low Alloy Steel	2400	100 to 200	0.2 to 0.5	1 to 4
Med Alloy Steel	2600	85 to 150	0.2 to 0.5	1 to 4

Table 1

Table 2 - Finish Turning Steel

Figure 4.4

Material	Ks. Value Ks (N/mm²)	Cutting Speed V (m/min)	Feedrate S (mm/rev)	Depth of Cut a (mm)
Carbon Steel				
C = 0.15%	1900	250 to 350	0.05 to 0.3	0.1 to 0.4
C = 0.35%	2100	175 to 275	0.05 to 0.3	0.1 to 0.4
C = 0.70%	2300	150 to 250	0.05 to 0.3	0.1 to 0.4
Low Alloy Steel	2400	100 to 200	0.05 to 0.3	0.1 to 0.4
Med Alloy Steel	2600	85 to 150	0.05 to 0.3	0.1 to 0.4

Table 2

Table 3 - Rough and Finish Turning Cast Iron

Figure 4.5

Material	Ks. Value Ks (N/mm²)	Cutting Speed V (m/min)	Feedrate S (mm/rev)	Depth of Cut a (mm)	
Grey Cast Iron				**Rough**	**Finish**
Low Tensile	1100	50 to 200	0.1 to 0.5	>2	<2
High Tensile	1500	50 to 200	0.1 to 0.5	>2	<2
Malleable C.Iron					
Pearlite	1000	100 to 250	0.1 to 0.5	>2	<2
Ferritic	1100	100 to 250	0.1 to 0.5	>2	<2
Nodular C.Iron					
Pearlite	2600	100 to 250	0.1 to 0.5	>2	<2
Ferritic	1800	100 to 250	0.1 to 0.5	>2	<2

Table 3

Notes:

Minimum depth of Cut for finishing should not be greater than the tool nose radius value.

Feedrate for roughing cuts should not exceed 2/3 of the tool nose radius.

Reduce Surface Speed figures by approximately 50% for Thread cutting, Parting off or Grooving.

Specific Cutting Force Correction Factors

Figure 4.6

Table 4 - C_1 Correction Factor for Entering Angles

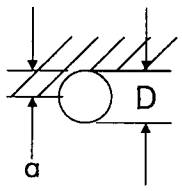
Entering Angle	90°	75°	72°	60°	45°	93°	Round	a/D	Factor
								.05	.22
								.10	.32
								.20	.43
								.30	.52
Correction Factor	1.0	0.96	0.94	0.86	0.70	1.0		.40	.59
								.50	.63

Table 4

Figure 4.7

Table 5 - C_2 Correction Factor for Feed Rate

Feed Rate	0.1	0.15	0.2	0.25	0.3	0.35	0.4
Correction Factor	0.94	1.32	1.22	1.14	1.08	1.03	1.00
Feed Rate	0.5	0.6	0.7	0.8	1.0	1.2	1.4
Correction Factor	0.94	0.89	0.85	0.82	0.77	0.72	0.69

Table 5

Turned Surface Finishes

Many factors effect the surface finish achieved when turning. The following table assumes that good turning practices are followed and that the best possible conditions are available. i.e., Machine and equipment in good condition with tools and component held effectively and with optimum rigidity.

The graph shows the effect of toolnose radius combined with feedrate on theoretical surface finish achievable.

Other factors that affect finish in practice are:-

1. Cutting speed

Generally, a low cutting speed leads to a lower shear angle, greater cutting forces and a longer contact time between tool and workpiece, this encourages edge build up which can lead to tearing and galling rather than cutting. Therefore an increased cutting speed can improve surface finish.

2. Rake angle

Particularly when cutting ductile materials a greater rake angle may improve the surface finish, this is achieved due to the increased shear angle and thus the decrease in cutting forces giving less tendency for the workpiece material to adhere to the tool cutting edge.

3. Dulled tools

When a tool becomes dull the flank wear land contact area is increased, this in turn increases the cutting force and heat is generated, this may lead to the larger flank wear land ripping out fragments of the workpiece. Keep tools sharp, index inserts regularly.

4. Coolant

This may improve the surface finish as it will reduce the tendency of workpiece material adhering to the tool due to the reduced temperature at the tool-chip interface. However coolant residue may contaminate the contact surface between tool and workpiece interfering with the metallurgical reactions which cause the tool to perform erratically.

Figure 4.9

Typical Turned Surface Finishes

ISO Roughness Grades No.	Ra, CLA, AA in µinches	Ra, CLA, AA in µmetres	Definitions	Typical Applications
N1	1	0.025		
N2	2	0.05		
N3	4	0.1	Special Condition Required	
N4	8	0.2	Extremely Fine Turning, High Speed, Low Feed.	Smooth surfaces for hydraulic purposes, no indentation or pitting. Metal parts in contact with 'O' seals, i.e. Ram cylinders, Piston valves.
N5	16	0.4	Very Fine Turning, Using a large nose radius tool.	Smooth surfaces without visible scratches. Metal parts in sliding contact with other metal parts, metal to metal sealing, i.e. Valve seating.
N6	32	0.8	Fine Turning, Using a large nose radius tool.	Smooth surfaces without distinguishable tool marks. Metal parts in sliding or rotating contact with other metal parts, i.e. Bearing Surfaces.
N7	63	1.6	Fine Turning, Using a medium nose radius tool.	Smooth surfaces without objectionable tool marks. Metal parts in fixed or stationary contact with others forming a seal, i.e. Hydraulic flanges.
N81	125	3.2	Standard Turning, Using a medium nose radius tool.	Surface requiring good finish appearance. Metal parts to be permanently bottled together, not suitable for air or oil sealing, i.e. Bearing cap.
N9	250	6.3	Coarse Turning, Using a medium nose radius tool.	Surface requiring fair finish appearance. General turning for non locating diameters and faces, i.e. Coupling faces, Pulleys.
N10	500	12.5	Rough Turning, To form approximate component shape.	Rough surface. Surfaces of hidden areas or machined for clearance, balance or welding.
N11	1000	25	Very Rough Turning, Maximum stock removal.	
N12	2000	50		

Table 6

Average Applications

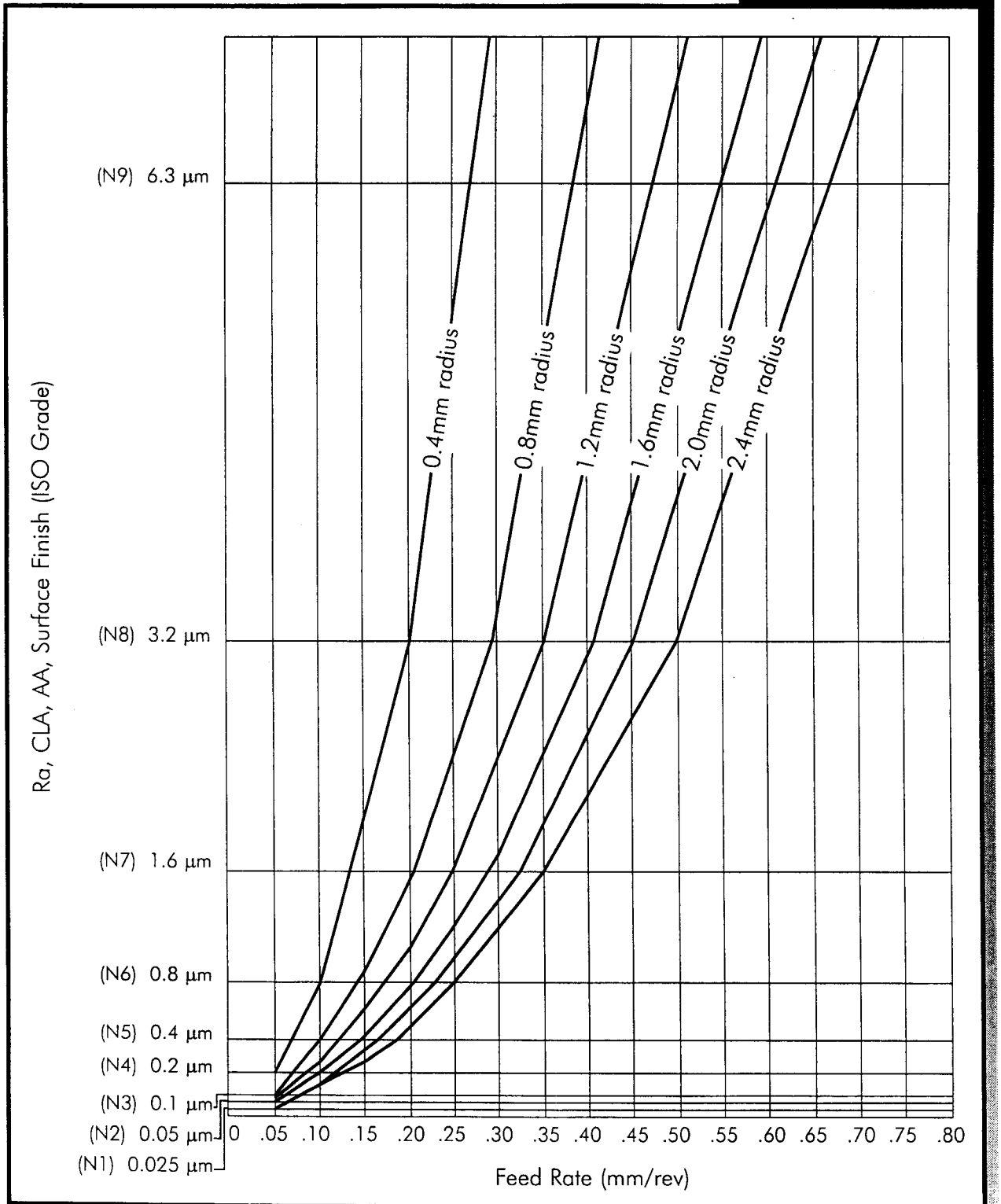
Less Frequent Applications

The ranges shown above are those typical of the listed processes, higher or lower values may be obtained under special conditions.

Thread Cutting Data

Graph demonstrating the effect of toolnose radius and feed rate on the theoretical surface finish when turning at optimum cutting speeds.

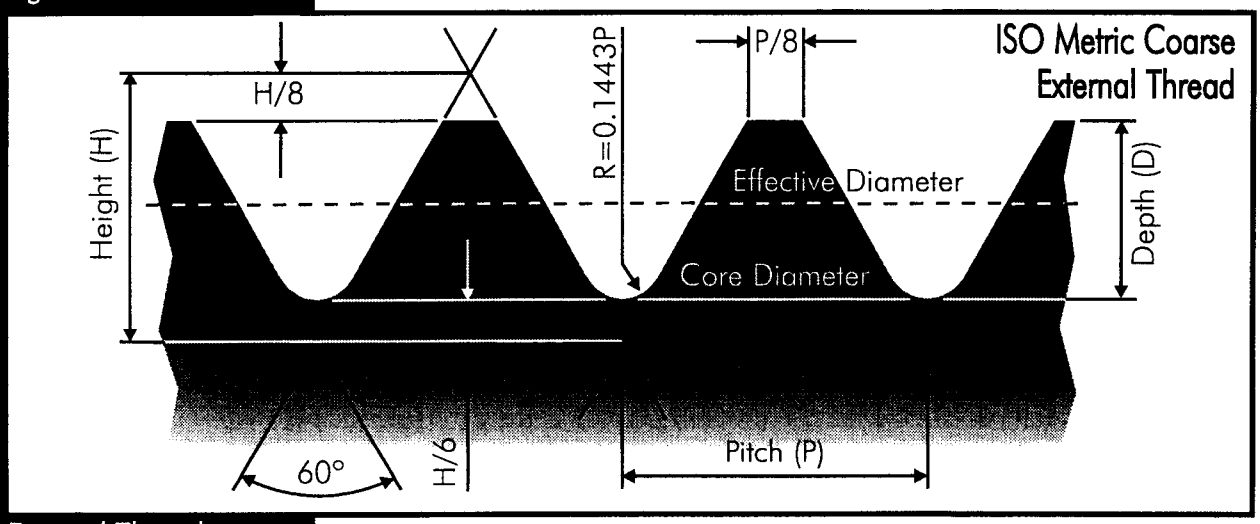
Figure 4.10



Thread Cutting Graph

ISO Metric Thread Data

Figure 4.11



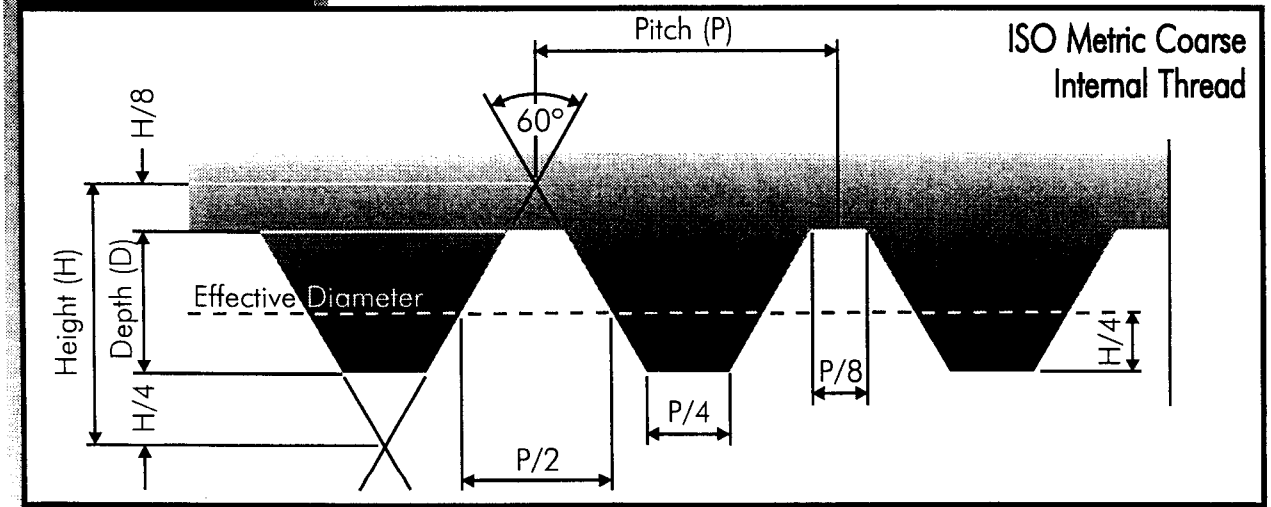
External Thread

Figure 4.12

O.Dia	Core Dia	Pitch	Depth	Flat	Effective	Tapping	Clear
3.0	2.3866	0.50	0.3067	0.0625	2.675	2.50	3.10
4.0	3.1412	0.70	0.4294	0.8750	3.545	3.30	4.10
5.0	4.0184	0.80	0.4908	0.1000	4.480	4.20	5.10
6.0	4.7732	1.00	0.6134	0.1250	5.350	5.00	6.10
8.0	6.4664	1.25	0.7668	0.15625	7.188	6.80	8.20
10.0	8.1596	1.50	0.9202	0.1875	9.026	8.50	10.20
12.0	9.8530	1.75	1.0735	0.21875	10.836	10.20	12.20
16.0	13.5462	2.00	1.2269	0.2500	14.701	14.00	16.25
20.0	16.9328	2.50	1.5336	0.3125	18.376	17.50	20.25
22.0	18.9328	2.50	1.5336	0.3125	20.376	19.50	22.25
24.0	20.3194	3.00	1.840.	0.3750	22.051	21.00	24.25
30.0	25.7060	3.50	2.1470	0.4375	27.727	26.50	30.50

Thread Data

Figure 4.13



Internal Thread

H = 0.866P

Contents

SPARE PARTS

SECTION: FIVE

SPARE PARTS

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Bed Assembly

Bed Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
2	D042-0097	MACHINE BASE - 1 METRE	1
3	FS-0646	M16 X 70 HEXAGON HEAD SET SCREW	4
4	FS-0976	M16 LOCKNUT	4
5	D700H1-010	BED SUPPORT STRIP	4
6	D045-0142	BED - 1 METRE	1

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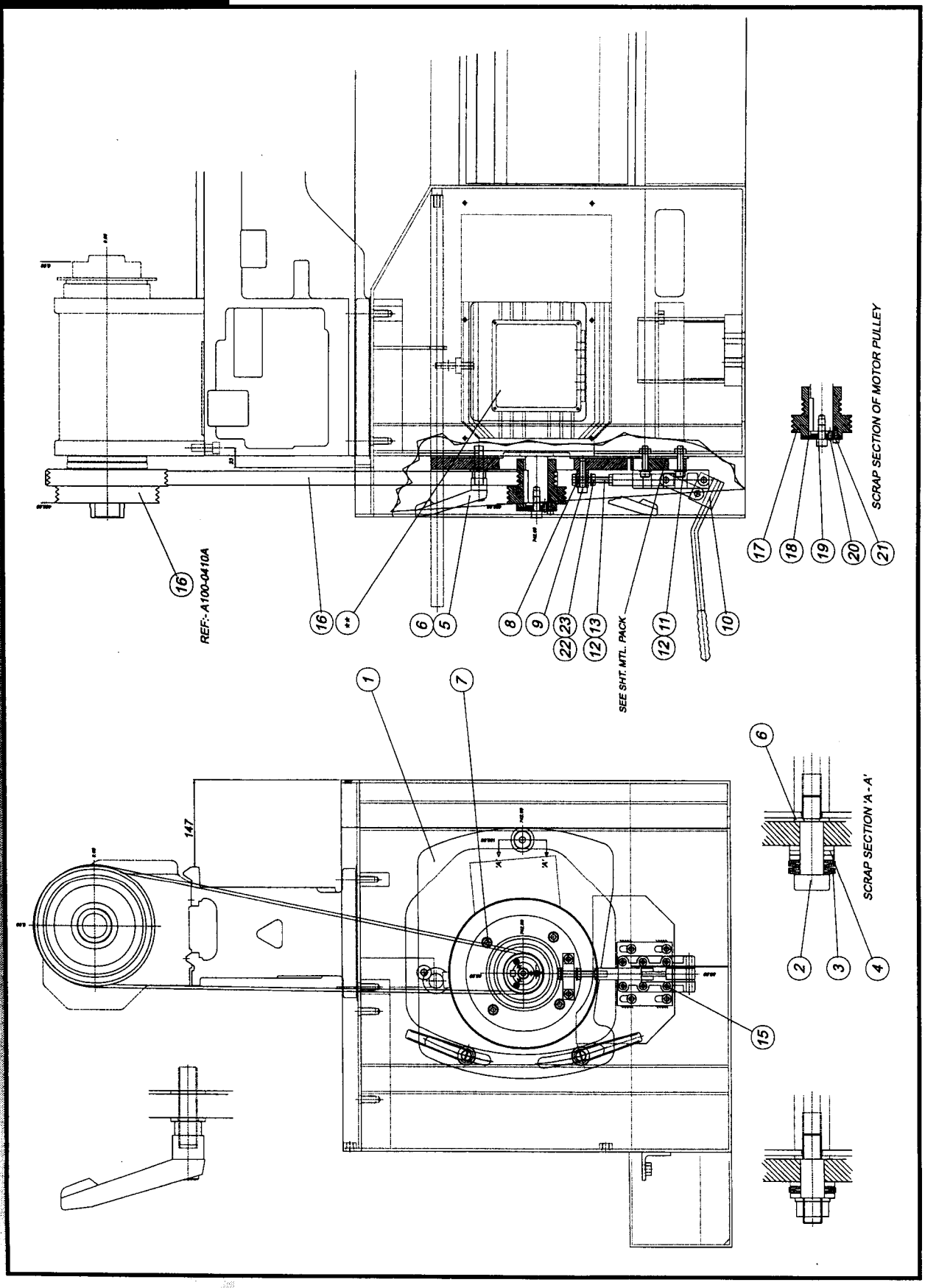
SPARE PARTS
A107-0401A

Motor Mounting



Motor Mounting

SPARE PARTS
A107-0401A

ITEM	PART NO.	DESCRIPTION	QTY.
1	D565-1502	MOTOR MOUNTING PLATE	1
2	FS-1320	M16 X 20 X 40 SHOULDER SCREW	1
3	B365-6436	SPRING	4
4	FP-0410	M20 WASHER	3
5	B515-0010	CLAMPING LEVER WITH INDEXING HANDLE	2
6	FP-0090	M16 WASHER	2
7	FS-0184	M10 X 25 SOCKET HEAD SCREW	4
8	D047-0182	BLOCK	1
9	FS-0192	M10 X 45 SOCKET HEAD SCREW	2
10	B515-0011	HEAVY DUTY PUSH/PULL LIFTING LEVER	1
11	FS-0190	M10 X 40 SOCKET HEAD SCREW	2
12	FP-0060	M10 WASHER	2
13	D834-0076	TUBE LIFTING LEVER RESTRICTING	1
14	D565-1515	PLATE LIFTING LEVER MOUNTING	1
15	FS-0172	M8 X 45 SOCKET HEAD SCREW	6
16	B345-5465	POLYFLEX BELT	1
17	D570-0477	PULLEY - MOTOR	1
18	D565-1503	PULLEY - RETAINING PLATE	1
19	FS-0206	M12 X 25 SOCKET HEAD SCREW	1
20	FS-0356	M6 X 16 SOCKET HEAD SCREW	3
21	FS-0134	M6 X 16 SOCKET HEAD SCREW	3
22	FS-0596	M10 X 70 HEXAGON HEAD SCREW	1
23	D536-0349	M10 LOCKNUT	1
REF:	*A100-0410B*	*HEADSTOCK ASSEMBLY*	
34	D570-0492	PULLEY - SPINDLE	1

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SPARE PARTS

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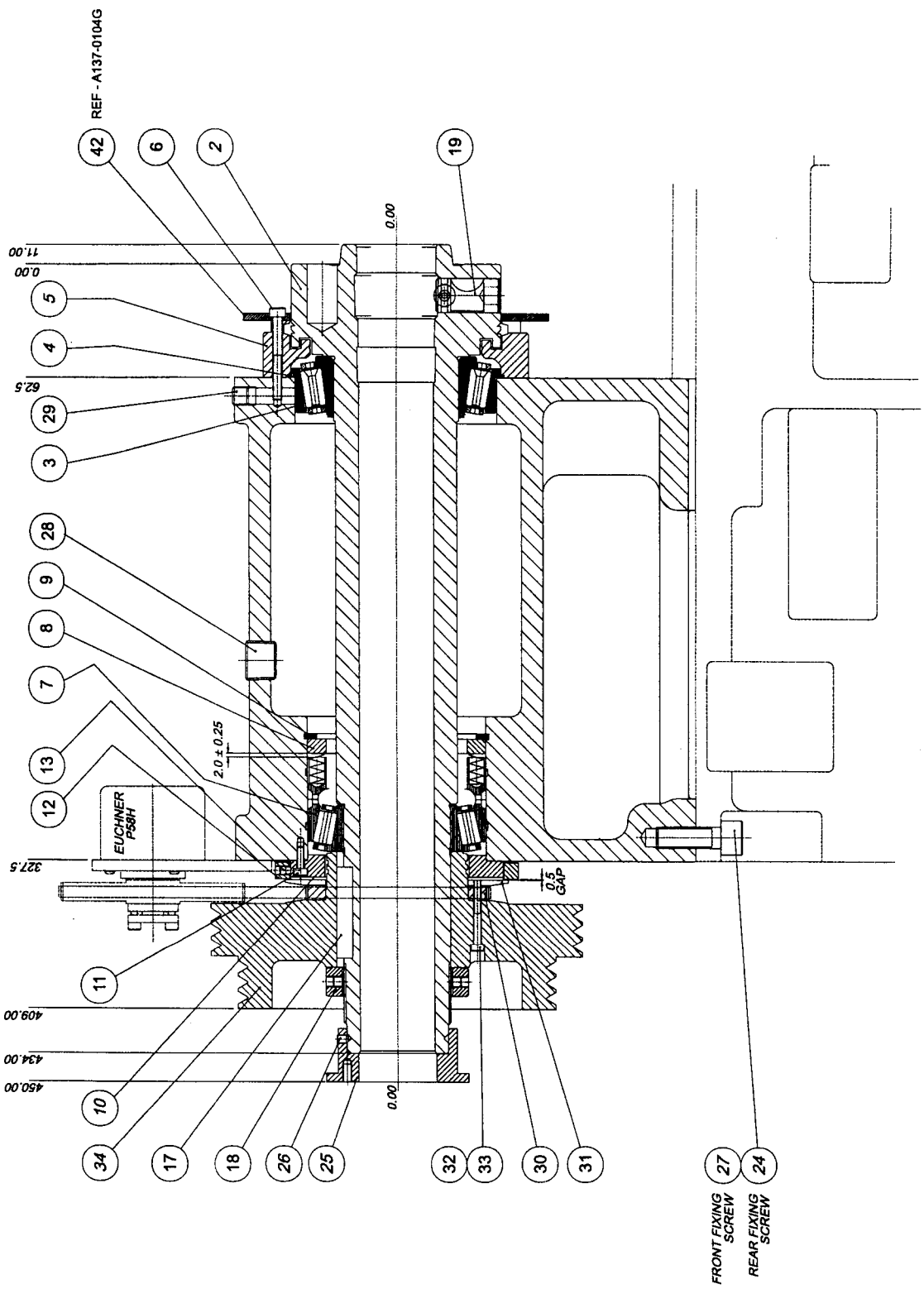
Headstock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0.00
5
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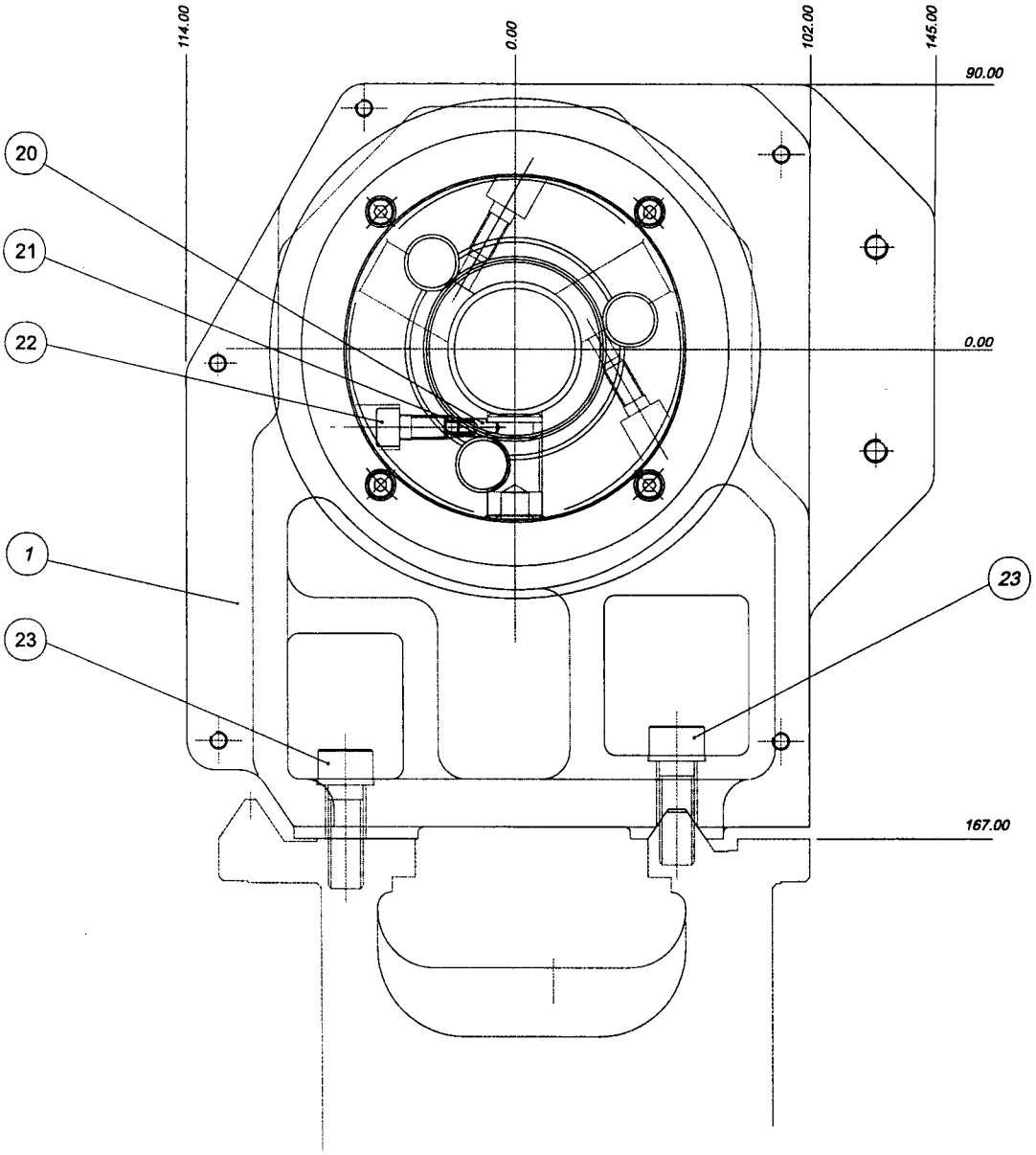
9
8
7
13
12
2.0 ± 0.25
EUCHNER
P58H
327.5
0.5
GAP
11
409.00
434.00
460.00
10
34
17
18
26
25
0.00
32
33
30
31
27
24
FRONT FIXING SCREW
REAR FIXING SCREW

Headstock

ITEM	PART NO.	DESCRIPTION	QTY.
1	D384-0051	HEADSTOCK CASTING	1
2	D709-0046	MAIN SPINDLE	1
3	D699-0783	SHAFT	1
5	D041-0231	SUPPORT BAR	1
6	D344-1259	GEAR 83T	1
7	D344-1260	GEAR 58T	1
8	D344-1261	GEAR 21T	1
9	D344-1262	GEAR 46T	1
10	D344-1263	GEAR 30T	1
12	D708-0461	SPACER	1
13	D132-0833	COVER FRONT BEARING	1
14	D132-0610	BACK BEARING COVER	1
15	D343-0177	GASKET - FRONT BEARING COVER	1
16	D132-0691	COVER INNER BACK BEARING	1
17	D132-0692	COVER INNER FRONT BEARING	1
19	D388-0125	HOUSING DRIVE SHAFT	1
21	D708-0462	SPACER	1
23	D708-0464	SPACER	1
24	D931-0342	TAB WASHER	1
25	D566-0185	PLUG	2
26	D566-0220	PLUG	1
27	D834-0028	SHIFTER TUBE	1
28	D708-0600	SPACER HEADSTOCK	1
29	D299-0071	FORK - GEAR SHIFTER	1
30	D931-0343	WASHER	1
31	D699-0910	SHAFT - RANGE CHANGE	1
32	D299-0068	SHIFTER FORK	1
33	D047-0093	BLOCK GEAR SHIFTER	1
38	D343-0269	GASKET - SP COOLANT	1
39	D646-0054	COOLANT THROWER	1
40	D565-1492	PLATE COOLANT THROWER	1
42	D133-0251	COLLAR REAR LOCKING	1
43	D343-0164	GASKET - REAR BEARING COVER	1
44	CE-0090	CAM	6
45	FS-0254	CAP SCREW	6

Headstock



Headstock

ITEM	PART NO.	DESCRIPTION	QTY.
46	D560-0288	COTTER PIN	1
47	D441-0076	KEY - SHIFTER TUBE	1
50	B362-5070	CIRCLIP	2
51	RA-0190	EXTERNAL CIRCLIP	1
52	RA-0260	EXTERNAL CIRCLIP	1
53	B632-1027	RETAINING RING	1
54	B363-0072	EXTERNAL CIRCLIP	2
55	RA-0130	EXTERNAL CIRCLIP	2
56	B361-5052	INTERNAL CIRCLIP	3
57	RA-0280	INTERNAL CIRCLIP	1
60	OA-0130	'O' RING	2
61	B412-0234	'O' RING DOWTY	1
62	OA-0240	'O' RING	3
63	B413-0695	'O' RING DOWTY	1
64	OA-0160	'O' RING	1
66	B413-0161	'O' RING DOWTY	2
68	B414-3221	OIL SEAL	1
70	B336-1228	BEARING	1
71	B336-1322	BEARING	1
72	BG-0080	BEARING	2
73	BG-0090	BEARING	1
74	B325-7501	ROLLER BEARING	1
75	B313-0418	RIGID BALL BEARING	1
77	BF-0150	BUSH	2
79	B343-5130	RECTANGULAR KEY 12 X 8 X 28 LONG	1
80	KA-0075	KEY 8 X 7 X 45 LONG	1
82	WA-0010	OIL WINDOW	1
83	B454-1001	OIL SIGHT	1
84	FR-0200	SCHNORR SPRING	5
87	FS-0050	M12 DETENT SCREW	1
88	FR-0300	CAM SPRING	1
91	FT-0150	M4 X 20 SPIROL PIN	1

Headstock

Headstock

ITEM	PART NO.	DESCRIPTION	QTY.
99	FS-0284	M5 X 10 BUTTON HEAD SCREW	3
100	FS-0134	M6 X 16 CAP HEAD SCREW	2
101	FS-0136	M6 X 20 CAP HEAD SCREW	6
102	FS-0138	M6 X 25 CAP HEAD SCREW	3
103	FS-0140	M6 X 30 CAP HEAD SCREW	3
106	FS-0148	M6 X 55 CAP HEAD SCREW	3
111	B163-0133	M6 X 12 SLOTTED PAN HEAD SCREW	5
113	FS-0436	M5 X 12 COUNTERSUNK SCREW	2
114	FS-0516	M8 X 12 CUP POINT SCREW	3
115	FS-0600	M12 X 25 HEXAGON HEAD SCREW	1
116	FS-0291	M6 X 8 BUTTON HEAD SCREW	3
117	B163-1642	M6 X 6 SET SCREW	3
118	FS-0378	M12 X 12 DOG POINT SCREW	1
119	FS-0502	M6 X 12 CUP POINT SCREW	5
120	FP-0025	M5 FORM C WASHER	2
121	PB-0110	1/2" BSPT SOCKET PLUG	1
122	B424-3200	1/8" BSPT HEXAGON SOCKET PLUG	2
125	FS-0974	5MM SIMMONDS LOCKNUT	1
126	B117-0151	FIBRE WASHER	4
128	PB-0030	3/4" BSPT DRAIN PLUG	1
129	D344-1404	GEAR 34T	1
130	D699-0893	INPUT SHAFT	1
131	KA-0370	RECTANGULAR KEY 10 X 8 X 55 LONG	1

SPARE PARTS

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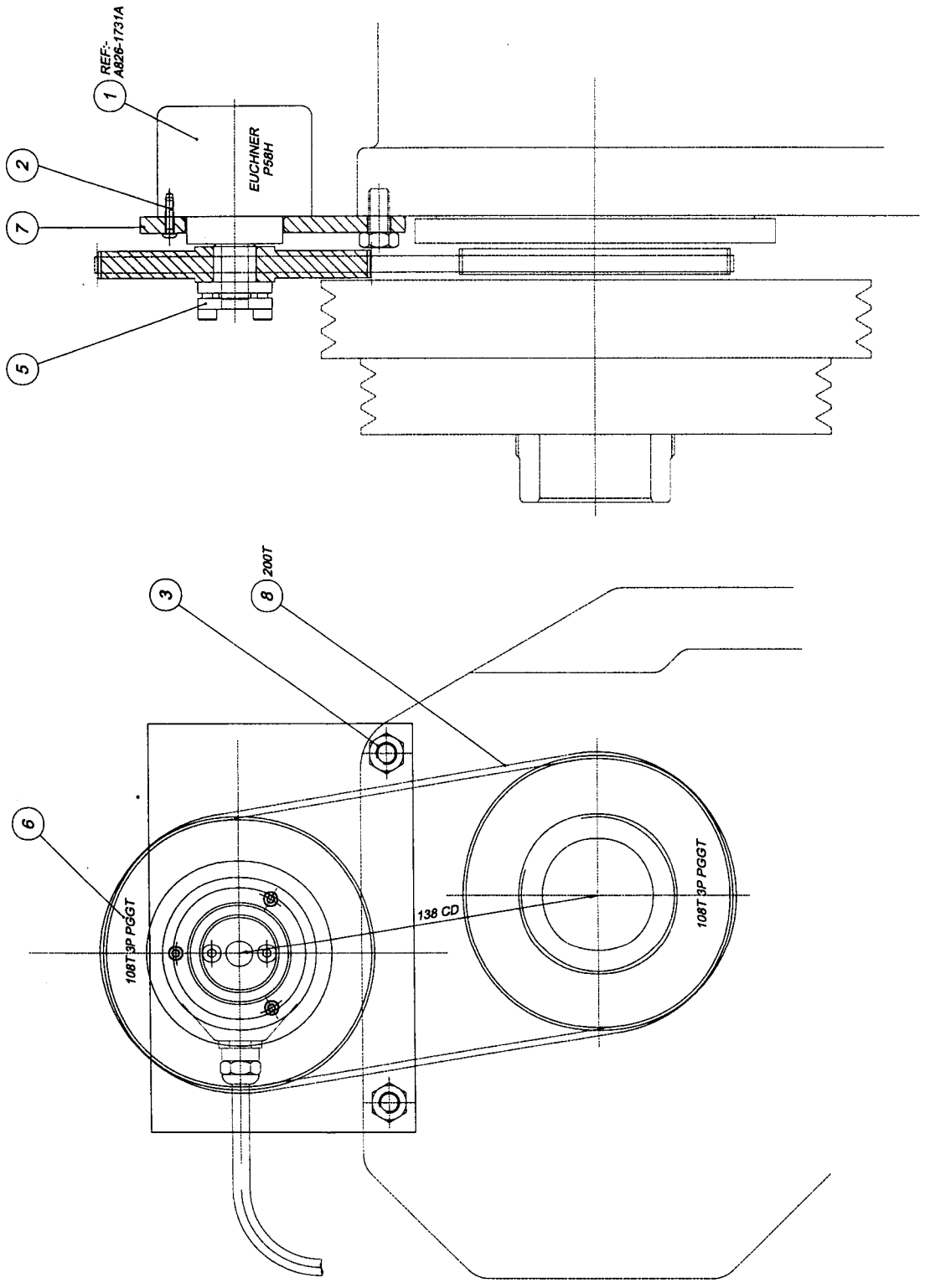
Contents

Spindle Encoder



Spindle Encoder

ITEM	PART NO.	DESCRIPTION	QTY.
2	FS-0320	M3 X 12 BUTTON HEAD SCREW	3
3	FS-0568	M8 X 16 HEXAGON HEAD SCREW	2
5	B765-0061	BUSH	1
6	D570-0490	PULLEY - ENCODER	1
7	D565-1551	PLATE - ENCODER MOUNTING	1
8	B346-1629	BELT - 200 TEETH	1
REF:	*A826-1731A*	*SPINDLE ENCODER/CABLE*	
1	E033-0001	ENCODER	1

SPARE PARTS

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SPARE PARTS

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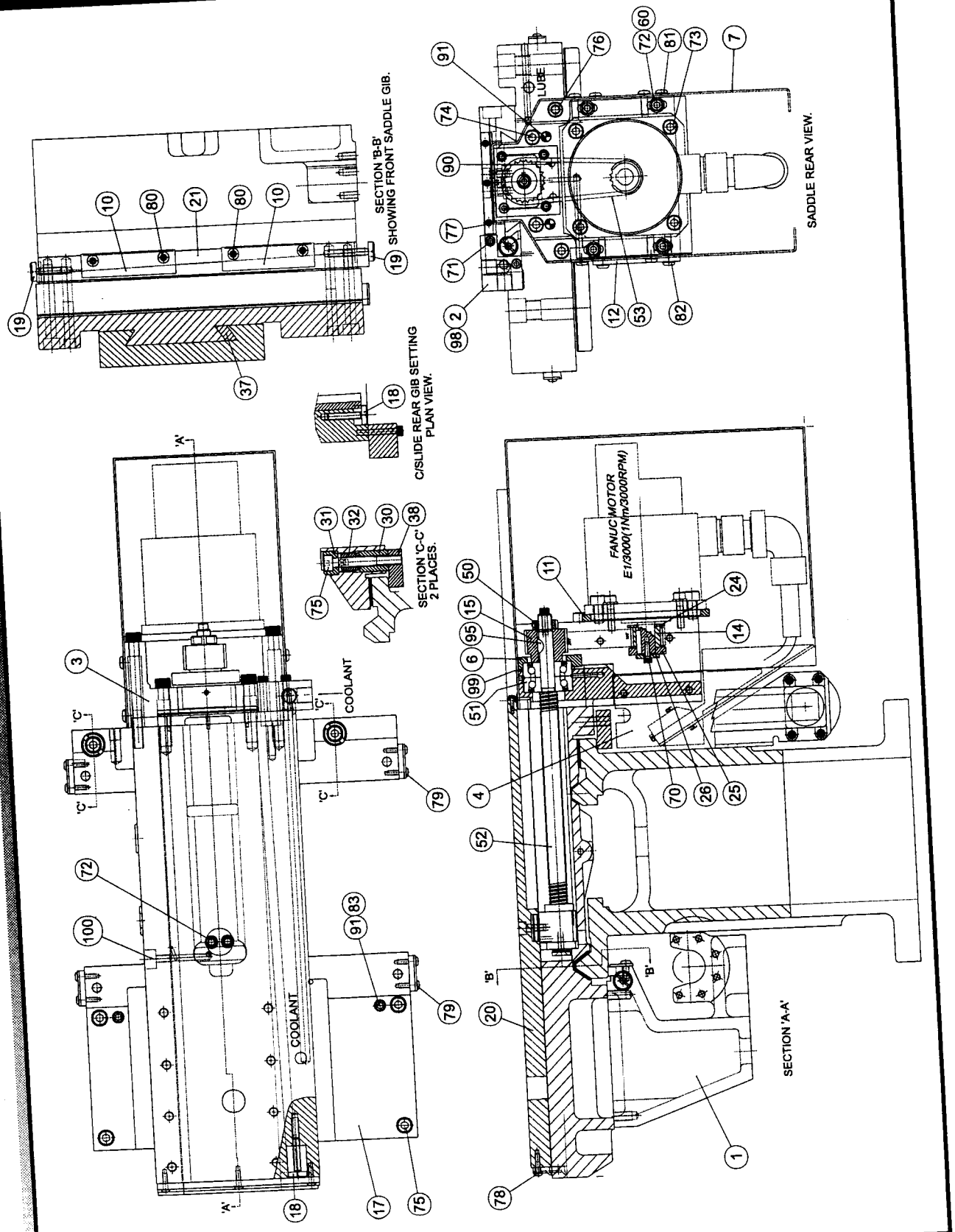
Contents

