

CNC SYSTEMS

OSP5020M **OSP500M-G**

OPERATION MANUAL (2nd Edition)

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OSP5020M-G

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TO ENSURE SAFE OPERATIONS

The machine is equipped with a variety of built-in safety devices. However, careless handling of the machine may lead to serious accidents. To prevent such a situation from occurring, all operators must carefully read the manuals supplied by Okuma so that they understand the machine before trying to operate it. All the items described below must be carefully observed when operating the machine or performing maintenance work. All operators must strictly follow the information.

1. Precautions When Installing the Machine

- (1) To hoist the machine, only use wires of the dimensions specified in the manual. They must be strong enough to support the weight of the machine.
- (2) To maintain the static machine accuracy within the guaranteed values, the following conditions must be satisfied:
 - Ambient temperature : 17 to 25°C (62.6°F to 77°F)
 - Humidity : 75% HR or less (without condensation)
 - The machine and the NC unit must not be subject to direct sunlight.
 - The machine and the NC unit must not be subject to any excessive vibrations.
 - The installation site must be free of dust and corrosives.
- (3) Make sure that the floor is strong enough to support the machine.
- (4) Allow space so that the machine table can be moved without interference.
- (5) If rust prevention coating is applied to the slideway surfaces, it must be removed completely.
- (6) The machine must be leveled carefully during initial installation; leveling greatly affects the machining accuracy and the service life of the machine.
- (7) Transit clamps are used for machine transportation. These clamps must be removed before turning ON the power.
- (8) Electrical wiring should only be carried out by Okuma's service technician or authorized electrical technician.
- (9) Do not connect the machine power cable to the same power board as noise generating equipment, such as an electric welder and electric discharge machine. Doing this will cause the NC to malfunction.
- (10) The machine should be grounded independently of other machines. If the machine must be grounded with other machines, do not connect the ground cable to the same ground terminal as noise generating equipment, such as an electric welder or an electric discharge machine.

2. Precautions Before Starting Machine Operation

- (1) Use the specified lubricating and hydraulic oil or an equivalent.
- (2) Do not set a large value for the lubricating oil supply interval. If this interval is too long, a sufficient amount of lubricating oil will not be supplied to the lubricating points, causing faulty machine operation.
- (3) Do not apply mechanical shocks to the NC, operations panel, or electrical control cabinet. Shocks applied to this equipment will malfunction or fail.
- (4) Close all the doors to the NC, operation panel, and electrical control cabinet to prevent entry of moisture, chips, and other foreign matter.
- (5) Check the cables and wiring for damages. Damaged cables or wiring may cause leakage or an electric shock.
- (6) Always be sure that there are no obstacles or people near the machine's movable parts before operating the machine.
- (7) It is recommended to use a water-soluble coolant to prevent fire. Do not attempt untended operation if a non-soluble coolant is used.

3. Precautions During Machine Operation

- (1) Perform daily inspection on the machine immediately after turning on the power.
- (2) The automatic lubricating unit supplies the lubricating oil to the lubricating points when the power supply is turned ON. However, when starting the machine after a long stop or during cold weather, the lubricating oil may not be supplied to all lubricating points. In such cases, supply lubricating oil manually by pressing the manual lubrication switch on the pendant operation panel.
- (3) Use the cutting tools which meet the machine specification. Do not use heavily worn tools.
- (4) Never try to touch the spindle or the tool in the spindle during spindle orientation. The spindle may rotate, causing serious accidents.
- (5) Never apply torque to the spindle after the completion of spindle indexing operation, for example by tightening the milling chuck. The spindle may rotate, causing serious accidents.
- (6) Make sure that the tools and workpieces are tightened securely.
- (7) Never try to remove chips while the spindle is rotating.
- (8) Never try to remove chips entangled in cutting tools by hand while the spindle is rotating.
To remove chips, make sure that the spindle has come to a complete stop, and use a brush or broom.
- (9) Never approach the cutting point during cutting. Coolant, chips, and/or broken tools splash.
- (10) Never start machine operation without the safety devices in place. Never remove the covers unless absolutely necessary.
- (11) Use extra care to machine motion when entering the inside of the enclosure shield. Never enter the inside of the enclosure shield during automatic operation.
- (12) Before loading or unloading a workpiece or tool, make sure that the spindle has come to a complete stop.

- (13) Never touch movable parts or stand near the machine during operation.
- (14) Never touch any switch with wet hands.
- (15) Visually check the switches on the operation panel before operating them.

4. Precautions on Maintenance and Inspection

- (1) Always turn OFF the power supply before performing maintenance and inspection.
- (2) Never attempt maintenance work while the power supply is ON. Always turn OFF the power supply before beginning maintenance.
- (3) Never change the parameter settings without consulting your Okuma representative.

5. Precautions on Operating the ATC and APC

- (1) Never stand close to the ATC and APC while they are operating.
- (2) The tool clamp mechanism in the magazine, tool change arm, and spindle are constructed to hold the tool securely. However, do not touch or stand near the ATC units while the ATC is operating because the tools in these units might drop due to unexpected causes.
- (3) When checking or replacing the tools in the ATC magazine, always select the step mode.
- (4) Because chips adhering to the magazine or tool change arm will cause faulty operation of the ATC, always remove them. However, never use compressed air to remove chips; compressed air will cause chips to enter the ATC units.
- (5) If the ATC or APC has stopped due to unknown reason and if it is necessary to check the ATC or APC while the power is ON, never touch the units because they might begin moving suddenly.

6. Other General Precautions

- (1) Keep the area around the machine clean and organized.
- (2) Wear clothes which are appropriate to safe operations. Follow the instructions of trained machine operators.
- (3) Cover your hair and do not wear loose clothing to avoid becoming tangled or caught in the machine. Always wear proper shoes and protective glasses when operating the machine.
- (4) All operators must read the operation and instruction manuals carefully in order to fully understand the machine.
- (5) All operators must know the positions of the emergency stop buttons so that they can use them when necessary.
- (6) Do not touch the terminals of the electrical control panel, transformer, and motors because high voltage is applied to some of the terminals.
- (7) If more than one person is operating the machine, all involved operators must cooperate and be able to communicate.

7. Symbols

This manual uses the following symbols to emphasize the items which must be strictly observed:



REMARKS

: Precaution in machine operations.

Default of this item affects the machining accuracy and smooth operation.



CAUTION

: Default of this item causes faulty machine operation, machine damage, or possible operator injury.

More care must be exercised to this item than the items indicated under "REMARKS".



WARNING

: Default of this item causes not only machine damage but also a serious accident may result including loss of life.

Sufficient care must be paid to this item.

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SECTION 1 INTRODUCTION

1. Features

The OSP5020M/OSP500M-G series consists of high performance numerically-controlled units (CNC) capable of handling a variety of software. Based on a design philosophy not found in conventional NC systems, the OSP5020M contains a number of functions and features not present even in our OSP2300M/3000M/5000M series which have also been pace-setters in the world of numerical controllers.

(1) Our High Resolution OSP Encoder

- (a) We have adopted a type OSP absolute-value position encoder, which means it is possible to begin machining the moment the unit is turned on, since actual position data is retained even after the power is turned off. Time consuming preparatory operations are a thing of the past.
- (b) The absolute position detecting type encoder is free of position error accumulation. Therefore, stable axis feed control and accurate position control are readily possible.

(2) Bubble Memory Storage for Variable CNC Software

The use of bubble memories for storage makes it possible to change software. NC control and system software functions may be added to the NC unit, even after delivery, whenever they may be desired.

(3) Across the Board Enrichment of Die Machining Functions

- (a) Storage of large capacity tapes, several thousand meters in length, is now possible. In addition, part programs may be entered on a floppy disk (3.5 inches), thus doing away with the bother of paper tape operations. (Optional)
- (b) Restarting operations have been improved by enhancing the sequence restart with a return search function (internally executed) and a mid-point start-up function (sequence number search).
- (c) A variety of locking functions, such as an STM lock, axis command cancel, and a machine lock have been provided.
- (d) A pulse handle for up to three axes and a pulse handle intervention function allow the machining talents of the individual operator full scope. (Optional)
- (e) The availability of manual interruption improves operation. A three-dimensional tool offset function has also been provided.

(4) Multi-task Processing

An adopted multi-task system permits the reading, punching, and editing of programs even during NC program execution, which greatly increases operation efficiency.

(5) Greatly Perfected Automatic and Untended Operations (Optional)

- (a) The use of schedule programs makes the machining of several types of workpieces possible.
- (b) Also, the following functions are provided: adaptive control function, tool control functions (tool life management, tool breakage detection, automatic spare tool selection, etc.), overload detection function, automatic work gauging function, automatic tool length compensation function, automatic zero offset function, tool change cycle when the tool breakage is detected during operation.

(6) **Simplified Programming**

The standard configuration contains a 12-inch CRT (OSP5020M)/a 9-inch CRT (OSP500M-G) which displays a variety of data, such as the actual position value, programs, set data, checks, diagnostics, messages, etc. The use of function keys displays the functions permissible in the mode you have selected. Also, an optional graphics CRT is available.

(7) **Improved System Expandability**

A file management function, the ability to serve as an FMS cell controller, and DNC communications have also been provided. The system has been designed to allow the addition of hardware and software updates so that the system will never lag behind changes in technology. In addition, a user-interactive function and a built-in automatic programming system have been provided.

2. Explanation

This programming manual contains instructions for programming the OSP5020M/OSP500M-G and precautions that should be observed when programming. A careful reading of the manual will be of great assistance in obtaining the full benefit of all the superior functions the machine has to offer. For the most complete understanding, this manual should be read in conjunction with the "Operation Manual for OSP5020M/OSP500M-G", as the two manuals are very closely related.

Machine improvements that have been made since this manual was written may occasionally result in slight differences between the manual and the machine.

SECTION 2 OPERATION

1. Outline of Operations

1-1. Type of Operations

The machine operation modes are largely classified into the following three modes:

- (1) Auto mode
- (2) MDI mode
- (3) Manual mode

The following are the preparatory operations:

- (4) Program operation
- (5) Parameter setting
- (6) Origin setting
- (7) Tool setting data

It is possible to select either mode (1) or (2), and to execute any of the preparatory operations (4) through (7) even while the NC is operating. For details, refer to Section 6-1, "Mode-Select Keys".

1-2. Operation Panel Description

Five types of operation panels are used:

- (1) NC operation panel (with CRT)
- (2) Machine operation panel
- (3) Pendant operation panel
- (4) Machine status display panel
- (5) Option panel

An NC operation panel is prepared for the OSP5020M/OSP500M-G.

The machine operation panel, and also the pendant operation panel, differ depending on machine specifications.

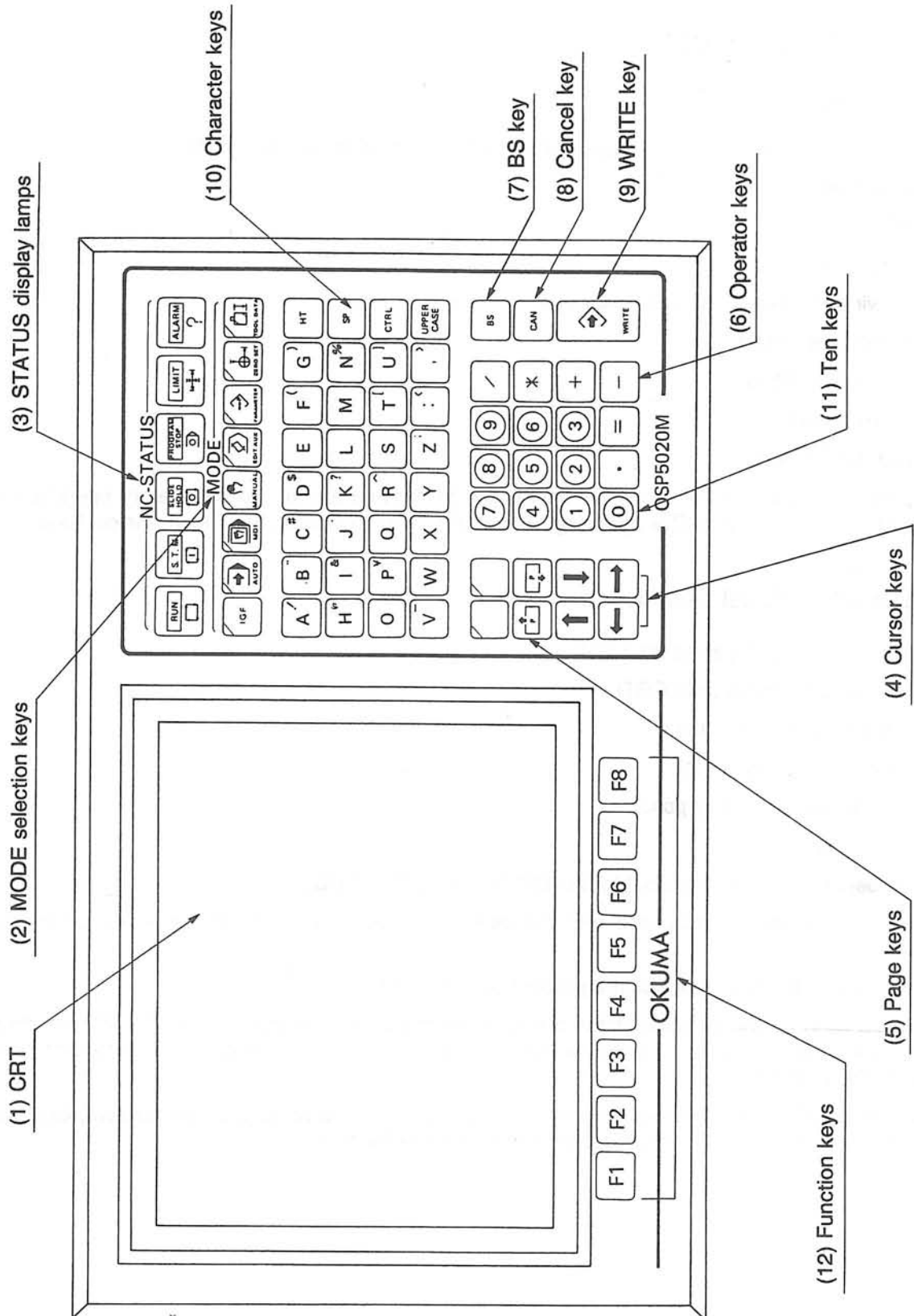
Some models are not equipped with a pendant operation panel.

Lamps are used on the machine status display panel to indicate the status of APC, ATC, spindle selection gears, interlocks, etc. A machine status display panel may not be provided, depending on the model or the specifications.

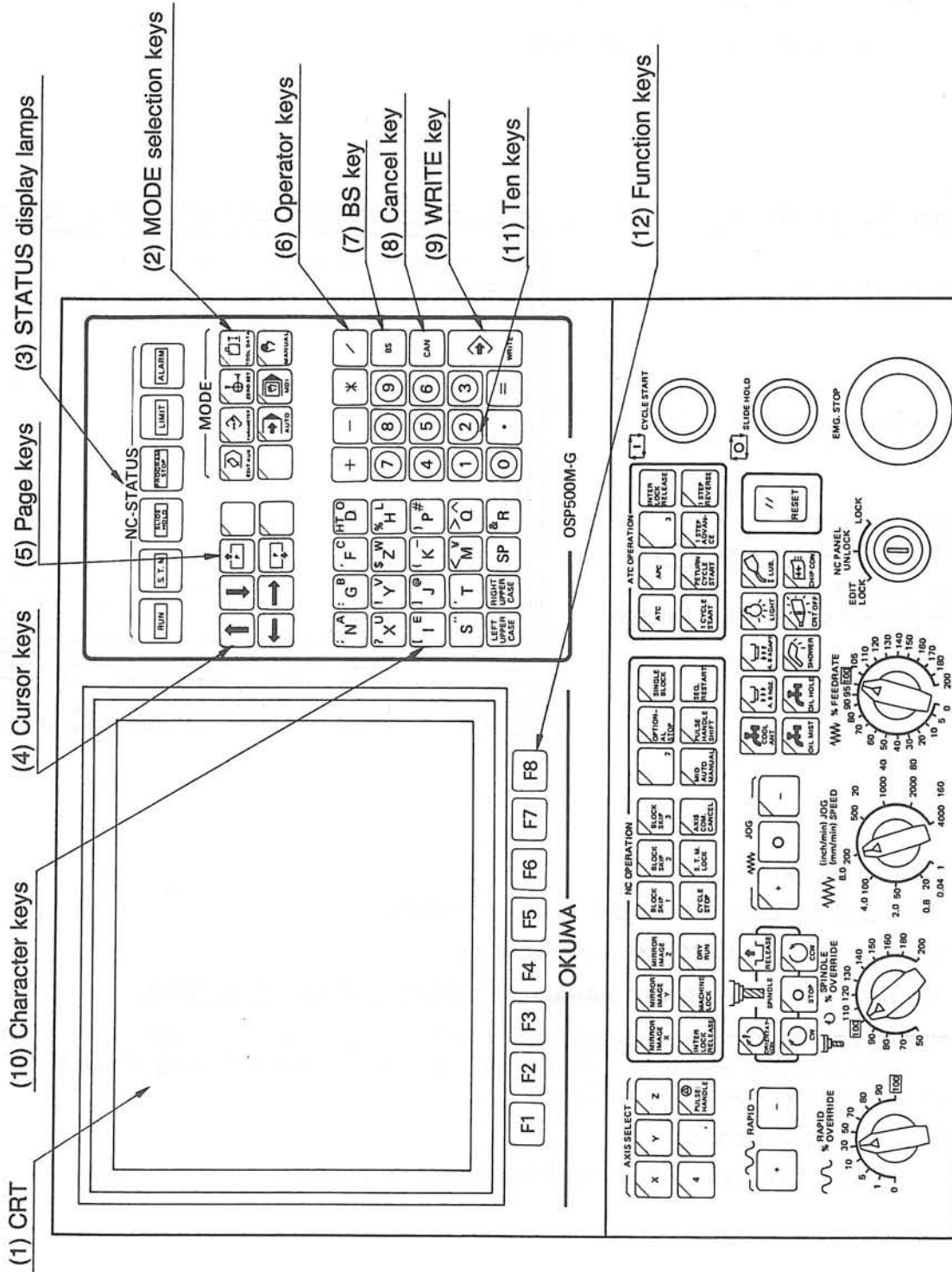
The option panel is equipped with an hour meter, and switches for rotating lamps, buzzers, lights, etc. Some of these switches are also dependent on model specifications.

1-2-1. NC Operation Panel

(1) NC Operation Panel for the OSP5020M



(2) NC Operation Panel for the OSP500M-G



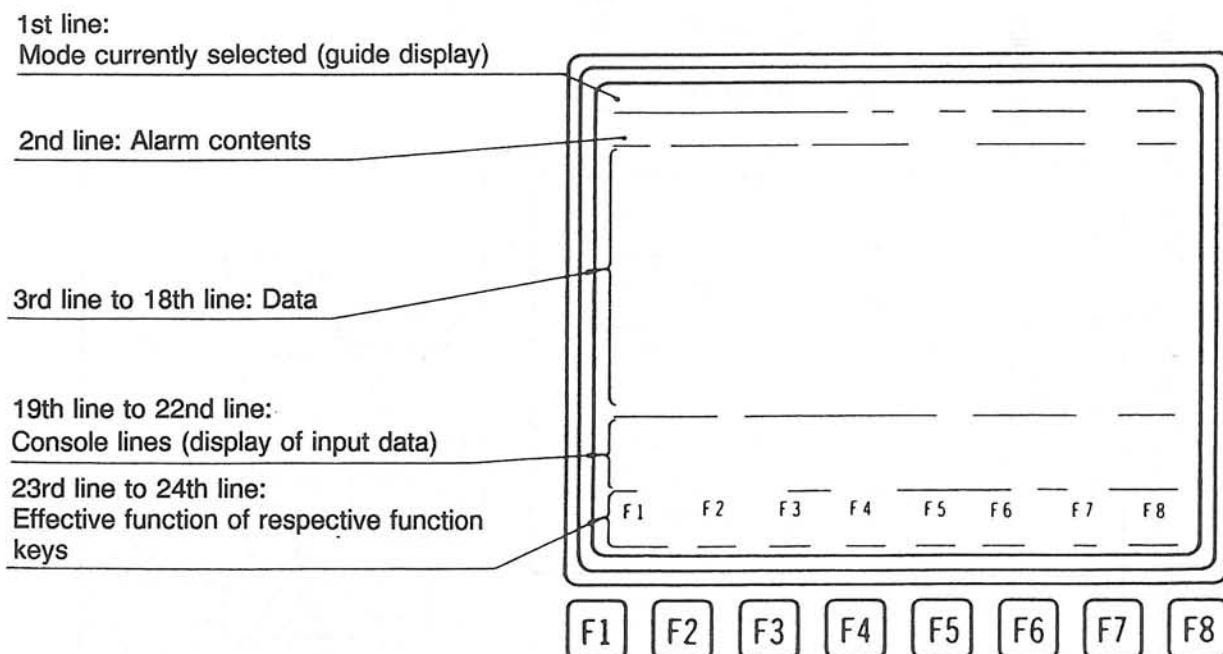
(1) CRT

The CRT can display 64 characters × 24 lines.

It shows actual position, part program, part program block, reference zero coordinates, tool offset values, parameter data, alarm, and others.

The display contents are determined by the selected operation mode, active operation step, and pressed function key (F1 through F8).

The basic display format is shown below:



(2) MODE Selection Keys

The MODE selection keys are divided into two groups:

Group 1 **AUTO, MDI, and MANUAL**

Group 2 **EDIT AUX, PARAMETER, ZERO SET, and TOOL DATA**

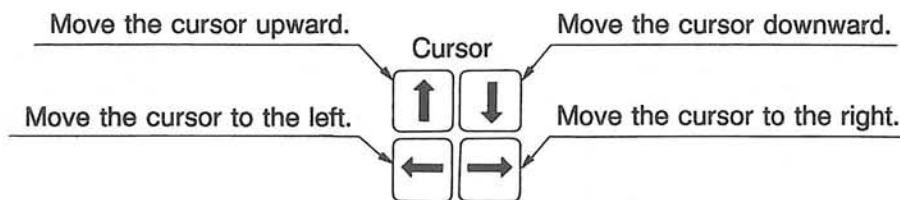
Required operation mode can be selected in each of the groups above. When a key corresponding to the mode required is pressed, the lamp lights at the upper left corner of that key. It goes off when another operation mode is selected.

(3) STATUS Display Lamps

The status display lamps indicate the NC operation conditions.

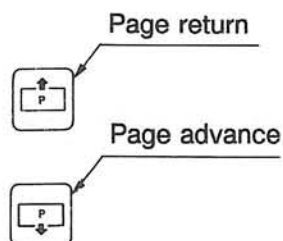
(4) Cursor Keys

These four keys are for moving the cursor on the screen.

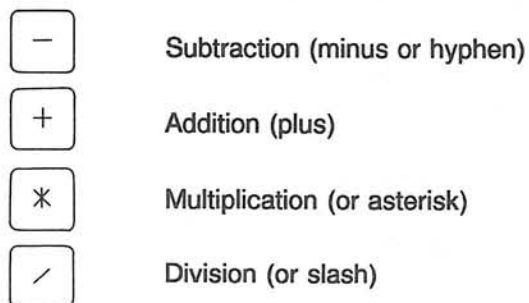


(5) Page Keys

These two keys are used for changing the displayed page.



(6) Operator Keys



(7) BS Key

The **BS** (backspace) key erases the last character entered sequentially, every time it is pressed. This key is also used for the directory display.

(8) CANCEL Key

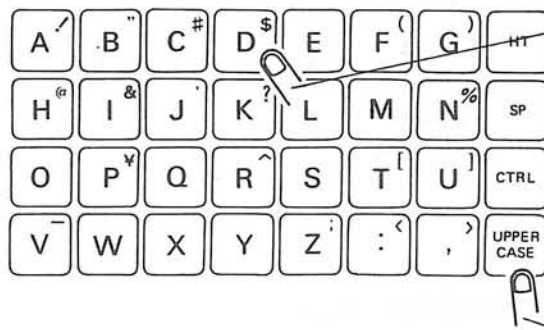
Press the **CANCEL** key when erroneous data has been entered. Each time this key is pressed, a line of input data entered is erased.

(9) WRITE Key

Press this key to select the operation mode or setting the data in the MDI mode.

(10) UPPER CASE Key

To input a character at the upper right corner of a key, use the UPPER CASE key (for OSP5020M).



To input character "\$", press the D key while holding down the UPPER CASE key.

To input a character at the upper right or the upper left corner of a key, use the RIGHT UPPER CASE key or the LEFT UPPER CASE key (for OSP500M-G).



To input character "O", press the D key while holding down the RIGHT UPPER CASE key.

(11) Ten Keys

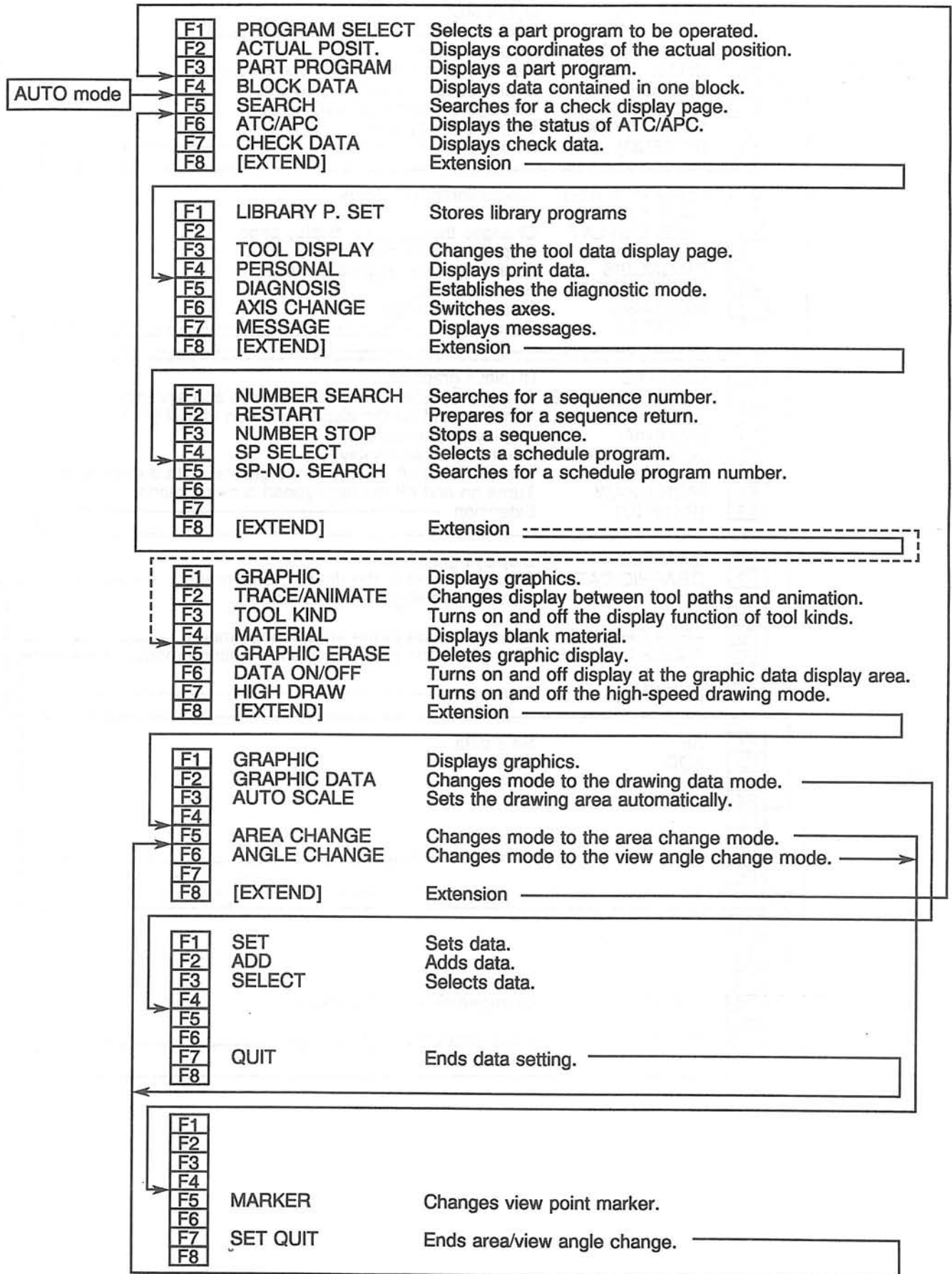
(12) Function Keys

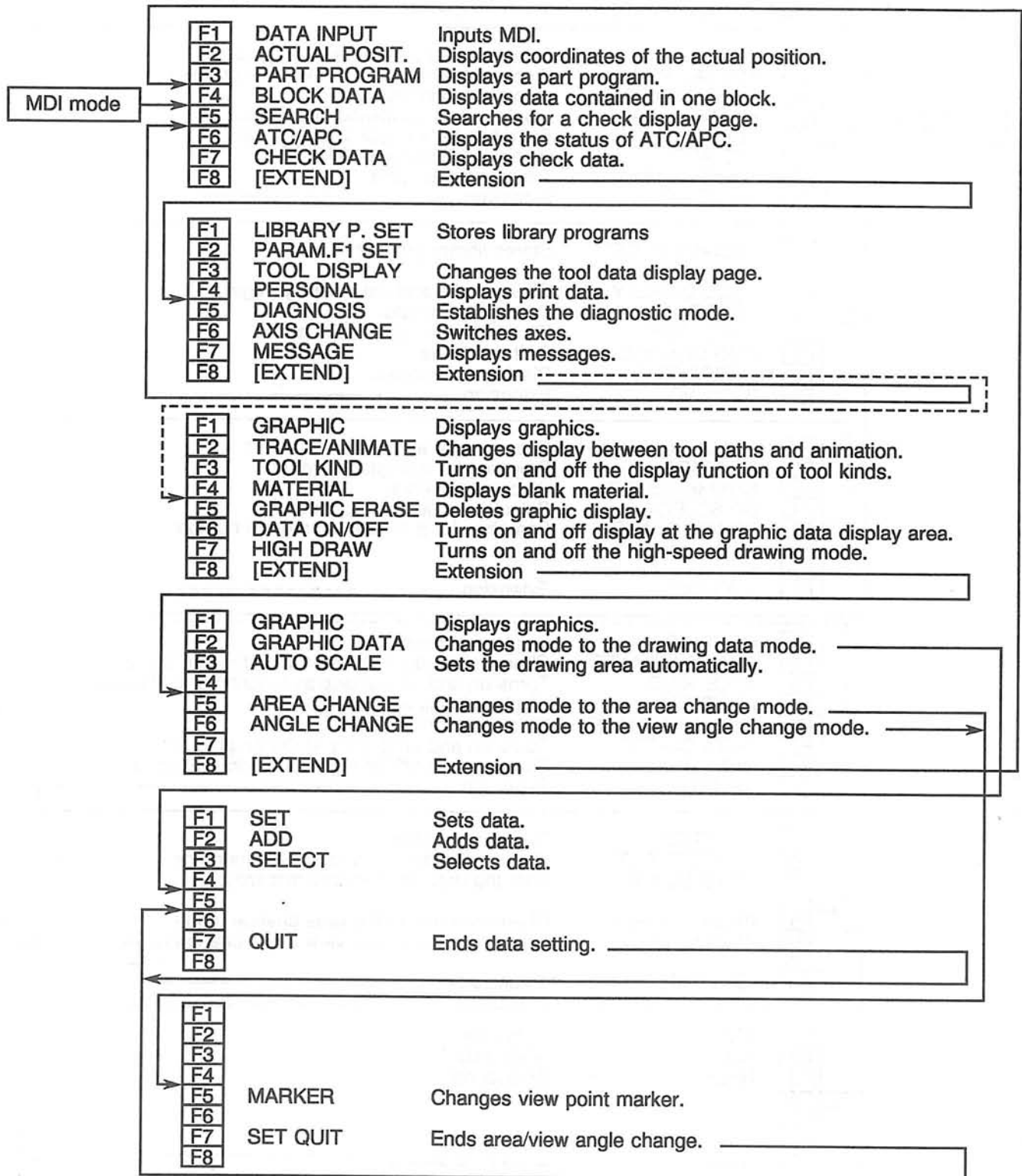
There are eight function keys on the NC operation panel. When the operator selects the desired operation mode, the CRT displays the necessary operation functions at the bottom line. Each function corresponds to a junction key (F1 through F8). Select the function to execute and press the corresponding function key.

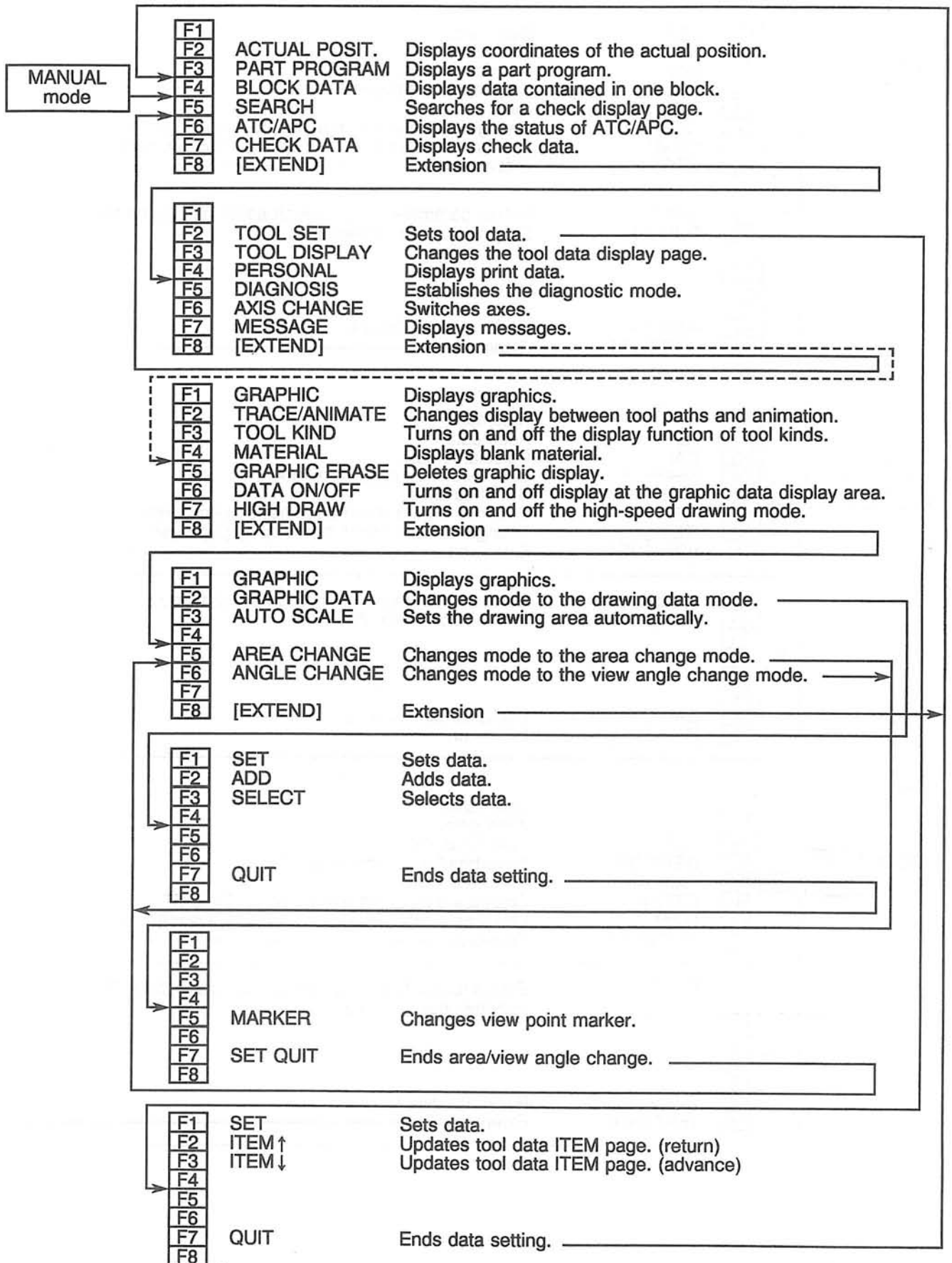
The CRT provides guide of operative steps corresponding to the sequence of operation. The operator can proceed with the intended operation simply by pressing the function keys according to the guide messages line on the CRT.

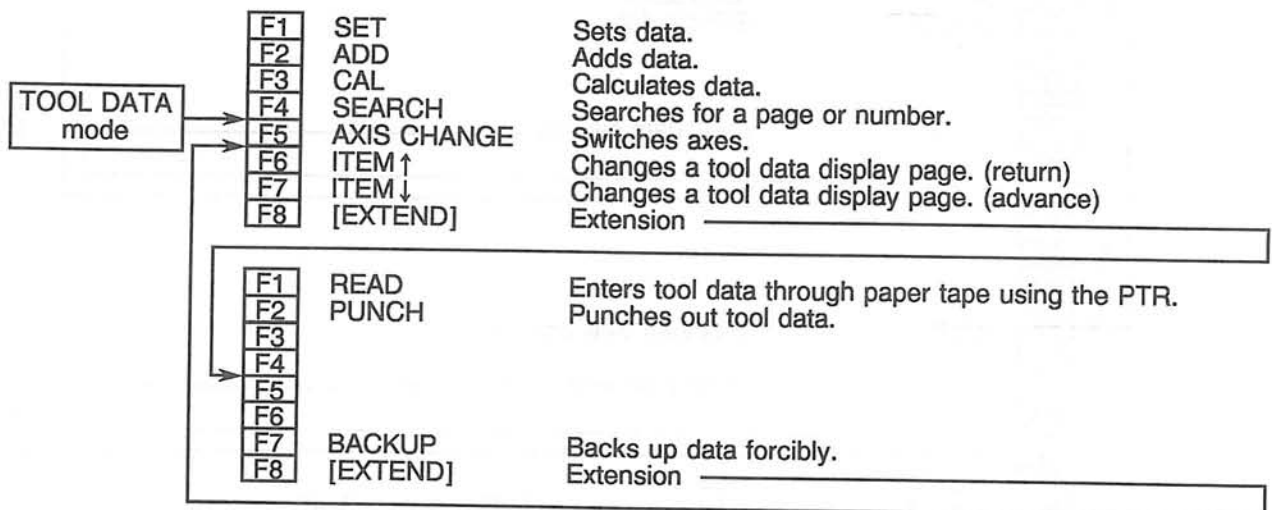
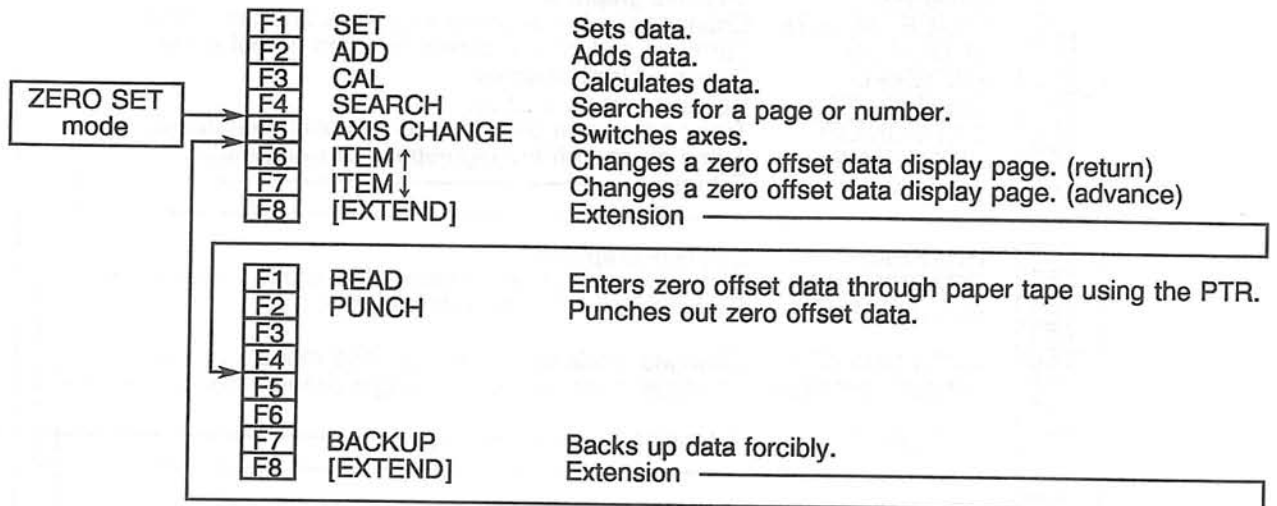
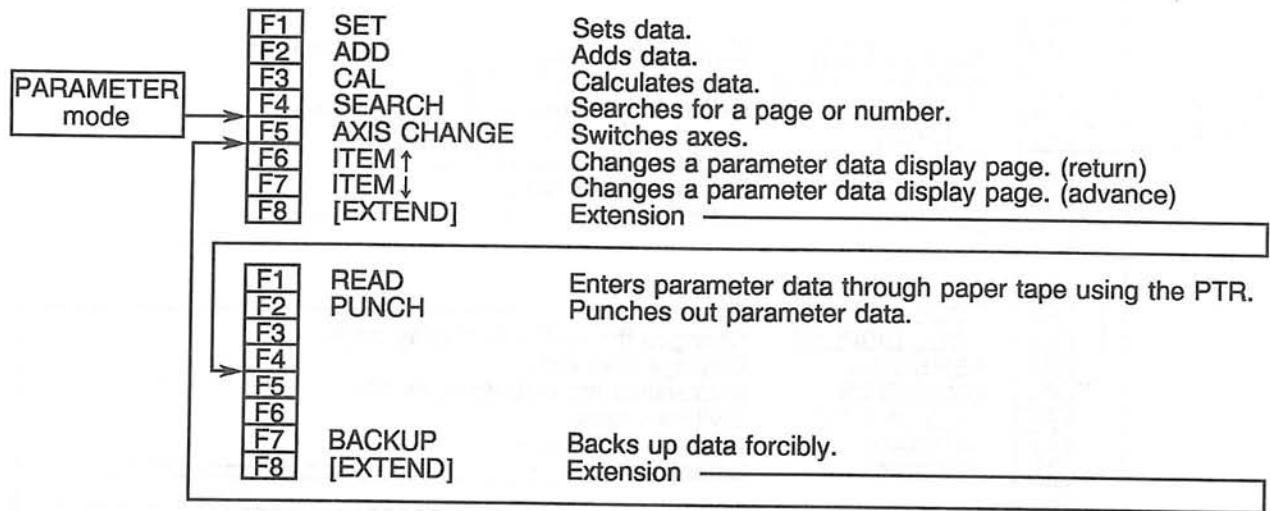
For those functions, refer to pages 8 through 14.

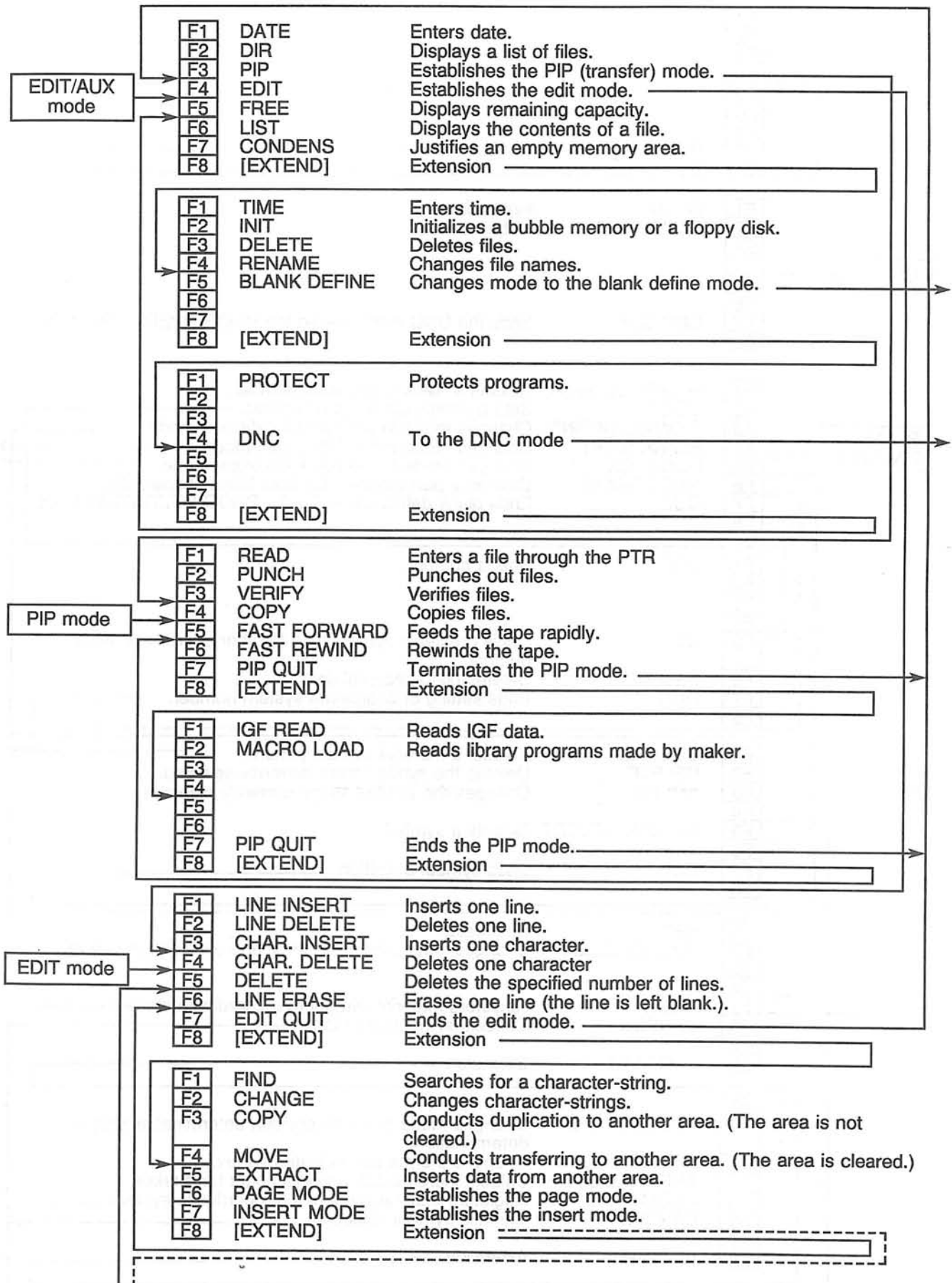
1-2-2. Mode and Corresponding Function Keys

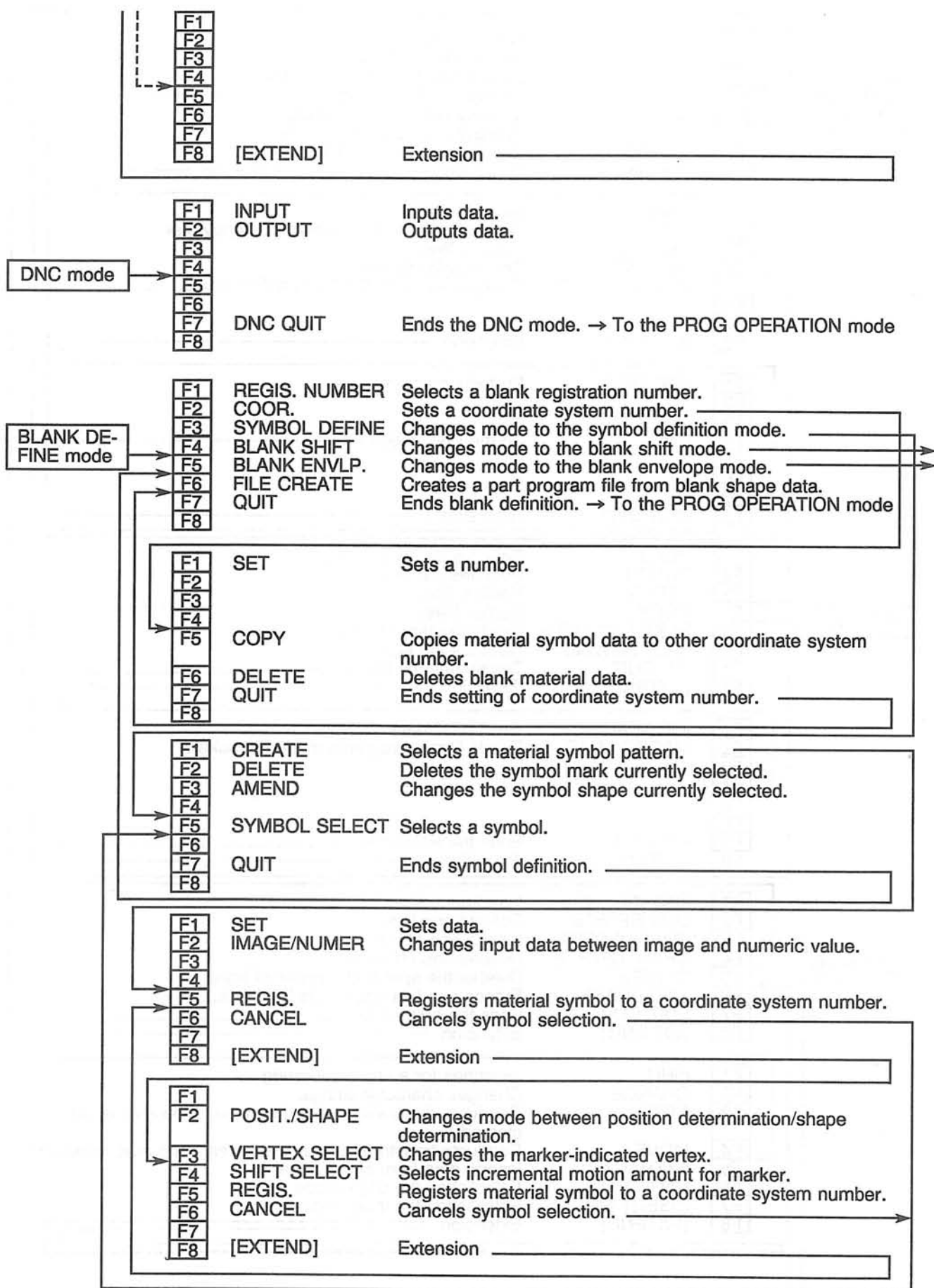


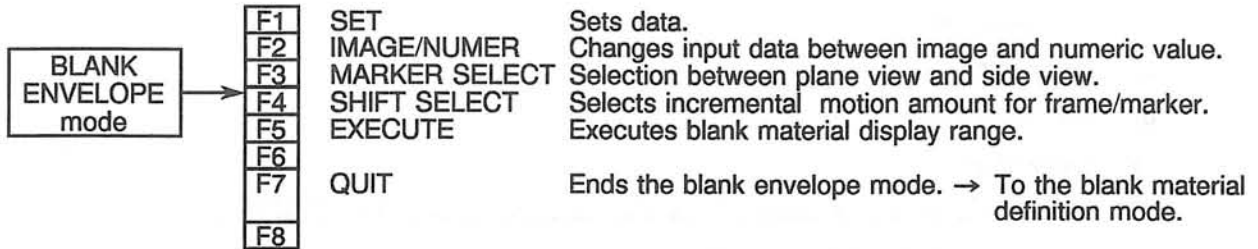
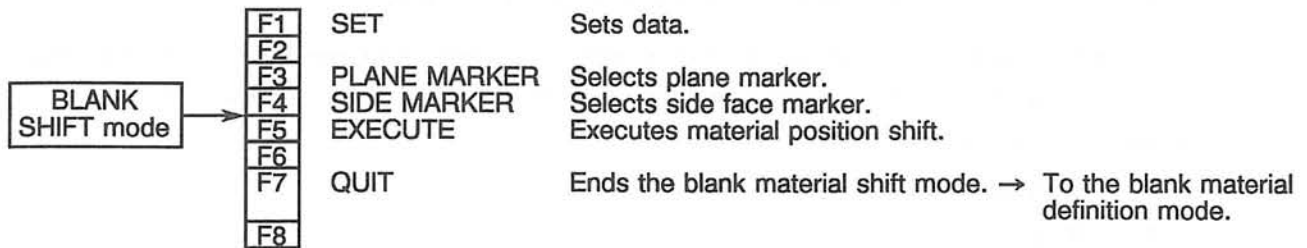












1-2-3. Machine Operation Panel and Pendant Operation Panel

Controls described below are provided on the machine operation panel and the pendant operation panel. The arrangement differs depending on machine models. Refer to the appended drawings.

(1) The following are the NC-related controls.

- 1) Cycle start
- 2) Slide hold
- 3) Reset
- 4) Sequence restart
- 5) Single block
- 6) Optional stop
- 7) Block skip

MDUL: Equivalent to optional block skip, and corresponds to "/1".MDNM

- 8) Program branch 1 (Block skip 2)
- 9) Program branch 2 (Block skip 3)
- 10) Axis command cancel
- 11) STM lock
- 12) Machine lock
- 13) Dry run
- 14) Manual intervention off (Or manual intervention)
- 15) Manual intervention on (Or manual intervention)
- 16) Mirror image X
- 17) Mirror image Y
- 18) Mirror image Z
- 19) Mirror image 4
- 20) Pulse handle shift
- 21) Interlock release
- 22) Cycle stop

(2) The following are the axis-related controls.

- 1) Manual feed axis selection, X, Y, Z, pulse handle ON
- 2) Rapid feed in the positive direction
- 3) Rapid feed in the negative direction
- 4) Cutting feed in the positive direction
- 5) Cutting feed in the negative direction
- 6) Cutting feed off
- 7) Rapid feedrate override
- 8) Cutting feedrate override
- 9) Manual cutting feedrate

(3) The following are the spindle-related controls.

- 1) Spindle CW rotation
- 2) Spindle CCW rotation
- 3) Spindle stop
- 4) Spindle orientation
- 5) Release
- 6) Spindle override
- 7) Spindle speed selection

(4) The following are the ATC/APC-related controls.

- 1) Operation/display selection (ATC/APC selection)
- 2) One cycle start
- 3) Return cycle start
- 4) One step advance
- 5) One step retract
- 6) Interlock release
- 7) Status display

Active step, next step, actual position, sequence number, run, starting conditions
(with some machine models, status information is displayed on the CRT screen.)

(5) The following are the peripherals-related controls.

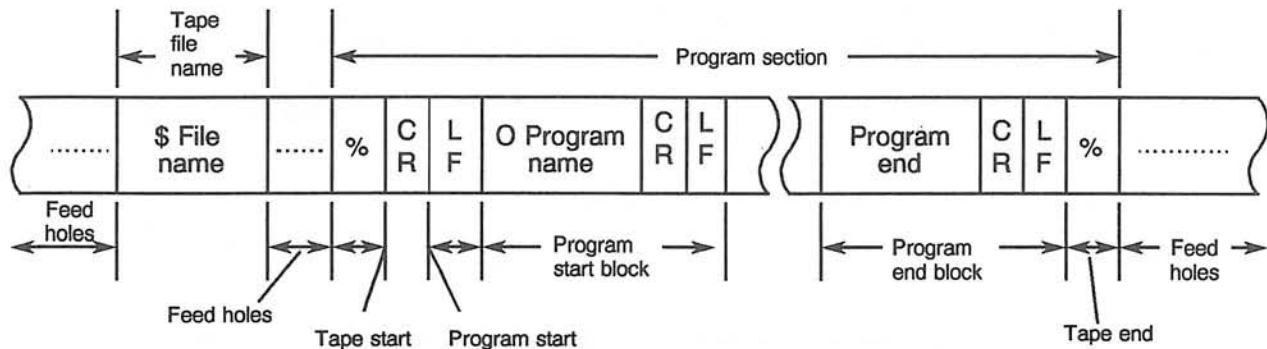
- 1) Coolant
- 2) Oil mist
- 3) Nozzle type air blower
- 4) Adaptor type air blower
- 5) Through-the-tool coolant
- 6) Work lamp
- 7) Chip conveyor
- 8) Slideway lubricating oil
- 9) Shower coolant
- 10) CRT off

(6) In addition to the above, the spindle load ammeter, position encoder display, and panel lock are available.

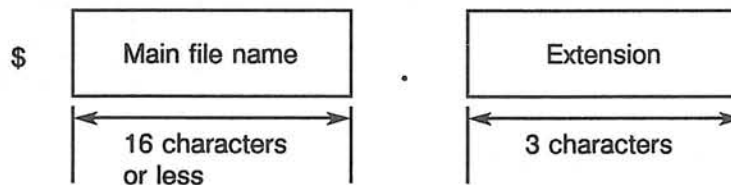
2. Program Creation

2-1. Program Tape Format

The following is the general part program format for the OSP5020M/OSP500M-G.



Since the OSP5020M/OSP500M-G is capable of managing files, store them in the part program. Presented below is the file name format.



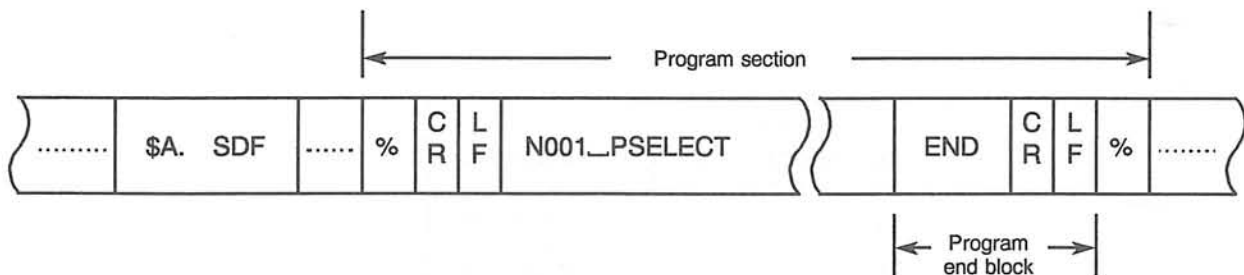
For details, refer to Section 12, 4. "File Management" in the Programming Manual for OSP5020M/OSP500M-G.

One EOB (CR) character may be used in lieu of CR and LF used in the ISO code. In the ISO code, CR may be omitted.

The program section must begin and end with a percent (%) code.

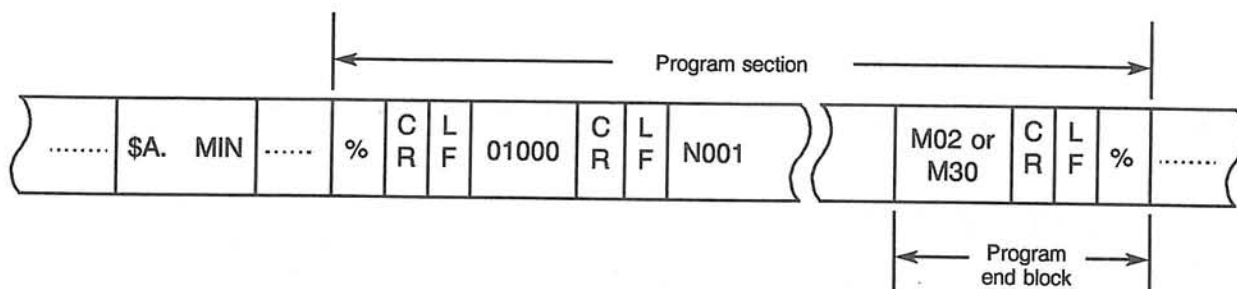
On the OSP5020M three types of programs are handled. Presented below are their tape formats:

(1) Schedule Program



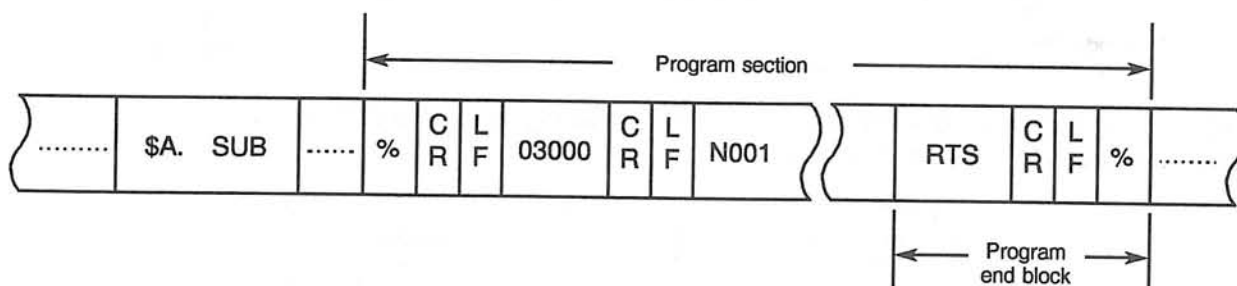
No program name may be stored into the schedule program. The program end block must contain END.

(2) Main Program



The program end block must contain M02 or M03

(3) Subprogram



The program end block must contain RTS.

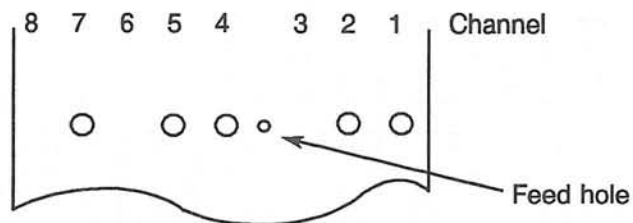
2-2. Characters Available in Tape Code

ISO or EIA code may be applied to the part program for the OSP5020M/OSP500M-G. Note that there are available and unavailable characters, and that there is no interchangeability between ISO and EIA codes. Presented in the next page is a list of available characters. Specification of the characters not covered in the list trigger an alarm or simply be ignored depending on the setting of the NC optional parameter (bit) no. 1, bits 6 and 7. For details, refer to Section 3, "Parameters".

Among characters and codes used on the OSP5020M/OSP500M-G, those indicated below are not specified in the EIA code. They should be set by NC optional parameter (bit) matching the puncher to be used.

OSP5020M/ OSP500M-G codes	Parameter No.
=	27
*	28
[	29
]	30
\$	31
#	49

Example: Suppose the puncher key "[]" is determined for punching the "=" code, and that the arrangement of punched holes by this key operation is as below.



Set this arrangement of punched holes by a "1" and a "0", where "1" indicating a punched hole and "0" a position not punched. Setting will be as below:

0 1 0 1 1 0 1 1

Set this at the No. 27 of NC optional parameter (bit). Repeating the same operations, set all the codes used on the OSP5020M.

EIA/ISO Code Chart

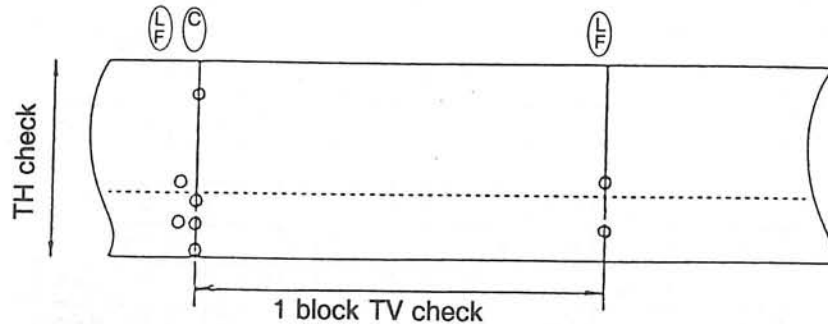
EIA Code										ISO Code										Remarks
Char- acter	8	7	6	5	4	3	2	1	Chan- nel	Char- acter	8	7	6	5	4	3	2	1	Chan- nel	
0			○			•				0			○	○		•				Numerical character 0
1						•		○		1	○		○	○		•			○	Numerical character 1
2						•		○		2	○		○	○		•		○		Numerical character 2
3				○		•		○	○	3			○	○		•		○	○	Numerical character 3
4						•	○			4	○		○	○		•	○			Numerical character 4
5				○		•	○		○	5			○	○		•	○		○	Numerical character 5
6				○		•	○	○		6			○	○		•	○	○		Numerical character 6
7						•	○	○	○	7	○		○	○		•	○	○	○	Numerical character 7
8					○	•				8	○		○	○	○	•				Numerical character 8
9				○	○	•			○	9			○	○	○	•			○	Numerical character 9
A		○	○			•			○	A		○				•			○	Alphabetical character A
B		○	○			•		○		B		○				•		○		Alphabetical character B
C		○	○	○		•		○	○	C	○	○				•		○	○	Alphabetical character C
D		○	○			•	○			D		○				•	○			Alphabetical character D
E		○	○	○		•	○		○	E	○	○				•	○		○	Alphabetical character E
F		○	○	○		•	○	○		F	○	○				•	○	○		Alphabetical character F
G		○	○			•	○	○	○	G		○				•	○	○	○	Alphabetical character G
H		○	○		○	•				H		○			○	•				Alphabetical character H
I		○	○	○	○	•			○	I	○	○			○	•			○	Alphabetical character I
J		○		○		•			○	J	○	○			○	•			○	Alphabetical character J
K		○		○		•		○		K		○			○	•		○	○	Alphabetical character K
L		○				•		○	○	L	○	○			○	•	○			Alphabetical character L
M		○		○		•	○			M		○			○	•	○		○	Alphabetical character M
N		○				•	○		○	N		○			○	•	○	○		Alphabetical character N
O		○				•	○	○		O	○	○			○	•	○	○	○	Alphabetical character O (program number or program name)
P		○		○		•	○	○	○	P		○		○		•				Alphabetical character P
Q		○		○	○	•				Q	○	○		○		•			○	Alphabetical character Q
R		○			○	•			○	R	○	○		○		•		○		Alphabetical character R
S			○	○		•		○		S		○		○		•		○	○	Alphabetical character S
T			○			•		○	○	T	○	○		○		•	○			Alphabetical character T
U			○	○		•	○			U		○		○		•	○		○	Alphabetical character U
V			○			•	○		○	V		○		○		•	○	○		Alphabetical character V
W			○			•	○	○		W	○	○		○		•	○	○	○	Alphabetical character W
X			○	○		•	○	○	○	X	○	○		○	○	•				Alphabetical character X
Y			○	○	○	•				Y		○		○	○	•			○	Alphabetical character Y
Z			○		○	•			○	Z		○		○	○	•		○		Alphabetical character Z

EIA Code										ISO Code										Remarks
Chan- nel Char- acter	8	7	6	5	4	3	2	1		Chan- nel Char- acter	8	7	6	5	4	3	2	1		
+		○	○	○		°				+			○		○	°		○	○	Plus Sign
-		○				°				-			○		○	°	○		○	Minus Sign
/			○	○		°		○		/	○		○		○	°	○	○	○	Block Delete or Division Symbol
BLANK						°				NULL						°				Null
SPACE				○		°				SPACE	○		○			°				Space*1
TAB			○	○	○	°	○	○		HT					○	°			○	Tab
ER					○	°		○	○	%	○		○			°	○		○	Program Start
CR/EOB	○					°				NL/LF					○	°		○		End of Block
						°				CR	○				○	°	○		○	Carriage Return*1
.		○	○		○	°		○	○	.			○		○	°	○	○		Period
,			○	○	○	°		○	○	,	○		○		○	°	○			Comma
DEL		○	○	○	○	°	○	○	○	DEL	○	○	○	○	○	°	○	○	○	Delete*1
BS			○		○	°		○		BS	○				○	°				Back Space*1
&					○	°	○	○		&	○		○			°	○	○		Ampersnad
						°										°				
(				○	○	°		○		(			○		○	°				Contol Out (Start of Comment)
)		○			○	°		○		)	○		○		○	°			○	Control In (End of Comment)
										\$			○			°	○			Dollar Symbol (Continuing Block)
										*	○		○		○	°		○		Symbol of Multiplication
										=	○		○	○	○	°	○		○	Equality Sign
										?			○	○	○	°	○	○	○	Question Mark
										[	○	○		○	○	°		○	○	Bracket, Left
										]	○	○		○	○	°	○		○	Bracket, Right
										:			○	○	○	°		○		Colon (Program Name of Number)
										;	○		○	○	○	°		○	○	Semicolon

*1 Ignored when used as cutting data.

2-3. Parity Check

Two types of parity checks, TV and TH, are conducted during the reading of a part program tape or in a verify operation.



(1) TH Check (Horizontal Parity)

This function checks if the number of holes per character of the machining tape is correct, and also checks for EIA if the number of holes is odd and for ISO if the number of holes is even. The DEL code which has eight holes does not cause a parity error.

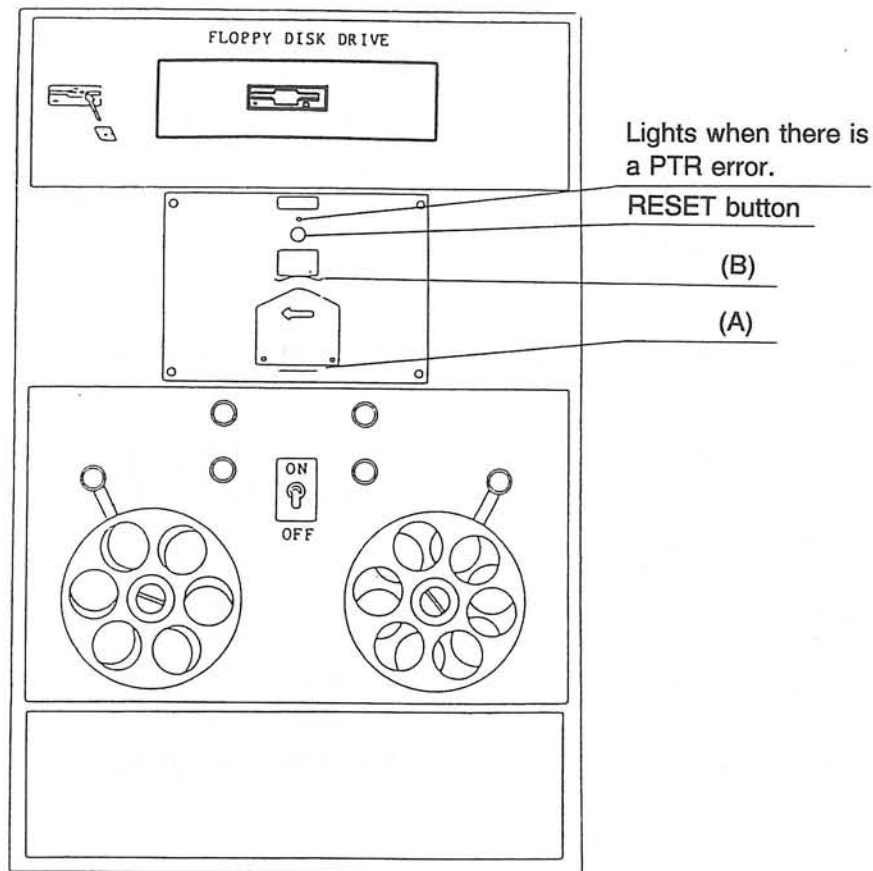
(2) TV Check (Vertical Parity)

This function checks if the number of characters, including LF (ISO) or CR (EIA) which constitute one block, is an even number. It may be selected whether or not this check should be carried out by the NC optional parameter (bit) No. 1, bit 2. For details, refer to 6-6, "Parameter Setting".

The check is applied to all the characters including comments.

In the TH check, it may be estimated whether the machining tape to be read is composed of ISO or EIA code characters and it may be selected whether or not automatic recognition should be conducted, by means of the NC optional parameter (bit) No. 1, bits 0 and 1. For details, refer to Section 3, "Parameters".

3. Tape Reader Handling



Operation Procedure:

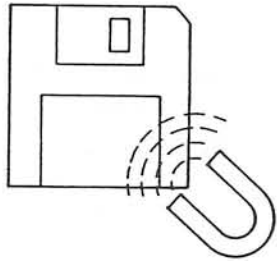
- (1) Insert the tape into the tape winder as shown in the diagram.
- (2) Push (A) upward.
- (3) Set the tape leader section in the tape reader.
- (4) Move (B) downward to hold the set tape.
- (5) Set the tape winder switch to "ON".

At this point, reading by the tape reader may begin.

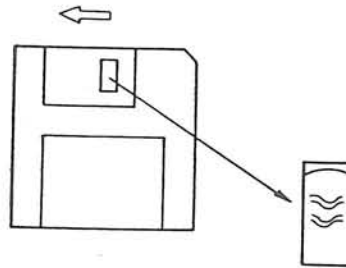
If an out-of-synchronization error occurs while reading the tape, the PTR ERROR lamp will light, press the reset button.

- Note 1:** Turning on the tape winder switch after setting the tape on the winder may cause the set tape to be cut. Therefore, check that there is no slackness in the tape when turning on the tape winder switch.
- Note 2:** Use either black or gray tape. To prevent reading errors, never use tapes of other colors.
- Note 3:** Place the tape in the tape reader with the white arrow pointing left.
- Note 4:** Place the tape feed portion preceding the first % (ER) code.

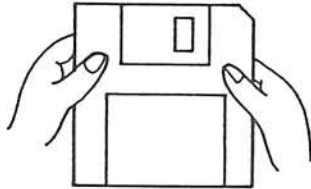
4. Floppy Disk Handling



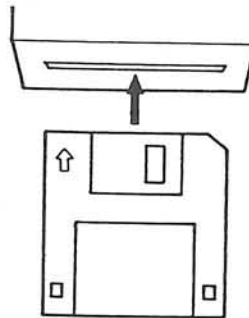
Never touch the magnetic surface.



Do not bring close to magnets.



Do not twist or fold.

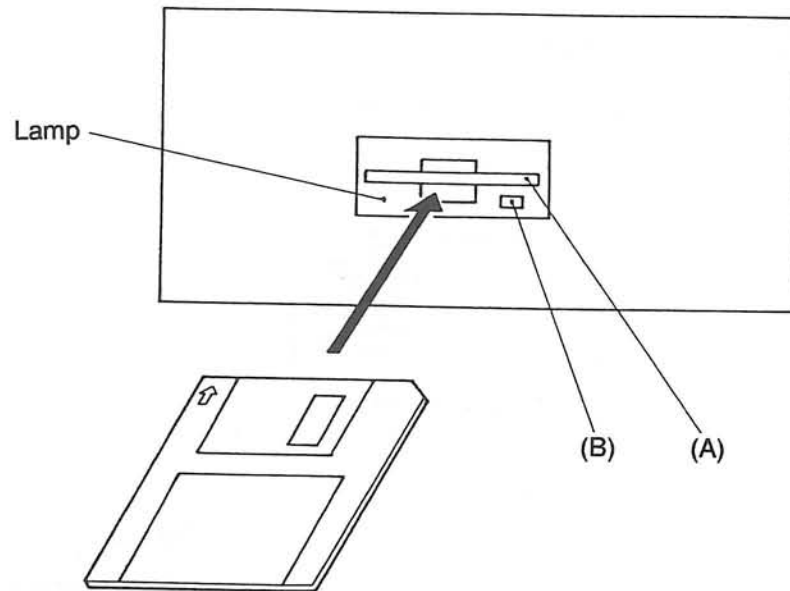


Always insert accurately.

When not using the floppy disk:

- (1) Place the floppy disk in the floppy disk storage box.
- (2) The floppy disk storage box should be placed into a moisture proof bag or box made of plastic or vinyl. In addition, avoid storing it in high temperature, high humidity or in direct sunlight.
- (3) Never leave it lying around on the machinery.

Floppy Disk Drive Operation:



- (1) Press (A) as shown in the above diagram and insert the floppy disk. Pay attention to the side of the floppy disk faces, when inserting. When the inserting floppy disk face is incorrect, it can not be inserted to the end of the slot.
- (2) When the floppy disk is inserted correctly, reading of the floppy disk begins.
- (3) Press down (B) to remove the floppy disk from the slot.

Note 1: Check that a floppy disk is not in the disk drive when cutting off the power.

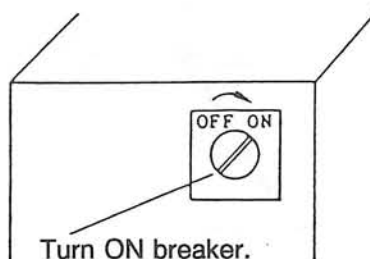
Note 2: The indicating lamp will light when reading/writing the floppy disk (not light only for inserting the floppy disk).

5. Power ON/OFF and Loading NC Control Tape

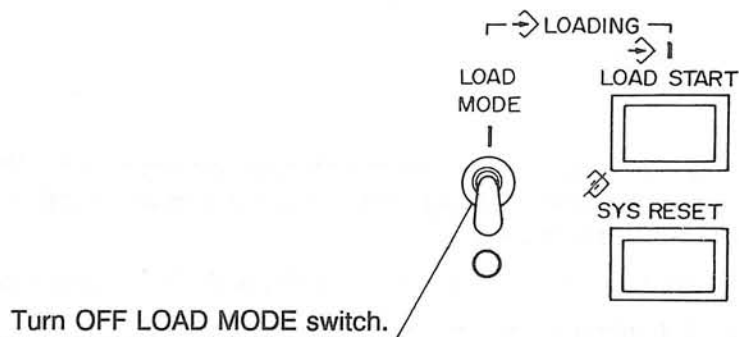
5-1. Power ON/OFF: Systems and Settings

5-1-1. NC Power ON Procedure

- (1) Turn ON the no-fuse breaker at the side of the control box.

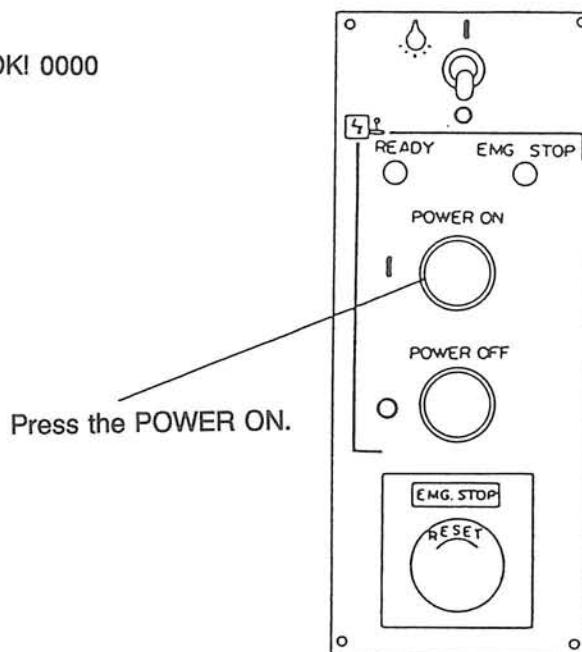


- (2) Turn off the **LOAD MODE** switch.



- (3) Press the POWER ON button on the operation power panel situated at the left door on the front of the control box. Now, the CPU is energized, and the following message is displayed on the CRT:

SBP*-- ** , **
MEMORY TEST OK! 0000
LOAD SYS



- (4) System software is loaded from the bubble memory.
- (5) After completion of loading, control is passed to the system software, and all control software with an extend name of .POL (power on loading) is loaded from the bubble memory.

The file name is displayed on the CRT

by loading. It takes about 30 to 60 seconds to load the control software.

There are six kinds of main control software having an extend name of .POL:

- (a) Main processor control software

MAA0*-----POL

- (b) Software for NC options

MAS00-00-A.POL

- (c) Software for NC message

MAM**-----POL

- (d) EC processor control software

MEA0*---*.POL

- (e) Software for machine options

MES00-00-A.POL

- (f) Software for EC message

MEM**---*.POL

The portions marked with " * " are indefinite and differ depending on the software preparation date and machine type.

- (6) After the completion of the above steps, control is passed to the NC control software, all software having an extension PBU (power off backup) is loaded from the bubble memory.

Three types of control software having an extension PBU are provided.

- (a) MAU0*---*.PBU

Backup of user parameter data, optional parameter data, work zero data and tool data

- (b) MDU0*---*.PBU

Backup of system parameter data

- (c) MSU0*---*.PBU

Backup of servo processor data

- (7) After the power is turned on, initial setting is made for peripherals connected to the OSP before it starts running as the NC. During this initial setup period, the CRT displays the following messages.

The message displayed varies depending on the machine specification.

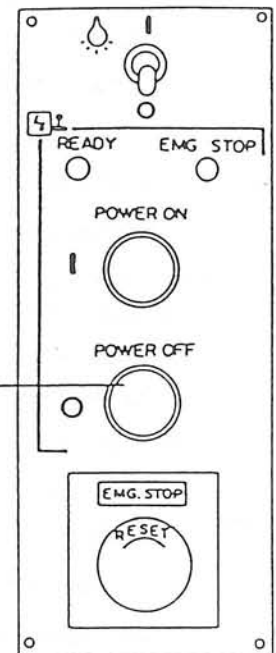
- (a) PBU FILE ON LOADING
 - (b) TAPE CONVERT ON LOADING
 - (c) IGF DATA ON INITIAL PROCESS
 - (d) GRAPHIC DATA ON INITIAL PROCESS
 - (e) EC PROCESSOR ON INITIAL PROCESS
 - (f) SERVO PROCESSOR ON INITIAL PROCESS
 - (g) AXIS PROCESSOR ON INITIAL PROCESS
- (8) The actual value is displayed in the CRT and the AUTO mode is established: the NC is ready for normal procedure.

5-1-2. NC Power OFF Procedure

- (1) Press the POWER OFF button on the operation power panel situated at the left door on the front of the control box.
- (2) Turn OFF the no-fuse breaker at the side of the control box.

Note: *If punchers and printers are connected, the above operations must be carried out after they are de-energized.*

Press the POWER OFF.



Note 1: *Data such as tool length offset, cutter radius compensation, the work coordinate system origin, and parameters are backed up by the bubble memory for certain time periods. If, right after the data is changed, the power is turned off, this may result in the data remaining unchanged.*

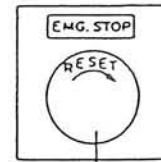
Note 2: *In that case, data is changed if power is turned off after execution of the backup command. The operation procedures are given in Section 6-3-4, (1) "Back Up Commands".*

5-2. Emergency Stop

For emergency stop, press the **EMG.STOP** button located on the machine operation panel or power panel.

All drive power excluding NC CPU power supply is turned off and an emergency stop alarm message is displayed at the CRT.

Once the **EMG.STOP** button is pressed, it remains engaged and power supply cannot be turned on. Reset by turning clockwise as indicated by the arrow mark before turning on power.



Press EMG. STOP.

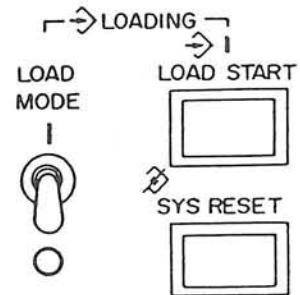
5-3. System Reset

Pressing the **SYS.RESET** button causes the CPU to be reset in a hardware fashion on control software to be started from the top (the address 0).

The **SYS.RESET** button is to be pressed when:

- (1) starting control software loading,
- (2) operation as NC is required after the completion of loading,
- (3) a return to normal NC operation is required because of the occurrence of a hardware related alarm, and
- (4) the system program is started.

Note: For the control supporting the MOP specification, turn off the power supply once and then turn it on again for the reset operation or the reset operation for (2), (3) and (4).

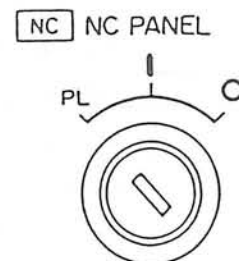


5-4. KEY-LOCK Type Switch

Since the switches on the NC operation panel are flat, a key-lock type switch is provided lest the adjacent keys are pressed or erroneous operation is caused even when keys are inadvertently hit.

The following are the mode restrictions and contents:

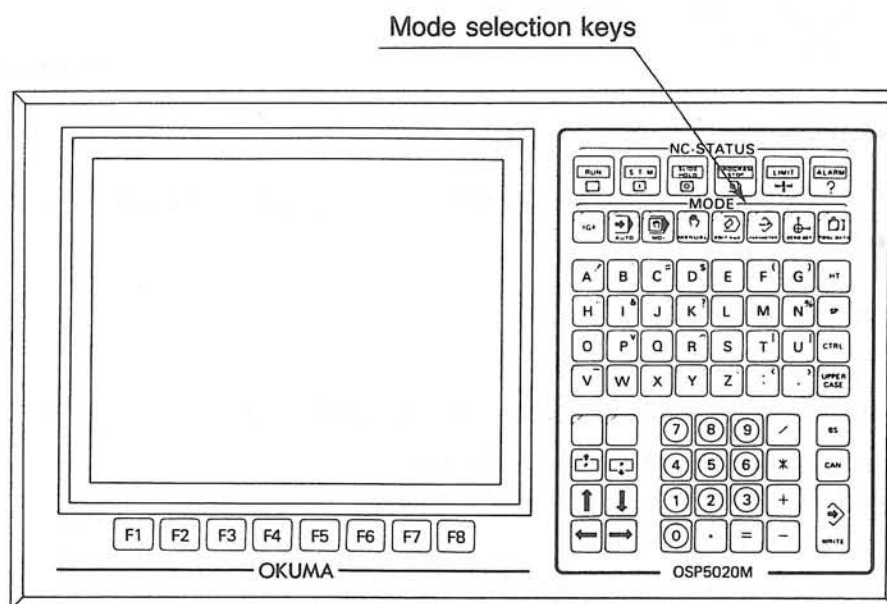
- (1) **I**
All the controls on the NC operation panel are operative.
- (2) **PL**
The operation of the controls on the NC operation panel except **EDIT/AUX** (program operation) and **PARAMETER** keys are operative.
- (3) **O**
No controls on the NC operation panel are operative.



6. Data Setting

Explanation in this section concentrates on the NC operation panel for OSP5020M.

6-1. Mode Selection Keys



The mode selection keys are classified into two groups, operation mode and data setting mode.

(1) Operation Mode:

(a) AUTO

Selects the operation mode in which a program stored in the bubble memory is read out to the IC memory and executed.

(b) MDI

Enter block commands to control machine operation.

(c) MANUAL

Permits manual operation with the machine operation panel or pulse handle operation box.

(2) Data Setting Mode:

(a) EDIT/AUX

This is the mode for reading, editing, punching-out, and printing out the program, operating the tape reader, and managing files.

(b) PARAMETER

Parameters and variables, including system parameters, user parameters, common variables, NC optional parameters, machine system and user parameters, are set.

(c) TOOL DATA

Used to set tool data such as tool length offset values, cutter radius compensation values, tool numbers for automatic tool change operation, tool management data and tool number and tool post number correspondence data.

(d) ZERO SET

Select this mode for setting the zero offset value.

- Pressing any of the mode operation selection keys will light the lamp in the key.
- If the mode is switched from any of the operation modes to the data setting mode, the lamp in the selected operation mode key starts flashing. This allows the operator to recognize the selected operation mode at a glance.
- Once program execution is started in the AUTO mode or MDI mode, switching the mode to Data Setting Mode, such as EDIT/AUX, PRAMETER, TOOL DATA, and ZERO SET, will not interrupt the program execution. Therefore, program editing, tape punching-out, tape reading-in, parameter setting, zero setting, tool data setting and other data setting operations are possible during stored program execution.

When program execution halts in the AUTO mode operation, while data setting operation is being carried out, due to Single Block ON or Program Stop command, it is necessary to press the **CYCLE START** button after switching the mode to AUTO to continue the AUTO mode operation.

- Switching the operation modes in the following sequence will reset the control:
 - (a) From manual to auto or MDI
 - (b) From auto or MDI to manual
 - (c) When the mode is switched from manual to the data setting mode, although the control is not reset, it is reset when any operation is selected after that.

Note 1: When the data has been set, the new data is stored in memory after two to three minutes have passed. Therefore, if the power is turned off immediately after the data has been set, the data may not be updated as desired.

Note 2: Before turning off the power supply and after setting the data, backup the data following the procedure explained in Section 6-3-4 (1), "Back Up Command".

6-2. Data Setting

Here is a list of parameters for data setting, together with their contents.

Category	Subcategory	Sub-subcategory	Entry Type	Axis Type	Data Elements		Unit	Internal Data Type
					Standard	Optional		
Work coordinate origin	—	—	Microns; integer	Linear axis	1	20 50 100	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	1	20 50 100	Degrees	4-byte integer
Tool data	Tool data	Tool length offset	Microns; integer	Linear axis	50	100 200 300	Inch system Metric system	4-byte integer
		Cutter radius compensation	Microns; integer	Linear axis	50	100 200 300	Inch system Metric system	4-byte integer
	ATC tool number	—	Integer	—	1	1	—	2-byte integer
	ATC pot no. & tool no.	—	Integer	—	No. of tool pots in magazine		—	2-byte integer
	Tool management data	—	Integer	—	50	100 200 300	—	2-byte integer
Parameter	Common variable	—	Microns; integer	—	128	128	—	8-byte floating-point data
	System parameter (NC)	Travel end limit	Microns; integer	Linear axis	2/1 axis	2/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	2/1 axis	2/1 axis	Degrees	4-byte integer
		Pitch error compensation range	Microns; integer	Linear axis	2/1 axis	2/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	2/1 axis	2/1 axis	Degrees	4-byte integer
		Pitch error compensation interval	2 bytes; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			2 bytes; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
		Number of pitch error compensation points	2 bytes; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			2 bytes; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
		Zero return operation execution sequence	2 bytes; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			2 bytes; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
		In-position width	2 bytes; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			2 bytes; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer

Category	Subcategory	Sub-subcategory	Entry Type	Axis Type	Data Elements		Unit	Internal Data Type
					Standard	Optional		
Parameter	System parameter (NC)	Home position	2 bytes; integer	Linear axis	8/1 axis	8/1 axis	Inch system Metric system	4-byte integer
			2 bytes; integer	Rotary axis	8/1 axis	8/1 axis	Degrees	4-byte integer
		Machine coordinate system origin	Microns; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
	Machine system parameter (word)	—	Integer	—	40	40	—	2-byte integer
	Machine system parameter (long word)	—	Integer	—	40	40	—	4-byte integer
	Machine user parameter (word)	—	Integer	—	40	40	—	2-byte integer
	Machine user parameter (long word)	—	Integer	—	40	40	—	4-byte integer
	User parameter (NC)	Programmable travel limit	Microns; integer	Linear axis	2/1 axis	2/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	2/1 axis	2/1 axis	Degrees	4-byte integer
		G-60 over-passing amount	Microns; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
		Backlash	Microns; integer	Linear axis	1/1 axis	1/1 axis	Inch system Metric system	4-byte integer
			Microns; integer	Rotary axis	1/1 axis	1/1 axis	Degrees	4-byte integer
	Machine user parameter (bit)	—	Bit string	—	320 bits	320 bits	—	1-byte integer
	G/M code macro	Simple call	Character	—	10	10	—	4-byte character
		Axis move call	Character	—	10	10	—	4-byte character
	Program name	—	Character	—	4	4	—	4-byte character

Category	Subcategory	Sub-subcategory	Entry Type	Axis Type	Data Elements		Unit	Internal Data Type
					Standard	Optional		
Parameter	Pitch error compensation	—	Integer	Linear axis	384	384	—	2-byte integer
			Integer	Rotary axis	384	384		2-byte integer
	NC optional parameter (long word)	—	Integer	—	64	64	—	4-byte integer
	NC optional parameter (word)	—	Integer	—	64	64	—	2-byte integer
	NC optional parameter (bit)	—	Bit string	—	480 bits	480 bits	—	1-byte

Note 1: The following parameters are not allowed to be set because there is no CRT display unless "1" is set in bit 7 of the NC optional parameter (bit) No. 16.

- 1) All system parameters
- 2) Machine system parameter (word)
- 3) Machine system parameter (long word)
- 4) NC optional parameter (long word) (from No. 32 onward)
- 5) NC optional parameter (word) (from No. 32 onward)
- 6) NC optional parameter (bit) (from No. 17 onward)

Note 2: The unit system for data setting can be set at NC optional parameter (bit) No. 9.

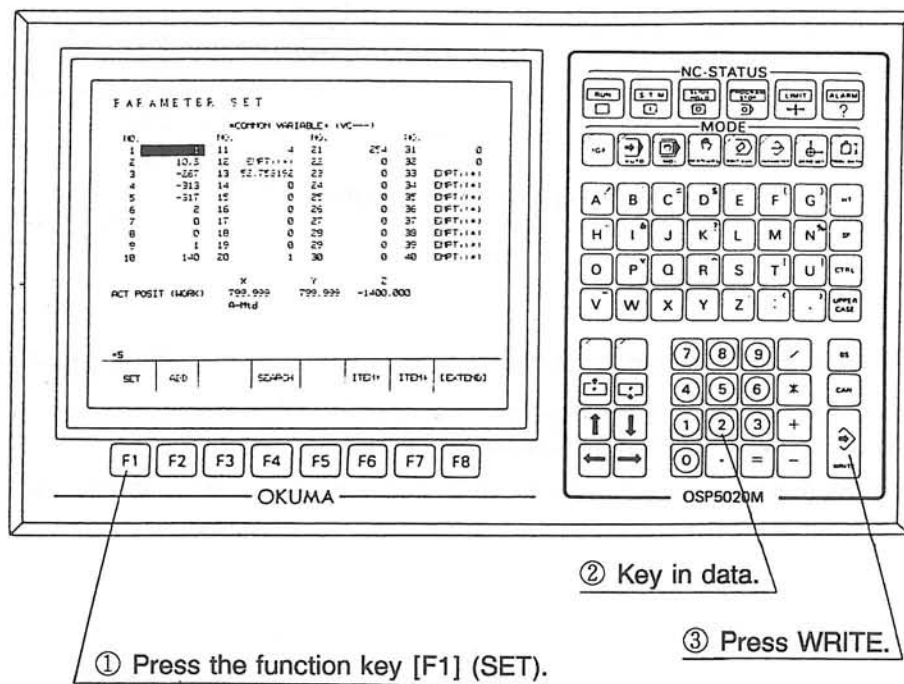
6-3. Data Set Commands

The data set commands are detailed in the following pages, and may be classified into three groups: commands for data setting, commands for parameter selection, and input/output commands for peripherals.

6-3-1. Commands for Data Setting

This group consists of three commands: SET, ADD, and CAL.

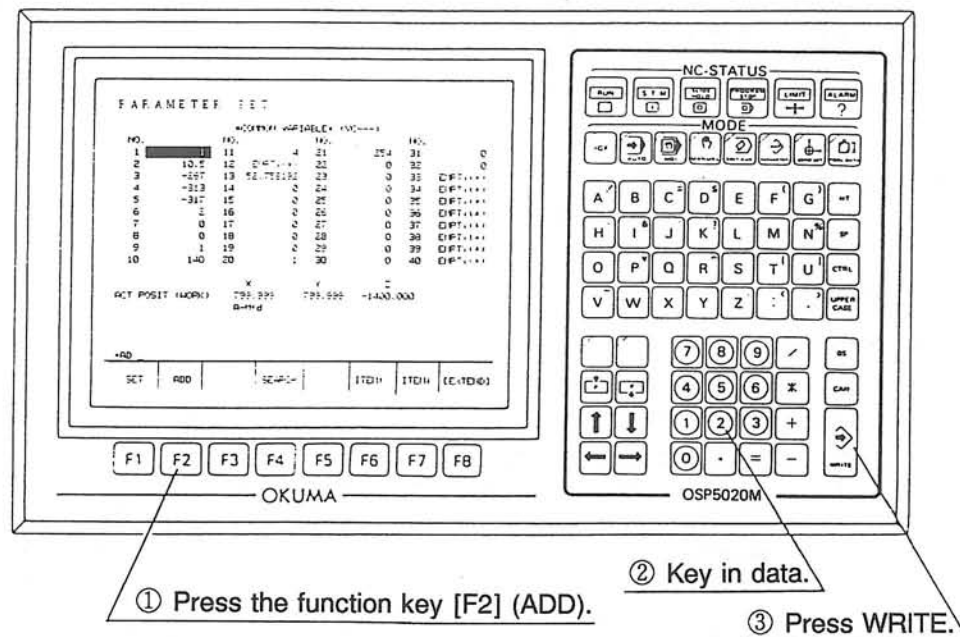
(1) SET Command



The data entered itself is a command serving as new data. In parameter setting, the SET command is effective when the function key [F1] is pressed, and displays "S" on the 21st line on the CRT.

Data setting is then carried out only when data is entered and the **WRITE** key is pressed.

