

STARMILL P.C. (ATC)

A
3 AXIS C.N.C.
BENCH MILLING
MACHINE



DENFORD

COMPUTERISED MACHINES AND SYSTEMS

STARMILL P. C. (ATC)

STARMILL P.C. is programmed using I.S.O. format, with the facility for proving the program using 2D or FULL 3D COLOUR TOOLPATH GRAPHICS. The software incorporates all the major functions and facilities used on industrial controllers, with a further option of linking to CAD/CAM and flexible manufacturing systems.

CONTROL SOFTWARE FEATURES

1. Industrial Format Programming through either DESK-TOP TUTOR or computer QWERTY keyboard.
2. Simultaneous 3 Axes Continuous Path eliminating dwells between program blocks.
3. MDI Programming Facility.
4. Circular and Linear Interpolation.
5. Programming format choice available from 1 of 2 Industrial Keypads.
6. Imperial or Metric Programming.
7. Subprogram with Repeat Facility/Program Call.
8. Combined use of Absolute or Incremental within same block.*
9. Tool Radius Compensation.
10. Circular and Rectangular Pocket Milling.
11. Peck Drilling Cycles.
12. Slot Milling Cycles.*
13. Q Parameter Programming.*
14. Manual and programmable machine stops.
15. Datum shift.
16. Tool length offsets for up to 32 tools.
17. Programming by use of Polar or Cartesian Co-ordinates.*
18. Programmable Dwell.
19. Optional Auxiliary Inputs & Outputs.
20. Output to printer or punch tape.
21. Program verification via Dry Run Facility.
22. Mirror Imaging.
23. Full G and M code listings with Context Sensitive Help.
24. Single Block or Auto Execution.
25. Comprehensive Toolpath Graphics including 2D and 3D Colour Simulation, Toolpath Plot and Machining Process Simulation with Tool Animation.
26. Zoomed or Sectioned Views with Rotation.
27. Directory Listing.
28. Program Merging facility.
29. Block Skip Function.
30. Block Search facility.
31. Full Edit mode allowing Alter, Delete, Insert.
32. Programs stored on Floppy or Hard Drive.
33. Editor Memory 64K.
34. Control can be integrated into Local Area Networks allowing access to shared/group program data.
35. Control text can be loaded into word processor for translation into different languages.
36. Automatic Error Checking with messages.
37. Cycle start, feed hold.
38. Continuous and Incremental Jog Modes with variable feedrates.
39. Screen Axis Display gives Absolute or Distance To Go Values.
40. Drip Feed facility from File Format Data.
41. Programmable Spindle Speeds 0-3000 r.p.m.
42. Spindle Speed Override 50-120%.
43. Programmable Feedrate 0-1000 mm/min. (0-500 mm/min on Z axis).
44. Feedrate Override 0-150%.

N.B. * FEATURES ONLY AVAILABLE WITH HEIDENHAIN CONTROL EMULATION.

ATC

Starmill can be ordered with a 3 station automatic toolchanger and optional tooling packages.

STANDARD EQUIPMENT

CNC software for selected P.C., RS232C Link, Installation - Maintenance and Instruction Manual, Spare Parts List, Maintenance Tools and Table Guard.

SAFETY FEATURES

Key Operated Emergency Stop Button, Tool Path Graphics to verify programs prior to machining. Automatic Tool Retraction and Spindle Stop for Tool change, Electronic Shear Pin built into spindle controller.

MECHANICAL

Working Table Surface	360 x 130 mm (14" x 5 1/8")
Longitudinal Travel (X)	160 mm (6 1/4")
Cross Travel (Y)	90 mm (3 1/2")
Head Travel (Z)	115 mm (4 1/2")
Spindle to Table	180 mm (7 1/8")
Spindle to Column	110 mm (4 3/8")
Spindle Taper (fitted with Quick Change Holder)	R8
Spindle Taper when ATC fitted	I.S.O.35
2 Tee Slots	10 mm width 50 mm centres
Z Axis Ballscrew	16 mm dia. x 5 mm Pitch
X Axis Ballscrew	10 mm dia. x 4 mm Pitch
Y Axis Ballscrew	10 mm dia. x 4 mm Pitch
Max. Machine Length	875 mm (34 1/2")
Max. Machine Width	800 mm (31 1/2")
Height	800 mm (31 1/2")
Weight (net) STD	170 kg (375 lbs)
System Resolution	0.01 mm (0.0004")

ELECTRICAL

Mains Supply
50/60 Hz - 1 phase 220/240 Volts. 8 AMP
Spindle Motor:
Varispeed 1/2 H.P. 180V DC. .2 kw.
Axes Motors:
Stepper Motors - 200 steps/rev.

EXTRA EQUIPMENT

Totally Enclosed Interlocked Guarding, Spray Mist Coolant, Quick Change Tooling, Printer, CAD/CAM and additional off line Computer Programming packages for extra micros, link to Robot and Pneumatic Vice, for interface with Denford FMS.

CAD/CAM SOFTWARE

For IBM PC - 100% Compatibles
- AutoCAD, AutoSKETCH.
- Mill CAM Designer
- Industrial 3D CAM System

IS DRIVEN

BY DIRECT

NUMERICAL

CONTROL (D.N.C.)

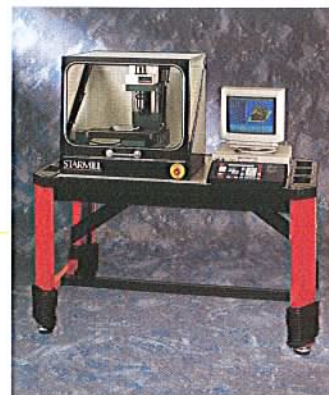
FROM

AN EXTERNAL

MICRO-

COMPUTER

AUTOMATIC TOOL CHANGER AVAILABLE



DENFORD MACHINE TOOLS LTD,
BIRDS ROYD, BRIGHOUSE
WEST YORKSHIRE, HD6 1NB
TELEPHONE: 0484 712264
TELEX: 517478 FAX: 0484 722160

Denford reserve the right to alter machine designs and specifications without prior notice.

N.B. The A.T.C., totally enclosed guarding, micro computer and bench shown on this leaflet are all optional extra equipment.

