

TOE-C843-8 31
INSTRUCTIONS

FOR MACHINING CENTER CNC

YASNAC[®] MX2

WITH 14" CRT CHARACTER DISPLAY

OPERATOR'S MANUAL

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

PREFACE

This manual describes the instructions for handling operator's station of YASNAC MX2 provided with 14" CRT character display (optional) in place of 9" CRT display (basic). Descriptions of NC operator's panel are numbered as Chapter 4 for your easy cross-reference to YASNAC MX2 OPERATOR'S MANUAL separately provided.

For the instructions other than the descriptions in this manual, refer to YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8 30).

The instructions given by using 9" CRT keyboard should be read, referring to Appendix Comparison of Operation Keys between 9" and 14" CRT Displays.

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4. NC OPERATOR'S STATION WITH 14" CRT CHARACTER DISPLAY

4.1 PUSHBUTTONS, LAMPS AND KEYS

Figs. 4.1 and 4.2 show an overall view of NC operator's panel with CRT display. The names and functions of operator's devices are as follows.

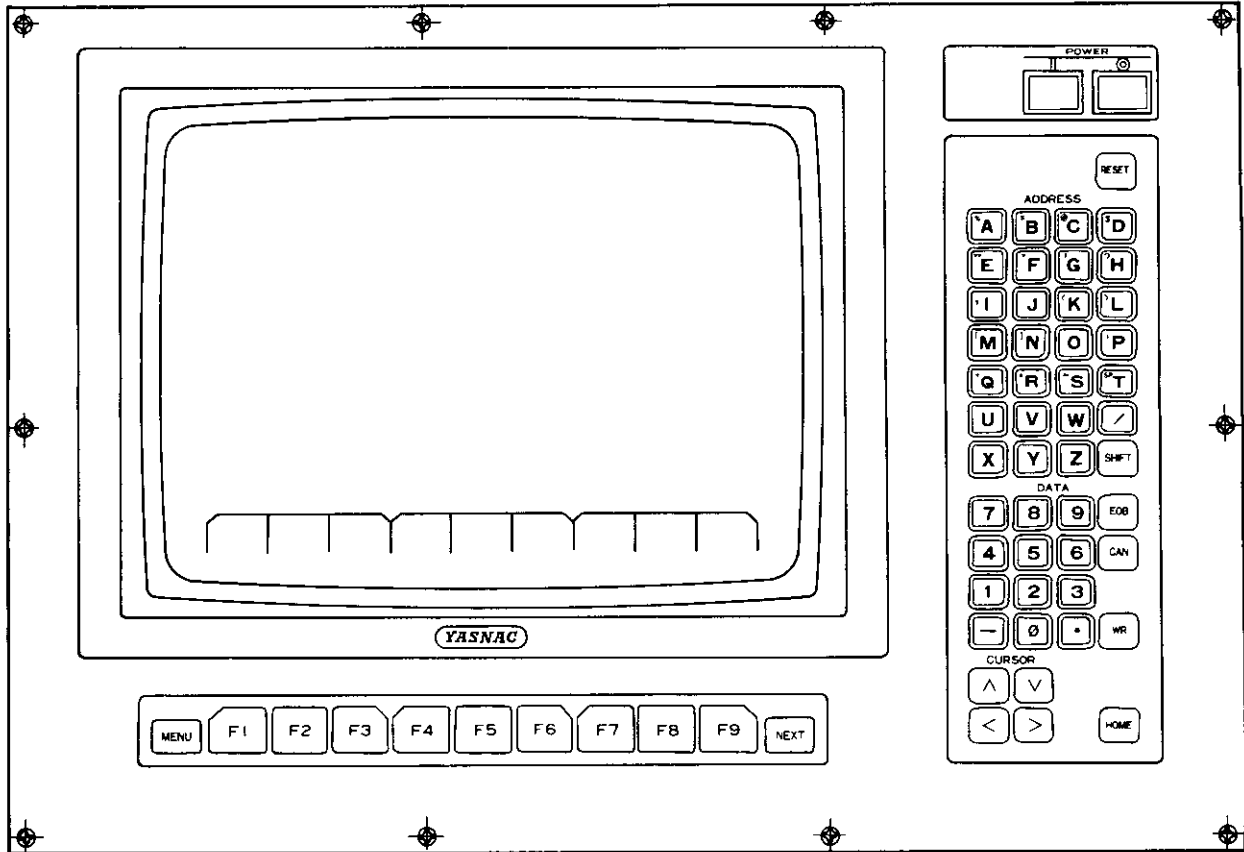


Fig. 4.1 NC Operator's Station with 14" CRT Character Display
(Keyboard on Right Side of CRT)

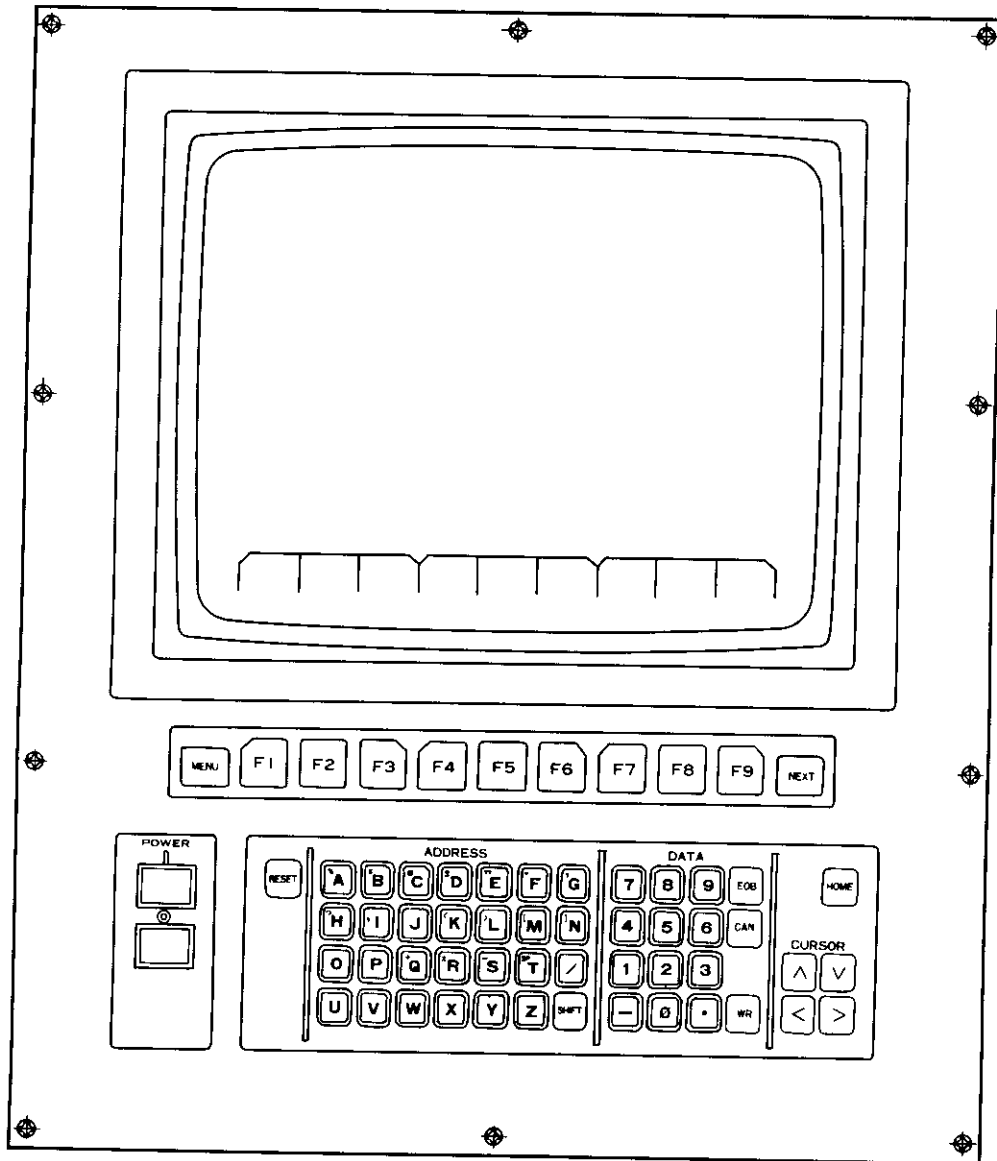


Fig. 4.2 NC Operator's Station with 14" CRT Character Display
(Keyboard below CRT)

4.1.1 POWER ON/OFF PUSHBUTTONS

· POWER ON pushbutton

To turn on the power for the control: Depress the pushbutton first to turn on the control power and depress it again to turn on the servo power. Push this button to recover the servo power after an emergency stop.

· POWER OFF pushbutton

To turn off the power for the control Depress it to turn off both the servo and control powers.

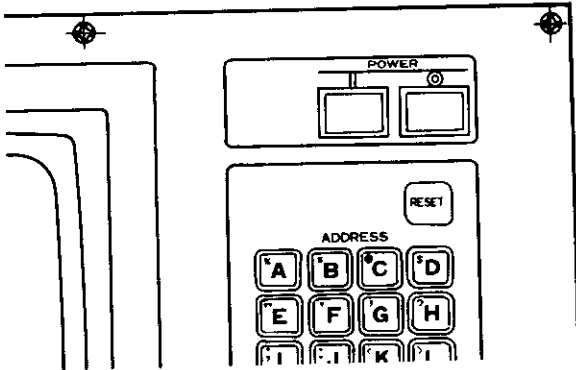


Fig. 4.2

4.1.2 14" CRT CHARACTER DISPLAY

According to each operation, this display indicates the alpha-numerical data in colors.

Braun tube size: 14 inches

Indicating characters:

Alphabetic characters, numerals, special characters and codes—73

Enlarged letters—64

Combined colors: Black, red, green, blue, magenta(violet), cyan, white.

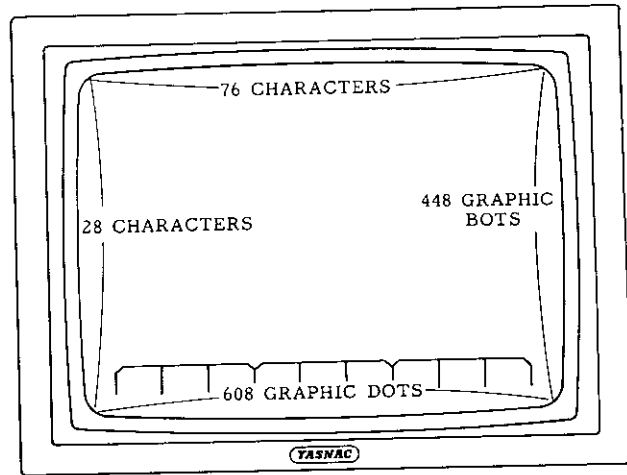


Fig. 4.3

4.1.3 FUNCTION SELECT KEYS (F1 TO F9)

- (1) Nine FUNCTION SELECT keys (F1 to F9) are located below the 14" CRT display. The functions of these keys are indicated on the screen, corresponding to actual key arrangement. Since the functions are changed according to the NC unit operation mode, these keys may be called soft keys.

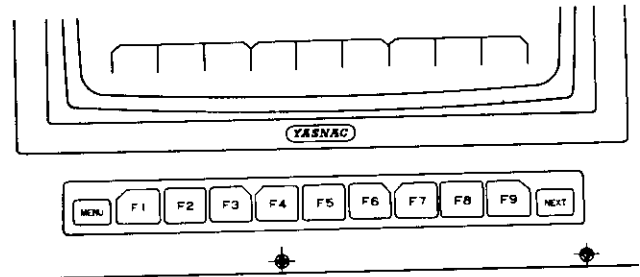


Fig. 4.5 FUNCTION Select Keys

- (2) For the standard NC unit, the purposes of FUNCTION SELECT keys are as shown below.

Displaying

ALM	DGN	PRM	SET	COM	PROG	POS	OFS	I
F1	F2	F3	F4	F5	F6	F7	F8	F9

Tape Start and Editing

OLF	VER	IN	ERS	INS	ALT			I
F1	F2	F3	F4	F5	F6	F7	F8	F9



Pressing F9 (⇩) key changes the set of eight functions either for displaying or tape start and editing.

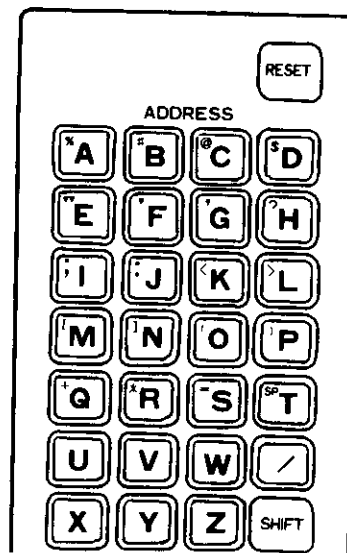
- (3) Functions for indicating

- (a) **[ALM]** (Alarm) key:
Select this key for display of alarm codes. The function becomes effective when the power is turned on.
- (b) **[DGN]** (Diagnosis) key:
Select this key for display of input/output signal status.
- (c) **[PRM]** (Parameter) key:
Select this key for display or writing-in of parameters.
- (d) **[SET]** (Setting) key:
Select this key for display or writing-in of setting data
- (e) **[COM]** (Command) key:
Select this key for display or writing-in (MDI) of the command data for automatic operation.
- (f) **[PROG]** (Program) key:
Select this key for display or writing-in of a part program.
- (g) **[POS]** (Position) key:
Select this key for display of various current positions.
- (h) **[OFS]** (Offset) key:
Select this key for display or writing-in of tool offset values.
- (4) Functions for tape start and editing
The following functions are used for the operation through tape data except in automatic operation mode. They are effective only in the EDT mode.
- (a) **[OUT]** key
This key is to start outputting various data in memory through data I/O interface.
- (b) **[IN]** key
This key is to start storing various data into memory through tape reader or data I/O interface.
- (c) **[VER]** (Verify) key
This key is to start verifying between memory data and punched tape data.
These keys are for editing a stored part program.
- (d) **[ERS]** (Erase) key:
Used for erasure of data in storage.
- (e) **[INS]** (Insert) key:
Used for insertion of data in memory.
- (f) **[ALT]** (Alter) key:
Used for alteration of data in memory.

- (5) NEXT key
The NEXT key is used for special purpose and expanding function in display or writing data.
- . Reading-in of additional tape data in EDIT mode.
 - . For other special purpose and expanding function.
- (6) MENU key
Pressing the MENU key displays the special screen programmed by machine tool manufacturers. For the contents and operation, refer to the machine tool manufacturers' instructions.

