MEIC-A699-001

MITSUBISHI

AC SPINDLE DRIVE

TROUBLESHOOTING MANUAL

September 1992

MITSUBISHI ELECTRIC INDUSTRIAL CONTROLS, INC.

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FR-SB TROUBLESHOOTING MANUAL

CHRIS TUMMILLO
06/4/92

A.) IOC TRIP (INVERTER) LED 705

1.) ALARMS COMES ON WHENEVER SPINDLE START COMMAND IS GIVEN.

i.) DAMAGE TO MAIN CIRCUIT POWER TRANSISTORS.

a.) REMOVE THE CONNECTIONS BETWEEN THE SPINDLE CONTROL AND THE MAIN MOTOR. DO SO BY DISCONNECTING WIRES AT TERMINAL STRIP LABELED U,V,W,. AFTER DISCONNECTING MOTOR LEADS TRY TO START THE SPINDLE CONTROL. IF ALARM COMES ON AGAIN PROBLEM IS WITHIN THE UNIT. IF ALARM DOES NOT COME ON PROBLEM IS WITH SPINDLE MOTOR WHICH MUST BE INSPECTED AND REPAIRED IF NECESSARY.

ii.) CUTTING CONDITIONS EXCEED SPINDLE CONTROL SPECIFICATIONS.

a.) LOAD BEING APPLIED TO MOTOR IS TO LARGE DURING HEAVY CUTS. CHECK LOAD ON MOTOR, EVALUATE PART PROGRAM AND MONITOR SPINDLE LOAD METER TO MAKE SURE HEAVIEST CUTS ARE BELOW 120% LOAD FOR HALF HOUR RATING.

iii.) MOTOR WINDING SHORT CIRCUIT OR GROUNDED.

a.) MEASURE ISOLATION RESISTANCE OF MOTOR WINDINGS. IF RESISTANCE IS LESS THEN 1 MEG OHM, INSPECT AND EVALUATE CONDITION OF MOTOR.

iv.) INSPECT THE WIRING BETWEEN THE SPINDLE CONTROL AND MOTOR.

a.) CHECK FOR INCORRECT WIRING, ISOLATION RESISTANCE, SHORTS BETWEEN MOTOR LEADS AND LOOSE TERMINAL CONNECTIONS.

v.) CHECK AC INPUT SUPPLY VOLTAGE.

a.) IF SOURCE VOLTAGE IS LESS THEN 180V BETWEEN X1,X2,X3, PROPER METHODS MUST BE TAKEN TO INCREASE POWER SUPPLY CAPACITY.

b.) INPUT POWER CAPACITY IS NOT CORRECT, CHECK SPECIFICATIONS FOR PROPER INPUT POWER WIRING AND MAIN TRANSFORMER.

iv.) IOC ALARM COMES INTERMITTENTLY DURING NORMAL OPERATION OF MACHINE.

a.) PLEASE PERFORM THE FOLLOWING ADJUSTMENTS:

1.) DC-CT OFFSETS:
i) TURN OFF THE MAIN CIRCUIT BREAKER CB1 ON THE FR-SB UNIT.
ii) TURN THE MAIN POWER ON.
iii) ADJUST VR308 ON FRS-SA1 SO THAT THE VOLTAGE BETWEEN CH312 & CH103 (COM) = 0mv +- 10mv.
iv) ADJUST VR306 ON FR-SA1 SO THAT THE VOLTAGE BETWEEN CH305 & CH103 (COM) = 0mv +- 10mv.

v.) TURN OFF MAIN POWER.

vi.) TURN ON CB1 ON FR-SB UNIT.

2.) SLIP ADJUSTMENT.

i.) ADJUST VR12(FRS-AX2A) SO THAT BOTH LED301 & LED302(FRS-SA1A) ARE ON AT TOP RPM IN CLOCKWISE DIRECTION.

B.) OVERLOAD LED 706.

1.) LOAD ON MOTOR IS TO HEAVY.

i.) CHECK LOAD METER INDICATION, IF LOAD METER IS EXCEEDING 120% FOR A PERIOD OF 1 MINUTE OR LONGER OVERLOAD WILL OCCUR.

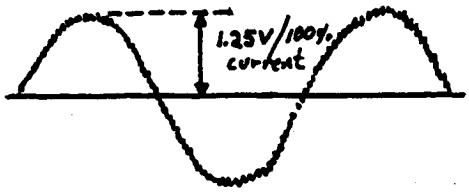
ii.) CHECK PART PROGRAM AND EVALUATE TO MAKE SURE THAT IT IS NOT EXCEEDING SPECIFICATIONS OF MOTOR AND CONTROL.

2.) MISS-ADJUSTMENT OF OVERLOAD DETECTION LEVEL.

i.) CHECK CH205 ON FRS-SA OR 3V, IF NOT ADJUST VR715 FOR 3V.

3.) PROBLEM WITH DC-CT USED FOR CURRENT DETECTION.

ii.) CHECK WAVEFORMS WITH OSCILLOSCOPE AT CH305 & CH312 CONFIRM THAT THE FOLLOWING ARE OBTAINED.



a.) IF THIS WAVEFORM IS NOT SEEN THE DC-CT IS THE PROBLEM.

b.) IF THIS WAVEFORM IS SEEN YET THE ALARM STILL COMES ON REPLACE OR REPAIR OF THE FRS-SA IS NEEDED.

C.) UNDERVOLTAGE (P15) LED 707.

1.) WHEN THIS ALARM COMES ON PLEASE CHECK DC VOLTAGE AT CH102 WHICH IS P15V IF THIS VOLTAGE DROPS BELOW 40% OF THIS VALUE THE ALARM WILL COME ON.

2.) IF ALARM COMES ON INTERMITTENTLY PLEASE MONITOR P15 AND N15 SUPPLY LINES IF NOTHING IS FOUND PLEASE REPLACE OR REPAIR FRS-SA P.C.B.

3.) PLEASE CHECK FUSES F701 AND F702 TO SEE IF THERE BLOWN IF ONE OR BOTH ARE BLOWN FIND CAUSE AND REPLACE DEFECTIVE FUSE.

D.) UNDERVOLTAGE (LINE) LED 708.

1.) THIS LED WILL COME ON IF INPUT LINE VOLTAGE DROPS TO LESS THEN 170V. THIS ALARM IS JUST A WARNING OR A CAUTION THIS WILL NOT STOP THE CONTROLLER FROM OPERATION.

i.) WHEN THIS ALARM COMES ON PLEASE CHECK AC INPUT VOLTAGE TO ASSURE PROPER SPECIFICATION, VOLTAGE SHOULD BE AS FOLLOWS.

a.) X1-X2 SHOULD BE 200-220V AND STABLE
b.) X2-X3 SHOULD BE 200-220V AND STABLE
c.) X1-X3 SHOULD BE 200-220V AND STABLE

ii.) IF THESE VOLTAGES DO NOT MEET THESE SPECS FIND CAUSE AND BRING TO PROPER STANDARDS.

E.) OVER REGENERATION LED 709.

1.) PROBLEM IS IN MAIN CIRCUIT.

i.) PLEASE CHECK BASE CIRCUIT FOR SCR TROUBLE IF SCR IS OPEN PROPER REGENERATION WILL NOT BE POSSIBLE. IF BASE SCR IS FOUND TO BE DEFECTIVE PLEASE REPLACE.

ii.) PROBLEM WITH CONTROL CKT ON HINGE IF NO PROBLEM IS FOUND WITH BASE CIRCUIT EVALUATION OF CONTROL CKTS IS NEEDED REPLACEMENT OR REPAIR OF HINGE PANEL MUST TAKE PLACE.

2.) IF ALARM COMES ON DURING NORMAL OPERATION OF MACHINE PLEASE CHECK THE FOLLOWING CONDITIONS.

i.) IF ALARM IS COMING ON DURING A DECELERATION MOVEMENT CHECK LOAD ON MOTOR IT COULD POSSIBLY BE OVERSPECIFICATION.

ii.) INERTIA IS VERY LARGE PLEASE CHECK FOR MECHANICAL PROBLEMS

iii.) DECELERATION TIME IS TO SHORT, IF THE DECELERATION TIME IS SHORTER THEN SPECIFIED ADJUSTMENT IS NECESSARY.

a.) TO ADJUST DECEL TIME PLEASE FIND VR708 ON THE FRS-AX P.C.B. ON TURN IT CLOCKWISE.

iv.) IT IS ALSO POSSIBLE THE INPUT VOLTAGE TO THE SPINDLE CONTROL IS TO HIGH, PLEASE CHECK AND ADJUST TO PROPER LEVEL IF NEED BE.

v.) PROBLEM IS WITH FAULT DETECTION IF NO PROBLEMS ARE FOUND WITH PREVIOUS ITEMS PLEASE REPLACE OR REPAIR FRS-SA P.C.B.

F.) OVERHEAT (THYRISTOR) LED 710.

1.) IF ALARM COMES ON INTERMITTENTLY DURING NORMAL OPERATION OF MACHINE PLEASE CHECK YHE FOLLOWING CONDITIONS.

i.) MAKE SURE THAT THE COOLING FANS IN CABINET AS WELL AS ON CONTROL ARE FUNCTIONING PROPERLY. IF THEY ARE NOT TEMPERATURE MAY EXCEED DESIRABLE LEVEL AND CAUSE ALARM TO COME ON.

ii.) CHECK TO MAKE SURE THAT OVERHEAT SENSOR ON CONTROL IS WORKING PROPERLY IF NOT REPLACE SENSOR.

iii.) PROBLEM WITH ALARM DECTECTION CIRCUIT. IF NO PROBLEMS ARE FOUND REPAIR OR REPLACEMENT OF FRS-SA P.C.B. IS NEEDED.

G.) FUSE BLOW LED 711.

1.) PLEASE CHECK FUSES IF FUSE IS BLOWN FIND CAUSE THEN REPLACE FUSE.

H.) OVER HEAT (MOTOR) LED 712.

1.) ALARM COMES ON INTERMITTENTLY DURING NORMAL OPERATION OF MACHINE. IF THIS HAPPENS PLEASE CHECK THE FOLLOWING CONDITIONS.

i.) CHECK TO SEE IF MAIN SPINDLE MOTOR IS ABNORMALLY HOT, IF MOTOR IS HOT PLEASE CHECK COOLING FAN LOCATED ON END OF SPINDLE MOTOR IF FAN IS NOT OPERATING CHECK BREAKER IF OK REPLACEMENT OF COOLING FAN IS NEEDED.

ii.) CHECK CUTTING CONDITIONS THEY MAY BE EXCEEDING SPECIFICATIONS CAUSING MOTOR TO OVERHEAT. RE-EVALUATION IS NEEDED ON OPERATING CONDITIONS AND PROPER METHODS MUST BE TAKEN.

iii.) PROBLEM WITH FAULT DECTECTION P.C.B. REPAIR OR REPLACEMENT IS NEEDED.

2.) IF ALARM COMES ON INT. AND NO CAUSE CAN BE FOUND PLEASE CHECK OVER HEAT SENSOR LOCATED INSIDE MAIN SPINDLE MOTOR.

I.) MOTOR BREAKER TRIP LED 713.

1.) THIS ALARM OCCURS WHEN THE BREAKER SUPPLYING POWER TO THE SPINDLE COOLING FAN HAS TRIPPED. WHEN THIS HAPPENS CHECK CONDITION OF FAN IT COULD POSSIBLY BE DEFECTIVE AND REPLACEMENT MAY BE NEEDED.

J.) OVERSPEED LED714.

1.) THE ALARM WILL ILLUMINATE WHEN THE MOTOR SPEED ROTATES AT 115% OF MAXIMUM MOTOR SPEED.

2.) TROUBLE COULD BE WITH CONTROL CIRCUITS ON FRS-AX P.C.B. PLEASE CHECK THE FOLLOWING.

i.) CLAMPING CIRCUIT FOR INPUT SPEED REFERENCE IS NOT ADJ. CORRECTLY OR MAY NOT BE FUNCTIONING PROPERLY. PLEASE CHECK CH707 TO COM ON AX P.C.B. IF LEVEL IS ABOVE 10V DC P.C.B. MUST BE REPAIRED OR REPLACED.

ii.) LED 301 AND 302 ARE NOT ILLUMINATED AT TOP SPEED, IN THIS CASE SLIP ADJUSTMENT IS NEEDED.

iii.) PROBLEM WITH TG FEEDBACK FROM MOTOR PLEASE CHECK FEEDBACK AS WELL AS COUPLING.

K.) SPINDLE WILL NOT START AND NO ALARMS ARE INDICATED.

1.) CHECK TO MAKE SURE THAT NC IS GIVING SPINDLE CONTROL A DIRECTION.

i.) WHEN EITHER A M03 OR M04 (SPINDLE FORWARD OR SPINDLE REVERSE) IS COMMANDED FROM NC PLEASE CHECK LED STATUS ON FRS-AX P.C.B.

a.) FIRST CHECK STATUS BY VERIFYING THAT:

1.) LED 702 FOR SPINDLE FORWARD IS ILLUMINATED.
2.) LED 703 FOR SPINDLE REVERSE IS ILLUMINATED.

b.) IF LEDS ARE NOT ILLUMINATED PLEASE CHECK VOLTAGE ON TB4 (FRS-AX) LABLED SRN OR SRI.

1.) WHEN SRN COMMAND IS GIVEN MEASURE DC VOLTAGE ON TB4 TERMINAL 18 IF SWITCH OR RELAY IS FUNCTIONING PROPERLY 0V SHOULD BE READ AT THIS POINT. IF NOT 24VDC IS READ PLEASE CHECK MACH. SIDE RELAY OR NC COMMAND VERIFICATION IS NEEDED. SAME HOLDS WHEN SRI COMMAND IS GIVEN.

2.) IF DIRECTION COMMAND IS GOOD BUT SPINDLE STILL WILL NOT TURN PLEASE CHECK TO MAKE SURE THAT SPEED COMMAND IS BEING GIVEN.

a.) CHECK INPUT SPEED COMMAND ON TB4 (FRS-AX) TERMINAL 1 LABLED SE1 WITH REF. TO SE2 THIS IS SPEED REF FROM NC THIS VOLTAGE SHOULD BE 0 TO 10V, 10 WOULD BE TOP SPEED.

b.) IF NO SPEED COMMAND IS MEASURED PLEASE CHECK NC SIDE TO VERIFY PROPER OUTPUT

3.) IF PREVIOUS STEPS ARE VERIFIED AND ASSURED TO BE GOOD, HINGE PANEL MUST BE REPAIRED OR REPLACED.

L.) NO ALARMS ARE INDICATED BUT SPINDLE ROTATES AT VERY LOW RPMS.

1.) PLEASE CHECK TO MAKE SURE THAT PROPER SUPPLY VOLTAGE IS BEING SUPPLIED.

i.) SUPPLY VOLTAGE SHOULD BE 200-220 VAC FROM PHASE TO PHASE. IF THIS VOLTAGE IS NOT CORRECT BE BRING TO STANDARDS.

ii.) PLEASE VERIFY CONDITION OF TG (TACH GENERATOR) MAKE THAT PROPER WIRING IS OBTAINED ALSO CHECK FOR LOOSE OR BROKEN CONNECTIONS.

M.) WHEN SPINDLE IS GIVEN A STOP COMMAND IS GIVEN IT TAKE A LONG TIME TO STOP.

1.) FIRST CHECK TO MAKE SURE THAT BELTS FROM SPINDLE MOTOR TO SPINDLE HEAD ARE NOT SLIPPING. IF BELTS ARE LOOSE OR OILY SPINDLE WILL NOT STOP PROPERLY.

2.) MAKE SURE THAT THE ZERO SPEED SIGNAL IS FUNCTIONING PROPERLY, IF ZERO SPEED OUTPUT IS ALWAYS ON WHEN A STOP COMMAND SIGNAL IS GIVEN SPINDLE WILL COAST TO A STOP.

N.) NC WILL NOT FEED WHEN SPINDLE SEEMS TO BE AT PROPER SPEED, OR CYCLE WILL NOT CONTINUE TO NEXT STEP.

1.) PROBLEM WITH UP-TO-SPEED OUTPUT CHECK RA 708 ON FRS-AX TO VERIFY THAT UP-TO SPEED SIGNAL IS OUTPUT TO NC.

i.) PROBLEM WITH OUTPUT RELAY REPLACE RA 708..
ii.) PROBLEM WITH UP-TO-SPEED DECTECTION CIRCUIT REPAIR OR REPLACE FRS-AX P.C.B.

L.) SPINDLE IS NOISY OR HAS SOME VIBRATION.

1.) PLEASE CHECK TO MAKE SURE THAT PROPER PHASE SEQUENCE IS OBTAINED.

2.) VERIFY THAT NOISE IS ELECTRICAL OR MECHANICAL DO SO BY RUNNING SPINDLE TO TOP SPEED THEN TURN POWER OFF SPINDLE WILL BE IN FREE RUN STATE IF NOISE REMAINS PROBLEM IS MECHANICAL IF NO NOISE PROBLEM IS ELECTRICAL.

i.) CHECK MOTOR BEARING ON MECHANICAL GEARS ON SPINDLE

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0 - PL1 (PHASE SEQUENCE)

60HZ
X
50HZ

IOC TRIP (INVERTER) —— 0 LED 1
OVER REGENERATION —— 0 LED 2
IOC TRIP (CONVERTER) —— 0 LED 3
OVER HEAT (CONTROLLER)— 0 LED 4
not used —— 0 LED 5
OVER HEAT (MOTOR) —— 0 LED 6
BREAKER TRIP —— 0 LED 7
OVER SPEED —— 0 LED 8
UNDER VOLTAGE (P15) —— 0 LED 9
UNDER VOLTAGE (LINE) —— 0 LED 10
TACH FEEDBACK FINE —— 0 LED 11
TACH FEEDBACK FINE —— 0 LED 12

SPEED CONTROLLER
LEAD LAG
VR2 SW2

FREQROL

MODEL FR-SD
MITSUBISHI ELECTRIC CORPORATION

NORMAL —— LED 13 0
INVERSE —— LED 14 0
OVER RIDE —— LED 15 0
CURRENT DETECTION— LED 16 0
ZERO SPEED —— LED 17 0
SPEED DETECTION— LED 18 0
UP TO SPEED —— LED 19 0
READY —— LED 20 0

VR3 LOAD
VR4
VR5
VR6 SPEED
METER CALIB
VR7 TACH FB FINE

1. INSTANTANEOUS OVER CURRENT - INVERTER — LED1
   - CONVERTER — LED3

A. Alarm On When Starting Or Stopping

1. Check Tach Generator Feedback
   a. Power On — PL1
   b. SET/SRN — LED20/LED13
   c. RPM is 1/3 of max.
   d. CH12 = +0.5vdc CH4 is com.
   e. RPM is max.
   f. CH12 = +1.5≈2.0vdc CH4 is com.
      * adjust VR7 to secure these values
   g. LED 11 & 12 should both be illuminated
   h. SET/SRI — LED20/LED14
   i. RPM is max.
   j. CH12 = -1.5vdc CH4 is com.
   k. LED 12 is illuminated

REMEDY: HINGE PANEL/ TACH GENERATOR/ CABLE

2. Check DC-CT Offset
   a. Power On — PL1
   b. CH8 is 0mv +/- 5mvdc CH4 is com.
      * adjust VR10 to secure this value
   c. CH9 is 0mv +/- 5mvdc CH4 is com.
      * adjust VR12 to secure this value

REMEDY: UNIT

3. Check For P-N Voltage
   a. Power On — PL1
   b. Main Cap Voltage is +50≈55vdc
      * adjust VR52 on GB1 brd. to secure this value

REMEDY: UNIT

B. Alarm On When Start Command

1. Check For Main Transistor Damage
   a. Disconnect U,V,W motor leads from terminal strip
   b. Power On
   c. SET/ SRN — LED20/LED13
   d. If no alarm, go to #2

REMEDY: UNIT

2. Check For Damage To Main Spindle Motor
   a. Disconnect motor leads at terminal block
   b. Megger test motor
      * U,V,W to ground
   c. If meggers good, go to #3

REMEDY: MOTOR

3. Check For Loose Connection
   a. Verify all connectors are securely fastened
   b. Remove Tach Generator from rear of spindle motor
   c. Inspect coupling between motor shaft and T.G.

REMEDY: TACH/ COUPLING

2. OVER-REGENERATION — LED2
   A. Alarm On When Decelerating
      1. Is Decel Time > 2 sec.
         a. Power On — PL1
         b. SET/SRN — LED20/13
         c. RPM is max.
         d. Remove SRN
         e. Decel time should be > 2 sec.
            * adjust VR27 CW to increase
      REMEDY: HINGE PANEL

      2. Check Slip Feedback
         (refer to IOC procedure)

      3. Confirm Regeneration Circuit
         a. Power On — PL1
         b. SET/SRN — LED20/13
         c. RPM is max.
         d. Remove SRN
         e. LED 62 on, LED 61 off
      REMEDY: HINGE PANEL

      4. Check for to heavy of load
      REMEDY: LIGHTEN LOAD/ DECREASE GD^2

3. OVER HEAT (CONTROLLER) — LED4
   A. Alarm On During Normal Operation
      1. Is The Controller Temperature Above Normal
         a. Are cooling fans functioning properly
         b. Are cycle times very short
         c. Is load to heavy

      2. Is The Controller Temperature Normal
         a. Install shorting wire at TB103 terminals TH-NO
         b. Power off and then on
         c. No alarm present
      REMEDY: SENSOR

         d. Alarm present
      REMEDY: HINGE PANEL

4. MOTOR BREAKER TRIP — LED5
   (not used)

5. OVER HEAT (MOTOR) — LED6
   A. Alarm On During Normal Operation
      1. Is The Motor Temperature Above Normal
         a. Is the blower fan functioning properly
            1. SET/SRN
            2. MS1 and MS2 = 200VAC
         b. Are cycle times very short
         c. Is load to heavy

2. Is Motor Temperature Normal
   a. Install shorting wire between anode of ZD24 (bottom side) to R407 (top side).
      * components found on right side of CON2
   b. Power off then on
   c. No Alarm present

REMEDY: SENSOR/ CABLE

   d. Alarm present

REMEDY: HINGE PANEL

6. BREAKER TRIP — LED7

A. Alarm On With Power On/ Start Command

1. CB1 Is Tripped
   a. Verify correct phase sequence — PL1
   b. Check for shorted SCR or transistor
   c. Check for main capacitor shorted

REMEDY: UNIT

2. CB1 Is Not Tripped
   a. Install shorting wire at TB103 terminals FB-NO
   b. Power off and then on
   c. No alarm present

REMEDY: BROKEN WIRE/ DEFECTIVE CB1

   d. Alarm present

REMEDY: HINGE PANEL

7. OVER SPEED — LED8

A. Alarm Comes On When Command Max. Speed

1. Does Motor Speed Overshoot
   a. Turn SW2 clockwise

2. Check Tach Generator Feedback
   a. Power On — PL1
   b. SET/SRN — LED20/LED13
   c. RPM is max.
   d. CH19 = +10vdc
   e. LED 11 & 12 should both be illuminated

REMEDY: ADJUST TACH FEEDBACK (refer to IOC)

3. Check Clamping Circuit
   a. Power On — PL1
   b. SET/SRI — LED20/LED14
   c. RPM is max.
   d. CH51 is +10≈11vdc CH4 is com.
   e. CH26 is +10vdc CH4 is com.

REMEDY: HINGE PANEL

8. UNDER VOLTAGE (P15) LED9

A. Alarm On With Power On

1. Verify All Power Supply Voltages

a. CH1 = +24vdc CH4 is com.

b. CH2 = +15vdc CH4 is com.

*CH2 is slightly adjustable by VR1 on FRS-GB1 brd.

c. CH3 = +5vdc CH4 is com.

d. CH5 = -15vdc CH4 is com.

e. CH13A = +15vdc CH13 is com.

f. CH17 = +5vdc CH13 is com.

REMEDY: HINGE PANEL

B. Alarm On Intermitently

1. Verify All Power Supply Voltages

2. Verify Motor Blower Fan Functions Properly

9. UNDER VOLTAGE (LINE) LED10

A. Alarm On With Power On

1. Check Source Voltage For Correct Rating

a. X1-X2-X3 = 220vac

REMEDY: INCREASE SOURCE VOLTAGE

B. Alarm On During Speed Change Or Heavy Load

1. Check Source Power Capacity

REMEDY: INCREASE POWER CPACITY

NOTE: This alarm is just an indication, no fault will occur

10. WHEN MANY ALARMS ON AT SAME TIME

A. Check For Secure Connections

1. Re-seat CON1 and CON2

B. Verify Power Supply Voltages (refer to under voltage (P15))

REMEDY: HINGE PANEL

11.

FR-SX TROUBLESHOOTING MANUAL

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12/3/91

A.) MOTOR OVERHEAT (LED 15)

1.) CHECK THE TEMPERATURE OF THE MAIN SPINDLE MOTOR TO SEE IF THE TEMPERATURE IS ABOVE NORMAL OPERATING CONDITIONS.

2.) CHECK THE OPERATION OF THE MAIN SPINDLE MOTOR COOLING FAN. MAKE SURE THAT THE FAN IS TURNING UNDER NORMAL RUNNING CONDITIONS, ALSO VERIFY THAT THE FAN IS FREE FROM BLOCKAGE THAT WOULD ENABLE THE FAN FROM TURNING.

i) IF THE COOLING FAN IS NOT OPERATING UNDER NORMAL CONDITIONS, PLEASE OBTAIN FAN MODEL THEN REPLACE DEFECTIVE COOLING FAN.

ii) IF COOLING FAN IS OPERATING AND ALARM IS STILL PRESENT AFTER RESETTING, SHORT MOTOR THERMAL PROTECT LOCATED IN SPINDLE DESIGNATED BY WIRES OHS1 AND OHS2 THEN RESET. IF ALARM DOES NOT LIGHT AFTER SHORTING OHS1 AND OHS2 REPLACEMENT OF MOTOR THERMAL PROJECT IS NEEDED. (NOTE: SPINDLE CAN OPERATED WITH OHS1 AND OHS2 SHORTED IF COOLING FAN AND PROPER VENTILATION IS VERIFIED.

iii) IF ALARM IS STILL PRESENT AFTER SHORTING OHS1 AND OHS2, PLEASE CHECK CONDITION OF CABLE BETWEEN SPINDLE MOTOR AND CONTROL. (SEE DIAGRAM FOR PIN CONFIGURATION) IF CABLE IS FOUND TO BE DEFECTIVE PLEASE REPAIR OR REPLACE.

iv) IF ALL PREVIOUS CONDITIONS HAVE BEEN SATISFIED AND NO PROBLEMS HAVE BEEN FOUND CHANGE HINGE PANEL PCB'S IN THIS ORDER.

1.) SX-CPU1,2
2.) SX-IO1

B.) EXCESSIVE SPEED ERROR (LED 14)

1.) IF ALARM OCCURS DURING NORMAL OPERATION OF MACHINE PLEASE CHECK THE FOLLOWING CONDITIONS.

i) CHECK CUTTING CONDITIONS FOR POSSIBLE OVERSPECIFICATION. LOAD METER SHOULD NOT EXCEEDS 120% IF ALARM OCCURS PLEASE EVALUATE PROGRAM PROBLEM WITH OVERLOAD.

2.) IF ALARM OCCURS WHEN A SPINDLE SPEED AND DIRECTION IS GIVEN.

ii) CHECK OPERATION OF SPINDLE CONTROL IN OPEN LOOP (SEE METHOD OF OPERATION IN OPEN LOOP.)

a.) IF SPINDLE CONTROL OPERATES IN OPEN LOOP, PLEASE CHECK OUTPUT WAVEFORMS FROM TACH GENERATOR (PLG). WAVEFORM CHECK POINTS ARE FOUND ON THE SX-CPU PCB.

1.) FOR CPU 0,1 PCB PLEASE CHECK CH56 & CH57.
2.) FOR CPU 2 PCB PLEASE CHECK CH59 & CH60

b.) IF A PROBLEM IS FOUND WITH THE FEEDBACK WAVEFORMS REPLACEMENT OF PLG IS NEEDED.

iii) CHECK BASE POWER TRANSISTORS FOR POSSIBLE OPEN CIRCUIT.

a.) RESISTANCE CHECK OF ALL BASE TRANSISTORS IS NEEDED, IF A TRANSISTOR IS FOUND TO BE QUESTIONABLE REPLACE AND EVALUATION OF BASE DRIVER WAVEFORMS IS NEEDED. (SEE BASE DRIVER WAVEFORM CHECKING PROCEDURE.)

iv) CHECK P-N VOLTAGE, (P-N VOLTAGE IS MEASURED ACROSS BASE CAPACITORS.) THIS VOLTAGE IS MEASURED WHEN SPINDLE CONTROL IS IN READY CONDITION ONLY. THIS VOLTAGE SHOULD BE 50V TO 55V DC AND STABLE.

a.) IF P-N VOLTAGE IS LOWER AND VERY UNSTABLE REPLACEMENT OF HINGE PANEL IS NEEDED.

C.) BREAKER TRIP (LED 13)

1.) DOES BREAKER TRIP EVERYTIME SPINDLE IS GIVEN A START COMMAND OR GIVEN A READY COMMAND. (NOTE IOC ALARM MAY HAVE HAPPENED FIRST.)

i) CHECK FOR SHORT CIRCUIT ON BASE, CHECK SCR'S ON CONVERTER SIDE AND POWER TRANSISTORS ON INVERTER SIDE. RESISTANCE CHECK ON BOTH CONVERTER AND INVERTER IS NEEDED.

a.) IF SHORT CIRCUIT IS FOUND REPAIR EVALUATE AND INSPECT SX-101 PCB.

b.) AFTER SHORT CIRCUIT IS FOUND IT IS POSSIBLE THAT SX-101 MAY HAVE TO BE REPLACED. (SEE REPLACEMENT PROCEDURE.)

c.) IF NO SHORT CIRCUITS HAVE BEEN FOUND AND NO PHYSICAL DAMAGE IS APPARENT REPLACE HINGE PANEL.

2.) BREAKER TRIPS INTERMITTENTLY DURING OPERATION.

i.) MAKE SURE THAT CUTTING CONDITION OF PART PROGRAM NOT EXCEED THE SPECIFICATIONS OF THE SPINDLE CONTROL. (POSSIBILITY THAT LOAD ON THE CONTROL EXCEEDS OUTPUT KW CAUSING USER OVERLOAD.)

ii) CHECK FOR LOOSE CONNECTIONS BETWEEN HINGE PANEL AND BASE. (CON 101, CON 102, CON 103, CON 104, CON 105, CON106 ALSO ALL SCREW AND BOLT CONNECTIONS.)

iii) POSSIBLE INTERMITTENT PROBLEM WITH CONTROL CIRCUITS ON HINGE PANEL PLEASE REPLACE HINGE PANEL IF NOTHING CONCLUSIVE IS FOUND IN PREVIOUS CHECKING PROCEDURES.

3.) BREAKER TRIP ALARM IS ON ALTHOUGH BREAKER IS NOT TRIPPED.

i.) LOCATE TERMINAL FB AND D024 ON SX-AJ1 PCB AND SHORT BETWEEN, AFTER SHORTING RESET CONTROL. IF ALARM IS NO LONGER PRESENT THE PROBLEM IS WITH THE ALARM CONTACTS IN NF BREAKER. REPLACEMENT BREAKER IS NEEDED.

ii.) IF ALARM IS STILL PRESENT AFTER RESETTING PLEASE REPLACE HINGE PANEL PROBLEM IS IN ALARM CIRCUITS.

D.) PHASE LOSS (LED 13 & 15)

1.) CHECK 3 PHASE AC INPUT VOLTAGE LOCATED AT CIRCUIT BREAKER OF SPINDLE CONTROL. WIRES LABELED X1,X2,X3. MEASURE BETWEEN X1-X2, X2-X3, X1-X3 VOLTAGE BETWEEN ALL 3 LEGS SHOULD BE AC 200-220V MAKE SURE ALL THREE PHASES ARE PRESENT.

i.) IF A MISSING PHASE IS FOUND FIND WHERE PHASE IS BEING DROPPED AND REMEDY.

2.) CHECK LINE FUSES LOCATED ON SX-AJ1 (F1,F2,F3) FOR OPEN. CHECK CAUSE OF FUSE BLOW AND REPLACE BLOWN FUSE.

3.) MAKE SURE THAT CON 105 ON BACK OF HINGE PANEL IS INSERTED AND SECURE. IF AN OSCILLOSCOPE IS AVAILABLE CON 105 CAN BE CHECKED TO MAKE SURE PHASE TRANSFORMER IS FUNCTIONING PROPERLY.

4.) CHECK OUTPUT LED'S LOCATED IN SX-PW TO ASSURE ALL ARE ILLUMINATED. IF ONE OR MORE LEDS FAIL TO ILLUMINATE REPLACEMENT OF SX-PW IS NEEDED.

5.) IF ALL PREVIOUS CHECKING PROCEDURES FAIL TO REMEDY PROBLEM PLEASE REPLACE HINGE PANEL PROBLEM IS IN THE ALARM CIRCUIT.

E.) EXTERNAL EMERGENCY (LED 13&14)

1.) THE CORRESPONDING ALARM WILL LIGHT WHEN AN EXTERNAL EMERGENCY STOP SIGNAL IS GIVEN. CHECK THE CAUSE OF THE EMERGENCY STOP AND THEN RESET.

F.) OVER SPEED (LED 13,14&15)

1.) OVER SPEED ALARM WILL ILLUMINATE IF IMPROPER MAX SPEED SELECTION IS MADE.

i.) PLEASE CHECK THE SWITCH SETTING ON CPU PCB, CHECK SW 1-7 FOR PROPER SELECTION ALSO MAKE SURE THAT PIN 1 ON THE SX-I01 IS INSERTED PROPERLY.

ii.) AFTER PROPER SETTINGS FOR SPINDLE MAX SPEED HAS BEEN VERIFIED, PLEASE VERIFY MAX SPEED VOLTAGE AT CH.37 TO DGA ON SX-I01. (PLEASE SEE MAX SPEED ADJUSTMENT PROCEDURE.)

2.) CHECK OUTPUT WAVEFORMS FROM TACH (PLG) FOR PROPER OUTPUT. (OSCILLOSCOPE IS REQUIRED.) IF PLG WAVEFORM ARE NOISY THERE IS A POSSIBILITY THAT OVER SPEED ALARM COULD COME ON.

3.) IF ALL PREVIOUS CHECKING PROCEDURES HAVE BEEN CONFIRMED TO BE GOOD PLEASE REPLACE HINGE PANEL PCB'S IN THE FOLLOWING ORDER.

