FR-5F
SPINDLE CONTROLLER
TROUBLE-SHOOTING GUIDE
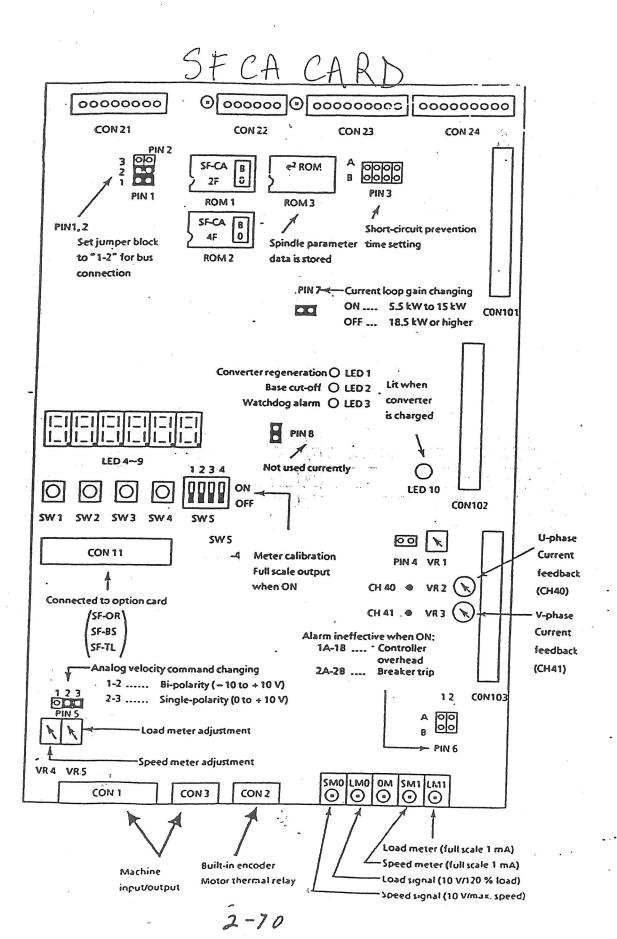
FR-SF / M32 PARAMETER CROSS REFERENCE TABLE

Parameter No.		FR-SF Parameter	
FR-SF	M-32	Name	Description
21	J81	PG1	Orient 1st deceleration point.
22	J82	PG2	Orient 2nd deceleration point.
23	J83	PGC	P Loop gain C axis sync-tap.
24	J84	ZRZ	Orient in position range.
25	J85	OSP	Spindle orient speed.
26	J86	CSP	Creep speed.
27	J87	PST	Position shift.
28	J88	BRC	Not used, set "0".
29	- - -	- - -	Not used, set "0".
2A	- - -	- - -	Not used, set "0".
2B	- - -	- - -	Not used, set "0".
2C	- - -	- - -	Not used, set "0".
2D	- - -	- - -	Not used, set "0"
2E	- - -	- - -	Not used, set "0".
2f	J101 U	OR1	
	J102 L	ORS1	Orient stop control 1.
30	J104 L	ORS2	Orient stop control 2.
31	J105	TSP	Motor maximum speed.
32	J106	ZSP	Zero speed range.
33	J107	CSN	Acceleration time constant.
34	J108	SDR/SDT	Up to speed detect range.
35	K1	TRQ/TLM	Torque limit by TL2.
36	K2	VKP	Speed loop proportional gain.
37	K3	VKI	Speed loop integral gain.
38	K4	TYP	Transition type S to P loop.
39	K5	GRA1	Spindle side: No. of teeth Gear #1.
3A	K6	GRA2	Spindle side: No. of teeth Gear #2.
3B	K7	GRA3	Spindle side: No. of teeth Gear #3.
3C	K8	GRA4	Spindle side: No. of teeth Gear #4.
3D	K9	GRB1	Motor side: No. of teeth Gear #1.
3E	K10	GRB2	Motor side: No. of teeth Gear #2.
3F	K11	GRB3	Motor side: No. of teeth Gear #3.
40	K12	GRB4	Motor side: No. of teeth Gear #4.

