OLYMPUS

300 RANGE

CNC MACHINING CENTRE

+

BOSCH CC 220M CONTROL

INSTRUCTION MANUAL No. 5006

Wadkin

LEICESTER

OLYMPUS

300 RANGE

CNC MACHINING CENTRE

M/C No.
TEST No.

INSTRUCTION MANUAL

www.DaltonsWadkin.com

MANUFACTURERS E.C. DECLARATION OF CONFORMITY

The following machine has undergone "Conformity Assessment" and is "self" certificated in accordance with:-

Supply of Machinery (Safety) Regulations 1992
and Amendment No. 2063

COMPANY

WADKIN PLC
Green Lane Road
Leicester LE5 4PF

RESPONSIBLE PERSON

Mr R T Perks (Managing Director)

MACHINE DESCRIPTION

TYPE CNC MACHINING CENTRE

MODEL OLYMPUS

DIRECTIVES COMPLIED WITH

Supply of Machinery (Safety) Regulations 1992
Amendment No. 2063 1994
Draught Proposal CEN/TC 142
ISO 9001 Part 1

SIGNED ON BEHALF OF WADKIN PLC

.....

OPERATING INSTRUCTIONS

FOR WADKIN OLYMPUS

COMPUTERISED NUMERICALLY CONTROLLED ROUTER

WITH BOSCH CC100/120 CONTROL

Whilst every effort has been made to ensure that the information contained in this publication is accurate and up-to-date, Wadkin PLC cannot accept any responsibility for any damage that may be caused as a result of omissions or errors contained herein.

07/91

CONTENTS

SECTION 1

HEALTH & SAFETY INFORMATION

1.1 WARNING

Ensure that you fully understand the manufacturer's instruction manual and have received sufficient training in the use of this machine and the particular safety precautions to be observed.

Persons under the age of 18 years should not operate this machine except under supervision during a course of training.

BEFORE OPERATING THIS MACHINE ENSURE THAT;

All guards and fences are securely fitted and correctly set in accordance with the current Regulations.

Tooling is of correct type, securely fastened, sharp and direction of rotation is appropriate.

Please do not run cutters above manufacturers recommended spindle speeds. If you are unsure check with the manufacturer.

Correct spindle speed and feed is selected for the cutter equipment.

Loose clothing is either removed or fastened and jewellery removed.

Suitable jigs and push sticks are available for use where appropriate.

The working area is well lit, clean and unobstructed.

Extraction equipment is switched on, properly adjusted and working efficiently.

Suitable protective equipment is available, eg. goggles, ear defenders and dust mask.

WHEN SETTING, CLEANING AND MAINTAINING THIS MACHINE;

Ensure all moving parts of the machine are stationary before setting, cleaning or making adjustments.

Report immediately to a person in authority any machine malfunction or operator hazard. Do not attempt to repair the machine unless competent to do so.

Ensure all power sources are isolated before any maintenance work commences.

1.2 HEALTH AND SAFETY ADVICE

This machine is designed and constructed to the principles of safeguarding and practical guidance contained in the British Standard Codes of Practice BS 5304:1988 'Safeguarding of Machinery', BS 6854:1987 'Safeguarding Woodworking Machines' and current guidance issued by the Health and Safety Executive.

The Health and Safety at Work etc. Act 1974 places duties on designers, manufacturers and suppliers to ensure that among other things: 1. articles supplied for use at work are, so far as is reasonably practicable, safe and without risks to health during setting, use, cleaning and maintenance and 2. persons supplied with the articles are provided with adequate information about the use for which they are designed and about conditions necessary to ensure that they will be safe and without risks to health.

These duties will apply to you if you re-supply the machine by way of sale, lease, hire or hire purchase.

Persons who install this machine for use at work have a duty under the Health and Safety at Work etc. Act 1974 to ensure, so far as is reasonably practicable, that nothing about the way in which it is installed makes it unsafe or a risk to health at all times during setting, use, cleaning and maintenance, this includes such aspects as correct assembly, electrical installation, construction of enclosures, fitting of guards and exhaust ventilating equipment. When installing this machine, consideration must be given to the provision of adequate lighting and working space.

This machine is supplied complete with all necessary safeguards to enable the user to comply with Woodworking Machine Regulations 1974. Details of correct installation and use, together with guidance on fitting and proper adjustment of guards are described in the Maintenance Manual.

The Woodworking Machine Regulations place absolute legal duty on employers and employees to ensure that guards and any other safety devices are securely fitted, correctly adjusted and properly maintained.

Repairs and maintenance must only be undertaken by competent technicians. Ensure that all power supplies are isolated before maintenance work commences. Instructions for routine maintenance are included in the Maintenance Manual.

Machine operators must have received sufficient training and instructions as to the dangers arising in connection with the machine, the precautions to be observed and the requirements of the Woodworking Machines Regulations which apply, except where they work under the adequate supervision of a person who has a thorough knowledge and experience of the machine and the required safeguards.

Persons under the age of eighteen years must have successfully completed an approved course of training before operating this machine at work, unless participating in a course of training under adequate supervision. (NB:-This paragraph is only relevant to: circular sawing machines, any sawing machine fitted with a circular blade, any planing machines for surfacing which is not mechanically fed or any vertical spindle moulding machine, including routers.

Before commencing work, ensure that the tooling is set to cut in the correct direction, securely fastened, sharp and is compatible with the machine and spindle speed.

1.2.1 DUST

Wood dust can be harmful to health by inhalation and skin contact and concentrations of small dust particles in the air can form an explosive mixture. These concentrations usually occur in dust extraction equipment which may be destroyed unless explosion precautions have been taken in the design and installation of the equipment.

Employers have duties under the Factories Act 1961, The Health and Safety at Work etc. Act 1974 and the Control of Substances Hazardous to Health Regulations 1988 to control wood dust in the workplace.

Employers should carry out an adequate assessment of the possible risks to health associated with wood dust to enable a valid decision to be made about the measures necessary to control the dust. It may be necessary to provide effective exhaust appliances.

Prevention or control of wood dust exposure should, so far as is reasonably practicable, be achieved by measures OTHER than the provision of personal protective equipment.

Further information and references to practical guidance are contained in free leaflets available from the Health and Safety Executive.

1.2.2 NOISE

Noise levels can vary widely from machine to machine depending on conditions of use. Persons exposed to high noise levels, even for a short time, may experience temporary partial hearing loss and continuous exposure to a high level can result in permanent hearing damage.

www.DaltonsWadkin.com

The Woodworking Machine Regulations require employers to take reasonable practicable measures to reduce noise levels where any person is likely to be exposed to a continuous equivalent noise level of 90 dB(A), or more, over an 8 hour working day. Additionally, suitable ear protectors must be provided, maintained and worn.

Machines identified as generating unhealthy noise levels should be appropriately marked with a warning of the need to wear hearing protection and it may be necessary to designate particular areas of the workplace as 'Ear protection zones'. Suitable warning signs are specified in the Safety Signs Regulations 1980. It may be necessary to construct a suitable noise enclosure, in which case professional advice should be sought.

Further information and references to practical guidance are contained in free leaflets available from the Health and Safety Executive.

1.3 DEALING WITH CHIPS AND DUST

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to provide for the removal of chips and dust produced during its use.

The employer's attention is drawn to:

THE CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS 1988

The levels of dust emitted by a woodworking machine depends upon many factors including:

Type of operation	eg. sawing, planing, sanding
Feed speed	
Material removal	
Workpiece	eg. solid wood, MDF, chipboard
Moisture content	

The control limit of 5 mg/cubic metre has been adopted as the exposure level for hardwood dust, the recommended exposure limit for softwood dust is also 5 mg/cubic metre.

Trade associations should be able to give advice on who can carry out the necessary tests. (Wadkin may also be able to furnish this information.)

The recommended air velocity at the extraction connection point is:

18.6 M/sec - at each head

Under certain circumstances Wadkin will be able to provide information on expected emission levels, or may, given the exact specifications, determine the expected emission levels for a given machine performing on a given component.

Dust test performed on CNC Routers at Wadkin Colne show personal exposures (which are the most meaningful) of 1.4, 1.5 and 1.2 mg/m^3 for 3 woods -
Pine, MDF and Oak. These values are significantly below their relevant occupational or maximum exposure limits. (Full details of these tests can be provided by Wadkin Colne, if required.)

REFERENCES

1988 No. 1657 - The control of substances Hazardous Health Regulations 1988
ISBN 0 11 087657 1 £3.00 HMSO
- Wood Dust: Hazards and Precautions HSE
- Occupational Exposure limited
ISBN 0 11 885411 9 HMSO

ASK, IF YOU REQUIRE ANY FURTHER INFORMATION.

1.4 NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS
OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details: ('LC'Head)

Spindle number:	1	2	3	4	5	6
Speed RPM	18,000	.....	.....	.....	.....	.....
Tool dia. (mm):	..90..	.....	.....	.....	.....	.....
Cut depth (mm):	..17..	.....	.....	.....	.....	.....

Workpiece:	width		height		length
	350	*	20	*	500
	.....		.....		.....

Species/type: .....OAK.....

Moisture: ...../.....

Feed M/min: .....3000.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading ....

Noise level at operator(s) position: ..... 86 dB (A)Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 90.5 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details:	('LC'Head)	('F'Head)			
Spindle number:	1	2	3	4	5	6
Speed RPM	18,000	24,000	.....	.....	.....	.....
Tool dia. (mm):	..30..	..30..	.....	.....	.....	.....
Cut depth (mm):	..25..	..25..	.....	.....	.....	.....

Workpiece:	width		height		length
	80	*	25	*	180
	.....		.....		.....

Species/type: .....PINE.....

Moisture: ...../.....

Feed M/min: .....3.5.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading ....

Noise level at operator(s) position: ..... 87 dB (A) Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 91.7 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details: ('LC'Head) (Drill)

Spindle number:	1	2	3	4	5	6
Speed RP	18,000	3,000	.....	.....	.....	.....
Tool dia. (mm):	..12.	..3..	.....	.....	.....	.....
Cut depth (mm):	..18.	..15..	.....	.....	.....	.....

Workpiece:	width		height		length
	200	*	18	*	400
	.....		.....		.....

Species/type: .....MDF.....

Moisture: ...../.....

Feed M/min: .....4.5.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading ....

Noise level at operator(s) position: ..... 85 dB (A) Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 86.3 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

SECTION 2

SPECIFICATION

www.DaltonsWadkin.com

BASIC MACHINE

1626 Machine

Programmable movements	X axis	1950 mm	(76 in)
	Y axis	2600 mm	(102 in)
Table size (each table)		1640 x 2660 mm	(65 x 105 in)
Floor space		4315 x 5260 mm	(170 x 207 in)
Height to top of servo motor		2300 mm	(91 in)

3216 Machine

Programmable movements	X axis	3915 mm	(154 in)
	Y axis	1600 mm	(63 in)
Table size (each table)		1640 x 1640 mm	(65 x 65 in)
Floor space		6280 x 3290 mm	(247 x 130 in)
Height to top of servo motor		2655 mm	(105 in)

3226 Machine

Programmable movements	X axis	3915 mm	(154 in)
	Y axis	2600 mm	(102 in)
Table size (each table)		1640 x 2640 mm	(65 x 104 in)
Floor space		6280 x 5260 mm	(247 x 207 in)
Height to top of servo motor		2655 mm	(105 in)

All Machines

Spindle nose to table	min.	25 mm
	max.	375 mm
Feedspeeds	'X' & 'Y' axes	0-15 m/min
	'Z' axis	0- 8 m/min
Rapid traverse speeds	'X' & 'Y' axes	20 m/min
	'Z' axis	10 m/min

www.DaltonsWadkin.com

HEAD DETAILS

HEAVY DUTY HEAD

TYPE **LC**

SPINDLE SPEEDS	INFINITELY VARIABLE 1500 - 18000 RPM
SPINDLE POWER (CONTINUOUS)	3 - 9 KW (4 - 12 HP)
SPINDLE TAPER	STANDARD WADKIN 20 DEGREE INCLUDED
	OPTIONAL NO.2 MORSE TAPER
	NO.3 MORSE TAPER
AIR SUPPLY	0.56 - 0.70 CUBIC M/MIN FREE AIR AT 4 BAR
(FOR COOLING)	(20 - 25 CFM AT 60 PSI)
LUBRICATION	OILED
	1 SHOT/8 HOURS RUNNING

HIGH SPEED HEAD

TYPE **F**

SPINDLE SPEEDS	INFINITELY VARIABLE 6000 - 24000 RPM
SPINDLE POWER	(CONTINUOUS) 3 KW (4 HP)
	(INTERMITTENT) 6 KW (8 HP)
SPINDLE TAPER	STANDARD WADKIN 20 DEGREE INCLUDED
	OPTIONAL NO.2 MORSE TAPER
FAN COOLED	
LUBRICATION	OILED
	1 SHOT/8 HOURS RUNNING

TOOL CHANGE HEAD

TYPE **TC0100**

SPINDLE SPEEDS	INFINITELY VARIABLE 0 - 20000 RPM
SPINDLE POWER	7.5 KW (10 HP)
	(CONSTANT AT 8000 - 20000 RPM)
SPINDLE TAPER	BT30 ISO
LUBRICATION	GREASED FOR LIFE
	BOTH SPINDLE AND MOTOR

HIGH POWERED HEAD

TYPE **FH**

SPINDLE SPEEDS	INFINITELY VARIABLE 1500 - 24000 RPM
SPINDLE POWER	(FULL SPEED) 6 KW (8 HP)
SPINDLE TAPER	STANDARD WADKIN 20 DEGREE INCLUDED
	OPTIONAL NO.2 MORSE TAPER
FAN COOLED	
LUBRICATION	OILED
	1 SHOT/8 HOURS RUNNING

SECTION 3

DESCRIPTION

3.0 INTRODUCTION

The Wadkin OLYMPUS 300 Series routing machine is designed for accurate, high speed, continuous contouring operations on wood, plastics, non-ferrous metals and numerous other materials. The machine operates under computerised numerical control (CNC) giving optimum performance with a high level of reliability.

The machine comprises of a robust fabricated base unit, which supports a beam via two columns. The head assembly moves along the beam, left to right to make the X axis. The machine table assembly is also mounted onto the main base. Twin tables split into two parts which move together or separately. The movement of the table from back to front is known as the Y axis. The head is moved up and down by the Z axis

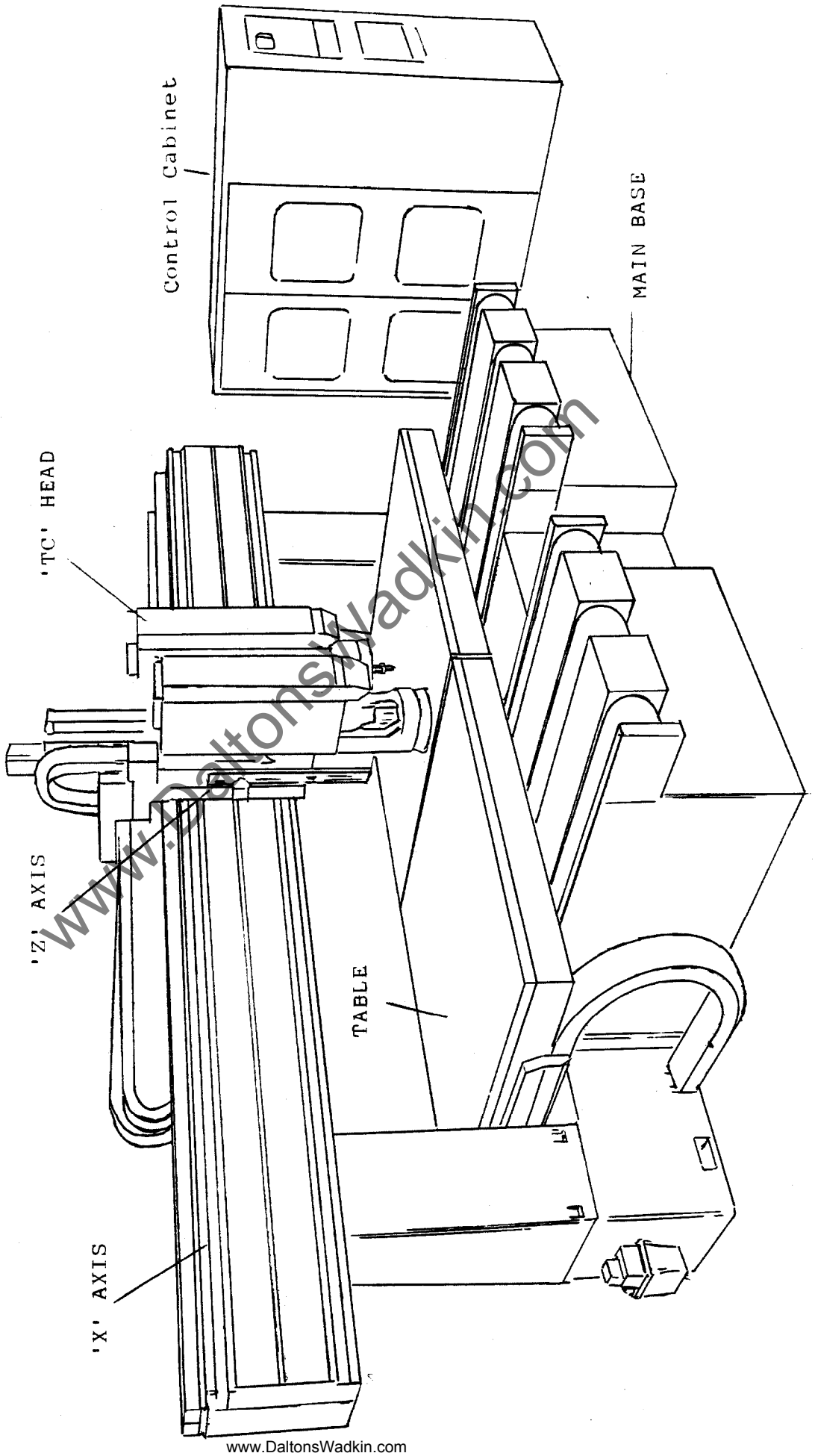


FIG. NO. 1 GENERAL VIEW OF MACHINE

3.1 MAIN BASE

The main base is a steel fabrication which is levelled by a series of jacking bolts resting on steel pads.

3.2 HEADSLIDE (Z OR E AXES)

The headslide(s) is mounted onto the front face of the gantry beam. The assembly comprises of hardened precision bars with the Z or E axis carried on linear bearings driven by a ballscrew. The slides also carry auxiliary slides for drill heads and multiple heads when fitted and is controlled by the CNC.

3.3 BEAM

This consists of a very substantial steel fabrication which carries one or more vertical axis assemblies, with various optional head configurations.

3.4 'LC' TYPE HEAD

The LC type router head has speeds ranging from 1500 - 18000 rev/min.

A forced air cooling system ensures that the router head is relatively quiet in operation and assists in maintaining low running temperatures over long periods of machining. An air pressure switch in the air supply line protects the router in the event of insufficient air flow. A solenoid valve controls the air supply such that the air flow is provided only when the router motor is switched on.

The standard head has a Wadkin 20^{o} taper bore, cutters or tool adaptors being retained in the spindle by means of a drawbolt. Parallel bore collets and special cutters as supplied by Wadkin PLC, can also be used. A spindle lock is provided to prevent spindle rotation whilst changing cutters, and a microswitch inside the router head top cover inhibits spindle operation whilst the cover is removed for tool changing purposes. A hand operated brake is provided enabling the spindle to be quickly brought to rest after being switched off.

3.5 'F' TYPE HIGH SPEED HEAD

The type 'F' fan-cooled router head has speeds ranging from 6000 - 24000 rev/min.

The standard router head has a Wadkin 20^{o} taper bore, cutters or tool adaptors being retained in the spindle by means of a chuck nut and collets. A spindle lock is provided to prevent spindle rotation whilst changing cutters and a microswitch provides an electrical interlock, switching off the inverter when the lock is operated. A hand operated brake is provided enabling the spindle to be quickly brought to rest after being switched off.

3.6 'FH' TYPE HEAD

The type 'FH' fan-cooled router head has speeds ranging from 1500 - 24000 rev/min.

The standard router head has a Wadkin 20^{o} taper bore, cutters or tool adaptors being retained in the spindle by means of a chuck nut and collets. A spindle lock is provided to prevent spindle rotation whilst changing cutters and a microswitch provides an electrical interlock, switching off the inverter when the lock is operated. A hand operated brake is provided enabling the spindle to be quickly brought to rest after being switched off.

3.7 TOOL CHANGE HEAD

This head is driven by a static inverter which provides infinitely variable speeds of 0-20000 rpm at the spindle. The power is constant from 8000-20000 rpm at 7.5 Kw (10 HP) continuously, for heavy duty machining.

The spindle bore is Machine Tool Standard ISO 30. Tools are released by a hydraulic cylinder, either from manual rapid tool-change or with the automatic tool-change option.

The motor is cooled by an electric fan.

3.8 TABLE(S)

The table(s) run on the linear way(s) in a single plan, front to back. If there are twin tables they can be moved together or independently of each other, by means of a single servo motor and clutch arrangement. This allows the machine to be adapted to pendulum load components, that is to load one stationary table, whilst machining on the other table.

3.9 AXIS DRIVES

The X, Y, Z and E axes are driven in a similar manner, by a pre-loaded high-precision recirculating ballscrew. Each ballscrew is driven by A.C. servo motor under full control of the CNC system. A ballnut attached to the axis, moves the axis linearly along its slideways as the ballscrew rotates.

3.10 PNEUMATIC SYSTEM (MULTI-HEAD MACHINE ONLY)

The headslide rise and fall cylinder is pneumatically operated. Pressurized air is routed from the connection point on the back of the gantry, via a filter, regulator and lubricator unit to a solenoid operated valve. With solenoid energised, air is routed to the upper chamber of the cylinder and the head is lowered. With the solenoid de-engerised, air is routed to the lower chamber of the cylinder, and the head is raised. All the solenoids can be found in the pneumatics cabinet mounted on the back of the beam.

3.11 'LC' HEAD AIR SUPPLY

Where the 'LC' type head is fitted, a further air supply connection point is provided for the forced air cooling system. Pressurised air is routed from the air connection point via a filter/regulator unit to valve SOL2. The solenoid is energised to provide an air supply to the router head whenever the head is running. A pressure switch provides and electrical interlock to switch off the routerhead should air supply fail, or fall below 2.8 kgf/cm (40 psi). A feedhold condition is caused if this occurs.

3.12 ELECTRICAL EQUIPMENT

The machine's electrical equipment comprises of the CNC system, axis servo drive units, router motors and inverter and associated power supplies, relays and contactors. Control of such relays and contactors is interfaced between the built in PLC via a printed circuit board with plug in connections and has LED indicators to show the current state of each output. This is an important aid to trouble shooting.

The power supply units, axis servo drive unit, fuses and control relays are mounted in the electrical cabinet.

The electrical cabinet has acrylic windows so that the output LED's can be seen and contactors etc. without opening the doors.

WARNING **ALWAYS** ISOLATE THE MACHINE BEFORE GOING INSIDE THE ELECTRICAL CABINET.

The electrical circuit diagrams for the machine are included in the UXCNC Maintenance Manual.

3.13 DRILLING HEAD(S)

Upto four drilling heads may be fitted depending on model, enabling components to be drilled as well as profiled on the same machine. The maximum size of drill shank than can be used is 13 mm diameter. Chuck capacity 12.7mm (0.5 inch) 0.85 HP, 3000 rpm.

The drill heads comprise of air motors mounted on independent slides. The drills advance lower than the router cutter and are started by a single 'M' code (see individual machine list). They are then fed into the work by the 'Z' axis which is fully programmable. This offers very accurate work.

After all holes have been drilled the unit is retracted and stopped by a single 'M' code. Fixed drilling cycles can be used with these drills, these are permanently stored in the CNC control and called up by 'G' codes.

3.14 MULTI-DRILLING HEAD

This device consists of 5 vertical spindles and one double ended horizontal spindle. The horizontal spindles, which rotate left and right handed, are located at the rear of the unit when mounted in Y axis and to the right when mounted in X. They are electrically driven and have independent control of the vertical advance by a pneumatic cylinder to each. This is controlled from the CNC program by means of electrical solenoid valves turned on by an 'M' code.

Any combination of the spindles can be selected and once advanced they are then fed into the workpiece by the Z axis. Fixed drilling cycles can be used as normal.

3.15 RIGHT ANGLE DRILL HEAD

This attachment replaces the chuck on the drill head and has a chuck mounted at 90 degrees to the drill.

This allows holes to be drilled in the edges of components.

The right-angle drill head is oeprated by the same 'M' codes as the normal drill heads (see individual machine list).

When setting the tool length for the drill, bring the drill head down to touch the workpiece witht the edge of the drill, this will give you a Z axis reading on the screen, to this reading add the radius of the cutter being used, this total value is then inserted into the 'L' column of the relevant tool store. ie. screen reading = Z-96.23, radius of cutter = 5 mm, total to enter = -101.23

To drill a hole in the side of the component make sure you clear the component by the length of the drill being used and the same applies after drill the hole and retracting.

The drilling cycle G81 cannot be used.

3.16 'M' CODE EXTENSION PACKAGE

Six sockets are provided to enable the customer to interface other equipment to the machine.

These are programmable 'on' or 'off' by 'M' codes.

110v AC o.5 amp for controlling an external relay.

Typical uses: pneumatic clamps, retractable stops, on/off initialise, conveyor or handling equipment etc.

3.17 VEINING HEAD

This is an attachment which screws onto the drill head in place of the chuck.

This unit provides an increase in speed to 18000 rpm and has a collet chuck. Used for light routing and veining, eg. veining small slots, dovetail slots, 'T' mould edge grooving with a small saw etc.

3.18 FLOATING VEINING HEAD

This device allows a veining head to be made to float from the top surface of the component. Accurate constant depth cutting is achieved where the stock is of variable thickness. A digital micrometer is used for adjustment for giving a very precise depth of cut.

3.18.1 Setting Tool Length Compensation

i) Unclamp 'A' and 'B' and slide upwards so tool can be seen and retightened.

ii) Using manual mode bring tool down to top of workpiece.

iii) Record Z axis reading and store in relevant tool store under the 'L' column as a Z- value.

iv) Leave tool touching workpiece.