1.) SX-CPU
2.) SX-IO1

G.) IOC TRIP (CONVERTER LED 12 & INVERTER LED 12 & 13)

1.) ALARM COMES ON WHENEVER A SPINDLE START COMMAND IS GIVEN.

i.) DAMAGE TO MAIN CIRCUIT POWER TRANSISTORS.

a.) REMOVE THE CONNECTIONS BETWEEN THE SPINDLE CONTROL AND THE MAIN MOTOR. DO SO BY DISCONNECTING WIRES AT TERMINAL STRIP LABELED U,V,W. AFTER DISCONNECTING MOTOR LEADS TRY TO START THE SPINDLE CONTROL. IF ALARM COMES ON AGAIN PROBLEM IS UNIT, IF ALARM DOES NOT COMES PROBLEM IS WITH MAIN SPINDLE MOTOR WHICH MUST BE INSPECTED AND REPAIRED.

ii.) CUTTING CONDITIONS EXCEED SPINDLE CONTROL SPECIFICATIONS.

a.) LOAD BEING APPLIED TO MOTOR IS TO LARGE DURING HEAVY CUTS. CHECK LOAD ON MOTOR, EVALUATE PART PROGRAM AND MONITOR SPINDLE LOAD METER TO MAKE SURE HEAVIEST CUTS ARE BELOW 120% LOAD FOR HALF HOUR RATING.

iii.) INSPECT THE WIRING BETWEEN THE SPINDLE CONTROL AND MOTOR

a.) CHECK FOR INCORRECT WIRING, ISOLATION RESISTANCE, SHORTS BETWEEN MOTOR LEADS AND LOOSE TERMINAL CONNECTIONS.

iv.) MOTOR WINDING SHORT CIRCUIT OR GROUNDED.

a.) MEASURE ISOLATION RESISTANCE OF MOTOR WINDINGS. IF RESISTANCE IS LESS THEN 1MEG OHM, INSPECT AND EVALUATE CONDITION OF MOTOR.

b.) IF MOTOR IS FOUND AT FAULT PLEASE REPLACE OR REWIND.

v.) CHECK AC INPUT SUPPLY VOLTAGE.

a.) IF SOURCE VOLTAGE IS LESS THEN 180V BETWEEN X1,X2,X3, PROPER METHODS MUST BE TAKEN TO INCREASE POWER SUPPLY CAPACITY.

b.) INPUT POWER CAPACITY IS NOT CORRECT, CHECK SPECIFICATION FOR PROPER INPUT POWER WIRING AND MAIN TRANSFORMER.

vi.) IOC ALARM COMES ON INTERMITTENTLY DURING NORMAL OPERATION OF MACHINE.

a.) CHECK CH 11 TO AGA ON SX-I01 FOR 10V DC PEAK IF ALARM IS INVERTER IOC. CHECK CH 9 FOR 10V DC PEAK FOR CONVERTER IOC. IF VOLTAGE AT THESE CHECK POINTS DO NOT EXCEED THIS 10V DC PEAK ALARM CIRCUITS ARE NOT FUNCTIONING PROPERLY THEREFORE HINGE REPLACEMENT IS NEEDED.

G.) CONTROLLER OVER HEAT (LED 12&15)

1.) OVER HEAT ALARM OCCURS DURING NORMAL OPERATION OF MACHINE.

i.) CHECK TEMPERATURE OF SPINDLE. IF TEMPERATURE APPEARS TO BE NORMAL SHORT TERMINALS TH-D024 LOCATED ON SX-AJ1 THEN RESET.

a.) ALARM IS NOT PRESENT AFTER RESETTING, CHECK OVER HEAT SENSORS LOCATED ON BASE OF SPINDLE CONTROL, REPLACE IF OVER HEAT DETECTORS ARE FOUND TO BE DEFECTIVE.

b.) IF SPINDLE CONTROL TEMPERATURE APPEARS TO BE ABOVE NORMAL, CHECK OPERATION OF SPINDLE CONTROL COOLING FANS. REPLACE IF DEFECTIVE OR CLEAN IF NECESSARY. ALSO CHECK FOR PROPER VENTILATION INSIDE MACHINE ELECTRICAL CABINET.

c.) IF OVER HEAT ALARM CONTINUES TO ILLUMINATE AFTER CONFIRMING ALL PREVIOUS CONDITION ARE GOOD, REPLACE HINGE PANEL PROBLEM WITH ALARM DETECTION CIRCUITS.

H.) UNDER VOLTAGE (LED 12&14)

1.) THE ALARM LEDS LIGHT WHEN THE INPUT SOURCE VOLTAGE DROPS BELOW 170V AC FOR 15mS OR LONGER.

i.) CHECK INPUT POWER LINE VOLTAGE TO MAKE SURE THAT THE VOLTAGE IS AT THE PROPER LEVEL, IF NOT INCREASE POWER INPUT VOLTAGE.

ii.) IF ALARM COMES ON DURING NORMAL OPERATION PLEASE EVALUATE INPUT POWER CAPACITY AS WELL CUTTING CONDITIONS.

iii.) IF ALL PREVIOUS CHECKING PROCEDURES HAVE BEEN CHECK AND FOUND TO HAVE NO PROBLEM FIRST REPLACE SX-PW THEN HINGE PCB'S.

J.) OVER VOLTAGE (CONVERTER LED 12.14&15)

1.) CHECK AC INCOMING VOLTAGE AT MAIN CIRCUIT BREAKER OF SPINDLE CONTROL. THIS VOLTAGE SHOULD BE 200V TO 230VAC. IF THE VOLTAGE MEASURED AT THE CIRCUIT BREAKER EXCEEDS THIS, OVER VOLTAGE ALARM WILL COME ON.

2.) CHECK INPUT LINE IMPEDANCE, (CHECK WIRE SIZE AND SPECIFICATIONS ON MAIN TRANSFORMER.

3.) CHECK RESISTANCE AS WELL AS PHYSICAL CONDITION OF CONVERTER SIDE SCR'S. IF THESE ARE FOUND TO BE OPEN OVER VOLTAGE ALARM WILL OCCUR. IF OSCILLOSCOPE IS AVAILABLE CHECK CONVERTER FIRING SEQUENCE.

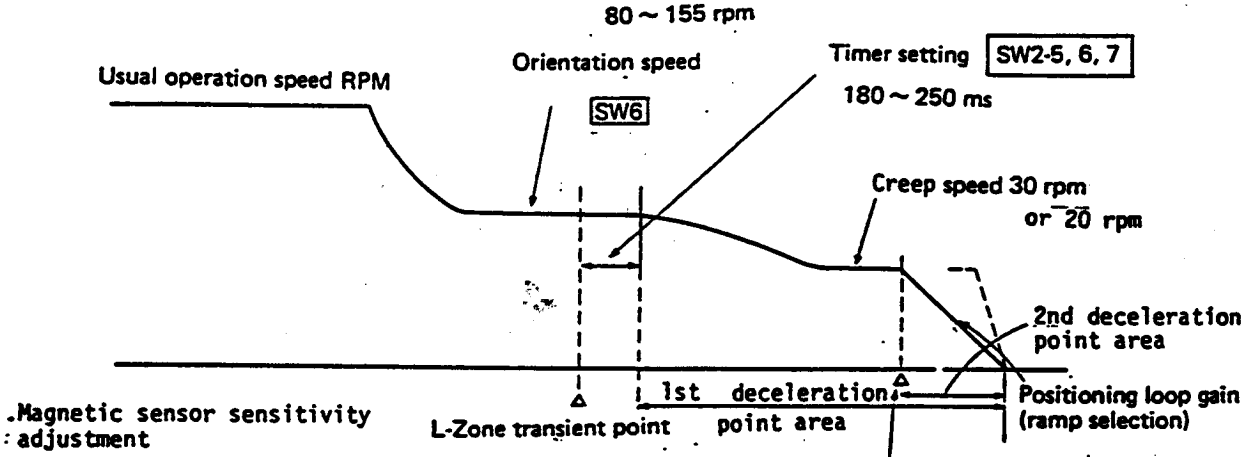
4.) IF PREVIOUS CHECKS HAVE BEEN DONE AND NOTHING CONCLUSIVE WAS FOUND OR IF ALARM IS INTERMITTENT PLEASE EXCHANGE COMPLETE HINGE PANEL.

I.) CPU FAULT 1,2&3 (CPU1 LED 12.13.15 CPU2 LED 12.13.14 CPU3 12.13.14.15)

1.) POSSIBLE TROUBLE WITH CPU PCB PLEASE EXCHANGE CPU OR COMPLETE HINGE PANEL.

3.5 Spindle orientation adjustment procedure

(1) Magnetic sensor type spindle orientation



SW2-	2	3	4
Low	O	O	O
↕	O	O	X
↕	⋮	⋮	⋮
High	X	X	X

Operate at the orientation speed with SW1-1 OFF and ST2, adjust VR4 to the limit at which the magnetic sensor sensitivity LED11 lights and set CH58A to the peak voltage ±10V

The speed change pattern at spindle orientation (indexing) is as illustrated above.

When the spindle stops running over the previously determined stop position (indexing position) .....

- Shorten setting of timer (SW2-5, 6, 7). (Extended 1st deceleration point area)
- Increase positioning loop gain (SW-2, 3, 4). (Extended 2nd deceleration point area)
- Decrease orientation speed.

When shorter orientation time is desired .....

- Prolong setting of timer (SW2-5, 6, 7). (Reduced 1st deceleration point area)
- Increase positioning loop gain SW2-2. 3. 4. (Reduced 2nd deceleration point area)
- Increase orientation speed.

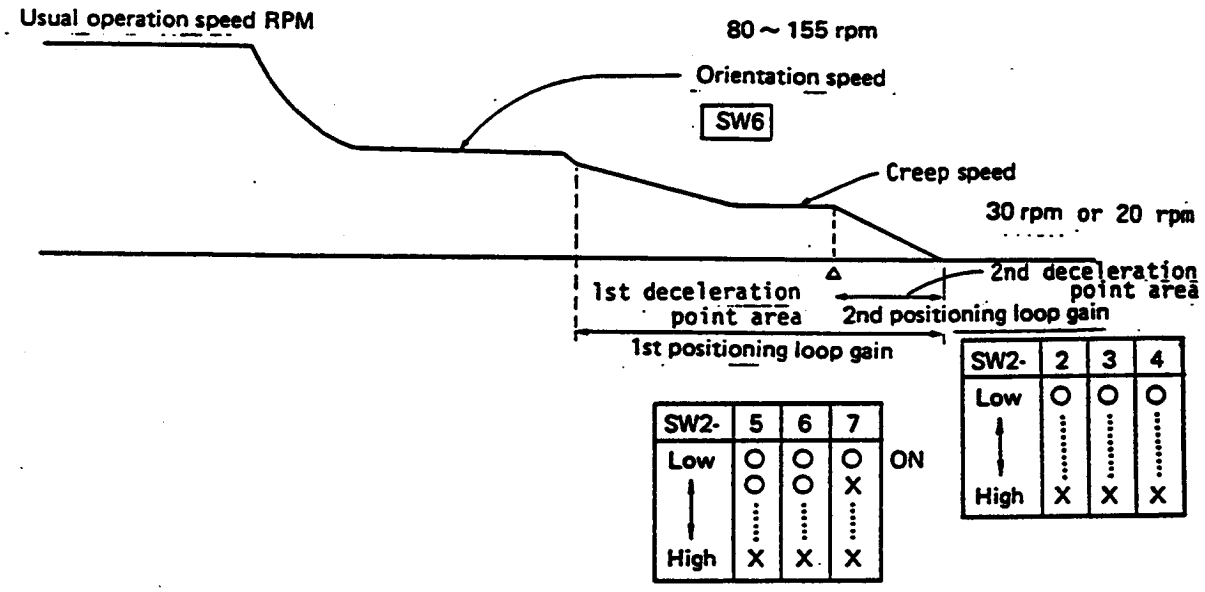
When hunting occurs at spindle stop .....

- Decrease positioning loop gain (SW2-2, 3, 4). (Extended 2nd deceleration point area)
- Decrease sensitivity of magnetic sensor (VR4).

Stop position can be adjusted by VR3.

> Notes: (1) The data of gearing ratio stored in the ROM should meet the gearing ratio in use.
>
> (2) Adjustment may vary depending on gearing ratio.

(2) Encoder type spindle orientation



The speed change pattern at spindle stop is as illustrated above.

When the spindle stops running over the predetermined stop position (indexing position) .....

- Decrease 1st positioning loop gain. (Extended 1st deceleration point area)
- Decrease orientation speed. (Extended 2nd deceleration point area)
- Decrease 2nd positioning loop gain.

When shorter orientation time is desired .....

- Increase 1st positioning loop gain. (Reduced 1st deceleration point area)
- Increase orientation speed. (Reduced 2nd deceleration point area)
- Increase 2nd positioning loop gain.

When hunting occurs at spindle stop .....

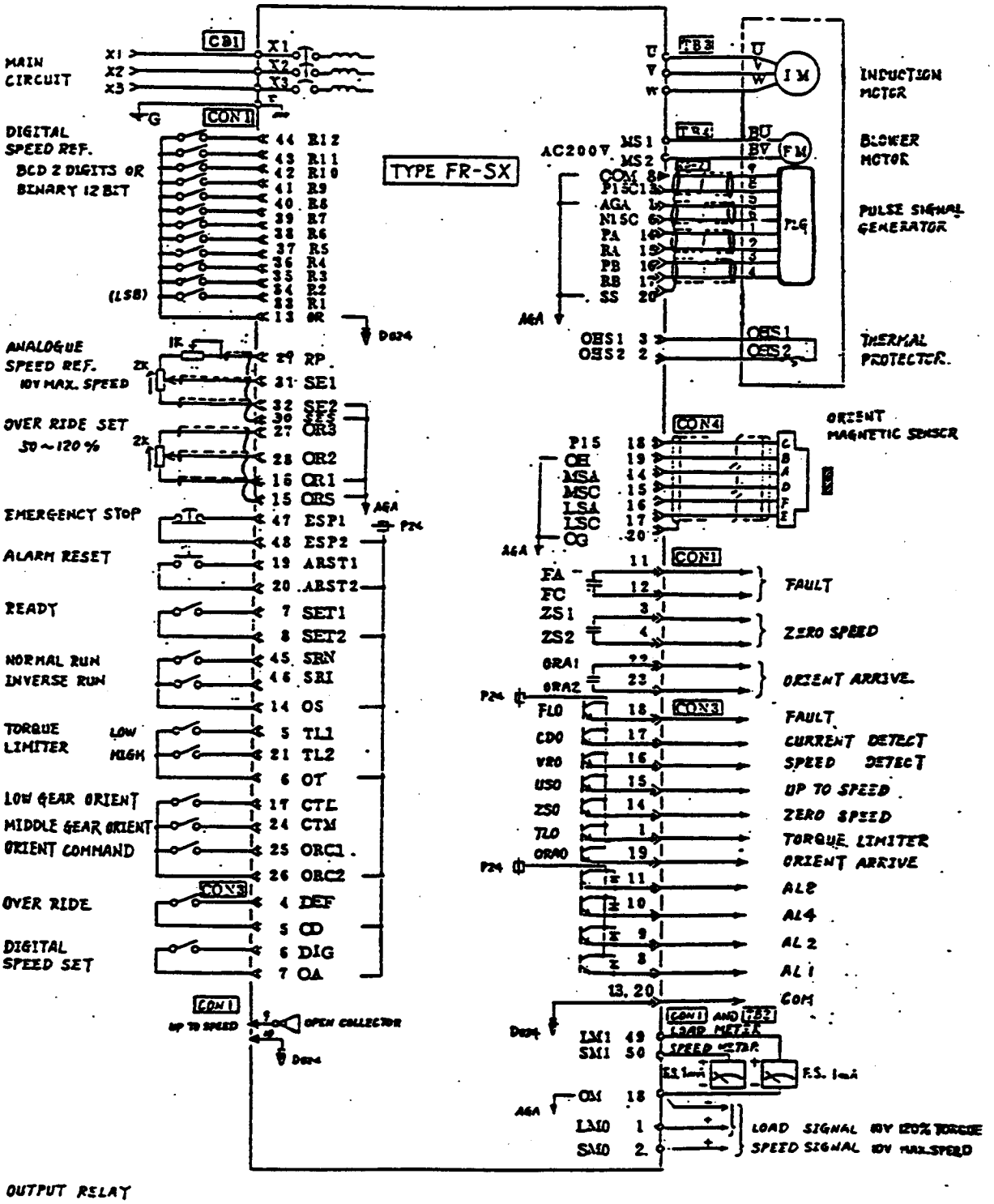
- Decrease 2nd positioning loop gain. (Extended 2nd deceleration point area)

Stop position can be adjusted by operating SW8, 9 and 10.

Notes: (1) The data of gearing ratio stored in the ROM should meet the gearing ratio in use.
(2) Adjustment may vary depending on gearing ratio.

2.4 External wiring

(1) AC spindle motor controller equipped with magnetic sensor type signale-point orientation function.



TROUBLESHOOTING AC SPINDLE CONTROLLER MODEL FR-SE

CHRIS TUMMILL
12/17/91

A. MOTOR OVERHEAT LED 15

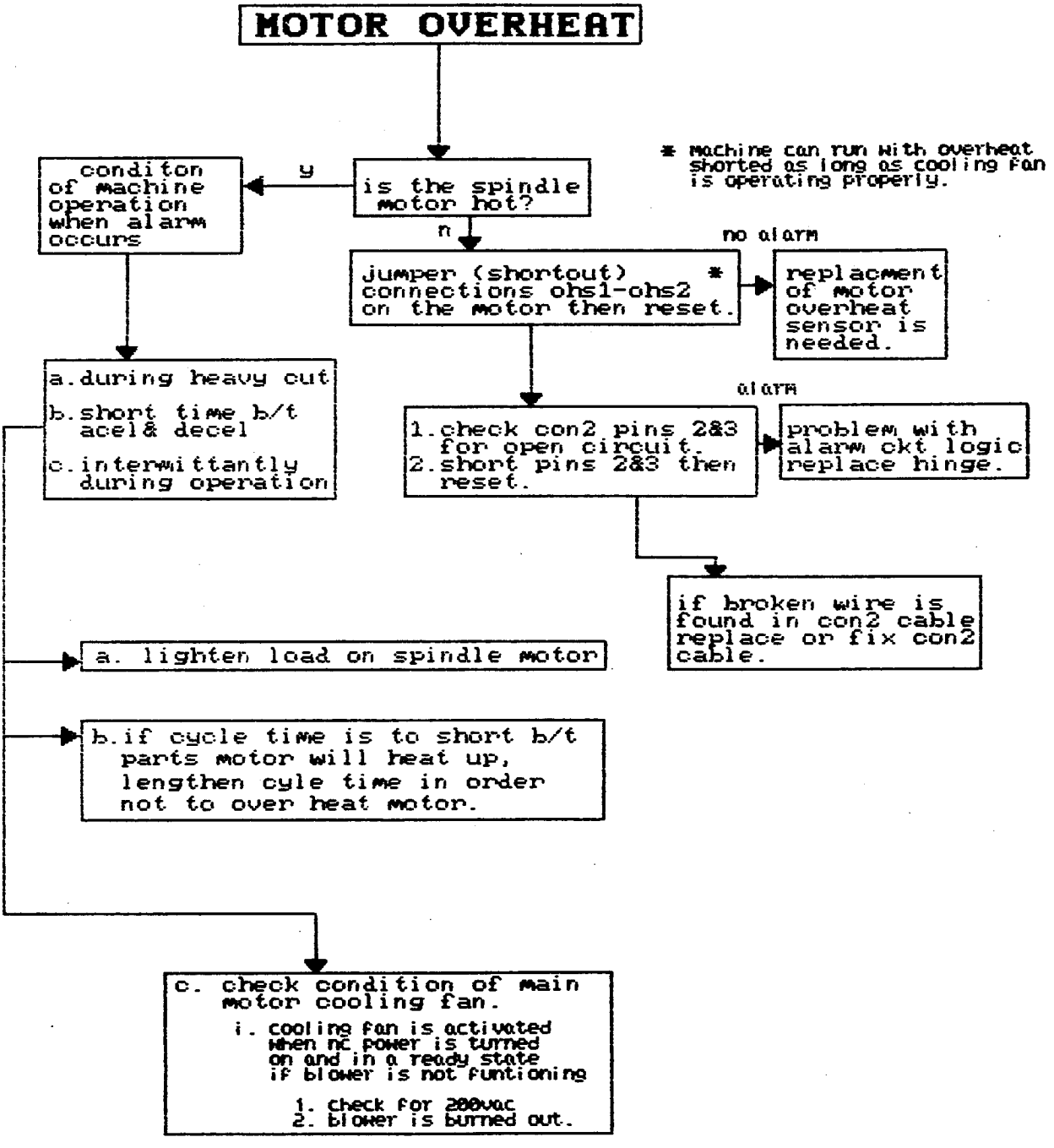
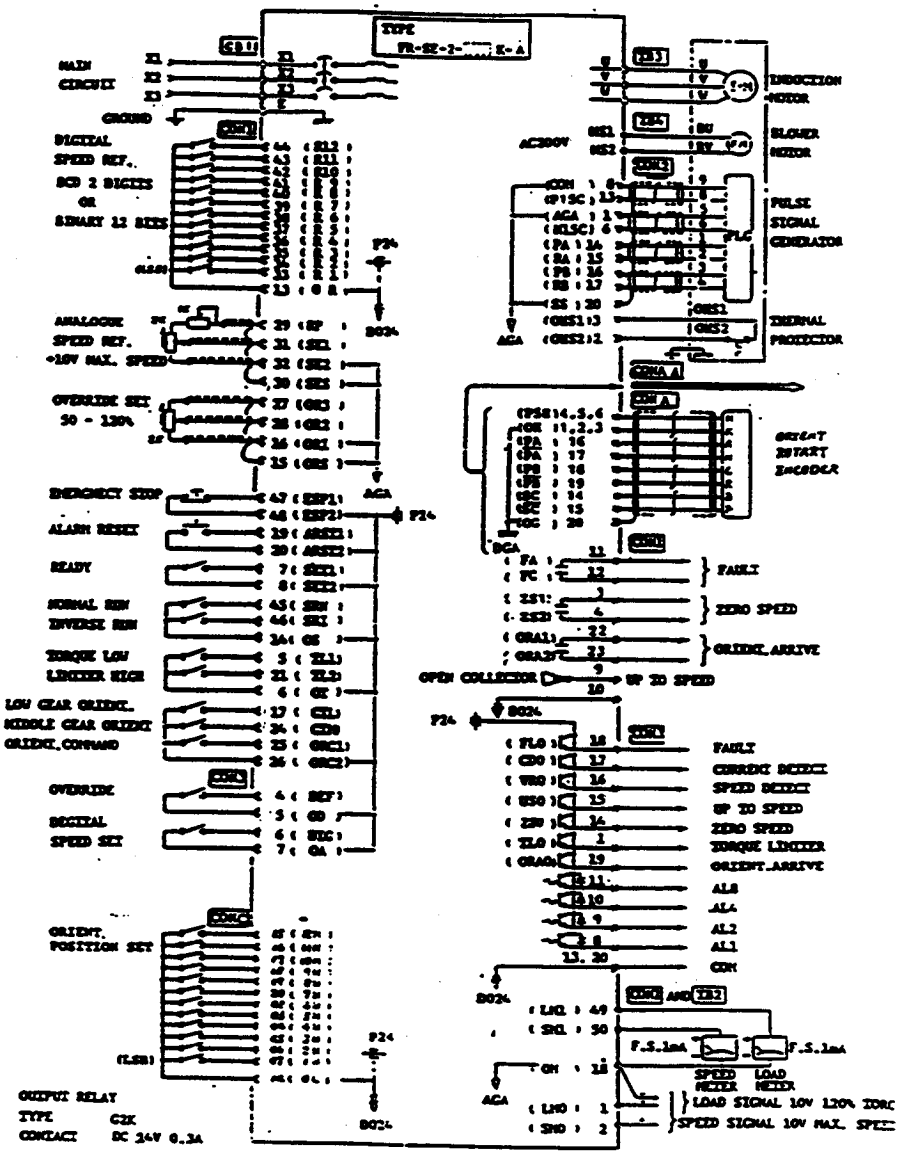
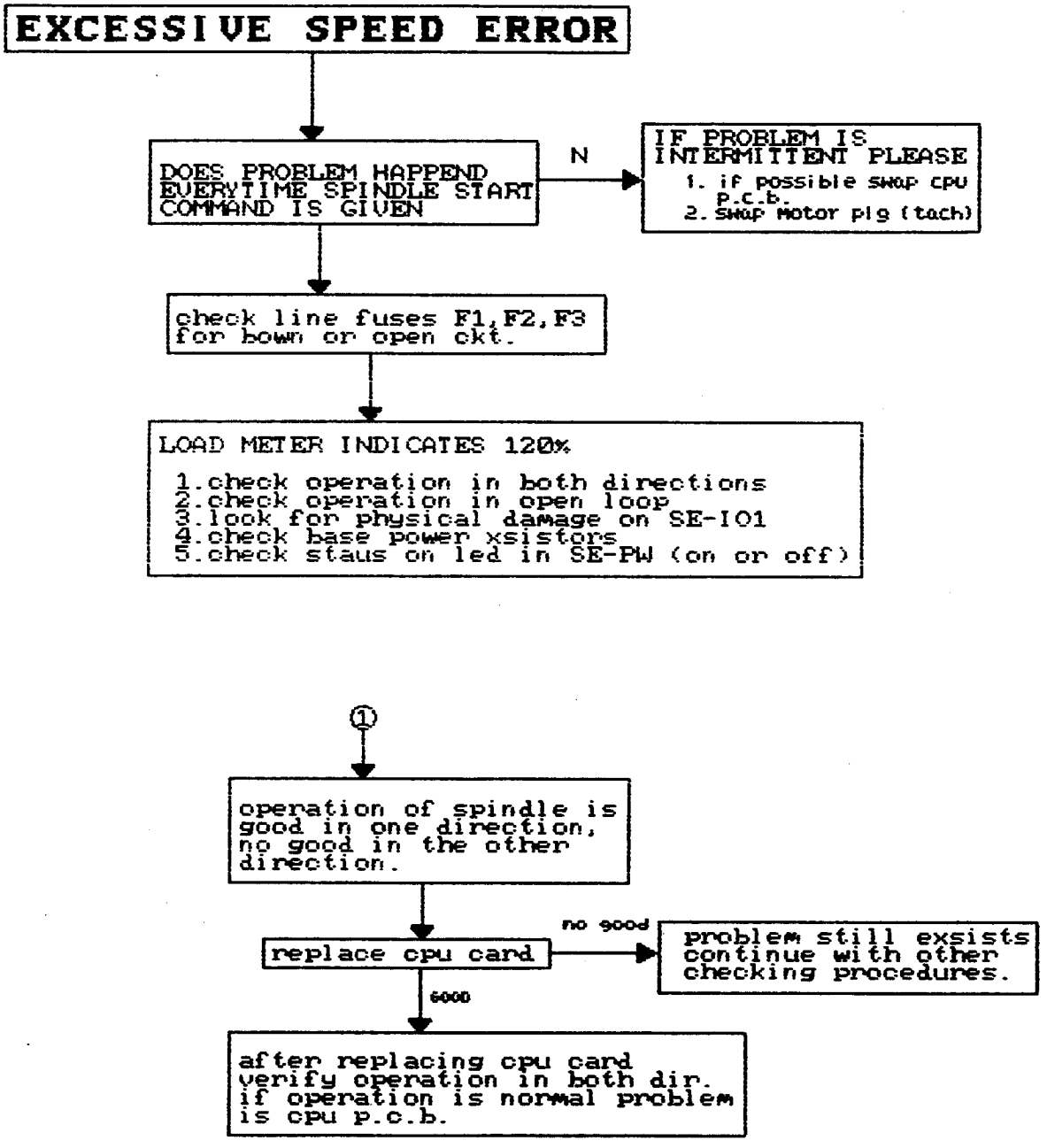


FIGURE 1. LOCATION OF POINTS FOR TROUBLESHOOTING MOTOR OVERHEA

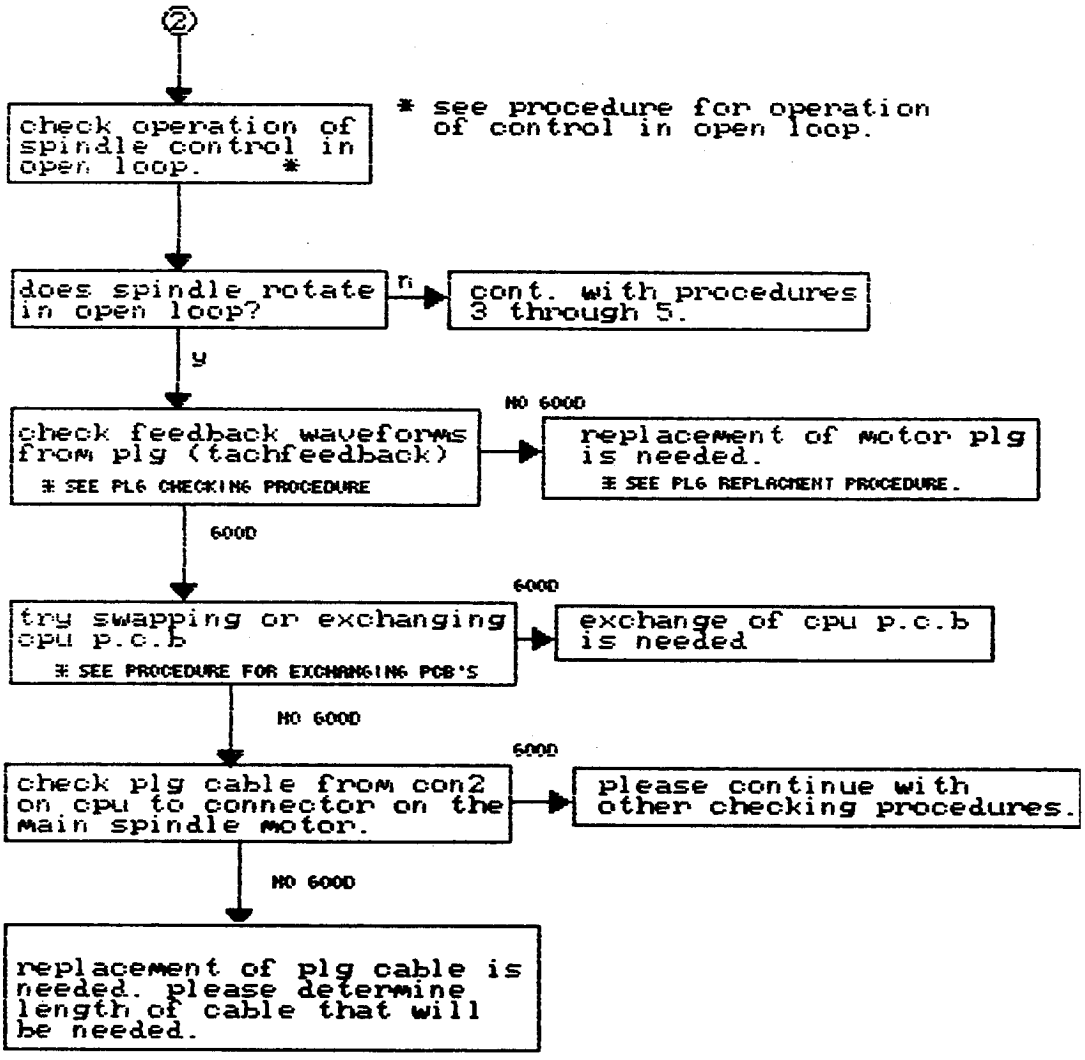


* FIGURE SHOWS CON 2 CABLE PIN CONFIGURATION LEFT SIDE NUMBERS LOCATED ON CON2 CONNECTOR ON CPU PCB.

B. EXCESSIVE SPEED ERROR LED 14



B. EXCESSIVE SPEED ERROR *(troubleshooting cont.)*



HINGE REPLACEMENT PROCEDURE

General Instructions for Changing FR-SE Card's (PCB)

1. Remove power from unit. (Use Machine Main Breaker)
   Note: FR-SE CB1 breaker does not remove power from SE-PW and other PCB's.
   Note: If Main Breaker cannot be shut off. Power can be removed by CB1 breaker and removal of fuses F1,F2, & F3. CAUTION:F1,F2, & F3 are live at this time. Fuses are usually located inside of base unit on the line filter. Refer to Figures 17 to 22 (FR-SE Base).
2. Removal of SE-CPU card. (Refer to Fig. 2)
   (1) Remove the connectors for external connection of orientation detector, PLG, etc. On CPU1: CON4 and CON2. On CPU2: CONA, CONAA, CON2, and CONC. To SE-IO card remove CON11 and CON12. Unscrew power supply wires P5A and DGA. Note: Honda connectors have screws and retaining clips.
   (2) Remove the card while compressing the card installation spacer claws.
3. Removal of SE-IO card. (Refer to Fig. 2)
   (1) After removal of the CPU card connectors according to the above procedure, remove the load/speed meter wiring from TB2, CON1, and CON3 of the I/O card.
   (2) Remove CON101, CON102, and CON103 on the rear of the hinge panel.
   (3) Remove the small hinge panel upon which the CPU card was installed.
   (4) Remove the screws fixing the I/O card, and then pull out the upper guide strongly and pull the I/O card from the SE-PW connectors. (CON21 - CON24).
4. Remove the SE-PW power supply. (Refer to Fig. 2)
   (1) Remove the CPU card and I/O card according to the above procedure.
   (2) Remove the three 200 volt AC power wires RO,SO, & E from the terminal block located on the base of the unit. Note: E is green and RO&SO are white with no polarity.
   (3) Remove the screws on the back of the hinge holding the SE-PW and the remove the SE-PW unit.
5. Assembly of hinge panel.
   (1) Install the new cards in the reverse order of the removal procedure.

Important Note: After replacement, confirm that all screws and connectors are tight and correct. Also verify positive insertion of the connectors.

Applying Power:

1. After replacement, all specific adjustment procedures should be observed. Especially current transformer offsets, meter calibration, and orientation.
2. Verify that EPROM's and switch settings are correct.
3. Optional: Verify that base driver waveforms are correct.
4. Verify spindle operation:
   (1) Confirm full speed range in each gear forward and reverse.
   (2) Confirm orient operation in each gear (Including ATC operation). Verify alignment before attempting ATC.

CHANGING FR-SE EPROM

Instructions for Changing FR-SE EPROM

(1) Please make sure that all power sources are turned off before changing EPROM. Because CB1 in the spindle drive does not remove power from the circuit boards it is necessary to turn off the machine main breaker.

(2) Note the position of the name plate and the locations of the EPROM's in Figure 15. The SE-CPU card is located just behind the front panel. Two EPROM's (ROM1 & ROM2) are located on the upper left side of the CPU card.

(3) Remove the EPROM very carefully with a ROM puller. Be sure not to bend the pins on the EPROM. The EPROM can be removed by prying very carefully on the corners between the EPROM and the socket with a small flat screw driver. Do not pry against or damage the printed circuit board.

(4) Confirm the version on the EPROM label and note number for proper socket location. Example: A1 in ROM1 socket.

(5) Locate notch or dot on EPROM and align that end of the EPROM with the notch on the printed circuit board outline. Refer to Figure 15 for detail. Carefully start all pins of the EPROM in the socket. Then apply firm pressure to seat the EPROM in the socket. Support the printed circuit board so that excessive bending does not occur. In the case of a new EPROM it may be necessary to bend all of the pins at right angles to the EPROM case before attempting insertion.

(6) Make sure all of the pins on the EPROM are properly inserted in the socket. Inspect for tilting of the EPROM and pins bent under the EPROM or bent out. Refer to Figure 15 for detail.

(7) Please record the machine serial number, the new EPROM version from the label, and the information form the spindle drive nameplate. Please return this information and the old EPROM's to Mitsubishi.

(8) Refer to Figure 15 for location and details of the nameplate.

Machine Serial Number..._____
Spindle Drive Type....._____
BN Number.............._____
SE Serial Number......._____
Manufacturing Date....._____
Check Number..........._____
EPROM Version.........._____

Note: Always keep the original hinge cover panel with the machine. This keeps the above information correct for that machine which is necessary for proper servicing of the drive.

PLG ADJUSTMENT PROCEDURE

PLG Adjustment Procedure FR-SE

(1) Normally PLG adjustment is not necessary. The PLG should be adjusted in open loop to prevent the spindle drive from responding to PLG signal loss while adjustments are made. Caution: In open loop sudden speed changes can cause damage.