SF CA CARD

Mazak

CON 21   CON 22   CON 23   CON 24

PIN 2
3
2
1
PIN 1

PIN1, 2
Set jumper block
to "1-2" for bus
connection

SF-CA 2F — ROM 1
SF-CA 4F — ROM 2

e² ROM — ROM 3
Spindle parameter data is stored

A
B
PIN 3
Short-circuit prevention time setting

CON101

PIN 7 ← Current loop gain changing
ON .... 5.5 kW to 15 kW
OFF ... 18.5 kW or higher

Converter regeneration ○ LED 1
Base cut-off ○ LED 2
Watchdog alarm ○ LED 3

Lit when converter is charged

LED 4~9

PIN 8
Not used currently

LED 10

CON102

SW 1   SW 2   SW 3   SW 4

1 2 3 4
SW 5
ON
OFF

SW 5
–4   Meter calibration
Full scale output
when ON

CON 11

Connected to option card
(SF-OR)
(SF-BS)
(SF-TL)

Analog velocity command changing
1-2 ...... Bi-polarity (− 10 to + 10 V)
2-3 ...... Single-polarity (0 to + 10 V)

1 2 3
PIN 5
Load meter adjustment
Speed meter adjustment

VR 4   VR 5

PIN 4   VR 1

CH 40 ● VR 2
CH 41 ● VR 3

U-phase
Current
feedback
(CH40)

V-phase
Current
feedback
(CH41)

Alarm ineffective when ON:
1A-1B .... Controller overhead
2A-2B .... Breaker trip

1 2   CON103
A
B
PIN 6

CON 1   CON 3   CON 2

SM0 LM0 0M SM1 LM11

Machine
input/output

Built-in encoder
Motor thermal relay

Load meter (full scale 1 mA)
Speed meter (full scale 1 mA)
Load signal (10 V/120 % load)
Speed signal (10 V/max. speed)

2-70

Appendix 2 Spindle alarm list

No.	Content		No.	Content	
10	Voltage down	PR	40		PR
11			41		PR
12	Memory fault 1	AR	42		PR
13			43		PR
14			44		PR
15	Memory fault 2	PR	45	Controller overheat	PR
16			46	Motor overheat	PR
17	Card fault	PR	47		
20	No signal 1 (PLC)	PR	50		
21	No signal 2 (Spindle ENC)	PR	51		
22	IC MACO12 fault	PR	52	Error excess	PR
23	Speed control error excess	PR	53		
24	Breaker trip/mian circuit fault	PR	54		
25	Converter overcurrent/brake fault	PR	55	Emergency stop	
26	Power phase failure	PR	56	Other axis fault	✽
27	CPU fault		57		
30			E0	Instantaneous power failure warning	✽
31	Overspeed	PR	E1	Overload warning	✽
32	Inverter overcurrent/overcurrent	PR	E2		
33	Overvoltage	PR	E3		
34	Data parity check error	PR	E4	Parameter error warning	✽
35	Data fault	PR	E5		
36	Data transfer fault	PR	E6		
37	Parameter error	PR	E7	NC emergency stop	

PR: Reset by turning off power supply of NC

AR: Reset by turning off power supply of spindle amplifier

NR: NC reset

✽: "Servo OFF" does not occur.

2-72

Alarm 56 Other Axis Fault
Alarm 57 Option Card Error

Long Accel/decel time

Motor Stalls While Cutting

Motor Will Not Accept Gear Shift Commands

No CW, CCW, or Ready

I.   Alarm 10 undervoltage

A. ALARM WITH POWER ON
1. INCOMING POWER SHOULD BE 200-230VAC +10/-15% AT THE
SPINDLE BREAKER. ALARM WILL OCCUR IF THE
INCOMING POWER IS 170VAC OR LESS FOR 15mSEC OR
LONGER 2. MEASURE VOLTAGE BETWEEN ACDOWN AND
DO24 ON CON21 OF SF-PW. IF THIS IS NOT 5VDC, SF-PW
IS DEFECTIVE.
B. ALARM WHILE RUNNING. CHECK INCOMING POWER
DURING ACCEL AND DECEL. IF VOLTAGE DROPS TO 170VAC
OR LESS
FOR 15mSEC OR MORE, THE INPUT POWER CAPACITY IS NOT
SUFFICIENT, AND SHOULD BE INCREASED.

II. ALARM 12, MEMORY ERROR 1
A. CHECK TO SEE THAT ROM'S 1, 2, AND 3 ON SF-CA PCB
ARE PROPERLY INSERTED, AND IN THE CORRECT LOCATIONS.
B. IF ROMS ARE OK THEN SF-CA PCB IS DEFECTIVE

III. ALARM 15, MEMORY ERROR 2
A. CHECK THAT CONNECTOR CN1A ON BUSLINK PCB IS PROPERLY
CONNECTED B. CHECK THAT CAM11 CABLE (USED FOR NC
BUSLINK) IS PROPERLY CONNECTED, AND REPLACE IF
NECESSARY.
C. MAKE SURE ALL GROUND WIRES FROM NC, SPINDLE
CONTROLLER, AND MOTOR ARE PROPERLY CONNECTED AND ALL
CABLES ARE CORRECTLY SHIELDED.
D. IF ALL CONNECTORS AND CABLES ARE OK, REPLACE
BUSLINK PCB.
E. IF BUSLINK PCB DOES NOT RESOLVE PROBLEM, PROBLEM
IS IN EITHER THE MC611 OR MC632 BOARDS ON THE NC SIDE