3.18.2 Setting Depth of Cut

i) Unclamp 'A' and 'B' and allow bottom of 'C' to touch workpiece.

ii) Reclamp 'B'.

iii) Ensure micrometer is in centre of store.

iv) Bring 'A' down to within 1 mm of surface 'D' (top of clamp 'B').

v) Using micrometer thimble 'E' wind micrometer spindle down to touch surface 'D' (with will automatically switch mircometer on).

vi) Press zero 'J' (re reset readout).

vii) Select metric or imperial 'H'.

viii) Using 'E' wind thimble away from surface 'D' watching readout until desired depth is reached, eg. 1.2 mm.

ix) Unclamp 'B' and push up to bottom of mircometer spindle with surface 'D'.

x) Unclamp 'B' and push up to bottom of micrometer spindle with surface 'D'.

xi) Reclamp 'B', depth of cut is now set.

3.18.3 Programming

i) To ensure the veining head floats, program 'Z' 5 mm deeper than depth of cut eg. Z- 6.2

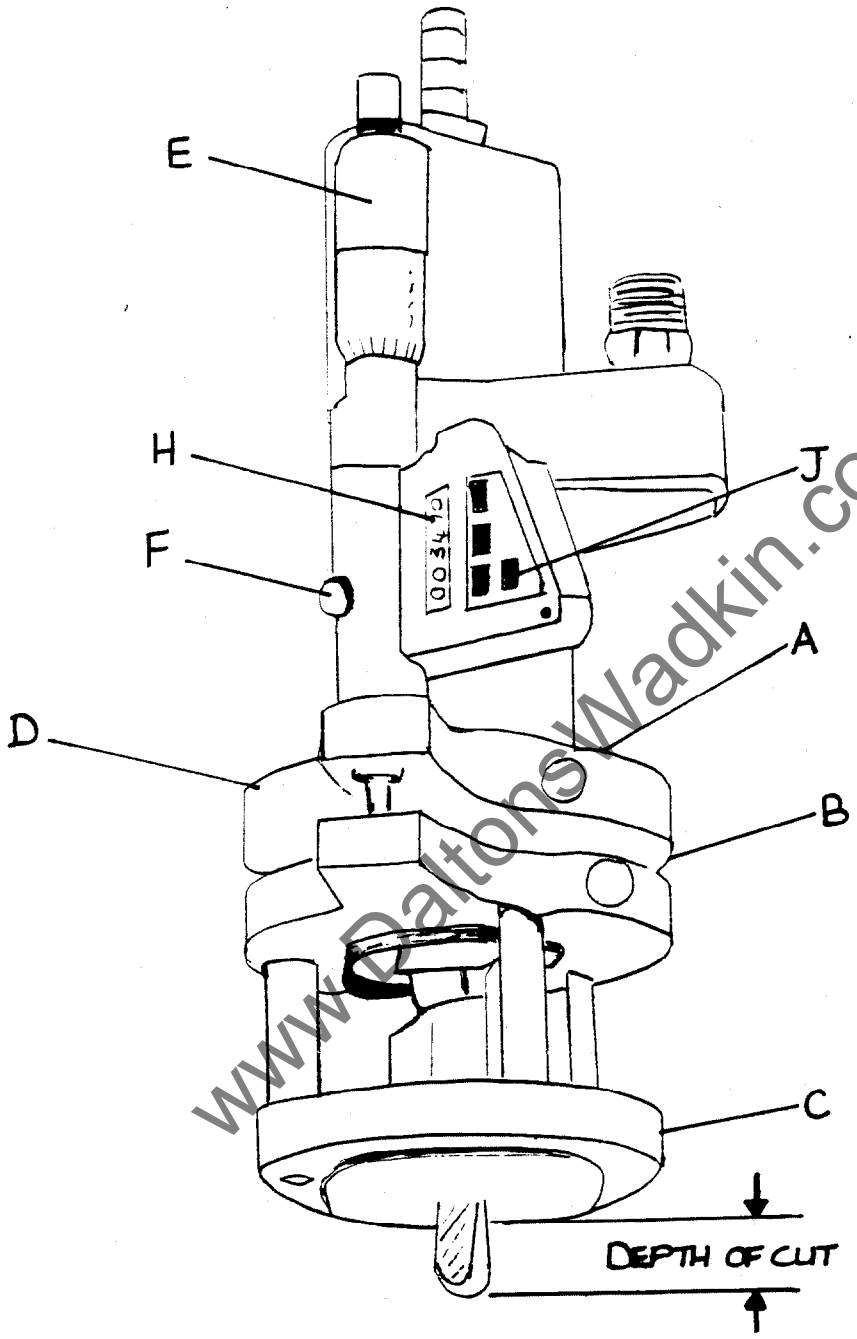


FIG. NO. 3.18a FLOATING VEINING HEAD

3.19 SUDS MIST

Consists of an atomising unit for spraying coolant to the cutter. Necessary when machining non-ferrous metal. eg. aluminium.

3.20 SERVO INDEXING SAW/ROUTER

This a complete self contained head with its own servo drive and spindle drive motors. It drives the standard saw/horizontal router unit. Any angle can be programmed by the CNC program. The head is then advanced on its own pneumatic stroke and a brake engages to ensure it cannot rotate whilst it is cutting. The unit can only be rotated whilst it is in the top position. The unit rotates in an anti-clockwise direction from E-5 to a maximum of E365. The spindle speed range of the unit is 100 r.p.m. to a maximum of 6,000 r.p.m. Zero position of the unit is with the saw parallel to the X axis at the rear of the machine, ie. its reference position. There is a built in cycle in the machine G827 (check specific machine list), for automatically offsetting the unit to the correct position.

The 'M' codes to operate the unit are generally:-

M68 - Lowers the whole unit
M69 - Raises the whole unit
M46 - Lowers the saw unit
M47 - Raises the saw unit

Note: The unit must be in its top position M47 before it can rotate.

M3 S6000 - Sets the spindle speed and clockwise rotation.
M11 - Starts the spindle
M12 - Stops the spindle

The unit can be programmed using polar co-ordinates or by using the normal X and Y co-ordinates. At each change of direction G827 must be programmed to offset the unit by the correct centres.

3.21 AUTO SCREW INSERTER HEAD

This device is used for clamping stacks of sheets together by inserting a woodscrew through previously drilled holes, into a plywood base board. After routing takes place the screws are removed to separate the component.

The device consists of a bowl mounted on the side of the machine holding the screws, this is connected via a pipe to the screw inserter. The unit is operated via 'M' codes, the standard codes are as follows:-

M90 - Bowl vibrate on
M91 - Bolw vibrate off
M92 - Inserter lower
M95 - Inserter rotate on
M96 - Inserter rotate off

Please check specific machine list for correct 'M' codes.

When programming using the inserter we must first switch bowl vibration on then inserter rotation on.

When M92 is programmed a screw is automatically fed down the pipe and screwed into the workpiece.

Different lengths of screws can be used and a stroke of the inserted can be adjusted to accommodate the lengths.

After the screw is inserted M92 will automatically retract the unit.

The vibrating bowl must be at least half full to work correctly.

3.22 TAPPING HEAD

This device is used for making threads in holes after drilling. The device has electrically controlled pitch feeding and has its own cycle once activated by an 'M' code. Depth of hole is adjusted by a depth stop contacting a proximity switch.

3.23 GROOVING SAW HEAD

This is a self contained unit with its own drive motor and manually operated indexing. Two motor sizes are available 1.7 kw or 3 kw. The output speed is 4,500 rpm. The maximum saw blade diameter is 150 mm. The spindle is 30 mm diameter. 'V' groove heads can also be mounted on this unit.

3.24 FOUR SPINDLE EDGE BORING UNIT

This is a self contained unit with its own drive motor and manually operated indexing or angular positioning. Four spindles are mounted at 90 degrees to each other. All spindles accept standard 10 mm shank boring bits or alternatively can be fitted with a small three jaw chuck Motor power is 1.7 kw and spindle speed 4,5000 rpm.

3.25 ISO 30 ARBOR

this device can be used to mount cutter heads or profile sanding disks. The spindle diameter is 30 mm and has a useable length of 60 mm. Spaces can be fitted for use with shorter cutter heads.

3.26 TWO SPINDLE HORIZONTAL ROUTER

This device has two router spindles set at 180 degrees from each other. They can be manually pre-set to different angles and have a protractor scale at 6,000 rpm for short periods of up to a maximum of 8000 rpm. Tool fixing is by locknut and collets.

3.27 EXTRACTION HOOD

All models are fitted with an extraction hood to each router head. For connection to a main or self contained vacuum extraction system, to keep the work area free from dust chippings.

3.28 VACUUM SYSTEM

The vacuum pumps provide suction for component clamping. The vacuum system is separately piped to the right and left-hand halves of the table allowing work to be clamped over either half or over the whole area.

The vacuum table is constructed of high molecular weight polyethylene and machine in a matrix pattern with pitch of 25 mm.

The vacuum system is controlled by means of push buttons on the pendant control panel. When clamping is selected, a vacuum sensing switch inhibits axis movement until sufficient vacuum is generated to hold the component securely in place. Control panel lamps indicated the current state of the system. Feedhold is forced when vacuum pressure is insufficient.

The vacuum pumps and controlling solenoid valves are located outside of the right-hand end of the table base.

A matrix patterned vacuum table is fitted as standard with vacuum option allowing components to be vacuum clamped without using special fixtures. The upper surface of the table has a pattern of grooves in to which a rubber sealing strip may be fitted to provide an efficient seal between the table and component.

Removable stops or fences can be used.

Vacuum cups can also be used.

3.29 VACUUM CUPS

These are used to minimise the number of fixtures required for parts with a reasonable surface area, for clamping by vacuum to the vacuum table. They fit into the matrix on the vacuum table and come in various sizes and heights.

Because the part is raised from the table when these are used, undercut tools and drills or any tool which has to go lower than the underside of the component, can be used without damage to the vacuum table.

SECTION 4

AUTOMATIC TOOLCHANGER

4.0 DESCRIPTION

(FOR 'TC' HEADS ONLY)

The automatic toolchanger comprises of a vertically mounted toolholding magazine with a capacity of ten tools as standard. The tool holders individually are 'links' in a chain, if more tools are required later this can be easily expanded. Whilst the machine is in cycles it is possible to program the number of the next tool that is required. The magazine rotates to bring the selected tool to the bottom position the gripper arm then removes that tool from its holder. When the command to toolchange is given, the router head raises, the gripper grabs the tool in the router head, the head releases the tool and lifts off it, the gripper arm rotates 180 degrees, the head comes down on the new tool, locks it into the spindle and the gripper arm moves away. The head can now start machining again, meanwhile the old tool is replaced in the magazine and the next tool required can then be selected and waiting for the next toolchange command.

NOTE: only use devices with the correct 'V' flange to DIN 69871 and ensure tools and holders have been accurately balanced before use. Do not use any tool holder with milled drive key slots as they will fall out of the toolchanger.

4.1 SETTING

The standard tool change carousel can hold upto 10 different tool adaptors.

These are loaded into the carousel manually by inching the carousel round with the 'inch' and 'forward' or 'reverse' buttons being pressed in at the same time.

If an adaptor contains a tool which is too large to go in the carousel, then this can be loaded manually into the head, but this tool must be unloaded manually - not returned to the carousel.

To set the tool change carousel in the correct position, in the electrical cabinet on the same side as the isolator is a small key. Open the cabinet leaving the machine switched on. Tune key, then return to the control. Go into machine mode, then MDI and key in the tool number for the position now opposite the head eg. T0006 then press cycle start. Return to the key in the cabinet and tune key back to original position. Close electrical cabinet, toolchange carousel is now set.

4.2 PROGRAMMING

The variables V70 - V79 should not be used in programs as these variables are taken up by 'M' codes for tool changing.

The tool to be placed into the head is selected by T000? ie T0001 - T0006 - T0010. The third and fourth digit after the 'T' selects the corresponding tool from the carousel. To do this through the Machine Mode of the control, select MDI then key in the required tool number eg. T0005, then press cycle start. The carousel rotates to position number five, the grippers move over and pick out T0005.

To put the tool into the router head, key in M6 and press cycle start. The head moves to the top of the slide, the grippers remove the tool presently held in the head (they carry out this procedure even if there is no tool in the head), the grippers rotate and place the new tool in the head. The grippers will then retract and replace the first tool into the correct location on the carousel. If no tool was removed, the grippers go through the motion of replacing a tool into the space vacated by the tool which has just been loaded.

So the code for tool selection is T00?? and for changing the tool is M6.

To select a tool in a program the four digit tool number is on a line of its own. The four digits comprise of the first two digits for the tool store, ie. tool radius and tool length and the next two digits for the position of the tool change carousel. Thus, if we were to select a tool in a program by:-

```
G1 X1000
T0006
Y1000
```

The 'T00' part of the tool call up will cancel the active tool length. So, to keep the current length active when calling up a new tool (assuming the correct length is in T05) then the correct call up in the program is:-

```
G1 X1000
T0506
Y1000
```

After calling for a tool to be selected (T000?) there needs to be at least 8 seconds time elapse before M6 is activated, to allow the carousel to move to the correct position and to allow the gripper to pick up the tool. This time can be either be running program time or a timed delay (eg G4 F8).

After an M6 tool change and before calling for another tool to be selected (T000?) there must be a delay of at least 6 seconds (either running program time or timed delay) to allow the grippers to replace the removed tool into its correct position in the tool change carousel. If the carousel is at the top position, the machine will not be able to move until the carousel has rotated to the correct position - thus incuring a further delay of a couple of seconds. therefore, programming from T0001 to T0006 back to T0002 to T0007 would be bad practice because the movements of the carousel itself will cause delays.

Cycle 68 resets the gripper towards the tool change carousel.

This cycle should be activated at the start of each program. (ie. G868).

When programming it is good practice to load the first tool outside the start of the program and outside a jump target eg.

```
T0001
G4 F8
M6
$99 M0
G90
G53  etc.
```

Then at the end of the program the same tool is called for again but this time the program jumps to $99 and misses the call up above $99.

```
G53 T00
G0 X1200 Y1000 Z0
T0001
G4 F8
M6
G24 P99  (Jumps back to $99 at start)
M30
```

This ensures that the correct tool is in the head at the start of the program, and after one run of the program all the tools would be in the correct sequence.

At the end of the day, shift or batch, the tool changer should be reset by keying in MDI, the code M21 and press cycle start to activate.

This will either (a) replace one tool from the gripper (b) replace second tool from the gripper; and remove and replace the tool from the head. If there is no tool in any of the above, the control jumps around the commands to the next instruction.

4.3 EMERGENCY STOP ROUTINES

'E' stop during M6 tool change when a gripper is holding a tool in the router head.

Release E Stop
Switch drives back on
Delete error message in Machine Mode, press Page out, then cycle start
M96, press cycle start (open grippers)
M79, press cycle start
M21, press cycle start

'E' stop during tool change after replacing one tool but before selecting next tool.

Release E stop
Switch drives on
Delete error message in Machine Mode, press Page out, then cycle start
M21, press cycle start

'E' stop during tool change after replacing tool and selecting next tool.

Release E stop
Switch drives on
Delete error message in Machine Mode, press Page out, then cycle start
M21, press cycle start

4.4 TEMPORARY MARKER STORES

If the air pressure or the mains voltage are switched off when there is a tool in the grippers, the grippers will open dropping the tool onto the table, possible causing damage to the tool.

To be able to tell what tools are in which positions, the control has a series of temporary marker stores allocated for this purpose.

TEMP STORE	20.0 - 20.7, 21.0, 21.1	TOOLS 1-10 in gripper A
TEMP STORE	22.0 - 22.7, 23.0, 23.1	TOOLS 1-10 IN gripper B
TEMP STORE	24.0 - 24.7, 25.0, 25.1	TOOLS 1-10 IN Router head.
TEMP STORE	28.0 - 28.7, 29.0, 29.1	TOOL CHANGE CAROUSEL 1-10 POSITIONS

To check the temporary stores go into Information Mode and then follow the next sequence by pressing the softkeys detailed:-

MACHINE STATUS
PICPLC DISPLAY
TABLES
I/O TEMP STORE

Now you should have three tables displayed on the screen headed INPUTS, OUTPUTS and TEMP STORE. Press the TEMP STORE softkey and key in 20, press enter, the temp store display will now show the area you need to check.

eg. If the tool change carousel was at position 5, Tool 9, in the router head and both grippers open, then temp store 28.4 (tool change carousel at position 5) and 25.0 (tool 9 in router head) would both be high.

4.5 ADAPTORS WHICH FIT INTO THE 'TC' HEAD

Devices not supplied by Wadkin can be used providing they meet the design criteria, but, Wadkin pullstuds MUST be used.

4.6 TOOLHOLDERS

This device is used with collets to grip tooling with straight shanks upto 25 mm diameter. Collets are available any size from 3 mm in 0.5 mm steps up to 25 mm.

SECTION 5

OPERATION

5.0 INTRODUCTION

The operating instructions given in the manual are intended as a general guide for machine operators. Specific instructions for particular workpieces should be given on the operator's worksheet normally provided with each machining program. Reference should also by made to the Bosch CC 300 User Handbook for further details of system control and operating procedures.

In accordance with good workshop practice it is important that the machine, particularly the worktable and spindle, is kept clean and free from dust and chippings. Planned preventive maintenacne is also important, in that it enables the necessary short periods of downtime to be predicted, and helps avoid the possibility of a major breakdown.

Simple daily maintenance procedures may be carried out by the operator at a convenient time (beginning and end of shift). Details of these and other maintenance procedures are given in the Maintenance manual.

This manual will cross reference to the Bosch CC300 User Handbook where appropriate, but will duplicate information where considered necessary for the convenience of the reader.

The machine is operated from a static control panel.

It should be noted that some of the options described may not be applicable to your machine.

CC 300 CONTROL PANEL

PLEASE REFER TO BOSCH CC 300 USERHANDBOOK.

5.2 STARTING UP THE MACHINE

(i) Close the main isolator, located on the left hand side of the electrical cabinet . The display will light up, automatically displaying Machine mode.

(ii) Ensure that the emergency stop buttons are reset.

(iii) An error is displayed, press cycle start, this will clear the error unless one or more of the axes is on an overtravel switch.

(iv) Press drives on/off button, (located bottom right of Manual Panel), hold for a second. The drives light will illuminate, and at the same time the inverter(s) will be activated. If axis error is still displayed, select low jog, select the axis which is on limit and jog off limit by using either the + or - key.

(v) Before referencing make sure that all the axes are away from their switches, jog off if necessary.

(vi) Press the Reference Point softkey, select each axis in tune and then press the + or - jog buttons, the machine will drive each axis to its reference switches.

(vii) Press page back key to return to first page of Machine Mode.

5.2 LOADING TOOLS ('LC' AND 'F' HEADS)

Tools are held in the router spindle by means of a chuck nut. Before changing tools the spindle must be locked by engaging the spindle lock. With the lock engaged, the spindle drive is disabled. The chuck nut can then be released using the spanner provided.

Note:- The spanner provided is designed to give the corret torque for tightening the chuck nut. Do not modify the spanner or use an extension.

WARNING

In the interest of operator safety the following points should be observed.

(i) **ALWAYS** stop the spindle before changing a tool.

(ii) **ALWAYS** engage the spindle lock before changing a tool, disengage afterwards.

(iii) **NEVER** leave the spanner on the chuck nut after changing a tool.

(iv) **ENSURE** that sufficient of the cutter shank paralled section is held in the collet, ie. that the cutter is secure.

(v) **ENSURE** that the collet and nut faces are clean and that the hardened loose insert in the collet nut can move to allow self centering of the locking taper.

5.3 LOADING TOOLS (TC HEAD)

The tools are held in special collet chucks with a ground taper which conforms to ISO 30 standards. The chucks are held into the spindle by pull stud and gripper arrangement.

If a toolchanger is fitted to the machine then tools can be changed automatically by selecting the desired tool number and activating a toolchange cycle by using M6.

5.4 STARTING UP THE SPINDLE

Ensure the cutters are balanced before carrying out the instructions.

(i) Ensure that the brake/spindle lock is in free position.

(ii) Ensure that the cutter is securely held.

(iii) Select M.D.I. (Manual Data Input)

(iv) Key in **M3** and press ENTER and then key in the spindle speed you wish to run at ie. S18000 (18000 rpm) and press ENTER again..

(v) Press CYCLE START to activate the spindle speed.

(vi) Now select the head you wish to start, ie. key in M17 and press ENTER, this starts the left hand head or single router head, M18 starts the right hand router head. Press CYCLE START to activate the code.

A similar method for starting the head(s) is by having the able steps in the form of a program, Run in Automatic Mode.

EXAMPLE PROGRAM TO RUN HEAD ONE UPTO 24,000 rpm.

```
N 1   M3 S24000
N 2   G4 F1
N 3   M17
N 4   G4 F5
N 5   M30
```

Note:- G4 F, is a dwell for 'x' number of seconds.

5.5 STOPPING THE SPINDLE

There are three codes which will stop the heads.

M10 - Stops heads
M5 - Stops spindle
M3 S0 - Stops spindle

These codes can either be keyed in in MDI or Machine Mode and activated by pressing CYCLE START.

5.6 STARTING THE VACUUM PUMP(S)

This can be done by programming M50/M52 in the program, executing M50/M52 in MDI and pressing cycle start.

5.7 SETTING VACUUM SYSTEM PRESSURE SWITCHES (where applicable)

ADJUSTING SCREW

RED POINTER

The vacuum system pressure switches are set up to an average value before despatch to the customer. If porus materials are to be clamped, it may be necessary to adjust the switches as described below.

The switches are located in the pneumatic cabinet at the rear of the gantry beam. Switch P1 controls the left-hand half of the clamping system, and P2 the right-hand half.

To determine whether the switches require adjustment, proceed as follows:-

(i) Place the component on the vacuum table or fixture (left or right-hand side as required) and press the vacuum 'On' button and the appropriate clamp 'On' button.

(ii) If the component is securely held but the clamp 'On' button is not illuminated and a feedhold condition exists, the pressure switch(es) should be adjusted as given below.

(iii) Open the pneumatic cabinet at the rear of the gantry beam and identify the relevant pressure switch P1 or P2. Remove the switch cover.

(iv) Check pressure shown on gauge (mounted in machines top guard).

(v) Adjust screw on pressure switch so that the red arrow points to slightly less than gauge reading. Green light should now be illuminated and feedhold condition cleared.

(vi) Repeat above procedure for other half of table if required.

NOTE: Factory setting is normally 9"Hg.

5.8 TURNING ON THE VACUUM TABLE (CLAMP)

This can be done by programming M54/M56 in the program, executing M54/M56 in MDI and pressing cycle start or by pressing the appropriate button on the Manual Panel function keys or in some cases buttons on the front of the machine table.

5.9 TURNING OFF THE VACUUM TABLE (UNCLAMP)

This can be done by programming M55/M57 in the program, executing M55/M57 in MDI and pressing cycle start, in some cases buttons on the front of the machine table.

5.10 STOPPING THE VACUUM PUMP

This can be done by programming M51/M53 in the program, executing M53/M55 in MDI and pressing cycle start.

5.11 SELECTING AND RUNNING A PROGRAM

Select the Automatic mode, then select softkey Program Selection and then Program Number. A list of programs stored will be displayed along with a program number if the desired program is not displayed press the softkey 'scroll down' until the program appears (only necessary if you don't know the program number). Select the program number required to run and press enter. The control then does a linking test to check for erros, wait until 'ready' appears on the screen.

Make sure the component is securely clamped, appropriate cutter compensation radius and tool length compensation value is entered in the correct tool store, and that the correct speed has been selected for the router heads.

Press the CYCLE START button to run the program, if this is the first run of a new tool length use the feedspeed override key to control the start of the program.

At any time during the cycle the feedhold button (CYCLE STOP) can be pressed to stop the axis movement.

5.11 SETTING A TOOL LENGTH USING TOOL STORE

When a program has been written it will contain at least one tool number (eg. H01), which is used to activate the tool length compensation. Before the program can be executed a datum must be set for the tool/tools being used in the appropriate tool store number.

The following procedure must be followed for the tool length to be activated accurately.

(i) Secure the desired tool(s) in the router/drill head(s).

(ii) Make sure the particular workpiece is vacuumed/clamped down.

(iii) If necessary lower the head/drill down on its pneumatic slide (this is done by the use of a 'M' code, see machine list)

(iv) Wind the head down, using the handwheel on the manual panel, until the tool is just touching the top of the workpiece.

(v) On the screen will be a value for the tool length displayed as a Z axis reading.

(vi) To ensure that this is the correct figure, select M.D.I. and key in the following commands pressing cycle start after each:-

G53 H00
G92

The correct figure will now be displayed as all offsets have been cancelled.

(vii) Activate the following keys to store the tool length value:-

a) Page out once,
b) Compensation mode
c) Tool Comp tables
d) Edit Tool Comp.
e) Active Table Yes/No

(viii) This brings up the tool radius store page with a list of tools from 1 to 48. There are two columns for each tool store.

ie. D1 X=0.000

X = Tool radius

To insert the tool length value, select the 'H' softkey. This brings up the tool length stores page with a list of tools from 1 to 48. There are two columns for each tool store.

ie. H1 Z0.000

(ix) Move the cursor across to the 'Z' column and key in the value from the Z axis reading from machine mode, and then press enter. **Make sure it is a negative (-) value.** (If a positive value is entered then the program will error as the Z axis will try to go upwards instead of downwards when the program is executed).

(x) Now page out and go back to Machine mode.

(xi) If the head/drill has been lowered via an 'M' code use the opposite code to retract the head/drill (see machine list)

(xii) To move the Z axis back to its top position, select M.D.I and key in G0 Z0 H00 and press cycle start.

The whole procedure should be repeated for all the tools/heads being used.

Note

When setting a tool length for a drill head, key in M61 in MDI (Machine mode) and press cycle start, this will stop the drill from rotating when it is in its down position. This is cancelled by M62.

