YASKAWA ELECTRIC

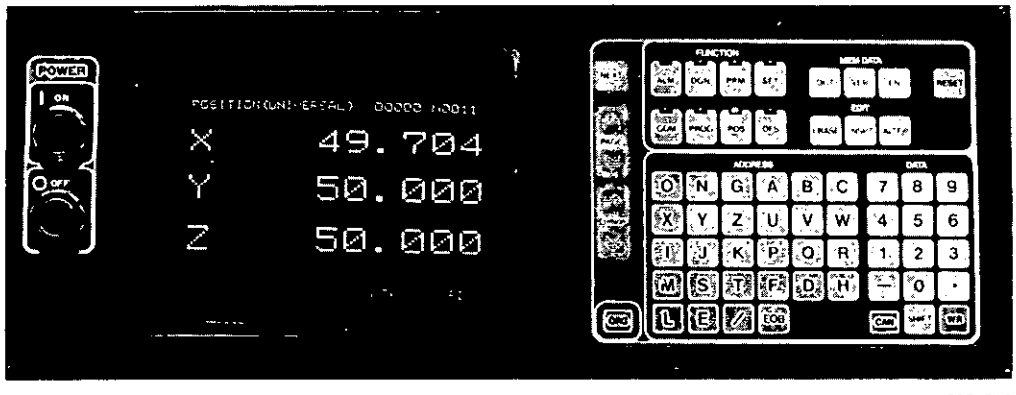
TOE-C843-8-35
INSTRUCTIONS

CNC SYSTEM FOR MACHINING CENTERS
YASNAC® MX2
MAINTENANCE MANUAL

Before initial operation read these instructions thoroughly, and retain for future reference

This manual is primarily intended to give operators instructions for YASNAC MX2 programming, operation and maintenance.

This manual applies to the basic and optional features of YASNAC MX2. The optional features are marked with a dagger. For the specifications of your YASNAC MX2, refer to the machine tool builder's manual.



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YASNAC MX2 OPERATOR'S STATION

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1. GENERAL

The YASNAC MX2 is a high-performance CNC for simultaneously controlling basically 3 and up to 5 axes of a machining center, with emphasis placed on high-speed machining, and programming capability.

When the control uses 14" color graphics character display, instead of 9" monochromatic character display, called ACGC (Advanced Color Graphics Computer), the sophisticated NC functions required for machine requirements can be created and provided for customers. This constitutes an epoch-making NC system never before available.

Part program capacity has been drastically expanded and is available in 40 m, 80 m, 150 m, 320 m, 640 m, and 1280 m tape lengths.

Built-in PC process time has been increased up to approximately 2.7 μseconds/step and maximum memory of sequence program has been greatly extended up to 64K bytes (approximately 16,000 steps).

1.1 COMPONENT ARRANGEMENT OF YASNAC CONTROL SYSTEM

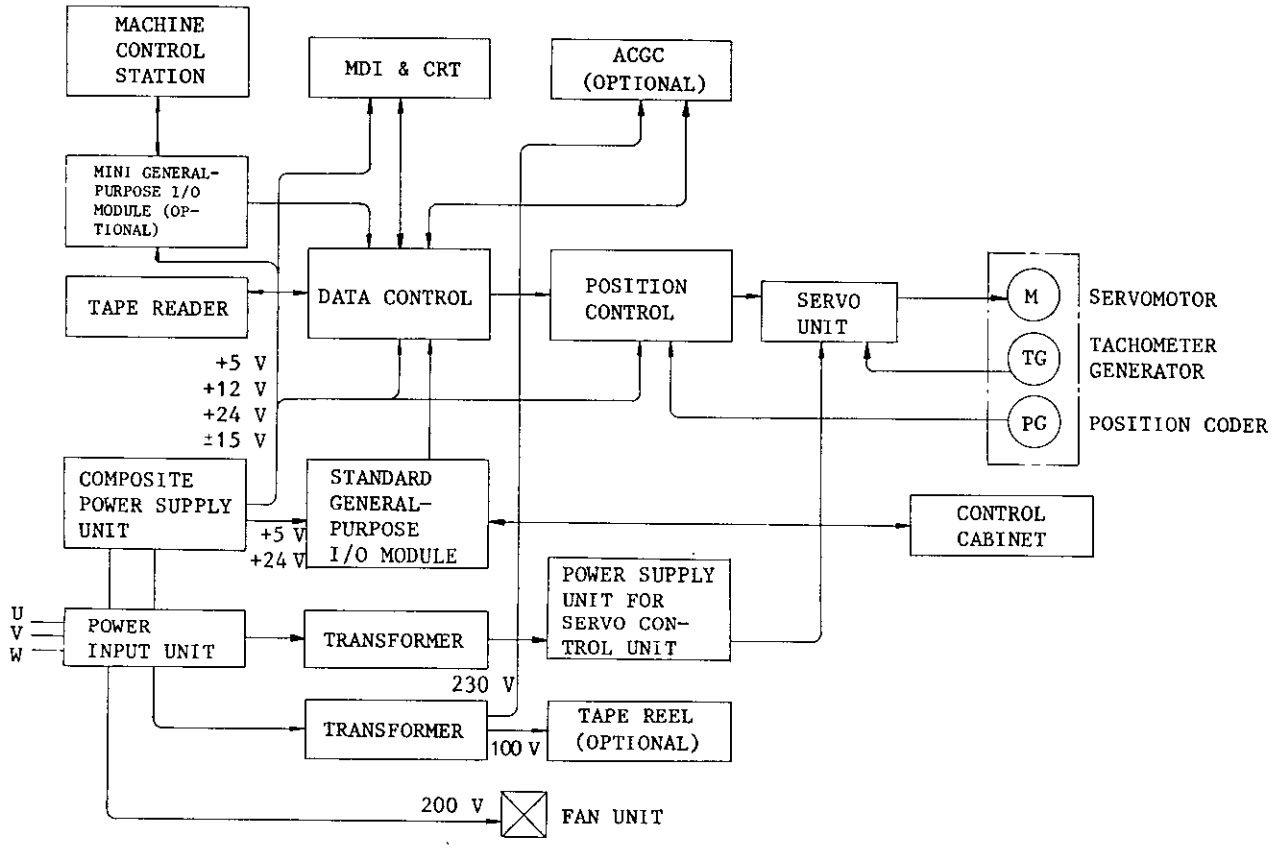


Fig. 1.1 Component Arrangement of YASNAC Control System

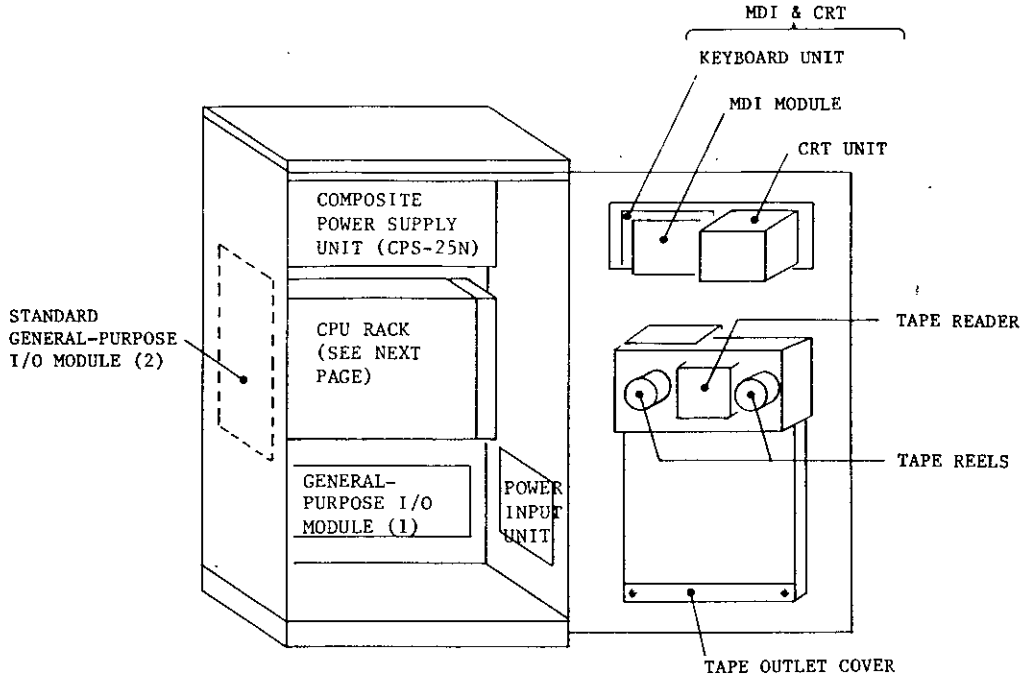


Fig. 1.2 Attached Type 1, with Door Open

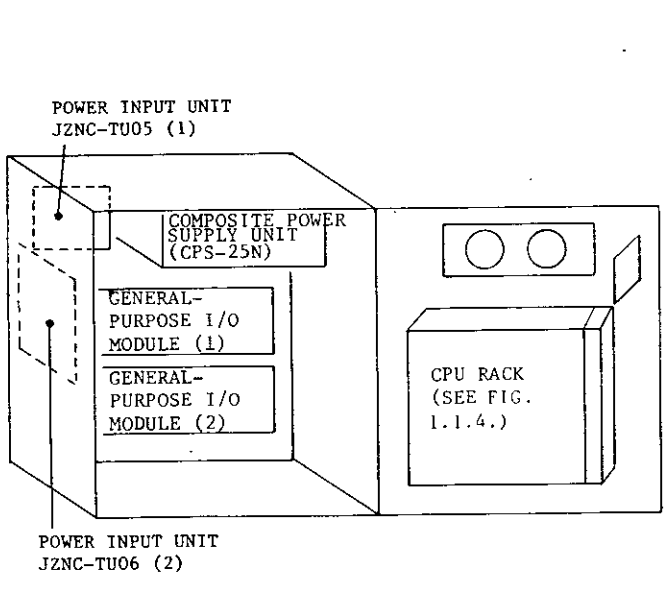


Fig. 1.3 Unbundled Type, with Door Open

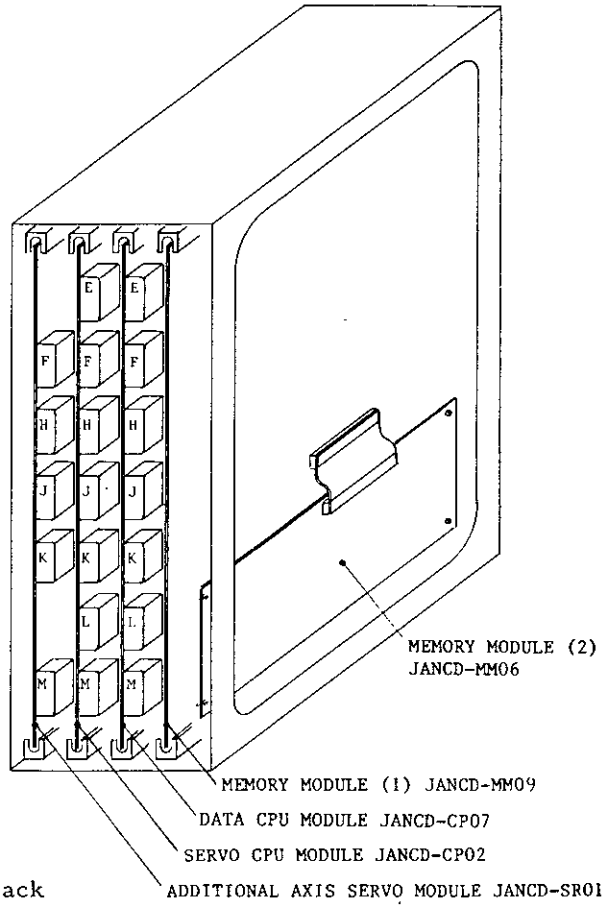


Fig. 1.4 CPU Rack

Table 1.1 List of Major Component Units

Component Name	Type Name	Component Code	Remarks
Power Input Unit	JZNC-TU04	DUN 4330	Attached type 1
	JZNC-TU17	DUN 5610	Free-standing type
	JZNC-TU06	DUN 4700	Unbundled type
Power Control Module	JANCD-TU01	DTN 3570	Included in the power input unit
Composite Power Supply Unit	CPS-25N	AVR 808	
Tape Reader	MODEL 2401-1	RED 16	
Tape Reels	MODEL 1500	RED 14	6 inches
	MODEL 1402-1	RED 13	8 inches
Data CPU Module	JANCD-CP07C	DTN 4260	
Servo CPU Module	JANCD-CP02	DTN 3510	
Memory Module (1)	JANCD-MM09-03	DTN 4280	
Memory Module (2)	JANCD-MM06	DTN 3630	320M
Battery Unit	JZNC-GBA02	DUN 650	
Additional Axis Control Module	JANCD-SR01	DTN 3600	
Control Panel Unit	JZNC-OP01	DUN 4210	
9" CRT Display Unit	TR-9DD1B	CRT 4	
Keyboard Unit	HMK-3993-02	SW 651	
MDI Module	JANCD SP01	DTN 3560	
Standard General-purpose I/O Module 1, 2	JANCD-IO01B	DTN 3580	
Mini I/O Module	JANCD-IO02	DTN 3680	

Table 1.2 ACGC Major Components

Component Name	Type Name	Component Code	Remarks
14" CRT Unit	C-5470YE	CRT 6	
Keyboard Unit (M)	HMK-9993-02	SW 677	Main key
Keyboard Unit (S)	HMK-9993-20	SW 679	Soft key
Power Supply Unit	VST-5-522/ST	AVR 378	
CPU Module	JANCD-CG01C	DTN 4470	
Graphic Module	JANCD-CG02	DTN 4490	
Bubble Memory Module (1)	FBC-501M4P	MEM 30	120K bytes
Bubble Memory Module (2)	FBC-502M4P		256K bytes
Bubble Memory Module (4)	FBC-504M4P	MEM 31	512K bytes

1. 2 BLOCK DIAGRAM OF YASNAC CONTROL SYSTEM

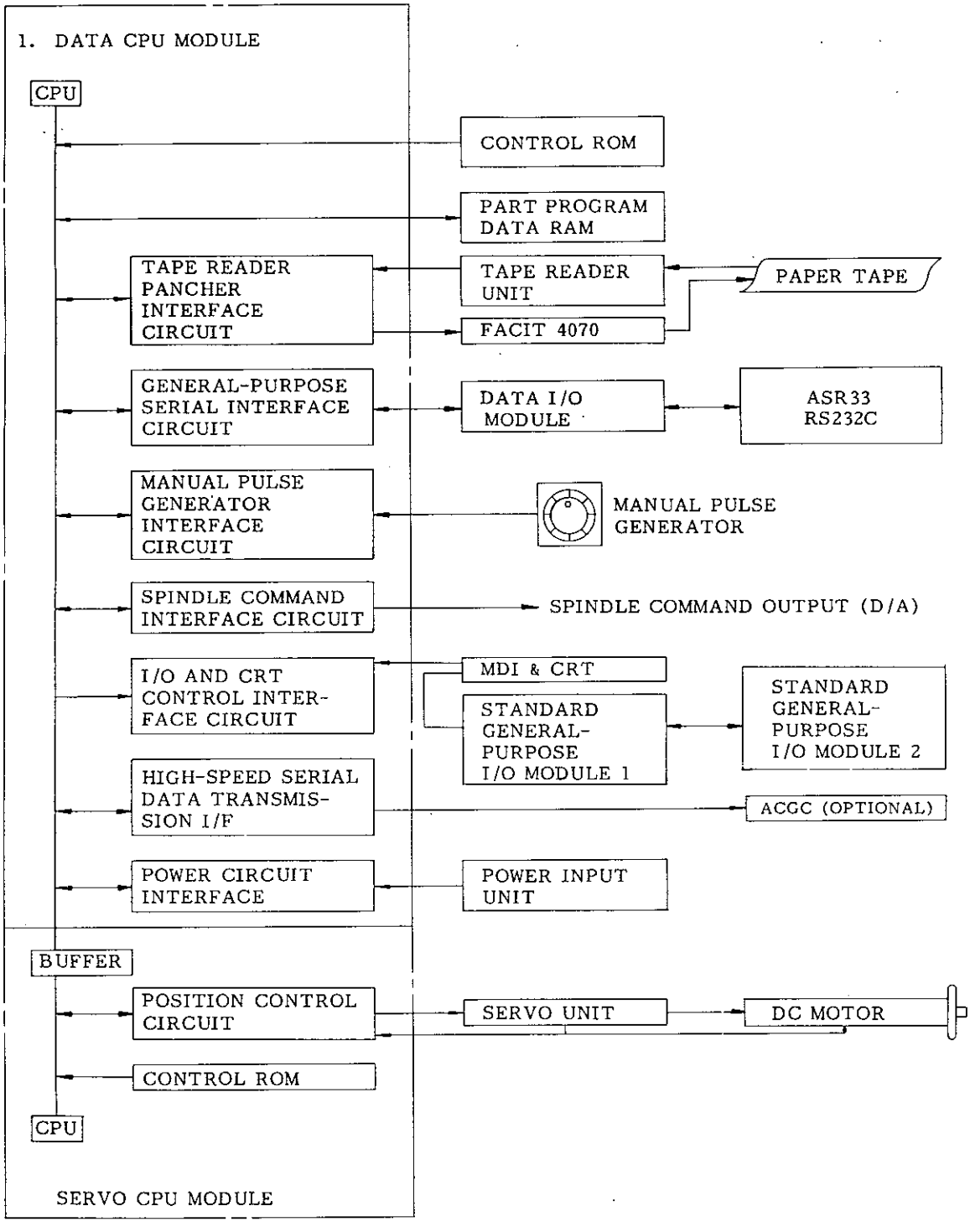


Fig. 1.5 Block Diagram of YASNAC Control System

1. 3 MAINTENANCE INSTRUMENTS

(1) Measuring instruments

Name	Specifications	Purpose
AC voltmeter	Capable of measuring AC power voltage Tolerance: ±2% or less	To measure AC power voltages
DC voltmeter	Maximum range: 10 V, 30 V Tolerance: ±2% or less (A digital voltmeter may be required.)	To measure DC power voltages
Oscilloscope	2-channel type, with a frequency range of 5 MHz or higher	To measure tape reader output waveforms, etc.
DC ammeter	Maximum range: 10 A, 30 A, 50 A Tolerance: ±2% or less	To measure currents flowing through DC motors

(2) Tools

- Phillips screwdriver: large, medium and small
- Standard screwdrivers: medium and small

(3) Chemicals

- Cleaning agent for tape reader (absolute alcohol)

1. 4 ROUTINE INSPECTION SCHEDULE

The following table shows the minimum requirements to be observed for maintenance time in order to keep the equipment in optimum condition for an extended period.

Table 1.3 Inspection Schedule

Items		Frequency	With the system off	With the system on	Remarks
Tape Reader	Cleaning of reading head	Daily	○		Including light source part.
	Cleaning of tape tumble box	Weekly	○		
	Lubrication of tension arm shaft end	As required	○		
Control Panel	Tight closing of doors	Daily	○		
	Checking for loose fit and gaps of side plates and worn door gaskets	Monthly	○		
Servomotor	Vibration and noise	Daily		○	Feel by hand, and do the audible inspection.
	Motor contamination and breakage	Daily or as required	○	○	Inspect visually.
	Burned spots, cracks, wear, and pressure of brushes	Every three months	○		Check the length of brushes.
	Roughened commutator surface		○		Check dark bar, threading and grooving of commutator.
	Dirt in interior of motor		○		Clean with compressed air.
Battery		Daily	○	○	See if alarm for BATTERY is displayed on CRT screen.

1.4.1 TAPE READER

(1) Cleaning the tape reader head (Daily)

(a) Remove tape rubbish and dust from the glass. with a blower brush. If the glass is stained with oil or oily dust, wipe it using a gauze or soft cloth with absolute alcohol. Also clean the tape guide and the tape retainer.

(b) Remove the dust, if any, on LED (light source) on top with a blower brush.

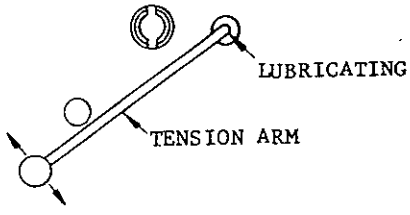
(2) Cleaning of tape tumble box (Weekly)

(a) Clean the braided nylon leading tape with a clean, soft cloth.

(b) Remove the tape outlet cover (See Fig. 1.2) by loosening two mounting screws and clean the bottom of the tape tumble box with cloth or brush.

(3) Lubricating of tension arm shaft†

For the control with 6 inch or 8 inch diameter reels, lubricate the shaft end of tension arm, when the tension arm does not move smoothly.



(In the case of 8-inch diameter reel)

NOTE

When trouble occurs in feeding or winding tape with 8 inch diameter reels, open the front door and brush away dust around the photo-coupler by using a blower brush.

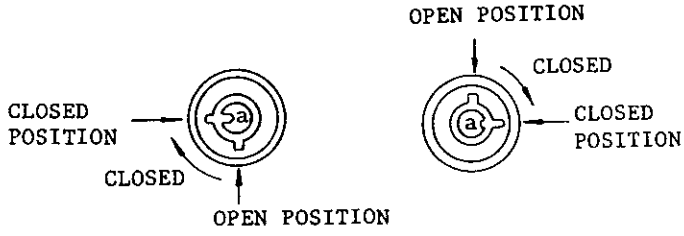
1.4.2 CONTROL PANEL

(1) Checks on doors for tight closing (Daily)

(a) The control panel is constructed as a dust-proof, sheet-steel enclosure with gasketed doors so as to keep off dust and oil mists. Keep each door tightly closed at all times.

†Tension arm shaft available as an option.

(b) After inspecting the control with door open, close the door and fasten door locks (2 per door) securely using the key provided (No. YE001). when opening or closing, insert the key all the way into the keyhole and turn until it clicks (approximately a quarter-turn). The key can be removed from an open or closed position.



With the door lock on right side of the door (Left-hand Hinged Door)

With the door lock on left side of the door (Right-hand Hinged Door)

NOTE

If the optional door interlocking switch is provided, opening the door shuts off the main power supply and stops all operations.

(c) Check gaskets on the rims of front and rear doors.

(d) See if the inside of enclosure is dusty. Clean it, if necessary.

(e) Check for any opening in the door base with the doors shut tightly.

1.4.3 SERVOMOTOR AND DC MOTOR FOR SPINDLE

(1) Vibration and noise (Daily)

Vibration can be checked by resting the hand on the motors, and for noise, using a listening stick is recommended. If any abnormality is found, contact maintenance personnel immediately.

(2) Motor contamination and impairment (Daily)

Check the motor exterior visually. If dirt or damage should be observed, inspect the motor by removing the machine cover. Refer to the machine tool builder's manual.

(3) Carbon brushes (Quareerly)

(a) The carbon dust from brushes, accumulated around the commutator, inside the motor, may cause motor troubles such as the layer short of armature and the flashover of commutator. In the worst case, it may lead to fatal damage. To avoid this, be sure to have an inspection on the commutators and brushes at least every three months.

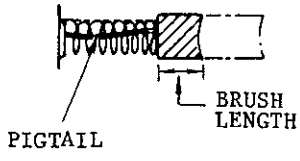
Double check to be sure power is OFF by turning off both control power and servo power before inspecting brushes and servomotor inside. (Disconnecting the circuit breaker of the power supply unit for servo control unit cannot shut off power completely). Failure to do so may cause fatal or serious injury.

(b) Under normal operating conditions, brush wears by 2 to 4 mm per 1000 operating hours. If wear is excessive, check to see if oil has contaminated armature surface, or if abnormal overcurrent flows through motor circuit.

(c) When brush length becomes shorter than those shown below, replace the brush with a new one.

Minertia motor junior series: 6 mm or below

(d) If either the brush, or pigtail is broken, the brush assembly must be replaced as a whole unit.



NOTE

When replacing the brush assembly, consult YASNAC service personnel.

(4) Commutator surface (Quarterly)

(a) Visually check surface roughness of the commutator through inspection window.

After 100 to 200 operating hours, the commutator should take on a polished light brown or chocolate color. The motor has developed an ideal commutator film and needs no attention other than to be kept clean.

(b) See if a blackened bar, threading (or grooving) is on the commutator. If any of the above is observed, investigate the cause of trouble.

Threading or grooving on the commutator surface may be due to too small of a motor load. A blackened bar is the result of carbon dust in commutator slots, or accidentally produced sparkings. If the carbon dust is a cause of blackened bar, wipe the commutator with a clean dry cloth to smooth the surface. If sparking occurs, contact the maintenance representative.

(5) Motor inside (dirty)

(a) Visually check the motor interior through inspection window.

The dried carbon dust will not affect motor running, but it is recommended that the inner parts such as commutator, brush-holders and brushes be cleaned with a dry compressed air (air pressure: 2-4 kg/cm^2, 28.5-56.5 ps)

(b) If oily carbon dust exists inside the motor due to poor oil seal or defective enclosure, contact YASNAC service personnel.

(6) Servomotor with oil seal

As the life expectancy of oil seals and brushes is 5000 hours, the inspection and maintenance by the company should be done every 5000 hours. If possible, yearly inspection taking less than 8 hours is recommended.

1.4.4 BATTERY

Make sure that "BAT" or "A/B" on the right-low position of CRT screen does not blink. If it is blinking, contact maintenance personnel. The battery must be replaced with a new one within a month.

2. TROUBLESHOOTING

2. 1 TROUBLE ISOLATION

Try to fully analyze the circumstances in which the trouble occurred. This is necessary for isolating the trouble and/or for having the YASNAC service personnel called in to correct the trouble. Verifying the following points will minimize the down time of your system:

2. 1. 1 NATURE AND CIRCUMSTANCES OF TROUBLE

(1) Type of trouble

- In what mode did the trouble occur?
- In what mode(s) does the system normally operate?
- What was the display of MDI & CRT when the trouble occurred?
- Was the positioning incorrect (error axis, positioning error, displayed position values)?
- Was the tool path erroneous (by how much)?
- Was the feedrate correct?
- Was an auxiliary function used?
- What was the alarm number?
- In which program did the trouble occur? What was the sequence number?
- Does the trouble recur in a particular mode?
- Is the trouble related to tool changing?
- Is the trouble associated with feedrate?

(2) Frequency of trouble

- When did the trouble develop? (Did it occur when other machines were in operation?)
- How often did it occur?

(3) Recurrence of trouble

- Run the program tape that experienced the trouble several times. Check the values in the NC unit and compare them with those being programmed. Is the trouble attributable to external disturbances?
- Verify the offset values and remaining distributed values being stored.
- Increase or decrease the override value.
- Ask the operator to explain the circumstances under which the trouble occurred.

2. 1. 2 Operations and Programming Checks

(1) Operations

- Was the operator properly trained?
- Was there a recent change of operators?
- Was the operator well familiar with the program?
- Was the program interrupted before completion?
- Was the program placed under incremental or absolute command?
- Was the tool compensation properly set?
- Can other operating modes be selected?
- Was the optional block skip function properly used?
- Was the tape correctly set?
- Was the program properly coded?
- Were there any inadvertent or erroneous operations?

(2) Punched tape

- Was the tape contaminated?
- Was the tape bent or crimpled?
- Were tapes properly spliced?
- Was the program successfully run prior to this operation?
- Was the tape correctly punched?
- Was the tape puncher operating normally?
- Was a black tape used?

(3) Programming

- Is the program new?
- Was the program formulated according to the instruction manual?
- Did the trouble occur in a particular block?
- Did the trouble occur in a subprogram?
- Was a check list made and used for tape verification?

(4) Settings

- Were there any corrections or adjustments made prior to starting the operation?
- Was a fuse blown?

- Was an emergency stop maintained?
- Was the machine tool ready to operate?
- Was an alarm state in effect?
- What was the alarm number?
- Was the alarm lamp lit on a module (on printed board)?
- Was the MODE switch in normal position?
- Was the override set to "0"?
- Was the machine lock set?
- Was the feed hold set?

(5) External factors

- Was the machine tool recently repaired or adjusted?
- Was the control cabinet recently repaired or adjusted?
- Was the NC unit recently repaired or adjusted?
- Is there any noise source (e.g., crane, high frequency sewing machine, electrical discharge machine, welding machine) within interference range?
- Was there any new machine recently installed nearby?
- Is there any other NC unit that has developed similar failures in your factory?
- Has the user made an attempt at adjustments inside the NC unit?
- Has the same trouble occured previously with this unit?

(6) Ambient conditions

- What was the temperature?
- Was there any abrupt change in temperature?
- Was the tape reader contaminated?
- Was there any oil or cutting fluid splashed, in the immediate area?
- Were there any vibrations?
- Was the system exposed to the direct sunlight?

2.1.3 NC UNIT CHECK

(1) Control unit exterior

- Was the MDI & CRT unit normal?
- Was the tape reader kept clean?
- Was the tape reader door closed?
- Was the unit operated with its door open?
- Did any machining chips enter the cabinet interior?

(2) Tape reader

- Was the tape reader contaminated?
- What were the characteristics of the waveforms from the tape reader?

(3) Control unit interior

- Was the control unit interior contaminated?
- Was the fan motor operating normally? (Was the air flow from the cooling air exhaust port normal?)
- Was the interior damaged by corrosive gas?

(4) Composite power supply unit

- Was the input voltage normal?
- Were the output voltages normal (+5 V, +12 V, +24 V, ±15 V)?
- Was each voltage within tolerance?
- Was a fuse blown?
- Was the circuit breaker tripped?
- Was the shield properly grounded?
- Was the wiring properly inside the control cabinet?
- How much did the input voltage fluctuate?
- Was there any significant drop in input voltage?
- Was the front or rear door open (with door interlock in effect)?
- Is there any machine that consumes a large amount of current in the factory (e.g., welding machine, electrical discharge machine)?

(5) Grounding

- Was grounding properly connected?
- Was the shield grounding proper?

(6) Cables

- Were cable connectors securely inserted?
- Was any internal cable damaged?
- Was any external cable damaged?
- Was any cable broken or contaminated?

2. 1. 3 NC UNIT CHECK (Cont'd)

(7) Modules (on printed circuit board)

- Were all modules securely installed?
- Were plug connectors properly secured?
- What was the revision letter?
- Were connections (on flat cable) between modules correct?

(8) MDI & CRT unit

- Can the power supply be turned on and off normally?

(9) Parameters

Did the actual parameters match those in the parameter table attached to the NC unit?

