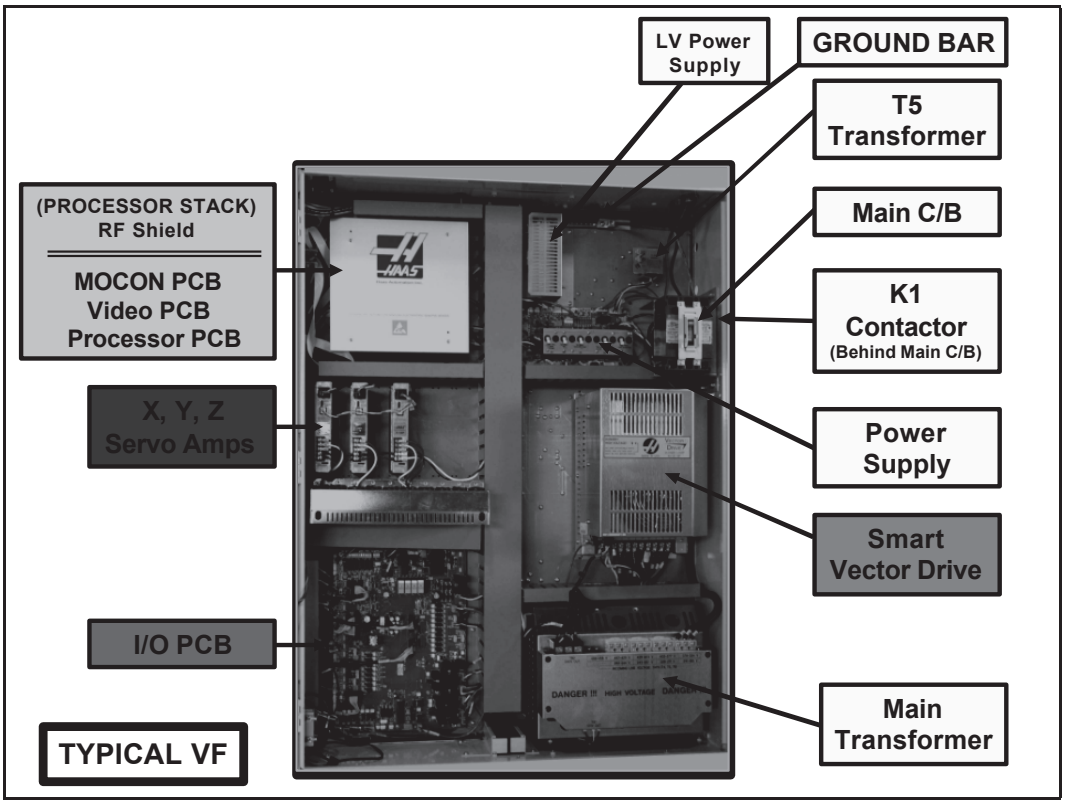
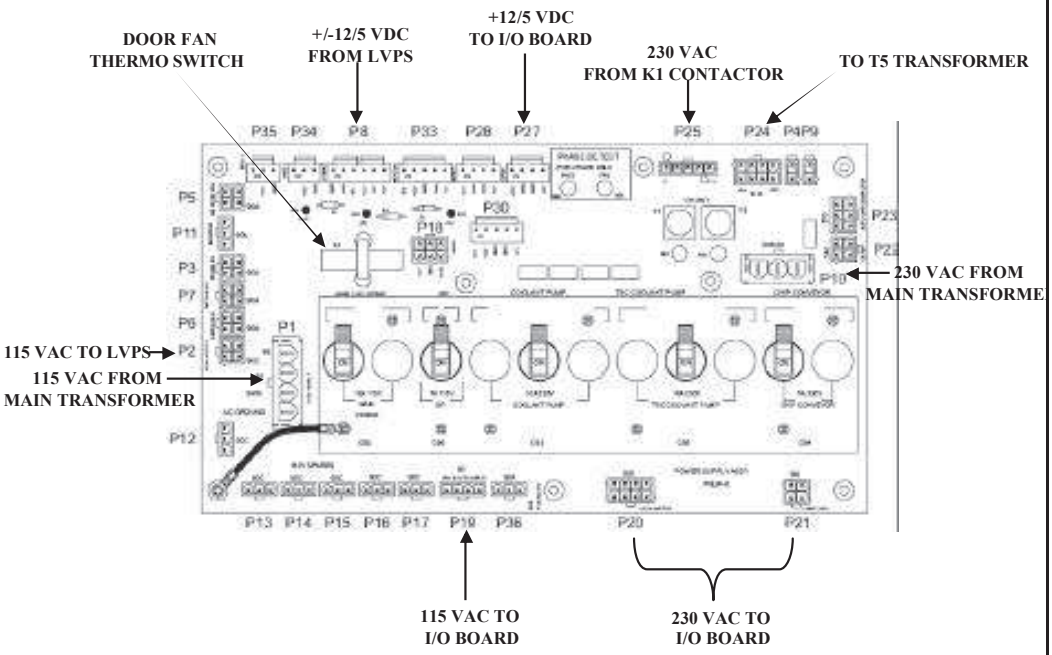
HAAS AUTOMATION TRAINING

PRESENTS

PRINTED CIRCUIT BOARDS
PCB's

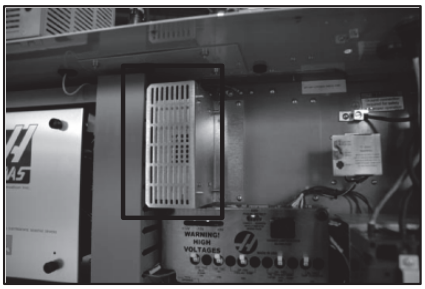


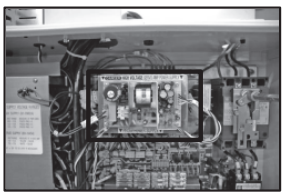
POWER PCB



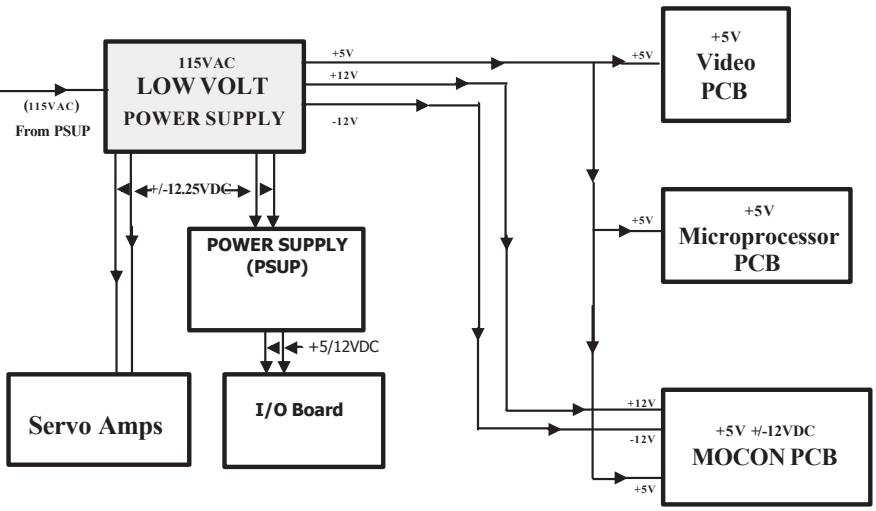
Low Volt Power Supplies

Current Version





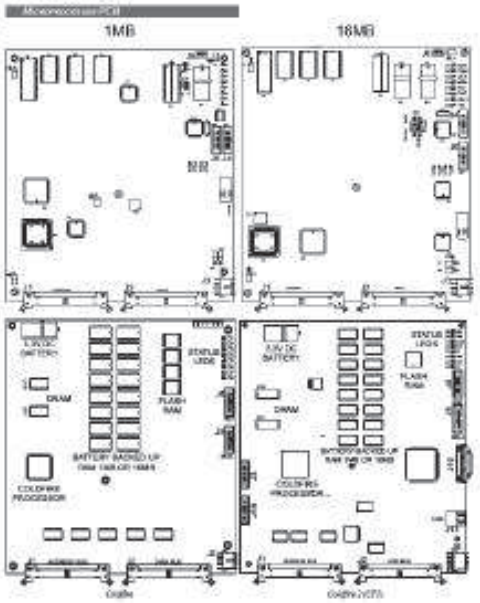
Older Versions Of Low Volt Power Supplies



LV power supply	
yellow	+12VDC
white	-12VDC
red	+5VDC
black	ground

Note: It is also possible for the Microprocessor PCB to have +12VDC as an input on the older generation machines.

Processors

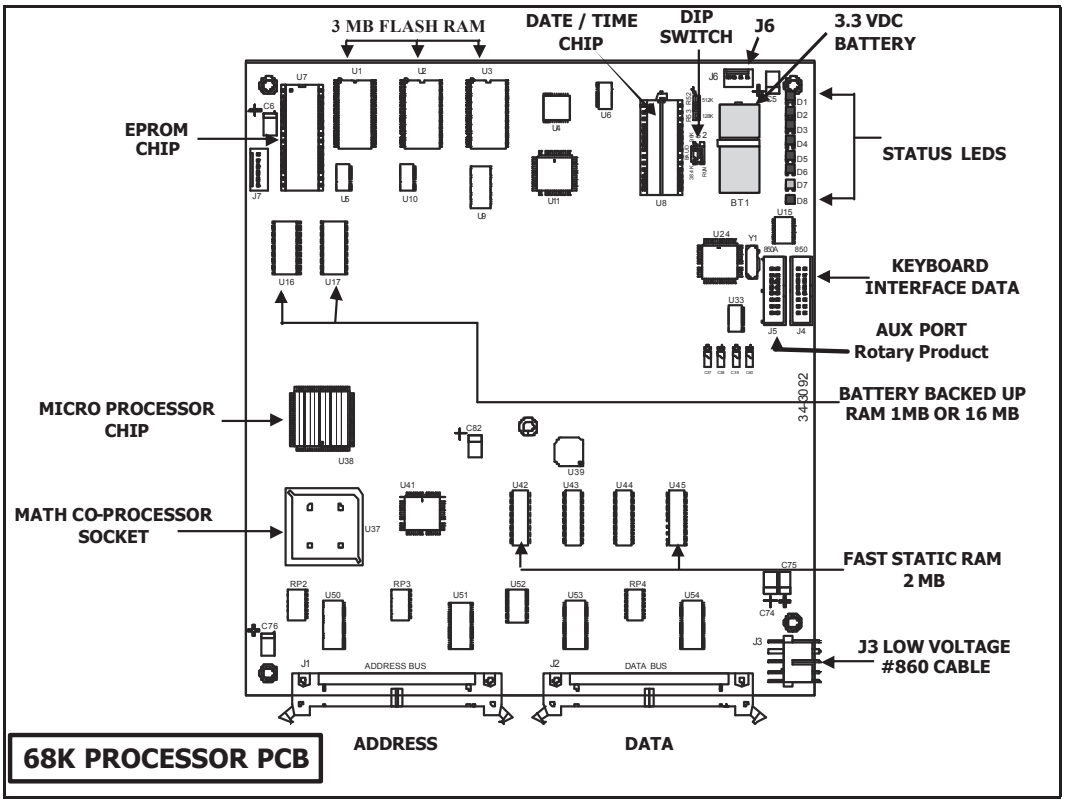


68K

68 K

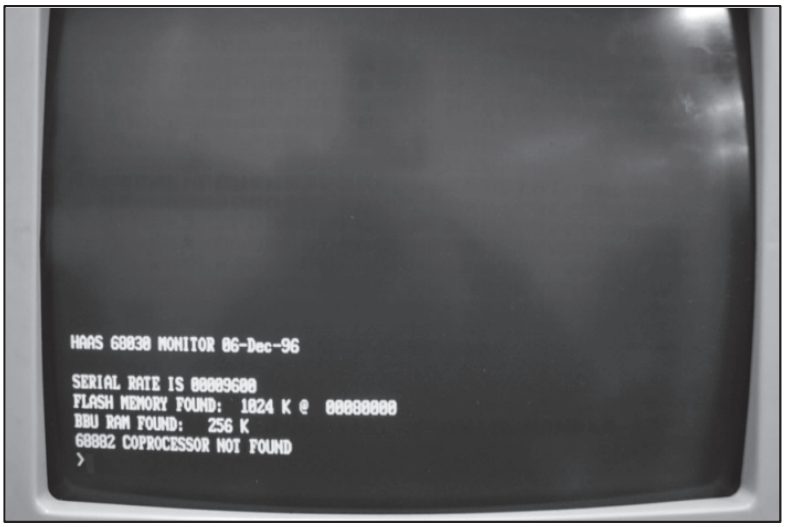
Coldfire 1

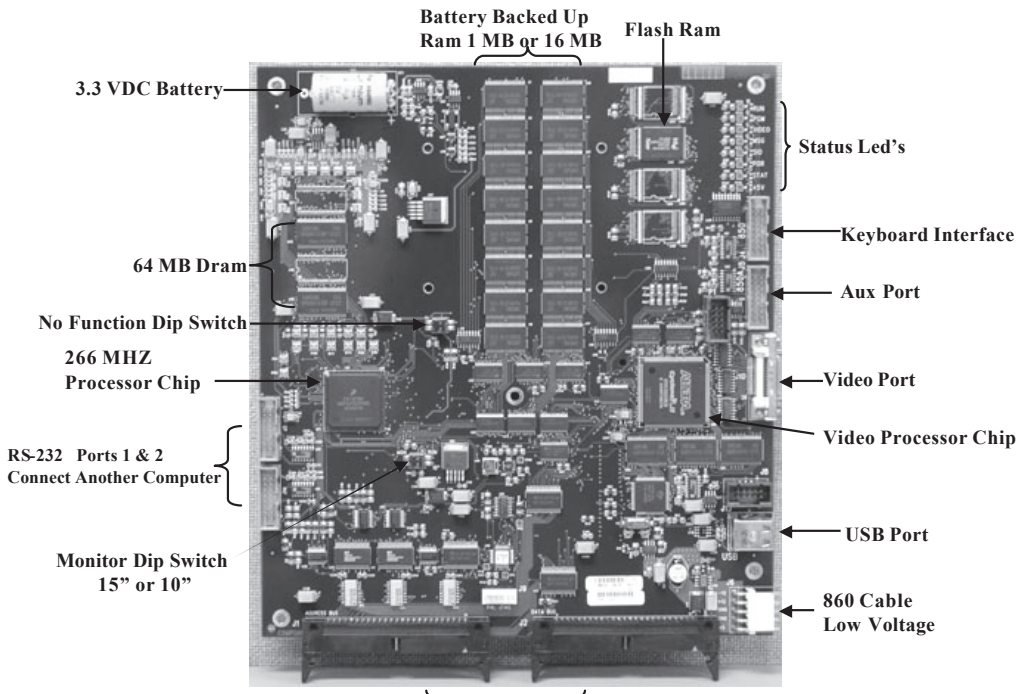
Coldfire 11



68K Processor

(13.xx and earlier software)