5.12 SETTING A TOOL LENGTH USING ZERO SHIFTS

When a program has been written the tool lengths for the head(s) being used needs to be set.

The following procedure must be followed for the tool length to be activated accurately.

(i) Secure the desired tool(s) in the router/drill head(s).

(ii) Make sure the particular workpiece is vacuumed/clamped down.

(iii) If necessary lower the head/drill down on its pneumatic slide (this is done by the use of a 'M' code, see machine list)

(iv) Wind the head down, using the handwheel on the manual panel, until the tool is just touching the top of the workpiece.

(v) On the screen will be a value for the tool length displayed as either a Z axis or W axis reading depending on which head is being set.

(vi) To ensure that this is the correct figure, select M.D.I. and key in the following commands pressing cycle start after each:-

```
G53 H00
G92
```

The correct figure will now be displayed as all offsets have been cancelled.

(vii) Activate the following keys to store the tool length value:-

a) Page out once,
b) Compensation Mode
c) Zero offsets tables
d) Edit
e) Active Table Yes/No

(viii) This brings up the Zero shift store page with a list zero shifts G54 to G59. There are four columns for each tool store.

ie. G54 X=0 Y=0 Z=0 W=0

X = for use with the VX component reading
Y = for use with the VY component reading
Z = Tool length for Z axis head(s)
W = Tool length for W axis head(s)

These codes are for a standard machine and may vary slightly for individual machines, please check the correct codes for your heads on the machine information list supplied.

(ix) To insert the tool length value, select the appropriate zero shift store number for the head/drill being set, using the arrow keys.

Move the cursor across to the to the Z or W column and key in the value from the Z/W axis reading from machine mode, and then press enter. **Make sure it is a negative (-) value.** (If a positive value is entered then the program will error as the Z axis will try to go upwards instead of downwards when the program is executed).

(x) Now page out and go back to Machine mode.

(xi) If the head/drill has been lowered via an 'M' code use the opposite code to retract the head/drill (see machine list)

(xii) To move the Z/W axis back to its top position, select M.D.I and key in G0 Z0 W0 or and press cycle start.

The whole procedure should be repeated for all the tools/heads being used.

Note

When setting a tool length for a drill head, key in M61 in MDI (Machine mode) and press cycle start, this will stop the drill from rotating when it is in its down position. This is cancelled by M62.

5.13 STOP AND ERROR CONDITIONS

5.13.1 PROGRAM STOP

A deliberate stop of the machining program can be entered in the program as required by M0. This can allow for component changing or component to be turned over etc. Machining will be resumed by pressing cycle start.

5.13.2 ERROR CONDITIONS

Should a machine or program fault occur, the machine stops will display error in the top right corner of the VDU. To display the error page from Automatic, press Information once or twice until Message List appears, make a note of the error and the line it occurs on if it is a program error, then repress Automatic and page out, and correct the error.

5.13.3 AXIS LIMITS

Under normal conditions if a movement is programmed which would cuase an overtravel condition movment ceases and a feedhold condition is forced when the axis reaches its travel limit. A message will be on the message list in Information mode to say which axis is on overtravel, also axis error will be displayed on the VDU.

To jog off the limit, select Machine mode, low jog rate and the axis which has overtravelled and then press the + or - button.

Example:- The message list says X+ overtravel, select 'X' and press the - button, the axis will move off the limit and the error will be cleared.

The reason for the fault condition should be investigated and corrected before machining is continued. Possible causes are:-

(i) Incorrect datum setting (incorrect use of G92, Zero shifts or Variable offsets).

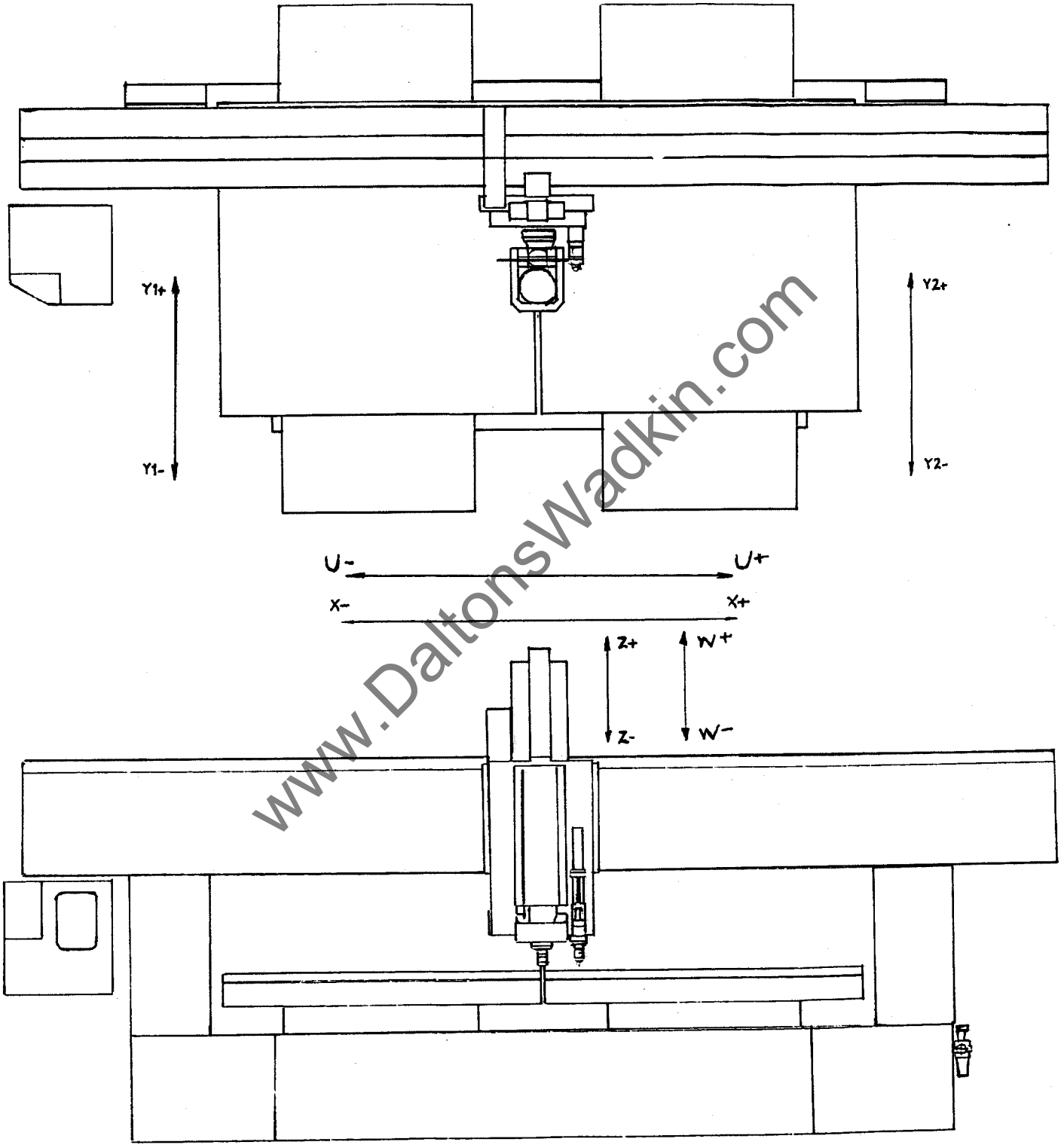
(ii) Programming error (wrong dimension).

(iii) Mirror image not cancelled or incorrectly programmed.

(iv) Incorrect programming of radius or length compensation.

SECTION 6

AUXILLARY INFORMATION



6.2 G CODES

G0 - POSITIONING AT RAPID TRAVERSE
G1 - LINEAR INTERPOLATION (WITH FEEDRATE)
G2 - CIRCULAR INTERPOLATION CLOCKWISE (WITH FEEDRATE)
G3 - CIRCULAR INTERPOLATION ANTI-CLOCKWISE (WITH FEEDRATE)
G4 - PROGRAMMED DWELL (WITH 'F' IN SECONDS)
G104 - DWELL IN REVOLUTIONS (WITH F-WORD)
G5 - CIRCULAR INTERPOLATION WITH TANGENTIAL ENTRY
G6 - ACCELERATION PROGRAMMING ON
G7 - ACCELERATION PROGRAMMING OFF
G8 - PATH SLOPE ON
G9 - PATH SLOPE OFF
G10 - AS G0, BUT WITH POLAR COORDINATES
G11 - AS G1, BUT WITH POLAR COORDINATES
G12 - AS G2, BUT WITH POLAR COORDINATES
G13 - AS G3, BUT WITH POLAR COORDINATES
G14 - KV PROGRAMMING ON
G15 - KV PROGRAMMING OFF
G16 - KV MEASUREMENT/ADJUSTMENT
G17 - PLANE SELECTION X,Y
G18 - PLANE SELECTION X,Z
G19 - PLANE SELECTION Y,Z
G20 - SELECT 2 OUT OF 6 AXES
G22 - SBP CALL UP COMP. ZS (WITH P,K,V-WORD)
G23 - CONDITIONAL JUMP (WITH L-WORD)
G24 - UNCONDITIONAL JUNP (WITH L-WORD)
G25 - MINIMUM LIMITS OF WORKING AREA
G26 - MAXIMUM LIMITS OF WORKING AREA
G125 - MINIMUM LIMITS OF PROBIHITED AREA
G126 - MAXIMUM LIMITS OF PROBIHITED AREA
G27 - CANCEL WORKING AREA LIMITATIONS
G128 - DECELERATION ON CORNERS ON
G28 - DECELERATION ON CORNERS ON
G29 - DECELERATION ON CORNERS OFF
G33 - THREAD CUTTING

G37 - POLE FOR MIRROR IMAGE AND ROTATION
G38 - PROGRAMMABLE MIRROR IMAGE, ROTATION, SCALING
G39 - CANCEL G37 AND G38
G253 - 2ND ADDITIVE ZERO SHIFT CALL UP
G40 - CUTTER PATH COMPENSATION OFF
G41 - CUTTER PATH COMPENSATION (TOOL LEFT OF CONTOUR)
G42 - CUTTER PATH COMPENSATION (TOOL RIGHT OF CONTOUR)
G140 - AXIS PARALLEL COMPNESATION OFF
G43 - AXIS PARALLEL COMPENSATION POSITIVE
G44 - AXIS PARALLEL COMPENSATION NEGATIVE
G145 - TOOL TABLE CORRECTION ON
G146 - TOOL TABLE CORRECTION OFF
G53 - CANCEL ZERO SHIFT OFFSET
G54 - G59 ZERO SHIFT CALL UP
G153 - 1ST ADDITIVE ZERO SHIFT OFF
G154 - G159 1ST ADDITIVE ZERO SHIFT CALL UP
GG254 - G259 2ND ADDITIVE ZERO SHIFT CALL UP
G60 - PROGRAMMED ZERO SHIFT ON
G61 - IN POSITION OPERATION ON
G62 - IN POSITION OPERATION OFF
G63 - SET FEEDRATE TO 100%
G64 - FEEDRATE OVERRIDE ON, WITH G41/G42 ACTIVE
G65 - FEEDRATE OVERRIDE OFF
G66 - CANCEL G63
G67 - PROGRAMMED ZERO SHIFT OFF
G68 - OUTER CORNERS AS ARC
G69 - OUTER CORNERS AS INTERSECTION
G70 - INCH PROGRAMMING
G71 - METRIC PROGRAMMING
G73 - LINEAR INTERPOLATION WITH IN POSITION OERATION
G74 - AUTOMATIC REFERENCING
G174 - REFERENCING VIA INTERMEDIATE POSITION
G274 - DRIVE AWAY FROM REFEREENCE POINT VIA INTERMEDIATE POSITION
G75 - ACTIVATE MEASURING PROBE INPUT
G76 - TRAVERSE TO MACHINE-SPECIFIC AXIS POSITION
G78 - CORRECTION AND FIXED CYCLES ON
G79 - CORRECTION AND FIXED CYCLES OFF
G80 - WORKING CYCLES OFF
G81 - G86 WORKING CYCLES CALL-UP

G90 - ABSOLUTE INPUT
G91 - INCREMENTAL INPUT
G92 - SET POSITION STORE
G192 - MINIMUM SPINDLE SPEED LIMIT
G292 - MAXIMUM SPINDLE SPEED LIMIT
G93 - TIME PROGRAMMING IN SECONDS
G94 - FEEDRATE IN MM/MIN
G95 - FEEDRATE IN MM/REV
G98 - RAPID RETRACT ON
G99 - RAPID RETRACT OFF

6.3 ADDRESSES

ADDRESS	DESCRIPTION
D	CUTTER RADIUS COMPENSATION
F	FEEDRATE IN MM/MIN OR DWELL TIME IN SECONDS)
G	'G' CODES SEE PREVIOUS LIST
H	TOOL NUMBER (H01 - H48)
L	REPETITION OF SUB-PROGRAM (1 - 99)
M	'M' CODES SEE PREVIOUS LIST
N	BLOCK NUMBER (LINE)
P	SUB-PROGRAM CALL UP NUMBER, JUMP TARGET (G24)
R	RAIUS OF ARC
S	SPINDLE SPEED
T	TOOL
U	AXIS POSITIONING
V	AXIS POSITIONING
W	AXIS POSITIONING
X	AXIS POSITIONING
Y	AXIS POSITIONING
Z	AXIS POSITIONING
W	AXIS POSITIONING

MAINTENANCE & TROUBLE SHOOTING INSTRUCTIONS

FOR WADKIN OLYMPUS

COMPUTERISED NUMERICALLY CONTROLLED ROUTER

WITH BOSCH CC 220 CONTROL

Whilst every effort has been made to ensure that the information contained in this publication is accurate and up-to-date, Wadkin PLC cannot accept any responsibility for any damage that may be caused as a result of omissions or errors contained herein.

07/91

CONTENTS

www.DaltonsWadkin.com

SECTION 1

HEALTH & SAFETY INFORMATION

BE CAREFUL

THIS MACHINE CAN BE DANGEROUS IF IMPROPERLY USED

Always Use Guards
Keep Clear Until Rotation Has Ceased

Always Operate As Instructed And In Accordance With Good Practice

Read Instruction Manual

For Replacement Parts, Tools & Accessories Contact:

Wadkin Leicester
Green Lane Works
Leicester. LE5 4PF
England
Telephone: 0533 769111
Telex: 34646 Wadkin G
Fax: 0533 742310

1.1 WARNING

Ensure that you fully understand the manufacturer's instruction manual and have received sufficient training in the use of this machine and the particular safety precautions to be observed.

Persons under the age of 18 years should not operate this machine except under supervision during a course of training.

BEFORE OPERATING THIS MACHINE ENSURE THAT;

All guards and fences are securely fitted and correctly set in accordance with the current Regulations.

Tooling is of correct type, securely fastened, sharp and direction of rotation is appropriate.

Please do not run cutters above manufacturers recommended spindle speeds. If you are unsure check with the manufacturer.

Correct spindle speed and feed is selected for the cutter equipment.

Loose clothing is either removed or fastened and jewellery removed.

Suitable jigs and push sticks are available for use where appropriate.

The working area is well lit, clean and unobstructed.

Extraction equipment is switched on, properly adjusted and working efficiently.

Suitable protective equipment is available, eg. goggles, ear defenders and dust mask.

WHEN SETTING, CLEANING AND MAINTAINING THIS MACHINE;

Ensure all moving parts of the machine are stationary before setting, cleaning or making adjustments.

Report immediately to a person in authority any machine malfunction or operator hazard. Do not attempt to repair the machine unless competent to do so.

Ensure all power sources are isolated before any maintenance work commences.

1.2 HEALTH AND SAFETY ADVICE

This machine is designed and constructed to the principles of safeguarding and practical guidance contained in the British Standard Codes of Practice BS 5304:1988 'Safeguarding of Machinery', BS 6854:1987 'Safeguarding Woodworking Machines' and current guidance issued by the Health and Safety Executive.

The Health and Safety at Work etc. Act 1974 places duties on designers, manufacturers and suppliers to ensure that among other things: 1. articles supplied for use at work are, so far as is reasonably practicable, safe and without risks to health during setting, use, cleaning and maintenance and 2. persons supplied with the articles are provided with adequate information about the use for which they are designed and about conditions necessary to ensure that they will be safe and without risks to health.

These duties will apply to you if you re-supply the machine by way of sale, lease, hire or hire purchase.

Persons who install this machine for use at work have a duty under the Health and Safety at Work etc. Act 1974 to ensure, so far as is reasonably practicable, that nothing about the way in which it is installed makes it unsafe or a risk to health at all times during setting, use, cleaning and maintenance, this includes such aspects as correct assembly, electrical installation, construction of enclosures, fitting of guards and exhaust ventilating equipment. When installing this machine, consideration must be given to the provision of adequate lighting and working space.

This machine is supplied complete with all necessary safeguards to enable the user to comply with Woodworking Machine Regulations 1974. Details of correct installation and use, together with guidance on fitting and proper adjustment of guards are described in the Maintenance Manual.

The Woodworking Machine Regulations place absolute legal duty on employers and employees to ensure that guards and any other safety devices are securely fitted, correctly adjusted and properly maintained.

Repairs and maintenance must only be undertaken by competent technicians. Ensure that all power supplies are isolated before maintenance work commences. Instructions for routine maintenance are included in the Maintenance Manual.

Machine operators must have received sufficient training and instructions as to the dangers arising in connection with the machine, the precautions to be observed and the requirements of the Woodworking Machines Regulations which apply, except where they work under the adequate supervision of a person who has a thorough knowledge and experience of the machine and the required safeguards.

Persons under the age of eighteen years must have successfully completed an approved course of training before operating this machine at work, unless participating in a course of training under adequate supervision. (NB:-This paragraph is only relevant to: circular sawing machines, any sawing machine fitted with a circular blade, any planing machines for surfacing which is not mechanically fed or any vertical spindle moulding machine, including routers.

Before commencing work, ensure that the tooling is set to cut in the correct direction, securely fastened, sharp and is compatible with the machine and spindle speed.

1.2.1 DUST

Wood dust can be harmful to health by inhalation and skin contact and concentrations of small dust particles in the air can form an explosive mixture. These concentrations usually occur in dust extraction equipment which may be destroyed unless explosion precautions have been taken in the design and installation of the equipment.

Employers have duties under the Factories Act 1961, The Health and Safety at Work etc. Act 1974 and the Control of Substances Hazardous to Health Regulations 1988 to control wood dust in the workplace.

Employers should carry out an adequate assessment of the possible risks to health associated with wood dust to enable a valid decision to be made about the measures necessary to control the dust. It may be necessary to provide effective exhaust appliances.

Prevention or control of wood dust exposure should, so far as is reasonably practicable, be achieved by measures OTHER than the provision of personal protective equipment.

Further information and references to practical guidance are contained in free leaflets available from the Health and Safety Executive.

1.2.2 NOISE

Noise levels can vary widely from machine to machine depending on conditions of use. Persons exposed to high noise levels, even for a short time, may experience temporary partial hearing loss and continuous exposure to a high level can result in permanent hearing damage.

The Woodworking Machine Regulations require employers to take reasonable practicable measures to reduce noise levels where any person is likely to be exposed to a continuous equivalent noise level of 90 dB(A), or more, over an 8 hour working day. Additionally, suitable ear protectors must be provided, maintained and worn.

Machines identified as generating unhealthy noise levels should be appropriately marked with a warning of the need to wear hearing protection and it may be necessary to designate particular areas of the workplace as 'Ear protection zones'. Suitable warning signs are specified in the Safety Signs Regulations 1980. It may be necessary to construct a suitable noise enclosure, in which case professional advice should be sought.

Further information and references to practical guidance are contained in free leaflets available from the Health and Safety Executive.

1.3 DEALING WITH CHIPS AND DUST

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to provide for the removal of chips and dust produced during its use.

The employer's attention is drawn to:

THE CONTROL OF SUBSTANCES HAZARDOUS TO HEALTH REGULATIONS 1988

The levels of dust emitted by a woodworking machine depends upon many factors including:

Type of operation	eg. sawing, planing, sanding
Feed speed	
Material removal	
Workpiece	eg. solid wood, MDF, chipboard
Moisture content	

The control limit of 5 mg/cubic metre has been adopted as the exposure level for hardwood dust, the recommended exposure limit for softwood dust is also 5 mg/cubic metre.

Trade associations should be able to give advice on who can carry out the necessary tests. (Wadkin may also be able to furnish this information.)

The recommended air velocity at the extraction connection point is:

18.6 M/sec - at each head

Under certain circumstances Wadkin will be able to provide information on expected emission levels, or may, given the exact specifications, determine the expected emission levels for a given machine performing on a given component.

Dust test performed on CNC Routers at Wadkin Colne show personal exposures (which are the most meaningful) of 1.4, 1.5 and 1.2 mg/m^3 for 3 woods -
Pine, MDF and Oak. These values are significantly below their relevant occupational or maximum exposure limits. (Full details of these tests can be provided by Wadkin Colne, if required.)

REFERENCES

1988 No. 1657 - The control of substances Hazardous Health Regulations 1988
ISBN 0 11 087657 1 £3.00 HMSO
- Wood Dust: Hazards and Precautions HSE
- Occupational Exposure limited
ISBN 0 11 885411 9 HMSO

ASK, IF YOU REQUIRE ANY FURTHER INFORMATION.

1.4 NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS
OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details: ('LC'Head)

Spindle number:	1	2	3	4	5	6
Speed RPM	18,000	.....	.....	.....	.....	.....
Tool dia. (mm):	..90..	.....	.....	.....	.....	.....
Cut depth (mm):	..17..	.....	.....	.....	.....	.....

Workpiece:	width		height		length
	350	*	20	*	500
	.....		.....		.....

Species/type: .....OAK.....

Moisture: ...../.....

Feed M/min: .....3000.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading ....

Noise level at operator(s) position: ..... 86 dB (A)Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 90.5 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details: ('LC'Head)('F'Head)

Spindle number:	1	2	3	4	5	6
Speed RPM	18,000	24,000	.....	.....	.....	.....
Tool dia. (mm):	..30..	..30..	.....	.....	.....	.....
Cut depth (mm):	..25..	..25..	.....	.....	.....	.....

Workpiece:	width		height		length
	80	*	25	*	180
	.....		.....		.....

Species/type: .....PINE.....

Moisture: ...../.....

Feed M/min: .....3.5.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading ....

Noise level at operator(s) position: ..... 87 dB (A) Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 91.7 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

NOISE AT WOODWORKING MACHINES

This machine has been designed, taking into account the latest state of the art, and to the greatest extent which is reasonably practicable, to reduce the noise emission to the lowest level.

A model of this machine has been tested in accordance with the draft European standard:

ISO/DIS 7960 AIRBORNE NOISE EMITTED BY MACHINE TOOLS
OPERATING CONDITIONS FOR WOODWORKING MACHINES

Machine: UX/FLC/C3/2612 - CNC ROUTER

Tooling Details: ('LC'Head) (Drill)

Spindle number:	1	2	3	4	5	6
Speed RP	18,000	3,000	.....	.....	.....	.....
Tool dia. (mm):	..12.	..3..	.....	.....	.....	.....
Cut depth (mm):	..18.	..15..	.....	.....	.....	.....

Workpiece:	width		height		length
	200	*	18	*	400

Species/type: .....MDF.....

Moisture: ...../.....

Feed M/min: .....4.5.....

Note any other special conditions: ..... Vacuum clamping; not tandom loading.....

Noise level at operator(s) position: ..... 85 dB (A) Leq ....

Noise level at noisiest position (state where) if other than operator position: ..... 86.3 dB (A) Leq ....

The employer's attention is drawn to:

THE NOISE AT WORK REGULATIONS 1989

Under these regulations, in certain circumstances, further action will need to be taken, eg the provision of ear protectors.

Wadkin will be pleased to help with further advice.

SECTION 2

INSTALLATION

2.1 INTRODUCTION

It is normal practice for the customer to prepare the machine site, position the machine and provide the required electrical and air supplies. A foundation plan for the particular machine is provided well in advance of machine delivery.

Normally, the machine will be delivered in a partially assembled and pre-aligned state. However, certain items forming part of the machine will have been disconnected and stored separately to simplify transit Typically, the general state of the machine when delivered, will be as follows:-

(i) The table will be positioned centrally.

(ii) A tooling pack will normally be brought by the demonstrator.

The customer should contact Wadkin Colne on 0282 866717 or in the case of machines outside Great Britain, the local distributor or Wadkin office, when the machine is in position with all services connected, to arrange for a commissioning to take place. This involves a demonstrator to final level the machine and check operation and alignments, connect all cables to electrical cabinet and connect vacuum pumps. This normally takes up to half a day, this will be then followed by two days on site training. The above service is carried out free of charge for new machines. Further training can be arranged with prior notice and will be charged on an hourly basis.

2.2 FOUNDATION NOTES (refer to foundation plan)

The machine should be sited on a solid concrete floor at least 150 mm thick. The positions of the rawbolt holes and jacking points are given on the foundation drawing specific to the particular machine.

2.3 LIFTING AND POSITIONING

The machine will be lifted using suitable slings as shown on the foundation plan supplied with the machine.

Locate the machine over the required position and gently lower the machine onto the floor plates provided. Remove the lifting bars and chains. Check that the machine is approximately level ensuring that the jacking screws are not fully tightened down so that further adjustment can be made when re-assembly is completed.

Ensure machine is placed on levelling plates, (supplied).

2.4 RE-ASSEMBLY AND CONNECTION OF SERVICES

The machine should now be fully re-assembled and brought into an operational state as follows:-

(i) Ensure that all superfluous packing is removed from the machine. In the case of export machines ensure brackets securing each axis are removed.

(ii) Connect electrical supply to the main isolator in the electrical cabinet. (Cable entry is via a removable plate at the rear of the cabinet). Ensure that the machine is properly earthed.

(iii) Ensure that an earth cable is connected to the brass stud next to the isolator of at least 10 mm cross sectional area, 16 mm preferred. The maximum resistance between the machine earth and the supply earth must not exceed 0.1 OHM. Supply meaning the electrical boards connection.

2.5 FINAL LEVELLING

(This is normally carried out by Wadkin engineers).

Centralise the table with respect to both its X and Y axes and check levels.