4.1.4 ADDRESS KEYS

These keys are to designate an address character when writing in various data



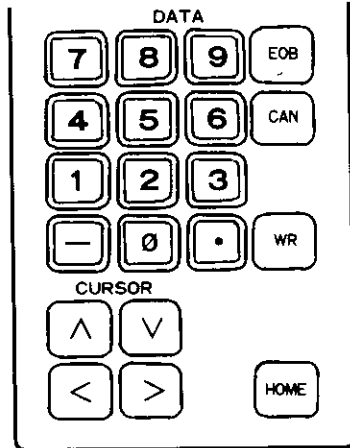
[/] (Slash) key: For an optional block skip command

[SHIFT] (shift) key:
Depressing SHIFT key after depressing **[A]** to **[T]** keys makes the display turn into special characters such as **[*]** to **[?]**, **[+]**, **[=]** which are written on the upper left corner of the keys.

Fig. 4.6 ADDRESS Keys

4.1.5 DATA KEYS

DATA keys can be used for writing-in of all numerical values such as tool offset value, setting data, parameter data, and so on, in addition to command value.



Note.

- 0 to 9 key } For input of numerical data
- (minus) key }
- (decimal point) key } For input of decimal point
- EOB (EOB) key. For the block end command
On the CRT display, ";" is displayed instead of "EOB "
- CAN (cancellation) key
For cancellation of the numeric value or address data erroneously keyed.
- WR (write) key.
For storing address data by address keys and data keys into buffer storage.

Fig. 4.7 DATA Keys

4.1.6 CURSOR KEYS

(1) < > keys: (turning pages)

The PAGE key is used to display the next page or the previous page when CRT display is regarded as a page. For example, when a bundle of tool offset values are displayed by OFS key, this key is pushed to display the next bundle of tool offset values, which just looks like opening the pages of a book.

- . Depressing > key displays the next page.
- . Depressing < key displays the previous page.
- . Keeping the keys depressed makes the page step automatically forward or backward.

(2) v ^ keys: (moving cursors)

The cursor control key is used to move the cursor on the screen. The position of the cursor is indicated by the flashing letter. For example, when a parameter data is displayed by PRM key, this key is pressed to display the parameter number to be specified.

- . Depressing v key moves the cursor forward.
- . Depressing ^ key moves the cursor forward.
- . Keepint the cursor control key depressed makes the cursor move automatically forward or backward.

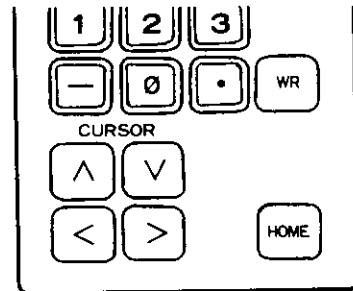


Fig. 4.8 CURSOR Keys

4.1.7 HOME KEYS

The HOME key is used to set the current position of the machine tool as the origin of the reference coordinate system. The origin setting can be made for each axis. The reference coordinate system means the coordinate system which is set by G92 command or the automatic coordinate system setting.

HOME key is used for the following operation.

- Reset of current position (UNIVERSAL, EXTERNAL)
- Reset of tool offset values
- Reset of operation time

4.1.8 RESET KEY

This key resets the control.

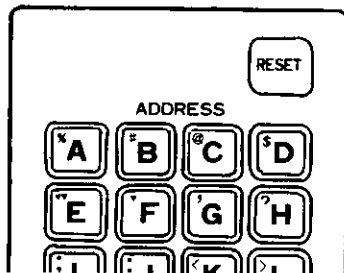


Fig. 4.9 RESET Key

Operations to be executed by this RESET key are:

- Move command cancel
- Buffer register clear
- Alarm code release if the cause is eliminated
- Tool offset cancel
- Auxiliary function cancel
- Label skip function ON
- Memory pointer rewind
- Sequence number reset
- RST signal transmission
- G code of A group

Refer to 2.9.1 LIST OF G CODES AND GROUPS in YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8.30).

The following will not be affected by operating the RESET key.

- Current position values of each axis.
- F commands
- S, T and B commands
- Tool offset values, setting data, parameter data

NOTE: Depressing the RESET key or the remote reset pushbutton is defined as "Reset operation" in this manual.

4.1.9 TAPE FEED AND SYSTEM NO. SWITCHES

These switches are mounted above the tape reader.

• TAPE FEED switch

This is a switch to wind and rewind the tape manually. Setting the switch to F (forward) causes the tape to feed. To rewind the tape, set the switch to R (reverse). This switch is effective, either manually or automatically.

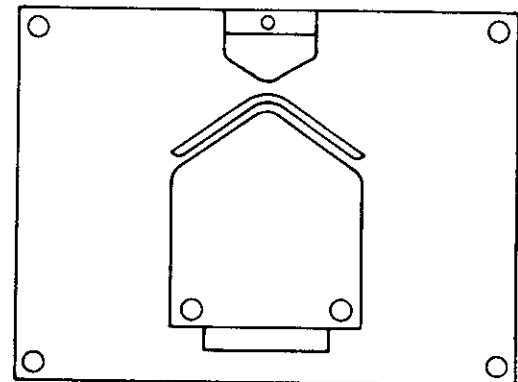
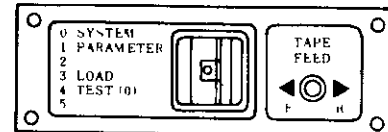


Fig. 4.10

• SYSTEM NO. switch

Set the switch at "0" during the usual operation. Functions of its each setting are as follows.

"0": SYSTEM

For usual operation. Writing parameters is prevented.

"1": PARAMETER

To write parameters. At this position, the Cycle Start is prevented.

"3": LOAD

To store the maintenance tape into the control.

"4": TEST (0)

The usual operation is similar to case of "0" SYSTEM. Self-diagnostics of the memory contents and checking of reference zero return position are omitted.

4.2 POWER ON/OFF OPERATION

4.2.1 TURNING ON POWER

Check the machine before turning on power, refer to the machine tool builder's manual for details. Operations after completion of preinspections are as follows.

Release Emergency Stop Button by turning clockwise.

- Depress the POWER ON pushbutton to turn on the control power and CRT power. The internal timer will be read in about two seconds. Then the servo power is ready for turning on, which is shown by alarm code "310."
- Depress the POWER ON pushbutton again to turn on the servo power. The NRD (NC READY) signal is sent out when the NC power is normally supplied.
- When the NRD signal turns on the machine power, and the MRD (MACHINE READY) signal returns back to the control, the READY lamp will be lit.

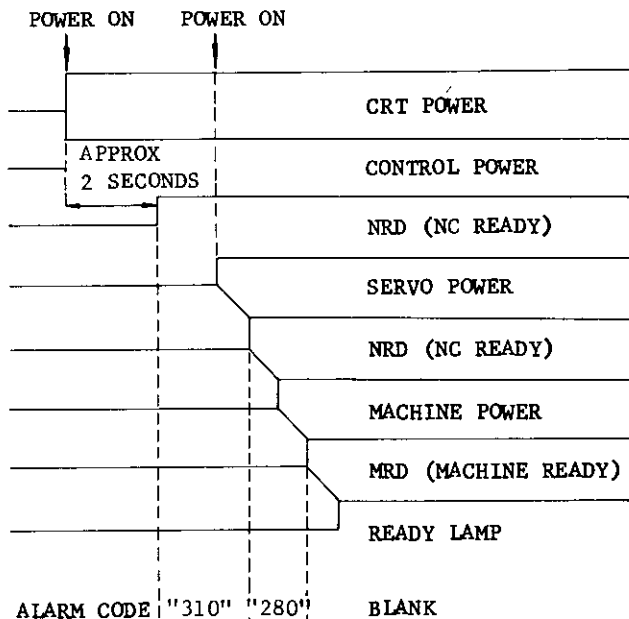


Fig. 4.11 Sequence of Turning on Operation

4.2.2 TURNING OFF POWER

Depressing the POWER OFF pushbutton causes both the servo and control powers to be turned off simultaneously. However, for more stable operation, use the following procedure.

- First depress the EMERGENCY STOP pushbutton to cut off the servo power. The NRD (NC READY) signal is interrupted, which usually results in turning the machine power, too.
- Depress the POWER OFF pushbutton to cut off the control power.

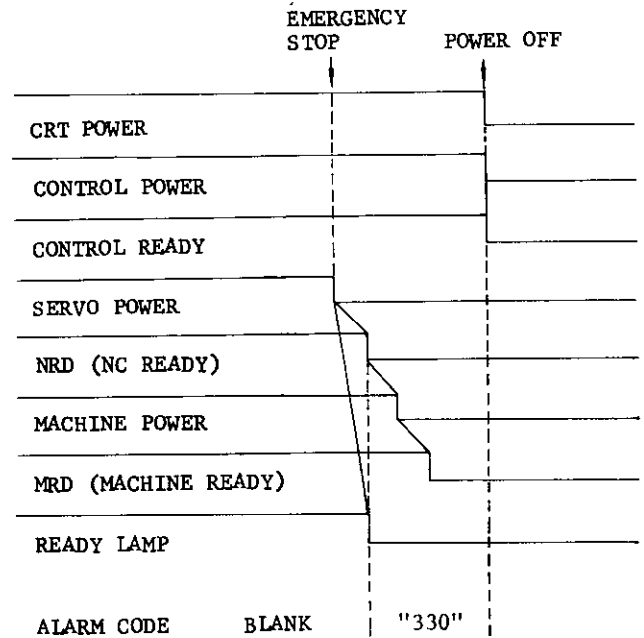


Fig. 4.12 Sequence of Turning off Operation

4.2.3 REMOTE POWER ON/OFF PUSHBUTTONS

Connect the power ON/OFF pushbuttons to EON, EOF and COM terminals on the control panel as shown below. Then the remote turning ON/OFF operation can be made exactly the same as with the POWER ON/OFF pushbuttons.

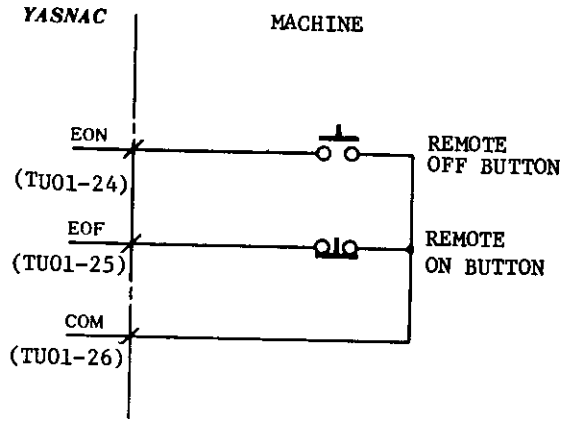


Fig. 4.13 Connections of Remote ON/OFF Pushbuttons

4.3 DISPLAY AND WRITING OPERATION

4.3.1 CONSTANT DISPLAY

The following display is made on both the top and bottom on the CRT, irrespective of the FUNCTION key currently selected.

(1) Function message

Any of the following eight function messages corresponding to the function display key is displayed at the top of CRT display.

- | | |
|-----------|----------|
| ALARM | PROGRAM |
| DIAGNOSIS | POSITION |
| PARAMETER | OFFSET |
| SETTING | |
| COMMAND | |

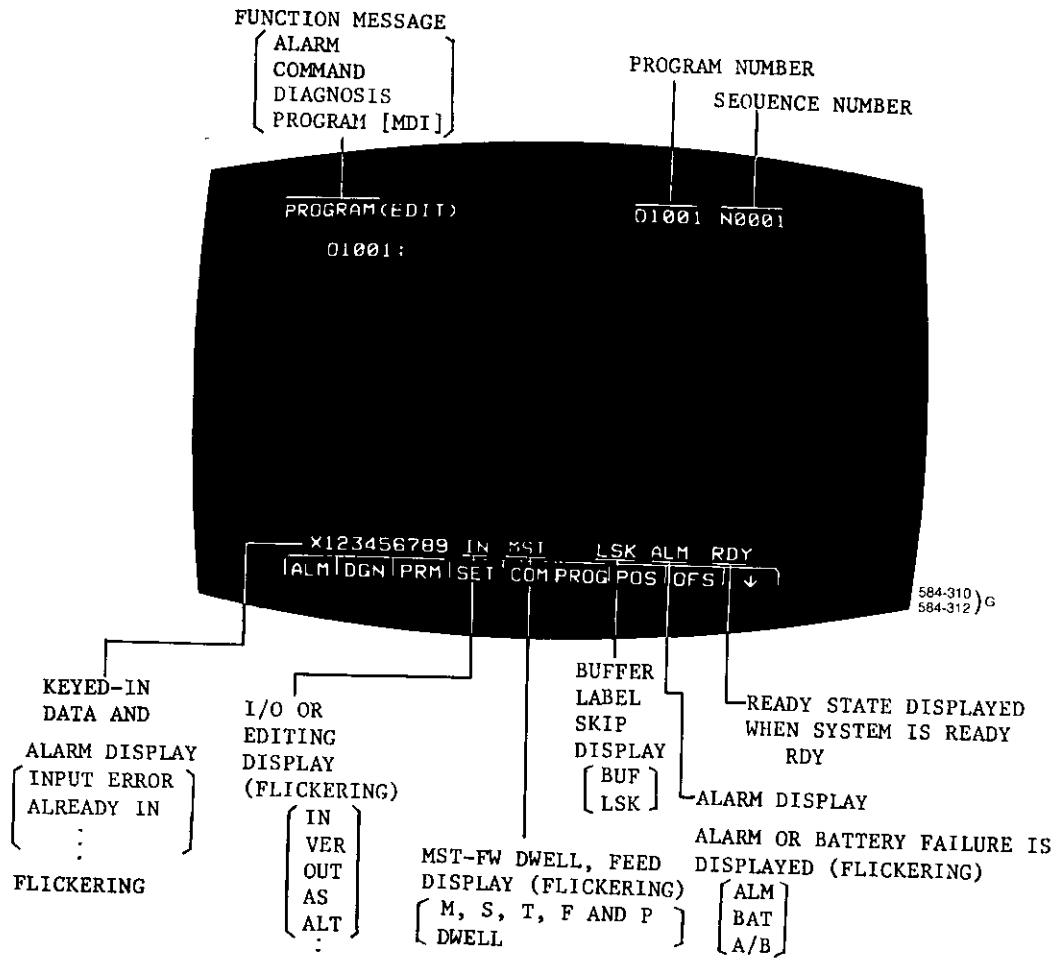


Fig. 4.14 Constant Display

4.3.1 CONSTANT DISPLAY (CONT'D)

(2) Program No.