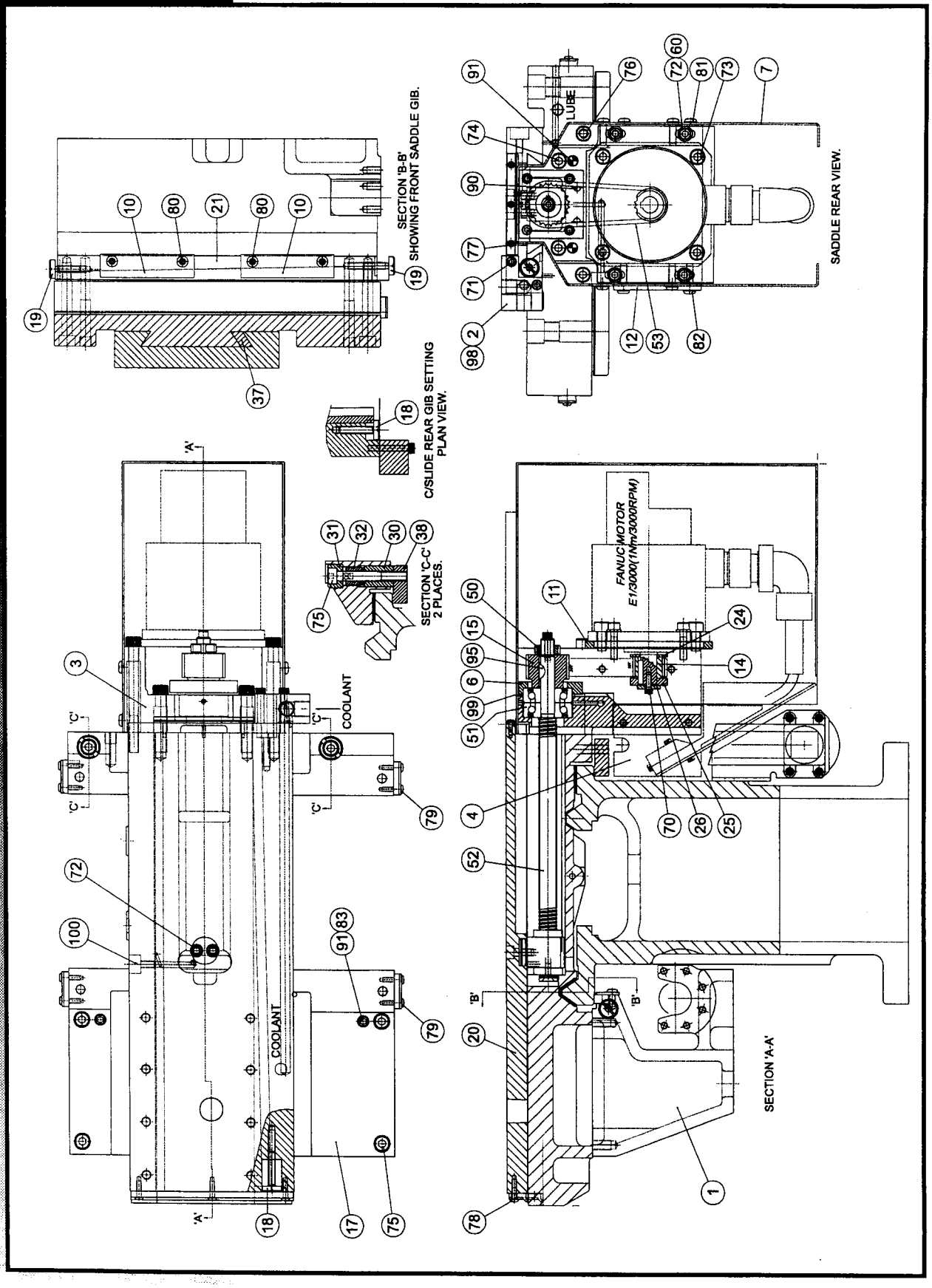
Saddle & 'X' Axis



Saddle & 'X' Axis

ITEM	PART NO.	DESCRIPTION	QTY.
1	D001-0057	APRON	1
2	0047-0181	BLOCK	1
3	D050-1030	BRACKET - X AXIS MOTOR	1
6	D122-0051	CAP - X AXIS BEARING	1
10	D565-1234	PLATE	2
14	D570-0418	PULLEY X/Z AXIS MOTOR	1
15	D570-0474	PULLEY X AXIS BALLSCREW	1
17	D696-0063	SADDLE	1
18	D697-0345	GIB ADJUSTING SCREW	2
19	D697-0398	GIB ADJUSTING SCREW	2
20	D705-0157	CROSSLIDE	1
21	D715-0312	TAPER GIB STRIP	1
24	D931-0388	WASHER - PULLEY END THIN	1
25	D931-0389	WASHER - PULLEY END THICK	1
26	D931-0390	WASHER - PULLEY RETAINING	1
30	D101H1-038	ADJUSTING SLEEVE	2
31	D111H1-005	CLAMP ADJUSTER	2
32	D121H1-007	ADJUSTING SCREW	2
37	D740H1-002	CROSS SLIDE STRIP	1
38	D905H012.1	REAR KEEP PLATE	1
50	B147-9342	M12 X 1,0 LOCKNUT	1
51	B313-6118	BALL BEARING	1
52	B314-0066	X AXIS BALLSCREW & NUT	1
53	B346-1628	BELT	1
60	FP-0040	M6 WASHER	4
70	FS-0094	M4 X 12 SOCKET HEAD SCREW	1
71	FS-0122	M5 X 35 SOCKET HEAD SCREW	2
72	FS-0134	M6 X 16 SOCKET HEAD SCREW	6
73	FS-0160	M8 X 16 SOCKET HEAD SCREW	4
74	FS-0172	M8 X 45 SOCKET HEAD SCREW	2
75	FS-0178	M8 X 60 SOCKET HEAD SCREW	6
76	B163-0150	M8 X 90 SOCKET HEAD SCREW	2
77	FS-0270	M3 X 8 BUTTON HEAD SCREW	3
78	FS-0274	M4 X 10 BUTTON HEAD SCREW	5
79	FS-0278	M4 X 12 BUTTON HEAD SCREW	8
80	FS-0284	M5 X 10 BUTTON HEAD SCREW	4

Saddle & 'X' Axis



Saddle & 'X' Axis

ITEM	PART NO.	DESCRIPTION	QTY.
81	FS-0294	M6 X 12 BUTTON HEAD SCREW	6
82	FS-0296	M6 X 16 BUTTON HEAD SCREW	2
83	FS-0809	M10 X 8 FLAT POINT SET SCREW	2
90	FT-0360	M6 X 24 PIN	2
91	FT-0890	M8 X 32 PIN	4
95	KA-0170	3 X 5 X 13MM WOODRUFF KEY	1
98	0A-0015	'O ' RING	1
99	0A-0280	'O ' RING	1
REF:	*A119-0407N*		
*4	D050-1031	BRACKET	1
*7	D132-1145	COVER - X AXIS MOTOR	1
*11	D565-1275	SERVO MOTOR PLATE	1
*12	D565-1497	PLATE	1

SPARE PARTS

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SPARE PARTS

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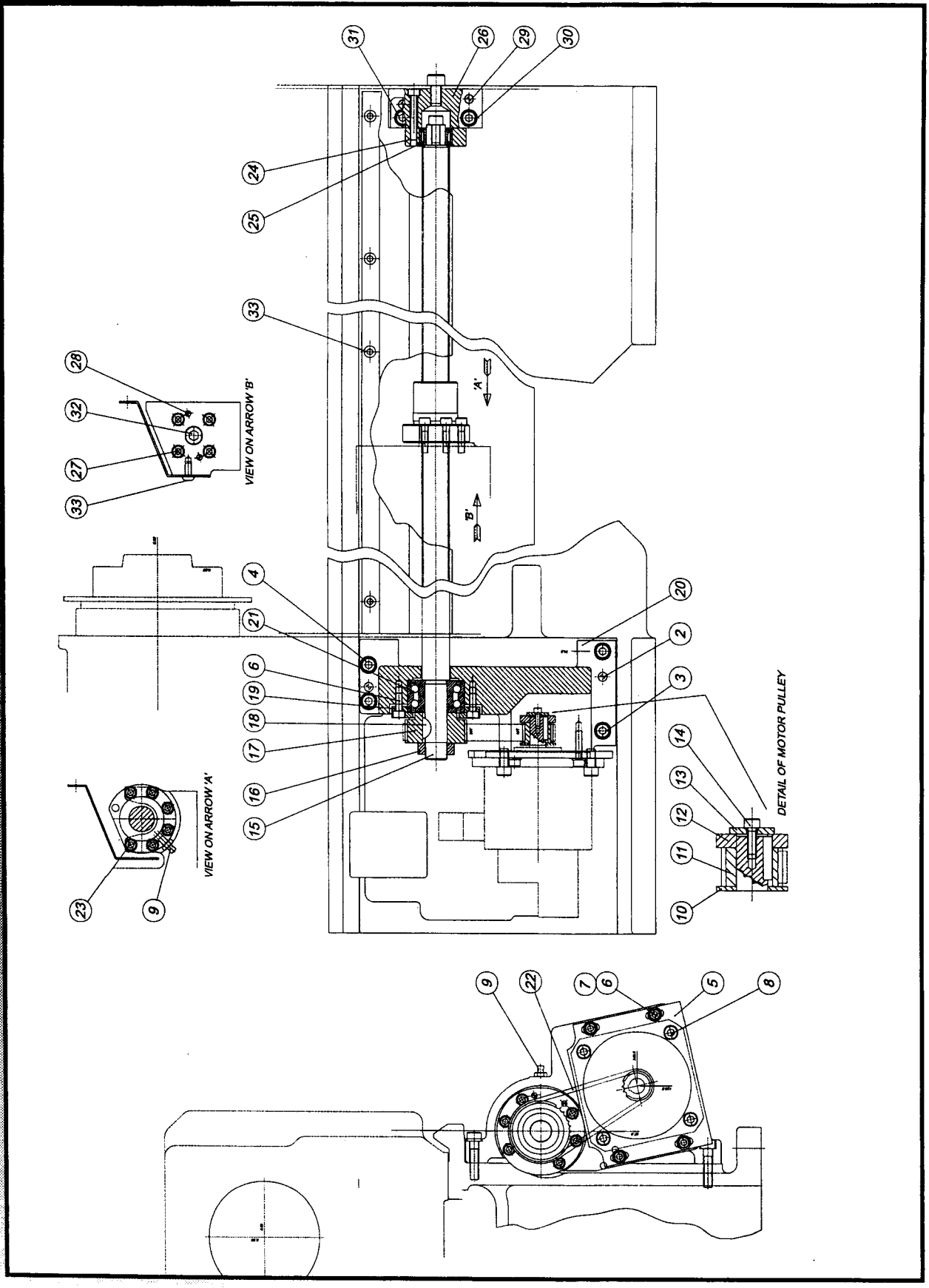
SPARE PARTS
A110-0412B

'Z' Axis



'Z' Axis

ITEM	PART NO.	DESCRIPTION	QTY.
1	D050-1024	BRACKET - Z-AXIS HEADEND BALLSCREW	1
2	B111Y7041	8X28 PIN	2
3	FS-0166	M8 X 30 SOCKET HEAD SCREW	2
4	FS-0168	M8 X 35 SOCKET HEAD SCREW	2
5	D565-1275	SERVO MOTOR PLATE	1
6	FS-0134	M6 X 16 SOCKET HEAD SCREW	10
7	FP-0040	M6 WASHER	4
8	FS-0160	M8 X 16 SOCKET HEAD SCREW	4
9	OC-0090	M6 GREASE NIPPLE	2
10	D931-0388	WASHER - PULLEY END THIN	1
11	D570-0418	PULLEY - X/Z AXIS MOTOR	1
12	D931-0389	WASHER - PULLEY END THICK	1
13	D931-0390	WASHER - PULLEY RETAINING	1
14	FS-0096	M4 X 16 SOCKET HEAD CAP SCREW	1
15	B314-0067	Z-AXIS BALLSCREW & NUT	1
16	B147-9339	M20 X 1,0 LOCKNUT	1
17	D570-0475	PULLEY - Z AXIS BALLSCREW	1
18	KA-0180	5 X 7.5 X 19 WOODRUFF KEY	1
19	D046-0084	BEARING CAP X AXIS	1
21	B313-6113	BALL BEARING	1
22	B346-1626	BELT	1
23	FS-0138	M6 X 25 SOCKET HEAD SCREW	6
24	D704-0149	BEARING HOUSING Z AXIS	1
25	B313-6119	NEEDLE BEARING	1
26	D050-1029	Z AXIS TAILEND BALLSCREW BRKT	1
27	FS-0144	M6 X 40 SOCKET HEAD SCREW	4
28	B111Y7025	6 X 30 MM PIN	2
29	B111Y7041	8 X 28 MM PIN	2
30	FS-0180	M8 X 70 SOCKET HEAD SCREW	1
31	FS-0162	M8 X 20 SOCKET HEAD SCREW	1
32	FS-0185	M10 X 16 SOCKET HEAD SCREW	1
33	B163-1900	M6 X 12 BUTTON HEAD SCREW	10

SPARE PARTS

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5.6.4

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Contents

SPARE PARTS

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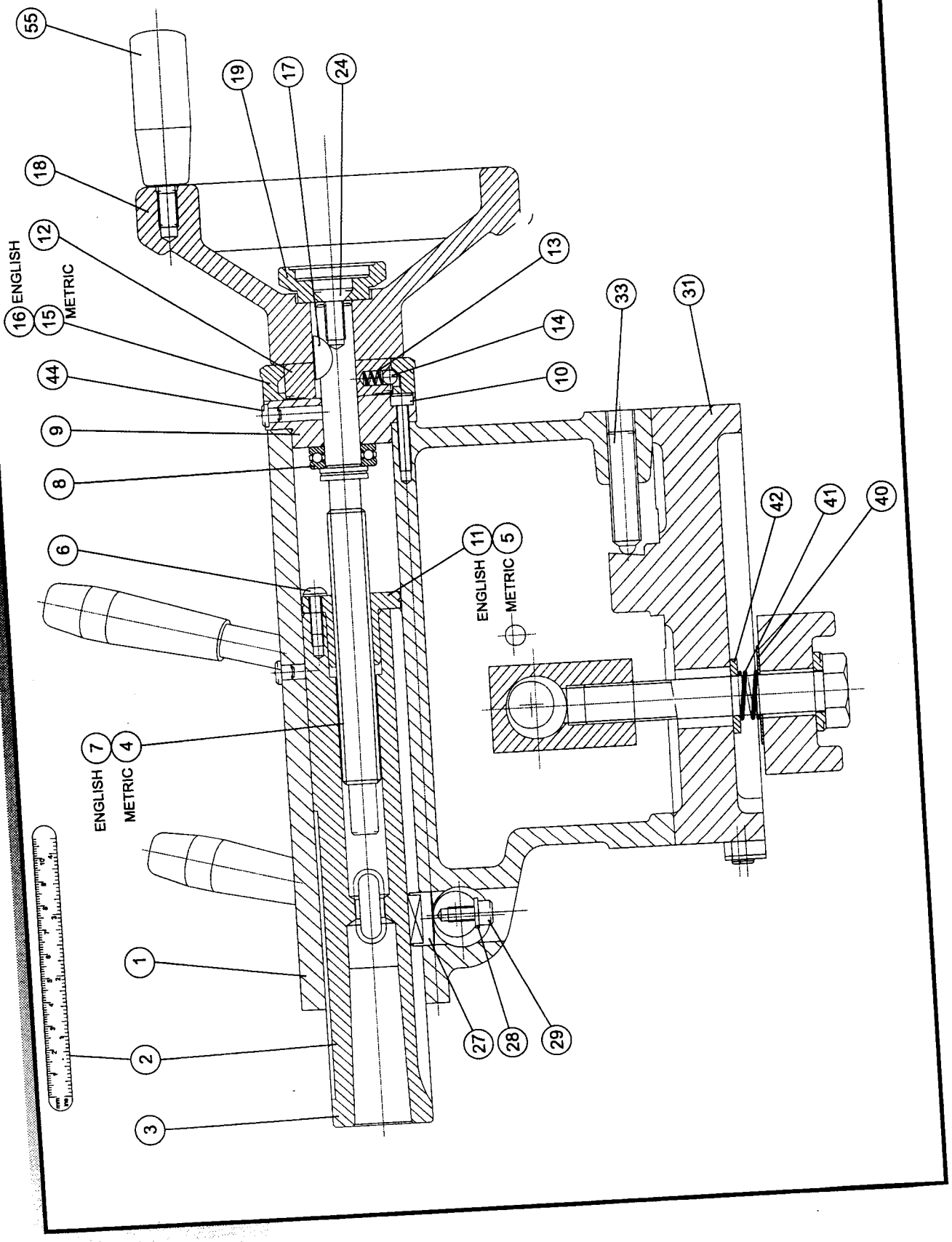
Tailstock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ENGLISH
METRIC
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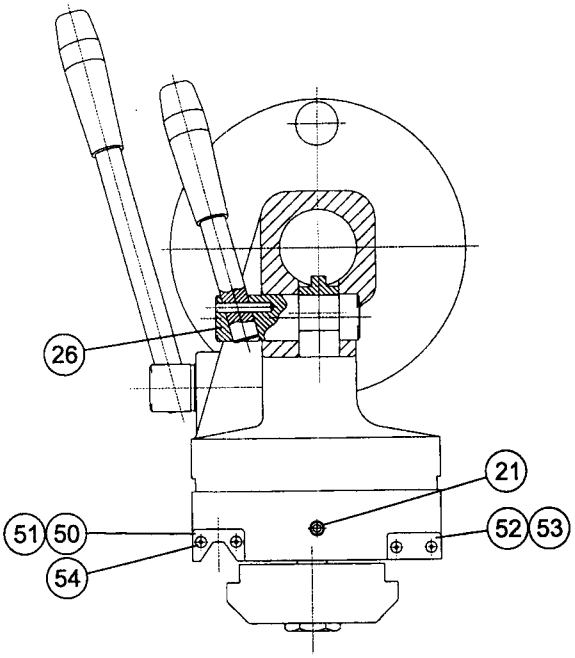
Tailstock

ITEM	PART NO.	DESCRIPTION	QTY.
1	D307H007 .1/V	TAILSTOCK BODY	1
2	D537-1255	STEEL GRADUATION PLATE	1
3	D207H3-005	QUILL	1
4	D282H1-001	TAILSTOCK SCREW (METRIC)	1
5	D118H3-003	TAILSTOCK NUT (METRIC)	1
6	FS-0290	M5 X 16 BUTTON HEAD SCREW	2
7	D282H1-002	TAILSTOCK SCREW (ENGLISH)	1
8	BG-0040	BEARING	1
9	D111H5-007	REAR BUSH	1
10	FS-0116	M5 X 20 CAP HEAD SCREW	4
11	D118H3-004	TAILSTOCK NUT (ENGLISH)	1
12	D001H3-035	DETENT RING	1
13	FR-0005	SPRING	3
14	UB-0006	M6 STEEL BALLS	3
15	SA-0080	DIAL (METRIC)	1
16	SA-0070	DIAL (ENGLISH)	1
17	KA-0180	5 X 7.5 X 19 WOODRUFF KEY	1
18	S2504C007	HANDWHEEL	1
19	S2504C008	SPACER	1
20	FS-0784	M8 X 20 COUNTERSUNK NYLOCK SCREW	1
21	FS-0366	M8 X 12 SCREW	1
22	A801H0103	BED CLAMP ASSEMBLY	1
23	D800H2-002	BLOCK	1
24	FS-0796	M8 X 20 NYLON SCREW	1
26	A801H0104	QUILL CLAMP ASSEMBLY	1
27	D000H2-004	QUILL KEY	1
28	FP-0040	M6 WASHER	1
29	FS-0130	M6 X 10 CAP HEAD SCREW	1
31	D820H7-002	TAILSTOCK BASE	1
33	FS-0892	M12 X 50 SOCKET HEAD SCREW	1
34	FS-0377	M10 X 50 SCREW	2
35	D907H013.1	STOP PIN	1
37	D820H5-001	PLATE	1
38	FS-0756	M16 X 100 HEXAGON HEAD BOLT	1
39	D001H2-099	WASHER	1
40	D001H3-037	RETAINING WASHER	1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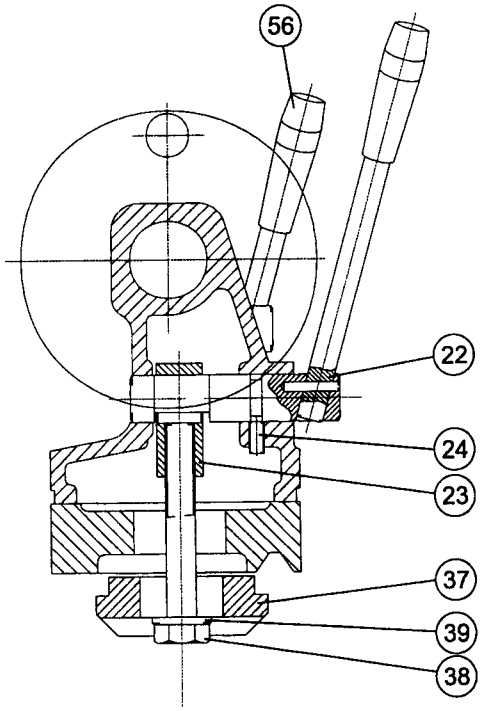
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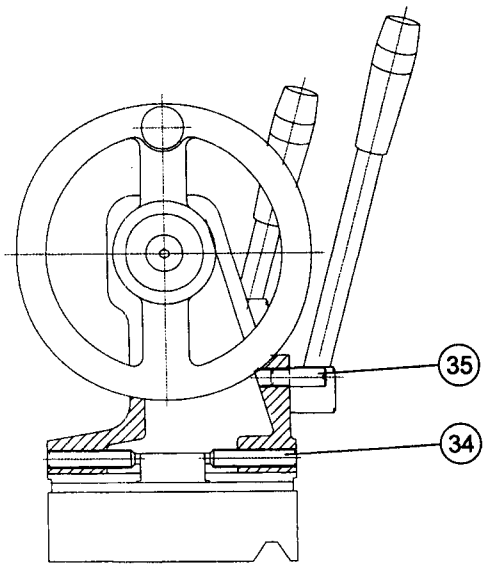
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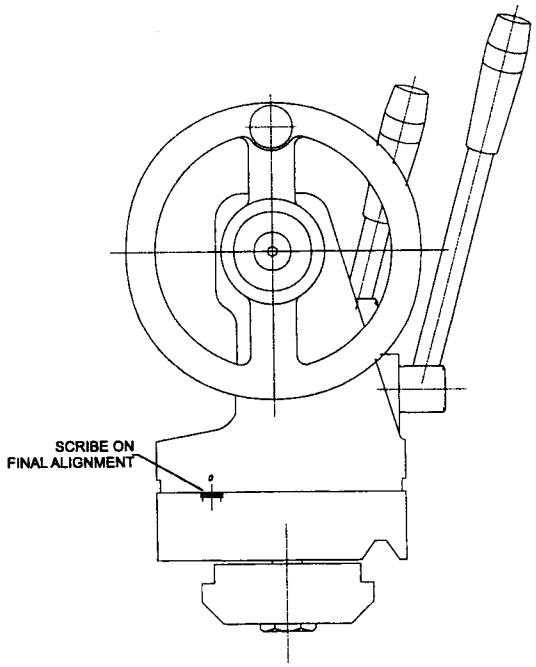
SCRIBE ON
FINAL ALIGNMENT

Tailstock

ITEM	PART NO.	DESCRIPTION	QTY.
41	FR-0011	SPRING	1
42	FP-0090	M16 WASHER	1
44	OC-0010	6MM CONCAVE DRIVE NIPPLE	2
50	GB-0020	VEE WIPER	1
51	GC-0020	WIPER COVER	1
52	GB-0030	FLAT WIPER	1
53	GC-0030	WIPER COVER	1
54	FS-0278	M4 X 12 BUTTON HEAD SCREW	4
55	HB-0030	M8 HANDLE	1
56	D382-0078	HANDLE	2

SPARE PARTS

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SPARE PARTS

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Contents

Coolant Assembly

Coolant Pump
B473-1322

Coolant Assembly

SPARE PARTS
A167-0104A

ITEM	PART NO.	DESCRIPTION	QTY.
1	PF-0020	1/2" BORE CLEAR PVC TUBE	1.2M
2	FU-0040	SIZE 00 JUBILEE CLIP	2
3	B233-1109	ENOTS TUBE CLIP	1
4	B425-0039	FLEXIBLE COOLANT PIPE	1
5	D704-0048	PLASTIC SLEEVE	1
7	PA-1780	TAILPIECE ADAPTOR	1
8	PA-1250	1/4" WASHER	1
9	B473-1322	COOLANT PUMP	1
10	R827-7328	25MM OIL RESISTANT HOSE	1M
11	FU-0025	SIZE 1 JUBILEE CLIP	2

SPARE PARTS

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Contents

Lubrication Assembly

Lubrication Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
1	B474-0013	LUBRICATION UNIT	1
2	B454-7300	M6 MALE CONNECTOR	1
3	B454-7301	TUBE NUT	1
4	PE-0050	4MM DIAMETER COPPER TUBE	.2M
5	B454-7303	ANCHOR BLOCK	1
6	B454-7304	COMPRESSION CONE	1
7	B454-7305	GREASE NIPPLE	1
8	B454-7306	90 DEGREE ELBOW	1
9	PF-0010	M4 NYLON TUBING	2

SPARE PARTS

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SPARE PARTS

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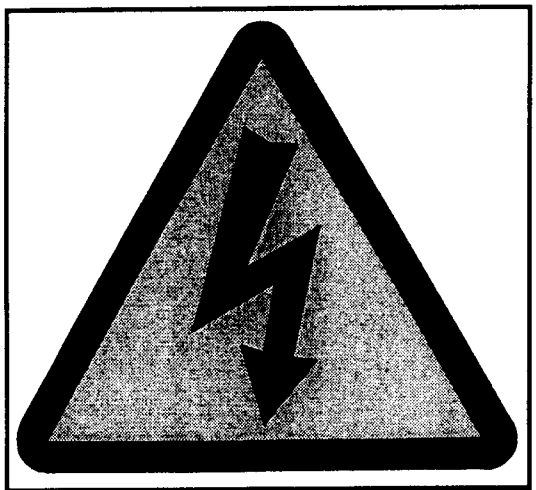
Nameplates



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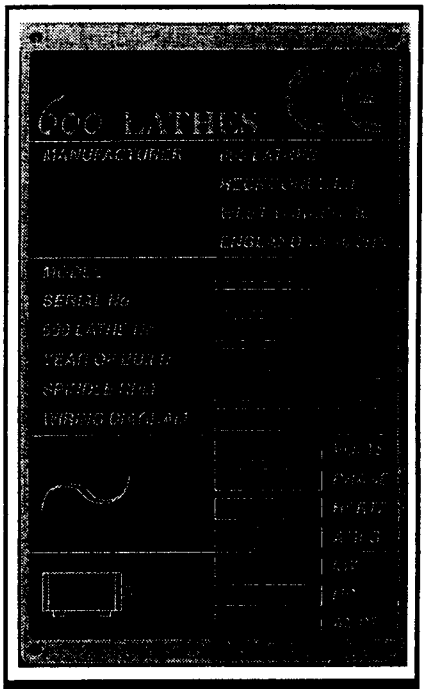

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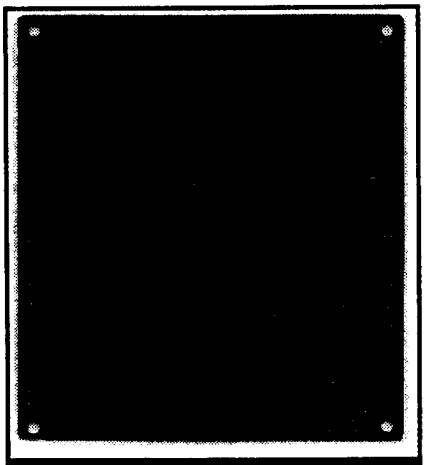

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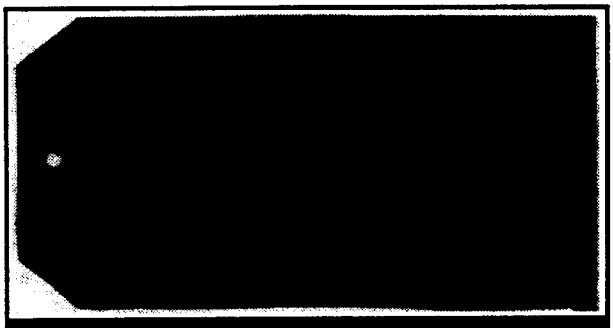

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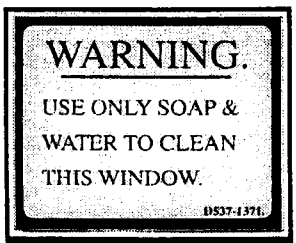

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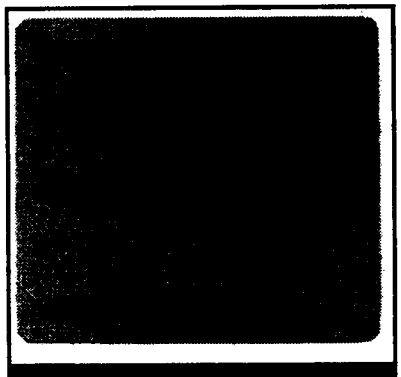

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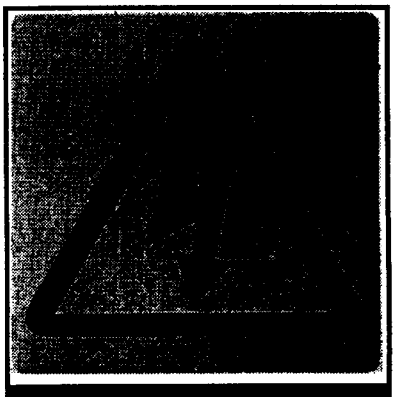
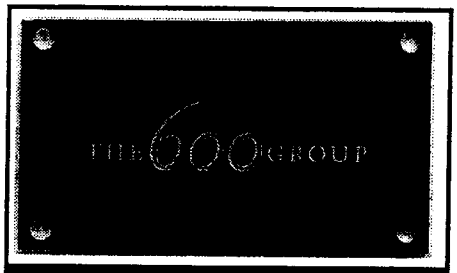


B513-0001

Nameplates

ITEM	PART NO.	DESCRIPTION	QTY.
3	D565Y0406	ELECTRICAL WARNING FLASH LABEL	1
5	D537-1276	HARRISON - GE FANUC/ALPHA NAMEPLATE	1
6	D537-1353	HARRISON 330 PLUS S NAMEPLATE	1
8	D537-1009	ELECTRICAL WARNING LABEL	1
10	D537-1213	CE MARKING CONFORMITY PLATE	1
11	D537-1410	DESIGN REGISTRATION PLATE	1
12	B513-0001	ELECTRICAL WARNING LABEL	1
16	D537-1039	RED ARROW LABEL	1
20	D537-1093	TIE ON WARNING LABEL	1
23	D537-1371	GUARD WINDOW WARNING STICKER	1
30	B123-6024	NO4 X 1/4" SELF TAPPING SCREW	14

Nameplates



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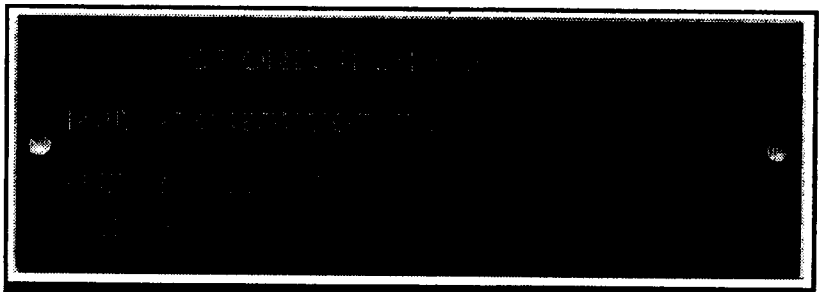

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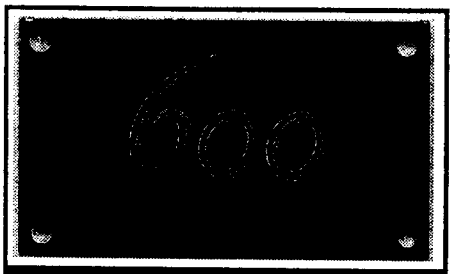

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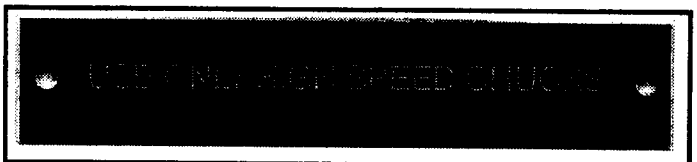

D537-1083 - USA ONLY

D537-1275 - USA ONLY

Nameplates

ITEM	PART NO.	DESCRIPTION	QTY.
17	D537-1071	600 GROUP NAMEPLATE	1
18	D537-1082	CHUCK WARNING NAMEPLATE	1
19	D537-1083	CHUCK WARNING NAMEPLATE - USA ONLY	1
21	D537-1170	600 LOGO NAMEPLATE - USA ONLY	1
22	D537-1275	WARNING NAMEPLATE - USA ONLY	1

SPARE PARTS

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Contents

SPARE PARTS
A137-0104C

Machine Guards & Sheet Metal Pack

SPARE PARTS
A137-0104C

Machine Guards & Sheet Metal Pack

ITEM	PART NO.	DESCRIPTION	QTY.
1	D132-1146	LEADSCREW COVER	1
2	D132-1145	X-AXIS MOTOR COVER	1
3	D050-1031	X-AXIS CABLE SHIELD BRACKET	1
4	D346-0523	FRONT BASE RAIL GUARD	1
5	D565-1275	SERVO MOTOR PLATE	2
7	D565-1520	MOTOR ACCESS PLATE	1
8	D346-0524	HEAD END ACCESS DOOR	1
9	D565-1525	COOLANT THROWER PLATE	1
10	D565-1522	BULKHEAD PLATE	1
11	D565-1552	HEADSTOCK INFILL PLATE	1
12	D565-1523	MACHINE CABINET FRONT INFILL PLATE	1
13	D565-1524	MACHINE CABINET REAR INFILL PLATE	1
14	D565-1593	SWARF SHIELD	1
15	D050-1050	DOOR SWITCH ACTUATOR BRACKET	1
16	D132-1155	COOLANT THROWER COVER	1
17	D132-1156	COOLANT COLLECTOR COVER	1
18	D050-1051	DOOR LATCH BRACKET	1
19	D346-0525	REAR SPLASHGUARD	1
20	D565-1526	BED FRONT INFILL PLATE	1
21	D565-1530	COLLET ATTACHMENT BLANKING PLATE	1
22	D346-0533	FRONT TRIMMINGS - BASE	1
23	D132-1157	CHUCK GUARD SWITCH COVER	1
24	D828-0085	COOLANT TANK	1
25	D565-1534	COOLANT TANK COVER	1
26	D050-1062	PULL DOWN GUARD BRACKET GUIDE	1
27	D132-1163	BED RIGHT HAND END COVER	1
28	D565-1515	LIFTING LEVER MOUNTING PLATE	1