(10) Interface

- Were the power cable and NC cable separately installed?
- Was the cable positively shielded?
- Were the relay, solenoid, motor, etc. each equipped with a noise suppressor?
- Were the I/O signals normally generated by the DGN (diagnostic) function?

(11) ACGC (option)

Can the power supply be turned on and off normally? Is the 5A glass-encased fuse on the rear panel in tact?

2. 2 TROUBLESHOOTING BY ALARM CODE

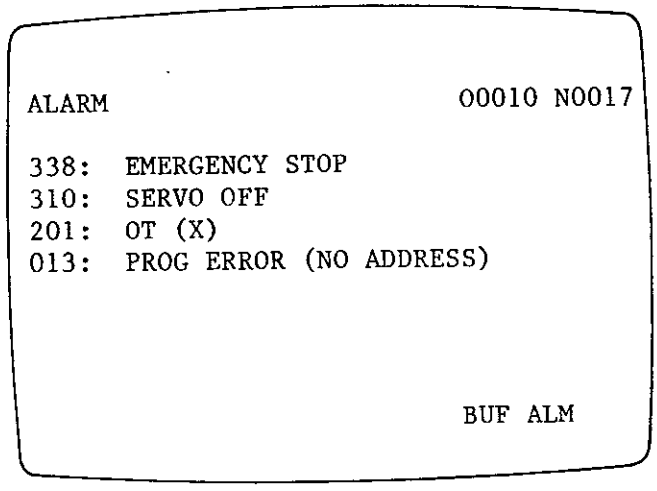
If an alarm condition occurs, a display "ALM" or "A/B" (for battery alarm) blinks on the bottom line of the CRT screen regardless of the mode or function. In this case, detailed information of the alarm condition will be displayed by the following operations:

1. Depress the (ALM) key

   This will cause up to 4 pairs of alarm codes and alarm messages to appear in order of importance, with the most serious one at the top.

   NOTE

   In an alarm state, the alarm screen appears taking priority over any other display. There is no need to operate the (PAGE ↓) key.



Alarm Codes and Messages

   Eliminate the cause of the alarm and depress the (RESET) key, and the alarm state and the alarm display will be reset. Notice that the alarm codes "800," "810," "820," "830" and "840" are displayed regardless of the selected function key.

2. The alarm codes are categorized as follows:

Table 2.1

Alarm No.	Spindle Operation	Type of Alarm
000 to 099	Stop at block end	Tape format error alarm
100 to 199	Stop at block end	Macro, operation, external input/output error, sequence error (1)
200 to 299	Decelerated to stop	Overtravel, reference point return, positioning, machine ready
300 to 399	Decelerated to stop	Servo, emergency stop, overload FG, RPG
400 to 499	Decelerated to stop	Sequence error (2)
500 to 599	Immediate stop	Sequence error (3)
600 to 699		Sequencer message
700 to 799		
800 to 899	NG system stop	CPU error, RAM error, ROM error Contact YASNAC service personnel.
900 to 999	—	Off-line error

2.2.1 LIST OF ALARM CODES

Table 2.2 List of Alarm Codes

Code	Causes	Code	Causes
000	POWER OFF	014	PROG ERROR ("-," "0")
	SETTING THE PARAMETER REQUIRING TURNING OFF POWER.		SIGN "-," "0" NOT CORRECTLY USED.
001	ZR UNREADY (X)	015	PROG ERROR (UNUSABLE CH)
	REFERENCE POINT RETURN NOT COMPLETED X.		UNUSABLE CHARACTER PROGRAMMED IN INSIGNIFICANT DATA AREA.
002	ZR UNREADY (Y)	016	PROG ERROR (UNUSABLE AXIS)
	REFERENCE POINT RETURN NOT COMPLETED Y.		INPUT OF A, B, C, U, V, W NOT DEFINED AS ADDITIONAL AXIS OR B-FUNCTION.
003	ZR UNREADY (Z)	017	PROG ERROR (8 DIGITS)
	REFERENCE POINT RETURN NOT COMPLETED Z.		INPUT DATA OVERFLOW (MORE THAN 8 CHARACTERS).
004	ZR UNREADY (4)	020	PROG ERROR (G)
	REFERENCE POINT RETURN NOT COMPLETED 4.		UNUSABLE G CODE OR G CODE NOT INCLUDED IN OPTIONS PROGRAMMED.
005	ZR UNREADY (5)	021	PROG ERROR (G)
	REFERENCE POINT RETURN NOT COMPLETED 5.		G CODE IN 1, 4, * GROUP PROGRAMMED SIMULTANEOUSLY IN A BLOCK.
010	TH ERROR	022	PROG ERROR (G02/03, G43/44)
	TAPE HORIZONTAL PARITY ERROR.		G43, G44 COMMANDED IN CIRCULAR INTERPOLATION MODE (G02, G03).
011	TV ERROR	023	PROG ERROR (G)
	TAPE VERTICAL PARITY ERROR.		UNUSABLE G CODE COMMANDED IN CANNED CYCLE.
012	OVERFLOW (128 CH)	024	PROG ERROR (G, G41/42)
	BUFFER CAPACITY OVERFLOW IN A BLOCK (128 CHARACTERS).		UNUSABLE CODE COMMANDED DURING COMPENSATION MODE.
013	PROG ERROR (NO ADDRESS)	025	PROG ERROR (G70/71/72)
	ADDRESS PLUS NO DATA AND NEXT ADDRESS COMMANDED. OR NO ADDRESS PLUS DATA.		G70 TO G72 COMMANDED EXCEPT IN CANNED CYCLES. .

NOTES:
1. No move command in three blocks in series at G41 (G42) command.
2. M00 commanded when rise.
3. Rise at circular interpolation block.

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
026	PROG ERROR (G41/42)	038	PROG ERROR (P, G10)
	RISE ERROR AT COMPENSATION C (COMMAND WHICH CANNOT BE ACCOMODATED CORRECTLY IN COMPENSATION C MODE) SEE NOTES		TOOL LARGE P WHEN WORK COORDINATE SYSTEM IS PROGRAM-INPUT
027	PROG ERROR (G41/42)	040	PROG ERROR (M98, G65/66)
	ERROR AT COMPENSATION C (ERROR IN CIRCULAR INTERPOLATION MODE)		• P NOT PROGRAMMED IN M98, G65, G66, G25. • P DIFFERENT FROM Q IN NO. IN G25MODE. • G25 AND M98/M99 PROGRAMMED SIMULTANEOUSLY.
030	PROG ERROR (F)	041	PROG ERROR (M08/09, G65/66)
	NO F-COMMAND IN FEED COMMAND		PROGRAM NO. (SEQUENCE NO.) NOT FOUND WHEN PROGRAM IS CALLED BY M98, M99, G65, G66, G25, G, M, T
031	PROG ERROR (R = 0)	042	PROG ERROR (M98, NEST)
	CIRCLE WITH RADIUS 0 COMMANDED IN CIRCULAR ARC COMMAND		SUBPROGRAM (G25) OR MACRO CALL FIVE-NESTED.
032	PROG ERROR (G02/03)		
	COMMANDS ON THREE AXES IN CIRCULAR ARC COMMAND WITHOUT HELICAL OPTION		
033	PROG ERROR (G02/03)	044	PROG ERROR (G12/13)
	COMMANDS ON MORE THAN FOUR AXES IN CIRCULAR ARC PLANE WHOSE ARC CANNOT BE SELECTED FROM THE COMMAND		IN CIRCLE CUTTING, PROGRAMMED RADIUS R IS SMALLER THAN COMPENSATION D.
034	PROG ERROR (G02/03)	045	CAL ERROR (G41/42)
	CIRCULAR ARC R DESIGNATION ERROR		—
035	PROG ERROR (D, H)	046	PROG ERROR (G41/42)
	TOO LARGE NO. OF H OR D CODE FOR TOOL RADIUS COMPENSATION AND TOOL LENGTH COMPENSATION		IN COMPENSATION C MODE, CIRCULAR ARC OUTSIDE OF COMPENSATION PLANE PROGRAMMED.
036	PROG ERROR (P, G10)	047	PROG ERROR (G41/42)
	TOO LARGE P (NUMBER DESIGNATION) WHEN OFFSET IS PROGRAM -INPUT		COMPENSATION PLANE CHANGED DURING COMPENSATION C MODE
037	PROG ERROR (P, G10)	048	PROG ERROR (G41/42)
	TOOL LARGE R WHEN WORK COORDINATE SYSTEM IS PROGRAM-INPUT		INTERSECTION POINT NOT OBTAINED BY INTERSECTION COMPUTATION

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
049	PROG ERROR (G41/42)	070	PROG ERROR (M02/30/99)
	REVERSE OR ALMOST REVERSE COMMANDED IN M97 MODE.		MEMORY OPERATION FINISH COMMAND NOT GIVEN.
050	SCALING ERROR	075	RS232C
	UNUSABLE G CODE (G92, G28 TO G30, G36 TO G38, G70 TO G72) IN SCALING MODE.		RS232C INTERFACE DISAGREEMENT OF NO. OF BITS AND NO. OF BAUD RATES.
051	SCALING ERROR	076	RS232C
	ERROR IN G51 AND G50 BLOCK FORMAT. SCALING FACTOR ZERO.		DATA TRANSMISSION FAILURE THROUGH RS232C INTERFACE.
055	PROG ERROR (M, S, T, B)	077	RS232C
	M, S, T, B COMMANDS IN THE BLOCK IN WHICH M, S, T, B CODE CANNOT BE COMMANDED		MORE THAN 10 CHARACTERS HAVE BEEN READ IN AFTER STOP CODE HAS BEEN TRANSMITTED THROUGH RS232C INTERFACE.
056	PROG ERROR (AXIS)	080	PROG ERROR (G10, G22/23)
	AXIS COMMAND IN G04, G20, AND G21 BLOCKS.		G10, G22, AND G23 COMMANDED WITH AXIS DATA.
058	MIRROR IMAGE (G28)	084	MIRROR IMAGE (G36/37/38)
	G28 COMMANDED DURING MIRROR IMAGE.		MIRROR IMAGE IS ON WITH G36 TO G38.
059	ZR UNREADY	085	PROG ERROR (G36/37)
	G28 NOT COMPLETED ON THE AXIS WHICH HAS G29 COMMAND OR REFERENCE POINT RETURN NOT COMPLETED ON THE AXIS.		COMMAND OF I (J) ON MORE THAN ONE AXIS AT G36 (G37).
066	RESET UNREADY (AFTER EDITING)	086	PROG ERROR (G38)
	—		COMMAND OTHER THAN K AT G38.
		087	PROG ERROR (G31/36/37/38)
			TOUCH SWITCH NOT ON WHEN MOTION REACHES AT END POINT BY G31, G36 TO G38 COMMANDS.
068	—	088	PROG ERROR (G36/37/38)
	EDITING BEING EXECUTED IN THE EDIT INHIBIT AREA.		TOUCH SWITCH CALCULATION ERROR AT G36 TO G38 COMMANDS.

2.2.1 LIST OF ALARM CODES (Cont'd)

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
100	CAL ERROR (FIXED POINT)	114	MACRO ERROR (DO-FORMAT)
	MAGNITUDE OF FIXED POINT DATA EXCEEDING UPPER LIMIT		NO. OF DOs AND ENDs NOT THE SAME.
101	CAL ERROR (FLOATING)	115	MACRO ERROR ([·] UNMACH)
	EXPONENT OF FLOATING POINT DATA EXCEEDING ALLOWABLE RANGE		NO. OF LEFT BRACKETS AND RIGHT BRACKETS NOT THE SAME.
102	CAL ERROR (DIVISION)	116	MACRO ERROR (DO-END NO.)
	CALCULATION DIVISOR ZERO OR OVERFLOW ERROR.		CONDITION $1 \leq n \leq 3$ NOT ESTABLISHED IN DOn.
103	CAL ERROR (SQUARE ROOT)	117	
	ROOT VALUE IS A NEGATIVE (-)		
104	PROG ERROR (DOUBLE ADD)	118	MACRO ERROR (GOTO N)
	SAME ADDRESS REPEATED IN A BLOCK.		CONDITION $0 \leq n \leq 9999$ NOT ESTABLISHED OR NO SEQUENCE NO. IN GO TO n.
105	MACRO ERROR (CONSTANT)	120	PRTN ERROR (NOT FOUND)
	CONSTANTS USABLE IN USER MACRO EXCEEDING THE LIMIT.		SEQUENCE NO. NOT FOUND IN PART PROGRAM.
106	MACRO ERROR	121	PRTN ERROR (G92)
	TOO MANY G CODES COMMANDED FOR CANCELLING G67.		G92 COMMANDED THROUGH MDI OPERATION DURING PROGRAM RESTART.
107	MACRO ERROR (FORMAT)	122	PRTN ERROR (G54-G59)
	ERROR IN THE FORMAT AND EQUATION.		G54 TO G59 COMMANDED THROUGH MDI OPERATION DURING PROGRAM RESTART.
108	MACRO ERROR (UNDEFIN # NO)	123	PRTN ERROR (ORG)
	UNDEFINED VARIABLE NO. DESIGNATED.		COORDINATE SYSTEM CHANGED BY DEPRESSING THE ORG BUTTON DURING PROGRAM RESTART.
109	MACRO ERROR (#NO NOT LEFT)	124	PRTN ERROR (MDI MOVE)
	COMMANDED PROHIBITED VARIABLE AS SUBSTITUTION IN LEFT-HAND SIDE OF THE EQUATION.		AXIS OPERATED BY MDI AFTER PROGRAM RESTART.
110	MACRO ERROR ([ ]5 LIMIT)	125	PROG ERROR (G122/123/124)
	MULTIPLE LAYERS OF PARENTHESIS EXCEEDING THE UPPER LIMIT (5).		ERROR EXISTS IN SPECIFICATION OF P, I, T, L, H, AND D WITH COMMANDS G122/123.
111	MACRO ERROR (MOVE G66-M99)	126	PROG ERROR (G122 DATA OVR)
	MOVE COMMAND IN M99 FINISHING COMMAND OF MACRO CALLED BY G66.		TOOL LIFE CONTROL DATA COMMANDS EXCEEDED CAPACITY
112	MACRO ERROR (5)	127	LIFE CTRL ERROR (T5 & T9999)
	LEVEL FOR CALLING MACRO EXCEEDING FOUR LEVELS.		ENTERED COMMAND FOR T5 DIGITS WITHOUT REGISTERING THE GROUP OR THERE IS AN ERROR IN THE T9999L ΔΔΔ COMMAND.

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
128	LIFE CTRL ERROR (T5 & H9999)	145	
	ENTERED COMMAND FOR T5 DIGITS ALTHOUGH ALL OF THE CONTENTS OF THE GROUP WERE IN SKP STATUS, OR ENTERED H(D)999 COMMAND WITHOUT REGISTERING TOOL NUMBERS H-NO AND D-NO.		
		146	PROG ERROR (G100)
			HIGH-SPEED CUTTING COMMAND G101 OR G102 NOT CANCELLED BY G100.
129	PROG ERROR (G54 TO G59 J)	147	PROG ERROR (PARAMETER ON)
	SPECIFIED AN EXCESSIVELY LARGE J IN THE WORK COORDINATE SYSTEM OR THE MODE WAS OTHER THAN G00/G01.		PARAMETER #6008 (D7) SET TO 1 AT HIGH-SPEED CUTTING COMMAND.
		170	MEM ERROR (OFS)
			TOOL OFFSET TOTAL CHECK ERROR
		172	MEM ERROR (SET)
			SETTING AREA TOTAL CHECK ERROR
		173	MEM ERROR (PRM)
			PARAMETER AREA TOTAL CHECK ERROR
		174	MEM ERROR (KEEP)
			TOTAL CHECK ERROR OF MACRO VARIABLES.
140	PROG ERROR (P NG)	175	MEM ERROR (MACR)
	NO AXIS COMMAND IN HIGH-SPEED CUTTING PROGRAM AT HIGH-SPEED CUTTING COMMAND.		TOTAL CHECK ERROR OF KEEP MEMORY.
141	PROG ERROR (FILE OVER)	179	OVER TEMP
	NO. OF BLOCKS IN REGISTERED PROGRAM EXCEEDING THE SPECIFIED VALUE IN HIGH-SPEED CUTTING.		PANEL INSIDE TEMPERATURE TOO HIGH
142	PROG ERROR (G00/G01/G02)	180	SEQ ERROR
	G CODE OTHER THAN G00, G01, G02 AND G03 OR M, S, T CODE COMMANDED IN REGISTERED PROGRAM AT HIGH-SPEED CUTTING COMMAND.		SEQUENCE ERROR (1)
143			
144	PROG ERROR (G101/G100)		
	ADDRESS OTHER THAN P COMMANDED IN G100, G101, G102 BLOCK.		

2. 2. 1 LIST OF ALARM CODES (Cont'd)

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
		201	OT (X)
			OVERTRAVEL X
		202	OT (Y)
			OVERTRAVEL Y
		203	OT (Z)
			OVERTRAVEL Z

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
204	OT (4)	223	S-OT2 (Z)
	OVERTRAVEL 4.		STORED STROKE LIMIT SECOND AREA (OUTSIDE INHIBIT) Z.
205	OT (5)	224	S-OT2 (4)
	OVERTRAVEL 5.		STORED STROKE LIMIT SECOND AREA (OUTSIDE INHIBIT) 4.
211	S-OT1 (X)	230	TOOL BROKEN
	STORED STROKE LIMIT FIRST AREA X.		AT BROKEN TOOL DETECTION BY G32, G33, Z-AXIS MOVES TO THE SET POSITION BUT SENS (T) INPUT NOT TURNED ON.
212	S-OT1 (Y)	231	ZR ERROR-AREA (X)
	STORED STROKE LIMIT FIRST AREA Y.		REFERENCE POINT RETURN AREA ERROR X.
213	S-OT1 (Z)	232	ZR ERROR-AREA (Y)
	STORED STROKE LIMIT FIRST AREA Z.		REFERENCE POINT RETURN AREA ERROR Y.
214	S-OT1 (4)	233	ZR ERROR-AREA (Z)
	STORED STROKE LIMIT FIRST AREA 4.		REFERENCE POINT RETURN AREA ERROR Z.
215	S-OT1 (5)	234	ZR ERROR-AREA (4)
	STORED STROKE LIMIT 1ST AREA 5.		REFERENCE POINT RETURN AREA ERROR 4.
220	S-OT2 (INSIDE)	235	ZR ERROR-AREA (5)
	STORED STROKE LIMIT SECOND AREA (INSIDE INHIBIT).		REFERENCE POINT RETURN ERROR 5.
221	S-OT2 (X)	241	ZR ERROR-POS (X)
	STORED STROKE LIMIT SECOND AREA (OUTSIDE INHIBIT) X.		REFERENCE POINT RETURN AREA ERROR X.
222	S-OT2 (Y)	242	ZR ERROR-POS (Y)
	STORED STROKE LIMIT SECOND AREA (OUTSIDE INHIBIT) Y.		REFERENCE POINT RETURN AREA ERROR Y.

2. 2. 1 LIST OF ALARM CODES (Cont'd)

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
243	ZR ERROR-POS (Z)	274	P-SET ERROR (4)
	REFERENCE POINT RETURN AREA ERROR Z.		P SET ERROR 4.
244	ZR ERROR-POS (4)	275	P-SET ERROR (5)
	REFERENCE POINT RETURN AREA ERROR 4.		PROGRAM SET ERROR 5.
245	ZR ERROR-POS (5)	280	MACH UNREADY
	REFERENCE POINT RETURN POSITION ERROR 5.		MACH RDY OFF.
250	S-OT3-5 (INSIDE)	310	SERVO POWER NOT SUPPLIED
	STORED STROKE LIMIT 3RD, 4TH, 5TH AREA INSIDE PROHIBITED.		SERVO POWER NOT SUPPLIED.
251	S-OT3-5 (X)	320	NC UNREADY
	STORED STROKE LIMIT 3RD, 4TH, 5TH AREA OUTSIDE PROHIBITED X.		NC UNREADY. SET UNREADY P SET UNREADY.
252	S-OT3-5 (Y)	330	EMERGENCY STOP
	STORED STROKE LIMIT 3RD, 4TH, 5TH AREA OUTSIDE PROHIBITED Y.		EMERGENCY STOP.
253	S-OT3-5 (Z)	331	FUSE (X)
	STORED STROKE LIMIT 3RD, 4TH, 5TH AREA OUTSIDE PROHIBITED Z.		FUSE BLOWN X.
271	P-SET ERROR (X)	332	FUSE (Y)
	P SET ERROR X.		FUSE BLOWN Y.
272	P-SET ERROR (Y)	333	FUSE (Z)
	P SET ERROR Y.		FUSE BLOWN Z.
273	P-SET ERROR (Z)	334	FUSE (4)
	P SET ERROR Z.		FUSE BLOWN 4.

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
335	FUSE (5)	355	OL (5)
	FUSE BLOWN 5.		OVERLOAD (1) 5.
341	SERVO ERROR (X)	357	OL (OTHERS)
	SERVO ERROR X.		OVERLOAD (2).
342	SERVO ERROR (Y)	361	PG ERROR (X)
	SERVO ERROR Y.		PG ERROR X.
343	SERVO ERROR (Z)	362	PG ERROR (Y)
	SERVO ERROR Z.		PG ERROR Y.
344	SERVO ERROR (4)	363	PG ERROR (Z)
	SERVO ERROR 4.		PG ERROR Z.
345	SERVO ERROR (5)	364	PG ERROR (4)
	SERVO ERROR 5.		PG ERROR 4.
351	OL (X)	365	PG ERROR (5)
	OVERLOAD (1) X.		PG ERROR 5.
352	OL (Y)	371	FG ERROR (X)
	OVERLOAD (1) Y.		FG ERROR X.
353	OL (Z)	372	FG ERROR (Y)
	OVERLOAD (1) Z.		FG ERROR Y.
354	OL (4)	373	FG ERROR (Z)
	OVERLOAD (1) 4.		FG ERROR Z.

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
374	FG ERROR (4)	394	TG ERROR (4)
	FG ERROR 4.		TG LEAD DISCONNECTION.
375	FG ERROR (5)	395	TG ERROR (5)
	FG ERROR 5.		TG LEAD DISCONNECTION.
381	RPG ERROR (X)	400	SEQ ERROR
	RPG ERROR 1.		SEQUENCE ERROR (2).
382	RPG ERROR (Y)	419	SEQ ERROR
	RPG ERROR 2.		SEQUENCE ERROR (2).
383	RPG ERROR (Z)	500	SEQ ERROR
	RPG ERROR 3.		SEQUENCE ERROR (3).
384	RPG ERROR (4)	519	SEQ ERROR
	RPG ERROR 4.		SEQUENCE ERROR (3).
385	RPG ERROR 5	800	MEM ERROR
	PROGRAM ERROR 5.		BUBBLE FAILURE INPUT/OUTPUT FAILURE.
391	TG ERROR (X)	801	MEM ERROR
	TG LEAD DISCONNECTION.		BUBBLE FAILURE INITIAL ERROR.
392	TG ERROR (Y)	802	MEM ERROR
	TG LEAD DISCONNECTION.		BUBBLE FAILURE UNDEFINED COMMAND.
393	TG ERROR (Z)	803	MEM ERROR
	TG LEAD DISCONNECTION.		BUBBLE FAILURE TRANSFER MISSING.

Table 2.2 List of Alarm Codes (Cont'd)

Code	Causes	Code	Causes
804	MEM ERROR		
	BUBBLE FAILURE. PARITY ERROR.		
805	MEM ERROR		
	BUBBLE FAILURE. NO MARKER.		
806	MEM ERROR		
	BUBBLE FAILURE. MANY DEFECT LOOPS.		
810	RAM ERROR		
	RAM CHECK ERROR.		
820	ROM ERROR		
	ROM CHECK ERROR.		
830	CPU ERROR		
	CPU ERROR (1).		
840	CPU ERROR		
	CPU ERROR (2).		
910	TAPE MEM ERROR		
	MEMORY VERIFYING ERROR (OFF-LINE).		
920	TAPE ERROR		
	TAPE READING-IN ERROR (OFF-LINE).		

2. 2. 2 COUNTERACTING ALARMS (Cont'd)

(1) Alarm 010 (Tape Horizontal Parity Error)

The number of data holes for each character is checked on the NC tape. An alarm is issued when the number is:

Even: for EIA tape

Odd: for ISO tape

(The description that follows applies to the EIA code.)

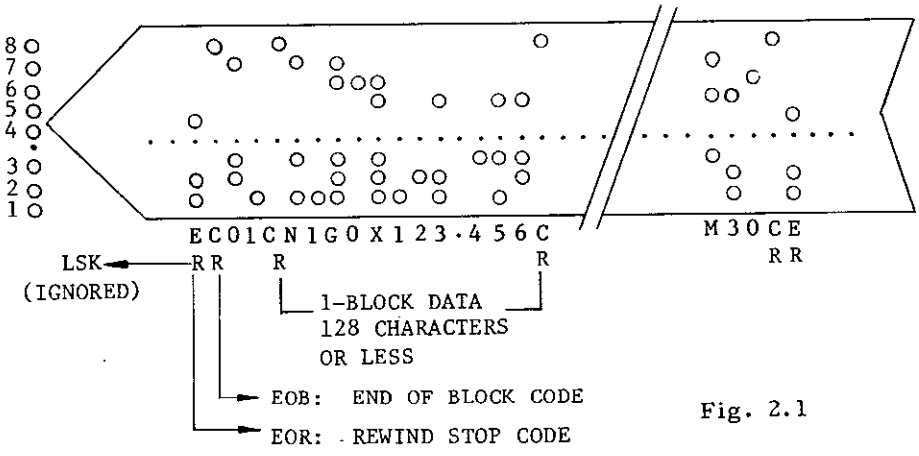
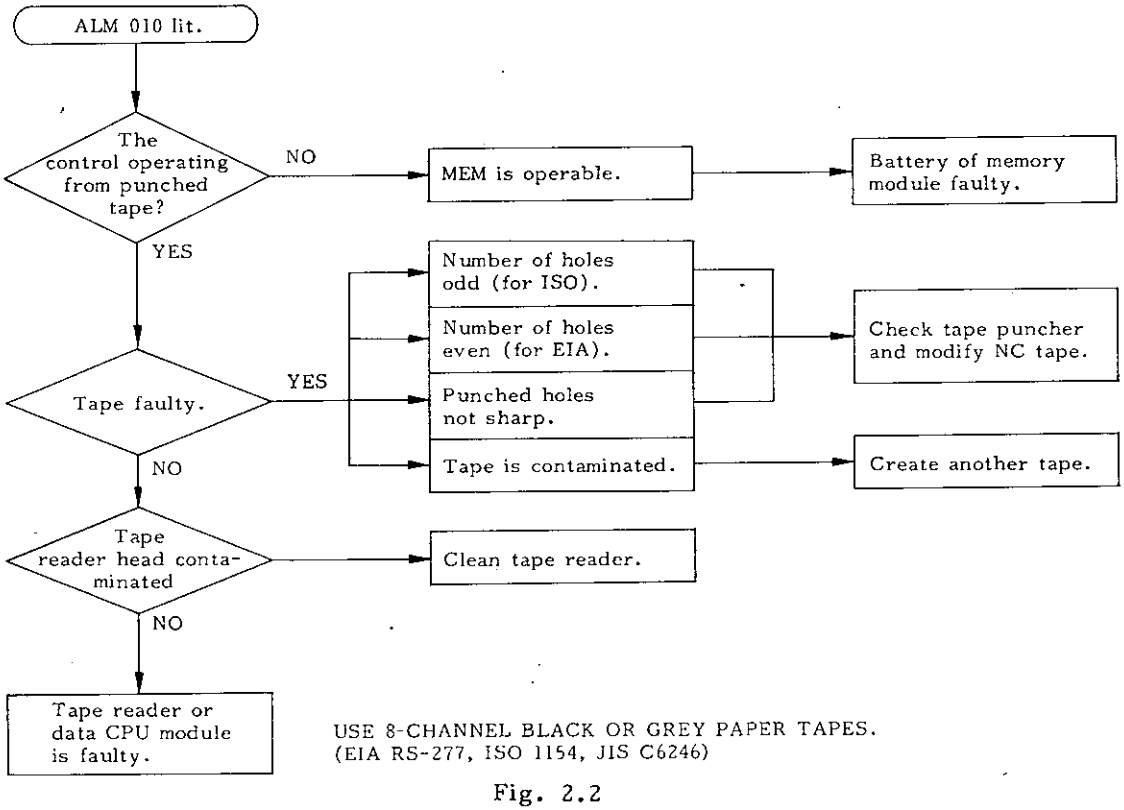


Fig. 2.1



USE 8-CHANNEL BLACK OR GREY PAPER TAPES.
(EIA RS-277, ISO 1154, JIS C6246)

Fig. 2.2

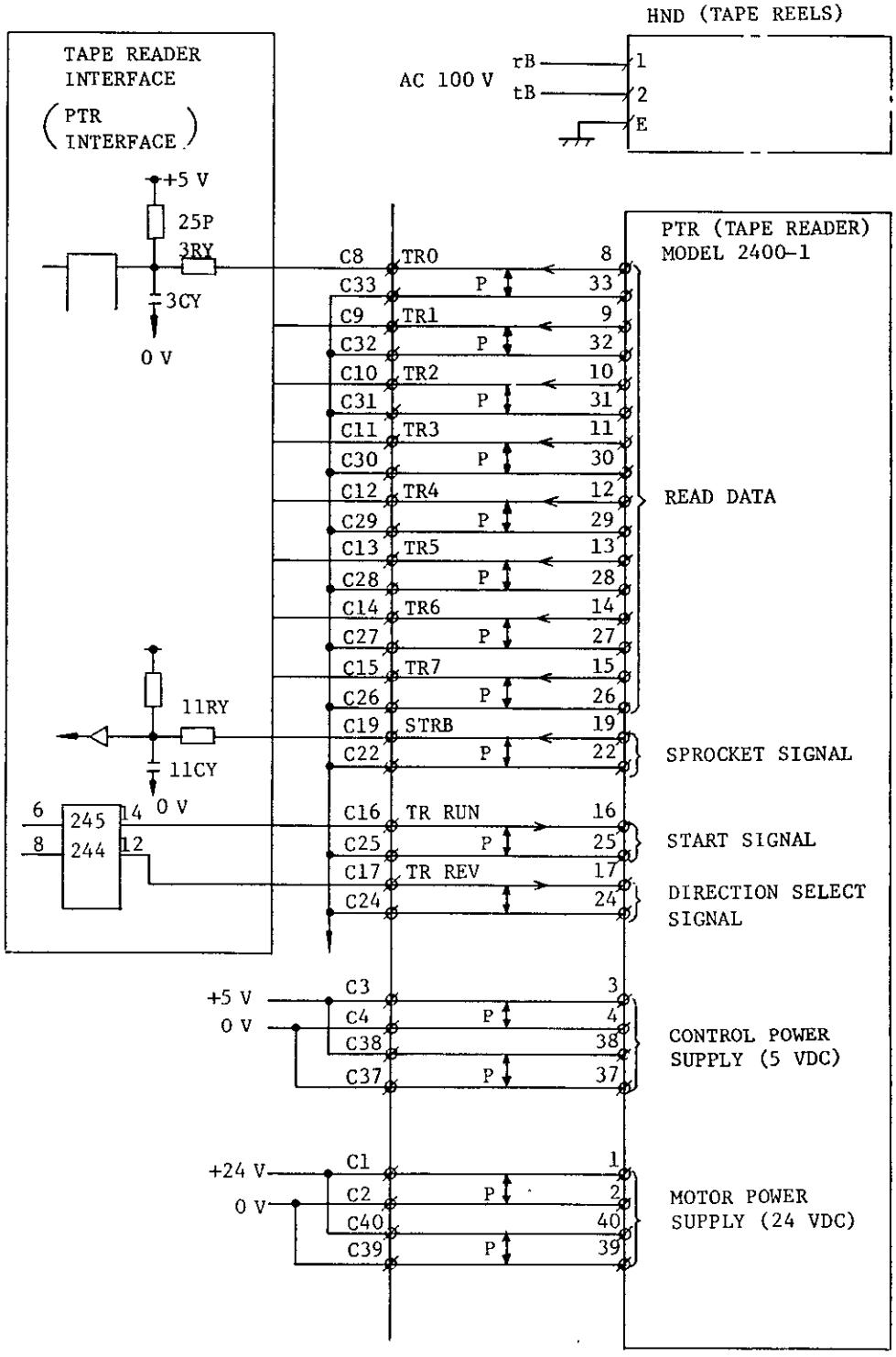


Fig. 2.3 Tape Reader Connection Diagram

2. 2. 2 COUNTERACTING ALARMS (Cont'd)

(2) Alarm 075, 076, 077 (RS 232C faulty)

075: RS 232C interface; disagreement between no. of bits and no. of baud rates

076: RS 232C interface; transmission failure

077: RS 232C interface; 10 characters or more were read-in after stop code was issued.