The program No. consisting of 0 and 4 digits under execution is constantly displayed at the top of CRT irrespective of function key.

(3) Sequence No.

The program No. consisting N and 4 digits under execution is constantly displayed at the top of CRT irrespective of function key.

(4) Display of keyed-in data and simple errors.

(a) Display of keyed-in data

Up to 32 characters of keyed-in data can be displayed at one time. The data is processed by using ERS key, INS key, ALT key, etc.

(b) Display of simple errors (flashing)

The messages shown below indicate simple errors which occur in keying or searching operation. Differing from the alarm codes, these error messages are cleared by depressing some key. (Generally CAN key)

- "INPUT ERROR!" ... Format error of keyed-in data
- "ALREADY IN!" ... The same number of part program has been stored already.
- "EDIT LOCK ON!" .. Editing operation is made with Edit Lock on.
- "MEMORY OVER!" ... Part program to be stored is beyond memory capacity.
- "PROGRAM OVER!"
... Registered number of part program is beyond 99 (basic) or 199 (option).
- "NOT FOUND!" ... Desired data has not been located.
- "BREAK POINT!" ... Break point occurs

(5) Display of I/O and editing (flashing)

The following messages are flashing on the display during loading of punched tape, address search or editing.

- "IN" ... loading tape
- "VER" ... verifying tape
- "OUT" ... punching tape out
- "AS" .. searching address
- "ALT" ... altering data in EDIT mode
- "INS" ... inserting data in EDIT mode
- "ERS" ... erasing data in EDIT mode

(6) Display of MST-FIN signal waiting, dwelling and feeding

- "M" ... waiting FIN signal of M command
 - "S" ... waiting FIN signal of S command
 - "T" ... waiting FIN signal of T command
 - "F" ... feeding
"R" is displayed at rapid traverse
 - "P" ... loading tape
 - "DWELL" . dwelling
- M, S, T, F and P are displayed independently of each other.

(7) Display of the state of buffer full and label skip

- "BUF" .. displayed at completion of advanced reading
- "LSK" ... displayed at label skip on

(8) Display of alarm (flashing)

Alarm continues to be displayed flashing until the cause is removed and reset operation is made.

- "ALM" .. indicates alarm state occurring
- "BAT" ... indicates battery alarm occurring
- "A/B" ... indicates both of alarm and battery alarm occurring

(9) Display of ready state

- "RDY" ... indicates the system is normal and the control is operable

4.3.2 DISPLAY OF COMMAND DATA

1. Depress COM key.

Anyone of the following three digits appears.

- A. Command data (COMMAND)
- B. Repetition number of subprogram (SUB PROG. NESTING)
- C. State of tool offset (COMMAND [OFFSET])

2. The above display steps forward or backward by depressing or key one by one.

4.3.2.1 COMMAND DATA DISPLAY

The display shows the block data under execution or just before execution in which compensation calculations have been completed. The conditions of the data to be displayed is as follows.

1. The data shows the contents of the active register during an automatic operation or a feed hold.
2. While the control is stopped at a block end, the contents of the buffer register are displayed. If the buffer register blank (BUF is not displayed), the contents of the just executed block are displayed.
3. In the MDI operation, the current block data are displayed after cycle is indicated.

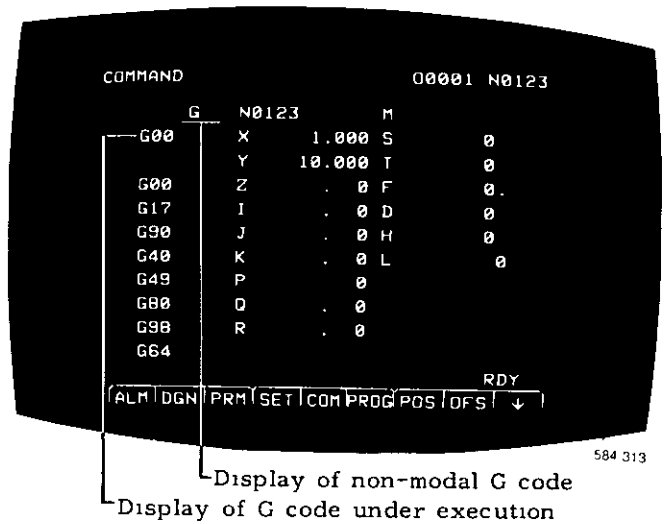
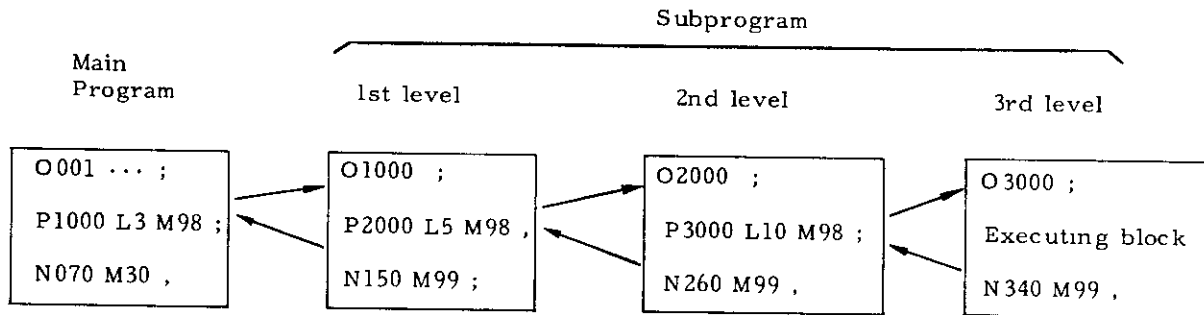


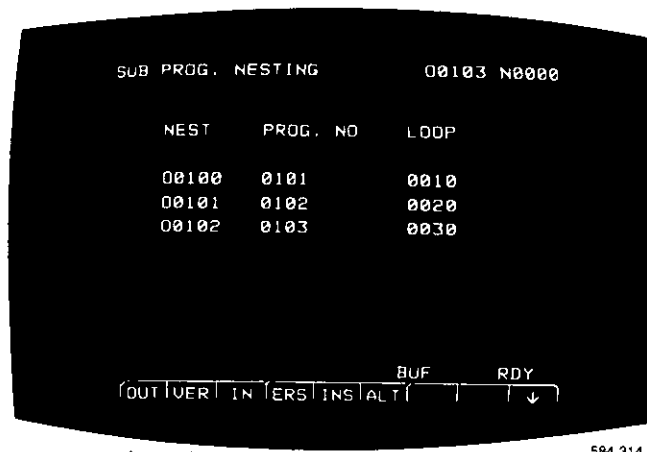
Fig. 4.15 Example of Command Display

4.3.2.2 DISPLAY OF REMAINING NUMBER OF REPETITIONS OF SUBPROGRAM (SUB PROG. NESTING)

The remaining number of repetitions of a subprogram is displayed.



The subprogram has executed the 3rd level twice and entered into the execution of 3rd time of the 3rd level.

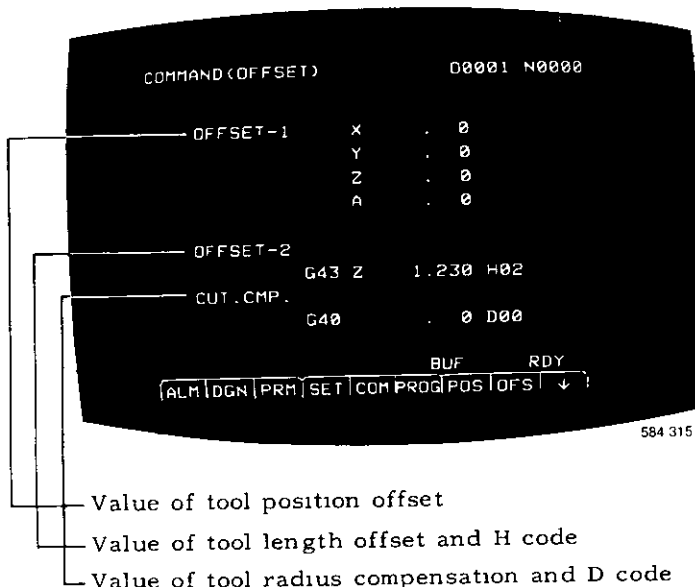


Remaining number of repetitions
Sequence number of subprogram start
Subprogram level (up to 4)

Fig. 4.16 Example of SUB PROG. NESTING

4.3.2.3 DISPLAY OF TOOL OFFSET STATE: COMMAND (OFFSET)

The current state of tool offset is displayed as shown below.



NOTE: Function COM is exclusively used for display. Data cannot be written under function COM. Select function PROG to write block data

Fig. 4.17 Example of Display of Tool Offset State

4.3.3 WRITING IN BLOCKS AND DISPLAYING CONTENTS BY MDI

In MDI, EDIT, and MEM modes, it is possible to write data into blocks by MDI and perform operation. (MEM mode permits displaying only.) The following operations are possible when function PROG. is selected.

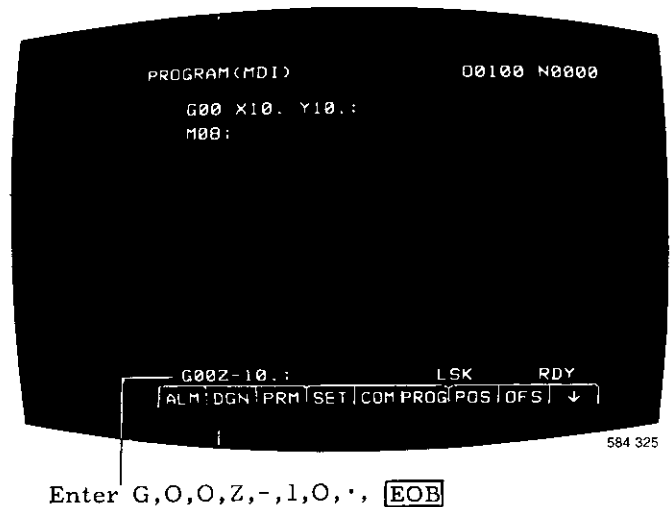
1. In MDI mode

A. Writing and displaying data

Data entered through the keyboard will appear on the bottom line of the CRT screen, from left to right. Up to 10 characters may be entered at a time.

Depress the WR key, then the data moves to the middle of the CRT and the bottom line becomes blank.

In MDI mode, data of up to 10 lines may be collected on the CRT screen.



Note: The depression of the EOB key appears ";."

Fig. 4.18 Writing-in Data

B. Editing MDI data

The \wedge , \vee , ERS, INS, and ALT keys permit editing multi-block data written in. Address (word) pointed to by the cursor will be edited. The \wedge , and \vee keys move the cursor forward and backward.

- (1) ERS key: When this key has been depressed, the whole word designated is erased.
- (2) INS key: This key inserts the data which has just been entered to the location which is next to the word the cursor points to.
- (3) ALT key: This key replaces the word which the cursor points to by the data which has just been entered.
- (4) WR key: This key appends the data which has just been entered at the end of the program displayed. In MDI mode, it is possible to edit only the current page.
Note: Editing is possible in MDI mode and EDIT mode.

C. Operation in MDI mode

Depress the Cycle Start button to let the program of blocks displayed on the CRT to run automatically

At the end of operation, the multi-block program displayed is cleared from the CRT.

2. In EDIT mode

See 4.6 EDITING OPERATION OF PART PROGRAMS.

Programs written by MDI can be executed repeatedly by M99.

3. In MEM mode

This mode permits the display of the program which is running by memory operation. The cursor points to the top of the block which is currently being executed, and it moves to the next block as execution proceeds. The position of the cursor is indicated by the flashing letter.

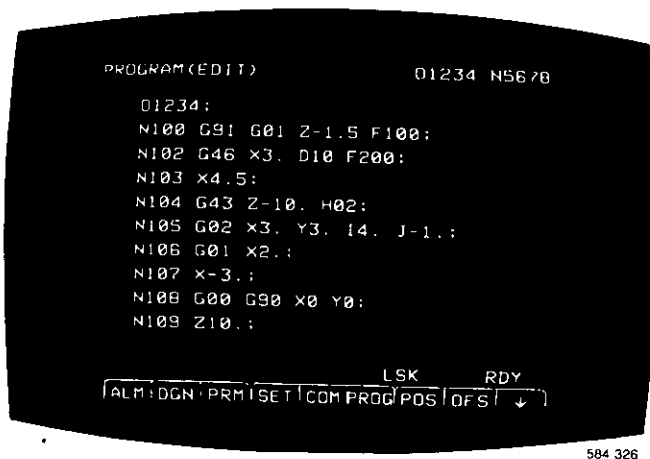


Fig. 4.19 Display of 10 Lines of Programs

4.3.4 DISPLAYING AND RESETTING CURRENT POSITION

It is possible to observe the current position in any mode. Operate as follows

1. Depress the POS key. Any of the following screens will appear.
 - A. Current position display-universal (POSITION [UNIVERSAL])
 - B. Current position display-external (POSITION [EXTERNAL])
 - C. Current position display-increment (POSITION [INCREMENT])
 - D. Current position display-all (POSITION)
 - E. Servo positioning error display (POSITION [ERROR])
2. Depress the \square and \square key, and one screen will change to the next.

NOTE: Mode E is possible only when the system No. switch is set at "4."

4.3.4.1 CURRENT POSITION DISPLAY (UNIVERSAL): POSITION (UNIVERSAL)

The current tool position which is the sum of the parameters of move commands will be displayed. Depending on the value of parameter #6005D5 (G92 display preset), either of the following will appear.

- When parameter #6005D5 = 1 (Position in the reference coordinate system)
1. The tool position displayed is based on the coordinate system set up with G92.
 2. To reset this screen, depress the HOME key after designating an axis with the ADDRESS key. The current position will be reset to "0." This is possible only during a manual operation mode (RAPID, JOG, STEP, or HANDLE). The depression of the HOME key is ineffective during normal operation and in the "buffer full" state.
 3. The coordinate system which is employed for this screen is called the "reference coordinate system." A work coordinate system (option) will be set up in reference to the reference coordinate system.

