

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

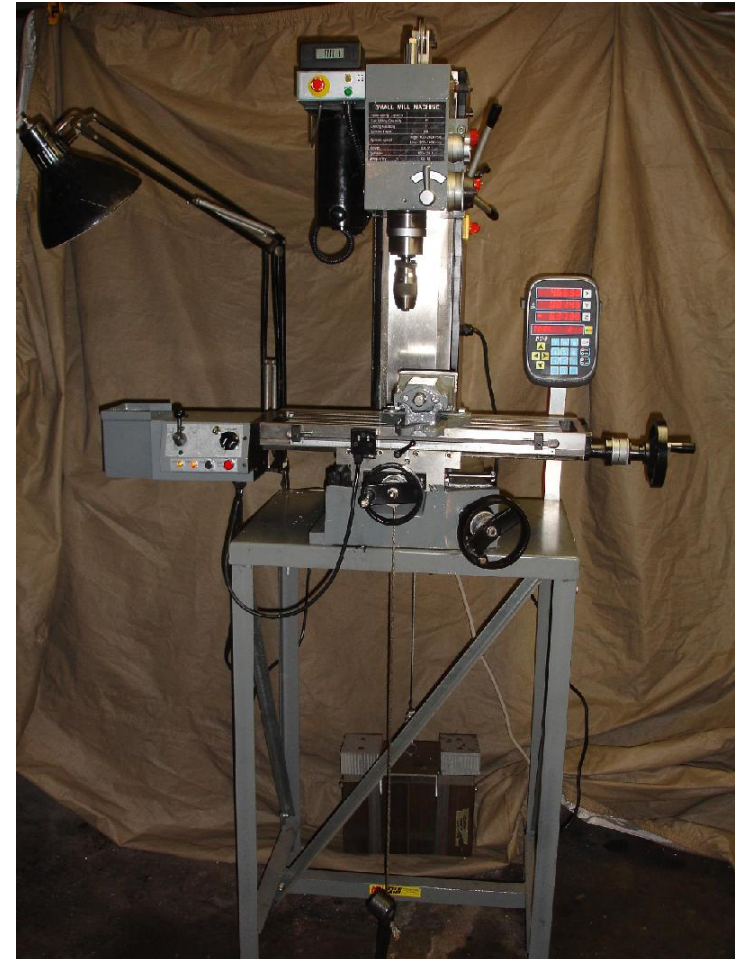
New (non-SIEG) Main Drive Electronics

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

Questions? Contact

bruce.s.murray@verizon.net

08/2007



B S Murray 8/2007

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

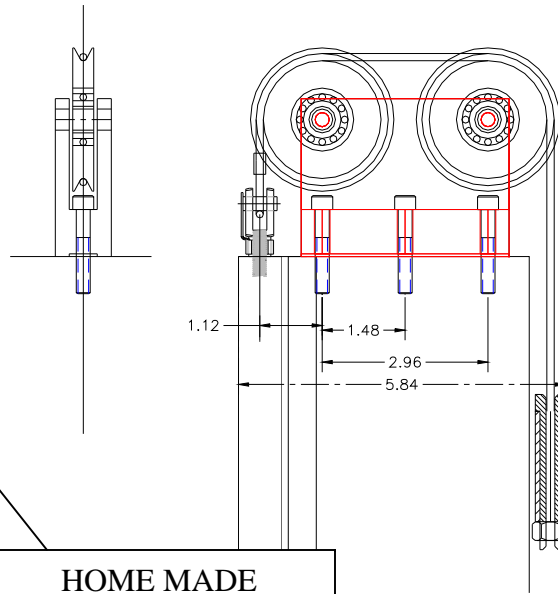
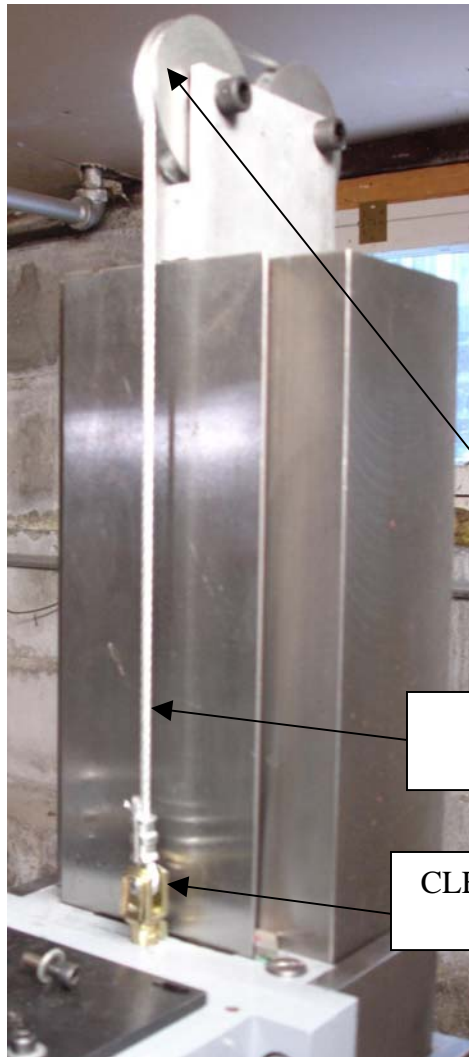
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USED FROM THIS DESCRIPTION IS
ENTIRELY AT YOUR OWN RISK



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Z-AXIS COUNTER BALANCE

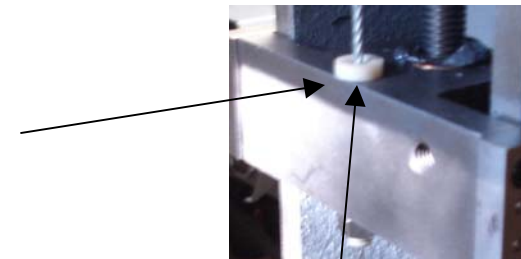
Copied from and with grateful
acknowledgement to BGBill
& his photos of Feb 2004