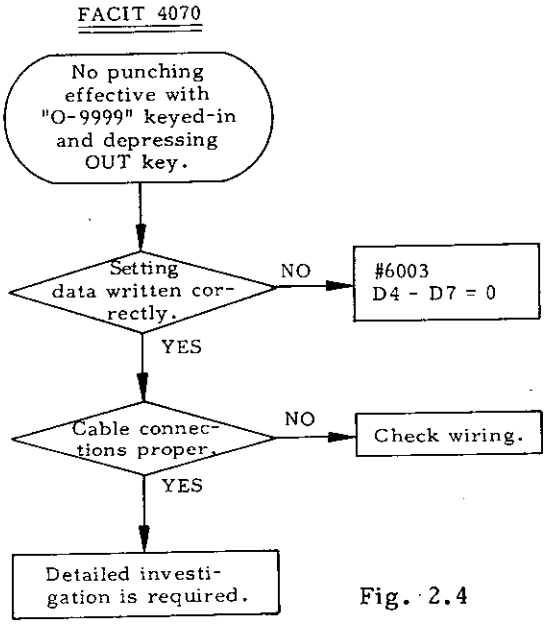


Fig. 2.4

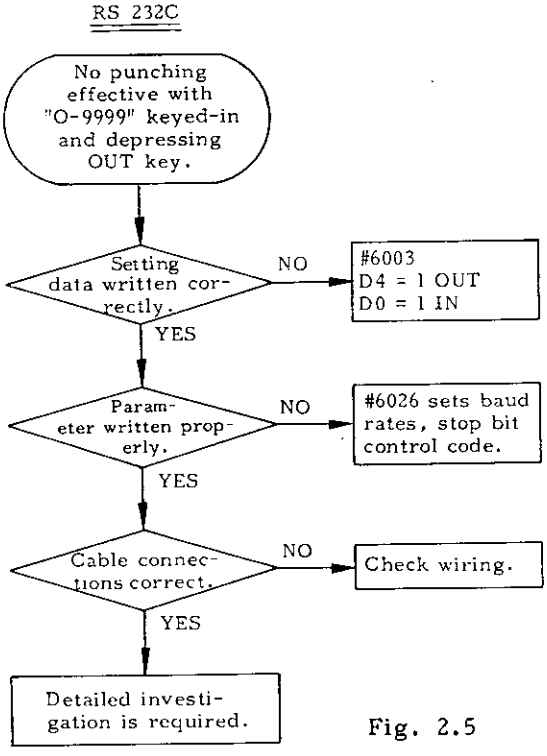


Fig. 2.5

SELECTION OF INTERFACES

Select the interface to be used by sitting numbers.

(a) Selection of input interface

Input Interface to be used	#6003D1 IDVCE1	E6003D0 IDVCE0
PTR interface*	0	0
RS232C interface	0	1

*Interface for tape unit (option) only.

(b) Selection of output interface

Output Interface to be used	#6003D5 ODVCE1	#6003D4 ODVCE0
FACIT 4070 interface	0	0
Current loop interface, RS232C interface	0	1

Common	Input/ Output	#6026 D3	#6026 D2	#6026D1	#6026 D0
Independent	Input	#6026 D3	#6026 D2	#6026 D1	#6026 D0
	Output	#6028 D3	#6028 D2	#6028 D1	#6028 D0
Baud rate value	50	0	0	0	0
	100	0	0	0	1
	110	0	0	1	0
	150	0	0	1	1
	200	0	1	0	0
	300	0	1	0	1
	600	0	1	1	0
	1200	0	1	1	1
	2400	1	0	0	0
	4800	1	0	0	1
	9600	1	0	1	0

Setting of stop bit length

Common	Input Output	#6026 D4	= 1:	Two bits for stop bit
Independent	Input	#6026 D4	= 0:	One bit for stop bit
	Output	#6028 D4		

Setting of control code output

Common	Input Output	#6026 D5	= 1:	Does not send control code.
Independent	Input	#6026 D5	= 0:	Sends control code.
	Output	#6028 D5		

Signals and Connection Diagram for FACIT 4070

Timing

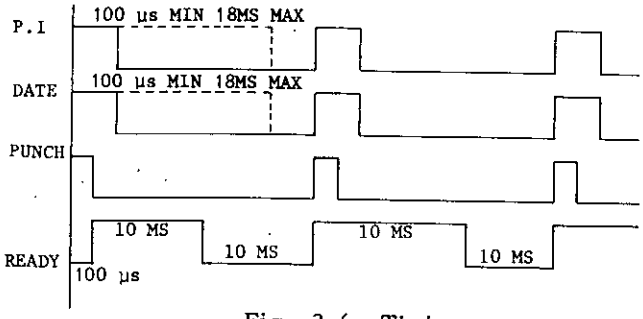


Fig. 2.6 Timing

FACIT4070 Interface Connecting Cable

NC (MR-20F)			Connections	External Equipment (DB-25P)	
Symbol	Signal Name	Pin No.		Pin No.	Symbol
PR	PUNCH READY	1		12	PR
TL	TAPE LOW	2		21	TL
ERR1	ERROR	3		20	ERR1
	Not Used	4			
+6 V	FACIT/ ASR. Auto-selection	5		24	+6 V
	Not Used	6			
	Not Used	7			
0 V	GROUND	8			
0 V	GROUND	9		10	SD
0 V	GROUND	10		25	0 V
CH1	PUNCH DATA 1	11		1	CH1
CH2	PUNCH DATA 2	12		2	CH2
CH3	PUNCH DATA 3	13		3	CH3
CH4	PUNCH DATA 4	14		4	CH4
CH5	PUNCH DATA 5	15		5	CH5
CH6	PUNCH DATA 6	16		6	CH6
CH7	PUNCH DATA 7	17		7	CH7
CH8	PUNCH DATA 8	18		8	CH8
CH9	FEED HOLD	19		9	CH9
PI	PUNCH INSTRUC-TION	20		11	PI

Note

Note: Pin numbers are applicable when the external equipment is FACIT 4070 and plug-in connector is DB-25P.

Current Loop (20 mA) Interface Connection Cable

NC (MR-20F)			Connections	External Equipment	
Symbol	Signal Name	Pin No.		Pin No.	Symbol
		1			
	Not Used	2			
		4			
+6 V	FACIT/ ASR. Auto-selection	5			
TTY2	Current loop (-)	6			
TTY1	Current loop (+)	7			
0 V	GROUND	8			
		9			
	Not Used	2			
		20			

(Note 2)

Note:
1. The type of connector and pin number are different with external equipment.
2. When the current loop (20 mA) interface is used, short-circut pin No. 4 (signal RS) and pin No. 5 (signal CS) of plug-in connector DB-25P for RS232C. Then connect the plug to the NC receptacle DB-25S.

RS232C Interface Connecting Cable (B)

NC (DB-25P)			Connections	External Equipment	
Symbol	Signal Name	Pin No.		Pin No.	Symbol
FG	Frame grounding	1			FG
SD	Sending data	2			SD
RD	Sending data	3			RD
RS	Receiving data	4			RS
CS	Capable of sending	5			CS
	Not used	6			DR
SG	Signal grounding	7			SG
		8			
	Not used	25			ER (OR IO ALARM)

2.2.2 COUNTERACTING ALARMS (Cont'd)

(3) Alarms 170, 172, 173 (MEM Error)

170: MEM error (OFS); tool offset total check error

172: MEM error (SET); setting area total check error

173: MEM error (PRM); parameter area total check error

Alarm No.	CRT Display	Location on Memory Module
		MM09-XX
170	MEMORY ERROR (OFS)	11J, 11K
172	MEMORY ERROR (SET)	
173	MEMORY ERROR (PRM)	

(4) Alarm 179 (Panel Inside Temperature Tool High)

This alarm is activated when the panel inside temperature is 45°C or higher. There are two possible causes: the ambient temperature is high, or the cooling fan inside the control panel or the external ventilation fan is stopped. Check for both conditions.

(5) Alarms 231 (X), 232 (Y), 233 (Z)
(Zero Return Area Error)

As shown below, an alarm results when reference zero point return is made between DECLS and reference zero point. Note that this error-check can be performed only after power supply is turned off and the manual return to reference zero point has been completed.

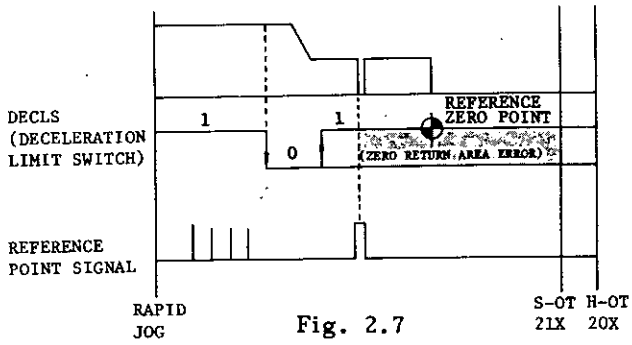


Fig. 2.7

(6) Alarms 241 (X), 242 (Y), 243 (Z)
(Reference Point Return Area Errors)

This type of alarm results when the reference point return performed manually or automatically (G27 or G28) is different from the previous reference point.

NOTE

This check is made when the system No. switch is set to "0."

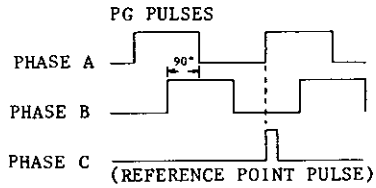


Fig. 2.8

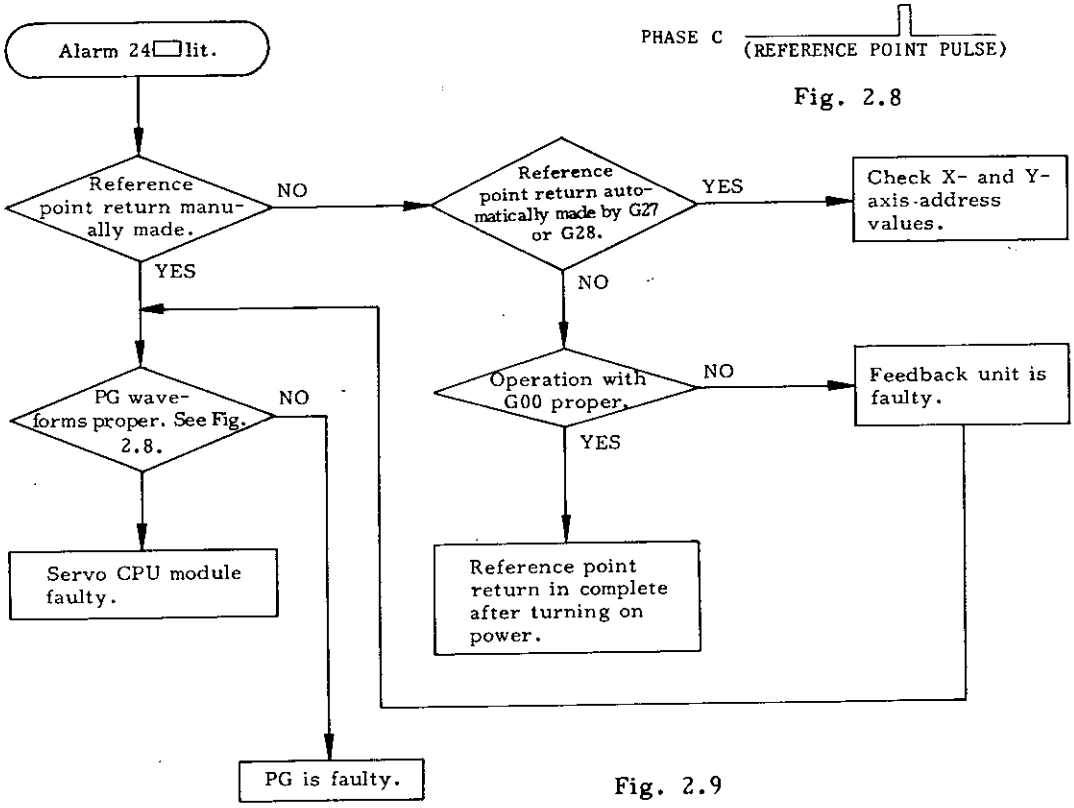


Fig. 2.9

(7) Alarms 271 (X), 272 (Y), 273 (Z)
(PSET Error)

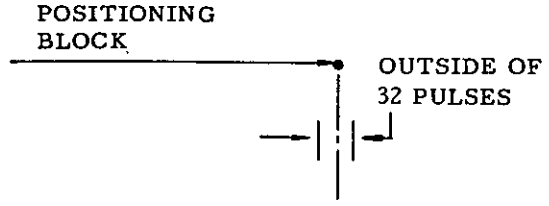
This type of error results when a difference between current position value and command value is 32 pulses or below (set by parameter) after positioning according to command.

Display on the CRT is:

COMMAND X 100
POSITION X Less than 99.968
or
100.33 or more

· Parameter settings

#6056 "32": X-axis
#6057 "32": Y-axis
#6058 "32": Z-axis



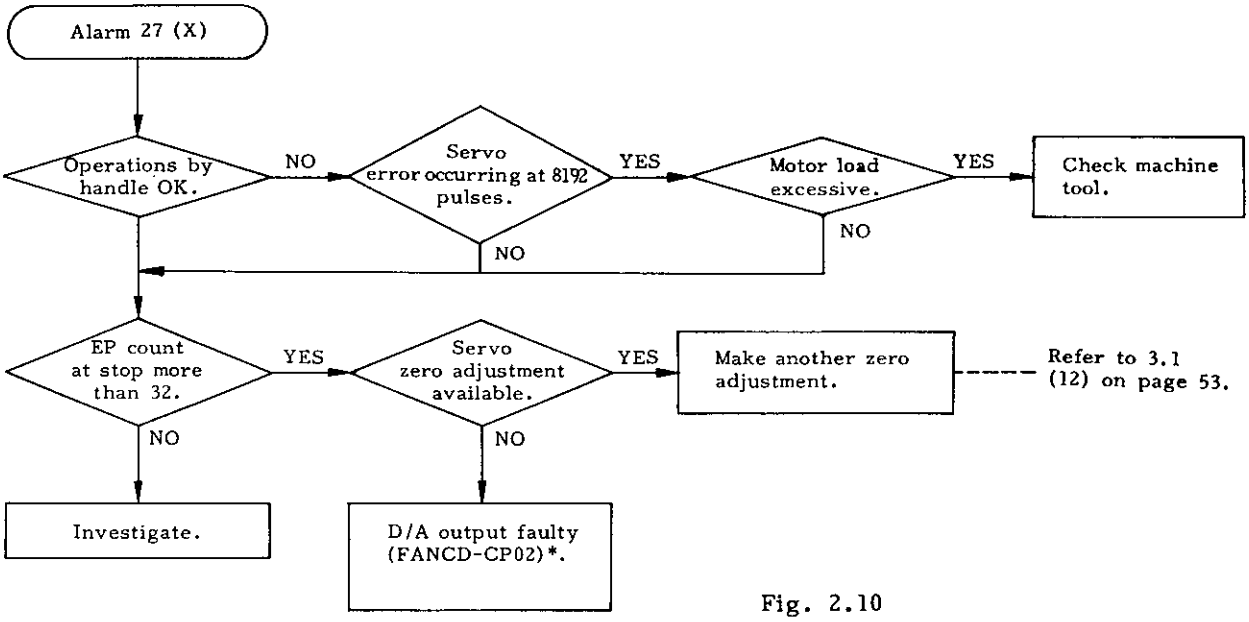


Fig. 2.10

* Measure the D/A voltage on an initial power application (1 pulse = 1.22 mV)

(8) Alarm 280 (Machine Unready)

This alarm results from the MER (machine unready) signal being off after transmission of the NC Ready Signal. Check to see if the MRD signal is normal. (See Fig. 2.11 and 2.12.)

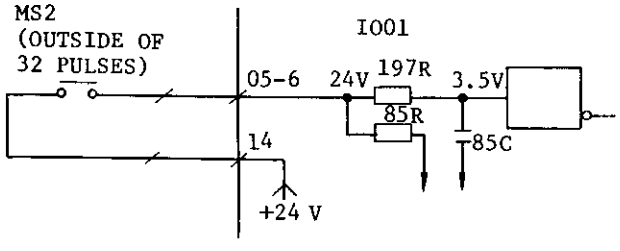


Fig. 2.11 Connection Example

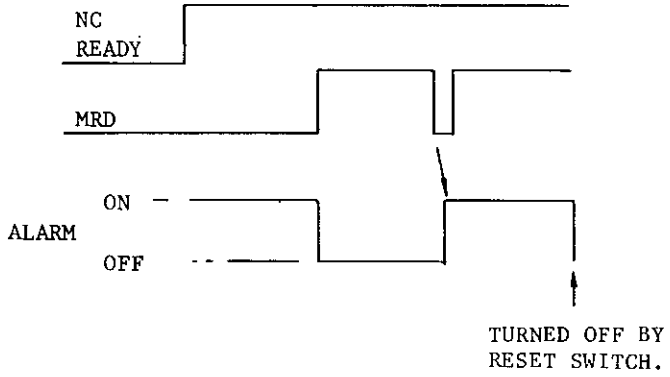


Fig. 2.12 Sequence

2. 2. 2 COUNTERACTING ALARMS (Cont'd)

(9) Alarm 330 (Emergency Stop)

This alarm is displayed and the system comes to a stop when the emergency stop pushbutton is depressed or when the machine stroke end limit switch is turned on.

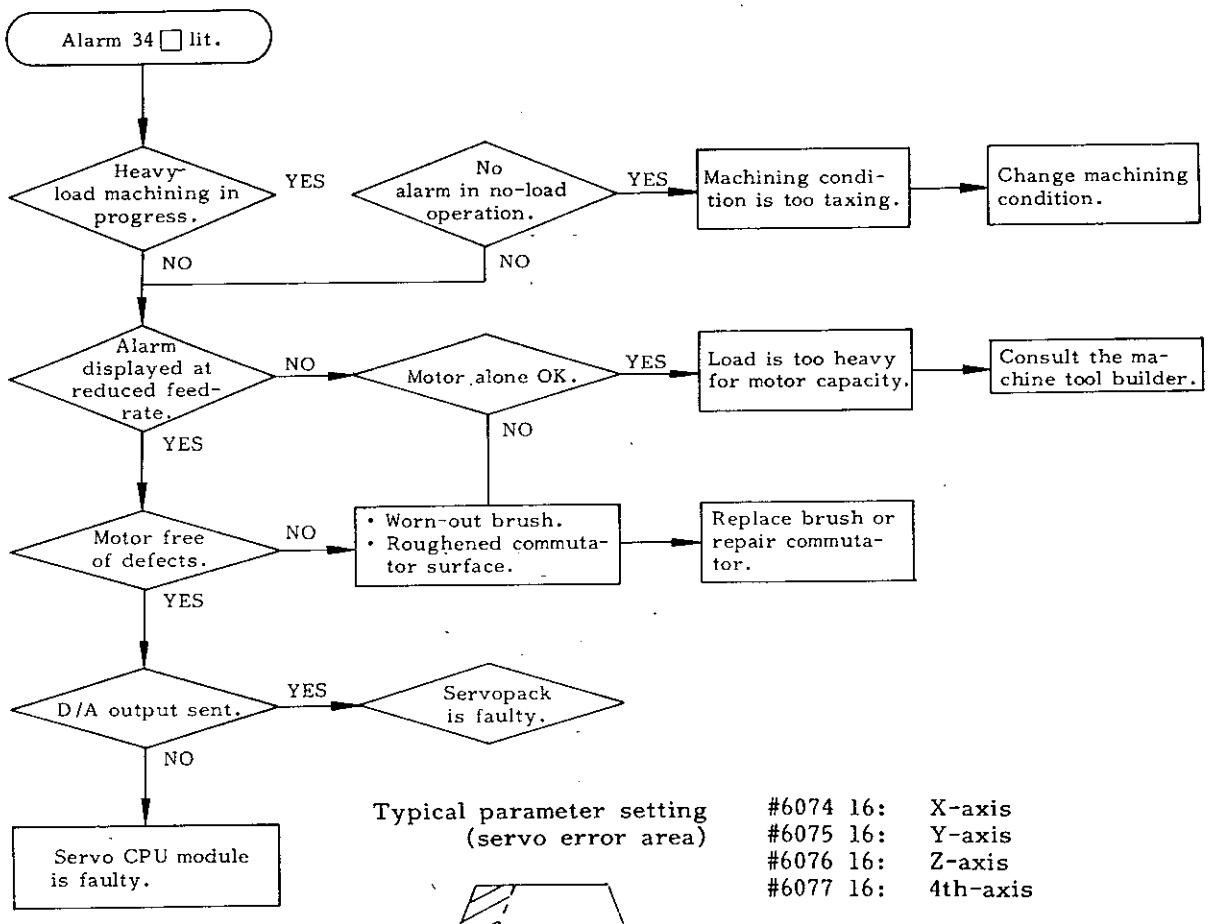
(10) Alarms 331 (X), 332 (Y), 333 (Z), 334 (4) (Servo Fuse Blown)

(Errors)

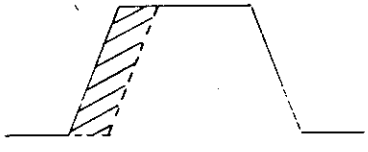
· Servopack fuse blown

These errors caused by damaged transistor(s). The above fault is caused by a transistor failure, damage, etc. When this alarm occurs, immediately contact YASNAC service personnel. Do not attempt to correct the trouble yourself.

(11) Alarms 341 (X), 342 (Y), 343 (Z), 344 (4) (Servo Error)



Typical parameter setting (servo error area)



#6074 16: X-axis
#6075 16: Y-axis
#6076 16: Z-axis
#6077 16: 4th-axis

An alarm is issued when the shaded portion (follow-up deviation) in the left-hand figure exceeds 8192 pulses.

Fig. 2.13

(12) Alarms 351 (X), 352 (Y), 353 (Z) (Overload (1))

Electronic thermal relay trip

These alarms indicate overload. Check the machining condition or machine tool load.

(13) Alarm 357 (Overload (2))

This alarm occurs when the temperature of regenerative resistance goes abnormally high. The cause may be the overloading of motor (more than 100% of the rating), or malfunctioning of the servo drive unit or servomotor.

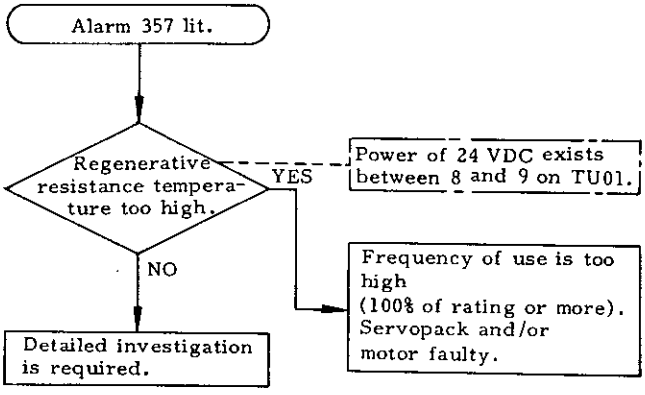


Fig. 2.14

(14) Alarms 361 (X), 362 (Y), 363 (Z) (PG error)

The possible cause is that no PG input is given to the servo CPU module despite the Servopack TGON signal being turned on.

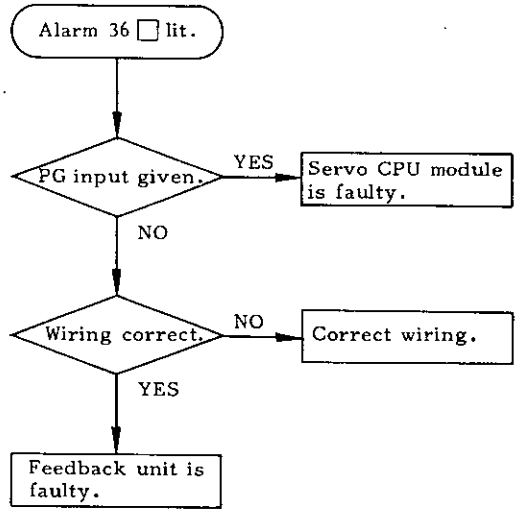


Fig. 2.15

· PG Waveforms (type ZC7)

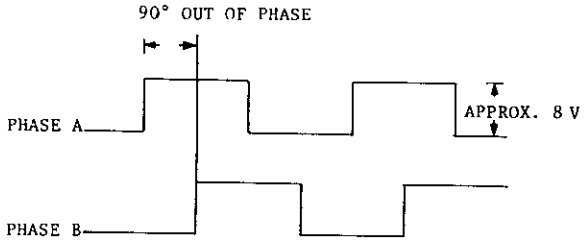


Fig. 2.16

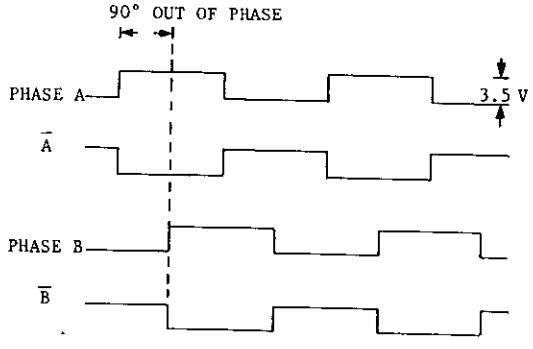
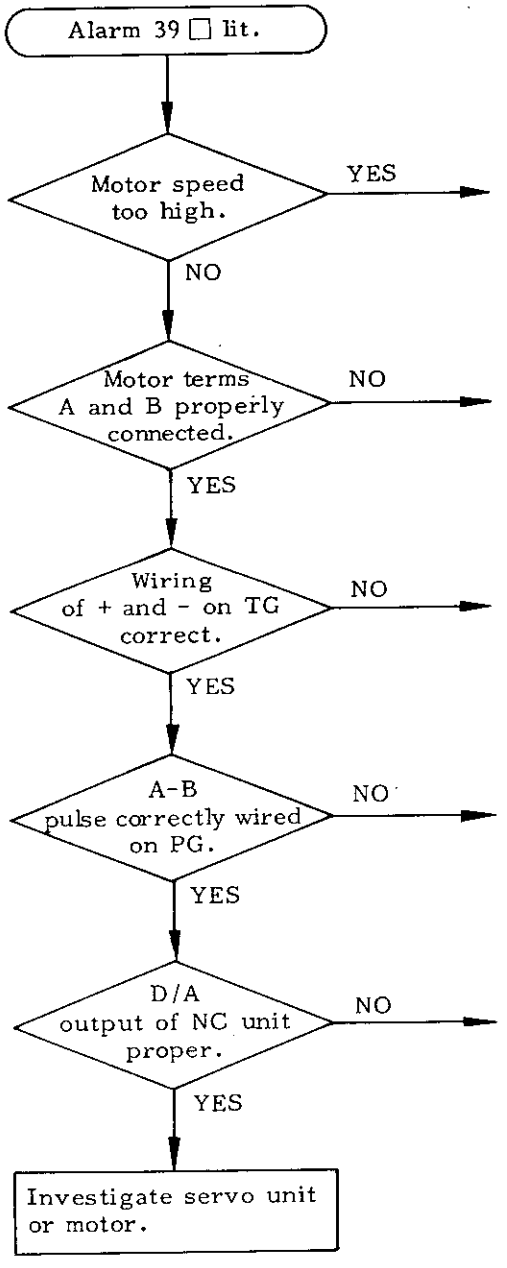


Fig. 2.17

2. 2. 2 COUNTERACTING ALARMS (Cont'd)

(15) Alarms 391 (X), 392 (Y), 393 (Z)
(TG error)

MR-K: The alarm is lit when PG and/or TG is wired in reverse or disconnected, or when A and B on the motor are wired in reverse.



Check the TG voltage.

- Does motor speed exceed the rating?
- Is the TG wiring correct?

If the rotation is clockwise viewed from drive end, motor terms A and B should be connected to servo unit terms A and B, respectively.

If the rotation is counterclockwise viewed from drive end, motor terms A and B should be connected to servo unit terms B and A, respectively.

