OSP7000M
OSP700M

OPERATION MANUAL
(3rd Edition)

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OKUMA

SAFETY PRECAUTIONS

The machine is equipped with safety devices which serve to protect personnel and the machine itself from hazards arising from unforeseen accidents. However, operators must not rely exclusively on these safety devices: they must also become fully familiar with the safety guidelines presented below to ensure accident-free operation.

This instruction manual and the warning signs attached to the machine cover only those hazards which Okuma can predict. Be aware that they do not cover all possible hazards.

1. PRECAUTIONS RELATING TO MACHINE INSTALLATION

(1) Install the machine at a site where the following conditions (the conditions for achievement of the guaranteed accuracy) apply.

- Ambient temperature: 17 to 25°C
- Ambient humidity: 75% max. (no condensation)
- Site not subject to direct sunlight or excessive vibration; environment as free of dust, acid, corrosive gases, and salt spray as possible.

(2) Prepare a primary power supply that complies with the following requirements.

- Voltage: 200 V
- Voltage fluctuation: ±10% max.
- Power supply frequency: 50/60 Hz
- Do not draw the primary power supply from a distribution panel that also supplies a major noise source (for example an electric welder or electric discharge machine) since this could cause malfunction of the NC unit.
- If possible connect the machine to a ground not used by any other equipment. If there is no choice but to use a common ground, the other equipment must not generate a large amount of noise (such as an electric welder or electric discharge machine).

(3) Installation Environment

Observe the following points when installing the electrical control cabinet.

- Make sure that the NC unit will not be subject to direct sunlight.
- Make sure that the electrical control cabinet will not be splashed with chips, water, or oil.
- Make sure that the electrical control cabinet and operation panel are not subject to excessive vibrations or shock.
- The permissible ambient temperature range for the electrical control cabinet is 0 to 40°C.
- The permissible ambient humidity range for the electrical control cabinet is 30 to 95% (no condensation).
- The maximum altitude at which the electrical control cabinet can be used is 1000 m (3281 ft.).

2. POINTS TO CHECK BEFORE TURNING ON THE POWER

(1) Close all the doors of the electrical control cabinet and operation panel to prevent the entry of water, chips, and dust.

(2) Make absolutely sure that there is nobody near the moving parts of the machine, and that there are no obstacles around the machine, before starting machine operation.

(3) When turning on the power, turn on the main power disconnect switch first, then the CONTROL ON switch on the operation panel.

3. PRECAUTIONS RELATING TO OPERATION

(1) After turning on the power, carry out inspection and adjustment in accordance with the daily inspection procedure described in this instruction manual.

(2) Use tools whose dimensions and type are appropriate for the work undertaken and the machine specifications. Do not use badly worn tools since they can cause accidents.

(3) Do not for any reason touch the spindle or tool while spindle indexing is in progress since the spindle could rotate: this is dangerous.

(4) Check that the workpiece and tool are properly secured.

(5) Never touch a workpiece or tool while it is rotating: this is extremely dangerous.

(6) Do not remove chips by hand while machining is in progress since this is dangerous. Always stop the machine first, then remove the chips with a brush or broom.

(7) Do not operate the machine with any of the safety devices removed. Do not operate the machine with any of the covers removed unless it is necessary to do so.

(8) Always stop the machine before mounting or removing a tool.

(9) Do not approach or touch any moving part of the machine while it is operating.

(10) Do not touch any switch or button with wet hands. This is extremely dangerous.

(11) Before using any switch or button on the operation panel, check that it is the one intended.

4. PRECAUTIONS RELATING TO THE ATC

(1) The tool clamps of the magazine, spindle, etc., are designed for reliability, but it is possible that a tool could be released and fall in the event of an unforeseen accident, exposing you to danger: do not touch or approach the ATC mechanism during ATC operation.

(2) Always inspect and change tools in the magazine in the manual magazine interrupt mode.

(3) Remove chips adhering to the magazine at appropriate intervals since they can cause misoperation.

Do not use compressed air to remove these chips since it will only push the chips further in.

(4) If the ATC stops during operation for some reason and it has to be inspected without turning the power off, do not touch the ATC since it may start moving suddenly.

5. ON FINISHING WORK

(1) On finishing work, clean the vicinity of the machine.

(2) Return the ATC, APC and other equipment to the predetermined retraction position.

(3) Always turn off the power to the machine before leaving it.

(4) To turn off the power, turn off the CONTROL ON switch on the operation panel first, then the main power disconnect switch.

6. PRECAUTIONS DURING MAINTENANCE INSPECTION AND WHEN TROUBLE OCCURS

In order to prevent unforeseen accidents, damage to the machine, etc., it is essential to observe the following points when performing maintenance inspections or during checking when trouble has occurred.

(1) When trouble occurs, press the emergency stop button on the operation panel to stop the machine.

(2) Consult the person responsible for maintenance to determine what corrective measures need to be taken.

(3) If two or more persons must work together, establish signals so that they can communicate to confirm safety before proceeding to each new step.

(4) Use only the specified replacement parts and fuses.

(5) Always turn the power off before starting inspection or changing parts.

(6) When parts are removed during inspection or repair work, always replace them as they were and secure them properly with their screws, etc.

(7) When carrying out inspections in which measuring instruments are used – for example voltage checks – make sure the instrument is properly calibrated.

(8) Do not keep combustible materials or metals inside the electrical control cabinet or terminal box.

(9) Check that cables and wires are free of damage: damaged cables and wires will cause current leakage and electric shocks.

(10) Maintenance inside the Electrical Control Cabinet

a) Switch the main power disconnect switch OFF before opening the electrical control cabinet door.

b) Even when the main power disconnect switch is OFF, there may some residual charge in the servo amplifier and spindle drive unit, and for this reason only service personnel are permitted to perform any work on these units. Even then, they must observe the following precautions.

- Servo amplifier

  Discharge the residual voltage one minute after turning off the breaker inside the unit.

- Spindle drive unit

  Discharge the residual voltage one minute after turning off the main power disconnect switch.

c) The electrical control cabinet contains the NC unit, and the NC unit has a printed circuit board whose memory stores the machining programs, parameters, etc. In order to ensure that the contents of this memory will be retained even when the power is switched off, the memory is supplied with power by a battery. Depending on how the printed circuit boards are handled, the contents of the memory may be destroyed and for this reason only service personnel should handle these boards.

(11) Periodic Inspection of the Electrical Control Cabinet

a) Cleaning the cooling unit

The cooling unit in the door of the electrical control cabinet serves to prevent excessive temperature rise inside the electrical control cabinet and increase the reliability of the NC unit. Inspect the following points every three months.

- Is the fan motor inside the cooling unit working?

  The motor is normal if there is a strong draft from the unit.

- Is the external air inlet blocked?

  If it is blocked, clean it with compressed air.

7. GENERAL PRECAUTIONS

(1) Keep the vicinity of the machine clean and tidy.

(2) Wear appropriate clothing while working, and follow the instructions of someone with sufficient training.

(3) Make sure that your clothes and hair cannot become entangled in the machine. Machine operators must wear safety equipment such as safety shoes and safety goggles.

(4) Machine operators must read the instruction manual carefully and make sure of the correct procedure before operating the machine.

(5) Memorize the position of the emergency stop button so that you can press it immediately at any time and from any position.

(6) Do not access the inside of the control panel, transformer, motor, etc., since they contain high-voltage terminals and other components which are extremely dangerous.

(7) If two or more persons must work together, establish signals so that they can communicate to confirm safety before proceeding to each new step.

8. SYMBOLS USED IN THIS MANUAL

The following warning indications are used in this manual to draw attention to information of particular importance. Read the instructions marked with these symbols carefully and follow them.

: Indicates an imminent hazard which, if not avoided, will result in death or serious injury.

: Indicates hazards which, if not avoided, could result in death or serious injury.

: Indicates hazards which, if not avoided, could result in minor injuries or damage to devices or equipment.

: Indicates precautions relating to operation or use.

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SECTION 1 INTRODUCTION

1. FEATURES

(1) Multiple Main CPU System Permits CNC Growth

The multiple main CPU system of the OSP7000/OSP700 allows it to use up to seven "engines" (main CPUs).

a) In order to ensure that it will not lag behind machine tools as they become ever faster and more accurate, the OSP7000/OSP700 features compatibility with sophisticated functions and high cost-performance.

b) Due to the configuration of the main CPU, the CNC can grow, giving it the flexibility required to suit different machine models and specifications.

(2) Compactness and High Reliability

Compactness and high reliability have been achieved by remodeling the hardware; innovations include the adoption of a new generation "flash" memory, and surface-mounting.

One of the cornerstones of the OSP technical concept – the ability to change the software – has been made possible by the flash memory. Our clients can add the functions of their choice to the NC system even after delivery.

(3) Expansion of Standard Specifications

The high cost-performance means that more sophisticated functions can be offered. The following specifications are featured as standard:

3.5" floppy disk drive

MS-DOS format I/O function

RS-232C interface

(4) User-friendly Operation Panel

User-friendliness was a priority in the development of the operation panel.

a) Design

The design emphasizes functional side faces, the display screen is easy to see, and the color scheme and tastefulness accentuate the high-class impression of the equipment.

b) Improved key operation

In order make operator interactions with the machine easier, the sheet that overlays the keys has been embossed.

(5) Compatibility with OSP5020M

Part programs created on an OSP5020M or OSP500∗M-G can be used at an OSP7000M/OSP700M without alteration.

(6) New Function "Machining Management Function" – History Management Function

The machining management function provides powerful back-up to ensure that the exceptional functions of the OSP7000M/OSP700M can be used efficiently. It is intended to assist with profitable small-lot production of a variety of workpieces and production of a variety of workpieces in variable lot sizes.

a) Slashed set-up time

Since part data changes in small-lot production are becoming increasingly frequent, we have attempted to speed up these part data changes by establishing an operating procedure that does not depend on the floppy disk format and in which the operator simply selects a file name from a directory.

Details of the work involved in setup (work instructions) can be displayed on the display screen.

b) Ascertaining the latest production status

The machining status and operating status can be displayed in real time on the screen of the NC unit.

c) Slashed down time

The information required for troubleshooting can be output accurately, promptly, and in a form in which it can be used, i.e., a hard copy output from a printer or data output to a floppy disk.

2. EXPLANATION

This manual describes how to operate the OSP7000M and gives precautions that should be observed. Please read this manual carefully and follow the operating procedures that it contains. For greater understanding, this manual should be read in conjunction with the Programming Manual for the OSP7000M, as the two manuals are very closely related.

Machine improvements made after this manual was written may occasionally result in discrepancies 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 6-1, "Mode-Select Keys".

1-2. Operation Panel Description

Five types of operation panels are used:

(1) NC operation panel (with display screen)

(2) Machine operation panel

(3) Option panel

The machine operation panel, differs depending on machine 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

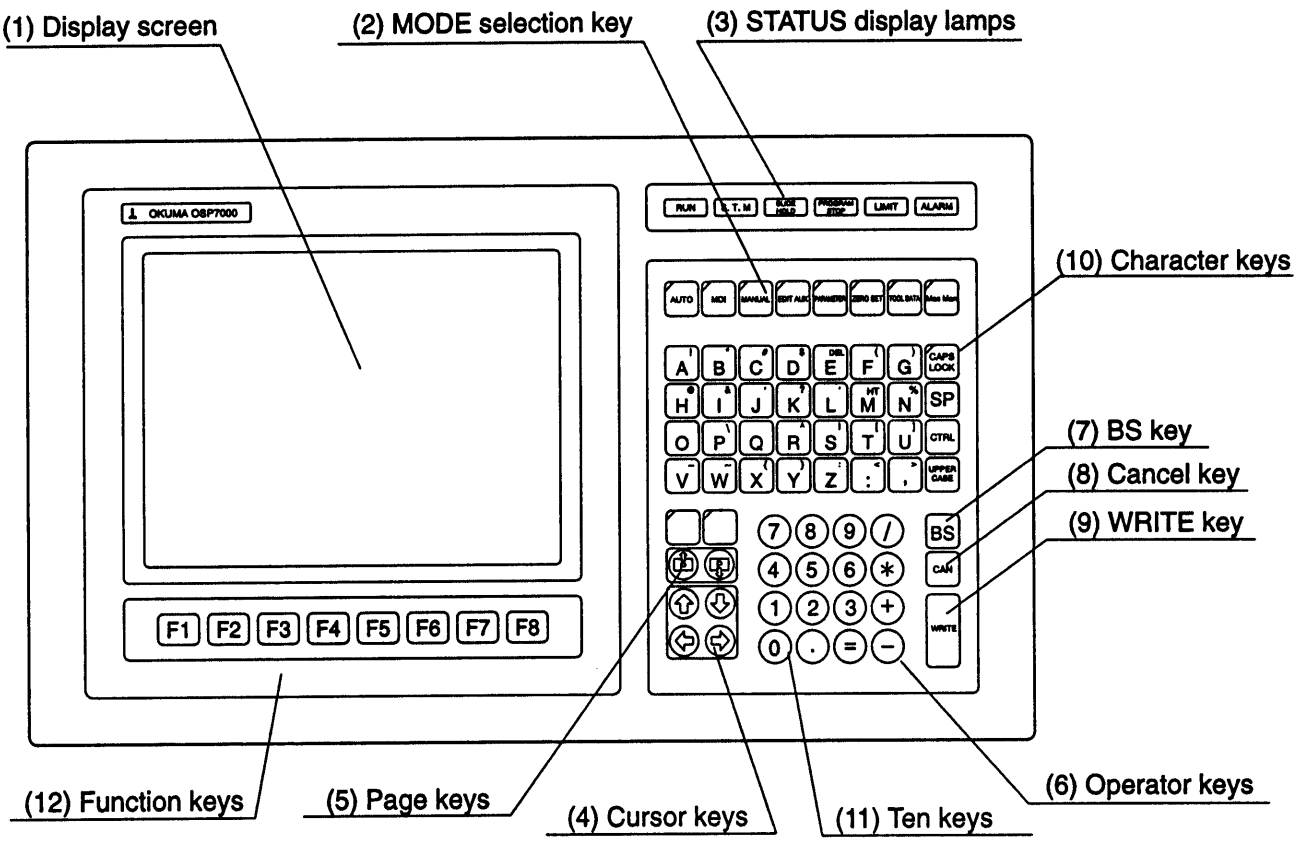


Fig. 2-1 NC Operation Panel

(1) Display screen

The display screen 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:

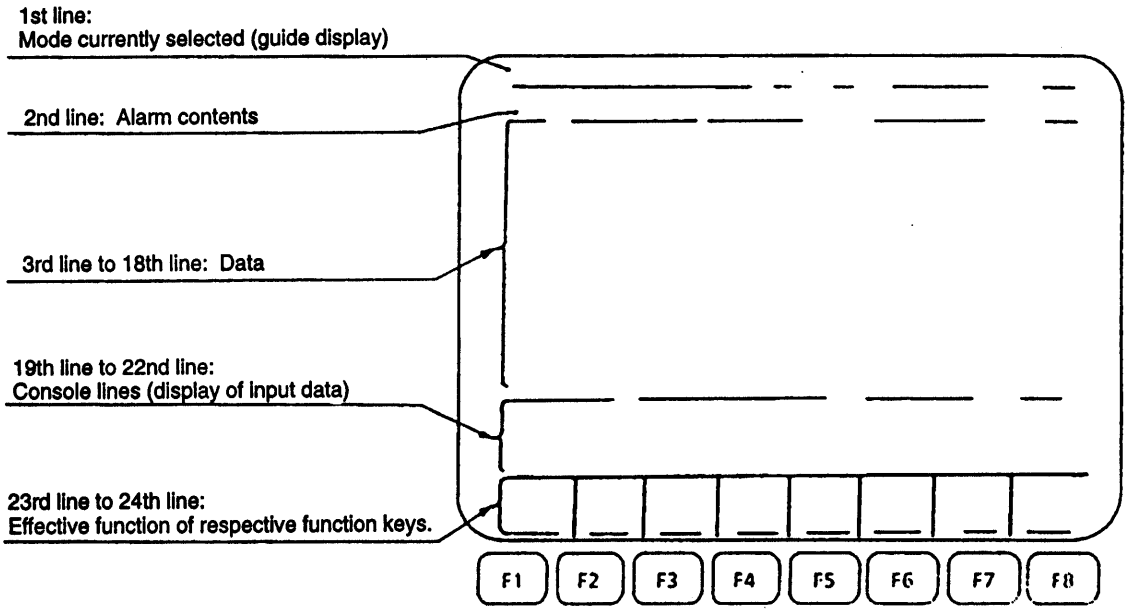


Fig. 2-2 Basic Display of Display Screen

(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

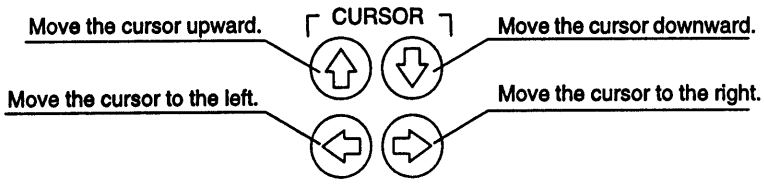
Required operation mode can be selected in each of the groups above. When a key corresponding to the mode required is pressed, the lamp lights at the upper left corner of that key. It goes off when another operation mode is selected.

(3) STATUS Display Lamps

The status display lamps indicate the NC operation conditions.

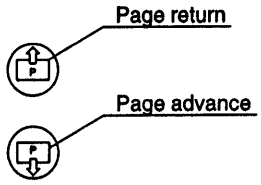
(4) Cursor Keys

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

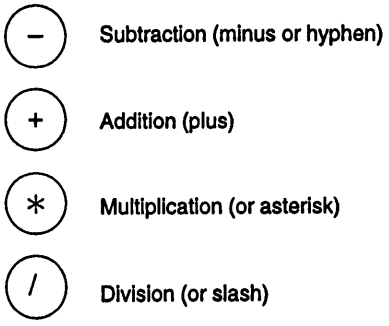


(5) Page Keys

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 and list displays.

(8) CANCEL Key

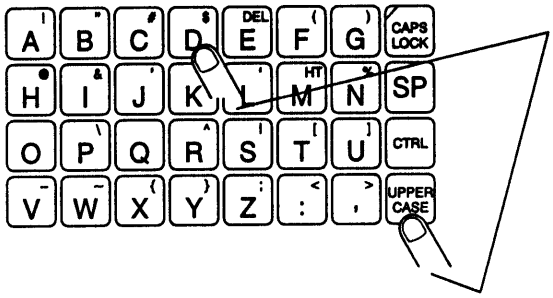
Press the CANCEL key when erroneous data has been entered. Each time this key is pressed, a line of input data entered is erased.

(9) WRITE Key

Press this key to select the operation mode or setting he 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 OSP7000M).



To input character "$", press the D key while holding down the 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 display screen displays the necessary operation functions at he bottom line. Each function corresponds to a function key (F1 through F8). Select the function to execute and press the corresponding function key.

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

1-2-2. Machine Operaton Panel

Controls described below are provided on the machine operation panel.

The arrangement differs depending on machine models. Refer to the appended drawings.

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

a) Cycle start

b) Slide hold

c) Reset

d) Sequence restart

e) Single block

f) Optional stop

g) Block skip

h) Program branch 1 (Block skip 2)

i) Program branch 2 (Block skip 3)

j) Axis command cancel

k) STM lock

l) Machine lock

m) Dry run

n) Manual intervention off (or manual intervention)

o) Manual intervention on (or manual intervention)

p) Mirror image X

q) Mirror image Y

r) Mirror image Z

s) Mirror image 4

t) Pulse handle shift

u) Interlock release

v) Cycle stop

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

a) Manual feed axis selection, X, Y, Z, pulse handle ON

b) Rapid feed in the positive direction

c) Rapid feed in the negative direction

d) Cutting feed in the positive direction

e) Cutting feed in the negative direction

f) Cutting feed off

g) Rapid feedrate overrride

h) Cutting feedrate override

i) Manual cutting feedrate

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

a) Spindle CW rotation

b) Spindle CCW rotation

c) Spindle stop

d) Spindle orientation

e) Release

f) Spindle override

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

a) Operation/display selection (ATC/APC selection)

b) One cycle start

c) Return cycle start

d) One step advance

e) One step retract

f) Interlock release

g) Status display

Active step, next step, actual position, sequence number, run, starting conditions

(Status information is displayed on the display screen.)

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

a) Coolant

b) Oil mist

c) Nozzle type air blower

d) Adaptor type air blower

e) Through-the-tool coolant

f) Work lamp

g) Chip conveyor

h) Slideway lubricating oil

i) Shower coolant

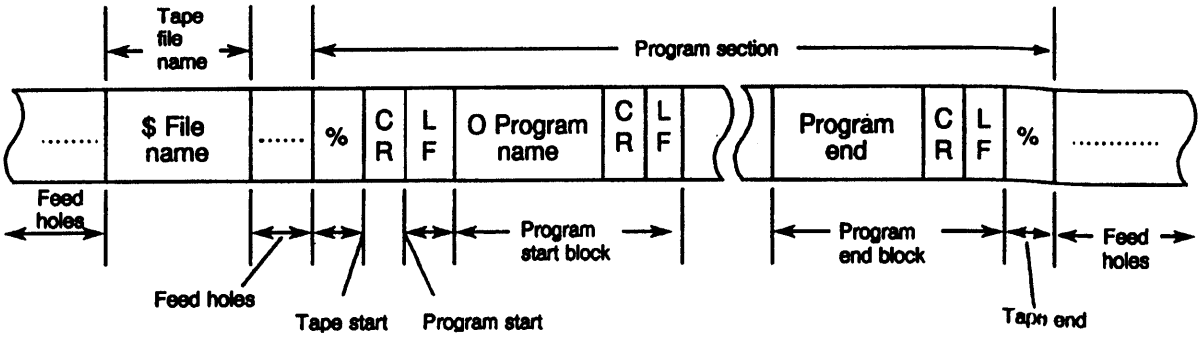
j) Display screen off

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

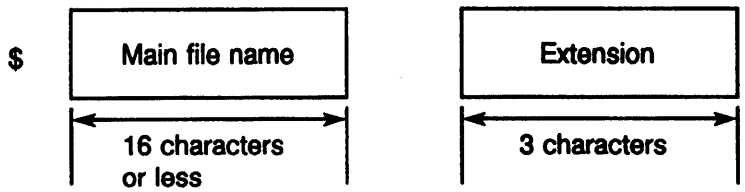
2. PROGRAM CREATION

2-1. Program Tape Format

The following is the general part program format for the OSP.



Since the OSP is capable of managing files, store them in the part program. Presented below is the file name format.



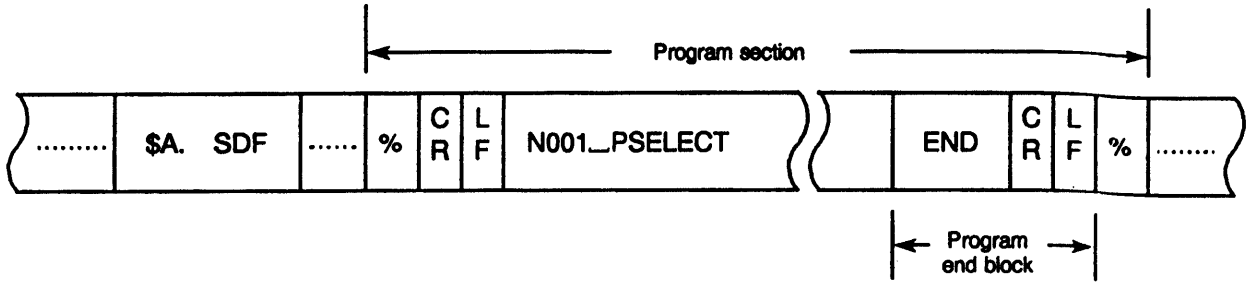
For details, refer to Section 18, "File Management" in the Programming Manual for OSP7000M.

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.

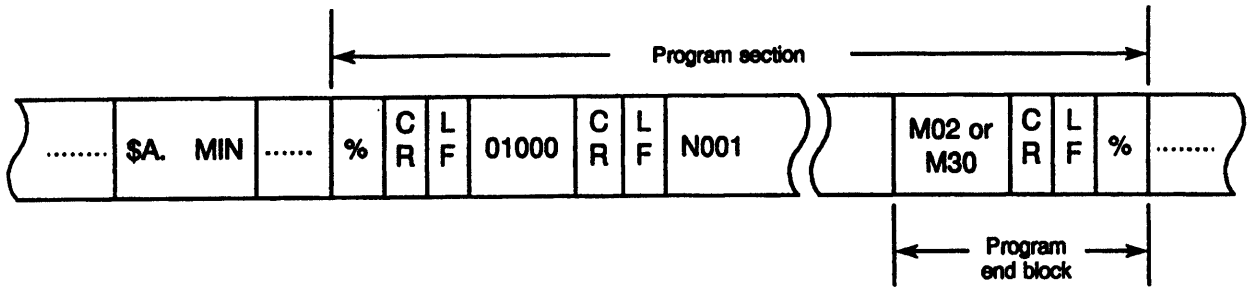
On the OSP, three types of programs are handled. Presented below are their tape formats:

(1) Schedule Program



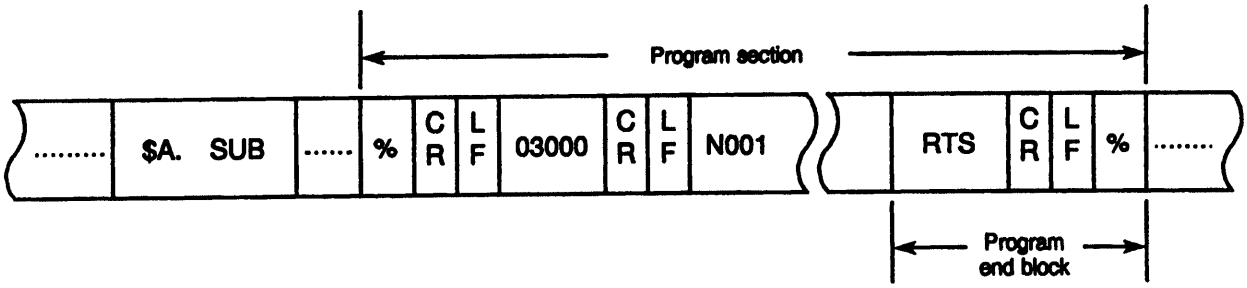
No program name may be stored into the schedule program. The program end block must contain END.

(2) Main Program



The program end block must contain M02 or M30.

(3) Subprogram



The program end block must contain RTS.

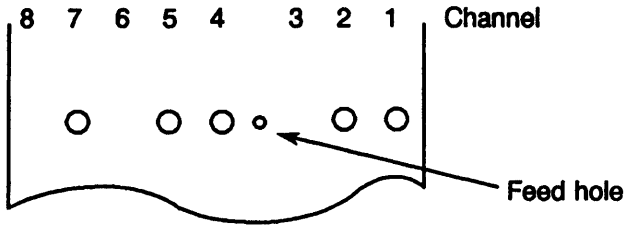
2-2. Characters Available in Tape Code

ISO or EIA code may be applied to the part program for the OSP. 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 OSP, 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.

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 OSP.

EIA/ISO Code Chart

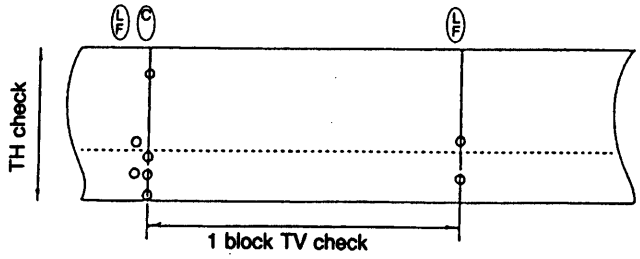
EIA Code										ISO Code										Remarks
Character \ Channel	8	7	6	5	4		3	2	1	Character \ Channel	8	7	6	5	4		3	2	1	
0			O			•				0			O	O		•				Numerical character 0
1						•			O	1	O		O	O		•			O	Numerical character 1
2						•		O		2	O		O	O		•		O		Numerical character 2
3				O		•		O	O	3			O	O		•		O	O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

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

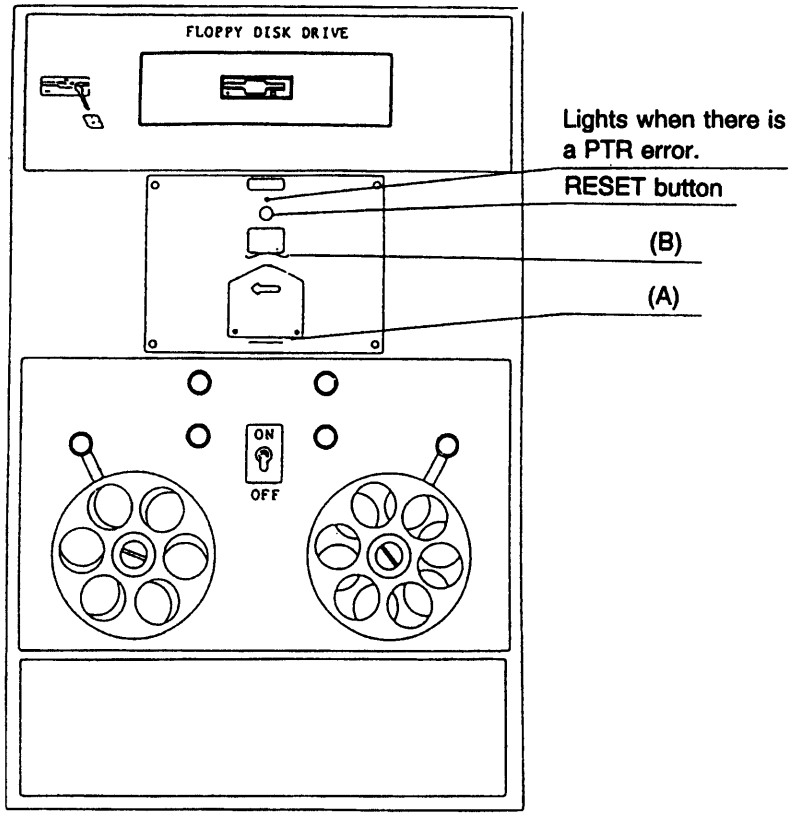


Fig. 2-3 Tape Reader

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.

[Supplement] : 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.

CAUTION : (1) Use either black or gray tape. To prevent reading errors, never use tapes of other colors.

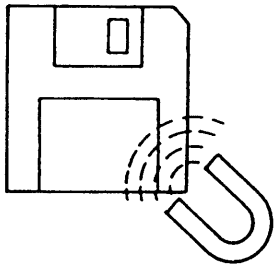
(2) Place the tape in the tape reader with the white arrow pointing left.

(3) Place the tape feed portion preceding the first % (ER) code.

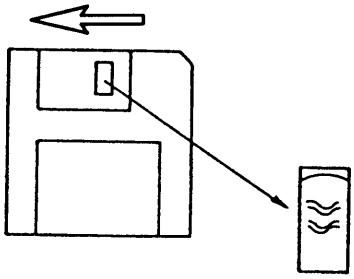
4. FLOPPY DISK HANDLING

4-1. Precaution of Floppy Disk Handing

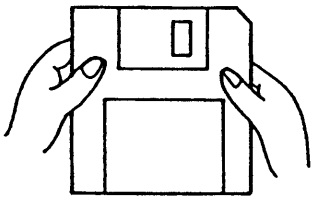
⚠CAUTION :



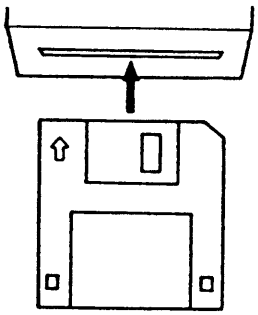
Do not bring close to magnets.



Never touch the magnetic surface.



Do not twist or fold.



Always insert accurately.

Fig. 2-4 Cautions on Handling Floppy Disk

(1) When not Using the Floppy Disk

a) Place the floppy disk in the floppy disk storage box.

b) 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.

c) Never leave it lying around on the machinery.

4-2. Floppy Disk Drive Operation

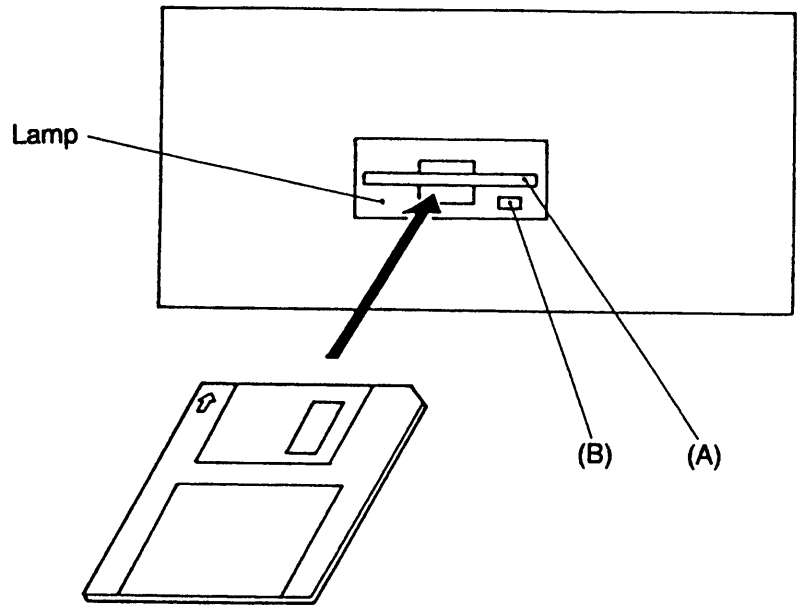


Fig. 2-5 Floppy Disk Drive Operation

a) 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.

b) When the floppy disk is inserted correctly, reading of the floppy disk begins.

c) Press down (B) to remove the floppy disk from the slot.

CAUTION :

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

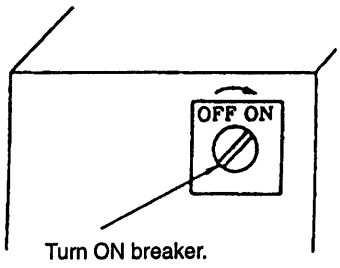
(2) The indicating lamp will light when reading/writing the floppy disk (not light only for inserting the floppy disk).

5. POWER ON/OFF AND INSTALLING NC CONTROL SOFTWARE

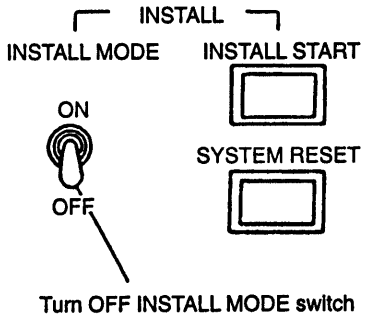
5-1. Power ON/OFF: Systems and Settings

5-1-1. NC Power ON Procedure

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



(2) Turn the MODE switch at the machine's control panel OFF. (This switch is normally OFF.)

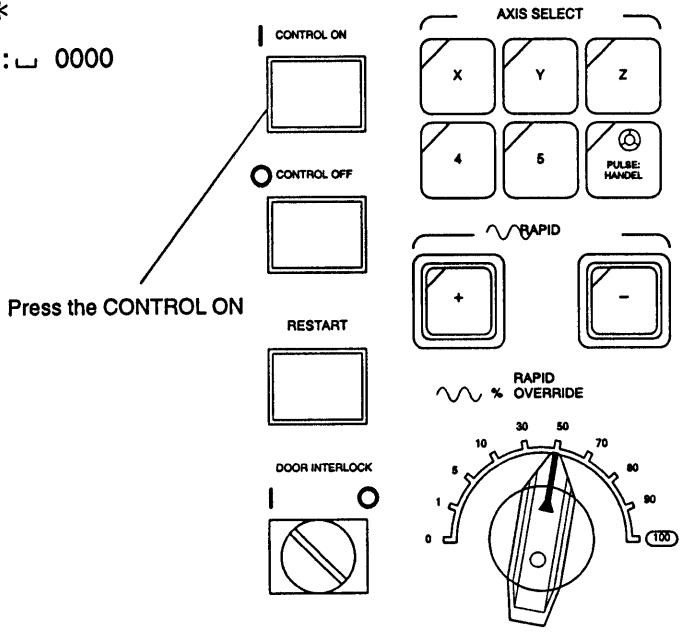


(3) Press the CONTROL ON button located at the left edge of the machine panel. Now, the CPU is energized, and the following message is displayed on the display screen:

SBP␣ *-␣ ***, **

MEMORY␣ TEST␣ :␣ 0000

LOAD SYS



(4) System software is loaded from the memory disk (FR).

(5) After completion of loading, control is passed to the system software, and all control software expressed as POLLOAD.SYS is loaded from the memory disk (FR).

The file name is displayed on the display screen as it is loaded.

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

(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 display screen displays the following messages.

The message displayed varies depending on the machine specification.

d) PBU FILE ON LOADING

e) TAPE CONVERT ON LOADING

f) IGF DATA ON INITIAL PROCESS

g) GRAPHIC DATA ON INITIAL PROCESS

h) EC PROCESSOR ON INITIAL PROCESS

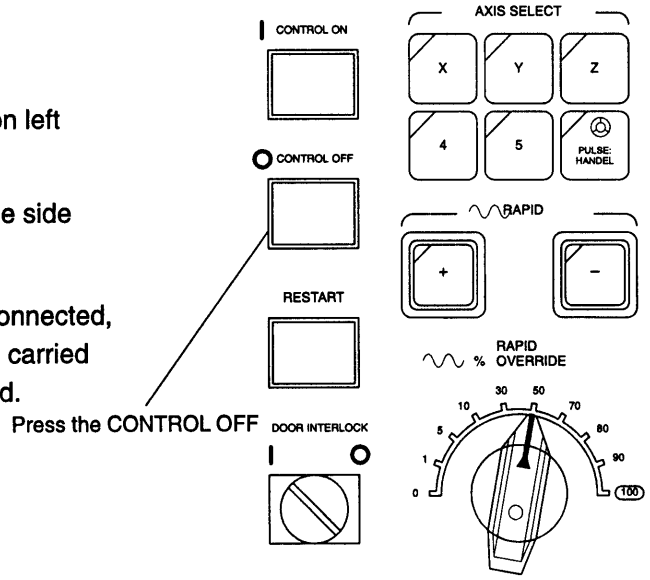
i) SERVO PROCESSOR ON INITIAL PROCESS

(8) The actual value is displayed in the display screen and the AUTO mode is established: the NC is ready for normal procedure.

5-1-2. NC Power OFF Procedure

(1) Press the CONTROL OFF button on left side of the machine panel.

(2) Turn OFF the no-fuse breaker at the side of the control box.



Press the CONTROL OFF

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

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

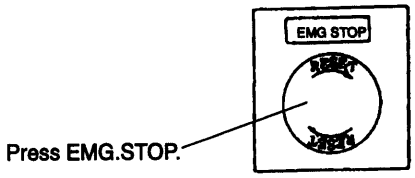
(2) In that case, data is changed if power is turned off after execution of the backup command. The operation procedures are given in 6-3-4, (1) "Back Up Commands".

5-2. Emergency Stop

For emergency stop, press the EMG.STOP button located on the machine operation panel or the side of control box.

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

Once the EMG.STOP button is pressed, it remains engaged and power supply cannot be turned on. The EMG.STOP button remains engaged once pressed, and the power cannot be switched ON. To cancel the EMG.STOP status, turn the switch in the direction indicated by the arrow. After the switch has returned to its original position, press the POWER ON button.



5-3. System Reset

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

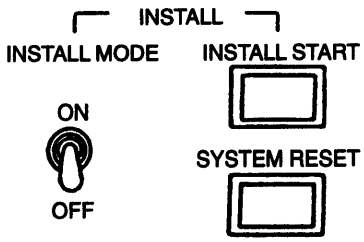
The SYS.RESET button is to be pressed when:

(1) starting control software installing,

(2) operation as NC is required after the completion of installing.

(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.



[Supplement] : For the control supporting the MOP-TOOL 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

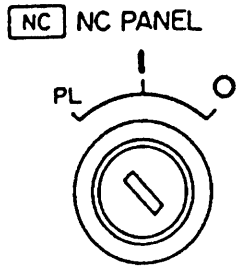
All the controls on the NC operation panel are operative.

(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 OSP7000M.

6-1. Mode Selection Keys

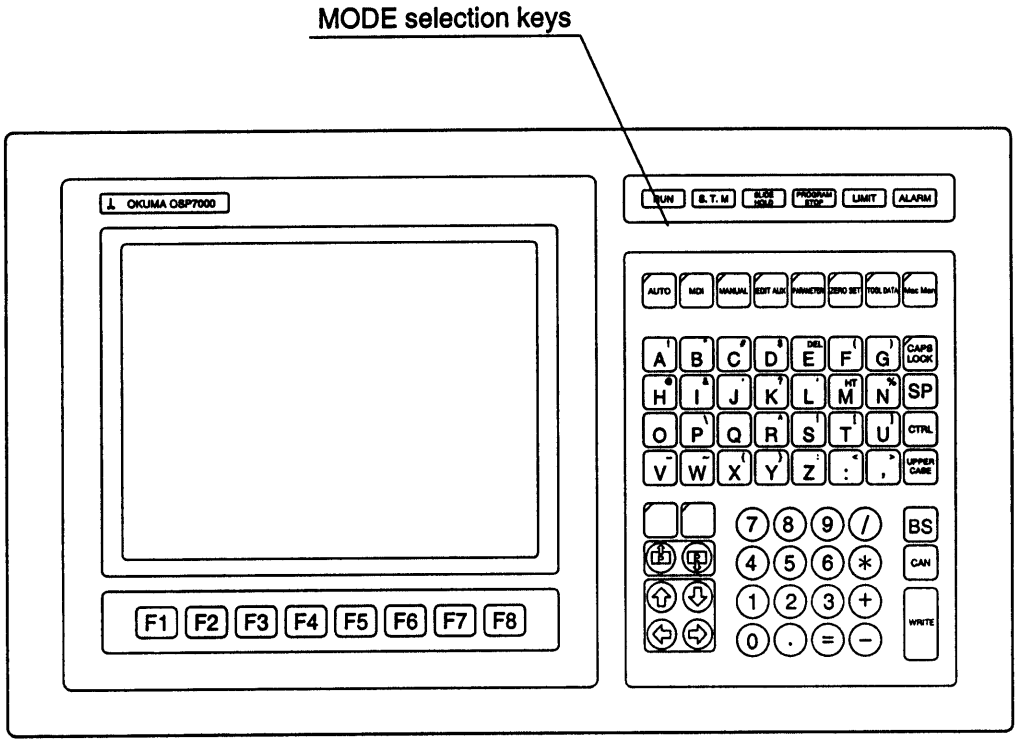


Fig. 2-6 Mode Selection Keys

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 memory disk (MD) 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

d) EDIT/AUX

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

e) PARAMETER

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

f) 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 pot number correspondence data.

g) 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, PARAMETER, 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.

⚠CAUTION : (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.

(2) Before turning off the power supply and after setting the data, backup the data following the procedure explained in 6-3-5. "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	4	20 50	Inch system Metric system	4-byte integer
				Rotary axis	4	20 50	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		—	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		—	8-byte floating-point data
	System parameter (NC)	Travel end limit	Microns; integer	Liner axis	2/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	2/1 axis		Degrees	4-byte integer
		Pitch error compensation range	Microns; integer	Liner axis	2/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	2/1 axis		Degrees	4-byte integer
		Pitch error compensation interval	2-byte; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
		Number of pitch error compensation points	2-byte; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
		Zero return operation execution sequence	2-byte; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary 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)	In-position width	2-byte; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
		Home position	2-byte; integer	Liner axis	32/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	8/1 axis		Degrees	4-byte integer
		Machine coordinate system origin	Microns; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
	Machine system parameter (word)	—	Integer	—	60		—	2-byte integer
	Machine system parameter (long word)	—	Integer	—	60		—	4-byte integer
	Machine user parameter (word)	—	Integer	—	40		—	2-byte integer
	Machine user parameter (long word)	—	Integer	—	40		—	4-byte integer
	Machine axis parameter	—	Microns; integer	Liner axis	24		Metric system	4-byte integer
				Rotary axis	24		Degrees	4-byte integer
	User parameter (NC)	Programmable travel limit	Microns; integer	Liner axis	2/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	2/1 axis		Degrees	4-byte integer
		G-60 over-passing amount	Microns; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
		Backlash	Microns; integer	Liner axis	1/1 axis		Inch system Metric system	4-byte integer
				Rotary axis	1/1 axis		Degrees	4-byte integer
	Machine user parameter (bit)	—	Bit string	—	320 bits		—	1-byte integer
	G/M code macro	Simple call	Character	—	10		—	4-byte integer
		Axis move call	Character	—	10		—	4-byte integer

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

(1) The following parameters are not allowed to be set because there is no display screen 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) Machine axis parameter

(5) NC optional parameter (long word) (from No. 32 onward)

(6) NC optional parameter (word) (from No. 32 onward)

(7) NC optional parameter (bit) (from No. 17 onward)

(8) 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

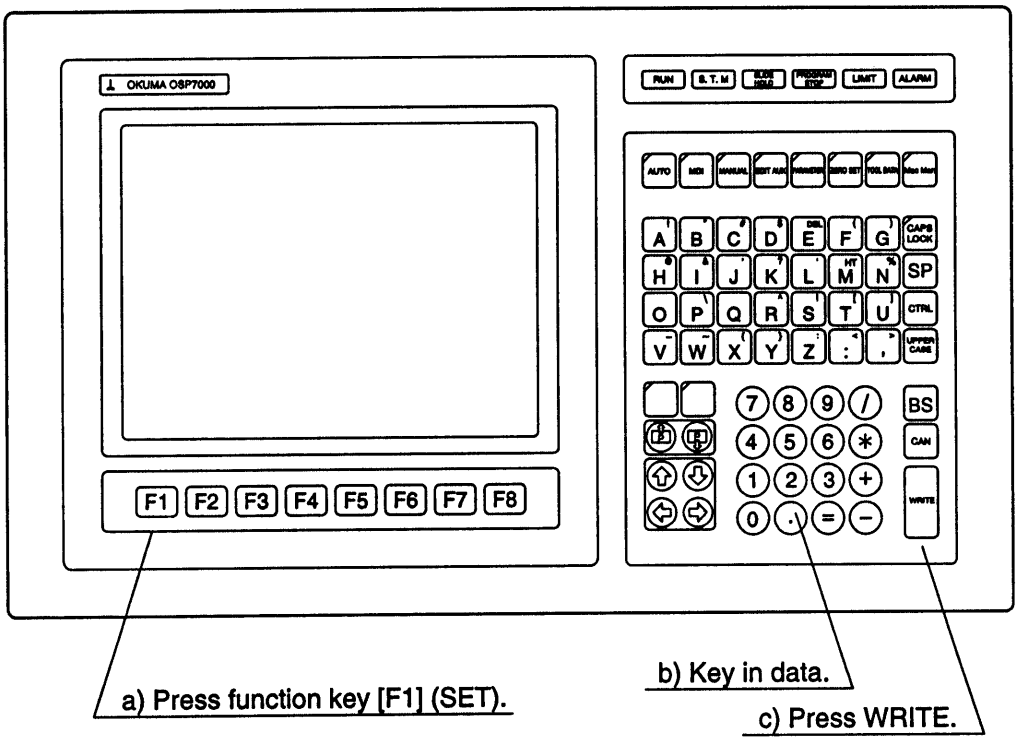


Fig. 2-7 SET Command

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

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

(2) ADD Command

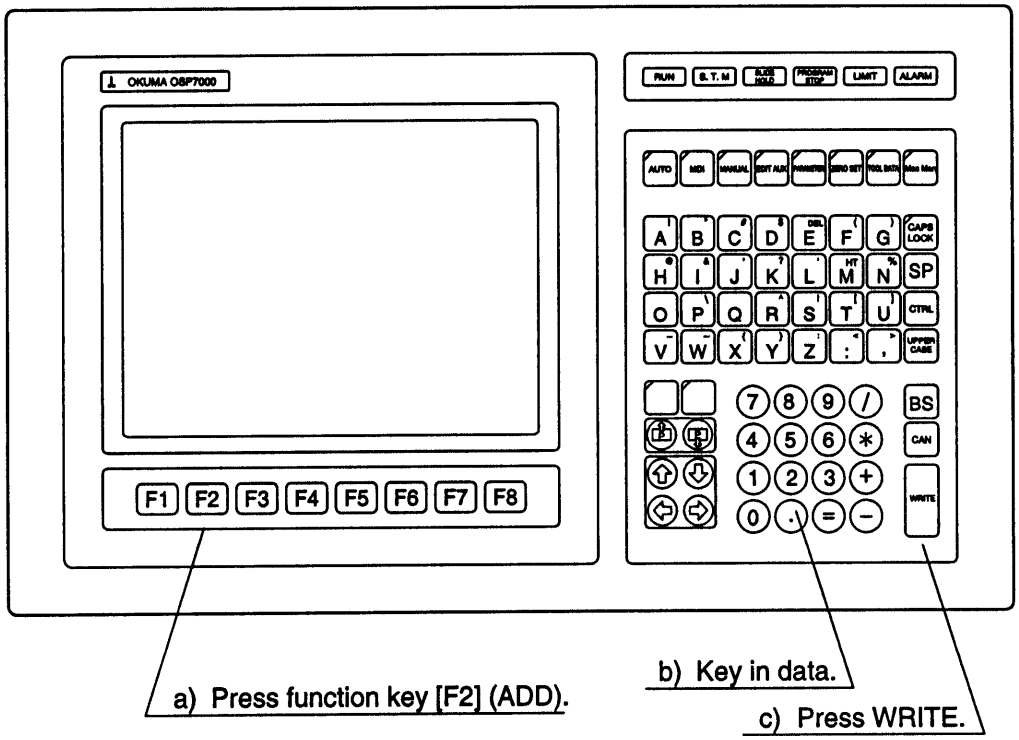


Fig. 2-8 ADD Command

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 function key [F2] is pressed, providing a display of "AD" on the 21st line on the display screen.

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

(3) CAL Command

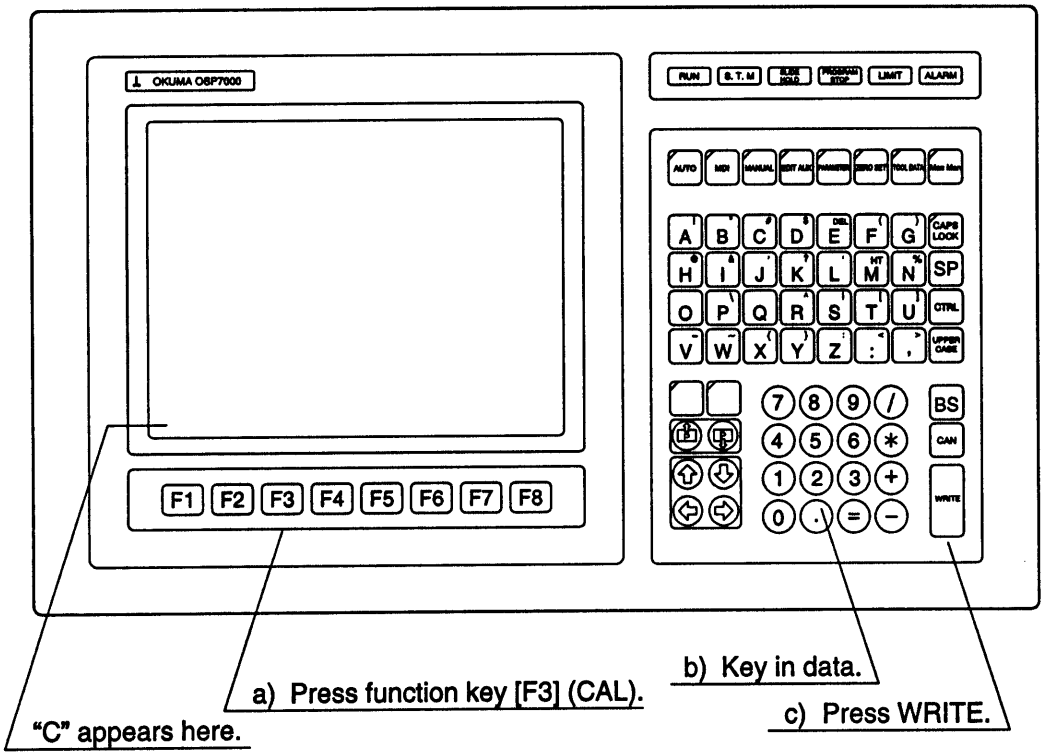


Fig. 2-9 CAL Command

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 function key [F3], providing a display of "C" on the 21st line on the display screen.

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

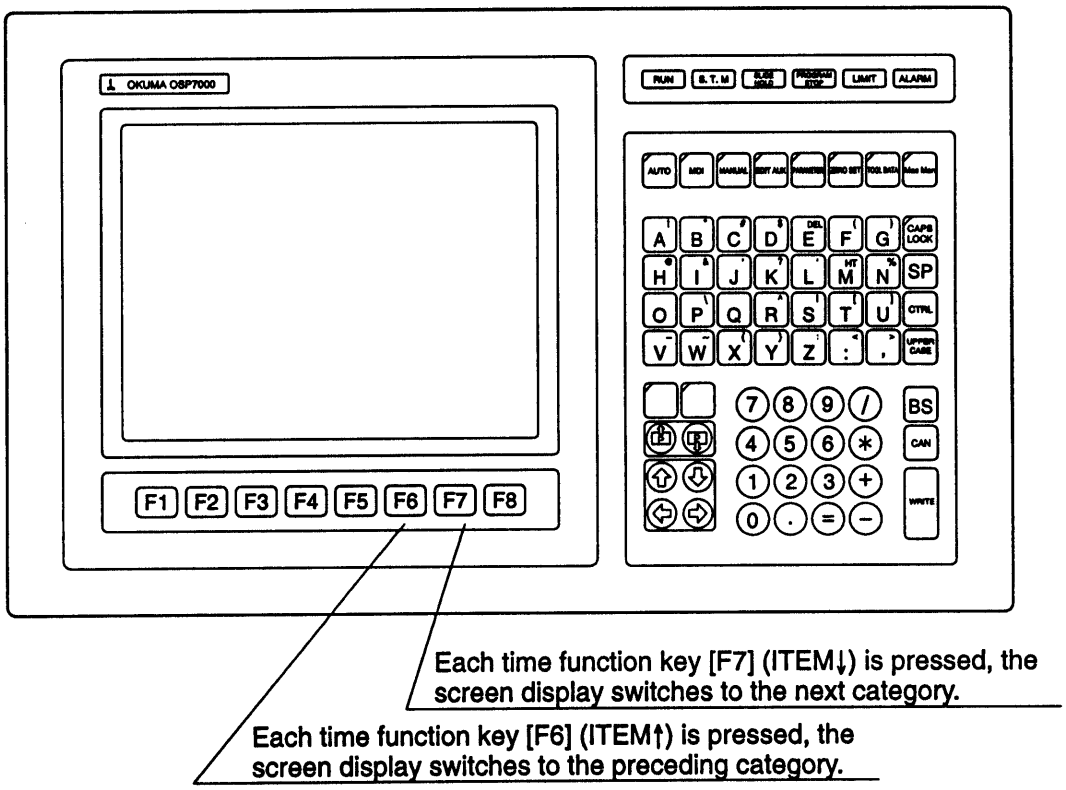


Fig. 2-10 ITEM Command

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

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

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

(2) SEARCH Command

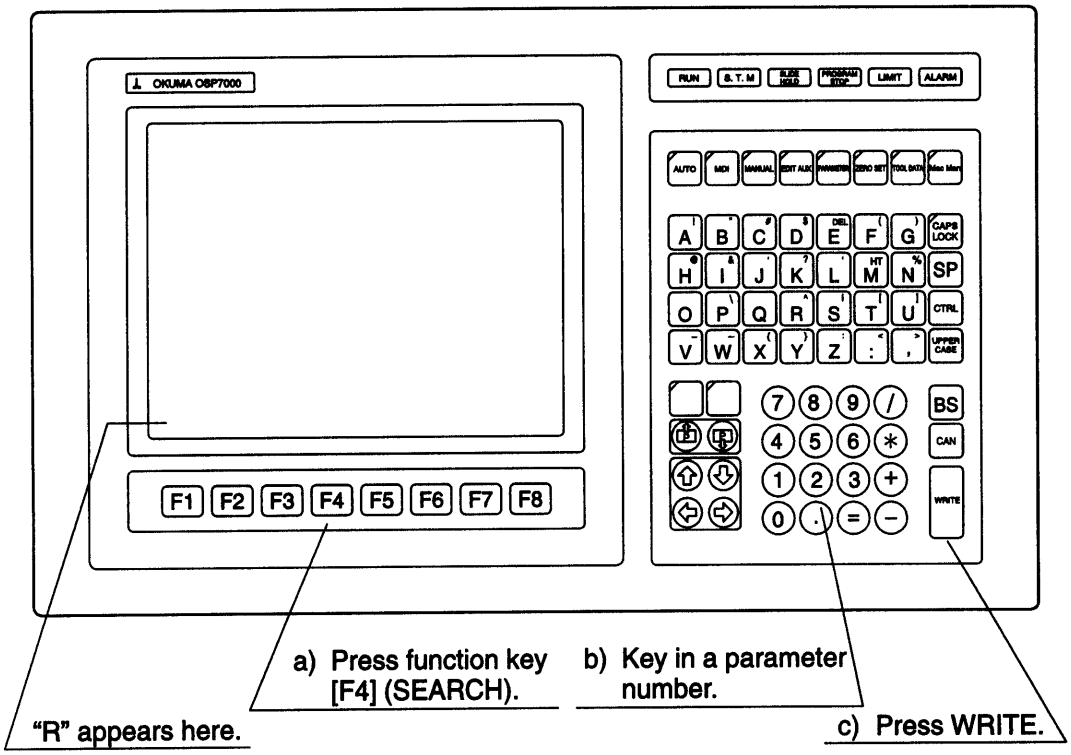


Fig. 2-11 SEARCH Command

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:

a) Press function key [F4].

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

b) Key in a data number on the keyboard.

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

c) Press the WRITE key.

This allows the cursor to be positioned at the data number specified. If the desired data No. is not displayed at the current screen, switch to the appropriate screen, then move the cursor to the data No. in question.

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.

a) Press function key [F4].

b) Key in the parameter number.

c) Key in a comma (,).

d) Key in a bit number.

e) Press the WRITE key.

(3) AXIS CHANGE Command

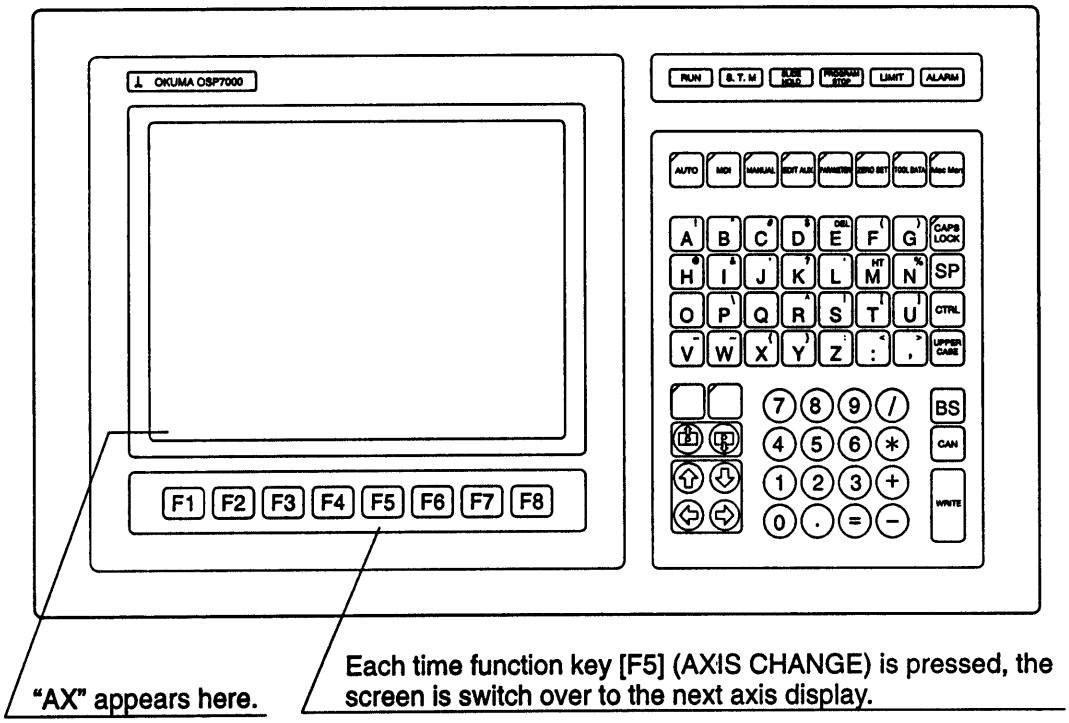


Fig. 2-12 AXIS CHANGE Command

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

(4) Cursor Keys

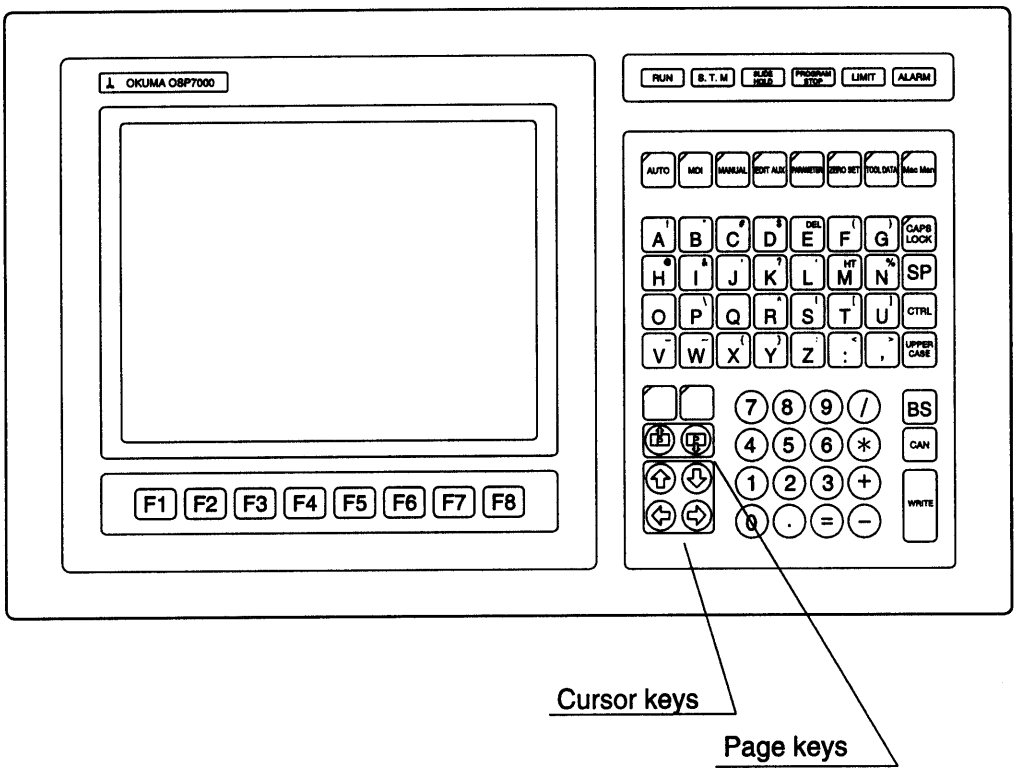


Fig. 2-13 Cursor Keys

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

PAGE ↓ When the PAGE ↓ key is pressed, the screen advances one page in the same category only.

PAGE ↑ When the PAGE ↑ key is pressed, the screen returns one page in the same category only.

(6) EXTEND Command

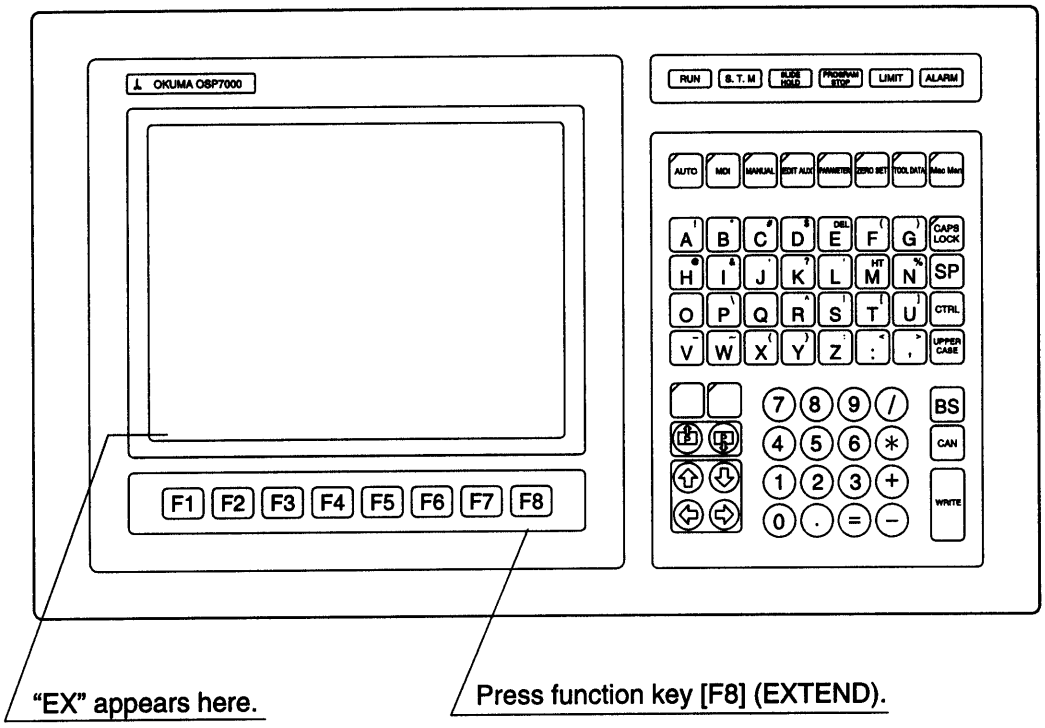


Fig. 2-14 EXTENDED Command

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.

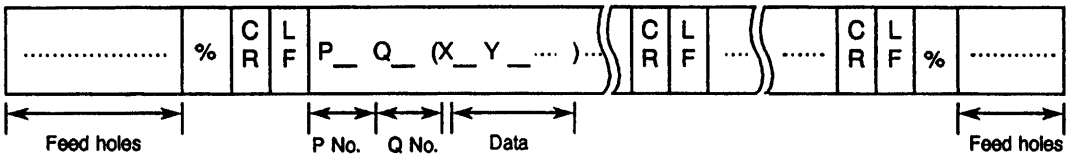
Function key [F8] provides a display of "EX" on the 21st line on the screen, resulting in a switched command only.

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

This group consists of two commands: READ, PUNCH and VERIFY.

(1) READ Command

This command is used to read a variety of setting related data from a paper tape or from another designated device.



The format of paper tape is shown above:

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 to No. of work coordinate systems	
Tool data	Tool length offset	200	1 to No. of offsets	
	Cutter radius compensation	210	1 to No. of offsets	
	Tool management number	220	1 to Largest tool pot number	
	No. of tool management number	230	1 to No. of offsets	
Parameter	Common variable	300	1 to 128	
	System parameter	400	1 to 56	1 to 40 : real 41 to 56 : integer (Note)
	User parameter	410	1 to 32	
	Pitch error compensation	600	1 to No. of compensation points.	(Note)
	NC optional parameter (long word)	700	1 to 64	1 to 32 : user 33 to 64 : system
	NC optional parameter (word)	710	1 to 64	1 to 32 : user 33 to 64 : system
	NC optional parameter (bit)	720	1 to 60	1 to 16 : user 17 to 60 : system
	Machine user parameter (long word)	800	1 to 40	
	Machine system parameter (long word)	810	1 to 60	(Note)
	Machine user parameter (word)	820	1 to 40	
	Machine system parameter (word)	830	1 to 60	(Note)
	Machine user parameter (bit)	840	1 to 40	
Communication Parameter Byte	—	900	1 to 11	Optional
NC hour meter	NC hour meter	910	1 to 4	Optional
	NC hour meter setting	911	1 to 4	Optional
NC work counter	NC work counter	920	1 to 4	Optional
	NC work counter setting	921	1 to 4	Optional

[Supplement] : 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:

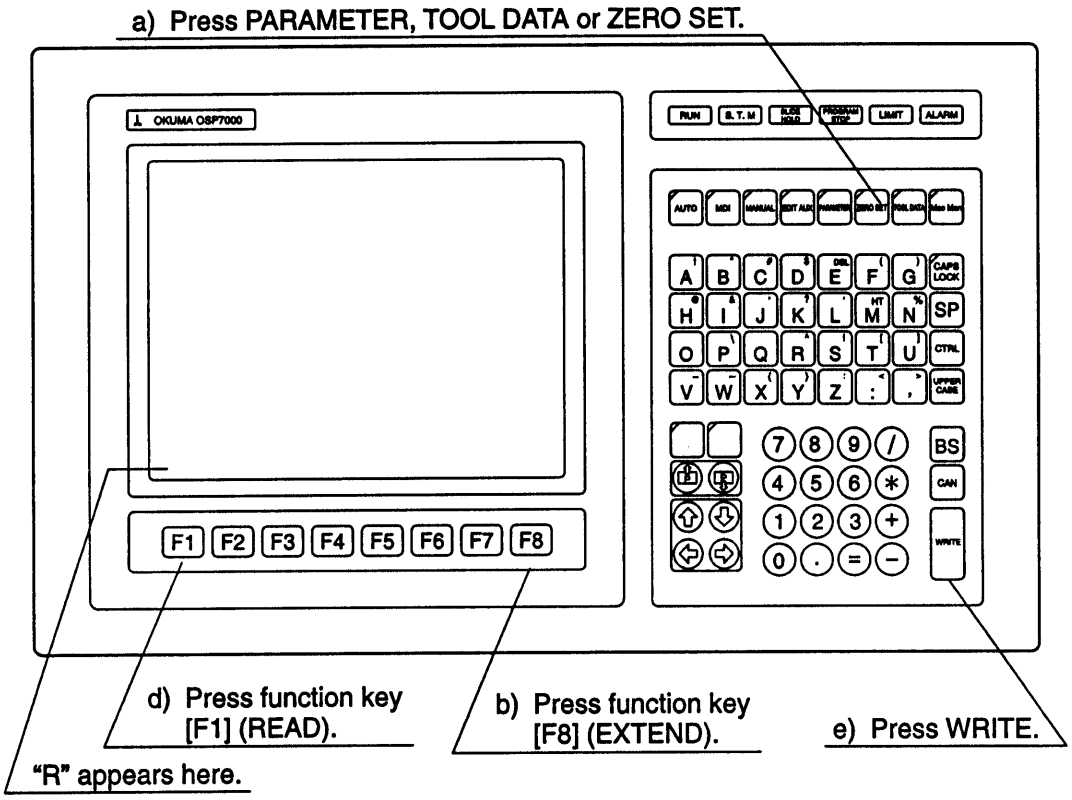


Fig. 2-15 Reading the Data from Tape

n) Press the PARAMETER, TOOL DATA or ZERO SET key.

o) Press function key [F8] (EXTEND).

This displays the READ (F1) command.

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

q) Press function key [F1] (READ).

This displays "R" on the 21st line on the display screen.

Next, enter the device name and the file name.

r) 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 display screen 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.

If the designated device is a sector device, a search will be conducted for the designated file name, and, if found, reading of that file will begin. If the file is not found, an error will occur and operation will be ended.

"5376 Data file not found"

* The tape reader is an optional device. If there is no tape reader, the tape reading operations described in items (3) and (5) above will be impossible.

(2) PUNCH Command

This is a command to punch various data required for data setting on the paper tape or from another designated device. 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 Command".
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:

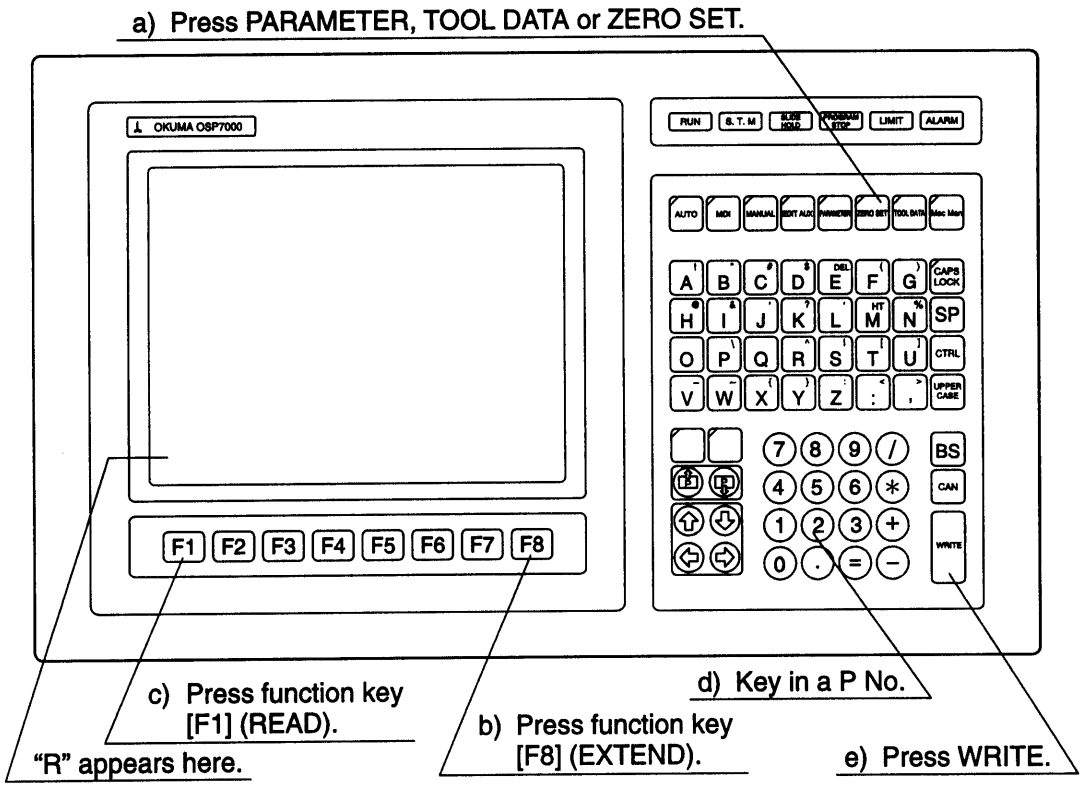


Fig. 2-16 PUNCH Command

s) Press the PARAMETER, TOOL DATA or ZERO SET key.

t) Press function key [F8] (EXTEND)

This displays the PUNCH [F2] command.

u) Press function key [F2] (PUNCH).

This displays "PU" on the 21st line on the display screen.

v) Enter the device name following "PU",the following names are usable.

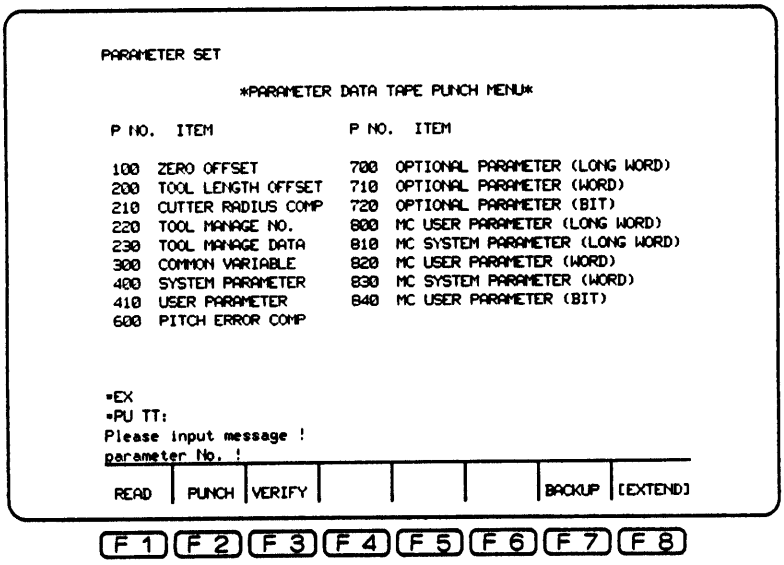
If a sector device is designated, a search will be conducted for the relevant sector device, and a check will be conducted to determine if a file of the same name already exists. If a file of the same name is found, a "File exists. over write? (Y/N)!" message will be displayed. Enter "Y" to execute overwriting, or "N" to cancel the punch operation. A "Comment input" message will be displayed, requesting any comments which may be required regarding the punch data. Enter a comment if necessary. If no comment is required, nothing should be entered.

* Parentheses marks "(" and ")" cannot be used in the comment. If used, an error will occur.

"5320 Wring character"

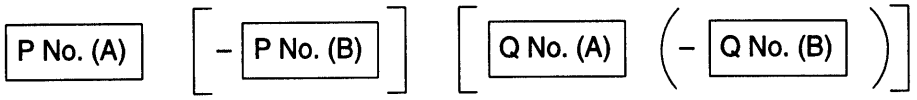
w) Press the WRITE key.

The prompt "parameter No.!" then appears.



Use the ⇧P and ⇩P keys to display P Nos. from "900" (2nd page).

an) From the menu, select the item number of the parameter data to be punched. The data entry format is as below:



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

ao) Press the WRITE key.

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

ap) After the completion of punching out the desired data, the parameter No. ! is displayed again. Repeat the steps f) and g) to punch out all the required data.

aq) 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.

[Supplement] : When the NC optional parameter (bit) No. 54 bit 3 is set to "0", only one data item can be specified for punching.

6-3-4. Verify

The VERIFY operation occurs in the same manner as the READ operation. The data which is read is not determined by the parameter settings. There may be cases when an error occurs even though the numeral displayed at "Parameter Set" is the same as that at the verify data. However, this is due simply to the fact that the number of digits following the displayed numeral are being held by the OSP, and there is no actual error. A "tolerance" designation can be made at the VERIFY operation as follows:

DV Device name; file name; numeric value

By entering the optional tolerance (numeric value) designation, an error will not occur even if a data mismatch occurs, provided that part of the parameter data which is read is within the tolerance range. Only positive integers can be designated as tolerance values. The tolerance system-of-units varies according to the parameter types being compared. Regarding data items with decimal points (system parameters, user parameters, zero offset, tool data, etc.), comparison will begin from the smallest displayed numeral (following decimal point). Optional parameter words and long parameter words, etc., have no decimal points, and are therefore compared as they are.

If the data error value exceeds the tolerance range, the following error message will be displayed:

5375 DATA VERIFY ERROR "MISMATCH LINES"

The following parameters (including the tolerance value) are compared during the VERIFY operation:

PNo.

100 Zero offset
200 Tool length offset
210 Cutter radius compensation
400 System parameter (excluding home position return order data)
410 User parameter
600 Thread pitch offset
700 NC optional parameter (long word)
710 Optional parameter (word)
800 Machine user parameter (long word)
810 Machine system parameter (long word)
820 Machine user parameter (word)
830 Machine system parameter (word)

6-3-5. Omitting the File Name and Device Name

- If the device name is not specified at the READ and VERIFY operations, the setting will be determined by optional parameter word No. 104 (initial value: 0, setting range: 0-11).

  The devices which correspond to the setting values are shown below.
  (This parameter setting becomes valid when power is switched ON.)

Setting Value	0	1	2	3	4	5	6	7	8	9	10	11
Device Name	TR	CN0	CN1	CN2	CN3	CN4	MD0	MD1	FD0	FD1	FD2	FD3

The "CN0" device name shown above represents the same device as the "TT" (teletyper) name.

- If the device name is not specified at the PUNCH operation, the setting will be determined by optional parameter word No. 103 (initial value: 0, setting range: 0-11). The devices which correspond to the setting values are shown below.
  (This parameter setting becomes valid when power is switched ON.)

Setting Value	0	1	2	3	4	5	6	7	8	9	10	11
Device Name	CN0	CN1	CN2	CN3	CN4	PP	MD0	MD1	FD0	FD1	FD2	FD3

  The "CN0" device name shown above represents the same device as the "TT" (teletyper) name.
- If the file name is not specified, a default file name will be designated according to operation function and device in question.
  The default file name is "A.TOP". This function features separate default values for the file and extend names. If only the extension name is omitted, it will be designated as ".TOP".

6-3-6. Other Commands

The OSP7000M has other commands as explained below:

CAUTION : Back Up Command

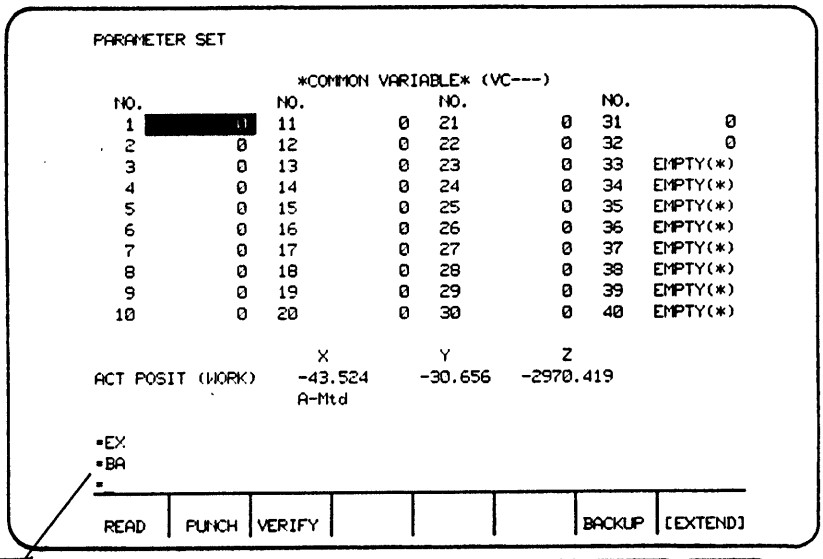
Data such as tool length offset, cutter radius compensation, origin of work coordinate systems and parameter except system parameter is backed up to memory disk (MD) in a preset interval. Therefore, turning off the power to the control right after renewing the data will cause the data to stay as it was 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 function key [F8] (EXTEND). The display will then be as follows:



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

F1 F2 F3 F4 F5 F6 F7 F8

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

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

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

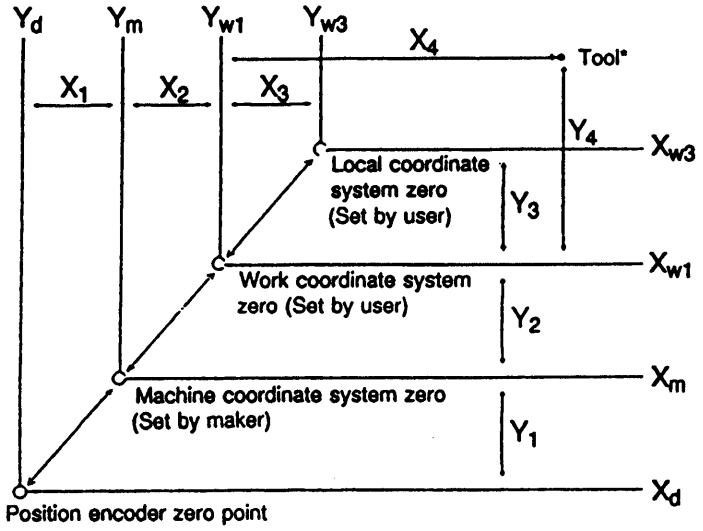
"= BA" appears on the console line and back up is continuously executed. After back up completion, "=" will appear on the screen.

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, 50 or 100 optional sets available.



Y_1: Machine zero offset amount

Y_2: Work zero offset amount

Fig. 2-17 Work Coordinate System Origin

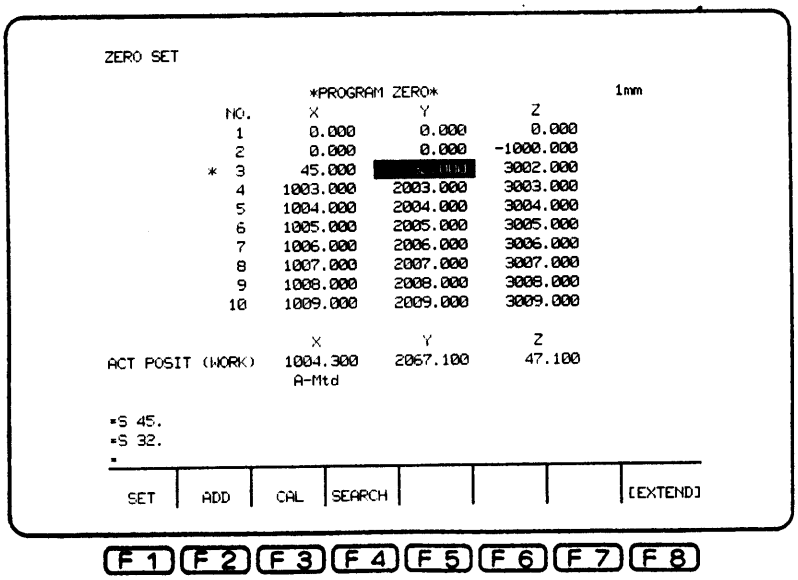
A function called the machine coordinate system origin has been implemented. After the position detector is replaced, all that remains is to set another machine coordinate system origin, without having to set all of the work coordinate system origins (and others) at new values. This may be applied to 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 display 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. 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.



(3) Setting

a) When the offset of the work zero (origin of work coordinate system) is known, press 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 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 function key [F3] (CAL) and enter the new actual position data. (In the previous drawing, key in 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.

[Supplement] : 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.)

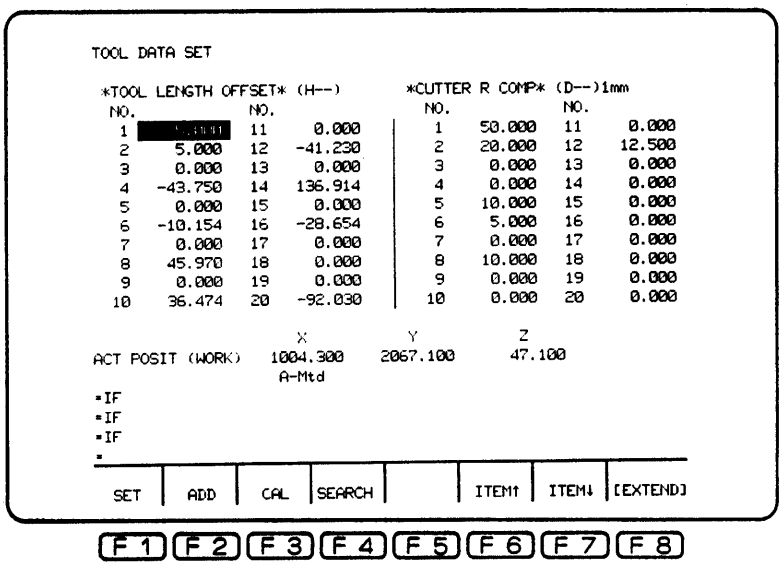
Data is set as follows:

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 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 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).



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 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 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 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-40VA [40VB]	MC-50VA MC-60VA
Conventional tool	Less than 95 mm dia. (3.74 in.) [110 mm (4.33 in.)]	Less than 135 mm dia. (5.31 in.)
Large-diameter tool	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 display screen. 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 4, 2-4, "ATC".

Setting:

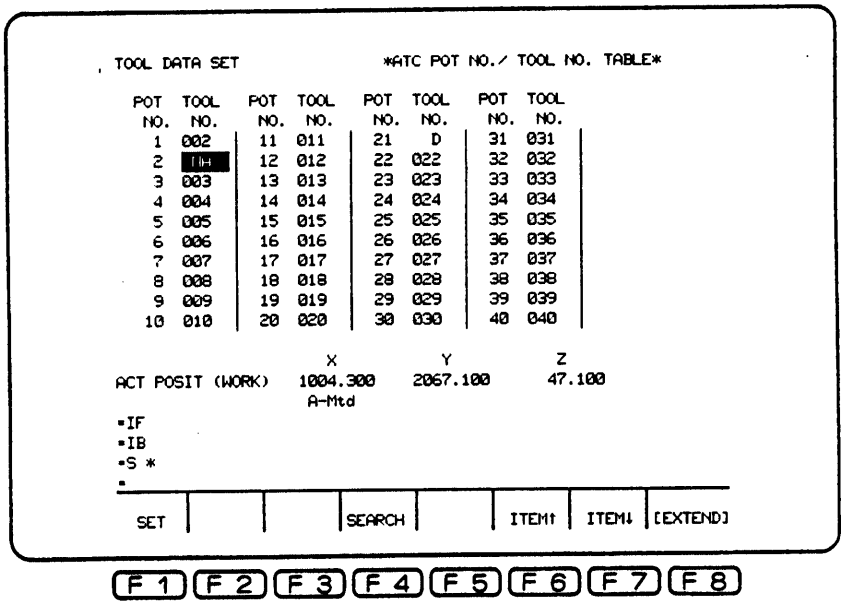


Fig. 2-18 Tool Data Offset (ATC Pot No./Tool No. Table)

(1) Press the TOOL DATA key.

(2) Press 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 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␣1

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

f) Heavy tool (depending on the machine type) — S␣5, M

g) Press the WRITE key.

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

[Supplement] :

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

   → : Tool change position with A TC
   >> : Manual tool change position

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-40VA ..... 20 tools
   MC-S0VA ..... 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.

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.

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

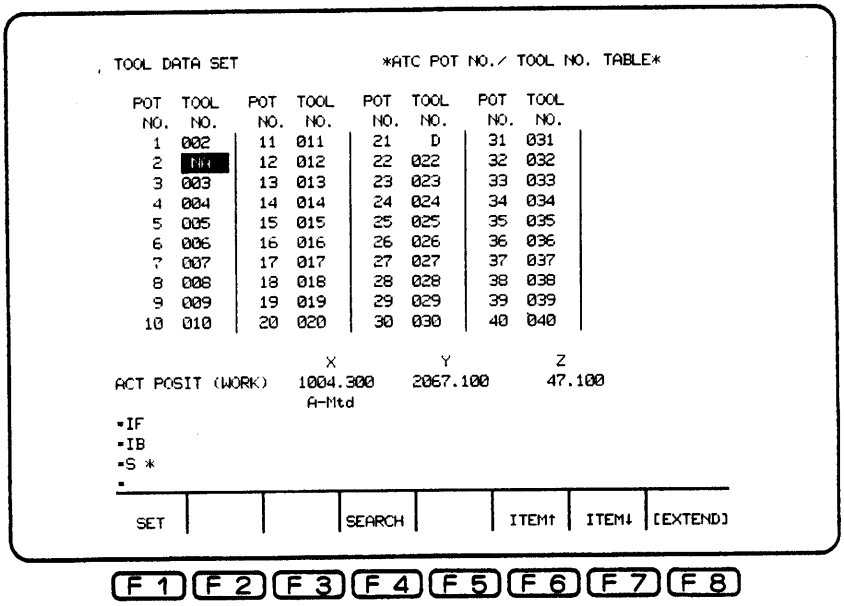
5. Any attempt to set a tool number for a toolpot which has a dummy tool in it causes an error. In this case, cancel the dummy tool code by entering "*" code. Note that the dummy tools placed in the adjacent toolpots for the one accommodating a large-diameter tool should not be cleared. A dummy tool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



(1) Press the TOOL DATA key.

(2) Press 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 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.

[Supplement] : 1. If the tool number already used is again entered for a new toolpot, an alarm occurs.

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.

Operating Procedure

(1) Clearing tool numbers

a) Press the TOOL DATA key.

b) Press function key [F7] (ITEM ↓).

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

c) 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)

d) 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.

(2) Setting tool numbers

a) Press the TOOL DATA key.

b) Press function key [F7] (ITEM ↓).

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

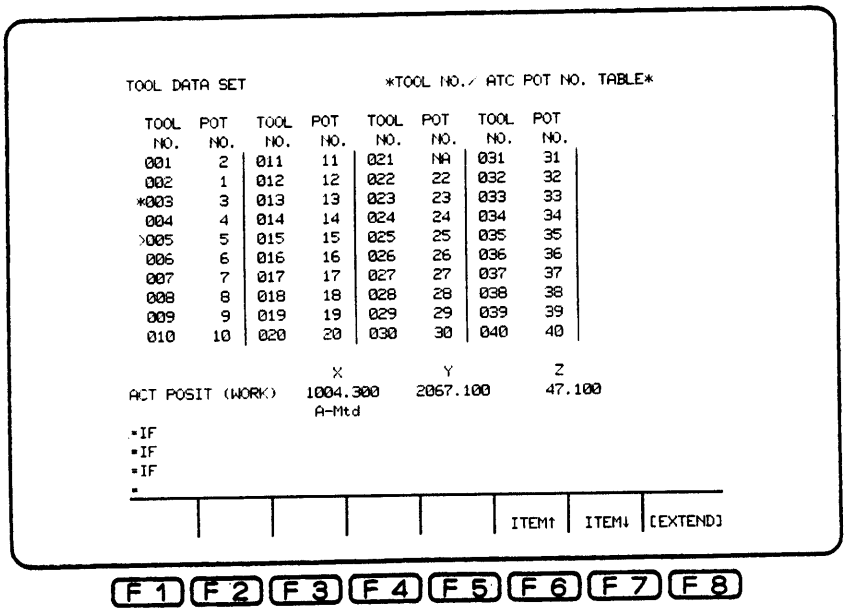
c) Key in "TSET" and press the WRITE key.

[Supplement] : 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:



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 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

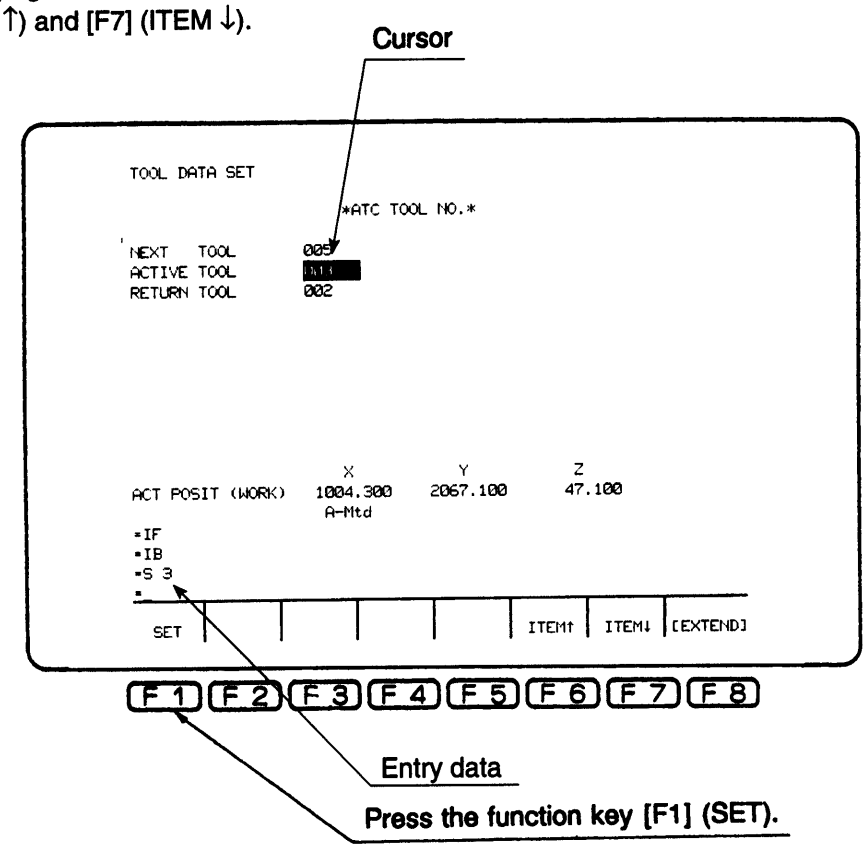
During automatic tool change operation, the tool set in the spindle is taken as the return tool when it is removed from the spindle by the tool change arm. This means the active tool number becomes the return tool number and the active tool number is cleared to "0". Then, the tool change arm swings and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

a) 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 sill also cause an error.

Example:

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

b) 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 15 types as indicated below. Parameter setting screens can be displayed as needed by pressing 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) Machine system parameter (long word)

(8) Machine system parameter (word)

(9) NC optional parameter (long word)

(10) NC optional parameter (word)

(11) NC optional parameter (bit)

(12) Input unit system

(13) Machine axis parameter

(14) System parameter

(15) 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 80 meters (262 feet) in the standard model. Furthermore, capacities of 160, 320, 640, 1280, 2560, 3840, 5120, 6400, 7680, 8960 and 10240 meters (525, 1050, 2100, 4200, 8400, 12600, 16800, 21000, 25200, 29400 and 33600 feet) are optional.

The OSP7000M 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 memory disk (MD), 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.	
MS-DOS	MSDS	Transfers the program files in the MS-DOS format.	Sub commands provided

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.

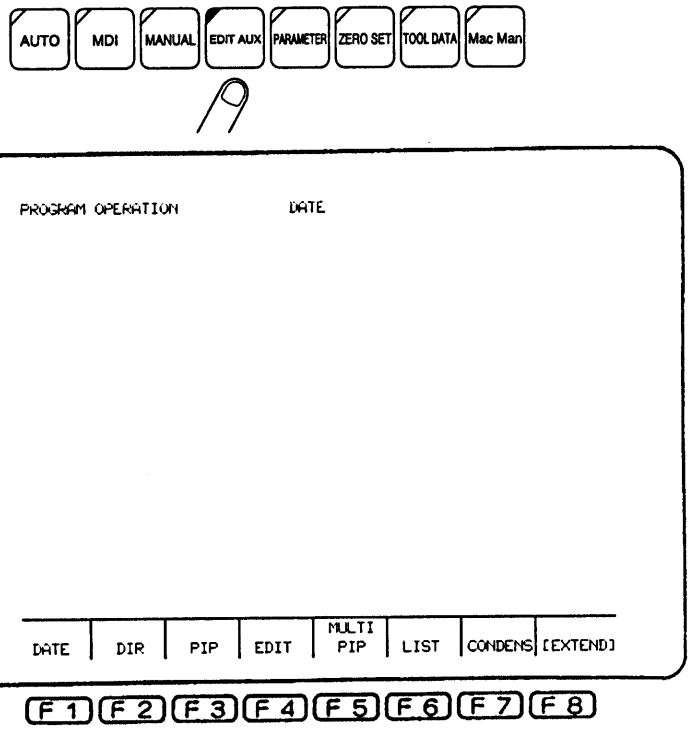
7-2. DATE

For the files, file creation date is entered for the file data, and referencing of the creation date is possible using the directory function. Once set, the date is maintained even if power supply is shut off.

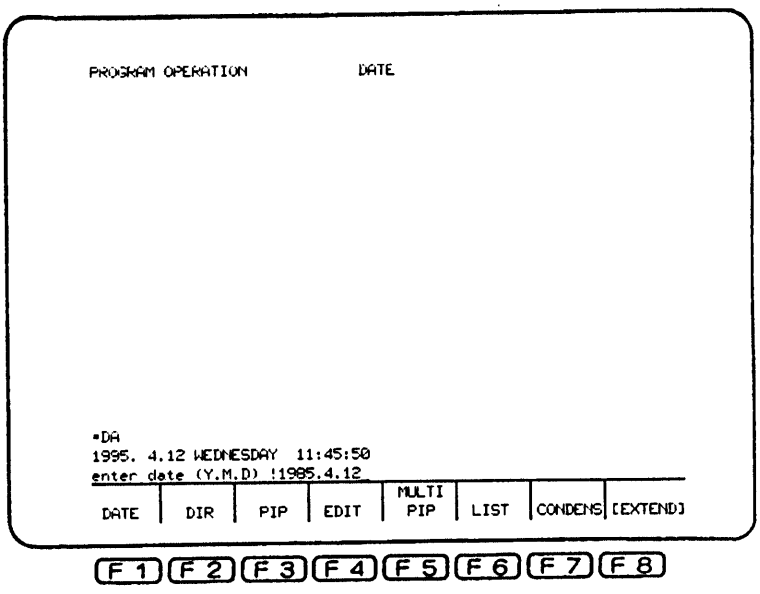
[Supplement] : Since this date data is very important for the functions such as MacMan, alarm log, etc., do not change it inadvertently.

Date setting procedure is given below.

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



(2) Press function key [F1] (DATE).



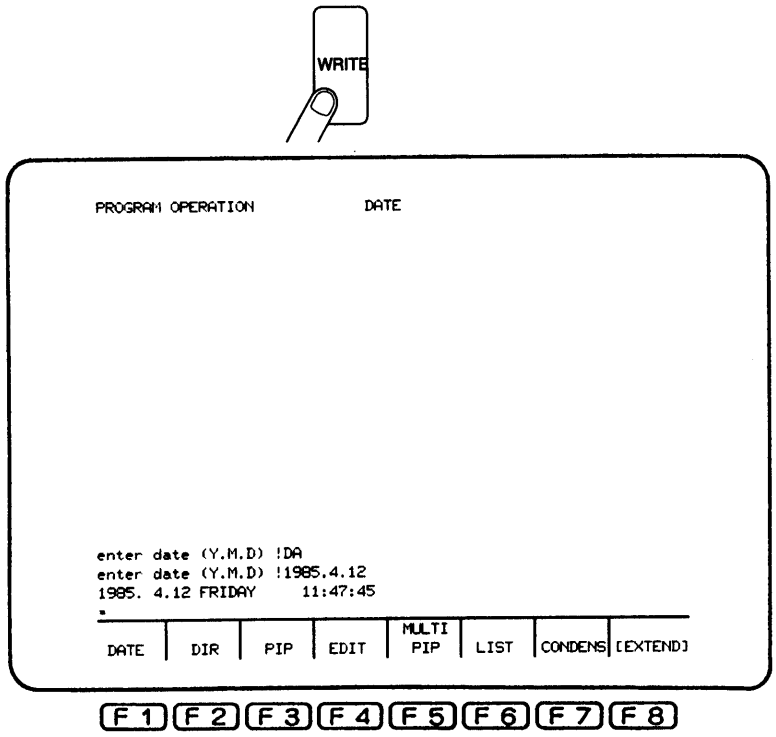
The following message is display on the console lines and readiness for inputting is completed.

```
= DA
1995. 4. 12 WEDNESDAY 11:45:50
enter date (Y.M.D)!
```

(3) Key in the year, month, and day with period put after each item following the prompt "!".

Example: 1995. 4. 12

(4) Press the WRITE key.



When the correct entry has been made, the CRT indicates date and a day of the week.

If the data entry is not correct, the CRT requests data entry again.

[Supplement] : 1. Entry of only right two digits is acceptable for year entry.

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

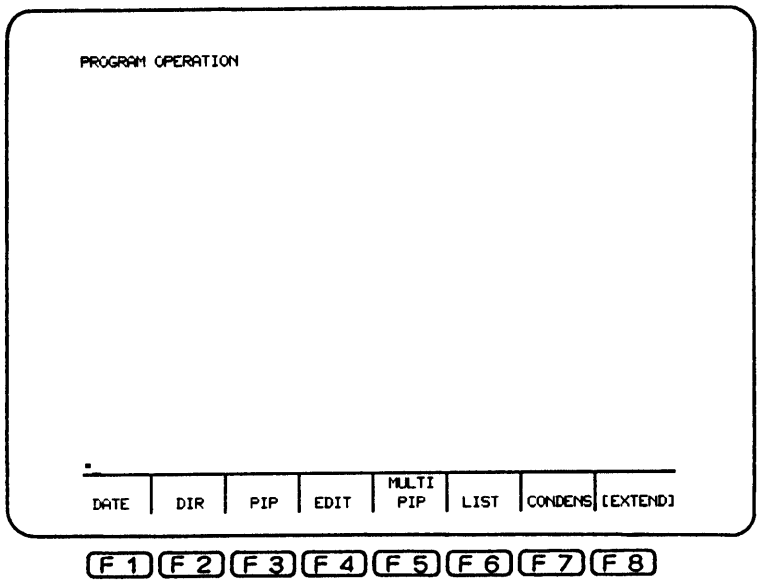
7-3. DIRECTORY

This is the function for making a list of files stored in the memory disk (MD1:) 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.

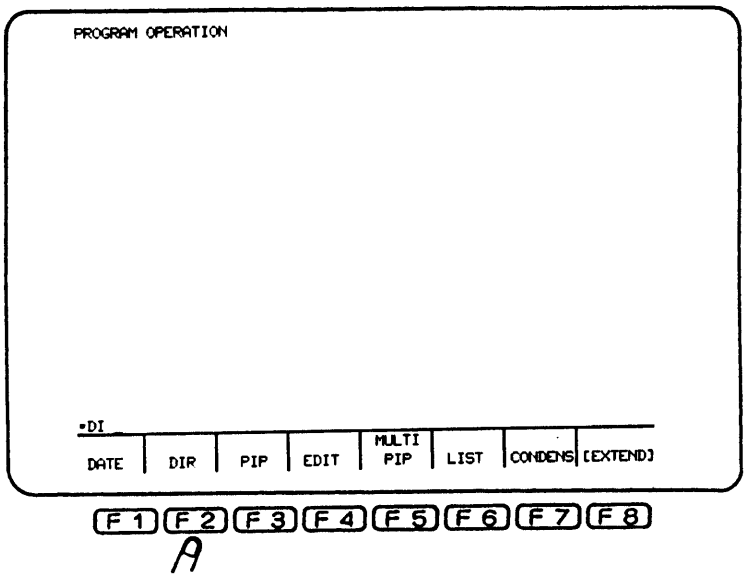
9

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



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

The display screen displays the prompt "DI" on its console line.



A

(3) Enter the device name, MD1: or FD0: . The default is MD1:.

(4) Press the WRITE key.

(5) The list of file names is displayed on the display screen.

```
PROGRAM OPERATION            DIR

DIR       MD1:*.*                                   PAGE    1

FILENAME              SEC   BYTE  CHARACTER DATE

G.MIN                 0001  00000C      12  1995. 4.12
XX.MIN                0001  00007F     127  1995. 3.23
CONEI.MIN             0001  000044      68  1995. 3.23
N.MIN                 0034  003264   12900  1995. 3.28
CONFIG.CNC            0001  000042      66  1995. 4. 7
X.MIN                 0001  00004D      77  1995. 4.11
TAIWA.MIN             0004  0002FC     764  1995. 3.17
ZZZZZ.MIN             0001  000073     115  1995. 3.17
G121.MIN              0015  0013CF    5071  1995. 3.17
H3-7-17-1.MIN         0003  000253     595  1995. 3.17
A1000.MIN             0001  00006B     107  1995. 3.17
A157.MIN              0008  0007CE    1998  1995. 3.17


=DI
| DATE | DIR | PIP | EDIT | MULTI PIP | LIST | CONDENS | [EXTEND] |
```

F1 F2 F3 F4 F5 F6 F7 F8

[Supplement] : 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.

[Supplement] :

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

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.

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.

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		Functions
Read	READ	Registers a part program after reading it through the floppy disk, etc.
Punch	PUNCH	Punches out the part program stored in the memory.
Verify	VERIFY	Verifies the program in the memory with the program on the floppy disk, etc.
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 MD1:.

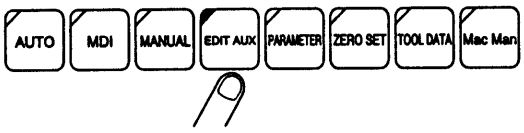
CAUTION : Never turn off power supply during the execution of file transfer. If it is turned off, the file contents will be unreliable.

7-4-1. Read

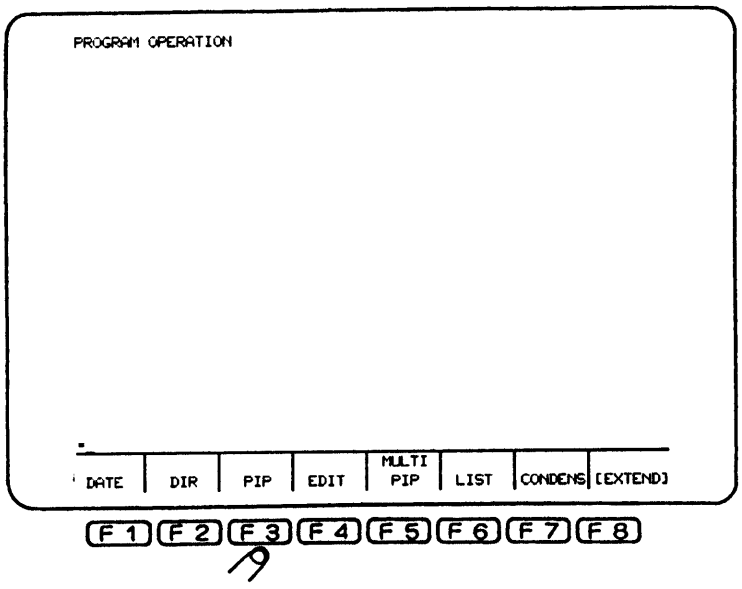
This is the operation to read a program by the tape reader or floppy disk and to store it in the memory.

The operation procedure details are as follows:

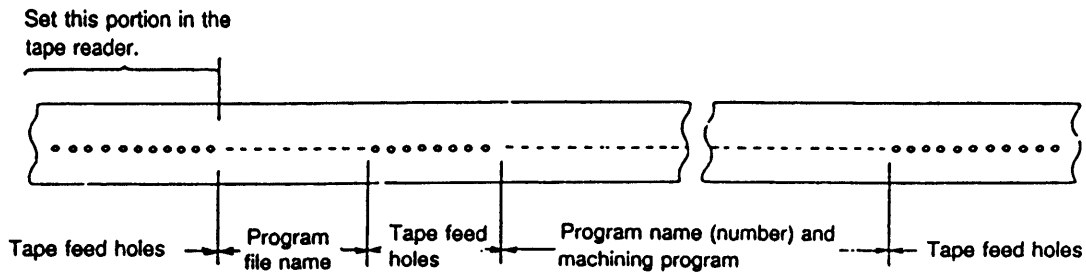
(1) Select the PROG OPERATION mode by pressing the EDIT AUX key.



The function name on the display screen will change as shown below.



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



[Supplement] : 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.

This applies only when the system is equipped with a tape reader.

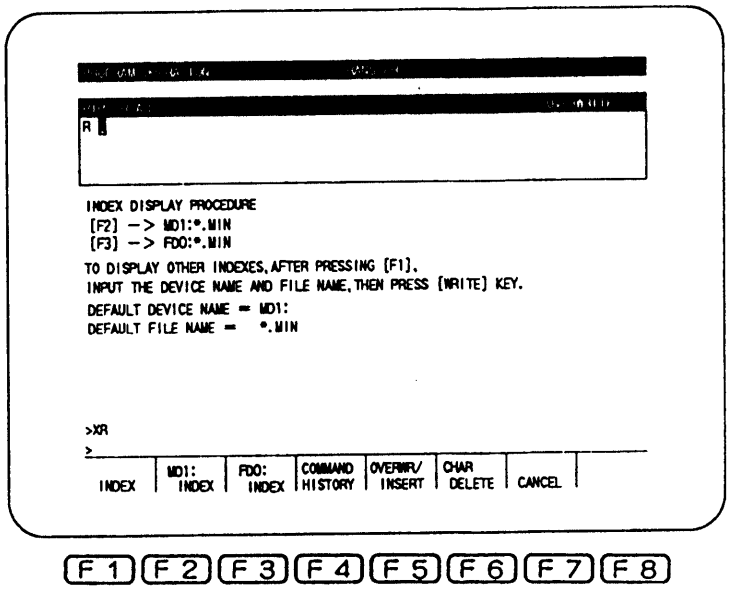
(3) Press function key [F3] (PIP).

(Note that the function name on the display screen will change.)

