

ANGLEMASTER 3000

Anglemaster 3000 Bedknife Grinder



SINCE 1979
precisionusa.com
YOUR GOLF COURSE SUPERMARKET
800-345-1960



User's Guide & Instruction Manual

Please read this manual carefully before using the Anglemaster.

This manual should be kept in a safe place so that it can be used for future reference.

ANGLEMASTER

AM3000 Precision Bedknife Grinder

You are now the owner/operator of a Bernhard's Anglemaster 3000 which, if cared for and operated correctly, will give you years of good service.

This manual will enable you to obtain the best results from your Anglemaster so please read it thoroughly before using your machine.

If you have any service or operational problems contact your distributor,
or phone our

Technical Helpline (USA only) – 1-888 474 6348

or

Bernhard and Company Ltd, England – (+44) 1788 811600

or email

techsupport@bernhard.co.uk

or use the technical support feedback form on our web site

www.expressdual.com or www.bernhard.co.uk

When ordering spare parts please quote the machine type and serial number.

THE MANUFACTURERS ACCEPT NO RESPONSIBILITY FOR ANY SITUATION ARISING FROM THE FITTING AND/OR USE OF NON-GENUINE SPARE PARTS.

Contents

Identification of Pictograms	3
Control Box Layout	4
Understanding the Machine	5
Safety	6
Set Up and Installation	7
Setting Up	9
Setting Angles of Cut	13
Electrical Fault Finding	16
Maintenance	18
Parts List	19
Wiring Diagrams	35
Bedknife Mounting Guide	38

Please quote this serial number on all correspondence:

Serial #:



BERNHARD AND COMPANY LTD

Bilton Road · Rugby · England · CV22 7DT
Tel +44 1788 811600 · Fax +44 1788 812640

Email: info@bernhard.co.uk

USA Toll Free **1-888 GRIND IT** (1-888 474 6348)

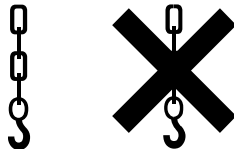
Identification of Pictograms



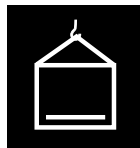
**BEWARE!
HIGH VOLTAGE**



**BEWARE!
MOVING COMPONENTS KEEP HANDS
AND OTHER OBJECTS CLEAR**



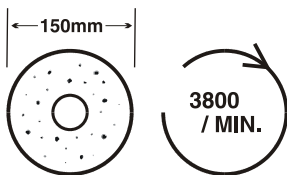
1. LIFT HERE
2. DO NOT LIFT HERE



TOTAL WEIGHT OF MACHINE (KG)



**WEAR EYE, EAR AND BREATHING
PROTECTION**



**MAXIMUM GRINDSTONE
DIAMETER 150mm
MAXIMUM SPEED 3800 Rev/Min**



**BEWARE!
MOVING GRINDSTONE AND SHAFT**

Control Box Layout

CURRENT ANGLE
"Where you are"

DESIRED ANGLE
"Where you want to be"

COOLANT PUMP

RESET 0° ANGLE

TRAVERSE CONTROL

**INCREASE/
DECREASE ANGLE**

GRINDSTONE CONTROL

MAGNET CONTROL

SERVICE SWITCH



(Bottom)
EMERGENCY STOP
(Twist anti-clockwise to release)

Understanding the Machine

Machine Functions

The ANGLEMASTER has three separate motors driving the grind stone, traverse and coolant pump respectively. Each has a separate start and stop button on the control panel.

Grind Stone

Directly driven by the main motor at up to 3800 rpm.

Traverse

Powered by a motor/gearbox unit under the grinding head carriage. Drives along a fixed, damped chain run. Traverse is physically engaged using the over-centre lever on the left front of the carriage.

Coolant pump

Fitted into the top of the coolant reservoir/settlement tank which is located inside the cabinet in the base of the machine.

Emergency stop

Pressing the large red mushroom headed button will stop ALL motors. The button will be locked into the off position. No motors will start when their buttons are pressed until the E-stop is released by twisting the knob counter-clockwise.

1. Safety

- 1.1 Always wear eye protection when operating the machine
- 1.2 Never leave rags or tools on the machine or wear loose clothing that could become caught up in the bedknife, grinding stone or shaft.
- 1.3 Never allow combustible materials to be placed on or around the machine
- 1.4 Always ensure that all parts of the bedknife being ground are securely fixed.
- 1.5 Never use the machine for any purpose other than that for which it was designed
- 1.6 If large units are to be ground, ear defenders should ideally be worn.
(The maximum noise, with a heavy cut on a 36" bedknife has been measured at 85 decibels).
- 1.7 Ensure that all electrical connections are sound and that cables are safely routed.
- 1.8 **NEVER** fit or use any grinding stone other than those supplied specifically for use on the ANGLEMASTER.
- 1.9 **NEVER** fit or use a grinding stone that has been dropped or damaged in any other way
- 1.10 Always mix and use coolant according to the manufacturer's instructions.
- 1.11 Never allow coolant to wash over the control box or other electrical parts.

Extreme caution should be used when removing a bedknife from the ANGLEMASTER.
Ideally protective gloves should be worn.

2. Installation

2.1 Handling

The weight of the machine is indicated on the plate on the front of the machine.

If the machine is supplied crated, it can be moved by a suitable forklift or pallet truck under the crate base (skid).

Once the lid and sides of the crate have been removed, the machine remains bolted to the base (skid).

LIFTING WITH CHAINS/STRAPS/FORKS MUST ONLY BE CARRIED OUT AS INDICATED BY LABELS ON THE MACHINE **NOT** BY MEANS OF THE TRAVERSE GUIDE RAILS.

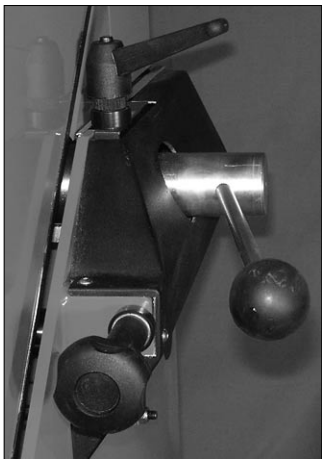
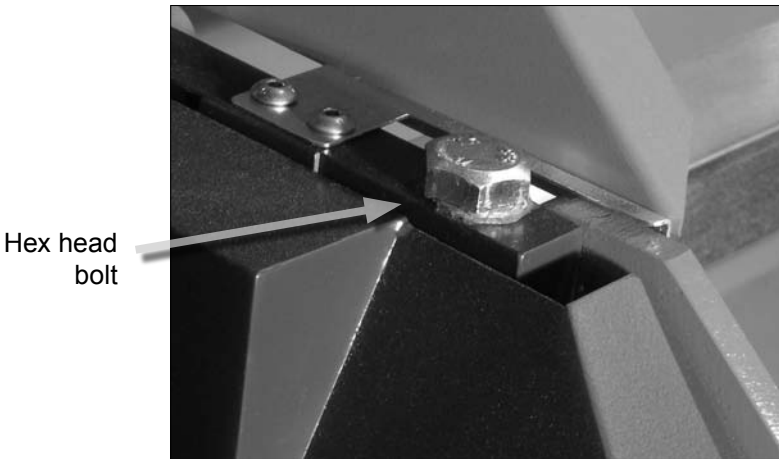


2.2 Location

The machine should be installed in a well-lit area, set up on a solid floor base of concrete or similar. Wooden floors should ideally be avoided.

Using a spirit level, laid across / along the traverse rails, the machine can be leveled easily, suitable metal packing may be placed under the cabinet chassis feet.

2.3 For transit purposes, the blade-mounting bar is locked in position at both ends. Some units may be shipped with a hex head bolt in the right hand clamp. If so, the clamp lock down lever is in the tool drawer of the machine cabinet. Remove replace the hex head bolt with the lever and tighten down.



The hex head bolt on the left-hand clamp should be eased off and adjusted to permit rotation of the mounting bar with a small amount of resistance.

Do not release the right hand clamp (lock down lever) until the weight has been taken on the angle control lever. For all subsequent use only the lock down lever will be used to hold the mounting bar in position. If the lock down lever does not appear to be applying enough force, the hex head bolt on the left-hand needs to be a little tighter.

2. Installation *(Continued)*

2.4 Electrical Supply

USE A QUALIFIED ELECTRICIAN.

All motors are dual cycle 220-230V 50/60Hz, single phase induction motors (Except variable speed traverse motor on DX models which is three phase).

Electrical connection should be via the electrical cable/plug/socket provided and should be to a 20 Amp breaker.

The main grinding head motor is overload protected, whilst coolant pump and traverse motors are independently fused.

Ensure that any cable / conduit run to the machine constitutes no hazard to operator or other personnel.

The machine **MUST BE EARTHED**.

2.5 Coolant

Check the location of the settlement tray in the coolant tank on the shelf in the cabinet under the left-hand side of the machine. It should sit beneath the collector funnel outlet (inlet into tank lid). Also check the connection of the coolant supply hose to the pump outlet.

The soluble additive may be used in the coolant tank and should be mixed according to the manufacturer's instructions (at 1 –1½ capful of additive per FULL tank of water). This fluid is suitable for all types of blade grinding and has good rust inhibiting properties (if used according to instructions).

Do not exceed the recommended concentration as this may lead to "loading" of the grindstone during usage, which may in turn affect grinding results.

Sediment in the coolant tank should not exceed ½". Surplus liquid should be returned to the tank and solid deposits removed at regular intervals, depending upon workload.



3. Setting Up

3.1 General

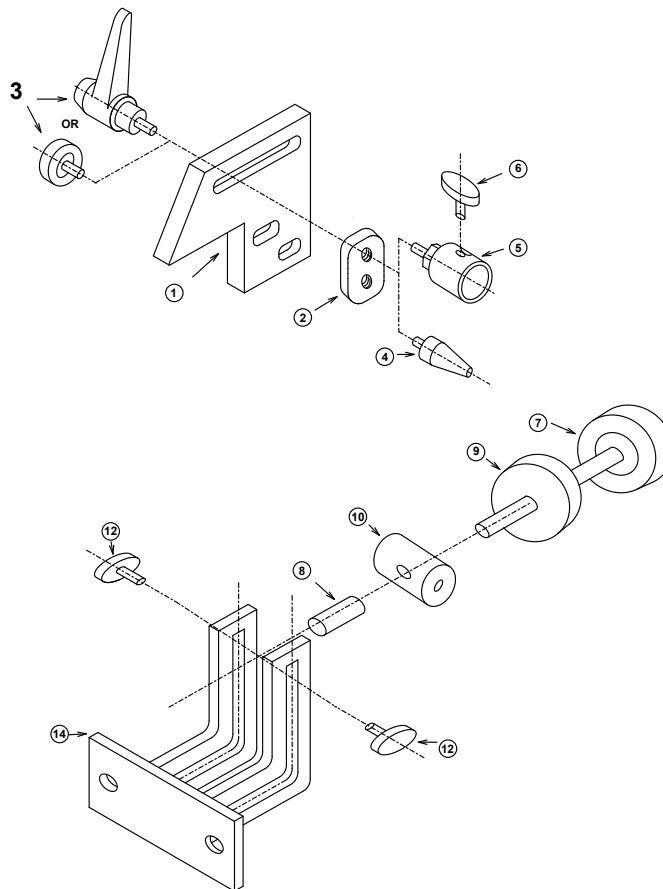
3.1.1 The ANGLEMASTER has a capacity of 40" between mounting brackets for complete bedknife/bedbar assemblies, or 42" for plain blades clamped directly to the mounting bar.

3.2 Mounting a bedknife

3.2.1 The machine is equipped with adjustable, universal bedknife mounting brackets which can easily be set to correspond with bed-bar fixing holes. In this way the bedknife is supported on the machine in a way that resembles, as closely as possible, its mounting in a cutting unit. Special adapters are available when required for certain units (Adjustable quadrant brackets may also be supplied, these are an option for those who prefer to bolt their bedknife assemblies to a support bracket arrangement).

3.2.2 Attach adjustable support plate (2) through horizontal slot using locking knob A / adjustable "kip" lever (3).

3.2.3 Fix either tapered pin (4) or cup (5) to adjustable support plate (Tapered pin fits all bedknife assemblies which either bolt on or locate over a male pivot pin; Cup support is for bedknife assemblies which mount similar to Toro 216, Spartan, 3500, 6500 etc).