If the rotation is clockwise viewed from drive end, connect motor connecting pins L(G) and M(H) to TG pins J10 and J11, respectively.

If the rotation is counterclockwise viewed from drive end, connect motor connecting pins L(G) and M(H) to TG pins J11 and J10, respectively

If the rotation is clockwise viewed from drive end, connect motor connecting pins A and B to PG pins J16 and J18 respectively.

If the rotation is counterclockwise viewed from drive end, connect motor connecting pins A and B to PG pins J18 and J16, respectively.

On a first power application, check the D/A output.

On a second power application, use EP (error pulse) for verification to check the D/A output.

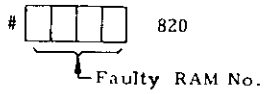
Fig. 2.18

(16) Alarm 810 (CPU error)

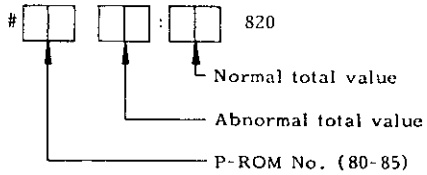
This alarm is displayed when a CPU malfunction prevents the operation.

(17) Alarm 820

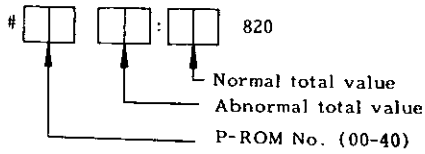
① RAM check error



② CP02 PROM error



③ MM01 MM09 PROM error



RAM No. and Location

RAM NO.	Memory Module Type	Location on Module Board	RAM NO.	Memory Module Type	Location on Module Board
#100	MM09	7E	#107	MM09	3D
#101		7D	#108		2E
#102		6E	#109		2D
#103		6D	#110		1E
#104		5E	#111		1D
#105		5D	#500	CP02	27C
#106		3E	#501	CP02	27A

2. 3 TROUBLESHOOTING WITHOUT ALARM CODES

The following flow charts are the instructions for correcting troubles not shown by alarm codes, in which basic operations are abnormal.

(1) Power cannot be applied.

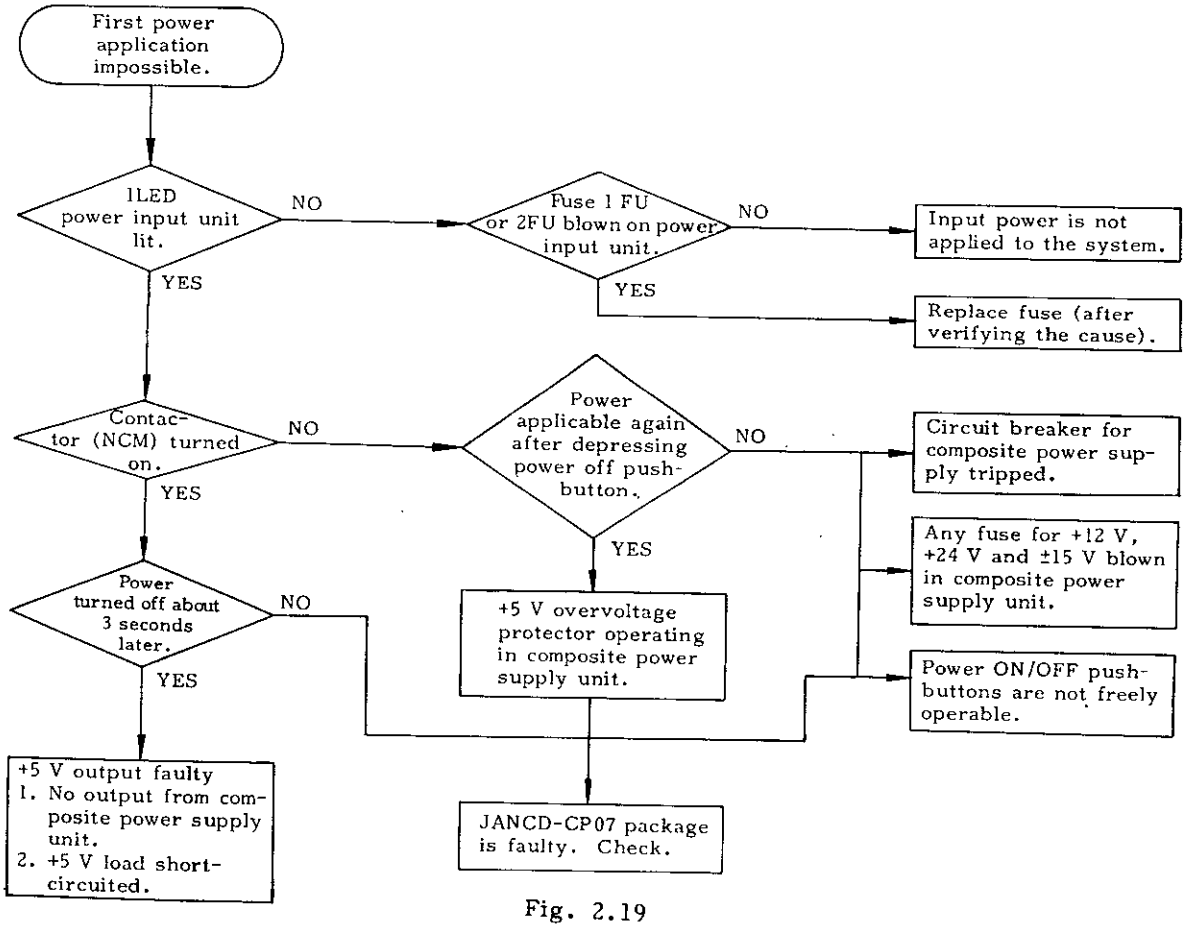
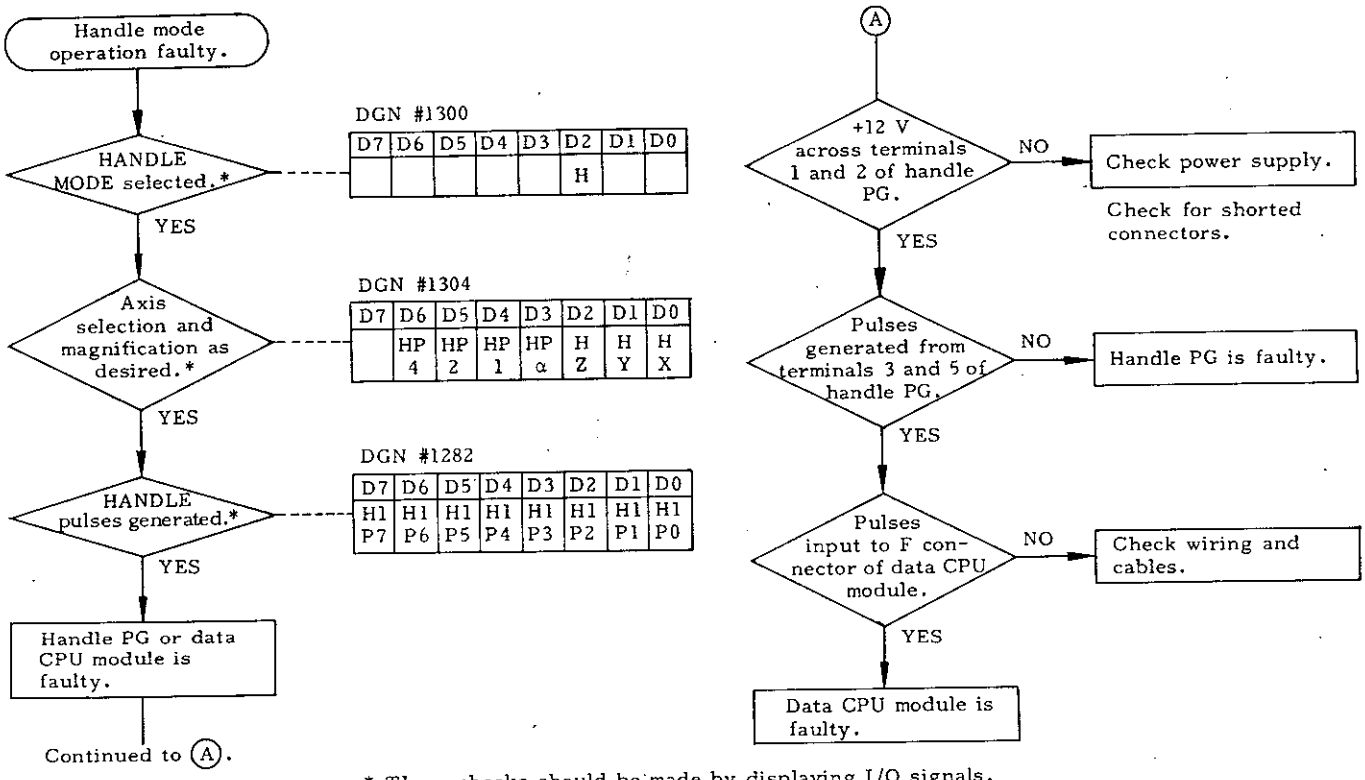


Fig. 2.19

2. 3 TROUBLESHOOTING WITHOUT ALARM CODES (Cont'd)

(4) HANDLE MODE operation is faulty.



* These checks should be made by displaying I/O signals.
Displayed at right side of each check item is the correct signal states.

Note: Set correctly the parameter #6272 (maximum manual handle feedrate; 1 = 7.5 mm/min.)

Fig. 2.20

· Handle PG Connection Diagram

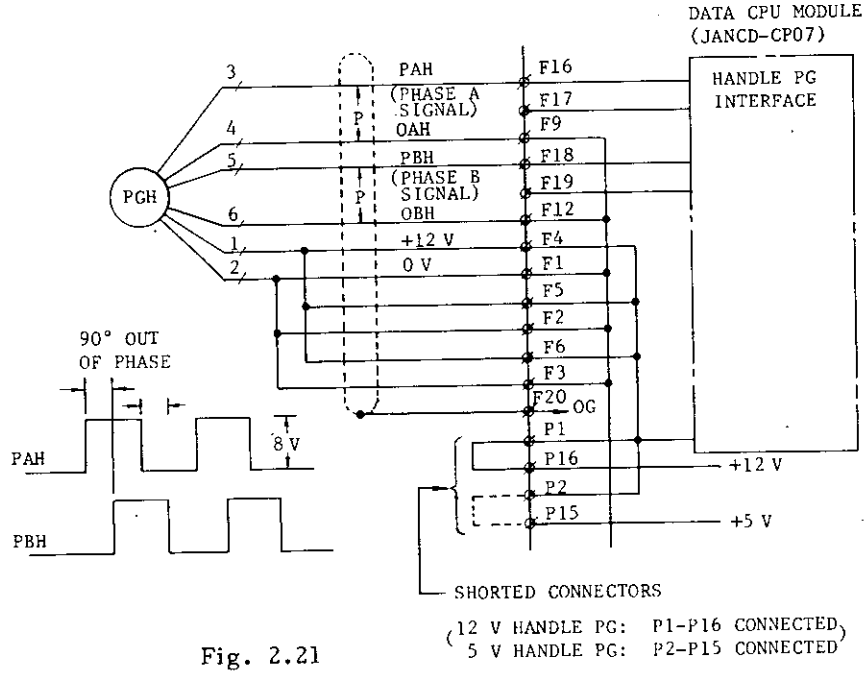


Fig. 2.21

(5) Manual jog mode operation faulty

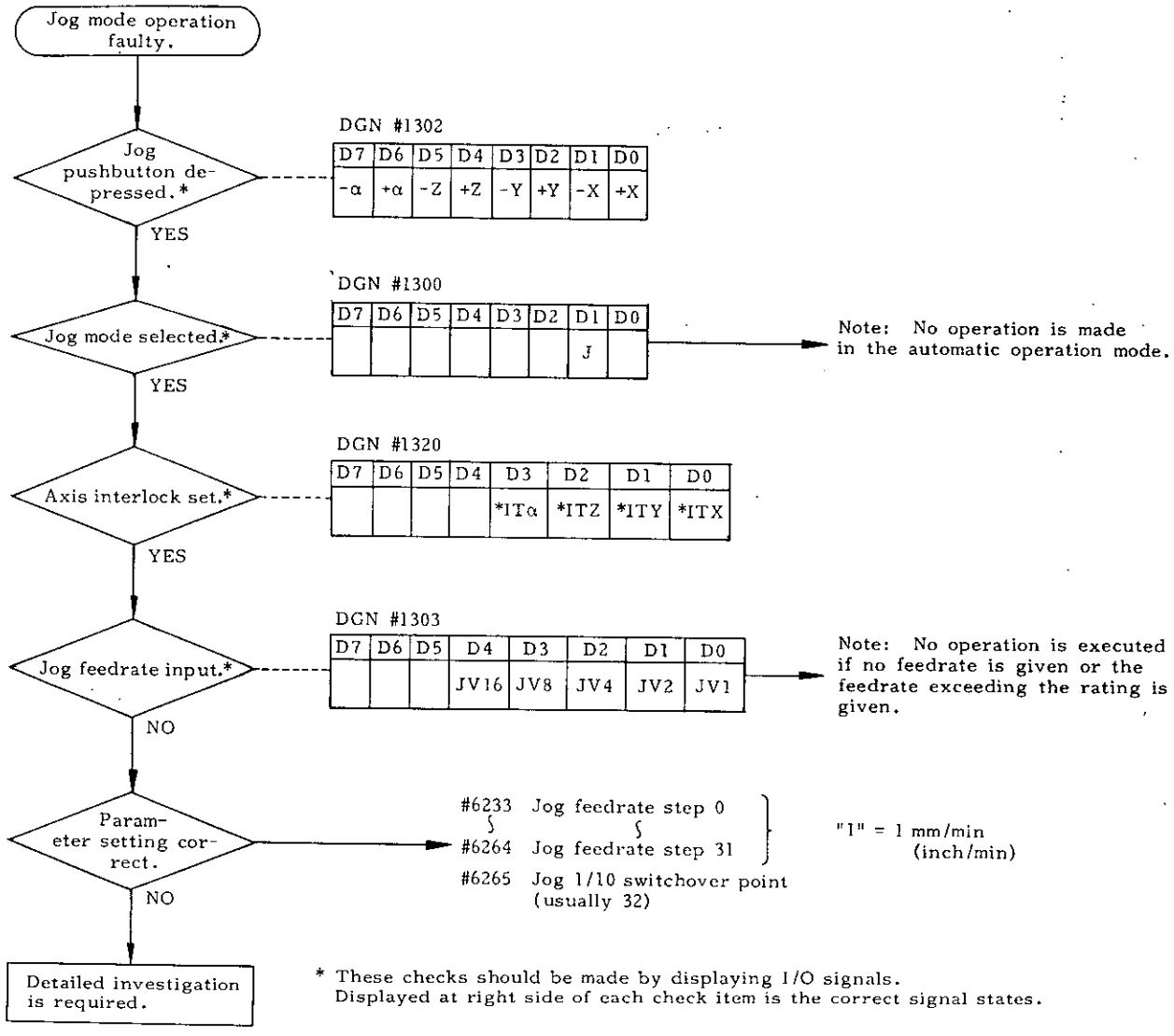
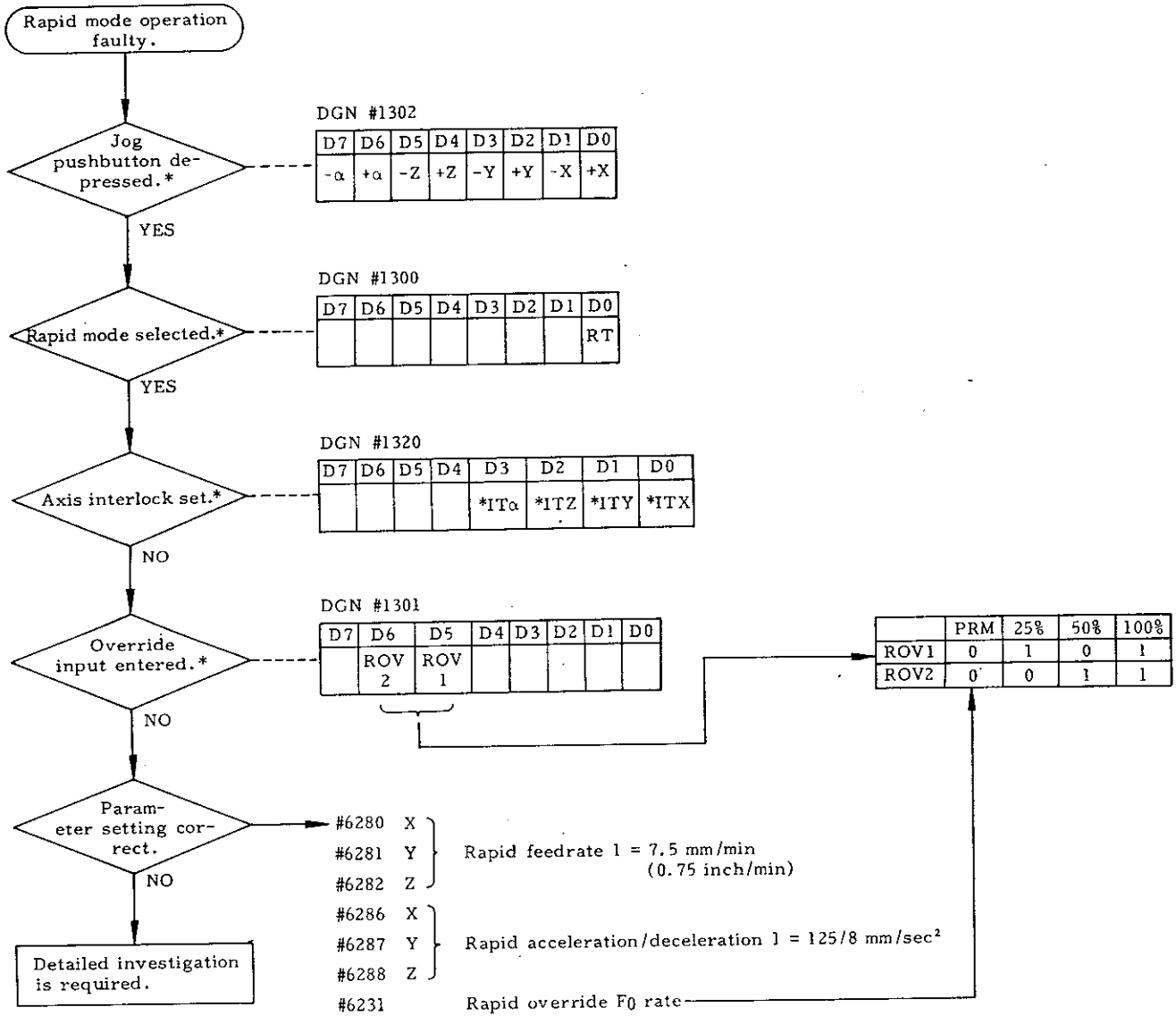


Fig.2.22

2. 3 TROUBLESHOOTING WITHOUT ALARM CODES (Cont'd)

(6) Manual rapid mode operation faulty



* These checks should be made by displaying I/O signals.
Displayed at right side of each check item is the correct signal status.

Fig.2.23

(7) Manual reference zero return operation faulty

(i)

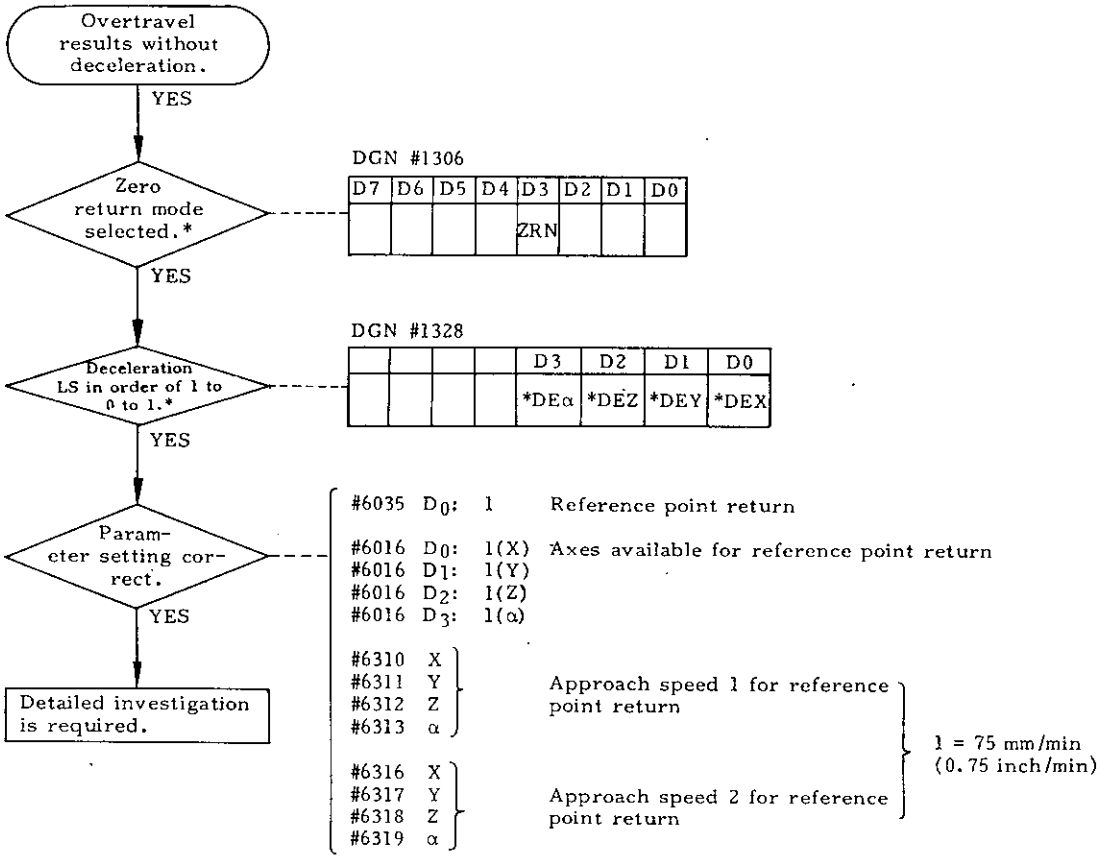
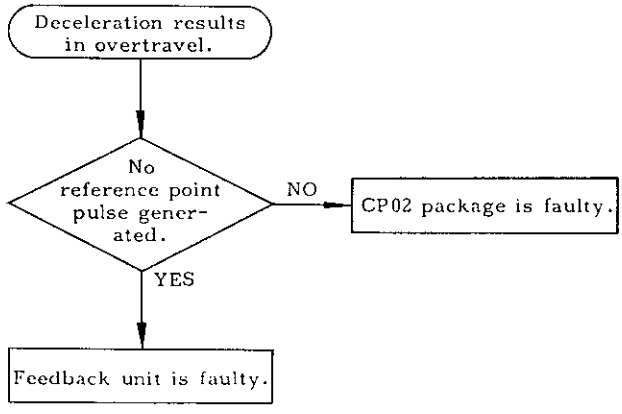


Fig.2.24

(ii)

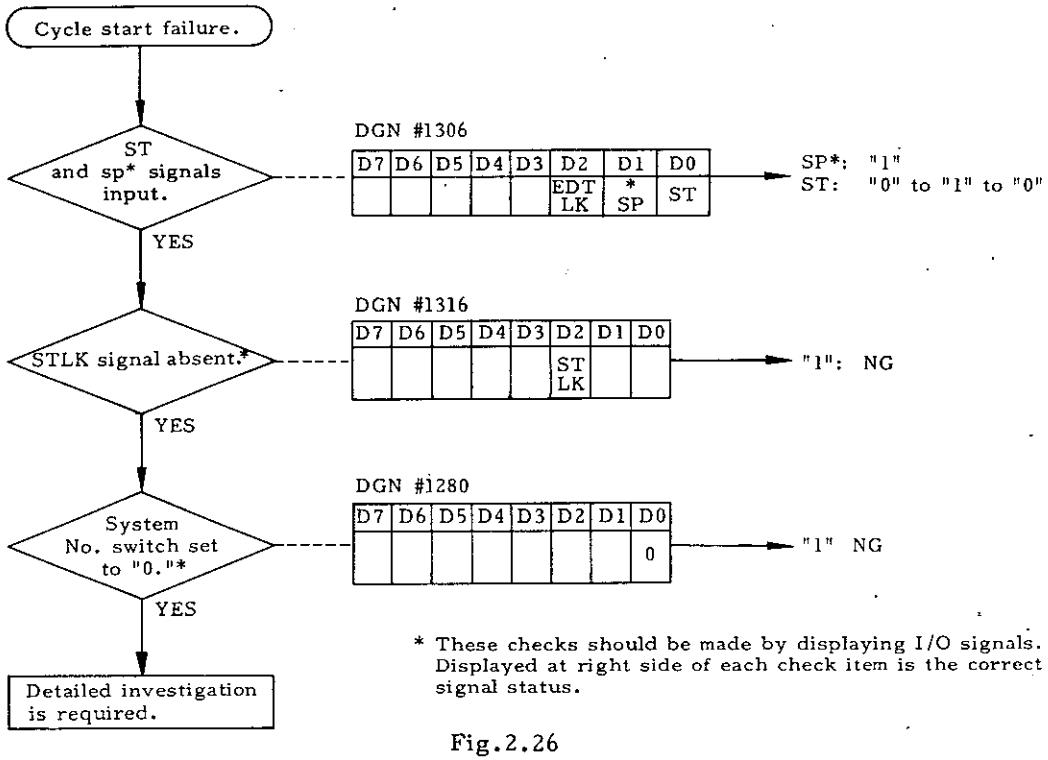


* These checks should be made by displaying I/O signals.
Displayed at right side of each check item is the correct signal status.

Fig. 2.25

2. 3 TROUBLESHOOTING WITHOUT ALARM CODES (Cont'd)

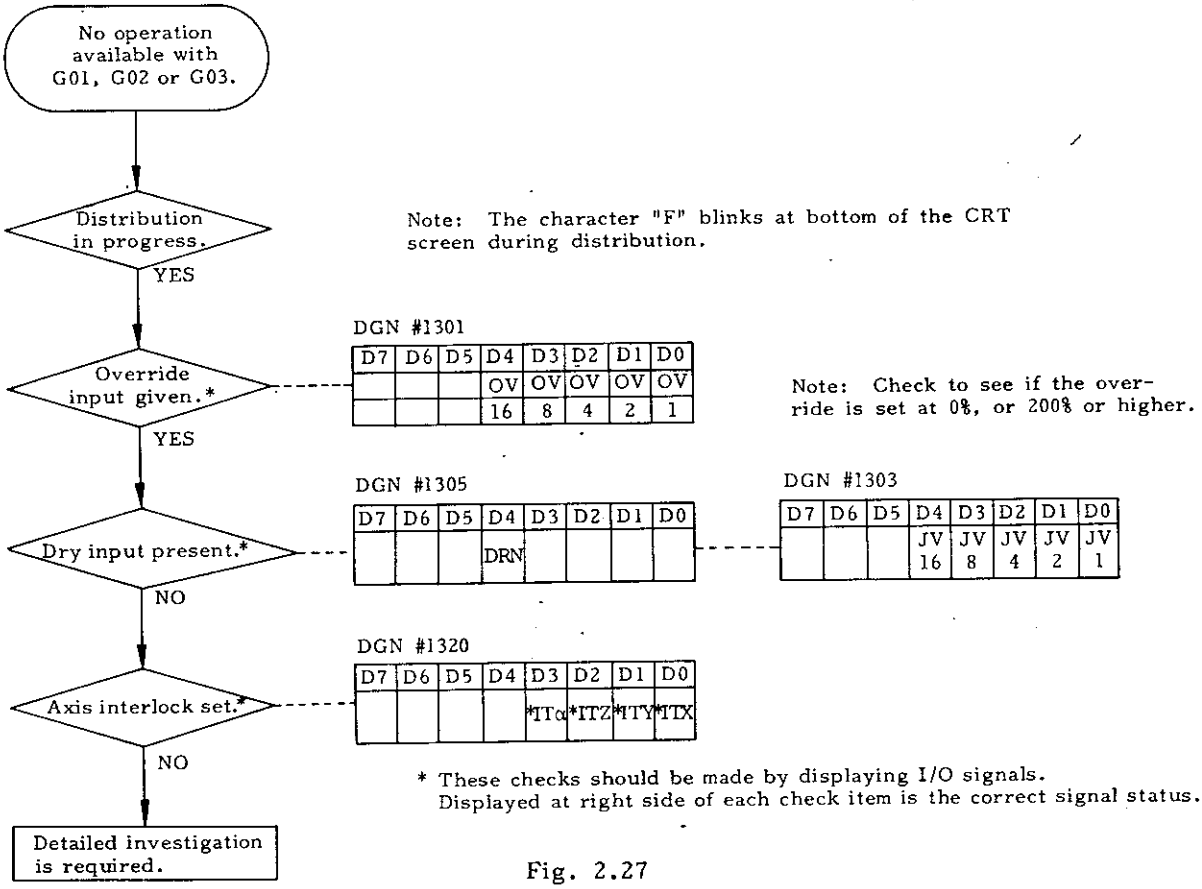
(8) Cycle start failure



* These checks should be made by displaying I/O signals. Displayed at right side of each check item is the correct signal status.

Fig.2.26

(9) No operation available with G01, G02 or G03



* These checks should be made by displaying I/O signals. Displayed at right side of each check item is the correct signal status.

Fig. 2.27

(10) Spindle does not rotate.