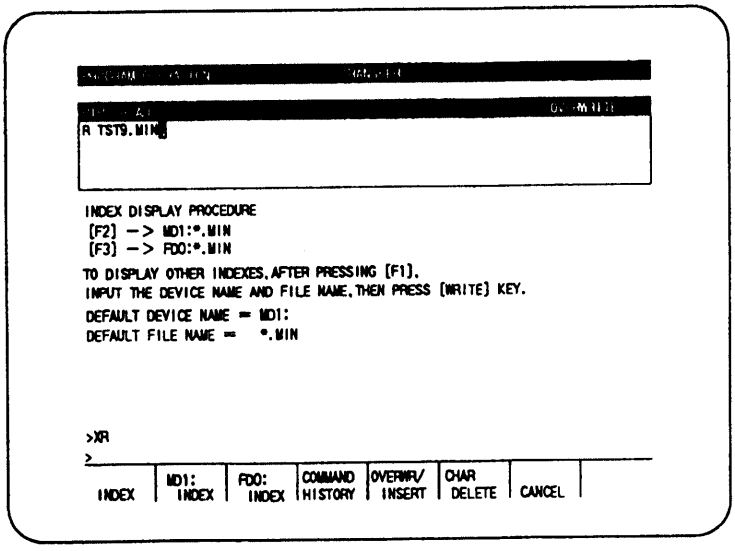
(4) Press function key [F1] (READ).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

PIP :READ ␣ R



F1 F2 F3 F4 F5 F6 F7 F8



F1 F2 F3 F4 F5 F6 F7 F8

(5) Press the WRITE key.

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

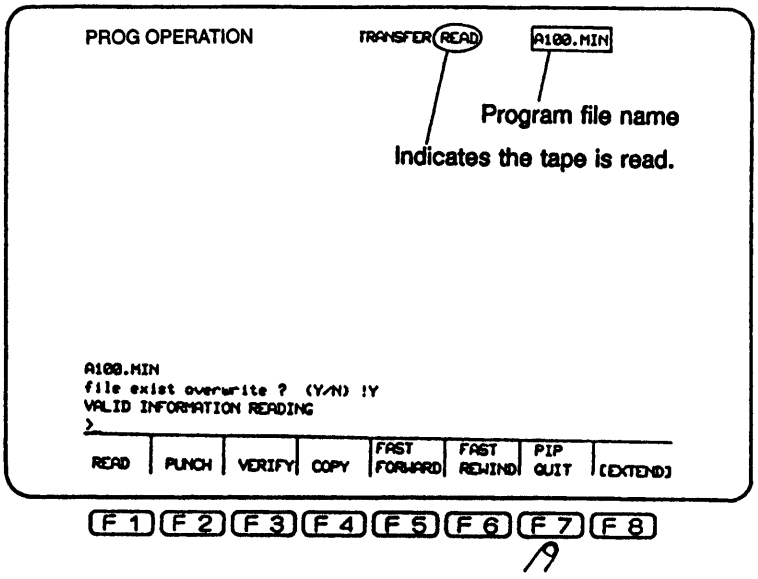
While the tape is being read, the display screen displays "READ" along with the "file name" on the first line.

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.

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



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

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

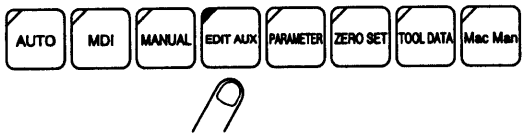
Refer to 7-4-3, "Verifying Punched Out Programs" for details and precautions of this operation.

[Supplement] : If an error occurs during tape reading, 31 characters preceding the error character are displayed on the console line of display screen.

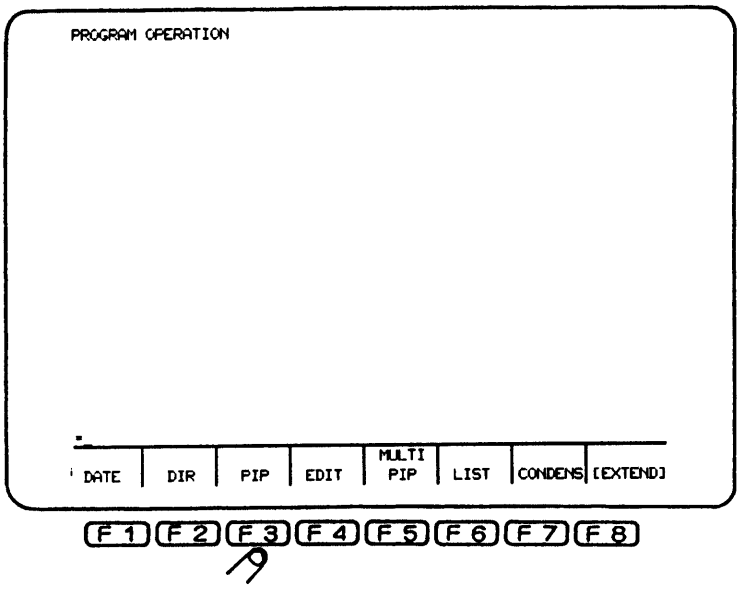
7-4-2. Punching Out Stored Program Data

This is the function to punch out the program data stored in the memory.
The procedure is as follows:

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

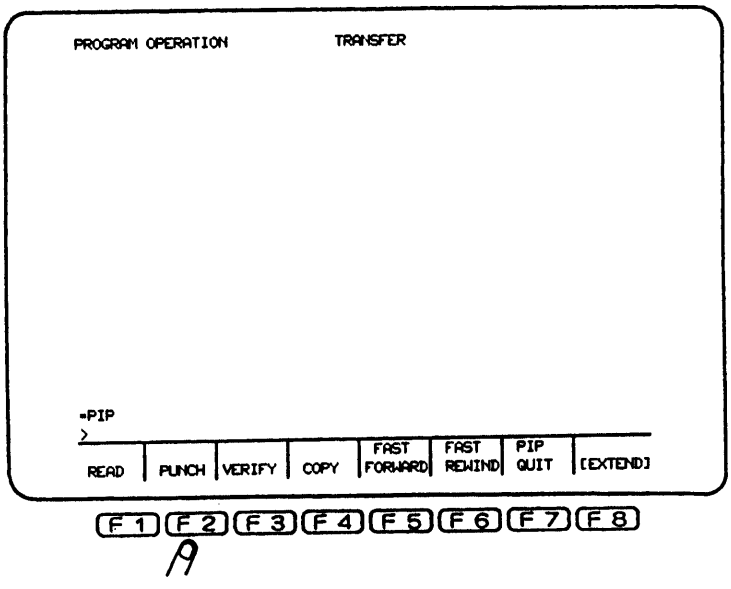


The function name on the display screen will change as shown below.



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

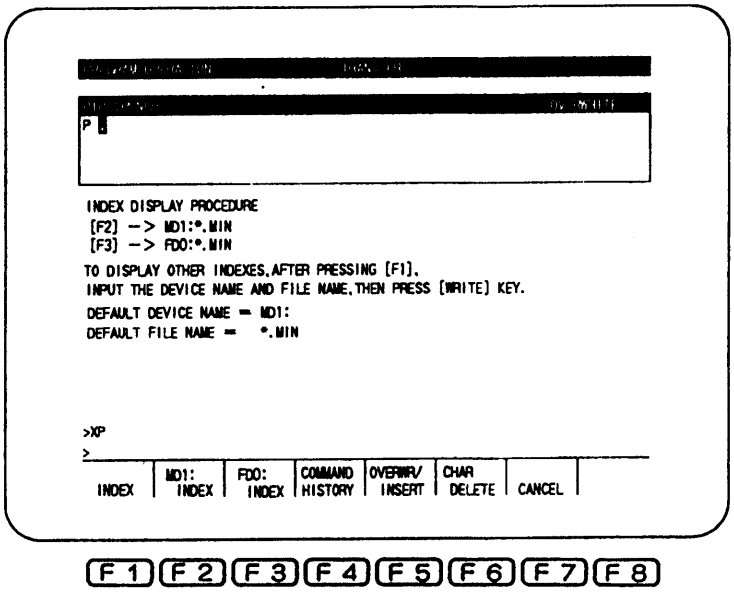
The function name on the display screen will change as shown below.

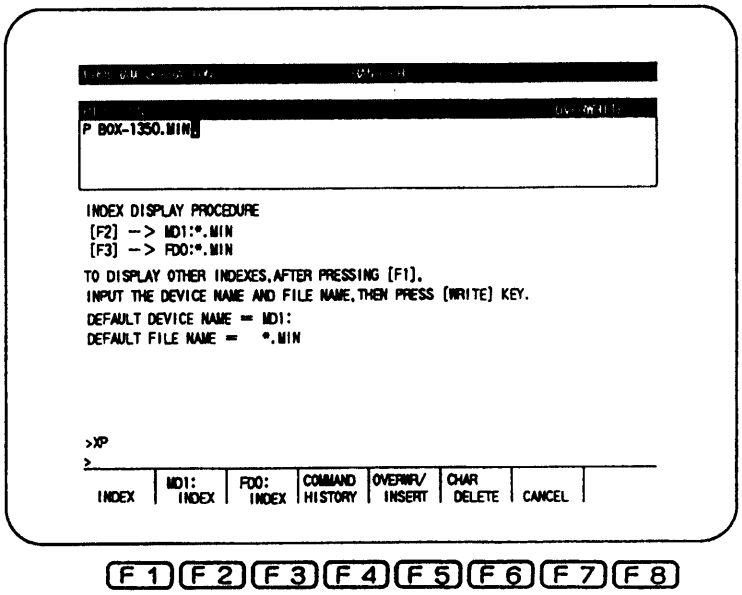


(3) Press function key [F2] (PUNCH).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

PIP :PUNCH P





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

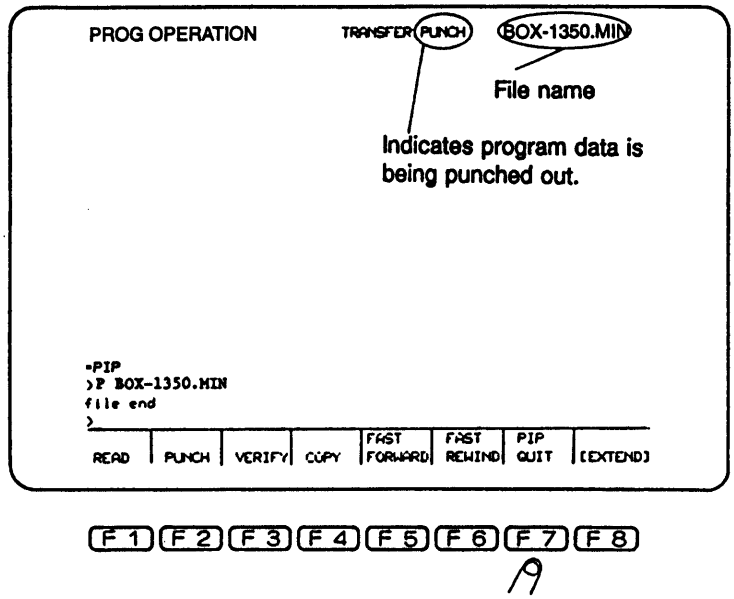
Example: BOX-1350.MIN

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

(5) Press the WRITE key.

This starts the tape punching out operation, during which the display screen 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.

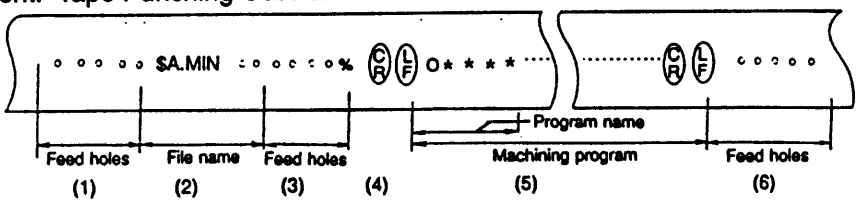


(6) Press function key [F7] (PIP QUIT).

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

[Supplement] : 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.

[Supplement] : 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 display screen.

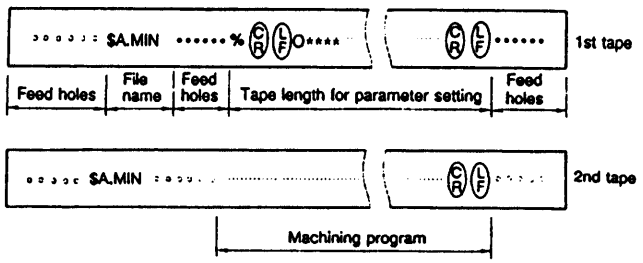
When the tape delimiting code is the "%" (ER) code, i.e., when bit 3 of parameter No. 1 of NC optional parameter (bit) is 1, the "%" code is punched out before feed holes.

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 feed) 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

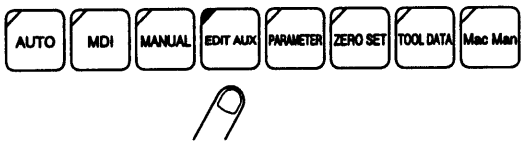


Consult 7-4-3, "Verifying Punched Out Programs" for details and supplements on this operation.

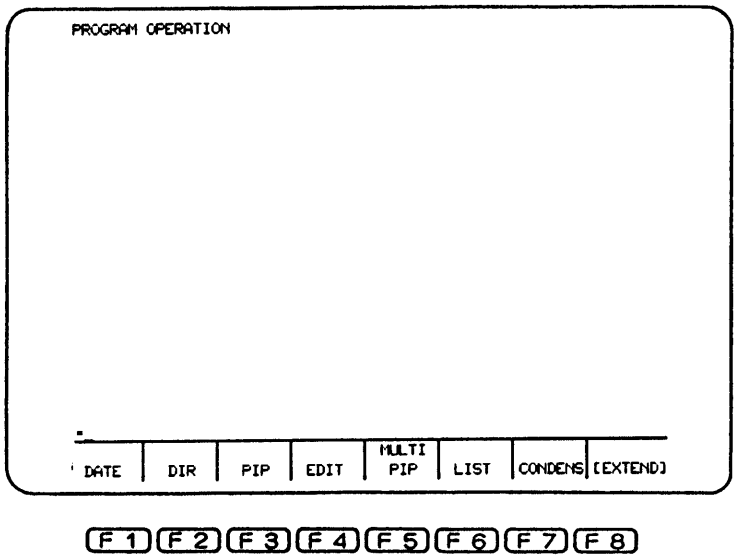
7-4-3. Verifying Punched Out Programs

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 memory, the floppy and the memory, the floppy and the floppy, the memory and the memory. The procedure is as follows:

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



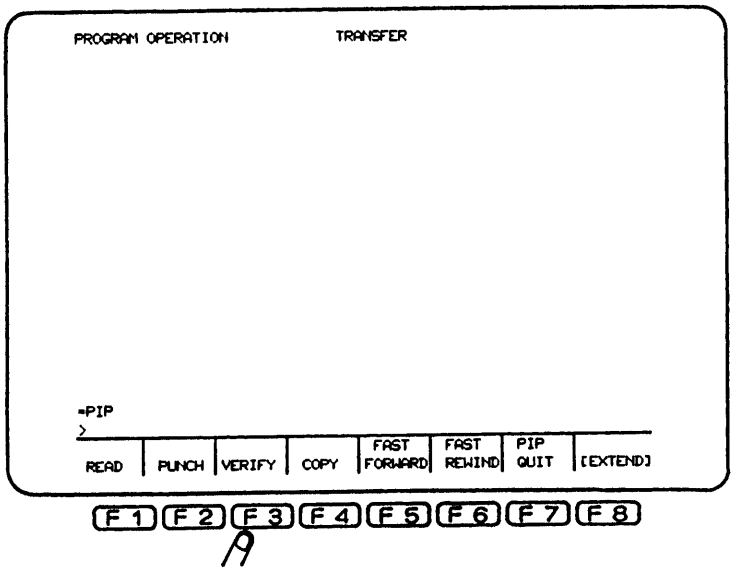
The function name on the display screen will change as shown below.



(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.

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

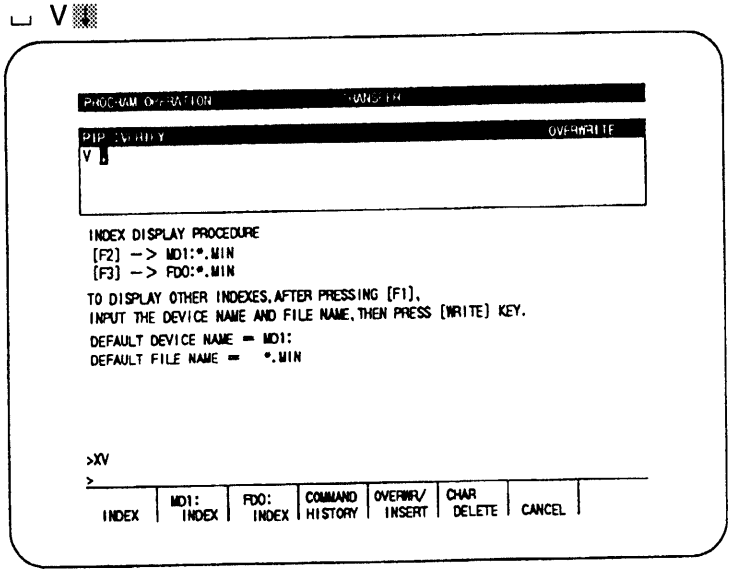
(Make sure that the display of the function names and the title changes.)



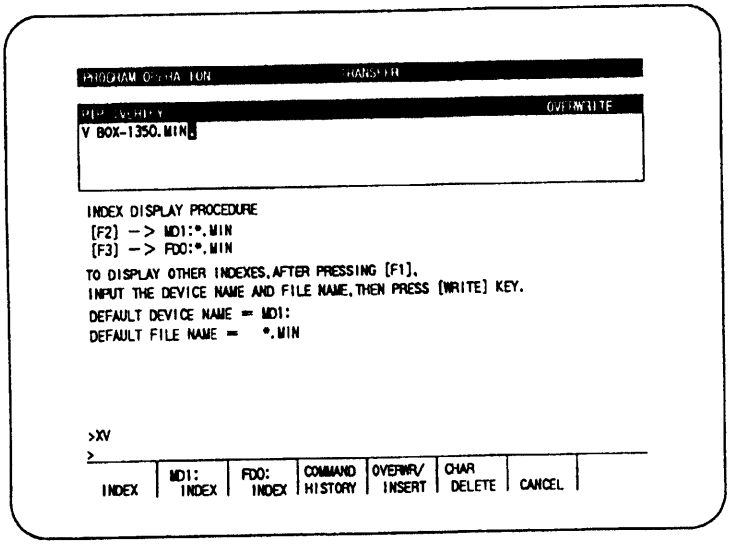
(4) Press function key [F3] (VERIFY).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

PIP :VERIFY ␣ V



F1 F2 F3 F4 F5 F6 F7 F8



F1 F2 F3 F4 F5 F6 F7 F8

(5) Key in the file name of the program to be verified.

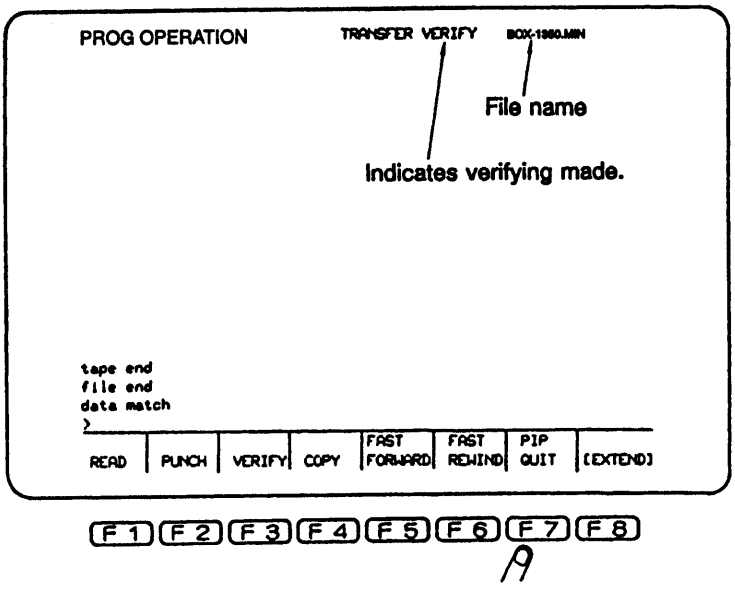
Example: BOX-1350.MIN.

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

(6) Press the WRITE key.

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

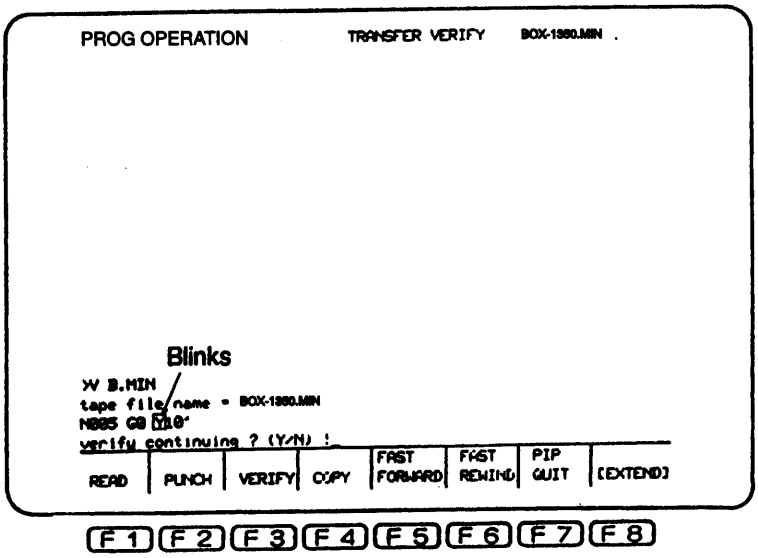
While verifying operation, the display screen displayed "VERIFY" along with the "file name".



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

[Supplement] : This completes verification of the punched out program data and the display mode return to the one in step (1).

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.



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 message 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

Supplements 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.

	bit1 Tape Code Parity Discrimination	bit0 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.

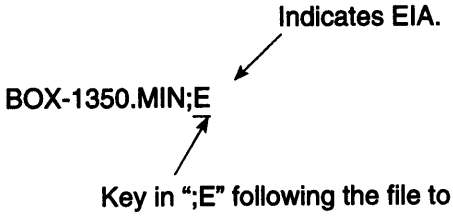
Refer to SECTION 3, "PARAMETERS" for the procedure to set parameters.

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.



[Supplement] : 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.

1) One file for one program

Only one program is registered in one file.

2) 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 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.

a) Press function key [F1] (READ)

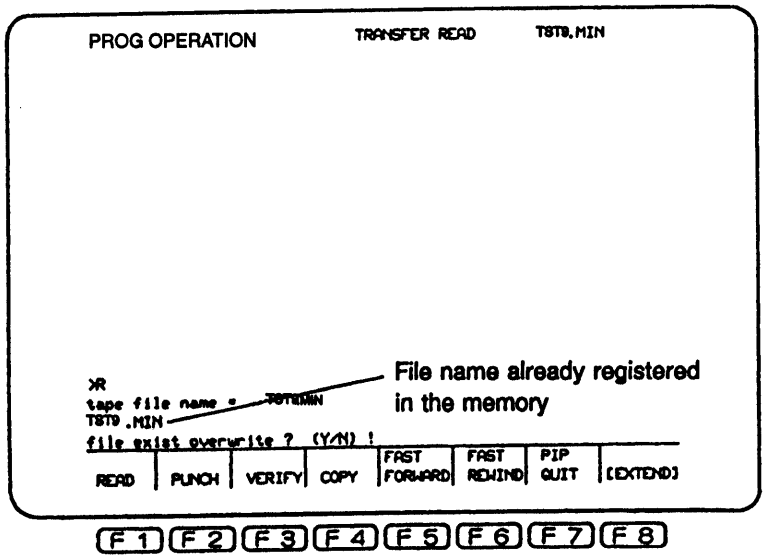
b) Key in the file name and ";A".

",file name;A"

c) 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.



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

b) The following message will be displayed on the display screen screen.

file exist overwrite? (Y/N)

c) 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.

[Supplement] : 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 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 display 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 not 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

Designates 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.

Feed holes	$	File name in EIA code	Feed holes	EOB	Significant information

EIA corresponding code

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

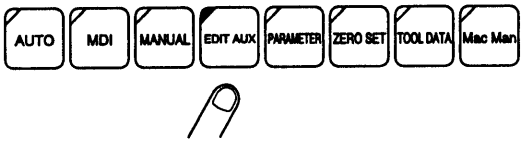
The coding system employed for NC data within the significant information area is recognized by the first end-of-program code (EOB).

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.

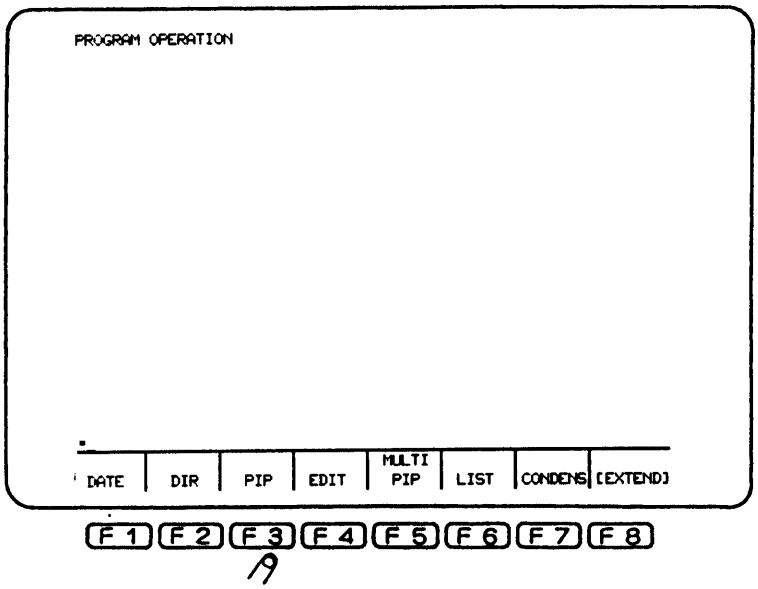
7-4-4. Duplication of Stored Program

To duplicate a file in the memory (MD1:) or a floppy disk (FD0:), follow the steps below.

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

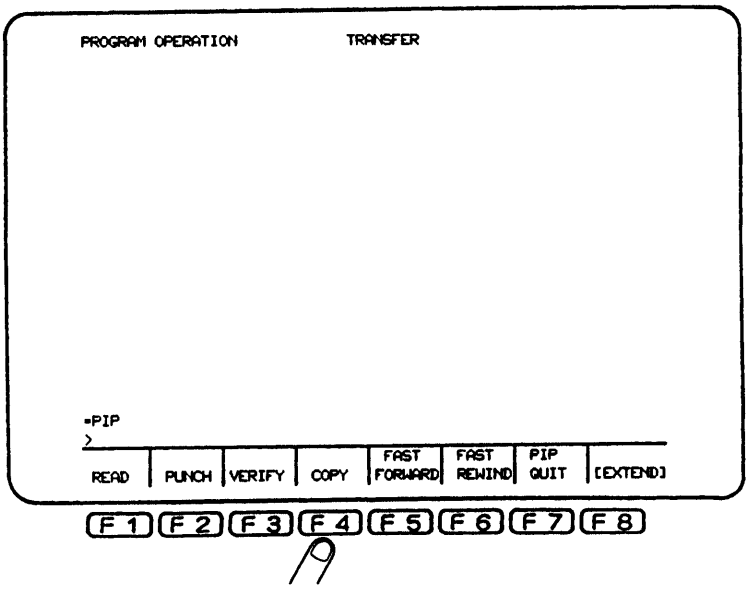


The function names on the display screen will change as shown below.



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

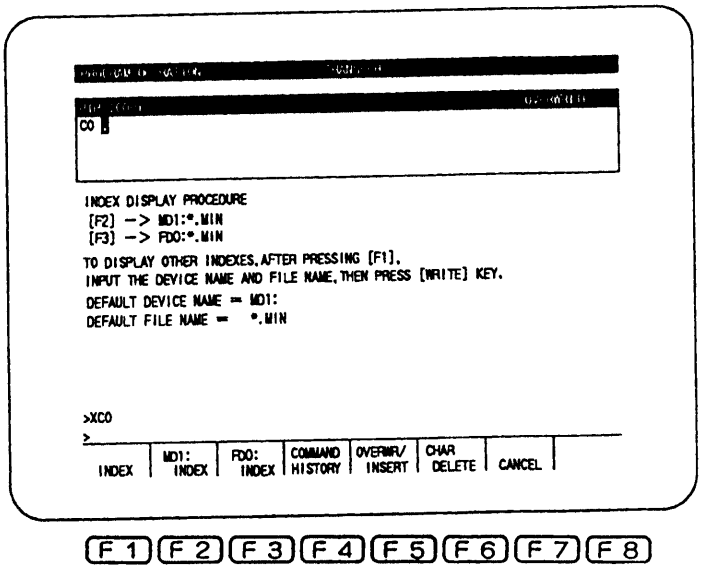
The screen will change. Make sure that TRANSFER is displayed on the screen.

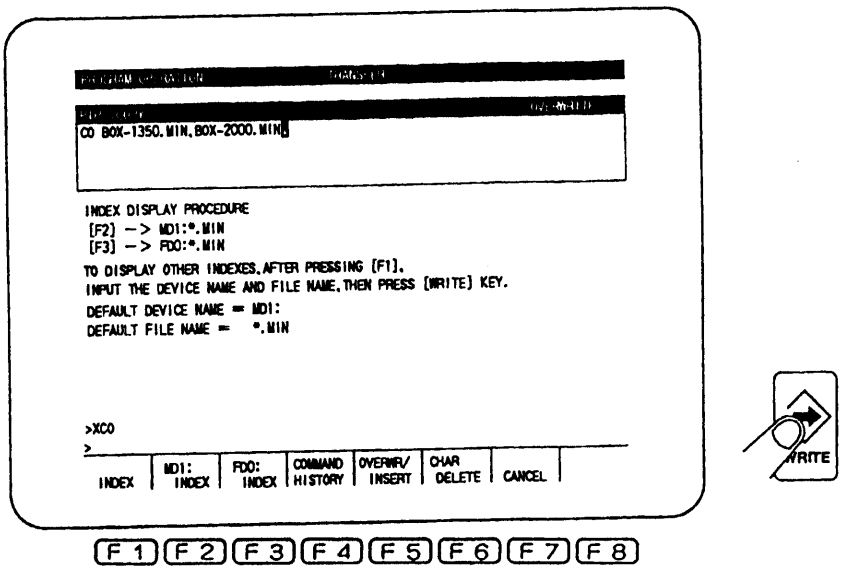


(3) Press function key [F4] (COPY).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

PIP :COPY ␣ CO





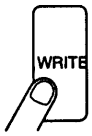
Enter the device name, MD1: or FD0:. (The default is MD1:.)

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

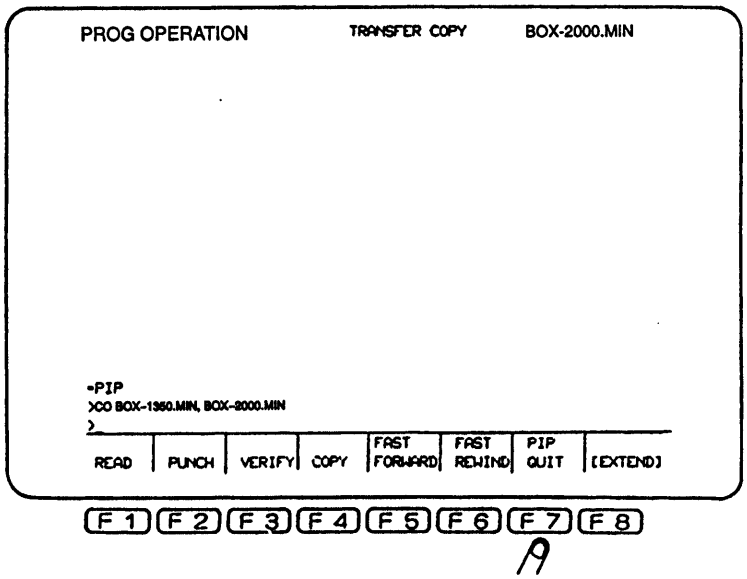
Example: BOX-1350.MIN, BOX-2000.MIN

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 memory with the file name "BOX-2000.MIN".



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

This completes program duplicating operation and the display 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).

[Supplement] :

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

2. When the file name "BOX-2000.MIN" which has been specified as the output file name already exists in the 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.

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

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 7-3, "Directory".)

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 – Fast Forward Feed

To feed the tape rapidly, follow the procedure below.

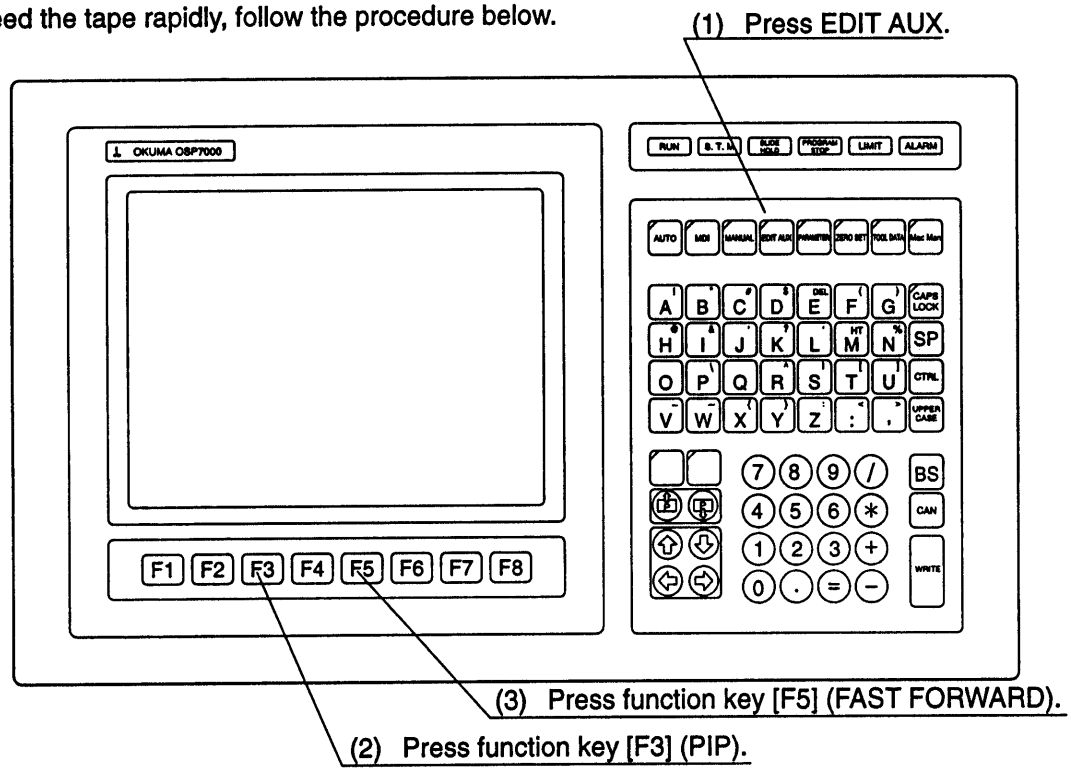
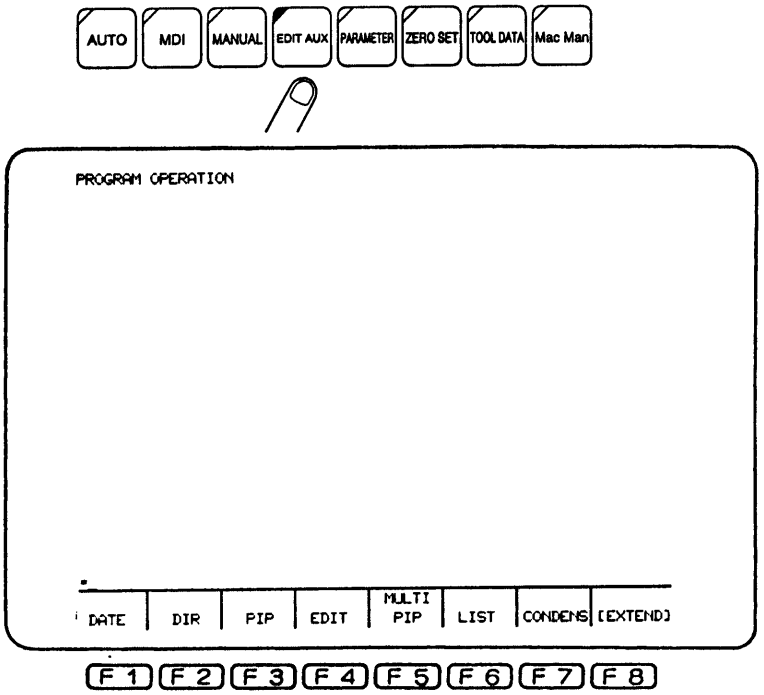


Fig. 2-19 Tape Reader Operation – Fast Forward Feed

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



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

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

(3) Press 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. Tape Reader Operation – Rewind

To rewind the tape, follow the procedure below.

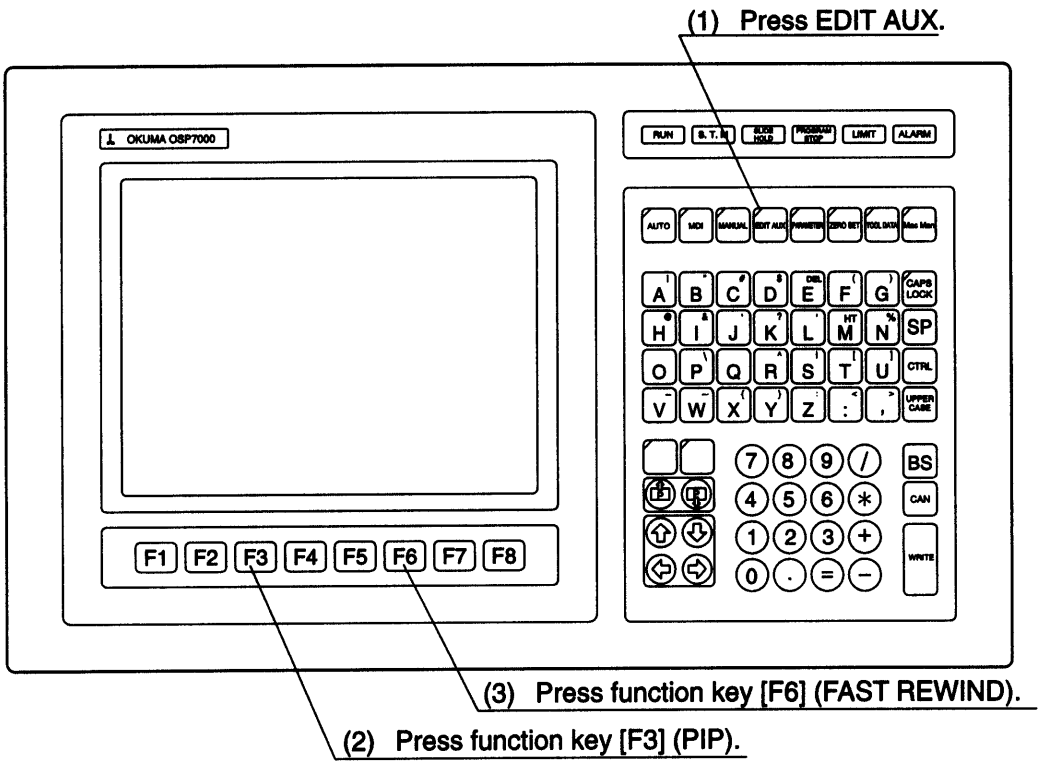
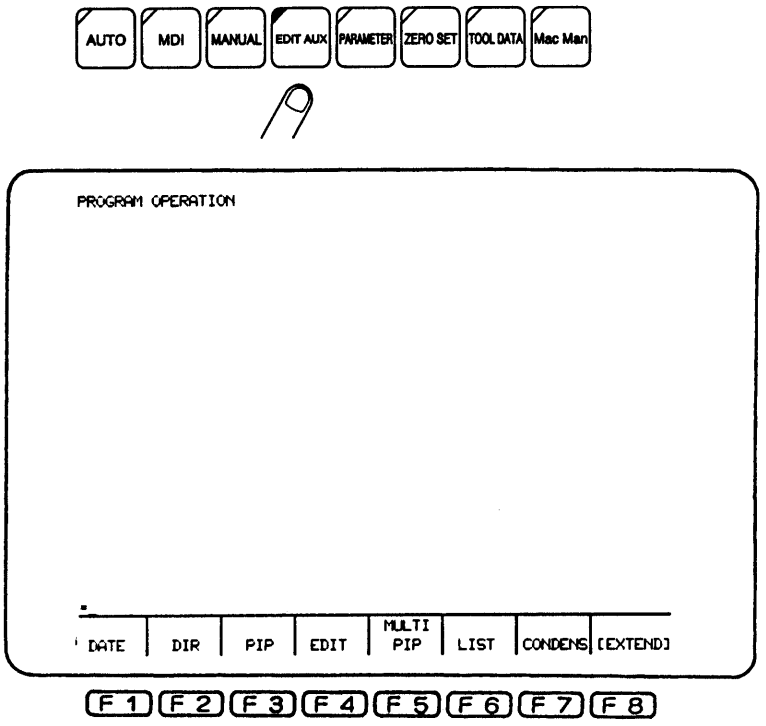


Fig. 2-20 Tape Reader Operation – Rewind

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

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



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

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

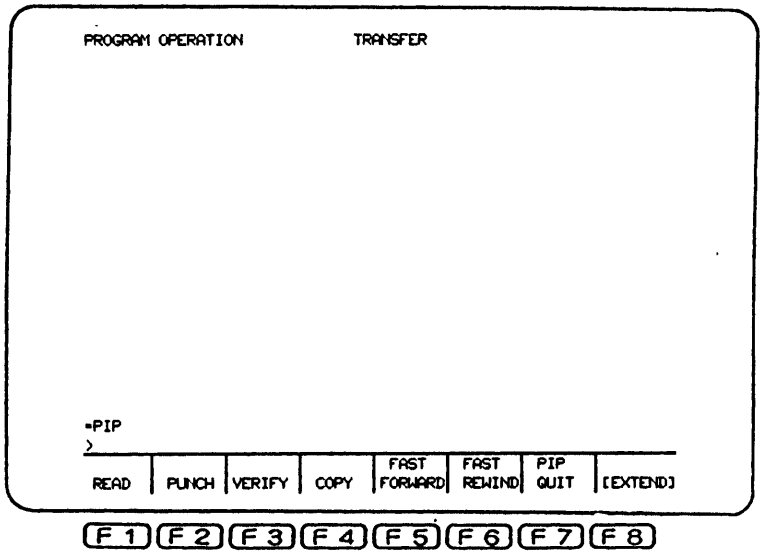
(3) Press function key [F6] (FAST REWIND).

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

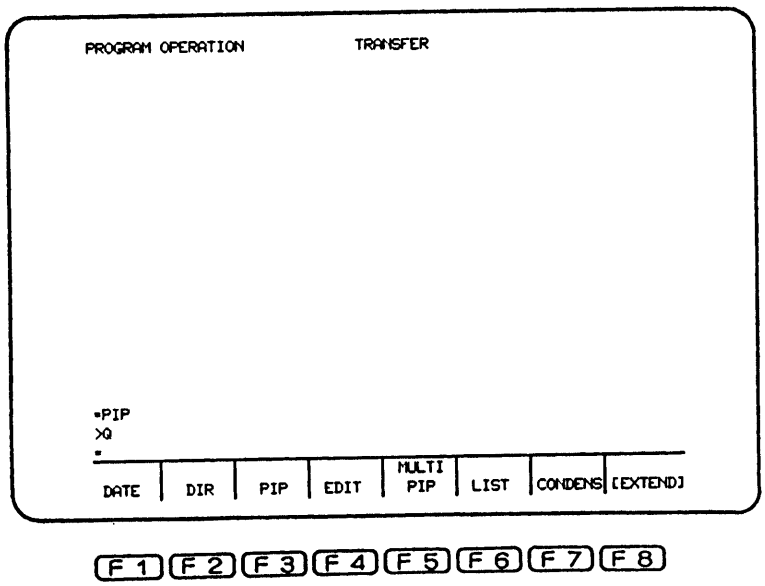
This sub command quits the transfer mode, and provides a return to the previous program operation mode. The operating procedure is indicated below.



(1) Press 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 display screen will change as shown below with assigned function names also changed.



7-5. Program Editing

In the program edit mode, modification, insertion, deletion, and others can be conducted for on programs stored in the 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 display screen, the symbol ">>" appears at the left-most position of the edit line. One line on the display screen contains a maximum of 63 characters.

- Edit Pointer

  This refers to the identifier indicating the character to be edited. On the display screen, 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 display screen, they are displayed on multiple lines with the 2nd and subsequent lines preceded by "&", indicating that the commands are continuous.

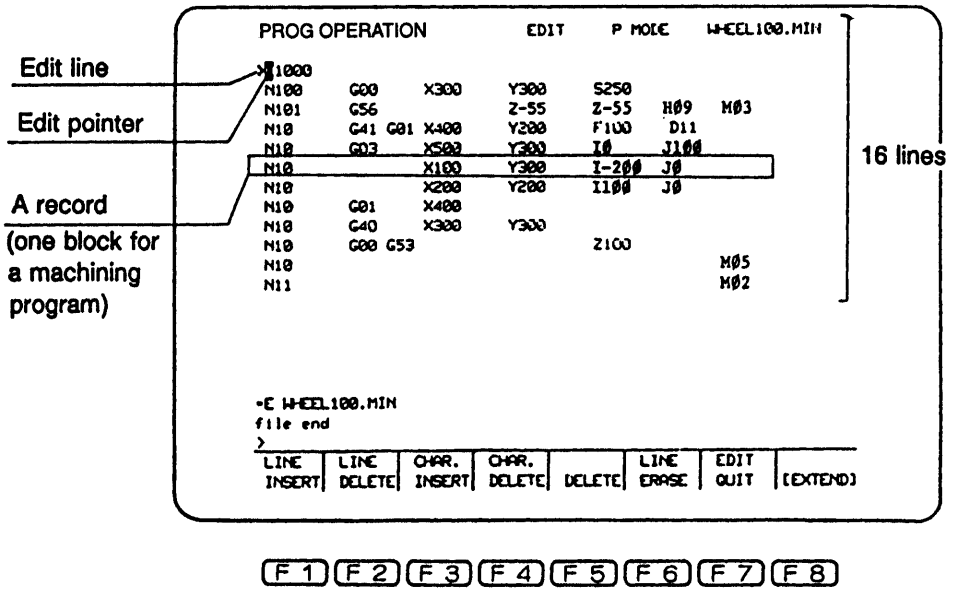
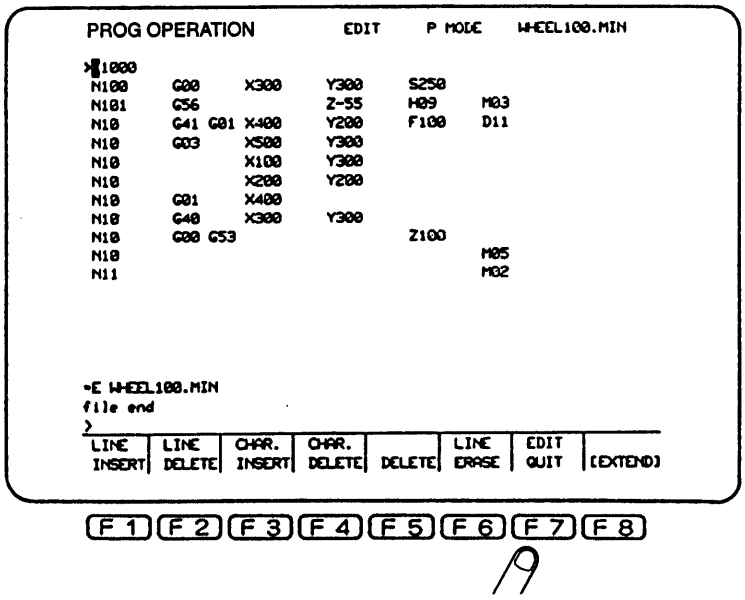
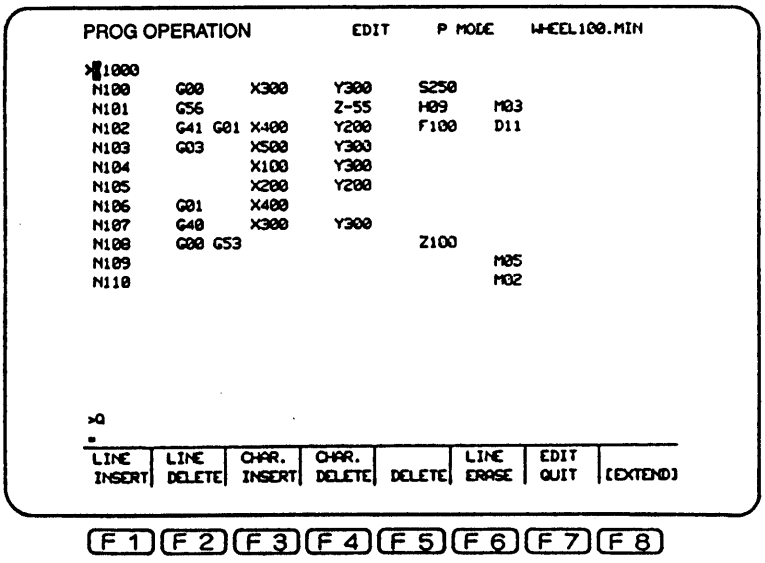


Fig. 2-21 Program Editing

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



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



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

Item		Functions
Insert line	INSERT LINE	Inserts a blank line right after the present edit line.
Delete line	DELETE LINE	Deletes the line including the edit pointer.
Insert character	INSERT CHARACTER	Inserts a blank space (for one character) right before the edit pointer.
Delete character	DELETE CHARACTER	Deletes the character identified by the edit pointer.
Delete	DELETE	Deletes the specified number of records (blocks) in a program.
Erase line	ERSE LINE	Erases the commands in the line which contains the edit pointer. The line remains as a blank line.
Quit	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	XTRACT	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 i through the keyboard before the character located by the edit pointer.

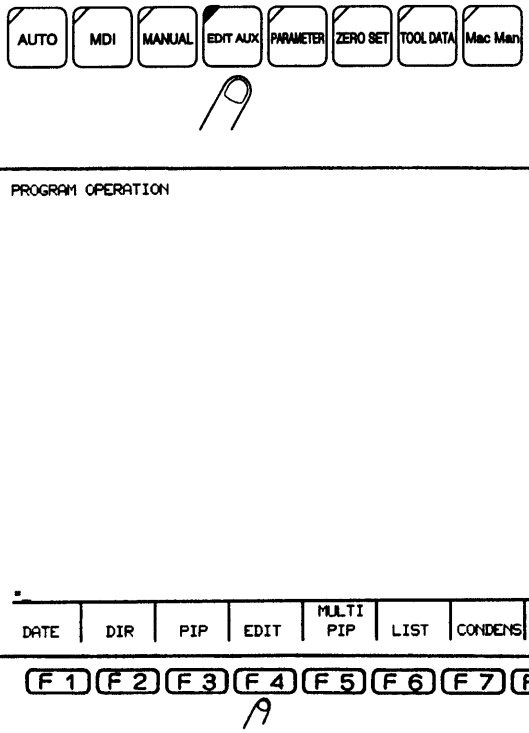
: Never turn off the power supply during the file transfer operation. If it has been turned off, data in the file might be unreliable.

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

(1) Readout of a Program File from the Memory

a) To directly input the file name

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

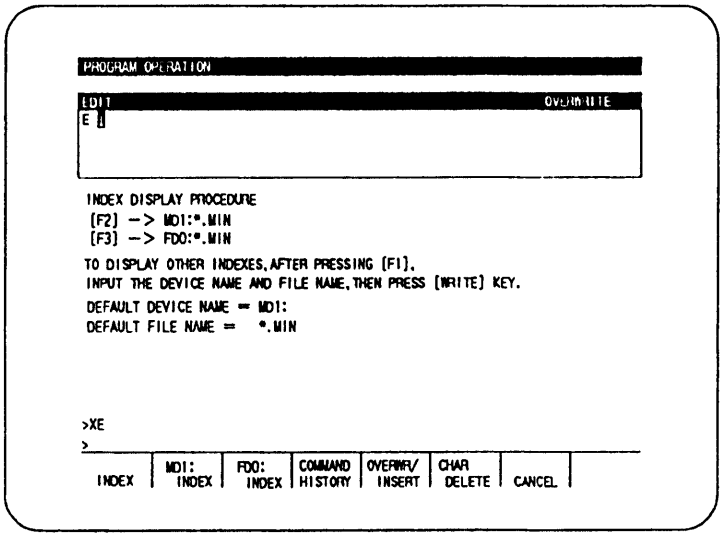


2) Press function key [F4] (EDIT).

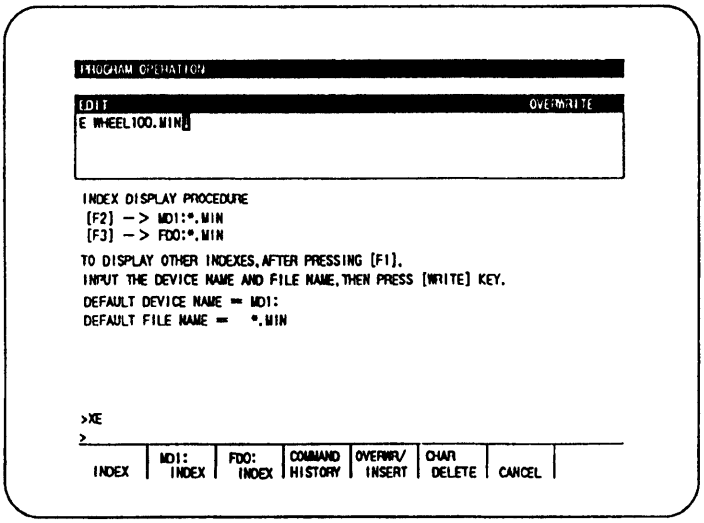
Make sure that the display will change as shown below.

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

EDIT ␣ E ▒



F1 F2 F3 F4 F5 F6 F7 F8



F1 F2 F3 F4 F5 F6 F7 F8

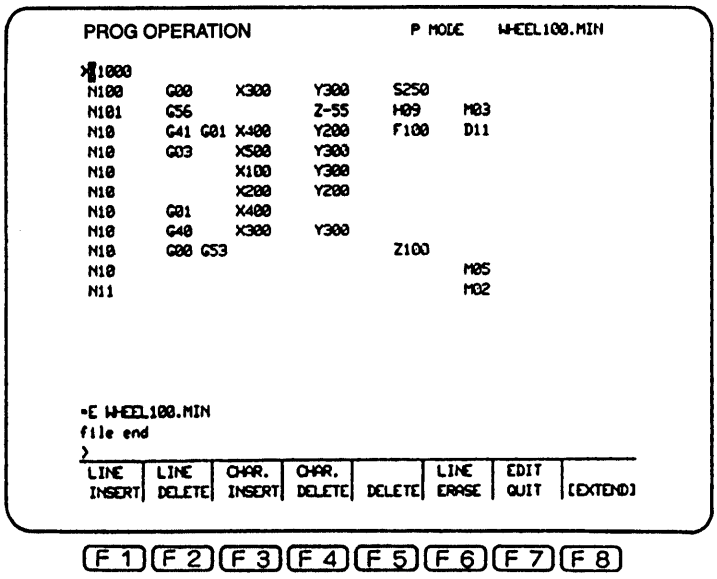
3) Key in the file name to be edited through the keyboard.

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.

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

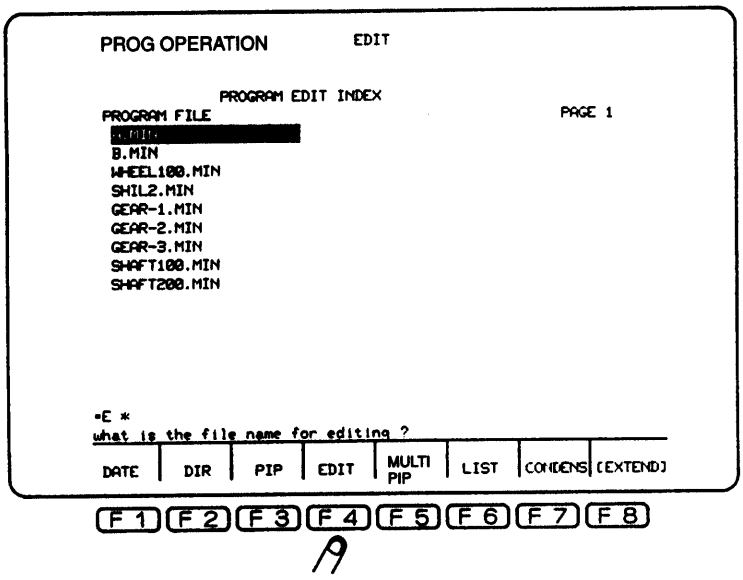


Program data of the file name "WHEEL100.MIN" is ready for editing.

b) Program selection using directory

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

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



2) Press 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.

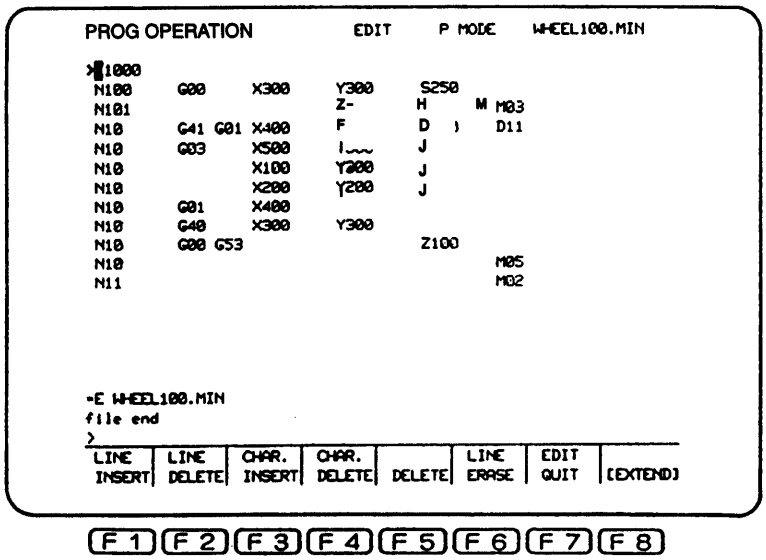
[Supplement] :

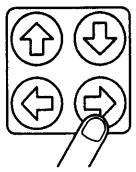
1. When any files have been registered in the memory, the PROGRAM EDIT INDEX screen is not displayed.
2. One screen page can display up to 12 file names. When more than 12 files are stored in the memory, press the PAGE key to change the display page.
3. When a file name is specified using symbols "*", and "?", all the corresponding files will be displayed on the PROGRAM EDIT INDEX screen.
4. For details of file name designation, refer to Note 3 in 7-3, "Directory".

(2) Cursor Operations

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

a) Cursor right movement

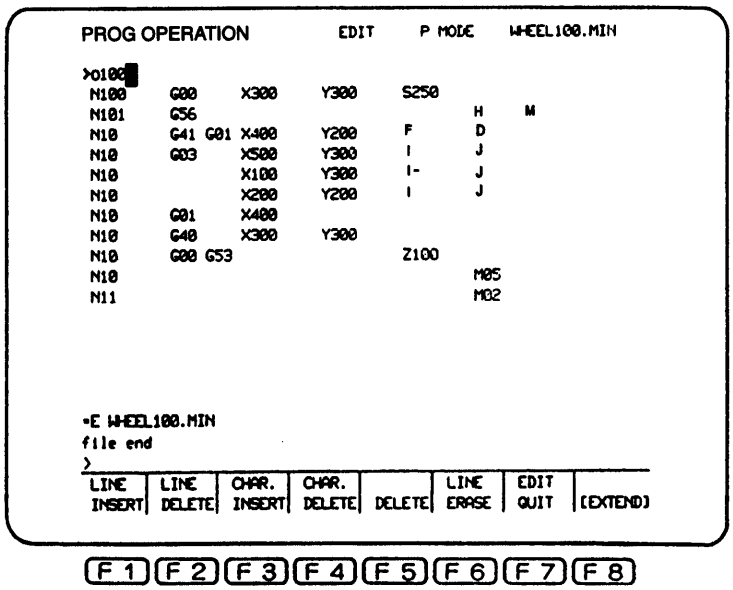


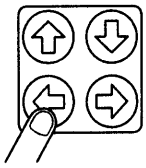


Each time the cursor key is pressed, the edit pointer (reversed display) moves to the right.

The edit pointer moves continuously while the cursor key is held down.

b) Cursor left movement

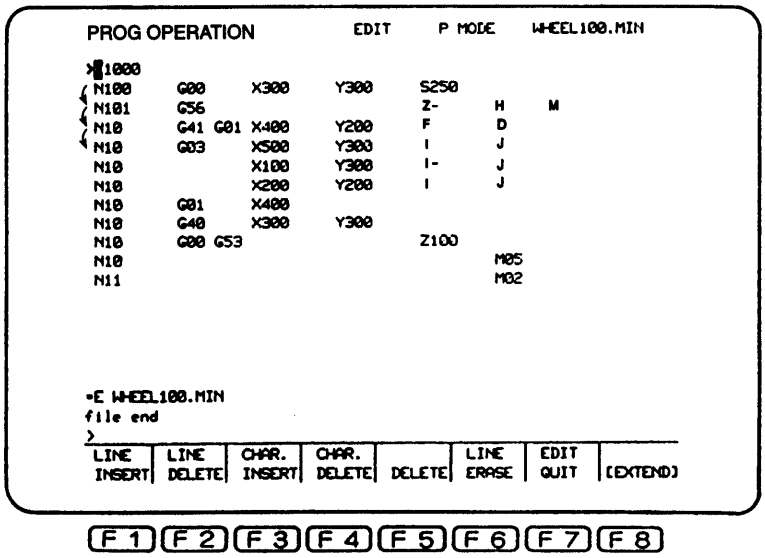


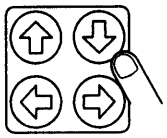


Each time the cursor key is pressed, the edit pointer (reversed display) moves to the left.

The edit pointer moves continuously while the cursor key is held down.

c) Cursor downward movement



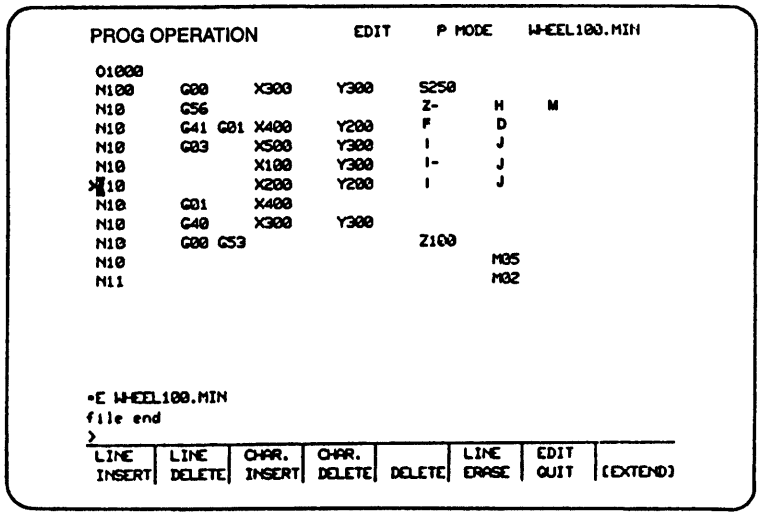


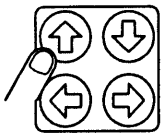
Each time the cursor key is pressed, the edit pointer (reversed display) and the edit line (>>) move down one line.

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





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 display 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 is pressed, the next page is displayed.

On the display 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 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.

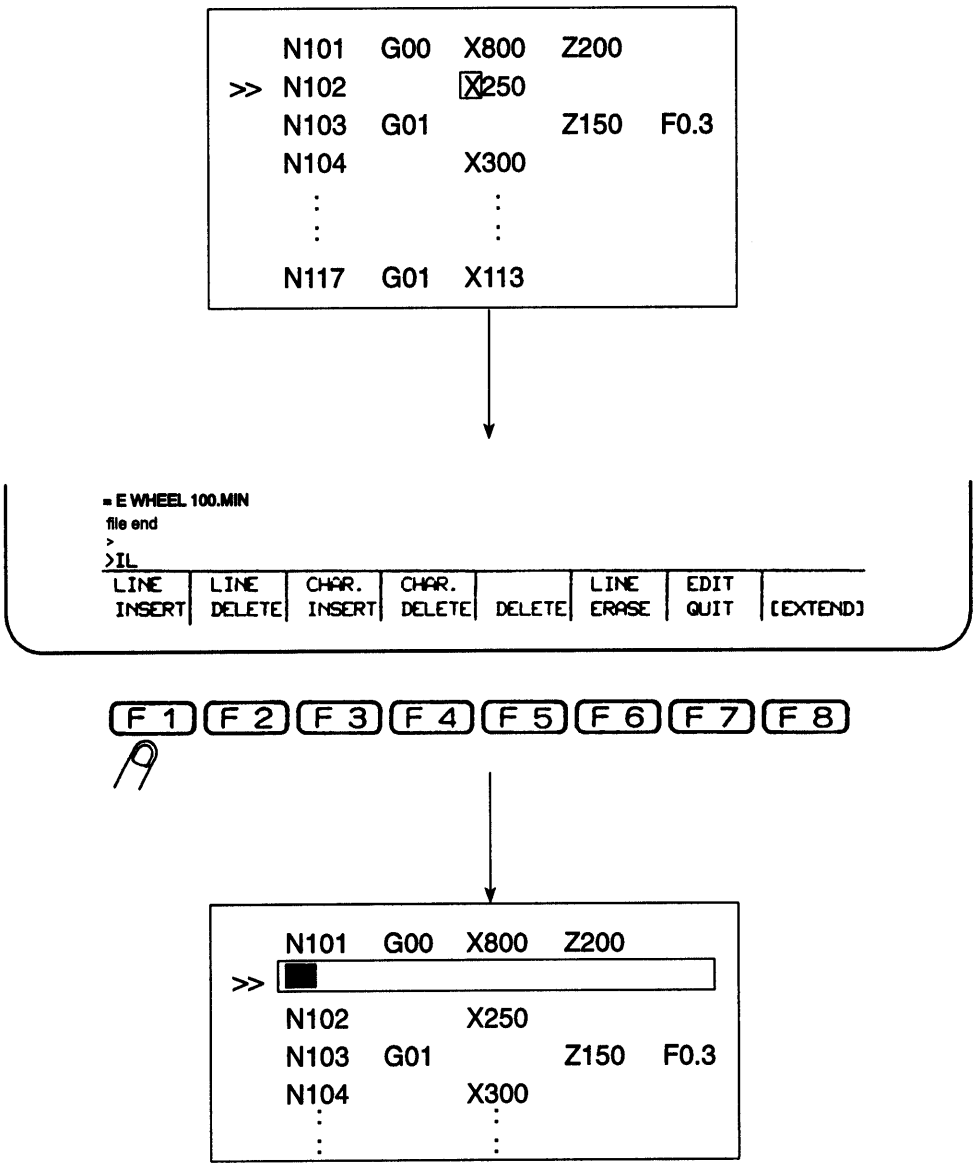
Press function key [F1] (LINE INSERT) to insert a blank line before the edit line (>>).

(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.



7-5-4. One Line Deletion

(1) This function deletes the edit line.

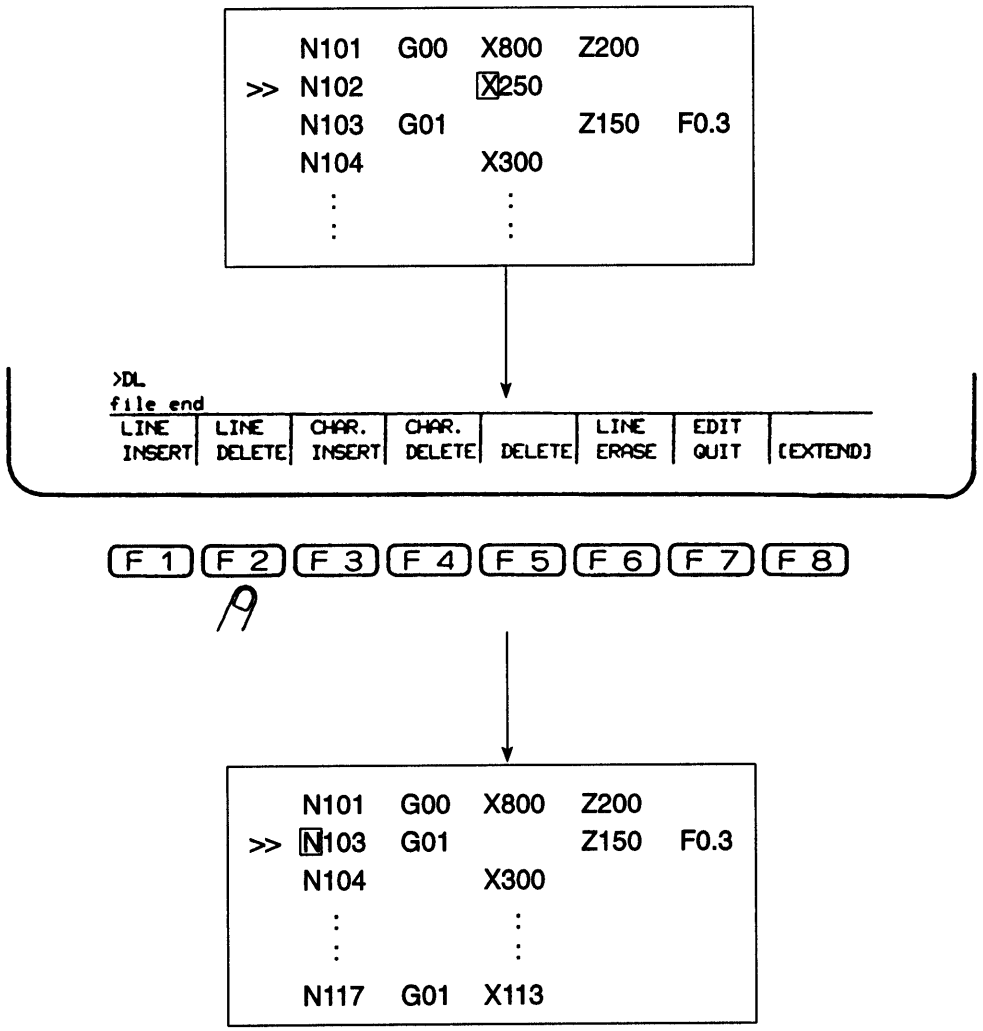
Press function key [F2] (LINE DELETE) to delete the edit line.

(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.



7-5-5. One Character Insertion

(1) This function inserts a space before the edit pointer.

Press function key [F3] (CHAR. INSERT) to insert a space right before the edit pointer.

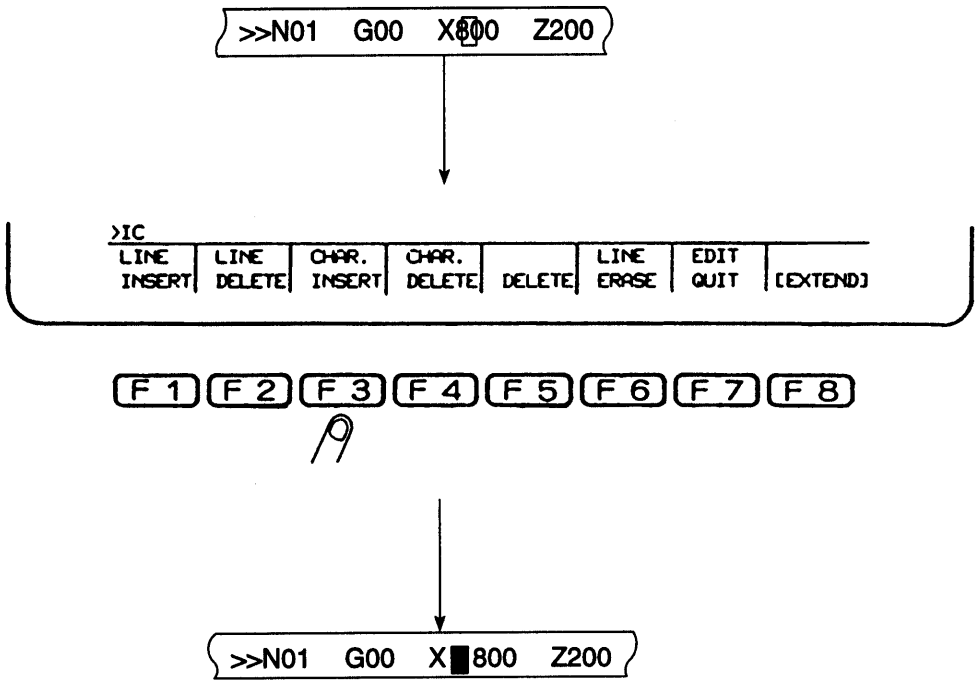
(2) Data following the edit pointer shifts to the right when a space has been inserted.

(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.

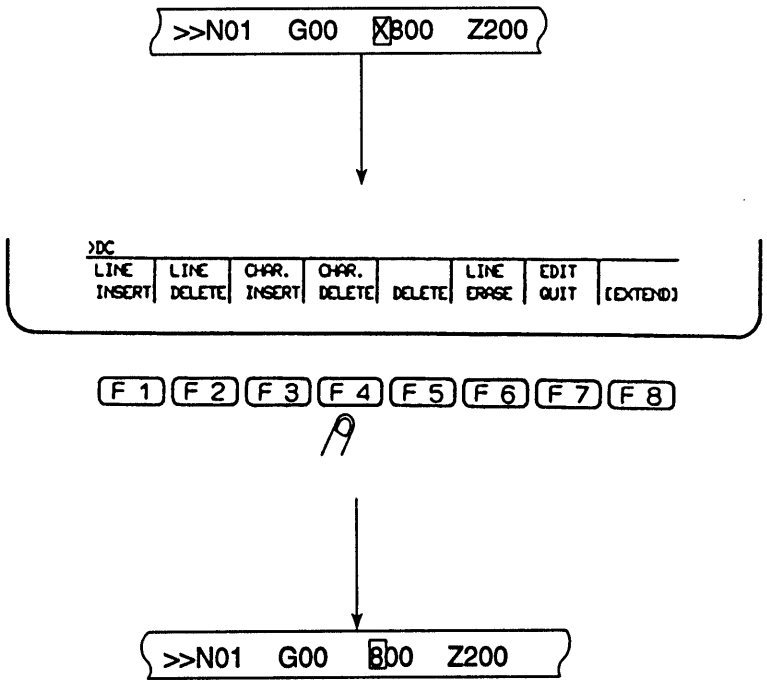
Press function key [F4] (CHAR. DELETE) to delete the character located by the edit pointer.

(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 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 INSERT | LINE DELETE | CHAR. INSERT | CHAR. DELETE | DELETE | LINE ERASE | EDIT QUIT | [EXTEND]
```

F1 F2 F3 F4 F5 F6 F7 F8

4

↓

Key in "4" through the keyboard.

↓

Press the **WRITE** key.

↓

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

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

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

7-5-8. One Line Erasing

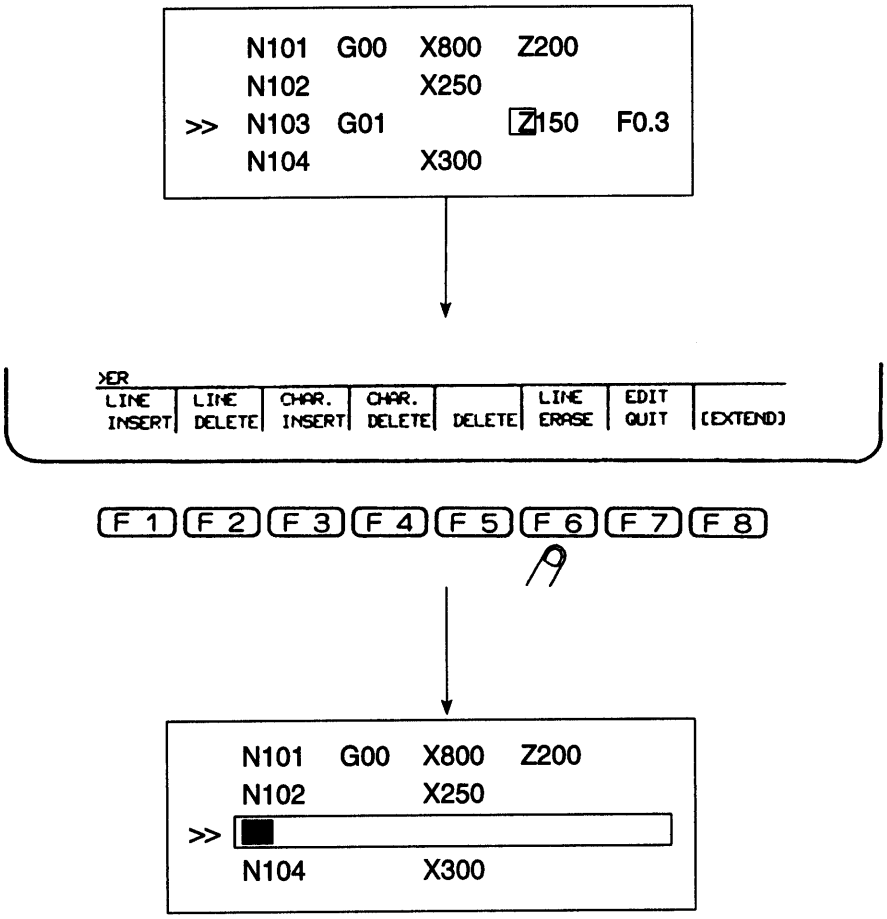
(1) This function erases program data in the edit line (>>). The blank line remains.

Press function key [F6] (LINE ERASE) to erase program data in the edit line. When data is erased, a blank line will remain.

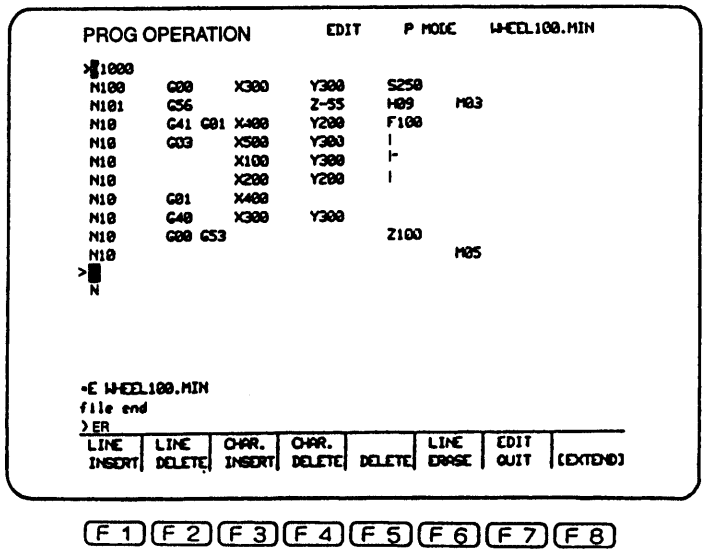
(2) The edit pointer is placed at the first character of the erased edit line.

(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.

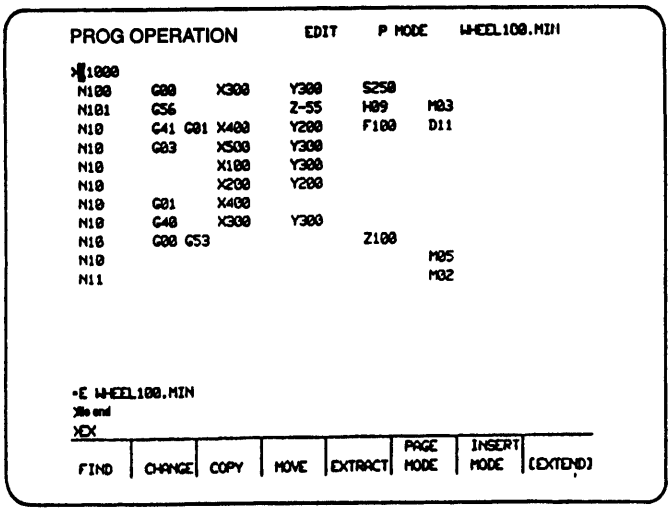


Before executing operations explained in 7-5-9 to 7-5-13, press function key [F8] (EXTEND).



F1 F2 F3 F4 F5 F6 F7 F8

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



F1 F2 F3 F4 F5 F6 F7 F8

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 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␣/

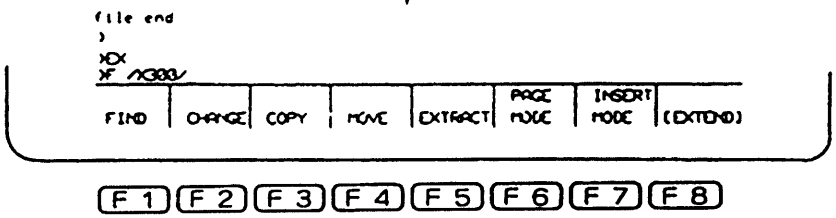
With this command, character-strings such as X100, X10.5, and others are not searched for.

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
    :                   :
    :                   :
```



F1 F2 F3 F4 F5 F6 F7 F8

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 display 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.

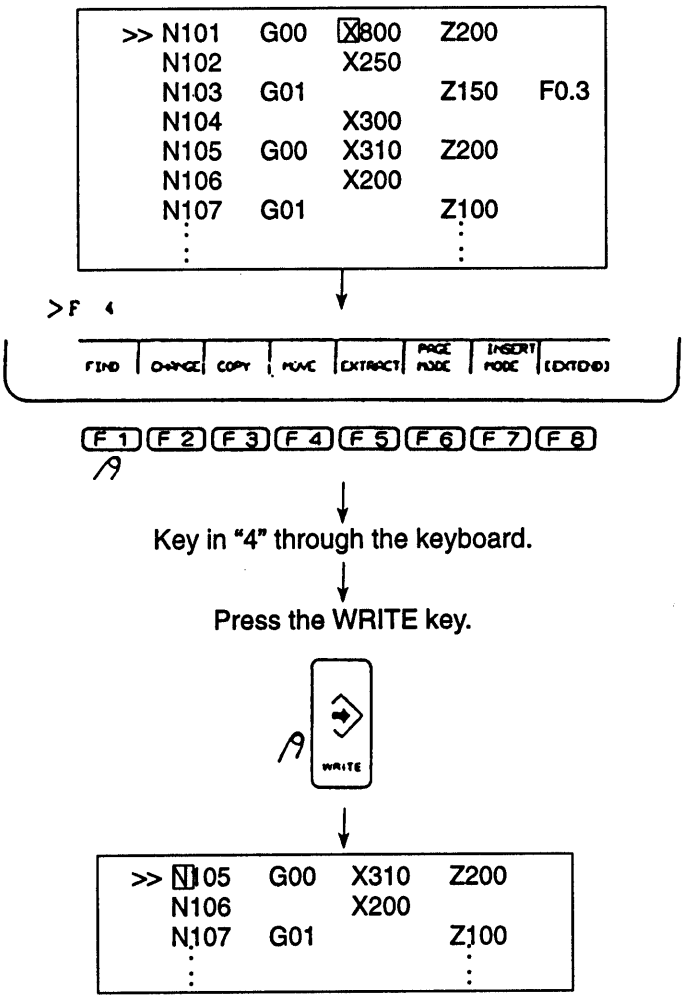
file end

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:



7-5-10. Change

(1) This function replaces a specified character-string with another character-string specified.

Press 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 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.

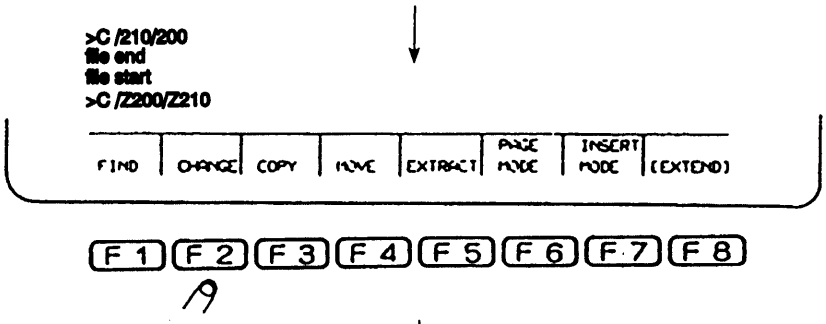
(7) The following option code can be used:

";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
   M104
   N105  G00  X310  Z200
   N106       X200
    :              :
    :              :
```



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.

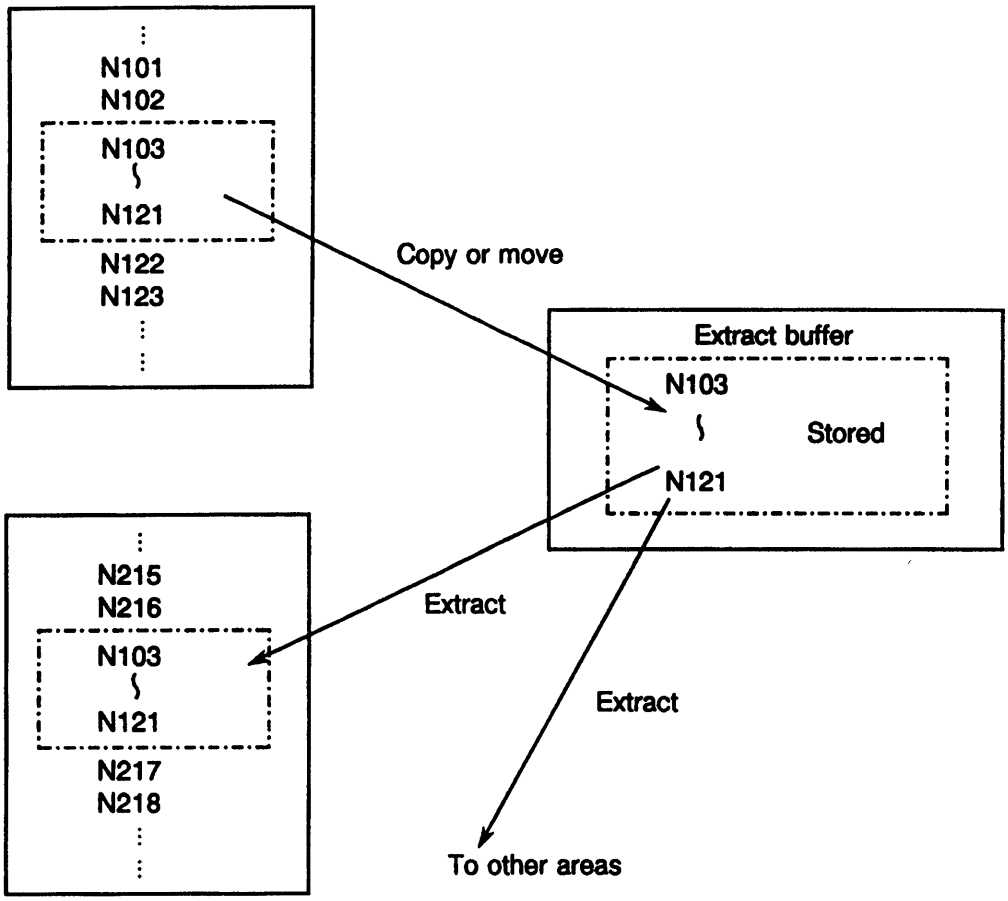


Fig. 2-22 Copy, Move, and Extract Functions

Operation Sequence:

- Save the group of commands into the extract buffer using the COPY of MOVE command.
- 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 character × 23 lines.

(1) Copy

This function transfers specified program data to the extract buffer.

Press 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 (>>) 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.

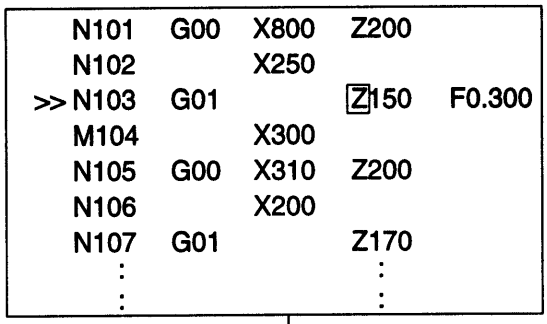
When a negative number exceeding the first line of the file is specified, program data up to the first line of the file is transferred.

f) Pressing the WRITE key without entering the number of lines causes program data in the edit line to be transferred.

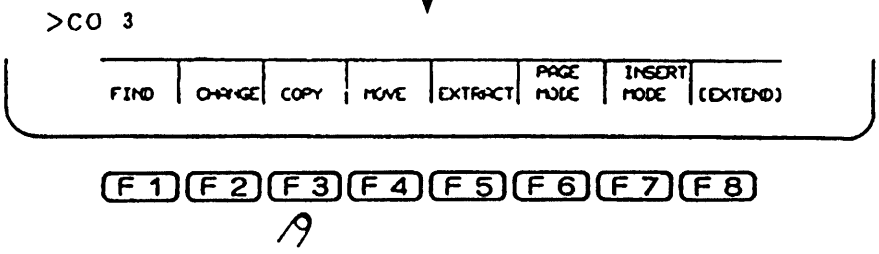
g) When an attempt has been made to transfer program data which is larger than the extract buffer, the message "extract buffer overflow" will appear on the display screen and copy operation is not executed.

Operation Example:

To duplicate blocks N103 through N105:

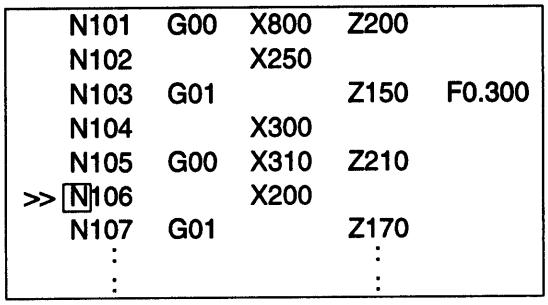


Move the symbol ">>" to N103 using the cursor control keys.



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 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 (>>) is transferred to the extract buffer.

b) The lines transferred to the extract buffer are erased from the display 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 display screen and move operation is not executed.

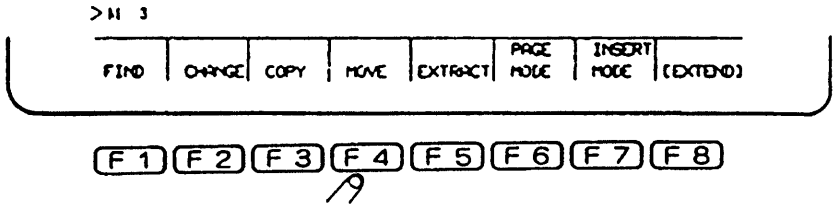
i) Pressing the WRITE key without entering the number of lines causes program data in the edit line to be transferred.

Operation Example:

To transfer blocks N103 through N105:

```
   N101   G00   X800   Z200
   N102         X250
>> N103   G01          Z150   F0.300
   M104         X300
   N105   G00   X310   Z200
   N106         X200
   N107   G01          Z170
    :                   :
    :                   :
```

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

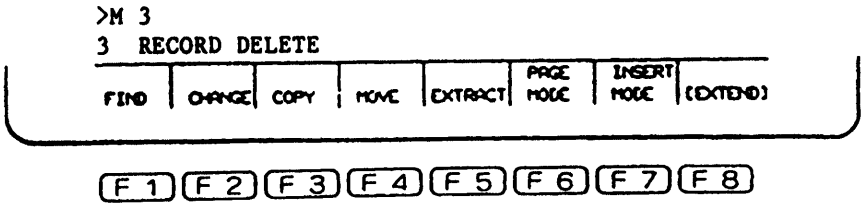


Key in "3" through the keyboard.

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 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:

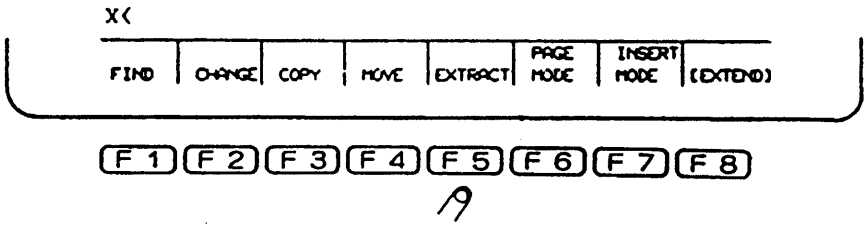
To insert program data in the extract buffer before N203

Data in the extract buffer

```
   N103   G01          Z150   F0.300
   N104          X300
   N105   G00    X310  Z200
```

```
   N210   G00    X600  Z200
   N202          X150
>> N203   G01          Z150   F0.400
   N204          X200
   N205   G00    X210  Z200
```

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



Press the WRITE key.

```
   N210   G00    X600  Z200
   N202          X150
   N103   G01          Z150   F0.300
   M104          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 display 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

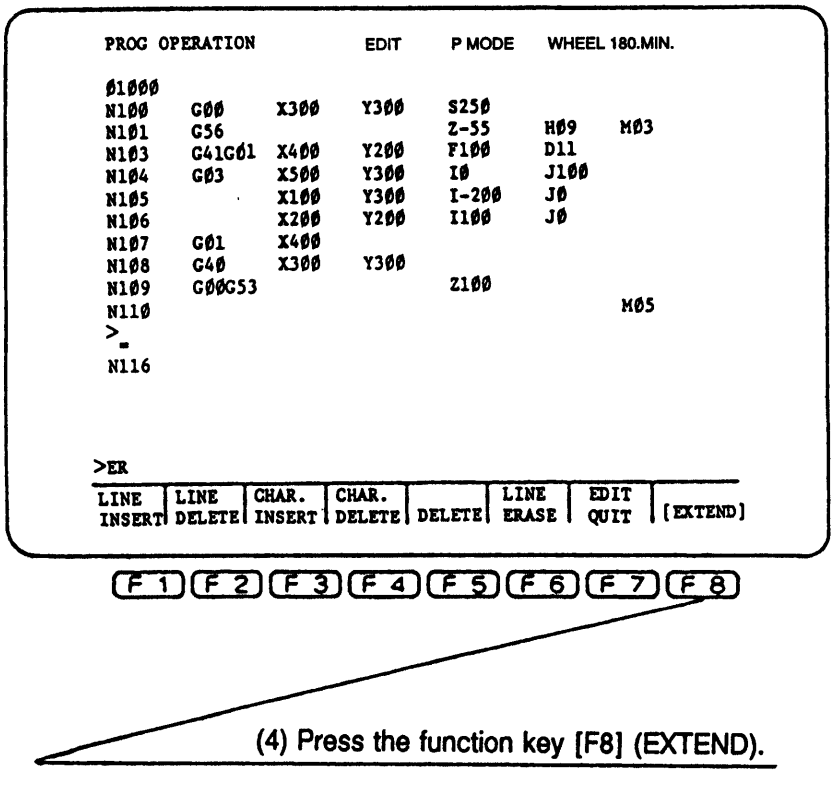
The operating procedure is as indicated below.

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

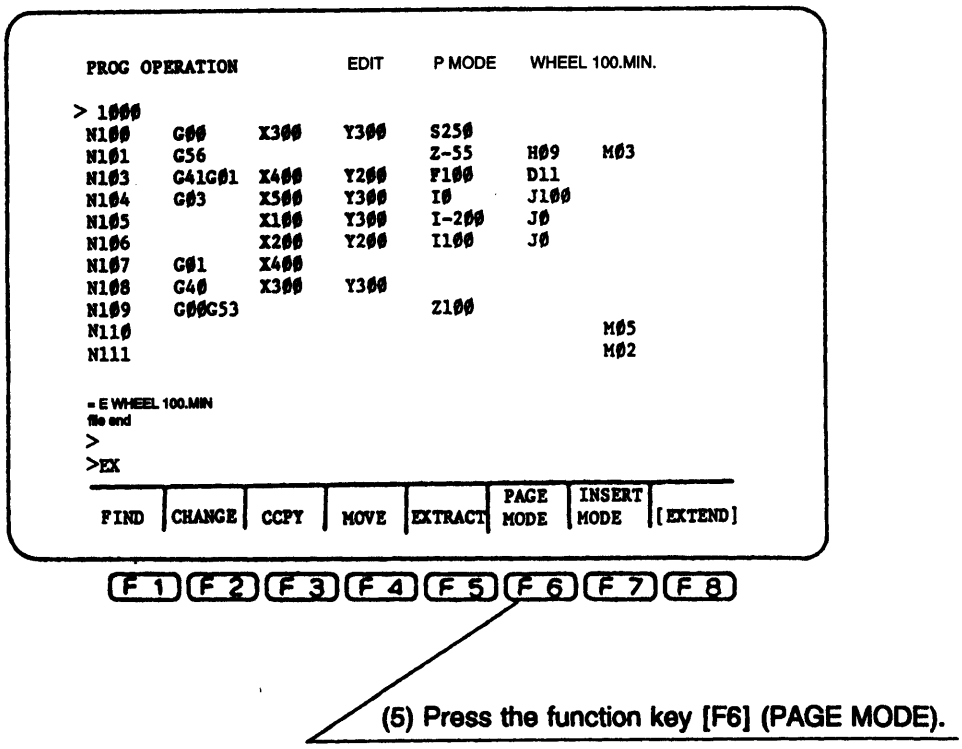
(2) Press function key [F4] (EDIT).

(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.



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



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

Page Mode Operation:

a) 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.

b) The edit pointer and the edit line do not shift to any other pages.

c) 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.

d) 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.

e) 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.

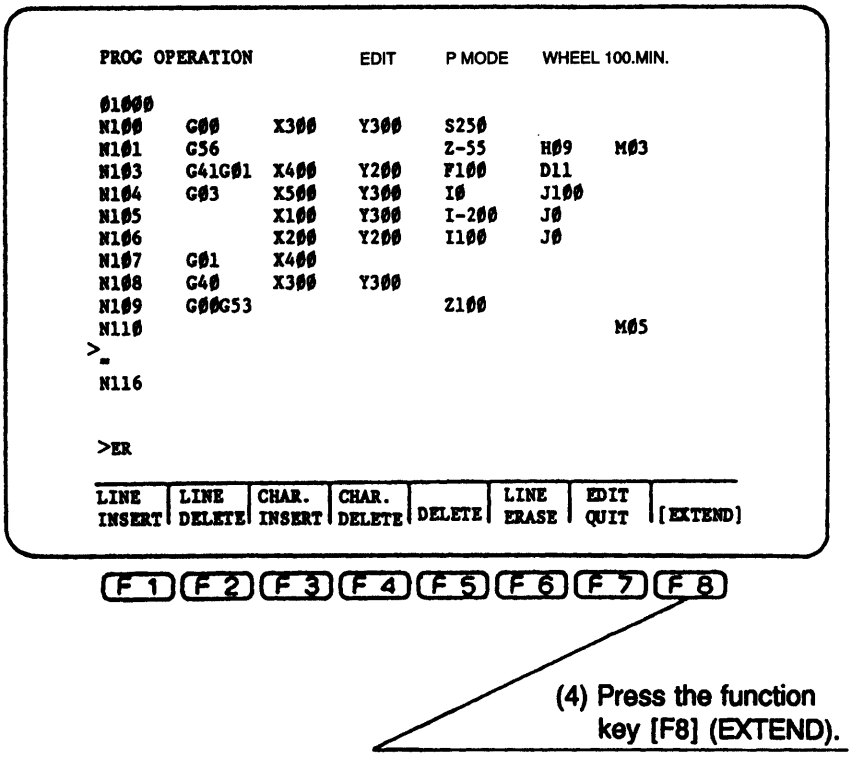
The operating procedure is as indicated below.

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

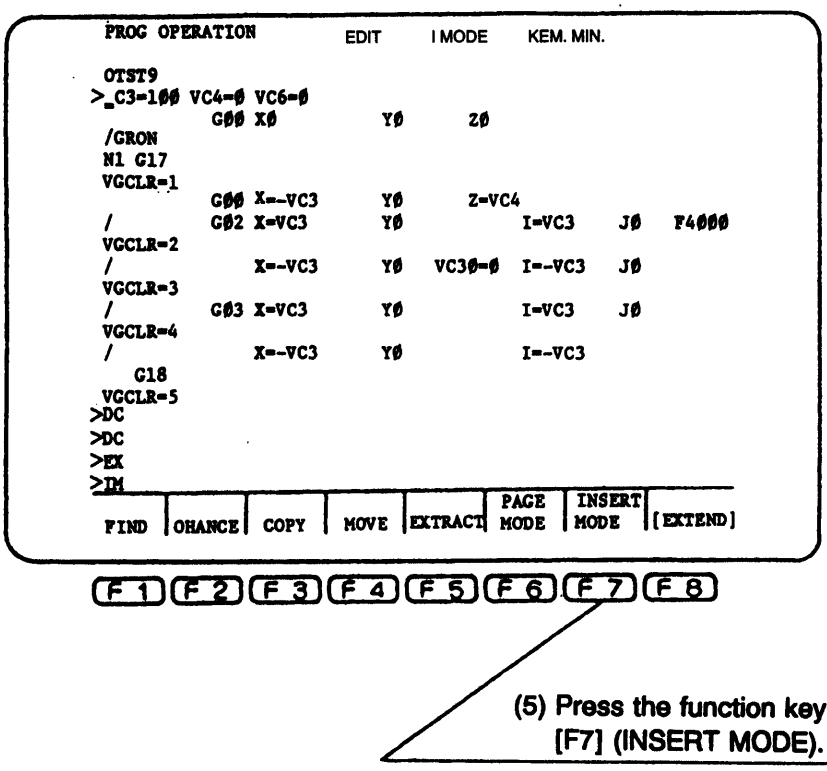
(2) Press function key [F4] (EDIT).

(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.



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



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

Insert Mode Operation:

a) 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.

b) The edit pointer and the edit line do not shift to any other pages.

When the cursor key ⇩ is pressed while the bottom line is designated as the edit line, the edit line moves to the top line.

c) When the cursor key ⇧ 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 ⇨ and ⇦ can be understood in the same manner. That is, when the cursor key ⇨ 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 ⇦ 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.

d) 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.

e) 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.

f) 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 .

7-6. MULTI-FILE TRANSFER (MPIP)

The MPIP command is used to transfer multiple part program files at a time using the RS232C interface.

The following sub commands are provided.

Item	Command	Function
Multi-file read	MR	Reads multiple part program files from an external device and stores them to the memory.
Multi-file punch	MP	Outputs multiple part program files, stored in the memory, to a tape punch.
Multi-file veiry	MV	Verifies multiple part program files, in an external device, against those in the memory.
Multi-file transfer end	Q	Quits the multi-file transfer mode.

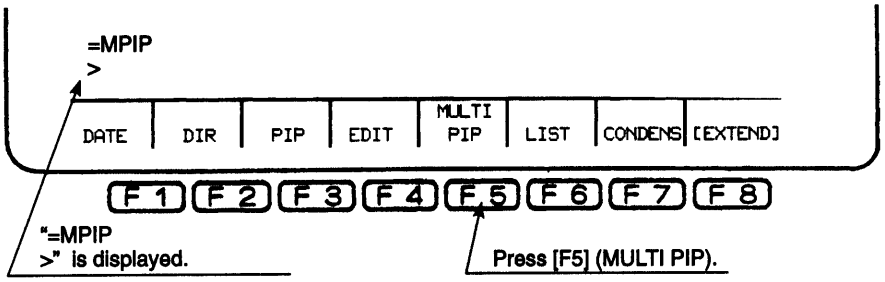
CAUTION : During file transfer processing, do not turn off the power supply. If the power supply is turned off during file transfer, the contents of file might be destroyed.

7-6-1. Multi-file Read

The multi-file read function reads multiple part programs from the external device and store them in the NC memory.

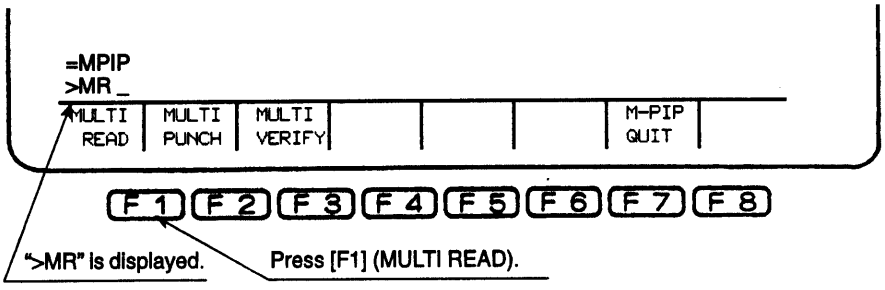
The operation procedure is indicated below:

(1) Press function key [F5] (MULTI PIP).



The function key names change as indicated in item (2).

(2) Press function key [F1] (MULTI READ).



"MR" is displayed on the console line.

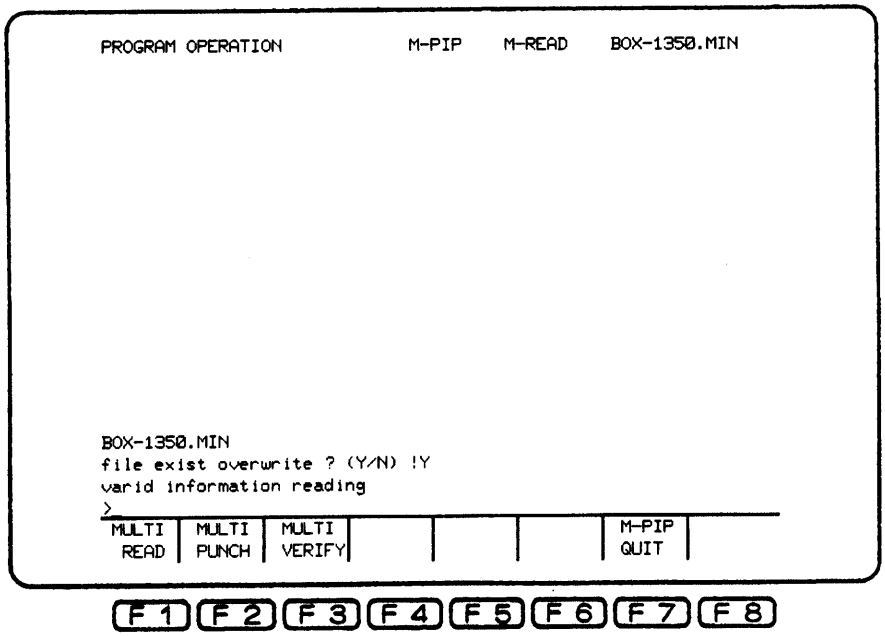
(3) Following ">MR", enter the file name of the file to be read using the keyboard and press the WRITE key.

The machining programs are read and stored in the NC memory.

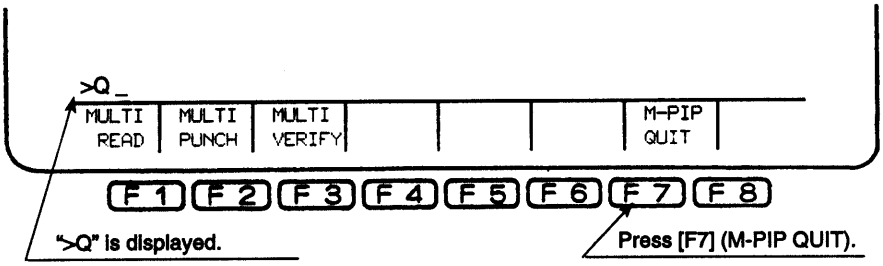
While the program is being read, "M-READ" and the file name are displayed at the upper right area of the screen.

After the start of program reading, "Valid information reading" is displayed on the console line.

At the completion of reading, ">" appears on the console line.



(4) Press function key [F7] (M-PIP QUIT).



The function key names return to those as displayed in item (1).

[Supplement] : Command format

>MR <input-device:><input-file-name><,<output-device:>><;option>WRITE

(1) Input-device

TT:, CN0:, CN1:, CN2:, CN3:

If no input-device name is specified, the default device set for NC optional parameter (word) No. 57 is selected. (If "0" is set for this parameter, CN0: is selected.)

(2) Input-file-name

Main file name : Alphanumerics (max. 16 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

Extension : Alphanumerics (max. 3 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

(3) Output-device:

MD0:, MD1:, FD0:, FD1:, FD2:, FD3:

Default device is MD1:.

(4) Option

Y: Unconditional overwrite; if the file of the same file name to be output already exists in the specified output device, the file is unconditionally overwritten in this operation.

[Supplement] :

1. If the text (tape data) read from the input device does not agree with the specified input file name, it is skipped and not stored to the output device.
2. If input file name is omitted, input file name of "*.*" is assumed and all read texts are stored to the specified output device.
3. If available space in the output device becomes full during reading, an error occurs and communication is shut off. In this case, the file being read is not stored.
4. If the file of the same file name already exists in the output device while no option Y is specified, the following messages are displayed on the console line.

   A.MIN
   file exist overwrite ? (Y/N) !

   If "Y" is input, the existing file is overwritten, and if "N" is input, the text to be read is skipped and the next file is read.
5. If an output file name is specified, an error occurs.

   5213 File name, error 11
6. If the read file agrees with the file selected for DNC-B mode operation, the text to be read is skipped and the next file is read.

   5226 Main program file selecting 'A.MIN

[Supplement] : 7. If the read text already exists in the output device and if it is protected, the text to be read is skipped and the next file is read.

'A.MIN File write protect

Example 1: >MR ∗.MIN [WRITE]

All files with extension ".MIN" are read and stored to MD1:.

Example 2: >MR BOX1???.MIN [WRITE]

All files beginning with "BOX1" and with extension ".MIN" are read and stored to MD1:. Files such as BOX1001.MIN and BOX1002.MIN are read.

Example 3: >MR [WRITE]

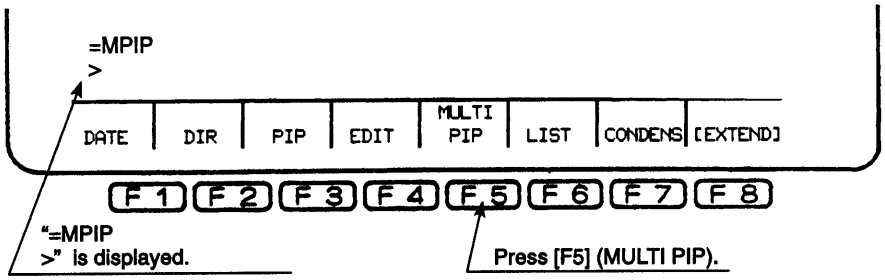
All input files are read and stored to MD1:.

7-6-2. Multi-file Punch

The multi-file punch function outputs multiple part programs, stored in the NC memory, to the punch device.

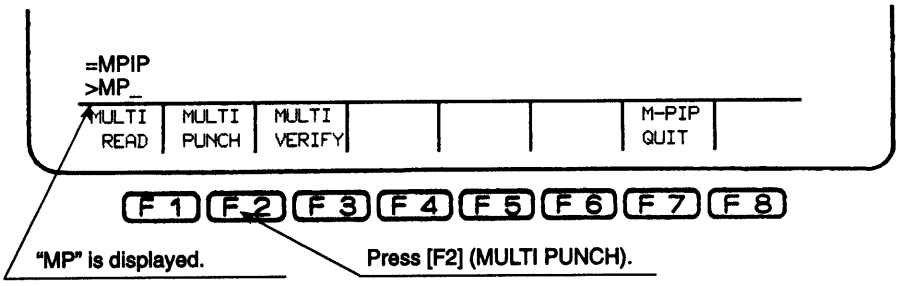
The operation procedure is indicated below:

(1) Press function key [F5] (MULTI PIP).



The function key names change as indicated in item (2).

(2) Press function key [F2] (MULTI PUNCH).