(2) ADD Command

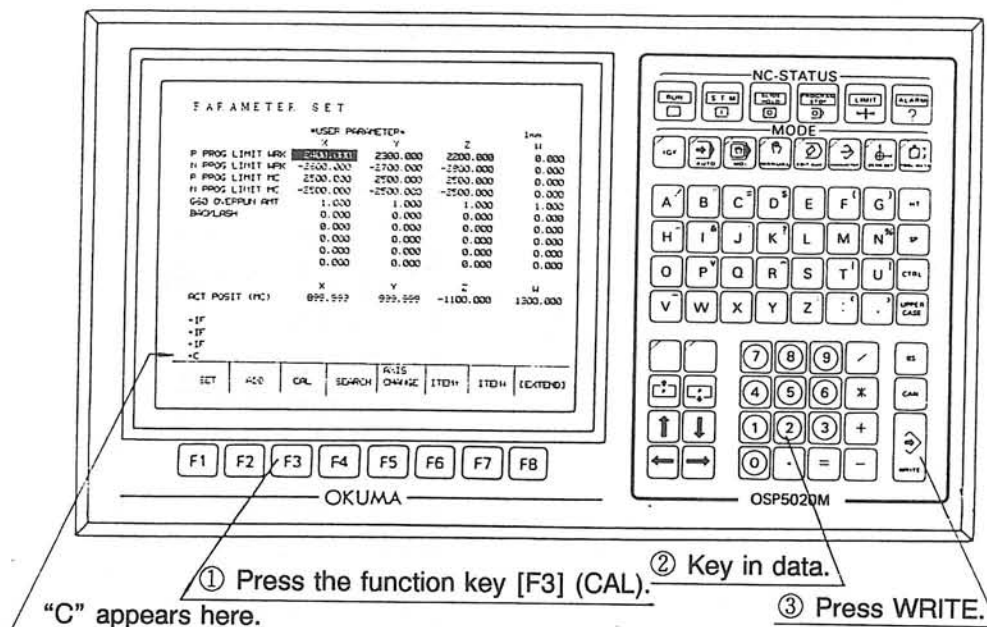


The data entered is added to the current data to form a command serving as new data.

In parameter setting, the ADD command is effective when the function key [F2] is pressed, providing a display of "AD" on the 21st line on the CRT.

Data setting is then carried out only when data is entered and the **WRITE** key is pressed.

(3) CAL command



An arithmetic operation is carried out between the data entered and the current value to form a command serving as new data for setting.

In parameter setting, the CAL command is effective by pressing the function key [F3], providing a display of "C" on the 21st line on the CRT.

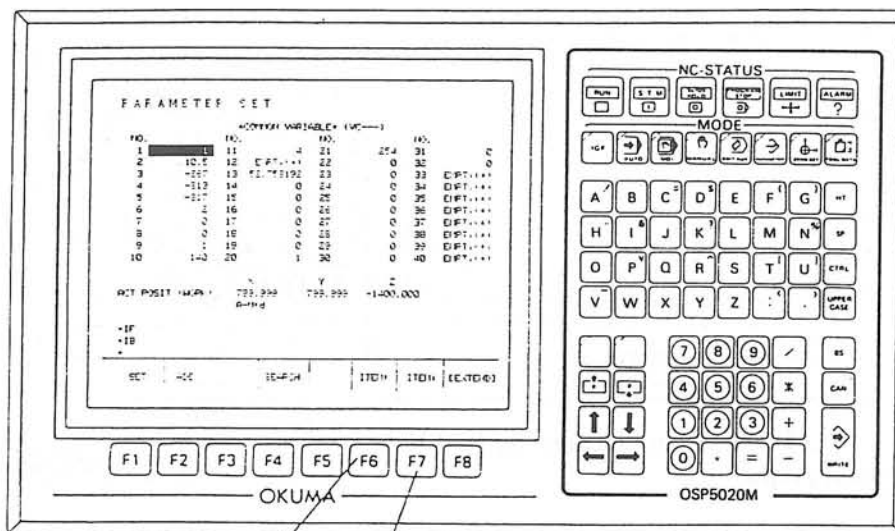
Data setting is then carried out only when data is entered and the **WRITE** key is pressed.

6-3-2. Commands for Parameter Selection

This group consists of six commands:

ITEM, SEARCH, AXIS CHANGE, CURSOR, PAGE and EXTEND.

(1) ITEM Command



Each time the function key [F7] (ITEM) is pressed, the screen display switches to the next category.

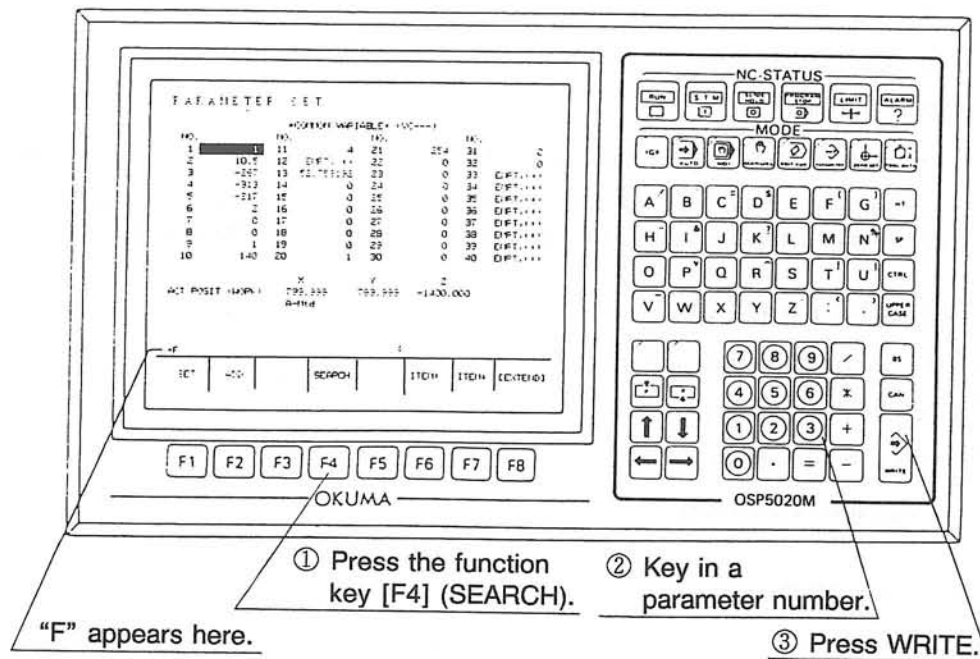
Each time the function key [F6] (ITEM) is pressed, the screen display switches to the preceding category.

This command is intended to select an appropriate parameter from those belonging to the subcategories in the table given in Section 6-2, "List of Data Set Parameters".

In data setting, the ITEM command is carried out when the function key [F6] or [F7] is pressed. Each time one of these keys is pressed, the CRT screen display is switched over to the preceding or next subcategory items.

"IF" or "IB" is displayed on the 21st line on the CRT and the screen display is switched over.

(2) SEARCH Command



In the subcategory group, which involves several data elements, the screen display is, sometimes, greater than one page. This SEARCH command, engaged by function key [F4], may be conveniently used to set the cursor with ease, although it is possible to place the cursor at the desired data using the Page key and the Cursor key.

Operating procedure is given below:

- ① Press the function key [F4].

This produces display of "F" on the 21st line on the CRT.

- ② Key in a data number on the keyboard.

Display of "F" is followed by this particular data.

- ③ Press the **WRITE** key.

This allows the cursor to be positioned at the data number specified. If the current screen does not include the data number, then the screen is switched over until that data number appears and the cursor is positioned there.

If there is nothing corresponding to the data number entered, the cursor is then positioned as follows:

(a) When smaller

The cursor is positioned at the first data.

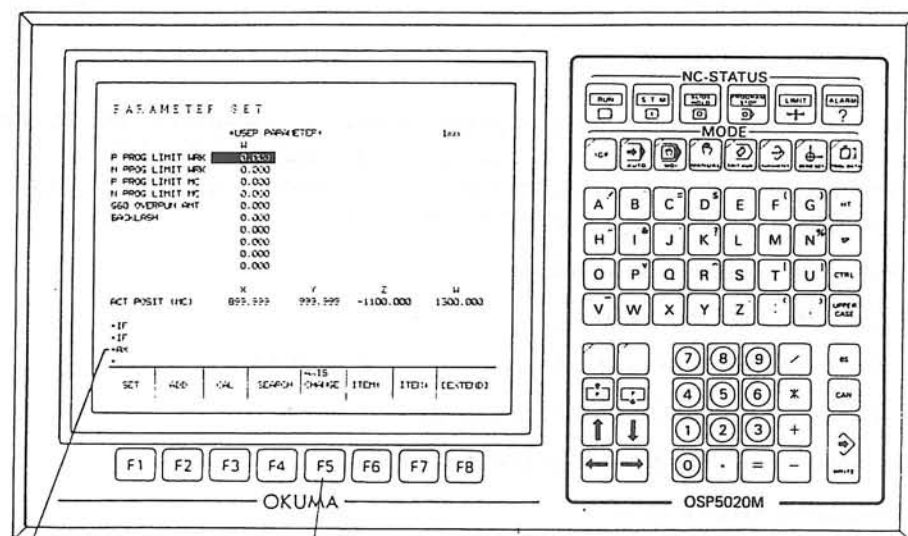
(b) When greater

The cursor is positioned at the last data.

The screen for setting bit type data (machine user parameter (bit), NC optional parameter (bit)) allows the simultaneous setting of both parameter number searching and parameter number setting.

- ① Press the function key [F4].
- ② Key in the parameter number.
- ③ Key in a comma (,).
- ④ Key in a bit number.
- ⑤ Press the **WRITE** key.

(3) AXIS CHANGE Command



"AX" appears here.

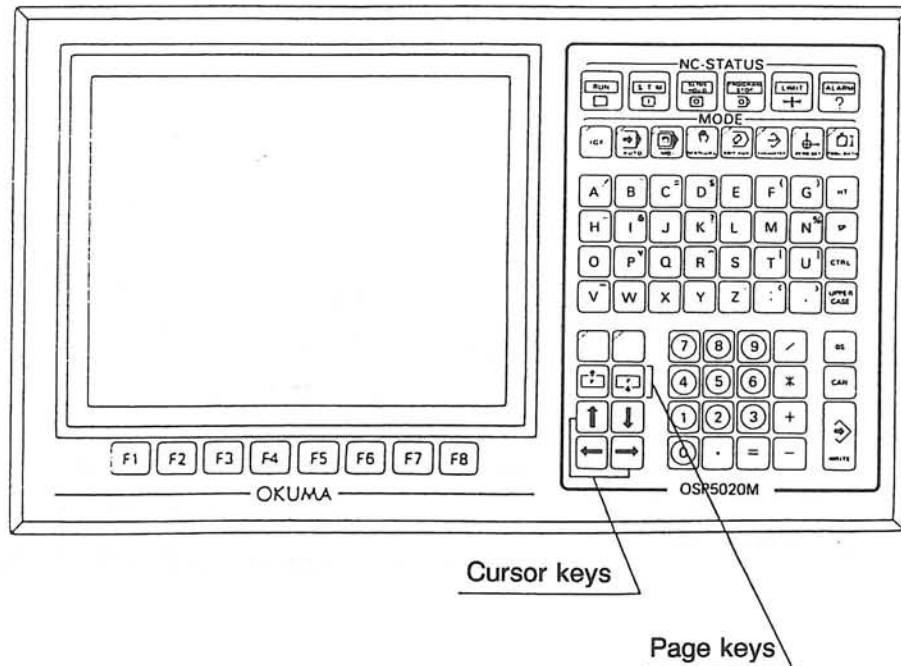
Each time the function key [F5] (AXIS CHANGE) is pressed, the screen is switched over to the next axis display.

In data setting, if there is a parameter of axis type, the 5th and 6th axes cannot be displayed on the same screen. The AXIS command is intended to switch the screen from one display to another.

Since the pitch error compensation data may be displayed on one axis per screen, the command is used for axis selection. Depending on the options, the 4th and following axes may or may not be displayed.

When the function key [F5] is pressed, "AX" appears on the 21st line on the CRT, resulting in a screen switch.

(4) Cursor Keys

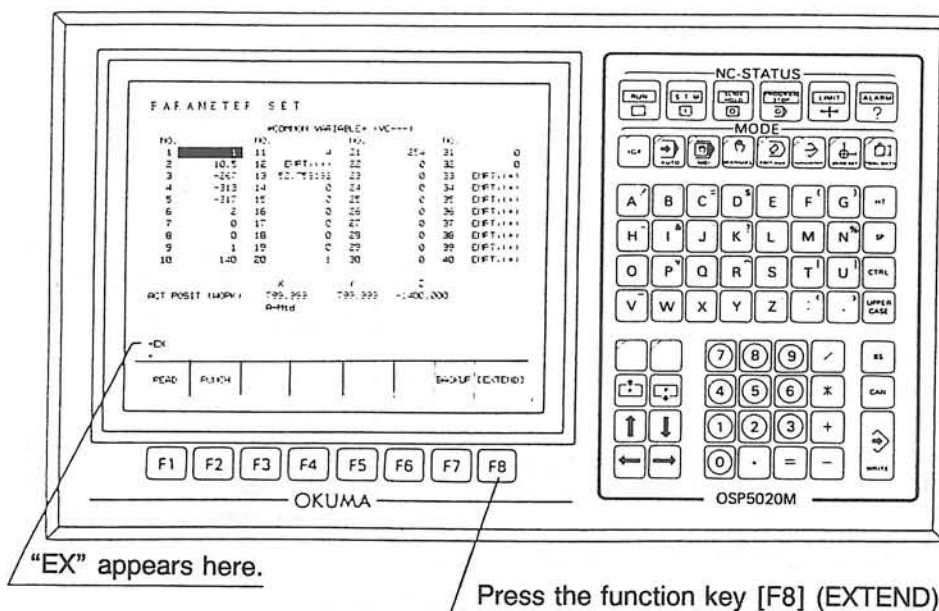


Move the cursor in the arrow-pointed direction, where the cursor stays at only the points including data to be set. When, for example, the cursor is at rest at the extreme left, press the cursor key [→]; this brings the cursor to the data element located at the extreme right. When the cursor is at the extreme right, press the cursor key [←]; this brings the cursor to the data element located at the extreme left. A similar relationship exists between the cursor keys [↓] and [↑].

(5) Page Keys

When the page key [P ↓] is pressed, the screen advances one page in the same category only. When the [P ↑] key is pressed, the screen returns one page in the same category only.

(6) EXTEND Command



Data setting involves many commands, which cannot be displayed at the same time (there are eight function keys available). The EXTEND command is intended to switch command displays.

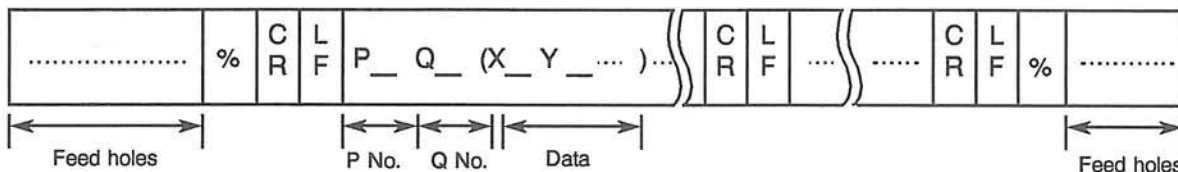
The function key [F8] provides a display of "EX" on the 21st line on the screen, resulting in a switched command only.

6-3-3. Input/Output Commands for Peripherals

This group consists of two commands: READ and PUNCH.

(1) READ Command

This is a command to read a variety of data required for data setting from paper tape and sets it in place.



The format of paper tape is shown below:

The P and Q must be specified, and are related to data setting as follows: P and Q specify the category and subcategory. Axis data is specified by X, Y, and Z, and the data not related to an axis is specified by R.

P and Q numbers are modal. It is not necessary to reprogram if the number is the same as the one programmed previously.

Both ISO and EIA codes may be used as conventional programs as the coding system.

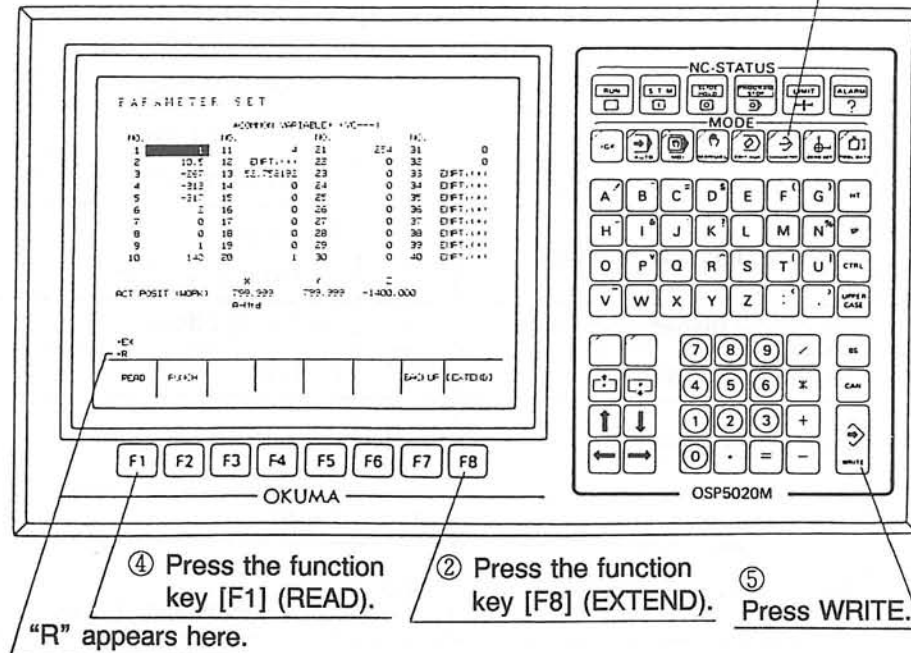
The relationship of data setting, P numbers and Q numbers, is as indicated below.

Category	Subcategory	P No.	Q No.	Remark
Work coordinate system origin	—	100	1 - No. of work coordinate systems	
Tool data	Tool length offset	200	1 - No. of offsets	
	Cutter radius compensation	210	1 - No. of offsets	
	Tool management number	220	1 - Largest tool pot number	
	No. of tool management sets	230	1 - No. of offsets	
Parameter	Common variable	300	1 - 128	
	System parameter	400	1 - 56	1 - 40: real 41 - 56: integer*
	User parameter	410	1 - 32	
	Pitch error compensation	600	1 - No. of compensation points	(Note)
	NC optional parameter (long word)	700	1 - 64	1 - 32: user 33 - 64: system
	NC optional parameter (word)	710	1 - 64	1 - 32: user 33 - 64: system
	NC optional parameter (bit)	720	1 - 64	1 - 16: user 17 - 64: system
	Machine user parameter (long word)	800	1 - 40	
	Machine system parameter (long word)	810	1 - 40	(Note)
	Machine user parameter (word)	820	1 - 40	
	Machine system parameter (word)	830	1 - 40	(Note)
	Machine user parameter (bit)	840	1 - 40	

Note: System parameters, pitch error compensation data, machine system parameters (long word) and machine system parameters (word) are effective only when NC optional parameter (bit) No. 16, bit 7 is "1" (interlock released).

Operating procedure is given below:

① Press **PARAMETER, TOOL DATA or ZERO SET**.



① Press the **PARAMETER, TOOL DATA or ZERO SET** key.

② Press the function key [F8] (EXTEND).

This displays the READ (F1) command.

③ Set a paper tape for data setting on the tape reader so that the leading feed holes come to the reader.

④ Press the function key [F1] (READ).

This displays "R" on the 21st line on the CRT.

⑤ Press the **WRITE** key.

This allows the paper tape to advance, so that the data on the tape is sequentially read and set.

Note that the tape reader stops when an error occurs during the setting and the CRT shows the message below:

read continuing? (Y/N)!

Press Y or N key. Keying in "Y" permits the tape reader to continue reading. The entry of "N" aborts the read command.

(2) PUNCH Command

This is a command to punch various data required for data setting on the paper tape. Paper tape format is the same as with the READ operation. This command allows setting data to be stored on a paper tape.

Tape format is the same as indicated in (1), "Read".

Punching out data under special conditions are shown below:

R__ Normal data

R/0 Empty

R/1 + overflow

R/2 - overflow

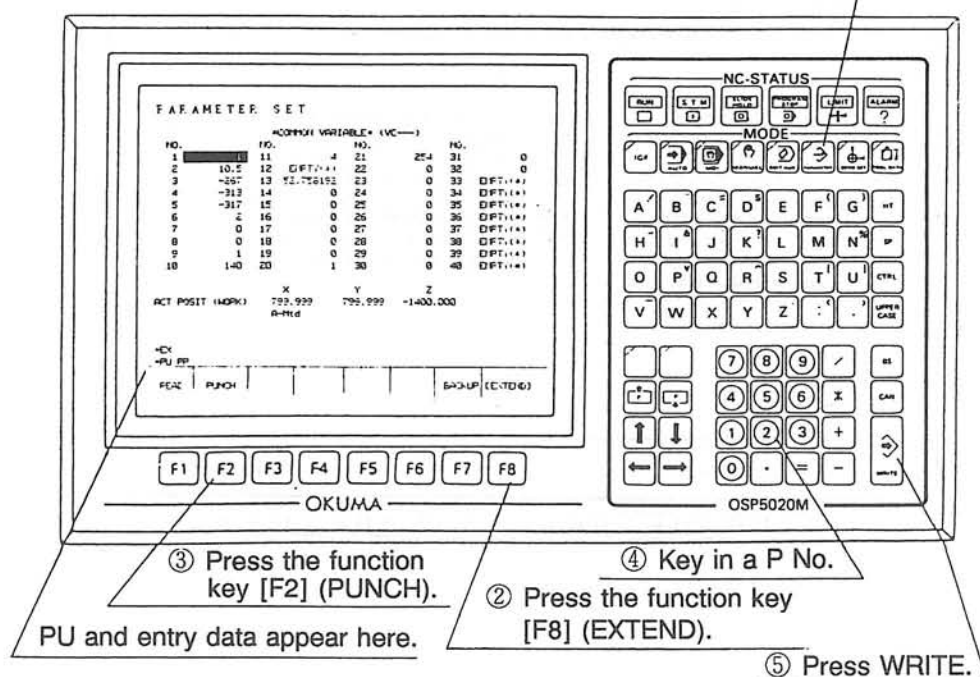
R/3 + underflow

R/4 - underflow

When the data of the type indicated above is entered, the same condition is set.

Operating procedure is shown as follows:

① Press PARAMETER, TOOL DATA or ZERO SET.



- ① Press the **PARAMETER, TOOL DATA** or **ZERO SET** key.
- ② Press the function key [F8] (EXTEND)
This displays the PUNCH [F2] command.
- ③ Press the function key [F2] (PUNCH).
This displays "PU_" on the 21st line on the CRT.
- ④ Enter the device name following "PU_", the following names are usable.

PP: puncher

TT: teletypewriter

When no device name is specified, the device is selected in accordance with the specification code set on the control.

- ⑤ Press the **WRITE** key.

The punch menu is displayed under the heading of *PARAMETER DATA TAPE PUNCH MENU* and then the feed holes and the percent code (%) are punched on paper tape.

The prompt [parameter No.!] then appears.

PARAMETER SET

* PARAMETER DATA TAPE PUNCH MENU *

P NO.	ITEM	P NO.	ITEM
100	ZERO OFFSET	700	OPTIONAL PARAMETER (LONG WORD)
200	TOOL LENGTH OFFSET	710	OPTIONAL PARAMETER (WORD)
210	CUTTER RADIUS COMP	720	OPTIONAL PARAMETER (BIT)
220	TOOL MANAGE NO.	800	MC USER PARAMETER (LONG WORD)
230	TOOL MANAGE DATA	810	MC SYSTEM PARAMETER (LONG WORD)
300	COMMON VARIABLE	820	MC USER PARAMETER (WORD)
400	SYSTEM PARAMETER	830	MC SYSTEM PARAMETER (WORD)
410	USER PARAMETER	840	MC USER PARAMETER (BIT)
600	PITCH ERROR COMP		

=EX
=PU TT:
parameter No. !

READ	PUNCH					BACKUP	[EXTEND]
------	-------	--	--	--	--	--------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

- ⑥ From the menu, select the item number of the parameter data to be punched.

The data entry format is as below:

$\boxed{\text{P No. (A)}} \left[- \boxed{\text{P No. (B)}} \right] \left[, \boxed{\text{Q No. (A)}} \left(- \boxed{\text{Q No. (B)}} \right) \right]$

Entry of a P and Q number should be made without characters P and Q. Use a delimiter “,” when a Q number is entered following a P number.

When a range of P numbers or Q numbers is to be specified, the P number (B) or the Q number (B) must be larger than the P number (A) or the Q number (A), respectively.

For the data entry, see examples below:

Example 1: Punching out all tool length offset data

parameter No. !200 [or 200-200]

Example 2: Punching out all the data from tool length offset to common variable

parameter No. !200-300

Example 3: Punching out No. 8 data of tool length offset data

parameter No. !200, 8 [or 200, 8-8]

Example 4: Punching out No. 8 data of parameter data from tool length offset data to common variable data

parameter No. !200-300, 8

Example 5: Punching out tool length offset data within a required range, from No. 2 to No. 8, for example

parameter No. !200, 2-8

Example 6: Punching out within a required range of parameter data from tool length offset data to common variable data

parameter No. !200-300, 2-8

- ⑦ Press the **WRITE** key.

The data within the selected range is punched out from the specified output device.

- ⑧ After the completion of punching out the desired data, the parameter No. ! is displayed again.

Repeat the steps ⑥ and ⑦ to punch out all the required data.

- ⑨ Finally, press only the **WRITE** key.

The percent (%) code and the trailing feed holes are punched out on the paper tape, thus ending the data punch mode. The display mode is also restored from the punch menu to the originally selected mode.

6-3-4. Other Commands

The OSP5020M has other commands as explained below:

(1) Back Up Command

Data such as tool length offset, cutter radius compensation, origin of work coordinate systems and parameter except system parameter is backed up to bubble in a preset interval. Therefore, turning off the power to the control right after renewing the data will cause the data to stay as it was without being updated.

The execution of the back up command will update the data even when the power is turned off.

Operating procedure is shown below:

- ① Press the **PARAMETER, ZERO SET** or **TOOL DATA** key.
- ② Press the function key [F8] (EXTEND). The display will then be as follows:

PARAMETER SET

MC USER PARAMETER (WORD)

NO.		NO.	
1	AXIS LUBE TIME	60	11 CROSSRL STOP TIME
2	CROSSRL LUBE TIME	2	12 CROSSRL UP TIME
3	AXIS PUMP TIME	30	13
4	CROSSRL PUMP TIME	30	14
5	TOOL UNCLAMP TIME	3	15
6	POWER SAVING TIME	60	16
7	END BUZZER TIME	10	17
8	PLUG TOOL NO.	0	18
9	SPDL OVLOAD TIME	2	19
10	OIL MIST TIME	60	20

	X	Y	Z
ACT POSIT (MC)	1200.000	1200.000	1200.000

*EX

*EX

*BA

"

READ
PUNCH

BACKUP
[EXTEND]

"=BA" is displayed.
After the completion
of backup, "=" is
displayed.

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

③ Press the function key [F7] (BACKUP).

② Press the function key [F8] (EXTEND).

- ③ Press the function key [F7] (BACKUP).

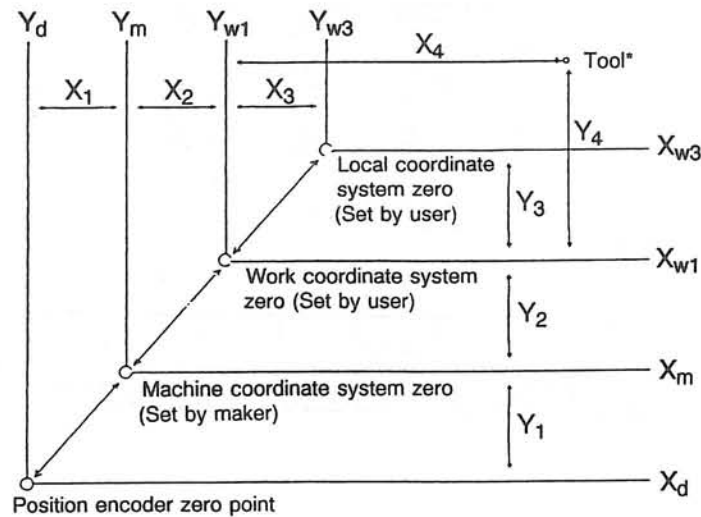
"=BA" appears on the console line and back up is continuously executed. After back up completion, "=" will appears on the screen.

Now, all the data has been backed up and the power to the control may be turned off at any time.

6-4. Zero Set Commands

6-4-1. Work Coordinate System Origin

This is the origin of the work coordinate system viewed from the origin of the machine coordinate system. There is 1 standard set and 20 or 50 optional sets available.



X_1, Y_1 : Machine zero offset amount

X_2, Y_2 : Work zero offset amount

A function called the machine coordinate system origin has been implemented. After the position detector is replaced, all that remains is to set another machine coordinate system origin, without having to set all of the work coordinate system origins (and others) at new values. This may be applied to soft-limits, thus helping to reduce the jobs required after the position encoder is replaced.

How to set the work coordinate system origin as follows:

- (1) Press the **ZERO SET** key.

This changes the CRT screen to Zero Set display.

- (2) The amount displayed on one screen covers up to 10 sets; to see any remaining sets, if 20, 50 or 100 optional sets are selected, press the page key [P ↓] to see on and after 11 set. One full screen of display covers up to four axes. The function key [F5] (AXIS CHANGE) should be pressed to see the remaining axes. When the desired screen appears, move the cursor to the particular data element.

ZERO SET

NO.	X	Y	Z
1	10.000	0.000	0.000
2	0.000	0.000	0.000
3	45.000	32.000	8.000
4	23.500	1230.000	456.200
5	32.580	-0.014	3.500
6	0.000	0.000	0.000
7	0.000	0.000	0.000
8	0.000	0.000	0.000
9	0.000	0.000	777.000
10	0.000	0.000	0.000

1mm

ACT POSIT (WORK)	X	Y	Z
	-350.320	-250.320	99.680

H-Mtd

*S 45.
*S 32
*S 8

SET
ADD
CAL
SEARCH

[EXTEND]

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

(3) Setting

- (a) When the offset of the work zero (origin of work coordinate system) is known, press the function key [F1] (SET) and enter that work zero offset. (The entry data is X_2 and Y_2 on the previous drawing.)
- (b) When the work zero has been set and it serves as the reference of further offset, press the function key [F2] (ADD) and enter the distance of the position to be set as viewed from the preset position.
- (c) When it is necessary to set the work zero offset which causes the present actual machine position to be the new desired actual position, press the function key [F3] (CAL) and enter the new actual position data. (In the previous drawing, key in X_4 and Y_4 , to set X_2 and Y_2 .) The entered data is displayed on the 21st line of the screen.

(4) Press the **WRITE** key.

This updates the data indicated by the cursor.

Note that a " * " appears before the number of the work coordinate system which is currently selected.

Note: Local coordinate systems are effective only in programming.

6-5. Tool Data Set Commands

6-5-1. Tool Length Offset and Cutter Radius Compensation

Tool offset or compensation has been incorporated since the tip position is dependent on tool type. Tool data consists of length offset and cutter radius compensation. The system offers 50 standard data elements (No. 1 to No. 50) and 100 (or 200 or 300) optional data elements. (No. 0 is limited to 0.)

Data is set as follows:

Before executing steps (1) and (2), set the zero offset of the tool axis. Mount the tool for setting. Manually align the tool tip with the reference surface. Press the function key [F3] (CAL) and key in the data, which consists of the axis name, the direction, and the current position as viewed from the origin, on the keyboard. Note, here, that the axis name represents the axis parallel to the axis on which the tool rotates (X, Y, and Z-axis).

- (1) Press the **TOOL DATA** key.

This displays the tool data. If the ATC tool number is displayed, press the function key [F6] or [F7] (ITEM). This changes the display to the tool data screen.

- (2) One page of display covers 20 sets of tool length offset values and as many sets of cutter radius compensation values. If desired data is not seen on the page, operate the page keys or the [F4] (SEARCH).

TOOL DATA SET							
TOOL LENGTH OFFSET (H--)				*CUTTER R COMP* (D--) 1mm			
NO.		NO.		NO.		NO.	
1	1.000	11	0.000	1	10.000	11	0.000
2	2.000	12	0.000	2	5.000	12	0.000
3	1.000	13	0.000	3	2.320	13	0.000
4	1.000	14	0.000	4	0.000	14	0.000
5	10.000	15	0.000	5	0.000	15	0.000
6	0.000	16	0.000	6	0.000	16	0.000
7	0.000	17	0.000	7	5.000	17	0.000
8	122.432	18	0.000	8	0.000	18	0.000
9	0.000	19	0.000	9	0.000	19	0.000
10	889.499	20	0.000	10	0.000	20	0.000

ACT POSIT (WORK)	X	Y	Z
	-350.320	-250.320	99.680
	A-Mtd		

=S 5.
=S 5.
=S 10
=

SET	ADD	CAL	SEARCH	ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	-------	-------	----------

F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8
-----	-----	-----	-----	-----	-----	-----	-----

After obtaining the page displaying the desired tool data, position the cursor at the desired data element.

(3) Setting

- (a) When the tool data is known, press the function key [F1] (SET) and enter tool data on the keyboard.
- (b) When the tool data has been set and the change amount from the set data is known, press the function key [F2] (ADD) and enter the change amount.

(c) Tool length offset

Before carrying out the above steps (1) and (2), set the zero offset of the tool axis. Mount the tool for setting.

Manually align the tool tip with the reference surface.

Press the function key [F3] (CAL) and key in the data, which consists of the axis name, the direction, and the current position as viewed from the origin. Note, here, that the axis name represents the axis parallel to the axis on which the tool rotates (X-, Y- and Z-axis).

Generally, the axis name is Z-axis.

Example: CAL Z 10.5

CAL Z -20.5

(4) Press the **WRITE** key.

The data is set at the position indicated by the cursor.

Note: The tool offset number presently selected is identified by an asterisk () appearing right before that tool offset number.*

6-5-2. ATC Pot No./Tool No. Table

Memory-random ATC Specification:

In the memory-random ATC system, the tool set in the spindle is returned to the magazine toolpot of the tool to be set in the spindle next. Therefore, the correspondence between the tool number and the pot number will change each time the tool change cycle is carried out. This requires the initial correspondence between the tool number and the magazine pot number to be stored in the control memory after setting all the tools in the magazine.

In addition, since the use of a large-diameter tool will cause an interference with adjacent tools, the control must be capable of recognizing a large-diameter tool so that the toolpot which accommodates one is placed between the pots having dummy tools or no tool. That is, the large-diameter tool must be returned to the toolpot originally stored.

A large-diameter tool is distinguished from other conventional tools based on tool diameter as shown below:

	MC-30VA	MC-40VA [40VB]	MC-50VA MC-60VA
Conventional tool	Less than 90 mm-dia. (3.54 in.)	Less than 95 mm-dia. (3.74 in.) [110 mm (4.33 in.)]	Less than 135 mm-dia. (5.31 in.)
Large-diameter tool	90 mm-dia. (3.54 in.) or larger	95 mm-dia. (3.74 in.) [110 mm (4.33 in.)] or larger	135 mm-dia. (5.31 in.) or larger

Setting of the correspondence between the tool number and toolpot number is made in the following two ways:

- (1) The table listing the original correspondence between the tool numbers and toolpot numbers should be made beforehand on the CRT. After that, the tools are set in the toolpots in accordance with the correspondence table data.
- (2) Tools are set in the spindle and they are returned to the magazine in the manual tool change operations. In this case, the toolpot where the tool in the spindle is to be returned may be specified or the one automatically selected may be used, as required.

Explanations in this section cover the procedure indicated in (1). For the procedure of (2), please refer to Section 2, 10-4. "ATC".

Setting:

TOOL DATA SET *ATC POT NO./ TOOL NO. TABLE*							
POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.
1	D	11	011P	21	007		
2	002L	12	012	22	022		
3	D	13	013	23	023		
4	001	14	026	24	NA		
5	D	15	NA				
6	006PL	16	025				
7	D	17	003				
8	004	18	NA				
9	009	19	019				
10	010	20	020				

ACT POSIT (WORK)	X -350.320 A-Mtd	Y -250.320	Z 99.680
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*S 25
 *S 6,PL
 *S *
 *

SET		SEARCH	ITEM*	ITEM*	[EXTEND]
-----	--	--------	-------	-------	----------

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

- ① Press the **TOOL DATA** key.
- ② Press the function key [F7] (ITEM).
The CRT will display the page of "*ATC POT NO./TOOL NO. TABLE*"
- ③ Locate the cursor at TOOL NO. position of the POT NO. for which the tool number is to be set.
- ④ Press the function key [F1] (SET)
"S_" will be displayed on the console line. ("_" indicates the space.)

⑤ Key in the desired tool number through the keyboard.

- (a) Conventional tool S_L
- (b) Large-diameter tool S_7, L
- (c) Dummy tool S_D
- (d) For clearing tool number S_*
- (e) Planer tool (optional) S_6, P

⑥ Press the **WRITE** key.

This sets the correspondence between the tool number and the toolpot number.

Note 1: The symbols "→" and "≫" appearing in the POT NO. column indicate the position of the corresponding toolpot.

→ : Tool change position with ATC

≫ : Manual tool change position

Note 2: The range of toolpot numbers which can be set is from "1" to the magazine capacity (the number of tools accommodated in the magazine).

Standard Specifications:

MC-30VA . . . 16 tools

MC-40VA . . . 20 tools

MC-50VA . . . 20 tools

MC-60VA . . . 20 tools

MC-400H . . . 32 tools

The usable number of tool numbers is identical to the programmable number of tool offset numbers.

Note 3: For a large-diameter, setting is allowed only when the two adjacent toolpots are assigned with no tool number or dummy tool code, "D". An alarm occurs if either of two adjacent toolpots is assigned with an actual tool number.

The setting of a large-diameter tool in a toolpot automatically sets dummy tool code, "D", at two adjacent toolpots.

Note 4: In case the tool number already used is again entered for a new toolpot, an alarm occurs.

Note 5: Any attempt to set a tool number for a toolpot which has a dummy tool in it causes an error. In this case, cancel the dummy tool code by entering "" code. Note that the dummy tools placed in the adjacent toolpots for the one accommodating a large-diameter tool should not be cleared. A dummy tool may be placed between two large-diameter tools as a common dummy tool.*

Fixed Address ATC Specifications:

To select a tool from the tools in the magazine using a tool number command, it is necessary to set the correspondence between the tool numbers and the toolpot numbers.

If an interference occurs between the tools stored in the two adjacent toolpots due to their diameters, set the safety adaptor in toolpots at both sides of the toolpot which holds a large-diameter tool. This prevents an occurrence of interference between the tools during tool setting operations.

Setting:

TOOL DATA SET *ATC POT NO./ TOOL NO. TABLE*							
POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.
1	001	11	011	21	021		
2	002	12	012	22	022		
3	003	13	013	23	023		
4	004	14	014	24	024		
5	005	15	015				
6	006	16	016				
7	007	17	017				
8	008	18	018				
9	009	19	019				
10	010	20	020				

ACT POSIT (WORK)	X -350.320 A-Mtd	Y -250.320	Z 99.680
------------------	------------------------	---------------	-------------

=S 1

SET		SEARCH		ITEM↑	ITEM↓	[EXTEND]
-----	--	--------	--	-------	-------	----------

F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8
-----	-----	-----	-----	-----	-----	-----	-----

- ① Press the **TOOL DATA** key.
- ② Press the function key [F7] (ITEM).
The CRT will display the page of "*ATC POT NO./TOOL NO. TABLE*".
- ③ Locate the cursor at the TOOL NO. position of the POT NO. for which the tool number is to be set.
- ④ Press the function key [F1] (SET).
The CRT will display "S_" on its console line. ("_" indicates the space.)
- ⑤ Key in the desired tool number through the keyboard.
 - (a) Tool number S_1
 - (b) Safety adaptor S_D
 - (c) For clearing tool number S_*
 - (d) Planer tool (optional) S_6, P
 - (e) Heavy tool S_1, M
- ⑥ Press the **WRITE** key.

This sets the correspondence between the tool number and the toolpot number.

- Note 1:** If the tool number already used is again entered for a new toolpot, an alarm occurs.
- Note 2:** An attempt to set a tool number for a toolpot which has a dummy tool in it causes an error. In this case, cancel the dummy tool code by entering "*" and set.

Clearing/Setting Tool Numbers:

It is possible to clear tool numbers set on the "ATC POT NO./TOOL NO. TABLE" screen at one time, or to set tool numbers which correspond to toolpot numbers (having same numbers) on the "ATC POT NO./TOOL NO. TABLE" at one time.

Note tool numbers can not be set at one time unless the correspondence between toolpot numbers and tool numbers are all cleared.

(1) Operating Procedure

(a) Clearing Tool Numbers

① Press the **TOOL DATA** key.

② Press the function key [F7] (ITEM ↓).

The CRT will display the page of "ATC POT NO./TOOL NO. TABLE".

③ Key in "TCAN" through the keyboard and press the **WRITE** key.

The following message will be displayed on the screen.

Tool table initialize OK ? (Y/N)

④ Key in "Y" and press the **WRITE** key to clear tool numbers.

Key in "N" and press the **WRITE** key to cancel clearing tool numbers.

(b) Setting Tool Numbers

① Press the **TOOL DATA** key.

② Press the function key [F7] (ITEM ↓).

The CRT will display the page of "ATC POT NO./TOOL NO. TABLE".

③ Key in "TSET" and press the **WRITE** key.

Note: When an attempt is made to set tool numbers without clearing the correspondence between toolpot numbers and tool numbers, no data will be set.

ATC Magazine Pot Number Display:

The following display allows the operator to check the correspondence between the registered cutting tools and the magazine pots. On this display page, setting is not possible.

Operations:

TOOL DATA SET *TOOL NO./ ATC POT NO. TABLE*							
TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.
001	1	011	11	021	21	031	NA
>002	2	012	12	022	22	032	NA
003	3	013	13	023	23	033	NA
004	4	014	14	024	24	034	NA
005	5	015	15	025	NA	035	NA
006	6	016	16	026	NA	036	NA
007	7	017	17	027	NA	037	NA
*008	8	018	18	028	NA	038	NA
009	9	019	19	029	NA	039	NA
010	10	020	20	030	NA	040	NA

ACT POSIT (WORK)	X -350.320 A-Mtd	Y -250.320	Z 99.680
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=IF							
=IF							
=IF							
=							

					ITEM↑	ITEM↓	(EXTEND)
--	--	--	--	--	-------	-------	----------

F1	F2	F3	F4	F5	F6	F7	F8
----	----	----	----	----	----	----	----

- L : Indicates a large-diameter tool.
- P : Indicates a planer tool.
- * : Indicates the tool number of the tool in the spindle (active tool number)
- : Indicates the next tool.

When the function key [F7] (ITEM↓) is pressed on the ATC POT NO./TOOL NO. TABLE screen, the TOOL NO./ATC POT NO. TABLE screen will be displayed.

Since the number of cutting tools is identical to the number of tool offset pairs, it is not possible to display all tool numbers (for a total of 40 tools) on one display page. Press the page key to change the display page.

6-5-3. ATC Tool Number (Fixed-Address ATC Specification)

With the fixed-address ATC specification, the active and/or next tool can be changed when any of the following operations has been executed.

- The tool in the spindle has been removed manually using the switches/buttons on the magazine manual operation panel.
- A tool has been manually set in the spindle using the controls on the magazine manual operation panel.
- The next tool number has been input erroneously.

Note however this operation is allowed only if is absolutely necessary. If ATC operation is interrupted, use the **1 STEP ADVANCE**, **1 STEP RETURN**, and **RETURN CYCLE START** keys on the machine operation panel to restore the interrupted operation.

(1) Active Tool

This indicates the tool currently set in the spindle.

If the tool has been removed manually from the spindle using the switches/buttons on the magazine manual operation panel, set "0" at ACTIVE TOOL.

To return a tool to the ATC magazine, first set the tool in the spindle using the switches/buttons on the magazine manual operation panel, set the active tool number, and then press the **1 CYCLE START** key on the machine operation panel. This returns the tool to the ATC magazine.

In this case, the ATC sequence number must be "1". This means the magazine pot number to which the tool is returned must be set at the active tool number.

Note that setting of the next tool is possible only when the ATC sequence number is "1".

(2) Next Tool

This indicates the tool to be replaced with the tool currently set in the spindle.

This setting is used to change the next tool number which has been entered erroneously. In this case, simply set the correct tool number.

"0" cannot be set as the next tool number. If it is necessary to clear the next tool, select the MDI operation mode, enter T00 or M63, and press the **CYCLE START** button.

Note that setting of the next tool is possible only when the ATC sequence number is "1".

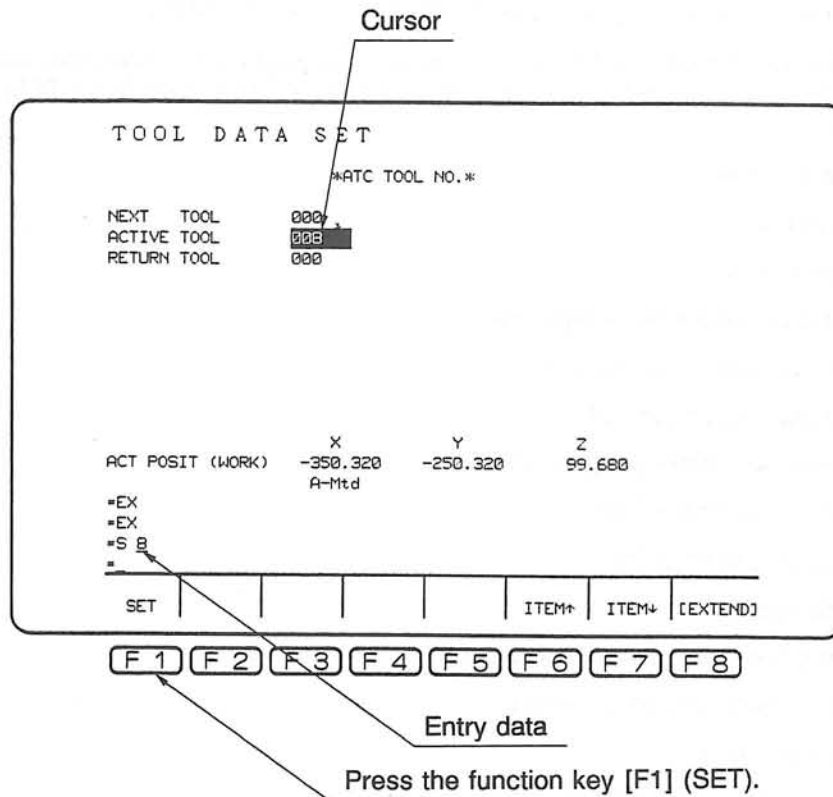
(3) Return Tool

During automatic tool change operation, the tool set in the spindle is taken as the return tool when it is removed from the spindle by the tool change arm. This means the active tool number becomes the return tool number and the active tool number is cleared to "0". Then, the tool change arm swings and sets the new tool in the spindle. At this moment, the next tool number is cleared to "0" and the next tool number becomes the active tool number.

The return tool number can be displayed but cannot be set.

Procedure to set tool numbers:

- ① Select the TOOL DATA SET mode.
- ② The TOOL DATA SET screen has two different pages: the ATC TOOL NO. page and the TOOL DATA page. The screen can be switched between these two pages by pressing the function keys [F6] (ITEM ↑) and [F7] (ITEM ↓).



- ③ Move the cursor in the vertical direction and place it at the desired data position (cursor cannot be moved in the horizontal direction.)
- Press the function key [F1] (SET) and key in the desired tool number. The keyed-in number will be displayed on the 21st line of the screen.

For MCM

When setting the actual tool number, it is necessary to designate whether the tool is set in the vertical spindle or the horizontal spindle.

Data to be entered:

Vertical spindle tool number
Horizontal spindle tool number, H

Entry of the data in other format will cause an error. The spindle types designation not matching the spindle presently selected will also cause an error.

Example:

[F1] (SET) 6 for vertical spindle
[F2] (SET) 8H for horizontal spindle

Display:

When tool numbers for the horizontal spindle are displayed, character "H" will be displayed following the tool number. For the vertical spindle, only the tool numbers will be displayed.

- ④ Press the **WRITE** key.

6-6. Parameter Setting

To perform NC operations, for example positioning, program editing, and so forth, data such as axis travel ranges, tape output code, and others, are predetermined for each individual function. However, there are cases in which these data needs to be changed in accordance with the change in operation conditions.

The data elements used to control NC functions are called parameters.

The parameters can be classified into 14 types as indicated below. Parameter setting screens can be displayed as needed by pressing the function keys [F6] (ITEM ↑) and [F7] (ITEM ↓) in the parameter setting mode.

- (1) Common variable
- (2) User parameter
- (3) G/M code macro
- (4) Machine user parameter (long word)
- (5) Machine user parameter (word)
- (6) Machine user parameter (bit)
- (7) NC optional parameter (long word)
- (8) NC optional parameter (word)
- (9) NC optional parameter (bit)
- (10) Input unit system
- (11) Machine system parameter (long word)
- (12) Machine system parameter (word)
- (13) System parameter
- (14) Pitch error compensation data

Contents and setting procedures of parameters are detailed in Section 3, "Parameters".

7. Program Management

The capacity of the memory for storing part programs is 40 meters (131 feet) in the standard model. Furthermore, capacities of 80, 160, 320, 640, 1280, 2560, 3840, 5120, 6400, 7680, 8960 and 10240 meters (262, 525, 1050, 2100, 4200, 8400, 12600, 16800, 21000, 25200, 29400 and 33600 feet) are optional.

The OSP5020M has commands for DATE entry, initializing, program deletion, etc. in addition to reading in and punching-put of a program tape and program editing.

In this system the file names can also be interchanged as individual programs are assigned a file name for managing the programs.

7-1. Program Commands List

Item	Command	Functions	Remarks
Date	DATE	Sets the date.	
Directory	DIR	Displays file directory.	
Transfer	PIP	Transfers program file.	Sub commands provided
Edit	EDIT	Edits program file.	Sub commands provided
Free capacity	FREE	Indicates remaining memory capacity.	
List	LIST	Lists file contents.	
Arrangement	CONDENS	Arranges the stored data.	
Time	TIME	Sets the time.	
Initializing	INIT	Initializes the bubble memory, floppy disks and other data storage devices.	
Deletion	DELETE	Deletes the specified file.	
Renaming	RENAME	Changes the specified file name.	
File protection	PROTECT	Prohibits writing to or renewing of the specified file.	

In a file name entered for directory display or for deletion, symbols “*” (asterisk) and “?” (question mark) are usable.

Here, “*” indicates a character string and “?” a character.

Example:

*.MIN	All files with extension MIN
.*	All files
AB*.MIN	Among files with extension MIN, those whose file name begins with AB
*AB.MIN	Among files with extension MIN, those whose file name ends with AB
SH?FT.MIN	Among files with extension MIN, those whose file name is SH?FT. (? represents an alphanumeric character, A through Z and 0 through 9)

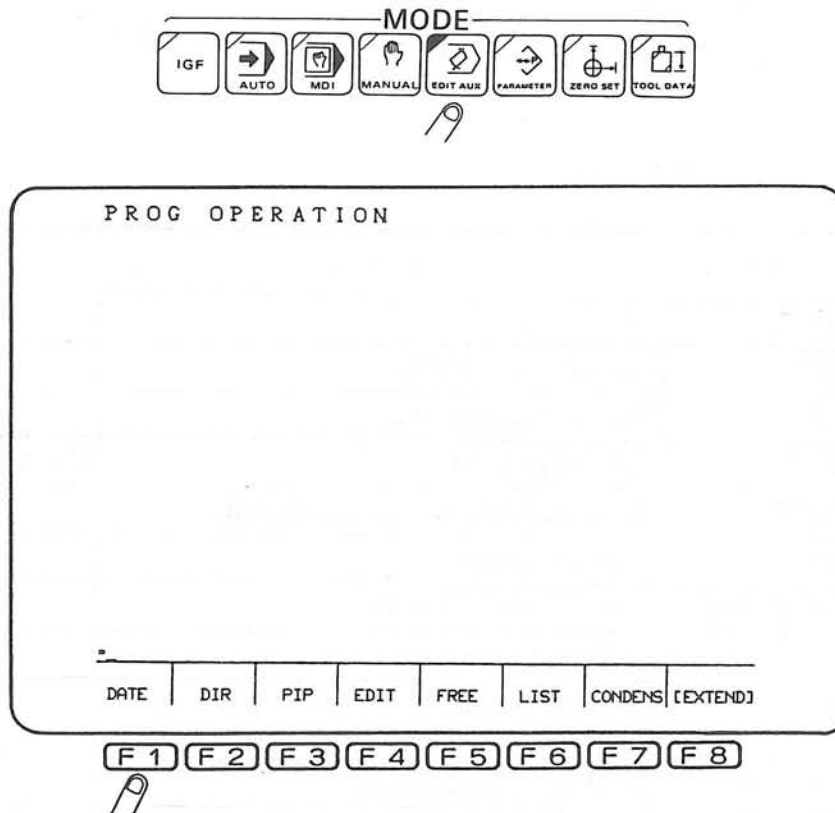
Each command is explained in detail in the following pages.

7-2. DATE

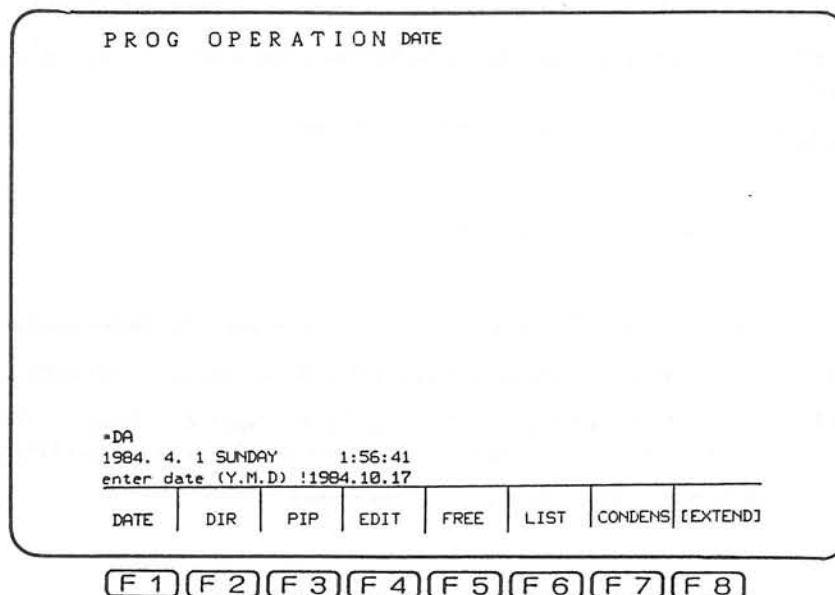
When making a file, the date can be entered. The system updates the date as long as power supply is not shut off. Note that if no date is set after power is turned on, the system automatically sets April 1, 1984.).

Date setting procedure is given below.

- (1) Select the PROG OPERATION mode by pressing the **EDIT AUX** key.



- (2) Press the function key [F1] (DATE)

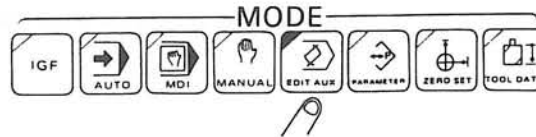


Note 2: Pressing the **WRITE** key without entering the date ends the operation and nothing occurs.

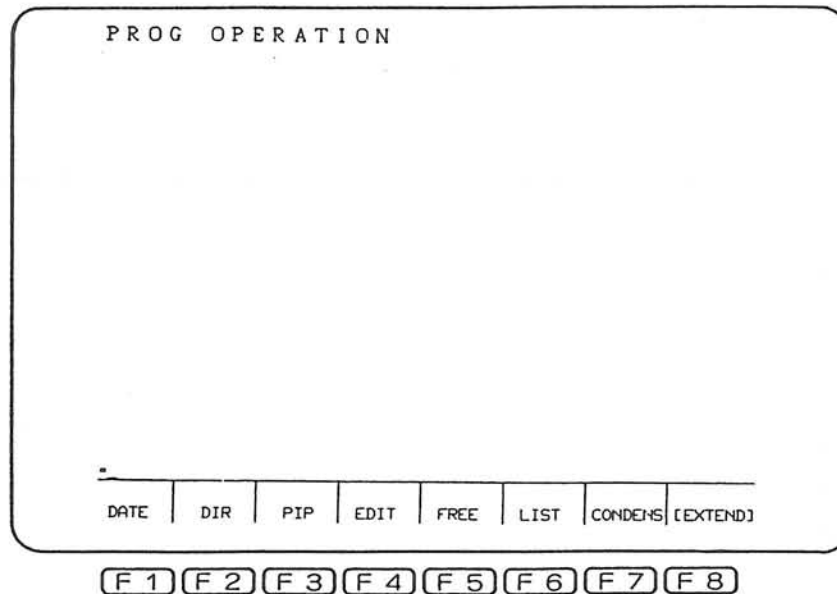
7-3. DIRECTORY

This is the function for making a list of files stored in the bubble memory (BB1:) or the floppy disk (FD0:). The list may be displayed on the CRT and it may also be printed.

- (1) Select the PROG OPERATION mode by pressing the **EDIT AUX** key.

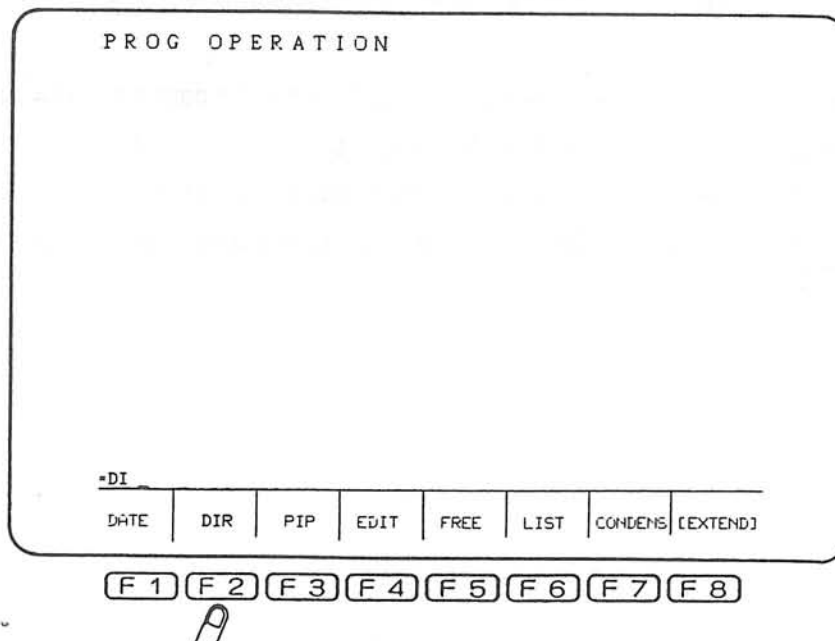


The function names on the CRT will change as shown below.



- (2) Press the function key [F2] (DIR).

The CRT displays the prompt "DI" on its console line.



- (3) Enter the device name, BB1: or FD0:. The default is BB1:.
- (4) Press the **WRITE** key.



- (5) The list of file names is displayed on the CRT.

PROG OPERATION DIR					
DIR	BB1:*,*			PAGE	1
FILENAME	SEC	BYTE	CHARACTER	DATE	
A.MIN	0001	000012	18	1984. 4. 1	
MIL.MIN	0001	0000BF	191	1984.10.17	
A100.MIN	0001	000010	16	1984.10.17	
A200.MIN	0001	00008D	141	1984.10.17	
A300.MIN	0001	000069	105	1984.10.17	
A400.MIN	0001	000014	20	1984.10.17	
A600.MIN	0001	00000F	15	1984.10.17	
A500.MIN	0001	000010	16	1984.10.17	
B1.MIN	0001	000013	19	1984.10.17	
B2.MIN	0001	000004	10	1984.10.17	
B3.MIN	0001	000021	33	1984.10.17	
B4.MIN	0001	000019	25	1984.10.17	
=DI					
DATE	DIR	PIP	EDIT	FREE	LIST CONDENS [EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6 F 7 F 8

Note 1: Up to 12 filenames are displayed on the screen.

When all filenames are not indicated on one display page, the CRT does not provide the prompt "=" and the cursor remains as it was.

In this case:

- (a) Press the **BS** key, and the display advances one page.
- (b) Press the **WRITE** key, and the display will advance continuously. To stop this advancement, press the **BS** key.
- (c) Press the **CANCEL** key, and the command will be aborted with the display unchanged.

Example: When there are many filenames,

- DIR and WRITE Display of the 1st page
- BS Keep pressing until the required page is displayed.
- CANCEL Abort the directory mode
- EDIT Specify the file, observing the display.

Note 2: When there are no files, the message "no file" is given.

Note 3: Key in a file name following the prompt "DI", and you can check whether that file exists or not.

In this file name entry step, the use of symbols "*" (asterisk) and "?" (question mark) is permitted.

The symbol "*" indicates a string of characters while the symbol "?" represents a character. "*" may be used only once in both a file name and extended name.

Therefore, by specifying "*" and "?" in a filename, all the file names corresponding to the entered file name are given.

Example 1: =DI_*. MIN [WRITE]

All the file names assigned with the extended file name MIN

Example 2: =DI_BOX*. MIN [WRITE]

All the file names assigned with the extended name MIN and the main file name beginning with BOX.

Example 3: =DI_*. * [WRITE]

All the file names (same as no data entry)

Example 4: =DI ??? . SUB [WRITE]

All the file names assigned with the extended name SUB, and whose main file name consists of up to three characters.

Example 5: =DI_BOX-1 ??? . * [WRITE]

All the file names whose main file name begins with BOX-1 and the remaining filename consists of up to three characters.

Note 4: Output device name can be entered following the filename. A comma should be inserted before the output device name.

Example: =DI_*. *, TT: [WRITE]

With the data entered as above, all the filenames are printed out by the teletypewriter.

As an output device name, PR: (printer) is also used.

Note 5: There is an Option Setting, indicated below, which follows the filename.

;P (file protected state is displayed following the date)

00: Not protected

01: User-protected

02: Maker-protected

Refer to "Part Program Floppy Disk Input/Output Function" in "Special Function Manual" for the directory of a floppy disk.

7-4. TRANSFER

This is the command to transfer a program, with the following sub commands:

Item	Command	Functions
Read	READ	Registers a part program after reading it through the tape reader.
Punch	PUNCH	Punches out the part program stored in the bubble memory.
Verify	VERIFY	Verify the program in the bubble memory with the program on the paper tape.
Copy	COPY	Copies the program file on memory.
Forward	FAST FORWARD	Tape reader rapid forward feed motion.
Rewind	FAST REWIND	Tape reader rewinding.
PIP quit	QUIT	Ends transfer mode and restores the program operation mode.
Macro program loading	MACRO LOADING	Copies files with extension .LIB in the floppy disk supplied by Okuma to BB1:.

**REMARKS**

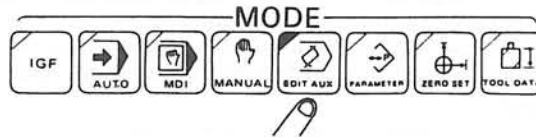
Never turn off power supply during the execution of file transfer or file editing. If it is turned off, the file contents will be unreliable.

7-4-1. Read

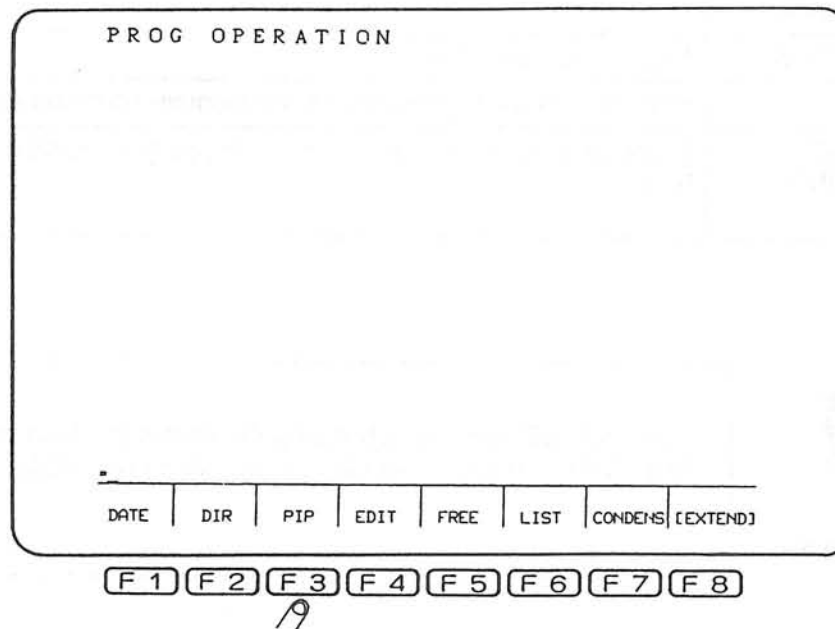
This is the operation to read a program by the tape reader and to store it in the bubble memory.

The operation procedure details are as follows:

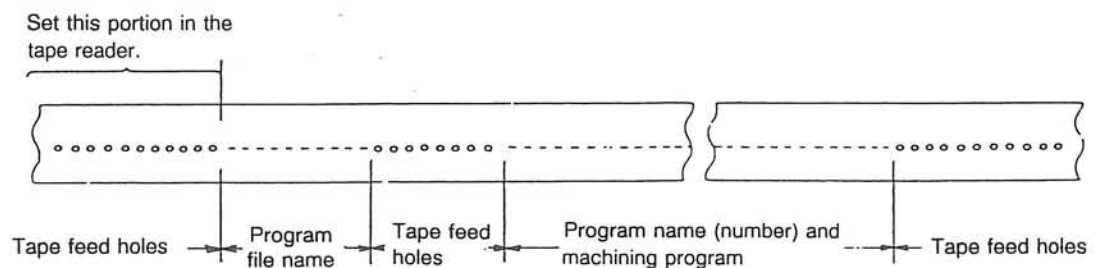
- (1) Select the PROG OPERATION mode by pressing the **EDIT AUX** key.



The function name on the CRT will change as shown below.



- (2) Set the program tape in the tape reader.



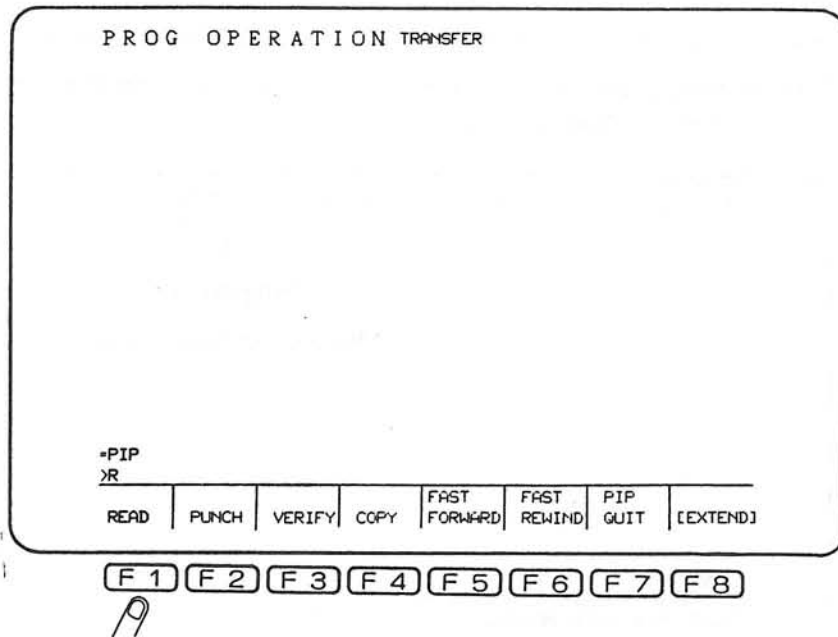
Note: Insert the tape into the tape reader, making sure that the feed holes of the tape leader section are aligned correctly over the tape reader sprocket.

- (3) Press the function key [F3] (PIP).

(Note that the function name on the CRT will change.)

- (4) Press the function key [F1] (READ).

The prompt "R" appears on the console line, indicating that the OSP5020M is ready for tape reading-in.



- (5) Press the **WRITE** key.



Pressing this key starts the tape reader. The commands on the tape are read and stored in memory.

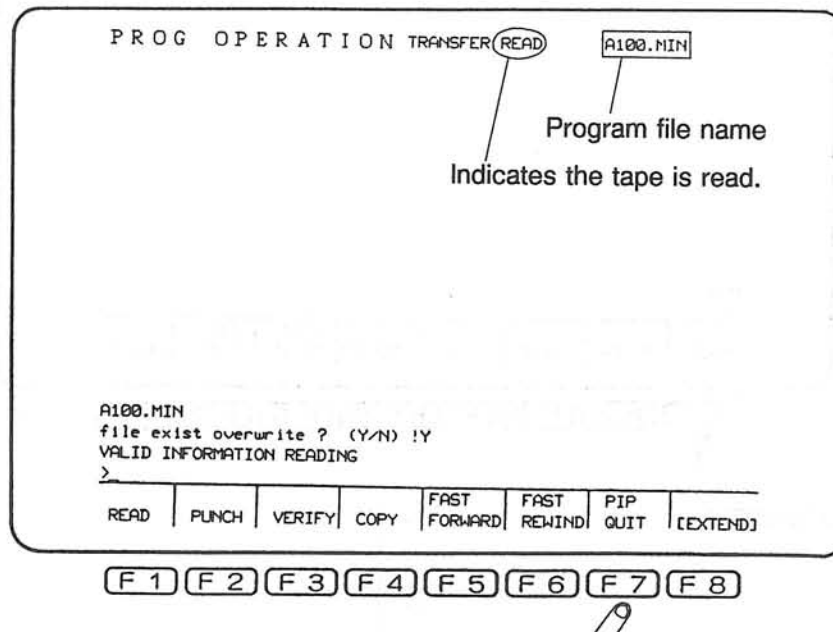
While the tape is being read, the CRT displays "READ" along with the "file name" on the first line.

When the first EOB code appears after the start of the tape reading-in, the message "VALID INFORMATION READING" is displayed.

At the completion of the tape reading-in, the tape is then rewound and read in the reverse order to verify the read and stored program against the program on the tape.

When the tape reading-in and verification is completed, ">" appears on the console line.

Note: Tape rewinding with or without tape verification is selectable by setting bits 4 and 5 of NC optional parameter (bit) No. 1.



(6) Press the function key [F7] (PIP QUIT).

This completes the tape reading-in operation and the CRT display returns to the mode as in step (1).

Refer to Section 2, 7-4-3. "Verifying Punched Out Programs" for details and precautions of this operation.

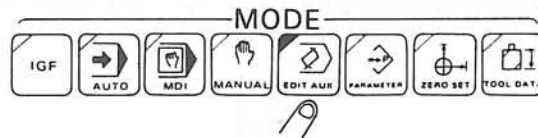
Note: If an error occurs during tape reading, 31 characters preceding the error character are displayed on the console line of CRT.

7-4-2. Punching Out Stored Program Data

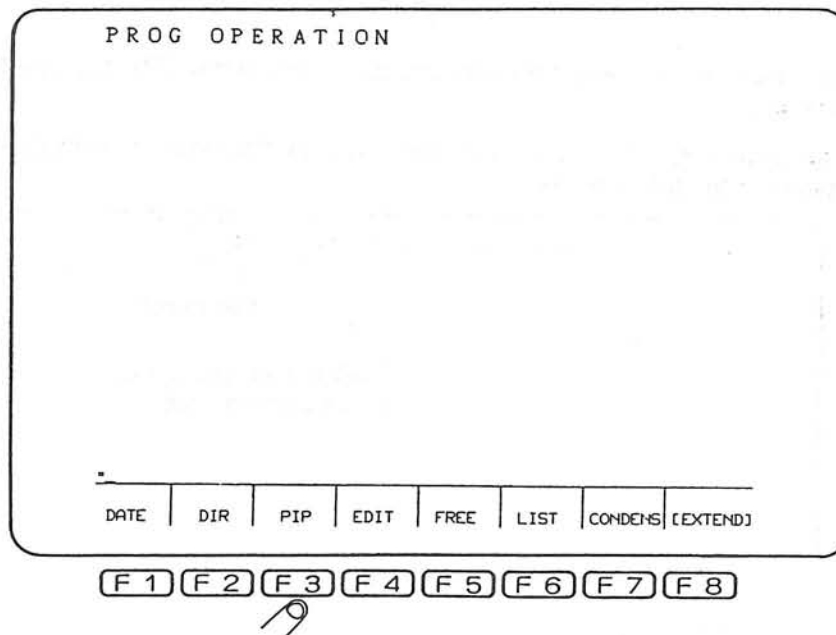
This is the function to punch out the program data stored in the bubble memory.

The procedure is as follows:

- (1) Select the PROG OPERATION mode with the **EDIT AUX** key.

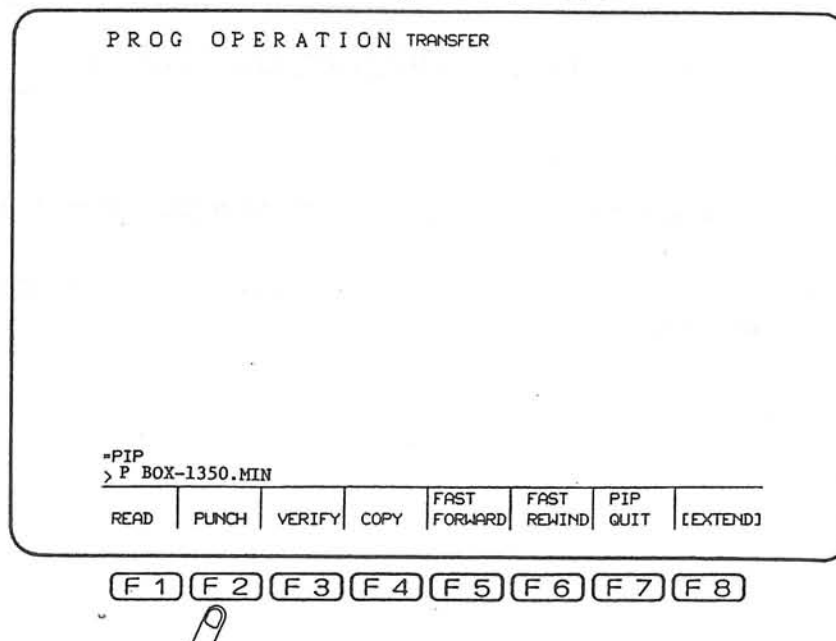


The function name on the CRT will change as shown below.



- (2) Press the function key [F3] (PIP).

The function name on the CRT will change as shown below.



- (3) Press the function key [F2] (PUNCH).

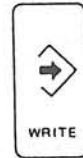
The CRT displays "P" on the console line, indicating that the control is ready for tape punching out.

- (4) Key in the program filename to be punched out.

Example: BOX-1350.MIN

For a program whose file is not specified, i.e., A.MIN, this name specification step is necessary.

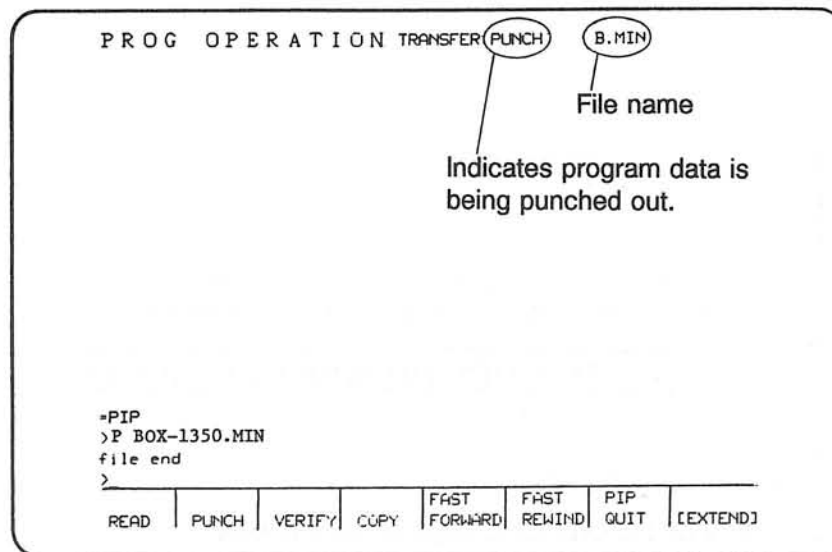
- (5) Press the **WRITE** key.



9

This starts the tape punching out operation, during which the CRT displays "PUNCH" along with the "filename".

When tape punching-out is completed, the message "file-end" is given on the console line and ">" appears in the following line.



F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

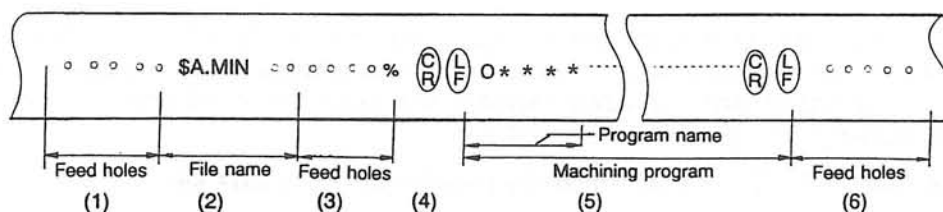
9

- (6) Press the function key [F7] (PIP QUIT).

This completes the tape punching out operation and the display returns to the mode as in step (1).

Note: That tape punching speed will be slowed down while machine operation is carried out simultaneously.

Supplement: Tape Punching Out Format



- (1) 600 tape feed holes are punched in the tape leader section.

The number of feed holes to be punched out can range, as needed, from 1 to 10000 with a parameter.

For details, consult Section 3, "Parameters".

- (2) The file name is punched out following the "\$" code. (Program data is punched out in the ISO coding system.)

- (3) 50 tape feed holes are punched out.

The number of the tape feed holes cannot be changed.

- (4) "%", and "CR", "LF" codes are punched out.

- (5) The part program data is punched out following the program name (number).

- (6) The same number of tape feed holes as in (1) are punched out in the tape trailing section.

Note 1: When the program data is punched out in the EIA coding system, the "CR" code is punched instead of the "CR" and "LF" codes.

When the program data is punched out in the EIA code, the presence of a code not available in the EIA coding system causes an error. Tape punching-out halts and an error message is given on the CRT.

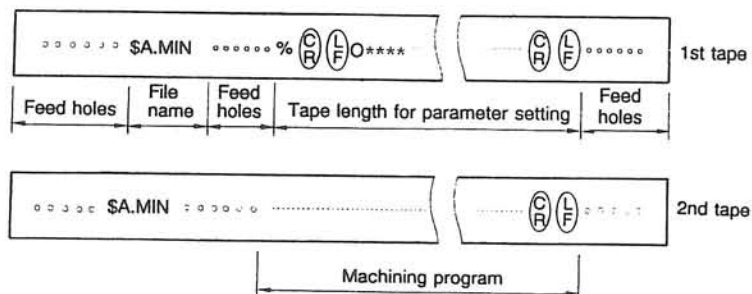
When the tape delimiting code is the "%" (ER) code, i.e., when bit 3 of parameter No. 1 of NC optional parameter (bit) is 1, the "%" code is punched out before feed holes.

Note 2: The part program is split and punched out, if it is too long to be contained in one paper tape roll. Paper tape length may be changed from 1 to 300 meters (3 to 984 feet) using the NC optional parameter (word) No. 2.

As the format, the file name is also punched out, for the second tape and so on. Since the tape ends with "CR" or "LF", actual tape length is somewhat different from the tape length set using the parameter.

When designating paper tape punch out operation on more than one paper taper roll, specify option D in the following format:

P < file-name > , < device-name > ; D



Consult Section 2, 7-4-3. "Verifying Punched Out Programs" for details and cautions on this operation.

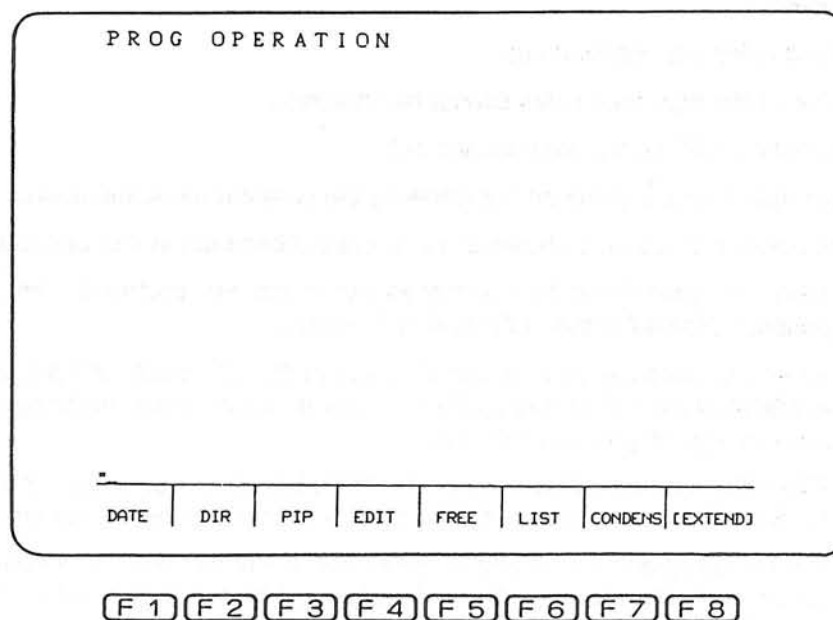
7-4-3. Verifying Punched Out Programs

This is the function for verifying the program transmitted to a target device or medium against the program stored in the source device between the paper tape and the floppy, the paper tape and the bubble memory, the floppy and the bubble memory, the floppy and the floppy, the bubble memory and the bubble memory. The procedure is as follows:

- (1) Select the PROG OPERATION mode by pressing the **EDIT AUX** key.

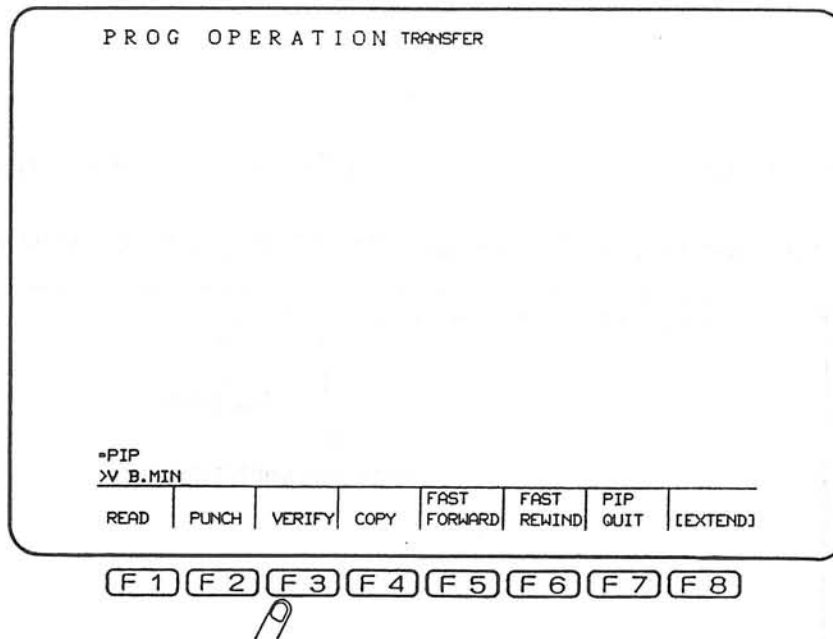


The function name on the CRT will change as shown below.



- (2) Set the tape to be verified in the tape reader in the same manner as for storing a program from a tape to memory.

- (Make sure that the display of the function names and the title changes.)



- "V" appears on the console line and the control is ready for verifying.

- Example:** BOX-1350.MIN.

This step is unnecessary for a program without a file name, i.e., A.MIN.

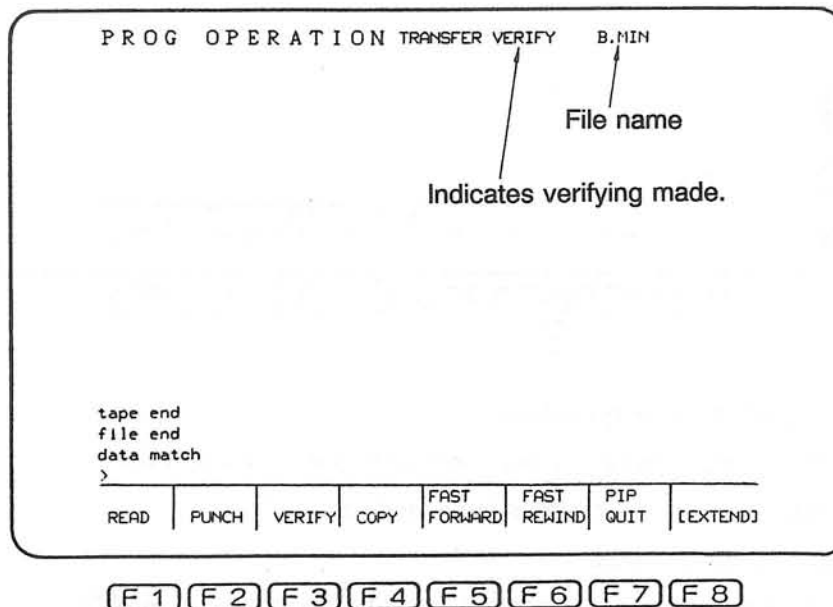
- (6) Press the **WRITE** key.



9

This starts the tape reader, and program data on the tape is read and compared with the stored program data.

While verifying operation, the CRT displays "VERIFY" along with the "file name".



- (7) Press the function key [F7] (PIP QUIT).

This completes verification of the punched out program data and the display mode returns to the one in step (1).

Note: When a data mismatch is found during tape verification, the block (line) which contains inconsistent data is displayed on the screen and the inconsistent character flickers.

```

PROG  OPERATION TRANSFER VERIFY  B.MIN

Blinks
>V B.MIN /
tape file name = B.MIN
N005 GO 110
verify continuing ? (Y/N) !

```

READ	PUNCH	VERIFY	COPY	FAST FORWARD	FAST REWIND	PIP QUIT	[EXTEND]
------	-------	--------	------	--------------	-------------	----------	----------

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

The following message is displayed, asking the operator if he wants to continue verification.

To continue verification, type "Y" and press the **WRITE** key.

To abort verification, type "N" and press the **WRITE** key.

When no data mismatch is found in verification operation, the following messages will be displayed on the screen.

- tape end
- file end
- data match

If data is left in the file after data on a tape has been read, the following messages will be displayed on the screen.

- tape end
- data match

If data is left in the tape after data on the file has been read, the following messages will be displayed on the screen.

- file end
- data match

Precautions for Tape Reading-in, Punching-out, and Verifying Operations

(1) There are two tape coding systems, EIA and ISO. The selection of a coding system can be conducted by:

- Parameter setting, or
- Designating the desired coding system each time tape reading-in, punching-out, or verifying operation is carried out.

(a) Parameter Setting

Bit 1 and bit 0 of NC optional parameter (bit) No. 1 are used to determine the tape coding system: bit 1 for tape code parity discrimination and bit 0 for tape code. The tape coding system is determined by the combination of these bits.

	bit 1	bit 0	
	Tape Code Parity Discrimination	Tape Code	Operation Condition
(A)	1	1	In the READ and VERIFY modes, the coding system is recognized automatically and program data is read or verified. In the PUNCH mode, program data is punched in the ISO coding system.
(B)	1	0	In the READ and VERIFY modes, the coding system is recognized automatically and program data is read or verified. In the PUNCH mode, program data is punched in the EIA coding system.
(C)	0	1	In the READ and VERIFY modes, the control assumes that the coding system is ISO. (If the actual tape code is not ISO, an alarm occurs.) In the PUNCH mode, program data is punched in the ISO coding system.
(D)	0	0	In the READ and VERIFY modes, the control assumes that the coding system is EIA. (If the actual tape code is not ISO, an alarm occurs.) In the PUNCH mode, program data is punched in the EIA coding system.

The standard setting is (A), in which the control reads both EIA- and ISO-coded tapes, and punches out program data in the ISO coding system.

Refer to Section 3, "PARAMETERS" for the procedure to set parameters.

(b) ISO or EIA Designation for READ, VERIFY, and PUNCH Operations

Follow the steps below when conducting READ, VERIFY, and PUNCH operations. This will allow the operator to directly select the coding system regardless of the coding system set by the parameter.

Example: To punch out stored program data in the EIA code

Key in the following command in step 4) of the punch-out procedure of a stored program.

BOX-1350.MIN;E

↑ Indicates EIA.

↑ Key in ";E" following the file to be punched out.

Note: *Designation of EIA, ISO, and Verifying*

;E EIA code

;I ISO code

;V Verifying

(2) There are two different methods to operate the machine with stored programs.

- One main program is stored in the memory and controls machine operation.
- More than one program is stored in the memory and the desired program is read and executed.

(a) When one main program is stored in the memory

In this case, it is necessary to assign a file name to the program. In the memory, however, the program is assigned the file name "A.MIN".

(b) When more than one program is stored in the memory

In this case, a program can be executed in two different ways.

i) One file for one program

Only one program is registered in one file.

ii) One file for several programs

More than one program is registered in one file.

In both cases, it is advisable to create the program by assigning a file name on the tape. If the file name is not assigned on the tape, follow the steps below and assign a file name when storing a program in the memory.

① Press the function key [F1] (READ).

② Key in the file name following a comma.

" ,file name"

③ Press the **WRITE** key.

With the steps above, the file name is specified and the program on the tape is stored in the memory.

To simplify program tape management, it is recommended to register one program in one file.

(3) To store program data following the program data already stored in the memory, follow the steps below.

① Press the function key [F1] (READ).

② Key in the file name and ";A".

" ,file name;A"

③ Press the **WRITE** key.

When the program is long and cannot be punched on one tape, the second and subsequent tapes should be read following the above steps.

- (4) When the file name is already registered in the memory and when it is necessary to store a program with the same file name, follow the steps indicated below to erase the previous program and to store a new program.

PROG OPERATION TRANSFER READ
A100.MIN

>R
 tape file name = A100.MIN
 A100.MIN
 file exist overwrite? (Y/N) !

File name already registered
 in the memory

READ
PUNCH
VERIFY
COPY
FAST FORWARD
FAST REWIND
PIP QUIT
[EXTEND]

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

① Press the function key [F1] (READ), key in the file name, and press the **WRITE** key.

② The following message will be displayed on the CRT screen.

file exist overwrite? (Y/N)

③ Type "Y" and press the **WRITE** key.

Data in the specified file is erased and new data is read from the tape reader and stored in the memory.

Note: If data does not need to be stored, type "N" and press the **WRITE** key.

When a file name is not given on the tape while the name of the file stored in the memory is "A.MIN" (that is, the file is not assigned a file name), it is not necessary to specify the file name after pressing the function key [F1] (READ).

- (5) File names can be specified and changed as required by inputting the following.

[F1] (READ) "Input File Name","Output File Name"

When an input file name has not been specified, the file name given on the tape is taken as the input file name. If no file name is given on the tape, the program is assigned the file name "A.MIN".

When an input file name is specified, it is necessary to check that the specified file name agrees with the file name on the tape. If the specified file name agrees with the file name on the tape, an error is generated. (An error message is displayed on the CRT screen.)

When an output file name has been specified, the specified file name is created in the memory.

When an output file name has not been specified, the input file name is used as the output file name.

In this case, the delimiter "," can be omitted.

To specify an output file name without entering an input file name, be sure to enter the delimiter ",".

Example 1: [F1](READ) BOX-1.MIN,BOX-2.MIN [WRITE]

A program assigned the file name "BOX-1.MIN" is stored in the memory, with its file name changed to "BOX-2.MIN".

Example 2: [F1](READ) BOX-2.MIN [WRITE]

The program is stored in the memory assigned the file name "BOX-2.MIN" regardless of the current file name.

Example 3: [F1](READ) BOX-2.MIN [WRITE]

The control first checks whether or not the file name given on the tape is "BOX-2.MIN". Then, the program is stored in the memory assigned with the file name "BOX-2.MIN".

Example 4: [F1](READ) [WRITE]

The program is stored in the memory with a file name assigned on the tape. If no file name is given on the tape, the program is assigned the file name "A.MIN".

Example 5: [F1](READ) BOX-1.MIN,BOX-2.MIN; AI [WRITE]

Stored in succession with a file name
which is already stored in the memory

Designate the ISO code.

The ISO-coded program data which has the file name "BOX-1.MIN" is stored following the file which is already stored in the memory with the file name "BOX-2.MIN".

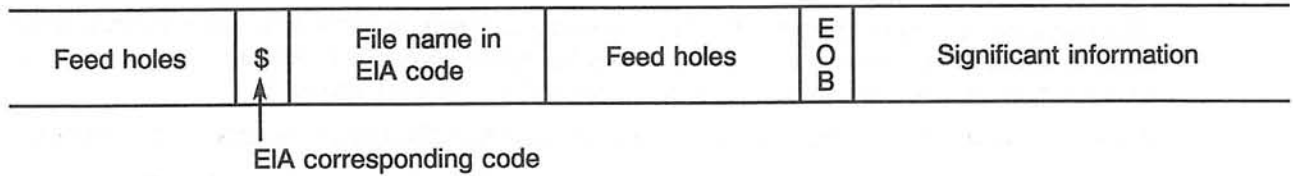
- (6) The following command reads a tape which contains wrong codes up to the end while replacing them with "!".

[F1](READ) File name;C [WRITE]

The number of read wrong codes is counted and displayed after the completion of tape read operation. Correct them in the program edit mode.

(7) Reading of a tape which has a file name punched in the EIA code

The file name punched in the EIA code can be read if an EIA-coded character which corresponds to \$ has been set at NC optional parameter (bit) No. 31.



The control recognizes the coding system of the file by the first "\$" code.

The coding system employed for NC data within the significant information area is recognized by the first end-of-program code (EOB).

During tape punch operation, the file name is always punched in the ISO code irrespective of the coding system which is employed to punch NC data.

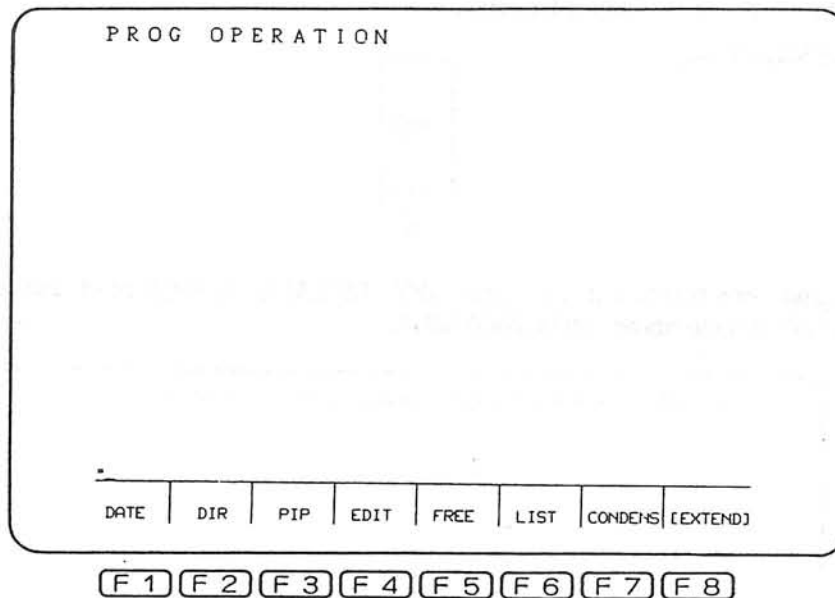
7-4-4. Duplication of Stored Programs

To duplicate a file in the bubble memory (BB1:) or a floppy disk (FD0:), follow the steps below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.

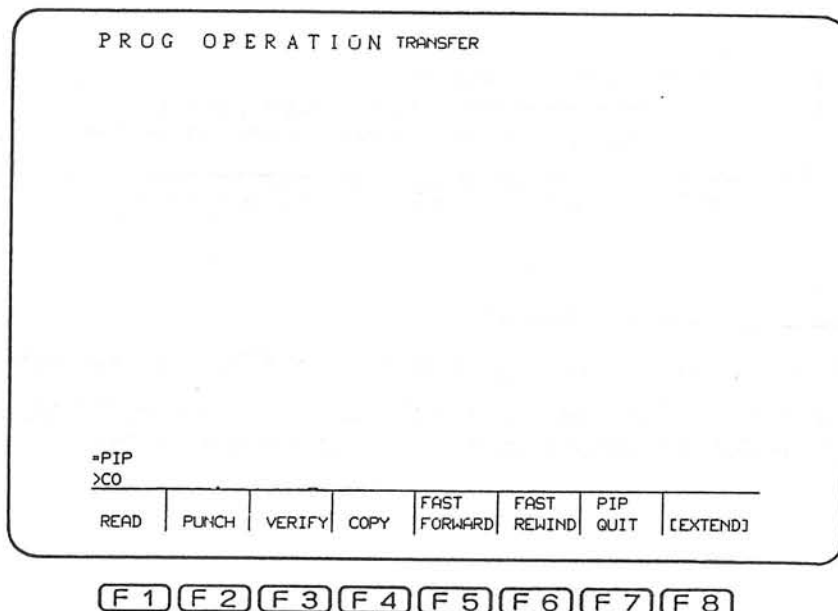


The function names on the CRT screen will change as shown below.