(2) With the CNC OFF. Set SW6-2 OFF (Open loop) and press ST1 (Reset) on the SE-CPU card. Refer to Figure 5 (SE-CPU1) and Figure 6 (SE-CPU2) for location.

(3) Turn the CNC ON. Command the spindle FWD and confirm LED3 CW on the FR-SE is ON. If not command REV instead.

(4) Caution: Increase and decrease motor speed slowly in open loop or damage may occur. Bring the spindle motor up to about 1800 RPM slowly in the FWD direction. See note on command RPM vs gear range. Make RPM adjustments manually if possible.

Note: This should be actual motor shaft RPM in CCW direction. (Refer to Figure 9A.) If the machine has gears, the commanded RPM should be compensated or else the spindle motor will be at an RPM greater than 1800 RPM.

Example: (Max. RPM for gear range / Max. motor RPM) x 1800
(4800 RPM / 6000 RPM) x 1800 = 1440 Command RPM

Note: If the CNC has a spindle override be aware of its setting. It can also be used to bring the motor speed up and down slowly.

(5) Adjust VR's located on PCB in motor to obtain the waveforms in Figure 9B at PA and PB or Pin 14 & 16 of CON2. Refer to Figure 8 for locations.

VR1: Offset for A Phase
VR2: Gain for A Phase
VR3: Offset for B Phase
VR4: Gain for B Phase

(6) Slow spindle to zero speed. Command spindle REV and verify LED4 CCW is ON. (If not command FWD.) Bring the spindle slowly up to about 1800 RPM and confirm that the waveforms in Fig. 9C are present at PA and PB. When the motor shaft is rotating CW the output could shift up to -0.3v.(-0.4v max.)

(7) Slow spindle to zero speed. Set SW6-2 ON (Closed loop) and press ST1 on SE-CPU card. Refer to Fig. 5 or Fig. 6.

(8) If the correct output cannot be obtained in (5) & (6) it may be necessary to adjust the gap between the sensor and the detection gear. Refer to Fig. 8 and the FR-SE Maintenance Manual. Then repeat adjustment procedure as necessary.

(9) Check PA and PB output waveforms at 0 to Max. RPM in FWD and REV to confirm that they are within the envelope shown in Figure 10. Specifically Max. RPM in FWD and REV.

U-006 Inc-

PG.

PLC CONFIGURERATION AND WAVEFORMS

FR-SE PLC

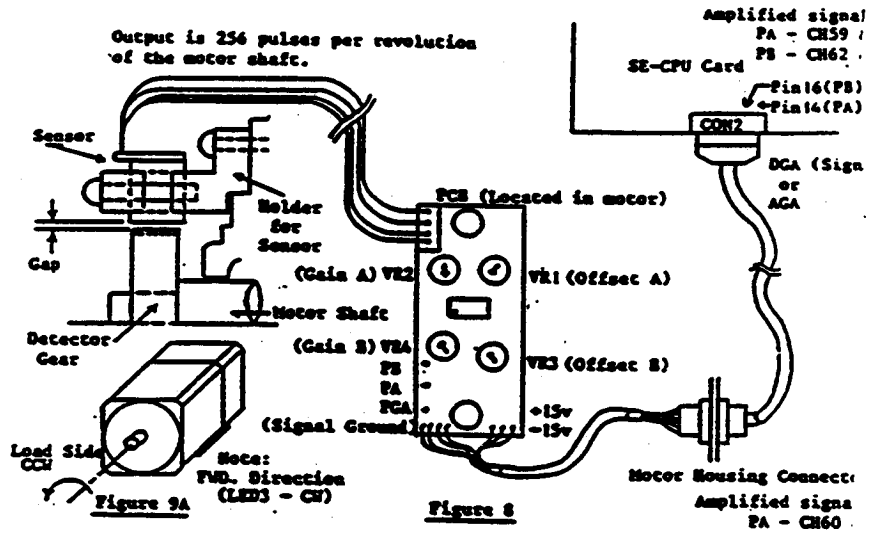
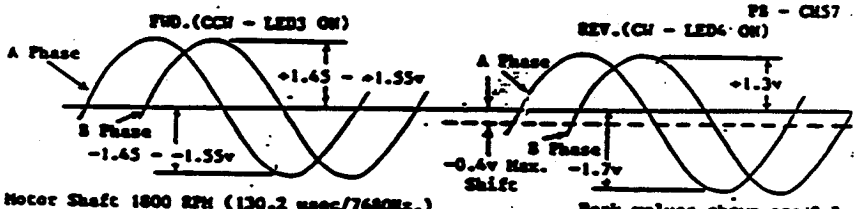


Figure 9A

Figure 8



Motor Shaft 1800 RPM (130.2 usec/7680Hz.)
Note: Motor shaft rotates CCW on CW or FWD. command.(LED 3)

Figure 9B

Peak values shown are 0.2v

Figure 9C

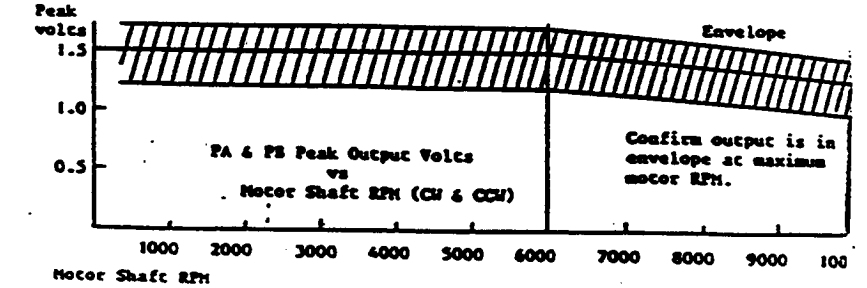
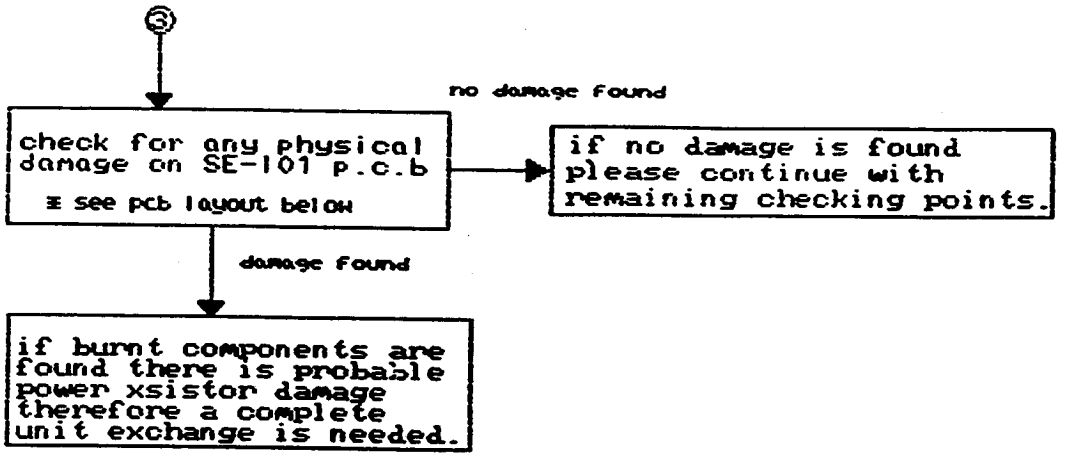
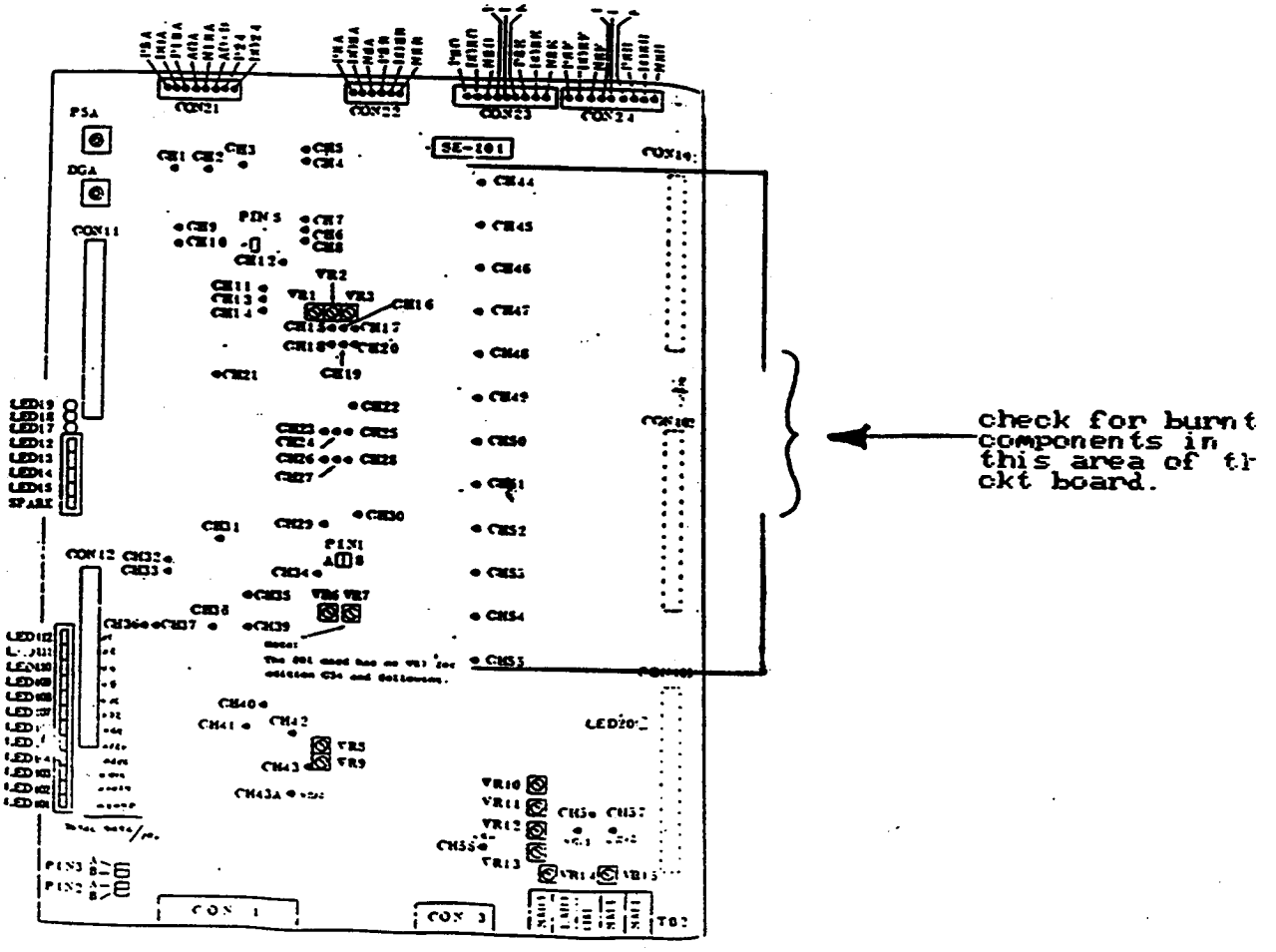


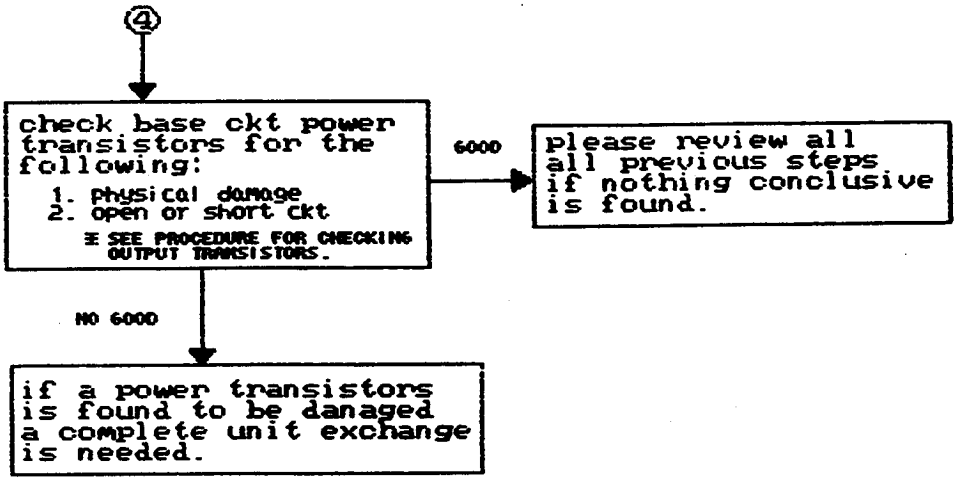
Figure 10

EXCESSIVE SPEED ERROR *(troubleshooting cont.)*





EXCESSIVE SPEED ERROR *(troubleshooting cont.)*



OUTPUT TRANSISTOR RESISTANCE CHECK

Testing Output Transistors, Diode, and Capacitors FR-SE

This is a basic resistance test designed to pinpoint defective components with minimal connection removal. It will indicate a shorted diode or output transistor. The normal meter reading obtained will vary with meter type and transistor type or lot. Refer to Figure 16 for location of components and check points in the following procedures.

(1) Turn machine main breaker OFF. Switch spindle CB1 OFF as an additional precaution. Up is OFF. It is located on the bottom left of the spindle controller.

(2) Disconnect motor leads from U,V, and W. Located on the bottom right of the spindle controller.

(3) Capacitor Check (C1): Locate large blue capacitors with sborting bars connecting them in parallel. Check the condition of the sight glass on the top of each capacitor. If it is damaged or blown the capacitor is bad and needs to be replaced. Be sure C1 is discharged before removal.

(4) Converter Section: Locate (P) and (N) on C1. Locate R3, S3, and T3 on contactor MC1. Refer to Figure 16. Discharge C1 through a 100 ohm 10w resistor across (P)&(N) or wait until zero volts is measured across (P)&(N). This is approximately one minute. In the following tests if a reading of 50 ohms or less is obtained a diode or transistor is bad. Use an ohmmeter to check the resistance between the following points.

Test Point	Bad Device	Test Point	Bad Device
P to R3	TRR or D1	N to R3	TRR or D1
P to S3	TRS or D1(D2)	N to S3	TRS or D1(D2)
P to T3	TRT or D1(D3)	N to T3	TRT or D1(D3)

(5) Inverter Section: Locate (P) and (N) on C1. Locate U, and W on TB3 motor terminal. Refer to Figure 16. Discharg C1, see step 5. In the following tests if a reading of 5(ohms or less is obtained a transistor is bad. Use an ohm to check the resistance between the following points.

Test Point	Bad Device	Test Point	Bad Device
P to U	TRU	N to U	TRU
P to V	TRV	N to V	TRV
P to W	TRW	N to W	TRW

(6) After changing transistors please check base driver forms. See Procedure for Checking Base Driver Waveforms. Return all connections and breakers to normal.

Note: Output transistor have an internal diode connected tween C & E. Removing CON101 and CON102 isolates output sistors from drivers on the SE-IO card. Removing R4, S4, isolates converter diodes from converter transistors.

EXCESSIVE SPEED ERROR *(troubleshooting cont.)*

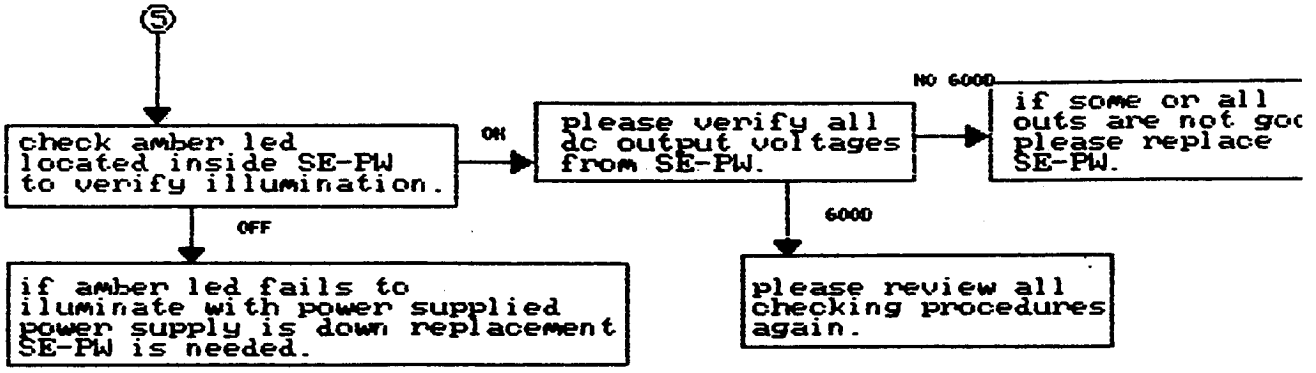
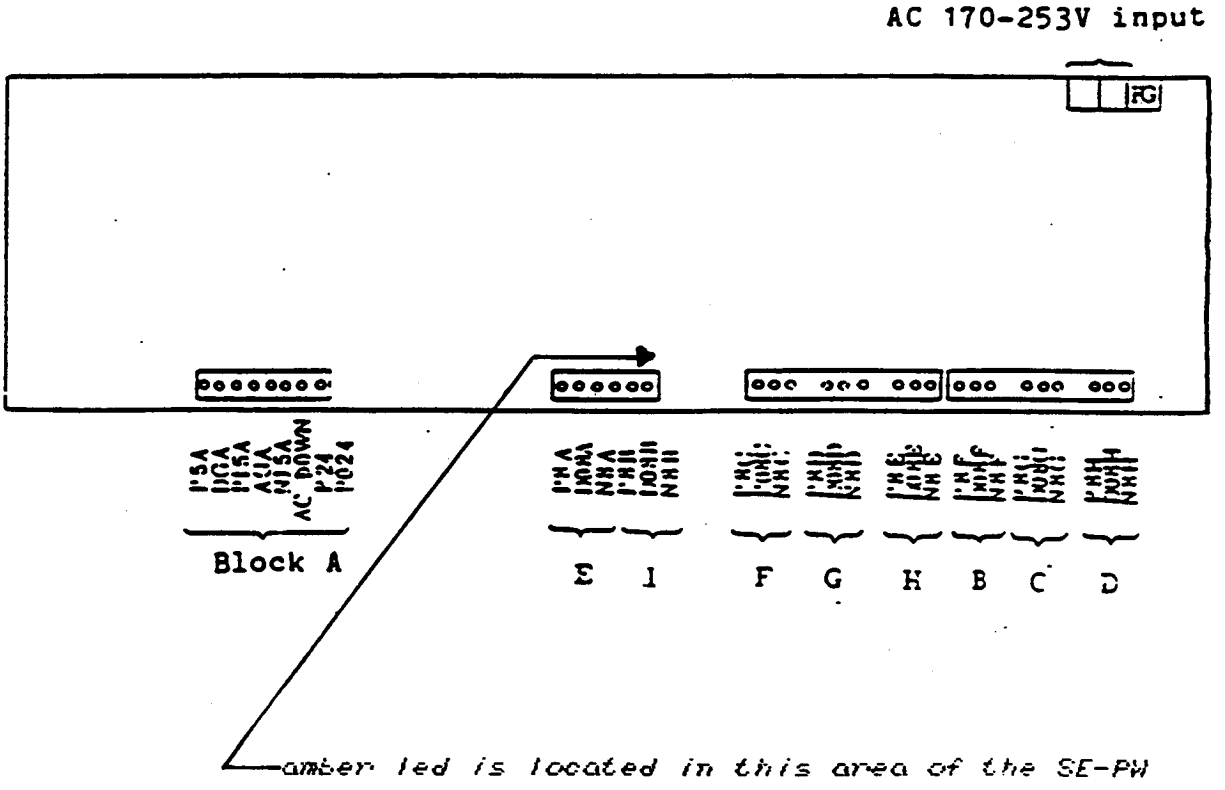
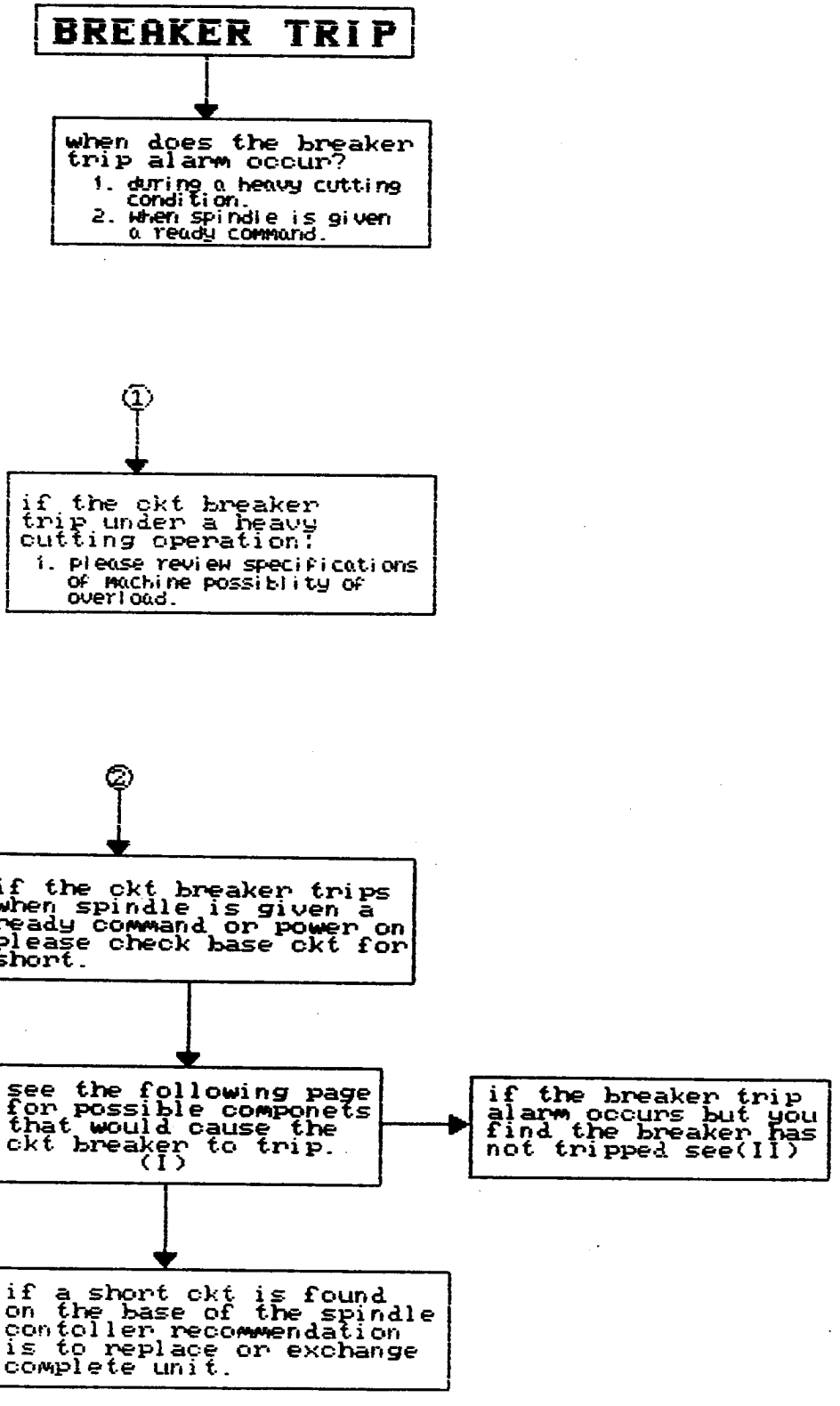


FIGURE SHOWS OUTPUT VOLTAGES



C. BREAKER TRIP LED 13

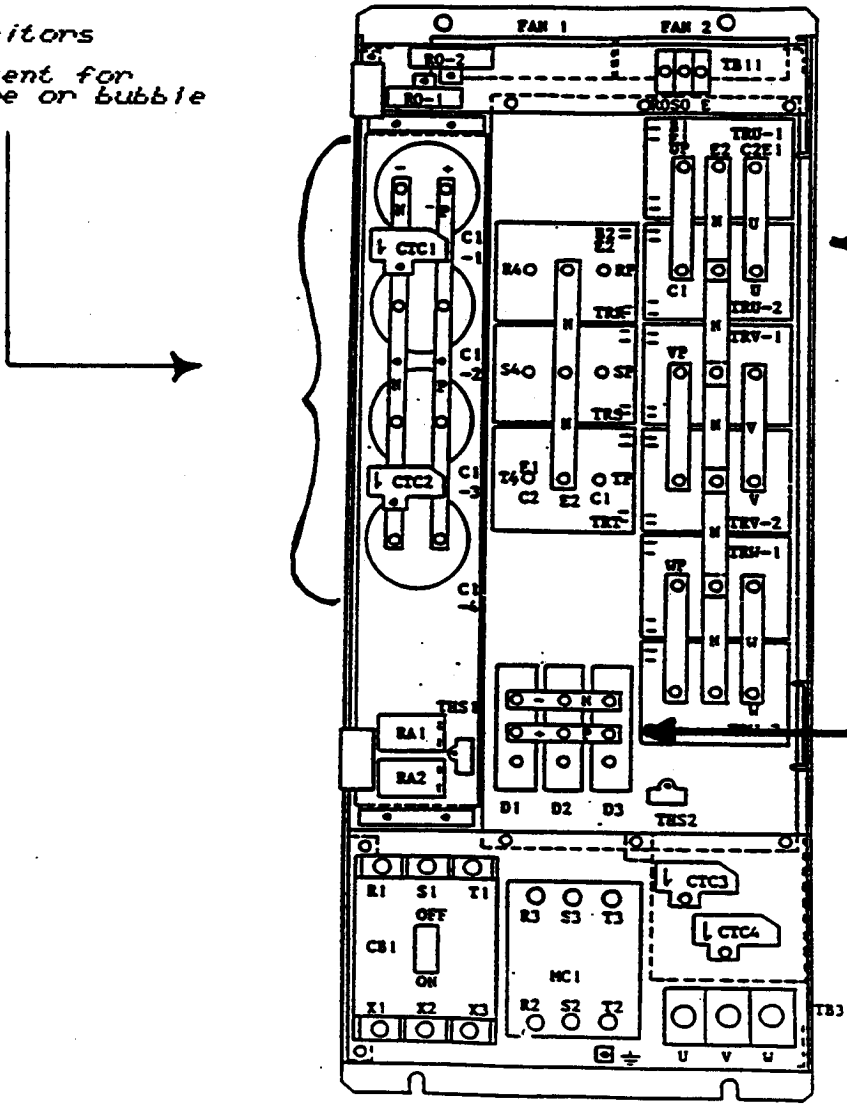


C. BREAKER TRIP (troubleshooting cont.)

I. POSSIBLE COMPONENTS TO CHECK DURING BREAKER TRIP.

capacitors

check vent for puncture or bubble



check for pwr xsitor short

check diode stack for short.

ckt breaker has 2 wires for alarm contact AC-AB.

C. BREAKER TRIP *(troubleshooting cont.)*

II. BREAKER TRIP ALARM WITH NO BREAKER TRIPPED

1.) if the breaker trip alarm comes although you find that the breaker on the spindle is no tripped. please follow the the instructions below.

a.) *find the shorting pin in the lower left corner of the SE-101 p.c.b the pin is labled pin 4 take a shorting pin and short the side labled fb.*

b.) *this will cancel the breaker trip alarm first reset the machine if the alarm is still present hinge replacement is needed. if the alarm is gone the alarm contacts in the breaker are at fault therefore a new breaker is needed.*

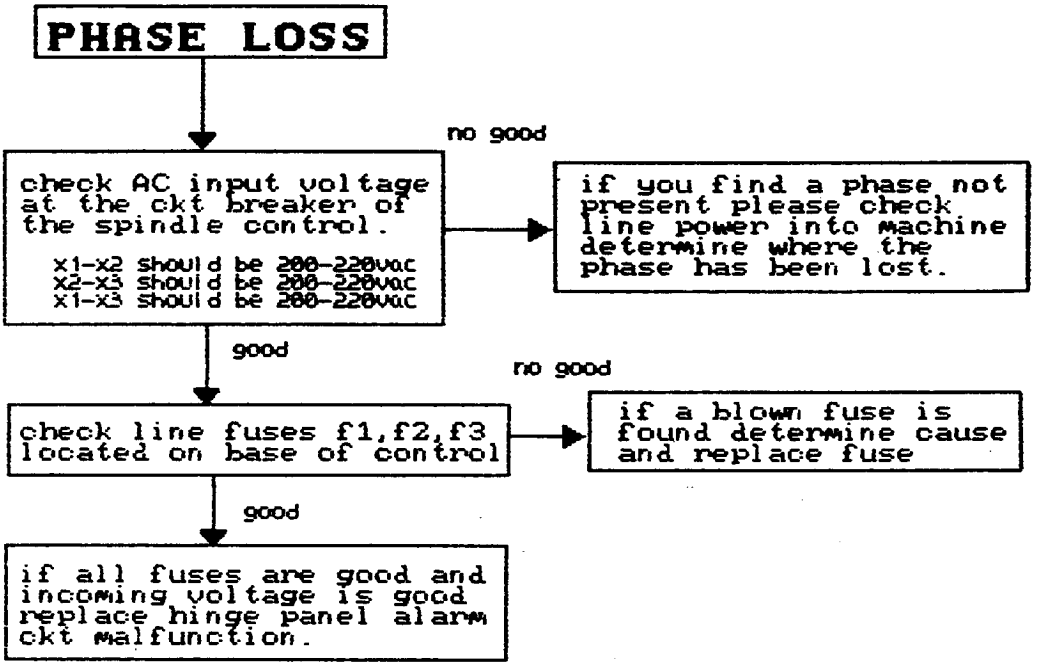
※ NOTE THE CONTROL WILL OPERATE WITH ALARM SHORTED BUT THE ALARM WILL NEVER COME ON.

pin 4 locate
in this area
of the SE-10

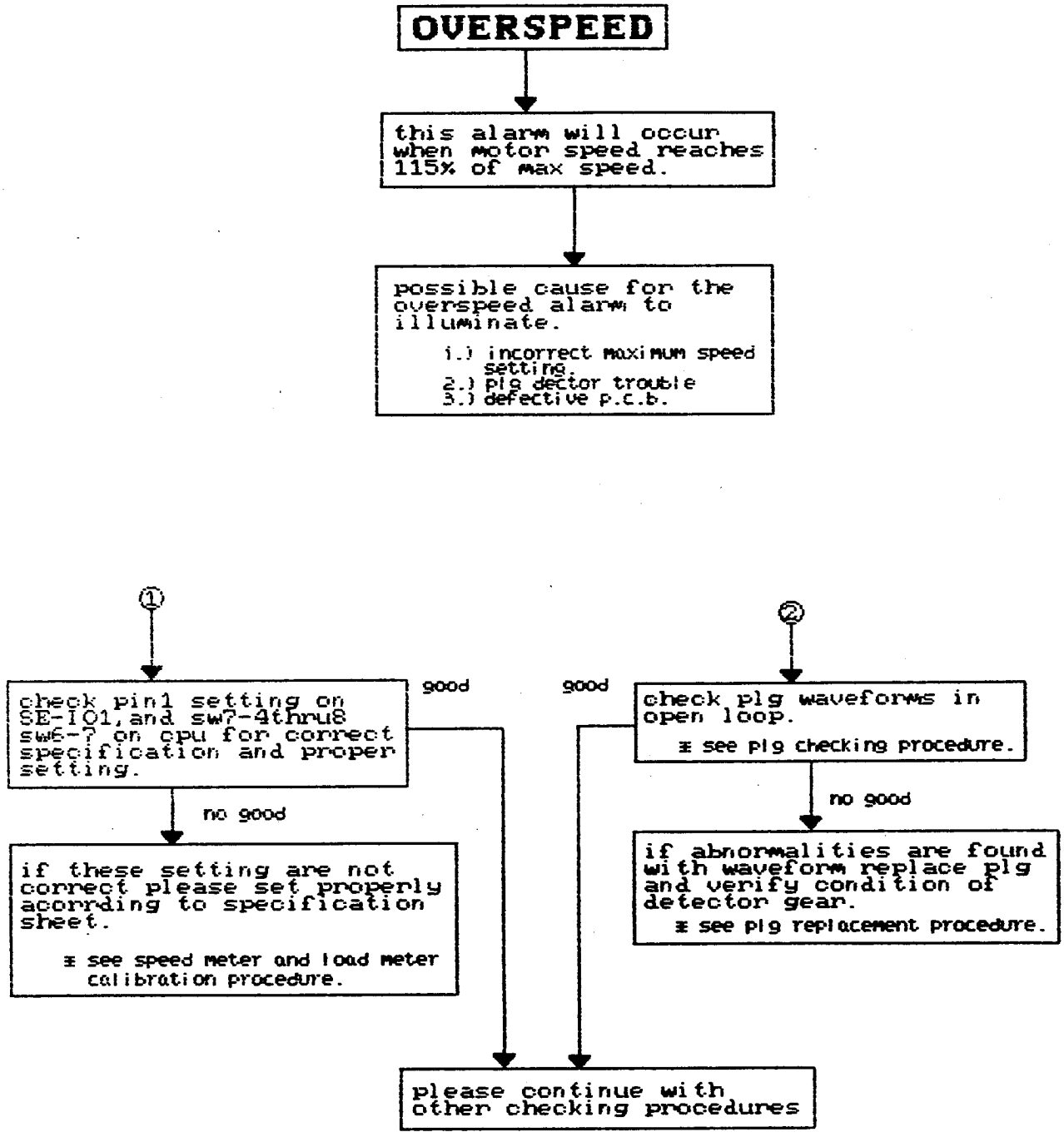
PIN 4

TH FB

D. PHASE LOSS ALARM LED 13 AND 15



E. OVERSPEED ALARM LED 13.14 and 15



③ *if other checking procedures are done and ther is no apparant problems found please replace the hinge panel p.c.b in this sequence.*

SE-CPU → SE-101

PROCEDURE FOR SETTING MAX SPEED AND METER CALIBRATIONS.

Maximum Speed Adjustment FR-SE

Note: Overspeed alarm may be caused by missadjustment.

(1) Set PIM1 (on SE-IO card), SW6-7, and SW7-4 on the SE-CPU card according to the following information. For other capacity/rpm settings (SW7-5,6,7,8) refer to Switch Setting Sheet with the machine. Refer to Figure 5 or 6 for SE-CPU and Figure 7 for SE-IO PCB layout.

Note: Motor base speed, top speed, and Kw capacity can be found on the motor name plate.

Standard Motor:				
Base Speed.....	1150/1500	1150/1500	1150/1500	1150/1500
SW7-4.....	ON/OFF	ON/OFF	ON/OFF	ON/OFF
Top Speed.....	3450/4500	4600/6000	6000/8000	8000/10000
PIM1.....	B/B	A/A	A/A&B	A&B/A&B
SW6-7.....	ON	OFF	OFF	OFF
New SE-IO PCB.....	VR6	VR6	VR6	VR6
Old SE-IO PCB.....	VR7	VR6	VR6	VR6

Note: On old SE-IO PCB set VR7 to 5 (Middle of rotation) if A&B is specified for PIM1 above. In step 2 adjust VR7 in place of VR6 were specified in the above table. VR7 is no longer used on new SE-IO Cards.