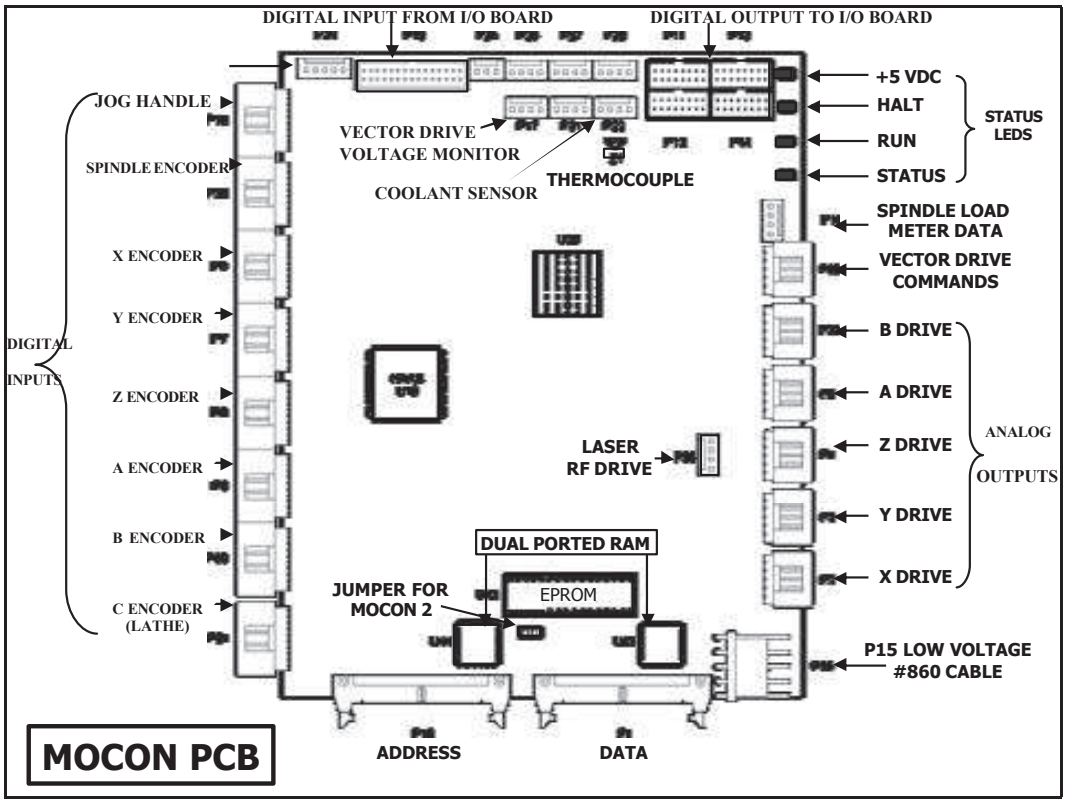


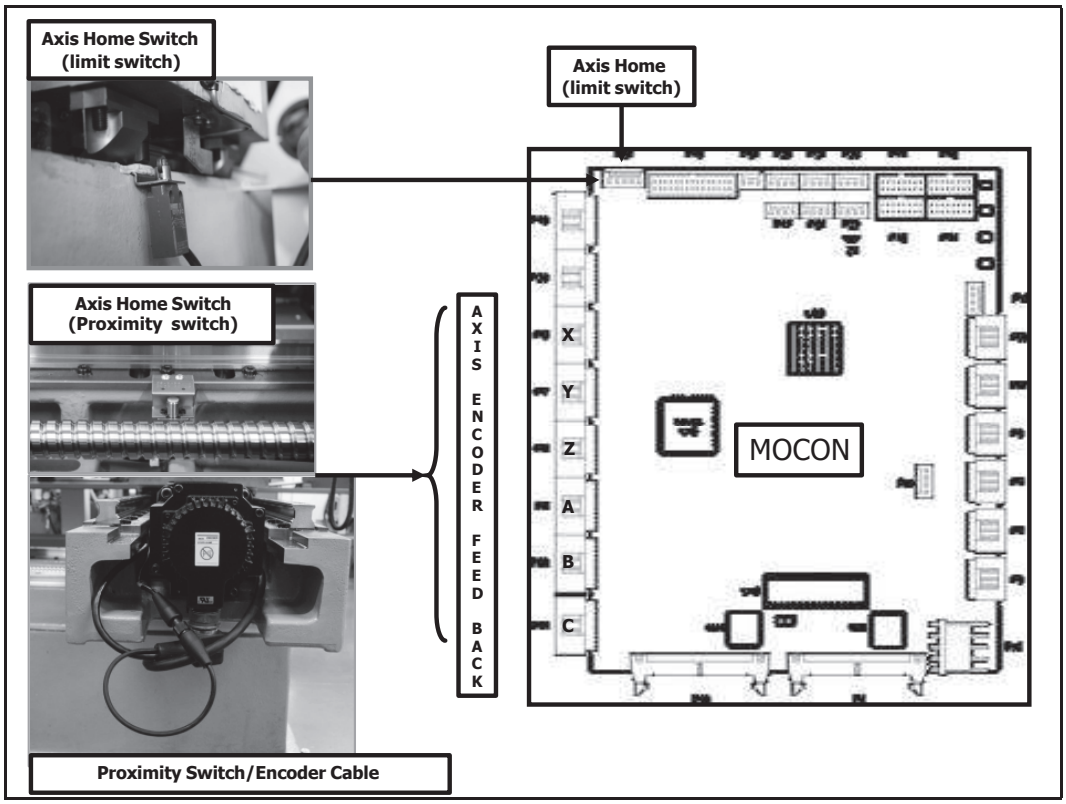
Coldfire II PCB

This shows how you can tell if there is a Coldfire Processor. This is the text that you will see when you press <PRGM/CONVRS> while turning on the control. You also need to check the Monitor Rev. Version 1.12R or LATER is required. The Software Readme file has instructions for updating the Monitor software.

→ **Haas 266 Mhz Coldfire Monitor – Rev. 1.10 Dec 19 2005**
Press H or ? for Help

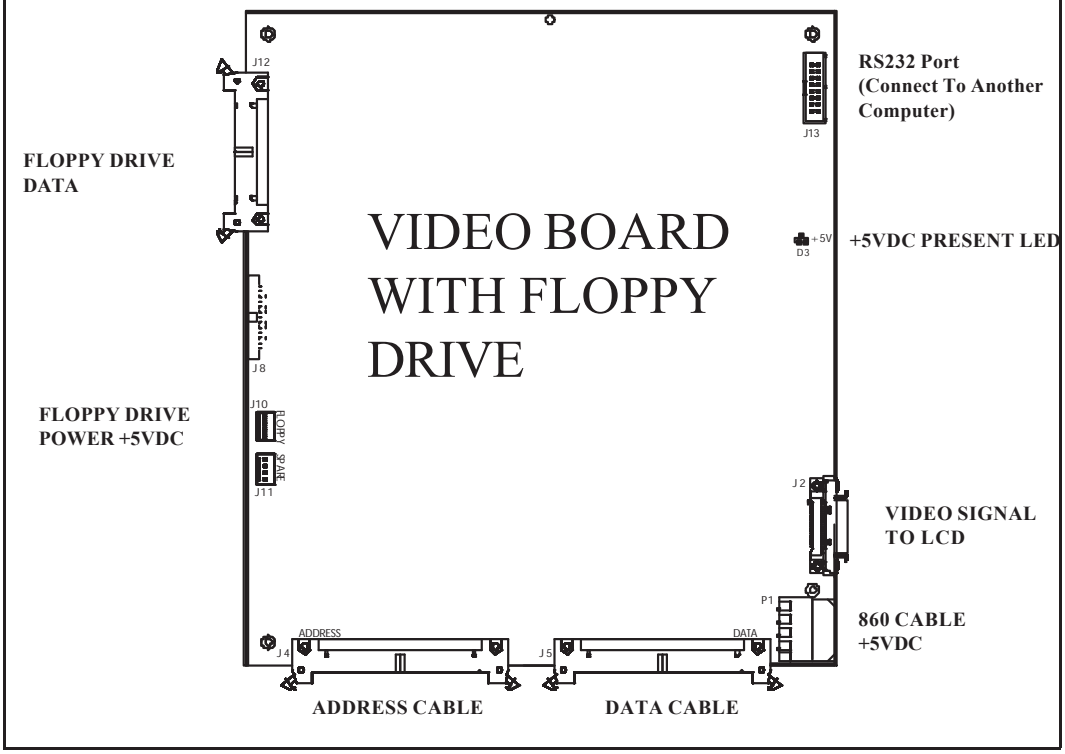
SERIAL RATE IS 00009600
CALCULATED MONITOR CRC IS: 0000EC26
FLASH MEMORY FOUND: 8 Mb
BBU RAM FOUND; 1 Mb
FPU FOUND
>_


DIGITAL INPUT FROM I/O BOARD
DIGITAL OUTPUT TO I/O BOARD
JOG HANDLE
SPINDLE ENCODER
X ENCODER
Y ENCODER
Z ENCODER
A ENCODER
B ENCODER
C ENCODER (LATHE)
DIGITAL INPUTS
VECTOR DRIVE VOLTAGE MONITOR
COOLANT SENSOR
THERMOCOUPLE
+5 VDC
HALT
RUN
STATUS
STATUS LEDS
SPINDLE LOAD METER DATA
VECTOR DRIVE COMMANDS
B DRIVE
A DRIVE
Z DRIVE
Y DRIVE
X DRIVE
ANALOG OUTPUTS
LASER RF DRIVE
DUAL PORTED RAM
EPROM
JUMPER FOR MOCON 2
P15 LOW VOLTAGE #860 CABLE
ADDRESS
DATA
MOCON PCB

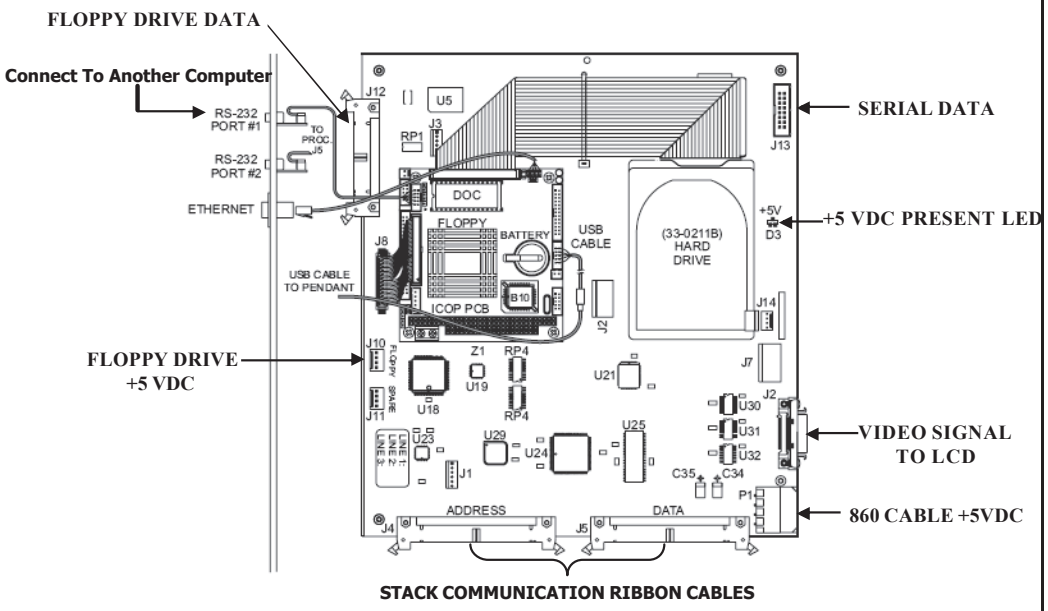

Axis Home Switch (limit switch)
Axis Home (limit switch)
Axis Home Switch (Proximity switch)
AXIS ENCODER FEED BACK
X
Y
Z
A
B
C
MOCON
Proximity Switch/Encoder Cable