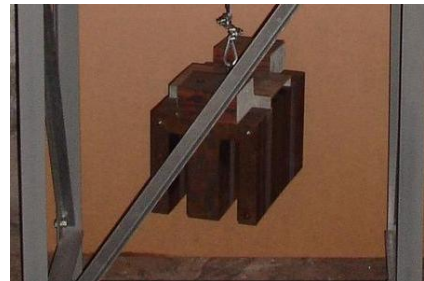
HOME MADE
PULLEYS on BALL
BEARINGS

1/8 WIRE ROPE
McMASTER

CLEVIS McMASTER
2447K13



DELIN BUSHING IN
SLIDER to PREVENT
CABLE RUBBING



100 Lbs of OLD
TRANSFORMER
STAMPINGS

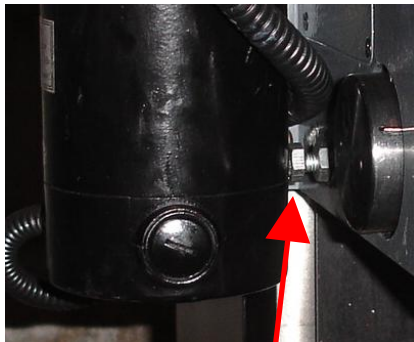
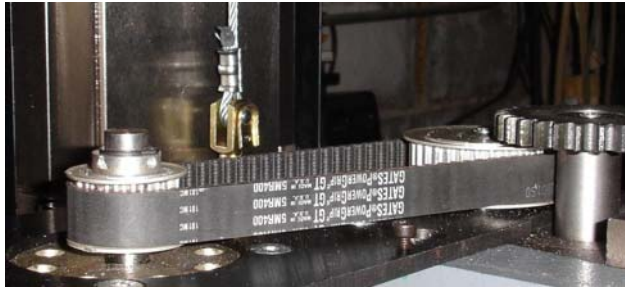


DELIN BUSHING in
BASE TABLE

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NEW BELT DRIVE

THE PROBLEMS I HEARD ABOUT ON A USER GROUP PERSUADED ME TO
GO TO A MORE CAPABLE BELT SYSTEM



BELT TRACKING
ADJUSTMENT BOLT

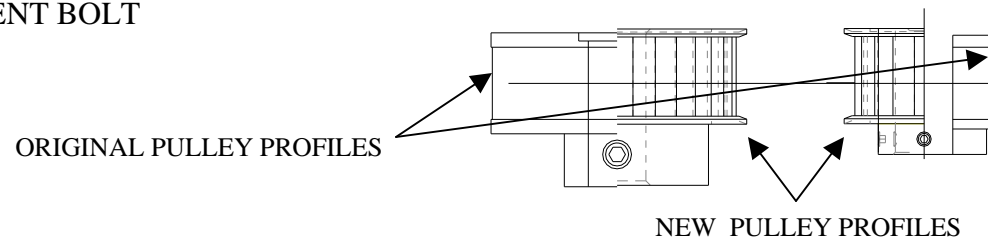
ORDERED FROM STOCK DRIVE PRODUCTS

| | | |
|------------------|--------------------|---------|
| 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

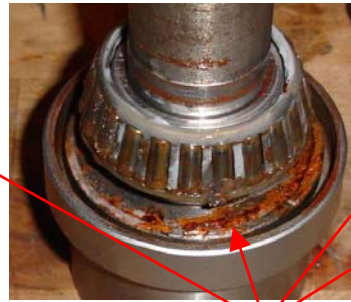
NOTE THAT THESE ARE ALUMINUM PULLEYS, HARD ANODISED, -
LET'S HOPE THEY LAST.



SPINDLE BEARINGS CHANGED



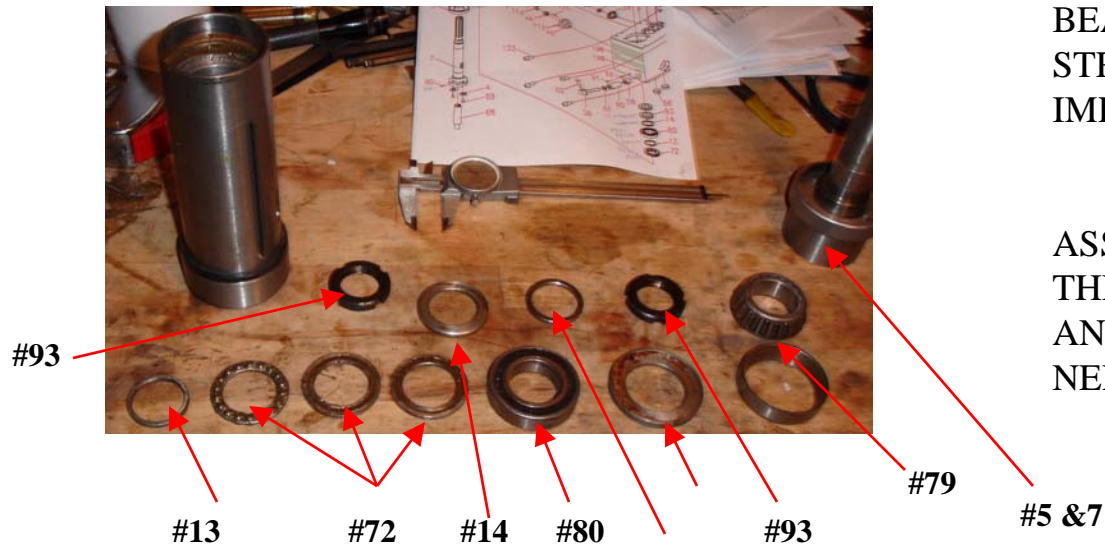
UPPER THRUST
BEARING #72
DAMAGE



CORROSION & RACE DAMAGE TO LOWER BEARING

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

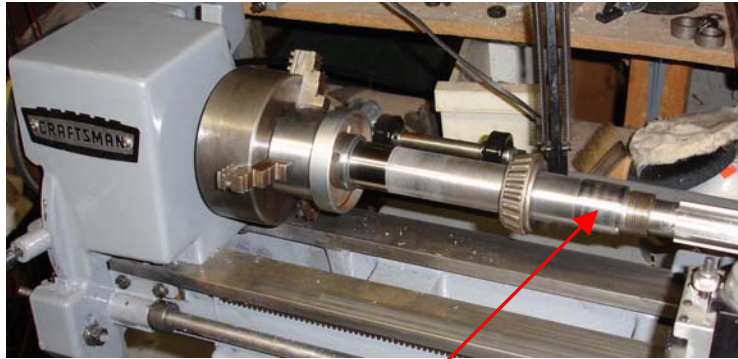
ASSEMBLY WAS REBUILT USING
THE SAME TYPE OF BEARING TOP
AND BOTTOM. NO MOD'S WERE
NEEDED TO ANY SIEG PART.