- (2) Press the function key [F3] (PIP).

The screen will change. Make sure that TRANSFER is displayed on the screen.



- (3) Press the function key [F4] (COPY).

The prompt “>CO” will be displayed on the command line, indicating that the system is ready for duplicating a program.

Enter the device name, BB1: or FD0:. (The default is BB1:.)

- (4) Key in the file name of the program to be duplicated.

Example:

BOX-1350.MIN, BOX-2000.MIN

Input file name

Output file name

- (5) Press the **WRITE** key.



The program which has the file name "BOX-1350.MIN" is duplicated and stored in the bubble memory with the file name "BOX-2000.MIN".

PROG OPERATION TRANSFER COPY C100.MIN

•PIP
>CO BOX-1350.MIN, BOX-20000.MIN
>

READ	PUNCH	VERIFY	COPY	FAST FORWARD	FAST REWIND	PIP QUIT	[EXTEND]
------	-------	--------	------	-----------------	----------------	-------------	----------

F1 F2 F3 F4 F5 F6 F7 F8

- (6) Press the function key [F7] (PIP QUIT).

This completes program duplicating operation and the CRT screen returns to the one in step (1).

For duplication of a floppy disk, refer to Section 1, "Program Input/Output Functions by Floppy Disks" in the Special Function Manual (No. 1) (Publication No. 3294-E).

Note 1: When the specified file name "BOX-1350.MIN" is not found in the bubble memory, the message "no file" will be displayed on the command line.

Note 2: When the file name "BOX-2000.MIN" which has been specified as the output file name already exists in the bubble memory, the following message will appear.

BOX-2000.MIN

file exist overwrite? (Y/N)

To erase the currently stored program and store the duplicated one, type "Y" and press the **WRITE** key.

Note 3: The output file name can be omitted when the output file name is the same as the input file name.

Note 4: When the output file name is omitted, symbols "*" and "?" can be used in an input file name. In this case, all the corresponding files are duplicated. (Refer to Section 2, 7-3. "Directory".)

Note 5: In addition to the above duplicating functions, the following functions are optionally available.

a) [COPY] Input File Name, Output File Name ;A

Duplication is executed following the file which is specified as the output file name.

b) [COPY] Input File Name, Output File Name ;A

The message "copy OK? (Y/N)" is displayed before starting program duplication.

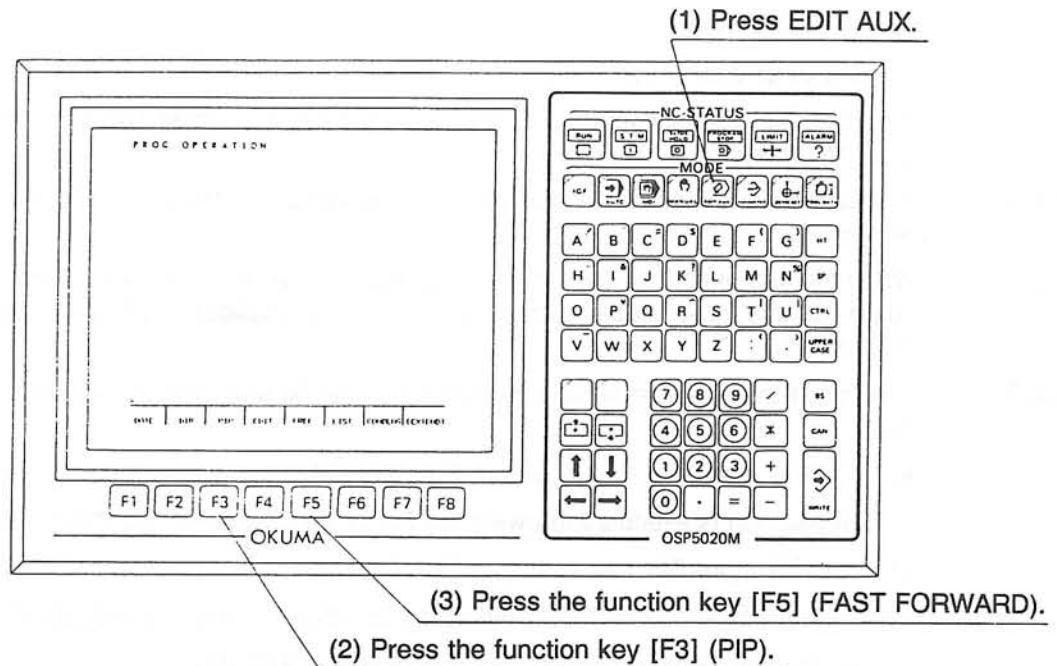
To start duplication, type "Y" and press the **WRITE** key.

To abort the operation, type "N" and press the **WRITE** key.

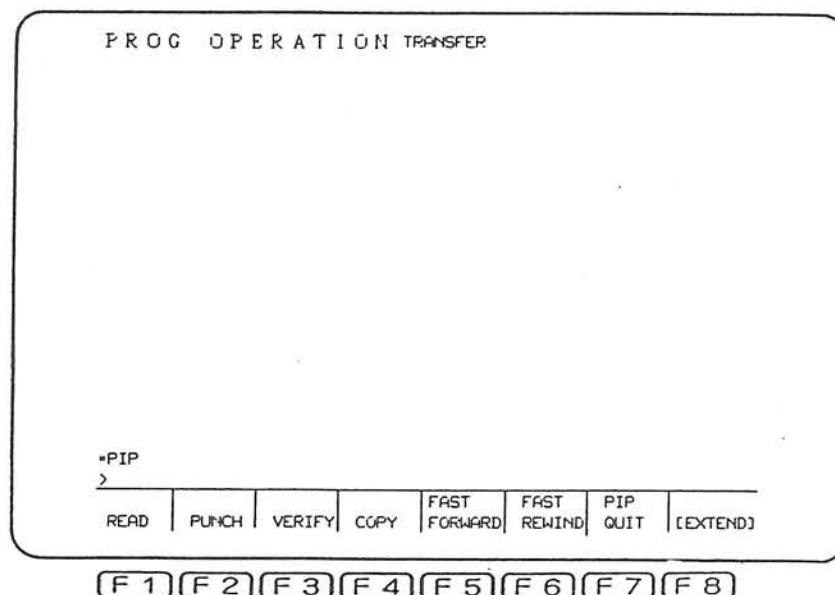
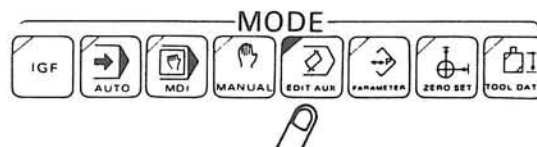
c) This function is effective when an optional external device such as a floppy disk drive is selected.

7-4-5. Tape Reader Operation - Tape Rapid Advance

To feed the tape rapidly, follow the procedure below.



- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.
The function names on the CRT screen will change as shown below.



- (2) Press the function key [F3] (PIP).

The screen will change as shown on the first figure in the previous page.

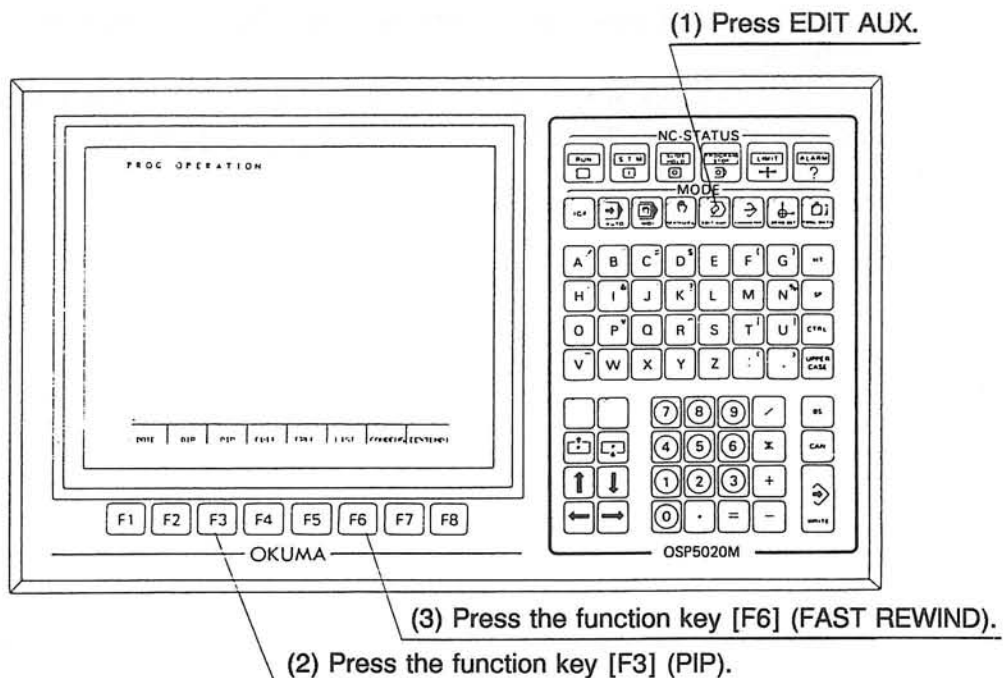
- (3) Press the function key [F5] (FAST FORWARD).

The prompt ">FF" will be displayed on the command line (21st line). The tape is fast forwarded to the end of the tape.

By setting corresponding data at NC optional parameter (bit) No. 1, bit 3, it is possible to select whether the control recognizes the end of a tape by feed holes or by a code. (% for ISO and ER for EIA).

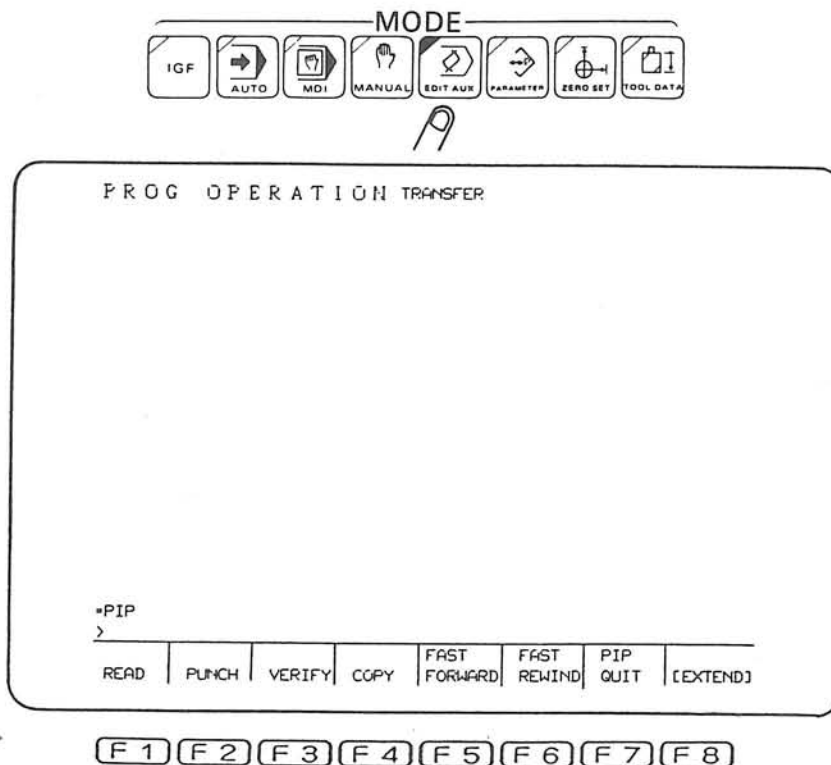
7-4-6. Taper Reader Operation - Rewind

To rewind the tape, follow the procedure below.



- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.

The function names on the CRT screen will change as shown below.



- (2) Press the function key [F3] (PIP).

The screen will change as shown on the first figure in previous page.

- (3) Press the function key [F6] (FAST REWIND).

The prompt ">FR" will be displayed on the line (21st line). The tape is rewound up to the beginning of the tape.

By setting corresponding data at NC optional parameter (bit) No. 1, bit 3, it is possible to select how the control recognizes the beginning of a tape; feed holes on a code. (% for ISO and ER for EIA).

7-4-7. PIP Quit

This sub command quits the transfer mode, and provides a return to the previous program operation mode. The operating procedure is indicated below.

P R O G O P E R A T I O N T R A N S F E R

»PIP
>

READ	PUNCH	VERIFY	COPY	FAST FORWARD	FAST REWIND	PIP QUIT	[EXTEND]
------	-------	--------	------	-----------------	----------------	-------------	----------

[F 1]
[F 2]
[F 3]
[F 4]
[F 5]
[F 6]
[F 7]
[F 8]

- (1) Press the function key [F7] (PIP QUIT).

The prompt ">Q" will be displayed on the command line. The transfer mode is quit and the previous program operation mode is restored.

The CRT screen will change as shown below with assigned function names also changed.

P R O G O P E R A T I O N T R A N S F E R

»PIP
>Q
»

DATE	DIR	PIP	EDIT	FREE	LIST	CONDENS	[EXTEND]
------	-----	-----	------	------	------	---------	----------

[F 1]
[F 2]
[F 3]
[F 4]
[F 5]
[F 6]
[F 7]
[F 8]

7-5. Program Editing

In the program edit mode, modification, insertion, deletion, and others can be conducted for on programs stored in the bubble memory.

Programs are edited in units of file.

Program editing-related terms are defined as follows.

- Edit Line

This is the line on which program edit operation is carried out.

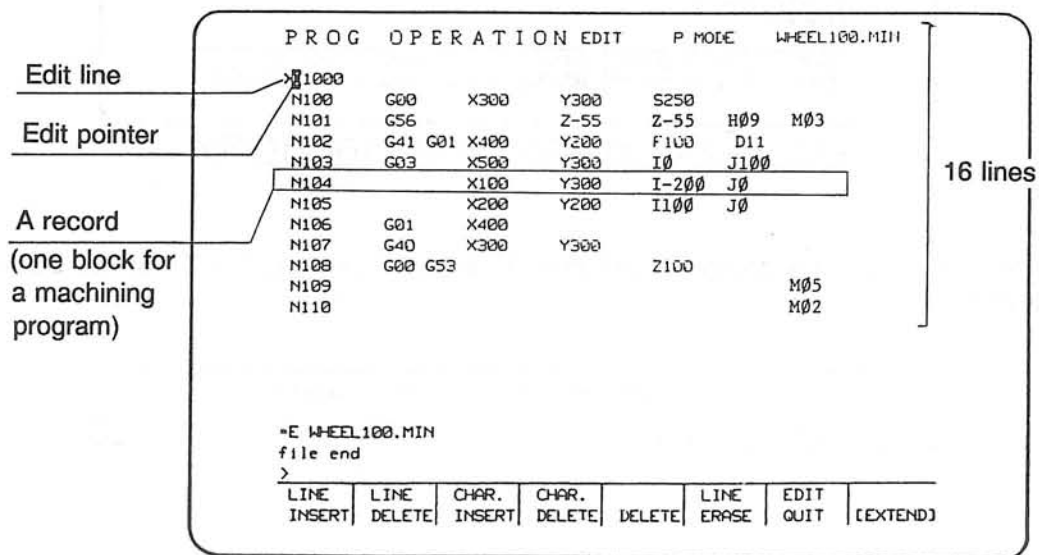
On the CRT screen, the symbol "»" appears at the left-most position of the edit line.
One line on the CRT screen contains a maximum of 63 characters.

- Edit Pointer

This refers to the identifier indicating the character to be edited. On the CRT, such a character is displayed in the reversed display mode.

- Record

This is so called a block in the program. The record consists of several commands beginning with a character right after the "LF" code and ending with the next "LF" code. If commands in a block cannot be displayed in one line on the CRT screen, they are displayed on multiple lines with the 2nd and subsequent lines preceded by "&", indicating that the commands are continuous.



[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]



REMARKS

When program edit operation has been completed, press the function key [F7] (PIP QUIT). Otherwise, edited data cannot be stored in the memory.

PROG OPERATION EDIT				P MODE	WHEEL100.MIN	
>1000						
N100	G00	X300	Y300	S250		
N101	G56		Z-55	H09	M03	
N102	G41 G01	X400	Y200	F100	D11	
N103	G03	X500	Y300			
N104		X100	Y300			
N105		X200	Y200			
N106	G01	X400				
N107	G40	X300	Y300			
N108	G00 G53			Z100		
N109					M05	
N110					M02	
-E WHEEL100.MIN						
file end						
>						
LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT [EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

Program edit operation is complete, and the CRT screen as indicated below will be displayed on the command line.

PROG OPERATION EDIT				P MODE	WHEEL100.MIN	
Keyed-in comment						
>						
"						
LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT [EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

7-5-1. Commands Used in the Program Edit Mode.

Item	Command	Functions
Insert line	LINE INSERT	Inserts a blank line right after the present edit line.
Delete line	LINE DELETE	Deletes the line including the edit pointer.
Insert character	CHAR.INSERT	Inserts a blank space (for one character) right before the edit pointer.
Delete character	CHAR.DELETE	Deletes the character identified by the edit pointer.
Delete	DELETE	Deletes the specified number of records (blocks) in a program.
Erase line	LINE ERASE	Erases the commands in the line which contains the edit pointer. The line remains as a blank line.
Quit	EDIT QUIT	Ends the program edit mode.
Find	FIND	Searches the specified character-string. Shifts the edit line by the specified number of lines.
Change	CHANGE	Replaces the specified character-string with the newly specified character-string.
Copy	COPY	Duplicates program data in the specified number of lines to the extract buffer. The original program data remains as it is.
Move	MOVE	Duplicates program data in the specified number of lines to the extract buffer. The original program data is deleted.
Extract	EXTRACT	Inserts program data in the extract buffer before the edit pointer.
Page mode	PAGE MODE	Replaces the character located by the edit pointer with the keyed-in character.
Insert mode	INSERT MODE	Inserts the character which has been keyed in through the keyboard before the character located by the edit pointer.



REMARKS

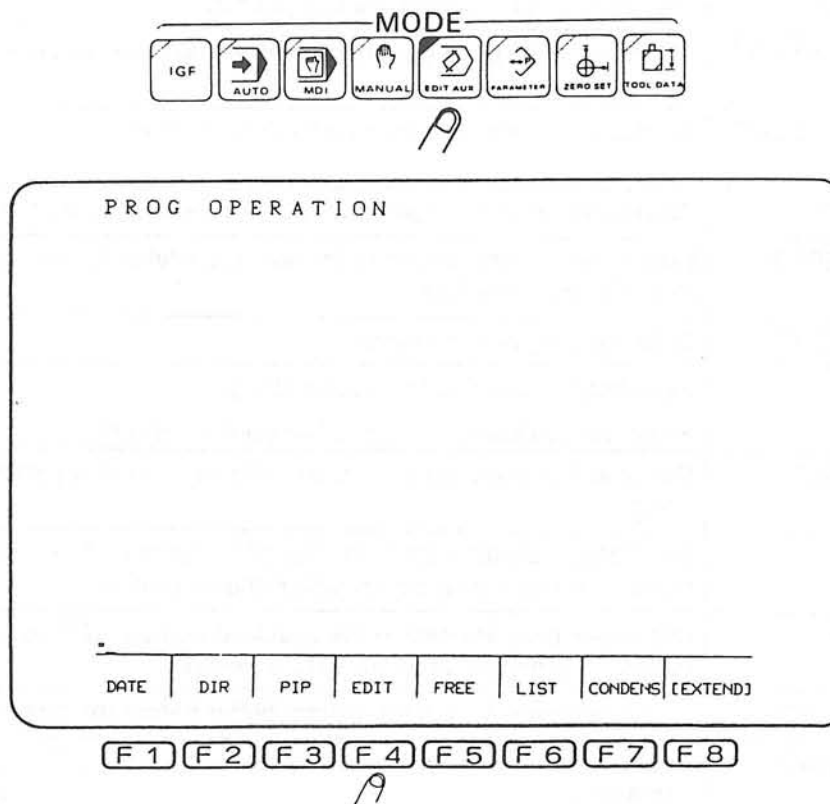
Never turn off the power supply during file transfer and file editing operations. If it has been turned off, data in the file might be unreliable.

7-5-2. Fundamental Operations Necessary for Program Editing

(1) Readout of a program file from the bubble memory

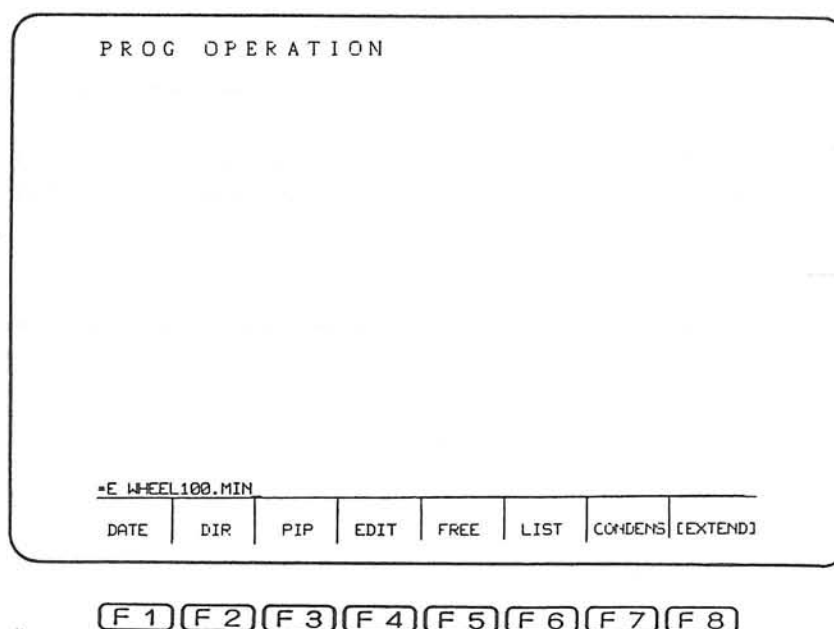
(a) To directly input the file name

① Press the **EDIT AUX** key to select the PROG OPERATION mode.



② Press the function key [F4] (EDIT).

Make sure that the display will change as shown below.



- ③ Key in the file name to be edited through the keyboard.

WHEEL100.MIN

When a program has been stored without specifying a file name, that is, when a program is stored with the file name "A.MIN", this step can be skipped.

- ④ Press the **WRITE** key.



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Program data of the specified file is searched and read into the editing area. At the same time, program data is displayed on the CRT screen.

PROG	OPERATION	EDIT	P	MODE	WHEEL100.MIN
>1000					
N100	G00	X300	Y300	S250	
N101	G56		Z-55	H09	M03
N102	G41	G01 X400	Y200	F100	D11
N103	G03	X500	Y300		
N104		X100	Y300		
N105		X200	Y200		
N106	G01	X400			
N107	G40	X300	Y300		
N108	G00	G53		Z100	
N109					M05
N110					M02
<E WHEEL100.MIN					
file end					
>					
LINE	LINE	CHAR.	CHAR.	LINE	EDIT
INSERT	DELETE	INSERT	DELETE	ERASE	QUIT
			DELETE		[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

Program data of the file name "WHEEL100.MIN" is ready for editing.

(b) Program selection using directory

A program to be edited can be selected by displaying the directory of programs stored in the bubble memory and placing the cursor at the desired file name.

- ① Press the **EDIT AUX** key to select the PROG OPERATION mode.

PROG OPERATION EDIT

PROGRAM EDIT INDEX

PROGRAM FILE

A.MIN

B.MIN

WHEEL100.MIN

SHIL2.MIN

GEAR-1.MIN

GEAR-2.MIN

GEAR-3.MIN

SHAFT100.MIN

SHAFT200.MIN

PAGE 1

#E *

what is the file name for editing ?

DATE	DIR	PIP	EDIT	FREE	LIST	CONDENS	[EXTEND]
------	-----	-----	------	------	------	---------	----------

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

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- ② Press the function key [F4] (EDIT).
- ③ Key in an asterisk "*" and press the **WRITE** key.

The CRT screen will change to the PROGRAM EDIT INDEX screen and the directory of the program file names is displayed on the screen.

- ④ Move the cursor to the desired file name.
- ⑤ Press the **WRITE** key.

The above procedure reads the program of the specified file in the memory to the edit buffer and allows program edit operation.

Note 1: When any files have been registered in the memory, the PROGRAM EDIT INDEX screen is not displayed.

Note 2: One screen page can display up to 12 file names. When more than 12 files are stored in the memory, press the PAGE key to change the display page.

Note 3: When a file name is specified using symbols "*" and "?", all the corresponding files will be displayed on the PROGRAM EDIT INDEX screen.

For details of file name designation, refer to Note 3 in 7-2. "Directory".

(2) Cursor operations

When the cursor key is pressed, the edit pointer and the edit line can be moved.

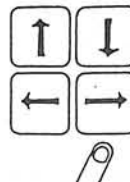
(a) Cursor right movement

PROG	OPERATION	EDIT	P MODE	WHEEL100.MIN
>O100				
N100	G00	X300	Y300	S250
N101	G56		Z-55	H09 M03
N102	G41 G01	X400	Y200	F100 D11
N103	G03	X500	Y300	
N104		X100	Y300	
N105		X200	Y200	
N106	G01	X400		
N107	G40	X300	Y300	
N108	G00 G53		Z100	
N109				M05
N110				M02

=E WHEEL100.MIN
file end
>

LINE	LINE	CHAR.	CHAR.		LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]



Each time the cursor key is pressed, the edit pointer (reversed display) moves to the right.
The edit pointer moves continuously while the cursor key is held down.

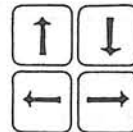
(b) Cursor left movement

PROG	OPERATION	EDIT	P MODE	WHEEL100.MIN
N100	G00	X300	Y300	S250
N101	G56		Z-55	H09 M03
N102	G41 G01	X400	Y200	F100 D11
N103	G03	X500	Y300	
N104		X100	Y300	
N105		X200	Y200	
N106	G01	X400		
N107	G40	X300	Y300	
N108	G00 G53		Z100	
N109				M05
N110				M02

-E WHEEL100.MIN
file end
>

LINE	LINE	CHAR.	CHAR.	DELETE	LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]



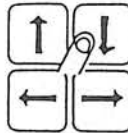
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Each time the cursor key is pressed, the edit pointer (reversed display) moves to the left.
The edit pointer moves continuously while the cursor key is held down.

(c) Cursor downward movement

PROG	OPERATION			EDIT	P MODE	WHEEL100.MIN	
>N100							
N100	G00	X300	Y300	S250			
N101	G56		Z-55	H09	M03		
N102	G41 G01	X400	Y200	F100	D11		
N103	G03	X500	Y300				
N104		X100	Y300				
N105		X200	Y200				
N106	G01	X400					
N107	G40	X300	Y300				
N108	G00 G53			Z100			
N109					M05		
N110					M02		
=E WHEEL100.MIN							
file end							
>							
LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT	[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8



Each time the cursor key is pressed, the edit pointer (reversed display) and the edit line (≥) move down one line.

The edit pointer and the edit line move continuously while the cursor key is held down.

When the cursor key is pressed with the edit line placed at the bottom, the edit line will return to the top.

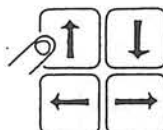
(d) Cursor upward movement

PROG	OPERATION	EDIT	P MODE	WHEEL100.MIN
O1000				
N100	G00	X300	Y300	S250
N101	G56		Z-55	H09 M03
N102	G41 G01	X400	Y200	F100 D11
N103	G03	X500	Y300	
N104		X100	Y300	
N105		X200	Y200	
N106	G01	X400		
N107	G40	X300	Y300	
N108	G00 G53		Z100	
N109				M05
N110				M02

=E WHEEL100.MIN
file end
>

LINE	LINE	CHAR.	CHAR.		LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]



Each time the cursor key is pressed, the edit pointer (reversed display) and the edit line (≥) move up one line.

The edit pointer and the edit line move continuously while the cursor key is held down.

When the cursor key is pressed with the edit line placed at the top (O1000 on the CRT screen), the edit line will move to the bottom.

Supplement:

When the cursor key is pressed continuously or held down until the edit pointer (reversed display) reaches the left-end or right-end position, the edit line (≥) moves up or down, respectively.

The edit pointer (reversed display) is placed on the edit line (≥). This means that the edit line and the edit pointer move together. The edit pointer moves as the edit line changes.

(3) Page down

When the page key [P ↓] is pressed, the next page is displayed.

On the CRT screen, 16 lines of program data are displayed on one display page. When program data to be edited is not found on the given page, press the page keys until required data is obtained.

Positions of the edit pointer and edit line remain unchanged.

When the last part of the file has been reached while the page key is pressed, the remaining blocks are displayed on the screen. The message "file end" will appear on the command line.

(4) Page Up

When the page key [P ↑] is pressed, the previous page is displayed.

When the first page has been reached, the display remains unchanged even if the page key is kept pressed. The message "beginning of file" will appear on the command line.

7-5-3. One Line Insertion

- (1) This function inserts a blank line right before the edit line.
Press the function key [F1] (LINE INSERT) to insert a blank line before the edit line ($\gg$).
- (2) Lines following the edit line shift down and the last line on that page disappears from the display and shifts to the next page.
- (3) The edit pointer shifts to the beginning of the inserted blank line.
- (4) The prompt ">IL" will be displayed on the command line.
- (5) This function is effective for inserting lines in the stored program.

```

N101  G00  X800  Z200
>>N102  X250
N103  G01          Z150  F0.3
N104          X300
:
:
N117  G01  X113

```



>IL							
LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT	[EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

9



```

N101  G00  X800  Z200
>> [ ]
N102          X250
N103  G01          Z150  F0.3
N104          X300
:
:

```

7-5-4. One Line Deletion

- (1) This function deletes the edit line.
Press the function key [F2] (LINE DELETE) to delete the edit line.
- (2) Lines following the edit line shift up and the first line on the next page shifts to the current page and displayed on the last line.
- (3) The edit pointer shifts to the first character of the line next to the deleted line.
- (4) The prompt ">DL" will be displayed on the command line.
- (5) This function is effective for deleting an entire line in the stored program.

```

N101  G00  X800  Z200
>>N102  X250
N103  G01  Z150  F0.3
N104      X300
:
:

```

>DL
file end

LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT	[EXTEND]
----------------	----------------	-----------------	-----------------	--------	---------------	--------------	----------

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

9

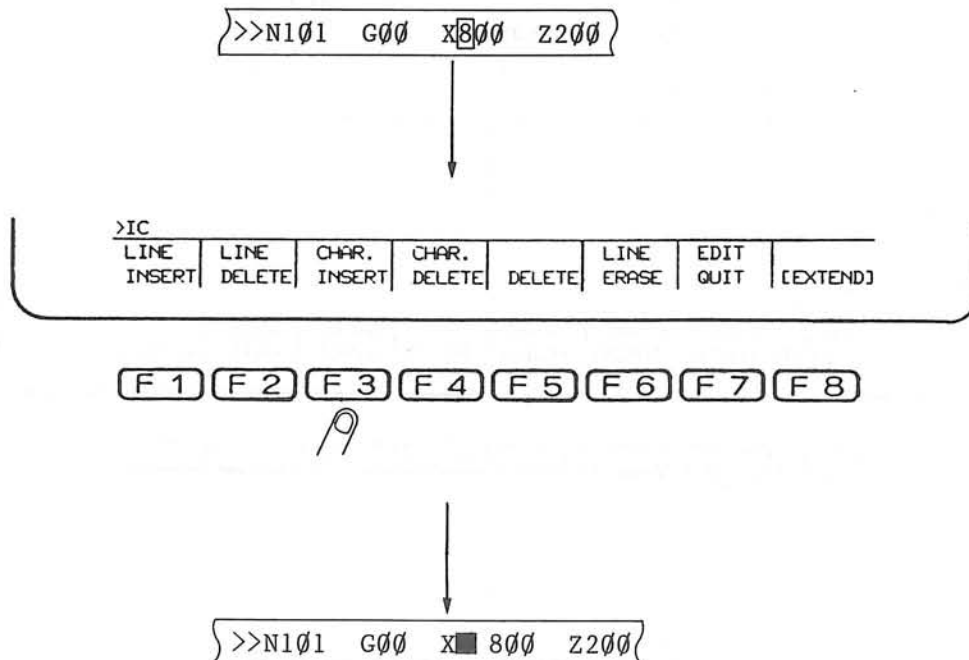
```

N101  G00  X800  Z200
>>N103  G01  Z150  F0.3
N104      X300
:
:
N117  G01  X113

```

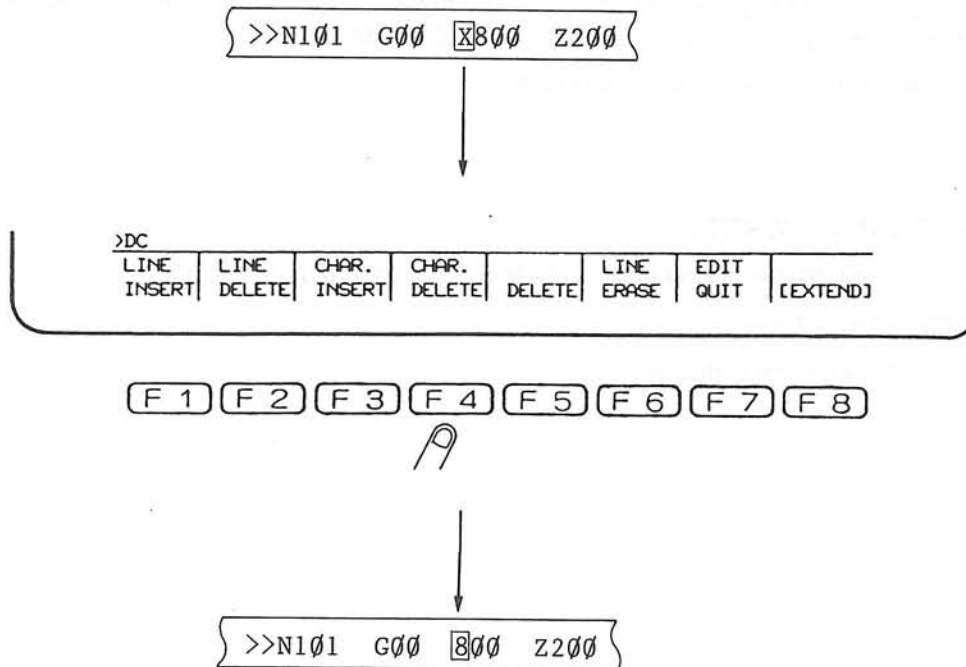
7-5-5. One Character Insertion

- (1) This function inserts a space before the edit pointer.
Press the function key [F3] (CHAR. INSERT) to insert a space right before the edit pointer.
- (2) Data following the edit pointer shifts to the right when a space has been inserted.
- (3) When there is any character other than a space at the end of the edit line, the message "letter insert impossible" will appear on the command line and the attempted insertion operation is not executed.
- (4) The position of the edit pointer remains unchanged.
- (5) The prompt ">IC" will be displayed on the command line.
- (6) This function is effective for inserting a character (numeral).



7-5-6. One Character Deletion

- (1) This function deletes a character located by the edit pointer.
Press the function key [F4] (CHAR. DELETE) to delete the character located by the edit pointer.
- (2) When the character is deleted, characters following the deleted one shift to the left.
- (3) The position of the edit pointer remains unchanged.
- (4) The prompt ">DC" will be displayed on the command line.
- (5) This function is effective for deleting program data in units of character.



7-5-7. Deletion

- (1) Program data in a specified range is deleted.

After specifying the number of lines to be deleted, press the function key [F5] (DELETE). The specified number of lines will be deleted including the edit line (≥).

- (2) The edit pointer is placed at the first character of the block which follows the final line of the deleted blocks.
- (3) When the number of the specified lines to be deleted is larger than the final block of the file, all program data up to the end of the file is deleted and the line right after the final line of the file becomes the edit line. In this case, the message "file end" will appear.
- (4) After program data has been deleted, the message "***RECORD DELETE" appears on the command line. Here, " ** " indicates the number of the deleted lines.
- (5) Lines following the deleted range will shift up.

Operation:

[F5](DELETE)-8 [WRITE]

Eight lines preceding the edit line (edit line not included) are deleted.

[F5](DELETE) [WRITE]

Only the edit line is deleted.

Example:

To delete four blocks from N103 to N106:

N101	G00	X800	Z200
N102		X250	
>>N103	G01		Z150 F0.3
N104		X300	
N105	G00	X310	Z200
N106		X200	
N107	G01		Z100
:			:
:			:

>DEL 4							
LINE	LINE	CHAR.	CHAR.		LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

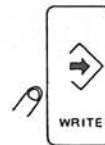
9



Key in "4" through the keyboard.



Press the **WRITE** key.



>>N101	G00	X800	Z200
N102		X250	
N107	G01		Z100
:			:
:			:

The command line of the CRT screen will show the following message.

>DEL 4							
4 RECORD DELETE							
beginning of file							
LINE	LINE	CHAR.	CHAR.		LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

7-5-8. One Line Erasing

- (1) This function erases program data in the edit line ($\geq$). The blank line remains.
Press the function key [F6] (LINE ERASE) to erase program data in the edit line. When data is erased, a blank line will remain.
- (2) The edit pointer is placed at the first character of the erased edit line.
- (3) The prompt ">ER" will be displayed on the command line.
- (4) This function is effective when replacing entire program data in a block with new program data.

N101	G00	X800	Z200
N102		X250	
>>N103	G01		Z150 F0.3
N104		X300	



>ER							
LINE	LINE	CHAR.	CHAR.		LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT	[EXTEND]

F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8
-----	-----	-----	-----	-----	-----	-----	-----



N101	G00	X800	Z200
N102		X250	
>>			
N104		X300	

Before executing operations explained in 7-5-9 to 7-5-13, press the function key [F8] (EXTEND).

PROG	OPERATION	EDIT	P MODE	WHEEL100.MIN		
>1000						
N100	G00	X300	Y300	S250		
N101	G56		Z-55	H09 M03		
N102	G41 G01	X400	Y200	F100 D11		
N103	G03	X500	Y300			
N104		X100	Y300			
N105		X200	Y200			
N106	G01	X400				
N107	G40	X300	Y300			
N108	G00 G53		Z100			
N109				M05		
N110				M02		
-E WHEEL100.MIN						
file end						
>						
LINE	LINE	CHAR.	CHAR.	LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	ERASE	QUIT	[EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

Press the function key [F8] (EXTEND). The function names on the CRT screen will change as shown below.

PROG	OPERATION	EDIT	P MODE	WHEEL100.MIN		
>1000						
N100	G00	X300	Y300	S250		
N101	G56		Z-55	H09 M03		
N102	G41 G01	X400	Y200	F100 D11		
N103	G03	X500	Y300			
N104		X100	Y300			
N105		X200	Y200			
N106	G01	X400				
N107	G40	X300	Y300			
N108	G00 G53		Z100			
N109				M05		
N110				M02		
02000						
N001	G00	X0	Y0	Z0		
N002	G01	X100				
N003			Y100			
-E WHEEL100.MIN						
>						
>EX						
FIND	CHANGE	COPY	MOVE	EXTRACT	PAGE	INSERT
					MODE	MODE

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

7-5-9. Find

This function searches for a specified character-string. It is also possible to advance or return the edit pointer by the specified number of lines.

(1) Search for character-string

- (a) The character-string specified by keying-in operation is searched for, starting from the character which is next to the one located by the edit pointer.
- (b) When the specified character-string has been found, the edit pointer stops at the first character of the character-string.
- (c) To specify a character-string, key in a character before and after it. Here, the character before and after the character-string must be the same, and the following characters cannot be used.

+, -, ,, ;, :, 0 through 9, space, and characters used within the character-string

Example: /G02/

- (d) The symbol "?" which specifies an arbitrary character can be used.

Example: /N?01/

This is the command to search for three-digit N codes whose lower two digits are "01".

Once a character-string has been specified, it is searched for each time the function key [F1] (FIND) and the **WRITE** key are pressed.

- (e) The symbol "@" in character-strings represents one character other than numbers and a decimal point.

Example: /X10@/

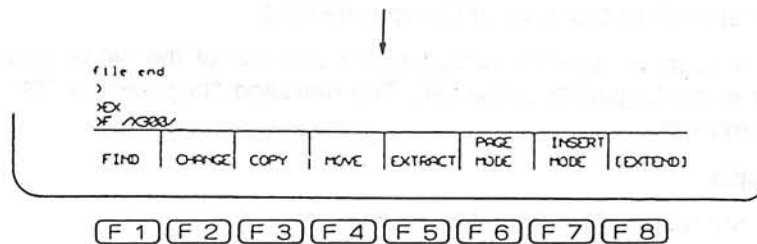
With this command, character-strings such as X100, X10.5, and others are not searched for.

- (f) Pressing any key on the operation panel interrupts this function at the point the key has been pressed.

Operation Example:

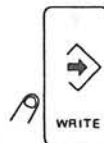
To search for "X300" from the program shown on the display below:

```
>>N101 G00 X800 Z200
N102      X250
N103 G01      Z150 F0.3
N104      X300
N105 G00 X310 Z200
N106      X200
N107 G01      Z100
:
:
```



Key in "/X300/" through the keyboard.

Press the **WRITE** key.



```
N101 G00 X800 Z200
N102      X250
N103 G01      Z150 F0.3
>>N104      X300
N105 G00 X310 Z200
N106      X200
N107 G01      Z100
:
:
```

(2) Edit Line Shifting

- (a) This function shifts the edit line by a specified number of lines.
- (b) The edit pointer is placed at the first character of that line.
- (c) On the CRT screen, the display changes so that the edit line is located on the first line of the screen.
- (d) When the specified number is larger than the last line of the file, the edit pointer is placed in the line next to the last line. In this case, two lines from the last line are displayed on the screen, followed by the following message on the command line.

file end

- (e) When a negative number is specified, the edit line shifts backward and the edit pointer is placed at the first character of the specified line.
- (f) When a negative number exceeding the first line of the file is specified, the edit pointer is placed at the beginning of the file. The message "beginning of file" will be displayed on the command line.

Operation Example:

To specify the fourth block from the edit line:

```
>>N101  G00  X800  Z200
      N102      X250
      N103  G01      Z150  F0.300
      N104      X300
      N105  G00  X310  Z200
      N106      X200
      N107  G01      Z100
      :
      :
```



> F 4

FIND	CHANGE	COPY	MOVE	EXTRACT	PAGE MODE	INSERT MODE	(EXTEND)
------	--------	------	------	---------	--------------	----------------	----------

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

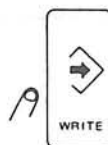
↙



Key in "4" through the keyboard.



Press the **WRITE** key.



```
>>N105  G00  X310  Z200
      N106      X200
      N107  G01      Z100
      :
      :
```


7-5-10. Change

- (1) This function replaces a specified character-string with another character-string specified.
Press the function key [F2] (CHANGE) to select this function.
- (2) The edit pointer is placed at the first character of the character-string which has replaced the previous character-string.

When the specified character-string is not found, the message "no character string" is displayed and the edit pointer does not move.
- (3) The same delimiter as explained in 7-5-9 is used.
- (4) The symbol "?" is used in quite the same manner as in 7-5-9. "Find" operation.
- (5) When program data contains several same character-strings, press the function key [F2] (CHANGE) and the **WRITE** key. The character-strings will be replaced one by one.
- (6) Pressing any key on the operation panel interrupts this function at the point the key has been pressed. In this case, character-strings are not replaced.
- (7) The following option code can be used:

";A" When this option code is designated, global search and replace can be executed. The character-strings are replaced at one time.

Operation Example:

To replace "Z200" in the N105 block with "Z210"

```
>>N101 G00 X800 Z250
N102      X250
N103 G01      Z150 F0.300
N104      X300
N105 G00 X310 Z200
N106      X200
:
:
```



X /Z100/Z200/							
FIND	CHANGE	COPY	MOVE	EXTRACT	PAGE MODE	INSERT MODE	(EXTEND)

F1 F2 F3 F4 F5 F6 F7 F8

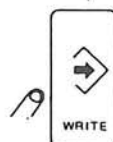
19



Key in "/Z200/Z210/" through the keyboard.



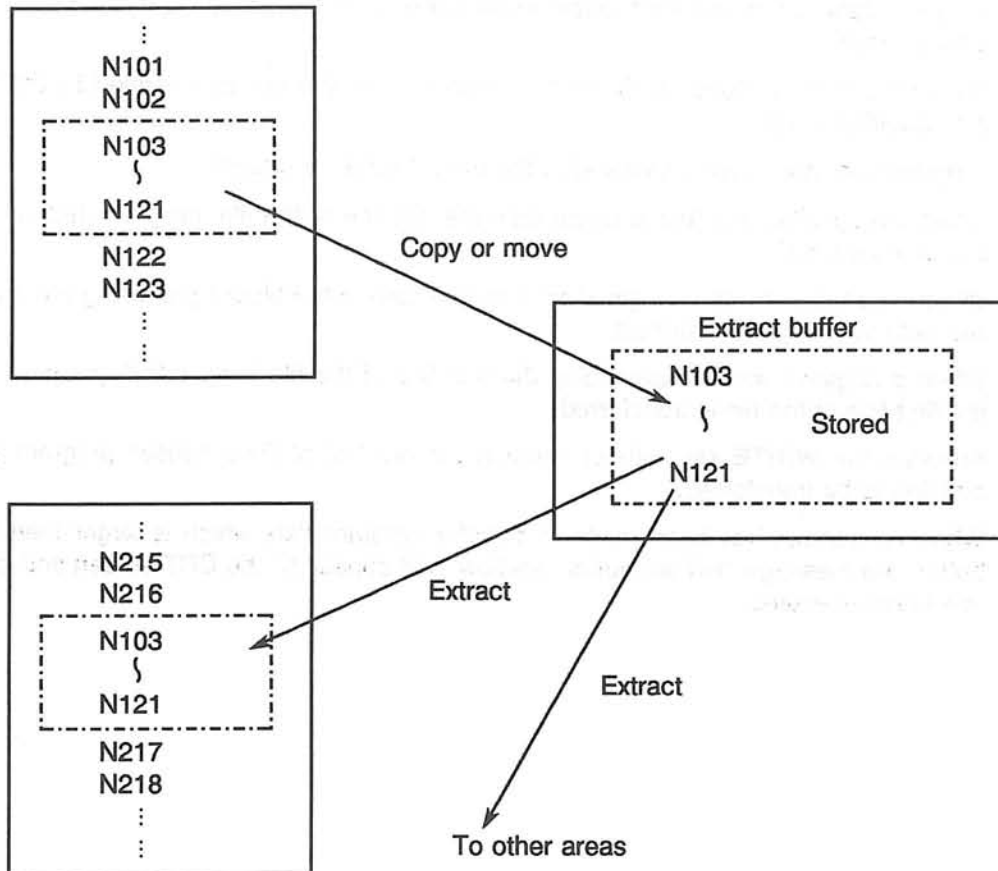
Press the **WRITE** key.



```
N101 G00 X800 Z250
N102      X250
N103 G01      Z150 F0.300
N104      X300
>>N105 G00 X310 Z210
N106      X200
:
:
```

7-5-11. Copy, Move, and Extract

These functions are used to transfer a group of commands from one program to another or to insert the same group of commands into several different positions of a program.



Operation Sequence:

- ① Save the group of commands into the extract buffer using the COPY or MOVE command.
- ② The EXTRACT command will insert the commands saved in the extract buffer into the specified sequence.

Here, the extract buffer means the buffer where commands are temporarily saved for copy or transfer operation. The buffer capacity is 64 characters x 23 lines.

(1) Copy

This function transfers specified program data to the extract buffer.

Press the function key [F3] (COPY) after the range (in terms of lines) of program data to be duplicated has been specified.

- (a) Program data in the specified range which starts from the edit line ($\geq$) is transferred to the extract buffer.
- (b) The edit pointer is placed at the first character of the line that is preceded by the last line of the specified range.
- (c) Program data previously registered in the extract buffer is erased.
- (d) When the specified number is larger than the last line of the file, program data up to the last line is transferred.
- (e) When a negative number is specified, program data in the blocks preceding the edit line (edit line not included) is transferred.

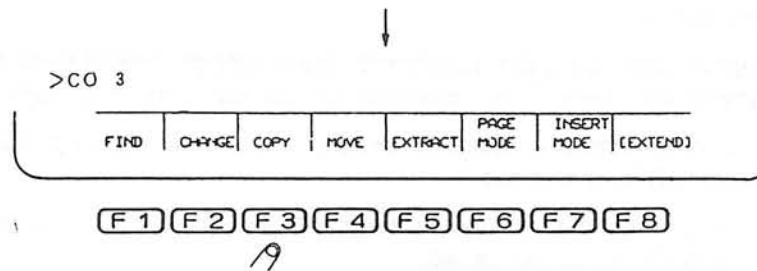
When a negative number exceeding the first line of the file is specified, program data up to the first line of the file is transferred.
- (f) Pressing the **WRITE** key without entering the number of lines causes program data in the edit line to be transferred.
- (g) When an attempt has been made to transfer program data which is larger than the extract buffer, the message "extract buffer overflow" will appear on the CRT screen and copy operation is not executed.

Operation Example:

To duplicate blocks N103 through N105:

N101	G00	X800	Z200
N102		X250	
>>N103	G01	Z150	F0.300
N104		X300	
N105	G00	X310	Z200
N106		X200	
N107	G01	Z170	
:		:	
:		:	

Move the symbol "≥" to N103 using the cursor control keys.

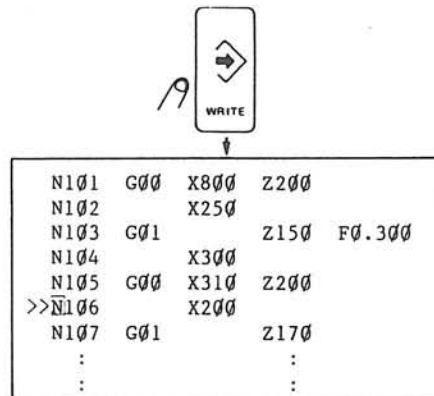


↓

Key in "3" through the keyboard.

↓

Press the **WRITE** key.



(2) Move

This function extracts program data in the specified range of a file and transfers it to the extract buffer.

Press the function key [F4] (MOVE) after the range (in terms of lines) of program data to be transferred has been specified.

- (a) Program data in the specified range which starts from the edit line ($\geq$) is transferred to the extract buffer.
- (b) The lines transferred to the extract buffer are erased from the CRT screen.
- (c) The edit pointer is shifted to the first character of the line next to the last line of transferred lines.
- (d) Program data previously registered in the extract buffer is erased.
- (e) When the specified number is larger than the last line of the file, program data up to the last line is transferred.
- (f) After program data has been transferred, the message "***RECORD DELETE" appears on the command line. Here, " ** " indicates the number of the specified lines.
- (g) When a negative number is specified, program data in the blocks preceding the edit line (edit line not included) is transferred.

When a negative number exceeding the first line of the file is specified, program data up to the first line of the file is transferred.

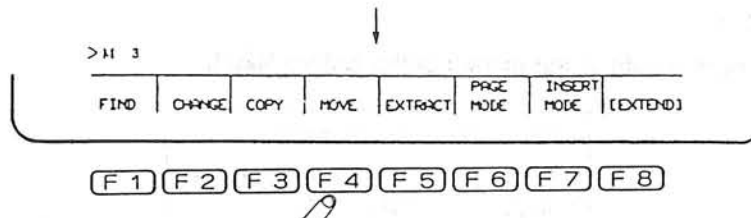
- (h) When an attempt has been made to transfer program data which is larger than the extract buffer, the message "extract buffer overflow" will appear on the CRT screen and move operation is not executed.
- (i) Pressing the **WRITE** key without entering the number of lines causes program data in the edit line to be transferred.

Operation Example:

To transfer blocks N103 through N105:

N101	G00	X800	Z200
N102		X250	
>>N103	G01		Z150 F0.300
N104		X300	
N105	G00	X310	Z200
N106		X200	
N107	G01		Z170
:			:

Move the symbol "≥" to N103 using the cursor control keys.



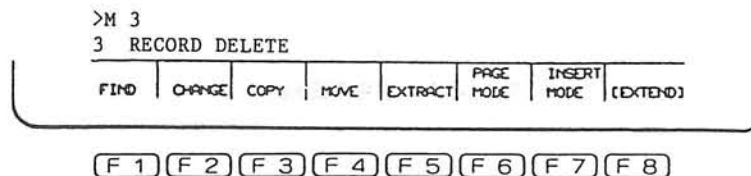
Key in "3" through the keyboard.

Press the **WRITE** key.



N101	G00	X800	Z200
N102		X250	
>>N106		X200	
N107	G01		Z170
:			:

The following message is displayed on the command line.



(3) Extract

This function inserts program data which is registered in the extra buffer before the edit line (≫). Press the function key [F5] (EXTRACT) and the **WRITE** key after the edit line has been selected.

- (a) Data in the extract buffer is inserted before the edit line (≫).
- (b) Data in the extract buffer is not erased.
- (c) The edit pointer remains at the same position.
- (d) If no data is registered in the extract buffer when EXTRACT operation is attempted, the message "extract buffer empty" is displayed and data transfer is not initiated.
- (e) To erase program data registered in the extract buffer, proceed as follows.

[F5](EXTRACT);C [WRITE]

File data is not changed.

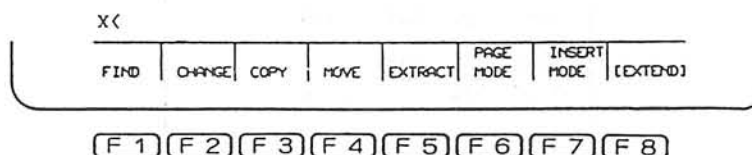
Operation Example:

To insert program data in the extract buffer before N203:

Data in the extract buffer				
N103	G01		Z150	F0.300
N104		X300		
N105	G00	X310	Z200	

N201	G00	X600	Z200	
N202		X150		
>>N203	G01		Z150	F0.400
N204		X200		
N205	G00	X210	Z200	

Move the symbol "≫" to N203 using the cursor control keys.



Press the **WRITE** key.



N201	G00	X600	Z200	
N202		X150		
N103	G01		Z150	F0.300
N104		X300		
N105	G00	X310	Z200	
>>N203	G01		Z150	F0.400
N204		X200		
N205	G00	X210	Z200	

7-5-12. Page Mode

The page mode (P mode) is used to fix the display given on the CRT screen to enable substitution of characters and others.

The page mode is used in the following cases:

- creating a new file
- replacing one character in an existing file
- adding a character-string to the end of a line

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.
- (2) Press the function key [F4] (EDIT).
- (3) Key in a file name and press the **WRITE** key. The screen as indicated below will be displayed.

This establishes the P mode.

When the insert mode needs to be changed to the P mode, follow the steps below.

PROG OPERATION EDIT
P MODE
WHEEL 180°.MIN.

```

01000
N100      G00      X300      Y300      S250
N101      G56
N103      G41G01    X400      Y200      F100      H09      M03
N104      G03      X500      Y300      I0        J100
N105              X100      Y300      I-200      J0
N106              X200      Y200      I100       J0
N107      G01      X400
N108      G40      X300      Y300
N109      G00G53
N110
>
=
N116

```

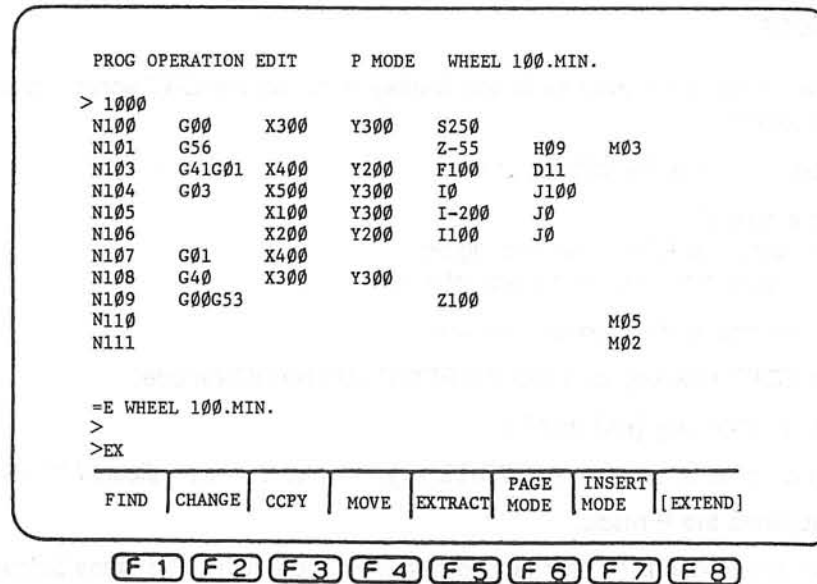
>ER

LINE	LINE	CHAR.	CHAR.	LINE	EDIT	
INSERT	DELETE	INSERT	DELETE	DELETE	ERASE	QUIT [EXTEND]

[F1][F2][F3][F4][F5][F6][F7][F8]

(4) Press the function key [F8] (EXTEND).

- (4) With the above screen displayed, press the function key [F8] (EXTEND). The screen will change as indicated on the following page.



(5) Press the function key [F6] (PAGE MODE).

- (5) Press the function key [F6] (PAGE MODE). "P MODE" will be displayed on the screen and the page mode will be established.

Page Mode Operation:

- When a character is keyed in in the page mode, the cursor-located character is replaced by the keyed-in character and the cursor moves to the right. In other words, in the page mode, the cursor is moved to the right and the character (including a space) located by the cursor is replaced by a keyed-in character each time data is entered. Therefore, if an attempt has been made to assign a character-string many digits of characters, subsequent character data might be replaced.
- The edit pointer and the edit line do not shift to any other pages.
- Each page has a total of 16 lines for edit operation.
When the **WRITE** key is pressed while the bottom line is designated as the edit line, 16 lines of data are shifted by one line each and a blank line is created on the 16th line. The edit line does not change and the edit pointer is placed at the beginning of that line.
- When the **WRITE** key is pressed while a line other than the bottom line is designated as the edit line, the edit line is moved to the subsequent line and the edit pointer is moved to the beginning of that line. This also applies to the insert mode.
- When the program cannot be displayed in one page (16 lines), press the page key [P ↓]. To return the display to the previous page, press the page key [P ↑].

7-5-13. Insert Mode

The insert mode (I mode) is used to add character-string(s) to the existing file. Each time data is keyed in through the keyboard, it is added.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.
- (2) Press the function key [F4] (EDIT).
- (3) Key in a file name and press the **WRITE** key. The screen as indicated below will be displayed.

This establishes the page mode.

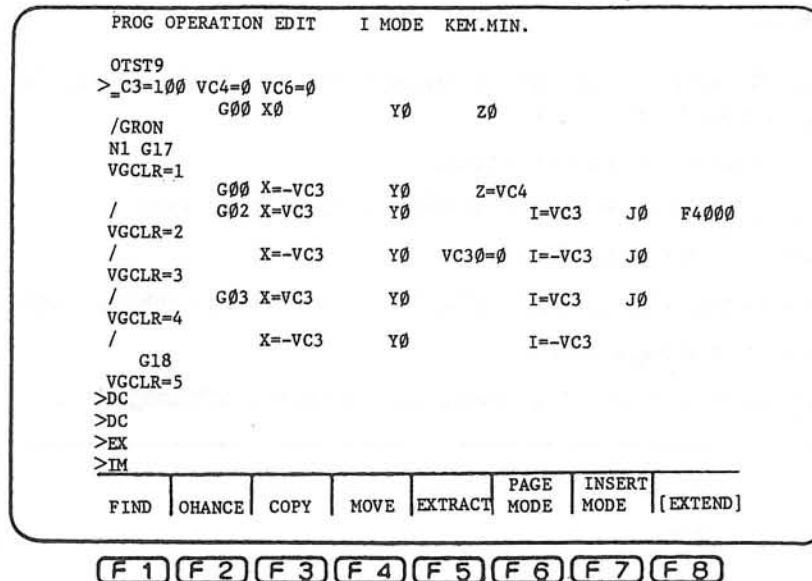
To change the page mode to the insert mode, proceed to the following steps.

PROG OPERATION EDIT			P MODE	WHEEL 100.MIN.		
01000						
N100	G00	X300	Y300	S250		
N101	G56			Z-55	H09	M03
N103	G41G01	X400	Y200	F100	D11	
N104	G03	X500	Y300	I0	J100	
N105		X100	Y300	I-200	J0	
N106		X200	Y200	I100	J0	
N107	G01	X400				
N108	G40	X300	Y300			
N109	G00G53			Z100		
N110						M05
>						
=						
N116						
>ER						
LINE INSERT	LINE DELETE	CHAR. INSERT	CHAR. DELETE	DELETE	LINE ERASE	EDIT QUIT
						[EXTEND]

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

- (4) Press the function key [F8] (EXTEND).

- (4) With the above screen displayed, press the function key [F8] (EXTEND). The screen will change as indicated on the following page.



(5) Press the function key
[F7] (INSERT MODE).

- (5) Press the function key [F7] (INSERT MODE). "I MODE" will be displayed on the screen and the insert mode will be established.

Insert Mode Operation:

- Each time a character is keyed in in the insert mode, it is inserted before the edit pointer and the character-strings following the edit pointer are shifted by one character. When data is inserted successively and the currently displayed data has reached the right end, data insertion is disabled.
- The edit pointer and the edit line do not shift to any other pages.
When the cursor key [$\downarrow$] is pressed while the bottom line is designated as the edit line, the edit line moves to the top line.
- When the cursor key [$\uparrow$] is pressed while the top line is designated as the edit line, the edit line moves to the bottom line. Movements activated by the cursor keys [$\rightarrow$] and [$\leftarrow$] can be understood in the same manner. That is, when the cursor key [$\rightarrow$] is pressed while the edit pointer is located at the right end of the bottom line, the edit pointer moves to the left end of the top line and the edit line moves to the top line. Similarly, when the cursor key [$\leftarrow$] is pressed while the edit pointer is located at the left end of the top line, the edit pointer moves to the right end of the bottom line and the edit line moves to the bottom line. In these cases, the display on the screen does not change.
- Each page has a total of 16 lines for edit operation.
When the **WRITE** key is pressed while the bottom line is designated as the edit line, 16 lines of data are shifted by one line each and a blank line is created on the 16th line. The edit line does not change and the edit pointer is placed at the beginning of that line.
- When the **WRITE** key is pressed while a line other than the bottom line is designated as the edit line, the edit line is moved to the subsequent line and the edit pointer is moved to the beginning of that line. This also applies to the page mode.
- When the program cannot be displayed in one page (16 lines), press the page key [P $\downarrow$]. To return the display to the previous page, press the page key [P $\uparrow$].

7-6. Free

This function displays the available capacity of the bubble memory (BB1:) or a floppy disk (FD0:).

The indication is made both in the number of sectors and bytes.

1 sector = 252 bytes

When creating a new file, all the remaining storage area cannot be used for storing program data since a file name, the number of sectors to be used, and other data are also stored together with program data.

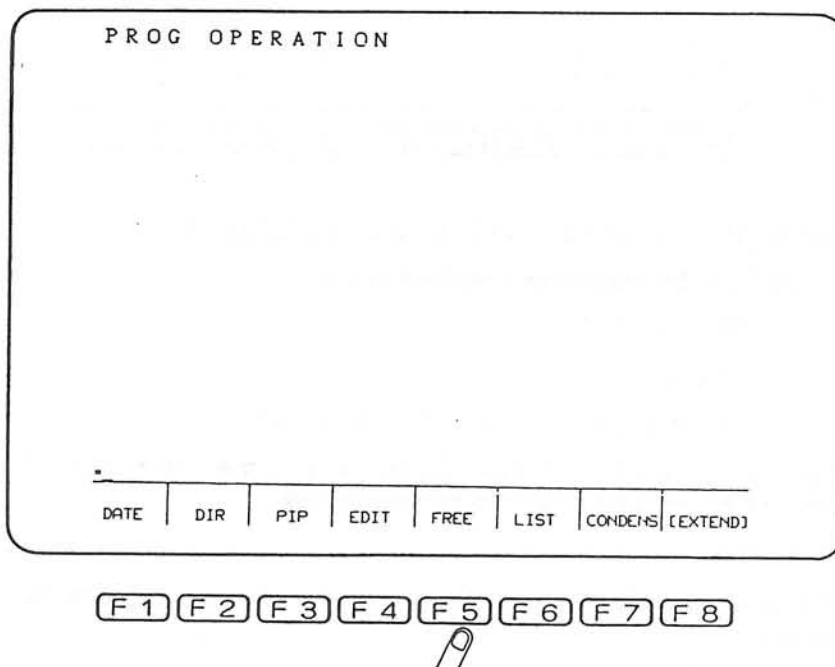
One byte corresponds to one character.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



- (2) Press the function key [F5] (FREE).

- (3) Key in a device name, BB1: or FD0. The default is BB1:.
- (4) Press the **WRITE** key.

The screen as indicated below will be displayed.

142/\$008E TOTAL SECTORS AVAILABLE
35784 TOTAL BYTES

PROG OPERATION FREE

FREE BB1: PAGE 1

142/\$008E TOTAL SECTORS AVAILABLE
35784 TOTAL BYTES
1212 m TAPE STORE LENGTH

•EX
•EX
•FR
•

DATE	DIR	PIP	EDIT	FREE	LIST	CONDENS	[EXTEND]
------	-----	-----	------	------	------	---------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

The number preceded by the symbol "\$" is a hexadecimal notation.

Note: \$008E is the hexadecimal notation of 142.

$$\text{\$}80 = 16 \times 8$$

$$\text{\$}E = 14$$

$$\text{Therefore, } \$008E = 16 \times 8 + 14 = 142$$

Refer to Section 1, "Program Input/Output Functions by Floppy Disks" in the Special Function Manual No. 1 for details of the remaining capacity of a floppy disk.

The following option code can be used:

";C" When this option code is designated, sizes of continuous capacity available are displayed in succession.

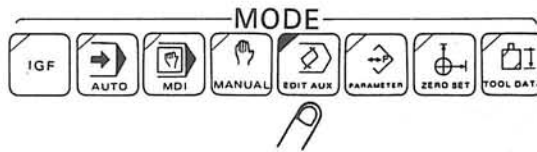
Example: =FR;C

7-7. List

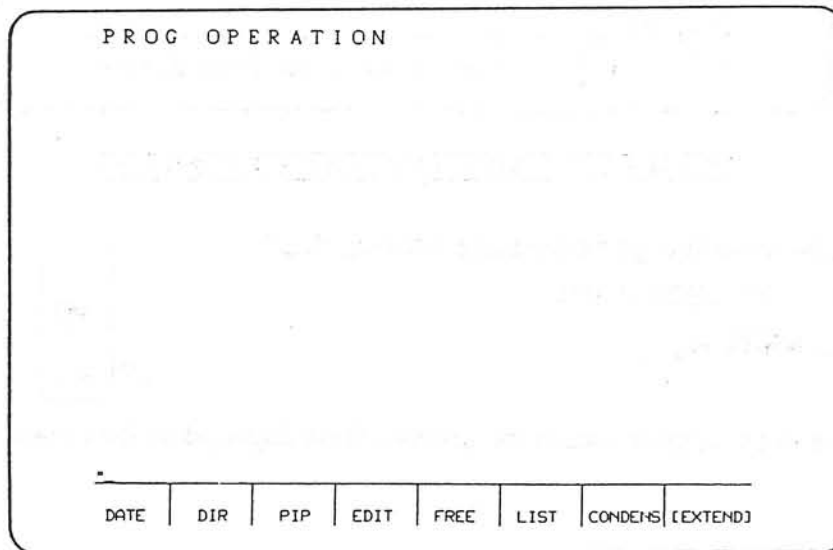
This function displays the list of a file on the CRT screen or prints them out using a printer.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



- (2) Press the function key [F6] (LIST).

The prompt “= L” will be displayed on the command line.

P R O G O P E R A T I O N

LIST BB1:BOX-1.MIN
PAGE 1


```

O11
N001 G00 X0
N002 Y0
N003 Z0
N004 CALL 077
N005 X11 Y11 Z11
M02
O12
N120 G00 X100
N121 Y100
N122 Z100
N123 CALL 077
=EX
=EX
=EX
=L BOX-1.MIN
    
```

DATE	DIR	PIP	EDIT	FREE	LIST	CONDENS	[EXTEND]
------	-----	-----	------	------	------	---------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

(3) Key in a file name through the keyboard following "L _".

Example: =L _BOX -1.MIN

(4) Press the **WRITE** key.



With the above steps, program data in the specified file is displayed on the screen.

Note 1: The list of a file is displayed in units of 12 lines per page.

If the list cannot be displayed on one page, the "=" code which indicates that the control is waiting for next command input is not displayed on the command line and the cursor remains as it was. Possible operations and the results are as indicated below.

- a) When the **BS** key is pressed, the display page will advance by one.
- b) When the **WRITE** key is pressed, the display page will advance continuously up to the last page. To stop it, press the **WRITE** key.
- c) When the **CANCEL** key is pressed, the command is aborted with the display page unchanged.

Example: When the list of a file is large

- 1) Press the function key [F6] (LIST) and the **WRITE** key. This will display the first page of the list.
- 2) Press the **BS** key repeatedly until the required page is obtained.
- 3) Press the **CANCEL** key to abort operation.
- 4) The next function can be started with the display unchanged.

Note 2: When a file name has not been entered, the screen will display the list of the file "A.MIN". That is, pressing the **WRITE** key without entering a file name has the same effect as entry of the file name "A.MIN".

Note 3: The device name to which the list of a file is output can be specified following the file name.

Each output device is provided with a code as specified below.

CRT on the operation panel : PN

Printer (optional) : PR

Teletypewriter (optional) : TT

Specify the code of the output device following the file name with a delimiter ",", placed between them. Key in ":" after the output device code.

When an output device code is not specified, the system selects the CRT on the operation panel as the output device.

Example 1: =L_,PR: [WRITE]

The list of the file named A.MIN is output to the printer.

Example 2: =L_BOX-1.NUB,TT: [WRITE]

The list of the file named BOX-1.MIN is output to the teletypewriter.

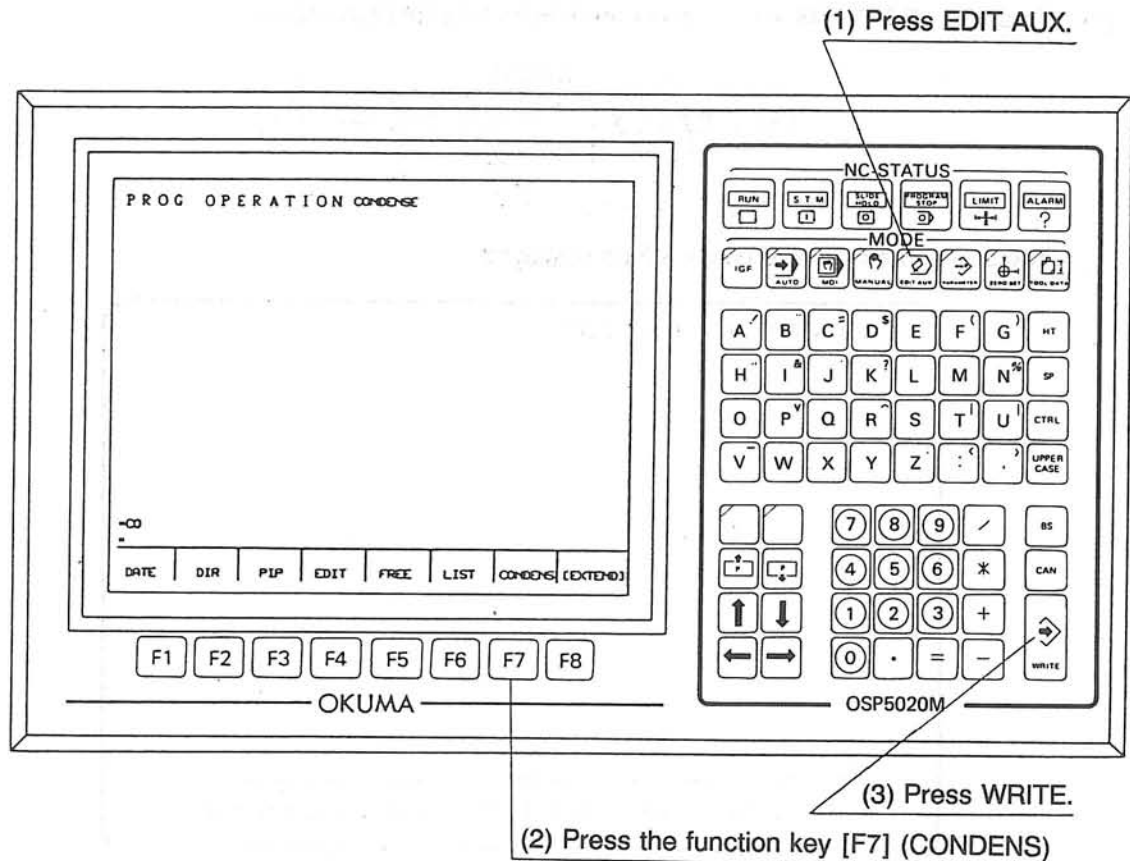
Note 4: The option code ";H" allows the operator to add a comment at the beginning of the list page. Key in ";H" following the output device.

7-8. Data Arrangement in Bubble Memory

When the program stored in the bubble memory is edited repeatedly, the unusable area in the bubble memory will increase. This decreases the available capacity of the bubble memory and restricts the number of programs to be stored.

This function is used to arrange data in the bubble memory so that it can be used effectively.

The operating procedure is as indicated below.



(1) Press the **EDIT AUX** key to select the PROG OPERATION mode.

(2) Press the function key [F7] (CONDENS).

The prompt "= CO" will be displayed on the command line.

(3) Press the **WRITE** key.

Arrangement of data in the bubble memory will start.

After the completion of arrangement, the prompt "=" will appear on the command line.

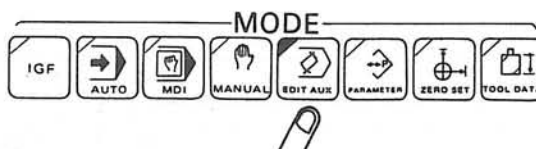
7-9. Time

The control can count the time by setting the reference time. This function allows the operator to know the present time.

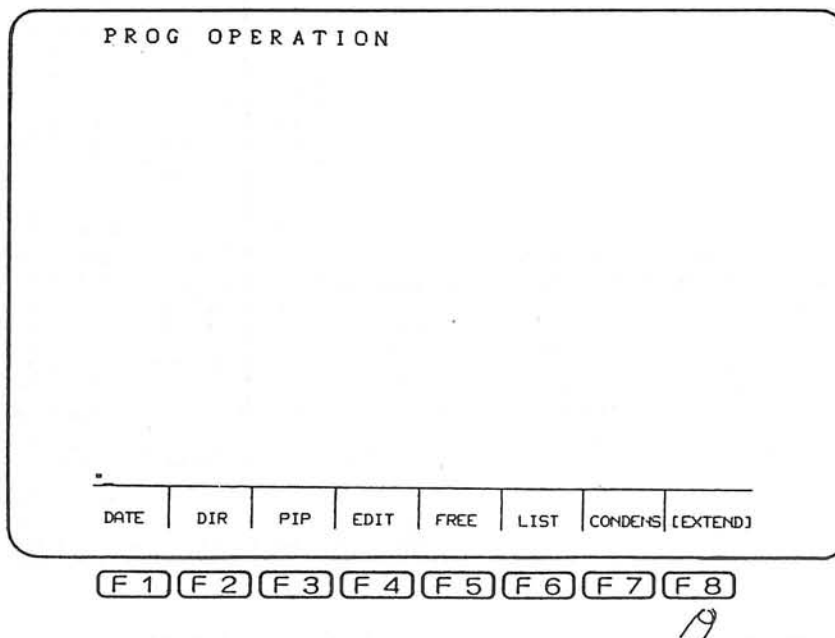
When the machine is provided with the optional gauging data printout function, gauging data can be printed out with the time of execution using this function.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.

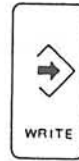


The screen as indicated below will be displayed.



- (2) Press the function key [F8] (EXTEND).

(5) Press the **WRITE** key.



9

PROG OPERATION TIME

1984. 4. 1 SUNDAY 0: 2:39

TIME (H:M:S) :8:30:5

1984. 4. 1 SUNDAY 8:30:5

Entry data

TIME
INIT
DELETE
RENAME

[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

When time data has been entered correctly, the screen displays the set date, day of the week, and time.

If time data has not been entered correctly, the screen displays "enter time (H:M:S)!" again, requesting the operator to enter correct data.

Note 1: When time data only needs to be checked and does not need to be set, simply press the **WRITE** key. The **TIME** command will terminate.

Note 2: The data setting range is as follows.

Hour 0 through 23

Minute 0 through 59

Second 0 through 59

Note 3: After 23-hour 59-minute 59-second, the time changes to 0-hour 0-minute 0-second and the date and the day of the week change.

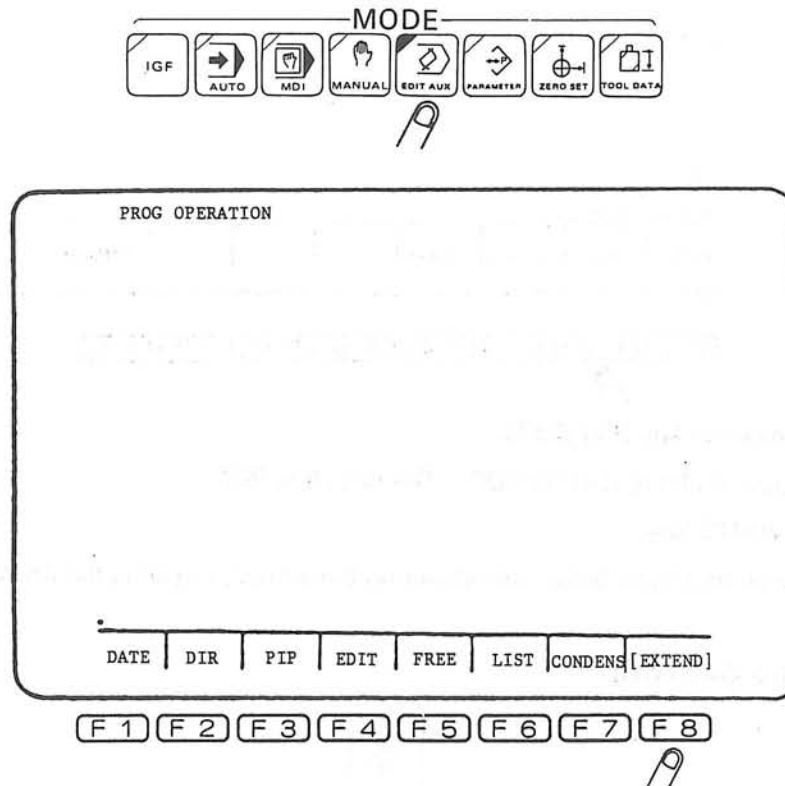
Note 4: The time is counted from 0-hour 0-minute 0-second when the NC is ready after turning on the power.

7-10. Initializing

This function initializes the storage device such as bubble memory and floppy disk. When this function is activated, all the data in the storage device will be deleted.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



- (2) Press the function key [F8] (EXTEND).

P R O G O P E R A T I O N I N I T

=EX
 =IN
 Initialize OK (Y/N) !

TIME

INIT

DELETE

RENAME

[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

9

- (3) Press the function key [F2] (INIT).
- (4) Enter the device name, BB1: or FD0:. The default is BB1:.
- (5) Press the **WRITE** key.

The indication as shown below will appear on the screen, requiring the operator to respond.

= IN

Initialize OK? (Y/N)



9

P R O G O P E R A T I O N I N I T

=EX
 =IN
 Initialize OK (Y/N) !N

TIME

INIT

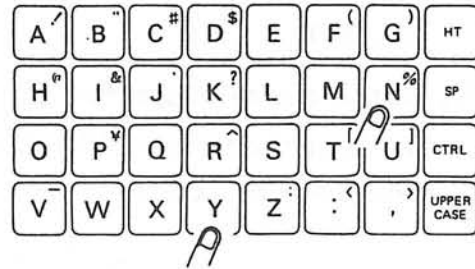
DELETE

RENAME

[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

- (6) To initialize the device, type Y.
To abort operation, type N.



- (7) Press the **WRITE** key.



When Y has been typed and the **WRITE** key has been pressed, the storage device will be initialized.

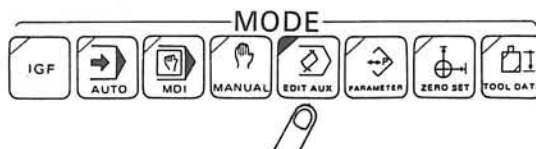
When N has been typed and the **WRITE** key has been pressed, initialization will be aborted.

For the procedure to initialize a floppy disk, refer to Section 1, "Program Input/Output Functions by Floppy Disks" in the Special Function Manual No. 1.

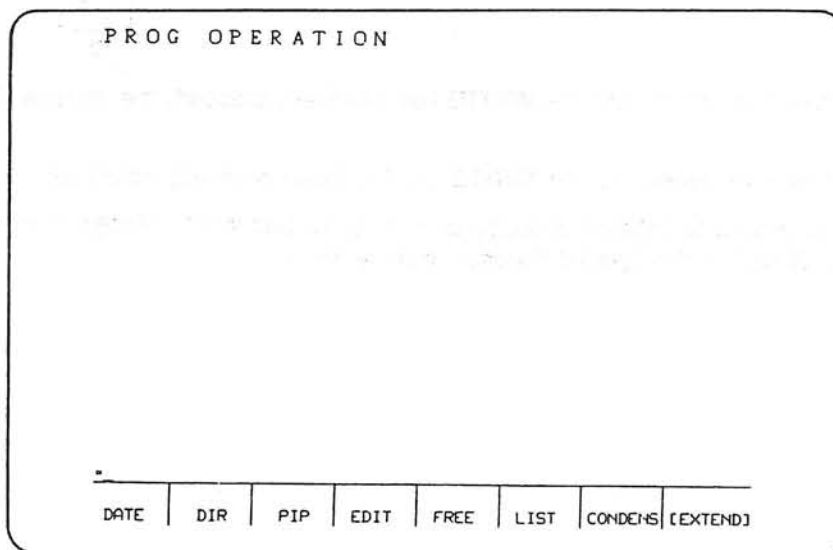
7-11. Deletion

This function deletes the specified file in the bubble memory (BB1:) or a floppy disk (FD0:).
The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



- (2) Press the function key [F8] (EXTEND).

- (3) Press the function key [F3] (DELETE).

The prompt "= DEL" will be displayed on the command line.

PROG OPERATION

=CX
=DEL

TIME

INIT

DELETE

RENAME

[EXTEND]

F1

F2

F3

F4

F5

F6

F7

F8

- (4) Enter the device name, BB1: or FD0:. The default is BB1:.

- (5) Press the **WRITE** key.



PROG OPERATION DELETE

=EX
=DEL BOX-1.MIN
BOX-1.MIN
"

TIME

INIT

DELETE

RENAME

[EXTEND]

F1

F2

F3

F4

F5

F6

F7

F8

The file A.MIN is deleted and the following message is displayed on the command line.

A.MIN deleted

Note 1: To delete a file other than A.MIN, specify a file name.
The file name extension .MIN can be omitted.

Example:

ABC.MIN	DEL ABC	_____	Can be omitted ↓
ABC.SUB	DEL ABC.SUB		

Note 2: When the specified file name does not exist in the storage device, the message "no file" is displayed on the command line.

Note 3: Symbols "?" and "*" can be used to specify a file name.
Functions of these symbols are the same as explained in 7-2., "Directory".

Example:

DEL*	Files whose file name extension is .MIN are all deleted.
DEL*.SUB	Files whose file name extension is .SUB are all deleted.
DEL BOX*.*	Files whose main file name begins with BOX are all deleted.
DEL *.*	All files are deleted.
DEL ???*.SUB . .	Files whose main file name consists of up to three characters followed by the extension .SUB are all deleted.

Note 4: Option code for file deleting operation

When the code ";V" is specified following the file name, it is possible to display the file name on the command line verify whether or not the specified file may be deleted.

Example:

DEL *.*;V [WRITE]

When the **WRITE** key is pressed, the following message will be displayed on the command line.

BOX-A1.MIN delete OK20 (Y/N)!

To delete the file, type Y and press the **WRITE** key.

To abort deletion, type N and press the **WRITE** key.

Since "*.*" has been entered as the file name, all file names will be displayed on the command line in sequence.

BOX-A2.MIN delete OK (Y/N)!

Enter Y or N as desired.

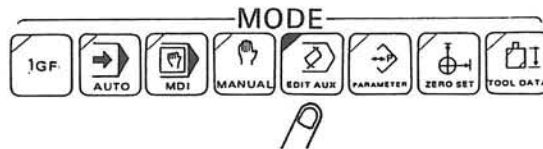
For the procedure to delete data in a floppy disk, refer to Section 1, "Program Input/Output Functions by Floppy Disks" in the Special Function Manual No. 1.

7-12. Rename

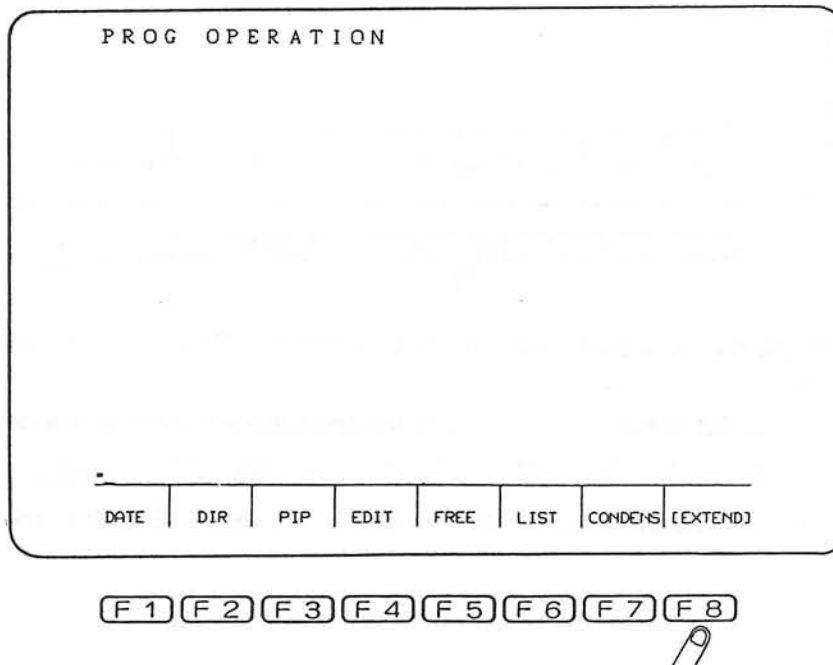
This function changes the name of the file stored in the bubble memory.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



- (2) Press the function key [F8] (EXTEND).

- (3) Press the function key [F4] (RENAME).

The "R" will be displayed on the command line.

P R O G O P E R A T I O N

=EX
=R

TIME

INIT

DELETE

RENAME

[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

9

- (4) First key in the current file name and then key in the new file name with a comma "," placed between them.

Example: R_SHIL1,SHIL2

The file name is SHIL1.MIN is changed to SHIL2.MIN.

R_SHIL1.SUB,SHIL1,SSB

The file name SHIL1.SUB is changed to SHIL1.SSB.

R_SHIL1.SUB,SHIL2.SUB

The file name SHIL1.SUB is changed to SHIL2.SUB.

- Note 1: When the current file name specified is not found, the message “no file” is displayed on the command line and renaming operation terminates.
- Note 2: When the new file name specified already exists in the bubble memory, the message “file exists” is displayed on the command line and renaming operation terminates.
- Note 3: Symbols “?” and “*” cannot be used to specify a file name. The error message “file name error” will be displayed on the screen if specified.

7-13. Protect

This function protects the specified file in the bubble memory (BB1:) or in a floppy disk (FD0:).

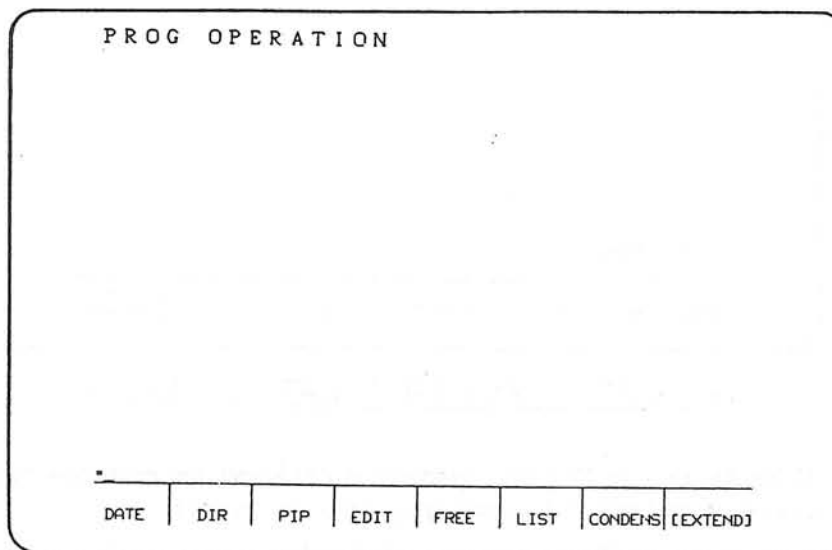
When this function is activated, file operations such as editing, deleting, and renaming cannot be conducted.

The operating procedure is as indicated below.

- (1) Press the **EDIT AUX** key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



- (2) Press the function key [F8] (EXTEND) two times.

- (3) Press the function key [F1] (PROTECT).

The "PROT" will be displayed on the command line.

P R O G O P E R A T I O N

=EX

=EX

=PROT

PROTECT

DNC

[EXTEND]

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

9

- (4) Enter the device name, file name to be protected, and option code.

Device name: BB1: or FD0:

The default is BB1:.

Option code: ;C, ;V, or ;CV

The option code can be omitted.

- (5) Press the **WRITE** key.



9

Note 1: When the specified file name does not exist in the storage device, the message "no file" will be displayed on the command line.

Note 2: Symbols "?" and "*" can be used to specify a file name.
Functions of these symbols are the same as explained in 7-3., "Directory".

Option codes for file protection:

The code ";C" specified following the file name cancels file protection.

The code ";V" specified following the file name displays the following message on the command line of the CRT screen to allow the operator to select whether or not the specified file is protected.

FILE PROTECT OK (Y/N)?

When file protection is desired, type Y and press the **WRITE** key.

When file protection is not desired, type N and press the **WRITE** key.

The code ";CV" specified following the file name displays the following message on the command line of the CRT screen allow the operator to select whether or not protection of the specified file is canceled.

FILE PROTECT CANCEL (Y/N)?

When file protection needs to be canceled, type Y and press the **WRITE** key.

When file protection does not need to be canceled, type N and press the **WRITE** key.

Example 1: ABC.MIN or BB1:ABC.MIN

This instruction protects the file ABC.MIN registered in the bubble memory.

Example 2: BCD.MIN;C or BB1:BCD.MIN;C

This instruction cancels protection of the file BCD.MIN registered in the bubble memory.

Example 3: CDE.MIN;V or BB1:CDE.MIN;V

When the **WRITE** key is pressed following the above instruction, the prompt as indicated below will be displayed on the command line.

CED.MIN FILE PROTECT OK (Y/N)?

Type Y and press the **WRITE** key to protect the file.

Type N and press the **WRITE** key not to protect the file.

Example 4: DEF.MIN;CV or BB1.DEF.MIN;CV

When the **WRITE** key is pressed following the above instruction, the prompt as indicated below will be displayed on the command line.

DEF.MIN FILE PROTECT CANCEL (Y/N)?

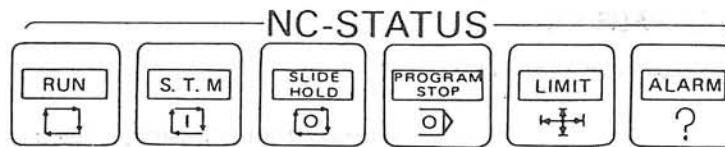
Type Y and press the **WRITE** key to cancel protection of the specified file.

Type N and press the **WRITE** key not to cancel protection of the specified file.

For the procedure to delete data in a floppy disk, refer to Section 1, "Program Input/Output Functions by Floppy Disks" in the Special Function Manual No. 1.

8. Display On CRT Panel

8-1. Status Display



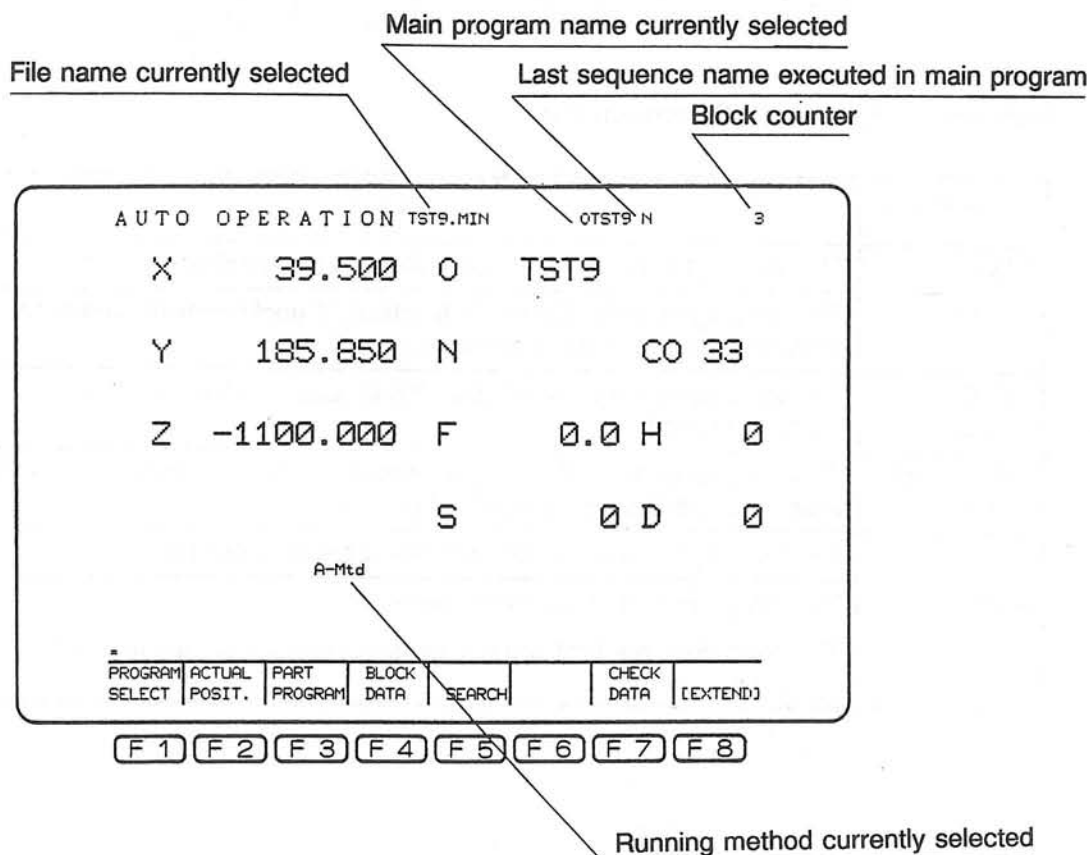
These lamps indicate the NC operation status.

Lamp Name	Function
RUN	This lamp lights when NC is computing the axis position.
S.T.M	This lamp lights while S (spindle function), T (tool function), and/or M (miscellaneous function) is being executed.
SLIDE HOLD	This lamp lights when the SLIDE HOLD button on the machine operation panel is pressed.
PROGRAM STOP	This lamp lights when the program stop or the optional stop command is executed, and flickers during dwell operation.
LIMIT	This lamp lights when an axis reaches a soft-limit position.
ALARM	This lamp lights when an alarm comes on. This lamp does not light when a warning message comes from an operation mistake.