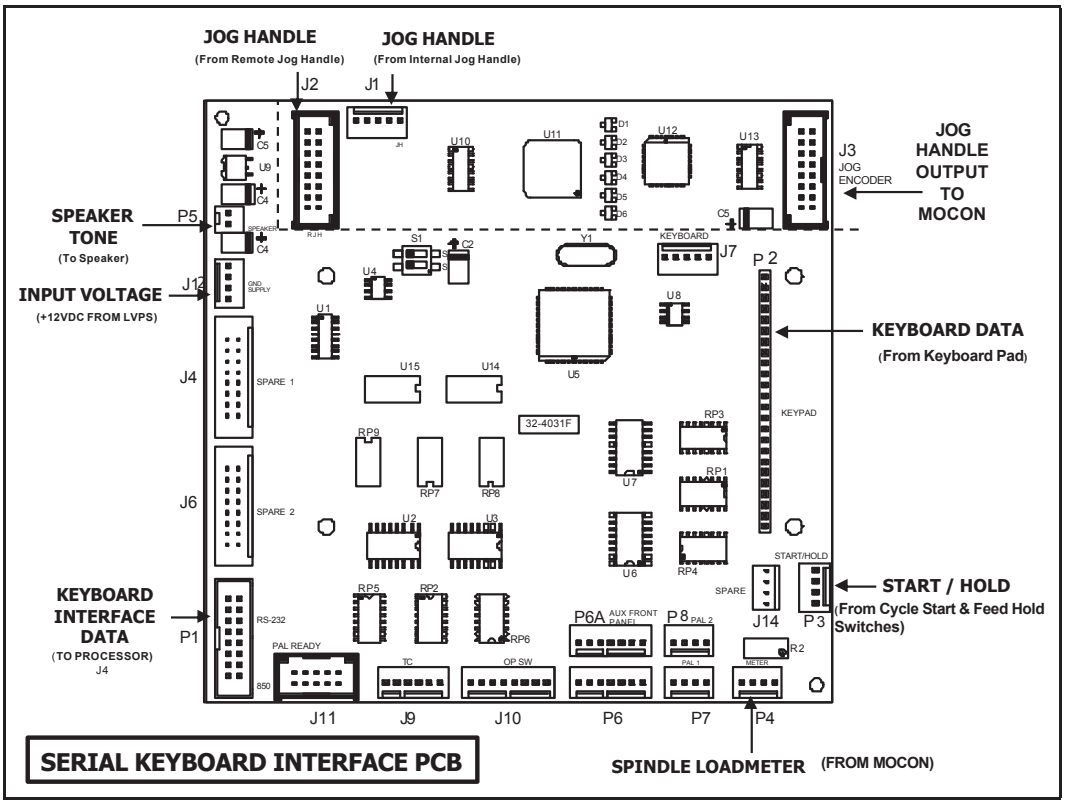
MOCON CAUSED ALARM

ALARM 157
MOCON WATCHDOG FAULT



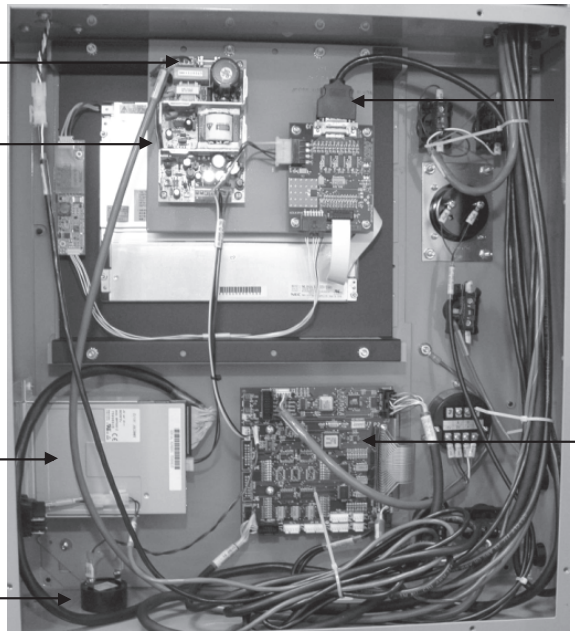
VIDEO BOARD WITH FLOPPY DRIVE
ENET - USB - HARD DRIVE

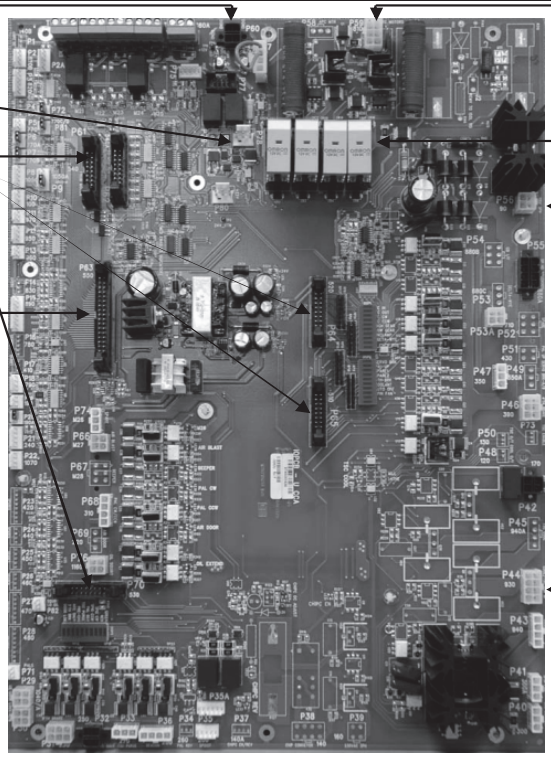




SERIAL KEYBOARD INTERFACE PCB

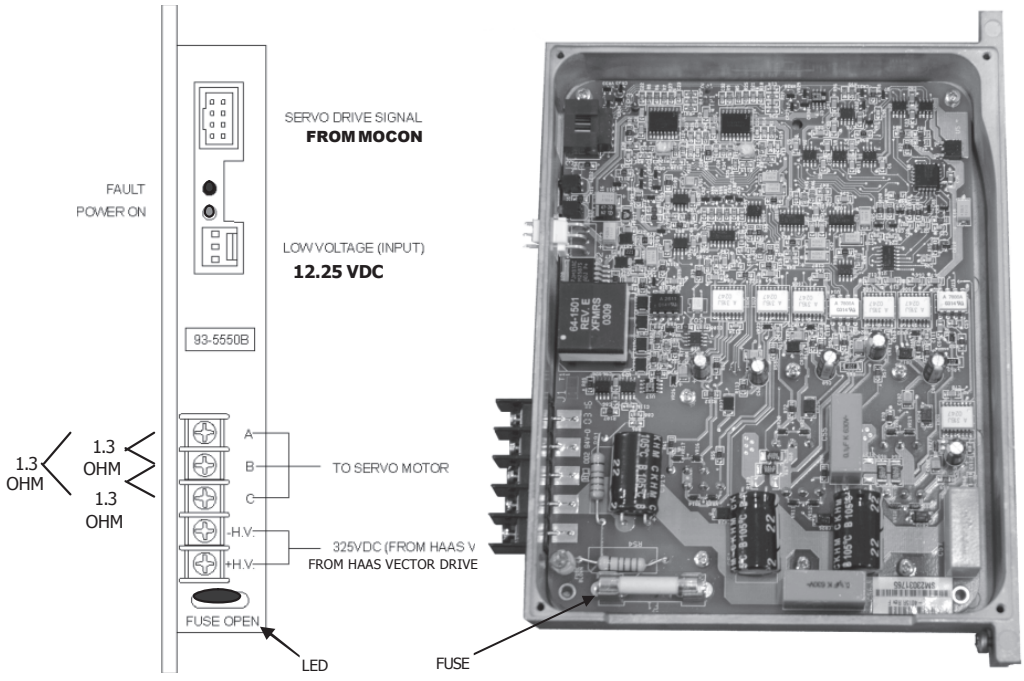
LCD MONITOR ASSEMBLY





I/O RELEASE NOTES

ALWAYS REFER TO THE RELEASE NOTES FOR THE I/O BOARD YOU ARE INSTALLING



SERVO AMPLIFER

IOPCB-U RELEASE NOTES

Rev. A – Production Release.
Rev. B – Added instructions for J1 & J2 (step5,8) Removed Pot. R119 and added instructions for the adjustment of R122 (step6)
Rev. C – Correct the DESCRIPTION to delete "This board also requires the PSUP-K or later"

DESCRIPTION

IOPCB-U is designed for new machines only. It is completely interchangeable and backward compatible with IO-S and IO-T only.

INTERCHANGE ABILITY

- IO-U is completely interchangeable with IO-S/IO-T. When replacing an IO-S/IO-T with an IO-U, follow the installation procedures below.
- IO-U is stuffed as three parts. 32-3083U is for the Haas SMTC. 32-3082U is a partially stuffed board for minimill, minilathe, and tool room mill. 32-3080U is for all other controls.

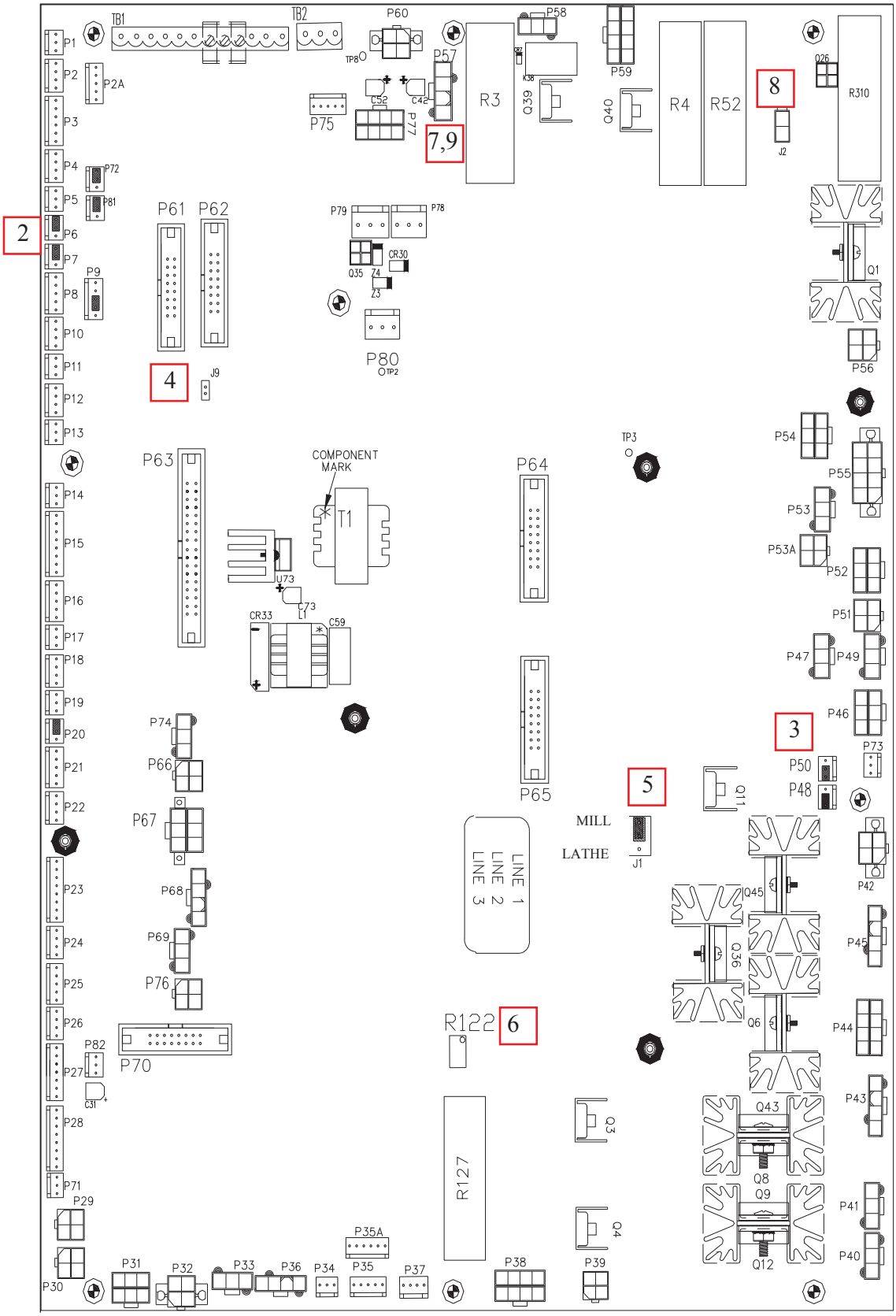
INSTALLATION PROCEDURES

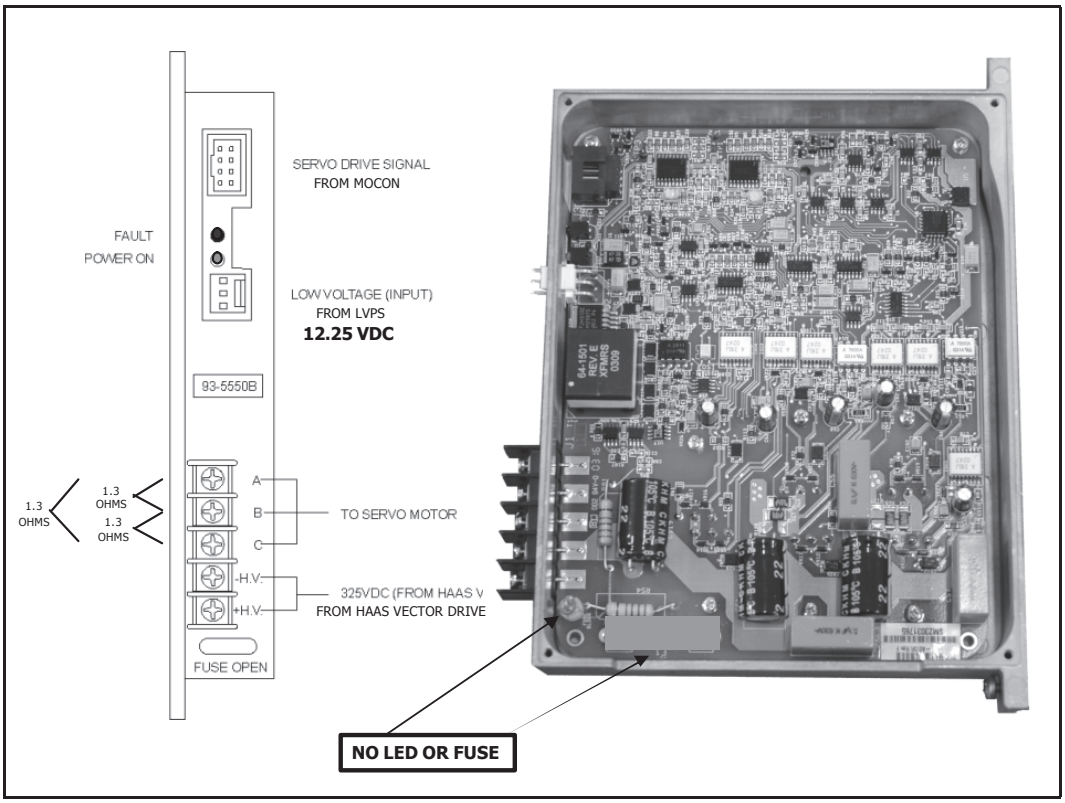
Power Off:

1. **Review all safety text printed in the PCB silkscreen.**
2. **Jumper any unused E-Stop input connectors (P6 or P7). Jumper second door switch input (P9) if unused. Jumper second remote unclamped input (P20) if unused. See attached drawing for jumper placement.**
3. **Verify that connector's P48 and P50 are jumpered, if no cable plugs are inserted.**
4. **Verify that no jumper is installed at J9. This header is used for testing only.**
5. **Set jumper (J1) to Mill position when replacing an I/O-S or I/O-T board with an I/O-U board for both Mill's and Lathes. When replacing an I/O-U board with another I/O-U board set Jumper (J1) in the same position as the board that is being replaced.**
6. **Use digital ohmmeter between TP6 and TP7 to adjust chipc over current R122 to 3KΩ +/- 100Ω for single-phase motors. Adjust to 4.5KΩ +/- 100Ω for 1-phase, belt style, lathe chip conveyor. The machine does not need to be turned off for this adjustment only the CB4 (chip conveyor) needs to be turned off.**
7. **For all SL and most VF, install tc jumper cable (33-0809, supplied) at P57. Remove only if there is a cable that will plug in here instead. If this cable is too short, a longer one is in the service kit.**
8. **The Jumper J2 is stuffed only for service. When replacing an IO-T/S, install jumper at J2. When replacing an I/O-U, check to see if there is a jumper at J2. The new board MUST match the old.**
9. **When replacing with a 34-3083U make sure to use the SMTC brake resistor cable (Haas p/n 33-0815B) at P57.**

