

NUM 750 F-MX

OPERATOR MANUAL

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NUM 750 F
OPERATOR'S MANUAL

Updating to index C

Complies with 750 F softwares to index J

IMPORTANT NOTE:

Some functionalities described herein may not be offered by your system, if the option concerned does not form part of the installed configuration, or if the functionality does not exist in the product version (in particular, version E products).

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NOTES

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NOTES

1.1 - CONTROL PANEL DESCRIPTION

The CNC NUM 750F is operated from controls situated on the CNC control panel and on the machine control panel.

These controls are grouped in 2 parts:

- to the right:
an assembly of switches and pushbuttons, enabling access to the machine operational procedures,
- to the left:
a keyboard-display assembly enabling access to the programmable controller and to the display of parameters, workpiece programs or machine positions.

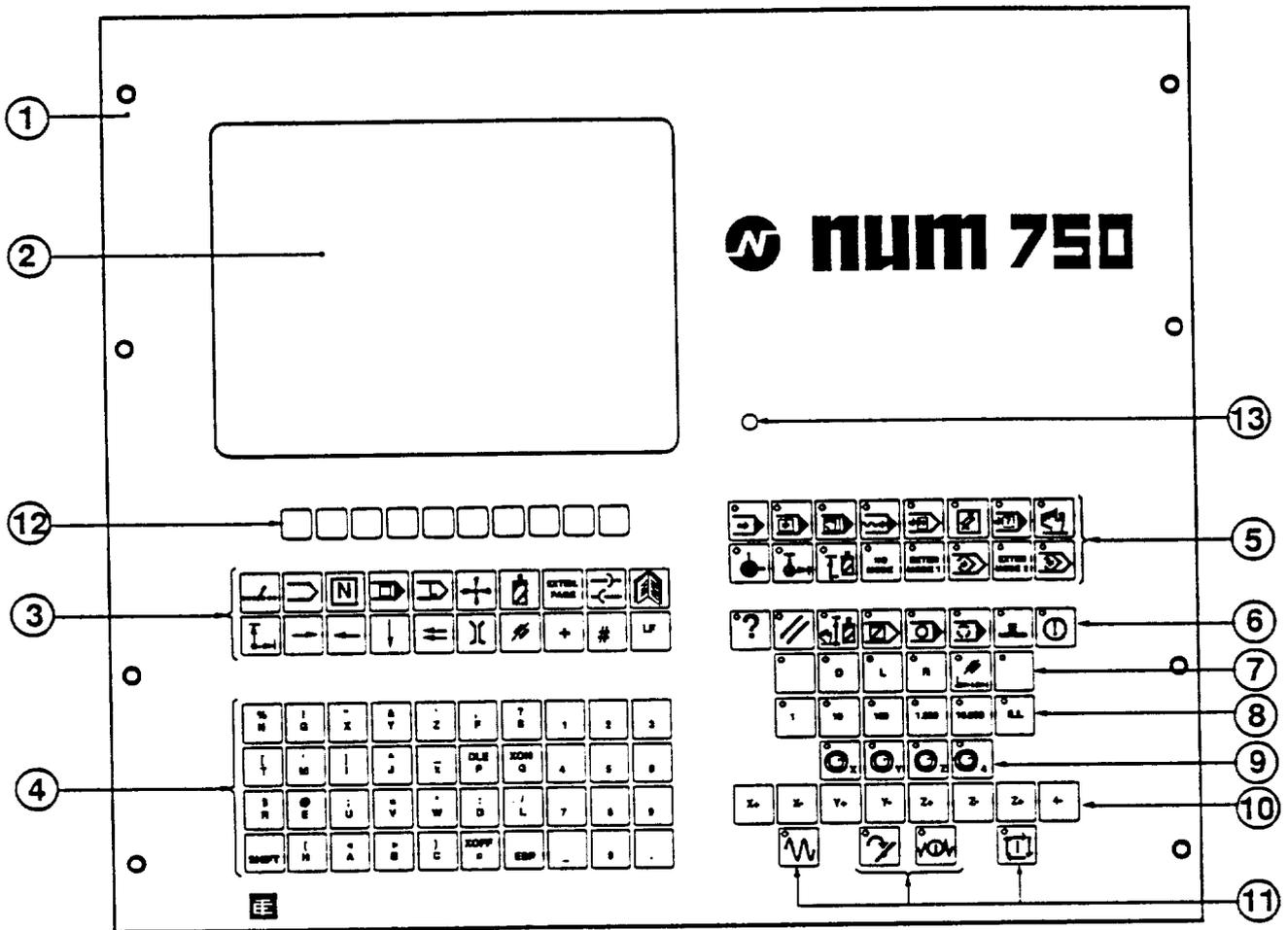
1.2 - SYMBOLS, PANEL, DISPLAY

The control panel comprises

- the pilot lights and their symbols,
- the illuminated pushbuttons and their symbols,
- the switches and their symbols,
- the alphanumeric keyboard,
- the display screen.

It enables communication with the system at the time of the various manipulations, or as the workpiece program proceeds.

NUM 750F CONTROL PANEL
9" or 10" screen

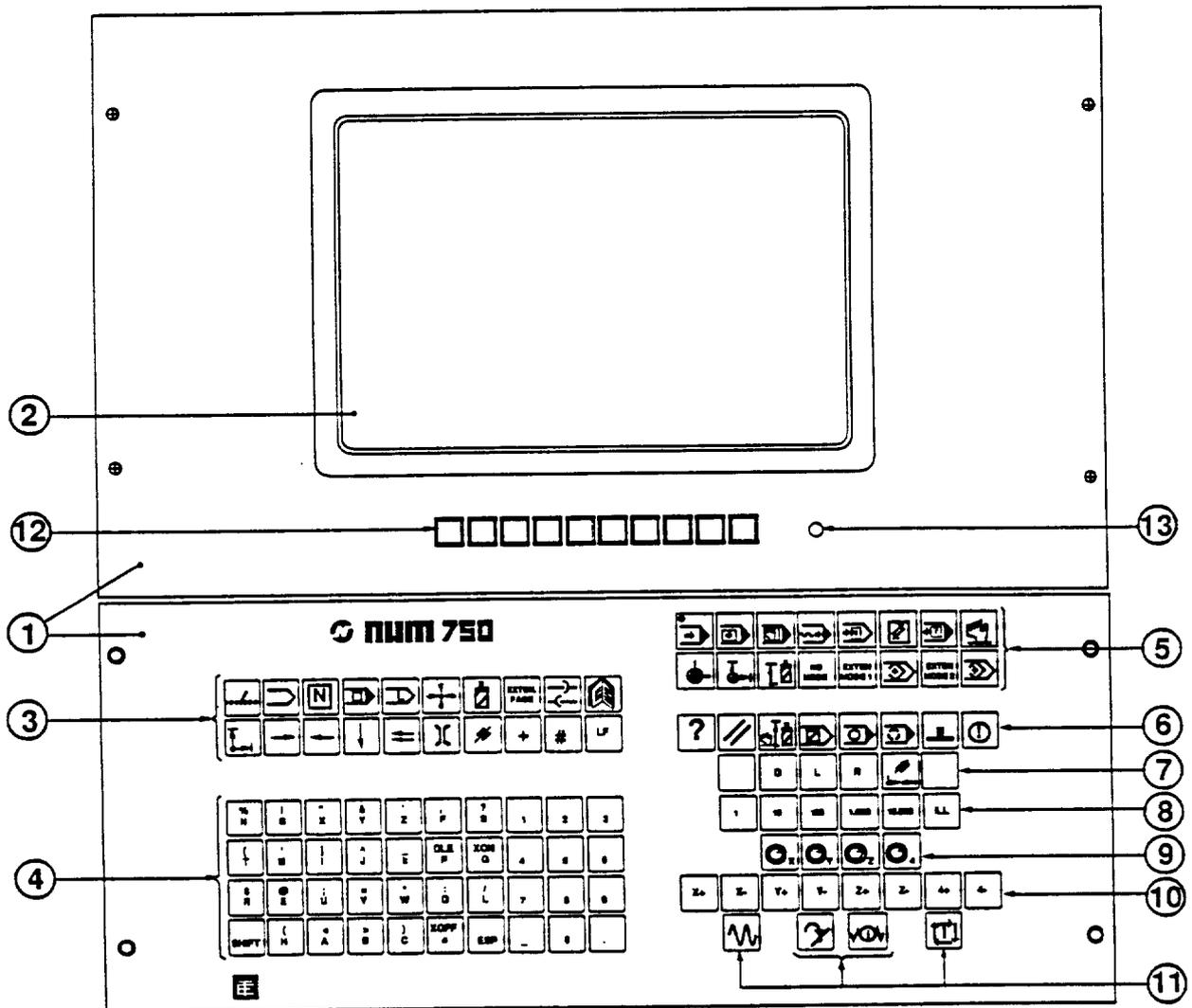


- 1 NC Control panel
- 2 Graphic black and white 9" or color 10" screen
- 3 Page selection and cursor control keyboard
- 4 Alphanumerical keyboard
- 5 Mode selection keyboard
- 6 Miscellaneous function and indicator light keyboard
- 7 Tool wear dynamic compensators
- 8 Manual movement increment selection
- 9 Axis selection controlled by electronic handwheel
- 10 Axis control keys - in manual mode
- 11 Control panel functions
- 12 Software keys for graphics drawing or conversational mode
- 13 Screen brightness potentiometer

NOTE:

The spindle and feed potentiometers and the key-operated selector switch must be mounted on the machine control panel.

NUM 750 F CONTROL PANEL
14" COLOR SCREEN



- 1 NC Control panel
- 2 Graphic color 14" screen
- 3 Page selection and cursor control keyboard
- 4 Alphanumerical keyboard
- 5 Mode selection keyboard
- 6 Miscellaneous function and indicator light keyboard
- 7 Tool wear dynamic compensators
- 8 Manual movement increment selection
- 9 Axis selection controlled by electronic handwheel
- 10 Axis control keys - in manual mode
- 11 Control panel functions
- 12 Software keys for graphics drawing or conversational mode
- 13 Screen brightness potentiometer

NOTE:

The spindle and feed potentiometers and the key-operated selector switch must be mounted on the machine control panel.



- ① - Main control panel (supplied by NUM)
- ② - Display: 9" black and white color (10" or 14") graphic screen
- ③ - Display control keyboard

	- CONTINUED	Continuation of the pages to be displayed.
	- LIST	List of workpiece program(s)
	- PROG	Image of the program being executed
	- IN PROGRESS	All active and modal functions of a block
	- L	Program variables
	- CUR PT	Coordinates of the current point
	- TOOL	Tool dimension and tool compensation
	- PAGE EXTEN	Graphic or conversational display; ISO programming or loading/unloading of work-piece programs while machining
	- INPUTS /OUTPUTS	
	- SERVICE	Communication for interfacing
	- OFFSET	Value of OFFSETS
	- CURSOR TO THE RIGHT	
	- CURSOR TO THE LEFT	
	- ONE PROGRAM STEP ADVANCE	
	- COMMUNICATION LINE ERASURE	
	- INSERTION of characters	
	- CANCELLATION of characters	
	- PLUS	Plus sign
	- REPLACE	The block pointed to in the communication line



- END OF BLOCK

④ - Alphanumerical keyboard

⑤ - Mode choice keyboard



- CONT Continuous execution



- SEQ Block to block execution



- MDI Manual data input



- RAP Rapid program execution



- SNS Sequence no. search



- MODIF Modification



- TEST Workpiece program test



- MANUAL Manual axes control



- MOS Machine origin setting



- SHIFT Origin offsets



- TOOL SET Tool setting



- NO MODE - NEUTRAL MODE Key illuminated on POWER ON



- Not used at present time



- LOAD Program loading into the memory



- Not used at present time



- UNLOAD Program unloading

⑥ - Various keyboard functions and pilot lights

	- FAULT	Fault pilot light
	- RESET	Reset to initial status
	- MAN TOOL	Manual introduction of tool dimensions
	- BLOCK SKIP	Validation of optional block skip
	- OPE	Operator pilot light
	- OPTION STOP	Enables optional stop
	- MIR	Mirror pilot light
	- STOP	External fault pilot light

⑦ - Dynamic compensation of tool wear

	- D	Address of the corrector to be incremented
	- L	Length compensation
	- R	Radius compensation
	-	Address of the corrector to be cancelled

⑧ - Choice of increment in manual shift

1 - 10 - 100 - 1000 - 10000 - ILL

⑨ - Choice of axes controlled by the electronic handwheel in manual mode

⑩ - Axes control keys in manual mode

⑪ - Control panel functions

	- CYS	Cycle start pulse key
	- FEED STOP	Feed stop pulse key
	- AX RECALL	Axis recall pulse key
	- RAP	Selection pulse key for rapid operation manual mode

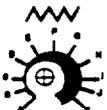
⑫ - Software keys:

These keys are equivalent to those of the first line of the page selection keyboard (3).

These are used for graphic drawing or the conversational mode.

NOTE:

Feed and speed potentiometers and interlock key switches shown below form part of the machine control panels.

-  ⑬ - 0 to 120 % feed rate override potentiometer
-  ⑭ - 50 to 100 % spindle speed override potentiometer
-  ⑮ - Interlocking key switch

-  MODIF LOCK Position forbidding program modifications
-  MODE Position allowing mode changes
-  MODE LOCK Position forbidding any mode change

1.3 - CURRENT PROGRAM DEFINITION

In multiprogramme, for the machining of a workpiece, the current program must be defined to the system, the sub-programs being enabled by the current program.

The latter is defined as being:

- either the last program entered into the memory, from the tape reader or from the keyboard.
- or, the program selected in the LOAD mode , choice of the current program.

Once the current program has been defined, it follows that:

- after RESET  or switching the system on, this program is automatically enabled.
- pressing the MODIF  key displays the program, except if in EEPROM.
- operation of key LIST  displays the list with & preceding % if this is a EEPROM program
- pressing the PROG  key displays the program number if the system is in CONT, SEQ, RAP, TEST and disabled cycle.

1.4 - MODES - GENERAL INFORMATION

1.4.1 - Neutral mode definition

After switching the system on, no mode is initialised. The pilot light of the NO MODE key  lights.

Pressing of the CYCLE key, on the axes jog pushbuttons, or on the alphanumeric keyboard has no effect on the system.

1.4.2 - Mode exclusivities

The modes shown on 5 of page 1.2 are mutually exclusive; two modes cannot be validated simultaneously.

For all these modes, with the exception of CONT, SEQ and RAP, pressing the TOOL MAN  key or the TOOL COMPENSATION  key will return the system to the neutral mode .

The TOOL MAN and TOOL COMPENSATION  keys cannot be enabled together, but can be enabled simultaneously with either the CONT or SEQ or RAP modes.

1.4.3 - Mode change during execution

Once a mode has been selected and a new mode is requested, the pilot lights for both modes flash (shorter time for the requested mode). The new mode will be enabled only at the end of the cycle in progress or at the end of a block, if the system is in the CONT mode.

If the system is not initialised, i.e. origin setting (MOS) not carried out, it is possible to select the CONT, SEQ, MDI or RAP modes; the pilot light corresponding to the chosen mode lights fixed while the FAULT light flashes.

1.4.4 - Interference between modes and display pages

The choice of the mode or the choice of the page displayed are independent of each other. Conversely, the choice of the mode can interfere with the page displayed and vice versa.

If the mode selected is MODIF, LOAD or UNLOAD, and CYCLE is not active page changing will return the system to neutral mode



Choice of the MODIF mode  causes the current program to be displayed whatever the page enabled. Except for LOAD and UNLOAD, if a new mode is selected the CUR PT page is displayed.

Choice of the SHIFT mode  forces the page OFFSET 2 . The page can only be changed after carrying out a mode change.

NOTE

If the system is in the graphic display or conversational modes no other page can be selected (current point, program in progress, program variables etc...).

2 - STARTING THE SYSTEM

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2.2 - EMERGENCY STOP	2-3
2.3 - OPERATION MONITORING ON SWITCHING ON	2-3

NOTES

Starting the system consists of switching it on and analysing its status with the help of information displayed on:

- the control panel (pilot lights or pushbuttons switched on or off).
- the display screen (access to all pages and to the communication system).

NOTE:

Control of the machine-tool/system CNC and the procedures which result from it are defined and carried out by the machine manufacturer who must supply 220 V mains to the CNC and follow an operational procedure.

2.1 - SWITCHING ON

- General switching on of power
- Switching the CNC on (RESET is done automatically),
- Switching the machine power on.

NOTE:

After switching the CNC off and on, all machining parameters (offsets, tool compensations, etc...) remain stored in the memory, but the axis positions are lost.

2.2 - EMERGENCY STOP

An emergency stop provokes power disconnection of the machine drives, the CNC remains switched on and the measurement initialized.

Before re-applying the power, a RESET must be carried out at the CNC control panel (cancelling the following error and the dimensions requested).

2.3 - OPERATION MONITORING ON SWITCHING ON

- Visual monitoring of the pilot lights
- Automatic monitoring of the CNC.

NOTES

3 - COMMUNICATION SYSTEM OPERATION

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3.2 - COMMUNICATION.....	3-5

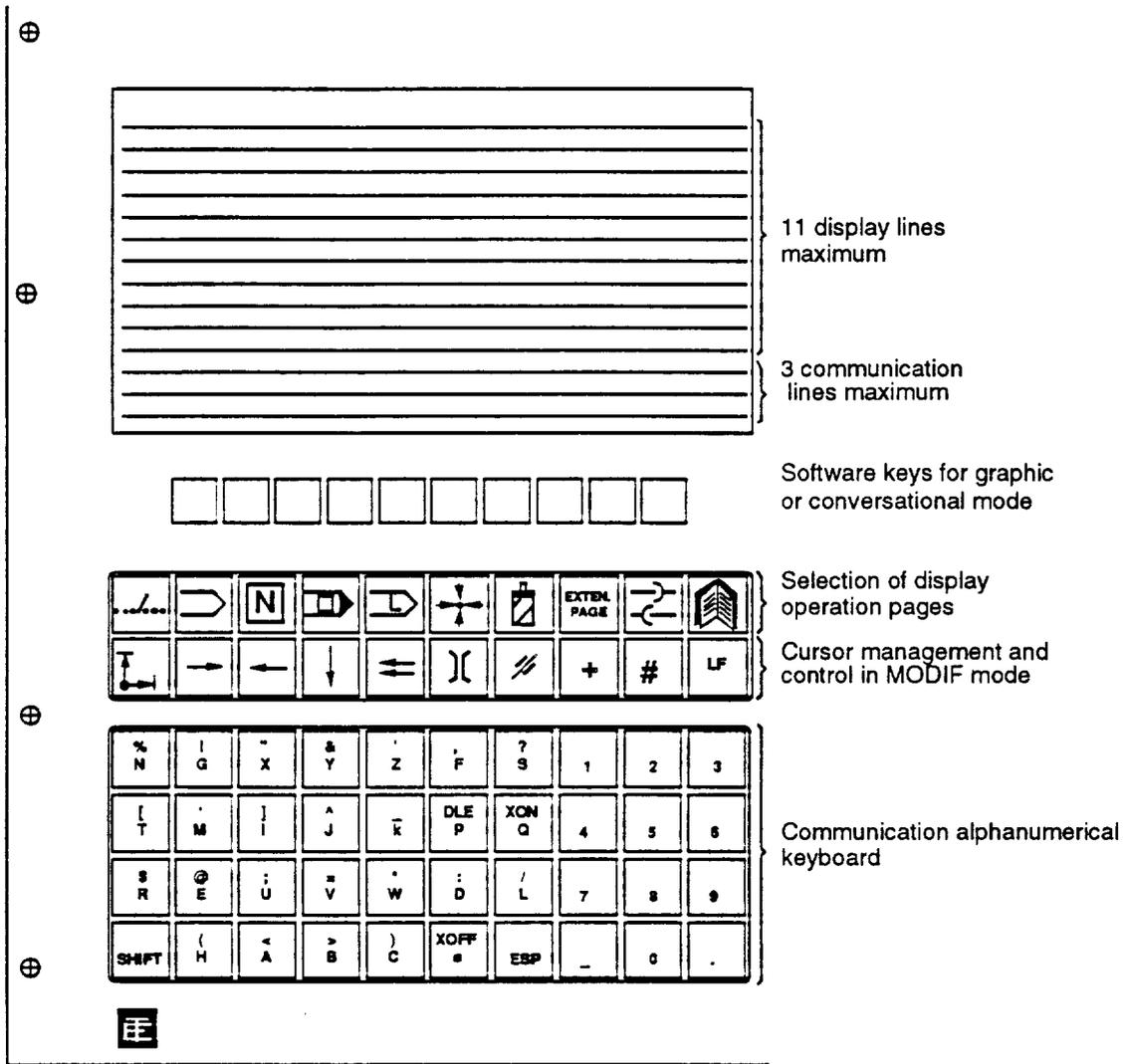
NOTES

The communication system consists of a display screen and an alphanumeric keyboard which allows communication with the system.

The communication system is used in conjunction with the control modes and enables:

- manual data inputs MDI
- workpiece program modifications MODIF
- sequence number searches SNS
- machine origin offsets OFFSETS
- tool table inputs MAN TOOL
- tool dimension settings TOOL SET
- keying in workpiece programs and monitoring their content on the screen LOAD

3.1 - KEYBOARD/DISPLAY SCREEN



- Each line can contain 40 alphanumerical characters.
- Generally, a data page occupies the first 11 lines.
- Depending on the length of the message the data composed on the keyboard by the operator is displayed on lines 10 - 11 and 12 of the screen.
- If the communication occupies 2 or 3 lines, the data written by the system on lines 10 and 11 is replaced temporarily by data composed by the operator.
- The system always maintains an empty line between the last program display line and the first communication line.

3.2 - COMMUNICATION

Data input through the keyboard with display on the last three lines of the screen is accessible in all modes requiring communication: MDI, MODIF, SNS, OFFSETS, DYNAMIC COMPENSATION, LIST, LOAD, UNLOAD, TOOL SET, MAN TOOL.

The communication lines (parameter input, workpiece program input, modifications, etc...) can be corrected at the keyboard at any time before pressing LF, by locating the characters to be modified by moving the cursor (flashing cursor appears at the location at which the character will be displayed: X_).



Movement of the cursor to the right, position by position, the cursor stops on the first position following the last character of the block.