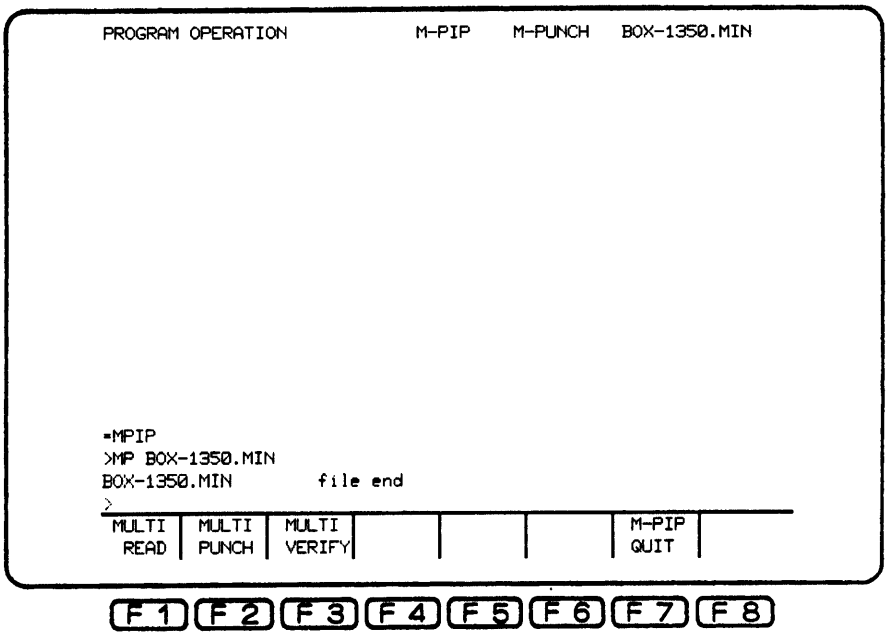
"MP" is displayed on the console line.

(3) Following ">MP", enter the file name of the file to be output to the punch device using the keyboard and press the WRITE key.

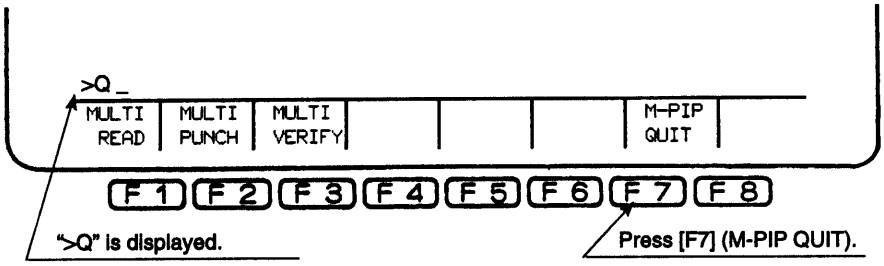
The part programs are output to the punch device.

While the program is being output to the punch device, "M-PUNCH" and the file name are displayed at the upper right area of the screen.

At the completion of output, "file end" appears on the console line, then ">" appears.



(4) Press function key [F7] (M-PIP QUIT).



The function key names return to those as displayed in item (1).

[Supplement] :

Command format

>MP <input-device:><input-file-name><,<output-device:>><;option>WRITE

(1) Input-device:

MD0:, MD1:, FD0:, FD1:, FD2:, FD3:

Default device is MD1:.

(2) Input-file-name

Main file name : Alphanumerics (max. 16 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

Extension : Alphanumerics (max. 3 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

(3) Output-device:

TT:, CN0:, CN1:, CN2:, CN3:

If no output-device name is specified, the default device set for optional parameter (word) No. 45 is selected. (If "5" is set for this parameter, CN0: is selected.)

(4) Option

P: Only protected files are output.
C: Only files which are not protected are output.

[Supplement] :

1. If input file name is omitted, input file name of "*.*" is assumed and all files are output to the punch device.
2. If none of the specified files exists in the input device, file is not output.

   File not found

3. If an output file name is specified, an error occurs.

   5213 File name, error 11

4. If only one file is output, it does not cause an error.

Example 1: >MP *.MIN [WRITE]

All files with extension .MIN in MD1: are output.

Example 2: >MP BOX1???.MIN [WRITE]

All files beginning with "BOX1" and with extension ".MIN" in MD1: are output. Files such as BOX1001.MIN and BOX1002.MIN are output.

Example 3: >MP [WRITE]

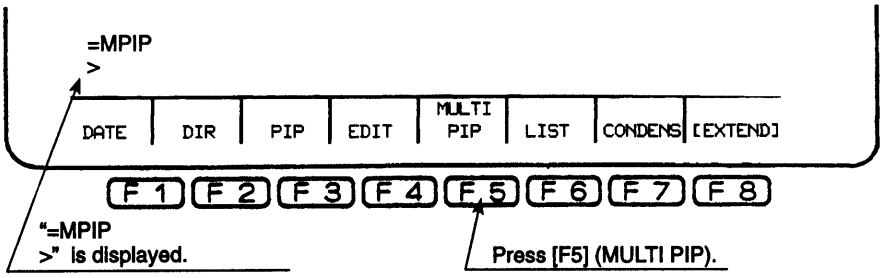
All files in MD1: are output.

7-6-3. Multi-file Verify

The multi-file verify function verifies multiple machining programs, stored in an external device, against those in the NC memory.

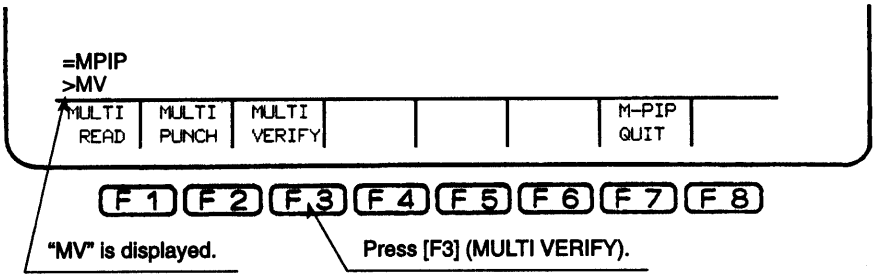
The operation procedure is indicated below:

(1) Press function key [F5] (MULTI PIP).



The function key names change as indicated in item (2).

(2) Press function key [F3] (MULTI VERIFY).

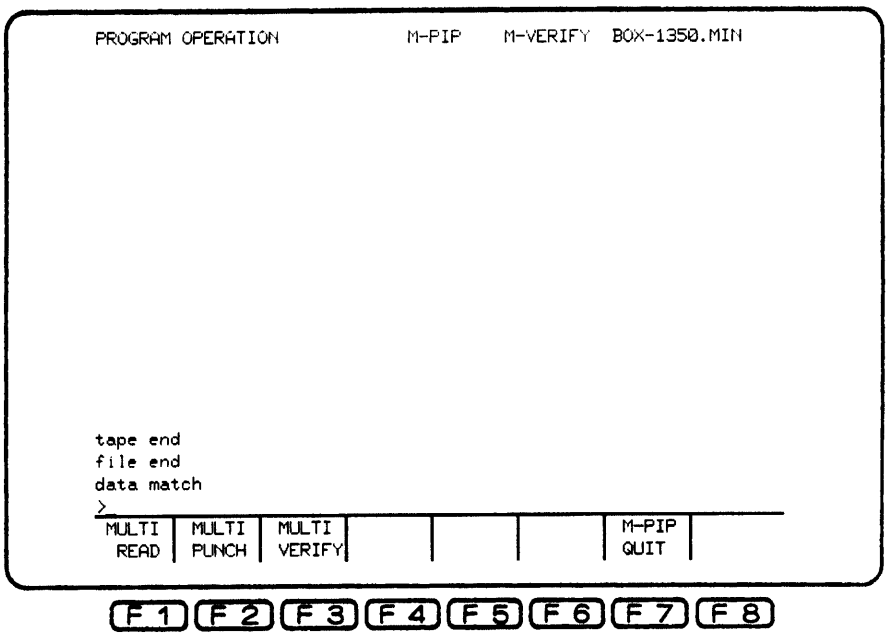


"MV" is displayed on the console line.

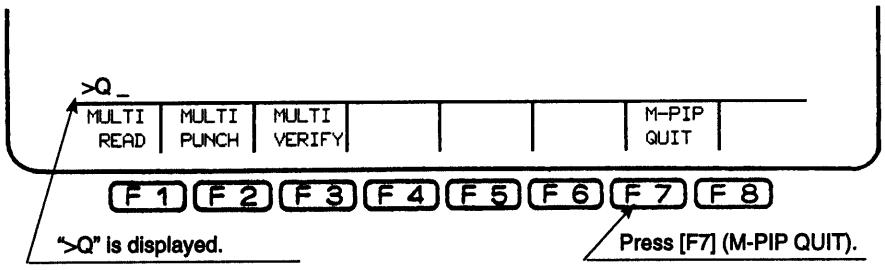
(3) Following ">MV", enter the file name of the file to be verified using the keyboard and press the WRITE key.

The specified part programs are read and compared to those stored in the NC memory.

While the program is being verified, "M-VERIFY" and the file name are displayed at the upper right area of the screen.



(4) Press function key [F7] (M-PIP QUIT).



The function key names return to those as displayed in item (1).

[Supplement] :

Command format

>MV <input-device:><input-file-name><,<output-device:>>WRITE

(1) input-device:

TT:, CN0:, CN1:, CN2:, CN3:

If no input-device name is specified, the default device set for NC optional parameter (word) No. 57 is selected. (If "0" is set for this parameter, CN0: is selected.)

(2) input-file-name

Main file name : Alphanumerics (max. 16 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

Extension : Alphanumerics (max. 3 characters), beginning with an alphabetical letter. Wild card ("*", "?") can be used.

(3) output-device:

MD0:, MD1:, FD0:, FD1:, FD2:, FD3:

Default device is MD1:.

[Supplement] :

1. If the text (tape data) read from the input device does not agree with the specified file name, it is skipped and not verified.

   In this case, the following message is displayed.

   5210 Input file name not same α '(tape) file name'
   α: Number of unmatched files

   If no files match with the tape data, the following message is displayed at the end.

   5210 Input file name not same error β
   β: Total number of unmatched files

2. If input file name is omitted, input file name of "*.*" is assumed and those which match the read texts are verified.

3. If unmatch is found, the corresponding line is displayed on the console line with unmatch character blinking on and off.

   The message "verify continuing (Y/N) !" is displayed. To continue verify, input "Y", then the program verify restarts from the next line. If "N" is input, the file containing the unmatch is skipped and program verify is executed from the next file.

   For each file, the result of verify is displayed:

   a) If all data matched, the following message is displayed and the next file is continuously verified.

      tape end . file end . data match .

[Supplement] : b) If file data remains although text (tape data) has been read to the end, the following message is displayed on the console line and the next file is continuously verified.

tape end
data match

c) If tape data remains although file data has been read to the end, the following message is displayed on the console line and the next file is continuously verified.

4. If an output file is output, it does not cause an error.

5213 File name, error 11

Example 1: >MV *.MIN [WRITE]

Verify is made with the files which have the same file name as the input files, having extension .MIN.

Example 2: >MV BOX1???.MIN [WRITE]

Verify is made with the files which have the same file name as the input files, having extension .MIN and beginning with BOX1. The files such as BOX1001.MIN and BOX1002.MIN are examples of such files.

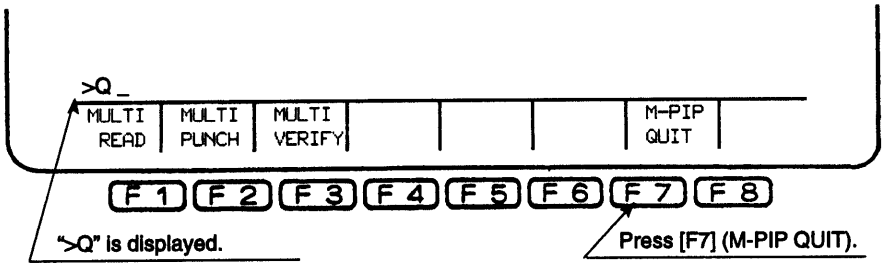
Example 3: >MV [WRITE]

Verify is made for all input files with the files having the same file name.

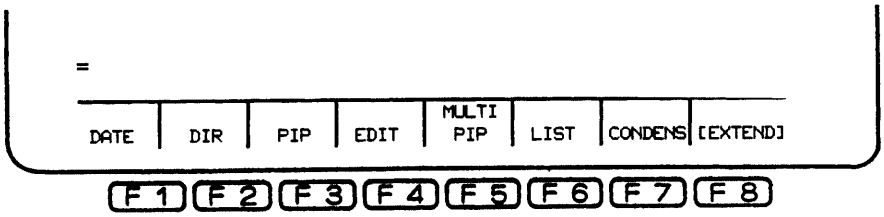
7-6-4. Quitting Multi-file Transfer

This function is used to quit the multi-file transfer mode and to return to the program operation mode.

(1) Press function key [F7] (MULTI QUIT).



">Q" is displayed on the console line and the system quits the multi-file transfer mode. The screen returns to the program operation mode screen and the function key names as indicated below are displayed.

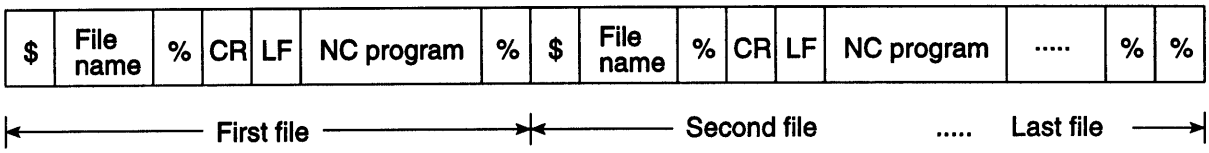


7-6-5. Notes on Using Multi-file Transfer Sub Commands

(1) Communication Text Format

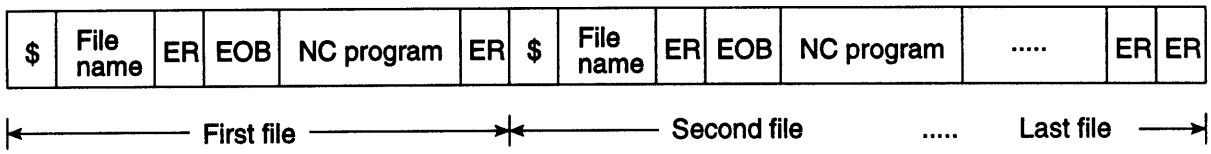
The text format used in multi-file transfer operation differs from the format used in a single file transfer operation. The format used in multi-file transfer operation is indicated below.

a) ISO code



1) The file name is preceded by "$" symbol.
2) The data which follows "% CR LF" is regarded as the machining program.
3) The program end code is fixed to "%". (NULL code is not allowed.)
4) The end of communication code is fixed to "%%". (NULL code is not allowed.)
5) Leading and trailing feed holes (NULL or space) are not provided.

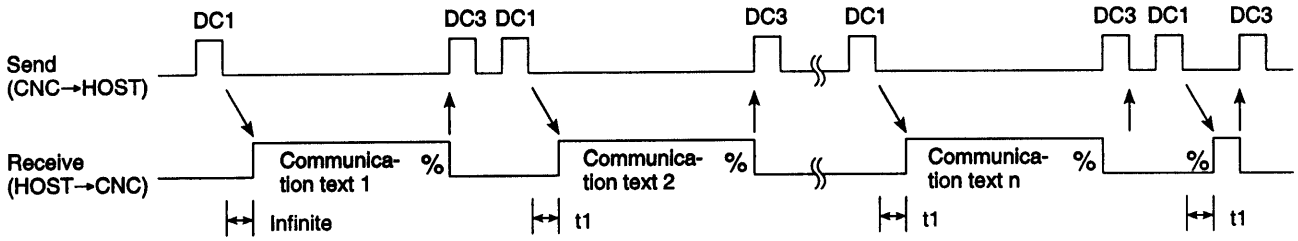
b) EIA code



1) A file name is preceded by "$" symbol (set for optional parameter (bit) No. 31).
2) The data which follows "ER EOB" is regarded as the part program.
3) The program end code is fixed to "ER". (NULL code is not allowed.)
4) The end of communication code is fixed to "ER ER". (NULL code is not allowed.)
5) Leading and trailing feed holes (NULL or space) are not provided.

(2) Timing Chart

a) Multi-file read and multi-file verify (CNC: master)



1* The DC3 code is output in the following cases.

1) Just after receiving the text file name

2) Just before writing text name to output device (every 252 characters) (multi-file read only)

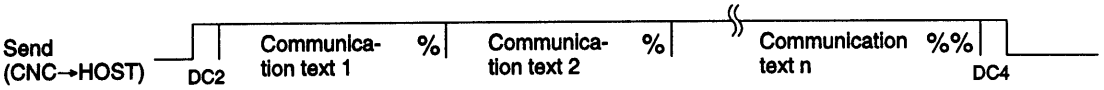
3) Just after receiving "%" code at the end of a part program

4) Just after receiving "%%" code which indicates the end of communication.

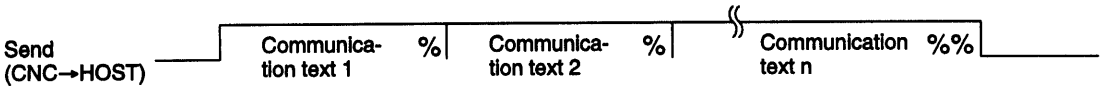
2* t1

"t1" indicates the "RS232C ready wait time" set for parameter.

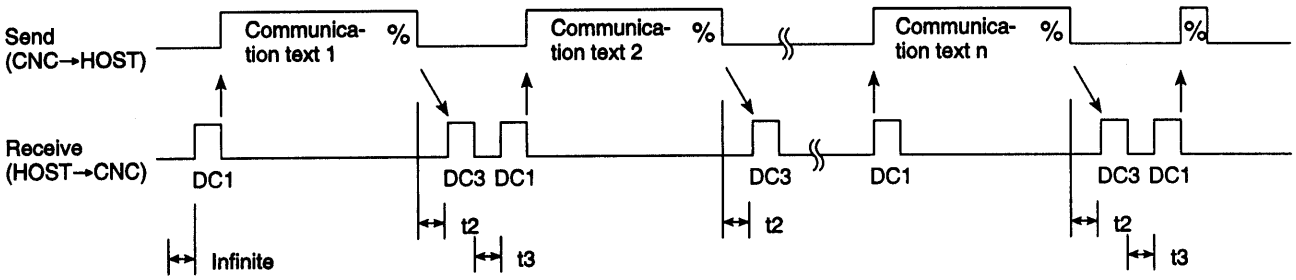
b) Multi-file punch (CNC: master, DC2/DC4 code output)



c) Multi-file punch (CNC: master, DC2/DC4 code not output)



d) Multi-file punch (CNC: slave)



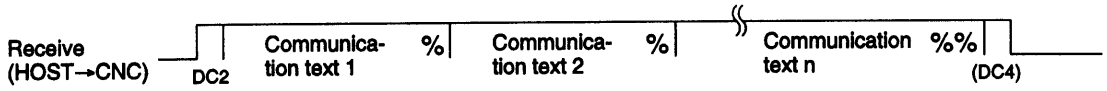
1* t2

"t2" indicates the "RS232C ready wait time" set for parameter.

2* t3

"t3" indicates the "RS232C ready wait time" set for parameter.

e) Multi-file read and multi-file verify



(3) Parameter Settings

Before connecting an external device, it is necessary to set the following parameters.

For details of parameters, refer to SECTION 3 "PARAMETERS".

a) NC optional parameter (bit) No. 1, 8, 12, 13, 14, 21, 22, 40

[Supplement] :

1. In multi-file transfer operation, since the tape delimiter code is fixed to "%" or "ER", the parameter (No. 1, bit 3) used for this setting is not used.
2. Verify in tape reading is effective only when the input device is TR: (tape reader). Therefore, the parameter (No. 1, bit 4) used to set the device is not used in multi-file read operation.
3. The multi-file transfer operation supports only standard DC code. Therefore, if the parameter setting* is for "DC code control type 2" or "no DC code control", an error occurs.

   * Bit 5 and 6 of No. 8, 13, 14, and 15:

     Setting should be ON for bit 5 and OFF for bit 6.

     5261 Device name error 1 'CN0'

     ↑

     Varies depending on the selected device name
4. In multi-file transfer operation, since file name punch is fixed to "yes", the parameter (No. 12, bit 2) used for this setting is not used.
5. In multi-file transfer operation, since feed hole punch is fixed to "no", the parameter (No. 12, bit 4 and bit 5) used for this setting is not used.

b) NC optional parameter (word) No. 6, 34 to 42, 45, and 57

[Supplement] :

1. In multi-file transfer operation, if "5" is set in the punch device name designation (No. 45), it selects "CN0:" instead of "PP:".
2. In multi-file transfer operation, if "0" is set in the tape read device name designation (No. 57), it selects "CN0:" instead of "TR:".

7-7. Free

This function displays the available capacity of the memory (MD1:) or a floppy disk (FD0:). The indication is made both in the number of sectors and bytes.

1 sector = 252 bytes

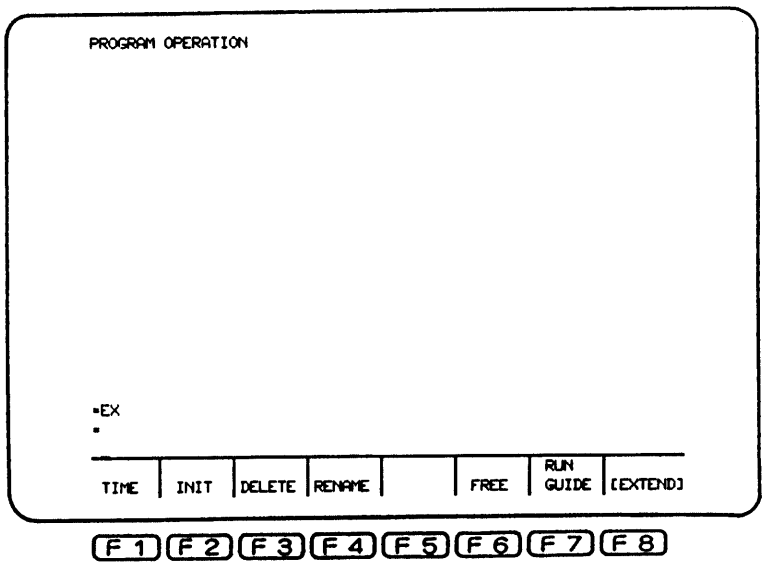
When creating a new file, all the remaining storage area cannot be used for storing program data since a file name, the number of sectors to be used, and other data are also stored together with program data.

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 function key [F6] (FREE).

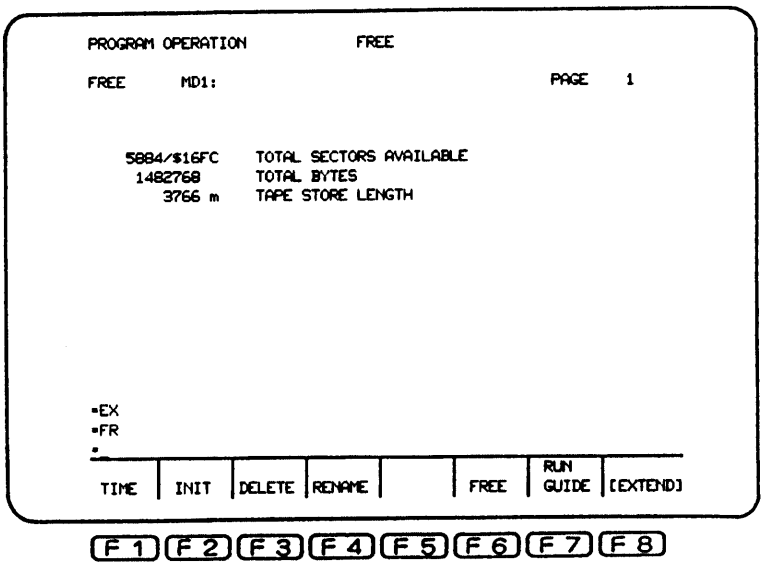
(3) Key in a device name, MD1: or FD0. The default is MD1:.

(4) Press the WRITE key.

The screen as indicated below will be displayed.

142/$008E TOTAL SECTORS AVAILABLE

35784 TOTAL BYTES



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

[Supplement] : $008E is the hexadecimal notation of 142.

$80 = 16 × 8

$E = 14

Therefore, $008E = 16 × 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:

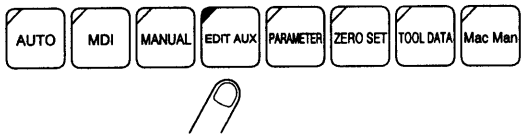
";C" When this option code is designated, sizes of continuous capacity available are displayed in succession.

Example: = FR;C

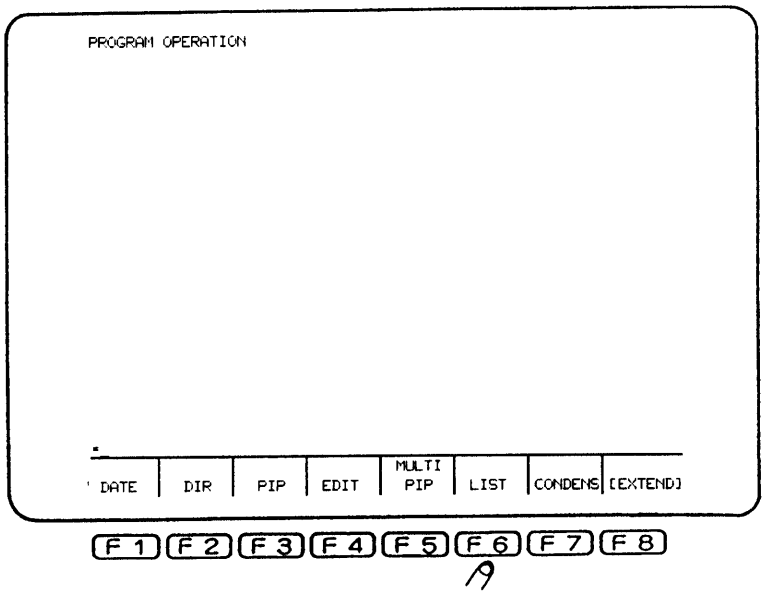
7-8. List

This function displays the list of a file on the display 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.



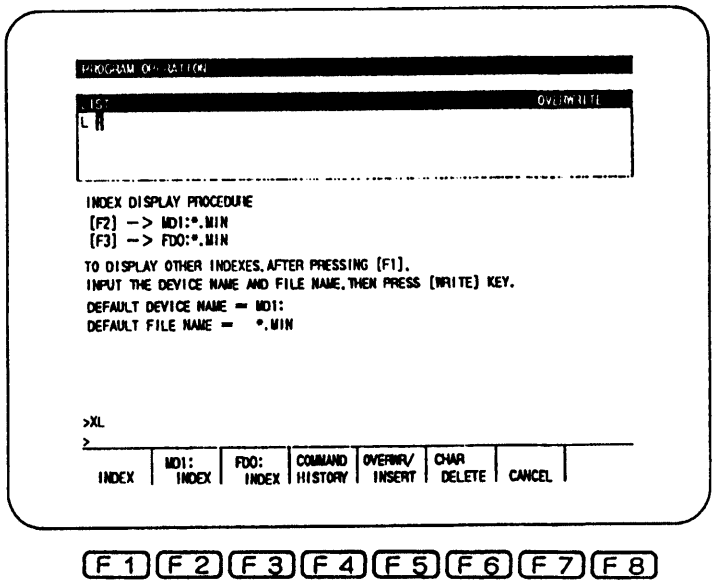
The screen as indicated below will be displayed.



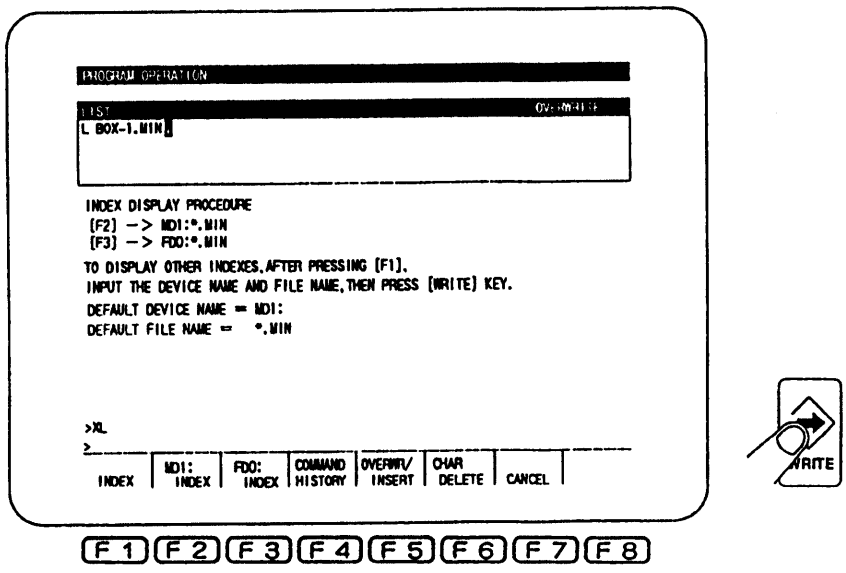
(2) Press function key [F6] (LIST).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

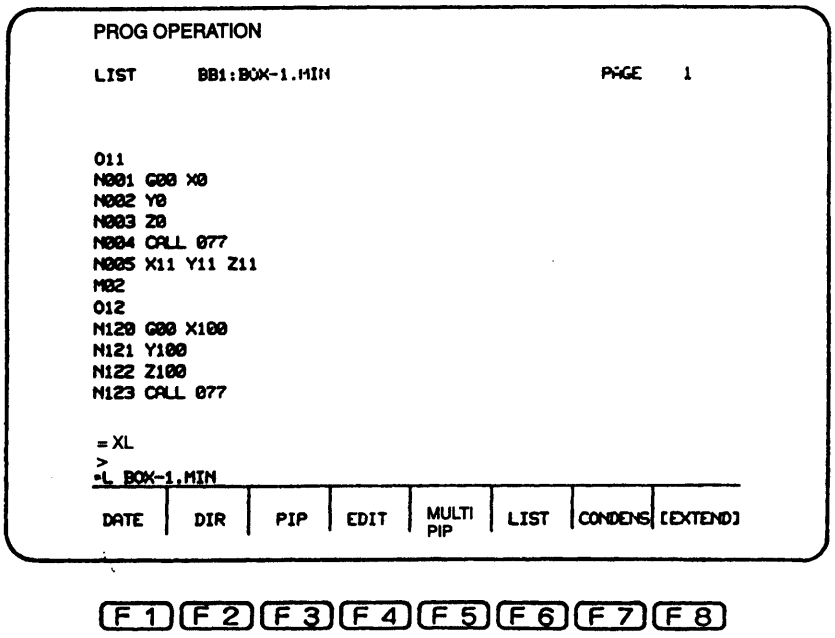
LIST␣ L▒



F1 F2 F3 F4 F5 F6 F7 F8



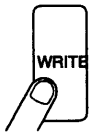
F1 F2 F3 F4 F5 F6 F7 F8



(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.

[Supplement] : 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 BS 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 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.

[Supplement] :

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".

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.

Display screen on the operation pane	: PN
Printer (optional)	: PR
Teletypewriter (optional)	: TT

   Specify the code of the output device folio wing 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 display screen on the operation panel as the output device.

   Example: L␣ ,PR: [WRITE]

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

   Example: L␣ BOX-1.MIN,TT: [WRITE]

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

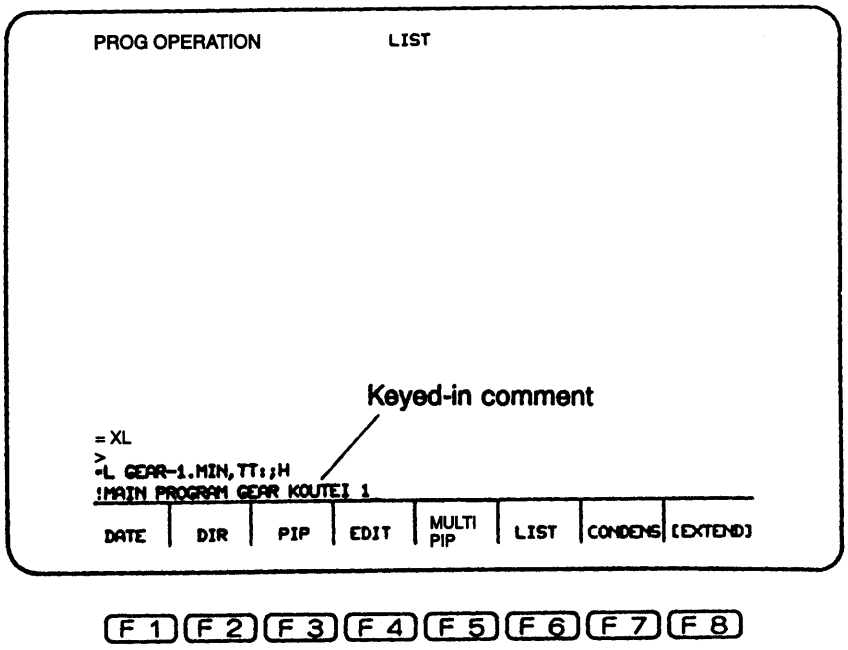
4. The option code ";H" allows the operator to add a comment at the beginning of the list page. Key in ";H" following the output device.

Example: L␣ GEAR-1.MIN,TT:;H [WRITE]

When the instructions indicated above are keyed in, the prompt "!" will appear on the command line, indicating that a comment can be entered.

A comment consisting of a maximum of 60 characters can be entered in through the keyboard.

When a command has been entered, press the WRITE key. List output will start.



List output to the teletypewriter is as shown below. The comment is output to on each list page.

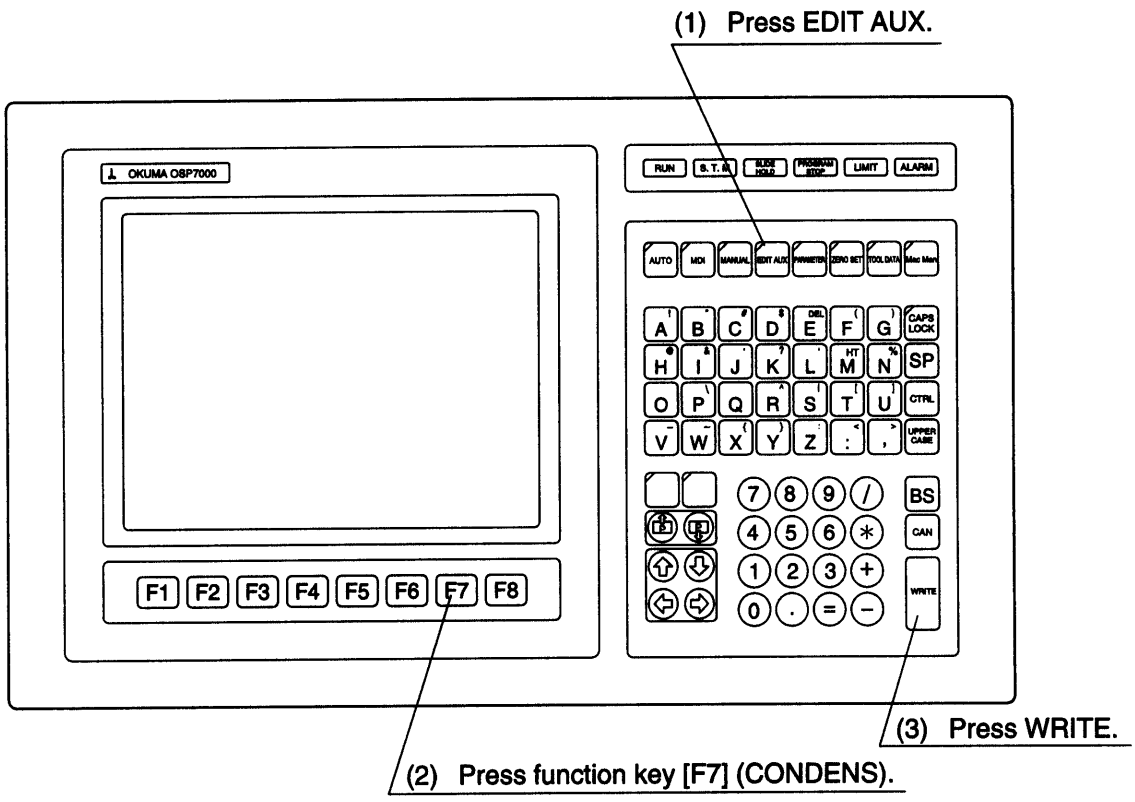
```
L      BB1    :   GEAR-1. MIN                                    PAGE1
MAIN PROGRAM GEAR KOUTEI 1

O1000
N100   G00   X300    Y300    S250
N101   G56                   Z-55     H09     M03
N103   G41   G01     X400    Y200     F100    D11
N104   G03           X500    Y300     I   0   J100
N105                 X100    Y300     I-200   J0
```

7-9. Data Arrangement in Memory

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

This function is used to arrange data in the 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 function key [F7] (CONDENS).

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

(3) Press the WRITE key.

Arrangement of data in the memory will start.

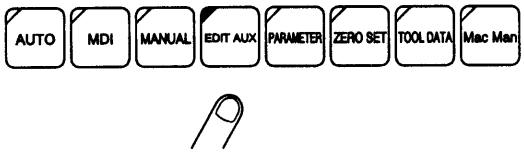
After the completion of arrangement, the prompt "=" will appear on the command line.

7-10. Time

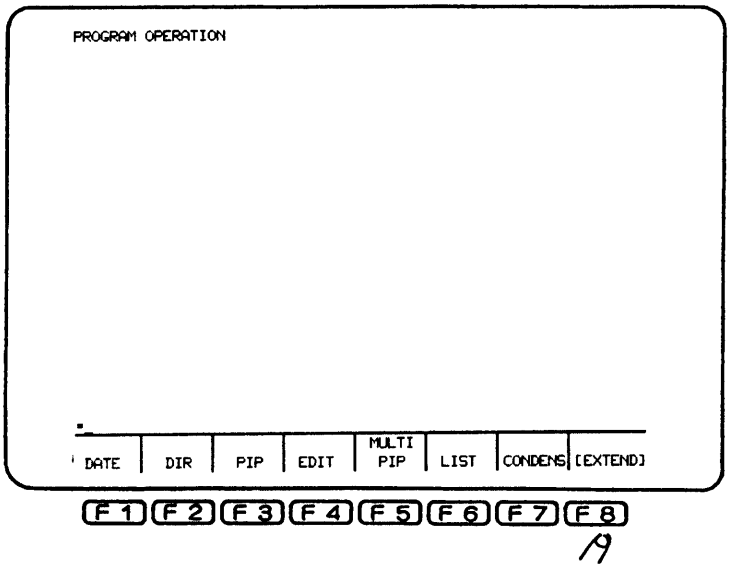
The control can count the time by setting the reference time. This function allows the operator to know the present time.

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 function key [F8] (EXTEND).

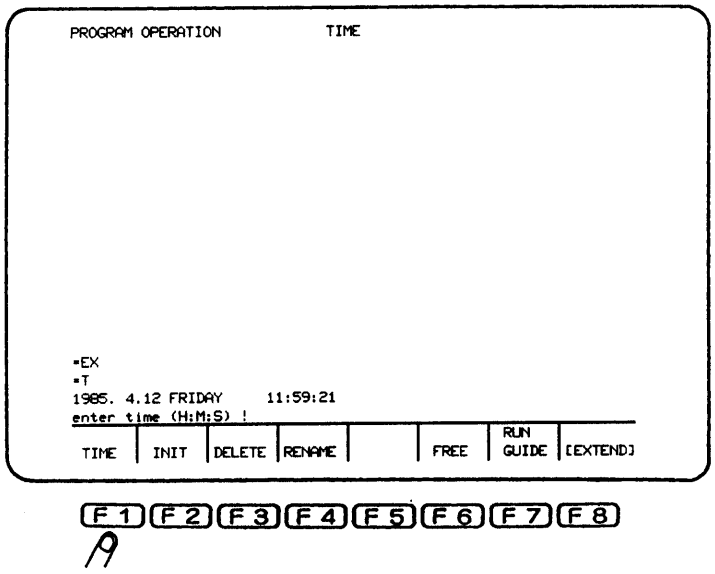
(3) Press function key [F1] (TIME).

When the indication as shown below has appeared on the screen, the system is ready for time data entry.

=T

1985. 4. 12 FRIDAY 11:59:21

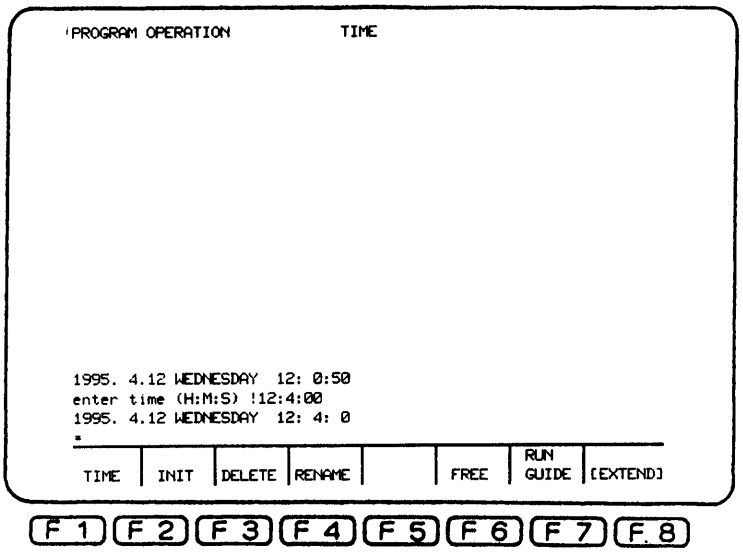
enter time (H:M:S)!



(4) Key in the present time through the keyboard: hours, minute, and second, each delimited by ":".

Example: 12:4:00

(5) Press the WRITE key.



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

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

[Supplement] :

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.
2. The data setting range is as follows.

   Hour : 0 through 23

   Minute : 0 through 59

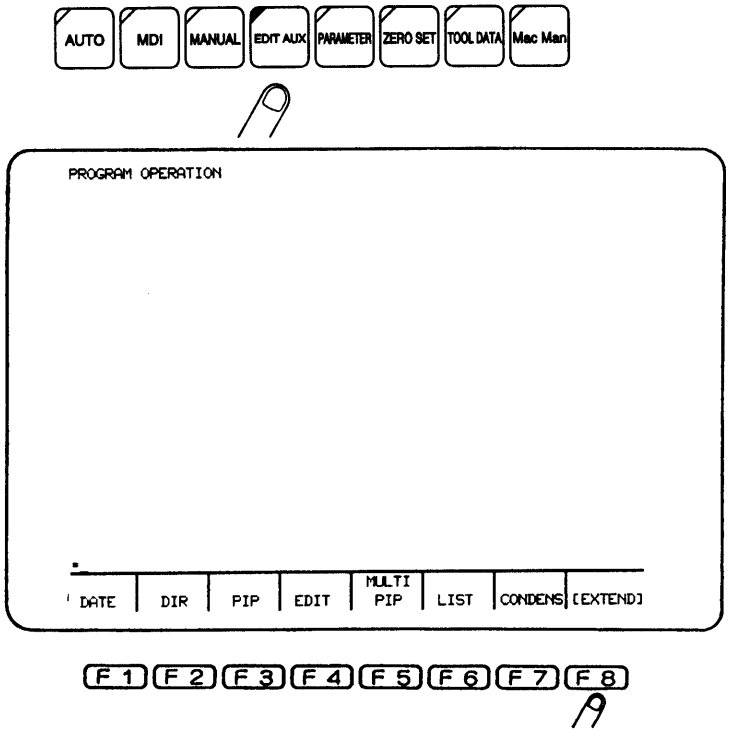
   Second : 0 through 59
3. After 23-hour 59-minute 59 second, the time changes to 0-hour 0-minute 0-second and the date and the day of the week change.
4. The time is counted from 0-hour 0-minute 0-second when the NC is ready after turning on the power.

7-11. Initializing

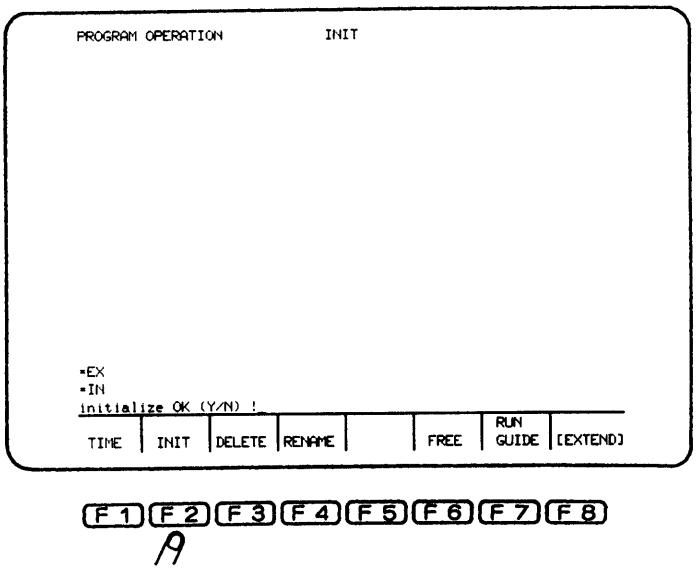
This function initializes the storage device such as memory and floppy disk. When this function is activated, all the data in the storage device will be deleted.

The operating procedure is as indicated below.

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



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

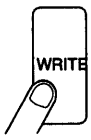


(3) Press function key [F2] (INIT).

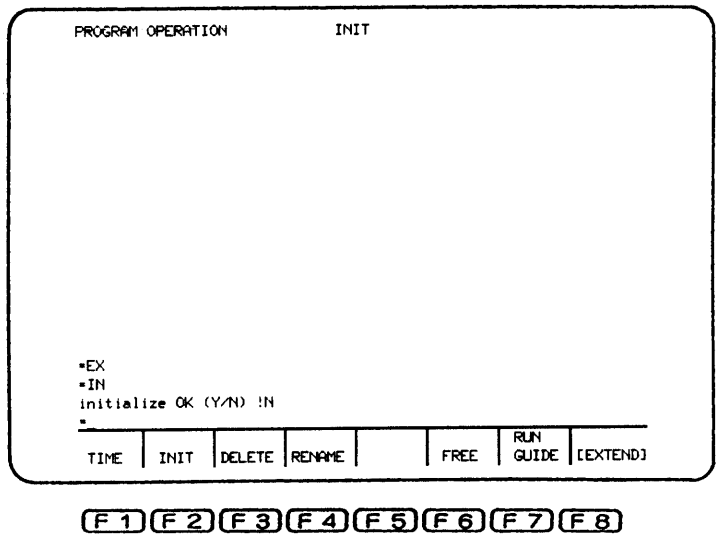
(4) Enter the device name, MD1: or FD0:. The default is MD1:.

(5) Press the WRITE key.
The indication as shown below will appear on the screen, requiring the operator to respond.

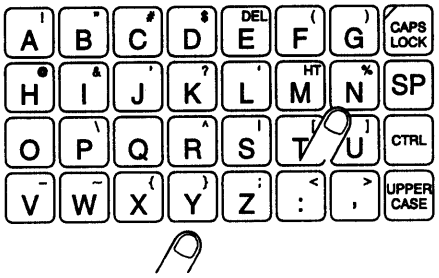
= IN



Initialize OK? (Y/N)



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



(7) Press the WRITE key.

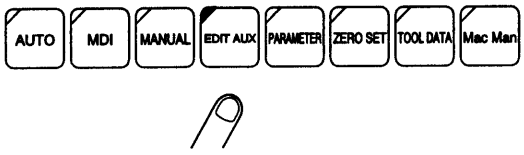
When Y has been typed and the WRITE key has been pressed, the storage device will be initialized.
When N has been typed and the WRITE key has been pressed, initialization will be aborted.

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.

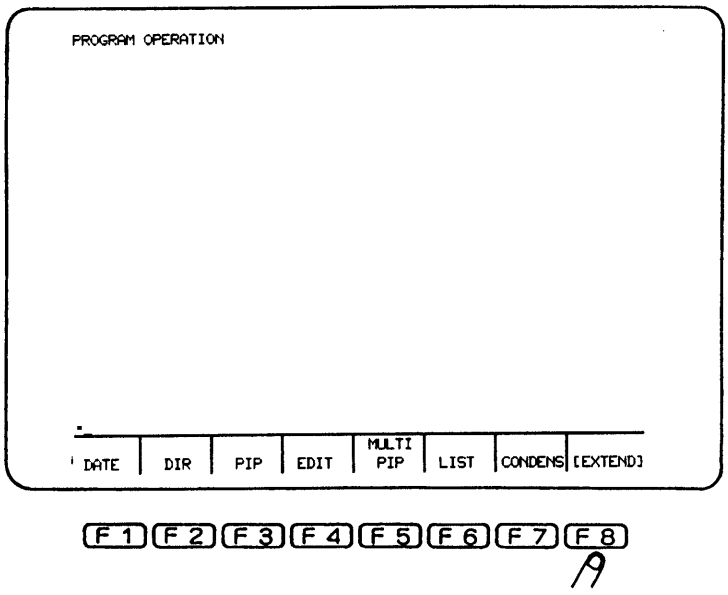
7-12. Deletion

This function deletes the specified file in the memory (MD1:) or a floppy disk (FD0:). The operating procedure is as indicated below.

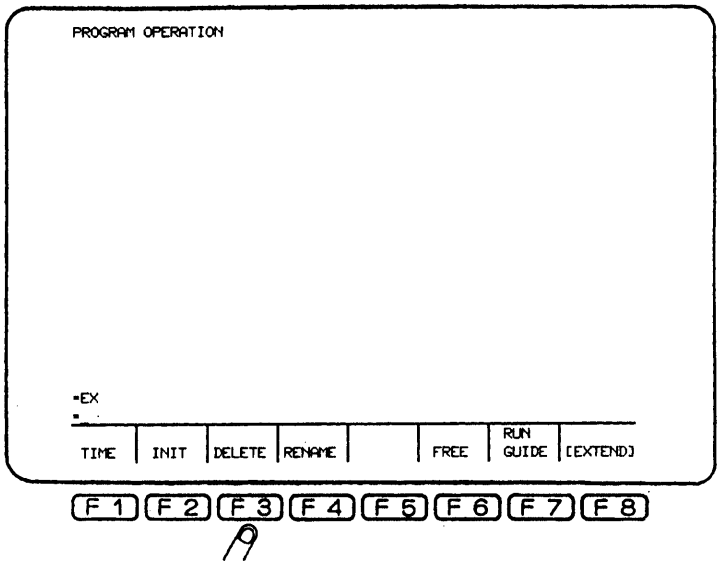
(1) Press the EDIT AUX key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



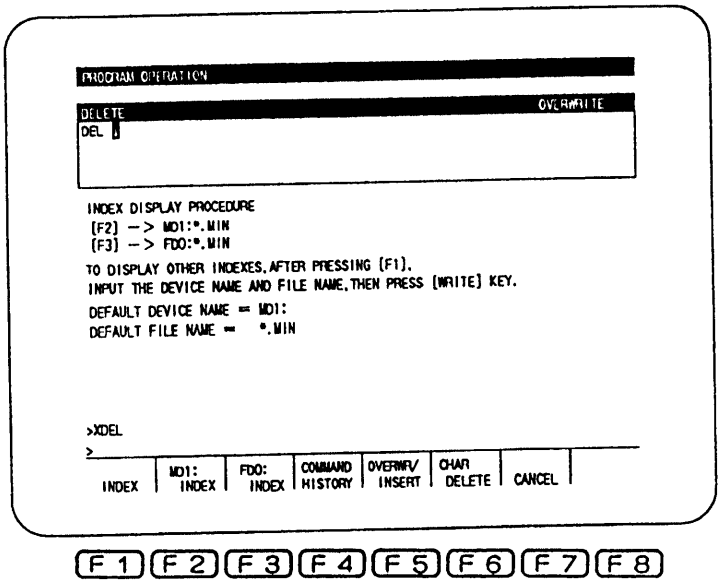
(2) Press function key [F8] (EXTEND).



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

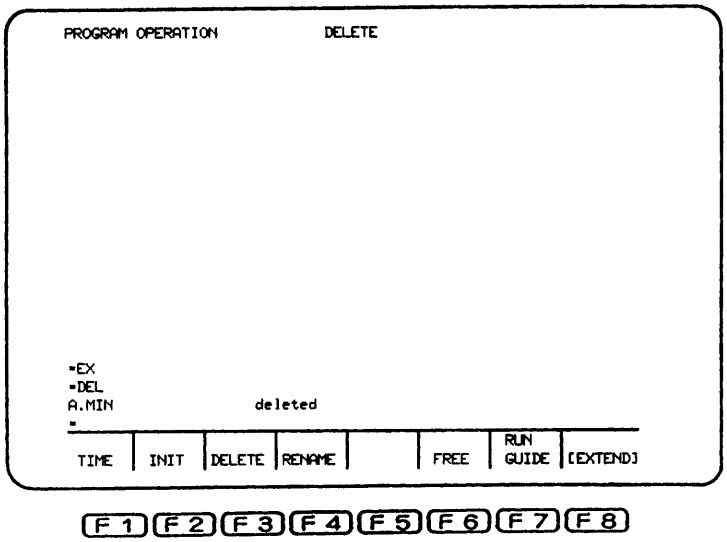
The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

DELETE ␣ DEL



(4) Enter the device name, MD1: or FD0:. The default is MD1:.

(5) Press the WRITE key.



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

A.MIN deleted

[Supplement] : 1. To delete a file other than A. MIN, specify a file name.

The file name extension .MIN can be omitted.

Example:

Can be omitted

ABC.MIN DEL ABC ___ ↙
ABC.SUB DEL ABC.SUB

2. When the specified file name does not exist in the storage device, the message "no file" is displayed on the command line.

3. Symbols "?"and "*" can be used to specify a file name.

Functions of these symbols are the same as explained in 7-3, "Directory".

Example:

DEL * . . . . Files whose file name extension is .MIN are all deleted.

DEL *.SUBFiles 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.

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 verity 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-AI.MIN delete OK (YIN)!

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.

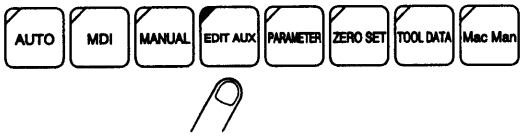
BOX-A2.MIN delete OK (Y/N)!

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.

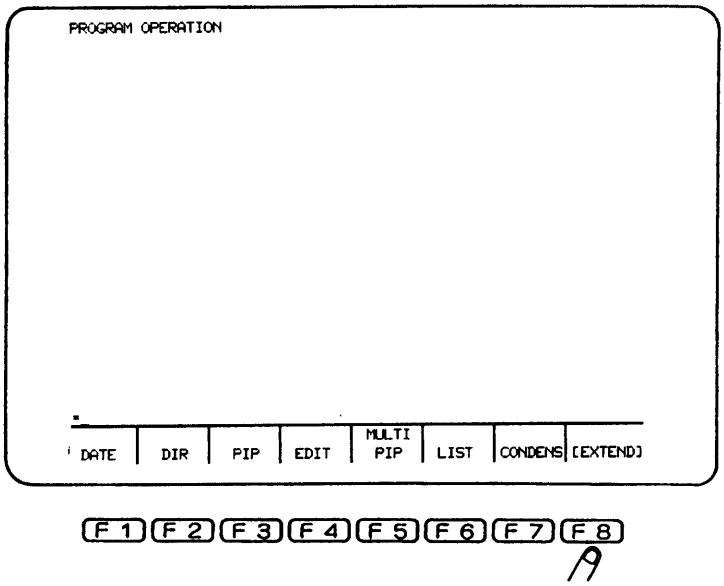
7-13. Rename

This function changes the name of the file stored in the memory. The operating procedure is as indicated below.

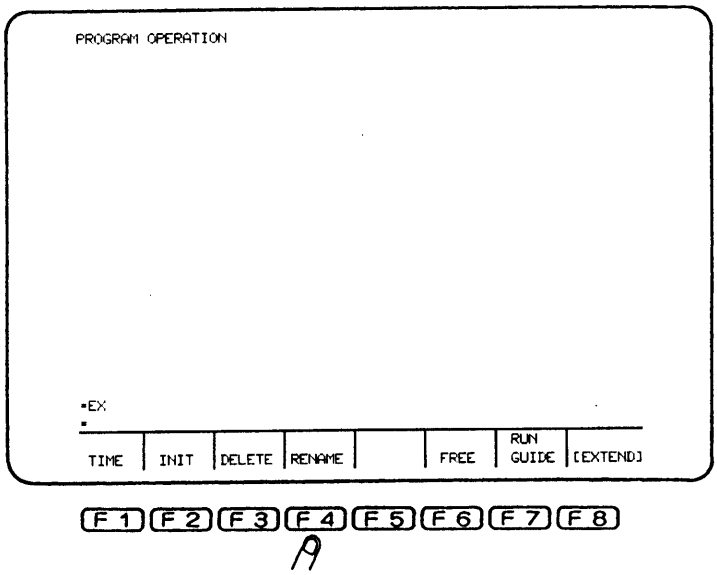
(1) Press the EDIT AUX key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



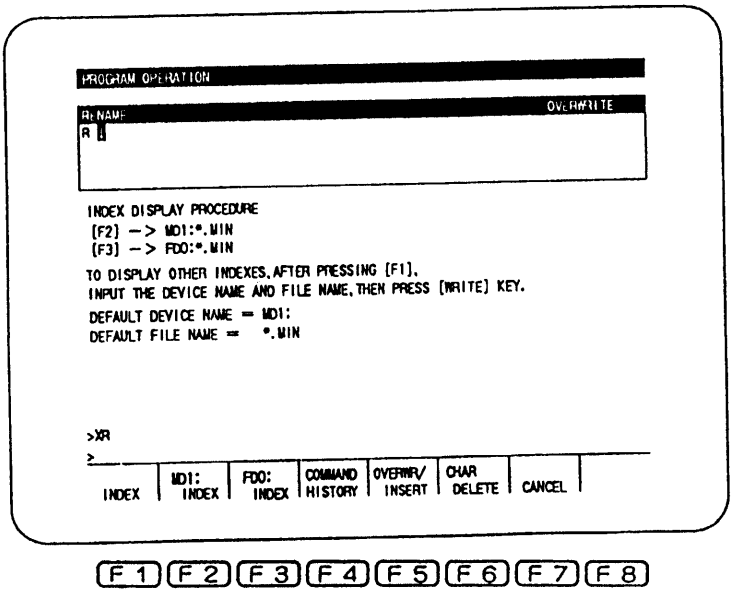
(2) Press function key [F8] (EXTEND).



(3) Press function key [F4] (RENAME).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

RENAME ␣ R

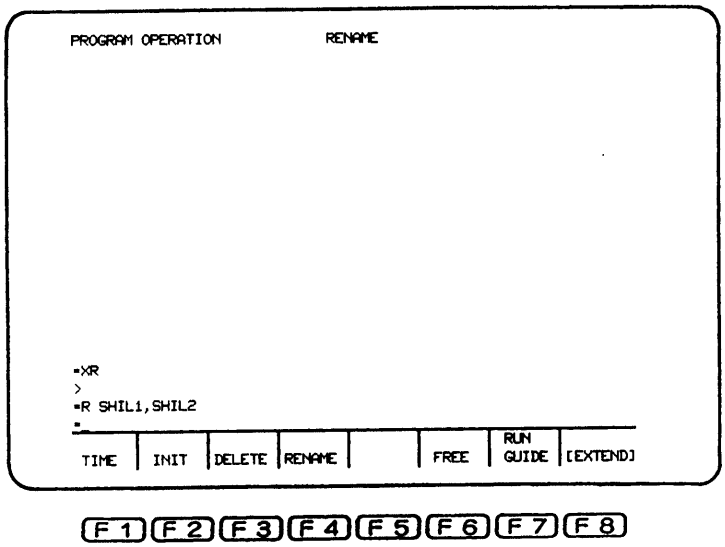


(4) First key in the current file name and then key in the new file name with a comma "," placed between them.

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.

(5) Press the WRITE key.

This completes file name change operation.



[Supplement] :

1. When the current file name specified is not found, the message "no file" is displayed on the command line and renaming operation terminates.
2. When the new file name specified already exists in the memory, the message "file exists" is displayed on the command line and renaming operation terminates.
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.

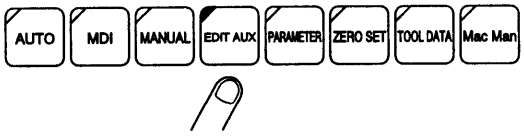
7-14. Protect

This function protects the specified file in the memory (MD1:) or in a floppy disk (FD0:).

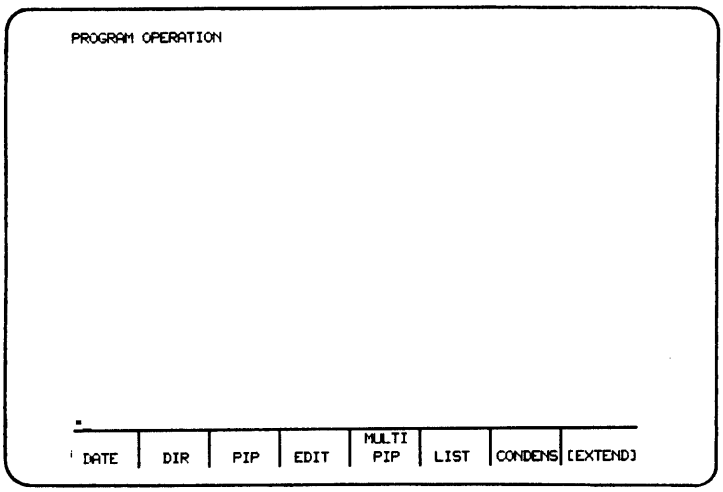
When this function is activated, file operations such as editing, deleting, and renaming cannot be conducted.

The operating procedure is as indicated below.

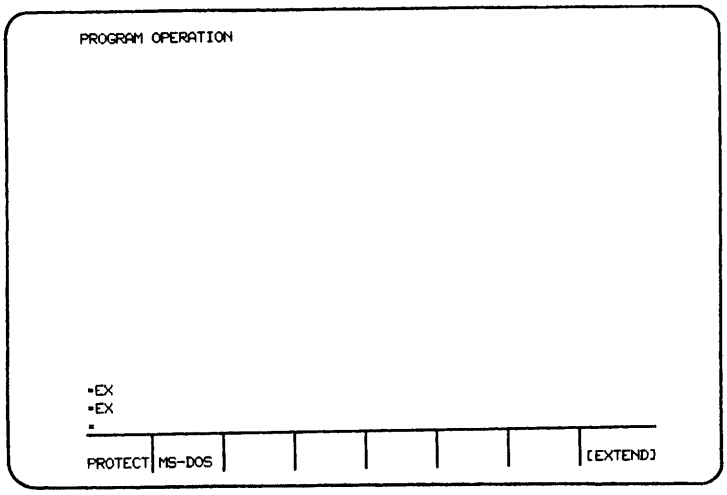
(1) Press the EDIT AUX key to select the PROG OPERATION mode.



The screen as indicated below will be displayed.



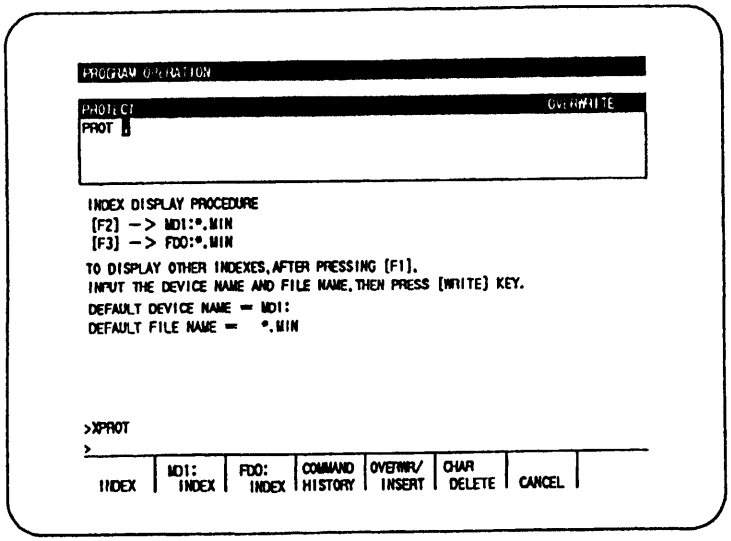
(2) Press function key [F8] (EXTEND) two times.



(3) Press function key [F1] (PROTECT).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

PROTECT ⌴ PROT

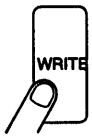


(4) Enter the device name, file name to be protected, and option code.

Device name: MD1: or FD0:
The default is MD1:.

Option code : ;C, ;V, or ;CV
The option code can be omitted.

(5) Press the WRITE key.



[Supplement] : 1. When the specified file name does not exist in the storage device, the message "no file" will be displayed on the command line.

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 display 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 display 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: PROT␣ ABC.MIN or PROT␣ MD1: ABC.MIN

This instruction protects the file ABC.MIN registered in the memory.

Example 2: PROT␣ BCD.MIN;C or PROT␣ MD1:BCD.MIN;C

This instruction cancels protection of the file BCD.MIN registered in the memory.

Example 3: PROT ␣ CDE.MIN;V or PROT ␣ MD1: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: PROT ␣ DEF.MIN;CV or PROT ␣ MD1: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.

7-15. NC Program Input/Output Function Using MS-DOS Format Floppy Disk

The MS-DOS format I/O function enables input and output of NC part programs using MS-DOS format 3.5 inch floppy disks.

(1) Program input and output using this function is possible with the following MS-DOS formats:

- 3.5 inch 2DD floppy disks (640 KB/720 KB)
- 3.5 inch 2HC floppy disks (1.20 MB)
- 3.5 inch 2HD floppy disks (1.23 MB)
- 3.5 inch 2HD floppy disks (1.44 MB)

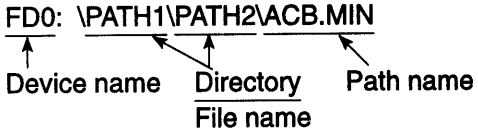
[Supplement] :
1. "MS-DOS" is a trademark of the Microsoft Corporation.
2. Even if a floppy disk can be read and written to at an MS-DOS-compatible personal computer, it may not be possible to read and write to the disk using this function if its format is not a regular one conforming to published MS-DOS literature.

(2) The following subcommands are available under this function.

Item		Function Outline
Directory	DIR	Displays an MS-DOS format directory.
Copying	COPY	Copies files from MS-DOS format to OSP format and vice versa.
Renaming	RENAME	Used to change specified file names in the MS-DOS format.
Deletion	DELETE	Used to delete specified files in the MS-DOS format.
Remaining capacity	FREE	Indicates the remaining memory capacity in the MS-DOS format.
File protection	PROTECT	Prohibits updating the information of specified files in the MS-DOS format.
MS-DOS Quit	QUIT	Used to quit MS-DOS.

7-15-1. Specifying MS-DOS File Names

MS-DOS file names are specified in the way shown below.

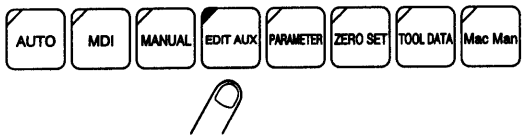


[Supplement] :
1. The reverse slash "\" is used as the delimiter between directory names (the "\" following the device name can be omitted).
2. It is not normally necessary to specify a device name when handling OSP files but it is essential to specify one for MS-DOS files.
3. The total length of the sequence "device name:path-name\file name" must not exceed 64 characters.
4. The length of the path-name must not exceed 47 characters.
5. The file name consists of a main file name (with a maximum length of 8 characters) and an extension name (with a maximum length of 3 characters), and a period "." is used as a delimiter between the main file name and extension. The file name must begin with a letter of the alphabet and the characters that follow it can only be numerals, letters of the alphabet, "." or "_".

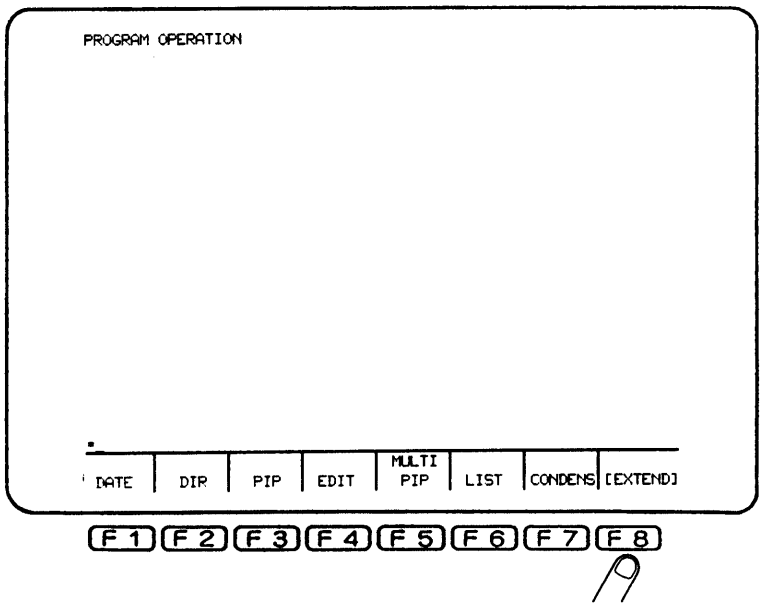
7-15-2. MS-DOS Operation Mode

To use the MS-DOS format I/O function, select the MS-DOS operation mode by following the procedure indicated below.

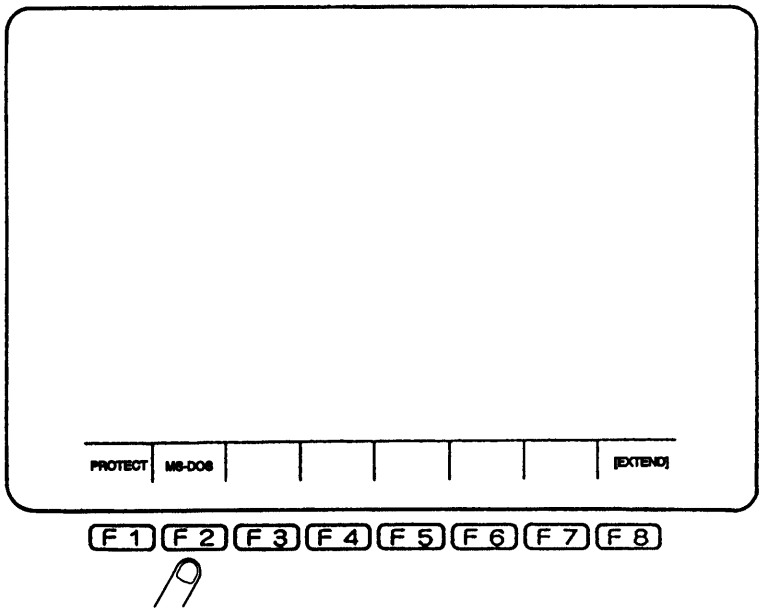
(1) Press the EDIT AUX mode selection key to select the PROG OPERATION mode.



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



(3) Press function key [F2] (MS-DOS).



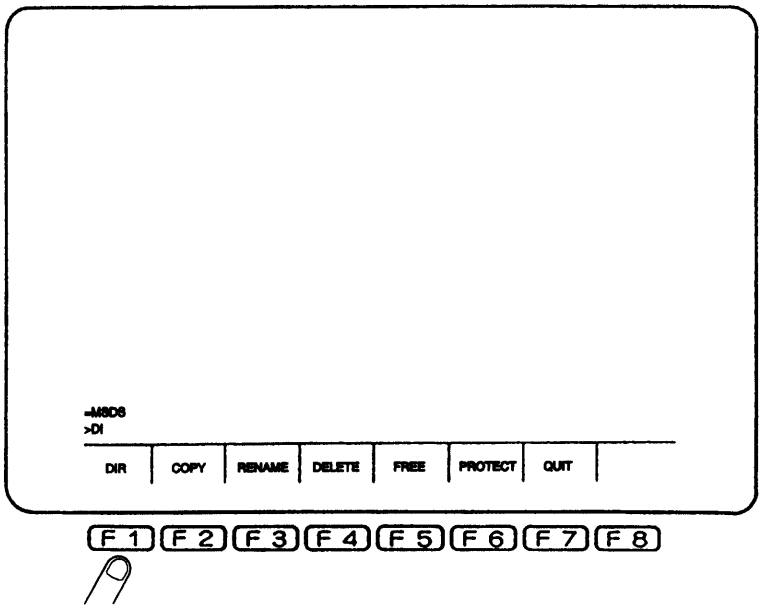
7-15-3. DIR (directory)

This function is used to display a list of the files and directories saved in an MS-DOS format floppy disk (FD0:).

The operating procedure is indicated below.

(1) Press function key [F1] (DIR).

"DI" is displayed on the command line.



(2) Enter the device name.

Example 1: The following command displays all the directory names and file names in the MS-DOS format floppy disk designated as device "FD0:".

>DI FD0:

Example 2: The following command displays all the directory names and file names in the directory "PATH" of the disk designated as device "FD0:".

>DI FD0:PATH (or alternatively, >DI FD0:\PATH)

Example 3: The following command displays all the directory names and file names under the directory "PATH1" which is under the directory "PATH" of the disk designated as device "FD0:".

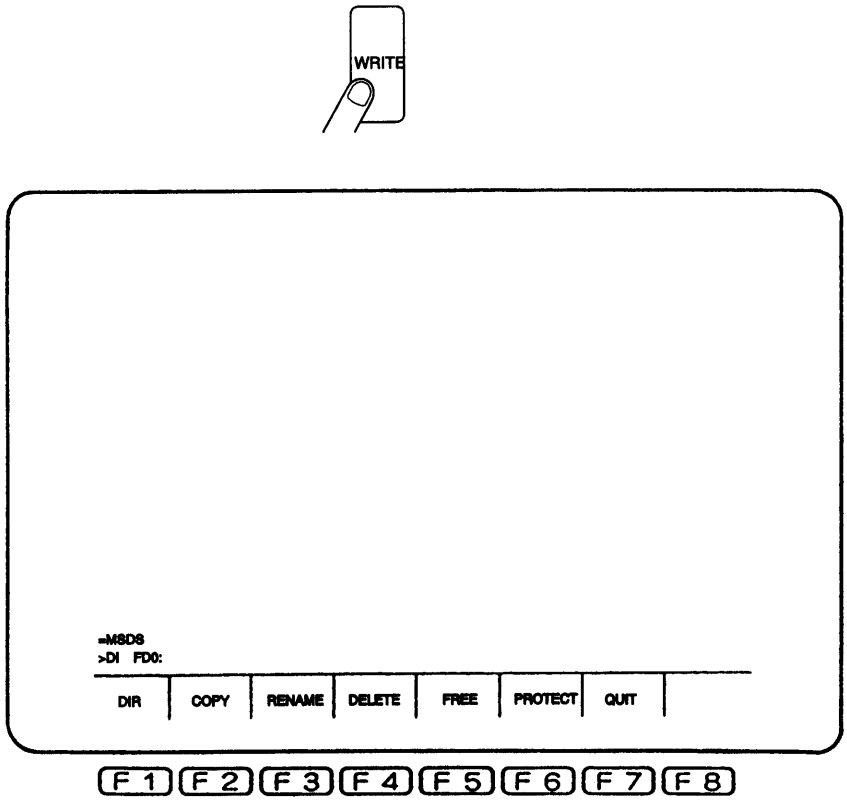
>DI FD0:PATH\PATH1

Example 4: The following command format displays all the directory names and file names that start with the character string "F0" in the directory "PATH" of the disk designated as device "FD0:".

>DI FD0:PATH\F0*

[Supplement] : The use of the wild cards "*" and "?" is only valid for files; an error will occur if either of these symbols is used with a device name or directory name (path name).

(3) Press the WRITE key.



[Supplement] : 1. A maximum of 12 file names and directory names can be displayed on each screen.

If it is not possible to display all the directory and file names on a single screen, the symbol "=" (the command prompt) will not be displayed on the command line and the cursor display will remain unchanged. In this condition:

a) Pressing the BS key will scroll the screen forward one page.

b) Pressing the WRITE key will scroll the display continuously in page units until the end of the directory is reached (press BS to stop scrolling part way through).

c) Pressing the CAN key will terminate execution of the command and leave the currently displayed page displayed.

2. "<DIR>" displayed in the sector column indicates that the entry is a directory.

3. The following options can be specified after the file name. They must be preceded by a semicolon ";".

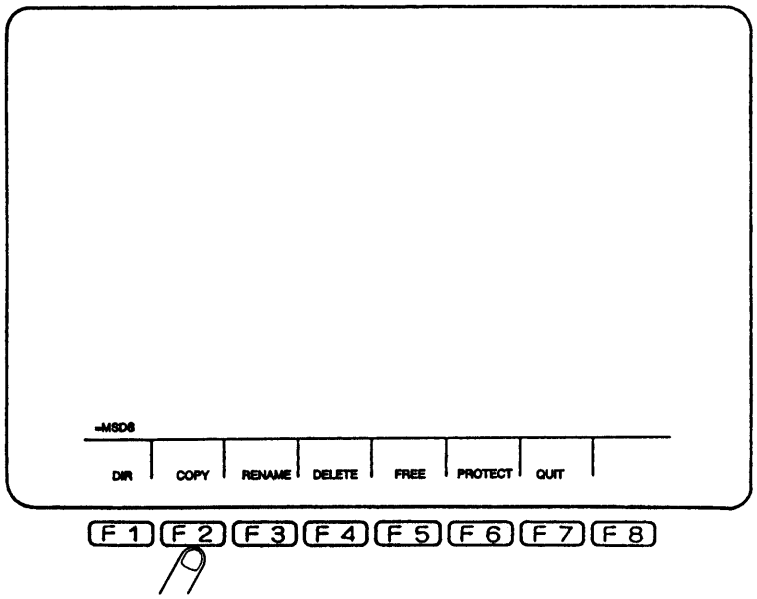
;P : Specifies display of the file protection status after the date:

00 : File not write protected
01 : File write protected

7-15-4. COPY (copying)

This function copies files from the MS-DOS format to the OSP format and vice versa.

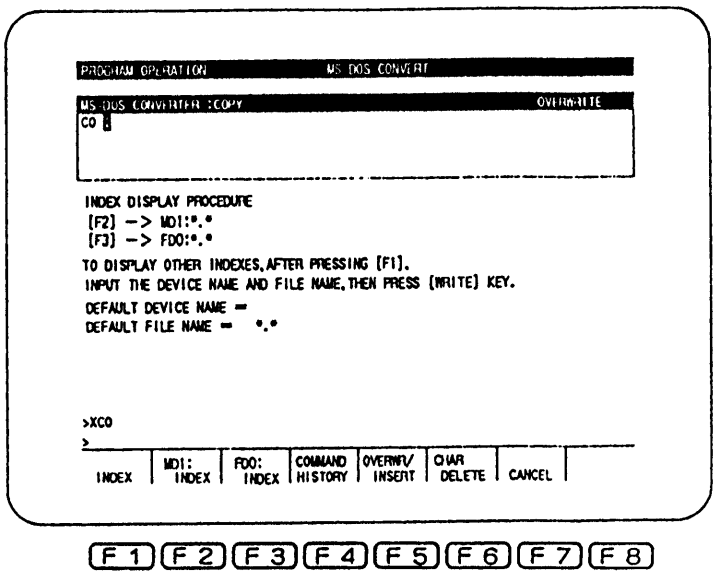
The operating procedure is indicated below.



(1) Press function key [F2] (COPY).

0The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

MS-DOS CONVERTER ␣: COPY ␣ CO ▒



(2) Enter the device name, path name, and file name of the program to be copied.

a) Use the following command format when copying from MS-DOS format to OSP format:

CO <device name>:<path name + file name or path name> <device name>:<file name>

If a path name is specified as the copying source, all the files (excluding directories) listed in the directory indicated by that path name will be copied.

b) Use the following command format when copying from OSP format to MS-DOS format:

CO <device name>:<file name> <device name>:<path name + file name or path name>

If a path name is specified as the copying destination, the file (or files) is (are) copied into the directory indicated by that path name.

Example 1: The following command copies A.MIN in FD0: (MS-DOS) to MD1: (OSP) under the file name B.MIN.

CO␣ FD0:A.MIN MD1:B.MIN

Example 2: The following command copies all files in the directory "PATH" of FD0: (MS-DOS) to MDI: (OSP).

CO␣ FD0:PATH* MD1:

or..

CO␣ FD0:PATH MD1:

Example 3: The following command copies all FD0: (MS-DOS) files whose main file names start with the letter C and comprise three characters or less to MDI: (OSP).

CO␣ FD0:C??.MIN MD1:

Example 4: The following command copies MAIN files (files without their extension names) from FD0: (MS-DOS) to MD1: (OSP).

CO␣ FD0:MAIN,MD1:

When this command is used "MIN" is automatically appended as the extension name of the destination file, so that the file name is MAIN.MIN.

Example 5: The following command copies A.MIN of MD1: (OSP) to FD0: (MS-DOS) under the name "B.MIN".

CO␣ MD1:A.MIN,FD0:B.MIN

Example 6: The following command copies A.MIN of MD1: (OSP) to FD0 (MS-DOS) under the name "C.MIN" under the directory "PATH".

CO␣ MD1:A.MIN,FD0:

Example 7: The following command copies A.MIN of MD1: (OSP) to FD0: (MS-DOS) under the same file name as it had in the copying source.

CO␣ MD1:A.MIN,FD0:

Example 8: The following command copies all files whose file names start with "A" in MD1: (OSP) to the directory "PATH" of FD0: (MS-DOS).

CO␣ MD1:A*,FD0:PATH

(3) Press the WRITE key.

[Supplement] :

1. The COPY function can only be used to copy between the OSP format and MS-DOS format. Attempts to copy from OSP to OSP or from MS-DOS to MS-DOS will result in an error.
2. This function has no default device name and it is therefore essential to specify the device name.
3. If no destination file name is specified it is made the same as the source file name.
4. Contiguous OSP format files cannot be overwritten. If an attempt is made to do this the message "file attribute unsame" is displayed.
5. If the specified destination file name already exists, the message "file exist overwrite? (Y/N)" will be displayed. To overwrite the file, enter "Y"; to abort the writing operation, enter "N".
6. If the copied file name contains any characters other than those listed below, these characters will all be replaced by question marks:

   space, !, ", #, $, %, &, ', (,), +, –, ., /, 0-9, :, ;, <, =, >, ?, @, A-Z, [, \,], ^, _, a-z, [, |,], –

CAUTION :

(1) Copying from OSP format to MS-DOS format is possible for ASCII data files but if this operation is attempted with a binary data file the message "file attribute unsame" is displayed and the copying operation is terminated.

Both ASCII data files and binary data files can be copied from MS-DOS format to OSP format, but binary data files may not be copied accurately.

(2) When copying from MS-DOS format to OSP format, if the MS-DOS file has no extension name, "MIN" is automatically appended to the OSP file name as a default. Similarly, when copying from OSP format to MS-DOS format, the extension name for the MS-DOS file will be "MIN" if no extension name is specified.

(3) The following option can be specified. It must be preceded by a semicolon ";".

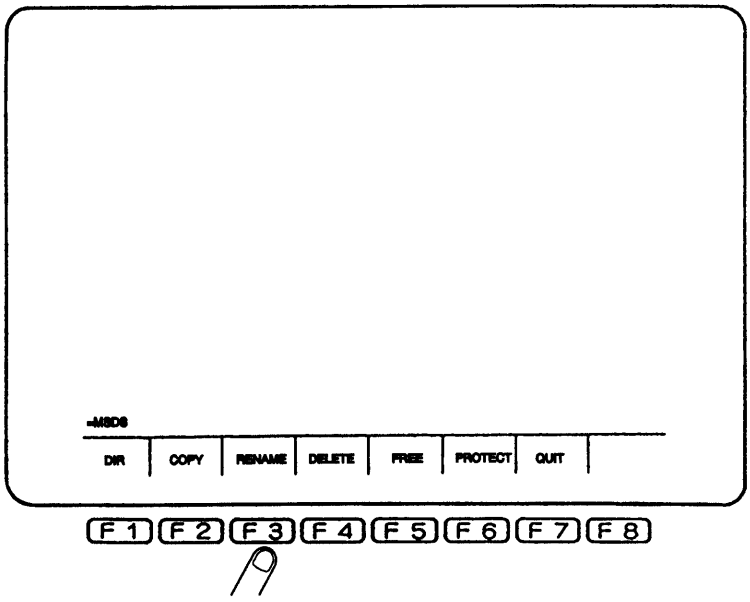
;V Specifies use of the following request for confirmation for each of the files specified for copying:

copy OK? (Y/N)

To copy the file, enter "Y"; to abort the copying operation, enter "N".

7-15-5. RENAME (renaming)

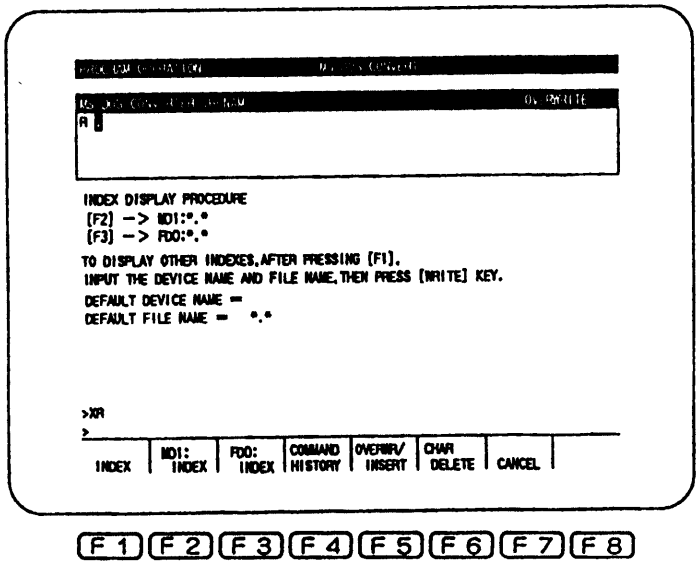
This function is used to change the name of an MS-DOS format file. The operating procedure is indicated below.



(1) Press function key [F3] (RENAME).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

MS-DOS CONVERTER ␣: RENAME ␣ R ▒



(2) Enter the file name (including the device name and path name) of the MS-DOS format file whose name is to be changed and the file name (not including the device name and path name) that it is to be changed to.

Example: The following command changes the file name FD0:PATH\PATH1\FILE to the file name FD0:PATH\PATH1:FILE1.
R␣ FD0:PATH\PATH1\FILE, FILE1

(3) Press the WRITE key.

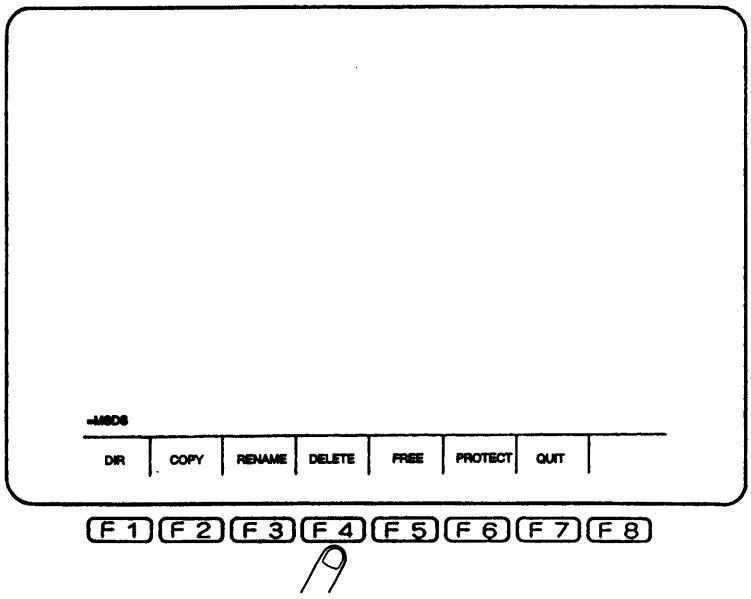
[Supplement] :

1. If the specified file (current file name) does not exist in the floppy disk, the message "no file" is displayed on the console lines and the renaming operation is terminated.
2. If a file with the same name as that specified for the file after the change already exists in the floppy disk, the message "file exist" is displayed on the console lines and the renaming operation is terminated.
3. The wild cards "*" and "?" cannot be used in the file names (their use will cause an error).
4. Specify only the file name (with no device name or path name) for the file name after the change. An error will occur if a device name or path name is specified.
5. If the specified file is a directory, the message "directory" is displayed on the console lines and the renaming operation is terminated.

7-15-6. DELETE (delete)

This function is used to delete MS-DOS format files.

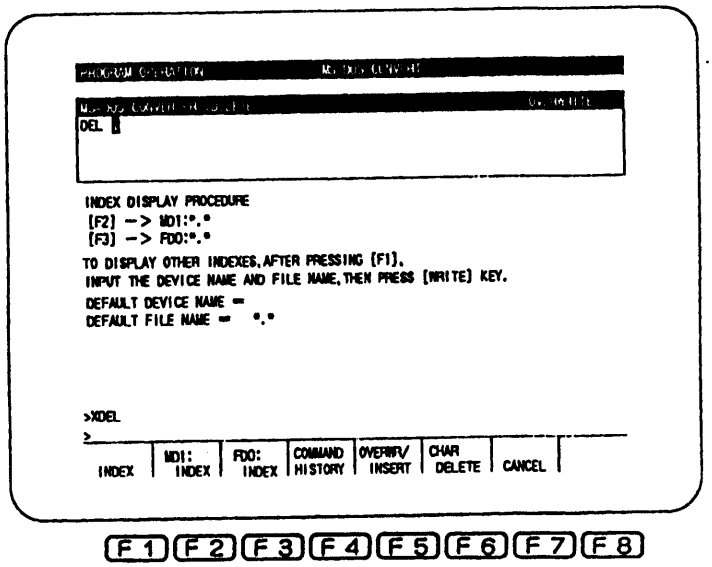
The operating procedure is indicated below.



(1) Press function key [F4] (DELETE).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

MS-DOS CONVERTER :DELETE ⌴ DEL ▩



(2) Enter the file name (including the device name and path name) of the MS-DOS format file that is to be deleted.

Example 1: The following command deletes the file FILE.MIN in device "FD0:".

DEL␣ FD0:FILE.MIN

Example 2: The following command deletes the file FILE2.MIN in the directory "PATH" of device "FD0:".

DEL␣ FD0:PATH\FILE2.MIN

Example 3: The following commands delete all files in the directory "PATH" of device "FD0:".

DEL␣ FD0:PATH*.*

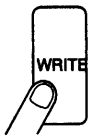
or

DEL␣ F0:PATH

In this case, because a directory has been specified as the file name to be deleted, all the files contained in that directory ("PATH"), except directories, will be deleted.

In order to make this clear, the request for confirmation "delete OK? (Y/N)" is displayed on the console lines.

(3) Press the WRITE key.



[Supplement] :

1. The wild cards "*" and "?" can be used in the file name (wild cards cannot be used in path names).
2. If no option is specified deletion is executed unconditionally (unless it is a path name that is specified for deletion).
3. Directories cannot be deleted.
4. Files protected by the file protection function cannot be deleted.
5. The following option can be specified. It must be preceded by a semicolon ";".

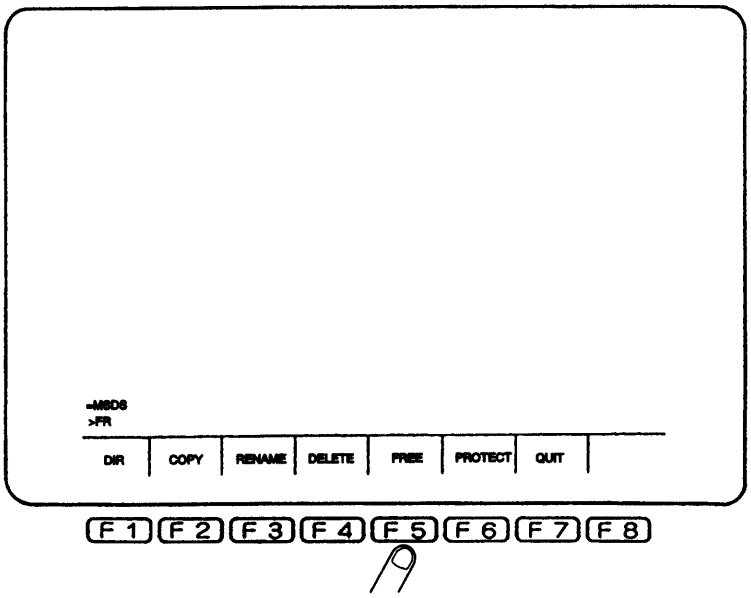
   ;V Specifies the use of a request for confirmation when an attempt is made to delete a file.

   To delete the file, enter "Y"; to abort the deleting operation, enter "N".

7-15-7. FREE (free)

This function displays the available capacity in an MS-DOS format floppy disk.

The operating procedure is indicated below.



(1) Press function key [F5] (FREE).

"FR" is displayed on the command line.

(2) Enter the device name.

Example: The following command displays the available capacity of device "FD0:".

>FR ␣ FD0:

(3) Press the WRITE key.

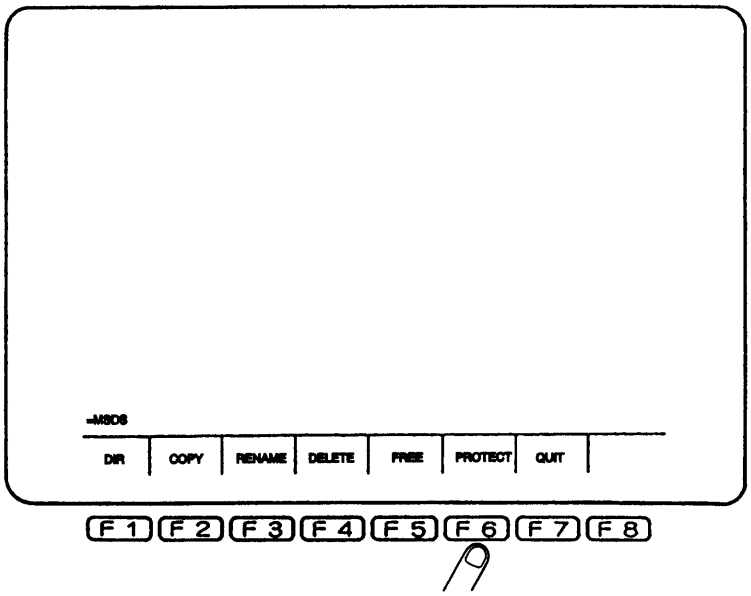
[Supplement] : Never specify any more than a device name in the command.

7-15-8. PROTECT (protect)

This function establishes, and cancels, write protection for MS-DOS files (it is equivalent to the ATTRIB function in MS-DOS.)

When a file is protected it cannot be renamed, deleted, or overwritten by copying.

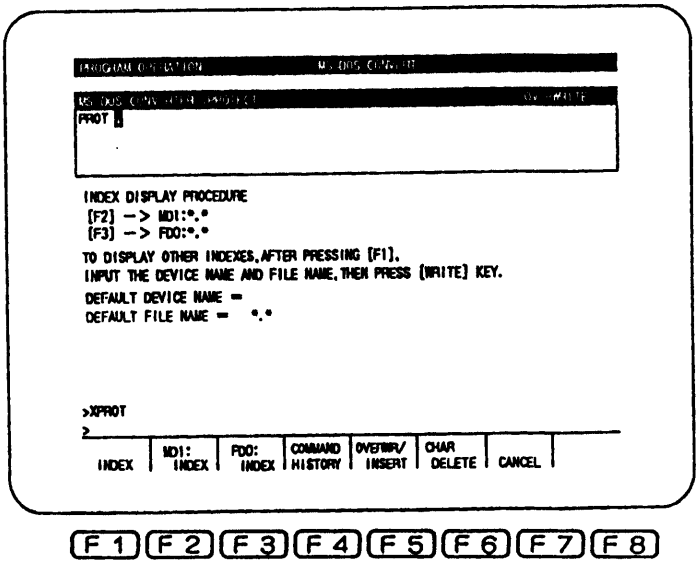
The operating procedure is indicated below.



(1) Press function key [F6] (PROTECT).

The screen changes to the directory selection-based file operation screen and the following is displayed on the screen.

MS-DOS CONVERTER ␣: PROTECT ␣ PROT ▒



(2) Enter the file name (including the device name and path name).

Example 1: The following command protects the file FILE.MIN in device "FD0:".

PROT FD0:FILE.MIN

Example 2: The following command protects all files with the extension name MIN in device "FD0:".

PROT FD0:*.MIN

Example 3: The following command cancels protection for the file FILE.MIN in device "FD0:".

PROT FD0:FILE.MIN;C

Example 4: The following command protects all files in the directory "PATH" of device "FD0:".

PROT FD0:PATH*.*

(3) Press the WRITE key.

[Supplement] :

1. The wild cards "*" and "?" can be used in file names.
2. If the specified file is a directory, the message "directory" is displayed on the console lines and the file protection operation is terminated.
3. If the option V (;V) is not specified, files will be protected (or have their protection canceled) unconditionally.
4. The following options can be specified. They must be preceded by a semicolon ";".

   ;C Cancels file protection.

   ;V Specifies use of a request for confirmation of whether or not the file may be protected (or have its protection canceled).

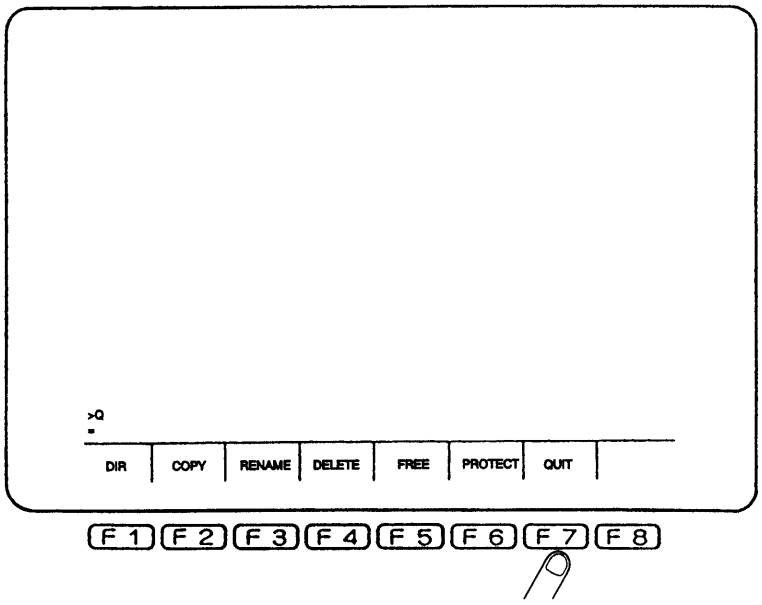
   If the file may be protected or file protection may be canceled, enter "Y"; to abort the file protection or protection cancellation operation, enter "N".

7-15-9. Quitting MS-DOS

This function quits the MS-DOS operation mode.

(1) Press function key [F7] (QUIT).

"PROT" is displayed on the command line.



7-15-10. Character Codes

(1) Carriage Return Character

In MS-DOS the carriage return character comprises two bytes for CR and LF ($0D, $0A).

In OSP there is only LF ($0A).

The OSP converts carriage return characters internally.

(2) File End Character

In MS-DOS the character ^Z ($1A) that indicates the end of a file is normally appended at the end of each file. There are cases in which this character is not appended.

If this character appears part way through a file, all the data following it is ignored.

(3) Treatment of Non-ASCII Characters etc. by OSP

Some codes that are not used in ASCII (most significant bit = 1) are used for European languages. The OSP cannot handle non-ASCII codes like these. When a file is read into the OSP, any non-ASCII codes that it contains (including control codes other than the carriage return code) are replaced by question marks "?".

In addition, since the file end character may appear as the second byte of a two-byte character, the OSP cannot determine whether it is the file end character or a second byte. The file end character is therefore ignored.

7-15-11. Miscellaneous Supplements

(1) In the MS-DOS conversion mode, file operations executed in the background, such as schedule program selection and external program selection, are suspended. When this happens, the following message is displayed on the alarm line:

"Alarm W61! Waiting prog selection during prog operation"

(2) If the destination file name in a copying operation already exists, the existing file is normally overwritten. However, if for some reason the copying operation cannot be completed normally and the copy of the source file cannot be created, this will mean that the existing file (which was being overwritten) is deleted. If this happens, the error message indicating the cause of the copying failure is displayed, then the following message is displayed on the console lines:

"<deleted file name> deleted"

Note, however, that – depending on the timing of the deletion of the existing file and the creation of the new one – this message can sometimes be displayed even when the file is successfully overwritten.

(3) When copying a file from the MS-DOS format to the OSP format, if the file name specified in the OSP format is the same as that of a program that is currently selected for automatic operation, and the program selection method was B, S, or M, an error will occur.

Similarly, an error will also occur if a file being processed by the schedule program automatic update function is specified.

(4) The floppy disk used with the MS-DOS format I/O function must be MS-DOS formatted.

An error will occur if a floppy disk that is not MS-DOS formatted is used. (But note that, for copying, either the source or destination must be OSP format.)

(5) Specifications such as "*A.MIN", where the wild card is used as the first character, are treated in the same way as "*.MIN".

If a directory is specified when using the DIR, COPY, or DELETE function, all the files contained in that directory will be subject to the specified operation. If a directory is specified for the RENAME or PROTECT function the message "directory" will be displayed on the console lines and the operation will be aborted because it is only possible to rename or protect one file at a time.

(6) Meaning of the wild card "*" under different functions

DIR : Both "*" and "*.*" specify all file names with and without extension names.

DELETE : "*" specifies file names without extension names and "*.*" specifies file names with extension names only.

PROTECT: "*" specifies file names without extension names and "*.*" specifies file names with extension names only.

COPY : "*" specifies file names without extension names and "*.*" specifies file names with extension names only.

8. TAPE PUNCH INTERFACE

(1) An RS-232C serial interface is provided to allow connection of a tape punch.

Connecting a peripheral device such as a tape reader or tape punch that also has an RS-232C serial interface to this RS-232C interface enables bulk transfer of NC part program data.

(2) The interface features a special-purpose connector on the puncher panel and must be connected to another interface that is compatible with this connector.

(3) There are two methods for data transfer using RS232C – the normal BTR (behind tape reader) method and a method using DC code control – and the method for connection to the peripheral device differs according to which of these is used.

(4) With the OSP, once connectable punch equipment has been selected, the connecting cable can also be selected, and, since the transfer method is pre-determined, the equipment is ready for data input and output immediately. However, when other devices are connected it is necessary to match the RS-232C interface signals to ensure that communication between the OSP and peripheral device is possible.

(5) Optionally, the number of RS-232C channels can be expanded to a maximum of four.

8-1. Parameter Settings

Set the following parameters before connecting a peripheral device.

After setting the parameters, press function key [F7] (BACKUP) and on completion of the backup operation switch the power off and then back on again.

The old parameter settings will remain valid if the power is not switched off and back on.

(1) NC optional parameter (bit) No.1

Bit No. / Parameter No.	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0
1	Special tape codes ignored	Special tape code alarm	Tape rewind	Tape read verify	Tape delimiter code: % (ER)	Tape TV check	Automatic tape code recognition	Tape coding system

a) bit 0 Tape coding system

= 1 : Tape code set to ISO code (Initial value = 1)

= 0 : Tape code set to EIA code

b) bit 1 Automatic tape code recognition

= 1 : Tape code automatically recognized (Initial value = 1)

= 0 : Tape code not automatically recognized

The codes used for tape punching and tape verification depend on the combination of the settings made for bit 0 and bit 1.

bit 1	bit 0	Operating Conditions
1	1	In "READ" and "VERIFY" operations, EIA and ISO tape codes are automatically recognized. In "PUNCH" operations, program data is punched in the ISO code.
1	0	In "VERIFY" operations, EIA and ISO codes are automatically recognized. In "PUNCH" operations, program data is punched in the EIA code.
0	1	In "VERIFY" operations, the control assumes that the coding system is ISO. (If the tape code is not ISO, an error occurs.) In "PUNCH" operations, program data is punched in the ISO code.
0	0	In "VERIFY" operations, the control assumes that the coding system is EIA. (If the tape code is not EIA, an error occurs.) In "PUNCH" operations, program data is punched in the EIA code.

c) bit 2 Tape TV check

The tape TV check is a check on the number of characters of tape data in each block of the program.

It is checked that the number of codes from the code following one LF (EOB) to the next LF (EOB) is an even number.

bit 2	Operating Conditions
0	In "READ" operations, no TV check is performed. In "PUNCH" operations, the number of characters per block is not adjusted.
1	In "READ" operations, it is checked if the number of characters in each block is an even number; if it is an odd number, an alarm occurs. In "PUNCH" operations, a space is added if necessary to make the number of characters in one block an even number.

(Initial value = 0)

d) bit 3 Tape delimiter code %/ER

Sets whether or not the %/ER code is used instead of tape feed to mark the end of program information on the tape.

bit 3	Operating Conditions
0	Tape feed is taken to indicate the end of program data.
1	The % (ER) code is taken to indicate the end of program data.

(Initial value = 0)

[Supplement] : The data up until the second appearance of an CR, and LF or EOB on the tape is ignored.

e) bit 4 Tape reading verification

Sets whether or not the program information is automatically verified when a tape is read.

bit 4	Operating Conditions
0	Verification is not performed on completion of a "READ" operation.
1	Verification is performed on completion of a "READ" operation.

(Initial value = 0)

[Supplement] : File names are not verified.

f) bit 5 Tape rewind

Sets whether or not the tape is rewound after reading (if verification is not performed).

bit 5	Operating Conditions
0	Operation stops after the tape has been read.
1	The tape is rewound after it has been read.

(Initial value = 0)

g) bit 6 Special code alarm

Sets whether or not special codes ($20 to $5F, HT) trigger an alarm.

h) bit 7 Special code store

Sets whether or not special codes are stored.

bit 7	bit 6	Operating Conditions
*	1	An alarm occurs when a special code is read.
1	0	Special codes are read but not stored.
0	0	Special codes are read normally.

(Initial values: bit 6 = 1, bit 7 = 0)

(2) NC optional parameters (bit) No. 8, 13, 14, 21, 22

Used to set the RS232C data handled by the channels used.

NC optional parameter (bit) No.	Channel	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	
No. 8	CN0 :	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/ 7-bit JIS	Even/ odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/ 2-bit stop bit	
No. 13	CN1 :									
No. 14	CN2 :									
No. 21	CN3 :									
		0	0	0	0	0	0	1	0	Initial value

Explanation of settings for parameter (bit) Nos. 8, 13, 14, 21, 22

a) bit 0 RS232C stop bit check

= 0 : 2 stop bits

= 1 : 1 stop bit

b) bit 1 Determines whether or not the RS232C interface uses the "EXT-INT" signal as the ready signal.

= 0 : The "EXT-INT" signal is used as the ready signal.

= 1 : The "EXT-INT" signal is not used as the ready signal.

c) bit 2 RS232C parity check (determines whether or not a parity bit is appended to 8-bit data)

= 0 : Parity check not performed

= 1 : Parity check performed

d) bit 3 RS232C even/odd parity

= 0 : Odd parity

= 1 : Even parity

e) bit 4 RS232C 8-bit/7-bit JIS

= 0 : 7-bit JIS

= 1 : 8-bit JIS

f) bits 5, 6 Specify the DC code control conditions.

bit 6	bit 5	Operating Conditions
0	0	No DC code control
1	0	No DC code control
0	1	Standard DC code control
1	1	DC code control TYPE 2

g) bit 7 Required file name output in DNC-A mode (special specification)

= 0 : Required file name not output
= 1 : Required file name output

(3) NC optional parameter (bit) No. 12

a) bit 2 Specifies whether or not the file name is punched out.

bit 2	Operating Conditions
0	The file name is punched out.
1	The file name is not punched out.

(Initial value = 0)

b) bit 3 Specifies the end of record code when punching in the ISO coding system.

bit 3	Operating Conditions
0	CR, LF is output.
1	Only LF is output.

(Initial value = 0)

c) bit 4 Specifies the code used for tape feed during punching.

bit 4	Operating Conditions
0	The NULL code is output.
1	The SPACE code is output.

(Initial value = 0)

d) bit 5 Specifies whether or not feed holes are punched during tape punching.

bit 5	Operating Conditions
0	Feed holes are punched.
1	Feed holes are not punched.

(Initial value = 0)

(4) NC optional parameters (bit) No. 27 to 31, 49 to 51

a) These parameters are used to set special EIA codes.

Parameter No.	bit 7	bit 6	bit 5	bit 4	bit 3	bit 2	bit 1	bit 0	
No. 27	Sets the punch holes for the EIA code that represents "=".								
No. 28	Sets the punch holes for the EIA code that represents "*".								
No. 29	Sets the punch holes for the EIA code that represents "[".								
No. 30	Sets the punch holes for the EIA code that represents "]".								
No. 31	Sets the punch holes for the EIA code that represents "$".								
No. 49	Sets the punch holes for the EIA code that represents "#".								
No. 50	Specifies an irregular code.								
No. 51	Specifies the regular code (ISO) corresponding to the irregular code.								
	0	0	0	0	0	0	0	0	Initial value

b) In both the EIA and ISO coding systems, it is possible to have one code treated as another in program reading and program punching.

c) Set a code which is to be treated as another code (i.e. an irregular code) for optional parameter (bit) No. 50 and the regular code that corresponds to this irregular code for optional parameter (bit) No. 51.

The regular code must be set in the ISO coding system.

1) If an irregular code is encountered during reading it is read as the corresponding regular code.

2) If the regular code corresponding to an irregular code occurs during punching, the irregular code is punched.

(5) NC optional parameters (word) No. 1, No. 2

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
1	Tape feed holes in punching	For punchout in the PIP holes in (transfer) mode, tape feed hole areas are punched out before and after program punch out. 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 machining 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 set by this parameter. The divisions are closed at the breaks of each block, so that the actual tape length is slightly different from the setting. 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 hole.	180 m (590 ft)	1 to 300 m (3.3 to 984 ft)

(6) NC optional parameters (word) No. 6, 39, 40, 41, 42

Set the baud rates for channels CN0: to CN3:.

NC Optional Parameter (word) No.	Channel	Contents	Initial Value
No. 6	CN0 :	Any of the following baud rates can be set: 110, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 19200,	600 baud
No. 39	CN1 :		
No. 40	CN2 :		
No. 41	CN3 :		

(7) NC optional parameters (word) No. 34, 35, 36, 37, 38

Set the ready completion waiting times for channels CN0: to CN3:.

NC Optional Parameter (word) No.	Channel	Setting Range (Unit: Seconds)	Operation	Initial Value
No. 34	CN0 :	1 to 9999	This is the waiting time between output of DC1 (tape reader start) or the cessation of data reception and reception of data; or the waiting time (when CTS and DSR are ON) until the RS232C ready completed status comes into effect. If there is no response within this time an alarm occurs.	10 seconds
No. 35	CN1 :			
No. 36	CN2 :			
No. 37	CN3 :			

(8) NC optional parameter (word) No. 45

Used to select the I/O channel for data transfer.

Setting for No. 45	Peripheral Device	Initial Value
0	CN0 : (TT:) [RS232C]	0 (This selects CN0:)
1	CN1 : [RS232C]	
2	CN2 : [RS232C]	
3	CN3 : [RS232C]	

8-2. Operating Procedure

Data is input from and output to peripheral devices using the functions available in the PIP (transfer) mode, which is accessed from the PROG OPERATION mode.

(1) The commands for reading, verifying, and punching NC programs (files) are expressed in the following format:

<command name> <input device name>:<input NC program name>, <output device name>:<output NC program name> [WRITE]

The command name is specified by using the function keys in the PIP mode.

Commands: R (Read)

V (Verify)

P (Punch)

(2) The commands for printing an NC program (file) or directory are expressed in the following format:

<command name> <input device name>:<input NC program name>, <output device name>:[WRITE]

The command name is specified by using the function keys.

Commands: L (List)

DI (Directory)

(3) Classification of peripheral devices

Sector devices

MD1: → User memory

FD0: → 3.5 inch floppy disk

FD1: → 3.5 inch or 8 inch floppy disk*

Tape reading devices

TR: → Standard tape reader

CN0: → Tape reader connected at RS232C channel 0*

CN1: → Tape reader connected at RS232C channel 1*

CN2: → Tape reader connected at RS232C channel 2*

CN3: → Tape reader connected at RS232C channel 3*

"*" indicates an option.