IV. ALARM 17 PCB ERROR. MAKE SURE THE SPINDLE
CONTACTOR PULLS IN AND OUT PROPERLY
IF NOT, COMPONENTS ON MAIN CIRCUIT ARE DEFECTIVE, AND
COMPLETE UNIT SHOULD BE EXCHANGED.
IF THE SPINDLE CONTACTOR PULLS IN OK, EXCHANGE SF-CA
PCB

V. ALARM 20 MAC007 ERROR
A. THE SF-CA PCB IS DEFECTIVE AND SHOULD BE REPLACED.

VI. ALARM 21 NO SIGNAL 2 (SPINDLE ENCODER)
A. CHECK CABLE FROM SPINDLE ENCODER TO SPINDLE
CONTROLLER FOR CONTINUITY AND PROPER CONNECTIONS.
REPLACE IF NECESSARY.
B. MAKE SURE THAT THE ENCODER IS RECEIVING 5VDC FROM
THE NC SIDE.
C. CHECK THAT PARAMETER #41 IS SET ACCORDING TO
PARAMETER SHEET
D. CHECK SPINDLE ENCODER TO MAKE SURE ALL SIGNALS
(A, B, AND Z PHASES) ARE OK. IF ANY SIGNALS ARE
MISSING, REPLACE THE ENCODER.
E. IF ABOVE DO NOT RESOLVE PROBLEM, THEN REPLACE SF-
TL(OR) PCB.

VII. ALARM 22 IC MAC012 ERROR. SF-CA CIRCUIT BOARD IS

2-74

DEFECTIVE AND MUST BE REPLACED

VIII. ALARM 23 EXCESSIVE SPEED ERROR
   A. CHECK FOR CORRECT PHASE SEQUENCE AND CONTINUITY OF THE U, V, AND W MOTOR LEADS AND REPLACE IF NECESSARY.
   B. CHECK FOR POSSIBLE MOTOR OVERLOAD. REVIEW CUTTING CONDITION AND TOOLING BEING USED.
   C. CHECK THE LED ON THE SF-PW POWER SUPPLY. IF IT IS NOT LIT REPLACE THE POWER SUPPLY
   D. IS AN OPEN LOOP POSSIBLE? IF SO PLG ON THE BACK OF THE MOTOR IS MISSADJUSTED. WHILE CHECKING THE A AND B PHASES FROM PLG,. USE VR1, VR2, VR3, AND VR4 TO SET PROPER GAIN AND OFFSET. IF SIGNALS ARE NO-GOOD AND CANNOT BE ADJUSTED, REPLACE THE PLG CIRCUIT BOARD.
   E. IF AN OPEN LOOP IS NOT POSSIBLE AND THE SPINDLE DOES NOT TURN, THE SPEED FEEDBACK CIRCUIT ON THE SF-CA CARD IS DEFECTIVE AND MUST BE REPLACED

IX ALARM 24 BREAKER TRIP
    ALARM 25 CONVERTER OVERCURRENT
    ALARM 32 INVERTER OVERCURRENT   ALL RELATED
   A. CHECK INCOMING POWER TO SPINDLE CONTROLLER WITH A SCOPE. DURING ACCELERATION AND DECELERATION THE SINE WAVE SHOULD BE CLEAN AND FREE OF NOISE
   B. CHECK PARAMETERS #01 AND #02 AND SET TO SPECIFICATIONS ON PARAMETER SHEET.
   C. CHECK DIODE STACK IN BASE UNIT FOR OPEN OR SHORTED CONDITIONS. IF BAD, CHECK MAIN FILTER CAPACITORS AND REPLACE AS NECESSARY
   D. IF SPINDLE WILL NOT RUN AT ALL AND ALARM WILL NOT RESET, CHECK THE MAIN POWER TRANSISTORS FOR SHORTS. IN THIS CASE THE COMPLETE UNIT SHOULD BE REPLACED.
   E. IF ALL ABOVE ITEMS ARE OK THE MOTOR NEEDS TO BE REBUILT.