(i) Using a 250 mm precision level, re-check the table along the Y axis adjusting the jacking screws as necessary to obtain the required accuracy.

(ii) When the correct levels are achieved, tighten the foundation bolts and re-check the levels to ensure no distortions have taken place.

(iii) Check the squareness of spindle to the table using a dial indicator maximum error over 600 mm trammel is 0.1 mm.

Switch the vacuum pumps on to observe the direction of rotation.

2.6 ELECTRICS

3 phase supply required at machine. See foundation plan for current requirements.

Earth to have a resistance of not more than 0.1 OHM between machine earth terminal and main factory earth terminal.

2.6.1 Full load current calculation

For each:-	AMPS (Full load):-
3 Kw 'F' head	8
6 Kw 'F' head	15
9 Kw 'LC' head	19
7.5 Kw 'TC' head	18
Multi-drill	3
Grooving saw	3
Four way drill	3
Sanding head	3
Basic machine	10
Vacuum pumps	
80 m3/hr	6.2
27 m3/hr	3.3

For a specific machine current load add up the values given for each head, vacuum pump(s) and basic machine and then use a diversity factor of 0.6.

Example

A machine with 2 x 3 Kw 'F' heads and twin 27 m3 vacuum pumps

2 off 'F' heads	16	
Basic machine	10	
2 off 27m3 pumps	6.6	
Total	32.6	
Diversity x 0.6	=	19.56 amps

2.7 EXTRACTION

Frequency head (each) Air volume 850M^3/hr (500 cfm) at 254 mm (10") water gauge required at extraction point, per head.

LC head (each) Air volume 1700 M^3/hr (1000 cfm) at 254 mm (10") water gauge required at extraction point, per head.

TC head (each) Air volume 850M^3M/hr (500 cfm) at 254 mm (10") water gauge required at extraction point, per head.

2.8 PNEUMATICS

Frequency head	Compressor to give 0.113 - 0.169 M^3 (4 - 6 cubic feet) free air per minute at 4.2 to 5.6 kilo per cm squared (60 to 80 psi).
LC head	Compressor to give 0.679 - 0.878 M^3 (24 - 31 cubic feet) free air per minute at 4 bar (80 psi). None lubricated.
TC head	Compressor to give .56 M^3 (5.3 cubic feet) free air per minute at 5.3 bar (80 psi).
Drill head	Approximately 0.538 M^3 (19 cubic feet) free air per minute at 5.3 bar (80 psi). Lubricated air.

Maximum demand intermittently from other equipment ie. cylinder etc. approximately - 0.114 M3/min (4 cubic feet) at 5.3 bar (80 psi).

SECTION 3

ROUTINE SERVICING

3.0 INTRODUCTION

The maintenance procedures outlined in this manual are intended as a guide to the amount of maintenance required to keep the machine in good working order. The periods stated assume single hour shift working, and should be reduced accordingly if the machine is being used on a 2 or 3 shift system. All maintenance carried out should be recorded as this enables future needs to be anticipated and maintenance practices to be modified with experience on a particular machine.

Most daily checks may be carried out by the machine operator, but all other maintenance should be performed by appropriately skilled technicians.

When carrying out maintenance or repairs, the following points should be considered.

3.0.1 All exposed pipe or hose ends should be blanked off to prevent dirt entering the system.

3.0.2 When checking for electrical faults ensure that all equipment leads and instrument probes are suitably insulated.

3.0.3 When carrying out major repairs or dismantling ensure that the machine is isolated from the electrical supply. If possible remove the main fuses, so that the machine cannot be switched on inadvertently.

3.0.4 Always keep the doors of cabinets containing electrical equipment closed to prevent the ingress of chips and dirt.

NEVER USE AIRLINES TO CLEAN THE ELECTRICAL CABINET.

3.1 MAINTENANCE

3.1.1 Daily Maintenance

(i) Thoroughly clean the machine using a suitable vacuum cleaner to remove all dust and chippings. Pay particular attention to the table area and the slideways and head.

(ii) 'F' & 'LC' heads.
Apply one shot of Shell Tellus 27 oil to the head bearing lubrication points every 12 hours of running time.

3.1.2 Weekly Maintenance

(i) Multi-head machines only.
Apply two shots of Shell Tonna T68 to the headslide (four points, on either side of the headslide).

(ii) Check the level of the oil in the airline lubricator. Top up if necessary with Shell Tellus 37.

(iii) Inspect the X and Y axis ballscrew covers for damage. Replace if necessary.

(iv) Vacuum System only.
Check the pipework for leaks or damage.
Empty the intake and exhaust filter jars and check the filters. Replace if necessary.
Clean the filters.

(v) Floating Head only.
Check the level of oil in the hydraulic system reservoir. Top up as necessary with Shell Tellus 37 oil.

(vi) Clean out the venturi blowers on the LC head (where fitted).

3.1.3 Monthly Maintenance

(i) Clean the external surfaces of electric motors.

(ii) Oil the bearings on the drill head and/or veining head.
Check oil level in central lubriaction unit Fig. 3.2a

3.1.4 Half Yearly Maintenance

(i) Check all the axes' ballnut fixings for security.

(ii) Check the router head fixing bolts for security

(iii) Clean the contacts of the motor contactors on the electrical panels. Do not fill the contacts - this only accelerates the wear.

WARNING - Ensure that the machine is isolated from the electrical panels. Do not allow dust and chippings to enter the electrical enclosure.

(iv) Check the operation of the axis travel limit switches. (Refer to Section 5 - Fault Finding for electrical details).

(v) Check the brake pad for wear.

(vi) Check the axis drive motor belt tension (X and Y axes). The maximum deflection allowed at the centre of the belt (thumb pressure only) is 5 mm. If a greater deflection is obtained, the belts may be tensioned by loosening the four bolts in the slotted holes on the motor mounting plate and sliding the plate and motor to obtain the correct tension. Tighten the bolts securely after adjustment has been carried out.

3.1.5 Yearly Maintenance

(i) Remove ball bushings wash and re-pack with grease.

(ii) Floating head only.
Drain the hydraulic power pack reservoir and fill with Shell Tellus 37 oil. Change the power pack filter element.

(iii) Vacuum pump only.
Check the vacuum pumps vanes for wear. (Refer to Section 5)

(iv) Replace intake and exhaust filters.

3.2 LUBRICATION

3.2.1 Lubrication Schedule

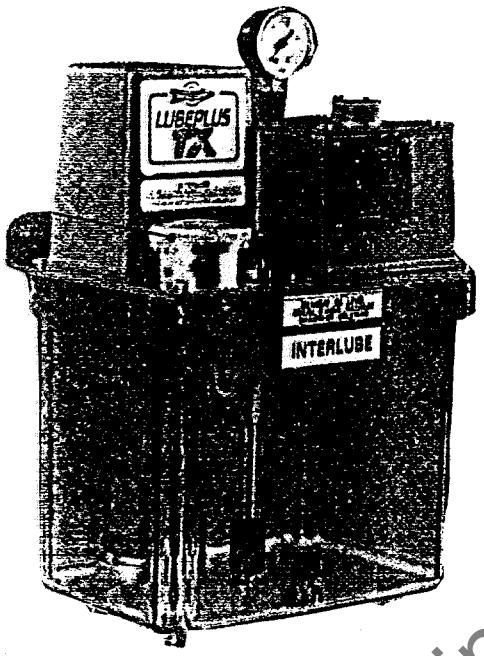
ITEM	LUBRICANT	APPLICATION METHOD	FREQUENCY	SEE FIG.NO
ROUTER HEADS				
F HEAD	SHELL TELLUS 27 (OIL)	1 CM^3 TO EACH POINT USING OIL GUN	12 HRS	3.2.1d
CC (F) HEAD	SHELL TELLUS 27 (OIL)	1 CM CUBED TO EACH POINT USING OIL GUN	12 HRS	
TC HEAD		DO NOT LUBRICATE		
LC HEAD	SHELL TELLUS 27 (OIL)	1 CM CUBED TO EACH POINT USING OIL GUN	12 HRS	3.2.1e
HEAD SLIDES	SHELL TELLUS 27 (OIL)	0.5 CM^3 TO EACH POINT	12 HRS	
HEAD OPTIONS				
MULTI-DRILL UNITS		1 CM^3 TO EACH POINT	500 HRS	3.2.1c
SERVO-INDEXING UNITS				
AIR DRILLS HRS	SHELL TELLUS 2.3.1p 27 (OIL)	0.5 CM^3 TO EACH POINT		
VEINING HEADS HRS	SHELL TELLUS 2.3.1P 27 (OIL)	0.5 CM^3 TO EACH POINT		
HEAD ADAPTORS				
RIGHT ANGLE GEAR-BOXES				
BALLSCREWS AND LINEAR BEARINGS ARE SERVED BY THE CENTRAL LUBRICATING UNIT.				
LUBRICATION TANK	INTERLUBE		160 HRS	3.2.1a

3.2.2 LUBRICANT EQUIVALENTS

Note:- The grades listed below may be direct 'Equivalents'. If in doubt consult your lubricant supplier for advice.

MOBIL	B.P.	CASTROL	ESSO	GULF	SHELL	TOTAL
Mobilplex 45	Energrease FG00-Ep	Impervia MM0	Esso fluid grease	Track roller grease	Alvania R2	Rolls N-0
Mobilplex 48	Energrease LS3	Shpeerol AP3	Beacon 3	Gulf crown grease No.3	Alvania R3	Multis specia 3
Vactra oil No. 2	Maccurat 68	Magna BD68	Febis K68	Slideway 68	Tonna T68	Droser VG68
DTE 24	Energol HLP 32	Hypsin WS32	Nuto 32	Harmony 32AW	Tellus 37	Azolla VG32
DTE BB	Energol CS220	Alpha SP150	Spartan EP150	Harmony 220E	Macoma R150	Azolla VG220
DTE heavy medium	Energol HLP68	Hypsin AWS68	Nuto H68	Harmony 68	Tellus 68	Azolla VG68
DTE light	Energol HLP 32	Hypsin VG32	Nuto H32	Harmony 32	Tellus 37	Azolla VG32
Mobilarma 522	Energol protective 10	Storage oil 10	Rustban 335	Oilcoat TD	Ensis oil 1	HD1BIO
Mobil Almo 525	Energol HLP 22	R.D. oil 32	Nuto H15	Harmony 32AW	Tellus R10	Azolla VG22
Mobilgrease special	Energrease L21M	Spheerol LMM	Beacon Q2 Moly	Gulflex Moly	Alania grease 2+MOS2	Multis MS2
DTE 13	Energol HLP 22	Hypsin AWH32		Hyrasil Multi	Tellus T37	Equivi VG22

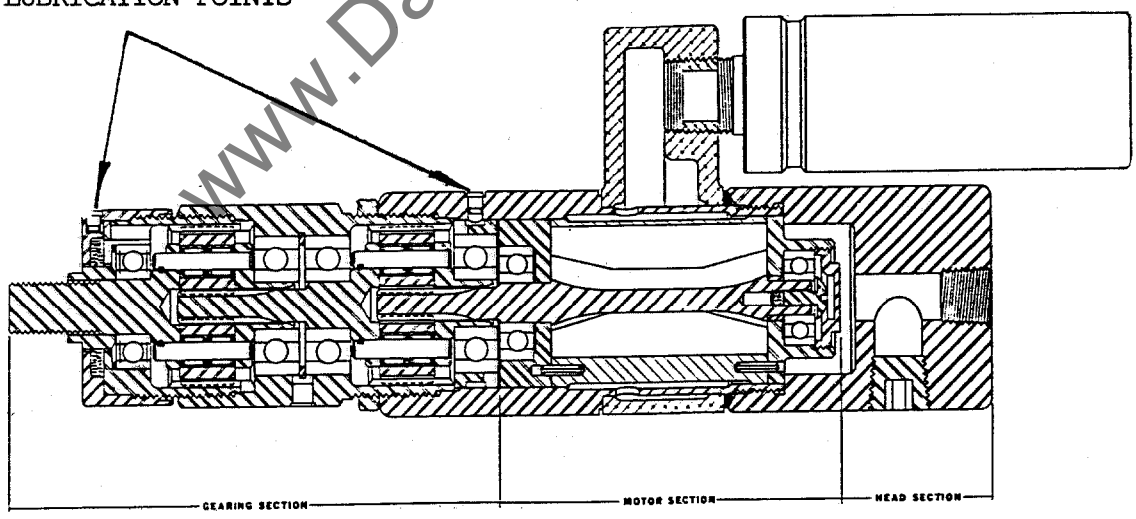
OIL FILLER CAP



OIL LEVEL WARNING LIGHT

FIG. 3.2.1a LUBRICATION UNIT

LUBRICATION POINTS



ARO DRILL MOTOR

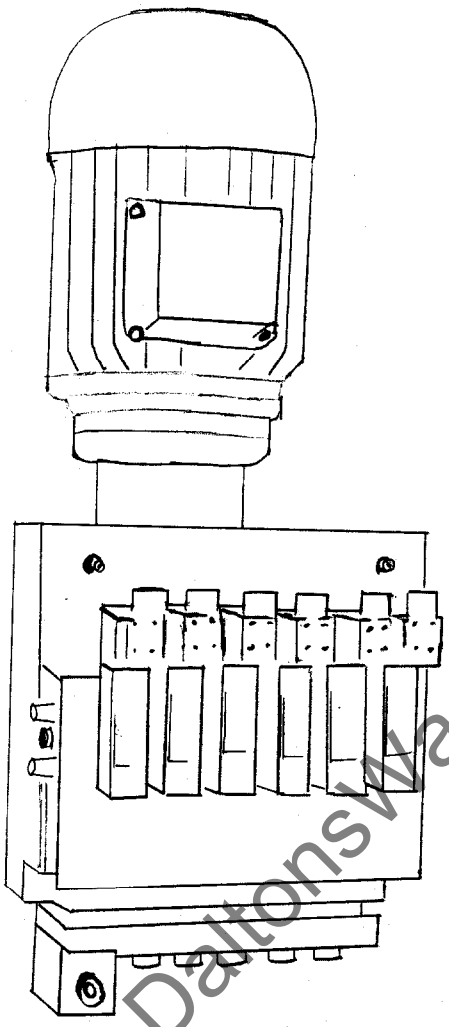


FIG. NO. 3.2.1c MULTI-DRILL UNIT

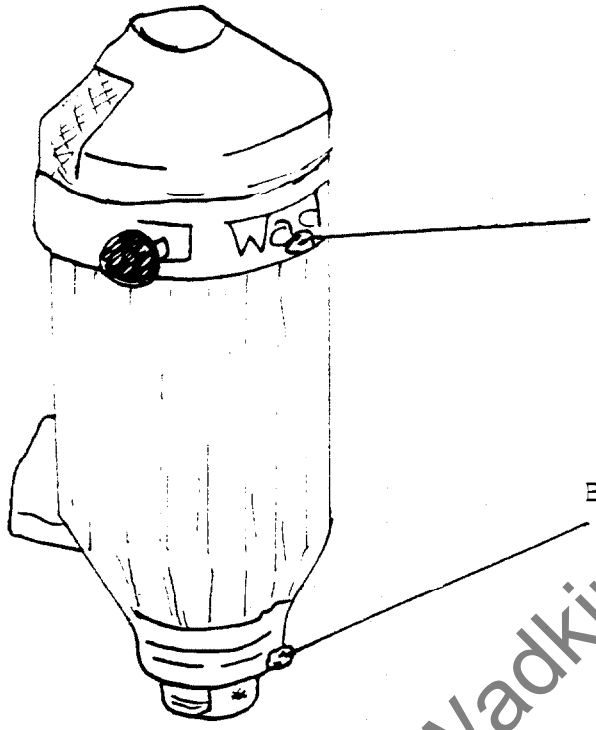


FIG. NO. 3.2.1e F-HEAD

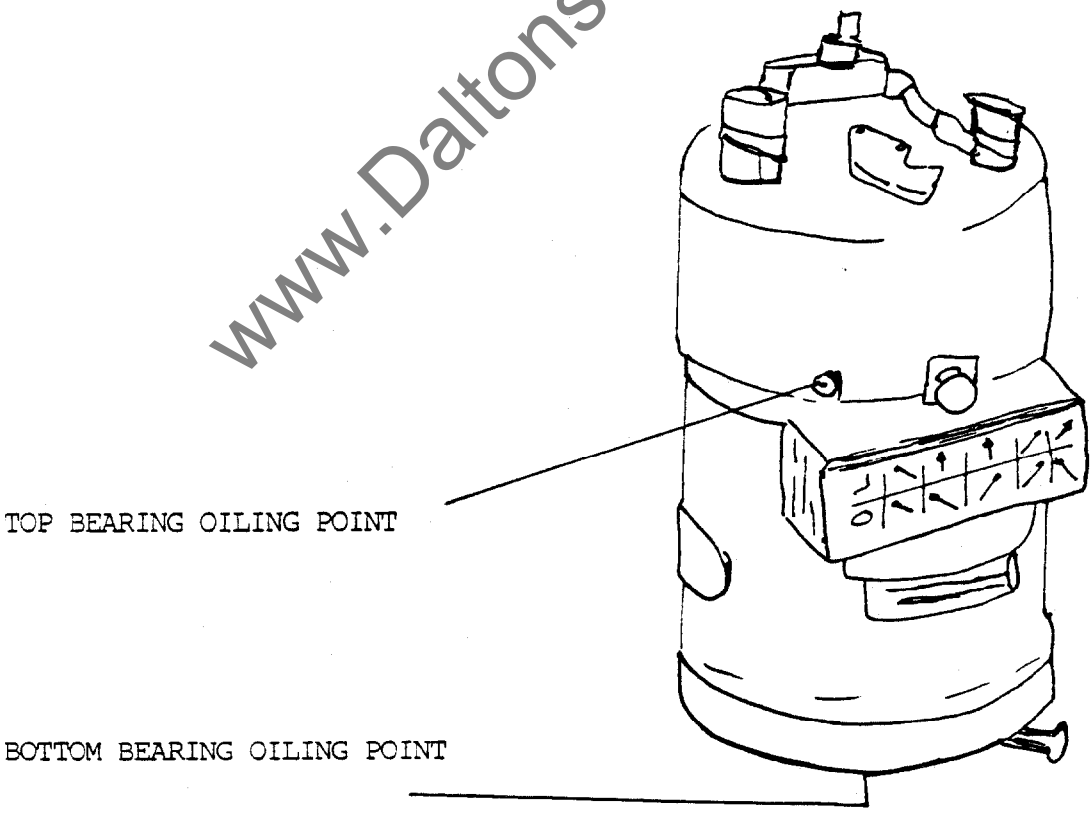


FIG. NO. 3,2,1d LC HEAD

SECTION 4

ELECTRICAL

4.0 INTRODUCTION

The procedures outlined in this section are intended as a guide to the location of possible machine faults.

All fault finding procedures should be carried out by appropriately skilled engineers, having due regard of personal safety. The machine must be electrically isolated before any item is disconnected.

Where tests are to be performed on live equipment, all probes, instrument leads etc. must be suitably insulated.

Note that the machine and control system's electronic circuitry can be damaged by incorrectly applied high voltage and currents. Suitable instruments for use with the machine are an oscilloscope or multimeter.

- **NEVER** use a battery and buzzer (or bell) or 'Meger' for checking cable continuity.

Wiring diagrams are supplied with each machine. All models are fitted with a programmable controller (P.C.) for the machine interface logic. A listing in ladder diagram form is supplied with each machine. The P.C. is integral to the CNC control and diagnostic functions can be performed on the V.D.U.

4.1 SELF HELP

In order for our Service Department to be able to assess the problems being experienced, it always helps to look into the diagnostic mode on the control, and make a note of anything displayed in the diagnostic pages. The answer or cause of the problem is very likely to be displayed there, this area is the main source of vital fault finding information. To gain access to thes areas see the enclosed sheets on service support which outlines what information can be gained from each particular area.

4.2 DIAGNOSTIC

After selecting diagnostic by press the control should display the initial page, see Fig. 4.2.1a. If the control does not display the intial page press the key again, the screen display will now display the initial page, Fig. 4.2.1a.

4.2.1 Drawing of Fig. 4.2.1a

This page displays any control errors and warnings towards the left of the screen display, active 'G' functions in the middle of the screen display, and status information towards the right of the screen display. At the bottom left hand side of the screen just above the soft key description the control also shows you the last feed speed, 'M' function and 'T' word programmed. Any information displayed on the left hand and right hand sides will be helpful when trying to diagnose an error.

4.2.2 Drawing of Fig. 4.2.2b

The next source of fault finding information can be found by pressing the diagnostic machine softkey then the MSD softkey, this will take you into the message list area. In the message list area. There are seven pages of Error and Machine Status messages, with a possible maximum of 28 statements per page. Each statement is continually displayed, when a statement is true the complete text is highlighted. When in contact with Wadkin any highlighted statement will help in trying to diagnose an error.

4.2.3 Drawing of Fig. 4.2.3c

The third source of fault finding information can be found by pressing the diagnostic machine softkey then the I/O status display and finally IOS-PIC, this bings you into the area that shows you the status of the inputs and outputs to the PLC.

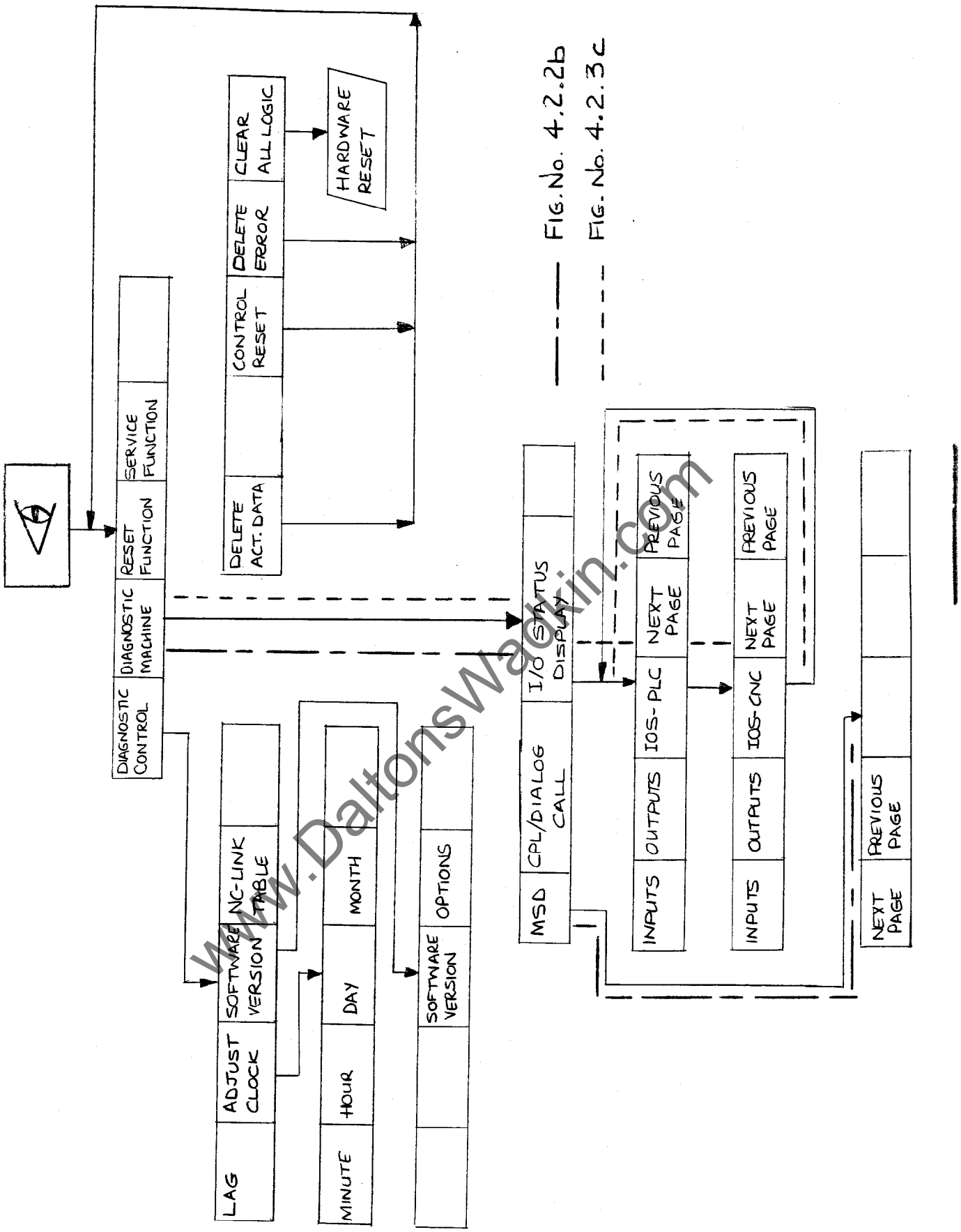
```
P          2   CP0   NC0                                    DIAGNOSTIC
N         50   ACT   STOP      PROGRAM ACTIVE               30.7  16:10
FAULTS                         CONDITION ON                 STATUS

RUN TIME ERROR:                 G   1   G  71               DRIVES ON
 OPTION INACTIVE                G  90   G  66               LSEC NOT ACTIVE
WARNING                         G 140   G  94
 PROGRAM ACTIVE                 G  40   G   7
                                G  17   G   8
                                G  27   G  15
                                G  29   G  79
                                G  80   G  53
                                G 153   G 253
                                G  67   G  39
                                G  62   G  97
                                G  65   G  68
                                G  99   G 146

AT LAST PROGR.
F   4000.0     M   41     T   0
```

DIAGNOSTIC CONTROL | DIAGNOSTIC MACHINE | RESET FUNCTION | SERVICE FUNCTION

Figure No. 4.2.1.a



4.3 Service Support

The following information can be shown:

		selected via:
NC-Status	displayed data	INFO
	active block, active cycle feedrate, S-word direction of spindle rotation software travel limits active compensations and offsets	
Machine-Status	state of I/Os (without PLC) errors	INFO
Errors	Errors, warnings, messages	INFO
Axes	Commanded position (relating to the active program zero point) = theoretical Position	INFO
	Actual position (relating to the machine position) = current position	INFO
	LAG (Following error)	INFO
	Distance to go	INFO/ Pushbutton on manual panel
PIC Monitor	The PIC 200 - program is executed. Sates of I/O and logical results can be displayed by a breakpoint function	INFO/MONITOR BREAKPOINT
Logbook	Operations and states of the control are recorded with the time of day for subsequent checks.	INFO/LOGBOOK

4.4 MACHINE STATUS DISPLAY

Always check the machine status display when a problem occurs.