Movement of the cursor to the left, position by position, the cursor stops at the beginning of the first communication line.



Cancellation of character on cursor and block movement to the left.



Creation of a space to add one character. The character presently on the cursor, as well as that part of the block to its right are offset by one position each time the key is pressed. The cursor ceases to flash.

Pressing a character offsets the cursor, as well as everything to the right, by one place to the right, with the character being written in the place vacated by the cursor.

Cancelling this command is done by   



or The cursor recommences flashing.



Erasing the communication line. Should there be an error, or if it is not required to transfer the communication line into the memory, pressing this key erases the whole communication line.



Scrolling the program block by block towards program end, at the pointer > position.



Key enabling the transfer of the communication line into the workpiece program, or transfer of a workpiece program block onto the communication line if it is preceded by #.

If there is nothing on the communication line, pressing this key allows the pointer > to be moved down to the next program block.

NOTES:

- Maintaining the pressure on a key, except for key  , provokes the automatic repetition of its function.
- The character which is cancelled or modified is that above the cursor.
- The character added takes its place above the cursor, which is shifted one space to the right.
- Should there be a syntax error, transfer of the communication line by LF, but the cursor is positioned under the address of the faulty word.

NOTES

4 - DISPLAY SYSTEM OPERATION

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NOTES

The display system consists of a screen and an alphanumeric keyboard which allows communication with the system, or monitoring of the workpiece program progression.

Eleven display functions are provided for this purpose:

	- CONTINUED	Continuation of the pages to be displayed (OFFSETS, LIST, TOOL, MODIF, PROG)
	- LIST	List of the workpiece program or programs
	- PROG	Image of the program being executed
	- IN PROGRESS	All active and modal functions of a block
	- L	Program variables
	- CUR PT	Coordinates of the current point
	- TOOL	Tool dimensions and tool compensations
	- EXTEN PAGE	Graphic display or conversational mode; ISO programming or loading/unloading of work-piece programs while machining
	- INPUTS/OUTPUTS	
	- SERVICE	Interfacing communication
	- OFFSETS DISPLAY	Values of OFFSETS 1 and 2

Operation of the display system is selected in terms of the mode chosen (JOG, MOS, OFFSETS, etc...). It is advisable to refer to the chapters using these modes.

During communication, it is not possible to change to a page other than the page displayed.

NOTE:

For some pages, a particular display line is highlighted (block in progress, No. of errors, etc...).

This highlighting is done by the cursor flashing at the beginning of the line.

4.1 -  LIST

```

% 4 5
N 1 0   T 2 1   M 6
N 2 0   G   X 1 4 2 . 2 3   Y - 3 0   Z 4 5
N 3 0   M 4 1   S 6 5 0   M 4

N 9 0 - - - - -

( & i n ) ( % , % ) ( O R ) ( % ) ( N )

```

This key allows the current workpiece program or other programs in the memory, together with the memory area available and the program size to be read.

It is active in all modes except LOAD and UNLOAD in progress.

If the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, then the current mode is abandoned in favour of the neutral mode (no mode selected).

If graphic display is in progress on the system LIST page cannot be selected.

Pressing LIST key  forces display of the beginning of the current program. A choice offered to the operator registers on the communication line.

If there is no program in the memory, only the communication line appears.

4.1.1- %%

This function enables the programs in the memory together with their size and the first 11 lines of each program stored in the memory to be displayed in accordance with the order in which they were entered.

NOTE:

*If there is no program stored, %% LF causes display of the first 3 or 4 lines depending on the stack allocation with 0 in the used bytes column.
To exit the display, change the page.*

Procedure

- Key in %% LF. Display of program directory:

```

                PROGRAM ZONE IN RAM
                USED      : 37206 BYTES
                AVAILABLE  : 45828 BYTES
                PROGRAM STACK: 2000 BYTES

                % 1200      4884 BYTES  12' 37"
                % 15       1226 BYTES
                % 25       7318 BYTES
                .
                .
    
```

This page informs the operator of the room available for the workpiece programs and of the size of each program. The sum of the two areas cannot correspond to the effective memory area if a utility is present in the system.

- Press CONTINUED  Program directory listing is continued if the number of programs is greater than one page, or the beginning of the first program is displayed.
- Press CONTINUED  Program listing is continued, until end of program is reached, then beginning of the second program is displayed.

When all programs have been displayed, the system returns to the program directory page.

NOTE:

- In the Program Directory page, the cursor  may be moved line by line by key . Pressing key LIST displays the beginning of the program pointed to, then by pressing CONTINUED displays the following sequences of this same program.
- Program %1200 above corresponds to the work-piece machining time without allowing for delays. This display is obtained by running the program in the TEST mode.
- The area used by the program stack is displayed only if a stack reservation has been made (used with symbolic variables).

Reservation of a stack is made in the MDI mode via % (1000) LF and cycle start, 1000 being the number of bytes reserved per stack: in the present case, 1000 for axes and 1000 for graphics. If the size defined is odd, the system takes the next lowest even size.

If the stack defined occupies all the available memory, stack reservation disappears from the page.

4.1.2- %

Key in % xxxx LF in order to choose a program required to be displayed. Pressing CONTINUED  displays, page by page, the complete program.

If the number of the program requested is not in the memory, the message «PROGRAM DOES NOT EXIST» appears on the communication line.

4.1.3 - N

Key in N xxxx LF to provoke a search for the required program sequence. This sequence registers on the 1st line with the continuation of the program on successive lines.

If a search for a sequence in a stored program is desired, key in % xx N xx LF.

NOTE:

If the sequence does not exist, «BLOCK DOES NOT EXIST» appears on the communication line. To erase the message and continue, change the page or select the same page.

4.1.4 - &n

Depending on the system composition, this consists of:

- The basic EEPROMs (6 kbytes) can be optionally extended to 22 K.
- EEPROM extension segment number 1 (128 Kbytes).
- EEPROM extension segment number 2 (128 Kbytes).

Programming %% or %xx, preceded by &n, enables reading of the programs in EEPROM (subroutines or resident programs), if the latter is not hidden; else it provides the program EEPROM numbers only.

The n after & gives the EEPROM extension number: 1 for segment, 2 for segment 2 and nothing for the basic EEPROM.

To list the programs contained in segment 1, write &1%% (LF). The display becomes:

**PROGRAMMED AREA IN EEPROM
IN USE : 19280 BYTES
AVAILABLE : 111784 BYTES**

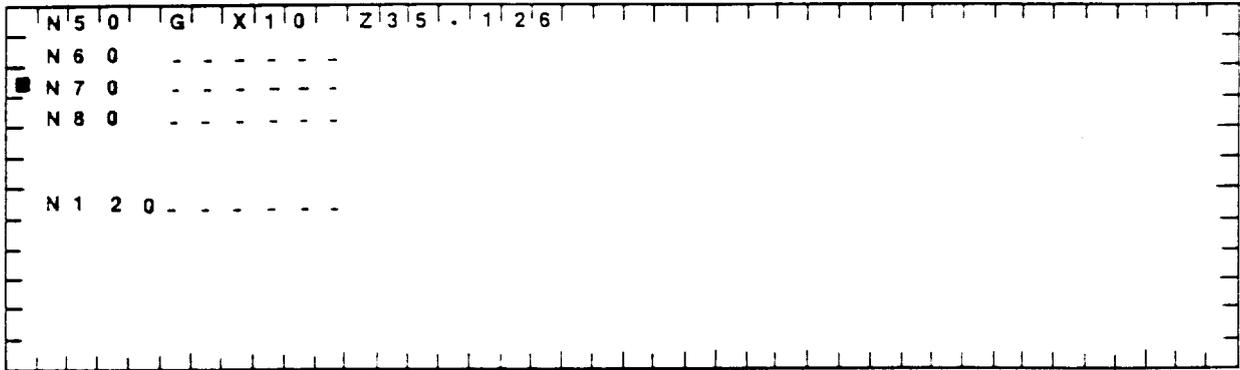
0 1 %	325	11928 BYTES
0 1 %	2312	350 BYTES
0 1 %	26	7002 BYTES

NOTE:

If there is no program in the memory, command & 1 %% results in the display of the top part of this page, with 0 bytes in the in-use field.

The rules mentioned in the above three paragraphs apply to this search.

4.2 -  PROG



This page represents the image of the program field in progress.

It is active in all modes except LOAD and UNLOAD.

If this display is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active. Then this mode is abandoned to the neutral mode (no mode selected). This page is not automatically called by selecting a mode.

If graphic display is in progress on the system, this page cannot be selected.

The cursor marks the block in progress.

When the cursor has arrived at the last block displayed, the screen will automatically refresh during the operation.

Line change is done either at the end of the execution of each block in continuous mode, or as soon as CYCLE start is pressed in sequential (BLK/BLK execution).

If no program is in progress, selection of this page displays the number of the current program (% xx) on the first line.

With each press on this key, if the program is in progress, the first line of the block in progress is displayed.

FAULT light  lit

If the FAULT light comes on, the error number, the faulty block program number and subroutine number are displayed on the last line of the screen.

4.3 -  IN PROGRESS

```

% 1 2 5   N 6 0   G 1   G 1 7   G 9 0   G 4 1   G 5 4   G 9 4   G 9 7   G 8 0
G 7 3   G 1 6 R+   X+ 1 2 . 3 2 4   Y - 2 6 . 1   Z + 0   B + 1 2 8 . 3 9 0
F 1 3 0 0   S 3 0 0   T 2   M 6 4   M 6 6   M 3   M 8   M 4 1   M 4 8

  P R O G   O F F S E T : X + 0   Y + 0   Z + 0   B + 0
  T O O L :   D 8   L + 1 1 2 . 2 5   R + 4 2 . 2 5   @ + 1 . 3
  S P I N D L E :   6 8 %
  M I R R O R S :   X
  
```

This page contains:

- The various subroutine interleavings for the sequence in course, if these exist. For example:

%125	%70	%100	N
Main	1st subroutine	2nd subroutine	Sequence number in course
program			in 2nd subroutine
- modal information of the block to be carried out. This has been programmed in the block in progress and in the preceding blocks, or in the blocks initialised on switching on,
- the offsets programmed,
- the values of the tool dimension corrector used in the block,
- the values of the spindle and feed rate potentiometers,
- the axes in mirror image.

It is active in all modes except LOAD and UNLOAD.

If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, the mode is abandoned to the neutral mode (no mode selected).

If graphic display is in progress on the system, this page cannot be selected.

This page is not automatically called by the choice of a mode.

FAULT pilot light  switched on

If the FAULT light comes on, the error number, the faulty block number, program number and subroutine number are displayed on the first line; the remainder of the text is pushed downwards by one line.

NOTE:

- This action only occurs in CONT, SEQ, MDI, SNS, and TEST modes. In the other modes the display retains the context it had when leaving the last execution mode (i.e. only the lamp gets illuminated).
- When a workpiece message is sent to the display, it appears on the first line (for ex.: «WORKPIECE FINISHING»).

4.4 -  PROGRAM VARIABLES

P R O G R A M V A R I A B L E S			
L	0 =	+ 0 .	L 1 0 = + 0 .
L	1 =	+ 2 4 . 5	L 1 1 = + 0 .
L	2 =	+ 0 .	L 1 2 = + 0 .
L	3 =	+ 0 .	L 1 3 = + 0 .
L	4 =	+ 3 .	L 1 4 = + 0 .
L	5 =	+ 0 .	L 1 5 = + 0 .
L	6 =	+ 0 .	L 1 6 = + 0 .
L	7 =	+ 0 .	L 1 7 = + 0 .
L	8 =	+ 0 .	L 1 8 = + 0 .
L	9 =	+ 0 .	L 1 9 = + 0 .

This page represents the table of program variables from L0 to L19 and L100 to L199 and L900 to L939 and the address table of equivalence. Their values are zero unless changed in CONT, SEQ, SNS and TEST modes in progress or when they are not used in the workpiece program.

It is active in all modes except LOAD and UNLOAD.

If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, this mode is abandoned to the neutral mode (no mode selected). This page is not called automatically by the mode selection.

If graphic display is in progress on the system, this page cannot be selected.

Procedure:

- Pressing PROGRAM VARIABLES key displays variables L0 to L19.
- Pressing CONTINUED key displays variables L100 to L109, CONTINUED, etc...

On arrival at L939, CONTINUED returns the display again to page L100 to L109. To display L0 to L19 again, PROGRAM VARIABLES key must be pressed twice.

NOTE:

Pressing PROGRAM VARIABLES key a second time displays the address table of equivalence which appears as follows:

ADDRESS EQUIVALENCE

@ A = A @ B = B @ C = C @ D = D
 @ E = E @ F = F @ G = G @ H = H

(For the explanation of address equivalences, se Programming Manual).

4.5 -  CUR PT

	CUR	PT / OP	DELTA	FOLLOWING
X	+	4 3 1 . 2 9 2	+	3 . 5 1 8 + 1 2 6
Y	+	3 3 4 . 6 4 6	+	2 8 . 3 6 1 + 3 2 9 3
Z	-	2 4 . 2 4 8	+	0 . + 0
B	+	3 0 . 0 0 0	+	0 . + 0

For each axis, this page contains:

- the absolute dimension of the position; Position < ± 99999.999 mm,
- the distance which remains to be run; To Go < ± 99999.999 mm,
- the following error during movement.

It is active in all modes except LOAD and UNLOAD.

If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, this mode is abandoned to the neutral mode (no mode selected).

If graphic display is in progress on the system, this page cannot be selected.

This page is automatically called by OFFSETS mode or when switching on.

First pressing of CUR PT key, allows the coordinates of the current point to be displayed with respect to the program origin (POSIT/PROG).

Pressing CUR PT key again gives the coordinates of the current point with respect to the measurement origin (POSIT/MACH).

FAULT pilot light  switched on

If the FAULT light comes on, the error number, the faulty block number, program number and subroutine number are displayed on the first line; the remainder of the text is pushed downwards by one line.

NOTE:

- The current point and the distance to go at any time during a movement are continuously monitored.
- When a workpiece message is sent to the display, it appears on the first line (for ex.: «WORKPIECE FINISHING»).

4.6 -  TOOL

D	1	L +	1 2 3 4	.	1 2 3	R +	1 2 3 . 4 5 6	(D)	+	1 2 3 . 4 5 6
D	2	L +	2 3	.	1 8 2	R +	1 3 . 3 2	(D)	+	1 . 2 6 5
D	3	L +	0	.		R +	0 .	(D)	+	0 .
D	4	L +	1 0	.	1 2	R +	8 4 .	(D)	+	0 . 5
D	5	L +	0	.		R +	0 . 0	(D)	+	0 .
D	6	L +	1 1 5	.	9 2	R +	4 6 . 7 8	(D)	+	0 .
D	7	L +	0	.		R +	0 .	(D)	+	0 .
D	8	L +	0	.	2 5 7	R +	0 .	(D)	+	0 .
D	9	L +	0	.		R +	0 .	(D)	+	0 .

This page contains the table of 9 or 10 triplets of tool dimensions, together with tool tip radius opposite the compensator Nos. D.

It is active in all modes, except LOAD and UNLOAD.

If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, the mode is abandoned to the neutral mode (no mode selected).

If graphic display is in progress on the system, this page cannot be selected.

This page is not automatically called by the choice of a mode, but is called on input of a tool dimension.

Pressing TOOL key enables correctors D1 to D9 to be displayed (D0 which always contains 0 is not displayed).

Pressing CONTINUED key  displays the triplets of the 10 following correctors.

By pressing CONTINUED on the last page (D90 to D99, or D250 to D255) the display returns to the first page.

D	1	DL + 9 9 . 8 5 6	DR + 9 9 . 9 9 9	H + 1 2 3 4 5 6 7 8
D	2	DL + 0 . 1 1 7	DR + 0 . 7 8 9	H + 7 8 9 0 0
D	3	DL + 0 .	DR + 0 .	H + 0
D	4	DL + 0 .	DR + 0 . 0 2 7	H + 0
D	5	DL + 0 .	DR + 0 .	H + 0
D	6	DL + 1 . 1 2	DR + 0 . 3 8 5	H + 0
D	7	DL + 0 .	DR + 0 .	H + 0
D	8	DL + 0 .	DR + 0 .	H + 0
D	9	DL + 0 .	DR + 0 .	H + 0

Once TOOL page has been selected, pressing TOOL key  again displays the tool dynamic compensations DL and DR of the 9 or 10 corrector numbers displayed.

Pressing CONTINUED key  enables the following dynamic compensation pages to be read.

If TOOL key is pressed again, tool compensation display is returned.

NOTE:

Function H is used to manage tool wear; for example, the elapsed machining time can cause an automatic tool change.

4.7 -  EXTEN PAGE : GRAPHIC DISPLAY OR CONVERSATIONAL MODE OPTION

```
          G R A P H I C   D I S P L A Y

> 0 G R A P H I C   P A R A M E T E R S
  1 P L A N E   1
  2 P L A N E   1 + 2
  3 T R A C E   W H I L E   C U T T I N G
  4 C O N V E R S A T I O N A L   P R O G R A M M I N G
  5 I S O   P R O G R A M M I N G
  6 P R O G R A M   L O A D I N G
  7 P R O G R A M   U N L O A D I N G

?
```

Pressing this key displays a menu through which selection of graphic operations can be achieved. It allows a graphic trace of any program stored in the memory, and in the case of a machining program in progress, a graphic trace of the tool movements as they occur (item 0 to 3).

This can be used to create, modify and test one or more programs in masked time (item 4).

This page is active in all modes except LOAD and UNLOAD. If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, this mode is abandoned and the neutral mode (no mode selected).

No other page can be selected if a menu heading has been chosen (for example: 1 LF). Graphics display mode must be exited by pressing SERVICE key.

To use this page, see the graphics display chapter for items 0 to 3 or the conversational programming manual for item 4.

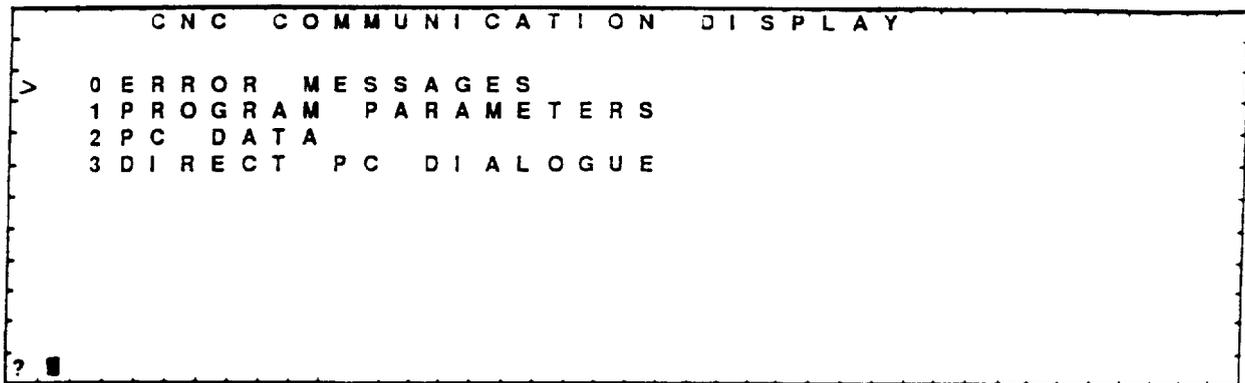
Line 5 enables preparation of an ISO language program while cutting.

Lines 6 and 7 are used to load or unload work-piece programs from a paper tape punch/reader while cutting.

NOTE:

Item 4, conversational programming, is displayed only if the system features this option.

4.8 - INPUTS-OUTPUTS



Pressing this key displays a menu, through which selection of the following operations can be achieved:

- the diagnostics of the machine faults,
- the external parameters (see Programming manual),
- the status of the programmable controller memories,
- information contained in the programmable controller program (e.g.: special tool management table).

The pointer is positioned against selections 0, 1, 2 or 3, to make the corresponding page active. Positioning is done by entering the line number followed by LF.

This page is active in all modes except LOAD and UNLOAD.

If this page is selected when the system is in MODIF, OFFSETS, LOAD or UNLOAD mode and CYCLE is not active, this mode is abandoned to the neutral mode (no mode selected). This page is not automatically called by choosing a mode.

If graphic display is in progress on the system this page cannot be selected.

NOTE:

If the system features option DNC1, pressing the CONTINUED  key displays the following menu:

```
NC INPUT-OUTPUT DISPLAY
> 10 DNC RECORDING - ASCII
  11 DNC RECORDING - HEXADECIMAL
```

When the system is exchanging information with a computer, by means of the DNC level 1 option (loading or unloading of work-piece program or tool dimensions from a computer), this menu allows the characters received or sent by the NC to be monitored (in ASCII or hexadecimal code).

From the index J NC software, it is possible to indicate if the APA 10 link is to be activated (software for microcomputer assisting programmable controller programming) from the «INPUTS-OUTPUTS» page.

- On the keyboard, type 12, then LF. The message «---> APA 10 link active <---» is displayed. To deactivate the APA 10 link, type 13, then LF. The message disappears.

NOTE:

The link is automatically deactivated when the LOAD or UNLOAD modes are activated.

4.8.1 - Diagnostic messages

```
                E R R O R   M E S S A G E S
2   H Y D R A U L I C   F A U L T
1 1 T U R R E T   N O N   I N D E X E D
```

When the page is activated (see paragraph 4.8), the above display appears.

If no machine fault is present, message no. 0 or a no fault message is displayed.

If one or more faults occur then, a message or maximum two messages register on the screen with their number. These messages, contained in the programmable controller program, have been entered there by the manufacturer at the start-up of the system.

NOTE:

- *This page is abandoned by the selection of another page or by selection of MODIF, OFFSETS, LOAD or UNLOAD mode.*
- *This page must be selected when the machine fault light is switched on.*

4.8.2- External parameters

```
PROGRAM PARAMETERS
E 6 0 0 0 0      -      2 1 4 1 6 4
E 4 0 0 0 0      +      1 9 0 0 0 0
```

This page enables the content of Exxxx type external parameters to be displayed.

When the page is activated (see paragraph 4.8), the question PARAMETERS? appears on the communication line.

Key in the parameter to be displayed (Eg: E 60000) which registers on the communication line. Pressing LF changes the page, and the parameter chosen, followed by its value, appears on the display.

Ten parameters can be displayed simultaneously; this is achieved by entering them one after the other, with a space between each, then LF.