Power On:

10. **Verify that parameter 209, "MCD RLY BRD", is set to a "1". The "Relay Bank Select" parameter 352 should be set to a 1, 2 or 3 depending on whether additional M-code relay boards are present.**
11. **Verify that parameter 57, "PH LOSS DET", is set to a "0".**
12. **Operate chip conveyor. If the motor will not run forward continuously, it is acceptable to decrease the over current (R122) by up to 1KΩ. If it still faults, replace the IOPCB and/or chipc motor. Jam the motor (using a piece of wood or by jamming the fan on the back of the motor if accessible) and verify that the motor stops and pauses before reversing (note that the belt style may not reverse, but will still pause). If it will not pause, increase the adjustment by up to 1K.**
13. **Operate spindle, tool changer, coolant, tsc, spigot, e-stop, beacon, door, and all optional equipment (pallet changer, barfeeder, etc.). Verify correct operation.**


TB1
TB2
P60
P58
P59
P57
7,9
R3
Q39
Q40
R4
R52
8
J2
Q26
R310
P1
P2
P2A
P3
P4
P72
P5
P81
2
P6
P7
P9
P8
P10
P11
P12
P13
P75
P77
C52
C42
TP8
P61
P62
P79
P78
CR30
Q35
Z4
Z3
P80
TP2
4
J9
Q1
P56
P54
P55
P53
P53A
P52
P51
P47
P49
P46
3
P50
P48
P73
P42
P45
P44
P43
P41
P40
P63
COMPONENT MARK
T1
U73
C73
L1
CR33
C59
P64
TP3
P65
5
MILL
LATHE
J1
Q11
Q45
Q36
Q6
Q43
Q8
Q9
Q12
P74
P66
P67
P68
P69
P76
P70
P82
C31
LINE 1
LINE 2
LINE 3
R122
6
R127
Q3
Q4
P39
P38
P35A
P31
P32
P33
P36
P34
P35
P37
P30
P29
P28
P27
P26
P25
P24
P23
P22
P21
P20
P19
P18
P17
P16
P15
P14
P71



