SIEG X3 Small Mill
Modifications made during the first two years of use.

• Machine bought in August 2005 and immediately stripped, cleaned, inspected, repainted and set up

•Principal Modifications:-
New motor belt drive
Power Feed Added
New (non SIEG) Power Feed Electronics
Shooting Star 3-Axis DRO fitted
Spindle Speed Tacho
Counterweight for Z Spindle Head
New (non-SIEG) Main Drive Electronics

Most of these modifications have been described already and are gathered here in this document for convenience

Questions? Contact
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08/2007
FIRST MODIFICATIONS
Bruce Murray  October 2005

• Z AXIS DEAD WEIGHT COUNTER-BALANCE SYSTEM
• NEW BELT DRIVE
• NEW SPINDLE BEARING ARRANGEMENT
• TABLE POWERFEED
• TACHO PICKUP TO READ SPINDLE SPEED
• DURABLE GRAY PAINT (POR15)

A BISON 4” VISE #7-222-005
IS SHOWN THE TABLE

DISCLAIMER:- ANYTHING COPIED OR
USED FROM THIS DESCRIPTION IS
ENTIRELY AT YOUR OWN RISK

B S Murray 8/2007
Z-AXIS COUNTER BALANCE

Copied from and with grateful acknowledgement to BGBill & his photos of Feb 2004

HOME MADE PULLEYS on BALL BEARINGS

1/8 WIRE ROPE McMASTER

CLEVIS McMASTER 2447K13

100 Lbs of OLD TRANSFORMER STAMPINGS

DELRIN BUSHING IN SLIDER to PREVENT CABLE RUBBING

DELRIN BUSHING in BASE TABLE

B S Murray 8/2007
NEW BELT DRIVE
THE PROBLEMS I HEARD ABOUT ON A USER GROUP PERSUADED ME TO GO TO A MORE CAPABLE BELT SYSTEM

ORDERED FROM STOCK DRIVE PRODUCTS
A 6R55M080150  80 GROOVE BELT GT2  $14.55
A 6A55M019DF1506  19 TOOTH PULLEY  $12.08
A 6A55M032DF1512  32 TOOTH PULLEY  $15.47

32 TOOTH PULLEY JUST NEEDED A KEYWAY CUT
19 TOOTH PULLEY WAS BORED OUT TO 12mm AND KEYWAY FILED
NOTE THAT THESE ARE ALUMINUM PULLEYS, HARD ANODISED, - LET'S HOPE THEY LAST.

B S Murray 8/2007
SPINDLE BEARINGS CHANGED

AS RECEIVED THE SPINDLE BEARING WAS ROUGH TO TURN. STRIP SHOWED CORROSION AND IMPACT DAMAGE ON #79 AND #72.

ASSEMBLY WAS REBUILT USING THE SAME TYPE OF BEARING TOP AND BOTTOM. NO MOD’S WERE NEEDED TO ANY SIEG PART.

NUMBERS ARE FROM PARTS DIAGRAM
SPINDLE BEARINGS

SAME TAPER ROLLER BEARING USED TOP AND BOTTOM.
(SKF P/N 32006)
PRELOAD CONTROLLED BY USE OF A BELLEVILLE WASHER AND A NEW THICK FLAT WASHER
NUT TIGHTENED TO COMPRESS BELLEVILLE WASHER BY 0.03”

BELLEVILLE WASHER
2”OD 1”ID 0.065” THICK
ID MACHINED TO JUST CLEAR THREAD on SPINDLE

SPINDLE BEARING SURFACE POLISHED FOR A SNUG SLIDING FIT FOR INNER RACE OF UPPER BEARING – THIS MAKES SURE PROPER PRELOAD IS APPLIED TO THE BEARING SET

LOCTITE

NEW THICK WASHER GETS BELLEVILLE FORCE ONTO INNER RACE AND ALSO PROTECTS UPPER BEARING

NOW IT TURNS AS SMOOTH AS SILK!

B S Murray 8/2007
WARNING:- THE ORIGINAL NUMBER TAGS CAN SLIP OFF A DISCONNECTED WIRE (ASK ME HOW I KNOW!)

GETS VERY CROWDED INSIDE AND THE SPEED CONTROL CAN GET DAMAGED DURING RE-ASSEMBLY

2 HOLE DRILLED TO CLEAR PINS AT THE END OF THE TABLE

2 HOLES DRILLED TO CLEAR PINS AT THE END OF THE TABLE

2 PLASTIC PLUNGERS REPLACE SCREWS SUPPLIED TO OPERATE MICROSWITCHES

2 #8-32 TAPPED HOLES INTO FRAME

MOTOR PLATE

ZYT-150
110V
4000RPM
CLASS E

150W
DC-110V
1.8A

SIEG POWERFEED PICTURES

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SIEG POWERFEED PICTURES
POWER FEED REPLACEMENT ELECTRONICS

After a short time the SIEG electronics stopped working and since there is no factory service information, I fitted a KBWS PWM amplifier made by KB Electronics. This has been completely reliable. The SIEG packaging is very tight and so I designed an extension to the original housing to mount the new electronics.
KBWS-15 Controller Housing on X3 Powerfeed

Bruce Murray Feb 2007

B S Murray 8/2007
TACHO PICKUP for SPINDLE SPEED INDICATOR

CHERRY PART# GS100502
SENSES TEETH ON GEAR THAT MESHES WITH SPINDLE GEAR
OUTPUT IS A RECTANGULAR PULSE TRAIN of 34 PER SPINDLE REVOLUTION
Shooting Star DRO fitted to an X3 Mill

Bruce Murray
Jun 2006

3 Axis Readout

DRO made by:-
Shooting Star Technology,
Rosedale BC Canada
Y Axis Encoder (attached to horizontal plate behind table)
This surface tapped to hold the plate that anchors the X & Y Encoders

Y Axis Encoder in position but not anchored
Custom block to hold top of rack

Rack

Z Axis Encoder

Encoder Mounting Plate

Hole through base for rack clearance
RETROFIT MAIN DRIVE ELECTRONICS

After some time the main drive electronics stopped functioning and I decided to take a more reliable route by installing a PWM module from KB Electronics.

Note that a PWM type module gives a much smoother starting and running than SCR types (such as the SIEG design).

Note also that I only provided for one direction of rotation since there is a possibility of damage to the module when reversing the motor leads. It is possible to arrange an inhibit circuit as in the case of the power feed, but it just did not seem worthwhile for me since I never need reverse rotation.

I also added a cooling fan
RETROFIT MAIN DRIVE plus tacho SCHEMATIC
COMMENTS

The mill is now working as I like it and I do not anticipate any more changes. The total cost of the machine including the base price and all its add-ons and changes is probably nearly $3000 which may seem a lot but, since the X3 is basically a good machine, with some TLC it can be made to work extremely well and also very reliably.

I am particularly pleased with the Z Axis movement since the dead weight counter-balance system gives very precise and easy control. In fact even when drilling very small holes I move the whole head and do not use the handwheel. This means that the Z axis DRO readings can be used (the only times I use the handwheel are when I am tapping since I want the tap to control the vertical position).

The X-axis lead screw system had over 0.050” of backlash and this was reduced to 0.010” by shimming the ball thrust bearings at the handle and also tightening the screws on the lead clearance slot.

I am happy to answer any questions about my work on this machine

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