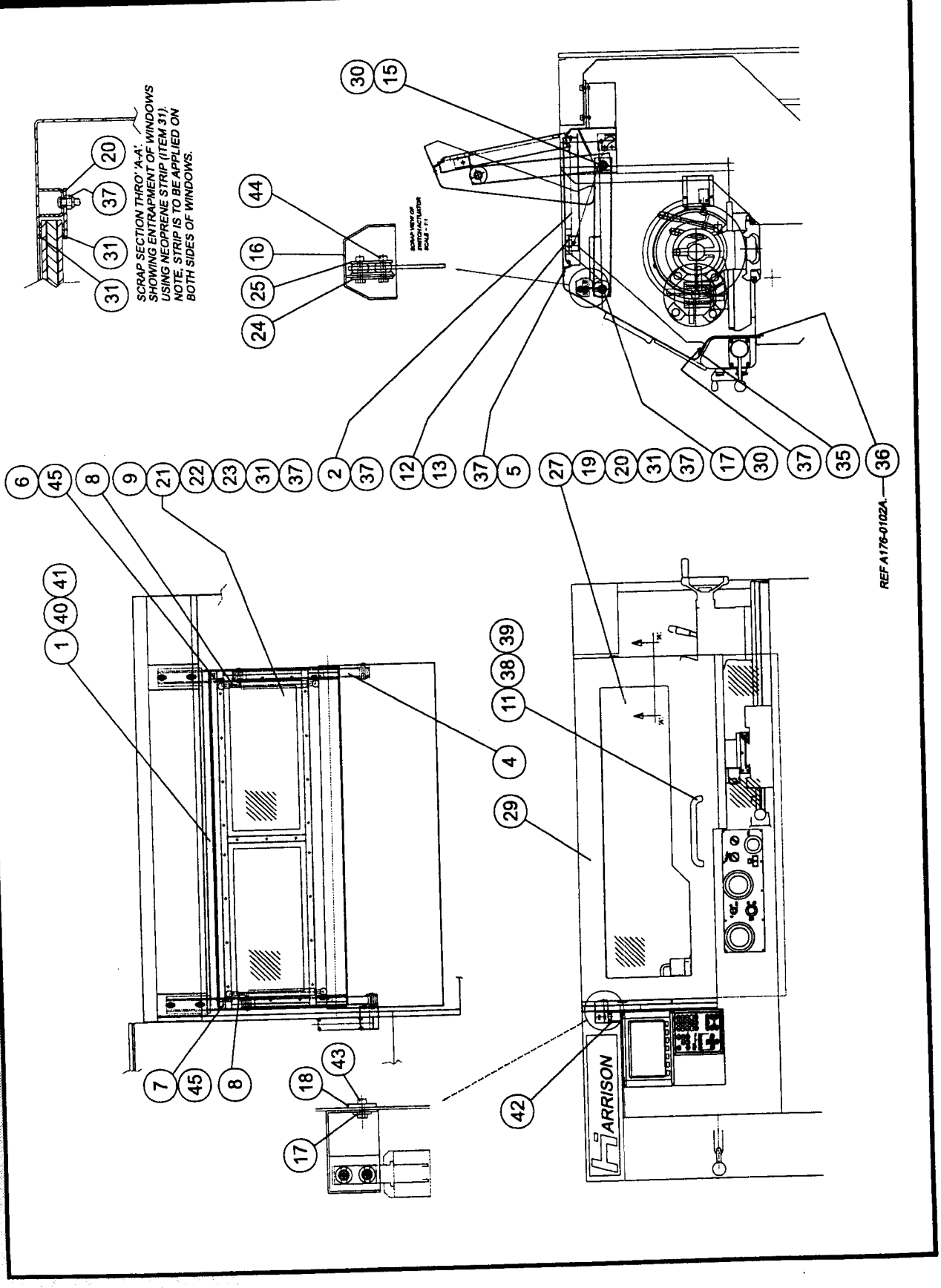
A137-0104D

Optional Right Hand Enclosure

ITEM	PART NO.	DESCRIPTION	QTY.
1	D346-0649	RIGHT HAND END GUARD	1

SPARE PARTS
A137-0105C

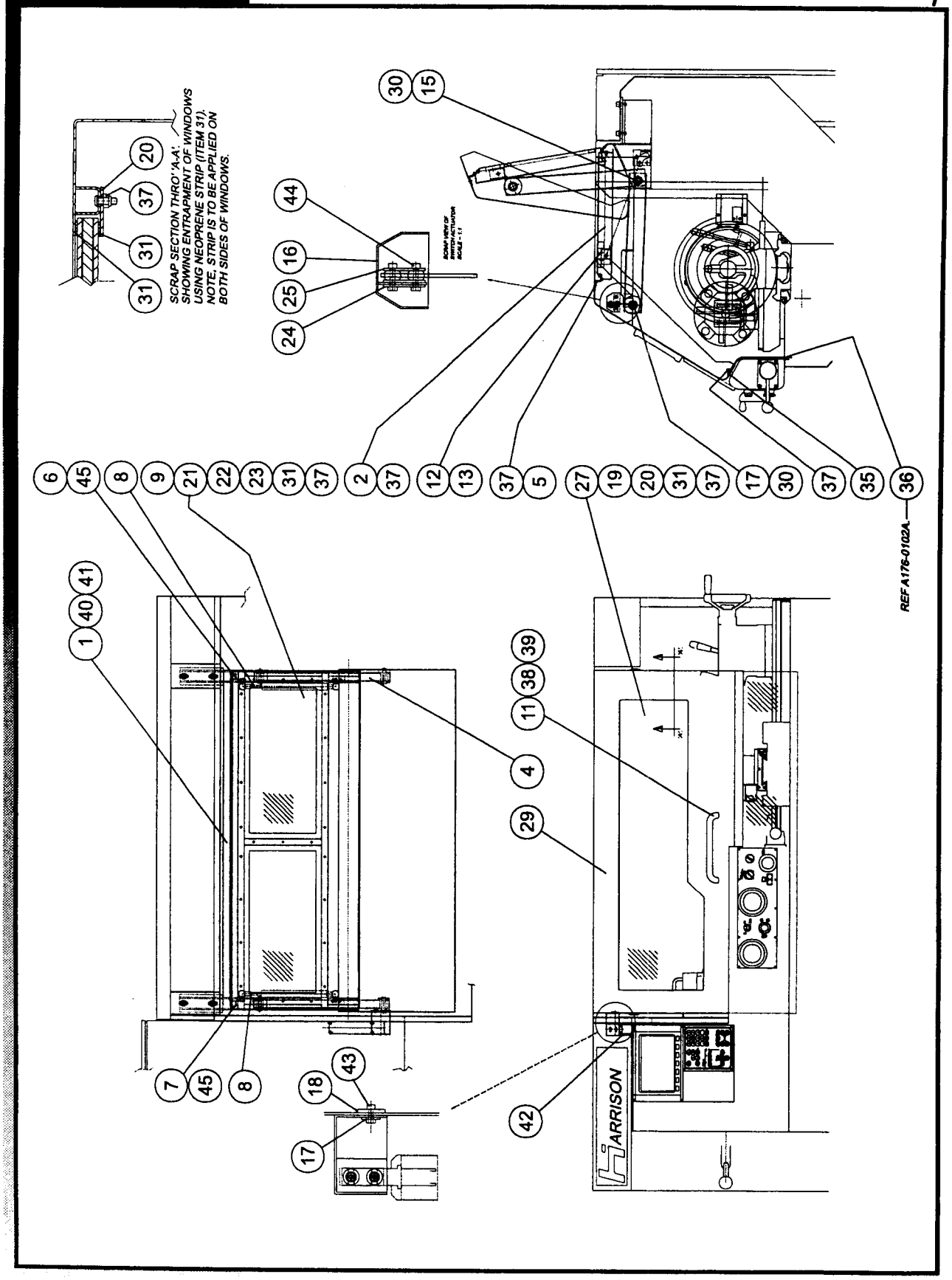
Pull Down Guard Assembly



Pull Down Guard Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
1	D050-1054	PULL DOWN GUARD MOUNTING BRACKET	1
2	D346-0526	PDG TOP SECTION	1
4	D454-0029	PDG LINK ARM	2
5	D386-0012	PDG HINGE	1
6	D050-1057	RIGHT HAND GAS SPRING CLAMPING BRACKET	1
7	D050-1058	LEFT HAND GAS SPRING CLAMPING BRACKET	1
8	B976-1077	GAS SPRING	2
9	D943-0035	PDG TOP WINDOW	1
11	B976-1067	PDG HANDLE	1
12	D050-1059	RIGHT HAND GAS SPRING ANCHOR BRACKET	1
13	D050-1060	LEFT HAND GAS SPRING ANCHOR BRACKET	1
14	D560-0353	PIN - PDG LINK ARM	2
15	D560-0354	PIN - PDG LINK ARM	2
16	D050-1111	SWITCH ACTUATOR MOUNTING BRACKET	1
17	D131-0122	SWITCH ACTUATOR CLAMP PLATE	1
18	D565-1532	SWITCH ACTUATOR CLAMP PLATE	1
19	D565-1535	PDG FRONT WINDOW CLAMP PLATE	2
20	D565-1536	PDG FRONT WINDOW CLAMP PLATE	2
21	D565-1537	PDG TOP WINDOW CLAMP PLATE	2
22	D565-1538	PDG TOP WINDOW CLAMP PLATE	1
23	D565-1539	PDG TOP WINDOW CLAMP PLATE	4
24	D131-0121	GUARD INTERLOCK SWITCH KEY CLAMP PLATE	1
25	D565-1571	PLATE - INTERLOCK SWITCH KEY	2
27	D943-0050	PDG FRONT WINDOW	1
29	D346-0590	PDG FRONT SECTION	1
30	B362-2017	CIRCLIP	8
31	R812Y0255	1/2" X 1/8" SELF ADHESIVE NEOPRENE STRIP	13
32	FP-0070	M12 BRIGHT WASHER	8
35	D131-0115	CLAMP - PVC COVER	1
36	FP-0040	M6 BRIGHT WASHER	67
37	FS-0930	M6 NYLOCK NUT	67

Pull Down Guard Assembly

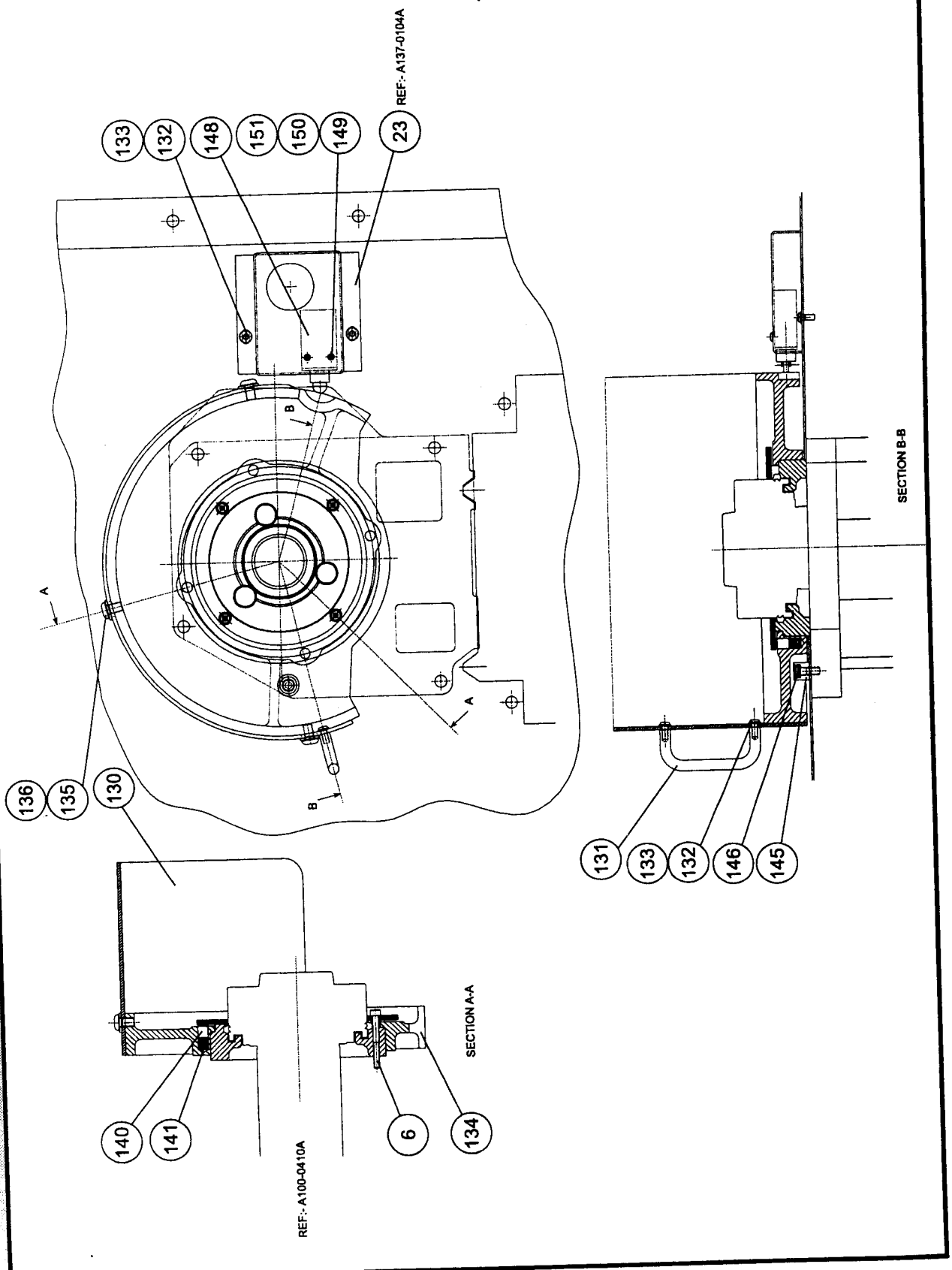


Pull Down Guard Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
38	B163-1905	M8 X 20 BUTTON HEAD SCREW	2
39	FP-0140	M8 WASHER - TYPE A	2
40	FS-0184	M10 X 25 SOCKET HEAD CAP SCREW	4
41	FP-0060	M10 BRIGHT WASHER	4
42	FS-0124	M5 X 40 SOCKET HEAD CAP SCREW	4
43	FS-0274	M4 X 10 BUTTON HEAD CAP SCREW	4
44	FS-0098	M4 X 20 SOCKET HEAD CAP SCREW	2
45	FS-0294	M6 X 12 BUTTON HEAD CAP SCREW	4
46	FS-0304	M8 X 16 BUTTON HEAD CAP SCREW	2

SPARE PARTS
A137-0104G

Chuck Guard Assembly



Chuck Guard Assembly

SPARE PARTS
A137-0104G

ITEM	PART NO.	DESCRIPTION	QTY.
130	D311H015.1	CANOPY - CHUCK GUARD	1
131	HA-0110	M5 HANDLE	1
132	FS-0286	M5 X 12 BUTTON HEAD SCREW	4
133	FP-0030	5MM WASHERS	4
134	D017H9-005	MOUNTING PLATE - CHUCK GUARD	1
135	FS-0302	M8 X 12 BUTTON HEAD SCREW	3
136	FP-0050	M8 WASHER	3
140	BD-0050	8MM CYLINDRICAL ROLLERS	4
141	FR-0230	SPRING	4
142	D646-0087	RETAINING RING - CHUCK GUARD	1
145	D311H002.1/V	STOP BUTTON	1
146	FS-0134	M6 X 16 SOCKET HEAD SCREW	1
149	FS-0098	M4 X 20 SOCKET HEAD SCREW	2
150	FS-0963	M4 DOMED NUT	2
151	FP-0170	M4 WASHER	2
REF:	*A137-0104A*	*MACHINE GUARDS*	
23	D132-1157	CHUCK GUARD SWITCH COVER	1
REF:	*A100-0410B*	*HEADSTOCK ASSEMBLY*	
6	FS-0126	M5 X 45 SOCKET HEAD SCREW	
148	LC-3030 Use Part # A8d6-1668A	Chuck Guard Switch	

SPARE PARTS

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Important when ordering

1. Quote component's part number and description, against each parts illustration for 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 onto the lathe bed at the tailstock end.

ACCESSORIES

SECTION: SIX

ACCESSORIES

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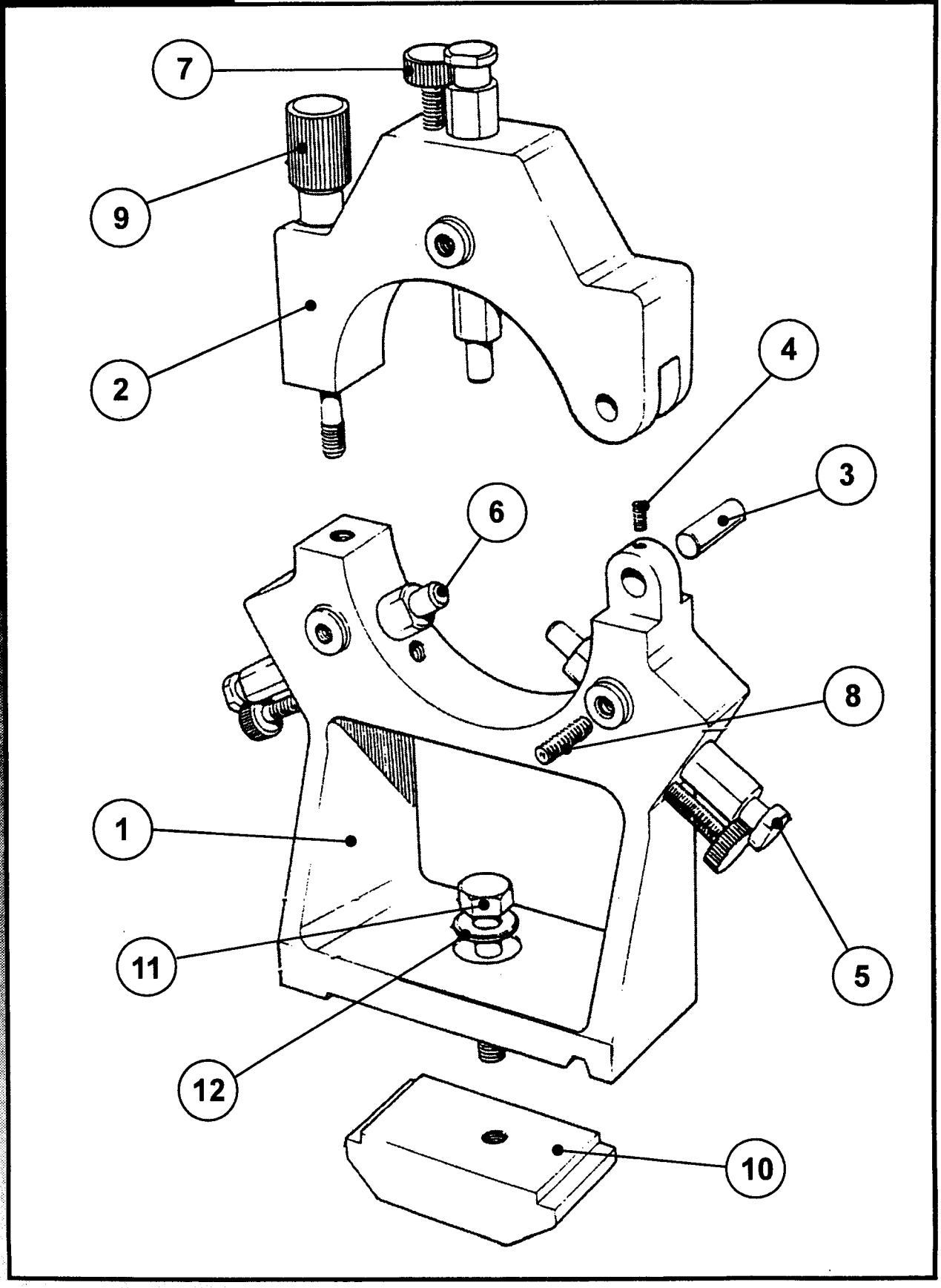
Stationary Steady



Stationary Steady

ITEM	PART NO.	DESCRIPTION	QTY.
1	D660H7-001	STATIONARY STEADY BASE	1
2	D660H7-002	STATIONARY STEADY TOP	1
3	D200H0-016	PIN	1
4	FS-0490	M5 X 6 SOCKET SET SCREW	1
5	D231H1-002	STEADY PIN	3
6	D100H1-009	STEADY PIN INSERT	3
7	D220H2-022	ADJUSTING SCREW	3
8	FS-0158	M8 X 12 SOCKET HEAD SCREW	3
9	D220H2-023	CLAMP SCREW	1
10	D810H3-002	CLAMP PLATE	1
11	FS-0608	M12 X 45 HEXAGON SET SCREW	1
12	FP-0070	M12 WASHER	1
	13290A	Steady Rest - Plain Finger	
	13300A	Steady Rest - Roller Finger	

ACCESSORIES

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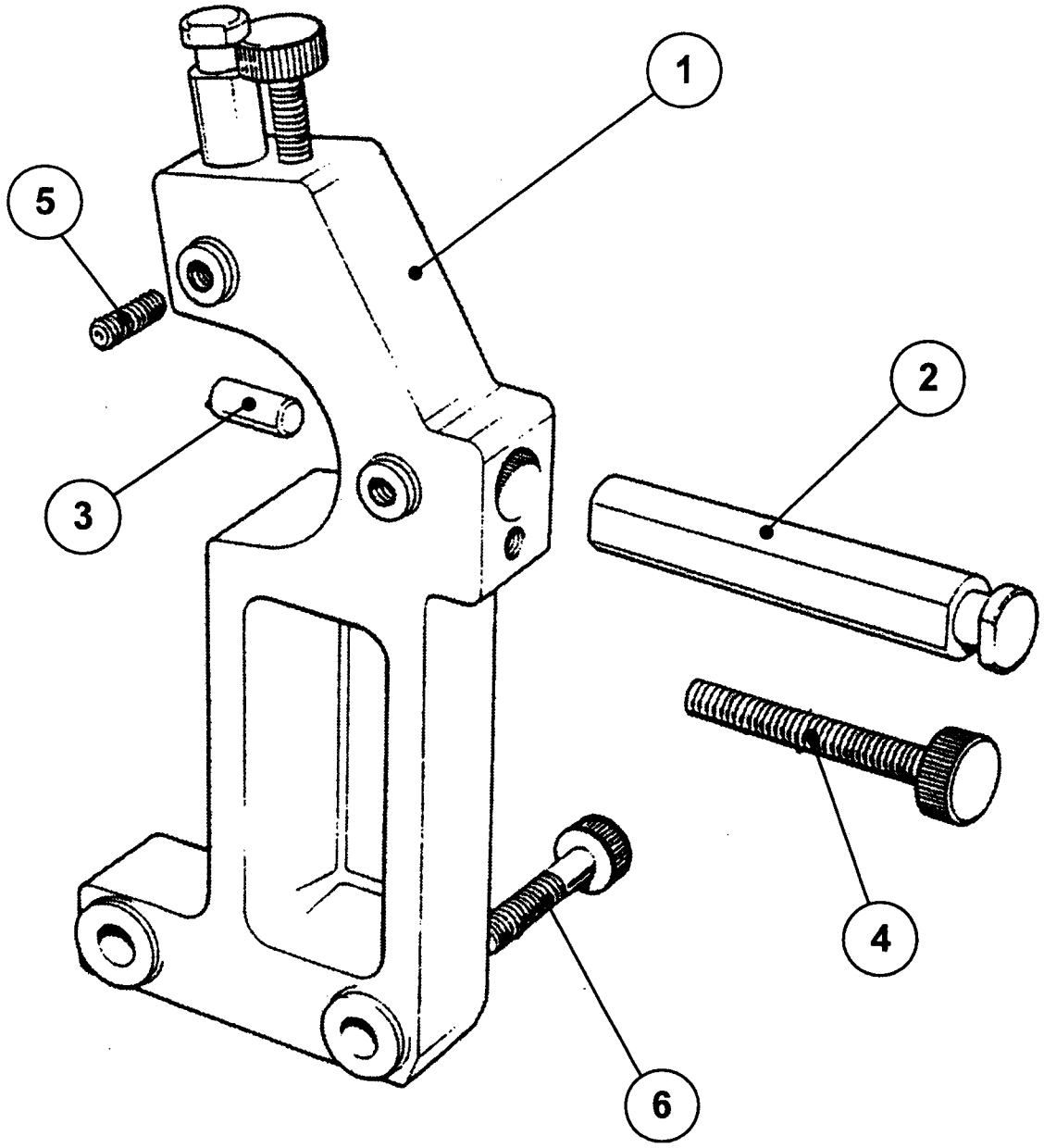
Travelling Steady



Travelling Steady

ITEM	PART NO.	DESCRIPTION	QTY.
1	D660H6-001	STEADY BODY	1
2	D231H1-003	STEADY PIN	2
3	D100H1-009	STEADY PIN INSERT	2
4	D220H2-021	ADJUSTING SCREW	2
5	FS-0158	M8 X 12 SOCKET HEAD SCREW	2
6	FS-0190	M10 X 40 SOCKET HEAD SCREW	2

ACCESSORIES

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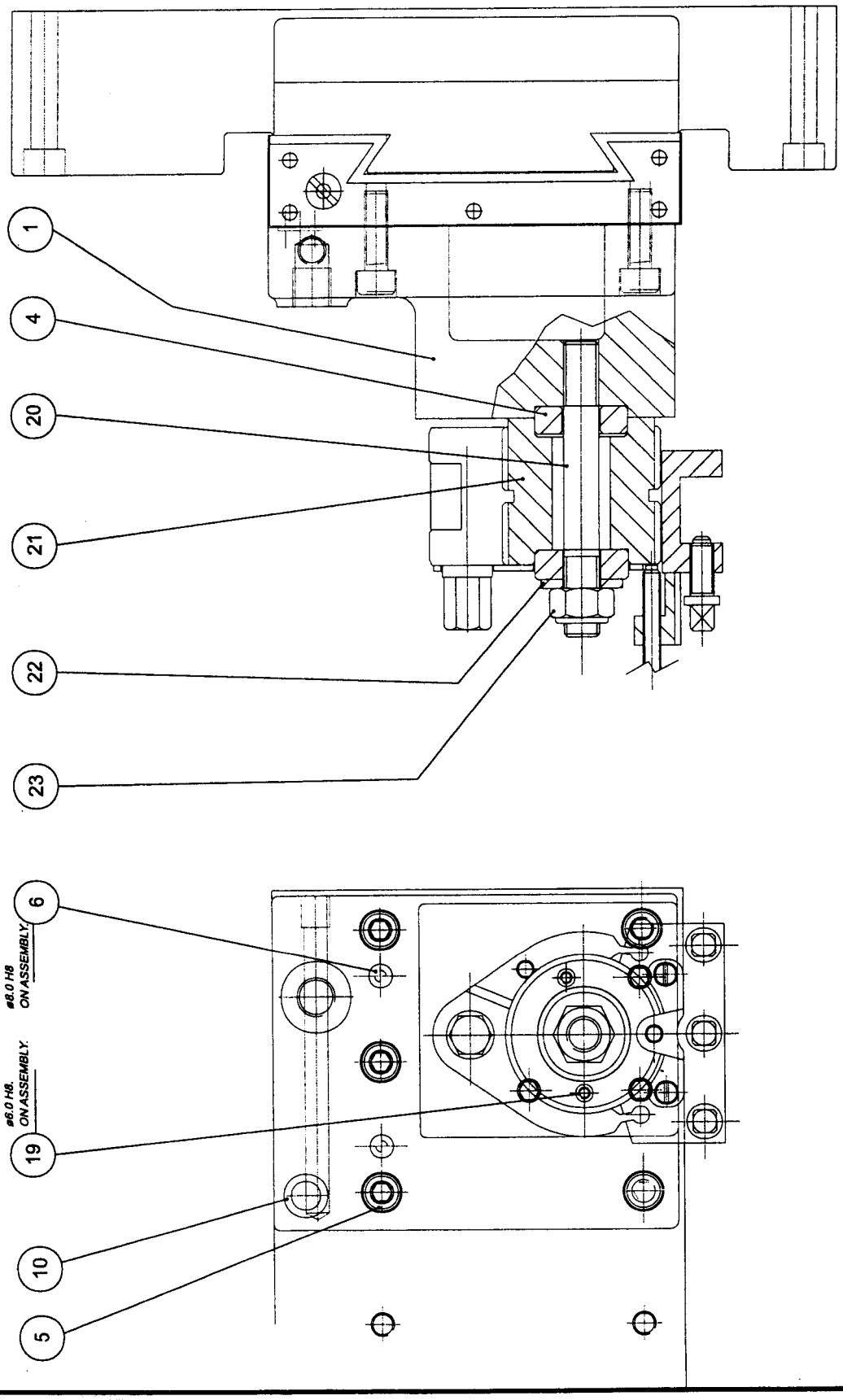
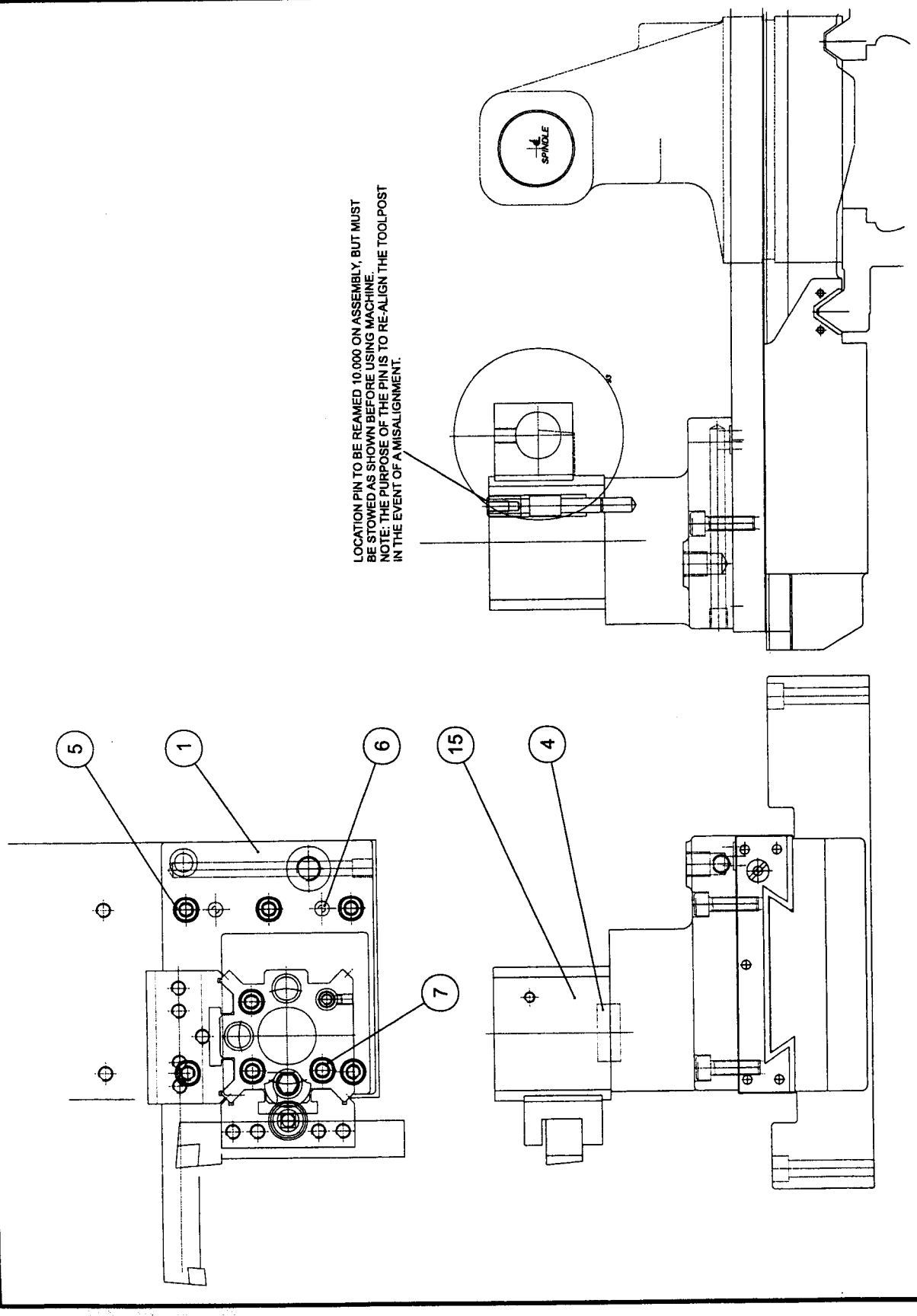
Multifix Toolpost



Multifix Toolpost

ITEM	PART NO.	DESCRIPTION	QTY.
1	D042-0100	TOOLPOST BASE	1
4	D133-0284	COLLAR	1
19	FT-0875	DOWEL 6MM X 24 HARDEN & GROUND	2
20	D711-0221	STUD	1
21	B935-1381	MULTIFIX TOOLPOST	1
22	B117-0049	WASHER M12	1
23	FS-0973	NYLOC LOCKNUT M12	1

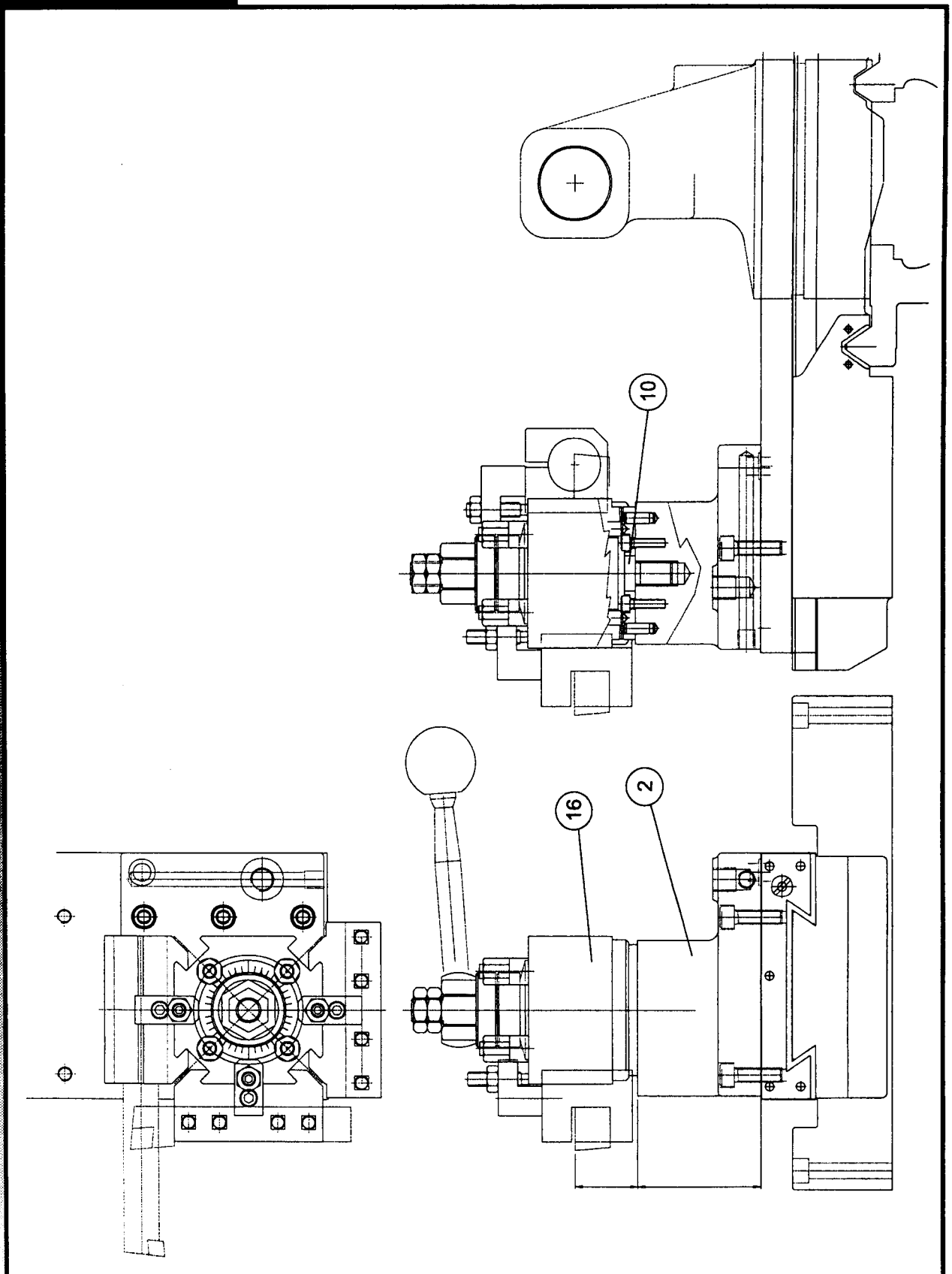
Dickson Quickchange Toolpost



Dickson Quickchange Toolpost

ITEM	PART NO.	DESCRIPTION	QTY.
1	D042-0100	TOOLPOST BASE	1
4	D001H2-085	LOCATION RING	1
5	FS-0164	M8 X 25 SOCKET HEAD CAP SCREW	5
6	B111Y7040	PIN	2
7	FS-0249	M8 X 75 SOCKET HEAD CAP SCREW	3
15	TA-0045	DICKSON Q/C TOOLPOST	1
		TOOLPOST OPTIONS	
	TS-0140	DICKSON Q/C STANDARD TOOLHOLDER	
	TS-0160	DICKSON Q/C VEE TYPE TOOLHOLDER	
	TS-0180	DICKSON Q/C NO. 1 MT TOOLHOLDER	
	TS-0200	DICKSON Q/C PARTING OFF TOOLHOLDER	
	B935-1352	DICKSON Q/C INVERTED TOOLHOLDER	

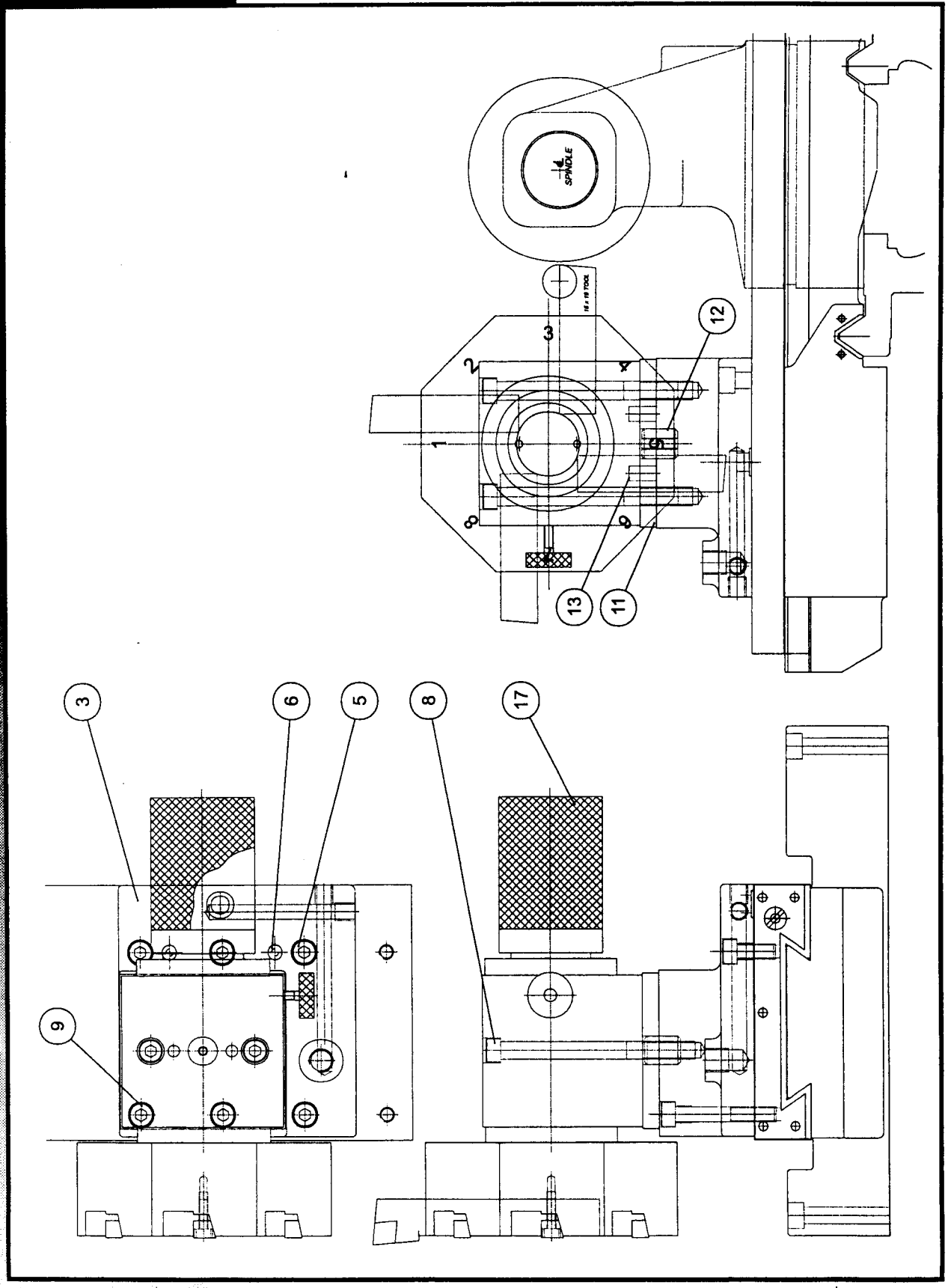
Parat Turret Toolpost



Parat Turret Toolpost

ITEM	PART NO.	DESCRIPTION	QTY.
2	D042-0101	TOOLPOST BASE	1
10	OA-0596	'O' RING	1
16	B935-5507	PARAT Q/C PRECISION TOOLPOST	
		TOOLPOST OPTIONS	
	B935-5508	PARAT LEFT HAND INVERTED TOOLHOLDER	
	B935-5509	PARAT STANDARD TOOLHOLDER	
	B935-5510	PARAT LEFT HAND EXTENDED TOOLHOLDER	
	B935-5511	PARAT RIGHT HAND EXTENDED TOOLHOLDER	
	B935-5513	PARAR BORING BAR TOOLHOLDER	
	B935-5514	PARAT NO. 1 MORSE TAPER SLEEVE	
	B935-5515	PARAT NO. 2 MORSE TAPER SLEEVE	

Dorian Turret Toolpost



Dorian Turret Toolpost

ITEM	PART NO.	DESCRIPTION	QTY.
3	D042-0099	TOOLPOST BASE	1
5	PS-0164	M8 X 25 SOCKET HEAD CAP SCREW	4
6	B111Y7040	PIN	2
8	FS-0181	M8 X 100 SOCKET HEAD SCREW	2
9	FS-0178	M8 X 60 SOCKET HEAD SCREW	2
11	D708-0419C	SPACER	1
12	D560-0355	PIN	1
13	FI-0930	M8 X 15 PIN	1
17	B935-5030	DORIAN TURRET	
		TURRET OPTIONS	
	B935-5031	DORIAN BORING BAR HOLDER	
	B935-5032	DORIAN 10MM REDUCING BUSH	
	B935-5033	DORIAN 12MM REDUCING BUSH	
	B935-5034	DORIAN 16MM REDUCING BUSH	
	B935-5035	DORIAN 20MM REDUCING BUSH	
	B935-5036	DORIAN NO. 2 MORSE TAPER BUSH	