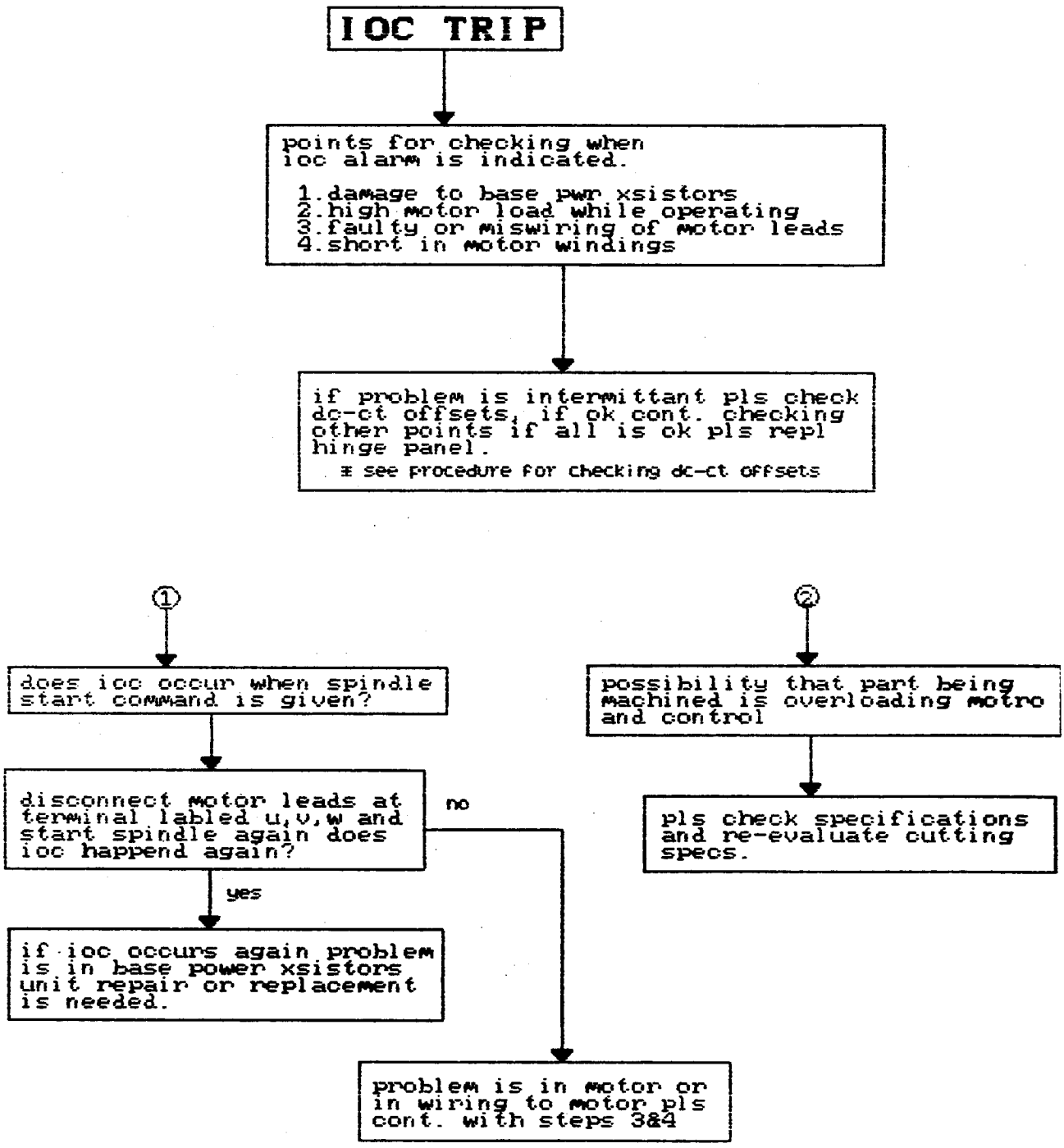
(2) SET SW6-6 to OFF and press ST1 (Reset) on the SE-CPU PCB. Adjust VR6 fully clockwise and then counterclockwise to obtain 10v at CN14 to DGA. Refer to Figure 7 for location of adjustment and check point.

Alternate Method: This method has low accuracy and should only be used for rough adjustment. For EPROM versions 480-F/490-C and later. Adjust VR6 fully clockwise and then turn it slowly counter-clockwise until LED17 lights. LED17 lights when voltage at CN1 to DGA is 9.8 to 9.9v.

(3) The speed meter should be reading max RPM at this time. Adjust VR14 to set Maximum speed reading on the speed meter. If fixed output is used or encoder, VR14 will have no effect on the meter reading or display. Refer to Meter Output Adjustment Procedure for more information.

(4) Return SW6-6 to the ON position and press ST1 (Reset) on the spindle drive to return it to normal operation. Confirm switches and pins (PIM1, SW6-7, and SW7-4,5,6,7,8) are set according to the Switch Setting Sheet for the spindle controler on that machine. If not correct, record setting difference and repeat adjustment procedure.

F. IOC TRIP INVERTER and CONVERTER LED 12.



3&4) *if no problems are found with spindle control i.e no power xsistor shorts & dc-ct offsets are good. when motor leads are disconnected and no alarm occurs please check motor and wiring to motor.*

DC-CT OFFSET PROCEDURE

Current Transformer Offset Adjustment Procedure FR-SE

(1) Offsets should be adjusted with zero current. This is done by switching CB1 breaker OFF on FR-SE and disabling the BREAKER TRIP alarm(*) caused by CB1. Refer to Fig. 3 or 4 for location of CB1. (Note that up is OFF.)

Note: Computer Numerical Control (CNC)...OFF
FR-SE Fuses F1, F2, & F3.....IN (GOOD)
Machine Main Breaker.....ON
Pin 4 (FB) on SE-IO card.....ON (*)
FR-SE Breaker CB1.....OFF

Note(*): It may not be necessary to disable the breaker trip alarm to complete current transformer adjustments.

Disable CB1 breaker trip alarm by inserting jumper (FB) on Pin 4 of SE-IO PCB. This is located on the lower right corner of the PCB and to the right of the TB2 screw terminal. Refer to lower right corner of Figure 7. A SPARE jumper strap can usually be found on the SE-CPU or SE-IO printed circuit boards.

(2) Adjust all DCCT offsets to 0v +/-5mv (note: +/-10mv is acceptable). Refer to bottom of Fig. 7 for location of adjustments and check points.

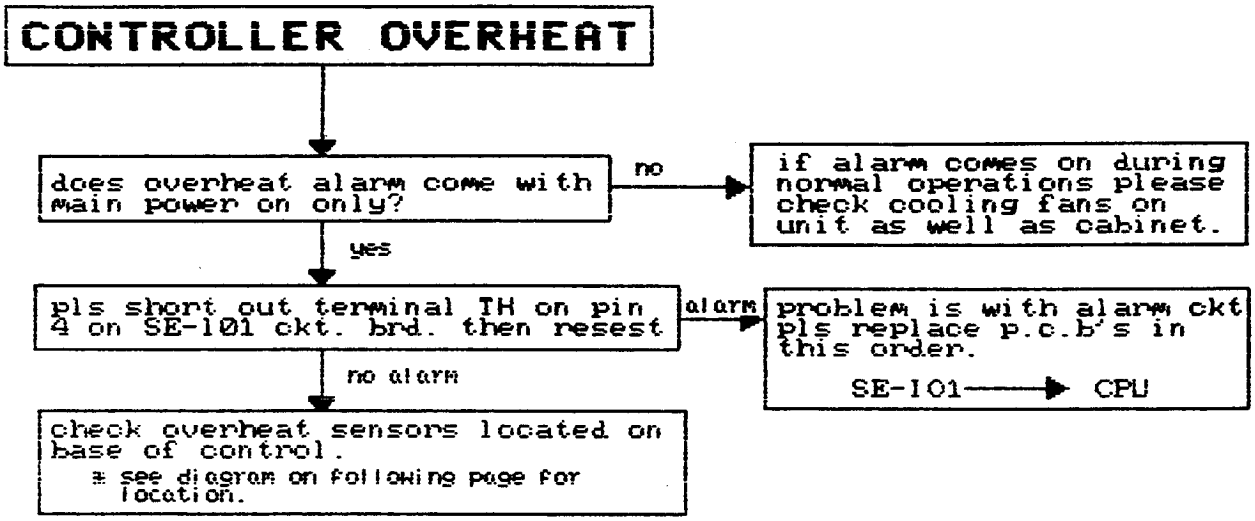
CTC1 Converter VR10 CN43A to CN2 (AGA) or DGA for 0v.
CTC2 Inverter VR11 CN58 to CN2 (AGA) or DGA for 0v.
CTC3 U Phase INV VR13 CN56 to CN2 (AGA) or DGA for 0v.
CTC4 V Phase INV VR12 CN57 to CN2 (AGA) or DGA for 0v.

(3) After adjustment return spindle drive to normal settings.

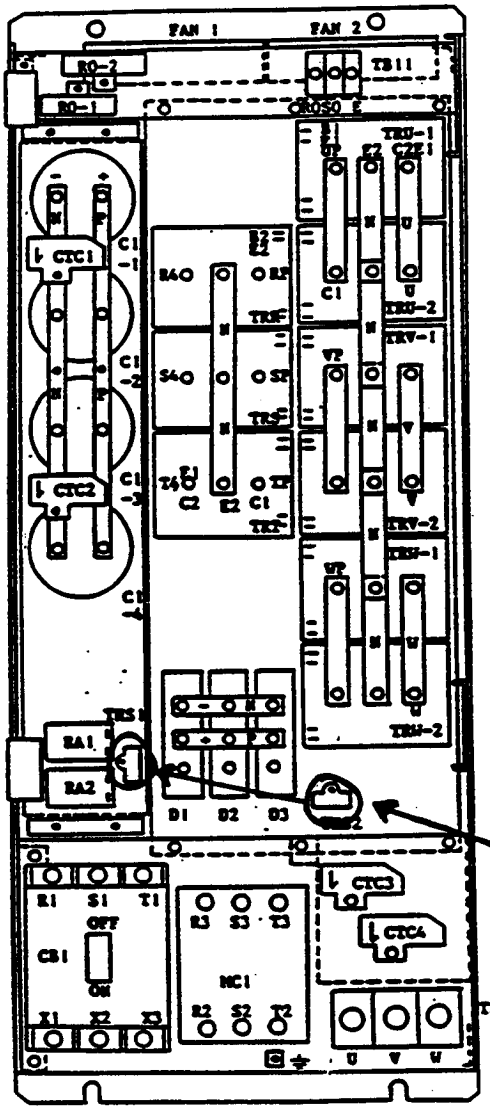
Note: CNC.....OFF
FR-SE Fuses F1, F2, & F3.....IN
Machine Main Breaker.....ON
Pin 4 (FB) on SE-IO card.....OFF
FR-SE Breaker CB1.....ON

Refer to Figures 17 to 22 (FR-SE Base) for location of fuses.

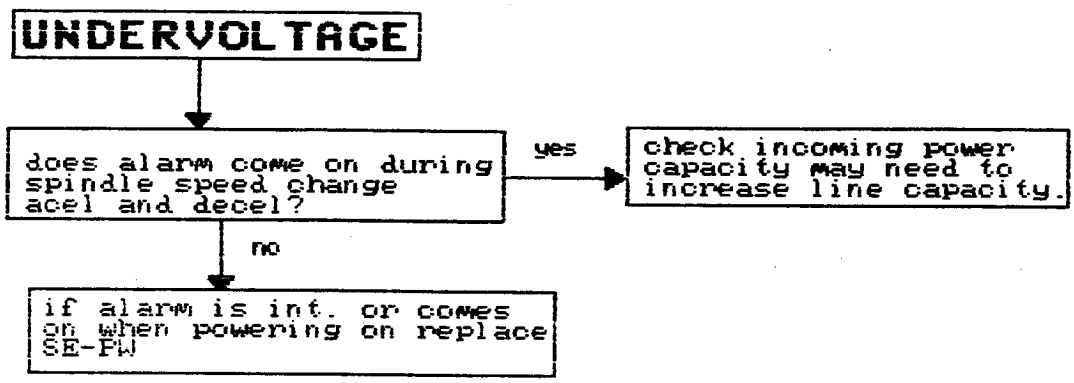
G. CONTROLLER OVERHEAT



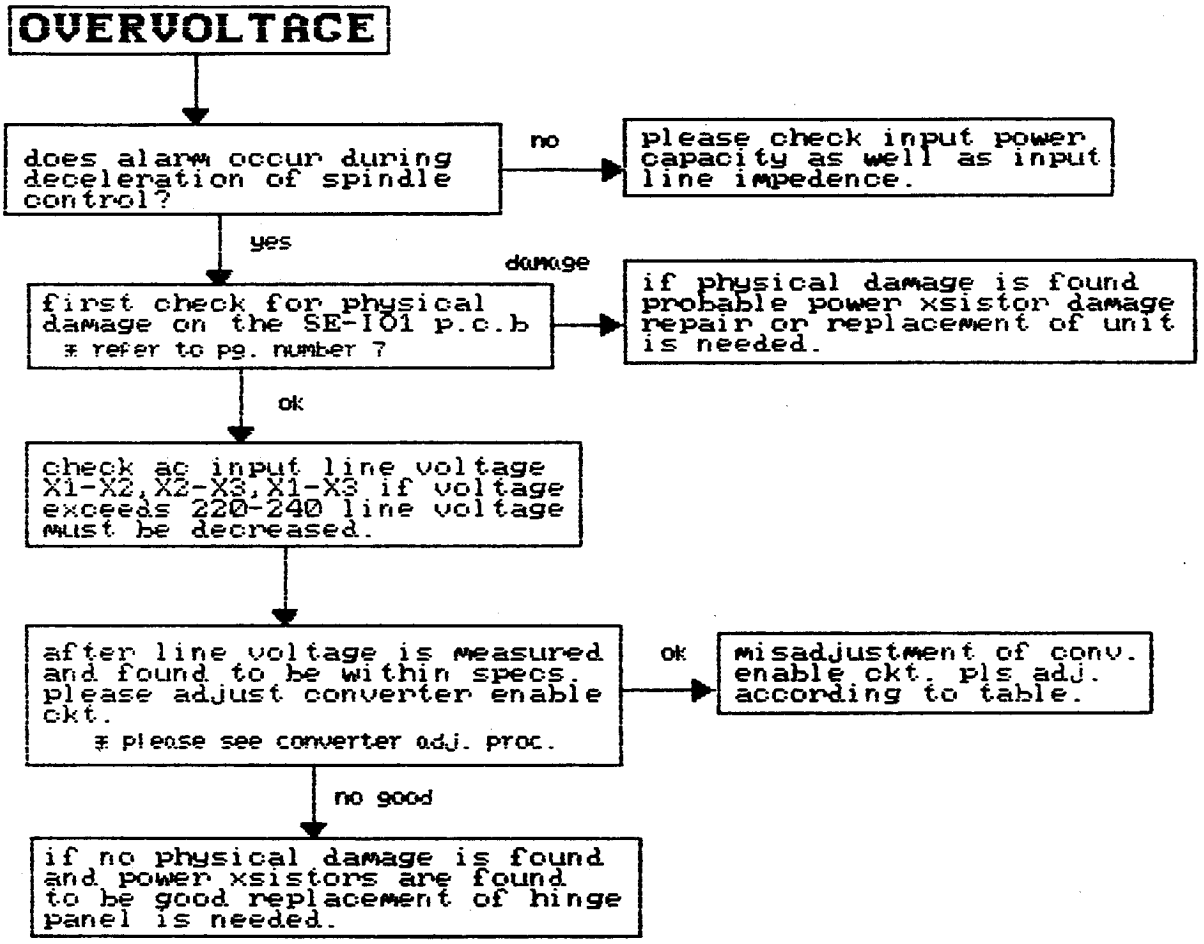
LOCATION OF OVERHEAT SENSORS



H. UNDERVOLTAGE LED 12,14



I . OVERVOLTAGE CONVERTER LED 12.14.15



CONVERTER ENABLE ADJUSTMENT PROCEDURE

Adjustment of Converter Enable Circuit FR-SE

Note: If VR8 and VR9 are misadjusted the converter will not turn off (LED 18 ON) or the converter will not turn on quick enough and cause damage to output transistors or capacitors.

(1) The drive should be in ready condition only. Verify LED19 and LED20 are ON and LED18 is OFF. The condition of converter enabled indicator (LED18) and base transistor cutoff indicator (LED19) may be incorrect if VR8 & VR9 are misadjusted.

(2) The basic adjustment involves adjusting VR8 & VR9 to obtain equal positive and negative voltages at CH42 and CH43. Repeat adjustment until equal. Refer to Figure 7 for location of check points and adjustments. Use the following table as a guide for approximate voltages that should be obtained.

P-N DC Voltage	CH42 P-N VR8	CH43 Line VR9	Approx. VAC Input at CB1
272v	+6.80v	-6.80v	192v
274v	+6.85v	-6.85v	194v
276v	+6.90v	-6.90v	195v
278v	+6.95v	-6.95v	197v
280v	+7.00v	-7.00v	198v
282v	+7.05v	-7.05v	199v
284v	+7.10v	-7.10v	201v
286v	+7.15v	-7.15v	202v
288v	+7.20v	-7.20v	204v
290v	+7.25v	-7.25v	205v
292v	+7.30v	-7.30v	206v
294v	+7.35v	-7.35v	208v
296v	+7.40v	-7.40v	209v
298v	+7.45v	-7.45v	211v
300v	+7.50v	-7.50v	212v
302v	+7.55v	-7.55v	214v
304v	+7.60v	-7.60v	215v
306v	+7.65v	-7.65v	216v
308v	+7.70v	-7.70v	218v
310v	+7.75v	-7.75v	219v
312v	+7.80v	-7.80v	221v
314v	+7.85v	-7.85v	222v
316v	+7.90v	-7.90v	223v
318v	+7.95v	-7.95v	225v
320v	+8.00v	-8.00v	226v
322v	+8.15v	-8.15v	228v
324v	+8.10v	-8.10v	229v
326v	+8.15v	-8.15v	230v
328v	+8.20v	-8.20v	232v
330v	+8.25v	-8.25v	233v
332v	+8.30v	-8.30v	235v
334v	+8.35v	-8.35v	236v

Note: This table is based on DC output of 400v generating 10v at CH42 and an AC input of 200v producing -7.07v at CH43.

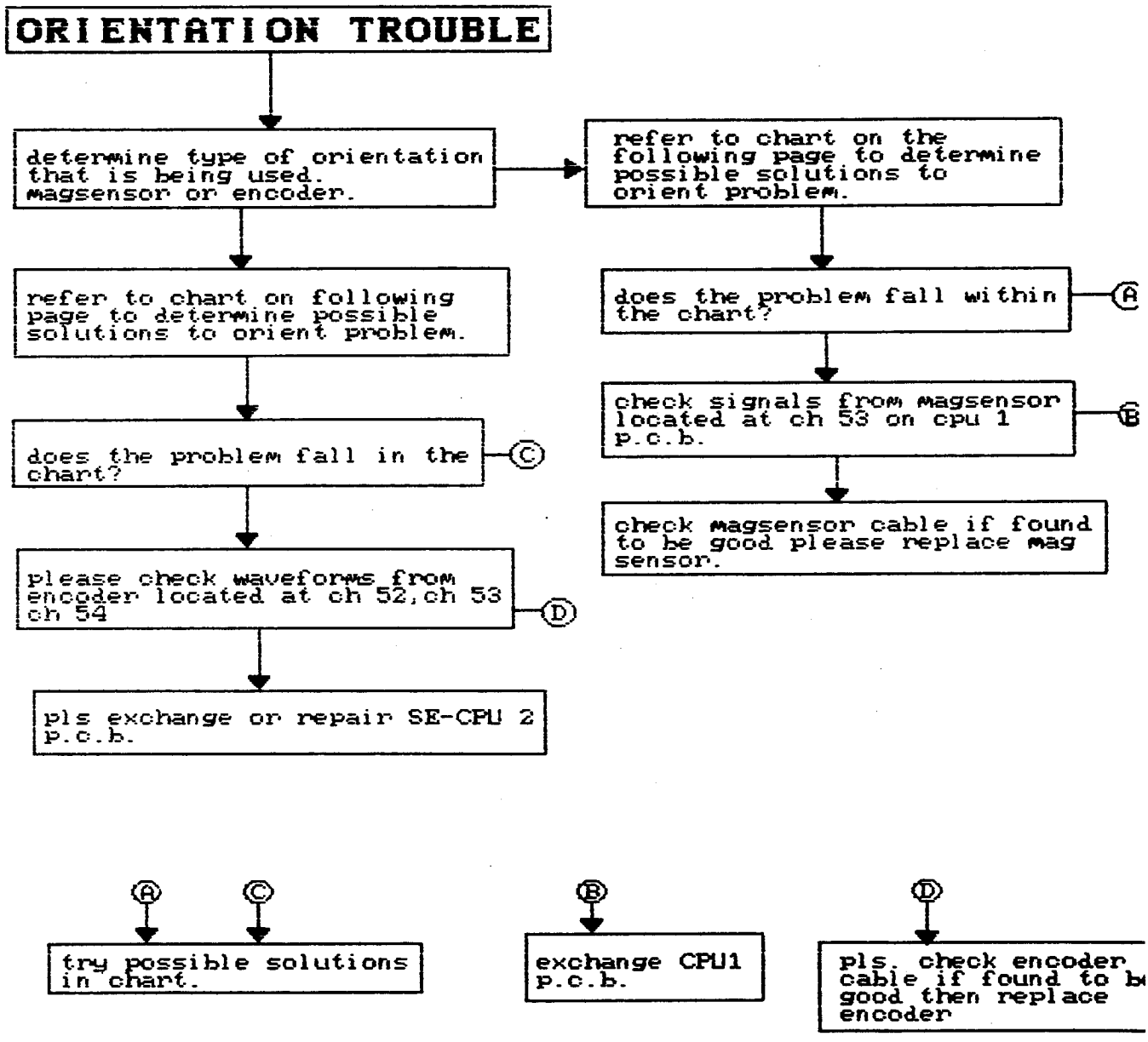
J. CPU FAULT 1,2,3

AL8 (LED12)	AL4 (LED13)	AL2 (LED14)	AL1 (LED15)
1	1	0	1
1	1	1	0
1	1	1	1

This consists of errors in the logic or in the operations inside the CPU cards. Observe the state after resetting. It may be necessary to replace the cards (or the CPU chips).

When LEDs 12 through 15 on the IO1 card do not light with resetting, the CPU card is faulty. Cards CPU1 and 2 must be replaced.

K. ORIENTATION TROUBLE

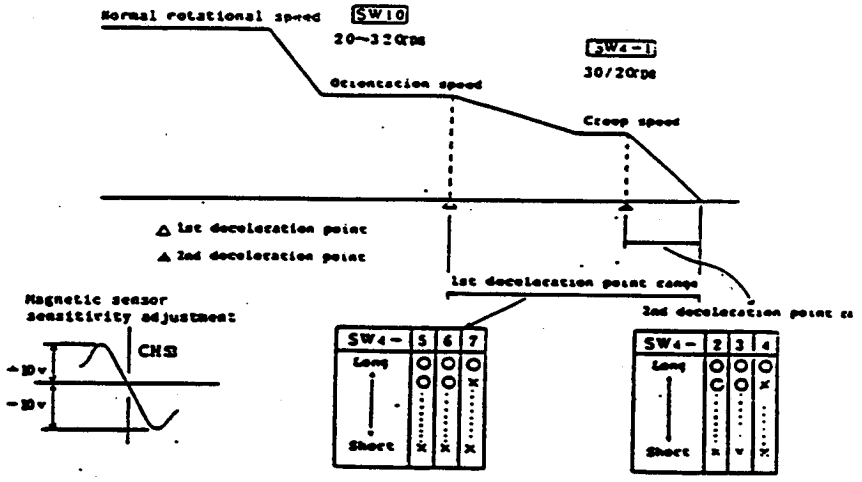


MAGSENSOR TYPE ORIENT

3.5 ORIENTATION ADJUSTMENT PROCEDURES

Note: Setting DIP Switches and setting pins may vary slightly depending on the ROM No. and bar zone of the printed circuit board. check these on the order parts list.

(1) Magnetic sensor system



Operate at the creep speed (20 to 30 rpm) and VR2 is adjusted to the limit at which the magnetic sensor sensitivity LED 11 lights, then CHS3 will be the peak voltage ± 10V.
The speed pattern for orientation is shown in the figure above.

In case of overshooting during stop:

- o Increase the 1st deceleration point range. (SW4-5,6,7)
- o Increase the 2nd deceleration point range. (SW4-2,3,4)
- o Reduce the orientation speed. (SW10 F→E→... →0)
- o Reduce the creep speed (SW4-1 OFF→ON)

Reduce the orientation time:

- o Reduce the 1st deceleration point range. (SW4-5,6,7)
- o Increase the orientation speed. (SW10 0→1→... →F)
- o Reduce the 2nd deceleration point range. (SW4-2,3,4)

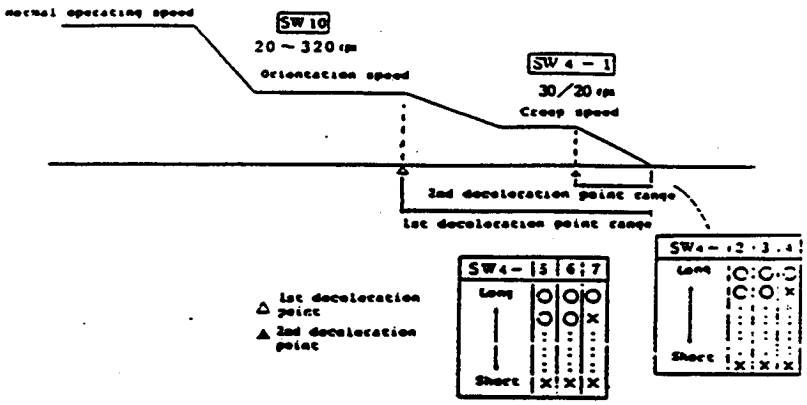
In case of hunting during stop:

- o Increase the 2nd deceleration point range. (SW4-2,3,4)
- o Reduce the magnetic sensor sensitivity. (VR2)
- o Reduce the creep speed. (SW4-1 OFF→ON)

Furthermore, the stop position is adjusted with the VR1 position shift.

ENCODER TYPE ORIENT

(2) Encoder system



The speed pattern during orientation is shown in the figure above.

In case of overshoorting during stop:

- o Increase the 1st deceleration point range. (SW4-5,6,7)
- o Reduce the orientation speed (SW10 F→E→...→0)
- o Increase the 2nd deceleration point range. (SW4-2,3,4)
- o Reduce the creep speed. (SW4-1 OFF→ON)

Reduce the orientation time:

- o Reduce the 1st deceleration point range. (SW4-5,6,7)
- o Increase the orientation speed. (SW10 0→1→...→F)
- o Reduce the 2nd deceleration point range. (SW4-2,3,4)

In case of hunting during stop:

- o Increase the 2nd deceleration point range. (SW4-2,3,4)
- o Reduce the creep speed. (SW4-1 OFF→ON)

Furthermore, the stop position is adjusted with the position shift SW13, 14 and 15.

FR-SF

TROUBLESHOOTING MANUAL

JOE BRUEN

11/14/91

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XII. SF-PW POWER SUPPLY——PGS. 33-34

I. ALO 10 UNDERVOLTAGE

A. ALARM WITH POWER ON

1. INCOMING POWER SHOULD BE 200-230VAC(+10%, -15%) AT THE BREAKER INSIDE THE SPINDLE CONTROLLER. ALARM WILL COME ON IF INCOMING POWER IS 170VAC OR LESS FOR 15mSEC OR MORE.

2. MEASURE VOLTAGE BETWEEN ACDOWN-DO24 ON CON21 OF SF-PW. IF NOT +5VDC, SF-PW IS DEFECTIVE.

B. ALARM WHILE RUNNING

1. CHECK INCOMING POWER DURING ACCEL & DECEL. IF VOLTAGE DROPS TO 170VAC OR LESS FOR 15mSEC OR MORE, INPUT POWER CAPACITY IS NOT SUFFICIENT & SHOULD BE INCREASED.

II. ALO 12 MEMORY ERROR 1

A. CHECK ROM'S 1, 2, & 3 ON SF-CA PCB THAT THEY ARE PROPERLY INSERTED AND IN THE CORRECT POSITION.

B. IF ROM'S ARE OK, SF-CA PCB IS DEFECTIVE.

III. ALO 15 MEMORY ERROR 2

A. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION.

B. CHECK CAM11 CABLE, WHICH IS USED FOR NC BUSLINK, FOR PROPER CONNECTION & REPLACE IF NECESSARY.

C. MAKE SURE ALL GROUND WIRES FROM NC, SPINDLE CONTROLLER, & MOTOR ARE PROPERLY CONNECTED & ALL CABLES ARE CORRECTLY SHIELDED.

D. IF ALL CONNECTORS & CABLES OK, EXCH. BUSLINK PCB.

E. IF BUSLINK PCB DOES NOT FIX PROBLEM, EXCH. EITHER MC611 OR MC632 ON NC SIDE.

IV. ALO 17 PCB ERROR

A. CHECK TO MAKE SURE CONTACTOR IN SPINDLE CONTROLLER PULLS IN & OUT PROPERLY. IF NOT, SOME COMPONENTS ON MAIN CKT. ARE DEFECTIVE & COMPLETE UNIT SHOULD BE EXCHANGED. IF OK, EXCH. SF-CA PCB.

V. ALO 20 IC MAC007 ERROR

A. THE MAC007 IC CHIP ON SF-CA PCB IS DEFECTIVE & MUST BE REPLACED OR EXCH. SF-CA PCB.

VI. ALO 21 NO SIGNAL 2 (SPINDLE ENCODER)

A. CHECK CABLE GOING FROM SPINDLE ENCODER TO SPINDLE CONTROLLER FOR CONTINUITY & PROPER CONNECTION. REPLACE IF NECESSARY.

B. CHECK SPINDLE ENCODER TO MAKE SURE ALL SIGNALS (A, B, & Z PHASES) ARE OK. REPLACE ENCODER IF ANY ONE OF THOSE SIGNALS ARE MISSING.

C. MAKE SURE ENCODER IS GETTING ITS 5VDC POWER SUPPLY FROM NC SIDE. THIS WILL CAUSE THE ENCODER SIGNALS NOT TO BE GENERATED.

D. CHECK PARAMETER #41 (OSL) FOR CORRECT SETTING & SET ACCORDING TO PARAMETER SHEET.

E. IF ALL ABOVE ITEMS ARE OK, EXCH. SF-TL(OR) PCB.

VII. ALO 22 IC MAC012 ERROR

A. THE MAC012 IC CHIP ON SF-CA IS DEFECTIVE & MUST BE REPLACED OR EXCH. SF-CA PCB.

VIII. ALO 23 EXCESSIVE SPEED ERROR

A. CHECK FOR CORRECT PHASE SEQUENCE & CONTINUITY OF U, V, & W MOTOR WIRES & REPLACE IF NECESSARY.

B. CHECK FOR POSSIBLE MOTOR OVERLOAD. REVIEW CUTTING CONDITION AND TOOL BEING USED.

C. CHECK TO SEE IF LED IN SF-PW IS LIT. IF NOT EXCH. SF-PW.

D. OPEN LOOP POSSIBLE? IF SO, PLG IN BACK OF MOTOR IS MISADJUSTED. WHILE CHECKING A & B PHASE SIGNALS FROM PLG, USE VR1, VR2, VR3, & VR4 TO SET PROPER GAIN & OFFSET. IF SIGNALS ARE NO GOOD & CANNOT BE ADJUSTED, EXCH. PLG PCB.

E. OPEN LOOP NOT POSSIBLE AND SPINDLE DOES NOT TURN, SPEED FEEDBACK CKT. ON SF-CA IS DEFECTIVE & MUST BE EXCHANGED.

IX. ALO 24 BREAKER TRIP
ALO 25 CONVERTER OVERCURRENT
ALO 32 INVERTER OVERCURRENT

— ALL RELATED

A. CHECK INCOMING POWER TO SPINDLE CONTROLLER WITH A SCOPE DURING ACCEL & DECEL & MAKE SURE SINE WAVE IS CLEAN & NOISE FREE.

B. CHECK PARAMETER #'S 01(NOX) & 02(MSL) TO PARAMETER SHEET & SET ACCORDINGLY.

Current Transformer

C. IF SPINDLE WILL NOT RUN AT ALL AND ALARM WILL NOT RESET, CHECK MAIN POWER TRANSISTORS FOR SHORT. IN THIS CASE, POWER TRANSISTOR(S) & SF-CA MUST BE EXCHANGED OR COMPLETE UNIT EXCH.

D. CHECK DIODE STACK IN BASE UNIT FOR SHORT OR OPEN CKT. IF BAD, CHECK IF MAIN CAPACITORS ARE BLOWN & REPLACE IF NECESSARY.

E. IF ALL ABOVE ITEMS OK, MOTOR SHOULD BE REBUILT AT MOTOR SHOP.

X. ALO 26 POWER PHASE LACK IF Alm 6/,11 /here Then

A. CHECK INCOMING POWER FOR 200-230VAC(+10%, -15%) BETWEEN EACH PHASE. IF PHASE MISSING, CHECK WIRING BACK TO MAIN TRANSFORMER. SF-CA

B. CHECK 5A FUSES(F1, F2, & F3) FOR CONTINUITY & REPLACE IF NECESSARY. Need to be replaced

XI. ALO 27 CPU ERROR (DIVISION ERROR)

A. CHECK GEAR RATIO PARAMETERS TO PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION.

C. CHECK NC BUSLINK(CAM11) CABLE FOR PROPER CONNECTION & REPLACE IF NECESSARY.

D. CHECK VKP, VKI, & ORS1 PARAMETERS TO PARAMETER SHEET & SET ACCORDINGLY.

E. IF PARAMETER #01(NOX) IS SET TO A "2", A SPECIAL MOTOR IS USED IN THIS CASE. CHECK PARAMETER #'S 81-AF TO PARAMETER SHEET & SET ACCORDINGLY.

XII. ALO 31 OVERSPEED

A. IF THE REFERENCE SPEED EXCEEDS 115% OF THE MAXIMUM SPEED, CHECK PARAMETER #31(TSP) TO THE PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK PLG FEEDBACK SIGNALS FOR CORRECT OFFSET & GAIN. IF SIGNALS WILL NOT ADJUST, EXCH. PLG PCB.

C. IF RPM IS UNSTABLE & AN OVERSHOOT OCCURS, CHECK WAVEFORM ACROSS SMO-OM TERMINALS ON SF-CA PCB. IF UNSTABLE, CHECK PARAMETER #'S 36 & 37(VKP & VKI) TO PARAMETER SHEET & SET ACCORDINGLY.

D. IF ALL ABOVE ITEMS CHECK OK, EXCH. SF-CA PCB.

XIII. ALO 33 CONVERTER OVERVOLTAGE

A. INCOMING VOLTAGE AT THE MAIN CKT. BREAKER OF THE SPINDLE CONTROLLER SHOULD BE 200-230VAC(+10%, -15%). IF VOLTAGE IS MORE THAN THE SPECIFIED LEVEL, ALARM WILL OCCUR.

B. CHECK THE INPUT POWER IMPEDANCE. IF TOO HIGH, ALARM WILL OCCUR AND IMPEDANCE MUST BE LOWERED.

C. CHECK RESISTANCE AND PHYSICAL CONDITION OF CONVERTER SIDE POWER TRANSISTORS IN BASE UNIT & FIRING CKT. ON SF-CA PCB. IF SHORTED OR DAMAGED, EXCH. SF-CA PCB AND CONVERTER SIDE POWER TRANSISTORS OR EXCH. COMPLETE UNIT.