DENFORD

COMPUTERISED MACHINES AND SYSTEMS

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BENCH MILLING

MACHINE



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COMPUTERISED MACHINES AND SYSTEMS

STARMILL (ATC)

STARMILL is programmed using I.S.O. format, with the facility for proving the programme using TOOL PATH GRAPHICS and the software incorporates all the major functions and facilities used on industrial controllers, with a further option of linking to CAD/CAM and flexible manufacturing systems.

GENERAL SPECIFICATIONS

SOFTWARE

1. Runs on BBC B+, BBC MASTER, Nimbus Pc, IBM and 100% compatible computers. BBC Econet and Novell network compatible.
2. Programmed using I.S.O. format using G and M codes.
3. Tool Path Graphics with Component Scale Facility for verifying the program before machining workpiece.
4. Edit and Simulate capability with full error correction.
5. Line by line input of programs with immediate tool path plot.
6. Context sensitive help always available.
7. RS232C interface, for DNC link to computers.
8. Link up from computer to printers, plotters and punch tape readers.
9. Axis jog in all the axes with fast feed rate and .01 mm jog.
10. Programmable feed rate 0-1000 mm/min.
11. Rapid traverse at 1000 mm/min.
12. Programmable spindle speed 50-3300 rpm.
13. 3 Axes linear interpolation with vectorially correcting feedrates.
14. Circular interpolation on any two axes.
15. Manual and programmable stop.
16. Nested Repeat facility allowing for build up of subroutines and do-loops for drilling, pocket milling, slotting and pecking cycles.
17. Mirror Imaging on XY planes simultaneously.
18. Program scaling and component scaling 0.01% to 650%.
19. Programmable offsets.
20. Absolute, Incremental inch, mm programming allowing for mixing.
21. Tool length offsets for up to 10 tools.
22. Programmable Dwell (0-9999) sec.
23. 2 programmable inputs and 2 outputs for communication with external equipment (Robots, FMS etc.)
24. Two way scroll CNC editor with help screen.
25. Full edit facilities include add, delete, insert, help and insertion of comments.
26. Interactive training lessons.
27. 500 to 5000 Block memory, dependent on computer type.
28. Single step and auto execution.
29. System Resolution 0.01 mm (0.0004").

ATC

Starmill can be ordered with a 3 station automatic toolchanger and optional tooling packages.

STANDARD EQUIPMENT

CNC software for selected P.C., RS232C Link, Quick Change Master Holder (when ordered without ATC), Installation - Maintenance and Instruction Manual, Spare Parts List, Maintenance Tools, Table Guard and Woven Nylon Cover.

SAFETY FEATURES

Key operated Emergency Stop Button, Power on indicator, Axes limit switches - Adjustable on Z axis, Diagnostic Fault Finder, Tool Path Graphics to verify programs prior to machining, Automatic Tool Retraction and Spindle Stop for Tool change, Electronic Shear Key built into spindle controller.

MECHANICAL

Working Table Surface	360 × 130 mm (14" × 5 $\frac{1}{8}$ ")
Longitudinal Travel	170 mm (6 $\frac{3}{4}$ ")
Cross Travel	90 mm (3 $\frac{1}{2}$ ")
Head Travel	115 mm (4 $\frac{1}{2}$ ")
Spindle to Table	180 mm (7 $\frac{1}{8}$ ")
Spindle to Column	110 mm (4 $\frac{1}{2}$ ")
Spindle Taper (fitted with Quick Change Holder)	R8
Spindle Taper when ATC fitted	I.S.O. 35
Z Tee Slots	10 mm width 50 mm centres
Z Axis Ballscrew	16 mm dia. × 5 mm Pitch
X Axis Ballscrew	10 mm dia. × 4 mm Pitch
Y Axis Ballscrew	10 mm dia. × 4 mm Pitch
Max. Machine Length	875 mm (34 $\frac{1}{2}$ ")
Max. Machine Width	800 mm (31 $\frac{1}{2}$ ")
Height	800 mm (31 $\frac{1}{2}$ ")
Weight (net)	100 kg (220 lbs)
System Resolution	0.01 mm (0.0004")

ELECTRICAL

Mains Supply
50/60 Hz - 1 phase 220/240 Volts. 8 AMP
Spindle Motor:
Varispeed 1/2 H.P. 180V DC. .2 kw.
Axes Motors:
Stepper Motors 200 steps/rev.

EXTRA EQUIPMENT

Spray Mist Coolant, Quick Change Tooling, Printer, CAD/CAM and additional off line Computer Programming packages for extra micros, link to Robot and Pneumatic Vice, for interface with Denford FMS.

CAD/CAM SOFTWARE

For Nimbus, IBM P.C. and 100% compatibles.
- Auto CAD, Auto CAM.

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GENERAL SPECIFICATIONS

SOFTWARE

1. Runs on Acorn, BBC Econet, IBM and 100% compatible microcomputers and networks.
2. Programmed using I.S.O. format using G and M codes.
3. Tool Path Graphics with Component Scale Facility for verifying the programme before machining workpiece.
4. Line by line input with immediate tool path plot.
5. RS232C interface, for DNC link to computers.
6. Link up from computer to printers, plotters and punch tape readers.
7. Axis jog in all the axes with fast feed rate and .01 mm jog.
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MECHANICAL

Working Table Surface	360 x 130 mm (14" x 5 1/8")
Longitudinal Travel	170 mm (6 3/8")
Cross Travel	100 mm (4")
Head Travel	140 mm (5 1/2")
Spindle to Table	190 mm (7 1/2")
Spindle to Column	110 mm (4 3/8")
Spindle Taper (fitted with Quick Change Holder)	R8
2 Tee Slots	10 mm width 50 mm centres
Z Axis Ballscrew	16 mm dia. x 5 mm Pitch
X Axis Ballscrew	10 mm dia. x 4 mm Pitch
Y Axis Ballscrew	10 mm dia. x 4 mm Pitch
Max. Machine Length	820 mm (32 1/4")
Max. Machine Width	800 mm (31 1/2")
Height	800 mm (31 1/2")
Weight (net)	100 kg (220 lbs)
System Resolution	0.01 mm (0.0004")

ELECTRICAL

Mains Supply
50/60 Hz - 1 phase 220/240 Volts.
Spindle Motor:
Varispeed 1/2 H.P. 180V DC.
Axes Motors:
Stepper Motors 200 steps/rev.