ACCESSORIES
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ELECTRICS

SECTION: SEVEN

ELECTRICS

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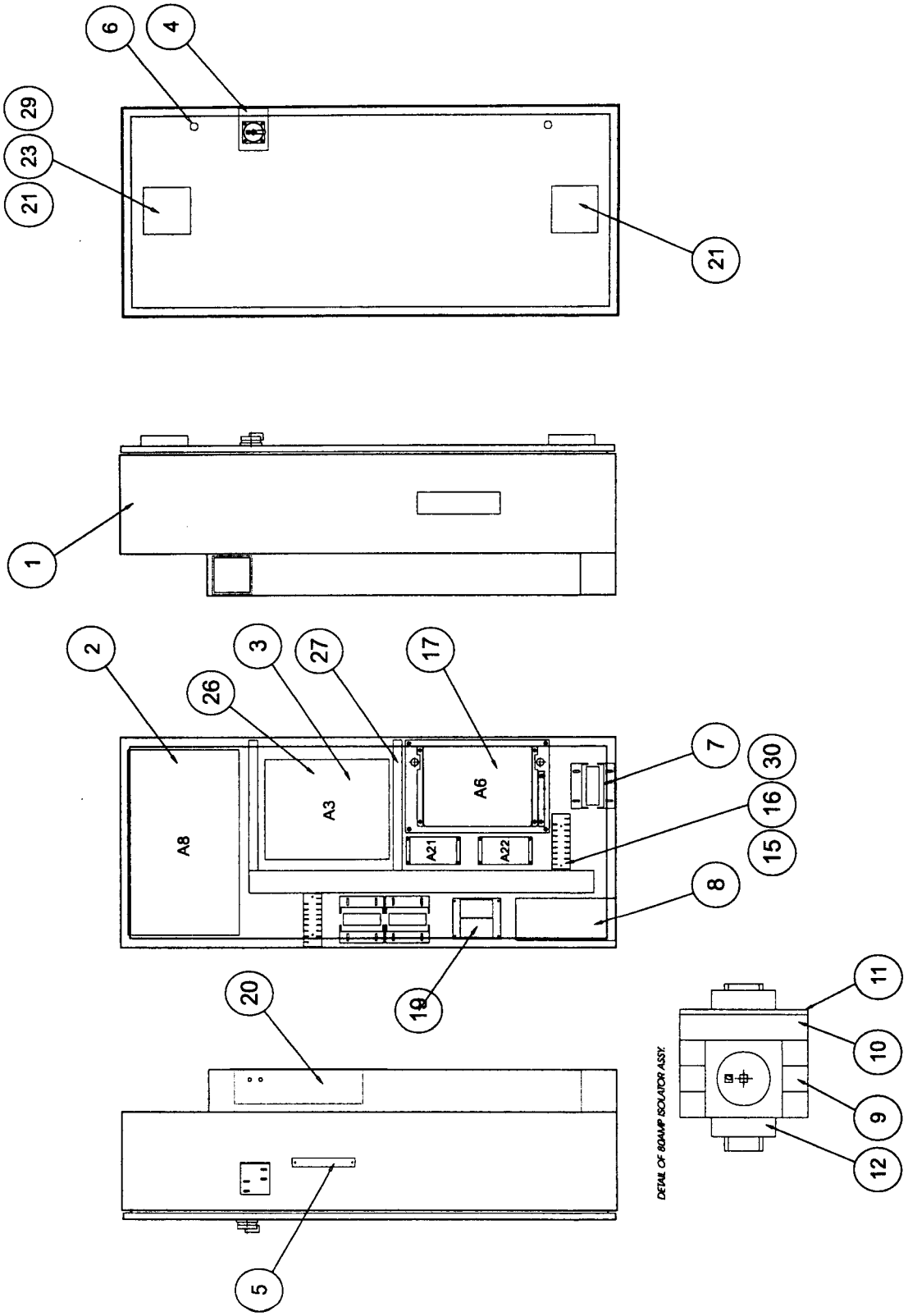
Electrical Cabinet Assembly



Electrical Cabinet Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
1	D125-0215	ELECTRICAL CABINET	1
2	A826-2937B	MAGNETICS PANEL	1
3	A826-2940A	CONTROL PCB	1
4	D050-1176	ELECTRICAL ISOLATOR MOUNTING BRACKET	1
5	BK1099	EARTH BAR	1
6	A826-2193A	3 POINT LOCK ASSEMBLY	2
7	BK1054	CABLE CLAMP BRACKET	6
8	E061-0072	1.6kVA 3 PHASE TRANSFORMER	1
9	E014-0026	80 AMP ISOLATOR	1
10	E074-0175	EARTH TERMINAL	1
11	E074-0171	TERMINAL END PLATE	1
12	E074-0112	TERMINAL END STOP	2
13	A826-2786B	CONTROL PCB SECURING KIT	1
14	A826-2587D	FANUC 21TI CABINET SUB ASSEMBLY KIT	1
15	D565-1558	CABLE CLAMP PLATE	2
16	E116-0173	CABLE SCREEN CLAMP	10
17	A826-2904B	SPINDLE DRIVE ASSEMBLY	1
18	A827-0016A	INTERNAL HARNESS KIT	1
19	A826-2587D	AXIS DRIVE FILTER ASSEMBLY	1
20	A826-2473A	BRAKE RESISTOR ASSEMBLY	1
21	E102-0002	120MM FAN FILTER	2
23	E161-0083	COOLING FAN	1
24	D537-1338	SERVICE AMENDMENT PLATE	1
26	E125-0007	60 X 100 SLOTTED DUCTING	1.5MT
27	E125-0003	25 X 80 SLOTTED DUCTING	2MT
29	E102-0004	FAN FINGER GUARD	1
30	E094-0045	M4 X 5 BRASS SPACER	4

ELECTRICS

A827-0016A

Internal Harness Kit

Internal Harness Kit

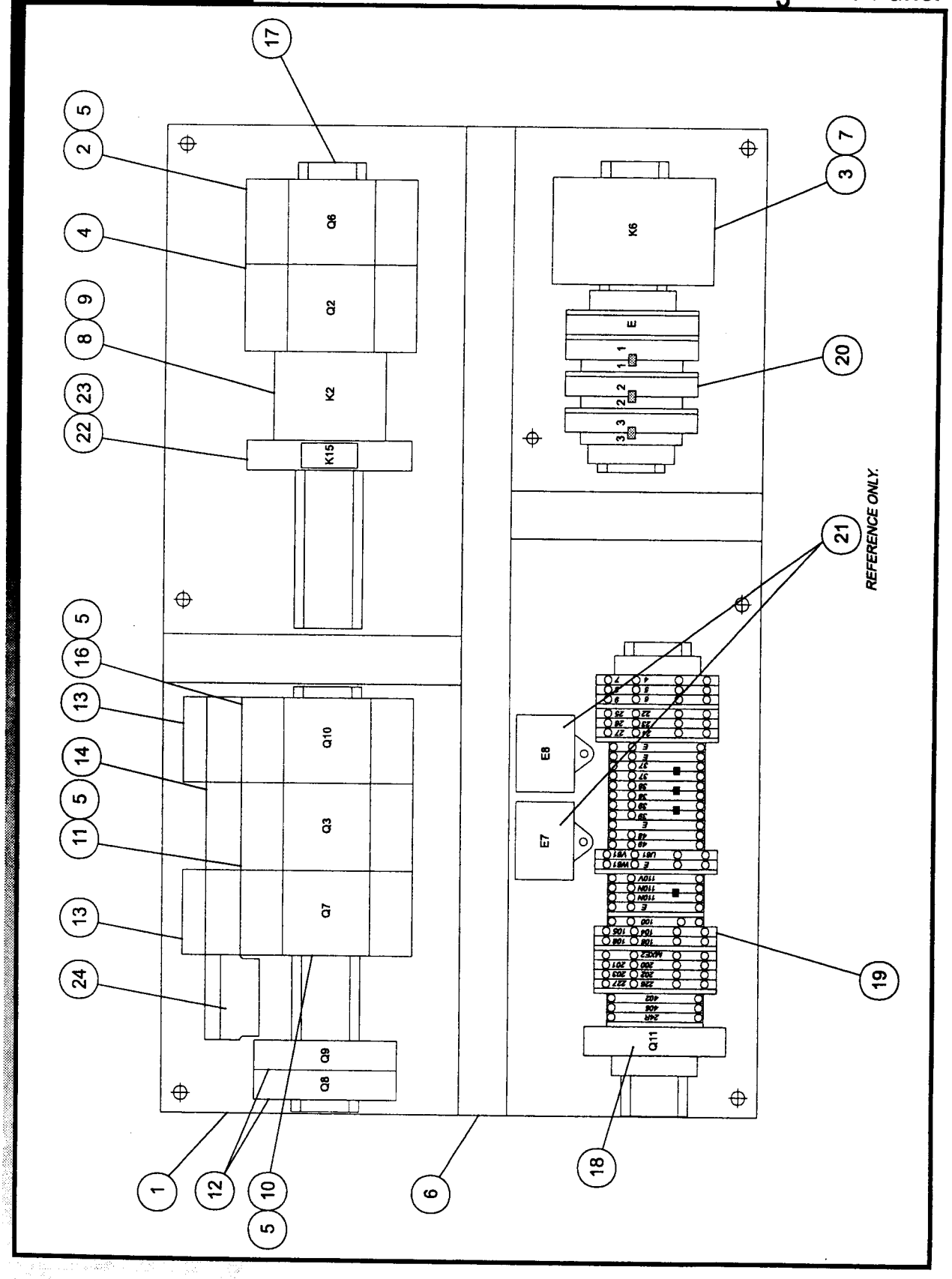
ITEM	PART NO.	DESCRIPTION	QTY.
1	A828-0273B	A8/X1 TO A3/X7 CABLE ASSEMBLY	1
2	A826-2512B	A8/X1-Q1 ISOLATOR CABLE	1
4	A826-2518B	A21/CX11-5 TO A22/CX11-4 CABLE ASSEMBLY	1
5	A828-0274B	A21/22/JX5 TO A3/X19 CABLE ASSEMBLY	1
6	A828-0275B	A21/CX11-4 TO A3/X12 CABLE ASSEMBLY	1
8	A826-2522B	A8/X1 TO COOLING FAN CABLE ASSEMBLY	1
11	A826-2525B	A8/X1 TO TRANSFORMER CABLE ASSEMBLY	1
12	A828-0271B	A3/X5 TO TRANSFORMER CABLE ASSEMBLY	1
14	A828-0277B	A8/X1 TO A3/X1 COOLANT POWER CABLE	1
15	A826-2189A	RESISTOR SHORTING LINK	1
16	A828-0279B	A3/X11 TO A3/X1 CABLE ASSEMBLY	1
17	A828-0319A	A3/X16 EMERGENCY STOP LINK	1
18	A828-0276B	D CHARGE UNIT TO A22/CX11-2 & 6 ASSEMBLY	1
19	A828-0347A	A8/X1 TO A3/X27 CABLE ASSEMBLY	1

External Harness Kit

A191-1202A

ITEM	PART NO.	DESCRIPTION	QTY.
1	A828-0285B	A3/X15 TO B61 SPINDLE ENCODER CABLE	1
2	A828-0189B	A3/X2 TO COOLANT PUMP CABLE	1
3	A828-0309B	A3/X10 TO CHUCK GUARD CABLE ASSEMBLY	1
4	A828-0195	REAR DRAGCHAIN ASSEMBLY	1
5	A826-2566B	SLIDE LUBRICATION CABLE ASSEMBLY	1

Magnetics Panel



Magnetics Panel

ITEM	PART NO.	DESCRIPTION	QTY.
1	D565-1765	MAGNETICS PANEL	1
2	E013-0040	3 POLE CCT BREAKER	1
3	E011-0104	110 VOLT CONTACTOR	1
4	E012-0011	6/10 AMP MOTOR STARTER	1
5	E011-0017	INSTANTANEOUS OVERLOAD N/O + N/C	4
6	E125-0008	25 X 60 SLOTTED DUCTING	0.8MT
7	E014-0007	SUPPRESSOR	1
8	E011-0046	110 VOLT CONTACTOR	1
9	E014-0011	SUPPRESSOR	1
10	E012-0003	0.16/0.25 AMP MOTOR STARTER	1
11	E012-0004	0.25/0.4 AMP MOTOR STARTER	1
12	E013-0018	1 AMP CIRCUIT BREAKER	2
13	E012-0027	TERMINAL BLOCK	2
14	E012-0025	4 WAY LINK	1
16	E012-0010	4/6 AMP MOTOR STARTER	1
17	E096-0068	SLOTTED DIN RAIL	0.46MT
18	E013-0019	2 AMP CIRCUIT BREAKER	1
19	A826-2938B	LEFT HAND SIDE TERMINAL RAIL ASSEMBLY	1
20	A826-2943A	RIGHT HAND SIDE TERMINAL RAIL ASSEMBLY	1
22	E017-0071	DIN RAIL MOUNTING RELAY BASE	1
23	E017-0072	110 VOLT RELAY	1
24	E012-0026	PROTECTIVE END COVER	1

A826-2904B

Spindle Drive Assembly

Spindle Drive Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
1	E018-0005	7.5kW VARIABLE SPEED DRIVE	1
2	D565-1676	SPINDLE DRIVE MOUNTING PLATE	1
3	E164-0010	RFI FILTER	1
4	D050-1194	DRIVE MOUNTING BRACKET	2
5	E097-0034	QUICK FIT GROMMET	2
6	E091-0104	M5 X 100 CAP HEAD SCREW	4
7	D050-1245	GLAND PLATE BRACKET	1
9	A826-2510C	SPINDLE DRIVE TO RFI FILTER CONNECTION	1
10	A828-0253B	A8/K5 TO E6 CABLE	1
11	A826-2531A	EARTH BRAID CONNECTION	1
12	A826-2534E	A3/X16-A6 SPINDLE COMMS CABLE	1
13	D297-0070	DRIVE MOUNTING FRAME	1

ELECTRICS

7.1

7.1.10

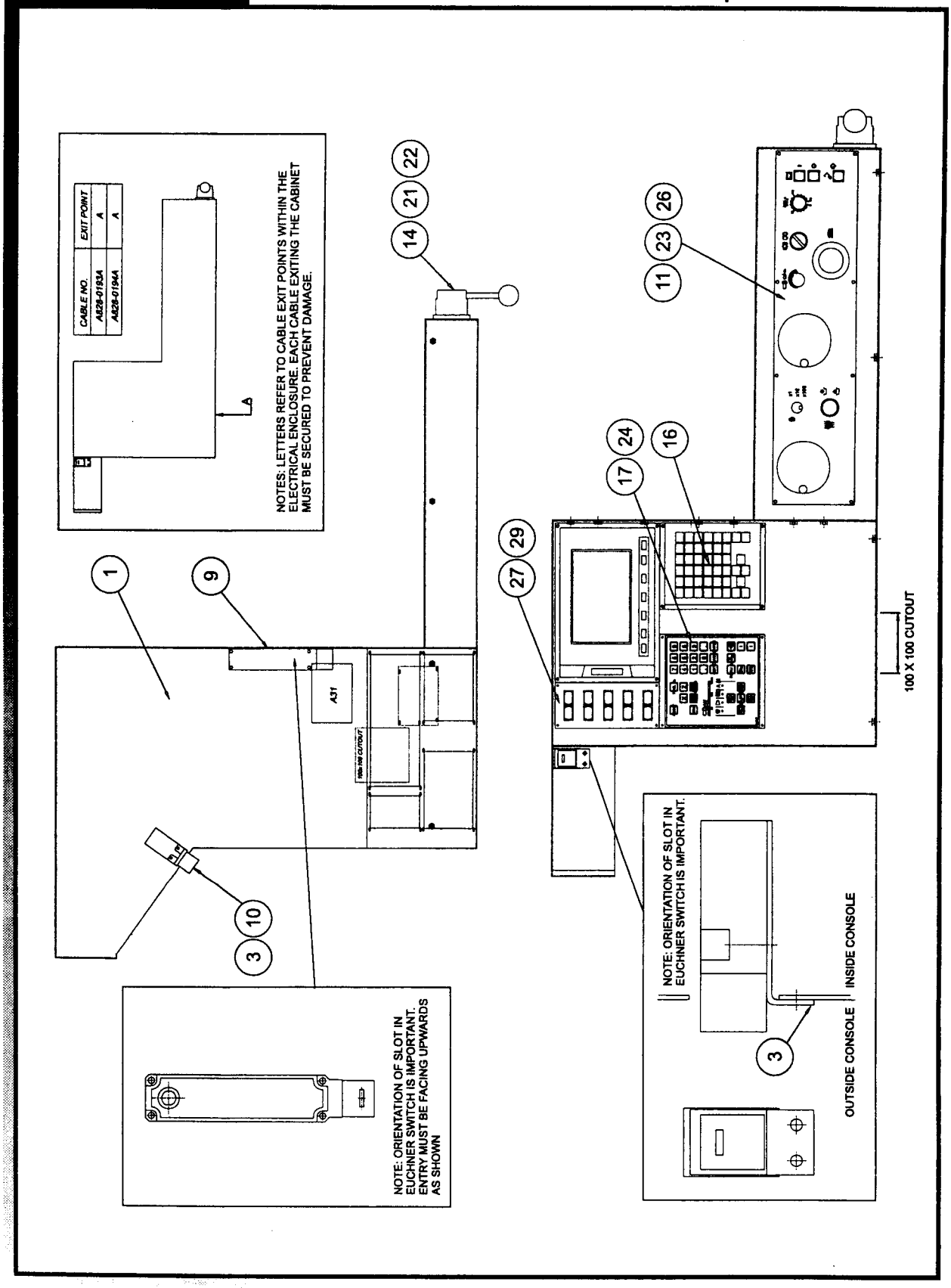
S3P-E01-JUL/1999

ELECTRICS

7.2

Contents

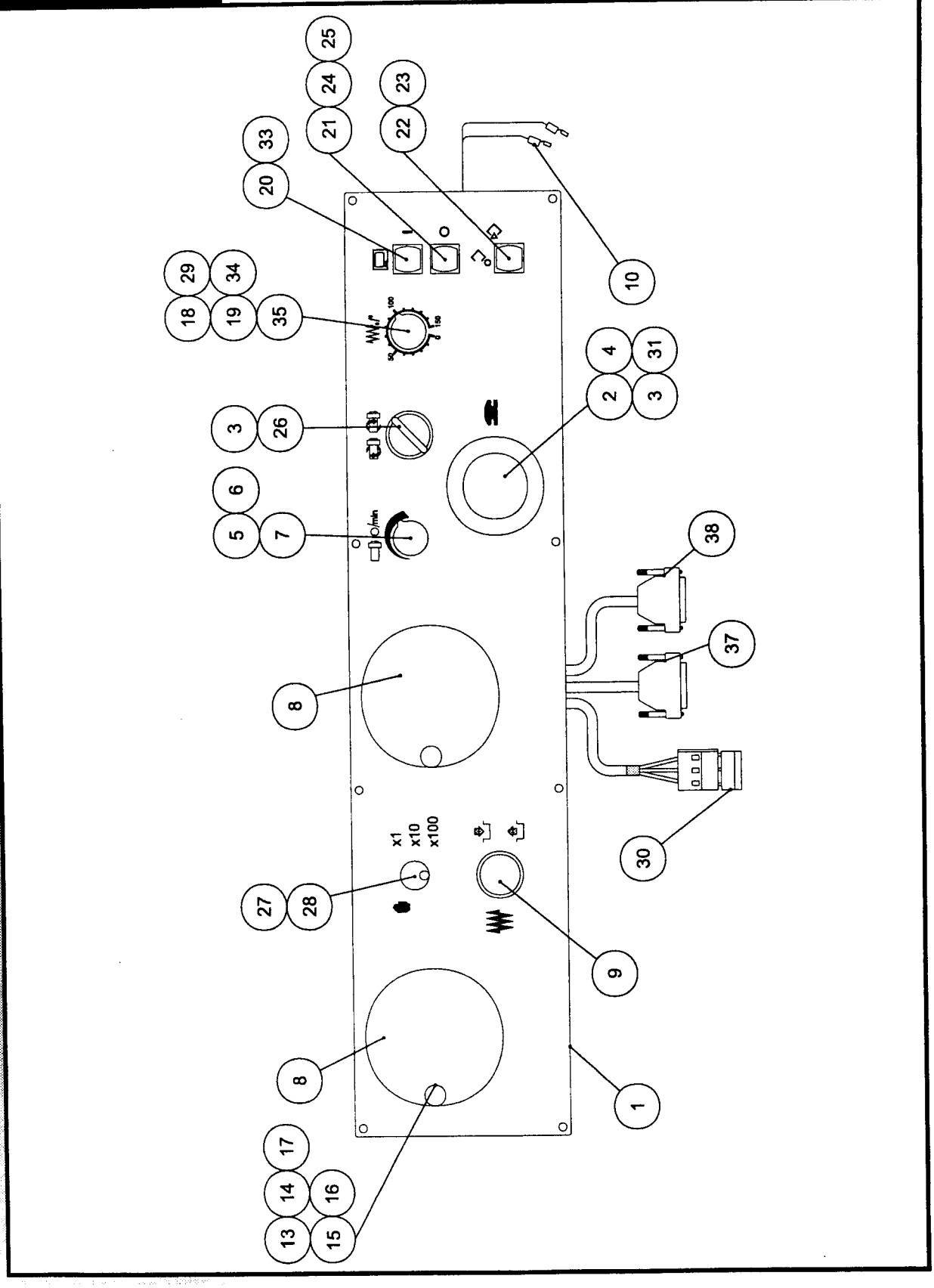
Operators Console



Operators Console

ITEM	PART NO.	DESCRIPTION	QTY.
1	D125-0205	OPERATOR CONTROL CABINET	1
2	A826-2954A	FANUC 21i CONSOLE KIT	1
3	D050-1045	HEADSTOCK INTERLOCK SWITCH BRACKET	1
11	A826-2967B	APRON CONTROL PANEL	1
14	A826-2956A	START/STOP SWITCH ASSEMBLY	1
15	D343-0274	GASKET - FANUC LCD SCREEN	1
16	D343-0273	GASKET - MDI PANEL	1
17	E095-0019	GASKET - PUSHBUTTON OPERATORS PANEL	1
21	E095-0016	GASKET - START/STOP LEVER	1
22	E091-0097	M5 X 16 BUTTON HEAD CAP SCREW	4
23	E091-0098	M4 X 12 BUTTON HEAD CAP SCREW	10
24	A826-2948A	OPERATORS PANEL ASSEMBLY	1
25	A827-0017	INTERNAL CABLE KIT OPERATORS CONTROL	1
26	D343-0283	GASKET - LOWER OPERATORS PANEL	1
27	A826-2951A	AUXILIARY KEYPAD ASSEMBLY	1
28	D537-1443	PUSHBUTTON INFILL PIECE	1
29	D343-0288	GASKET - OPERATOR PANEL	1

Apron Control Panel



Apron Control Panel

ITEM	PART NO.	DESCRIPTION	QTY.
1	D565-1783	OPERATOR CONTROL MOUNTING PANEL	1
2	E016-0037	EMERGENCY STOP PUSHBUTTON	1
3	E011-0090	CONTACT BODY	1
4	E082-0030	EMERGENCY STOP LEGEND	1
5	E163-0014	POTETIOMETER SWITCH	1
6	E044-0013	BLACK KNOB	1
7	E044-0014	BLUE CAP	1
8	E141-0010	MANUAL PULSE GENERATOR	2
9	E042-0015	TWO POSITION JOYSTICK	1
10	E075-0040	FEMALE TERMINAL	2
13	A806-0593A	HANDWHEEL BUSH SUB ASSEMBLY	2
14	E091-0008	M4 X 16 BUTTON HEAD	6
15	E094-0047	DRAG ADJUSTMENT STUD	2
16	E091-0096	M6 X 6 SOCKET HEAD SET SCREW	2
17	E094-0046	SPRING	2
18	E131-0074	SWITCH PCB	1
19	E042-0031	16 POSITION SELECTOR SWITCH	1
20	E016-0049	GREEN SQUARE PUSHBUTTON	1
21	E016-0053	RED SQUARE PUSHBUTTON	1
22	E016-0059	2 POSITION KEY SWITCH	1
23	E016-0063	CONTACT BLOCK	1
24	E016-0057	RED LED	1
25	E016-0071	PUSH BUTTON COVER	1
26	E041-0035	2 POSITION SELECTOR SWITCH	1
27	E041-0011	SWITCH	1
28	E096-0044	WATERPROOF LEVER COVER	1
29	E071-0012	8 PIN IC SOCKET	1
30	A828-0313A	X11 TO SPINDLE SPEED POTENTIOMETER CABLE	1
31	E011-0088	PB CONTACT	1
32	E032-0012	MICROSWITCH	1
33	E016-0064	GREEN LED	1
34	E044-0018	BLACK KNOB	1
37	A828-0315A	A7/X3 TO OPERATOR PANEL CABLE	1
38	A828-0314C	A7/X1 TO OPERATOR PANEL CABLE	1

Secondary Operators Panel

Secondary Operators Panel

A826-2948A

ITEM	PART NO.	DESCRIPTION	QTY.
2	D558-0079	PUSH BUTTON MOUNTING PANEL	1
3	E082-0041	OPERATOR PANEL FACIA	1

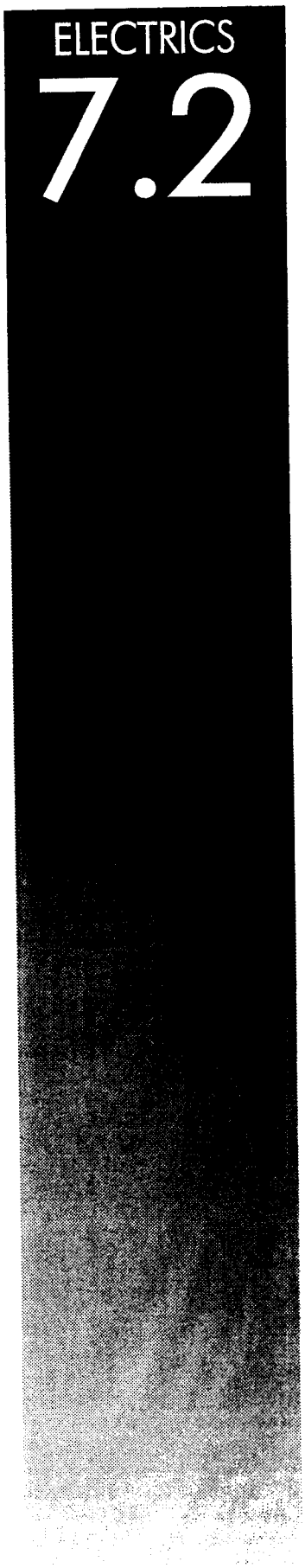
Fanuc 21i Console Kit

A826-2954A

ITEM	PART NO.	DESCRIPTION	QTY.
1	B703-0603	MONOCHROME CRT/MDI	1

ELECTRICS

7.2



7.2.8

S3P-E01-JUL/1999

Contents

Fanuc 21i Cabinet Sub Assembly

ITEM	PART NO.	DESCRIPTION	QTY.
1	B703-0584	SERVO AMPLIFIER	2
2	B703-0549	SURGE ABSORBER	1
3	B703-0462	BATTERY	2
4	B703-0646	BATTERY CASE	2
5	B703-0382	CABLE CLAMP	1
6	B703-0644	OPTICAL CABLE	1
7	B703-0645	DISCHARGE UNIT	1

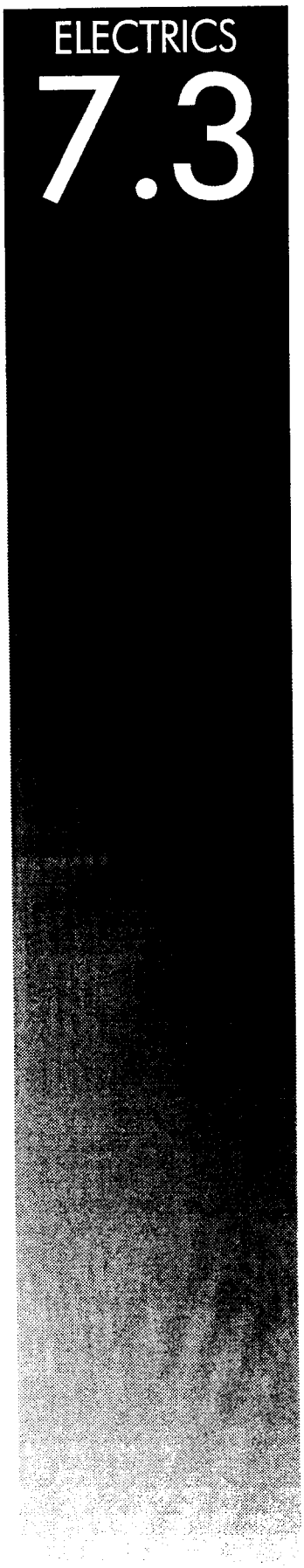
Fanuc 21i Machine Kit

A826-2953A

ITEM	PART NO.	DESCRIPTION	QTY.
1	B618-0049	X AXIS SERVO MOTOR	1
2	B618-0054	Z AXIS SERVO MOTOR	1
3	B703-0607	PANUC POSITION ENCODER	1

ELECTRICS

7.3



7.3.4

S3P-E01-JUL/1999

Contents

Supply Options 200/208/220/230 Volt

A191-0631B

ITEM	PART NO.	DESCRIPTION	QTY.
1	B772-3025	TRANSFORMER	1
3	A826-1077A	HARNESS ASSEMBLY	1

Supply Options 460/575 Volt

A191-0631A

ITEM	PART NO.	DESCRIPTION	QTY.
1	B772-3026	TRANSFORMER	1
3	A826-1077A	HARNESS ASSEMBLY	1

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DO NOT SCALE – IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)

CONTENTS

ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated ↓ Surface Finish ✓ (μ CLA)
3-Decimal ± .025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-000

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	05.05.99

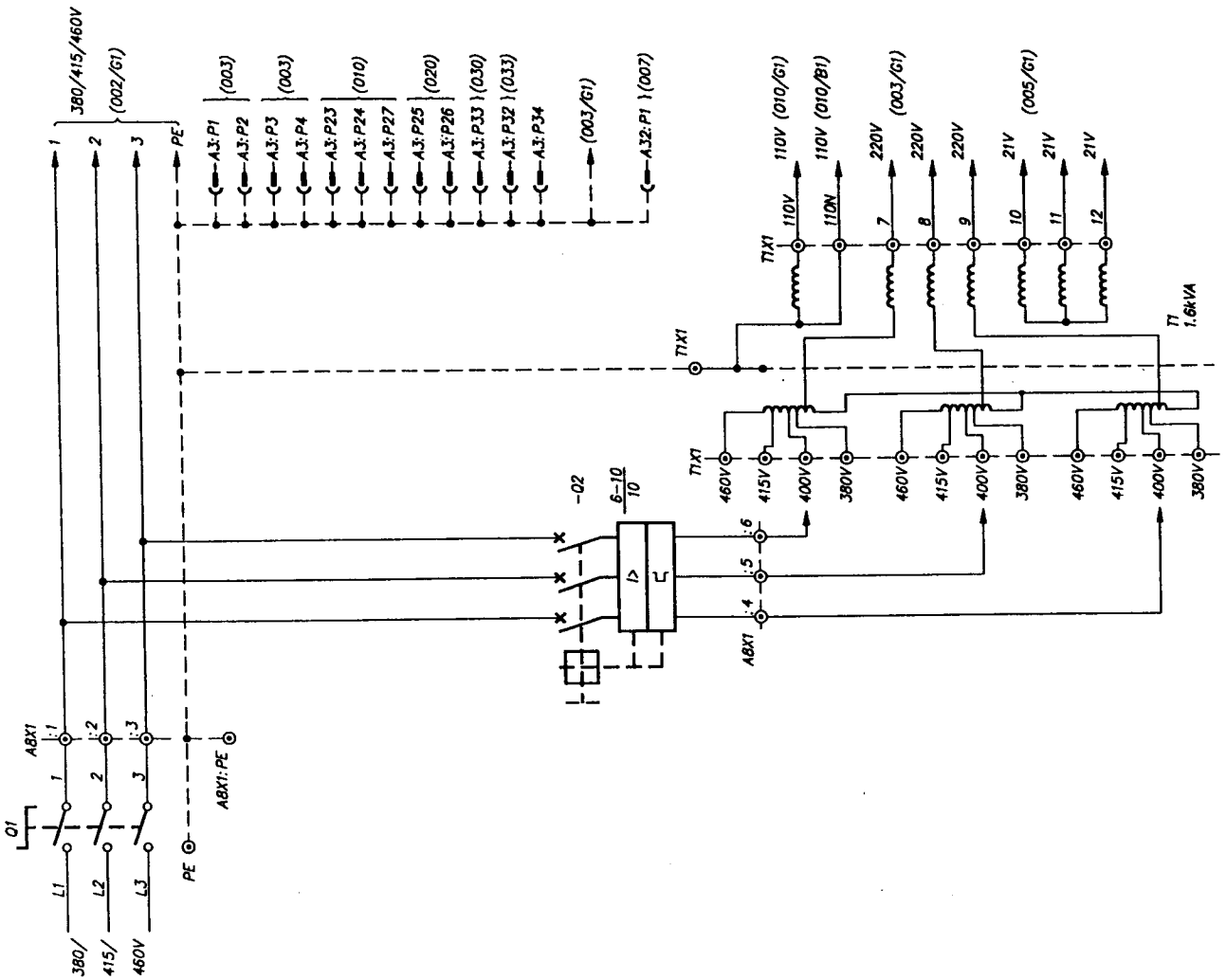
Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE CONTENTS

Part No. AS6-050-00

A3

DO NOT SCALE — IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-001				
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A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 3 PH. SUPPLIES

Part No. AS6-050-001

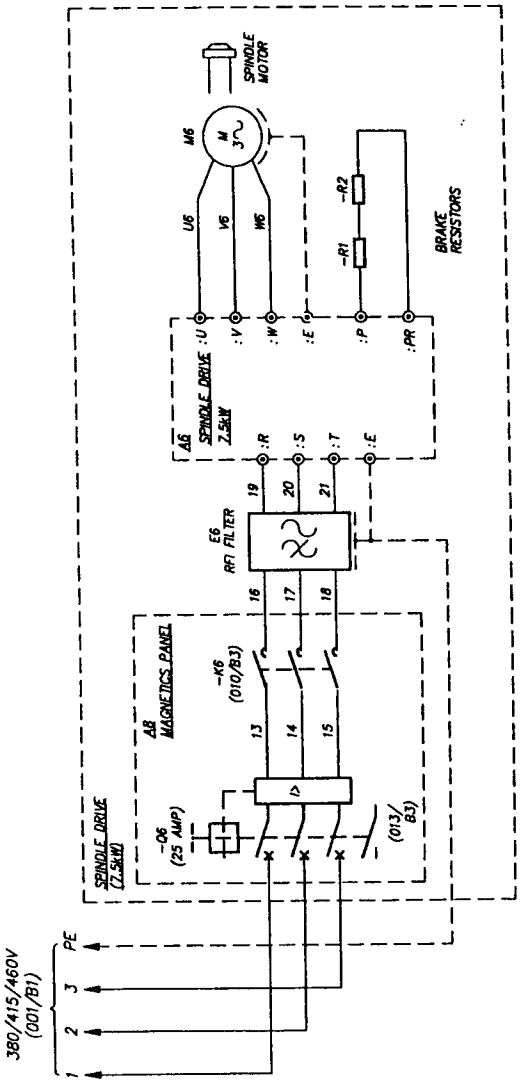
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-002

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.98
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.01.98
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE SPINDLE DRIVE SUPPLY

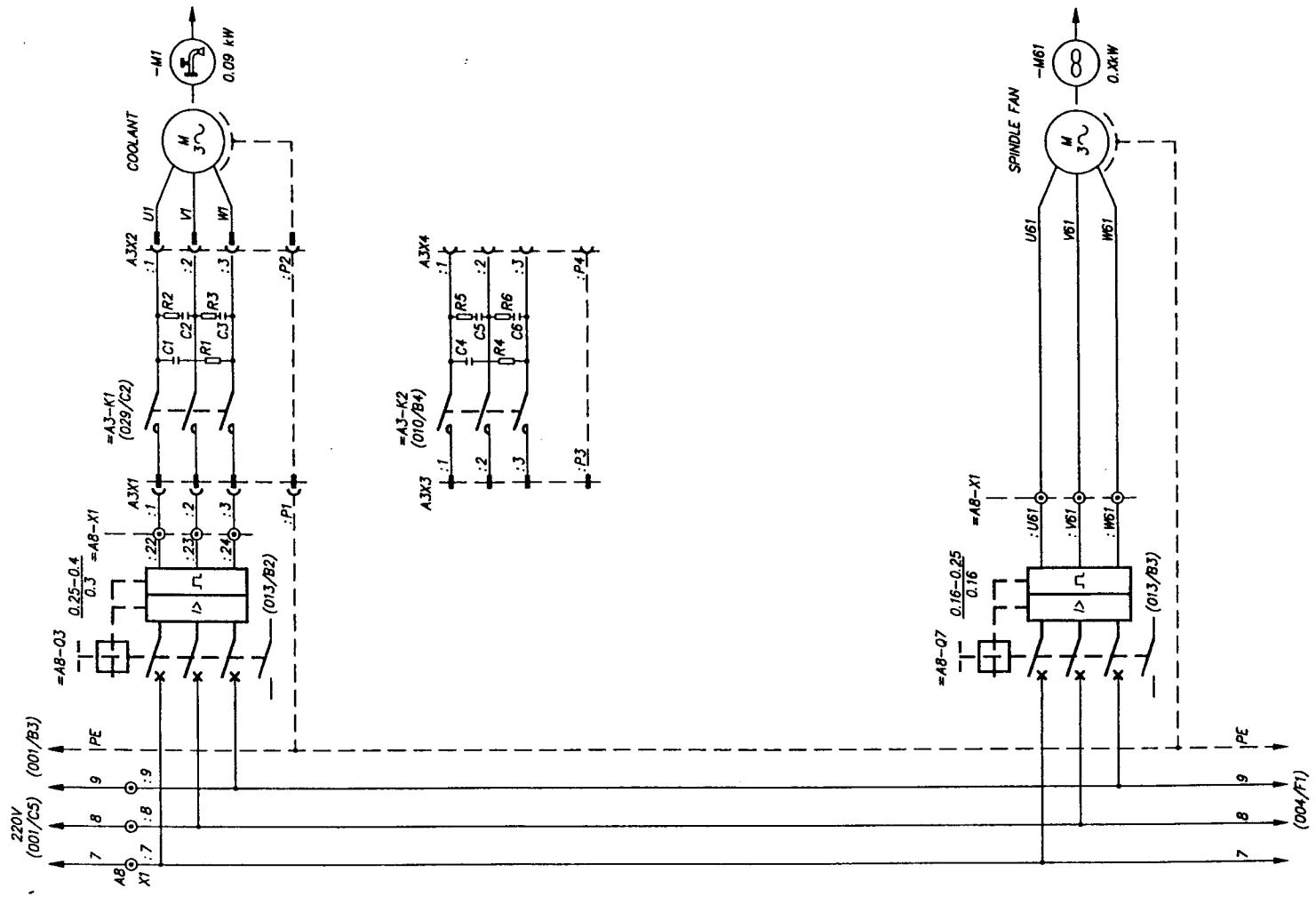
Part No. AS6-050-002

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated Tr... Surface Finish ∀ (μ CLA)
3–Decimal ... ±.025, 2 Decimal Places ±0.25
1 Decim... Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No.	AS6-050-003		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.98
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.01.98
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE 220V 3PH. LOADS		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

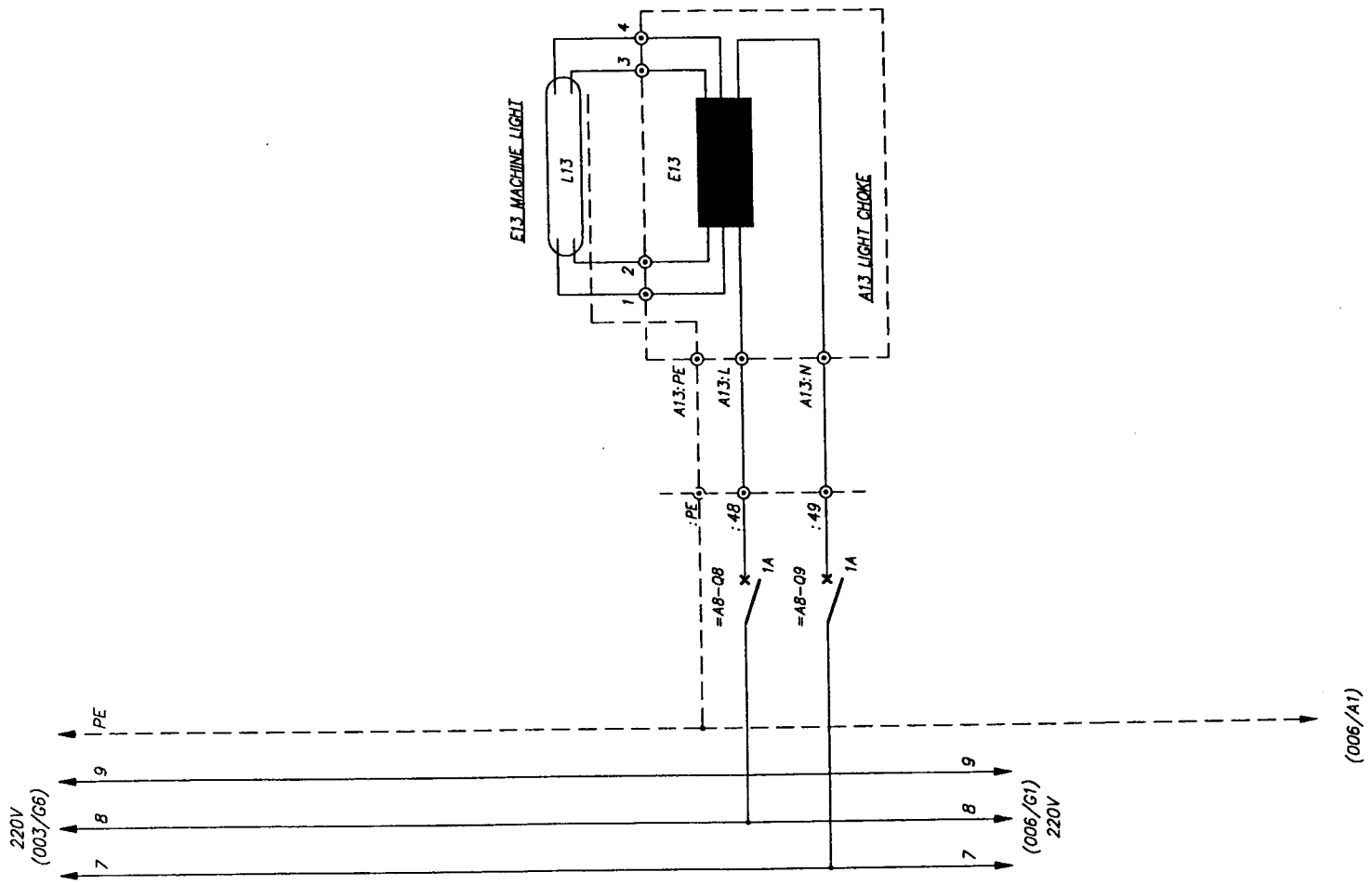
Tolerance And Surface Finish Unless Otherwise Stated To Be:– Surface Finish $\sqrt{}$ (μ CLA)
3–Decimal Places ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

AS6-050-003
Part No.