4.3.4.1 CURRENT POSITION DISPLAY (UNIVERSAL) (CONT'D)

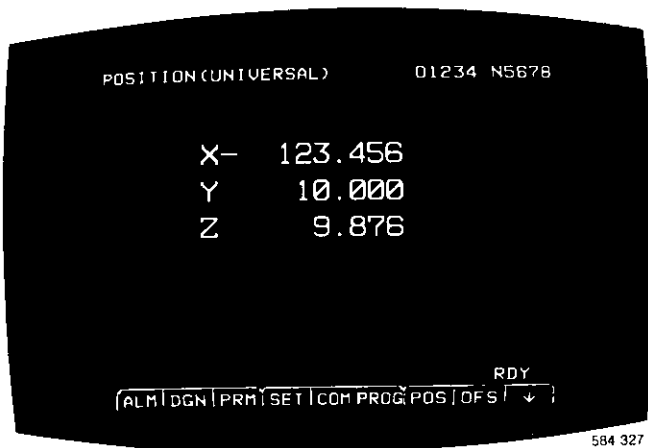


Fig. 4.20 Current Position Display (Universal)-Example

When parameter #6005D5 = 0 (Position obtained by simple summation)

1. G92, even if issued, does not affect the display. Move commands will be added and displayed.
2. To reset this screen, depress the HOME key after designating an axis with the ADDRESS key. The current position along the designated axis will be reset to "0." This is possible in any modes and even during operation.

4.3.4.2 CURRENT POSITION DISPLAY (EXTERNAL): POSITION (EXTERNAL)

- Move commands will be summed and displayed. G92, if issued, does not affect the display.

To reset this screen, depress the HOME key after designating an axis with the ADDRESS key. The current position along the designated axis will be reset to "0." This is possible in any modes and even during operation.

These displaying and resetting operations are the same as with the case of POSITION (UNIVERSAL) #6005D5 = 0 (Position obtained by simple summation). But the resetting operation is effective only to the displayed screen since there are independent position registers.

The data displayed in this mode are the same as those displayed on the "3-axis/4-axis external position display" (option). You may consider that the coordinate data of POSITION (EXTERNAL) are transmitted to the outside as they are unchanged.

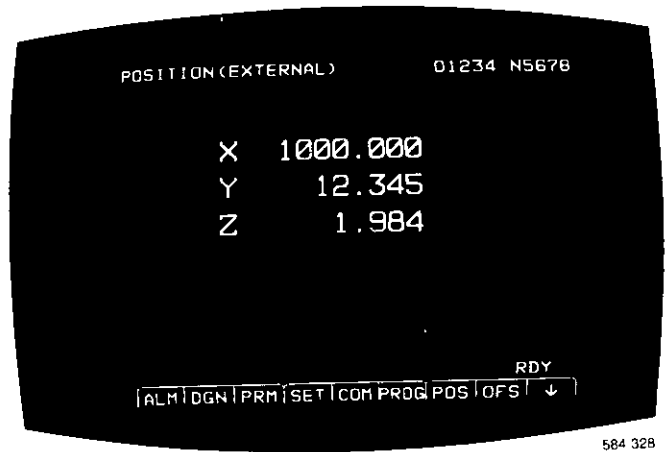


Fig. 4.21 Current Position Display (External)-Example (with 4-axis control)

4.3.4.3 CURRENT POSITION DISPLAY (INCREMENT): POSITION [INCREMENT]

Displayed in this mode are:

- In automatic mode, distance to the end point of the block at every moment
- In manual mode, distance to the position where manual operation is to start. The increment display in manual mode will be cancelled in automatic mode.

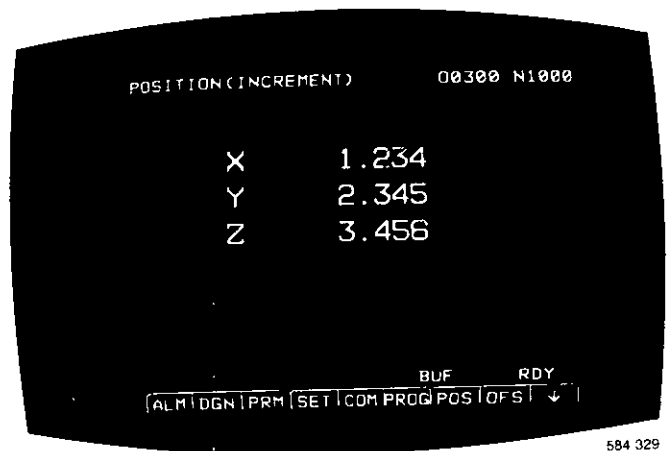


Fig. 4.22 Current Position Display (Increment)-Example

4.3.4.4 CURRENT POSITION DISPLAY (ALL): POSITION

- All position data will be displayed.
- <MACHINE> coordinates indicate the current position in the coordinate system whose origin is the reference point set up by resetting. Data for "stored stroke limit†" and "pitch error compensation†" functions are defined in this coordinate system.

4.3.4.5 SERVO POSITIONING ERROR DISPLAY: ERROR PULSE

- This screen appears only when the system No. switch is set at "4." This mode will be normally used during maintenance.
- Servo positioning error means the difference between the command position and the current tool position. Error will be displayed in units of pulse.

4.3.5 DISPLAYING AND WRITING TOOL OFFSET DATA

Tool offset data are stored in the memory of the control. These data may be displayed and rewritten in any mode and even during automatic operation.

- Displaying tool offset data.

1. Select the OFS function key.
2. Enter numerals, like 1 and 0, then depress the \square or \square key. Then ten pairs of tool offset, number and tool offset, including the designated pair, will be displayed and the cursor positioned at the designated tool offset number.

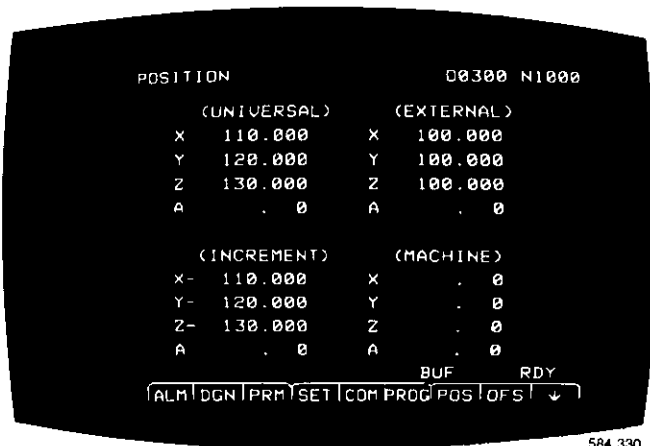


Fig. 4.23 Current Position Display (All) - Example

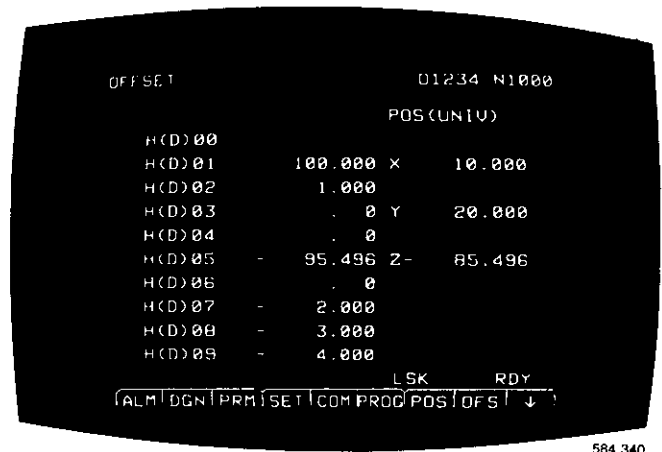


Fig. 4.24 Display of Ten Pairs of Tool Offset Number and Data

3. Depress the \square or \square key to move to a smaller or larger tool offset number. If you move the cursor beyond the first or last tool offset number displayed in the current screen, the neighboring ten sets of tool offset number and tool offset will appear automatically.
4. The preceding or following page may be displayed by depressing the \square or \square key. The cursor will be positioned at the first tool offset number displayed on that page.
5. Tool offset will be displayed in units of 0.001 mm (or (0.0001")) and up to 999.999 mm (or 99.9999").

- Writing tool offset data

To rewrite tool offset data, specify an increment which is to add arithmetically to a tool offset data held in memory.

1. Position the cursor at the tool offset number whose offset data is to be changed.
2. Enter the increment which is to be added to the tool offset.
3. Depress the WR key. Then the specified increment will be added to the old tool offset.

4.3.5 DISPLAYING AND WRITING TOOL OFFSET DATA (CONT'D)

NOTES

- A new tool offset itself may be input instead of an increment. For this purpose, depress the HOME key first. The tool offset number pointed by the cursor will be reset to "0." Then enter a new tool offset.
- Tool offset data held in the memory of the control are preserved even after power is turned off
- It is possible to rewrite tool offset data in any mode, even during automatic operation.
- Tool offsets modified during automatic operation become effective when the system starts to read commands for a new block. The old tool offsets remain effective for the current block and the blocks whose data are already read in the buffer for advance reading.

4.3.6 DISPLAYING AND WRITING SETTING DATA

In this system, varying setting data are held in the internal memory and permit to specify mirror image axes, TV check on/off, etc. For details, see Appendix 1, LIST OF SETTING NUMBERS.

It is possible to display and write setting data at any time even during automatic operation.

1. Types of setting

Setting is made in binary mode or decimal mode.

A. Binary mode

Setting numbers #6000-#6004 are associated with setting data of binary mode, that is, 8-bit information (D7-D0). Each bit indicates the ON/OFF state of the associated function. The decimal value of each line is given at the rightmost column.

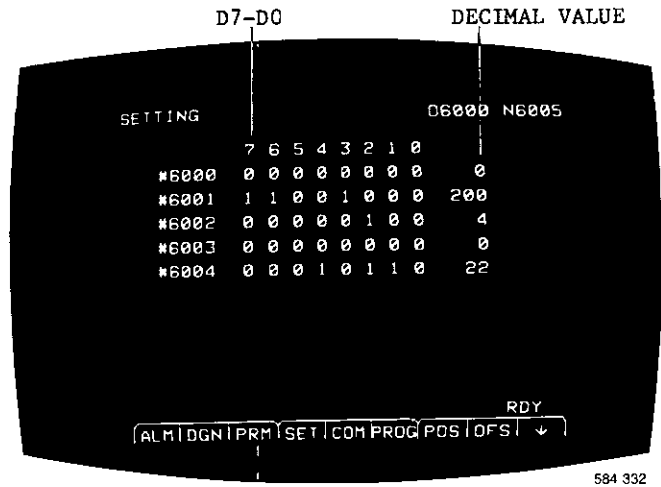


Fig. 4.25 Setting (Deciaml model)-Example

B. Decimal mode

Setting numbers of #6200-#6219 and #6500-#6599 are associated with setting data of decimal mode.

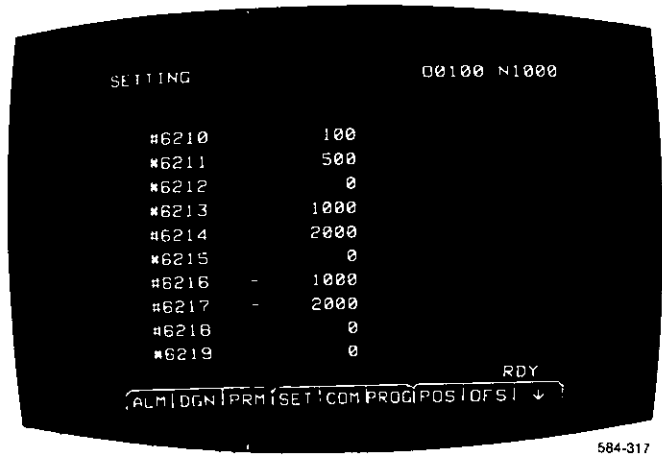


Fig. 4.26 Setting (Decimal mode)-Example

2. Displaying setting data

- Enter a setting number then depress the \downarrow or \uparrow key. ("#" need not be entered.) Up to 10 groups of setting number and data will be displayed at a time.
- Depress the CURSOR keys \downarrow or \uparrow to change a setting number and the \rightarrow or \leftarrow keys to change a screen.

3. Writing setting data

A. In binary mode

- (1) Designate a desired setting number.
- (2) Depress the INSRT key. The cursor moves to the bit data from a setting number. Designate the data of D7.
- (3) Depress the \downarrow key. Each time the key is depressed, the cursor moves one bit toward D0. Locate the cursor at a desired bit position.
- (4) Depress the WR key. The designated bit data reverses (0 to 1 or 1 to 0). If you depress the WR key again, the bit data will reverse again. Normally, "1" designates ON state and "0" OFF state.
- (5) To write data in decimal mode, locate the cursor at the rightmost column (decimal data).

EXAMPLE: Writing in decimal mode

Entered data	7	6	5	4	3	2	1	0	
\downarrow 0 WR	0	0	0	0	0	0	0	0	0
\downarrow 2 5 5 WR	1	1	1	1	1	1	1	1	255

- (6) Repeat steps (2) through (5) to write desired data. If you keep the \downarrow or \uparrow key depressed, the cursor will move column by column in the screen automatically.
- (7) When data has been written, depress the INSRT key. Normally, this sequence of operations begins and ends both with the depression of the INSRT key.

B. In decimal mode

- (1) Designate a desired setting number.

- (2) Enter a data and depress the WR key. The data will be assigned to the setting number which the cursor points to.
- (3) Depress the \downarrow , \uparrow or \rightarrow , \leftarrow key to change a setting number or the screen.

4.3.7 DISPLAYING AND WRITING PARAMETERS

In this system, varying parameters are stored in the memory and they determine operating conditions such as tape code and feed rate. For details, see Appendix 2, LIST OF PARAMETER NUMBERS of YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8.30). The parameters may be displayed at any time even during automatic operation.

1. Kinds of parameters

Parameters are displayed either in decimal mode in binary mode.

PARAMETER	7	6	5	4	3	2	1	0	
#6010	0	0	0	0	0	1	0	1	5
#6011	0	0	0	0	0	0	0	0	0
#6012	0	0	0	0	0	1	1	1	7
#6013	0	0	0	0	0	1	1	1	7
#6014	0	0	0	0	0	0	0	0	0
#6015	0	0	1	0	0	1	0		34
#6016	0	0	0	0	1	1	1		7
#6017	1	0	0	0	0	1	1		131
#6018	0	0	0	0	0	0	0		0
#6019	0	0	0	0	0	0	0		0

LSK RDY
ALM DGN PRM SET COM PROG POS DFS

584 318

Fig. 4.27 Parameters (in binary mode)-Example

Parameter numbers #6005-#6045 are assigned to binary mode. Those of #6050 and up are assigned to decimal mode.