NUMBERS ARE FROM PARTS DIAGRAM

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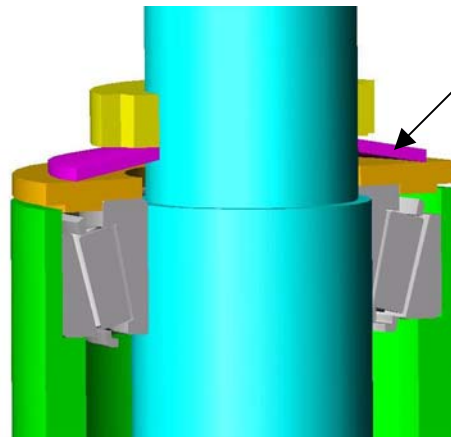
SPINDLE BEARINGS



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*

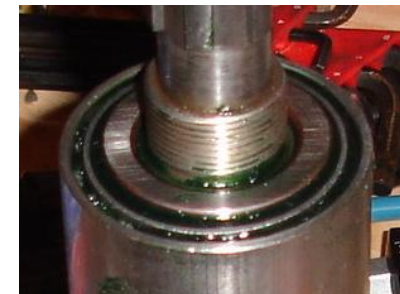


LOCTITE



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

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



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"
NOT FLAT

NOW IT TURNS AS SMOOTH AS SILK !

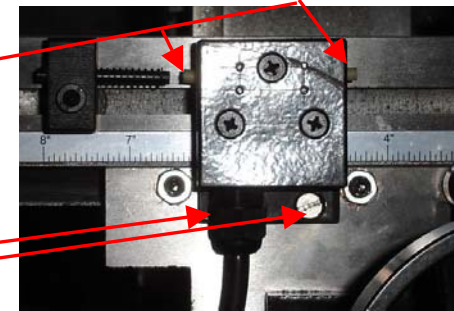
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SIEG POWERFEED PICTURES

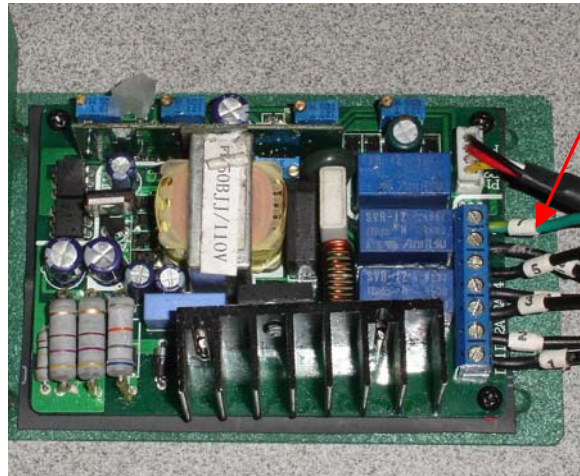
MOTOR PLATE



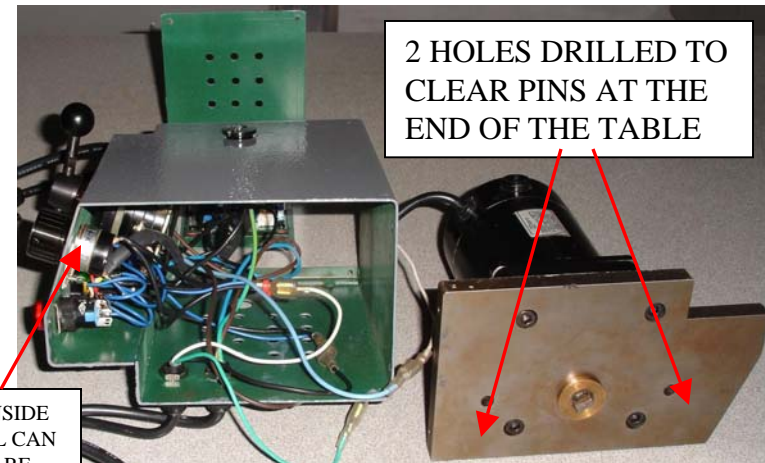
2 PLASTIC PLUNGERS
REPLACE SCREWS
SUPPLIED TO OPERATE
MICROSWITCHES



WARNING:- THE
ORIGINAL NUMBER TAGS
CAN SLIP OFF A
DISCONNECTED WIRE
(ASK ME HOW I KNOW!)