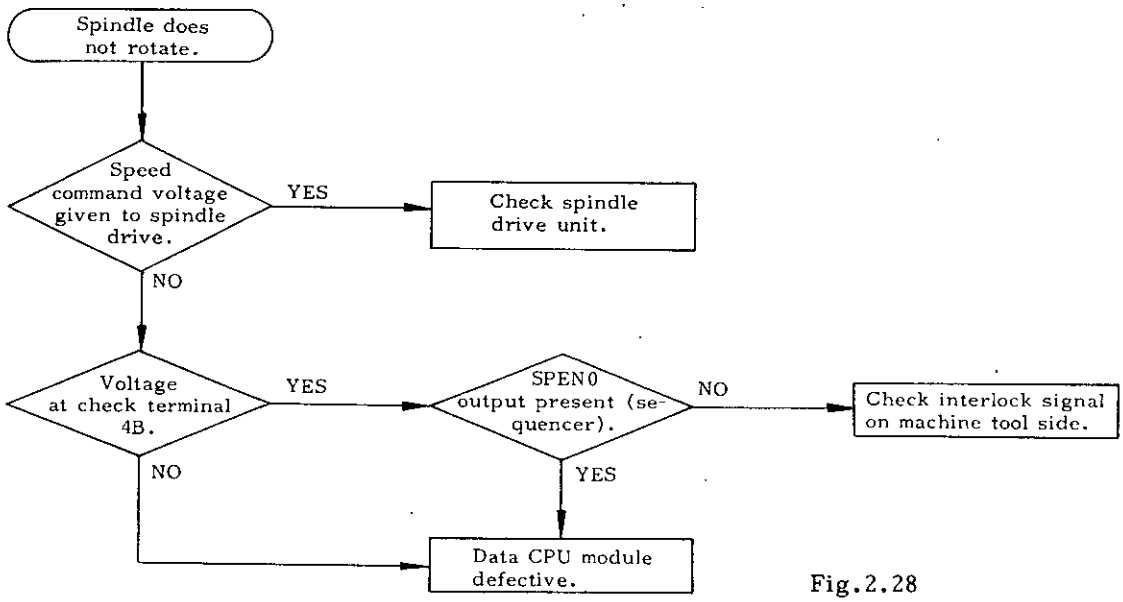


Fig.2.28

· Connection Diagram for Spindle

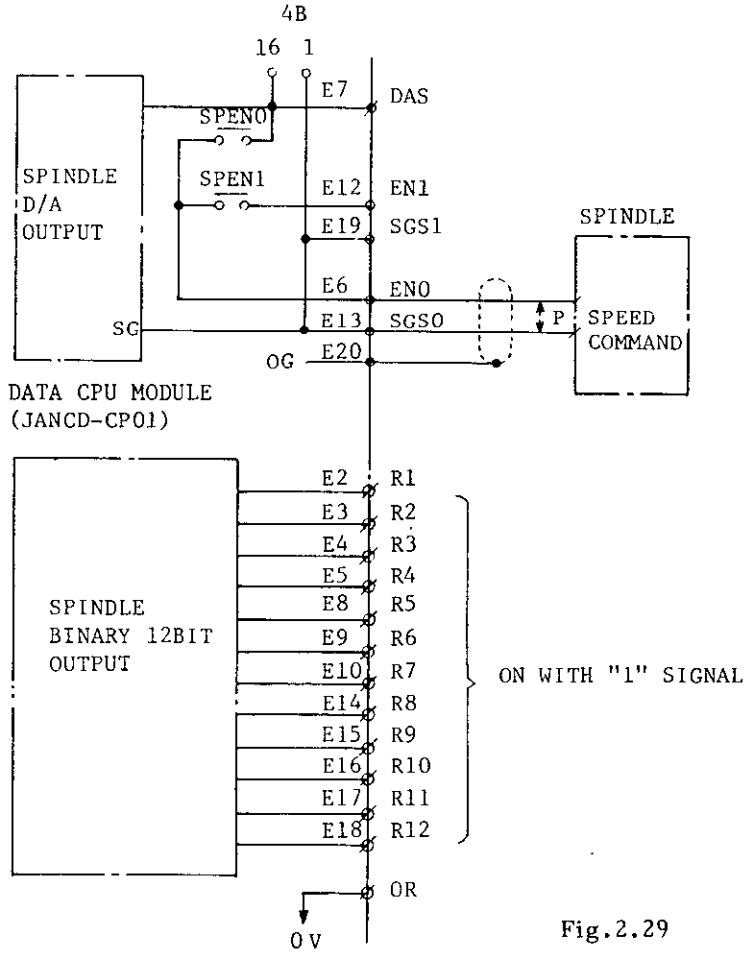


Fig.2.29

2. 3 TROUBLESHOOTING WITHOUT ALARM CODES (Cont'd)

(11) The 9-inch CRT screen brightness adjustment

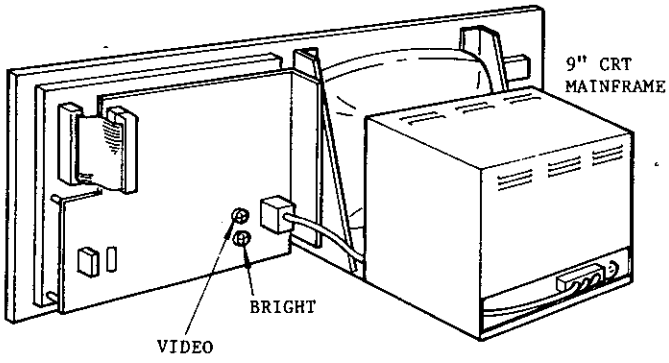


Fig. 2.30 9" CRT Screen Brightness Adjustment

The screen brightness can be adjusted by BRIGHT control to satisfy the desire of the user.

- BRIGHT: adjusts brightness
- VIDEO: adjusts contrast

Do not adjust the contrast unless there is a critical need.

2. 4 ACGC MAINTENANCE

2. 4. 1 ACGC TROUBLE SERVICE ACTIVITY

The ACGC may fail as the result of one of the following:

(1) Hardware fault

(2) System software fault

(3) Application program fault

For (1) and (2) contact your YASNAC service personnel.

When the cause seems to be application program, contact the service agent of the applicable machine tool company.

2. 4. 2 ACGC ALARM INDICATION

(1) A YASNAC system equipped with ACGC, a machine-triggered alarm may appear. For details of the alarm, refer to the Instruction Manual of the machine tool company.

(2) When no machine-triggered alarm appears, the screen indicates the alarm code for the same content as for the "9-inch CRT-NC operation panel." For details, refer to para 2.2 Fault Indication and Corrective action by Alarm Number.

(3) ACGC performs self-diagnosis and data check, and any trouble in ACGC is indicated by an alarm. Table 2.3 describes the alarms of ACGC.

Table 2.3 List of ACGC Alarms

Alarm Indication and Cause	Action
SYSTEM PROM TOTAL ERROR: ☐ The PROM containing the system software is faulty. The faulty PROM No. appears on ☐.	Contact YASNAC personnel.
+12V/-12V POWER DOWN The power supply for RS232C interface is faulty.	Contact YASNAC personnel.
PARAMETER ERROR The parameter value indicating the bubble memory capacity stored in the bubble memory differs from the parameter value the ACGC has.	Initialize the bubble memory correctly.
BUBBLE ERROR: ☐ The bubble memory does not operate correctly. The detail of the bubble memory error appears on ☐. The possible cause may be a fault of the bubble memory, DC power unit, or graphic module (CG02).	Contact YASNAC personnel.
BUBBLE READ ERROR When the bubble loader is used, the content of the bubble memory differs from that of the bubble loader.	The bubble loader is a maintenance device which is operated by YASNAC service personnel or machine tool manufacturer.

2.4.3 FAULTS NOT DISPLAYED BY ACGC ALARM INDICATION

(1) CRT screen remains blank:

If nothing appears on the CRT screen after power is turned on, check the following:

① AC power supply, e.g. one phase is open.

② CRT fuse blown.

③ Supply voltage at the ACGC rear panel terminal is 230 VAC ±15%.

④ DC supply in ACGC is normal. (Voltages are +5 V, +12 V, and -12 V.)

⑤ Wiring between the PCB and CRT is correct.

After checking these items, turn on power again.

If the normal operation cannot be achieved, contact YASNAC service personnel.

(2) No keybord operation is accepted (hang up)

(a) Although message may appear on the CRT screen after power is turned on, no keyboard operation is accepted:

① Check keyboard wiring for loose or open connections.

② Check the terminals of the DC supply unit for +5 V, +12 V, and - 12 V.

③ Depress a key and check for a beep.

- If a beep occurs, the keyboard is normal.
- If no peep, some key may be faulty. Check the following.

(b) After power is turned on and some operation is performed, keyboard output is not accepted:

1. Check CRT screen for an alarm message. If there is an alarm, take appropriate corrective action.
2. Record the preceding check procedure, then repeat the same operation beginning with power on, and check to see if the same malfunction recurs. If operation does not return to normal, contact YASNAC service personnel.

(3) CRT display flutters or curves

Check magnetic articles near the CRT, such as magnets, transformers, or arc welders. Remove or relocate such devices.

CAUTION

Note that if a strong magnetic device is placed near the CRT, the screen color may run due to residual magnetic field after it has been removed.

(4) CRT display is dark

If the CRT display is dark, adjust the BRIGHT control on the CRT rear panel by turning clockwise. (see the figure below).

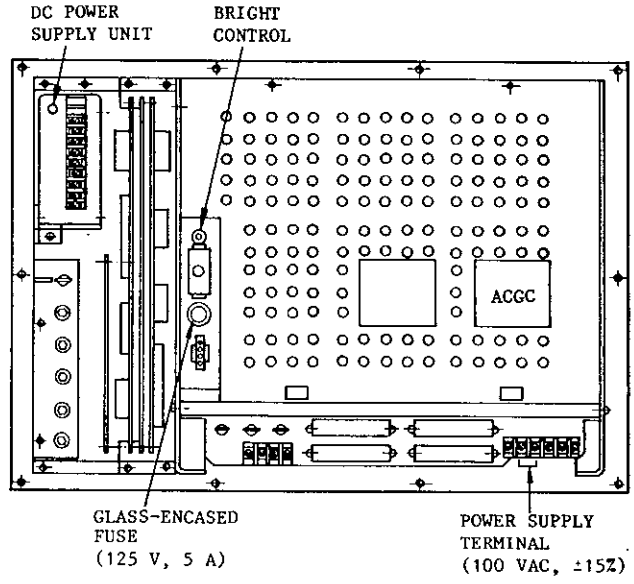


Fig. 2.31 Rear View of ACGC Unit

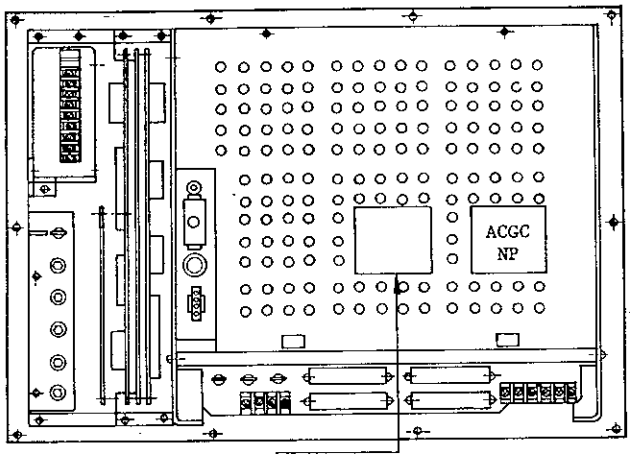
CAUTION

The brightness has been preset to the best condition at the factory. Adjustments may be made to compensate for local light conditions. If the bright control is maintained at a high setting, it may reduce the life of that circuit.

2. 4. 4 SOFTWARE VERSION INDICATION

If memory-related hardware, such as the bubble memory, fails, it is often desirable, after repair, to recover the stored software. For easy identification, software is managed with a version number, and can be determined by one of two methods:

(1) Indicated on "System No. Label" on the nameplate on the back of the CRT.



ACGC System No.	Application PR:	Application BU:
Date Sign.	Date Sign.	Date Sign.

SYSTEM NO. LABEL

Fig. 2.32 Nameplate on Back of CRT

(2) Displayed on the CRT screen

(a) A sample indication in NC mode is shown below. This appears only when power is turned on.

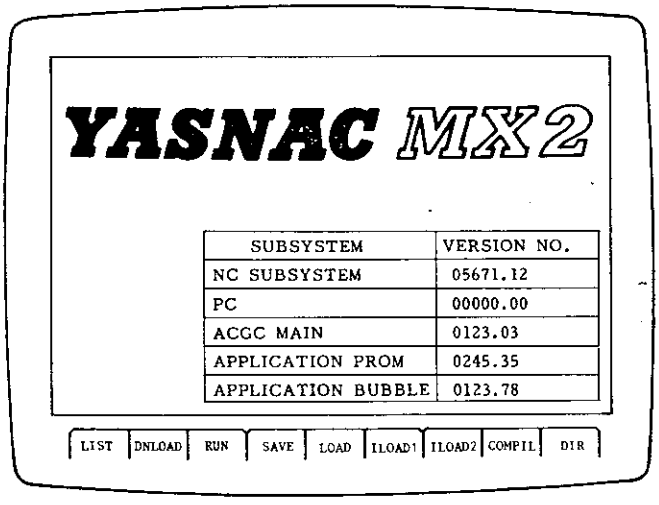


Fig. 2.33 Sample of Various Software Version Nos. in NC Mode

(b) A sample indication in ACGC mode is shown below.

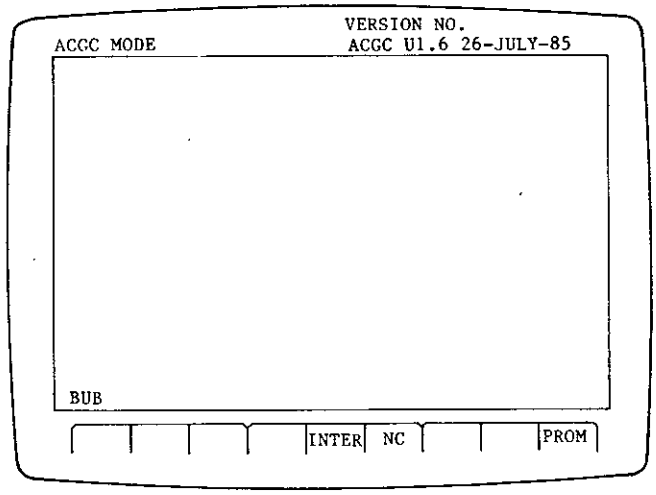
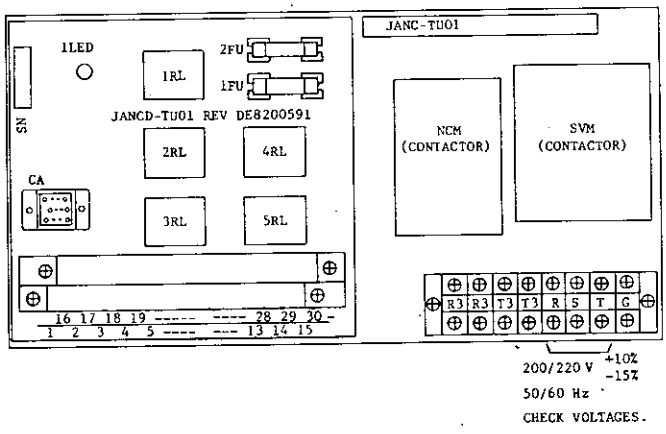


Fig. 2.34 Sample of ACGC Main Software Version Nos. in ACGC Mode

When memory-related hardware fails, notify the service agent of machine tool manufacturer or your YASNAC service personnel and report the latest version number of the related software.

2. 5 SUPPLY VOLTAGE CHECK

2. 5. 1 INPUT POWER SUPPLY VOLTAGE CHECK



1LED: Glows red while power is being applied to the NC unit.

1FU, 2FU: Either of these glass-encased fuses (250 V, 0.3 A) turns off 1LED when blown.

2. 5. 2 DC POWER SUPPLY VOLTAGE CHECK

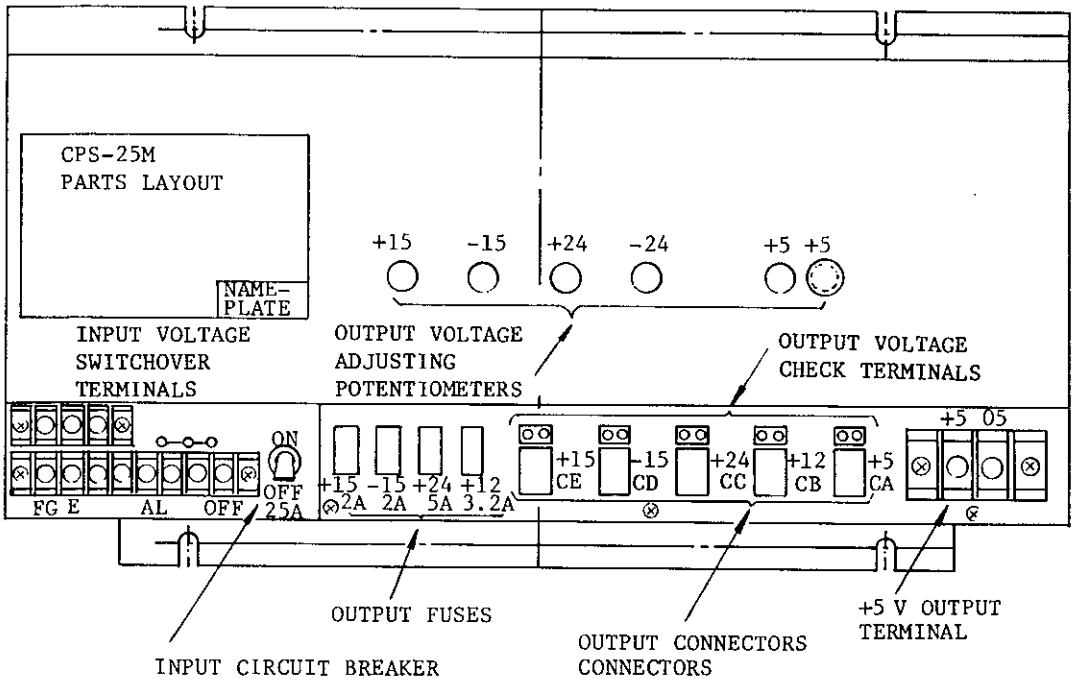


Fig. 2.36

Output Fuses

Voltage	Fuse Type	Capacity
+15V	MP-20	2A
-15V	MP-20	2A
+24V	MP-50	5A
+12V	MP-32	3.2A

(1) Switchover by input power supply voltage

Switch the input power supply voltage switchover terminal common bars (see Fig. 2.36) according to the input power supply voltage.

(2) Specifications of composite power supply unit

Table 2.4

Rated output	Rated current	Allowable voltage range	Applications
+5 V	25 A	5.15 V	Logic circuitry, reed relay
+12 V	2 A	11.88 - 12.12 V	CRT, memory
+24 V	4.2 A	23.76 - 24.24 V	Tape reader, CRT I/O signals
+15 V	1.5 A	14.85 - 15.15 V	Position control circuitry
-15 V	1.5 A	-14.85 - -15.15 V	Position control circuitry

Each output voltage is factory-set and usually requires no further adjustment. But if any output voltages are not in allowable voltage range, adjust to the normal value using voltage adjusting potentiometers.

2. 6 STATUS DISPLAY BY ON-LINE DIAGNOSTICS FUNCTION (DCN)

When the I/O section of the NC unit is suspected of failure, diagnostic numbers can be keyed-in on the NC control panel to display and check I/O signals for status.

2. 6. 1 OUTLINE OF DISPLAYS

Diagnostic No.	Display contents
#1000 - #1096	Input signals for machine tool
#1100 - #1157	Output signals to machine tool
#1200 - #1291	Output signals to power sequence (PC)
#1300 - #1350	Input signals from power sequence (PC)

NOTE: With a power sequence (PC) setup built in, signals #1000 to #1157 vary in meaning depending on each power sequence program. Read the machine tool builder's manual.

2. 6. 2 OPERATING PROCEDURE TO DISPLAY INPUT/OUTPUT SIGNALS

1. Depress the (DGN) key.

   A page containing the diagnostic number specified previously will appear on the CRT screen, with the status of I/O signals displayed in "1," "0" and hexadecimal digits.

2. Key-in the diagnostic number to be displayed, and depress the CURSOR ↑ or ↓ key. This will change the screen to the page containing keyed-in number.

"1": contact closed "0": contact open

   The data on each line is displayed in hexadecimal digits in the rightmost positions on the screen.

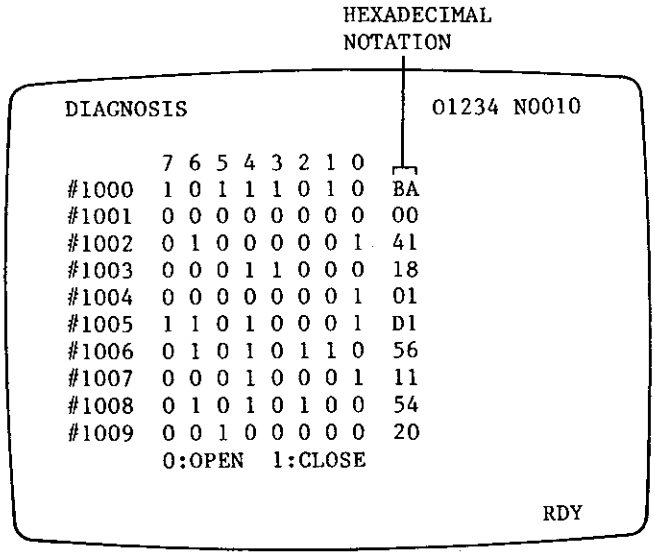


Fig.2.37 Example of Input/Output Signal Display

3. Press the [CURSOR ↓] key.

   The cursor will move down by 1 line to the next diagnostic number. Keeping this key depressed continuously moves down the cursor. When the cursor reaches the last lower line, the screen switches to the next page.

4. Press the [↑ CURSOR] key.

   The cursor will move up by 1 line to the previous diagnostic number. Keeping this key depressed continuously moves up the cursor. When the cursor reaches top line, the screen switches to the previous page.

5. Depress the [PAGE ↓] key.

   The next page will be displayed.

6. Depress the [↑ PAGE] key.

   The previous page will be displayed.

2. 6. 3 LIST OF STANDARD INPUT/OUTPUT SIGNALS

Table 2.5 shows the list of I/O diagnostic numbers and their corresponding I/O signal names.

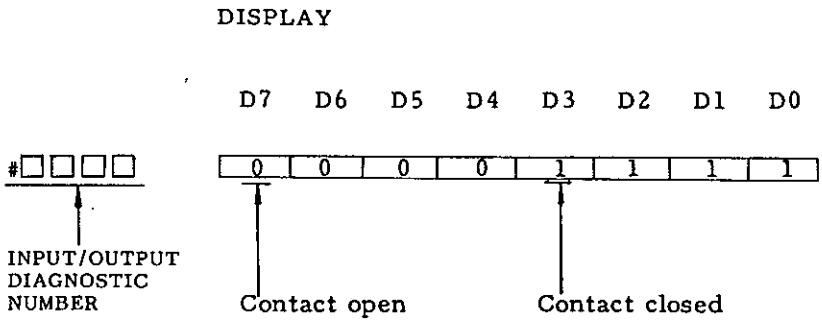
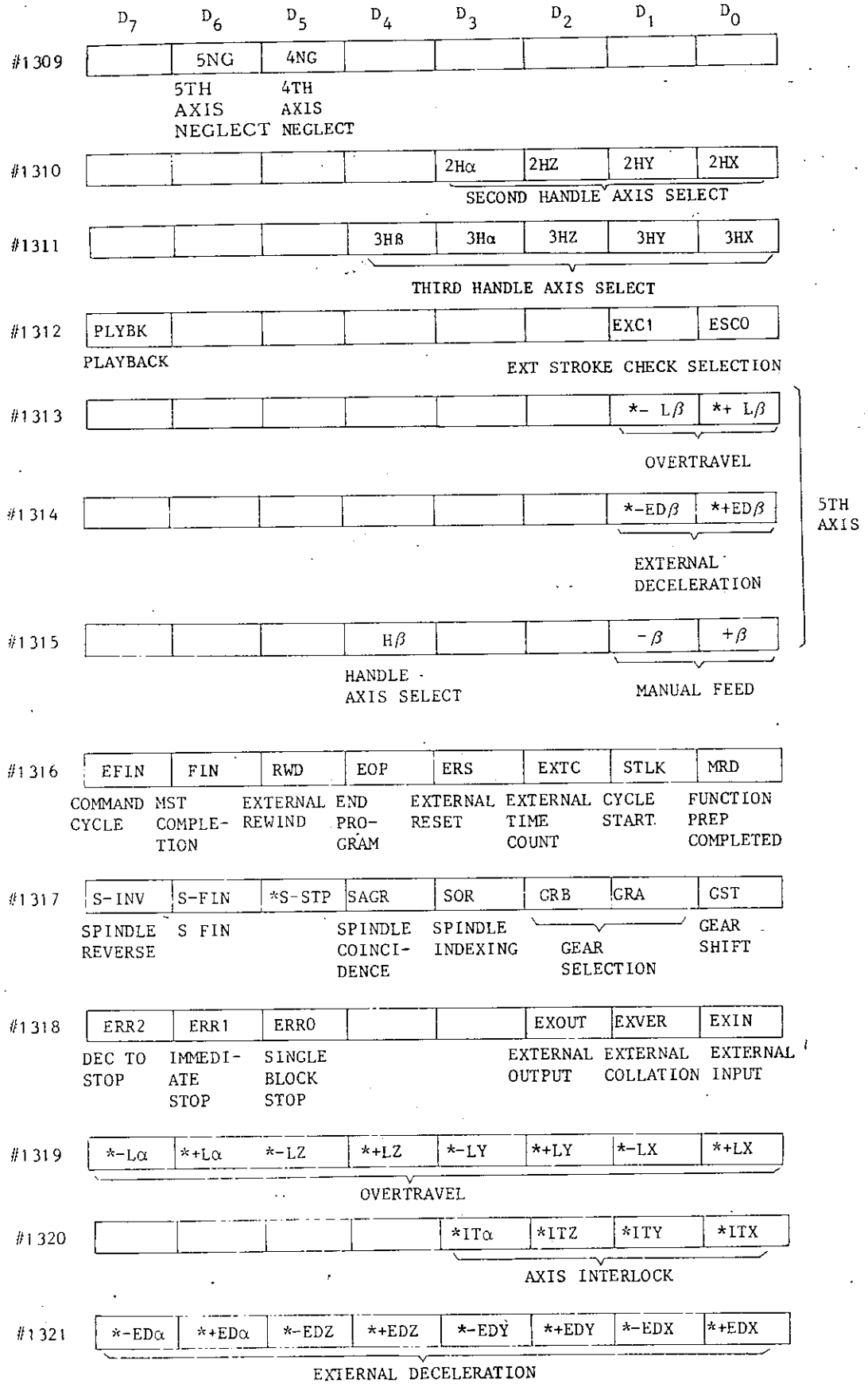


Table 2.5 List of Standard Input Signals

	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
#1300	EDT	MEM	D	T	S	H	J	RT
	EDIT	MEMORY	MDI	TAPE	STEP	HANDLE	MANUAL FEED	RAPID TRAVERSE
#1301	OVC	ROV2	ROV1	OV16	OV8	OV4	OV2	OV1
	OVERRIDE CANCEL	RAPID TRAVERSE RATE OVERRIDE		FEEDRATE OVERRIDE				
#1302	-α	+α	-Z	+Z	-Y	+Y	-X	+X
	JOB PB							
#1303	SPC	SPB	SPA	JV16	JV8	JV4	JV2	JV1
	SPINDLE SPEED OVERRIDE			MANUAL FEEDRATE OVERRIDE				
#1304	DRS	MP4	MP2	MP1	Hα	HZ	HY	HX
	DISPLAY RESET	HANDLE PULSE MULTIPLY			HANDLE AXIS			
#1305	AFL	MLK	OPT	DRN	BDT	DLK		SBK
	M-FUNCTION LOCK	MACHINE LOCK	OPTIONAL STOP	DRY RUN	BLOCK DELETE	DISPLAY LOCK		SINGLE BLOCK
#1306	SRN	F1	RET	TLMI	ZRN	EDTLK	SP	ST
	PROGRAM RESTART	F1-DIGIT	RETRACT	TLMIN	ZERO RETURN	EDIT LOCK	FEED HOLD	CYCLE START
#1307	PINT	ANG	ABS		MI	MIZ	MIY	MIX
	PROGRAM INTER-RUPTION	Z-AXIS LOCK	MANUAL ABSOLUTE		MIRROR IMAGE			
#1308	9BDT	8BDT	7BDT	6BDT	5BDT	4BDT	3BDT	2BDT
	SPECIAL BLOCK DELETE							

Table 2.5 List of Standard Input Signals (Cont'd)



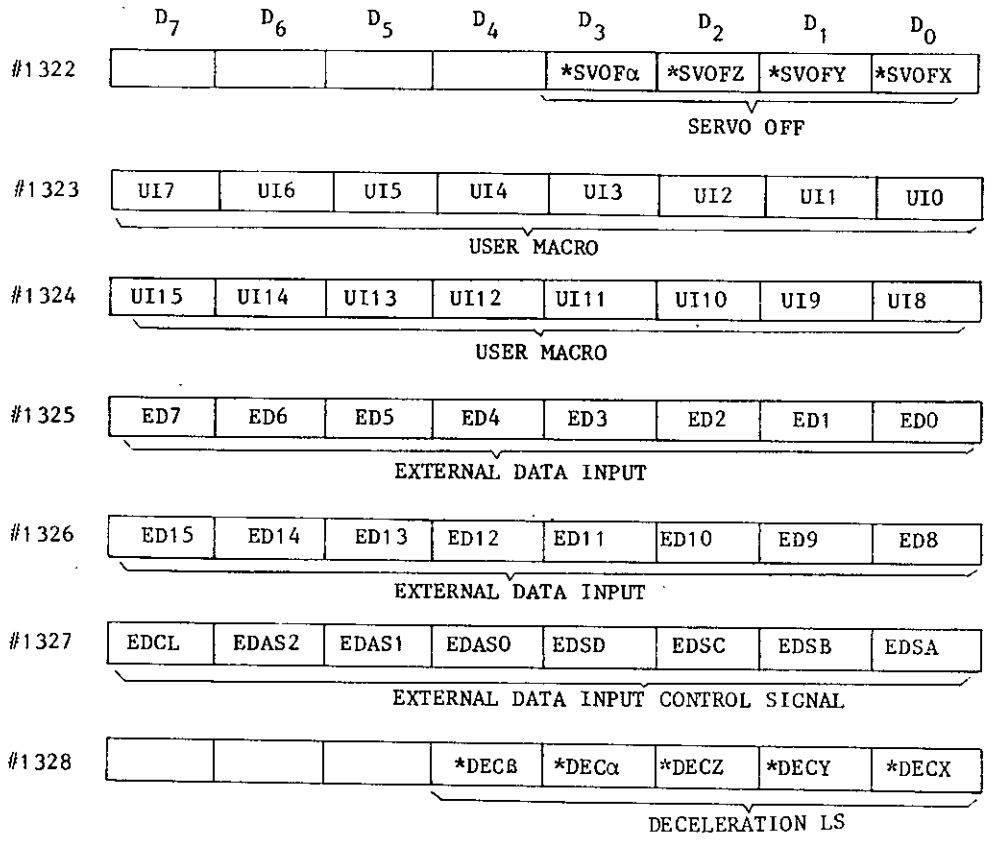

D7 D6 D5 D4 D3 D2 D1 D0
#1322
*SVOFα *SVOFZ *SVOFY *SVOFX
SERVO OFF
#1323
UI7 UI6 UI5 UI4 UI3 UI2 UI1 UI0
USER MACRO
#1324
UI15 UI14 UI13 UI12 UI11 UI10 UI9 UI8
USER MACRO
#1325
ED7 ED6 ED5 ED4 ED3 ED2 ED1 ED0
EXTERNAL DATA INPUT
#1326
ED15 ED14 ED13 ED12 ED11 ED10 ED9 ED8
EXTERNAL DATA INPUT
#1327
EDCL EDAS2 EDAS1 EDAS0 EDSD EDSC EDSB EDSA
EXTERNAL DATA INPUT CONTROL SIGNAL
#1328
*DECß *DECα *DECZ *DECY *DECX
DECELERATION LS