Smart Amplifier

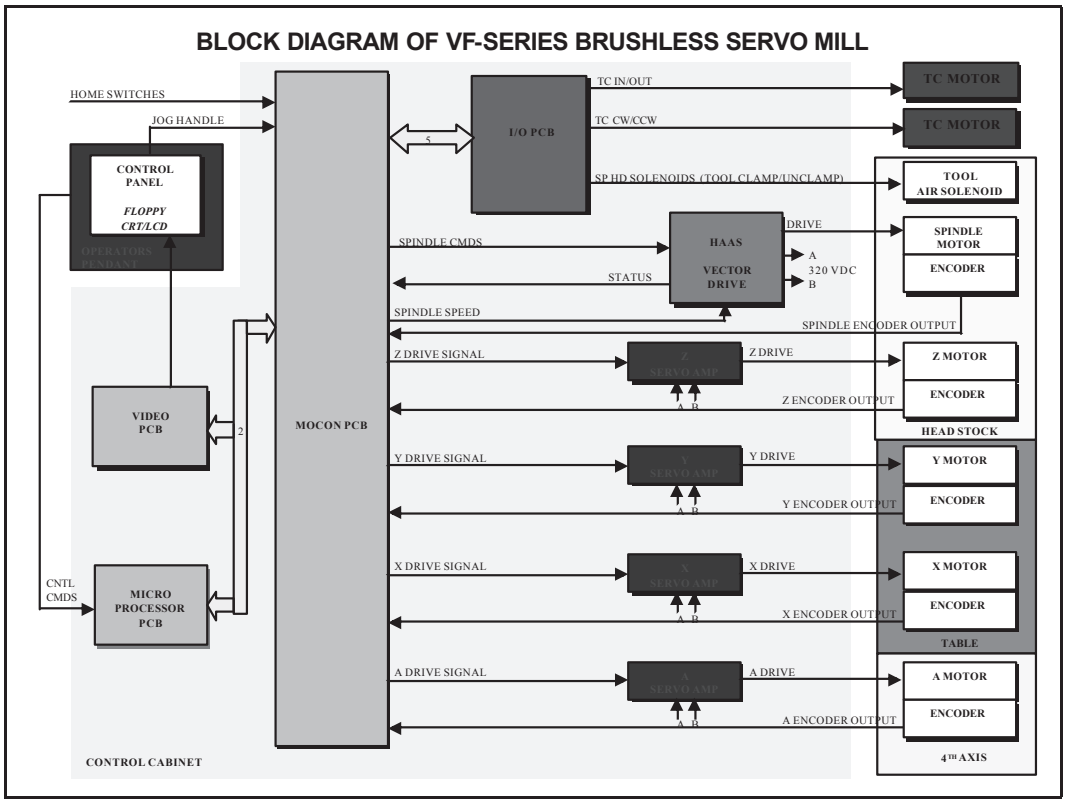
Servo Drive Signal From Mocon

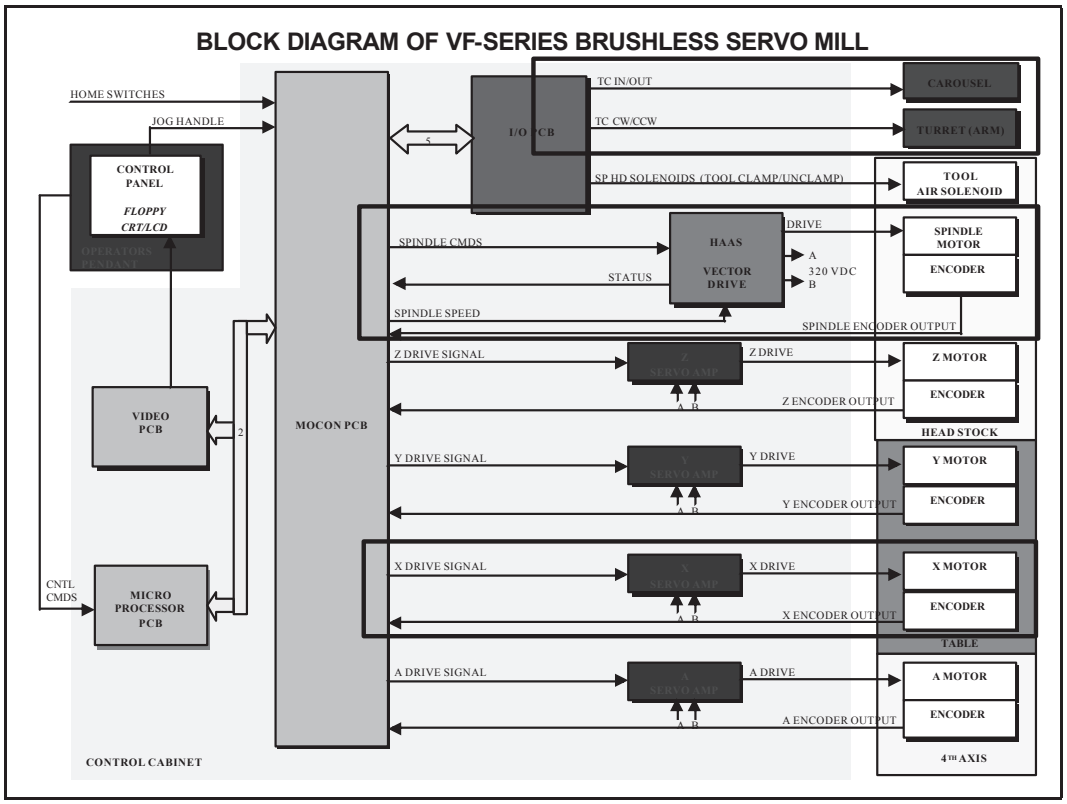
Fault Led

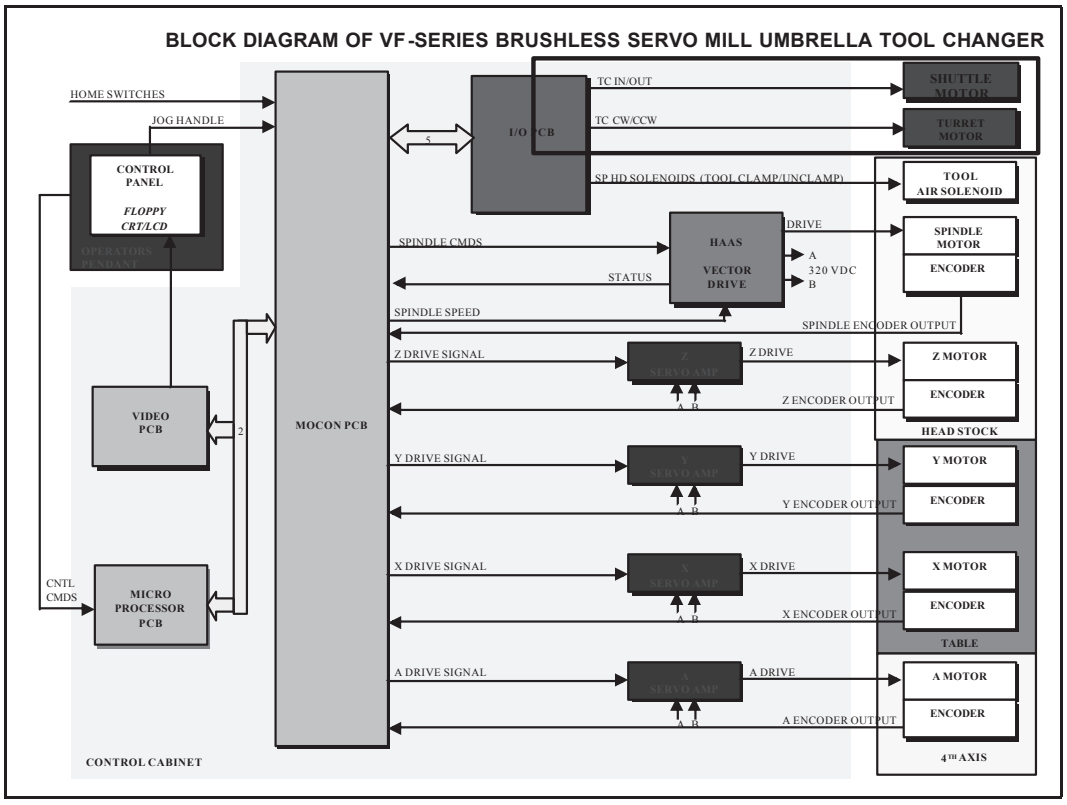
No 12.25 VDC From Low Volt Power Supply

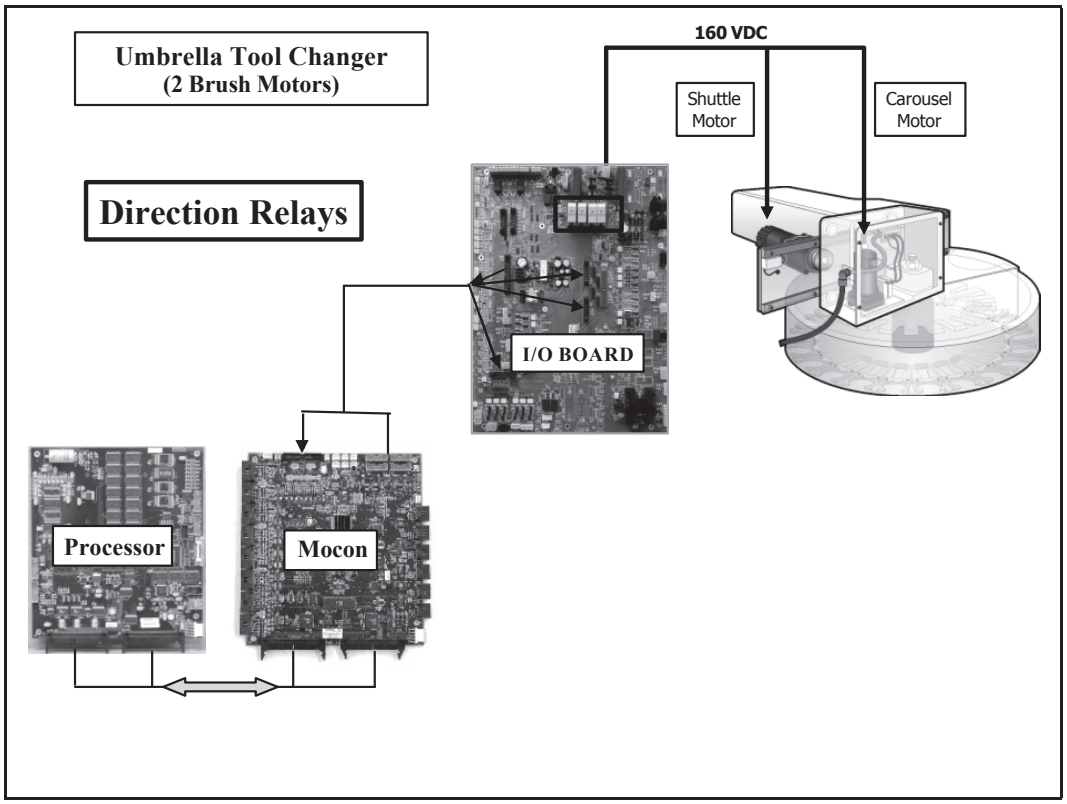
325 VDC PWM Output To Axis Motor

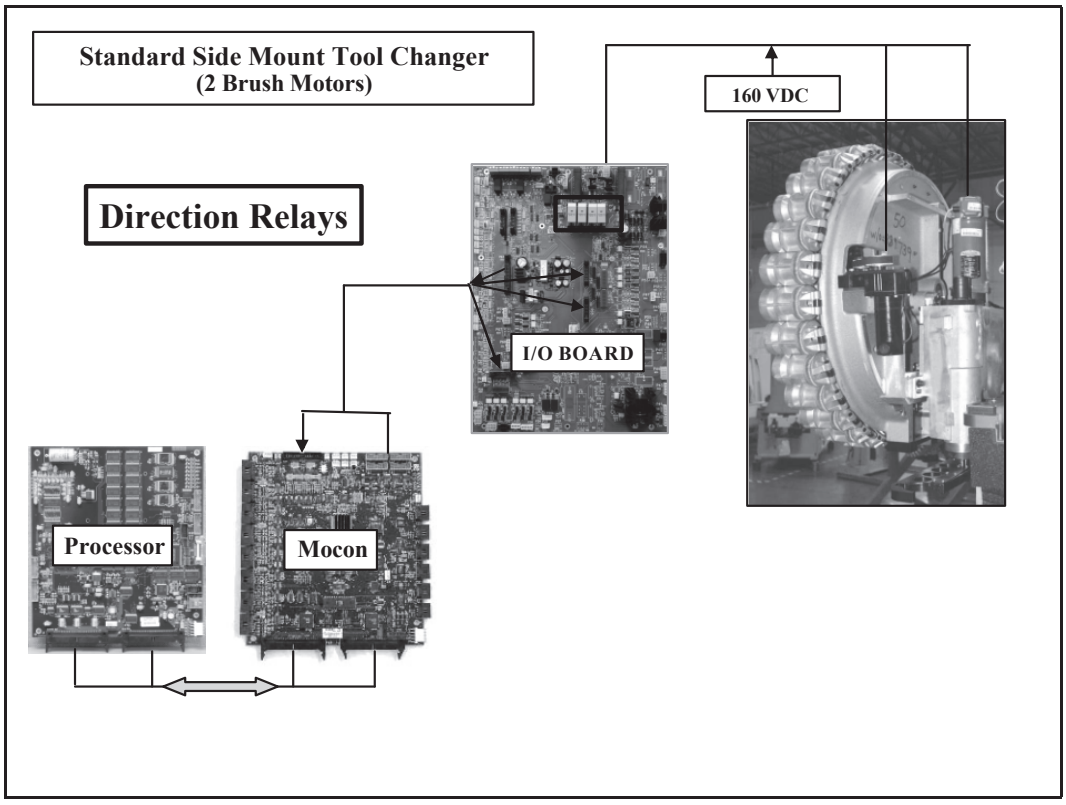
325 VDC From Vector Drive

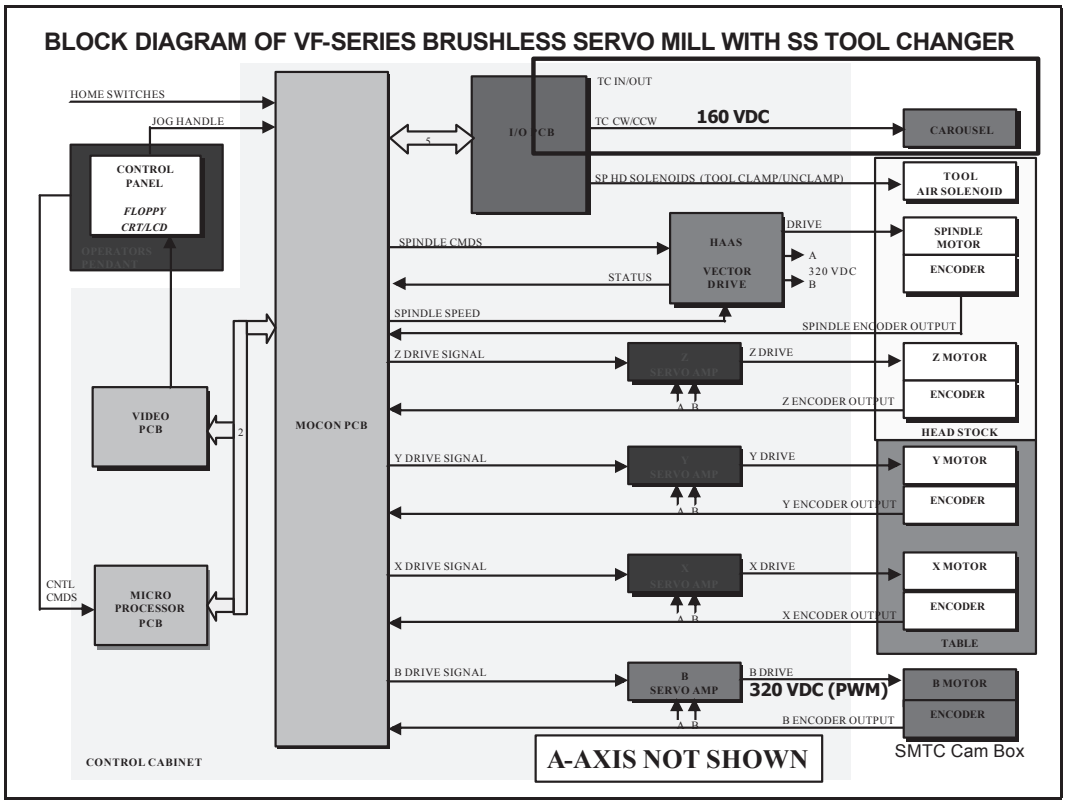

BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL
HOME SWITCHES
JOG HANDLE
CONTROL PANEL
FLOPPY
CRT/LCD
OPERATORS PENDANT
VIDEO PCB
MICRO PROCESSOR PCB
CNTL CMDS
MOCON PCB
I/O PCB
TC IN/OUT
TC CW/CCW
SP HD SOLENOIDS (TOOL CLAMP/UNCLAMP)
SPINDLE CMDS
STATUS
HAAS VECTOR DRIVE
DRIVE
320 VDC
SPINDLE SPEED
SPINDLE ENCODER OUTPUT
Z DRIVE SIGNAL
Z SERVO AMP
Z DRIVE
Z ENCODER OUTPUT
Y DRIVE SIGNAL
Y SERVO AMP
Y DRIVE
Y ENCODER OUTPUT
X DRIVE SIGNAL
X SERVO AMP
X DRIVE
X ENCODER OUTPUT
A DRIVE SIGNAL
A SERVO AMP
A DRIVE
A ENCODER OUTPUT
TC MOTOR
TC MOTOR
TOOL AIR SOLENOID
SPINDLE MOTOR
ENCODER
Z MOTOR
ENCODER
HEAD STOCK
Y MOTOR
ENCODER
X MOTOR
ENCODER
TABLE
A MOTOR
ENCODER
4TH AXIS
CONTROL CABINET


BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL
HOME SWITCHES
JOG HANDLE
CONTROL PANEL
FLOPPY
CRT/LCD
OPERATORS PENDANT
VIDEO PCB
MICRO PROCESSOR PCB
CNTL CMDS
MOCON PCB
I/O PCB
TC IN/OUT
TC CW/CCW
SP HD SOLENOIDS (TOOL CLAMP/UNCLAMP)
SPINDLE CMDS
STATUS
HAAS VECTOR DRIVE
DRIVE
320 VDC
SPINDLE SPEED
SPINDLE ENCODER OUTPUT
Z DRIVE SIGNAL
Z SERVO AMP
Z DRIVE
Z ENCODER OUTPUT
Y DRIVE SIGNAL
Y SERVO AMP
Y DRIVE
Y ENCODER OUTPUT
X DRIVE SIGNAL
X SERVO AMP
X DRIVE
X ENCODER OUTPUT
A DRIVE SIGNAL
A SERVO AMP
A DRIVE
A ENCODER OUTPUT
CAROUSEL
TURRET (ARM)
TOOL AIR SOLENOID
SPINDLE MOTOR
ENCODER
Z MOTOR
ENCODER
HEAD STOCK
Y MOTOR
ENCODER
X MOTOR
ENCODER
TABLE
A MOTOR
ENCODER
4TH AXIS
CONTROL CABINET

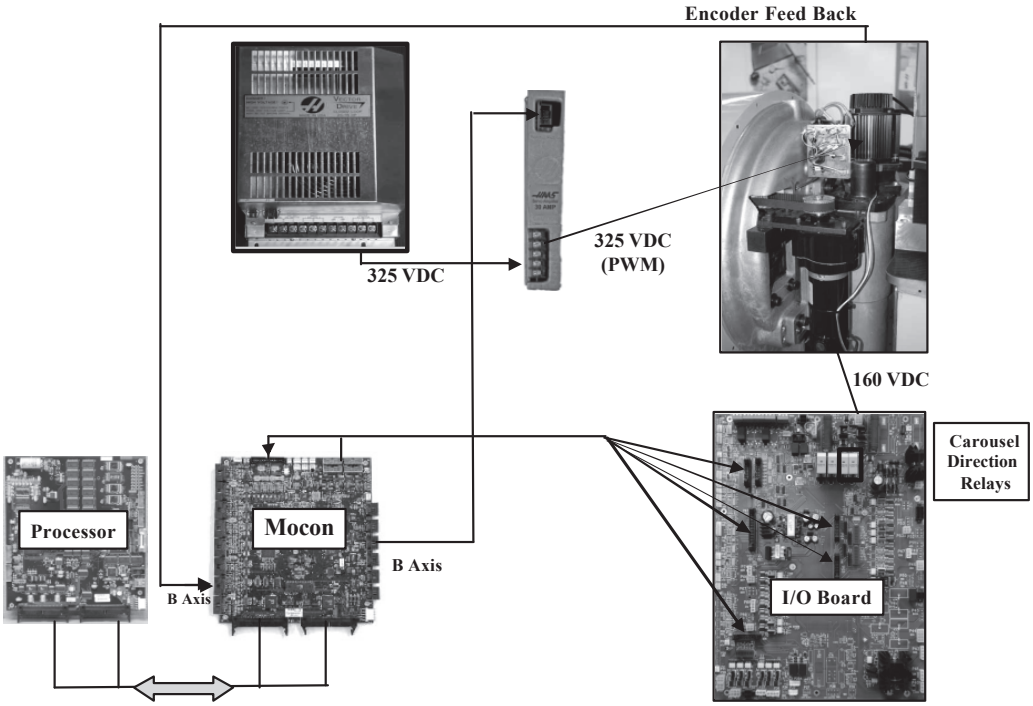

BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL UMBRELLA TOOL CHANGER
HOME SWITCHES
JOG HANDLE
CONTROL PANEL
FLOPPY
CRT/LCD
OPERATORS PENDANT
VIDEO PCB
MICRO PROCESSOR PCB
CNTL CMDS
MOCON PCB
I/O PCB
TC IN/OUT
TC CW/CCW
SHUTTLE MOTOR
TURRET MOTOR
SP HD SOLENOIDS (TOOL CLAMP/UNCLAMP)
TOOL AIR SOLENOID
SPINDLE CMDS
STATUS
HAAS VECTOR DRIVE
DRIVE
A
320 VDC
B
SPINDLE MOTOR
ENCODER
SPINDLE SPEED
SPINDLE ENCODER OUTPUT
Z DRIVE SIGNAL
Z SERVO AMP
Z DRIVE
Z MOTOR
ENCODER
Z ENCODER OUTPUT
HEAD STOCK
Y DRIVE SIGNAL
Y SERVO AMP
Y DRIVE
Y MOTOR
ENCODER
Y ENCODER OUTPUT
X DRIVE SIGNAL
X SERVO AMP
X DRIVE
X MOTOR
ENCODER
X ENCODER OUTPUT
TABLE
A DRIVE SIGNAL
A SERVO AMP
A DRIVE
A MOTOR
ENCODER
A ENCODER OUTPUT
4TH AXIS
CONTROL CABINET


Umbrella Tool Changer
(2 Brush Motors)
160 VDC
Shuttle Motor
Carousel Motor
Direction Relays
I/O BOARD
Processor
Mocon

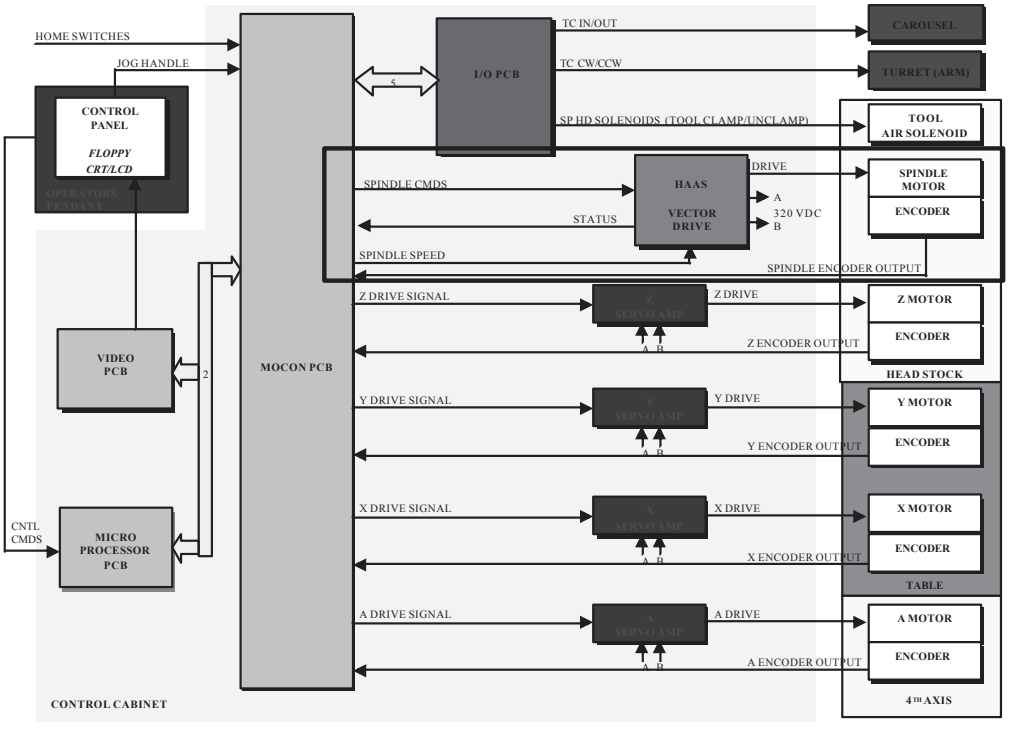

Standard Side Mount Tool Changer
(2 Brush Motors)
160 VDC
Direction Relays
I/O BOARD
Processor
Mocon