Tape punching devices

CN0: → Tape punch connected at RS232C channel 0*

CN1: → Tape punch connected at RS232C channel 1*

CN2: → Tape punch connected at RS232C channel 2*

CN3: → Tape punch connected at RS232C channel 3*

Printing devices

CN: → Console

PN: → Operation panel (Display screen)

CN0: → Printer connected at RS232C channel 0*

CN1: → Printer connected at RS232C channel 1*

CN2: → Printer connected at RS232C channel 2*

CN3: → Printer connected at RS232C channel 3*

"*" indicates an option.

a) FD0: is a 3.5 inch floppy disk and FD1: is an 8 inch floppy disk.

b) CN0: can also be used as device name TT:.

c) The input device names and output device names that can be specified are fixed for each command, as shown in the table below.

COMMAND NAME	PERMISSIBLE INPUT DEVICES	PERMISSIBLE OUTPUT DEVICES
R : READ	TAPE READING DEVICES	SECTOR DEVICES
V : VERIFY	TAPE READING DEVICES	SECTOR DEVICES
P : PUNCH	SECTOR DEVICES	TAPE PUNCHING DEVICES
L : LIST	SECTOR DEVICES	PRINTING DEVICES
DI : DIR	SECTOR DEVICES	PRINTING DEVICES
FR: FREE	SECTOR DEVICES	PRINTING DEVICES

d) If no device name is specified, the following selections are made automatically:

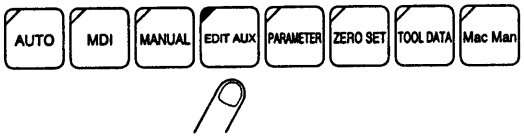
For sector devices	MD1:	
For tape reading devices	TR:	(This selection can be changed by setting NC optional parameter (word) No. 57.)
For tape punching devices	CN0:	(This selection can be changed by setting NC optional parameter (word) No. 45.)
For printing devices	PN:	

e) If no output NC program name is specified, the same name as the input NC program name is automatically assigned.

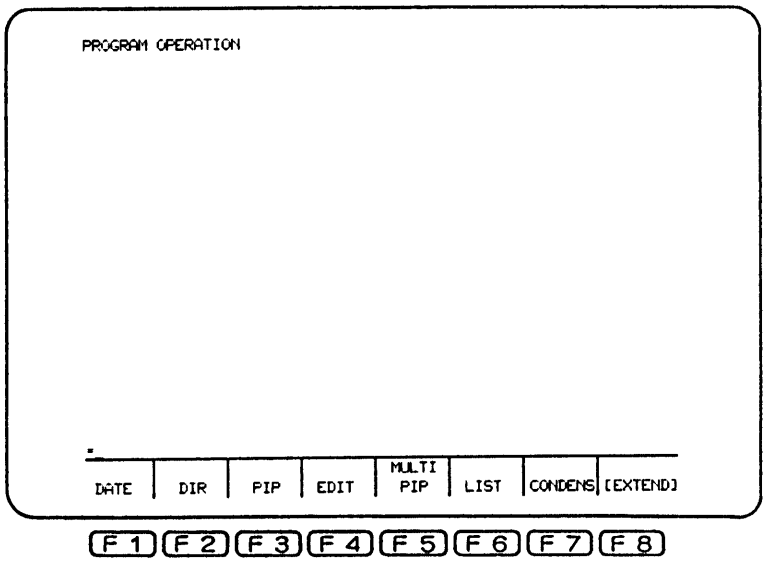
f) If no input NC program name is specified, the name "A.MIN" will be automatically assigned unless a program name is designated on the tape, in which case that name will be used.

(4) The operating procedure is indicated below.

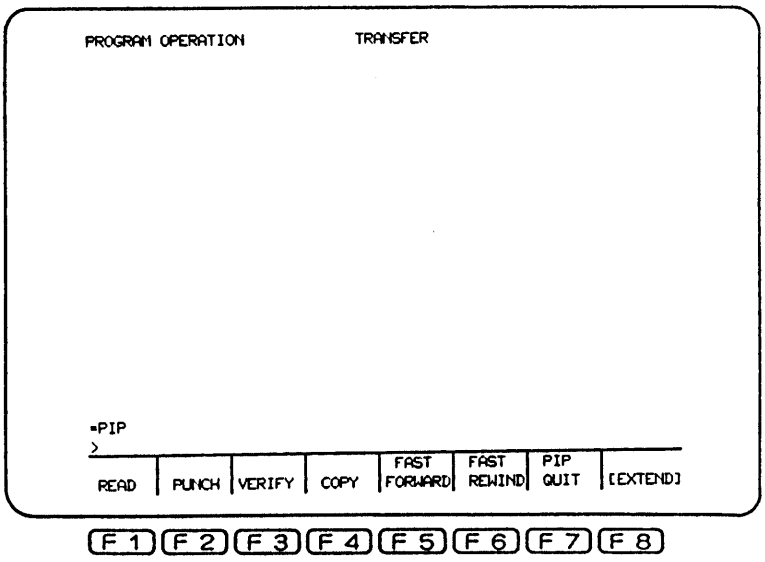
a) Press the EDIT AUX mode selection key to display the PROG OPERATION screen.



b) Press function key [F3] (PIP); the commands assigned to the function keys will change.



c) READ, PUNCH, or VERIFY can now be selected by pressing function keys [F1] through [F3].



[Supplement] : Function key [F4] (COPY) can only be used if a floppy disk drive (option) is installed.

1) To read

While in the PIP mode, press function key [F1] (READ) and then specify the device name.

When the following command is given, the tape reader at CN0: starts reading the tape:

R CN0: [WRITE]

The RS232C interface allows use of up to four channels (CN0: through CN4:) and which of these channels are used is determined according to the specification.

When using the tape reader provided as an accessory, the tape is rewound and the program verified if bit 4 of NC optional parameter (bit) No. 1 is set to "1", or if the option "V" is specified, unless one of the channels CN0: through CN3: is set, in which case verification is not executed in this way.

The VERIFY command is given in the same way as the READ command; first press function key [F3] (VERIFY) and then specify the device name to execute verification:

When the following command is given, the tape reader at CN0: starts verifying the tape:

V CN0: [WRITE]

In the case of both READ and VERIFY, if no device name is specified the device name is automatically selected in accordance with the setting for NC optional parameter (word) No. 57 ("designation of read device").

2) To punch

Press function key [F2] (PUCH) and then key in the NC program name (file name) and the output device name.

When the following command is given, the device connected at CN1: punches out the NC program (file) LAP1.MIN:

P LAP1,CN1: [WRITE]

If no device name is specified, the device name will be automatically selected in accordance with the setting for NC optional parameter (word) No. 45 ("designation of punch device").

3) To print

Print-outs can be executed at RS232C-compatible devices by specifying the device name after the relevant command.

The following commands would be used to print out a list and a directory, respectively, at the device connected at CN2:

L LAP1,CN2: [WRITE]

DI,CN2: [WRITE]

If no device name is specified, the list/directory is output to the display screen in the operation panel.

8-3. Tape Format

8-3-1. Input Format

(1) ISO Coding System

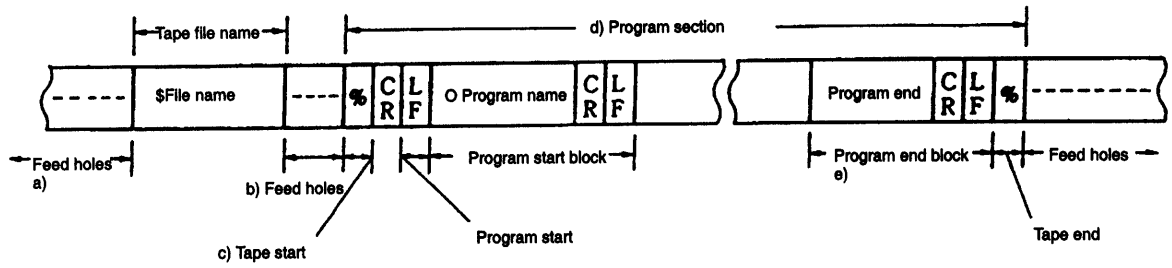


Fig. 2-23 Input Format (ISO Coding System)

(2) EIA Coding System

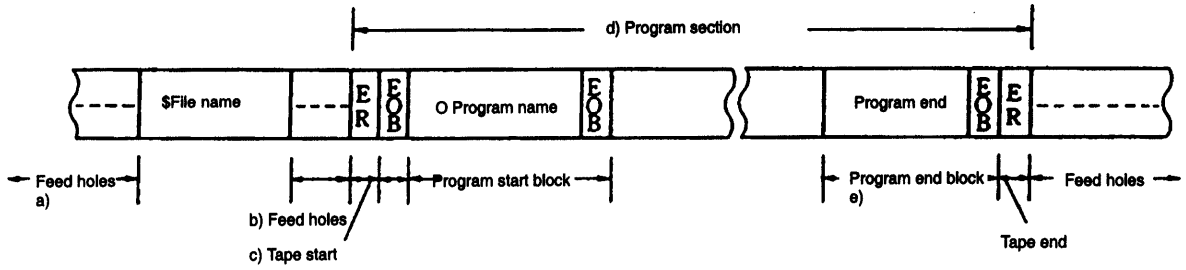


Fig. 2-24 Input Format (EIA Coding System)

a) Feed holes (In ISO coding: NUL or SPACE, in EIA coding: BLANK or SPACE)

b) Input the file name after the "$" symbol.

If no file name is specified, the same file name as that specified for the output NC program name will be automatically selected. If no output NC program name is specified, the name set will be "A.MIN".

c) Feed holes

d) Start and end the program section with the % (ER) code.

e) Always include M02 or M30, or END, or RTS, in the program end block.

[Supplement] : Codes that cannot be set in the EIA coding system can be replaced by codes that can be set so that they can be read. For details, see 8-3-3.

8-3-2. Output Format

(1) ISO Code

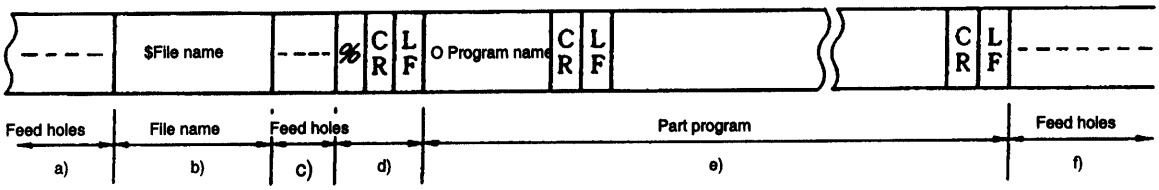


Fig. 2-25 Output Format (ISO Code)

(2) EIA Code

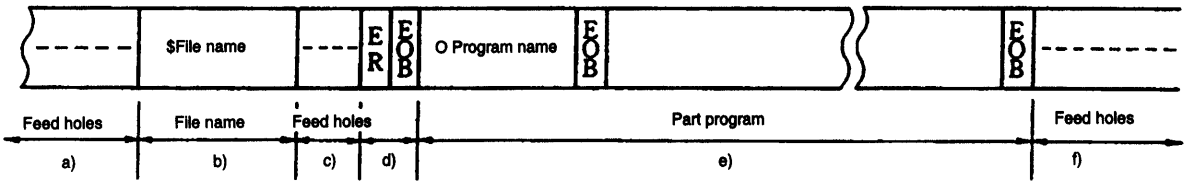


Fig. 2-26 Output Format (EIA Code) (1)

a) 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 Section3, "Parameters".

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

c) 50 tape feed holes are punched out.

The number of the tape feed holes cannot be changed.

d) Either of the following is punched out.

%, CR, and LF

ER and EOB

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

f) The same number of tape feed holes as in a) are punched out in the tape trailing section.

[Supplement] : 1. 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 or "ER" is punched out before feed holes.

[Supplement] : 2. The part program is split and punched out, if it si too long to be contained in one paper tape roll. Paper tape length may be changed from 1 to 300 meters (3 to 984 feed) 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 difference 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

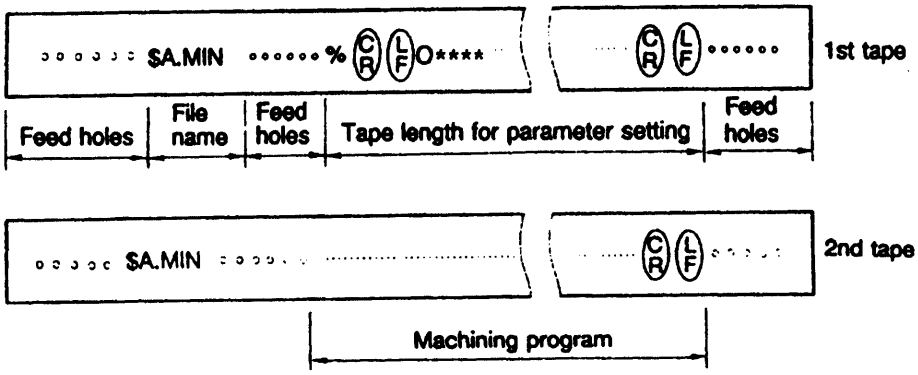


Fig. 2-27 Output Format (EIA Code) (2)

8-3-3. EIA Special Codes

(1) There are some characters, such as "=" and "*", that are not represented by codes in the EIA coding system. To make it possible to use these characters when creating an EIA program tape, other characters are sometimes temporarily substituted for them.

(2) When a program tape created in this way is read into the NC, the substituted characters must be converted back to "=" and "*" by using editing functions.

(3) This troublesome procedure is made easier by setting EIA special codes for the characters for which substitution is necessary in advance; the control then automatically substitutes the appropriate characters when a program is input from or output to tape.

a) Setting the EIA special codes

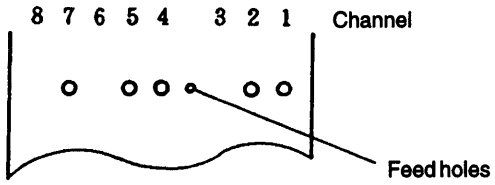
1) Special codes can be set for the following 6 characters:

= * [ ] $ #

2) Special codes are set as bit patterns in NC optional parameters (bit) No. 27 through 31 and No. 49.

NC optional parameter (bit) No. 27	Set the EIA code pattern that substitutes for "=".
NC optional parameter (bit) No. 28	Set the EIA code pattern that substitutes for "*".
NC optional parameter (bit) No. 29	Set the EIA code pattern that substitutes for "[".
NC optional parameter (bit) No. 30	Set the EIA code pattern that substitutes for "]".
NC optional parameter (bit) No. 31	Set the EIA code pattern that substitutes for "$".
NC optional parameter (bit) No. 49	Set the EIA code pattern that substitutes for "#".

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 OSP7000M.

[Supplement] :

1. When inputting a program in the EIA coding system, if the special code "$" is input at the head of the program, the character string immediately following the "$" is read as the file name (in EIA codes) for the program.

2. When outputting a program using the EIA coding system, if the "$" special code is set the file name will be punched out in EIA codes. If the "$" special code is not set, the file name will be punched out in ISO codes.

3. There is no check to determine whether or not the bit patterns assigned to special codes already represent characters in the EIA coding system.

   Example: If the special code for the character "=" is set as 01100001 (the EIA code for "A") and "A=B" is output for punching, what will actually be punched is "AAB". When the tape is read, the data will be interpreted as "==B".

4. Special codes are only converted when commands are executed in the PIP mode.

   They are not converted in the DNC mode.

8-4. Specifications

8-4-1. RS232C Interface

(1) Communication Method

Start-stop synchronization

This is a method in which a pre-determined signal is sent at the beginning and end of a character.

The data for each character comprises the following bits (see Fig. 8-6): (A) start bit (1 bit), (B) information bits (8 bits), (C) parity bit (1 bit), (D) stop bit (2 bits).

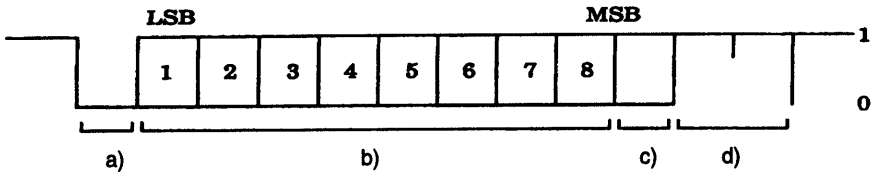


Fig. 2-28 Bit Configuration

(2) Baud Rate (BPS – baud)

110, 150, 200, 300, 600, 1200, 2400, 4800, 9600, 19200

(3) Data Configuration

Start bit	:	1 bit
Data bits	:	8 bits
Parity bit	:	1 bit or absent (selected by parameter setting)
Stop bits	:	1 bit or 2 bits (selected by parameter setting)

(4) Parity Check (character parity)

Odd/even parity or no parity check (selected by parameter setting)

(5) Max. Data Transmission Distance

RS232C	:	Cable length up to 15 m
RS422	:	Cable length up to 1200 m (RS232C-RS422 converter used)
Fiber-optic cable	:	Cable length is up to 2000 m (RS232C-optical converter used)

(6) RS232C Signal Levels

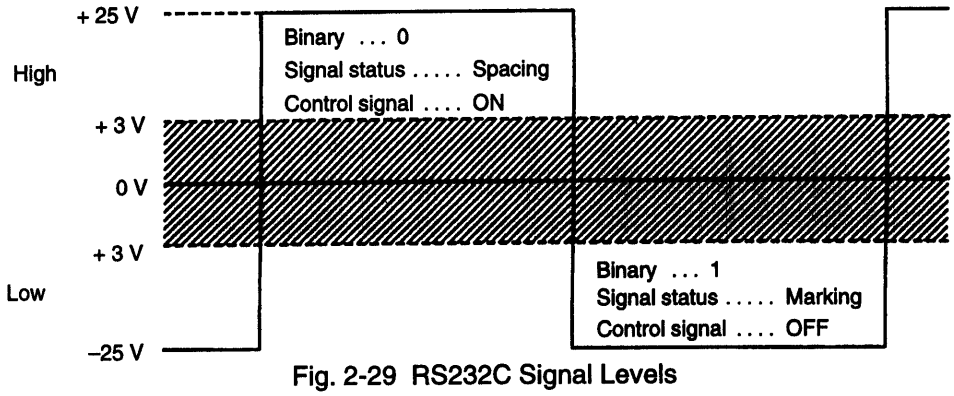
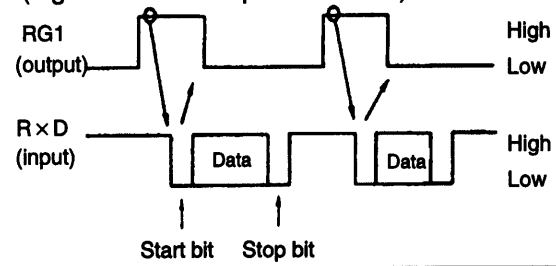
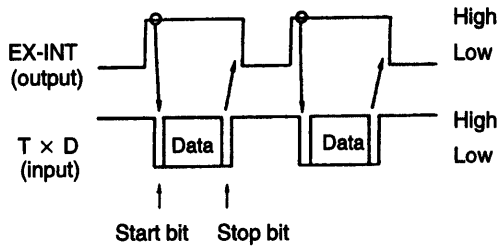


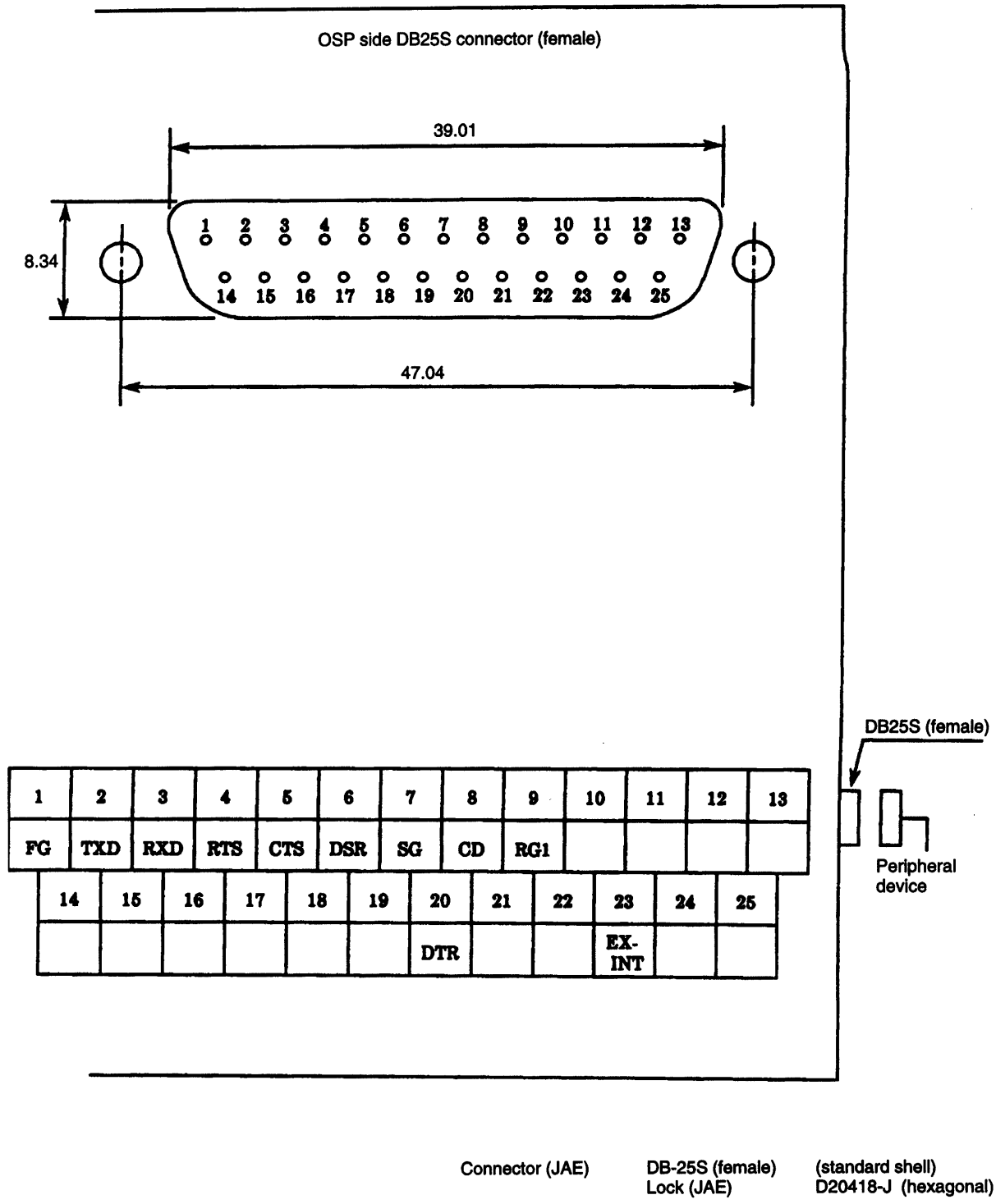
Fig. 2-29 RS232C Signal Levels

(7) Signal Descriptions

Pin No. (DB25)	Signal Name	Direction	Details
1	FG	—	Protective grounding
2	TXD	Output	Send data Data line from the OSP to peripheral devices.
3	RXD	Input	Send data Data line from peripheral device to the OSP.
4	RTS	Output	Request to send Comes ON when data transmission or reception starts. Thereafter, it is normally ON.
5	CTS	Input	Clear to send When this signal is OFF, data is not output from the OSP. Used for BUSY/READY control. If this signal is not used, connect the RTS signal at the NC.
6	DSR	Input	Data set ready Indicates that the peripheral device is in the communication enabled status. If this signal goes OFF during data communication, an error will occur at the OSP. This signal cannot be used to execute BUSY/READY control. If this signal is not used, connect it to DTR at the OSP side.
7	SG	—	Connection for signals
9	RG1	Output	Data request (register 1) This signal is used to execute receive BUSY control at the OSP side. It comes ON when the OSP is in the reception enabled status and data transfer from a peripheral device is requested. It goes OFF on reception of a start bit from the peripheral device (it goes OFF once per character). 
10	RG2	Output	Register 2 Presently not used.
11	SG	—	Grounding for signal
12	SG	—	Grounding for signal

Pin No. (DB25)	Signal Name	Direction	Details
13	SG	—	Grounding for signal
20	DTR	Output	Data terminal ready This signal comes ON when the OSP is ready for operation. If data is transferred to the OSP while this signal is OFF, it will not be read by the OSP.
23	EX-INT	Input	External interrupt This signal is used for BUSY/READY control at the peripheral device side. When this signal is used, the following applies for transfer of each character: (1) When the signal is OFF, the OSP cannot start data transfer. (2) When data transfer starts, this signal temporarily goes OFF; when it comes ON again the next data is transferred. (It goes through the sequence ON, OFF, and ON for each character).  The EXT-INT signal cannot be used for a peripheral device which has a buffer, meaning that the ready signal does not switch ON/OFF for every character. For this type of device, use the CTS signal.

(3) Connector Layout



Connector (JAE) DB-25S (female) (standard shell)
Lock (JAE) D20418-J (hexagonal)

Fig. 2-30 Connector Layout

8-5. Connection to Peripheral Devices

If the peripheral device is to be connected via a FACIT4070 parallel interface, all that is required is to select a cable that matches the connector pin layout at the NC side; punching can start immediately after the connection of a peripheral device. However, if an RS232C interface is used, since the signals used vary according to the peripheral device used, a special-purpose cable is required to connect the relevant signals.

A typical example is shown below.

8-5-1. BTR System (No DC Codes)

Example 1:

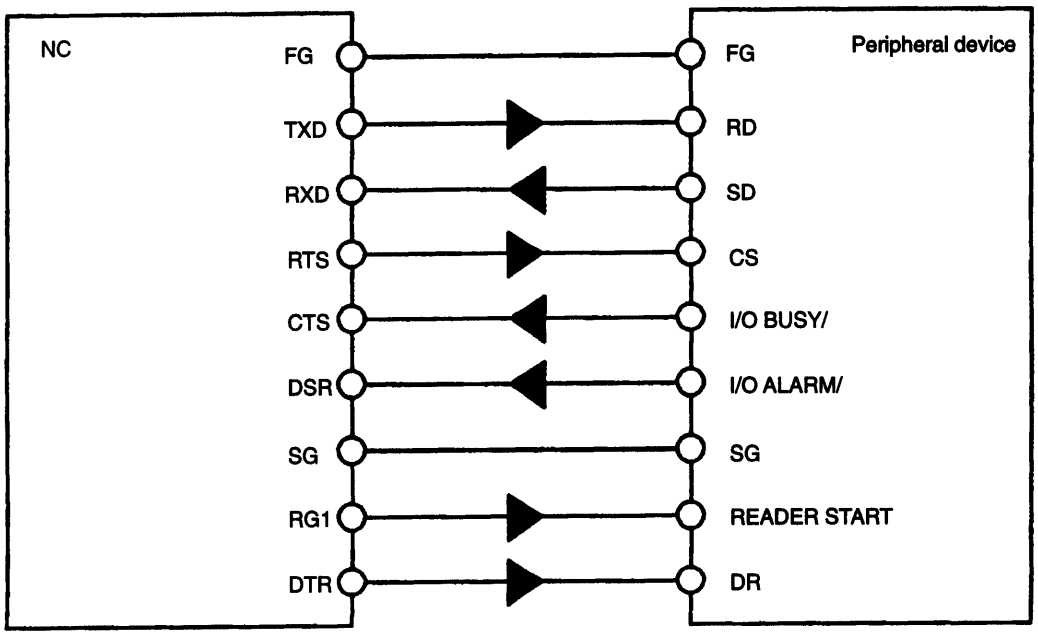


Fig. 2-31 Connection for BTR System (No DC Codes) (1)

[Supplement] : Since no EXT-INT signal is used in this example, bit 1 of NC optional parameter (bit) No. 8 (No. 13, 14, 21, 22) (Ready signals of CN0: to CN4:) should be set to "1" in advance.

(1) Timing Chart for READ

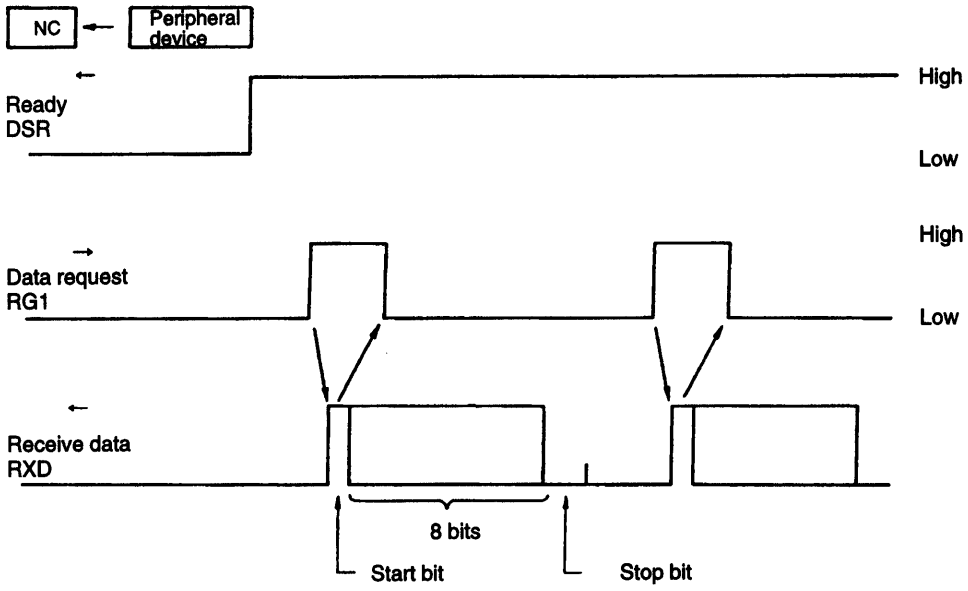


Fig. 2-32 Timing Chart for READ [BTR System (No DC Codes)]

a) Data request signal RG1 is output from the NC.

b) On receiving this signal, the peripheral device transfers serial data.

c) The data request signal is forcibly set to the "Low" status in the interface circuit by the start bit in the received data.

(2) Timing Chart for PUNCH and LIST

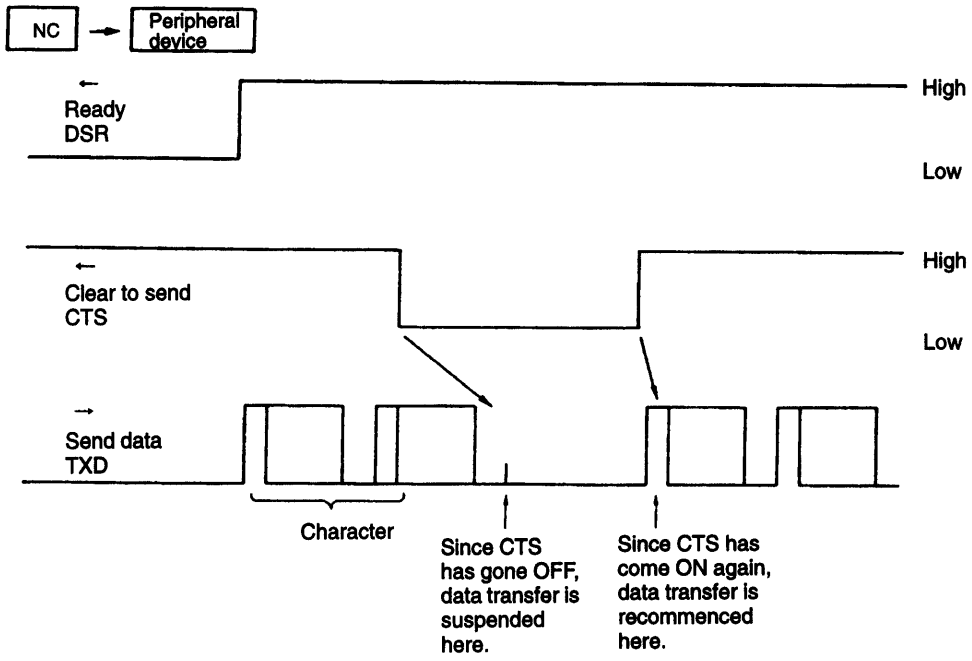


Fig. 2-33 Timing Chart for PUNCH and LIST [BTR System (No DC Codes)]

a) While CTS is OFF, no data is sent from the NC.

b) If CTS goes OFF during data transfer, data transfer is suspended within two characters from that point.

c) When CTS comes ON again, data transfer is recommenced.

Example 2:

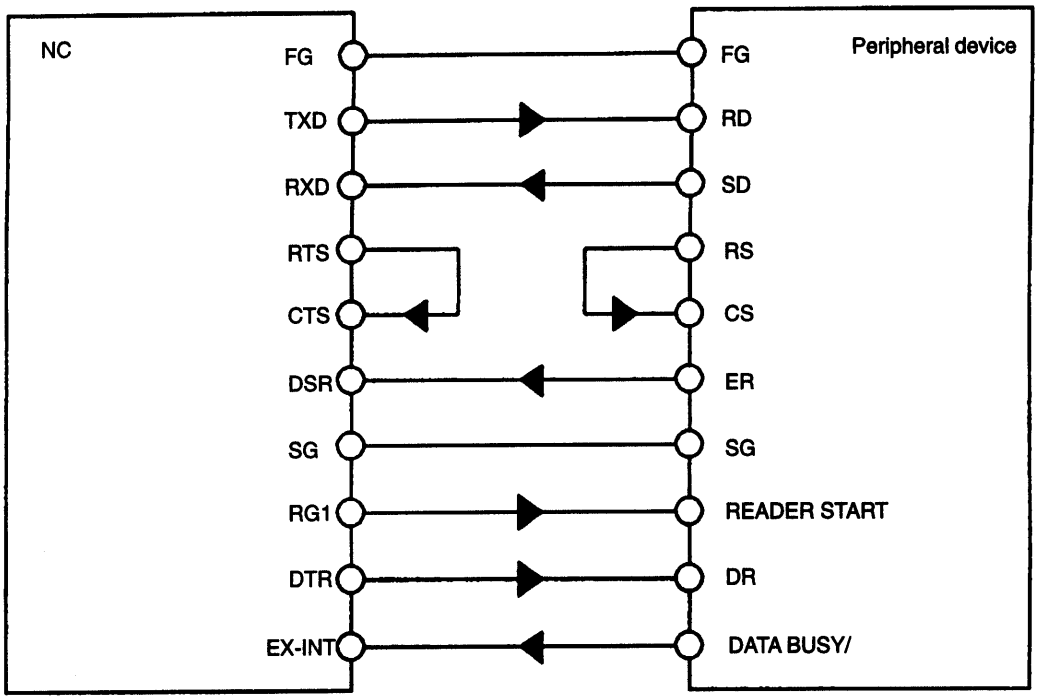


Fig. 2-34 Connection for BTR System (No DC Codes) (2)

[Supplement] : Since an EXT-INT signal is used in this example, bit 1 of NC optional parameter (bit) No. 8 (No. 13, 14, 21, 22) (Ready signals of CN0: to CN4:) should be set to "0" in advance.

(3) The timing chart for READ is the same as that shown in Example 1.

(4) Timing Chart for PUNCH

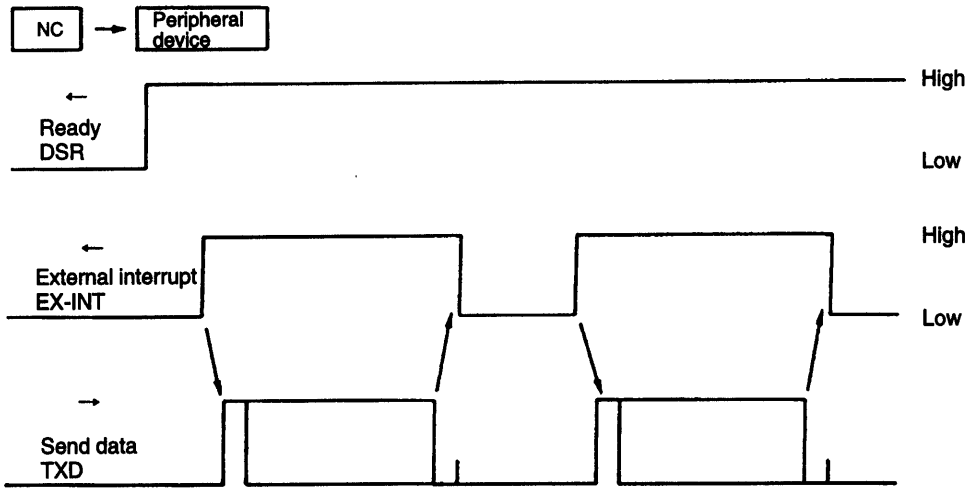


Fig. 2-35 Timing Chart for PUNCH [BTR System (No DC Codes)]

a) When the external interrupt signal EXT-INT comes ON, data is sent from the NC.

b) On reading the stop bit, the peripheral device forcibly sets the external interrupt signal to "Low". It is essential that the external interrupt signal be set to "Low" temporarily.

c) On completion of processing, the peripheral device switches the EXT-INT signal ON again.

8-5-2. DC Code Control

When DC code control is effective, the NC outputs DC control codes to control data transfer.

The user can select whether or not DC code control is performed by parameter setting.

The available DC control codes are DC1 through DC4, as shown below.

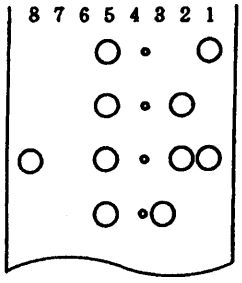
"DC" is the abbreviation for "device control", and these device control characters serve to start peripheral devices.

DC1 : Tape reader start →

DC2 : Tape punch start →

DC3 : Tape reader stop →

DC4 : Tape punch stop →



[Supplement] : 1. Since DC control codes are automatically generated from the NC, the user does not have to write them into programs.

2. The control codes used are the ones shown above, regardless of whether the ISO or EIA coding system is used.

3. The NC unit cannot be controlled by control codes sent from the peripheral device.

Example 1:

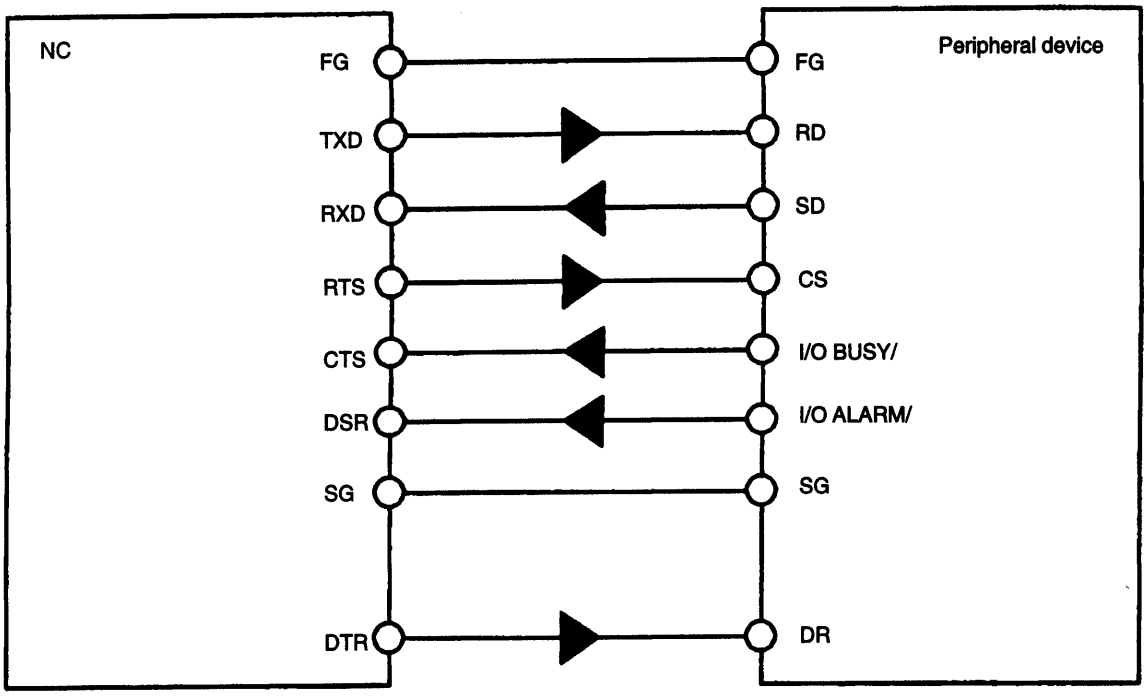


Fig. 2-36 Connection for DC Code Control

[Supplement] : Since no EXT-INT signal is used in this example, bit 1 of NC optional parameter (bit) No. 8 (No.13, 14, 21, 22) (Ready signals of CN0: to CN4:) should be set to "1" in advance.

(1) Timing Chart for READ

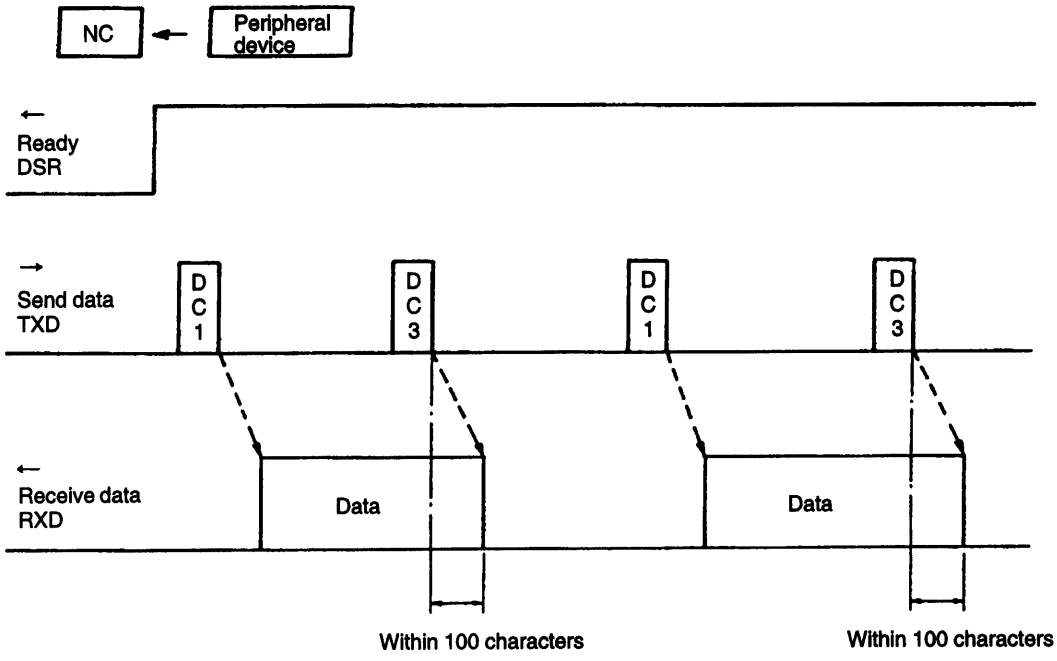


Fig. 2-37 Timing chart for READ (DC Code Control)

a) The NC sends the DC1 code.

b) On receiving the DC1 code, the peripheral device starts transferring data to the NC.

c) After reading the program name, the NC sends the DC3 code.

d) On receiving the DC3 code, the peripheral device suspends transfer of data to the NC. Data transfer stops within 100 characters after transmission of the DC3 code.

e) When processing at the NC is completed, the NC sends the DC1 code again.

f) On receiving the DC1 code, the peripheral device starts transferring the data immediately following the data sent in the last transfer operation.

g) The NC sends a DC3 code and a DC1 code during reading of each 256-character section of the NC program (equivalent to a tape length of 0.65 m).

h) The peripheral device sends the end of record code and data transfer is terminated.

i) On completion of data reading, the NC sends the DC3 code.

(2) Timing Chart for PUNCH

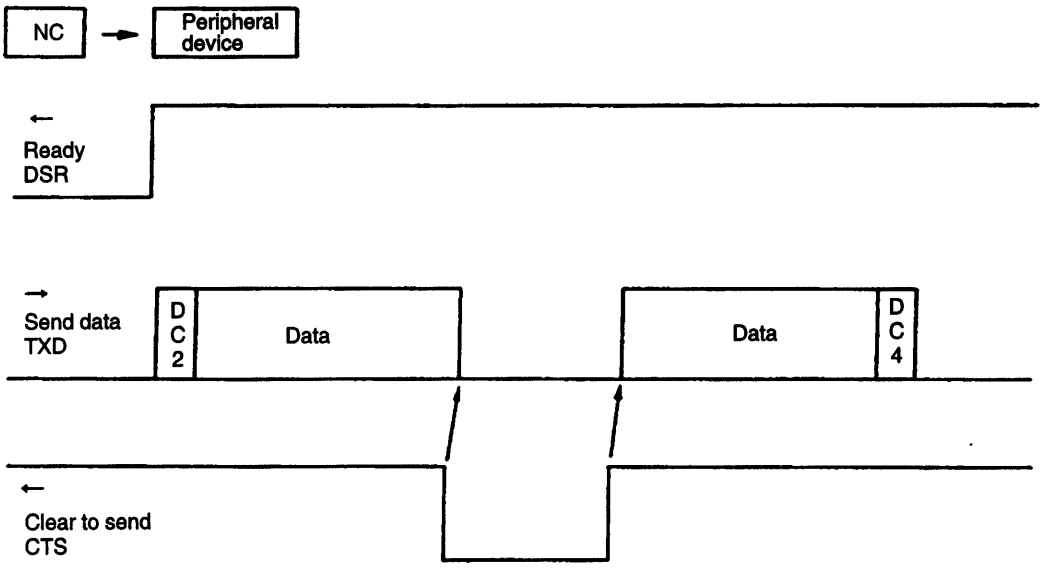


Fig. 2-38 Timing Chart for PUNCH (DC Code Control)

a) The NC sends the DC2 code.

b) If the CTS signal is ON, the data to be transferred is sent immediately following the DC2 code.

c) When the CTS signal goes OFF, data transfer is suspended.
When the CTS signal comes ON again, the NC starts transferring the data following the previous transfer data.

d) When data transfer is completed, the NC sends the DC4 code.

8-5-3. DC Code Control TYPE2

In the standard DC code control described in 8-5-2, DC codes can only be output from the NC. In TYPE2 control however, DC codes can also be output from the peripheral device.

When this type of control is used, the NC uses the four control codes DC1, DC2, DC3 and DC4, and the host computer side uses two: DC1 and DC3.

DC Code	NC	Host Computer
DC1	Enables data reading: (1) Starts data reading. (2) Cancels temporary stops.	Enables data reading: (1) Responds to DC2. (2) Cancels temporary stops.
DC2	Sent to the peripheral device at the beginning of a data transfer operation as a data reading request.	
DC3	Requests temporary stoppage of data transfer from the peripheral device.	Requests temporary stoppage of data transfer from the NC.
DC4	Terminates data transfer.	

To make TYPE2 control effective, set "1" for both the standard DC code control bit and the DC code control TYPE2 bit in the NC optional parameter (bit) for the relevant channel.

Example 1:

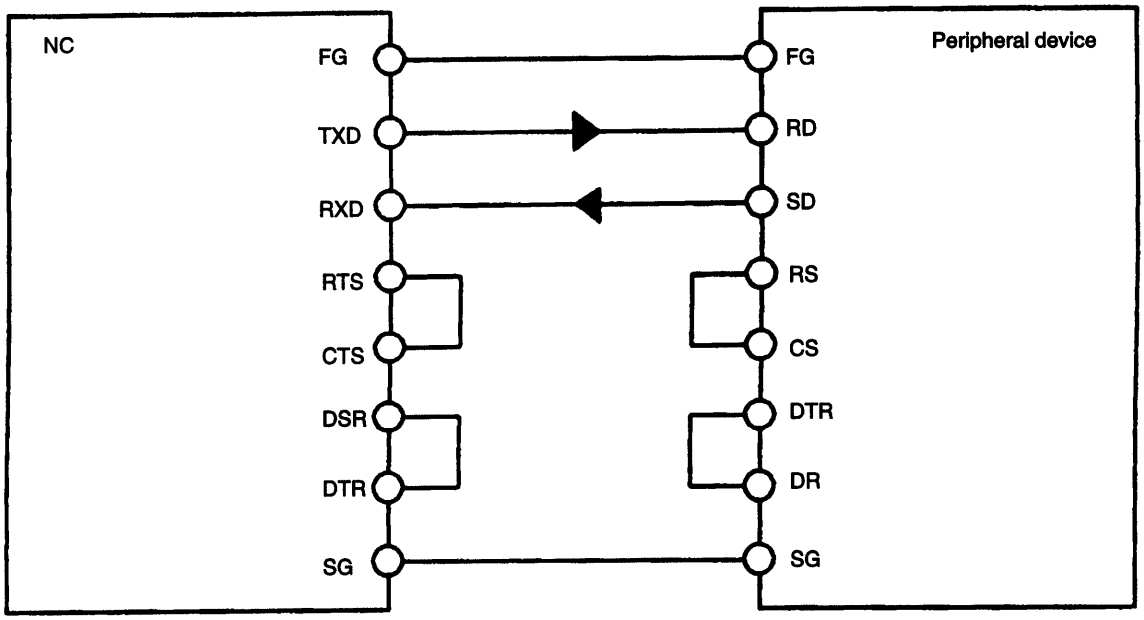


Fig. 2-39 Connection for DC Code Control TYPE2

(1) Timing Chart for READ

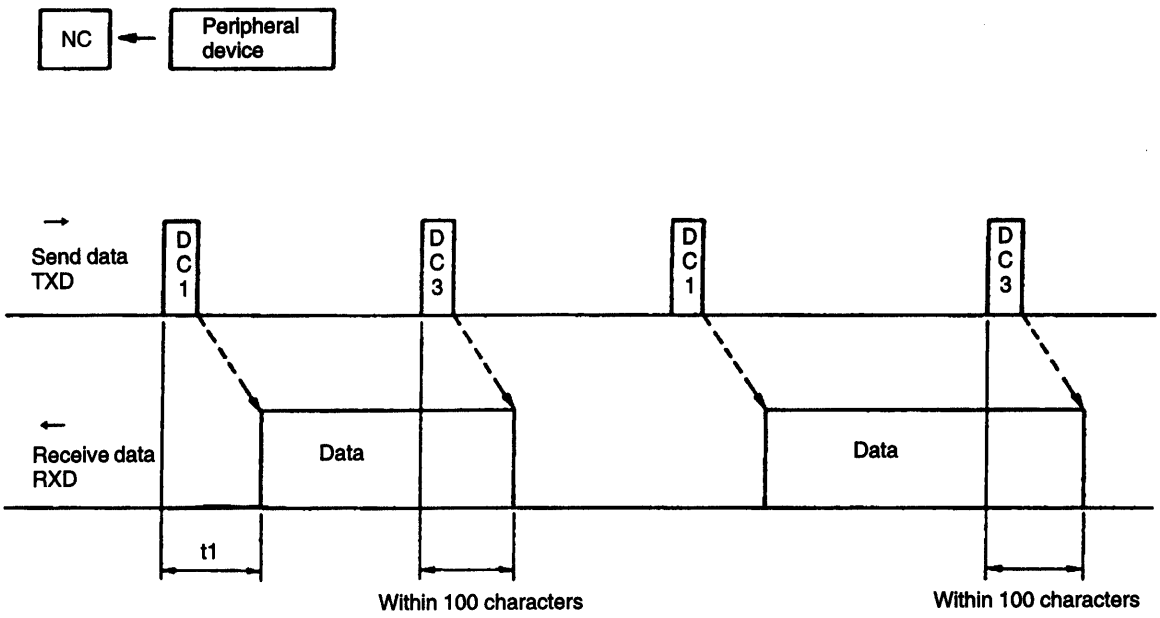


Fig. 2-40 Timing Chart for READ (DC Code Control TYPE2)

a) The NC sends the DC1 code.

b) On receiving the DC1 code, the peripheral device starts transferring data to the NC.

c) After reading the program name, the NC unit sends the DC3 code.

d) On receiving the DC3 code, the peripheral device suspends transfer of data to the NC. Data transfer stops within 100 characters after transmission of the DC3 code.

e) When processing at the NC is completed, the NC sends the DC1 code again.

f) On receiving the DC1 code, the peripheral device starts transferring the data immediately following the data sent in the last transfer operation.

g) The NC sends a DC3 code and a DC1 code during reading of each 256-character section of the NC program (equivalent to a tape length of 0.65 m).

h) The peripheral device sends the end of record code and data transfer is terminated.

i) On completion of data reading, the NC sends the DC3 code.

(2) Timing chart for PUNCH

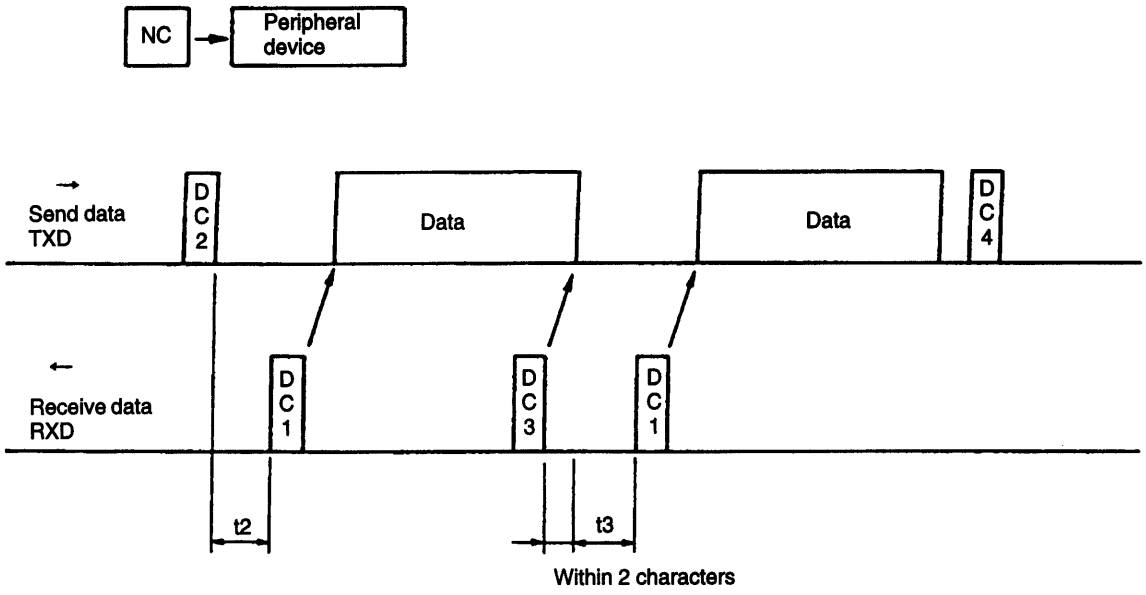


Fig. 2-41 Timing Chart for PUNCH (DC Code Control TYPE2)

a) The NC sends the DC2 code.

b) On receiving the DC2 code, the peripheral device sends the DC1 code to the NC.

c) On reading the DC1 code, the NC starts transferring data to the peripheral device.

d) If reception processing for the data transfer cannot keep pace with data reception, the peripheral device sends the DC3 code.

e) The NC stops data transfer within 2 characters after receiving the DC3 code.

f) After completing the processing backlog, the peripheral device sends the DC1 code again.

g) On receiving the DC1 code, the NC starts transferring the data immediately following the data sent in the last transfer operation.

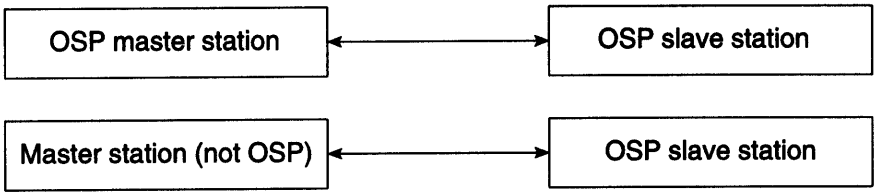
h) The NC sends the end of record code at the beginning of the transfer data and the DC4 code when data transfer is completed.

[Supplement] : If the times t1, t2 and t3 overrun the set values for the ready completion waiting times for the RS-232C channels set in the NC optional parameters (word), an RS232C device reading error occurs.

8-5-4. Slave Station Function

If an attempt is made to transfer data between two OSPs, it is normally impossible because both of the OSPs function as master stations. The slave station function allows communication between two OSPs by making one of them a slave station.

In the slave station mode, an OSP operates in the same way as a tape reader/punch.



Example: Example connection to a peripheral device when using the slave station function

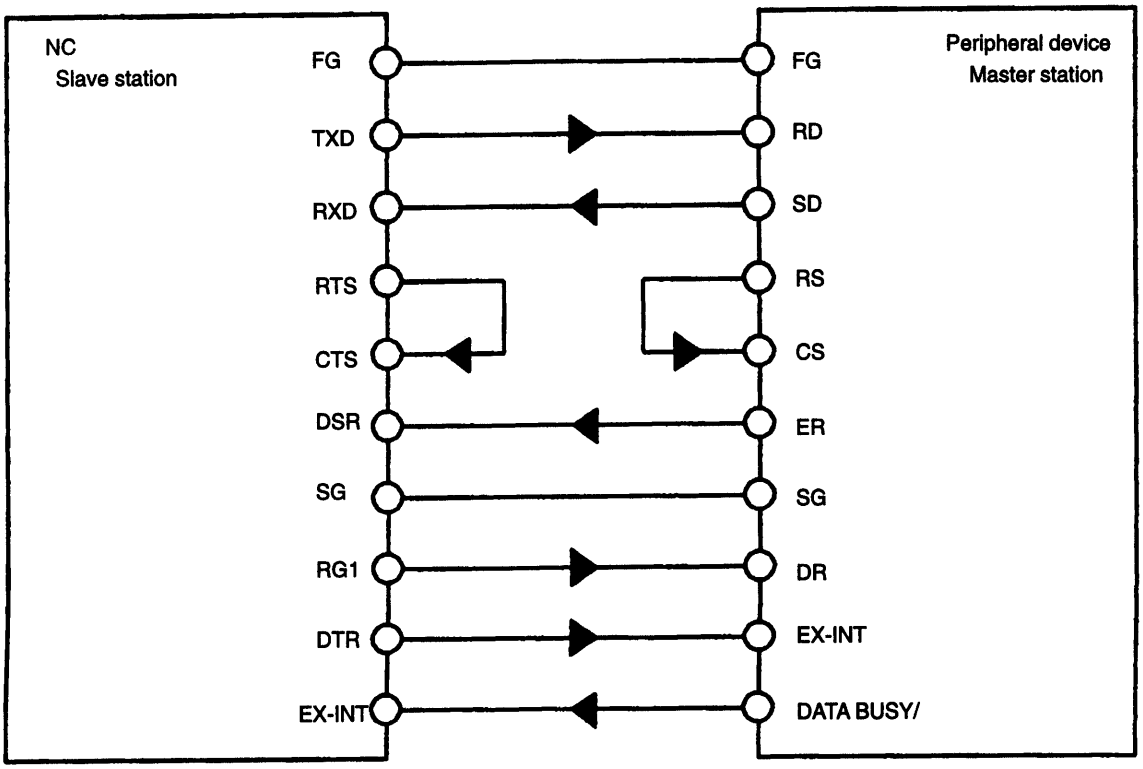


Fig. 2-42 Example Connection (1)

[Supplement] : Since an EXT-INT signal is used in this example, bit 1 of NC optional parameter (bit) No. 8 (No. 13, 14, 21, 22) (Ready signals of CN0: to CN4:) should be set to "0" in advance.

a) The timing chart for READ is the same as the one shown in 8-5-1 (Example 1).

b) The timing chart for PUNCH is the same as the one shown in 8-5-1 (Example 2).

c) When reading, the tape feed data following the program section is ignored.

When punching, the tape feed data following the program section is not punched out.

d) Notwithstanding c) above, if the end of record code is NULL, one character of NULL data is punched out.

Example: Example connection to a peripheral device when using the slave station function and DC code control

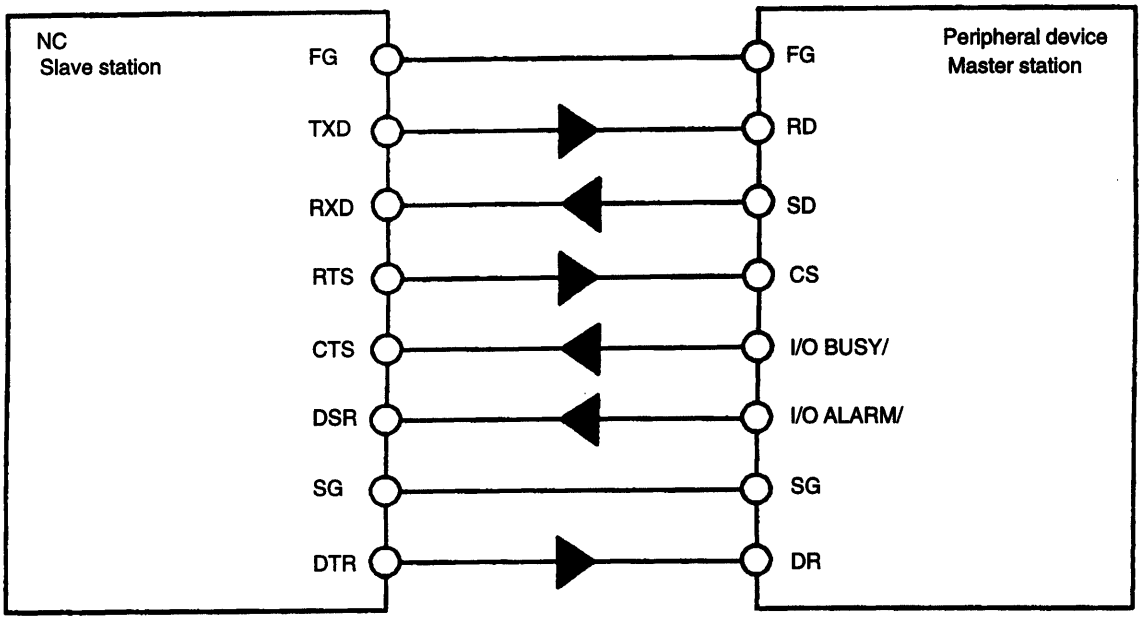


Fig. 2-43 Example Connection (2)

[Supplement] : Since no EXT-INT signal is used in this example, bit 1 of NC optional parameter (bit) No. 8 (No. 13, 14, 21, 22) (Ready signals of CN0: to CN4:) should be set to "1" in advance.

(1) Timing Chart for READ

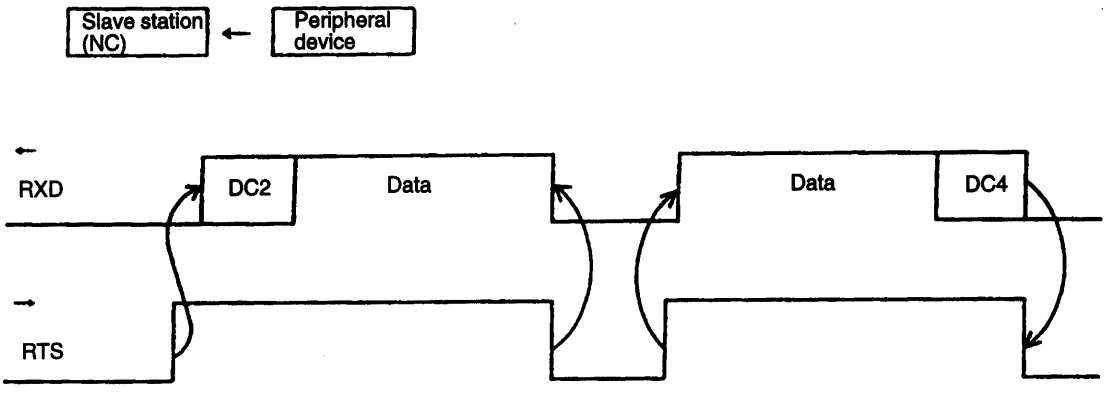


Fig. 2-44 Timing Chart for READ (Slave Station Function)

a) When reading operation is executed at the NC, the RTS signal is switched ON.

b) The peripheral device outputs the DC2 code.

c) On reading the DC2 code, the NC starts data input processing.

d) When the NC needs to stop reading temporarily to execute processing, it switches the RTS signal OFF. When this signal goes OFF, the peripheral device suspends data transfer to the NC.

e) On completing the backlog of processing, the NC unit switches the RTS signal back ON.

When the RTS signal comes ON, the peripheral device recommences data transfer to the NC.

f) The peripheral device outputs the DC4 code to terminate data transfer.

g) On reading the DC4 code, the NC switches the RTS signal OFF, terminating data reading.

(2) Timing Chart for PUNCH

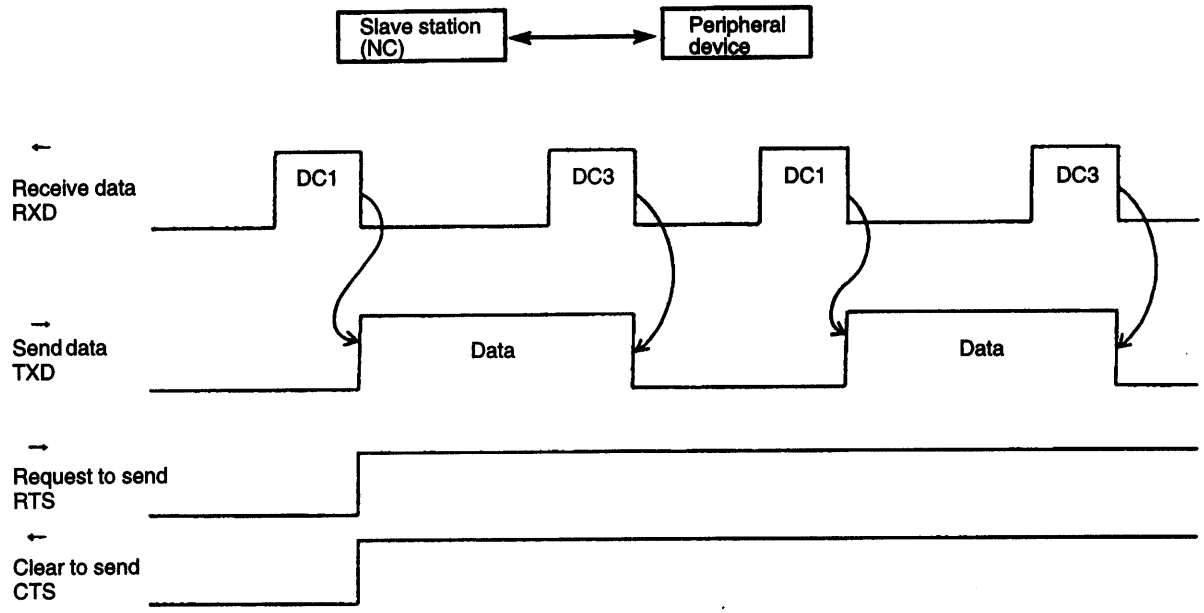


Fig. 2-45 Timing Chart for PUNCH (Slave Station Function)

a) On reading the DC1 code sent from the peripheral device, the NC executes punch processing of the data.

b) On reading the DC3 code sent from the peripheral device, the NC suspends punch processing.

c) On reading a DC1 code sent from the peripheral device again, the NC recommences punch processing.

d) When all the data has been punched, the NC terminates punch processing on reception of the DC3 code from the peripheral device.

Example: Example connection between OSPs using the slave station function

Communication between two OSPs is executed by making one the master station and the other the slave station.

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

OSP DB25

Pin No.	Signal Name
1	FG
3	RXD
2	TXD
5	CTS
4	RTS
20	DTR
7	SG
6	DSR
11	

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

(1) For the parameters indicated above, set the same values for the two OSPs.

(2) Set the channel used for the peripheral device by setting NC optional parameter (word) No. 45 (designation of punch device) and NC optional parameter (word) No. 57 (designation of read device) in advance.

(3) Bits 0 to 4 of NC optional parameter (bit) No. 40 are used to select master or slave status for each channel: set one of the two OSPs as the master station (set "0") and the other as the slave station (set "1").

(4) On completion of the steps above, communication between the two OSPs will be possible.

8-6. Example Punch Connections

The following connection examples assume that the punching device is connected at CN0: (FRP board).

(1) FACIT : FACIT 4070

(2) FACIT : FACIT N1000

(3) KYORITSUSHA : All punch models

(4) KYORITSUSHA : Accumulator D60

(5) CITIZEN : Protyper 7652NC

(6) CITIZEN : CRP-2500

(7) CASIO : 650NC, 750NC

(8) JBN : PR30

(9) NEC DATA TERMINALS : NDT-9501

(10) TANAKA BUSINESS MACHINES : PT30RS

(11) TANAKA BUSINESS MACHINES : PT30RP

(12) FANUC : PPR

(13) MIKUNI TOKUSHU KIKI : CF30, CF10

(14) TAKAHASHI DENKI : HFD-35

(15) ANRITSU : DPT610A

(16) ACC SYSTEM : PT-PR

[Supplement] : The specifications of these punches are subject to change without prior notice. Be aware that such changes may make it impossible to punch out data using the connection examples that follow.

These connection examples are applicable at the time of writing (March, 1986).

8-6-1. FACIT 4070

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

FACIT4070 DB25P (slide lock)

Pin No.	Signal Name
1	FG
3	RD
20	DTR
7	SG

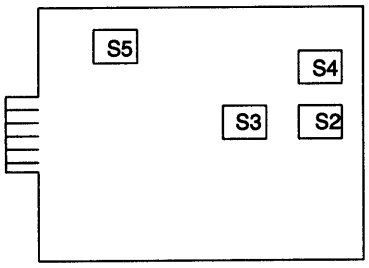
NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	0	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	600

* indicates either "0" or "1" can be set.

Punch Switch Settings



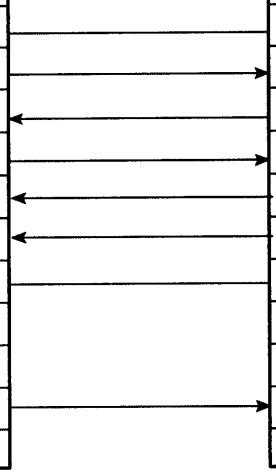
RS232C interface

- S1 : SER (SER, PAR, SERIAL WITH ERROR CODE)
- S2 : No. 1 ON, others OFF
- S3 : No. 6 ON, others OFF
- S4 : No. 4 ON, others OFF
- S5 : All OFF

8-6-2. FACIT N1000

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23



FACIT N1000

Pin No.	Signal Name
1	FG
3	RXD
2	TXD
5	CTS
4	RTS
20	DTR
7	SG
6	DSR

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

46 Set bit 3 of NC optional parameter (bit) No. 1 to "1" (tape delimiting code: %).

FACIT N1000 Parameter Settings:

Parameter

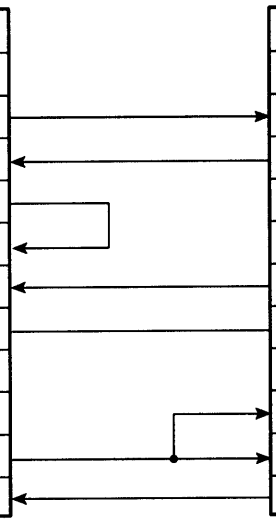
1-1 RS232C (input port)
1-2 RS232C (output port)
1-3 ASC (input code)
1-4 ASC (output code)
1-5 ON (file marker on input)
1-6 DC (end of record code)
1-7 OFF (file marker on output)
1-8 OFF (TV check)

2-1 2400 (baud rate)
2-2 7 (word length)
2-3 2 (stop bit)
2-4 EVEN (even parity)
2-5 NC (DC1/DC3 control executed)

8-6-3. KYORITSUSHA – ALL Models (Tape Punch)

OSP

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23



Kyoritsu punch DB25P (slide lock)

Pin No.	Signal Name
10	RD
1	SD
2	DTR
7	SG
11	DSR
12	CTS
5	RS

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

46 Set bit 3 of NC optional parameter (bit) No. 1 to "1" (tape delimiting code: %).

Punch Switch Settings (for KRP8250)

Left Right

0	5

Left

No.	Functions
0	DC codes used
1	Not used
2	ISO/EIA
3	ISO/ASK II
4	No DC codes
5	Not used
6	Not used
7	Local test
8	Stop bit: 1
9	Not used

Right

No.	Baud Rates
0	Not used
1	110
2	300
3	600
4	1200
5	2400
6	4800
7	Not used
8	Not used
9	Not used

8-6-4. KYORITSUSHA – Accumulator D60

OSP

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

D60 DB25P (screw lock type)

Pin No.	Signal Name
3	RXD
2	TDX
6	DTR
7	SG
5	CTS
8	DSR
4	RTS

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

8-6-5. CITIZEN – 7652NC

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

7652NC DB25 (screw lock type)

Pin No.	Signal Name
1	FG
3	RD
2	SD
4	RS
5	CS
20	ER
7	SG
18	READERSTART
6	DR
11	DATA BUSY/

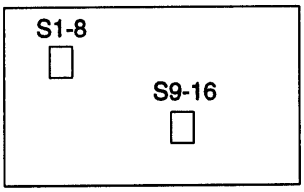
NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

7652NC Switch Settings (Open the Punch's Rear Door to Set the Switches.)



S1, S2, S4, S5, S9, S10, S12, S13, S15 → ON

S3, S6, S7, S8, S11, S14, S16, → OFF

S17 to S36 all OFF

8-6-6. CITIZEN – CRP-2500

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

CRP-2500

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
20	ER
7	SG
6	DR

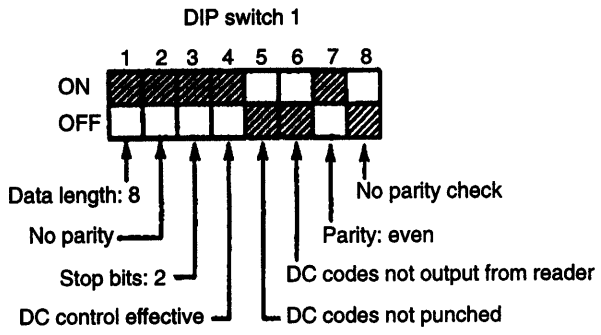
NC Parameters OSP

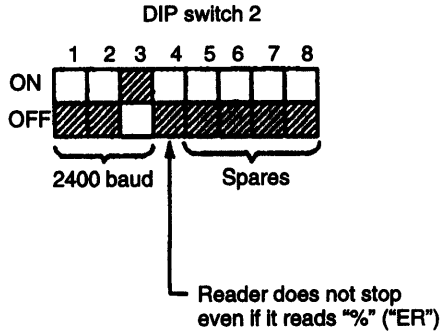
	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

Punch DIP Switch Settings





8-6-7. CASIO – 650NC, 750NC

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

650NC, 750NC DB25 (screw lock type)

Pin No.	Signal Name
1	FG
3	RD
2	SD
8	CD
20	ER
7	SG
5	CS
6	DR
4	RS

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	300

* indicates either "0" or "1" can be set.

650NC Switch Settings

(Switch Name)	(23 Switch Position)			
Spec	10C	SW1, SW2, SW3, SW4, SW5, SW9, SW10	→	ON
		SW6, SW7, SW8	→	OFF
Level	1B	SW1 to SW4	all ON	
Baud rate	11G	Set the slide switch to "300".		

8-6-8. JBM – PR30

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

JBM PP30 DB25 (screw lock type)

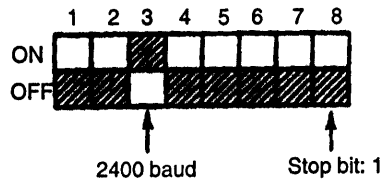
Pin No.	Signal Name
9	RD
14	SD
15	CTS
13	RTS
24	P.ON
25	GND

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

PR-30 Switch Settings
(DIP Switch Settings)



No. 3 ON, all others OFF

* indicates either "0" or "1" can be set.

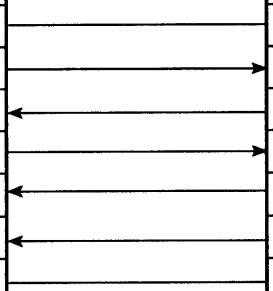
* The punch can be used regardless of whether DC code control is performed or not, but when using the tape reader supplied as an accessory to the punch, DC code control must be effective.

Note : JBM punches that do not have □ × □□□ inscribed on their name plates are for use with parallel data only and cannot be used for RS232C applications.

8-6-9. NEC DATA TERMINALS – NDT-9501

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23



NDT-9501

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
6	DR
7	SG

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
Optional parameter (bit) No. 8	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

* indicates either "0" or "1" can be set.

Set bit 3 of NC optional parameter (bit) No. 1 to "1" (tape delimiting code: %).

NDT-9501 Settings

- Coding system : ISO (standard for OSP)
- Baud rate : 2400 BPS (standard for OSP)

The JBM data collector DC1 is the same device as the NDT-9501.

Note: Since the NDT-9501 ignores data until the first % code is received, the file name is not recorded when data including a file name is sent from the OSP. Consequently, when data is sent from the NDT-9501 to the OSP, it does not include a file name.

8-6-10. TANAKA BUSINESS MACHINES – PT-30RS

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

TCM PT-30RS DS25P (screw lock type)

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
20	ER
7	SG
4	RS

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

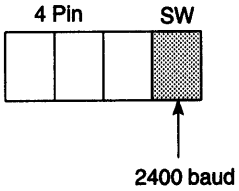
NC optional parameter (word) No. 6	Baud Rate
	2400

* Punching (printing): possible regardless of whether or not DC code control is effective.

Reader: Can only be used if DC code control is effective.

* indicates either "0" or "1" can be set.

Punch Switch Settings



8-6-11. TANAKA BUSINESS MACHINES – PT-30RP

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

TBM PT-30RP DS25P (screw lock type)

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
20	ER
7	SG

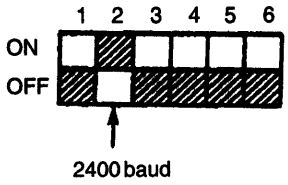
NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

Punch Switch Settings

6-pole DIP SW



No. 2 ON, all others OFF

* Punching (printing): possible regardless of whether or not DC code control is effective.

Reader: Can only be used if DC code control is effective.

* indicates either "0" or "1" can be set.

☆ PT-30R
PT-30P
PT-30RP
PT-30M INI

Printing out with these models is possible using the same connection.

R : Punch, reader
P : Punch, printer
PR: Punch, printer, reader

8-6-12. FANUC – PPR

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

PPR DB25S (screw lock type)

Pin No.	Signal Name
1	FG
2	RD
3	SD
4	CS
5	$\overline{\text{I/O BUSY}}$
6	$\overline{\text{I/O ALARM}}$
7	SG
8	
20	DR

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	4800

Note: * *indicates either "0" or "1" can be set.*

* If the bit for standard DC code control is not set to "1", press the PTP key at the FANUC PPR.

* The punch can be used regardless of whether DC code control is performed or not, but when using the tape reader supplied as an accessory to the punch, DC code control must be effective.

8-6-13. MIKUNI TOKUSHU KIKI – CF30, CF10

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

CF30, CF10 DB25S

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
20	ER
7	SG
8	CD

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	4800

Note: * *indicates either "0" or "1" can be set.*

Optional parameter (bit) No. 1	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
	Condition set	Special tape codes ignored	Special tape code alarm	Tape rewind	Tape read verify	Tape delimiter code: % (ER)	Tape TV check	Automatic tape code recognition	Tape coding system

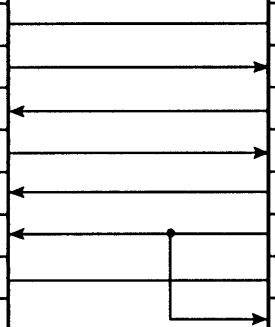
NC optional parameter (word) No. 34	RS232C Busy Time
	60 (seconds)

Note: * *indicates either "0" or "1" can be set.*

8-6-14. TAKAHASHI DENKI – HFD-35

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23



HFD-35

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
20	ER
7	SG
8	CD

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

Note: * *indicates either "0" or "1" can be set.*

Optional parameter (bit) No. 1	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
	Condition set	Special tape codes ignored	Special tape code alarm	Tape rewind	Tape read verify	Tape delimiter code: % (ER)	Tape TV check	Automatic tape code recognition	Tape coding system

Note: * *indicates either "0" or "1" can be set.*

8-6-15. ANRITSU – DPT610A

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23

DPT 610A

Pin No.	Signal Name
1	FG
3	RD
2	SD
5	CS
4	RS
20	ER
7	SG
6	DS

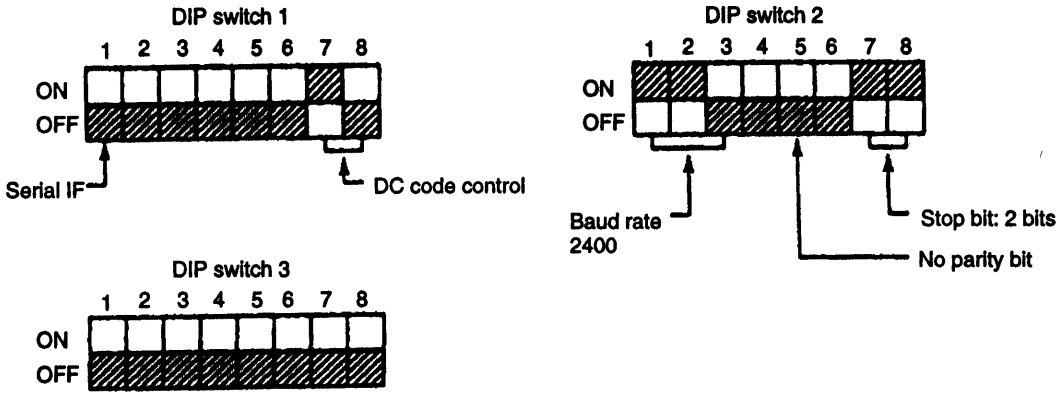
NC Parameters OSP

Optional parameter (bit) No. 8	Bit	7	6	5	4	3	2	1	0
	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	2400

Note: * *indicates either "0" or "1" can be set.*

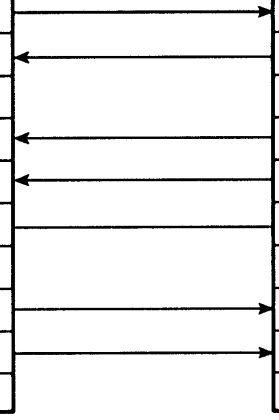
Punch Settings



8-6-16. ACC SYSTEM – PT-PR

OSP DB25

Signal Name	Pin No.
FG	1
TXD	2
RXD	3
RTS	4
CTS	5
DSR	6
SG	7
CD	8
RG1	9
DTR	20
EX-INT	23



PT-PR

Pin No.	Signal Name
3	RD
2	SD
4	RS
20	ER
7	SG
5	CS
6	DSR

NC Parameters OSP

	Bit	7	6	5	4	3	2	1	0
Optional parameter (bit) No. 8	Data	0	0	1	*	0	0	1	0
	Condition set	File name read/not read	DC code control TYPE 2	Standard DC code control	8-bit JIS/7-bit JIS	Even/odd parity	Parity check performed/ not performed	Ready signal setting	1-bit/2-bit stop bit

NC optional parameter (word) No. 6	Baud Rate
	600

Note: * *indicates either "0" or "1" can be set.*

9. OSP FORMAT I/O FUNCTION

Conventionally, NC part programs are stored on paper tape; this function makes storage possible on floppy disks instead. Either 3.5 inch or 8 inch floppy disks can be used (Note 1).

See 9-3-3 for details on physical formats and logical formats.

Note that the floppy disk drive for 8-inch floppy disks is an option.

9-1. Floppy Disk Drive

(1) Built-in Type 3.5 Inch Floppy Disk Drive

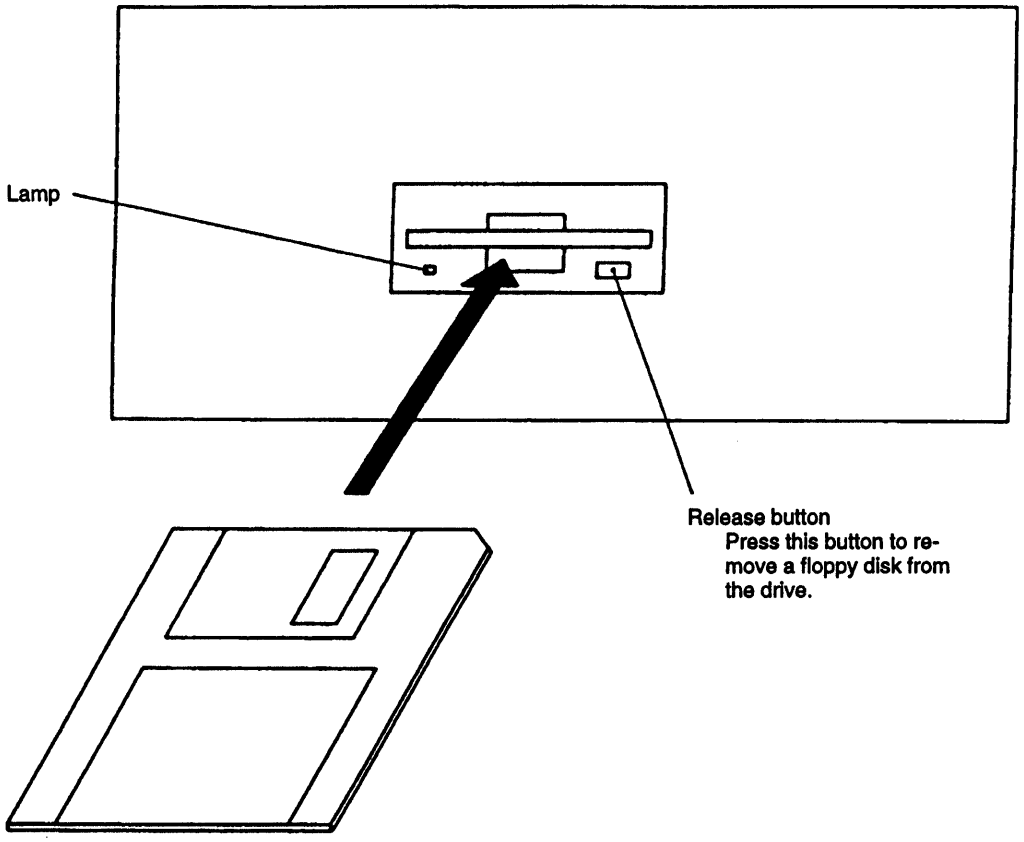


Fig. 2-46 Built-in Type 3.5 Inch Floppy Disk Drive

One of the device names – FD0: or FD1: – is indicated on the floppy disk drive unit; use the unit in accordance with this indication.

a) Installing a floppy disk

Insert the floppy disk into the drive while it is oriented as shown above. Make sure that it clicks home properly.

b) Removing a floppy disk

Press the release button to remove a disk.

[Supplement] : 1. The lamp on the drive is lit only while disk reading or writing is in progress.

2. The lamp does not light to indicate that a floppy disk is installed.

(2) Portable 3.5 inch Floppy Disk Drive Unit (Option)

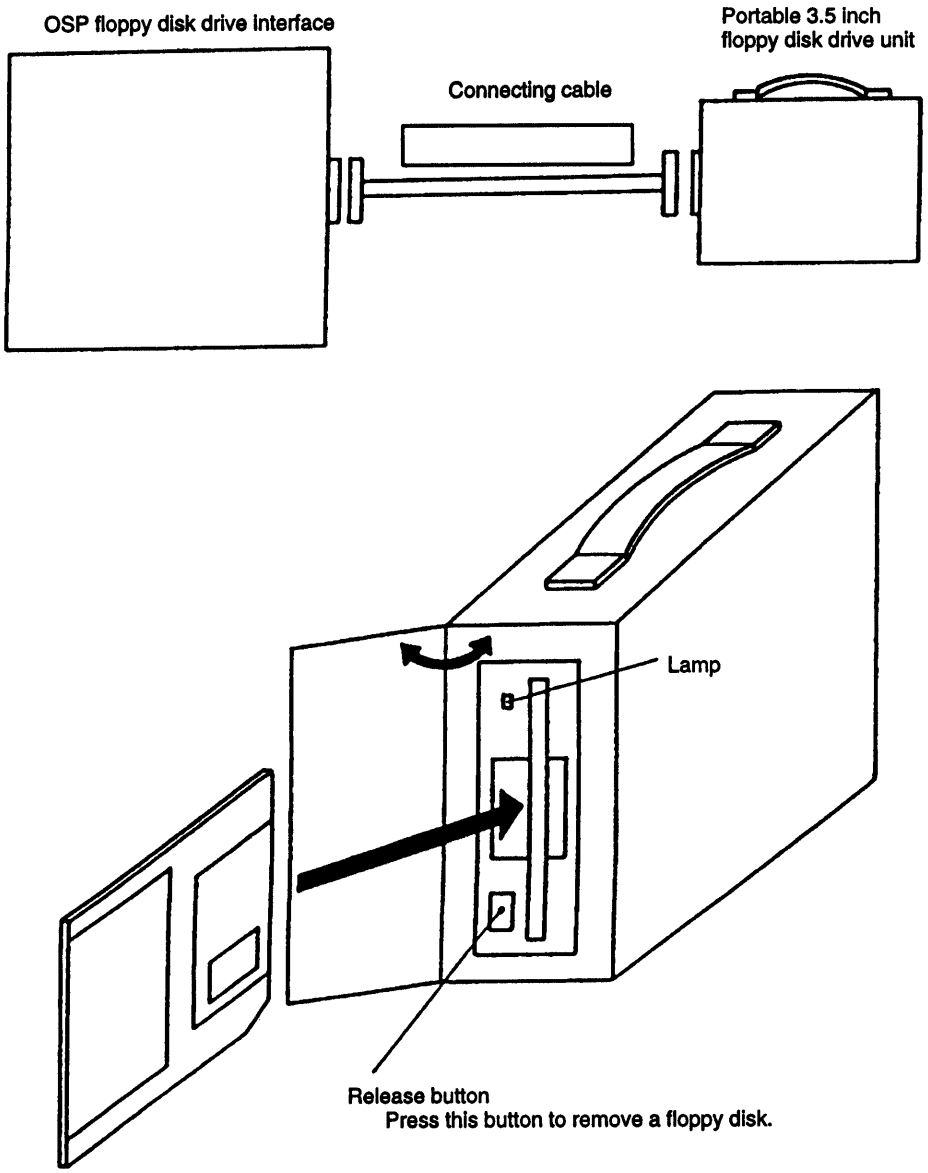


Fig. 2-47 Portable 3.5 Inch Floppy Disk Drive Unit (Option)

One of the device names – FD0: or FD1: – is indicated on the floppy disk drive unit; use the unit in accordance with this indication.

a) Installing a floppy disk

Insert the floppy disk into the drive while it is oriented as shown in the figure on the previous page; make sure that it clicks home properly.

b) Removing a floppy disk

Press the release button to remove a disk.

CAUTION : (1) Always switch off the power before connecting the cable to the OSP floppy disk drive interface or disconnecting it.

(2) The lamp on the drive is lit only while disk reading or writing is in progress; it does not light to indicate that a floppy disk is installed.

(3) Portable 8-inch Floppy Disk Drive Unit (Option)

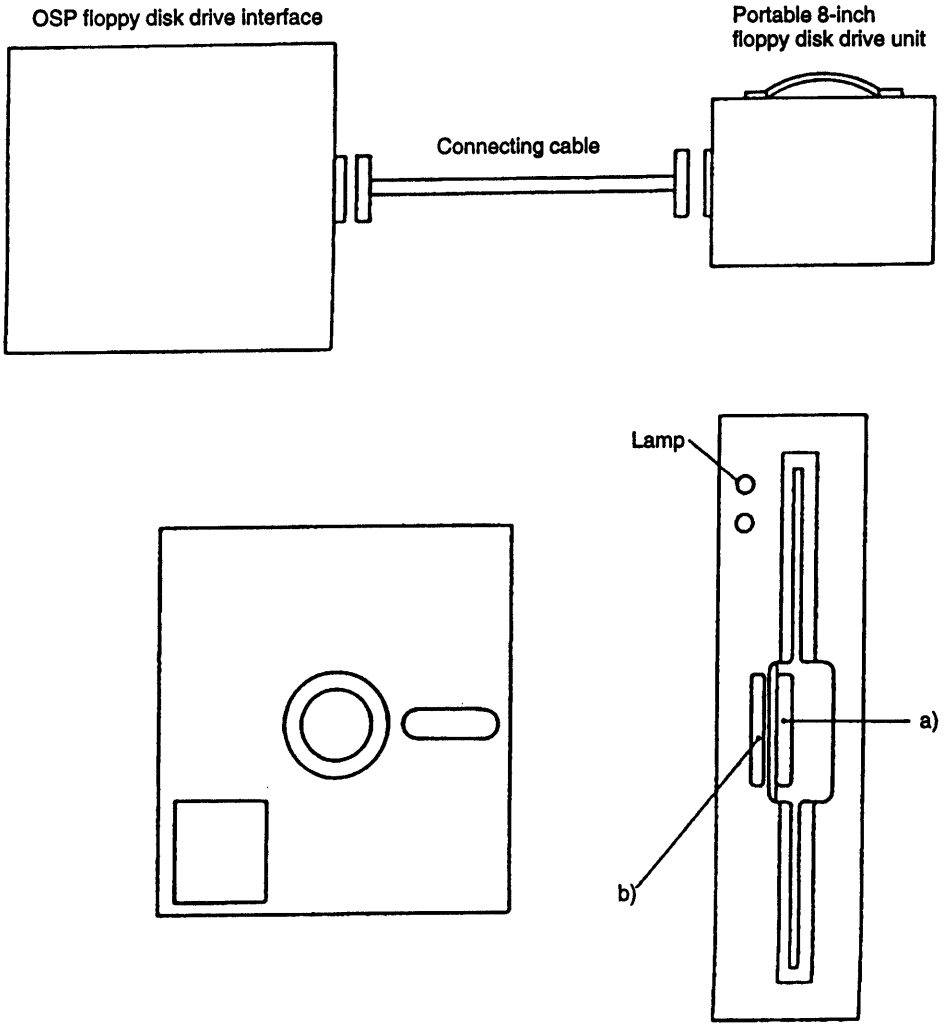


Fig. 2-48 Portable 8-inch Floppy Disk Drive Unit (Option)

One of the device names – FD0: or FD1: – is indicated on the floppy disk drive unit; use the unit in accordance with this indication.

a) Installing a floppy disk

Press the part marked (B) in the figure above and insert the disk while it is oriented as shown above. After installing the disk, slide the cover to the left by pressing against part (A).

b) Removing a floppy disk

Press part (B).

CAUTION : (1) Always switch off the power before connecting the cable to the OSP floppy disk drive interface or disconnecting it.

(2) The lamp on the drive lights to indicate that a floppy disk has been installed correctly.

9-2. Operation Overview

(1) The "floppy disk I/O function" means operations (A) (B) (C) and (D) in the illustration below.

(2) Operation (F) is only applicable when the optional tape punch specification is used.

(3) Operations (G) and (H) are applicable in standard specifications.

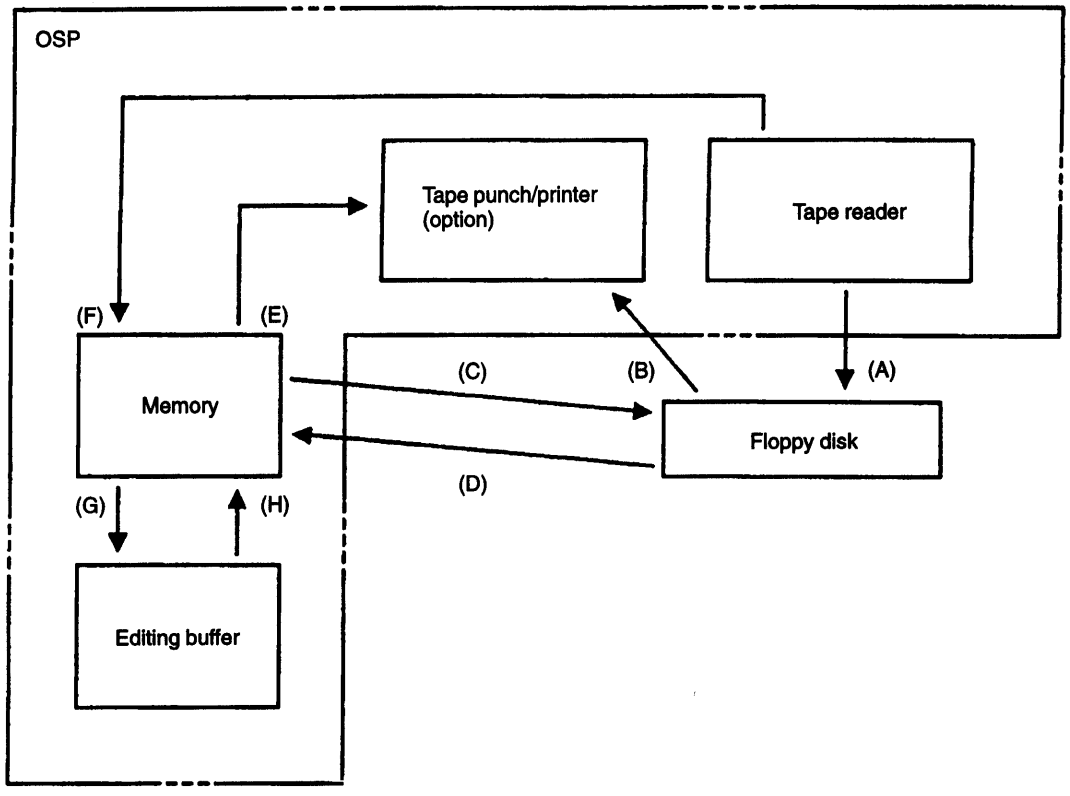


Fig. 2-49 Operation Overview

a) A part program on paper tape can be read directly into a floppy disk by using the READ command in the PIP (transfer) mode, which is accessed from the PROG OPERATION mode.

b) A part program can be output from the floppy disk to the tape punch or printer in the following manner:

   1) A part program stored in a floppy disk can be output directly to a tape punch to punch out a paper tape by using the PUNCH command in the PIP mode of the PROG OPERATION mode.

   2) Similarly, a part program stored in a floppy disk can be output directly to a printer to create a process sheet by using the LIST command.

   3) The file names of part programs stored in a floppy disk can be output directly to a printer to create a directory of file names by using the DIR command.

c) Part programs stored in the memory of the NC can be copied to a floppy disk by using the COPY command in the PIP mode of the PROG OPERATION mode.

d) Part programs stored in a floppy disk can be copied to the memory of the NC by using the COPY command in the PIP mode of the PROG OPERATION mode.

e) A part program can be output from the NC memory to the tape punch or printer in the following manner:

   1) Part programs stored in the NC memory can be output to a tape punch to record them on paper tape by using the PUNCH command in the PIP mode of the PROG OPERATION mode.

   2) Similarly, part programs stored in the NC memory can be output directly to a printer to create process lists by using the LIST command.

   3) The file names of part programs stored in the NC memory can be output directly to a printer to create a directory of file names by using the DIR command.

f) A part program on paper tape can be read directly into the NC memory by using the READ command in the PIP mode of the PROG OPERATION mode.

g) Part programs can be transferred from the NC memory to a buffer area for program editing or execution in the following manner:

   1) Part programs stored in the NC memory can be transferred to the buffer area for editing by using the EDIT command in the PIP mode of the PROG OPERATION mode.

   2) A part program stored in the NC memory can be transferred to the buffer area for program execution by using the PROGRAM SELECT command in the AUTO mode.

h) A part program in the editing buffer can be returned to the NC memory by using the EDIT command in the PROG OPERATION mode.

9-2-1. Operation Commands

(1) The operation commands are used to transfer data in an input device to an output device.

Command \ Peripheral Device		Sector Device	Tape Reading Device	Tape Punching Device	Printing Device
F2 DIR		Input			Output
F3 PIP	F1 READ	Output	Input		
	F2 PUNCH	Input		Output	
	F3 VERIFY	Output Input	Input		
	F4 COPY	Input Output			
F5 FREE		Input			Output
F6 LIST		Input			Output
F2 INIT		Output			
F3 DELETE		Output			
F4 RENAME		Output			
F1 PROTECT		Output			

(2) Peripheral device classification and abbreviations

Sector devices

MD1: → User memory
FD0: → 3.5 inch floppy disk
FD1: → 3.5 inch or 8 inch floppy disk*

Tape reading devices

TR: → Standard tape reader
CN0: → Tape reader connected at RS232C channel 0*
CN1: → Tape reader connected at RS232C channel 1*
CN2: → Tape reader connected at RS232C channel 2*
CN3: → Tape reader connected at RS232C channel 3*

Tape punching devices

CN0: → Tape punch connected at RS232C channel 0*
CN1: → Tape punch connected at RS232C channel 1*
CN2: → Tape punch connected at RS232C channel 2*
CN3: → Tape punch connected at RS232C channel 3*

Printing devices

CN: → Console
PN: → Operation panel display screen
CN0: → Printer connected at RS232C channel 0*
CN1: → Printer connected at RS232C channel 1*
CN2: → Printer connected at RS232C channel 2*
CN3: → Printer connected at RS232C channel 3*

"*" indicates an option.

(3) The default devices are indicated below.

For sector devices	MD1:	
Tape reading devices	TR:	(This automatic selection can be changed by setting NC optional parameter (word) No.57.)
Tape punching devices	CN0	(This automatic selection can be changed by setting NC optional parameter (word) No.45.)
Printing devices	PN:	(a) The default device for a tape reading device or tape punching device can be changed by changing the parameter settings. (b) If the output NC program name is not specified, the input program name is assigned to the output program. (c) If the input NC program name is not specified, the name assigned will be A.MIN unless an NC program name is specified on the tape, in which case that name will be used.

9-2-2. Types of Floppy Disk

(1) 3.5 Inch Floppy Disks

Type	Recommended Maker	Format for OSP
2DD 80 track 135 TPI	TDK 3M Hitachi Maxell	9 sectors/track 512 bytes/sector
2HD 80 track 135 TPI		18 sectors/track 512 bytes/sector

(2) 8 Inch Floppy Disks

IBM P/N2305830 (Hitachi Maxell FD1-128) (IBM DISKETTE 1)	Single-sided, single-density 77 cylinders/disk 1 track/cylinder 26 sectors/track 128 bytes/sector
IBM P/N2736700 (Hitachi Maxell FD2-256) (IBM DISKETTE 2)	Double-sided, single-density 77 cylinders/disk 2 tracks/cylinder 15 sectors/track 256 bytes/sector
IBM P/N1766872 (Hitachi Maxell FD2-256D) (IBM DISKETTE2D)	Double-sided, double-density 77 cylinders/disk 2 tracks/cylinder 26 sectors/track 256 bytes/sector

(3) Supplement

a) Since the OSP creates files in the OSP format (a file management system exclusive to OSP), it cannot write to or read floppy disks containing files created in the IBM format on another computer.

b) New floppy disks must be initialized before they can be used.

c) To enable the OSP to read an IBM format (logical format) floppy disk, select the IBM format floppy disk I/O function (option). A separate option (IBM format) is also required to handle "multi-volume" files that occupy two or more floppy disks. (For 8-inch floppy disks only)

d) The storage capacity of each type of floppy disk, expressed in terms of the equivalent tape length, is indicated in the table below.

Floppy Disk Type	3.5 Inch		8 Inch		
	2DD	3HD/2HC	FD1-128	FD2-256	FD2-256D
Storage Capacity (tape length) [m]	1840	3770	650	1470	2550

(4) Cautions on Handling Floppy Disks

CAUTION :
- Do not touch the magnetic surfaces of the disk or wipe them with anything.
- Keep disks away from magnets.
- Do not write on floppy disks with pencils or ball point pens (use felt-tip pens).
- Do not apply pressure to disks by gripping them with clips, etc.
- When storing a disk, always put it back into its cover and keep it in its box.
- Do not leave disks in places where they are exposed to direct sunlight or heat.

9-2-3. Sector Devices

The assignment of sector device names is determined by the specifications, as shown below.

Specification \ Sector device	3.5 Inch Floppy Disks Only	8 Inch Floppy Disks Only	Both 3.5 Inch and 8 Inch Floppy Disks
FD0:	○	○	○ 3.5 inch floppy disk
FD1:			○ 8 inch floppy disk

Whether the floppy disk drive is assigned drive name FD0: or FD1: is indicated on the disk drive in the case of built-in type. For the portable type, the indication is given on the floppy disk drive interface.

9-3. Guide to Operations

In the explanations that follow, the 3.5 inch floppy disks are identified as sector device "FD0:", 8 inch floppy disks are identified as sector device "FD1:", and where no distinction needs to be made between 3.5 inch and 8 inch disks, the disk is identified as sector device "FD0:". Determine whether the floppy disk actually used is FD0: or FD1: by checking the indication on the floppy disk drive or floppy disk drive interface.

9-3-1. Initialization of Floppy Disks

New floppy disks and floppy disks which have not been initialized in the OSP format must be initialized before they can be used with the OSP.

Disks which have already been initialized in the OSP format can be initialized again in order to delete all the part programs stored on them.

3.5 Inch Floppy Disks

(1) Operating Procedure

a) Press the EDIT/AUX key to select the PROG OPERATION mode.

b) Press function key [F8] ([EXTEND]).

c) Press function key [F2] (INIT).

d) =IN␣ FD0: [WRITE] ← The underlined sections are to be keyed in by the operator.

If no device name is specified, the memory is initialized.

This gap indicates that a space ([SP]) is required.

e) "initialize OK (Y/N)!" will be displayed.

Enter the following:

!Y [WRITE]

f) "formatting (Y/N)!" will be displayed.

Enter the following:

!Y [WRITE]

g) "format(2DD-720K=0,2HD-1.44M=1)!" will be displayed.

Enter "0" or "1" depending on whether the floppy disk type is 2DD or 2HD.

For a 2HD disk, enter:

!1 [WRITE]

The floppy disk will be initialized and the initialization command will be terminated.

In the case of a disk that has already been initialized in the OSP format, enter "N" at step f). After initialization of the disk, the message shown below will be displayed and the initialization command will be terminated.

FD0:OSP format (2HD-1.44M) (for 2HD)

8 Inch Floppy Disks

(1) Operating Procedure

a) Press the EDIT/AUX key to select the PROG OPERATION mode.

b) Press function key [F8] ([EXTEND]).

c) Press function key [F2] (INIT).

d) =IN␣ FD1: [WRITE] ← The underlined sections are to be keyed in by the operator.

If no device name is specified, the memory is initialized.

This gap indicates that a space ([SP]) is required.

e) FD1:OSP format (FD2-256D)

Floppy disk type (Double-sided, double-density)

initialize OK(Y/N) ! Y [WRITE]

[Supplement] : 1. If the disk to be initialized is a new one which has never been initialized in the OSP format, it is usually written in the IBM format, in which case the following message is displayed at step e) above:

FD1:IBM format(FD2-256D)

initialize OK(Y/N)!

Enter the following response to initialize the disk in the OSP format:

! Y [WRITE]

2. If the optional IBM format floppy disk I/O function is being used, the procedure from step e) onward will be as follows:

a) FD1:OSP format(FD2-256D)

initialize OK(Y/N)!

If "Y [WRITE]" is entered in response, the following message will be displayed.

b) type (OSP=O,IBM=I)

Enter the following to initialize the disk in the OSP format:

! O [WRITE]

[Supplement] : 3. When a floppy disk is initialized, its type (FD1-128, FD2-256, FD2-256D) is automatically recognized on reading its data. However, if the data has been destroyed, the following message will be displayed at step e) above and it will not be possible to initialize the disk:

FD1: ???format (FD?-???)
405 floppy disc initialization ERROR

If an attempt is made to initialize a floppy disk that has been initialized in the IBM format by an OSP5000M at an OSP500M-G/OSP5000M-G/OSP5020M, the following message will be displayed at step e) above and it will not be possible to initialize the disk:

FD1: IBM format (FD?-???)
405 floppy disc initialization ERROR

(The same thing will happen with a disk that has been used in an automatic programming device that uses its own format, distinct from the IBM and OSP formats.)

In this case the disk can be initialized by specifying its type using the option code ";F".

Example: To specify a double-sided, double-density disk (FD2-256D):

= IN FD1:;F [WRITE]
initialize OK(Y/N)! Y [WRITE]
formatting (Y/N)! N [WRITE]
format (FD2-128=0,FD2-256=1,FD2-256D=2,FD1-128=3)! 2 [WRITE]
(Do not use the FD2-128 type since it requires special formatting.)

4. If the floppy disk's formatting data (index data) is destroyed, the error "330 floppy disk read/write ERROR" occurs and initialization is not possible.

(Possible reasons for this error include exposure of the disk to magnetism, damage to the floppy disk, and use of the disk in a device with different formatting.)

If this happens, use the ;F option code and input the following to initialize the disk:

formatting (Y/N)! Y [WRITE]

(Note that floppy disks are consumables and that an age-related defect in the floppy disk itself will mean that it cannot be initialized.)

Once a disk has been formatted, it cannot be guaranteed that it can be read and written to at any floppy disk drive unit other than the one at which it was formatted; do not use the disk in other disk drives unnecessarily.

9-3-2. Deleting Specified Files

The following procedure is used to delete files stored in a floppy disk by specifying their file names.

(1) Press the EDIT/AUX key to select the PROG OPERATION mode. =
(2) Press function key [F8] ([EXTEND]). =EX
(3) Press function key [F3] (DELETE). =XDEL
(4) DEL FD0:ABC.MIN [WRITE]
FD0:ABC.MIN deleted
This deletes the file ABC.MIN that was stored in the disk.

9-3-3. Renaming Files

The following procedure is used to change the names of files.

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

(2) Press function key [F8] ([EXTEND]). =EX

(3) Press function key [F4] (RENAME). =XR

(4) R FD0:ABC.MIN,DEF.MIN [WRITE]

This changes the name of the file ABC.MIN stored in the disk to DEF.MIN. The data contained in the file remains completely unchanged.

9-3-4. Floppy Disk Directory

The following procedure is used to display or print out a list of file names of all the files in the floppy disk.

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

(2) Press function key [F2] (DIR). =DI

(3) =DI FD0:,CN0: [WRITE]

If no output device name is specified, "PN:" (display screen in the operation panel) is automatically selected.

When the command above is executed, a list of the files in the floppy disk is printed out at the printer connected to channel 0 of the NC unit (the printer is an option).

The following option can be used:

;P ..... Specifies display of the file protection status.

9-3-5. Free Area in Floppy Disk

The following procedure is used to check the size of the free area in a floppy disk.

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

(2) Press function key [F5] (FREE). =FR

(3) =FR FD0:,CN0: [WRITE]

If no output device name is specified, "PN:" (display screen in the operation panel) is automatically selected and the free area size is displayed on the operation panel display screen.

When the command above is executed, the free area size of the floppy disk is printed out at a printer (the printer is an option).

The following option can be used:

;C ..... Specifies a search for contiguous free area.

=FR FD0:,CN0: ;C [WRITE]

9-3-6. List of the Specified File

The following procedure is used to display the list of the specified file on the operation panel display screen, or print out the list at a printer.

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

(2) Press function key [F6] (LIST). =XL

(3) L FD0:ABC.MIN,PN: [WRITE]

If no output device name is specified, "PN:" (display screen in the operation panel) is automatically selected and the list of the specified file is displayed on the operation panel display screen.

When the command above is executed, the list of the specified file is printed out at a printer (the printer is an option).

9-3-7. Reading from a Tape Reader

The following procedure is used to read a part program on paper tape from a tape reader into a floppy disk.

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

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

(3) Press function key [F3] (PIP) to enable peripheral I/O operations. =PIP
>

(4) Press function key [F1] (READ). >XR

(5) R,FD0:ABC.MIN [WRITE]

When this command is executed, the part program on paper tape is read from the tape reader into the floppy disk with the file name ABC.MIN appended to it.

The following options can be used:

Option Code	Meaning
;E	Designates the EIA code.
;I	Designates the ISO code.
;V	Designates verification.
;A	Appended to the specified file.
;C	If a reading error occurs, "!" is used to mark the location of the error and reading continues.

9-3-8. Punching Out the Specified File

The following procedure is used to punch out the data of the specified file onto paper tape.

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

(2) Press function key [F3] (PIP) to enable peripheral I/0 operations. =PIP
>

(3) Press function key [F2] (PUNCH). >XP

(4) P FD0:ABC.MIN,PP: [WRITE]

If no output device name is specified, the data is output to the default device specified in the parameters.