EXTRA EQUIPMENT

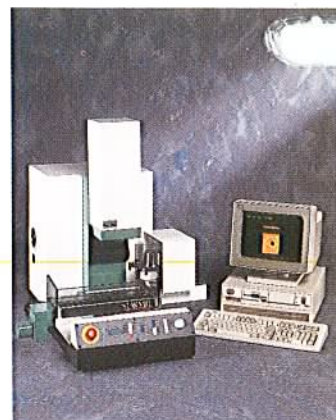
Spray Mist Coolant, Quick Change Tooling, Printer, CAD/CAM and additional off line Computer Programming packages for extra micros, link to Robot and Pneumatic Vice, for interface with Denford FMS.

CAD/CAM SOFTWARE

For IBM P.C and 100% compatibles.
- Auto CAD, Auto CAM.
For BBC computers.
- EASICAD, EASICAM - Compas Starter/Cam.
For Nimbus Computers.
- Compas Designer, Auto CAM.
- Auto CAD, Auto CAM.

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DENFORD

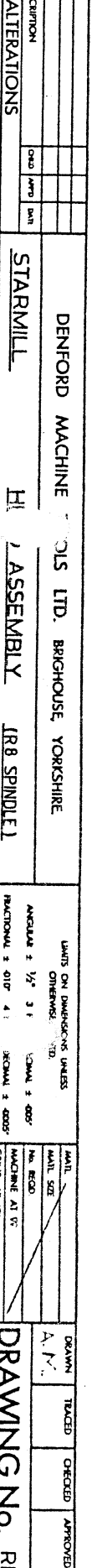
COMPUTERISED MACHINES AND SYSTEMS

STARMILL

PART LIST INDEX

HEAD	RM.1/100
BASE & CROSS SLIDE DRIVE	RM.1/200
COLUMN & HEAD DRIVE	RM.1/300
TABLE & CROSS SLIDE	RM.1/400
CABINET	RM.1/500
A.T.C.	RM.1/700

DRG. No.



DRAWN	TRACED	CHECKED	APPROVED	DATE	SIGNATURE
A. M.				12-8-86	

DRAWING NO. BM-1/100

STARMILL HEADRM.1/100

<u>PART No.</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
RM.1/101A	HEAD	1
102	SPINDLE (R8)	1
* 103	SPINDLE (No 2 MT)	1
* 104	SPINDLE (No 30 INT.)	1
105	SPINDLE PULLEY	1
106	COLLAR	1
107	GREASE COLLAR	1
108	RPM. SENSOR TRIP	1
109	R8 SPINDLE END CAP	1
* 110	30 INT. SPINDLE TENON	2
111	DRAW BAR CAP MOUNTING	1
112	DRAW BAR CAP	1
113A	HEAD COVER	1
114	RPM. SENSOR BRACKET	1
115B	HEAD GIB STRIP	1
117	GIB STRIP SCREW	1
118	GIB STRIP LOCK	1

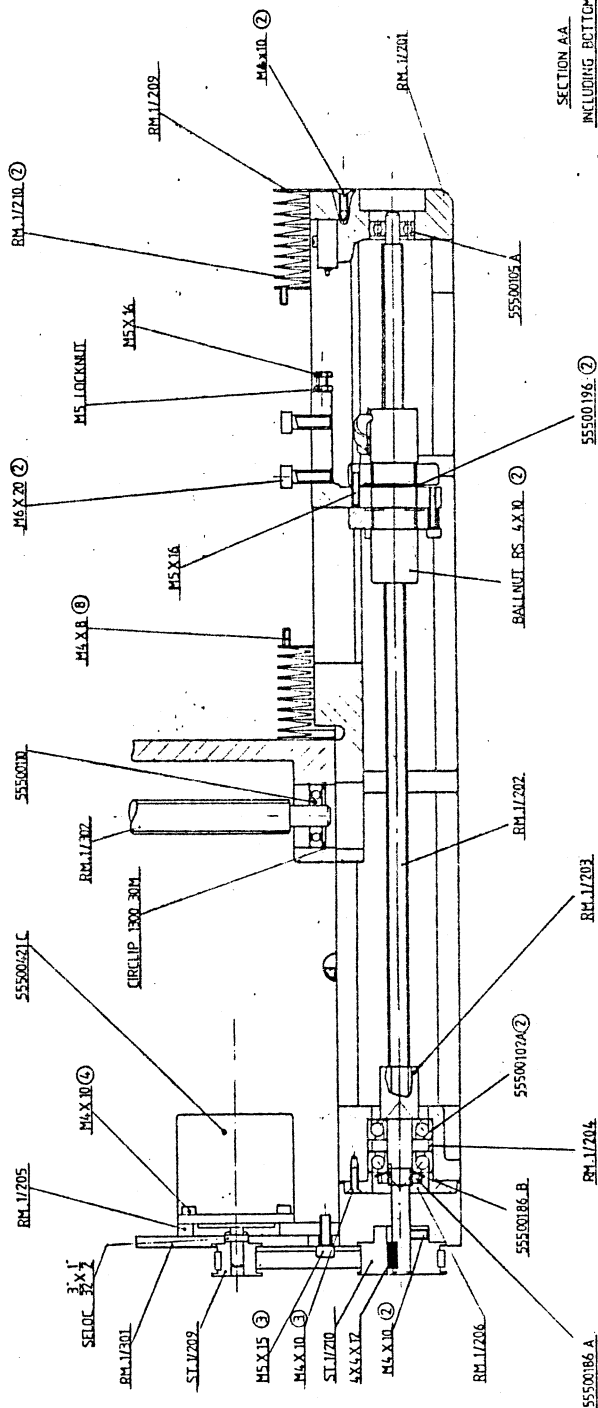
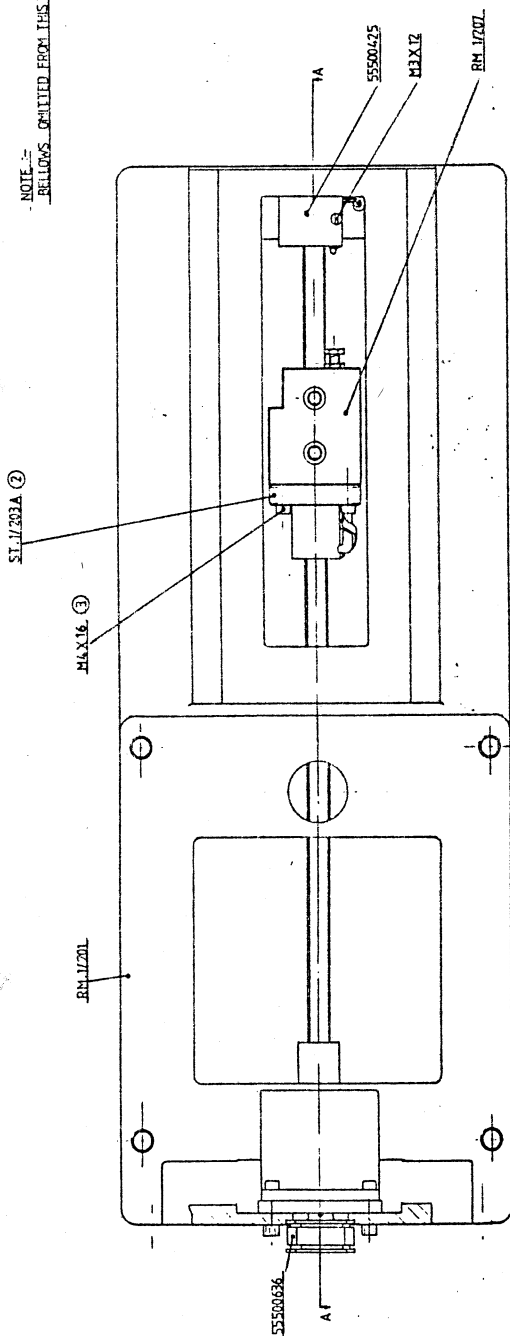
<u>DESCRIPTION</u>	<u>MANUFACTURER & REF.</u>	<u>COMPUTER No.</u>	<u>QTY.</u>
BEARING	FAG 7208 B	55500102D	2
LOCKNUT	FAG KM 8	55500186H	1
TABWASHER	FAG MB 8	55500186I	1
SENSOR	BALLUFF NJ1 58 GN	55500401A	1
DRIVE BELT	POLY 'V' 246 J6	55500628	1
OILER	LUMATIC B044	55501113	2
NYLOS RING	NYLOS 6208	55500113C	1