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

AS6-050-004

Part No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.98
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.01.98
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 220V 3PH. LOADS

AS6-05C 004

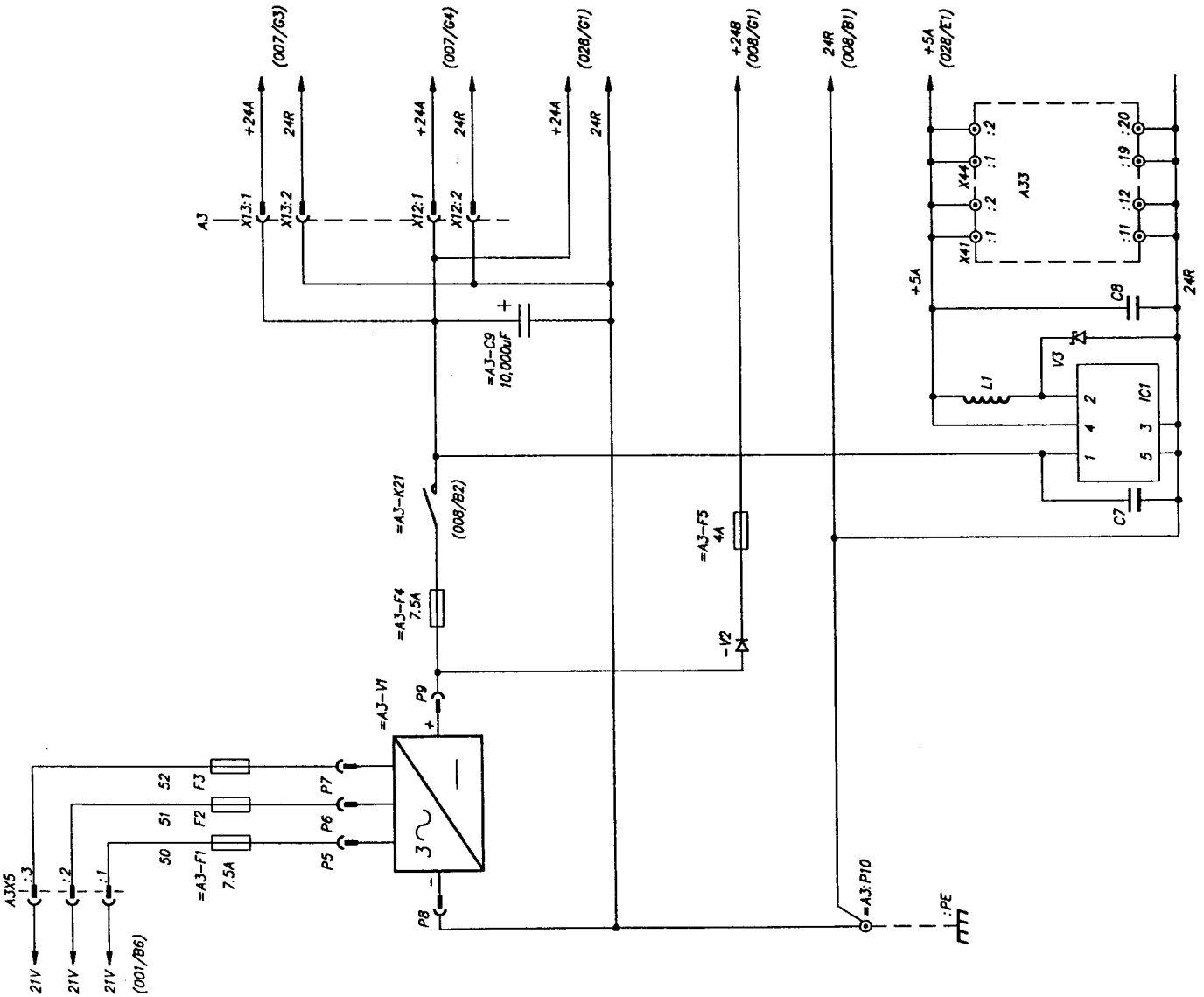
Part No.

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance and Surface Finish Unless Otherwise Stated :- Surface Finish ∀ (μ CLA)
3-Decima... ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	05.05.99
2		EXTRA CONNECTIONS TO X44 ADDED.K6 NOW K21	25529	16.06.99

Part No. AS6-050-005

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 24V DC SUPPLY

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

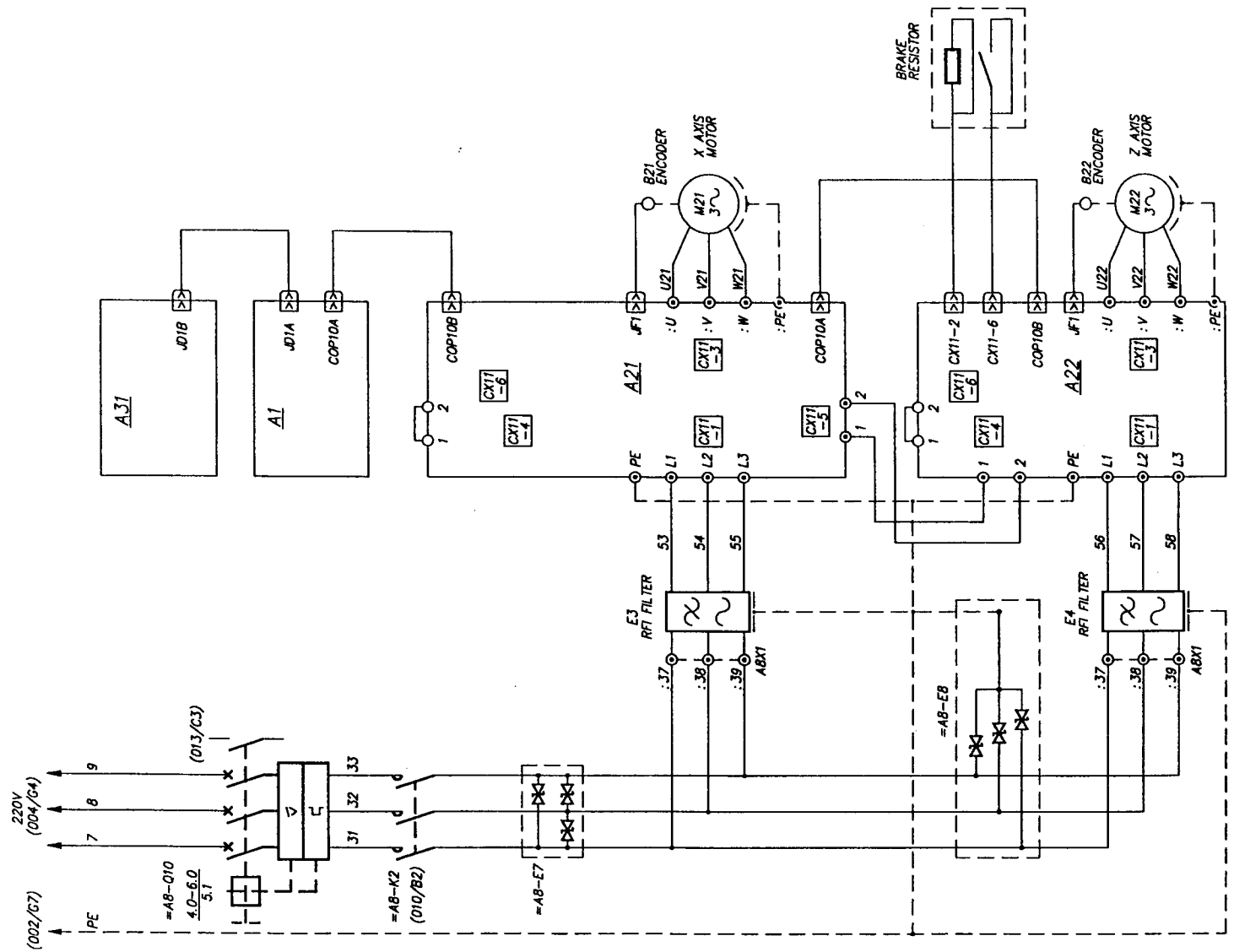
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

Part No. AS6-050-005

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance and Surface Finish Unless Otherwise Stated ? – Surface Finish ∀ (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

AS6-050-006
Part No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	05.05.99
2		BRAKE RESISTOR WAS CON. TO A21(X AXIS)	25505	19.05.99

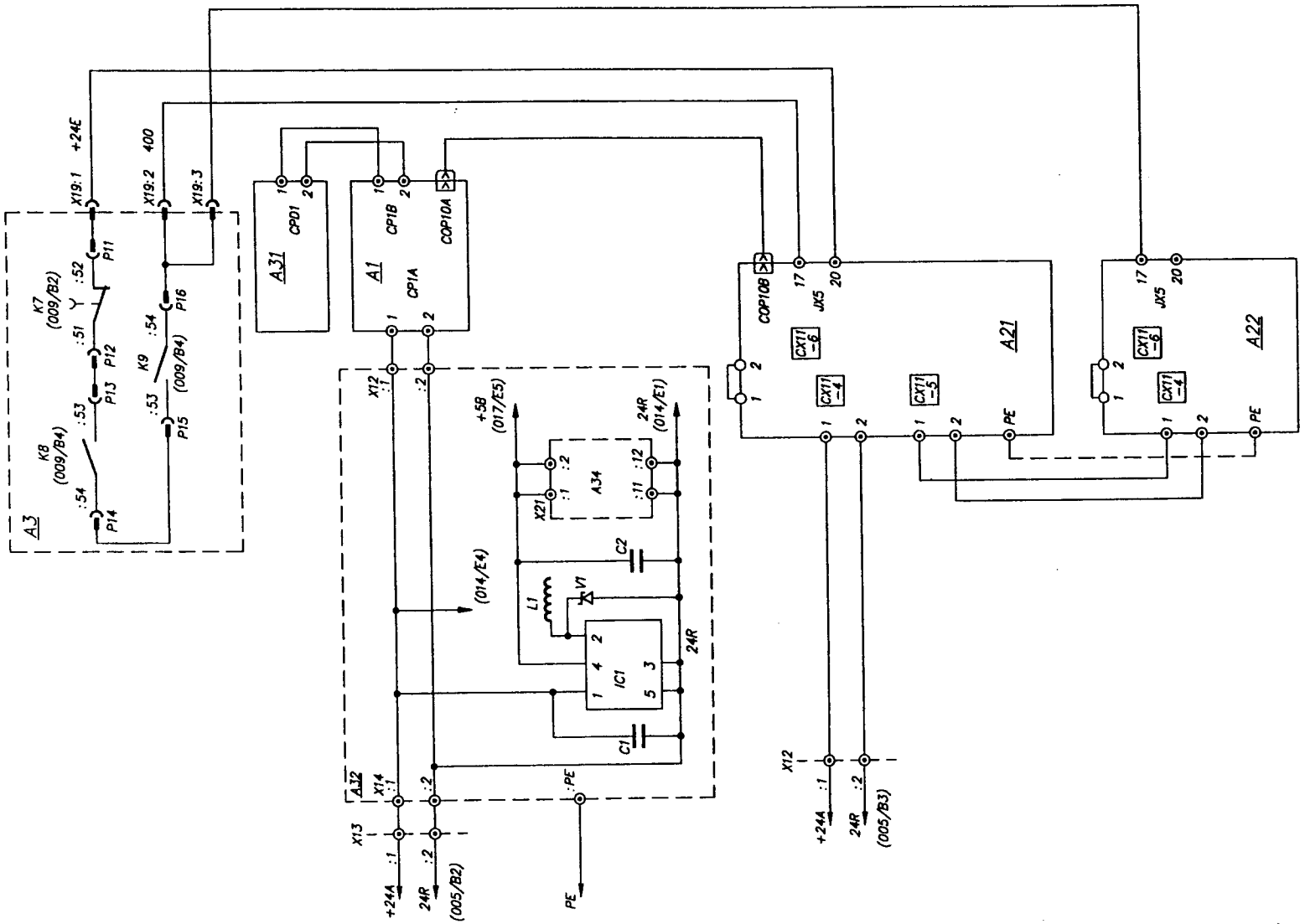
Chk'd		Date	14.01.99
Drawn	R PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 220V 3PH. LOADS

AS6-050 006
Part No.

A3

DO NOT SCALE – IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-007			
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	–	05.05.99

Chk'd		Date	14.01.99
Drawn	R PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE AXIS DRIVE CONTROLS		
Part No.	AS6-050-007		

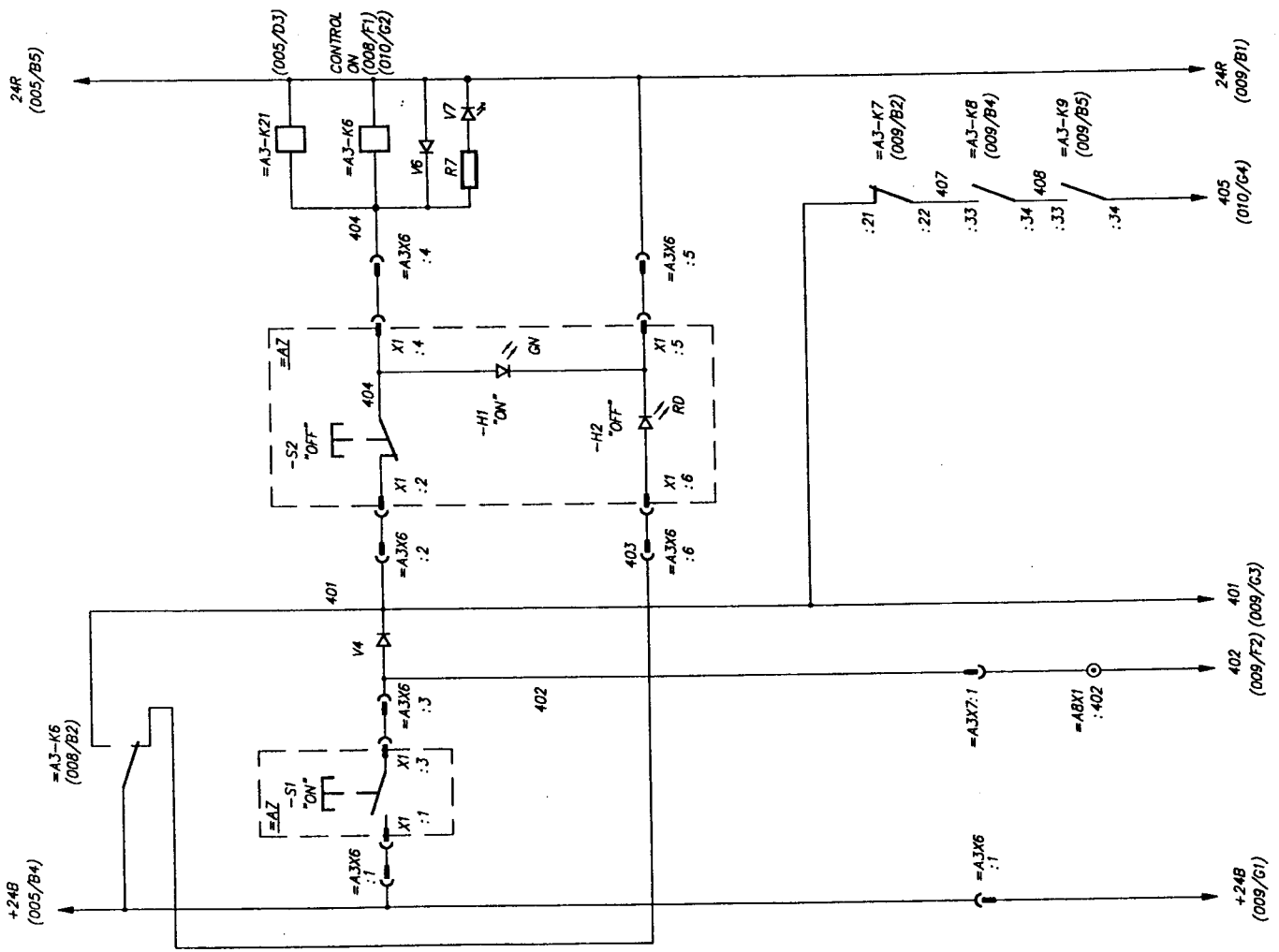
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated To Be:– Surface Finish (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No.	AS6-050-008		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		K7 WAS CONN. TO +24B,NOW	25529	16.06.99
		CONN. TO 401. K21 ADDED		

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE 24V DC CONTROL		
Part No.	AS6-050-008		

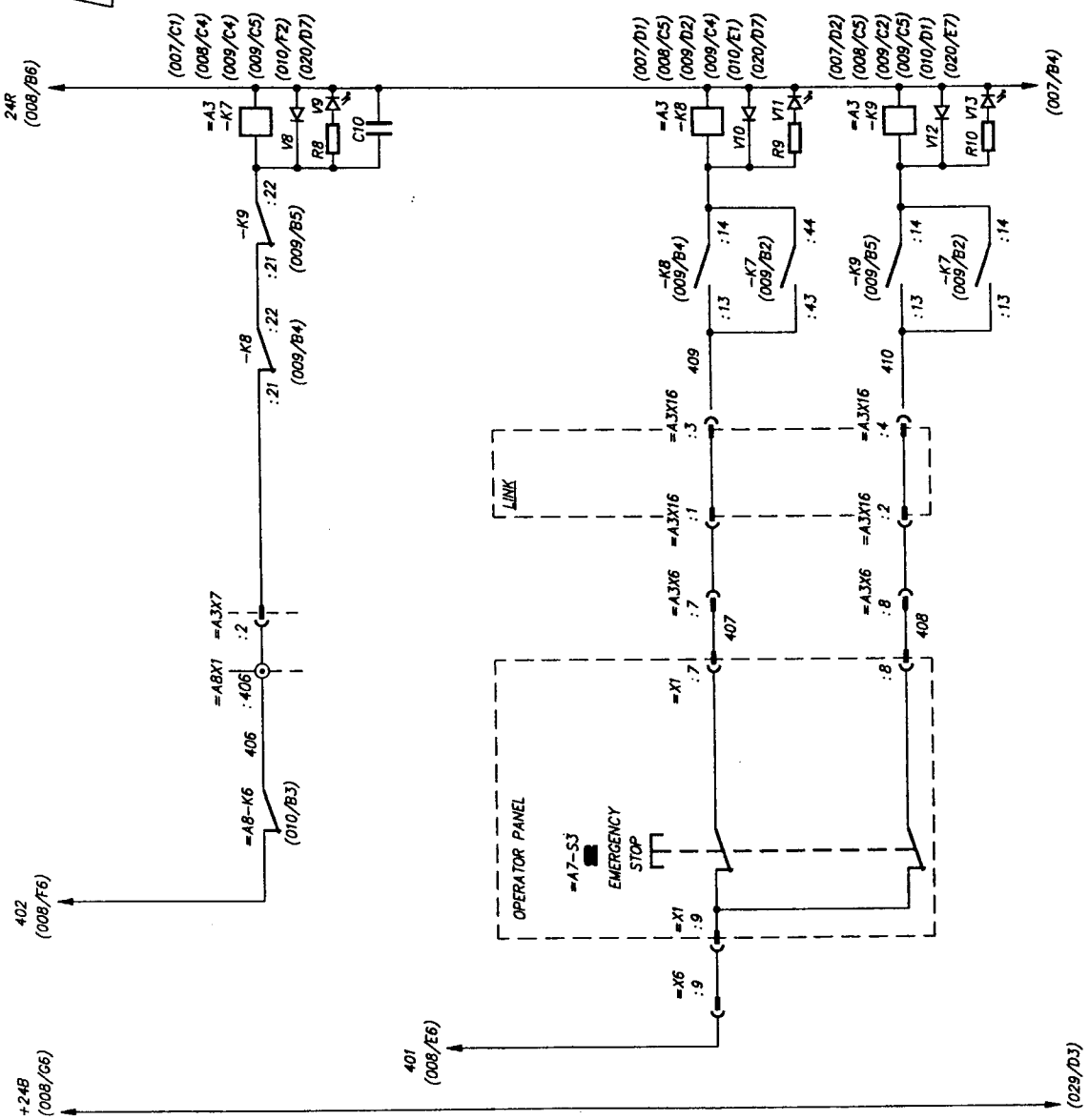
600 ATHES LIMITED Heckmondwike, Yorkshire. THE 600 GROUP gland.

Tolerance And Surface Finish Unless Otherwise Stated To Be:– Surface Finish ∇ (μ CLA) 3-Decimc ces ±.025, 2 Decimal Places ±0.25 1 D Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

AS6-050-009

Part No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		E STOP WAS CONN. TO X1: 1	25529	16.06.99
		NOW CONN. TO X1: 9.X1: 9		
		NOW CONN. TO 401		
		INSTEAD OF +24B		

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 24V DC CONTROL

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish ∛ (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

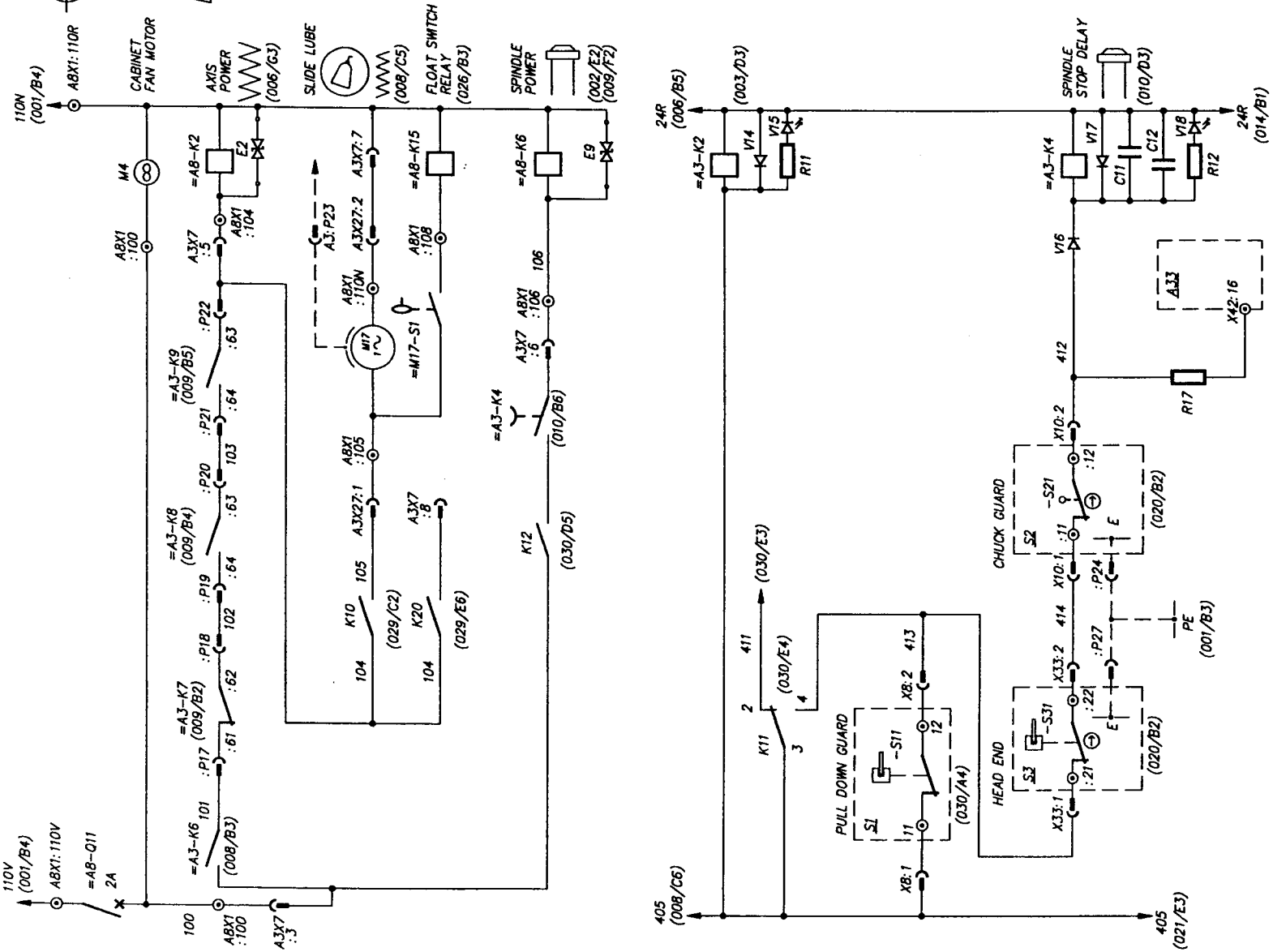
AS6-050-009

Part No.

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-010

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE AC / DC CONTROL

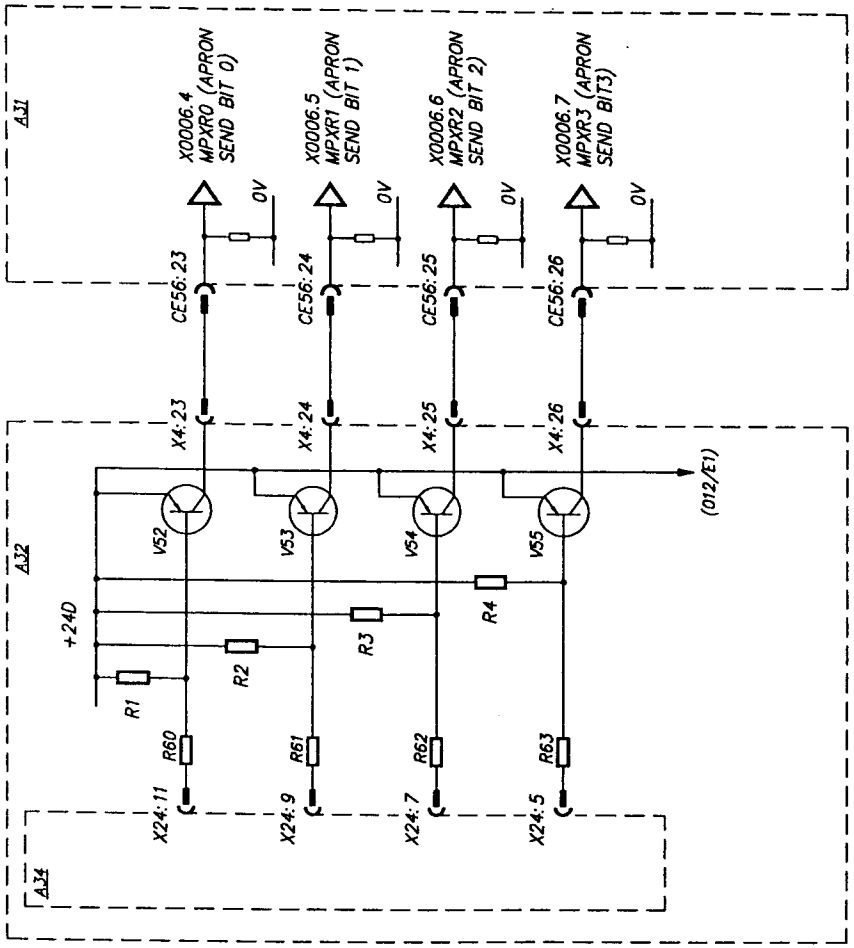
Part No. AS6-050-010

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated T... Surface Finish ∀ (μ CLA)
3-Decimal ... ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE — IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No.	AS6-050-011		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE NODE MULTIPLEXING CIRCUIT		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

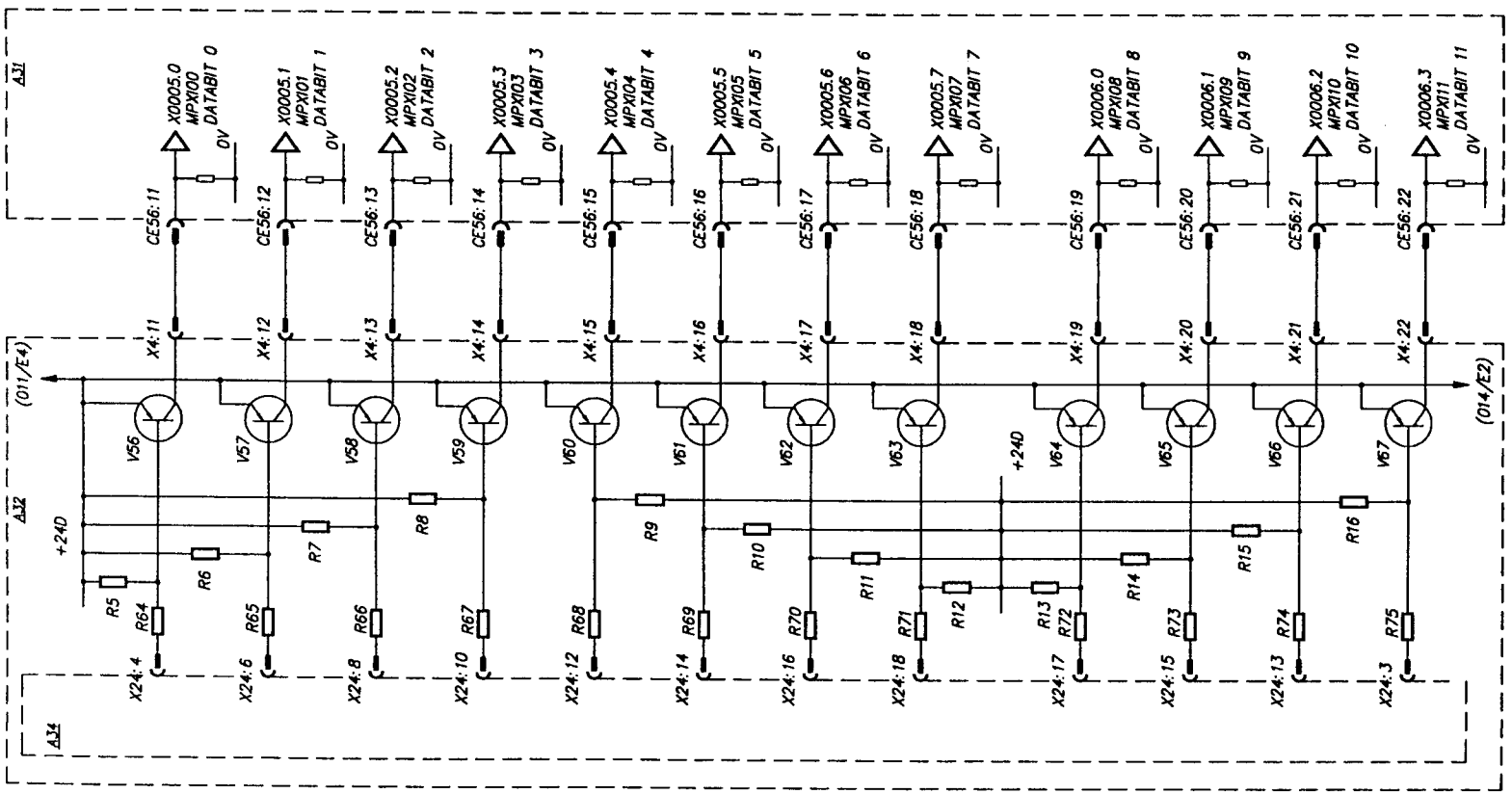
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish (μ CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-011

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-012

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE NODE MULTIPLEXING CIRCUIT

Part No. AS6-05(012

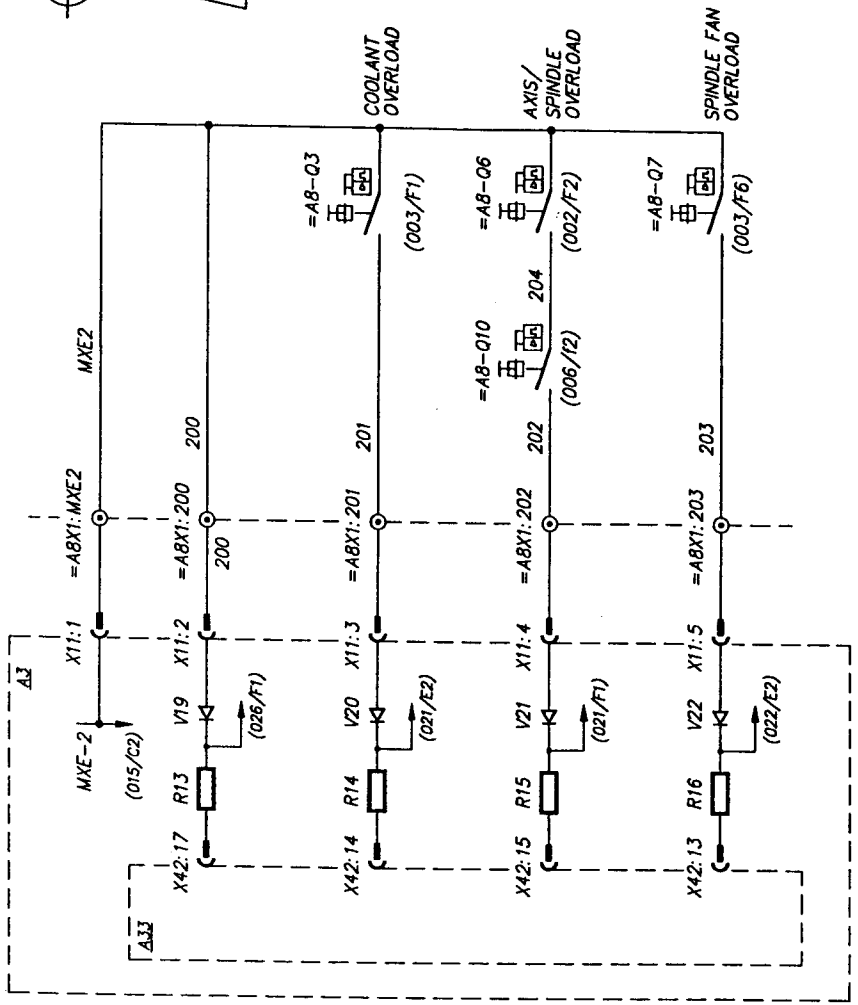
600 LA..ES LIMITED Heckmondwike, Yorkshire, Eng...nd.

Tolerance A.. Surface Finish Unless Otherwise Stated T(Surface Finish $\sqrt{}$ (μ CLA)
3–Decimal . ±.025, 2 Decimal Places ±0.25
1 Decima Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-013

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE ENCLOSURE OVERLOAD SIGNALS

Part No. AS6-050-013

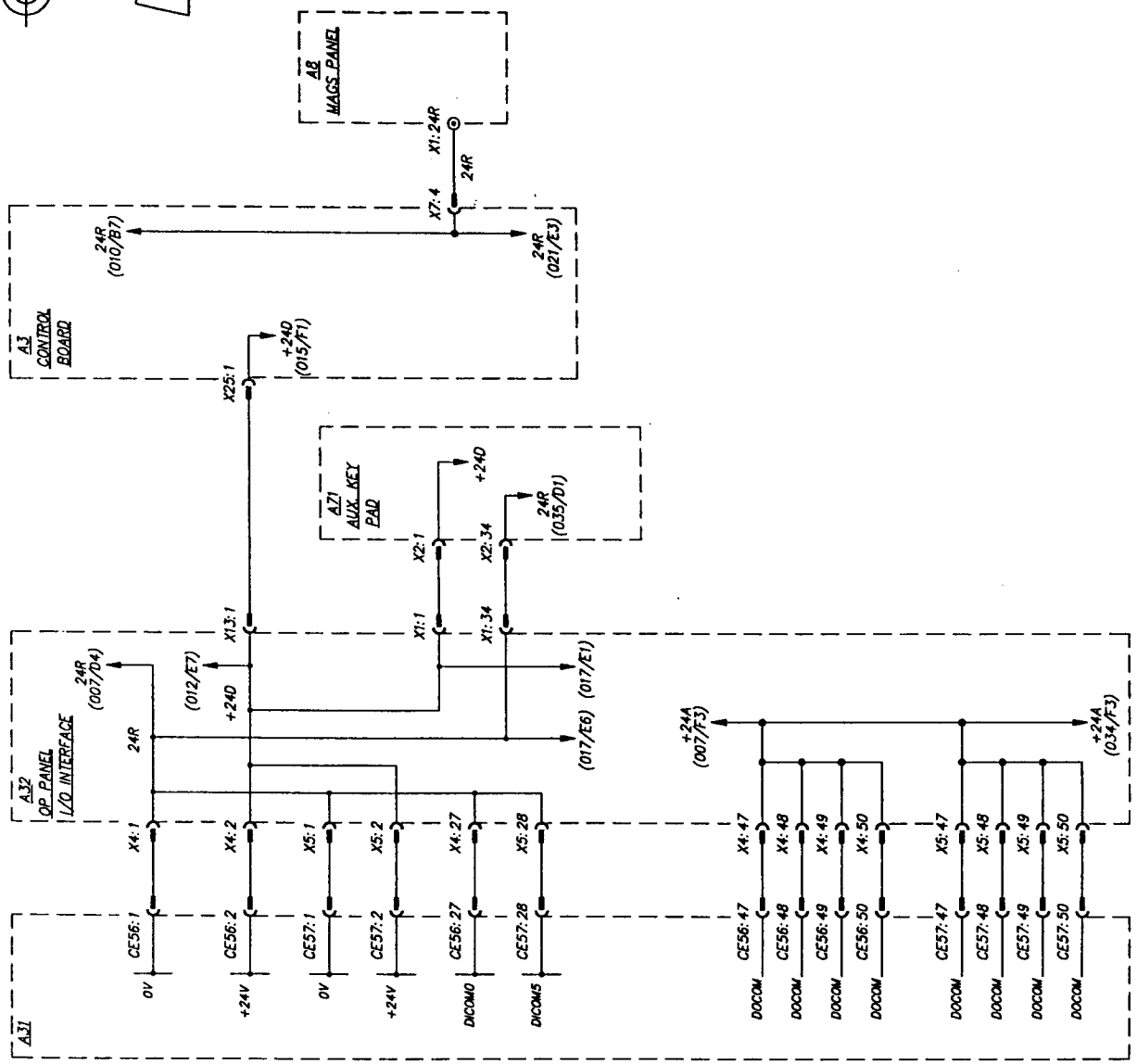
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-014

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE CNC INPUT/OUTPUT SUPPLY

Part No. AS6-050 014

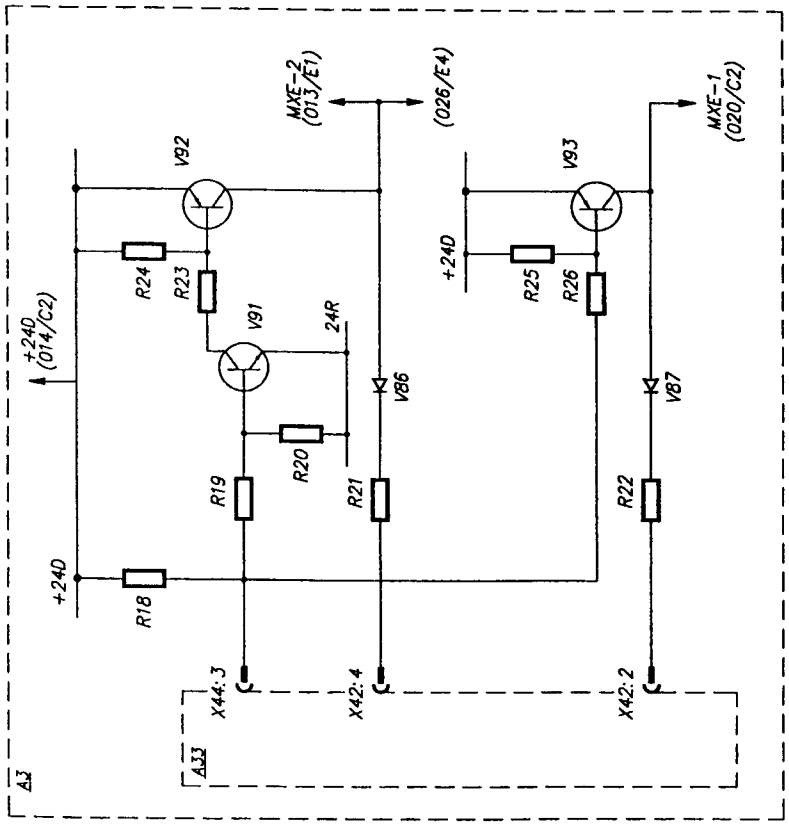
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance and Surface Finish Unless Otherwise Stated :- Surface Finish ∜ (μ CLA)
3-Decimal Places ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-015

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE MULTIPLEXING CIRCUIT SUPPLIES

Part No. AS6-050-015

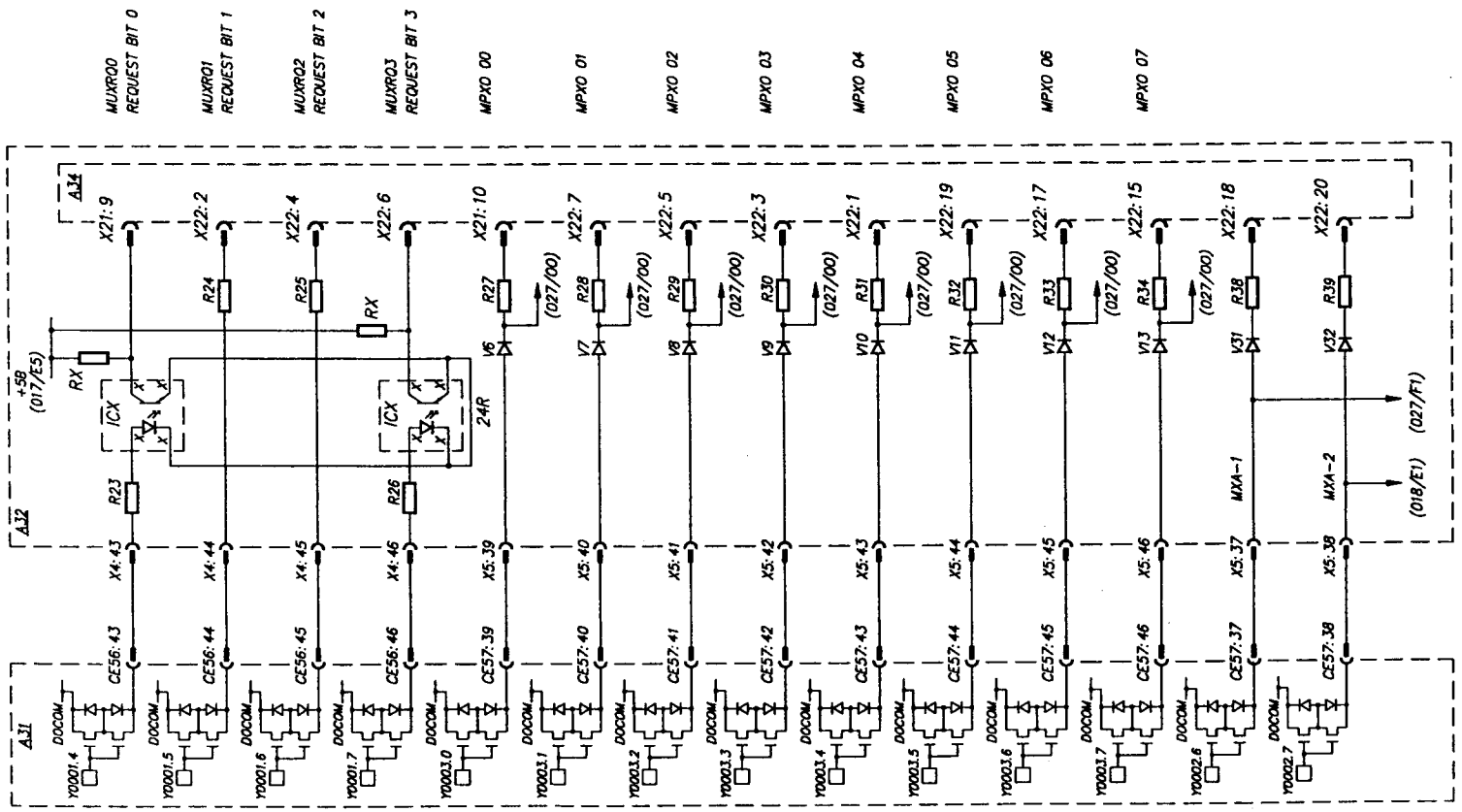
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

AS6-050-016

Port No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	08.05.99
2		X21:9 AND X22:6 NOW CONN. THRO. OPTO CIRC.	25529	16.06.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE MULTIPLEXING CIRCUIT SUPPLIES (APRON NODE)

600 LATHES LIMITED Heckmondwike, Yorkshire

600 gland.

Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish $\sqrt{}$ (μ CLA) 3–Decimal Places ±0.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

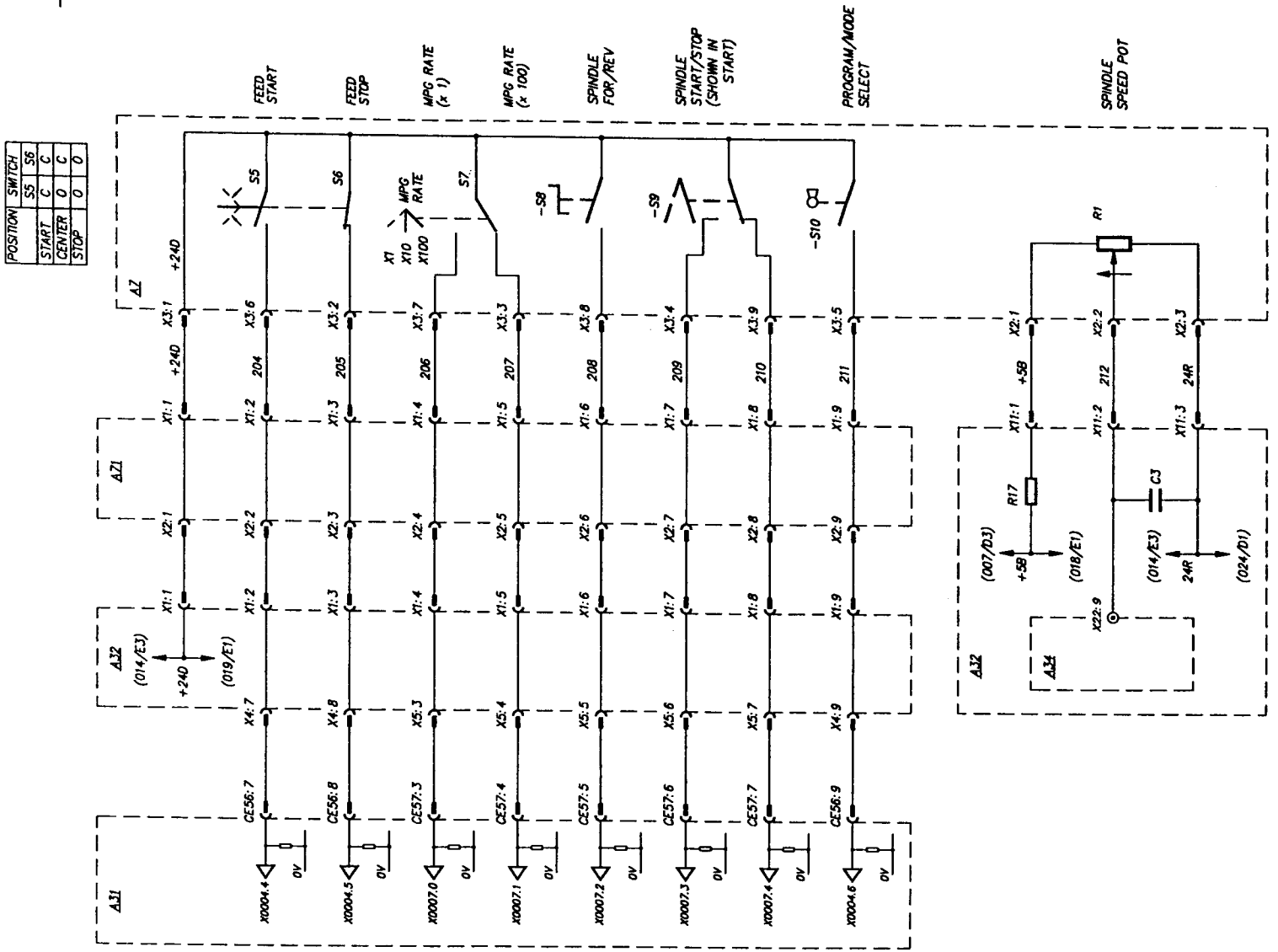
AS6-050-016

Port No.

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
B		START/STOP CHANGED	–	30.04.99
		FROM SEPERATE CONTACTS		
		TO CHANGE OVER		
1		PRODUCTION ISSUE	25472	06.05.99

Part No. AS6-050-017

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE CNC INPUTS (1)

Part No. AS6-050-017

ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

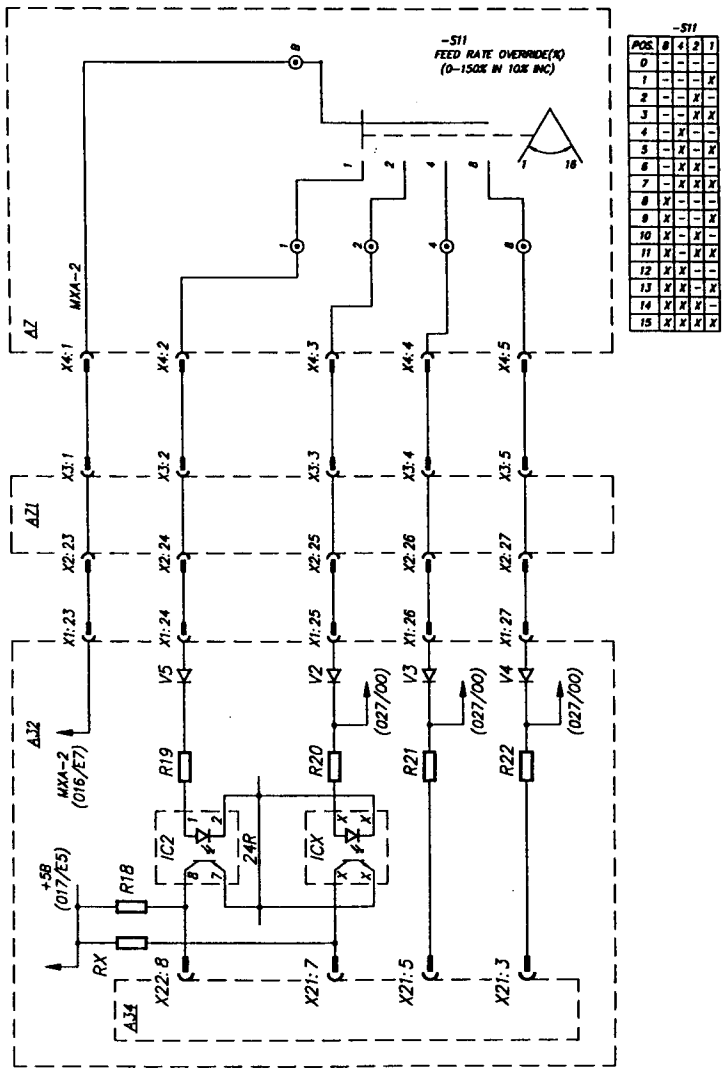
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



-S11 POS.	8	4	2	1
0	-	-	-	-
1	-	-	-	X
2	-	-	X	-
3	-	-	X	X
4	-	X	-	-
5	-	X	-	X
6	-	X	X	-
7	-	X	X	X
8	X	-	-	-
9	X	-	-	X
10	X	-	X	-
11	X	-	X	X
12	X	X	-	-
13	X	X	-	X
14	X	X	X	-
15	X	X	X	X

ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-018

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		X21:7 CONN. NOW THRO	25529	16.06.99
		OPTO CIRCUIT		

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE FEED RATE OVERRIDE CIRCUIT

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

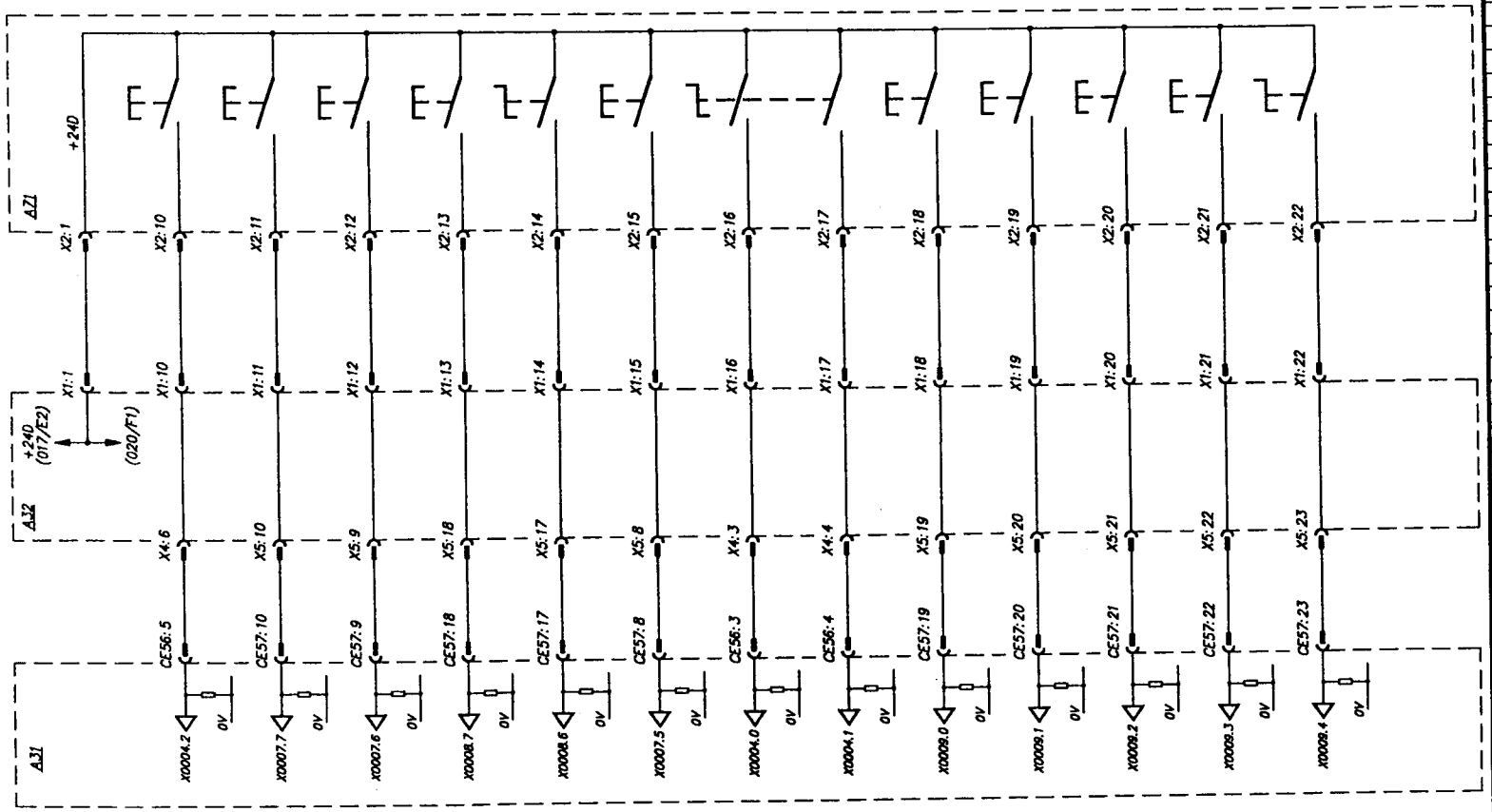
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish (μ CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-018

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No.	AS6-050-019		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE CNC INPUTS (2)		
Part No.	AS6-050-019		

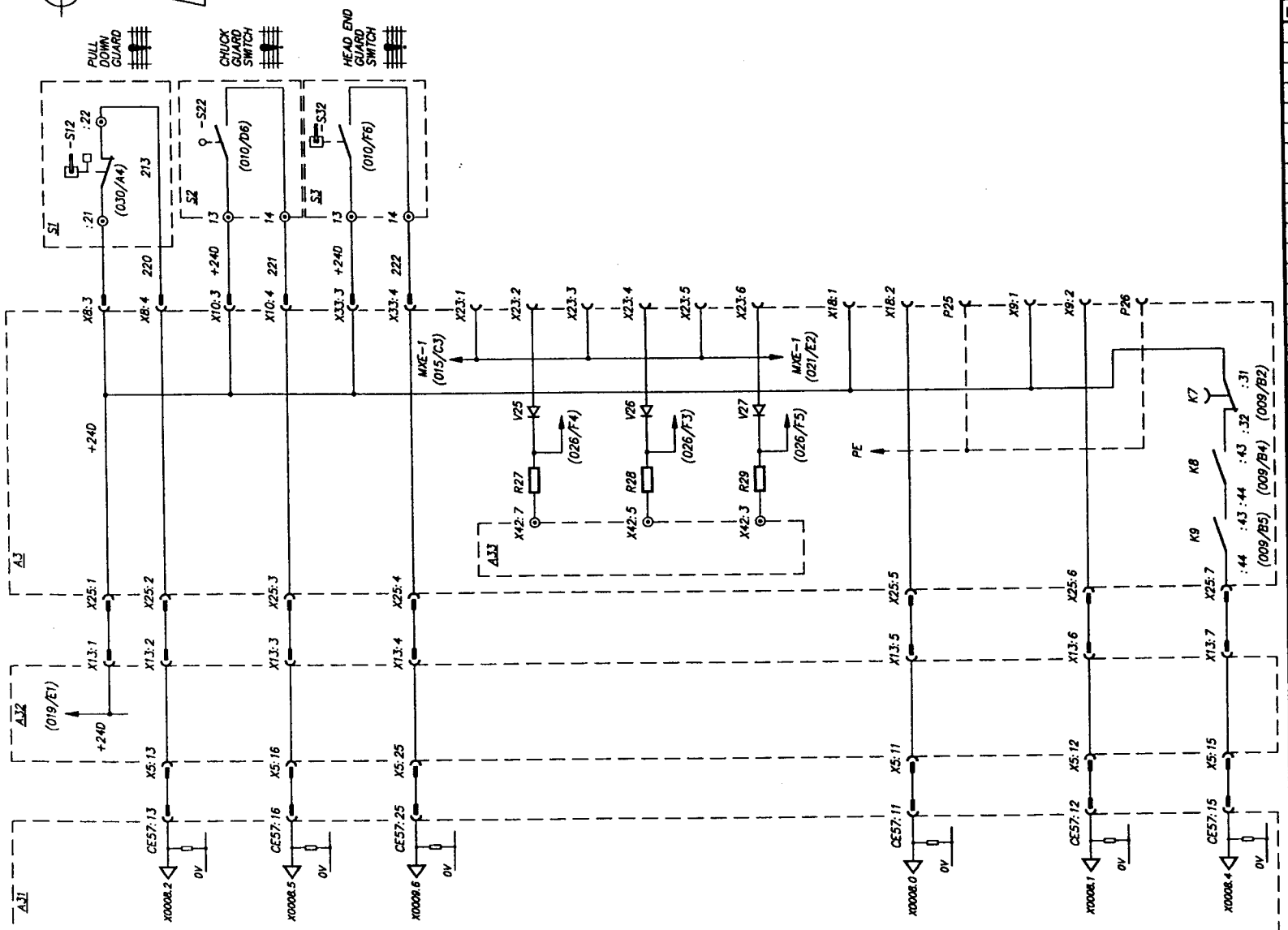
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-020

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE CNC INPUTS (3)

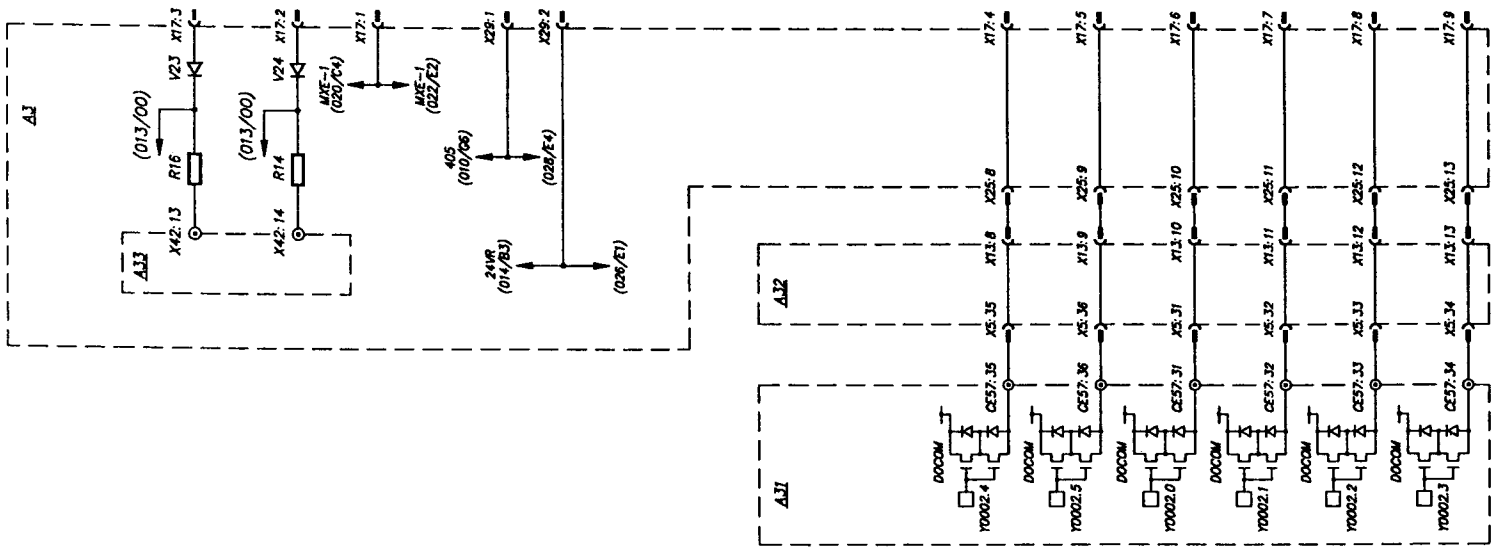
Part No. AS6-05 -020

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance Stated 3–Decimal ... Surface Finish Unless Otherwise ... Surface Finish ... (μ CLA) ... es ±.025, 2 Decimal Places ±0.25, 1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE — IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No.	AS6-050-021		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE ADDITIONAL CIRCUITRY		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

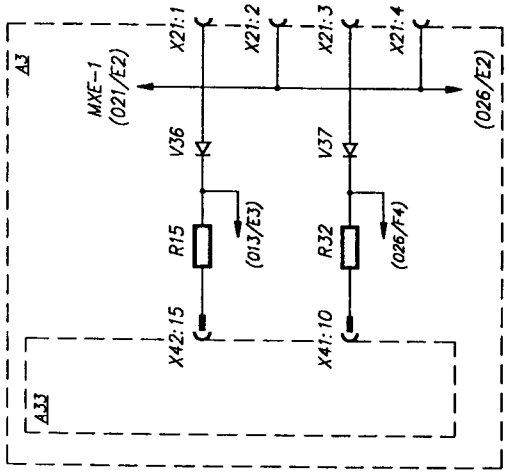
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish $\sqrt{}$ (μ CLA) 3–Decimal Places ±.025, 2 Decimal Places ±0.25, 1 Decimal Place ±0.7, Whole No ±1.0

AS6-050-021 Part No.

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-022

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE ENCLOSURE INPUTS(1)

Part No. AS6-05 022

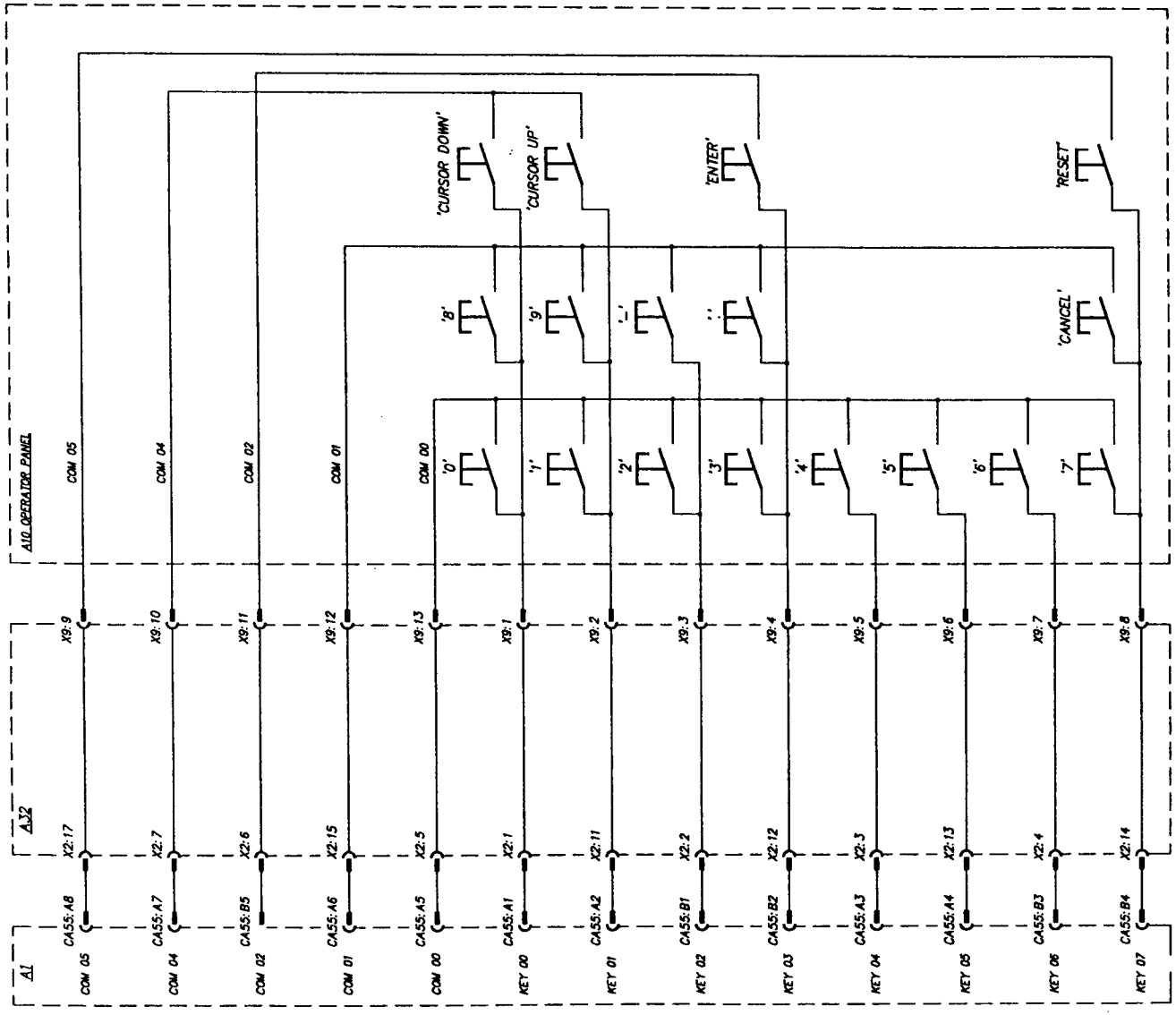
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance [illegible] Surface Finish Unless Otherwise Stated T - Surface Finish (μ CLA)
3-Decimal [illegible] ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-023

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE 2ND OP PANEL P/BUTTON (1)

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

THE 600 GROUP

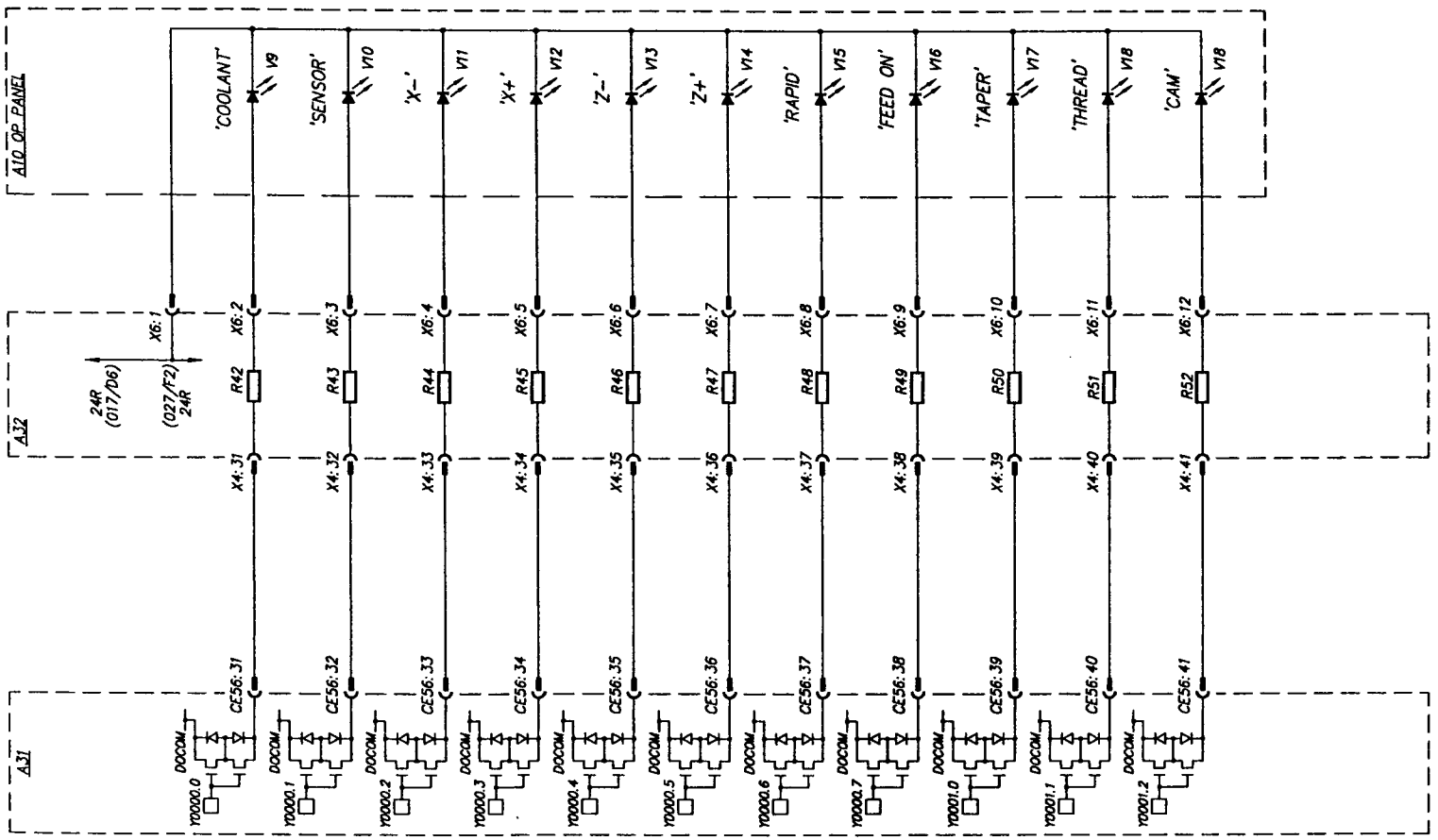
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish ∀ (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

Part No. AS6-050-023

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated :- Surface Finish (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

Part No. AS6-050-024

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

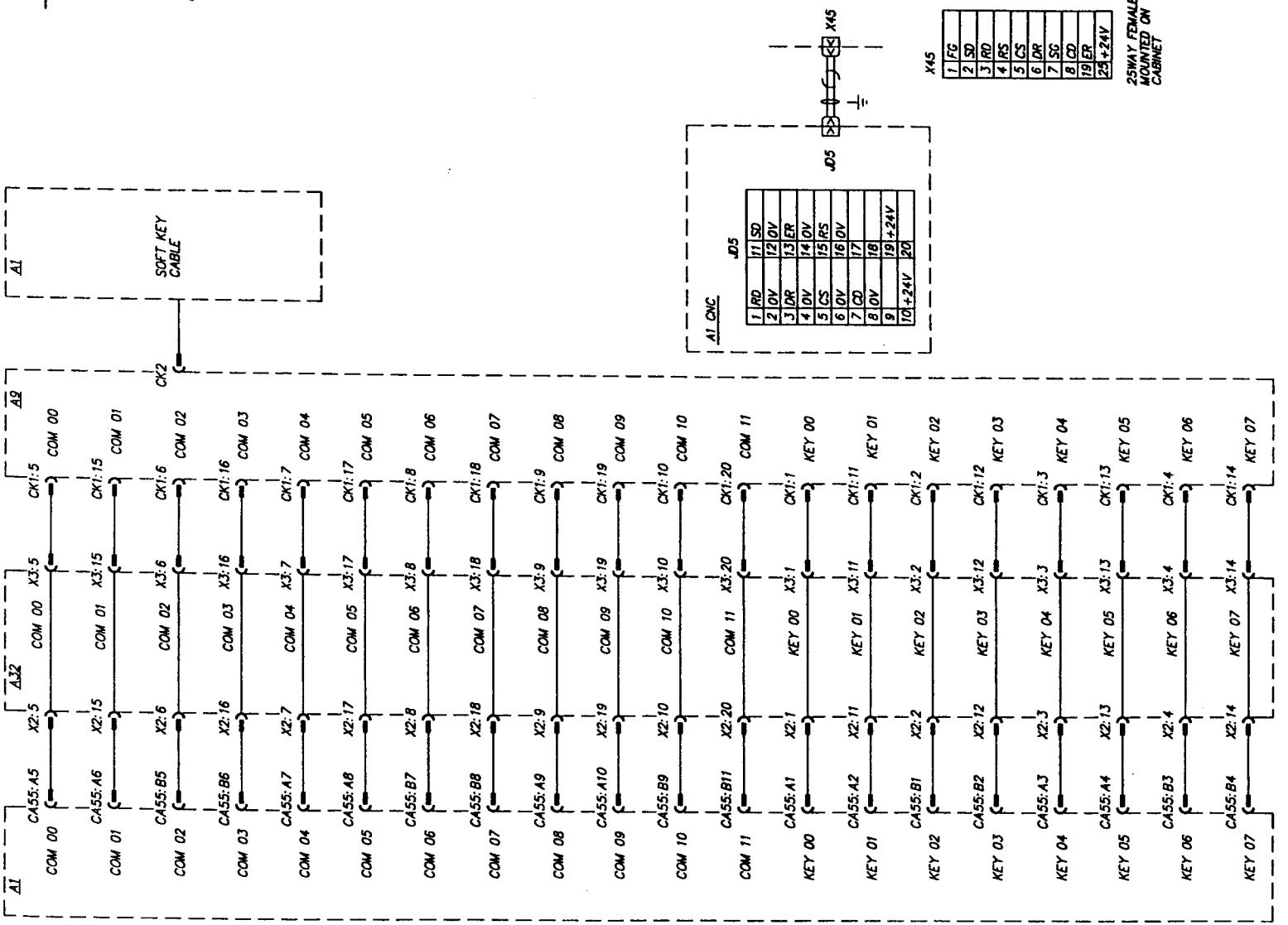
Title: SUPER ALPHA 330 LATHE 2ND OP PANEL INDICATORS

Part No. AS6-050-024

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No.	AS6-050-025

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE RS232/MDI PANEL		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

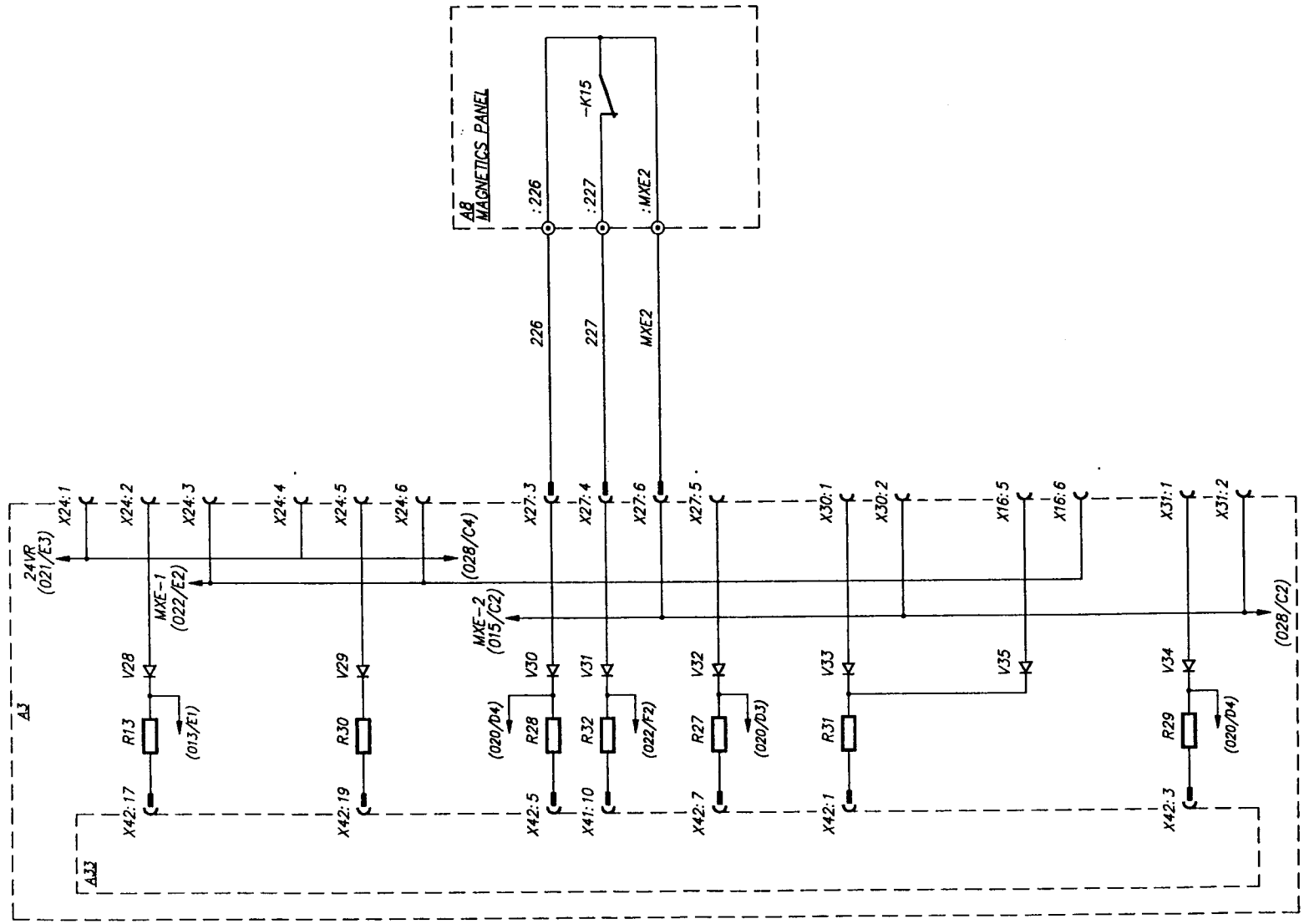
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish $\sqrt{}$ (μ CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25, 1 Decimal Place ±0.7, Whole No ±1.0

AS6-050-025 Part No.