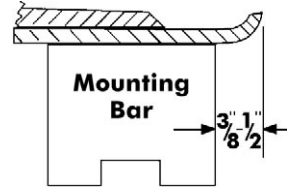


1. BRACKET BODY
2. ADJUSTABLE SUPPORT PLATE
3. LOCKING KNOB A / ADJUSTABLE LEVER
4. TAPERED SUPPORT PIN
5. SUPPORT CUP
6. LOCKING KNOB
7. CENTRAL JACKING SCREW
8. JACKING SCREW END EXTENSION
9. KNURLED LOCKING NUT
10. TRUNNION
11. LOCKING KNOB
12. SUPPORT BRACKET

3. Setting Up (Continued)

3.2.4 There are two alignment stops at the front face of the mounting bar. Rotate the tabs so that they stand above the top face of the mounting bar.

3.2.5 Using the bedknife, draw the stops out as far as they will go (only slight pressure is required). Adjust the nut on the back of the stops to adjust the travel.



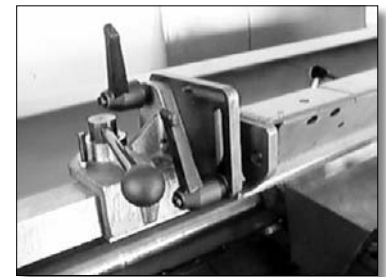
The bedknife should be set to overhang the mounting bar such that the back of the trough lines up with the edge of the mounting bar (the leading edge of the bedknife will be around 3/8" - 1/2" forward of the front edge of the mounting bar). This should ensure that the stone will not grind the back of the bedknife.

3.2.6 Switch on the electromagnets. The bedknife assembly is now held so that it can be easily mounted.

3.2.7 Universal Brackets

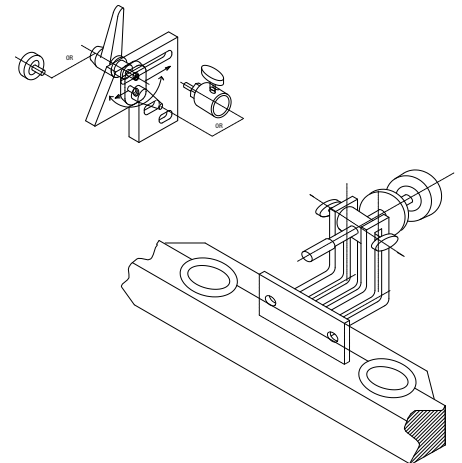
If using the Universal Bedknife Mounting Brackets:

Slide the mounting bracket assembly to the bedknife assembly and locate bedknife using tapered pin or cup support (according to its mounting type).



3.2.8 Lock the bracket end to the Anglemaster mounting bar, then lock the support plate in position using locking knob / adjustable lever.

3.2.9 Rotate the mounting bar forward to improve to improve access and adjust the height and angle of the jacking screw assembly so that the jacking screw end extension aligns with a suitable point on the back of the bedknife assembly. Lock in position with 2 knobs.



Loosen locking nut, adjust jacking screw against the rear of the bedknife assembly with just enough pressure to keep the lower front of the bedknife assembly against the Anglemaster mounting bar (to stop it swinging when the bar is rotated) re-tighten locknut.



Jacking screw against bedknife
(Bar shown rotated to vertical position for clarity)

3. Setting Up (Continued)

3.2.10 Quadrant Brackets

If using the quadrant brackets:

Loosen the ball lever of the left-hand sole plate bracket by pushing down, and slide the assembly up to the left-hand end of the bedbar.

Slacken the quadrant locking lever and swing the quadrant until a bedbar fixing hole aligns with one of the slots.

Tighten the sole plate and quadrant and fasten the bedbar with a suitable bolt.

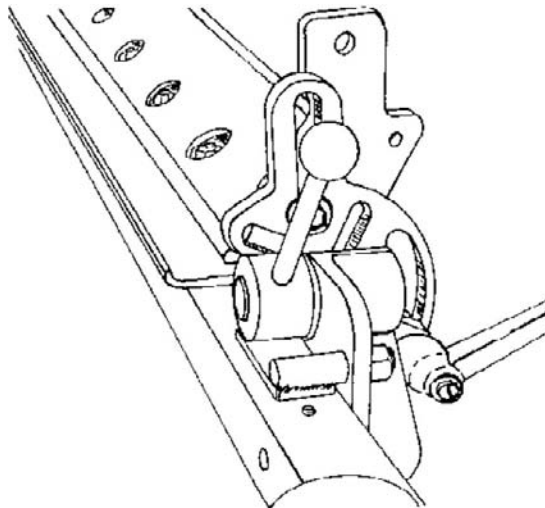
Repeat the procedure for the right hand bracket, ensuring that, when both ends are tightened, the bedknife is still resting on the mounting bar.

(In order to minimize the possibility of distorting very light bedbars, it is advisable to fit a flat washer between bedbar and mounting quadrant).

3.2.11 Rotate the two spring loaded alignment stops to that they retract and sit against the front of the mounting bar (beneath the overhang of the bedknife).

When the grinding motor is started, the electromagnets will de-energize so that they do not adversely affect the straightness of the bedknife or grind.

When the grinding motor is stopped, the electromagnets will re-energize, holding the bedknife assembly so that it can be easily unbolted from the quadrant brackets.



3. Setting Up (Continued)

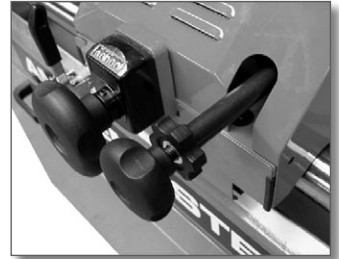
3.5 Grinding stone dressing

A diamond dresser is supplied, fitted to the grinding head.

The grinding stone should be dressed periodically, by adjusting the dresser towards the stone with the secondary control knob that draws the dresser onto the stone. Then rotate the control knob back and forth making a few light passes of the dresser, to ensure that the stone does not become "loaded" (clogged). New stones should ALWAYS be dressed!

There is no necessity to alter the set up to do this. The cut can simply be taken off with the single point feed handwheel and the stone can be dressed mid way through a grind, if necessary.

Ensure that adequate eye / breathing protection is used.



3.6 Grinding stone replacement

Isolate the electrical supply. Rotate the mounting bar so that the top face (magnets) face the operator. Wind the grinding head back to it's rear-most position (nearest the operator) Insert a 6mm hex key into the socket at the rear of the motor and undo the grindstone nut with the box spanner provided.



Key



Box spanner

Before fitting a replacement stone, the new stone should be carefully examined for damage. It should be held loosely and "rung" by tapping gently with a non-metallic object such as a screwdriver handle. A sound stone will make a clear ringing noise. Reject a stone that sounds "dead". Ensure that there is no loose grit/debris between the stone and the mounting flanges.

4. Setting Angles of Cut

4.1 The angle of cut is adjusted by rotating the mounting bar assembly, complete with bedknife, so that it is presented to the grinding stone at the required angle. Take the weight of the assembly on the control lever, loosen lock-down lever then use the control lever to rotate the assembly to the required angle, tighten the lock-down lever.

4.2 **Applying a cut**

The Bedknife blade is adjusted parallel to the grinding access. The mounting bar is paralleled by drawing the mounting bar / bedknife assembly towards the grinding stone, by means of the two handwheels

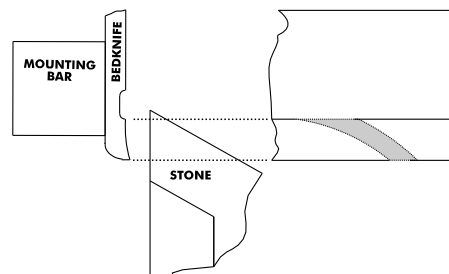
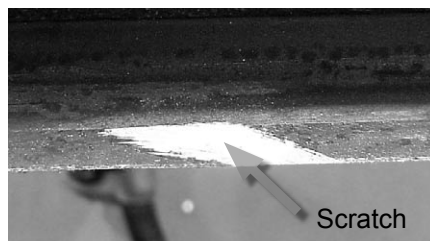
Once the bedknife has been set, the cut is applied via the single point feed handwheel on the grinding head/carriage.

Handwheels must be moved equal amounts. If one is moved considerably more than the other (during set up for instance) mounting bar misalignment could result in the slide block/ feed screws jamming.

4.3 Rotate the mounting bar so that the bedknife is vertical.


4.4 If not already done, release the motor unit from the traverse chain using the lever at the front left hand side of the motor unit.

The guard mounted on top of the motor unit can be adjusted so that you can see the contact point of the stone to the bedknife. Slacken the locating screws to move this and retighten. The guard should only be move the minimum to allow visibility. This will need adjusting as the stone wears over time.



Scratch across the top face of the bedknife (by hand with the grinding motor off, or with experience with the grinding stone motor running).

Adjust the mounting bar so that the grinding stone scratches the full worn face of the bedknife from edge to edge in one spot (You have effectively found the datum relationship between reel and bedknife).

4.5  Press reset button to set the current position of bedknife – left hand “Where you are” display shows zero. Now the bedknife’ blade and machine are both set to 0°



(On a brand new bedknife, scratch across the new face and reset display to 0°, then hold reset button whilst using the + and - buttons to adjust the “when you are” display to the correct angle for that bedknife according to it’s size:

-7°, small units; -9°, medium units; -12°, large units.

As the blade has no wear the angle will be correct as applied by the manufacturer).

4. Setting Angles of Cut *(Continued)*

4.6 Grinding the Top Face of the bedknife



Using the + and - buttons adjust the right hand “Where to want to be” display to the required angle to be applied to the bedknife.

Now apply a relief grind (reverse angle) to the top face of the bedknife by releasing the mounting bar and pushing back on the control lever.

APPLY:

Small blades -5° to -9° (eg. greens mowers)

Medium blades -6° to -12° (tees, surrounds and small fairway)

Heavy blades -7° to -15° (large fairway and gang units)



In each case use the lowest angle for very clean conditions, the highest angle for rough conditions.

(On new bedknives add max 1° to the scratch setting, ie that angle ground at the factory).

When the “Where you are” value equals the desired “Where you want to be” angle it changes to read “Top”.

Lower the guard.

This example: Setting -7° degrees on top face.

a) Use  and  buttons adjust the right hand “Where to want to be” display to -7°.

b) Display reads **t-07°**:



c) Rotate mounting bar so the left “Where you are” current angle changes from 00° towards -07° until it indicates TOP.



4. Setting Angles of Cut (Continued)

4.7 Start the grinding wheel motor and slowly hand traverse the grinding carriage along the length of the bedknife, with very light contact.

Set the traverse stops on the front of the machine chassis, so that the grinding stone just clears the ends of the blade.

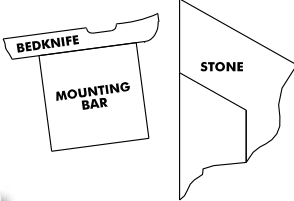
Preliminary setting up passes, with hand traverse during set up, may be made without coolant. Similarly, initial grinding can be carried out without coolant. For the latter stages, a moderate flow of coolant should be directed onto the bedknife, as close as possible to the point of contact with the grinding stone.

Ensure that the ground surface is parallel along the whole length of the bedknife.

With the auto traverse engaged, grind the bedknife until it “sparks out” (only occasional sparks seen as grinding stone passes the blade – no real metal removal).

4.8 **Grinding the Front Face of the bedknife**

Rotate the mounting bar forwards, continue through 0°, through 90° until both displays show **Front** when the front face has reached 5°.



As for the top face, grind the front face parallel from end to end.

Check that the cutting edge is sharp and remove any burr as necessary.

4.9 Unbolt the bedbar from the bedknife mounting brackets. Switch off the electromagnets and remove the bedknife assembly from the Anglemaster.