To display another parameter subsequent to the first, without deleting the latter, press CONTINUED  + (plus) and the number of the parameter to be displayed, followed by LF.

NOTE:

- When they are dimensions, or dimensional values, the values displayed are expressed in decimal to the micron.
- This page is abandoned by selecting another page or by selection of MODIF, OFFSETS, LOAD or UNLOAD mode.

4.8.3- Programmable controller memory

PROGRAMMABLE CONTROLLER MEMORY			
B . 1 4	1		
M . 1 0	2	\$ 0 2	
EN . 2 0	1 1	\$ 0 8	
T . 0	1 7 6	\$ 0 0 8 0	

This page enables the programmable controller inputs-outputs status, internal parameters, memories, timers, counters to be displayed during machining or otherwise.

When the page is activated, the question ADDRESSES? appears on the communication line.

Key in the operand required for display (e.g.: B.14), which then registers on the communication line. Pressing LF changes the page and the operand followed by its value appears on the display. For B.14, 0 or 1 will be displayed according to the status of the programmable controller program internal variable.

Ten operands can be displayed simultaneously; this is achieved by entering them one after the other, with a space between each, then LF.

Example: ADDRESSES? B.14 M.10 EN.20 T.0 LF

If, having requested an operand, one requires another to be displayed without erasing the first one, press CONTINUED



+ (plus) and the operand to be displayed, then LF.

NOTE:

- The numerical operands are displayed in decimal and hexadecimal values (hex. value preceded by sign \$).
- This page is abandoned by selecting another page or selection of MODIF, OFFSETS, LOAD or UNLOAD mode.

4.8.4 - Transparent mode

This mode is provided to allow the control panel and the screen to be used for special applications processed at the level of the programmable controller (input and display of the tool life table, for example).

The directions for use must be described in the handbook of the machine manufacturer.

If nothing has been programmed in the programmable controller concerning the transparent mode, then when the page is activated (see paragraph 4.8) the screen remains empty.

NOTE:

This page is abandoned by the selection of another page, or selection of MODIF, OFFSETS, LOAD or UNLOAD

```

RESIDENT UTILITY
A = ENGLISH F = FRENCH
PERIPHERAL : READ/PUNC
NO UTILITIES IN RAM

0 PERIPHERAL SELECTION
3 UTILITY LOADER
5 MACHINE PARAMETERS
9 5 MACHINE PARAMETERS

```

This page allows the screen to be used as a communication element for the installation and maintenance.

Generally, the text above is displayed.

If for maintenance reasons, special utilities are present in the RAM, the message «NO UTILITIES IN RAM» is replaced by «SERVICE: UTILITIES IN RAM».

This state must be exceptional and temporary.

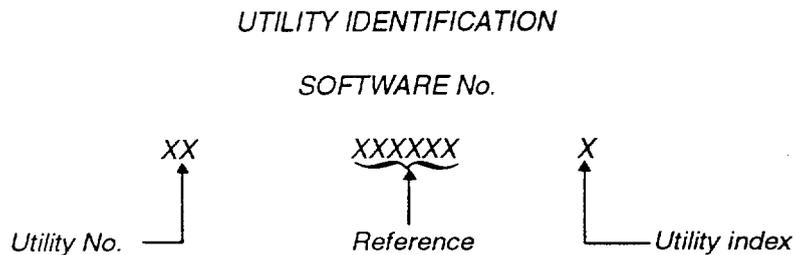
NOTE:

This page is abandoned by selecting another page, or selection of MODIF, OFFSETS, LOAD, or UNLOAD mode.

COMMENT

When in this page, operation of key Z followed by  is used to display the reference and index of the utilities stored in the REEPROM.

The following page is displayed:



Operation of the CONTINUED key  is used to display a second «UTILITY IDENTIFICATION» page.

Further operation of the CONTINUED key  enables return to the «RESIDENT UTILITY PROGRAM» page.

4.10 -  OFFSETS DISPLAY

	S	C	A	L	E	E	1	0	0	0	1	0	0	0			
	D A T 1					D A T 2					D A T 3						
X	-	1	6	2	.	3	5	5	+	0	.	+	2	.	2	5	*
Y	-	8	6	.	0	8	3	+	1	1	0	.	2	4	+	0	.
Z	-	1	2	2	.	6	2	9	-	6	.	5	-	1	.	8	*
B	+	3	.	1	7	6	+	0	.	+	0	.	0	.			

For each of the axes, this page contains:

- the SHIFT, between the measured origin and the work-piece zero,
- DAT1, offset between work-piece zero and program zero,
- DAT3, where necessary, corresponding to index table eccentricity.

The axes involved by DAT3 are indicated by an asterisk in the value written in DAT3.

- scale factor E.

This is active in all modes except in-course LOAD and UNLOAD.

If the system is in the MODIF, SHIFT, LOAD or UNLOAD mode and the CYCLE is not engaged, the mode is abandoned, followed by changeover to the neutral mode (no mode selected).

This page is called automatically by the SHIFT mode.

NOTE:

The heading Scale does not appear if the system does not have this option.

5 - INITIALISATION AND MACHINE SET UP

	PAGE
5.1 - DEFINITION OF RUNS AND ORIGINS	5-4
5.2 - THE MILLING MACHINE AXES	5-5
5.3 - MANUAL MODE	5-7
5.3.1 - ILL Continuous movement	5-7
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5.5 - OFFSET MODE	5-11
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5.5.2 - DAT 1 entered at the keyboard	5-11
5.5.3 - DAT 2 entered at the keyboard	5-12
5.5.4 - DAT 3 entered at the keyboard	5-12
5.5.5 - SCALE entered at keyboard	5-12

NOTES

Initialization and machine start allow:

- the movement of a slide, with the aid of the MANUAL controls,
- the initialization of the axis measurements, with the help of the MOS (Machine origin setting) procedure,
- entry of the origin settings on the machine, with the aid of DAT 1 (determination and input of origin offsets as necessary),
- entry of the tool compensations settings, with the aid of the TOOL SET procedure.

NOTE:

In the remainder of this manual, the following conditions are assumed:

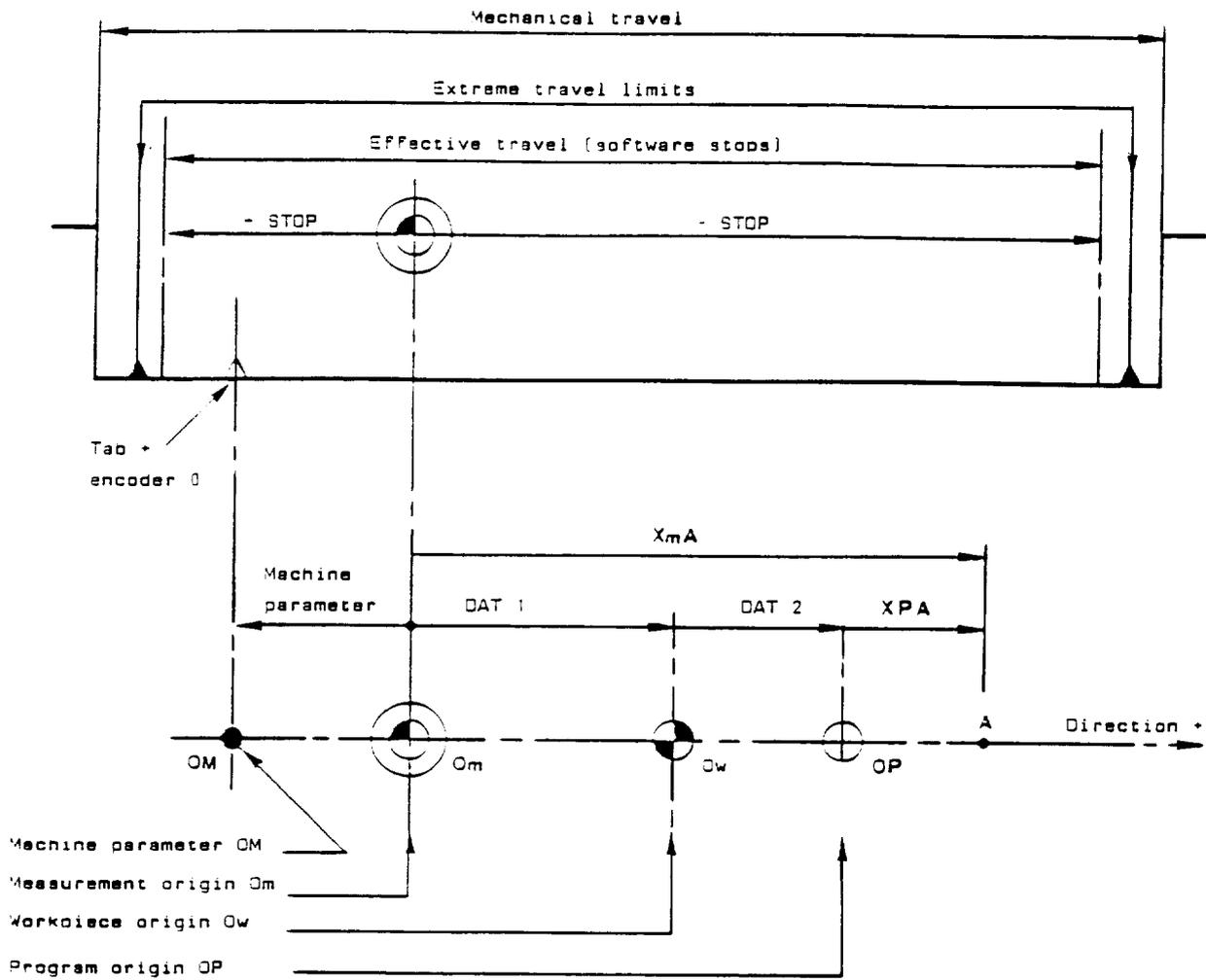
- *Machine origin (MOS) carried out: input of DAT 1, and possibly DAT 2 and/or DAT 3, origin offsets, and additionally tool compensations have been entered.*
- *In a number of procedures, machine parameter input is not imperative to the control system. However, using the machine-system combination implies that these inputs have been entered correctly.*
- *The spindle potentiometer is not mentioned, but it is active in all execution modes.*
- *Access to the modes described in the following pages are only effective if the position of the interlocking key switch enables them.*

After switching on, the following operations are to be carried out before machining a workpiece:

- 1) MANUAL retract, if necessary
- 2) Execution of the homing procedure MOS's
- 3) Measurement and input of DAT 1
- 4) Input of DAT 2 and/or DAT 3 if necessary
- 5) Measurement and input of TOOL SET (tool dimension)

If DAT 1 and the tool dimensions have been entered previously, the CNC is ready to carry out the selected program immediately after the MOS.

5.1 - DEFINITION OF RUNS AND ORIGINS



- OM : Physical position of the slide at origin setting
- Om : Measurement origin
- Op : Known reference point of the workpiece which is accessible for origin setting
- OP : Program dimensioning system origin

OM/Om = Distance of the machine origin with respect to the measurement origin.
Machine parameter defined by the manufacturer.

Op/Om = Workpiece origin with respect to the measurement origin
= DAT 1

OP/Op = Program origin with respect to the workpiece origin
= DAT 2

OP/Om = Program origin with respect to the measurement origin = DAT 1 + DAT 2

For point A, the dimensional value with respect to the measurement origin is :

$$X_{mA} = X_{PA} + \overline{\text{DAT 1}} + \overline{\text{DAT 2}} \quad X_{PA} \text{ dimension of point with respect to } A/_{OP}$$

Offsets and dimensions are expressed in algebraic values.

5.2 - THE MILLING MACHINE AXES

The axes are marked X, Y, Z ... (A, B or C) in accordance with the prevailing standards.

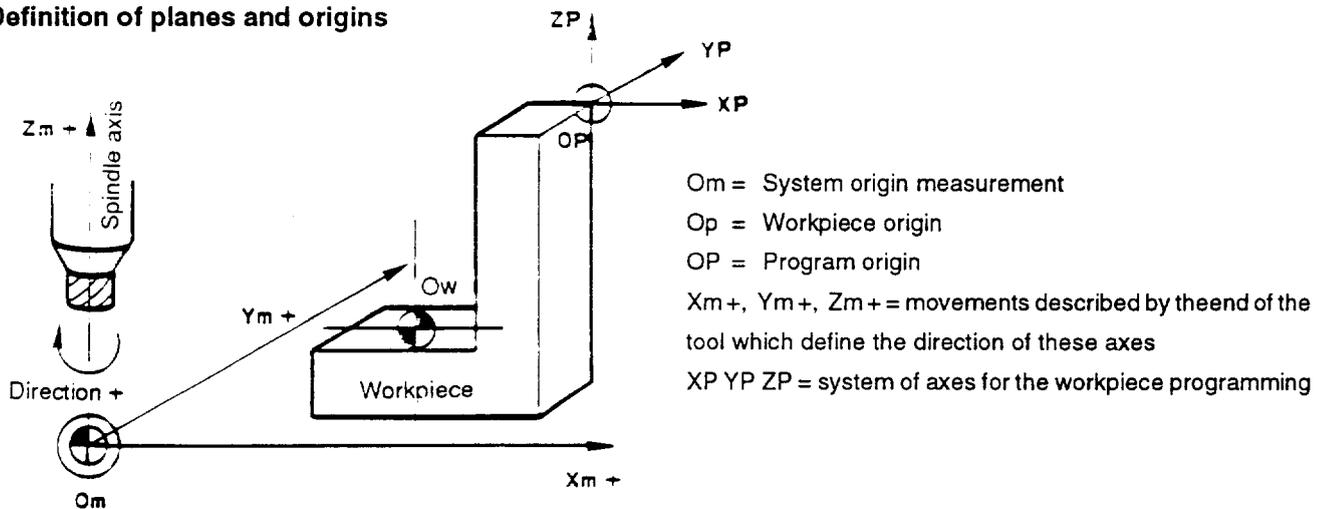
The dimensions are programmed with respect to an origin workpiece coordinate system (Program origin).

The spindle axis, defined as axis Z, is the axis defining the main position of the spindle; if it can be orientated differently, the reference coordinate system is then defined by circular permutation.

EXAMPLE:

XY (Z) ZX (Y) YZ (X)

Definition of planes and origins



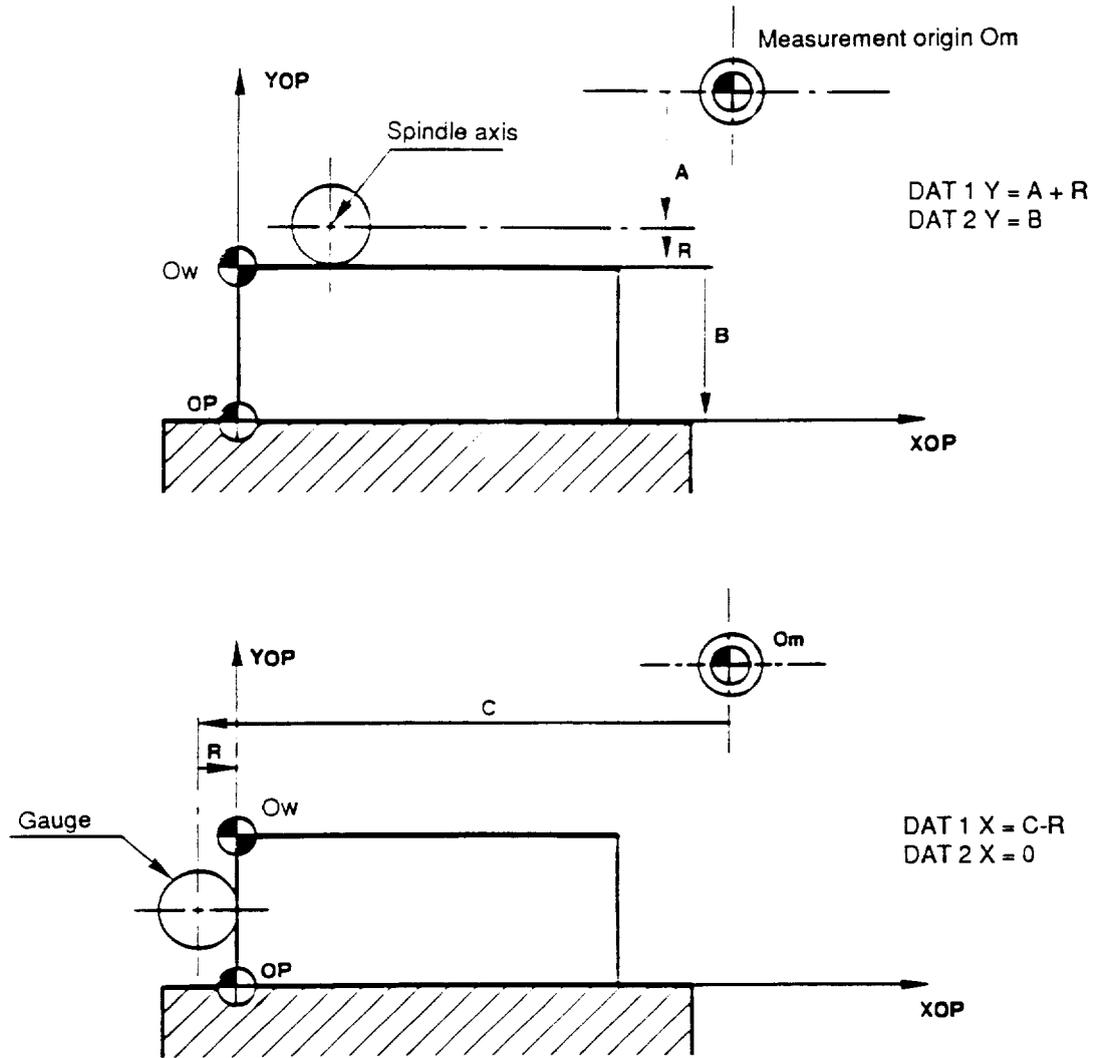
NOTE:

At initialisation, it is the X, Y (G17) plane that is defined.

DEFINITION OF DATS 1 AND 2

The program origin is the piece part datum for the programmer.

This origin may not always be accessible to the operator. It is then defined with respect to the measurement origin with the help of parameters X DAT 1, Y DAT 1 and Z DAT 1, if needs be completed by X DAT 2, Y DAT 2 and Z DAT 2.



The Y DATS 1 and 2 values entered are negative in the above case.

5.3 - MANUAL MODE

This mode enables the operator to move the axes manually either by means of the JOG pushbuttons or the switchable handwheel.

5.3.1 - ILL Continuous movement

Mode access conditions

- Modes CONT, SEQ, MDI, RAP, SNS, TEST, LOAD or UNLOAD not being executed.
- No intervention in progress.
- MANUAL selected.

Procedure

- 1 - Select MANUAL mode 
- 2 - Select key 
- 3 - Movement by maintaining pressure on the \pm direction keys for the desired axis or on the remote JOG pushbuttons. Releasing the key stops the slide after taking up the tracking error.

The rate of movement corresponds to the value entered in the machine parameter, and can be overridden by the feed rate potentiometer.

The movements are carried out axis by axis. If two axes are commanded simultaneously there is no movement.

COMMENTS:

- Simultaneous operation of key RAP  enables movement at the rapid rate entered in the machine parameter. This rate can be overridden by the feed rate potentiometer.
- Key FEED STOP is ineffective.

5.3.2 - JOG Incremental movement

Mode access conditions

- Modes CONT, SEQ, MDI, RAP, SNS, TEST, LOAD or UNLOAD not being executed.
- No intervention in progress.
- MANUAL selected.

Procedure

- 1 - Select the manual mode .
- 2 - Select a JOG increment: 1 μ , 10 μ , 100 μ , 1000 μ , 10000 μ
- 3 - Movement by pulse action on the \pm direction keys of the desired axis or on the remote jog pushbuttons, if fitted.

Movement is carried out axis by axis at a feed defined by a machine parameter which can be overridden by the feed rate potentiometer.

COMMENTS:

- Another movement cannot be commanded before the previous command is complete.
- Simultaneous action on the rapid key allows movement at the rapid rate defined by a machine parameter and can be overridden by the feed rate potentiometer.
- Action on FEED STOP stops the movement (flashing pilot light); pressing feed stop again allows the movement to be proceeded with.

If FEED STOP is pressed during movement, then pressing RESET key  cancels the remainder of the movement which had been commanded.

5.3.3 - Handwheel

Continuous movement by rotation of the handwheel.

Mode access conditions

- CONT, SEQ, MDI, RAP, SNS, TEST, LOAD, or UNLOAD mode not being executed.
- No intervention in progress.
- MANUAL selected.

Procedure

- 1 - Select MANUAL mode .
- 2 - Select HANDWHEEL key  or  or  or .
- 3 - Turn the handwheel in the direction of the movement required.
The rate of the movement is proportional to the rotation speed.
In general, one division corresponds to 1 μ . With an external selector, it is possible to obtain increments of 10 μ or 100 μ per division (see manufacturer's handbook).

5.4 - MOS MODE

The FAULT pilot light flashes when switching on and will switch off only when origin setting has been carried out on all axes.

5.4.1 - Origin setting on datum switch

Mode access conditions

- RESET status.
- Feed rate potentiometer not on zero.

Procedure

- 1 - Disengage the tool from the workpiece in MANUAL mode (if necessary)  or position the axes on the correct side of the datum switch, or disengage the axes which are already on a datum switch.
- 2 - Select mode MOS 
- 3 - Movement is incurred by maintaining pressure on the \pm keys of the selected axis or of the external jog pushbuttons, if fitted, or of the handwheel. Releasing the key or MOS completion of that axis, causes the motion to stop.

Only the correct direction is allowed by machine parameter.

2 axes cannot be operated simultaneously.

During movement, the cycle pilot light switches on, it switches off when the origin setting is carried out.

COMMENTS:

- *If the MOS's have not been carried out, selecting other modes is possible. The mode selected flashes but an error code is generated if a commanded move is requested of a non datumed axis.*
- *Requesting a MOS on an axis which is already on the datum switch generates an error message (error 32), and the FAULT pilot light switches on steady.*

In that case a reset  must be carried out and the procedure must be resumed at 1.

- *The feed rate can be overridden by the feed rate potentiometer.*
- *The movement can be carried out at rapid speed by simultaneous action on RAP key .*

5.4.2 - Origin statement through the keyboard

It can happen that in some cases, the origin setting stop is not accessible (workpiece erected on table which does not allow a movement without collision). The slide can then be driven to a known machine position and the corresponding dimension can be entered relative to measurement origin; the measurement is thus initialized.