2 #8-32 TAPPED HOLES
INTO FRAME

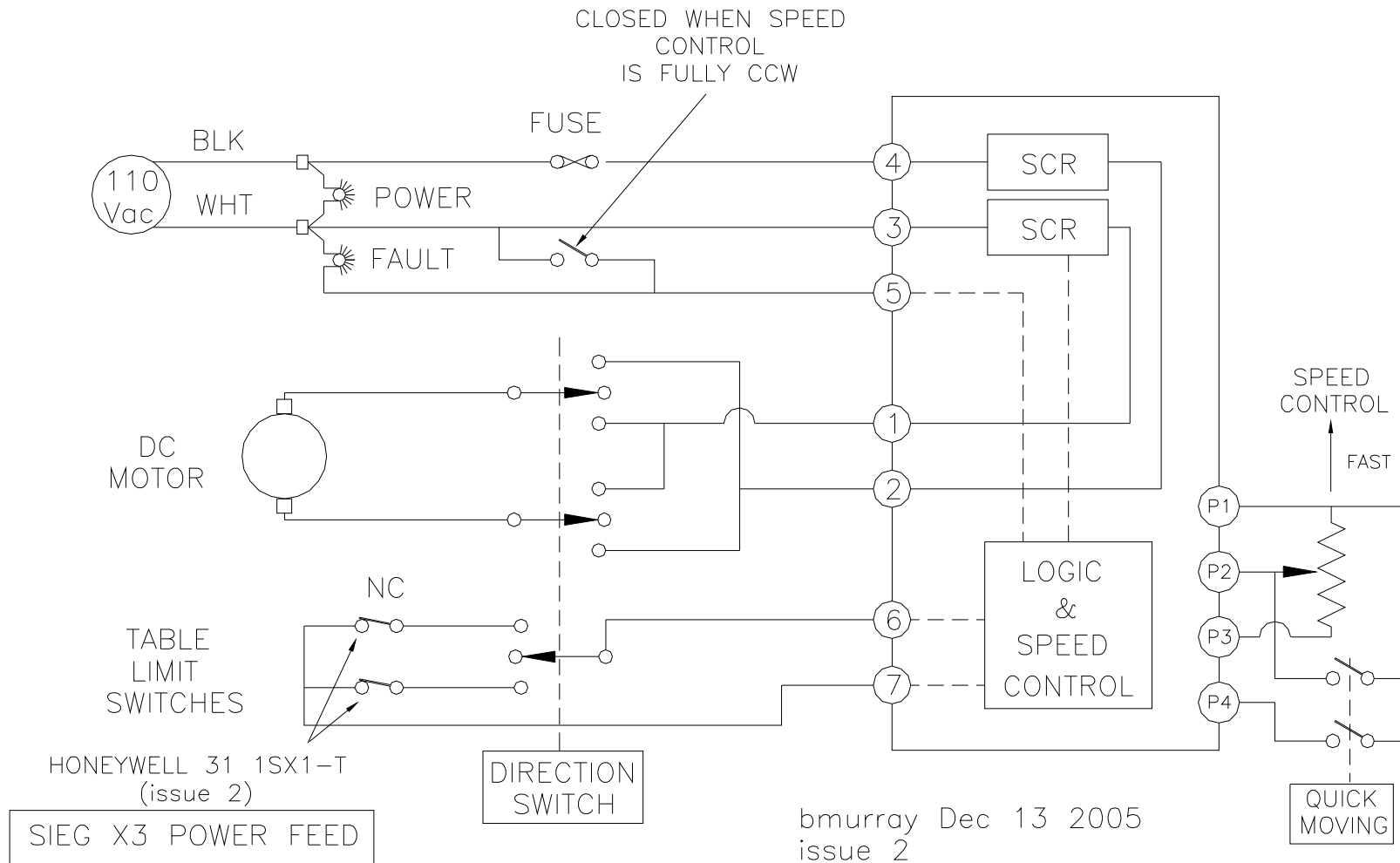


2 HOLES DRILLED TO
CLEAR PINS AT THE
END OF THE TABLE

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