*

NOTE

These parts are optional alternatives

NOTE :-
BELLOWS OMITTED FROM THIS VIEW



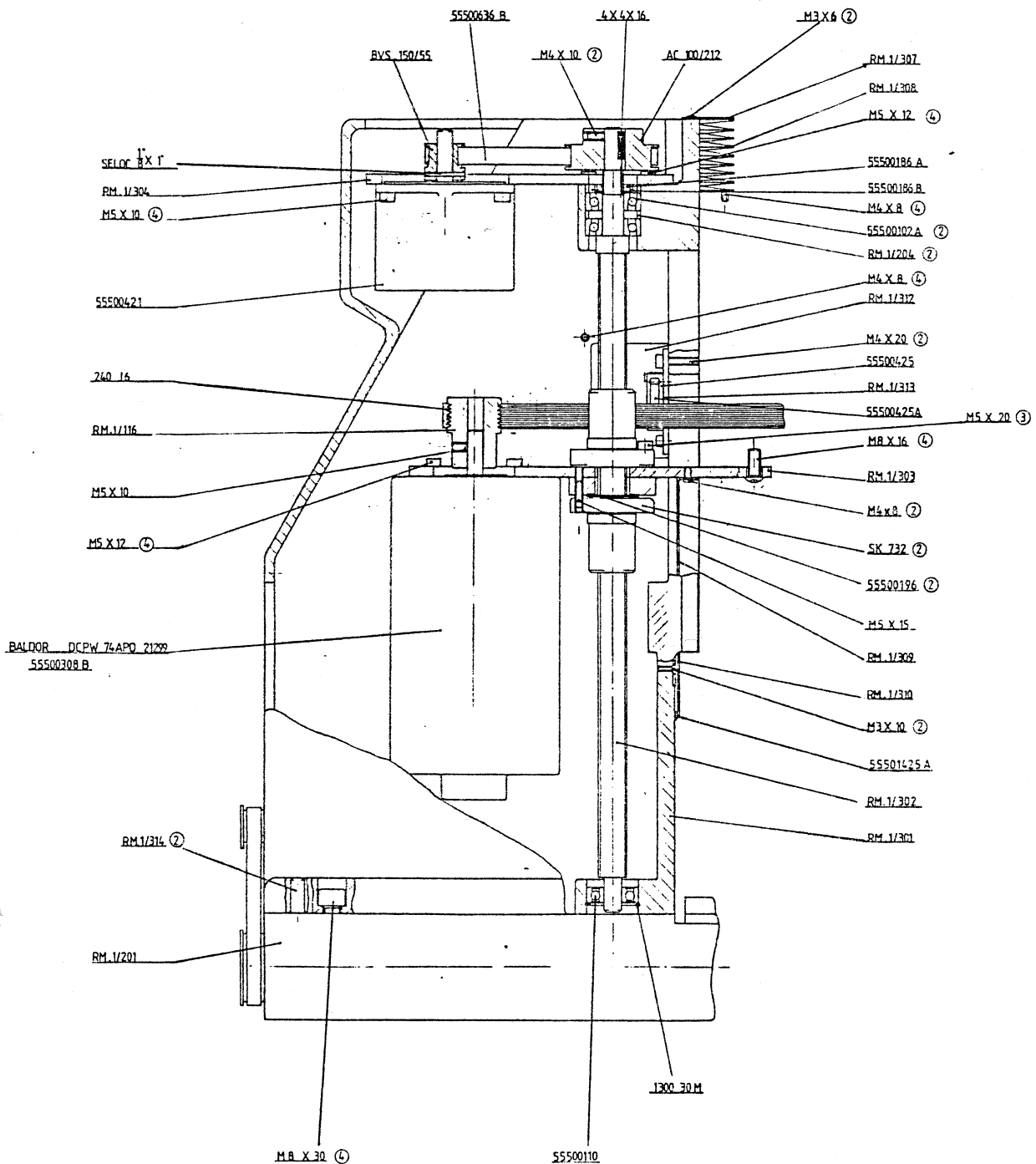
SECTION A-A
INCLUDING BOTTOM OF COLUMN

STARMILL		DENFORD		FINE TOOLS LTD. BRIGHOUSE, YORKSHIRE.		DRAUGHTSMAN: J. H. WILKINSON CHECKED: J. H. WILKINSON DATE: 2.3.55	
DRAWING NO. RM.1/200 DRAWING TRACKED: AM DATE: 16.7.82		UNITS ON DRAWINGS: MM/16 DIMENSIONS: IN/16 ANGULAR: 1° 3' PLACE DECIMAL = 005' FRACTIONAL: 1/16" PLACE DECIMAL = 0005'		MAIL SIZE: A4 MAIL: 100g MACHINE AT: 100g CARDINAL: 100g		SCALE: 1:1	
DESCRIPTION: BASE & CROSS SLIDE DRIVE ALTERNATIONS:		UNITS: 100g DATE: 16.7.82		UNITS: 100g DATE: 16.7.82		UNITS: 100g DATE: 16.7.82	