8-2. Actual Position Display

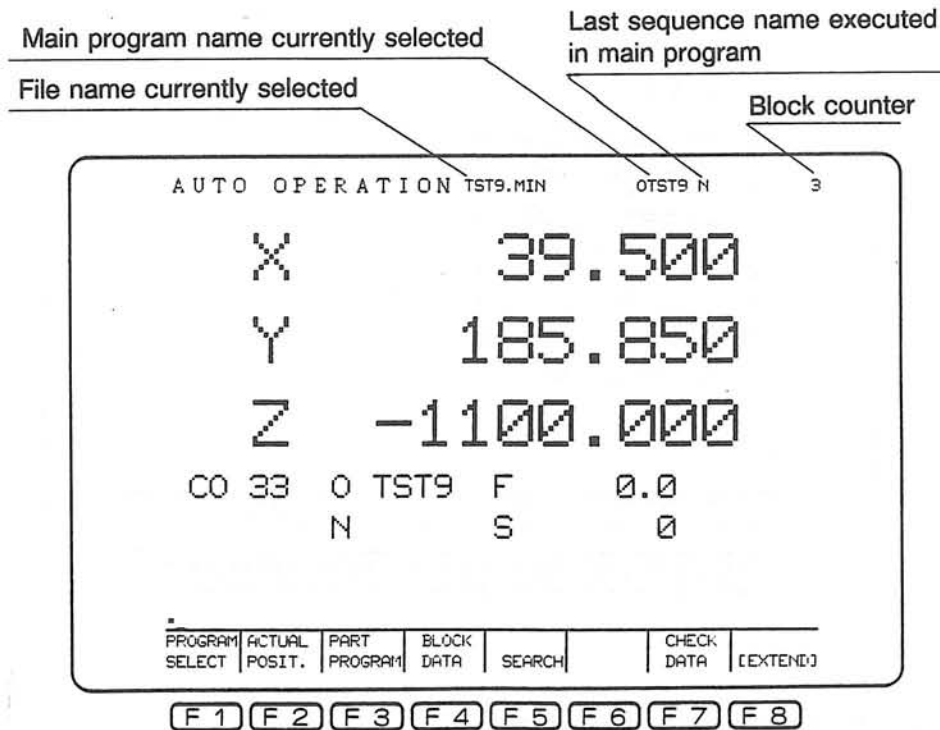
When the function key [F2] (ACTUAL POSIT.) is pressed, the actual position information page is displayed on the CRT. There are three types of display and switching from one display mode to another is done by pressing the **PAGE** key.

(1) Page 1 (Double Extension Indication)



Note: The symbol “-” appears before axis address on which the mirror image function is active.

(2) Page 1 (Four-fold Extension Indication)



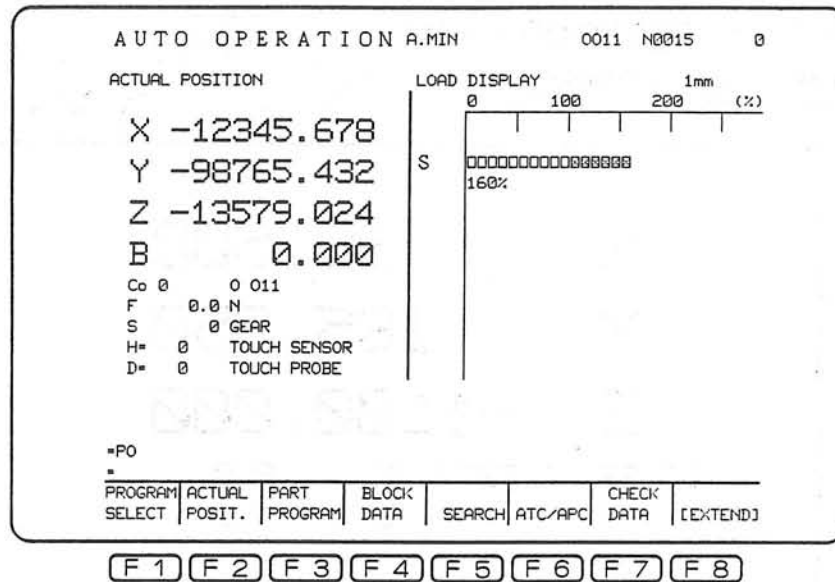
- X : X-axis actual position on active block
- Y : Y-axis actual position on active block
- Z : Z-axis actual position on active block
- CO : Work coordinate system number
- O : Currently active program name
- N : Currently active sequence name
- F : Actual feedrate (overridden programmed F value)
- S : Actual spindle speed (overridden programmed S value)
- H : Tool length offset number
- D : Cutter radius compensation number

Change-over of double extension and four-fold extension can be carried out on the NC optional parameter (bit) No. 4, bit 6.

NC optional parameter (bit) No. 4, bit 6:

- 0 Double extension
- 1 Four-fold extension

(3) Page 2



- X : X-axis actual position on active block
Y : Y-axis actual position on active block
Z : Z-axis actual position on active block
CO : Work coordinate number
O : Currently active program name
N : Currently active sequence name
F : Actual feedrate (overridden programmed F value)
S : Actual spindle speed (overridden programmed S value)
H : Tool length offset number
D : Cutter radius compensation number
GEAR : Spindle drive gear conditions (release, low, middle, high)
TOUCH SENSOR: Touch sensor status; Reverse display with touch sensor ON
TOUCH PROBE : Touch probe status; Reverse display with touch probe ON
S (Spindle) : Spindle load condition (indicated by graph and percent values)
- Note:** This display screen is available for OSP5020M/OSP500M-G NC operation panel specification.

(4) Page 3

AUTO OPERATION TST9.MIN				OTST9 N	3
ACTUAL POSITION				1mm	
	X	Y	Z		
LOCAL COORDINATES	39.500	185.850	-1100.000		
WORK COORDS (APA)	39.500	185.850	-1100.000		
WORK COORDS	39.500	185.850	-1100.000		
MACHINE COORDS	139.820	336.170	-899.680		
FEEDBACK COORDS	2639.820	2836.170	1600.320		
TARGET VALUE	39.500	185.850	-1100.000		
DISTANCE REMAINING	0.000	0.000	0.000		
MANUAL SHIFT ACTUL	0.000	0.000	0.000		
MANUAL SHIFT TOTAL	0.000	0.000	0.000		
A-Mtd					
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA [EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6 F 7 F 8

- LOCAL COORDINATES : Distance referenced to the origin of the local coordinate system
- WORK COORDS (APA) : Distance referenced to the origin of the work coordinate system
- WORK COORDS : Distance referenced to the origin of the work coordinate system
- MACHINE COORDS : Distance referenced to the machine origin
- FEEDBACK COORDS : Output (numerical value) from the position encoder
- TARGET VALUE : Target value
- DISTANCE REMAINING : Distance remaining to the target point (commanded point)
- MANUAL SHIFT ACTUL : Axis manual shift amount (current operation)
- MANUAL SHIFT TOTAL : Axis manual shift amount (total)

8-3. Program Display

When the function key [F3] (PART PROGRAM) is pressed, the program information pages are accessed. There are three types of program information display pages such as schedule program, main program and MDI program. The display page can be changed by pressing the **PAGE** key.

(1) Schedule Program

AUTO OPERATION				NA2 1	
PROGRAM		*SCHEDULE*		1mm	
N001 VSET VC1=1 N002 PSELECT GEAR.MIN,0100 Q-10 N003 PSELECT SHAFT.MIN N004 PSELECT WHEEL.MIN END				DIS X 0.000 Y 0.000 Z 0.000	
				Co 1 O F 0.0 N S 0 H= 0 0.000 D= 0 0.000	
ACT POSIT (WORK)		X	Y	Z	
		-350.000	-250.000	100.000	
=PR					
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA [EXTEND]
[F 1]	[F 2]	[F 3]	[F 4]	[F 5]	[F 6] [F 7] [F 8]

(2) Current Main Program

AUTO OPERATION A.MIN				O	N	3														
PROGRAM				* CURRENT MAIN PROGRAM *		1mm														
G15H5				DIS	X	0.000														
G56X0Y0Z500H1					Y	0.000														
↑S1000M3					Z	0.000														
G0X100Y100					C	0.0000														
CALL 0100				Co	5															
G0X200Y150				O	F	0.0														
CALL 0100				N	S	0														
M30				H=	1	0.000														
				D=	0	0.000														
SPINDLE LOAD				0%																
ACT POSIT (WORK)	X	Y	Z	C																
	0.000	0.000	100.000	0.0000																
	A-Mtd																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>PROGRAM</td> <td>ACTUAL</td> <td>PART</td> <td>BLOCK</td> <td></td> <td>CHECK</td> <td></td> </tr> <tr> <td>SELECT</td> <td>POSIT.</td> <td>PROGRAM</td> <td>DATA</td> <td>SEARCH</td> <td>DATA</td> <td>[EXTEND]</td> </tr> </table>							PROGRAM	ACTUAL	PART	BLOCK		CHECK		SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]
PROGRAM	ACTUAL	PART	BLOCK		CHECK															
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]														
F1F2F3F4F5F6F7F8																				

➤: Block just read into the buffer.

↑: Block being executed.

Note: Display of SPINDLE LOAD is available for OSP5020M/OSP500M-G NC operation panel specification and only for brushless servo motor specification.

(3) Read Main Program

AUTO OPERATION A.MIN				O	N	3														
PROGRAM				*READ MAIN PROGRAM*		1mm														
G15H5				DIS	X	0.000														
G56X0Y0Z500H1					Y	0.000														
↑S1000M3					Z	0.000														
G0X100Y100					C	0.0000														
CALL 0100				Co	5															
G0X200Y150				O	F	0.0														
CALL 0100				N	S	0														
M30				H=	1	0.000														
				D=	0	0.000														
SPINDLE LOAD				0%																
ACT POSIT (WORK)	X	Y	Z	C																
	0.000	0.000	100.000	0.0000																
	A-Mtd																			
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>PROGRAM</td> <td>ACTUAL</td> <td>PART</td> <td>BLOCK</td> <td></td> <td>CHECK</td> <td></td> </tr> <tr> <td>SELECT</td> <td>POSIT.</td> <td>PROGRAM</td> <td>DATA</td> <td>SEARCH</td> <td>DATA</td> <td>[EXTEND]</td> </tr> </table>							PROGRAM	ACTUAL	PART	BLOCK		CHECK		SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]
PROGRAM	ACTUAL	PART	BLOCK		CHECK															
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]														
F1F2F3F4F5F6F7F8																				

(4) MDI Program

AUTO OPERATION TST9.MIN				OTST9 N		1	
PROGRAM		*MDI PROGRAM*		1mm			
G90G0X0Y0Z0		*CURRENT*		DIS	X	350.000	
RTMDI					Y	250.000	
					Z	0.000	
		BUFFER		Co	1		
				O	TST9	F	0.0
				N	S	0	
				H=	0	0.000	
				D=	0	0.000	
ACT POSIT (WORK)		X	Y	Z			
		-350.000	-250.000	100.000			
		A-Mtd					
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]	

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

8-4. Block Display

The function key [F4] (BLOCK DATA) accesses the block data pages.

Under the heading of BLOCK DATA, five pages of block data display are available: CURRENT, BUFFER, SECOND BUFFER, THIRD BUFFER and READ.

These pages are selectable by pressing the **PAGE** key.

(1) Display of One Block Data Currently Executed

AUTO OPERATION TST9.MIN					OTST9 N3		3	
BLOCK DATA			CURRENT			1mm		
G01	M15	X	-350.320	S	0	Sr	0	
G17	M115	Y	-250.320	Tc	0	So	0	
G23	M131	Z	99.680	Tn	0			
G53	M135			M	0	Fm	0.000	
G90	M137			H	0	Fr	0.000	
G94	M139			D	0			
	M133	I	0.000			Pr	0	
		J	0.000			Pe	0	
		K	0.000	Np	0	Nr	0	
		F				Ns		
		Fd	0.000	Hc		Cr	0	
		Ft	0			Ce	0	
		F1	0			BC	3	
A-Mtd						EMPTY		
=EX =EX =BL								
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]	

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

(2) Display of One Block Data in Buffer (to be Executed Next)

AUTO OPERATION TST9.MIN					OTST9 N3		3	
BLOCK DATA			BUFFER			1mm		
G01	M15	X	-350.320	S	0	Sr	0	
G17	M115	Y	-250.320	Tc	0	So	0	
G23	M131	Z	99.680	Tn	0			
G53	M135			M	0	Fm	0.000	
G90	M137			H	0	Fr	0.000	
G94	M139			D	0			
	M133	I	0.000			Pr	0	
		J	0.000			Pe	0	
		K	0.000	Np	0	Nr	0	
		F				Ns		
		Fd	0.000	Hc		Cr	0	
		Ft	0			Ce	0	
		F1	0			BC	3	
A-Mtd						EMPTY		
=EX =EX =BL								
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]	

[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]

(3) Display of One Block Data in Second Buffer

AUTO OPERATION TST9.MIN						OTST9 N3		3	
BLOCK DATA		SECOND BUFFER				1mm			
G01	M15	X	-350.320	S	0	Sr	0		
G17	M115	Y	-250.320	Tc	0	So	0		
G23	M131	Z	99.680	Tn	0				
G53	M135			M	0	Fm	0.000		
G90	M137			H	0	Fr	0.000		
G94	M139			D	0				
	M133	I	0.000			Pr	0		
		J	0.000			Pe	0		
		K	0.000	Np	0	Nr	0		
		F				Ns			
		Fd	0.000	Hc		Cr	0		
		Ft	0			Ce	0		
		F1	0			BC	3		
		A-Mtd				EMPTY			

-EX
 -EX
 -BL
 "

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK	
SELECT	POSIT.	PROGRAM	DATA		DATA	[EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6	F 7 F 8

(4) Display of One Block Data in Third Buffer

AUTO OPERATION A.MIN						0 N		5	
BLOCK DATA		THIRD BUFFER				1mm			
G00	M15	X	5.000	S	0	Sr	0		
G17	M115	Y	5.000	Tc	0	So	0		
G23	M131	Z	0.000	Tn	0				
G53	M135	C	0.0000	M	0	Fm	0.000		
G90	M137			H	0	Fr+OVERFLOW			
G94	M139			D	0				
	M133	I	0.000	Ha	0	Pr	0		
	M326	J	0.000			Pe	0		
		K	0.000	Np	0	Nr	0		
		F	0.000			Ns			
		Fd	0.000	Hc	5	Cr	0		
		Ft	0			Ce	0		
		F1				BC	5		
		A-Mtd				EMPTY			

"

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	ATC/APC	CHECK	
SELECT	POSIT.	PROGRAM	DATA			DATA	[EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6	F 7 F 8	

(5) Display of One Block Data Just Read

AUTO OPERATION TST9.MIN										OTST9 NS		3	
BLOCK DATA				READ				1mm					
G01	M15	X	-350.320	S	0	Sr	0						
G17	M115	Y	-250.320	Tc	0	So	0						
G23	M131	Z	99.680	Tn	0								
G53	M135			M	0	Fm	0.000						
G90	M137			H	0	Fr	0.000						
G94	M139			D	0								
	M133	I	0.000			Pr	0						
		J	0.000			Pe	0						
		K	0.000	Np	0	Nr	0						
		F				Ns							
		Fd	0.000	Hc		Cr	0						
		Ft	0			Ce	0						
		F1	0			BC	3						
		A-Mtd				EMPTY							

=EX
 =EX
 =BL
 =

PROGRAM	ACTUAL	PART	BLOCK		CHECK	
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]
F1	F2	F3	F4	F5	F6	F7 F8

X : X-axis command value
Y : Y-axis command value
Z : Z-axis command value
I : I command value
J : J command value
K : K command value
F : Feedrate command value
Fd : Feedrate command value (0.001 mm/6.4 ms)
Ft : Feedrate (F1-digit command)
FI : Feedrate (F1-digit command)
S : Spindle speed command value
Sr : Actual spindle speed
So : Spindle speed command value (overridden)
Tc : Active tool number
Tn : Next tool number
M : M command value
H : Tool length offset number
D : Cutter radius compensation number
Fm : Actual feedrate (mm/min)
Fr : Actual feedrate (mm/rev)
Pr : Main program repeat count by schedule operation
Pe : Main program execution count by schedule operation
Np : Hole number in coordinate calculation
Nr : Hole number for restart
Ns : Sequence specified by the sequence stop
Hc : Work coordinate system number
Cr : Number of subprogram to be repeated
Ce : Number of subprogram actually repeated
BC : Block counter
EMPTY : No data in buffer
(EXIST : Data existing in buffer)

8-5. ATC Tool Setting Data Display (Memory-random ATC Specification)

Pressing the function key [F8] (EXTEND) changes the key guidance display. The function key [F3] (TOOL DISPLAY) allows the ATC tool setting page to be accessed. In this mode, there are two pages such as *ATC TOOL SET (TOOL REF)* and *ATC TOOL SET (POT REF)*. The function key [F3] (TOOL DISPLAY) switches the display from one page to another.

(1) ATC Tool Set (Tool Reference)

MDI OPERATION										TST9.MIN	OTST9 N	2
ATC TOOL SET (TOOL REF)												
TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.					
001	NA	011	11	021	NA	031	NA	SPCY POT NA				
002	2	012	NA	022	NA	032	NA	ACT TOOL 009				
003	3	013	13	023	NA	033	NA	NXT TOOL NA				
004	NA	014	NA	024	NA	034	NA					
005L	5	015L	15	025	NA	035	NA					
006	NA	016	NA	026	NA	036	NA					
007	7	017	17	027	NA	037	NA					
008	8	018	18	028	NA	038	NA					
*009	NA	019	NA	029	NA	039	NA					
010	10	020	20	030	NA	040	NA					
=TD =TD =TD =IN												
LIBRARY P. SET		TOOL DISPLAY		PER-SONAL		DIAG-NOSIS		MESSAGE		[EXTEND]		
[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]												

(2) ATC Tool Set (Pot Reference)

MDI OPERATION										TST9.MIN	OTST9 N	2
ATC TOOL SET (POT REF)												
POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.					
+ 1	NA	11	011					SPCY POT NA				
2	002	12	NA					ACT TOOL 009				
3	003	13	013					NXT TOOL NA				
4	D	14	D									
5	005L	15	015L									
6	D	16	D									
7	007	17	017									
8	008	18	018									
9	NA	19	NA									
10	010	20	020									
=TD =TD =TD =IN												
LIBRARY P. SET		TOOL DISPLAY		PER-SONAL		DIAG-NOSIS		MESSAGE		[EXTEND]		
[F1] [F2] [F3] [F4] [F5] [F6] [F7] [F8]												

8-6. Message Display (optional)

Press the function key [F7] (MESSAGE) to display the messages in a program. An MSG command in a program automatically changes the display to the message page during the automatic mode operation and the programmed message is displayed in double-extension characters.

While the CRT is in the message display mode, display page may be switched to the actual position display, program display, block display, and check display using a proper function key. The NMSG command in a program automatically returns the display mode from the message display mode to the original display mode. The message displayed on the CRT is the one specified in the program last.

Example :

```

N100  :
N101  :
N102 M00 MSG (CHECK TOOL!) ..... This automatically changes the display
                                     mode to the message mode and "CHECK
                                     TOOL!" appears on the CRT.
N103 NMSG ..... This restores the display mode to the original
                                     mode.
N104  :
N110 X100 Y100 (WORK FINISH) ..... Switching the display mode into the mes-
                                     sage by pressing the function key allows the
                                     CRT to display the comment "WORK FIN-
                                     ISH".

```

AUTO OPERATION B.MIN					01	NSTR	1
CHECK TOOL!							
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]	

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

8-7. Check Display

The OSP5020M/OSP500M-G has a number of check functions by which the panel input/output status and the machine signal input/output status are indicated on the CRT during operation in automatic mode, MDI mode, and manual mode. The following items can be monitored:

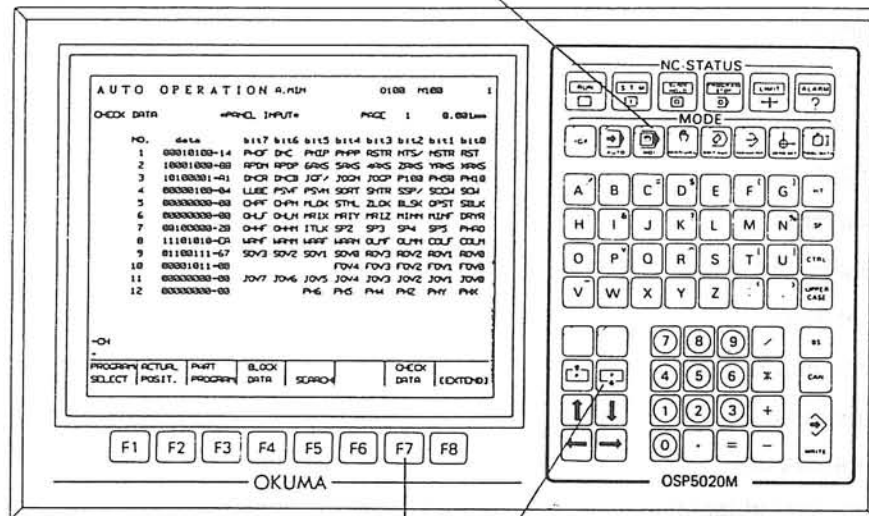
1. Panel input
2. Panel output
3. NC input
4. NC output
5. External input
6. External output
7. Pendant input
8. Pendant output
9. Machine input
10. Machine output
11. Machine extend input
12. Machine extend output
13. NC specification codes
14. Machine specification codes
15. NC axis data
16. Machine axis data
17. Diagnostics
18. Alarm message list
19. System variables
20. DNC (optional)

Select the data to be displayed by an NC optional parameter (bit) No. 5, bit 0 to bit 4.

Contents of input/output signals displayed at the CHECK DATA display page differ depending on machine tool model and specifications. For details, refer to Maintenance Manual for individual models.

Description of operating procedure:

- (1) Press either the **MANUAL**, **MDI** or **AUTO** key.



- (2) Press the function key [F7] (**CHECK DATA**).

- (3) Press the page key to change the screen display one screen at a time.

- (1) Press either **MANUAL**, **MDI**, or **AUTO** key.

The guides shown in the illustration above are displayed, but for F1, a different guide is indicated for each of the modes, as shown below.

- Automatic mode operation **PROGRAM SELECT**
- MDI mode operation **DATA INPUT**
- Manual Mode Operation **None**

- (2) Press the function key [F7] (**CHECK DATA**).

The CRT displays a check data indications page.

- (3) Press either the [P ↓] or [P ↑] page key to display the check data desired.

Pressing [P ↓] once advances a page.

Pressing [P ↑] once returns a page.

The **SEARCH** command displays the check data by one-touch operation, without repeatedly pressing the page key.

The explanation of operations (1) and (2) given on the previous page is omitted here as they both apply in this case.

- (4) Press the function key [F5] (**SEARCH**).

"=F" is displayed on the CRT console line.

- (5) Enter the desired page number through the keyboard.

The input data is displayed following "=F_".

Example: =F_10

- (6) Press the **WRITE** key.

This will display the desired check data.

When the **WRITE** key is pressed without inputting data following "= F₁", the menu display shown below will be displayed.

AUTO OPERATION				PAGE 1	
CHECK DATA INDEX				PAGE 1	
NO.	ITEM	NO.	ITEM		
* 1	PANEL INPUT	13	NC AXIS DATA		
2	PANEL OUTPUT	14	NC AXIS DATA MAG. DISP.		
3	NC INPUT	15	MACHINE AXIS DATA		
4	NC OUTPUT	16	MEMORY DATA		
5	PENDANT INPUT	17	SYS. VAR. AXIS DATA		
6	PENDANT OUTPUT	18	SYS. VAR. ZERO OFFSET		
7	MACHINE INPUT	19	SYS. VAR. ZERO OFFSET MSB		
8	MACHINE OUTPUT	20	SYS. VAR. TOOL OFFSET		
9	MACHINE EX INPUT	21	SYS. VAR. TOOL OFFSET MSB		
10	MACHINE EX OUTPUT	22	SYS. VAR. SYSTEM PARAMETER		
11	NC SPEC TABLE	23	SYS. VAR. HOME POSITION		
12	MC SPEC TABLE	24	SYS. VAR. MACHINE DATA		

=CH
=F
Input a number of screen. !

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]
-------------------	------------------	-----------------	---------------	--------	---------------	----------

F1 F2 F3 F4 F5 F6 F7 F8

Input the number for required item and press the **WRITE** key to display the first page of the required item screen.

8-7-1. Panel Input

On the "CHECK DATA *PANEL INPUT*" pages, the on/off status of individual switches on the machine operation panel are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*PANEL INPUT*								PAGE	1	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00000100=04	PHON	DNC	PNIP	PNPP	RSTR	NTSY	NSTR	RST			
2	01000010=42	RPDN	RPDR	6AXS	5AXS	4AXS	3AXS	VAXS	XAXS			
3	10100000=A0	DNCR	DNCB	JGFR	JOGN	JOGP	P100	PH50	PH10			
4	00000100=04	LUBE	PSVF	PSVN	SORT	SNTR	SSPZ	SCCW	SCW			
5	00001000=08	CHFF	CHPN	MLOK	STML	ZLOK	BLSK	OPST	SLUK			
6	00000000=00	SHWF	SHWN	MRIX	MRIY	MRIZ	MINN	MINF	DRYR			
7	00000000=00	OHMF	OHNN	ITLK	SP2	SP3	SP4	SP5	PHAD			
8	10101010=AA	WANE	WANN	WAF	WAAN	OLMF	OLMN	COLF	COLN			
9	01100110=66	SOV3	SOV2	SOV1	SOV0	ROV3	ROV2	ROV1	ROV0			
10	00000100=04					FOV4	FOV3	FOV2	FOV0			
11	00000000=00	JOV7	JOV6	JOV5	JOV4	JOV3	JOV2	JOV1	JOV0			
12	00000000=00					PH6	PH5	PH4	PH2	PHY	PHX	
A-Mtd												
=CH												
PROGRAM ACTUAL PART BLOCK SEARCH CHECK DATA [EXTEND]												
SELECT POSIT. PROGRAM DATA												

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

8-7-2. Panel Output

On the "CHECK DATA *PANEL OUTPUT*" pages, the on/off status of individual indicating lamps on the machine operation panel are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*PANEL OUTPUT*								PAGE	5	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00010000=10		HGR1	MGR1	UGR1	ORTL	NTRL	COLL	SCHL			
2	00000000=00	PSVL	LUBL	SHAL	OHLL	WANL	WAAL	OLML	COLL			
3	00001000=08	CHPL	F2L	F1L		TSSL	TPVL	JGNL	JGPK			
4	00000000=00											
5	00000000=00											
6	00000000=00											
7	00000000=00											
8	00000000=00											
9	00000000=00											
10	00000000=00											
11	00001000=08	F4L	F3L	MLKL	SLKL	ZLKL	BSKL	OSPL	SBLL			
12	00000000=00	F6L	F5L	MRYL	MRXL	MRZL	MINL	MIFL	DRYL			
A-Mtd												
=CH												
PROGRAM ACTUAL PART BLOCK SEARCH CHECK DATA [EXTEND]												
SELECT POSIT. PROGRAM DATA												

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

8-7-3. NC Input

On the "CHECK DATA *NC INPUT*" pages, the on/off status of individual input signals to the NC processor are displayed.

AUTO OPERATION A.MIN				0 N 2					
CHECK DATA		*NC INPUT*		PAGE 9 1mm					
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
1	00000000=00	SALM							
2	00000000=00	EALM		AMDT		AXCD	AML2	AML1	AML0
3	00000000=00					AXD3	AXD2	AXD1	AXD0
4	00000000=00	ERSF							
5	00000000=00			LOKW	LOKV	LOKU	LOKZ	LOKY	LOKX
6	00000000=00						LOKC	LOKB	LOKA
7	00000000=00	HP7	HP6	HP5	HP4	HP3	HP2	HP1	HP0
8	00000000=00	HP31	HP30	HP29	HP28	HP27	HP26	HP25	HP24
9	00000000=00	SAB	TAB	MAB	RTAB	RSAB	PRST		
10	00100000=20	ERST	ESTR	ETSS					
11	00000000=00			CLSW	CLSV	CLSU	CLSZ	CLSY	CLSX
12	00000000=00						CLSC	CLSB	CLSA

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK
SELECT	POSIT.	PROGRAM	DATA		DATA
					[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

8-7-4. NC Output

On the "CHECK DATA *NC OUTPUT*" pages, the on/off status of individual output signals from the NC processor are displayed.

AUTO OPERATION A.MIN				0 N 2					
CHECK DATA		*NC OUTPUT*		PAGE 11 1mm					
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
1	00000000=00							MAL2	MAL1
2	00000000=00	ERSS							MDRS
3	00000000=00			DRVW	DRVV	DRVU	DRVZ	DRVY	DRVX
4	00000000=00						DRVC	DRVB	DRVA
5	00000000=00			UCLW	UCLV	UCLU	UCLZ	UCLY	UCLX
6	00000000=00						UCLC	UCLB	UCLA
7	00000000=00	HF7	HF6	HF5	HF4	HF3	HF2	HF1	HF0
8	00000000=00	HF31	HF30	HF29	HF28	HF27	HF26	HF25	HF24
9	00000000=00			HPFW	HPFV	HPFU	HPFZ	HPFY	HPFX
10	00000000=00						HPFC	HPFB	HPFA
11	00000001=01	SF	TF	MF	RTF	RSF	PRSA		ALTA
12	00000100=04	SVDI				MINT	ZLOK	SLOK	MLOK

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK
SELECT	POSIT.	PROGRAM	DATA		DATA
					[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

8-7-5. External Input

On the "CHECK DATA *EXTERNAL INPUT*" pages, the on/off status of individual input signals to the NC processor are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*EXTERNAL INPUT*								PAGE	13	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00000000=00	IN16	IN15	IN14	IN13	IN12	IN11	IN10	IN09			
2	00000000=00	IN08	IN07	IN06	IN05	IN04	IN03	IN02	IN01			
3	00000000=00	PN16	PN15	PN14	PN13	PN12	PN11	PN10	PN09			
4	00000000=00	PN08	PN07	PN06	PN05	PN04	PN03	PN02	PN01			
5	00000000=00									PRST		
6	00000000=00											
7	00000000=00											
8	00000000=00											
9	00000000=00											
10	00000000=00											
11	00000000=00											
12	00000000=00											
A-Mtd												
=CH												
=												
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	ATC/APC	CHECK DATA	[EXTEND]					
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8					

8-7-6. External Output

On the "CHECK DATA *EXTERNAL OUTPUT*" pages, the on/off status of individual output signals from the NC processor are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*EXTERNAL OUTPUT*								PAGE	17	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00000000=00	OT16	OT15	OT14	OT13	OT12	OT11	OT10	OT09			
2	00000000=00	OT08	OT07	OT06	OT05	OT04	OT03	OT02	OT01			
3	00000000=00	PN16	PN15	PN14	PN13	PN12	PN11	PN10	PN09			
4	00000000=00	PN08	PN07	PN06	PN05	PN04	PN03	PN02	PN01			
5	00000000=00									PRER	PRNA	PRSA
6	00000000=00											
7	00000000=00											
8	00000000=00											
9	00000000=00											
10	00000000=00											
11	00000000=00											
12	00000000=00											
A-Mtd												
=CH												
=												
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	ATC/APC	CHECK DATA	[EXTEND]					
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8					

8-7-7. Pendant Input

The on/off status of individual switches on the pendant operation panel are displayed.

AUTO OPERATION		N 1							
CHECK DATA		*PENDANT INPUT*							
PAGE 13		1mm							
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
1	01000000=40	JOGN	JGFI	JOGP	RPDN	RPDP			
2	00000001=01	EPHP		6AXS	5AXS	4AXS	3AXS	YAXS	AXS
3	00000000=00			PH6	PH5	PH4	PH3	PH2	PH1
4	01111111=7F	JOV7	JOV6	JOV5	JOV4	JOV3	JOV2	JOV1	JOV0
5	00000001=01						PH50	PH10	PH01
6	00001111=0F				FOV4	FOV3	FOV2	FOV1	FOV0
7	01110000=70	<-SPINDLE	REV	CR-	ROV3	ROP2	ROV1	ROV0	
8	00000000=00	MRIY	MRIX	SBLK	OPST	BLSK	ZLOK	STHL	MLOK
9	00000000=00	SP4	SP3	SP2	SP1	DRYR	MINF	MINN	MRIZ
10	00000000=00							PHAD	SPS
11	00000000=00					PEZ2	PEY	PEZ1	PEX
12	00000000=00								

*CH

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]
F1	F2	F3	F4	F5	F6	F7 F8

8-7-8. Pendant Output

The on/off status of individual indicating lamps on the pendant operation panel are displayed.

AUTO OPERATION		N 1							
CHECK DATA		*PENDANT OUTPUT*							
PAGE 15		1mm							
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0
1	00000000=00	MRYL	MRXL	SBLL	OSPL	BSKL	ZLKL	SLKL	MLKL
2	00000000=00	SP4L	SP3L	SP2L	SP1L	DRYL	MIFL	MINL	MRZL
3	00000000=00			JGNL	JGPL			PHAL	SPSL
4	00000000=00	TPVL	TSSL						
5	00000001=01					EZ2L	EZ1L	PEYL	EXL
6	00000000=00								
7	00000000=00								
8	00000000=00								
9	00000000=00								
10	00000000=00								
11	00000000=00								
12	00000000=00								

*CH

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]
F1	F2	F3	F4	F5	F6	F7 F8

8-7-9. Machine Input

On the "CHECK DATA *MACHINE INPUT*" pages, the on/off status of individual input signals from the limit switches are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*MACHINE INPUT*								PAGE 19	1mm	
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	11111111=FF	FWOK	AXE	OLS	OLS	OL4	OL2	OLY	OLX			
2	00001101=0D	EMAB	WORM	SPOL	SP05	APER	SP2	SPCN	RRDK			
3	10101010=AA	OLC	CIPN	OL0	OHM	OLC	COLM	OLL	LUBM			
4	00001110=0E	APOF	WFLP	BZON	AML	HOC	CLP	LBD	LBPR			
5	01111111=7F		HTM	OPR	SHLC	HDLC	SLOK	OLHD	HDM			
6	00000000=00	AUCL	ACLP	A-AX	MGSP	MGCC	MGCH	MGCH	MGIN			
7	00010100=14	TUPB	TCPB	TXPR	INDA	SGNB	SGLE	SGMB	SGHB			
8	01010101=55	EADW	EALP	MTLS	RSCL	RSVL	RSHL	MGUC	MGCL			
9	11010100=D4			TUCL	TCLP	EBLS	EALS	ERLS	ESLS			
10	00000000=00	P100	PH50	PH10	PHD5	PHD4	PHD2	PHDY	PHDX			
11	00000100=04				SRLS	SMLS	SELS	SFLS	SELS			
12	00001111=0F				OLAC	OLCL	PACF	PACN	PCLF	PCLN		
A-Mtd												
=CH												
PROGRAM ACTUAL PART BLOCK CHECK												
SELECT	POSIT.	PROGRAM	DATA	SEARCH		DATA	[EXTEND]					

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

8-7-10. Machine Output

On the "CHECK DATA *MACHINE OUTPUT*" pages, the on/off status of individual output signals to solenoids and relays are displayed.

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*MACHINE OUTPUT*								PAGE 21	1mm	
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00100011=23	TPRL	TUCL	TCLL	MGIL		FWOF	ZUBR	LDON			
2	00000000=00	PLAC	FLCL		PMIL		WQPL	ENTL	ENSL			
3	00000000=00	EXM8	EXM7	EXM6	EXM5	EXM4	EXM3	EXM2	EXM1			
4	00000000=00											
5	10000000=80	HDUR	2HMT	PLPL	PLWR	CHIP	OHLM	COLM	LUBM			
6	10000000=80											
7	00000000=00			MSCL	MSAC			3HMT	PLNC	BUZZ		
8	00000000=00											
9	00000000=00	MGUS	ARAS	ARNS	OLMS	SGSD	SGSC	SGSB	SGSA			
10	10010100=94	ACCS	ACWS	ACCS	ACWS	ADWS	ALPS	MCCW	MGCH			
11	00000000=00	ACLS	TSAS	TUCS	SARS			MSLS	WRKC			
12	00000000=00							IXCU	IXCC	IXCW		
A-Mtd												
=CH												
PROGRAM ACTUAL PART BLOCK CHECK												
SELECT	POSIT.	PROGRAM	DATA	SEARCH		DATA	[EXTEND]					

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

8-7-11. Machine Extend Input

This page displays the input status of the machine extend card.

AUTO OPERATION A.MIN										0	N	3
CHECK DATA										*MACHINE EX INPUT*		
										PAGE	25	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00000000=00											
2	00000000=00											
3	00000000=00											
4	00000000=00											
5	11000000=00									MGNS		

A-Mtd
Input a number of screen. !6
=F
Input a number of screen. !9
=

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
-------------------	------------------	-----------------	---------------	--------	--	---------------	----------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

8-7-12. Machine Extend Output

This page displays the output status of the machine extend card.

AUTO OPERATION A.MIN										0	N	3
CHECK DATA										*MACHINE EX OUTPUT*		
										PAGE	26	1mm
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00000000=00											
2	00000000=00											
3	00000000=00											
4	00000000=00											
5	00100000=20									VAOR VAPR VARV		

A-Mtd
Input a number of screen. !6
=F
Input a number of screen. !9
=

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
-------------------	------------------	-----------------	---------------	--------	--	---------------	----------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

8-7-13. NC Specification Codes

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*NC SPEC TABLE*				PAGE 25		1mm				
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	11111111=FF	SDPR	SBPR	ECAL	SYV	IOV		REVF	INML			
2	01010011=53	T100	T300	T200	Z050	Z020		MVOL	LSTR			
3	00000000=00	BFUN	EPHD	PHD3	PHD2	MIPI	S6AX	S5AX	S4AX			
4	11111111=FF	G50S	G62S	G61S	G43S	G92S	G31S	G60S	HELI			
5	11111010=FA	EPSN	OKUM	232C		F1D4	F4DG	F1DG	RAMC			
6	01000111=47	MADS	MCD3	S24M	BLSM	EC-T	AX-T	EC-P	AX-P			
7	01000000=40		EPC1	RLT1	RLT0	BSW2	BSW1	BSW0	CSTP			
8	10100111=A7	EXP4	EXP2	GRP	PPC	IGF	FDI	FDFO	COLR			
9	00000011=03		ECPB	EXPA	MIR6	MIR5	MIR4	BSP3	BSP2			
10	00111111=3F	EIGF	IMAP	MSG	G22S	G28S	MAP5	MAP4	MAP2			
11	11110100=F4	SSTP	RET	AXSC	STML	DRYR	AXSL		SHTH			
12	00000000=00	EIML				DNCC	DNCB	DNCA				
A-Mtd												
=CH												
"												
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]					
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8					

8-7-14. Machine Specification Codes

AUTO OPERATION A.MIN										0	N	2
CHECK DATA		*MC SPEC TABLE*				PAGE 27		1mm				
NO.	data	bit7	bit6	bit5	bit4	bit3	bit2	bit1	bit0			
1	00110010=32	LTC	AAC	APC	ATC		FVAC	VACS	ACSP			
2	00000000=00							SPP2	SPP1			
3	00000000=00	ATCL	PLSD	HAAT	TCPC	TSSR	CLHC	SABL	HOCL			
4	00000001=01	PDNT		SRV2	NCY2	SRV1	NCY1	PSTL	AHLP			
5	00001010=0A		CRSZ	CR10	CRSF			WARM	SPCT			
6	00000000=00						MAAC	MATT	MSPC			
7	00000000=00		AAT2	AAT6	AAT3	AACH	AACC	AACT	AACT			
8	10001010=B4	SF	DF	M120	M100	MG70	MG50	MG32				
9	00000000=00						M50H	M4VA	MCBH			
10	10001011=B5	PACH	DRIL	PLTR	12PA	10PA	6PAP	2PRT	2PSH			
11	00000000=00					M60H	SFTT	APCP	NSST	APUN		
12	00000000=00	MG20								LIUP		
A-Mtd												
=CH												
"												
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]					
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8					

8-7-15. NC Axis Data

The NC axis data is displayed in decimal numbers on the CRT, as shown below.

AUTO OPERATION A.MIN				0	N	2
CHECK DATA	*NC AXIS DATA*		PAGE	28	1mm	
	X	Y	Z			
RDIF	0.000	0.000	0.000			
ODIF	0.000	0.000	0.000			
RCON	3399.999	3499.999	1400.000			
RAPA	3399.999	3499.999	1400.000			
RSAPA	0.000	0.000	0.000			
RSVPVAR1	0.000	0.000	0.000			
RSVPVAR2	0.000	0.000	0.000			

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK		CHECK
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

- RDIF Difference between calculated value and position encoder output
- ODIF Difference between calculated value and position encoder output with acceleration/deceleration activated
- RCON Calculated value
- RAPA Position encoder output
- RSAPA Position encoder output when contact with the touch setter is detected
- RAVVAR1 Servo data
(Designate the content of display with NC optional parameter (word) No. 10.)
- RAVVAR2 Servo data
(Designate the content of display with NC optional parameter (word) No. 10.)

Additionally, the screen displaying only ODIF and RAPA in enlarged characters is provided.

8-7-16. Machine Axis Data

The machine axis data is displayed in decimal numbers on the CRT, as shown below.

A U T O O P E R A T I O N A . M I N 0 N 2

CHECK DATA *MACHINE AXIS DATA* PAGE 30 1mm

	CA	MG1	
R D I F	0	0	
R C O N	0	163839	
R A P A	0	163839	
R C O M	0	0	

A-Mtd

=CH

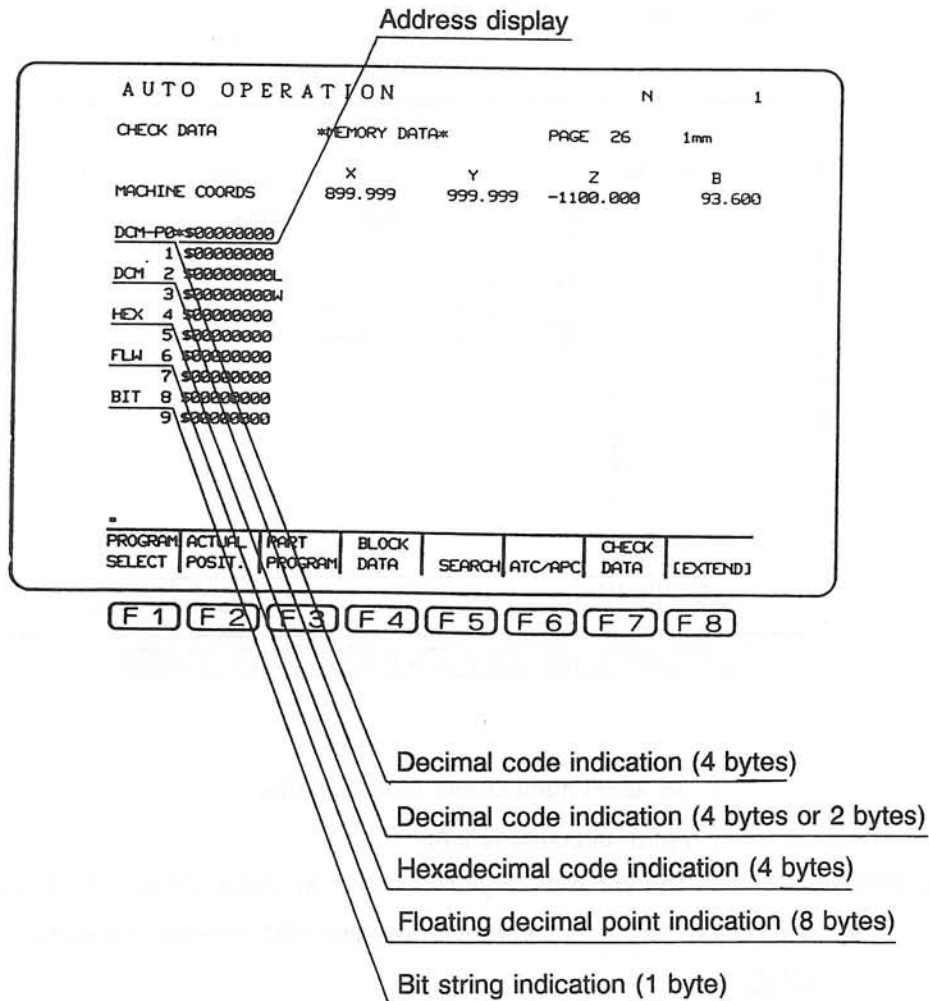
PROGRAM	ACTUAL	PART	BLOCK		CHECK	
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

RDIF		Difference between calculated value and position encoder output
RCON		Calculated value
RAPA		Position encoder output
RCON		Command value
CA		Carrier axis
MG1		Magazine axis
MG2		Varies depending on machine specifications (refer to maintenance manual)
MG3		Varies depending on machine specifications (refer to maintenance manual)
W		Crossrail axis

8-7-17. Diagnostics

Any memory content in the memory can be displayed in a designated format on the screen.



① * : Displayed to the right of the diagnosis data: indicates the cursor key operation enabling position.

(Once a check address is set in the conventional manner, check address is increased or decreased in units of the data type being checked by pressing the cursor keys [↑], [↓], [←], [→].)

② W : 2-byte indication of DCM data

L : 4-byte indication of DCM data

8-7-18. Alarm Message List

The list of alarms is displayed, indicating alarm number, alarm occurrence time, alarm code and its comment of the latest 12 alarms.

AUTO OPERATION N 0

CHECK DATA * ALARM LIST * PAGE 35 1mm

NO.	ALM-NO.	TIME	CODE	COMMENT
1	543	0:12: 6		X
2	901	0:11: 1		
3	116-Y	0:10:28		
4	406	0:10: 5	2	
5	422	0: 9: .7		ELSZ
6	428	0: 8: 5	6300	
7				
8				
9				
10				
11				
12				

PROGRAM
SELECT

ACTUAL
POSIT.

PART
PROGRAM

BLOCK
DATA

SEARCH

CHECK
DATA

[EXTEND]

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

A-NO. : An alarm number and the axis index

TIME : Alarm occurrence time

CODE/CHARACTER : The same display as given on conventional alarm display page.

Note: The data on this display is cleared by executing the following command.

ALMC ←

8-7-19. System Variables

The contents of the system variables are displayed on the CRT for each individual format.

AUTO OPERATION A.MIN				0	N	2
CHECK DATA	*SYSTEM VARIABLE*		PAGE 32	1mm		
	X	Y	Z			
VRCO*	3399.999	3499.999	1400.000			
VAPA*	3399.999	3499.999	1400.000			
VSAP*	0.000	0.000	0.000			
VDIM*	20.000	20.000	20.000			
VALA*	1.200	1.200	1.200			
VODM*	5.000	5.000	5.000			
VDMP*	5250	5250	5250			
VDDA*	256	256	256			
VVDA*	1300	1300	1300			
VDAM*	16383	16383	16383			

A-Mtd

#CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK	
SELECT	POSIT.	PROGRAM	DATA		DATA	[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

AUTO OPERATION A.MIN				0	N	2
CHECK DATA	*SYSTEM VARIABLE*		PAGE 33	1mm		
	X	Y	Z			
VZOF*[1]	100.000	200.000	300.000			
[2]	10.000	20.000	50.000			
[3]	0.000	0.000	0.000			
[4]	0.000	0.000	0.000			
[5]	0.000	0.000	0.000			
[6]	0.000	0.000	0.000			
[7]	0.000	0.000	0.000			
[8]	0.000	0.000	0.000			
[9]	0.000	0.000	0.000			
[10]	0.000	0.000	0.000			

A-Mtd

#CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK	
SELECT	POSIT.	PROGRAM	DATA		DATA	[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

AUTO OPERATION A.MIN				0	N	2
CHECK DATA		*SYSTEM VARIABLE*		PAGE 38	1mm	
V Z O F *	[51]	X	0.000	Y	0.000	Z
	[52]		0.000		0.000	
	[53]		0.000		0.000	
	[54]		0.000		0.000	
	[55]		0.000		0.000	
	[56]		0.000		0.000	
	[57]		0.000		0.000	
	[58]		0.000		0.000	
	[59]		0.000		0.000	
	[60]		0.000		0.000	
A-Mtd						
=CH						
=						
PROGRAM	ACTUAL	PART	BLOCK		CHECK	
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

AUTO OPERATION A.MIN				0	N	2
CHECK DATA		*SYSTEM VARIABLE*		PAGE 39	1mm	
V T O F H [N]				V T O F D [N]		
NO.		NO.		NO.		NO.
1	500.000	11	0.000	1	-400.000	11
2	0.000	12	0.000	2	0.000	12
3	0.000	13	0.000	3	0.000	13
4	0.000	14	0.000	4	0.000	14
5	0.000	15	0.000	5	0.000	15
6	0.000	16	0.000	6	0.000	16
7	0.000	17	0.000	7	0.000	17
8	0.000	18	0.000	8	0.000	18
9	0.000	19	0.000	9	0.000	19
10	0.000	20	0.000	10	0.000	20
A-Mtd						
=CH						
=						
PROGRAM	ACTUAL	PART	BLOCK		CHECK	
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA	[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

AUTO OPERATION A.MIN 0 N 2

CHECK DATA *SYSTEM VARIABLE* PAGE 54 1mm

V T O F H [N]				V T O F D [N]			
NO.		NO.		NO.		NO.	
301	0.000	311	0.000	301	0.000	311	0.000
302	0.000	312	0.000	302	0.000	312	0.000
303	0.000	313	0.000	303	0.000	313	0.000
304	0.000	314	0.000	304	0.000	314	0.000
305	0.000	315	0.000	305	0.000	315	0.000
306	0.000	316	0.000	306	0.000	316	0.000
307	0.000	317	0.000	307	0.000	317	0.000
308	0.000	318	0.000	308	0.000	318	0.000
309	0.000	319	0.000	309	0.000	319	0.000
310	0.000	320	0.000	310	0.000	320	0.000

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK	
SELECT	POSIT.	PROGRAM	DATA		DATA	[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

AUTO OPERATION A.MIN 0 N 2

CHECK DATA *SYSTEM VARIABLE* PAGE 55 1mm

	X	Y	Z
V F P L *	2400.000	2300.000	2200.000
V N F L *	-2600.000	-2700.000	-2800.000
V P S L *	2500.000	2500.000	2500.000
V N S L *	-2500.000	-2500.000	-2500.000
V I N P *	0.003	0.003	0.003
V E L C *	0.000	0.000	0.000
V M O F *	2500.000	2500.000	2500.000
V H F I *	0.020	0.020	0.020

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK	SEARCH	CHECK	
SELECT	POSIT.	PROGRAM	DATA		DATA	[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

AUTO OPERATION A.MIN 0 N 2

CHECK DATA *SYSTEM VARIABLE* PAGE 56 1mm

	X	Y	Z
VHPP*[1]	100.000	200.000	300.000
[2]	0.000	0.000	400.000
[3]	0.000	0.000	500.000
[4]	0.000	0.000	600.000
[5]	0.000	0.000	700.000
[6]	0.000	0.000	800.000
[7]	0.000	0.000	900.000
[8]	0.000	0.000	1000.000

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK		CHECK
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA
					[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

AUTO OPERATION A.MIN 0 N 2

CHECK DATA *MC SYSTEM VARIABLE* PAGE 57 1mm

VATOL	0
VNTOL	0
VSPTN	0

A-Mtd

=CH

PROGRAM	ACTUAL	PART	BLOCK		CHECK
SELECT	POSIT.	PROGRAM	DATA	SEARCH	DATA
					[EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

A U T O O P E R A T I O N A . M I N				0	N	2
CHECK DATA		*SYSTEM VARIABLE*		PAGE 58	1mm	
V N C O M [1] 00000000 [2] 00000000 [3] 00000000 [4] 00000000						
A-Mtd						
*CH *						
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

A U T O O P E R A T I O N A . M I N				0	N	2
CHECK DATA		*SYSTEM VARIABLE*		PAGE 59	1mm	
V P C N T 0 V O K 1 00000000-00 V O K 2 00000000-00 V N U M 0 V I N T G 0 V P R T 00000000-00 V M P C 1 00000000-00 V M P C 2 00000000-00 V M P T 00000000-00 V T L C N 0 V I N S 00000010-02 V I N F 00000000-00 A-Mtd						
V F S T 00000000-00 V I N C H 00000010-02 V S P C O 01010011-53 V S P S B 00110111-37 V M L O K 00000000-00 V A C O D 1 20000						
*CH *						
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

8-7-20. DNC (optional)

AUTO OPERATION DNC-PROGRAM						N	2
CHECK DATA		* DNC RECEIVE DATA *		PAGE	32	1mm	
\$0000	30B1365A	B1362EB1	39B70A47	B1C6B135	016Z16.197.G1F15		
\$0010	300A4EC9	B136B1D8	2DB43530	2C30B2B8	0.N9161X-450.028		
\$0020	592DB1B1	302EB233	B45AB133	2E35B7B2	Y-110.234Z13.572		
\$0030	0A47B1C6	B230300A	4E39B236	B1D82DB4	.G1F200.N9261X-4		
\$0040	35302EC30	30B4592D	B130392E	5AB1332E	50.004Y-109.213.		
\$0050	3939B10A	47B1C633	30300A47	39B1D82D	991.G1F300.G91X-		
\$0060	302E30B1	B759302E	3036335A	302E30B2	0.017Y0.063Z0.02		
\$0070	B10AD82D	B12E3335	B859302E	B130B15A	1.X-1.358Y0.101Z		
\$0080	302EB1B4	390AD82D	B42EB435	3659302E	0.149.X-4.456Y0.		
\$0090	3030B85A	302EB2B8	0AD82DB2	2EB8B233	008Z0.28.X-2.823		
READ POINTER \$06AA				TRANSFER CODE		ISO	
WRITE POINTER \$06AA				PROGRAM CODE		ISO	
R-Mtd							
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8

AUTO OPERATION DNC-PROGRAM						N	2
CHECK DATA		* DNC HISTORY *		PAGE	33	1mm	
P-NO	TIME	STATUS	ITEM	CONTENTS			
C\$0000	0: 9:11.75	2	4	1 7			
C\$0001	0: 9:11.75	2	5	5 54			
C\$0002	0: 9:11.85	2	6	5 6			
C\$0003	0: 9:16.35	2	4	1 7			
C\$0004	0: 9:16.35	2	5	5 54			
C\$0005	0: 9:16.45	2	6	5 6			
C\$0006	0: 9:20.95	2	4	1 7			
C\$0007	0: 9:20.95	2	5	5 54			
C\$0008	0: 9:21. 5	2	6	5 6			
C\$0009	0: 9:25.55	2	4	1 7			
CURRENT POINTER		C\$002A					
LAST ERROR POINTER		E\$0000					
R-Mtd							
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8

AUTO OPERATION		N	0
CHECK DATA	DNC (B)	PAGE 69	1mm
HOST CPU STATUS	0		
CNC STATUS	0		
PARAMETER	Nb 2000 byte		
	No 50 byte		
	Ne 10 times		
	Tp 5 sec		
	To 20 sec		
	Ti 10 msec		
	Tx 100 msec		
	Tw 5 sec		
CONVERT CODE	A0		
CONVERTED CODE	A0		
HOST CPU(ITY) STATUS			
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA
			SEARCH
			CHECK DATA
			[EXTEND]

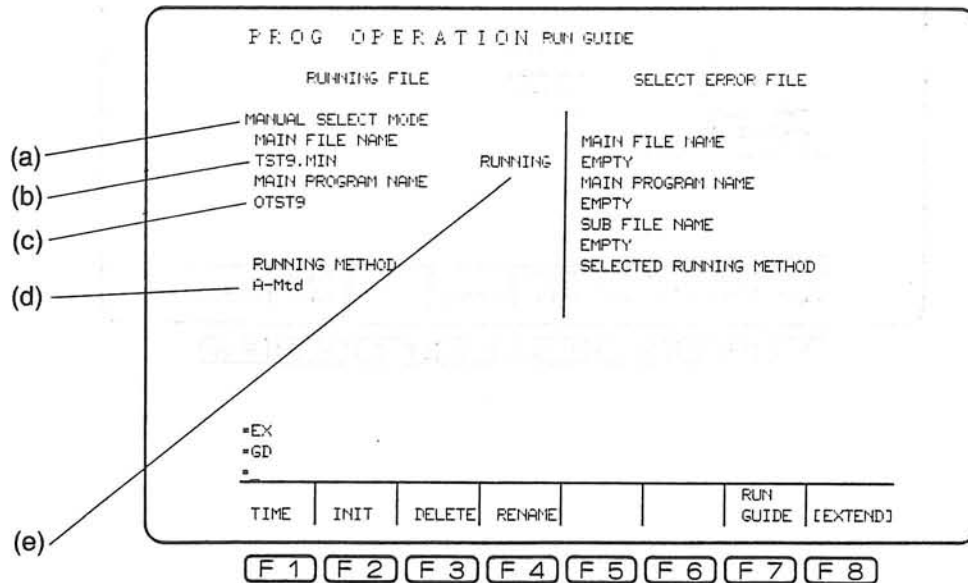
[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

8-8. Run Guide Display

After selecting the EDIT AUX mode, press the function key [F7] (RUN GUIDE), and the RUN GUIDE screen is displayed.

(1) RUNNING FILE

The operation status of the file currently selected is displayed at the left half area on the screen.



(a) File selection method

This field indicates how the file has been selected and is being operated.

Display	Contents
MULTI VOLUME MODE	Multi-volume operation
PPC MODE	Operation in the pallet pool line control
EXTERNAL SELECT MODE	Operation by external program selection command
SCHEDULE MODE	Scheduled program operation
MANUAL SELECT MODE	Operation by manual program selection

(b) MAIN FILE NAME

This field indicates the main file name currently selected.

(c) MAIN PROGRAM NAME

This field indicates the main file program name currently selected.

(d) RUNNING METHOD

This field indicates the operation method of the program currently selected.

Display	Contents
A-Mtd	Normal operation
B-Mtd	Large volume operation
S-Mtd	Operation without branching and subprograms
M-Mtd	Multi-volume operation

(e) Operation status

This field indicates the current operation status of the program selected.

Display	Contents
SELECTED	Program selection complete, but it is not run.
RUNNING	Program is being executed.
END	Program execution has been completed; this display is given until the next program is selected or the next cycle is started.

(2) SELECT ERROR FILE

If an error occurred during automatic program selection, file is displayed at the right half of the screen.

PROG OPERATION RUN GUIDE
 403 ALARM B Schedule program: main program load 10000002
 RUNNING FILE SELECT ERROR FILE

MANUAL SELECT MODE	END	MAIN FILE NAME	(f)
MAIN FILE NAME		A.MIN	(g)
TST9.MIN		MAIN PROGRAM NAME	(h)
MAIN PROGRAM NAME		0100	(i)
OTST9		SUB FILE NAME	
		EMPTY	
RUNNING METHOD		SELECTED RUNNING METHOD	
A-Mtd		A-Mtd	

•EX
 •GD
 •

TIME	INIT	DELETE	RENAME			RUN GUIDE	[EXTEND]
------	------	--------	--------	--	--	-----------	----------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

(f) MAIN FILE NAME

This field indicates the main file name selected if a program selection error has occurred.

(g) MAIN PROGRAM NAME

This field indicates the main file program name selected if a program selection error has occurred.

(h) SUB FILE NAME

This field indicates the sub file name selected if a program selection error has occurred.

(i) SELECTED RUNNING METHOD

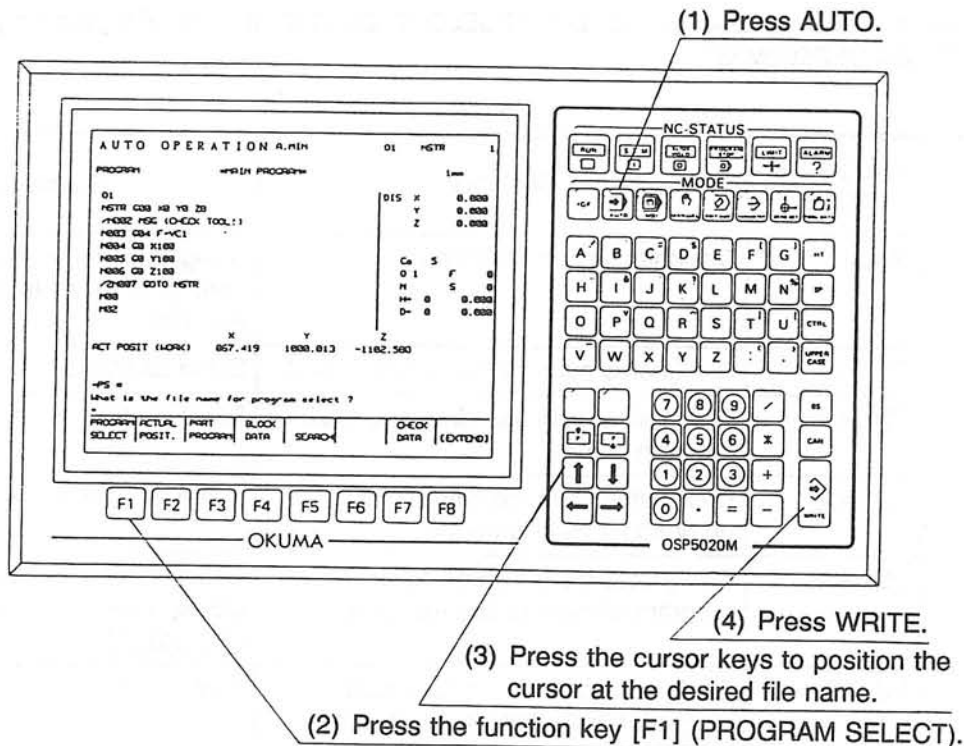
This field indicates the operation method selected when a program selection error has occurred. The operation method is explained in detail in (1), "Running File".

9. Functions and Operations in Automatic Mode Operation

9-1. Main Program Selection and Operation

In order to execute a part program in the automatic mode, first select the part program. Programs stored in the memory have their own file names since programs are managed as files. The specified main program is read from the part programs stored in the file and the subprogram, called in the main program, is searched out in the specified sub file to be loaded to the NC.

The operating procedure is described below:



- (1) Press the **AUTO** key.
- (2) Press the function key [F1] (PROGRAM SELECT).

"PS" is displayed in the 21st line on the CRT.

- (3) Enter the designation mode from the table below.

The data entered is indicated following the prompt "PS_".

The input format is as indicated below and entry of an asterisk (*) instead of a file name, will display a file name directory.

= PS_ main-file-name, main-program-name, sub-file-name; option

Main file name File name of main programs

Sub file name File name of sub programs which are called from a main program

Option Designation of A, B and S option

For details, refer to Section 12, 2-1. "PSELECT BLOCK" in the "Programming Manual for OSP5020M/OSP500M-G".

Procedure	Designation Mode	Contents	Remarks
(a)	PS_*	Designates main file name.	Designation of device name for calling out main file is also possible.
	PS_*;	Designates main file name and option.	Same as above.
(b)	PS_*,*	Designates main file name and main program name.	Same as above.
	PS_*,*;	Designates main file name, main program name and option.	Same as above.
(c)	PS_*,*,*	Designates main file name, main program name and sub file name.	Designation of device name for calling out main and sub file is also possible.
	PS_*,*,*;	Designates main file name, main program name, sub file name and option.	Same as above.
(d)	PS_*,*,*	Designates main file name and sub file name.	
	PS_*,*,*	A.MIN is automatically selected as main file name. Designates main program name and sub file name.	

(a) Designation mode PS_* (or PS_*;)

AUTO OPERATION A.MIN
01 NSTR 1

1mm

PROGRAM SELECT INDEX

MAIN PROGRAM FILE

A.MIN

MIL.MIN

A100.MIN

A200.MIN

A300.MIN

A400.MIN

A600.MIN

A500.MIN

B1.MIN

B2.MIN

PAGE 1

*PS *

What is the file name for program select ?

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
-------------------	------------------	-----------------	---------------	--------	--	---------------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

1) Key in as PS_* or PS_*;.

2) Press the **WRITE** key.

The display is changed to the PROGRAM SELECT INDEX page and main file names registered are displayed. (This searches files having extension "MIN" from BB1:.)

3) Position the cursor at the desired file name.

4) Press the **WRITE** key.

AUTO OPERATION A.MIN				01	NSTR	1
				1mm		
PROGRAM SELECT INDEX						
MAIN PROGRAM FILE				PAGE 1		
A.MIN						
MIL.MIN						
A100.MIN						
A200.MIN						
A300.MIN						
A400.MIN						
A600.MIN						
A500.MIN						
B1.MIN						
B2.MIN						
*PS *;						
What is the file name for program select ?						
A:method A B:method B S:without branch,subprogram function						
What is the option for program select ? !B						
PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	[EXTEND]

(F1) (F2) (F3) (F4) (F5) (F6) (F7) (F8)

- 5) If there is an option designation “;”, the screen automatically goes to the option designation mode and the messages below are displayed at the lower block on the CRT.

A:method A B:method B S:without branch,subprogram function

What is the option for program select? !

Key in “A”, “B”, or “S” as desired. (Option B and option S can be specified simultaneously.)

- 6) Press the **WRITE** key.

Entry of “B” in response to the prompt “What is the option for program select? !” selects the operation method B (large capacity operation method). If the control is not supported by this operation method, the entry is ignored.

When the **WRITE** key is pressed without entering any character in response to the prompt “What is the option for program select? !”, the control operates in accordance with the setting of the NC optional parameter (word) No. 11.

(b) Designation mode PS_*,* (or PS_*,*;))

AUTO OPERATION A.MIN
01 NSTR 1

1mm

PROGRAM SELECT INDEX

MAIN PROGRAM FILE

A.MIN

MIL.MIN

A100.MIN

A200.MIN

A300.MIN

A400.MIN

A600.MIN

A600.MIN

B1.MIN

B2.MIN

PAGE 1

=PS *,*

What is the file name for program select ?

What is the program name for program select ? !

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH		CHECK DATA	[EXTEND]
-------------------	------------------	-----------------	---------------	--------	--	---------------	----------

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

- 1) Key in as PS_*,* or PS_*,*;
- 2) Select main file names in the same procedures as 2), 3) and 4) in (a).
- 3) Enter the main program name when the prompt "What is the program name for program select? !" is displayed at the lower section of the screen.

For example, selecting main program name O100 is as follows:

What is the program name for program select? !O100

- 4) Press the **WRITE** key.
If the **WRITE** key is pressed without entering the program name, the first program in the main file is selected.
- 5) When there is an option designation ";", the CRT allows the entry of option designation code. Follow the steps 5) and 6) in (a).

(c) Designation mode PS_*,*,* (or PS_*,*,*;))

AUTO OPERATION B.MIN
01 INSTR 1

1mm

PROGRAM SELECT INDEX

SUB PROGRAM FILE

A.SUB

B.SUB

C.SUB

D.SUB

E.SUB

PAGE 1

*PS *,*,*

What is the file name for program select ?

What is the program name for program select ? !0100

What is the file name for program select ?

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	CHECK DATA	(EXTEND)

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

- 1) Key in as PS_*,*,* or PS_*,*,*;.
 - 2) Select the main file name in the same procedures as 2), 3) and 4) in (a).
 - 3) Select the program name in the same procedures as 3) and 4) in (b).
 - 4) The screen will then display the subprogram file names.
Files having extension "SUB" in BB1:.
 - 5) Position the cursor at the desired file name.
 - 6) Press the **WRITE** key.
 - 7) If there is an option designation ";", the CRT allows the entry of option designation code.
Follow the steps 5) and 6) in (a).
- (4) By pressing the **WRITE** key, the main program can be read from the specified main file, while the subprogram called up in the main program is loaded to the NC, and the main program is displayed on the CRT.
- If the subprogram called up in the main program cannot be found in the specified sub file, it should be searched for in the sub file of the extension SSB so that loading can start. If it still cannot be found, an error occurs.
- (5) Press the **CYCLE START** button.

By pressing the **CYCLE START** button, the main program can be started.

Note 1: If a main file name is omitted, A.MIN is used. If the main program is omitted, the first program in the main file name is used.

Note 2: Search of the subprogram which has been stored as a part of the main file is made first.

Note 3: When the sub file name is omitted, the search of a subprogram called in the main program is made only for the sub file of the extension .SSB or .MSB. Therefore, the sub file with extension .SUB should be input without fail. Only one kind of sub file can be input.

(If the subprogram in the main file calls the other subprogram, the subprogram to be called must be stored after the one from which it is called.)

- Note 4:** *If there is no specified file name or program name, an error occurs. Then, the program selected previously becomes invalid. Always confirm that the valid file name or program name is displayed on the first line of the CRT.*
- Note 5:** *A program once selected is valid until the next program is selected. Selecting the schedule program is invalid.*
- Note 6:** *Direct specification of the file name without using symbol "*" is also allowed.*
- Note 7:** *Main and sub file name directory can be searched for using alphabetic character, "-", "?", or "*".*

Table 9-1 Operation Comparison between Normal Storage Capacity Memory and Large Storage Capacity Memory

Item		Selection and Operation of Normal Storage Capacity	Selection and Operation of Large Storage Capacity	Remarks
Parameter setting		Method A	Method B	
Specification of S option in PROGRAM SELECT command mode		Invalid	Valid	
			S option not specified	S option specified
			Up to total length of the stored main program	
Program size limitation	Main program	Total tape length is less than 80 meters (3.15 ft.). (optionally 160 meters (6.30 ft.)*1)	Total tape length is less than 100 meters (3.94 ft.)*2	Total tape length is less than 100 meters (3.94 ft.)*2
	Subprogram			
	Library program			
	Schedule program			
Subprogram function		Available	Available	Unavailable (alarm)
Branch function		Available	Available	Unavailable (alarm)
Instruction for jump destination of branch instruction	Main program	Sequence label, sequence number	Sequence label only	
	Subprogram			
	Library program			
	Schedule program			
Main program sequence label limit		No limit	Fewer than 30 pcs.	No limit
Execution time for PROGRAM SELECT command		Several tens seconds to several minutes	Several tens seconds to several minutes	Ends at once

*1 When operation buffer expansion specification is selected, capacity is extended to 320 - 1,280 meters (12.60 - 50.39 ft.).

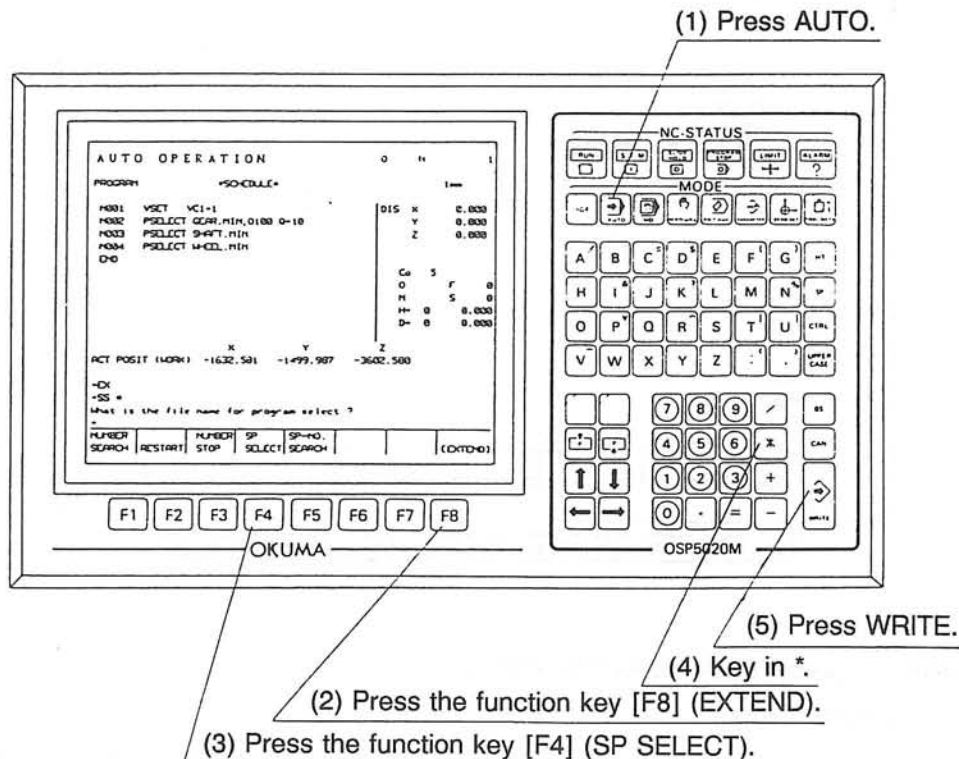
*2 When operation buffer expansion specification is selected, the length is as follows:

- Less than 270 meters (10.63 ft.) for 320 meter (12.60 ft.) specification
- Less than 590 meters (23.23 ft.) for 640 meter (25.20 ft.) specification
- Less than 1,230 meters (48.43 ft.) for 1,280 meter (50.39 ft.) specification

9-2. Schedule Program Selection and Operation (optional)

This function allows unmanned automatic and continuous machining work by utilizing the pallet changer when successive identical work pieces are machined.

For details, refer to Section 12, 2. "Schedule Programs" in the "Programming Manual for OSP5020M/OSP500M-G". The operating procedure is described below:



(1) Press the **AUTO** key.

(2) Press the function key [F8] (EXTEND) twice.

For the guidance of the function keys, [F1] (NUMBER SEARCH) and others are displayed on the CRT.

(3) Press the function key [F4] (SP SELECT). "SS" is displayed on the 21st line on the screen.

(4) Enter " * ".

SS_*

- (5) Press the **WRITE** key.

The display will be switched to the PROGRAM SELECT INDEX page and the schedule program file names registered are shown. (Files having an extension of "SDF" are searched from the BB1:.)

AUTO OPERATION
O H 1

1mm

PROGRAM SELECT INDEX

SCHEDULE PROGRAM FILE
PAGE 1

P00.SDF
AH.SDF
ERTDISPLAY.SDF

•EX
•EX
•SS *

What is the file name for program select ?

NUMBER	NUMBER	SP	SP-NO.			
SEARCH	RESTART	STOP	SELECT	SEARCH		[EXTEND]

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

- (6) Position the cursor at the desired file name.

- (7) Press the **WRITE** key.

The schedule program is selected and the control is placed in the scheduled operation mode.

- (8) Press the **CYCLE START** button.

This starts the continuous operation in accordance with the programmed schedule.

Note 1: Selection of a schedule program file by directly keying in the file name is also possible.

SS_schedule-program-file-name [WRITE]

Note 2: Main and sub file name directory can be searched for using alphabetic character, "-", "?", or "*".

CYCLE STOP

The cycle stops after the execution of a main program when the **CYCLE STOP** key has been pressed to turn on the lamp (CYCLE STOP function activated).

To resume the operation, press the **CYCLE START** button.

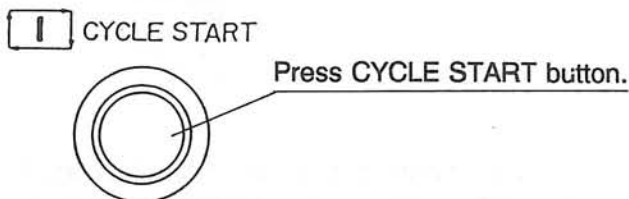


- Note 1:** *Schedule program selection should be done only after resetting the NC. If the schedule program is selected during operation, an error will occur.*
- Note 2:** *When the normal automatic operation (AUTO mode operation by main program selection) is done after selecting the schedule program, the program should be selected again.*
- Note 3:** *When the **CYCLE START** button is pressed with the **SINGLE BLOCK** switch set ON in schedule program operation mode, the main program will be selected by the schedule program and the machine will wait in the start state. Then, if the **CYCLE START** button is pressed, the machine returns to the normal single block mode state.*
But the machine will not stop in the blocks containing VSET, IF and GOTO instructions.
- Note 4:** *When the **RESET** button is pressed during the operation in accordance with a schedule program, the part program selected when the NC has been reset will be executed again from the start if the **CYCLE START** button is pressed.*
If the repetition number of the part program is specified in the program block selection block in the schedule program, the program execution stopped during machining will not be counted.
- Note 5:** *When the **CYCLE START** button is pressed after selecting the schedule program, the main program is first selected and machine operation using the selected main program begins after the completion of main program selection. If the control is reset while a main program is being selected, the main program is not selected.*
- Note 6:** *The main program executed in the schedule program operation mode is cleared from the operation buffer after the completion of the program execution.*

9-3. Cycle Start and Slide Hold

(1) Cycle Start

Press the **CYCLE START** button on the machine operation panel to start the NC operation.



(a) Cycle start after NC reset:

This is effective during automatic operation or MDI operation. The program is read and executed for each separate mode, cycle start requires the following conditions.

[In automatic operation]

The schedule program or the main program has been selected correctly.

[In MDI operation]

The one-block instruction has been entered in the MDI buffer.

(b) Cycle start after shutdown by single block or program stop:

The next block can be executed by pressing the **CYCLE START** button in automatic mode.

(c) Cycle start in slide hold mode:

When the **CYCLE START** button is pressed, function generation which was interrupted, begins again.

Note 1: Press and release the **CYCLE START** button to begin the operation, but when the machine is stopped temporarily due to the activation of the **SLIDE HOLD** button, cycle start is made when the **CYCLE START** button is only pressed.

Note 2: Pressing the **CYCLE START** button during the program selection, sequence number searching and return search is ineffective.

Note 3: While the **SLIDE HOLD** button is being pressed, the **CYCLE START** button is inoperative.

Note 4: During the operation, the **RUN** lamp on the NC operation panel comes on, excluding the slide hold mode.

Note 5: Even in the setting mode, cycle start is possible provided that the mode previously selected is auto or MDI and the setting of bit 5 of NC optional parameter (bit) No. 2 is "1"

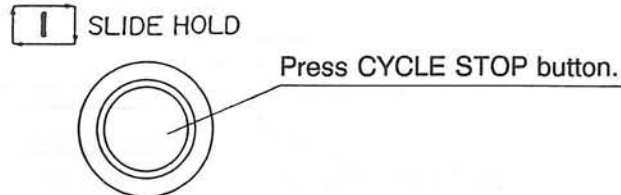
Note 6: When alarms (P, A, B, and C) are on, cycle start by pressing the **CYCLE START** button is impossible.

Note 7: An error occurs when the **CYCLE START** button is pressed after return search has been executed. In this case, cycle start is possible by pressing the **SEQUENCE RE-START** button.

(2) Slide Hold

Axis movement can be stopped temporarily or program execution can be stopped by pressing the **SLIDE HOLD** button during operation.

Slide hold means the NC halt is made during axis movement. Start-up hold means the NC halt made before or after the completion of an axis movement.



Slide hold during function generation:

- During axis movement by rapid feed or cutting feed

Axis movement stops after deceleration. When the axis stops halfway in a commanded axis travel, it is in a slide hold state. If the axis reaches the target point before it is stopped, or the operation mode stops after the execution of the other commands in that block are completed, then this is the start-up hold state, and is the same as a stop in the single block or program stop.

- During dwell

Dwell immediately stops and the machine is brought to the slide hold state.

During operation, excluding function generation
(during the execution of miscellaneous commands):

The slide hold is not effective for miscellaneous functions but the SLIDE HOLD lamp stays on. The machine is brought to a start-up hold state, since the operation halts after the execution of miscellaneous functions.

Note 1: When axis movement and miscellaneous functions are in the same block, there are two cases for the execution order of the commands.

- With The execution of axis movement commands and auxiliary functions start simultaneously.
- After The axis movement is completed the execution of miscellaneous function starts.

Depending on the above conditions,

if machine hold occurs during axis movement (including dwell) Slide hold

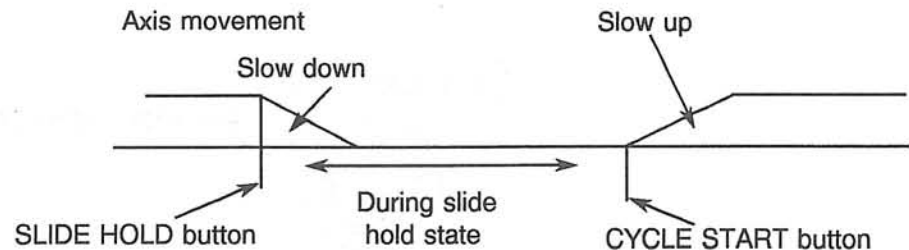
if the machine halts at a time other than axis movement Start-up hold

Note 2: During the slide hold (excluding start-up hold), the SLIDE HOLD lamp on the NC operation panel comes on (although the slide hold state is a part of the machine operating state, the RUN lamp will go off).

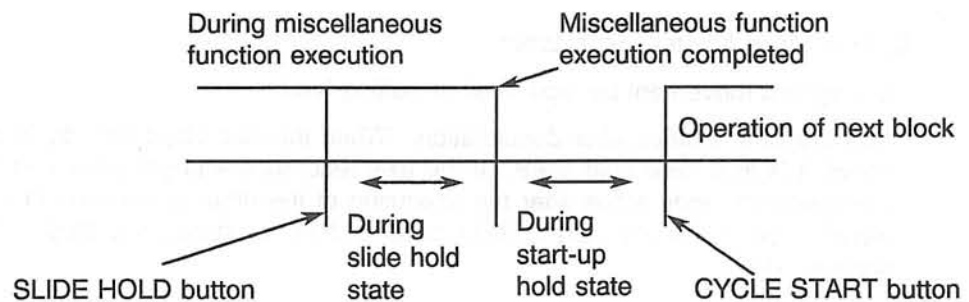
Note 3: If the machine is brought to the start-up hold state by the activation of the **SLIDE HOLD** button, both the SLIDE HOLD and the RUN lamp go off.

Note 4: Cycle start in slide hold is activated once the **CYCLE START** button is pressed. (In the start-up hold state, cycle start is activated when the pressed **CYCLE START** button is released.)

Note 5: Examples of slide hold
[During axis movement]

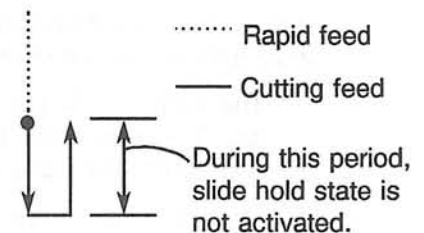


[During miscellaneous function execution]



Note 6: Even if the **SLIDE HOLD** button is pressed during the execution of a tapping cycle - G84 (tapping cycle) and G74 (reverse tapping cycle), the tapping cycle is not interrupted. Slide hold is activated after the completion of the tapping cycle. The machine will not stop operation, but after the operation is completed, it stops operation temporarily.

Note that the synchronized tapping cycle (G284 and G274) is different from above described tapping cycle. For details, refer to the manual for OSP5020M/OSP500M-G special function No. 1, Section 8 "Synchronized Tapping Function".



Note 7: The slide hold function can be activated and deactivated by the programmed M codes, M140 and M141.

M140 : Slide hold ineffective

M141 : Slide hold effective

The **SLIDE HOLD** button is inoperative for the blocks containing M140 and M141, and the slide hold function is not activated even when the **SLIDE HOLD** button is pressed during such period.

Note that the control is in the M141 mode after it is reset.

9-4. Resetting NC

The NC reset means initializing the internal NC status. The NC system is reset when:

- (1) the **RESET** button is pressed,
- (2) the external reset signal is input,
- (3) the **MACHINE LOCK** key is turned on or off,
- (4) the operation mode is changed over from MANUAL mode to AUTO or MDI mode,
- (5) the operation mode is changed over from AUTO or MDI mode to MANUAL mode,
- (6) the operation mode is changed from MANUAL mode to DATA SET mode and then to AUTO or MDI mode.

NC resetting operation:

The state that the NC is reset by the change of the operation mode is called mode reset.

The NC resetting operation stops the machine operation immediately and the NC system is initialized at the same time.

- Note 1: When the **RESET** button is pressed during axis movement, the machine slows down and then stops axis movement. The actual reset is done after axis movement has stopped.*
- Note 2: Even if the **RESET** button is continuously pressed, reset is done only one time.*
- Note 3: By the mode reset, the status conditions related to the spindle (spindle rotation, orientation, spindle speed and selected gear range) will not be reset, and the previous status is retained.*

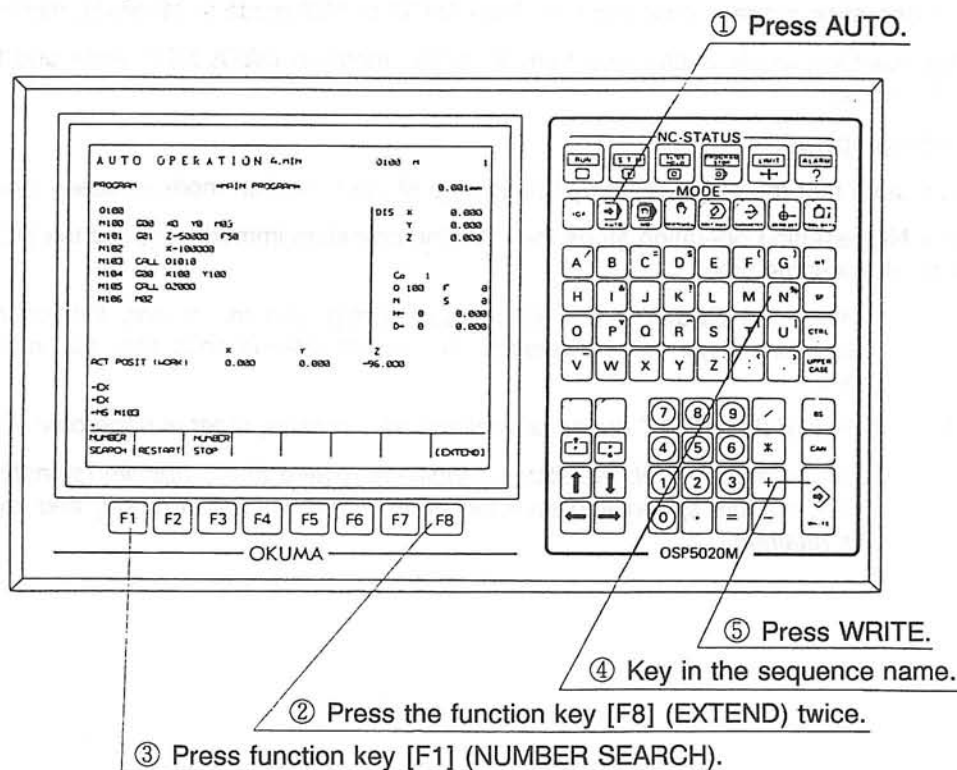
9-5. Sequence Search and MID-START

Sequence search is used to start the operation from a required sequence of a main program. The specified sequence is searched by the sequence name or the cursor, and then the operation is started from the searched sequence by pressing the **CYCLE START** button.

The operating procedure for the sequence search is described below.

(1) Sequence Search by Sequence Name or No. of Blocks

When the main program is selected correctly in automatic mode, perform the following operation.



- ① Press the **AUTO** key.
- ② Press the function key **[F8] (EXTEND)** twice.
Function names such as **[F1] NUMBER SEARCH** will be displayed.
- ③ Press the function key **[F1] (NUMBER SEARCH)**. "NS" is displayed on the 21st line of the CRT.
- ④ Enter the specified sequence name or the required number of blocks.
- ⑤ Press the **WRITE** key.

The sequence name is searched for from the main program head currently selected, and the sequence pointer moves to the found sequence name position. When the number of blocks has been keyed in, the search is made in the specified number (either positive or negative) of blocks from the currently located pointer position.

The following cases result in errors:

- (a) When the specified sequence name is not found in the program.
- (b) While the schedule program is executed (from schedule program start-up to the end).
- (c) Whether the search is made or not during the execution of a main program can be selected by setting proper data at bit 3 of NC optional parameter (bit) No. 4.
- (d) When the main program is not selected correctly.

Note: In cases (b) and (c), the sequence number search can be executed after resetting the NC.

(2) Sequence Search by Cursor

In the automatic mode, the sequence pointer may be moved as desired by the cursor keys when the main program has been selected correctly and the CRT displays the program.

[↓] one sequence advance

[↑] one sequence return

In the following cases, the cursor keys are inoperative:

- While the schedule program is being executed
- When the CRT display is not the program display
- When the sequence pointer leaves the selected main program by the cursor key operation

(3) Restart after Sequence Search

Program execution starts from the sequence identified by the sequence pointer when the **CYCLE START** button is pressed.

Since programmed commands which were not read during the sequence search are not valid, a modal status must be set as needed by entering the necessary commands from the keyboard so that the actual status and the programmed status match.

Note 1: During the sequence search, the read pointer is moved, while the modal instruction value and coordinate instruction value are disregarded. Subprogram CALL and GOTO are not done.

Note 2: The sequence search is used for start-up after a pause during the machining work, while the return search is used for the return to the block while the machining is under-way.

Note 3: The number of the sequence repetition cannot be specified during sequence search.

Note 4: Additionally, the optional block skip does not affect the sequence search.

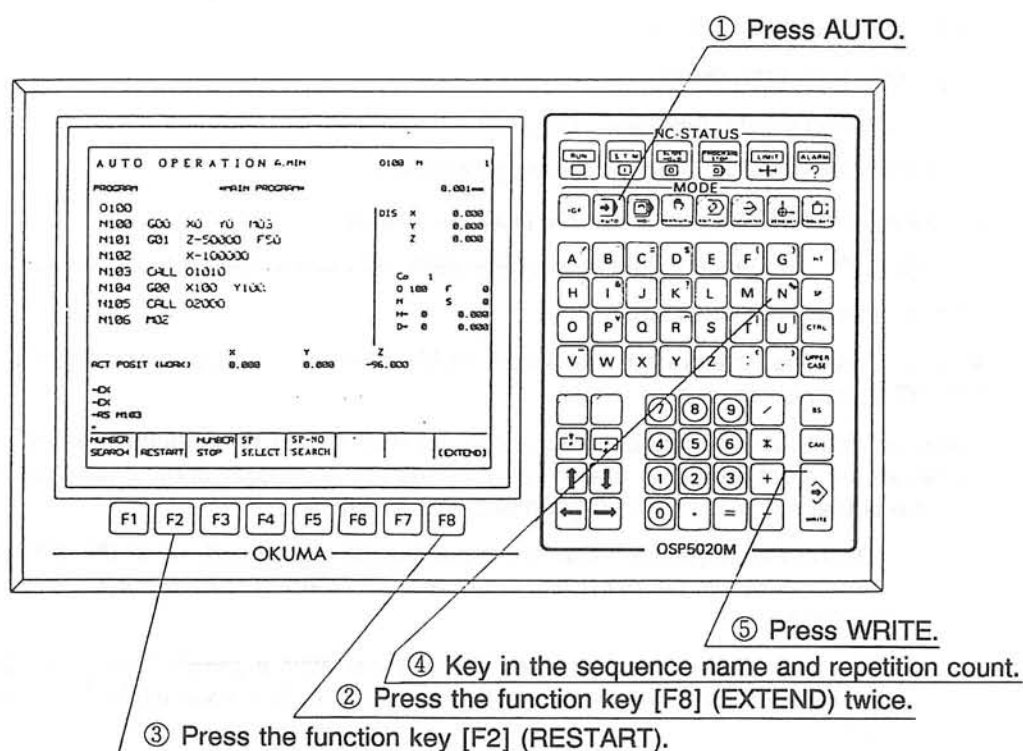
9-6. Return Search and Sequence Restart

When the machining cycle is interrupted during automatic operation because of tool breakage or other troubles, this function is used to restart the operation after necessary measures such as tool replacement have been taken.

After locating the sequence pointer to the specified sequence by return-search-operation, in which the commands are processed in the CPU, press the **SEQ. RESTART** button. This positions the axes at the point commanded last at the manual cutting feedrate. Press the **CYCLE START** button, then the operation will be resumed from the same sequence.

(1) Return Search

When the main program is selected correctly in the automatic mode, carry out the steps following:



- ① Press the **AUTO** key.
- ② Press the function key [F8] (EXTEND) twice.
- ③ Press the function key [F2] (RESTART).
"RS" is displayed on the 21st line on the CRT.
- ④ Enter the sequence name and repetition count, or the block count.

Input format is as follows:

= RS_ sequence name, repetition count or block count value

When the sequence name is specified, the repetition count must be less than 9999. If entry of the repetition counter is omitted, it is regarded as "1".

When the block count is specified, the count value must be less than 65535.

For entering a block count, the relative number may be given as indicated below.

Example:

592 592nd block

* Block count value which was counted at NC reset

*-2 The block two blocks ahead of the block count value above

- ⑤ Press the **WRITE** key.

The return operation is executed up to the specified sequence.

Restarting operation refers to the operation in which all the commands are processed within the control, without giving output signals for axis motions, and S, T, M and B functions. CALL command, RTS command and coordinate system shifting are also processed.

The block count is the count of the sequence executed from the program start after reset. Control statements such as GOTO, CALL, etc. are not counted. The count value and sequence name are not cleared by NC reset or by turning the power source on or off, and can therefore, be used for return after reset. They are cleared when the operation begins.

Note 1: When only the function key [F2] (RESTART) is pressed and there is no instruction for the sequence name or block count, an error occurs.

Note 2: If return search operation is intended while a schedule or a main program is being executed, an error occurs.

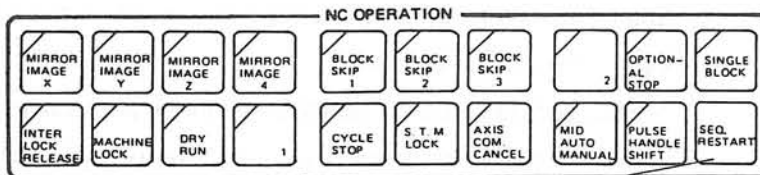
Note 3: The return operation up to M02 of the program is possible by the [F2] (RESTART)_E [WRITE] key operation. Reset by M02 (or M03) is not carried out.

(2) Sequence Restart

This function can be used only after the return search.

OSP5020M Machine
Operation Panel

For OSP5020M Machine Operation Flat Panel/
OSP500M-G NC Operation Panel



Press the **SEQUENCE RESTART** key.

When the **SEQ. RESTART** button is pressed, the program status up to the specified block is returned automatically.

Automatic return of miscellaneous functions:

(a) Return of the last S code

Whenever there is an S code, the S code is executed unconditionally.

(b) T code does not return automatically

The T code (next tool instruction) does not return automatically. Therefore, if the next tool number, which is now input, is a different one, it must be reset on the tool data setting page, or if the next tool number is zero, input must be done by MDI before the start of return search operation.

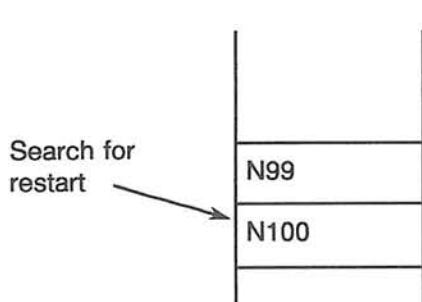
(c) Among the M codes, only those related to spindle operation can be recovered.

The M code is grouped, and the last modal state of the group returns successively.

- The M03, M04, M05, and M19 codes are regarded as belonging to the same group and the return is made to the M code last given.
- The ones related to the ATC (M06, M63, M64, M65) and the APC (M60, etc.) do not return automatically. Therefore, the operator should select the tool carefully.
- One-shot M codes (M00, M01, etc.) do not return automatically.

(d) The axes return to the point programmed in the return sequence at a manual cutting feedrate.

(e) After axes have reached the return point in the sequence return operation, the operation stops at that point independent of SINGLE BLOCK key setting. To resume the operation, the **CYCLE START** button must be pressed.

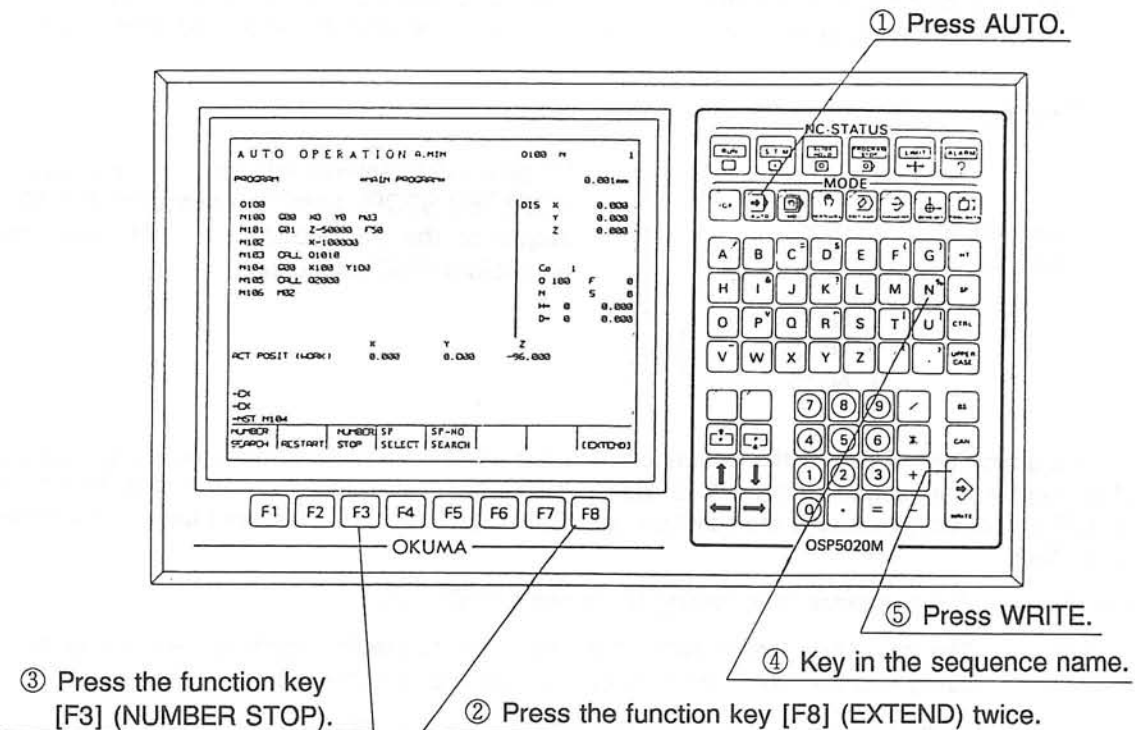


- ① Key in N100 after pressing the function key [F2] (RESTART). Then, press the **WRITE** key. This prepares for the return of the latest state up to the N100.
- ② Press the **SEQ. RESTART** button.
The axes return to the point commanded last at a cutting feedrate after the S and M states have been recovered automatically.
- ③ After axes have reached the return point in the sequence return operation, the operation stops at that point independent of SINGLE BLOCK key setting. To resume the operation, the **CYCLE START** button must be pressed.