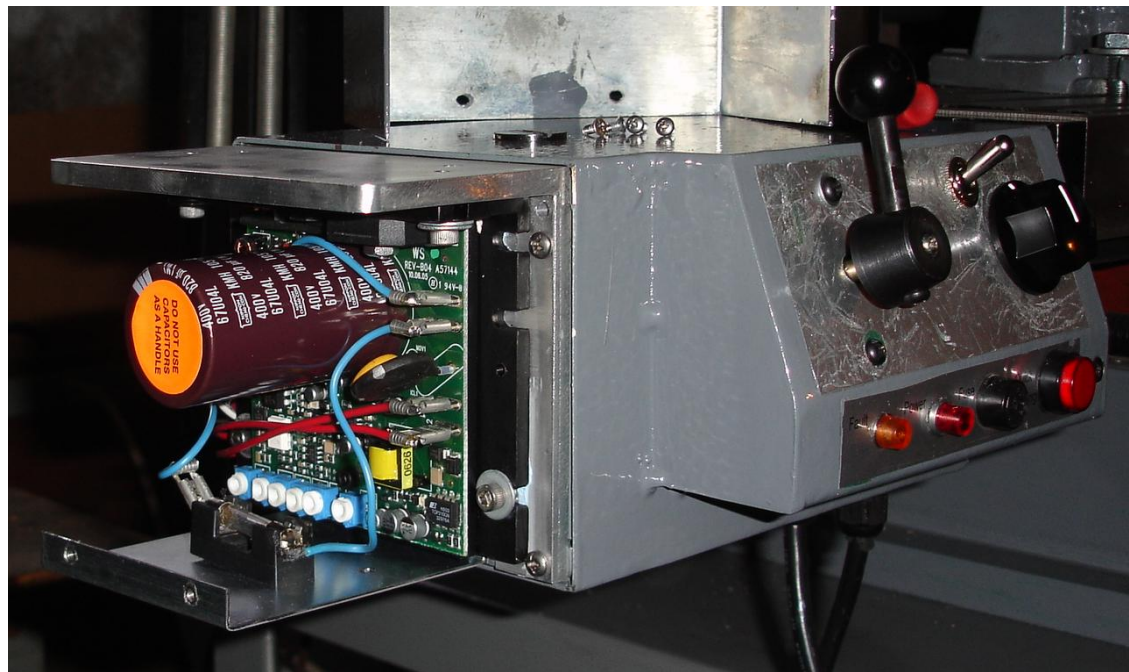


SIEG POWERFEED SCHEMATIC

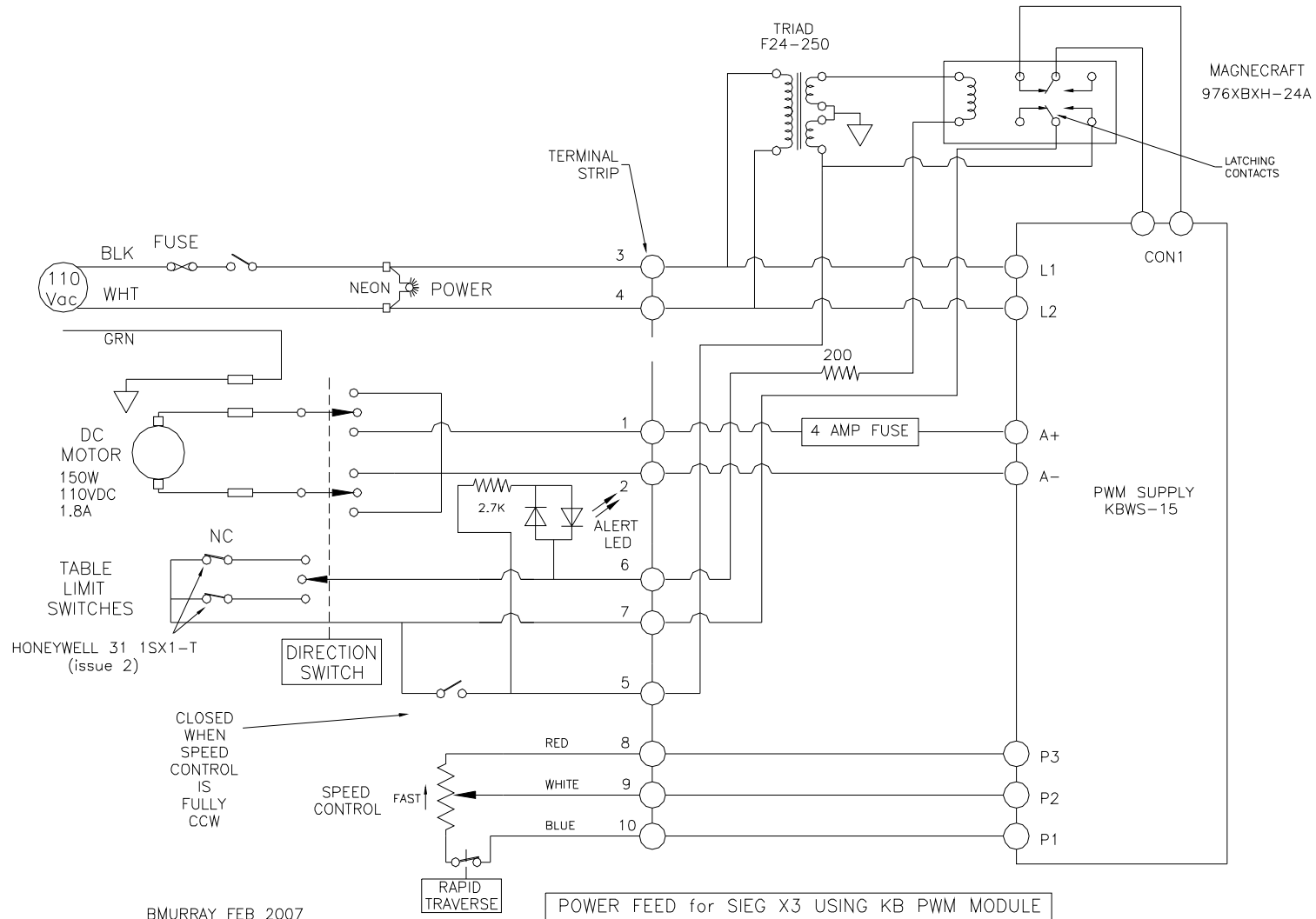


POWER FEED REPLACEMENT ELECTRONICS

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.