When the command above is executed, the entire contents of the file ABC.MIN are punched out at the tape punch (the tape punch is an option).

The following options can be used:

Option Code	Meaning
;E	Designates the EIA code.
;I	Designates the ISO code.

9-3-9. Verifying Programs Punched to Paper Tape

The following procedure is used to check that a part program punched to paper tape matches a part program in a floppy disk.

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

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

(3) Press function key [F3] (PIP) to enable peripheral I/O operations. =PIP
>

(4) Press function key [F3] (VERIFY). >XV

(5) V,FD0:ABC.MIN [WRITE]

When the command above is executed, it is checked that the program data punched on paper tape matches the program data stored in the floppy disk under the file name ABC.MIN.

The tape reader device name (TR:) can be omitted.

Verification ends with the following display on the display screen:

end of tape
end of file
all same data

If there is a data mismatch, the location in the data at which the mismatch has been detected is displayed blinking and verification is temporarily stopped.

The following options can be used:

Option Code	Meaning
;E	Designates the EIA code.
;I	Designates the ISO code.

9-3-10. Saving Program Stored in Memory to Floppy Disk

The following procedure is used to save the program of the specified file to a floppy disk.

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

(2) Press function key [F3] (PIP) to enable peripheral I/O operations. =PIP
>

(3) Press function key [F4] (COPY). >XCO

(4) CO ABC.MIN,FD0: [WRITE]

This transfers the data of the file ABC.MIN stored in the memory to the floppy disk under the same file name.

The following options can be used:

Option Code	Meaning
;E	Designates the EIA code.
;I	Designates the ISO code.
;A	Appended to the specified file.
;V	Specifies output of a Y/N message to request confirmation.

9-3-11. Transferring Programs from Floppy Disk to Memory

The following procedure is used to transfer the program of the specified file saved in a floppy disk to the memory.

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

(2) Press function key [F3] (PIP) to enable peripheral I/O operations. =PIP
>

(3) Press function key [F4] (COPY). >XCO

(4) CO FD0:ABC.MIN,[WRITE]

This transfers the data of the file ABC.MIN saved in the floppy disk to the memory under the same file name.

The following options can be used:

Option Code	Meaning
;E	Designates the EIA code.
;I	Designates the ISO code.
;A	Appended to the specified file.
;V	Specifies output of a Y/N message to request confirmation.

9-3-12. Protecting Floppy Disk Files

The following procedure is used to prohibit overwriting, modification and deletion of floppy disk files, or to cancel this prohibition.

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

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

(3) Press function key [F5] (PROTECT).

(4) PROT FD0:A.MIN [WRITE]

"??A.MIN protected" will be displayed, indicating that file A.MIN in the floppy disk is now protected. Thereafter, the message "??A.MIN write protected??" will be displayed and the attempted operation prohibited in the following cases:

a) When the output file name specified for an [F1] (READ) operation is FD0:A.MIN

b) When the output file name specified for an [F4] (COPY) operation is FD0:A.MIN.

c) When the output file name specified for an [F4] (EDIT) operation is FD0:A.MIN.

d) When the output file name specified for an [F3] (DELETE) operation is FD0:A.MIN.

e) When the output file name specified for an [F4] (RENAME) operation is FD0:A.MIN.

The following options can be used:

Option Code	Meaning
;C	Cancels protection of the specified file.
;V	Specifies output of a Y/N message to request confirmation.

10. DIRECTORY-SELECTION-BASED FILE OPERATION FUNCTION

Operations such as writing files (part programs, etc.) to the NC and outputting files from the NC to floppy disks are collectively called "file processing". In order to execute a file processing operation, a command that describes the details of the intended processing must be created and the created command must be given to the NC.

10-1. File Processing

10-1-1. Procedure for Executing File Processing

(1) Calling Up the Command Creation Screen

Press one of the file processing function keys – for example COPY or READ – to display the command creation screen.

(2) Creating the Command

Create and edit the command on the command creation screen. Since the first part of the command (which specifies the command function) is entered automatically, the user has only to input the file name(s) and option codes.

(3) Executing the Command

With the command creation screen still displayed, press the WRITE key.

The created command is given to the NC and executed.

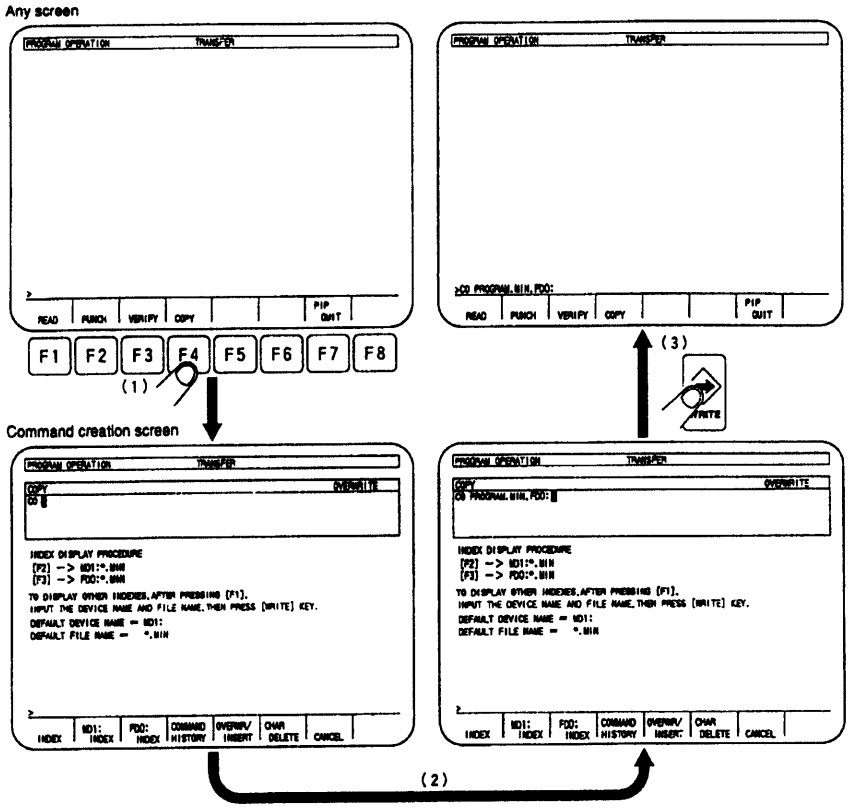


Fig. 2-50 Procedure for Executing File Processing

10-1-2. Method for Creating Commands

(1) To delete the File "PROGRAM.MIN":

The procedure used for deleting the file by directly entering the file name

a) Press function key [F3] (DELETE) in the PROG OPERATION mode.

The command creation screen will be displayed.

"DEL", which indicates the DELETE function, will automatically appear on the command line.

DEL ▒

b) Key in the file name "PROGRAM.MIN".

DEL PROGRAM.MIN▒

c) The command is now completed; press the WRITE key.

The created command "DEL PROGRAM.MIN" will be given to the NC and the file "PROGRAM.MIN" will be deleted.

(2) Copying the file "PROGRAM.MIN" from a Floppy Disk to the NC Memory under the file name "S01.MIN":

The procedure used for copying the file by selecting the file name from the directory

a) Press function key [F4] (COPY) in the PROG OPERATION mode.

The command creation screen will be displayed.

"CO", which indicates the COPY function, will automatically appear on the command line.

CO ▒

b) Enter the device name "FD0:" and the file name "PROGRAM.MIN".

Do this either by keying in "FD0:" and "PROGRAM.MIN" or by displaying the directory for device "FD0:" and selecting the file name "PROGRAM.MIN" from it.

For details on selecting files from directories, see 10-4, "Selecting Files From Directories (OSP Format) or 10-5, "Selecting Files From Directories (MS-DOS Format)".

CO FD0:PROGRAM.MIN▒

c) Key in the rest of the command ", S01.MIN".

CO FD0:PROGRAM.MIN,S01.MIN▒

d) The command is now completed; press the WRITE key to execute it.

The created command, "CO FD0:PROGRAM.MIN,S01.MIN" will be given to the NC and file "PROGRAM.MIN" in the floppy disk will be copied to the memory under the file name "S01.MIN".

(3) Copying the file "S01.MIN" in the NC Memory to a Floppy Disk under the file name "PROGRAM.MIN":

The procedure used for copying the file by selecting the file name from the directory

a) Press function key [F4] (COPY) in the PROG OPERATION mode.

The command creation screen will be displayed. "CO", which indicates the COPY function, will automatically appear on the command line.

CO

b) Key in the file name "S01.MIN" and a comma ",".

CO S01.MIN,

c) Enter the device name "FD0:" and the file name "PROGRAM.MIN".

Do this either by keying in "FD0:" and "PROGRAM.MIN" or by displaying the directory for device "FD0:" and selecting the file name "PROGRAM.MIN" from it.

For details on selecting files from directories, see 10-4, "Selecting Files From Directories (OSP Format) or 10-5, "Selecting Files From Directories (MS-DOS Format)".

CO S01.MIN,FD0:PROGRAM.MIN

d) The command is now completed: press the WRITE key to execute it.

The created command, "CO S01.MIN,FD0:PROGRAM.MIN" will be given to the NC and file "S01.MIN" will be copied to the floppy disk under the file name "PROGRAM.MIN".

(4) If Input Error is Found:

If an error is found in the created command, move the edit pointer to the location of the error and correct the character.

a) Assume that the following erroneous command has been keyed in instead of "CO PROGRAM.MIN,S01.MIN" due to a typing error:

CO PROGSAM.MIN,S01.MIN

b) Using the cursor keys, move the edit pointer to the character to be corrected, "S".

CO PROGSAM.MIN,S01.MIN

c) Key in "R".

For details on editing commands, see 15-2, "Creating and Editing Commands".

CO PROGRAM.MIN,S01.MIN

d) The command has now been corrected; press the WRITE key to execute it.

(5) Executing a Command Similar to the Command Previously Executed:

When executing the command "CO PROGRAM.MIN,FD0:S02.MIN" after the execution of the similar command "CO PROGRAM.MIN,FD0:S01.MIN", the new command can be created following the procedure indicated below using the previously executed command.

Create the required command by editing the previous command.

a) Press function key [F4] (COPY) in the PROG OPERATION mode.

The command creation screen will be displayed.

"CO", which indicates the COPY function, will automatically appear on the command line.

CO ▒

b) Key in the file name "PROGRAM.MIN" and a comma ",".

CO PROGRAM.MIN,▒

c) Enter the device name "FD0:" and the file name "S01.MIN".

Do this either by keying in "FD0:" and "S01.MIN" or by displaying the directory for device "FD0:" and selecting the file name "S01.MIN" from it.

For details on selecting files from directories, see 10-4, "Selecting Files From Directories (OSP Format) or 10-5, "Selecting Files From Directories (MS-DOS Format)".

CO PROGRAM.MIN,FD0:S01.MIN▒

d) The command is now completed: press the WRITE key to execute it.

The created command, "CO PROGRAM.MIN,FD0:S01.MIN" will be given to the NC and file "PROGRAM.MIN" will be copied to the floppy disk under the file name "S01.MIN".

e) Press function key [F4] (COPY) in the PROG OPERATION mode once more.

CO ▒

f) Read the previous command.

For details on how to do this, refer to 10-3, "Use of the Previous Command".

CO PROGRAM.MIN,FD0:S01.MIN▒

g) Using the cursor keys, move the edit pointer "▒" to the character to be changed, "1".

CO PROGRAM.MIN,FD0:S0▒.MIN▒

h) Key in "2".

CO PROGRAM.MIN,FD0:S0▒.MIN▒

i) The command is now completed; press the WRITE key to execute it.

The created command, "CO PROGRAM.MIN,FD0:S02.MIN" will be given to the NC and file "PROGRAM.MIN" will be copied to the floppy disk under the file name "S02.MIN".

10-1-3. Command Execution

(1) To Execute a Command

To execute the command that is currently displayed in lines 4 to 7 of the command creation screen, press the WRITE key. The screen will revert to its original condition and the command will be executed.

The created command will be saved as the "command history".

(2) To Abort Execution of a Command

To abort execution of the command currently displayed in lines 4 to 7 of the command creation screen, press [F7] (CANCEL). The screen will revert to its original condition and the command will not be executed.

The created command will not be saved as the "command history".

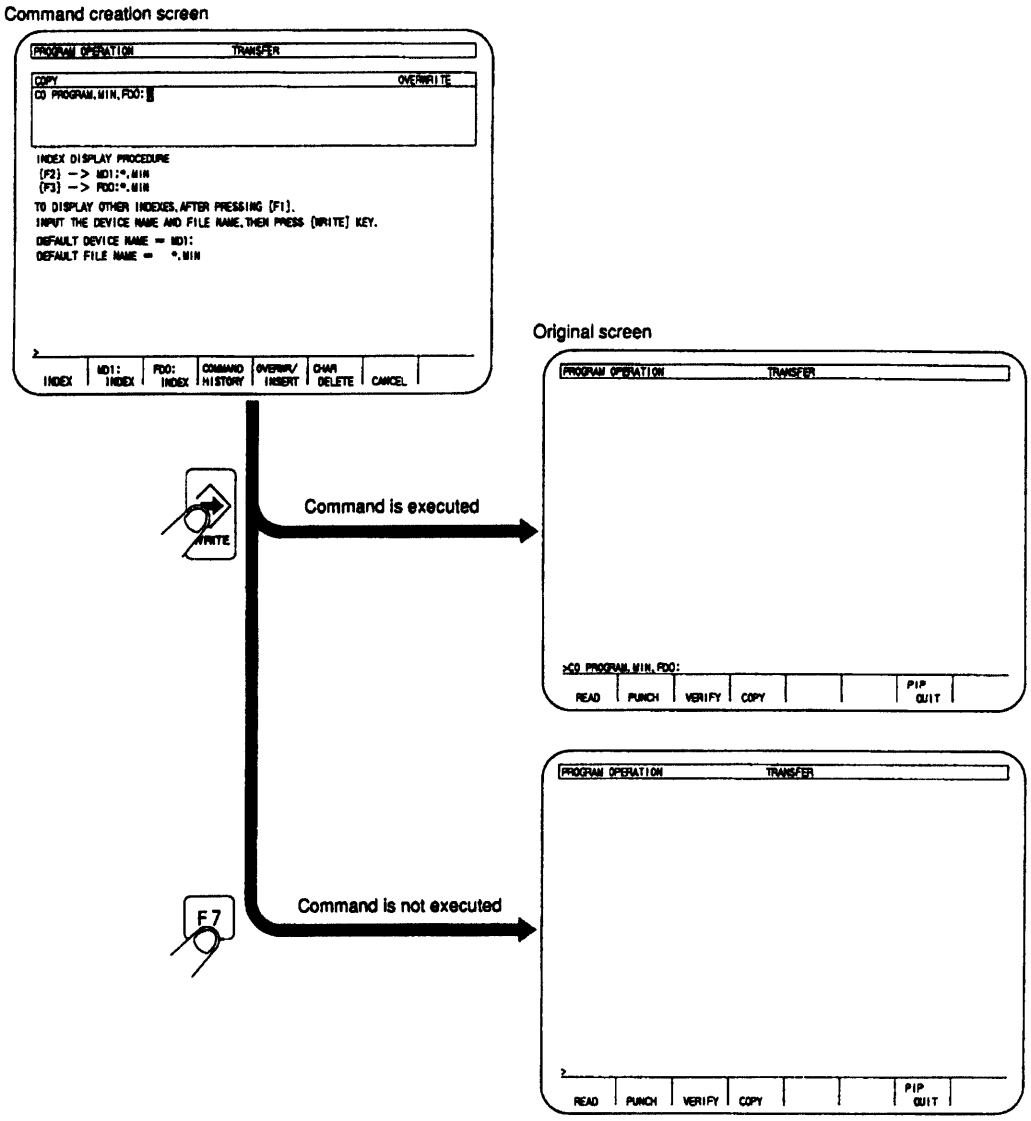
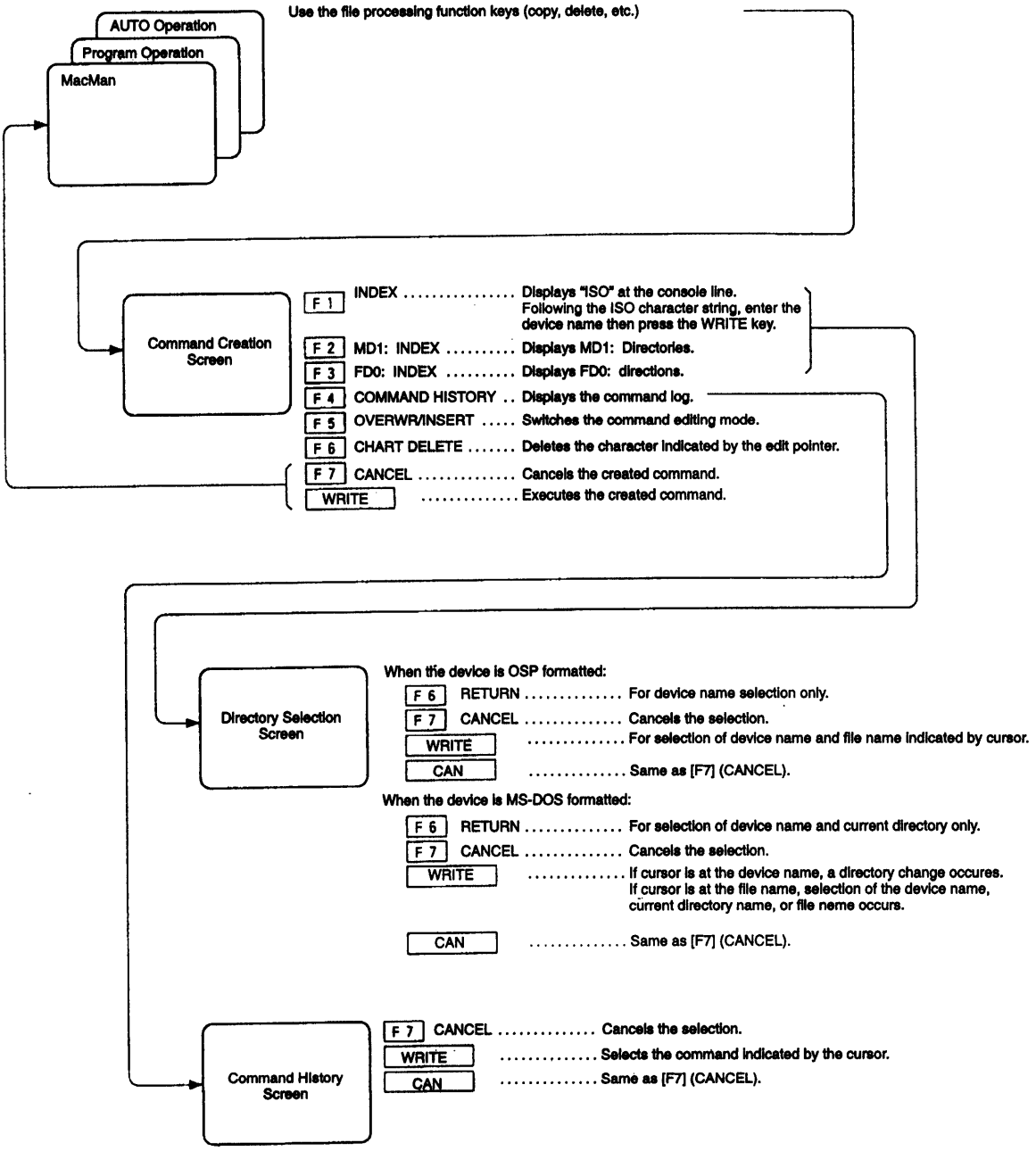


Fig. 2-51 Command Creation Screen

10-1-4. Operation Transition



10-2. Creating and Editing Commands

10-2-1. Command Creation Screen

Lines 4 to 7 : The command is created and edited here.

Characters keyed in are entered at the position of the edit pointer. When a character is entered, the edit pointer moves to the next character space.

The downward-pointing arrow "↓" indicates the end of the command. Up to 255 characters can be entered.

The character string being entered to create a command can be modified by moving the edit pointer with the cursor keys.

When the WRITE key is pressed the currently displayed command is executed regardless of the position of the edit pointer.

Lines 9 to 15 : The procedure for displaying directories is shown below.

To display a directory, press one of the following function keys:

[F1] (INDEX), [F2] (MD1: INDEX), [F3] (FD0: INDEX)

[F2] → MD1: ∗.MIN

If the [F2] (MD1: INDEX) key is pressed, the directory of MD1 related files (machining programs) with an extend name of "MIN" will be displayed.

[F3] → FD0: ∗.MIN

If the [F3] (FD0: INDEX) key is pressed, the directory of the "FD0" floppy disk files (machining programs) with an extend name of "MIN" will be displayed.

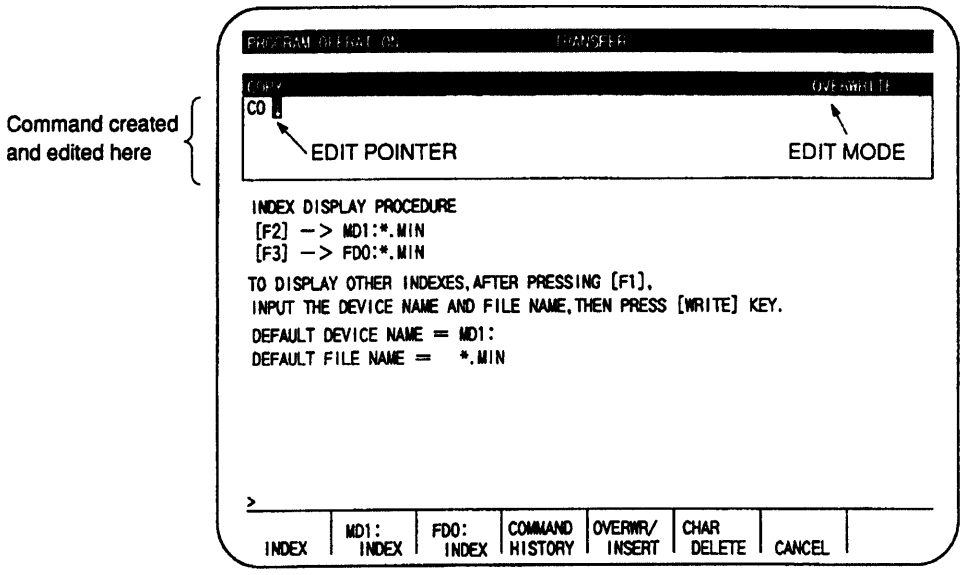


Fig. 2-52 Command Creation Screen

10-2-2. Operation of the Edit Pointer

(1) Moving the Edit Pointer to the Right

The edit pointer will move one space to the right every time the right cursor key is pressed.

When the edit pointer is at the right end of a line, pressing the right cursor key will cause it to move to the left end of the next line, unless it is on the final (7th) line, in which case it will not move.

(2) Moving the Edit Pointer to the Left

The edit pointer will move one space to the left every time the left cursor key is pressed.

When the edit pointer is at the left end of a line, pressing the left cursor key will cause it to move to the right end of the next line, unless it is on the uppermost (4th) line, in which case it will not move.

(3) Moving the Edit Pointer Downward

The edit pointer will move one line downward every time the "down" cursor key is pressed, unless it is on the final (7th) line, in which case it will not move.

(4) Moving the Edit Pointer Upward

The edit pointer will move one line upward every time the "up" cursor key is pressed, unless it is on the uppermost (4th) line, in which case it will not move.

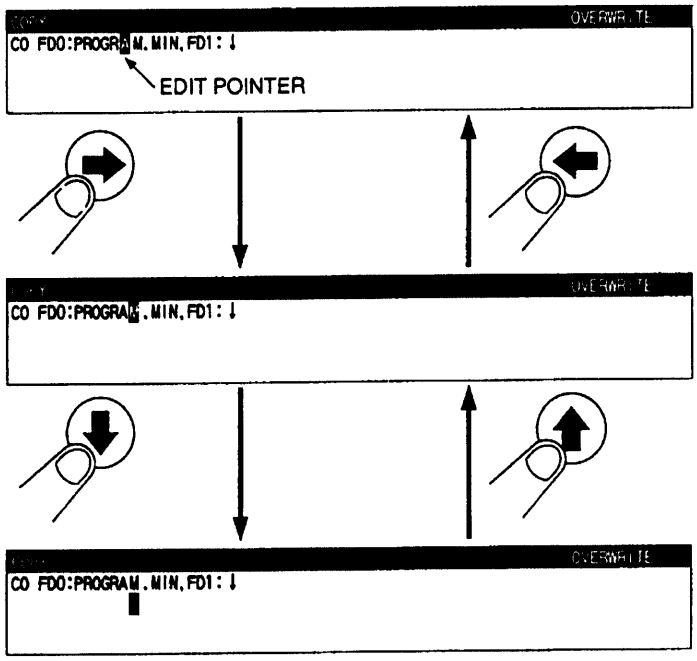


Fig. 2-53 Operation of Edit Pointer

10-2-3. Editing Modes

Lines 4 to 7 of the command creation screen have two editing modes (overwrite and insert).

Immediately after displaying the command creation screen, the overwrite mode will be effective.

(1) Overwrite Mode

The overwrite mode is used to fix the command displayed in lines 4 to 7 of the command creation screen in order to overwrite a character or characters in the command.

In the example shown below, "1" is entered at the position of the edit pointer and the edit pointer moves to the position of the next character ":". Note that in this case none of the characters has moved.

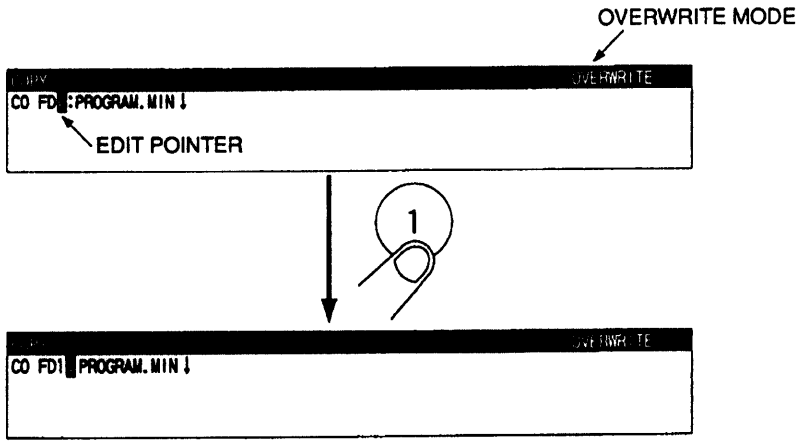


Fig. 2-54 Editing Modes (Overwrite Mode)

(2) Insert Mode

The insert mode is used to insert additional characters into the command displayed in lines 4 to 7 of the command creation screen; the characters already entered move to accommodate each new character entered from the keyboard.

In the example shown below, the character string to the right of the edit pointer – "AM.MIN" – moves to the right to accommodate the character "R" as it is inserted at the left of the edit pointer.

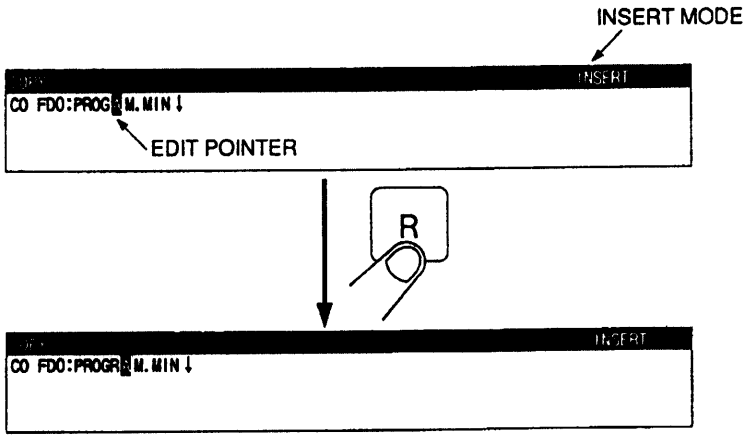


Fig. 2-55 Editing Modes (Insert Mode)

(3) Switching between Editing Modes

To change the editing mode, press function key [F5] (OVERWR/INSERT). If the overwrite mode is currently effective the insert mode will become effective, and if the insert mode is currently effective the overwrite mode will become effective.

The current mode is displayed at the command creation screen at the right end of the 3rd line.

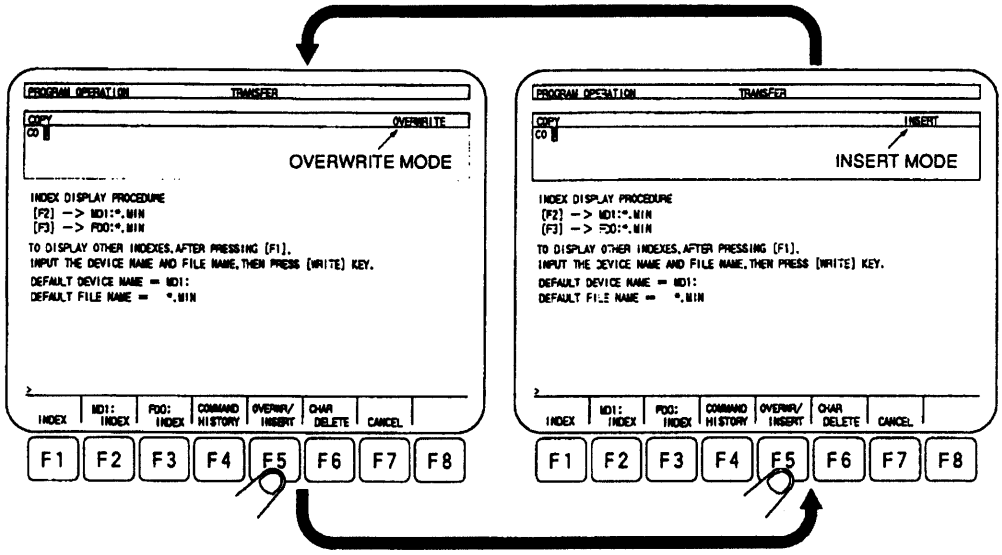


Fig. 2-56 Switching between Editing Modes

10-2-4. Deleting Characters

(1) Function Key [F6] (CHAR DELETE)

Use of this key deletes a single character at the position of the edit pointer, whereupon the character string to the right of the deleted character shifts one place to the left to close the space. The edit pointer remains at the same position.

In the example shown below, the character "A" located by the edit pointer is deleted and the character string ":PROGRAM.MIN" to the right of the edit pointer moves one place to the left to close the space.

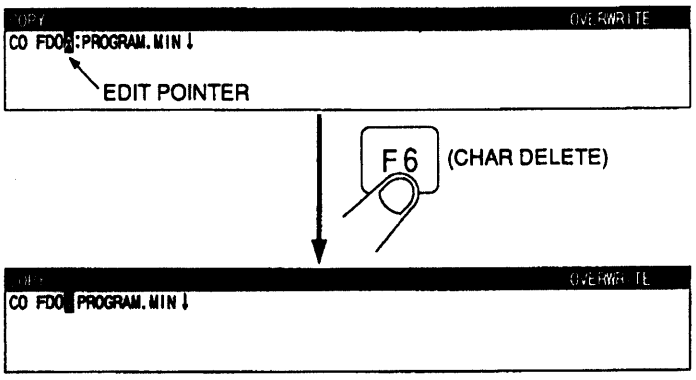


Fig. 2-57 Deleting Characters (Function Key [F6])

(2) BS Key (Backspace Key)

Use of this key deletes a single character to the left of the edit pointer and causes the character string that starts at the position of the edit pointer to move one place to the left to close the space.

In the example shown below the character "A" to the left of the edit pointer is deleted and the character string ":PROGRAM.MIN" that starts at the position of the edit pointer shifts one place to the left.

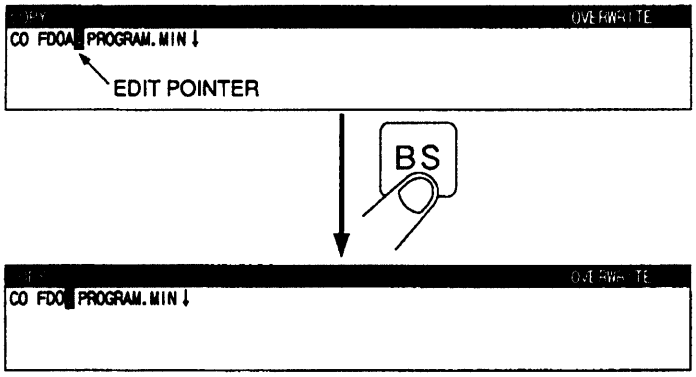


Fig. 2-58 Deleting Characters (BS Key)

10-2-5. Notes on Creating and Editing Commands

(1) Maximum Command Length

The downward-pointing arrow symbol "↓" signifies the end of the command and the maximum command length of 255 characters is reached when this symbol is at the right end of the seventh line.

When the "insert" editing mode is effective, it is not possible to key in a character at any position when this limit has been reached.

(2) Automatic Space Insertion

When a character is keyed in while the edit pointer is located to the right of the downward-pointing arrow "↓", spaces are automatically inserted up to the position where that character is keyed in.

When the BS key is pressed while the edit pointer is located to the right of the downward-pointing arrow "↓", the edit pointer moves to the position of the downward-pointing arrow.

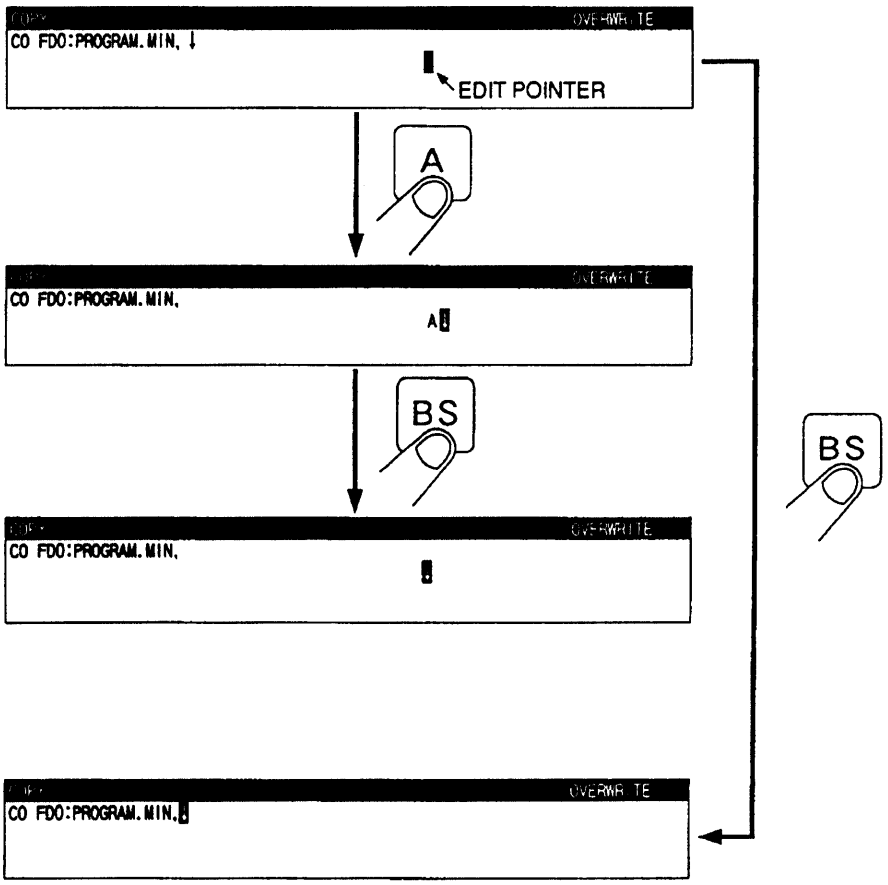


Fig. 2-59 Automatic Space Insertion

10-3. Use of the Command History

The last 5 commands which have been used are stored as the "command log". Previously created commands can therefore by used again by selecting them from the command log. They can also be revised before they are used.

(1) At the command creation screen, press function key [F4] (COMMAND HISTORY) to switch to the command history screen.

(2) Use the cursor control keys to move the cursor to the desired command.

(3) Press the WRITE key.

The system will return to the Command Selection screen, and the selected command will be read into lines 4 to 7. To execute the command as it is, press the WRITE key.

If reading to the command selection screen is not required, press the [F7] (CANCEL) key at the sommand history screen. The system will return to the command selection screen without reading the selected command.

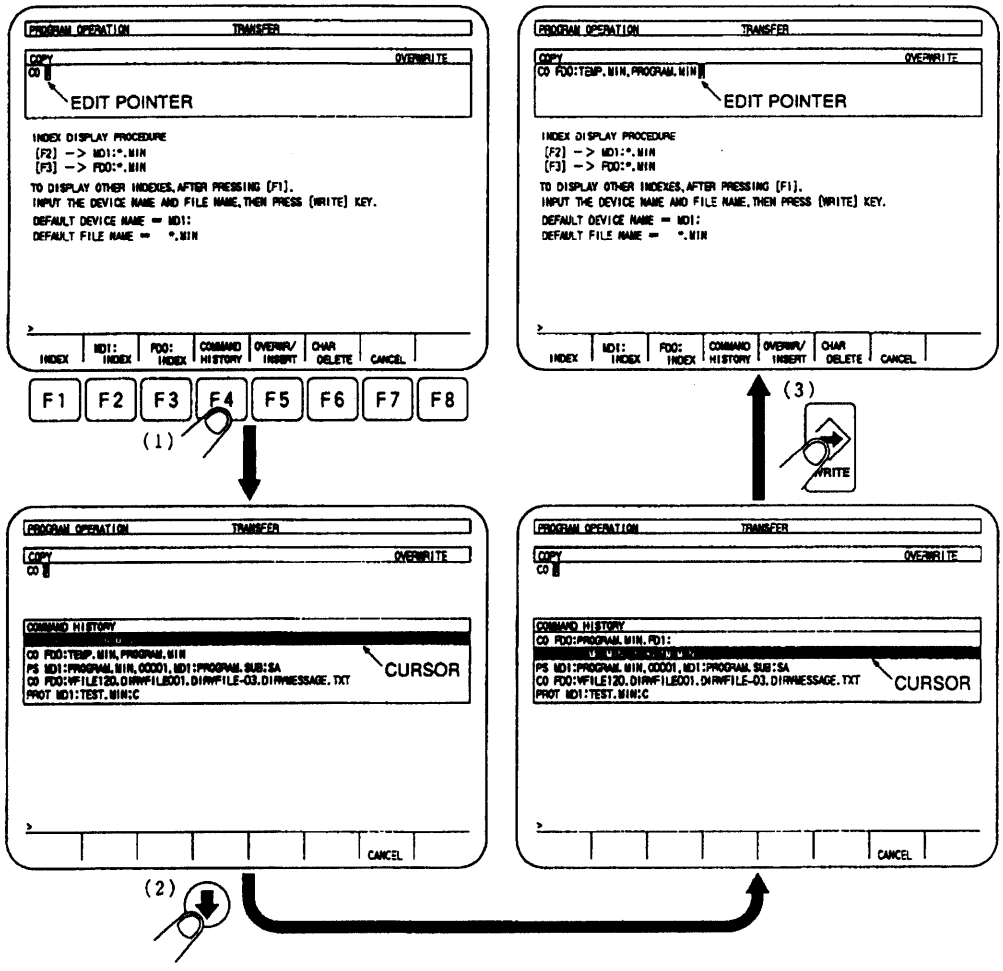


Fig. 2-60 Use of the Command History

10-4. Selecting Files From Directories (OSP Format)

10-4-1. Procedure for Selecting Files from Directories

(1) At the Command Creation screen, press one of the following function keys:

[F1] (INDEX), [F2] (MD1: INDEX), [F3] (FD0:INDEX)

If function key [F1] (INDEX) is pressed, "ISO" will be displayed at the console line. Following the "ISO" character string, enter the desired device name and file name, then press the WRITE key.

(2) At the directory selection screen, use the cursor keys to locate the cursor at the file name of the file to be selected.

(3) Press the WRITE key.

The display will return to the command creation screen and the device name and file name selected with the cursor are entered at the position of the edit pointer.

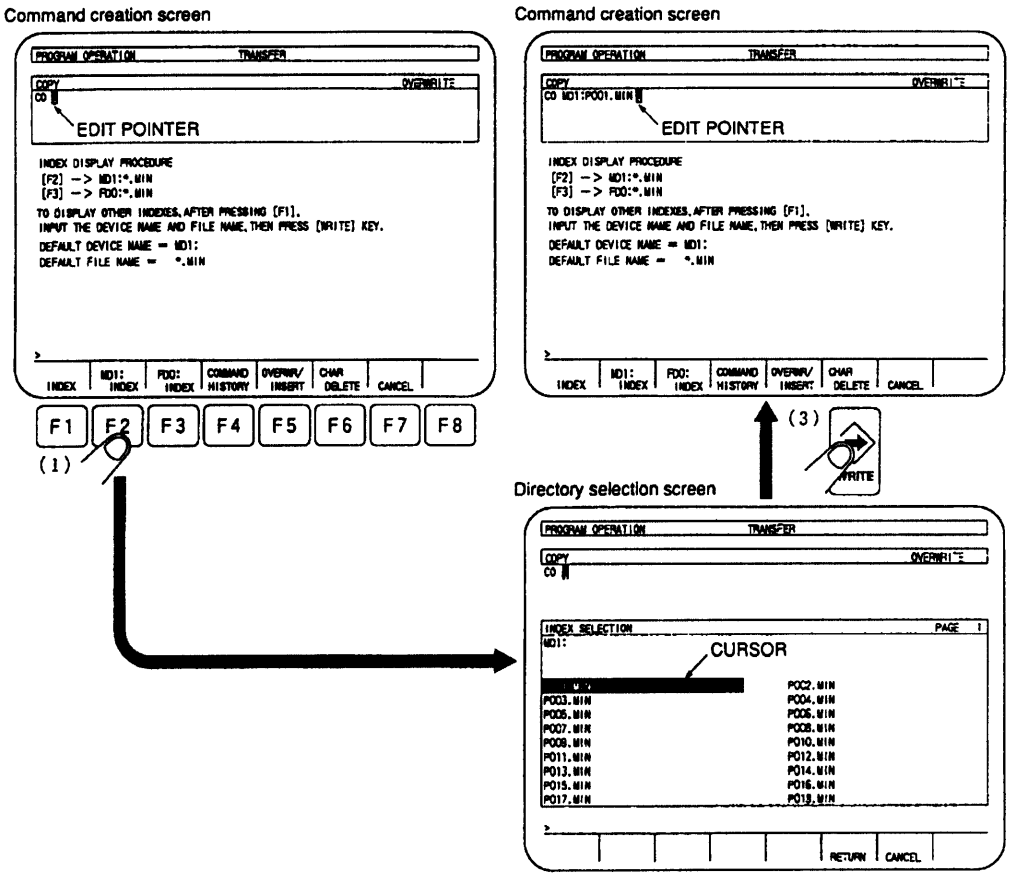


Fig. 2-61 Selecting a File from Directory

10-4-2. Directory Selection Screen

If the selected device is OSP format, the directory selection screen will take the form shown below.

For its appearance when the selected device is MS-DOS format, refer to 10-5, "Selecting Files from Directories (MS-DOS Format)".

Lines 4 to 7 : The command being created is displayed here.

The selected file name is entered at the position of the edit pointer. The edit pointer cannot be moved by pressing the cursor keys.

Line 9 : The device name for the displayed directory is displayed here.

Lines 12 to 20 : The directory is displayed here.

Move the cursor to the file name to be selected by using the cursor keys.

If no file name is displayed, it means that the selected device does not contain files.

Up to 18 file names are displayed on each screen. If there are more than 18 registered files in a directory, the page up/down keys can be used to display other pages.

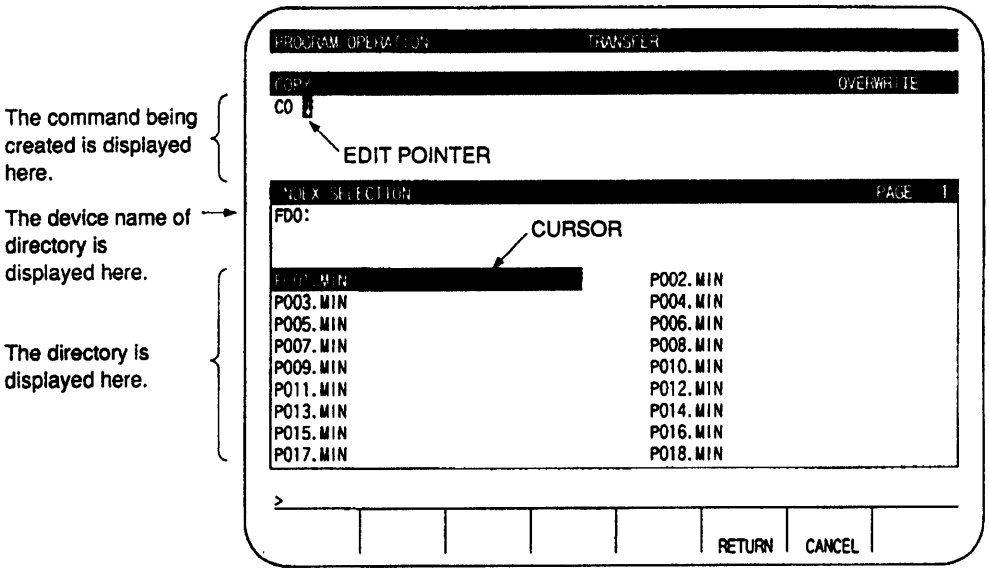


Fig. 2-62 Directory Selection Screen

10-4-3. Cursor and Page Operations

(1) Moving the Cursor to the Right

Each time the "right" cursor key is pressed, the cursor moves to the file name which is adjacent and to the right, or below and to the left, with respect to the current cursor position. If the cursor is located at the final file name in the directory, it moves to the first file name in the directory.

(2) Moving the Cursor to the Left

Each time the "left" cursor key is pressed, the cursor moves to the file name which is adjacent and to the left, or above and to the right, with respect to the current cursor position. If the cursor is located at the first file name in the directory, it moves to the final file name in the directory.

(3) Moving the Cursor Downward

Each time the "down" cursor key is pressed, the cursor moves to the file name directly below the current position. If the cursor is located at the final file name in the directory, it moves to the first file name in the directory.

(4) Moving the Cursor Upward

Each time the "up" cursor key is pressed, the cursor moves to the file name directly above the current position. If the cursor is located at the first file name in the directory, it moves to the final file name in the directory.

(5) Changing Pages

Up to 18 file names cam be displayed on the directory selection screen. If there are more than 18 files registered in the directory, other pages can be displayed by pressing the page up/down keys.

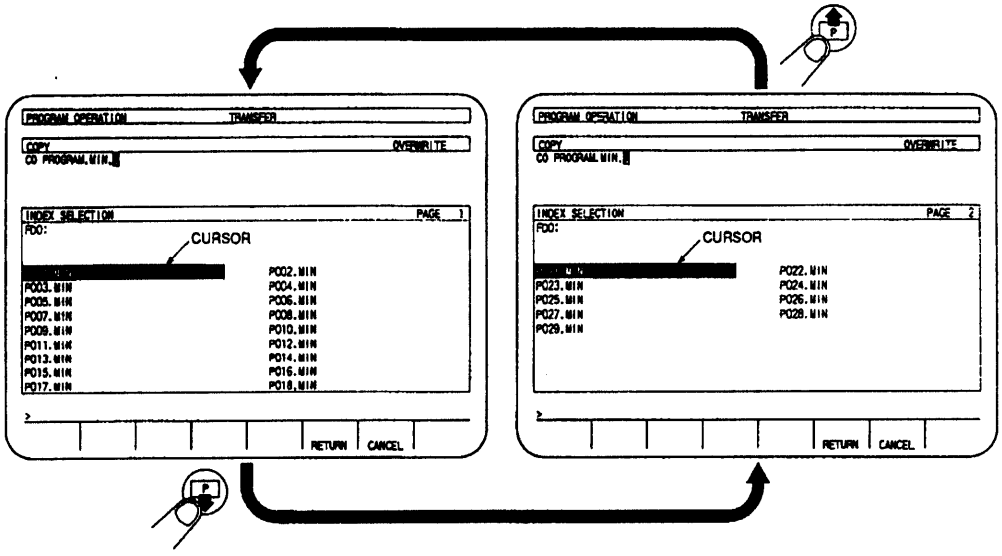


Fig. 2-63 Cursor and Page Operations

10-4-4. Function Keys [F6] (RETURN), [F7] (CANCEL) and Cancel Key

When function key [F6] (RETURN) key is pressed, the command creation screen is displayed and the device name only is entered at the position of the edit pointer. The file name that was at the cursor position is not entered.

When function key [F7] (CANCEL) or the Cancel key is pressed, the command creation screen is displayed and neither the device name nor the file name at the cursor position are entered on it.

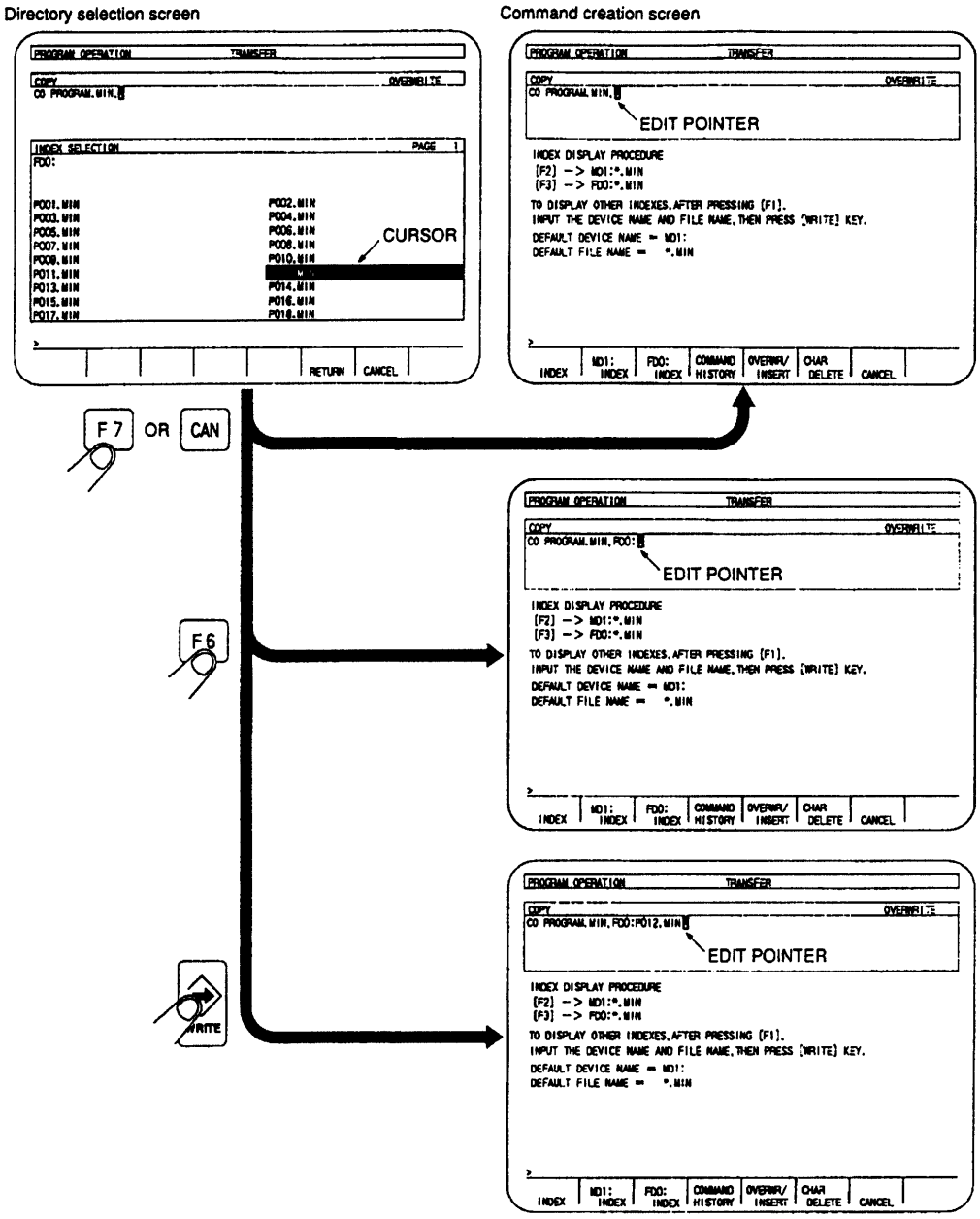


Fig. 2-64 Function Keys [F6] (RETURN), [F7] (CANCEL) and Cancel Key

10-4-5. Effects of the Editing Modes

(1) Overwrite Mode

In the overwrite mode, the positions of characters in the character string are fixed and the file name selected from the directory is written over the part of the character string that starts at the position of the edit pointer.

(2) Insert Mode

In the insert mode, the part of the character string that starts at the position of the edit cursor shifts to the right as the file name selected from the directory is inserted to the left of the edit pointer.

If the command length is caused to exceed 255 characters by adding the file name, the 256th and subsequent characters are deleted.

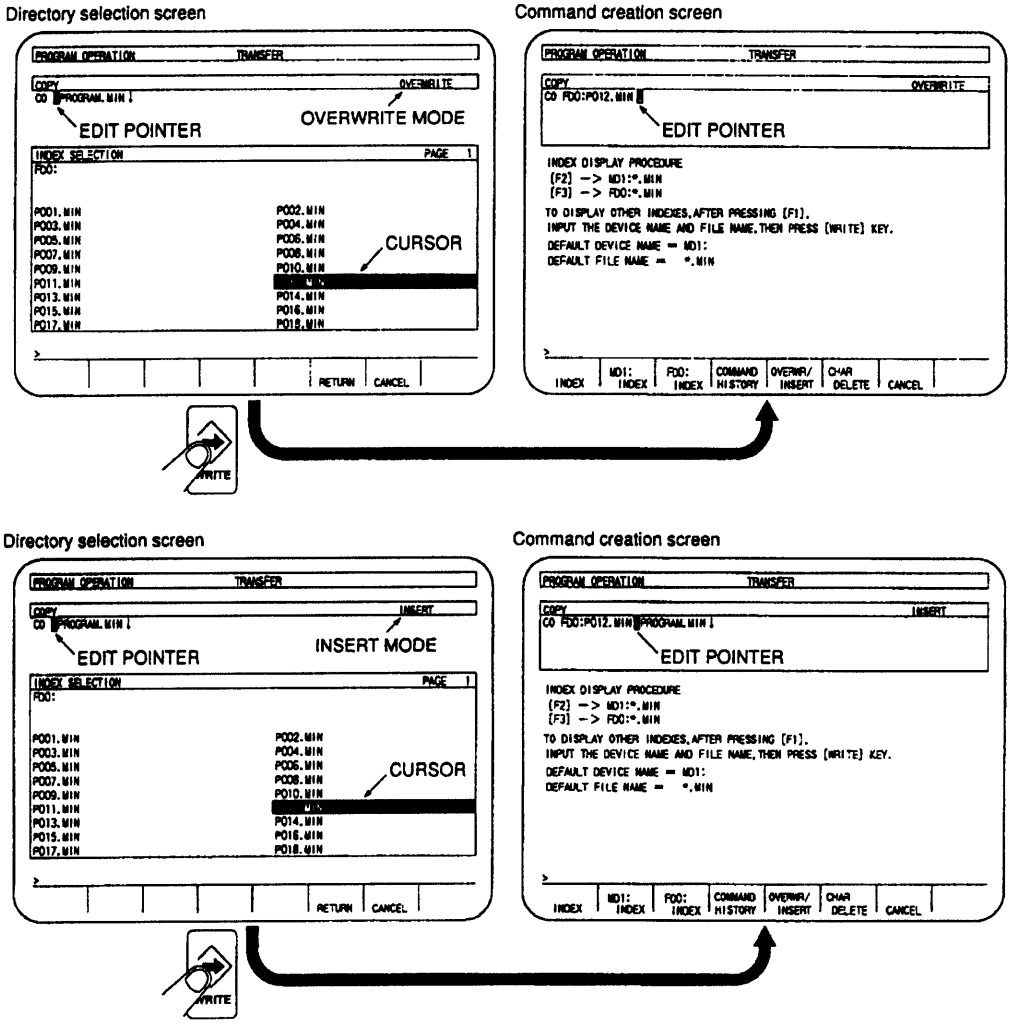


Fig. 2-65 Effects of the Editing Modes

10-4-6. Method for Displaying Directories

(1) NC Memory's "md1:" Directory Display:

Press function key [F2] (MD1: INDEX).

The directory content can be specified by using the following input procedure.

[F2] –> MD1:∗.MIN

When function key [F2] (MD1: INDEX) is pressed, the directory of all NC memory "MD1:" files having extend names of "MIN" (machining program) will be displayed.

[F2] –> MD1:∗.SDF

When function key [F2] (MD1: INDEX) is pressed, the directory of all NC memory "MD1:" files having extend names of "SDF" (schedule program) will be displayed.

[F2] –> MD1:∗.∗

When function key [F2] (MD1: INDEX) is pressed, the directory of all NC memory "MD1:" files will be displayed.

(2) "FD0:" Directory Display

Press function key [F3] (FD0: INDEX).

The directory content can be specified by using the following input procedure.

[F3] –> FD0:∗.MIN

When function key [F3] (FD0: INDEX) is pressed, the directory of all "FD0:" floppy disk files having extend names of "MIN" (machining program) will be displayed.

[F3] –> FD0:∗.SDF

When function key [F3] (FD0: INDEX) is pressed, the directory of all "FD0:" floppy disk files having extend names of "SDF" (schedule program) will be displayed.

[F3] –> FD0:∗.∗

When function key [F3] (FD0: INDEX) is pressed, the directory of all "FD0:" floppy disk files will be displayed.

(3) Other Directory Displays

When function key [F1] (INDEX) is pressed, "ISO" will be displayed at the console line. Following the "ISO" character string, enter the desired file name and device name, then press the WRITE key.

The directory display procedures shown below apply when OSP formatted floppy disk is used at the floppy disk drive unit.

```
> ISO MD1: [WRITE]
```

The "MD1:" and default file name directory will be displayed.

For details regarding default file names, refer to the "method for displaying directories".

```
> ISO FD0: [WRITE]
```

The "FD0:" and default file name directory will be displayed.

```
> ISO FD*: [WRITE]
```

The message "ERROR IN SPECIFIED DEVICE NAME" will be displayed at the console line and the system will return to the Directory Selection Screen.

Wildcard symbols such as "*" and "?" cannot be used when designating device names.

```
> ISO FD0: *.* [WRITE]
```

The directory of all "FD0:" floppy disk files is displayed.

The result is the same for the following file name designations:
"*", "*.", ".*", "."

```
> ISO FD0: *.MIN [WRITE]
```

The directory of all "FD0:" floppy disk files with the extension namesf "MIN" is displayed.

```
[> ISO FD0: ???.MIN [WRITE]
```

The directory of all "FD0:" floppy disk files with main file name whose consists of three or fewer alphanumeric characters and whose extension name is "MIN" is displayed.

```
> ISO FD0: ABC.* [WRITE]
```

The directory of all "FD0:" floppy disk files whose main file name is "ABC" is displayed.

The same would happen if the specified file name were "ABC" or "ABC.".

```
> ISO FD0: ABC.?? [WRITE]
```

The directory of all "FD0:" floppy disk files whose main file name is "ABC" and whose extension name consists of no more than two alphanumeric characters is displayed.

```
> ISO FD0: MS*.TXT [WRITE]
```

The directory of all "FD0:" floppy disk files whose main file name starts with "MS" and whose extension name is "TXT" is displayed.

```
> ISO FD0: MS??.TXT [WRITE]
```

The directory of all "FD0:" floppy disk files whose main file name starts with "MS" and comprises a total of no more than 4 alphanumeric characters, and whose extension name is "TXT" is displayed.

```
> ISO FD0: ABC.MIN [WRITE]
```

The "FD0:" floppy disk file name of "ABC.MIN" will be displayed if it exists.

```
> ISO FD0: 123.* [WRITE]
```

```
> ISO FD0: ABCDEFG0123456789.* [WRITE]
```

The message "ERROR IN SPECIFIED FILE NAME." is displayed.

In the OSP format, main file names must start with a letter of the alphabet and consist of a total of no more than 16 alphanumeric characters.

```
> ISO FD0: *.123 [WRITE]
```

```
> ISO FD0: *.ABCD [WRITE]
```

The message "ERROR IN SPECIFIED FILE NAME." is displayed.

In the OSP format, extension names must start with a letter of the alphabet and consist of a total of no more than 3 alphanumeric characters.

```
> ISO FD0: \ABC\*.* [WRITE]
```

If a path name is specified although the device to be selected is OSP format, the message "PATH NAME CANNOT BE SPECIFIED IN THIS DEVICE." will be displayed on the console line.

10-5. Selecting Files From Directories (MS-DOS Format)

When working with the MS-DOS format – for example in the machining management mode – it is possible to display the directories of MS-DOS format floppy disks.

10-5-1. Procedure for Selecting Files from Directories

(1) At the Command Creation Screen, press one of the following function keys: [F1] (INDEX), [F2] (MD1: INDEX), [F3] (FD0: INDEX).

If function key [F1] (INDEX) is pressed, "ISO" will be displayed at the console line. Following the "ISO" character string, enter the desired device name, path name, and file name, then press the WRITE key.

(2) At the directory selection screen, use the cursor keys to locate the cursor at the file name of the file to be selected.

(3) Press the WRITE key.

The display will return to the command creation screen and the device name, current directory name, and file name selected with the cursor, are entered on it at the position of the edit pointer.

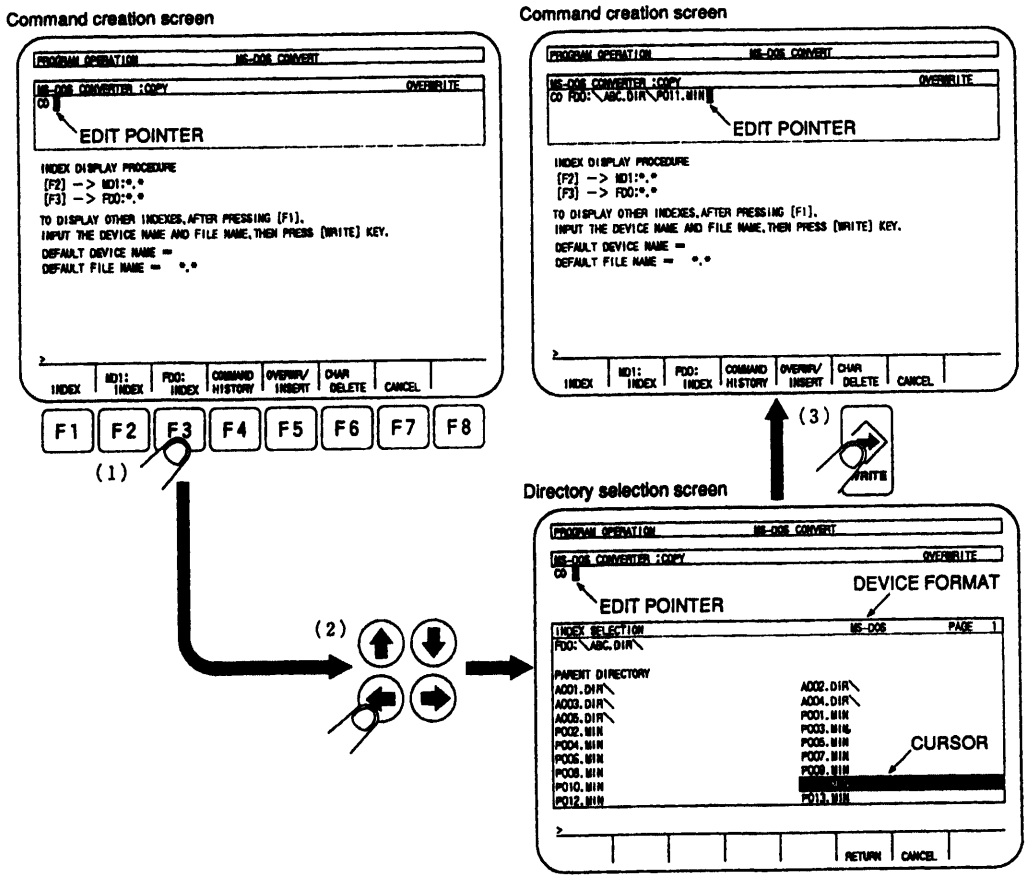


Fig. 2-66 Procedure for Selecting Files from Directories

10-5-2. Directory Selection Screen (for MS-DOS Format Devices)

Lines 4 to 7 : The command being created is displayed here.

The selected file name is entered at the position of the edit pointer. The edit pointer cannot be moved by pressing the cursor keys.

Line 8 : If the device is MS-DOS format, "MS-DOS" is displayed here.

Line 9 : The device name for the displayed directory, and the current directory name, are displayed here.

Line 11 : Normally, "PARENT DIRECTORY" is displayed here.

To change the directory to the parent directory, locate the cursor at "PARENT DIRECTORY" and press the [WRITE] key.

Lines 12 to 20 : The directory is displayed here.

File names and directory names are displayed ("\" is appended at the end of directory names).

If no file name is displayed, it means that the selected device does not contain files.

When the cursor is located at a file name and the WRITE key pressed, the selected file name is entered at the position of the edit pointer.

When the cursor is located at a directory name and the WRITE key pressed, the directory changes to the selected directory.

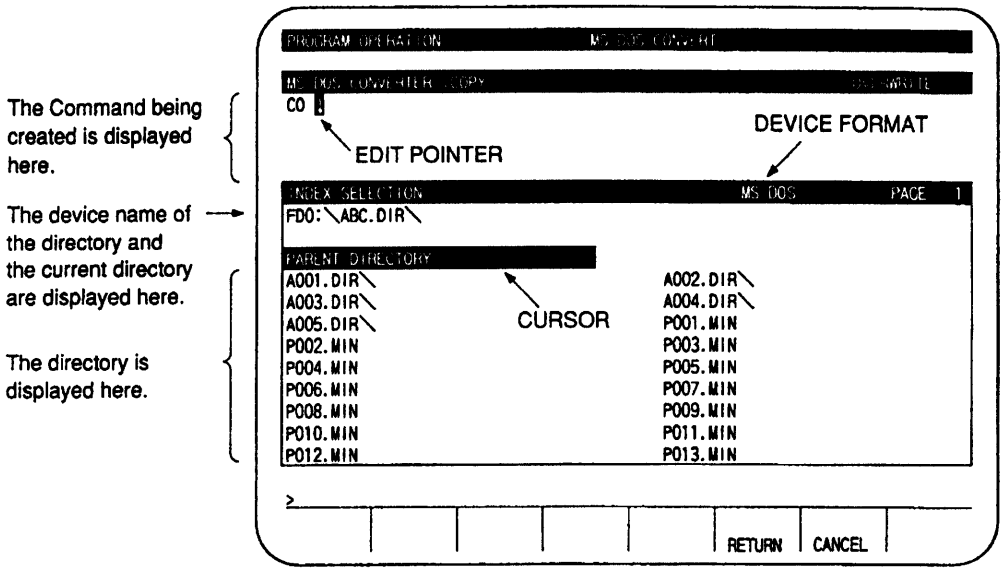


Fig. 2-67 Directory Selection Screen (for MS-DOS Format Devices)

10-5-3. Changing the Directory

The directory can be changed by locating the cursor at the required directory name and pressing the WRITE key.

If the cursor is located at "PARENT DIRECTORY" and the WRITE key pressed, the directory changes to the parent directory.

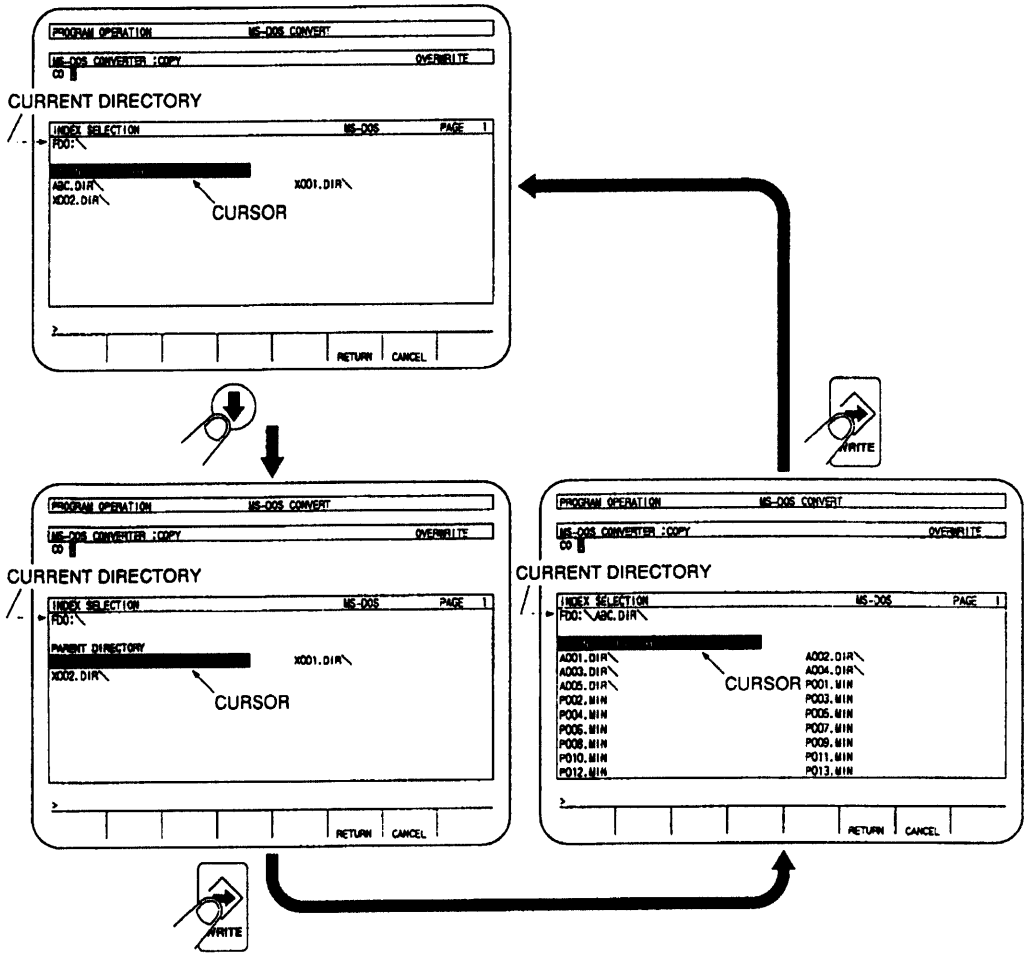


Fig. 2-68 Changing the Directory

10-5-4. Function Keys [F6] (RETURN), [F7] (CANCEL) and Cancel Key

When function key [F6] (RETURN) is pressed, the command creation screen is displayed and the device name only is entered at the position of the edit pointer. The file name that was at the cursor position is not entered.

When function key [F7] (CANCEL) or the Cancel key is pressed, the command creation screen is displayed and neither the device name nor the file name at the cursor position are entered on it.

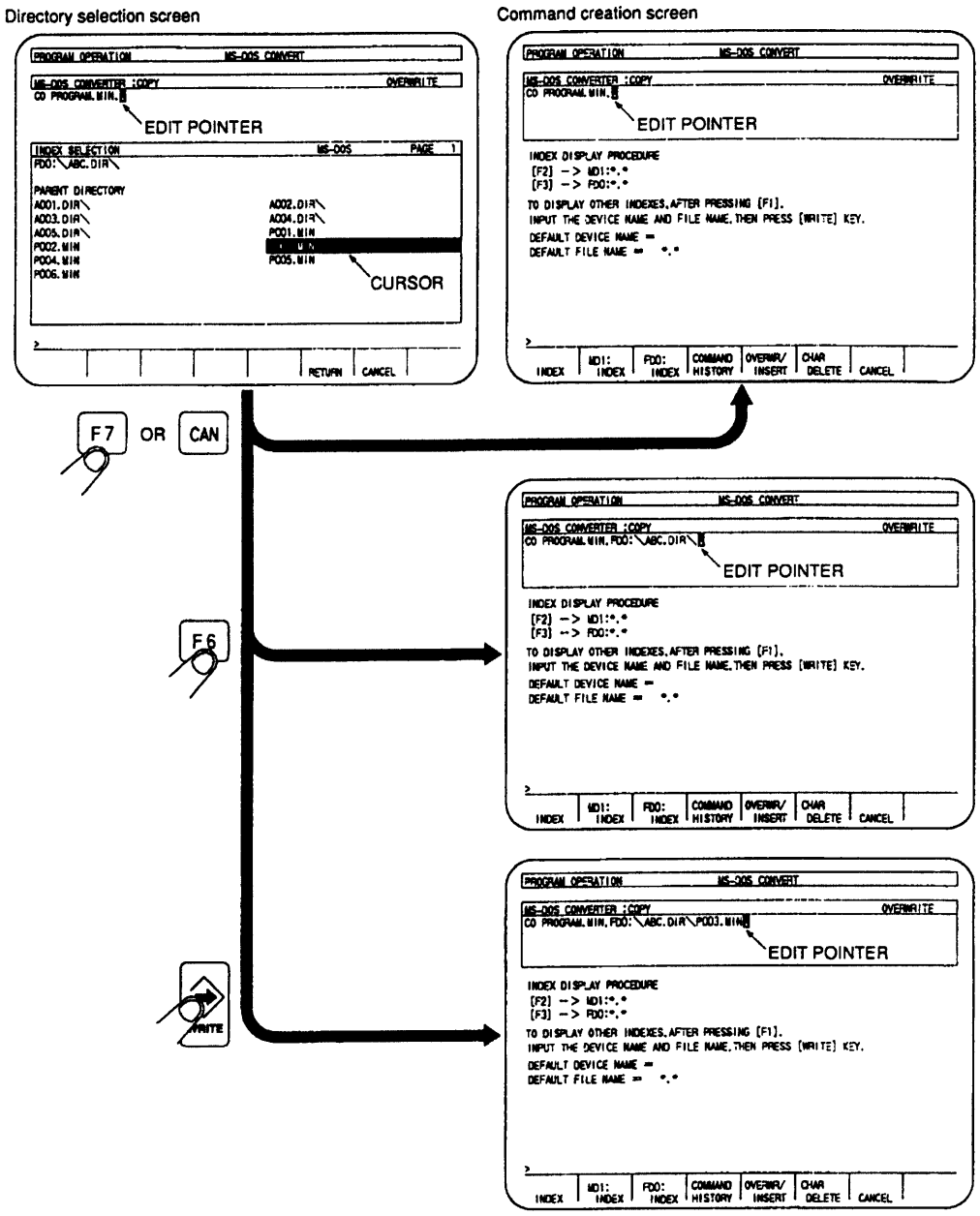


Fig. 2-69 Function Key [F6] (RETURN), [F7] (CANCEL) and Cancel Key

10-5-5. Method for Displaying Directories

The examples presented below are applicable when an MS-DOS format floppy disk is set in device "FD0:".

For the details when an OSP format floppy disk is set in device "FD0:", see 10-4, "Selecting Files From Directories (OSP Format)".

(1) When no device name, path name, or file name is specified before pressing the [WRITE] key (When the [WRITE] key is pressed immediately after pressing function key [F1] (INDEX):

```
>ISO
```

Normally, the directory for device "MDI:" is displayed.

However, in the machining management mode, the directory corresponding to the default device name and default path name specified in the environment settings is displayed.

(2) When a device name is entered before pressing the [WRITE] key

(When the device name and WRITE are entered after pressing the [F1] (INDEX) function key)

```
>ISO  FD0:
```

If device "FD0:" is MS-DOS format, generally, the directories under its root directory are displayed.

However, in the machining management mode, the directory corresponding to the default device name specified in the environment settings is displayed.

If device "FD0:" is not MS-DOS format, an error message is displayed on the console line and the display returns to the directory selection screen.

(3) When a path name is entered before pressing the [WRITE] key

(When the path name and WRITE are entered after pressing the [F1] (INDEX) function key)

```
>ISO  FD0:\ABC\
```

(Absolute path designation)

If device "FD0:" is MS-DOS format, the directory under path "\ABC\" of device "FD0:" is displayed.

If the path "\ABC\" does not exist in the device, the message "SPECIFIED PATH DOESN'T EXIST." is displayed on the console line.

If the device is not MS-DOS format, the message "PATH NAME CANNOT BE SPECIFIED IN THIS DEVICE." is displayed on the console line.

```
>ISO  FD0:ABC\
```

(Relative path designation)

If device "FD0:" is MS-DOS format, generally, the directory under path "\ABC\" of device "FD0:" is displayed.

However, in the machining management mode, the directory is displayed under the specified path which is regarded as the subdirectory of the default path name set in the environment settings.

```
>ISO  FD0:\*.*\
```

The message "ERROR IN SPECIFIED PATH NAME." is displayed on the console line.

The wild cards "*" and "?" cannot be used in any of the directory names that make up a path name.

```
>ISO  FD0:\ABC.1234\
```

```
>ISO  FD0:\123456789.ABC
```

The message "ERROR IN SPECIFIED PATH NAME." is displayed on the console line.

The following restrictions apply to the directory names that make up path names: the main directory name must comprise no more than eight alphanumeric characters and the extension must comprise no more than three alphanumeric characters.

(4) When the [WRITE] key is pressed after entering a file name:

(When the file name and WRITE are entered after pressing the [F1] (INDEX) function key)

```
>ISO  FD0:\ABC\*.*
```

If device "FD0:" is MS-DOS format, a directory of all files in the path "\ABC\" of device "FD0:" is displayed.

```
>ISO  FD0:\ABC\*.MIN
```

If device "FD0:" is MS-DOS format, a directory of all files in path "\ABC\" of device "FD0:" whose extension name is "MIN" is displayed.

```
>ISO  FD0:\ABC\ABC.*
```

If device "FD0:" is MS-DOS format, a directory of all files in path "\ABC\" of device "FD0:" whose main file name is "ABC" is displayed.

```
>ISO  FD0:\ABC\MS*.TXT
```

If device "FD0:" is MS-DOS format, a directory of all files in path "\ABC\" of device "FD0:" whose main file name starts with "MS" and whose extension name is "TXT" is displayed.

```
>ISO  FD0:\ABC\MS??.TXT
```

If device "FD0:" is MS-DOS format, a directory of all files in path "\ABC\" of device "FD0:" whose main file name starts with "MS" and comprises no more than four alphanumeric characters, and whose extension name is "TXT" is displayed.

```
>ISO  FD0:\ABC\123456789.ABC
```

```
>ISO  FD0:\ABC\ABC.1234
```

The message "ERROR IN SPECIFIED PATH NAME." is displayed on the console line.

If a path name is specified, the format is taken to be MS-DOS and therefore the main file name must consist of no more than eight alphanumeric characters and the extension name must consist of no more than three alphanumeric characters.

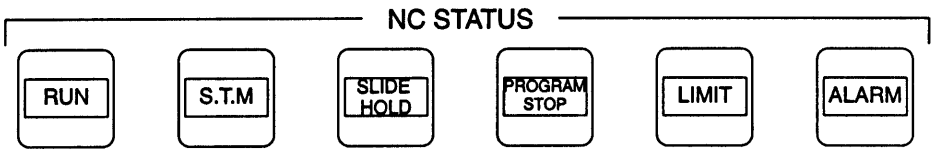
(5) When function key is pressed:

(when F3 (FD0: DIR) is pressed)

Directories contained in the route directory for the FD0: device will be displayed. In the "machining management" mode, this directory display will occur in accordance with the "default path name" designated by the environment setting.

11. PANEL DISPLAY SCREEN

11-1. 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.

11-2. Actual Position Display

When function key [F2] (ACTUAL POSIT.) is pressed, the actual position information page is displayed on the display screen. The actual position data are displayed in the following three pages and a RELATIVE ACT POSIT screen. To advance or reverse the pages, press the PAGE keys.

(1) Page 1 (Four-fold Extension Indication)

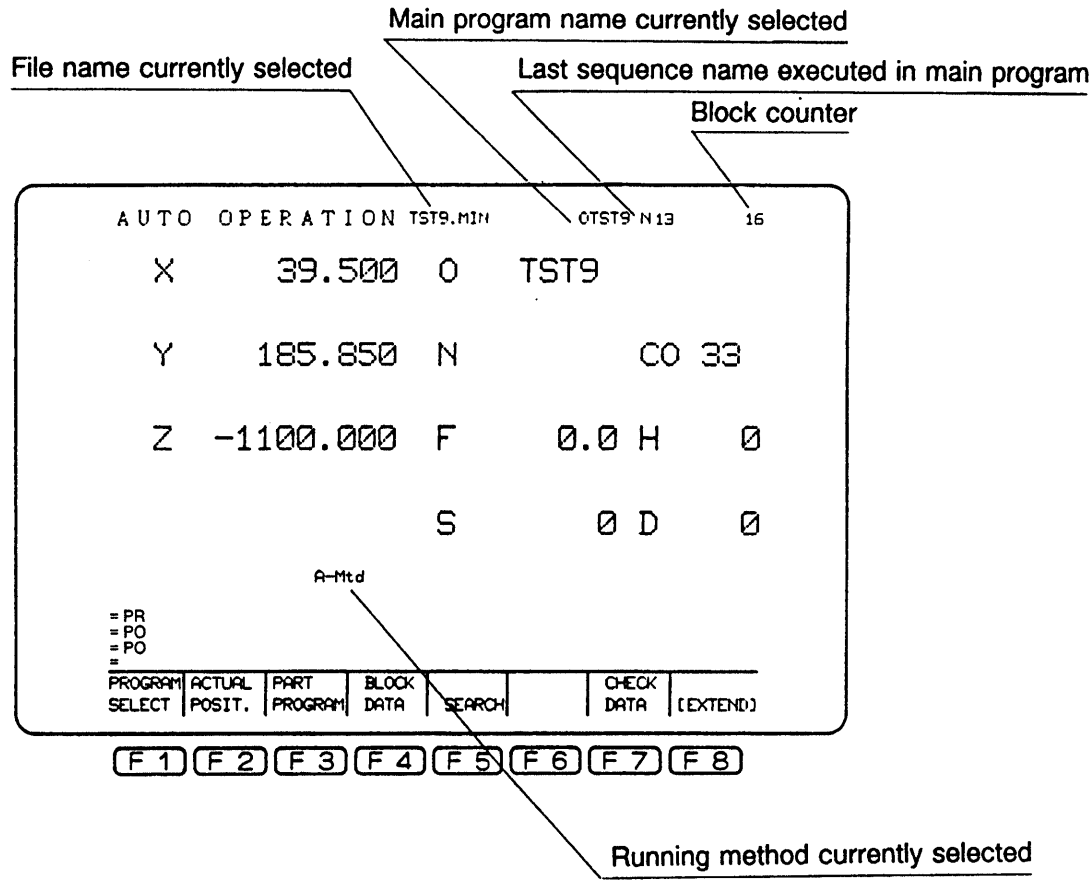


Fig. 2-70 Actual Position Display (Four-fold Extension Indication)

Note: The symbol "–" appears before axis address on which the mirror image function is active.

(2) Page 1 (Sixteen-fold Extension Indication)

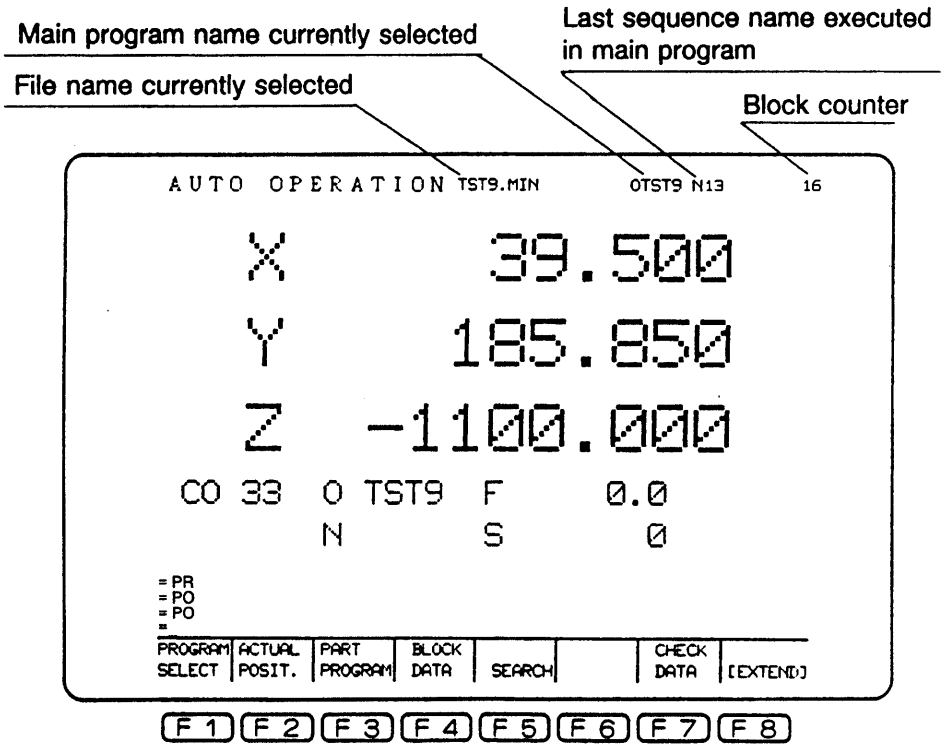


Fig. 2-71 Actual Position Display 1 – (Sixteen-fold Extension Indication)

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 Four-fold extension and Sixteen-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 ..... Four-fold extension
1 ..... Sixteen-fold extension

(3) Page 2

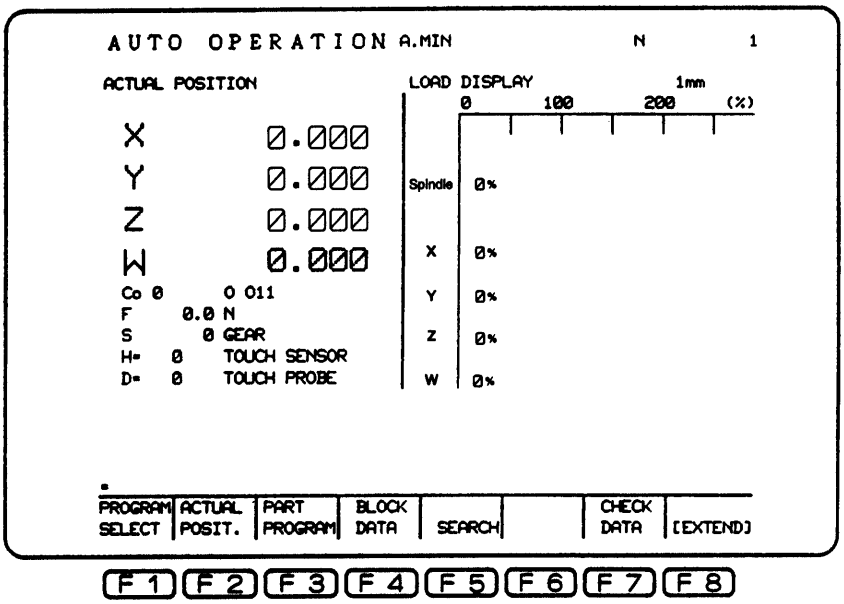


Fig. 2-72 Actual Position Display (2)

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)

(4) Page 3

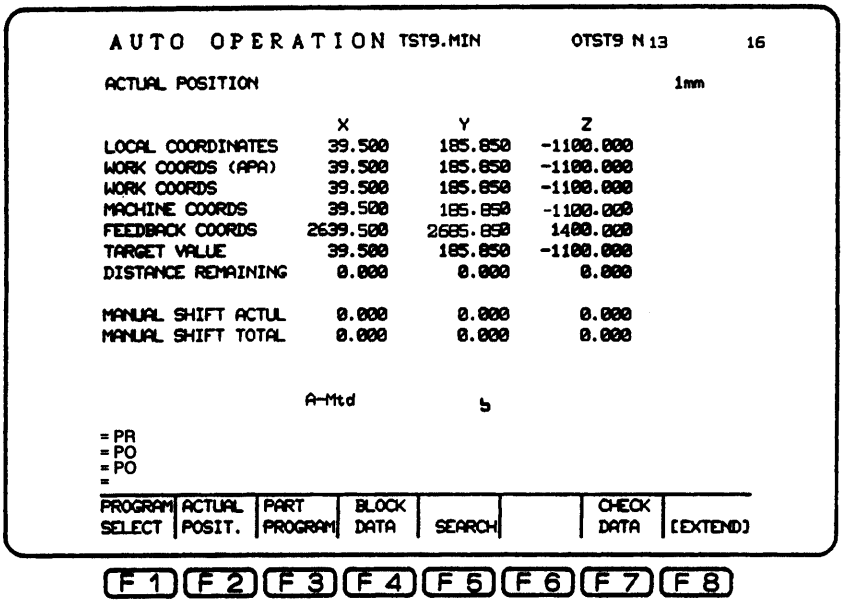


Fig. 2-73 Actual Position Display (3)

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)

11-2-1. RELATIVE ACT POSIT Screen

The RELATIVE ACT POSIT screen looks like as follows.

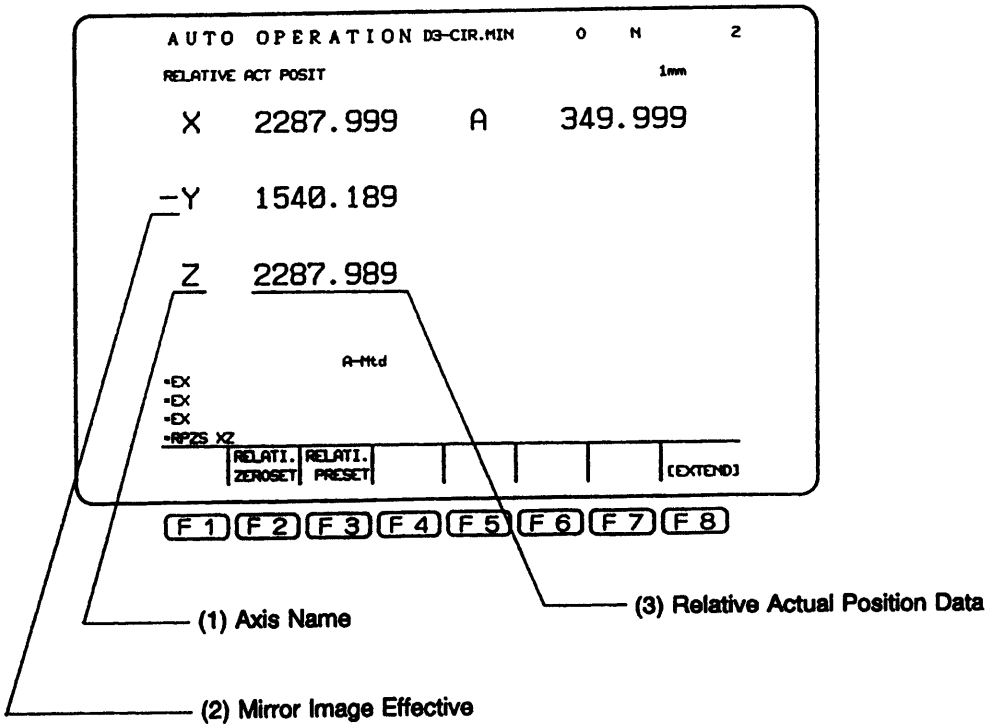


Fig. 2-74 Relative Act Posit Screen

a) Axis name

Indicates a basic axis name (X, Y, or Z) or an additional axis name (A, B, C, etc.).

An additional axis name is displayed only when an additional axis has been selected.

b) Mirror image effective

When mirror image is effective, a minus sign "–" is placed preceding the axis name.

When mirror image is not effective, no sign is placed.

c) Relative actual position data

Relative actual position data calculated using the following equation is displayed in the selected unit system.

Relative actual position data of an additional axis is displayed only when an additional axis is selected.

Relative actual position data = (coordinate value output from the encoder [Supplement] : 1)
– (Reference position [Supplement] : 2) – (Tool length offset value)
– (Machine zero point)

[Supplement] : 1. Whether or not the manual shift amount is added can be set at NC optional parameter (bit) No. 5, bit 7.

2. The reference position is the zero point (in the machine coordinate system) for the relative actual position. For the procedure to set the reference position, refer to (1) "Reference Position Setting".

d) Reference position

The reference position is the zero point in the machine coordinate system and is used to display the relative actual position, or, in their words, the zero point in the relative coordinate system. The reference position is calculated form the equation below and displayed for each axis in the selected unit system.

Relative actual position data of an additional axis is displayed only when an additional axis is selected.

Reference position = (output from position encoder [Supplement] : 1) – (actual position value [Supplement] : 2)
– (tool length offset value) – (machine zero point)

[Supplement] : 1. Like the actual position display, it is possible to select whether or not the manual shift amount is included in the output form the position encoder by setting data at NC optional parameter (bit) No. 5, bit 7.

2. Where the actual position is set in the coordinate system is input. Refer to (1) "Reference Position Setting".

(1) Reference Position Setting

The reference position is the zero point (in the machine coordinate system) which is used to display the relative actual position, or, in other words, the zero point in the relative coordinate system. The reference position can be obtained by setting the coordinate value of the actual position.

The reference position can be set in two different manners : by setting the actual position at "0" and by setting the actual position at a desired position.

To set the reference position, press function key [F8] (EXTEND) in the automatic, MDI, or manual operation mode repeatedly until functions "RELATI. ZEROSET" and "RELATI. PRESET" are assigned to function keys [F2] and [F3], respectively.

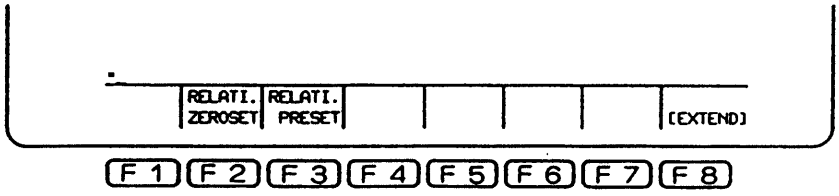


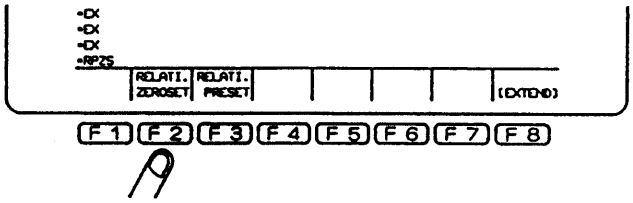
Fig. 2-75 Reference Position Setting

a) Setting the actual position at "0"

Follow the procedure below when setting the actual position at "0" in the relative coordinate system.

1) Press function key [F2] (RELATI. ZEROSET) in the automatic, MDI, or manual operation mode.

   The prompt "= RPZS" will be displayed on the console line of the display screen.

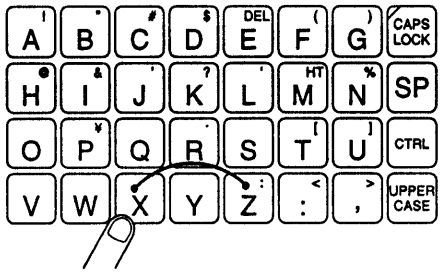


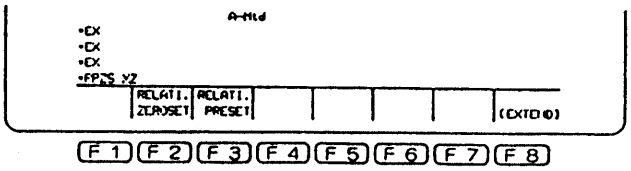
2) Key in axis address(es) for which "0" is set through the keyboard. When no axis address has been keyed in, "0" is set for all axes.

   Example: To set "0" for X and Z axes

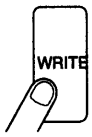
   = RPZS XZ

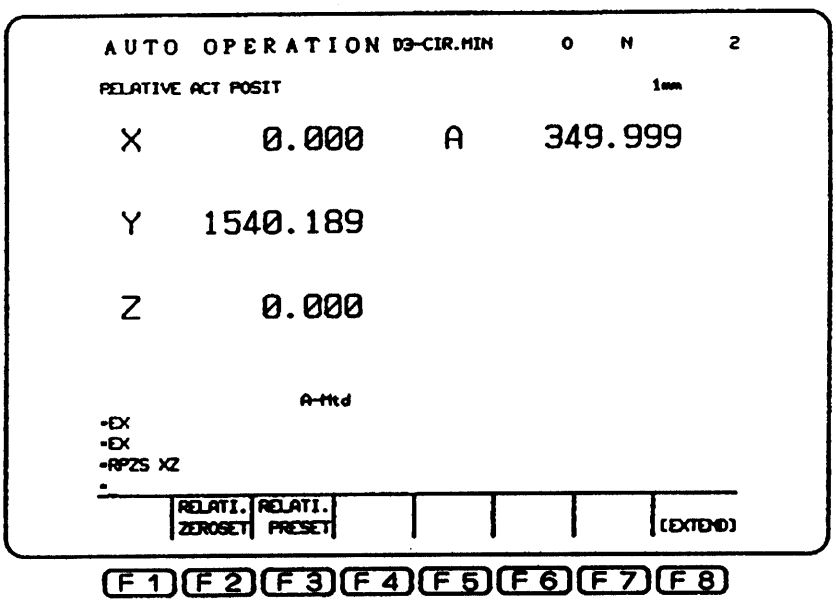
   Key in axis addresses





3) Press the WRITE key.





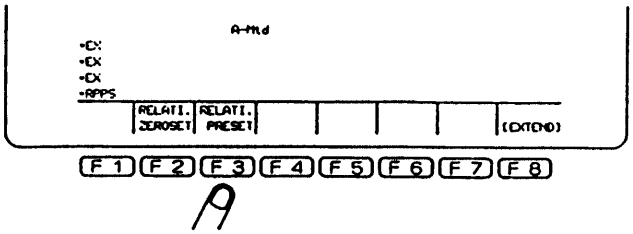
The reference position with which the actual position of the designated axis is "0" is obtained and relative actual position data of the designated axis will change to "0".

b) Setting the actual position at a desired position

Follow the procedure below when setting the actual position at a desired position in the relative coordinate system.

1) Press function key [F3] (RELATI. PRESET) in the automatic, MDI, or manual operation mode.

   The prompt "= RPPS" will be displayed on the console line of the display screen.

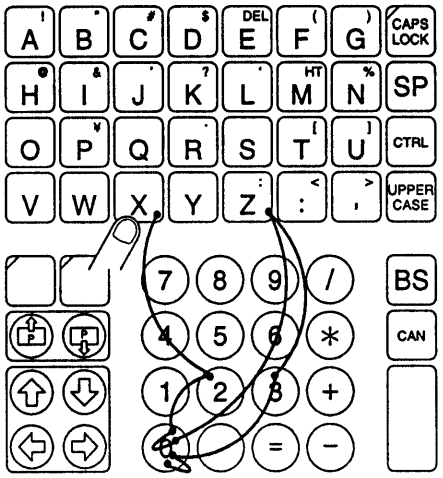


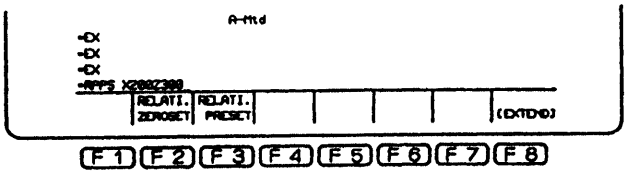
2) Key in axis address(es) and numerical value for which the actual position is set at a desired position through the keyboard. When no axis address has been keyed in, the actual position is set at a desired position for each axis.

   Example 1: To set the actual position of X and Z axes at 200 and 300, respectively

   = RPPS X200Z300

   Key in axis addresses and numerical values.



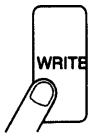


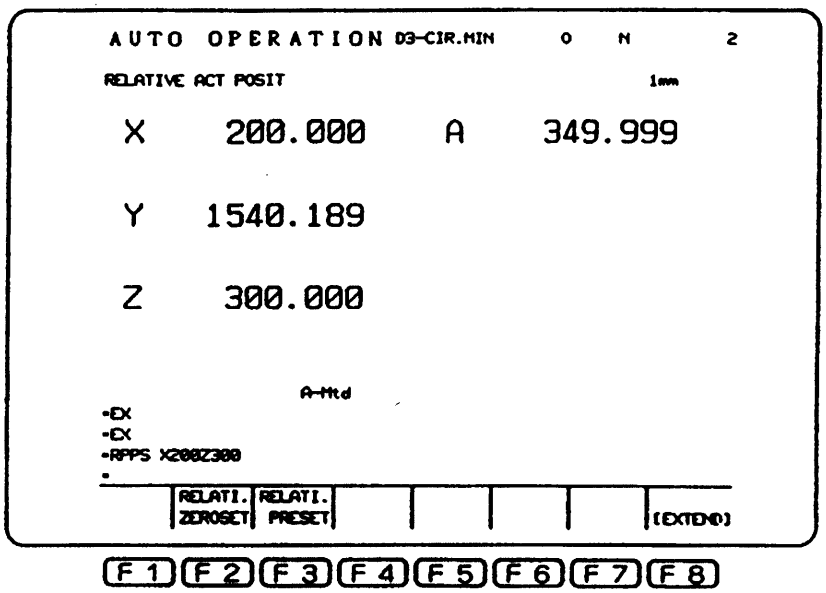
   Example 2: To set the actual position of all axes at 100

   = RPPS 100

   Key in a numerical value without specifying axis addresses.

3) Press the WRITE key.





The reference position with which the actual position of the designated axis is a desired position is obtained and relative actual position data of the designated axis will change to a desired position.

[Supplement] : Pressing the WRITE key without keying in address(es) and numerical value(s) does not set anything.

c) Data setting range and restrictions

1) Data is input in the unit system (metric or inch) employed for machine operation and the decimal point position is fixed. For example, when "1" has been input while the 0.001 mm unit system is selected, it is recognized as 1 mm. The same rule also applies to the inch system.

2) Data can be set within the following range.

For linear axes: –99999.999 mm to +99999.999 mm

(When the inch system is selected, the entered value is converted into a metric value and checked if it is within the above range.)

For rotary axes: –99999.999° to +99999·999° (for the 0.001° unit system)

–9999.9999° to +9999·9999° (for the 0.0001° unit system)

(2) Supplements

a) Data is input in the unit system (metric or inch) employed for machine operation and the decimal point position is fixed. (For example, when "1 n has been input while the 0.001 mm unit system is selected, it is recognized as 1 mm.)

b) When changing the reference position of all axes including rotary axes, the entered value is interpreted as length and degree.

c) The reference position cannot be set for an indexable axis. In this case, the actual position data is displayed on the RELATIVE ACT POSIT screen.

However, when axis designation was not made with reference position setting, "0" is set at the indexable axis, causing no error.

d) When the power is turned off, reference position data becomes "0" since it is not backed up by turning off of the power. (The machine zero point is employed as the reference position.)

However, when actual position data in the work coordinate system is rounded (parameter (bit) No. 2 bit 1 is ON) with the multi-turn rotary table specification, reference position data is calculated in reverse order. Therefore, when the work zero point is other than "0", a value other than "0" is set as reference position data.

e) Work coordinate values do not change when the reference position has been changed.

f) When the relative actual position value is smaller than –99999.999 mm (–9999.9999 inch for the inch system), "– OVERFLOW" will be displayed on the display screen.

When the relative actual position value is larger than +99999.999 mm (+9999.9999 inch for the inch system), "+ OVERFLOW" will be displayed on the display screen.

g) The display of the relative actual position of a rotary axis (rotary table) varies depending on the rotary axis specification.

1) Rotary table and indexable axis specification

The relative actual position is displayed within 0° and 360°. The reference position is also displayed within 0° and 360°.

2) Rotary axis with limits and multi-turn rotary table

The relative actual position obtained using the equation on page 23 is displayed as it is. With the multi-turn rotary table, whether or not relative actual position data is expressed within 0° and 360° when the NC is reset can be set at NC optional parameter No. 2, bit 1.

When the additional axis is removed with the removable axis specification, "– OVERFLOW" will be displayed as relative actual position data.

11-3. Program Display

When 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

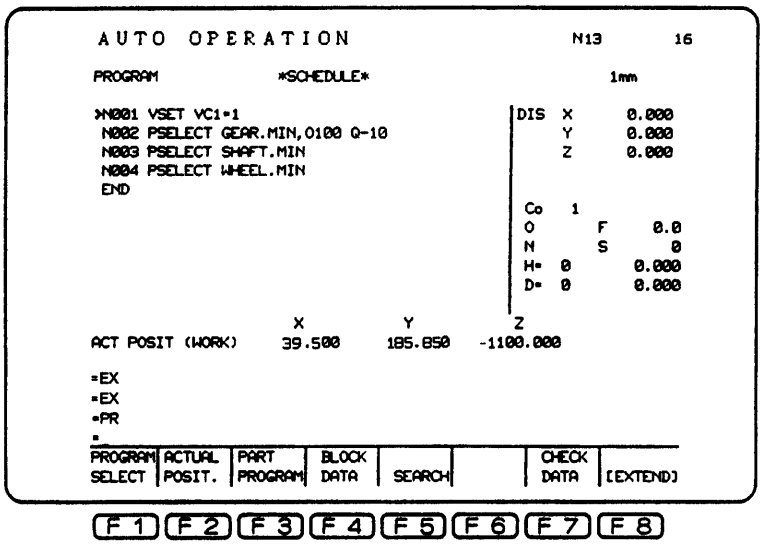
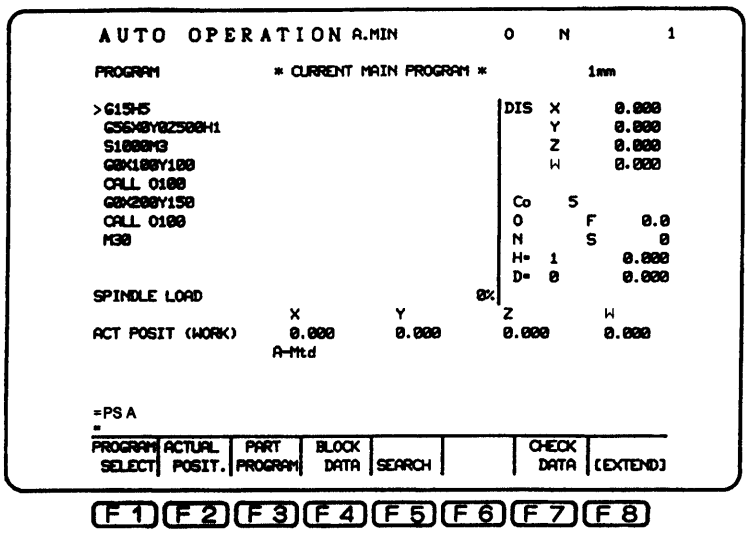


Fig. 2-76 Schedule Program Screen

(2) Current Main Program



>> : Block just read into the buffer

↑ : Block being executed.

Fig. 2-77 Current Main Program Screen

(3) Read Main Program

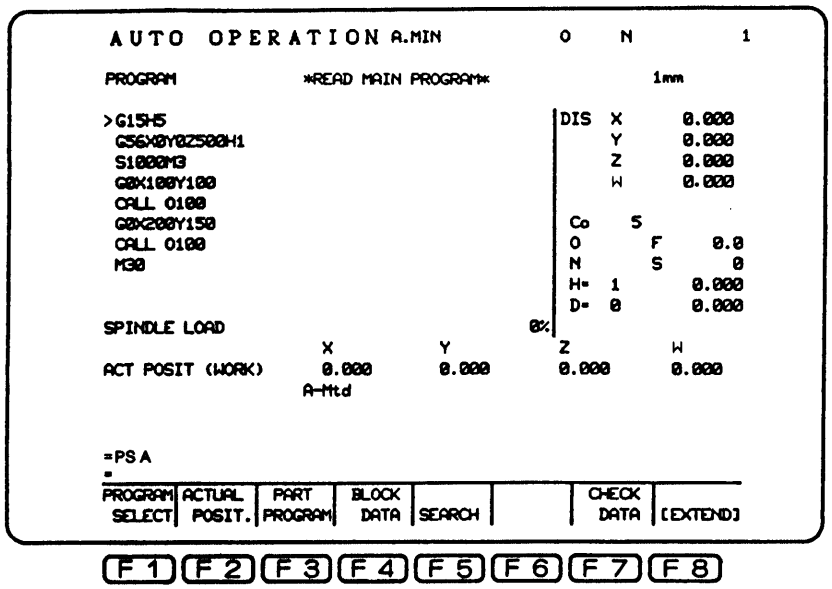


Fig. 2-78 Read Main Program Screen

(4) MDI Program

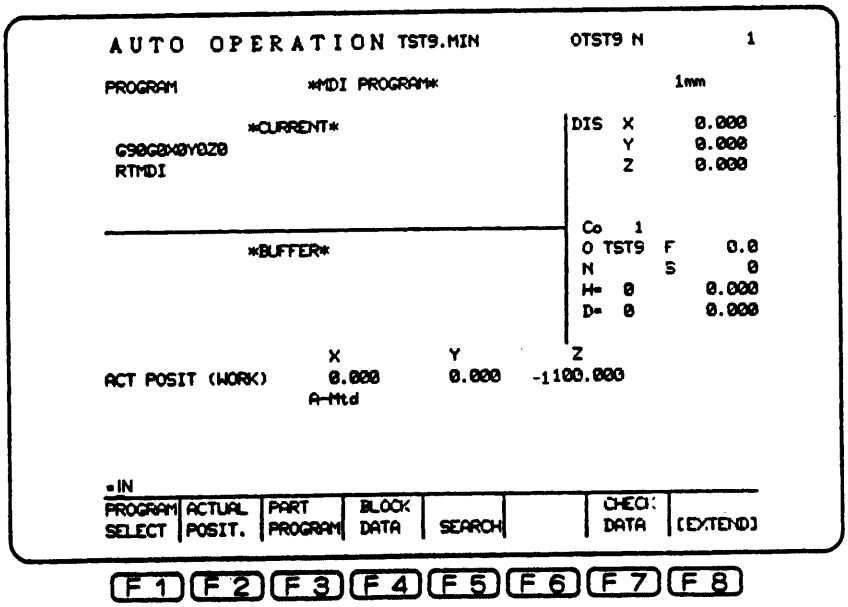


Fig. 2-79 MDI Program Screen

11-4. Block Display

Function key [F4] (BLOCK DATA) accesses the block data pages.

Under the heading of BLOCK DATA, four pages of block data display are available: CURRENT, BUFFER, SECOND BUFFER, and THIRD BUFFER.

These pages are selectable by pressing the PAGE key.

(1) Display of One Block Data Currently Executed

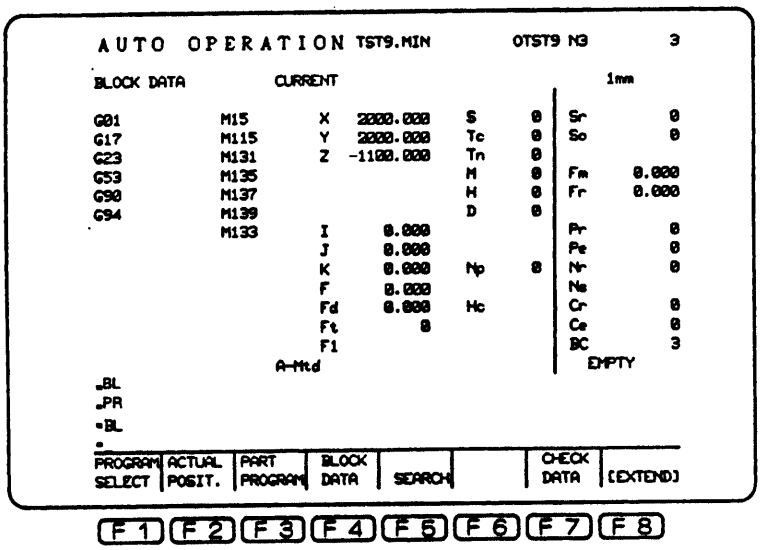


Fig. 2-80 Display of One Block Date Currently Executed

(2) Display of One Block Data in Buffer (to be Executed Next).