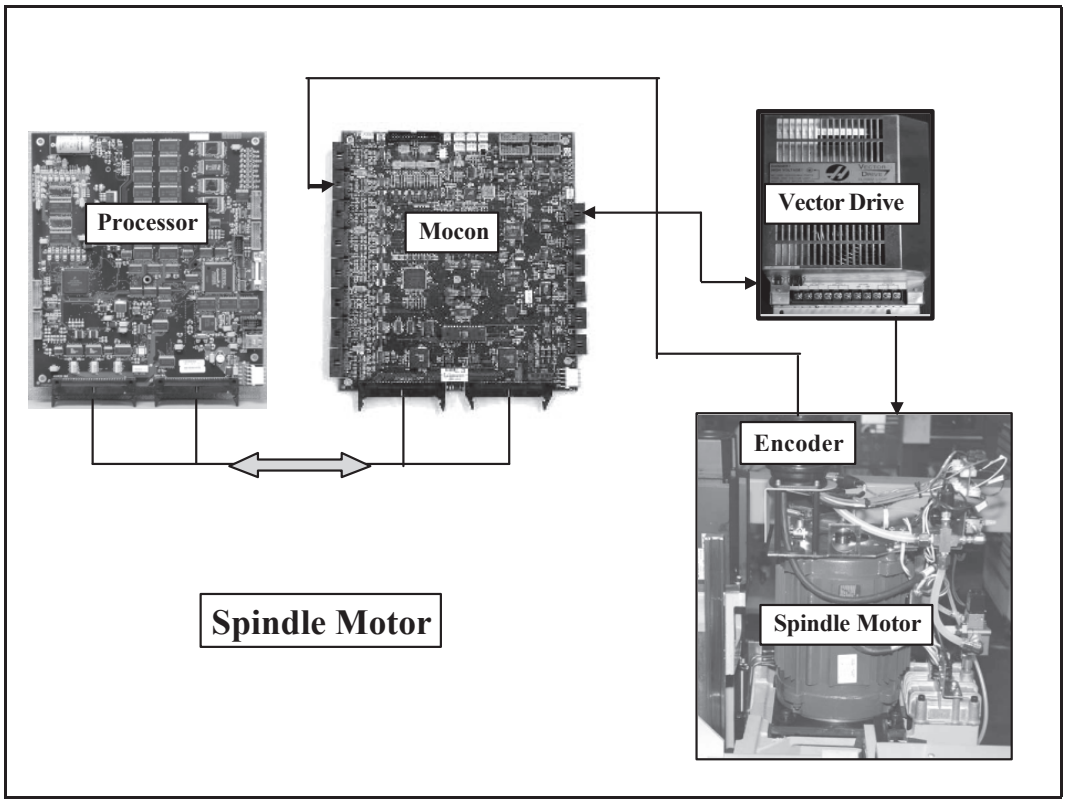

BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL WITH SS TOOL CHANGER
HOME SWITCHES
JOG HANDLE
CONTROL PANEL
FLOPPY
CRT/LCD
OPERATORS PENDANT
VIDEO PCB
CNTL CMDS
MICRO PROCESSOR PCB
MOCON PCB
CONTROL CABINET
I/O PCB
TC IN/OUT
TC CW/CCW
160 VDC
CAROUSEL
SP HD SOLENOIDS (TOOL CLAMP/UNCLAMP)
TOOL AIR SOLENOID
SPINDLE CMDS
STATUS
HAAS VECTOR DRIVE
DRIVE
A
320 VDC
B
SPINDLE MOTOR
ENCODER
SPINDLE SPEED
SPINDLE ENCODER OUTPUT
Z DRIVE SIGNAL
Z SERVO AMP
Z DRIVE
Z MOTOR
ENCODER
Z ENCODER OUTPUT
HEAD STOCK
Y DRIVE SIGNAL
Y SERVO AMP
Y DRIVE
Y MOTOR
ENCODER
Y ENCODER OUTPUT
X DRIVE SIGNAL
X SERVO AMP
X DRIVE
X MOTOR
ENCODER
X ENCODER OUTPUT
TABLE
B DRIVE SIGNAL
B SERVO AMP
B DRIVE
320 VDC (PWM)
B MOTOR
ENCODER
B ENCODER OUTPUT
SMTC Cam Box
A-AXIS NOT SHOWN

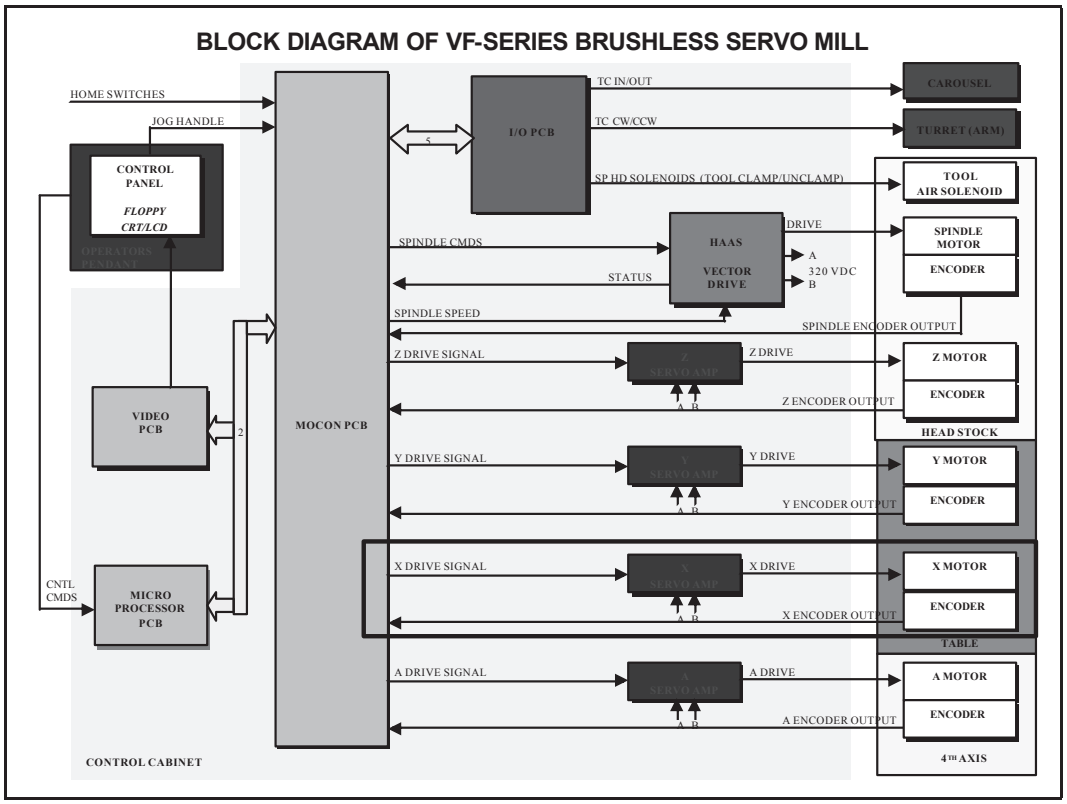
Super Speed Side Mount TC (1 Brush & 1 Brushless Motor)

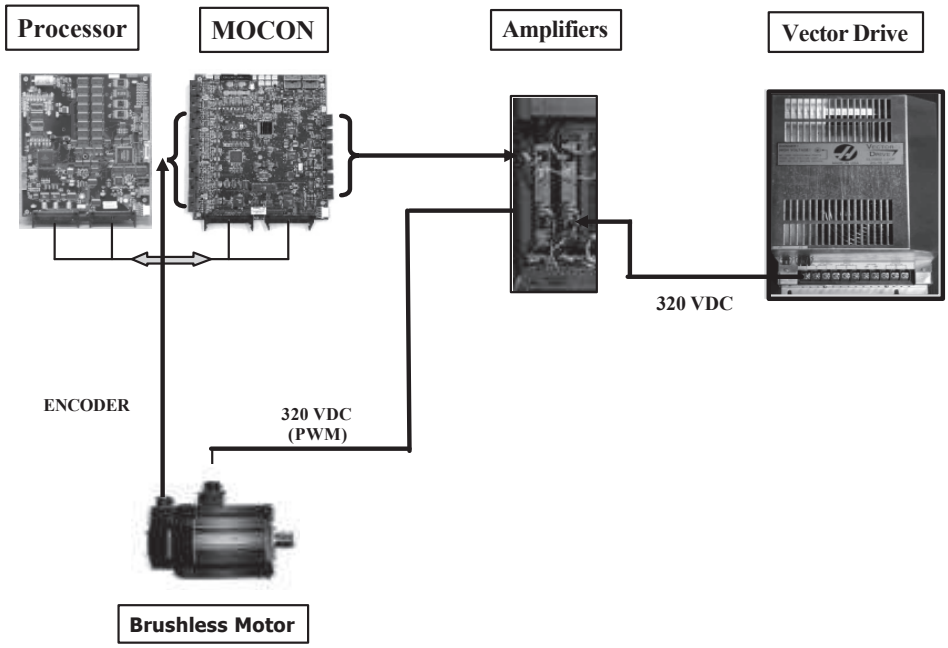


BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL

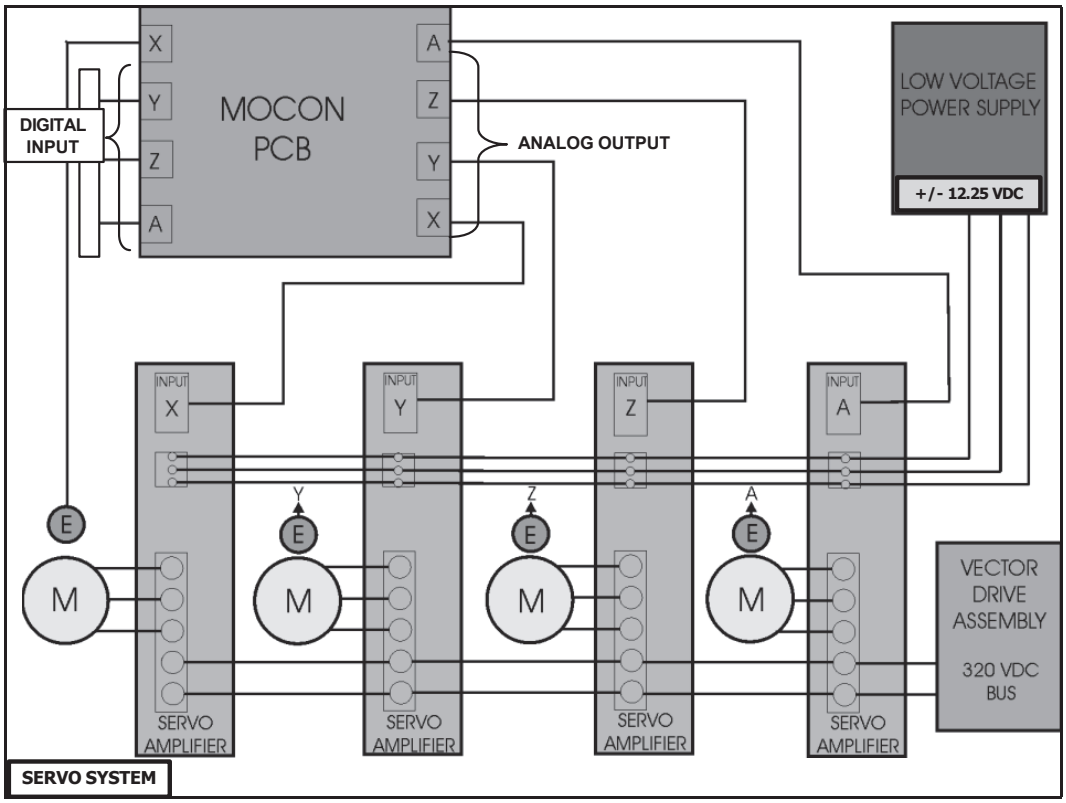



Processor
Mocon
Vector Drive
Encoder
Spindle Motor
Spindle Motor

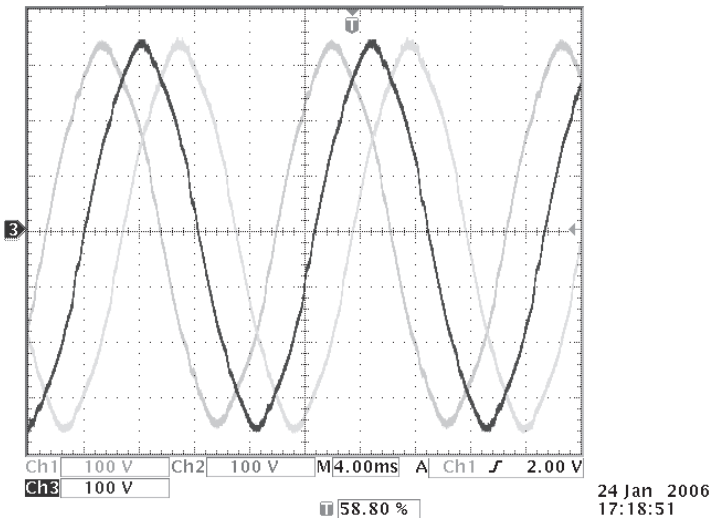

BLOCK DIAGRAM OF VF-SERIES BRUSHLESS SERVO MILL
HOME SWITCHES
JOG HANDLE
CONTROL PANEL
FLOPPY
CRT/LCD
OPERATORS PENDANT
VIDEO PCB
CNTL CMDS
MICRO PROCESSOR PCB
MOCON PCB
CONTROL CABINET
I/O PCB
TC IN/OUT
TC CW/CCW
SP HD SOLENOIDS (TOOL CLAMP/UNCLAMP)
SPINDLE CMDS
STATUS
HAAS VECTOR DRIVE
DRIVE
A
320 VDC
B
SPINDLE SPEED
SPINDLE ENCODER OUTPUT
Z DRIVE SIGNAL
Z SERVO AMP
Z DRIVE
Z ENCODER OUTPUT
Y DRIVE SIGNAL
Y SERVO AMP
Y DRIVE
Y ENCODER OUTPUT
X DRIVE SIGNAL
X SERVO AMP
X DRIVE
X ENCODER OUTPUT
A DRIVE SIGNAL
A SERVO AMP
A DRIVE
A ENCODER OUTPUT
CAROUSEL
TURRET (ARM)
TOOL AIR SOLENOID
SPINDLE MOTOR
ENCODER
Z MOTOR
ENCODER
HEAD STOCK
Y MOTOR
ENCODER
X MOTOR
ENCODER
TABLE
A MOTOR
ENCODER
4TH AXIS