X. ALARM 26 POWER PHASE MISSING
   A. CHECK INCOMING POWER FOR 200-220VAC +10/-15% BETWEEN EACH PHASE. IF PHASE MISSING, CHECK WIRING BACK TO MAIN TRANSFORMER.
   B. CHECK FUSES F1, F2, AND F3 AND REPLACE AS NECESSARY. (FUSES ARE 5 AMPS)

XI. ALARM 27 CPU ERROR, (DIVISION ERROR)
   A. CHECK GEAR RATIO PARAMETERS TO PARAMETER SHEET AND SET ACCORDINGLY
   B. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE CONNECTION C. CHECK NC BUSLINK CABLE (CAM11) FOR PROPER CONNECTIONS AND REPLACE IF NECESSARY
   D. CHECK PARAMETERS VKP, VKI, AND ORS1 WITH THE PARAMETER SHEET AND SET ACCORDINGLY
   E. IF PARAMETER #1 NOX IS SET TO 2, A SPECIAL MOTOR IS

USED. CHECK PARAMETER #S 81 TO AF TO THE VALUES ON THE PARAMETER SHEET AND SET THEM ACCORDINGLY.

XII. ALARM 31 OVERSPEED

2-75

A. IF THE REFERENCE SPEED EXCEEDS 115% OF THE
MAXIMUM SPEED, CHECK PARAMETER #31 (TSP) WITH THE
PARAMETER SHEET
B. CHECK PLG FEEDBACK SIGNALS FOR CORRECT OFFSET AND
GAIN. IF SIGNALS WILL NOT ADJUST, REPLACE THE PLG
CIRCUIT BOARD C. IF THE SPINDLE SPEED IS UNSTABLE
AND OVERSHOOT OCCURS, CHECK THE WAVEFORMS ACROSS SMO-OM
TERMINALS ON THE SF-CA CIRCUIT BOARD. IF UNSTABLE,
CHECK PARAMETER NUMBERS 36 AND 37 TO THE PARAMETER
SHEET AND SET ACCORDINGLY.
D. IF ALL OF THE ABOVE ITEMS ARE CORRECT, REPLACE
THE SF-CA CIRCUIT BOARD

XIII. ALARM 33 CONVERTER OVERVOLTAGE
A. CHECK INCOMING VOLTAGE AT THE CIRCUIT BREAKER. IT
SHOULD BE LESS THAN 253VAC (230+10%) IF VOLTAGE IS
HIGHER, THIS ALARM WILL OCCUR.
B. CHECK THE INPUT POWER IMPEDANCE. IF TOO HIGH,
THIS ALARM WILL OCCUR. IMPEDANCE NEEDS TO BE LOWERED
C. CHECK RESISTANCE AND PHYSICAL CONDITION OF
CONVERTER SIDE POWER TRANSISTORS IN BASE UNIT AND
THE FIRING ON THE SF-CA CIRCUIT BOARD. IF DAMAGED,
THE COMPLETE UNIT SHOULD BE REPLACED.
D. IF ALL THE ABOVE ITEMS CHECK OUT, THEN REPLACE
THE SF-CA CIRCUIT BOARD.

XIV. ALARM 13 EXTERNAL CLOCK ERROR   ALL RELATED
ALARM 34 DATA PARITY ERROR
ALARM 35 DATA ERROR
ALARM 36 TRANSFER ERROR
A. CHECK CONNECTOR CN1A ON BUSLINK PCB FOR SECURE
CONNECTIONS B. CHECK NC BUSLINK (CAM11) CABLE FOR
PROPER CONNECTIONS AND REPLACE IF NECESSARY C. MAKE
SURE THAT ALL GROUNDS ARE SECURE AND THAT ALL CABLES
ARE PROPERLY SHIELDED.
D. CHECK THE TERMINATING RESISTANCE PLUG ON THE
BUSLINK PCB FOR A SECURE CONNECTION AND REPLACE IF
NECESSARY
E. IF THE ABOVE ITEMS ARE CORRECT, THE BUS INTERFACE
CIRCUIT ON EITHER THE SPINDLE OR NC SIDE IS
DEFECTIVE.

XV. ALARM 37 PARAMETER ERROR
A. THIS ALARM INDICATES THAT A PARAMETER HAS BEEN
SET WITH A VALUE LARGER THAN ITS ALLOWABLE RANGE.

XVI. ALARM 45 CONTROLLER OVERHEAT
A. PLACE A SHORTING PIN ON PIN 6 (1A AND 1B) OF SF-
CA PCB
1 IF THE ALARM IS STILL PRESENT, THE ALARM
CIRCUIT ON THE SF-CA CARD IS DEFECTIVE

2 IF THE ALARM IS RESET THEN
a. CHECK FANS INSIDE SPINDLE CONTROLLER
REPLACE IF NECESSARY
b. CHECK FANS IN ELECTRICAL CABINET

c. CHECK FOR CONTINUITY ACROSS THS1 AND
   THS2 IN BASE UNIT. REPLACE IF CIRCUIT IS
   OPEN.