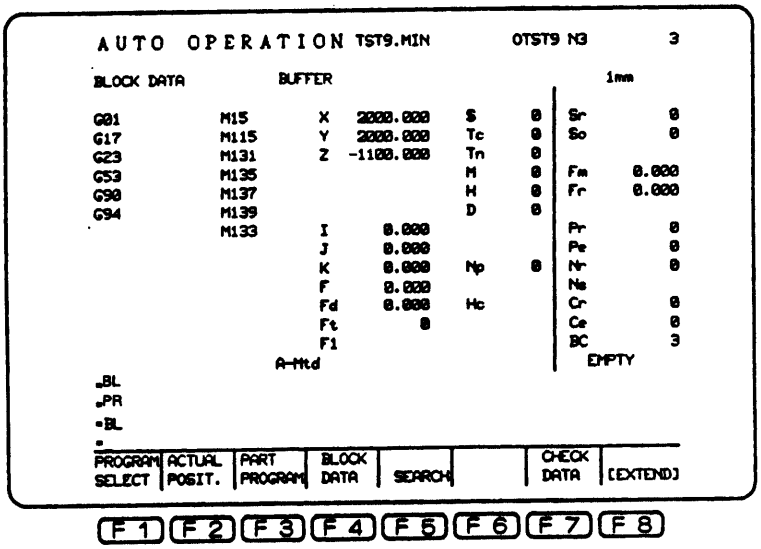


Fig. 2-81 Display of One Block Data in Buffer (to be Executed Next)

(3) Display of One Block Data in Second Buffer

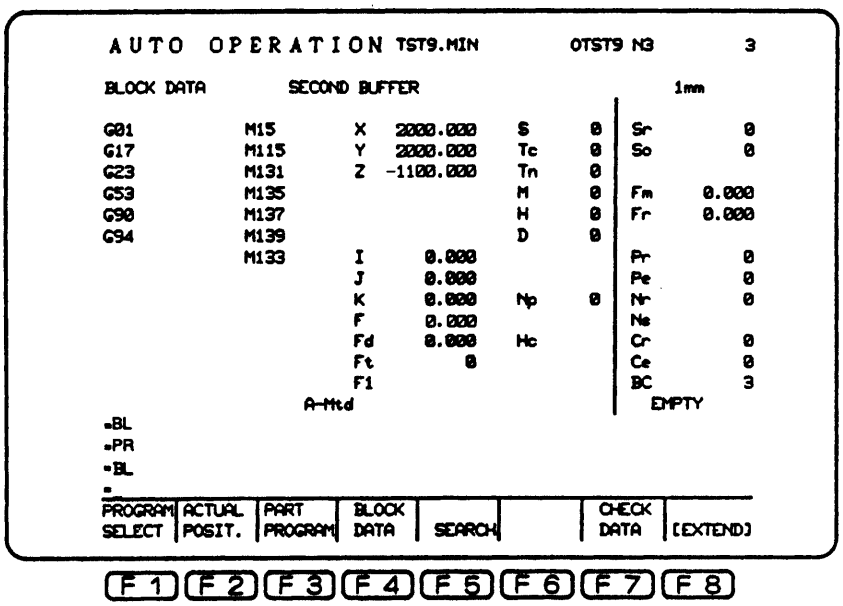


Fig. 2-82 Display of One Block Data in Second Buffer

(4) Display of One Block Data in Third Buffer

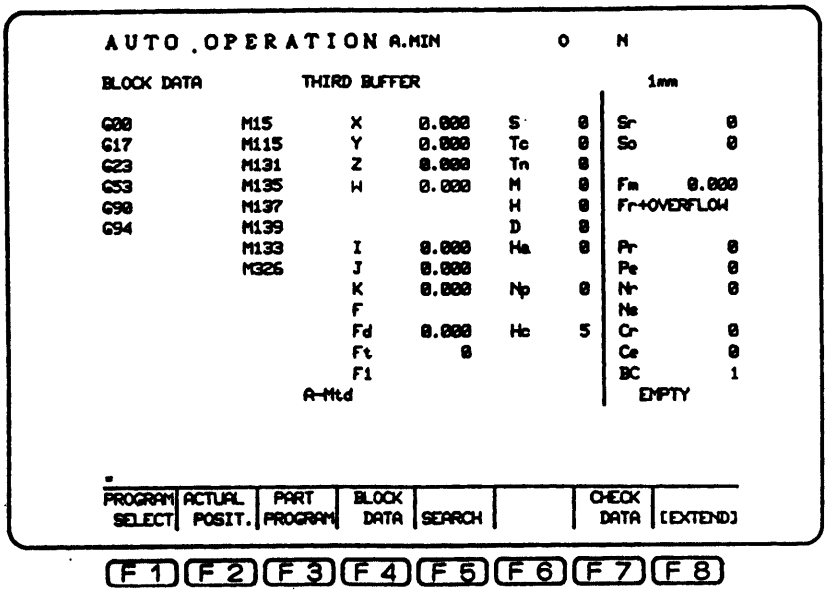


Fig. 2-83 Display of One Block Data in Third Buffer

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)
F1 : 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)

11-5. ATC Tool Setting Data Display (Memory-Random ATC Specification)

Pressing function key [F8] (EXTEND) changes the key guidance display. 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)∗. Function key [F3] (TOOL DISPLAY) switches the display from one page to another.

(1) ATC Tool Set (Tool Reference)

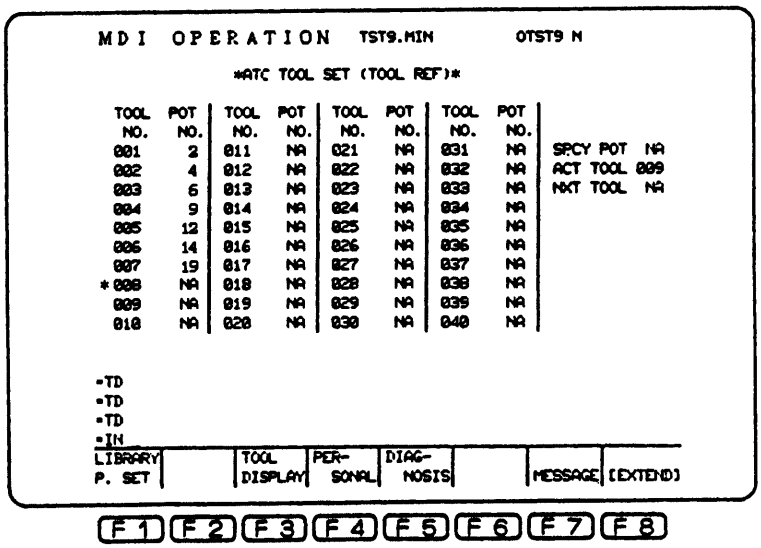


Fig. 2-84 ATC Tool Set (Tool Reference) Screen

(2) ATC Tool Set (Pot Reference)

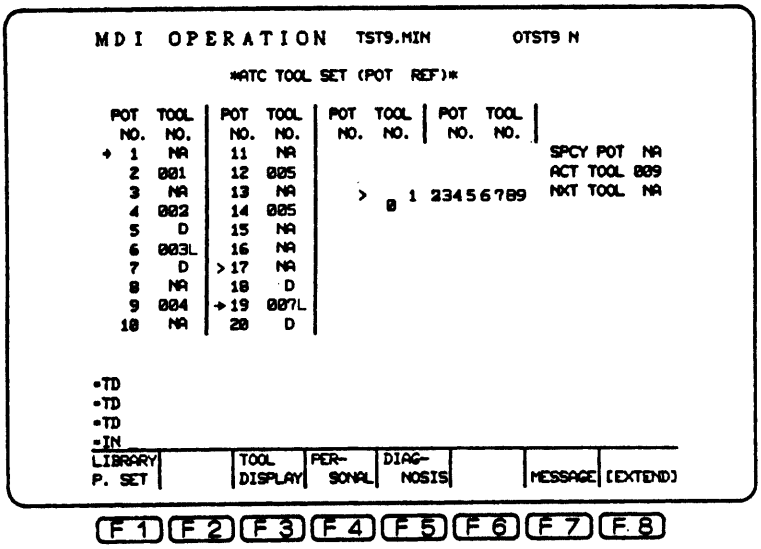


Fig. 2-85 ATC Tool Set (Pot Reference) Screen

11-6. Message Display (optional)

Press 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 display screen 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 display screen 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 display screen.

N103 NMSG ..... This restores the display mode to the original mode.

N104 :

N110 X100 Y100 (WORK FINISH) ..... Switching the display mode into the message by pressing function key allows the display screen to display the comment "WORK FINISH".

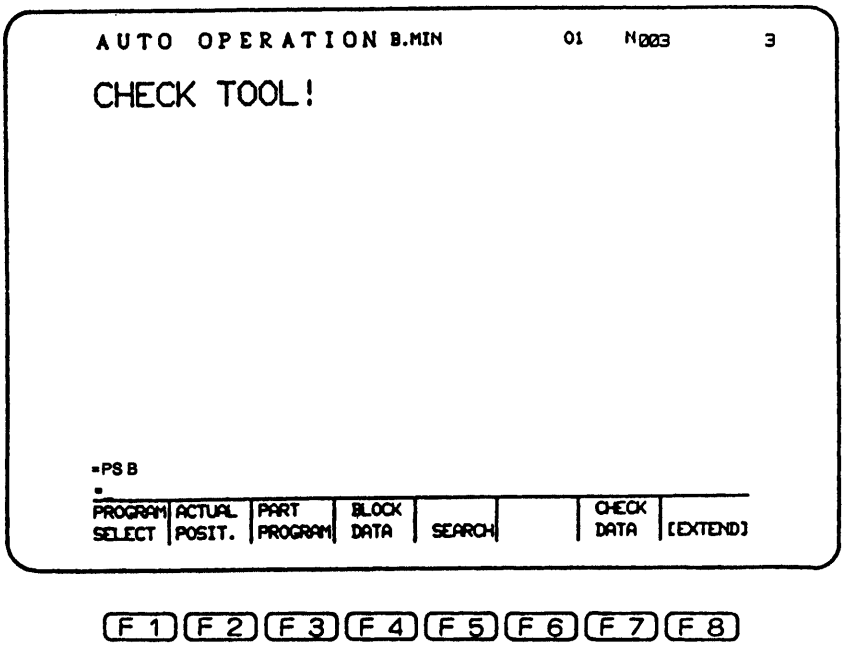


Fig. 2-86 Message Display Screen

11-7. Check Display

The OSP has a number of check functions by which the panel input/output status and the machine signal input/output status are indicated on the display screen during operation in automatic mode, MDI mode, and manual mode. The following items can be monitored:

1. Field Net I/O
2. Panel input
3. Panel output
4. Machine input
5. Machine output
6. NC input
7. NC output
8. NC specification codes
9. Machine specification codes
10. NC axis data
11. Machine axis data
12. Diagnostics
13. System variables
14. 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:

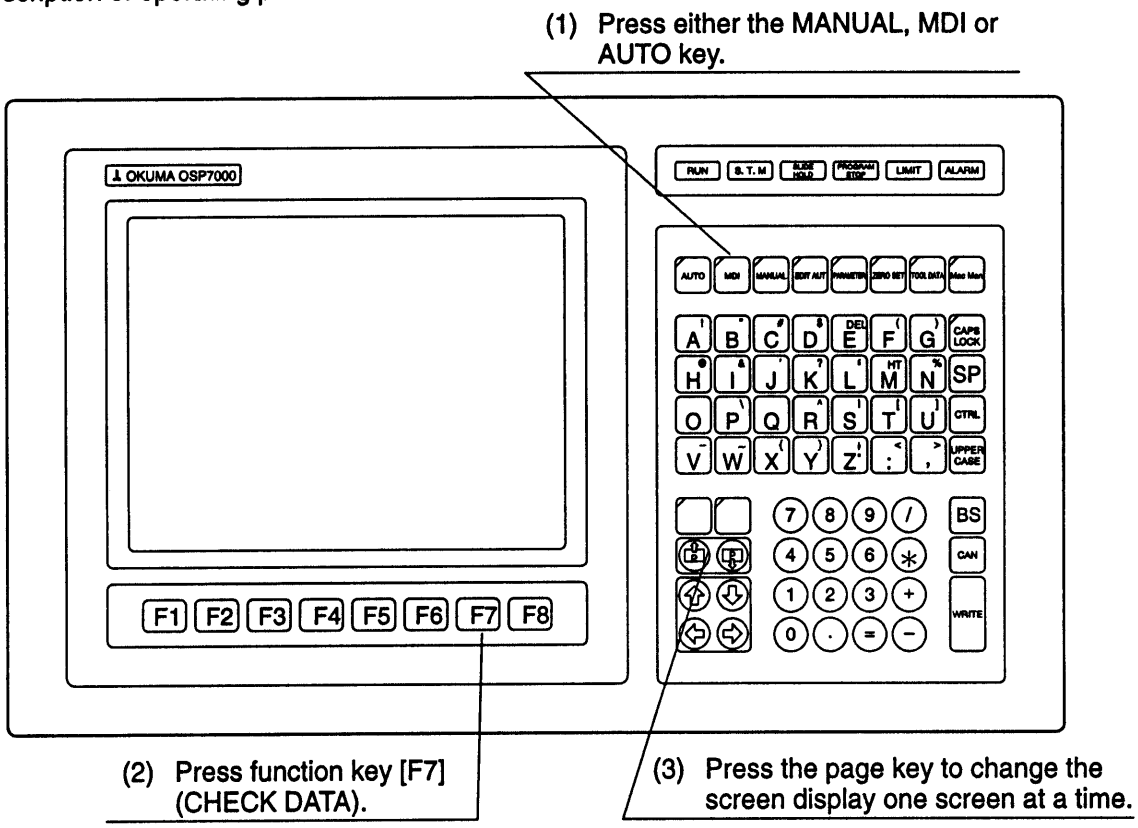


Fig. 2-87 Displaying the CHECK DATA INDEX Page

(1) Press either MANUAL, MDI, or AUTO key.

The guides shown in the illustration above are displayed, but for FI, 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 function key [F7] (CHECK DATA).

The display screen displays a check data indications page.

(3) Press either the ⇩ or ⇧ page key to display the check data desired.

Pressing ⇩ once advances a page.
Pressing ⇧ 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 above is omitted here as they both apply in this case.

(4) Press function key [F5] (SEARCH).

"= F" is displayed on the display screen 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 "= F␣ ", the menu display shown below will be displayed.

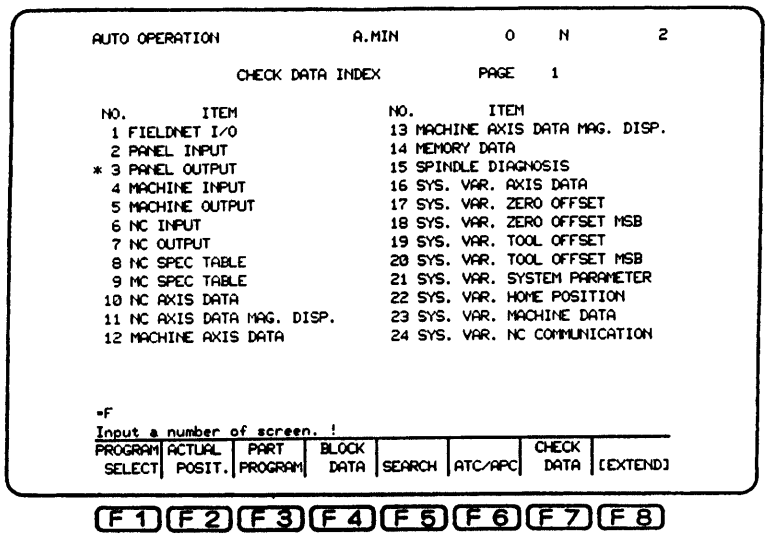


Fig. 2-88 Check Display Screen

Input the number for required item and press the WRITE key to display the first page of the required item screen.

11-7-1. Field Net I/O

The field net input/output statuses are indicated by highlight displays.

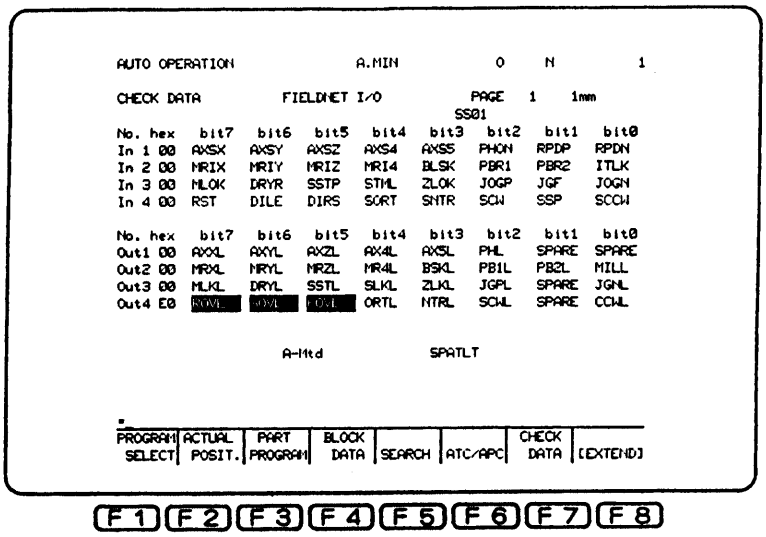


Fig. 2-89 Field Net I/O Screen

11-7-2. Panel Input

On the "CHECK DATA ∗PANEL INPUT∗" pages, the on/off status of individual switches on the machine operation panel are displayed.

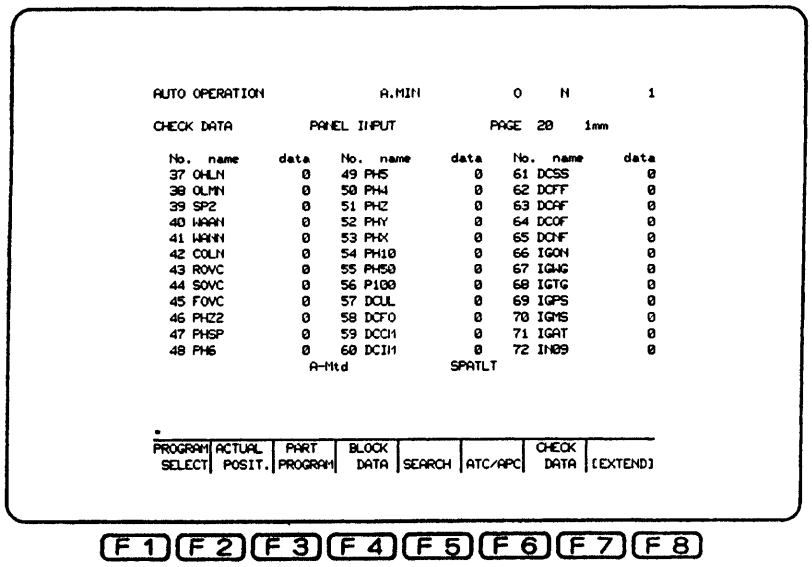


Fig. 2-90 Panel Input Screen

11-7-3. Panel Output

On the "CHECK DATA ∗PANEL OUTPUT∗" pages, the on/off status of individual indicating lamps on the machine operation panel are displayed.

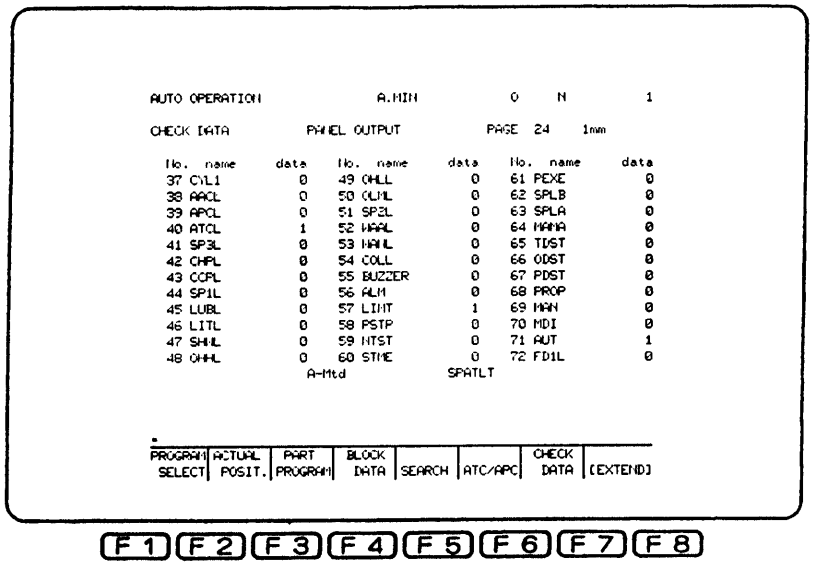


Fig. 2-91 Panel Output Screen

11-7-4. Machine Input

On the "CHECK DATA ∗EC INPUT∗" pages, the on/off status of individual input signals from the limit switches are displayed.

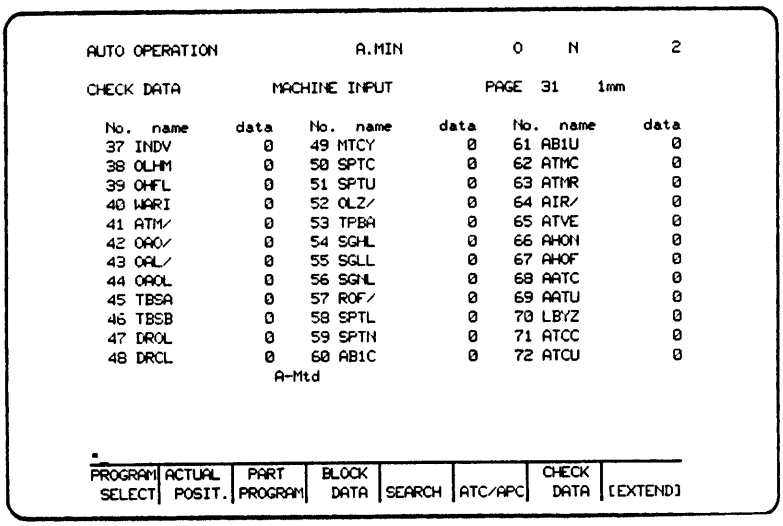


Fig. 2-92 Machine Input Screen

11-7-5. Machine Output

On the "CHECK DATA ∗EC OUTPUT∗" pages, the on/off status of individual output signals to solenoids and relays are displayed.

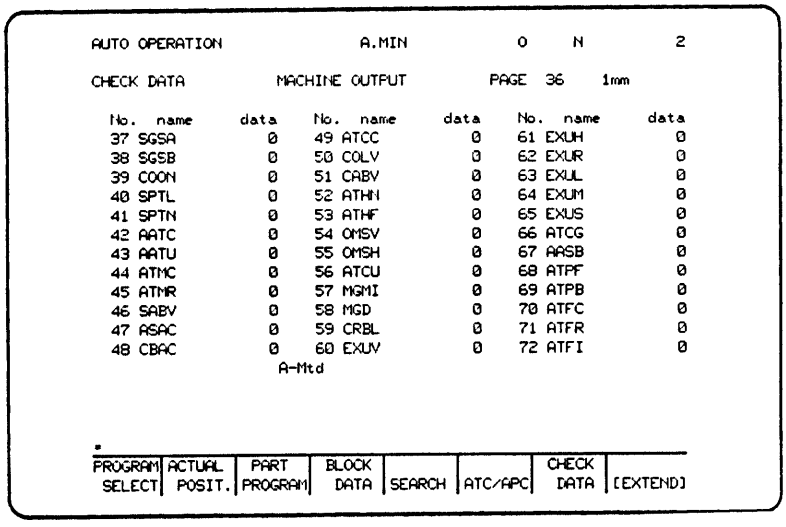


Fig. 2-93 Machine Output Screen

11-7-6. NC Input

On the "CHECK DATA ∗NC INPUT∗" pages, the on/off status of individual input signals to the NC processor are displayed.

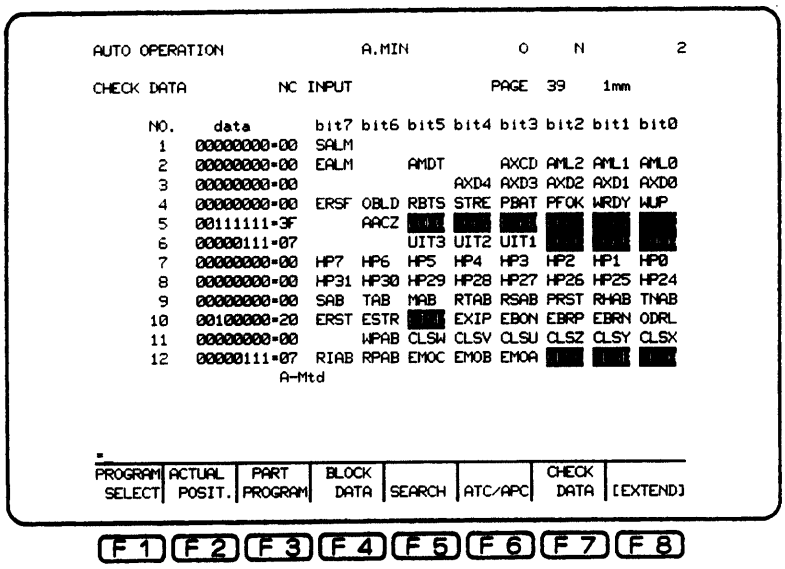


Fig. 2-94 NC Input Screen

11-7-7. NC Output

On the "CHECK DATA ∗NC OUTPUT∗" pages, the on/off status of individual output signals from the NC processor are displayed.

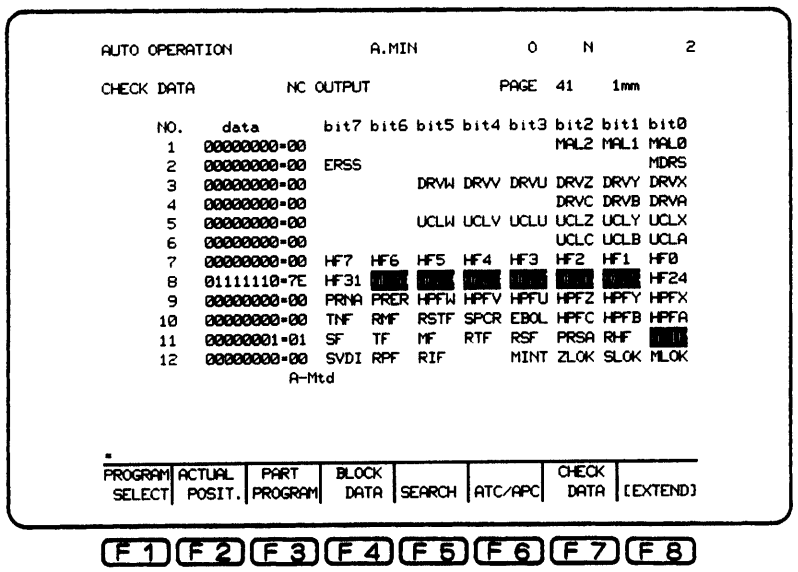


Fig. 2-95 NC Output Screen

11-7-8. NC Specification Codes

```
AUTO OPERATION              A.MIN          0    N         2

CHECK DATA          NC SPEC TABLE          PAGE  43    1mm

      NO.    data       bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0
       1   11111011=FB  SDPR SBPR ECAL SYV  01DG 01MC REVF INML
       2   01000111=47  T100 T300 T200 Z050 Z020 3DCR MVOL LSTR
       3   01000000=40  BFUN EPHD PHD3 PHD2 MIPH S6AX S5AX S4AX
       4   11111111=FF  G50S G62S G61S G43S G92S G31S G60S HELI
       5   00010010=12  EPSN OKUM 232C F1PR F1D4      F1DG RAMC
       6   01010110=56  MADS FRPB      BLSM EC-T AX-T EC-P AX-P
       7   00000000=00  GRTB SYC5 RLT1 RLT0 SYC4 SYCZ SYCY SYCX
       8   00100111=27  EXP4 EXP2 GRP  PPC  IGF  FDFI FDFO COLR
       9   10000000=80  AXCH EXPB EXPA MIR6 MIR5 MIR4 BSP3 BSP2
      10   01111111=7F  EIGF EPBK MSG  G22S G28S MAP5 MAP4 MAP2
      11   11101100=EC  SSTP RET  AXSC MEED PHID AXSL JGNF SFTH
      12   11000000=C0  EIML EGCA DNC3 DNC2 DNC1 DNCB DNCA
                  A-Mtd


*
PROGRAM SELECT | ACTUAL POSIT. | PART PROGRAM | BLOCK DATA | SEARCH | ATC/APC | CHECK DATA | [EXTEND]
```

F1 F2 F3 F4 F5 F6 F7 F8

Fig. 2-96 NC Specification Codes Screen

11-7-9. Machine Specification Codes

```
AUTO OPERATION              A.MIN          0    N         1

CHECK DATA          MC SPEC TABLE          PAGE  39    1mm

      NO.    data       bit7 bit6 bit5 bit4 bit3 bit2 bit1 bit0
       1   00000001=01       SPR3 SPR2 SPR1      AAC  APC  ATC
       2   00000000=00  NCST PDNT                SPOL      MOT1
       3   00001000=08       M120 M100 MG70 MG50 MG32 MG30 MG20
       4   00000000=00  MSPC      EXAT ATTC ATAT PLSD ASC  SAH
       5   00000000=00                CRSZ ACW  CR10 CRSF
       6   00000000=00  PLTR DRIL          PL12 PL10 PL6
       7   00000000=00                APIL NSST APUN APCS
       8   00000000=00                AACR AACC AACT AACF
       9   00000000=00           ATCD      ATRF MAAC MATT
      10   01111111=7F       CHIP WKSO OHLH MST  AIRA AIRN COL
      11   00000000=00  TSUT TOI       SPCT ATOH SOLH OLHL HOLH
      12   00000000=00  WARM          EXHM SRV2 NCY2 SRVM NCYM
                  A-Mtd


*F 14
*
PROGRAM SELECT | ACTUAL POSIT. | PART PROGRAM | BLOCK DATA | SEARCH | ATC/APC | CHECK DATA | [EXTEND]
```

F1 F2 F3 F4 F5 F6 F7 F8

Fig. 2-97 Machine Specification Codes Screen

11-7-10.NC Axis Data

The NC axis data is displayed in decimal numbers on the display screen, as shown below.

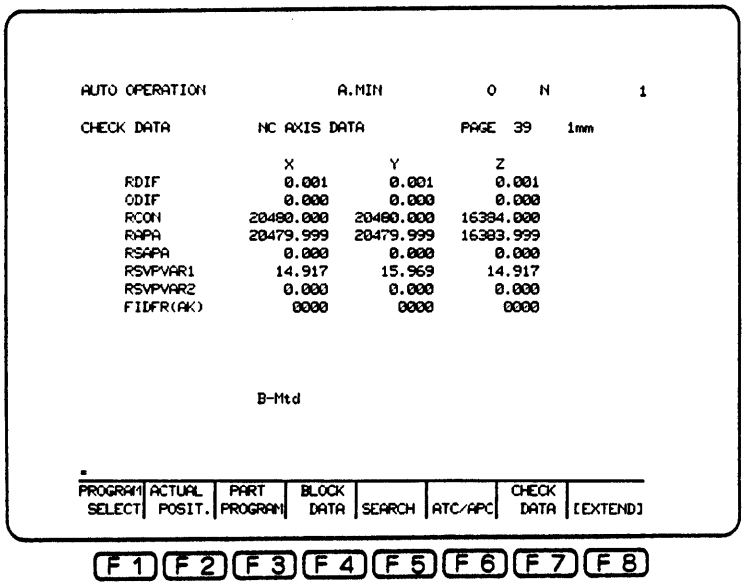


Fig. 2-98 NC Axis Data Screen

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.)

FIDFR (AK) .. Indicates the inductosyn ON/OFF state

Additionally, the NC axis data enlarge display screen displaying ODIF, RAPA and load data in enlarged characters is provided.

11-7-11. Machine Axis Data

The machine axis data is displayed in decimal numbers on the display screen, as shown below.

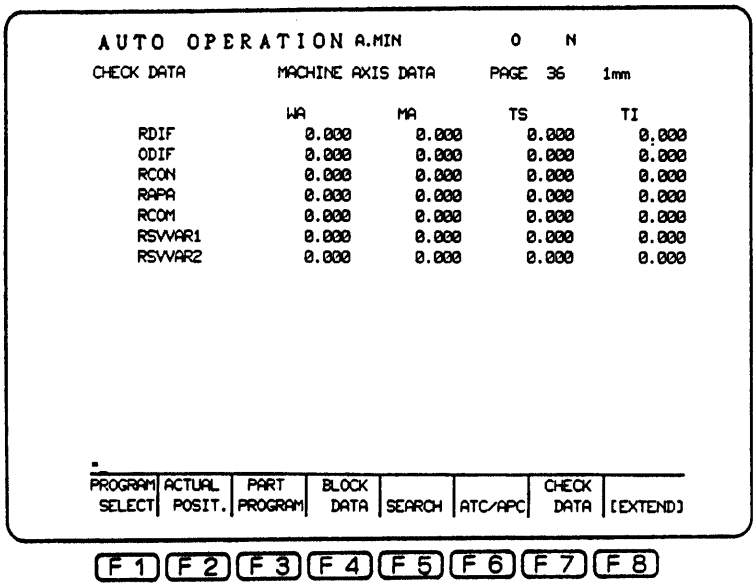


Fig. 2-99 Machine Axis Data Screen

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

RCOM ..... Command value

RCCON ..... This is the RCON with the position encoder offset incorporated (applies to systems with axis switching specifications).

RCAPA ..... This is the RAPA with the position encoder offset incorporated (applies to systems with axis switching specifications).

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.)

WA ..... Crossrail

MA ..... Magazine

TS ..... Varies depending on the machine being used. Refer to the Maintenance Manual for the machine in question.

TI ..... Varies depending on the machine being used. Refer to the Maintenance Manual for the machine in question.

Additionally, the machine axis data enlarge display screen displaying ODIF, RAPA and load data in enlarged characters is provided.

11-7-12.Diagnostics

Any memory content in the memory can be displayed in a designated format on the screen.

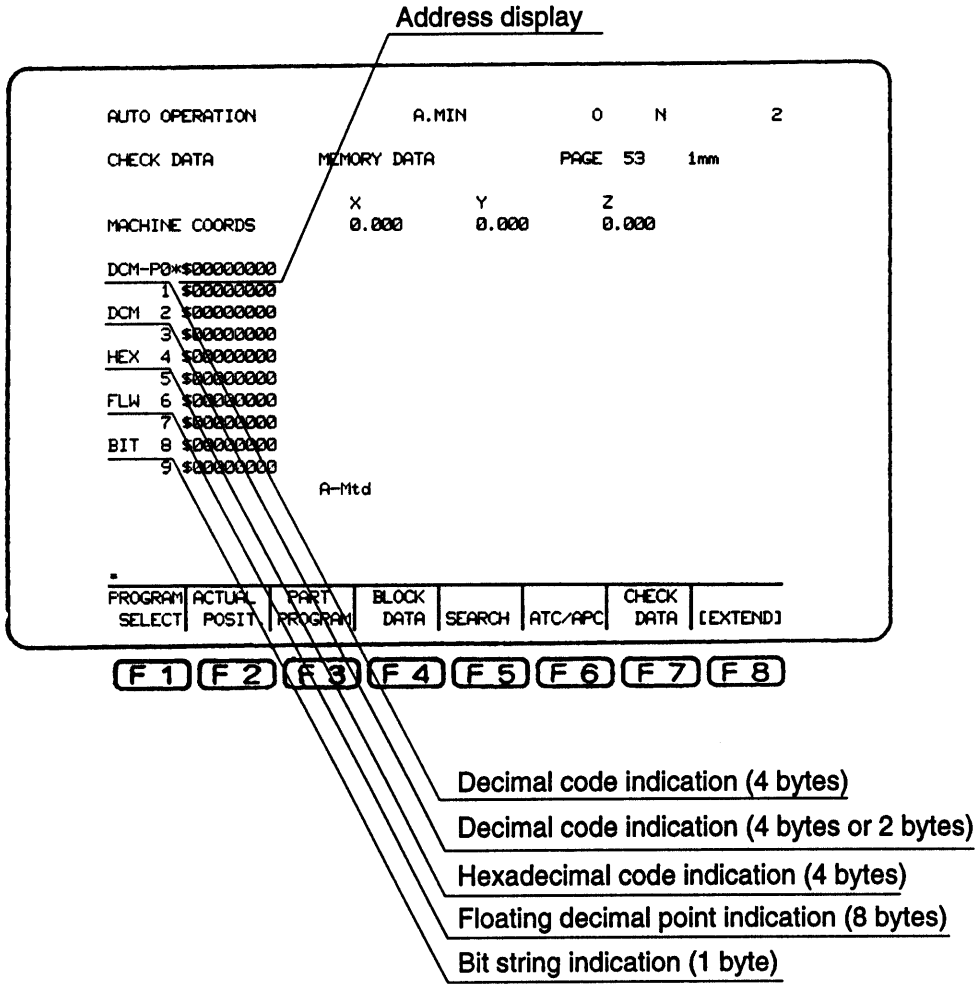


Fig. 2-100 Diagnostics Screen

a) ＊: 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 and setting position is changed by pressing the cursor keys ⇧ , ⇩ , ⇦ , ⇨ .)

b) W: 2-byte indication of DCM data

L : 4-byte indication of DCM data

Additionally, the spindle diagnosis display screen is provided.

11-7-13.System Variables

The contents of the system variables are displayed on the display screen for each individual format.

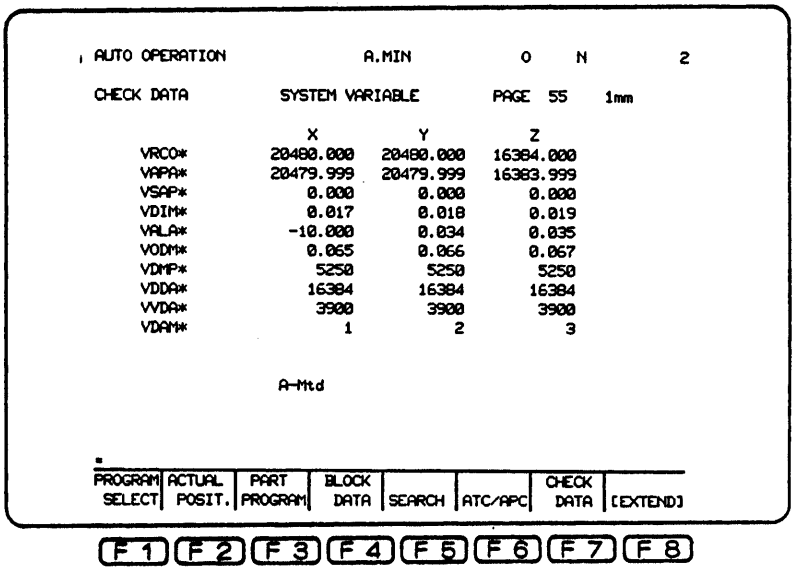


Fig. 2-101 System Variables Screen (1)

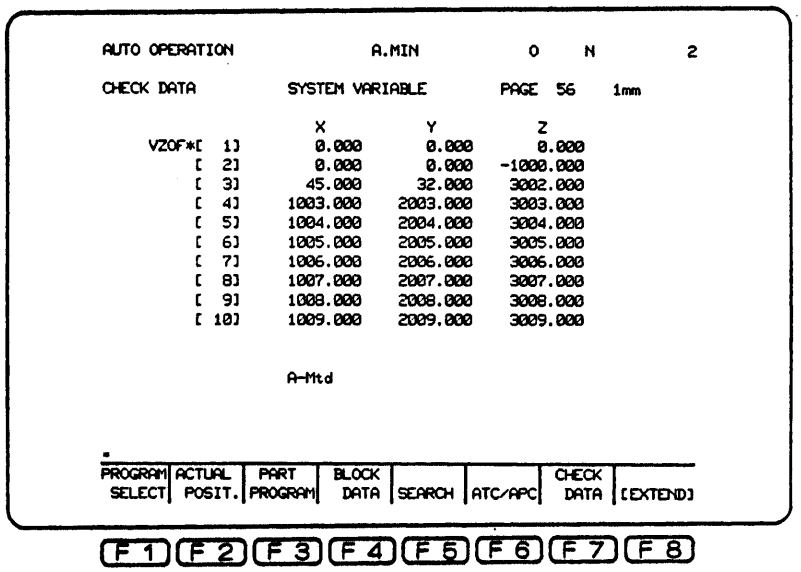


Fig. 2-102 System Variables Screen (2)

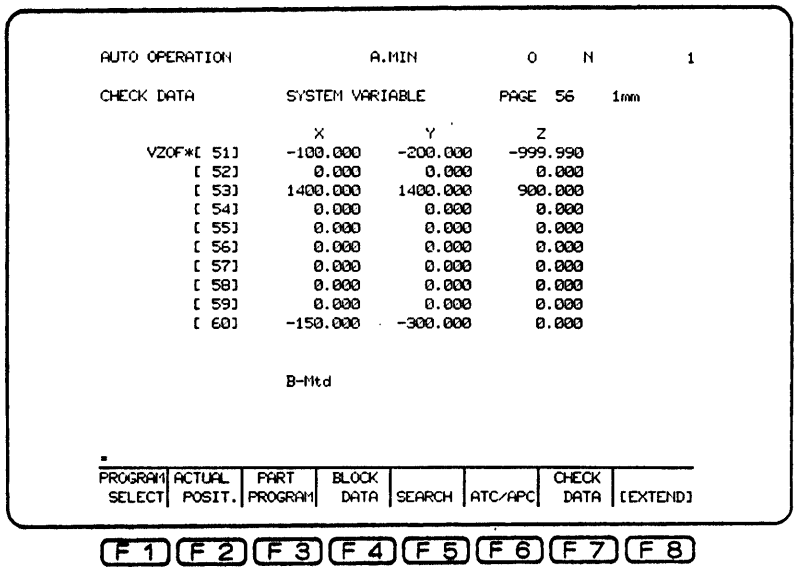


Fig. 2-103 System Variables Screen (3)

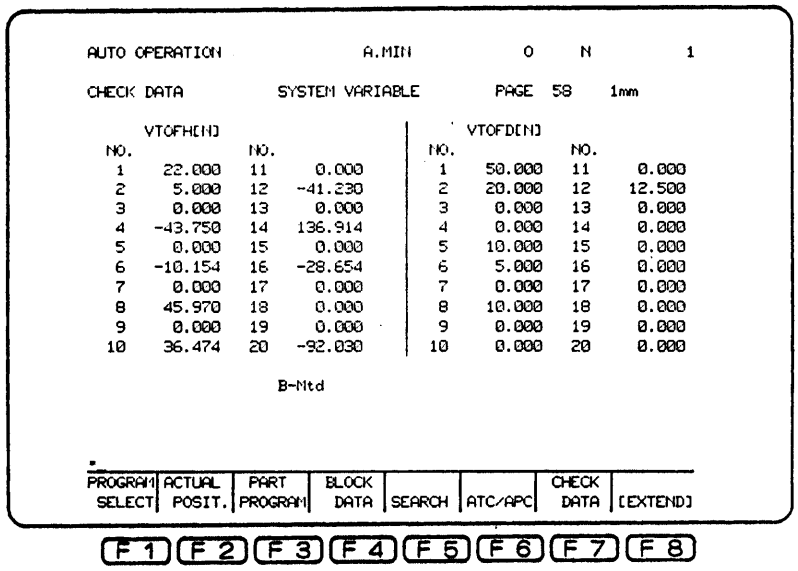


Fig. 2-104 System Variables Screen (4)

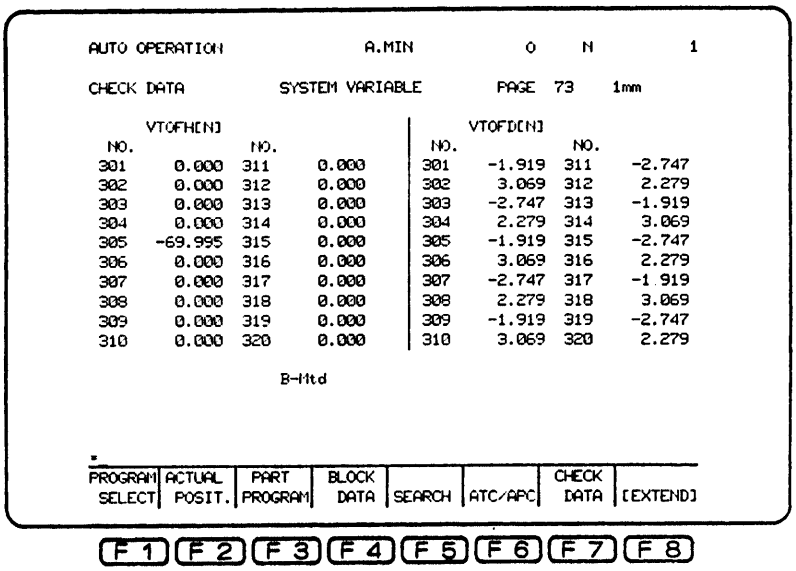


Fig. 2-105 System Variables Screen (5)

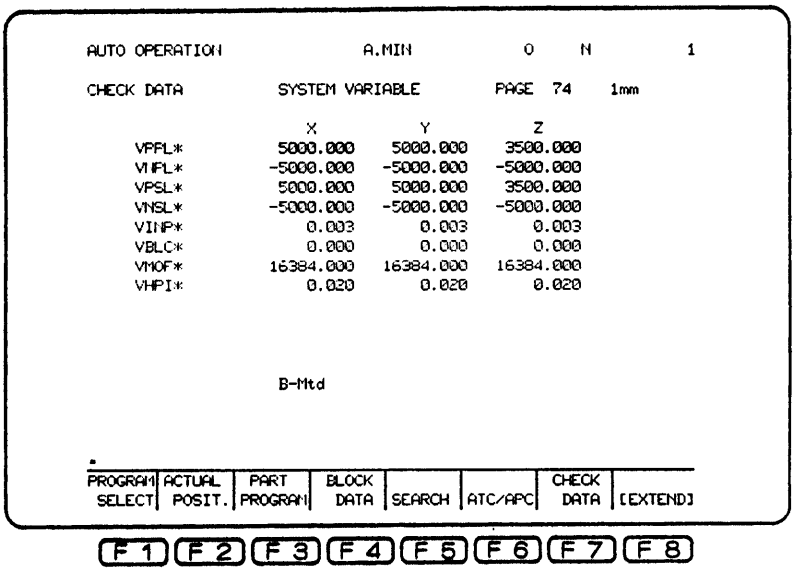


Fig. 2-106 System Variables Screen (6)

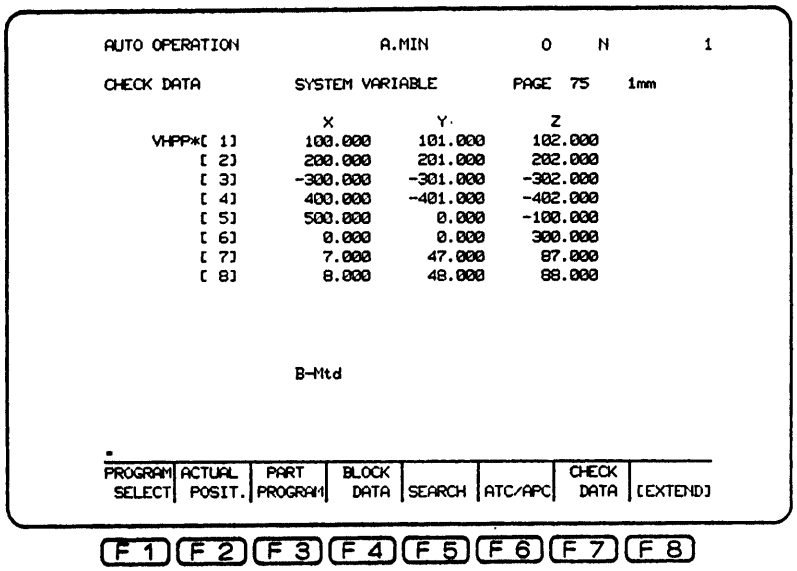


Fig. 2-107 System Variables Screen (7)

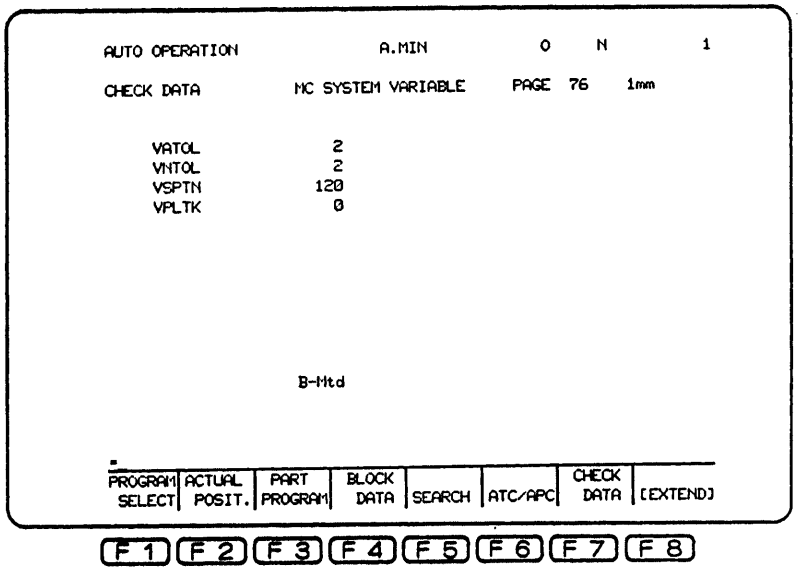


Fig. 2-108 System Variables Screen (8)

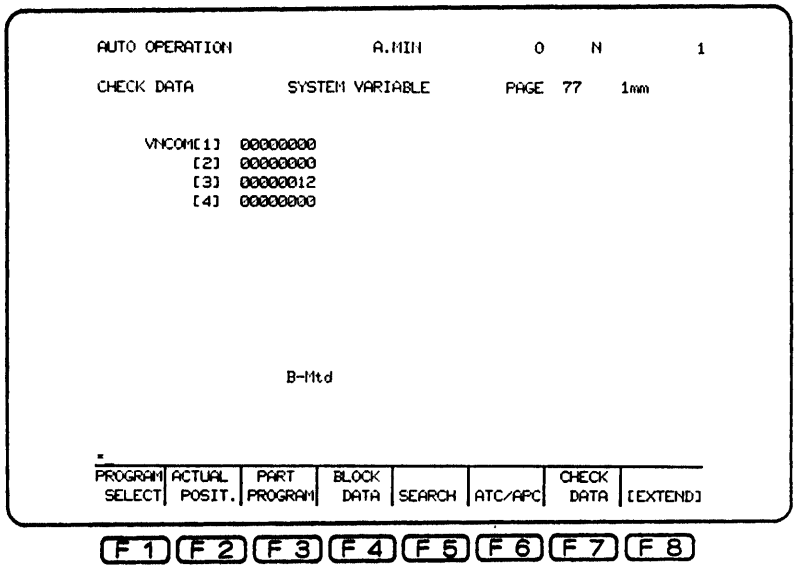


Fig. 2-109 System Variables Screen (9)

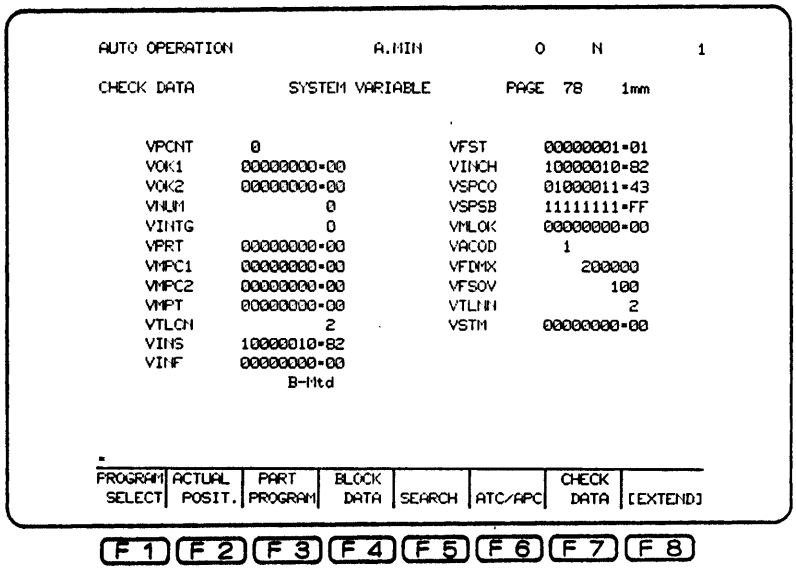


Fig. 2-110 System Variables Screen (10)

11-7-14.DNC (optional)

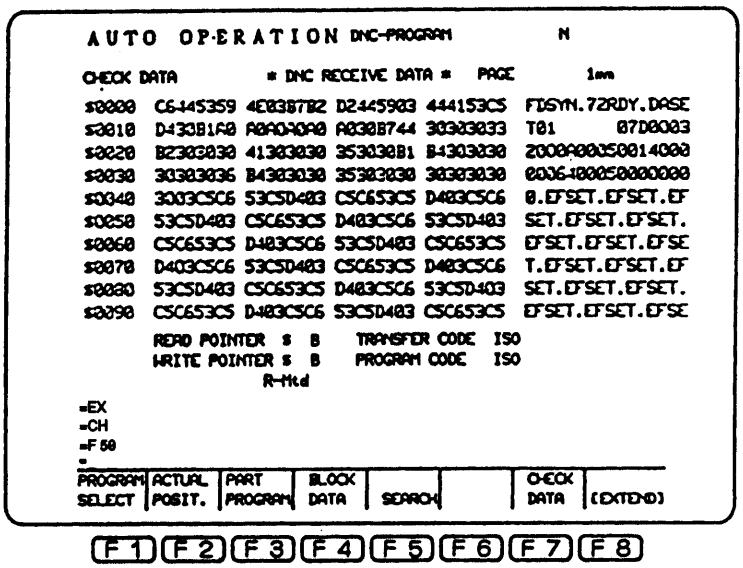


Fig. 2-111 DNC Screen (1)

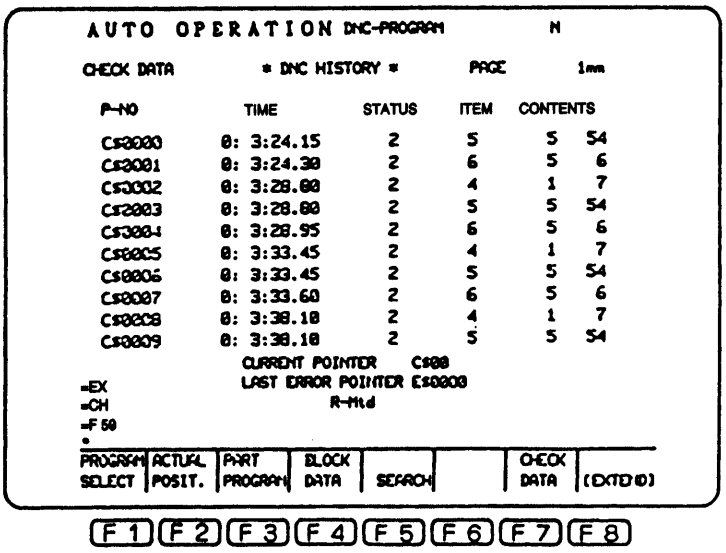


Fig. 2-112 DNC Screen (2)

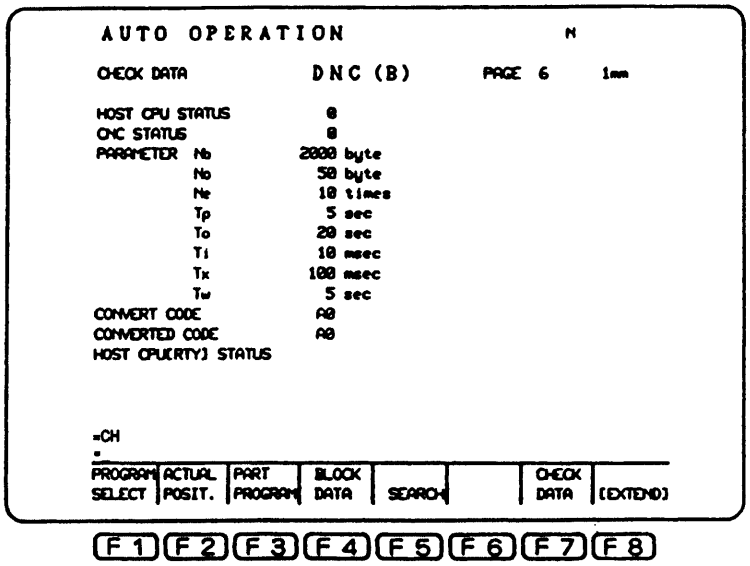


Fig. 2-113 DNC Screen (3)

11-8. Run Guide Display

After selecting the EDIT AUX mode, press 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.

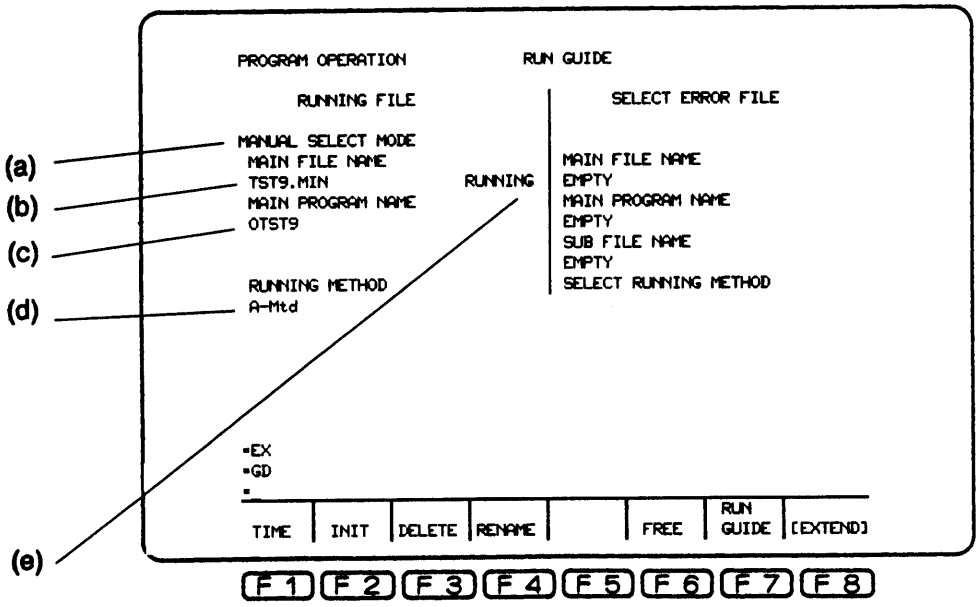


Fig. 2-114 Running File Display

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 subprogram
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.

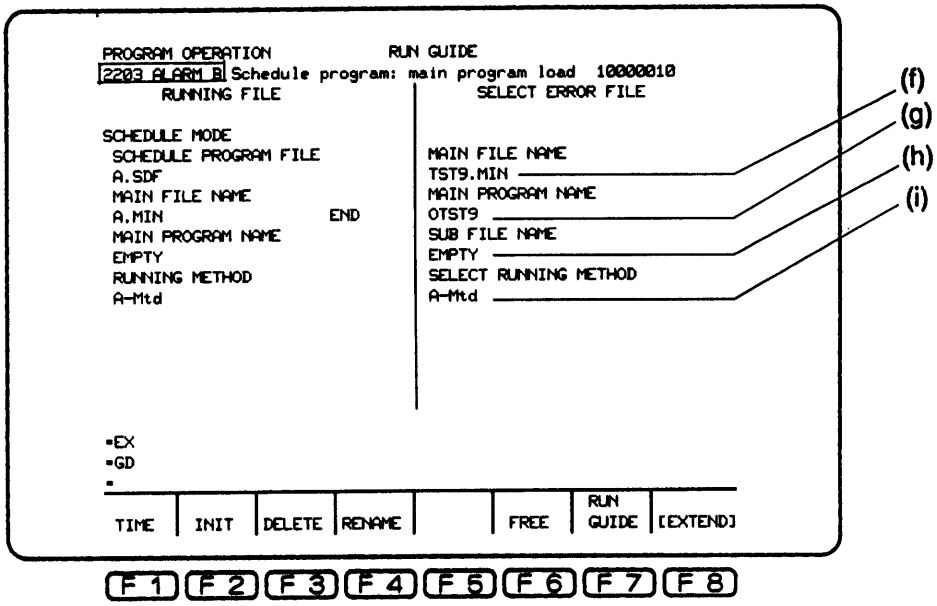


Fig. 2-115 Select Error File Display

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 d) in (1), "RUNNING FILE".

12. FUNCTIONS AND OPERATIONS IN AUTOMATIC MODE OPERATION

12-1. 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:

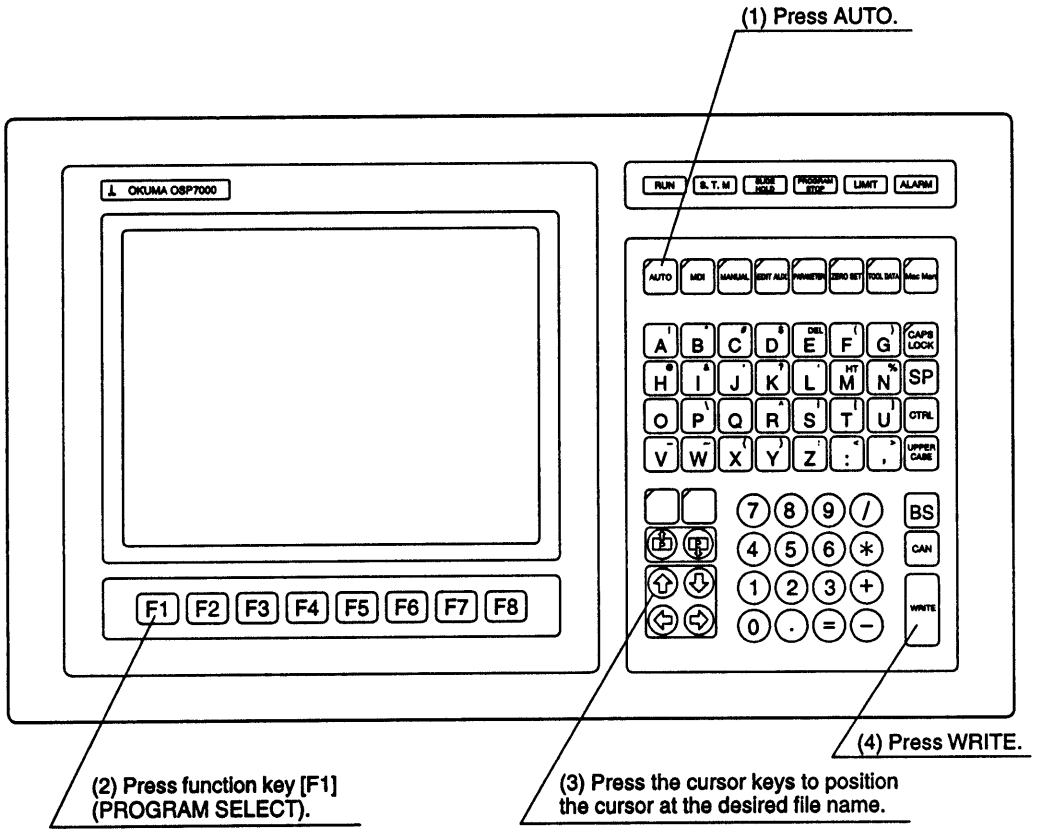


Fig. 2-116 Selecting and Executing Main Program

(1) Press the AUTO key.

(2) Press function key [F1] (PROGRAM SELECT).

"PS" is displayed in the 21st line on the display screen.

(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

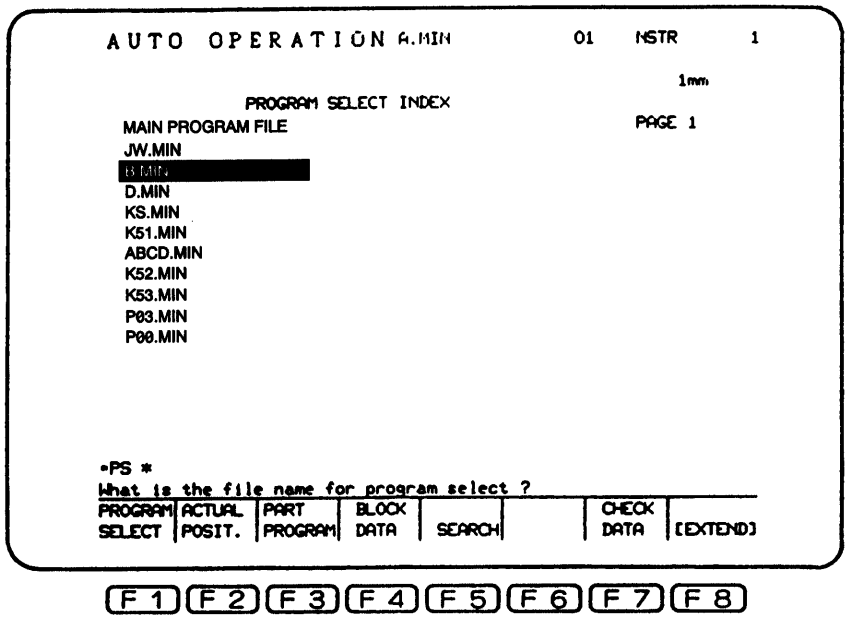
Sub-file-name ..... File name of sub programs which are called from a main program

Option ..... Designation of A, B and S option

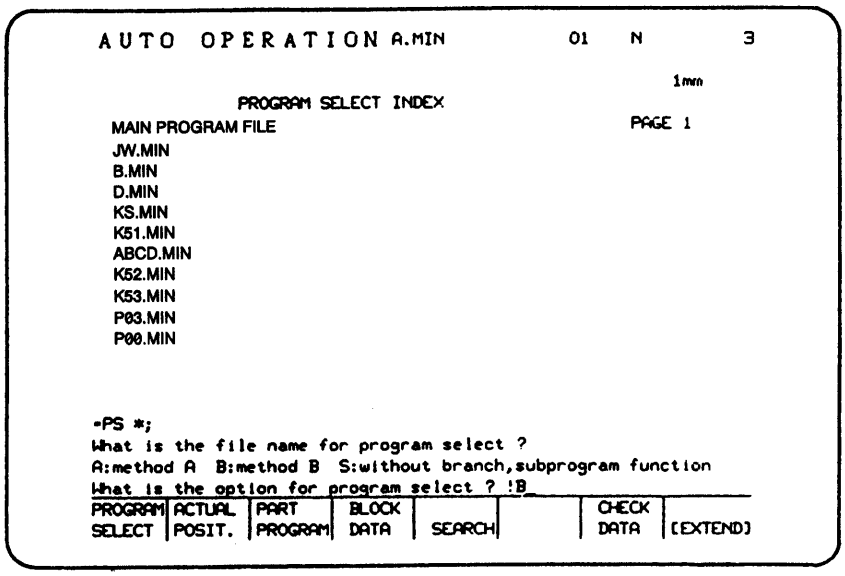
For details, refer to 16-1, "PSELECT BLOCK" in the Programming Manual for OSP7000M.

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 tile 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 tile name.	

a) Designation mode PS␣ ∗ (or PS␣ ∗;)



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 MD1:.)
3) Position the cursor at the desired file name.
4) Press the WRITE key.



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 display screen.

A: method A B: method B S: without branch, subprogram function

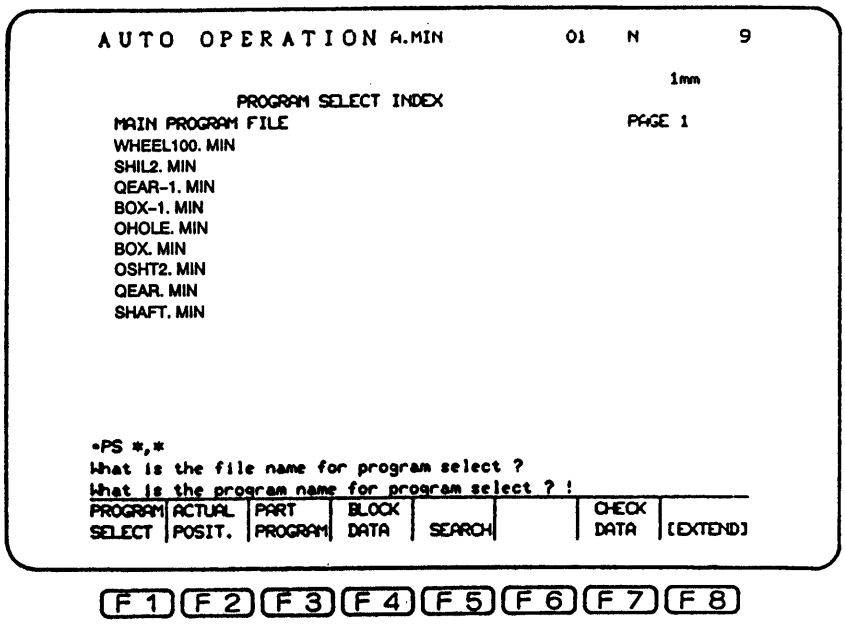
What is the option for program select? !

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␣ ∗,∗;)



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:

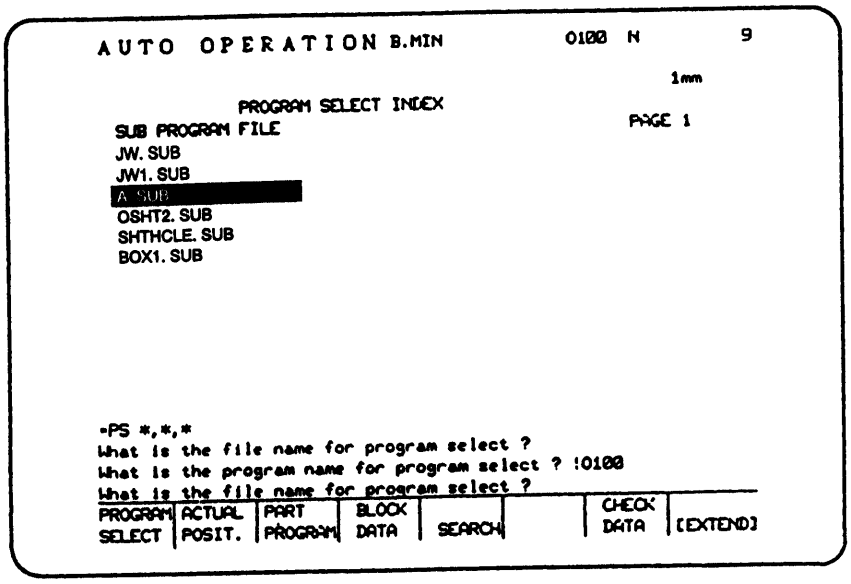
What is the program name for program select? !O100

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␣ *,*,*;)



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 MD1:.

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 display screen.

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.

[Supplement] :

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.
2. Search of the subprogram which has been stored as a part of the main file is made first.
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 becalled must be stored after the one from which it is called.)
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 display screen.
5. A program once selected is valid until the next program is selected. Selecting the schedule program is invalid.
6. Direct specification of the file name without using symbol "*"is also allowed.
7. Main and sub file name directory can be searched for using alphabetic character, "-", "?", or "*".

Table 2.1 Operation Comparison between Normal Storage Capacity Memory and Large Storage Capacity Memory

<table>
<tr><th colspan="2" rowspan="2">Item</th><th rowspan="2">Selection and Operation of Normal Storage Capacity</th><th colspan="2">Selection and Operation of Large Storage Capacity</th><th rowspan="2">Remarks</th></tr>
<tr><td colspan="2">Method B</td></tr>
<tr><td colspan="2">Parameter setting</td><td>Method A</td><td colspan="2">Method B</td><td></td></tr>
<tr><td colspan="2" rowspan="2">Specification of S option in PROGRAM SELECT command mode</td><td>Invalid</td><td colspan="2">Valid</td><td rowspan="2"></td></tr>
<tr><td></td><td>S option not specified</td><td>S option specified</td></tr>
<tr><td rowspan="4">Program size limitation</td><td>Main program</td><td rowspan="4">Total tape length is less than 80 meters (3.15 ft.). (optionally 160 meters (6.30 ft.)*1</td><td colspan="2">Up to total length of the stored main program</td><td rowspan="4"></td></tr>
<tr><td>Subprogram</td><td rowspan="3">Total tape length is less than 100 meters (3.94 ft.).*2</td><td>—</td></tr>
<tr><td>Library program</td><td rowspan="2">Total tape length is less than 100 meters (3.94 ft.).*2</td></tr>
<tr><td>Schedule program</td></tr>
<tr><td colspan="2">Subprogram function</td><td>Available</td><td>Available</td><td>Unavailable (alarm)</td><td></td></tr>
<tr><td colspan="2">Branch function</td><td>Available</td><td>Available</td><td>Unavailable (alarm)</td><td></td></tr>
<tr><td rowspan="4">Instruction for jump destination of branch instruction</td><td>Main program</td><td rowspan="4">Sequence label, sequence number</td><td>Sequence label only</td><td rowspan="4">—</td><td rowspan="4"></td></tr>
<tr><td>Subprogram</td><td rowspan="3">Sequence label or sequence number</td></tr>
<tr><td>Library program</td></tr>
<tr><td>Schedule program</td></tr>
<tr><td colspan="2">Main program sequence label limit</td><td>No limit</td><td>Fewer than 30 pcs.</td><td>No limit</td><td></td></tr>
<tr><td colspan="2">Execution time for PROGRAM SELECT command</td><td>Several tens seconds to several minutes</td><td>Several tens seconds to several minutes</td><td>Ends at once</td><td></td></tr>
</table>

[Supplement] :

1. When operation buffer expansion specification is selected, capacity is extended to 320 to 1280 meters (12.60 to 50.39 ft.).
2. When operation buffer expansion specification is selected, the length is as follow:
   - Less than 270 meters (10.63 ft.) for 320 meter (12.60 ft.) specification
   - Less than 590 meters (23.23 ft.) for 320 meter (25.20 ft.) specification
   - Less than 1230 meters (48.43 ft.) for 320 meter (50.39 ft.) specification

12-2. Schedule Program Selection and Operation

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 16, "Schedule Programs" in the Programming Manual for OSP7000M.

The operating procedure is described below:

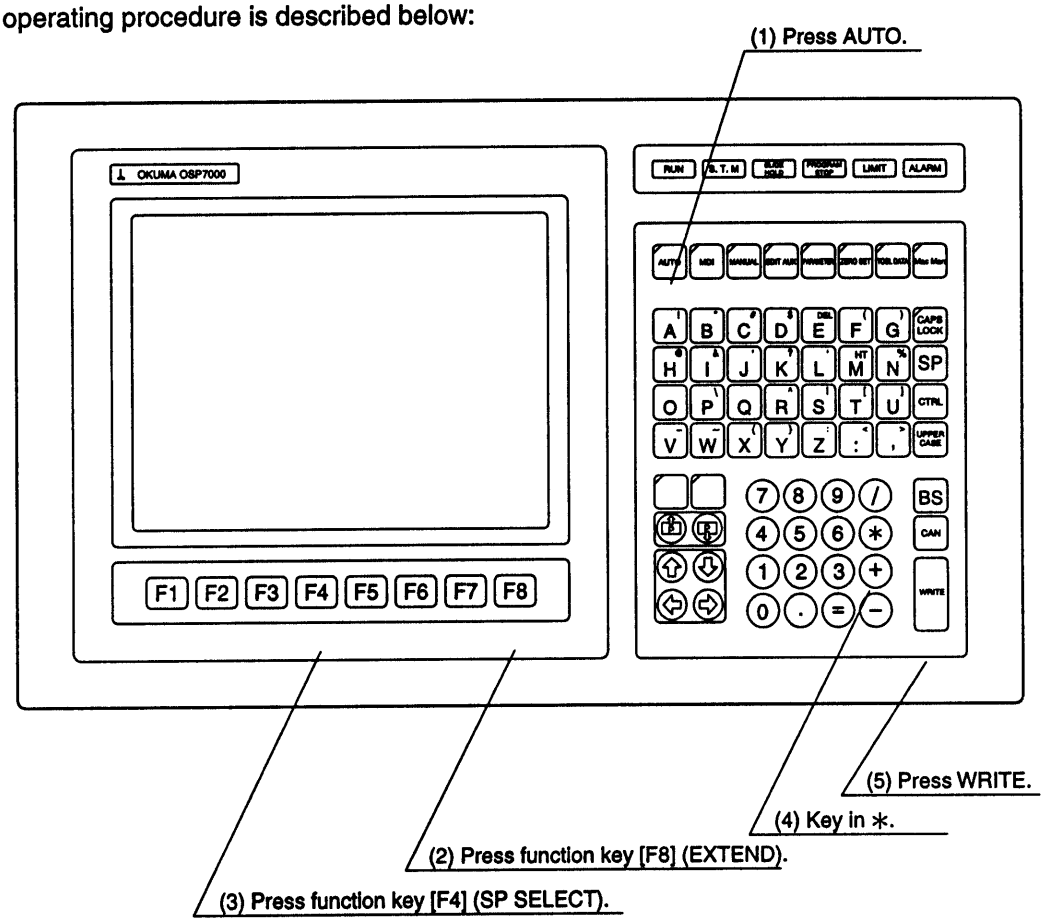


Fig. 2-117 Selecting and Executing Schedule Program

(1) Press the AUTO key.

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

For the guidance of function keys, [F1] (NUMBER SEARCH) and others are displayed on the display screen.

(3) Press function key [F4] (SP SELECT).

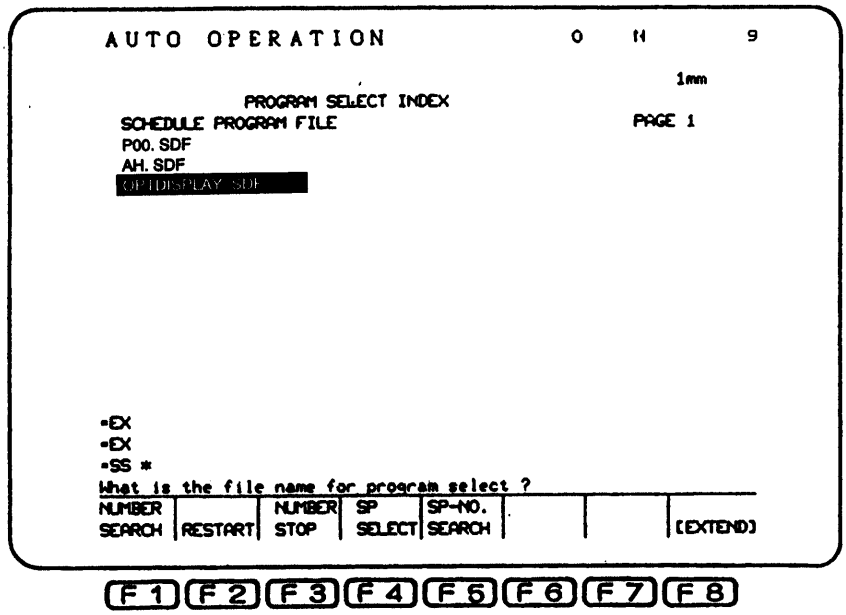
"SS" is displayed on the 21st line on the screen.

(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 MD1:.)



(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.

[Supplement] : 1. Selection of a schedule program file by directly keying in the file name is also possible.

SS ␣ schedule-program-file-name [WRITE]

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.

[Supplement] :

1. Schedule program selection should be done only after resetting the NC. If the schedule program is selected during operation, an error will occur.
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.
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.

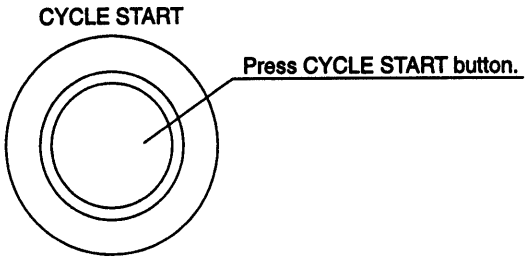
   But the machine will not stop in the blocks containing VSET, IF and GOTO instructions.
4. When the RESET button is pressed during the operation in accordance with a schedule program, the part program selected when the NC has been reset will be executed again from the start if the CYCLE START button is 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.
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.
6. The main program executed in the schedule program operation mode is cleared from the operation buffer after the completion of the program execution.

12-3. 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.

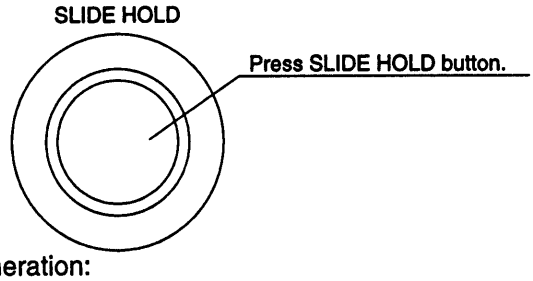
[Supplement] :

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.
2. Pressing the CYCLE START button during the program selection, sequence number searching and return search is ineffective.
3. While the SLIDE HOLD button is being pressed, the CYCLE START button is inoperative.
4. During the operation, the RUN lamp on the STATUS display screen comes on, excluding the slide hold mode.
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"
6. When alarms (P, A, B, and C) are on, cycle start by pressing the CYCLE START button is impossible.
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 RESTART button.

(2) Slide Hold

Axis movement can be stopped temporarily or program execution can be stopped by pressing the SLIDE MOLD 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.

[Supplement] : 1. When axis movement and miscellaneous functions are in the same block, there are two cases for the execution order of the commands.
   a) With ..... The execution of axis movement commands and auxiliary functions start simultaneously.
   b) After ..... The axis movement is completed the execution of miscellaneous function starts.

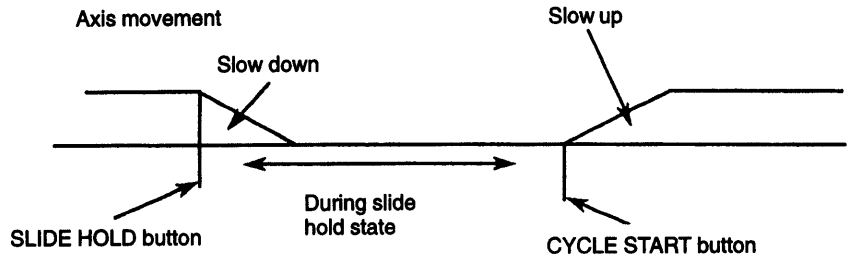
   Depending on the above conditions,
   if machine hold occurs during axis movement (including dwell) ..... Slide hold
   if the machine halts at a time other than axis movement ..... Start-up hold

2. During the slide hold (excluding start-up hold), the SLIDE HOLD lamp on the STATUS display comes on (although the slide hold state is a part of the machine operating state, the RUN lamp will go off).
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.

CAUTION : (1) 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.)

(2) Examples of slide hold

[During axis movement]



[During miscellaneous function execution]

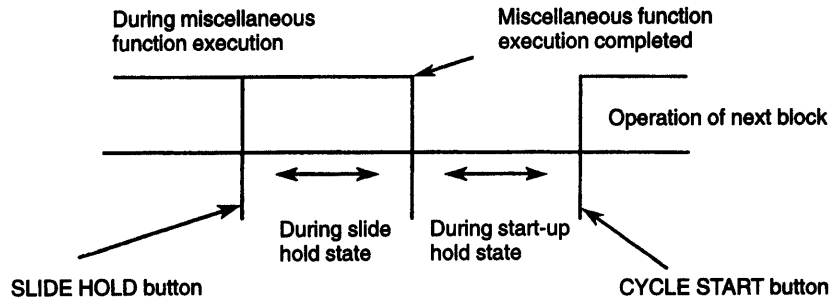
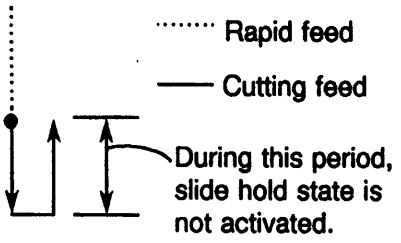


Fig. 2-118 Examples of slide hold

[Supplement] : 1. 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 Section 8, "Synchronized Tapping Function" in the manual for OSP7000M Special Function No. 1.



2. 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.

12-4. 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.

[Supplement] :

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.
2. Even if the RESET button is continuously pressed, reset is done only one time.
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.

12-5. 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.

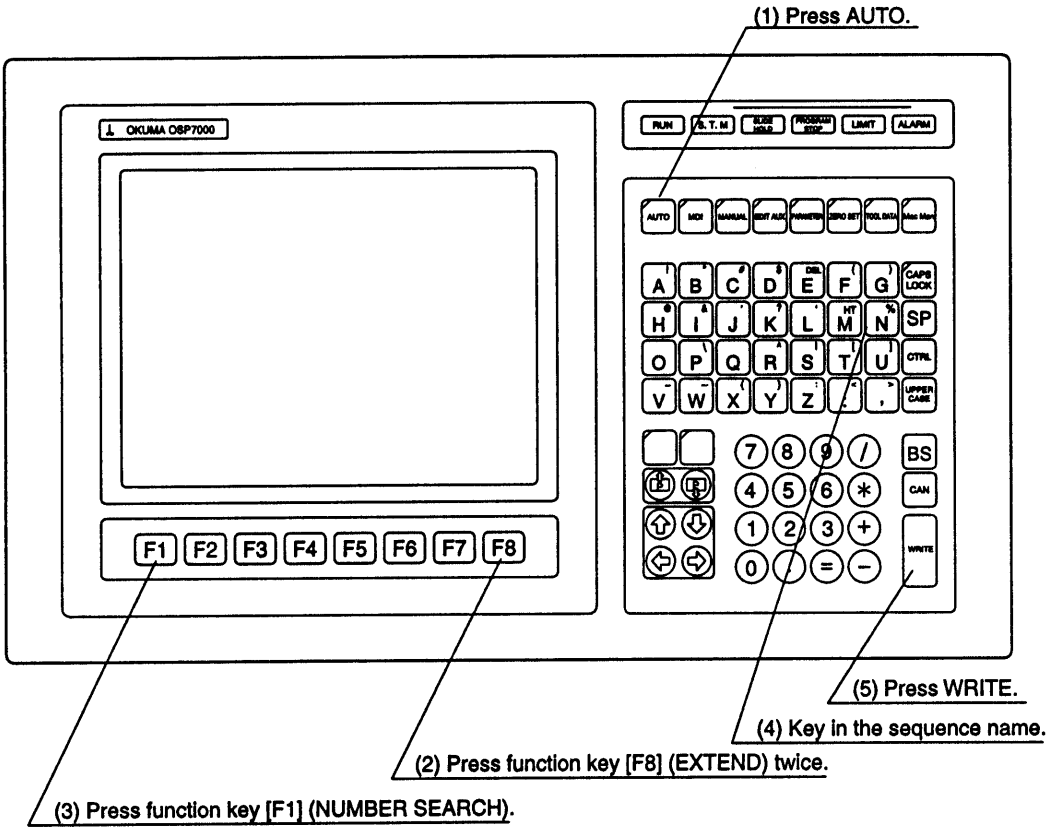


Fig. 2-119 Sequence Search by Sequence Name or No. of Blocks

a) Press the AUTO key.

b) Press function key [F8] (EXTEND) twice.

Function names such as [F1] NUMBER SEARCH will be displayed.

c) Press function key [F1] (NUMBER SEARCH). "NS" is displayed on the 21st line of the display screen.

d) Enter the specified sequence name or the required number of blocks.

e) 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:

1) When the specified sequence name is not found in the program.

2) While the schedule program is executed (from schedule program start-up to the end).

3) 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.

4) When the main program is not selected correctly.

Note: In cases 2) and 3), 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 display screen 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 display screen 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 model status must be set as needed by entering the necessary commands from the keyboard so that the actual status and the programmed status match.

[Supplement] :

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.
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 underway.
3. The number of the sequence repetition cannot be specified during sequence search.
4. Additionally, the optional block skip does not affect the sequence search.

12-6. 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:

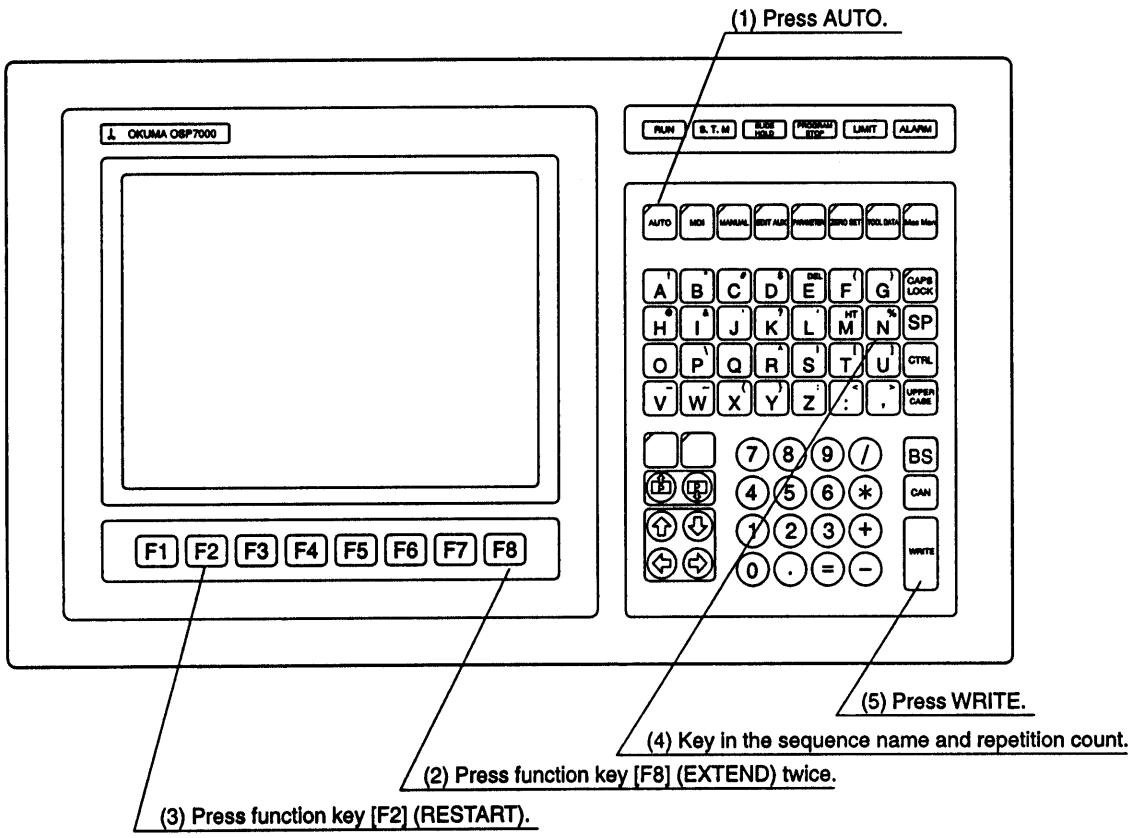


Fig. 2-120 Return Search and Sequence Restart

a) Press the AUTO key.

b) Press function key [F8] (EXTEND) twice.

c) Press function key [F2] (RESTART).

"RS" is displayed on the 21st line on the display screen.

d) 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 99999999.

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

e) 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.

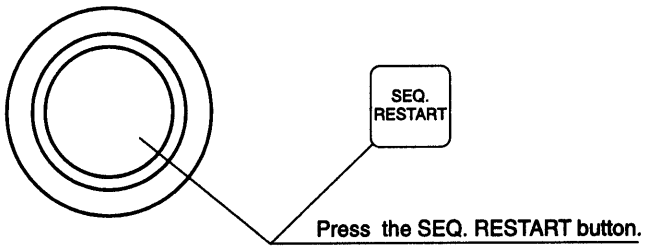
The block count is the count of the sequence executed from the program start after reset. Control statements such as GOTO, CALL, etc. are not counted. The count value and sequence name are not cleared by NC reset or by turning the power source on or off, and can therefore, be used for return after reset. They are cleared when the operation begins.

[Supplement] :

1. When only function key [F2] (RESTART) is pressed and there is no instruction for the sequence name or block count, an error occurs.
2. If return search operation is intended while a schedule or a main program is being executed, an error occurs.
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.



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.

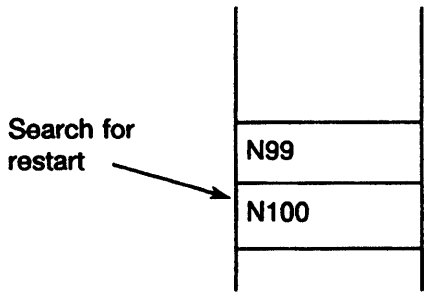
c) Among the M codes, only those related to spindle operation can be recovered.

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 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.

12-7. 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:

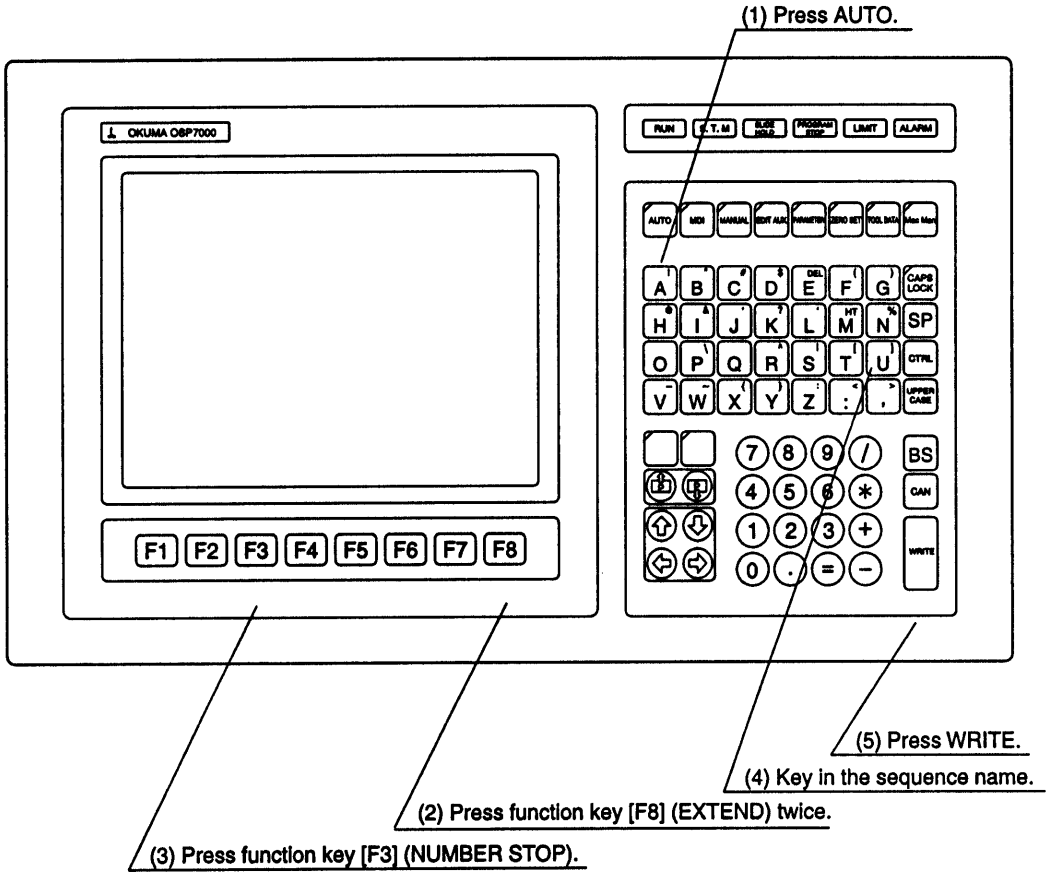


Fig. 2-121 Sequence Stop Operation

(1) Press the AUTO key.

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

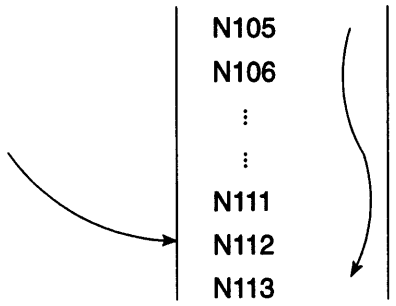
(3) Press function key [F3] (NUMBER STOP).
"NST" is displayed on the 21st line on the display screen.

(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:



When N112 is entered following function key [F3] (NUMBER STOP) during the execution of N105 sequence, the machine stops after N112 execution and before N113 execution.

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 function key [F3] (NUMBER STOP) without keying in any sequence name data.

[Supplement] :

1. The sequence stop setting is cleared by NC reset.
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.
3. Setting during the scheduled operation causes errors.
4. If the main program is selected correctly, setting is possible either before or during execution of the main program.
5. Even if the sequence name which has been already read is set, the program cannot be stopped at that sequence.

12-8. MDI Operation

MDI is an abbreviation for Manual Data Input and each block of data entered is executed as in automatic mode operation.

The operation procedure is described below:

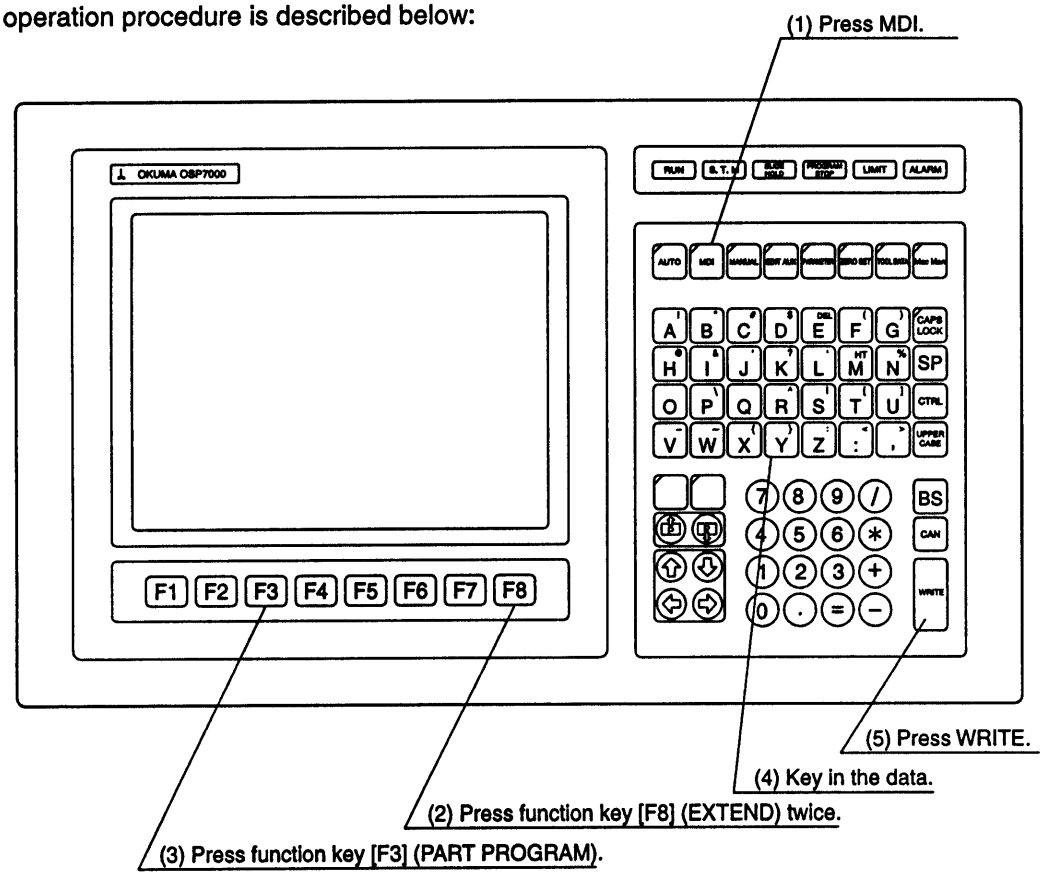


Fig. 2-122 MDI Operation

(1) Press the MDI key.

"IN" is displayed on the 21st line on the display screen.

(2) Press function key [F3] (PART PROGRAM).

The title ∗MDI PROGRAM∗ is displayed on the display screen.

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.

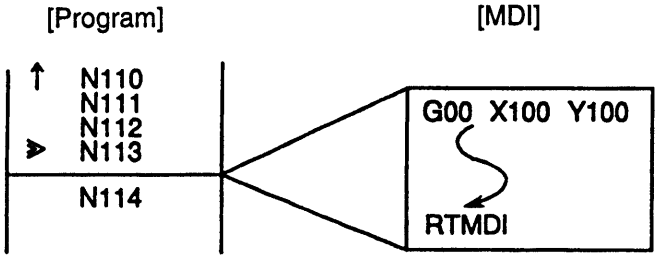
(6) If steps (3) to (5) are executed repeatedly, the NC operates successively.

Automatic mode operation and MDI mode operation:

(1) During the execution of the automatic mode operation, the MDI mode operation may be inserted after interrupting the automatic mode operation.

(2) 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 display screen. (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.



(3) 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.

(4) 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.

(5) 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.

(6) 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.

Subprogram call in the MDI mode operation:

(1) 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.

(2) 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.

[Supplement] : 1. The following commands cannot be specified in the MDI mode:

Branch commands ..... GOTO and IF

Commands used in schedule program ..... VSET, PSELECT, etc.

2. During the execution of a schedule program, the MDI mode operation is possible if a main program is not being executed.

3. The CYCLE START button becomes effective when it is released after it is pressed as in the automatic mode operation.

12-9. 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.

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.

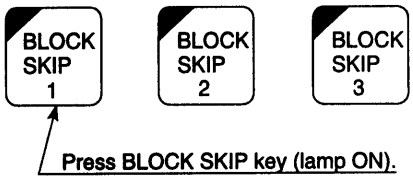
f) During the program execution called in MDI mode, setting of the SINGLE BLOCK key is effective.

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.

12-10. Optional Block Skip

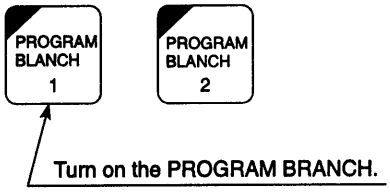
Any block specified with the slash (/) by the program can be disregarded when the BLOCK SKIP key on the machine operation panel is switched on.



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 OSP7000M.

12-11. 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 Section 2,10, in the Programming Manual for OSP7000M.

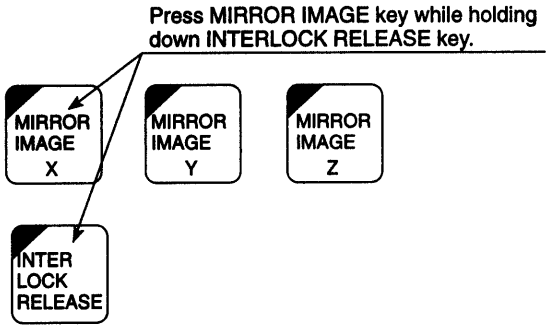
12-12. Optional Stop

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.

[Supplement] : 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.

12-13. 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:

(1) 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.

(2) To cancel the mirror image function, press the MIRROR IMAGE key while holding down the INTERLOCK RELEASE key again.

(3) 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.

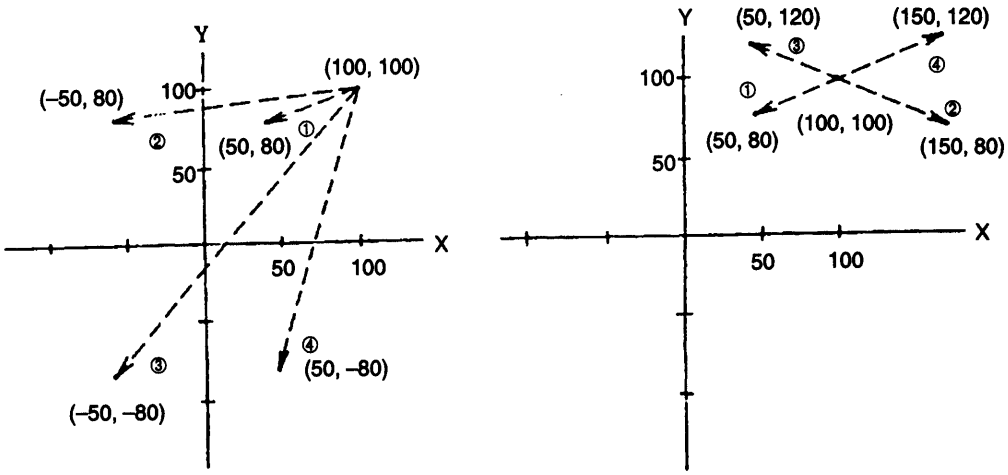
The programmable mirror image is optional.

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 X,Y: Normal
② X : Mirror image ON
Y : Normal
③ X,Y: Mirror image ON
④ X : Normal
Y : Mirror image ON

Fig. 2-123 Example of Mirror Image

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.

[Supplement] :

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.

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.

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.

4. The mirror image function is valid for the instruction G51 P__ which indicates the coordinates of the center for scaling.

[Supplement] : 5. The mirror image function is invalid for the coordinate system shift G11 P__.

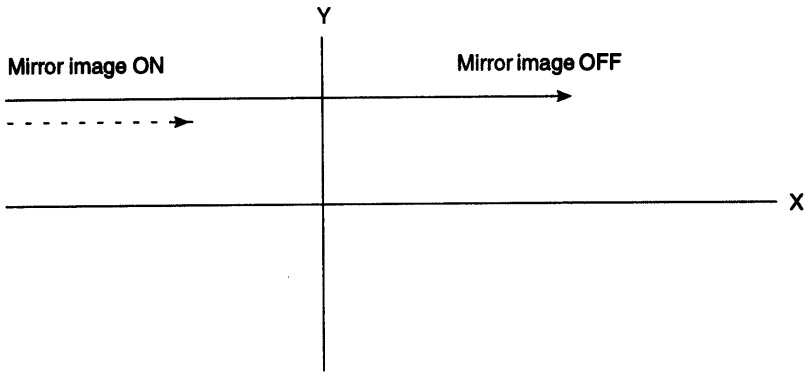
6. While the mirror image function is active, G codes which indicate the direction of axis movement and I, J, and K commands are changed as needed.

   Circular interpolation (G02,G03)

   Cutter radius compensation (G41,G42), etc.

7. The positioning direction for 660 one-direction positioning is not changed even in a mirror image ON state.

   Example:



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 OSP7000M for details.

12-13-1. 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:

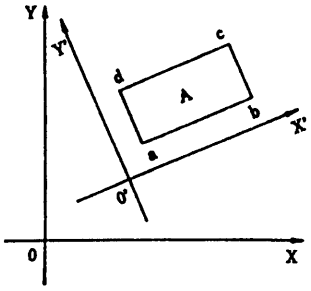
NC Optional Parameter (bit) No. 34, bit 2	
0	The mirror image function is activated in the local coordinate system.
1	The mirror image function is activated in the work coordinate system.

The initial setting is "0".

CAUTION : When the setting has been changed, press 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

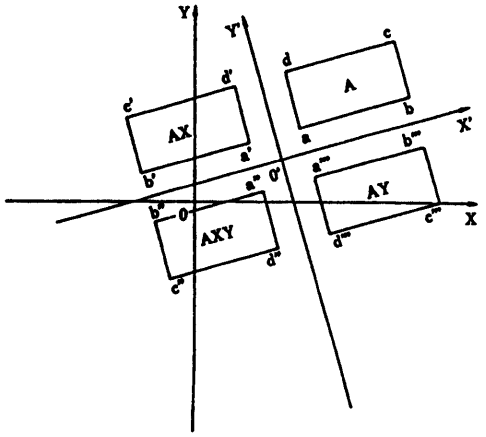


Fig. 2-124 Mirror Image in the Local Coordinate System (G90 Mode)

2) Mirror image in the work coordinate system

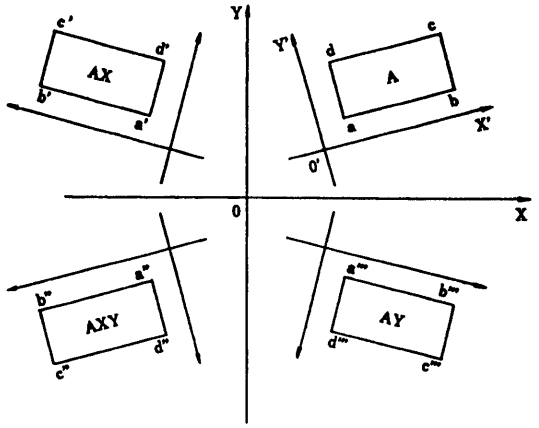


Fig. 2-125 Mirror Image in the Work Coordinate System (G90 Mode)

b) In the G91 (incremental command) mode

1) Mirror image in the local coordinate system

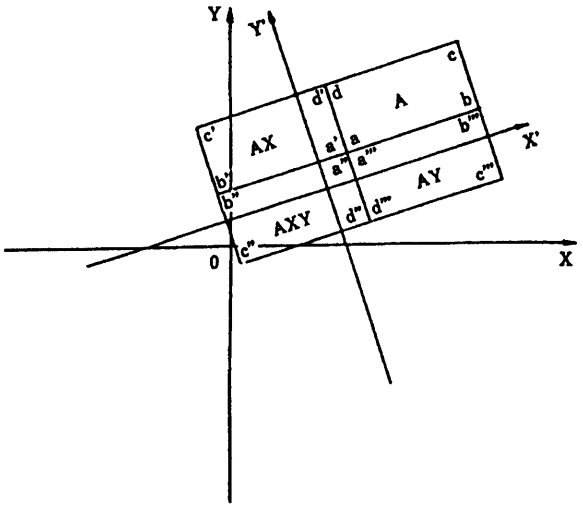


Fig. 2-126 Mirror Image in the Local Coordinate System (G91 Mode)

2) Mirror image in the work coordinate system

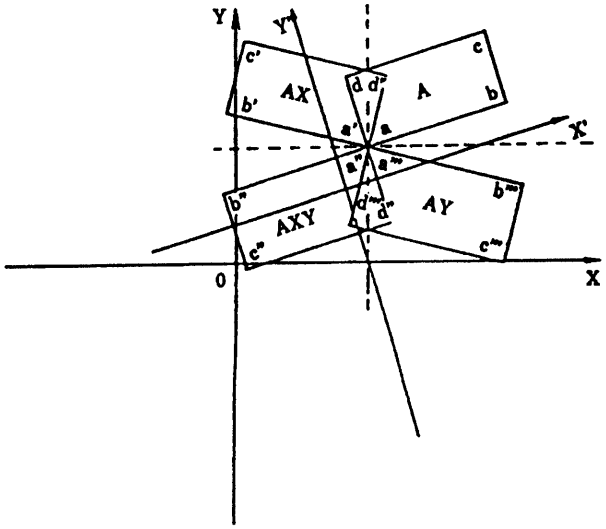


Fig. 2-127 Mirror Image in the Work Coordinate System (G91 Mode)

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.
(Machining order : a → b→ c→ d)

12-14. Override

These are rotary switches to change the feedrate or the spindle speed within a certain range during machine operation.

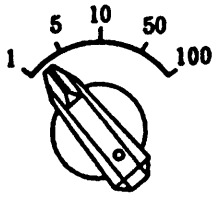
(1) Feedrate Override

Programmed, manually input, or dial-set feedrates can be changed during operation.

a) Rapid feedrate override

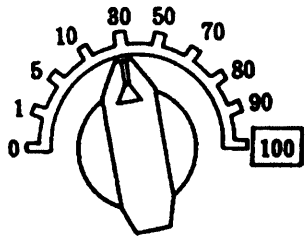
Pendant Operation Panel

RAPID OVERRIDE (%)



Machine Operation panel

RAPID OVERRIDE (%)



This is effective during manual rapid feed operation and programmed rapid feed mode (G00, G60, etc.).

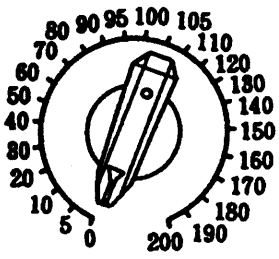
When 100% is selected, the axes move at the rapid feedrate of the machine.

b) Cutting feedrate override

This is effective for the programmed cutting feedrates in G01, G02, G03 and other modes.