4.3.7 DISPLAYING AND WRITING PARAMETERS (CONT'D)

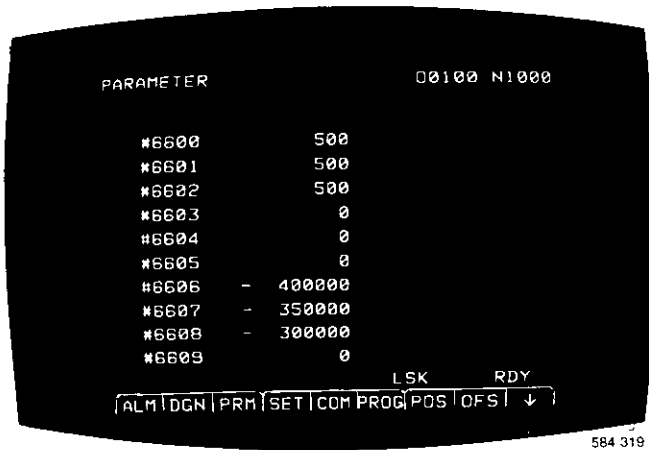


Fig. 4.28 Parameters (in decimal mode)-Example

2. Displaying parameters

Operation is the same as in displaying setting data except that PRM should be depressed instead of SET. See 4.3.6 DISPLAYING AND WRITING SETTING DATA of YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8.30).

3. Writing parameters

The parameter values are preset according to the performance of the machine and purposes. Therefore, you should consult the machine tool builder if you want to change parameter settings.

The parameters are protected with a system No. switch provided on the tape reader so that they should not be destroyed by wrong operation. Normally system No. 0 is selected and, at this time, the parameters cannot be rewritten by any operation.

A. The operation of writing parameters is the same as of writing setting data but the parameters are protected. See 4.3.6 DISPLAYING AND WRITING SETTING DATA.

B. Parameters cannot be rewritten unless the system No. switch is set at "1."

After rewriting parameters, be sure to reset the system No. switch at "0."

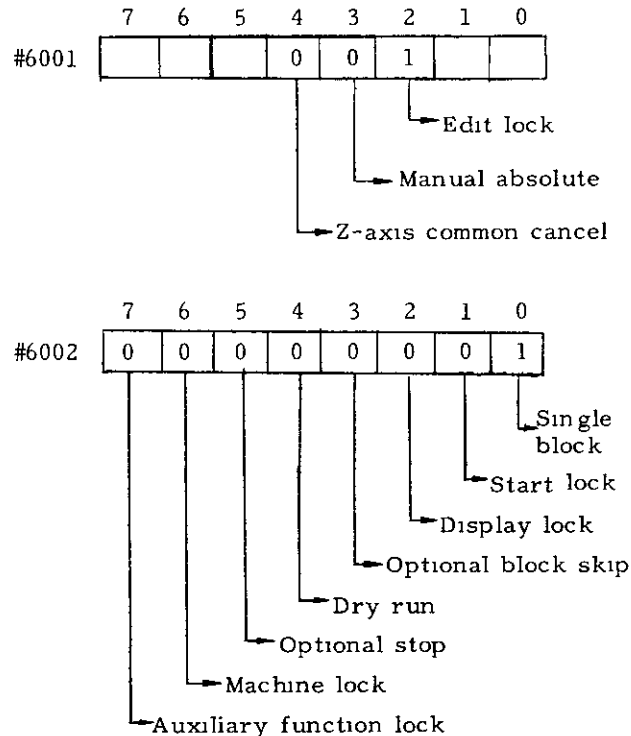
C. If the following parameters have been changed, be sure to turn off power then turn it on again. Otherwise the system might fail to operate properly.

- #6009
 - #6010
 - #6023
 - #6032
 - #6086 to #6091
 - #6094 to #6099
 - #6068 to #6071
 - #6322 to #6337
 - #6642 to #6645
 - #8000 to #8511
- After reading in parameter tape

4.3.8 INTERNAL TOGGLE SWITCHES

The following switches may be easily turned on and off on the NC operator's station even when they cannot be operated on the machine control station. Setting numbers and their contents are as follows.

"1" = On, "0" = Off



If the machine control station is provided with the switches that turn on and off the above functions, the state of a switch on the machine's control station is ORed with that of the NC operator's panel to determine the state finally.

Setting data	Machine's switch	Result on/off
"0" = OFF	OFF	OFF
"0" = OFF	ON	ON
"1" = ON	OFF	ON
"1" = ON	ON	ON

The functions of the internal toggle switches work only when parameter #6006D3 = 1 (internal toggle switch function on). If it is off, only the switches of the machine control station work.

4.3.9 OPERATION TIME DISPLAY

The system counts the duration of automatic operation and it may be displayed. This function permits the display of the time it has been taken for a piece of work or the total operational time of the system.

1. Procedure of display

Depress the ALM key, then select a screen running time with the key as shown below.

Three kinds of operation time will be displayed in hours, minutes, and seconds.

Top Total operating time after POWER ON

Middle: Total operating time of CYCLE START

Bottom: Total operating time of FEED

2. Resetting display

Each time of operational time may be reset independently by the following procedure.

When operating times are displayed:

- A. "1" "ORG" POWER ON time at the top will be reset.
- B. "2" "ORG" CYCLE START time in the middle will be reset.
- C. "3" "ORG" FEED time at the bottom will be reset

The timers of operation time preserve data unless they are reset, even after power is turned off.

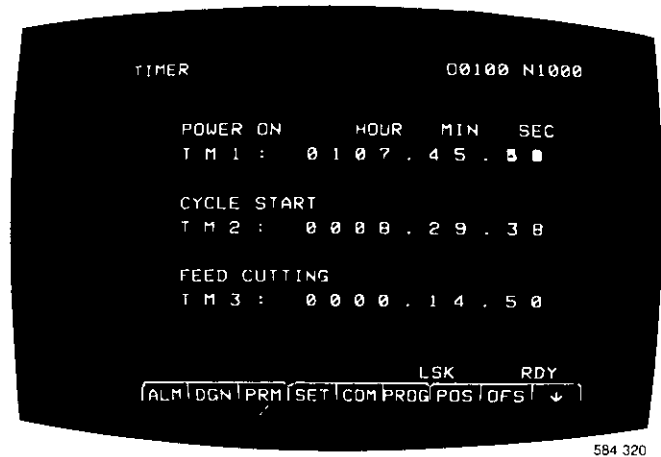


Fig. 4.29 Operation Time Display

4.3.10 ADDRESS SEARCH

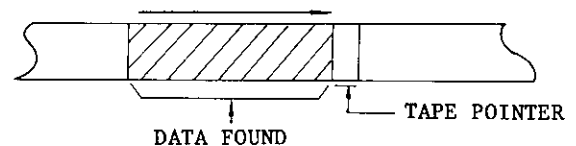
Search continues until a data (character string) held on tape or in the memory which coincides with the data (character string) entered through the NC operator's panel is found. The contents of tape will be searched in TAPE mode and those of the part program memory in MEM or EDIT mode.

1. Operation

- A. Select TAPE, MEM, or EDIT mode.
- B. Depress the PROG function key.
- C. Depress the RESET key. "LSK" appears and the pointer returns to the top of the program number in MEM mode.
- D. Enter the data (string of not more than 10 characters headed by address) to be searched.
- E. Depress the key. Search starts. "AS" blinks during search.

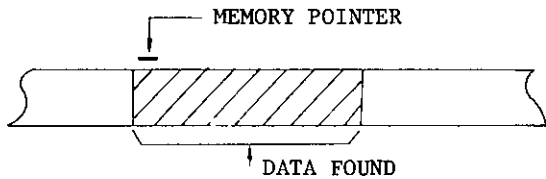
2. End of search

- A. "AS" disappears when search is completed.
- (1) In TAPE mode, the tape pointer points to the character that immediately follows the data found and the tape stops.



4.3.10 ADDRESS SEARCH (CONT'D)

- (2) In MEM or EDIT mode, the pointer of the part program memory points to the top of the data found (pointed by the cursor). In all cases, only search will be performed but neither BUF display nor advance reading will be performed.



- B. "AS" disappears and "NOT FOUND!" appears on the CRT if the desired data is not found. This message will disappear when you depress a key (CAN normally) of the control station.
3. Remarks
- Do not omit leading zeros of the search data. The data itself which has been entered through the keyboard will be compared with those on the tape or in the part program memory.
 - When searching a program number cataloged, leading zeros may be omitted.
 - Commands encountered during search will be ignored even if they are modal commands.
 - On Cycle Start after search, the data of a block which the pointer points to will be read in and executed.
4. Search of program number

The address search function also permits to search a part program out of those stored in the memory.

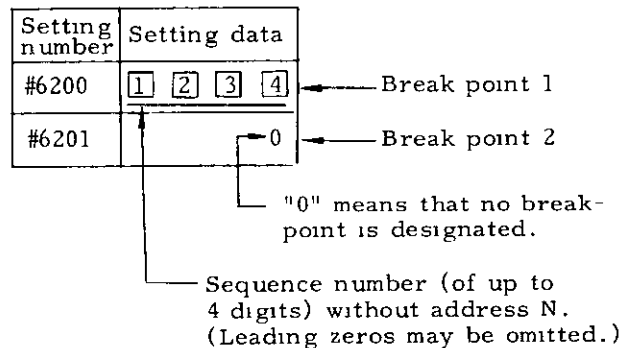
- Select MEM or EDIT mode.
- Depress the PROG function key.
- Depress the RESET key.
- Enter the program number "0□□□□."
- Depress the key.

The designated program number will be searched. The result of search is as described in 2. In MEM mode, you may depress the CYCLE START button immediately after completion of search to start automatic operation from the beginning of the program.

4.3.11 BREAKPOINT FUNCTION

It is possible to suspend operation at the end of a block by designating a sequence number in set function. Location is 6200 and 6201.

- If the current sequence number is found to be equal to a sequence number designated as setting data during automatic operation, operation will stop after execution of the block like in single block operation.
- The designated sequence number is called a breakpoint and up to two breakpoints may be designated.
- Setting numbers are as follows for designating breakpoints.



- "BREAKPOINT!" appears blinking when operation has stopped at a breakpoint. To restart, depress the CYCLE START button.

NOTE: If the breakpoint function is not used, set the contents of #6200 and #6201 to "0."

4.3.12 ALARM CODE DISPLAY

If an alarm status has happened, ALM" or "A/B" (on battery alarm) blinks on the bottom line of the screen regardless of working mode and function. If this happens, the detailed information of the alarm status may be displayed by the following operation.

- Depress the ALM key.

Then up to four pairs of alarm code and message will be displayed, with more serious one on a higher line.

NOTE: The alarm screen will appear during an alarm state and therefore, it is not needed to operate the key.

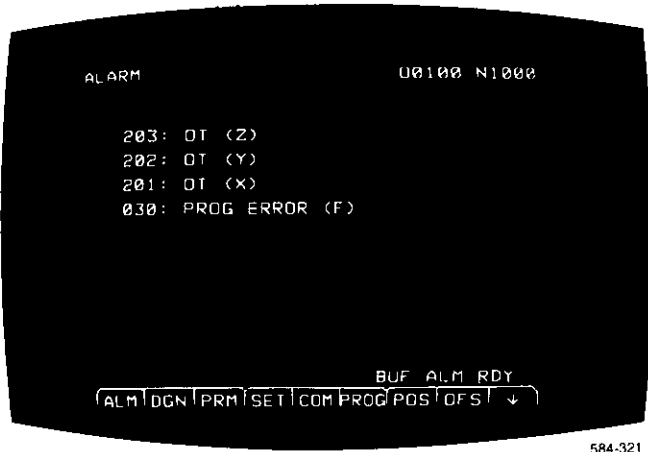


Fig. 4.30 Alarm Codes and Message Displayed-Example

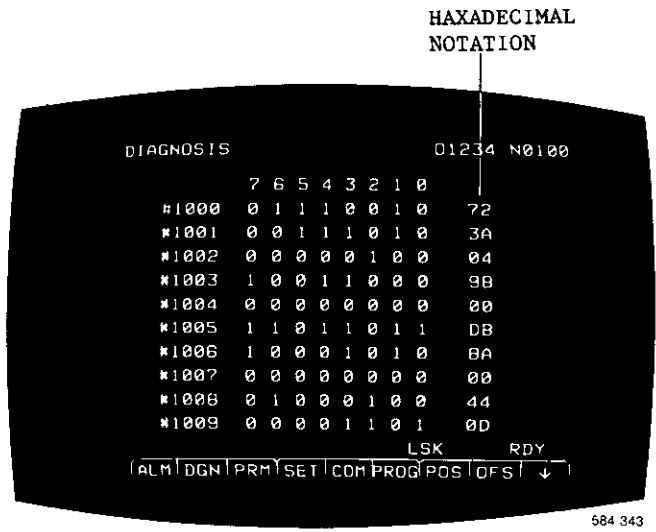


Fig. 4.31 State of I/O Signals Displayed-Example

To reset the alarm status and screen, remove the cause of alarm then depress the RESET key.

For the detail of alarm codes, see Appendix 5, LIST OF ALARM CODES of YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8.30).

4.3.13 DISPLAYING ON/OFF INPUT/OUTPUT SIGNALS

Depress the DGN function key, and the state of every input/output signal will be displayed on the CRT. This is possible at any time even during automatic operation.

For more detail of this operation, see 8.6.3 DIAGNOSTICS OF INPUT/OUTPUT SIGNALS of YASNAC MX2 OPERATOR'S MANUAL (TOE-C843-8.30).

The state of the input/output signal is also given in the hexadecimal notation at the rightmost column for the ease of maintenance work.

4.4 TAPE INPUT/OUTPUT OPERATIONS OF NC DATA

Such NC data as tool offsets, setting data, and parameter data may be read from and written onto tape. A tape reader will work to read data from tape. To write data onto tape, a data input/output interface (option) is needed.

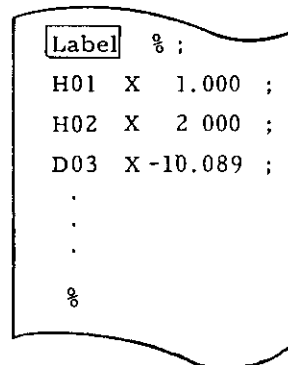
Here we assume that this option is incorporated.

See 4.7.2 I/O DEVICES AND BAUD RATE SETTING for how to set the type of input/output device (setting #6003) and baud rate (parameter #6026).

4.4.1 INPUTTING TOOL OFFSETS FROM TAPE

Though tool offsets are normally input by MDI operation, they may also be entered by means of paper tape.

1. The tape format of tool offsets is as follows.



Note:
Either H or D may be used for address.

2. The input operation is as follows.

- A. Select EDIT mode.
- B. Depress the RESET key.
- C. Depress the OFS key.
- D. Set the tool offset data tape onto the tape reader.
- E. Depress the IN key.