DIAGNOSTIC - DIAGNOSTIC MACHINE - M.S.D.

4.4.1 Fault and Machine Status Messages.

If a fault occurs during machine operation a message will be displayed in the M.S.D. page, which will assist in fault finding.

To look at an error exit the N.C. Mode and select Diagnostic Mode. The Diagnostic Machine the M.S.D. The relevant fault is likely to be displayed in clear text and should be self explanatory.

eg. IOLD - VACUUM PUMP, OVERLOAD TRIPPED.

4.5 P.C. MONITORING

The machine interface logic is programmed in the controller. A print out of the program in ladder diagram is supplied with the machine. The ladder diagram is similar to an electrical schematic diagram using relay logic.

The P.C. works with a series of inputs and outputs, and temp. stores. The program determines which inputs etc. must be high or low in a determined combination before giving an output or temp. store.

The controller has a monitoring function to allow the states of all the inputs and outputs to be displayed on the V.D.U. which aids fault finding. To enter the Monitor Mode select Diagnostic Mode - Diagnostic Machine - Monitor PLC, you will now see the P.C. program displayed. An example of what may be on the screen is shown in Fig.3.5c.

Fig. 4.5.1d

ADDRESS	COMMAND	OPERAND	INPUT	RES.	OUTPUT
0	U	M 37.0	H	H	
1	ON	M 37.0	H	H	
2	=	A 5.3		H	H
3	=	A 0.0		H	H
4	=	A 0.1		H	H
5	=	A 0.2		H	H
6	=	A 0.3		H	H
7	=	A 1.0		H	H
8	=	A 1.3		H	H
9	=	A 1.1		H	H
10	=	A 1.2		H	H

Step shows the program step number, these numbers can also be found on the P.C. listing as eg. ADDR: 00351 is step 351.

In the ladder diagram only the first address number in a line of logic is shown for simplicity.

The program instruction is shown, the function of these are shown below in Fig 4.5.2e

The address is shown, this is the bit location of the program element. eg. 36.1 is byte 36 bit1.

The state of the input or output is shown H for high and L for low.

The result of the logic chain is shown H for high and L for low.

Fig. 4.5.2e

LIST OF PROGRAM INSTRUCTIONS

U - AND (NORMALLY OPEN CONTACT)
UN - AND NOT (NORMALLY CLOSED CONTACT)
O - OR
ON - OR NOT
E - INPUT
A - OUTPUT
S - SET ((STORE) OUTPUT OR MARKER)
R - RESET ((STORE) OUTPUT OR MARKER)
SPB - JUMP
M - MARKER (Temporary store)
NOP - NO OPERATION
PE - PE END

The listing supplied with the machine is in ladder diagram form, an example 'rung' is shown, see for steps 10 - 13 as previous example.

```
        progr. rg              6 addr.: 00010

        I  1.0     I   10.4    I  9.7                  M 40.0
+ ----      -----      /  ------      ------------------  (S)
```

So here the marker (40.0) is set if input (1.0) is high and input (10.4) is low and input (9.7) is high.

In Monitor PLC there are two other softkey modes available - I.O.M table and Breakpoint:-

4.6 I.O.M. TABLE, FIG. 4.6f

On selection of this mode you will be faced with 5 more sofkeys.

INPUT - OUTPUT - MARKER - AND 2 SCROLL KEYS

The tables are to be used in conjunction with the input/output diagrams supplied with the machine.

As an example:-

To check whether 1 OLD VAC PUMP 1 overload has tripped. First find out which input 1OLD signal is sent to using the input drawing in this case it is I 44.2

On the control select the input softkey and page down to the group with input line 44, look to see whether 44.2 is indicated by H or L.

H = 24 V PRESENT AT INPUT
L = 0 V PRESENT AT INPUT

Therefore if I 44.2 is indicated L 1OLD overload has tripped.

NO PROGRAM | CPO ACT | NCO STOP | DIAGNOSTIC 14.10 9:21

		INPUT									OUTPUT								
	BIT	0	1	2	3	4	5	6	7		BIT	0	1	2	3	4	5	6	7
E	0	L	L	L	L	L	L	H	L	A	0	H	H	H	H	L	L	L	L
E	1	L	L	L	L	L	L	L	L	A	1	H	H	H	H	L	L	L	L
E	2	H	H	H	L	L	L	L	L	A	2	L	L	L	L	L	L	L	L
E	3	L	L	L	L	L	L	L	L	A	3	L	L	L	L	L	L	L	L
E	4	L	L	L	L	L	L	L	L	A	4	L	L	L	L	L	L	L	L
E	5	L	L	L	L	L	L	L	L	A	5	H	L	L	H	L	L	L	L
E	6	L	L	L	L	L	L	L	L	A	6	L	L	L	L	L	L	L	L
E	7	L	L	L	L	L	L	L	L	A	7	H	L	L	L	L	L	L	L
E	8	L	L	L	L	L	H	L	L	A	8	L	L	L	L	L	L	L	L
E	9	L	L	L	L	L	L	L	L	A	9	L	L	L	H	L	L	L	L
E	10	L	L	L	L	H	L	L	L	A	10	L	L	L	L	L	L	L	L
E	11	L	L	L	L	L	L	L	L	A	11	L	L	L	L	L	L	L	L
E	12	L	L	L	L	L	L	L	L	A	12	H	L	L	L	L	L	L	L
E	13	L	L	L	L	L	L	L	L	A	14	L	L	L	L	L	L	L	L
E	14	L	L	L	L	L	L	L	L	A	15	L	L	L	L	L	L	L	L

IOS -CNC E

INPUTS OUTPUTS IOS-CNC NEXT PAGE PREVIOUS PAGE

Fig. 4.6f I - O - M TABLE

4.7 BREAKPOINT MODE

If an intermittent fault is present on the machine it can be difficult to locate the cause. The breakpoint function allows you to set a trap to locate the error.

Procedure for using Breakpoint facility.

(i) Select Diagnostic Mode.

(ii) Select Diagnostic Machine on softkeys.

(iii) Select Monitor PLC on softkeys.

(iv) Select Search Address key in 0 and press return, the display will then goto start of program.

(v) Press Breakpoint softkey.

(vi) Press Delete softkey.

(vii) Press Result softkey.

The display reads address and a cursor is flashing.

(viii) Key in the address of the signal you wish to monitor by looking in the PLC Progtam printout. eg. Input 42.4 (ESTOP) is located at address 00504.

(ix) You are now given a selection of 4 softkey modes. As an example INPUT 42.4 should always be high under normal working conditions. So if the ESTOP signal is being suspected of failing intermittently, negative pulse softkey should be selected. The control will then look for a momentary 'blip' in the signal.

If a fault occurs and the input selected has changed condition it will be displayed in the Montior PLC Mode.

4.8 MACHINES WITH CL300 UNITS.

Machines fitted with a CL300 unit do not have the P.C. Monitoring facility. However, the High or Low Status of Inputs and Outputs can be easily checked on the CL300 unit as each Input or Output has its own LED indicator lamp. The I/O tables can also be viewed as on all other machines. See Fig. 4.6f.

SECTION 5

ELECTRICAL TROUBLE-SHOOTING

5.0 GENERAL

The machine installation is very important and no further servicing should be carried out until certain basic elements have been checked.
Most faults associated with any computer are usually caused by the mains supply or earth being noisy or unstable. We cannot stress enough the importance of a good clean earth and stable, noise free supply.

It is important that the supply voltage to the machine falls within the limits of the voltage specified when the machine was ordered. In general AC Drive machines will operate on either 380 volts or 415 volts AC +/- 10%. If the supply voltage falls outside these limits then a transformer will be required in the mains supply to ensure the correct voltage levels are achieved.

eg. If the supply voltage of a machine is rated at 415 V AC but is supplied with say 450 volts. The voltage to the control will rise to 128 volts AC. This could result in the control to function incorrectly and may damage the control if sustained. The same could apply if under voltage was supplied. This is more likely to cause persistent servo errors and the control may intermittently shut down.

5.0.1 Machine Air Supply

The machine air supply should conform to the specified standard on the machine foundation plan (supplies vary depending on drill heads configuration). If a separate compressor is used and is not capable of the correct supply the mains air pressure switch will shut the machine off when the pressure falls below 35 p.s.i. Again, the machine may cut well until the drill is used and the pressure drops due to the exhaust on the drill.

5.1 Encoders (closed loop positional feedback system)

The encoder unit is the measuring instrument used to ensure that the axis has moved to the correct position as commanded by the control.

The encoder type used is usually a rotary type and is usually fastened to the none drive end of the axis motors. On encoder being used per axis.

Depending on the design of the machine the encoder may be fastened directly to the ballscrew or alternatively a linear encoder may be used. In all cases the encoder still operates in the same way by sending back to the control information relating to the position of the axis.

The sending out from the control of commands and the receiving of the information back from the encoder is called the closed loop positional feedback system.

If this loop or circuit is broken in any way then it will normally result in the control shutting down the drives. The faults outlined in this section are some of the more common experienced and are set out as a fault and remedy listing and this should act a guide if problem occurs.

5.1.1 Fault No. 1 - Creeping

Symptom No. 1 Machine creeps in one or more axes in both auto or manual regardless of feedrate override.

Fault a) Broken wires in encoder harness.
Remedy a) Replace broken wires with spares or renew entire harness.
Fault b) Badly adjusted offset (s).
Remedy b) Display actual position via axes display and ensure readouts are stable at zero when axes are stopped. Adjust via offset pots on regulator cards.
Fault c) Bad grounding on encoder circuit.
Remedy c) Check grounding on encoders. Encoder can should be connected to pin 11 on encoder plug. NB: This problem could also cause tape reader problems when the drives are on.
Fault d) Encoder plugs/sockets not made correctly.
Remedy d) Check security of encoder plugs/sockets and conditions of pins etc, especially on Control conenctions.
Fault e) Faulty encoder.
Remedy e) Fit new encoder.
Fault f) Axis readout moving slowly round on all axes.
Remedy f) Check with message page for either servo error or interpolator stop, ie. drive on signal missing.

5.1.2 Fault No.2 - Mispositioning

Symptom No. 1 Axis goes to wrong position during program but readout show correct position.

Fault a) Low voltage to encoder lamp from Control.

Remedy a) Check voltage to encoder. Adjust if necessary or find point of lost voltage.

Fault b) Encoder coupling loose or rubbing on flange inside motor.

Remedy b) Check encoder coupling.

Symptom No. 2 Axis references in wrong place.

Fault a) -

Remedy a) - As Symptom No. 1

Fault b)

Fault b) -

Fault c) Operator sending machine to reference position whilst on ultimate limit switches.

Remedy c) Jog off limit positions in all 3 axes (or 4 axes) before referencing.

Fault d) Waste material fouling table limit switches or loose limit swithc trigger cams or broken limit switches.

Remedy d) Check operation and function of table limits and triggrer cams.

Check parameters are the same as on your sheet with machine.

5.1.3 Fault No. 3 - Axis Take off

Symptom No. 1 When drives switched on, axis creeps slowly and the takes-off or accelerates and trips servo error. Servo error when drive is switched on.

Fault a) -

Remedy a)

Fault b) - As Symptom No. 1, Fault No. 2

Remedy b) -

Fault c) Encoder shaft coupling loose.

Remedy c) Tighten coupling. Make sure coupling is not broken. Sometimes they break and cause intermittent mis-positioning since they will still drive through friction between the two parts.

Symptom No. 2 Axis takes-off in manual as soon as manual mode is selected.

Fault a) -

Remedy a)

Fault b) - As Symptom No. 1, Fault No. 2

Remedy b) -

Fault c) Faulty manual panel.

Remedy c) Replace manual panel.

Symptom No. 3 Axis appears to perform short take off movements during program while G1 F---- is active then returns to normal.
Fault a) Intermittent break in encoder harness which is re-making before servo distance (30 mm) is achieved.
Remedy a) Replace faulty wire(s) with spare core(s) or renew harness.

If encoder fault exists, the control will usually display:-
'? Axis measuring system disconnected' on message page.

5.2 TACHOS (CLOSED LOOP SPEED FEEDBACK SYSTEM

5.2.1 Fault No. 1 - Take off

Symptom No. 1 One or more axis take-off when drive-on is activated. Machine trips and displays servo error.

Fault a) Tacho wires connected wrong way round or motor wires.
Remedy a) Invert tacho connections or motor wires.

Smptom No. 2 Axis takes-off after activating manual mode and pressing either + or - jog buttons.
Fault a) Short circuit or open circuit on tacho.
Remedy a) Trace cause of short or open circuit and rectify. If no resistance or infinate resistance is present on motor tacho terminals, replace motor. NB: This condition will be indicated by the illumination of the red tacho monitoring LED on the amplifier power supply card.

5.3 CONTROL PROBLEMS

5.3.1 Fault No. 1 - No M-functions

Symptom No. 1 M-code not activated when called up in manual or automatic.
Fault a) No 110V AC supplied to M-code system.
Remedy a) Rectify cause of 110V AC supply failure and restore.
Fault b) Parameters are corrupted.
Remedy b) Eliminate cause of corruption eg. faulty battery and re-load parameters.

5.3.2 Fault No. 2 - Interface will not work

Symptom No. 1 Tapes cannot be input or data output via equipment known to be in working order.
Fault a) Break in extension cable between pendant and Bosch CC unit.
Remedy a) Locate broken core(s) and rewire.

5.4 ELECTROMECHANICAL HARDWARE AND MACHINE WIRING

The following represents a cross-section of the most common machine wiring faults and component failures.

5.4.1 FAULT NO. 1 - FAULTY DRILL ADVANCE SOLENOIDS

Symptom No. 1 Drills will not advance even though voltage is present to solenoid.
Fault a) Solenoid action interfered with by ingress of dust.
Remedy a) Remove, clean or replace solenoid valve.
Fault b) Solenoid winding broken down. This is usually accompanied by a slight burning smell.
Remedy b) Replace solenoid.
Fault c) Solenoid spring broken.
Remedy c) Replace spring or solenoid.

The above refers to all solenoid operated functions such as drills, vacuum clamp/unclamp, air clamps etc.

5.4.2 Fault No. 2 - Faulty head limit switch

Symptom No. 1 Head fails to start although all standard pre-conditions have been met.
Fault a) Head limit switch faulty.
Remedy a) Test for continuity through limit switch. Replace if necessary.
Faulty b) Head limit switch not closing when brake released.
Remedy b) Limit switch out of position. Reposition limit switch or relieve cut-out on brake mechanism.

Symptom No. 2 Head does not stop when brake pressed.

Fault a) Limit switch out of position. Check I.O. table.
Remedy a) Reposition limit switch so it opens when brake pressed or lock on.
Fault b) Limit switch faulty - not opening.
Remedy b) Check continuity through limit switch and replace if necessary.

5.4.3 Fault No. 3 - Faulty three phase suppressors

This normally causes motor fuses to rupture.

Symptom No. 1 3 Phase suppressor burnt, bulged.

Fault a) Faulty suppressor.
Remedy a) Replace suppressor.

Symptom No. 2 3 Phase unit (eg. vacuum pump) will not start.

Fault a) Faulty suppressor.
Remedy a) Disconnect suppressor. Unit will start. Replace suppressor. Check fuses in motor circuit.

5.4.4 Fault No. 4 - Faulty limit switch

Symptom No. 1 Machine ignores limit switch under controlled feed conditions.

Fault a) Limit switch not breaking. Check operation of limit switch by looking at I.O. status.

Remedy a) Repair or replace limit switch.

Fault b) Dog out of position and tripping switch.

Remedy b) Reposition trip dog.

Symptom No. 2 Machine references in wrong place although encoders and wiring all ok.

Fault a) Limit switch loose on limit switch body.

Remedy a) Tighten limit switch mounting fully down or replace limit switch if threads stripped.

Fault b) Dog loose in track or incorrectly adjusted.

Remedy b) Tighten Allen screws. Adjust by moving dog forward or back 5mm.

Fault c) Reference limit switch jammed in.

Remedy c) Release with penetrating oil. Check operation with I.O. status.

5.4.5 Fault No. 5 - Intermittent tripping of 3-phase unit

Always first check to see that full supply voltage is present on all 3 phases if not work back from motor terminals to determine where problem is eg. overload, topside of contactor, fuses.

Symptom No.1 3-phase unit (eg. head, vacuum pump) trips intermittently then restarts without pressing overload reset.

Fault a) Loose fuse holders in fuse carriers.

Remedy a) Tighten fuse holders in fuse carriers.
Bad connection on connector plugs in base. (Vacuum pumps only).
Loose connections on contactor or motor terminals.
Faulty head limit switch.

5.5 AC DRIVES

The main difference encountered when using AC drives is the introduction of permenantly excited brushless motors and their supply and control units which are of modular construction.

The Servo Motors are permenantly excited and brushless and are used with positional and velocity servo loops.

They have a three phase stator winding and a rotor excited by permanent magnets. A brushless tacho generator is incorporated for velocity feedback. The switching of the currents from phase to phase is controlled in the associated axis module with the aid of the rotor position feedback monitor.

The control and supply units are modular and can be broken down into individual units.

VM Module = In this unit the mains supply voltage.

ie. 3 x 380 - 3 x 415 volts +/- 10% is rectified to give a DC voltage. This module also works in conjunction with

Capacitor Module which helps to smooth out the rectified voltage into a smooth DC supply which is then used by the control modules.

SM Modules this controls the axis drive motors and interprets the command signal sent out from the control into actual movements of the axis motor in direct proportion to the value of the command signal.

In conjunction with the rotor positional feedback and the brushless tacho the SM Module regulates the motor torque and speed.

ASM Modules in this unit with the aid of a DC/AC converter it generates a 3 phase voltage systems of variable frequency and amplitude from the DC Link. This allows speed regulation of high frequency heads required for router motors.

Optimization Card Care needs to be taken to keep the optimization cards with the correct axis to which they have been designated. Each card is set up when the machine is commissioned and is dedicated to its own axis.

The card is really very similar to the optimization card on the DC drive unit except most of the setting is done by using D.I.P switches. It also has three adjustment potentiometers, offset pot, tacho adjustment and command adjustment all being available.

5.6 DIAGNOSTIC MODULES SM UNITS

IMPORTANT TURN OFF MAINS SUPPLY BEFORE FITTING CARDS.

The diagnostic module on the SC-TC units are a simple plug in module. Usually only one diagnostic unit is required per machine and can be fitted into any axis with a problem to help fault finding.

It can be unplugged and moved into another axis switch off drives before changing position of diagnostic unit.

The seven segment display indicates possible fault causes refer to Fault Code Sheet provided.

5.7 ASM FAULT DIAGNOSTIC UNIT

This unit is again a plug in module and gives out a display via a series of LED's Reference to the diagnostic fault display list would then help to diagnose the fault.

The diagnostic unit plugs into the ASM unit.

Usually only one diagnostic unit is supplied and in the case of mulitple ASM units it can be swopped to the appropriate unit with suspected fault.

To fit the unit to the ASM. See the attached drawing.

(i) Remove the optimization card.

(ii) Remove the connectors X6 and X1

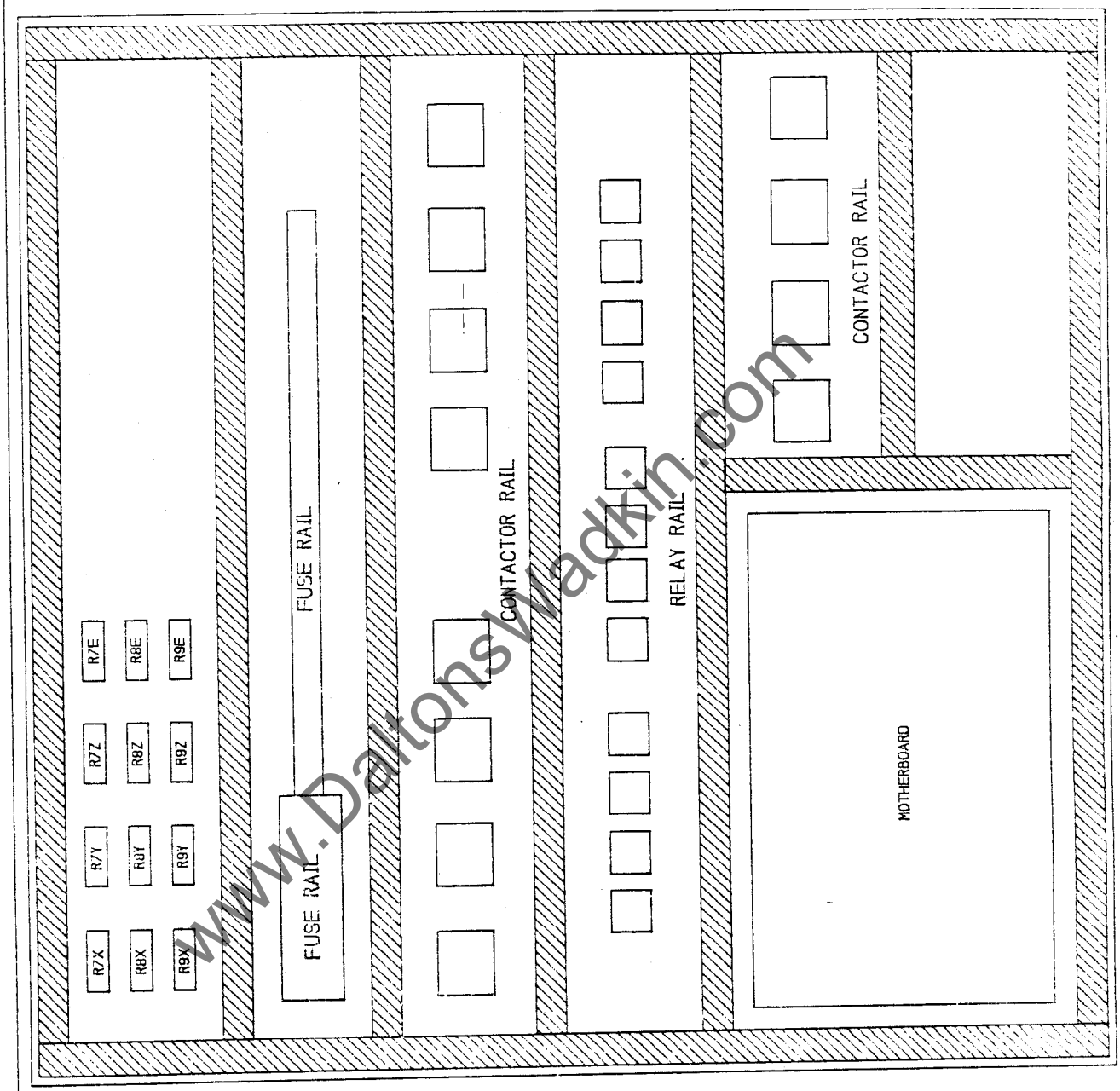
(iii) Remove the ASM front plate.

(iv) Plug in diagnostic card in position shown.

(v) Refit ASM cover, connectors and optimization card.

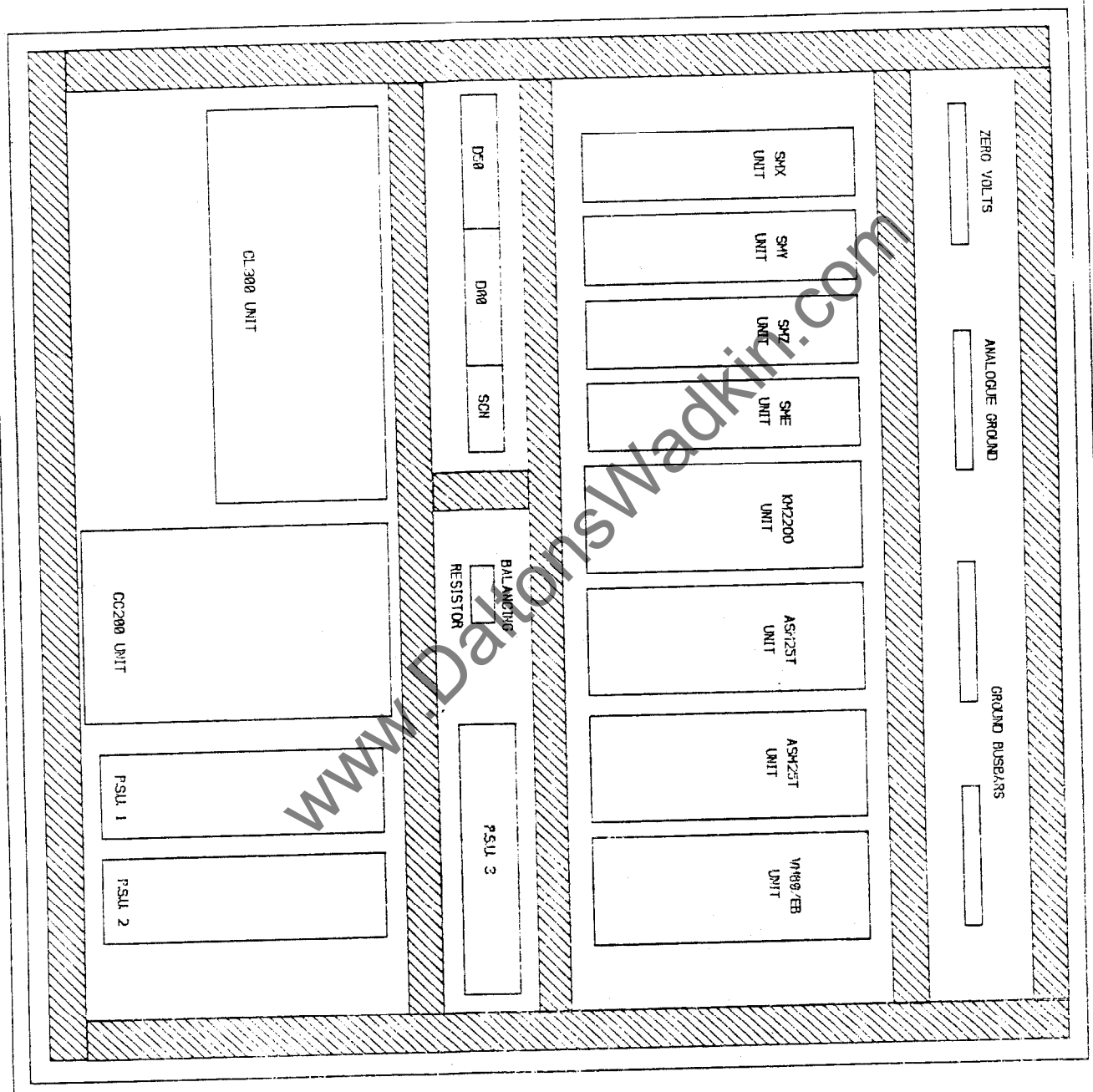
(vi) On diagnostic card Plug X31 connect cables to 24v and 0v on VM unit.