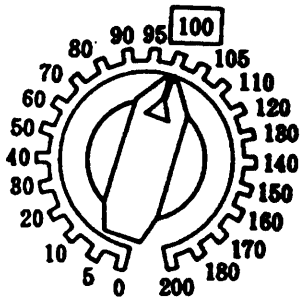
Pendant Operation Panel

FEEDRATE (%)



Machine Operation panel

FEEDRATE (%)

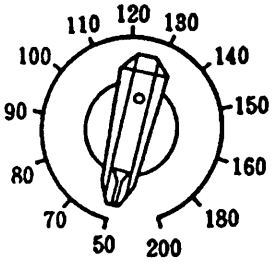


[Supplement] :
1. Override rotary switch setting is ignored in tapping cycles called by G74 and G84.
2. After the M136 execution, the override rate is fixed at 100% irrespective of the rotary switch setting until M137 is commanded and executed.
3. The axis does not move at a 0% override switch setting.

(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.

SPINDLE OVERRIDE



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.

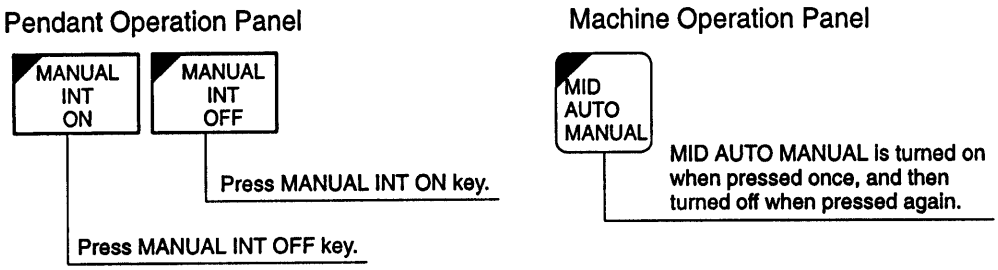
   The spindle rotates at the minimum spindle speed in the selected gear range.

The actual spindle speed is displayed on the display screen.

12-15. 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.

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 3rd page of ACT POSIT pages:

[Screen 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.

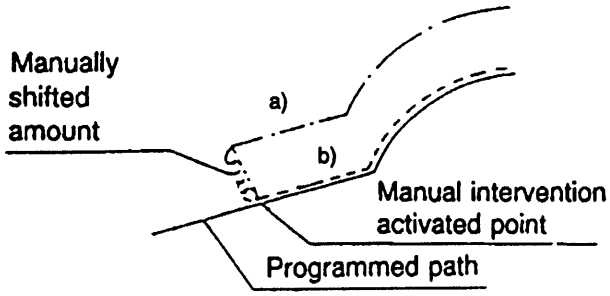
(4) Before restarting the sequence operation, restore the miscellaneous functions to the previous conditions, and locate the axes near the position where the intervention has been made using manual cutting feed or pulse handle. Then, press the SEQ. RESTART button. With this, the axes return to the original position. The data displayed at MANUAL SHIFT ACTUL will become zero at the same time.

CAUTION : 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.

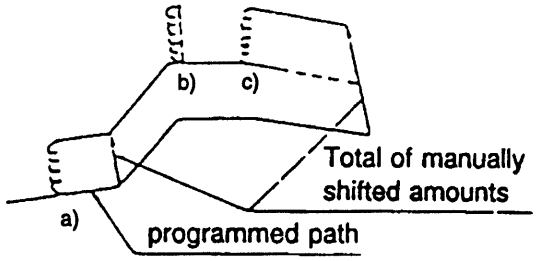
(5) Pressing the MANUAL INT. ON (MID AUTO MANUAL) or SEQ. RESTART button automatically cancels the manual intervention mode.

Example of Manual Intervention:



a) —— · —— · ——
SEQ.RESTART not pressed after manual axis feed

b) - - - - - - - - - - -
SEQ.RESTART pressed after manual axis feed



a) SEQ.RESTART not pressed after manual axis feed
b) SEQ.RESTART pressed after manual axis feed
c) SEQ.RESTART not pressed after manual axis feed

[Supplement] : During manual intervention mode, automatic return of miscellaneous functions is not made. This permits the change of spindle speed or tools during this mode.

CAUTION : 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.

12-16. 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:

(1) Press the PULSE 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 display screen.

[Supplement] :

1. The MANUAL SHIFT ACTUL data is cleared ("0") when the MANUAL INT. ON key is pressed.
2. The MANUAL SHIFT TOTAL data is cleared ("0") when the POWER ON button is pressed.

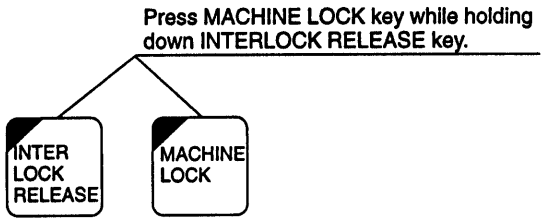
   It is also cleared when the RESET button is pressed when parametric data (bit 2 of NC optional parameter (bit) No. 4) is so set.
3. Axis travel amount using the pulse handle is added to the axis position data which is used for judging travel end.
4. While the PULSE HANDLE SHIFT key is off, the pulse handle is inoperative.

12-17. 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 display screen are updated as the program is executed.

Operating Procedure:



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.

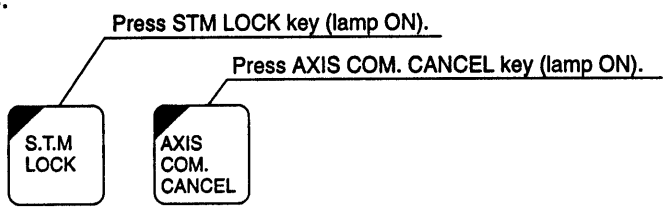
Auxiliary functions other than S,T and M are all locked.

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.

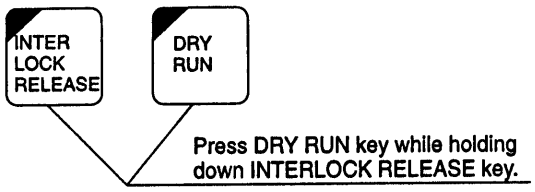


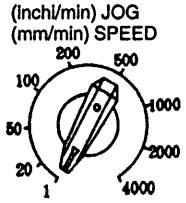
[Supplement] :

1. Override or dry function is also effective as in normal cutting operation.
2. The axis specified by the axis command cancel function may be moved by manual or manual intervention operation.
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.
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.
5. While the STM lock function is active, manual operation of S, T and M functions is possible by manual intervention operation.

12-18. 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.





In the rapid feed (G00) mode, the data set at bit 2 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.

12-19. 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 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 OSP7000M will extinguish the operation end light.

12-20. Operation End Buzzer (optional)

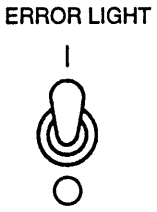
Operates in the same conditions as the operation end light. The operation end buzzer sounds when these conditions have been satisfied. However, the BUZZER switch on the OPERATION END MODE panel must first be turned on.

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.

12-21. Error Light (optional)

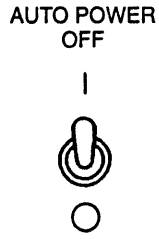
The error light is turned on when an alarm state is detected. The ERROR LIGHT switch must first be turned on. The lamp is turned off when the control is reset. If the control is provided with the alarm warning light specification, the operation end light or the operation end buzzer will not be activated when an alarm occurs.



12-22. 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
Automatic operation Single block off	(1) Schedule program after executing END in a schedule program (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).

12-23. 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 s 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:

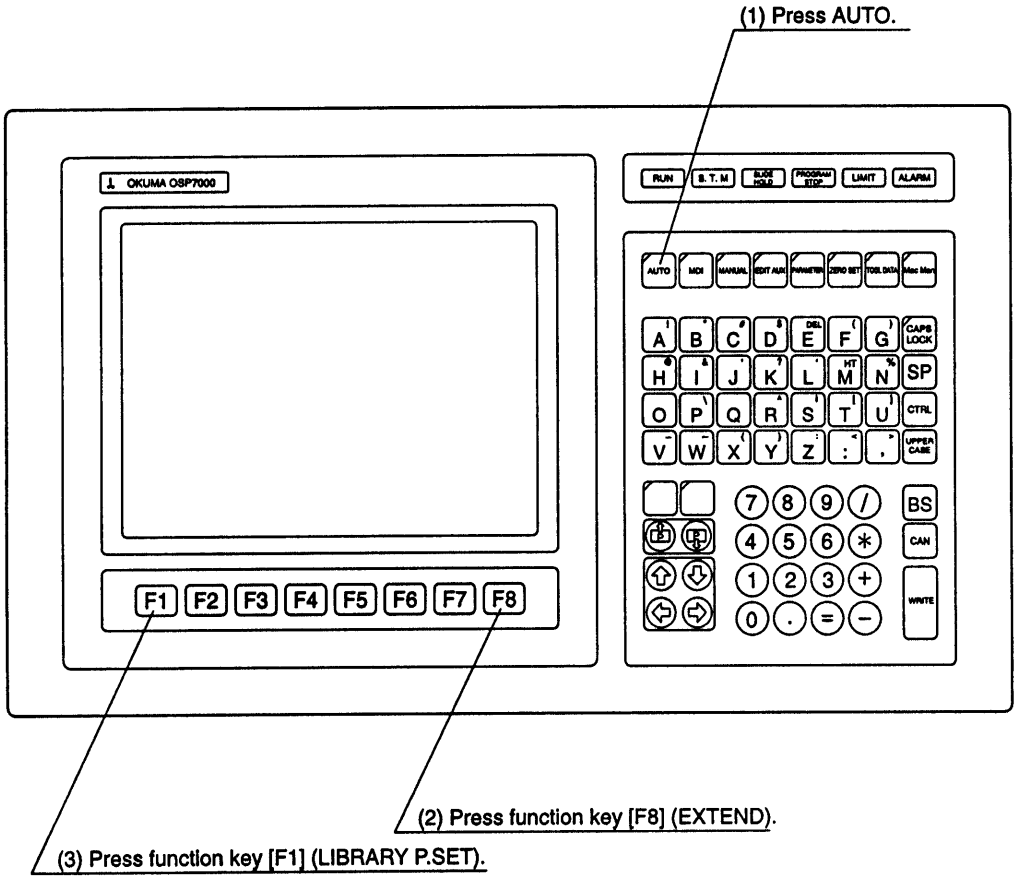


Fig. 2-128 Registering Library Programs

(1) Press the AUTO key.

(2) Press function key [F8] (EXTEND).The function messages will change as shown above. (The message "LIBRARY P. SET" appears above F1 .)

(3) Press function key [F1] (LIBRARY P. SET).

"LP" is displayed on the 21st line on display screen.

Operating procedure for library program registration:

(1) Library Program Directory Display

Press function key [F1] (LIBRARY P.SET), key in "LP ␣ " and then press the WRITE key.

The display screen displays the library program directory and the remaining capacity in the number of bytes.

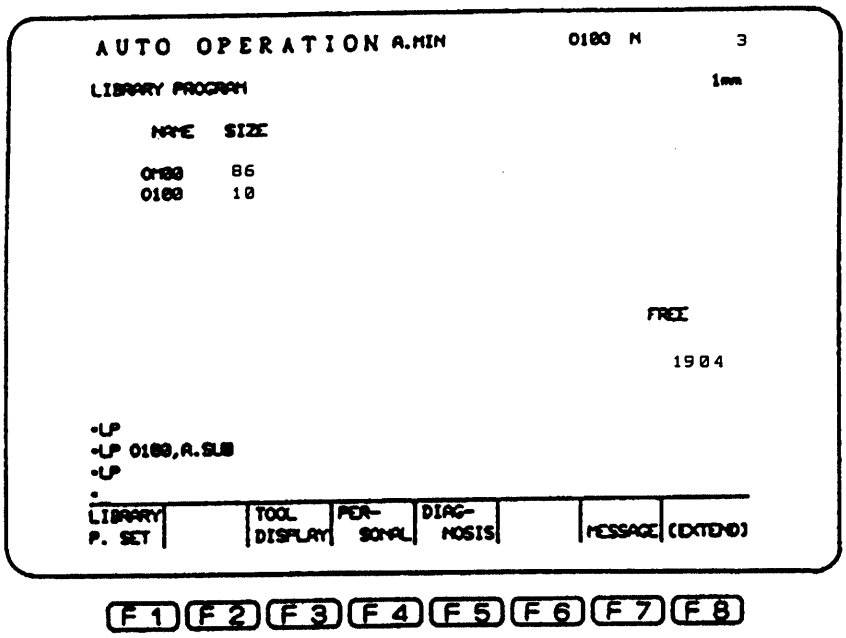


Fig. 2-129 Library Program Directory Display

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 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****".

When a program name is omitted, all the subprograms in the file specified following the comma (,) are registered as library programs.

Up to 65 subprograms can be registered.

Note that a main program cannot be registered as a library program.

(3) Deleting Library Program

Press 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 function key [F1] (LIBRARY P.SET) and key in as follows:

LP ␣ ;I [WRITE]

With the operation above, the programs registered as library programs are all deleted.

(5) Specifying Buffer Size of Library Program

Press function key [F1] (LIBRARY P.SET) and key in as follows:

LP ␣ n;I [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.

[Supplement] : 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 function key [F1] (LIBRARY P. SET) and key in as follows:

LP ␣ 0;I [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.

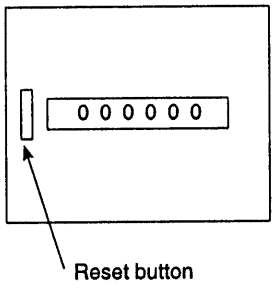
⚠CAUTION : (1) A library program is distinguished only by its program name. Therefore, it is impossible to register more than one library program which have the same name.

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.

(2) Turn off and on the power alter adding a new library program.

12-24. 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 to 999999). It is provided with the reset function.

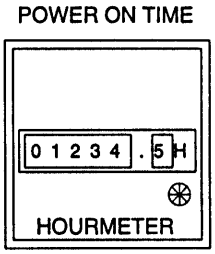


12-25. Hour Meter (optional)

(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 to 99999.9 hours

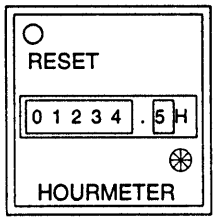


(2) NC RUNNING TIME Hour Meter

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 to 9999.9 hours

The hour meter is provided with the RESET button.

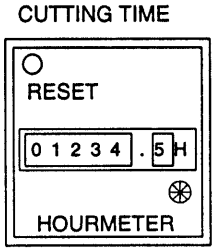


(3) CUTTING TIME Hour Meter

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 to 9999.9 hours

The hour meter is provided with the RESET button.

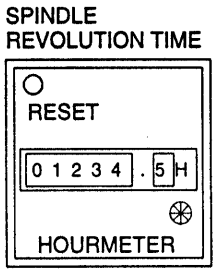


(4) SPINDLE REVOLUTION TIME Hour Meter

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 to 9999.9 hours

The hour meter is provided with the RESET button.



[Supplement] : When hour meters are selected, (1) POWER ON TIME hour meter and (2) NC RUNNING TIME hour meter are usually equipped.

12-26. F1-Digit Feed (optional)

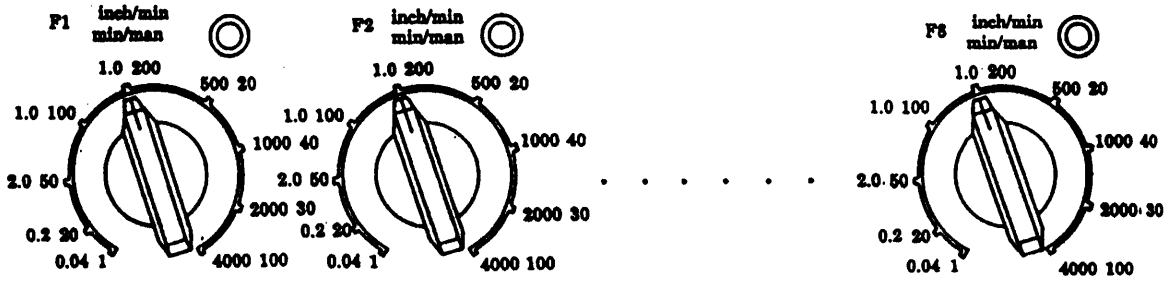
(1) The F1-digit feed function allows the use of feedrate setting dials (F1 to F8, or F1 to F4) on the F1 to digit feed operation panel. The operator should set axis feedrates on these dials and when F1 to F8 (or F1 to F4) command is read, the corresponding feedrate setting dial is selected and axis motion commands are executed at the feedrate set on the dial.

(2) 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.

(3) Setting of the dial can be changed while a cutting is in progress.

(4) The feedrate override dial is ineffective while a feedrate command is given in one-digit F command.

(5) An alarm occurs if an F1-digit command is given in the G95 (feed per revolution) mode.



F1-digit Feedrate Setting Dials

13. MANUAL OPERATION FUNCTIONS

Manual operation is possible when the MANUAL lamp is on or flickering.

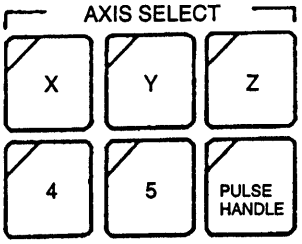
13-1. Manual Axis Feed Functions

13-1-1. 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).

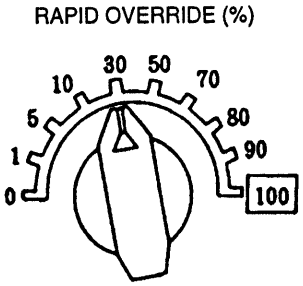
Machine Operation Panel



(2) Select the override rate by this rapid feedrate selection rotary switch.

This switch is operative while an axis is being fed.

Machine Operation Panel

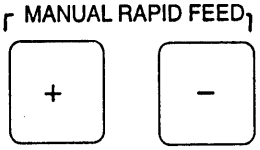


(3) Press the RAPID/+ button to feed the axis in the plus direction.

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.

Machine Operation Panel

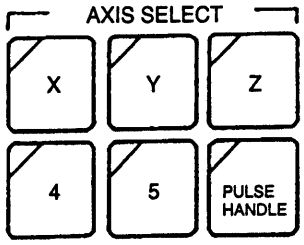


13-1-2. Manual Cutting (Jog) Feed

It is possible to manually feed each axis at a specific jog feedrate.

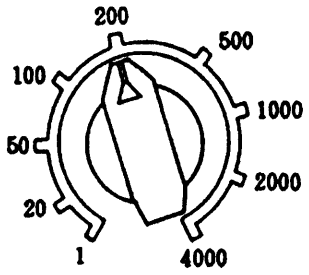
(1) Select the axis to feed by the AXIS SELECT switch (key).

Machine Operation Panel



(2) Select the jog feedrate by the jog feedrate selector switch. This rotary switch is operative even during axis feed.

Machine Operation Panel



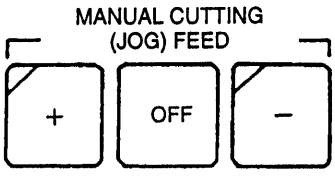
(3) Press the JOG/+ button to feed the axis in the plus direction.

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.

Machine Operation Panel



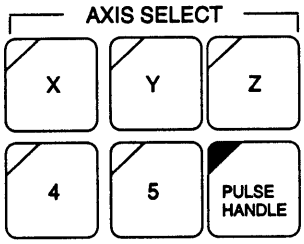
(4) When the JOG OFF button is pressed, the axis feed is stopped.

13-1-3. Manual Pulse Feed

It is possible to feed each axis using the pulse handle.

(1) Select the PULSE HANDLE from AXIS SELECT.

Machine Operation Panel



(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.

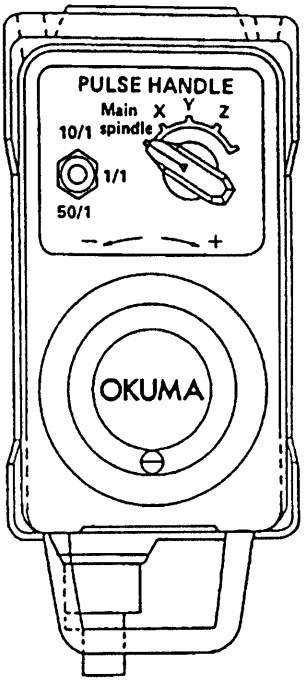
(3) Select the axis to be fed with the AXIS SELECT switch (key).

(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.

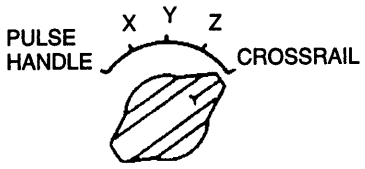
[Supplement] : When "50" is selected for the magnification, the axis feeds almost as fast as rapid feedrate. In this case, the alarm sometimes occurs.



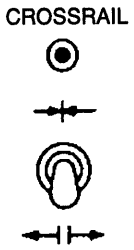
13-1-4. Crossrail Control

Crossrail can be moved rapidly.

(1) Select CROSS RAIL.

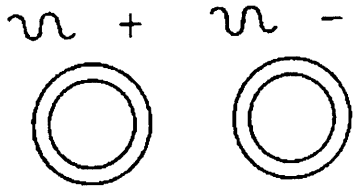


(2) Turn the crossrail clamp/unclamp switch in the unclamp position.



(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.

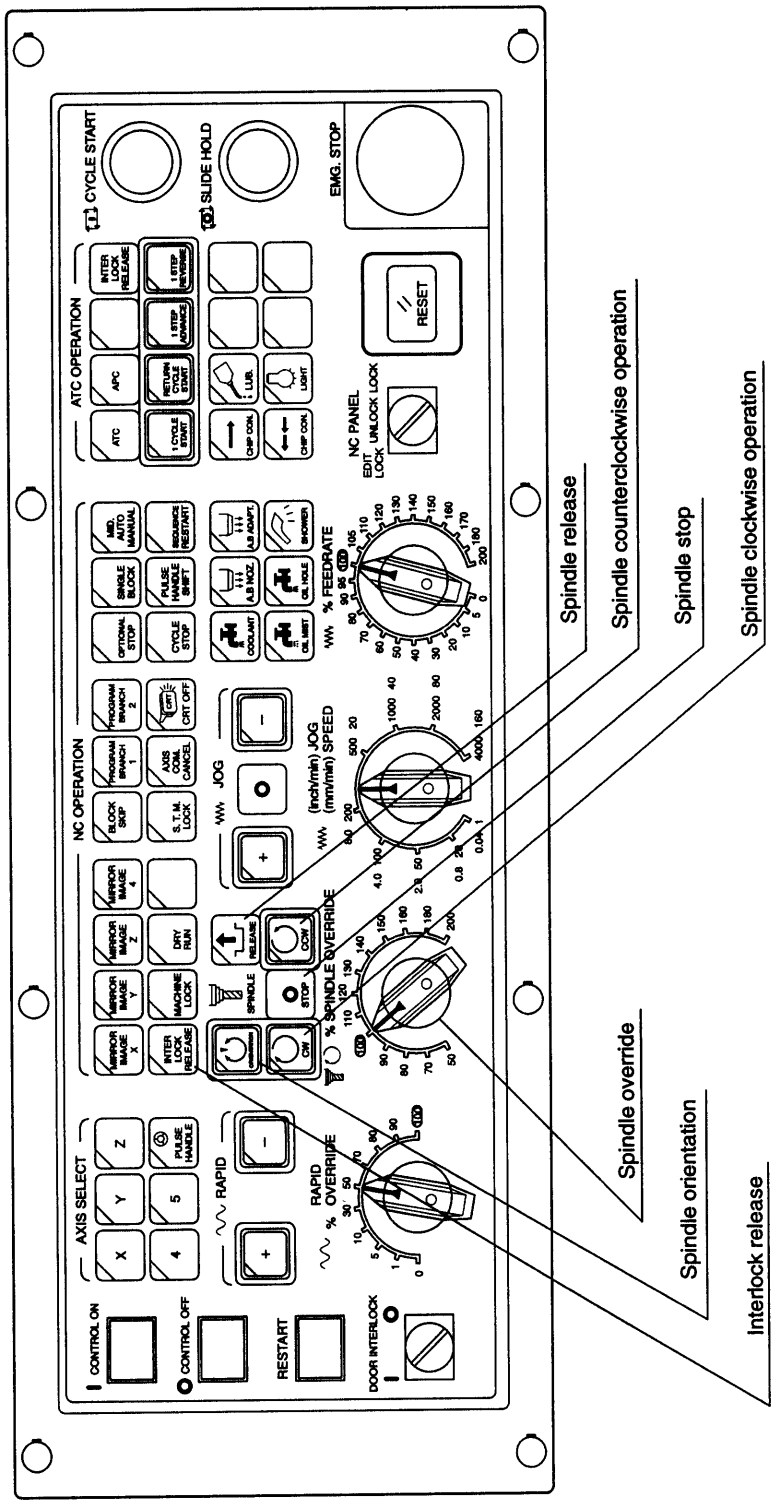
RAPID/+ ..... upward
RAPID/– ..... downward



[Supplement] : 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.

13-2 Spindle Operation

(1) Flat Panel



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

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.

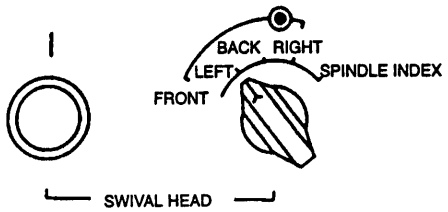
d) Spindle orientation

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.

13-3. 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 to 19, 50 to 66. (only for MCM)

[Supplement] : 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

2. Usually, the swivel head (attachment) is rotated in the clockwise direction. In the M17 mode, it is rotated in the counterclockwise direction.

13-4. ATC

13-4-1. 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:

1) 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.

2) 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 2) is explained. Refer to 6-5-2, "ATC Pot No./Tool No. Table" for the procedure for 1).

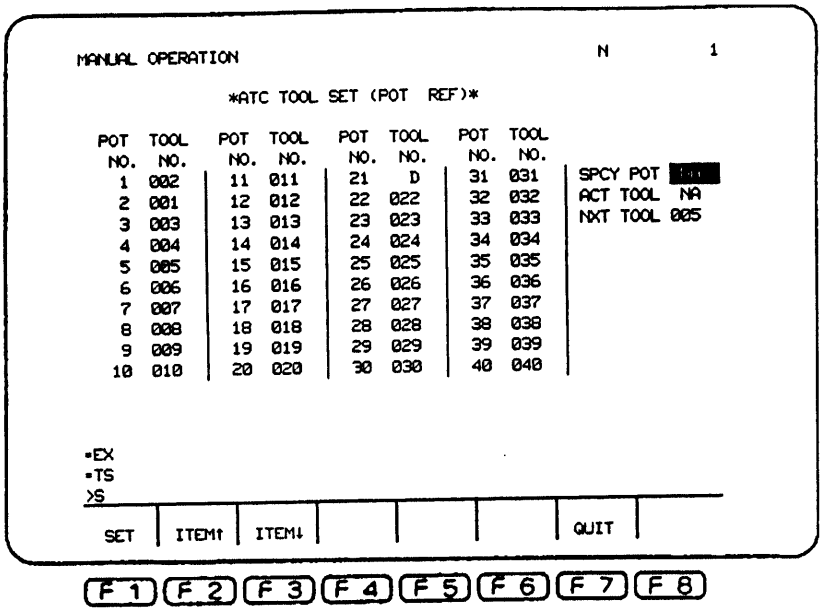
a) Setting procedure

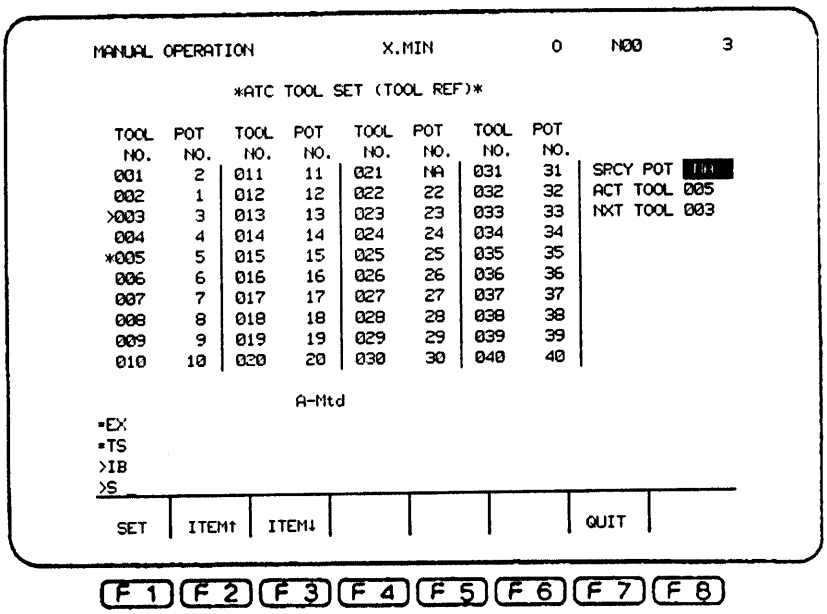
1) Switch the mode to "manual" by pressing the MANUAL key.

The display is possible in the automatic and MDI modes also. However, the setting is effective only in the manual mode.

2) Press function key [F8] (EXTEND) to change function key guide message. Then press function key [F2] (TOOL SET).

3) The ∗ATC TOOL SET (POT REF)∗ page is displayed. Pressing function key [F3] (ITEM ↓) changes the display page to ∗ATC TOOL SET (TOOL REF)∗.


MANUAL OPERATION
N 1
ATC TOOL SET (POT REF)
POT NO. TOOL NO.
1 002 | 11 011 | 21 D | 31 031
2 001 | 12 012 | 22 022 | 32 032
3 003 | 13 013 | 23 023 | 33 033
4 004 | 14 014 | 24 024 | 34 034
5 005 | 15 015 | 25 025 | 35 035
6 006 | 16 016 | 26 026 | 36 036
7 007 | 17 017 | 27 027 | 37 037
8 008 | 18 018 | 28 028 | 38 038
9 009 | 19 019 | 29 029 | 39 039
10 010 | 20 020 | 30 030 | 40 040
SPCY POT
ACT TOOL NA
NXT TOOL 005
=EX
=TS
>S
SET
ITEM↑
ITEM↓
QUIT
F1 F2 F3 F4 F5 F6 F7 F8


MANUAL OPERATION
X.MIN 0 N00 3
ATC TOOL SET (TOOL REF)
TOOL NO. POT NO.
001 2 | 011 11 | 021 NA | 031 31
002 1 | 012 12 | 022 22 | 032 32
>003 3 | 013 13 | 023 23 | 033 33
004 4 | 014 14 | 024 24 | 034 34
*005 5 | 015 15 | 025 25 | 035 35
006 6 | 016 16 | 026 26 | 036 36
007 7 | 017 17 | 027 27 | 037 37
008 8 | 018 18 | 028 28 | 038 38
009 9 | 019 19 | 029 29 | 039 39
010 10 | 020 20 | 030 30 | 040 40
SPCY POT
ACT TOOL 005
NXT TOOL 003
A-Mtd
=EX
=TS
>IB
>S
SET
ITEM↑
ITEM↓
QUIT
F1 F2 F3 F4 F5 F6 F7 F8

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.

b) Symbols on the display pages are as follows

1) 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.

2) ATC TOOL SET (TOOL REF)

>> : Indicates the next tool.

* : Indicates the active tool.

c) The data to be set

1) SPCY POT

This is used for specifying the toolpot to which the active tool is to be returned, if necessary.

[Supplement] : 1. The maximum number is the number of toolpots in the magazine.

MC-40 VA 20 tools
MC-50 VA 20 tools
MC-60 VA 20 tools

2. If another tool number has already been assigned to the specified toolpot number, an error occurs.

3. When specifying a toolpot number for returning a large-diameter tool," the adjacent toolpots should have a dummy tool or they should be left empty. Otherwise, an error occurs.

2) ACT TOOL

This indicates the tool number of the tool set in the spindle.

[Supplement] : 1. The maximum tool number is the same as the number of tool offsets. (50 in standard)

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.

3. Setting of a large-diameter tool (XX, L) is possible but the setting of a dummy tool (D) is impossible.

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.

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).

3) NXT TOOL

This indicates the tool number to be set in the spindle next. No data is entered for the first tool returning cycle.

[Supplement] : 1. The maximum number is the same as the active tool.

2. In case there is a mismatch between the tool number specified and the toolpot number, an error occurs.

3. Setting of a large-diameter tool (,L) and dummy tool (D) is impossible.

4. An error will occur when pot number is specified in the SPCY POT data location.

d) 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.

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.

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.

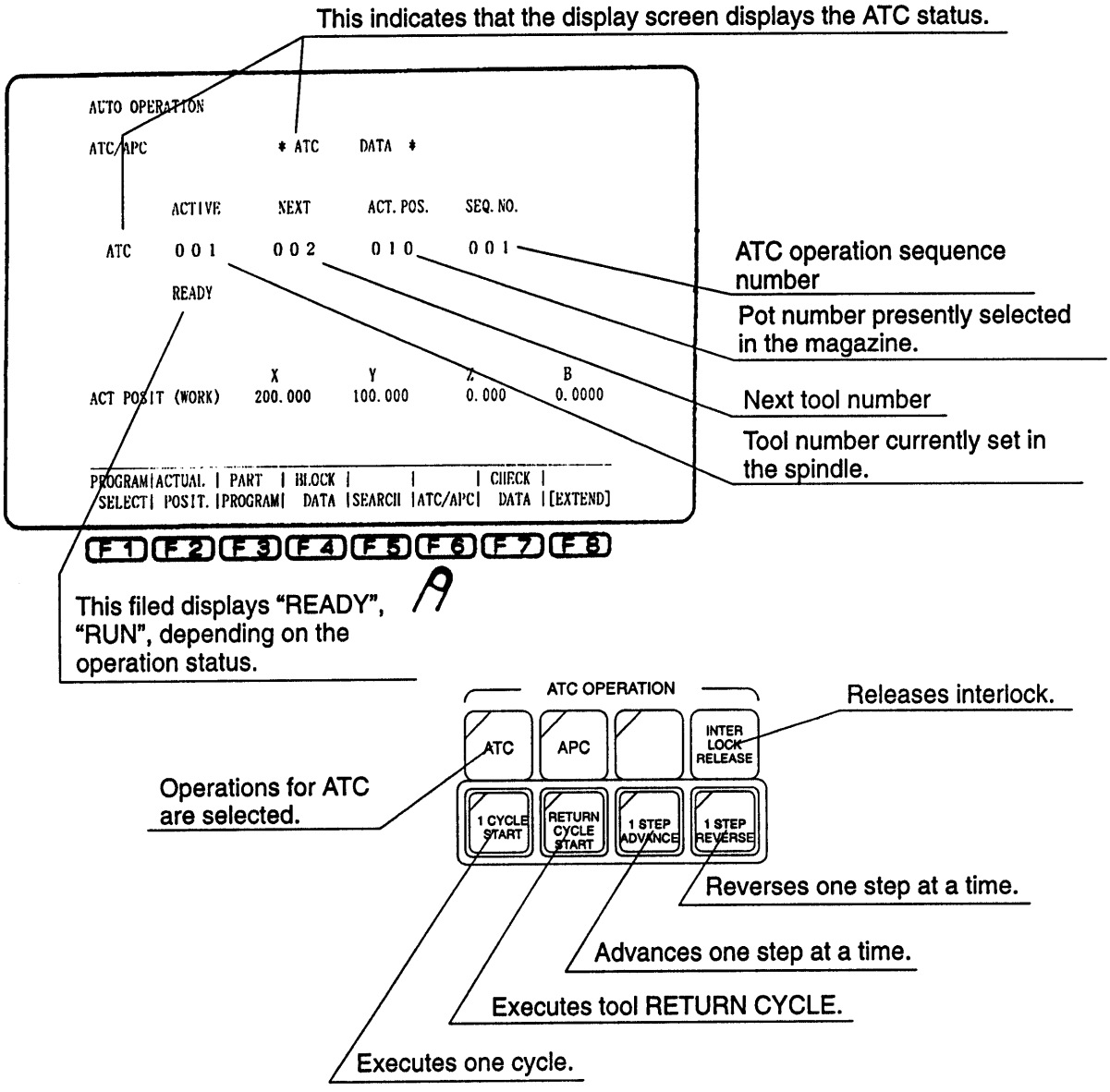
The empty pot located nearest to the presently indexed pot is automatically selected and the tool return cycle is started.

[Supplement] :

1. Pressing the 1 CYCLE START key with the next tool number specified, initiates the normal tool change cycle.
2. The SPCY POT data is automatically cleared after the execution of "1 cycle start" command.
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.
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.
5. When entering a large-diameter tool, enter ",L" following the tool number.

(2) OPERATION ON ATC OPERATION PANEL

a) Status indication and operation keys



1) ATC/APC display

In the automatic, MDI or manual mode, press function key [F6] (ATC/APC) to display the ATC/APC screen.

2) Selection of ATC operation

Press the ATC key at the ATC OPERATION panel. Whether the ATC operation is selected can be checked by the display screen display – ∗ATC DATA∗.

3) 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 13-4-1 for memory-random ATC specification, and 6-5, "Tool Data Set" for fixed address ATC specification.

4) 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.

5) 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 I 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 display 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 display screen.

6) 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.

7) 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.

For ATC operation, refer to the maintenance manuals for each models.

b) ATC restoration

1) 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.

2) 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".

3) 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.

4) 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.

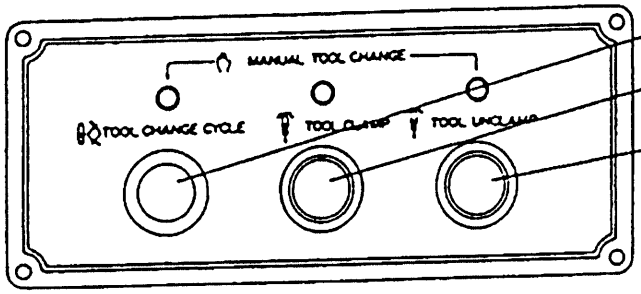
To change the next tool number, set the required number at the TOOL DATA SET screen.

[Supplement] : ATC operation sequence numbers corresponding to tool return cycle are indicated below.

	Operation Sequence Numbers
MC-400H	11 to 14
MC-500H/600H	22 to 24
MCV-A 24-tool ATC	19 to 24
MCV-B 24-tool ATC	19 to 24
MCV-A 50- or more tools ATC	16 to 20
MCV-B 50- or more tools ATC	34 to 42
MCR-B	41 to 53

For details, refer to the maintenance manuals for each models.

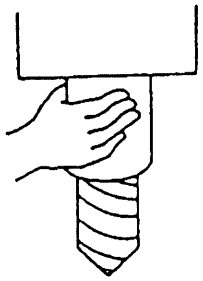
13-4-2. Manual Tool Change



(1) Press the TOOL CHANGE CYCLE button.

(2) Press the TOOL CLAMP button.

(2) Press the TOOL UNCLAMP button.



(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.

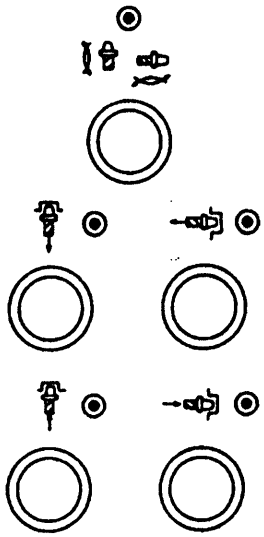
A lamp lights for each button pressed to show the respective condition.

⚠CAUTION : 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.

CAUTION :

(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.

(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.

13-4-3. 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 eve 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 5-2, "Emergency Stop".)

Operating method is shown below:

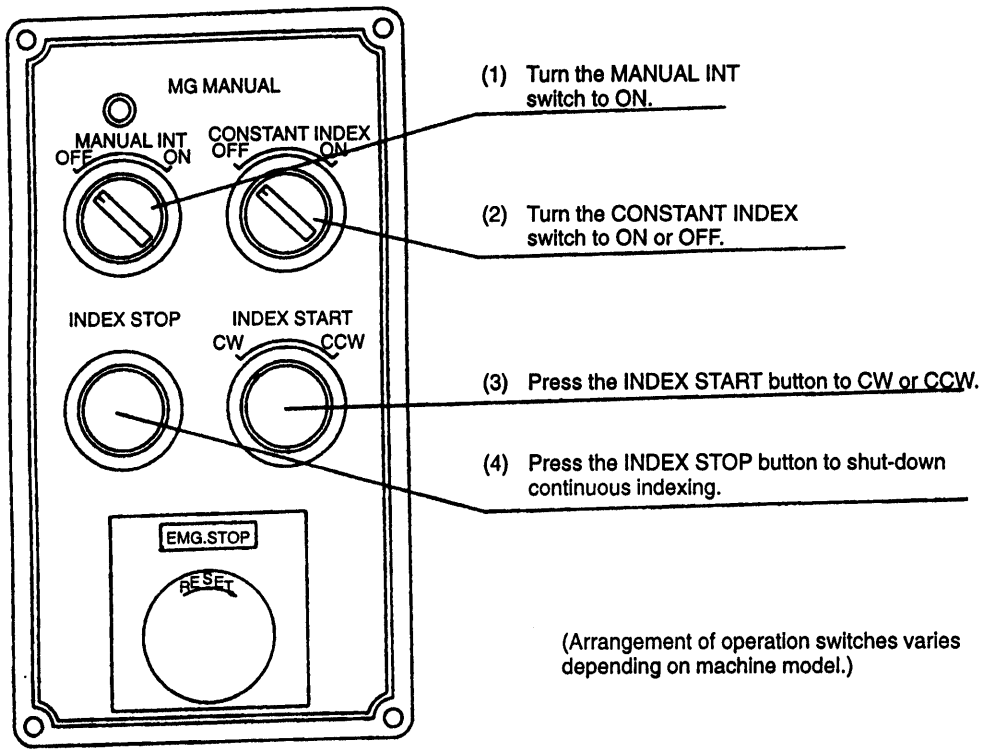


Fig. 2-130 Manual Magazine Operation

(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.

13-4-4. 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.

13-5. APC

13-5-1. APC Operation

(1) Status Indication and operation keys

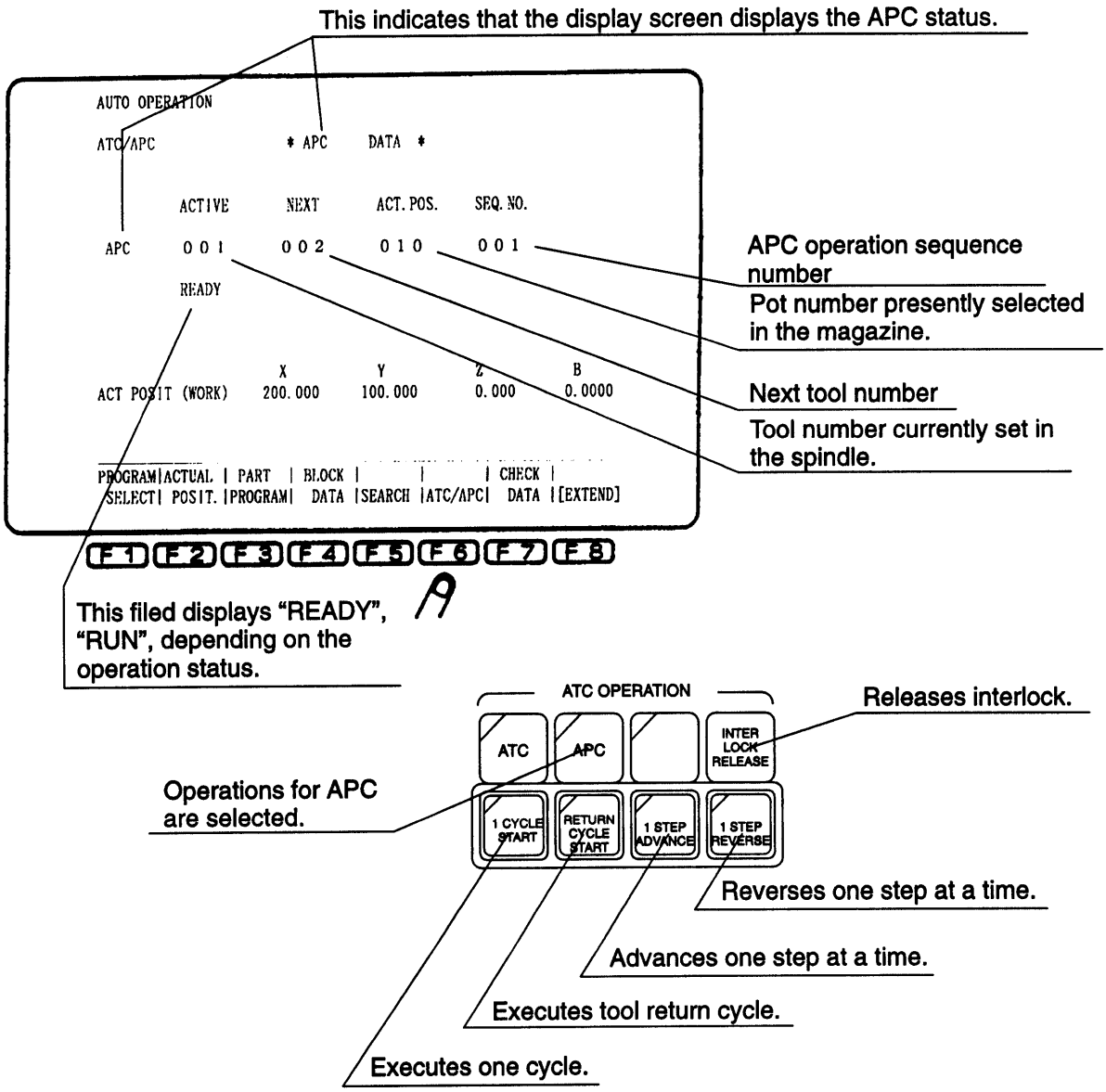


Fig. 2-131 APC Operation Using Flat Panel

a) ATC/APC display

In the automatic, MDI or manual mode, press 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.

For ATC operation, refer to maintenance manuals for each models.

13-5-2. 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.

13-5-3. 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)

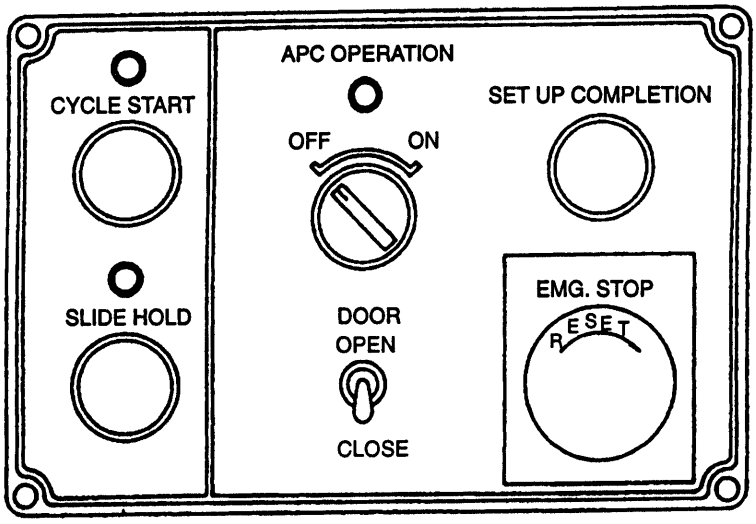


Fig. 2-132 APC Operation Panel – Parallel or Rotary Type 2-pallet APC (Vertical/Horizontal Machining Center)

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 OSP7000M 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)

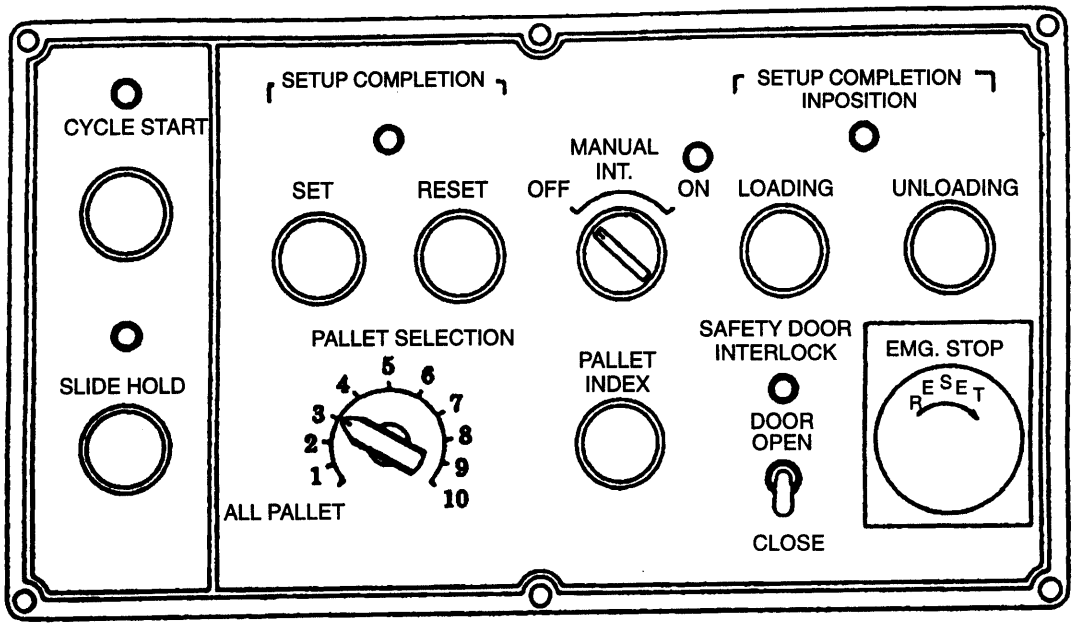


Fig. 2-133 APC Operation Panel – Multi-Pallet APC (Horizontal Machining Center)

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

1) UNLOADING

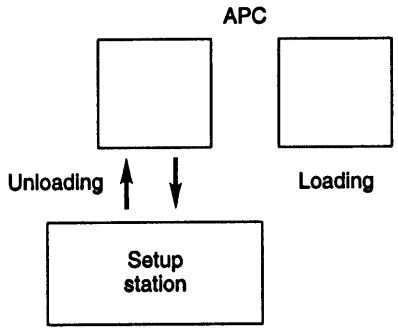
The pallet at the pallet changer is transferred to the setup station.

2) LOADING

The pallet on the setup station is transferred to the pallet changer.

3) 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

1) 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.

2) 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

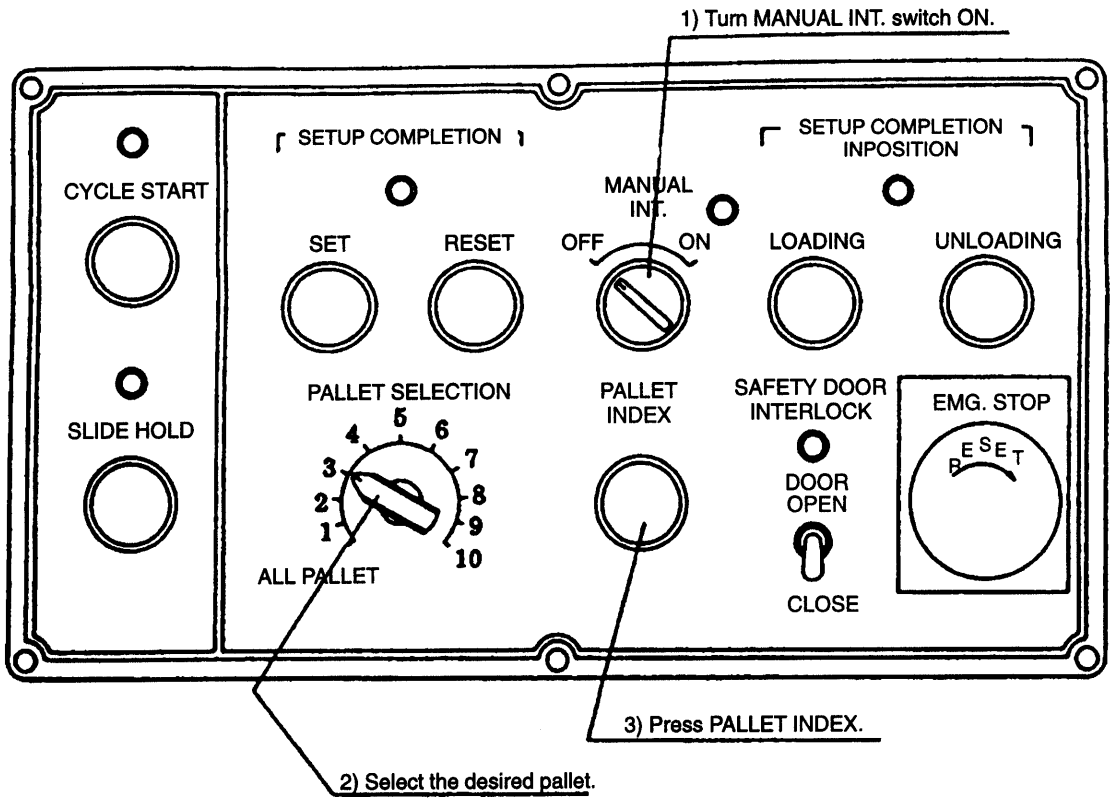


Fig. 2-134 Example of Pallet Changer Operations (Multi-pallet APC) – Indexing Pallet

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

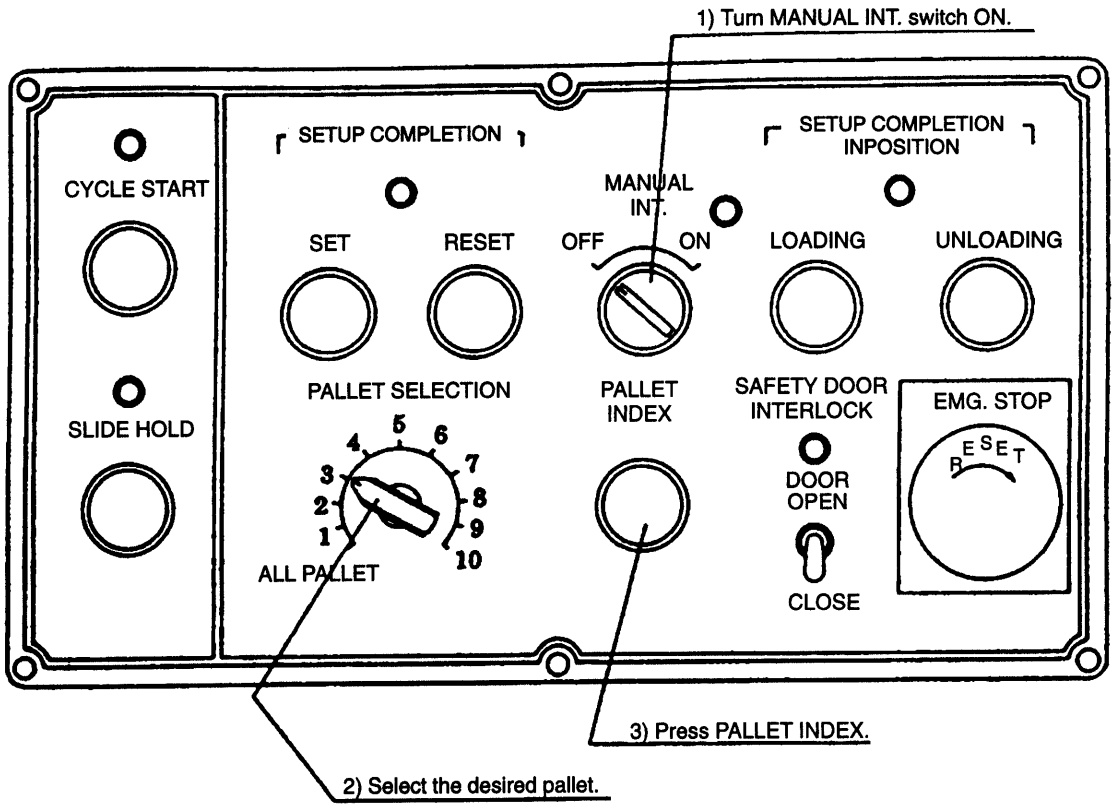


Fig. 2-135 Example of Pallet Changer Operations (Multi-pallet APC)
Setup Completion – Set/Reset Operations

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

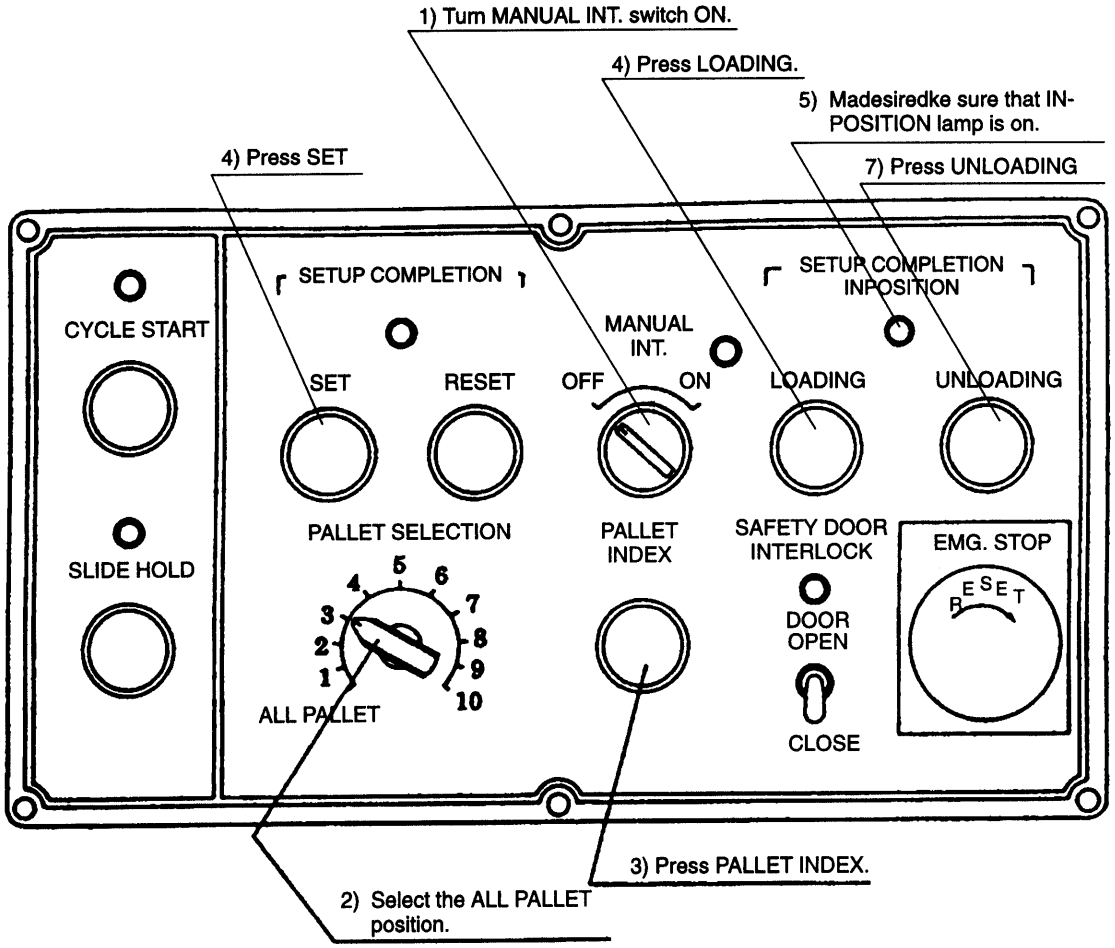


Fig. 2-136 Example of Pallet Changer Operations (Multi-pallet APC)
Setup Station – Loading/Unloading a Pallet

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.

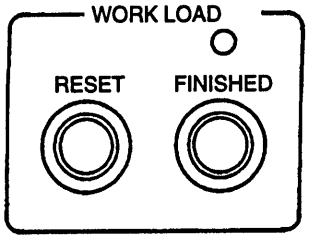
(3) Double-Column Machining Center

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

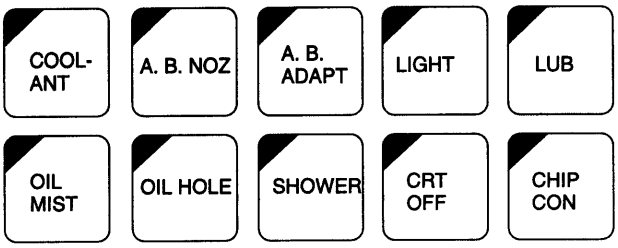
In case that workpiece re-setup operation should be performed after completion of the workpiece setup, press this button to cancel the workpiece setup completed state. When this button is pressed, its indicating lamp goes off.



13-6. Other Functions

These include the COOLANT, OIL MIST, AIR BLOW, OIL HOLE, CHIP CONVEYOR and DISPLAY SCREEN.

(1) Operation keys



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.

(2) Keys

a) COOLANT, OIL MIST, AIR BLOW, 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) SCR

ON ..... Display is disabled.

OFF ..... Display is enabled.

Turning this key off when display screen is not required can elongate service life of display screen.

CAUTION : 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-axis and crossrail (W-axis) are in the unclamp state.

SECTION 3 PARAMETERS

1. KINDS OF PARAMETERS USED BY OSP7000M

With the OSP7000M, 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 axis parameter

(12) Machine system parameter (long word)

(13) Machine system parameter (word)

(14) System parameter

(15) 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		MACHINE AXIS PARAMETER MA-axis zero point MB-axis zero point MC-axis zero point	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.) for double-column model and 0.3 mm (0.012 in.) for vertical model
		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) N0. 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

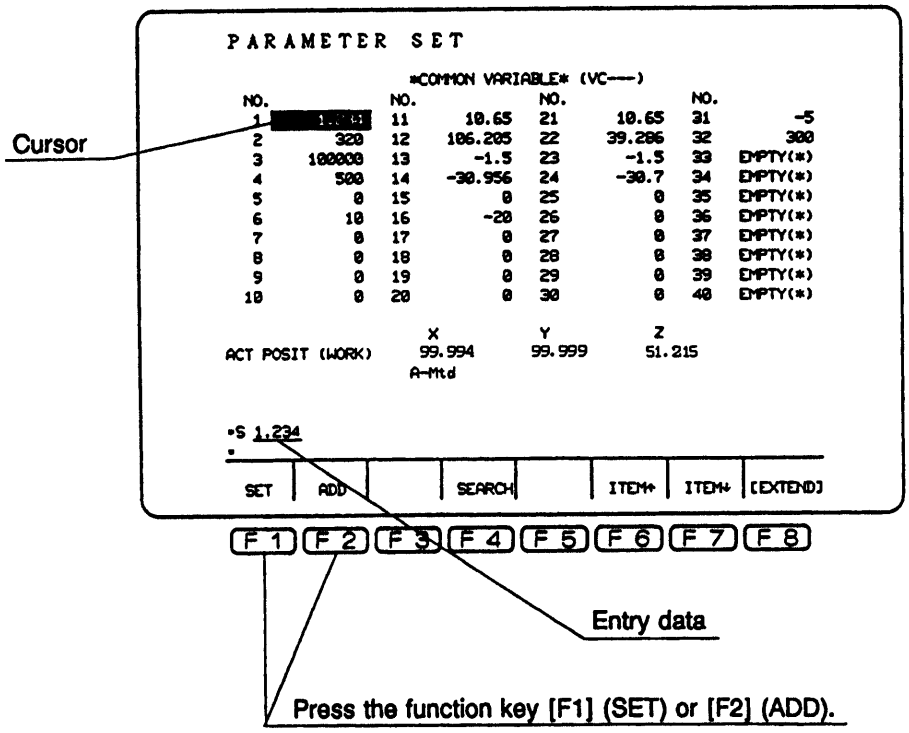
The variables, which are common to schedule programs, main programs and subprograms, may be referenced and updated. For details, see Section 13, 2-1, "Common Variables" in the Programming Manual for OSP7000M. There are 128 sets, from VC1 to VC128. Setting procedure is shown below.

(1) Press the PARAMETER key.

(2) Press 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 ⇧ and ⇩ , and position the cursor to the desired setting.

Alternatively, use function key [F4] (SEARCH) to set the cursor at the desired data element.



(4) Setting

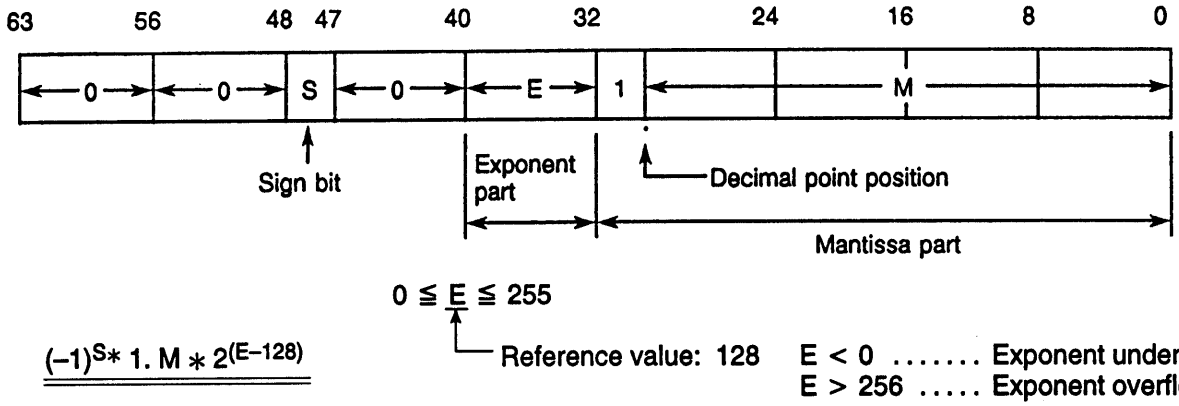
a) When the value of a common variable is known, then press function key [F1] (SET) and enter that value.

b) When the value has already been set and the increment/decrement from that value is to be set, press 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.

[Supplement] : Up to eight digits of data elements may be entered. Internally, they are floating point numbers which are eight bytes long.



$0 \leqq E \leqq 255$

Reference value: 128

$(-1)^S * 1.M * 2^{(E-128)}$

E < 0 ..... Exponent underflow
E > 256 ..... Exponent overflow

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 13, 2, "Variables Function" in the Programming Manual for OSP7000M.

3-2. User Parameters

The following user parameters are available.

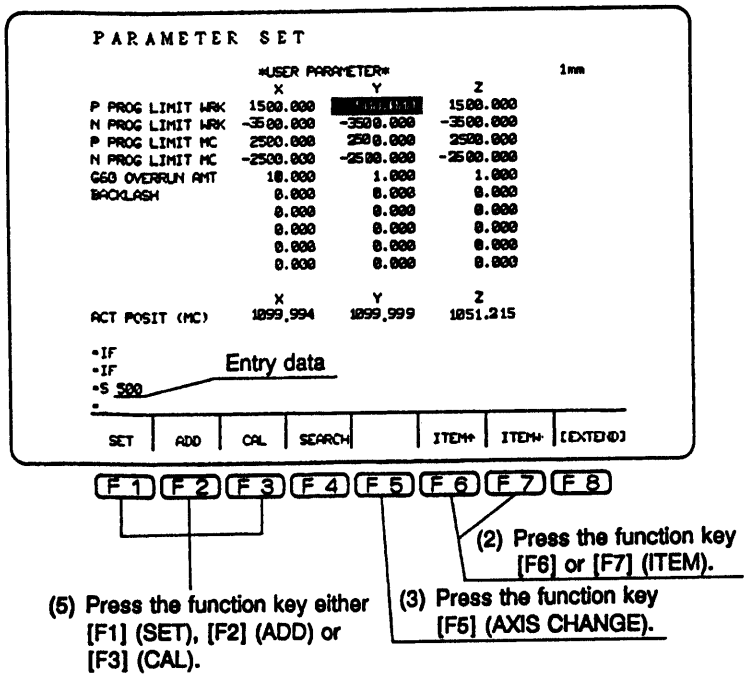
No.	CRT Display	Contents	Factory-set Initial Value	Setting Range
1	P PROG LIMIT WRK	Software-based P-directional and N-directional travel end limits disclosed to users. Displayed in the work coordinate system.	Depends on machine specification	−99999999 to +99999999
2	N PROG LIMIT WRK		Same as above	−99999999 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.	Double-column : 1000 [1 mm (0.04 in.)] Vertical : 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 function key [F6] or [F7] (ITEM) until the USER PARAMETER screen appears.



(3) When it is necessary to set data for the additional axes (the 5th and following axes), press 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 function key [F1] (SET) and enter that value.

b) When setting any increment as viewed from the previously set position, press 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 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

(1) G code Macro

The G code macro provides the functions equivalent to MODIN, MODOUT and CALL.

a) G100

The same code as MODOUT, which cancels MODIN. Its format is as follows:

G100 (no argument setting)

b) 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)

c) 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.

(2) M code Macro

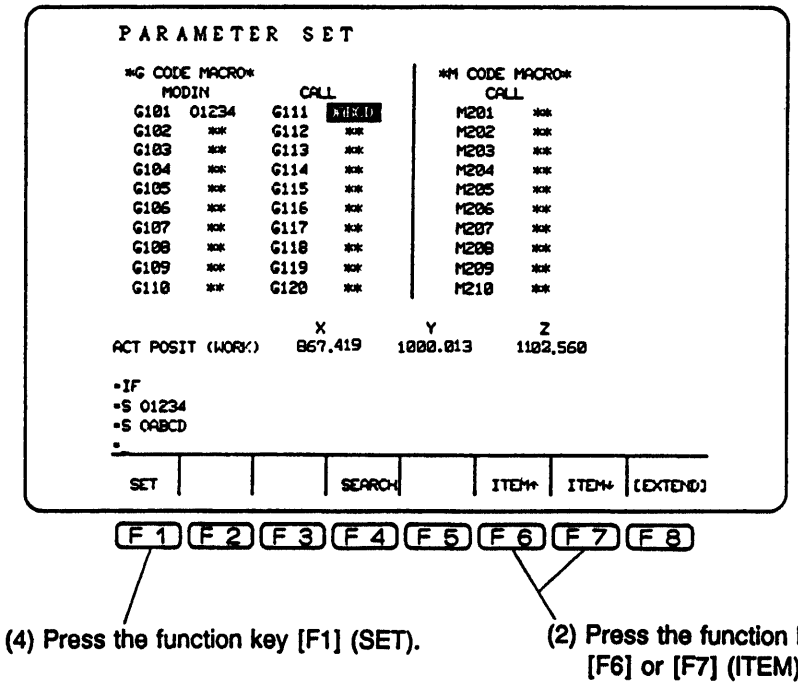
The M code macro is a function which allows an M code to call a subprogram. It consists of M201 to M210. The program name used by the M code is set by a parameter.

For the details of G and M code macros, see SECTION 10, 3, "G and M Code Macro Functions" in the Programming Manual for OSP7000M.

Operating procedure is as follows:

(1) Press the PARAMETER key.

(2) Press function key [F6] or [F7] (ITEM) until the G/M CODE MACRO screen appears.



(3) Using the cursor keys, place the cursor at the desired data.

(4) Press 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.

[Supplement] : A program name which is set at OO000 to OO999 will result in an alarm. The OO000 and following are intended for use by the maker subprograms only, users are not allowed to use them.

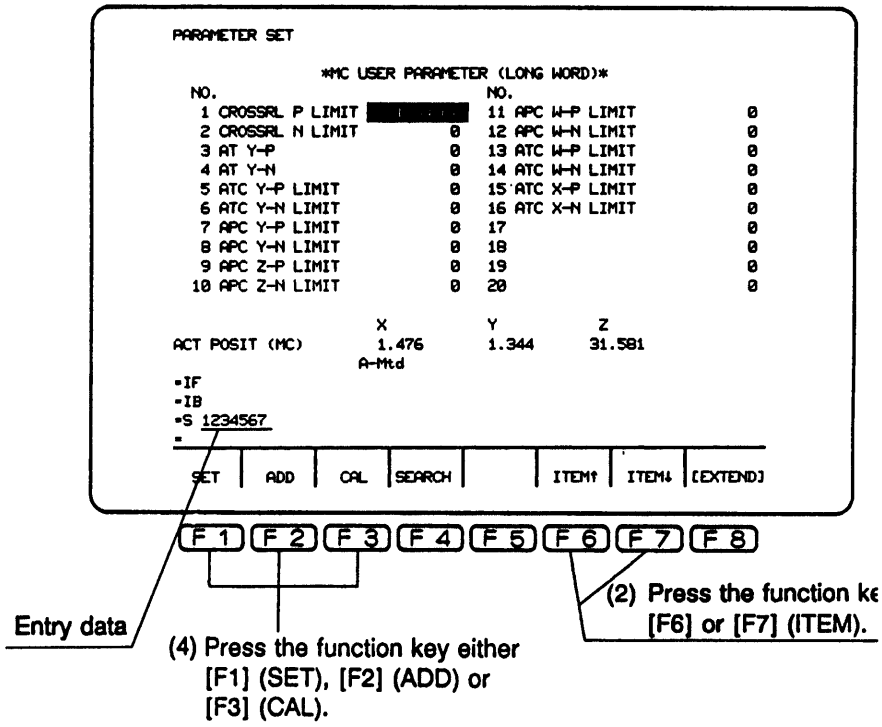
3-4. Machine User Parameter (Long Word)

Parameter No.	Screen 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 Y-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 Y-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 function key [F6] or [F7] (ITEM) until the MC USER PARAMETER (LONG WORD) screen appears.



(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 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 function key [F2] (ADD) and enter the increment.

c) If new data is set at a position relative to the active value (position), press 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.	Screen 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	10 min	0 - 10	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 - 120	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 - 600	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.	Screen 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.	SET	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:

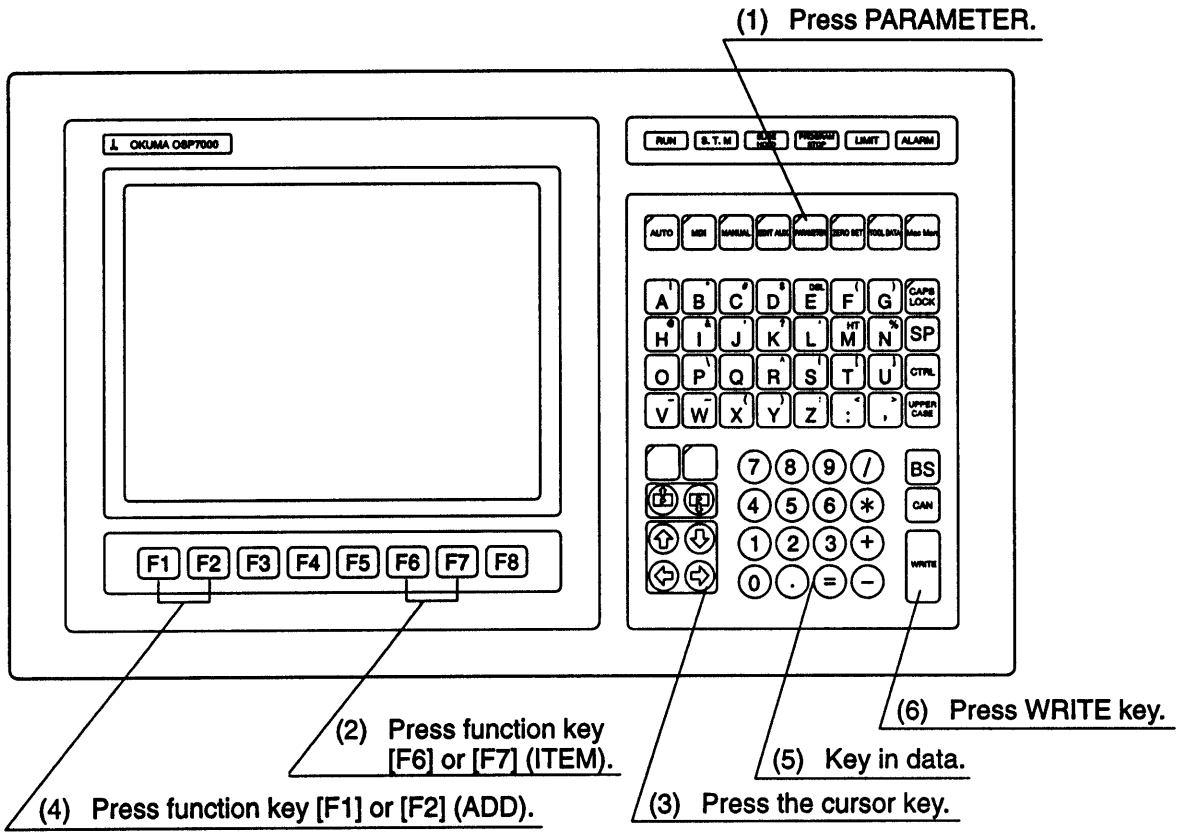
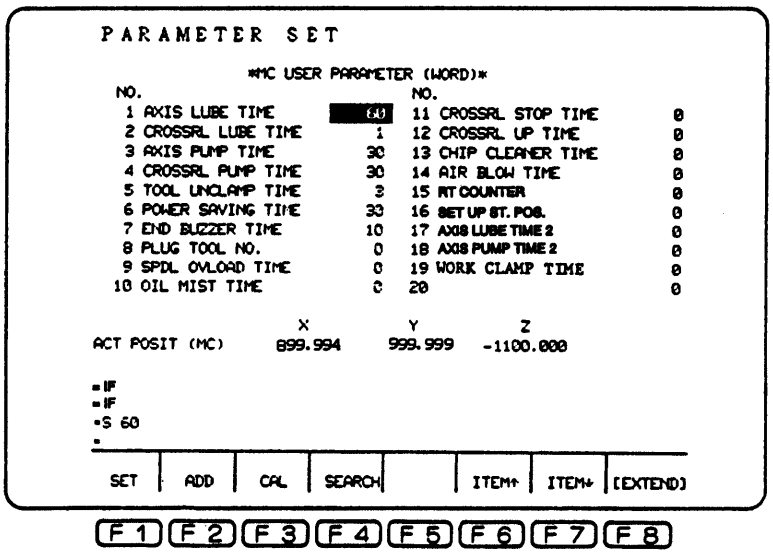


Fig. 3-1 Machine User Parameter (Word)

(1) Press the PARAMETER key.

(2) Press 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.



Setting:

If data is previously known:

(4) Press 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 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				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		Ineffective	Effective	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 ×4 or ×1	×4	×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:

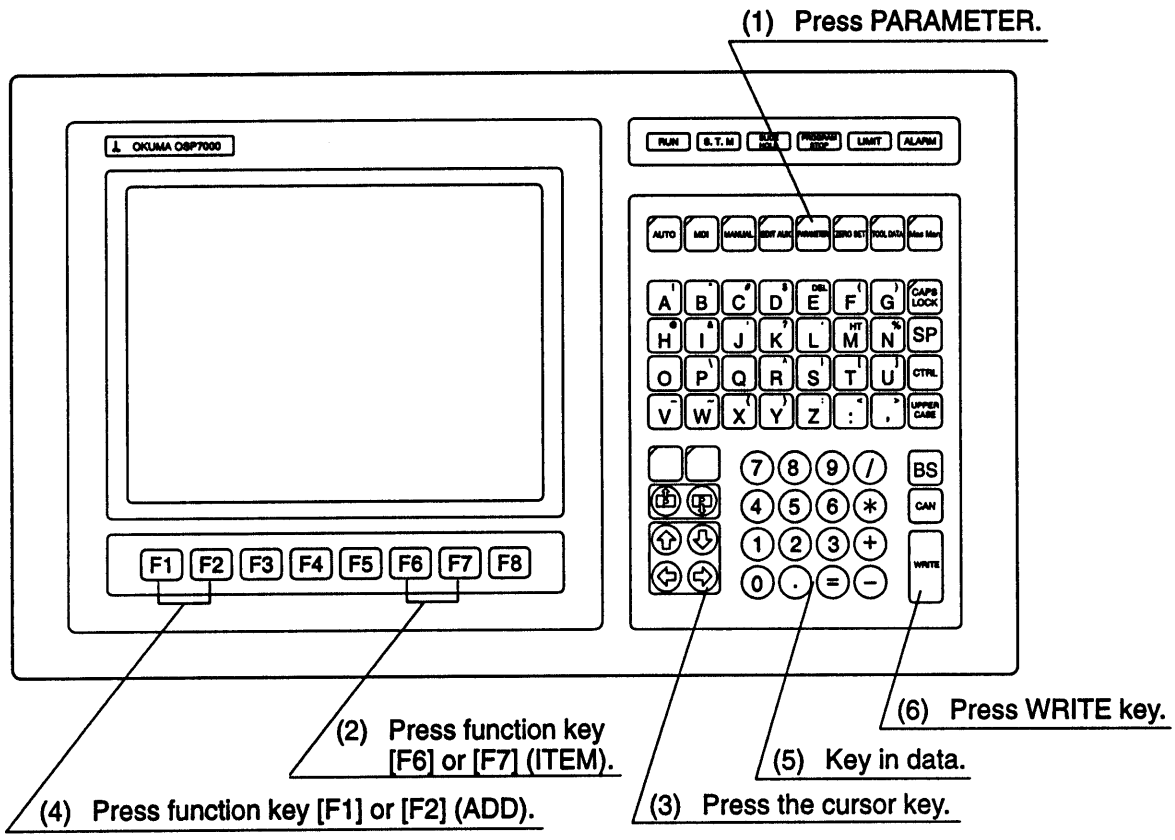


Fig. 3-2 Machine User Parameter (Bit)

(1) Press the PARAMETER key.

(2) Press 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.

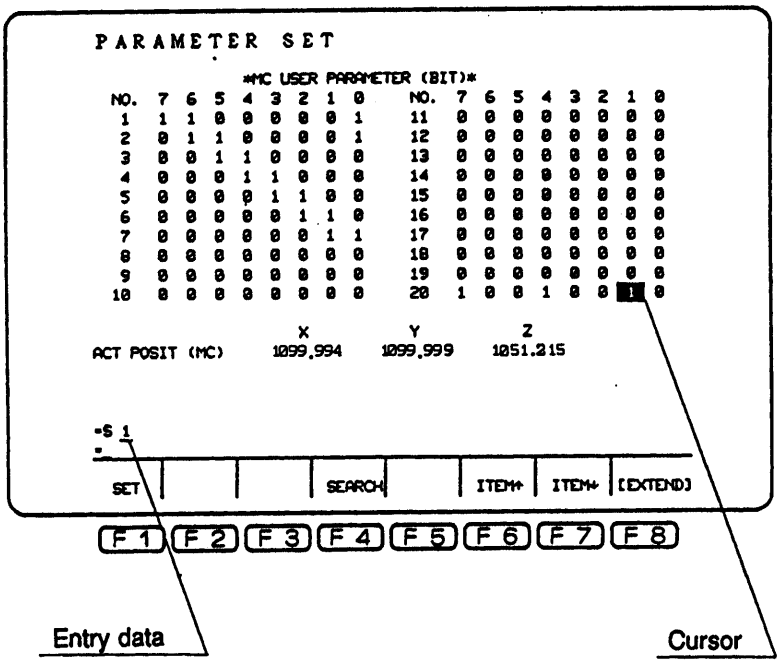
(4) Press function key [F1] (SET).

(5) Enter the data.

The entry data is only 0 or 1.

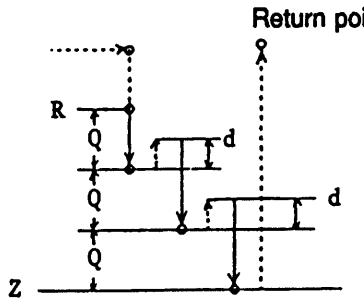
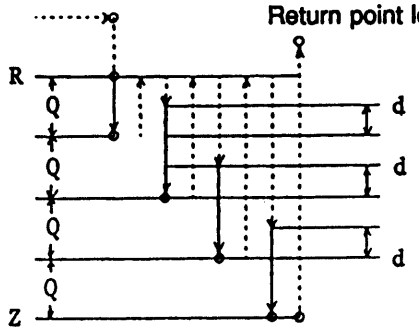
(6) Press the WRITE key.

This rewrites data indicated by the cursor.

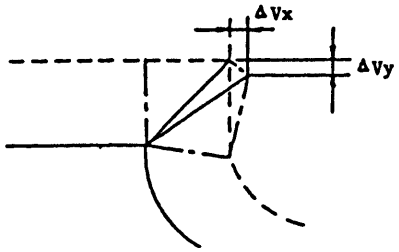
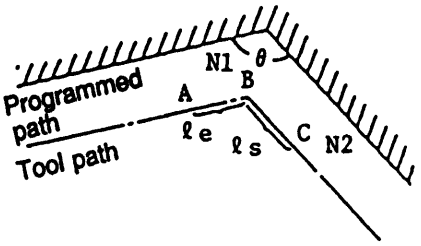


3-7. NC Optional Parameter (Long Word)

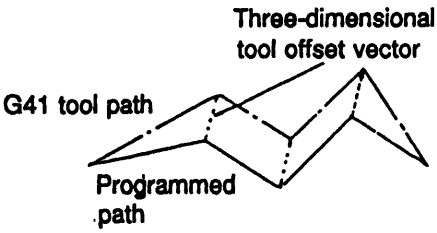
The optional parameter (long words) that follow are available. The parameter numbers are keyed to the numbers on the display screen.

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

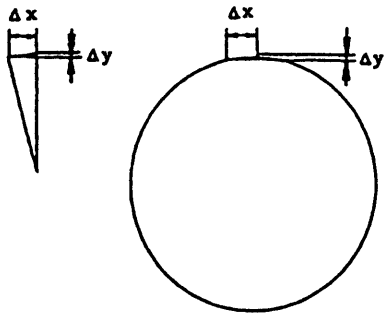
※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
4※	Cutter radius compensation vector check data	For an extremely small corner movement, if $\Delta Vx \leqq \Delta V$ and $\Delta Vy \leqq \Delta V$, then ignores the rear moving point for movement. The ΔV is set by the check data. 	50 (0.05 mm) (0.002 in.)	0 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		

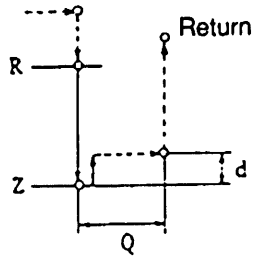
※ In μm unit specification, the factory set initial value and the setting range are ten times those in mm unit specification.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
7	Three-dimensional tool offset vector size	 Vector component in Xp-axis direction: $\Delta Vx = ir/p$ Vector component in Yp-axis direction: $\Delta Vy = jr/p$ Vector component in Zp-axis direction: $\Delta Vz = kr/p$ 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.

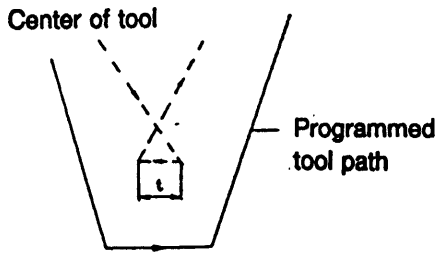
Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
9※	Error data resulting from cutter radius compensation calculation for minute circular arcs and quasi-full circles in cutter radius compensation mode	 Minute arc Quasi-full circle ($\Delta X \leqq \Delta V, \Delta Y \leqq \Delta V$) (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 200000

※ 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
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 RMILI (inner round milling)	Sets the distance between the first positioning point for RMILI (inner round milling) and the workpiece endface.	500 (0.05 mm) (0.02 in.)	500 to 5000
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 359999 or 0 to 3599999
16	Spindle IN-P check value	Spindle (C-axis) IN-P check value is set.	Depends on machine specification	*0 to 359999 or 0 to 3599999
17	Spindle index angle at rapid feedrate	Rapid feedrate (angle) of spindle indexing is set.	Depends on machine specification	*0 to 359999 or 0 to 3599999

* 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 3599999
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.

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
36	Z-axis cutting position	For I-MAP B specifications, this parameter sets the tool's OD for convex solid profiles at a position (Z-cut position) away from the cutting allowance. Standard setting amount: 5000	0 (μm)	–99999999 to +99999999
37	Approach position	For I-MAP B specifications, this parameter sets the approach position for concave solid profiles. Standard setting amount: 1000	0 (μm)	–99999999 to +99999999
38	Travel width at pick operation	For I-MAP B specifications, this parameter sets the travel width at pick operation for irregular solid profiles. Standard setting amount: 1500	0 (μm)	–99999999 to +99999999
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:

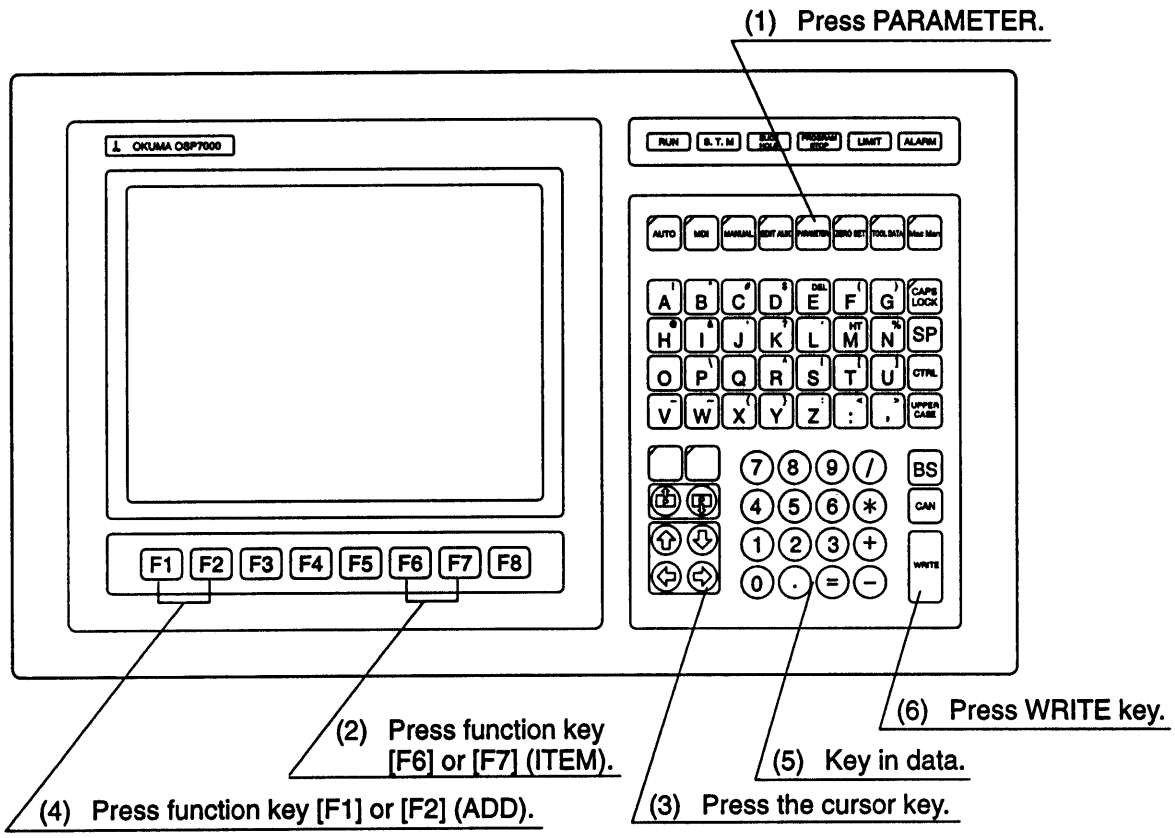
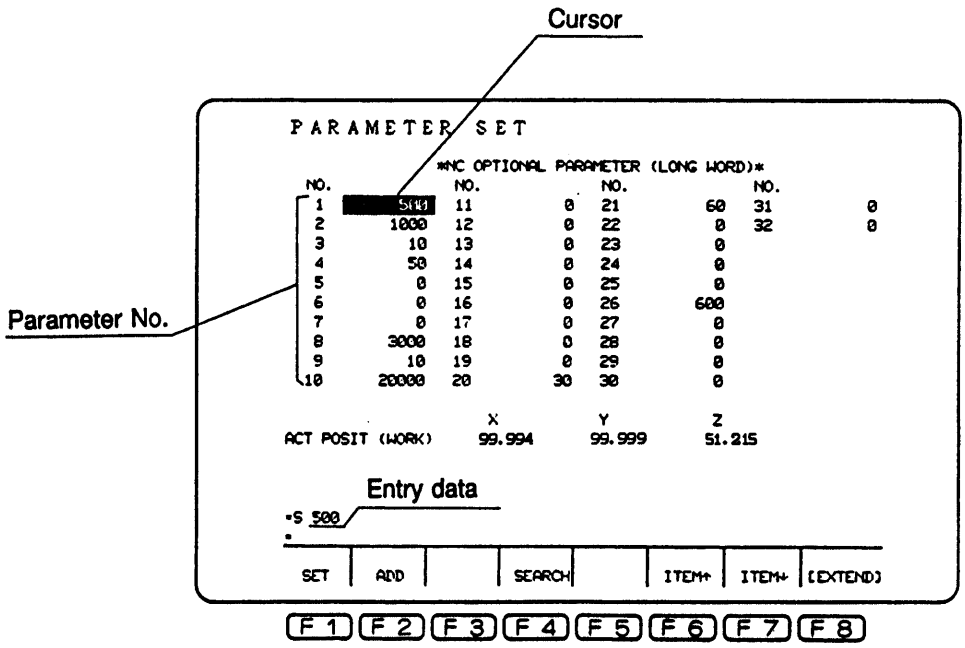


Fig. 3-3 NC Optional Parameter (Long Word)

(1) Press the PARAMETER key.

(2) Press 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.



Setting:

When data is previously known:

(4) Press 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 function key [F2] (ADD).

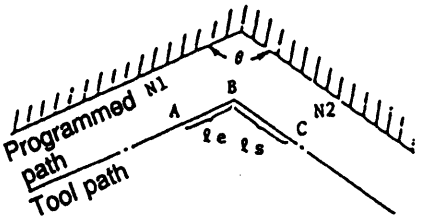
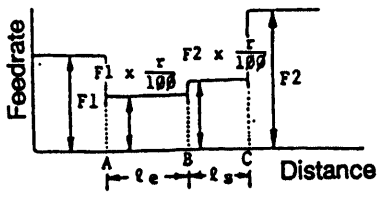
(5) Enter the increment on the keyboard.

(6) Press the WRITE key.

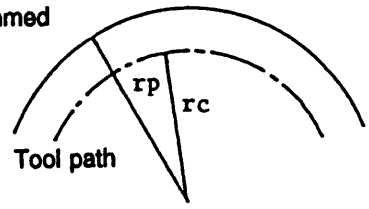
This rewrites the data indicated by the cursor.

3-8. NC Optional Parameter (Word)

The optional parameter (words) the follow are available.

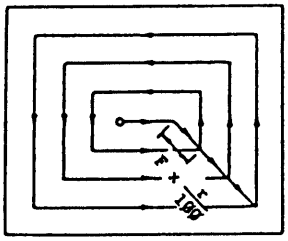
Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
1	Tape feed holes in punching	For a punchout in the PIP (transfer) mode, there is a tape feed before the program is punched out, which is followed by tape feed. The number of feed holes is set by this parameter.	600	1 to 10000
2	Defaults 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)

<table>
<tr><th>Param-
eter
No.</th><th>Item</th><th>Contents</th><th>Factory
Set
Initial
Value</th><th>Setting
Range</th></tr>
<tr><td>5</td><td>Decelerating ratio of cutter radius compensation arc's internal override</td><td>Programmed path
 

Generally, the feedrate during cutter radius compensation is controlled so that the tool center path gets the specified speed. Parameter setting, however, provides and 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 ×100 ≧ Parameter setting
Actual feedrate = Specified speed × rc/rp
(b) When rc/rp × 100 < Parameter setting
Actual feedrate = Specified speed × (Parameter setting/100)</td><td>100%</td><td>1 to 100%</td></tr>
<tr><td>*6</td><td>NC baud rate for RC232C Channel 0</td><td>This parameter sets the baud rate of the RS232C interface when used for the puncher.
<table><tr><th>Baud rate</th></tr><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></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.</td><td>600
(0.6 K baud)</td><td>110 to 19200
(baud)</td></tr>
</table>

NC optional parameter (word)

<table>
<tr><th>Parameter No.</th><th>Item</th><th>Contents</th><th>Factory Set Initial Value</th><th>Setting Range</th></tr>
<tr><td>7</td><td>Override in pocket milling (spiral type) corner cutting</td><td>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.</td><td>100%</td><td>1 to 100%</td></tr>
<tr><td>8</td><td>Magazine pot number for touch probe</td><td>This parameter specifies the magazine pot number for storing the touch probe.</td><td>0</td><td>0 to Number of magazine pots</td></tr>
<tr><td>9</td><td>Imaginary spindle rpm for machine lock</td><td>This parameter specifies the imaginary spindle speed for the machine lock mode operation.</td><td>2000 min^{-1} (rpm)</td><td>1 to 8000 min^{-1} (rpm)</td></tr>
<tr><td>10</td><td>Servo processor monitor function</td><td>This parameter specifies the number of DSVPVAR1 (leftmost 2 digits) and RSVPVAR2 (rightmost 2 digits) display on the CHECK page.</td><td>0</td><td>0 to 9999</td></tr>
<tr><td>11</td><td>Designation of operation method</td><td>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></td><td>1</td><td>0 to 3</td></tr>
</table>

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	0 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)

<table>
<tr><th>Parameter No.</th><th>Item</th><th>Contents</th><th>Factory Set Initial Value</th><th>Setting Range</th></tr>
<tr><td>43</td><td>RS232C channel used for DNC-A channel</td><td><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></td><td>0 (channel)</td><td>0 to 4 (channel)</td></tr>
<tr><td>44</td><td>Channel No. for DC code control</td><td>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></td><td>0</td><td>0 to 4</td></tr>
<tr><td>*45</td><td>Designation of punch device</td><td><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></td><td>0</td><td>0 to 5</td></tr>
</table>

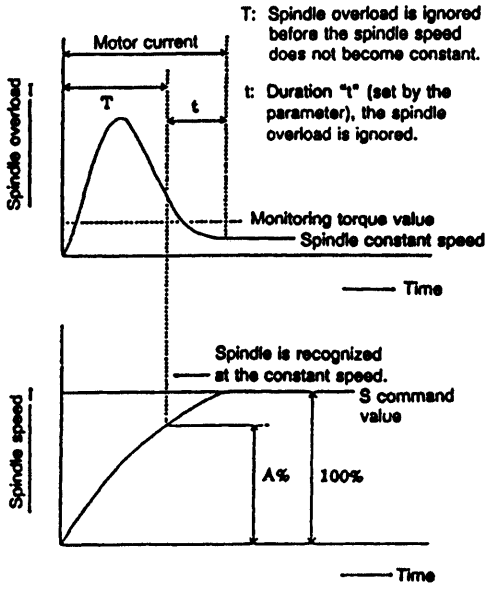
Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data, then turn it on again.

NC optional parameter (word)

<table>
<tr><th>Param-
eter
No.</th><th>Item</th><th>Contents</th><th>Factory
Set
Initial
Value</th><th>Setting
Range</th></tr>
<tr><td>*46</td><td>Designation of print data output external device name</td><td><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></td><td>0</td><td>0 to 5</td></tr>
<tr><td>48</td><td>Average number of sampling data sets for load display</td><td>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.</td><td>16</td><td>4 to 80</td></tr>
<tr><td>*49</td><td>Time constant for linear acceleration/ deceleration</td><td>This specifies the time constant for linear acceleration/deceleration for synchronized control. (N × 12.8 ms)</td><td>20</td><td>0 to 30</td></tr>
<tr><td>50</td><td>Synchronization error allowance A</td><td>If a synchronization error between the master and slave axes exceeds this value during normal machine operation conditions, an alarm occurs.</td><td>200 (μm)
(0.008 in.)</td><td>0 to 1000</td></tr>
<tr><td>51</td><td>Synchronization error allowance B</td><td>If a synchronization error between the master and slave axes exceeds this value when power is turned on, an alarm occurs.</td><td>1000 (μm)
(0.04 in.)</td><td>0 to 5000</td></tr>
<tr><td>*57</td><td>Designation of read device (no DC code control)</td><td><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></td><td>0</td><td>0 to 5</td></tr>
<tr><td>59</td><td>3-D arc projection path judgment tolerance amount</td><td>The tolerance amount used to determine whether the path obtained by projecting the 3-D arc on a plane is a line or not.</td><td>0</td><td>0 to 32767</td></tr>
</table>

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)

<table>
<tr><th>Parameter No.</th><th>Item</th><th>Contents</th><th>Factory Set Initial Value</th><th>Setting Range</th></tr>
<tr><td>61</td><td>Synchronized tapping torque monitor
Spindle speed (A)</td><td rowspan="2">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.
 
</td><td>0%</td><td>1 to 100</td></tr>
<tr><td>62</td><td>Synchronized tapping torque monitor
Waiting time (t)</td><td>0 (×0.1sec)</td><td>1 to 1000</td></tr>
</table>

NC optional parameter (word)

Parameter No.	Item	Contents	Factory Set Initial Value	Setting Range
*103	Default device name for PUNCH function	Sets the default device name for the PUNCH function. 0: TT (CN0) 1: CN1 2: CN2 3: CN3 4: CN4 5: PP 6: MD0 7: MD1 8: FD0 9: FD1 10: FD2 11: FD3	0	0 to 11
*104	Default device names for READ and VERIFY functions	Sets the default device names for the READ and VERIFY functions. 0: TR 1:TT (CN0) 2: CN1 3: CN2 4: CN3 5: CN4 6: MD0 7: MD1 8: FD0 9: FD1 10: FD2 11: FD3	0	0 to 11
105	Interactive gauging approach speed	Sets the initial (first pass) approach speed toward the workpiece at interactive gauging.	0	0 to 2000
110	Indexing offset amount	Sets the touch probe's indexing (M19) offset amount for one-direction gauging at the AUTO gauging function.	0	0 to 359
111	Puncher IF and parameter input/output	Delay period timer which sets the delay time from the point when the puncher IF and parameter input/output command ends (normal or error end), until the point when the RS switches OFF. When set to "0", RS is not switched OFF.	0	0 to 9999
112	Puncher IF and parameter input/output	Designates the amount of RS OFF time after the puncher IF and parameter input/output command ends (normal or error end). (RS switches ON when this period elapses.) Parameter Nos. 111 and 112 can be used simultaneously.	0	0 to 9999
113	Synchronous tapping return speed override	Sets the return speed override value (%) for synchronous tapping. A setting of "0" is processed as 100%.	0	1 to 200

Parameters indicated by and asterisk (*) require turning off power supply once after setting new data. Turn it back on.

Data setting procedure is as follows:

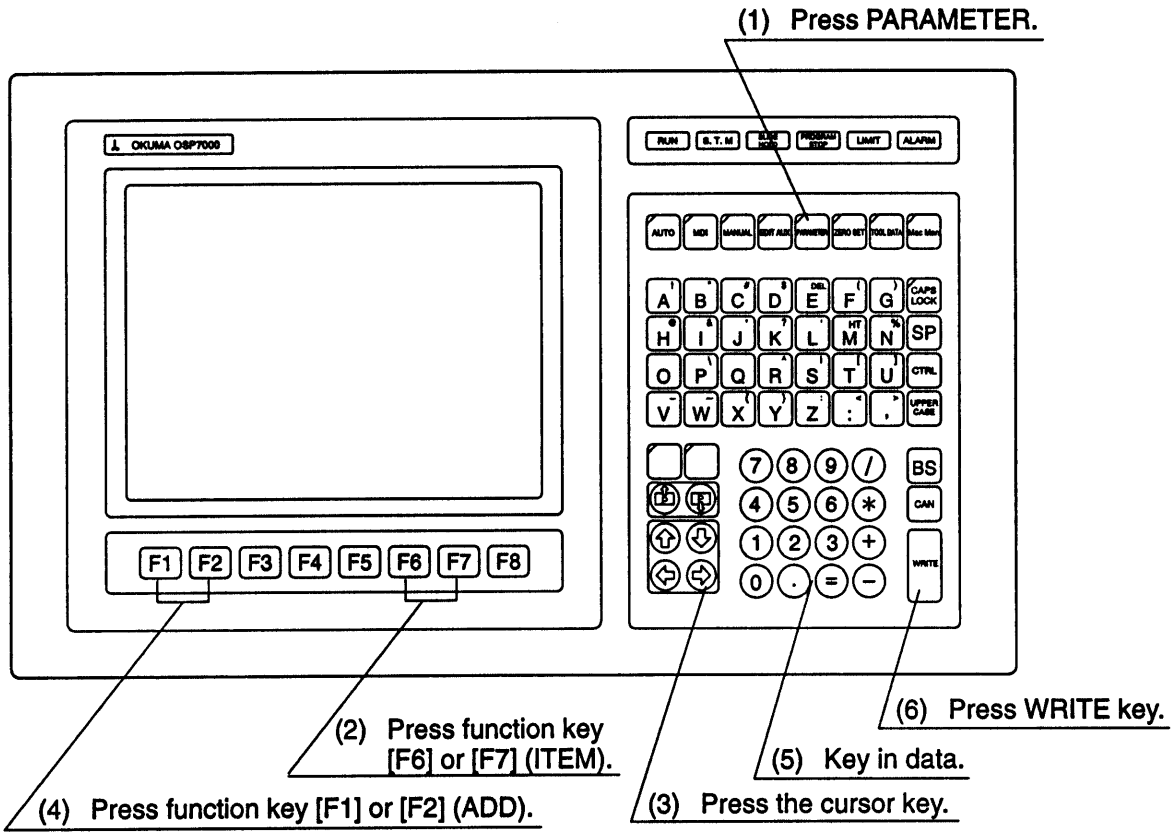
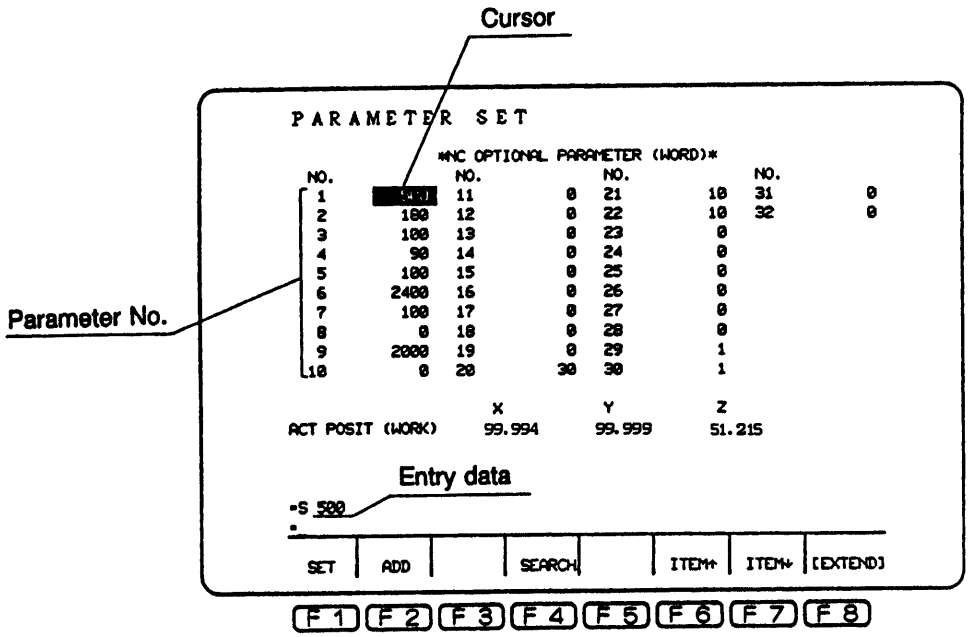


Fig. 3-4 NC Optional Parameter (Word)

(1) Press the PARAMETER key.

(2) Press 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.



Setting:

When data is previously known:

(4) Press 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 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 optional parameter (bits) the 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	Does	Does not	0
	3	There is a tape delimiting code.	ISO % EIA ER	Feed holes	0
	4	Verifies tape during reading	Does	Does not	0
	5	Rewinds tape without verifying after tape reading	Does	Does not	0
	6	Handles special code (other than $20-$5F, HT) as an alarm.	Does	Does not	1
	7	Does not store special code	Does	Does not	0

Tape Code Setting	Automatic Tape Code Recognition	Operating Conditions
1	1	In "READ" and "VERIFY", tape code is automatically recognized irrespective of ISO/EIA. In "PUNCH", ISO is used.
0	1	In "READ" and "VERIFY", tape code is automatically discriminated irrespective of ISO/EIA. In "PUNCH", EIA is used.
1	0	In "READ" and "VERIFY", ISO code is used, and wrong tape code results in an error. In "PUNCH", ISO is used.
0	0	In "READ" and "VERIFY", EIA code is used, and wrong tape code results in an error. In "PUNCH", EIA is used.

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
	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
3	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/mm	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

[Supplement]

*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 μm 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

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
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 μm 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 command	4-digit command	0
	1	Spindle speed is programmed in S2-digit when tape conversion function is off.	2-digit command	4-digit command	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

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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.