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No.	AS6-050-026		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		K15 WAS N/O	25592	29.07.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA LATHE ENCLOSURE INPUTS(2)		
Part No.	AS6-05[illegible]-026		

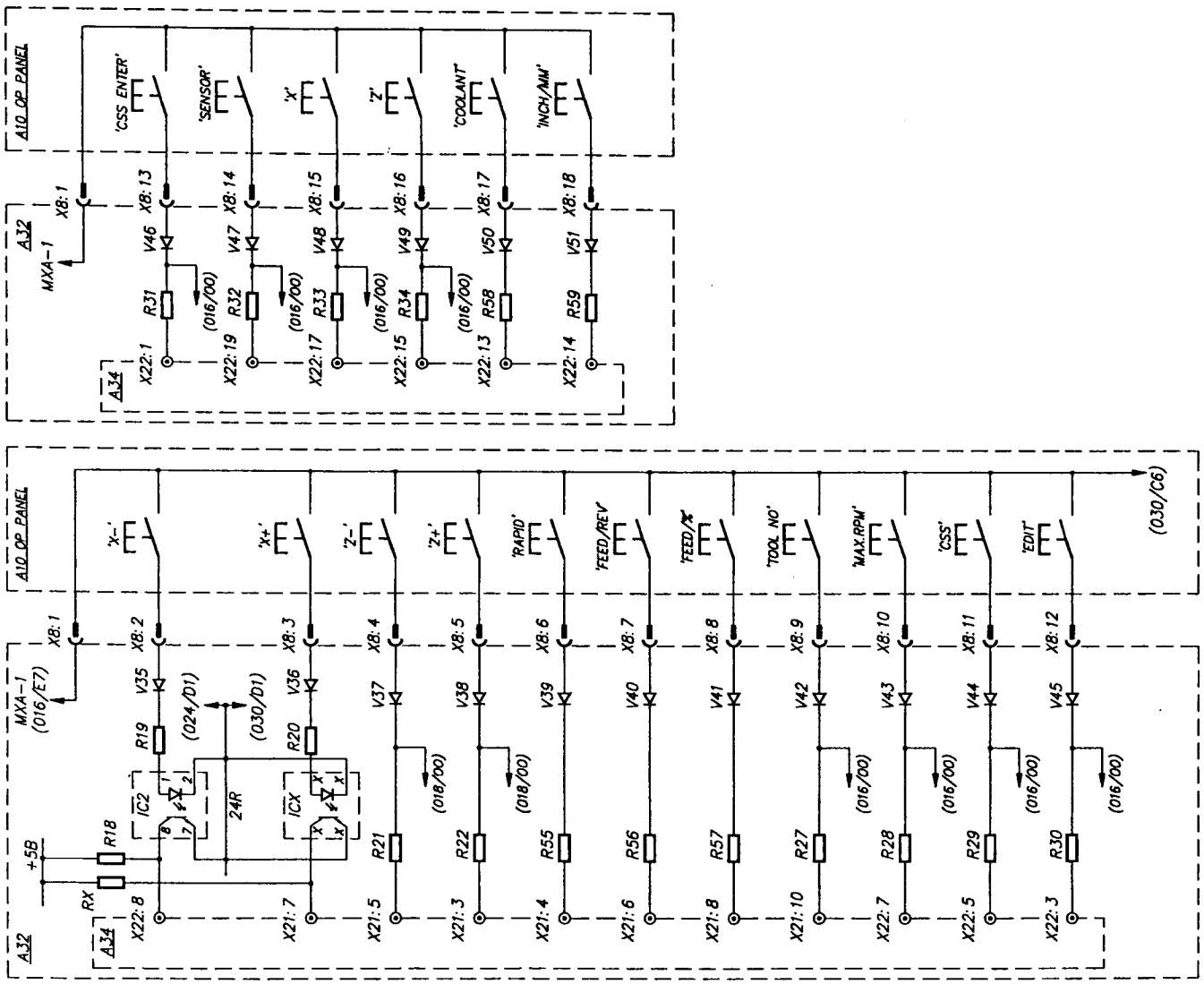
600 LA[illegible]ES LIMITED Heckmondwike, Yorkshire, En[illegible]nd.

Tolerance And Surface Finish Unless Otherwise Stated T[illegible] – Surface Finish ∀ (μ CLA)
3–Decimal [illegible]s ±.025, 2 Decimal Places ±0.25
1 Deci[illegible] Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

AS6-050-027

Part No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	08.05.99
2		X21:7 NOW CONNECTED THRO OPTO CIRCUIT	25529	16.06.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Costing No.			

Title: SUPER ALPHA 330 LATHE 2ND OP PANEL P/BUTTONS (2)

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated To Be:– Surface Finish $\sqrt{}$ (μ CLA)
2 Decimal Places ?0.10
1 Decimal Places ?0.4

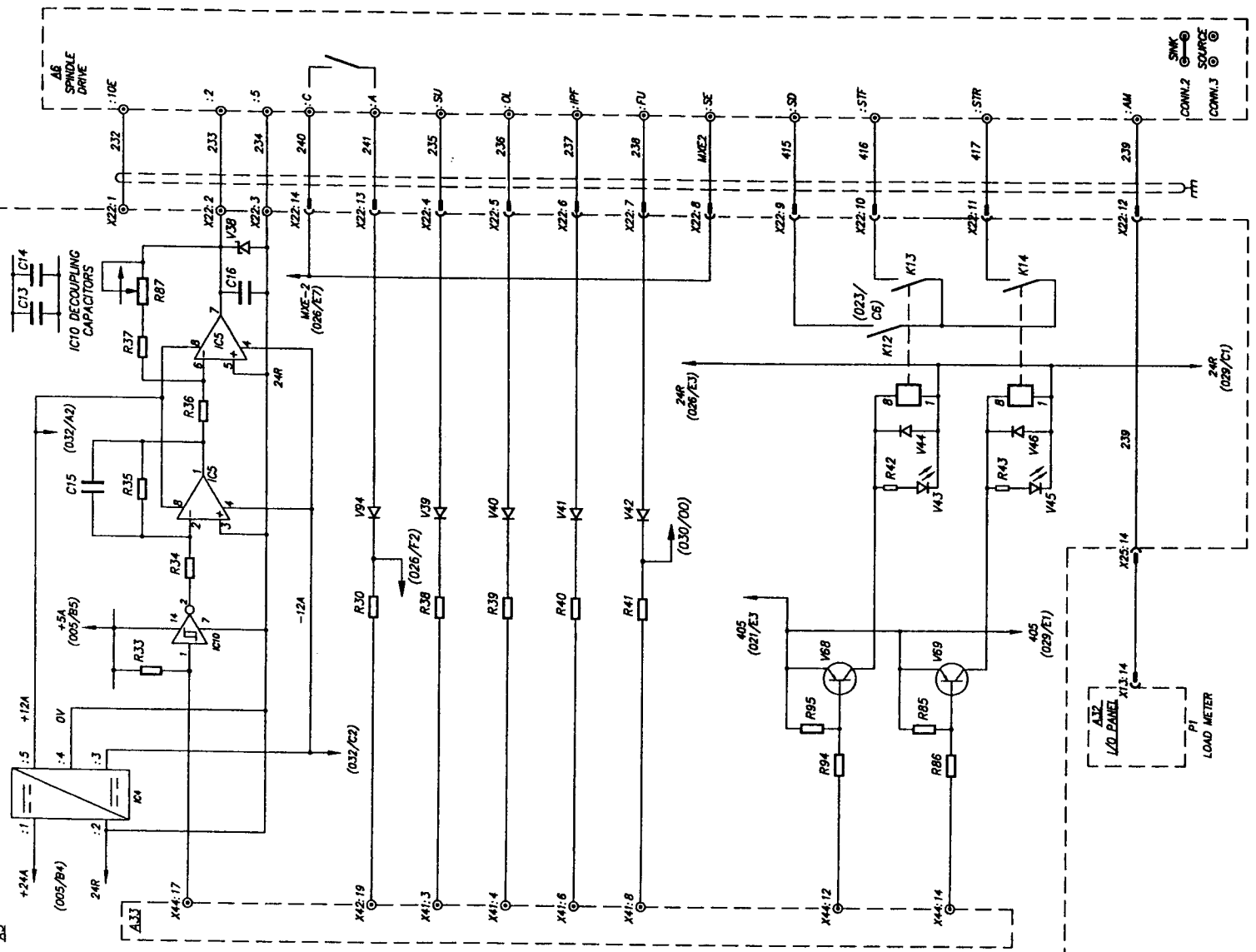
AS6-050-027

Part No.

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-028

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
B		X22:13 & 14 AND	–	29.03.99
		ASSOCIATED CIRCUIT ADDED,		
		SINK/SOURCE LINKS ADDED.		
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE SPINDLE DRIVE-CONTROLS

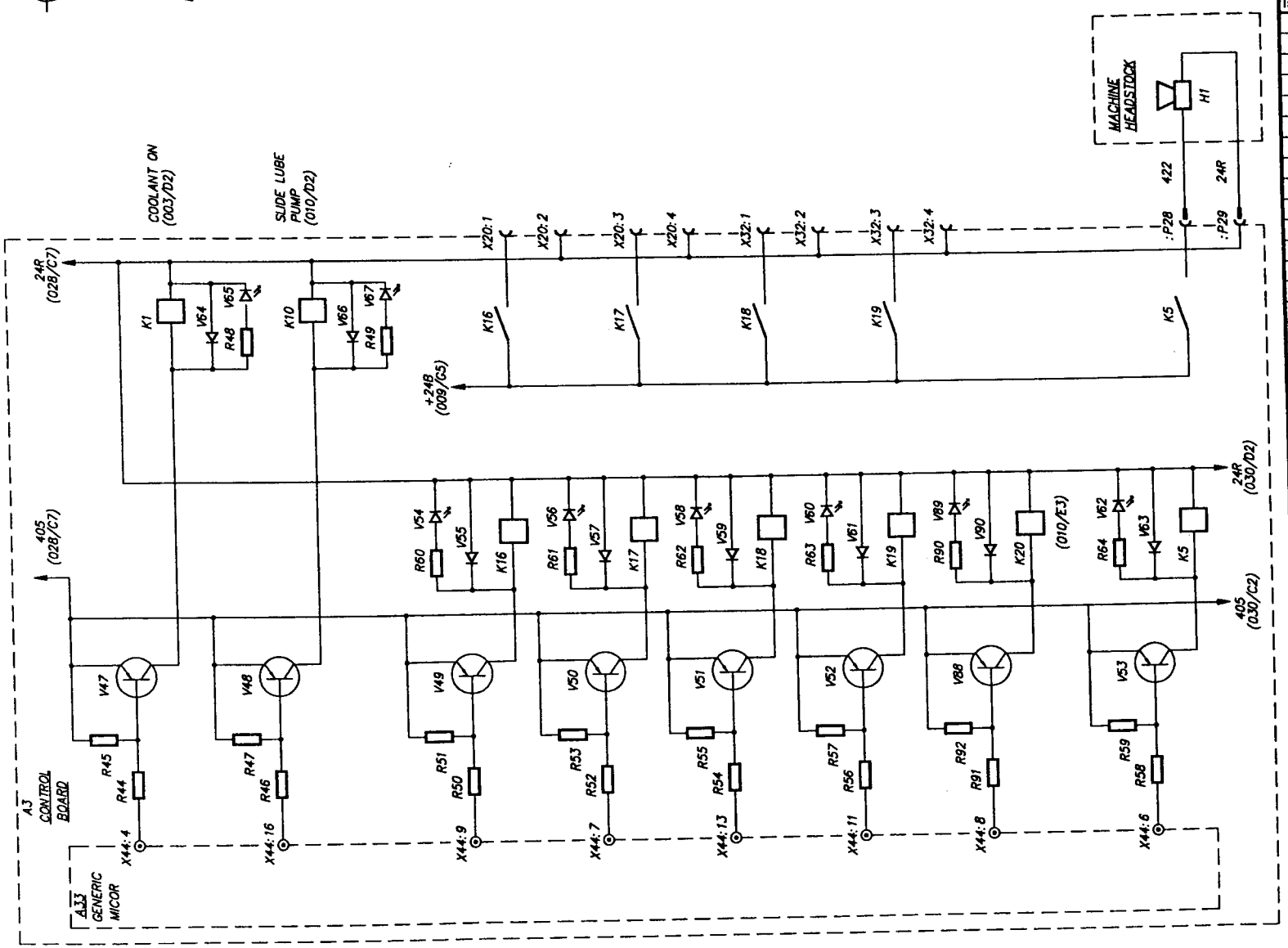
Part No. AS6-05 028

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance and Surface Finish Unless Otherwise Stated – Surface Finish ∀ (μ CLA)
3–Decimal es ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE – IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No. AS6-050-029

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE ENCLOSURE OUTPUTS (1)

Part No. AS6-050-029

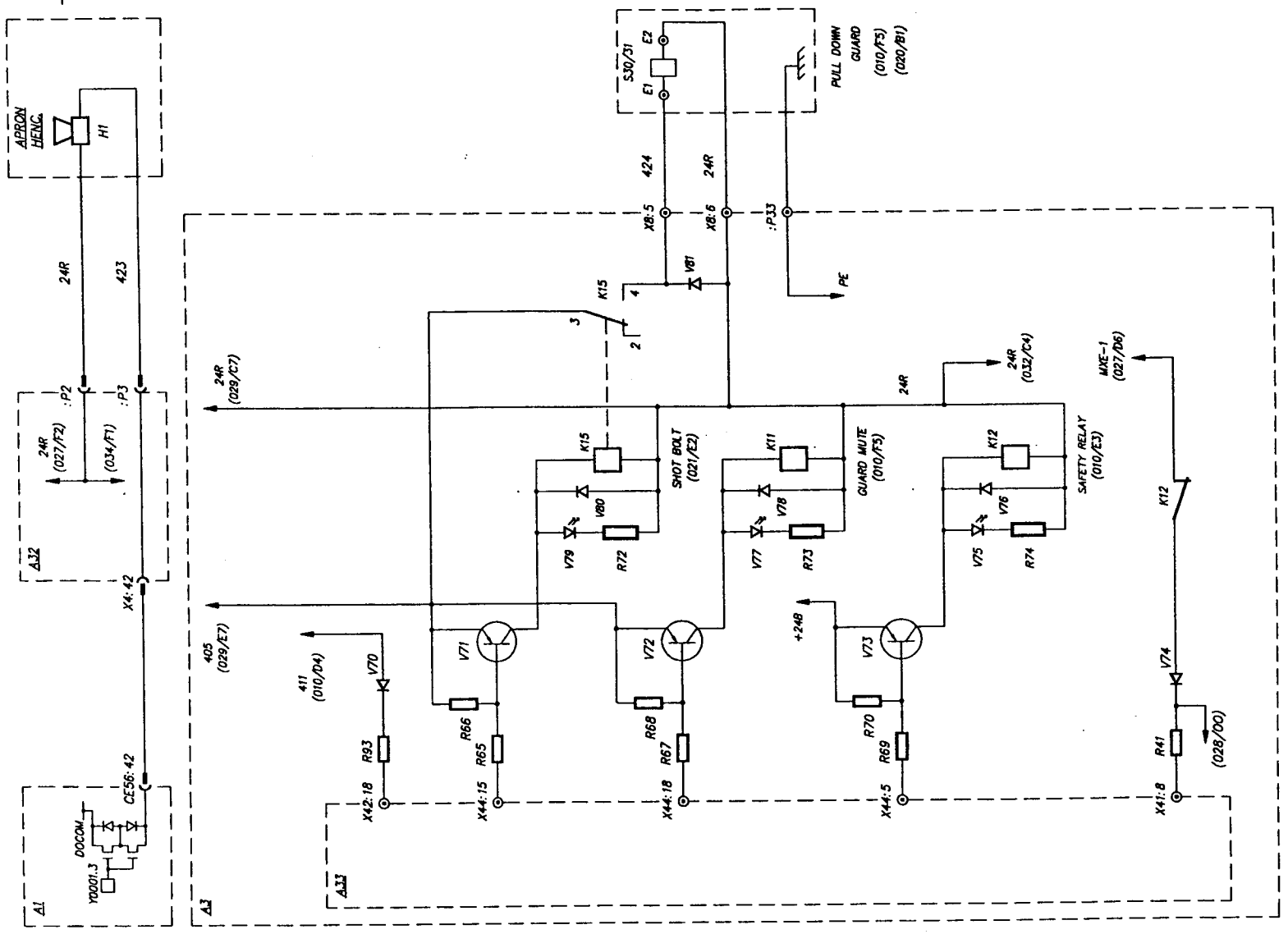
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

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

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

Part No.	AS6-050-030		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	08.05.99
2		SAFETY RELAY TRANSISTOR CIRCUIT	25484	30.07.99
		MOVED FROM 405 TO +24B		

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE ENCLOSURE OUTPUTS(2)		
Part No.	AS6-05 -030		

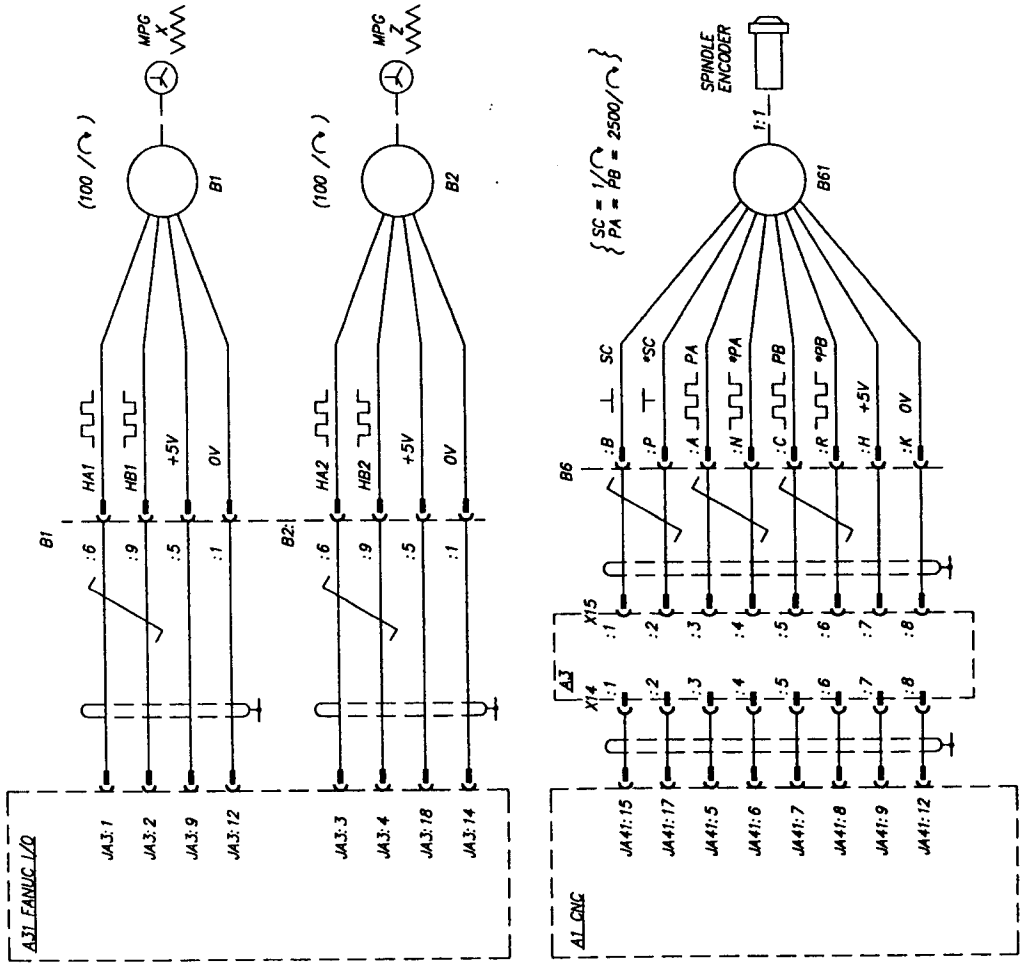
600 LATHES LIMITED Heckmondwike, Yorkshire, England.

Tolerance And Surface Finish Unless Otherwise Stated :- Surface Finish (μ CLA)
3–Decimal Places ±.025, 2 Decimal Places ±0.25
1 Dec. Place ±0.7, Whole No ±1.0

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-031

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE MPGS AND SPIN. ENC.

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

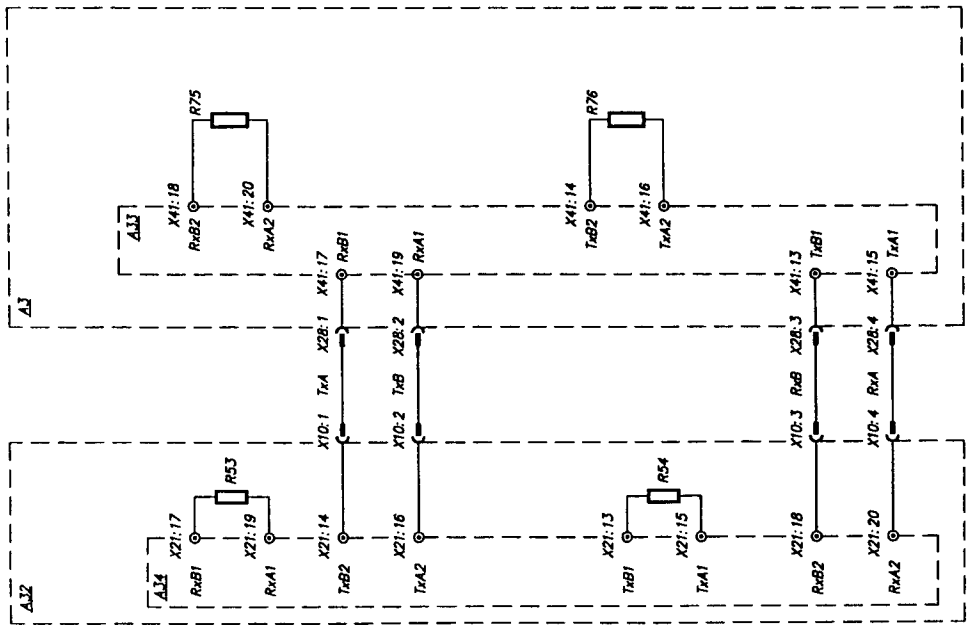
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish (CLA)
3-Decimal Places ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-031

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

AS6-050-032

Part No.

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		IC2,3,7+8 REMOVED.SW1,X26 REMOVED.CIRCUIT CHANGED	25529	16.06.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			

Title: SUPER ALPHA 330 LATHE NODE RS485 COMMS

600 LATHES LIMITED Heckmondwike, Yorkshire England.

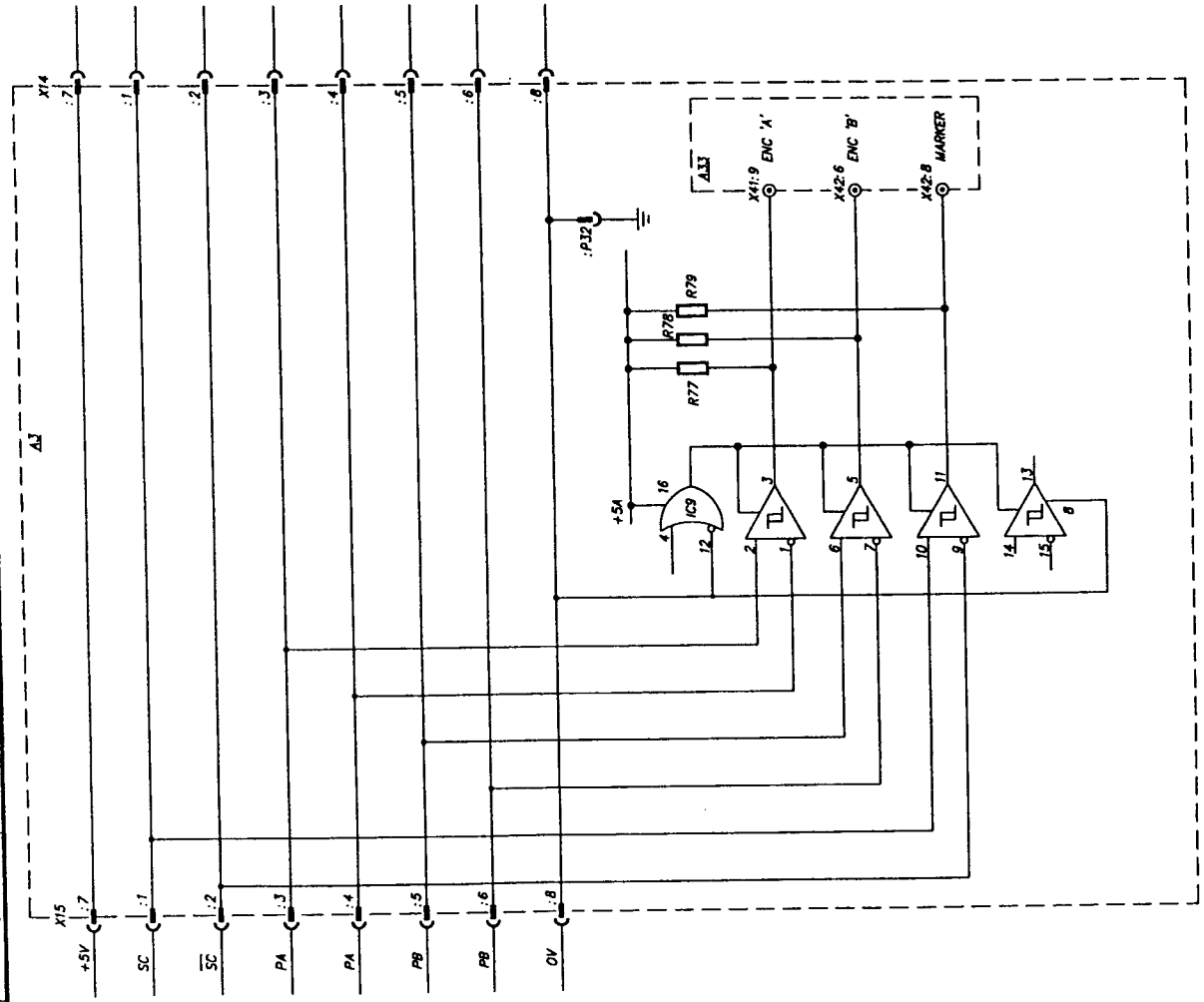
Tolerance And Surface Finish Unless Otherwise Stated To Be:– Surface Finish ∀ (μ CLA)
3–Decimal Places ±.025, 2 Decimal Places ±0.25
1 [illegible] Place ±0.7, Whole No ±1.0

AS6-050-032

Part No.

A3

DO NOT SCALE — IF IN DOUBT ASK BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No. AS6-050-033

Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99
2		R80,88,89+V82,83 REMOVED	25529	16.06.99
		CONNECTION TO X42:8 ADDED		
		CIRCUIT CHANGED TO INC.		
		MARKER PULSE		

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA LATHE ENCODER CIRCUIT		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

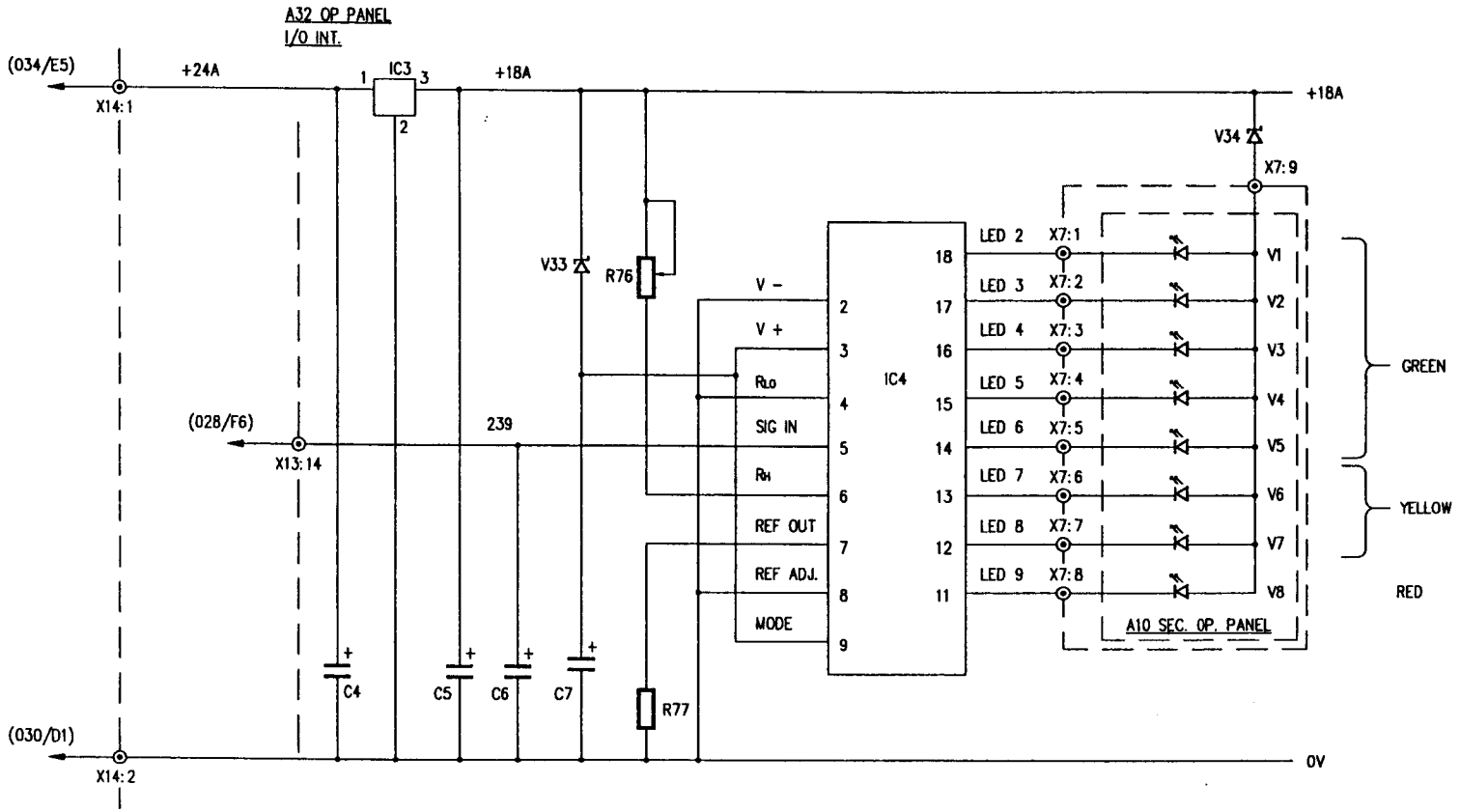
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish ∀ (μ CLA)
3-Decimal Places ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-033

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



Part No.				AS6–050–034
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	06.05.99

Chk'd		Date	14.01.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE LOAD METER		

ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

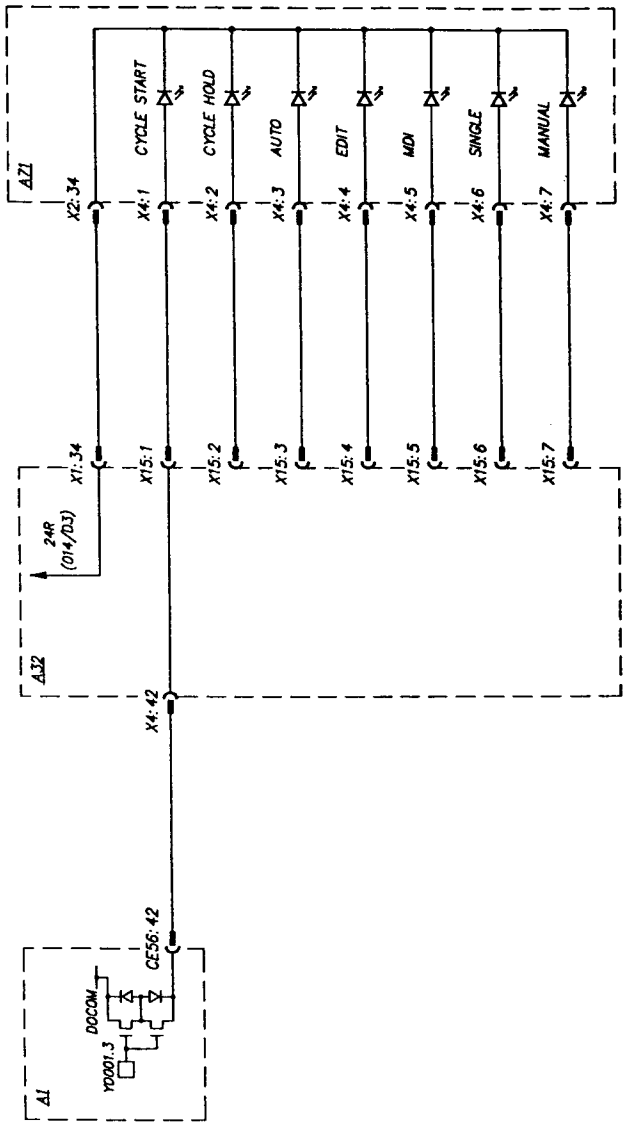
Tolerance And Surface Finish Unless Otherwise Stated T – Surface Finish $\sqrt{}$ (μ CLA)
3–Decimal Places ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

AS7–050–034 Part No.

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No.	AS6-050-035		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	–	14.01.99
1		PRODUCTION ISSUE	25472	08.05.99

Chk'd		Date	08.03.99
Drawn	R.PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE AUX KEY PAD LIGHTS		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

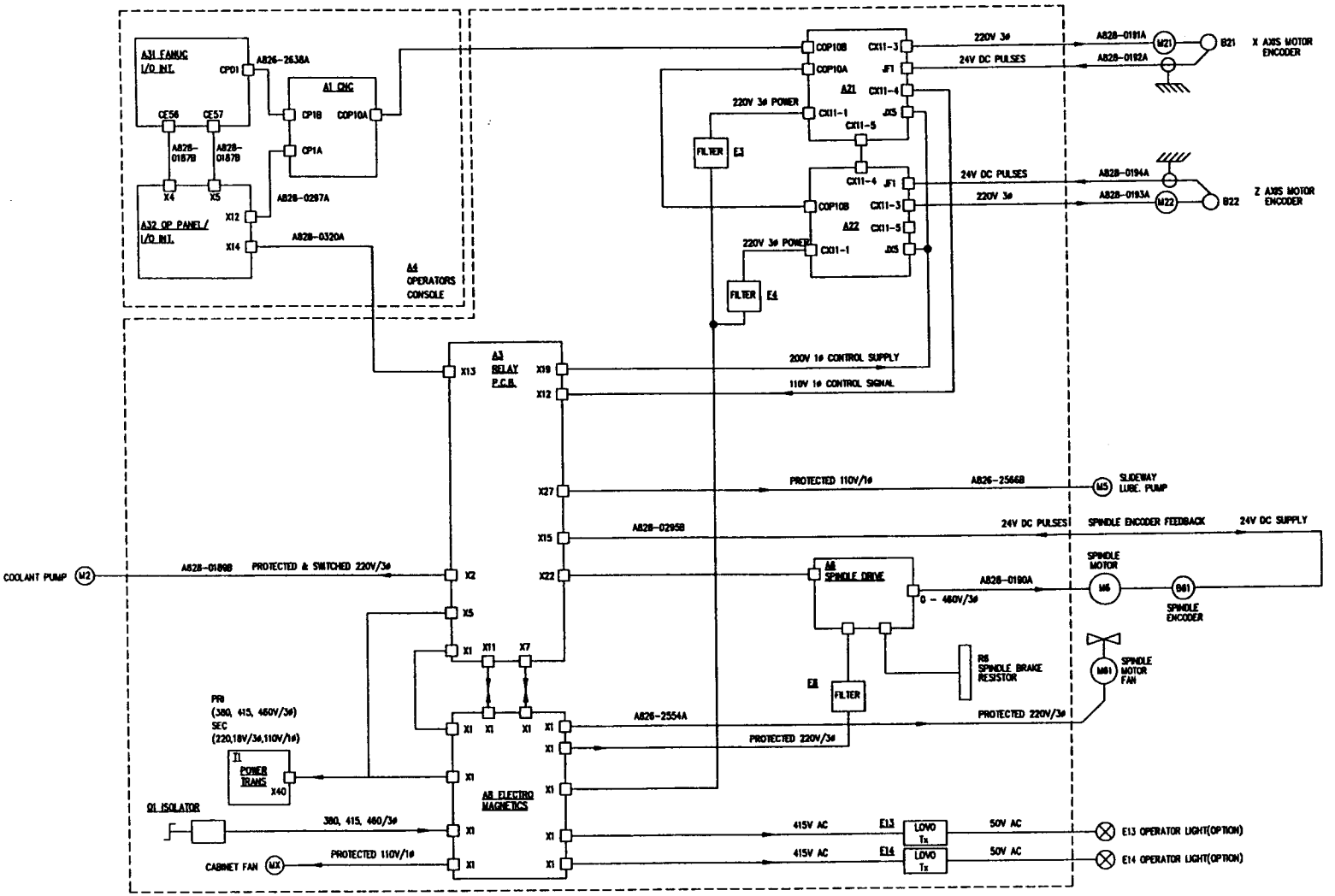
Tolerance And Surface Finish Unless Otherwise Stated To Be:- Surface Finish ∀ (μ CLA) 3-Decimal Places ±.025, 2 Decimal Places ±0.25 1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-050-035

A3

DO NOT SCALE – IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 ⚠

Part No.	AS6-050-036		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.04.89
1		PRODUCTION ISSUE	25472	05.05.89

Chk'd		Date	xxxxxx
Drawn	R PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE ELEC INT. DIAGRAM		

600 LATHES LIMITED Heckmondwike, Yorkshire, England.

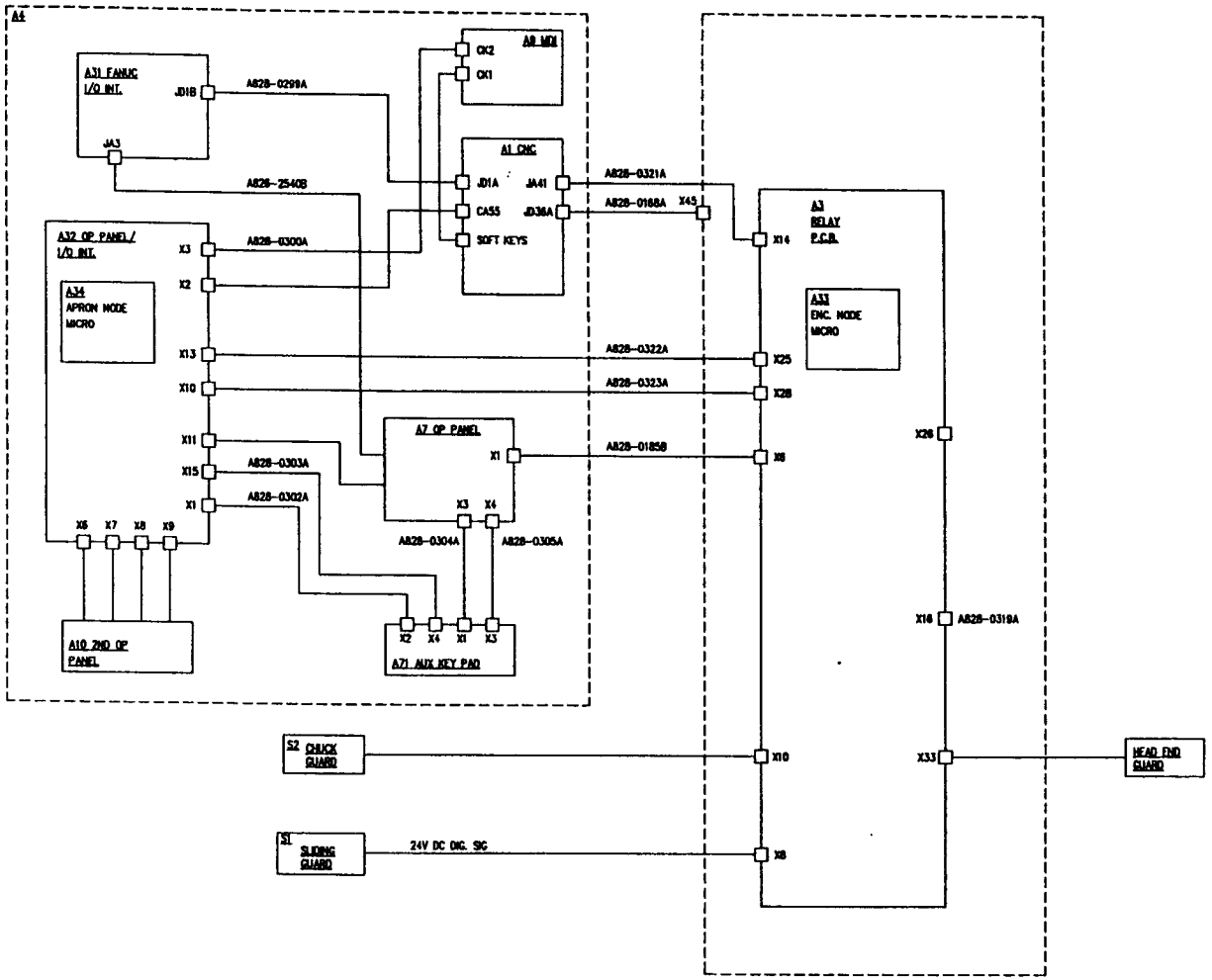
Tolerance ... Surface Finish Unless Otherwise Stated T ... - Surface Finish ... (μ CLA)
3–Decimal ... ±.025, 2 Decimal Places ±0.25
1 Decimal Place ±0.7, Whole No ±1.0

Part No. AS6-05 ...36

A3

DO NOT SCALE — IF IN DOUBT ASK

BREAK ALL SHARP CORNERS (0.5 X 45?max)



Part No.	AS6-050-037		
Iss.	Mod.	Modification	Issue No.	Date
A		PROTOTYPE ISSUE	-	14.04.99
1		PRODUCTION ISSUE	25472	05.05.99

Chk'd		Date	14.04.99
Drawn	R PRIEST	Scale	NTS
Finish			
Heat Treatm't			
Material			
Casting No			
Title	SUPER ALPHA 330 LATHE ELEC INT. DIAGRAM		

ALL DIMENSIONS IN MILLIMETRES

Generally Drawn To BS308 △

600 LATHES LIMITED Heckmondwike, Yorkshire, England. THE 600 GROUP

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

Part No. AS6-050-037

Contents

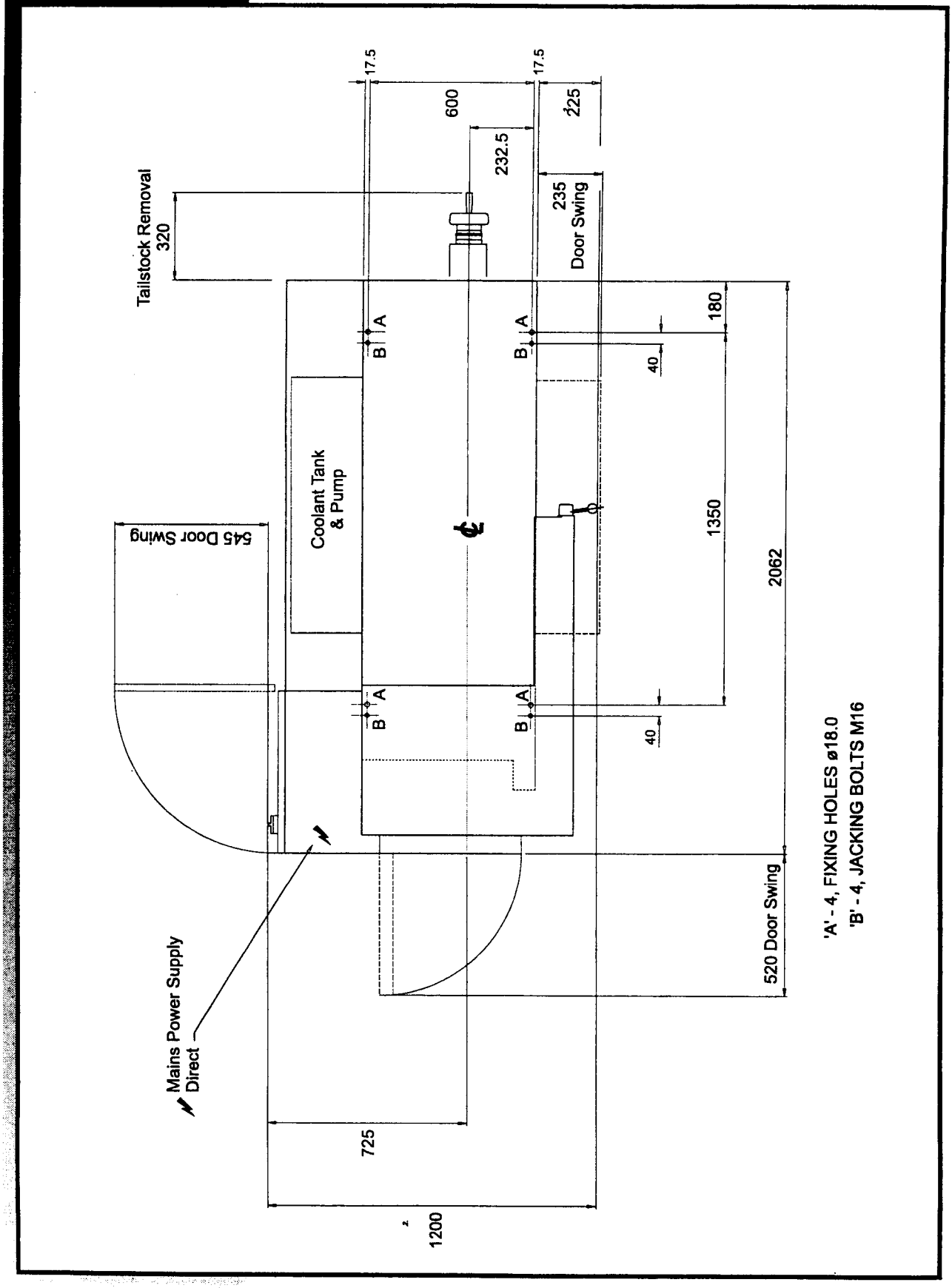
Notes and Requirements :

For the safe lifting installation and commissioning and for optimum operational performance of your 'ALPHA plus LATHE', it is essential that the following instructions are carefully followed.