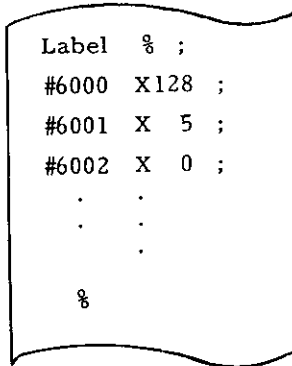
The tape reader starts to read the tape. "IN" blinks on the CRT while the data are read.

- F. The tape reader stops when it has read "%"
(or ER). "IN" disappears from the CRT. Now the tool offset data have been read into memory.

4.4.2 INPUTTING SETTING DATA AND PARAMETER DATA

Though setting data and parameter data are normally input by MDI operation, they may also be entered by means of paper tape. Setting data and parameter data may be input from a single tape

1. The tape format is as follows.



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

Note: "%" is used in the ISO code and "ER" in the EIA code.

2. The input operation is as follows.

- A. Select EDIT mode.
- B. Depress the RESET key.
- C. Depress the PRM key.
- D. Set the setting/parameter data tape onto the tape reader.
- E. Depress IN key.

The tape reader starts to read the tape. "IN" blinks on the CRT while the data are read.

- F. The tape reader stops when it has read "%" (or "ER"). "IN" disappears from the CRT. Now the setting/parameter data have been read into memory.

Turn on power again because the control is in the HOLD state (key inoperative) at completion of input.

4.4.3 OUTPUTTING TOOL OFFSETS TO PAPER TAPE

The tool offset data set in the system may be output to paper tape.

1. The output operation is as follows

- A. Select EDIT mode.
- B. Depress the RESET key.
- C. Depress the OFS key.
- D. Check that the punch is ready for operation.

- E. Depress the OUT key.

The paper tape punch punches the tool offset data onto paper tape and stops automatically when all contents of the tool offset memory have been output.

- F. To suspend the operation, depress the RESET key.

At this time, the output operation cannot be resumed. Restart from the beginning.

2. The tape format is the same as that described in 4.4.1 INPUTTING TOOL OFFSETS FROM TAPE.

4.4.4 OUTPUTTING SETTING DATA AND PARAMETER DATA TO PAPER TAPE

1. The output operation is as follows.

- A. Select EDIT mode.
- B. Depress the RESET key.
- C. Depress the PRM key.
- D. Check that the punch is ready for operation.
- E. Depress the OUT key.

The paper tape punch punches the setting/parameter data onto paper tape continuously.

- F. To suspend the operation, depress the RESET key.

At this time, the output operation cannot be resumed. Restart from the beginning.

2. The tape format is the same as that described in 4.4.2 INPUTTING SETTING DATA AND PARAMETER DATA.

4.4.5 OUTPUTTING PART PROGRAM TO PAPER TAPE

- (1) The part program of the designated program number is punched out by the following operations:
 - a. Connect the external equipment such as the tape puncher to the NC via the data input/output interface.
 - b. Make the external equipment relay for operation.
 - c. Power on the NC.

- d. Select the EDIT mode.
- e. Depress the PROG function key.
- f. Check to see if the external equipment is ready.
- g. Depress the RESET key.
- h. Depress "O" key and key in program number.
- i. Depress the OUT key.

- J. To discontinue the punch out operation, depress the RESET key. However, the discontinued operation cannot be resumed. Go back to f. and repeat the operations all over again.

NOTE. When RESET, OUT are operated without keying in the program number, the part program of the currently displayed program number is outputted.

The part program of the keyed-in program number is output to the external equipment. If it is a tape puncher, tape punch is performed. When the output of the part program is completed, the tape puncher stops automatically. During the output of data, "OUT" is flashing.

(2) Punch out of all part programs

All registered part programs may be output to the external equipment by the above operations except that 0 - 9 9 9 9 must be keyed in the operation of h. All part programs stored in the memory are output (punched out, etc.) consecutively.

NOTE: The contents of program number 00000 are outputted only when #6231D₃ = 1.

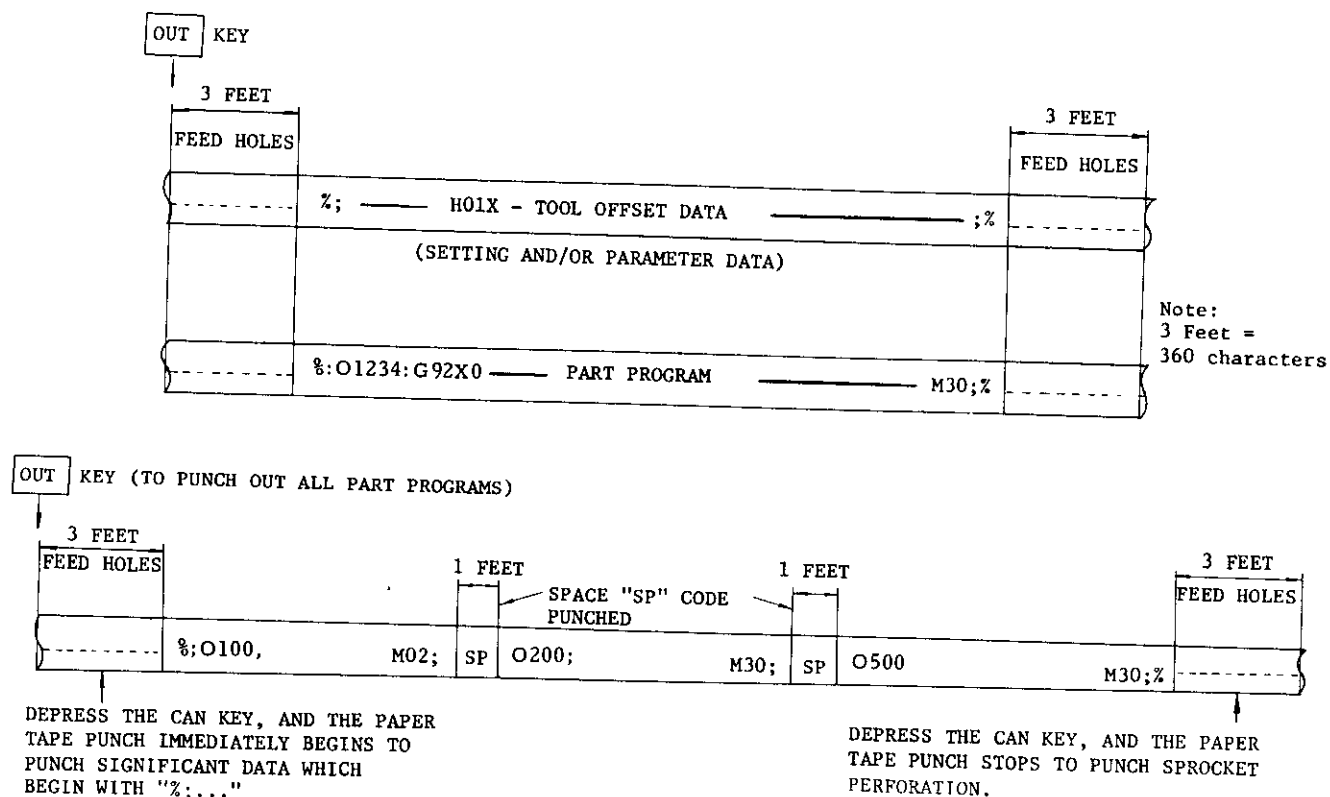
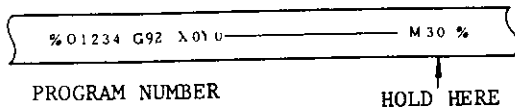


Fig. 4.32 Data and Program Formats on Paper Tape

4.5 LOADING PART PROGRAMS INTO MEMORY

4.5.1 LOADING PART PROGRAM TAPE INTO MEMORY

- (1) Loading a part program which has a program number.
 - a. Select EDIT mode.
 - b. Depress the PROG key.
 - c. Load the NC tape to the tape reader or an equivalent external device.

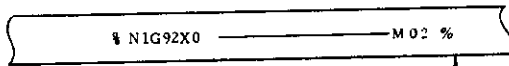


- d. Depress the RESET key.
- e. Depress the IN key.

Then the system starts to read the tape and enlists the program number punched on the tape as the first record. The system checks for a duplicate of the program number as in 1. Operation ends with error if the designated program number is not found on the tape.

When the tape reader has read "M02 ;," "M03 ;," or "M99 ;," it stops and "IN" disappears from the CRT. Now the part program has been stored in memory.

- (2) Loading a part program which has no program number.
 - a. Select EDIT mode.
 - b. Depress the PROG keys.
 - c. Load the NC tape to the tape reader or an equivalent external device.



The tape stops at this location when loading is completed.

- d. Depress the RESET key.
- e. Depress the address 0 key then enter the program number.
- f. Depress the IN key.

The system starts to read the tape. If the keyed-in program number coincides with the registered program number, "ALREADY IN" blinks on the CRT screen. If this happens, delete the program number, then repeat steps a. through f. while the tape is being read, "IN" blinks on the CRT.

- g. When the tape reader has read "M02 ;," "M03 ;," or "M99 ;," it stops and "IN" disappears from the CRT. Now the part program has been stored in memory.

NOTES.

1. Program number "00000" is always in the registered state, so it cannot be erased. This program number should not be used.
2. The tape which has no program number may be stored as described before. However, write a program number to the head of the tape, in principle. The operation of "Oxxxx IN" described before causes only program number registration. It does not cause the storing of information of "00000" into the part program memory. Only the program number on tape is stored into the memory. Assume that a tape having no program number is stored and then all part programs are punched out by depressing "0," "-", "9," "9," "9," "9," and "OUT" keys. Since this tape contains programs with no program number, the correct restoring of all part programs may not be performed by depressing "0," "-", "9," "9," "9," "9," and "IN" keys.
3. Consequently, when a tape having no program number has been stored, write the program number to the head of part program by the EDIT operation.

EXAMPLE:

N1 G92 X0 Z0 ;

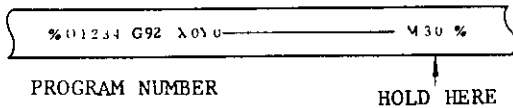
When this is in the first block, position the cursor to N and key in as follows (in EDIT and PROG modes):

Oxxxx ; N1 ALTER

- (3) Storing a program with program numbers changed I

To register a program with a program number different from the one punched on tape, perform the following operations.

- a. Select the EDIT mode.
- b. Depress the PROG key.
- c. Set the NC tape to the tape reader or the external equivalent equipment.

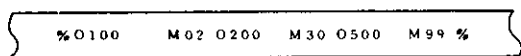


- d. Depress the RESET key.
- e. Key in "O" and PROGRAM NUMBER.
- f. Depress the IN key.
The program number entered from the key is registered in preference to the program number punched on the tape. At this time, the program number on the tape is written to the part program memory simply as a label.
M02 ;, M30 ; or M99 ; is read and the storing operation is completed.

NOTE

- 1. If a program is stored with a changed program number as described above, the program number punched on the tape is stored in the part program memory without change. Consequently, to avoid the confusion in the later handling, replace the program number in the part program memory with changed program number by the EDIT operation.

- (4) Loading part programs from a tape
 - a. Select EDIT mode.
 - b. Depress the PROG key.
 - c. Load the NC tape to the tape reader or an equivalent external device.



The tape stops to travel here. The tape stops to travel here.
The tape stops to travel here.

- d. Depress the RESET key.
- e. Depress the IN key.
Then the system starts to read the tape and enlists the program number punched on the tape as the first record. The system checks for duplication of program number as described in (2).

The tape reader stops each time it has read "M02 ;," "M30 ;," or "M99 ;,."

- f. Depress the IN key again.
The tape reader resumes to read the tape. Repeat this operation until all programs are loaded.

(5) Storing a program with program numbers changed II

When "O" key is depressed and program number is keyed in before depressing IN key as described in (4) above, the keyed in program number is registered in preference to the program number punched on the NC tape.

(6) Loading programs continuously

Programs existing on a tape as shown in (4) may be loaded continuously without interruption. For this purpose, depress "O," "-", "9," "9," "9," and "9" before the first depression of the IN key. The tape reader stops at the position of "%."

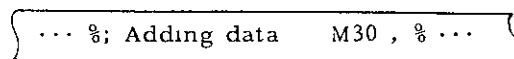
4.5.2 MAKING ADDITION TO A PART PROGRAM

Perform the following operation to add data to a part program which is already loaded.

- a. Select EDIT mode.
- b. Depress the PROG key
- c. Depress the O key then enter the part program number and depress the key.

The system searches the designated program.

- d. Load the tape of adding data to the tape reader.



- e. Depress the RESET key.
- f. Depress the NEXT and IN keys in this order.
The data will be read from the tape into the memory.

NOTE You cannot add data to a program from the middle of it. If necessary, delete the last part of the program by editing operation and perform this adding.

4.5.3 LOADING PART PROGRAMS BY MDI

Part programs may be loaded manually. Perform the following.

- a. Select EDIT mode.
- b. Depress the PROG key
- c. Depress the RESET key.
- d. Depress the O key then enter the part program number and depress the WR key

The designated program number will be registered. If this number already exists, "ALREADY IN" blinks and, in this case, it is required to delete the registered program number.

- e. Write the part program by operating the address key and the data key. As shown in the figure below, the keyed in data is displayed on the bottom line from left to right sequentially. The maximum number of characters that can be written at a time is 32. Within this limit, data may be keyed in over multiple words or blocks. However, when the 10th character is keyed in, the normal display shown to the right of the line is blanked.
- f. Depress the INSRT key.
The keyed in data is stored in the part program memory.
- g. Repeat the operations of e. and f. above to write the part program. The program edit operation is enabled by the use of ERS, INS, and ALT keys during this program storing operation.

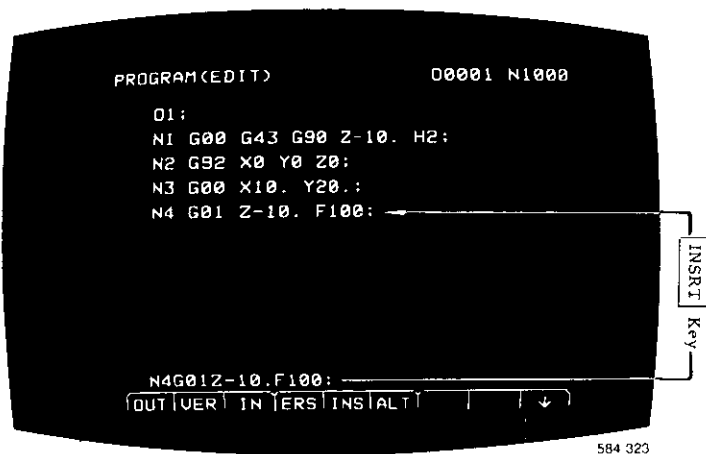


Fig. 4.33 Loading Part Programs by MDI

- h. Key in M02 ;, M30 ,, or M99 ; and depress INS key. This completes the storing of the part program.