STARMILL BASE & CROSS SLIDE DRIVERM.1/200

<u>PART No.</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
RM.1/201	BASE	1
202	'Y' AXIS BALLSCREW	1
203	'Y' AXIS BALLSCREW ADAPTOR	1
204	BEARING SPACER	1
205	'Y' AXIS MOTOR PLATE	1
206	RETAINING PLATE	1
207	'Y' AXIS BALLNUT BRACKET	1
208		
209A	BASE BELLOW END PLATE	1
210	BASE BELLOW	2
211		
212		
213		
ST.1/203A	BALLNUT HOUSING	2
209	12T MOTOR PULLEY	1
210	24T PULLEY	1

<u>DESCRIPTION</u>	<u>MANUFACTURER & REF.</u>	<u>COMPUTER No.</u>	<u>QTY.</u>
BEARING	FAG 7201 B	55500102A	2
BEARING	FAG 627 2RS	55500105A	1
LOCKNUT	FAG KM1	55500186A	1
TABWASHER	FAG MB1	55500186B	1
DISC SPRING	29.7 x 17.4 x 0.40	55500196	2
STEP MOTOR	CENRONIC DYNAMICS HY-200-2220-210-A8	55500421C	1
MICROSWITCH	BURGRSS V3S	55500425	1
TIMING BELT	FENNER 100 XL 037	55500636	1
TIMING PULLEY	FENNER 24 XL 037 (ST.1/210)	55500638A	1
TIMING PULLEY	FENNER 12 XL 037 (ST.1/209)	55500640	1
BALLNUT	HO FONG RS 4 x 10		2
HINGE	SOUTHCO E6.10.301.20	55501229A	2



DRAWING NO.	DENFORD MACHINE TOOLS LTD. BARGHOUSE, YORKSHIRE.		LIMITS OF DIMENSIONS UNLESS OTHERWISE STATED		DATE	CHECKED	APPROVED	DATE	SCALE
					AUG 1 1977			23/78	
DRAWING NO.	COLUMN & HEAD DRIVE		ANGULAR 1:1 3 PLACE DECIMAL 1 60°		AM.				
	STARMILL		RATIONAL 1:1 3 PLACE DECIMAL 1 60°						
DESCRIPTION OF ALTERATIONS									

STARMILL COLUMN & HEAD DRIVERM.1/300

<u>PART No.</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
RM.1/301	COLUMN	1
302	COLUMN BALLSCREW	1
303A	SPINDLE MOTOR PLATE	1
304	'Z' AXIS MOTOR PLATE	1
305		
306	COLUMN TOP COVER	1
307	COLUMN BELLOW TOP COVER	1
308	COLUMN BELLOW	1
309	COLUMN COVER PLATE	1
310	COLUMN COVER PLATE (STATIONARY)	1
312	COLUMN SWITCH COVER	1
313	COLUMN SWITCH PLATE	1
314	DOWEL PIN	2
315	BALLNUT SUPPORT PLATE	1
116B	MOTOR PULLEY	1
204	BEARING SPACER	2
BVS.150/55	12T PULLEY	1
AC.100/212	30T PULLEY	1
SK.732	BALLNUT FLANGED 16 x 5P	2

<u>DESCRIPTION</u>	<u>MANUFACTURER & REF</u>	<u>COMPUTER No.</u>	<u>QTY.</u>
BEARING	FAG 7201 B	55500102A	2
BEARING	FAG 6200 2RS	55500110	1
LOCKNUT	FAG KM1	55500186A	1
TABWASHER	FAG MB1	55500186B	1
DC. MOTOR	BALDOR DCPM 74AH021299	55500308B	1
STEP MOTOR	CETRONIC DYNAMICS HY-200-3424-310-A8	55500421	1
MICROSWITCH	BURGESS V3S	55500425	1
MICROSWITCH ACTUATOR	BURGESS VLR 1	55500425A	1
TIMING BELT	FENNER 120 XL 037	55500636B	1
TIMING PULLEY	FENNER 30 XL 037 (AC.100/212)	55500639	1
TIMING PULLEY	FENNER 12 XL 037 (BVS.150/55)	55500640	1
WIPER	A-6 x 72mm long	55501425A	1
DISC SPRING	29.7 x 17.4 x 0.40	55500196	2.

FRONT VIEW

DRG. No.

NOTE :-

BASE BELLOWS RM 1/209 &
TABLE GUARD RM 1/416
ARE OMITTED FROM THIS ARRANGMENT

SECTIONED FRONT VIEW

[illegible]

STARMILL

NOTES ON THE DISCUSSION

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<u>PART No.</u>	<u>DESCRIPTION</u>	<u>QTY.</u>
RM.1/401	CROSS SLIDE	1
402	TABLE	1
403	TABLE BALLSCREW	1
404	TABLE BALLSCREW ADAPTOR	1
405	TABLE BALLNUT HOUSING	2
406	TABLE DRIVE HOUSING	1
407	TABLE BEARING HOUSING	1
408	CROSS SLIDE GIB STRIP	1
409A	TABLE GIB STRIP	1
410	TABLE MOTOR BRACKET	1
411	TABLE SWITCH COVER PLATE	1
412	TABLE SWITCH BRACKET	1
413	TABLE BALLNUT MOUNTING	1
414		
415	CLAMP WASHER	1
416	TABLE GUARD	1
417	DATUM AND LIMIT TRIP	
118	GIB STRIP LOCK	2
117	GIB STRIP SCREW	2
TR.1/414	SWITCH PLATE	1
417	X MOTOR CONNECTION BOX	1
ST.1/209	12T MOTOR PULLEY	1
ST.1/210	24T PULLEY	1