D. IF ABOVE ITEMS CHECK OK, EXCH. SF-CA PCB.

XIV. ALO 13 EXTERNAL CLOCK ERROR / ALO 34 DATA PARITY ERROR / ALO 35 DATA ERROR / ALO 36 TRANSFER ERROR — ALL RELATED

A. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION.

B. CHECK NC BUSLINK(CAM 11) CABLE FOR PROPER CONNECTION & REPLACE IF NECESSARY.

C. MAKE SURE ALL CABLES ARE CORRECTLY SHIELDED & THAT ALL GROUND WIRES ARE TIGHTLY SECURE.

D. CHECK THE TERMINATIVE RESISTOR ON BUSLINK PCB FOR PROPER CONNECTION & REPLACE IF NECESSARY.

E. IF ABOVE ITEMS CHECK OK, THE BUS INTERFACE CKT. ON EITHER THE SPINDLE SIDE OR NC SIDE IS DEFECTIVE.

XV. ALO 37 PARAMETER ERROR

A. THIS ALARM OCCURS WHEN A PARAMETER EXCEEDS ITS ALLOWABLE RANGE. CHECK ALL PARAMETERS TO PARAMETER SHEET & SET ACCORDINGLY.

XVI. ALO 45 CONTROLLER OVERHEAT

A. PLACE SHORT PIN ON PIN 6(1A & 1B) OF SF-CA PCB. IF ALARM STILL PRESENT, ALARM CKT. DEFECTIVE ON SF-CA PCB.

B. IF ALARM CANCELS THEN-->

1. REPLACE FAN(S) INSIDE SPINDLE CONTROLLER IF INOPERATIVE OR DIRTY.

2. REPLACE FAN(S) INSIDE ELECTRICAL CABINET IF INOPERATIVE OR DIRTY.

3. CHECK FOR CONTINUITY ACROSS THS1 & THS2 IN BASE UNIT. REPLACE IF OPEN CKT.

XVII. ALO 46 MOTOR OVERHEAT

A. SHORT OHS1 & OHS2 WIRES INSIDE MOTOR TERMINAL BOX. IF ALARM STILL PRESENT, ALARM CKT. DEFECTIVE ON SF-CA PCB.

B. IF ALARM CANCELS THEN-->

1. IF SPINDLE MOTOR IS HOT, REPLACE COOLING FAN IF INOPERATIVE OR DIRTY. IF MOTOR IS OVERLOADED, REVIEW CUTTING CONDITION & TOOL BEING USED. ALSO IF MOTOR IS FREQUENTLY STARTED & STOPPED, DECREASE FREQUENCY OF START & STOP OPERATION OR INCREASE THE VALUE OF THE ACCEL TIME CONSTANT PARAMETER #33(CSN).

2. IF MOTOR IS NOT HOT, CHECK FOR CONTINUITY ACROSS OHS1 & OHS2 IN MOTOR TERMINAL BOX. REPLACE THERMAL SENSOR IF OPEN CKT.

XVIII. ALO 52 OVERDROOP

A. CHECK PARAMETER #03(PLG) TO THE PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK BITS 8 & E OF PARAMETER #30(ORS2) TO THE PARAMETER SHEET & SET ACCORDINGLY.

C. CHECK ORIENTATION ENCODER FOR PROPER OPERATION & REPLACE IF NECESSARY.

D. IF ABOVE ITEMS OK, INCREASE THE VALUE OF ACCEL TIME CONSTANT PARAMETER #33(CSN).

XIX. ALO 56 OTHER AXIS FAULT

A. REFER TO SERVO DRIVE MAINTENANCE MANUAL IF OTHER AXIS ALARM OCCURS.

B. CHECK NC BUSLINK(CAM11) CABLE FOR PROPER CONNECTION TO SPINDLE.

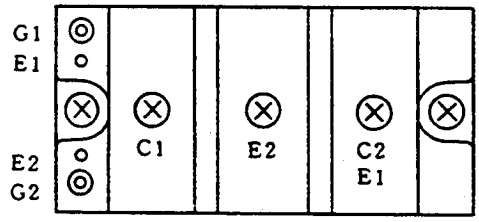
CN1A-->CAM11 CABLE
CN1B-->TERMINATIVE RESISTOR ---> REPLACE IF NECESSARY

XX. ALO 57 OPTION CARD ERROR

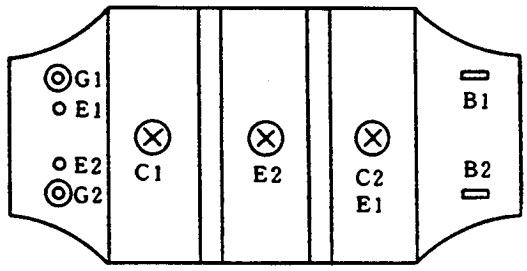
A. OPTION CARD INSTALLED ON SPINDLE CONTROLLER IS NOT THE CORRECT ONE. CHECK MACHINE SPECIFICATION & INSTALL CORRECT PCB.

CHECKING TRANSISTOR MODULE (INVERTER & CONVERTER SIDE)

(A) 75A OR LESS

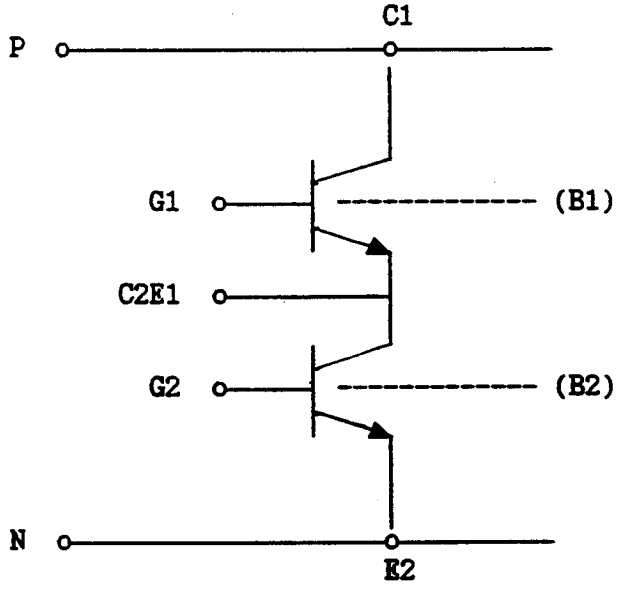


(B) 100A OR MORE



NOTE

THE FOLLOWING FIGURE SHOWS THE RELATIONSHIP BETWEEN THE TERMINAL SYMBOLS AND CIRCUIT DIAGRAM OF THE ABOVE TRANSISTOR MODULES.



A) MOTOR WIRES U, V, & W SHOULD BE DISCONNECTED BEFORE CHECKING.

B) SF-CA CARD SHOULD BE REMOVED FROM THE HINGE PANEL.

C) EVEN IF ONE OF THE TRANSISTOR MODULES IS DEFECTIVE, THE COMPLETE UNIT SHOULD BE EXCHANGED.

CHECKING TRANSISTOR MODULE (INVERTER & CONVERTER SIDE)

CHECKING TERMINAL	ANALOG METER TEST TERMINAL	GOOD	NO GOOD
BETWEEN C1-C2E1	C1: + TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
	C1: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN C1-G1	C1: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	C1: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN G1-C2E1	G1: + TERMINAL	SEVERAL 100OHM	SEV. 10OHM, INFINITE
	G1: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN C2E1-E2	C2E1:+TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
	C2E1:-TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN C2E1-G2	C2E1:+TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	C2E1:-TERMINAL	INFINITE	SHORT SEVERAL 100OHM
BETWEEN G2-E2	G2: + TERMINAL	SEVERAL 100OHM	SHORT, INFINITE
	G2: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN B1-C1	B1: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	B1: - TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
BETWEEN B2-C2E1	B2: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	B2: - TERMINAL	SEVERAL 10OHM	SHORT, INFINITE

NOTE

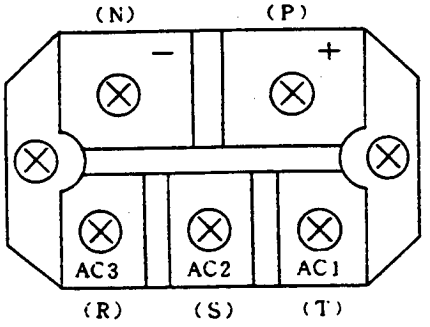
A) USE ANALOG METER FOR TEST READINGS (X10OHM RANGE)

B) + TERMINAL IS RED LEAD OF ANALOG METER

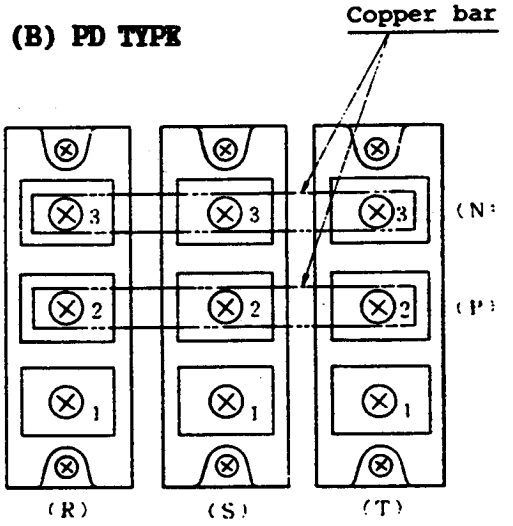
C) - TERMINAL IS BLACK LEAD OF ANALOG METER

CHECKING DIODE STACK

(A) PT TYPE

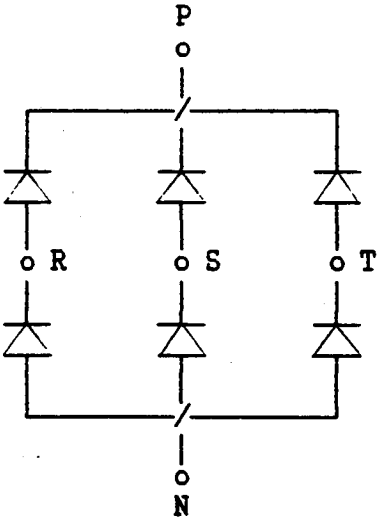


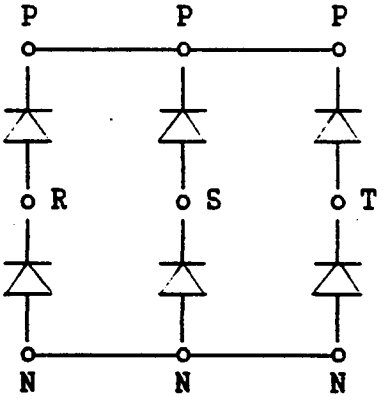
(B) PD TYPE



****NOTE****

THE FOLLOWING FIGURES SHOW THE RELATIONSHIP BETWEEN THE TERMINAL SYMBOLS AND CIRCUIT DIAGRAMS OF THE ABOVE DIODE STACKS.





A) DISCONNECT P & N WIRES FROM DIODE STACKS BEFORE CHECKING.

B) EVEN IF ONE OF THE DIODE STACKS IS DEFECTIVE, THE COMPLETE UNIT SHOULD BE EXCHANGED.

CHECKING DIODE STACK

CHECKING TERMINAL	ANALOG METER TEST TERMINAL	GOOD	NO GOOD
BETWEEN P & R	P: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	P: - TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
BETWEEN P & S	P: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	P: - TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
BETWEEN P & T	P: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	P: - TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
BETWEEN N & R	N: + TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
	N: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN N & S	N: + TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
	N: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN N & T	N: + TERMINAL	SEVERAL 10OHM	SHORT, INFINITE
	N: - TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
BETWEEN P & N	P: + TERMINAL	INFINITE	SHORT, SEVERAL 100OHM
	P: - TERMINAL	SEVERAL 100OHM	SHORT, INFINITE

NOTE

A) USE ANALOG METER FOR TEST READINGS (X10OHM RANGE)

B) + TERMINAL IS RED LEAD OF ANALOG METER

C) - TERMINAL IS BLACK LEAD OF ANALOG METER

FR-SF BI-MOS TRANSISTOR CHECK

These are IN-CIRCUIT ohm readings taken with main breaker off, motor, and SF-CA card connected to base. Readings taken with a digital multimeter. Normally a 1Kohm resistor is connected between Gate and Emitter.

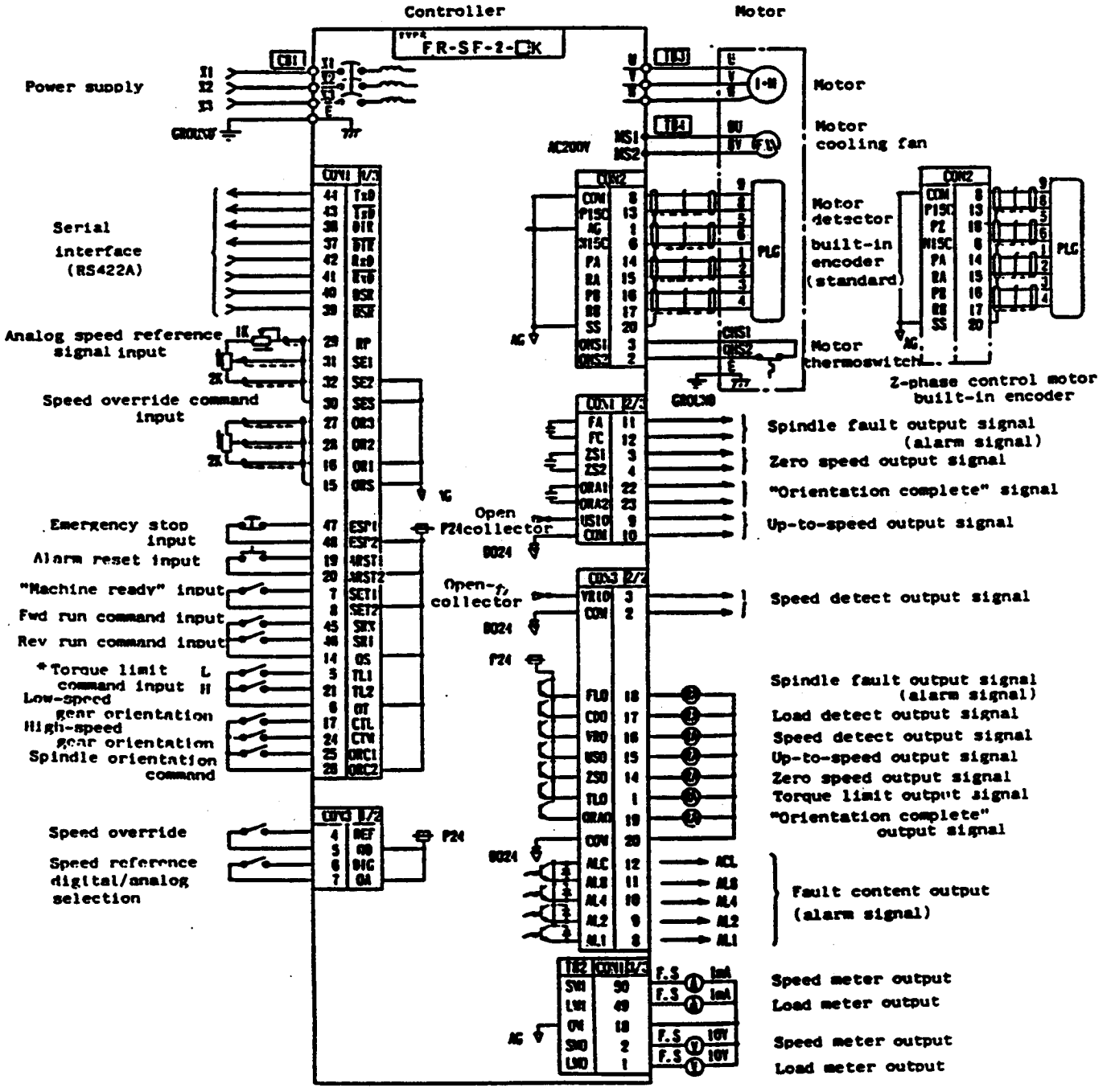
Inverter			Converter		
Collector to Emitter Test			Diode Test Collector to Emitter Test		
P to U		10KΩ to 40KΩ	P to R3		40KΩ to 100KΩ
P to V		10KΩ to 40KΩ	P to S3		40KΩ to 100KΩ
P to W		10KΩ to 40KΩ	P to T3		40KΩ to 100KΩ
U to N		10KΩ to 40KΩ	R3 to N		40KΩ to 100KΩ
V to N		10KΩ to 40KΩ	S3 to N		40KΩ to 100KΩ
W to N		10KΩ to 40KΩ	T3 to N		40KΩ to 100KΩ
Collector to Gate Test			Collector to Gate Test		
P to CH47		30KΩ to 100KΩ	P to CH53		50KΩ to 100KΩ
P to CH48		30KΩ to 100KΩ	P to CH54		50KΩ to 100KΩ
P to CH49		30KΩ to 100KΩ	P to CH55		50KΩ to 100KΩ
U to CH50		30KΩ to 100KΩ	R3 to CH56		50KΩ to 100KΩ
V to CH51		30KΩ to 100KΩ	S3 to CH57		50KΩ to 100KΩ
W to CH52		30KΩ to 100KΩ	T3 to CH58		50KΩ to 100KΩ
Gate to Emitter Test *			Gate to Emitter Test		
CH47 to U		900Ω to 1KΩ	CH53 to R3		900Ω to 1KΩ
CH48 to V		900Ω to 1KΩ	CH54 to S3		900Ω to 1KΩ
CH49 to W		900Ω to 1KΩ	CH55 to T3		900Ω to 1KΩ
CH50 to N		900Ω to 1KΩ	CH56 to N		900Ω to 1KΩ
CH51 to N		900Ω to 1KΩ	CH57 to N		900Ω to 1KΩ
CH52 to N		900Ω to 1KΩ	CH58 to N		900Ω to 1KΩ

* Value is for transistor • 2 if two trans are in parallel etc

FR-SF /320M /335M /M32 /T32 SPINDLE PARAMETER CROSS REFERENCE TABLE						
FR-SF PARA. No.#	320M PARA. NO.#	335M PARA. No.#	M32 PARA. No.#	T32 PARA. No.#	FR-SF PARA. Name	FR-SF PARAMETER Description.
21	1	33	J81	SP1	PG1	Orient 1st deceleration point.
22	2	34	J82	SP2	PG2	Orient 2nd deceleration point.
23	3	35	J83	SP3	PGC	P Loop gain C axis sync-tap.
24	4	36	J84	SP4	ZRZ	Orient in position range.
25	5	37	J85	SP5	OSP	Spindle orientation speed.
26	6	38	J86	SP6	CSP	Orientation creep speed.
27	7	39	J87	SP7	PST	Position shift amount.
28	8	40	J88	SP8	BRC	Not used, Spindle side.
29	9	41	---	SP9	---	Not used, Spindle side.
2A	10	42	---	SP10	---	Not used, Spindle side.
2B	11	43	---	SP11	---	Not used, Spindle side.
2C	12	44	---	SP12	---	Not used, Spindle side.
2D	13	45	---	SP13	---	Not used, Spindle side.
2E	14	46	---	SP14	---	Not used, Spindle side.
2F	15	47	J101U J102L	SP15	OR1/ ORS1	Orient stop control 1.
30	16	48	J103U J104L	SP16	OR2/ ORS2	Orient stop control 2.
31	17	49	J105	SP17	TSP	Maximum motor speed.
32	18	50	J106	SP18	ZSP	Zero speed range.
33	19	51	J107	SP19	CSN	Acceleration time constant.
34	20	52	J108	SP20	SDR/ SDT	Up to speed detect range.
35	21	53	K1	SP21	TRQ/ TLM	Torque limit by TL2.
36	22	54	K2	SP22	VKP	Speed Loop proportional gain.
37	23	55	K3	SP23	VKI	Speed Loop integral gain.
38	24	56	K4	SP24	TYP	Transition type S to P Loop.
39	25	57	K5	SP25	GRA1	Spindle side No. of teeth Gear #1.
3A	26	58	K6	SP26	GRA2	Spindle side No. of teeth Gear #2.
3B	27	59	K7	SP27	GRA3	Spindle side No. of teeth Gear #3.
3C	28	60	K8	SP28	GRA4	Spindle side No. of teeth Gear #4.
3D	29	61	K9	SP29	GRB1	Motor side No. of teeth Gear #1.
3E	30	62	K10	SP30	GRB2	Motor side No. of teeth Gear #2.
3F	31	63	K11	SP31	GRB3	Motor side No. of teeth Gear #3.
40	32	64	K12	SP32	GRB4	Motor side No. of teeth Gear #4.

2.5 External wiring

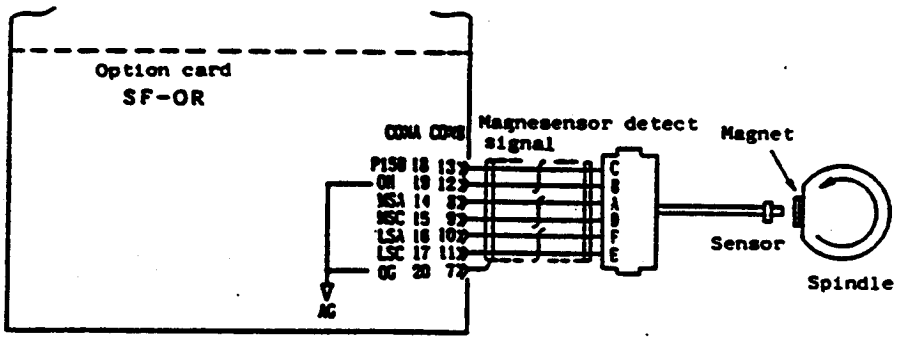
2.5.1 Basic wiring (without option card) FR-SF-2-□K



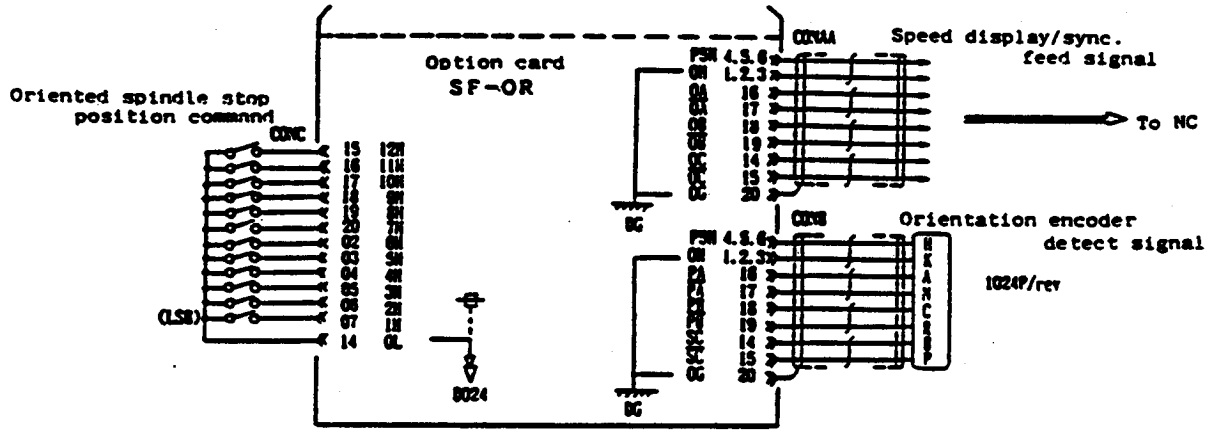
Note *: When the system is equipped with index function, input signal TL1 is used for "CW index", and TL2 for "CCW index".

2.5.2 Model equipped with oriented spindle stop function (with option card SF-OR) FR-SF-2-□K-R

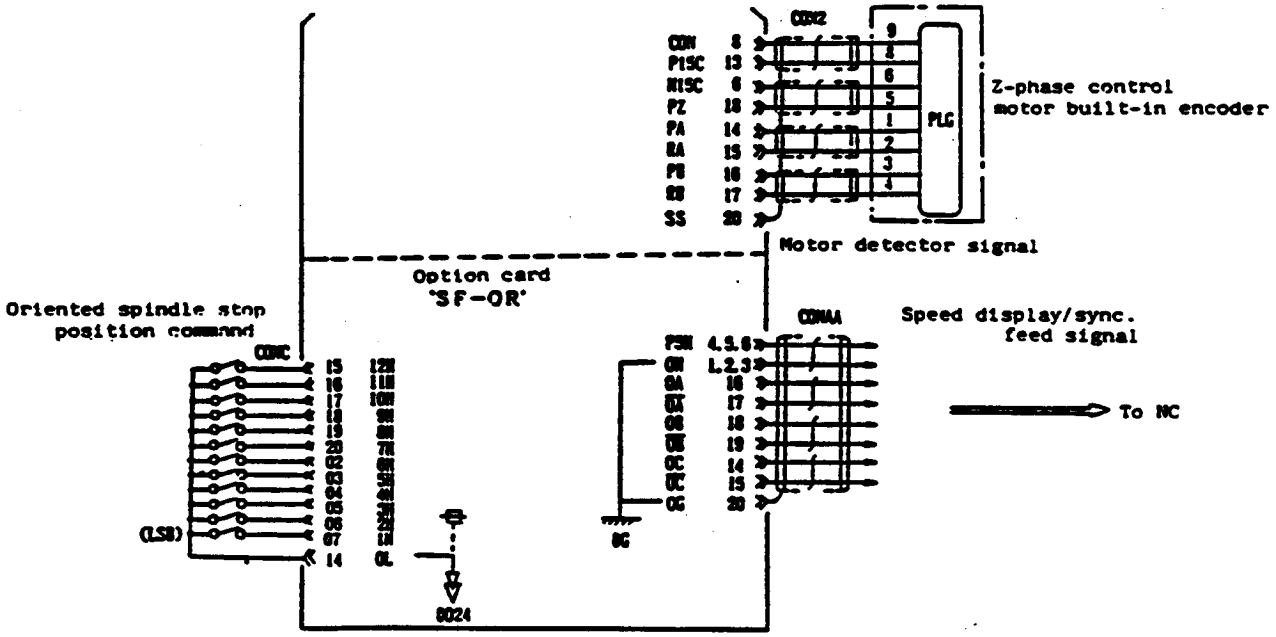
(1) Magnesensor spindle orientation (1 div.)



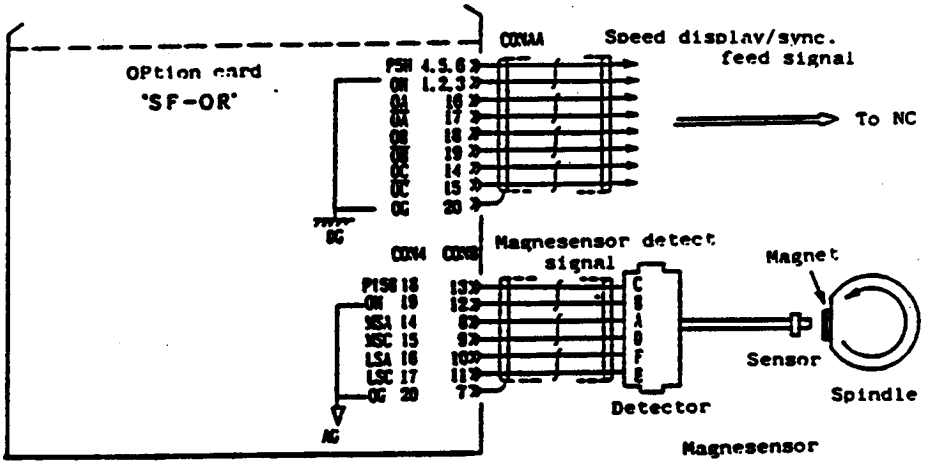
(2) Encoder spindle orientation (4096 div.)/indexing function



(3) Z-phase control motor built-in encoder multi-point spindle orientation/index function

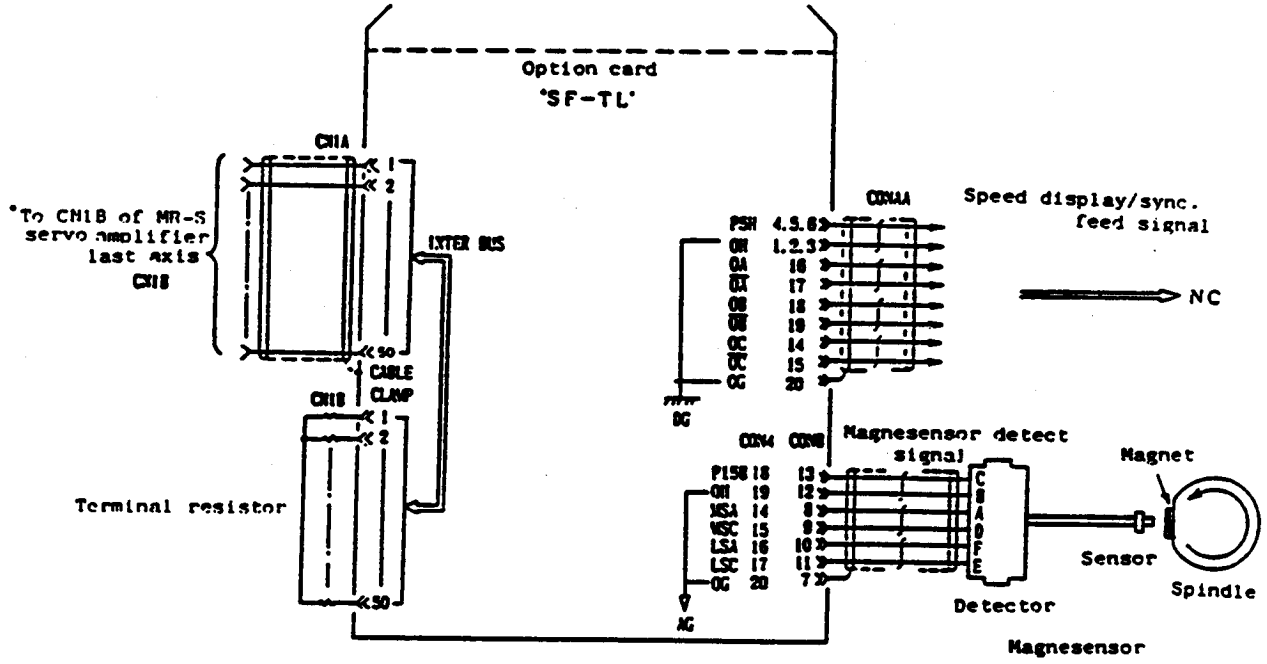


(4) Magnesensor spindle orientation (1 div.) with motor speed feedback output (for spindle speed display, sync. feed signal)

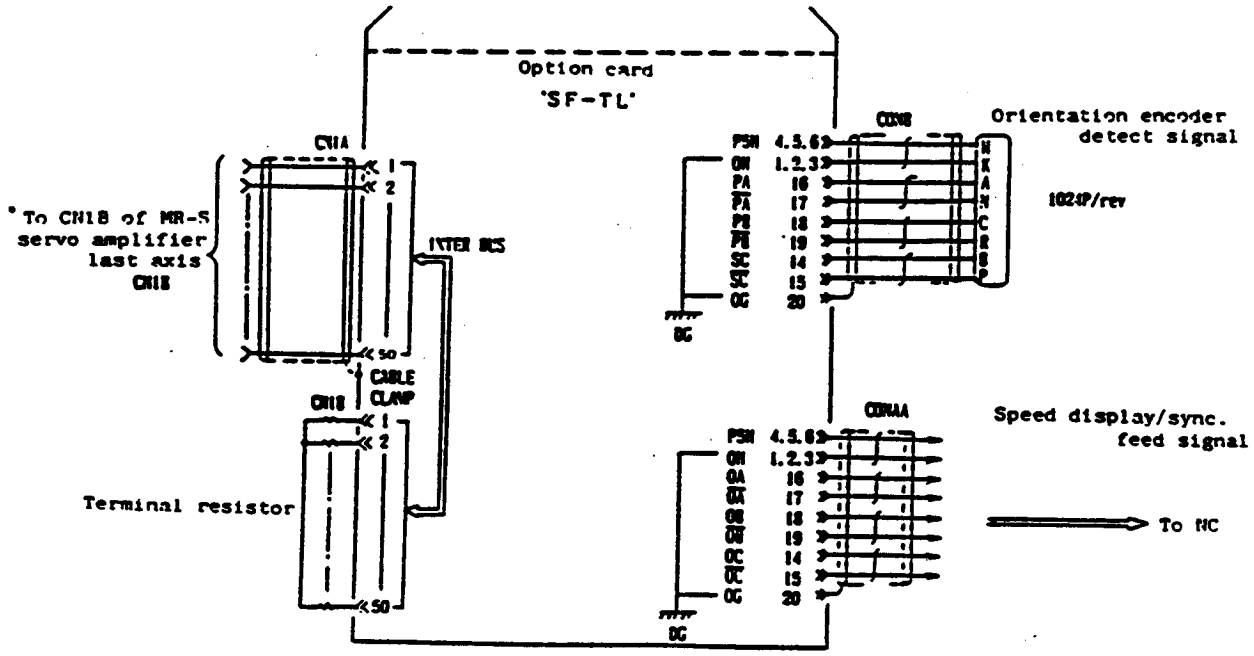


2.5.3 Model bus-linked to M300 series CNC, and equipped with high-speed sync. tap spindle orientation (with option card SF-TL) FR-SF-2-□K-T

(1) Motor built-in encoder high-speed sync. tap magnesensor spindle orientation (1 div.)

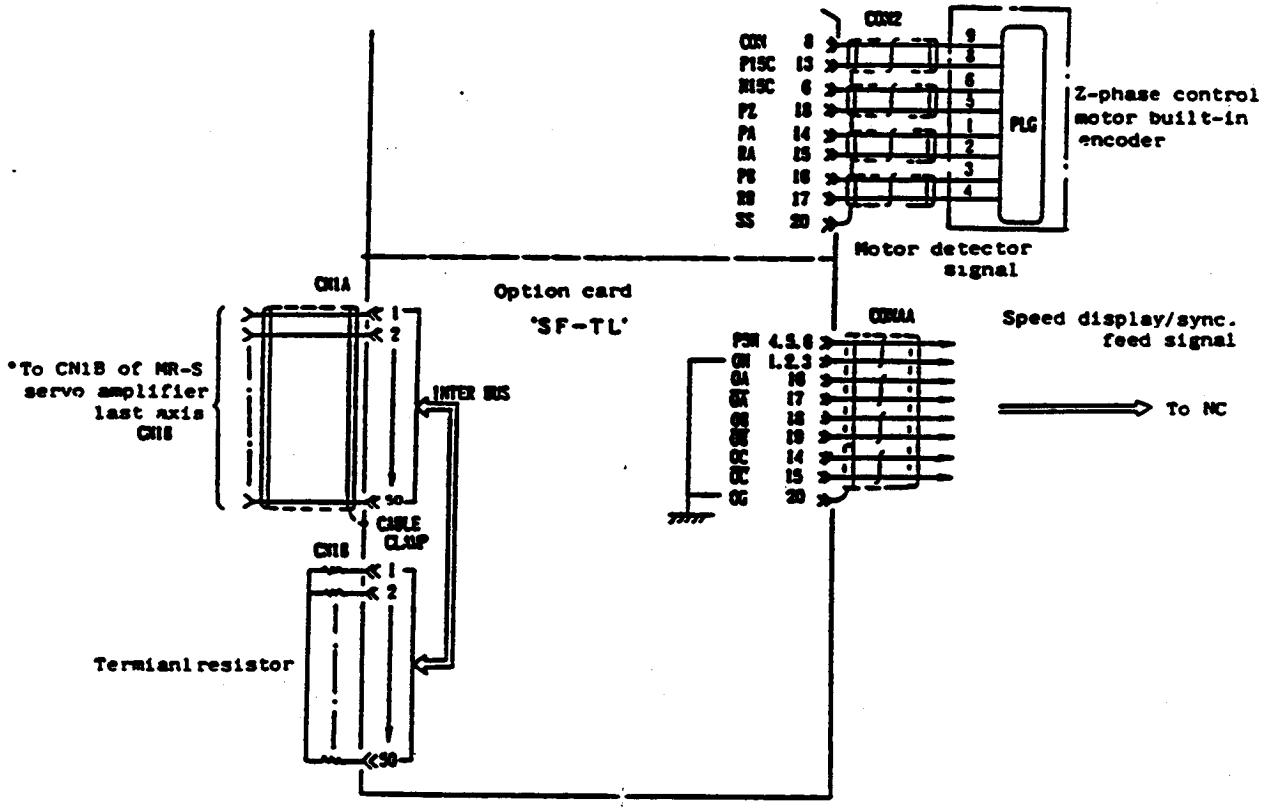


(2) Encoder high-speed sync. tap spindle orientation (4096 div.)/index function



*When cable is used for bus-line connection to M300, it must be shielded with cable clamps (secured to grounding plate). For installation of the cable, refer to the Standard Specification (BNP-A0901-18-E).