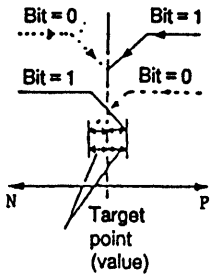
NC optional parameter (bit)

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)

<table>
<tr><th>Parameter No.</th><th>Bit No.</th><th>Contents</th><th>Set 1</th><th>Set 0</th><th>Factory Set Initial Value</th></tr>
<tr><td rowspan="8">17</td><td>0</td><td>Fixes the cycle axis for a fixed cycle, which may be any axis other than plane designation, at the Z-axis.</td><td>Does</td><td>Does not</td><td>0</td></tr>
<tr><td>1</td><td rowspan="2"><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".</td><td rowspan="2">See the table at the left.</td><td rowspan="2"></td><td>0</td></tr>
<tr><td>2</td><td>0</td></tr>
<tr><td>3</td><td>At a reset, clears the mirror images for all axes, providing normal conditions.</td><td>Does</td><td>Does not</td><td>0</td></tr>
<tr><td>4</td><td></td><td></td><td></td><td>0</td></tr>
<tr><td>5</td><td>External program selection is executed for main program or schedule program.</td><td>Schedule program</td><td>Main program</td><td>0</td></tr>
<tr><td>6</td><td>In external program selection operation, the selection of the same file name is not executed.</td><td>Does not</td><td>Does</td><td>0</td></tr>
<tr><td>7</td><td>Specifies which tapping cycle the G codes (G74, G84) call, conventional tapping cycle or synchronized</td><td>Synchronized tapping cycle</td><td>Conventional tapping cycle</td><td>0</td></tr>
<tr><td rowspan="8">18</td><td>0</td><td rowspan="8">Specifies the G code to be set automatically when the power supply is turned on.</td><td>G00</td><td>G01</td><td>1</td></tr>
<tr><td>1</td><td>G18</td><td>G17</td><td>0</td></tr>
<tr><td>2</td><td>G19</td><td>G17</td><td>0</td></tr>
<tr><td>3</td><td>G56</td><td>G53</td><td>0</td></tr>
<tr><td>4</td><td>G91</td><td>G90</td><td>0</td></tr>
<tr><td>5</td><td>G95</td><td>G94</td><td>0</td></tr>
<tr><td>6</td><td>G22</td><td>G23</td><td>0</td></tr>
<tr><td>7</td><td></td><td></td><td>0</td></tr>
</table>

NC optional parameter (bit)

Parameter No.	Bit No.	Contents		Set 1	Set 0	Factory Set Initial Value
19	0	X-axis	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.)	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

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	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.	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

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NC optional parameter (bit)

Parameter No.	Bit No.	Contents		Set 1	Set 0	Factory Set Initial Value
24	0	No. 9	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.	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	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.	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	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.	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
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	During AUTO and MDI mode cutting feed, an alarm is activated if one or more axes is at the limit.	Does	Does not	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
33	0	Graphic coordinate system is made effective when NC is reset.	Effective	Ineffective	0
	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/WRITE 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	B-axis rotation interlock status	Ineffictive	Effective	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	MCV-A chip cover interference prevention	Does	Does not	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 μm 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	NG1 tool as replacement tool (for spare tool replacement specs.)	Does not	Does	0
	6				0
	7	Communication device of MOP-TOOL (RS-232C)			0
39	0	Interruption effective command (EIN)	Ineffective	Effective	0
	1	Interruption signal	Status trigger	Edge trigger	0
	2	Execution of the interruption 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 IF channel	Slave station	Master station	0
	1	Designation of master or slave station for CN1: RS232C IF channel	Slave station	Master station	0
	2	Designation of master or slave station for CN2: RS232C IF channel	Slave station	Master station	0
	3	Designation of master or slave station for CN3: RS232C IF channel	Slave station	Master station	0
	4	Designation of master or slave station for CN4: RS232C IF channel	Slave station	Master	0
	5	No alarm activated by cutter radius compensation interference check	Does not	Does	0
	6	DC2, DC4 input/output at parameter input/output, file transmission reading, and punch	Does not	Does	0
	7	No END DC at vacant reading and DC code control or DC code control type 2, following the data end code at parameter input/output and file transmission reading (No END DC3 wait at slave station punching.)	Does not	Does	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				
	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				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	Gauging at 3 points to find the center between the opposing inner faces or outer-faces.	3 points	2 points	0
	4	External program selection ON/OFF switch.	Ineffective	Effective	0
	5	Cutter radius compensation designated according to the tool list file which is automatically selected when program is selected.	Does	Does not	0
	6	Selection of method for synchronized tapping torque monitoring			0
	7	Executes tape conversion operation.	Does	Does not	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.			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			0
	2				0
	3	Input PNO one-time at parameter input/output function punch output			0
	4	Parameter input/output function,; file name is output in punch operation.			0
	5				0
	6	For 0.0001 ckg type M-axis, the pulse handle magnification is 10 times the indicated value. ×1 → ×10, ×10 → ×100, ×50 → ×500	×10 the SW indication	SW indication applies as is	0
	7	For multiple rotating axis parameters, or No. 39, bits 3, 4 and 5.	Basic axis for rotation axis parameter	No. 39 bit 3, 4 and 5	0

NC optional parameter (bit)

Parameter No.	Bit No.	Contents	Set 1	Set 0	Factory Set Initial Value
60	0	At G11/G10 commands, the actual position (including mirror image, increment, attachment offset, and tool length offset) is calculated.	Enabled	Disabled	0
	1	At G11/G10 commands, the actual position (including mirror image and increment) is calculated.	Enabled	Disabled	0
	2	At G69/G68 commands, the actual position (including mirror image, increment, attachment offset, and tool length offset) is calculated.	Enabled	Disabled	0
	3	G-codes and M-codes will not be initialized when NC RESET is pressed during I-PACK editing. However, the cutter radius compensation codes (G40, G41, G42) will be initialized.	Not Initialized	Initialized	0
	4				0
	5				0
	6				0
	7				0
61	*0	Sensor input 1 A-contact/B-contact switching. MSB touch sensor (touch signal)	B-contact	A-contact	0
	*1	Sensor input 2 A-contact/B-contact switching. MSB touch probe (touch signal)	B-contact	A-contact	0
	*2	Sensor input 3 A-contact/B-contact switching. MSB touch probe (CD carrier maintenance signal)	B-contact	A-contact	0
	*3	Sensor input 4 A-contact/B-contact switching. User sensor 1 (touch signal)	B-contact	A-contact	0
	*4	Sensor input 5 A-contact/B-contact switching. User sensor 2 (touch signal)	B-contact	A-contact	0
	*5	Sensor input 6 A-contact/B-contact switching. User sensor (CD carrier maintenance signal)	B-contact	A-contact	0
	*6	Sensor input 7 A-contact/B-contact switching.	B-contact	A-contact	0
	*7	Sensor input 8 A-contact/B-contact switching.	B-contact	A-contact	

Parameters indicated by an asterisk (*) require turning off the power supply once after setting new data.

[Supplement] : 1. The bit 0 setting is only valid at systems with inch/metric switching specifications (Optioal).

2. When the bit 5 setting is 1, the time units will always be 0.01 secs.

Data setting procedure is as follows:

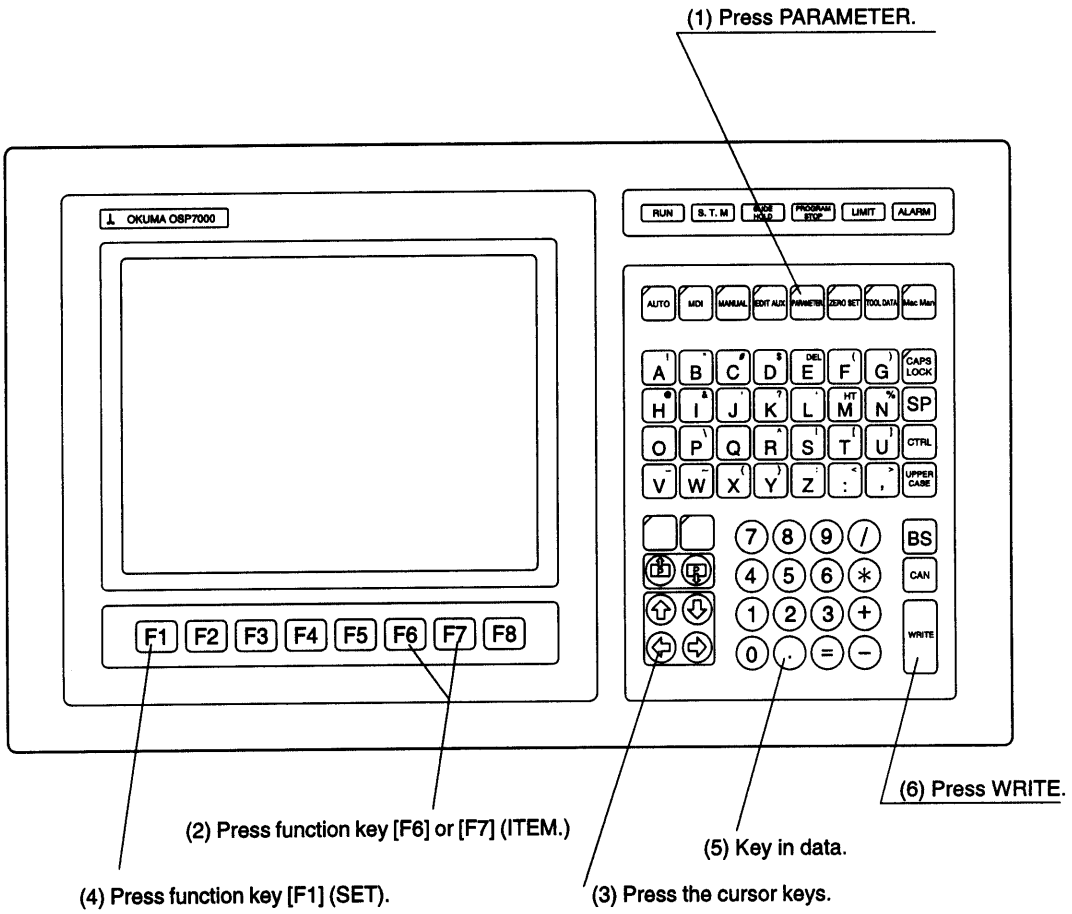
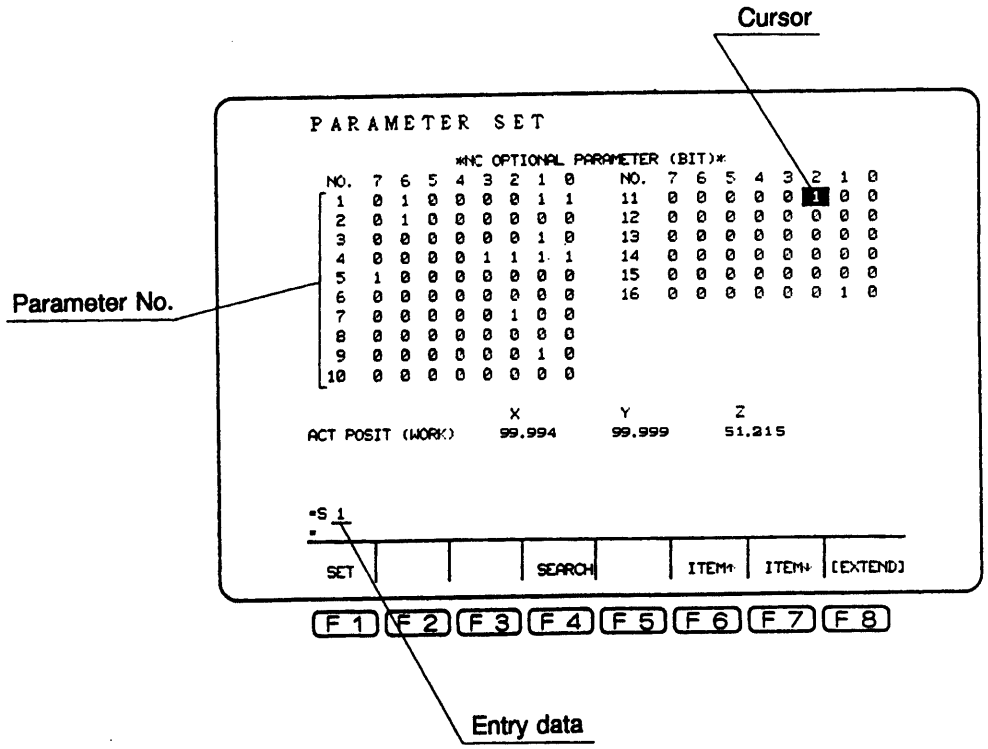


Fig. 3-5 NC Optional Parameter (Bit)

(1) Press the PARAMETER key.

(2) Press function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.

(3) Position the cursor at the desired data.



(4) Press 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.

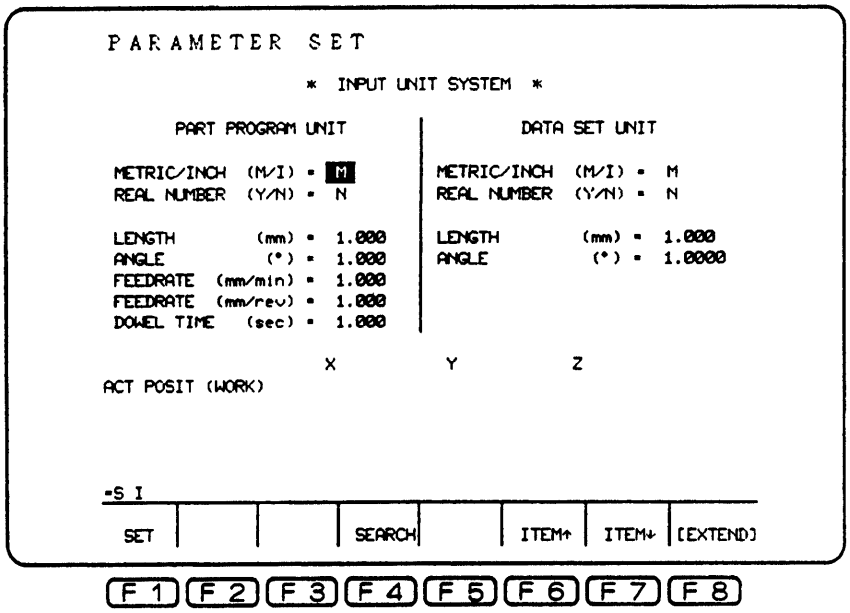


Fig. 3-6 Unit Systems for Programming

Operation parameter (bit)									Length (mm)	Angle (°)	Speed (mm/min)	Speed (mm/rev)	Time (sec)
No. 4	No. 3												
0	7	6	5	4	3	2	1	0					
0	*	*	*	*	*	*	1	0	1	1	1	1	1
0	0	*	0	0	0	0	0	0	0.001	0.001	1	0.01	0.1
0	0	*	0	0	0	1	0	0	0.01	0.001	1	0.01	0.1
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	0.001	0.001	1	0.001	0.1
0	*	*	1	0	0	0	0	0	0.001	0.001	1	0.01	0.01
0	1	*	0	0	0	0	0	0	0.001	0.001	1	0.01	0.001
1	0	*	0	0	0	0	0	0	0.001	0.0001	1	0.01	0.1

3-11. Machine axis parameter

The machine axis parameters designate the settings for data related to the machine axis. All the machine axis are listed below, though some may not be present at certain machine models.

MA axis: ATC Magazine axis 1

MB axis: ATC Magazine axis 2 (Multiple magazines)

MC axis: ATC Magazine axis 3 (Multiple magazines)

TS axis: ATC change arm rotation axis

TI axis: ATC change arm IN/OUT axis

PA axis: APC axis 1

PB axis: APC axis 2

PL axis: Multi-pallet magazine axis

AT axis: Attachment axis

AA axis: Attachment magazine axis 1

AB axis: Attachment magazine axis 2

CA axis: ATC carrier axis

CB axis: AAC (AT) carrier axis

WA axis: Crossrail (EC-W) axis

The machine axis parameters are listed below.

<Screen 1>

Display Screen 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
IN POSITION	"In-position confirmation zone" at positioning	Same as above	0.000 to 10.000	Same as above
CLAMP	"Positioning clamp confirmation zone" at positioning	Same as above	Same as above	Same as above
ZERO-POINT	Distance from encoder zero-point to control zero-point	Same as above	0.000 to 99999.999	Same as above
ENCODER OFFSET	Encoder's zero cross shift amount	Same as above	–99999.999 to 99999.999	Same as above
BACKLASH	Back lash compensation amount	Same as above	Same as above	Same as above
OVERRUN AMT	Overrun amount at single-direction positioning	Same as above	0.000 to 99999.999	Same as above

<Screen 2>

Display Screen Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
OFFSET 1 to 8	General purpose data used at each axis	Depends on machine specification	–99999.999 to 99999.999	Selected unit system

<Screen 3>

Display Screen Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
OFFSET 9 to 16	General purpose data used at each axis	Depends on machine specification	–99999.999 to 99999.999	Selected unit system

<Contents of each axis parameter>

axis	Item	Contents
MA	P TRAVEL LIMIT	Not used.
MB	N TRAVEL LIMIT	Not used.
MC	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the magazine's zero-point. Designates the APA setting when pot No. 1 is positioned at the tool change unit.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.
	OFFSET 2	Tool unloading unit offset Inorder to position the magazine at the tool unloading unit, the distance from zero-point when pot No. 1 is at the tool unloading unit must be designated.

axis	Item	Contents
TS	P TRAVEL LIMIT	Sets the P stroke limit.
	N TRAVEL LIMIT	Sets the N stroke limit.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the zero-point (tool change arm's "tool grasp" position).
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.

axis	Item	Contents
TS	OVERRUN AMT	Not used.
	OFFSET 1	Tool change arm's "tool grasp" distance Designates the distance from the tool change arm's waiting position to its "tool grasp" position.

axis	Item	Contents
TI	P TRAVEL LIMIT	Sets the P stroke limit.
	N TRAVEL LIMIT	Sets the N stroke limit.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the zero-point (vertical spindle's tool insertion position).
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.
	OFFSET 1	Horizonatal spindle's tool insertion position (MCR-B2/MCM-B) Designates the relative distance between zero-point and the horizontal spindle's tool insertion position.
		Protective pot's tool insertion position (MCV-A2) Designates the relative distance between zero-point and the protective pot's tool insertion position.
	OFFSET 2	Magazine's tool insertion position Designates the relative distance between zero-point and the magazine's tool insertion position.
	OFFSET 3	Tool extraction position Designates the relative distance between zero-point and the tool extraction position.
	OFFSET 4	Tool insertion position (15° tilt) Designates the relative distance between zero-point and the tool imsertion position.
	OFFSET 5	Tool insertion position (30° tilt) Designates the relative distance between zero-point and the tool imsertion position.
	OFFSET 6	Tool insertion position (45° tilt) Designates the relative distance between zero-point and the tool imsertion position.
	OFFSET 7	Tool insertion position (60° tilt) Designates the relative distance between zero-point and the tool imsertion position.
	OFFSET 8	Tool insertion position (75° tilt) Designates the relative distance between zero-point and the tool imsertion position.

axis	Item	Contents
PA	P TRAVEL LIMIT	Not used.
	N TRAVEL LIMIT	Not used.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the shifter's zero-point.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.
	OFFSET 1	APC axis travel enabled position Designates the APC shifter axis position where X- and B-axis travel are enabled.
	OFFSET 2	Shifter HP confirmation position Designates the shifter stop position during a shifter ADVANCE when the X-, Z-, and B- axis are not at their home positions.

axis	Item	Contents
PL	P TRAVEL LIMIT	Not used.
	N TRAVEL LIMIT	Not used.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the pallet magazine's zero-point.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.

axis	Item	Contents
CA	P TRAVEL LIMIT	Sets the P stroke limit.
	N TRAVEL LIMIT	Sets the N stroke limit.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the carrier's zero-point.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.
	OFFSET 1	Vertical spindle tool insertion position Designates the relative distance from zero-point to the vertical spindle's tool insertion position.
	OFFSET 2	Horizontal spindle tool insertion position Designates the relative distance from zero-point to the horizontal spindle's tool insertion position.
	OFFSET 3	Magazine tool insertion position Designates the relative distance from zero-point to the magazine's tool insertion position.
	OFFSET 4	Tool extraction position Designates the relative distance from zero-point to the spindle's tool extraction position.
	OFFSET 5	Attachment tool change position Designates the relative distacne from zero-point to the attachment tool change position.

axis	Item	Contents
CB	P TRAVEL LIMIT	Sets the P stroke limit.
	N TRAVEL LIMIT	Sets the N stroke limit.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the AT carrier's zero-point.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Not used.
	OFFSET 1	AT carrier wait position Designates the attachment carrier's waiting position.

axis	Item	Contents
WA	P TRAVEL LIMIT	Sets the P stroke limit.
	N TRAVEL LIMIT	Sets the N stroke limit.
	IN POSITION	Sets the in position amount.
	CLAMP	Sets the clamp width.
	ZERO-POINT	Designates the crossrail zero-point.
	ENCODER OFFSET	Sets the encoder compansation amount.
	BACKLASH	Sets the backlash amount.
	OVERRUN AMT	Sets Overrun amount at single-direction positioning.
	OFFSET 1	Designates the relative distance from zero-point to the position attained by M199/M85 positioning.
	OFFSET 2	Designates the relative distance from zero-point to the position attained by M198/M84 positioning.
	OFFSET 3	Designates the relative distance from zero-point to the position attained by M197/M83 positioning.
	OFFSET 4	Designates the relative distance from zero-point to the position attained by M196/M82 positioning.
	OFFSET 5	Designates the relative distance from zero-point to the position attained by M195/M81 positioning.
	OFFSET 6	Designates the relative distance from zero-point to the position attained by M194 positioning.
	OFFSET 7	Designates the relative distance from zero-point to the position attained by M193 positioning.
	OFFSET 8	Designates the relative distance from zero-point to the position attained by M192 positioning.
	OFFSET 9	Designates the relative distance from zero-point to the position attained by M191 positioning.
	OFFSET 10	Designates the relative distance from zero-point to the position attained by M190 positioning.
	OFFSET 11	Display zero-offset Designates the relative distance of the actual position display's "machine axis" WP zero-point from the crossrail zero-point.

Axis except above are not used.

Setting procedure is as follows:

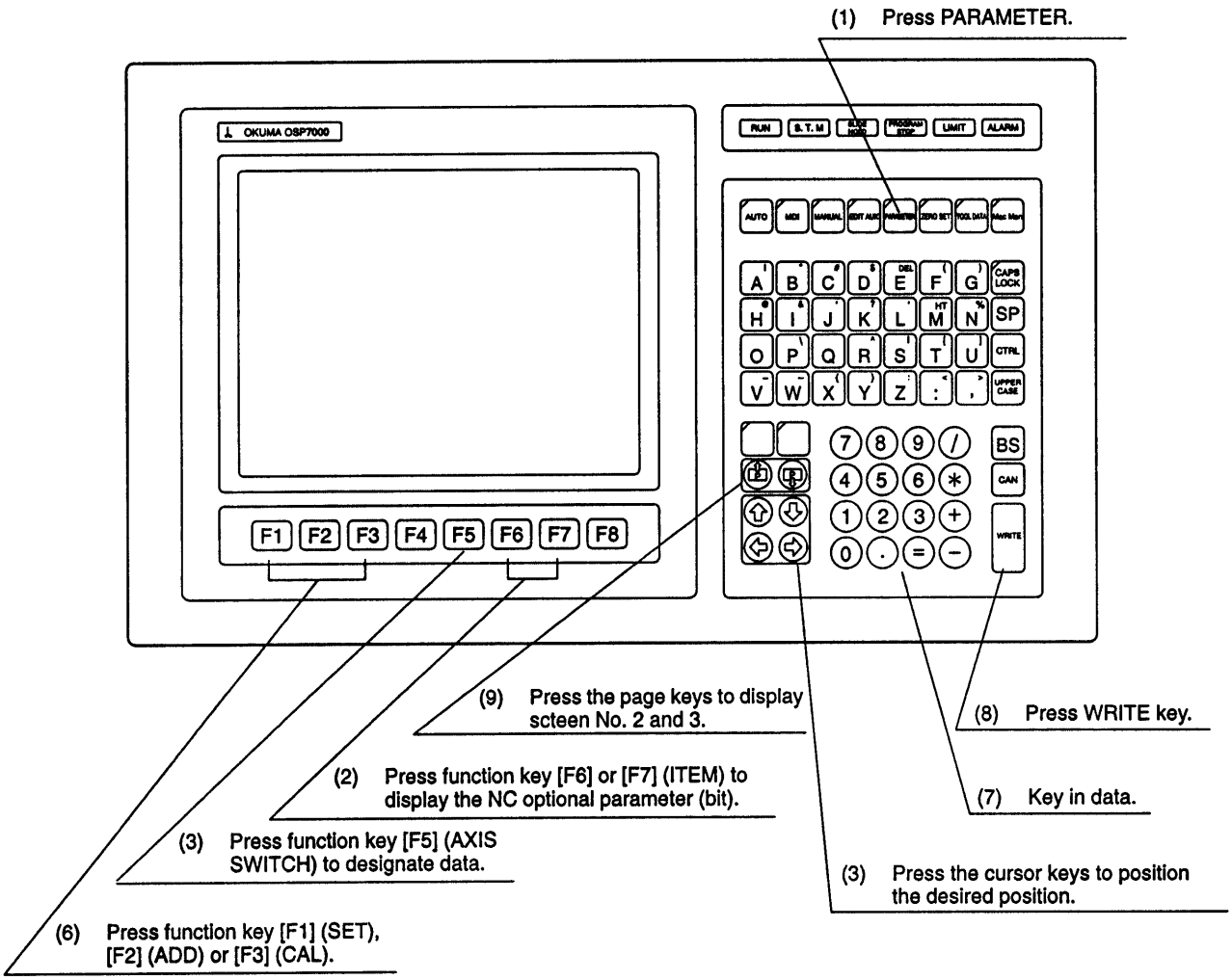
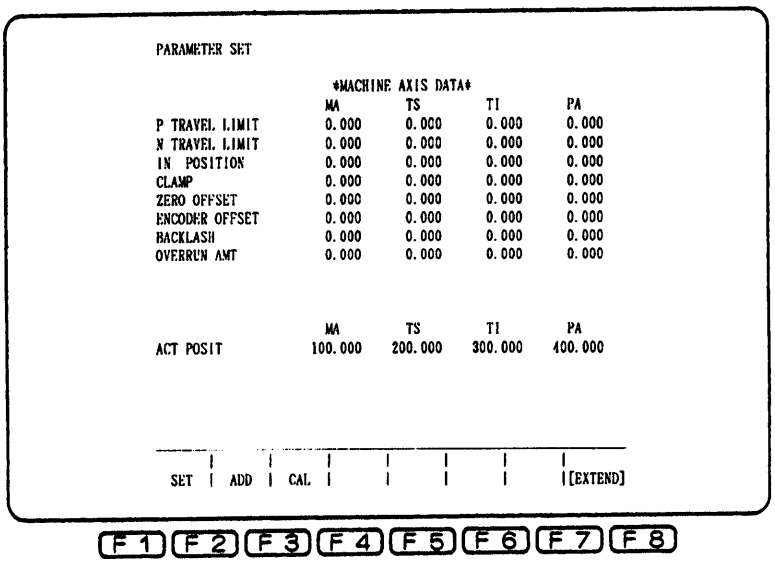


Fig. 3-7 Machine System Parameter (Word)

(1) Press the PARAMETER key.

(2) Press function key [F6] or [F7] (ITEM) until the MACHINE AXIS DATA screen appears.



(3) To designate data settings for mount axis subsequent to axis No. 5, press function key [F5] (AXIS SWITCH).

(4) Using the cursor keys, position the cursor at the desired position.

(5) Setting:

a) When data is previously known

(6) Press function key [F1] (SET).

(7) Enter the data with keyboard.

b) When data has already been set and it is necessary to set the increment decrement against the data

(6) Press function key [F2] (ADD).

(7) Enter the increment/decrement with keyboard.

c) When new setting is made at the position relative to the current value

(6) Press function key [F3] (CAL).

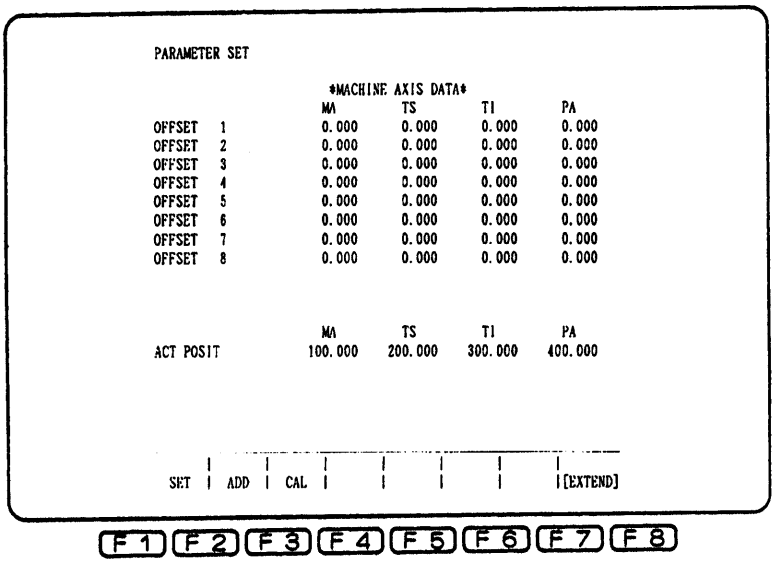
(7) Enter the relative value.

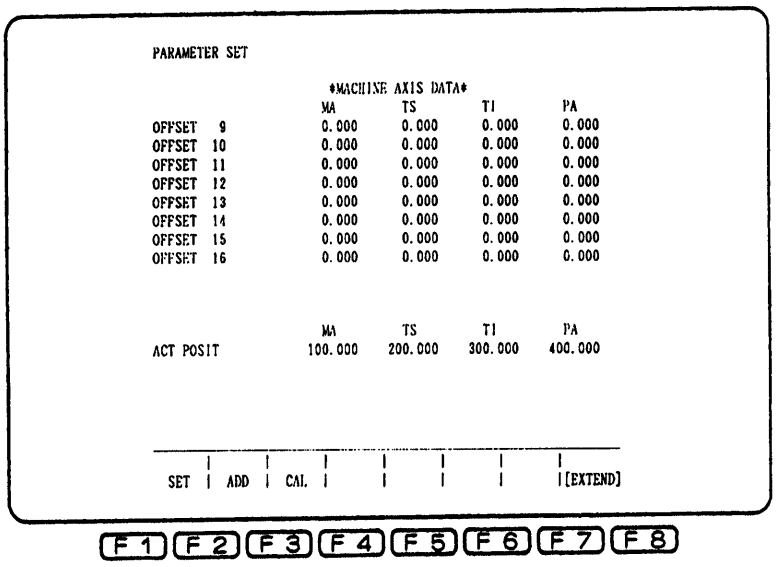
[Supplement] : This procedure cannot be used for the following setting items: in-position, clamp zone, encoder offset, backlash, and single-direction overshoot amount.

(8) Press the WRITE key.

This rewrites the data indicated by the cursor.

(9) Press the ⇩P ⇧P page keys to display screen No. 2 and 3.





3-12. Machine System Parameter (Long Word)

The machine system parameter (long word) consists of the setting items that follow.

Parameter No.	Display Screen Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
10	AT BACKLASH (P)	Backlash compensation amount for attachment indexing (in the forward direction)	SET ADD	Depends on machine specification	−999 to 999	1 part
13	SWIVEL HEAD OFFST	Output value of the absolute position encoder at the attachment's forward position	SET	Same as above	Depends on machine specification	1 part
15	AT AIR Z-P LIMIT	Z-axis position in the positive direction for air blow range of attachment joint	SET ADD CAL	Same as above	−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	9 to 999	1 part
20	AT BACKLASH (N)	Backlash compensation amount for attachment indexing (in the reverse direction)	Same as above	Same as above	−999 to +999	1 part
21	CROSS OFFSET	Crossrail follow-up offset value of the magazine		Same as above	0 to 99999999	0.001 mm (0.00004 in.)
46	AT-B IN POSITION	In position width for attachment B-axis indexing	SET ADD	Same as above	0 to 359,999	0.001 deg.
47	AT-B BACKLASH	Backlash compensation amount for attachment B-axis indexing	Same as above	Same as above	Same as above	0.001 deg.
48	SPINDLE INDEX POS	Spindle index offset (high-precision VAC)	SET ADD CAL	Same as above	0 to 359,999	0.001 deg.

Parameter No.	Display Screen Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
58	AT SPINDLE INDEX POS	Spindle index position for attachment C-axis indexing (in increment of 5°)	Same as above	Depends on machine specification	0 to 359,999	0.001 deg.
68	AT-B INDEX OFFSET	Spindle index position for attachment B-axis indexing	SET ADD CAL	Same as above	0 to 359,999	0.001 deg.
75	AT-C INDEX OFFSET	Spindle index position for attachment C-axis indexing (in increment of 1°)	Same as above	Same as above	Same as above	0.001 deg.

Setting procedure is as follows:

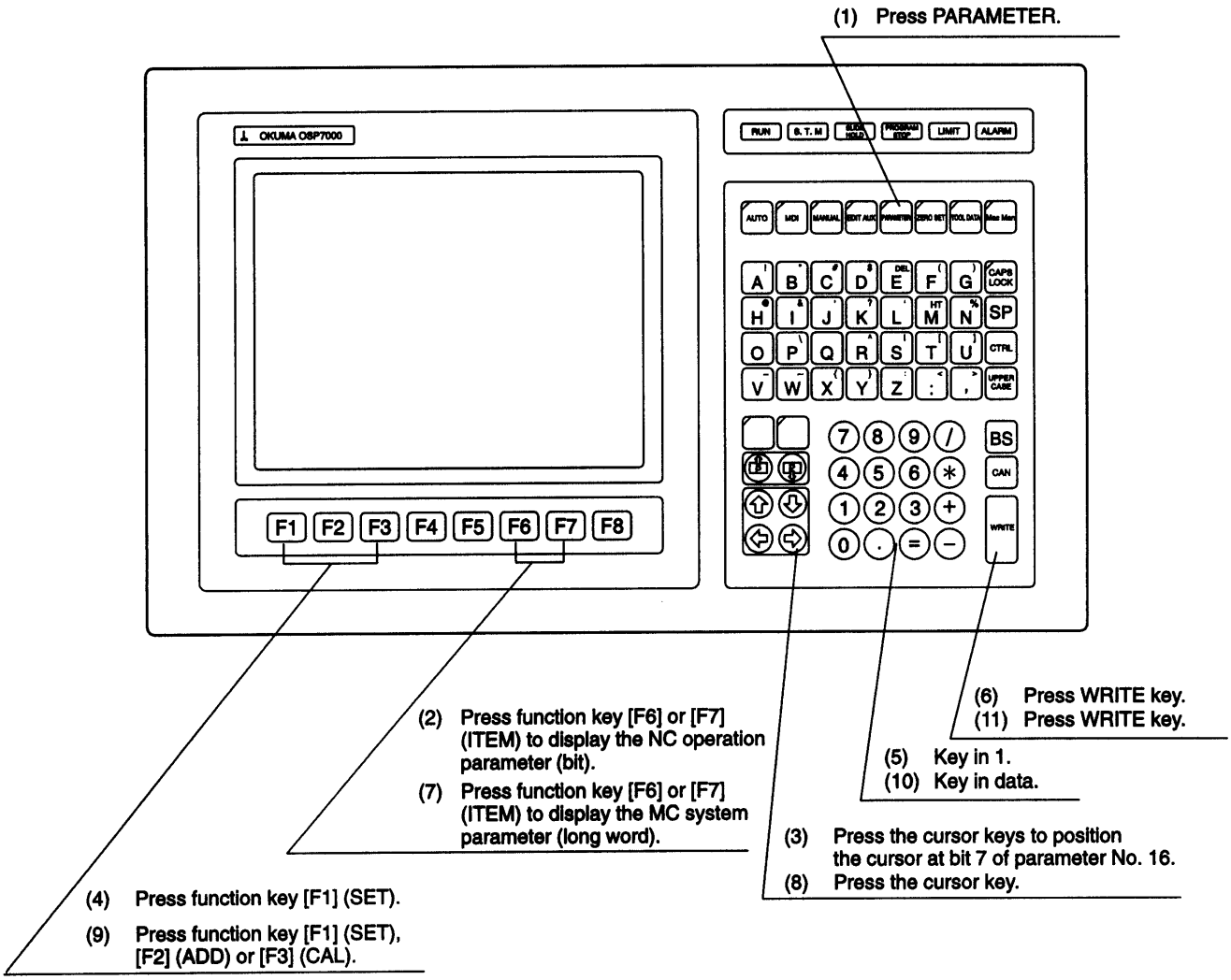


Fig. 3-8 Machine System Parameter (Long Word)

(1) Press the PARAMETER key.

(2) Press function key [F6] or [F7] (ITEM) until the NC OPTIONAL PARAMETER (BIT) screen appears.

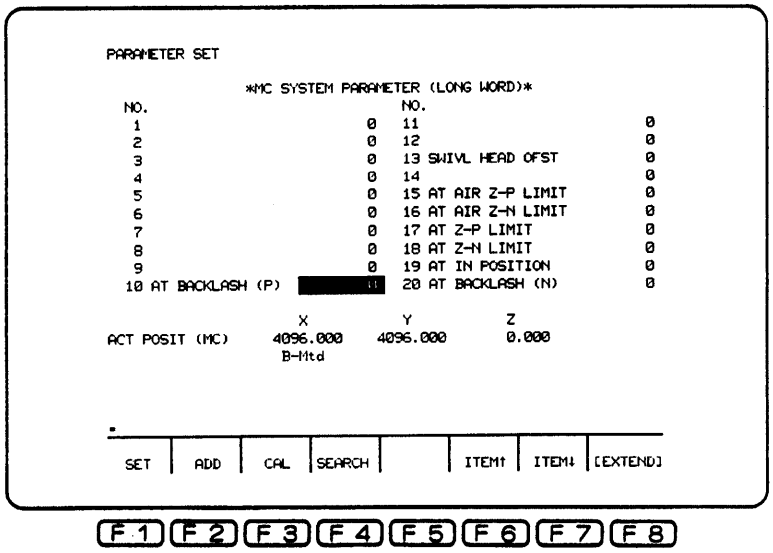
(3) Press the cursor keys to position the cursor at bit 7 of parameter No. 16.

(4) Press 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).



(6) Press 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 function key [F1] (SET).

(9) Enter the data with keyboard.

a) When data has already been set and it is necessary to set the increment against the data

(8) Press function key [F2] (ADD)

(9) Enter the increment with keyboard.

b) When new setting is made at the position relative to the current value

(8) Press function key [F3] (CAL).

(9) Enter the relative value with keyboard.

(10) Press the WRITE key.

This rewrites the data indicated by the cursor.

3-13. Machine System Parameter (Word)

The MC system parameter (word) includes the setting items that follow.

Parameter No.	Display Screen 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.	Display Screen 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	AT-B SEQ NO.	Operation sequence number for attachment B-axis indexing	Same as above	Same as above	0 to 10	
13	AT-C SEQ NO.	Operation sequence number for attachment C-axis indexing	Same as above	Same as above	0 to 10	
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)

Param-eter No.	Display Screen 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 specifica-tion.	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	—
35	ACCEL/DECEL COEFF	This parameter specifies the spindle rotation acceleration/deceleration factor.	SET ADD	Depends on machine specifica-tion.	0 to 65535	—

Machine system parameter (word)

Parameter No.	Display Screen Name	Contents	Effective Command	Factory Set Initial Value	Setting Range	Setting Unit
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						
55	AAC CROSS POS.	Crossrail position during AAC operation	SET	Same as above	0 to 200	
56	AT-B 1° INDEX IN-P	In position width for attachment B-axis indexing (in increment of 1°)	SET ADD	Same as above	0 to 1000	1 part
57	AT-C 1° INDEX IN-P	In position width for attachment C-axis indexing (in increment of 1°)	Same as above	Same as above	Same as above	Same as above

Setting procedure is as follows:

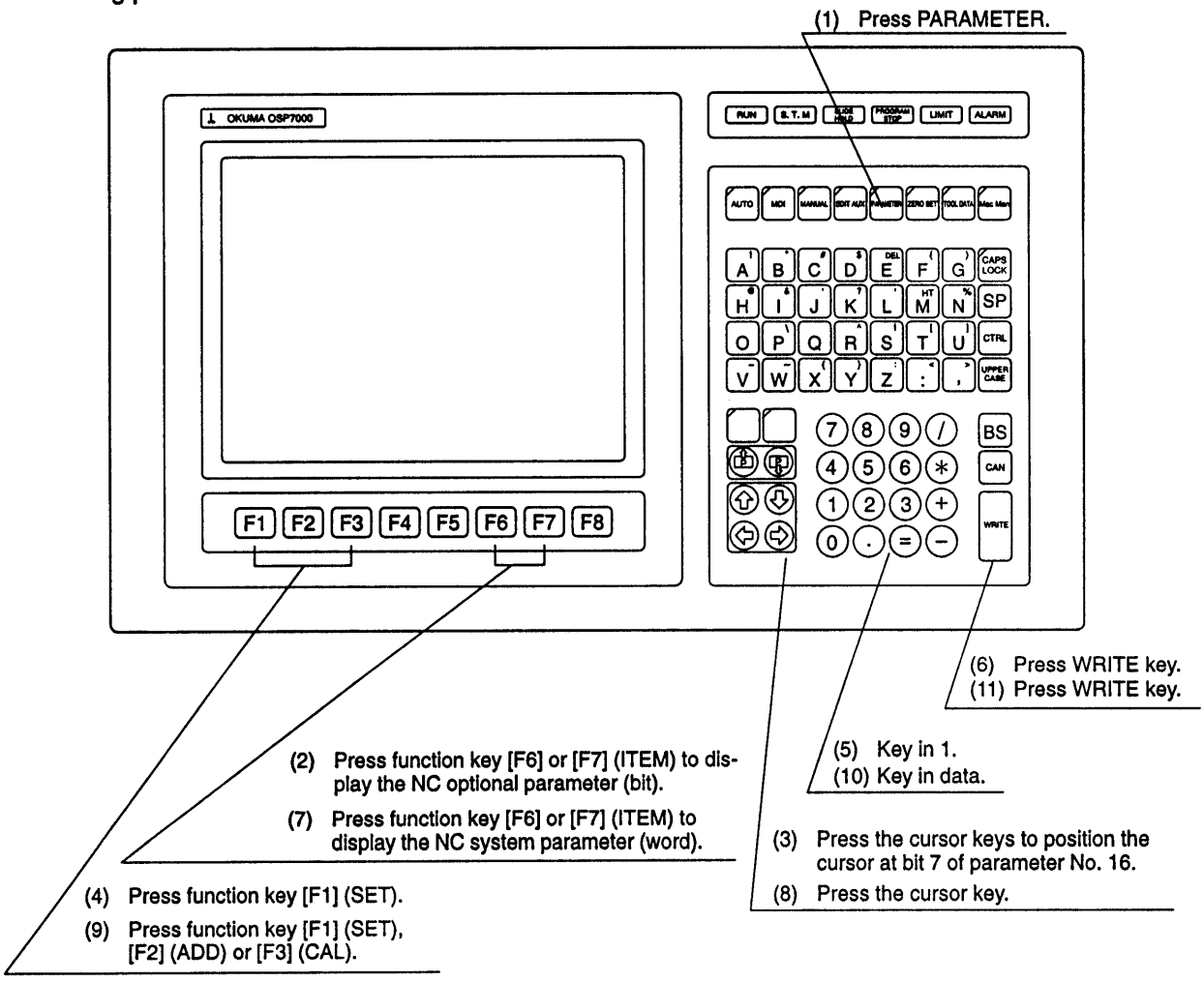


Fig. 3-9 System Parameter

(1) Press the PARAMETER key.

(2) Press 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 function key [F1] (SET) and key in 1 with keyboard.

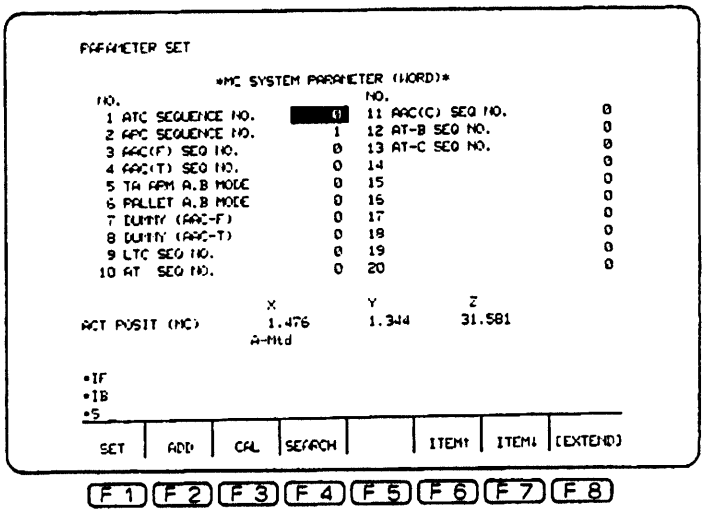
(5) Press the WRITE key.

Parameter No. 17 and following data are displayed on the display screen. This enables the setting of the NC system parameter (word).

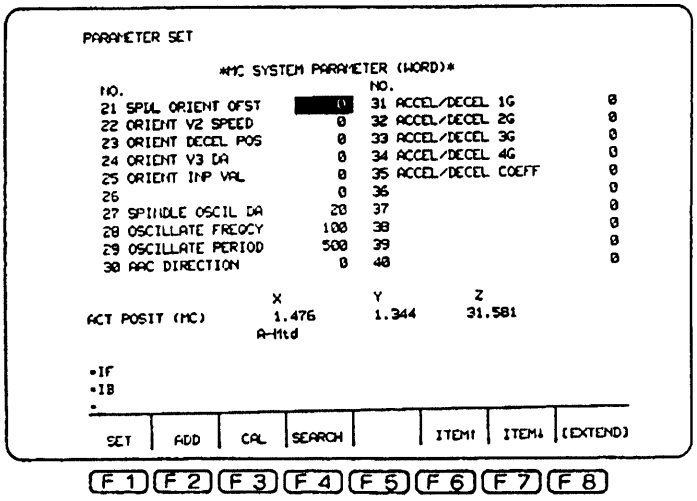
(6) Press function key [F6] or [F7] (ITEM) until the NC SYSTEM PARAMETER (WORD) appears.

(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:



Page 2 looks like:



(8) Position the cursor at the desired position.

Setting:

a) When data is previously known

(9) Press 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 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 function key [F3] (CAL).

(10) Enter the relative value with keyboard

(11) Press the WRITE key.

This rewrites the data indicated by the cursor.

3-14. System Parameter

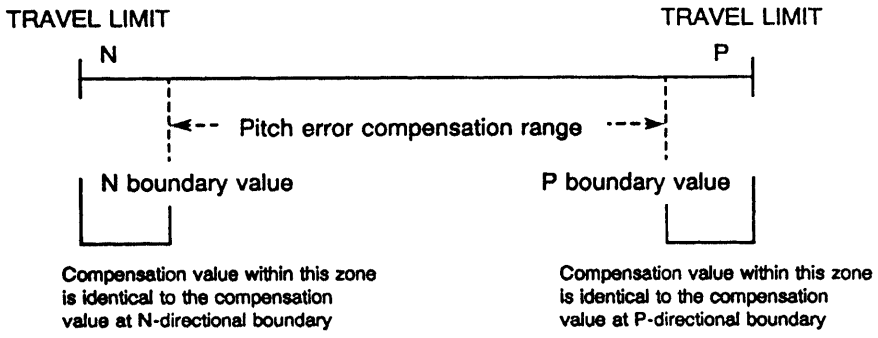
On the ∗SYSTEM PARAMETER∗ display screen, page 1 includes the following items are displayed:

The display screen is not provided depending on the machine model.

<Screen 1>

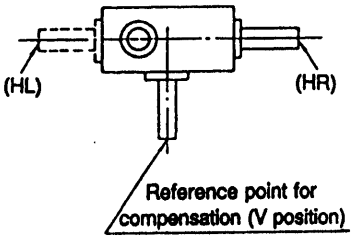
Display Screen Name	Contents	Factory Set Initial Value mm (in.)	Setting Range	Setting Unit
P TRAVEL LIMIT	P-directional travel end limit in the machine coordinate system	Depends on machine specification	−99999999 to +99999999	Selected unit system
N TRAVEL LIMIT	N-directional travel end limit in the machine 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

CAUTION : If P andlor 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>

Display Screen 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.	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>

Display Screen 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 axis 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
ALIGNMENT CORRECTION AMOUNT	This parameter designates the amount of misalignment between the rotational center line of the rotating axis and the mechanical zero point of the linear axis.	0	Same as above	Same as above
ENCODER OFFSET*	This parameter offsets the zero-cross point of the position encoder.	0	Same as above	Same as above
*P-STROKE LIMIT 2	This is the No.2 P-direction stroke limit at the machine coordinate system (varies according to machine specs. See the operation manual for the machine in question.)		Same as above	Same as above
N-STROKE LIMIT 2	This is the No.2 N-direction stroke limit at the machine coordinate system (varies according to machine specs. See the operation manual for the machine in question.)		Same as above	Same as above

<Screen 4>

Display Screen 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>

Display Screen 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>

Display Screen 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>

Display Screen 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∗

Display Screen 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

CAUTION : 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.

Example: HOME POSITION 1

X	Y	Z
1	0	3

Z-axis does not move.

<Screen 9> ∗HOME POSITION MOVEMENT ORDER∗

Display Screen 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∗

Display Screen 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∗

Display Screen 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∗

Display Screen 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 introducsyn and type E position sensor, and it is not effective for models not equipped with introducsyn scale.	Depends on machine and axis	–81920 to 49152	—
P-INDUCTO-SYN RANGE	Designates the inductosyn's effective P-direction range at the machine coordinate system.	0	–99999999 to 99999999	Selected unit system
N-INDUCTO-SYN RANGE	Designates the inductosyn's effective N-direction range at the machine coordinate system.	0		

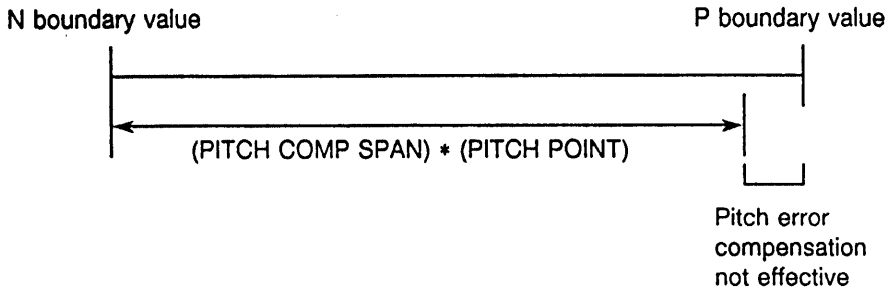
<Screen 13> *HOME POSITION MOVEMENT ORDER*

Display Screen 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	0 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.

[Supplement] : 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 caluculated 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-direction boundary) − (N-direction boundary) ≦ (Pitch comp span) * (Pitch point)*



<Screen 2>

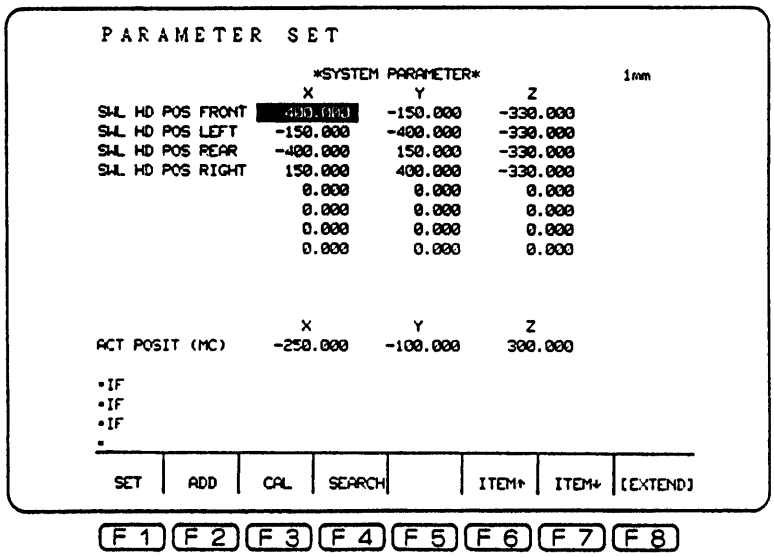


Fig. 3-10 System Parameter Display Screen 2

<Screen 3>

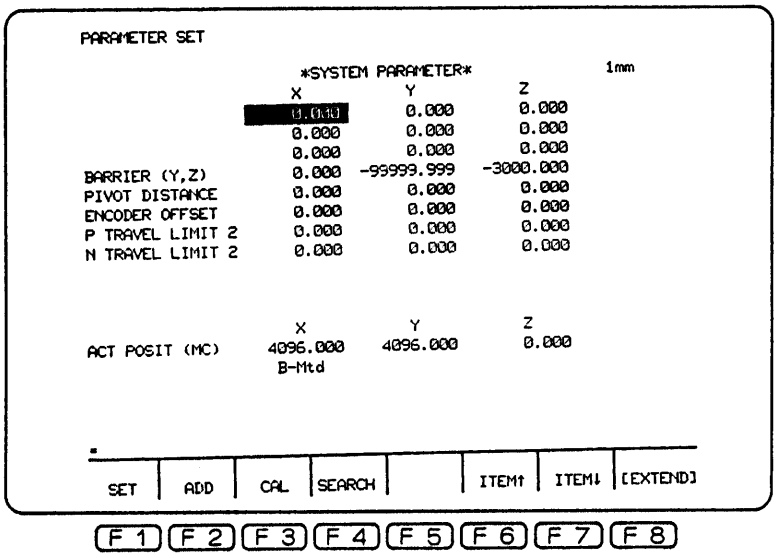


Fig. 3-11 System Parameter Display Screen 3

<Screen 4>

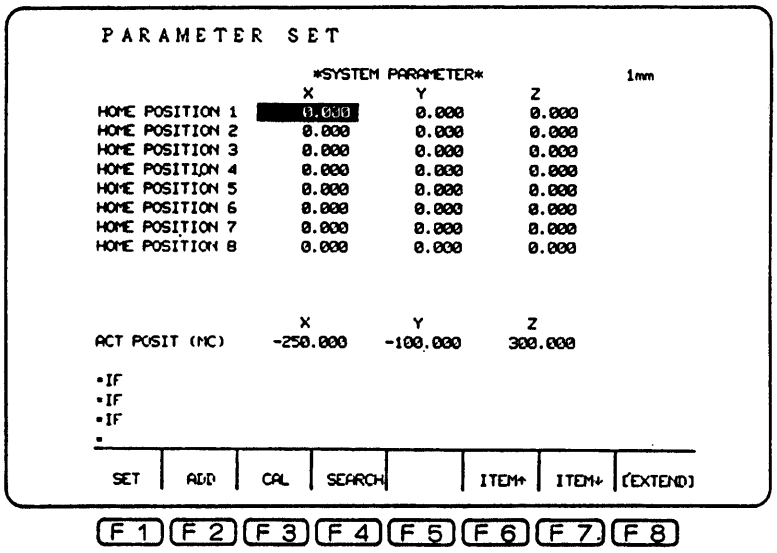


Fig. 3-12 System Parameter Display Screen 4

<Screen 5>

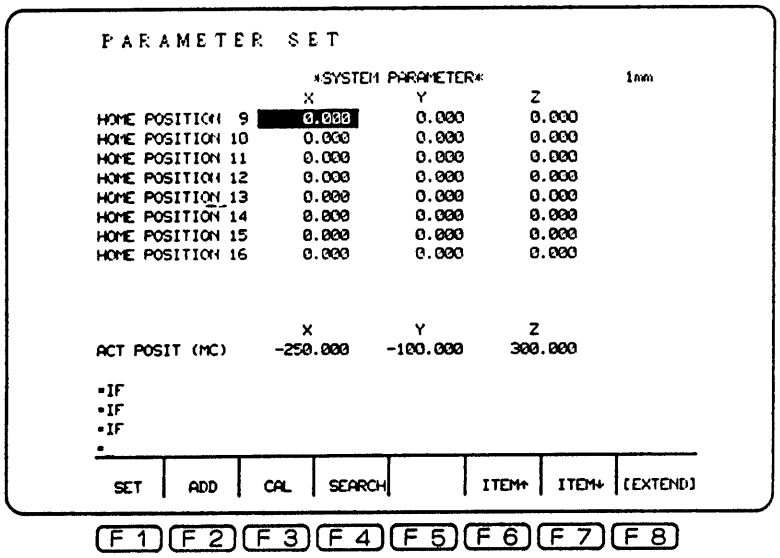


Fig. 3-13 System Parameter Display Screen 5

<Screen 6>

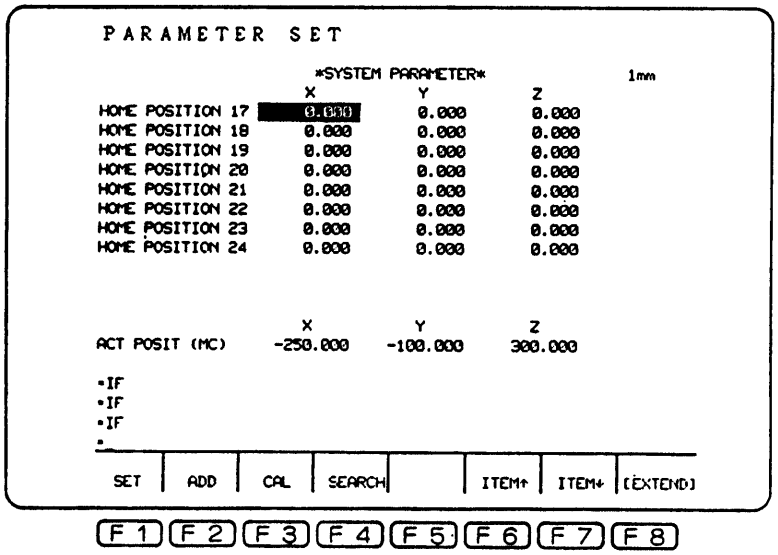


Fig. 3-14 System Parameter Display Screen 6

<Screen 7>

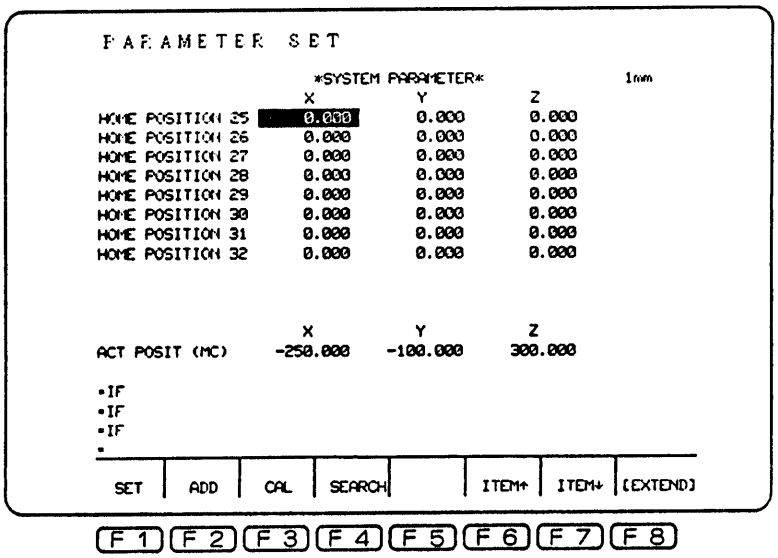


Fig. 3-15 System Parameter Display Screen 7

<Screen 8>

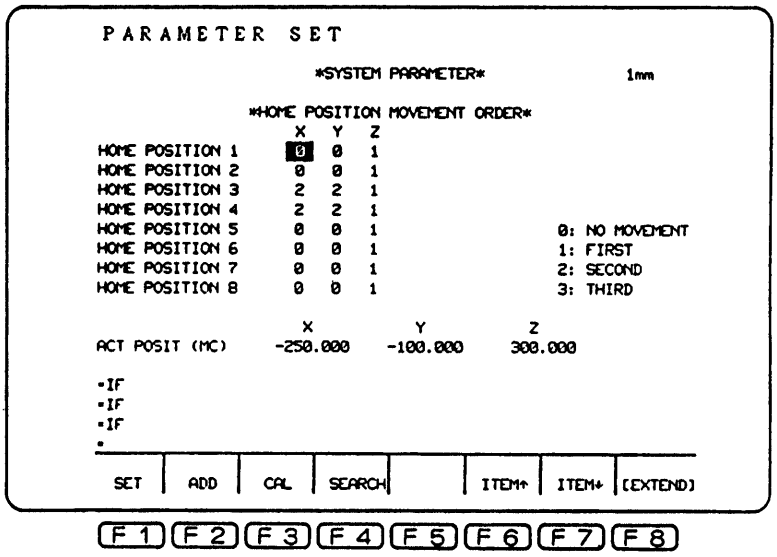


Fig. 3-16 System Parameter Display Screen 8

<Screen 9>

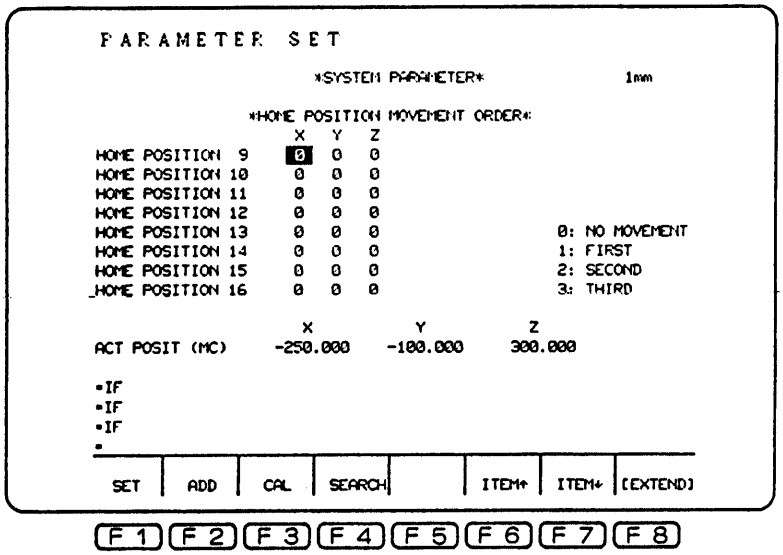


Fig. 3-17 System Parameter Display Screen 9

<Screen 10>

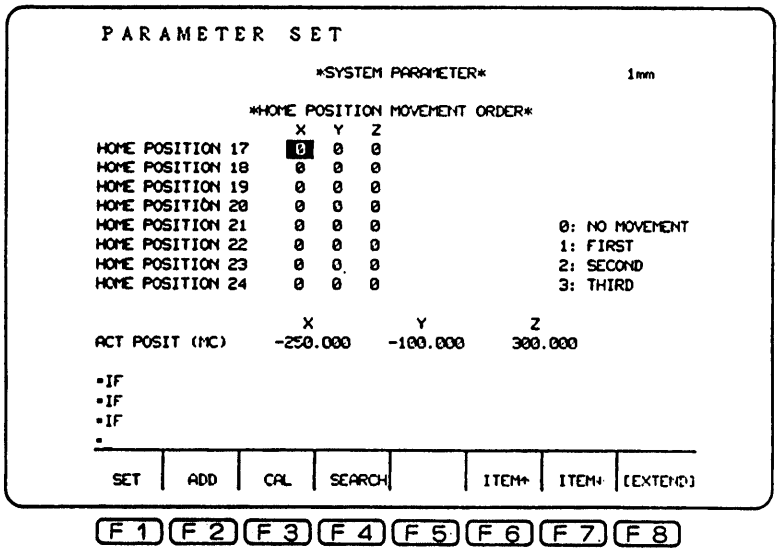


Fig. 3-18 System Parameter Display Screen 10

<Screen 11>

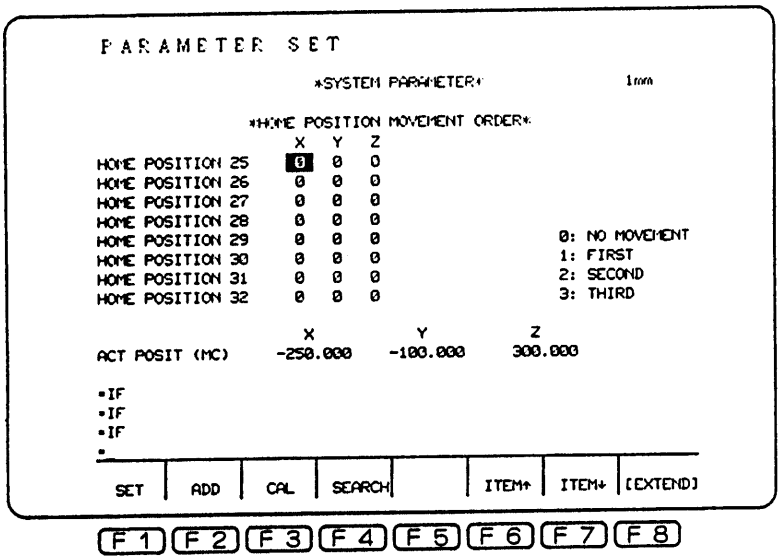


Fig. 3-19 System Parameter Display Screen 11

<Screen 12>

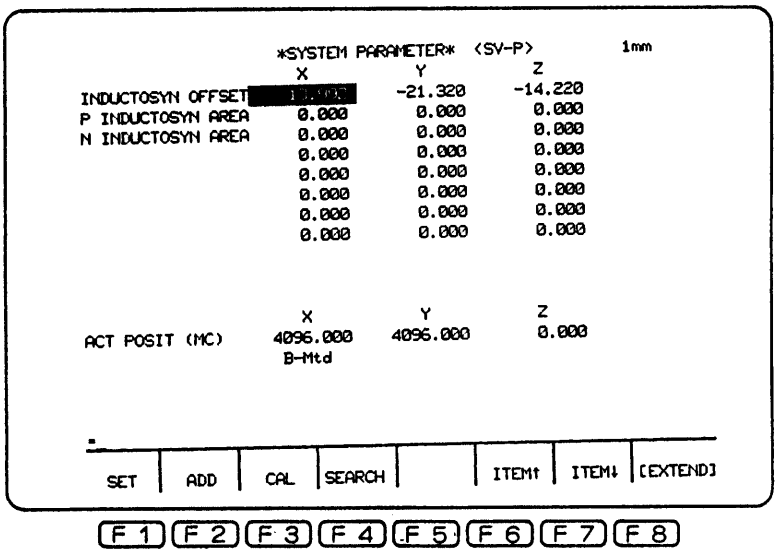


Fig. 3-20 System Parameter Display Screen 12

<Screen 13>

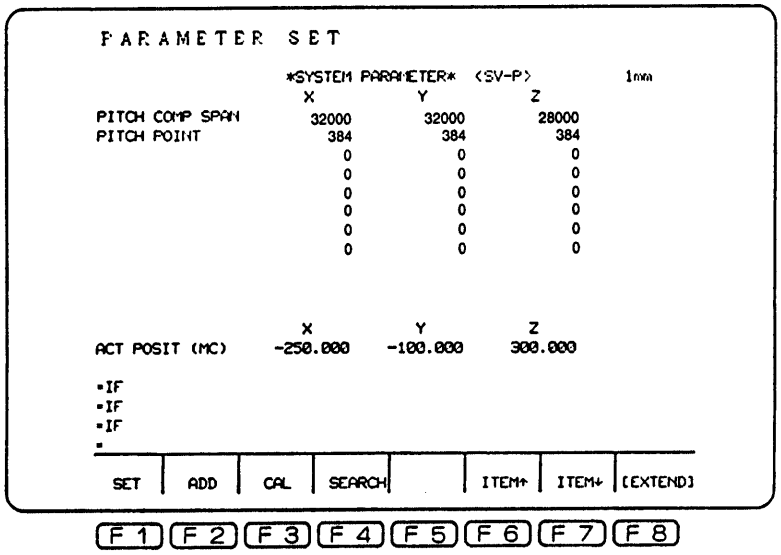


Fig. 3-21 System Parameter Display Screen 13

3-15. 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 pm.

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:

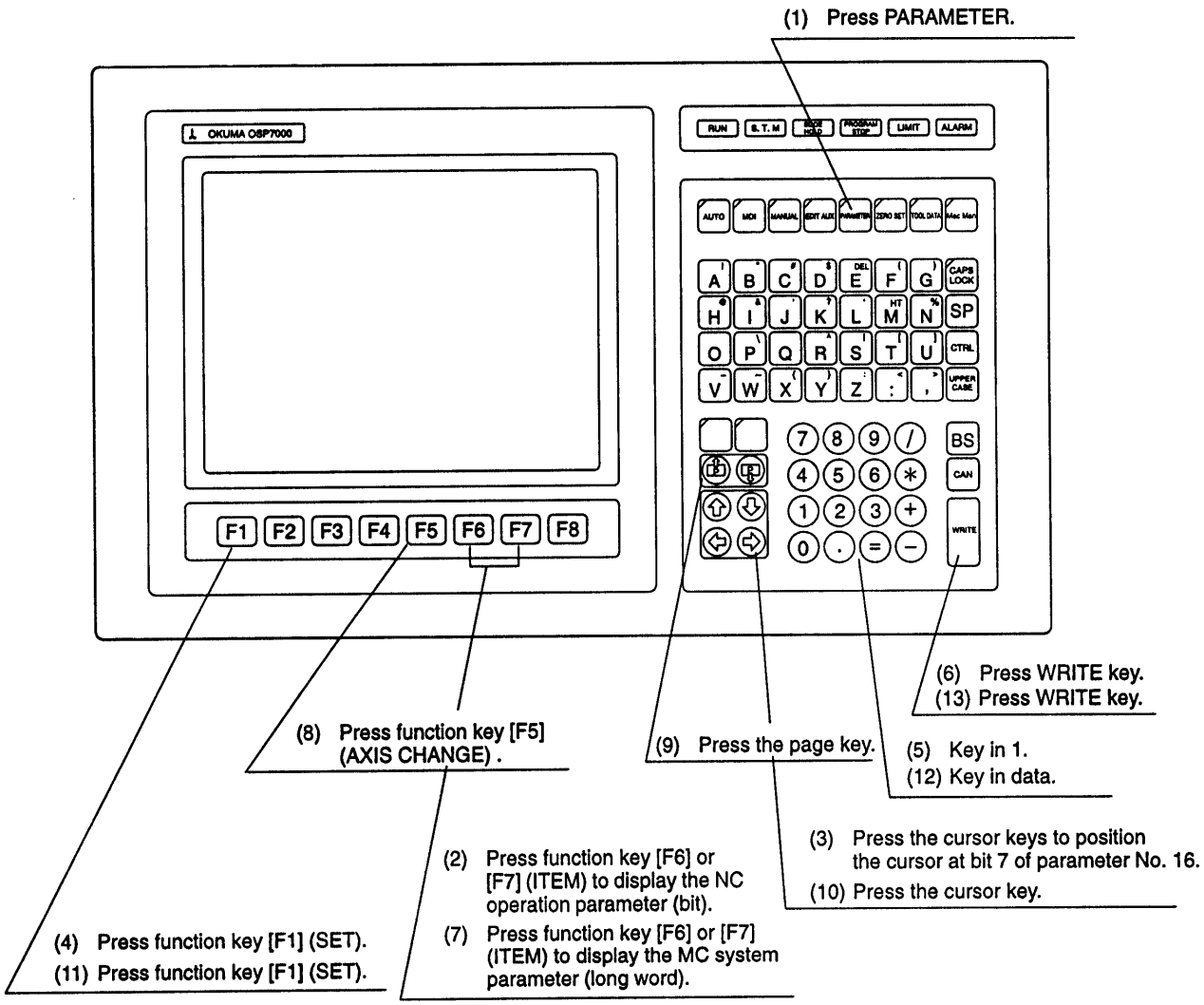


Fig. 3-22 System Parameter

(1) Press the PARAMETER key.

(2) Press 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 function key [F1] (SET).

(5) Enter 1 on the keyboard.

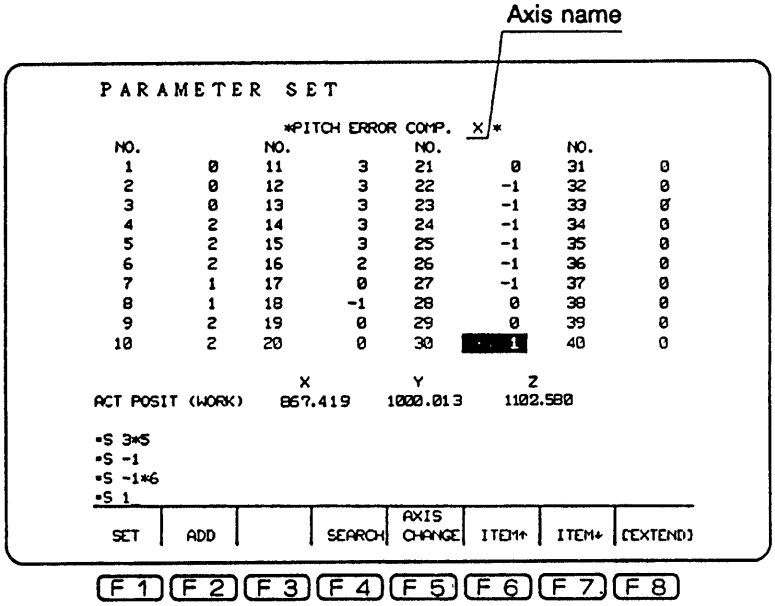
(6) Press the WRITE key.

This enables the setting of the pitch error compensation.

(7) Press function key [F6] or [F7] (ITEM) until the screw pitch offset appears.

(8) Since one screen displays only one axis data, press 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.



(10) Position the cursor at the desired position.

(11) Press 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 μm" 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

1. NC OPERATION PANEL

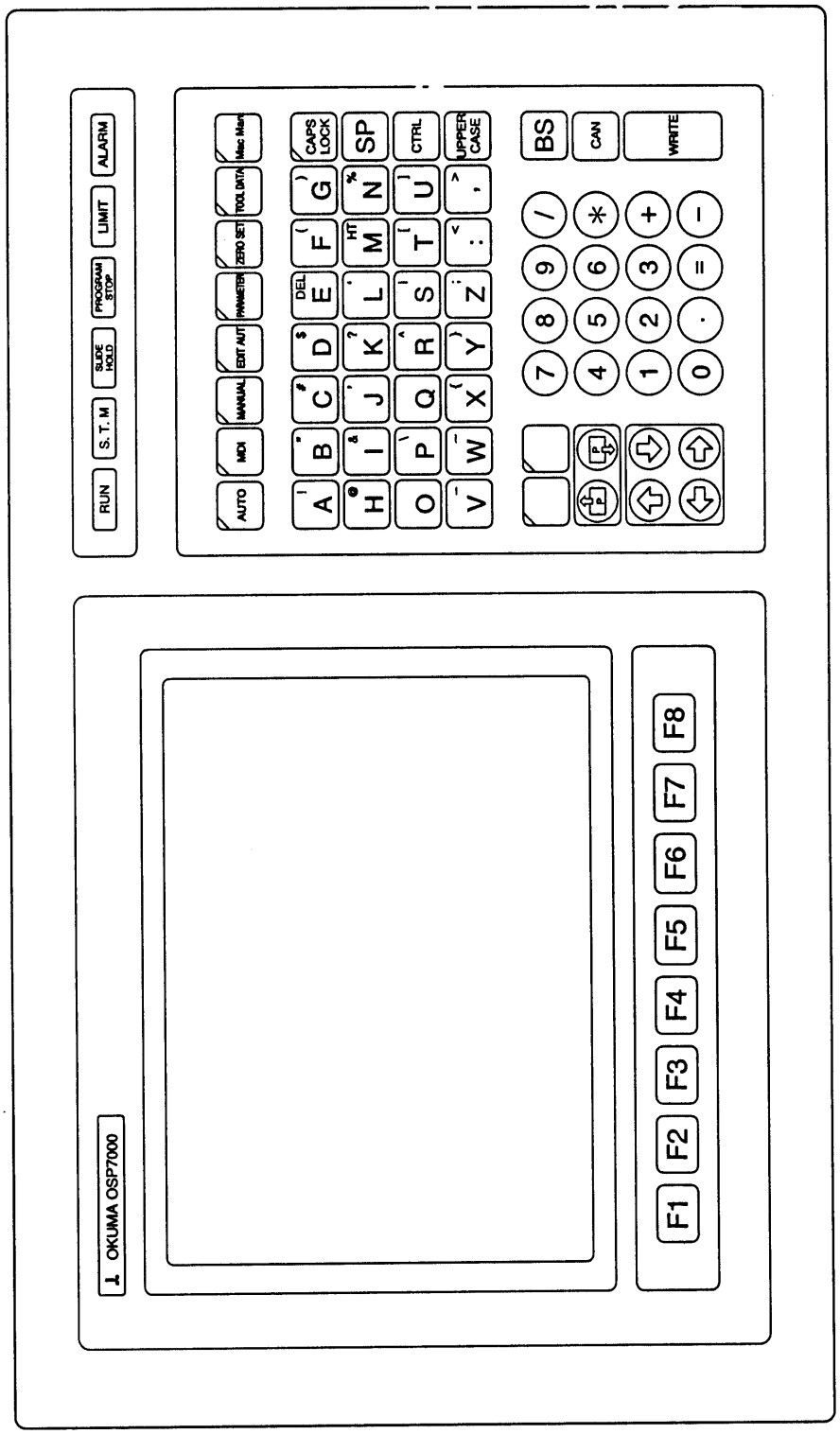


Fig. 4-1 NC Operation Panel

2. MACHINE OPERATION PANEL

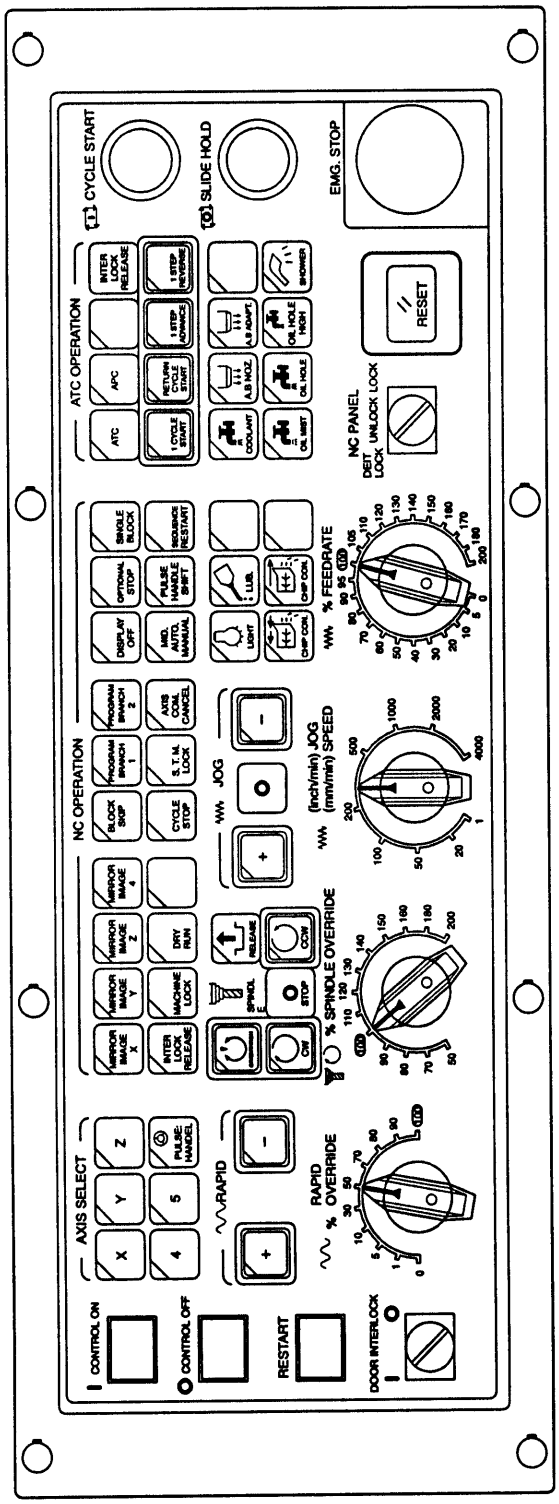


Fig. 4-2 Machine Operation Panel

3. PULSE HANDLE

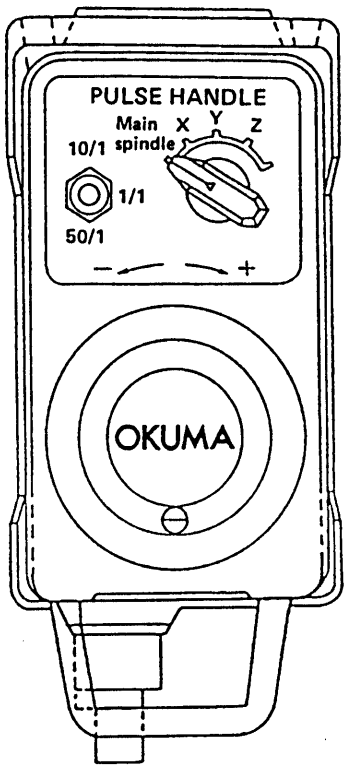


Fig. 4-5 Pulse Handle

4. OPTION PANEL

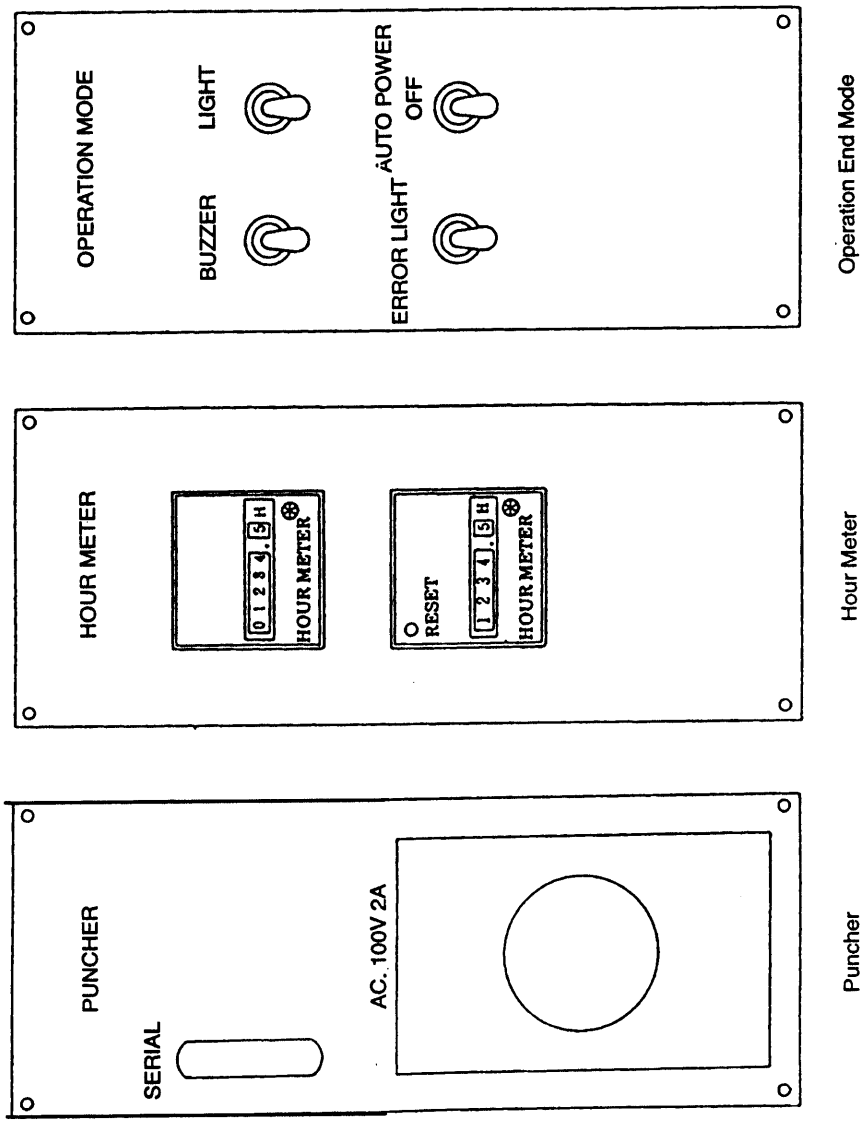


Fig. 4-6 Option Panel

5. MANUAL TOOL CHANGE OPERATION PANEL FOR OSP7000M

5-1. Manual Tool Change Operation Panel (MC-40VA/50VA/60VA)

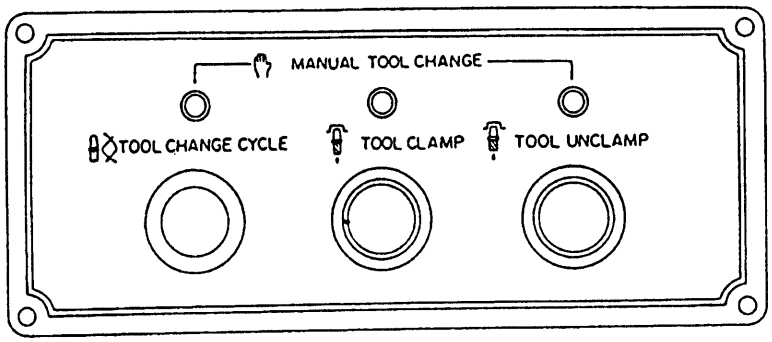


Fig. 4-7 Manual Tool Change Operation Panel (MC-30VA/40VA/50VA/60VA)

5-2. Manual Tool Change Operation Panel (MC-400H/500H/600H/800H)

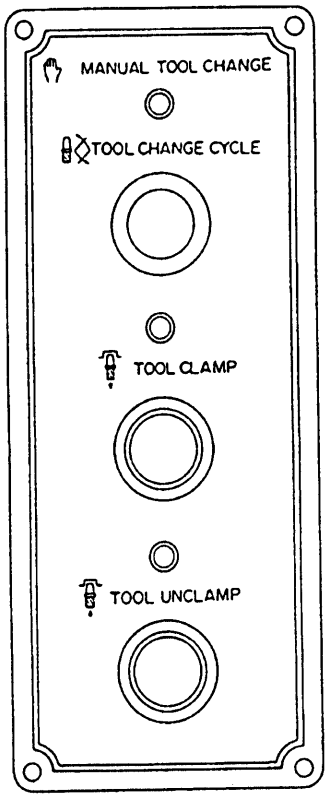


Fig. 4-8 Manual Tool Change Operation Panel (MC-400H/500H/600H/800H)

5-3. Manual Tool Change Operation Panel (MDB-A/B, MCV-A/B)

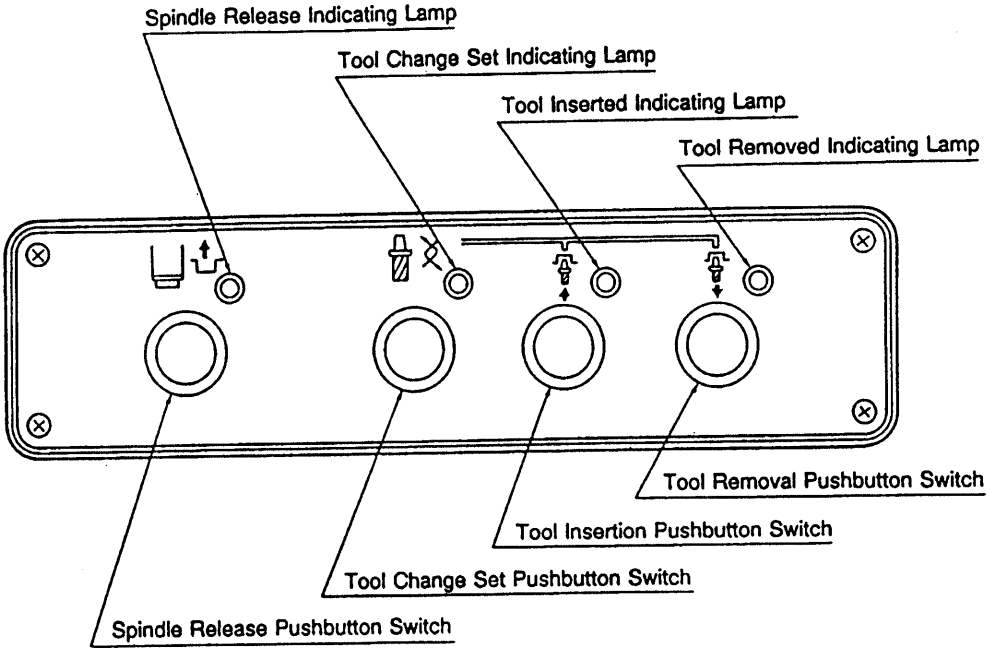


Fig. 4-9 Manual Tool Change Operation Panel (MDB-A/B, MCV-A/B)

5-4. Manual Tool Change Operation Panel (MDB-A/B, MCV-A/B)

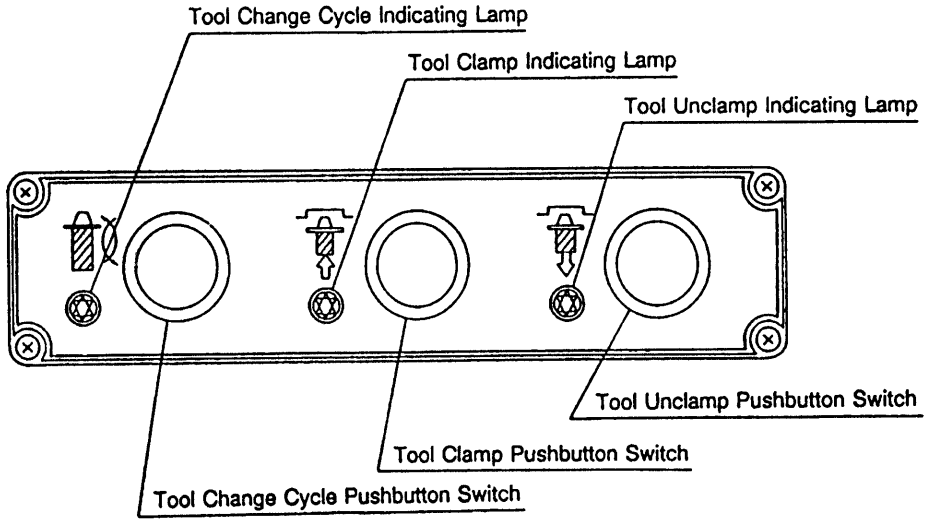


Fig. 4-10 Manual Tool Change Operation Panel (MDB-A/B, MCV-A/B)

6. MAGAZINE MANUAL OPERATION PANEL

6-1. Magazine Manual Operation Panel

(MC-30VA/40VA/50VA/60VA)

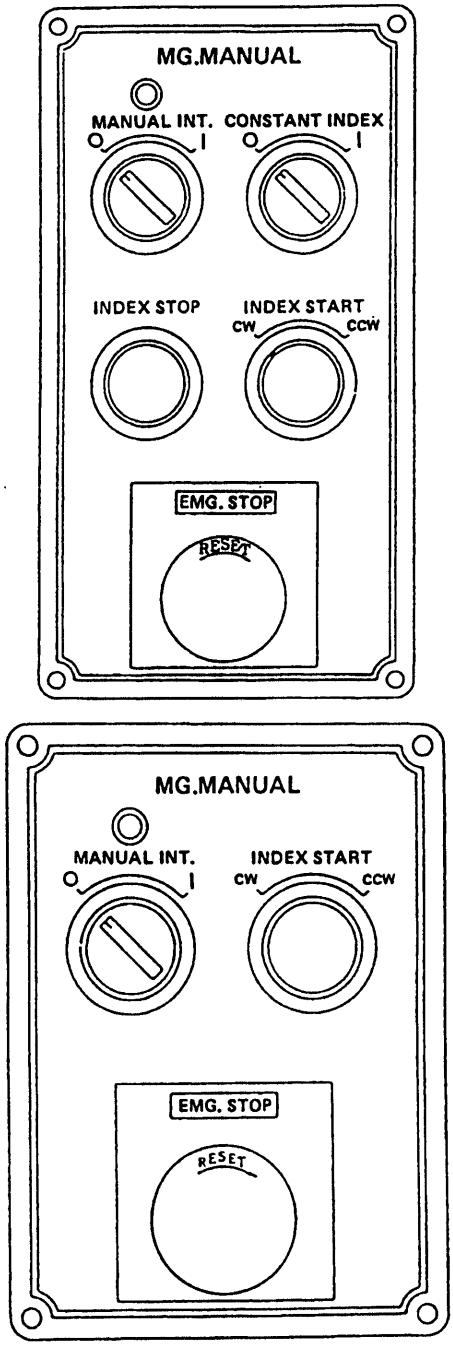


Fig. 4-11 Magazine Manual Operation Panel

6-2. Magazine Manual Operation Panel

(MC-400H/500H/600H/800H)

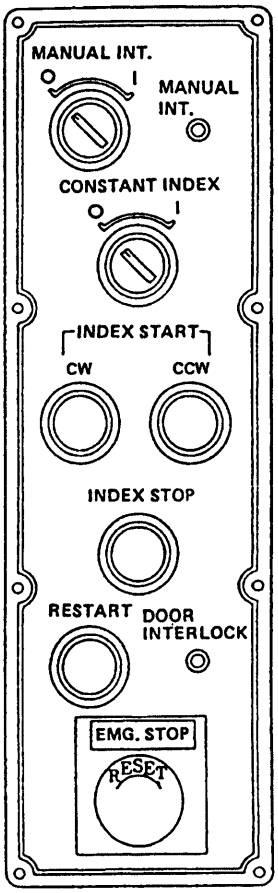


Fig. 4-12. Magazine Manual Operation Panel

6-3. Magazine Manual Operation Panel (Double Column)

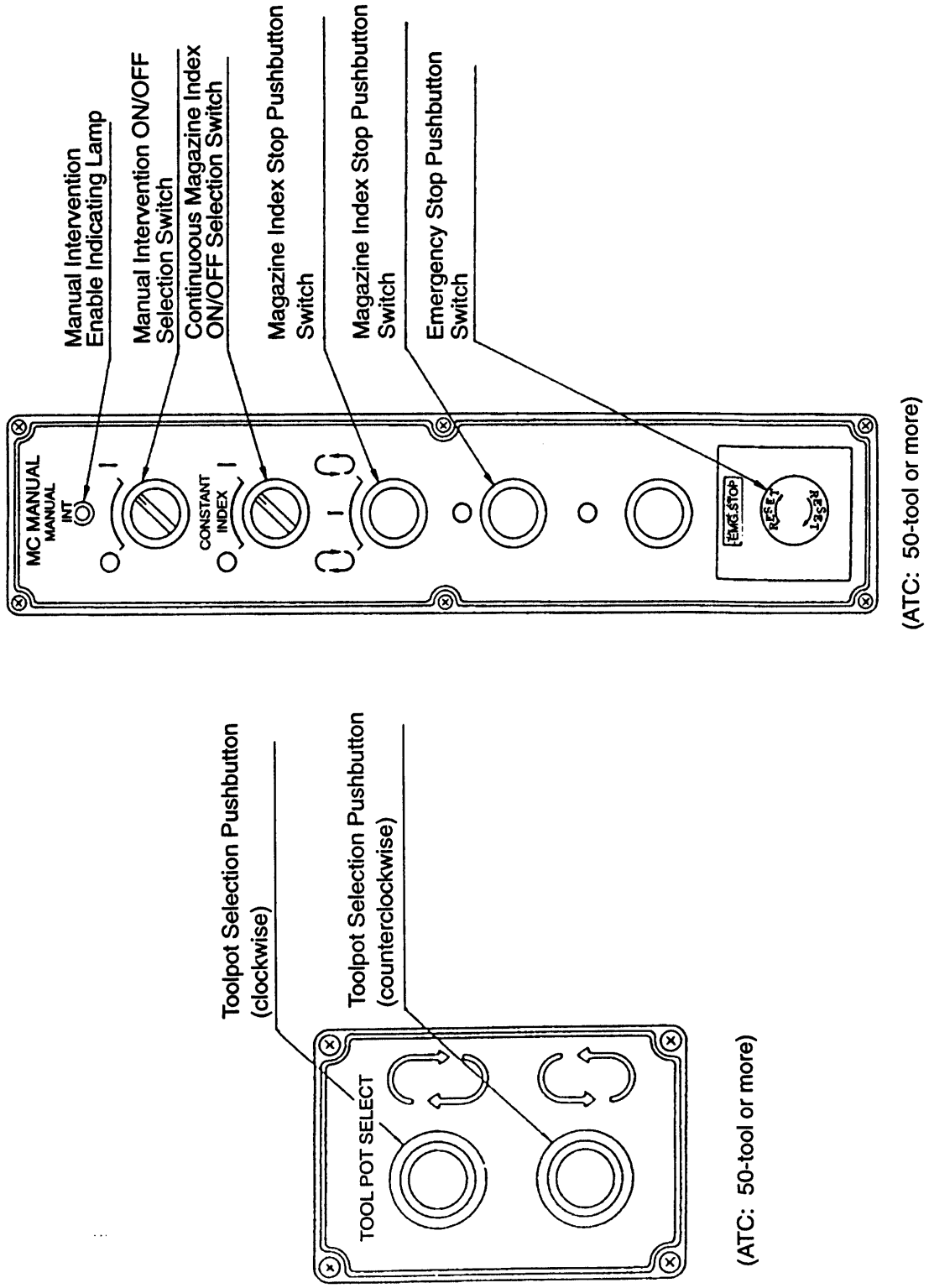


Fig. 4-13 Machine Manual Operation Panel (Double Column)

7. PARALLEL TYPE 2-PALLET APC OPERATION PANEL

7-1. Parallel Type 2-Pallet APC Operation Panel (MC-40VA/50VA/60VA)

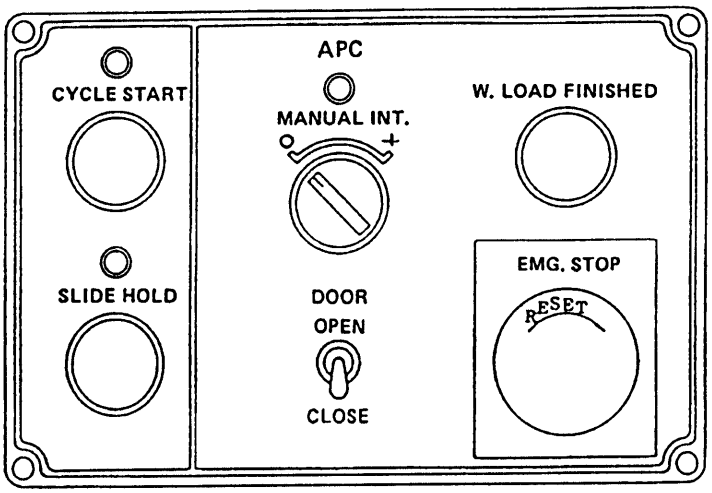


Fig. 4-14 Parallel Type 2-Pallet APC Operation Panel (MC-40VA/50VA/60VA)

7-2. Parallel Type 2-Pallet APC Operation Panel (MC-500H/600H/800H)

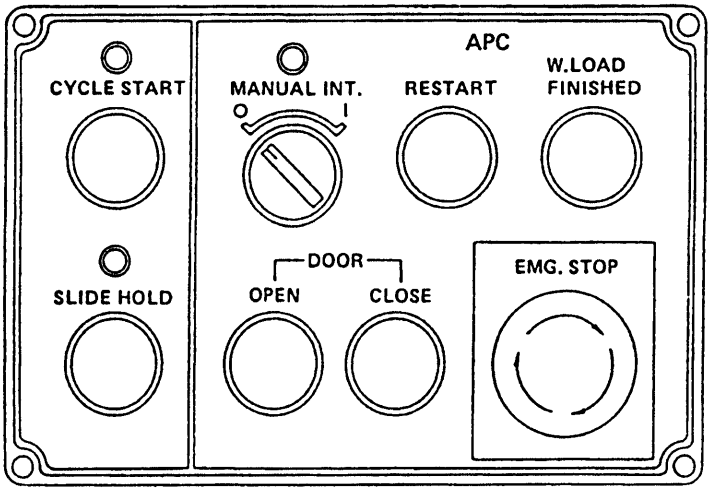


Fig. 4-15 Parallel Type 2-Pallet APC Operation Panel (MC-500H/600H/800H)

8. ROTARY TYPE 2-PALLET APC OPERATION PANEL

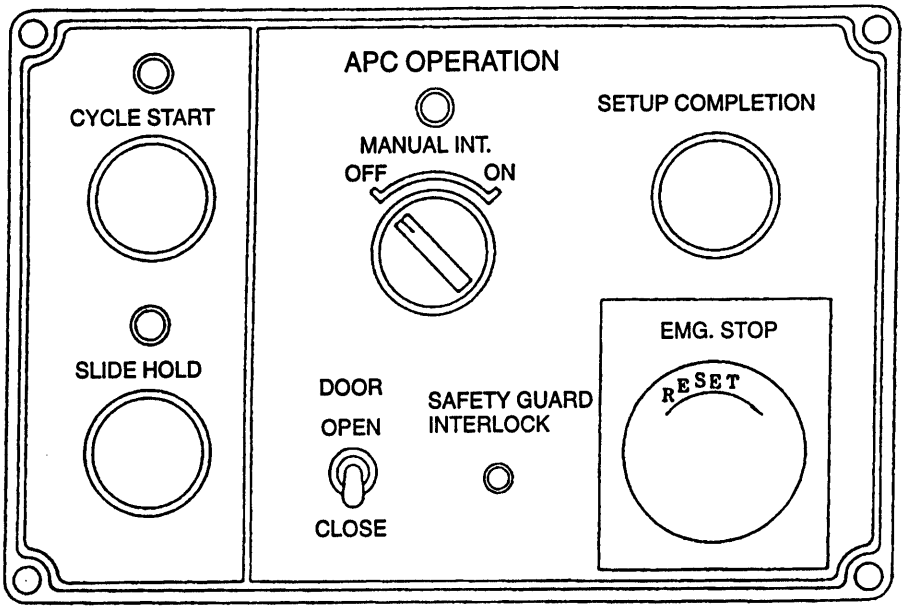


Fig. 4-16 Rotary Type 2-Pallet APC Operation Panel

9. ROTARY TYPE MULTI-PALLET APC OPERATION PANEL

9-1. Rotary Type Multi-pallet APC Operation (with Setup Station)

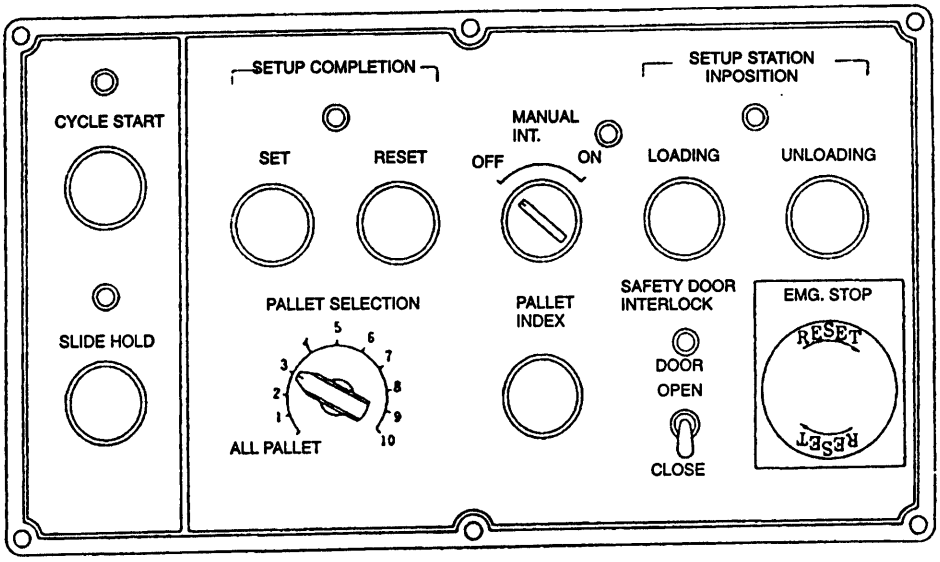


Fig. 4-17 Rotary Type Multi-pallet APC Operation (with Setup Station)

9-2. Rotary Type Multi-pallet APC Operation (without Setup Station)

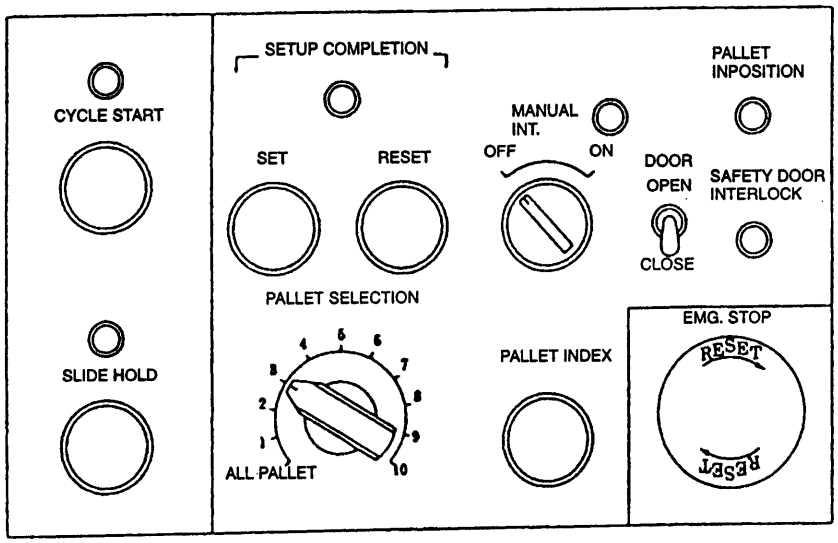


Fig. 4-18 Rotary Type Multi-pallet APC Operation (without Setup Station)

10. ATTACHMENT OPERATION PANEL

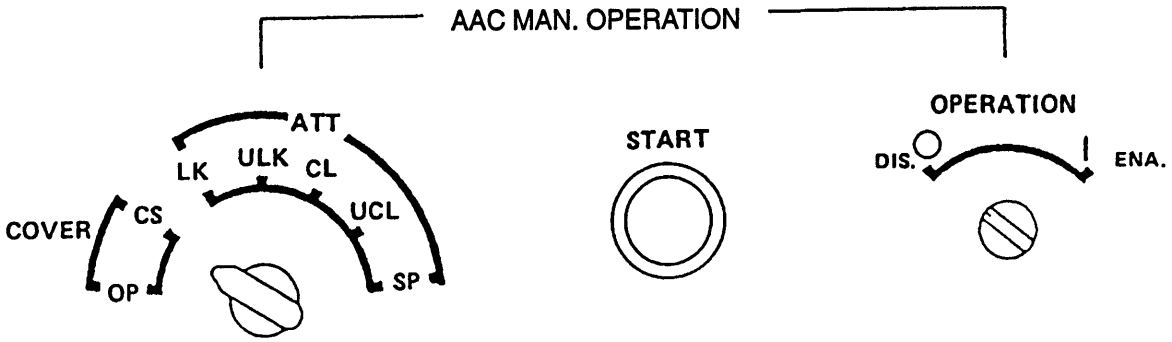


Fig. 4-19 AAC Operation Panel

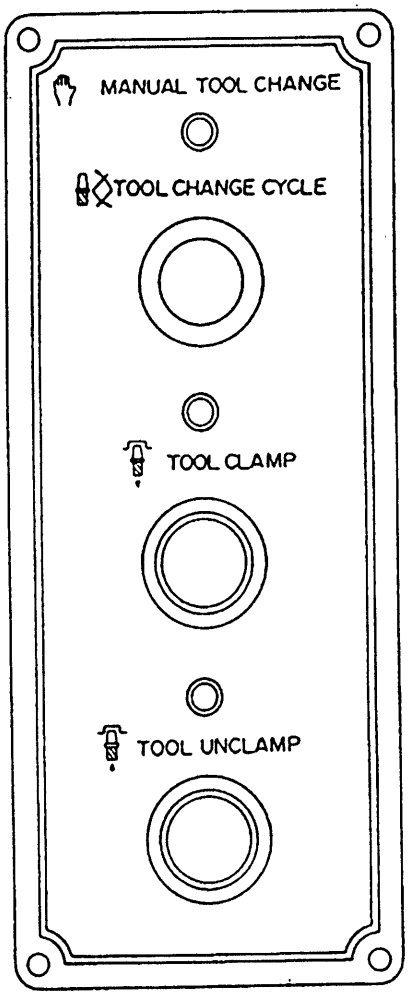


Fig. 4-20 Attachment Manual Tool Change Panel

11. LIST OF G CODES

Code	Group	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	Group	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	Group	Functions	Optional
G62	19	Programmable mirror image function	○
G63			
G64 *1	14	Cutting mode	○
G65 G66			
G67			
G68 G69	24	Cancel of G68 Setting of 3-D coordinate system conversion	○
G70			
G71	11	Fixed cycle, Designation of return level for M53	
G72			
G73 G74	11	Fixed cycle, High speed drilling cycle Fixed cycle, Reverse tapping	
G75			
G76	11	Fixed cycle, Fine boring	
G77 G78 G79			
G80 *1 G81 G82 G83 G84 G85 G86 G87	11	Fixed cycle, Mode cancel Fixed cycle, Drill/spot boring Fixed cycle, Drill/counter boring Fixed cycle, Deep-hole drilling cycle Fixed cycle, Tapping Fixed cycle, Boring Fixed cycle, Boring Fixed cycle, Back boring	
G88			
G89	11	Fixed cycle, Boring	
G90 *3 G91 *3	12	Absolute dimensioning 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	Group	Functions	Optional
G92	20	Setting of work coordinate system	
G93			
G94 *3 G95 *3	13	Feed per min Feed per rev	
G96 G97 G98 G99			
G172	0	3-D arc nearest path	
G173	0	3-D arc farthest path	
G174	77	Cylinder side-face machining OFF	
G175	77	Cylinder side-face machining ON	
G176	71	F-code and S-code ignore CANCEL	
G177	71	F-code and S-code ignore	
G178	0	Threading fixed cycle in the No. 1 axis direction in a plane	
G179	0	Threading fixed cycle in the No. 2 axis direction in a plane	
G180	64	Attachment rotation compensation CANCEL	
G181	64	Attachment rotation compensation facing FRONT	
G182	64	Attachment rotation compensation facing LEFT	
G183	64	Attachment rotation compensation facing REAR	
G184	64	Attachment rotation compensation facing RIGHT	
G185	64	Attachment rotation compensation facing DOWN	
G186	65	Tolerance control mode CANCEL	
G187	65	Tolerance control mode ON	
G188	69	No. 2 tool length offset CANCEL	
G189	69	No. 2 tool length offset ON	
G190	39	Constant G90 mode (absolute) processing	
G191	25	Manual shift amount CANCEL	
G192	67	Top face detection fixed cycle mode CANCEL	
G193	67	Top face detection fixed cycle mode ON	
G194	68	Fixed cycle mode with breakage detection CANCEL	
G195	68	Fixed cycle mode with breakage detection ON	
G196	26	Block call at each sub-program ON	
G197	26	Block call at each sub-program CANCEL	

(cont'd)

Code	Group	Functions	Optional
G198	70	Threading compound fixed cycle in the No. 1 axis direction in a plane	
G199	70	Threading compound fixed cycle in the No. 2 axis direction in a plane	
G256	78	3-D arc projection surface selection	
G274	10	Fixed cycle synchronous tapping reverse tapping cycle	○
G284	10	Fixed cycle synchronous tapping tapping cycle	○

*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.

12. LIST OF MNEMONIC CODES

Code	Group	Contents	Optional
NOEX	34	Specification of the sequence not executed	
CALL	27	Subprogram, Simple call	
RTS		Subprogram, End code	
MODIN		Subprogram, Call after positioning mode ON	
MODOUT		Subprogram, Call after positioning mode OFF	
GOTO	28	Branch command, Unconditional jump	
IF		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	29	Coordinate calculation function, Omit	○
RSTRT		Coordinate calculation function, Restart	
LAA	30	Coordinate calculation function, Line at angle	○
ARC		Coordinate calculation function, Arc	
GRDX		Coordinate calculation function, Grid X	
GRDY		Coordinate calculation function, Grid Y	
DGRDX		Coordinate calculation function, Double grid X	
DGRDY		Coordinate calculation function, Double grid Y	
SQRX		Coordinate calculation function, Square X	
SQRY		Coordinate calculation function, Square Y	
BHC		Coordinate calculation function, Bolt hole circle	
FMILR	31	Area machining, Face milling (Rough)	○
FMILF		Area machining, Face milling (Finish)	
PMIL		Area machining, Pocket milling (Zigzag)	
PMILR		Area machining, Pocket milling (Spiral)	
RMILO		Area machining, Round milling (Out)	
RMILI		Area machining, Round milling (In)	
MSG	35	Message display	○
NMSG		Restoring original display	
NCYL	36	Fixed cycle, No cycle movement	
COPY	39	Copy, initial value of local coordinate system for parallel shift or rotation	○
COPYE		Copy end, Incremental value for parallel shift or rotation of local coordinate system	
CHFC		Arbitrary-angle chamfering	○
CHFR		Arbitrary-angle chamfering (rounding)	

13. LIST OF M CODES

Code	Group	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	Group	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	Group	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	Group	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	Group	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	Pallet loading command at PPC ON				
M161		Pallet unloading command at PPC ON				
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	Group	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M172	3	Long tool-tool change-command	After	one-shot		○
M166		ATC active tool return mode specification	At the same time	one-shot		○
M170	3	AAC (F) attachment change	After	one-shot	F: Floor type T: able type	
M171		AAC (T) attachment change	After	one-sho		
M173	3	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		

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Code	Group	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M234	50	Synchronized tapping gear selection range command (gear determined according to available spindle speeds in each gear range)				
M235	50	Synchronized tapping gear selection range command (spindle speeds in the 1st gear range are covered by 2nd gear range)				
M236	50	Synchronized tapping gear selection range command (spindle speeds in the 1st and 2nd gear ranges are covered by 3rd gear range)				
M237	50	Synchronized tapping gear selection range command (entire speeds are covered by 4th gear range)				
M238	39	Soft override DISABLED				
M239	39	Soft override ENABLED				
M292	44	Threading fixed cycle chamfering ON				
M293	44	Threading fixed cycle chamfering OFF				
M294	43	Compound fixed cycle cutting pattern 1				
M295	43	Compound fixed cycle cutting pattern 2				
M296	43	Compound fixed cycle cutting pattern 3				
M323	2	MC500/600H APC/ATC simultaneous operating M-code				
M326	51	Synchronized tapping torque monitoring DISABLED				
M327	51	Synchronized tapping torque monitoring ENABLED				
M331	56	6th axis rotary table FORWARD				
M332	56	6th axis rotary table REVERSE				
M396	49	Synchronized tapping 1-speed gear indexing				

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Code	Group	Function Element	Against Axis Movement	Modal/ One-shot	Remarks	Optional
M397	49	Synchronous tapping 2-speed gear indexing				
M398	49	Synchronous tapping 3-speed gear indexing				
M399	49	Synchronous tapping 4-speed gear indexing				
M900	53	Interrupt program DISABLED command				

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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.

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