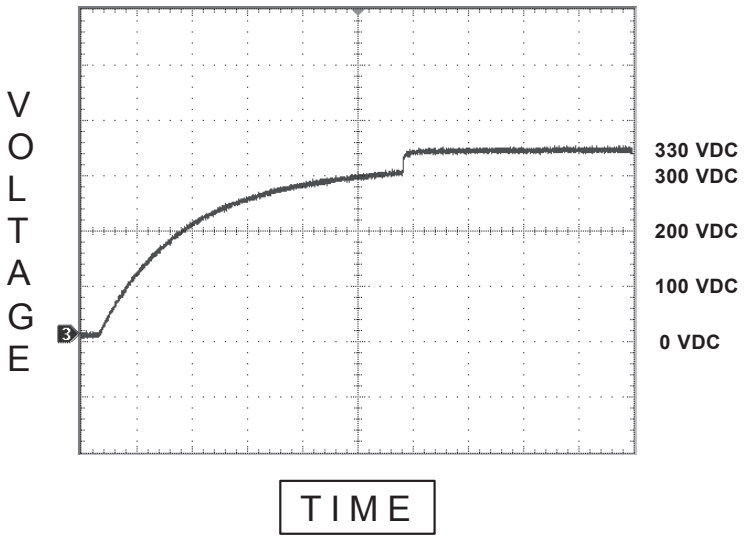
Servo System



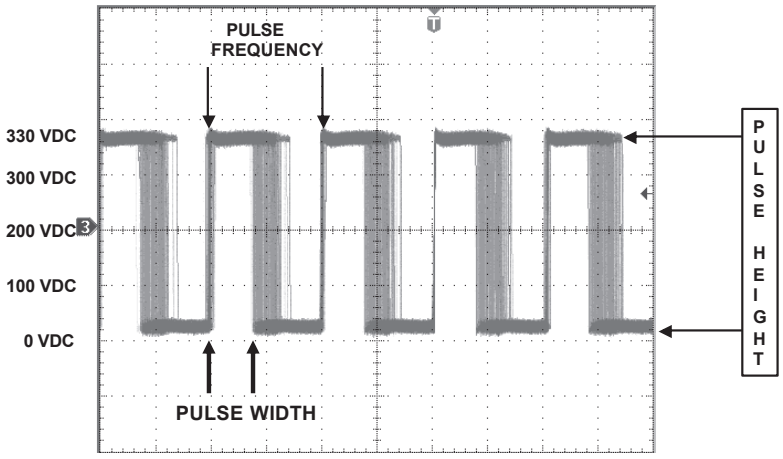
3 PHASE 230 VAC INCOMMING LINE VOLTAGE



320 VDC BUSS VOLTAGE TO SERVO AMPS



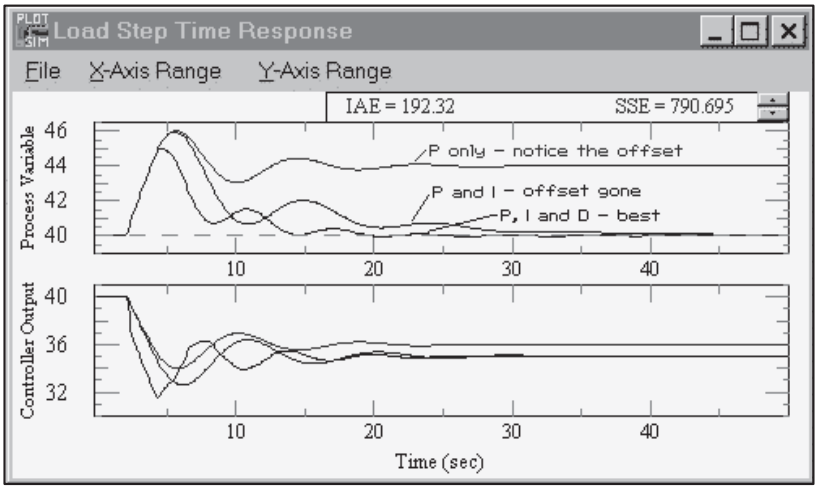
PULSED WIDTH MODULATION
(PULSED DC TO SERVO/SPINDLE MOTOR)
FROM AMPLIFIER/VECTOR DRIVE

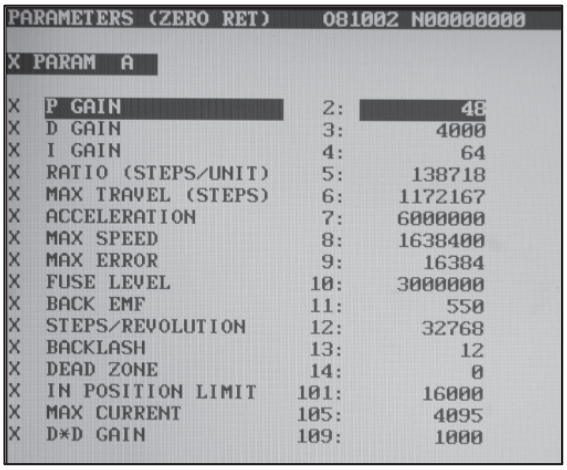


PID - LOOP

P GAIN -I GAIN - D GAIN

PROPORTIONAL-INTERGAL-DERIVATE

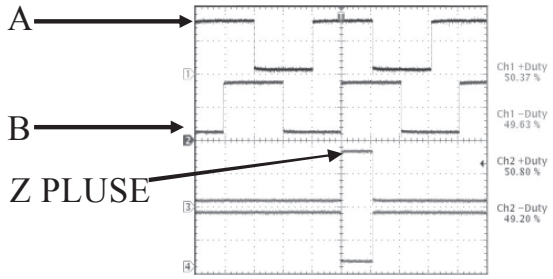




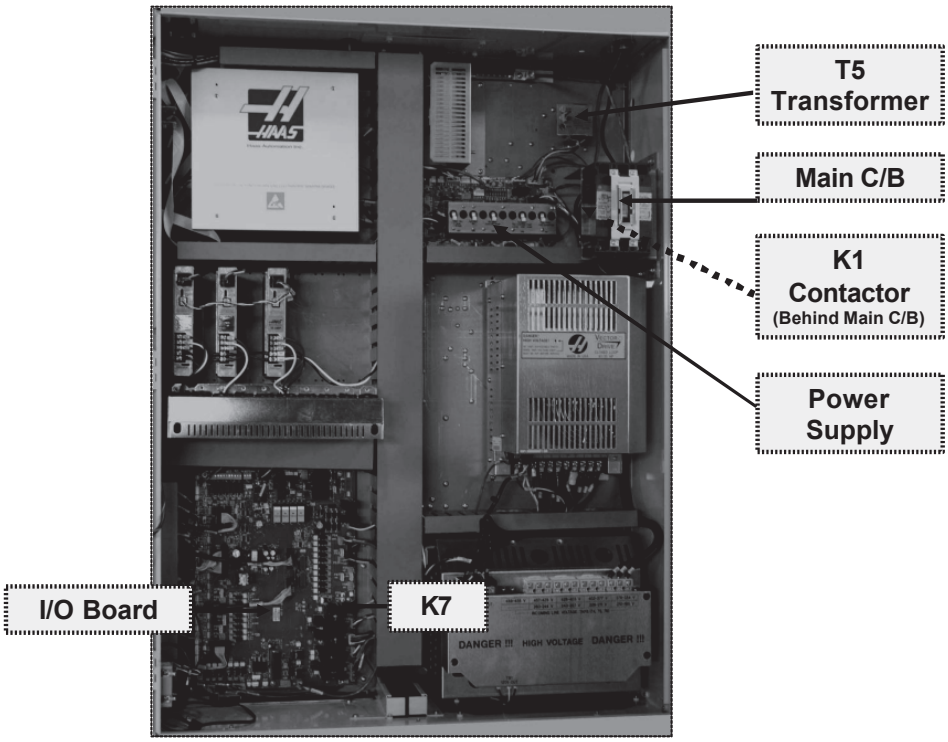
ENCODER SIGNAL

(FEED BACK TO MOCON)

Scope CH1-4 correspond to encoder signals A, B, Z & Z not respectively. The encoder signal phasing, voltage levels, and duty cycle, shown below, all meet Haas requirements. In addition these encoders meet or exceed the Haas requirements as provided in the 60-1815 specification.



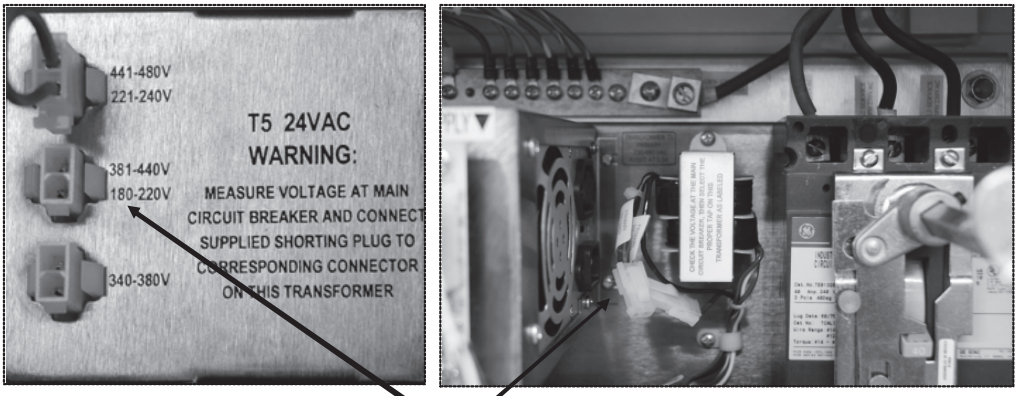
Power On Circuit



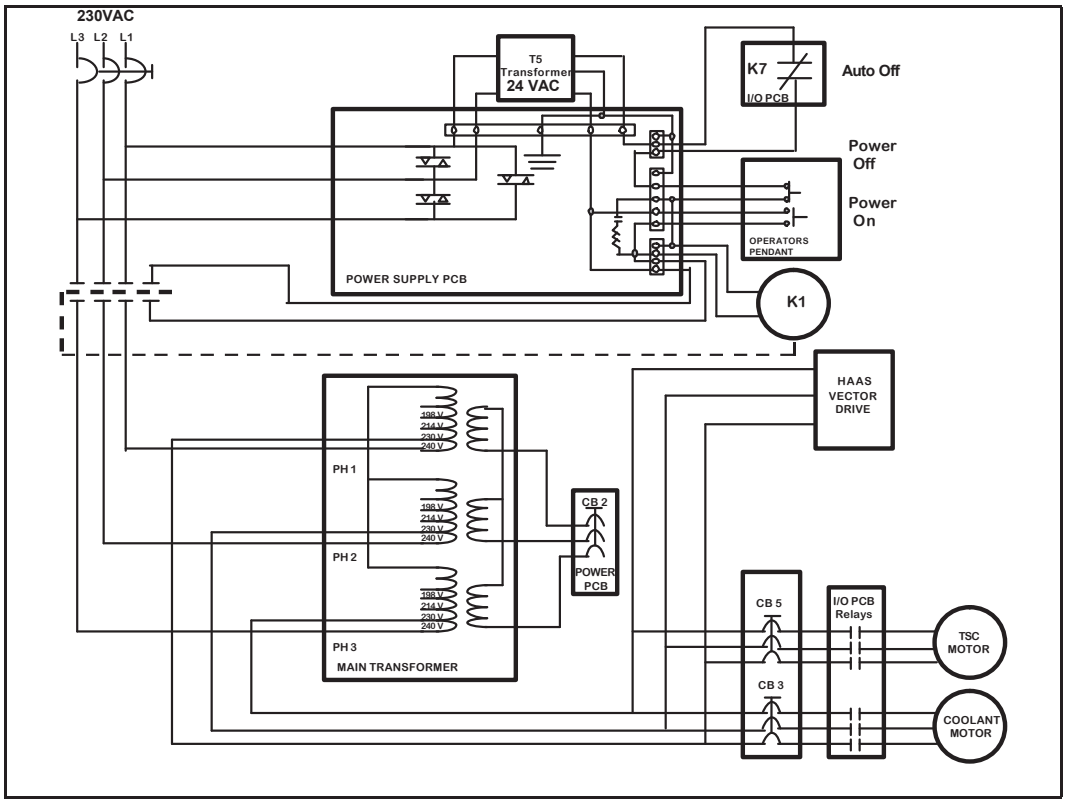
T5 TRANSFORMER

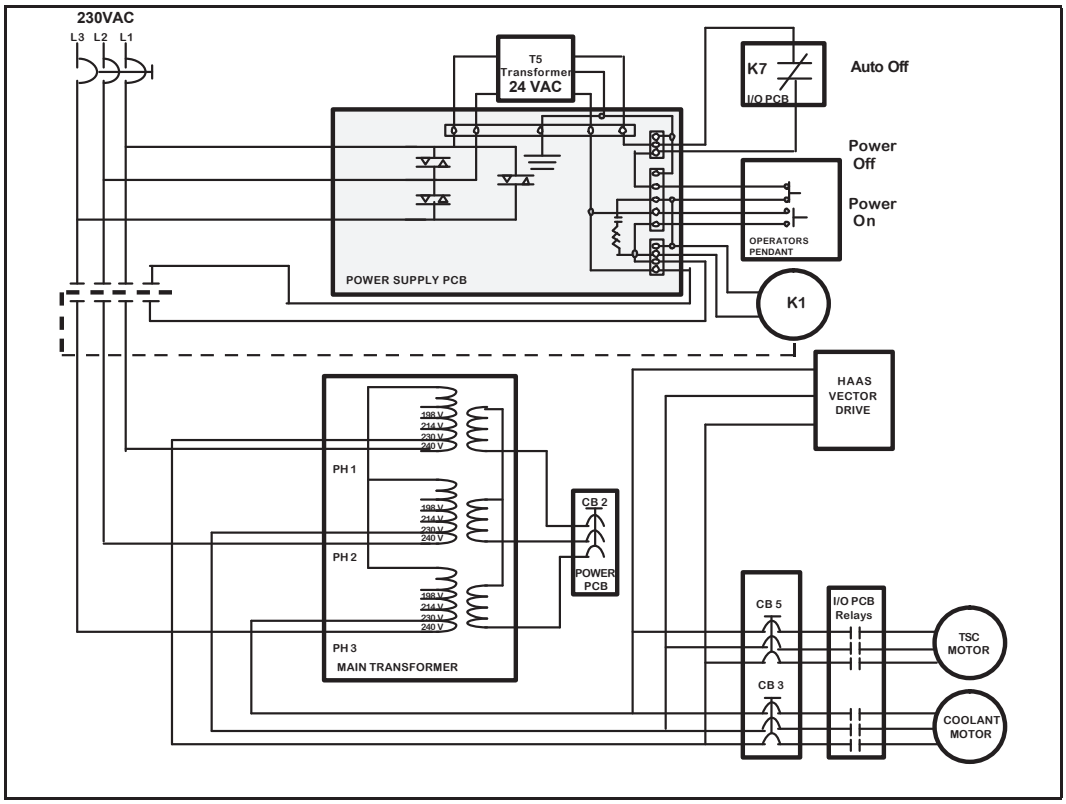
Current

Early



VOLTAGE TAPS


230VAC
L3 L2 L1
T5
Transformer
24 VAC
K7
I/O PCB
Auto Off
Power
Off
Power
On
OPERATORS
PENDANT
POWER SUPPLY PCB
K1
HAAS
VECTOR
DRIVE
198 V
214 V
230 V
240 V
PH 1
PH 2
PH 3
MAIN TRANSFORMER
CB 2
POWER
PCB
CB 5
CB 3
I/O PCB
Relays
TSC
MOTOR
COOLANT
MOTOR