4.5.4 DISPLAY OF REGISTERED PROGRAM NUMBER

This screen displays all registered program numbers and the number of remaining characters in the part program memory

- (1) The number of program numbers that can be registered depends on options

Table 4.3.9.1

No.	Max. Number of Programs	Type	Program No. Table
1	99	Basic	01 to 02
2	199	Option 1	01 to 04
3	999	Option 2	01 to 19

- (2) All program numbers already registered are displayed. By depressing > or < key, the page shown below may be obtained.

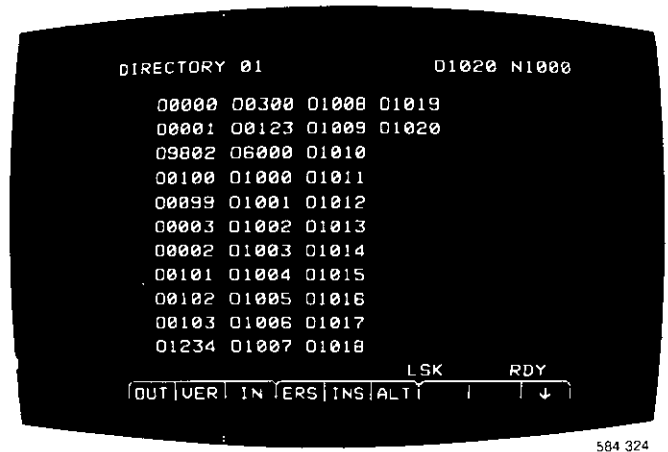


Fig. 4.34 Display of Registered Program Number

Note: This screen displays only the registered program numbers. A program number is registered by depressing the PROG function key in EDIT mode.

4.6 EDIT

4.6.1 PART PROGRAM DISPLAY

Stored program contents can be displayed, and checked by the operator.

Part Program Call

1. Select the EDIT mode.
2. Depress the RESET and PROG keys.
3. Input the program number with ADDRESS 0 and depress the $\square \vee$ key.

The specified program number will be searched and the data of 10 lines from the beginning of program will be displayed on the CRT. If the program number is not found by searching, "NOT FOUND" will flicker. The display will be reset by depressing the CAN key.

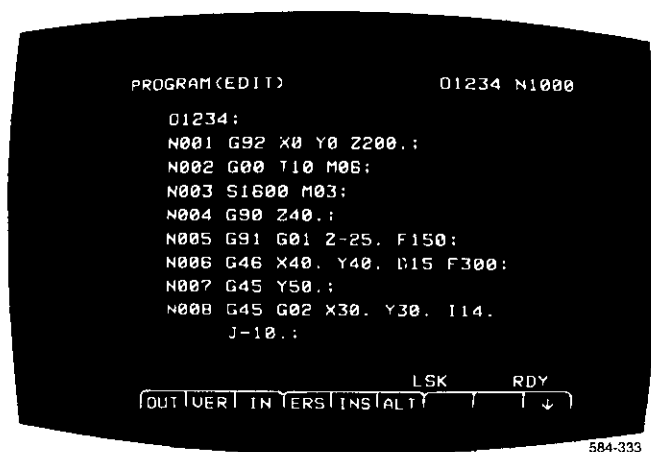


Fig. 4.35 Part Program Display

Operation of PAGE and CURSOR key

1. Page keys $\square <$ or $\square >$ respectively advances and returns by one page.
2. CURSOR keys $\square \wedge$ or $\square \vee$ respectively moves the CURSOR after and before a word.

Operation in the MEM mode

Searching can be performed in the MEM mode. However, page and cursor cannot be moved by

$\square \wedge$, $\square \vee$, $\square >$ or $\square <$ keys.

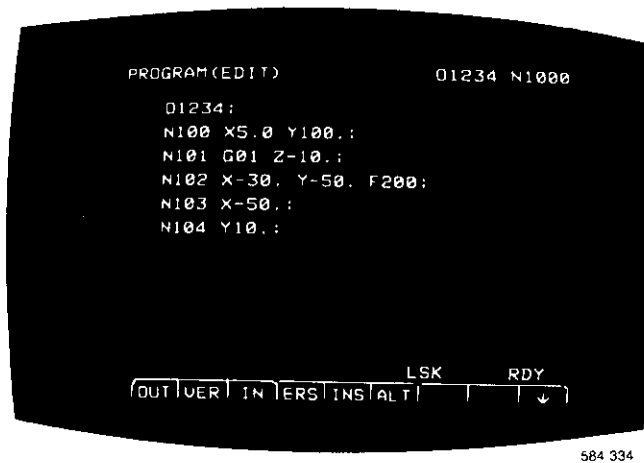
4.6.2 DELETING PART PROGRAM BLOCK

Part programs can be deleted using PROG keys in the EDIT mode.

Deletion of Words

Move the CURSOR to the word to be deleted and depress the ERASE key. The CURSOR-indicated word will be deleted.

Before Deletion



After Modification: F200 Erased

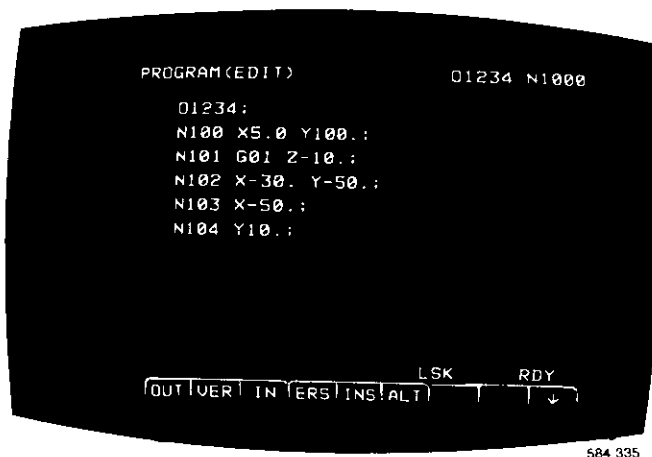


Fig. 4.36 Deleting Part Program Block

4.6.2 DELETING PART PROGRAM BLOCK (CONT'D)

Deletion of Program No.

Enter the program No. with address O and depress the ERASE key. The specified program No. and its part program will be deleted.

Deletion of All the program numbers

Input O -, 9, 9, 9, 9 and depress the ERASE key. All the registered program numbers will be deleted. Program No. "0" is registered newly in the form of EOB.

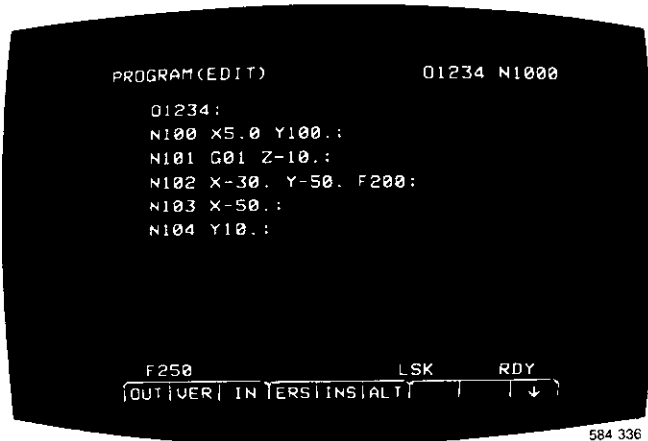
4.6.3 MODIFYING PART PROGRAM BLOCK

Program modification is made using PROG key in the EDIT mode.

Word Modification

Specify the word to be altered with the CURSOR key in the new word, and depress the ALTER key. The new word will replace the CURSOR-indicated word.

Before Modification



After Modification:
F200 changed to F250

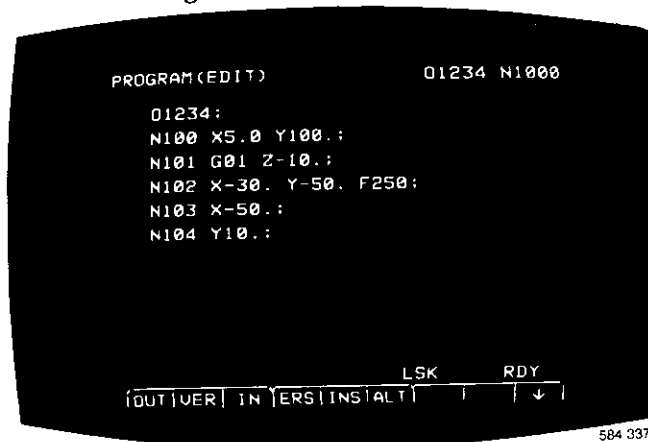


Fig. 4.37 Modifying Part Program Block

Words less than 32 characters can replace one word specified.

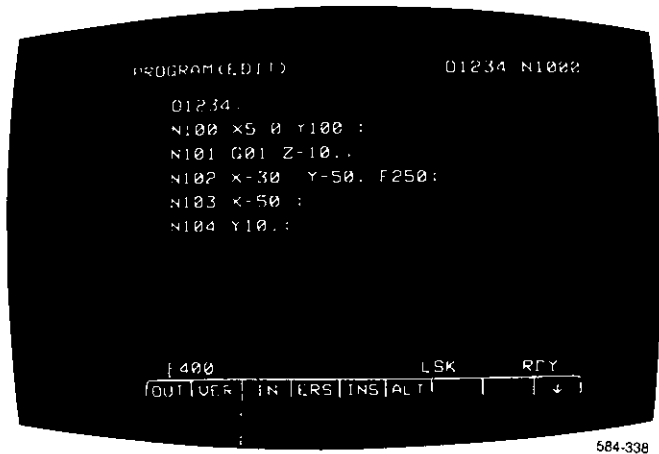
4.6.4 ADDING PART PROGRAM (INSRT KEY)

Programs will be inserted using PROG key in the EDIT mode.

Insertion of words

Specify the word before the word to be added using CURSOR, key in the data to be added, and depress the INSRT key. The new data will be inserted immediately after the word specified by the CURSOR.

Before Insertion



After Insertion:
F400 inserted

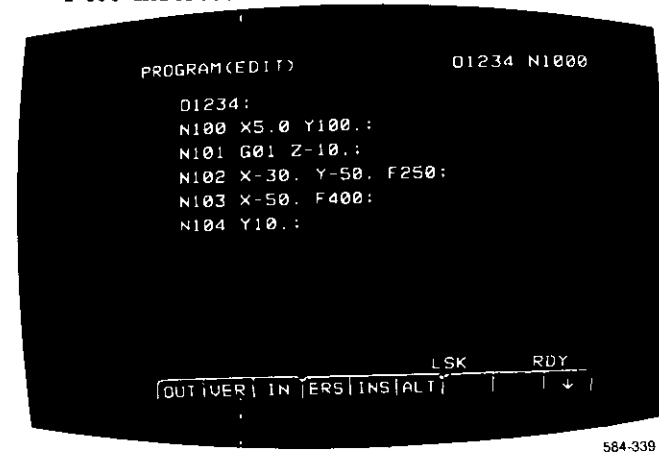


Fig. 4.38 Adding Part Program

After insertion, CURSOR indicates the last word keyed in words less than 32 characters can be inserted as one group.

4.7 SUPPLEMENT TO DATA INPUT / OUTPUT INTERFACE (OPTIONAL)

- (1) Part Programs.
- (2) Tool Offset Amount.
- (3) Setting Data and Parameters.

The external equipment having the designated input/output interface may be attached to the NC to input/output the following NC information.

4.7.1 TYPES AND FUNCTIONS OF INTERFACE

Table 4.1

	1	2	3	4
Name of interface	FACIT4070 Interface	Current Loop Interface(20mA)	RS232C Interface	RS422 Interface
Type of interface	Parallel-Voltage Interface	Serial-Current Interface	Serial-Voltage Interface	Serial-Balanced Interface
Data transmission speed	70 char/s	Parameter setting	Input #6026 Output #6028	Input #6027 Output #6029
Connector (Note)	MR-20MR		DB-25S	DB-37S
Max cable length	5 m	50 m	15 m	100 m
External equipment	FACIT4070 or equipment having equivalent interface	ASR-33 or equipment having current loop (20 mA) interface	Equipment having RS232C interface	Equipment having RS422 interface
Functions	Output the NC data to the external equipment (for punching out NC tape)		<ul style="list-style-type: none"> • Storing NC data into NC memory or collating them. • Outputting NC data to external equipment (punch out) • Automatic operation in the Tape mode 	

Note The types of the connector on the NC side. For the mating connectors to this connector, use the following MR-20F, DB-25P, DB-37P

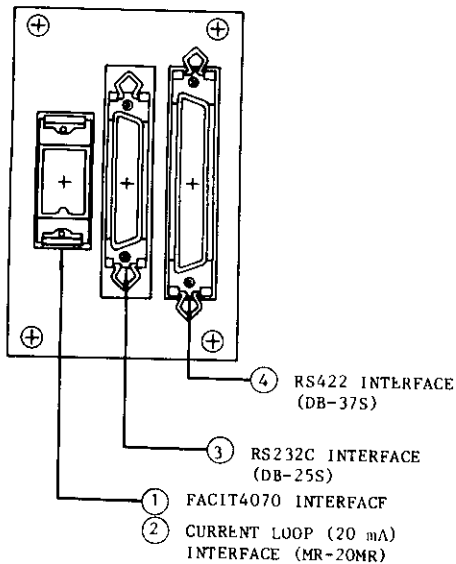


Fig. 4.39 Data I/O Interface Receptacles in Control Cabinet

4.7.2 SETTING OF DATA INPUT / OUTPUT INTERFACE TO BE USED

To use data input/output interface, it is necessary to set which interface is to be used. Make this setting as follows:

- (1) Setting of Data Input Interface to Be Used

IDVCE1 (#6003, D1)	IDVCE0 (#6003, D0)	Data Input Interface to be used
0	0	PTR Interface (Note)
0	1	RS232C Interface
1	0	RS422 Interface

Note: PTR interface is for the standard tape reader. Usually, this interface is set.