(vii) Diagnostic module should now work and indicate via LED on fault conditions. Note: this module can also be fitted to a VM unit.



TITLE: CONTACTOR PANEL LAYOUT FOR ALL OLYPUS MACHINES	WADKIN COLNE TRAWDEN, LANCS.	DRG. NO. WOC30101	ISSUE NO. 01

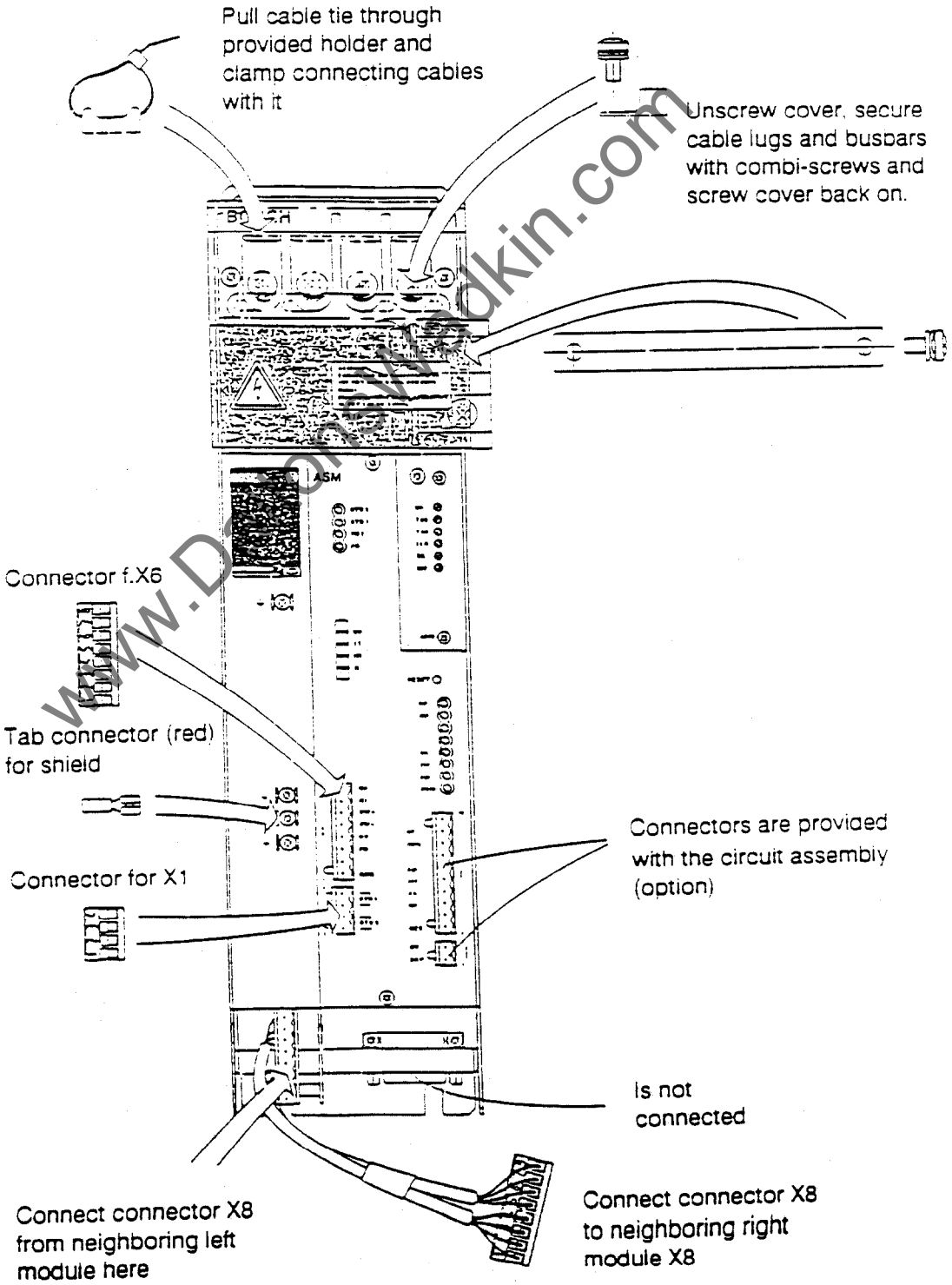
07/91



TITLE: DRIVES PANEL LAYOUT OLYMPUS WITH CL300 UNIT	WADKIN COLNE TRAWDEN, LANCS.	DRG. NO. WDC30100	ISSUE NO. 01

4.4 Installation instructions

4.4.1 Frequency converter ASM 10...50 -T(A)



5.8 X7 Pin Allocation

X7.1 Reset Input RES

Stored fault signals can be reset via the reset input (H-level, +24V) or with the 'RESET' button on the module.

X7.3 Module Fault M_F

The signal goes from +24V to LOW when overcurrent is produced in the module. The red LED M_F comes on. Ready 2 (BTB 2) is cancelled.

X7.4 Heat Sink Temperature OK

The signal goes from +24 V to LOW when the heat sink temperature in the module rises aboe a set maximum limit due to overload, high ambient temperature or fan failure.
The yellow LED OK will come on. Ready 1 (BTB 1) is cancelled.

X7.5 Module Overload I x t

The signal goes from +24V to LOW as soon as the current limit value is reached. The yellow LED I x t comes on. Ready 1 (BTB 1) is cancelled.

X7.6 Current Limit I_{gr}

The signal goes to LOW when the unit limit current is being exceeded in the event of a failure.
The yellow LED I_{gr} will come on.

X7.8 Frequency Comparison fi = fs

The signal goes from +24V to LOW when the unit limit current is exceeded in the event of a failure.
The yellow LED I_{gr} will come on.

7.9 Power Supply Fault N_F

The signal goes from +24V to LOW when the +/- 15V supply voltages for the electronics lies outside the tolerance range. The red LED N_F will come on. Ready 2 (BTB 2) is cancelled.

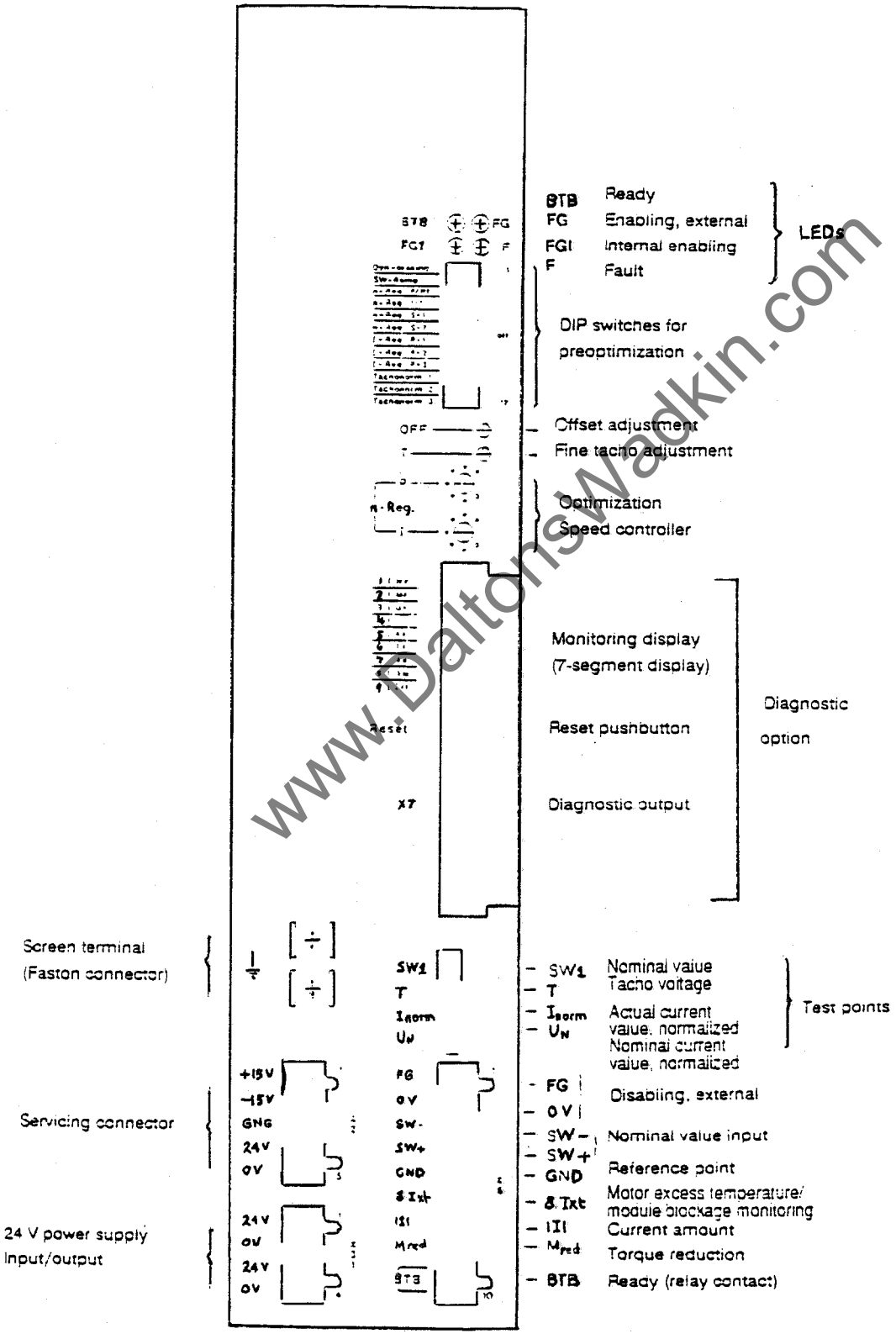
5.9 Terminal Strip

X31 Voltage Supply for Diagnostics Card

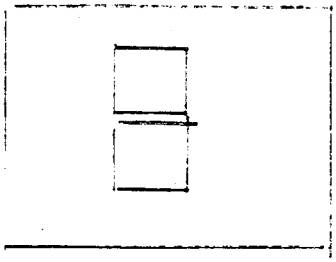
X31.1 + 24V
Maximum load 100 mA per output X7, plus 80 mA for internal supply.

X31.2 O V
Reference potential for X31.1 (+24 V).

5.8 Front panel designations on the SM



5.10 7-Segment display



LED Qty.	Des.	Fault type	Possible cause	Effect
1	NF	Power supply unit fault	External 24V supply voltage outside the permissible tolerances a) Wrong transformer b) Wrong voltage (or excessive ripple) c) Connection fault, d) Module defective (24 V overloaded) Internal =/- 15 V logic voltage outside the permissible tolerance: a) Overload on interface terminals, wiring fault b) Module defective	No BTB ('ready') No FG1 ('internal enabling') (RESET by pushbutton or 24 V signal)
2	M_F	Module fault	Load current too high, motor not turning despite activation a) Load short circuit b) Load connection fault c) Module defective	No BTB (ready) No FG1 ('internal enabling') (RESET by pushbutton or 24 V signal)
3	U>	Excess voltage	DC link voltage too high a) Mains voltage too high b) Ballast limit reached (due to extreme braking) c) Ballast switch defective operating without ballast switch d) Module defective	No BTB (ready) No FG1 ('internal enabling') (RESET by pushbutton or 24 V signal)
5	K_F	Commutation fault	Rotor position signal defective a) Tacho connector not plugged in or plugged in incorrectly b) Connection fault, short circuit, tacho cable discontinuity c) Tacho electronics in the motor or module defective.	No BTB (ready) No FG1 ('internal enabling') (RESET by pushbutton or 24 V signal)

LED Qty.	Des.	Fault type	Possible cause	Effect
6	T_F	Tacho fault	Motor rotating, but no tacho voltage a) Tacho connector not plugged in or plugged in incorrectly b) Connection fault, short circuit, tacho cable dicontinuity c) Tacho electronics in the motor or module defective	No BTB (ready) No FG1 ('internal enabling') (RESET by pushbutton or 24 V signal)
7		Heatsink temperature	Heatsink temperature of the power section (> 80 degrees centigrade) a) Inadequate or obstructed air supply b) Fan not fitted or not or not connected (SM 15/30 and 25/50) c) Environment too warm d) Module load too high e) Module defective	Display for approximately 1 minute without effect followed by FG1 ('internal enabling') and BTB ('ready') inhibited. (RESET by pushbutton or 24 V signal)
8	M	Motor temperature	Motor winding temperature too high (> degrees centigrade) a) Motor is overloaded b) Air supply inadequate c) Motor underdimensioned d) Temperature sensor or sensor line defective, module defective, motor winding temperature < - 10 degrees centigrade	Display for approximately 1 minute without effect followed by FG1 ('internal enabling') and ('ready') and inhibited (RESET by pushbutton or 24 V signal)
9	1xt	Blockage monitoring	Overload at low speed n <3.3 rmp at $n_N \leq 300$ rpm n <5.0 rpm at $n_N > 300$ rpm a) Standstill torque too high b) Axis at mechanical stop c) Module defective	1 max. is reduced by approximately 50% to nominal current (Reduction remains until blockage is eliminated)

5.11 GENERAL PREVENTATIVE ELECTRICAL MAINTENANCE

Many problems can be avoided by general maintenance.

The main points to look out for are:-

(i) The control relies on battery back-up when the CNC is switched off. THe battery should be changed every twelve months. (See ?.?.? for battery maintenance).

(ii) Many problems are caused by the ingress of foreign materials. All the electrical cabinets should be kept shut and periodically cleaned. Cleaning should be done by vacuuming, never by blow-line (this blows dirt and water into the contactors). All seals should be replaced as they perish.

(iii) External influences (eg. scrap boxes) should not be allowed to interfere with any moving harnesses.

(iv) Limit switches etc. should be kept free from pieces of wood or other materials.

(v) Damaged cables or electro-mechanical units should be immediately replaced.

(vi) Router heads, vacuum pumps should be periodically cleaned to ensure the correct operation of cooling fans (all motors employed are T.E.F.V).

(vii) Weak fuses should always be renewed (eg. when an overload has occured and the fuse has 'blued' but not blown).

(viii) Check cooling fan filter on CC 100 end rack.

5.11.1 PNEUMATIC

The pneumatic connection should be made to the main air valve on the regulator / lubricator mounted on the left hand side of the machine. Set regulator to 80 p.s.i. if drill heads are fitted the maximum volume of air required is 20 c.f.m.

5.12 TO CHANGE BATTERY ON CC 300M CONTROL

5.12.1 CP Battery

(i) Switch off mains isolator.

(ii) Remove battery cover on CP 2 card, (far left hand card).

(iii) Replace battery ensuring polarity is correct. Refit cover.

(iv) Switch on mains isolator. Set time and date in diagnostic mode.

5.12.2 MEM Battery

(i) Machine must be switched ON whilst battery is changed, otherwise data loss will occur.

(ii) Take care when working, as the machine is live.

(iii) Remove cover on MEM 4 card (second from left).

(iv) Replace battery (ensure correct polarity) refit cover.

(v) Close elctrical cabinet doors.

5.12.3 Changing Battery on CL300 Unit (if fitted).

(i) Machine must be switched ON whilst battery is changed.

(ii) Take care when working as the machine is live.

(iii) Remove battery cover and replace battery (ensure correct polarity) refit cover.

(iv) Close electrical cabinet doors.

5.13 RIETSCHLE VACUUM PUMPS TR...V

5.13.1 Models

This section covers models TR...V, see name plate (N), which consists of 3 sizes from 40 up to 80m^3/h. (Fig. I: TR40, III: TR 80, ii: TR40 in single phase version).

5.13.2 Application

These dry running vacuum pumps are suitable for use with normal humidity and dry gases up to an absolute pressure of 100 mbar.

Please note:

The ambient temperature may not exceed 40 degrees centigrade. At higher temperatures please contact us.

No dangerous mixture (ie. solvent), excessive humid ari, water vapour, or aggressive gases or traces of oil or grease in the air can be sucked in.

5.13.3 Location

Filter housing (G) and lubrication point (L) must be easily accessible. There must be space enough to disassemble end cover (c) for exchanging the rotor blades. Also the cooling air inlet (E) and outlet (F) must be positioned so that there is unrestricted movement of air (Fig.I and III)

5.13.4 Starting Up

(i) Compare current, voltage, frequency of the incoming supply agains the motro name plate (N).

(ii) If a direct on line Motor starter is fitted check the overload settings against the full load current on the motor name plate.
Electrical connections may only be made by electro-specialists.

(iii) Check that the direction of rotation of the pump is correct by switching the unit on and off for a short period. (see label (O)).

(iv) Vacuum connection at poisition (A). Exhaust silencer (exhaust port) (B). Instead of an exhaust silencer teh exhausted air may be ducted away by a pipe.

Note: If the suction line is longer than 3 m we recommend the fitting of a non return valve (ZRK).

(v) The vacuum can be regulated by regulation valve (C) (Fig. I and III).

5.13.5 Service

Air filtration:

Filter cartridges (f) on the suction side shouldbe cleaned every month and replaced every year. Service intervals depend up on the level of contamination.

Changing the filter cartridges: remove the thumb scres (s) and pull of the filter lid (g) complete with gasket (d), loosen the securing nut (m) and remove the filters. Pull off the filters (f) and clean. Use compressed air or knock out manually. (Fig. IV)

5.13.6 Lubrication

Lubrication point (L), Excessgrease outlet (K). The bearings should be greased after every 5000 operating hours, or at the latest at yearly intervals. They can be greased until the grease comes out from (K).

We recommend: Chevron SRI Grease 2 (see label (M)). Please note: TR 40V is equipped with sealed for life bearings and need no greasing. (Fig. III)

5.13.7 Blades

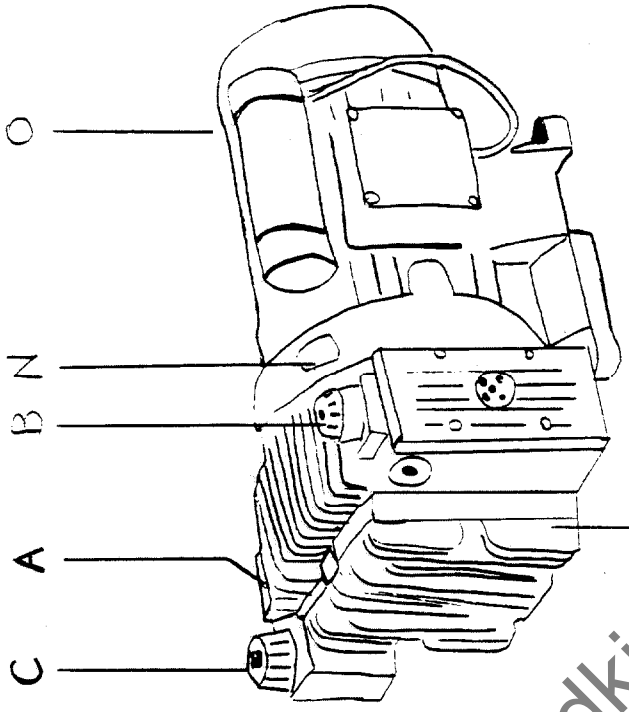
Model Range TR...V has six carbon blades. TR 40 V: first check blades after 5,000 hours and then after 1,000 operating hours. TR 60-80V: first check blades after 3,000 operating hours and then after 500 operating hours.

Blade replacement:

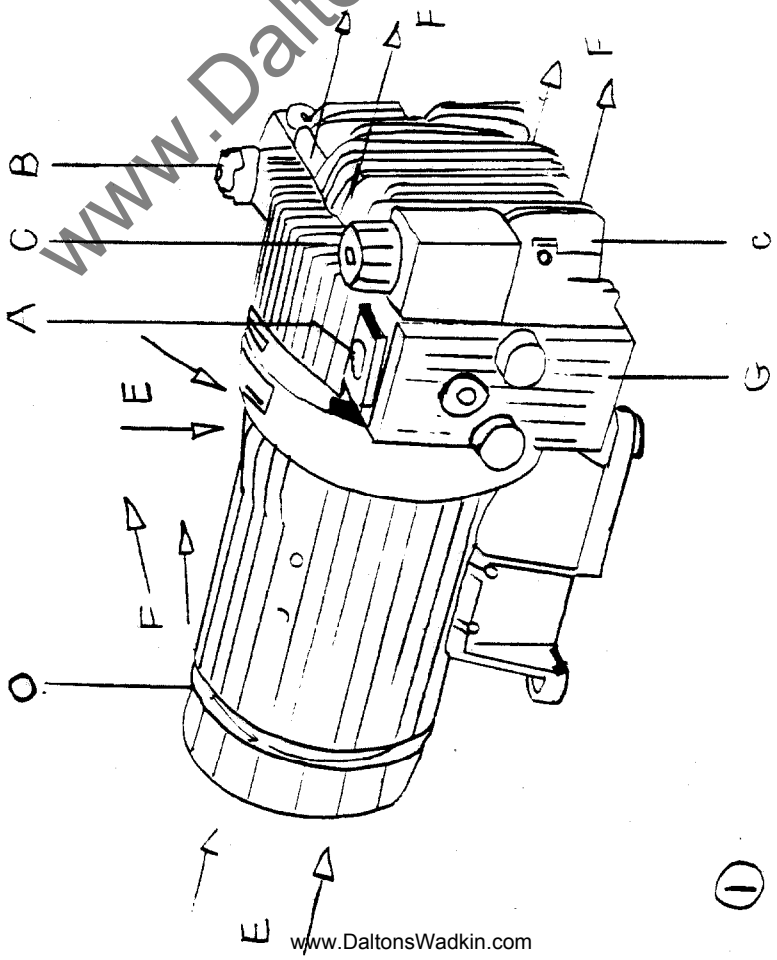
Remove the end cover (c) and take out the blades (a) for checking. All the blades in the pump should have a minimum height (X) as follows:

Type	X (minimum height)
TR 40 V	36 mm
TR 80 V	40 mm
TR 80 V	45 mm

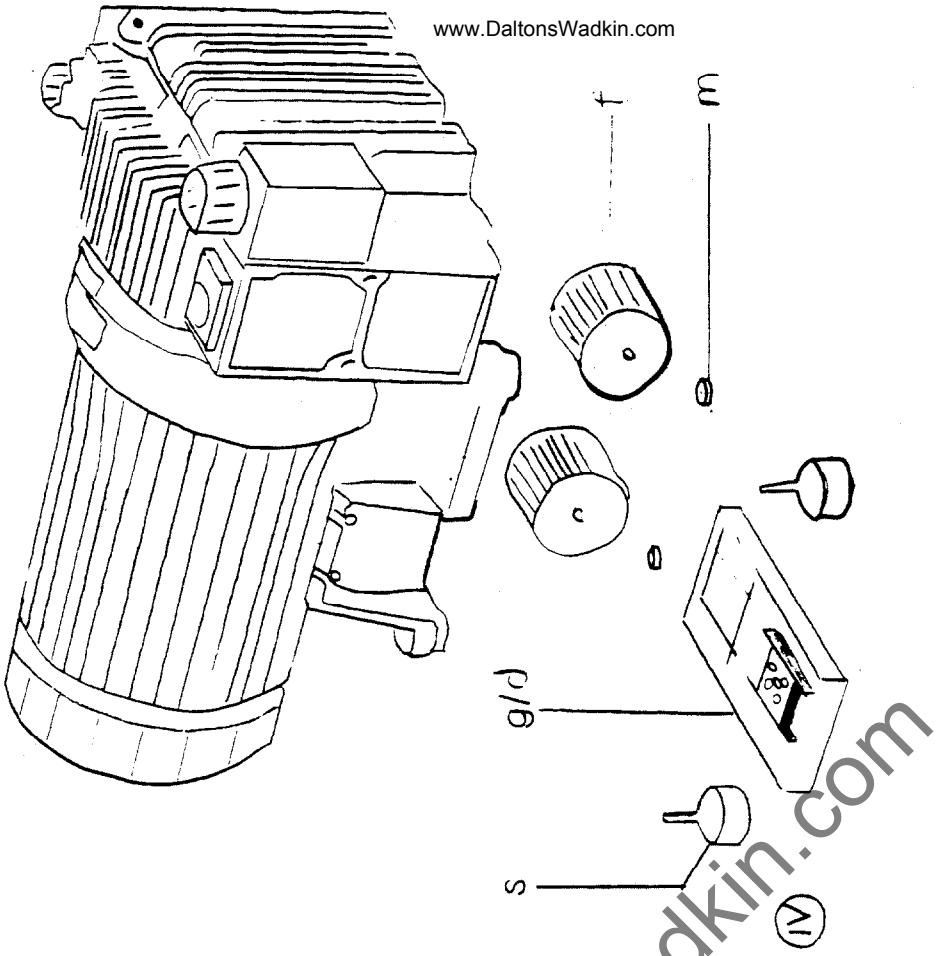
Before refitting blades blow out the cylinder and rotor slots. Place the blades in the slots with the radius outwards (Y) such that the bevel is in the direction of rotation (O) and corresponds with the radius of the cylinder (Z). Refit the end cover (c). Before restarting the pump check the free movement of the blades by rotating the motor cooling fan (r), by removing the fan cowl (l) (Fig. V).