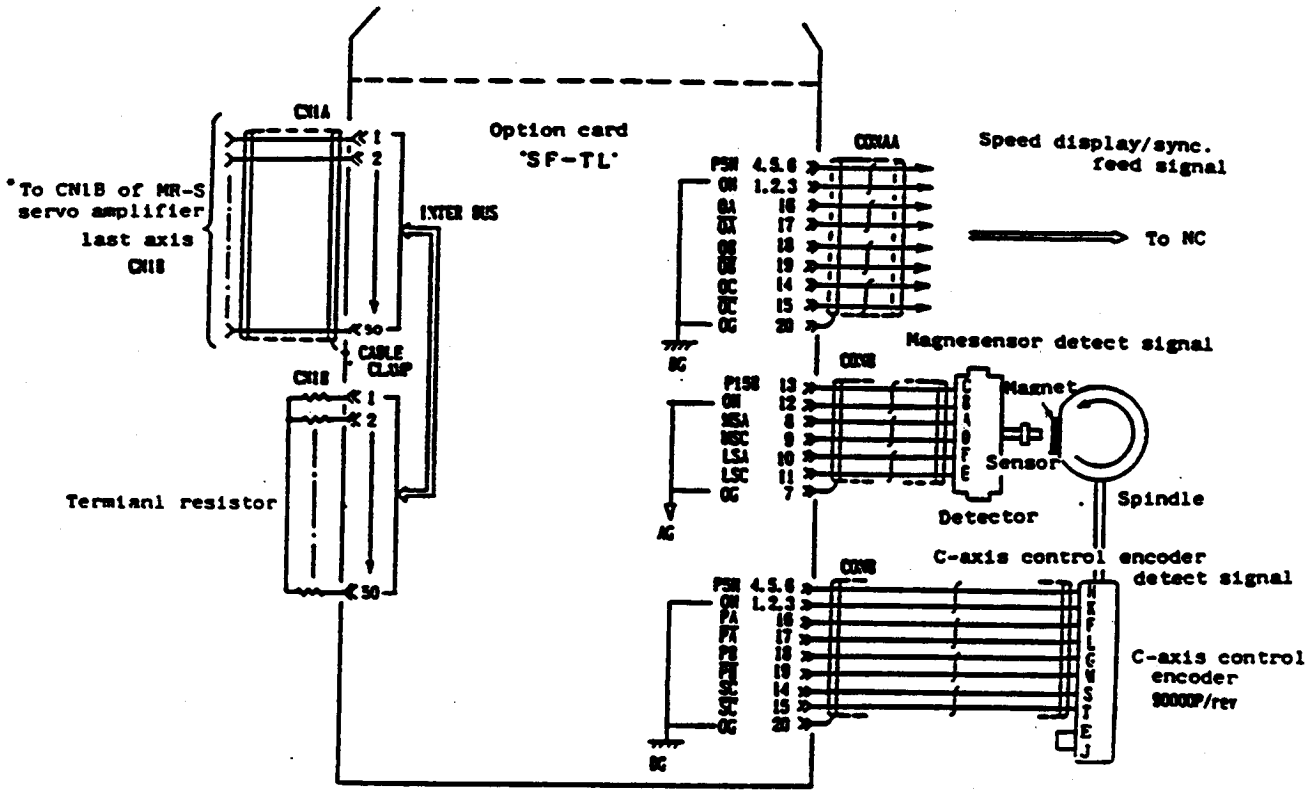
(3) Z-phase control motor built-in encoder high-speed sync. tap multi-point spindle orientation/index function



*When cable is used for bas-line connection to M300, it must be shielded with cable clamps (secured to grounding plate). For installation of the cable, refer to the Standard Specification (BNP-A0801-18-E).

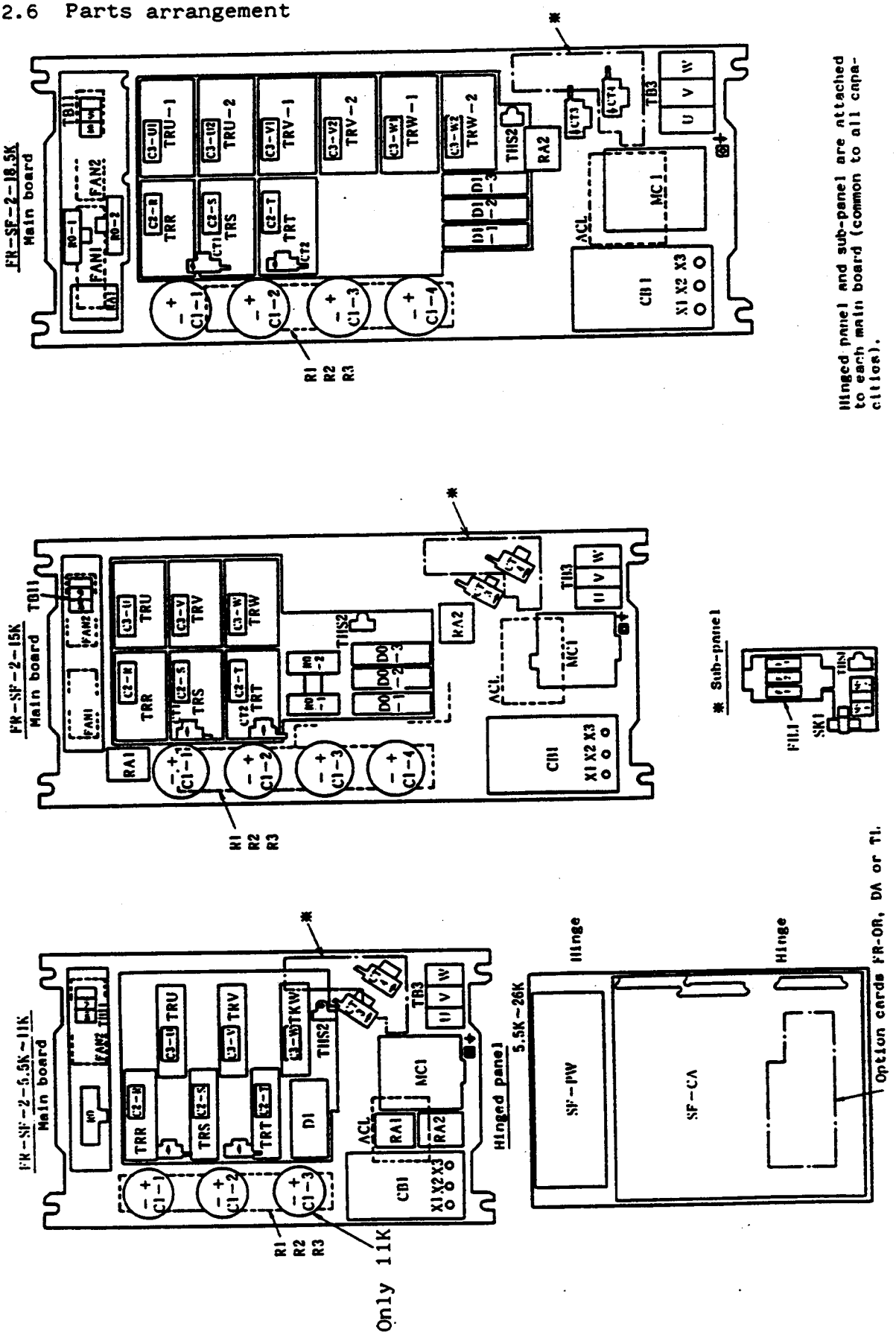
2.5.4 Model bus-linked to M300 series CNC

(1) C-axis control magnesensor spindle orientation (with option card SF-TL) FR-SF-2-□K-T

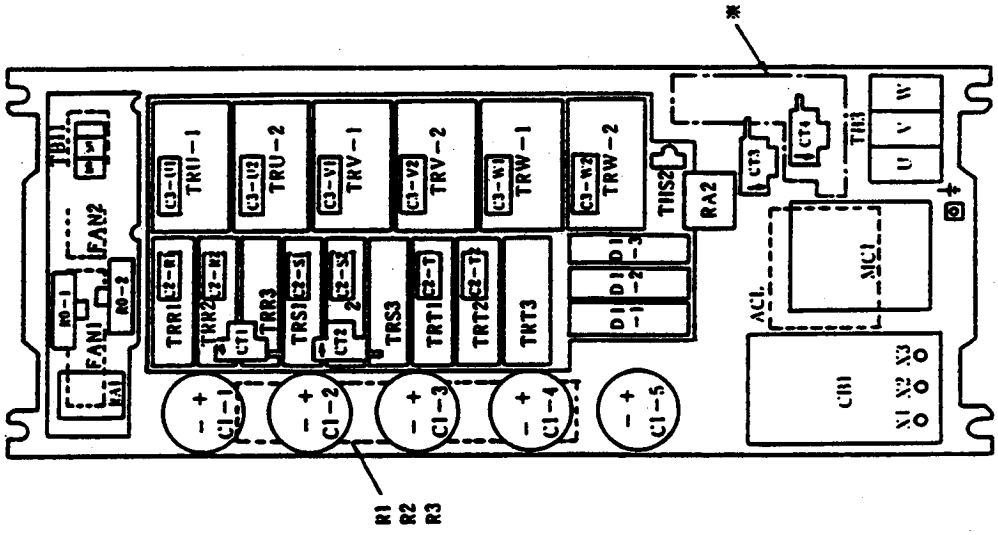


*When cable is used for bas-line connection to M300, it must be shielded with cable clamps (secured to grounding plate). For installation of the cable, refer to the Standard Specification (BNP-A0801-18-E).

2.6 Parts arrangement



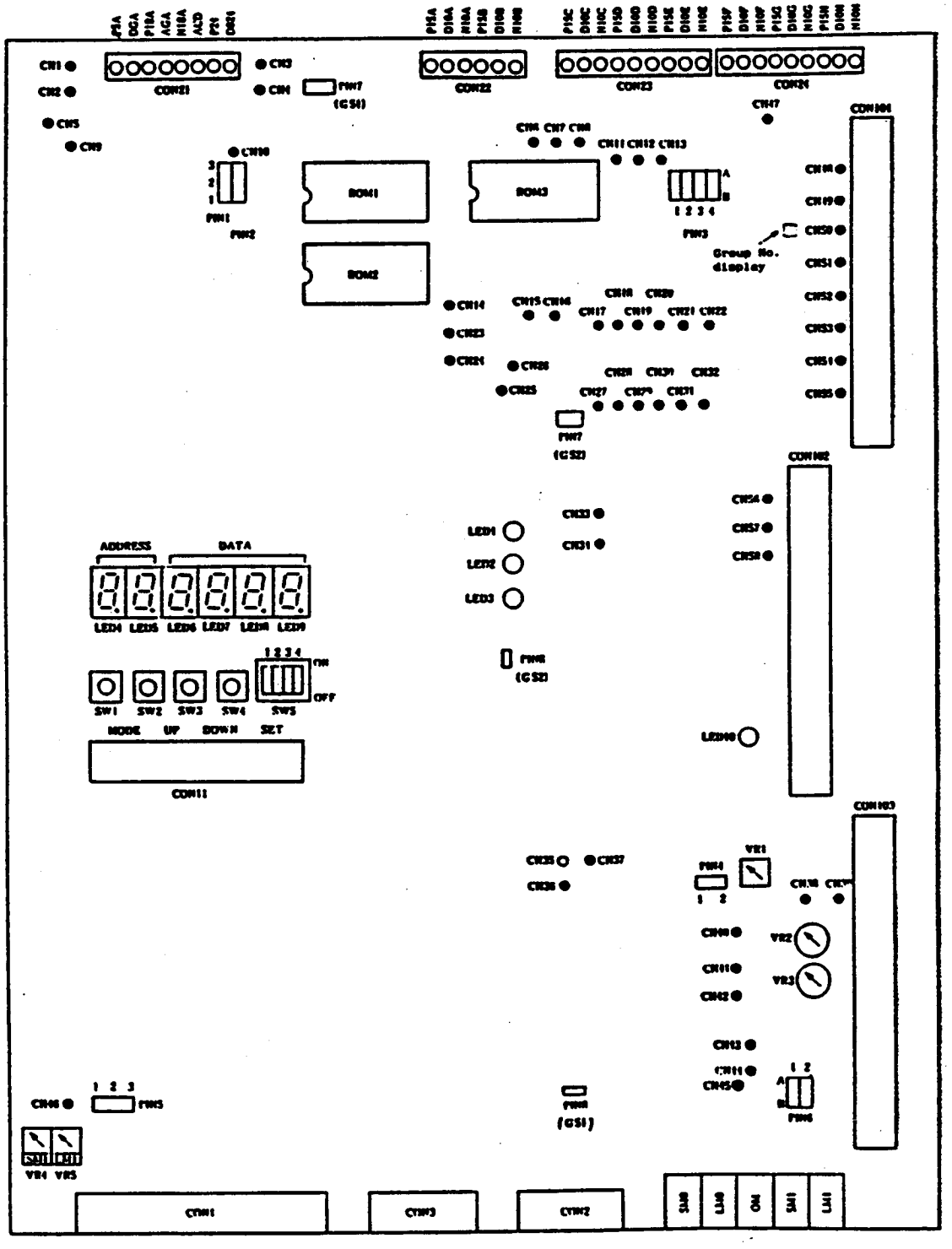
FR-SF-2-22K,26K
Main board



§4. CARD CHECK

4.1 Card SF-CA

Note: PIN7 and PIN8 differ depending on card group No. (G51 or G52).



(1) DIP switch list

O: DIP switch set at ON
×: DIP switch set at OFF

Switch No.	Name	Description
SW5-1 to 3	TEST MODE selection	TEST MODE is selected. 1 2 3 × × × ..... Normal setting O × × ..... NC parameters are ignored. × O × ..... FR-SF internally set parameters become valid. O O × ..... × × O ..... O × O ..... × O O ..... O O O ..... Test mode o Test aging o Parameter transfer o ROM initialization
SW5-4	Meter calibration	4 O ..... Meter full-scale output × ..... Meter normal mode For calibration of speed meter and load meter When SW5-4 is set at ON, meter full-scale voltage is output. Adjust potentiometer VR4 for calibration of speed meter, and VR5 for calibration of load meter.

(2) Pushbutton list

Switch No.	Name	Description
SW1	MODE	LED display mode is selected. Each time the button is pressed, display mode changes in the following sequence: "STATUS" ⟶ "DIAGNOSIS" ⟶ "ALARM" ⟶ "PARAMETER(1)" .... "PARAMETER(8)" ⟶ "DEBUG"
SW2	UP	This button is pressed to scroll up display in each mode. In PARAMETER mode, parameter data is incremented when this button is pressed after

Switch No.	Name	Description
		UP button is pressed.
SW3	DOWN	This button is pressed to scroll down display in each mode. In PARAMETER mode, parameter data is decremented when this button is pressed after DOWN button is pressed.
SW4	SET	This button is pressed to rewrite parameter. When SET button is pressed during PARAMETER mode, parameter data flickers. Then press UP and/or DOWN button to rewrite the data.
PB1		This button is pressed to reset CPU. After parameter is rewritten, press this button. Do not reset CPU while motor is running.

(3) Jumper pin list

Pin No.	Name	Setting	Description
PIN1 PIN2	Bus interface setting *For use of this function, parameter should be set. (#04MOD)		This setting is made when FR-SF is not bus-linked with M300 series CNC. Set parameter #04MOD to "0".
			This setting is made when FR-SF is bus-linked with M300 series CNC. Set parameter #04MOD to "2".
PIN3	Short-circuit prevention time setting		Time for which short-circuiting of transistors is prevented is set. Since improper setting may cause damage to equipment, make sure the setting meets the order specification table.
PIN4	Test pin for conveter check		These test pins are used in the final test before shipment. Do not set pin.
PIN5	Analog speed reference signal selection *For use of this function, parameter should be set. (#05DSR)		For single-polarity signal input (0 to +10V) Set parameter #05DSR to "0".
			For double-polarity signal input (-10 to +10V) *When input offset must be adjusted finely, this setting is used. Set paam parameter #05DSR to "1".
PIN6	Test pin for control circuit check		These test pins are used in the final test before shipment. Alarm caused by controller overheat is reset when 1A is connected to 1B. When 2A is connected to 2B, alarm caused by tripping of breaker is reset.
PIN7	Current loop gain select		For FR-SF capacity ranging from 5.5kW to 15kW

Pin No.	Name	Setting	Description
PIN7 (cont'd)			For FR-SF capacity larger than 18.5kW
PIN8			(Currently not used)

(4) LED list

LED No.	Description
LED1	Lights during regenerative energy is arising (converter).
LED2	Lights when inverter/converter base current is interrupted.
LED3	Watch dog alarm Lights after the power is turned on or after resetting. When FR-SF is bus-linked with M300 series CNC, the LED goes on lighting until initialization of NC is completed.
LED4 〜 LED9	Status display and alarm display
LED10	Lights during converter charging.

(5) Potentiometer list

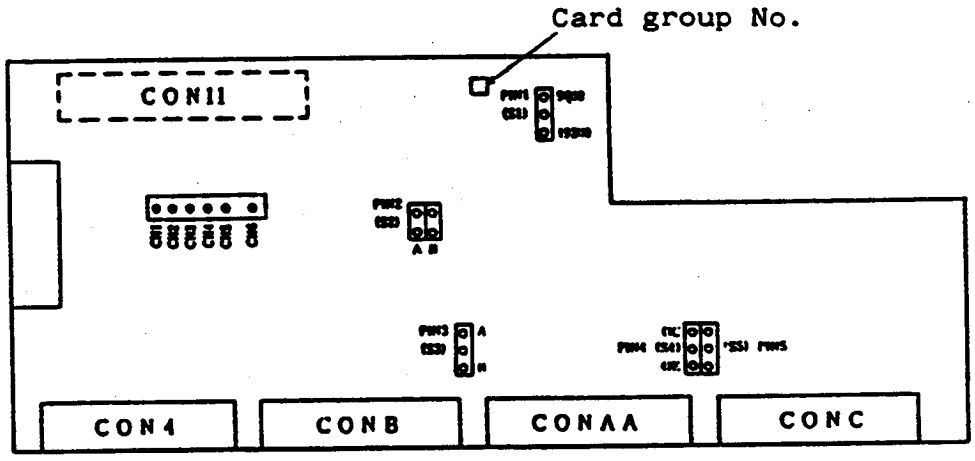
VR No.	Description
VR1	Converter voltage gain adjustment (CH35)
VR2	U-phase current feedback zero adjustment (CH40)
VR3	V-phase current feedback zero adjustment (CH41)
VR4	Speed meter adjustment
VR5	Load meter adjustment

(6) Check terminal list

Terminal No.	Common	Description
CH1	DGA	+5V
CH2		OV, DGA (digital signal grounding)
CH3		OV, DO24 (+24V grounding)
CH4	DO24	+24V
CH5	AGA	+15V
CH6	AGA	U-phase voltage command
CH7	AGA	V-phase voltage command
CH8	AGA	W-phase voltage command
CH9		OV, AGA (analog signal grounding)
CH10	AGA	-15V
CH11	AGA	V-phase PWM waveform
CH12	AGA	W-phase PWM waveform
CH13	AGA	U-phase PWM waveform
CH14	AGA	V-phase standard sinusoidal vaveform
CH15	AGA	W-phase sandaard sinusoidal waveform
CH16	AGA	W-phase inverter current detection
CH17	AGA	U-phase base amplifier drive signal
CH18	AGA	V-phase base amplifier drive signal
CH19	AGA	W-phase base amplifier drive signal
CH20	AGA	$\overline{U}$-phase base amplifier drive signal
CH21	AGA	$\overline{V}$-phase base amplifier drive signal
CH22	AGA	$\overline{W}$-phase base amplifier drive signal
CH23	AGA	U-phase standard sinusoidal waveform
CH24	AGA	Triangle wave carrier
CH25	AGA	Current amplitude command
CH26	AGA	-10V standard voltage
CH27	AGA	R-phase base amplifier drive waveform
CH28	AGA	S-phase base amplifier drive waveform

Terminal No.	Common	Description
CH29	AGA	T-phase base amplifier drive waveform
CH30	AGA	$\bar{R}$-phase base amplifier drive waveform
CH31	AGA	$\bar{S}$-phase base amplifier drive waveform
CH32	AGA	$\bar{T}$-phase base amplifier drive waveform
CH33	DGA	Regenerative brake current control ... H level
CH34	AGA	Regenerative brake overcurrent .... L level
CH35	AGA	10V for 400V converter voltage
CH36	AGA	Supply voltage peak rectification
CH37	AGA	AD converter intput (speed feedback and voltage reference signal detection)
CH38	AGA	+10V standard voltage
CH39	AGA	Regenerative converter current detect 10V at 200%
CH40	AGA	U-phase inverter current detect 2.5V at 100%
CH41	AGA	V-phase inverter current detect 2.5V at 100%
CH42	AGA	Converter DC current detect 10V at 200%
CH43	AGA	Inverter U, V, W-phase current full-wave rectification waveform 10V at 200%
CH44	AGA	Speed feedback, B-phase
CH45	AGA	Speed feedback, A-phase
CH46	AGA	Analog speed reference signal input
CH47	CON24-2	Inverter base amplifier output, U phase
CH48	CON26-6	Inverter base amplifier output, V phase
CH49	CON24-10	Inverter base amplifier output, W phase
CH50	CON22-2	Inverter base amplifier output, $\bar{U}$ phase
CH51	CON22-2	Inverter base amplifier output, $\bar{V}$ phase
CH52	CON22-2	Inverter base amplifier output, $\bar{W}$ phase
CH53	CON23-2	Converter base amplifier output, R phase
CH54	CON23-6	Converter base amplifier output, S phase
CH55	CON23-10	Converter base amplifier output, T phase
CH56	CON22-5	Converter base amplifier output, $\bar{R}$ phase
CH57	CON22-5	Converter base amplifier output, $\bar{S}$ phase
CH58	CON22-5	Converter base amplifier output, $\bar{T}$ phase

4.2 Card SF-OR



Note: Name of pin may differ depending on card group No. (G51, G52).

G51	(S1)	(S2)	(S3)	(S4)	(S5)
After G51	PIN1	PIN2	PIN3	PIN4	PIN5

(1) Jumper pin list

Pin No.	Name	Setting	Description
PIN (S1)	Baudrate selection		CON60 serial interface baudrate is set to 9600.
			CON60 serial interface baudrate is set to 19200.
PIN2 (S2)			(Currently not used)
			(Currently not used)
PIN3 (S3)	Oriented spindle stop encoder power supply		Power supply of NC is not available.
			Power supply of NC is available.
PIN4 (S4)	Oriented spindle stop position command interface selection		Synchro drive (open collector)
			Source drive (open emitter)
PIN5 (S5)	Oriented spindle stop position command interface common output selection		CONC-14 is used for DGA.
			CONC-14 is used for 24V.

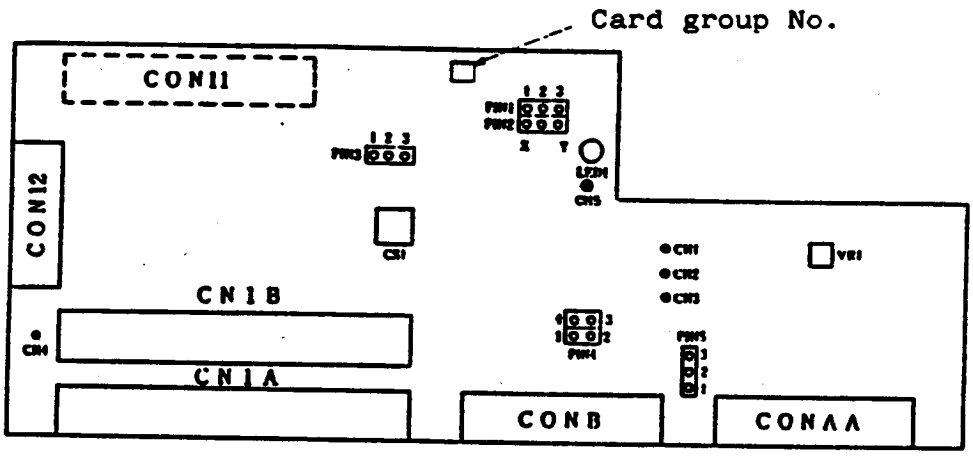
(2) Check terminal list

Terminal No.	Common	Description
CH1	DGA	Position feedback, A phase
CH2	DGA	Position feedback, B phase
CH3	DGA	Position feedback, Z phase
CH4	AGA	Magnesensor output
CH5	DGA	Magnesensor, linear zone output
CH6		Digital signal, common (DGA)

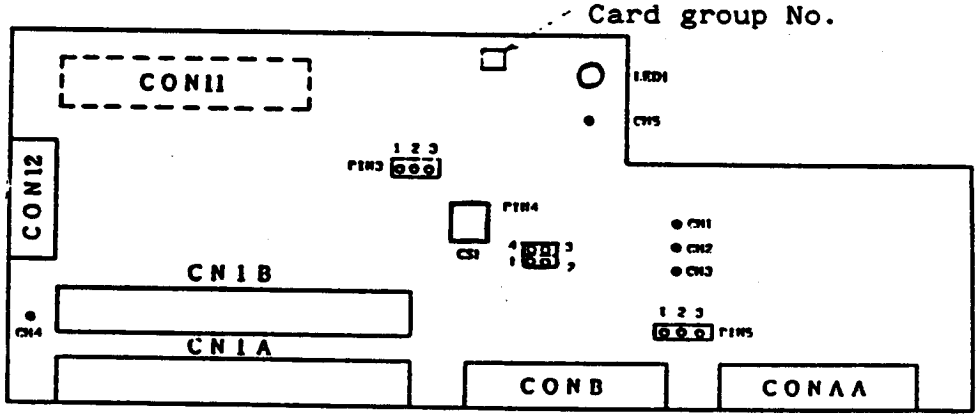
Note: Common "AG" should be take from CH9 of card SF-CA.

4.3 Card SF-TL

(1) Parts arrangement, card G51 group



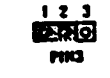
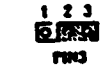
(2) Parts arrangement, card G52 group



(3) Switch list

Name	Description
CS1	Rotary switch for axis No. setting. Usually, it is set to "6". When C-axis control is used, C axis No. is set.

(4) Jumper pin list

Pin No.	Name	Setting	Description
PIN1 PIN2 (Not provided for card group No. 52)	CONAA output selection		Encoder feedback signal from CONB is output.
			Feedback signal from motor detector (CON2) is output to CONAA. For Z phase, linear zone of magne-sensor is output.
			Feedback signal from motor detector (CON2) is output to CONAA.
PIN3	Baudrate selection		CON12 serial interface baudrate is set to 19200.
			CON12 serial interface baudrate is set to 9600.
PIN4	Test pin		Usuall, "1" is connected to "2". When "1-2" is opened and "3-4" is closed, emergency stop signal caming through bus-link cable is ignored.
PIN5	Oriented spindle stop encoder power supply		Power supply of NC is not available.
			Power supply of NC is available.

(5) LED list

LED No.	Description
LED1	Encoder open circuit detection This LED lights when magnesensor is used (it does not detect open circuit of magnesensor).

(6) Potentiometer list

VR No.	Decription
VR1	Magnesensor sensitivity is adjusted.

Note: VR1 is not used in cards after card group No. G52.

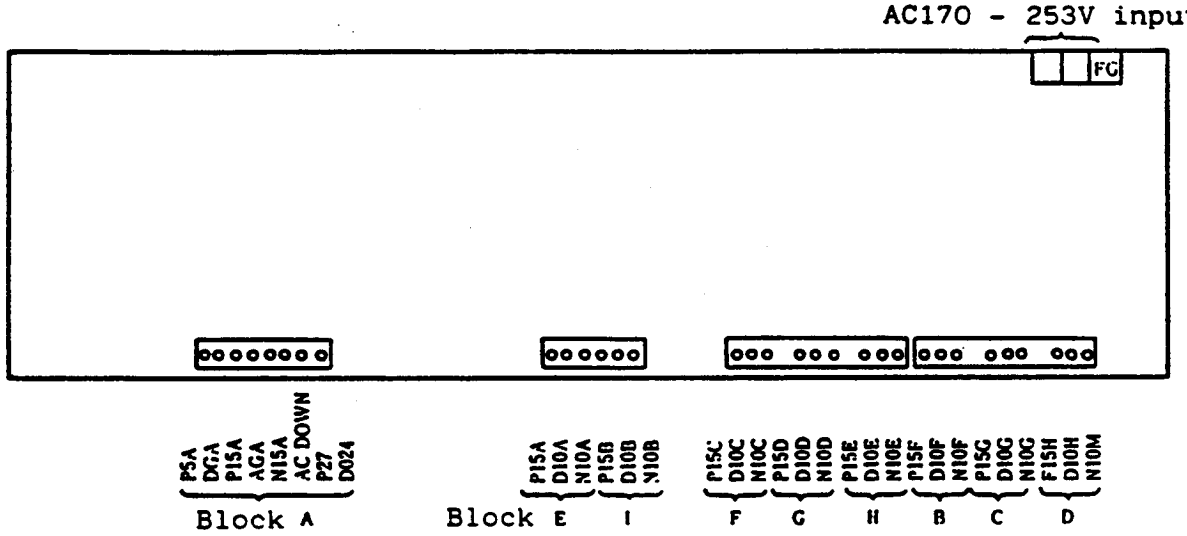
(7) Check terminal list

Terminal No.	Common	Description
CH1	DGA	Position feedback, A phase
CH2	DGA	Position feedback, B phase
CH3	DGA	Position feedback, Z phase
CH4	AGA	Magnesensor output (MS signal)
CH5	DGA	Linear zone output (LS signal)

*Common DGA and AGA should be taken from card SF-CA.

4.4 Card SF-PW

This card provides all DC power supplies necessary for FR-SF.



Notes: 1. All blocks other than block A are not insulated from the main circuit.

2. "O" line of block A is connected internally.

Block	Name	Common		DC output voltage	
A	P5A	DGA	Common	+ 5V	± 3%
	P24A	D024		+24V	±10%
	P18A	AGA		+18V	±10%
	N18A			−18V	±10%
B	P15	D10F		+15V	±10%
	N10			−10V	±10%
C	P15	D10G		+15V	±10%
	N10			−10V	±10%
D	P15	D10H		+15V	±10%
	N10			−10V	±10%
E	P15	D10A		+15V	±10%
	N10			−10V	±10%
F	P15	D10C		+15V	±10%
	N10			−10V	±10%
G	P15	D10D		+15V	±10%
	N10			−10V	±10%
H	P15	D10E		+15V	±10%
	N10			−10V	±10%
I	P15	D10B		+15V	±10%
	N10			−10V	±10%
J	ACDOWN signal				

FR-SF

ADDITIONAL

TROUBLESHOOTING

JOE BRUEN

12/6/91

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I. PROBLEM CONDITIONS WITH REMEDIES——————PGS. 1-3

II. MAGNESENSOR ORIENT ADJUSTMENT PROCEDURE——————PGS. 4-7

III. ENCODER ORIENT ADJUSTMENT PROCEDURE——————PGS. 8-10

I. LONG ACCKL/DECKL TIME

A. CHECK PARAMETER #33(CSN) TO THE PARAMETER SHEET & SET ACCORDINGLY

B. CHECK PARAMETER #01(NOX) & #02(MSL) TO THE PARAMETER SHEET & SET ACCORDINGLY.

C. CHECK ROM'S 1, 2, & 3 ON SF-CA PCB THAT THEY ARE CORRECTLY NUMBERED TO BN# SPECIFICATION SHEET.

D. CHECK THE TORQUE LIMIT COMMANDS, PARAMETER #1U(BITS 2 & 3) ON SF-CA PCB THAT THEY ARE NOT BEING TURNED ON.

E. CHECK THE MAIN DRIVE BELT(S) FROM THE SPINDLE MOTOR TO THE SPINDLE HEAD FOR TENSION & REPLACE IF NECESSARY.

II. MOTOR STALLS WHILE CUTTING

A. CHECK THE MAIN DRIVE BELT(S) FROM THE SPINDLE MOTOR TO THE SPINDLE HEAD FOR TENSION & REPLACE IF NECESSARY.

B. CHECK ROM'S 1, 2, & 3 ON SF-CA PCB THAT THEY ARE CORRECTLY NUMBERED TO BN# SPECIFICATION SHEET.

C. CHECK THE TORQUE LIMIT COMMANDS, PARAMETER #1U(BITS 2 & 3) ON SF-CA PCB THAT THEY ARE NOT BEING TURNED ON.

D. CHECK TORQUE LIMIT PARAMETER #35(TLM) TO THE PARAMETER SHEET & SET ACCORDINGLY.

III. MACHINE WILL NOT ACCEPT GEAR SHIFT COMMAND

A. CHECK OUTPUT SIGNAL PARAMETER #4U(STS2) TO MAKE SURE ALL THE OUTPUT BITS TO THE NC ARE PROPERLY SET, DEPENDING UPON THE STATUS OF THE SPINDLE CONTROLLER. IF NOT, EXCH. SF-CA PCB.

B. CHECK EXTERNAL INPUT SIGNAL PARAMETER #1U(BITS 0 & 1), TO MAKE SURE THE NC SIDE IS GIVING PROPER DIRECTION COMMAND TO SPINDLE FOR GEAR SHIFT.

IV. NO CW. CCW. OR READY

A. CHECK EXTERNAL INTERFACE MODE SELECTION PARAMETER #04(MOD) TO HTE PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK EXTERNAL INPUT PARAMETER #1U(BITS 0 & 1) AND PARAMETER #2U (BIT 0) FOR PROPER BIT COMMAND FROM THE NC SIDE.

C. CHECK EXTERNAL OUTPUT PARAMETER #3U(BIT 0) AND PARAMETER #4U (BITS 8 & 9) FOR PROPER BIT OUTPUT OF SF-CA PCB. IF OUTPUT BITS ARE NOT PRESENT AND INPUT BITS ARE, EXCH. SF-CA PCB.

V. GEAR NOISE

A. CHECK IF GEAR NOISE HAPPENS WHEN MAIN POWER IS SHUT OFF WITH SPINDLE RUNNING. IF NOISE GOES AWAY, GO TO STEP #B. IF NOISE PERSISTS, CONTACT MACHINE MANUFACTURER.