XVII. ALARM 46 MOTOR OVERHEAT
   A. SHORT OHS1 AND OHS2 WIRES TOGETHER
      INSIDE THE MOTOR TERMINAL BOX.
      1. IF ALARM IS STILL PRESENT THE SF-CA BOARD IS
         DEFECTIVE
      2. IF THE ALARM CLEARS THEN:
         a. IF SPINDLE MOTOR IS HOT,
            1. CHECK COOLING FAN AND REPLACE IF NOT
               FUNCTIONING.
            2. IF MOTOR IS OVERLOADED, REVIEW THE
               CUTTING CONDITIONS AND TOOLING BEING
               USED 3. IF MOTOR IS FREQUENTLY BEING
         STARTED AND STOPPED, DECREASE FREQUENCY
               OF STARTS AND STOPS OR INCREASE THE
               VALUE OF THE ACCELERATION TIME
               CONSTANT PARAMETER 33 (CSN)
      B. IF SPINDLE MOTOR IS NOT HOT
         1. CHECK FOR CONTINUITY ACROSS OHS1
            AND OHS2. IF OPEN REPLACE SENSOR.

XVIII. ALARM 52 OVERDROOP
   A. CHECK PARAMETER #03(PLG) WITH THE VALUE ON THE
      PARAMETER SHEET AND SET IT ACCORDINGLY
   B. CHECK BITS 8 AND E OF PARAMETER 30(ORS2) WITH THE
      VALUE ON THE PARAMETER SHEET AND SET ACCORDINGLY.
   C. CHECK ORIENTATION ENCODER FOR PROPER OPERATION
      AND REPLACE IF NECESSARY D. IF THE ABOVE ITEMS ARE
   CORRECT, INCREASE THE VALUE OF THE ACCELERATION TIME
      CONSTANT PARAMETER #33(CSN).

XIX. ALARM 56 OTHER AXIS FAULT
   A. CHECK NC BUSLINK (CAM11) CABLE FOR PROPER
      CONNECTION TO SPINDLE
            CN1A---->CAM11 CABLE
            CN1B---->TERMINATING RESISTANCE
   B. REFER TO SERVO DRIVE MAINTENANCE MANUAL

XX. ALARM 57 OPTION CARD ERROR
   A. INCORRECT OPTION CARD INSTALLED

XXI. LONG ACCEL/DECEL TIME
   A. CHECK PARAMETER #33(CSN)
   B. CHECK PARAMETER #01(NOX) AND #02(MSL)
   C. CHECK THAT ROMS 1, 2, AND 3 ON SF-CA PCB
      ARE CORRECTLY NUMBERED TO BN# SPECIFICATION SHEET
   D. CHECK THE TORQUE LIMIT COMMANDS PARAMETER
      #1U(BITS 2 AND 3) ON THE SF-CA PCB ARE NOT BEING
      TURNED ON.
   E. CHECK THE DRIVE BELTS FROM THE SPINDLE MOTOR

XXII. MOTOR STALLS WHILE CUTTING
   A. CHECK BELTS FROM SPINDLE MOTOR
   B. CHECK ROMS 1,2, AND 3 ON SF-CA PCB ARE CORRECTLY
      NUMBERED TO BN# SPECIFICATION SHEET

C. CHECK TORQUE LIMIT COMMANDS, PARAMETER #1U BITS
(2 AND 3) THEY SHOULD NOT BE ON
D. CHECK TORQUE LIMIT PARAMETER #35(TLM) WITH THE
PARAMETER SHEET AND SET ACCORDINGLY
XXIII. MOTOR WILL NOT ACCEPT GEAR SHIFT COMMANDS
A. CHECK OUTPUT SIGNAL PARAMETER #4U(STS2) TO MAKE
SURE THAT ALL THE OUTPUT BITS TO THE NC ARE PROPERLY
SET, DEPENDING ON THE STATUS OF THE SPINDLE
CONTROLLER. IF NOT, EXCHANGE THE SF-CA CARD B.
CHECK EXTERNAL INPUT SIGNAL PARAMETER #1U (BITS 0 AND
1), TO MAKE SURE THAT THE NC SIDE IS GIVING THE
PROPER DIRECTION COMMAND TO THE SPINDLE FOR
GEARSHIFT XXIV. NO CW, CCW, OR READY
A. Check external interface mode selection parameter
#04(MOD) to the parameter sheet and 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
outputs from SF-CA PCB. If output bits are not
present and input bits are, replace SF-CA PCB