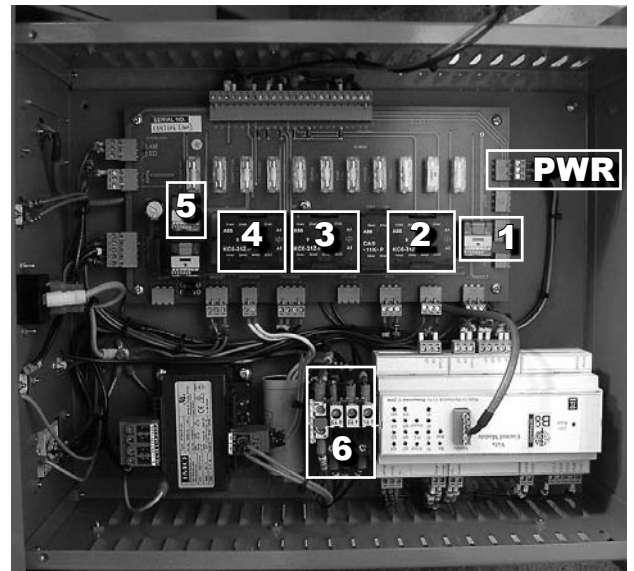
5. Electrical Fault Finding

5.1 USE A QUALIFIED ELECTRICIAN

- 5.1.1 In the event of any motor not starting / magnets not working, the following procedure should be adopted.
- 5.1.2 Check voltage at control box at PWR Plug to Control PCB in the electrical drawer.
- 5.1.3 Check main fuses/breakers feeding machine if voltage is not normal - also check individually labelled fuses on Control PCB.
- 5.1.4 Check that **EMERGENCY STOP BUTTON** on control pendant is not locked in **STOP** position.
- 5.1.5 Check for open circuit on overload terminals 95 and 96, press overload reset button to correct (see Service Bulletin #4).
- 5.1.6 Check that reset button on clear control box lid is not permanently in contact with red button on overload. Adjust as required (see Service Bulletin #1).
- 5.1.7 Listen for the functioning of all four contactors/relays in the control box by operating the individual motor control buttons, and the reversing microswitch. Contactor number 4 should move in and out depending on the position of the microswitch.

The contactors are positioned as shown:

- 1. Coolant Relay
 - 2. Grinding Motor Contactor
 - 3. Traverse Contactor
 - 4. Traverse Reversing Contactor
 - 5. Magnet Relay
 - 6. Overload (beneath reset button)
- PWR: Power Plug



- 5.1.8 If the relevant contactor appears to be operating correctly check the voltage on the out going plug at the Control PCB and then the voltage at the appropriate motor terminals.

5. Electrical Fault Finding (*Continued*)

5.2 Coolant Pump

If the voltage is correct at the coolant pump a new pump is required.

5.3 Traverse Motor

If the voltage is correct at the traverse motor terminals, try fitting a new capacitor before assuming that the motor itself is at fault.

If the traverse jumps at the change in direction, check microswitch and contactor operation but most likely is a capacitor failure (often resulting from a low voltage supply).

5.4 Grinding Motor

If the voltage is correct at motor terminals check the current/amps at terminals T2 & T3 (on thermal overload contactor, then at "MAIN" plug on Control PCB). If the current exceeds the full load current indicated on the motor plate, a new motor is needed. If below full load current the overload could be set too low (see Service Bulletin #4).

5.5 Magnets

Check for 12V DC at terminals 2 and 3 at the 4 pole socket at the rear of the drawer (closest to the largest 16 pole connector. If no volts are present, check output at "MAGNET" plug on main Control PCB - then at transformer (**Warning**: where voltage will be AC).

6. Maintenance

6.1 Maintenance

As with any precision machine, a small amount of time and trouble taken on routine maintenance and cleaning will pay valuable dividends in terms of overall efficiency and component life.

6.2 Lubrication

A small amount of light oil should be applied to the sliding and rotating surfaces of the feed screws/slides and mounting bar assemblies and to the traverse chain as required, at approximately 3 monthly intervals, depending on the work load of the machine.

6.3 Traverse Chain

The chain should be adjusted as required by adjusting the bolts where the chain ends are attached to the machine chassis. The springs at these points should NOT be fully compressed as they provide damping at the change in traverse direction.

6.4 Rails

Rails should be kept as clean as possible. Although the rear rail is cleaned by wipers attached to the carriage cover, some dust/debris will still collect on this rail.

Wipe the rails down daily and spray with WD40 at the end of each day's grinding.

NOTE 1: Always wipe the rails before grinding as oil / WD 40 will cause grinding debris to stick during operation.

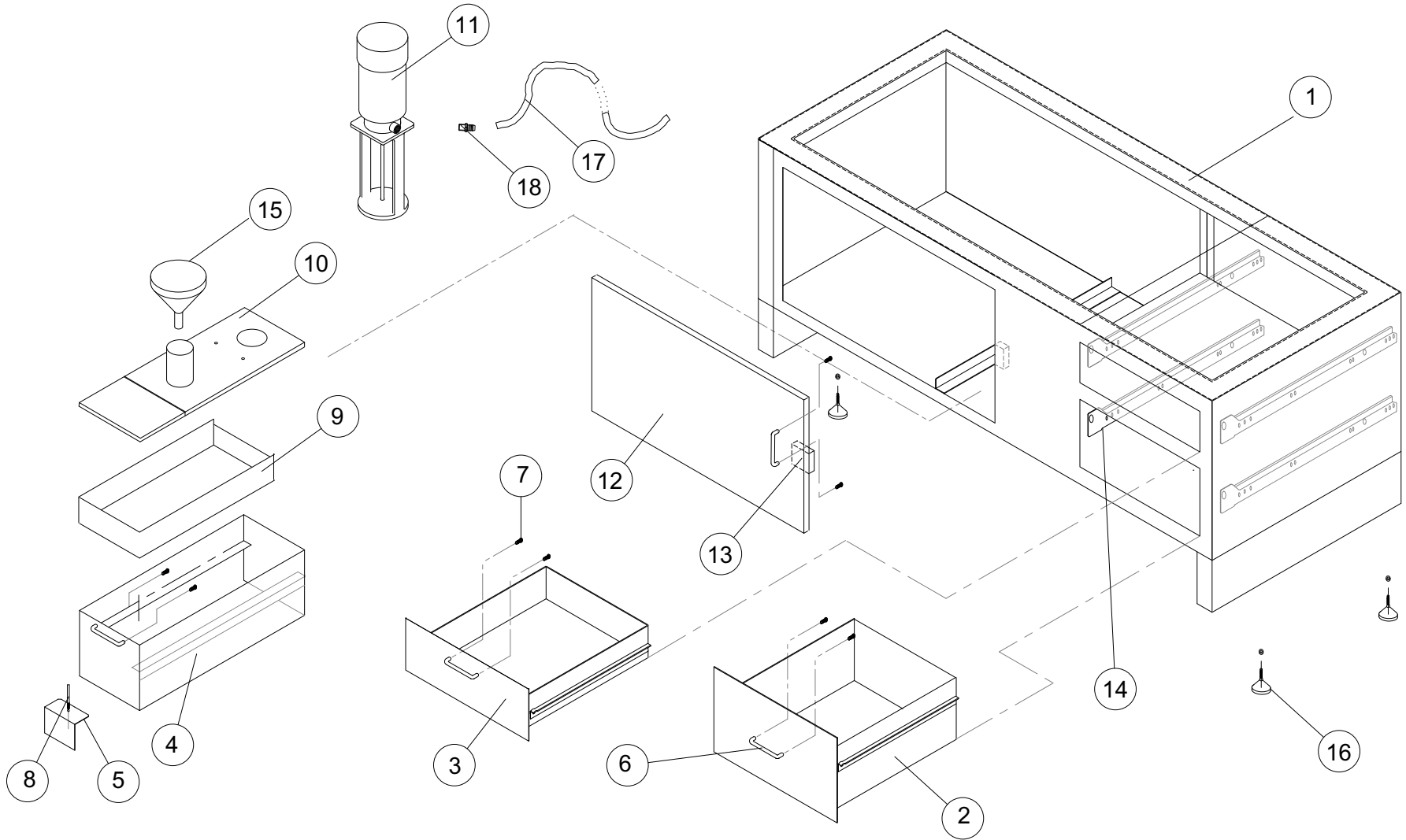
NOTE 2: The rolling action of the carriage bearings along the rails will eventually result in the appearance of narrow "flats" on the rails where the gearings run. This is perfectly normal and DOES NOT affect the accuracy of the machine (These narrow flats are actually work-hardened areas).

7. Parts List

	Page
BASE FRAME _____	18
MAIN FRAME _____	20
DUST TRAY AND GUARDS _____	22
MOUNTING BAR _____	24
TRAVERSE MOTOR AND CARRIAGE _____	26
MAIN MOTOR AND SLIDE _____	28
MOTOR GUARD _____	30
CONTROL BOX _____	31
ELECTRICAL DRAWER _____	32
SAFETY GUARD _____	34

Ref #	Name of Part	Qty.	Part #
BASE FRAME _____			
1	Base Cabinet.....	1	A6304
2	Bottom Drawer.....	1	A6308
3	Top Drawer.....	1	A6309
4	Coolant Tank.....	1	A6315
5	Coolant Tank Stop Bracket.....	1	A6316
6	Drawer Handle.....	4	A6110
7	Button Head Screw M6 x 10.....	8	A5142
8	Stop Bracket Screw.....	1	
9	Coolant Settlement Tray.....	1	A6314
10	Coolant Tank Top.....	1	A6317
11	Coolant Pump.....	1	A6009
12	Cabinet Door.....	1	A6306
13	Magnetic Door Catch.....	1	A6740
14	Drawer Runner Set L.H. & R.H.	4	A6741
15	Funnel.....	1	A6855
16	Adjustable Feet.....	4	A6107
17	Coolant Pipe.....	1	A6733
18	Pump Base Fitting 3/8" BSP.....	1	A6763

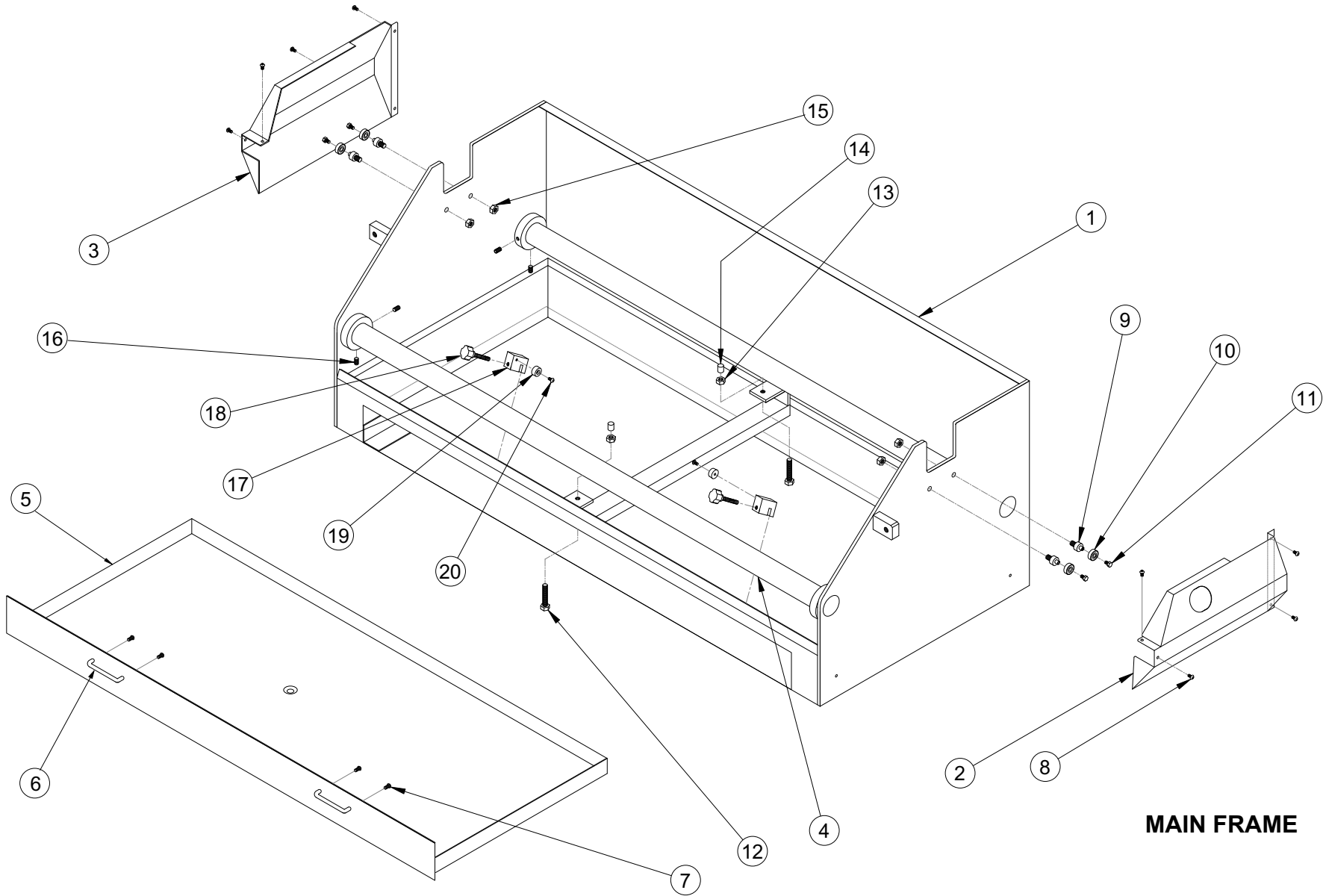
7. Parts List (Continued)