Mode access condition

- RESET status.

Procedure

- 1 - Select MANUAL mode 
- 2 - Position the slide on the points where the origin must be stated
- 3 - Select mode MOS 
- 4 - Key in the real position of the slide.
Example: X - 20.37 Y 143.798 Z 42.8 LF

COMMENT:

- *This origin setting does not take into account values entered in machine parameter to define measurement 0. The dimension appearing on the CURRENT POINT/MO page is that entered at the keyboard.*
- *The normal origin setting can be carried out on axes, on which the datum switch is accessible, and stated through the keyboards for the others axes.*

5.5 - OFFSET MODE

Introduction of DATS 1, 2, 3 and SCALE.

5.5.1 - OFFSET defined by the position of the slide

Mode access conditions

- RESET status.
- Origin setting carried out (MOS).

Procedure

- 1 - Select MANUAL mode 
- 2 - Bring the spindle nose reference surface in contact with the calibration workpiece or a predetermined position.
- 3 - Select OFFSETS mode  which brings about display of the OFFSETS DISPLAY page. «DAT 1» is displayed on the communication line.
- 4 - Key in *Z LF or *X LF *Y LF on the alphanumeric keyboard.
On the OFFSETS DISPLAY page the DAT 1 value in Z or X or Y appears, which is the value of the current point with respect to the measurement origin (Om).
- 5 - Resume the operation in 1 for the other axes.

5.5.2 - DAT 1 entered at the keyboard

Mode access conditions

- RESET status.

Procedure

- 1 - Select OFFSETS mode  . « DAT 1 » is displayed on the communication line of OFFSETS DISPLAY page.
- 2 - Key in the values of DAT 1 which are displayed on the communication line.
Example: DAT 1: X-12.25 Y-123.158 Z-25.3
These values are defined with respect to the measurement origin (Om).
- 3 - Press LF. The DAT 1 values are transferred to in the DAT 1 line of the OFFSETS DISPLAY page.

5.5.3 - DAT 2 entered at the keyboard

Mode access condition

- RESET status.

Procedure

- 1 - Select DAT 1 mode . « DAT 1 » is displayed on the communication line.
- 2 - Press CONTINUED , « DAT 2 » appears on the communication line.
- 3 - Key in the values to be entered in X, Y and Z which register on the communication line.
Example: DAT 2: X - 20.35 Y - 12.382 Z - 112.78
- 4 - Press LF which transfers these values to X DAT 2, Y DAT 2 and Z DAT 2.

COMMENT:

Any modification of DAT 2 amounts to moving the program origin OP.
Page CUR PT/OP is modified accordingly.

5.5.4 - DAT 3 entered at the keyboard (if option)

Mode access condition

- RESET status.

Procedure

- 1 - Select display mode OFFSETS . « DAT 1 » is displayed on the communication line.
- 2 - Press CONTINUED key , « DAT 2 » appears on the communication line.
- 3 - Press CONTINUED key again, « DAT 3 » appears on the communication line.
- 4 - Key in the values to be entered for the axes considered, (marked by an asterisk) which register on the communication line.
Example: DAT 3: X - 1.23 Z + 2.547
- 5 - Press LF which transfers of these values to X DAT 3 and Z DAT 3.

NOTE:

It is impossible to enter a value for the axis which is not involved.

5.5.5 - SCALE entered at keyboard (if option)

Mode access condition

- RESET status

Procedure

- 1 - Identical to above. DAT 3 being displayed on the communication line, when the CONTINUED key is pressed «SCALE E..» is displayed on the communication line.
- 2 - Key in the value to be entered, preceded by E (Example: E10; the workpiece will be machined to the nearest 1/100th).
- 3 - Press LF which registers the new scale value on the first line of the page.

6 - TOOL SETTING

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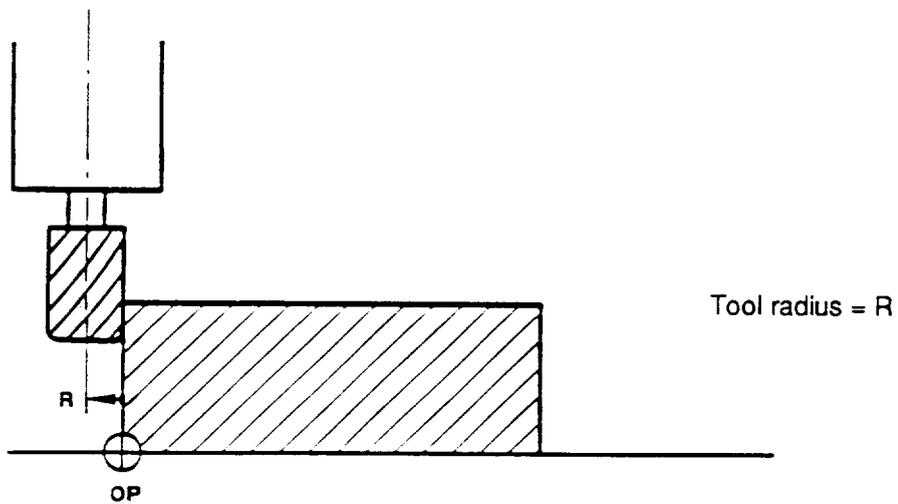
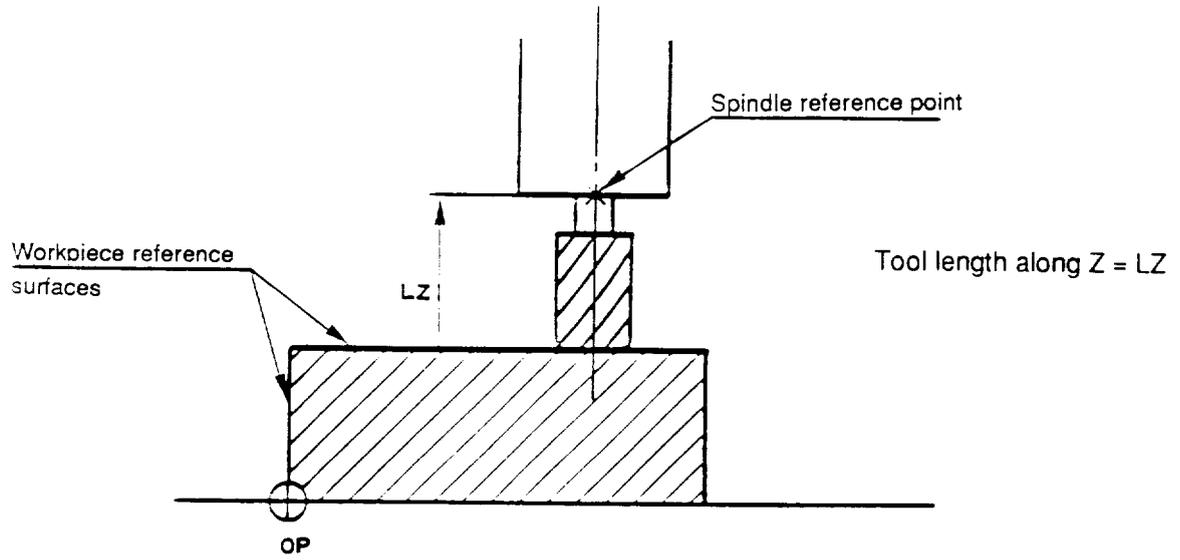
NOTES

This chapter deals with the definition of the tools and the various modes for entering their specifications on the keyboard.

Automatic loadings by tape are dealt with in paragraph 7.4, their unloadings in paragraph 9.2.

6.1 - TOOL DIMENSIONS

Distance between the tool cutting face and the spindle reference point.



6.2 - DYNAMIC TOOL COMPENSATIONS

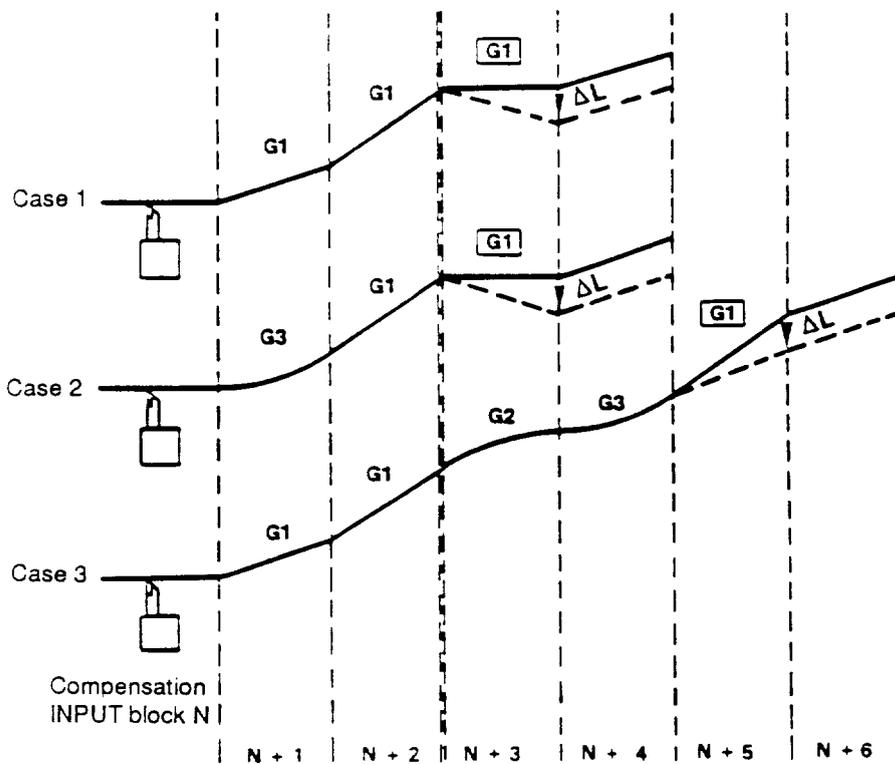
Tool dimensions can be modified by a dynamic compensation of limited range. The compensation values are accumulated for each corrector, except D0, and they can be compared with a threshold by using parameterised programming.

The maximum value which can be entered at each operation is ± 0.999 mm.

The accumulation of every corrector can be reset to zero by the operator, through the programmable controller, or through input of a new tool dimension.

A dynamic compensation entered during execution of block N becomes active from the first linear interpolation block following block N+2 (if the blocks are numbered sequentially). This is valid only for length; dimension Z is programmed.

The radius compensation is taken into account only in state G40.



6.3 - TOOL SET MODE

Allows semi-automatic measurement of the tool dimensions from a standard workpiece.

Mode access conditions

- RESET status.
- MOS carried out.
- DAT 1, DAT 2 (if necessary) entered.
- Selected tool in position.
- Standard workpiece in position.
- Mode in progress completed or block in progress can be interrupted.

Procedure

- 1 - Select TOOL SET mode 
- 2 - Input the standard workpiece dimensions through the keyboard. They are displayed on the communication line in page CURRENT PT or TOOL.
X 50 or Y 80 Z 135 (LF)
- 3 - Bring the tool into contact with the standard workpiece in CONTINUOUS JOG, JOG or HANDWHEEL 
(Z axis: spindle perpendicular to the X, Y plane).
- 4 - The distance between the program 0 and the spindle origin is displayed on page CURRENT PT/OP.
- 5 - Enter, through the keyboard, the corrector number in which the value of the tool dimension must be stored then the axis Z followed by $\pm L$, as well as the value of the cutting tool tip radius, if necessary, if it has not been entered previously.
D13 Z $\pm L$ @ 1.2
(values registering on the communication line in the place of the standard workpiece dimensions).
- 6 - Press LF. TOOL page is displayed automatically and the value of the tool dimension in L as well as the value of @ are displayed on the line of the corrector concerned. (The sign of the valve in L is taken from the $\pm L$ command.)
- 7 - For radius compensation, resume the procedure at 3 (movement of axis X or Y). In 5, after the number of the corrector key in X or Y followed by R. The value of @ does not have to be written again.

D13 X R

COMMENT:

- To set the other tools, if the same standard workpiece is used, operation 2 is not necessary, as the values are stored in the memory.

6.4 - MAN TOOL MODE



Allows tool dimensions to be entered through the keyboard if the system is in CONT, SEQ, or RAP. If another mode is in progress, then this must be completed before the MAN TOOL mode is allowed: for example, end of program loading in LOAD mode or end of commanded movement requested in MDI mode...

This mode is cancelled by a request for a new mode.

Mode access conditions

- To be in CONT, SEQ or RAP, or any other mode if CYCLE is completed.
- MOS irrelevant.

Procedure

1 - Select, MAN TOOL mode



2 - Key in the corrector number followed by the tool dimension values, and the radius of the cutting tool tip if necessary.

These values register on the communication line whatever the page selected, except for pages INPUTS-OUTPUTS and LIST.

D7 L + 112.325 R + 23.287 @.46

- 3 - Press LF. The value is transferred to the tool dimension table and the TOOL page is displayed. The communication line is erased.
- 4 - Resume at 2 for the other correctors.
- 5 - Mode cancelling by pressing MAN TOOL key.

COMMENT:

- *The values can be modified or set to zero by the same procedure.
For a zero value, write D7 L LF: the length tool dimension on corrector 7 is set to zero.*
- *Modification of a tool dimension can be done during machining (do not however, modify a corrector in current use).*
- *Corrector D0, the content of which is always zero, cannot be modified.*

6.5 - DYNAMIC TOOL COMPENSATION INPUT

This function allows the dynamic tool compensation table associated with the tool compensation tables to be modified during machining.

It uses area ⑦ of the control panel (see paragraph. 1.2) which is specially assigned to this purpose.

This function is cancelled upon each mode change or after input of a value.

Mode access conditions

- To be in CONT, SEQ, RAP or any other mode if CYCLE is completed.
- MOS irrelevant.

Procedure

- 1 - Select CORRECTOR .
- 2 - Display on the communication line, on any page (except INPUTS-OUTPUTS and LIST) CORRECTION INC: D.
- 3 - Key in the corrector number on the keyboard. It registers after D.
- 4 - Select with the compensation keys  or  where the compensation must be carried out.
- 5 - Key in the **compensation value, which must be less than one millimeter.**
On the communication line: INC COR: D16 L -.024 R .005
(Do not write 0 before point).
- 6 - Press LF. The compensation value transferred to the dynamic tool compensation table can be displayed by a double operation of TOOL page key. The value entered accumulates with the previous compensations. The pilot light of key D switches off.

COMMENTS:

- *The accumulation of the values input to the dynamic compensation for a corrector can be cancelled by selecting key *
CORRECTION CLEAR D: display on the communication line:
Key in the no. of the corrector, and R or L, LF
CORRECTION CLEAR: D 6 L (LF).
- *The length correction is accepted if the Z axis is programmed.*
The radius correction is accepted only if the system is in state G40 with return to G41 or G42.

7 - LOADING OF WORKPIECE PROGRAMS AND TOOL DIMENSIONS

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NOTES

This chapter describes the loading modes of workpiece programs and tool dimensions.

A work-piece program must be completely stored in the RAM or EEPROM memory before being executed, unless the operator is working in the reader passing or DNC mode (see paragraph 11.5).

IMPORTANT:

A program coded in EIA cannot use the facilities of the parameterised programming as the extra characters needed are not available.

7.1 - LOADING A WORKPIECE PROGRAM FROM TAPE

Mode access conditions

- RESET status.
- Reader connected, switched on.

Procedure

1 - Position the tape in the reader before the % (start of program code. Provide a leader compatible with the peripheral).

2 - Select LOAD mode 

which displays the following menu:

LOAD MODES

- > 0 PROGRAM FROM TAPE
- 1 TOOL DIMENSIONS FROM TAPE
- 2 MANUAL PROGRAM INPUT
- 3 CHOICE OF CURRENT PROGRAM
- 4 PROGRAM BY DNC
- 5 TOOL DIMENSIONS BY DNC
- 6 DIALOG WITH COMPUTER

3 - With the pointer in front of line 0, press CYCLE key  .
The reader starts and the program loads, the beginning of the program is displayed.

4 - On reading X OFF, the reader stops, the CYCLE pilot light switches off and the «LOAD MODES» menu is again displayed.

The last program loaded becomes the current program and can be displayed on page LIST 

5 - If other programs must be stored, re-position the tape in the reader, resume at 3.

COMMENTS:

- Items 1, 4, 5 and 6 exist only if the system features the corresponding options.
- The last program loaded becomes the current program.
- If the loaded program has the same number as a program already stored, the cycle light remains lit at the end of loading.

The following message appears:

«PROGRAM OF SAME No. OVERWRITE OLD PROG (Y/N):»

- If the reply is Yes, the former program is destroyed, the new program is stored and the cycle light goes out.
- If the reply is No, the new program is not accepted, and the cycle light goes out.

- *If the memory becomes saturated during loading, loading is interrupted, the fault pilot light comes on and error 36 is displayed on pages IN PROGRESS or CURRENT PT.*

If this occurs, RESET and delete some of the unused programs (see 9.2.1).

- *The program tape can be in EIA or ISO.*
- *If % is absent (or EOR) or X OFF (or BS), the reader keeps running and does not stop.*
- *If there is a wrong or unknown character or syntax errors, the error will be detected in the TEST or AUTO modes.*
- *During read-in, operation of the RESET key  stops the reader and changes the system over to the neutral mode (no mode selected). What was part loaded is cancelled.*

7.2 - WORKPIECE PROGRAM LOADING FROM THE KEYBOARD

Mode access condition

- RESET status.

Procedure

- 1 - Select LOAD mode 
LOADING MODES menu displayed (see chapter 7.1).
- 2 - Key in 2 LF
The pointer > will set to line 2 of the menu.
- 3 - Press CYCLE  which will light up.
- 4 - Type % xxx (program number) on the keyboard, this is displayed on the communication line. It is possible to write comments between brackets.
- 5 - Press LF. the menu page is erased and the communication line is transferred to the first line of the screen.
- 6 - Key in the first block, which is displayed on the communication line. Sequence numbering and spaces between the addresses are to be made by the programmer.
- 7 - Press LF, the communication is transferred to follow the % xxx line.
- 8 - Repeat the procedure from step 6 for the subsequent blocks, which will be inserted one after the other. (program display).
- 9 - After the last program block key in X OFF LF. The cycle pilot light goes out and the «LOADING MODES» menu is displayed.

The programme loaded can be displayed on the LIST page 

COMMENTS:

- *The last program loaded becomes the current program.*
- *If the program loaded has the same number as a program already stored, the initial LF returns the cursor to % of the program to be entered.*
- *The last block must contain M02, except if it is a subroutine. If this is so re-select the main program as the current program. (see § 7.3).*
- *The sequences need not be in increasing order. A block may not have a sequence number.*
- *Actuation of RESET  cancels what has been entered if X OFF was not keyed in, and the system changes over to the neutral mode (no mode selected).*

7.3 - CURRENT PROGRAM CHOICE

Mode access condition

- RESET status.

Procedure

- 1 - Select the LOAD mode 
The LOADING MODE menu is displayed (see § 7.1)
- 2 - Key in 3 LF
The pointer > sets to line 3 of the menu.
- 3 - Press CYCLE key  which lights up.
(%...)_ is displayed on the communication line.
- 4 - Type % on the keyboard, followed by the number of the program chosen.
(% ...)_ % 123 is displayed on the communication line.
- 5 - Press LF. The cycle pilot light goes out. The current program is automatically displayed with changeover to the neutral mode (no mode selected).

COMMENTS:

- *If the program number does not exist, the flashing cursor is set to % when LF is operated.*
- *If the syntax is incorrect, character other than numerical in the number or format more than 4 digits, the flashing cursor is set to % when LF is pressed.*
- *If the current program is stored in EEPROM, the choice is made as above, without having &n precede %, but &n%xx will be displayed on 5.*

CAUTION:

Selection of a current program can be made either in RAM or EEPROM. The search sequence performed by the system is as follows:

- RAM,
- EEPROM, segment number 2,
- EEPROM, segment number 1,
- basic EEPROM.

This implies that, if a program of the same number is in RAM and in basic EEPROM, that in the basic EEPROM can never be called, as the search stops on the first corresponding program encountered.

7.4 - LOADING THE TOOL DIMENSIONS FROM TAPE

Mode access conditions

- RESET status
- Reader connected and switched on

Procedure

- 1 - Position the tape on the reader before %

- 2 - Select the LOAD mode
Display of the LOADING MODES menu (see § 7.1)
- 3 - Type 1 LF on the keyboard
The pointer is positioned on line 1 of the menu.
- 4 - Press CYCLE key 

The reader starts and the system reads the data, which is displayed on the communications line, block by block.

After the system analyses the block it is transferred, if correct, to the tool dimension table. If it is incorrect, the read-in stops. Correct or cancel the block at the keyboard. When the correction is made, press LF to transfer the communication line into the table and start the read-in again.

On reading X OFF, the reader stops, the cycle pilot light switches off and the «LOADING MODES» menu is displayed.

The tool dimensions can be displayed on the TOOL page



NOTE:

- *Tape syntax*

```
%  
D1 L12 R34.2 @.3 CR LF  
D7 L24.45 CR LF  
D9 L43.784 R14 @.4 CR LF  
,  
,  
,  
X OFF
```

- *Loading a corrector only modifies the correctors recorded on the tape. If it is desired to reset unused correctors, they must be programmed on tape. Dxx LR @ (CR LF) values of LR and @ zero.*
- *In a corrector, if an address is not written, its value will be that already stored.*
- *Operating RESET  cancels loading and makes the system change over to the neutral mode (no mode selected).*

7.5 - LOADING A PROGRAM FROM DNC

Before proceeding with the loading of a workpiece program via a DNC link, the exchange procedures with the latter must be activated. The controls depend on the computer used. The link procedures are described in the DNC1 - presentation instructions no. 938592.

For the controls necessary and the name of the files, please refer to the manufacturer's handbook.

EXAMPLE OF LOADING FROM A COMPUTER

Mode access conditions

- RESET status.
- Connections with DNC made.

Procedure

- 1 - Select the LOAD mode 
Display of LOAD MODES menu (see paragraph 7.1).
- 2 - Key in 6 LF (DIALOG WITH COMPUTER)
The pointer is positioned on line 6 of the menu.
- 3 - Press the CYCLE key .
The following message is displayed:

**COMMUNICATION WITH COMPUTER
(BREAK + SHIFT.P, EXIT = H.OFF)**

- 4 - Effect a BREAK, i.e. press simultaneously keys SHIFT and P.