9-7. Sequence Stop (optional)

This is the function to stop the program execution at a desired sequence while the automatic operation is carried out. Note that the sequence to be set must be the one already executed. The operation stops in the same manner as a single block stop: the spindle, coolant and other miscellaneous functions which are brought to a stop, when M00 is executed, do not stop. The operation can be resumed by simply pressing the **CYCLE START** button.

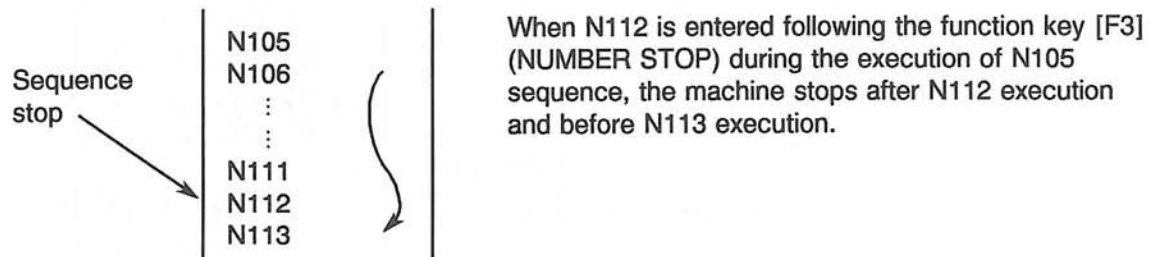
The operation procedure is described below:



- (1) Press the **AUTO** key.
- (2) Press the function key [F8] (EXTEND) twice.
- (3) Press the function key [F3] (NUMBER STOP).
"NST" is displayed on the 21st line on the CRT.
- (4) Key in the sequence name where the operation is to be halted on the keyboard.
- (5) Press the **WRITE** key.

When the block of the specified sequence name is read during automatic operation, the blocks up to the sequence before the specified sequence are executed and the machine stops.

Example:



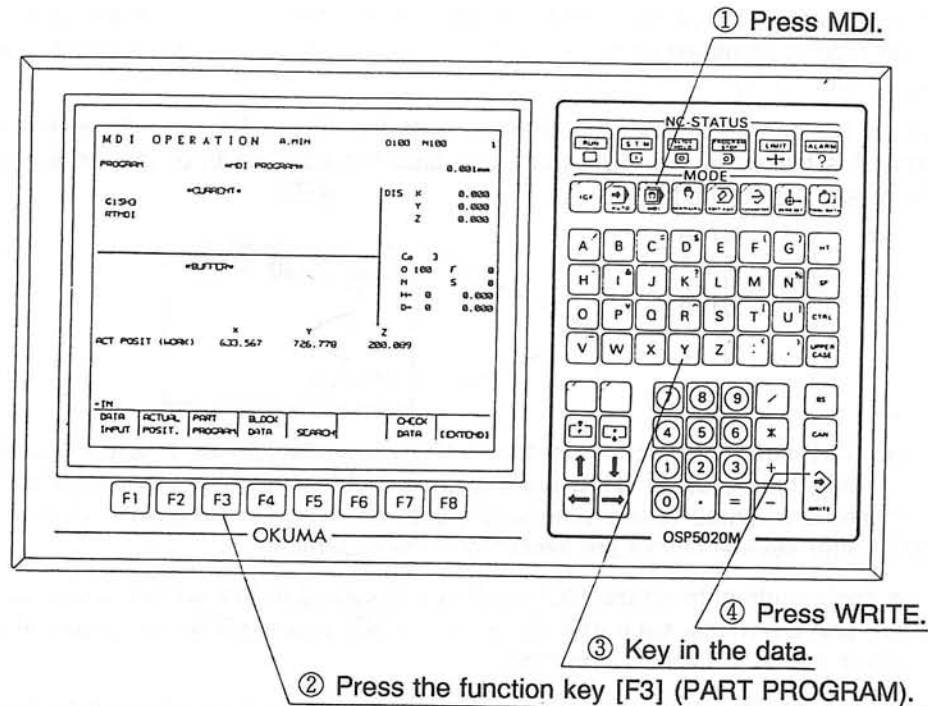
The sequence name, where the sequence stop is to be executed, can be changed by specifying another required sequence name. It is also possible to cancel the sequence stop by pressing the **WRITE** key directly following the function key [F3] (NUMBER STOP) without keying in any sequence name data.

- Note 1:** The sequence stop setting is cleared by NC reset.
- Note 2:** The sequence name entered for the step sequence name is handled as a character string and therefore, comparison as a number is not made.
- Note 3:** Setting during the scheduled operation causes errors.
- Note 4:** If the main program is selected correctly, setting is possible either before or during execution of the main program.
- Note 5:** Even if the sequence name which has been already read is set, the program cannot be stopped at that sequence.

9-8. MDI Operation

MDI is an abbreviation for Manual Data Input and each block of data entered is executed as in automatic mode operation.

(1) The operation procedure is described below

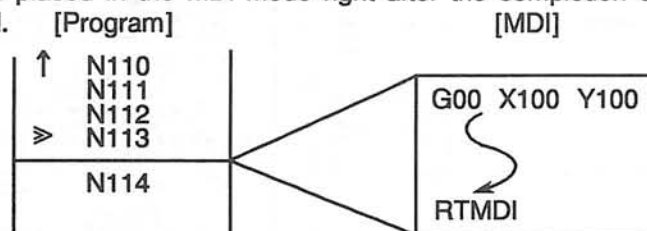


- ① Press the **MDI** key.
"IN" is displayed on the 21st line on the CRT.
- ② Press the function key [F3] (PART PROGRAM).
The title *MDI PROGRAM* is displayed on the CRT.
If this display page is not given, press the **PAGE** key until this page is displayed.
(Note that MDI operation is possible without this step.)
- ③ Enter the data of one block on the keyboard.
This data is displayed on the console line (21st line).
- ④ Press the **WRITE** key.
The entered data is displayed in the buffer field of the MDI program display. The RTMDI (Return from MDI) Instruction is automatically inserted.
In the BUFFER field, only one block of commands may be entered. If an attempt is made to enter a block of commands when another block of commands is displayed in the BUFFER field, the commands presently displayed are cleared.
- ⑤ Press the **CYCLE START** button.
The input data is executed when this button is pressed. The input data is transferred from the BUFFER field to the CURRENT field and the BUFFER field is cleared.
- ⑥ If steps (3) to (5) are executed repeatedly, the NC operates successively.

(2) Automatic mode operation and MDI mode operation

- (a) During the execution of the automatic mode operation, the MDI mode operation may be inserted after interrupting the automatic mode operation.
- (b) Switching the operation mode from the automatic to the MDI causes the control to halt after the execution of the commands in the block which has been read at the time of operation mode switching, thus permitting the entry of the data. Note that the block which has just been read is identified by the symbol "≥" on the CRT. (The block being executed is designated with "↑".)

When the operation mode is switched from the Single Block mode to the MDI mode, the control is placed in the MDI mode right after the completion of the block, once it has been executed.



- (c) If the MDI mode is switched on during N110 execution by automatic operation (single block mode off), blocks up to N113 are executed and the machine stops operation. Then, if the machine is returned to the automatic mode, the program execution is continued from block N114 after several blocks are executed in the MDI mode.
- (d) The commands entered the MDI mode are executed in the same manner as those in a program, and the modal state established in the MDI mode will remain active after the operation mode is switched back to automatic.
- (e) When the MDI mode is selected while the cutter radius compensation function is active, the axis movement commands keyed in and executed in the MDI mode are also controlled by this function.

* The manually inputted data may be executed directly after the commands of the block which has been executed when the operation mode is switched from the automatic (single block mode off) to the MDI. That is, the data reading-in mode as in the single block mode can be set. This setting is made by bit 7 of NC optional parameter (bit) No. 2.

(3) Subprogram call in the MDI mode operation:

- (a) Although the CALL command (single call) may be activated in the MDI mode, the MODIN command (call of subprogram after axis movement) is not effective in this mode. For the call of a subprogram, the main program from which the subprogram is called should be selected before it is called in the MDI mode.
- (b) During the execution of a subprogram, the single block mode may be turned on and off as needed. While the single block mode is off, the called subprogram is executed up to its end and then the control stops operation. If the single block mode is on, the called subprogram is executed by one block and the control stops. Pressing the **CYCLE START** button after that causes blocks of commands to be executed sequentially block by block each time it is pressed. The entry of new data is not allowed until the completion of the called subprogram.

Note 1: The following commands cannot be specified in the MDI mode:

Branch commands GOTO and IF

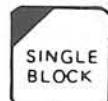
Commands used in schedule program VSET, PSELECT, etc.

Note 2: During the execution of a schedule program, the MDI mode operation is possible if a main program is not being executed.

Note 3: The **CYCLE START** button becomes effective when it is released after it is pressed as in the automatic mode operation.

9-9. Single Block

This is the function to check a program by actually executing it block-by-block. The single block mode is activated by pressing the **SINGLE BLOCK** key on the machine operation panel.



Press SINGLE BLOCK key (lamp ON).

There are two types of single blocks.

(1) Execute single block

This stops by the block accompanying axis movement execution, miscellaneous function operation or coordinate system setting. This does not stop by control statements such as CALL, GOTO, etc., or a macro call command, return command, and NOEX statement.

(2) Read single block

This stops at all blocks including the control statement.

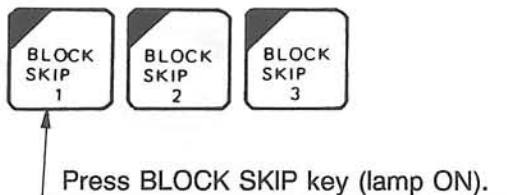
- (a) Execute single block is generally used, but for checking programmed operation, read single block is used.
- (b) Read single block is switched on by setting 1 at bit 0 of NC optional parameter (bit) No. 2.
- (c) Execute single block is determined by switch status after one-block execution.

The read single block is determined by switch status when one block is read.

- (d) If the single block is switched on during automatic operation and single block OFF state, the block under execution is completed and the machine stops operation. If there is any buffered block at this stage, one block is executed every time the **CYCLE START** button is pressed. If the buffer empties, a new block is read and executed.
- (e) Read single block is used to stop the execution of a program by each control statement, IF, GOTO and VSET in the schedule program.
- (f) During the program execution called in MDI mode, setting of the **SINGLE BLOCK** key is effective.
- (g) For the details of the stopping manner during single block mode at macro codes, refer to the appropriate section.
- (h) During the area machining mode, the axis stops at the completion of each motion when the single block is on.

9-10. Optional Block Skip

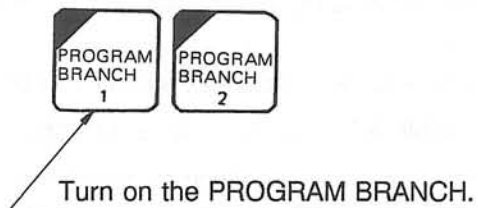
Any block specified with the slash (/) by the program can be disregarded when the **BLOCK SKIP** key on the machine operation panel is switched on.



One **BLOCK SKIP** key is provided as a standard function. Optionally up to three keys are available. For details, consult Section 2, 9. "Optional Block Skip" in the "Programming Manual for OSP5020M/OSP500M-G"

9-11. Program Branch

The program branch command in the part program is executed by pressing the **PROGRAM BRANCH** key



Two **PROGRAM BRANCH** keys are provided and each of them turns on/off a program branch command respectively.

For details, refer to the Programming Manual for OSP5020M/OSP500M-G, Section 2, 10.

9-12. Optional Stop

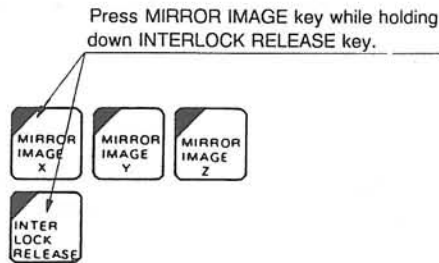
Program stop is done in the same way as for M00, by the block specified by the M01 in the program, by switching on the **OPTIONAL STOP** key on the machine operation panel. When the key is off, M01 is neglected.



Note: When M01 is executed, the spindle rotation and coolant supply etc. stop as required. These cannot, however, be returned automatically at the next cycle start.

9-13. Mirror Image

Each of X, Y, Z, 4th, 5th, and 6th axes has a flat key for turning on and off the mirror image function, and the sign of the coordinate value of the ON axis is reversed.



The operation procedure is described below.

Press the **MIRROR IMAGE** key of the desired axis for which mirror image function is to be performed while holding down the **INTERLOCK RELEASE** key.

To cancel the mirror image function, press the **MIRROR IMAGE** key while holding down the **INTERLOCK RELEASE** key again.

In addition, there is a programmable mirror image (G62) function, having the mutual relation described below:

Mirror Image by Switch	Mirror Image by G Code	Switch of the Coordinate Value Data Signs
OFF	OFF	Does not switch
OFF	ON	Switches
ON	OFF	Switches
ON	ON	Does not switch

The relation is established for each axis, independently.

The programmable mirror image is optional.

Example:

(a) In absolute dimensioning

N80 G90 X100 Y100

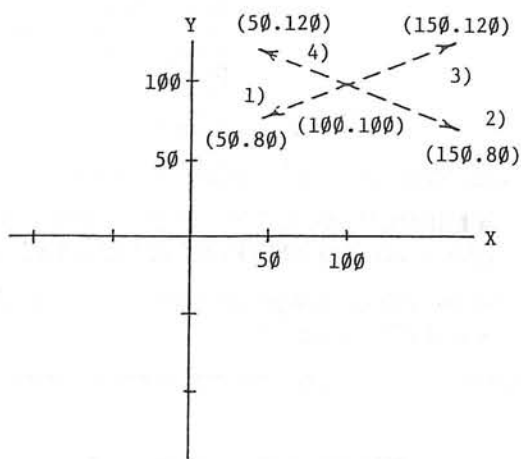
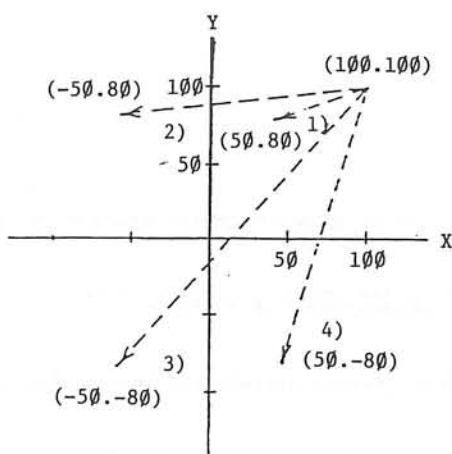
N81 X50 Y80

MIRROR IMAGE
Setting changed
here

(b) In incremental dimensioning

N80 G90 X100 Y100

N81 G91 X-50 Y-20



① Both X and Y are normal.

② Mirror image on only X-axis.

③ Mirror image on both X and Y axes.

④ Mirror image on only Y-axis.

When the mirror image is on, as shown in the example, the sign of the programmed command itself is switched, disregarding whether the selected dimensioning system is absolute or incremental.

Note 1: When the **MIRROR IMAGE** key is changed during automatic operation, the state will be changed over from the newly read block. The buffered commands are executed in the previously selected mirror image/normal state.

Note 2: During the single block mode operation switching, the **MIRROR IMAGE** key from on to off or vice versa after the completion of a block of commands will change over the state from the next block.

Example:

N100
N101
N102
Mirror image ON

When, after the execution block N101 in the single block mode, start-up is done with mirror image ON, the operation starts from N102 in the mirror image ON state.

Note 3: Be aware of the following related capabilities:

The mirror image function is valid for the instruction G92 P__ which establishes a work coordinate system.

Note 4: The mirror image function is valid for the instruction G51 P__ which indicates the coordinates of the center for scaling.

Note 5: The mirror image function is invalid for the coordinate system shift G11 P__.

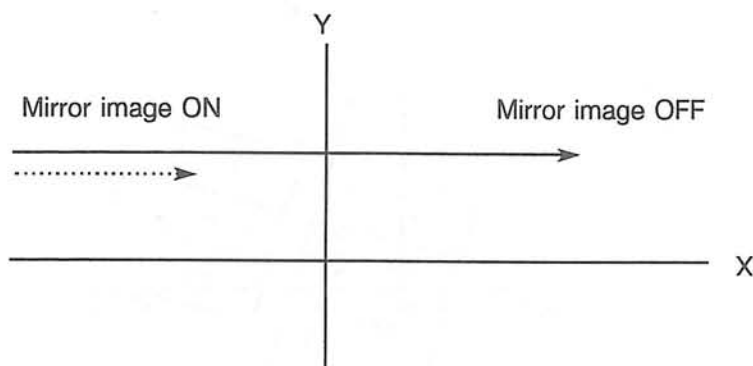
Note 6: While the mirror image function is active, G codes which indicate the direction of axis movement and I, J, and K commands are changed as needed.

Circular interpolation (G02, G03)

Cutter radius compensation (G41, G42), etc.

Note 7: The positioning direction for G60 one-direction positioning is not changed even in a mirror image ON state.

Example:



Note 8: On the CRT, the mirror image ON axes are identified by the "-" sign before the axis address of X, Y, Z, etc.

Refer to Section 4-5, "Programmable Mirror Image (G62)" in the "Programming Manual for OSP5020M/OSP500M-G" for details.

9-13-1. Mirror Image in the Work Coordinate System

Normally, when programming is executed in the local coordinate system, the mirror image function is effective in the local coordinate system. However, it is also possible to activate the mirror image function in the work coordinate system currently selected by changing parameter data.

(1) Parameter Setting

Whether the mirror image function is activated in the local coordinate system or in the work coordinate system can be set at the following parameter:

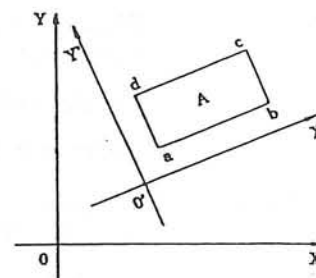
NC Optional Parameter (bit) No. 34, bit 2	
0	The mirror image function is activated in the local coordinate system.
1	The mirror image function is activated in the work coordinate system.

The initial setting is "0".

Note: When the setting has been changed, press the function key [F7] (BACKUP). After the completion of backup operation, turn off the power to the NC and turn it back on again. The new setting does not become effective only by changing the setting.

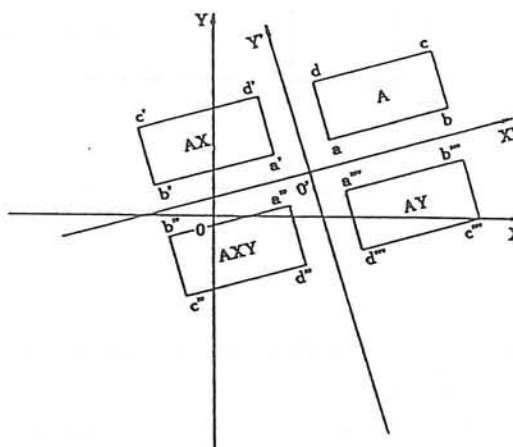
(2) Comparison of Mirror Image Between in the Local Coordinate System and in the Work Coordinate System

In the figure to the right, the local coordinate system $X'-Y'$ is set on the $X-Y$ plane of the work coordinate system $X-Y$, and area A is machined. Under such conditions, the relation of mirror image between in the local coordinate system and in the work coordinate system is as explained below.

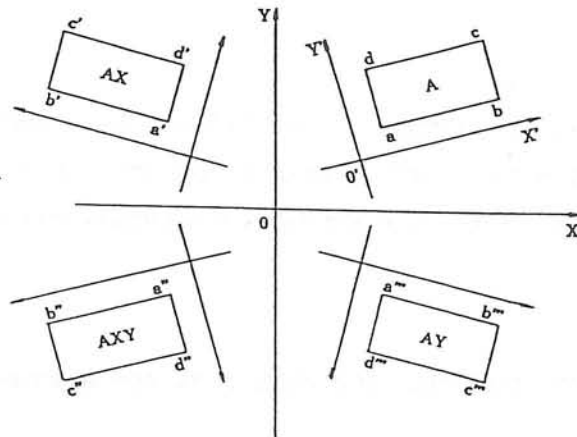


(a) In the G90 (absolute command) mode

1) Mirror Image in the Local Coordinate System

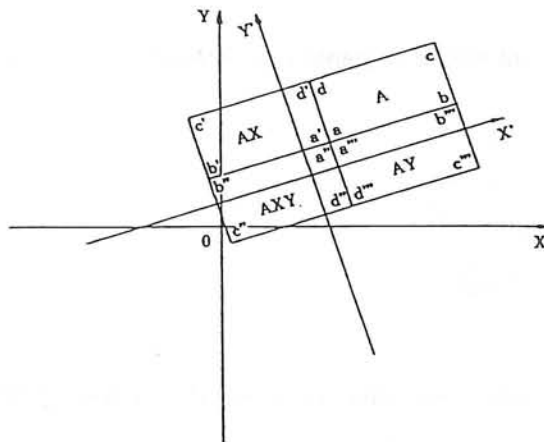


2) Mirror Image in the Work Coordinate System

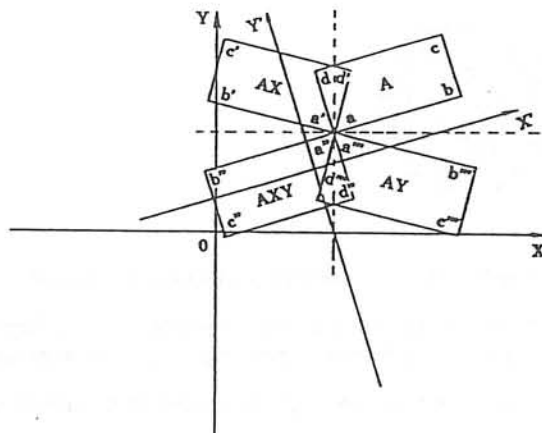


(b) In the G91 (incremental command) mode

1) Mirror Image in the Local Coordinate System



2) Mirror Image in the Work Coordinate System



In the G91 mode, if no rotational elements are included in the local coordinate system and the coordinate system is shifted only parallel, the mirror image function has the same effect in the local and work coordinate systems.

Explanation for the figures:

- AX . . . X-axis mirror image is turned on for machining area A.
- AY . . . Y-axis mirror image is turned on for machining area A.
- AXY . . X-axis mirror image and Y-axis mirror image are turned on for machining area A.

9-14. Override

These are rotary switches to change the feedrate or the spindle speed within a certain range during machine operation.

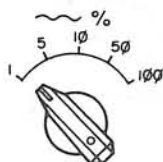
(1) Feedrate Override

Programmed, manually input, or dial-set feedrates can be changed during operation.

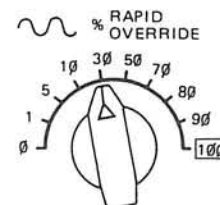
(a) Rapid Feedrate Override

This is effective during manual rapid feed operation and programmed rapid feed mode (G00, G60, etc.).

OSP5020M pendant operation panel specification:



OSP5020M flat panel specification:

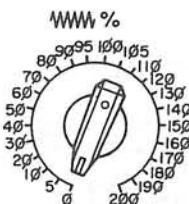


When 100% is selected, the axes move at the rapid feedrate of the machine.

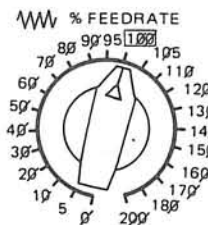
(b) Cutting Feedrate Override

This is effective for the programmed cutting feedrates in G01, G02, G03 and other modes.

OSP5020M pendant operation panel specification:



OSP5020M flat panel specification:



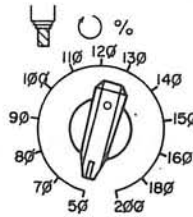
Note 1: Override rotary switch setting is ignored in tapping cycles called by G74 and G84.

Note 2: After the M137 execution, the override rate is fixed at 100% irrespective of the rotary switch setting until M138 is commanded and executed.

Note 3: The axis does not move at a 0% override switch setting.

(2) Spindle Speed Override

This is a rotary switch to change the spindle speed on the DC or VAC spindle drive motor specification. 13 steps from 50% to 200% can be selected.



With an S command, spindle drive gear range selection is done automatically. This gear range selection is made assuming that the override switch is set as 100%. Therefore, if an override rate other than 100% is selected, the actual spindle speed might require the gear range change although the programmed spindle speed does not change. In this case, no gear range change is actually done and the following spindle speed is selected, instead.

- (a) The S command causes a spindle speed over the maximum spindle speed in the selected range when it is multiplied by the set override rate.

The spindle rotates at the maximum spindle speed in the selected gear range.

- (b) The S command causes a spindle speed below the minimum spindle speed in the selected range to occur when it is multiplied by the set override rate.

The spindle rotates at the minimum spindle speed in the selected gear range.

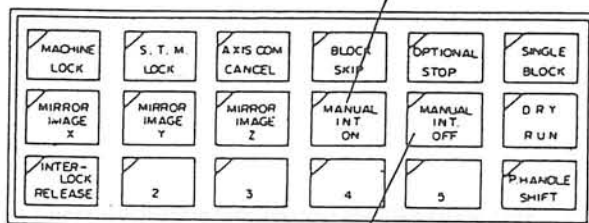
The actual spindle speed is displayed on the CRT.

9-15. Manual Intervention During Automatic Operation and Restart

Manual intervention refers to the function in which manual operation is performed during AUTO or MDI mode operations.

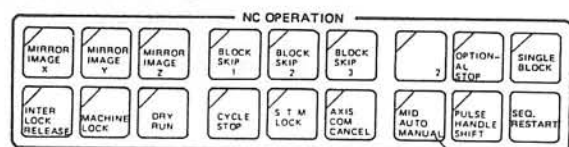
OSP5020M pendant operation panel specification:

Press MANUAL INT ON key.



Press MANUAL INT OFF key.

OSP5020M flat panel specification:



MID AUTO MANUAL is turned on when pressed once, and then turned off when pressed again.

The operation below is the procedure to return to carry out manual operation using this manual intervention function.

- (1) During the AUTO or MDI mode operation, press either the **SLIDE HOLD** button or the **SINGLE BLOCK** button to stop the cycle.
- (2) Press the **MANUAL INT. ON (MID AUTO MANUAL)** button (lamp ON).

The control is now placed in the manual intervention mode.

(3) Carry out necessary manual operations.

- Manual axis cutting feed
- Manual axis rapid feed
- Manual axis feed by pulse handle
- Spindle rotation
- Tool change, etc.

After manual axis feed, that distance is displayed on the CRT-2nd page of ACT POSIT pages:

[CRT Display]

MANUAL SHIFT ACTUL Manually shifted amount in the present manual intervention operation.

MANUAL SHIFT TOTAL A total of manually shifted amounts until the present manual intervention operation.

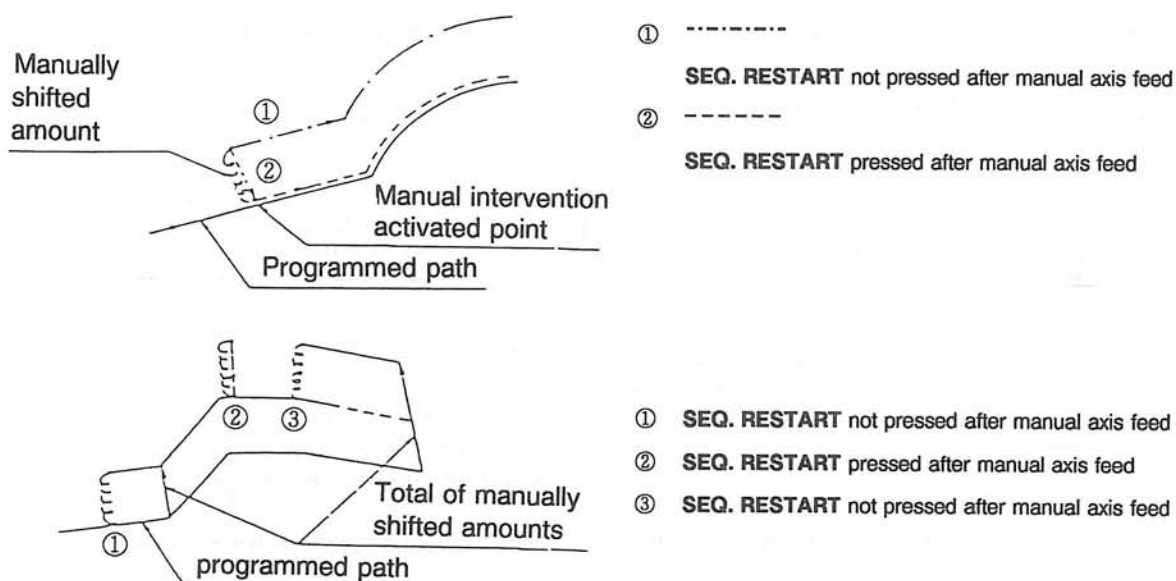
- (4) In the manual intervention mode, restore the miscellaneous functions (spindle speed, etc.) to the conditions before the manual intervention and locate the axes near the position where manual intervention has been made. Press the **SEQ. RESTART** button. With this, the axes return to the original position. The data displayed at MANUAL SHIFT ACTUL will become zero at the same time.

Note: In this return operation, the axes are fed at a rapid feedrate. Therefore, it is necessary to confirm that the return motion will not cause interference between the spindle or the cutting tool with the workpiece or the fixture on the table.

If the SEQ. RESTART button is not pressed, the manually fed amount is not zeroed.

- (5) Pressing the **MANUAL INT. ON (MID AUTO MANUAL)** or **SEQ. RESTART** button automatically cancels the manual intervention mode.

Example of Manual Intervention:



Note 1: During manual intervention mode, automatic return of miscellaneous functions is not made. This permits the change of spindle speed or tools during this mode.

Note 2: Even when tool offset and/or cutter radius compensation data has been changed for a newly set tool (manual change), this data does not become effective at the point when the return to the originally located position is completed.

9-16. Inserting Pulse Handle Operations

On a machining center, it is sometimes required to feed the Z-axis manually while positioning of the X- and Y-axis is made as programmed. Or when machining a cast workpiece on which stock removal amount varies greatly, it is necessary to adjust the depth of cut manually. In such operations, axis motion controlled by the pulse handle can be inserted to the programmed axis movements.

Operation to insert axis movement by the pulse handle is explained below:



Press P. HANDLE SHIFT key (lamp ON).

- (1) Press the **P.HANDLE SHIFT** key to turn it on (lamp ON).
- (2) Set the **AXIS SELECT** selector on the pulse handle operation panel to the axis which is to be moved. Also select the multiplication factor.
- (3) Feed the axis by turning the pulse handle.

The amount fed by the pulse handle is shown in the **MANUAL SHIFT TOTAL** line. Automatic return is not made for the amount fed by the pulse handle. If it is then necessary to return the axis by turning the pulse handle while observing the **MANUAL SHIFT TOTAL** data on the CRT.

Note 1: The **MANUAL SHIFT ACTUL** data is cleared ("0") when the **MANUAL INT. ON** key is pressed.

Note 2: The **MANUAL SHIFT TOTAL** data is cleared ("0") when the **POWER ON** button is pressed.

It is also cleared when the **RESET** button is pressed when parametric data (bit 2 of NC optional parameter (bit) No. 4) is so set.

Note 3: Axis travel amount using the pulse handle is added to the axis position data which is used for judging travel end.

Note 4: While the **P. HANDLE SHIFT** key is off, the pulse handle is inoperative.

9-17. Lock Functions

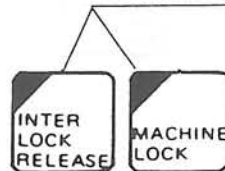
(1) Machine Lock

This is the function to check the program only by the display while all machine movement is stopped.

The actual position values given on the CRT are updated as the program is executed.

Operating Procedure:

Press MACHINE LOCK key while holding down INTERLOCK RELEASE key.



Press the **MACHINE LOCK** key while holding down the **INTERLOCK RELEASE** key.

The control is then placed in the machine lock state.

To cancel the machine lock state, press the **MACHINE LOCK** key while holding down the **INTERLOCK RELEASE** key.

(2) Cancellation of Axis Command

This is the function to lock the movement of the specified axis. It is effectively used to plot the programmed path by a pen fixed on the spindle.

Auxiliary functions other than S,T and M are all locked.

M functions associated with an axis motion are not executed.

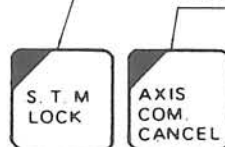
The axis to be locked is set to the Z-axis as the standard specification but this may be optionally changed to the X- or Y-axis.

(3) S, T, and M Function Lock (optional)

This is the function to check the program by executing the axis movement commands without miscellaneous commands.

Press STM LOCK key (lamp ON).

Press AXIS COM. CANCEL key (lamp ON).



Note 1: Override or dry function is also effective as in normal cutting operation.

Note 2: The axis specified by the axis command cancel function may be moved by manual or manual intervention operation.

Note 3: The spindle does not turn while the STM lock function is active. In this mode, the feedrate programmed in "mm/rev" mode is calculated assuming that the spindle speed is 2000 rpm.

Note 4: The home position return which is accompanied by an M06 tool change command is ineffective as long as the STM lock function is active.

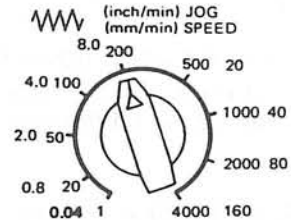
Note 5: While the STM lock function is active, manual operation of S, T and M functions is possible by manual intervention operation.

9-18. Dry Run

Dry run is a function for running the machine at the feedrate set by the cutting feedrate rotary switch on the machine operation panel, while disregarding the programmed feedrates in G01, G02, G03 and other similar modes.



Press DRY RUN key while holding down INTERLOCK RELEASE key.



In the rapid feed (G00) mode, the data set at bit 3 of NC optional parameter (bit) No. 2 determines whether the dry run is effective or not. Switching the **DRY RUN** key on/off is possible even while commands in a block are being executed. When changed over, the machine is immediately set to the state selected.

S, T and M functions are executed as usual when the **DRY RUN** key is on.

The dry run function is effective while the machine lock function is active.

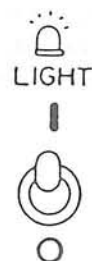
Be careful when activating this dry run function since it is effective during a G74 and G84 tapping cycle, or during the G31 skip function.

Be sure to press the **INTERLOCK RELEASE** key when pressing the **DRY RUN** key to turn on or off the DRY RUN function.

9-19. Operation End Light (optional)

The operation end light goes on when the following conditions have been satisfied. However, the LIGHT switch on the OPERATION END MODE panel must first be turned on.

Mode	Condition
Automatic operation	- When alarm occurs
Single block off	- When program is completed
	(1) Schedule program after executing END in a schedule program.
	(2) Main program after executing M00, M01, M02 or M30 in a main program.



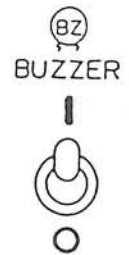
Restarting will extinguish the operation end light.

When the alarm occurs, resetting the OSP5020M will extinguish the operation end light.

9-20. Operation End Buzzer (optional)

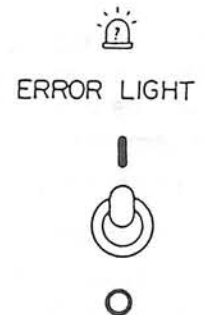
Operates in the same conditions as the operation end light. The operation end buzzer sounds when these conditions have been satisfied. However, the **BUZZER** switch on the OPERATION END MODE panel must first be turned on.

The buzzer will sound during the period set by the MC user parameter (word) No. 7 - operation end buzzer timer. Restarting will cut off the operation end buzzer.



9-21. Error Light (optional)

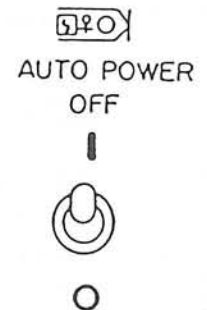
The error light is turned on when an alarm state is detected. The **ERROR LIGHT** switch must first be turned on. The lamp is turned off when the control is reset. If the control is provided with the alarm warning light specification, the operation end light or the operation end buzzer will not be activated when an alarm occurs.



9-22. Auto Power Off (optional)

The power cuts off when the following conditions have been satisfied. However, the **AUTO POWER OFF** switch on the OPERATION END MODE panel must first be turned on.

Mode	Condition single block off
Automatic operation	(1) Schedule program after executing END in a schedule program
Single block off	(2) Main program after executing M02 or M30 in a main program

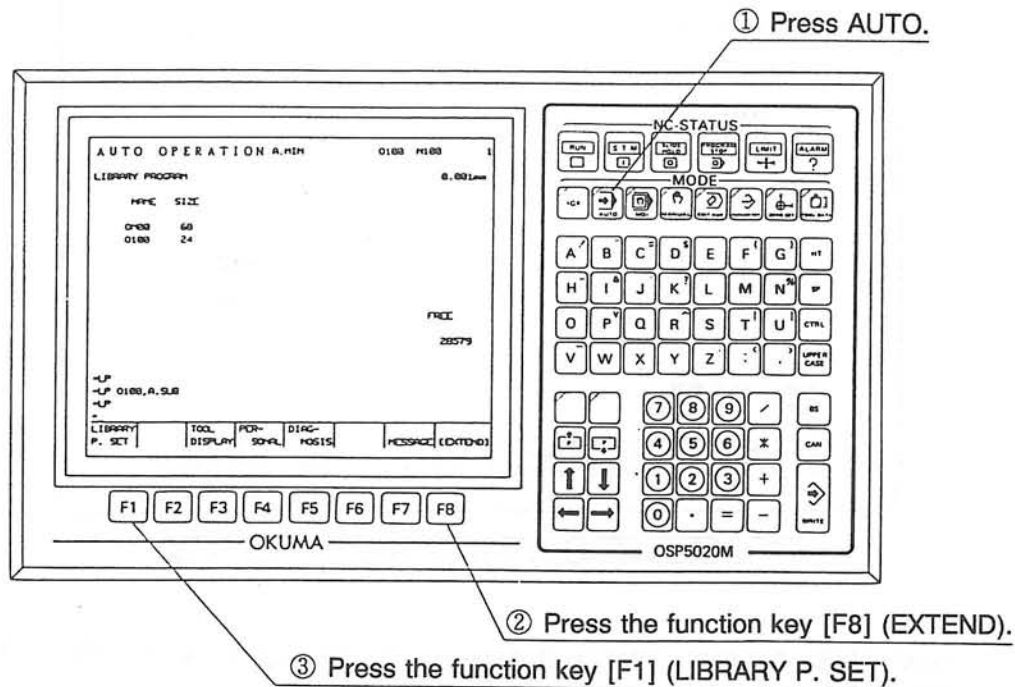


When this function is used and there are blocks changing/setting parameters on the program, it is recommended to make the backup function effective with M02/M03 (Set "1" at NC optional parameter (bit) No. 33, bit 1).

9-23. Library Program Registration

This is the function necessary for executing such items as a subprogram and a G code macro through the MDI operation or for operating the program which contains subprogram call commands in the large capacity mode operation after specifying the S option. That is, the registration of subprograms is possible with this library program registration function. Such a registration is usually made when the PROGRAM SELECT function key is pressed.

The operating procedure is shown below:



- (1) Press the **AUTO** key.
- (2) Press the function key [F8] (EXTEND).
- (3) Press the function key [F1] (LIBRARY P. SET).

The function messages will change as shown above. (The message "LIBRARY P. SET" appears above F1.)

"LP" is displayed on the 21st line on the CRT.

Operating procedure for library program registration:

(1) Library Program Directory Display

Press the function key [F1] (LIBRARY P.SET), key in "LP_" and then press the **WRITE** key.

The CRT displays the library program directory and the remaining capacity in the number of bytes.

AUTO OPERATION A.MIN				0100	N100	1
LIBRARY PROGRAM				0.001mm		
NAME		SIZE				
0100		68				
0100		24				
				FREE		
				28579		
-LP						
-LP 0100,A.SUB						
-LP						
*						
LIBRARY	TOOL	PER-	DIAG-			
P. SET	DISPLAY	SONAL	NOSIS	MESSAGE	[EXTEND]	

[F 1] [F 2] [F 3] [F 4] [F 5] [F 6] [F 7] [F 8]

When library program directory is displayed on two pages, use the **BS** or **WRITE** key to change the display screen.

(2) Library Program Registration

Press the function key [F1] (LIBRARY P. SET) and key in program name and file name as follows.

LP_program name, file name [**WRITE**].

The library program can now be registered.

When a file name is omitted, subprograms in all the SSB files are registered when the entered program name is "O****", and those in all the MSB files are registered when the entered program name is "O0***".

When a program name is omitted, all the subprograms in the file specified following the comma (,) are registered as library programs.

Up to sixty-five subprograms can be registered.

Note that a main program cannot be registered as a library program.

(3) Deleting Library Program

Press the function key [F1] (LIBRARY P. SET) and key in the program name as follows.

LP_program name;C [**WRITE**].

With the operation above, the programs registered as library programs are deleted.

(4) Initializing Library Program

Press the function key [F1] (LIBRARY P.SET) and key in as follows.

LP_n;l [WRITE].

With the operation above, the programs registered as library programs are all deleted.

(5) Specifying Buffer Size of Library Program

Press the function key [F1] (LIBRARY P.SET) and key in as follows.

LP_n;l [WRITE].

With the operation above, the buffer size of "n" bytes for registering the library programs is ensured. At the time of delivery, this "n" is set at "0".

Note that when the buffer size specification is changed, the library program registration state and the program selection state are all cleared.

Note 1: To ensure the NC program registration area for operation without using library programs as much as practicable, zero the library program registration by the operation below:

Press the function key [F1] (LIBRARY P. SET) and key in as follows.

LP_0;l [WRITE].

The library programs registered in the operations above, can be accessed by the required MDI mode operation. They can also be referenced in the S option mode or the equivalent operation mode (DNC, for instance).

(6) The subprograms in the file which have an extension LIB are automatically registered as library programs when power supply to the control is turned on. Therefore, G code macro or other subprograms which are frequently used are recommended to be stored in the LIB file. This permits them to be called any time as conventional G codes.

Note 2: A library program is distinguished only by its program name. Therefore, it is impossible to register more than one library program which have the same name.

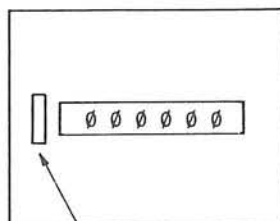
If the subprogram in the user program has the same name as the library program, the library program is given priority when such a subprogram is intended to be called.

Note 3: Turn off and on the power after adding a new library program.

9-24. Work Counter (optional)

Count data is incremented when the machining completion signal (M02 or M30) is executed.

The counter has a six-digit capacity (0 - 999999). It is provided with the reset function.



Reset button

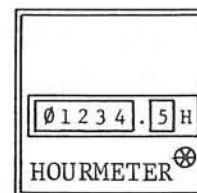
9-25. Hour Meter (optional)

(1) POWER ON TIME Hour Meter

The hour meter accumulates length of time in which operation power has been turned on.

Hour meter range: 0 - 99999.9 hours

POWER ON TIME



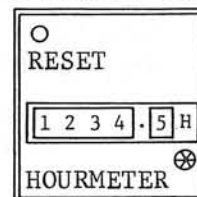
(2) NC RUNNING TIME Hour Meter

The hour meter accumulates length of time in which the RUN lamp in the NC operation panel status indicating lamps has been lit.

Hour meter range: 0 - 9999.9 hours

The hour meter is provided with the **RESET** button.

NC RUNNING TIME



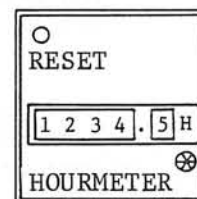
(3) CUTTING TIME Hour Meter

The hour meter accumulates length of time in which cutting has been conducted (G01, G02 or G03 mode) in the automatic or MDI operations.

Hour meter range: 0 - 9999.9 hours

The hour meter is provided with the **RESET** button.

CUTTING TIME



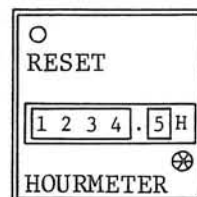
(4) SPINDLE REVOLUTION TIME Hour Meter

The hour meter accumulates length of time in which the spindle has been rotating (CW or CCW) disregarding the operation mode.

Hour meter range: 0 - 9999.9 hours

The hour meter is provided with the **RESET** button.

SPINDLE
REVOLUTION TIME



Note: When hour meters are selected, (1) POWER ON TIME hour meter and (2) NC RUNNING TIME hour meter are usually equipped.

9-26. F1-Digit Feed (optional)

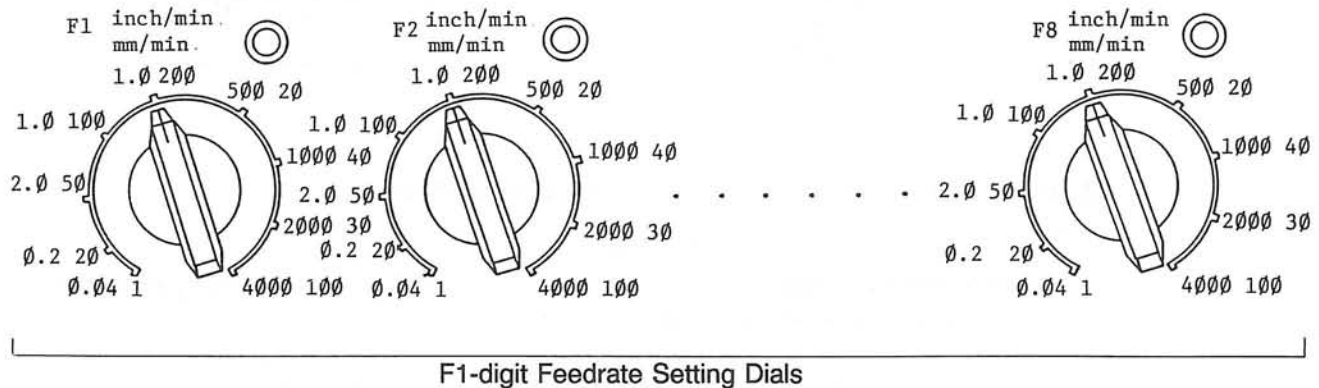
The F1-digit feed function allows the use of feedrate setting dials (F1 - F8, or F1 - F4) on the F1-digit feed operation panel. The operator should set axis feedrates on these dials and when F1 - F8 (or F1 - F4) command is read, the corresponding feedrate setting dial is selected and axis motion commands are executed at the feedrate set on the dial.

The indicating lamp above the dial lights up when the corresponding feedrate setting dial is selected. Once the dial is selected, the selected condition is not cleared by resetting the NC. It is cleared when a four-digit F command is executed or the power to the control is turned off.

F0 command selects a rapid feedrate.

Setting of the dial can be changed while a cutting is in progress. The feedrate override dial is ineffective while a feedrate command is given in one-digit F command.

An alarm occurs if an F1-digit command is given in the G95 (feed per revolution) mode.



10. Manual Operation Functions

Manual operation is possible when the MANUAL lamp is on or flickering.

10-1. Manual Axis Feed Functions

10-1-1. Manual Rapid Feed

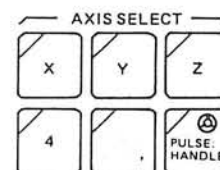
It is possible to manually feed each axis at a rapid feedrate.

- (1) Select the axis to feed by the **AXIS SELECT** switch (key).

OSP5020M pendant
operation panel specification:



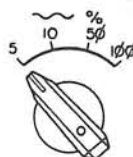
OSP5020M flat panel specification:



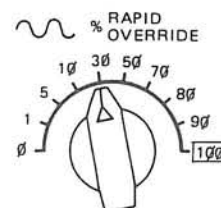
- (2) Select the override rate by this rapid feedrate selection rotary switch.

This switch is operative while an axis is being fed.

OSP5020M pendant
operation panel specification:



OSP5020M flat panel specification:

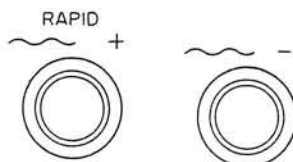


- (3) Press the **RAPID/+** button to feed the axis in the plus direction.

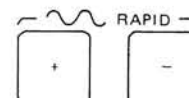
Press the **RAPID/-** button to feed the axis in the minus direction.

The axis moves only as long as these buttons are pressed down. When they are released, axis motion stops.

OSP5020M pendant
operation panel specification:



OSP5020M flat panel specification:

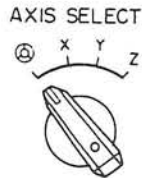


10-1-2. Manual Cutting (Jog) Feed

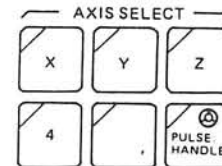
It is possible to manually feed each axis at a specific jog feedrate.

- (1) Select the axis to feed by the **AXIS SELECT** switch (key).

OSP5020M pendant
operation panel specification:

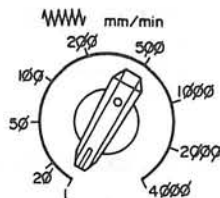


OSP5020M flat panel specification:

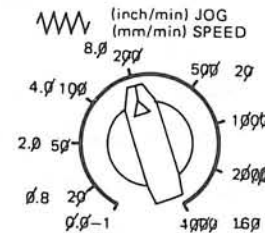


- (2) Select the jog feedrate by the jog feedrate selector switch. This rotary switch is operative even during axis feed.

OSP5020M pendant
operation panel specification:



OSP5020M flat panel specification:



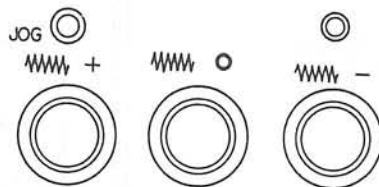
- (3) Press the **JOG/+** button to feed the axis in the plus direction.

Press the **JOG/-** button to feed the axis in the minus direction.

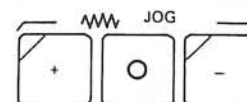
Pressing these buttons once will activate the axis feed until the **JOG OFF** button is pressed.

While an axis is moving, pressing the JOG feed button, which requires feed in the opposite direction, stops the axis feed then starts in the newly selected direction. Therefore, an indicating lamp is provided for each of the JOG feed buttons so that the operator can know the direction of present axis feed.

OSP5020M pendant
operation panel specification:



OSP5020M flat panel specification:



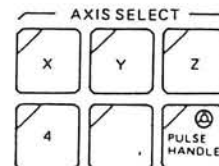
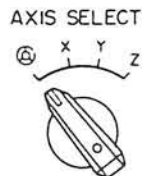
- (4) When the **JOG OFF** button is pressed, the axis feed is stopped.

10-1-3. Manual Pulse Feed

It is possible to feed each axis using the pulse handle.

OSP5020M pendant
operation panel specification:

OSP5020M flat panel specification:



- (1) Select the **PULSE HANDLE** from **AXIS SELECT**.
- (2) Select the magnification factor with the magnification factor selector switch.
 - 1 The selected axis is fed 0.001 mm (0.00004 in.) each pulse.
 - 10 The selected axis is fed 0.01 mm (0.0004 in.) each pulse.
 - 50 The selected axis is fed 0.05 mm (0.002 in.) each pulse.

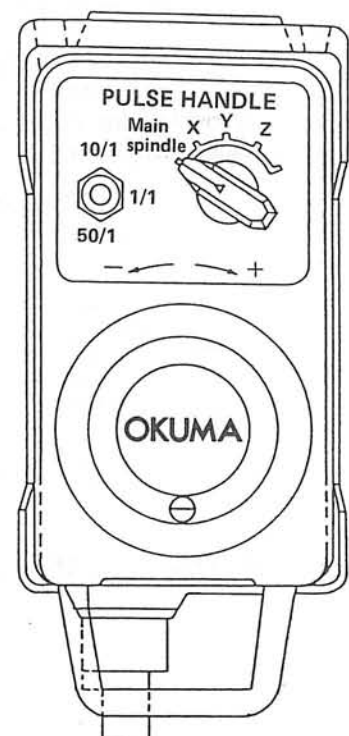
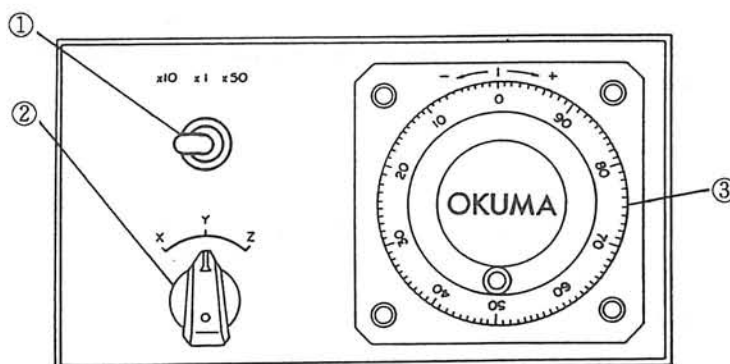
- (3) Select the axis to be fed with the **AXIS SELECT** switch (key).

- (4) Turn the pulse handle.

Turning the handle in the clockwise direction feeds the axis in the positive (plus) direction.

Turning the handle in the counterclockwise direction feeds the axis in the negative (minus) direction.

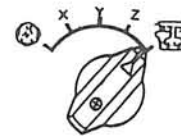
Note: When "50" is selected for the magnification, the axis feeds almost as fast as rapid feedrate. In this case, the alarm sometimes occurs.



10-1-4. Crossrail Control

Crossrail can be moved rapidly.

- (1) Select CROSS RAIL.



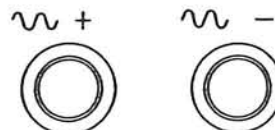
- (2) Turn the crossrail clamp/unclamp switch in the unclamp position.



- (3) After making sure that the crossrail clamp indication lamp has been turned off, press the **RAPID/+** or **RAPID/-** button depending on the desired crossrail movement direction.

RAPID/+ upward

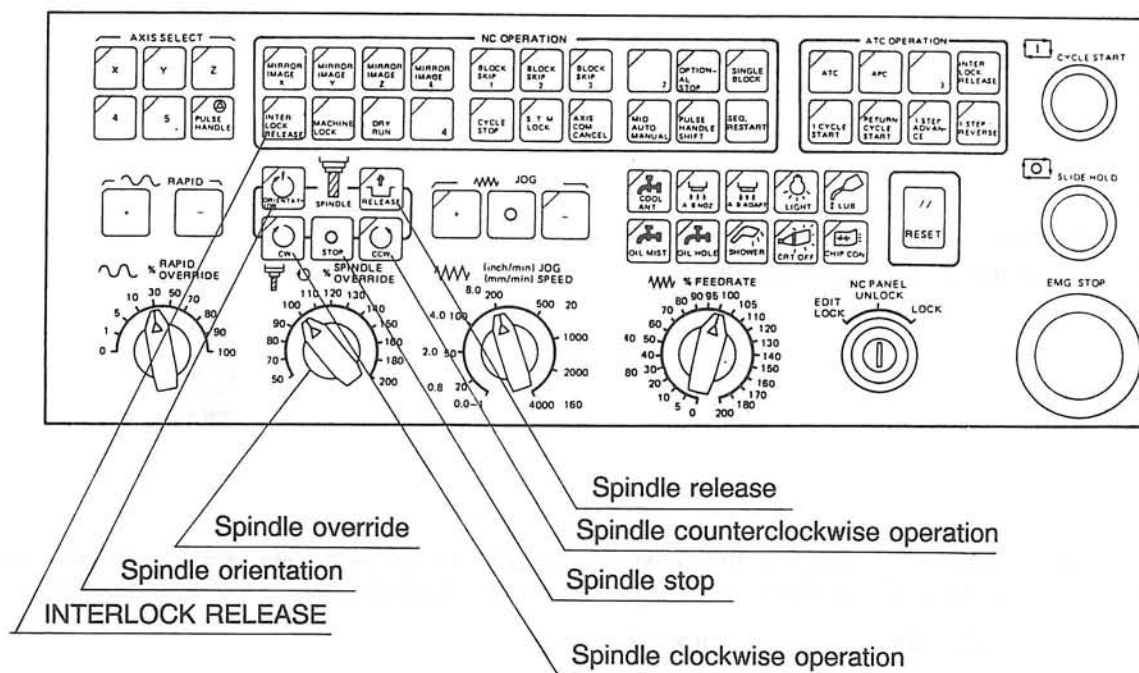
RAPID/- downward



Note: When the crossrail movable indicating lamp is provided and if it is not on, pressing the **RAPID/+** or **RAPID/-** button does not start crossrail movement. This indicates that the spindlehead is positioned either at the left or at the right end of the crossrail. Move the spindlehead (Y-axis) away from the end position.

10-2. Spindle Operation

(1) OSP5020M Flat Panel Specification:



(a) Spindle Rotation

Enter the desired spindle speed (S command) in the MDI mode. This automatically selects the spindle drive gear range. Note that an S command cannot be given in the manual mode.

Switch to the manual mode, select the spindle rotation direction either CW or CCW, then press the key selected while holding down **INTERLOCK RELEASE** button (Note).

The spindle starts rotation at a commanded speed. When the spindle speed override rotary switch is set at other than 100%, the spindle rotates at the overridden speed.

(b) Spindle Stop

Press the **SPINDLE STOP** button to stop the spindle.

(c) Spindle Release

Press the **SPINDLE RELEASE** button to put the spindle gear into the release (neutral) position. This button is operative only while the spindle stays at rest (**SPINDLE STOP** button pressed). This release state permits manual spindle rotation.

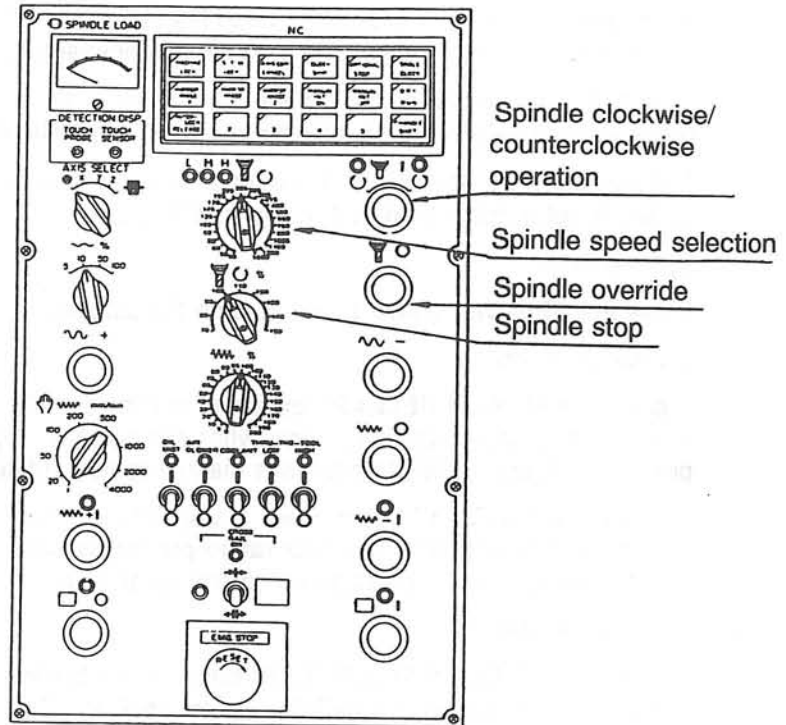
Pressing the **CW/CCW** button while the spindle is in the release state starts the spindle at a commanded speed after the gear range previously selected has been selected again. The spindle release cannot be canceled in any other way.

(d) Spindle Orientation

Press the **SPINDLE ORIENTATION** button while holding down **INTERLOCK RELEASE** button to stop the spindle at a definite angular position. This **ORIENTATION** button is operative while the spindle is rotating. Pressing the **ORIENTATION** button simultaneously initiates spindle orientation and triggers the button's indicator lamp.

Upon completion of the orientation, the lamp stops flashing and remains illuminated. Rotating the spindle cancels the orientation state. The orientation position and speed are set by machine system parameters.

(2) OSP5020M Pendant Operation Panel:

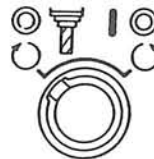


(a) Spindle rotation

- 1) Select the required spindle speed with the rotary switch.



- 2) Select the spindle rotation direction (CW or CCW) and press the button inside. The spindle will rotate at a selected speed multiplied by spindle speed override ratio.



Note: The spindle speed may be changed during spindle rotation by turning the spindle speed selection rotary switch. However, if the speed selected newly does not fall within the range currently selected, an alarm occurs and the spindle keeps rotating at the previously selected speed.

(b) Spindle rotation off

Press the **OFF** button to stop the spindle.

(c) Spindle release

Press the **RELEASE** button to put the spindle gear into the release (neutral) position. This button is operative only while the spindle stays at a rest (spindle **OFF** button pressed). This release state permits manual spindle rotation.

Pressing the **CW/CCW** button while the spindle is in the release state, starts the spindle at a commanded speed after the gear range previously selected has been selected again. The spindle release cannot be cancelled in any other way.

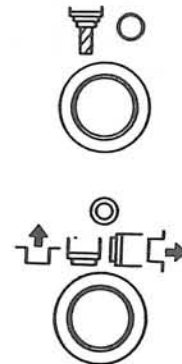
The location of the spindle release button differs depending on machine models:

MDB-A/B, MCV-A/B

Operation panel at spindlehead lower portion

MCR, MCM

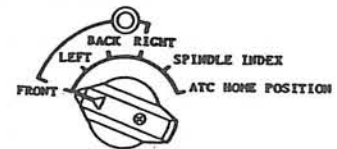
Pendant operation panel



(d) Spindle orientation

With MCV-B and MCR, manual spindle orientation is possible when the AAC (automatic attachment changer) is possible. With MCM, manual spindle orientation is standard.

- 1) Place the swivel head index position selector switch at **SPINDLE INDEX**.

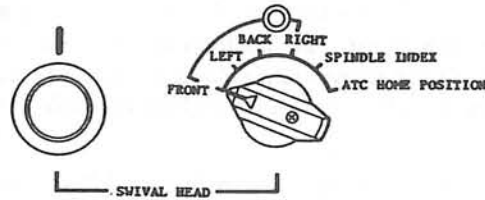


- 2) Press the swivel head index start pushbutton switch, and the spindle is orient stopped. When the spindle is started next, the spindle begins rotating and the orientation mode is canceled.



10-3. Indexing Swivel Head (Indexing Attachment)

The swivel head (attachment) can be indexed to the required position by pressing the swivel head (attachment) indexing start button after selecting the required position (FR/RH/RR/LH) by the index position selecting switch. For the swivel head (attachment) indexing operation, following conditions must be met.



Conditions for the operation:

- (1) Spindle is stopped.
- (2) Tool is clamped (both for vertical and horizontal spindles).
- (3) Tool change arm is retracted.
- (4) Swivel head in indexable range indicating lamp is illuminated.
- (5) Swivel head index pin is extracted. (only for MCM)
- (6) Spindle orientation pin is not extracted.
(Swivel head index command includes the orientation pin extraction.)
- (7) Not in alarm A occurrence
- (8) ATC operation sequence number is within 1 - 19, 50 - 66. (only for MCM)

Note 1: In completely automated operation including ATC, the swivel head is automatically indexed for automatic tool change operation after Z-axis is moved up to the tool change position. (only for MCM)

*RR position for vertical spindle
FR position for horizontal spindle*

Note 2: Usually, the swivel head (attachment) is rotated in the clockwise direction. In the M17 mode, it is rotated in the counterclockwise direction.

10-4. ATC

10-4-1. ATC Operations

- (1) Establishment of Correspondence between Toolpot Numbers and Tool Numbers by Manual Tool Change Operation

This method is applied to the following models with 32-tool or smaller ATC capacity.

MC-30VA, MC-40VA, MC-50VA, MC-60VA

In the memory-random ATC system the tool in the spindle is returned to the toolpot in which the tool to be set in the spindle next is held. Therefore, the correspondence between the toolpot numbers and the tool numbers changes each time the automatic tool change cycle is carried out. This means that the initial correspondence between toolpot numbers and tool numbers must be set and stored in the memory before starting the ATC operation.

For setting this correspondence, there are two ways as follows:

- (a) The table listing the correspondence between the toolpot numbers and tool numbers is made in advance, the correspondence table is established on the screen and individual tools are stored in the corresponding toolpots according to the established correspondence.
- (b) A tool is manually set in the spindle and is returned to the toolpot specified or to an empty pot, automatically selected by the manual tool change operation.

In this section the procedure for (b) is explained. Refer to Section 2, 6-5-2. "ATC Pot No./Tool No. Table" for the procedure for (a).

Setting Procedure:

- ① Switch the mode to "manual" by pressing the **MANUAL** key.
The display is possible in the automatic and MDI modes also. However, the setting is effective only in the manual mode.
- ② Press the function key [F8] (EXTEND) to change the function key guide message. Then press the function key [F2] (TOOL SET).
- ③ The *ATC TOOL SET (POT REF)* page is displayed. Pressing the function key [F3] (ITEM ↓) changes the display page to *ATC TOOL SET (TOOL REF)*.

MAN. OPERATION A.MIN. 0100 N100 1

= ATC TOOL SET (POT REF) =

POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.
1	NA	11	NA				
2	001	12	005				
3	NA	13	NA				
4	002	14	006				
5	D	15	NA				
6	003L	16	NA				
7	D	> 17	NA				
8	NA	18	D				
9	004	→ 19	007L				
10	NA	20	D				

SPCY POT
ACT TOOL 888
NXT TOOL NA

=TS
>S 1
>S =
>S

SET	ITEM↑	ITEM↓				QUIT
-----	-------	-------	--	--	--	------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

MAN. OPERATION A.MIN. 0100 N100 1

= ATC TOOL SET (TOOL REF) =

TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.	TOOL NO.	POT NO.
>001	2	011	NA	021	NA	031	NA
002	4	012	NA	022	NA	032	NA
003L	6	013	NA	023	NA	033	NA
004	9	014	NA	024	NA	034	NA
005	12	015	NA	025	NA	035	NA
006	14	016	NA	026	NA	036	NA
007L	19	017	NA	027	NA	037	NA
*008	NA	018	NA	028	NA	038	NA
009	NA	019	NA	029	NA	039	NA
010	NA	020	NA	030	NA	040	NA

SPCY POT
ACT TOOL 000
NXT TOOL 001

=EX
=TS
>S

SET	ITEM↑	ITEM↓				QUIT
-----	-------	-------	--	--	--	------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

Setting is possible on either of the display pages.

Note that POT NO. and TOOL NO. at the left hand column are only for display purpose and setting them is impossible.

(2) Symbols on the display pages are as follows:

(a) ATC TOOL SET (POT REF)

→ : Indicates the next tool.

➤ : Indicates the toolpot number which is located at the position where a tool can be manually removed from or inserted into the toolpot.

(b) ATC TOOL SET (TOOL REF)

➤ : Indicates the next tool.

* : Indicates the active tool.

(3) The data to be set:

(a) SPCY POT

This is used for specifying the toolpot to which the active tool is to be returned, if necessary.

Note 1: The maximum number is the number of toolpots in the magazine.

MC-30VA 16 tools

MC-40VA 20 tools

MC-50VA 20 tools

MC-60VA 20 tools

Note 2: If another tool number has already been assigned to the specified toolpot number, an error occurs.

Note 3: When specifying a toolpot number for returning a large-diameter tool, the adjacent toolpots should have dummy tools or they should be left empty.

Otherwise, an error occurs.

(b) ACT TOOL

This indicates the tool number of the tool set in the spindle.

Note 1: The maximum tool number is the same as the number of tool offsets. (50 in standard)

Note 2: In case the set tool number has already been assigned to another toolpot number, an error occurs. Although a large-diameter tool (XX,L) can be set, setting of a dummy tool (D) is impossible. In case the pot number has already been specified in the SPCY POT column, and when a large-diameter tool is specified, the adjacent toolpots should have no tool data or be assigned with dummy tool (D). Otherwise, an alarm occurs.

Note 3: Setting of a large-diameter tool (XX, L) is possible but the setting of a dummy tool (D) is impossible.

Note 4: In case a large-diameter tool is specified with pot number entered in the SPCY POT, an error will occur if no tool or a dummy tool (D) is not assigned with the pots prior/next to the SPCY POT.

Note 5: In case a large-diameter tool is specified with no pot number entered in the SPCY POT data location, an error will occur if there are no three empty pots arranged in succession or no two empty pots in succession next to the pot assigned with a dummy tool (D).

(c) NXT TOOL

This indicates the tool number to be set in the spindle next. No data is entered for the first tool returning cycle.

Note 1: The maximum number is the same as the active tool.

Note 2: In case there is a mismatch between the tool number specified and the toolpot number, an error occurs.

Note 3: Setting of a large-diameter tool (,L) and dummy tool (D) is impossible.

Note 4: An error will occur when pot number is specified in the SPCY POT data location.

(4) Returning a tool to the magazine

When returning a tool to the magazine pot, there are two methods such as (a) specifying the toolpot number; and (b) returning the tool to an empty pot automatically. These two methods are detailed below. For the procedure to set a tool on the spindle manually, refer to the section covering the manual tool change procedure.

(a) Tool return cycle with pot number specified:

- ① Position the cursor on the SPCY POT data location.

Key in the return pot number and press the **WRITE** key.

- ② Set a tool in the spindle.

- ③ Position the cursor on the ACT TOOL data location.

After keying in the active tool number, press the **WRITE** key. In this case, the data of NXT TOOL should be NA. If a tool number has been entered, key in " * " after locating the cursor on NXT TOOL, to clear the data.

- ④ Press the **1 CYCLE START** key.

The tool in the spindle is returned to the specified pot and the correspondence between the toolpot number and the tool number is set and stored.

If this operation is intended for the pot which is assigned with another tool number, an error occurs and tool return cycle is not started.

(b) Tool return cycle without pot number specified:

- ① Clear the data of the SPCY POT by entering as asterisk (*).
- ② Set a tool in the spindle.
- ③ Enter the active tool number for ACT TOOL.

In this data entry, the NXT TOOL data must be NA.

- ④ Press the **1 CYCLE START** key.

The empty pot located nearest to the presently indexed pot is automatically selected and the tool return cycle is started.

*Note 1: Pressing the **1 CYCLE START** key with the next tool number specified, initiates the normal tool change cycle.*

Note 2: The SPCY POT data is automatically cleared after the execution of "1 cycle start" command.

*Note 3: The SPCY POT data is only for tool return cycle. Therefore, if this data and the NXT TOOL data have both been entered when the **1 CYCLE START** key is pressed, an error occurs.*

Note 4: In the automatic empty pot selection, the empty pot is looked for in the magazine clockwise direction rotation. If there is no empty pot, an error occurs and no return cycle is carried out.

Note 5: When entering a large-diameter tool, enter ",L" following the tool number.

(2) Operations with ATC Operation Panel Controls

ATC operation sequence numbers are shown below.

[MC-30VA]

1	Next tool number write
2	Magazine index
3	Standby (Waiting for the completion of machining cycle)
4	Magazine pot - vertical
5	Spindle tool change cycle ON
6	Tool change arm - rotation
7	Active tool number write
8	Magazine pot - horizontal
9	Magazine index
10	Magazine pot - vertical
11	Spindle tool change cycle ON
12	Tool change arm - rotation
13	Magazine pot - horizontal

[MC-40VA/50VA/60VA 20-/32-tool ATC]

1	Next tool number write
2	Magazine index
3	Standby (Waiting for the completion of a machining cycle)
4	Magazine pot - vertical
5	Magazine pot - vertical confirmation
6	Tool change arm - rotation
7	Magazine pot - horizontal
8	Magazine pot - horizontal confirmation
9	Normal/Large - dia. tool change (pot horizontal)
10	Magazine index
11	Magazine pot - vertical
12	Magazine pot - vertical confirmation
13	Tool change arm - rotation
14	Magazine pot - horizontal

[MC-40VA/50VA/60VA 50-/70-tool ATC]

1	Next tool number write
2	Magazine index
3	Sub arm - to magazine
4	Sub arm - tool removal
5	Sub arm - to ready station
6	Sub arm - tool insertion
7	Ready station - tool clamp
8	Sub arm - retraction
9	Standby (Waiting for the completion of machining cycle)
10	Ready station - vertical
11	Tool change arm - rotation
12	Ready station - vertical confirmation
13	Ready station - horizontal
14	Sub arm - to ready station
15	Ready station - tool unclamp
16	Sub arm - tool removal
17	Sub arm - to magazine
18	Sub arm - tool insertion
19	Sub arm - to ready station

[MC-400H]

1	Next tool number write
2	Magazine index
3	Sub arm - grip
4	Sub arm - swing to standby position
5	Sub arm - rotation to SP position
6	Standby (Waiting for the completion of machining cycle)
7	Spindle - index
8	ATC door open
9	Tool change position shift
10	Spindle belleville spring unclamp
11	Tool change arm - rotation
12	Sub arm - rotation to MG position
13	Sub arm - swing to pot position
14	Sub arm - ungrip
15	Magazine index
16	Sub arm - grip
17	Sub arm - swing to standby position
18	Sub arm - rotation to SP position
19	Tool change arm - rotation
20	Spindle belleville spring clamp
21	ATC door close
22	Sub arm - rotation to MG position
23	Sub arm - swing to pot position
24	Sub arm - ungrip

[MC-500H/600H/800H]

1	Next tool number write
2	Magazine index
3	Sub arm - clockwise rotation
4	Ready station - location pin OUT
5	Ready station - rotation to SP position
6	Ready station - location pin IN
7	Standby (Waiting for the completion of machining cycle)
8	ATC door (cover) open
9	Tool change arm - rotation
10	ATC door close
11	Ready station - location pin OUT
12	Ready station - rotation to SP position
13	Ready station - location pin IN
14	Sub arm - counterclockwise rotation

[MCV-A: 24-tool MCV-B: 24-tool]

1	Next tool number write
2	Magazine index
3	Sub arm to MG
4	Sub arm tool removal
5	Sub arm to ready station
6	Sub arm tool insert
7	Ready station clamp
8	Sub arm retract
9	Waiting for completion of machining cycle
10	Ready station downward
11	Tool change arm at tool gripping position
12	Ready station unclamp
13	Tool change arm down
14	Tool change arm 180 deg. rotation
15	Tool change arm up
16	Ready station clamp
17	Tool change arm at standby position
18	Ready station horizontal
19	Sub arm to ready station
20	Ready station unclamp
21	Sub arm tool removal
22	Sub arm to MG
23	Sub arm tool insert
24	Sub arm to ready station

[MCV-A: 50 or more tools]

1	Next tool number write
2	Magazine index
3	Tool change arm to MG
4	Tool change arm tool removal
5	Tool change arm at swing upright position
6	Tool change arm down
7	Tool change arm insert
8	Standby (Waiting for completion of machining cycle)
9	Tool change arm to spindle
10	Tool in spindle unclamp
11	Tool change arm tool removal
12	Tool change arm rotation
13	Tool change arm tool insert
14	Tool in spindle clamp
15	Tool change arm at swing upright position
16	Tool change arm tool removal
17	Tool change arm horizontal
18	Tool change arm to MG
19	Tool change arm tool insert
20	Tool change arm at swing upright position

[MCV-B: 50 or more tools]

1	Next tool number write
2	Magazine index
3	Sub arm extend to MG
4	Sub arm tool remove from MG
5	Sub arm retract from ready station
6	Sub arm swing to ready station
7	Sub arm extend to ready station
8	Sub arm tool insert to ready station
9	Ready station clamp
10	Sub arm retract from ready station
11	Ready station downward
12	Tool change unit down
13	Carrier to CS position
14	Ready station unclamp
15	Tool change arm down
16	Carrier to CW position
17	Tool change arm up
18	Tool change unit up
19	Standby (Waiting for completion of machining cycle)
20	Carrier to CH position
21	Tool in spindle unclamp
22	Tool change arm down
23	Tool change arm 180 deg. rotation
24	Tool change arm up
25	Tool in spindle clamp
26	Carrier to CW position
27	Tool change unit down
28	Tool change arm down
29	Carrier to CS position
30	Tool change arm up
31	Ready station clamp
32	Carrier to CW position
33	Tool change unit up
34	Ready station downward
35	Sub arm extend to ready station
36	Ready station unclamp

[MCV-B: 50 or more tools]

37	Sub arm tool removal from ready station
38	Sub arm retract from ready station
39	Sub arm swing to MG
40	Sub arm extend to MG
41	Sub arm tool insert to MG
42	Sub arm retract from MG

[MCM]

1	Next tool number write
2	Magazine index
3	Sub arm to MG
4	Sub arm tool remove from MG
5	Sub arm return from MG
6	Sub arm swing to ready station
7	Sub arm to ready station
8	Sub arm tool insert to ready station
9	Ready station tool clamp
10	Sub arm return from ready station
11	Ready station downward
12	Carrier to CS position
13	Ready station tool unclamp
14	Tool change arm down
15	Carrier to CW position
16	Ready station horizontal position
17	Tool change arm up
18	Tool change unit up
19	Standby (Waiting for completion of machining cycle)
20	Spindle to tool change position for vertical spindle
21	Swivel head at back position
22	Carrier to CH position
23	Tool change unit down
24	Carrier to CV position
25	Tool change arm 70 deg. tool gripping position
26	Tool in spindle unclamp
27	Tool change arm down
28	Tool change arm 180 deg. rotation
29	Tool change arm up
30	Tool in spindle clamp
31	Tool change arm 90 deg. retraction position
32	Carrier to CH position
33	Tool change unit up
34	Carrier to CN position
35	Spindle to tool change position for horizontal spindle
36	Swivel head at front position

[MCM]

37	Carrier to CH position
38	Tool change unit down
39	Tool change unit horizontal position
40	Tool change arm 90 deg. tool gripping position
41	Tool in spindle unclamp
42	Tool change arm down
43	Tool change arm 180 deg. rotation
44	Tool change arm up
45	Tool in spindle clamp
46	Tool change arm 90 deg. retraction position
47	Tool change unit vertical position
48	Tool change unit up
49	Carrier to CN position
50	Carrier to CW position
51	Tool change unit down
52	Tool change arm down
53	Ready station downward
54	Carrier to CS position
55	Tool change arm up
56	Ready station tool clamp
57	Carrier to CW position
58	Ready station horizontal
59	Sub arm to Ready station
60	Ready station tool clamp
61	Sub arm ready station tool removal
62	Sub arm return from ready station
63	Sub arm swing to MG
64	Sub arm to MG
65	Sub arm tool insert to MG
66	Sub arm return from MG

[MCR-B]

1	Next tool number write
2	Magazine index
3	Sub arm at MG tool gripping position
4	Sub arm tool remove from MG
5	Sub arm return from MG
6	Sub arm swing to ready station
7	Sub arm at RS tool gripping position
8	Sub arm at RS tool insertion position
9	Ready station tool clamp
10	Sub arm at RS tool retraction position
11	Ready station downward
12	Tool change unit at RS position
13	Ready station tool unclamp
14	Tool change arm RS tool removal position
15	Tool change unit at standby position
16	Tool change arm tool insertion position
17	Standby (Waiting for completion of machining cycle)
18	ATC door open
19	Tool change unit at SP position
20	Tool in spindle unclamp
21	Tool change arm spindle tool removal position
22	Tool change arm 180 deg. rotation
23	Tool change arm spindle tool insertion position
24	Tool in spindle clamp
25	Tool change unit at standby position
26	ATC door close
27	Tool change arm tool removal position
28	Tool change unit at RS position
29	Tool change arm RS tool insertion position
30	Ready station tool clamp
31	Tool change unit at standby position
32	Ready station rotation horizontal
33	Sub arm magazine tool gripping position
34	Ready station tool unclamp
35	Sub arm RS tool removal position
36	Sub arm at RS tool retraction position

[MCR-B]

37	Sub arm swing to MG
38	Sub arm magazine tool gripping position
39	Sub arm at MG tool insertion position
40	Sub arm at MG tool retraction position
41	Tool change unit horizontal
42	Standby (Waiting for completion of machining cycle)
43	Attachment turn enabled position (ATC door open)
44	Attachment forward
45	Spindle head retraction position
46	Tool change unit at SP position
47	Attachment tool unclamp
48	Tool change arm spindle tool removal position
49	Tool change arm 180 deg. rotation
50	Tool change arm spindle tool insertion position
51	Attachment tool unclamp
52	Tool change unit at standby position
53	Tool change unit vertical (ATC door close)
54	Standby (Waiting for completion of machining cycle)
55	Attachment tool change retract position (ATC door open)
56	Tool change unit at SP position
57	Tool in spindle unclamp
58	Tool change arm spindle tool removal position
59	Tool change arm 180 deg. rotation
60	Tool change arm spindle tool insertion position
61	Tool in spindle clamp
62	Tool change unit at standby position
63	Attachment turn enabled position (ATC door open)

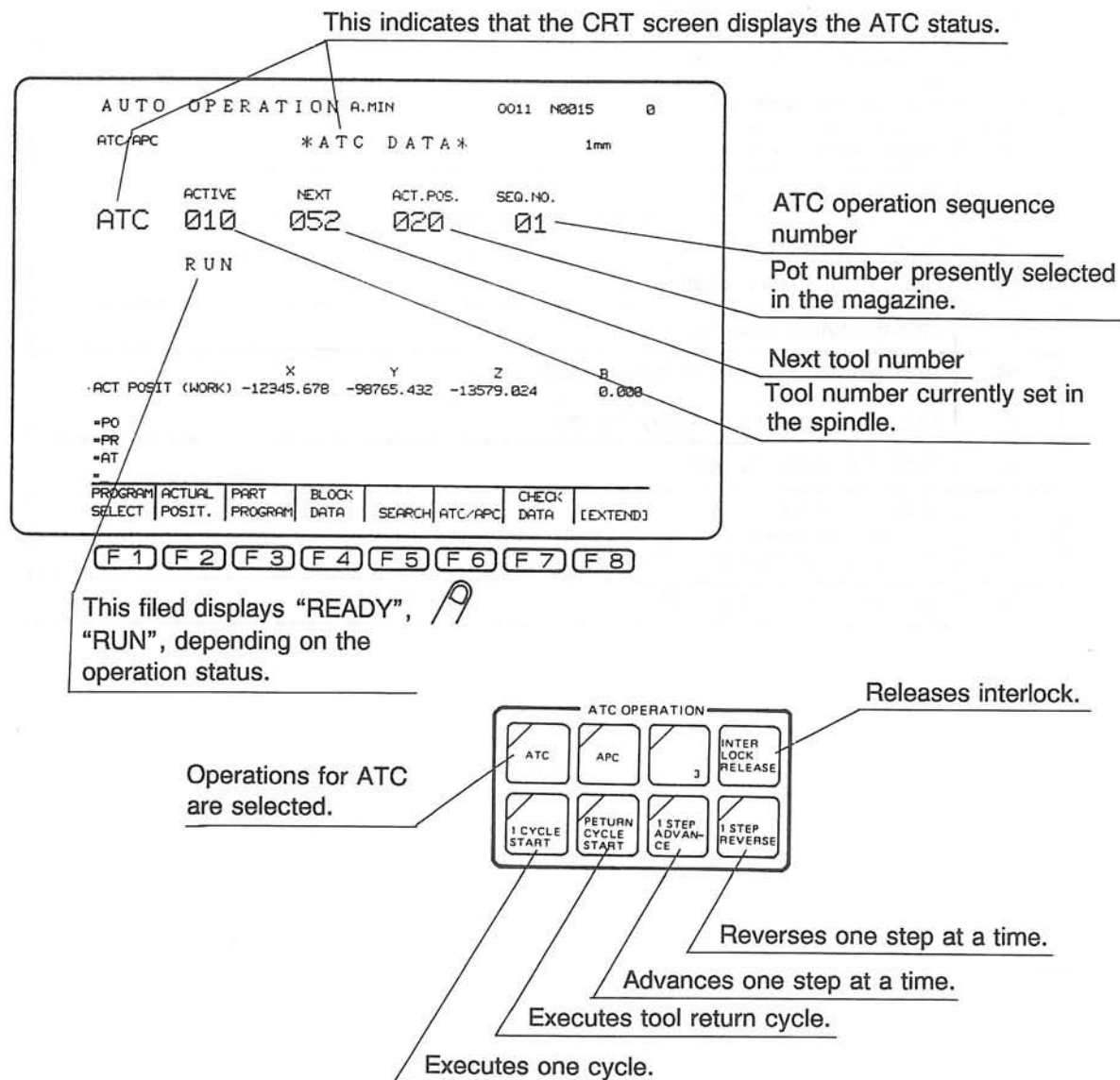
[MCR]

1	Next tool number write
2	Magazine index
3	Sub arm to MG
4	Sub arm tool remove from MG
5	Sub arm return from MG
6	Sub arm swing to ready station
7	Sub arm to ready station
8	Sub arm tool insert to ready station
9	Ready station tool clamp
10	Sub arm return from ready station
11	Ready station downward
12	Carrier to CS position
13	Ready station tool unclamp
14	Tool change arm down
15	Carrier to CW position
16	Ready station horizontal position
17	Tool change arm up
18	Tool change unit up
19	Standby (Waiting for completion of machining cycle)
20	Spindle to tool change position
21	Carrier to CH position
22	Tool change unit down
23	Carrier to CV position
24	Tool change arm 90 deg. tool gripping position
25	Tool in spindle unclamp
26	Tool change arm down
27	Tool change arm 180 deg. rotation
28	Tool change arm up
29	Tool in spindle clamp
30	Tool index arm 90 deg. retraction position
31	Carrier to CH position
32	Tool change unit up
33	Carrier to CN position
34	CONTINUE
35	Tool change unit down
36	Tool change arm down

[MCR]

37	Ready station downward
38	Carrier to CS position
39	Tool change arm up
40	Ready station tool clamp
41	Carrier to CW position
42	Ready station horizontal
43	Sub arm to Ready station
44	Ready station tool clamp
45	Sub arm Ready station tool removal
46	Sub arm return from ready station
47	Sub arm swing to MG
48	Sub arm to MG
49	Sub arm tool insert to MG
50	Sub arm return from MG

(1) OSP5020M flat panel specification:



(a) ATC/APC display

In the automatic, MDI or manual mode, press the function key [F6] (ATC/APC) to display the ATC/APC screen.

(b) Selection of ATC operation

Press the ATC key at the ATC OPERATION panel. Whether the ATC operation is selected can be checked by the CRT screen display - *ATC DATA*

(c) 1 CYCLE START

The "1-cycle start" operation is allowed only when the message "READY" is displayed with the ATC sequence number set at "1". This automatically carries out one complete automatic tool change cycle.

When it is necessary to change the tool numbers of ACTIVE and NEXT, follow the procedure indicated in 10-4-1 for memory-random ATC specification, and 6-5, "Tool Data Set" for fixed address ATC specification.

(d) **RETURN CYCLE START**

The return cycle operation is possible from any ATC operation sequence number.

The operations activated by the pressing of the **RETURN CYCLE START** key depend on the ATC operation sequence where it is pressed. That is, when it is pressed before the tool change arm 180 degree rotation, the tool return cycle immediately starts and no tool change cycle occurs. However, when the **RETURN CYCLE START** key is pressed after the tool change arm 180 degree rotation sequence, then the automatic tool change cycle is continued.

(e) **1 STEP ADVANCE**

ATC operations advance one step at a time. When the cycle does not advance even if this key is pressed, due to presence of unfulfilled conditions for tool change position or spindle orientation, press the **1 STEP ADVANCE** key while pressing the **INTERLOCK RELEASE** key. It will then ignore them and continue operations.

This key is inoperative while the message "RUN" is being displayed on the CRT screen even if the ATC is not operating. In this case, clear the "RUN" message from the screen by resetting, before pressing the **1 STEP ADVANCE** key.

Note that when mechanical conditions are not met, the **1 STEP ADVANCE** key is not operative even when the **INTERLOCK RELEASE** key is pressed since these conditions are not ignored. The message "RUN" remains on the CRT screen.

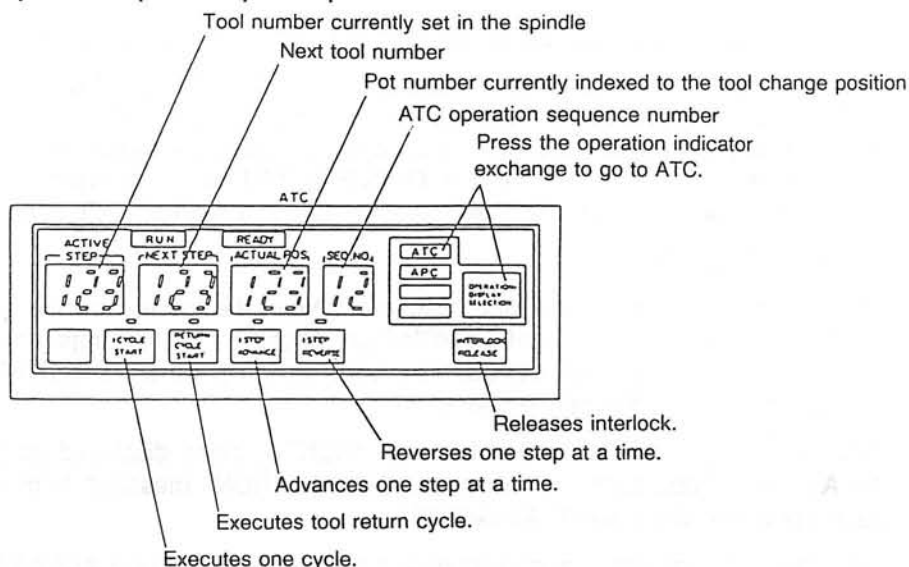
(f) **1 STEP REVERSE**

This returns the ATC operations one step each time it is pressed. Functions of the **1 STEP RETURN** key are the same as the **1 STEP ADVANCE** key except that the ATC operations are returned instead of advanced.

(g) **INTERLOCK RELEASE**

The spindle orientation completion and tool change position conditions are ignored only as long as this key is pressed. It will not ignore other mechanical conditions.

(2) OSP5020M pendant operation panel specification:



(a) 1 CYCLE START

Operations are possible when the **READY** lamp lights on the ATC operation panel and the ATC operation sequence number is at 1. This automatically executes one complete automatic tool change cycle.

When it is necessary to change the tool numbers of **ACTIVE** and **NEXT**, follow the procedure indicated in 10-3-1, (1) "Establishment of Correspondence between Toolpot Numbers and Tool Numbers by Manual Tool Change Operation" for memory-random ATC specification, and 6-5, "Tool Data Set", for fixed address ATC specification.

(b) RETURN CYCLE START

The return cycle operation is possible from any ATC operation sequence number.

The operations activated by the pressing of the **RETURN CYCLE START** key depends on the ATC operation sequence where it is pressed. That is, when it is pressed before the tool change arm 180 degree rotation, the tool return cycle immediately starts and no tool change cycle occurs. However, when the **RETURN CYCLE START** key is pressed after the tool change arm 180 degree rotation sequence, then the automatic tool change cycle is continued.

(c) 1 STEP ADVANCE

ATC operations advance one step at a time. When the cycle does not advance, even if this button is pressed due to presence of unfulfilled conditions for tool change position or spindle orientation, press the **1 STEP ADVANCE** key while pressing the **INTERLOCK RELEASE** key. It will then ignore them and continue operations.

This button is inoperative while the **RUN** lamp is lit even if the ATC is not operating. In this case, extinguish the **RUN** lamp by resetting before pressing the **1 STEP ADVANCE** key.

Note that when mechanical conditions are met, the **1 STEP ADVANCE** key is not operative even when the **INTERLOCK RELEASE** key is pressed since these conditions are not ignored.

(d) 1 STEP REVERSE

This returns the ATC operations one step each time it is pressed. Functions of the **1 STEP REVERSE** key are the same as the **1 STEP ADVANCE** key except that the ATC operations are returned instead of advanced.

(e) INTERLOCK RELEASE

The spindle orientation completion and tool change position conditions are ignored only as long as this key is pressed. It will not ignore other mechanical conditions.

(3) ATC Restoration:

- (a) When the ATC shuts down during the cycle, discover the defect by a diagnosis message, and, after restoring conditions, reset the ATC operation sequence number to 1 with the **1 STEP ADVANCE** key.

For diagnosis message, refer to the Maintenance Manual for individual machine models.

- (b) If a disconnection occurs during ATC cycle execution, the spindle orientation completion and the tool change position conditions are erased. To restore, press the **1 STEP ADVANCE** key while pressing the **INTERLOCK RELEASE** key to reset the ATC operation sequence number to "1".
- (c) When the ATC operation is reset during the cycle, the **1 STEP ADVANCE**, **1 STEP REVERSE** or **RETURN CYCLE START** key can also be used.
- (d) In the return cycle, even when the ATC operation sequence number is set to "1" by depressing the **RETURN CYCLE START** key after resetting the operation, the next tool number is not set at "0". The operation above, during the ATC operation sequence, numbers smaller than those indicated above, resets the next tool number to "0". This is because the tool change operation with the next tool will possibly be made if the next tool number has been written when the ATC operation sequenced number is set to "1" by the **1 STEP ADVANCE** key.

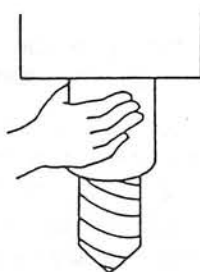
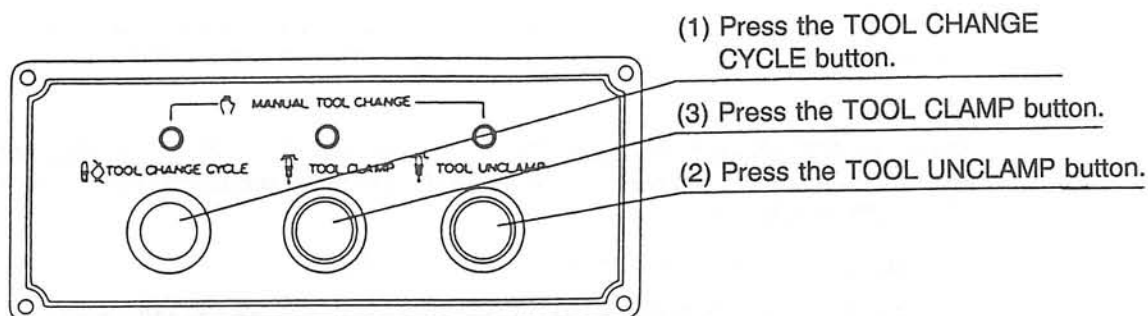
When it is necessary to set the next tool number to "0", enter T00 in the MDI mode and press the **CYCLE START** button after pressing the **WRITE** key since "0" entry for the next tool is impossible in the tool data setting mode.

To change the next tool number, set the required number at the TOOL DATA SET screen.

Note: ATC operation sequence numbers corresponding to tool return cycle are indicated below.

MC-400H		Operation sequence numbers	11 - 14
MC-500H/600H		Operation sequence numbers	22 - 24
MCV-A	24-tool ATC	Operation sequence numbers	19 - 24
MCV-B	24-tool ATC	Operation sequence numbers	19 - 24
MCV-A	50- or more tools ATC	Operation sequence numbers	16 - 20
MCV-B	50- or more tools ATC	Operation sequence numbers	34 - 42
MCM		Operation sequence numbers	50 - 66
MCR		Operation sequence numbers	50 - 66
MCR-B		Operation sequence numbers	41- 53

10-4-2. Manual Tool Change



(Arrangement of operation switches varies depending on machine model.)

- (1) Press the **TOOL CHANGE CYCLE** button.

The X, Y and Z-axis move together to the tool change position. (varies depending on machine model.)

- (2) Hold the tool set in the spindle by hand, press the **TOOL UNCLAMP** button, and remove the tool.
- (3) Set the new tool in the spindle and press the **TOOL CLAMP** button. This completes manual tool change operation.

A lamp lights for each button pressed to show the respective condition. When changing tools manually, the tool number presently on the spindle and the active tool number displayed on the ATC operation panel will differ. Write the correct active tool number on the *TOOL DATA SET* page to avoid having the tool returned to the wrong magazine pot.