INSTALLATION

SECTION: EIGHT

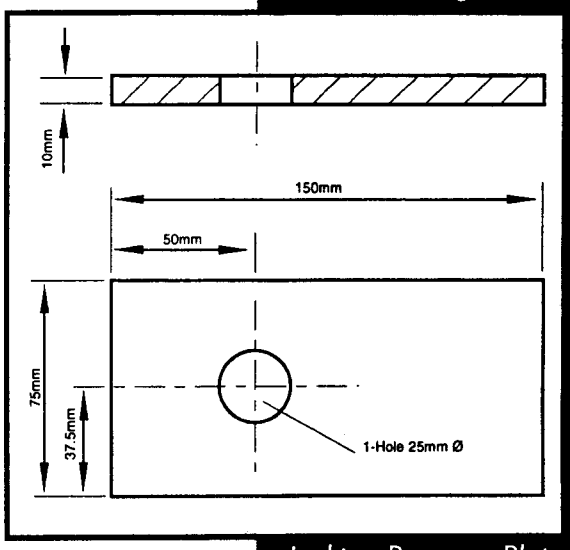
Installation Plan



Installation Site

The floor must be flat, level and suitable as a machine foundation. Referring to the machine foundation plan, allow sufficient area around the machine for operation and ancillary services, e.g. work loading, swarf removal, coolant tank cleaning and access to the electrical cabinet. Allow for the loading of bar stock or lengthy material (through the hollow spindle) at the left hand end of the machine and consider the electrical supply requirements, and mains cable entry position when making siting arrangements.

Figure 8.1



Jacking Pressure Plate

Do not site your lathe near other machinery or plant causing abnormal vibration or electrical interference, e.g. presses, guillotines, welding equipment, high frequency heating plant, etc. and ensure that high voltage electrical cables are not present at the proposed site. The ideal ambient temperature for operation of your lathe is 20° but stable temperatures between 10° to 30°C should normally be acceptable.

NOTE: When installing the lathe ensure that the machine is set at a sufficient height to allow for the swarf tray to be placed underneath.

Machine Fixing Requirements

The lathe may be used in a freestanding condition but for best results should be bolted down. In all cases, jacking bolt pressure plates must be provided at each of the jacking bolt positions.
Where the lathe is to be bolted down we recommend steel pressure plates - *Figure 8.1.*

INSTALLATION

8

Machine Fixing Preparation

For M12 Expanding "Rawl-Studs" (or equivalent)

Mark out the 4 stud centres as follows:

1. Temporarily position the lathe precisely at the proposed working site.
2. Referring to the foundation plan (for the fixing stud hole positions) spot through each of the 4 fixing stud hole using a dab of paint or marking blue' on the end of a round bar which will just pass through the hole, say Ø17mm (11/16") X 60mm (2 1/2") long.
3. Remove the machine then drill for and fit the "rawl-studs" at the marked centres.

Note:
The paramount requirement for this operation is accuracy, and the studs must be vertical to ensure alignment when the machine is finally lowered onto the studs.

Alternative for M16 foundation studs grouted in position.

For this method suitably large holes should be excavated at the stud centres to allow the machine complete with studs (hanging in place) to be positioned for grouting

Items required

4 off Foundation studs (M16)
2 off Timber packing's :- say 20 x 150 x 1000mm (3/4 x 6 x 40")
Non-shrink, Quick-set, proprietory foundation grout material.

Method

1. Considering the foundation bolts to be used and manufacturers recommendations for the grout material, excavate suitably large holes at the foundation stud centres. (These may be marked out from the foundation plan)
2. Lift the lathe (see separate lifting instructions) and loosely hang a foundation stud at each of the 4 foundation stud holes.
3. Place the timber packing (laid transversely) on the inside of the fixing bolts allowing room to work and to fit jacking bolts.
4. Lower the lathe (with the studs still hanging in place) into position to rest on the packing boards.
5. Pour the grout material and trowel off flat and level with the floor surface.
6. Allow full setting time for the grout material then fit the jacking bolt pressure plates and remove the timber packings.

Important Note.

T.S.Harrisons can not be responsible for foundation fixing difficulties but every effort will be made to assist if contact is made with our service department.

Lifting The Lathe

Machine Weight: 1200 KG

Before lifting refer to the appropriate Lifting Diagram and observe the following Safety Guidance notes - they are provided for your benefit.

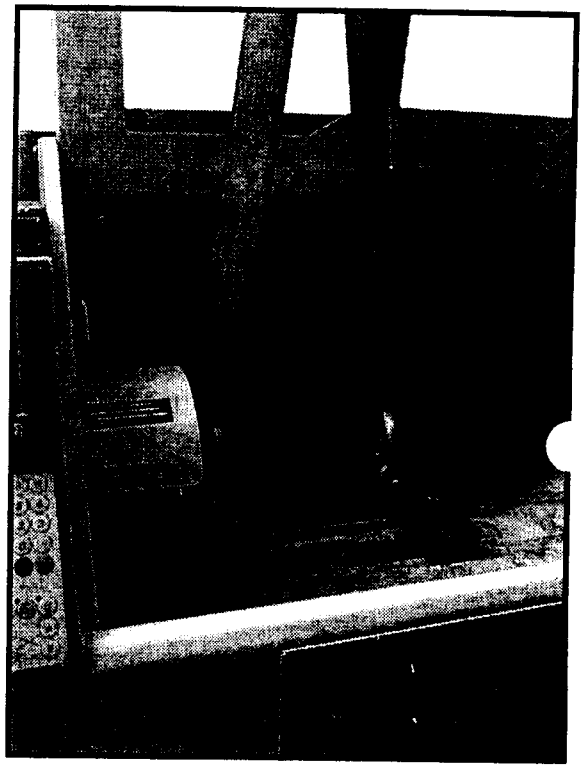
1. Arrange for someone to help you and seek qualified advice if you have any doubts on how to proceed.
2. It is recommended that the lathe lifter clamp is used in order to prevent damage to the lathe during lifting. This can be obtained from your supplier.

   T.S.Harrisons Item No. A176-0409A

3. Check that any attaching equipment and the crane or hoist you are going to use has a lifting capacity well in excess of the machine weight to be lifted.
4. Carefully check the condition of all the lifting equipment you are going to use and replace anything you have the least doubt about with a certified item.
5. Referring to the appropriate Lifting Diagram, note the position of the saddle and tailstock assemblies shown and ensure that they are physically in the same position on the lathe to be lifted so as to give a balanced lift.
6. Never attempt to lift your lathe with the mains electrical supply connected and make sure that any free-standing electrical items are disconnected and removed from the machine.
7. Do not use lifting equipment to drag the lathe around, ensure only vertical lift conditions.
8. Avoid shock loading - take up the lift carefully.
9. If fibre rope or webbing slings are to be used to link your crane hook to the lathe lifter then refer to the sling manufacturer's instructions and safety recommendations and follow them implicitly.

Note:
To balance the machine when lifting provision is made to allow the saddle to be manually wound along the bed (i.e. without the need for the electrical supply to be connected) as follows, but it is essential that the bedways are first cleaned and oiled as per the instructions given in the installation notes.

1. Remove screws and small plate on the tail end face of the front chip guard.
2. Insert a 6mm A/flats hexagon key into the socket provided in the exposed end of the z axis ballscrew, (we recommend a 'T' handled or brace mounted key).
3. Turn ballscrew as required.
4. Replace the small clamp plate and screws.



Final Positioning at the Prepared Site

When the lathe is finally in position place one of the pressure plates under each of the 4 jacking bolts.
If fixing studs are being used then make sure that the nuts are well clear of the base at this stage to allow for levelling.

Cleaning

Before connecting the electrical supply to your machine remove all the anticorrosion coating, using only white spirit or paraffin.

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.

Lubrication

Spindle and Drive Motor

This unit is pre-lubricated and 'sealed for life' requiring no routine maintenance.

Axis Drive Motors

These units are also pre-lubricated and 'sealed for life' requiring no routine maintenance.

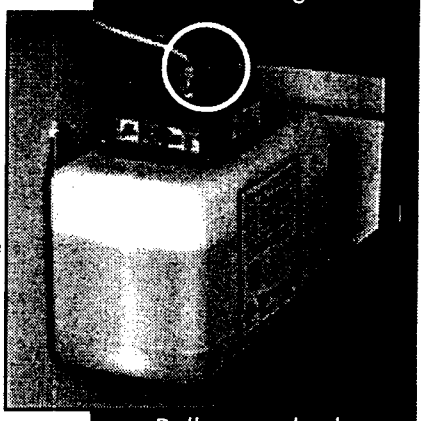
Ballscrews

Ballscrews should be greased at regular intervals (see section 2.5).

Slideways

Before operating the machine the lubrication system must be primed. To do this fill the Autolube tank with oil and pull up and let handle (A) retract 5 times or until it is apparent that lubrication has reached the slideways - *Figure 8.2*.

Figure 8.2



Pull up and release the handle

INSTALLATION

8

Electrical Connections

(Refer to section 7)

Warning!

Lethal voltages are present in the electrical equipment of this machine. Only suitably qualified personnel should be permitted to install, test, adjust or repair any part of the machine or ancillary equipment. All warning and cautionary notices pertaining to this machine and its equipment must be strictly observed.

Machine Control Circuit Transformer

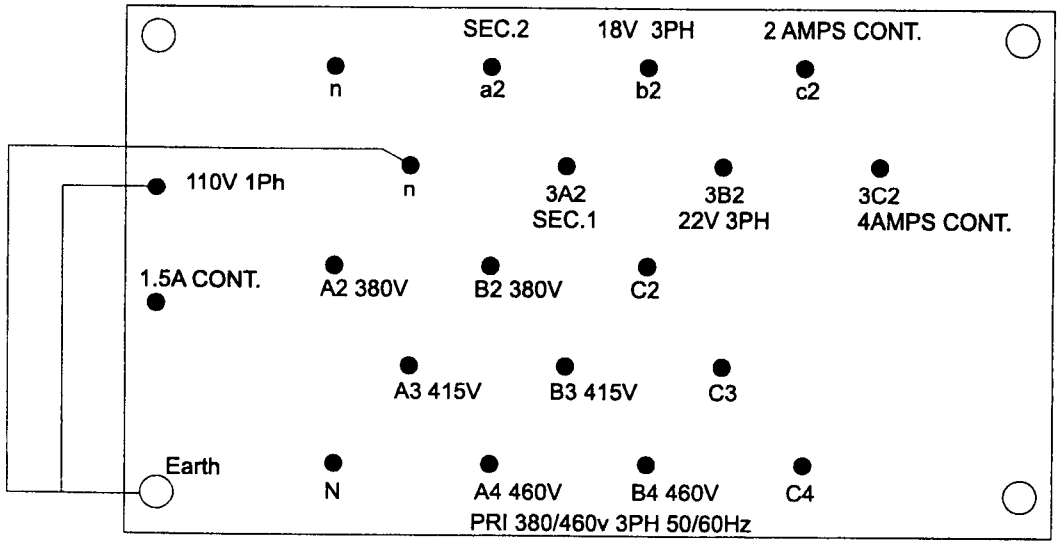
(Located in the bottom L.H. corner of the Electrical Cabinet)

Before connecting the mains supply, the tappings on this transformer must be checked for correct voltage input. *Figure 8.4.*

Figure 8.3

Transformer

Figure 8.4



Tranformer Tappings

Mains Supply and Recommended Fuses

Standard Machines (Directly Connected)

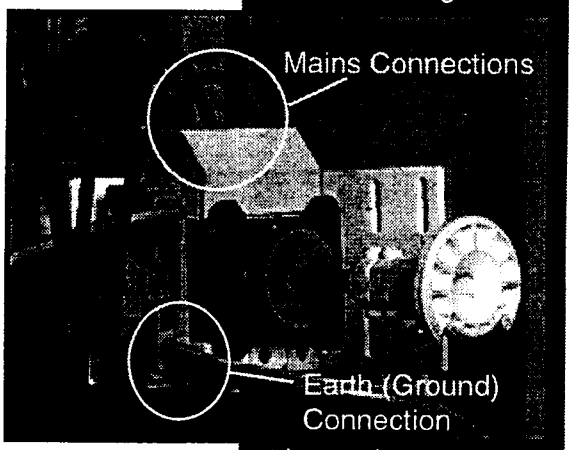
Power should be supplied to the lathe from a separate fused isolator.

(See Table on Page 8.10 for Fuse Ratings)

Entry to the electrical cabinet is at the bottom R.H. side looking at the back of the machine and connections are to be made to the input terminals of the machine isolator switch.

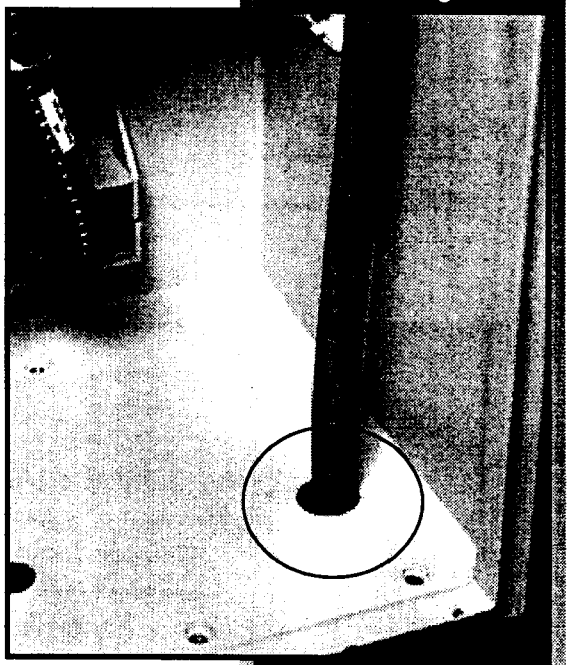
An earth (ground) line connection must be included. *Figure 8.5.*

Figure 8.5



Electrical Connections

Figure 8.6



Mains Entry Point

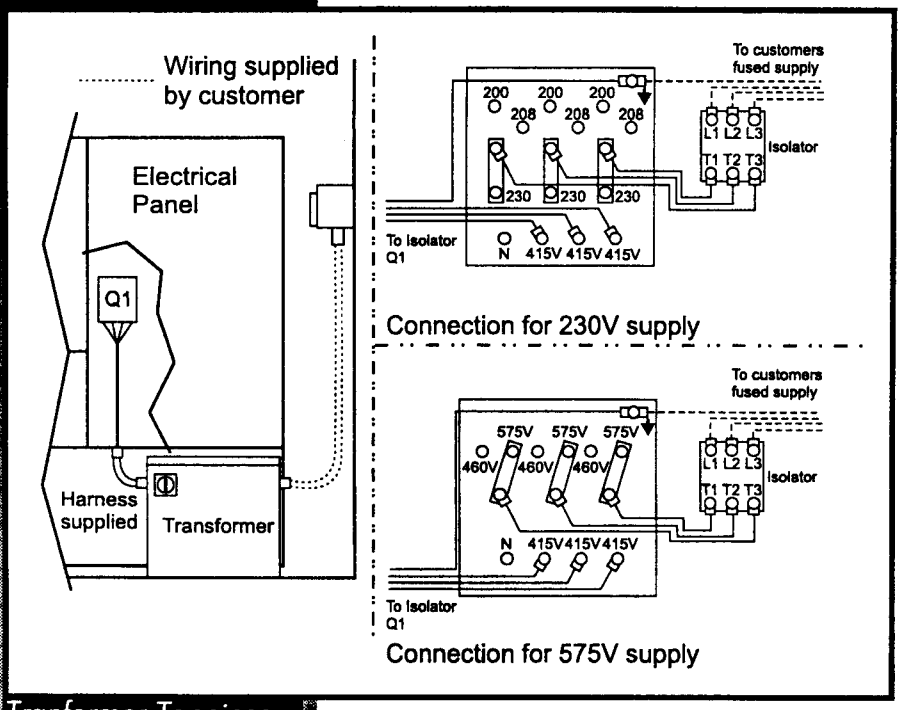
Mains Supply and Recommended Fuses

Machines Supplied with an External Mains Supply Transformer

The transformer is disconnected and transported with the lathe as a free-standing item complete with flying leads and conduit assembly. It should be re-connected via the mains entry point at the bottom R.H. side of the electrical cabinet (looking at the back of the machine) to the input terminals of the machine isolator, including the earth (ground) line - *Figure 8.6.*

Before connecting the mains supply, the external transformer tappings must be checked to ensure correct voltage input.

Figure 8.7



Tranformer Tappings

Power should be supplied to this transformer from a separate fused isolator.

For 3 phase 50/60 Hz AC supply:

Electrical Installation Requirements, Total Power Consumption 21kVA						
Supply Voltage	208	230	380	415	460	575
Fuse Rating (A)	63	63	40	35	35	25
Single Wire Armoured or singles in conduit PVC Cable mm^2	16	16	6	6	6	4

Mains supply lines are connected to the appropriate terminals on the Transformer Isolator switch.

An earth (ground) line connection must be included - *Figure 8.5.*

Correct Phase Connection

Although the spindle motor will always run in the direction desired regardless of phase connection, the coolant pump must be checked to ensure rotation is correct. This may be checked by observing the direction of rotation of the coolant pump (clockwise when viewed from above) on rundown. If this is not the case the input phases should be changed. Failure to do this could result in damage to the coolant pump.

Running In Procedure

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 spindle 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.

INSTALLATION

8

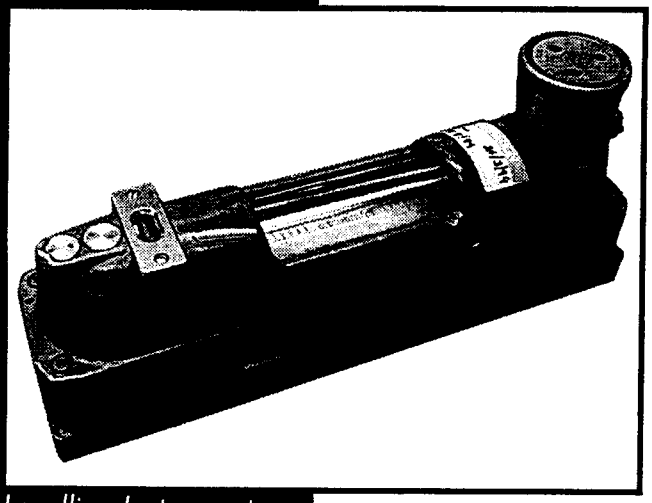
Levelling the Alpha 330 plus Lathe

"Levelling" is a general term adopted for the process of reproducing at user site, the bedway straightness built into your lathe at manufacture.

Equipment required

See figure 8.8

Figure 8.8



Levelling Instrument

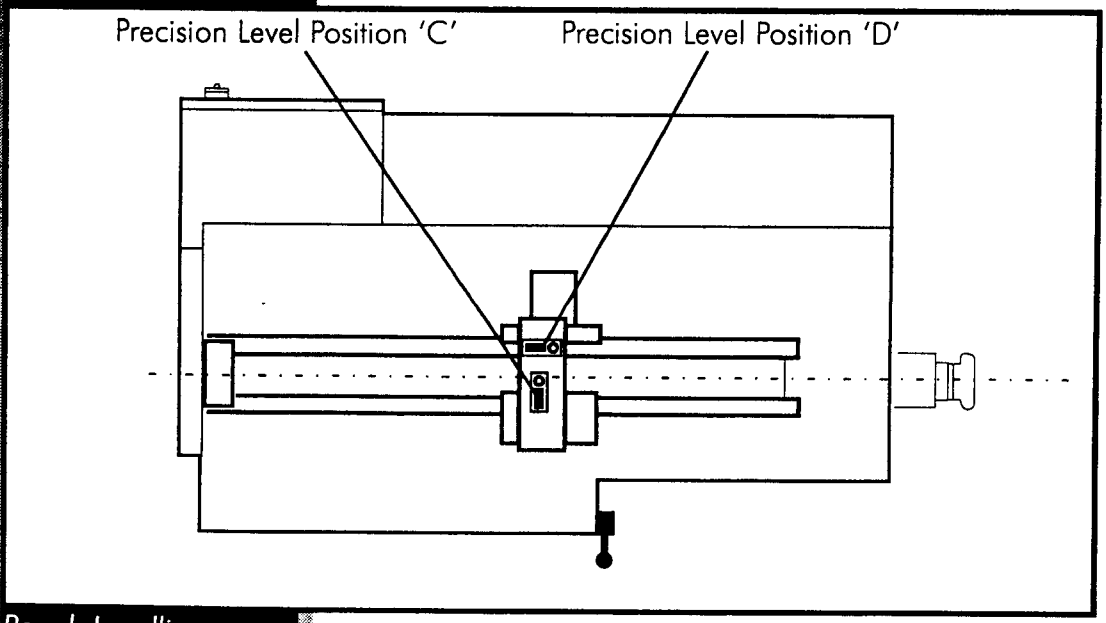
Conditions required

The lathe should be initially positioned, cleaned and powered up in accordance with our previous installation instructions:-

Method

A. Rough levelling of the whole machine generally to a true horizontal plane.

Figure 8.9



Rough Levelling

Referring to the diagram Figure 8.9 move the saddle/carriage assembly roughly into a central position along the bed length (by means of the large electronic handwheel) and place the level, set at zero adjustment, alternatively in the positions 'C' and 'D' on the Cross Slide and level the machine into the horizontal plane by means of the 4 jacking bolts. Absolute precision is not necessary for this operation.

B. Transverse Levelling

For best results this work should be carried out with the pull down work guard in the closed (down) condition.

This process is used to eliminate twist along the bedways.

With the level in position 'C' on the Cross slide, take precise level readings at a series of points along the bedway by using the large electronic handwheel to progressively move the saddle/carriage assembly along.

Use the 4 jacking bolts to make adjustments for twist until satisfactory straightness is achieved. 0.04mm/1000mm max. is the figure quoted in our Test Chart for Standard Accuracy Lathes and 0.03mm/1000mm max. for precision lathes.

C. Longitudinal Levelling

For best results this work should be carried out with the pull down work guard in the closed (down) condition.

Carefully following the previous levelling processes will normally reproduce the manufactured longitudinal level conditions, i.e.:-

0 to 0.015mm convex for Precision Lathes

A check for this may be made by taking precise level readings along the bed length with the level placed longitudinally (position 'D') on the Cross Slide.

Where adjustment needs to be made for longitudinal level then a relief or increase of weight distribution on the appropriate jacking bolts may be introduced provided transverse level is not disturbed.

D. Re-check Transverse Levels

E. Fixing

If the machine is to be bolted down, then, progressively and in sequence, equally tighten the 8 foundation stud nuts but so as not to disturb level conditions

F. Re-check

Re-check level (s) again and if necessary repeat the above process until correct level and fix conditions are obtained with the jacking bolt locknuts finally tightened.

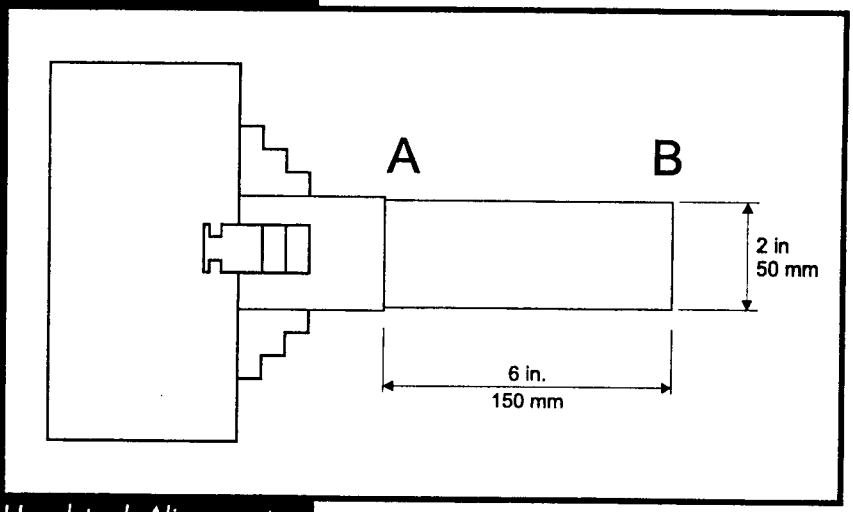
Alignment Checks

The following checks may be made for machine alignment.

Headstock Check

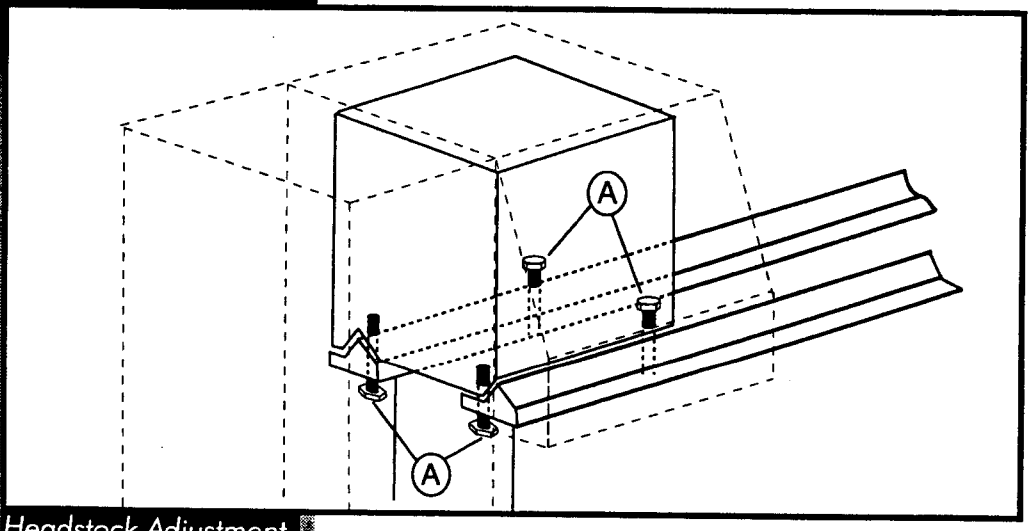
Take a light cut over a 150mm (6") length of 50mm (2") diameter steel bar held in a chuck (but not supported at the free end). Micrometer readings at each end of the turned bar A and B should be within 0.01 mm.(0.0004") - *Figure 8.10*

Figure 8.10



Headstock Alignment

Figure 8.11



Headstock Adjustment

To correct a greater difference in readings, first open the end guard and loosen the four headstock screws (A). Adjust the headstock as required and tighten the headstock screws. Repeat above test and if necessary re-adjust headstock until Micrometer readings are within required tolerances - *Figure 8.11*

Tailstock Check

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 body laterally. Recheck alignment.

INSTALLATION 8

8.16

S3P-E01-JUN/1999

Contents

NOTES & REQUIREMENTS:

Regular maintenance is the key to trouble-free operation of your lathe.
Introduction of the simple procedures outlined here will ensure reliable performance, maintained accuracy and general longevity of your machine.
We recommend that you make use of the log sheets included to keep a record and help ensure that your machine recieves regular arrention.

MAINTENANCE

SECTION: NINE

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Lubrication Details

Regular Attention

For trouble free operation keep the lathe clean and regularly maintained. Lubrication should be carried out as on following pages, using the various lubricants detailed below lubricants.

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.

Chuck

Grease each week Molycote"D" Century Lacerta ASD.

Tailstock

Oil each week Tellus 32 (ISO HM32)

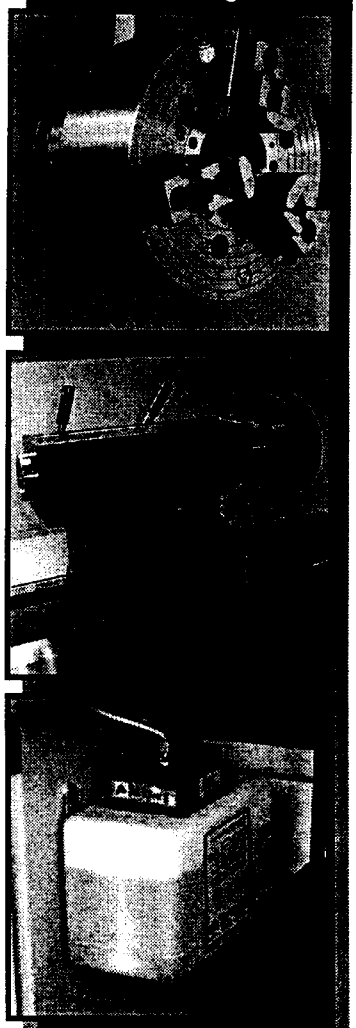
Slideways

Both the X and Z Axis slideways are lubricated by a self-contained motorised pump unit mounted in the head end cabinet. The oil level must be checked daily or as dictated by experience and topped up accordingly. Oil level is readily visible through the semi-transparent container. When oil level drops sufficiently low a red LED on the unit will light indicating an immediate refill is required.
Use oil type ISO G68 e.g. Century Cheviot CX, Shell Tonna TX68.

Ballscrews

Add Approximately 0.25cc of grease to each ballscrew at 2 weekly intervals.
Grease with Fuchs Renolit LX-EP2, Shell Retinex LX or equivalent.

Figure 9.1



Regular Maintenance and Adjustments

Regular maintenance is the key to reliable machine operation. It is essential that the following procedures are carried out at least as frequently as the time intervals laid down. Producing a log can be a help to ensure that maintenance is regularly carried out.

Daily Attention

Oil Levels

Check that the slideway lubrication reservoir is not empty.
This is located in the cabinet at the head end of the machine.
This is a total loss system so frequent replenishment should be expected.

Swarf Clearance

Empty the swarf bin and clear the coolant drain holes regularly, and as is necessary to keep a tidy working environment.

Coolant Level

Make a regular check of the coolant tank level (this can be seen by pulling out the swarf bin). Replenish coolant as necessary.

Workholding Equipment

Check that the workholding equipment is adequately lubricated as poor lubrication will adversely affect the workpiece gripping forces. (Refer to the workholding equipment suppliers maintenance instruction manual for the recommended lubricants together with further details on general maintenance).

Operator Viewing Windows

Clean the external surface of the viewing windows using only a soap and water solution. Any other method may cause serious damage to the polycarbonate material and inhibit its safety properties.

** Use lubricants as described on page 9.3 - 'Lubrication Details'*

Weekly Routines

Daily Maintenance

Perform all the checks that comprise the daily maintenace routine on page 9.4

Check Coolant Condition.

Make a visual check for deterioration in condition of the coolant and, if necessary, pump out the tank and replace with new coolant.

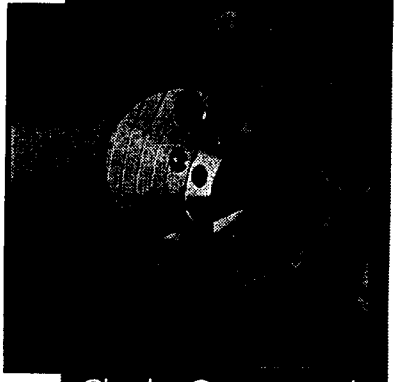
Grease Chuck

Apply grease* to the chuck via the grease nipples provided - in accordance with the chuck manufacturer's instructions. *(Figure 9.2)*

Oil the Tailstock

Manually lubricate the tailstock barrel.*

Figure 9.2



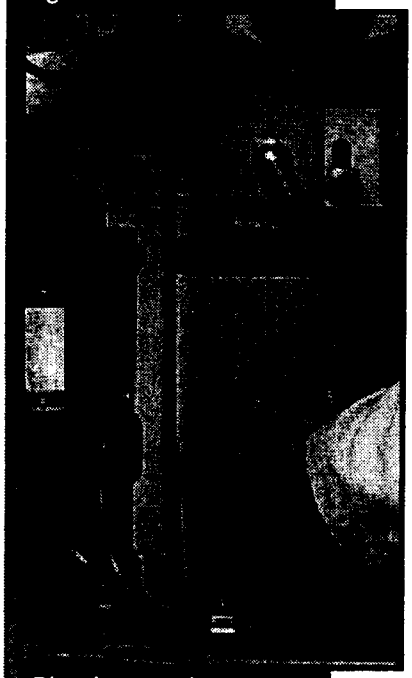
Chuck - Grease nipple

** Use lubricants as described on page 9.3 - 'Lubrication Details'*

Quarterly Maintenance

All the daily and weekly lubrication checks and routines should be carried out with plus the following :-

Figure 9.3



Checking Belt Tension

Coolant

Whilst the coolant tank is empty the pump may be inspected and any swarf that may be in the tank removed.

Guards

Guard hinges and runners should be cleaned and then lubricated with a light machine oil.

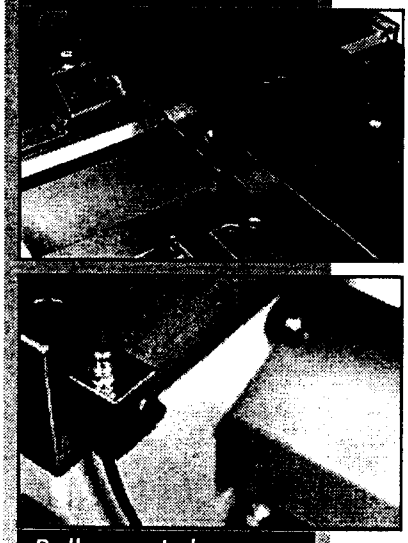
Slideways

All exposed slideways should be cleaned and inspected for unnecessary wear which would possibly indicate that the lubrication system is defective, which should then be repaired as required. Oil the full length of exposed slideways before operation.

Main Drive Belt

The main drive belt tension should be checked.
Switch off mains isolator. Open end guard door and check belt deflection approximately half way between the top and the bottom pulleys. Deflection should be 8mm (5/16") for a force of 3kg (7lbs). (*Figure 9.3*)

Figure 9.4



Ballscrew Lubrication

Motor Adjustment

If adjustment is required, release the two fixing handles and use the lifting lever to apply tension to the belt before tightening the handles when required tension is achieved.

Tailstock Barrel

The tailstock barrel should be fully extended, cleaned, inspected for damage and for unnecessary wear. Lightly oil the barrel before retraction.

Ballscrews

Both X and Z Axis ballscrews should be greased using the ballnut grease nipples situated on the apron and crosslide of the machine. (*Figure 9.4*)*

** Use lubricants as described on page 9.3 - 'Lubrication Details'*

Annual (or 2000 Hours Running) Requirements.

All quarterly maintenance is required plus the following :-

Slideway GIB Adjustments.

Provision is provided to take up any slackness in both cross-slide and saddle movements but care should be taken not to over-tighten. We recommend that you contact our Service Department if you have the slightest doubt about undertaking this operation, since axis drive stall and/or excessive wear could result from incorrect adjustments.

Cross Slide

A taper gib strip is provided at the right-hand side of the cross slide with the thick end towards the front. (See the 'X' Axis Assembly Drawings - *Section 5.6*). Take up any slack as follows:-

1. Back-off rear adjusting screw, say 1/8 turn.
2. Tighten front screw to lock strip in new position.
3. Check for consistent sliding condition over full length of cross slide travel.

Saddle

There are two methods used for tightening the saddle gib strips.

Front Adjusters:
The front of the saddle uses a taper gib strip similar to the cross slide with the thick end located at the right hand side. Take up the slack as follows:

1. Back-off left hand adjusting screw, say 1/8 turn.
2. Tighten right hand screw to lock strip in new position.
3. Check for consistent sliding condition over full length of travel.

Rear Adjusters:
The rear of the saddle uses two plates located underneath attached via two bolts. Take up the slack as follows:

1. Release the socket head screw.
2. Slightly turn the slotted head sleeve anti-clockwise.
3. Re-clamp the cap screw.
4. Check for consistent sliding condition over full length of travel.

** Use lubricants as described on page 9.3 - 'Lubrication Details'*

Annual (or 2000 Hours Running) Requirements.

Machine Levelling

Check machine levels as per the installation instructions and make adjustments if necessary.

Alignment Checks

Check machine alignments as per the installation instructions but note that adjustment for headstock alignments must not be undertaken without first establishing that transverse and longitudinal levelling is within specification.

Axis Drive Belts

Check tension and adjust if necessary.

Maintenance Log Sheets

Machine Type: _____

Serial No: _____ Commission Date: _____

Year One

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Two

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Three

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

* - A tick here should indicate confirmation of 12 off, weekly maintenance procedures, performed regularly during the period in question.

** - A tick here should indicate confirmation of 4 off, quarterly maintenance procedures.

Maintenance Log Sheets

Machine Type: _____

Serial No: _____ Commission Date: _____

Year Four

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Five

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Six

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

* - A tick here should indicate confirmation of 12 off, weekly maintenance procedures, performed regularly during the period in question.

** - A tick here should indicate confirmation of 4 off, quarterly maintenance procedures.

Maintenance Log Sheets

Machine Type: _____

Serial No: _____ Commission Date: _____

Year Seven

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Eight

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

Year Nine

Quarterly Maintenance	1st Quarter Tick	Sign/Date	2nd Quarter Tick	Sign/Date	3rd Quarter Tick	Sign/Date	4th Quarter Tick	Sign/Date	Annual Maintenance	Year Tick	Sign/Date
Weekly Routines*									Quarterly Routines**		
Coolant									Check Alignments		
Oil Guards									Check Gib Strip		
Oil Slideways									Check Levelling		
Main Belt Check									Check Axis Belts		
Oil Tailstock											
Grease Ballscrews											

* - A tick here should indicate confirmation of 12 off, weekly maintenance procedures, performed regularly during the period in question.

** - A tick here should indicate confirmation of 4 off, quarterly maintenance procedures.

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