Display of message: ENTER USER NO. =

Key in the name of the file, typically: TRA: 9. FCU LF.

If the name is correct, the = sign is displayed again.

Key in the type of transfer and then the program requested; in the present case computer to NC:
= CALCN P73.MA LF (Program %73. MA program label).

PROCEDURE WRITING

is displayed

The computer is ready to transmit the program.

NOTE:

The message ENTER USER NO. is displayed the first time that it is desired to communicate with the computer, subsequently, use the question = (CALCN P.....).

- 5 - Exit from the page via X OFF which returns us to the LOADING MODES menu with CYCLE light off.
- 6 - Type 4 LF on keyboard.
The pointer sets to line 4 of the menu.

7 - Press the CYCLE key.

The program is loaded into the memory and displayed. At end of loading, the CYCLE light goes out and the LOADING MODES menu is displayed.

This program has become the current program.

If the loaded program has the same number as a program already stored, the cycle light remains lit on end of loading.

The following message appears: «PROGRAM OF SAME No. OVERWRITE OLD PROG. (Y/N):»

- If the reply is Yes, the former program is destroyed, the new program is stored and the cycle light goes out.
- If the reply is No, the new program is not accepted, and the cycle light goes out.

8 - If another program is to be loaded repeat the procedure from step 2.

NOTE:

- If the workpiece program storage memory is saturated, error 36 is displayed. This fault disappears when memory space is made available by destroying an existing program or programs (see mode MODIF).
- If a data exchange fault occurs, error 30 is displayed. The last 130 characters can be tested via the DNC RECORD page, obtained by pressing INPUT/OUTPUT key  and then CONTINUED  and selecting item 10, for ASCII characters, or 11 for hexadecimal characters.
- Whatever the type of computer used, the general procedure outlined must be observed, only the controls or messages or the file name can be different.

7.6 - LOADING OF TOOL DIMENSIONS FROM A DNC

The procedure is similar to program loading from a DNC link, except that in paragraph 6, 5 (tool dimensions by DNC) must be keyed in instead of 4.

7.7 - LOADING OF ISO WORK-PIECE PROGRAM FROM KEYBOARD WHILE CUTTING

The load while cutting function applies only to work-piece programs. This is only possible in the CONT, SEQ, RAP and JOG modes.

This function is subject to the following functional restrictions:

Access to the loading modes is refused:

- if the screen/keyboard resource is not available,
- if the MDI, SNS, MODIF, TEST, MOS, SHIFT, TOOL SET, LOAD and UNLOAD modes are active,
- if the program field is already used for another application,
- if the loading or unloading mode is already in course during a demand.

During loading, the following are disabled:

- SNS, MODIF, TOOL SET, LOAD and UNLOAD modes

on the «DISPLAY EXTEN» page, the «CONVERSATIONAL PROGRAMMING» and «ISO PROGRAMMING» menus are disabled,

and faults:

- on the «SERVICE» page; access to utility 3 refused.

In TEST mode; if a program uses the program area requested for loading/unloading.

The flashing «=» sign in the «PROGRAM MANAGEMENT» page indicates that the loading function is active.

This sign is opposite the active menu line.

Mode access condition

- RESET state
- Must be in CONT, SEQ, RAP or JOG mode.

Procedure:

- On pressing the PAGE EXTEN  key, display of the following menu:

GRAPHIC MENU

```
> 0 GRAPHIC PARAMETERS
  1 PLANE 1
  2 PLANE 2
  3 TRACE WHILE CUTTING
  4 CONVERSATIONAL PROGRAMMING
  5 ISO PROGRAMMING
  6 PROGRAM LOADING
  7 PROGRAM UNLOADING
```

- Choose line 5 «ISO PROGRAMMING», then press LF.

The «DEFINE PROGRAM» message is displayed.

- Type the program number to be created: % 123 (LF).
- «CREATE NEW PROGRAM? (Y/N):» displayed.

If the reply is No, return to the previous message; if Yes, the program number, preceded by the cursor = appears at the top of the page.

- Writing of each program block must be preceded by +; for example + N50 ... (LF).
- Complete the program via M2, except if this is a subroutine, in which case M2 is not programmed.

COMMENT:

- In the LIST (%%) page, the edited program is prefixed by the sign -: % - 123
- To confirm the loaded programs, a RESET is required outside the MODIF mode, for example end of machining in CONT mode.

- It is possible to quit the «LOADING MODE» page at any time.
- The «PROGRAM AREA FULL» message is displayed in cases in which the memory area is not sufficient to store a program.

Refusal messages displayed during operations

Several messages can be displayed on the «GRAPHIC DISPLAY» page. These messages indicate system refusal of operations outside the application field.

These messages are:

- «Refusal: Program area access conflict»,
- «Refusal: Prohibited in this mode»,
- «Refusal: Other cases».

Deletion of several blocks

This procedure is used to delete several blocks in the program during editing, or any program in the memory except the current program.

- Point the cursor (=) to the first block to be deleted.
- On the keyboard, type the number of the last block to be deleted after command DEL.

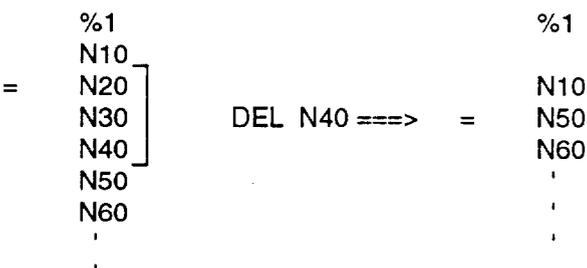
For example DEL N50
 or DEL N50 + q if the last block to be modified is not numbered.

- The sequences between the block pointed and the specified block inclusive are deleted.

NOTE:

- The last block to be deleted must come after the block pointed.

EXAMPLE:



7.8 - LOADING OF WORK-PIECE PROGRAMS FROM TAPE WHILE MACHINING

The access conditions are identical to those in the previous paragraph, and the reader must be connected to the READ/PUNCH line and switched on.

From the graphic display menu, select line 6, «PROGRAM LOADING»; then press LF.

The following page is displayed:

```
LOADING MODE
> 0 PROGRAM FROM PUNCHED TAPE
  Abandon : "<<--" then "! 9"
?_
```

- Type 0, then LF.

COMMENT:

If the reader is not connected, the «READ/PUNCH LINE ACCESS DEMAND» message is displayed.

When loading is completed, the message «LOADING COMPLETED» is displayed.

- To quit, type  then 9 LF.

If the system detects a program already existing in the NC during loading, the «PROGRAM EXISTS: <---" message is displayed.

Press key  . The next page is displayed.

% 1

DELETE PROGRAM HAVING SAME NUMBER? Y, N: -

- Confirm deletion of program present in NC or not.
 - If the reply is Yes, the program in the memory is deleted and the program being loaded stored.
 - If the reply is No, the program being loaded is ignored.

NOTES

8. - WORKPIECE PROGRAM MONITORING

PAGE

8.1 - TEST MODE	8-4
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NOTES

Workpiece program monitoring (TEST)  enables testing of the workpiece program.

The system analyses and processes this program without moving the slides, a feature which provides significant time saving.

The following are analysed and processed:

- preparatory and auxiliary functions,
- suitability of the data preparatory to movements in linear and circular interpolation,
- tool compensation etc.

8.1 - TEST MODE

Execution and internal processing of the workpiece program. Syntax and coherence testing of the blocks.

Mode access conditions

- DAT 1, DAT 2 and DAT 3 carried out.
- Workpiece program enabled.
- RESET state.
- Mode in progress completed, otherwise block in progress can be interrupted.
- No intervention in progress.

Procedure

- 1 - Select TEST mode 
- 2 - Select PROG page , or IN PROGRESS  or CUR PT  in order to follow the progress of the program.
- 3 - Press cycle  (the pilot light comes on).
- 4 - Program processing. No movement carried out.
- 5 - END OF TEST, the CYCLE pilot light goes out. The workpiece machining time is displayed on the LIST page (see § 4.1.1).

ERRORS

The system detects an error:

FAULT  lights, CYCLE goes out, the error number and the block number concerned are displayed on page CUR PT or IN PROGRESS.

CORRECTION

- Change to the MODIF mode  (consult error list in the APPENDIX)
- Type the faulty block number on the keyboard Nxxx (LF)
- Correct the programming accordingly. FAULT goes out. Repeat TEST from 1 for the rest of the monitoring. Should the block contain several errors, the system will again stop on this block.

NOTE

- Functions M00 and M01 are ignored.
- If the error is due to a limit overshoot, a RESET must be made to clear the fault, after correction of the program or DAT 1, before repeating the test from step 1.

9. - WORKPIECE PROGRAM CORRECTION

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9.2.6 - Insertion of a program or part of a program in the «MODIF» mode	9-10

NOTES

Workpiece programs are corrected in the MODIF mode .

This mode enabled corrections, additions and deletions to be made to the program initially loaded.

These modifications are made to the program stored in the memory.

Using mode MODIF implies prior knowledge of the programming manual.

CAUTION:

An EEPROM program can be modified only if the system features the «EEPROM > RAM» duplication option.

9.1 - GENERAL

Modification of a program requires a series of manipulations which must be performed in the order described below, some manipulations can be replaced by others according to the modification to be carried out.

1 - Program selection

- The program to be modified is the current program: this is displayed automatically by pressing MODIF.
- The program to be modified is not the current program: press MODIF to display the current program, then request the program to be modified from the keyboard by typing % xx LF, this is then displayed instead of the current program.

2 - Sequence selection

Having confirmed the program to be modified, select the sequence by:

- Keying in the sequence number: N120 LF
- The number of a known sequence plus an increment if the block sought is not numbered: N150 + 5 LF
- Scrolling the program in front of the pointer > by pressing keys .
- Scrolling of the pointer > (maximum 8 blocks) in front of the program sequences displayed by operation of key .
- Search for a character string, which, on each operation of LF, points to the next sequence containing this character string.

For example:

; M41 LF The first block containing M41 is positioned in front of the pointer.

; LF Next block containing M41 is positioned against the pointer >.

COMMENT

A search for a block which is not contained in the current program can be made directly with % xxx N xxx LF.

3 - Deletion of a block

The block pointed is deleted by: - (minus) LF. The next block automatically becomes the current block.

4 - Addition of a block

The block to be added is placed after the block pointed and becomes the current block.

+ N.. X.. LF.

5 - Block modification

The system offers three possibilities for modifying a block:

- By transferring the block pointed to the communication line # LF.
Modification of the block by cursor management (see § 3.2).
Transfer of the communication line back into the memory by LF.
- By complete modification of the block; the block pointed to is replaced by the block composed on the communication line:

Nxx Xxx..... LF

- By replacing one character string by another:

; M41 ; M42 LF Replacement of M41 by M42 in the block pointed.

; LF Search for next block containing M41.

9.2.3 - Deletion or insertion of a block, deletion of several blocks

Mode access conditions

- Mode in progress completed, otherwise the block in progress can be interrupted.
- No intervention in progress (FEED STOP)

Procedure

- 1 - Select MODIF mode 
the current program is displayed.
- 2 - If the sequence to be modified is not in the current program, select the program by keying in:
% n LF n: program number
- 3 - Search for the sequence to be modified using:
 - Either, Nxxx LF, the sequence will be displayed opposite the pointer and will become the current block,
 - Or  to scroll the program block by block in front of the pointer >.
 - Or LF alone, which moves the pointer > in front of the blocks from the first to the seventh line of the display, then returns to the first line and so on without moving the page displayed.
 - Or, a combination of all three methods.
- 4 - Deletion of current block

With the block on the line pointed, key in -LF. The current block is deleted and the next block becomes the current block.
- 5 - Insertion of a block

Key in + followed by the block to be inserted, which is displayed on the communication line.

e.g. + N115 Z127 X23.5 LF

This new block is inserted between the current block and the next block. The new block inserted becomes the current block.
- 6 - Repeat the procedure from step 3 if other blocks are to be modified.

NOTE

- *It is possible to look for a block which is not in the current program by:*

*% n Np LF n : program number
 p : block number*

- *An unaddressed block will be sought by:*

*Np + q LF p : known block number
 q : incrementation of Np to obtain the unaddressed block.*

Deletion of several blocks

This procedure is used to delete several blocks in a program.

- Having selected the program to be modified, point the cursor (>) to the first block to be deleted.
- On the keyboard, type the number of the last block to be deleted after command DEL.

Example: DEL N... (LF)
 or DEL N... + q (LF) for an unidentified block.

- The sequences between the block pointed and the specified block, inclusive, are deleted.

NOTE:

The last block to be deleted should be located after the block pointed.

EXAMPLE:

```

%1                                %1
N10
> N20 ]      ---> DEL N40 ---> N10
N30 ]      N50
N40 ]      N60
N50
N60
:
:
:
```

COMMENT:

Deletion of several blocks can also be made in the «ISO PROGRAMMING» mode, obtained via command PAGE
EXTEN  (see paragraph 7.7).

9.2.4 - Block modification

There are three possibilities: Transfer of the current block to the communication line, complete modification of the block, or modification of a character string.

Mode access conditions

- Mode in progress completed, otherwise the block in progress can be interrupted.
- No intervention in progress. (FEED STOP)

9.2.4.1 - By transfer of the block to the communication line

Procedure

- 1 - Select mode MODIF 
The current program is displayed.
- 2 - If the block to be modified is not in the current program, select the program by keying in:
% n LF n: program number
- 3 - Bring the sequence to be modified to the active position, i.e. aligned with the pointer > by:
 - Either, Nxxx LF
 - Or  to scroll the program block by block in front of the pointer >.
 - Or LF alone, which moves the pointer > in front of the blocks from the first to the seventh line of the display, then returns to the first line and so on without moving the page displayed.
 - Or, a combination of all three methods.
- 4 - Transfer the current block to the communication line: # LF
- 5 - Make the necessary modifications by moving the cursor (modification, insertion or deletion of characters).
- 6 - Press LF, the old current block is replaced by the modified block which becomes the new current block.

9.2.4.2 - By complete modification of the block

The first three steps of the procedure are identical to those of the previous paragraph.

At step 4, press #, then enter the new block on the communication line.

e.g.: # N120 X30 Y100 F100

Operation of LF causes transfer of the block, which replaces the current block.

9.2.4.3 - By modification of a character string

The syntax for this modification is:

; string 1 ; string 2 LF

String 1 is replaced by string 2 in the current block. If string 1 does not belong to the current block, the command is refused: the flashing cursor returns to #.

e.g.: # ; M41 ; M42 LF replaces function M41 by function M42 in the current block.

This type of modification can be repeated on other blocks by command *LF.

EXAMPLE

Operator command	System reaction
; M41 LF	Search for first program block containing function M 4 1 . This becomes the current block and sets to the pointer line.
# ; M41 ; M42 LF	In this block M41 is replaced by M42.
; LF	Search for next block containing this same function M41.
* LF	Display of the modification requested on the communication line: # ; M41 ; M42.
LF	Execution of the modification; M41 replaced by M42 in this new block.
; LF	Search for next block containing M41.
etc.	

NOTE

If a block is not to be modified, repeat ; LF, which will seek the next block.

Procedure

- 1 - Select MODIF mode .
- 2 - Enable the program to be modified if this is not a main program.
- 3 - Seek the sequence to be modified via Nxxx LF or execute the commands of the previous example.

9.2.5 - Teaching function

A program can be created or modified in the teaching mode. This operation is performed in the MODIF mode and the machine origin settings must have been made.

The MODIF mode provides access to the axes jog controls.

Character «!» is used to enter the current point coordinates automatically.

9.2.5.1 - Block modification

The coordinates contained in a block can be modified by the methods previously described, but they can also be made to take on current point values.

Having selected the program, and in the MODIF mode, seek the block to be modified. Using the jogs, position the slide to the new current point desired.

Press # ! X Z LF the X and Z coordinates are modified in the pointed block, if these exist.

or

! LF all coordinates present in the block are modified (if X only is programmed, this will be modified).

or

! X LF only X is modified, if present.

If an axis is to be added to a block, it is necessary to bring the block onto the communication line and add the axis, preceded by «!».

For example: > N100 X20
 # LF
on communication line: # N 100 X20 !Z LF (!Z: added characters).

9.2.5.2 - Addition of block

In the MODIF mode, blocks can be added to an existing program.

After selecting the block after which the new data is to be inserted and positioning the axis or axes to the point to be entered, proceed as follows, knowing that the names of the axes placed in the block to the right of the «!» character have their current points entered automatically.

On the communication line: + N80 ! LF all coordinates are entered

+ N90 F100 ! X LF

becomes

N90 F100 Xxxx

+ N100 X150 ! Z LF

becomes

N100 X150 Zzzzz

9.2.5.3 - Program creation

Using the LOAD mode, create a program from the keyboard:

for example:

```
% 2  
M2  
X OFF
```

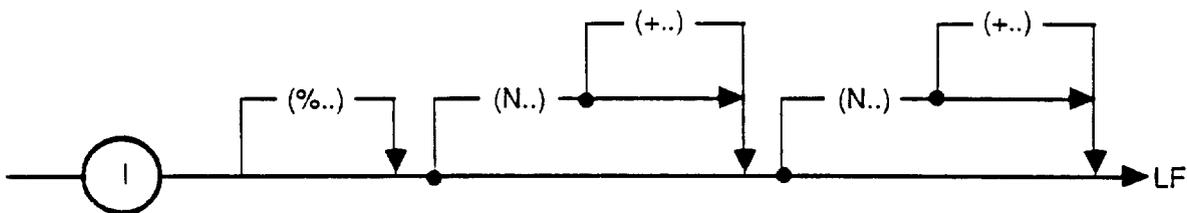
Change to MODIF mode and proceed as for addition of a block.

9.2.6 - Insertion of a program or part of a program in the MODIF mode

This procedure is used to duplicate a program or insert parts of a program in to another program.

Block insertion is made (subsequent to the block pointed to by the cursor) in the MODIF mode with character «I». The block number to be inserted must be less than 32767.

After having changed to the MODIF mode and having selected the program and sequence after which insertion is to be made, type the following syntax on the keyboard:



Non-respect of this syntax will result in refusal of the command; the dialogue cursor is brought back to the head of the line under character «I».

When insertion is impossible due to lack of memory space, the MODIFICATION IMPOSSIBLE message appear.

Comments:

- When the program number %... is not stated, it is the program in course of modification which is addressed.
- The pair of sequence numbers forms the limits of the field to be inserted. Both limits are included in the insertion.
- When only sequence number N.. is defined in the command, this addresses the beginning of the area to be inserted, the end limit being the end of the program.
- To reach unnumbered blocks, a limit can be stated by a sequence number plus a value. For example, if N10 + 3 is programmed, the limit is the 3rd block after sequence N10.

EXAMPLE:

- Modif mode

```
%  
N10 -  
N20 -  
N30 -  
> N40 -  
N50 -  
,
```

Communications line: I N10 N30:

Sequences 10 to 30 will be inserted after sequence 40.

- Modif mode

```
%2           %4  
N10 -        N10 -  
N20 -        N20 -  
N30 -        N30 -  
> N40 -        N40  
N50 -        (N40 + 1) --  
              (N40 + 2) --  
              (N40 + 3) --  
              (N40 + 4) --  
              N50 -  
              N60 -
```

Communications line I % 4 N20 N40 + 2:

After sequence 40 of %2, sequences N20 to N42 (N40 + 2) of program 4 will be inserted.

- Modif mode

```
% 1  
N10  
N20  
> N30 -  
N40 -  
N50 -
```

Communications line I N10 N50:

This insertion is not correct, but no error will be reported.

After N30, N10 to N30 will be inserted, then N10 to N20 again. It is impossible to insert blocks containing the location at which they should be inserted.

NOTES

10. - PROGRAM OUTPUTTING

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NOTES

The UNLOAD mode  enables:

- The different programs in the system memory, whether modified or not, to be stored using the UNLOAD mode to tape or to a host computer.
- Storage of the tool dimensions, stored in the correction tables, to be stored on paper tape or to a host computer.

CAUTION:

Programs in EEPROM can only be edited if the system does not feature the «protected macros» option.

UNLOAD MODE

10.1 - PUNCHING OUT A PROGRAM

Mode access conditions

- RESET status.
- Peripheral connected.

10.1.1 - Outputting the current program

Procedure

- 1 - Select UNLOAD mode  .

The following menu is displayed:

UNLOAD MODES

```
> 0 CURRENT PROGRAM TO TAPE
  1 TOOL CORRECTIONS TO TAPE
  2 OTHER PROGRAM TO TAPE
  3 CURRENT PROGRAM TO DNC
  4 TOOL CORRECTIONS TO DNC
  5 OTHER PROGRAM TO DNC
  6 DIALOGUE WITH HOST
```

- 2 - If the pointer > is not aligned with 0, type   .
- 3 - Press CYCLE  , which lights up.

The current program is displayed instead of the menu.

About 1 meter of blank tape leader is fed out, then the program is punched out. At the end of the program about 1 m of blank trailer is fed out.

- 4 - Having punched out the program the CYCLE pilot light goes out and the UNLOAD MODES menu is displayed again.

COMMENTS

- Items 1, 3, 4, 5 and 6 exist only if the system features the corresponding options.
- The tape is punched according to the code of the last program loaded by the reader (ISO or EIA).
- Punching out can be interrupted by pressing RESET  which causes changeover to the neutral mode (no mode selected).

10.1.2 - Output of a program other than the current program

Procedure

- 1 - Select UNLOAD mode .
The UNLOAD MODES menu is displayed.
- 2 - Type 2 LF, to select OTHER PROGRAM TO TAPE.
The pointer sets to line 2.
- 3 - Press CYCLE , the pilot light comes on.
The communication line reads:

(&n) (%% or %* or %..)_

n = EEPROM extension number (1 for segment 1, 2 for segment 2, nothing for basic).

- %% is the output request for all the programs in the memory
 - %* is the output request for the current program
 - %.. is the output request for the given program
 - &n followed by %% is the demand for unloading all segment n programs in EEPROM.
 - &n followed by %xx is a demand for unloading the given program from segment n in EEPROM.
- 4 - Key in the program desired, followed by LF.

If the given program does not exist, the cursor returns under %.

The program being output is displayed instead of the menu.(preceded by &n, if the program is in EEPROM). About 1 meter of blank tape leader is fed out, then the program is punched out, at the end of the program about 1 m of blank trailer fed out.