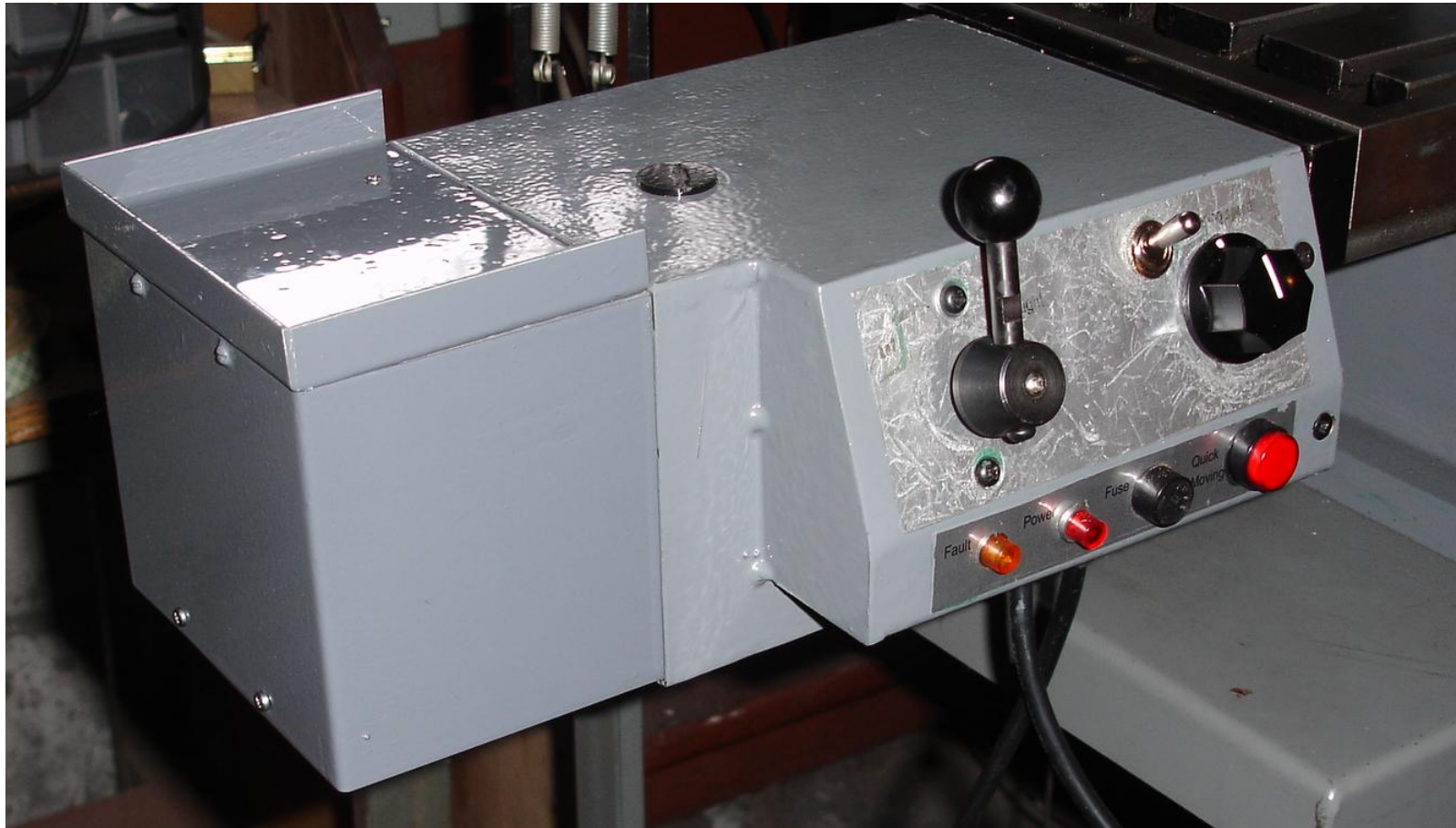
RETROFIT ELECTRONICS for POWERFEED



BMURRAY FEB 2007

POWER FEED for SIEG X3 USING KB PWM MODULE

KBWS-15 Controller Housing on X3 Powerfeed



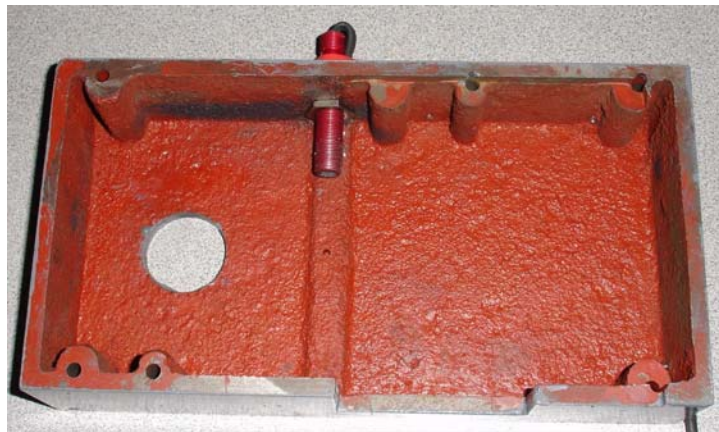
Bruce Murray Feb 2007

B S Murray 8/2007

TACHO PICKUP for SPINDLE SPEED INDICATOR



CHERRY PART# GS100502
SENSES TEETH ON GEAR THAT
MESSES WITH SPINDLE GEAR
OUTPUT IS A RECTANGULAR PULSE
TRAIN of 34 PER SPINDLE REVOLUTION