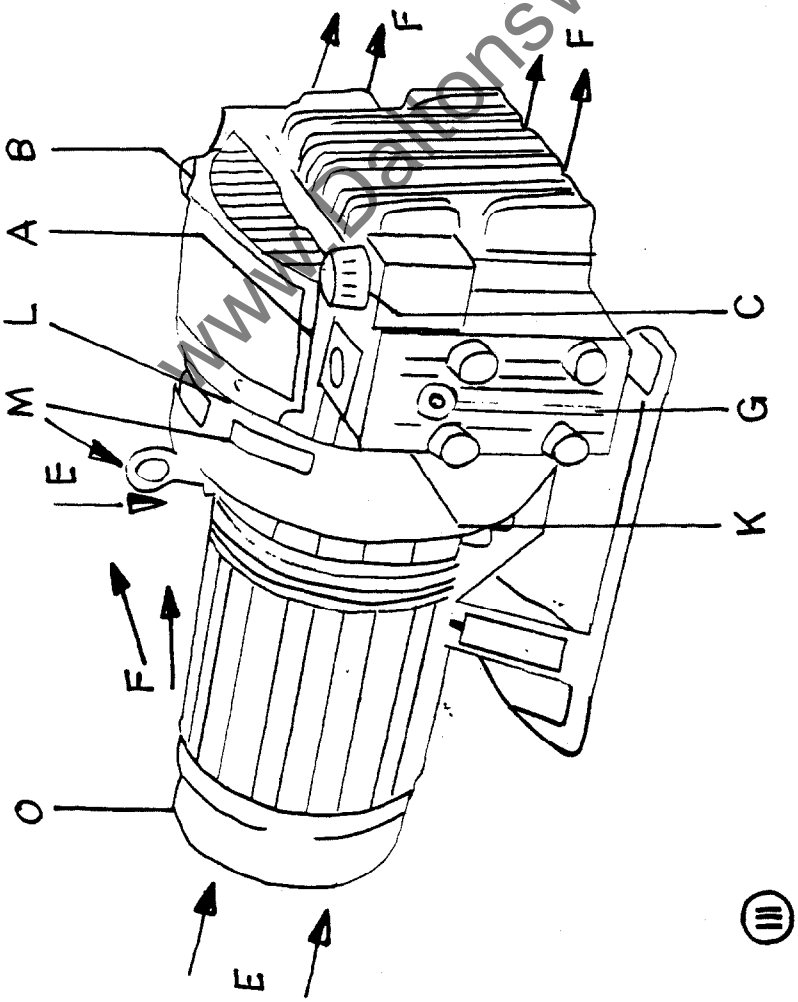


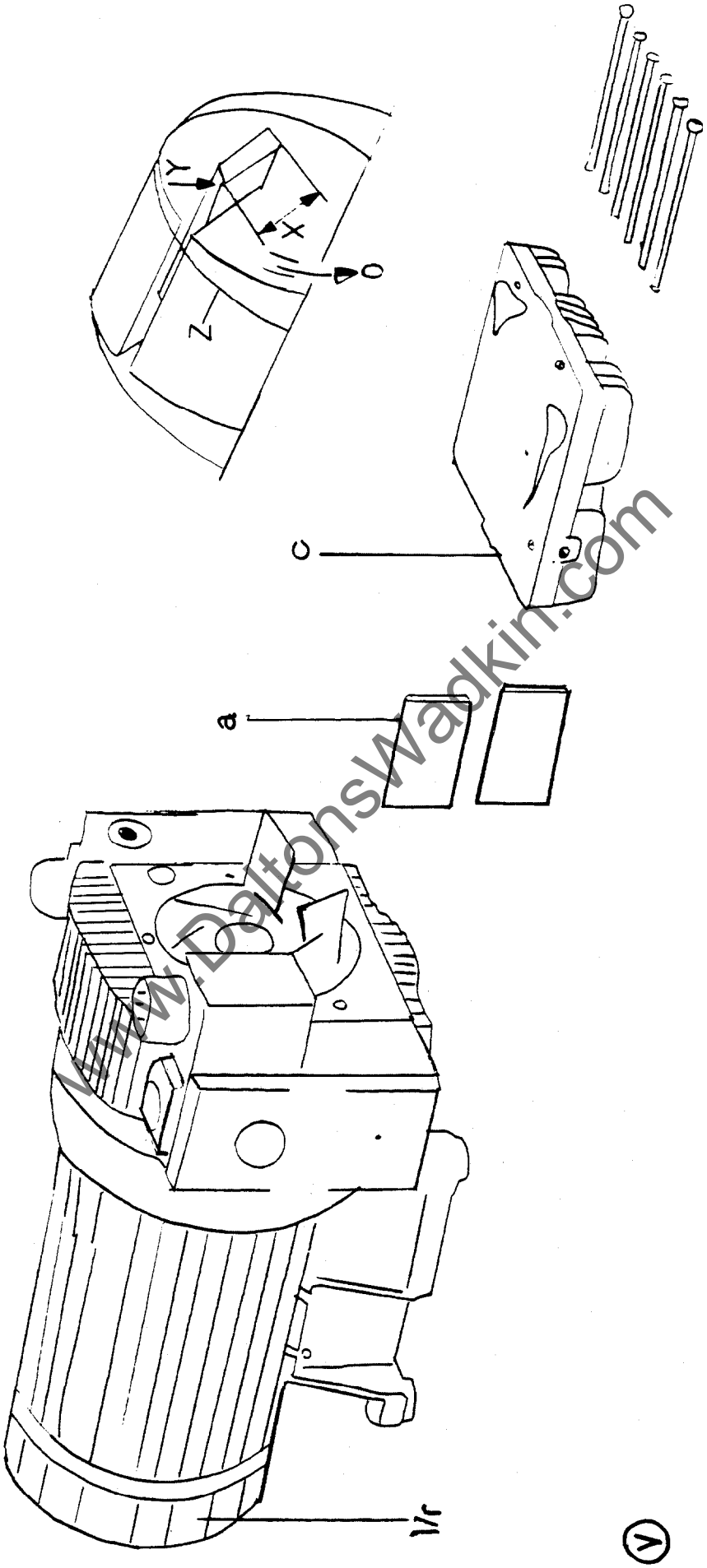
⊜



⊝







SECTION 8

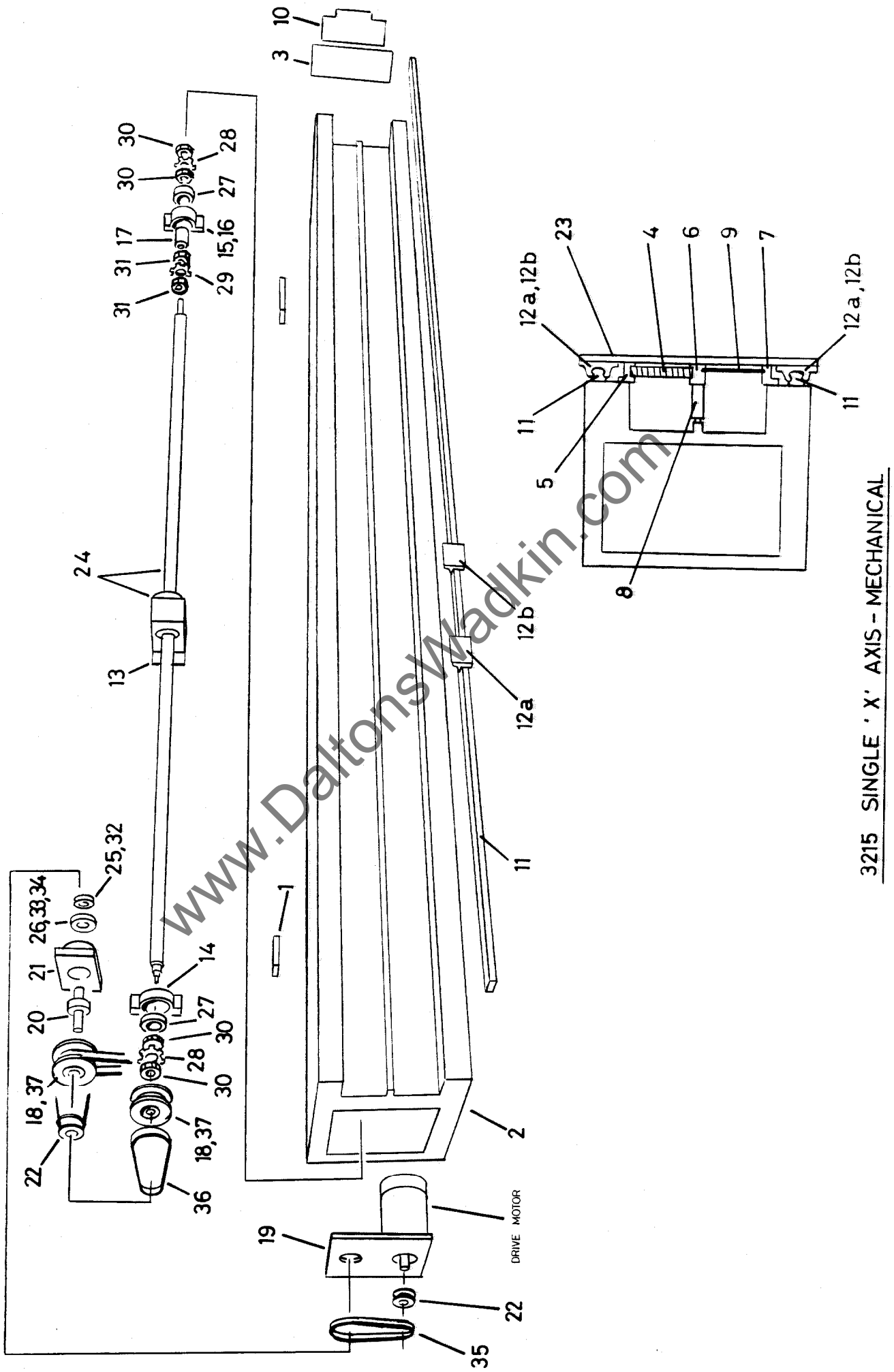
ILLUSTRATED PARTS LISTS

'X' AXIS - OLYMPUS

Key to Illustration

Ref. No.	Description	Part No.	Quantity Single	Quantity Twin
1	LIMIT SWITCH CAM RAIL	G 220	4	4
2	GANTRY	G 400	1	1
3	END COVER	G 402	2	2
4	BELLOWS	G 404	2	4
5	BELLOWS TOP RAIL	G 405	1	2
6	BELLOWS & COVER MID RAIL	G 406	1	1
7	COVER PLATE BOTTOM RAIL	G 407	1	1
8	BELLOWS SUPPORT	G 409	36	36
9	FRONT COVER PLATE	G 410	1	-
10	BELLOWS END PLATE	G 411	2	2
11	LENEAR RAIL	K7012094	2	2
12a	LINEAR BEARING BLOCK	K7012104	2	4
12b	LINEAR BEARING BLOCK	K7012106	2	4
13	NUT HOUSING SHIM PLATE	G 452	1	2
14	DRIVE END BEARING HOUSING	G 453	1	2
15	TAIL END BEARING HOUSING	G 454	1	2
16	TAILE END HOUSING SHIM PLATE	G 455	1	2
17	BEARING SPACER	G 456	1	2
18	DRIVEN PULLEY	G 457/1	2	4
19	MOTOR MOUTING PLATE	G 458	1	2
20	INTERMEDIATE SHAFT	G 460	1	2
21	INTERSHAFT HOUSING	G 461	1	2
22	DRIVE PULLEY	G 462	2	4
23	'X' AXIS CARRIAGE	G 465	1	2
24	'X' AXIS BALLSCREW & NUT	G 475	1	2
25	INTERSHAFT TAIL BEARING	K7012010	1	2
26	INTERSHAFT FRONT BEARING	K7012012	1	2
27	BALLSCREW BEARING	K7012090	2	4
28	LOCKNUT WASHER	K7012212	2	4
29	LOCKNUT WASHER	K7012214	2	4
30	LCOKNUT	K7012312	4	8
31	LOCKNUT	K7012314	2	4
32	20 MM DIA. EXTERNAL CIRCLIPS	K7017020	1	2
33	30 MM DIA. EXTERNAL CIRCLIPS	K7017030	1	2
34	55 MM DIA. INTERNAL CIRCLIPS	K7017055	1	2
35	TIMING BELT 565.5M.25	K7018560	1	2
36	TIMING BELT 665.5M.25 SCREW	K7018652	1	2
37	TAPER LCOKBUSH 1610 X 24 SCREW	K7019100	2	4
*	MOTOR PLATE	G 401	2	-
*	X/Z DIRECTION PLATE	G 417	2	-
*	5" EXTRACTION HOSE	K7020610	30	-
*	TAPER PIN 5 MM LONG	C 518	12	24

* NOT ILLUSTRATED

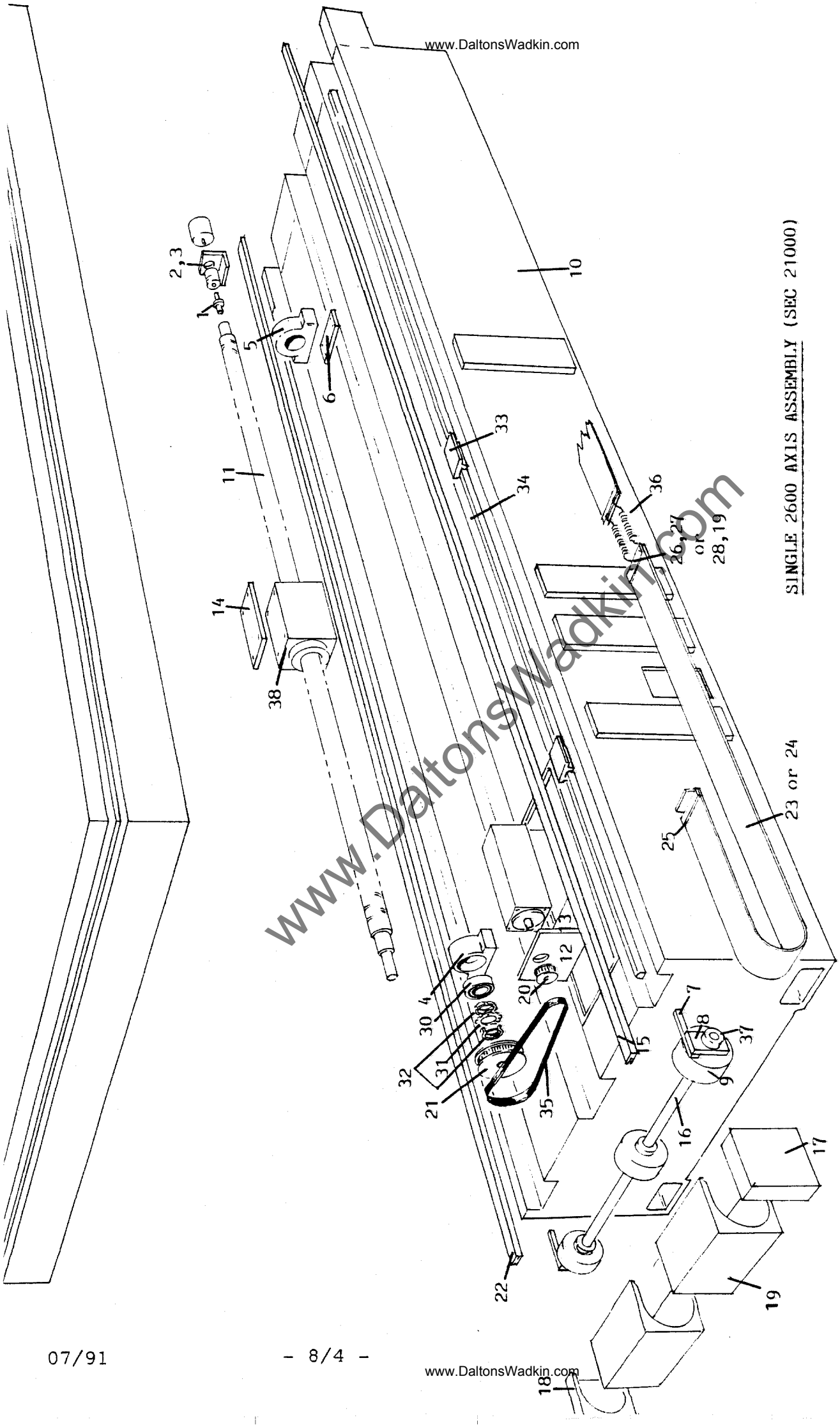


3215 SINGLE 'X' AXIS - MECHANICAL

SINGLE 2600MM AXIS ASSEMBLY

Key to Illustration

Ref. No.	Description	Part No.	Quantity
1	ENCODER PIN	G 219	1
2	ENCODER BRACKET	G 231	1
3	ENCODER BRACKET MOUNTING BLOCK	G 232	1
4	DRIVE END BEARING HOUSING	G 453	1
5	FALL END BEARING HOUSING	G 454	1
6	TAIL END HOUSING SHIM PLATE	G 455	1
7	APRON/SADDLE BAR	G 1304/1	8
8	APRON SUPPORT PLATE	G 1305/1	8
9	ROLLER	G 1307/1	12
10	2600 MM AXIS BASE	G 1900/2	1
11	2600 MM AXIS BALLSCREW	G 1901/1	1
12	MOTOR MOUNTING PLATE	G 1906/1	1
13	ANGLE BASE PLATE	G 1910/1	1
14	NUT HOUSING PACKING PLATE	G 1913/1	1
15	APRON RUNWAY INTERNAL	G 1973/2	4
16	APRON SUPPORT BAR	G 1924/1	2
17	APRON COVER RIGHT	G 1975/2	2
18	APRON COVER LEFT	G 1926/2	2
19	APRON COVER CENTRE	G 1927/2	4
20	MOTOR PULLEY (SINGLE)	G 1929/1	1
21	BALLSCREW PULLEY (SINGLE)	G 1930/1	1
22	APRON RUNWAY EXTERNAL	G 1933/2	2
23	BALLSCREW APRON 2E016B	G 1947/1	2
24	LINEARWAY APRON 2E016B	G 1948/1	4
25	BALLSCREW APRON MOUNTING PLATE	G 1950/1	2
26	BALLSCREW APRON JOINT	G 1953/1	2
27	BALLSCREW APRON JOINT	G 1954/1	2
28	LINEARWAY APRON JOINT	G 1955/1	4
29	LINEARWAY APRON JOINT	G 1956/1	8
30	INA ZKLF 3080 2RS BEARING	K7012090	2
31	LOCKNUT WASHER MB 6	K7012212	2
32	LOCKNUT KM 6	K7012312	4
33	LWHT 25 CI BT1 HSB	K7012694	4
34	LWH 25 R3900 B HSB	K7012970	2
35	TIMING BELT 665.5M.25	K7018652	1
36	SPRINGS ENTEX 556	K7084556	6
37	LOCKING COLLAR	UX 1262	12
38	'X' AXIS NUT HOUSING	UX 3412	1

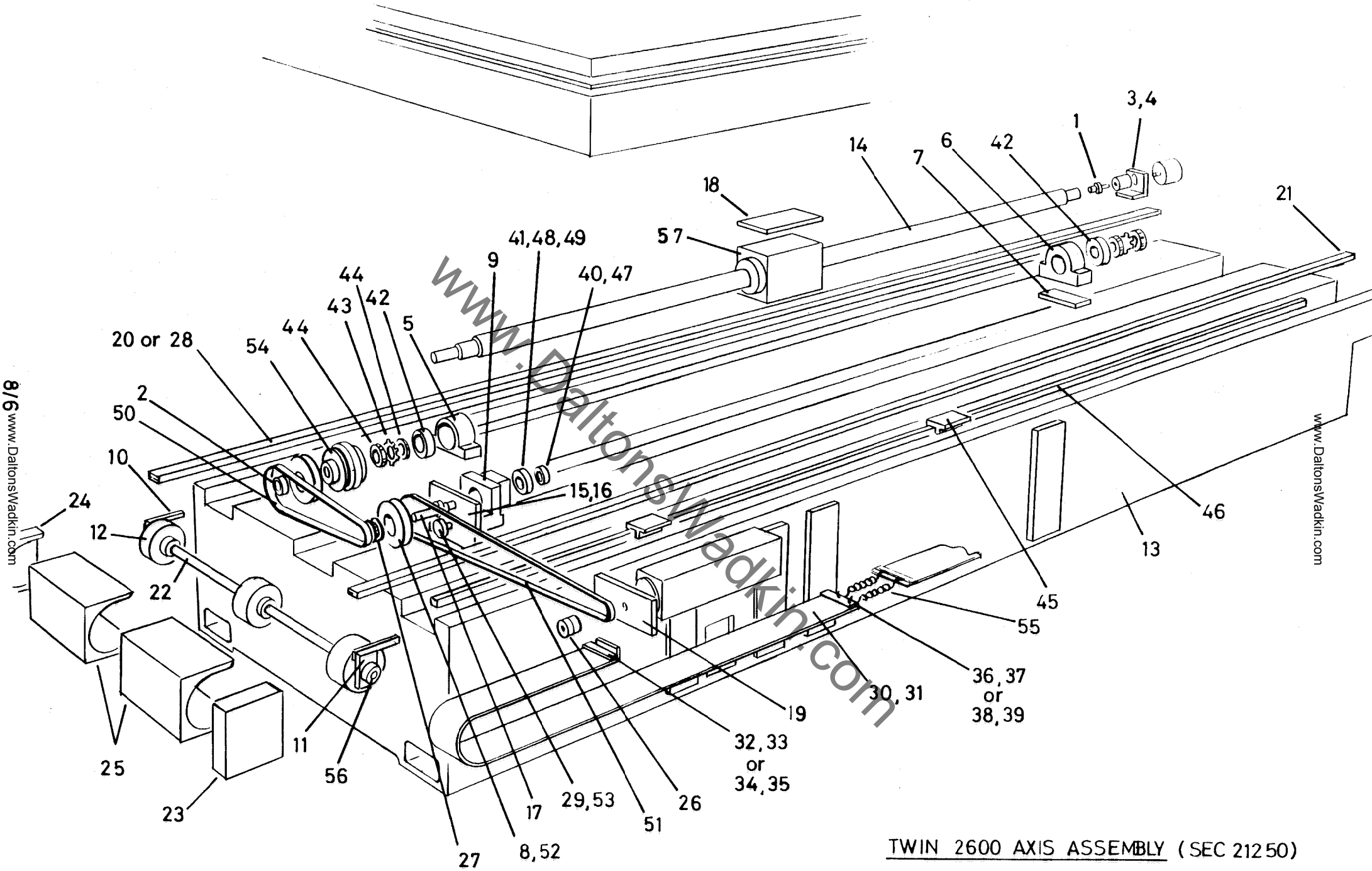


SINGLE 2600 AXIS ASSEMBLY (SEC 21000)

TWIN 2600MM AXIS ASSEMBLY

Key to Illustration

Ref. No.	Description	Part No.	Quantity
1	ENCODER PIN	G 219	2
2	ROTOR BEARING RETAINER	G 222	2
3	ENCODER BRACKET	G 231	2
4	ENCODER BRACKET MOUNTING BLOCK	G 232	2
5	DRIVE END BEARING HOUSING	G 453	2
6	TAIL END BEARING HOUSING	G 454	2
7	TAIL END HOUSING SHIM PLATE	G 455	2
8	DRIVEN PULLEY	G 457/1	2
9	INTERSHAFT HOUSING	G 461	2
10	APRON/SADDLE BAR	G 1304/1	16
11	APRON SUPPORT PLATE	G 1305/1	16
12	ROLLER	G 1307/1	24
13	2600 MM AXIS BASE	G 1900/2	2
14	2600 MM AXIS BALLSCREW	G 1901/1	2
15	REDUCTION MOUNTING PLATE	G 1907/1	2
16	ANGLE BASE PLATE	G 1910/1	2
17	INTERMEDIATE PULLEY SPINDLE	G 1911/1	2
18	NUT HOUSING PACKING PLATE	G 1913/1	2
19	MOTOR PLATE	G 917/1	1
20	APRON RUNWAY-TWIN BASE	G 1922/2	2
21	APRON RUNWAY-INTERNAL	G 1923/2	8
22	APRON SUPPORT BAR	G 1924/1	4
23	APRON COVER-RIGHT	G 1925/2	4
24	APRON COVER-LEFT	G 1926/2	4
25	APRON COVER-CENTRE	G 1927/2	8
26	MOTOR PULLEY (TWIN)	G 1928/1	1
27	INTERMED DRIVING PULLEY	G 1932/1	2
28	APRON RUNWAY-EXTERNAL	G 1933/2	2
29	BELT TENSION ADJACENT PLATE	G 1936/1	2
30	BALLSCREW APRON 2E016B	G 1947/1	4
31	LINEARWAY APRON 2E016B	G 1948/1	8
32	BALLSCREW APRON MOUNTING BLOCK	G 1949/1	4
33	BALLSCREW APRON MOUNTING PLATE	G 1950/1	4
34	LINEARWAY APRON MOUNTING BRAKET	G 1951/1	8
35	LINEARWAY APRON MOUNTING PLATE	G 1952/1	8
36	BALLSCREW APRON JOINT	G 1953/1	8
37	BALLSCREW APRON JOINT	G 1954/1	4
38	LINEARWAY APRON JOINT	G 1955/1	8
39	LINEARWAY APRON JOINT	G 1956/1	8
40	INTER-SHAFT BEARING - SMALL	K7012010	2
41	INTER-SHAFT BEARING LARGE	K7012012	2
42	BALLSCREW BEARING	K7012090	4
43	LOCKNUT WASHER	K7012212	4
44	LOCKNUT	K7012312	8
45	LINEAR BEARING BLOCK	K7012964	8
46	LINEAR RAIL	K7012970	4
47	20 MM DIA. EXTERNAL CIRCLIPS	K7017020	2