B. DOES NOISE PERSIST IN OPEN LOOP? IF NOT GO TO STEP #C. IF SO, ADJUST CT OFFSETS ON SF-CA PCB. ALSO, VERIFY ALL PARAMETERS ARE PROPERLY SET TO THE PARAMETER SHEET. IF PREVIOUS ITEMS CHECK OK, EXCH. SF-CA PCB.

C. CHECK ADJUSTMENT OF PLG IN BACK OF MOTOR. WHILE CHECKING A & B PHASE SIGNALS FROM PLG, USE VR1, VR2, VR3, & VR4 TO SET PROPER GAIN & OFFSET. IF SIGNALS ARE NO GOOD & CANNOT BE ADJUSTED, EXCH. PLG PCB & SENSOR.

VI. NO LED'S

A. CHECK INCOMING POWER AT RO-SO TERMINALS IN UPPER RIGHT HAND CORNER OF BASE UNIT. IF OK, GO TO STEP #B. IF NOT, CHECK F1, F2, & F3 (5A) FUSES ON MAIN LINE FILTER. IF BLOWN, REFER TO "FUSE BLOW" EXPLANATION.

B. DISCONNECT SF-CA PCB FROM SF-PW. DISCONNECT CON101, 102, 103 FROM HINGE PANEL. RECONNECT SF-CA TO SF-PW. IF LED'S COME UP, REFER TO "TRANSISTOR MODULE CHECK" IN TROUBLESHOOTING MANUAL TO FIND SHORTED TRANSISTOR. IF LED'S DO NOT COME UP, EXCH. SF-PW.

VII. FUSE BLOW

A. WITH MAIN POWER ON

1. DISCONNECT SF-PW WIRES FROM RO-SO TERMINALS IN UPPER RIGHT CORNER OF BASE UNIT. IF FUSES DO NOT BLOW, EXCH. SF-PW.

B. WITH NC POWER ON

1. DISCONNECT MS1-MS2 WIRES FROM BASE UNIT LOCATED NEAR U, V, & W MOTOR LEADS. IF FUSES DO NOT BLOW, REPLACE MOTOR COOLING FAN IF INOPERATIVE OR DIRTY.

VIII. RPM DIFFERENT THAN COMMANDED

A. CHECK ALL PARAMETERS TO PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK REFERENCE SPEED STATUS DISPLAY(LETTER C), TO MAKE SURE THE NC SIDE OUTPUTS THE CORRECT SPEED REFERENCE.

C. CHECK PLG IN BACK OF MOTOR FOR PROPER ADJUSTMENT.

D. CHECK FOR POSSIBLE MOTOR OVERLOAD. REVIEW CUTTING CONDITION & TOOL BEING USED.

E. CHECK TO MAKE SURE OVERRIDE COMMAND IS OFF WHEN CHECKING RPM DISPLAY ON THE SF-CA PCB.

F. IF ALL ABOVE ITEMS CHECK OK, EXCH. SF-CA PCB.

IX. ORIENTATION PROBLEMS

A. IF MOTOR ROTATES AT ORIENT SPEED BUT DOES NOT STOP, THEN—>

1. CHECK SIGNALS COMING BACK FROM THE ENCODER OR MAG SENSOR. IF SIGNALS ARE NO GOOD, REPLACE EITHER WITH A NEW ONE.

2. IF SIGNALS OK IN ITEM #1, CHECK SIGNALS AT THE ORIENT CARD & SF-CA PCB. IF SIGNALS ARE NO GOOD, EXCH. PCB'S IN THAT ORDER.

3. IF YOU ARE USING ENCODER ORIENT, MAKE SURE ENCODER IS RECEIVING ITS 5V POWER SUPPLY FROM THE NC SIDE. ALSO, MAKE SURE JUMPER PIN SETTINGS ARE SET CORRECTLY ON SPINDLE ORIENT CARD.

4. CHECK PARAMETER #41(OSL) TO PARAMETER SHEET & SET ACCORDINGLY.

B. ORIENT PROCEDURE OK BUT STOP STATE IS ABNORMAL

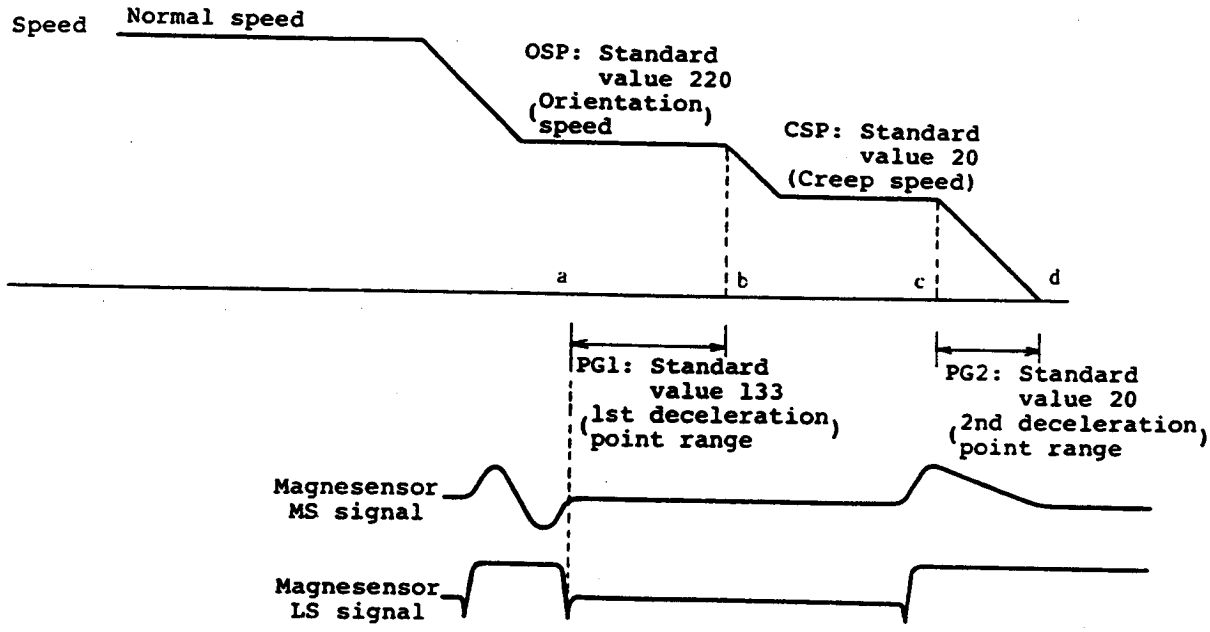
1. CHECK "ORIENTATION ADJUSTMENT PROCEDURES" IN THE FOLLOWING PAGES DEPENDING UPON THE TYPE OF ORIENTATION YOU HAVE.

2. IF ITEM #1 CHECKS OK AND CANNOT BE ADJUSTED, CHECK FOR BACKLASH IN THE GEARS ON THE MACHINE SIDE DEPENDING UPON THE GEAR BEING USED AT THE TIME THE PROBLEM OCCURS.

3. IF ITEM #2 CHECKS OK OR THE PROBLEM HAPPENS IN ALL GEARS, EXCH. ORIENT PCB & SF-CA PCB IN THAT ORDER.

3.4 Adjustment

3.4.1 In the case of magnesensor



Adjust the orientation parameters (OSP, CSP, PG1, PG2, and PST) in the following manner so that the maximum values can be obtained.

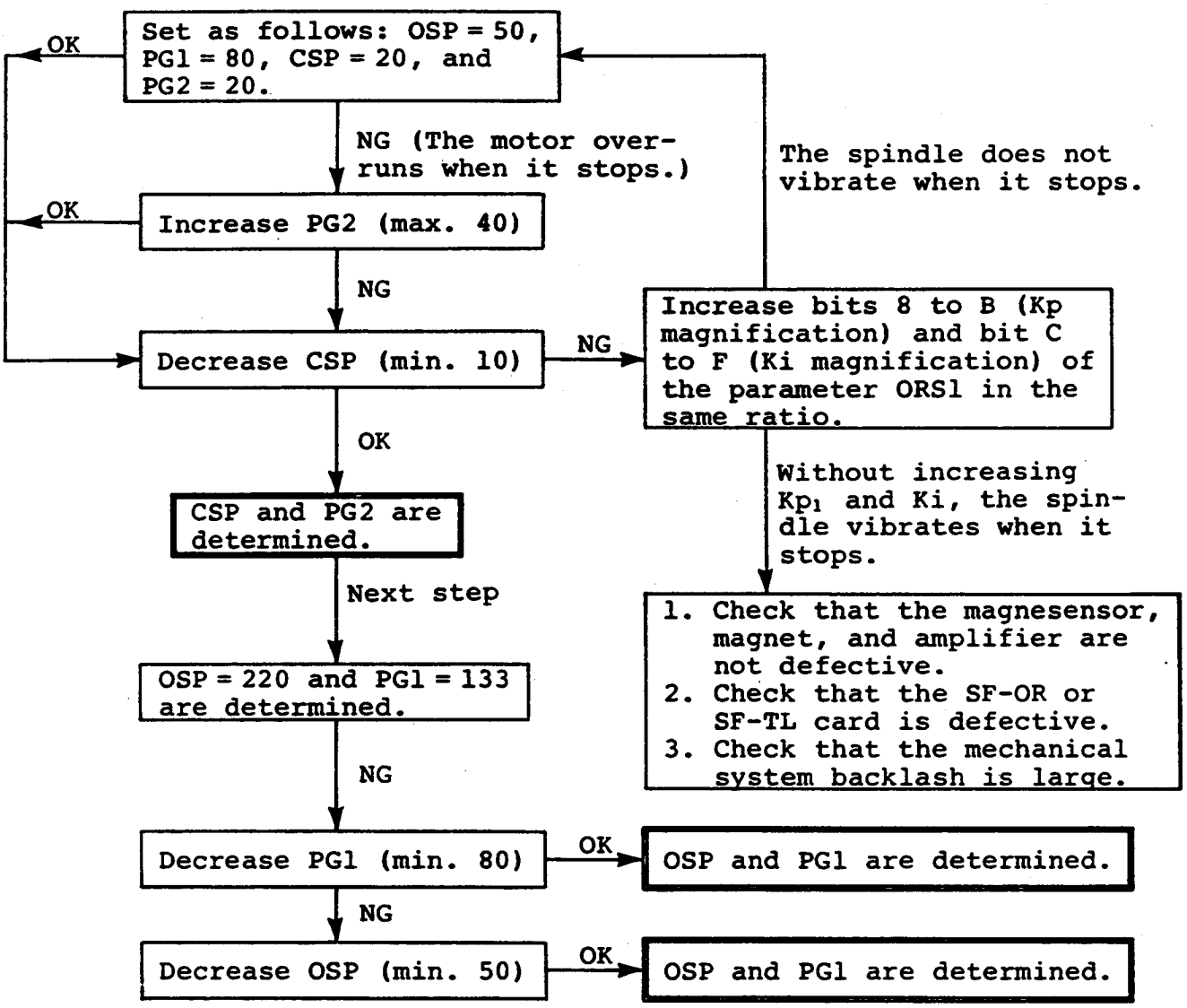
(Note) PG1: Based on point a, move point b.
When a small value is set to PG1, point b approaches point a.
PG2: Based on point d, move point c.
When a small value is set to PG2, point c approaches point d.

In the adjustment using the following flowchart, since a gear where spindle speed is high tends to overrun, it should be adjusted first.

In addition, use the parameters being adjusted and check that each gear and each speed can be used.

(Note) Adjust the stop position (point d) using the parameter (PST).

(Note) If the spindle hunts when the motor is stopped by the orientation operation, the selection of the mounting direction of the orientation detector is inverted. At the time, correct the selection using the parameter ORS2 bit 8.



(Note) 1. When the orientation time is long because the time period (point b to c) on which the spindle rotates at a creep speed, increase OSP and PG1 in the manner that the spindle doesn't overrun when it stops. (The maximum value of OSP = 300; the maximum value of PG1 = 200)

2. The parameter ORS1 bits 0 to 3 (W_T selection) are the compensation gain for delay/advance of bit 4 (control method in servo lock situation). Increase W_T and the temporary servo rigidity increases and the torque against the position deviation decreases.

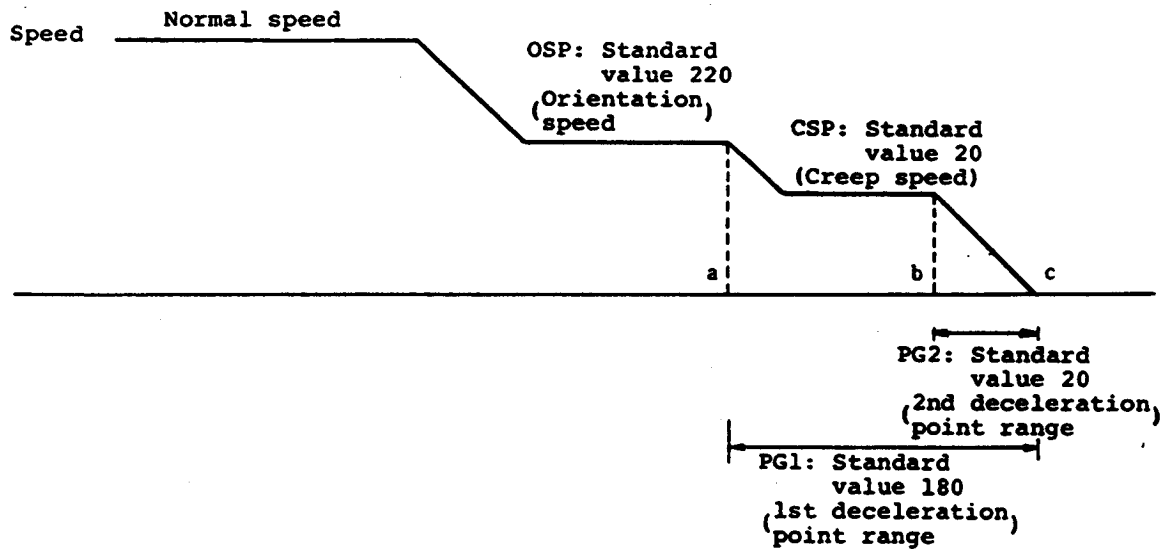
The effects of four major parameters relating to the stability of the orientation are listed in the following table.

Phenomenon	Adjustment procedure			
	OSP	CSP	PG1	PG2
The spindle overruns when it stops.	↘	↘	↘	↗
The orientation time is long.	↗	→	↗	→
The spindle hunts when it stops.	→	↘	→	↗

(Note 1) ↗ : Increase the parameter value.
→ : Do not change the parameter value.
↘ : Decrease the parameter value.

(Note 2) When the spindle remarkably hunts in the orientation stop state, since the selection of the mounting direction of the orientation detector is reversed, correct the selection with the parameter ORS2 bit 8.

3.4.2 Encoder type

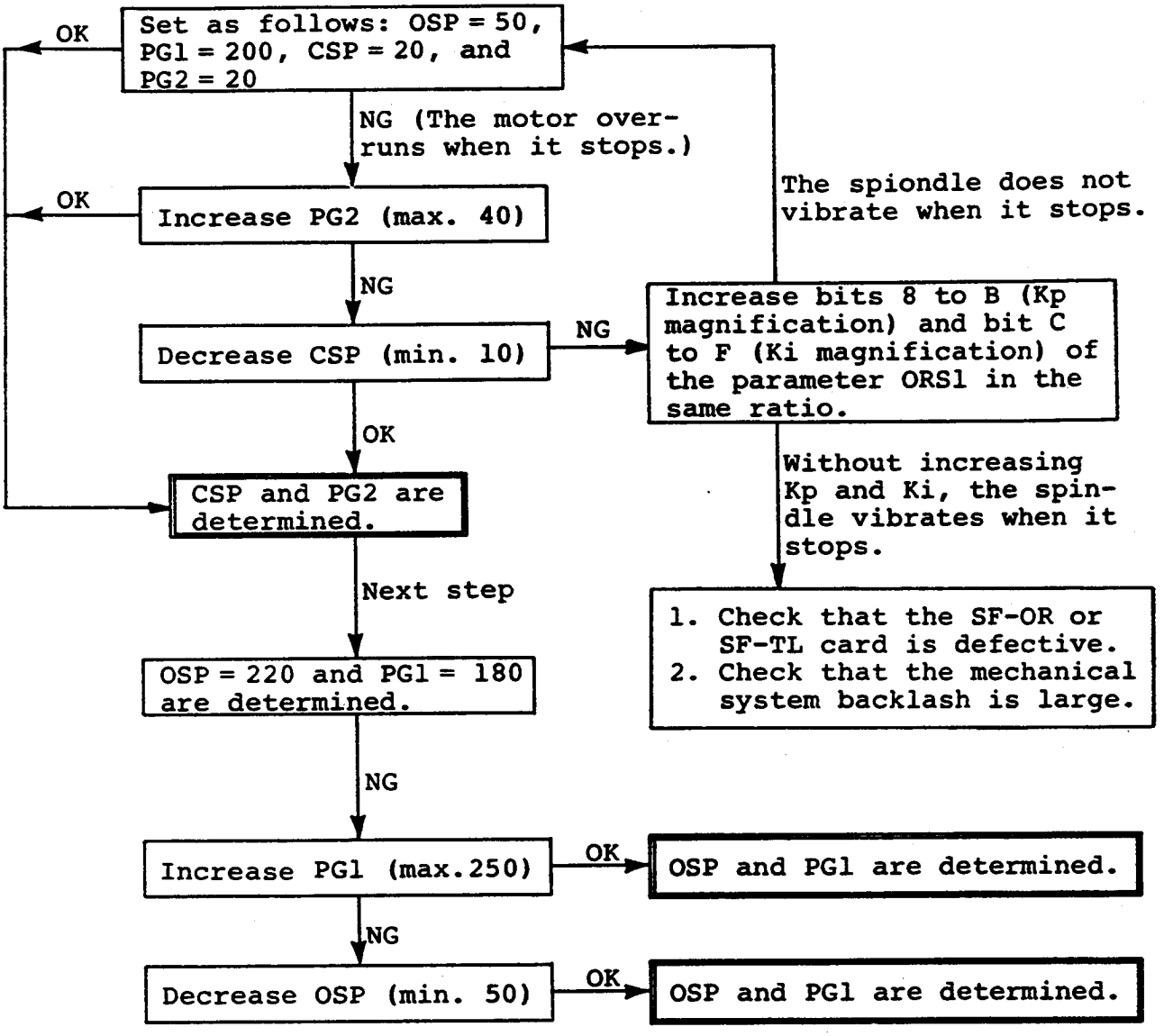


Adjust the orientation parameters (OSP, CSP, PG1, PG2, and PST) in the following manner so that the best values can be obtained.

(Note) PG1: Based on point c, move point a.
When decreasing PG1, point a approaches point c.
PG2: Based on point c, move point b.
When decreasing PG2, point b approaches point c.

In the adjustment using the following flowchart, generally, a gear where the spindle speed is high tends to overrun, so it should be adjusted first.
In addition, with the parameters obtained by the adjustment, check that the spindle correctly rotates at each speed and by each gear.

(Note) The stop position (point c) is adjusted by the parameter (PST).



(Note) 1. When the orientation time becomes long because the time period on which the spindle rotates at a creep speed (point b to c) is long, decrease PG1 or increase OSP in the manner that the spindle does not overrun when it stops. (PG1 > PG2, the maximum value of OSP = 300.)

2. The parameter ORS1 bits 0 to 3 (W_T selection) are the compensation gain for delay/advance of bit 4 (control method in servo lock situation). Increase W_T and the temporary servo rigidity increases and the torque against the position deviation decreases.

The effects of four major parameters relating to the stability of the orientation are listed in the following table.

Phenomenon	Adjustment procedure			
	OSP	CSP	PG1	PG2
The spindle overruns when it stops.	↘	↘	↗	↗
The orientation time is long.	↗	→	↘	→
The spindle hunts when it stops.	→	↘	→	↗

(Note 1) ↗ : Increase the parameter value.
→ : Do not change the parameter value.
↘ : Decrease the parameter value.

(Note 2) When the spindle remarkably hunts in the orientation stop state, since the selection of the mounting direction of the orientation detector is reversed, correct the selection with the parameter ORS2 bit 8.

FR-SFJ

TROUBLESHOOTING MANUAL

JOE BRUKN

11/22/91

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II. DIAGRAM WITHOUT BUSLINK——PG. 6

III. DIAGRAM WITH BUSLINK——PG. 7

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V. SFJ-CA1 PCB——PGS. 10-14

VI. SF-ORJ PCB——PG. 15

VII. SF-TLJ PCB——PG. 16

VIII. SF-DAJ PCB——PG. 17

I. ALO 10 UNDERVOLTAGE

A. ALARM WITH POWER ON

1. INCOMING POWER SHOULD BE 200-230VAC(+10%, -15%) AT R, S, T TERMINAL INSIDE SPINDLE CONTROLLER.

2. IF INCOMING POWER CHECKS OK, EXCH. IM-PW POWER SUPPLY.

B. ALARM WHILE RUNNING

1. CHECK INCOMING POWER DURING ACCEL & DECEL. IF VOLTAGE DROPS TO 170VAC OR LESS FOR 15mSEC OR MORE, INPUT POWER CAPACITY IS NOT SUFFICIENT & MUST BE INCREASED.

II. ALO 12 MEMORY ERROR 1

A. CHECK ROM'S 1, 2, & 3 ON SFJ-CA1 THAT THEY ARE PROPERLY INSERTED AND IN THE RIGHT POSITION.

B. IF ROMS CHECK OK, EXCH. SFJ-CA1 PCB.

III. ALO 15 MEMORY ERROR 2

A. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION.

B. CHECK NC BUSLINK(CAM11) CABLE FOR SECURE CONNECTION & REPLACE IF NECESSARY.

C. MAKE SURE ALL GROUND WIRES FROM NC, SPINDLE CONTROLLER & MOTOR ARE PROPERLY CONNECTED & CABLES ARE CORRECTLY SHIELDED.

D. IF ALL CONNECTIONS & CABLES ARE OK, EXCH. SPINDLE BUSLINK PCB.

IV. ALO 21 NO SIGNAL SPINDLE ENCODER

A. CHECK CABLE GOING FROM SPINDLE ENCODER TO SPINDLE CONTROLLER FOR CONTINUITY & PROPER CONNECTION. REPLACE IF NECESSARY.

B. CHECK SPINDLE ENCODER TO MAKE SURE ALL SIGNALS GOING TO THE SPINDLE CONTROLLER ARE OK(A, B, & Z PHASE). REPLACE ENCODER IF SIGNALS ARE NOT PRESENT.

C. MAKE SURE ENCODER IS GETTING ITS 5V POWER SUPPLY FROM NC SIDE. THIS WILL CAUSE THE SIGNALS NOT TO BE GENERATED.

D. CHECK PARAMETER #41(OSL) TO THE PARAMETER SHEET & SET ACCORDINGLY

E. IF ALL ABOVE ITEMS OK, EXCH. SF-TLJ(ORJ) PCB.

V. ALO 23 EXCESSIVE SPEED ERROR

A. MAKE SURE PHASE SEQUENCE AND CONTINUITY OF U, V, & W MOTOR WIRES ARE CORRECT & CHANGE IF INCORRECT OR IF CONTINUITY IS BROKEN.

B. MAKE SURE MOTOR IS NOT BEING OVERLOADED. IF SO, CHECK CUTTING CONDITION & TOOL BEING USED.

C. OPEN LOOP POSSIBLE? IF SO, PLG IN BACK OF MOTOR IS MISADJUSTED OR DEFECTIVE. CHECK A & B PHASE SIGNALS FROM PLG. IF MISADJUSTED, USE VR1, VR2, VR3, & VR4 ON PLG PCB TO SET PROPER GAIN & OFFSET. IF SIGNALS ARE NO GOOD, EXCH. PLG PCB.

D. IF SPINDLE DOES NOT TURN AFTER OPEN LOOP TEST, SPEED FEEDBACK CKT. ON SFJ-CA1 PCB IS DEFECTIVE & MUST BE EXCHANGED.

E. CHECK PARAMETER #02(MSL) TO THE PARAMETER SHEET & SET ACCORDINGLY

F. CHECK PARAMETER #52(SETM) TO THE PARA. SHEET & SET ACCORDINGLY.

VI. ALO 24 MAIN CIRCUIT FAULT / ALO 25 BRAKING CIRCUIT FAULT — ALL RELATED

A. CHECK FOR ANY PHYSICAL DAMAGE ON SPINDLE UNIT. IF NONE PRESENT, EXCH. SFJ-CA1 PCB.

B. IF SFJ-CA1 DOES NOT FIX PROB., EXCH. COMPLETE UNIT.

VII. ALO 31 OVERSPEED

A. IF THE REFERENCE SPEED EXCEEDS 115% OF THE MAXIMUM SPEED, CHECK PARAMETER #31(TSP) TO THE PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK SIGNALS FROM CH31 & CH32 TO CH23(COMMON) ON SFJ-CA1 PCB AT 1500 RPM. IF SIGNALS APPEAR NOISY, REPLACE CON2 FEEDBACK CABLE. IF THE FREQUENCY OF THE SIGNAL IS NOT 3.2KHZ, REPLACE PLG FEEDBACK PCB.

C. IF ALARM OCCURS DURING SYNCHRONOUS TAPPING MODE, CHECK PARAMETER #30(ORS2) TO THE PARAMETER SHEET & SET ACORDINGLY. CHECK GEAR RATIO PARAMETER #'S 39-40(HEX) TO THE PARAMETER SHEET & SET ACCORDINGLY.

D. IF ALL ABOVE ITEMS CHECK OK, EXCH. SFJ-CA1 PCB.

VIII. ALO 32 INVERTER OVERCURRENT

A. CHECK MOTOR CONSTANT PARAMETER #02(MSL) TO THE PARAMETER SHEET & SET ACCORDINGLY.

B. VERIFY THAT THE LOAD METER OUTPUT IS NOT GREATER THAN 120%. IF SO, REDUCE LOAD CONDITION.

C. CHECK MOTOR WIRES(U, V, & W) FOR SECURE & PROPER CONNECTION.

D. MEGGER MOTOR FROM EACH PHASE TO GROUND & CHECK FOR SHORT. NORMAL RESISTANCE READING SHOULD BE INFINITE OHMS.

E. VERIFY THAT THE INCOMING POWER AT R, S, & T TERMINAL OF THE SPINDLE CONTROLLER IS NOT GOING BELOW 170VAC. IF SO, POWER SUPPLY CAPACITY IS NOT SUFFICIENT & MUST BE INCREASED.

F. IF ALL ABOVE ITEMS CHECK OK, EXCH. COMPLETE UNIT.

IX. ALO 33 CONVERTER OVERVOLTAGE

A. CHECK DISCHARGE RESISTOR UNIT FOR PROPER CONNECTION.

B. CHECK RESISTANCE ACROSS R1-R2 OF DISCHARGE RESISTOR UNIT.
SHOULD BE: 30OHM FOR 2.2K-3.7K
15OHM FOR 5.5K-7.5K

C. CHECK MOTOR CONSTANT PARAMETER #02(MSL) TO THE PARAMETER SHEET & SET ACCORDINGLY.

D. IF ALL ABOVE ITEMS CHECK OK, EXCH. COMPLETE UNIT.

X. ALO 13 EXTERNAL CLOCK ERROR
ALO 34 DATA PARITY ERROR
ALO 35 DATA ERROR
ALO 36 TRANSFER ERROR

——ALL RELATED

A. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION.

B. CHECK NC BUSLINK(CAM11) CABLE FOR PROPER CONNECTION & REPLACE IF NECESSARY.

C. MAKE SURE ALL CABLES ARE CORRECTLY SHIELDED & THAT ALL GROUND WIRES ARE TIGHTLY SECURE.

D. CHECK THE TERMINATIVE RESISTOR ON BUSLINK PCB(CN1B) FOR PROPER CONNECTION & REPLACE IF NECESSARY.

E. IF ABOVE ITEMS CHECK OK, THE BUS INTERFACE CKT. ON EITHER THE SPINDLE SIDE OR NC SIDE IS DEFECTIVE.

XI. ALO 37 PARAMETER ERROR

A. THIS ALARM OCCURS WHEN A PARAMETER EXCEEDS ITS ALLOWABLE RANGE. CHECK ALL PARAMETERS TO THE PARAMETER SHEET & SET ACCORDINGLY.

XII. ALO 45 CONTROLLER OVERHEAT

A. PLACE JUMPER WIRE ACROSS THS(THERMAL SENSOR) IN BASE UNIT. IF ALARM STILL PRESENT, ALARM CKT. IS DEFECTIVE ON SFJ-CA1 PCB.

B. IF ALARM CANCELS THEN-->

1. REPLACE FAN(S) INSIDE SPINDLE CONTROLLER IF INOPERATIVE OR DIRTY.

2. REPLACE FAN(S) INSIDE ELECTRICAL CABINET IF INOPERATIVE OR DIRTY.

3. CHECK FOR CONTINUITY ACROSS THS(THERMAL SENSOR) IN BASE UNIT. REPLACE IF OPEN CKT.

XIII. ALO 46 MOTOR OR RESISTOR OVERHEAT

A. SHORT OHS1 & OHS2 WIRES INSIDE MOTOR TERMINAL BOX. IF ALARM STILL APPEARS, GO TO STEP #B. IF ALARM CANCELS AND SPINDLE MOTOR IS HOT, REPLACE COOLING FAN IF INOPERATIVE OR DIRTY. IF MOTOR IS OVERLOADED, REVIEW CUTTING CONDITION & TOOL BEING USED. ALSO, IF MOTOR IS FREQUENTLY STARTED & STOPPED, DECREASE FREQUENCY OF START & STOP OPERATION OR INCREASE THE VALUE OF ACCEL TIME CONSTANT PARAMETER #33(CSN). IF MOTOR IS NOT HOT, REPLACE THERMAL SENSOR INSIDE MOTOR.

B. SHORT A & B TERMINALS LOCATED IN THE TOP RIGHT CORNER OF THE BASE UNIT. IF ALARM STILL APPEARS, GO TO STEP #C. IF ALARM CANCELS AND DISCHARGE UNIT IS HOT, REPLACE COOLING FAN IF INOPERATIVE OR DIRTY. IF MOTOR IS FREQUENTLY STARTED & STOPPED, DECREASE START & STOP OPERATION OR INCREASE THE VALUE OF ACCEL TIME CONSTANT PARAMETER #33(CSN). IF DISCHARGE RESISTOR IS NOT HOT, REPLACE THERMAL SENSOR INSIDE DISCHARGE RESISTOR UNIT.

C. IF ALARM STILL PRESENT AFTER ITEMS A & B, ALARM CKT. ON SFJ-CA1 PCB IS DEFECTIVE.

XIV. ALO 52 OVERDROOP (ERROR EXCESS POSITION)

A. CHECK BIT 8 OF PARAMETER #30(ORS2) TO THE PARAMETER SHEET & SET ACCORDINGLY.

B. CHECK PARAMETER #26(CSP) TO THE PARAMETER SHEET & SET ACCORDINGLY

C. CHECK ORIENTATION ENCODER FOR PROPER OPERATION & REPLACE IF NECESSARY.

D. CHECK MACHINE PARAMETER TAP T1 ON NC SIDE TO THE PARAMETER SHEET & SET ACCORDINGLY.

E. IF ALL ABOVE ITEMS CHECK OK, EXCH. ORIENT PCB ON SPINDLE UNIT.

XV. ALO 56 OTHER AXIS FAULT

A. REFER TO SERVO DRIVE MAINTENANCE MANUAL IF OTHER AXIS ALARM OCCURS.

B. CHECK NC BUSLINK(CAM11) CABLE FOR PROPER CONNECTION TO SPINDLE.

CN1A --> CAM11 CABLE
CN1B --> TERMINATIVE RESISTOR
——REPLACE IF NECESSARY

XVI. ALO 57 OPTION CARD ERROR

A. OPTION CARD INSTALLED ON SPINDLE CONTROLLER IS NOT THE CORRECT ONE. CHECK MACHINE SPECIFICATION & INSTALL CORRECT PCB.