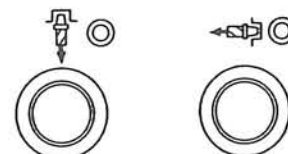
MCM:

- 1) Press the **TOOL CHANGE CYCLE** button.

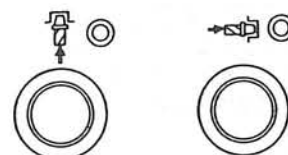
The indicating lamp above the **TOOL CHANGE CYCLE** button comes on indicating that a tool change cycle can be carried out.



- 2) Hold the tool in the spindle by hand or using a proper base and press the **TOOL UNCLAMP** button for vertical or horizontal spindle. The tool in the spindle can be removed. When the **TOOL UNCLAMP** button is pressed, the indicating lamp above the button comes on.



- 3) Set a new tool in the spindle and press the **TOOL CLAMP** button for the spindle for which the tool is to be set. This turns off the TOOL UNCLAMP and TOOL CHANGE CYCLE lamps and the manual tool change cycle ends.



Note 1: When it is necessary to cancel the manual tool change cycle mode after pressing the **TOOL CHANGE CYCLE** button, simply press the **TOOL CHANGE FINISH** button on the machine operation panel.

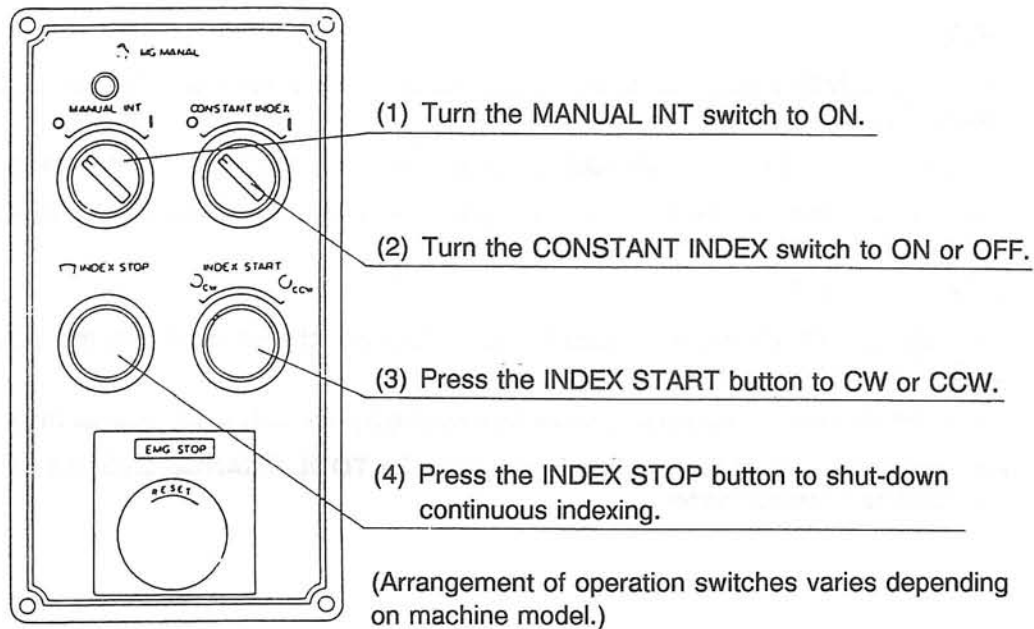
Note 2: When changing tools manually, the tool number presently on the spindle and the active tool number displayed on the ATC operation panel will differ. Write the correct active tool number on the *TOOL DATA SET* screen to avoid having the tool returned to the swing magazine pot.

10-4-3. Manual Magazine Operation

Turn the **MANUAL INT.** switch on the MG MANUAL operation panel ON to allow manual magazine operation.

Switch Name	Function
MANUAL INT - ON	The automatic tool change cycle is interrupted immediately even during ATC operation when the MANUAL INT. switch is ON. The lamp above the switch lights, indicating that manual magazine operations are enabled. The lamp will not light up when manual magazine operation creates hazards and it is not allowed. After returning the MANUAL INT. switch back to OFF from ON, the interrupted cycle will automatically restart from the ATC operation point reached before turning the switch to ON and will execute until up to the end of the cycle.
CONSTANT INDEX - ON	Continuously rotates the magazine without stopping at each pot.
INDEX START - CW/CCW	CW Rotates the magazine in a clockwise direction CCW Rotates the magazine in a counterclockwise direction
INDEX STOP	Pressing this button while the magazine is in continuous rotation stops the magazine at the nearest pot position in the direction of rotation.
EMG. STOP	Cuts operating power to the NC control box. (Refer to Section 5-2. "Emergency Stop")

Operating method is shown below.



- (1) The lamp lights when the **MANUAL INT.** switch is ON, indicating that manual magazine operation is possible.
- (2) Set the **CONSTANT INDEX** switch ON or OFF.
 - ON Starts continuous rotations.
 - OFF . . . Stops at each pot.
- (3) After setting the **INDEX START** button to CW or CCW, press it. The magazine starts rotating. Magazine operating conditions are shown below.

Constant Index	Index Start	Magazine Operation
ON	CW	Continuous rotation in the clockwise direction until the INDEX STOP button is pressed.
	CCW	Continuous rotation in the counterclockwise direction until the INDEX STOP button is pressed
OFF	CW	Stops at each pot while rotating in the clockwise direction.
	CCW	Stops at each pot while rotating in the counterclockwise direction

With the **CONSTANT INDEX** switch turned OFF, the magazine will rotate as long as the **INDEX START** button is pressed. Releasing the button will stop the magazine at the nearest pot position in the direction of rotation.

- (4) The magazine rotates continuously when the **CONSTANT INDEX** switch is turned ON. Pressing the **INDEX STOP** button stops the magazine at the nearest pot position in the direction of rotation.

10-4-4. Manual Tool Change in Automatic Mode Operation

(1) MDB

The entry of M06 places the control in the manual tool change mode like the **TOOL CHANGE CYCLE** button has been pressed.

Exchange the tools in the same manner as exchanging the tools in the manual mode operation.

After the completion of the tool exchange, press the **TOOL CHANGE CYCLE FINISH** button on the machine operation panel.

(2) MCV, MCR, MCM

The entry of M70 places the control in the manual tool change mode like the **TOOL CHANGE CYCLE** button has been pressed.

Exchange the tools in the same manner as exchanging the tools in the manual mode operation.

After the completion of the tool exchange, press the **TOOL CHANGE CYCLE FINISH** button on the machine operation panel.

10-5. APC

10-5-1. APC Operations

APC operation sequences for each pallet changer type are indicated below:

[MC-30VA Rotary Type 2-pallet APC]

1	APC ready
2	APC pallet change position (HP3)
3	Pallet unclamp
4	APC rotation (CCW)
5	Pallet clamp
6	Door close
7	APC ready
8	APC pallet change position (HP3)
9	Pallet unclamp
10	APC rotation (CW)
11	Pallet clamp
12	Door close

[MC-400H Rotary Type 2-pallet APC]

1	APC ready
2	APC pallet change position (HP3)
3	Arm pallet gripping position A
4	Pallet unclamp
5	Pallet gripping
6	Arm pallet gripping position B
7	Pallet ungripping
8	Pallet clamp
9	Arm standby position

[MC-40VA/50VA/60VA
Parallel Type 2-pallet APC]

1	APC Ready
2	A-pallet at APC position (HP3), Door open
3	A-pallet unclamp
4	A-pallet unloading
5	A-pallet lock B-pallet at APC position (HP4)
6	B-pallet unlock
7	B-pallet loading
8	B-pallet clamp, Door close
9	APC Ready
10	B-pallet at APC position (HP4), Door open
11	B-pallet unclamp
12	B-pallet unloading
13	B-pallet lock A-pallet at APC position (HP3)
14	A-pallet unlock
15	A-pallet loading
16	A-pallet clamp, Door close

[MC-500H/600H/800H
Parallel Type 2-pallet APC]

1	APC ready
2	L-pallet at APC position (HP3), Door open
3	A-shifter advance, Pallet unclamp
4	Shifter at L side
5	Shifter retraction
6	R-pallet at APC position (HP4)
7	Shifter at R side
8	Shifter advance
9	Shifter at L side, Pallet clamp, Door close
10	Shifter at standby position
11	APC ready
12	R-pallet at APC position (HP4), Door open
13	Shifter advance, Pallet unclamp
14	Shifter at R side
15	Shifter retraction
16	L-pallet at APC position (HP3)
17	Shifter at L side
18	Shifter advance
19	Shifter at R side, Pallet clamp, Door close
20	Shifter at standby position

[MC-500H/600H/800H Multi-pallet APC]

1	APC ready
2	Return pallet indexing
3	APC pallet change position (HP3)
4	Arm advance
5	Pallet unclamp
6	Arm retraction
7	Next pallet indexing
8	Arm advance
9	Pallet clamp
10	Arm retraction
11	Door close

[MCV-A Longitudinal Loading APC]

R PALLET UNLOADING CYCLE	1	APC ready
	2	R pallet unclamp
	3	R pallet retraction
	4	Carrier rightward
L PALLET LOADING CYCLE	5	L pallet advance
	6	L pallet positioning
	7	L pallet clamp
L PALLET UNLOADING CYCLE	8	APC ready
	9	L pallet unclamp
	10	L pallet retraction
	11	Carrier leftward
R PALLET LOADING CYCLE	12	R pallet advance
	13	R pallet positioning
	14	R pallet clamp

[MCV-B, MCM, MCR Longitudinal
Loading APC]

R PALLET UNLOADING CYCLE	1	APC ready
	2	Pallet change position
	3	R pallet unclamp
	4	R pallet retraction
L PALLET LOADING CYCLE	5	Carrier rightward
	6	L pallet advance
	7	L pallet positioning
L PALLET UNLOADING CYCLE	8	L pallet clamp
	9	APC ready
	10	Pallet change position
	11	L pallet unclamp
R PALLET LOADING CYCLE	12	L pallet retraction
	13	Carrier leftward
	14	R pallet advance
	15	R pallet positioning
	16	R pallet clamp

(1) OSP5020M Flat Panel Specification:

This indicates that the CRT screen displays the APC status.

AUTO OPERATION A.MIN 0011 N0015 0

ATC/APC *APC DATA* 1mm

APC ACTIVE NEXT ACT.POS. SEQ.NO.

001 003 001 01

RUN

ACT POSIT (WORK) X Y Z B

-12345.678 -98765.432 -13579.024 0.000

PROGRAM SELECT	ACTUAL POSIT.	PART PROGRAM	BLOCK DATA	SEARCH	ATC/APC	CHECK DATA	[EXTEND]
----------------	---------------	--------------	------------	--------	---------	------------	----------

F1 F2 F3 F4 F5 F6 F7 F8

APC operation sequence number

Pallet number position determined by APC.

Next pallet number

Pallet number currently selected on the table.

Displays of ACTIVE and NEXT are available only for multi-pallet APC specification

This field displays "READY", "RUN", depending on the operation status.

Operations for APC are selected.

ATC OPERATION

ATC APC 3 INTER LOCK RELEASE

1 CYCLE START RETURN CYCLE START 1 STEP ADVANCE 1 STEP REVERSE

Reverses one step at a time.

Advances one step at a time.

Executes APC return cycle.

Executes one cycle of APC.

(a) ATC/APC display

In the automatic, MDI or manual mode, press the function key [F6] (ATC/APC) to display the ATC/APC screen.

(b) Selection of APC operation

Press the APC key at the APC OPERATION panel. Whether the APC operation is selected can be checked by the CRT screen display - *APC DATA*.

(c) 1 CYCLE START

When this key is pressed, one automatic pallet change cycle is carried out. Note that this operation is effective only when the message "READY" is displayed on the screen.

(d) RETURN CYCLE START

When this key is pressed, the automatic pallet change cycle is carried out in the reverse order up to its operation sequence number of "1".

(e) 1 STEP ADVANCE

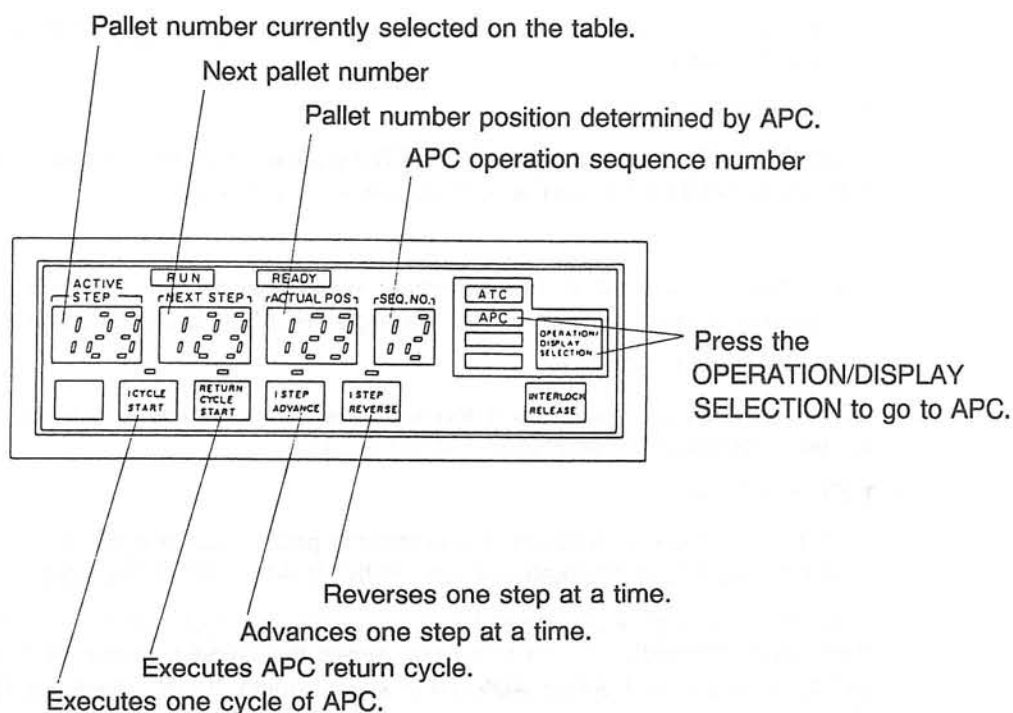
Each time this key is pressed, the automatic pallet change cycle is advanced step by step. Note that this key is inoperative when "RUN" is displayed on the screen.

If "RUN" message is displayed for a long time, the cycle will be stopped due to unfulfilled step advance conditions. In this case, press the **RESET** button to clear "RUN" message and then press the **1 STEP ADVANCE** key. Should "RUN" message appear again, consult your local Okuma representative.

(f) 1 STEP REVERSE

This operation returns the automatic pallet change cycle step by step each time it is pressed. Functions of the **1 STEP REVERSE** key are the same as the **1 STEP ADVANCE** key except that the APC operations are returned instead of advanced.

(2) OSP5020M Machine Panel Specification:



(a) 1 CYCLE START

When this key is pressed, one automatic pallet change cycle is carried out. Note that this operation is effective only when the READY lamp is on.

(b) RETURN CYCLE START

This key executes the automatic pallet change cycle in the reverse order up to its operation sequence number of "1".

(c) 1 STEP ADVANCE

Each time this key is pressed, the automatic pallet change cycle is advanced step by step. Note that this key is inoperative when the RUN lamp is on.

If the RUN lamp stays on for a long time, the cycle will be stopped due to unfulfilled step advance conditions. In this case, press the **RESET** button to turn the READY lamp off and then press the **1 STEP ADVANCE** key. Should the RUN lamp remain on, consult your local Okuma representative.

(d) 1 STEP REVERSE

This operation returns the automatic pallet change cycle step by step each time it is pressed. Functions of the **1 STEP REVERSE** key are the same as the **1 STEP ADVANCE** key except that the APC operations are returned instead of advanced.

10-5-2. Automatic APC Operations

(1) Pallet change

Automatic pallet change cycle is carried out by executing the M60 command.

(2) Workpiece setup completion

The automatic pallet change cycle is carried out after the workpiece setup has been confirmed. This setup completion condition is confirmed by pressing the **WORK LOAD FINISHED** button.

The **WORK LOAD FINISHED** button is located on the operation panel and also on the separately installed APC operation panel (option). Both of these buttons have the same function. When the **WORK LOAD FINISHED** button is pressed, its indicating lamp lights.

Even when the automatic pallet change M code command is read while the workpiece setup completion is not confirmed (lamp OFF), the APC does not operate. In this case, the diagnosis message tells that the workpiece setup is not confirmed. Press the **WORK LOAD FINISHED** button after making sure that the workpiece has been set on the pallet.

In the manual mode, the control is always in the state that the **WORK LOAD FINISHED** button is pressed.

(3) WORK LOAD RESET pushbutton switch

If the **WORK LOAD FINISHED** button is pressed mistakenly while a workpiece has not been set on the pallet, this setup completion confirmation state can be cancelled by pressing the **WORK LOAD RESET** button.

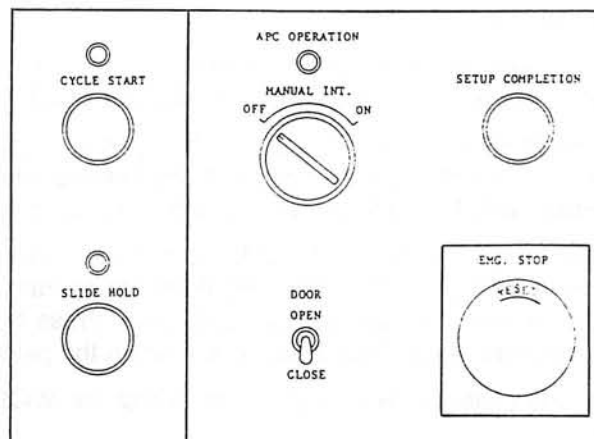
The **WORK LOAD RESET** button is located on the operation panel and also on the separately installed APC operation panel (option). Both of these buttons have the same function. When the **WORK LOAD RESET** button is pressed, its indicating lamp goes off.

The workpiece setup completed state cannot be cancelled by pressing the **RESET** button.

10-5-3. Manual APC Operations

Manual pallet changer operation is possible when the **MANUAL INT.** switch is set at the ON position.

(1) Parallel or Rotary Type 2-pallet APC (Vertical/Horizontal Machining Center)



(a) MANUAL INT. ON/OFF

Turning the **MANUAL INT.** switch ON during the automatic pallet change cycle interrupts the automatic pallet change cycle being carried out and manual pallet change operation is permitted. The indicating lamp above this selector switch lights when the switch is ON. In case the manual pallet change operation is dangerous, the indicating lamp does not come on, thus inhibiting manual pallet change operation intervention.

Returning the switch to the OFF position and pressing the **SETUP COMPLETION** button will automatically resume the interrupted automatic pallet change cycle from the sequence where the interruption has occurred up to the end of the cycle.

(b) SETUP COMPLETION

This button should be pressed after the setup of workpiece on the pallet has been completed. The indicating lamp lights and the OSP5020M acknowledges set up completion.

(c) DOOR OPEN/CLOSE

OPEN The door enclosing the machine is opened.

CLOSE The door enclosing the machine is closed.

The setting of the **DOOR CLOSE/DOOR OPEN** switch is effective even when the **MANUAL INT.** switch is set in the OFF position. During the automatic pallet change cycle, the door will not be closed even when the switch is turned down to the CLOSE position since automatic pallet change cycle is carried out with the door open. The door will be closed only after the completion of the cycle.

(d) CYCLE START

Pressing this button starts the NC system operation.

(e) SLIDE HOLD

This button brings the NC system into the slide hold mode.

(f) EMG. STOP

This button shuts off the control power of the NC system.

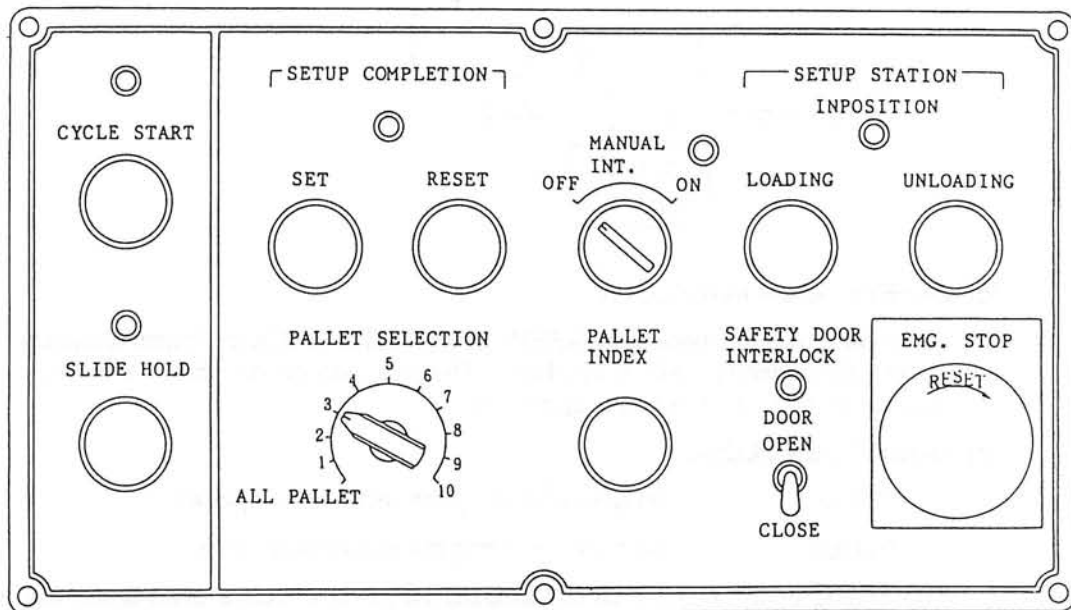
(g) PALLET IN POSITION (for MC-H parallel type 2-pallet APC)

The PALLET IN POSITION lamp will light when the pallet is positioned at the predetermined position.

(h) SAFETY GUARD INTERLOCK (rotary type 2-pallet APC)

While the guard is open, the SAFETY GUARD INTERLOCK indicating lamp stays on and automatic pallet changer cycle is disabled. The lamp will go off when the safety guard is closed, thus enabling pallet changer position.

(2) Multi-pallet APC (Horizontal Machining Center)



(a) PALLET MANUAL INT. ON.

Turning the **MANUAL INT.** switch to the ON position during the automatic pallet change cycle interrupts the current automatic pallet change cycle and manual pallet change operation is permitted. The indicating lamp above this switch lights when the switch is ON. If the manual pallet change operation is dangerous, the indicating lamp does not come on, thus inhibiting manual pallet change operation intervention.

Returning the switch OFF will automatically resume the interrupted automatic pallet change cycle from the sequence where the interruption has occurred to the end of the cycle.

(b) SETUP STATION

UNLOADING:

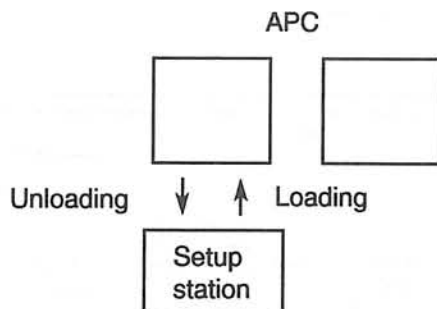
The pallet at the pallet changer is transferred to the setup station.

LOADING:

The pallet on the setup station is transferred to the pallet changer.

IN POSITION:

This indicating lamp lights when a pallet is set at the predetermined correct position on the setup station.



(c) SAFETY DOOR INTERLOCK

While the guard is open, the SAFETY DOOR INTERLOCK indication lamp stays on and automatic pallet change cycle is disabled. The lamp will go off when the safety guard is closed, thus permitting pallet changer operation.

(d) DOOR OPEN/CLOSE

OPEN The door enclosing the machine is opened.

CLOSE The door enclosing the machine is closed.

The setting of the **DOOR OPEN/CLOSE** switch is effective even when the **PALLET MANUAL INT.** switch is set in the OFF position. During the automatic pallet change cycle, the door will not be closed even when the switch is turned down to the CLOSE position since automatic pallet change cycle is carried out with the door open. The door will be closed only after completion of the cycle.

(e) PALLET SELECTION

This switch is used to select the pallet number for pallet indexing operation. It is also used for setting or resetting the SETUP COMPLETION state.

(f) PALLET INDEX

When the **PALLET INDEX** button is pressed, the pallet station corresponding to the number set on the **PALLET SELECTION** dial is indexed to the pallet change position in front of the machine table. When the **PALLET SELECTION** dial is set in the ALL PALLET position, a single pallet is selected each time the **PALLET INDEX** button is pressed.

Continual pressing results in constant rotation, until it is released, the next pallet is indexed at the pallet change position.

(g) SETUP COMPLETION

SET: After the completion of the setup on a pallet, select the pallet number of that pallet on the **PALLET SELECTION** dial and then press the **SET** button. This establishes a ready for machining status of that pallet. The indicating lamp will light when the **SET** button is pressed.

Pressing the **SET** button with the **PALLET SELECTION** dial set in the ALL PALLET position allows all pallets to be set in the ready for machining status.

RESET: This button is used for canceling the ready for machining status for a pallet which has been set in the ready for machining status. Select the pallet number by the **PALLET SELECTION** dial and then press the **RESET** button. This cancels the ready for machining status of that pallet. The indicating lamp will go off when the cancel operation is accepted.

Pressing the **RESET** button with the **PALLET SELECTION** dial set in the ALL PALLET position allows the ready for machining status to be canceled for all pallets.

(h) CYCLE START

Pressing this button starts the NC system operation.

(i) SLIDE HOLD

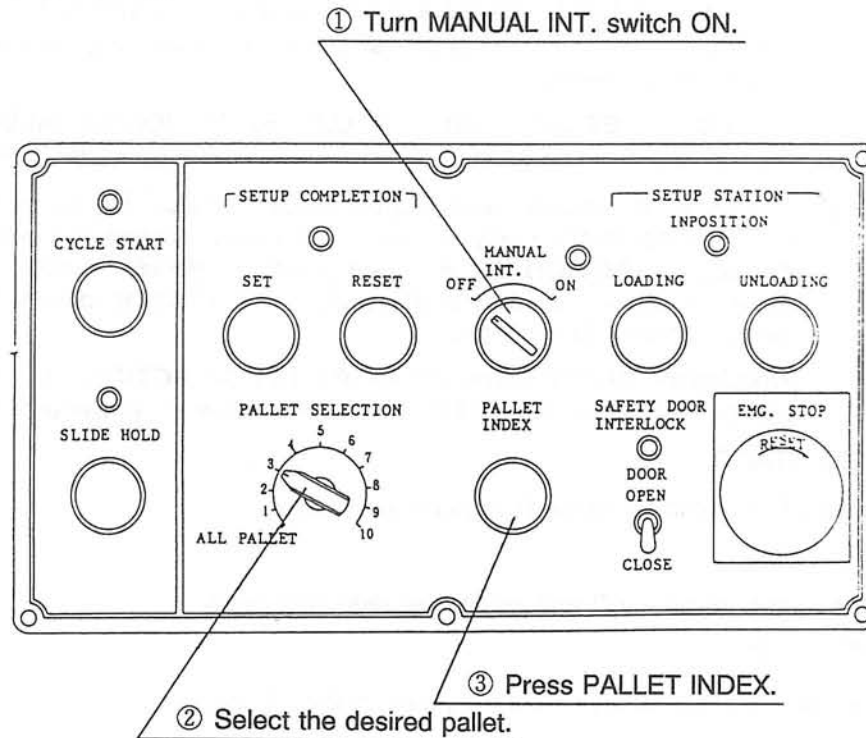
This button brings the NC system into the slide hold mode.

(j) EMG. STOP

Pressing this button shuts off control power of the NC system.

Example of Pallet Changer Operations (Multi-pallet APC)

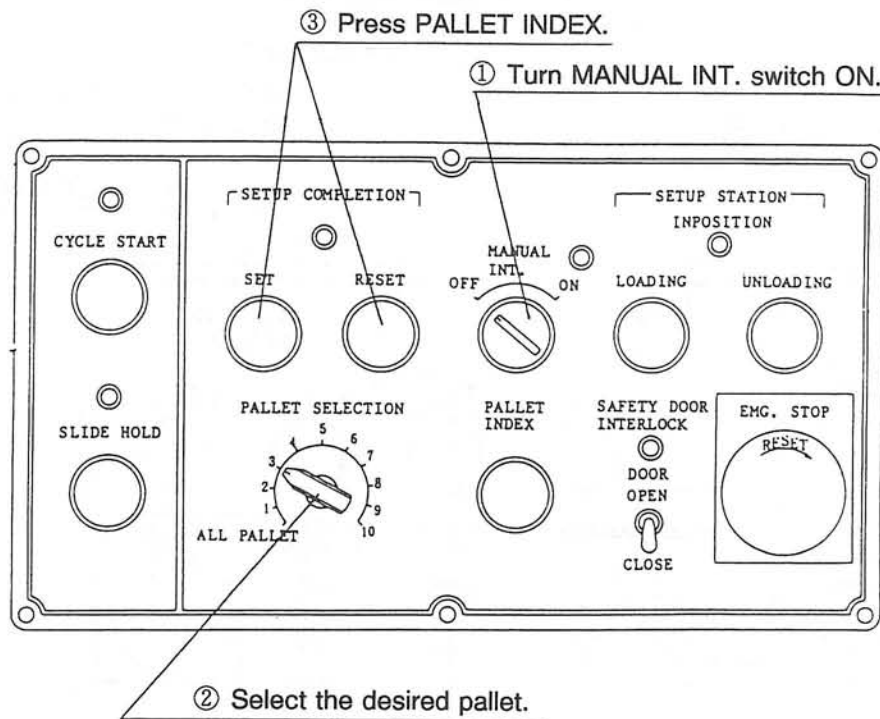
(a) Pallet Indexing



- ① Turn the **MANUAL INT.** switch to the ON position.
- ② Select the required pallet by the **PALLET SELECTION** dial.
- ③ Press the **PALLET INDEX** button.

Steps ① through ③ index the required pallet to the machine table position for pallet change operation.

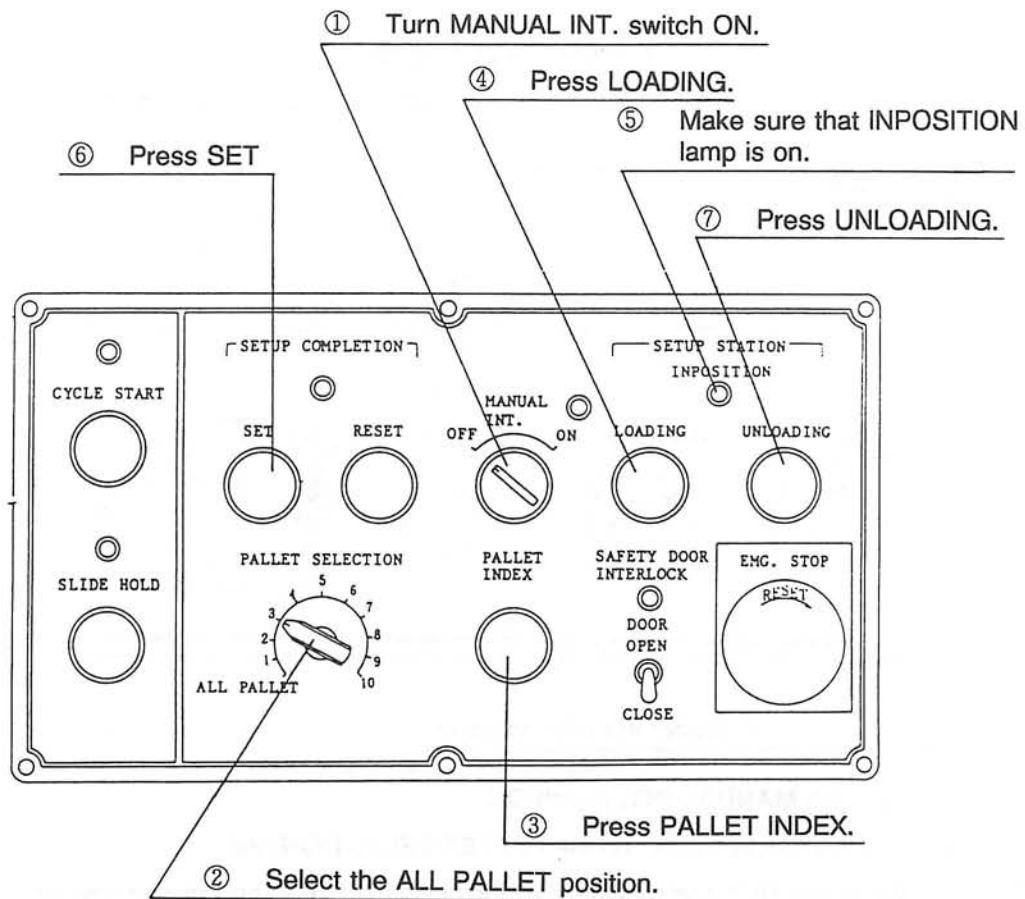
(b) Setup Completion - Set/reset Operations



- ① Turn the **MANUAL INT.** switch ON.
- ② Dial the required pallet on the **PALLET SELECTION** dial.
- ③ Press the **SET** button after the completion of setup on the selected pallet. To cancel the setup completion or ready for machining state, press the **RESET** button.

In case the **ALL PALLET** position is selected, in step ② above, **SET** and **RESET** buttons are effective for all pallets.

(c) Setup Station



- ① Turn the **MANUAL INT.** switch ON.
- ② Turn the **PALLET SELECTION** dial to the ALL PALLET position.
- ③ Position the required pallet in front of the setup station by pressing the **PALLET INDEX** button.
- ④ Press the **LOADING** button to transfer the pallet to the setup station.
- ⑤ Set a workpiece to be machined on the pallet. Make sure that the pallet is located at the correct position by the illumination of the IN POSITION indicating lamp. If it is not on, then adjust the pallet position so that the IN POSITION lamp will light.
- ⑥ Press the **SET** button to establish the ready for machining status for that pallet.
- ⑦ Press the **UNLOADING** button to transfer the pallet to the APC.

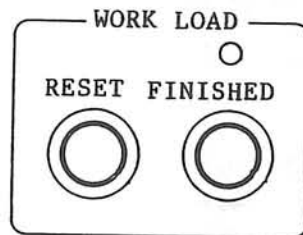
(3) Double-column Machining Center

(a) WORK LOAD FINISHED

Press this button after loading a workpiece on the pallet. When this button is pressed, its indicating lamp lights and the workpiece setup completed state is on.

(b) WORK LOAD RESET

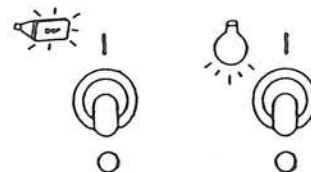
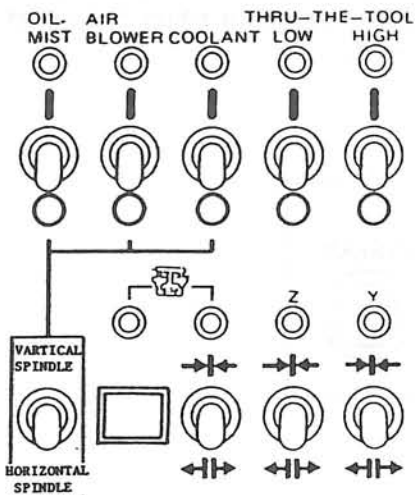
In case that workpiece re-setup operation should be performed after completion of the workpiece setup, press this button to cancel the workpiece setup completed state. When this button is pressed, its indicating lamp goes off.



10-5. Other Functions

These include the COOLANT, OIL MIST, AIR BLOW, OIL HOLE, CHIP CONVEYOR and CRT DISPLAY.

(1) OSP5020M Pendant Operation Panel Specification:



These switches except the CRT DISPLAY are 3-position type and are marked ON in the upper position and OFF in the lower position. The corresponding lamps light up when the switches are ON.

(2) OSP5020M Flat Panel Specification:



These keys are flat keys. When a key is pressed, the LED at the upper left corner turns on and the corresponding function is turned on. When it is pressed again, the function is turned off and the lamp goes off simultaneously.

(3) Switches

(a) COOLANT, OIL MIST, A.B NOZ./ADAPT, OIL HOLE

Setting of these keys is effective independent of the operation mode, whether **MANUAL**, **MDI** or **AUTO**.

For both M08 and M09, the M code entered last becomes effective in the same way as the coolant switches.

(b) LUB.

When the key is pressed, axis slideway is lubricated.

(c) CRT DISPLAY

ON Power supply for CRT is turned on.

OFF Power supply for CRT is turned off.

Turning this key off when CRT display is not required can elongate service life of CRT.

(d) Y/Z AXIS CROSS RAIL (W) CLAMP

When these axis clamp switches set at the upper position, the corresponding axis (Y for spindlehead, Z for ram and W for crossrail) is clamped with the indicating lamp lighted up. Turning the switches to the lower position unclamp the axis and the indicating lamp goes off.

If the axes are clamped during axis feed, the axis movement is brought to a stop and clamped. However, this operation will cause the guideways to be worn rapidly and therefore clamp/unclamp operation should no be carried out while the axes are being fed.

When power is turned on to the machine, X-, Y- and are in the unclamp state.

SECTION 3 PARAMETERS

1. **Kinds of Parameters Used by OSP5020M/OSP500M-G**

With the OSP5020M/OSP500M-G, parameters are classified as indicated below and special display screens are prepared for individual parameter types to allow parameter setting by directly inputting a numerical value or setting required data in units of bits.

- (1) Common variable
- (2) User parameter
- (3) G/M code macro
- (4) Machine user parameter (long word)
- (5) Machine user parameter (word)
- (6) Machine user parameter (bit)
- (7) NC optional parameter (long word)
- (8) NC optional parameter (word)
- (9) NC optional parameter (bit)
- (10) Input unit system
- (11) Machine system parameter (long word)
- (12) Machine system parameter (word)
- (13) System parameter
- (14) Pitch error compensation

2. Parameter Table by Function

Setting Item	Parameter to be Set	Remarks
Travel end limit	SYSTEM PARAMETER P TRAVEL LIMIT N TRAVEL LIMIT	Factory-set by Okuma
Programmable limit	USER PARAMETER P PROG LIMIT WRK N PROG LIMIT WRK P PROG LIMIT MC N PROG LIMIT MC	Specified by user. Factory-set at the same value as the system parameter
Pitch error compensation	SYSTEM PARAMETER P PITCH ERR COMP N PITCH ERR COMP PITCH COMP SPAN PITCH POINT	Factory-set by Okuma
	NC OPTIONAL PARAMETER (WORD) NO. 33 (Number of pitch error compensation points)	
	PITCH ERROR COMP.	
In-position check amount (Exact stop check)	SYSTEM PARAMETER IN POSITION	Factory-set by Okuma
In-position check amount (Exact stop check at a home position command)	SYSTEM PARAMETER IN POSITION (H)	Factory-set by Okuma
Backlash compensation	USER PARAMETER BACKLASH	Factory-set by Okuma
Machine coordinate system offset value	SYSTEM PARAMETER ZERO OFFSET (MC)	Factory-set by Okuma
ATC home position	SYSTEM PARAMETER HOME POSITION 1	Factory-set by Okuma
Home position of: Parallel type 2-pallet APC-L Multi-pallet APC	SYSTEM PARAMETER HOME POSITION 3	Factory-set by Okuma
Home position of parallel type 2-pallet APC-R	SYSTEM PARAMETER HOME POSITION 4	Factory-set by Okuma

Setting Item		Parameter to be Set	Remarks
Servo drive unit controlling constants		SYSTEM PARAMETER HARD SERVO COEFF KV VALUE SLOW-UP/DOWN	Factory-set by Okuma
Machine origin of magazine		MC SYSTEM PARAMETER (LONG WORD) No. 9 MAGAZINE OFFST 1 No. 10 MAGAZINE OFFST 2 No. 11 MAGAZINE OFFST 3	Factory-set by Okuma
ATC		ATC tool number entry for tool data setting NXT TOOL ACT TOOL	This setting should be limited to such cases where the recovery is impossible due to trouble in the ATC.
		MC SYSTEM PARAMETER (WORD) No. 1 ATC SEQUENCE NO. No. 5 TA ARM A.B MODE	
APC		MC SYSTEM PARAMETER (WORD) No. 2 APC SEQUENCE NO. No. 6 PALLET A.B MODE	This setting should be limited to such cases where the recovery is impossible due to a problem in the APC.
Spindle	Spindle orientation	MC SYSTEM PARAMETER (WORD) No. 21 SPDL ORIENT OFST	Factory-set by Okuma
	Spindle oscillation	MC SYSTEM PARAMETER (WORD) No. 27 SPINDLE OSCIL DA No. 28 OSCILLATE FREQCY No. 29 OSCILLATE PERIOD	
Uni-directional positioning		USER PARAMETER G60 OVERRUN AMT	Excess travel for uni-directional positioning Factory-set at 1 mm (0.04 in.)
		NC OPTIONAL PARAMETER (BIT) No. 19: bit 0 to bit 5	Final positioning direction for one-directional positioning Factory-set at P direction for all axes

Setting Item	Parameter to be Set	Remarks
Fixed cycle	NC OPTIONAL PARAMETER (LONG WORD) No. 1	Retraction for G73 cycle Factory-set at 0.3 mm (0.012 in.)
	NC OPTIONAL PARAMETER (LONG WORD) No. 2	Retraction for G83 cycle Factory-set at 1 mm (0.04 in.)
	NC OPTIONAL PARAMETER (LONG WORD) No. 11	Retraction for G76 and G87 before orientation Factory set at 0.5 mm (0.02 in.)
	NC OPTIONAL PARAMETER (BIT) No. 17: bit 0	Always keeps the fixed cycle's cycle axis at the Z-axis. Not factory-set at Z-axis
	NC OPTIONAL PARAMETER (BIT) No. 17: bit 1 & bit 2	Shift direction for fixed cycle
Tape punch	NC OPTIONAL PARAMETER (WORD) No. 1	Number of tape feed holes for tape punching Factory-set at 600
	NC OPTIONAL PARAMETER (WORD) No. 2	Individual tape length for incremental tape punching Factory-set at 180 meters (590 feet)
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 0	Tape code for tape punching Factory-set at ISO code
Puncher	NC OPTIONAL PARAMETER (WORD) No. 6	Puncher's baud rate Factory-set at 600BPS
	NC OPTIONAL PARAMETER (BIT) No. 8: bit 0	Stop bit Factory-set at 2 stop bits
	NC OPTIONAL PARAMETER (BIT) No. 8: bit 1	Sets whether the DATA READY signal is controlled by an external signal Factory-set at "controlled by internal signal"

Setting Item	Parameter to be Set	Remarks
Puncher	NC OPTIONAL PARAMETER (BIT) No. 8: bit 2	Parity check execution Factory-set at "not execute"
	NC OPTIONAL PARAMETER (BIT) No. 8: bit 3	Even parity Factory-set at odd parity
Tape Reading	NC OPTIONAL PARAMETER (BIT) No. 1: bit 0 No. 1: bit 1	Code for tape reading, such as fixed tape code and automatic recognition Factory-set at automatic recognition and ISO code
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 2	TV check run Factory-set at "not execute"
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 3	Tape delimiter code Factory-set at feed holes
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 4	Verifying on tape rewinding after tape reading Factory-set at "not execute"
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 5	Automatic tape rewinding after tape reading Factory-set at "not execute"
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 6	Special code as an alarm Factory-set at an alarm
	NC OPTIONAL PARAMETER (BIT) No. 1: bit 7	Special code neglected Factory-set at "not neglected"
	NC OPTIONAL PARAMETER (BIT) No. 2: bit 0	A block including control statements such as CALL and GOTO is handled as a block. Not factory-set as such

Setting Item		Parameter to be Set	Remarks
Offset	Cutter radius compensation	NC OPTIONAL PARAMETER (LONG WORD) No. 4	Data for compensation vector check Factory-set at 0.05 mm (0.002 in.)
		NC OPTIONAL PARAMETER (LONG WORD) No. 5 No. 6	Starting/endpoint decelerating distance compensation corner override Factory-set at 0 for both points
		NC OPTIONAL PARAMETER (LONG WORD) No. 9	Data for errors in calculating minute arc and quasi-full circles Factory-set at 0.01 mm (0.0004 in.)
		NC OPTIONAL PARAMETER (WORD) No. 3	Decelerating rate for compensation corner override Factory-set at 100%
		NC OPTIONAL PARAMETER (WORD) No. 4	Internal identification angle for compensation corner override Factory-set at 90 degrees
		NC OPTIONAL PARAMETER (WORD) No. 5	Decelerating rate for compensation arc's internal override Factory-set at 100%
	Three-dimensional tool offset	NC OPTIONAL PARAMETER (LONG WORD) No. 7	Size of offset vector for three-dimensional tool offset Factory-set at 0 mm
Circular interpolation		NC OPTIONAL PARAMETER (LONG WORD) No. 3	Data for circular arc check (Difference in radius between starting and end points) Factory-set at 0.01 mm (0.0004 in.)
		NC OPTIONAL PARAMETER (BIT) No. 20: bit 1	For single-axis command, actual position or a point on the arc is taken as the command value for the axis not programmed. Factory-set at "actual position"

Setting Item	Parameter to be Set	Remarks
Unit system for setting	NC OPTIONAL PARAMETER (BIT) No. 9: bits 0 to 7 INPUT UNIT SYSTEM NC OPTIONAL PARAMETER (BIT) No. 3: bits 0 to 7	Change in the setting unit system Factory-set at 1 mm (0.04 in.), 1°, 1 sec, 1mm/min (0.04 ipm) and 1 mm/rev (0.04 ipr)
Display	NC OPTIONAL PARAMETER (BIT) No. 4: bit 4	Subprogram (SSB) not displayed Factory-set at "displayed"
	NC OPTIONAL PARAMETER (BIT) No. 4: bit 5	Program display, indicating the remaining amount of travel Factory-set at "not displayed"
	NC OPTIONAL PARAMETER (BIT) No. 4: bit 6	4 × 4 as the size of the enlarged display characters for the actual position Factory-set at 2 × 2
	NC OPTIONAL PARAMETER (BIT) No. 5: bits 0 to 4	Check display's screen mode Factory-set at I/O bit, specification bit, axis data, NC diagnostic data, system and I/O parameters
	NC OPTIONAL PARAMETER (BIT) No. 5: bit 7	Current value display including the addition of manual intervention Factory-set at the value obtained by addition
Processing at power on	NC OPTIONAL PARAMETER (BIT) No. 4: bit 1	Automatic program selection Factory-set at "execute"
	NC OPTIONAL PARAMETER (BIT) No. 18: bits 0 to 6	Selection of G code which is set automatically when power supply is turned on Factory-set at G00, G17, G53, G90, G94 and G23
Processing at resetting	NC OPTIONAL PARAMETER (BIT) No. 4: bit 2	NC reset, bringing the total sum of manual intervention to 0 Factory-set at 0
	NC OPTIONAL PARAMETER (BIT) No. 17: bit 3	NC reset, causing the mirror image to be normal for all axes Factory-set at "not normal"

Setting Item	Parameter to be Set	Remarks
Workpiece geometry enlargement/reduction	NC OPTIONAL PARAMETER (BIT) No. 6: bits 0 to 5	Execution of workpiece geometry enlargement or reduction Factory-set at "not execute" for all axes
Axis command cancel	NC OPTIONAL PARAMETER (BIT) No. 7: bits 0 to 5	Selection of the axis to be command canceled Factory-set at Z-axis command cancel
Display and setting of: System parameter Pitch error compensation Machine system parameter (long word) Machine system parameter (word) NC optional parameter (long word) No. 33 and trailing data NC optional parameter (word) No. 33 and trailing data NC optional parameter (bit) No. 17 and trailing data	NC OPTIONAL PARAMETER (BIT) No. 16: bit 7	Making all these parameters settable Factory-set at "not settable"
Lubrication	MC USER PARAMETER (WORD) No. 1: AXIS LUBE TIME	Axis lubricating interval timer Factory-set at 30 min
	MC USER PARAMETER (WORD) No. 2: CROSSRL LUBE TIME	Crossrail lubricating interval timer Factory-set at 2 min
	MC USER PARAMETER (WORD) No. 3: AXIS PUMP TIME	Axis lubricating pump ON time Factory-set at 30 sec
	MC USER PARAMETER (WORD) No. 4: CROSSRL PUMP TIME	Crossrail lubricating pump ON time Factory-set at 30 sec

Setting Item	Parameter to be Set	Remarks
ATC	MC USER PARAMETER (WORD) No. 5: TOOL UNCLAMP TIME	Spindle tool unclamp time Factory-set at 3 sec
	MC USER PARAMETER (WORD) No. 8: PLUG TOOL NO.	Plug tool number Factory-set at 0
End buzzer	MC USER PARAMETER (WORD) No. 7: END BUZZER TIME	End-of-operation buzzer ON time Factory-set at 10 sec
Power save	MC USER PARAMETER (WORD) No. 6: POWER SAVING TIME	Power save condition check time Factory-set at 30 min

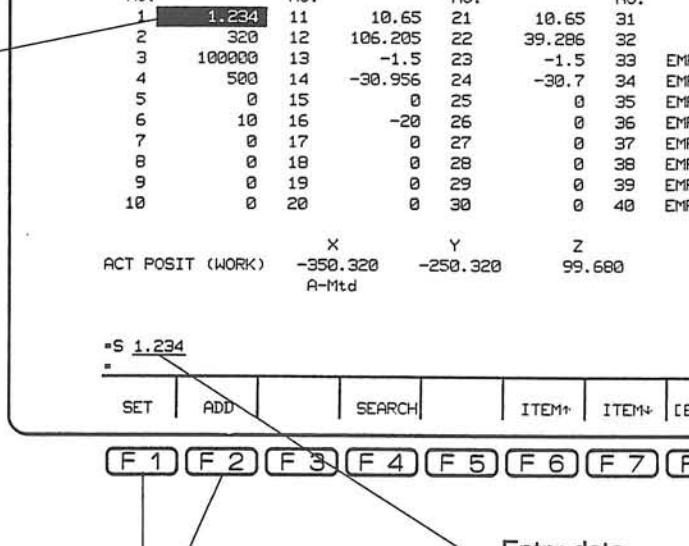
3. Description of Parameter and Setting Procedure

3-1. Common Variables

The variables, which are common to schedule programs, main programs and subprograms, may be referenced and updated. For details, see Section 11, 1-2-1. "Common Variables" in the "Programming Manual for OSP5020M (Publication No. 3336-E)". There are 128 sets, from VC1 to VC128. Setting procedure is shown below.

- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the COMMON VARIABLE screen appears.
- (3) One page of display includes 40 sets of data. If the particular page does not include desired data, switch page using the page keys [P ↑] and [P ↓], and position the cursor to the desired setting.

Alternatively, use the function key [F4] (SEARCH) to set the cursor at the desired data element.



PARAMETER SET

COMMON VARIABLE (VC---)

NO.		NO.		NO.		NO.	
1	1.234	11	10.65	21	10.65	31	-5
2	320	12	106.205	22	39.286	32	300
3	100000	13	-1.5	23	-1.5	33	EMPTY(*)
4	500	14	-30.956	24	-30.7	34	EMPTY(*)
5	0	15	0	25	0	35	EMPTY(*)
6	10	16	-20	26	0	36	EMPTY(*)
7	0	17	0	27	0	37	EMPTY(*)
8	0	18	0	28	0	38	EMPTY(*)
9	0	19	0	29	0	39	EMPTY(*)
10	0	20	0	30	0	40	EMPTY(*)

ACT POSIT (WORK) X -350.320 Y -250.320 Z 99.680
A-Mtd

*S 1.234

SET ADD SEARCH ITEM+ ITEM+ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

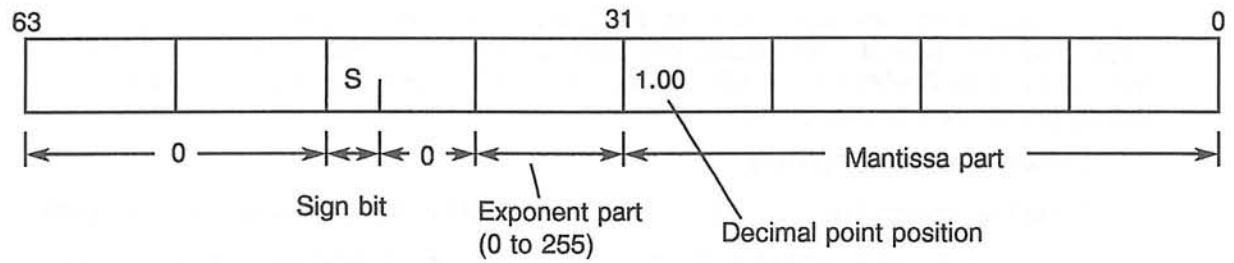
Entry data

Press the function key [F1] (SET) or [F2] (ADD).

- (4) Setting
 - (a) When the value of a common variable is known, then press the function key [F1] (SET) and enter that value.
 - (b) When the value has already been set and the increment/decrement from that value is to be set, press the function key [F2] (ADD) and enter those values.
- (5) Press the **WRITE** key.

This allows the value to be written at the position indicated by the cursor.

Note: Up to eight digits of data elements may be entered. Internally, they are floating point numbers which are eight bytes long.



Key in " * " as entry data and press the **WRITE** key. This results in setting EMPTY. The EMPTY data is displayed as EMPTY(*). For EMPTY, refer to Section 11, 1-2. "Variables Function" in the "Programming Manual for OSP5020M/OSP500M-G".

3-2. User Parameters

The following user parameters are available.

No.	CRT Display	Contents	Factory-set Initial Value	Setting Range
1	P PROG LIMIT WRK	Software-based P-directional and N-directional travel end limits disclosed to users. Displayed in the work coordinate system.	Depends on machine specification	–99999999 to +99999999
2	N PROG LIMIT WRK		Same as above	–99999999 to +99999999
3	P PROG LIMIT MC	Software-based P-directional and N-directional travel end limits disclosed to users. Displayed in the machine coordinate system.	Same as above	–99999999 to +99999999
4	N PROG LIMIT MC		Same as above	–99999999 to +99999999
5	G60 OVERRUN AMT	Amount of a jump in uni-directional positioning. The direction is set by the NC optional parameter (bit), No. 19.	300 (0.3 mm) (0.012 in.)	0 to 30000
6	BACKLASH	Backlash compensation amounts for individual axes are set.	10 (0.01 mm) (0.0004 in.)	0 to 1000
7	CLAMP IN-P	Clamp in-position width for each axis. (If the setting is “0”, clamp in-position check is not carried out.)	0	0.000 to 1.000

The P PROG LIMIT WRK and P PROG LIMIT MC display the same data as the coordinate values in the work machine and coordinate systems. Both data may be switched either by parameter setting or by program (G22) setting. The same applies to the N PROG LIMIT WRK and N PROG LIMIT MC.

Setting procedure is shown below:

- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the USER PARAMETER screen appears.

PARAMETER SET

	USER PARAMETER			1mm
	X	Y	Z	
P PROG LIMIT WRK	2400.000	500.000	-200.000	
N PROG LIMIT WRK	-2600.000	-1150.000	-1000.000	
P PROG LIMIT MC	2500.000	650.000	0.000	
N PROG LIMIT MC	-2500.000	-1000.000	-800.000	
G60 OVERRIDE AMT	1.000	1.000	1.000	
BACKLASH	0.000	0.000	0.000	
	0.000	0.000	0.000	
	0.000	0.000	0.000	
	0.000	0.000	0.000	
	0.000	0.000	0.000	

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

*IF

*IF

*S 500

Entry data

SET
ADD
CAL
SEARCH
ITEM↑
ITEM↓
[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

(5) Press the function key either [F1] (SET), [F2] (ADD) or [F3] (CAL).

(3) Press the function key [F5] (AXIS CHANGE).

(2) Press the function key [F6] or [F7] (ITEM).

- (3) When it is necessary to set data for the additional axes (the 5th and following axes), press the function key [F5] (AXIS CHANGE).
- (4) Using the cursor keys, position the cursor at the setting data.
- (5) Setting
 - (a) When a value is known, press the function key [F1] (SET) and enter that value.
 - (b) When setting any increment as viewed from the previously set position, press the function key [F2] (ADD) and enter that increment on the keyboard.
 - (c) In new setting at any position relative to the active value (position), press the function key [F3] (CAL) and enter the data, which is the relative value of the position to be set as viewed from the active value (position) with numerical keys.

Note that this setting may not be used for the excess travel in one-directional positioning.

- (6) Press the **WRITE** key.

This rewrites the data indicated by the cursor. When the set data is outside the travel end limits set by the system parameter, the corresponding error message appears. In this case, the data is ineffective and is not set.

3-3. G/M Code Macro Setting

The G code macro provides the functions equivalent to MODIN, MODOUT and CALL.

(1) G100

The same code as MODOUT, which cancels MODIN. Its format is as follows:

G100 (no argument setting)

(2) G101 to G110

The same code as MODIN, which executes the specified subprograms after axis movement on a block basis. Its format is:

G101 (argument setting)

(3) G111 to G120

The same as CALL, which is a simple subprogram call. Its format is:

G111 (argument setting)

Thus, the program name used by this G code is set by a parameter.

The M code macro is a function which allows an M code to call a subprogram. It consists of M201 to M210. The program name used by the M code is set by a parameter.

For the details of G and M code macros, see Section 10, 3. "G and M Code Macro Functions" in the "Programming Manual for OSP5020M/OSP500M-G".

Operating procedure is as follows:

- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the G/M CODE MACRO screen appears.

PARAMETER SET			
G CODE MACRO		*M CODE MACRO*	
MODIN	CALL	CALL	
G101 01234	G111 OABCD	M201 **	
G102 **	G112 **	M202 **	
G103 **	G113 **	M203 **	
G104 **	G114 **	M204 **	
G105 **	G115 **	M205 **	
G106 **	G116 **	M206 **	
G107 **	G117 **	M207 **	
G108 **	G118 **	M208 **	
G109 **	G119 **	M209 **	
G110 **	G120 **	M210 **	
ACT POSIT (WORK)		X	Y
		-350.320	-250.320
		A-Mtd	Z
			99.680
=IF			
=S 01234			
=S OABCD			
=			
SET		SEARCH	ITEM+ ITEM+ [EXTEND]

F 1

F 2

F 3

F 4

F 5

F 6

F 7

F 8

(4) Press the function key [F1] (SET).

(2) Press the function key [F6] or [F7] (ITEM).

- (3) Using the cursor keys, place the cursor at the desired data.
- (4) Press the function key [F1] (SET) and enter a program name on the keyboard.
To clear the program name, enter " * ".
- (5) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

Display of " ** " in the program name column indicates that the corresponding program name has not been registered.

Note: A program name which is set at 00000 to 00999 will result in an alarm. The 00000 and following are intended for use by the maker subprograms only, users are not allowed to use them.

3-4. Machine User Parameter (Long Word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
1	CROSSRL P LIMIT	Movable range of crossrail (Y-axis) in the positive direction	SET, ADD CAL	Depends on machine specification	-99999999 to 99999999	0.001 mm (0.00004 in.)
2	CROSSRL N LIMIT	Movable range of crossrail (Y-axis) in the negative direction	Same as above	Same as above	Same as above	Same as above
3	AT Y-P	Index allowable range of swivel head or attachment in the positive direction of Y-axis	Same as above	Same as above	Same as above	Same as above
4	AT Y-N	Index allowable range of swivel head or attachment in the negative direction of Y-axis	Same as above	Same as above	Same as above	Same as above
5	ATC P LIMIT	Tool change allowable range in the positive direction of Y-axis	Same as above	Same as above	Same as above	Same as above
6	ATC N LIMIT	Tool change allowable range in the negative direction of Y-axis	Same as above	Same as above	Same as above	Same as above
7	APC Y-P LIMIT	Pallet change allowable range in the positive direction of Y-axis	Same as above	Same as above	Same as above	Same as above
8	APC Y-N LIMIT	Pallet change allowable range in the negative direction of Y-axis	Same as above	Same as above	Same as above	Same as above
9	APC Z-P LIMIT	Pallet change allowable range in the positive direction of Z-axis	Same as above	Same as above	Same as above	Same as above
10	APC Z-N LIMIT	Pallet change allowable range in the negative direction of Z-axis	Same as above	Same as above	Same as above	Same as above
11	APC W-P LIMIT	Pallet change allowable range in the positive direction of W-axis	Same as above	Same as above	Same as above	Same as above
12	APC W-N LIMIT	Pallet change allowable in the negative direction of W-axis	Same as above	Same as above	Same as above	Same as above
13	ATC W-P LIMIT	ATC change allowable range in the positive direction of W-axis	Same as above	0	Same as above	Same as above
14	ATC W-N LIMIT	ATC change allowable range in the negative direction of W-axis	Same as above	0	Same as above	Same as above
15	ATC X-P LIMIT	ATC change allowable range in the positive direction of X-axis	Same as above	0	Same as above	Same as above
16	ATC X-N LIMIT	ATC change allowable range in the negative direction of X-axis	Same as above	0	Same as above	Same as above

Operating procedure is as follows:

- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the MC USER PARAMETER (LONG WORD) screen appears.

PARAMETER SET

MC USER PARAMETER (LONG WORD)

NO.		NO.	
1	CROSSRL P LIMIT 1234.567	11	APC W-P LIMIT 0.000
2	CROSSRL N LIMIT 0.000	12	APC W-N LIMIT 0.000
3	AT Y-P 0.000	13	0.000
4	AT Y-N 0.000	14	0.000
5	ATC P LIMIT 0.000	15	0.000
6	ATC N LIMIT 0.000	16	0.000
7	APC Y-P LIMIT 0.000	17	0.000
8	APC Y-N LIMIT 0.000	18	0.000
9	APC Z-P LIMIT 0.000	19	0.000
10	APC Z-N LIMIT 0.000	20	0.000

ACT POSIT (MC) X Y Z
 -250.000 -100.000 300.000
 A-Mtd

*S 1234567

SET ADD CAL SEARCH ITEM↑ ITEM↓ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

Entry data

(4) Press the function key either [F1] (SET), [F2] (ADD) or [F3] (CAL).

(2) Press the function key [F6] or [F7] (ITEM).

- (3) Using the cursor keys, position the cursor at the desired data.
- (4) Setting
 - (a) When the data to be set is previously known, press the function key [F1] (SET) and enter that data.
 - (b) When data has already been set and it is necessary to set the increment relative to that position, press the function key [F2] (ADD) and enter the increment.
 - (c) If new data is set at a position relative to the active value (position), press the function key [F3] (CAL) and key in the data, which is the relative value of the position to be set as viewed from the active value (position).
- (5) Press the **WRITE** key.
This rewrites the data at the position indicated by the cursor.

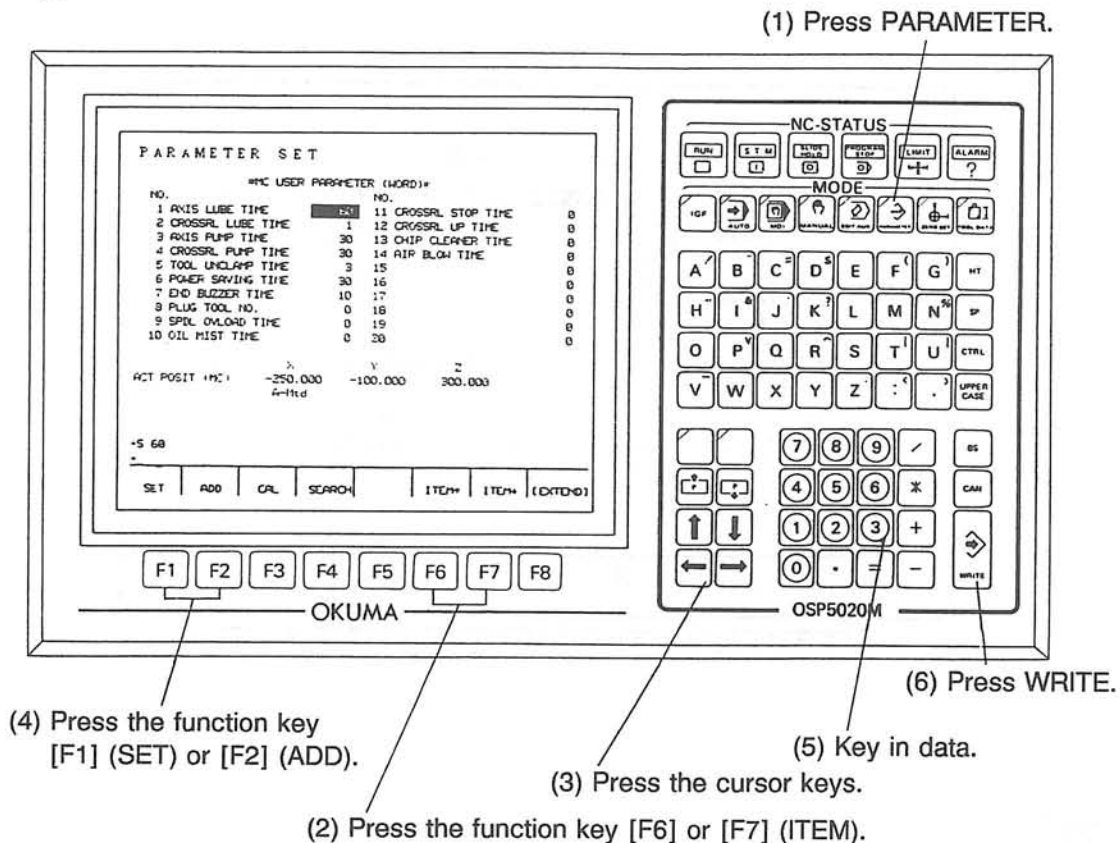
3-5. Machine User Parameter (Word)

The machine user parameter (word) consists of the following elements:

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
1	AXIS LUBE TIME	Cycle time for axis lubrication (Interval)	SET, ADD	30 min	0 - 120	1 min
2	CROSSRL LUBE TIME	Cycle time for crossrail lubrication (interval)	Same as above	2 min	0 - 120	1 min
3	AXIS PUMP TIME	Time during which the axis lubrication pump motor is on	Same as above	Depends on machine specification	15 - 60	1 sec
4	CROSSRL PUMP TIME	Time during which the crossrail lubricating pump motor is on	Same as above	Same as above	15 - 60	1 sec
5	TOOL UNCLAMP TIME	Maximum time taken to unclamp the tool after pressing the tool unclamp button	Same as above	3 sec	0 - 30	1 sec
6	POWER SAVING TIME	Time for a power save which is made when a preset time has elapsed the NC comes to a stop	Same as above	30 min	0 - 60	1 min
7	END BUZZER TIME	Time required from the moment the OPERATION END buzzer begins to sound until it stops sounding	Same as above	10 sec	0 - 60	1 sec
8	PLUG TOOL NO.	After the end of operation, if it is necessary to keep the tool mounted on the spindle free of foreign matter, that tool is specified.	SET only	Depends on machine specification	0 to the number of magazine tools	—
9	SPDL OVERLOAD TIME	Time for the control to determine "overload" state after the meter relay has been actuated	SET, ADD	Same as above	0 - 60	1 sec
10	OIL MIST TIME	Mist on time of the oil mist coolant supply system	Same as above	Same as above	0 - 3600	1 sec
11	CROSSRL STOP TIME	Stop time for the crossrail in its upward movements	Same as above	Same as above	0 - 600	0.1 sec

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
12	CROSSRL UP TIME	Upward movement time of the crossrail in its upward movements	SET, ADD	Depends on machine specification	0 - 600	0.1 sec
13	CHIP CLEANER TIME	ON duration of chip cleaner	Same as above	Same as above	0 - 60	1 sec
14	AIR BLOW TIME	ON duration of tapped hole chip air blow	Same as above	Same as above	0 - 3600	1 sec
15	RT COUNTER		Same as above	Same as above	0 - 999	
16	SET UP ST. POS.	Pallet carrier position at setup station is set.	SET	Same as above	0 to maximum number of pallets	—
17	AXIS LUBE TIME 2	Cycle time for second axis lubrication (Interval)	SET, ADD	Same as above	0 to 120	1 min
18	AXIS PUMP TIME 2	Time during which second axis lubrication pump motor is on	Same as above	Same as above	0 - 180	1 sec
19	WORK CLAMP TIME	Workpiece clamping is assumed to have been completed when a period, set at this timer, has elapsed after the execution of workpiece clamp command.	Same as above	Same as above	0 - 1000	0.01 sec
20	WORK UNCLAMP TIME	Workpiece unclamping is assumed to have been completed when a period, set at this timer, has elapsed after the execution of workpiece unclamp command.	Same as above	Same as above	0 - 1000	0.01 sec
21			Same as above	Same as above	0 - 1000	0.01 sec
22			Same as above	Same as above	0 - 1000	0.01 sec
40		System check mode	Same as above	0	0 - 999	—

Setting procedure is as follows:



- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the MC USER PARAMETER (WORD) screen appears.
- (3) Using the cursor keys, position the cursor at the desired data.

PARAMETER SET

MC USER PARAMETER (WORD)

NO.		NO.	
1	AXIS LUBE TIME	60	11 CROSSRL STOP TIME
2	CROSSRL LUBE TIME	1	12 CROSSRL UP TIME
3	AXIS PUMP TIME	30	13 CHIP CLEANER TIME
4	CROSSRL PUMP TIME	30	14 AIR BLOW TIME
5	TOOL UNCLAMP TIME	3	15
6	POWER SAVING TIME	30	16
7	END BUZZER TIME	10	17
8	PLUS TOOL NO.	0	18
9	SPDL OVLOAD TIME	0	19 WORK CLAMP TIME
10	OIL MIST TIME	0	20

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

#S 60

SET	ADD	CAL	SEARCH		ITEM+	ITEM+	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F 1	F 2	F 3	F 4	F 5	F 6	F 7	F 8
-----	-----	-----	-----	-----	-----	-----	-----

Setting:

If data is previously known:

- (4) Press the function key [F1] (SET).
- (5) Enter data on the keyboard.

If data has already been set and it is necessary to set the increment against the data:

- (4) Press the function key [F2] (ADD).
- (5) Enter the increment.
- (6) Press the **WRITE** key.

This rewrites the data at the cursor position.

3-6. Machine User Parameter (Bit)

The machine user parameter bits available are listed below:

Parameter No.	Bit No.	Contents	SET 1	SET 0	Factory Set Initial Value
1	0	Issuing an M09 command does not turn off the coolant.	Does not turn off	Turns off	0
	1	Issuing an M09 command does not turn off the through-the-tool coolant low pressure.	Does not turn off	Turns off	0
	2	Issuing an M09 command does not turn off the through-the-tool coolant high pressure.	Does not turn off	Turns off	0
	3	Issuing an M09 command does not turn off the air blow (nozzle) type.	Does not turn off.	Turns off	0
	4	Issuing an M09 command does not turn off the air blow (adapter type).	Does not turn off	Turns off	0
	5	Issuing an M09 command does not turn off the oil mist.	Does not turn off	Turns off	0
	6	Issuing an M09 command does not turn off the work shower.	Does not turn off	Turns off	0
	7				0
2	0	An M00/M01 does not turn off the spindle or coolant groups	Does not turn off	Turns off	0
	1	Alarm generation is added as a requirement for automatic power shutdown (OFF).	Adds	Does not add	0
	2	Spindle stops when an alarm of level B occurs.	Stops	Does not stop	0
	3	Spindle speed override is made effective for S2-digit specification.	Effective	Ineffective	0
	4	A level A alarm is made ineffective when APC door open confirmation signal is turned off.	Ineffective	Effective	0
	5				0
	6	Power save function is made ineffective during M00 or M01 mode.	Ineffective	Effective	0
	7	Power save function is made ineffective.	Ineffective	Effective	0
3	0	M181 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	1	M182 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	2	M183 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	3	M184 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	4	M185 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	5	M186 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	6	M187 external M command is made effective after completion of positioning.	Effective	Ineffective	0
	7	M188 external M command is made effective after completion of positioning.	Effective	Ineffective	0

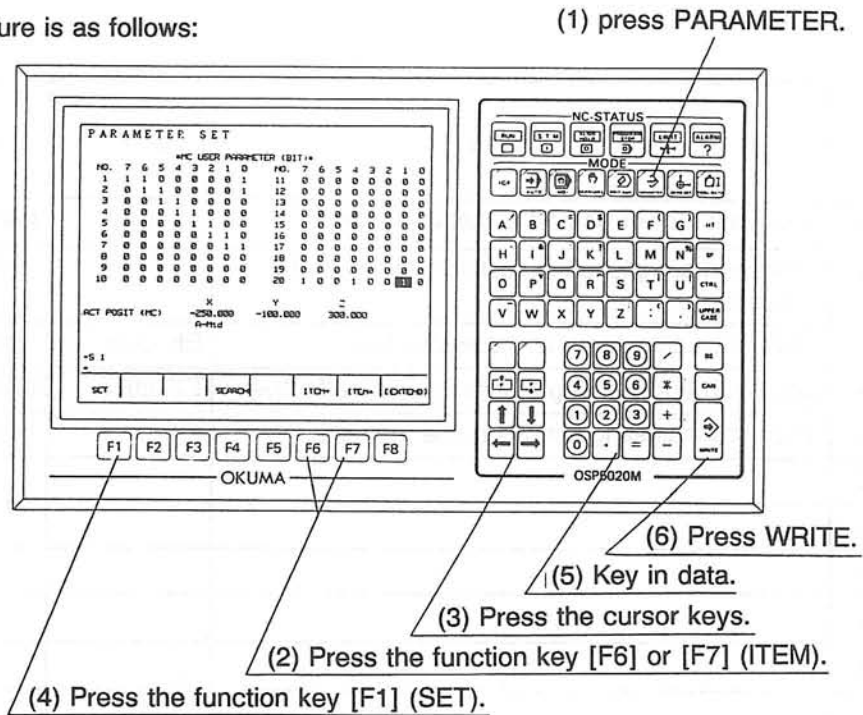
Parameter No.	Bit No.	Contents	SET 1	SET 0	Factory Set Initial Value
4	0	Attachment joint air blower is ineffective when attachment is installed.	Ineffective	Effective	0
	1	Attachment joint air blower is ineffective when adaptor is installed.	Ineffective	Effective	0
	2	For multi-link magazine, command is executed for the No. 2 magazine.	Executed	Not executed	0
	3	For multi-link magazine, command is executed for the No. 3 magazine.	Executed	Not executed	0
	4	With MC-40H and MC-3VA, standby is carried out at magazine rotation position.	Carried out	Not carried out	0
	5	With MC-40H, tool change arm door open interlock function is made ineffective.	Ineffective	Effective	0
	6	Spindle rotation is continued even when operation door interlock function is activated.	Continued	Not continued	0
	7	Manual intervention mode is made ineffective when magazine door interlock function is activated.	Ineffective	Effective	0
5	0	Specification code of the second timer is ignored.	Ignored	Not ignored	0
	1	The second timer is used for counting spindle rotation period.	Used	Not used	0
	2	The second timer is used for counting NC operation period.	Used	Not used	0
	3	Automatic operation condition is added for the second timer.	Added	Not added	0
	4	Automatic operation and single block off conditions are added to the second timer.	Added	Not added	0
	5				0
	6				0
	7				0
6	0	Specification code of the third timer is ignored.	Ignored	Not Ignored	0
	1	The third timer is used for counting spindle rotation period.	Used	Not used	0
	2	The third timer is used for counting NC operation period.	Used	Not used	0
	3	Automatic operation condition is added for the third timer.	Added	Not added	0
	4	Automatic operation and single block off conditions are added to the third timer.	Added	Not added	0
	5				0
	6				0
	7				0

Parameter No.	Bit No.	Contents	SET 1	SET 0	Factory Set Initial Value
7	0	Single block off condition is made ineffective for the third indicating lamp (NC running).	Ineffective	Effective	0
	1	Automatic operation and single block off conditions are made ineffective for the third indicating lamp (NC running).	Ineffective	Effective	0
	2	The third indicating lamp (NC running) is turned off when an alarm occurs.	Turned off	Not turned off	0
	3				0
	4				0
	5				0
	6				0
	7				0
8	0	Single block off condition for alarm lamp is made ineffective	Ineffective	Effective	0
	1	Automatic operation and single block off conditions for alarm lamp are made ineffective.	Ineffective	Effective	0
	2				0
	3				0
	4	Single block off condition for operation end indicating lamp is made ineffective.	Ineffective	Effective	0
	5	Automatic operation and single block off conditions for operation end indicating lamp are made ineffective.	Ineffective	Effective	0
	6				0
	7				0
9	0	Single block off condition for operation end warning buzzer is made ineffective.	Ineffective	Effective	0
	1	Automatic operation and single block off conditions for operation end warning buzzer are made ineffective	Ineffective	Effective	0
	2	Operation end warning buzzer is not turned off by timer.	Not turned off	Turned off	0
	3	Operation end warning buzzer is not turned on when alarm occurs.	Not turned on	Turned on	0
	4	Operation end warning buzzer is not turned on when completing the program.	Not turned on	Turned on	0
	5				0
	6				0
	7				0

Parameter No.	Bit No.	Contents	SET 1	SET 0	Factory Set Initial Value
10	0	ATC cycle in progress for APC start conditions is made ineffective.	Ineffective	Effective	0
	1	The S command entered through the pendant operation panel is made ineffective during manual intervention.	Ineffective	Effective	0
	2	WRITE and READ are made ineffective for the ATC sequence, TD, and S data.	Ineffective	Effective	0
	3	The VAC gain is increased during synchronized tapping.	Does	Does not	0
	4	The operation logic of the APC for the FMS specification is made effective.	Effective	Ineffective	0
	5	The value of S command can be minimized up to the minimum value for the motor speed.	Can	Can not	0
	6	A level A alarm is generated when the X-, Y-, or Z-axis overload is detected.	Alarm A	Alarm C	0
	7	Chuck grips the ID of the workpiece.	ID	OD	0
11	0	Enter "Automatic operation mode" to output conditions of external hour meter.	Enter	Not enter	1
	1	Enter "RUN lamp on" to output conditions of external hour meter.	Enter	Not enter	1
	2	Enter "Spindle in rotating" to output conditions of external hour meter.	Enter	Not enter	0
	3	Enter "Axis moving" to output conditions of external hour meter.	Enter	Not enter	0
	4	Enter "Spindle speed override 100%" to output conditions of external hour meter.	Enter	Not enter	1
	5	Enter "Feedrate override 100%" to output conditions of external hour meter.	Enter	Not enter	1
	6	Enter "Single block off" to output conditions of external hour meter.	Enter	Not enter	1
	7				
13	0	Interface TYPE-B for the robot/loader is made effective.	Effective	Ineffective	0
	1	Interface TYPE-C for the robot/loader is made effective.	Effective	Ineffective	0
	2	The "tool exist in magazine pot confirmation" interlock is made ineffective.	Ineffective	Effective	0
	3	Manual tool change is enabled nearby the tool orientation position. (MC-500H/600H)	Enabled	Not enabled	0
	4	Pin IN/OUT command from the stacker crane and APC for the FMS specification are made ineffective.	Ineffective	Effective	0
	5				0
	6	The "no tool in spindle" interlock is made ineffective.	Ineffective	Effective	0
	7				0

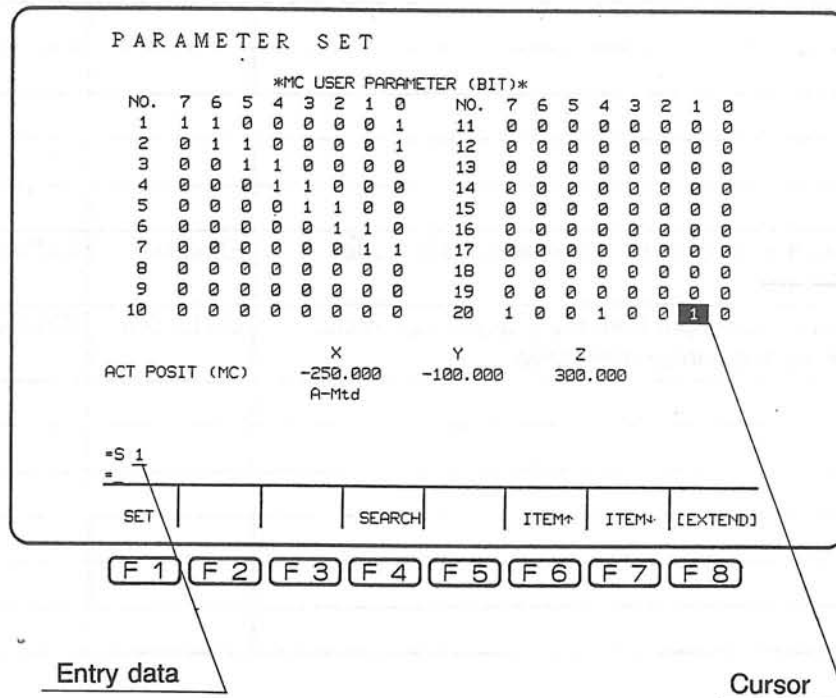
Parameter No.	Bit No.	Contents	SET 1	SET 0	Factory Set Initial Value
14	0	Automatic power shutoff is made effective.	Effective	Ineffective	0
	1	Operation completion indicating lamp is made effective.	Effective	Ineffective	0
	2	Alarm indicating lamp is made effective.	Effective	Ineffective	0
	3	Operation end warning buzzer is made effective.	Effective	Ineffective	0
	4	The third indicating lamp is made effective.	Effective	Ineffective	0
	5				0
	6				0
	7				0
21	0				0
	1				0
	2				0
	3	Selection of the magnification for magnetic pulse generator from $\times 4$ or $\times 1$	$\times 4$	$\times 1$	0
	4				0
	5				0
	6				0
	7				0
39	0	This makes setting of the attachment swivel range ineffective.	Ineffective	Effective	0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0
40	0	This makes crossrail automatic offset mode effective.	Effective	Ineffective	0
	1	This makes input from the crossrail automatic positioning sensor ineffective.	Ineffective	Effective	0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0

Setting procedure is as follows:



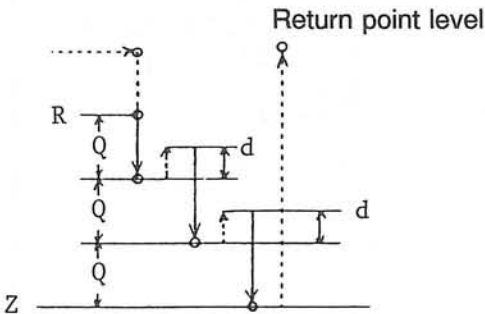
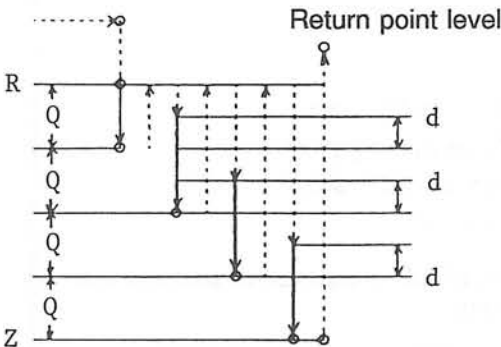
- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the MC USER PARAMETER (BIT) screen appears.
- (3) Using the cursor keys, position the cursor at the desired data.
- (4) Press the function key [F1] (SET).
- (5) Enter the data.
The entry data is only 0 or 1.
- (6) Press the **WRITE** key.

This rewrites data indicated by the cursor.

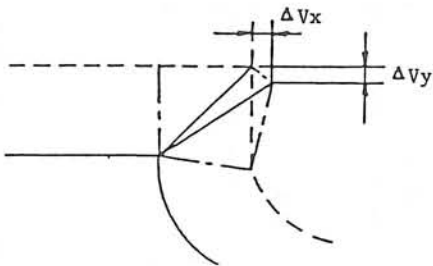
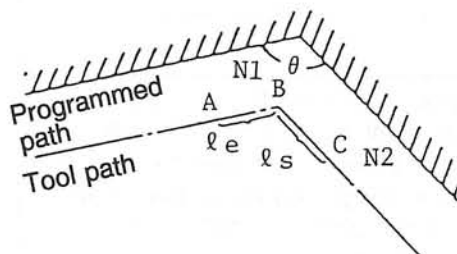


3-7. NC Optional Parameter (Long Word)

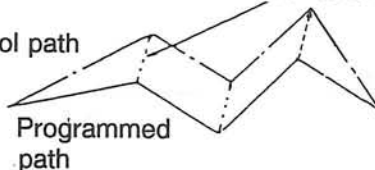
The optional parameter (long words) that follow are available. The parameter numbers are keyed to the numbers on the CRT screen.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
1※	Retraction in G73 cycle (high-speed deep hole)	In G73 cycle, Z-axis is infed by "Q", retracted to level "d" and then infed by "Q + d". "d" is the retraction amount. 	300 (0.3 mm) (0.012 in.)	0 to 10000
2※	Retraction in G83 cycle (deep hole)	In G83 cycle, Z-axis is infed by "Q", retracted to level "R" in a rapid feedrate, and then positioned to the level "d" higher than the previously infed level. Infeed by "Q + d" is made after that. "d" is the retraction amount. 	1000 (1 mm) (0.04 in.)	0 to 1000
3※	Arc check data	An alarm will occur if, in an arc command, the difference in radius between the starting point and the end point is greater than the preset level, set by the check data.	10 (0.01 mm) (0.0004 in.)	2 to 200

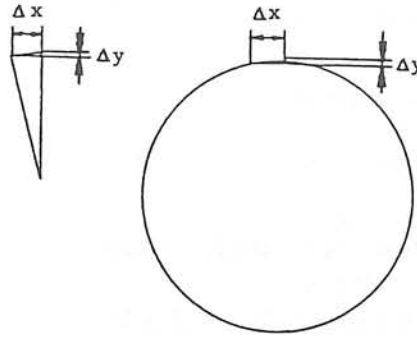
※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
4※	Cutter radius compensation vector check data	For an extremely small corner movement, if $\Delta V_x \leq \Delta V$ and $\Delta V_y \leq \Delta V$, then ignores the rear moving point for movement. The ΔV is set by the check data. 	50 (0.05 mm) (0.002 in.)	2 to 5000
5	Decelerating distance at end point for cutter radius compensation corner override		0	0 to 99999999
6	Decelerating distance at starting point for cutter radius compensation corner override	A : Override ON point B : N1 positioning point C : Override OFF point N1 X_ Y_ F1 N2 X_ Y_ F2 ℓe: Decelerating distance at corner's end point ℓs: Decelerating distance at corner's starting point		

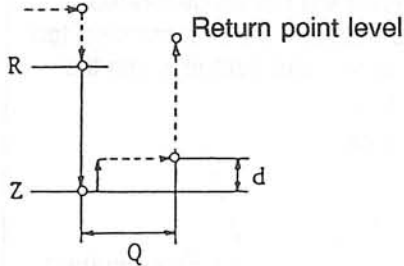
※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
7	Three-dimensional tool offset vector size	Three-dimensional tool offset vector  G41 tool path Programmed path Vector component in Xp-axis direction: $\Delta V_x = ir/p$ Vector component in Yp-axis direction: $\Delta V_y = jr/p$ Vector component in Zp-axis direction: $\Delta V_z = kr/p$ where i, j & k: Values specified by I, J and K, respectively r : Tool offset value corresponding to the tool offset number specified by D p : Parameter-set Value; for 0, the following equation applies. $P = \sqrt{i^2 + j^2 + k^2}$	0	-99999999 to +99999999
8※	G31 (skip function) feedrate	Sets the feedrate for G31 (skip function)	0	1 to 20000

※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

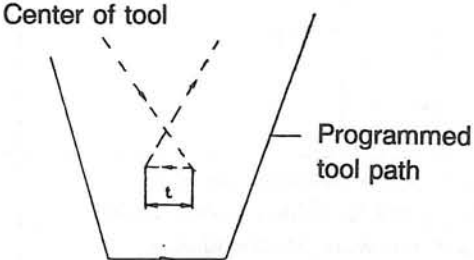
Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
9※	Error data resulting from cutter radius compensation calculation for minute circular arcs and quasi-full circles in cutter radius compensation mode	 Minute arc Quasi-full circle $(\Delta X \leq \Delta V, \Delta Y \leq \Delta V)$ (a) Minute arc The horizontal and vertical distances between the starting point and the end point of a circular arc are smaller than the setting. (b) Quasi-full circle A circular arc which is almost a full circle. The horizontal and vertical distances of the gap of the arc are smaller than the setting. The setting ΔV is given by the error data. The endpoint of a minute circular arc is ignored and no arc movement takes place. The endpoint of a quasi-full circle is ignored and the arc is handled as a full circle which begins at the starting point.	10 (0.01 mm) (0.0004 in.)	2 to 200
10	Maximum feedrate clamp value	When an attempt is made to feed an axis at a rate exceeding the preset value, the axis feedrate is clamped at this value and the alarm indication setting unit is mm/min.	Rapid feedrate of machine	0 to 20000

※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Param- eter No.	Item	Contents	Factory Set Initial Value	Setting Range
11※	Retraction amount in G76 (fine boring) and G87 (back boring) cycles	In the G76 and G87 cycle, the cutting tool is infed to level "Z" where a dwell of "P" seconds is carried out and then it is retracted upwards by "d". At this retracted level, the cutting tool is shifted by "Q" in the direction opposite to the tool bit. This sets the amount "d". 	500 (0.05 mm) (0.02 in.)	0 to 10000
12※	Positioning point for RMIL (inner round milling)	Sets the distance between the first positioning point for RMIL (inner round milling) and the workpiece endface.	500 (0.05 mm) (0.02 in.)	0 to 10000
13	Number of bytes for the program data transmission until the DNC-B cycle start.	Sets the number of bytes for the program data transmission until the cycle start in the DNC-B remote buffer operation mode with communication control protocol is started.	0	0 to 99999999
14	Feedrate change value in the fixed cycle when the coordinate system conversion	Sets the feedrate value when the rapid feedrate is changed to a cutting feedrate in the fixed cycle during 3-D coordinate system conversion.	20000 (20m/min)	1 to 20000
15	Spindle index zero	Spindle index zero position (Spindle index machine zero for E command)	Depends on machine specification	*0 to 359.999 or 0 to 359.9999
16	Spindle IN-P check value	Spindle (C-axis) IN-P check value is set.	Depends on machine specification	*0 to 359.999 or 0 to 359.9999
17	Spindle index angle at rapid feedrate	Rapid feedrate (angle) of spindle indexing is set.	Depends on machine specification	*0 to 359.999 or 0 to 359.9999

* Setting unit: VAC control unit (1/1000° or 1/10000°)

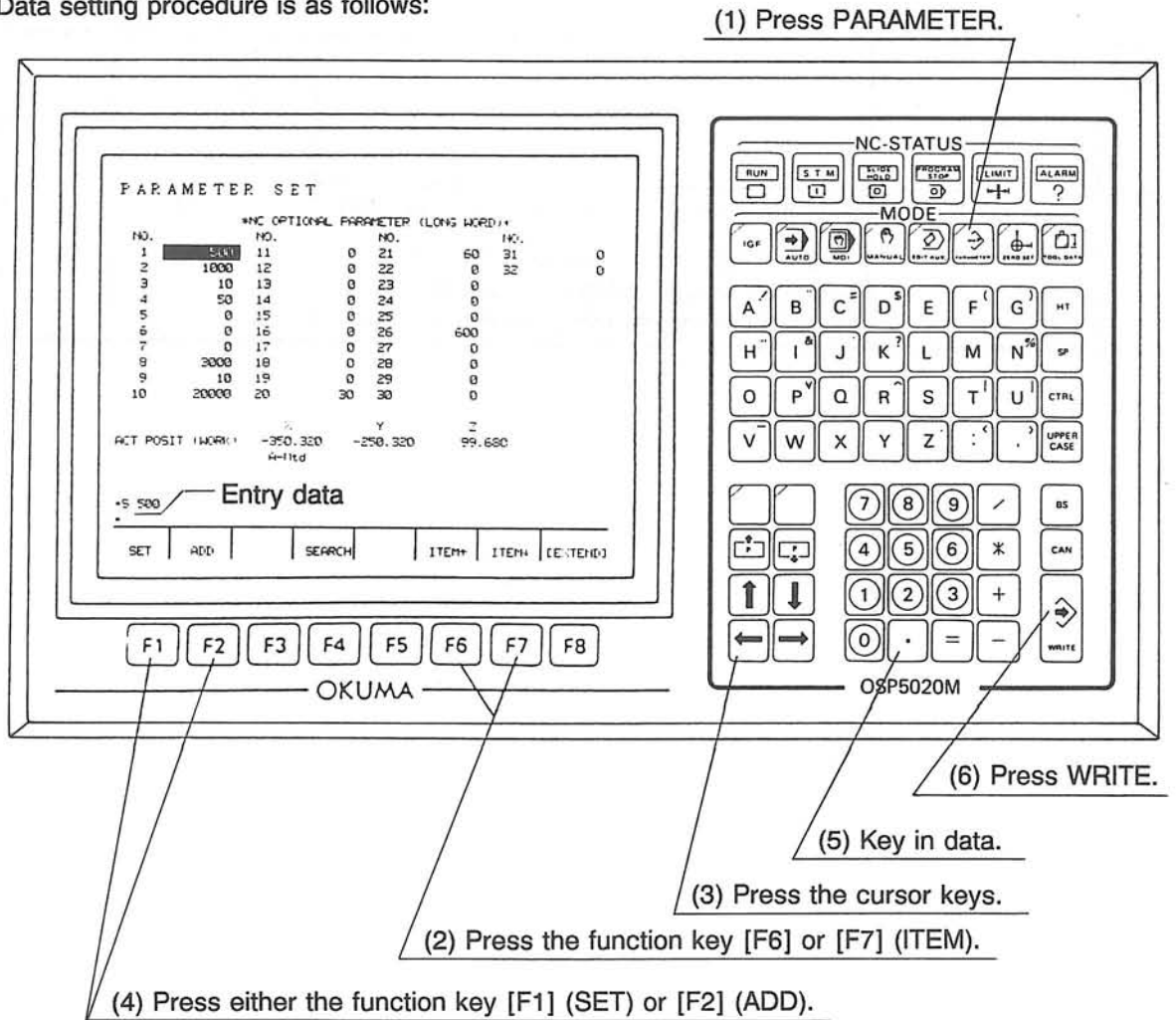
※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
18※	Tolerance for the interference with cutter radius compensation	When the programmed tool path is different from the actual tool path as shown in the figure below, a tool interference error is generated while the tool does not interfere with the workpiece. To avoid this, set the tolerance range ("t" in the figure below) for interference. Interference error will not be generated when the gap between the programmed tool path and the actual tool path is within the tolerance range. 	0 (μm)	0 to 99999999
19	Spindle orientation offset value	Sets the offset amount during spindle orientation with the high-precision VAC.	0 (deg)	0 to 359.9999
22※	Acceleration/deceleration speed constant for F1-digit feed	Sets the acceleration/deceleration speed constant for F1-digit feed (both rotary switch and parameter).	0	0 to 4000000
23	Motor continuous rating	Sets the spindle motor cont. rating for the synchronized tapping torque monitor. Refer to the final specifications of the machine when setting data.	0 (W)	110 to 99999999
33	Synchronization position shift amount (μm)	If the setting is "0" when power is turned on, the difference between the master and slave axis command values (SRSCON) is automatically set as the synchronization shift amount.	0	Automatic setting
34	Cutting start point for RMILO (outer round milling)	Sets the distance between the cutting start point for RMILO (outer round milling) and the workpiece endface.	0 (μm)	-99999999 to +99999999
35	Cutting start point for RMILI (inner round milling)	Sets the distance between the cutting start point for RMILI (inner round milling) and the workpiece endface.	0 (μm)	-99999999 to +99999999

※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Param- eter No.	Item	Contents	Factory Set Initial Value	Setting Range
44	Maximum tool length	Sets the maximum length of tool to be used. This setting is necessary to shorten the operation time by using the automatic tool length offset/broken tool detection function.	0 (μm)	0 to 999

Data setting procedure is as follows:



- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (LONG WORD) screen appears.
- (3) Using the cursor keys, position the cursor at desired data.

Cursor

PARAMETER SET

NO.		*NC OPTIONAL PARAMETER (LONG WORD)*			
1	500	11	0	21	60
2	1000	12	0	22	0
3	10	13	0	23	0
4	50	14	0	24	0
5	0	15	0	25	0
6	0	16	0	26	600
7	0	17	0	27	0
8	3000	18	0	28	0
9	10	19	0	29	0
10	20000	20	30	30	0

ACT POSIT (WORK)	X -350.320 A-Mtd	Y -250.320	Z 99.680
------------------	------------------------	---------------	-------------

Entry data

#S 500

SET	ADD	SEARCH	ITEM↑	ITEM↓	[EXTEND]
-----	-----	--------	-------	-------	----------

Parameter No.