Table 2.5 LIst of Standard Input Signals (Cont'd)

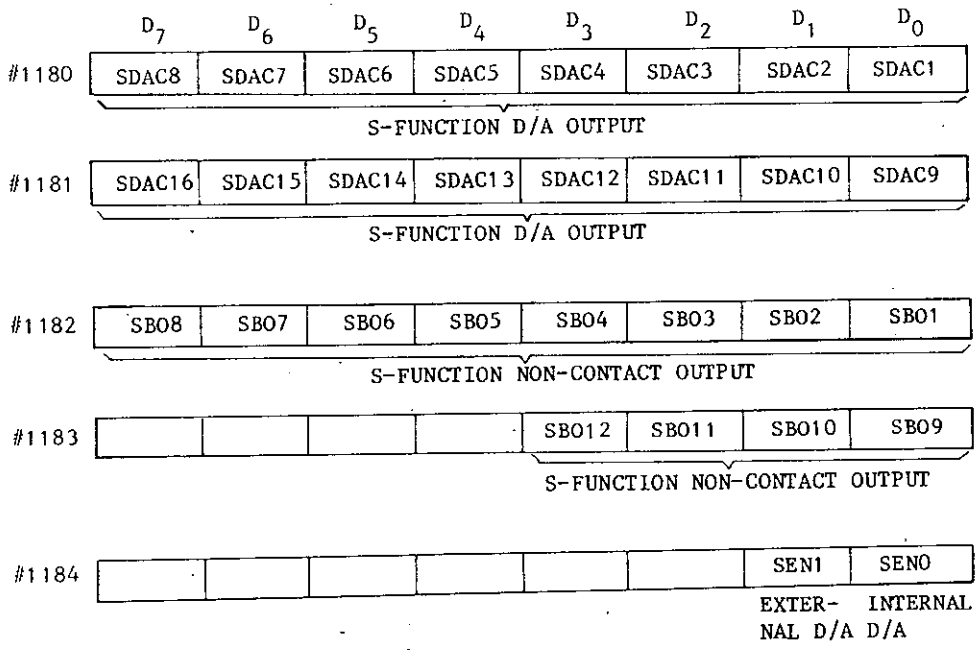


Table 2.6 List of Standard Output Signals

	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
#1200	M30	M02	M01	M00	DEN	OP	SPL	STL
					POSITIONING COMPLETED	FEEDING	TEMPORARY STOP	CYCLE START
#1201	2ZPα	2ZPZ	2ZPY	2ZPX	1ZPα	1ZPZ	1ZPY	1ZPX
	SECOND REFERENCE POINT LAMP				FIRST REFERENCE POINT LAMP			
#1202	4ZPα	4ZPZ	4ZPY	4ZPX	3ZPα	3ZPZ	3ZPY	3ZPX
	FOURTH REFERENCE POINT LAMP				THIRD REFERENCE POINT LAMP			
#1204								
#1205								
#1206								
#1207								
#1208								
#1209								
#1210								
#1211								
#1212								
#1213								
#1214								
#1215								
#1216	T8/T28	T7/T24	T6/T22	T5/T21	T4/T18	T3/T14	T2/T12	T1/T11
	T FUNCTION BINARY/BCD OUTPUT							
#1217	T16/T48	T15/T44	T14/T42	T13/T41	T12/T38	T11/T34	T10/T32	T9/T31
	T FUNCTION BINARY/BCD OUTPUT							

Table 2.6 List of Standard Output Signals (Cont'd)

	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0
#1218	TAP	M04S	TLMO	G80S	EREND	ESEND	RST	AL
	TAPPING SPINDLE		TOOL LENGTH MEASURE-MENT	CHANNED CYCLE	EXTERNAL DATA INPUT COMPLET-ED	EXTERNAL DATA INPUT COMPLET-ED	RESET	ALARM
#1219	SRV	SSP	EMF	EF	BF	TF	SF	MF
	SPINDLE REVERSE	SPINDLE STOP	MF FOR CANNED CYCLE	EXTERNAL OPERA-TION	B-FUNC-TION	T-FUNC-TION	S-FUNC-TION	M-FUNC-FION
#1220	SB8	SB7	SB6	SB5	SB4	SB3	SB2	SB1
	S-FUNCTION BINARY OUTPUT							
#1221					SB12	SB11	SB10	SB9
					S-FUNCTION BINARY OUTPUT			
#1222	M8	M7	M6	M5	M4	M3	M2	M1
	M-FUNCTION BINARY/BCD OUTPUT							
#1223	OS	EDTS	IER	4NGC	AUTO	MAN	RDY	RWD
	ORIENTA-TION	EDITING	INPUT ERROR	4TH AXIS NEBLECT	AUTO-MATIC	MANUAL	PREPARA-TION COMPLETED	REWIND
#1224	SDA8	SDA7	SDA6	SDA5	SDA4	SDA3	SDA2	SDA1
	SPINDLE OPERATION COMMAND							
#1225	SDA16	SDA15	SDA14	SDA13	SDA12	SDA11	SDA10	SDA9
	SPINDLE OPERATION COMMAND							
#1232	B8/B28	B7/B24	B6/B22	B5/B21	B4/B18	B3/B14	B2/B12	B1/B11
	B FUNCTION BINARY/BCD OUTPUT							
#1233	B16/B48	B15/B44	B14/B42	B13/B41	B12/B38	B11/B34	B10/B32	B9/B31
	B FUNCTION BINARY/BCD OUTPUT							
#1234	S28	S24	S22	S21	S18	S14	S12/GRH	S11/GRL
	S FUNCTION BCD OUTPUT						LOW-SPEED GEAR	HIGH-SPEED GEAR

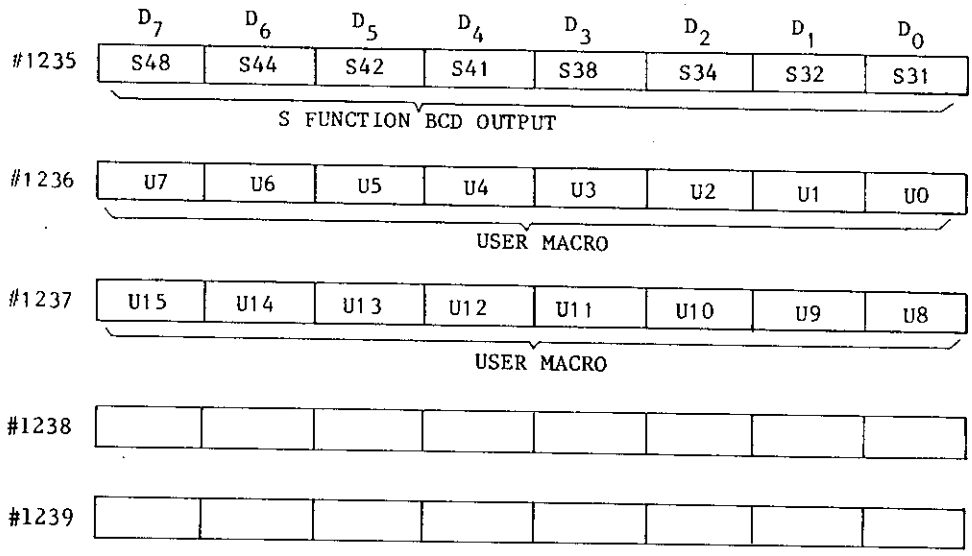
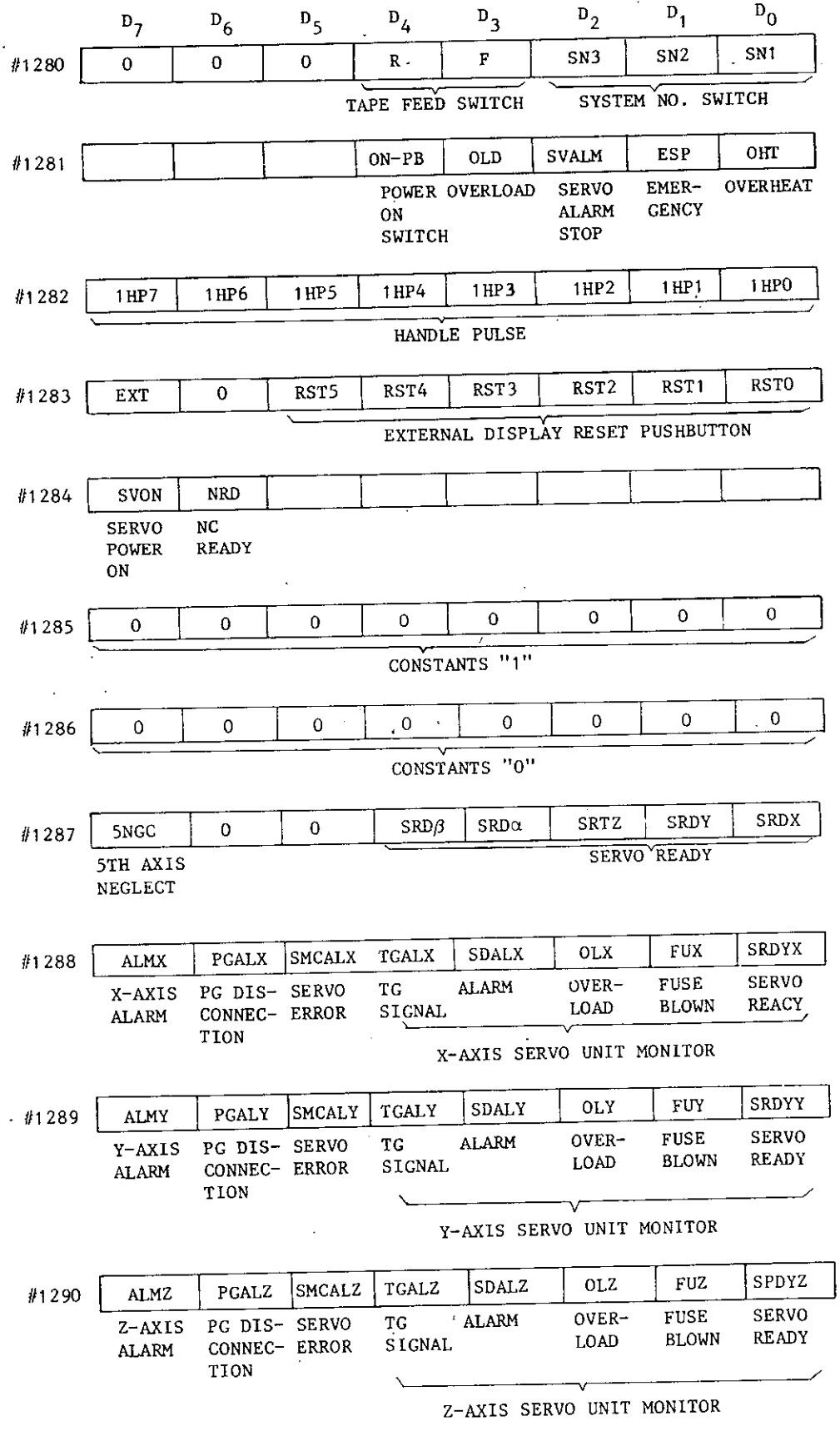
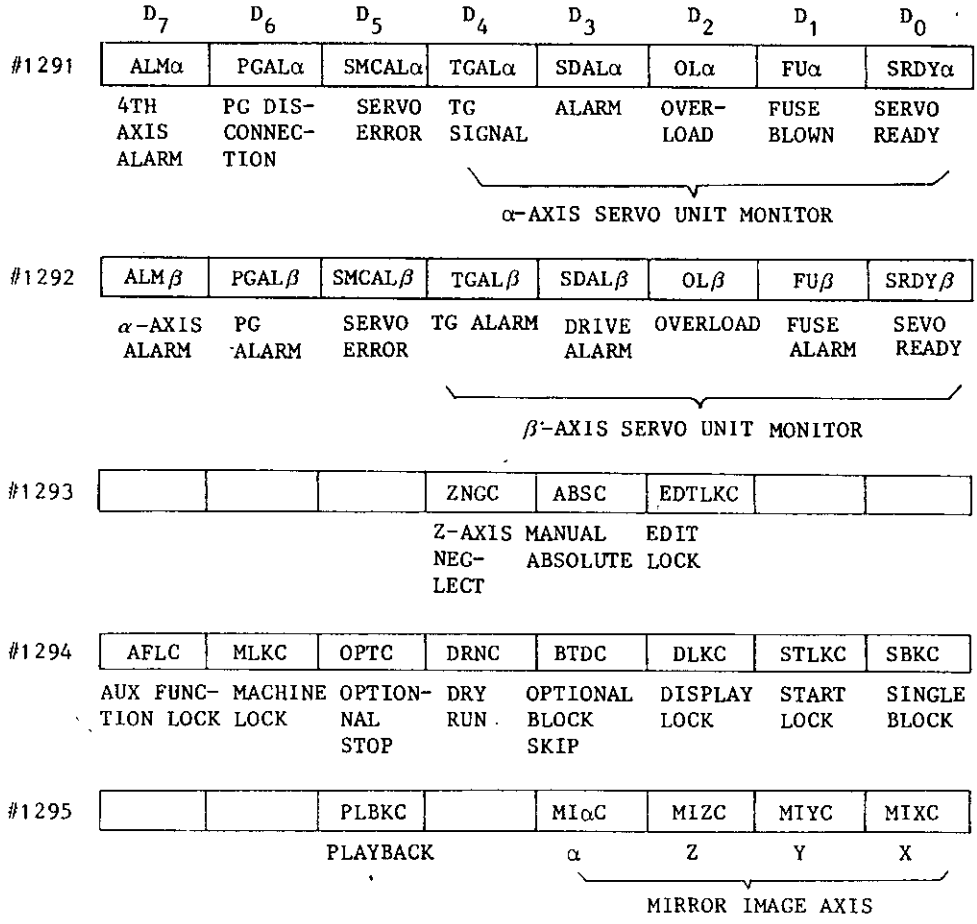

D7 D6 D5 D4 D3 D2 D1 D0
#1235
S48 S44 S42 S41 S38 S34 S32 S31
S FUNCTION BCD OUTPUT
#1236
U7 U6 U5 U4 U3 U2 U1 U0
USER MACRO
#1237
U15 U14 U13 U12 U11 U10 U9 U8
USER MACRO
#1238
#1239

Table 2.6 List of Standard Output Signals (Cont'd)




D7 D6 D5 D4 D3 D2 D1 D0
#1291
ALMα PGALα SMCALα TGALα SDALα OLα FUα SRDYα
4TH AXIS ALARM
PG DIS-CONNEC-TION
SERVO ERROR
TG SIGNAL
ALARM
OVER-LOAD
FUSE BLOWN
SERVO READY
α-AXIS SERVO UNIT MONITOR
#1292
ALMβ PGALβ SMCALβ TGALβ SDALβ OLβ FUβ SRDYβ
α-AXIS ALARM
PG ALARM
SERVO ERROR
TG ALARM
DRIVE ALARM
OVERLOAD
FUSE ALARM
SEVO READY
β-AXIS SERVO UNIT MONITOR
#1293
ZNGC ABSC EDTLKC
Z-AXIS NEG-LECT
MANUAL ABSOLUTE
EDIT LOCK
#1294
AFLC MLKC OPTC DRNC BTDC DLKC STLKC SBKC
AUX FUNC-TION LOCK
MACHINE LOCK
OPTION-NAL STOP
DRY RUN
OPTIONAL BLOCK SKIP
DISPLAY LOCK
START LOCK
SINGLE BLOCK
#1295
PLBKC MIαC MIZC MIYC MIXC
PLAYBACK
α Z Y X
MIRROR IMAGE AXIS

3. ADJUSTMENTS UPON INSTALLATION

3. 1 ADJUSTMENT PROCEDURES

Upon installation, make adjustments in reference to the adjustment procedures given in the table below.

Table 3.1 Adjustment Procedures

No.	Procedure	Remarks
1	Check the interior and exterior of the control cabinet.	
2	Check screw terminals for tightness.	
3	Connect external cables and check.	
4	Connect the power input cable.	
5	Check connector and module locations to be sure of positive connections.	
6	Check settings.	
7	Check the input power supply voltage and frequency.	
8	Check that the composite power supply unit outputs are not short-circuited.	
9	Check the output voltages after a first power application.	
10	Check the I/O signals between the NC unit and the machine tool.	
11	Check parameters and setting data.	
12	Perform a second power application.	
13	Check to be sure the emergency stop functions.	
14	Check movement on each axis by manual feed.	
15	Adjust the servo system.	
16	Check that all NC functions are successfully operable.	

(1) Check the interior and exterior of the control cabinet.

- Check the control panel exterior for contamination and damage.
- Check the module connections inside the cabinet for tightness.
- Check the cables and lead bunch inside the cabinet for damage.

(2) Check screw terminals for loose connections.

- Power input unit terminal block
- Composite power supply unit terminal block (+15 V, 0 V)
- CPU rack terminal block (+5 V, 0 V, +12 V, +24 V, ±15 V)
- Power on/off pushbutton switches on MDI and CRT unit
- Control power transformer terminal block
- Check each terminal block cover, if any, for dislocation.

(3) Connect external cables.

- Check that the cable shield is connected to the ground block through clamp.
- Check that the MDI and CRT unit is equipped with a serial transfer bus terminal connector (JZNC-TN01).
- Check that a protective ground wire is installed between the control unit and the machine tool.
- Check that the protective ground wire is of a one-point ground type.

(4) Connect the power input cable.

Before connecting the power input cable, verify that power input terminals R, S and T inside the control unit are not shorted.

(5) Check connector and module locations and insertions.

- Check that the screws on the module clamps are tightened on the CPU rack.
- Check that the clamp claws on Honda connectors are tightened and that clamp screws are securely in place.
- Check that the clamp claws on power supply connectors are in place.
- Check that the clamp claws on flat cables are in place.

(6) Check settings.

Verify the control power transformer setting in reference to the input power supply voltage (see para. 3.2).

(7) Check input power supply voltage and frequency.

- Check that the power supply voltage and frequency meet ratings.
- Check that the input power supply capacity is high enough for power consumption of the control unit.

(8) Check that the composite power supply unit outputs are not shirt-circuited. Check for short-circuit between:

- +5 V and 0 V
- +12 V and 0 V
- +24 V and 0 V
- +15 V and 0 V
- -15 V and 0 V

(9) Check the output voltages after a first power application.
Depress the POWER ON pushbutton for first power application.

- Check that the air flow from the cooling air exhaust port is normal.
- Verify the output voltages of the composite power supply unit.

+5 V	5.15 V
+12 V	11.88 - 12.12 V
+24 V	23.76 - 24.24 V
+15 V	14.85 - 15.15 V
-15 V	-14.85 - -15.15 V

The +5 V output can be adjusted with an ADJ potentiometer in the composite power supply unit.

(10) Check the I/O signals between the control unit and the machine tool.
Check the I/O signals according to the list of I/O signals (see 2.5 Status Display by Self-Diagnostic Function).

(11) Check parameters and setting data.
Conduct checkups according to the list of parameters (see 3.3 Displaying and Writing Parameters).

(12) Perform a second power application.

Press the POWER-ON pushbutton again for second power application.

- An alarm, if displayed, should be dealt with according to the list of alarms.
- Check that each axis can be placed under servo clamp.
- Adjust the ZERO ADJ potentiometer on the servo drive unit so that the servo position deviation comes within 0 ±2 pulses in the servo clamp state.

NOTE

Servo deviation pulses can be displayed on the MDI & CRT unit by following the steps given below:

1. Set the system No. switch to "4."
2. Depress the POS key.
3. Depress the PAGE ↓ or ↑ PAGE key to select the display (POSITION "ERROR") of a servo position deviation value.
4. After adjustment, set the system No. switch back to "0."

(13) Verify the emergency stop.

With emergency stop activated (e.g., by emergency stop pushbutton, machine end LS), check that the second power supply (servo power supply) is turned off and that the alarm display "330: EMERGENCY STOP" appears.

(14) Check movement on each axis by manual feed.

- Check that the machine tool properly follows up on the movement made by handle or step feed.
- Operate the machine tool by manual jog feed. Activate its OT limit switch intentionally, and check to see that the machine is stopped by detection of an overtravel alarm.
- Check that the machine tool follows in the entire feedrate range in manual jog and rapid feed.

3. 1 ADJUSTMENT PROCEDURES (Cont'd)

(15) Adjust the servo system.

· Operate the machine tool by F4-digit feed or G00 feed in the MDI mode. Check the servo position deviation on the MDI & CRT unit. With the feedrate and servo position deviation, the position gain Kp is obtained by the formula:

$$Kp = 16.7 \times \frac{F}{E}$$

where, F: feedrate (mm/min)

E: servo position deviation (0.001 mm)

Kp: position gain ($sec.^{-1}$)

Turn the INPUT ADJ potentiometer for servo position deviation adjustment on the servo drive unit so that the position gain comes within ±10% of the target value. The difference between the axes should be 1% or less.

(16) Check that all NC functions are successfully operable.

· Check that reference point return is normally performed.

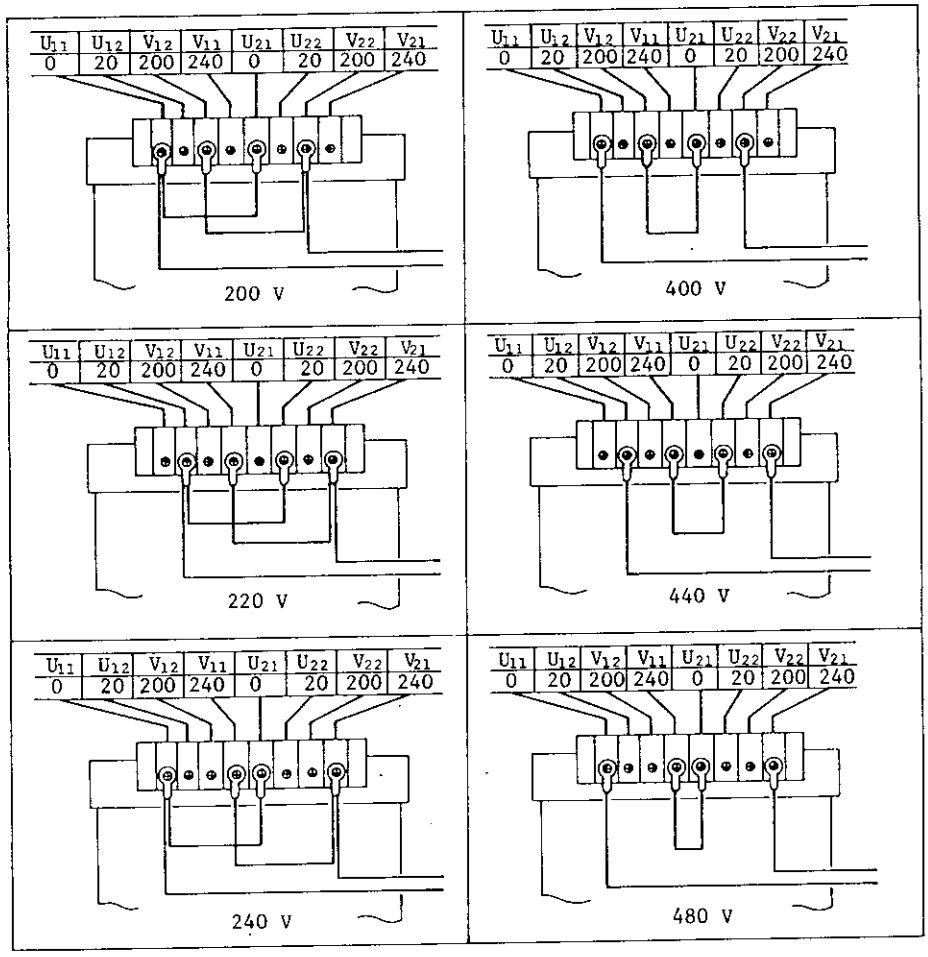
· Run the test tape on each machine for check.

3. 2 POWER TRANSFORMER CONNECTIONS

3. 2. 1 TAP CHANGING ON CONTROL TRANSFORMER (1T)

When a control transformer (1T) is incorporated, check the tap connections on the primary side of the transformer. The supply voltage must be within +10% and -15% of the tap voltage. If this condition is not met, change the tap connection according to the following figures.

Table 3.2 Transformer Tap Connections according to Supply Voltage



3. 3 DISPLAYING AND WRITING PARAMETERS

This system has various parameters stored in memory. They determine operating conditions such as tape conding and feedrate. The parameters can always be displayed regardless of the mode even during automatic operation.

3. 3. 1 PARAMETER TYPES

Parameters are displayed either in binary or in decimal digits.

```
PARAMETER                          01234 N0017

        7 6 5 4 3 2 1 0
#6010   0 0 0 0 0 0 1 1    3
#6011   0 0 0 0 0 0 0 0    0
#6012   0 0 0 0 1 1 1 0   14
#6013   0 0 0 0 0 0 0 0    0
#6014   0 0 0 0 0 1 1 0    6
#6015   0 0 1 0 0 1 1 1   39
#6016   0 0 1 0 0 1 0 0   36
#6017   0 0 0 0 0 1 0 0    4
#6018   0 0 1 0 0 0 0 0   32
#6019   0 0 0 0 0 1 0 0    4
        0:OFF  1:ON

                                   RDY
```

Fig. 3.1 Typical Parameter Display (in binary digits)

Parameters #6005 to #6045 are displayed in binary digits.

```
PARAMETER                          01234 N0017

#6600       1000000
#6601       2000000
#6602        500000
#6603             0
#6604             0
#6605             0
#6606   -   1000000
#6607   -   1000000
#6608   -    500000
#6609   -         0

                                   RDY
```

Fig. 3.2 Typical Parameter Display (in decimal digits)

Parameters #6050 and larger are displayed in decimal digits.

3. 3. 2 PARAMETER DATA DISPLAY

1. Key-in a parameter number and press the [CURSOR ↓] or [↑ CURSOR] key. The symbol "#" need not be typed. Up to ten parameter numbers and their contents can be displayed.

2. The parameter number specification can be updated by operating the [CURSOR ↓] or [↑ CURSOR] key. The screen can be updated by operating the [PAGE ↓] or [↑ PAGE] key.

3. 3. 3 PARAMETER DATA WRITING

Set the system No. switch to "1."

For display in decimal digits

1. Specify a desired parameter number.
2. Depress the INSRT key. The cursor will move from the parameter number to the binary digit display, indicating the bit position of D7 first.
3. Depress the [CURSOR ↓] key. The cursor moves by 1 bit towards the bit position D0 every time this key is pressed. Keeping this key depressed can continuously move the cursor to the desired position.
4. Depress the WR key, and the designated bit data reverses (0 to 1 or 1 to 0). Pressing the key again will reverse the data. Generally, "1" represents the function being on and "0" being off.
5. Only when the cursor is set to the rightmost decimal position decimal data can be keyed in.

Key-in data	7	6	5	4	3	2	1	0	
[0] [WR]	0	0	0	0	0	0	0	0	0
[2] [5] [5] [WR]	1	1	1	1	1	1	1	1	255

6. Repeat steps 2. to 5. to write desired parameter data.

   Keeping the [CURSOR ↓] or [↑ CURSOR] key depressed moves the cursor continuously on the screen.

3. 3. 3 PARAMETER DATA WRITING (Cont'd)

7. With the writing completed, depress the INSRT key in a "sandwiching" manner (INSRT, data, and INSRT in that order).

For display in binary digits

1. Specify a desired parameter number.
2. Key in the data and depress the WR key. The data will be written to the parameter number indicated by the cursor.
3. The parameter number specification can be updated by operating the [CURSOR ↓], [↑ CURSOR] or [PAGE ↓] [↑ PAGE] key.
   Check that the writing has normally completed, and set the system No. switch back to "0."

3. 3. 4 TAPE INPUT OF SETTING DATA AND PARAMETER DATA

Although setting data and parameter data are generally input through MDI operation, they can also be entered by means of punched paper tape. The two types of data may be input from a single tape.

(1) The tape format is as follows:

```
Label   % ;
#6000   X128  ;
#6001   X   5 ;
#6002   X   0 ;
  .     .
  .     .
  .     .
  %
```

Note:
1. "%" is used in the ISO code and "ER" in the EIA code.
2. "N" is used in the EIA code instead of "#."

Fig. 3.3

(2) The input operation procedure is as follows:

(a) Select the EDIT mode.

(b) Depress the [RESET] key.

(c) Depress the [PRM] key.

(d) Set the setting/parameter data tape onto the tape reader.

(e) Depress the [IN] key. The tape reader will start reading the tape. "IN" blinks on the CRT screen while the data is being read.

(f) On completion of reading symbol % (or characters ER), the tape reader comes to a stop and causes the "IN" display to disappear from the CRT screen. This completes the data input.

3. 3. 5 PUNCHING-OUT OF SETTING DATA AND PARAMETER DATA

The punching out procedure is as follows:

1. Select the EDIT mode.
2. Depress the [RESET] key.
3. Depress the [PRM] key. The setting and parameter data will be continuously punched out.
4. To interrupt the puncing operation, depress the [RESET] key.

Parameter numbers are classified in the following five groups:

Table 2.1

Parameter number	Group
#6005 to #6049	Setting by bit
#6050 to #6199	Setting by byte
#6220 to #6399	Setting by word
#6600 to #6699	Setting by double words
#7000 to #7095	Setting by byte for sequencer

Optimum data of parameters have been set according to machine performance and applications. For any modification of parameter data, consult the machine tool builder.