BASE FRAME

7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
MAIN FRAME			
1	Main Frame	1	A4072
2	M't'g Bar Feedscrew Guard R.H.....	1	
3	M't'g Bar Feedscrew Guard L.H.....	1	
4	Rail	2	A6717
5	Large Dust Drawer	1	A6332
6	Drawer Handle	2	A6110
7	Button Head Screw M6 x 8	4	A5158
8	Button Head Screw M5 x 6	8	A5138
9	Eccentric for Slide Block	4	A9211
10	Bearing	4	A7723
11	Hex. Head Bolt M6 x 12	4	A5718
12	Rail Adjuster Bolt M10 x 50	2	A5755
13	Nut M10	2	A5503
14	Brass Cap.....	2	A9222
15	Nut M10	4	A5503
16	Socket Grub Screw M8 x 30	8	A5188
17	Reversing Stop	2	A4115
18	4 Lobe Knob M8 x 45	2	A6133
19	Buffer for Reversing Stop.....	2	A6819
20	Button H'd S'k't Screw M5 x 10.....	2	A5129

7. Parts List (Continued)

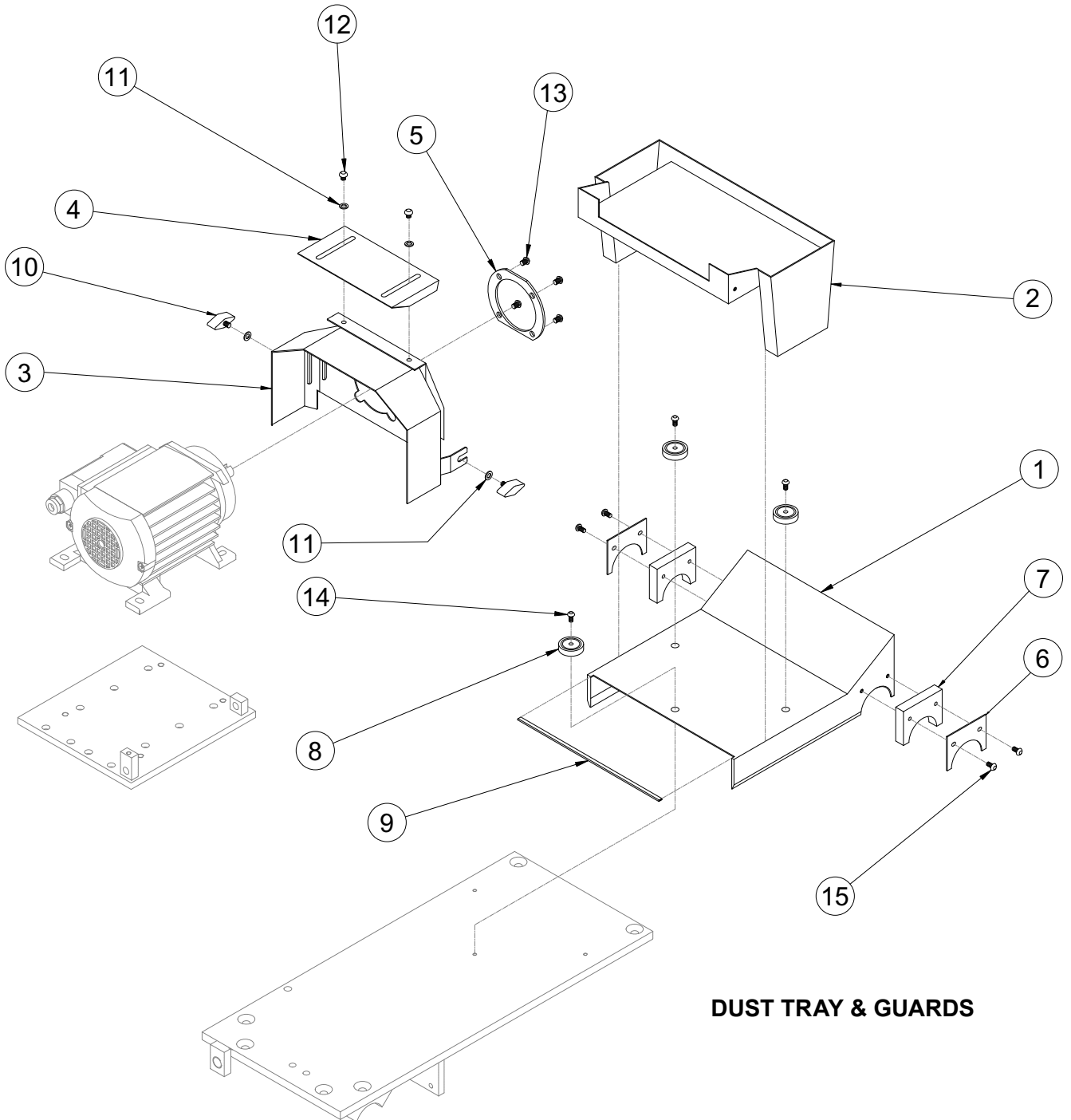


MAIN FRAME

7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
DUST TRAY & GUARDS			
1	Rear Rail Guard	1	A6347
2	Removeable Dust Tray	1	A6350
3	Grinding Wheel Guard	1	A6330
4	Adjustable Spark Guard	1	A6301
5	Clamp Ring	1	A6444
6	Wiper Plate	2	A4104
7	Wiper Felt	2	A6766
8	Magnet	3	A6704
9	Grommet Strip	1	A8219
10	Wing Knob M6 x 8	2	A6144
11	Washer M6	4	A6144
12	Button Head Screw M6 x 8	2	A5158
13	Button Head Screw M6 x 8	4	A5158
14	Button Head Screw M5 x 8	3	A5205
15	Button Head Screw M5 x 8	4	A5205

7. Parts List (Continued)

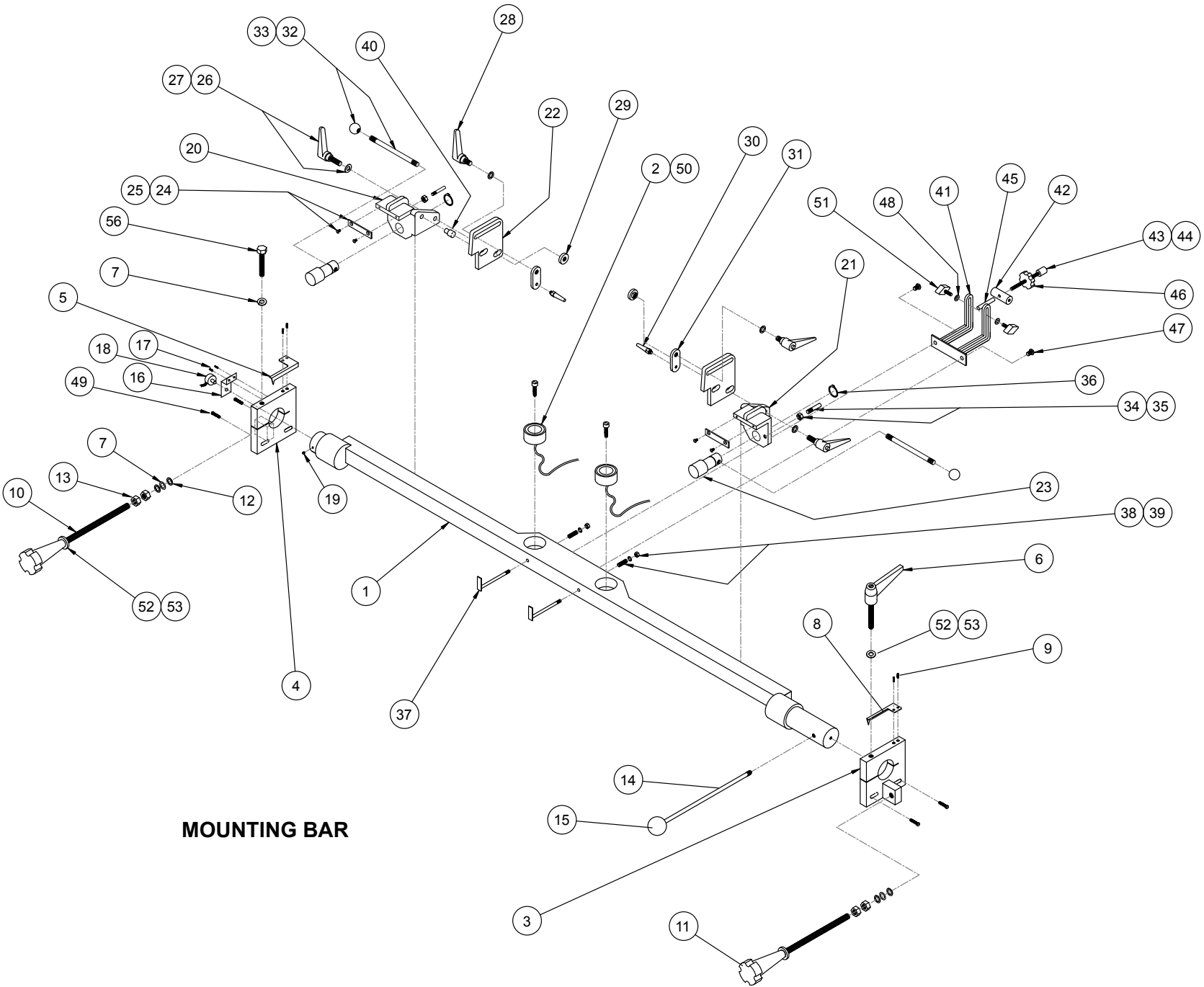


DUST TRAY & GUARDS

7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
MOUNTING BAR			
1	Mounting Bar	1	A4081
2	Magnet.....	2	A6753
3	Mounting Bar Block R.H.....	1	A4083
4	Mounting Bar Block L.H.....	1	A4082
5	Mounting Bar Pointer L.H.....	1	A6339
6	Kip Lever M12 x 80.....	1	A6196
7	Washer M12	3	A5314
8	Mounting Bar Pointer R.H.....	1	A6340
9	Button Head Screw M6 x 8	4	A5158
10	Mounting Bar Feedscrew	2	A5417
11	M'ting Bar F'screw Handwheel	2	A6135
12	Single Coil Washer M12	4	A5312
13	Nut M12	4	A5506
14	Mounting Bar Lever	1	A9070
15	Ball Knob	1	A6134
16	Angle Potentiometer Bracket	1	
17	Mounting Screws.....	2	
18	Angle Potentiometer	1	
19	Grun Screw	1	
20	Soleplate Casting L.H.	1	A4130
21	Soleplate Casting R.H.....	1	A4131
22	Quadrant Plate	2	A4302
23	Eccentric Pin	2	A9031
24	S'plate Casting Retaining Strip	2	A4132
25	C's'k Socket Screw M4 x 8.....	4	A5127
26	Kip Lever M10 x 30.....	2	A6119
27	Washer M10	4	A5310
28	Kip Lever M10 x 15.....	2	A6181
29	Captive Nut M10.....	2	A9023
30	Taper Pin	2	A9119
31	Taper Pin Plate.....	2	A4089
32	Eccentric Pin Handle.....	2	A4184
33	Ball Knob	2	A6115
34	Lever Stop	2	A9062
35	Nut M8	2	A5519
36	Circlip 25mm	2	A5603
37	Mounting Bar Finger.....	2	A4085
38	Spring M8 x 30	2	A6752
39	Nyloc Nut M6.....	2	A5517
40	Quadrant Pivot Pin	2	A9105
41	Centre Jacking Screw Bracket.....	1	A4374
42	Mounting Bar Bracket Boss.....	1	A9198
43	Jacking Screw Knob.....	1	A6193
44	Jacking Screw	1	A5470
45	Thread Extension.....	1	A9197
46	M8 Locking Nut	1	A6179
47	Button Hd S'k't Screw M8 x 12.....	2	A5194
48	Washer M6	5	A5320
49	Shoulder Screw M10 x 12 x 25.....	4	A5120
50	Button Head Screw M6 x 16	2	A5148
51	Wing Knob M6 x 15	2	A6129
52	Thrust Bearing.....	3	A7738
53	Cover for Thrust Bearing.....	3	A6195
54	¾" dia Cup Locator (not shown).....	2	A2733
55	19mm Taper Pin (not shown).....	2	A9266
56	Hex Head Bolt M12 x 75.....	1	A5715
57	Cable Potentiometer to Lyra OCB (Not Shown)	1	