F1 F2 F3 F4 F5 F6 F7 F8

Setting:

When data is previously known:

- (4) Press the function key [F1] (SET).
- (5) Enter the data on the keyboard.
- (6) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

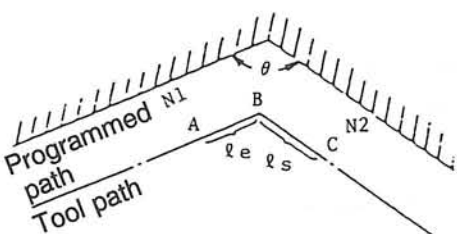
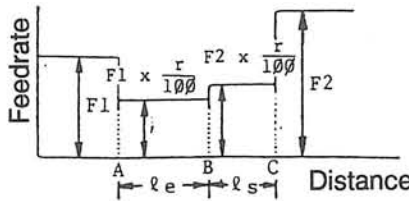
When data has already been set and it is necessary to set the increment from the data:

- (4) Press the function key [F2] (ADD).
- (5) Enter the increment on the keyboard.
- (6) Press the **WRITE** key.

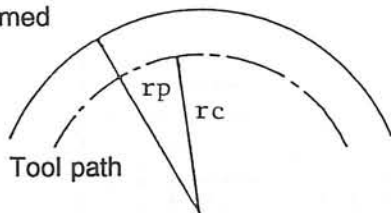
This rewrites the data indicated by the cursor.

3-8. NC Optional Parameter (Word)

The optional parameter (words) that follow are available

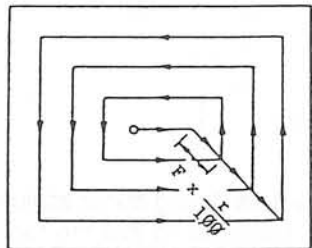
Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
1	Tape feed holes in punching	For a punchout in the PIP (transfer) mode, there is a tape feed before the program is punched out, which is followed by tape feed. The number of feed holes is set by this parameter.	600	1 to 10000
2	Defaults of tape lengths in divided punching	A file of part programs which is too long to be stored in a roll of paper tape is divided into smaller files to be punched out. The lengths of the divisions are closed at the breaks of each block, so that the setting is slightly different from the actual tape length. A divided punchout gives the beginning of each tape part a file name. Note that the setting does not include the lengths corresponding to the file name and feed holes.	180 m (590 feet)	1 to 300 m (3 - 984 feet.)
3	Decelerating ratio of cutter radius compensation corner override	 N1 X_Y_ F1 N2 X_Y_ F2 A : Override ON point B : N1 positioning C : Override OFF point r : Decelerating ratio θ : Corner's internal identification angle	100%	1 to 100%
4	Internal identification angle of cutter radius compensation corner override		90 deg	1 to 179 deg

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range										
5	Decelerating ratio of cutter radius compensation arc's internal override	Programmed path  Tool path Generally, the feedrate during cutter radius compensation is controlled so that the tool center path gets the specified speed. Parameter setting, however, provides an override which permits the feedrate on the programmed path to get the specified speed although it is limited to circular arc's inside cutting. (a) When $rc/rp \times 100 \geq$ Parameter setting Actual feedrate = Specified speed $\times rc/rp$ (b) When $rc/rp \times 100 <$ Parameter setting Actual feedrate = Specified speed $\times$ (Parameter setting/100)	100%	1 to 100%										
*6	NC baud rate for RC232C Channel 0	This parameter sets the baud rate of the RS232C interface when used for the puncher. <table border="1"><thead><tr><th>Baud rate</th></tr></thead><tbody><tr><td>110</td></tr><tr><td>150</td></tr><tr><td>300</td></tr><tr><td>600</td></tr><tr><td>1200</td></tr><tr><td>2400</td></tr><tr><td>4800</td></tr><tr><td>9600</td></tr><tr><td>19200</td></tr></tbody></table> If a baud rate other than the value indicated above is set, the baud rate closest to and smaller than the setting is selected.	Baud rate	110	150	300	600	1200	2400	4800	9600	19200	600 (0.6 K baud)	110 to 19200 (baud)
Baud rate														
110														
150														
300														
600														
1200														
2400														
4800														
9600														
19200														

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data, then turn it on again.

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range										
7	Override in pocket milling (spiral type) corner cutting	Pocket milling (spiral type) PMILR  In the movement illustrated above, this parameter specifies the override of the feedrate of the 45-degree cut. Actual feedrate = Specified speed × (r/100) This value of r is set by the parameter.	100%	1 to 100%										
8	Magazine pot number for touch probe	This parameter specifies the magazine pot number for storing the touch probe.	0	0 to Number of magazine pots										
9	Imaginary spindle rpm for machine lock	This parameter specifies the imaginary spindle speed for the machine lock mode operation.	2000 rpm (min ⁻¹)	1 to 8000 rpm (min ⁻¹)										
10	Servo processor monitor function	This parameter specifies the number of DSVPVAR1 (leftmost 2 digits) and RSVPVAR2 (rightmost 2 digits) display on the CHECK page.	0	0 to 9999										
11	Designation of operation method	This specifies the operation method to be selected when option designation is not given at the time program selection is made. <table><tr><th>Setting</th><th>Operation Method</th></tr><tr><td>0</td><td>Normal operation (method A)</td></tr><tr><td>1</td><td>Large volume operation (method B)</td></tr><tr><td>2</td><td>Operation without branching and subprograms (method S)</td></tr><tr><td>3</td><td>Multi-volume operation (method M)</td></tr></table>	Setting	Operation Method	0	Normal operation (method A)	1	Large volume operation (method B)	2	Operation without branching and subprograms (method S)	3	Multi-volume operation (method M)	1	0 to 3
Setting	Operation Method													
0	Normal operation (method A)													
1	Large volume operation (method B)													
2	Operation without branching and subprograms (method S)													
3	Multi-volume operation (method M)													

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
12	Rapid feedrate override in traveling to home position	This specifies the override value for rapid feedrate when traveling rapidly to home position.	0	0 to 100%
13	Schedule program auto update	Automatic updating of schedule program 0 : Ineffective 1 : Effective	0	0 to 1
15	Machine number for DNC link	This parameter specifies the machine number for DNC link.	0	0 to 9999
16	Number of bytes in one block for batch output in DNC-B mode	This specifies the number of bytes in one block when NC program is reverse-transmitted in protocol A.	0	0 to 4000
17	Baud rate for RS422 channel	This specifies the baud rate for RS422 channels (MAIN CARD 7)	200 (baud)	111 to 19200 (baud)
18	STM answer back time over check period	When S, T and M commands are executed, if the completion of the command is not confirmed within the period set at this parameter, an alarm occurs.	120 (min)	0 to 120 (min)
19	In-position time over check period	If all axes do not arrive within in-position zone within the preset duration after the completion of calculation, an alarm occurs.	6000 (600 sec)	0 to 6000 (× 0.1 sec)
20	Spindle load max. %	Set the percent value which corresponds to full scale (torque command \$FF) indication of the spindle load to be displayed on the load display screen.	180	1 to 500
21	Allowable number (n) of torque low for synchronized tapping	An alarm occurs when the spindle load torque exceeds the allowable value for the duration of 6.4*n (msec) continuously while the synchronized tapping torque is monitored. Sets the allowable number (n) of low torque for the synchronized tapping	0	0 to 32
23	File read waiting time for channel 0 in DNC-B mode	Sets the duration from filename designation (DC4 output) to the file read (DC1 output) for channel 0 with DC code control. If "0" is set, the parameter No. 34 will be used automatically.	0 sec	0 to 9999
24	File read waiting time for channel 1 in DNC-B mode	Sets the duration from filename designation (DC4 output) to file read (DC1 output) for channel 1 with DC code control. If "0" is set, the parameter No. 35 will be used automatically.	0 sec	0 to 9999

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
25	File read waiting time for channel 2 in DNC-B mode	Sets the duration from filename designation (DC4 output) to file read (DC1 output) for channel 2 with DC code control. If "0" is set, the parameter No. 36 will be used automatically.	0 sec	0 to 9999
26	File read waiting time for channel 3 in DNC-B mode	Sets the duration from filename designation (DC4 output) to file read (DC1 output) for channel 3 with DC code control. If "0" is set, the parameter No. 37 will be used automatically.	0 sec	0 to 9999
27	File read waiting time for channel 4 in DNC-B mode	Sets the duration from filename designation (DC4 output) to file read (DC1 output) for channel 4 with DC code control. If "0" is set, the parameter No. 38 will be used automatically.	0 sec	0 to 9999
28	Answer waiting period in DNC-C mode	In the DNC-C specification, limit of answer waiting period after sending [C,NCP] (NC program transmission request) for input and verify operations.	30	1 to 9999
29	Home position number of the first sequence point	This specifies the home position number for the first reference point return command - tape conversion specification (FANUC).	0	1 to 8
30	Home position number of the second reference point	This specifies the home position number for the second reference point return command - tape conversion specification (FANUC).	0	1 to 8
31	Home position number of the third reference point	This specifies the home position number for the third reference point return command - tape conversion specification (FANUC).	0	1 to 8
32	Home position number of the fourth reference point	This specifies the home position number for the fourth reference point return command - tape conversion specification (FANUC).	0	1 to 8
33	Maximum allowable sets of screw pitch error compensation	This parameter specifies the total number of sets of pitch error compensation data of all axes.	2304	0 to 2304

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
*34	Ready completion waiting time for RS232C channel 0	This specifies the duration in which the RS232C channel 0 must be set ready. If it is not set ready within the time specified, an alarm occurs.	10 (sec)	1 to 9999 (sec)
*35	Ready completion waiting time for RS232C channel 1	This specifies the duration in which the RS232C channel 1 must be set ready. If it is not set ready within the time specified, an alarm occurs.	10 (sec)	1 to 9999 (sec)
*36	Ready completion waiting time for RS232C channel 2	This specifies the duration in which the RS232C channel 2 must be set ready. If it is not set ready within the time specified, an alarm occurs.	10 (sec)	1 to 9999 (sec)
*37	Ready completion waiting time for RS232C channel 3	This specifies the duration in which the RS232C channel 3 must be set ready. If it is not set ready within the time specified, an alarm occurs.	10 (sec)	1 to 9999 (sec)
*38	Ready completion waiting time for RS232C channel 4	This specifies the duration in which the RS232C channel 4 must be set ready. If it is not set ready within the time specified, an alarm occurs.	10 (sec)	1 to 9999 (sec)
*39	Baud rate of RS232C channel 1	This parameter specifies the baud rate for RS232C channel 1.	600 (0.6K baud)	110 to 19200 (baud)
*40	Baud rate of RS232C channel 2	This parameter specifies the baud rate for RS232C channel 2.	600 (0.6 K baud)	110 to 19200 (baud)
*41	Baud rate of RS232C channel 3	This parameter specifies the baud rate for RS232C channel 3.	600 (0.6 K baud)	110 to 19200 (baud)
*42	Baud rate of RS232C channel 4	This parameter specifies the baud rate for RS232C channel 4.	600 (0.6 K baud)	110 to 19200 (baud)

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data, then turn it on again.

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range														
43	RS232C channel used for DNC-A channel	<table><tr><th>Setting</th><th>Device Name</th></tr><tr><td>0</td><td>TT : (CN0) [RS232C]</td></tr><tr><td>1</td><td>CN1 : [RS232C]</td></tr><tr><td>2</td><td>CN2 : [RS232C]</td></tr><tr><td>3</td><td>CN3 : [RS232C]</td></tr><tr><td>4</td><td>CN4 : [RS232C]</td></tr></table>	Setting	Device Name	0	TT : (CN0) [RS232C]	1	CN1 : [RS232C]	2	CN2 : [RS232C]	3	CN3 : [RS232C]	4	CN4 : [RS232C]	0 (channel)	0 to 4 (channel)		
Setting	Device Name																	
0	TT : (CN0) [RS232C]																	
1	CN1 : [RS232C]																	
2	CN2 : [RS232C]																	
3	CN3 : [RS232C]																	
4	CN4 : [RS232C]																	
44	Channel No. for DC code control	Sets the channel No. for DC code control in the infinite buffer operation mode. <table><tr><td>CN0 :</td><td>0</td></tr><tr><td>CN1 :</td><td>1</td></tr><tr><td>CN2 :</td><td>2</td></tr><tr><td>CN3 :</td><td>3</td></tr><tr><td>CN4 :</td><td>4</td></tr></table>	CN0 :	0	CN1 :	1	CN2 :	2	CN3 :	3	CN4 :	4	0	0 to 4				
CN0 :	0																	
CN1 :	1																	
CN2 :	2																	
CN3 :	3																	
CN4 :	4																	
*45	Designation of punch device	<table><tr><th>Setting</th><th>Device Name</th></tr><tr><td>0</td><td>TT : (CN0) [RS232C]</td></tr><tr><td>1</td><td>CN1 : [RS232C]</td></tr><tr><td>2</td><td>CN2 : [RS232C]</td></tr><tr><td>3</td><td>CN3 : [RS232C]</td></tr><tr><td>4</td><td>CN4 : [RS232C]</td></tr><tr><td>5</td><td>PP : [Parallel]</td></tr></table>	Setting	Device Name	0	TT : (CN0) [RS232C]	1	CN1 : [RS232C]	2	CN2 : [RS232C]	3	CN3 : [RS232C]	4	CN4 : [RS232C]	5	PP : [Parallel]	0	0 to 5
Setting	Device Name																	
0	TT : (CN0) [RS232C]																	
1	CN1 : [RS232C]																	
2	CN2 : [RS232C]																	
3	CN3 : [RS232C]																	
4	CN4 : [RS232C]																	
5	PP : [Parallel]																	

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data, then turn it on again.

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range														
46	Designation of print data output external device name	<table><tr><th>Setting</th><th>Device Name</th></tr><tr><td>0</td><td>TT : (CN0) [RS232C]</td></tr><tr><td>1</td><td>CN1 : [RS232C]</td></tr><tr><td>2</td><td>CN2 : [RS232C]</td></tr><tr><td>3</td><td>CN3 : [RS232C]</td></tr><tr><td>4</td><td>CN4 : [RS232C]</td></tr><tr><td>5</td><td>PR : [Centronics]</td></tr></table>	Setting	Device Name	0	TT : (CN0) [RS232C]	1	CN1 : [RS232C]	2	CN2 : [RS232C]	3	CN3 : [RS232C]	4	CN4 : [RS232C]	5	PR : [Centronics]	0	0 to 5
Setting	Device Name																	
0	TT : (CN0) [RS232C]																	
1	CN1 : [RS232C]																	
2	CN2 : [RS232C]																	
3	CN3 : [RS232C]																	
4	CN4 : [RS232C]																	
5	PR : [Centronics]																	
48	Average number of sampling data sets for load display	This specifies the number (n) of load data sets to be sampled; spindle and axis load data is the average value of these sampled data sets.	16	4 to 80														
*49	Time constant for linear acceleration/ deceleration	This specifies the time constant for linear acceleration/deceleration for synchronized control. (N × 12.8 ms)	20	0 to 30														
50	Synchronization error allowance A	If a synchronization error between the master and slave axes exceeds this value during normal machine operation conditions, an alarm occurs.	200 (μm) (0.008 in.)	0 to 1000														
51	Synchronization error allowance B	If a synchronization error between the master and slave axes exceeds this value when power is turned on, an alarm occurs.	1000 (μm) (0.04 in.)	0 to 5000														
*57	Designation of read device (no DC code control)	<table><tr><th>Setting</th><th>Device Name</th></tr><tr><td>0</td><td>TR : Standard tape reader</td></tr><tr><td>1</td><td>CN0: RS232C channel 0 tape reader</td></tr><tr><td>2</td><td>CN1: RS232C channel 1 tape reader</td></tr><tr><td>3</td><td>CN2: RS232C channel 2 tape reader</td></tr><tr><td>4</td><td>CN3: RS232C channel 3 tape reader</td></tr><tr><td>5</td><td>CN4: RS232C channel 4 tape reader</td></tr></table>	Setting	Device Name	0	TR : Standard tape reader	1	CN0: RS232C channel 0 tape reader	2	CN1: RS232C channel 1 tape reader	3	CN2: RS232C channel 2 tape reader	4	CN3: RS232C channel 3 tape reader	5	CN4: RS232C channel 4 tape reader	0	0 to 5
Setting	Device Name																	
0	TR : Standard tape reader																	
1	CN0: RS232C channel 0 tape reader																	
2	CN1: RS232C channel 1 tape reader																	
3	CN2: RS232C channel 2 tape reader																	
4	CN3: RS232C channel 3 tape reader																	
5	CN4: RS232C channel 4 tape reader																	
59	3-D arc projection path judgment tolerance amount	The tolerance amount used to determine whether the path obtained by projecting the 3-D arc on a plane is a line or not.	0	0 to 32767														

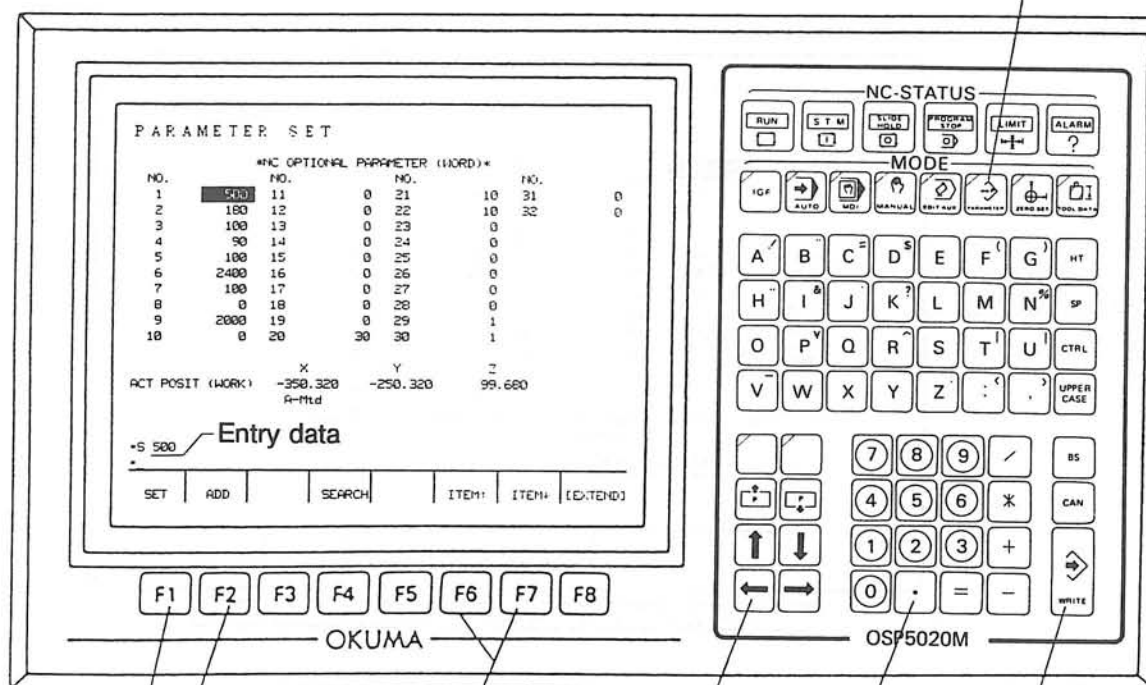
Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data, then turn it on again.

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
61	Synchronized tapping torque monitor Spindle speed (A)	Synchronized tapping torque monitoring starts in the following manner (1) Spindle overload is ignored until the spindle speed reaches A% of the S command value. (2) When the spindle speed reaches A% of the S command value, torque monitoring starts after duration "t" (100 msec) to wait the spindle speed to be constant.	0%	1 to 100
62	Synchronized tapping torque monitor Waiting time (t)	T: Spindle overload is ignored before the spindle speed does not become constant. t: Duration "t" (set by the parameter), the spindle overload is ignored. Spindle overload Motor current Monitoring torque value Spindle constant speed Time Spindle speed Spindle is recognized at the constant speed. S command value A% 100% Time	0 (×0.1sec)	1 to 1000

Data setting procedure is as follows:

(1) Press **PARAMETER**.



(6) Press **WRITE**.

(5) Key in data.

(3) Press the cursor keys.

(2) Press the function key [F6] or [F7] (**ITEM**).

(4) Press the function key either [F1] (**SET**) or [F2] (**ADD**).

- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (**ITEM**) more than once until the **NC OPTIONAL PARAMETER (WORD)** screen appears.
- (3) Using the cursor keys, position the cursor at the desired data.

Cursor

PARAMETER SET

NO.		*NC OPTIONAL PARAMETER (WORD)*			
		NO.		NO.	NO.
1	500	11	0	21	10 31 0
2	180	12	0	22	10 32 0
3	100	13	0	23	0
4	90	14	0	24	0
5	100	15	0	25	0
6	2400	16	0	26	0
7	100	17	0	27	0
8	0	18	0	28	0
9	2000	19	0	29	1
10	0	20	30	30	1

X	Y	Z
ACT POSIT (WORK) -350.320	-250.320	99.680
A-Mtd		

Entry data

*S 500

SET	ADD	SEARCH	ITEM+ ITEM- [EXTEND]
-----	-----	--------	----------------------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

Parameter No.

Setting:

When data is previously known:

- (4) Press the function key [F1] (SET).
- (5) Enter the data with key board.
- (6) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

When data has already been set and it is necessary to set the increment from the data:

- (4) Press the function key [F2] (ADD).
- (5) Enter the increment with key board.
- (6) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

3-9. NC Optional Parameter (Bit)

The NC optional parameter (bits) that follow are available.

Parameter No.	Bit No.	Contents			Set 1	Set 0	Factory Set Initial Value	
1	0	Sets Tape code				ISO	EIA	1
	1	Recognition tape code automatically				Does	Does not	1
	2	Carries out a tape TV check	Tape Code Setting	Automatic Tape Code Recognition	Operating Conditions	Does	Does not	0
	3	There is a tape delimiting code.	1	1	In "READ" and "VERIFY", tape code is automatically recognized irrespective of ISO/EIA. In "PUNCH", ISO is used.	ISO % EIA ER	Feed holes	0
	4	Verifies tape during reading	0	1	In "READ" and "VERIFY", tape code is automatically discriminated irrespective of ISO/EIA. In "PUNCH", EIA is used.	Does	Does not	0
	5	Rewinds tape without verifying after tape reading	1	0	In "READ" and "VERIFY", ISO code is used, and wrong tape code results in an error. In "PUNCH", ISO is used.	Does	Does not	0
	6	Handles special code (other than \$20-\$5F, HT) as an alarm.	0	0	In "READ" and "VERIFY", EIA code is used, and wrong tape code results in an error. In "PUNCH", EIA is used.	Does	Does not	1
	7	Does not store special code				Does	Does not	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
2	0	During automatic operation with the single block ON, a block of a control statement such as IF, GOTO or CALL usually does not come to a stop until the next block is executed. This bit is intended to select a stop or a non-stop in the particular control statement block.	Stop	Non-Stop	0
	1	In multiple rotary table rotation control, rounding processing of the actual value on the work coordinate system is carried out when the control is reset.	Does	Does not	0
	2	Makes the dry run effective even at rapid feed, and operates by the manually selected feedrate.	Effective	Ineffective	0
	3				
	4	Output of print function to external device is made effective.	Effective	Ineffective	0
	5	Cycle start after the mode has been switched from the automatic to setting is possible.	Possible	Impossible	0
	6	Makes fraction processing. Always set at "1".	Does	Does not	1
3	7	During automatic operation with the single block OFF, does not carry out reading or arithmetic operations for any of the blocks that follow the block in process until the operation is completed. Note, however, that during cutter radius compensation, reading and arithmetic operations are carried out until the intersecting point is found (for up to three blocks).	No buffering	Buffering	0
	0	Selects inches or mm for length unit system. *1	Inch	mm	0
	1	Selects 1 mm, 1 inch, 1 deg. and 1 sec for the input unit system.	Yes	As set by bit 2 to bit 5 and bit 7	1
	2	Selects 0.01 mm or 0.001 mm for length unit system.	0.01 mm	0.001 mm	0
	3	Selects either 0.1 mm/min and 0.01 inch/min or 1 mm/min and 0.1 inch/min for the speed input system.	0.1 mm/min 0.01 inch/min	1 mm/min 0.1 inch/min	0
	4	Selects either 0.001 mm/rev and 0.0001 inch/rev or 0.01 mm/rev and 0.001 inch/rev for the speed input system.	0.001 mm/rev 0.0001 inch/rev	0.01 mm/rev 0.001 inch/rev	0
	5	Selects 0.01 sec or 0.1 sec for the time input unit.	0.01 sec	0.1 sec	0
	6	Selects 1 mm, 1 inch, 1 deg. and 1 sec for the unit of the data with decimal point.	Yes	As set by bit 1 - bit 5 and bit 7	0
	7	Selects 0.001 sec or 0.1 sec for the time input system. *2	0.001 sec	0.1 sec	0

*1: Setting of bit 0 is effective only when the optional inch/metric switchable function is selected.

*2: Unit of input time always 0.01 sec when setting of bit 5 is "1".

NC optional parameter (bit)

Parameter No.	Bit No.	Contents		Set 1	Set 0	Factory Set Initial Value
4	0	Selects 0.001 deg or 0.0001 deg for angle unit system.		0.0001 deg	0.001 deg	0
	1	A system reset is followed by bubble memory loading and it takes 80 seconds or so for the NC to be normal. Then, the automatic operation mode is established. This bit is intended to make an automatic selection of the program selected before the system reset. (The same applies also when the power supply is turned on.)		Does	Does not	1
	2	In an NC reset, zeros the manual shift in manual interruption and the shift in pulse handle interruption (MANUAL SHIFT ACTUL/MANUAL SHIFT TOTAL).		Does	Does not, but as it is.	1
	3	Enables the program sequence number search after NC start.		Possible	Impossible	1
	4	Does not display the system subprogram (SSC, LIB) in automatic operation mode.		Does not	Does	0
	5					0
	6	Selects 4 × 4 as the character size for the enlarged display of the actual position data.		Does (4 × 4)	Does not (2 × 2 is selected)	0
	7	Displays position data on the remote position display unit in incremental values in reference to the position		Does	Does not	0
5	0	Input/output bit screen	In automatic, MDI or manual operation mode, if the check display is selected, these screens do not appear. That is, pressing the page key provides a display of screens whose bit is "0" but no display of screens whose bit is "1".	Does not display	Displays	0
	1	Specification bit screen		Does not display	Displays	0
	2	Axis data screen		Does not display	Displays	0
	3	NC/spindle diagnostic data screen		Does not display	Displays	0
	4	System & I/O variable screen		Does not display	Displays	0
	5	Index of diagnosis page is displayed by \$4000.		Display by \$4000	Display by \$20	0
	6	Actual position data (extended characters) is displayed in reference to the origin of local coordinate system.		From local coordinate system origin	From work coordinate system origin	0
	7	To produce the current value and graphic to be displayed, adds the shift in the manual intervention or pulse handle overlap.		Does	Does not	1

NC optional parameter (bit)

Parameter No.	Bit No.	Contents		Set 1	Set 0	Factory Set Initial Value
6	0	Enlarges/reduces the graph for the X-axis.		Does	Does not	0
	1	Enlarges/reduces the graph for the Y-axis.		Does	Does not	0
	2	Enlarges/reduces the graph for the Z-axis.		Does	Does not	0
	3	Enlarges/reduces the graph for the 4th-axis.		Does	Does not	0
	4	Enlarges/reduces the graph for the 5th-axis.		Does	Does not	0
	5	Enlarges/reduces the graph for the 6th-axis.		Does	Does not	0
	6	Displays the current position (enlarged) on the slanted coordinate system.		Does	Does not	0
	7	External simultaneous axis position display		There is	There is not	0
7	0	When the AXIS COM. CANCEL switch is turned ON, the axis commands whose bit is "1" are canceled and neither arithmetic operation nor ordinary operation is carried out.	Cancels the X-axis command	Does	Does not	0
	1		Cancels the Y-axis command	Does	Does not	0
	2		Cancels the Z-axis command	Does	Does not	1
	3		Cancels the 4th-axis command	Does	Does not	0
	4		Cancels the 5th-axis command	Does	Does not	0
	5		Cancels the 6th-axis command	Does	Does not	0
	6	Axis lock	All axis locked	Does	Does not all	0
	7		Axis lock ON/OFF	ON	OFF	0
8	*0	Stop bit of CN0: (RS232C)		1 bit	2 bit	0
	*1	Ready signal of CN0: (RS232C)		Internal READY	External READY	1
	*2	Parity check of CN0: (RS232C)		Checked	Not checked	0
	*3	Parity of CN0: (RS232C)		Even	Odd	0
	*4	8-bit JIS of CN0: (RS232C)		There is	There is not	0
	*5	DC code of CN0: (RSC232C)		There is	There is not	0
	*6	DC code control type 2 of CN0: (RS232C)		Executed	Not executed	0
	*7	File name present in reading operation at CN0: (RS232C) in DNC-A mode		Present	Not present	0

Parameters indicated by an asterisk (*) require turning off of power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
9	0	In data setting, unit system of length is either "inch" or "mm".	Inch	mm	0
	1	In data setting, setting unit is either minimum setting unit or 1 mm, 1 inch, 1 deg. and 1 sec.	1 mm, 1 inch, 1 deg, 1 sec	Minimum setting unit	1
	2	In data setting, unit system of length is either 0.1 μ m or 0.00001 inch.	Does	Does not	0
	3	In data setting, unit system of angle is either 0.001 deg. or 0.0001 deg.	0.0001 deg.	0.001 deg.	0
	4				0
	5	Operation mode(s) inoperative for edit lock specification when the EDIT LOCK (partly restricted) mode is selected.	Program edit, parameter setting	Program edit	0
	6	In the data setting, the decimal point indicates 1 mm, 1 inch, 1 deg. and 1 sec.	Basic unit	Bit 1 setting	0
	7	In the EDIT LOCK mode, the maximum increment for tool length upset and cutter radius compensation is 1 mm/0.1 inch.			0
10	0	Default of EBCDIC, for floppy disk of IBM format	Does	Does not	0
	1	Default of ASCII, for floppy disk of IBM format	Does	Does not	0
	2	End code (%) is available for floppy disk of IBM format.	Yes	No	0
	3	NC file name is not output at DNC punch output.	Not output	Output	0
	4	Verify output is made at DNC punch output.	Output	Not output	0
	*5	Selection of IBM format (standard IBM format and JIS specified IBM format)	JIS specified IBM format	Standard IBM format	0
	*6	Extension is used for file name in data input/output using floppy disk of IBM format	Not used (blank)	Used	0
	7	Tool length and tool radius compensation can be added maximum 1 mm/0.1 inch when PL mode is selected.	Can	Can not	0

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NC optional parameter (bit)					
Param- eter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
11	*0	Tape conversion function is executed. (OSP3000M level I , FS-9M level I / II)	Yes	No	0
	1				0
	2				0
	3	End of record code for NC program transmission (DNC-B, C)	LF	CR, LF	0
	4				0
	5	Designation of the parameter setting screen for coordinate system conversion	2nd screen	1st screen	0
	6	Gives a command for transmitting the coordinate system conversion value when the operation mode is switched to MANUAL.	Dose	Dose not	0
	7	Ignores the minimum value for the 0.1 μ m external position display.	Dose	Dose not (displays)	0
12	0	Spindle speed is programmed in S2-digit when tape conversion function is on.	2-digit comman d	4-digit comman d	0
	1	Spindle speed is programmed in S2-digit when tape conversion function is off.	2-digit comman d	4-digit comman d	0
	2	File name output for tape punch out	Not punched	Punched	0
	3	End of record code for tape punch operation in ISO code	LF	CR, LF	0
	4	Code used for tape feed for tape punch operation	Space	NULL	0
	5	Specifies whether tape feed portion is punched.	Punched	Not punched	0
	6	Communication link is reset by pressing NC reset button (DNC-C).	Reset	Not reset	0
	7				0

Parameters indicated by an asterisk (*) require turning off of power supply once after setting new data.
Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
13	*0	Stop bit of CN1: (RS232C)	1 bit	2 bit	0
	*1	Ready signal of CN1: (RS232C)	Internal READY	External READY	0
	*2	Parity check of CN1: (RS232C)	Checked	Not checked	0
	*3	Parity of CN1: (RS232C)	Even	Odd	0
	*4	8-bit JIS of CN1: (RS232C)	There is	There is not	0
	*5	DC code of CN1: (RS232C)	There is	There is not	0
	*6	DC code control type 2 of CN1: (RS232C)	Executed	Not executed	0
	*7	File name present in reading operation at CN1: (RS232C) in DNC-A mode	Present	Not present	0
14	*0	Stop bit of CN2: (RS232C)	1 bit	2 bit	0
	*1	Ready signal of CN2: (RS232C)	Internal READY	External READY	0
	*2	Parity check of CN2: (RS232C)	Checked	Not checked	0
	*3	Parity of CN2: (RS232C)	Even	Odd	0
	*4	8-bit JIS of CN2: (RS232C)	There is	There is not	0
	*5	DC code of CN2: (RS232C)	There is	There is not	0
	*6	DC code control type 2 of CN2: (RS232C)	Executed	Not executed	0
	*7	File name present in reading operation at CN2: (RS232C) in DNC-A mode	Present	Not present	0

Parameters indicated by an asterisk (*) require turning off of power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
15	0				0
	1				0
	2				0
	3				0
	4				0
	5	STM answer time over check function is made effective. Alarm 615 STM time over Optional parameter (word) No. 18	Effective	Ineffective	0
	6	In-position time over check function is made effective. Alarm 616 In-position monitoring time over Optional parameter (word) No. 19	Effective	Ineffective	0
	7	In the inch system, the unit system for an F command used for a rotary axis can be selected.	25.4 deg/min	1 deg/min	0
16	0				0
	1				0
	2				0
	3				0
	4				0
	5	Type A buffer operation in the DNC-B mode	Type A	Type B (large capacity)	0
	6	Displays the common variable setting screen with the comment.	Does	Does not	0
	7	Displays and enables the setting of: system parameter, pitch error compensation, machine system parameter (word), machine system parameter (long word) and No. 33 and following Nos. in the NC optional parameter (word); and No. 17 and trailing Nos. in the NC optional parameter (bit).	Setting OK	Setting NG	0

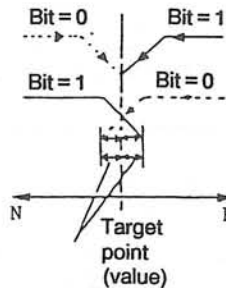
NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value														
17	0	Fixes the cycle axis for a fixed cycle, which may be any axis other than plane designation, at the Z-axis.	Does	Does not	0														
	1	<table><tr><td>Bit 1</td><td>0</td><td>0</td><td>1</td><td>1</td></tr><tr><td>Bit 2</td><td>0</td><td>1</td><td>0</td><td>1</td></tr><tr><td>Shift direction</td><td>P-X</td><td>N-X</td><td>P-Y</td><td>N-Y</td></tr></table> Specifies the shift direction and axis in a fixed cycle (G76, G87). This is effective only when bit 0 is "1".	Bit 1	0	0	1	1	Bit 2	0	1	0	1	Shift direction	P-X	N-X	P-Y	N-Y		0
	Bit 1		0	0	1	1													
	Bit 2		0	1	0	1													
	Shift direction	P-X	N-X	P-Y	N-Y														
	2	0																	
	3	At a reset, clears the mirror images for all axes, providing normal conditions.	Does	Does not	0														
	4				0														
	5	External program selection is executed for main program or schedule program.	Schedule program	Main program	0														
	6	In external program selection operation, the selection of the same file name is not executed.	Does not	Does	0														
	7	Specifies which tapping cycle the G codes (G74, G84) call, conventional tapping cycle or synchronized	Synchronized tapping cycle	Conventional tapping cycle	0														
18	0	Specifies the G code to be set automatically when the power supply is turned on.	G00	G01	1														
	1		G18	G17	0														
	2		G19	G17	0														
	3		G56	G53	0														
	4		G91	G90	0														
	5		G95	G94	0														
	6		G22	G23	0														
		7				0													

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
19	0	X-axis	N direction	P direction	0
	1	Y-axis	Same as above	Same as above	0
	2	Z-axis	Same as above	Same as above	1
	3	4th axis	Same as above	Same as above	0
	4	5th axis	Same as above	Same as above	0
	5	6th axis	Same as above	Same as above	0
	6	DNC communication ON/OFF	ON	OFF	0
	7	DNC buffer operation ON/OFF	ON	OFF	0

One-directional positioning at a target point is carried out after an overrun is made against that point. It is possible to determine the final positioning direction on an axis base. In other words, once the N-direction is established, N-directional positioning does not involve an overrun; but P-directional positioning involves an overrun before actual positioning. If the P-direction is established, the relationship is reversed.



(This excess travel is set by a user parameter.)

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
20	0	Gives D.STA transmission request in the simple DNC (DNC-C) mode	Does	Does not	0
	1	For single-axis command, actual position or a point on the arc is taken as the command value for the axis not programmed.	Any point on arc	Actual position	0
	2	Z-axis moves to the upward limit position when alarm B occurs.	Yes	No	0
	3	Message code in the simple DNC (DNC-C) mode	ASCII	ISO	0
	4	End code in the simple DNC (DNC-C) mode	ETX	CR	0
	5	Delimiter code in the simple DNC (DNC-C) mode	NUL	%	0
	6	Designates the file extension in host computer in the simple DNC (DNC-C) mode	Does	Does not	0
	7	Protocol selection in the DNC-B mode	Protocol B	Protocol A	0
21	*0	Stop bit of CN3: (RS232C)	1 bit	2 bit	0
	*1	Ready signal of CN3: (RS232C)	Internal READY	External READY	0
	*2	Parity check of CN3: (RS232C)	Checked	Not checked	0
	*3	Parity of CN3: (RS232C)	Even	Odd	0
	*4	8-bit JIS of CN3: (RS232C)	There is	There is not	0
	*5	DC code of CN3: (RS232C)	There is	There is not	0
	*6	DC control type 2 of CN3: (RS232C)	Executed	Not executed	0
	*7	File name present in reading operation at CN3: (RS232C) in DNC-A mode	Present	Not present	0

Parameters indicated by an asterisk (*) require turning off of power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
22	*0	Stop bit of CN4: (RS232C)	1 bit	2 bit	0
	*1	Ready signal of CN4: (RS232C)	Internal READY	External READY	0
	*2	Parity check of CN4: (RS232C)	Checked	Not checked	0
	*3	Parity of CN4: (RS232C)	Even	Odd	0
	*4	8-bit JIS of CN4: (RS232C)	There is	There is not	0
	*5	DC code of CN4: (RS232C)	There is	There is not	0
	*6	DC control type 2 of CN4: (RS232C)	Executed	Not executed	0
	*7	File name present in reading operation at CN4: (RS232C) in DNC-A mode	Present	Not present	0
23	0	No. 1	Parameter	Override switch	0
	1	No. 2	Parameter	Override switch	0
	2	No. 3	Parameter	Override switch	0
	3	No. 4	Parameter	Override switch	0
	4	No. 5	Parameter	Override switch	0
	5	No. 6	Parameter	Override switch	0
	6	No. 7	Parameter	Override switch	0
	7	No. 8	Parameter	Override switch	0

Parameters indicated by an asterisk (*) require turning off of power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
24	0	No. 9	Parameter	Override switch	0
	1	No. 10	Parameter	Override switch	0
	2	No. 11	Parameter	Override switch	0
	3	No. 12	Parameter	Override switch	0
	4	No. 13	Parameter	Override switch	0
	5	No. 14	Parameter	Override switch	0
	6	No. 15	Parameter	Override switch	0
	7	No. 16	Parameter	Override switch	0
25	0	No. 17	Parameter	Override switch	0
	1	No. 18	Parameter	Override switch	0
	2	No. 19	Parameter	Override switch	0
	3	No. 20	Parameter	Override switch	0
	4	No. 21	Parameter	Override switch	0
	5	No. 22	Parameter	Override switch	0
	6	No. 23	Parameter	Override switch	0
	7	No. 24	Parameter	Override switch	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
26	0	No. 25	Parameter	Override switch	0
	1	No. 26	Parameter	Override switch	0
	2	No. 27	Parameter	Override switch	0
	3	No. 28	Parameter	Override switch	0
	4	No. 29	Parameter	Override switch	0
	5	No. 30	Parameter	Override switch	0
	6	No. 31	Parameter	Override switch	0
	7	No. 32	Parameter	Override switch	0
In the positioning at the home position, its rapid feedrate is controlled either by setting of override switch or setting value for NC optional parameter (word) No. 12. Setting is possible from No. 1 to No. 32. No. 1 corresponds to home position number 1.					
27	0	Specifies the EIA code which represents “=”. Conditions of the hole, punched or not punched, when the key to be used for punching the symbol “=” is pressed are set in terms of the bit data. Same for following setting.	Punched	Not punched	0
	1		Punched	Not punched	0
	2		Punched	Not punched	0
	3		Punched	Not punched	0
	4		Punched	Not punched	0
	5		Punched	Not punched	0
	6		Punched	Not punched	0
	7		Punched	Not punched	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
28	0	Specifies the EIA code which represents “*”.	Punched	Not punched	0
	1		Punched	Not punched	0
	2		Punched	Not punched	0
	3		Punched	Not punched	0
	4		Punched	Not punched	0
	5		Punched	Not punched	0
	6		Punched	Not punched	0
	7		Punched	Not punched	0
29	0	Specifies the EIA code which represents “[”.	Punched	Not punched	0
	1		Punched	Not punched	0
	2		Punched	Not punched	0
	3		Punched	Not punched	0
	4		Punched	Not punched	0
	5		Punched	Not punched	0
	6		Punched	Not punched	0
	7		Punched	Not punched	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
30	0	Specifies the EIA code which represents "]".	Punched	Not punched	0
	1		Punched	Not punched	0
	2		Punched	Not punched	0
	3		Punched	Not punched	0
	4		Punched	Not punched	0
	5		Punched	Not punched	0
	6		Punched	Not punched	0
	7		Punched	Not punched	0
31	0	Specifies the EIA code which represents "\$".	Punched	Not punched	0
	1		Punched	Not punched	0
	2		Punched	Not punched	0
	3		Punched	Not punched	0
	4		Punched	Not punched	0
	5		Punched	Not punched	0
	6		Punched	Not punched	0
	7		Punched	Not punched	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
32	0	Setting of machine parameter data is enabled when debugging	Enabled	Not enabled	0
	1				0
	2				0
	3				0
	4				0
	5				0
	6	NC output is performed during box check.	Output	Not output	0
	7	Carries out box check.	Does	Does not	0
	0	Graphic coordinate system is made effective when NC is reset.	Effective	Ineffective	0
33	1	Backup function is effective when M02 or M30 is executed.	Effective	Ineffective	0
	2	The mirror image function is effective in the slanted coordinate system ("0" is set at No. 34, bit 2)	Effective	Follow No. 34, bit 2	0
	3	Counting of counters (work counter, NC running counter, spindle rotation counter, cutting time counter) occurs only in auto mode.	Only AUTO mode	All modes	0
	4				0
	5				0
	6	The Z-axis automatic retract function is effective when a B-axis rotation command is given	Effective	Ineffective	0
	7	Gathering minute blocks when interpreting a program	Effective	Ineffective	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
34	0	Single block stop at point R level in the fixed cycle is effective.	Effective	Ineffective	0
	*1	Communication with MOP	Not made	Made	0
	*2	Mirror image effective in	Work coordinate system	Local coordinate system or slanted coordinate system	0
	3	System G code macros 300 - 349 are MODIN type.	MODIN	CALL	0
	*4	System variable VINCH is made write enabled.	READ/WR ITE enabled	Only READ enabled	0
	5	Splash guard interlock is effective.	Effective	Ineffective	0
	*6	To set whether the calculation results of the function (ROUND, FIX, FUP) are to convert numerical data into an integer with or without a decimal point when setting it for an address character.	With decimal point	Integer	0
	7	Space for attachment rotation offset	U-/V-/W-axis	X-/Y-/Z-axis	0
35	0	EC-P check on diagnosis screen	Effective	Ineffective	0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
36	0	The unit of variables assigned to MSB is set at 0.001 mm (0.0001 inches) when bit 0 and bit 6 of NC optional parameter (bit) No. 3 are "0" and "1", respectively.	0.001 mm (0.0001 in.)	1 mm (1 in.)	0
	1	Uni-direction automatic gauging with touch probe	Does	Does not	0
	2	Automatic gauging and automatic tool length offset/broken tool detection with ring sensor	Does	Does not	0
	3	Default of the maximum tool length for automatic tool length offset/broken tool detection	Effective	Ineffective	0
	4				0
	5				0
	6				0
	7				0
37	0	Synchronized operation; synchronized error compensation mode input	ON	OFF	0
	1	Synchronized operation; synchronized position shift amount setting	Possible	Impossible	0
	2	Semi-synchronized operation in the DNC-B mode	Effective	Ineffective	0
	3	Plane on which 3-D arc is projected is fixed using G17, G18, or G19.	Effective	Ineffective	0
	4	In the rapid feed mode operation, the command causing overtravel causes an alarm	Yes	No	0
	5	Selection of PQR command method for 3-D arc	Normal vector	Position	0
	6	With PPC P selection, the workpiece number is taken as the file name.	Yes	No	0
	7	Pitch error compensation ineffective (laser measurement mode) (in 0.1 μ m control specification)	Ineffective	Effective	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
38	0	Stop bit of MOP-TOOL	1 bit	2 bit	0
	1	Read signal of MOP-TOOL	Internal READY	External READY	0
	2	Parity check of MOP-TOOL	Checked	Not checked	0
	3	Parity of MOP-TOOL	Even	Odd	0
	4				0
	5				0
	6				0
	7	Communication device of MOP-TOOL (RS232L)			0
39	0	Interrupt effective command (EIN)	Ineffective	Effective	0
	1	Interrupt signal	Status trigger	Edge trigger	0
	2	Execution of the interrupt program	End of block	Interrupting block	0
	*3	A-axis multi-turn function is made effective.	Effective	Ineffective	0
	*4	B-axis multi-turn function is made effective.	Effective	Ineffective	0
	*5	C-axis multi-turn function is made effective.	Effective	Ineffective	0
	6	Animated graphic display	Not supported	Supported	0
	7				0
40	0	Designation of master or slave station for CN0: RS232C 1F channel	Slave station	Master station	0
	1	Designation of master or slave station for CN1: RS232C 1F channel	Slave station	Master station	0
	2	Designation of master or slave station for CN2: RS232C 1F channel	Slave station	Master station	0
	3	Designation of master or slave station for CN3: RS232C 1F channel	Slave station	Master station	0
	4	Designation of master or slave station for CN4: RS232C 1F channel	Slave station	Master	0
	5				0
	6				0
	7				0

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data. Turn it back on.

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
43	0	↑ DNC-B method, protocol A Data at 41st to 44th byte of SAT and SET command bit 0			0
	1	Data at 41st to 44th byte of SAT and SET command bit 1			0
	2	Data at 41st to 44th byte of SAT and SET command bit 2			0
	3	Data at 41st to 44th byte of SAT and SET command bit 3			0
	4	Data at 41st to 44th byte of SAT and SET command bit 4			0
	5	Data at 41st to 44th byte of SAT and SET command bit 5			0
	6	Data at 41st to 44th byte of SAT and SET command bit 6			0
	7	Data at 41st to 44th byte of SAT and SET command bit 7			0
44	0	Data at 41st to 44th byte of SAT and SET command bit 8			0
	1	Data at 41st to 44th byte of SAT and SET command bit 9			0
	2	Data at 41st to 44th byte of SAT and SET command bit 10			0
	3	Data at 41st to 44th byte of SAT and SET command bit 11			0
	4	Data at 41st to 44th byte of SAT and SET command bit 12			0
	5	Data at 41st to 44th byte of SAT and SET command bit 13			0
	6	Data at 41st to 44th byte of SAT and SET command bit 14			0
	7	↓ Data at 41st to 44th byte of SAT and SET command bit 15			0
46	0	G00 linear interpolation positioning is carried out.	Yes	No	0
	1	G60 linear interpolation positioning is carried out.	Yes	No	0
	2	G30 linear interpolation positioning is carried out.	Yes	No	0
	3	M6, M60 linear interpolation positioning is carried out.	Yes	No	0
	4	Level B alarm occurs if a positioning point exceeds the travel limit.	Effective	Ineffective	0
	5	The centers of ID and OD are gauged at three points in manual gauging operation.	Yes	No	0
	6	Auto-cycle/single is effective at the start of interactive work gauging operation.	Auto/single effective	Auto effective	0
	7	Automatic zero point setting is carried out in interactive work gauging operation.	Carried out	Not carried out	0

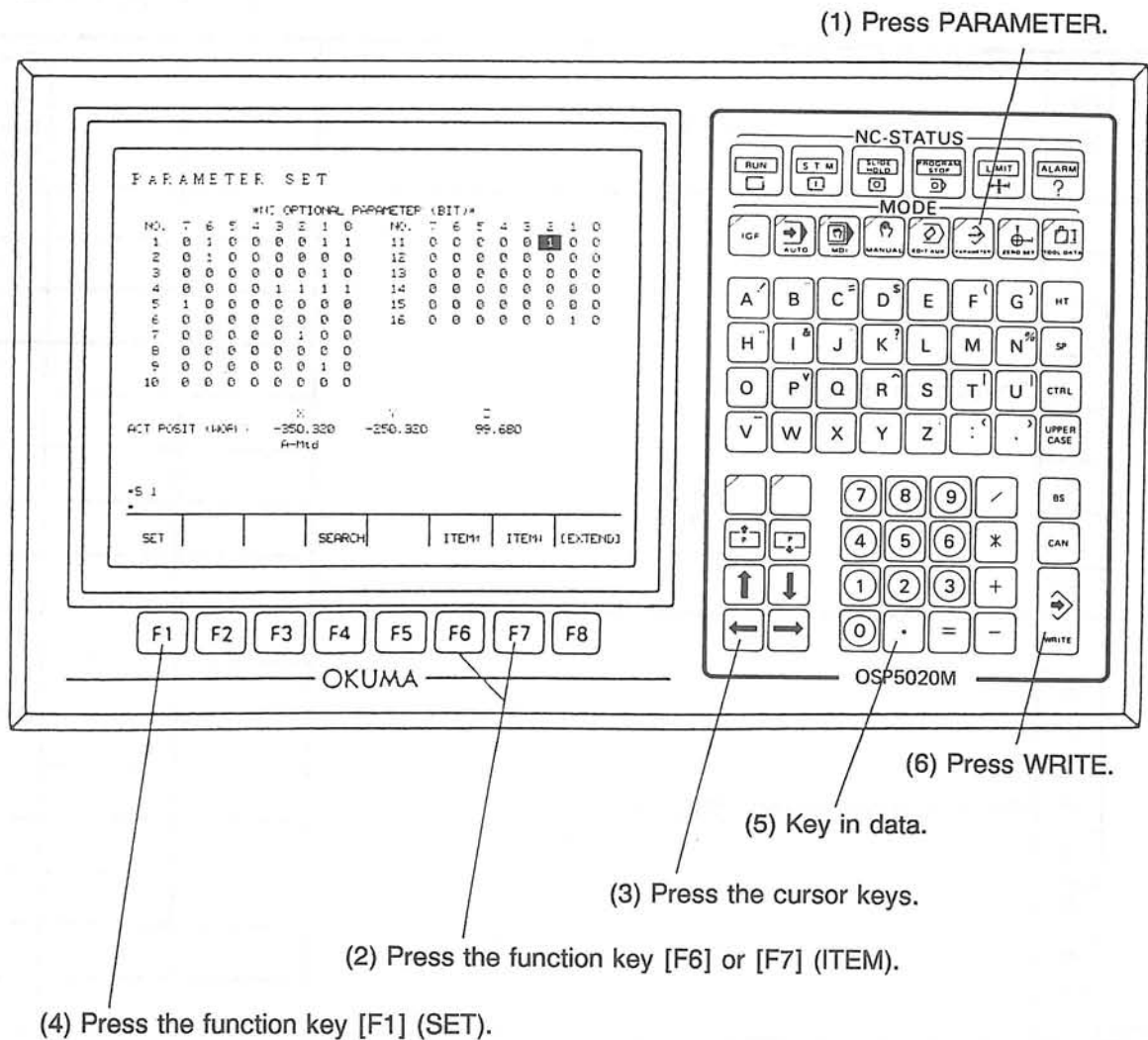
NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
47	0				0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7	Executes FS-9M tape conversion operation	Does	Does not	0
48	0				0
	1	Coordinate system in which tool length offset is carried out in 3-D coordinate system conversion	Slanted coordinate system	Work coordinate system	0
	2				0
	3				0
	4				0
	5				0
	6	Selection of method for synchronized tapping torque monitoring			0
	7				0
49	0	Specifies the EIA code which represents "#".			0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
50	0	Specifies an irregular code.			0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0
51	0	Specifies a regular code (ISO code).			0
	1				0
	2				0
	3				0
	4				0
	5				0
	6				0
	7				0
54	0	Additional axis selection in the upper surface detection mode for fixed cycle LE command	Additional axis	Basic axis	0
	1	Shifts by the manual interruption shift amount in the broken tool detection mode for fixed cycle LP command	Does	Does not	0
	2				0
	3				0
	4				0
	5				0
	6	Multiplying factor of the pulse generator multiplied by 10 when the 0.0001° rotary axis specification is selected. X1→X10 X10→X100 X50→X500	Does	Does not	0
	7	Selects axis configuration for the multi-turn rotary table from the rotary axis parameter or from the settings at NC optional parameter (bit) No. 39, bits 3, 4, and 5.	Rotary axis parameter	No. 39, bit 3, 4, or 5	0

Data setting procedure is as follows:



- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.
- (3) Position the cursor at the desired data.

PARAMETER SET

INC. OPTIONAL PARAMETER (BIT)

NO.	7	6	5	4	3	2	1	0	NO.	7	6	5	4	3	2	1	0
1	0	1	0	0	0	0	1	1	11	0	0	0	0	0	1	0	0
2	0	1	0	0	0	0	0	0	12	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	1	0	13	0	0	0	0	0	0	0	0
4	0	0	0	0	1	1	1	1	14	0	0	0	0	0	0	0	0
5	1	0	0	0	0	0	0	0	15	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	16	0	0	0	0	0	0	1	0
7	0	0	0	0	0	1	0	0									
8	0	0	0	0	0	0	0	0									
9	0	0	0	0	0	0	1	0									
10	0	0	0	0	0	0	0	0									

ACT POSIT (WORK) X Y Z
 -350.320 -250.320 99.680
 A-Mtd

#S 1
 #

SET			SEARCH	ITEM1	ITEM1	[EXTEND]
-----	--	--	--------	-------	-------	----------

F1 F2 F3 F4 F5 F6 F7 F8

Cursor

Parameter No.

Entry data

(4) Press the function key [F1] (SET).

(5) Enter the data with keyboard.

The entry of any number other than 0 and 1 or any character will result in an error.

(6) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

3-10. Unit Systems for Programming

The unit systems set by NC optional parameter (bit) No. 3, bit 0 through bit 7, and No. 9, bit 0 and bit 1, can be confirmed on the display.

From this page, it is possible to set the unit system.

Note that the unit systems of length, angle, feedrate (mm/min), feedrate (mm/rev) and time are determined by the combination of bit data, changing the unit systems from this page might unexpectedly change other unit systems.

The setting for REAL NUMBER (Y/N) is related with the setting for bit 6 of NC optional parameter (bit) No. 3 and No. 9.

If the change of the unit systems is required, change them using the NC optional parameter (bit) No.3.

PARAMETER SET

* INPUT UNIT SYSTEM *

PART PROGRAM UNIT	DATA SET UNIT
METRIC/INCH (M/I) = M	METRIC/INCH (M/I) = M
REAL NUMBER (Y/N) = N	REAL NUMBER (Y/N) = N
LENGTH (mm) = 1.000	LENGTH (mm) = 1.000
ANGLE (°) = 1.000	ANGLE (°) = 1.0000
FEEDRATE (mm/min) = 1.000	
FEEDRATE (mm/rev) = 1.000	
DWEL TIME (sec) = 1.000	

	X	Y	Z
ACT POSIT (WORK)	-350.320	-250.320	99.600
	A-Mtd		

*S I

SET		SEARCH	ITEM↑	ITEM↓	[EXTEND]
-----	--	--------	-------	-------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

Optional parameter (bit)														
No. 4	No. 3								Length (mm)	Angle (°)	Speed (mm/min)	Speed (mm/rev)	Time (sec)	
	0	7	6	5	4	3	2	1						0
0	*	*	*	*	*	*	*	1	0	1	1	1	1	
0	0	*	0	0	0	0	0	0	0	0.001	0.001	1	0.01	0.1
0	0	*	0	0	0	0	1	0	0	0.01	0.001	1	0.01	0.1
0	0	*	0	0	0	1	0	0	0	0.001	0.001	0.1	0.01	0.1
0	0	*	0	1	0	0	0	0	0	0.001	0.001	1	0.001	0.1
0	*	*	1	0	0	0	0	0	0	0.001	0.001	1	0.01	0.01
0	1	*	0	0	0	0	0	0	0	0.001	0.001	1	0.01	0.001
1	0	*	0	0	0	0	0	0	0	0.001	0.0001	1	0.01	0.1

3-11. Machine System Paramter (Long Word)

The machine system parameter (long word) consists of the setting items that follow.

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
1	CARRIER OFFST CA	Output value of the absolute position encoder at the carrier's CA position	SET ADD CAL	Depends on machine specification.	0 to 99999999	0.001 mm (0.00004 in.)
2	CARRIER OFFST CH	Output value of the absolute position encoder at the carrier's CH position	Same as above	Same as above	-99999999 to 99999999	0.001 mm (0.00004 in.)
3	CARRIER OFFST CV	Output value of the absolute position encoder at the carrier's CV position	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
4	CARRIER OFFST CS	Output value of the absolute position encoder at the carrier's CS position	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
5	CARRIER OFFST CD	Output value of the absolute position encoder at the carrier's CD position	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
7	CARRIER P LIMIT	Carrier's P-directional travel end limit	Same as above	Depends on machine specification	-99999999 to 99999999	0.001 mm (0.00004 in.)
8	CARRIER N LIMIT	Carrier's N-directional travel end limit	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
9	MAGAZINE OFFST 1	Output value of the absolute position encoder in the T1 which serves as the origin of the 1st magazine	Same as above	Same as above	Depends on machine specification.	1 part
10	MAGAZINE OFFST 2		Same as above	0	Same as above	1 part
11	MAGAZINE OFFST 3		Same as above	0	Same as above	1 part

Machine system parameter (long word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
12	AAC MAG OFFST	Output value of the absolute position encoder at the AAC magazine's zero position	SET ADD CAL	Depends on machine specification.	Depends on machine specification	1 part
13	SWIVEL HEAD OFFST	Output value of the absolute position encoder at the attachment's forward position	Same as above	Same as above	Same as above	1 part
14						
15	AT AIR Z-P LIMIT	Z-axis position in the positive direction for air blow range of attachment joint	SET ADD CAL	Depends on machine specification.	-99999999 to 99999999	0.001 mm (0.00004 in.)
16	AT AIR Z-N LIMIT	Z-axis position in the negative direction for air blow range of attachment joint	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
17	AT SWIVEL Z-P LIMIT	Z-axis position in the positive direction for attachment swivel range	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
18	AT SWIVEL Z-N LIMIT	Z-axis position in the negative direction for attachment swivel range	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
19	AT IN POSITION	In position width for manual attachment indexing	SET ADD	Same as above	0 to 999	1 part
20	AT BACKLASH	Backlash compensation amount for attachment indexing	Same as above	Same as above	-999 to 999	1 part
21	CROSSRAIL ZERO	Numeric value from absolute position encoder at zero for automatic crossrail positioning	SET ADD CAL	Same as above	0 to 99999999	0.001 mm (0.00004 in.)

Machine system parameter (long word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
22	CROSS OFFST1	Relative position of M85 (M199) from zero of automatic crossrail positioning	SET ADD CAL	Depends on machine specification.	-99999999 to 99999999	0.001 mm (0.00004 in.)
23	CROSS OFFST 2	Relative position of M84 (M198) from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
24	CROSS OFFST 3	Relative position of M83 (M197) from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
25	CROSS OFFST 4	Relative position of M82 (M196) from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
26	CROSS OFFST 5	Relative position of M81 (M195) from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
27	CROSS OFFST 6	Relative position of M194 from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
28	CROSS OFFST 7	Relative position of M193 from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
29	CROSS OFFST 8	Relative position of M192 from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
30	CROSS OFFST 9	Relative position of M191 from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
31	CROSS OFFST 10	Relative position of M190 from zero of automatic crossrail positioning	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)

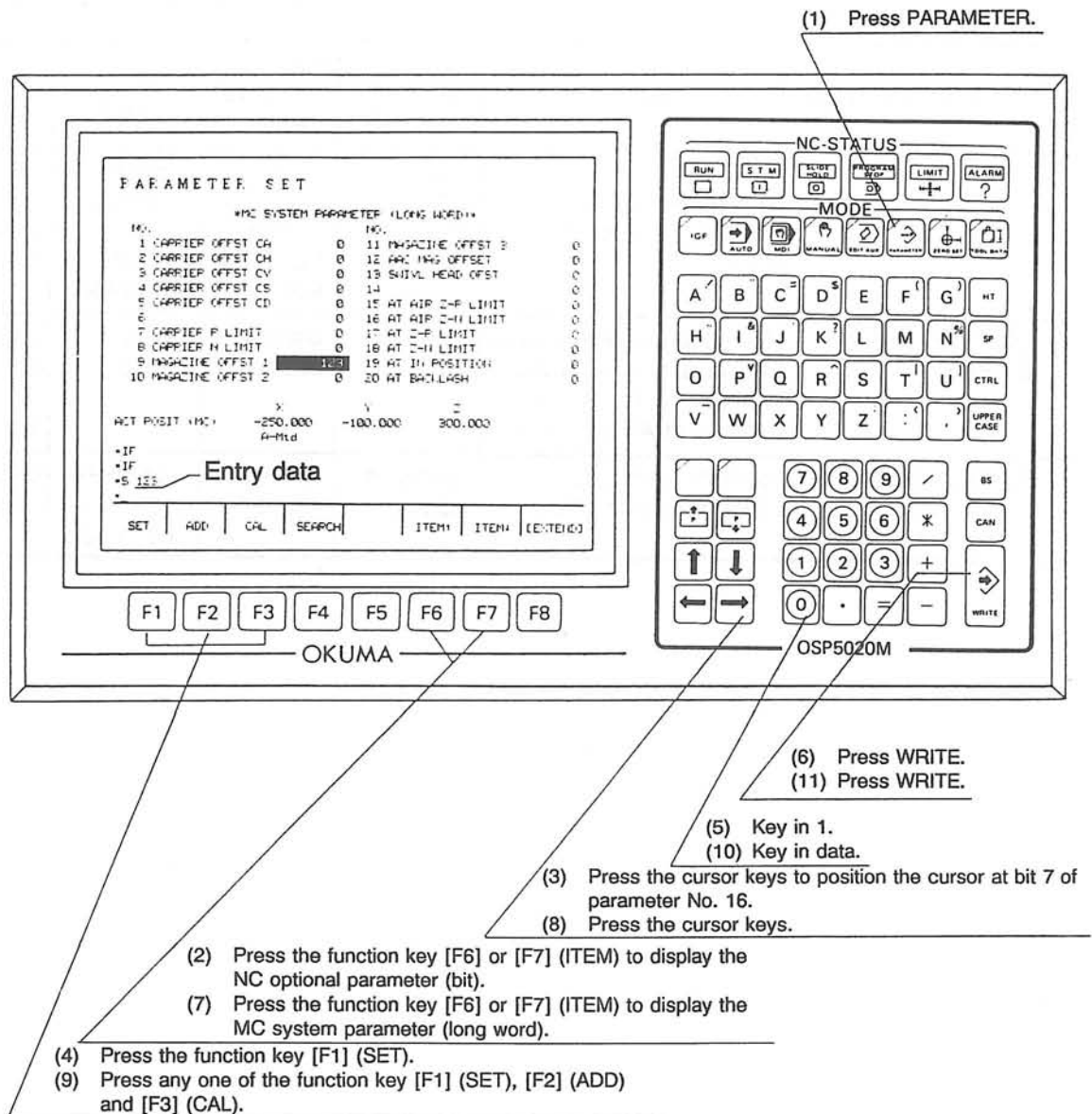
Machine system parameter (long word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
32	CROSS SEC.LIMIT P		SET ADD CAL	Depends on machine specification	Depends on machine specification	0.001 mm (0.00004 in.)
33	CROSS SEC.LIMIT N		Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
34						
35						
36	PALLET MAGAZINE OFFSET	Output value of the absolute position encoder at the APC pallet magazine's zero position	SET ADD CAL	Depends on machine specification	Depends on machine specification	1 part
37						
38						
39						
40						
41	SHIFTER ORIGIN	Standby position of APC shifter	SET ADD CAL	Depends on machine specification	0 to shifter APAMAX	0.001 mm (0.00004 in.)
42	SHIFTER P LIMIT	Travel end limit of APC shifter in the positive direction	Same as above	Same as above	- shifter APAMAX to + shifter APAMAX	0.001 mm (0.00004 in.)
43	SHIFTER N LIMIT	Travel end limit of APC shifter in the negative direction	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)

Machine system parameter (long word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
44	APC LIMIT	APC shifter position which allows axis movement of X and B axes.	SET ADD CAL	Depends on machine Specification	– Shifter APAMAX to + Shifter APAMAX	0.001 mm (0.00004 in.)
45	SHIFTER HP CHECK	Mid-stop position of APC shifter advancing motion when X, Z and B axes are not at APC position	Same as above	Same as above	Same as above	0.001 mm (0.00004 in.)
48	SPINDL INDEX POS	Spindle index offset (high-precision VAC)	Same as above	Same as above	–359.999 to +359.999	0.001 deg.

Setting procedure is as follows:



- (1) Press the **PARAMETER** key.
- (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.
- (3) Press the cursor keys to position the cursor at bit 7 of parameter No. 16.
- (4) Press the function key [F1] (set) and key in 1.
- (5) Press the **WRITE** key.

Parameter No. 17 and following data are displayed on the CRT.

This enables the setting of the MC system parameter (long word).

PARAMETER SET

MC SYSTEM PARAMETER (LONG WORD)

NO.		NO.	
1	CARRIER OFFST CA	0	11 MAGAZINE OFFST 3
2	CARRIER OFFST CH	0	12 AAC MAG OFFSET
3	CARRIER OFFST CV	0	13 SWIVL HEAD OFST
4	CARRIER OFFST CS	0	14
5	CARRIER OFFST CD	0	15 AT AIR Z-P LIMIT
6		0	16 AT AIR Z-N LIMIT
7	CARRIER P LIMIT	0	17 AT Z-P LIMIT
8	CARRIER N LIMIT	0	18 AT Z-N LIMIT
9	MAGAZINE OFFST 1	123	19 AT IN POSITION
10	MAGAZINE OFFST 2	0	20 AT BACKLASH

ACT POSIT (MC)	X	Y	Z
	-250.000	-100.000	300.000
	A-Mtd		

*IF
*IF
*S 123

Entry data

SET	ADD	CAL	SEARCH		ITEM+	ITEM-	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F 1
F 2
F 3
F 4
F 5
F 6
F 7
F 8

(6) Press the function key [F6] or [F7] (ITEM) until the MC SYSTEM PARAMETER (LONG WORD) screen appears.

(7) Using the cursor keys, position the cursor at the desired position.

Setting:

(a) When data is previously known

(8) Press the function key [F1] (SET).

(9) Enter the data with keyboard.

(b) When data has already been set and it is necessary to set the increment against the data

(8) Press the function key [F2] (ADD)

(9) Enter the increment with keyboard.

(c) When new setting is made at the position relative to the current value

(8) Press the function key [F3] (CAL).

(9) Enter the relative value with keyboard.

(10) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

3-12. Machine System Parameter (Word)

The MC system parameter (word) includes the setting items that follow.

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
1	ATC SEQUENCE NO.	Operation sequence number of the ATC	SET	Depends on machine specification.	The range of ATC operation Sequence number	
2	APC SEQUENCE NO.	Operation sequence number of the APC	Same as above	Same as above	The range of APC operation sequence number	
3	AAC(F) SEQUENCE NO.	Operation sequence number of the AAC (floor type)	Same as above	Same as above	The range of AAC operation sequence number	
4	AAC(T) SEQUENCE NO.	Operation sequence number of the AAC (table type)	Same as above	Same as above	Same as above	
5	TA ARM A,B MODE	The ATC change arm, because of its mechanism, does not rotate only in one direction, but alternately changes its direction between right and left. Either mode is specified by this parameter.	Same as above	Same as above	1 or 2	
6	PALLET A,B MODE	APC pallet operation mode A, B (A = 1 B = 2)	Same as above	Same as above	Same as above	
7	PLUG TOOL (AAC-F)	Set the T number of the plug tool (floor type).	Same as above	Same as above	0 to 999	
8	PLUG TOOL (AAC-T)	Set the T number of the plug tool (table type).	Same as above	Same as above	Same as above	
9	LTC SEQ NO.	Operation sequence number of the LTC (long tool change unit)	Same as above	Same as above	The range of LTC operation sequence number	

Machine system parameter (word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
10	AT SEQ NO.	Operation sequence number for swivel head or attachment	SET	Depends on machine specification.	0 to 10	
11	AAC(C) SEQ NO.	Operation sequence number for AAC operations (column type)	Same as above	Same as above	The range of AAC operation sequence number	
12						
13						
21	SPDL ORIENT OFST	In the execution of M06 or M19 which orients the spindle, this parameter specifies how many pulses there are from the orientation position to the spindle pulse's marker position.	SET ADD CAL	Depends on machine specification.	-4095 to 4095	1 pulse
22	ORIENT V2 SPEED	This parameter specifies spindle speed for beginning spindle orientation.	SET ADD	Same as above	0 to 200	1 rpm
23	ORIENT DECEL POS	This parameter specifies the point at which deceleration begins in spindle orientation in terms of the number of parts prior to the spindle orientation position.	Same as above	Same as above	0 to 4095	1 part
24	ORIENT V3 DA	This parameter specifies the creep speed (speed after deceleration) for spindle orientation.	Same as above	Same as above	0 to 100	1 bit
25	ORIENT INP VAL	This parameter specifies the in-position confirmation position for spindle orientation in terms of the number of parts prior to the spindle orientation position.	Same as above	Same as above	0 to 100	1 part
26						

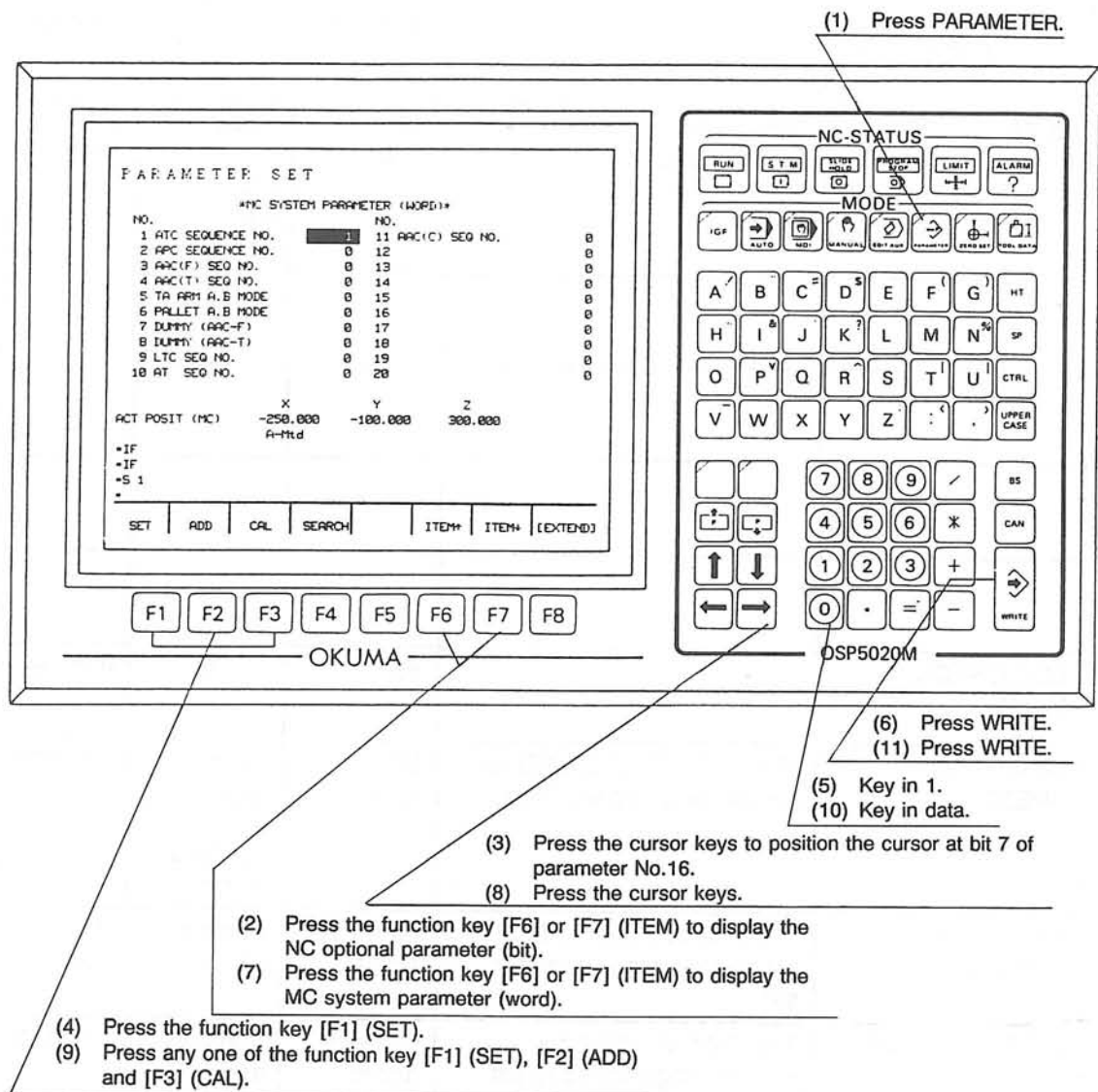
Machine system parameter (word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
27	SPINDLE OSCIL DA	This spindle will oscillate in gear change. DA output in this oscillation is set by this parameter. DA voltage = [(parameter setting)/16383]*10V	SET	100	0 to 16383	—
28	OSCILLATE FREQCY	In spindle oscillation, there is an output to the gear shifting solenoid and the motor is oscillated after a period of time, which is set by this parameter.	SET ADD	100	0 to 500	10 sec
29	OSCILLATE PERIOD	In spindle oscillation, the motor repeats CW and CCW movements, the time for which is set by this parameter.	Same as above	500	0 to 500	Same as above
30	AAC COUNTER		Same as above	Depends on machine specification.	1 to 4	—
31	ACCEL/DECEL 1G	This parameter specifies the acceleration/deceleration constant for the first spindle speed range.	SET ADD	Same as above	0 to 16383	—
32	ACCEL/DECEL 2G	This parameter specifies the acceleration/deceleration constant for the second spindle speed range.	Same as above	Same as above	Same as above	—
33	ACCEL/DECEL 3G	This parameter specifies the acceleration/deceleration constant for the third spindle speed range.	Same as above	Same as above	Same as above	—
34	ACCEL/DECEL 4G	This parameter specifies the acceleration/deceleration constant for the fourth spindle speed range.	Same as above	Same as above	Same as above	—

Machine system parameter (word)

Parameter No.	CRT Display Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
35	ACCEL/DECEL COEFF	This parameter specifies the spindle rotation acceleration/deceleration factor.	SET ADD	Depends on machine specification.	0 to 65535	—
36						
37						
38						
39						
40	BOX CHECK MODE		SET	0	0 to 15	—
41	ORIENT V2 SPEED	The ORIENT V2 SPEED for second range speed is set.	SET ADD	Varies depending on machine model	0 to 200	
42	ORIENT DECEL POS 2G	The ORIENT DECEL POS for the second range speed is set.	Same as above	Same as above	0 to 4095	
43	ORIENT V3DA 2G	The ORIENT V3DA for second range speed is set.	Same as above	Same as above	0 to 100	
44	ORIENT INP VAL 2G	The ORIENT INP VAL for second range speed is set.	Same as above	Same as above	0 to 100	
45	ORIENT V2 SPEED 3G	The ORIENT V2 SPEED for third range speed is set.	Same as above	Same as above	0 to 200	
46	ORIENT DECEL POS 3G	The ORIENT DECEL POS for third range speed is set.	Same as above	Same as above	0 to 4095	
47	ORIENT V3DA 3G	The ORIENT V3DA for third range speed is set.	Same as above	Same as above	0 to 100	
48	ORIENT INP VAL 3G	The ORIENT INP VAL for third range speed is set.	Same as above	Same as above	0 to 100	
49	CHANGE ARM OFFSET	The CHANGE ARM OFFSET is set.	SET ADD CAL	Same as above	0 to 1023	

Setting procedure is as follows:



- (1) Press the **PARAMETER** key.
 - (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.
 - (3) Press the cursor keys to position the cursor at bit 7 of parameter No. 16.
 - (4) Press the function key [F1] (SET) and key in 1.
 - (5) Press the **WRITE** key.
- Parameter No. 17 and following data are displayed on the CRT. This enables the setting of the MC system parameter (word).
- (6) Press the function key [F6] or [F7] (ITEM) until the MC SYSTEM PARAMETER (WORD) appears.

- (7) If no setting data is on the screen, press the page key [P ↓] to advance the screen to page 2.
Page 1 looks like:

PARAMETER SET			
MC SYSTEM PARAMETER (WORD)			
NO.		NO.	
1 ATC SEQUENCE NO.	1	11 AAC(C) SEQ NO.	0
2 APC SEQUENCE NO.	0	12	0
3 AAC(F) SEQ NO.	0	13	0
4 AAC(T) SEQ NO.	0	14	0
5 TA ARM A.B MODE	0	15	0
6 PALLET A.B MODE	0	16	0
7 DUMMY (AAC-F)	0	17	0
8 DUMMY (AAC-T)	0	18	0
9 LTC SEQ NO.	0	19	0
10 AT SEQ NO.	0	20	0
ACT POSIT (MC) X Y Z			
	-250.000	-100.000	300.000
	A-Mtd		
=IF			
=IF			
=S 1			
=			
SET	ADD	CAL	SEARCH
			ITEM↑
			ITEM↓
			[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

Page 2 looks like:

PARAMETER SET			
MC SYSTEM PARAMETER (WORD)			
NO.		NO.	
21 SPDL ORIENT OFST	0	31 ACCEL/DECEL 1G	0
22 ORIENT V2 SPEED	0	32 ACCEL/DECEL 2G	0
23 ORIENT DECEL POS	0	33 ACCEL/DECEL 3G	0
24 ORIENT V3 DA	0	34 ACCEL/DECEL 4G	0
25 ORIENT INP VAL	0	35 ACCEL/DECEL COEFF	0
26	0	36	0
27 SPINDLE OSCIL DA	100	37	0
28 OSCILLATE FREQCY	100	38	0
29 OSCILLATE PERIOD	200	39	0
30 AAC DIRECTION	1	40	0
ACT POSIT (MC) X Y Z			
	899.999	999.999	-1100.000
=IF			
=IF			
=IF			
=			
SET	ADD	CAL	SEARCH
			ITEM↑
			ITEM↓
			[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

- (8) Using the cursor keys, position the cursor at the desired position.

Setting:

- (a) When data is previously known

(9) Press the function key [F1] (SET).

(10) Enter the data with keyboard.

- (b) When data has already been set and it is necessary to set the increment against the data

(9) Press the function key [F2] (ADD).

(10) Enter the increment with keyboard.

- (c) When new setting is made at the position relative to the current value

(9) Press the function key [F3] (CAL).

(10) Enter the relative value.

- (11) Press the **WRITE** key.

This rewrites the data indicated by the cursor.

3-13. System Parameter

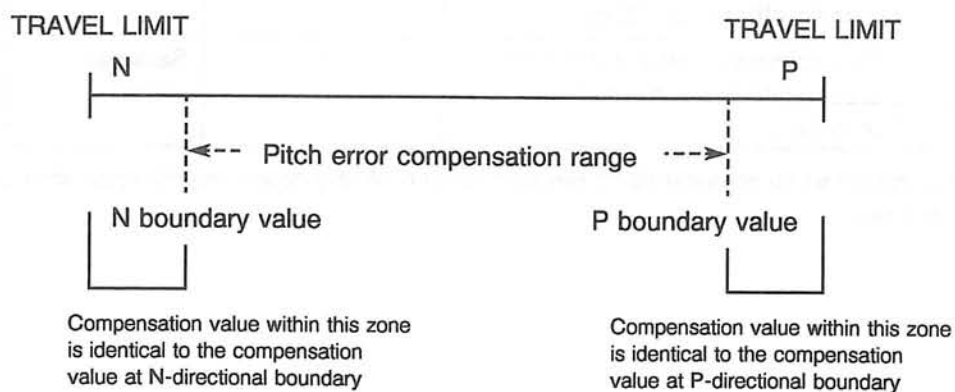
On the *SYSTEM PARAMETER* display screen, page 1 includes the following items are displayed:

This display screen is not provided depending on the machine model.

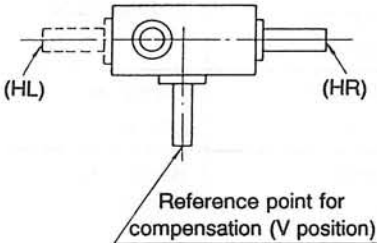
< Screen 1 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
P TRAVEL LIMIT	P-directional travel end limit in the machine coordinate system	Depends on machine specification	-99999999 to +99999999	Selected unit system
N TRAVEL LIMIT	N-directional travel end limit in the machine coordinate system	Same as above	Same as above	Same as above
P PITCH ERR COMP	Specifies the range for pitch error compensation in the machine coordinate system. Sets the P- and N-directional boundaries. Normally, sets the value equivalent to the travel end limit. (Note 1)	Same as above	Same as above	Same as above
N NPITCH ERROR COMP		Same as above	Same as above	Same as above
IN POSITION	Sets the check data to be used in executing exact stop checks.	3	0 to 1000	Same as above
ZERO OFFSET (MACHINE)	Sets the zero offset of the machine coordinate system for each axis.	Depends on machine specification.	0 to 99999999	Same as above
IN POSITION (H)	Sets the in-position width used in positioning at the home position of each axis at the execution of ATC, APC, etc.	20	0 to 1000	Same as above

Note 1: If P and/or N boundary value is set inside the TRAVEL LIMIT (P, N), compensation within the zone outside the boundary to TRAVEL END is carried out using the compensation value effective at the boundary.



< Screen 2 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
SWL HD POS FRONT	These parameters set the positions (front, left, rear and right) of the horizontal spindle in reference to the spindle vertical position.  Reference point for compensation (V position)	X = 400 (15.75) Y = -150 (-5.91) Z = -330 (-12.99)	-99999999 to 99999999	Selected unit system
SWL HD POS LEFT		X = -150 (-5.91) Y = -400 (-15.75) Z = -330 (-12.99)	Same as above	Same as above
SWL HD POS REAR		X = -400 (-15.75) Y = 150 (5.91) Z = -330 (-12.99)	Same as above	Same as above
SWL HD POS RIGHT		X = 150 (5.91) Y = 400 (15.75) Z = -330 (-12.99)	Same as above	Same as above

< Screen 3 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
BARRIER (Y, Z)	On MC-H series machining center, if both of Y- and Z-axis enter a certain area at the same time, they will interfere with each other. To prevent this, a barrier is set so that an alarm is triggered with axis motion halted if both of these two axes exist in the barrier zone at the same time. The setting is effective only for Y- and Z-axis. This function is not effective for models other than MC-H.	0	-99999999 to 99999999	Selected unit system
ENCODER OFFSET*	This parameter offsets the zero-cross point of the position encoder.	0	Same as above	Same as above

Parameter indicated by an asterisk (*) requires turning off the power supply once after setting new data. Turn it back on.

<Screen 4>

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 1	Sets the home position for the ATC. Setting should be carried out in the machine coordinate system.	Depends on machine specification	-99999999 to +99999999	Selected unit system
HOME POSITION 2		Same as above	Same as above	Same as above
HOME POSITION 3	Sets the home position for a left pallet change in the rotary type 2-pallet APC. This is also employed as the home position for the parallel type 2-pallet APC and rotary type multi-pallet APC. Setting should be carried out in the machine coordinate system.	Same as above	Same as above	Same as above
HOME POSITION 4	Sets the home position for a right pallet change in the rotary type 2-pallet APC. This is also employed as the home position for the parallel type 2-pallet APC. Setting should be carried out in the machine coordinate system.	Same as above	Same as above	Same as above
HOME POSITION 5		Same as above	Same as above	Same as above
HOME POSITION 6		Same as above	Same as above	Same as above
HOME POSITION 7		Same as above	Same as above	Same as above
HOME POSITION 8		Same as above	Same as above	Same as above

< Screen 5 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 9		Depends on machine specification	-99999999 to +99999999	Selected unit system
HOME POSITION 10		Same as above	Same as above	Same as above
HOME POSITION 11		Same as above	Same as above	Same as above
HOME POSITION 12		Same as above	Same as above	Same as above
HOME POSITION 13		Same as above	Same as above	Same as above
HOME POSITION 14		Same as above	Same as above	Same as above
HOME POSITION 15		Same as above	Same as above	Same as above
HOME POSITION 16		Same as above	Same as above	Same as above

< Screen 6 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 17		Depends on machine specification	-99999999 to +99999999	Selected unit system
HOME POSITION 18		Same as above	Same as above	Same as above
HOME POSITION 19		Same as above	Same as above	Same as above
HOME POSITION 20		Same as above	Same as above	Same as above
HOME POSITION 21		Same as above	Same as above	Same as above
HOME POSITION 22		Same as above	Same as above	Same as above
HOME POSITION 23		Same as above	Same as above	Same as above
HOME POSITION 24		Same as above	Same as above	Same as above

< Screen 7 >

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 25		Depends on machine specification	-99999999 to +99999999	Selected unit system
HOME POSITION 26		Same as above	Same as above	Same as above
HOME POSITION 27		Same as above	Same as above	Same as above
HOME POSITION 28		Same as above	Same as above	Same as above
HOME POSITION 29		Same as above	Same as above	Same as above
HOME POSITION 30		Same as above	Same as above	Same as above
HOME POSITION 31		Same as above	Same as above	Same as above
HOME POSITION 32		Same as above	Same as above	Same as above

<Screen 8> *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 1	Sets the axis moving sequence in the home position 1	Depends on machine specification.	0 to 3	—
HOME POSITION 2	Sets the axis moving sequence in the home position 2	Same as above	Same as above	—
HOME POSITION 3	Sets the axis moving sequence in the home position 3	Same as above	Same as above	—
HOME POSITION 4	Sets the axis moving sequence in the home position 4	Same as above	Same as above	—
HOME POSITION 5	Sets the axis moving sequence in the home position 5	Same as above	Same as above	—
HOME POSITION 6	Sets the axis moving sequence in the home position 6	Same as above	Same as above	—
HOME POSITION 7	Sets the axis moving sequence in the home position 7	Same as above	Same as above	—
HOME POSITION 8	Sets the axis moving sequence in the home position 8	Same as above	Same as above	—

- 0: No axis movement
- 1: 1st
- 2: 2nd
- 3: 3rd

Note: For the same home position number, the operation sequence should be set so that the axes are moved sequentially. Assigning numbers which are not consecutive causes the operation to be interrupted.

		X Y Z
<i>Example:</i>	HOME POSITION 1	1 0 3
	Z-axis does not move.	

<Screen 9> *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 9	Sets the axis moving sequence in the home position 9	Depends on machine specification	0 to 3	—
HOME POSITION 10	Sets the axis moving sequence in the home position 10	Same as above	Same as above	—
HOME POSITION 11	Sets the axis moving sequence in the home position 11	Same as above	Same as above	—
HOME POSITION 12	Sets the axis moving sequence in the home position 12	Same as above	Same as above	—
HOME POSITION 13	Sets the axis moving sequence in the home position 13	Same as above	Same as above	—
HOME POSITION 14	Sets the axis moving sequence in the home position 14	Same as above	Same as above	—
HOME POSITION 15	Sets the axis moving sequence in the home position 15	Same as above	Same as above	—
HOME POSITION 16	Sets the axis moving sequence in the home position 16	Same as above	Same as above	—

<Screen 10> *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 17	Sets the axis moving sequence in the home position 17	Depends on machine specification	0 to 3	—
HOME POSITION 18	Sets the axis moving sequence in the home position 18	Same as above	Same as above	—
HOME POSITION 19	Sets the axis moving sequence in the home position 19	Same as above	Same as above	—
HOME POSITION 20	Sets the axis moving sequence in the home position 20	Same as above	Same as above	—
HOME POSITION 21	Sets the axis moving sequence in the home position 21	Same as above	Same as above	—
HOME POSITION 22	Sets the axis moving sequence in the home position 22	Same as above	Same as above	—
HOME POSITION 23	Sets the axis moving sequence in the home position 23	Same as above	Same as above	—
HOME POSITION 24	Sets the axis moving sequence in the home position 24	Same as above	Same as above	—

< Screen 11 > *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
HOME POSITION 25	Sets the axis moving sequence in the home position 25	Depends on machine specification	0 to 3	—
HOME POSITION 26	Sets the axis moving sequence in the home position 26	Same as above	Same as above	—
HOME POSITION 27	Sets the axis moving sequence in the home position 27	Same as above	Same as above	—
HOME POSITION 28	Sets the axis moving sequence in the home position 28	Same as above	Same as above	—
HOME POSITION 29	Sets the axis moving sequence in the home position 29	Same as above	Same as above	—
HOME POSITION 30	Sets the axis moving sequence in the home position 30	Same as above	Same as above	—
HOME POSITION 31	Sets the axis moving sequence in the home position 31	Same as above	Same as above	—
HOME POSITION 32	Sets the axis moving sequence in the home position 32	Same as above	Same as above	—

< Screen 12 > *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
INDUCTOSYN OFFSET*	This parameter data is used for matching the phase of the Inductosyn and type E position sensor, and it is not effective for models not equipped with Inductosyn scale.	Depends on machine and axis	-81920 to 49152	—

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data. Turn it back on.

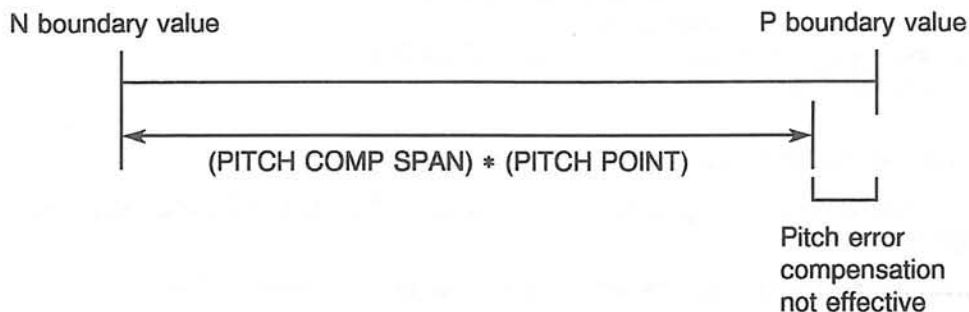
< Screen 13 > *HOME POSITION MOVEMENT ORDER*

CRT Display Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
PITCH COMP SPAN*	Specifies the interval between sets of points for setting pitch error compensation data	Depends on machine and axis	1 to 65535	Selected unit system
PITCH POINT*	Sets the total number of pitch points for each axis (Note 2)	Same as above	0 to 384	—
HARD SERVO COEFF	Sets the two servo processor: coefficient: Setting = Hard servo ratio (%) × 163.84	Same as above	0 to 16384	—
KV VALUE	Sets the KV value: Setting = KV × 52	Same as above	52 to 5200	—
SLOW UP/DOWN COEFF	Sets the accel/decel coefficient: Setting = Kcv[1/sec] × 105	Same as above	105 to 21000	—

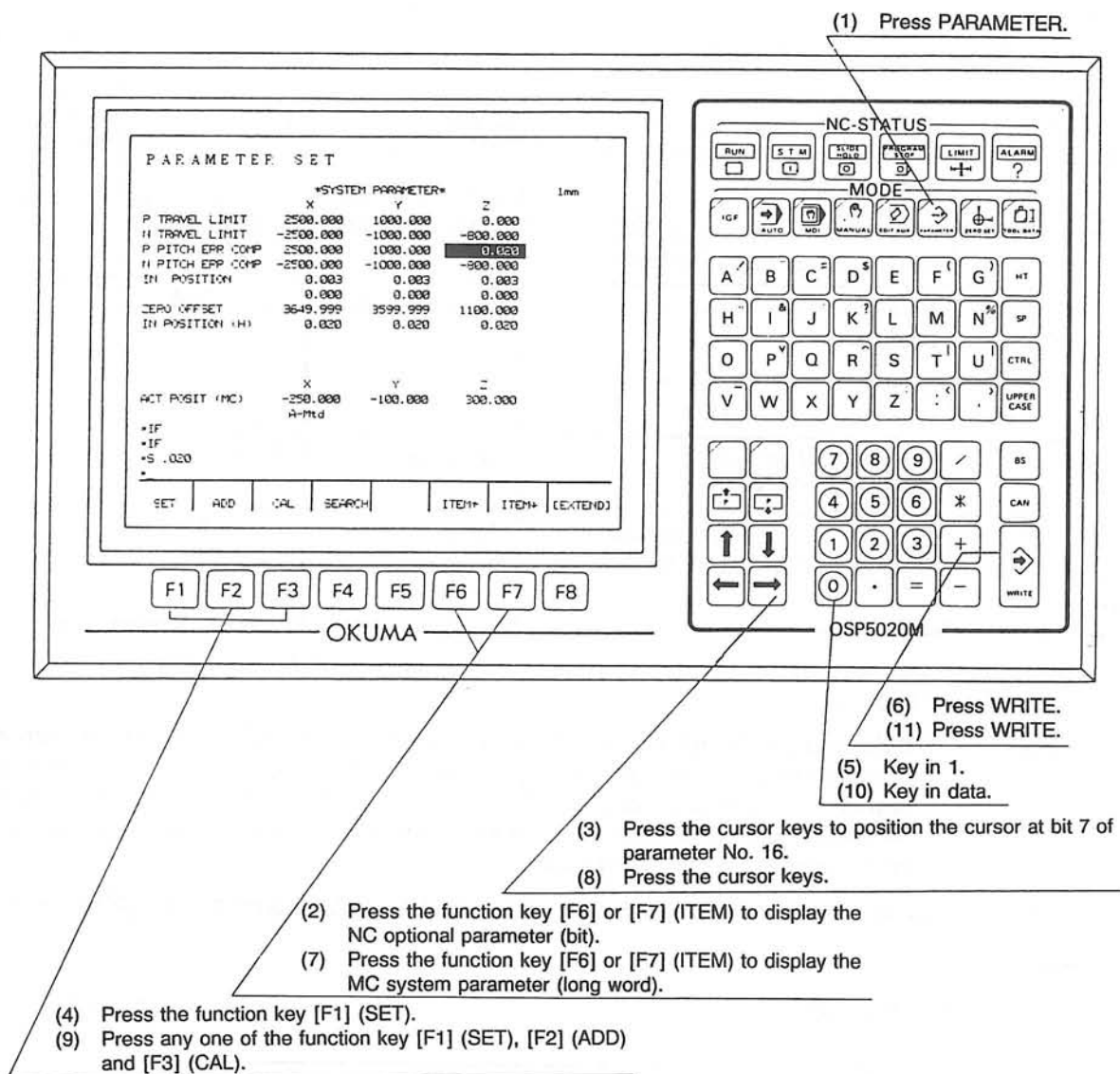
Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data. Turn it back on.

Note: If the product of the PITCH COMP SPAN and PITCH POINT is smaller than the pitch compensation range, the pitch error compensation is not effective within the area beyond the point calculated as the product of them up to the P boundary point, which will cause pitch error alarm. Therefore, pitch error compensation parameter data must be set to meet the following inequality.

$$(P\text{-direction boundary}) - (N\text{-direction boundary}) \leq (\text{Pitch comp span}) * (\text{Pitch point})$$



Setting procedure is as follows:



- (1) Press the **PARAMETER** key.
 - (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.
 - (3) Press the cursor keys to position the cursor at bit 7 of parameter No. 16.
 - (4) Press the function key [F1] (SET) and key in 1 with keyboard.
 - (5) Press the **WRITE** key.
- Parameter No. 17 and following data are displayed on the CRT.
- This enables the setting of the system parameter.
- (6) Press the function key [F6] or [F7] (ITEM) until the SYSTEM PARAMETER screen appears.
 - (7) Unless the desired data is displayed on page 1, press the page keys.
 - (8) Position the cursor at the desired position.