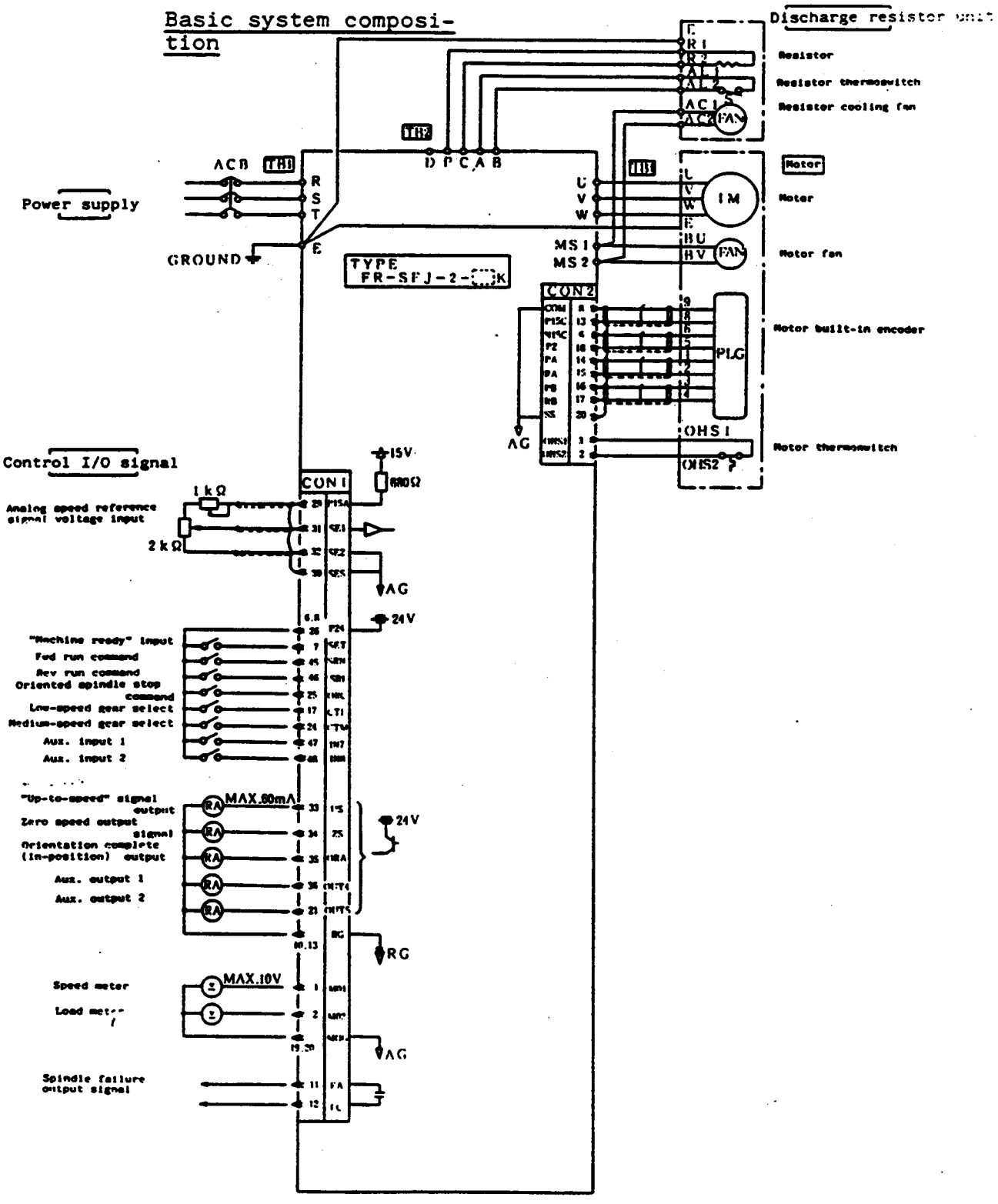
§2. WIRING

2.1 External wiring

2.1.1 Control system where FR-SFJ is not connected to M300 through bus line

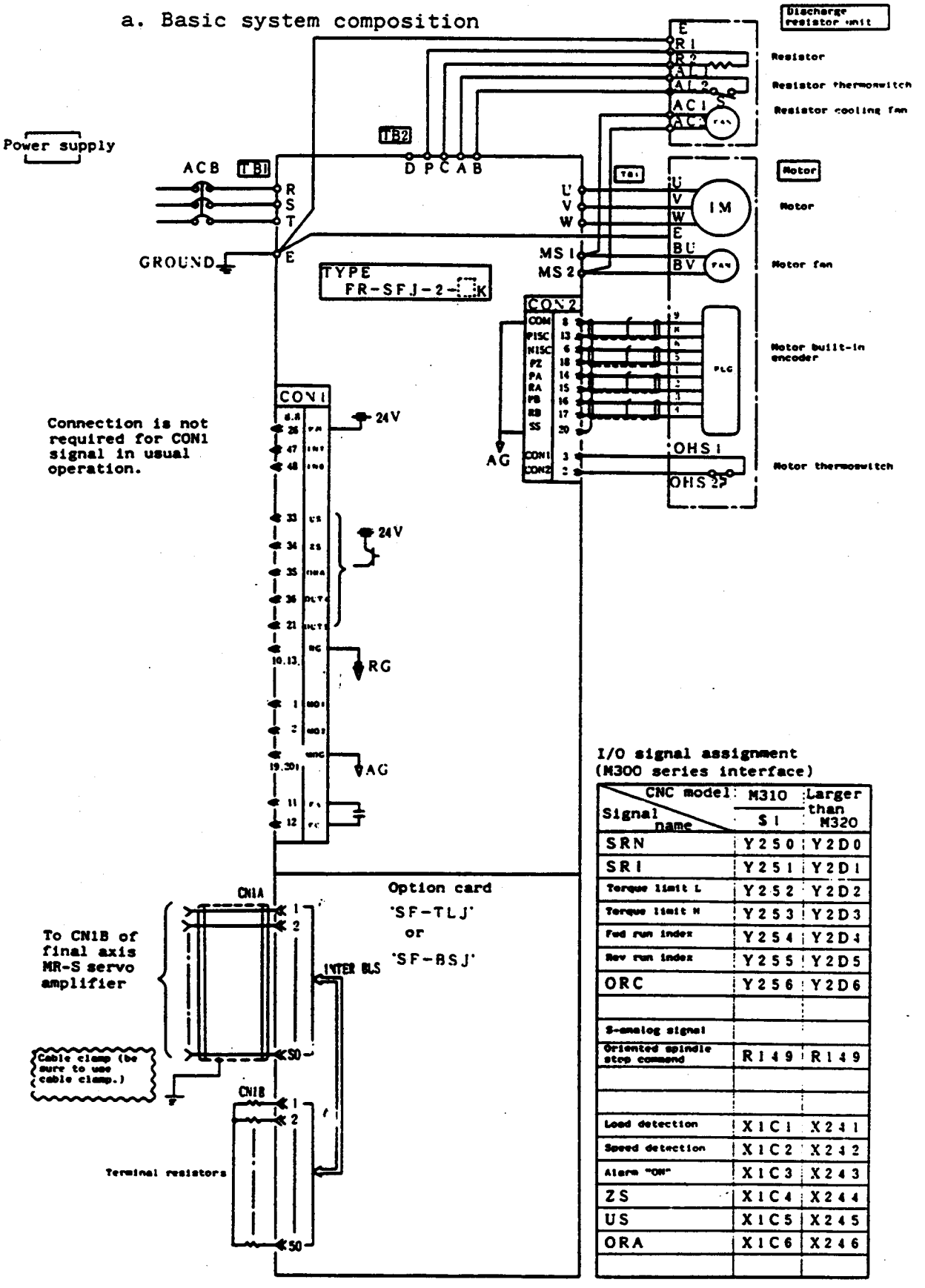
a. Analog speed reference signal

Basic system composition



2.1.2 Control system where FR-SFJ is connected to M300 through bus line (option card SF-TLJ is used) FR-SFJ-2-□K-T

a. Basic system composition



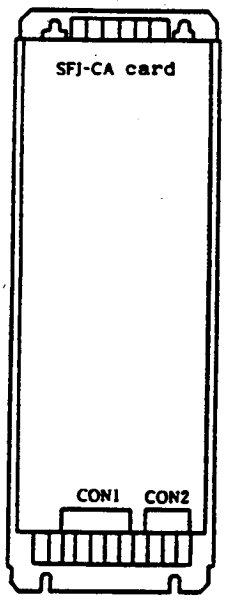
I/O signal assignment (M300 series interface)

CNC model / Signal name	M310 S1	Larger than M320
SRN	Y250	Y2D0
SR1	Y251	Y2D1
Torque limit L	Y252	Y2D2
Torque limit H	Y253	Y2D3
Fwd run index	Y254	Y2D4
Rev run index	Y255	Y2D5
ORC	Y256	Y2D6
S-analog signal		
Oriented spindle stop command	R149	R149
Load detection	X1C1	X241
Speed detection	X1C2	X242
Alarm "ON"	X1C3	X243
ZS	X1C4	X244
US	X1C5	X245
ORA	X1C6	X246

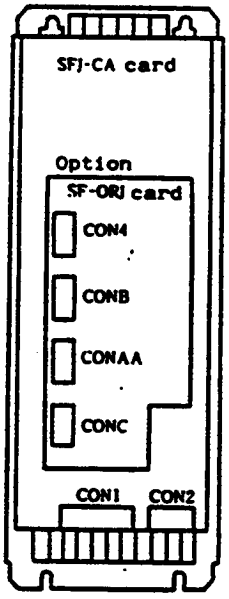
2.2 Parts arrangement

(1) SFJ-CA card and option card

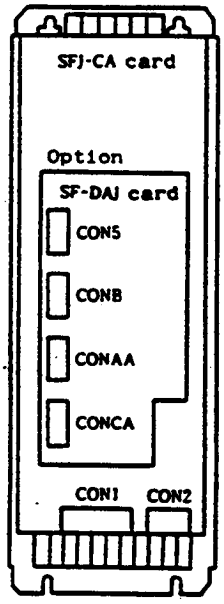
FR-SFJ-2- □K



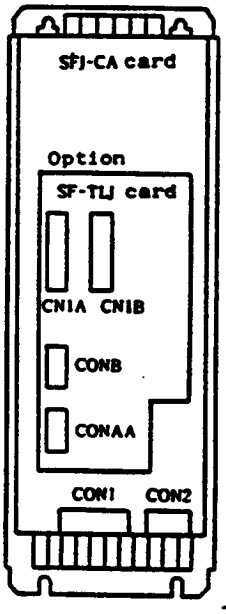
FR-SFJ-2- □K-R



FR-SFJ-2- □K-D

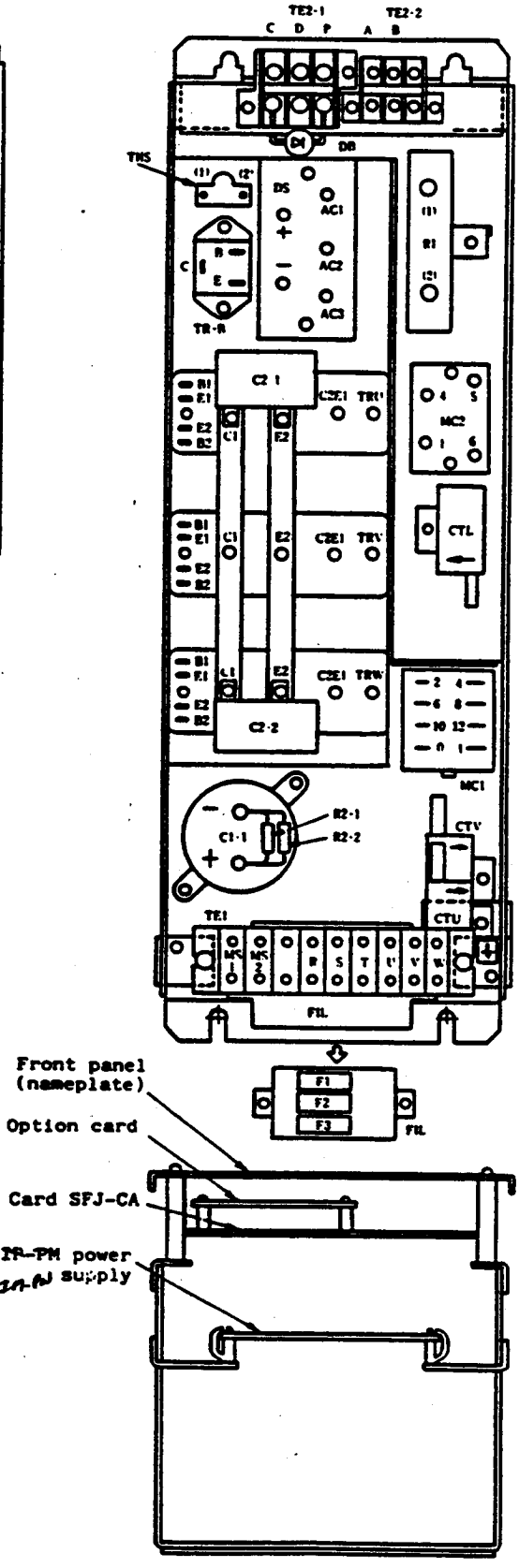


FR-SFJ-2- □K-T

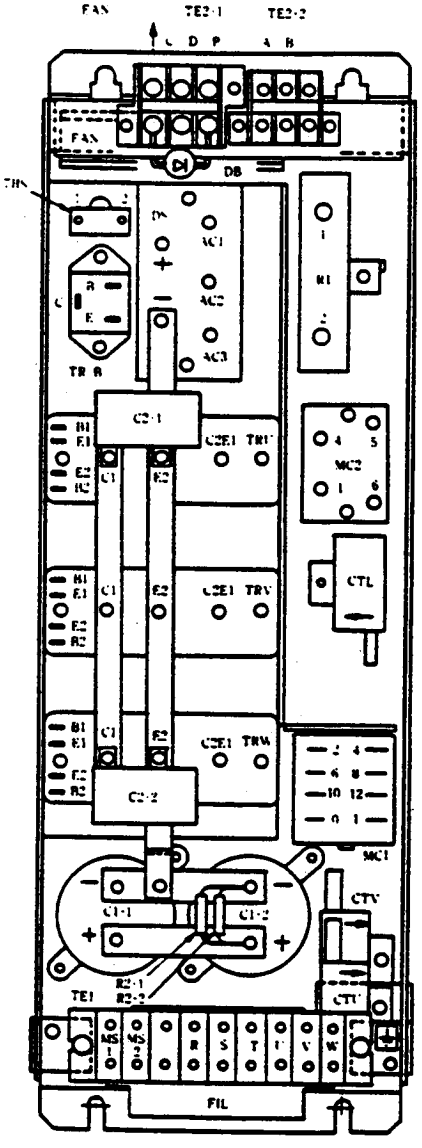


(2) Main board

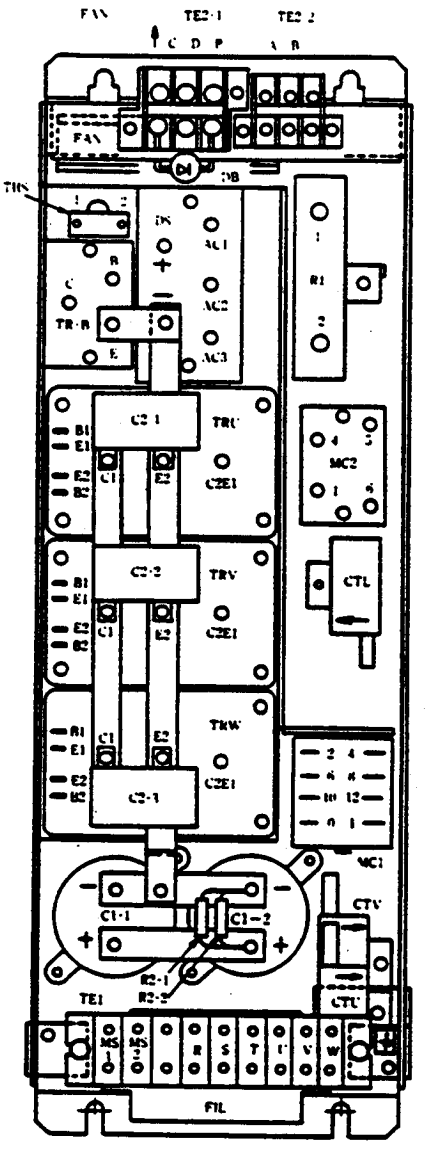
FR-SFJ-2-2.2K



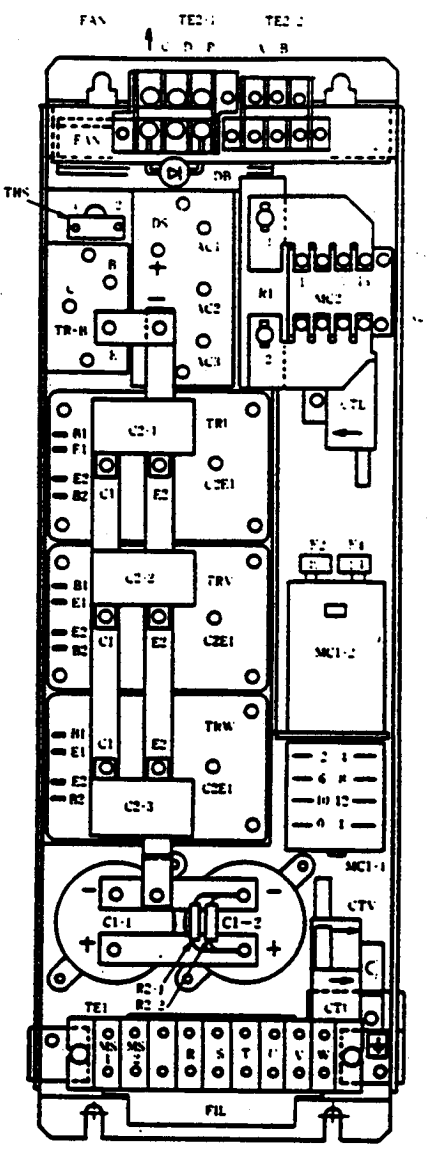
FR-SFJ-2-3.7K



FR-SFJ-2-5.5K



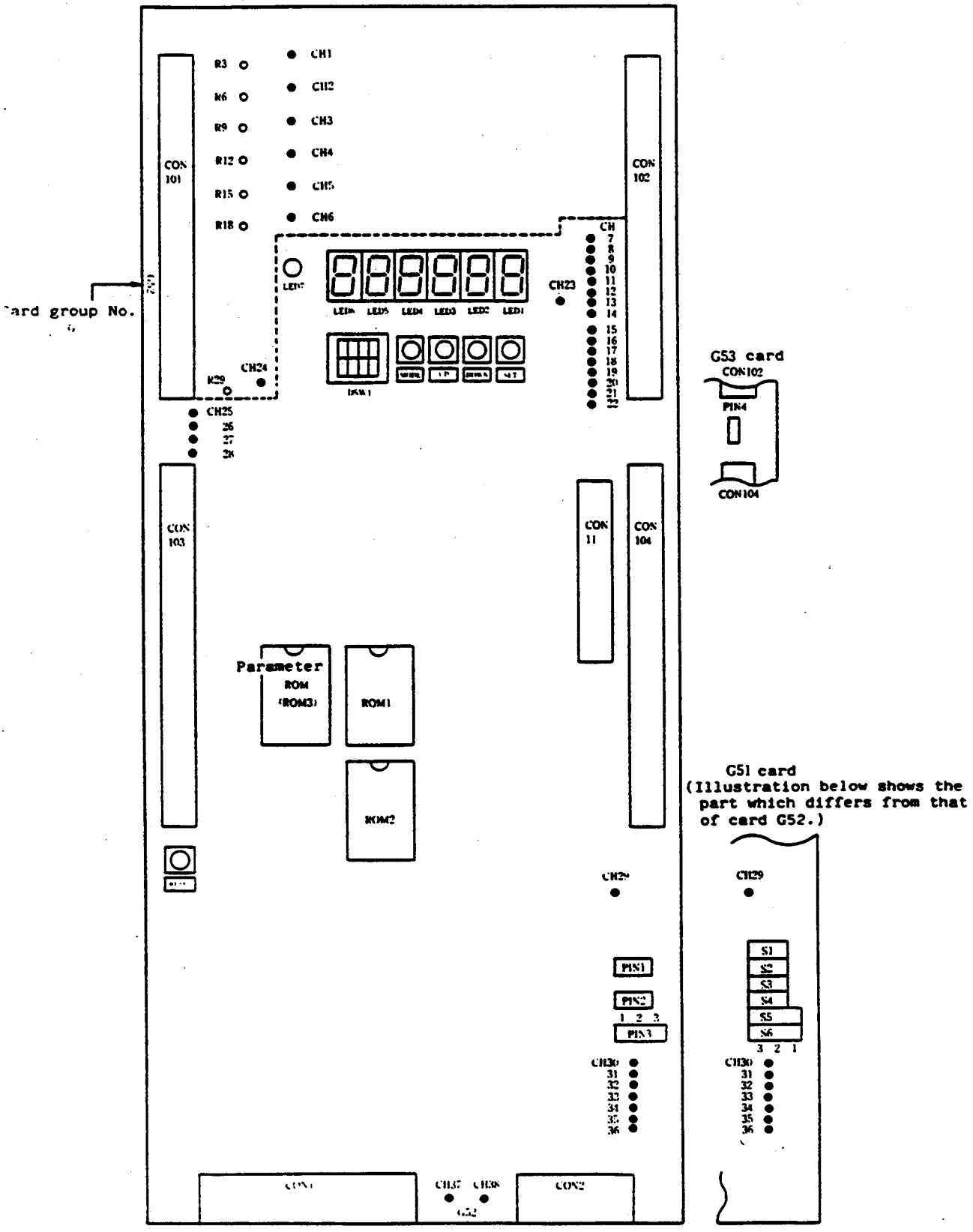
FR-SFJ-2-7.5K



§4. CARD SETTINGS AND CHECK TERMINALS

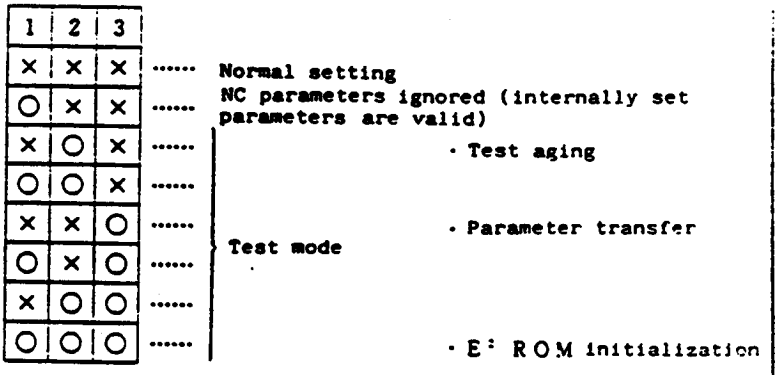
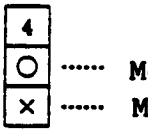
4.1 SFJ-CA1 card

Card group No. G52



(1) DIP switch setting table

○: Set to "ON"
×: Set to "OFF"

Switch No.	Name	Description
DSW1-1 ~ -3	Test mode	Test mode is selected. 
DSW1-4	Meter calibration	(For ROM versions after "BO")  Speed meter and load meter can be calibrated.

(2) Pushbutton table

Name	Description
MODE	Refer to the description about the readout of FR-SFJ
UP	
DOWN	
SET	
RESET	This pushbutton is for master reset of CPU. Press it after parameter setting.

(3) Jumper pin setting table

Card group No.: G51 ▨ .... Set ⊙⊙ .... Not set

No.	Name	Setting	Description	Standard setting
S1	Watchdog alarm	▨	Watchdog alarm is valid.	▨
		⊙⊙	Watchdog alarm is invalid.	
S2	Power control loop gain setting	▨	"High-current" loop gain	▨
		⊙⊙	"Low-current" loop gain	
S3	Bus interface	S3 ▨ / S6 3 2 1 ⊙▨	FR-SFJ is not connected to M300 series CNC through bus line. (Parameter #04 is set to "0".)	Shown to the left
		S3 ⊙⊙ / S6 3 2 1 ▨⊙	FR-SFJ is connected to M300 series CNC through bus line. (Parameter #04 is set to "2".)	
S4	Test pin	⊙⊙	Pin should be removed for test.	⊙⊙
S5	RAM storage capacity setting	3 2 1 ▨⊙	64Kbit RAM is used.	▨⊙
		3 2 1 ⊙▨	16Kbit RAM is used.	

Card group No.: G52

No.	Name	Setting	Description	Standard setting
PIN1	Current control loop gain setting	▨	"High-current" loop gain	▨
		⊙⊙	"Low-current" loop gain	
PIN2 PIN3	Bus interface	PIN2 ▨ / PIN3 1 2 3 ▨⊙	FR-SFJ is not connected to M300 series CNC through bus line. (Parameter #04 is set to "0".)	Shown to the left
		PIN2 ⊙⊙ / PIN3 1 2 3 ⊙▨	FR-SFJ is connected to M300 series CNC through bus line. (Parameter #04 is set to "2".)	

Card group No.: G53 (for additional switches to card G52

No.	Name	Setting	Description	Standard setting
PIN4	Load meter filter time constant setting		Time constant is set to about 400ms (same as that for card G52).	
			Time constant is set to about 100ms.	
SPARE	Spare		For spare	

(4) LED table

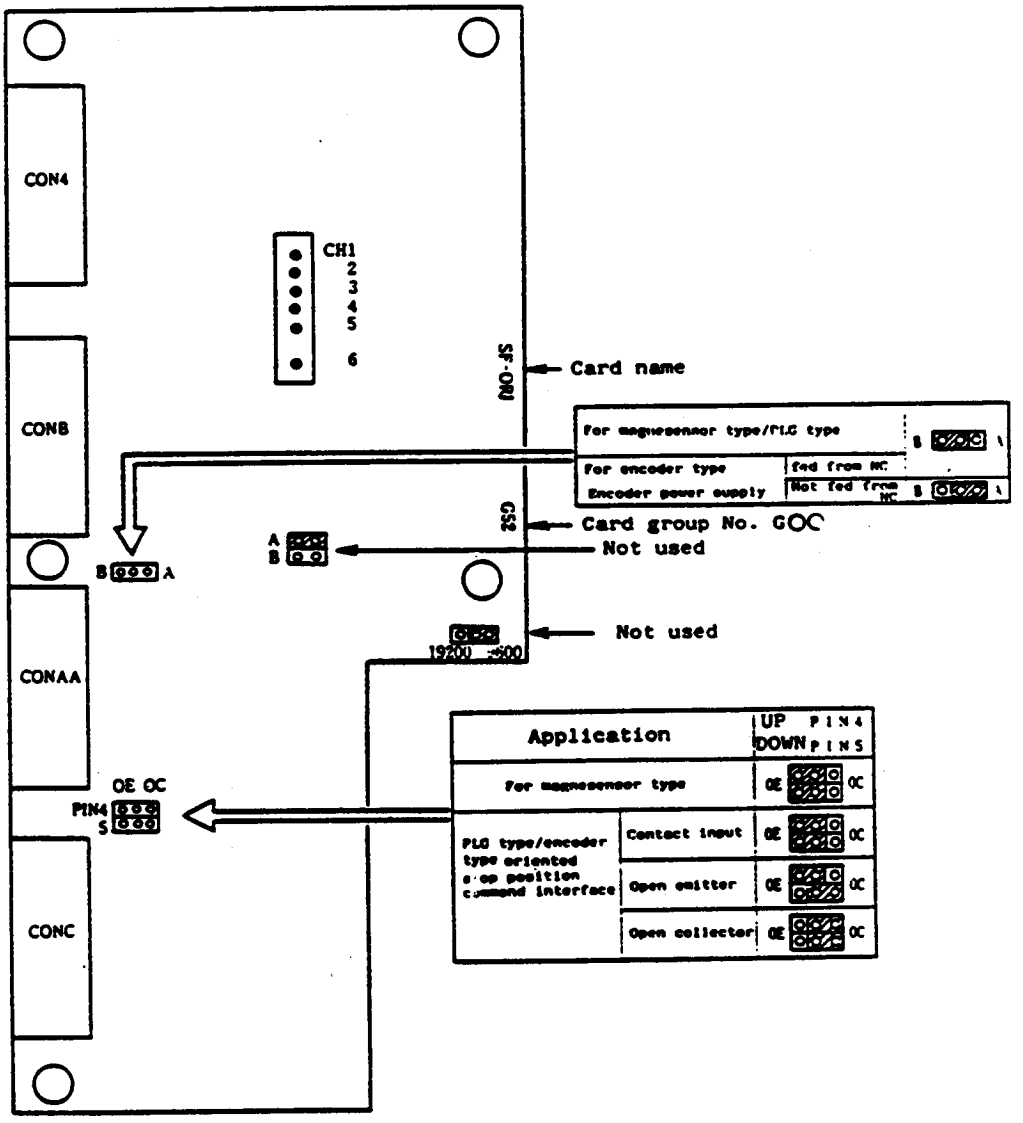
No.	Description
LED1 ~ LED6	Status display and alarm display
LED7	Lights in case of watchdog alarm.

(5) Check terminal table

	No.	Common	Description
↯	CH1	R3, left	U-phase base amplifier drive signal
↯	CH2	R6, left	V-phase base amplifier drive signal
↯	CH3	R9, left	W-phase base amplifier drive signal
↯	CH4	R12, left	$\bar{U}$-phase base amplifier drive signal
↯	CH5	R15, left	$\bar{V}$-phase base amplifier drive signal
↯	CH6	R18, left	$\bar{W}$-phase base amplifier drive signal
	CH7		Not used
	CH8	AG	$\bar{W}$-phase PWM waveform
	CH9		$\bar{V}$-phase PWM waveform
	CH10		$\bar{U}$-phase PWM waveform
	CH11		W-phase PWM waveform
	CH12		V-phase PWM waveform
	CH13		U-phase PWM waveform
	CH14		Brake transistor PWM waveform
	CH15		U-phase PWM waveform
	CH16		V-phase PWM waveform
	CH17		W-phase PWM waveform
	CH18		V-phase current waveform
	CH19		A/D converter input waveform
	CH20		U, V, W phase full-wave rectification waveform
	CH21		Converter current waveform
	CH22		U-phase current waveform
	CH23	-	OV, AG (analog ground)
↯	CH24	R29, left	Brake transistor, base amplifier drive signal
	CH25	-	RG (relay ground)
	CH26	RG	+24V power supply
	CH27	-	OV DG (digital signal ground)
	CH28	DG	+5V power supply
	CH29	AG	OV AG (analog signal ground)
	CH30		Analog speed reference signal input
	CH31		Speed feedback, A phase
	CH32		Speed feedback, B phase
	CH33		Speed feedback, Z phase
	CH34		+15V power supply
	CH35	-	OV, AG (Analog signal ground)
	CH36	AG	-15V power supply
	CH37		Speed meter output
	CH38		Load meter output

↯ is at high voltage. Pay attention to electric shock.

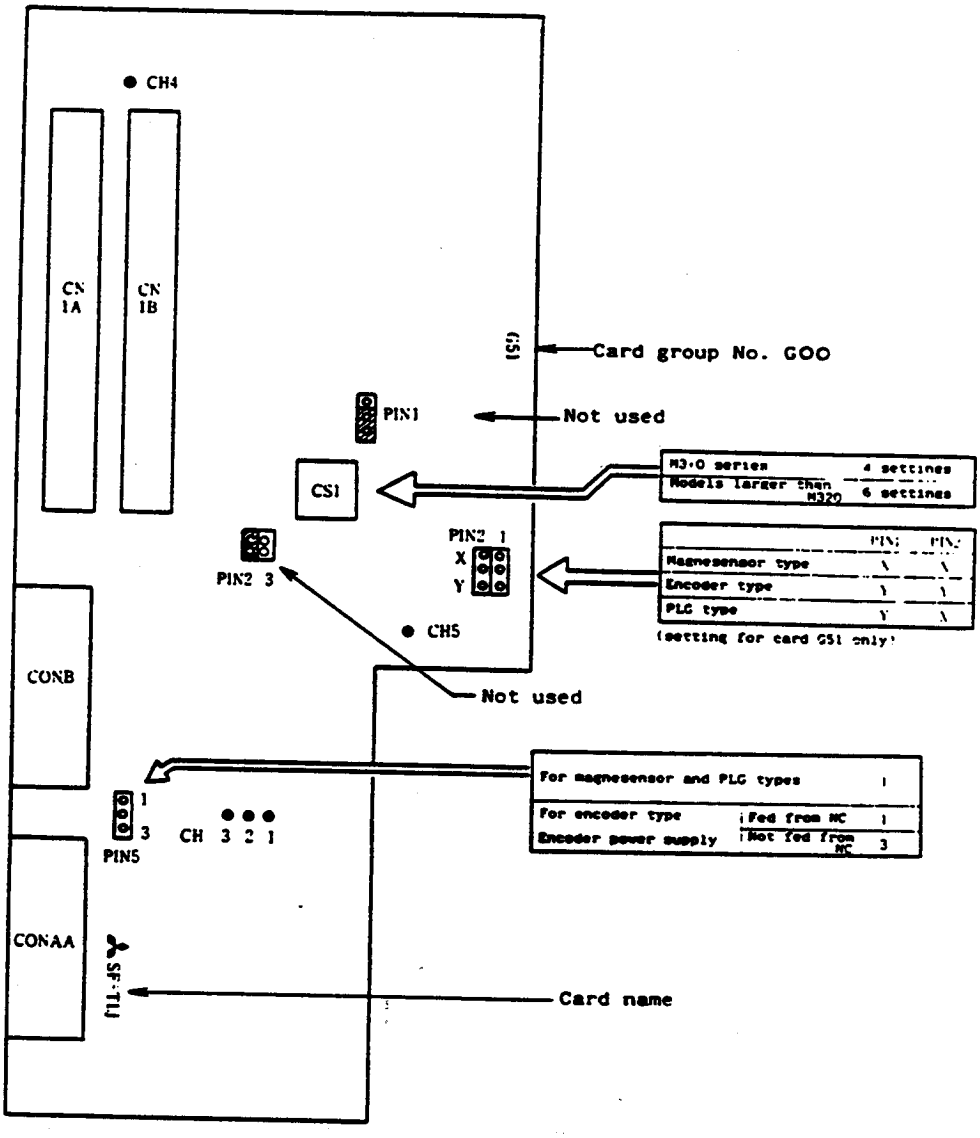
4.2 Card SF-ORJ



Check terminal table

No.	Common	Description
CH1	CH6	Position control feedback, A phase
CH2	CH6	Position control feedback, B phase
CH3	CH6	Position control feedback, Z phase
CH4	CH6	Magnesensor output
CH5	CH6	Magnesensor linear zone output
CH6	——	Common (DG)

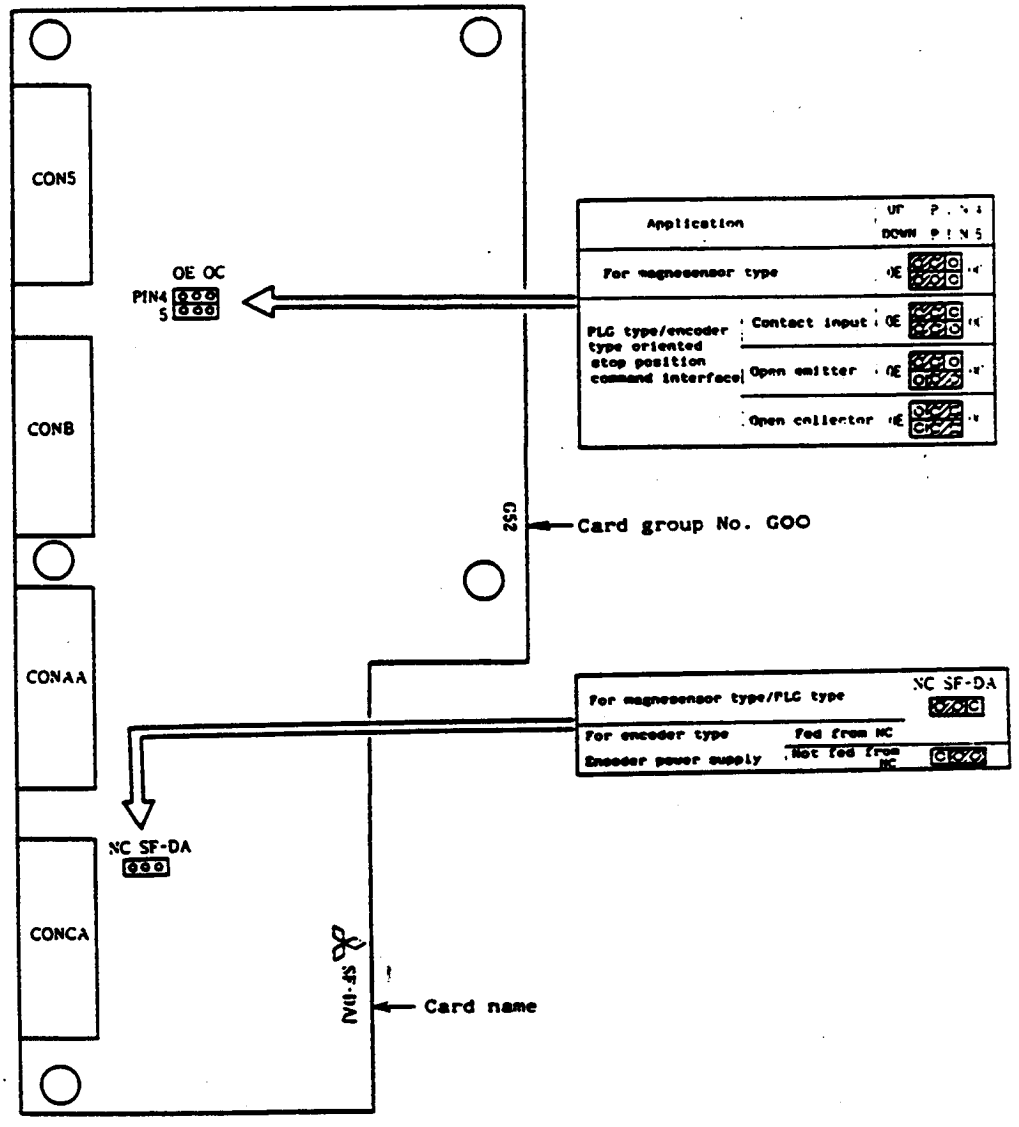
4.3 Card SF-TLJ



Check terminal table

No.	Common	Description
CH1	DG	Position control feedback, A phase
CH2	DG	Position control feedback, B phase
CH3	DG	Position control feedback, Z phase
CH4	DG	Magnesensor output
CH5	DG	Magnesensor linear zone output

4.4 Card SF-DAJ



Check terminal table

No.	Common	Description
CH1	CH6	Position control feedback, A phase
CH2	CH6	Position control feedback, B phase
CH3	CH6	Position control feedback, Z phase
CH4	CH6	Magnesensor output
CH5	CH6	Magnesensor linear zone output
CH6	——	Common (DG)
CH10	——	Common (RG))