7. Parts List (Continued)

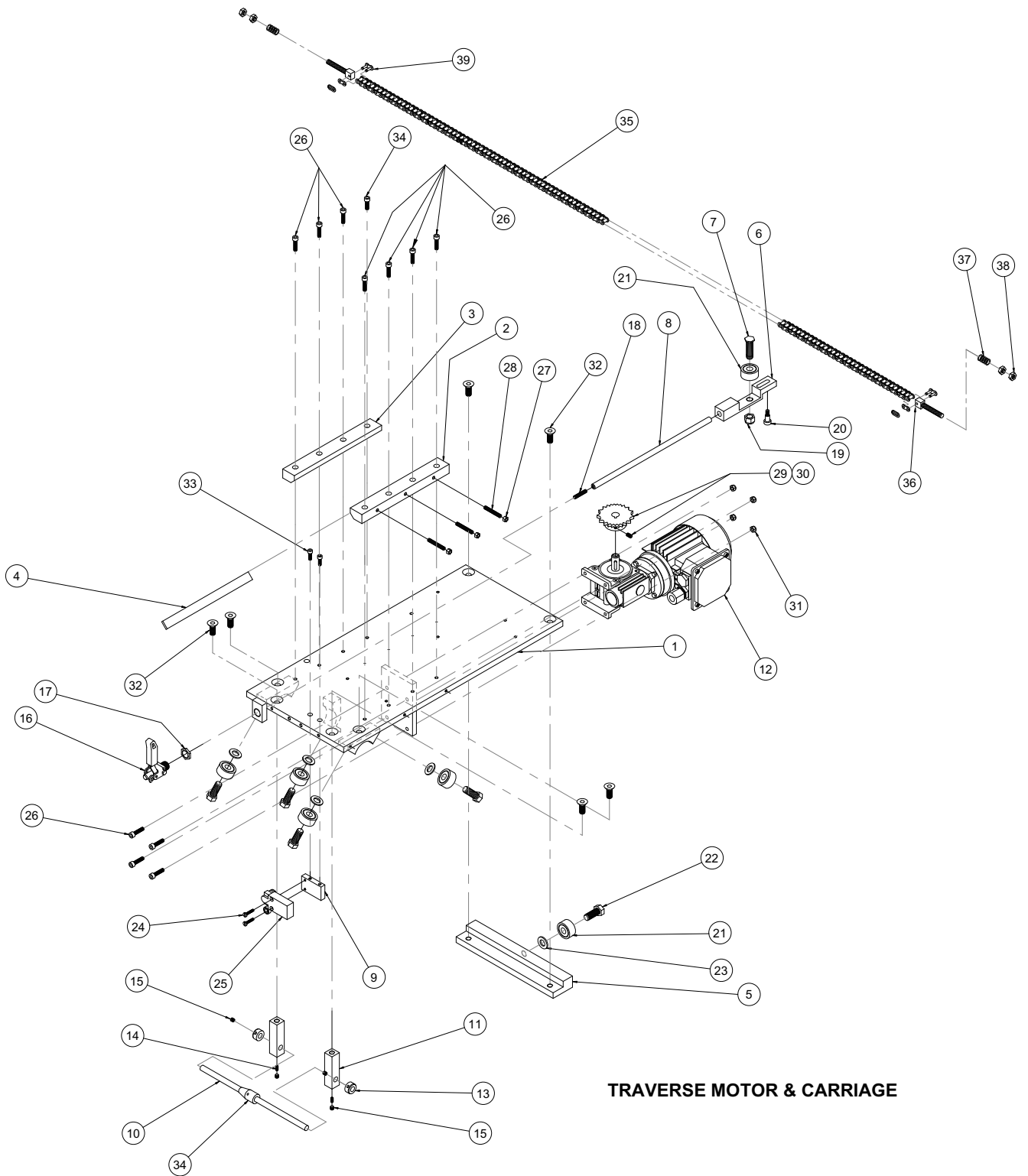


MOUNTING BAR

7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
TRAVERSE MOTOR AND CARRIAGE			
1	Carriage Plate	1	A4023
2	Carriage Plate Slide R.H.	1	A4304
3	Carriage Plate Slide L.H.	1	A4024
4	Jib Strip	1	A4061
5	Rear Adj. Bearing Block	1	A4107
6	Clutch Engagement Bracket	1	A4292
7	Hex. Head Sp'c'l Set Screw	1	A9065
	M12 x 40		
8	Clutch Shaft	1	A9214
9	Microswitch Mounting Block	1	A4075
10	Reversing Bar	1	A9110
11	Reversing Bar Support Block	2	A4114
12	Traverse Motor 60Hz	1	A6023
	Traverse Motor 50Hz	1	A6021
	Traverse Motor 3 phase	1	A6020
13	10mm Collar large	2	A9006
14	5mm Spring	2	A6718
15	Grub Screw M6 x 6	4	A5156
16	Toggle Latch	1	A6884
17	Halfnut M16	1	A5527
18	Grub screw M6 x 30	1	A5215
19	Nyloc Nut M12	1	A5507
20	Shoulder Bolt M8 x 12 x 6	1	A5165
21	Bearing	7	A7713
22	Hex. Head Bolt M12 x 30	1	A5713
23	Special Washer M12	1	A5211
24	Pan Head Screw M4 x 20	2	A5412
25	Microswitch	1	A8133
26	Cap Head Screw M6 x 25	11	A5152
27	Nut M6	3	A5516
28	Jib Strip Screw M6 x 40	3	A5111
29	Sprocket	1	A7606
30	Grub Screw M6 x 10	1	A5175
31	Nyloc Nut M6	4	A5517
32	C's'k Socket Screw M10 x 25	6	A5115
33	Cap head Screw M5 x 16	2	A5132
34	Reversing Bar Actuator	1	A9112
35	Traverse Chain	1	A4144
36	Chain Tension Bolt	2	A5420
37	Tension Spring	2	A6739
38	Nut M10	4	A5504
39	Chain Link	2	A7502

7. Parts List (Continued)

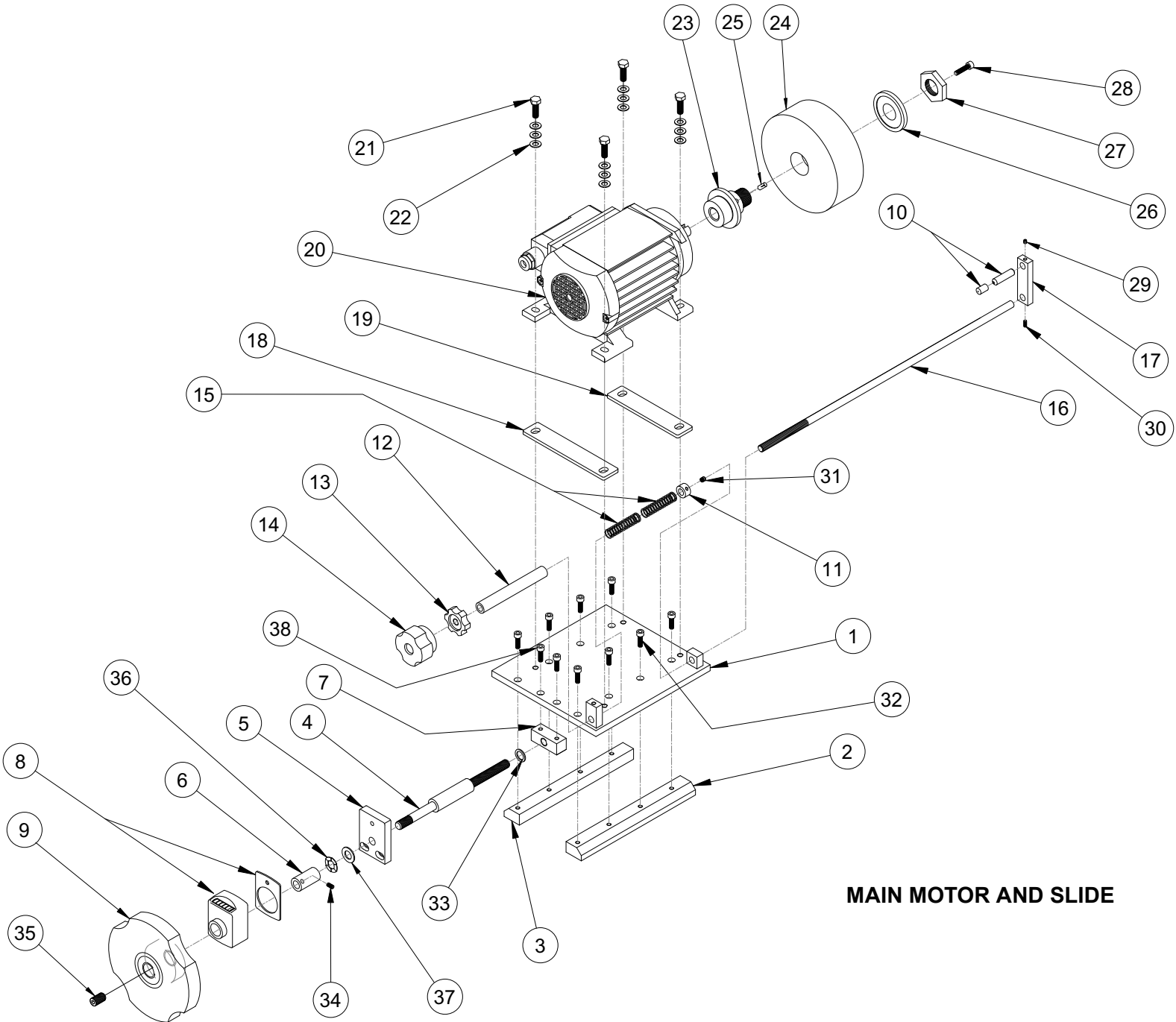


TRAVERSE MOTOR & CARRIAGE

7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
MAIN MOTOR AND SLIDE			
1	Motor Plate	1	A4076
2	Motor Plate Slide R.H.....	1	A4305
3	Motor Plate Slide L.H.	1	A4077
4	Carriage Feedscrew.....	1	A9213
5	Siko Counter Support Block.....	1	A4124
6	Siko Counter Insert	1	A9115
7	Motor Slide Nut.....	1	A4040
8	Siko Counter.....	1	A6771
9	Handwheel	1	A6106
10	Diamond Dresser	1	A6737
11	10mm Collar small.....	1	A5105
12	Spacer	1	A9030
13	Locking Knob.....	1	A6105
14	4 Lobe Knob 50mm.....	1	A6103
15	Spring 12mm o/d x 60	2	A6711
16	Diamond Dresser Shaft.....	1	A9029
17	Diamond Dresser Holder	1	A6738
18	Motor Spacer Plate (short).....	1	R4114
19	Motor Spacer Plate (long).....	1	A4113
20	Motor 60 Hz.....	1	A6006
	Motor 50Hz.....	1	A6004
	Motor 3 Phase	1	A6005
21	Hex Head Bolt M8 x 25	4	A5723
22	Washer M8	12	A5321
23	Grinding Wheel Ext. Shaft	1	A9053
24	Grinding Wheel Parallel Cup.....	1	A6507
	Grinding Wheel Taper Cup.....	1	A6520 (not shown)
25	Mills Pin M6 x 10	1	A5468
26	Extension Shaft Flange.....	1	A9054
27	Extension Shaft Nut	1	A9055
28	Socket Cap Head Screw M6 x 25	1	A5152
29	Socket Screw M5 x 5.....	1	A5137
30	Socket Set Screw M5 x 10	1	A5131
31	Socket Screw M6 x 6.....	1	A5156
32	S'k't Cap H'd Screw M6 x 20.....	8	A5150
33	Washer M12 (special).....	1	A5487
34	Socket Set Screw M5 x 10	1	A5131
35	Socket Screw M12 x 20	1	A5486
36	Crinkle Washer M12	1	A5325
37	Washer M12	1	A5315
38	Socket Cap Head Screw M6 x 20	2	A5150