Should all the programs be requested, a space of about 15 cm is provided automatically between the end of one program and the beginning of the next. The beginning of each program being punched out is displayed.

- 5 - When the program or programs have been output, the CYCLE light goes out, followed by return to the UNLOAD MODES menu.

COMMENTS

- The tape is punched according to the code of the last program loaded by the reader.
- Punching out can be interrupted by pressing RESET  which causes changeover to the neutral mode (no mode selected).
- Programs in EEPROM can be output only if the system does not feature the «protected macros» option.

10.2 - OUTPUTTING THE TABLE OF TOOL DIMENSIONS

Mode access conditions

- RESET status.
- Peripheral connected.

Procedure

- 1 - Select UNLOAD mode 
The UNLOAD MODES menu is displayed.
- 2 - Type 1 LF, the pointer sets to line 1 TOOL DIMENSIONS TO TAPE
- 3 - Press CYCLE , the light comes on.
About 1 meter of blank tape leader is fed out, then the whole of the tool dimension table is punched out, at the end of the program about 1 m of blank trailer is fed out.
- 4 - When the table has been output, the CYCLE light goes out, the display remains on the UNLOAD MODES menu.

COMMENT

- *Punching out can be interrupted by pressing RESET  which causes changeover to the neutral mode (no mode selected).*

10.3 - OUTPUTTING OF PROGRAM TO DNC

Before loading a workpiece program into a computer, the computer exchange procedures must be activated. The commands depend on the computer used and the connection procedures are described in document DNC1 - Presentation no. 938592.

For the commands to be used and the file name, refer to the Manufacturer's Manual.

Example of loading with a given type of computer

Mode access conditions

- RESET status.
- Connections to DNC made.

Procedure

1 - Select UNLOAD mode 
The UNLOAD MODES menu is displayed (see § 10.1.1).

2 - Type 6 LF (DIALOGUE WITH HOST)
The pointer sets to line 6 of the menu.

3 - Press CYCLE key 

The following message is displayed:

**DIALOGUE WITH HOST
(BREAK = SHIFT.P, EXIT = X OFF)**

4 - Make a BREAK, i.e. press keys SHIFT and P simultaneously.

The message: ENTER USER NO. = is displayed.

Type the file name: TRA: 9. LATHE LF

If the name is correct, the = sign is displayed again.

Type the type of transfer and the program requested: in this case, NC to computer: = CNCAL LF

PROCEDURE ON STANDBY is displayed.

The computer is ready to record the program.

NOTE

The message ENTER USER NO. is displayed only during initial communication with the computer, subsequently the question = (CNCAL). is displayed directly.

5 - Quit the page via X OFF which returns the user to the UNLOADING MODES menu.

6 - Depending on whether it is desired to output the current program or another, type 3 or 5 LF.

7 - Press CYCLE key

- If the current program is desired, it is transferred to the computer,
- if the other programs are to be transferred, the question

(&n) (%%..., %*, %..)? n: EEPROM extension number

(&n) EEPROM program output (if option not locked)

%% output of all programs

%* corresponds to current program

%... type % followed by program number: %9121 LF

- At end of output the CYCLE light goes out and the UNLOAD MODES menu is displayed.

NOTE

- If a data exchange fault occurs, error 30 is displayed. The last 130 characters exchanged can be tested on the DNC RECORD page, obtained by pressing the INPUTS/OUTPUTS key  the pressing CONTINUED , and selecting item 10 for ASCII characters, or item 11 for hexadecimal characters.
- The above procedure is to be respected whatever the type of computer used, the only the commands, messages or file names may vary.
- In the example, and as a safety measure, the beginnings of the programs include the file name:

Example: %9121 (TRA: $\frac{9. \text{MILL}}{\downarrow}$. $\frac{P9121}{\downarrow}$. $\frac{SA}{\downarrow}$)
File Prog no. Label

10.4 - OUTPUTTING TOOL DIMENSIONS TO DNC

The procedure is identical to that for outputting a workpiece program to a computer, except that in 6, 4 must be typed.

10.5 - OUTPUTTING WORK-PIECE PROGRAM WHILE MACHINING

The output while machining function applies only to work-piece programs. This is possible only in modes CONT, SEQ, RAP and JOG.

This function is subject to the following restrictions:

Access to the editing mode is refused:

- if the Screen/Keyboard resource is not available,
- if the MDI, SNS, MODIF, TEST, MOS, SHIFT, TOOL SET, LOAD and UNLOAD modes are active,
- if the program area is already used for another application,
- if the loading or unloading mode is already in course when a new demand is made.

During outputting:

- modes SNS, MODIF, TOOL SET, LOAD and UNLOAD are disabled.

on the «DISPLAY EXTENSION» page, the «CONVERSATIONAL PROGRAMMING» and «ISO PROGRAMMING» menus are disabled.

and faults:

- on the «SERVICE» page; access to utility 3 is refused.

in the TEST mode: if a program is using the program area demanded for loading/unloading.

A flashing «=» in the «PROGRAM MANAGEMENT» menu page indicates that the editing function is active.

This sign is located against the active line of the menu.

Mode access conditions

- RESET status
- Must be in CONT, SEQ, RAP or JOG modes.
- Peripheral connected to READ/PUNCH line and switched on.

Procedure:

- When PAGE EXTEN  is pressed, the following menu is displayed:

GRAPHIC DISPLAY

- > 0 GRAPHIC PARAMETERS
 - 1 PLANE 1
 - 2 PLANE 2
 - 3 DRAW WHILE CUTTING
 - 4 CONVERSATIONAL PROGRAMMING
 - 5 ISO PROGRAMMING
 - 6 PROGRAM LOADING
 - 7 PROGRAM UNLOADING

- Select line 7, «PROGRAM UNLOADING», then press LF.

The following page is displayed:

UNLOADING MODE

- 0 CURRENT PROGRAM ONTO TAPE
- 1 OTHER PROGRAMS ONTO TAPE

Abandon = "<<--" then «!9»
?_

- To unload the current program, type 0 then LF. At end of unloading, the «UNLOADING COMPLETED» message is displayed.
- To unload another program, type 1 then LF. The following page is displayed:

UNLOADING MODE

- > 2 OTHER PROGRAMS ONTO TAPE

& (% % OR % * OR %..) _

- %% is the demand to output all programs in memory
- %* is the demand to output the current program
- %.. is the demand to output the given program.
- & % followed by %% is the demand to output all programs in EEPROM
- & % followed by %xx is the demand to output a given program in EEPROM
- On the keyboard, type the output desired, followed by LF.
- At end of unloading, the «UNLOADING COMPLETED» message is displayed.
- To quit the menu item, press  then 9 LF.

NOTE:

- *It is possible to quit the «UNLOAD MODE» page at any moment.*
- *The «UNLOADING IN COURSE» message is displayed during the unloading operation.*
- *At end of unloading, the message «UNLOADING COMPLETED» is displayed.*

Refusal messages displayed during operations

Several messages may be displayed on the «GRAPHIC DISPLAY» page. These messages indicate system refusal for operations outside of the application field.

These messages are:

- «Refusal: Program field access conflict»,
- «Refusal: Prohibited in this mode»,
- «Refusal: Other cases».

11. -EXECUTION OF A WORKPIECE PROGRAM

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NOTES

The execution of a stored workpiece program (CONT, SEQ, RAP) enables:

- in CONT  , machining of the workpiece in continuous mode from % (EOR in EIA) up to M2,
- In SEQ  , machining of the workpiece sequence by sequence in order to monitor machining operation progression.
- In RAP  , movement of axes at rapid traverse to monitor movements, tool changes etc.

Execution of the workpiece program can also be performed directly from the reader or in the computer, without storing the program.

This mode, called «DRIP FEED», is used for very long programs which cannot be completely stored, or for the execution of a single workpiece.

11.1 - CONT MODE

Execution of workpiece program with automatic continuation of the blocks.

Mode access conditions

- MOSs carried out.
- Mode in progress completed.

Procedure

- 1 - Select CONT mode  .
- 2 - Wait until this is confirmed if another mode is in progress (pilot light steady).
- 3 - Press CYCLE key , the pilot light comes on and program execution, up to M02 or M00 or M01, is enabled.
The program progression is displayed by selecting pages PROG  or IN PROGRESS  .
Axes movements are displayed by selecting page CUR PT  .

POSSIBLE STOPS

- Feed rate potentiometer at 0.
- Programmed stop M00 or M01 enabled (OPERATOR light comes on).
- End of program M02.
- Mode change or external information (end of block stop).
- FEED STOP  .

In this case the program can be stopped by pressing RESET  , with return to the beginning of the program.

- Reading of function M12 (see paragraph 12.8.3).

COMMENTS

- *If a mode change is requested during machining, it will be effective from the end of the first interruptable block encountered.*
- *It is possible to modify a block during operation:*
 - *Select MODIF mode which will be enabled at the end of the first interruptable block encountered, the CYCLE light goes out.*
 - *Modify the block.*
 - *Select CONT mode and press CYCLE. The program will resume from where it left off.*
 - *Proceed in the same manner if it is desired to carry out an MDI command (Manual introduction of a block).*
- *It is not necessary to perform MOSs on all axes in order to work in CONT, but the workpiece program must only contain axes for which the MOSs have been performed.*

For example, axes X, Y, Z and B. If the program includes X, Y and Z only, it is not necessary to perform the MOS on axis B to obtain movements on X, Y and Z (FAULT light flashes).
- *If the program is in EEPROM, its content cannot be displayed in the PROG page if the system features the «protected macros» option.*

11.2 - SEQ MODE

Execution of workpiece program block by block.

Mode access conditions

- MOSs carried out.
- Mode in progress completed, if not block in progress can be interrupted.

Procedure

- 1 - Select SEQ mode .
- 2 - Wait for SEQ to be enabled if another mode is in progress (pilot light steady).
- 3 - Press CYCLE key .

The pilot light comes on and the block is executed. The CYCLE light goes out at end of execution. Restart by pressing CYCLE.

Program progress is displayed by selecting pages PROG  or IN PROGRESS .

Axes movements are displayed by selecting page CUR PT .

POSSIBLE STOPS:

- Feed rate potentiometer at 0.
- Mode change or external information (end of block stop).
- FEED STOP .

In this case the program can be stopped by pressing RESET , with return to the beginning of the program.

- Reading of function M12 (see paragraph 12.8.3).

COMMENTS

- *With the CYCLE pilot light off, the rest of the program can be cancelled by pressing RESET, with return to the beginning of the program.*
- *It is not necessary to perform MOSs on all axes in order to work in SEQ, on condition that the workpiece program only contains axes for which the MOSs have performed.*
For example, consider axes X, Y, Z and B. If the program contains only X, Y and Z, it is not necessary to perform the MOS on the B axis to obtain movements on X, Y and Z (FAULT light flashes).
- *If function M997 is programmed, the system behaves as if it were in the CONT mode, until an M998, M999 or M2 function is encountered.*
- *If the program is in EEPROM, its content cannot be displayed in the PROG page if the system features the «protected macros» option.*

11.3 - RAPID MODE

Execution of workpiece program at rapid traverse.

Mode access conditions

- MOSs carried out.
- Mode in progress completed, if not block in progress can be interrupted.

Procedure

- 1 - Select RAPID mode  .
- 2 - Wait for RAPID to be enabled if another mode is in progress (pilot light steady).
- 3 - Press CYCLE key  . The pilot light comes on.

The program is executed at the maximum machine traverse programmed in the machine parameter, instead of the feed speeds programmed in F (variable by potentiometer only). All functions are sent to the machine and executed.

Program progress is displayed by selecting pages PROG  or IN PROGRESS  .

Axes movements are displayed by selecting page CUR PT  .

POSSIBLE STOPS

- Feed rate potentiometer at 0.
- Programmed stop M00 or M01 enabled.
- End of program M02.
- Mode change or external information (end of block stop).
- FEED STOP  .

In this case the program can be stopped by pressing RESET  , with return to the beginning of the program.

- Reading of function M12 (see paragraph 12.8.3).

COMMENTS

- *It is not necessary to perform MOSs on all axes in order to work in RAP, on condition that the workpiece program only contains axes for which the MOSs have been performed.*

For example, consider the X, Y, Z and B axes. If the program contains only X, Y and Z, it is not necessary to perform the MOS on the B axis to obtain movements along X, Y and Z (FAULT light flashes).

11.4 - MDI MODE

Manual entry of block without storage in the memory.

Mode access conditions

- MOSs carried out.
- Mode in progress completed, otherwise block in progress can be interrupted.

Procedure

- 1 - Select MDI mode  .
- 2 - Wait for MDI to be enabled if another mode is in progress (pilot light steady)
- 3 - Key in the block, followed by LF.
- 4 - Press CYCLE key  .

The pilot light comes on and the block is executed. Displayed on page PROG

- 5 - The CYCLE pilot light goes out at end of execution.
- 6 - If necessary repeat the procedure from step 3.

COMMENTS

- *The block is not stored in the workpiece memory.*
- *Any action commanded in MDI modifies the in-progress working conditions, therefore it is necessary that the initial conditions are re-established when quitting mode MDI, or ensure that the new conditions entered are compatible with continuation of the program.*
- *FEED STOP  is active during movement.*
- *An MDI can only be performed on an axis for which a MOS has been made.*

CAUTION:

If structured programming is used, stacks must be reserved in the RAM; if not, error 195 will be displayed when the program is run.

This reservation is made by entering: % (2000) LF, then cycle, in the MDI mode.

In the LIST page, 4000 bytes appear opposite the program stack: 2000 bytes for axes and 2000 bytes for graphics.

If the defined stack size is odd, the system uses the lower even size.

If the defined stock occupies all the available memory, stack reservation disappears from page %%.

11.5 - «DRIP FEED» MODE (reader or DNC1)

This mode enables the machining of a workpiece or the monitoring of a program **via data sent** directly from a reader or computer.

Procedure

- 1 - Select the LOAD mode .

Display of the LOAD MODES menu

- 2 - Select item 3: CURRENT PROGRAM CHOICE

- 3 - Press the CYCLE key .

The question (% ...) is displayed on the communication line.

- 4 - Reply PPR LF for **reader drip feed** mode or PPL LF for DNC1 drip feed mode.

The effect of this command is to reserve a buffer memory of 32000 characters. When the available area is less than this value but greater than 1 Kbyte, the system appropriates all the remaining area. If there is less than 1 Kbyte, the drip feed mode is refused and error 36 is displayed.

Selection of the drip feed mode automatically calls the IN COURSE page, and display, on the first line, of:

PPR }
or } % 0 N0 G1...
PPL }

This mode is also indicated on the LIST page .

- 5 - Select the desired operating mode (CONT, SEQ, RAP, SNS or TEST) and press the cycle key to both load and execute the program simultaneously.

COMMENT

In the DNC1 drip feed mode, it is necessary in 1 to pass via item 6 of the menu (DIALOGUE WITH HOST) to choose the file prior to loading it (see Paragraph 7.5). On display of the PROCEDURE WAITING message, return to the load mode, and repeat the procedure from point 2.

Cancellation of drip feed mode

This is made by selection of a new current program in the memory, via the CURRENT PROGRAM SELECTION mode. This cancellation causes release of the reserve buffer area.

NOTE

When a program is executed in the drip feed mode, calling memory resident subroutines (G77 H..) is allowed. However, all elements referring to block numbers of the drip feed program are prohibited:

- Jumps to sequences: (G79 - G10) N..
- Calls for a suite of sequences (G77 N.. N..)
- Emergency disengagement block declarations (G75 N..).

12 - OPERATOR INTERVENTION DURING MACHINING

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NOTES

During machining the operator can:

- disengage the slide (e.g. should a tool break), after a machining stop (FEED STOP - AXIS RECALL),
- reinitialise the system (RESET) with machining resumed from the beginning of the program,
- seek the sequence number (SNS) intended to resume machining at a given point,
- validation of optional stop (MO1) or block jump.
- adjust the settings of the feed and spindle potentiometers,
- continue execution of a program after
 - M00 or M01
 - Manual report
 - After reading function M12
- perform a manual disengagement
- monitor progress by means of the pilot lights:
 - FAULT
 - STOP
- load work-piece programs from keyboard or tape (see paragraph 7.7 or 7.8).
- unload work-piece programs (see paragraph 10.5).

12.1 - FEED STOP AX RECALL

The machining stop is caused by pressing FEED STOP, moving the slide to disengage it and recalling the axes by pressing AX RECALL.

Feed stop is also caused by function M12 (see paragraph 12.8.3).

Mode access conditions

One of modes CONT, SEQ, MDI, RAP or MANUAL incremental active.

FEED STOP

Procedure

1 - Press the FEED STOP key .

- the movements stop and the pilot light comes on. The CYCLE  pilot light remains lit.
- the auxiliary functions (spindle etc.) become inactive.

2 - Press FEED STOP  again

The pilot light goes out and the movements start again.

AX RECALL

1 - Press FEED STOP .

The movements stop and the pilot light comes on. The CYCLE  pilot light remains lit. The axes push buttons are enabled.

2 - Jog axis by axis in the unlimited mode to disengage the slides. The AX RECALL pilot light flashes.

3 - Press AX RECALL key .

The AX RECALL pilot light stays steady.

4 - Operate the JOG pushbuttons axis by axis, to return the slide to the point left in the appropriate direction (the opposite direction is inactive). Once the slide is in position both directions are disabled.

5 - Press FEED STOP key . The AX RECALL and FEED STOP lights go out, and the interrupted sequence resumes.

COMMENTS

- The status of the flashing AX RECALL pilot light can only be seen on the NC control panel.
- During axis movement in AX RECALL, the DELTA of the CUR PT page displays the distance run with respect to the point of interruption.
- FEED STOP does not stop spindle rotation.
- At step 4, since the slide is at the interrupted position, both movement directions can be enabled again by pressing AX RECALL, the pilot light starts flashing.
- In rigid tapping, operation of FEED STOP causes tapping to be stopped before the bottom of the hole.

CAUTION:

In rigid tapping (G84), operation of FEED STOP during the cycle causes tapping to be stopped before reaching the bottom of the hole. Clearing FEED STOP is possible only when the axis has returned to the top of the hole, at which point the machine stops.

12.2 - RESET

Operation of this key, enables general resetting of the process which was in progress.

RESET is inactive if there is no movement, i.e. in the following cases:

- CYCLE pilot light  off in modes CONT, SEQ, RAP, MDI
- FEED STOP key  active (pilot light on)
- Feed rate potentiometer at 0 (in thread cutting, the potentiometer is active in the return and positioning phases only).
- LOAD mode  in progress.
- UNLOAD mode  in progress.
- SNS mode  in progress.
- TEST mode  in progress.

12.3 - SNS MODE

Resumption of a program from block N.

Mode access conditions

- MOSs performed.
- Mode in progress completed, otherwise block in progress can be interrupted.
- No INTERV in progress.

Procedure

- 1 - Select mode SNS .
- 2 - Wait for the mode to be enabled (end of mode in progress or end of block in progress), the pilot light comes on.
- 3 - At the keyboard enter the block sought:
Nn LF n = block number.
- 4 - Press CYCLE . The pilot light comes on and the system starts searching by analysing the blocks and storing their values.

Output of the coded M functions is the only function executed during the search (the decoded M and T functions can also be executed as a function of the definition of machine parameter P7 by the constructor).

- 5 - The search finishes when the system encounters the block preceding that sought.

If the number sought does not exist, the FAULT  light comes on and error 35 is displayed on page CUR PT  or IN PROGRESS 

12.4 - OPTIONAL STOP

An optional stop is enabled or disabled by pressing the pushbutton which lights or goes out. Enabling is effective when the light is on. This operation is possible at any time.

The enabled M01 is processed in the same manner as M00.

The program is interrupted, the OPERATOR pilot light  flashes and the CYCLE light goes out.

12.5 - BLOCK SKIP (/)

A block skip is enabled or disabled by pressing the pushbutton which lights or goes out. Enabling is effective when the light is on. This is possible only in the RESET status or after an enabled M00 or M01. The blocks preceded by / (slash) are ignored when the pilot light is on.

12.6 - MIRROR PILOT LIGHT

This pilot light indicates that a mirror function has been requested on one axis at least. The axis or axes concerned are indicated on page OFFSETS .

12.7 - POTENTIOMETERS (Feed rate and spindle speed)

The feed rate and spindle speed potentiometers allow the programmed feed rate to be varied by 0 to 120% and the spindle speed to be varied from 50 to 100%, if the spindle is commanded directly.

The percentages are displayed on page IN PROGRESS.

These are effective in all movement control modes (JOG, MOS, CONT, SEQ, RAP and MDI).

Special cases

- 1) - In the case of feed limitation, due to machine characteristics, at linear and circular interpolation limits, it will be possible to limit the real feed rate although the feed potentiometer is at maximum.

Example

If the machine limits = 6 m/mn, programming F 10000 will be limited to 60% of the potentiometer value, the feed rate will not increase beyond this value.

- 2) - If M49 is programmed in the workpiece program, the potentiometers will be inactive. Their values will then be 100%.

12.8 - CONTINUATION OF PROGRAM EXECUTION

12.8.1 - Stopping on enabled M00 or M01

This stop calls for an operator intervention defined in the machining program. The CYCLE pilot light goes out.

After the corresponding intervention, the cycle is restarted with the CYCLE key 

Pilot light M00: 

- Lit: indicates that the system is in the RESET status.
- Off: indicates that the CYCLE is in progress in modes CONT, SEQ, RAP, SNS and MDI.
- Flashing: indicates a program stop (functions M00 or M01).

COMMENT

The operator pilot light on the machine control panel lights steadily when the NC control panel pilot light is flashing.

12.8.2 - Stop with request for report

If the machine requires manual intervention, range change, tool change, etc., and these functions are programmed with a request for a report or acknowledgement, the machine stops, the operator executes the function and operates a button, provided for this purpose, on the machine enabling acknowledgement via return signal CRM (see machine Manufacturer's Manual).

12.8.3 - Stopping on reading M12

M12 is an «after» decoded M function. This forces the «INTERV» mode (FEED STOP and CYCLE lights lit) and hands over to the axis manipulators or the handwheel for manual movements in the unlimited mode only; the system remains in the program execution mode: CONT or SEQ

In the TEST or SNS mode, this function is ignored.

Invalidation of FEED STOP by the operator cancels function M12 and results in the continuation of execution of the program from the new position of the slides; there is no axis recall.