Setting:

- (a) When data is previously known
 - (9) Press the function key [F1] (SET).
 - (10) Enter the data with keyboard
 - (b) When data has already been set and it is necessary to set the increment against the data
 - (9) Press the function key [F2] (ADD).
 - (10) Enter the increment with keyboard
 - (c) When new data is made at the position relative to the current value
 - (9) Press the function key [F3] (CAL).
 - (10) Enter the relative value with keyboard
- (11) Press the **WRITE** key.
This rewrites the data indicated by the cursor.
- (12) Carry out the backup operation. Turn off the power, then turn it back on.

System parameter display screens are shown below.

<Screen 1>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
P TRAVEL LIMIT	2500.000	1000.000	0.000
N TRAVEL LIMIT	-2500.000	-1000.000	-800.000
P PITCH ERR COMP	2500.000	1000.000	0.020
N PITCH ERR COMP	-2500.000	-1000.000	-800.000
IN POSITION	0.003	0.003	0.003
	0.000	0.000	0.000
ZERO OFFSET	3649.999	3599.999	1100.000
IN POSITION (H)	0.020	0.020	0.020

1mm

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

*IF
*IF
*S .020
*

SET	ADD	CAL	SEARCH	ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	-------	-------	----------

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 2>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
SWL HD POS FRONT	400.000	-150.000	-330.000
SWL HD POS LEFT	-150.000	-400.000	-330.000
SWL HD POS REAR	-400.000	150.000	-330.000
SWL HD POS RIGHT	150.000	400.000	-330.000
	0.000	0.000	0.000
	0.000	0.000	0.000
	0.000	0.000	0.000
	0.000	0.000	0.000

1mm

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

*IF
*IF
*IF
*

SET	ADD	CAL	SEARCH	ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	-------	-------	----------

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 3>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
	0.000	0.000	0.000
	0.000	0.000	0.000
	0.000	0.000	0.000
BARRIER (Y,Z)	0.000	0.000	0.000
	0.000	0.000	0.000
ENCODER OFFSET	0.000	0.000	0.000
	0.000	0.000	0.000
	0.000	0.000	0.000
	0.000	0.000	0.000
ACT POSIT (MC)	X -250.000 A-Mtd	Y -100.000	Z 300.000
=IF			
=IF			
=IF			
=			
SET	ADD	CAL	SEARCH
			ITEM+
			ITEM+
			[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

<Screen 4>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
HOME POSITION 1	0.000	0.000	0.000
HOME POSITION 2	0.000	0.000	0.000
HOME POSITION 3	0.000	0.000	0.000
HOME POSITION 4	0.000	0.000	0.000
HOME POSITION 5	0.000	0.000	0.000
HOME POSITION 6	0.000	0.000	0.000
HOME POSITION 7	0.000	0.000	0.000
HOME POSITION 8	0.000	0.000	0.000
ACT POSIT (MC)	X -250.000 A-Mtd	Y -100.000	Z 300.000
=IF			
=IF			
=IF			
=			
SET	ADD	CAL	SEARCH
			ITEM+
			ITEM+
			[EXTEND]

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

<Screen 5>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
HOME POSITION 9	0.000	0.000	0.000
HOME POSITION 10	0.000	0.000	0.000
HOME POSITION 11	0.000	0.000	0.000
HOME POSITION 12	0.000	0.000	0.000
HOME POSITION 13	0.000	0.000	0.000
HOME POSITION 14	0.000	0.000	0.000
HOME POSITION 15	0.000	0.000	0.000
HOME POSITION 16	0.000	0.000	0.000

1mm

ACT POSIT (MC)	X	Y	Z
	-250.000	-100.000	300.000
	A-Mtd		

=IF
=IF
=IF
=

SET	ADD	CAL	SEARCH		ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

<Screen 6>

PARAMETER SET			
SYSTEM PARAMETER			
	X	Y	Z
HOME POSITION 17	0.000	0.000	0.000
HOME POSITION 18	0.000	0.000	0.000
HOME POSITION 19	0.000	0.000	0.000
HOME POSITION 20	0.000	0.000	0.000
HOME POSITION 21	0.000	0.000	0.000
HOME POSITION 22	0.000	0.000	0.000
HOME POSITION 23	0.000	0.000	0.000
HOME POSITION 24	0.000	0.000	0.000

1mm

ACT POSIT (MC)	X	Y	Z
	-250.000	-100.000	300.000
	A-Mtd		

=IF
=IF
=IF
=

SET	ADD	CAL	SEARCH		ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

<Screen 7>

PARAMETER SET

SYSTEM PARAMETER 1mm

	X	Y	Z
HOME POSITION 25	0.000	0.000	0.000
HOME POSITION 26	0.000	0.000	0.000
HOME POSITION 27	0.000	0.000	0.000
HOME POSITION 28	0.000	0.000	0.000
HOME POSITION 29	0.000	0.000	0.000
HOME POSITION 30	0.000	0.000	0.000
HOME POSITION 31	0.000	0.000	0.000
HOME POSITION 32	0.000	0.000	0.000

ACT POSIT (MC) X Y Z
-250.000 -100.000 300.000
A-Mtd

=IF
=IF
=IF
=

SET ADD CAL SEARCH ITEM+ ITEM+ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 8>

PARAMETER SET

SYSTEM PARAMETER 1mm

HOME POSITION MOVEMENT ORDER

	X	Y	Z
HOME POSITION 1	0	0	1
HOME POSITION 2	0	0	1
HOME POSITION 3	2	2	1
HOME POSITION 4	2	2	1
HOME POSITION 5	0	0	1
HOME POSITION 6	0	0	1
HOME POSITION 7	0	0	1
HOME POSITION 8	0	0	1

0: NO MOVEMENT
1: FIRST
2: SECOND
3: THIRD

ACT POSIT (MC) X Y Z
-250.000 -100.000 300.000
A-Mtd

=IF
=IF
=IF
=

SET ADD CAL SEARCH ITEM+ ITEM+ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 9>

PARAMETER SET

SYSTEM PARAMETER 1mm

HOME POSITION MOVEMENT ORDER

	X	Y	Z	
HOME POSITION 9	0	0	0	
HOME POSITION 10	0	0	0	
HOME POSITION 11	0	0	0	
HOME POSITION 12	0	0	0	
HOME POSITION 13	0	0	0	
HOME POSITION 14	0	0	0	
HOME POSITION 15	0	0	0	
HOME POSITION 16	0	0	0	

0: NO MOVEMENT
 1: FIRST
 2: SECOND
 3: THIRD

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

=IF
=IF
=IF
=

SET	ADD	CAL	SEARCH		ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F1
F2
F3
F4
F5
F6
F7
F8

<Screen 10>

PARAMETER SET

SYSTEM PARAMETER 1mm

HOME POSITION MOVEMENT ORDER

	X	Y	Z	
HOME POSITION 17	0	0	0	
HOME POSITION 18	0	0	0	
HOME POSITION 19	0	0	0	
HOME POSITION 20	0	0	0	
HOME POSITION 21	0	0	0	
HOME POSITION 22	0	0	0	
HOME POSITION 23	0	0	0	
HOME POSITION 24	0	0	0	

0: NO MOVEMENT
 1: FIRST
 2: SECOND
 3: THIRD

	X	Y	Z
ACT POSIT (MC)	-250.000	-100.000	300.000
	A-Mtd		

=IF
=IF
=IF
=

SET	ADD	CAL	SEARCH		ITEM↑	ITEM↓	[EXTEND]
-----	-----	-----	--------	--	-------	-------	----------

F1
F2
F3
F4
F5
F6
F7
F8

<Screen 11>

PARAMETER SET

SYSTEM PARAMETER 1mm

HOME POSITION MOVEMENT ORDER

	X	Y	Z
HOME POSITION 25	0	0	0
HOME POSITION 26	0	0	0
HOME POSITION 27	0	0	0
HOME POSITION 28	0	0	0
HOME POSITION 29	0	0	0
HOME POSITION 30	0	0	0
HOME POSITION 31	0	0	0
HOME POSITION 32	0	0	0

0: NO MOVEMENT
1: FIRST
2: SECOND
3: THIRD

ACT POSIT (MC) X Y Z
-250.000 -100.000 300.000
A-Mtd

*IF
*IF
*IF
*

SET ADD CAL SEARCH ITEM+ ITEM+ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 12>

PARAMETER SET

SYSTEM PARAMETER <SV-P> 1mm

INDUCTOSYN OFFSET

X	Y	Z
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000
0.000	0.000	0.000

ACT POSIT (MC) X Y Z
-250.000 -100.000 300.000
A-Mtd

*IF
*IF
*IF
*

SET ADD CAL SEARCH ITEM+ ITEM+ [EXTEND]

F1 F2 F3 F4 F5 F6 F7 F8

<Screen 13>

PARAMETER SET				
	SYSTEM PARAMETER (SV-P)			1mm
	X	Y	Z	
PITCH COMP SPAN	20000	20000	20000	
PITCH POINT	100	100	100	
HARD SERVO COEFF	256	256	256	
KV VALUE	1300	1300	1300	
SLOW UP/DOWN	5250	5250	5250	
	0	0	0	
	0	0	0	
	0	0	0	
ACT POSIT (MC)	X -250.000 A-Mtd	Y -100.000	Z 300.000	
=IF				
=IF				
=IF				
=				
SET	ADD	CAL	SEARCH	ITEM+ ITEM+ [EXTEND]

F1
F2
F3
F4
F5
F6
F7
F8

3-14. Pitch Error Compensation

The ball screws each have their own pitch-to-pitch errors, which may be compensated for by the setting of the pitch error compensation data.

The pitch error compensation data provides a total of 2304 values for all the axes (384 values for each axis). Note that the amount displayed in one screen covers only 40 values for a single axis.

Before setting the pitch error compensation value, use the following procedure:

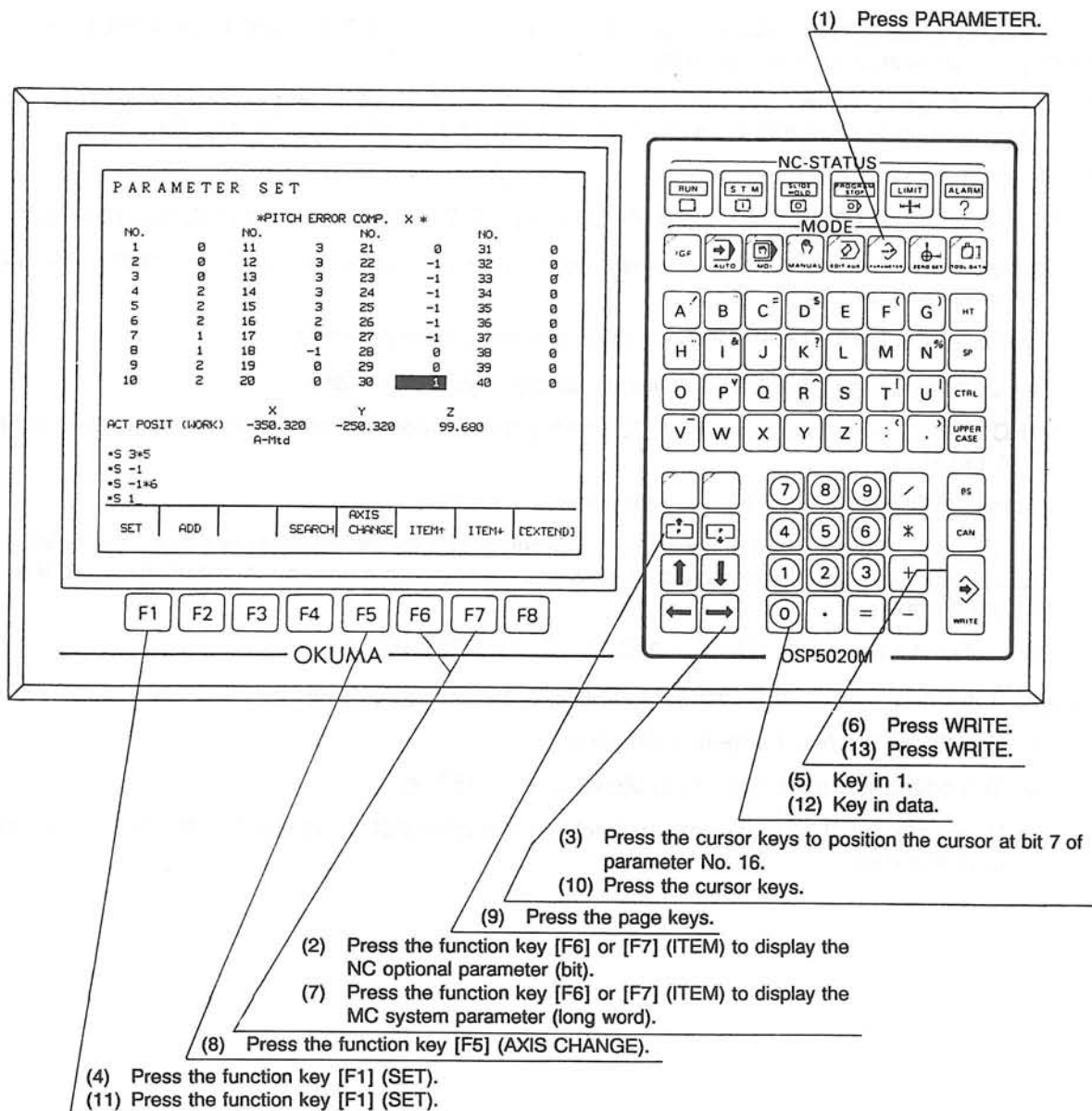
- (1) Set the P PITCH ERR COMP and N PITCH ERR COMP on page 1 of the system parameter.
This determines the range of the screw pitch offset - from what position (N) to what position (P) in that ball screw.
- (2) Set the PITCH ERR COMP SPAN on page 7 of the system parameter.
This determines the pitch between values for the screw pitch offset.
- (3) In NC optional parameter (word) No. 33, set the total number of screw pitch compensation values for all the axes.
- (4) Set the PITCH POINT on page 7 of the system parameter.
This sets the number of pitch error compensation points for individual axes (max.: 384 points per axis). Setting is possible for individual axes and it should be made in the order of X, Y, Z the 4th and the 5th axes.

For further details, refer to Section 3, 3-13. "System Parameter".

Here are a few suggestions to be followed in setting the pitch error compensation:

- (a) Set "0" as the No. 1 data of each axis.
- (b) The adjacent error of each data allows up to 16383 μm .
- (c) When the result of (data sets) * (pitch error compensation) is close to the axis travel, then set extra data.

Setting procedure is as follows:



- (1) Press the **PARAMETER** key.
 - (2) Press the function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.
 - (3) Press the cursor keys to position the cursor at bit 7 of parameter No. 16.
 - (4) Press the function key [F1] (SET).
 - (5) Enter 1 on the keyboard.
 - (6) Press the **WRITE** key.
- This enables the setting of the pitch error compensation.
- (7) Press the function key [F6] or [F7] (ITEM) until the screw pitch offset appears.

- (8) Since one screen displays only one axis data, press the function key [F5] (AXIS CHANGE) if it is necessary to set a different axis from the screen display. Each time that key is pressed, axes are switched as follows: X → Y → Z → X → Y → Z.
- (9) Since one screen displays only 40 sets of data, press the [P↓] key if it is necessary to display No. 41 and following. Each time that key is pressed, the screen advances one page.

PARAMETER SET

NO.		*PITCH ERROR COMP.		X *		NO.	
1	0	11	3	21	0	31	0
2	0	12	3	22	-1	32	0
3	0	13	3	23	-1	33	0
4	2	14	3	24	-1	34	0
5	2	15	3	25	-1	35	0
6	2	16	2	26	-1	36	0
7	1	17	0	27	-1	37	0
8	1	18	-1	28	0	38	0
9	2	19	0	29	0	39	0
10	2	20	0	30	1	40	0

X Y Z

ACT POSIT (WORK) -350.320 -250.320 99.680

A-Mtd

*S 3*5
*S -1
*S -1*6
*S 1

SET	ADD	SEARCH	AXIS CHANGE	ITEM↑	ITEM↓	EXTEND
-----	-----	--------	-------------	-------	-------	--------

F 1 F 2 F 3 F 4 F 5 F 6 F 7 F 8

- (10) Position the cursor at the desired position.

- (11) Press the function key [F1] (SET).

- (12) Key in the compensation value through the keyboard.

If it is necessary to set the same data continuously starting at the position indicated by the cursor, enter data as follows:

[offset] * [data elements]

Example: [7] * [20]

Data of "7 μ m" is set at 20 points from the cursor located point.

- (13) Press the **WRITE** key.

This rewrites data indicated by the cursor.

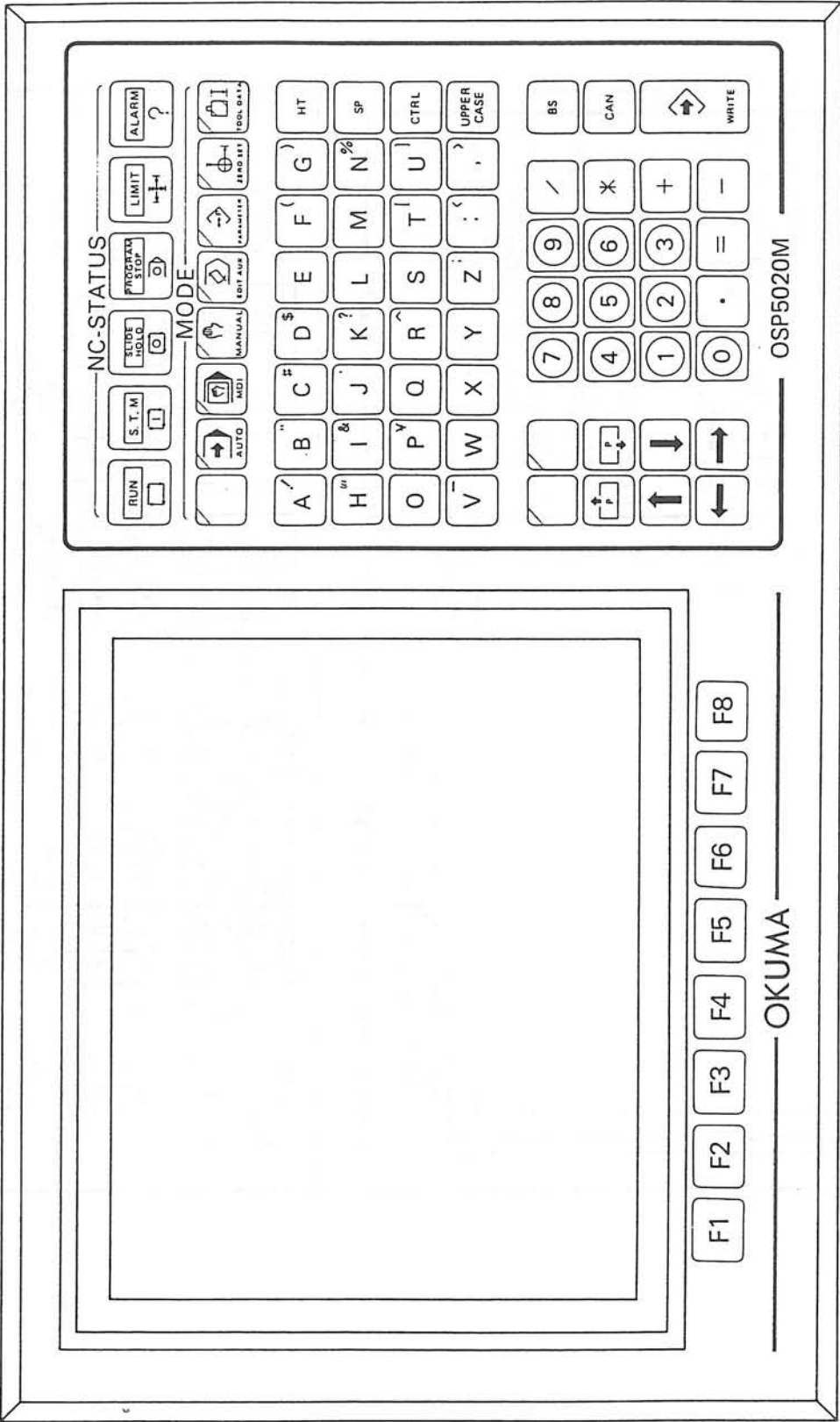
- (14) After carrying out back-up operations, turn off the power supply once and then turn it back on.

SECTION 4 APPENDED FIGURES

NC Operation Panel for OSP5020M
Machine Operation Panel for OSP5020M (Flat Panel)
Pendant Operation Panel for OSP5020M
Machine Operation Panel for OSP5020M
Pulse Handle
Option Panel
Floppy Disk Drive, PTR and Check Panel
Manual Tool Change Operation Panel for OSP5020M
Magazine Manual Operation Panel
Parallel Type 2-Pallet APC Operation Panel
Rotary Type 2-Pallet APC Operation Panel
Rotary Type Multi-Pallet APC Operation Panel
Attachment Operation Panel
List of G Codes
List of Mnemonic Codes
List of M Codes

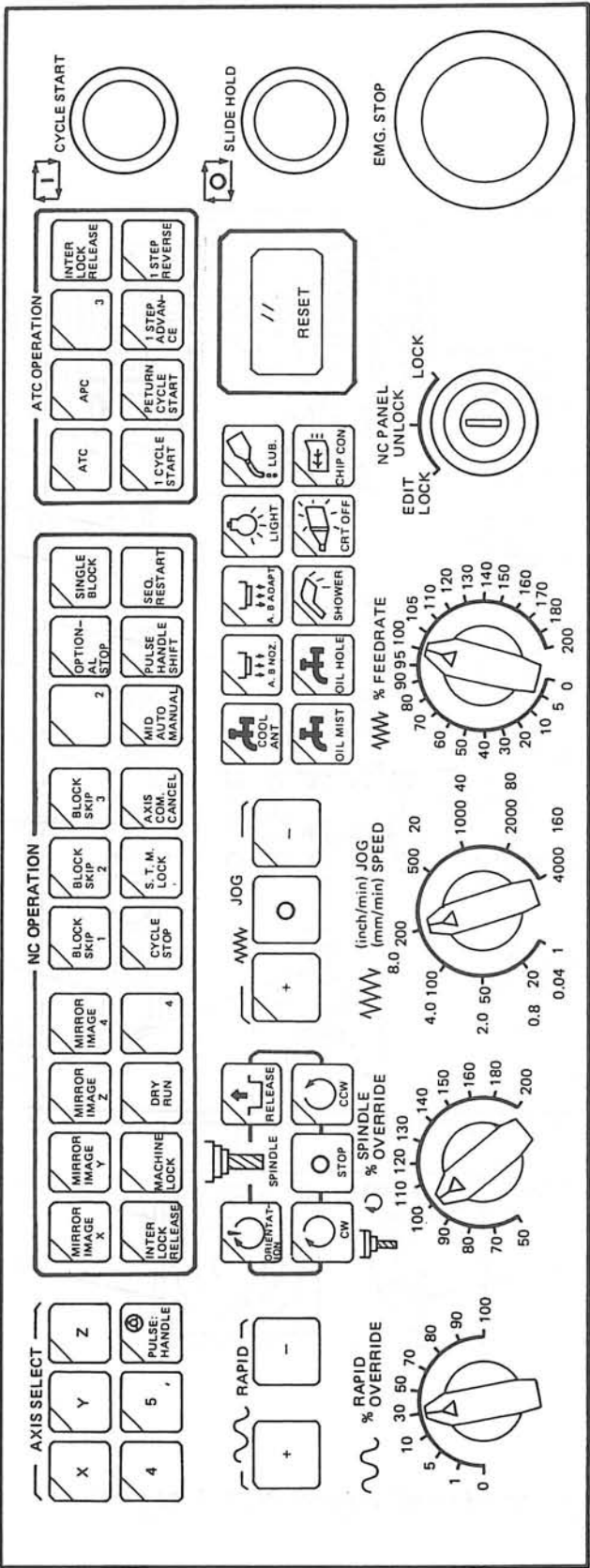
1. NC Operation Panel

(1) For OSP5020M



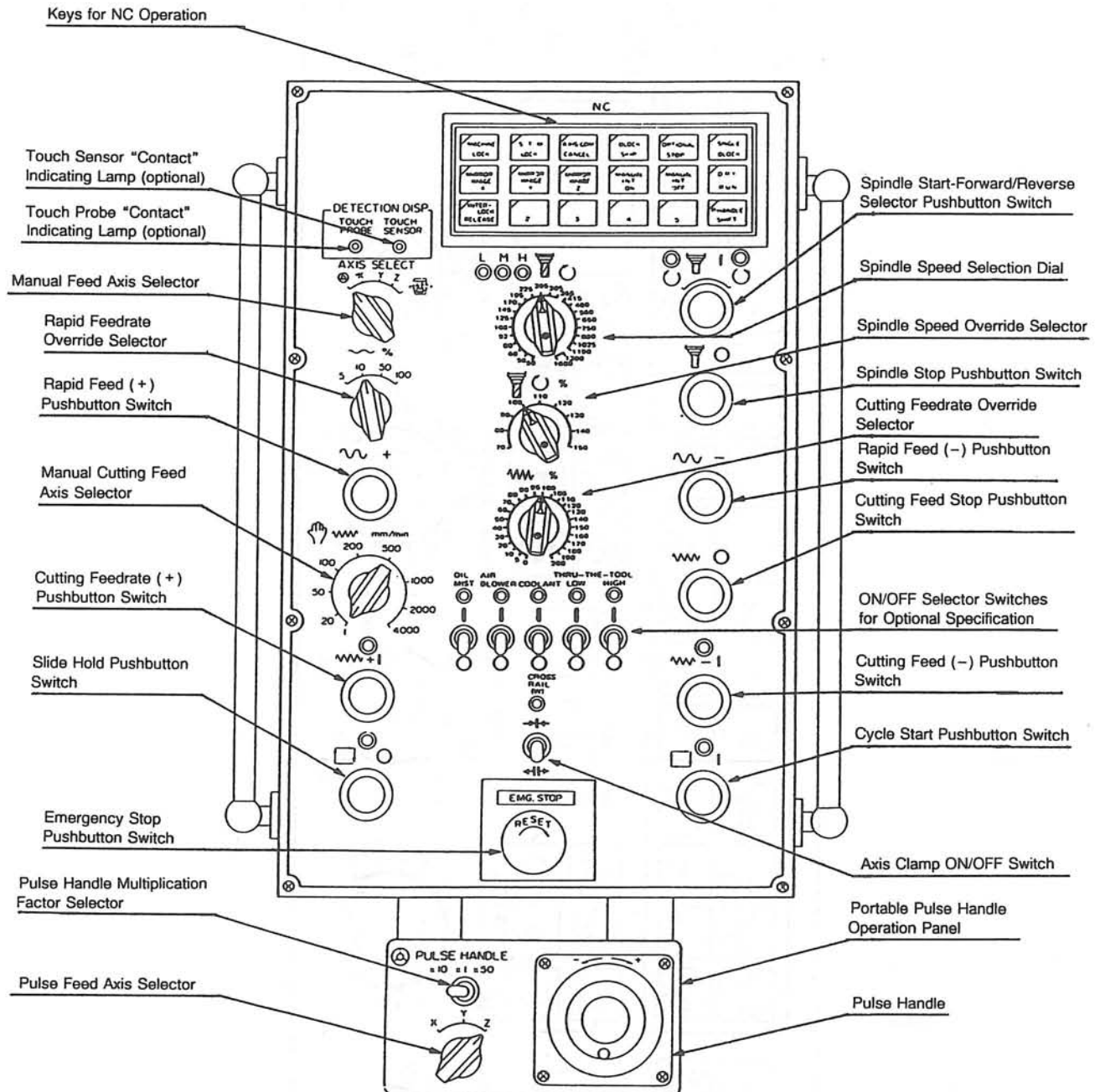


2. Machine Operation Panel for OSP5020M (Flat Panel)



3. Pendant Operation Panel for OSP5020M

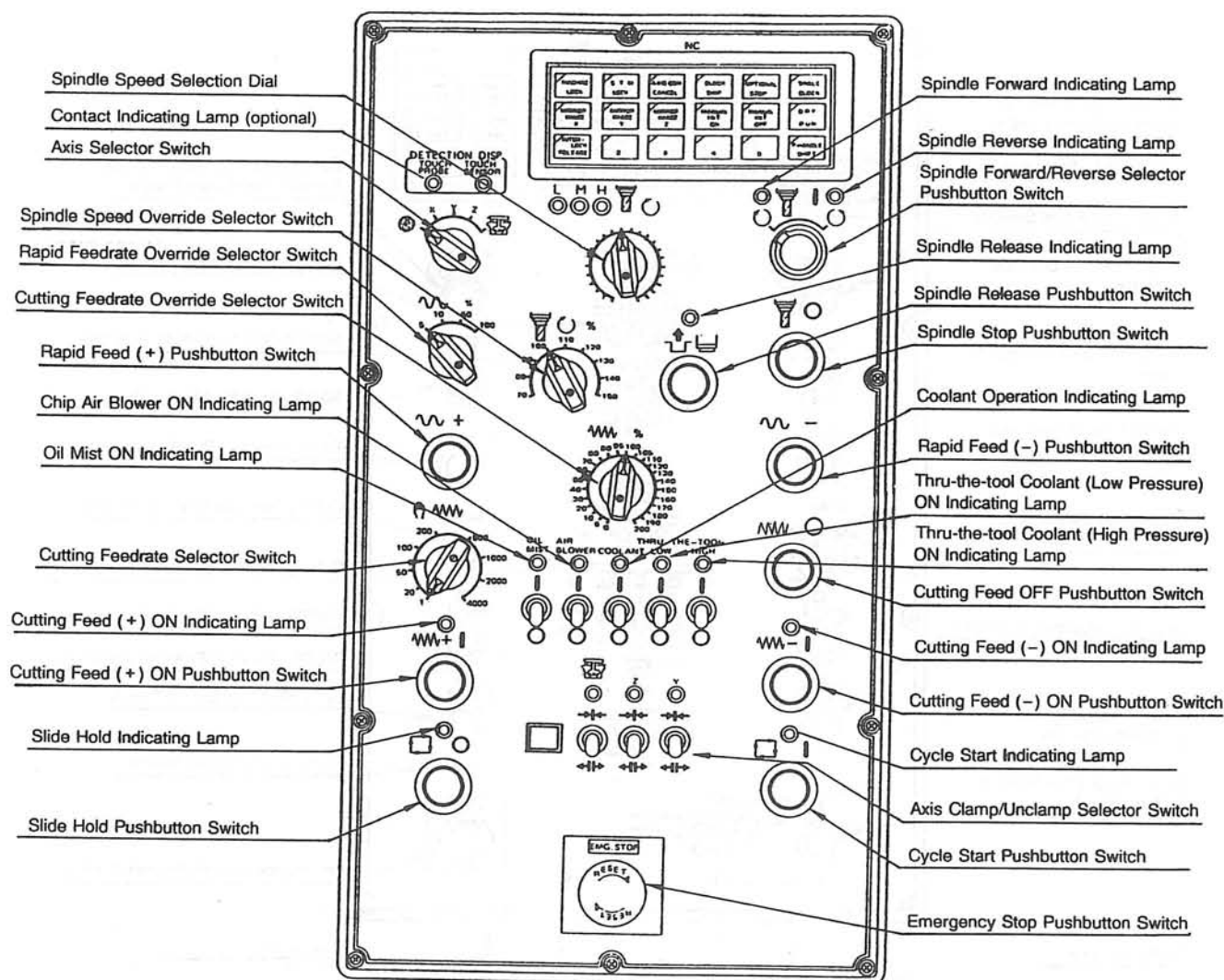
3-1. Pendant Operation Panel for OSP5020M (MDB-A, MCV-A)



Pendant Operation Panel (MDB-A, MCV-A)

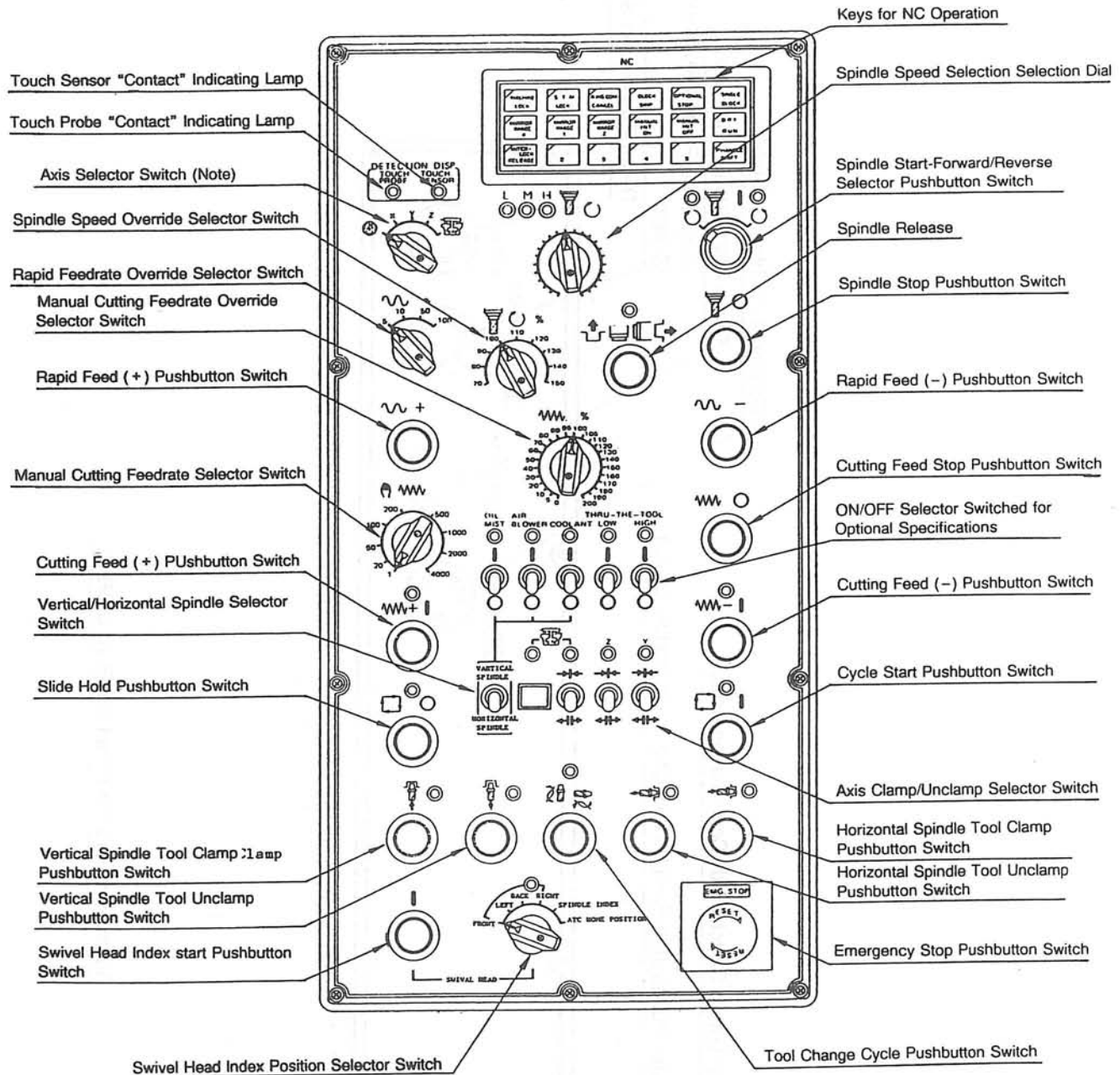
3-2. Pendant Operation Panel for OSP5020M (MDB-B, MCV-B)

3-3. Pendant Operation Panel for OSP5020M (MCR)



Pendant Operation Panel (MCR Elevating Crossrail)

3-4. Pendant Operation Panel for OSP5020M (MCM)

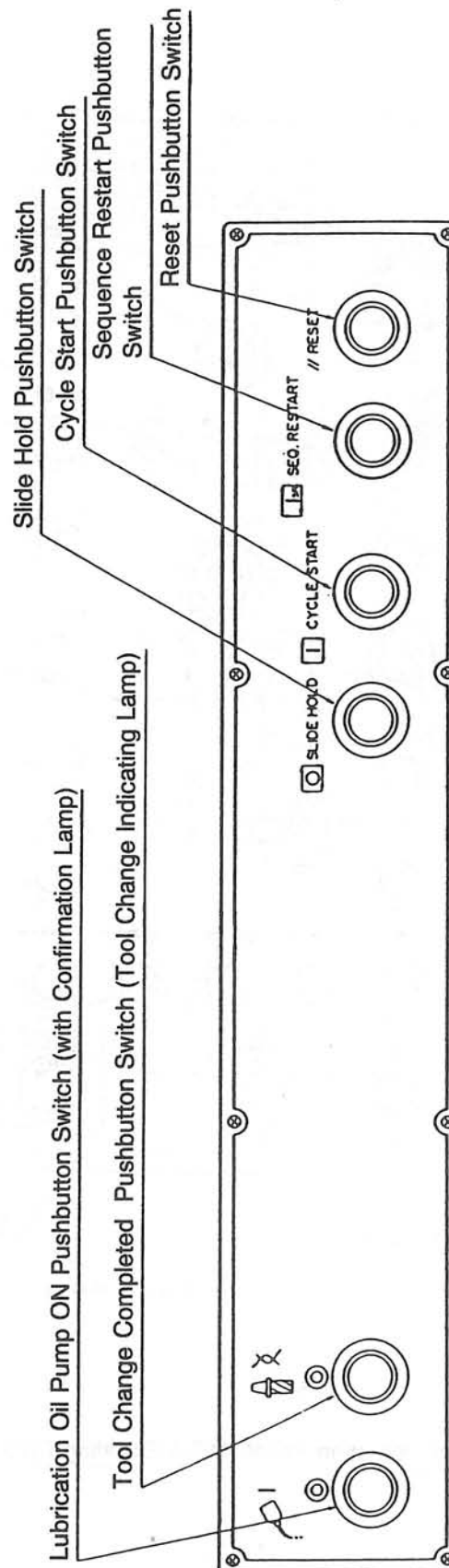


Note: W-axis for NC operation and crossrail for mechanical control

Pendant Operation Panel (MCM Elevating Crossrail)

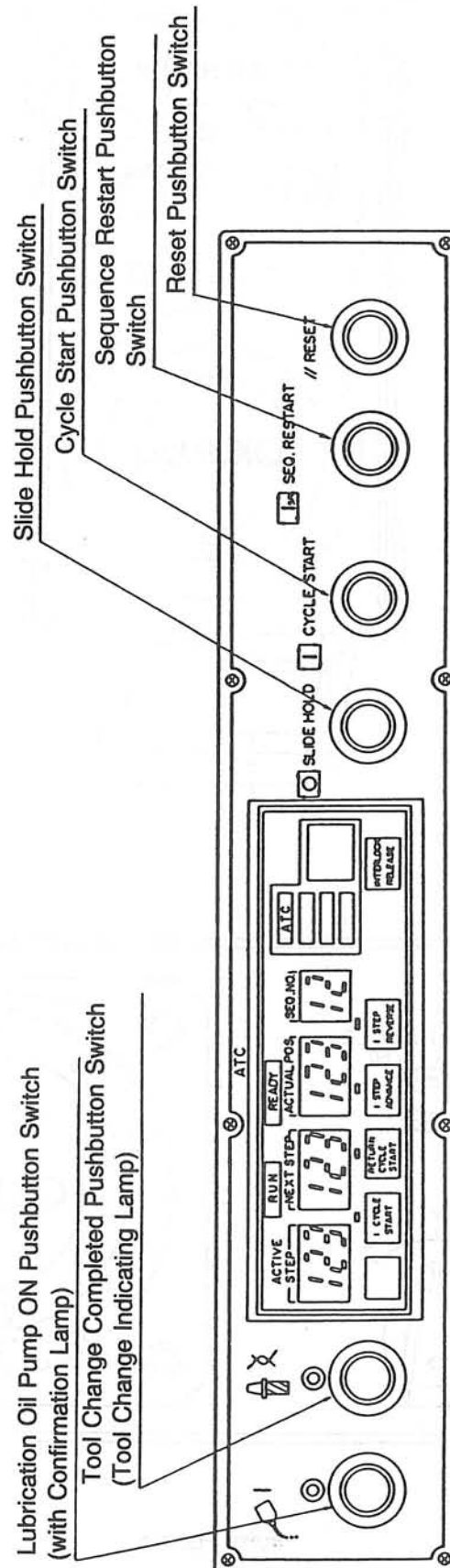
4. Machine Operation Panel for OSP5020M

4-1. Machine Operation Panel for OSP5020M (MDB-A, MDB-B)



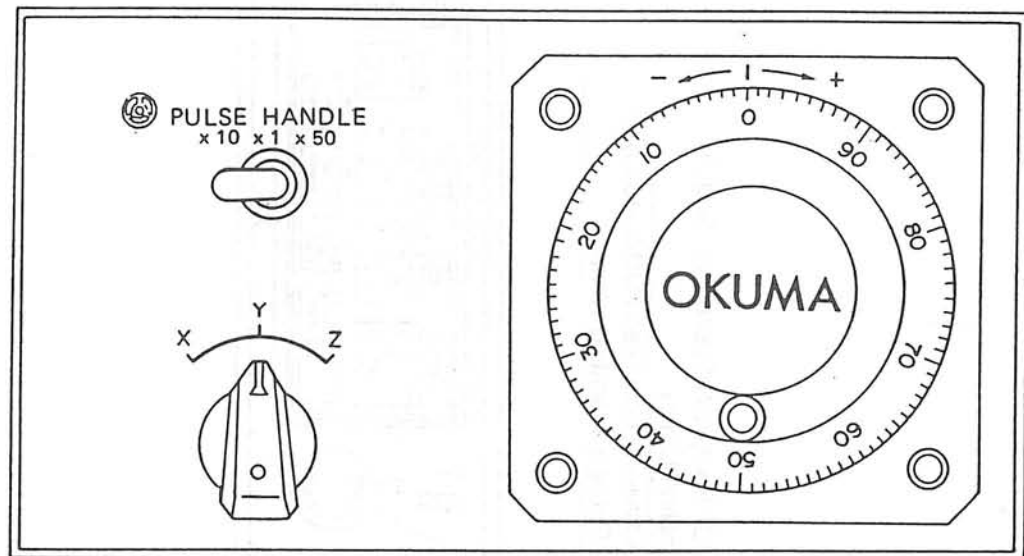
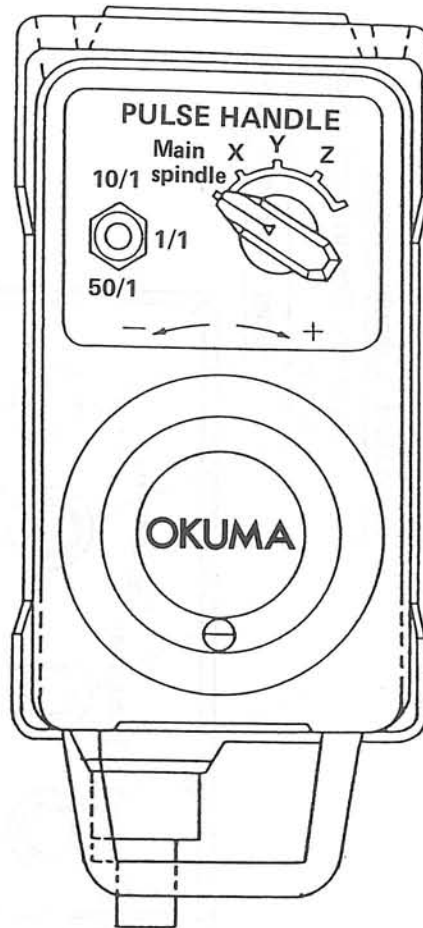
Machine Operation Panel (MDB-A, MDB-B)

4-2. Machine Operation Panel for OSP5020M (MCV-A/MCV-B/MCR/MCM)



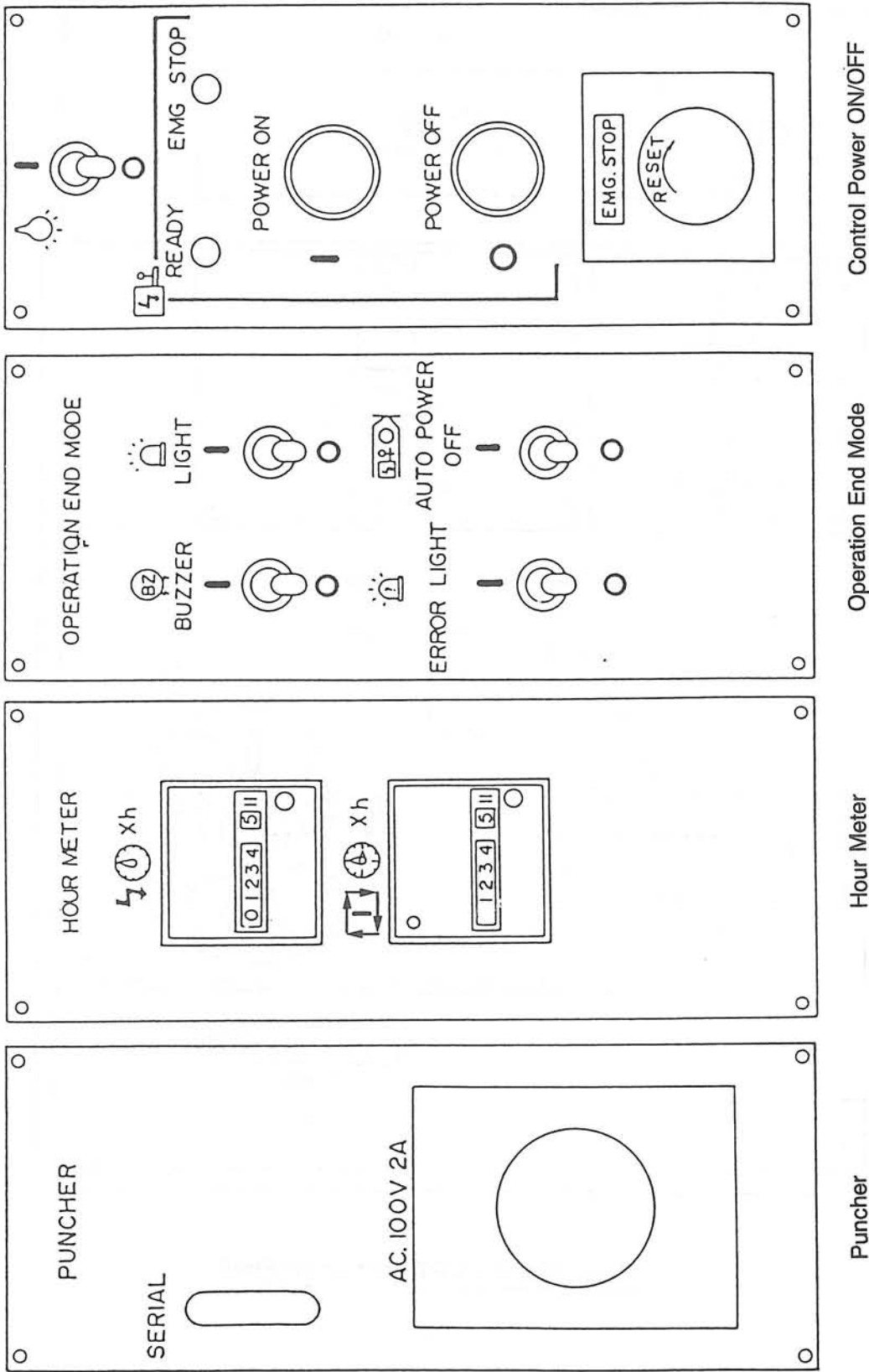
Machine Operation Panel (MCV-A, MCV-B, MDR, MCM)

5. Pulse Handle



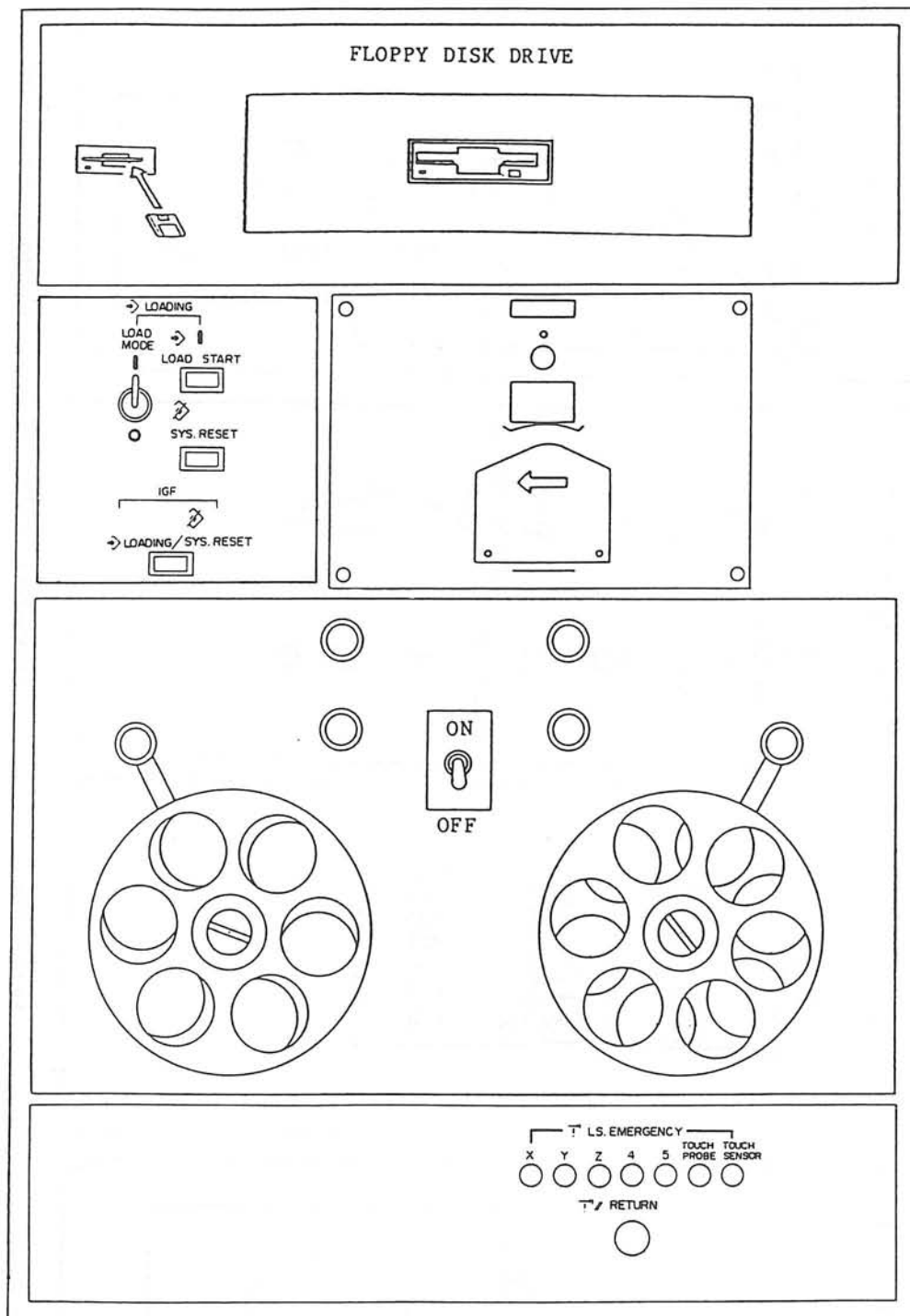
Pulse Handle

6. Option Panel



Option Panel

7. Floppy Disk Drive, PTR and Check Panel

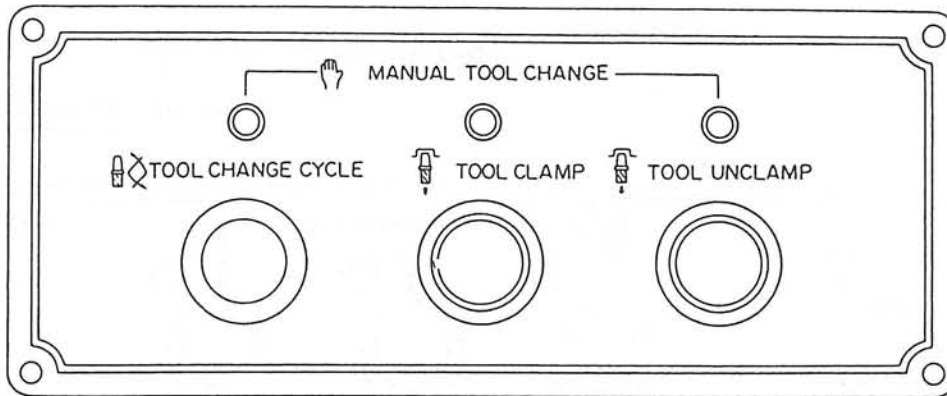


Floppy Disk Drive, PTR and Check Panel

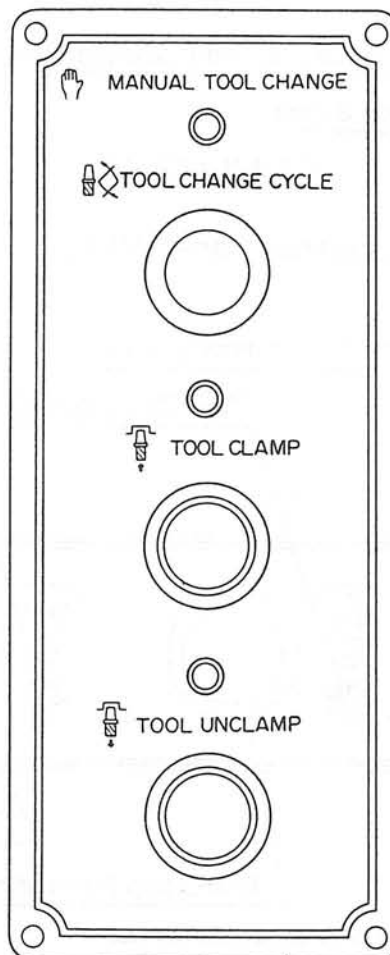
Note: The tape winder is 180 meter (590 feet) specification.
Arrangement of operation switches varies depending on machine model.

8. Manual Tool Change Operation Panel for OSP5020M

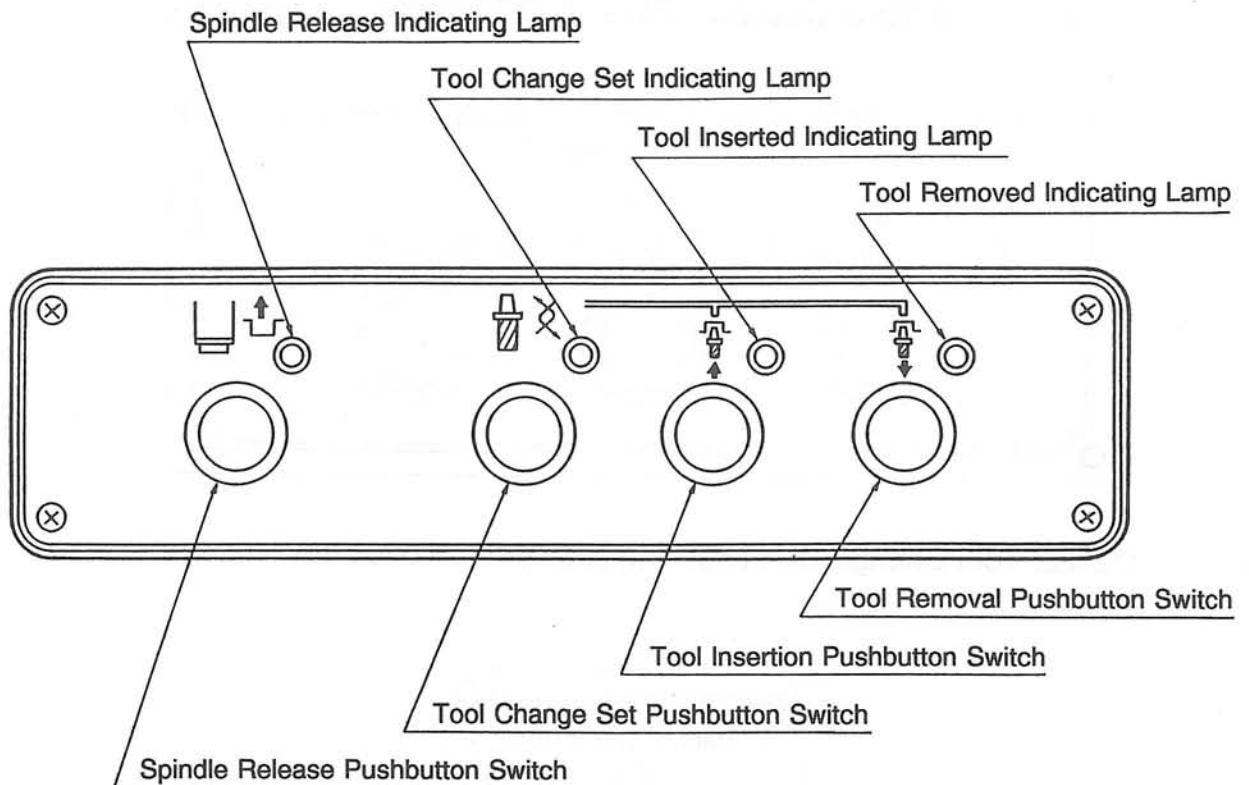
8-1. Manual Tool Change Operation Panel (MC-30VA/40VA/50VA/60VA)



8-2. Manual Tool Change Operation Panel (MC-400H/500H/600H/800H)

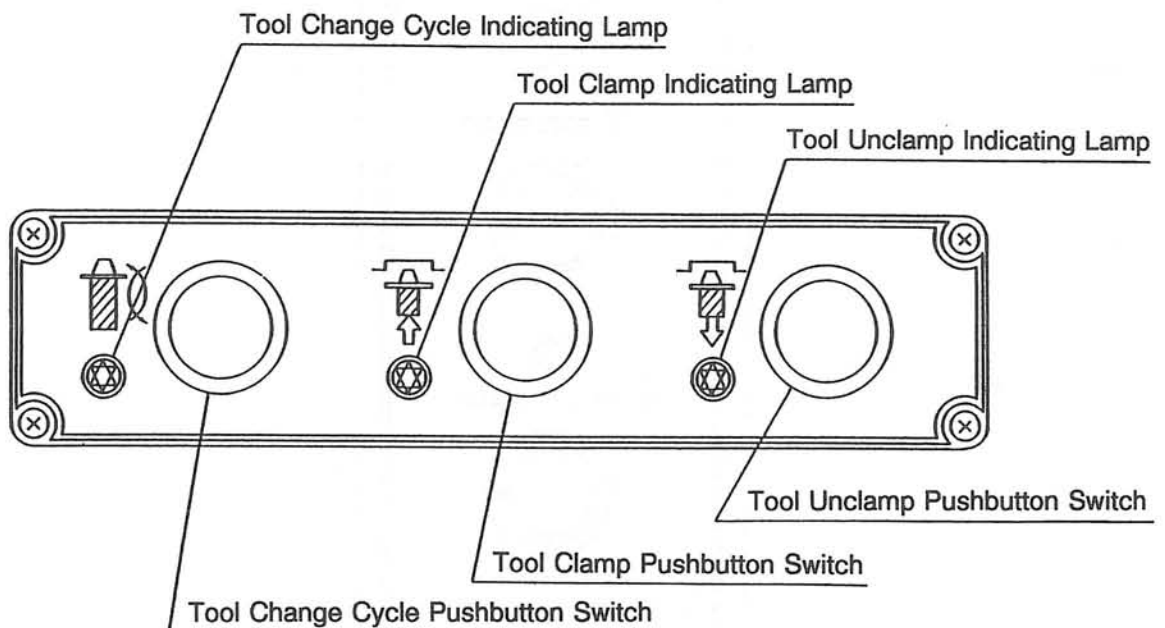


8-3. Manual Tool Change Operation Panel (MDB-A/B, MCV-A/B)



(MDB-A/B, MCV-A/B)

8-4. Manual Tool Change Operation Panel (MCR)

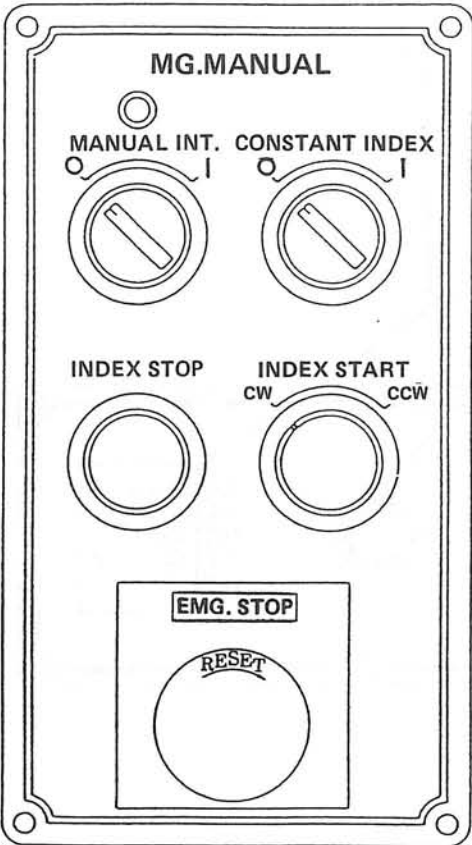


(MDR)

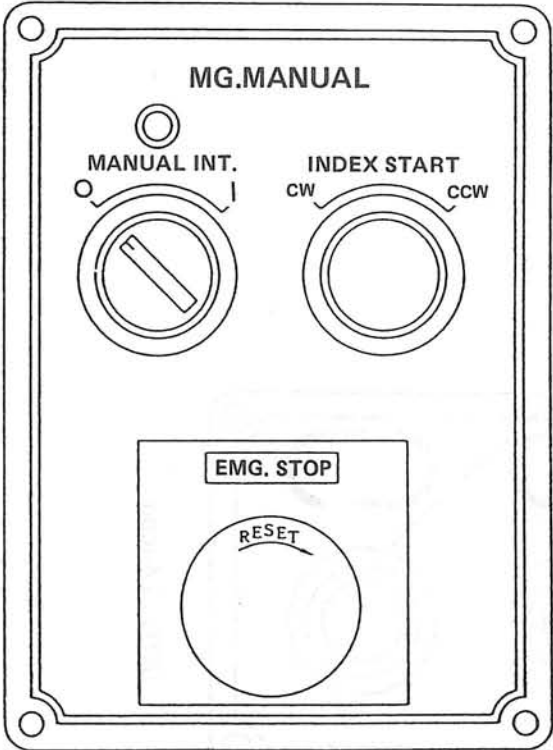
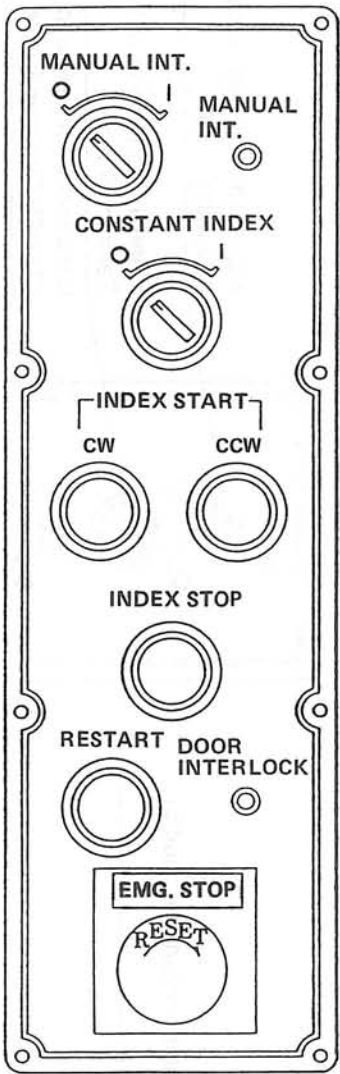
9. Magazine Manual Operation Panel

9-1. Magazine Manual Operation Panel (Machining Center)

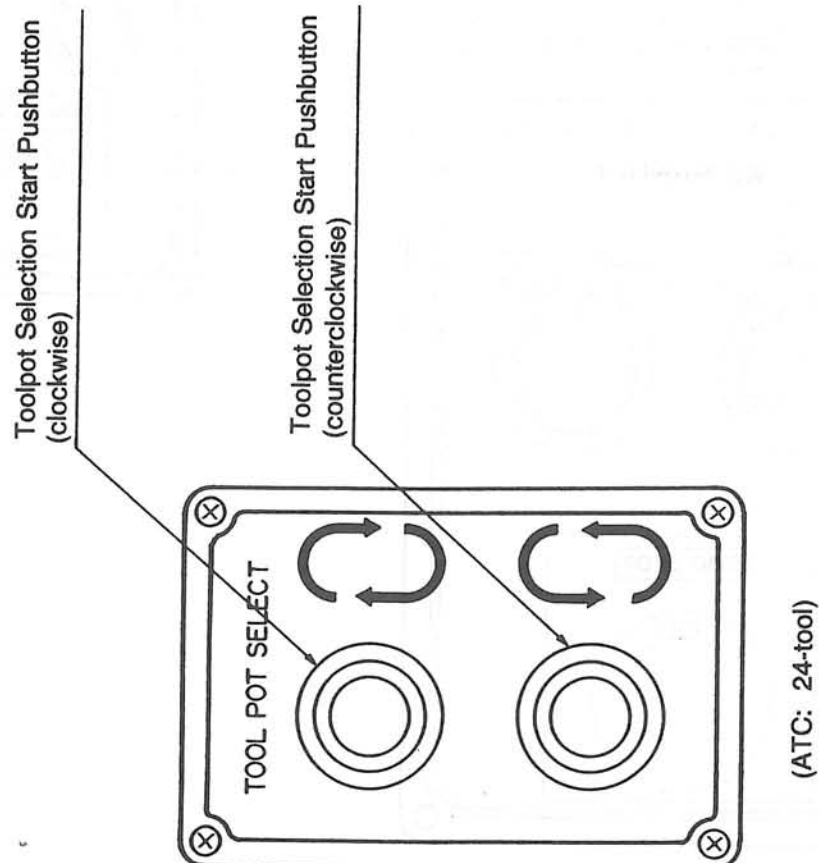
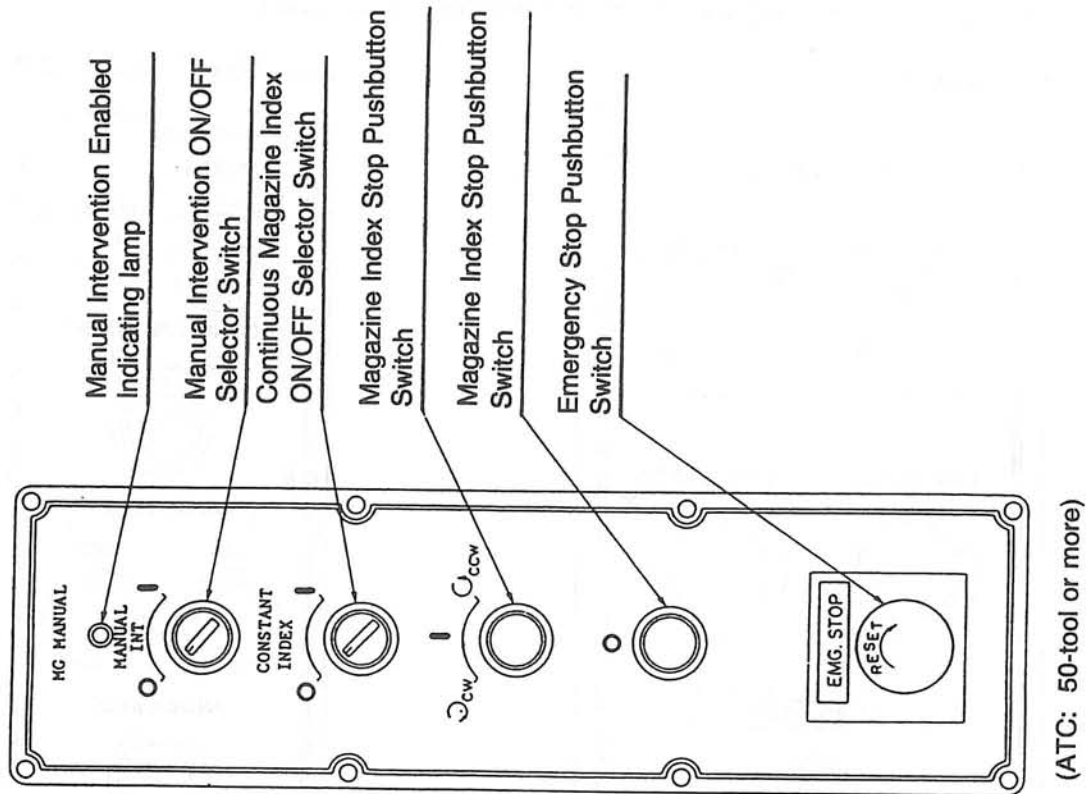
(MC-30VA/40VA/50VA/60VA)



(MC-400H/500H/600H/800H)

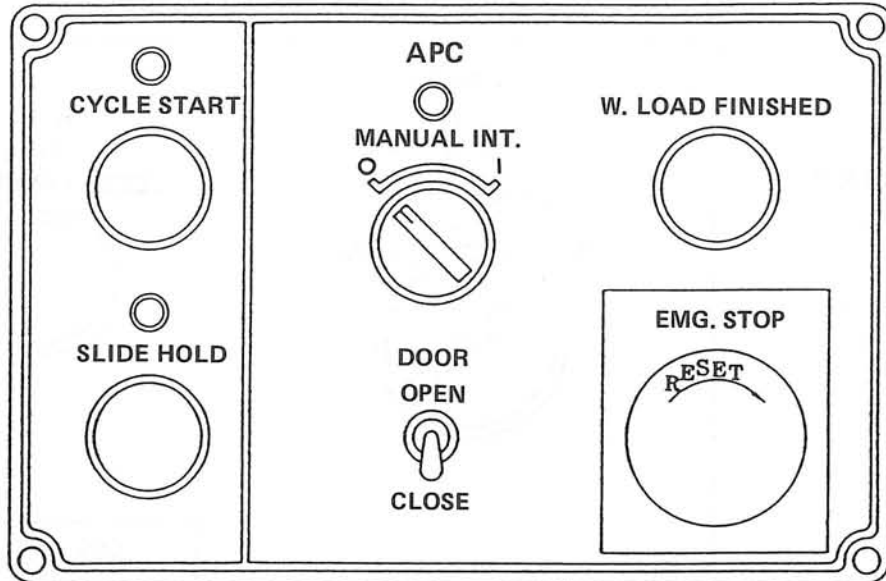


9-2. Magazine Manual Operation Panel (Double-column MC)

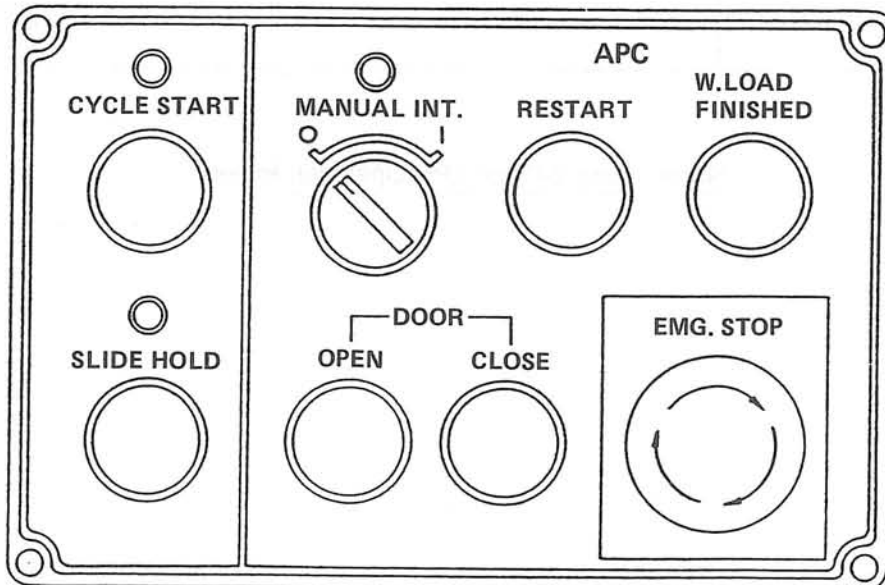


10. Parallel Type 2-Pallet APC Operation Panel

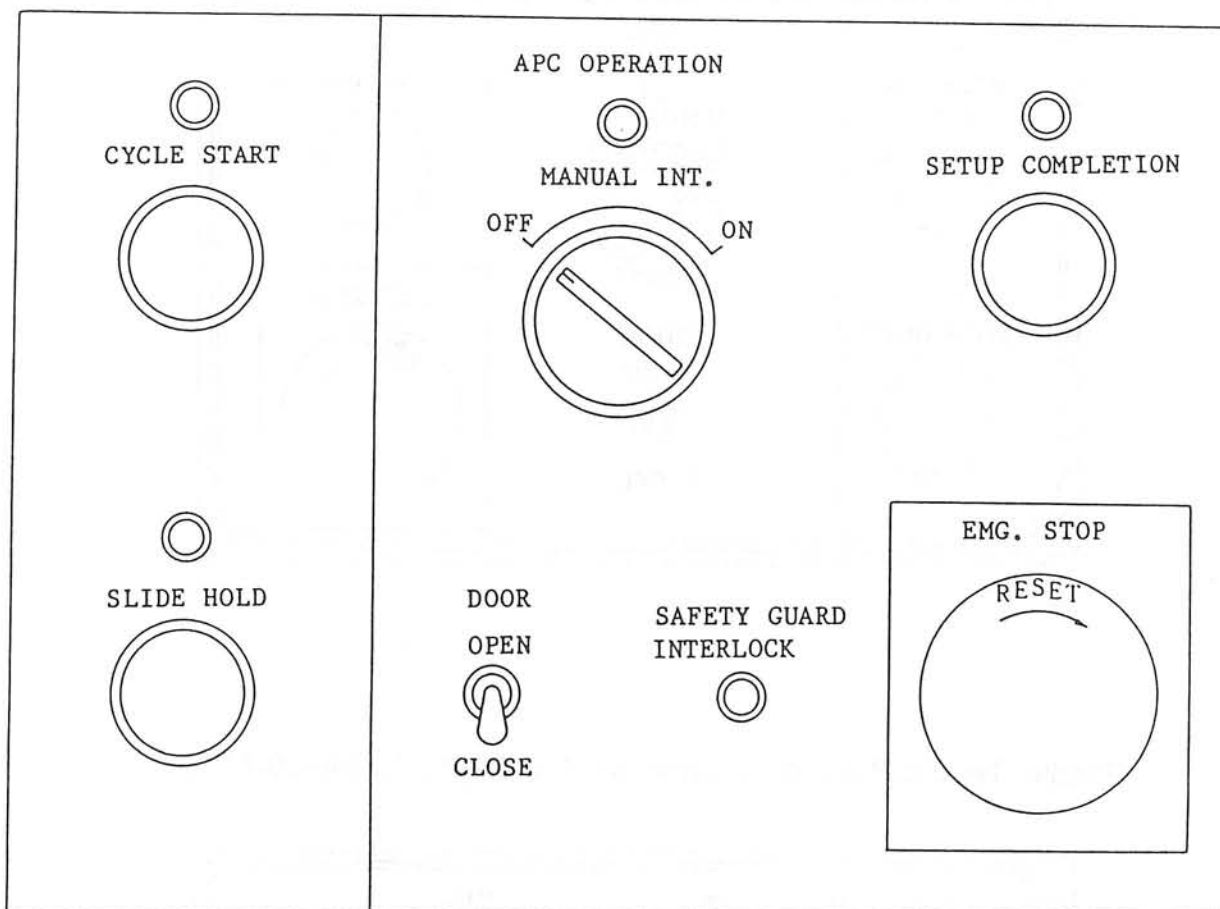
10-1. Parallel Type 2-Pallet APC Operation Panel (MC-40VA/50VA/60VA)



10-2. Parallel Type 2-Pallet APC Operation Panel (MC-500H/600H/800H)



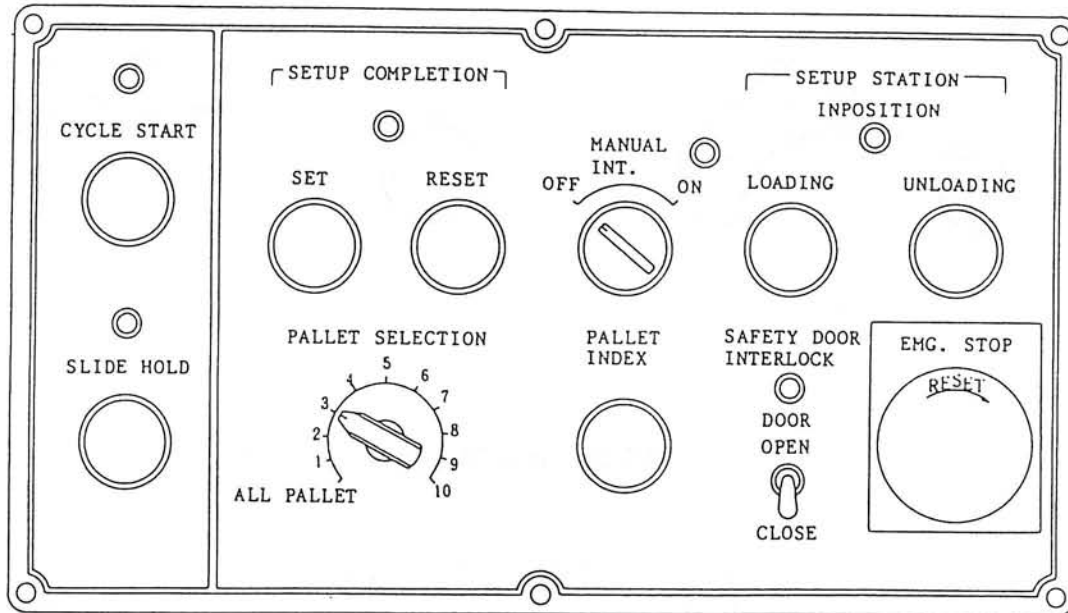
11. Rotary Type 2-Pallet APC Operation Panel



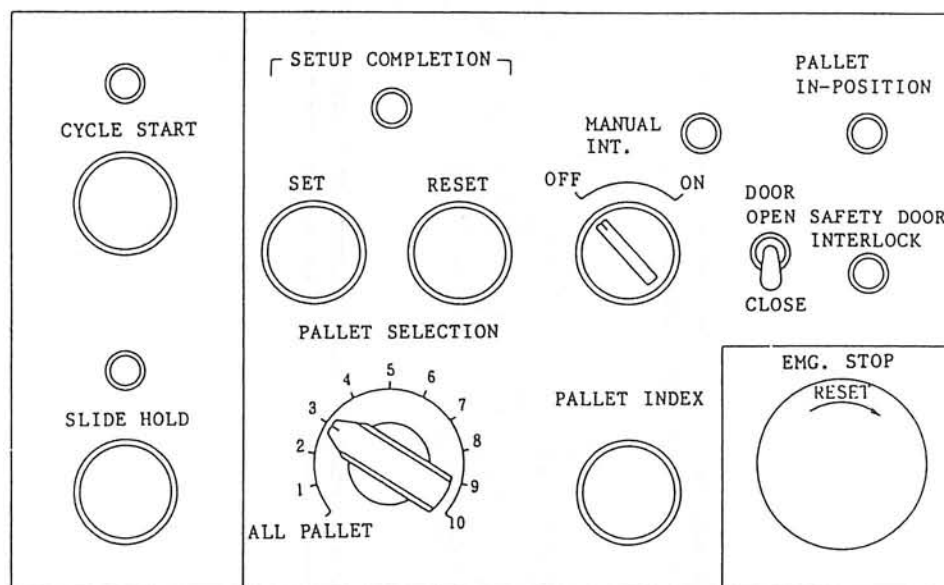
Rotary Type 2-Pallet APC Operation Panel

12. Rotary Type Multi-Pallet APC Operation Panel

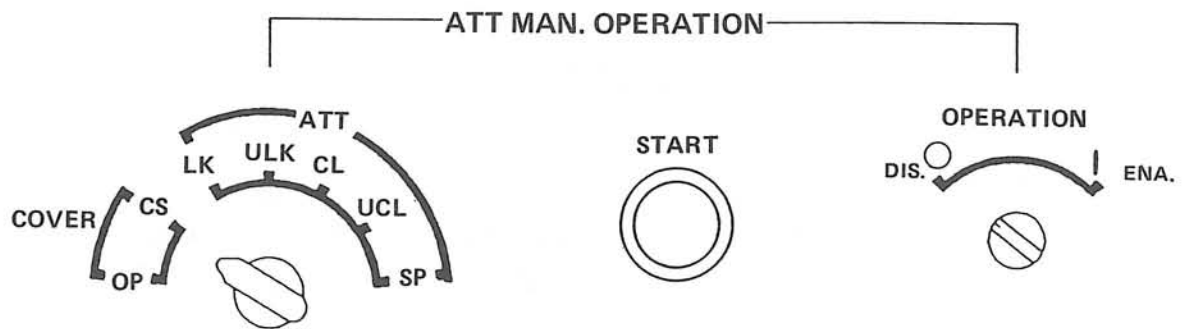
12-1. Rotary Type Multi-Pallet APC Operation Panel (With Setup Station)



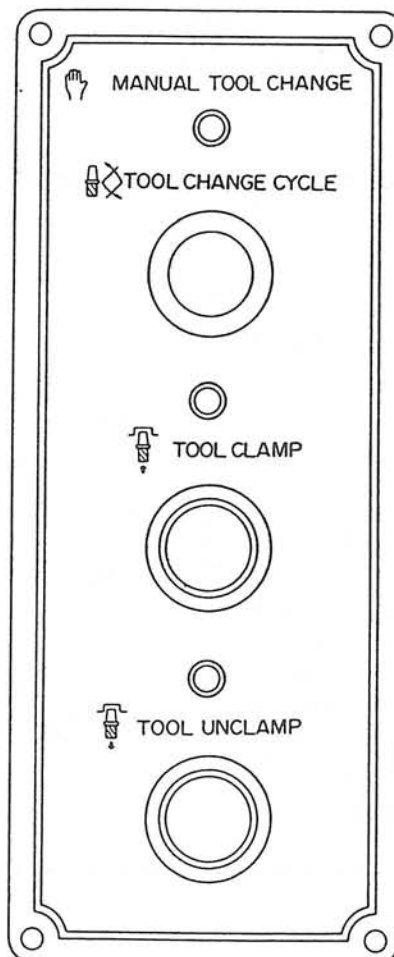
12-2. Rotary Type Multi-Pallet APC Operation Panel (Without Setup Station)



13. Attachment Operation Panel



AAC Operation Panel



Attachment Manual Tool Change Panel

14. List of G Codes

Code	Grope	Functions	Optional
G00 *3 G01 *3 G02 G03	1	Positioning Linear interpolation Circular interpolation-Helical cutting (CW) Circular interpolation-Helical cutting (CCW)	
G04 *2	2	Dwell	
G05 G06 G07 G08			
G09 *2	18	Exact stop	○
G10 *1 G11	3	Cancel of G11 Parallel and rotation shift of coordinate system	○
G12 G13			
G14		Axis name designation/cancel	○
G15 G16 *2	4	Selection of work coordinate system (Modal) Selection of work coordinate system (One-shot)	○
G17 *3 G18 *2 G19 *2	5	Plane selection: XY Plane selection: ZX Plane selection: YZ	
G20 *2 G21 *2	15	Inch input confirmation Metric input confirmation	○
G22 *3 G23 *3	6	Programmable travel limit ON Programmable travel limit cancel	○
G24 G25 G26 G27 G28 G29			

*1 Has already been set when power supply is turned on.

*2 Effective in a specified block.

*3 May be set by an initial condition parameter.

(cont'd)

Code	Grope	Functions	Optional
G30 *2	16	Positioning to home position	
G31 *2	17	Skip function	○
G32 G33 G34 G35 G36 G37 G38			
G40 *1 G41 G42	7	Cutter radius compensation cancel Cutter radius compensation, left Cutter Radius compensation, right	
G43 *1 G44	8	Three dimensional compensation cancel Three dimensional compensation ON	○
G45 G46 G47 G48 G49			
G50 *1 G51	9	Enlargement and reduction of geometry cancel Enlargement and reduction of geometry ON	○
G52			
G53 *3 G54 G55 G56 *3 G57 G58 G59	10	Tool length offset cancel Tool length offset, X-axis Tool length offset, Y-axis Tool length offset, Y-axis Tool length offset, 4th-axis Tool length offset, 5th-axis Tool length offset, 6th-axis	
G60	1	One-directional positioning	
G61	14	Exact stop mode	○

*1 Has already been set when power supply is turned on.

*2 Effective in a specified block.

*3 May be set by an initial condition parameter.

(cont'd)

Code	Grope	Functions	Optional
G62	19	Programmable mirror image function	○
G63			
G64 *1	14	Cutting mode	○
G65			
G66			
G67			
G68	24	Cancel of G68	○
G69		Setting of 3-D coordinate system conversion	
G70			
G71	11	Fixed cycle, Designation of return level for M53	
G72			
G73	11	Fixed cycle, High speed drilling cycle	
G74		Fixed cycle, Reverse tapping	
G75			
G76	11	Fixed cycle, Fine boring	
G77			
G78			
G79			
G80 *1	11	Fixed cycle, Mode cancel	
G81		Fixed cycle, Drill/spot boring	
G82		Fixed cycle, Drill/counter boring	
G83		Fixed cycle, Deep-hole drilling cycle	
G84		Fixed cycle, Tapping	
G85		Fixed cycle, Boring	
G86		Fixed cycle, Boring	
G87		Fixed cycle, Back boring	
G88			
G89	11	Fixed cycle, Boring	
G90 *3	12	Absolute dimensioning	
G91 *3		Incremental dimensioning	

*1 Has already been set when power supply is turned on.

*2 Effective in a specified block.

*3 May be set by an initial condition parameter.

(cont'd)

Code	Grope	Functions	Optional
G92	20	Setting of work coordinate system	☐
G93			
G94 *3		Feed per min	☐
G95 *3		Feed per rev	
G96			
G97			
G98			
G99			

*1 Has already been set when power supply is turned on.

*2 Effective in a specified block.

*3 May be set by an initial condition parameter.

15. List of Mnemonic Codes

Code	Grope	Contents	Optional
NOEX	34	Specification of the sequence not executed	
CALL RTS MODIN MODOUT	27	Subprogram, Simple call Subprogram, End code Subprogram, Call after positioning mode ON Subprogram, Call after positioning mode OFF	
GOTO IF	28	Branch command, Unconditional jump Branch command, Conditional jump (6 kinds)	
RTMCR		Macro processing end code (used only in system)	
RTMDI		MDI processing end code (used only in system)	
OMIT RSTRT	29	Coordinate calculation function, Omit Coordinate calculation function, Restart	○
LAA ARC GRDX GRDY DGRDX DGRDY SQRX SQRY BHC	30	Coordinate calculation function, Line at angle Coordinate calculation function, Arc Coordinate calculation function, Grid X Coordinate calculation function, Grid Y Coordinate calculation function, Double grid X Coordinate calculation function, Double grid Y Coordinate calculation function, Square X Coordinate calculation function, Square Y Coordinate calculation function, Bolt hole circle	○
FMILR FMILF PMIL PMILR RMILO RMILI	31	Area machining, Face milling (Rough) Area machining, Face milling (Finish) Area machining, Pocket milling (Zigzag) Area machining, Pocket milling (Spiral) Area machining, Round milling (Out) Area machining, Round milling (In)	○
MSG NMSG	35	Message display Restoring original display	○
NCYL	36	Fixed cycle, No cycle movement	
COPY COPYE	39	Copy, initial value of local coordinate system for parallel shift or rotation Copy end, Incremental value for parallel shift or rotation of local coordinate system	○
CHFC CHFR		Arbitrary-angle chamfering Arbitrary-angle chamfering (rounding)	○

16. List of M Codes

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M00	1	Program stop	After	one-shot		
M01		Optional stop	After	one-shot		
M02	18	End of program	After	one-shot		
M30		End of tape	After	one-shot		
M03	2	Spindle CW	At the same time	modal		
M04		Spindle CCW	At the same time	modal		
M05		Spindle stop	After	modal		
M19		Spindle orientation	After	modal		
M06	3	Vertical spindle tool change	After	one-shot		
M77		Horizontal spindle tool change	After	one-shot		
M07	8	Oil mist coolant ON	At the same time	modal		○
M08	10	Coolant pump ON	At the same time	modal		○
M09	24	Coolant system OFF (M07, 08, 12, 50, 51, 59, 120 OFF)	After	modal		○
M10	30	A-axis clamp	After	modal		○
M11		A-axis unclamp	After	modal		
M12	22	Chip air blow ON	At the same time	modal		○
M15	5	Rotary index table CW (4th-axis)	At the same time	modal		
M16		Rotary index table CCW (4th-axis)	At the same time	modal		
M17	7	Swivel head index CCW	At the same time	one-shot	Effective for only the first M73 - M76	
M20	31	B-axis clamp	After	modal		○
M21		B-axis unclamp	After	modal		(Except for MC-H)
M22	32	Y-axis clamp	After	modal		
M23		Y-axis unclamp	After	modal		
M24	33	Z-axis clamp	After	modal		
M25		Z-axis unclamp	After	modal		
M26	35	C-axis clamp	After	modal		○
M27		C-axis unclamp	After	modal		
M32	38	Splash guard door close	At the same time	modal		○
M33		Splash guard door open	At the same time	modal		

(cont'd)

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M40	11	High/middle-high/middle-low/low range	At the same time	modal	Spindle gears are automatically determined by RPM command.	
M41		High/middle-high/middle-low range	At the same time	modal		
M42		High/middle-high range	At the same time	modal		
M43		High range	At the same time	modal		
M44		AAC (F) next attachment clear	At the same time	one-shot	F: Floor type T: Table type	○
M45		AAC (F) change preparation	At the same time	one-shot		
M46		AAC (F) no next attachment	At the same time	one-shot		
M47		AAC (T) no next attachment	At the same time	one-shot		
M48		AAC (T) next attachment clear	At the same time	one-shot		
M49		AAC (T) change preparation	At the same time	one-shot		
M50	23	Through-the-tool coolant, low pressure ON	At the same time	modal		○
M51		Through-the-tool coolant, high pressure ON	At the same time	modal		
M52	12	Return level in fixed cycle: upper limit	At the same time	one-shot		
M53	13	Return level in fixed cycle: specified level	At the same time	modal		
M54		Return level in fixed cycle: R level	At the same time	modal		
M57	34	W-axis clamp	After	modal		○
M58		W-axis unclamp	After	modal		
M59	25	Chip air blow ON	At the same time	modal		○
M60	4	Pallet change cycle	After	one-shot		○
M62		Vertical spindle tool change preparation	After	modal		○
M68		Vertical spindle tool clamp	After	modal		
M69		Vertical spindle tool unclamp	After	modal		
M63	21	No next tool in automatic tool change cycle	At the same time	one-shot		
M64		Next tool return cycle	At the same time	one-shot		
M65		ATC ready	At the same time	one-shot		

(cont'd)

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M66	14	Continuous tool change between vertical and horizontal spindle (same tool)	At the same time	one-shot		
M67		Continuous tool change between vertical and horizontal spindle (different tool)	At the same time	one-shot		
M70	3	Manual tool change	After	one-shot		
M71		Attachment manual tool change	After	one-shot		○
M72		Horizontal spindle tool change preparation	After	modal		
M78		Horizontal spindle tool clamp	After	modal		
M79		Horizontal spindle tool unclamp	After	modal		
M73	15	Swivel head, front position	After	one-shot		
M74		Swivel head, left position	After	one-shot		
M75		Swivel head, back position	After	one-shot		
M76		Swivel head, right position	After	one-shot		
M81	27	Automatic W-axis positioning 1	After	one-shot		○
M82		Automatic W-axis positioning 2	After	one-shot		
M83		Automatic W-axis positioning 3	After	one-shot		
M84		Automatic W-axis positioning 4	After	one-shot		
M85		Automatic W-axis positioning 5	After	one-shot		
M87		Oil mist/Air blow ON	At the same time	one-shot	Effective for M90, 91 and 98	○
M88		Dust collector ON	At the same time	modal		○
M89		Dust collector OFF	At the same time	modal		
M90		Vertical spindle oil mist cycle mode ON	At the same time	modal		
M98		Horizontal spindle oil mist cycle mode ON	At the same time	modal		
M91		Tap-drill hole chip air blow cycle mode ON	At the same time	modal	Turned OFF by M09	○

(cont'd)

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M101	4	Pallet selection 1	After	one-shot		○
M102		Pallet selection 2	After	one-shot		
M103		Pallet selection 3	After	one-shot		
M104		Pallet selection 4	After	one-shot		
M105		Pallet selection 5	After	one-shot		
M106		Pallet selection 6	After	one-shot		
M107		Pallet selection 7	After	one-shot		
M108		Pallet selection 8	After	one-shot		
M109		Pallet selection 9	After	one-shot		
M110		Pallet selection 10	After	one-shot		
M111		Pallet selection 11	After	one-shot		
M112		Pallet selection 12	After	one-shot		
M115	6	5th axis-rotary table forward	At the same time	modal		○
M116		5th axis-rotary table reverse	At the same time	modal		
M118		Spindle orientation (reverse)	After	modal		
M119		Spindle orientation (reverse/forward)	After	modal		
M120		Shower coolant ON	At the same time	modal		○
M130	9	Spindle rotation condition for cutting feed OFF	At the same time	modal		
M131		Spindle rotation condition for cutting feed ON	At the same time	modal		
M132	37	Single block ineffective	At the same time	modal		
M133		Single block effective	At the same time	modal		
M134	16	Spindle speed override ineffective	At the same time	modal		
M135		Spindle speed override effective	At the same time	modal		
M136	17	Feedrate override ineffective	At the same time	modal		
M137		Feedrate override effective	At the same time	modal		
M138	36	Dry run ineffective	At the same time	modal		
M139		Dry run effective	At the same time	modal		
M140	39	Slide hold ineffective	At the same time	modal		
M141		Slide hold effective	At the same time	modal		

(cont'd)

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M142		Spindle overload detection ineffective	At the same time	modal		○
M143		Spindle overload detection effective	At the same time	modal		
M144	19	Touch sensor advance	After	modal		○
M145		Touch sensor retraction	After	modal		
M150	28	Coolant group specification-vertical spindle	At the same time	modal		○
M151		Coolant group specification-horizontal spindle	At the same time	modal		
M152		Coolant group specification-3rd group	At the same time	modal		
M153		Coolant group specification-4th group	At the same time	modal		
M154	20	Sensor air blow OFF	After	modal		○
M155		Sensor air blow ON	At the same time	modal		
M157		AAC (2 st.) no next tool	After	one-shot		○
M158		AAC (2 st.) next tool clear	After	one-shot		
M159		AAC (2 st.) attachment preparation	After	one-shot		
M160	4					
M161						
M163		Long tool-no next tool	At the same time	one-shot		○
M165		Long tool-tool change preparation	At the same time	one-shot	Safety cover specification for next tool	

(cont'd)

Code	Grope	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M172	3	Long tool-tool change-command	After	one-shot		○
M166	3	ATC active tool return mode specification	At the same time	one-shot		○
M170		AAC (F) attachment change	After	one-shot	F: Floor type T: able type	○
M171		AAC (T) attachment change	After	one-sho		
M173		AAC (2 st.) attachment change command	After	one-shot		
M176		Dust collection mode-sir blow	At the same time	one-shot		○
M178	4	Dust collection mode-ON	At the same time	modal		○
M179		Dust collection mode-OFF	At the same time	modal		
M177	3	Angular attachment tool change	After	one-shot	AT-ATC	○
M181	38	External M signal	At the same time	one-shot		○
M182		External M signal	At the same time	one-shot		
M183		External M signal	At the same time	one-shot		
M184		External M signal	At the same time	one-shot		
M185		External M signal	At the same time	one-shot		
M186		External M signal	At the same time	one-shot		○
M187		External M signal	At the same time	one-shot		
M188		External M signal	At the same time	one-shot		
M190		Automatic W-axis positioning 1	After	one-shot	For automatic W-axis positioning 10 points specification	○
M191		Automatic W-axis positioning 2	After	one-shot		
M192		Automatic W-axis positioning 3	After	one-shot		
M193		Automatic W-axis positioning 4	After	one-shot		
M194		Automatic W-axis positioning 5	After	one-shot		
M195		Automatic W-axis positioning 6	After	one-shot		
M196		Automatic W-axis positioning 7	After	one-shot		
M197		Automatic W-axis positioning 8	After	one-shot		
M198		Automatic W-axis positioning 9	After	one-shot		
M199		Automatic W-axis positioning 10	After	one-shot		

LIST OF PUBLICATIONS

Publication No.	Date	Edition
3610-E	October 1991	1st
3610-E-R1	December 1991	2nd

This manual may be at variance with the actual product due to specification or design changes.

Please also note that specifications are subject to change without notice.

If you require clarification or further explanation of any point in this manual, please contact your OKUMA representative.