Shooting Star DRO fitted to an X3 Mill

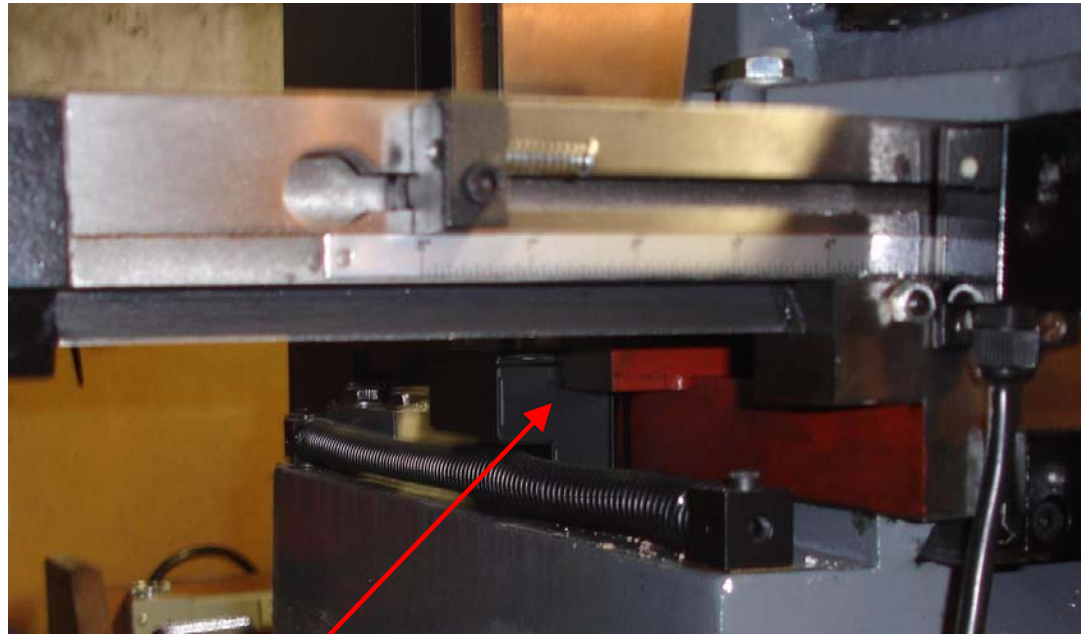
Bruce Murray

Jun 2006

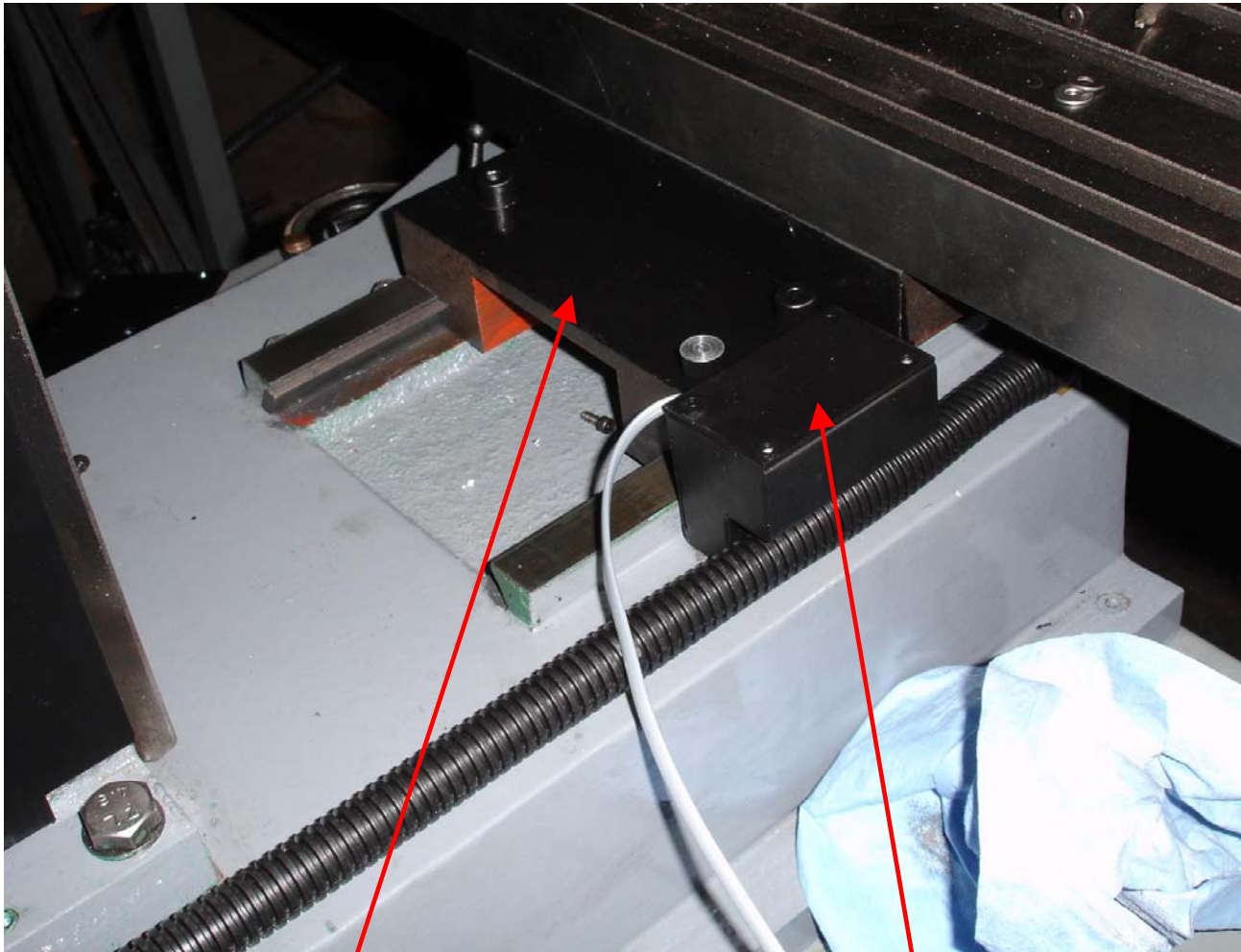
3 Axis Readout

DRO made by:-
Shooting Star Technology,
Rosedale BC Canada



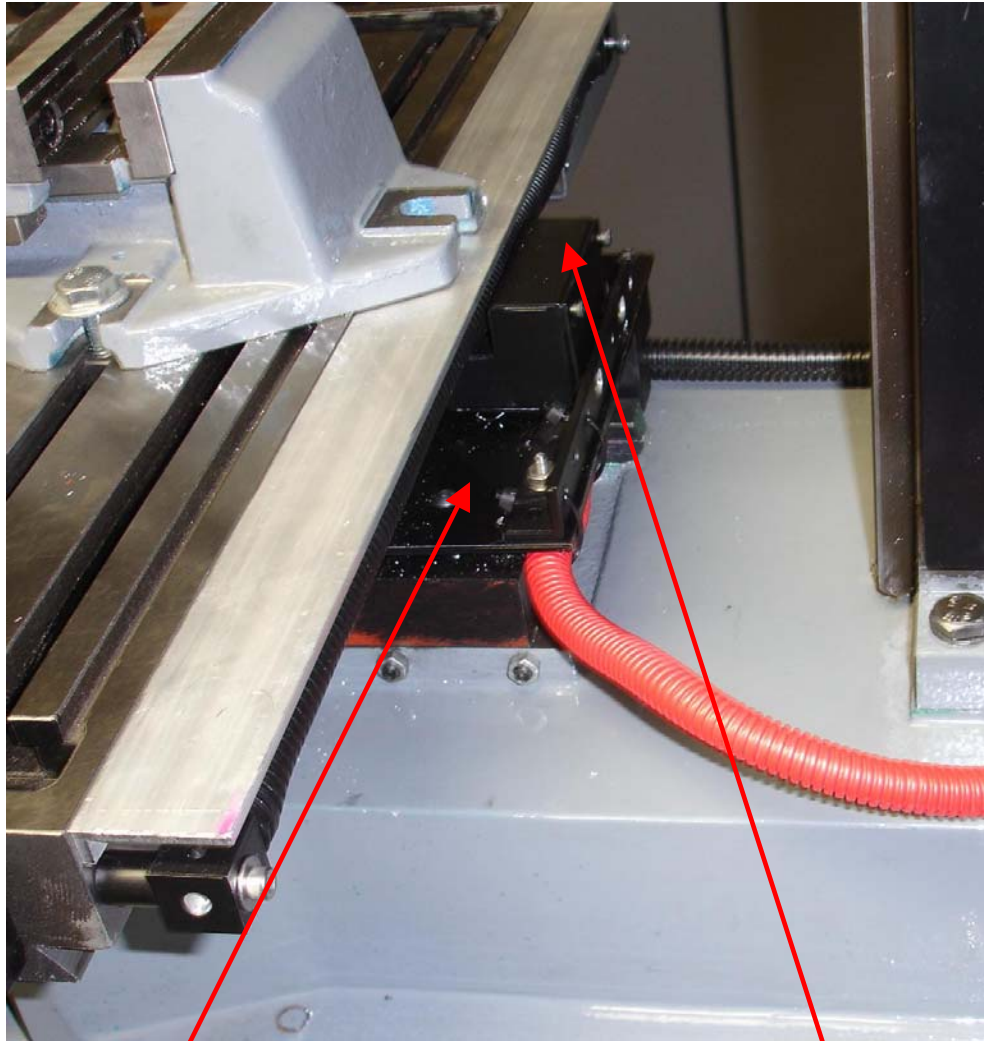


Y Axis Encoder (attached to horizontal plate behind table)