230VAC
L3 L2 L1
T5
Transformer
24 VAC
K7
I/O PCB
Auto Off
Power
Off
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OPERATORS
PENDANT
POWER SUPPLY PCB
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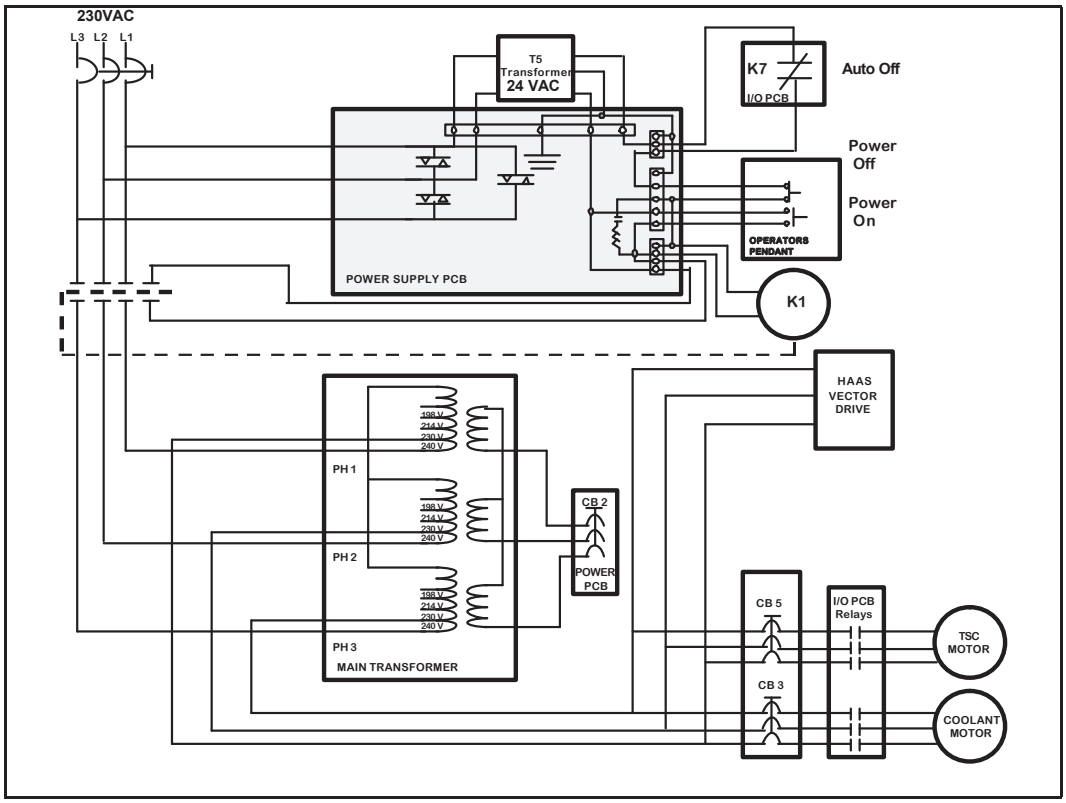
MOTOR


230VAC
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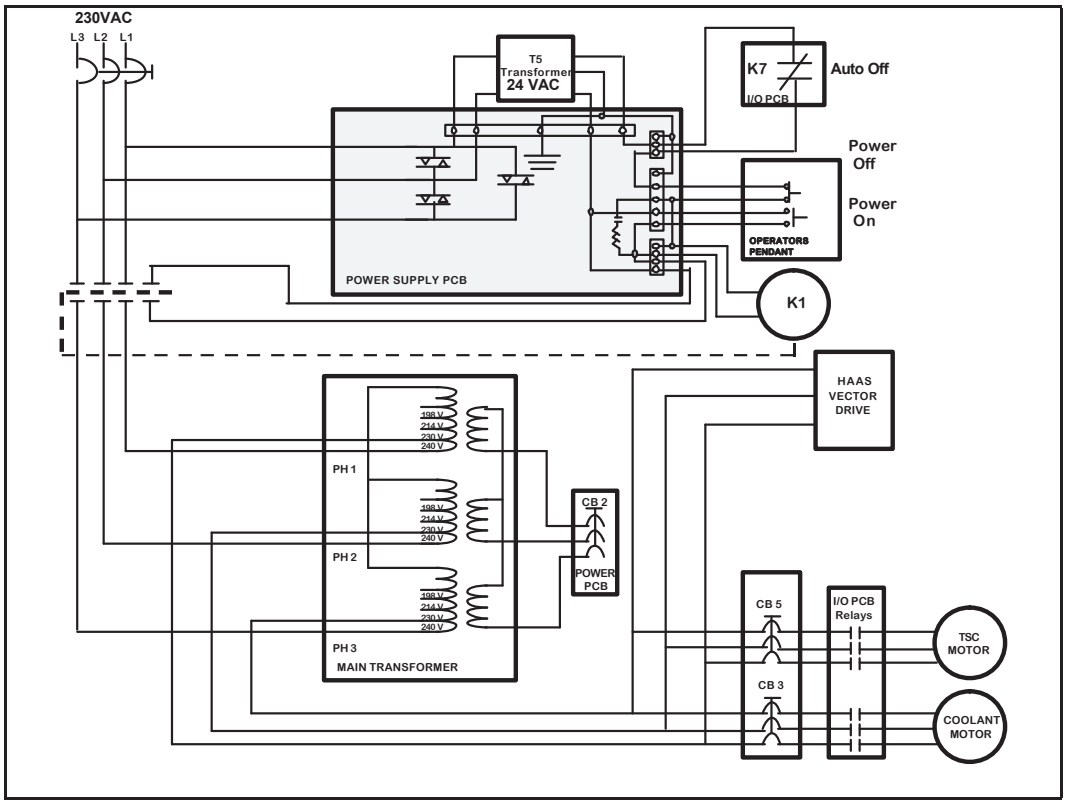
MOTOR


230VAC
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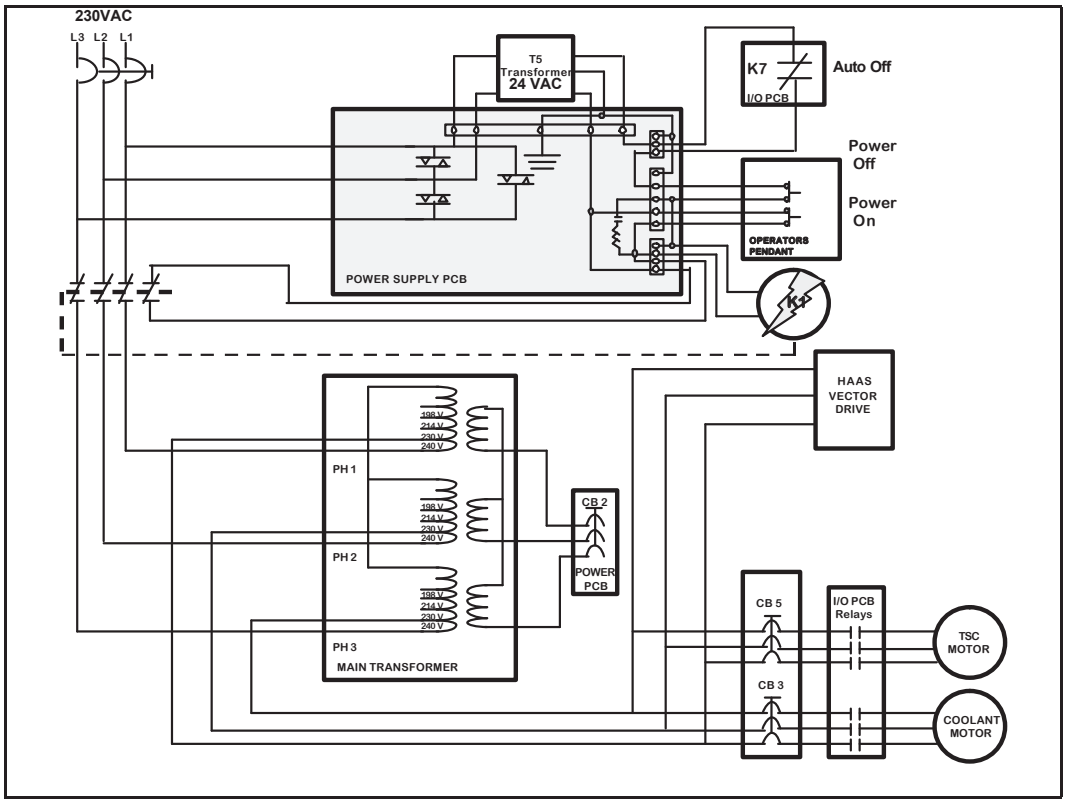
MOTOR


230VAC
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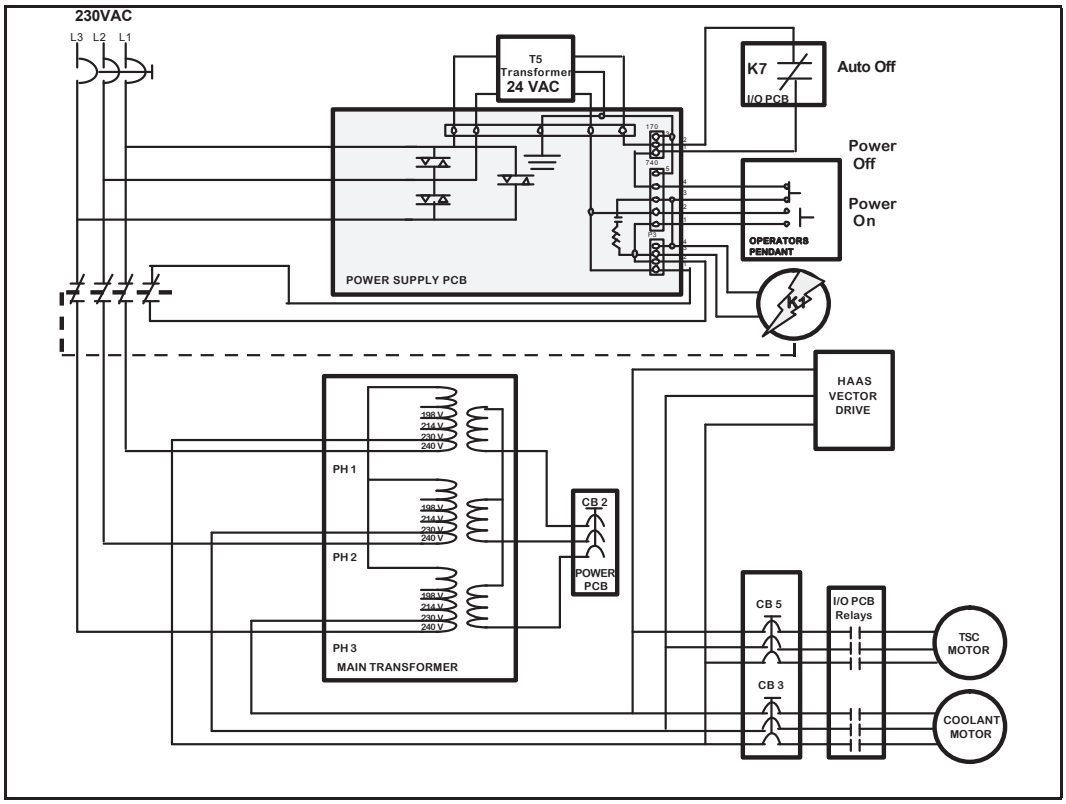
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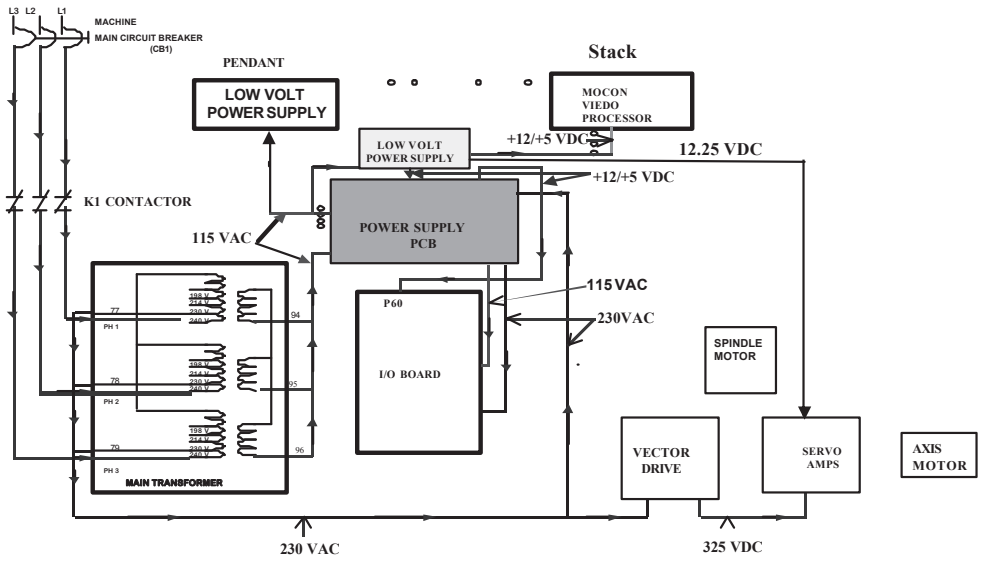
PCB
CB 5
CB 3
I/O PCB
Relays
TSC
MOTOR
COOLANT
MOTOR

POWER ON SERVOS/SPINDLE NOT ENERGIZED

WHERE THE POWER GOES AFTER THE POWER ON BUTTON IS RELEASED



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