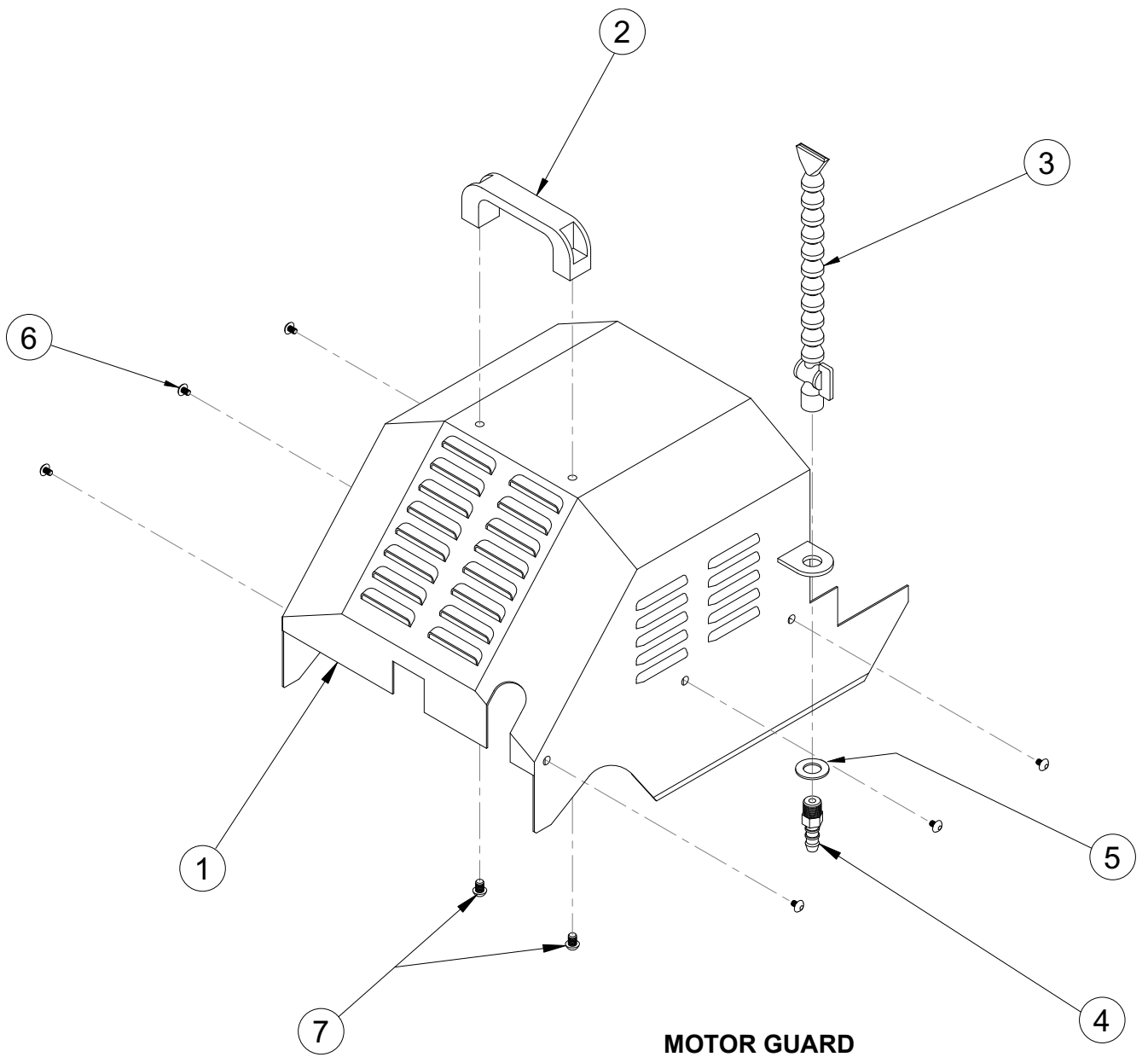
7. Parts List (Continued)



MAIN MOTOR AND SLIDE

7. Parts List (Continued)

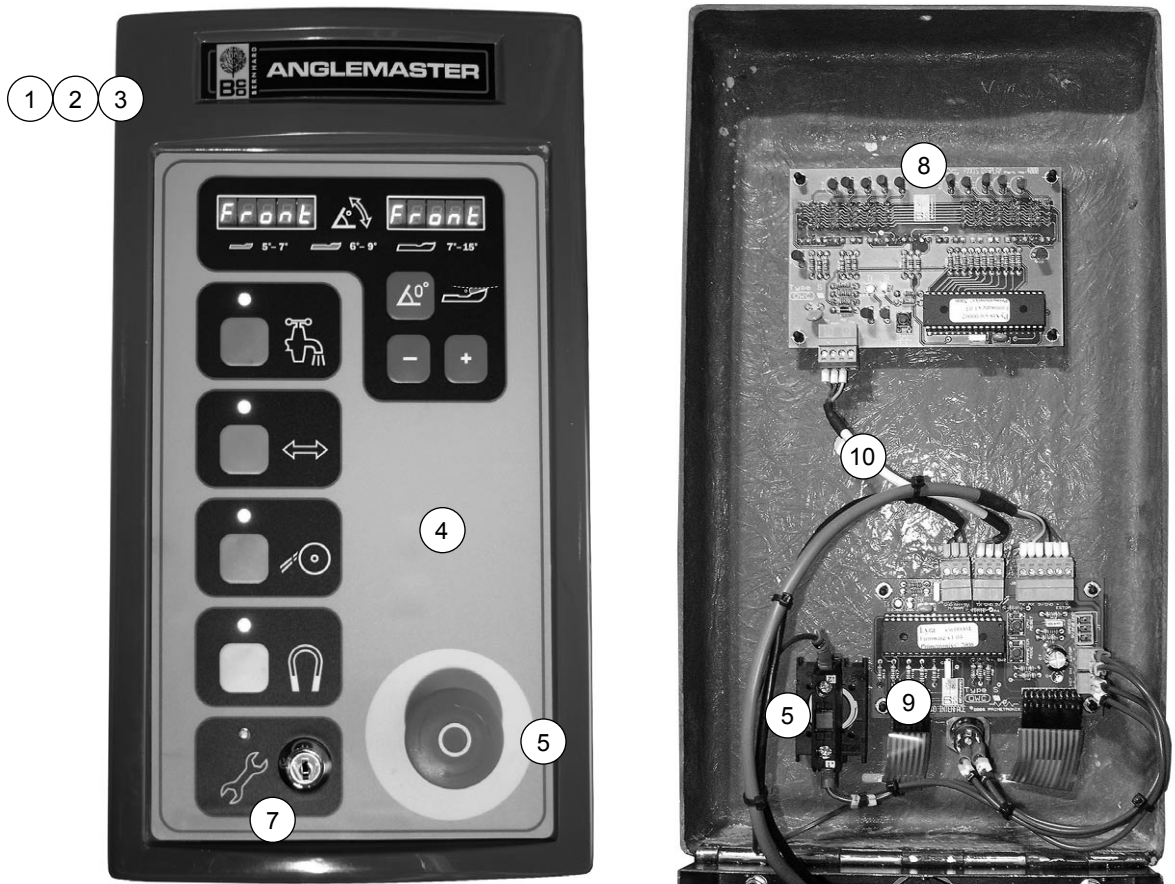
Ref #	Name of Part	Qty.	Part #
MOTOR GUARD			
1	Guard.....	1	A6335
2	Handle	1	A6110
3	Stay Put Hose & Tap	1	A6773
4	Hose Tail.....	1	A6726
5	Washer M12	1	A5315
6	Button Head Screw M5 x 6	6	A5138
7	Button Head Screw M6 x 8	2	A5158



MOTOR GUARD

7. Parts List (Continued)

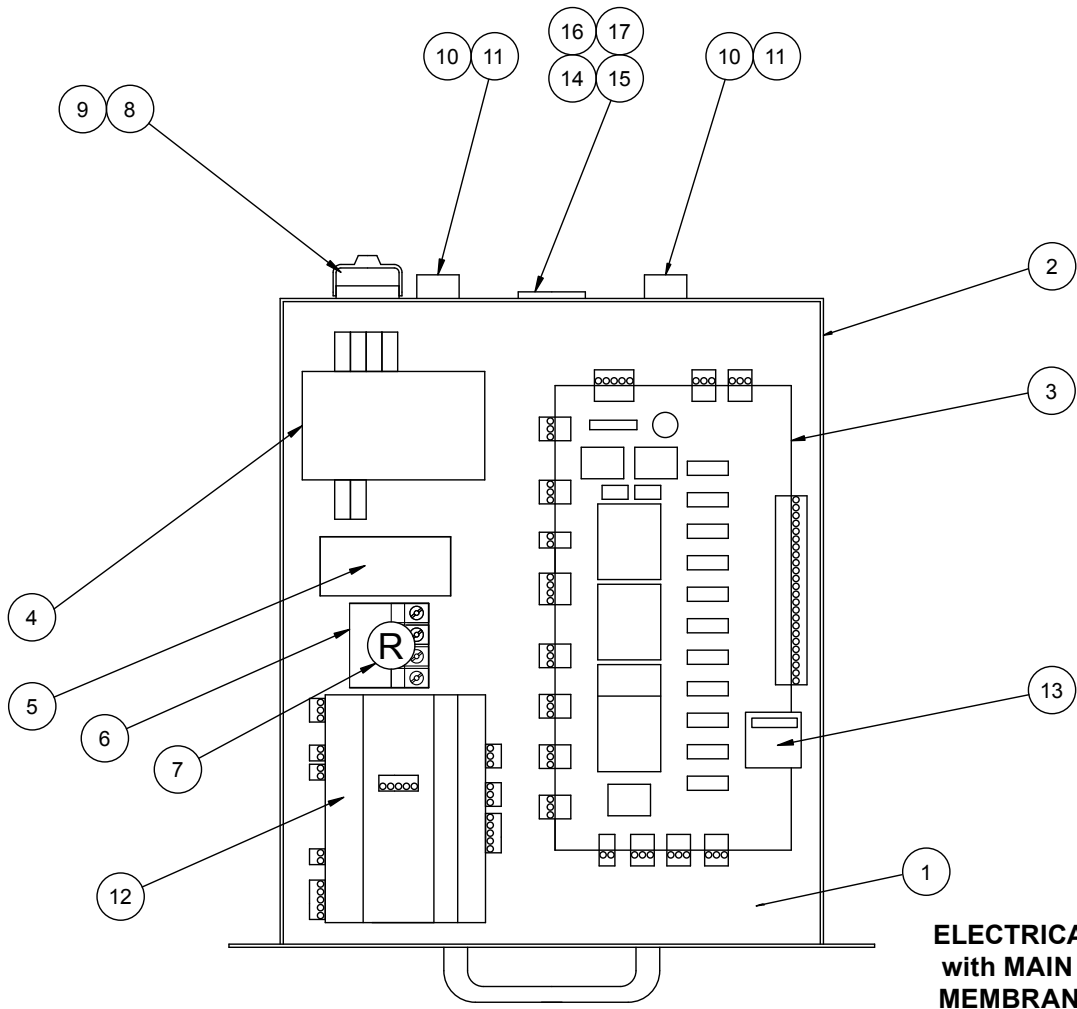
Ref #	Name of Part	Qty.	Part #
CONTROL BOX – MEMBRANE PANEL			
1	Control Box.....	1	A3486
2	Control Box Lid.....	1	A3487
3	Control Box Arm.....	1	A4029
4	Membrane key panel.....	1	A3330
5	Emergency Stop Button.....	1	A8073
6	Contact Block N/C.....	1	A8888
7	Service key switch.....	1	A3060
8	Pyxis- display PCB (for membrane keypad).....	1	A3502
9	Lyra - interface PCB (for membrane keypad).....	1	A3503
10	Lead set for membrane panel.....	1	A3506
11	Button Head Screw M5 x 10.....	4	A5129
12	Crinkle Washer M5.....	4	A5319
13	Nut M5.....	4	A5512
14	Screw M3 x 6.....	6	A8108
15	Hexagon Bolt M10 x 40.....	2	A5737