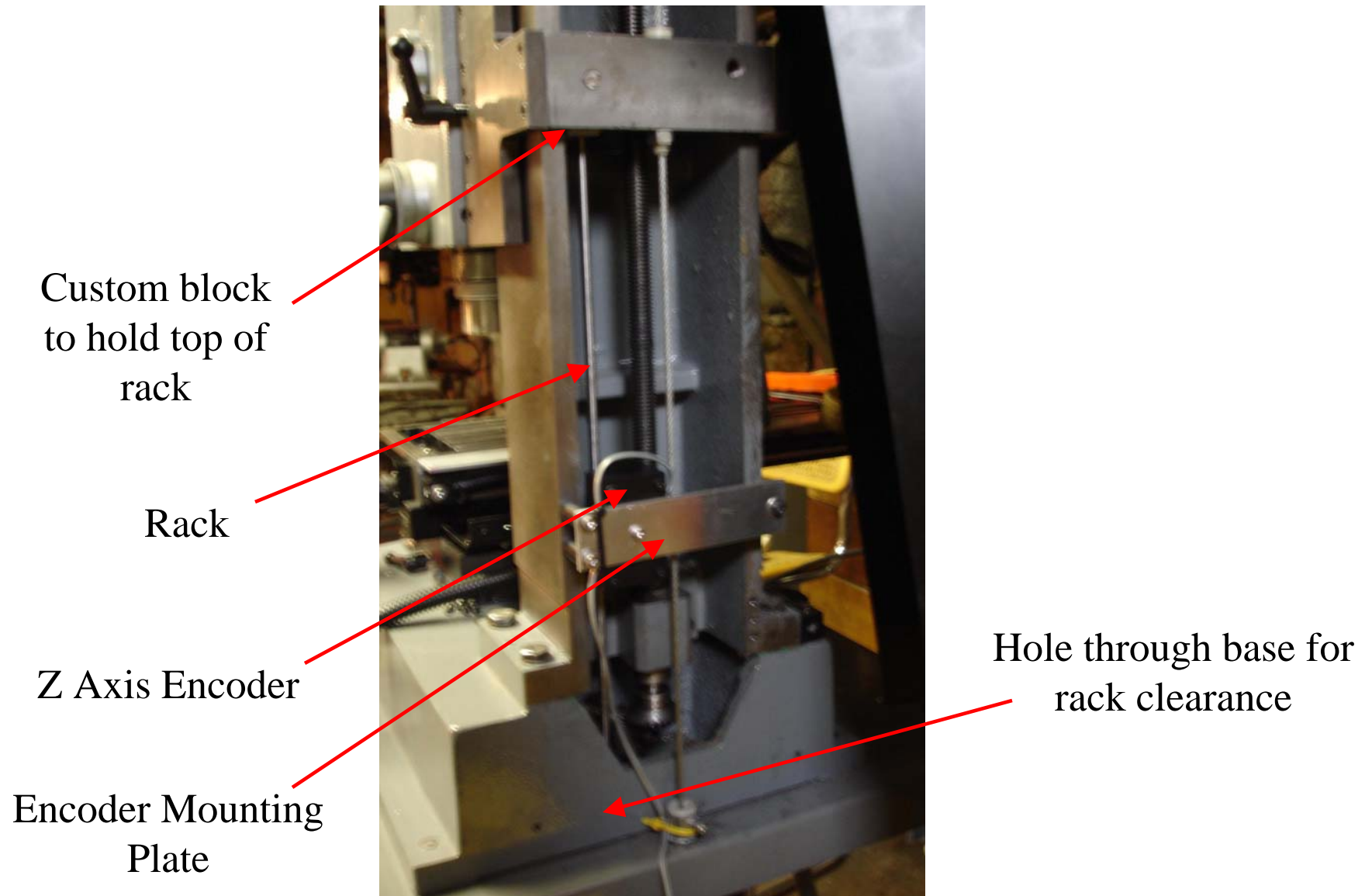
This surface tapped to hold the plate that anchors the X & Y Encoders

Y Axis Encoder in position but not anchored



Horizontal Mounting Plate

X axis Encoder



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.

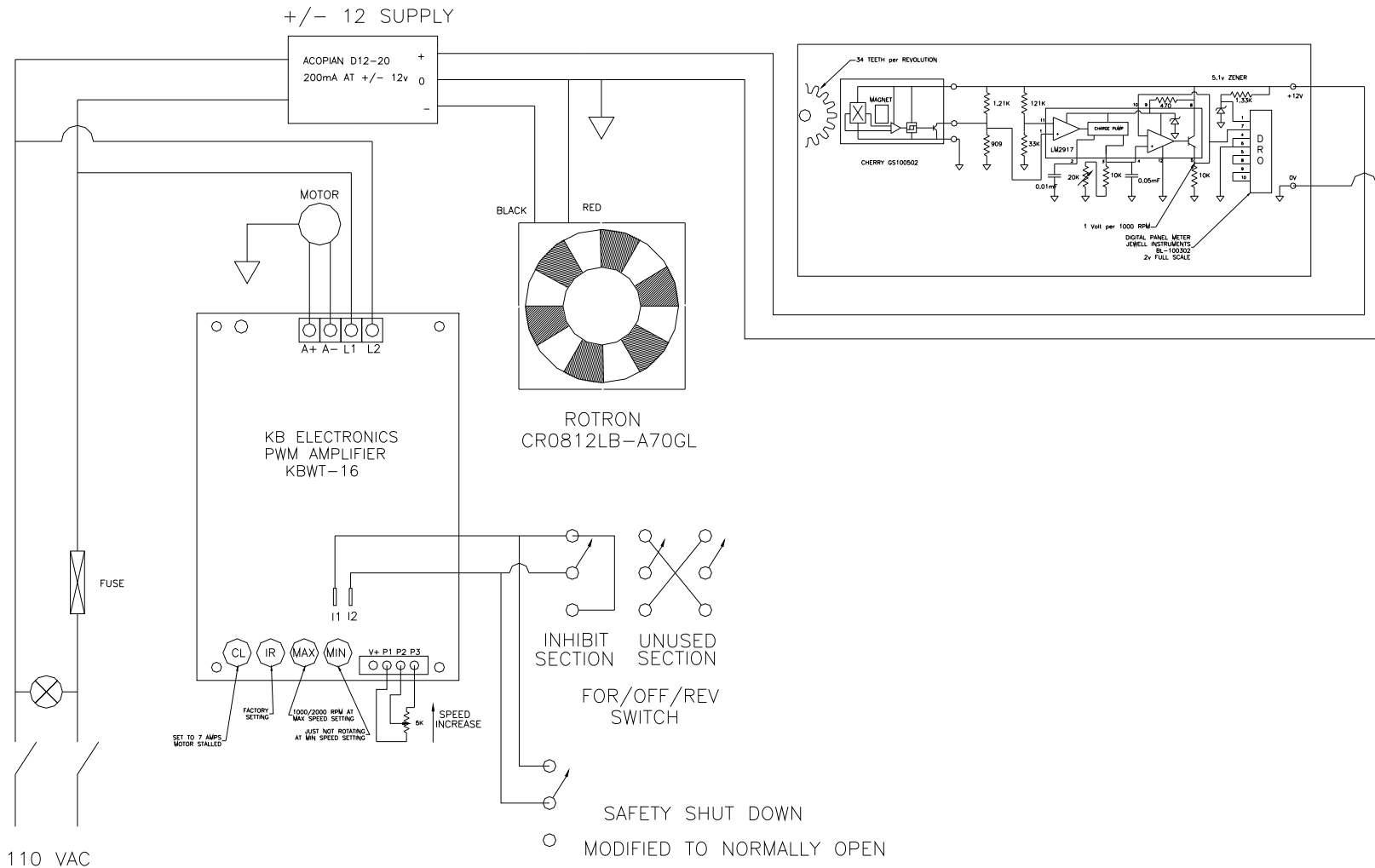
Note that a PWM type module gives a much smoother starting and running than SCR types (such as the SIEG design).

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

bruce.s.murray@verizon.net