<u>DESCRIPTION</u>	<u>MANUFACTURER & REF.</u>	<u>COMPUTER No.</u>	<u>QTY.</u>
BEARING	FAG 7201 B	55500102A	2
BEARING	FAG 627 2RS	55500105A	1
LOCKNUT	FAG KM1	55500186A	1
TABWASHER	FAG MB1	55500186B	1
STEP MOTOR	CETRONIC DYNAMICS HY-200-2220-210-A8	55500421C	1
MICROSWITCH	BURGESS V3S	55500425	1
MICROSWITCH ACTUATOR	BURGESS VLR 1	55500425A	1
TIMING BELT	FENNER 70 XL 037	55500631	1
TIMING PULLEY	FENNER 24 XL 037 (ST.1/210)	55500638A	1
TIMING PULLEY	FENNER 12 XL 037 (ST.1/209)	55500640	1
OILER	LUMATIC BO-4	55501113	2
BALLNUT	HO FONG RS 4 x 10		2
HOLE PLUG	HARMSWORTH TOWNSLEY 211-E1062-01		1

NEW STARMILL CABINET

23/1/89

RM 2/500

RM 2/501 CABINET

RM 2/502 SUPPORT PLINTH

RM 2/503A CONNECTION PANEL

RM 2/504 REAR COVER

~~RM 2/505 SUPPORT BLOCK (FREE ISSUE)~~ 2

RM 2/506 SAME BY CUT-OUTS

STARMILL CABINETRM. 1/500

PART No.	DESCRIPTION	QTY.
RM. 1/501 A	CABINET	1
502	CABINET TOP	1
503	CONTROL PANEL BACKPLATE	1
504		
505	CABINET PANEL R.H.	1
506	CABINET PANLE L.H.	1
507		
508		
509		
510		
511	CABINET PANEL ANGLE	2
512	FINGER GUARD	1
CH. 267D	SPECIFICATION PLATE	1
CH. 439A	FRONT CONTROL PANEL	1



DESCRIPTIONMANUFACTURER & REFCOMPUTER No.QTY.