Function M12 is visible in the programmable controller via bit E.14, as long as FEED STOP remains lit.

12.9 - EMERGENCY DISENGAGEMENT (option)

Operation of the emergency disengagement button on the machine control panel interrupts the workpiece program in progress and activates the disengagement subroutine.

The workpiece program can be broken down into sections, with a disengagement subroutine corresponding to each section. Operation of the disengagement button interrupts the program and activates the subroutine corresponding to the section interrupted. (See Programming Manual).

COMMENT

If no disengagement program is provided, the system changes to FEED STOP and the movements are stopped. These can be restarted by pressing FEED STOP.

12.10 - STOP PILOT LIGHT

This pilot light indicates a machine fault and when activated from the programmable controller, causes the movements to stop.

(Refer to the Manufacturer's Handbook for its significance).

12.11 - PROGRAM RESUMPTION AFTER MACHINE ERROR

In the case of a machine error indicated by the FAULT  light, display of the error in question in the «PROG», «IN COURSE» and «CURRENT PAGES», it is possible to clear this error without resetting and to resume the interrupted program.

Machine errors taken into consideration for program resumption are E30 to E32, E36, E39 and E40 to E48 (excessive tracking error along one axis).

The signal is sent to the programmable controller by a pushbutton on the machine console (see manufacturer's manual) if this is enabled by machine parameter bit P7 (bit 2 of N1 at 1).

If not, the clear demand will be ignored and only RESET can be used to clear the error.

Machine errors E39 and E40 to E48 cause a power break, while E30 to E32 and E36 cause stopping without a power break.

- If the system is in the CONT, SEQ, RAP or MDI mode and the cycle is running, resumption is made as follows:
 - on appearance of the error, FAULT lights and CYCLE light goes out,
 - after clearing the cause of the error, operation of the «CLEAR ERROR» button lights FEED STOP; AX RECALL flashes and the CYCLE light lights; the FAULT lights goes out and the error display is cleared.
- For error E39 or E40 to E48, reapply power, then confirm AX RECALL and set the axes to the point left when the error occurred.
- With the axes in position, press FEED STOP. The FEED STOP and AX RECALL lights go out and the cycle continues.

CAUTION:

Operation of the «CLEAR ERROR» button does not directly restore the M functions cancelled during the power break.

If the system is in the MOS, TEST, SNS, MODIF, LOAD, UNLOAD or NEUTRAL mode, «CLEAR ERROR» only clears the error displayed after correction of the cause or clearing of the tracking error, without any effect on FEED STOP or CYCLE.

NOTES

13 - GRAPHIC DISPLAY

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NOTES

13.1 - GENERAL

13.1.1 - Implementation

Press the «EXTEN PAGE» key  to display the following menu:

```
GRAPHIC DISPLAY
0 GRAPHIC PARAMETERS
1 PLANE 1
2 PLANE 2
3 DRAW WHILE CUTTING
4 CONVERSATIONAL PROGRAMMING
5 ISO PROGRAMMING
6 PROGRAM LOADING
7 PROGRAM UNLOADING
```

Only items 0 to 3 are used in the graphic display. Each of these items provides access to a display page.

13.1.2 - General presentation

The graphic display is used to draw program movements along the three axes X, Y or Z, in 2D graphics (X, Y or Y, Z or Z, X).

If the system features the 3D Graphic option, see paragraph 13.4.

The trace is valid for carried axes if the machine has secondary axes.

There are two trace modes:

- preparatory mode
- camera mode.

In **preparatory mode**, all or part of one program can be displayed:

- front view (in the plane of trace 1),
- view from the left, the right, above or below (in the plane of trace 2).

The front view corresponds to a projection onto one of the main geometric planes, X-Y, Y-Z or Z-X. The plane is selected from a menu (see below).

During this trace, programming errors are detected and processed as follows:

- trace stops on the last valid block,
- error message is displayed as follows:
 - If the «CONVERSATIONAL» option is confirmed the message appears with a description: e.g.:

```
«ERROR02 BLOCK Nxx»
«G FUNCTION NOT RECOGNIZED BY SYSTEM»
```
 - otherwise the following message appears:

```
«ERROR 02 BLOCK Nxx».
```

This type of trace works independently of the machining operation in progress and the «current program».

In camera mode, the trace depicts the tool movements of the machining operation in progress. The traces are created in relation to plane 1 or 2.

13.2 - PAGE PRESENTATION

Each page contains a softkey selection chart comprising ten boxes. Each box corresponds to a «view » key.

They offer:

- a selection of responses (names of axes, etc.),
- a selection of functions (automatic scaling, zoom, etc.).

Each keypad selection chart contains the «OUT» function giving immediate access to the GRAPHIC DISPLAY menu.

Any operation started can be interrupted by pressing a «view» key.

Example: automatic scaling, zoom, trace.

13.3 - PAGE DESCRIPTION

13.3.1 - Graphic parameters

13.3.1.1 - Description

This page consists of highlighted fields which are used to define trace conditions (figure 1).

Movement from one field to another is possible with the aid of the direction keys :

«cursor forward»  , «cursor backward»  , «line down»  .

When the current field has been selected, it flashes and can be modified using:

- the alphanumerical keyboard,
- the functions available in the keypad selection chart.

A field can be erased using the dialogue line erase key  .

13.3.1.2 - Filling in the fields

- Name of plane 1:
Use the keypad selection chart to indicate the name of the plane to be displayed on the screen (see figure 1). The X-Y plane is the default plane.
- Name of plane 2:
Use the keypad selection chart to indicate the type of view to be displayed (see figure 2). The default view is a view from above. Initialize in underside view
- Minimum and Maximum dimensions:
Specify the minimum and maximum dimensions of each axis to define the scale of the simulation.

Give the response:

- by keying in the information, or,
 - automatically, by activating the TRACE PLANE 1 or TRACE PLANE 2 or SCALING 1 + 2 functions (if the program has been declared)
- Name(s) of the program(s) to be traced:
Use the alphanumeric keyboard to enter the name of the program to be traced in the plane for graphic display 1 and 2 (e.g.: %200) .
 - Sequence numbers:
Sections of programs for each graphic plane can be selected with sequence numbers.
There are:
 - 3 pairs maximum in number, (1 per line, beginning on LH side, end on RH side),
 - optional: by default the whole program is traced.

Use the alphanumerical keyboard.

For one pair, if a sequence is defined in the box on the left and nothing appears in the box on the right, the trace will start at the specified sequence number and continue to the end of the program: the opposite is the case if a sequence number is specified on the right and nothing appears on the left, i.e., the trace starts at the beginning of the program and stops at the specified sequence.

- «TRACE PLANE 1», «TRACE PLANE 2» or «SCALING 1+2» are automatic functions which define the scale of the program in relation to the pairs of sequence numbers if they are present.

Programming errors detected whilst scaling is in progress are indicated as described in paragraph 13.1.2. The system will retain the scale as it was when it detected the error, therefore allowing the program to be traced as far as the faulty block.

NOTE:

The system features the 3D graphic option; refer to paragraph 13.4.

13.3.2 - Plane 1 (see figure 3)

When this page is accessed, it triggers an automatic trace of the program previously defined in the «PLANE 1» option of the «GRAPHIC DISPLAY» page.

IMPORTANT:

Only the blocks executed by the machine are traced.

Programming errors are detected whilst the trace is in progress, and printed as described in paragraph 13.1.2.

Tool paths are represented by:

- dashes for movement in G0 mode, and,
- lines for movement in modes G1, G2 and G3.

Machining cycles are represented by:

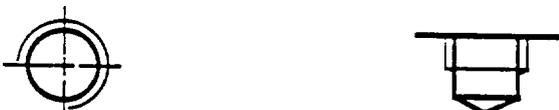
- in drilling mode G81 or G82



- in woodpeck or chiprupt modes G83 or G87



- in tapping mode G84



- in boring mode G85, G86, G88, G89



The diameters depend on the tool dimensions.

When the trace is complete, the keypad selection chart offers the following functions:

- **HARD COPY:**
Copy of the graphic image on graphic printer (colour or black and white).
During print out, printing can be interrupted by pressing one of the display keys.
- «TRACE SIM»
Used to check movements of the tool without moving the slide.
- «SELECT ZOOM»:
Pressing this key changes the keypad selection chart and gives access to zoom mode (figure 4).

This mode allows the user to:

- enlarge a portion of the image,
- find the first image immediately,
- confirm the zoomed image.

A detail is selected by means of a window which can be reduced or enlarged and, moved in 4 directions. To do this use the functions offered in the title block.

A detail defined as above is enlarged by using the «ZOOM» function on the keypad selection chart.

Zoom can be repeated on an area already enlarged. The maximum zoom is approximately 500 μ on the X-axis, and 400 μ on the Y-axis.

Activating function «END ZOOM» returns the display to the original image.

To confirm an enlarged detail, the «SIDE VALID» function must be used. If the user quits the display mode and then enters it again, the enlarged part will be displayed.

13.3.3 - Plane 2

Access this page to trace the program in the plane defined in the «PLANE 2» option of the «GRAPHIC DISPLAY» page.

For details of the function keys, refer to paragraph 13.3.2 and figures 4 and 5.

13.3.4 - Trace while cutting (see figures 6 and 7)

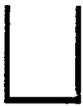
The tool movements are traced in real time in this page.

They take place in relation to the referential defined in planes 1 and 2.

When the system enters this mode, plane 1 appears and the traces are in relation to the referential of plane 1. Refer to the description of the function keys below.

The tool is depicted as follows:

- for movement in G40 mode by a cross,
- for movement in G41 and G42 mode by



Cylindrical milling



Toric milling



Spherical milling

Diameters and radii of the milling machine tips are in relation to the tool dimensions.

The current block is displayed in ISO format except when in conversational programming mode (option).

The keypad selection chart offers the following functions:

- «HARD COPY»
Copy of graphic image on graphic printer (color or black and white).
This function disappears on starting a program (cycle UT).
During graphic print out operation of a display key interrupts printing.
- «RUBBER»
Rubs out the tool traces without deleting the images displayed by selecting «PLANE 1» and «PLANE 2».
- «PLANE 1»
Displays plane 1 if it has already been traced: the tool movement is then displayed in this referential.
- «PLANE 2»
Displays plane 2 if it has already been traced: the tool movement is then displayed in this referential.
- «CLEAR PLANE»
Suspends the display of planes 1 and 2, without erasing the tool traces.

13.3.5 - Drawing in simulation mode (Figure 8)

In the Plane 1 or Plane 2 pages, the «DRAWING SIM» key is used to check the movements of the tool, **without the slide moving**.

From the title block keys, the part program is run either continuously or sequentially after pressing the title block cycle key. The title block FEED STOP key stops the movement. Tool path is used to display tool movements only, without storing all movements. The top right window provides the values of the slide current point.

%200 (Program for the displayed part)
(ROTARY TABLE)

N10 D1 F5000 G17 M3 GX-500 YZ50

N20 Z (trimming)

N30 G3 X-500 Y IJ

N40 G0 Z10

N45 X-510

N50 Z

N60 G3 X+510 Y IJ

N70 G3 X-510 Y IJ

N75

N80 G Z50 (central circular pocket)

N90 XY

N100Z

N120 G45 XYZ-30 EB60 P20 Q15 EP500 EQ500 (central circular pocket)

N140 G Z50 (4 pockets by angular offset)

N150 X-300 Y

N160 Z

N170 G77 H100

N180 L0=L0+90 EDL0 G79 L0<=330 N140

N200 L0=0 (4 reliefs by angular offset)

N210 G77 H210

N220 L0=L0+90 EDL0 G79 L0<=270 N210

N999 M2

%100

(POCKET CYCLE *** DON'T FORGET THE TOOL RADIUS)

N20 G45 X-320 Y Z-30 EX300 EY50 EB22 P20 Q8 I2 J2 EP500 EQ500

%210

(INTER-POCKET RELIEF)

N5 G X80 Y170

N10 G1 EA-90 ES- EB20

N20 G2 I J R170 ES+ EB20

N30 G1 EA0 X435 Y80 EB20

N40 G3 X80 Y435 I J EB20

N50 G1 Y170

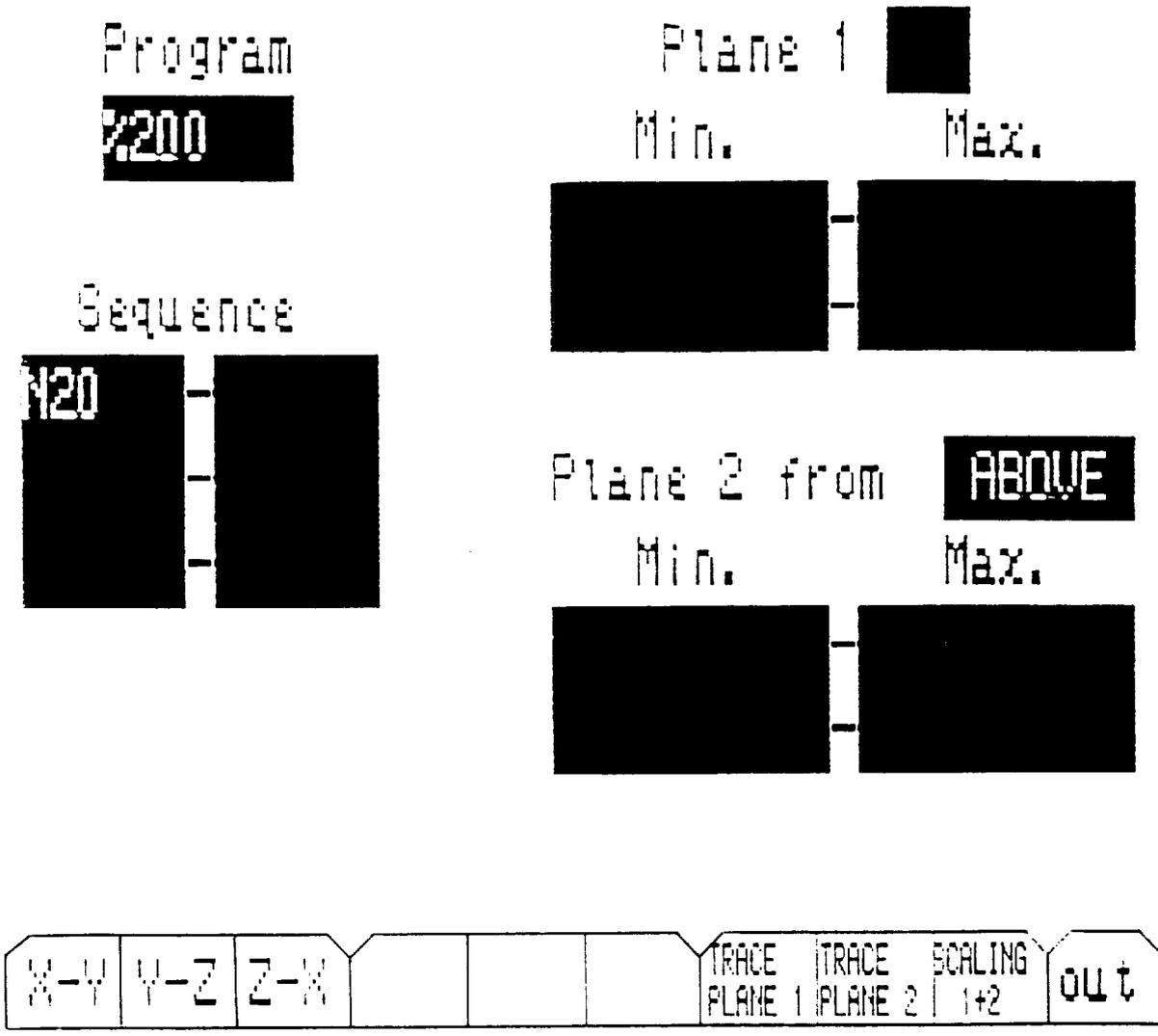


FIGURE 1: GRAPHIC PARAMETERS PAGE- PLANE DEFINITION 1

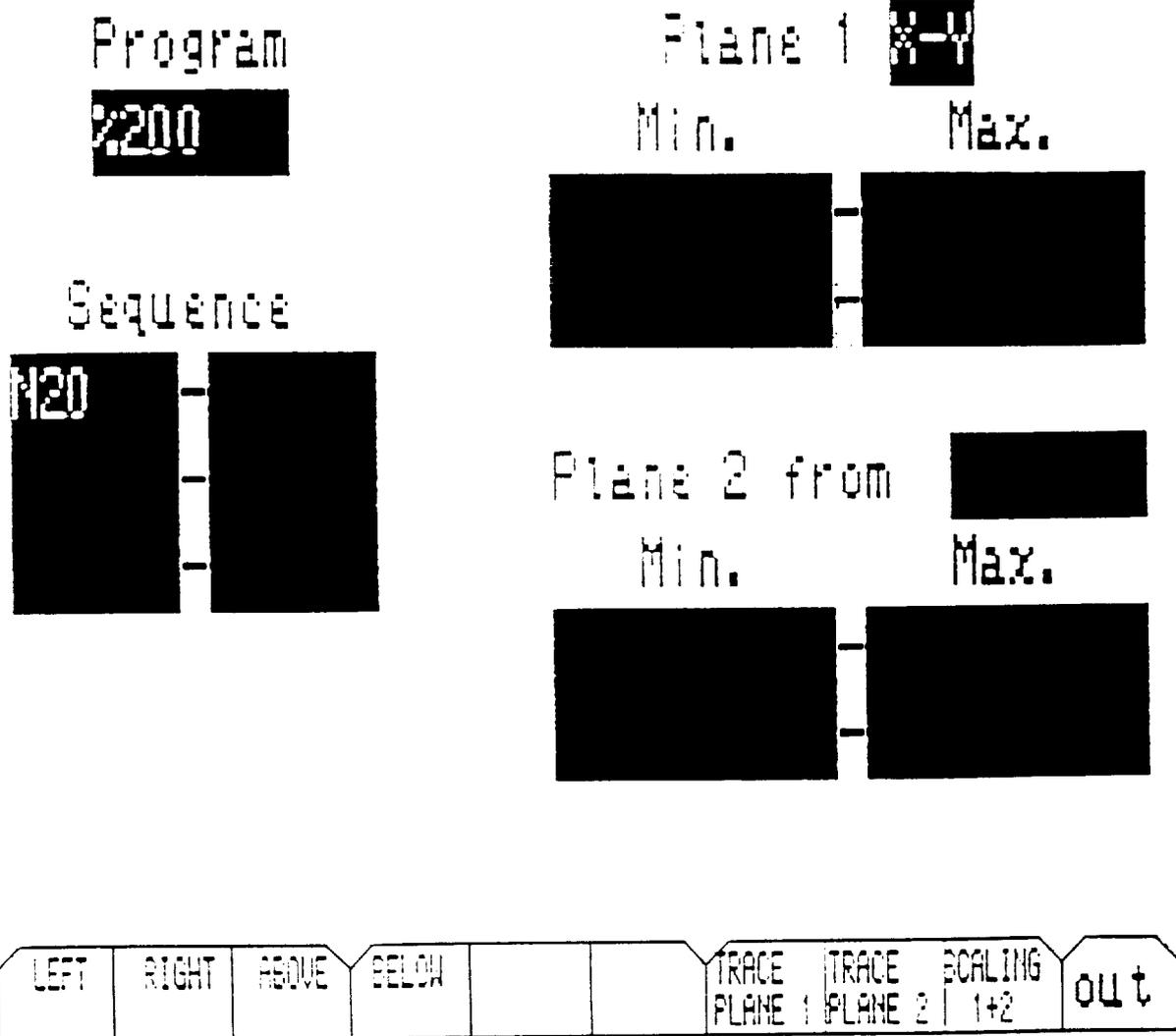


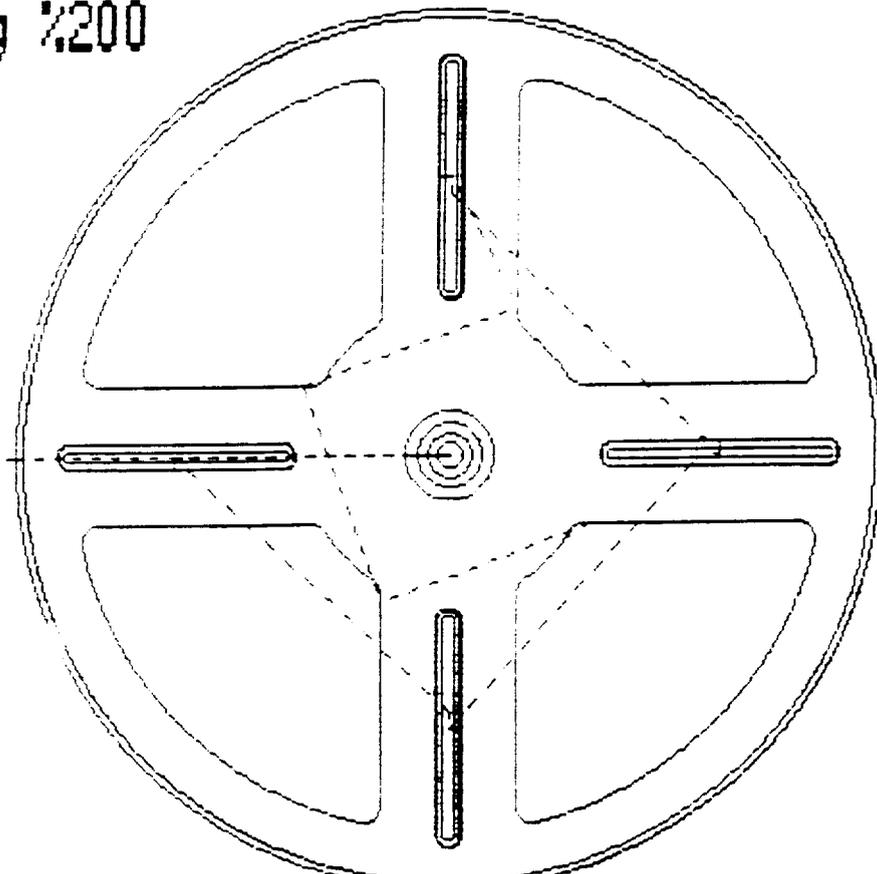
FIGURE 2: GRAPHIC PARAMETERS PAGE- PLANE DEFINITION 2