CONTROL BOX

7. Parts List (Continued)

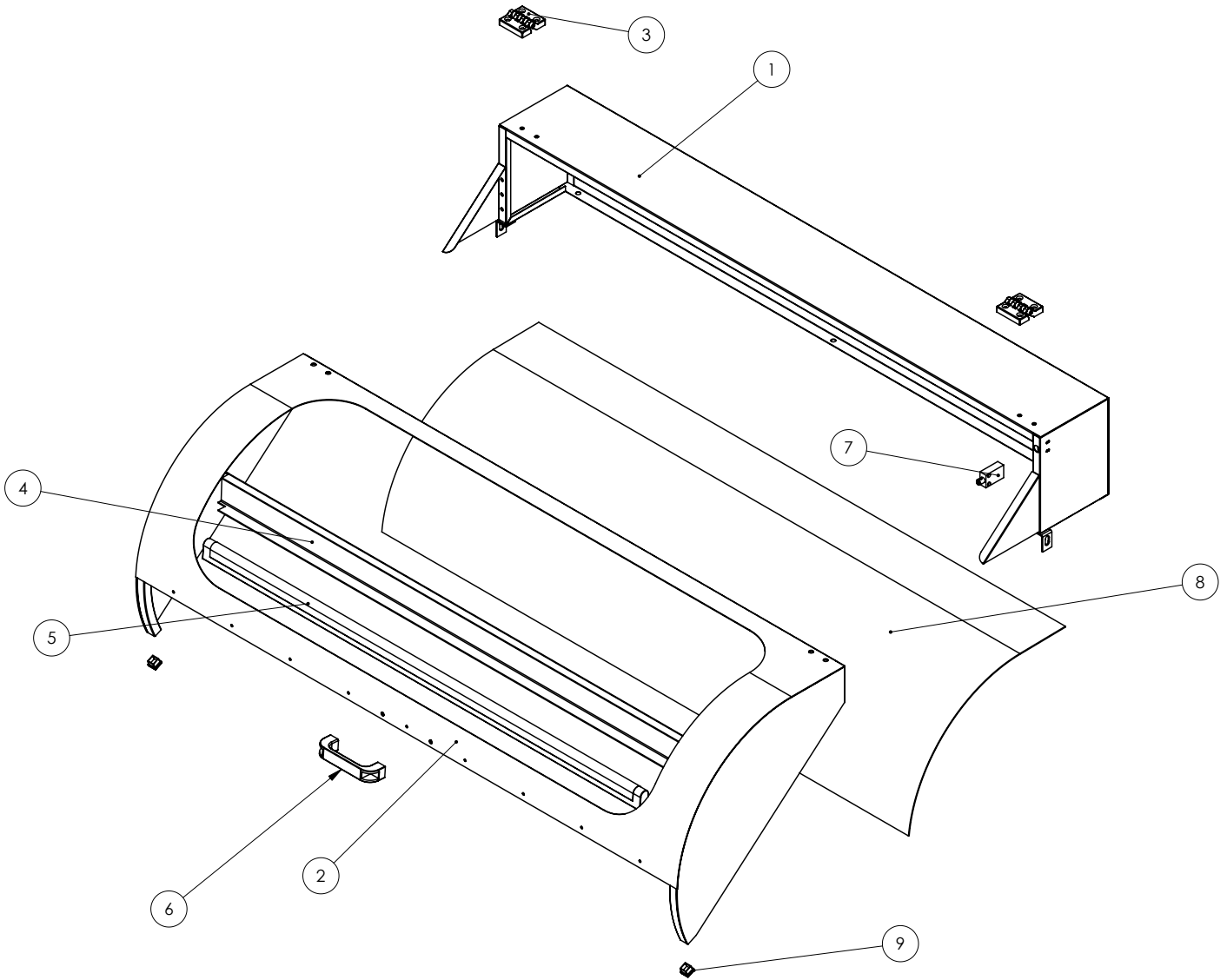
Ref #	Name of Part	Qty.	Part #
ELECTRICAL DRAWER with MAIN PCB – (membrane operator panel) _			
1	Polycarbonate Cover.....	1	A6970
2	Electrical Drawer Inner.....	1	A6969
3	Main PCB	1	A8970
4	24v Transformer	1	A8928
5	Capacitor 6.3µf.....	1	A8401
6	Thermal O'load 50 /60 Hz.....	1	A8117
7	Reset Button.....	1	A8130
8	10 way Socket	1	A8003
9	10 way Plug (to Carriage).....	1	A8002
10	3 pole Socket.....	2	A8026
11	3 pole Plug (to Coolant Pump & Magnets).....	2	A8025
12	Vela i/o module for membrane keypad	1	A3504
13	Hours run meter 24v DC	1	A8206
14	Mains Power Supply Plug	1	A8125
15	Power Supply Lead		
	(USA).....	1	A8211
	(Europe).....	1	A8212
	(UK).....	1	A8213
16	4 pole Socket (for Interlocks)	1	A8028 (UK & Europe)
17	4 pole Plug (for Interlocks)	1	A8027 (UK & Europe)



ELECTRICAL DRAWER with MAIN PCB (WITH MEMBRANE KEYPAD)

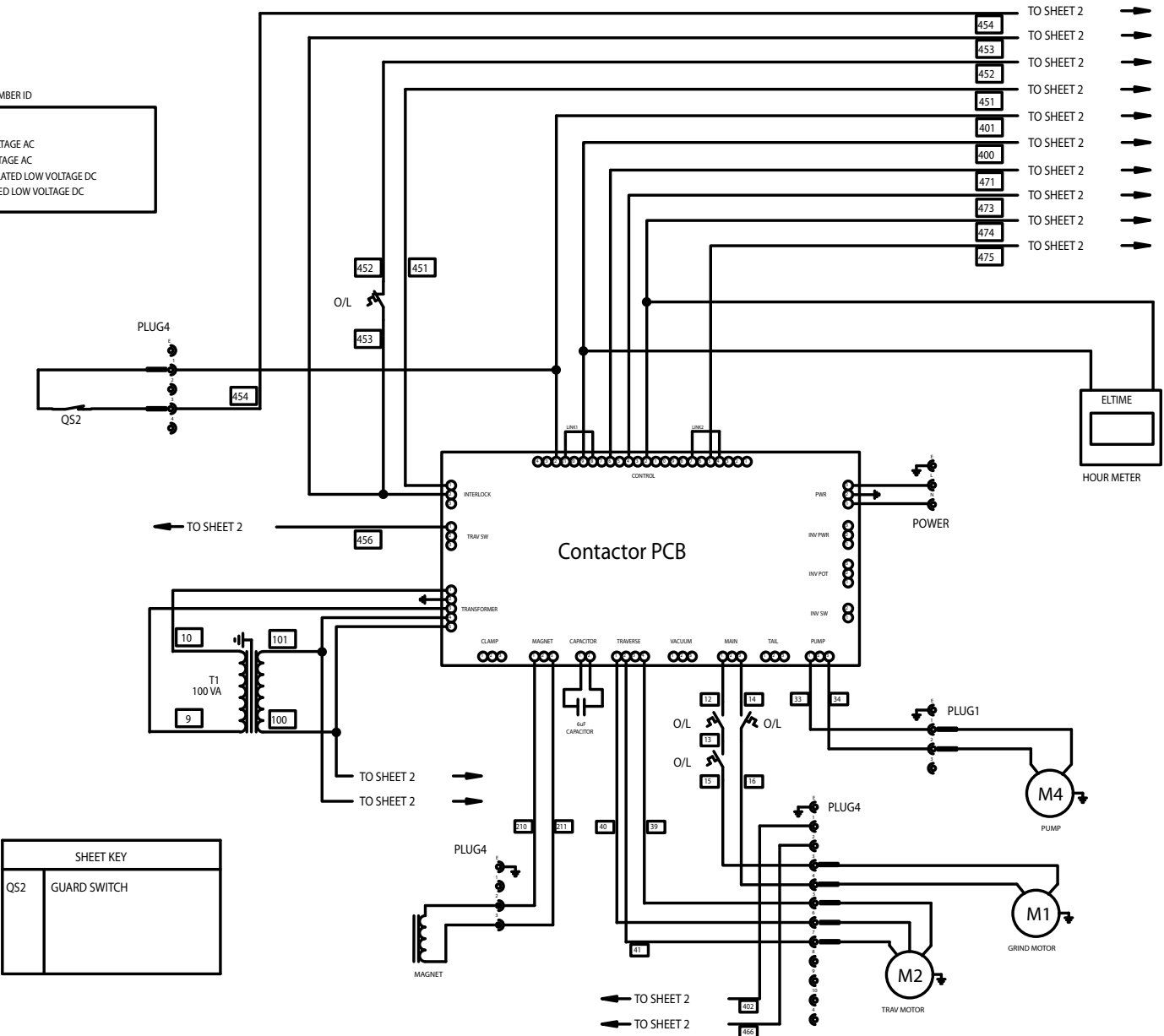
7. Parts List (Continued)

Ref #	Name of Part	Qty.	Part #
SAFETY GUARD (2007-on)			
1	Rear Guard Back Box	1	A06310
2	AM3000 Front Guard	1	A04323
3	Hinge 800056.....	2	A06109
4	AM3000 New Light Cover.....	1	A03181
5	Long Light.....	1	A08239
6	Large Bridge Handle	1	A06108
7	Microswitch.....	1	A08225
8	2mm Polycarbonate Guard Window	1	A03384
9	20x20 Knock In	2	A06101