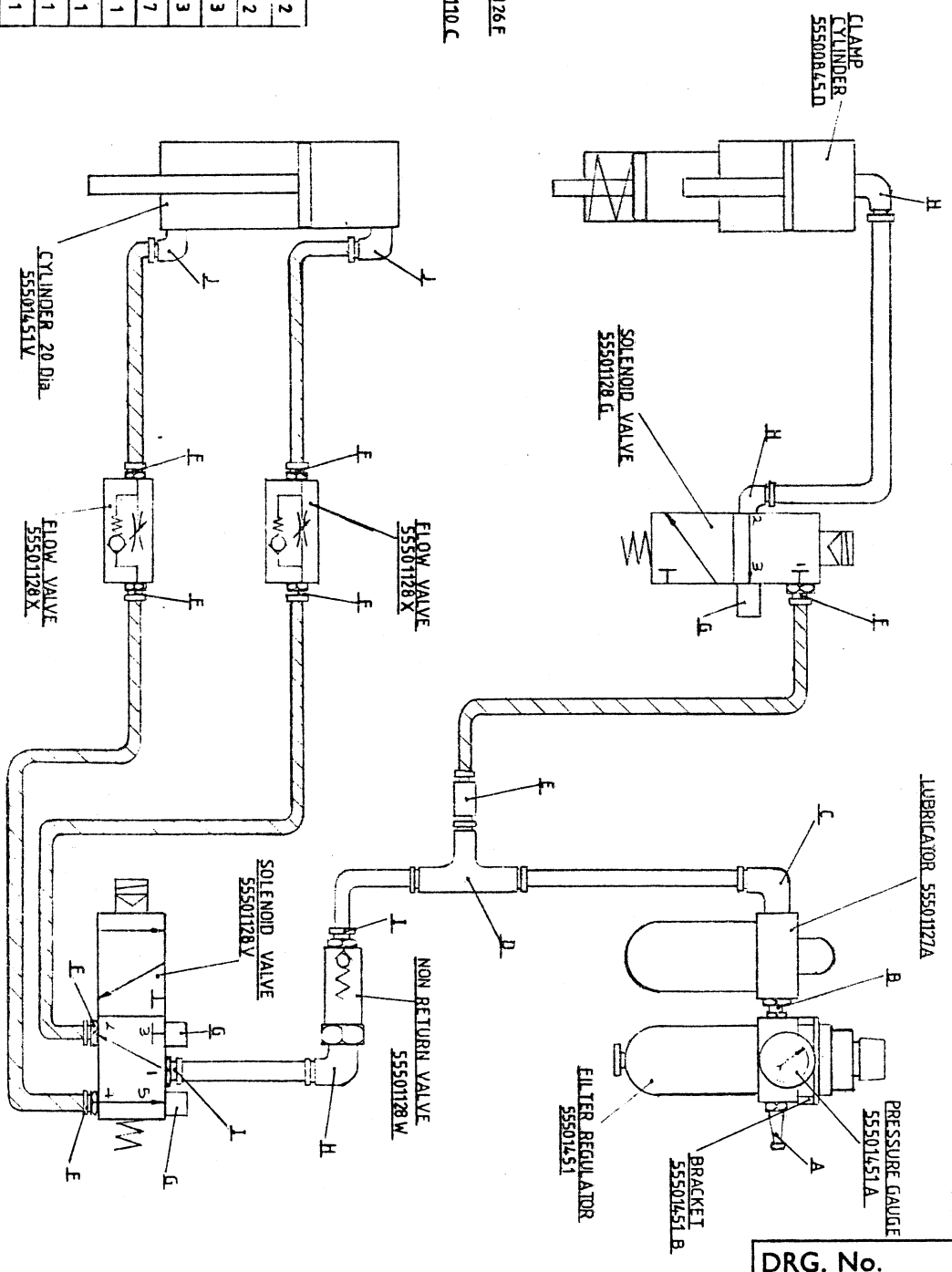
ENCLOSURE
ENCLOSURE PLATE

SAREL 8026
SAREL 5226

55500420D
55500420E

1
1

 4mm dia 55501126 F
 6mm dia 55501110 C



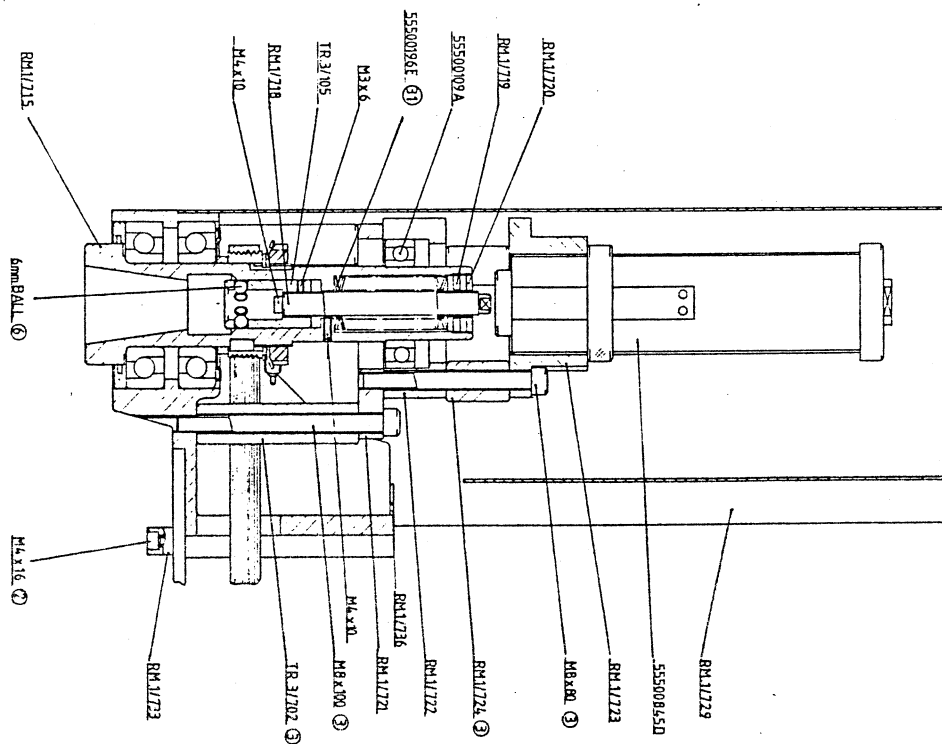
J	PUSH IN ELBOW 1/8"-4mm	55501128 B	2
I	PUSH IN ADAPTOR 1/8"-6mm	55501451 C	2
H	PUSH IN ELBOW 1/8"-6mm	55501129 H	3
G	PLASTIC SILENCER 1/8" B.S.P.	55501128 T	3
F	PUSH IN ADAPTOR 1/8"-4mm	55501128 N	7
E	REDUCER 6mm - 4mm	55501129 I	1
D	CONNECTION TEE 6mm	55501451 L	1
C	PUSH IN ELBOW 1/4"-6mm	55501451 D	1
B	REDUCER 1/4"-1/8" B.S.P.	55501128 M	1
A	HOSE ADAPTOR 1/8" B.S.P.	55501451 S	1

DESCRIPTION	COMPUTER	OFF
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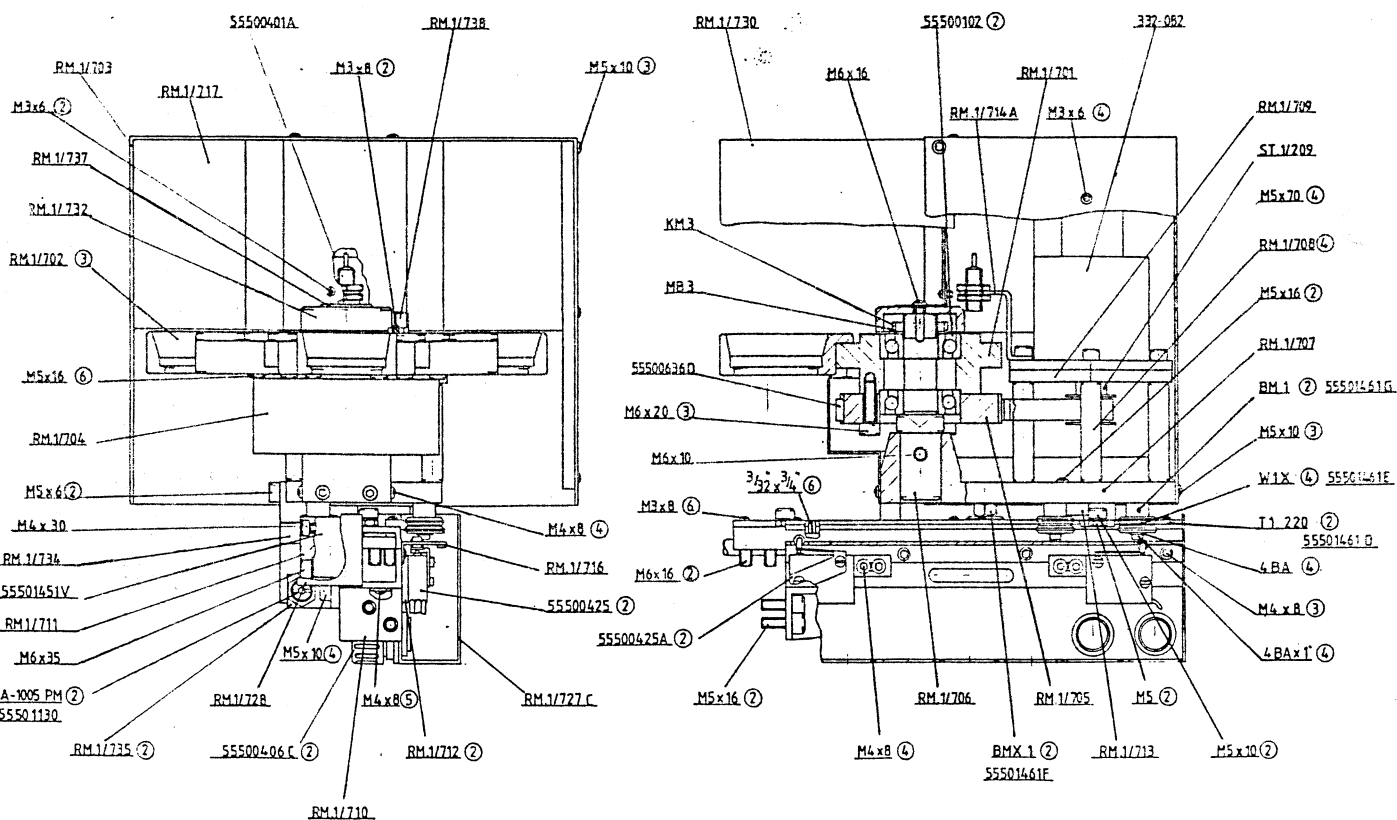
DRAWN		TRACED	CHECKED	APPROVED	DATE	SCALE
A.M.						
DRAWING No. RM 1/ 700 A						

STAR MILL A.T.C.
 PNEUMATIC LAYOUT

DRG. No.