XXV   Gear Noise
A.   Check if gear noise occurs when main power is
shut off with the motor running. If noise goes
away, go to step B. If noise persists. contact
your machine tool builder
B.   Does noise persist in open loop? If not go
to step C. If it does, adjust CT offsets on SF-
CA PCB. Also verify that all parameters are
properly set according to the parameter sheet.
If these items check out ok, replace the SF-CA
circuit board.
C.   Check adjustments of the PLG circuit card on
the back of the motor. While checking A & B
phase signals from PLG, use VR1, 2, 3, & 4 to
set proper gain and offset. If signals are not
good, and cannot be adjusted, exchange PLG
circuit board and sensor.

XXVI   NO LEDS
A.   Check incoming power at RO-SO terminals in the
upper right hand corner of base unit. If OK, go
to step B. If not, check F1, 2, &3 (5amp)
fuses on main line filter. IF they are blown,
refer to the fuse blow explanation

B.   Disconnect SF-CA PCB from SF-PW. Disconnect
CON101, 102, 103 from the hinge panel.
Reconnect SF-CA to SF-PW. If LEDS come on, refer
to transistor module checking procedure in the
troubleshooting manual to find the shorted
transistor. If the leds do not come on, replace

the SF-PW circuit board.

XXVII   Blown Fuses
    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, replace SF-PW
    B. With NC Power on
       1. Disconnect MS1 and MS2 wires from base
          unit located near U, V, &W motor leads. If
          fuses do not blow, replace motor cooling fan

XXVIII   RPM Different than Command
    A. Check all parameters to parameter sheet and set
       accordingly
    B. Check reference speed status display (letter C)
       to make sure that the NC side is out-putting the
       correct speed reference. C. Check the PLG
circuit board on the back of the motor for proper
       adjustment
    D. Check for possible motor overload. Review
       cutting conditions, and tooling being used E.
Check to make sure that the override command is off
       when checking the RPM display of the SF-CA
       board. F. If all of the above items are ok,
replace the SF-CA circuit board.

XXIX   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 the sensor or encoder 2. If the
     signals in item #1 are ok, check the signals at
          the orient card and SF-CA circuit card. If
          the signals are not good, exchange the
          orient card first and if that does not solve
          the problem, then replace the SF-CA card
       3. If encoder orientation is used, make
          sure that the encoder is receiving its 5
          volt power supply from the NC side. Also
          make sure that the jumper pin settings on
          the orient card are correct. 4. Check
     parameter #41 (OSL) to the parameter sheet and
          set accordingly.

    B. Orient Procedure is OK, But the Stop State is
       Abnormal. 1. Check the orientation adjustment
     procedure on the following pages, depending on
          the type of orientation that you are using.
       2. If item #1 is ok, and cannot be adjusted
          check for backlash in the gearing on the
          machine side. 3. If the problem occurs in
     all gears, or the backlash is normal, replace

the orientation circuit board and then the
SF-CA board in that order.

STATIC CHECK

BI-MOS TRANSISTOR CHECKING PROCEDURE FR-SF

1. PREPARATION

   1 TURN OFF THE MACHINE MAIN POWER SWITCH OR BREAKER

   2 TURN OFF THE SPINDLE DRIVE CIRCUIT BREAKER CB-1

   3 CONNECT TEST LEADS TO THE FIRST SET OF THE TEST POINTS
     SHOWN BELOW. ATTACH THE PROBE'S GROUND CLIP TO THE
     CONNECTOR PIN AND THE PROBE ITSELF TO THE CHECK POINT.
     SET THE OSCILLOSCOPE TO VIEW A NEGATIVE TEN VOLTS DC.