8. Wiring Diagrams

Sheet 1	_____	Page	35
Sheet 2	_____		36
Sheet 3	_____		37



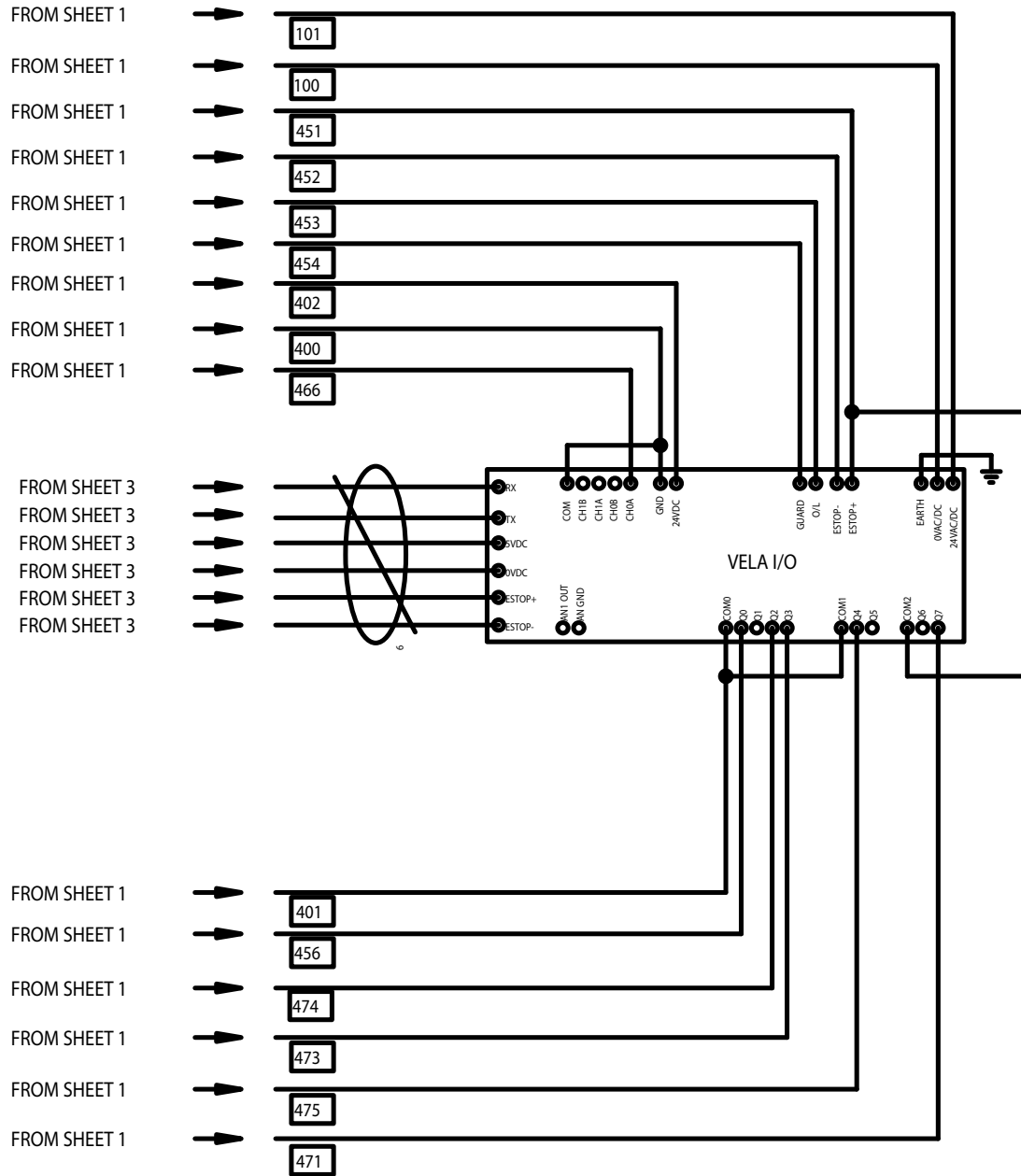
WIRE NUMBER ID

0-99	HIGH VOLTAGE AC
100-199	LOW VOLTAGE AC
200-399	UNREGULATED LOW VOLTAGE DC
400-	REGULATED LOW VOLTAGE DC

SHEET KEY

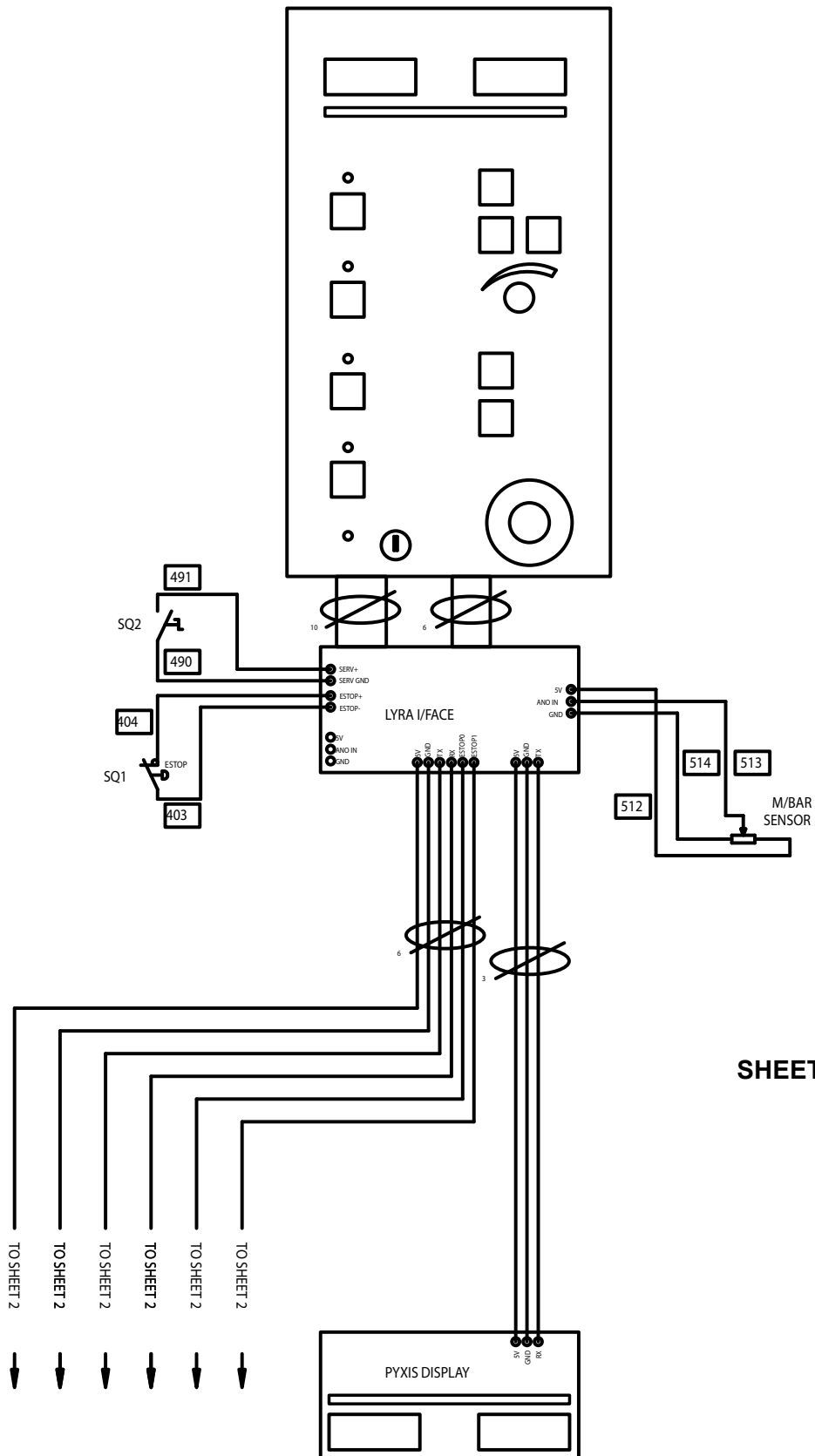
QS2	GUARD SWITCH
-----	--------------

8. Wiring Diagrams (Continued)



SHEET 2

8. Wiring Diagrams (Continued)



SHEET 3



ANGLEMASTER 3000

Setting up Bedknife grinding angles

www.anglemaster.com

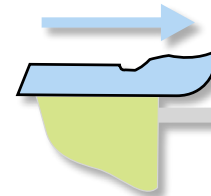
1-888 GRIND IT

© BERNHARD AND COMPANY LTD

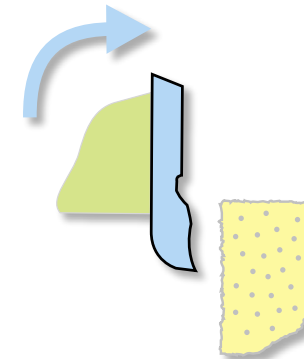
1 Mount Bedknife against Tabs



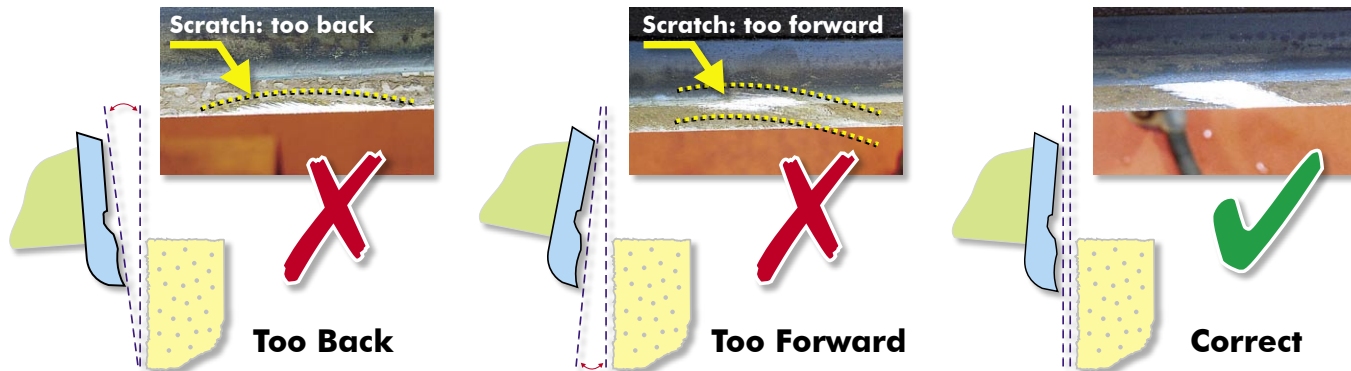
Turn on Magnet and secure bedknife to Brackets. Release and rotate tabs away.



2 Rotate to Top Face



3 Finding 0° on Top Face – Scratch lightly with grinding stone



4 Set 0°

Press the **RESET** button to set the left "Where-you-are" display to the current angle of Zero.



On a **BRAND NEW BLADE**: Scratch across the face, instead of zero °, press reset button to set left hand "Where you are" display to zero; hold reset button and press + or - buttons to increment the "where-you-are" display to the correct angle for that blade: -7° **Small**; -9° **Medium**; -12° **Large**; the angle for that blade as ground by the manufacturer – there is no wear yet. Add a maximum of 1° to this setting before truing the face of the blade.



5 Set Top Face Angle



Press + or - buttons to change the right "Where you want to be" display to the required angle



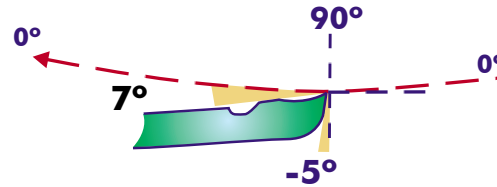
This example:
Desired Angle 07°



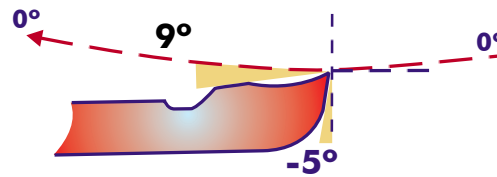
Rotate mounting bar so the left "Where you are" current angle changes from 00° towards -07° until it indicates TOP.



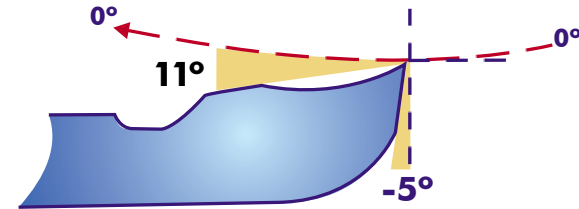
SMALL BLADES... 7°
± DIRT FACTOR of 2° = 5° - 9°



MEDIUM BLADES... 9°
± DIRT FACTOR of 3° = 6° - 12°



LARGE BLADES... 11°
± DIRT FACTOR of 4° = 7° - 15°

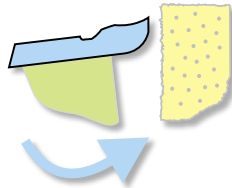


6 Grind Top Face



7 Set Front Face Angle

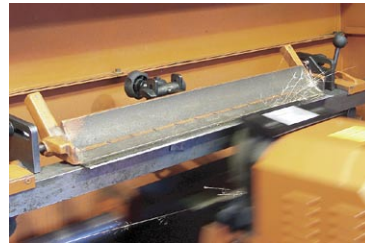
Rotate Mounting Bar to front face position. When the top face angle reaches -5° the "Where you are" and "Where you want to be" both read FRONT.



As the mounting bar passes horizontal (90) position the left "Where you are" display changes from T 90° to F -01° and the right "Where you want to be" display changes to Front.



8 Grind Front Face



Grind Front Face to a visible parallel line

Centre of Bedknife

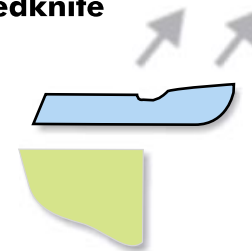


9 Remove Bedknife

Rotate Mounting Bar to horizontal

Release brackets

Remove Bedknife



Safety enclosure (guard) interlocks and “service” switch

Express Dual and Anglemaster models ED3000, ED3000DX, ED5000, AM3000, AM3000DX

Express Dual and Anglemaster machines are now supplied with safety enclosures as standard. These enclosures are fitted with a safety interlock switch so that the safety enclosure must be in the closed position before the motors can be started. Similarly, the motors will shut down if the safety enclosure is opened.

The control panel for all Express Dual and Anglemaster models 3000, 3000DX and 5000 will also be fitted with a key operated service switch. This provides a manual override to by-pass the interlock switch **for relevant service and maintenance purposes only** and should only be used by **suitably qualified personnel**. The service key should be removed from the machine for normal operation. The service key cannot be removed when the machine is in “service” mode and an adjacent led illuminates to draw attention to the fact that this mode has been selected.

If you have any service or operational problems contact your distributor,
or phone our

Technical Helpline (USA only) – 1-888 474 6348

or

Bernhard and Company Ltd, England – (+44) 1788 811600

or email

techsupport@bernhard.co.uk

use the technical support feedback form on our web site

www.expressdual.com or www.bernhard.co.uk



BERNHARD AND COMPANY LTD

Bilton Road · Rugby · England · CV22 7DT
Tel +44 1788 811600 · Fax +44 1788 812640

Email: info@bernhard.co.uk

USA Toll Free **1-888 GRIND IT** (1-888 474 6348)

SINCE 1979
precisionusa.com
YOUR GOLF COURSE SUPERMARKET
800-345-1960