4.7.2 SETTING OF DATA INPUT/OUTPUT INTERFACE TO BE USED (CONT'D)

(2) Setting of Data Output Interface to Be Used

ODVCE1 (#6003, D5)	ODVCE0 (#6003, D4)	Name of Interface
0	0	FACIT4070 Interface
0	1	Current Loop Interface RS232C Interface
1	0	RS422 Interface

4.7.3 SETTING OF BAUD RATE AND OTHERS OF SERIAL INTERFACE

To use serial interface (current loop, RS232C, or RS422), it is necessary to set the baud rate, stop bit length, and control code transmission specification to parameters.

(1) Current Loop or RS232C Interface

As shown below, the data is set for input and output combined or separately.

#6028 D6

- 0 ... Data is set for input and output combined.
- 1 ... Data is set for input and output separately

a. Setting of Baud rate

	Input and Output in Common	#6026D3	#6026D2	#6026D1	#6026D0
	Input	#6026D3	#6026D2	#6026D1	#6026D0
	Output	#6028D3	#6028D2	#6028D1	#6028D0
Baud Rate	50	0	0	0	0
	100	0	0	0	1
	110	0	0	1	0
	150	0	0	1	1
	200	0	1	0	0
	300	0	1	0	1
	600	0	1	1	0
	1200	0	1	1	1
	2400	1	0	0	0
	4800	1	0	0	1
	9600	1	0	1	0

b. Setting of stop bit length

Input and Output in Common	#6026D4	= 1: Stop bit as 2 bits = 0: Stop bit as 1 bit
Input	#6026D4	
Output	#6028D4	

c. Setting of control code transmission designation

Input and Output in Common	#6026D5	= 1: Does not send out control code = 0: Sends out control code
Input	#6026D5	
Output	#6028D5	

(2) RS422 Interface

As shown below, the data is set for input and output combined or separately.

#6029 D6

- 0 ... Data is set for input and output combined.
- 1 ... Data is set for input and output separately.

a. Setting Baud Rate

	Input and Output in Common	#6027D3	#6027D2	#6027D1	#6027D0
	Input	#6027D3	#6027D2	#6027D1	#6027D0
	Output	#6029D3	#6029D2	#6029D1	#6029D0
Baud Rate	50	0	0	0	0
	100	0	0	0	1
	110	0	0	1	0
	150	0	0	1	1
	200	0	1	0	0
	300	0	1	0	1
	600	0	1	1	0
	1200	0	1	1	1
	2400	1	0	0	0
	4800	1	0	0	1
	9600	1	0	1	0

b. Setting Stop Bit

Input and Output in Common	#6027D4	= 1. Stop bit as 2 bits
Input	#6027D4	= 0. Stop bit as 1 bit
Output	#6029D4	

c. Setting Control Code Sending

Input and Output in Common	#6027D5	= 1. Does not send control code
Input	#6027D5	= 0: Sends control code
Output	#6029D5	

Notes:

1. Some controls do not allow the switching between the setting types by #6028D6 but are fixed to the type in which data is set for input and output combined.
2. Set the baud rate and stop bit length according to the specifications of the input/output equipment to be used.
3. The start and stop signals to be sent from the NC to the input/output equipment after pressing IN, VER, or OUT key are called "control codes." If the specifications of the input/output equipment do not allow the acceptance of the control codes, set the parameter for control code transmission designation to "1" (not send). In this case, it is necessary to press IN, VER, or OUT key on the NC side then start/stop the input/output equipment manually.

4.7.4 CABLE CONNECTOR SPECIFICATIONS

The specifications of the cable connectors for data input/output interface are as shown in Tables 4.7.10 through 4.7.14. These specifications depend on the external equipment to be used and are therefore listed in this publication for reference purpose only. Refer to the manual of the external equipment.

Table 4.2 FACIT4070 Interface Connecting Cable

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

↑ Note

Note: The pin numbers at the time the external equipment is FACIT 4070 and its plug-in connector is DB-25P

**4.7.4 CABLE CONNECTOR SPECIFICATIONS
(CONT'D)**

**Table 4.3 Current Loop (20 mA)
Interface Connection Cable**

NC (MR-20F)			Connections	External Equipment	
Symbol	Signal Name	Pin No.		Pin No.	Symbol
		1			
	Not Used	2			
		4			
		5			
+6 V	FACTIT/ ASR. Auto- selection	5			
TTY2	Current loop (-)	6			
TTY1	Current loop (+)	7			
0 V	GROUND	8			
		9			
	Not Used	10			
		20			

(Note 2)

Notes:

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

**Table 4.4 RS232C Interface
Connecting Cable (A)**

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

Note When the external equipment does not control the CS (Capable of Sending) signal given to NC, short-circuit pins RS and CS on both ends of the cable as shown in Table 4.7.13.

**Table 4.5 RS232C Interface
Connecting Cable (B)**

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

Table 4.6 RS422 Interface Connection Cable

NC (DB-37P)			Connections	External Equipment	
Symbol	Signal Name	Pin No.		Pin No	Symbol
SHIELD	Shield	1			
	Not used	2			
	Not used	3			
SD	Sending data	4			SD
	Not used	5			
RD	Receiving data	6			RD
RS	Request sending	7			RS
	Not used	8			
CS	Capable of sending	9			CS
	Not used	10			
	Not used	11			
ER	NC ready	12			ER
DR	I/O device ready	13			DR
		14			
	Not used	15			
		18			
SG	Signal grounding	19			
	Not used	20			
	Not used	21			
*SD	Sending data	22			*SD
	Not used	23			
*RD	Receiving data	24			*RD
*RS	Request sending	25			*RS
	Not used	26			
*CS	Capable of sending	27			*CS
	Not used	28			
	Not used	29			
*ER	NC ready	30			*ER
*DR	I/O device ready	31			*DR
	Not used	32			
		37			

Table 4.7 RS232C Interface Connection Cable (B)

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

4.7.5 OPERATIONS USING DATA INPUT/OUTPUT INTERFACE

The use of data input/output interface allows the following operations and runs

- (1) The input/output operations of tool offset amounts, setting data, and parameter data and the output operations (punch out) of part programs. For details, see 4.4 TAPE INPUT/OUTPUT OPERATIONS OF NC DATA.
- (2) The storing of part programs into memory. For details, see 4.5 LOADING PART PROGRAMS INTO MEMORY.
- (3) Tape-verification of part programs, tool offset amount, setting data, and parameter data. For details, see 4.8 TAPR VERIFYING.
- (4) Automatic run in tape mode.

The control may be automatically run in tape mode not via the tape reader on the machine but via the data input/output interface. For details, see 7.6 OPERATION IN TAPE AND MEMORY MODE.

4.8 TAPE VERIFYING

The punched tape may be compared to the contents of the NC internal memory to check if they match.

- Part program
- Tool offset data
- Setting data and parameter

The punched tape is entered through the NC tape reader or the data input/output interface (option) For the methods of setting the input/output equipment (setting #6003) and the baud rate (parameters #6026 through #6029), refer to 4 9 DATA INPUT/OUTPUT INTERFACE. The following description is made assuming that this option is installed

4.8.1 SETTING AND PARAMETER TAPE VERIFYING

1. Select "1" of system No switch.
- 2 Set the MODE SELECT switch to the EDIT.
3. Depress PRM function key.
- 4 Depress RESET key
5. Load the NC tape via tape reader
6. Depress VER key.
Tape starts, and the contents of tape and the contents of setting/parameter are verified. "VER" is blinks on the CRT.
If disagreement with the tape data is detected, "INPUT ERROR" blinks on the CRT.
- 7 After completion of verifying without disagreement, tape reader stops and "VER" disappears.

4.8.2 TOOL OFFSET VALUE TAPE VERIFYING

- 1 Set the MODE SELECT switch to the EDIT.
- 2 Depress OFS function key.
3. Depress RESET key.
4. Load the source tape via tape reader.
5. Depress VER key
Tape starts, and the contents of tape and the contents of tool offset values are verified. If disagreement with the tape data is detected, "INPUT ERROR" blinks on the CRT.
- 6 After completion of verifying without disagreement, tape reader stops and "VER" disappears.

4.8.3 VERIFYING PART PROGRAM TAPE

- (1) Verifying a part program tape having program number
 - a. Select the EDIT mode.
 - b. Depress the PROG function key.
 - c. Set the part program tape to the tape reader.
 - d. Depress the RESET key.
 - e Depress the VER key.

The tape is started to compare the contents of the part program memory to the contents of the part program tape. During this operation, "VER" blinks. If a mismatch is found, "INPUT ERROR" is displayed blinks on the CRT.

When a match is found and this operation is completed, the tape reader stops, upon which "VER" display is erased.

Note By the operation of "RESET, VER," the verifying feature verifies the data from the tape head to % code

- (2) Verifying a part program tape having no program number
 - a. Select the EDIT mode
 - b. Depress the PROG function key.
 - c. Set the part program to the tape reader.
 - d. Depress the RESET key.
 - e. Depress the "O" key and key in program number
 - f. Depress VER key.

The tape starts to compare the contents of the part program memory to the contents of the part program tape. During this operation, "VER" keeps blinking. If a mismatch is found, "INPUT ERROR" is blinks on the CRT. When a match is found and this operation is completed, the tape reader stops, upon which "VER" display is erased. If the keyed in program number is not found in the memory, "NOT FOUND!" blinks. In this case, depress the CAN key and start with the operation of d.

NOTES:

1. The operations for verification with a program number different from the program number punched on the tape are the same as those of (2) above. The keyed-in program number is processed in preference to the punched program number.
2. Verification by the operation of "Oxxxx VER" regards the punched information as the information on the keyed-in program number. Hence, when verifying a tape containing program numbers, no program number should be keyed in.
- (3) Verifying a tape containing multiple part programs

Multiple part programs punched in a single tape are continuously verified by the following operations:

- a. Select the EDIT mode.
 - b. Depress the PROG function key.
 - c. Set the part program tape to the tape reader.
 - d. Depress the RESET key.
 - e. Depress the VER key.
- When M02, M30, or M99 is read, the tape reader does not stop but all the part programs are continuously verified up to % code. When the verification is completed, the tape reader stops at the position of % code.

4.8.4 SUMMARY OF EDITING OPERATION

Operation		Edit Lock	System No Switch	Mode	Function	Procedure		
Parameter	Storing from NC operator's panel keyboard		1	EDIT	PRM	Parameter number → <input type="text"/> CURSOR Data → <input type="text"/> WR		
	Storing from tape (Note 4) (Note 6)		1			RESET → IN		
	Punch out (Note 3)					<input type="text"/> RESET → <input type="text"/> OUT		
	Matching with tape (Note 4)					<input type="text"/> RESET → <input type="text"/> VER		
Setting	Storing from NC operator's panel keyboard			EDIT	SET	Setting number → <input type="text"/> CURSOR Data → <input type="text"/> WR		
	Storing from tape		1			RESET → IN		
	Punch out					<input type="text"/> RESET → <input type="text"/> OUT		
	Matching with tape					<input type="text"/> RESET → <input type="text"/> VER		
Offset	Storing from NC operator's panel keyboard			EDIT	OFS	Offset number → <input type="text"/> CURSOR Data → <input type="text"/> WR		
	Storing from tape					RESET → IN		
	Punch out					<input type="text"/> RESET → <input type="text"/> OUT		
	Matching with tape					<input type="text"/> RESET → <input type="text"/> VER		
	Clear of all offsets					<input type="text"/> O → -9999 → <input type="text"/> ORG		
Part program	Storing from tape	One part program	Tape with number 0	OFF	EDIT	PROG	<input type="text"/> O → Program number → <input type="text"/> WR Repeat of edit operation "addition of address data"	
			Tape without number 0	OFF			RESET → <input type="text"/> O → Program number → <input type="text"/> IN	
		All part programs on tape	OFF	RESET → <input type="text"/> O → -9999 → <input type="text"/> IN				
		Addition to registered part program	OFF	RESET → <input type="text"/> NEXT → <input type="text"/> IN				
	Punch out	Designated part program						RESET → <input type="text"/> O → Program number → <input type="text"/> OUT
		All part programs						RESET → <input type="text"/> O → -9999 → <input type="text"/> OUT
	Matching with tape	One part program	Tape with number 0					RESET → <input type="text"/> VER
			Tape without number 0 (Note 1)					RESET → <input type="text"/> O → Program number → <input type="text"/> VER
		All part programs on tape						RESET → <input type="text"/> VER
	Edit	Modify of address data (Note 2)		OFF				<input type="text"/> CURSOR (Set to address data to be modified) → Address data → <input type="text"/> ALTER
		Add of address data (Note 2)		OFF				<input type="text"/> CURSOR (Set to address data just before addition) → Address data → <input type="text"/> INSRT
		Delete of one address data		OFF				<input type="text"/> CURSOR (Set to address data to be deleted) → <input type="text"/> ERASE
		Delete of one block (Note 5)		OFF				<input type="text"/> CURSOR (Set to address data at head of block to be deleted) → <input type="text"/> EOB → <input type="text"/> ERASE
	Address search						TAPE MEM EDIT	Address data to be searched → <input type="text"/> CURSOR
	Clear	Designated part program		OFF			EDIT	<input type="text"/> O → Program number to be searched → <input type="text"/> ERASE
All part programs on tape		OFF		<input type="text"/> O → -9999 → <input type="text"/> ERASE				

Notes

- 1 Storing of a part program having a program number different from program number 0 on tape is performed by the same operation as for "tape without program number 0"
- 2 Within the limit of 32 characters, addition of multiple address data and the change to one address data are permitted
- 3 Setting is punched out at the same time

- 4 If the tape contains setting information, it is also stored and matched at the same time
- 5 When the cursor to the address data in the middle of a block and EOB and ERASE keys are depressed, the data following the cursor position is deleted
- 6 When data has been stored from a parameter tape, turn the power on and off

**APPENDIX COMPARISON OF OPERATION KEYS
BETWEEN 9" AND 14" CRT DISPLAYS**

9" CRT Display	14" CRT Display	Key Name	
		Alarm	Function Key
		Diagnosis	
		Parameter	
		Setting	
		Command	
		Program	
		Position	
		Offset	
		Out	
		Verify	
		In	Tape Start Key
		Erase	Edit Key
		Insert	
		Alter	
		Reset key	
		Next	

9 CRT Display	14" CRT Display	Key Name	
		Previous page	Cursor Key
		Next page	
		Cursor backward	
		Cursor forward	
		Home key	
		Address	Address Key and Data Key
		Slash	
		End of block	
		Numerals	
		Minus	
		Decimal point	
		Cancel	
		Shift	
		Write	
		Menu key	

FOR MACHINING CENTER CNC

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WITH 14" CRT CHARACTER DISPLAY OPERATOR'S MANUAL



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