   4 TURN ON THE MACHINE MAIN BREAKER AND OBSERVE THE VOLTAGE
     BETWEEN THE TEST POINTS SHOWN AND THEN TURN OFF THE MAIN
     CIRCUIT BREAKER WITHIN FIVE SECONDS.
     (THIS IS BECAUSE THE SF-PW AND/OR SF-CA CARDS
     COULD BE DESTROYED AGAIN IF THE BASE UNIT IS STILL
     DEFECTIVE. THIS IS TRUE EVEN WITH CB-1 OFF) DO THE SAME
     FOR THE SUBSEQUENT POINTS

```
         ┌─ CH 47 .... TO ..... CON 24 PIN  2
     I    │
     N    │  CH 48 .... TO ..... CON 24 PIN  6
     V    │
     E    │  CH 49 .... TO ..... CON 24 PIN 10
     R    │
     T    │  CH 50 .... TO ..... CON 22 PIN  2
     E    │
     R    │  CH 51 .... TO ..... CON 22 PIN  2
          │
          └─ CH 52 .... TO ..... CON 22 PIN  2

         ┌─ CH 53 .... TO ..... CON 23 PIN  2
     C    │
     O    │  CH 54 .... TO ..... CON 23 PIN  6
     N    │
     V    │  CH 55 .... TO ..... CON 23 PIN 10
     E    │
     R    │  CH 56 .... TO ..... CON 22 PIN  5
     T    │
     E    │  CH 57 .... TO ..... CON 22 PIN  5
     R    │
          └─ CH 58 .... TO ..... CON 22 PIN  5
```

IN EACH OF THESE CASES A -10 VOLT DC DIFFERENCE SHOULD
BE SEEN. THIS IS THE STATIC DC BIAS ON THE TRANSISTOR. ANY
VARIANCE FROM THIS VOLTAGE INDICATES A PROBLEM WITH THE
APPROPRIATE TRANSISTOR OR BIASING CIRCUIT.

2-81

CHECKING THE INVERTED (DRIVE) SIDE

1. TURN OFF THE MACHINE MAIN POWER BREAKER OR SWITCH
2. TURN OFF THE SPINDLE DRIVE CIRCUIT BREAKER CB-1
3. ON THE SF-CA CARD, SHORT PIN 6 SIDE 2 A TO B(THIS
   CANCELS THE CIRCUIT BREAKER TRIP ALARM). PIN 6 IS
   LOCATED ON THE BOTTOM RIGHT CORNER OF THE SF-CA CARD
4. TURN ON THE MACHINE MAIN BREAKER
5. TURN ON THE CONTROL POWER
6. REWRITE SPINDLE PARAMETER 58 TO 1* (NOTE 2) THE
   DRIVE MAY COME UP IN ALARM 17. SETTING PARAMETER 58
   TO 1 WILL   CLEAR THIS ALARM
7. TURN THE CONTROL OFF AND THEN BACK ON (THIS
   ENABLES THE NEW PARAMETER SETTING)

NOTE 2   TO CHANGE PARAMETER #58 PRESS THE MODE SWITCH
          UNTILL THE LEFT TWO DIGITS OF THE SIX SEVEN
          SEGMENT LEDS SHOWS 41. THIS IS THE MODE IN WHICH
          WE CAN ACCESS PARAMETERS 41 THROUGH 60. PRESS THE
          DOWN BUTTON UNTILL 58 IS DISPLAYED IN THE LEFT TWO
          DIGITS. THE DIGIT ON THE RIGHT WILL DISPLAY 0.
          TO CHANGE THIS TO A ONE, PRESS THE SET SWITCH.
          THE PARAMETER NUMBER WILL BEGIN FLASHING. USE THE
          UP AND DOWN BUTTONS TO CHANGE THE VALUE ON THE
          RIGHT TO WHAT YOU WANT AND PRESS THE SET BUTTON
          AGAIN.

7. SET THE SPEED COMMAND TO ZERO
8. PUT THE SPINDLE DRIVE IN OPEN LOOP. (SET
   PARAMETER #0 TO 1 **NOTE 3). DO NOT PRESS THE RESET
   SWITCH AFTER THIS SETTING, OR PARAMETER #0 WILL
   RETURN TO ITS ORIGINAL CONDITION, "0".

** NOTE 3
    TO REWRITE DATA, USE THE SAME PROCEDURE AS IN
    NOTE 2. HOWEVER IT IS NOT NECESSARY TO PRESS PB1
    (RESET SWITCH) AFTER REWRITING DATA
    TO SELECT PARAMETER ADDRESS #0, PRESS THE MODE
    SWITCH UNTILL "E1" APPEARS IN THE TWO POSITIONS ON
    THE LEFT. THEN PRESS THE 'DOWN' SWITCH ONCE. THE
    ADDRESS DISPLAY SHOWS "00".