Data pertaining to parameters #6033 to #6049 must not be modified, for they have been incorporated as part of the system.

3.3.6 SETTING NUMBERS AND THEIR CONTENTS

#6000	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Sets punch-out code to ISO

0: Sets punch-out code to EIA

D6 1: Performs TV check of tape

0: Performs TV check of tape

D5 1: Sets playback ON

0: Sets playback ON/OFF with an external switch

D4, D3, D2, D1, D0

Selects whether to make the mirror image of the 5 axis, 4 axis, Z axis, Y axis and X axis effective in successive order orto make them external switches.

1: Mirror image effective

0: External switch

#6001	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Emits operating panel buzzer sound

0: Does not emit operating panel buzzer sound

D6 1: Automatically discriminates between EIA/ISO during tape code input

0: Discrimination of EIA/ISO during tape code input will not be automatic but by #6000 D7.

D5 1: Executes stored stroke limit when machine is locked.

0: Does not execute stored stroke limit when machine is locked.

D4 Z axis cancelling switch

1: ON

0: OFF

D3 Manual absolute switch
1: ON
0: OFF

D2 Editing lock switch
1: ON
0: OFF

D1 1: Checks the 2nd prohibited area of stored stroke limit

0: Does not check the 2nd prohibited area of stored stroke limit

D0 1: Changes input units to inch inputs

0: Changes input units to MM inputs

#6002	D7	D6	D5	D4	D3	D2	D1	D0

D7 Auxiliary function lock switch
1: ON
0: OFF

D6 Machine lock switch
1: ON
0: OFF

D5 Optional stop switch
1: ON
0: OFF

D4 Dry run switch
1: ON
0: OFF

D3 Optional block skipping switch
1: ON
0: OFF

D2 Display lock switch
1: ON
0: OFF

D1 Start lock switch
1: ON
0: OFF

D0 Single block switch
1: ON
0: OFF

3.3.6 SETTING NUMBERS AND THEIR CONTENTS (Cont'd)

#6003				D4	D3		D1	D0

D0, D1: Selects the output device of the data input interface

D4, D3: Selects the input device of the data input interface

Setting Code	Input Device	Output Device	Paramenter for Setting Baud Rate
0, 0	Tape reader	FACIT puncher	—
0, 1 (SIO-1)	RS232C	RS232C Current loop (20mA)	#6026 (6028) D3 to D0
1, 0 (SIO-2)	RS422	RS422	#6027 (#6029) D3 to D0

#6004		D6	D5	D4	D3		D1	D0

D6 1: Cancels life data when executing command G122

0: Does not cancel life data when executing command G122

D5 1: Executes high speed cutting function

0: Carries out regular automatic operation in relation to command G101. Performs data registration only in relation to command G101. Performs data registration only in relation to command G102 during regular automatic operation.

D4 1: Programs of program numbers 8000 through 8999 cannot be registered, erased or edited.

0: Normal registration, erasure and editing can be performed.

D3 1: Programs with program numbers 8000 through 8999 will not be displayed.

0: Programs with program numbers 8000 through 8999 will be displayed.

D1 1: Single blocks become effective in relation to an operation command from the user program.

0: Single blocks become ineffective in relation to operation commands or control commands from the user program.

D0 1: The next block will be executed if there is no skip signal input until shifting of the G31 block ends.

0: Causes alarm "087"

#6200 Break point -1

#6201 Break point -2

Sets break point sequence.
Setting range 1 through 9999. Will not stop at 0.

#6204

Specifies group number during tool change and reset.
Setting range 1 through 128.

#6207

Sets program number.
Specifies program number of tape when inputting tape without a program number.
Setting range 1 through 9999.

#6210

Sets dwell time when executing G76 and G77.
Setting: "1" = 1 ms

#6211

Sets amount of S when executing G73.
Setting: "1" = 0.001 mm

#6213

Sets shift amount when executing G83.
Setting: "1" = 0.001 mm

#6500

#6501

Sets scaling multiple. Multiple = #6500/#6501
Scale multiple = 1 when setting is "0."

#6506

Sets angle during execution of commands G76 and G77.
Setting: "1" = 0.001 deg

#6507

Sets tool length measuring bias.
Setting: "1" = 0.001 mm

#6508

Sets tool length measuring bottom level.
Setting: "1" = 0.001 mm

#6510 (X axis)

#6511 (Y axis)

#6512 (Z axis)

Sets stored stroke limit of the X, Y, and Z axes and the boundary value in the positive direction of the 2nd prohibited area.
Setting range: 0 - ±99999999
Setting: "1" = 0.001mm

#6513	(X axis)
#6514	(Y axis)
#6515	(Z axis)

Sets stored stroke limit of the X, Y and Z axis in successive order and also the negative direction boundary value of the 2nd prohibited area.
Setting range: 0 - ±99999999
Setting: "1" = 0.001 mm

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS

#6516	X-axis
#6517	Y-axis
#6518	Z-axis
#6519	4th-axis
#6520	5th-axis

Work coordinate system setting G54(J1)
Setting: "1" = 0.001mm

#6522	X-axis
#6523	Y-axis
#6524	Z-axis
#6525	4th-axis
#6526	5th-axis

Work coordinate system setting G55(J1)
Setting: "1" = 0.001mm

#6528	X-axis
#6529	Y-axis
#6530	Z-axis
#6531	4th-axis
#6532	5th-axis

Work coordinate system setting G56 (J1)
Setting: "1" = 0.001mm

#6534	X-axis
#6535	Y-axis
#6536	Z-axis
#6537	4th-axis
#6538	5th-axis

Work coordinate system setting G57 (J1)
Setting: "1" = 0.001mm

#6540	X-axis
#6541	Y-axis
#6542	Z-axis
#6543	4th-axis
#6544	5th-axis

Work coordinate system setting G58 (J1)
Setting: "1" = 0.001mm

#6546	X-axis
#6547	Y-axis
#6548	Z-axis
#6549	4th-axis
#6550	5th-axis

Work coordinate system setting G59 (J1)
Setting: "1" = 0.001mm

#6552	X-axis
#6553	Y-axis
#6554	Z-axis
#6555	4th-axis
#6556	5th-axis

Coordinate value at skip signal ON
Setting: "1" = 0.001mm

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS

#6560	F0
#6561	F1
#6562	F2
#6563	F3
#6564	F4
#6565	F5
#6566	F6
#6567	F7
#6568	F8
#6569	F9

F1-digit speed setting
Setting: "1" = 0.001mm

#6700	X-axis
#6701	Y-axis
#6702	Z-axis

Work coordinate system setting G54 (J2)
Setting: "1" = 0.001mm

#6703	X-axis
#6704	Y-axis
#6705	Z-axis

Work coordinate system setting G55 (J2)
Setting: "1" = 0.001mm

#6706	X-axis
#6707	Y-axis
#6708	Z-axis

Work coordinate system setting G56 (J2)
Setting: "1" = 0.001mm

#6709	X-axis
#6710	Y-axis
#6711	Z-axis

Work coordinate system setting G57 (J2)
Setting: "1" = 0.001mm

#6712	X-axis
#6713	Y-axis
#6714	Z-axis

Work coordinate system setting G58 (J2)
Setting: "1" = 0.001mm

#6715	X-axis
#6716	Y-axis
#6717	Z-axis

Work coordinate system setting G59 (J2)
Setting: "1" = 0.001mm

#6718	X-axis
#6719	Y-axis
#6720	Z-axis

Work coordinate system setting G54 (J3)
Setting: "1" = 0.001mm

#6721	X-axis
#6722	Y-axis
#6723	Z-axis

Work coordinate system setting G55 (J3)
Setting: "1" = 0.001mm

#6724	X-axis
#6725	Y-axis
#6726	Z-axis

Work coordinate system setting G56 (J3)
Setting: "1" = 0.001mm

#6727	X-axis
#6728	Y-axis
#6729	Z-axis

Work coordinate system setting G57 (J3)
Setting: "1" = 0.001mm

#6730	X-axis
#6731	Y-axis
#6732	Z-axis

Work coordinate system setting G58 (J3)
Setting: "1" = 0.001mm

#6733	X-axis
#6734	Y-axis
#6735	Z-axis

Work coordinate system setting G59(J3)
Setting: "1" = 0.001mm

#6736	X-axis
#6737	Y-axis
#6738	Z-axis

Work coordinate system setting G54 (J4)
Setting: "1" = 0.001mm

#6739	X-axis
#6740	Y-axis
#6741	Z-axis

Work coordinate system setting G55(J4)
Setting: "1" = 0.001mm

#6742	X-axis
#6743	Y-axis
#6744	Z-axis

Work coordinate system setting G56 (J4)
Setting: "1" = 0.001mm

#6745	X-axis
#6746	Y-axis
#6747	Z-axis

Work coordinate system setting G57 (J4)
Setting: "1" = 0.001mm

#6748	X-axis
#6749	Y-axis
#6750	Z-axis

Work coordinate system setting G58 (J4)
Setting: "1" = 0.001mm

#6751	X-axis
#6752	Y-axis
#6753	Z-axis

Work coordinate system setting G59 (J4)
Setting: "1" = 0.001mm

#6754	X-axis
#6755	Y-axis
#6756	Z-axis

Work coordinate system setting G54(J5)
Setting: "1" = 0.001mm

#6757	X-axis
#6758	Y-axis
#6759	Z-axis

Work coordinate system setting G55 (J5)
Setting: "1" = 0.001mm

#6760	X-axis
#6761	Y-axis
#6762	Z-axis

Work coordinate system setting G56 (J5)
Setting: "1" = 0.001mm

#6763	X-axis
#6764	Y-axis
#6765	Z-axis

Work coordinate system setting G57 (J5)
Setting: "1" = 0.001mm

#6766	X-axis
#6767	Y-axis
#6768	Z-axis

Work coordinate system setting G58 (J5)
Setting: "1" = 0.001mm

#6769	X-axis
#6770	Y-axis
#6771	Z-axis

Work coordinate system setting G59 (J5)
Setting: "1" = 0.001mm

#6005	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0

D_7 1: Stores the H code for reset, G92 and G28.

0: Sets the H code to H00 for reset, G92 and G28.

D_6 1: Stores the G code in the 01 group for reset.

0: Sets the G code in the 01 group to G00 for reset.

D_5 1: Allows the current value display (universal) to be preset by the coordinate system seeeing command G92.

At this time, the [ORG] key is capable of Zero Setup.

0: Keeps the current value display (universal) from being preset by the coordinate system setting command G92.

At this time, the [ORG] key is incapable of Zero Setup.

D_4, D_3: Status of G codes at power on.

D_4	D_3	Initial status
1	0	Sets the G code in the 08 group to G44 on power application.
0	1	Sets the G code in the 08 group to G43 on power application.
0	0	Sets the G code in the 08 group to G49 on power application.

D_2 1: Sets the G code in the 01 group to G01 on power application.

0: Sets the G code in the 01 group to G00 on power application.

D_1 1: Sets the G code in the 05 group to G95 on power application.

0: Sets the G code in the 05 group to G94 on power application.

D_0 1: Sets the G code in the 05 group to G91 on power application.

0: Sets the G code in the 05 group to G90 on power application.

#6006	D_7	D_6	D_5	D_4	D_3	D_2	D_1	D_0

D_7, D_6 Signs of S4-digit analog (SDA) output

D_7	D_6	Sign	
1	1	Minus	Plus
1	0	Plus	Minus
0	1	Minus	Minus
0	0	Plus	Plus
		SINV signal off	SINV signal on

D5 1: Sets the least input increment to 0.01 mm (or 0.001 in., 0.01 deg.).

0: Sets the least input increment to 0.001 mm (or 0.0001 in., 0.001 deg.).

D_4 1: Checks to see if the spindle speed match signal (SAGR) is off upon transition from a rapid traverse block to a cutting feed block.

0: Provides no check on the spindle speed match signal (SAGR).

D_3 1: Enables the internal toggle switches.

0: Disables the internal toggle switches.

See #6003

D_2 1: Enables dry run in response to the rapid traverse command.

0: Disables dry run in response to the rapid traverse command.

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

D_1 1: Causes an alarm ("001-004") upon cycle start when reference point return is not made after power application.

0: Causes no alarm.

NOTE: Set "1" when pitch error compensation or stored stroke limit is provided.

D0 1: Enables automatic coordinate system setting

2: Disables automatic coordinate system setting.

Refer to #6630 to #6639.

#6007	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Disables start interlock after EDT.

0: Enables start interlock after EDT.

D6 1: Employs the newly entered tool compensation value in place of the old value.

0: Adds the newly entered tool compensation value to the soterd value to establish another offset.

D5 1: Enables error detect ON mode at dwell.

0: Disables error detect On mode at dwell.

D_4 1: Provides output during rewinding.

0: Provides no output during rewinding.

D_3 1: Sets the least increment to 0.0001 in.

0: Sets the least increment to 0.001 mm.

D_2 1: Makes the spindle override 100% during tapping.

0: Does not make the spindle override 100% during tapping.

D_1 1: Establishes the prohibited area of the 3rd, 4th, and 5th stored stroke limit outside the boundary.

0: Establishes the prohibited area of the 3rd, 4th, and 5th stored stroke limit inside the boundary.

D_0 1: Establishes the prohibited area of the 2nd stored stroke limit outside the boundary.

0: Establishes the prohibited area of the 2nd stored stroke limit inside the boundary.

#6008	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: High speed cutting memory division effective

0: High speed cutting memory division ineffective (high speed cutting not possible)

D6 1: Sets G31 through G34 (G codes for gap elimination and tool damages).

0: Sets G31 through G34 nonmodal.

D5 1: 0 is changeable with ALT operation.

0: 0 is not changeable with ALT operation.

D4 1: Feed hold block stop ineffective when tapping with G84

0: Feed hold block stop effective when tapping with G84

D3 1: Manual absolute effective in the G91 mode.

0: Manual absoulte ineffective in the G91 mode.

D2 1: Changes approach speed to jog speed when restarting program.

0: Changes approach speed to fast feed when restarting program.

D1 1: Does not clear the common variables of #100 through #149.

0: Clears the common variables of #100 through #149.

Note: Some controls are not provided with the parameter #6008.

D0 1: Sets tool damage and gap elimination direction to plus (+).

0: Sets tool damage and gap elimination direction to minus (-).

#6009				D4	D3	D2	D1	D0

D4, D_3, D_2, D_1, D_0

Specify the start direction of backlash compensation on the 4th-, 5th-, Z-, Y- and X-axes, respectively, upon power application.

1: Minus direction

0: Plus direction

#6010				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify the direction of reference point return on th 4th-, 5th-, Z-, Y- and X-axes, respectively.

1: Minus direction

0: Plus direction

NOTE: The specification is effective for an axis with #6016 at "1."

#6011				D4	D3	D2	D1	D0

D4, D3, D2, D1, D0

1: Causes alarms (001 to 005) at the block including axis movement command if cycle start is activated without reference point return of 5th, 4th, Z-, Y-, and X-axis.

Note: Blocks without axis movement command and G28 block will be executed without alarms.

0: Activates cycle start without reference point check.

#6012				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify whether or not the plus-direction external deceleration signal is effective on the 4th-,5th-,Z-,Y- and X-axes, respectively.

1: Makes the plus-direction external deceleration signal effective.

0: Makes the plus-direction external deceleration signal ineffective.

#6013				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify whether or not the minus-direction external deceleration signal is effective on the 4th-, 5th-, Z-, Y- and X-axes, respectively.

1: Makes the minus direction external deceleration signal effective.

0: Makes the minus direction external deceleration signal ineffective.

#6014				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify the direction of the G60 unidirectional approach upper limit on the 4th-, 5th-, Z-, Y- and X-axes, respectively.

1: Minus direction

0: Plus direction

NOTE: The approach upper limit is set with #6062 to #6065.

#6015				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify whether or not the automatic coordinate system setting is effective on the 4th-, 5th-, Z-, Y- and X-axes, respectively.

1: Effective

0: Ineffective

NOTE: The automatic coordinate system is established with the following parameters:

Metric system; #6636 - #6639

Inch system; #6630 - #6633

#6016				D4	D3	D2	D1	D0

D_4, D_3, D_2, D_1, D_0

Specify whether or not reference point return is effective on the 4th-, 5th-, Z-, Y- and X-ases, respectively.

1: Makes reference point return effective.

0: Makes reference point return ineffective.

#6017	D7	D6	D5	D4	D3	D2	D1	D0

D_7 - D_0

Specify whether or not a hole is to be made on channels 8-1, respectively, in a code corresponding to symbol "#" (used with user macro) in the EIA code.

1: Hole

0: No hole

Example:
D_7 - D_0 = 01001001

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

The code with holes on channels 7, 4 and 1 is considered equivalent to symbol "#" in the EIA code. No code for use by the unit can be set.

NOTE: The specification of D_7 - D_0 =00000000 assumes that symbol "#" is not used in the EIA code.

#6018	D_7	D_6	D_5	D_4		D_2	D_1	D_0

D_7 1: Provides dwell at hole bottom in the canned cycles of G76 and G77.

0: Does not provide dwell at hole bottom in the canned cycles of G76 and G77.

NOTE: The dwell time is set with #6210.

D_6 1: Establishes M03 for G74 and M04 for G84 as the M code for output at hole bottom in the canned cycles of G74 and G84.

0: Reverses the M code in effect before the canned cycles for output at hole bottom in the canned cycle of G74 and G84.

Before canned cycle	Hole bottom
M03	M04
M04	M03

NOTE: This specification is effective when D_4 = 0 in #6018.

D_5 1: Rotates the spindle forward and in reverse, outputting M05 at hole bottom in the canned cycles of G74 and G84.

0: Rotates the spindle forward and in reverse, not outputting M05 at hole bottom in the canned cycles of G74 and G84.

NOTE: This specification is effective when D_4 = 0 in #6018.

D_4 1: Outputs a read-only signal (SSP, SRV, OSS) in the canned cycles.

0: Outputs the M code in the canned cycles

D_2 1: Causes the X and Y movement in the canned cycles to follow the G code in group 01 (G02 and G03 regarded as G01).

0: Causes the X and Y movement in the canned cycles to stay in rapid traverse.

D_1 1: Outputs the FMF signal twice in a canned cycle.

0: Outputs the FMF signal once in a canned cycle.

D_0 1: Outputs the external operation signal EF at the end of positioning by G81 (G81 being external operation function).

0: Does not output the external operation signal EF at the end of positioning by G81 (G81 being canned cycle).

#6019	D7	D6	D5	D4	D3	D2	D1	D0

D7 Resets the memory at the initial rewind percentagle "%" during tape operation.

1: Effective

0: Ineffective

D_5 1: Enables dry run at thread-cutting (G33).

0: Disables dry run at thread-cutting (G33).

D_4 1: Employs the feedrate set in parameter #6232 for the skip function command (G31).

0: Employs the F code command as the feedrate for the skip function command (G31).

D3 1: Reset OFF at Emergency Stop

0: Reset ON at Emergency Stop

D_2, D_1

Specify the tool shift direction in the canned cycles of G76 and G77 (effective when #6019 = 0).

D_2	D_1	Shift direction
1	1	-Y
1	0	+Y
0	1	-X
0	0	+X

D_0 1: Allows the tool shift direction in the canned cycles of G76 and G77 to be specified in setting #6506 (specifiable in the +X direction in increments of 0.001; the shift being cutting feed).

0: Allows the tool shift direction in the canned cycles of G76 and G77 to be specified in D_2 and D_1 of parameter #6019 (specifiable only axially).

#6020	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Assigns selection of group specification numbers to an external signal when the tool change skip signal is ON during life control.

0: Assigns selection of group specification numbers to the currently specified group when the tool change skip signal is ON during life control.

D6 1: Assigns selection of the T command group to the T command immediately prior during the M06 command in life control.

0: Assigns selection of the T command to the latest T command during the M06 command in life control.

D5 1: Assigns group number specififcation to an external signal during tool change reset in life control.

0: Assigns group number specification to setting #6204 during tool change reset in life control.

D4 1: Counts with M02/M30 when count is the type of life control.

0: Counts with T9999L△△△ when count is the type of life control.

D_3 1: Sets F14 (in/rev.) for the feed per revolution in the inch system.

0: Sets F13 (in/rev.) for the feed per revolution in the inch system.

D_2 1: Sets F23 (mm/rev.) for the feed per revolution in the metric system.

0: Sets F22 (mm/rev.) for the feed per revolution in the metric system.

D_1 1: Sets F32 (mm/min.) for the feed per minute in the metric system.

0: Sets F31 (mm/min.) for the feed per minute in the inch system.

D_0 1: Sets F51 (mm/min.) for the feed per minute in the metric system.

0: Sets F50 (mm/min.) for the feed per minute in the metric system.

#6021	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Makes editing interlock O9000 through O9999 effective.

0: Makes editing interlock O9000 through O9999 ineffective.

D6 1: Erases and stores the previous O when loading a tape provided with an O.

0: ALREADY IN will be displayed if the same O number exists when a tape with an O is loaded.

D5 1: Executes ON/OFF control of RTS during DNC operation until loading ends.

0: Sets RTS to ON state during DNC operation until loading ends.

D4 1: Refers to DR (Data set ready) during DNC operation.

0: Does not refer to DR (Data set ready) during DNC operation.

D3 1: Outputs O0 with O through 9999 OUT.

0: Does not output O0 with 0 through 9999 OUT.

D2 1: Displays the 0 number when the power supply is turned on and off.

0: Displays 0 when power is turned on.

D_1 1: Employs the value following address O or N as the program number (speciable in one block).

0: Employs the value following address O as the program number.

D_0 1: Considers M02, M30 and M99 as the program end when machining data is stored into memory.

0: Does not consider M02, M30 and M99 as the program end when machining data is stored into memory.

#6022	D7	D6	D5	D4	D3	D2	D1	D0

D7 1: Sets input unit of parameter setting to 10 RPM when specifying the S5 digits.

0: Sets input unit of parameter setting to 1 RPM when specifying the S5 digits.

D6 1: Enables binary search of EDIT/MEM. Character search is also possible if the NEXT key is pressed.

0: Enables search of EDIT/MEM character only.

D5 1: Makes editing display of O90000 through O9000 Interlock effective.

0: Makes editing display O9000 through O9999 ineffective.

D4 1: Makes intermediate POT display effective.

0: Makes intermediate POT display ineffective.

D3 1: Makes tool POT word display effective.

0: Makes tool POT byte display effective.

D2 1: Enables writing word

0: Enables writing bytes in keep memory.

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

D1 1: No parity bit when punching out an ISO tape

0: Parity bit exists when punching out an ISO tape

D0 1: Enables read of ISO tape possible even without parity.

0: Disables read of ISO tape without parity.

#6023		D6		D4	D3	D2	D1	D0

D6 1: Enables the additional axis to ignore signal 4NG.

0: Disables the additional axis to ignore signal 4NG.

D4-D0

Set the address for pan-out and CRT display on the additional axis.

Address	D4	D3	D2	D1	D0
A	0	0	0	0	1
B	0	0	0	1	0
C	0	0	0	1	1
U	1	0	1	0	1
V	1	0	1	1	0
W	1	0	1	1	1

#6024		D6		D4	D3	D2	D1	D0

D6 1: Enables signal 5NG to ignore the additional axis

0: Disables signal 5NG to ignore the additional axis

D4-D0: Set address of pan-out and CRT display on the additional axis.

Address	D4	D3	D2	D1	D0
A	0	0	0	0	1
B	0	0	0	1	0
C	0	0	0	1	1
U	1	0	1	0	1
V	1	0	1	1	0
W	1	0	1	1	1

Note: These parameters cannot be written when parameter #6030-D7 is "0."

#6025								

Parameter #6025 cannot be written at any time.

#6026			D5	D4	D3	D2	D1	D0
#6027			D5	D4	D3	D2	D1	D0

#6026, #6027:

D5 1: Does not allow the control code (DC1 - DC4) to be used on the I/O device.

0: Allows the control code (DC1 - DC4) to be used on the I/O device.

D4 1: Employs 2 stop bits on the I/O device.

0: Employs 1 stop bit on the I/O device.

D3 - D0

Baud rate setting

Baud rate	D3	D2	D1	D0
50	0	0	0	0
100	0	0	0	1
110	0	0	1	0
150	0	0	1	1
200	0	1	0	0
300	0	1	0	1
600	0	1	1	0
1200	0	1	1	1
2400	1	0	0	0
4800	1	0	0	1
9600	1	0	1	0

NOTE: #6026 provides the setting on input device 1(SIO-1) and #6027 on input device 2(SIO-2).

#6028		D6	D5	D4	D3	D2	D1	D0
#6029		D6	D5	D4	D3	D2	D1	D0

D6 1: Output device: Uses the value set by #6026 and #6027 as the baud rate of SIO-1 or -2.

0: Output device: The baud rate of SIO -1 or -2 complies with the setting of #6028 and #6029.

D5 1: Does not use control codes (DC1-DC4).

0: Uses control codes (DC1-DC4)

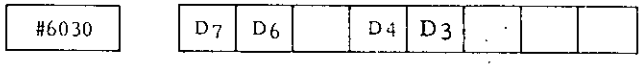
D4 1: Sets stop bits as two bits in the output device.

0: Sets stop bits as one bit

Baud rate setting

Baud Rate	D3	D2	D1	D0
50	0	0	0	0
100	0	0	0	1
110	0	0	1	0
150	0	0	1	1
200	0	1	0	0
300	0	1	0	1
600	0	1	1	0
1200	0	1	1	1
2400	1	0	0	0
4800	1	0	0	1
9600	1	0	1	0

Note: 1. #6028 is for setting output device 1 (SIO-1).
2. #6029 is for setting output device 2 (SIO-2).



D7 1: Provides an additional axis control module.

0: Does not provide an additional axis control module.

D6 1: Causes the system to filter the spindle PG reference point signal before reading it.

0: Allows the system to read the spindle PG reference point signal as it is.

D5 1: Makes external speed reduction effective

0: Makes external speed reduction ineffective

D4 1: Enables the axis interlock function.

0: Disables the axis interlock function.

D3 1: Sets Y axis for radial direction measurements of the tool setter.

0: Sets X axis for radial direction measurements of the tool setter.

D1 1: Enables changeover from on-line state NC to the XSD mode.

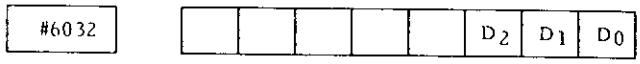
0: Disables changeover from on-line state NC to the XSD mode.

D_2, D_1, D_0

Specify whether or not the direct-in signals IN2, IN1 and IN0 are effective, respectively.

1: Effective with signal "0"

0: Effective with signal "1"

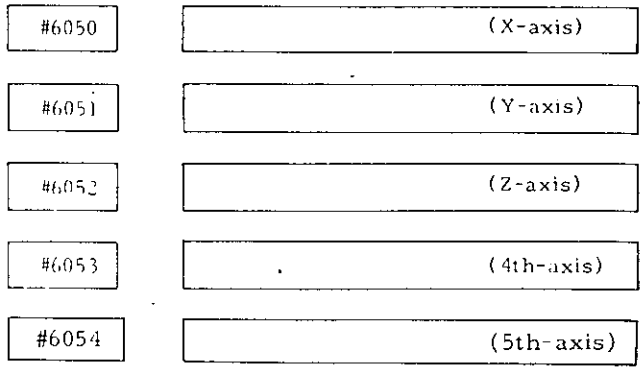


D_2, D_1, D_0

Specify whether or not the direct-in signals IN2, IN1 and IN0 are effective, respectively.

1: Ineffective

0: Effective



#6050 to #6054:

Specify the backlash compensation, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes (setting range: 0-255; "1" = least output increment).

3.3.7 PARAMETER NUMBERS AND THEIR ENTS CONTENTS (Cont'd)

#6056	(X-axis)
#6057	(Y-axis)
#6058	(Z-axis)
#6059	(4th-axis)
#6060	(5th-axis)

#6056 to #6060:

Specify the position error offset, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes (setting range: 0 - 255; "1" = least output increment). The standard setting is 32.

#6062	(X-axis)
#6063	(Y-axis)
#6064	(Z-axis)
#6065	(4th-axis)
#6066	(5th-axis)

#6062 to #6066:

Specify the overtravel, respectively, on the X-, Y-, Z-, 4th-, and 5th-axis in unidirectional approach (G60; setting range: 0 - 127; "1" = least input increment).

#6068	(X-axis)
#6069	(Y-axis)
#6070	(Z-axis)
#6071	(4th-axis)
#6072	(5th-axis)

#6068 to #6072

Output in pitch error offset pulses the pitch error compensation times each magnification specification, respectively, for the X-, Y-, Z-, 4th-, and 5th-axes. The setting range is 0 to 3, and "1" represents a magnification of 1 "0," pitch error offset in effective.

#6074	(X-axis)
#6075	(Y-axis)
#6076	(Z-axis)
#6077	(4th-axis)
#6078	(5th-axis)

#6074 to #6078:

Causes an alarm "34*" when a position deviation exceeding the critical servo error value is detected respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting formula: $n = 16 \times \frac{c}{b}$

Standard setting: 16 (b = c)

b; D/A saturation value (pulse count) set in #6080 - #6083

c; Critical servo error value (pulse count)

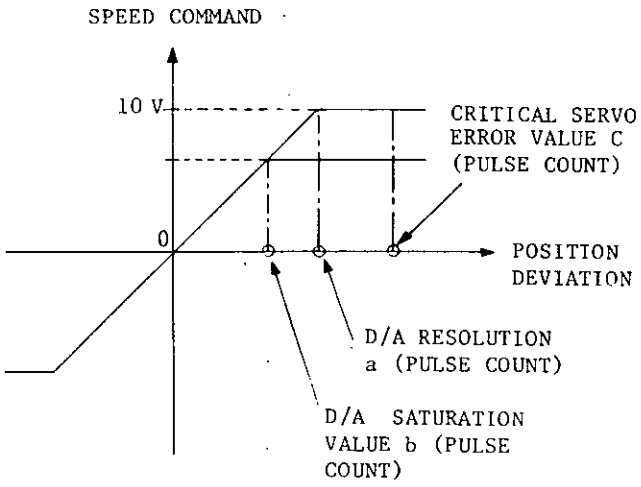


Fig. 3.3.6.1

#6080	(X-axis)
#6081	(Y-axis)
#6082	(Z-axis)
#6083	(4th-axis)
#6084	(5th-axis)

#6080 to #6083:

Specify the D/A saturation value, respectively, for the X-, Y-, Z-, 4th-, and 5th-axes.