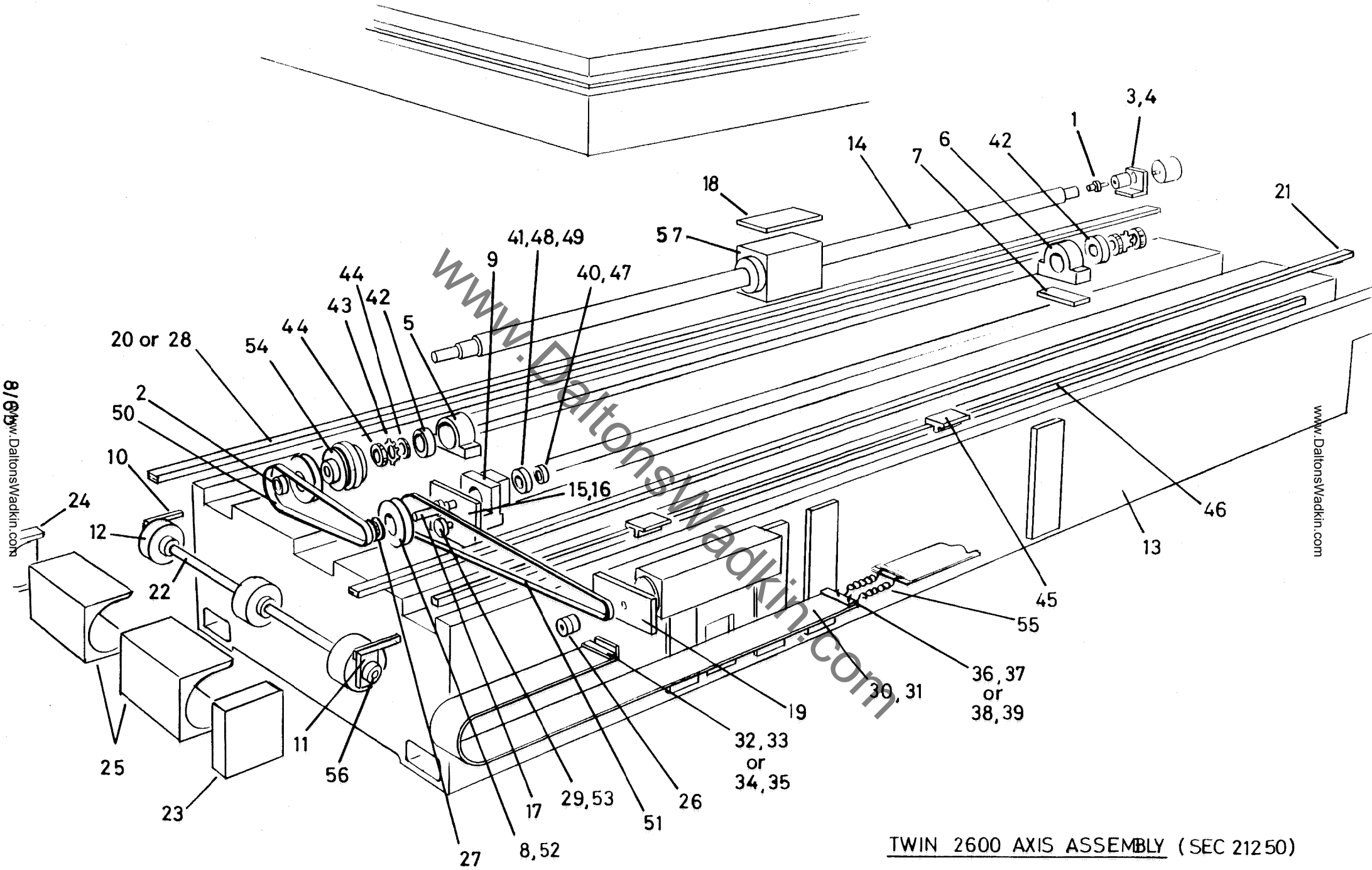


TWIN 2600 AXIS ASSEMBLY (SEC 21250)

TWIN 2600 MM AXIS ASSEMBLY

Key to Illustration

Ref No.	Description	Part No.	Quantity
48	30 MM EXTERNAL CIRCLIPS	K7017030	2
49	55 MM INTERNAL CIRCLIPS	K7017055	2
50	TIMING BELT	K7018652	1
51	TIMING BELT	K7018662	2
52	TAPERLOCKBUSH 1610 X 24	K7019100	2
53	TENSION ROLLER R11	K7019234	2
54	CLUTCH	K7019750	2
55	SPRINGS	K7084556	12
56	LOCKING COLLAR	UX 1262	24
57	X AXIS NUT HOUSING	UX 3412	2



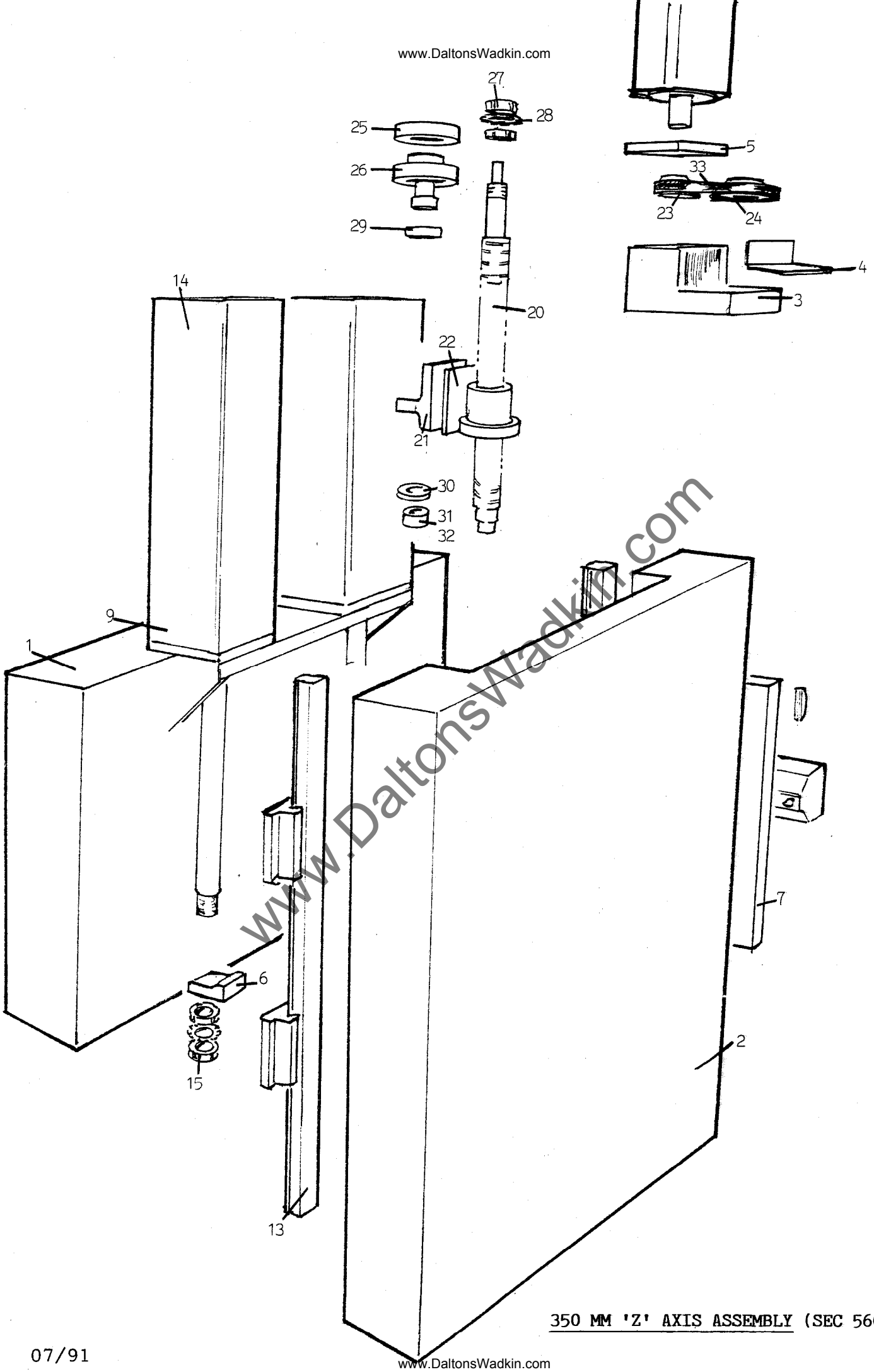
TWIN 2600 AXIS ASSEMBLY (SEC 21250)

350 MM 'Z' AXIS ASSEMBLY

Key to Illustration

Ref. No.		Description	Part No.	Quantity
1		'Z' AXIS BASE	G 600	1
2		'Z' AXIS SLIDE	G 601	1
3		'Z' AXIS TOP BEARING HOUSING	G 602	1
4		TOP BEARING HOUSING COVER	G 603/1	1
5		'Z' AXIS MOTOR MOUTING PLATE	G 604	1
6		COUTERBALANCE BRACKET	G 605	2
7		CAM RAIL 'Z'	G 606	1
8	*	'X' AXIS LIMIT SWITCH BRACKET	G 608	1
9		COUNTER BALANCE CYCLINDER PLATE	G 612	2
10	*	'Z' AXIS LIMIT SWITCH BRACKET	G 613	1
11	*	'Z' AXIS BASE OIL TRAP PLATE	G 620/1	1
12	*	'Z' AXIS SLIDE OIL TRAP PLATE	G 621/1	1
13		IKO BEARING 1WA25C2R80OT2HSB	K7012099	2
14		CYCLINDER M930/400	K7068276	2
15		LOCKNUT M/P1501/57	K7068277	2
20		'Z' AXIS BALLSCREW	G 650/2	1
21		'Z' AXIS NUT HOUSING	G 651	1
22		'Z' AXIS NUT SHIM PLATE	G 652	1
23		'Z' AXIS MOTOR PULLEY	G 653	1
24		'Z' AXIS SCREW PULLEY	G 654	1
25		SEAL CARRIER DR. 2068	K7012086	1
26		ZARE 2068 LTN BEARING	K7012088	1
27		LOCKNUT WASHER MB 4	K7012208	1
28		LOCKNUT	K7012308	2
29		WESTON 30x42x7 R21 L/SEAL	K7012582	1
30		WESTON 25x35x7 R4 L/SEAL	K7012584	1
31		BK 2820A NEEDLE BEARING	K7013472	1
32		IR 22x28x20.5	K7013652	1
33		TIMING BELT 375.5M.25	K7018654	1

* NOT ILLUSTRATED



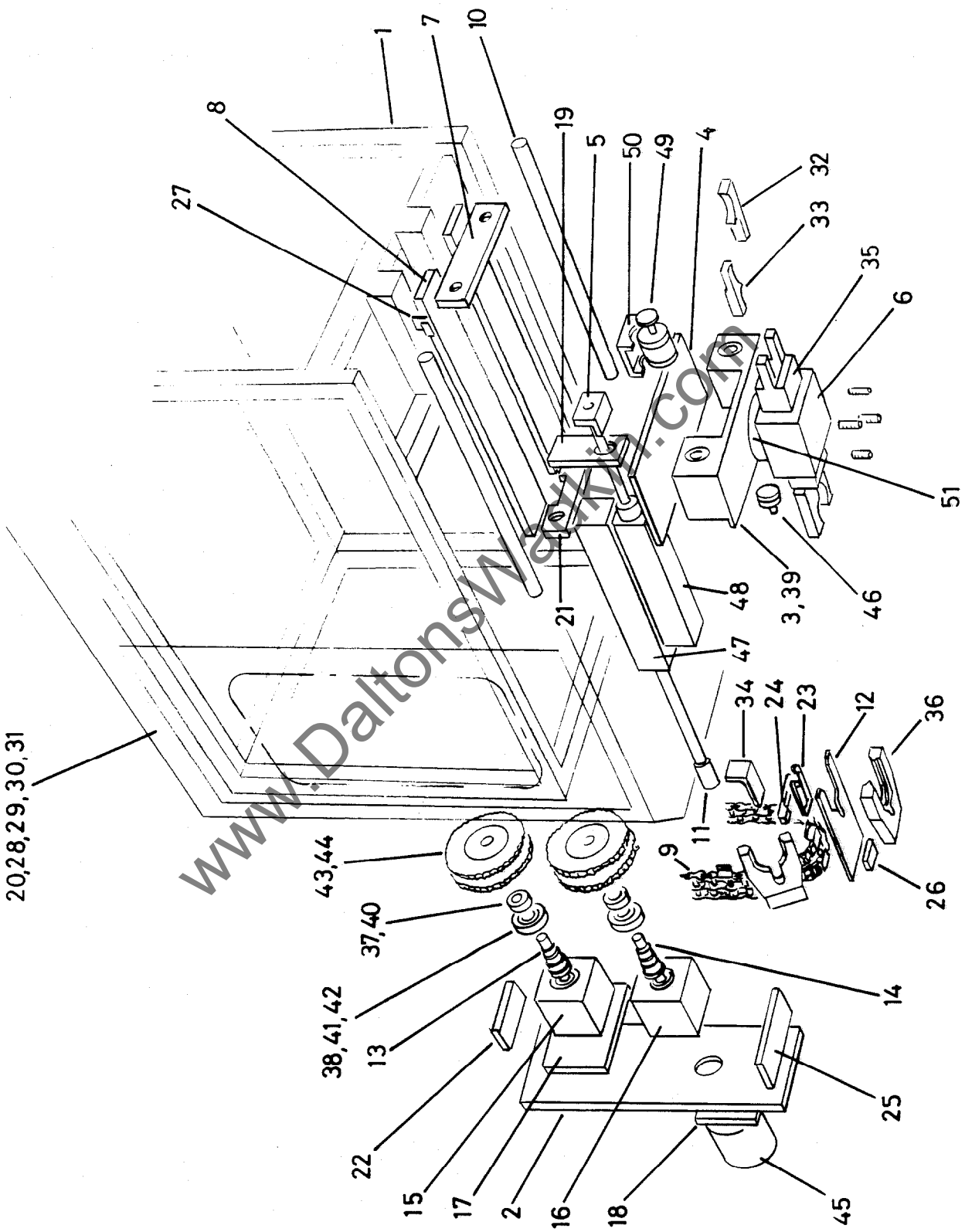
350 MM 'Z' AXIS ASSEMBLY (SEC 5605)

07/91

MK II (DIN) TOOLCHANGER

Key to Illustration

Ref. No.	Description	Part No.	Quantity
1	RIGHT HAND TOOLCHANGE FRAME	TC 0200/2	1
1	LEFT HAND TOOLCHANGE FRAME	TC 0248/1	1
2	TOOLCHANGE MOUNT PLATE	TC 0201/3	1
3	SLIDE CARRIAGE	TC 0203/1	1
4	CARRIGE TOP STRAP	TC 0204/1	1
5	SLIDE SYLINDER MOUNTING BRACKET	TC 0205/1	1
6	GRIPPER MOUTING BLOCK	TC 0206/1	1
7	BAR CARRIAGE HEAD END	TC 0208/1	1
8	SLIDE TOP STRAP	TC 0209/1	2
9	TOOLCHANGE CAROUSEL CHAIN (40")	TC 0210/1	1
10	LINEAR SHAFT	TC 0211/1	2
11	CYLINDER EXTENSION PIECE	TC 0212/1	1
12	TOOLHOLDER MOUNTING PLATE	TC 0213/2	10
13	DRIVEN PULLEY SHAFT	TC 0216/1	1
14	DRIVE PULLEY SHAFT	TC 0217/1	1
15	DRIVEN PULLEY HOUSING	TC 0218/1	1
16	DRIVE SHAFT HOUSING	TC 0219/1	1
17	DRIVEN SHAFT HSG MOUTING PLATE	TC 0220/1	1
18	MOTOR MOUTING PLATE	TC 0221/1	1
19	CYLINDER MOUNTING PLATE	TC 0222/1	1
20	TOOLCHANGE CABINET-RIGHT	TC 0229/1	1
20	TOOLCHANGE CABINET-LEFT	TC 0249/1	1
21	BAR CARRIAGE RACK END	TC 0230/1	1
22	CHAIN TENSIONER	TC 0231/1	1
23	SPRING CLIP	TC 0232/1	10
24	SPRING CLAMP	TC 0233/1	10
25	PROXY SWITCH PLATE	TC 0234/1	1
26	PROXY TARGET CARRIER	TC 0235/2	10
27	PROXY BRACKET	TC 0240/1	4
28	TC CABINET WINDOW-DOOR	TC 0243/1	1
29	TC CABIENT WINDOW FRONT	TC 0244/1	1
30	TOOLCHANGE WARNING PLATE	TC 0245/1	1
31	TOOLCHANGE JOG PLATE	TC 0246/1	1
32	GRIPPER JAW 'A'	TC 0251/1	2
33	GRIPPER JAW 'B' RIGHT-HAND	TC 0258/1	2
33	GRIPPER JAW 'C' LEFT-HAND	TC 0267/1	2
34	TOOL POSITION SENSOR BRACKET	TC 0266/1	1
35	GRIPPER UNIT - M/60310	TC 0268/1	2
36	TOOLHOLDER	G 812/2	10
37	BEARING	K7012012	2
38	BEARING	K7012596	2
39	LINEAR BEARING	K7012910	4
40	CIRCLIP 30 MM DIA.	K7017510	2
41	CIRCLIP 40 MM DIA.	K7017512	2
42	CIRCLIP 68 MM DIA.	K7017514	2
43	TAPERLOCK BUSH	K7019152	2
44	CHAIN SPROCKET 4512020	K7019218	2

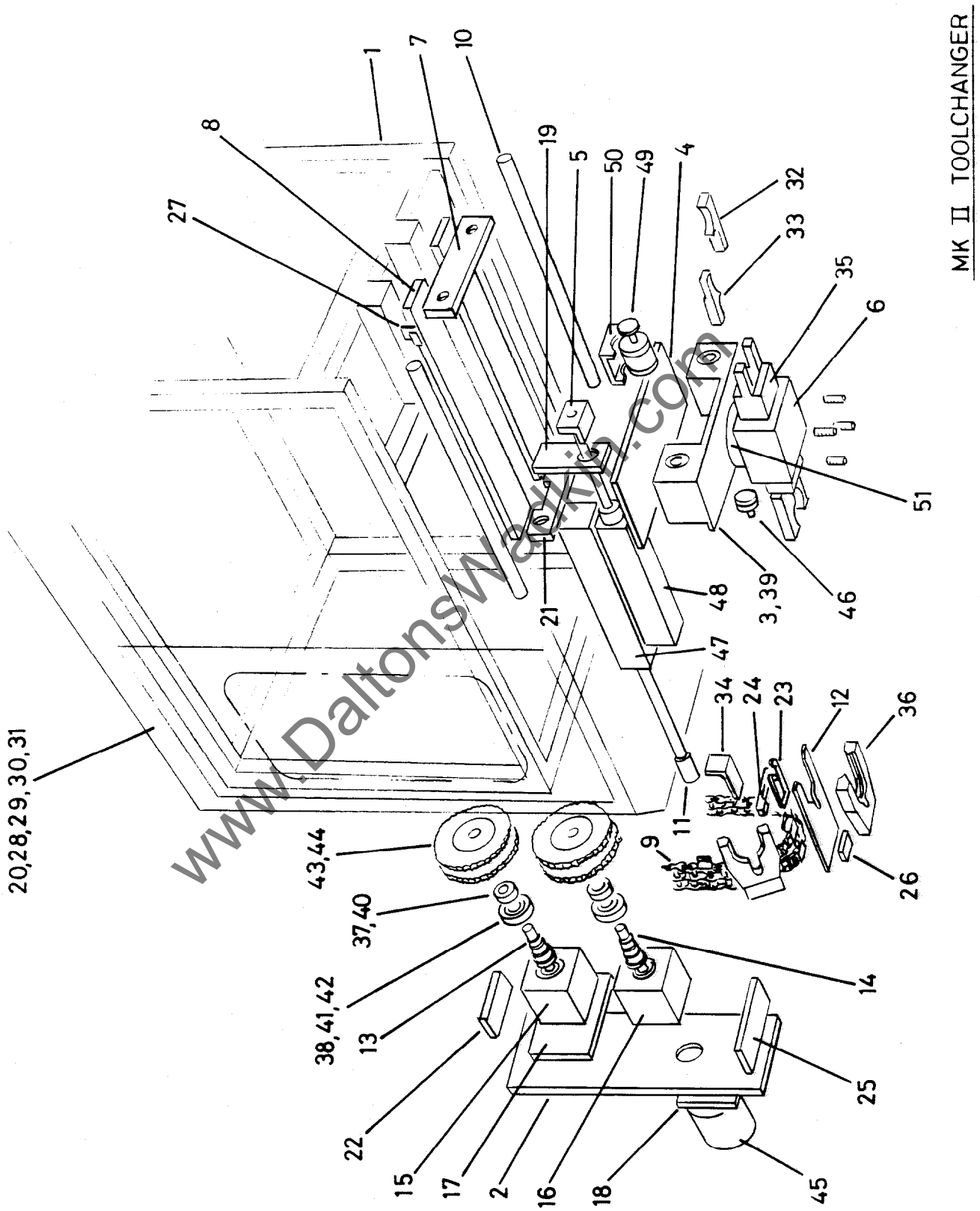


MK II (DIN) TOOLCHANGER

Key to Illustration

Ref. No.	Description	Part No.	Quantity
45	MKII TC BRAKE GEAR MOTOR	K7032198	1
46	CMT BUFFER TYPE E-SOFT	K7054830	1
47	CYLINDER M9125/225	K7068280	1
48	CYLINDER M9125/150	K7068282	1
49	SHOCK ABSORBER C/59838/1	K7068284	1
50	MOUNTING QC/59838/21	K7068286	2
51	ROTARY MODULE M/60220	K7068290	1

NOTE: THIS LIST DOES NOT INCLUDE:-
i) PNEUMATIC OR ELECTRICAL EQUIPMENT
ii) SUNDRY BOUGHTOUT ITEMS, IE. NUTS AND BOLTS.



SECTION 9

SPARE PARTS

9.1 INSTRUCTIONS WHEN ORDERING SPARE/REPLACEMENT PARTS

The undermentioned information should be given with all orders requresting spare/replacement parts.

(i) Machine type.

(ii) Machine serial number

(iii) Part number of required parts, as stated in the instruction manual.

(iv) If no manual available, as full a description as possible of the required part includeing location within the machine.

(v) Order number and full company name and address.

(vi) Company account number, with Wadkin,if known.

(vii) All telephone orders must be followed by an official order, clearly marked 'Confirmation order'.

9.2 RECOMMENDED ELECTRICAL SPARES - 2 YEARS

PART NO.	DESCRIPTION	QUANTITY
K7030439	7.2A 110VA.C/24VD.C POWER SUPPLY	
K7030115	KLIPPON 2.5N CONNECTORS	
K7040835	BAILEY & MACKAY 108V PRESSURE SWITCH	
K7040840	BAILEY & MACKAY 110V PRESSURE SWITCH	
K7040800	BAILEY & MACKAY 85V PRESSURE SWITCH	
K7040211	TELEMECHANIQUE LC1-D254 CONTACTOR	
K7040170	TELEMECHANIQUE LR1-K09314 7-10A OVERLOAD	
K7040247	TELEMECHANIQUE LC1-D093 CONTACTOR	
K7040250	TELEMECHANIQUE LC1-D123 CONTACTOR	
K7040200	TELEMECHANIQUE LA1-D04 CONTACT BLOCK	
K7024893	11 PIN RELAY BASE	
K7024884	110V 11 PIN RELAY	
K7024890	24V 11 PIN RELAY	
K7023105	LN4002 DIODE	
K7030566	1 PHASE SUPPRESSOR	
K7030666	3 PHASE SUPPRESSOR	
K7035193	P.C.B. 24V RELAY/CLIP/SELECTOR	
K7030206	GOLD 50W RESISTOR	
K7044360	15M*10CORE 0.22 MM SCN CABLE	
K7038166	HIGHLAND INDICATOR	
K7038147	HIGHLAND GREEN LENS	
K7038164	12V L.E.D.	
K7038182	HIGHLAND KEYSWITCH	
K7022107	CC 100 BATTERY	
K7040230	TELEMECHANIQUE LR1-D25322 18-25A OVERLOAD (TC AND LC HEADS)	
K7030125	KLIPPON SAKS5 FUSE HOLDER	
K7030123	KLIPPON SAKS3 FUSE HOLDER	
K7028025	35 AMP NEOZED FUSE	
K7028020	20 AMP NEOZED FUSE	
K7028028	50 AMP NEOZED FUSE	
K7028125	15 AMP GLASS FUSE	
K7028115	10 AMP GLASS FUSE	
K7028118	5 AMP GLASS FUSE	
K7028115	2 AMP GLASS FUSE	
K7028088	1 AMP GLASS FUSE	
K7028138	500 M AMP 20 MM GLASS FUSE (MOTHERBOARD M-CODES)	
K7028136	5 AMP 20 MM GLASS FUSE (MOTHERBOARD)	

9.3 RECOMMENDED SPARES FOR TOOLCHANGER - 2 YEARS

PART NO.	DESCRIPTION	QUANTITY
K7040650	OMRON TLX1 FIG GRIPPER ARM DIRECTION INDICATOR	
K7040652	OMRON TLX5 MF1 PROXIMITY SWITCH	
K7040642	BALLUFF BES 516 346 110Y PROXIMITY SWITCH	
K7030019	BALLUFF BES 516 3005 5MM PROXIMITY SWITCH	
K7078606	MARTONAIR M1339 AIR SWITCH (TOOL GRIPPERS)	
K7038160	28 VOLT INDICATOR LAMPS	
K7038106	HIGHLAND LATCHING 1 POLE PUSHBUTTON	
K7038102	HIGHLAND NON LATCHING 1 POLE PUSHBUTTON	
K7038104	HIGHLAND NON LATCHING 4 POLE PUSHBUTTON	
K7036027	R.S. 1K OHM POTENTIOMETER	
K7030205	COLVERN 5K OHM POTENTIOMETER	
K7036023	BLACK POT. KNOBS	
K7036022	BLACK ROTARY SWITCH KNOBS	
K7036026	BLACK CAP FOR K7036022/3	
K7036024	NUT COVER FOR K7036022/3	
K7036000	3 WAY ROTARY SWITCH	
K7036021	6 WAY ROTARY SWITCH	