9. CHECK THE SIX BASE WAVEFORMS USING THE OSCILLOSCOPE
   (READY-ON, SRN OR SRI - ON, THEN CHECK) ***
        CH47 .... TO .... CON 24 PIN 2
        CH48 .... TO .... CON 24 PIN 6
        CH49 .... TO .... CON 24 PIN 10
        CH50 .... TO .... CON 22 PIN 2
        CH51 .... TO .... CON 22 PIN 2
        CH52 .... TO .... CON 22 PIN 2

10. FROM THE CONTROL, COMMAND A SPINDLE SPEED. CHANGE
    THE SPINDLE SPEED BOTH UP AND DOWN AND WATCH WHAT
    HAPPENS TO THE WAVEFORM

CONVERTER (BREAK) SIDE

11. CHANGE DISPLAY TO DE-BUG MODE.
    SELECT ADDRESS #564
    WRITE DOWN THE DATA IN #564
    SELECT ADDRESS #5FE
    WRITE DOWN THE DATA IN #5FE
    CHANGE THE DATA IN #5FE SO THAT THE NEW DATA ARE
    EQUAL TO OR GREATER THAN THE DATA IN #564 PLUS C
    (IN HEXADECIMAL)
    LED 1 SHOULD BE ON INDICATING THE DRIVE IS NOW IN
    THE REGENERATIVE STATE
    (DO NOT PRESS RESET OTHERWISE THE DATA IN #5FE
    WILL BE CHANGED TO THE ORIGINAL DATA.)

12. CHECK THE 6 BASE WAVEFORMS USING THE SCOPE.
    (READY ON AND SRN OR SRI ON THEN CHECK THE
      FOLLOWING)
    TRY CHANGING THE COMANDED SPEED
    CH53 .... TO .... CON 23 PIN 2
    CH54 .... TO .... CON 23 PIN 6
    CH55 .... TO .... CON 23 PIN 10
    CH56 .... TO .... CON 22 PIN 5
    CH57 .... TO .... CON 22 PIN 5
    CH58 .... TO .... CON 22 PIN 5

13. AFTER CHECKING THESE WAVEFORMS, REWRITE PARAMETER
    #58 TO "0" AND PRESS THE RESET BUTTON AND REMOVE THE
    JUMPER FROM PIN 6 TO 2

****NOTE 4
    1 SELECTING THE DEBUG MODE. WHEN THE MODE SWITCH IS
      PRESSED 11 TIMES, THE DISPLAY CHANGES TO THE DEBUG
      MODE 2. SELECTING ADDRESS #564
      PROCESS STARTS IN LEAST SIGNIFICANT DIGIT (UNITS)
      PRESS DOWN SWITCH FOUR TIMES INCREMENTS LEAST
        SIGNIFICANT DIGIT TO 4
      PRESS UP SWITCH ONCE MOVES SETABLE DISPLAY TO THE
        TENS DIGIT PRESS DOWN SWITCH SIX TIMES
        SETS TENS DIGIT DISPLAY TO SIX
      PRESS UP SWITCH ONCE
        MOVES SETABLE DISPLAY TO HUNDREDS DIGIT
      PRESS DOWN SWITCH FIVE TIMES INCREMENTS HUNDREDS
        DISPLAY TO FIVE
      THIS PROCEDURE SELECTS ADDRESS #564

3. TO READ THE DATA THAT IS IN ADDRESS #564,
    PRESS THE SET SWITCH ONCE

2-83

(THE ACTUAL DATA THAT WILL BE IN ADDRESS #564 IS
UNPREDICTABLE).   TO RETURN TO THE ADDRESS MODE,
PRESS THE <u>UP</u> OR <u>DOWN</u> SWITCH ONCE

4. TO SELECT ADDRESS #5FE FOLLOW THE SAME PROCEDURE AS
SHOWN ABOVE
5. TO CHANGE DATA
    PRESS <u>SET</u> ONCE.   d_0000 WILL BE DISPLAYED
    PRESS <u>SET</u> ONE MORE TIME.   THE LEAST SIGNIFICANT
    DIGIT IN THE DISPLAY WILL START BLINKING,
    INDICATING THAT THIS DIGIT CAN BE CHANGED.

6. THE NEW DATA SET INTO #5FE HAS TO BE EQUAL TO OR
    GREATER THAN THE CONTENTS OF #564 IN HEX PLUS C
    FOR EXAMPLE, IF #564 IS B3
         #5FE > B3+C
         #5FE > BF
    IN THE ABOVE CASE, ANY VALUE CAN BE SET INTO #5FE,
    AS LONG AS IT IS GREATER THAN BF

   TO CHANGE THE DATA TO C0 FOR EXAMPLE
    PRESS THE <u>UP</u> SWITCH ONCE THE TENS DISPLAY WILL
    BLINK PRESS THE <u>DOWN</u> SWITCH 12 TIMES. C WILL BE
    DISPLAYED IN THE TENS DISPLAY
    PRESS THE <u>SET</u> SWITCH ONCE
DATA INPUT IS NOW COMPLETE AND LED 1 SHOULD BE ON