Setting formula: $2^{(7+n)} = b$

b: D/A saturation value (pulse count)

NOTE: "n" is set.

Standard setting: 6 (b = 8192 pulses)

NOTE: Make the setting so that b = a.

a: D/A resolution (pulse count)

#6086	(X-axis)
#6087	(Y-axis)
#6088	(Z-axis)
#6089	(4th-axis)
#6090	(5th-axis)

#6086 to #6090:

Specify the PG pulse magnification and D/A resolution, respectively, for the X-, Y-, Z-, 4th-, and 5th-axes.
Setting formula: n1 + n2

(1) PG pulse magnification value n1

PG pulse magnification	n1
x 1	64
x 2	80
x 4	112
x 8	48

(2) D/A resolution value n2

D/A resolution a (pulse count)	n2
32768 pulses	14
16384 pulses	13
8192 pulses	12
4096 pulses	11

Standard value: n2 = 12

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

#6092	

Specifies the exponential function acceleration/deceleration time constant for cutting feed (common to all axes).

The setting formula is: "n" = $\frac{t}{4}$ - 1

where, t: time constant(ms), specifiable in units of 4 ms

#6093	

Specifies the exponential function acceleration/deceleration speed bias for cutting feed (common to all axes).

Setting: "1" = 2 kpps.

#6094	(X-axis)
#6095	(Y-axis)
#6096	(Z-axis)
#6097	(4th-axis)
#6098	(5th-axis)

#6094 to #6098:

Specify the reference point return method, respectively, for the X-, Y-, Z- , 4th- and 5th-axes.

"0" of NZ signal enabled		○	
NZ signal employed		○	○
Reference point pulse used	○		
Parameter setting	64	48	32

Standard setting: 64

#6106	

Specifies the "rapid traverse section" for a "returning semicircle" by the proportionate semicircle radius in circle cutting (G12, G13).

Setting range: 0 - 10 (x 10%)

Examples:

1. A setting of 0 creates a rapid traverse section automatically computed by the program command values.
2. A setting of 10 (= 100%) makes the entire "returning semicircle" into a "rapid traverse section."

#6107	

Specifies the number of manual pulse generators.

Setting range: 1 - 3

#6110	([ )
#6111	( ])
#6112	(*)
#6113	(=)
#6114	(( )
#6115	( ))

#6110 to #6115:

Specify punches of the codes corresponding to the symbols of EIA codes used in the user macro body.

1: Punched

0: Not punched

#6116	
#6117	
#6118	
#6119	

Maximum 4 types of M codes to stop advance reading.

#6120	G-1
#6121	G-2
#6122	G-3
#6123	G-4
#6124	G-5
#6125	G-6
#6126	G-7
#6127	G-8
#6128	G-9
#6129	G-10

#6120 to #6129:

Specify up to 10 G codes for calling user macros.

#6130	M-1
#6131	M-2
#6132	M-3
#6133	M-4

#6130 to #6133:

Specify up to 4 M codes for calling user macros.

Setting range: 03 - 29, 31 - 89

NOTE: M00, M01, M02, M30 and M90 - M99 cannot be called by user macros.

#6134	

1: Allows the T code to call a user macro.

0: Does not allow the T code to call a user macro.

#6141	
#6142	
#6143	
#6144	
#6145	
#6146	
#6147	
#6148	
#6149	

#6141 to #6149:

Specify the feedrate change for one increment on a manual pulse generator, for F1 to F9, respectively, of F1-digit designation.

Setting: "1" = 0.1 mm/min.

#6220	

Specifies the interval from the time, M, S, T and B codes are transmitted until the time MF, SF, TF and BF are transmitted.

Setting: "1" = 1 ms

#6221	

Specifies the interval from gear output (GRH, GRL) unit SF transmission when an S5-digit designation is added.

Setting: "1" = 1 ms

#6222	

Specify the maximum handle feedrate, which is common to the linear axes (X, Y, Z, U, V, W).

Setting: "1" = 7.5 mm/min.

NOTE: The settings for the rotary axes (A, B, C) are made with #6348.

#6223

Specifies the tool shift speed for canned cycles of G76 and G77.

Setting: "1" = 1 mm/min.

NOTE: This specification is effective when #6019D_0 = 1.
If #6019D_0 = 0, rapid traverse is is effective regardless of this parameter specification.

#6224

Specifies the delay time for checking the spindle speed reaching signal (SAGR).

Setting: "1" = 1 ms

#6225

Specifies the feedrate for the rapid traverse section in circle cutting (G12, G13).

Setting: "1" = 1 mm/min.

#6226

#6227

#6226, #6227

Specify the maximum feedrate for F1-digit designation.

Setting: "1" = 1 mm/min.

NOTE: The maximum feedrate for F1-F4 commands is set in #6226 and that for F5-F9 commands in #6227. Any feedrates increased on manual pulse generators are bunched into these settings.

#6228

Specifies the maximum feedrate for the rotary axes (A, B, C).

Setting: "1" = 1 mm/min.

#6229 1900

Specifies the maximum feedrate for the rotary axes (A, B, C).

Setting: "1" = 1 mm/min.

NOTE: any feedrate greater than those set in #6228 and #6229 are bunched into those settings.

#6230

When a circular path is drawn in tool radius compensation outside a corner approaching 180°, the movement follows on a very small circular arc. In this, arc movement is considered to affect the workpiece surface machining, this parameter is used to set the critical arc value.

Setting: "1" = 0.001 mm (metric system)
"1" = 0.0001 in. (inch system)

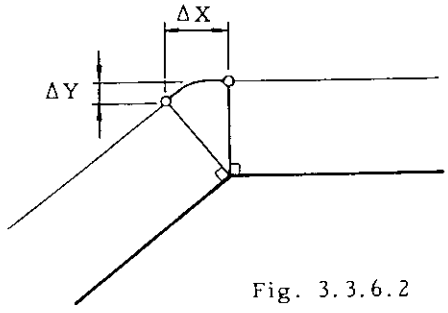


Fig. 3.3.6.2

The corner arc setting is ignored when:

$\Delta X \leq$ #6230

$\Delta Y \leq$ #6230

Standard setting = 5

#6231

Specifies the F_0 speed for rapid traverse override.

Setting: "1" = 7.5 mm/min.

#6232

Specifies the feedrate in the skip function (G31).

Setting: "1" = 1 mm/min.

NOTE: This setting is effective when parameter #6019D_4 = 1.

#6233

#6264

#6233 to #6264

Specify the feedrate for the respective positions on the jog feedrate select switch.

Setting: "1" = 1 mm/min.

Typical settings

Table 3.3.6 Typical Settings mm/min

Switch position	Parameter		Continuous manual feedrate	
	Number	Setting	#6250 = 0	#6250 = 10
0	#6233	0	0	0
1	#6234	1	1	0.1
2	#6235	2	2	0.2
3	#6236	4	4	0.4
4	#6237	6	6	0.6
5	#6238	8	8	0.8
6	#6239	10	10	1.0
7	#6240	12	12	1.2
8	#6241	15	15	1.5
9	#6242	20	20	2.0
10	#6243	25	25	25
11	#6244	30	30	30
12	#6245	40	40	40
13	#6246	50	50	50
14	#6247	60	60	60
15	#6248	80	80	80
16	#6249	100	100	100
17	#6250	120	120	120
18	#6251	150	150	150
19	#6252	200	200	200
20	#6253	250	250	250
21	#6254	300	300	300
22	#6255	400	400	400
23	#6256	500	500	500
24	#6257	600	600	600
25	#6258	800	800	800
26	#6259	1000	1000	1000
27	#6260	1200	1200	1200
28	#6261	1500	1500	1500
29	#6262	2000	2000	2000
30	#6263	2500	2500	2500
31	#6264	3000	3000	3000

#6265

The manual feedrates set in parameters #6233 to #6264 can each be reduced to a tenth of the original setting. This applies to the settings on all switch positions lower than the value specified in this parameter #6265.

Setting: 0 - 31 (switch position)

#6266

#6267

#6268

#6269

#6266 to #6269:

Specify the spindle speed upper limit, respectively, for gears 1, 2, 3 and 4 (specifiable only in S5-digit designation).

Setting: 0 - 9999 (rpm)

#6270

Specifies the speed command output value to the spindle motor when a gear shift (GR0) input is entered (specifiable only in S5-digit designation). The setting formula is:

$$\frac{\text{Gear shift spindle motor speed}}{\text{Maximum speed of spindle motor (command = 10 V)}} \times 32767$$

Setting range: 0 - 32767

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

#6271	
#6272	
#6273	
#6274	

#6271 to #6274:

Specify the maximum speed of the spindle, respectively, for gears 1, 2, 3 and 4 each selected by an input signal (specifiable in S5-digit designation). Set the spindle speed applicable when the speed command voltage is 10 V.

Setting range: 0 - 99999 (rpm)

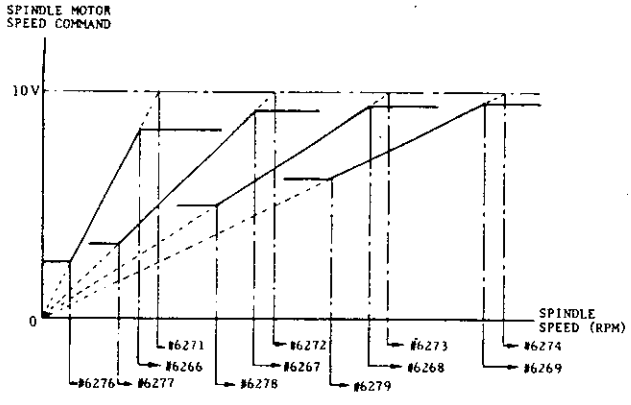


Fig. 3.3.6.3

#6275	

Specifies the spindle motor speed in effect when a spindle orientation (SOR) input is entered (specifiable in S5-digit designation).

Setting range: 0 - 99999 (rpm)

#6276	
#6277	
#6278	
#6279	

#6276 to #6279:

Specify the minimum speed of the spindle, respectively, for gears 1, 2, 3 and 4 each selected by an input signal (specifiable in S5-digit designation).

Setting range: 0 - 99999 (rpm)

#6280	2000	(X-axis)
#6281	2000	(Y-axis)
#6282	1600	(Z-axis)
#6283		(4th-axis)
#6284		(5th-axis)

#6280 to #6284:

Specify the rapid traverse rate, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 7.5 mm/min.

#6286		(X-axis)
#6287		(Y-axis)
#6288		(Z-axis)
#6289		(4th-axis)
#6290		(5th-axis)

#6286 to #6290:

Specify the first-stage time constant in linear acceleration/deceleration, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 125/8 (mm/sec^2)

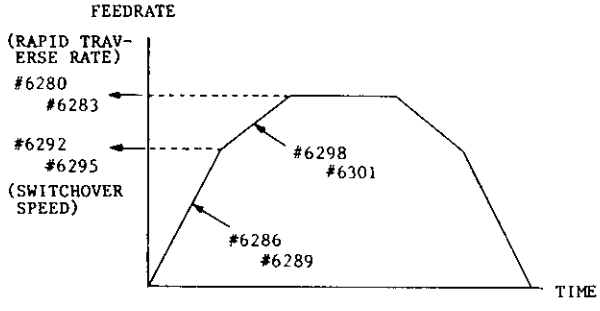


Fig. 3.3.6.4

#6292		(X-axis)
#6293		(Y-axis)
#6294		(Z-axis)
#6295		(4th-axis)
#6296		(5th-axis)

#6292 to #6296:

Specify the second-stage time constant switchover speed in linear acceleration/deceleration, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 7.5 mm/min.

#6298		(X-axis)
#6299		(Y-axis)
#6300		(Z-axis)
#6301		(4th-axis)
#6302		(5th-axis)

#6298 to #6302:

Specify the second-stage time constant in linear acceleration/deceleration, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 125/8 (mm/sec^2)

#6304		(X-axis)
#6305		(Y-axis)
#6306	1959	(Z-axis)
#6307		(4th-axis)
#6308		(5th-axis)

#6304 to #6308:

Specify the traverse distance for reference point return, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 0.001 mm

#6310	10	(X-axis)
#6311	10	(Y-axis)
#6312	10	(Z-axis)
#6313	10	(4th-axis)
#6314	10	(5th-axis)

#6310 to #6314:

Specify the approach speed 1 for reference point return, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 7.5 mm/min.

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

#6316	40	(X-axis)
#6317	40	(Y-axis)
#6318	40	(Z-axis)
#6319	40	(4th-axis)
#6320	40	(5th-axis)

#6316 to #6320:

Specify the approach speed 2 for reference point return, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 7.5 mm/min.

NOTE: The parameters associated with reference point return operations are as follows:

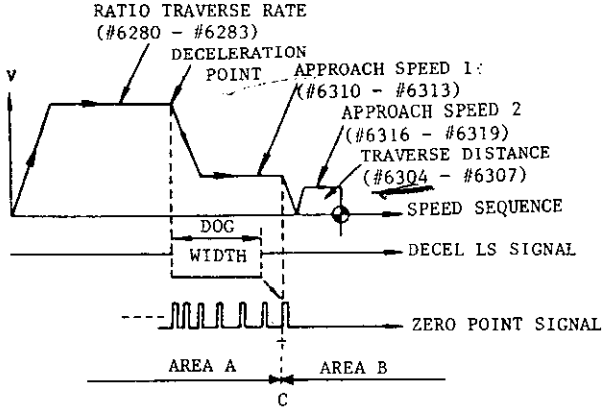


Fig. 3.3.6.5

- Reference point return direction: #6010 D_0 - D_3
- Reference point return enabled/disabled: #6016 D_6 - D_3

#6322		(X-axis)
#6323		(Y-axis)
#6324		(Z-axis)
#6325		(4th-axis)
#6326		(5th-axis)

#6322 to #6326:

Specify the number of the start point for pitch error compensation, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: 0 - 511

#6328		(X-axis)
#6329		(Y-axis)
#6330		(Z-axis)
#6331		(4th-axis)
#6332		(5th-axis)

#6328 to #6332:

Specify the number of the start point for pitch error compensation, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: 0 - 511

#6334		(X-axis)
#6335		(Y-axis)
#6336		(Z-axis)
#6337		(4th-axis)
#6338		(5th-axis)

#6334 to #6338:

Specify the reference point for pitch error compensation, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: 0 - 511

#6340	

Specifies the external deceleration speed for rapid traverse.

Setting: "1" = 7.5 mm/min. (common to all axes)

#6341	

Specifies the external deceleration speed for cutting feed.

Setting: "1" = 1 mm/min. (common to all axes)

#6342	(X-axis)
#6343	(Y-axis)
#6344	(Z-axis)
#6345	(4th-axis)
#6346	(5th-axis)

#6342 to #6346:

Specify the offset in external workpiece coordinate system shift, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: 1 = 0.001 mm

NOTE: Usually, these parameters are automatically set from the machine tool side through the external data input function.

#6348	16

Specifies the maximum speed for handle feed on the rotary axes (A, B, C).

Setting: "1" = 7.5 mm/min.

#6350	(X-axis)
#6351	(Y-axis)
#6352	(Z-axis)
#6353	(4th-axis)
#6354	(5th-axis)

#6350 to #6354:

Specify the rapid traverse accel/decel constants X-, Y-, Z-, and 4th-, and 5th-axis handle feed, respectively.

Setting: "1" = 125/8 mm/sec^2

#6355	
#6356	

For tool pot indication

#6355: Sets tool pot indication start No.

#6356: Sets tool pot indication end No.

#6357	(X-axis)
#6358	(Y-axis)
#6359	(Z-axis)

#6357 to #6359:

Specify the time between ESP and SVOF for X-, Y-, and Z-axis, respectively.

Setting: "1" = 8 msec

#6600	(X-axis)
#6601	(Y-axis)
#6602	(Z-axis)
#6603	(4th-axis)
#6604	(5th-axis)

#6600 to #6604:

Specify the plus direction boundary value for stored stroke limit 1, respectively, on the X-, Y-, Z-, 4th- and 5th-axes.

Setting: "1" = 0.001 mm

#6606	(X-axis)
#6607	(Y-axis)
#6608	(Z-axis)
#6609	(4th-axis)
#6610	(5th-axis)

#6606 to #6610:

Specify the minus direction boundary value for stored stroke limit 1, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 0.001 mm

#6612	(X-axis)
#6613	(Y-axis)
#6614	(Z-axis)
#6615	(4th-axis)
#6616	(5th-axis)

#6612 to #6616:

Specify the distance between the first and the second reference point, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

#6618	(X-axis)
#6619	(Y-axis)
#6620	(Z-axis)
#6621	(4th-axis)
#6622	(5th-axis)

#6618 to #6622:

Specify the distance between the first and the third reference point, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

#6624	(X-axis)
#6625	(Y-axis)
#6626	(Z-axis)
#6627	(4th-axis)
#6628	(5th-axis)

#6624 to #6628:

Specify the distance between the first and the fourth reference point, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 0.001 mm

#6630	(X-axis)
#6631	(Y-axis)
#6632	(Z-axis)
#6633	(4th-axis)
#6634	(5th-axis)

#6630 to #6634

Specify the value for automatic coordinate system setting at the time of inch input, respectively, on the X-, Y-, Z-, and 4th, and 5th-axes. A desired value should be set in inches for the distance between the first reference point and the reference point of the coordinate system to be established.

Setting: "1" = 0.0001 in.

#6636	(X-axis)
#6637	(Y-axis)
#6638	(Z-axis)
#6639	(4th-axis)
#6640	(5th-axis)

#6636 to #6640:

Specify the value for automatic coordinate system setting at the time of metric input, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes. A desired value should be set in millimeters for the distance between the first reference point and the reference point of the coordinate system to be established.

Setting: "1" = 0.001 mm

NOTE: Each setting is effective only for an axis with parameter #6015 at "1."

#6642	(X-axis)
#6643	(Y-axis)
#6644	(Z-axis)
#6645	(4th-axis)
#6646	(5th-axis)

#6642 to #6646:

Specify the compensation interval in pitch error compensation, respectively, on the X-, Y-, Z-, 4th-, and 5th-axes.

Setting: "1" = 0.001 mm (metric output)
"1" = 0.0001 in. (inch output)

#6650	(X-axis)
#6651	(Y-axis)
#6652	(Z-axis)

#6650 to #6652:

Specify stored stroke limit 3 for X-, Y-, and Z-axis, respectively.

Plus (+) boundary setting: "1" = 0.001 mm

#6653	(X-axis)
#6654	(Y-axis)
#6655	(Z-axis)

#6653 to #6655:

Specify stored stroke limit 3 for X-, Y-, and Z-axis, respecitively.

Minus (-) boundary setting: "1" + 0.001 mm

#6656	(X-axis)
#6657	(Y-axis)
#6658	(Z-axis)

#6656 to #6658:

Specify stored stroke limit 4 for X-, Y-, and Z-axis, respectively.

Plus (+) boundary setting: "1" = 0.001 mm

#6659	(X-axis)
#6660	(Y-axis)
#6661	(Z-axis)

#6659 to #6661 (optional):

Specify stored stroke limit 4 for X-, Y-, and Z-axis, respectively.

Minus (-) boundary setting: "1" = 0.001 mm

#6662	(X-axis)
#6663	(Y-axis)
#6664	(Z-axis)

#6662 to #6664 (optional):

Specify stored stroke limit 5 for X-, Y-, and Z-axis, respectively.

Plus (+) boundary setting: "1" = 0.001 mm

#6665	(X-axis)
#6666	(Y-axis)
#6667	(Z-axis)

#6665 to #6667 (optional):

Specify stored stroke limit 5 for X-, Y-, and Z-axis, respectively.

Minus (-) boundary setting: "1" = 0.001 mm

3.3.7 PARAMETER NUMBERS AND THEIR CONTENTS (Cont'd)

#8000	(number 0)
⎫	
⎭	
#8511	(number 511)

#8000 to #8511

Specify the respective values of pitch error compensation.

Setting: 0 - ±15 (output increment)

NOTE: Parameters #6322 to #6339 determine specific combinations of settings and axes.

APPENDIX STORED LEADSCREW ERROR COMPENSATION

This function automatically compensates for leadscrew error on each axis according to the compensation data set by parameter and is effective after completion of reference point return. The compensation data are made on the distances between the reference point on each axis and specified points.

Compensation axes: X, Y, Z, 4th-, and 5th-axes. (including rotary axis)

No. of correction points: 512 Max.

Compensation base point: Reference point

Compensation interval: 6000 Pulses or more

Data setting system: Absolute/incremental (Set by Parameter #6039$_{D2}$)

Compensation value:

Minimum compensation unit: 1 pulse (least output increment)
Compensation multiplication: X13 max.
One-time-compensation value: 15 pulses max. (Compensation multiplication)

Note 1:

Regardless of absolute/incremental setting, the difference between neighboring compensation values should be (15 pulses x compensation multiplication) and below.

Note 2:

Maximum set value in case of absolute setting is ±127 pulses. Compensation multiplication is taken on this value.

Note 3:

No. of correction points on each axis can be arbitrary as far as the total compensation points are within 512.

Note 4:

Where the 4th and 5th axis is a rotary axis, operation is possible within ±200 revolution maximum.

Note 5:

For the axis requiring no leadscrew error compensation, set the parameter for compensation multiplication factor at "0."

Table A-1

	Axis	Parameter #	Functions
Compensation interval	X to β	#6642 to #6646	6000 OR MORE "1" = 1 pulse
Absolute/incremental setting switchable		#6039$_{D2}$	"0" = Incremental setting "1" = Absolute setting
Compensation reference no.	X to β	#6334 to #6338	Value of parameter # of compensation on each point minus 8000 will be written
Compensation max point	X to β	#6322 to #6326	
Compensation min point	X to β	#6328 to #6332	
Compensation value on each point	X to β	#8000 to #8511	-15 to +15 (Incremental setting) "1" = 1 pulse
Compensation multiplication	X to β	#6068 to #6072	0 to 3 "1" = 1X

The figure below shows the example of writing the data for X axis.

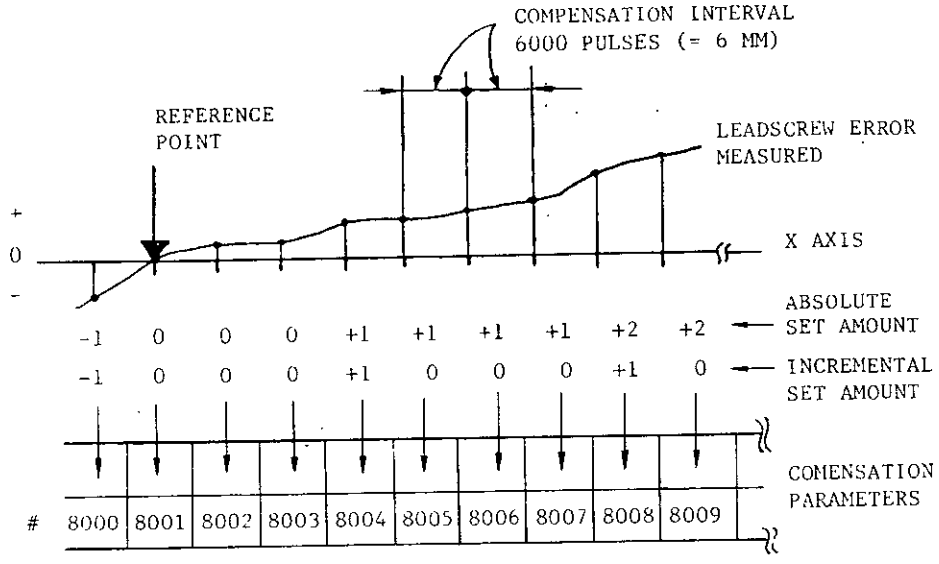


Fig. A-1

In the above figure,

Compensation interval: 6000 pulses

Absolute/incremental: Incremental

Compensation multiplication: x 1

Compensation point on X axis: 100 points

Each parameter is set as follows:

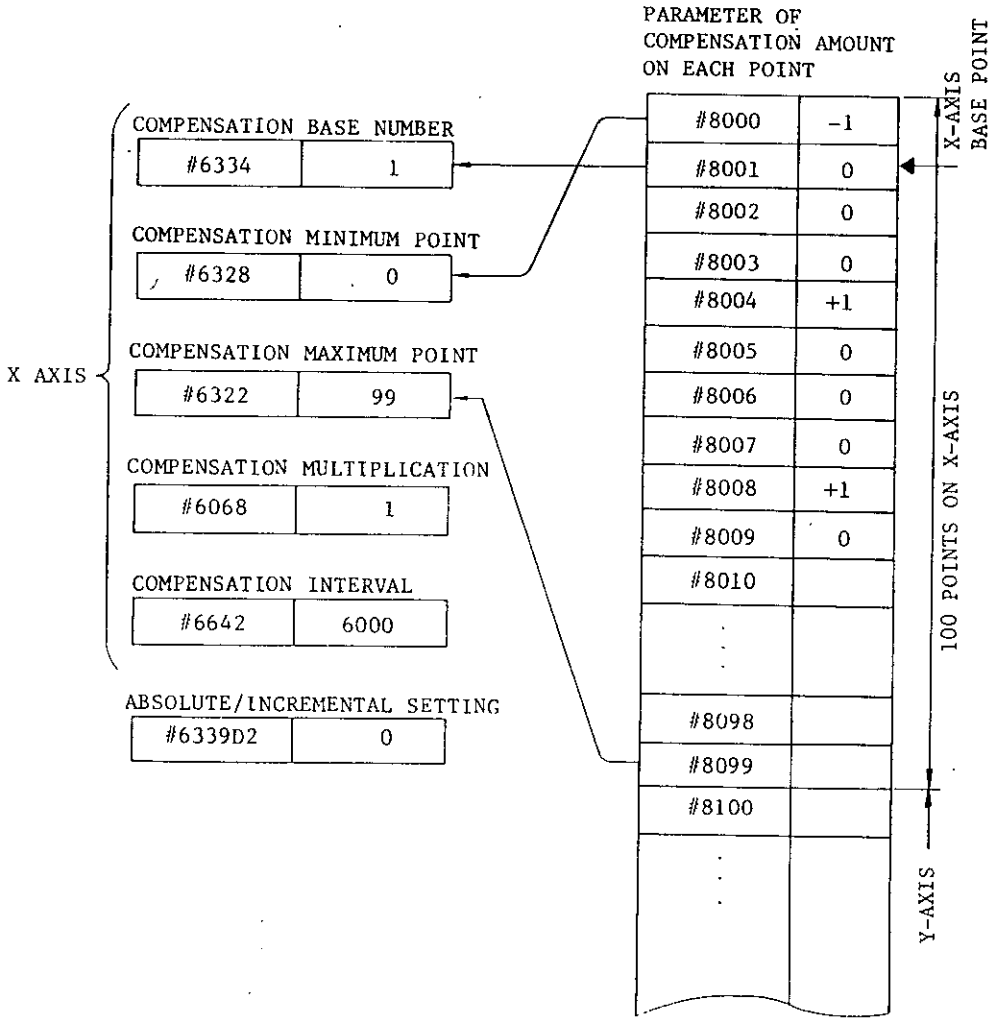


Fig. A-2

To use the 4th and 5th axes as the rotary axis, follow the rules shown below in addition to the rules for setting X-, Y, and Z-axes.

(1) Compensation Interval

The compensation interval should be more than 6000 pulses and the quotient obtained by dividing 360000 by the compensation interval become a positive integer.

(2) Compensation Amount at Reference Point

The compensation amount to be set to the reference point should be as follows:

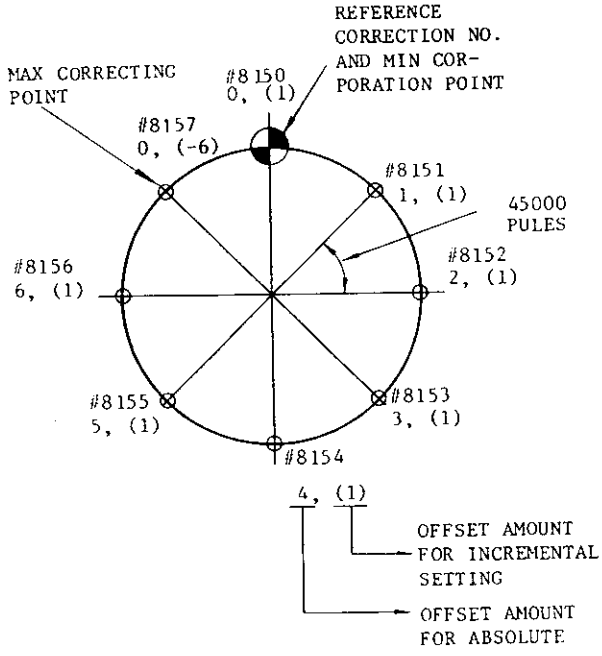
a. Absolute setting ··· "0"

b. Incremental setting ··· "0"

In the case of incremental setting, set such a value for the compensation amount at compensation maximum point that the sum of the compensation amount of each point becomes "0."

(3) Sample Writing

If the compensation interval is 45000 pulses (one rotation divided by 8) as shown below, set the parameters as follows.



4th axis of rotary axis

Offset reference No.

#6337	150

Offset min point

#6331	150

Offset max point

#6325	157

Offset multiplication factor

#6071	1

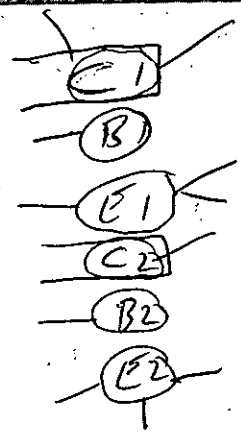
Offset point

#6645	45000

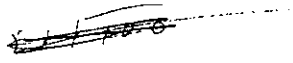
Offset parameter at each point

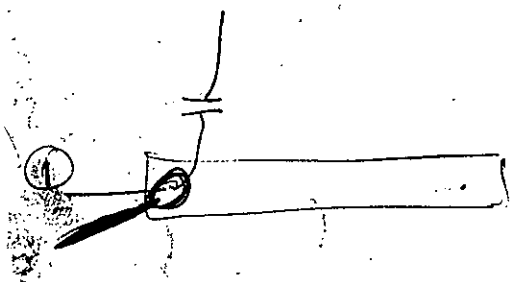
Parameter	Absolute setting	Incremental setting
#8150	0	0
#8151	1	1
#8152	2	1
#8153	3	1
#8154	4	1
#8155	5	1
#8156	6	1
#8157	0	-6
⋮	⋮	⋮

Fig. A-3



1
35





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