For parts not numbered see DRG No RM 1/100



Part No.	DESCRIPTION	QTY
RM.1/701	TURRET	1
702	TOOL HOLDER	1
703A	MOTOR COVER	3
704	PULLEY COVER	1
705	TURRET PULLEY	1
706	BEARING SHAFT	1
707	CARRIAGE	1
708	SUPPORT PILLAR	1
709	MOTOR PLATE	4
710A	TRACK SUPPORT	1
711	CYLINDER SUPPORT	1
712A	MICRO SWITCH PLATE	1
713	STOP	2
714A	SENSOR PLATE	1
* 715	SPINDLE (No.35 INT.)	1
716	SWITCH GUARD	1
717	SENSOR GUARD	1
* 718	DRAW BAR	1
* 719	PRE LOAD NUT	1
720	LIMIT NUT	1
* 721	MOUNTING PLATE	1
* 722	BEARING FLANGE	1
* 723	PISTON FLANGE	1
* 724	SUPPORT PILLARS	1
725	PLUG HOOD	3
726B	PNEUMATIC MOUNTING PLATE	1
727D	TRACK GUARD	1
728	CYLINDER COVER	1
* 729	HEAD COVER	1
730	TOOL GUARD	1
731	TABLE GUARD	1
732	BEARING CAP	1
* 733		1
734	SHOCK ABSORBER BLOCK	1
735	SHOCK ADSORBER BRACKET	1
736	BELLOW SUPPORT PLATE	2
737	SENSOR GUARD LUG	1
738	SENSOR TRIP	1
739	FLOW VALVE BRACKET	1
740	CARRIAGE LEG	1
741	SHOCK ABSORBER BUSH	2
742	CONDUIT BRACKET	1
* TR.1/119	HEAD KNOCK OFF MICRO SWITCH BOX	1
* TR.3/105	DRAW BAR COLLET	1
* 702	MOUNTING PILLAR	3
		1
ST.1/209	MOTOR PULLEY 12T	1
AC.100/209	MOTOR PLATE SPACER	1

* These parts are added to HEAD ASSEMBLY RM.1/100

The following RM.1/100 parts are OMITTED

RM.1/102	SPINDLE
109	END CAP
111	DRAW BAR CAP MOUNTING
112	DRAW BAR CAP
113	HEAD COVER

DESCRIPTION	MANUFACTURER & REF	COMPUTER No.	QTY
BEARING	FAG 7203B	55500102	2
BEARING	FAG 6007 2RS	55500109A	1
LOCKNUT	FAG KM 3	55500184E	1
TABWASHER	FAG MB 3	55500184F	1
DISC SPRING	28 x 14.1 x 1.25	55500196E	31
MICRO SWITCH	BURGESS 4CR QR	55500381C	1
SENSOR	BALLUFF NJ 58 GN	55500401A	2
MICRO SWITCH	BURGESS V3S	55500425	2
ACTUATOR	BURGESS VLR 1	55500425A	2
TIMING BELT	FENNER 130XL037	55500636D	1
TIMING PULLEY	FENNER 48XL050 (RM.1/705)	55500637	1
TIMING PULLEY	FENNER 12XL037 (ST.1/209)	55500640	1
SLIDE TRACK	HEPCO T1 x 220mm	55501461D	2
SLIDE WHEEL	HEPCO WLX	55501461E	4
ADJUSTABLE BUSH	HEPCO BMX1	55501461F	2
STATIONARY BUSH	HEPCO BML	55501461G	2
STEP MOTOR	R.S. 332-082	332-082	1
STEEL BALL	6mm Dia '250'		6
NYLON 'P' CLIP	R.S. 543-377	543-377	1
SHOCK ABSORBER	ACE FA-1005 PM	55501130	2
CLAMP UNIT	BRAUER 489	55500845D	1
NYLON TUBE	6mm dia	55501110C	
NYLON TUBE	4mm dia	55501126F	
LUBRICATOR	ENOTS 104-100-MPQD	55501127A	1
PUSH IN ELBOW	ENOTS 97-1005-02	55501128B	2
SOLENOID VALVE	ENOTS 14-1135-50-240	55501128G	1
REDUCER CONNECTOR	1/8" x 1/8" M. B145148 ENOTS 36-06301	55501128H	1
PUSH IN ADAPTOR	ENOTS 97-1505-02	55501128N	7
PLASTIC SILENCER	1/8" BSP. S/S 1x10	55501128T	3
SOLENOID VALVE	ENOTS X4-1155-50-240	55501128V	1
NON RETURN VALVE	ENOTS 04-0355-00-000	55501128W	1
FLOW VALVE	ENOTS 04-0351-00-000	55501128X	2
PUSH IN ELBOW	ENOTS 97-1114-04	55501129H	3
REDUCING CON.	ENOTS 97-1517-27	55501129I	4
FILTER REGULATOR	ENOTS B06-101-AZKS	55501451	1
PRESSURE GUAGE	ENOTS 07-0131-16	55501451A	1
BRACKET	ENOTS 18-001-053	55501451B	1
PUSH IN ADAPTOR	ENOTS 97-1505-04	55501451C	2
PUSH IN ELBOW	ENOTS 97-1005-10	55501451D	1
CON. TEE	ENOTS 97-1514-042	55501451L 1128D	1
HOSE ADAPTOR	1/8" BSP. SCHRADER 8051-11	55501451S	1
CYLINDER	ENOTS 60-152-01-0160	55501451V	1