<p>Program %200</p> <p>Sequence N20</p>	<p>Plane 1 X-Y</p> <p>Min. Max.</p> <table border="0"> <tr> <td>-552.187</td> <td>+542.187</td> </tr> <tr> <td>-541.875</td> <td>+541.875</td> </tr> </table> <p>Plane 2 from ABOVE</p> <p>Min. Max.</p> <table border="0"> <tr> <td>-552.187</td> <td>+542.187</td> </tr> <tr> <td>-32.5</td> <td>+52.5</td> </tr> </table>	-552.187	+542.187	-541.875	+541.875	-552.187	+542.187	-32.5	+52.5
-552.187	+542.187								
-541.875	+541.875								
-552.187	+542.187								
-32.5	+52.5								

						TRACE	TRACE	SCALING	
						PLANE 1	PLANE 2	1+2	OUT

FIGURE 3: AUTOMATIC SCALING - PLANE 1 AND 2

Prog %200



X : -717.087; 707.087 Y : -541.875; 541.875 X

HARD COPY			SIMUL. TRACE	SELECT ZOOM			Out
-----------	--	--	--------------	-------------	--	--	-----

FIGURE 4 - PLANE 1

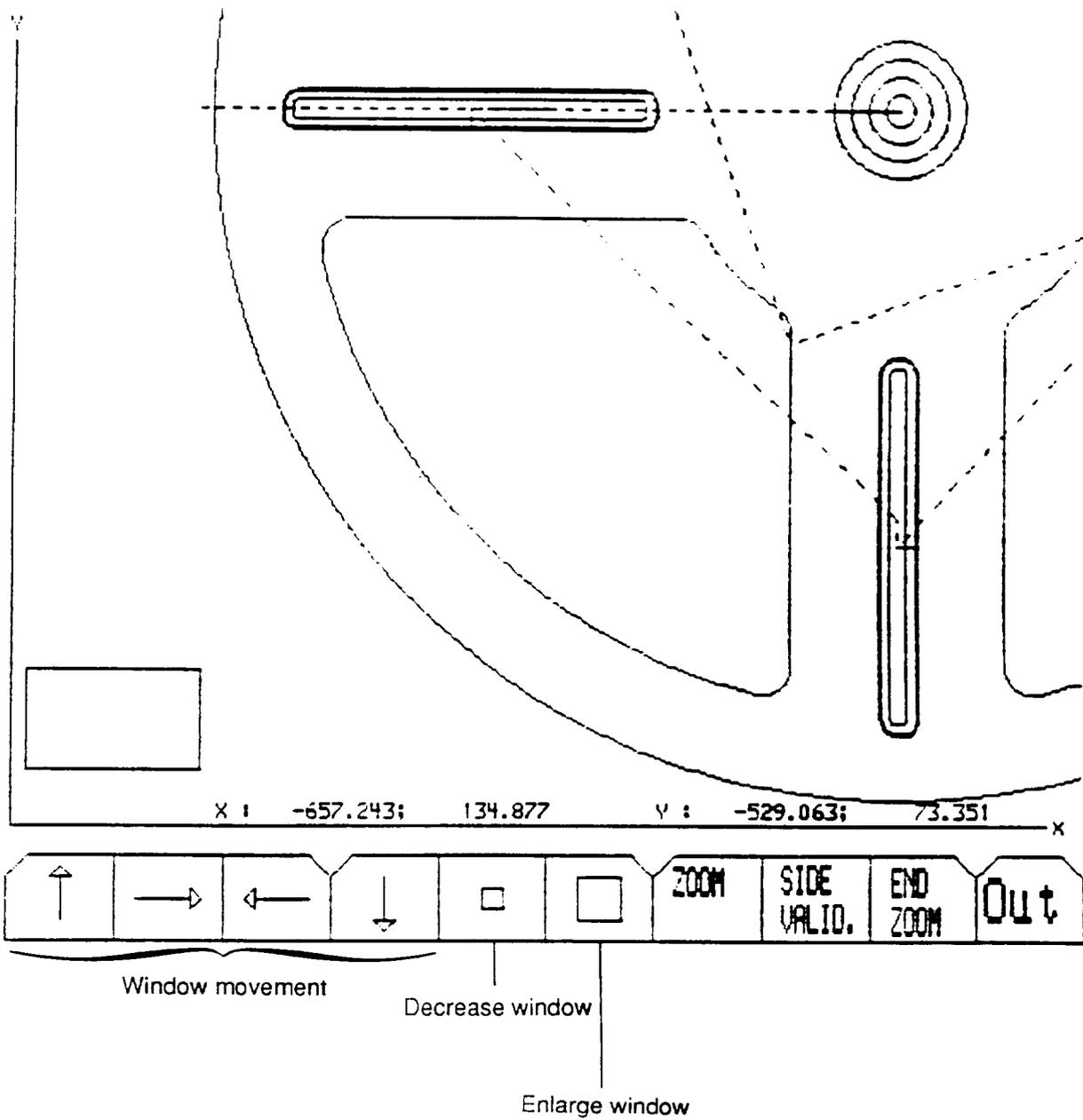


FIGURE 5 - ZOOM MODE

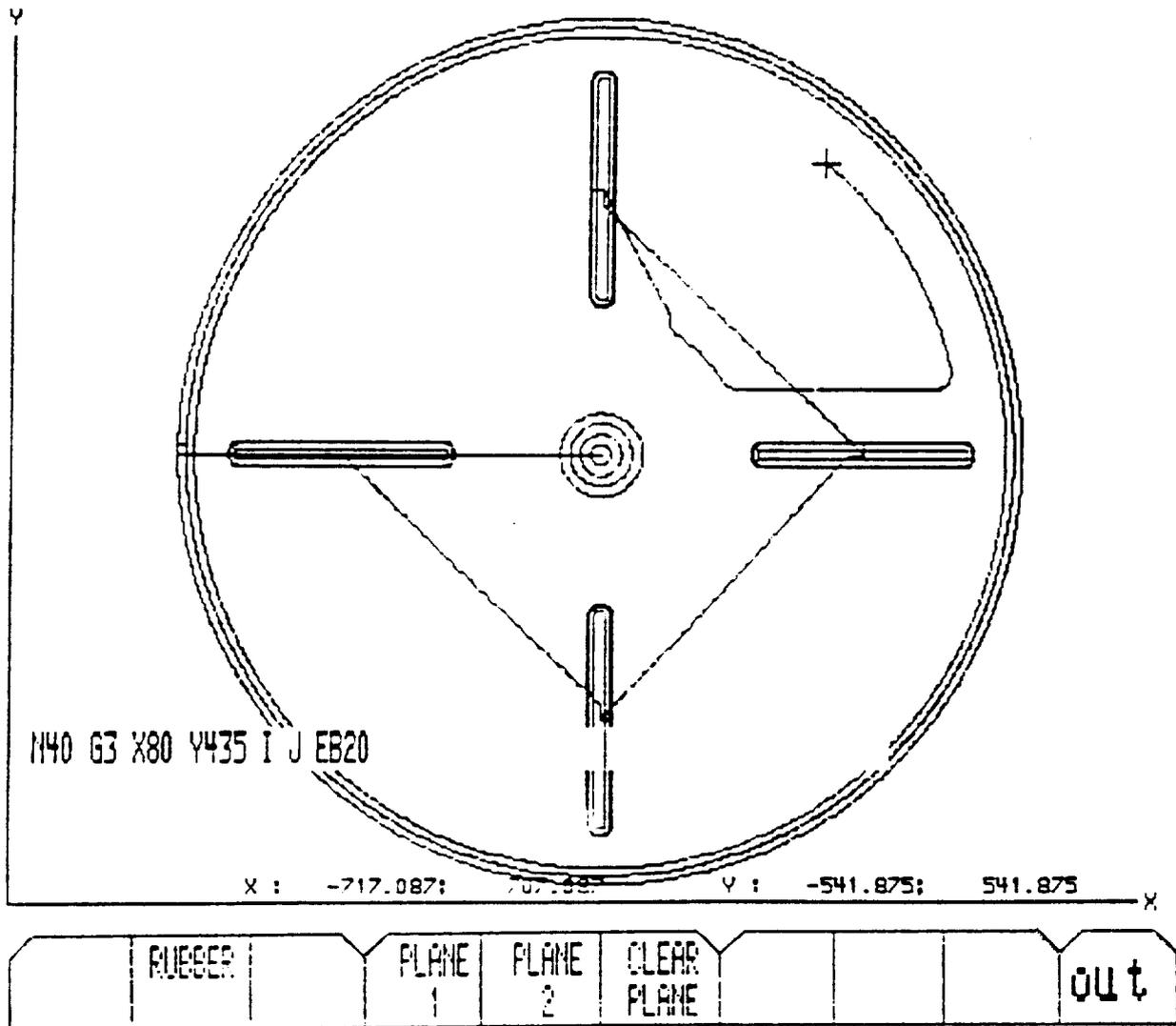


FIGURE 6 - TRACE WHILE CUTTING

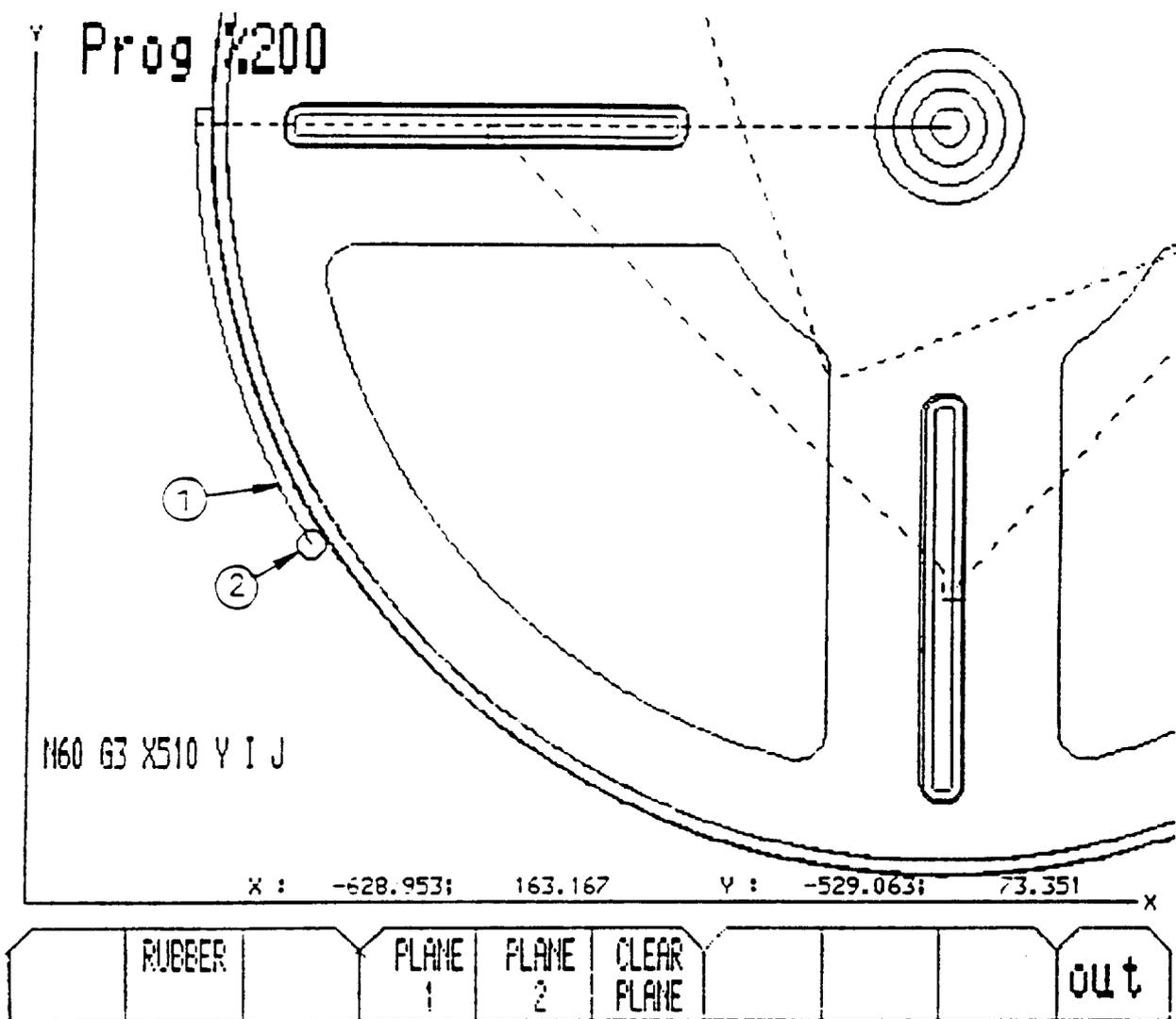


FIGURE 7 - TRACE WHILE CUTTING

- Trajectory ① is executed on radius correction.
- ② = representation of tool.
- Function RUBBER erases trajectory ① .



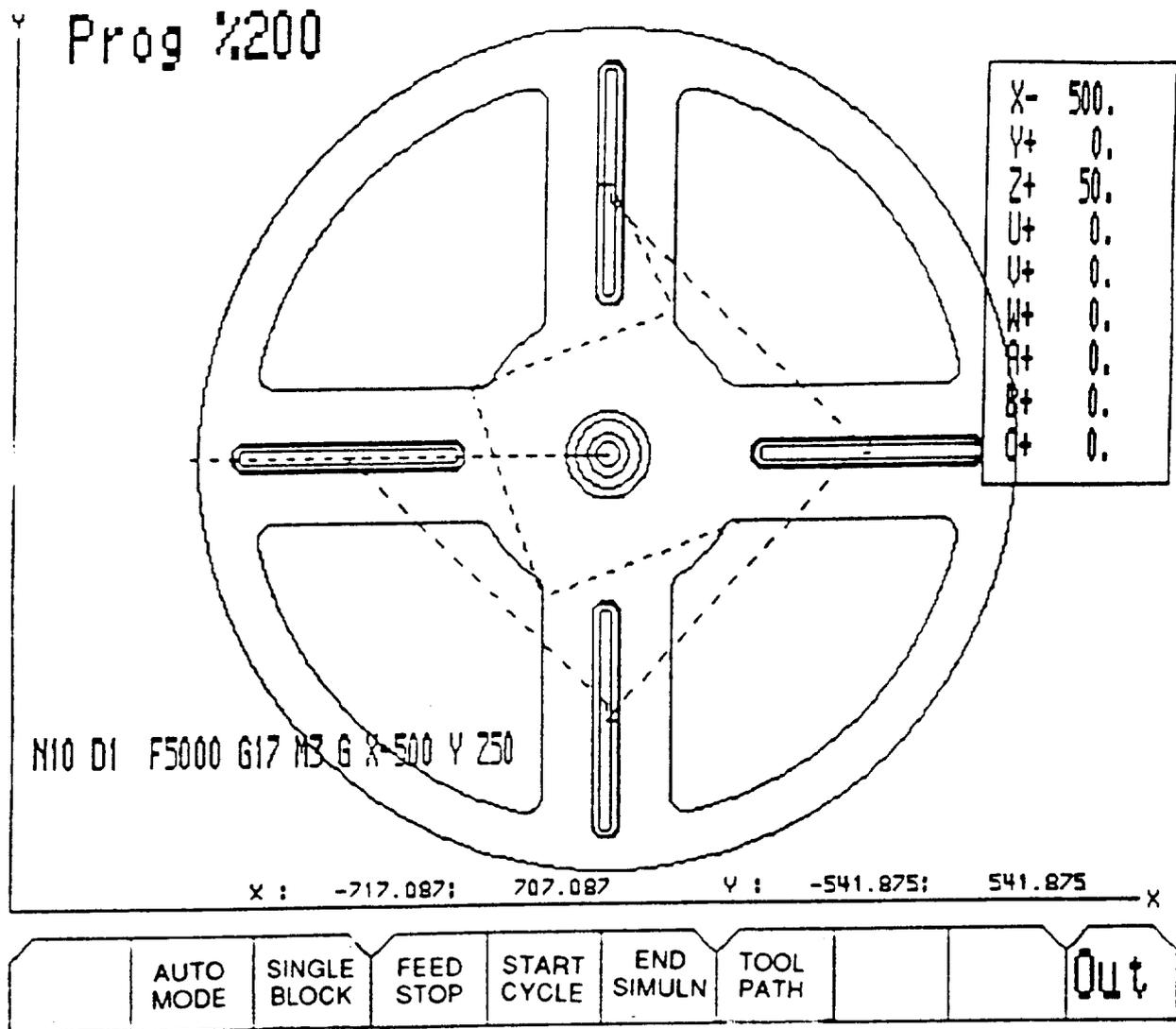


FIGURE 8 - SIMULATION DRAWING

13.4 - 3D GRAPHIC DISPLAY (option)

The 3D graphic display is used to display a part in three dimensions from a work-piece program written in ISO or conversational language.

This option offers the following functionalities:

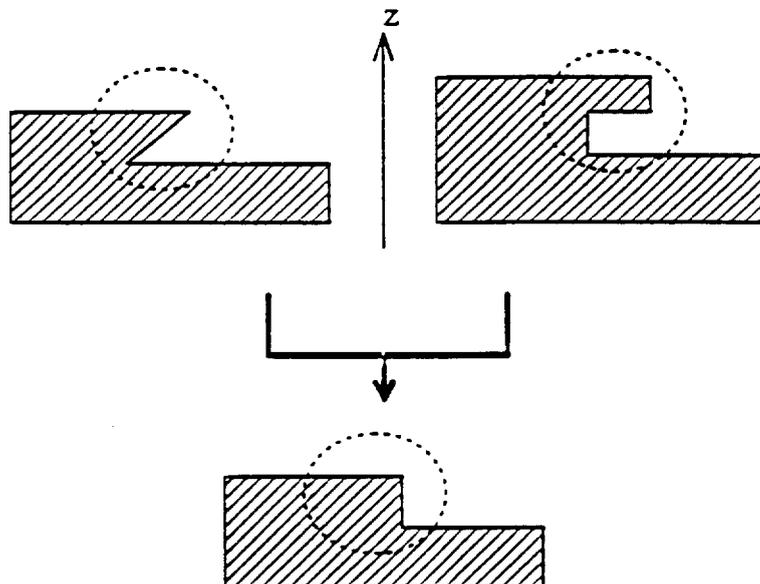
- display of the part in three dimensions in isometric projection,
- rotation by +90 or -90 degrees around the machining axis,
- zoom of part in three dimensions,
- representation of the front view in plane projection, or lefthand views and undersides in sections, and a section perpendicular to the machining axis (specially suitable for machining all types of pockets).

The 3D graphics can handle all types of machining operations, such as:

- geometric programming of profiles,
- numaform,
- unisurf,
- complex pockets,
- programs obtained from conversational language, etc.

13.4.1 - 3D graphic display characteristics

- Only axes X, Y, Z, U, V and W are processed.
- The machining direction is programmed and determines the machining operations accepted for the 3D display.
- 3D display is obtained by machining simulation. This deals with cylindrical, toroidal and spherical milling cutters and drills.
- Under-cuts are not displayed.



13.4.2 - Implementation of 3D graphic display

13.4.2.1 - Tool and blank declaration

To display a 3D image, it is necessary to define the blank definition and the tool dimensions in the tool table.

The blank dimensions, in rectangular shaped form, are declared in the work-piece program in the following way:

EM+ Xmax, Ymax, Zmac and EM- Xmin, Ymin, Zmin.

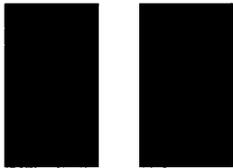
EM+ and EM- must be in the same ISO block. The dimensions are expressed in work-piece reference mode.

IMPORTANT NOTE

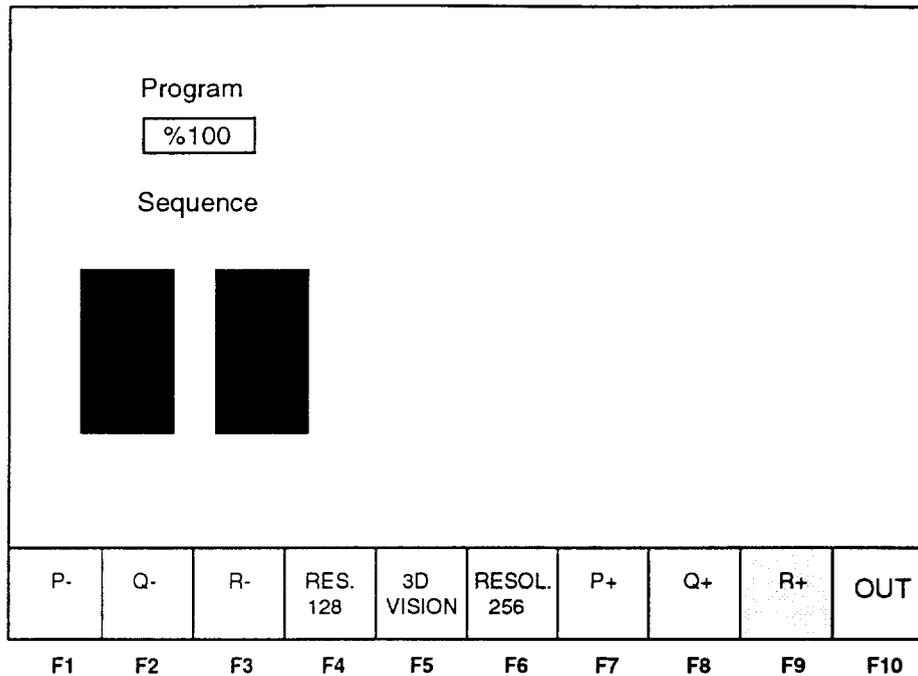
Only blocks which follow the EM's are accepted in 3D drawing.

13.4.2.2. - Perspective display of work-piece

The 3D function is accessible from the «Graphic Parameters» page containing the data concerning the part to be displayed.

Program									
<input type="text" value="%100"/>									
Sequence									
									
				3D VISION		TRACE PLANE 1	TRACE PLANE 2	FRAME 1+2	OUT
F1	F2	F3	F4	F5	F6	F7	F8	F9	F10

The title block of the «Graphic Parameters» page provides access to the 2D graphic functions already existing (TRACE PLANE 1, TRACE PLANE 2, FRAME 1+2) and the 3D vision function. Selection of this function displays a new title block, enabling the choice of machining direction and model resolution.



The selections, displayed in inverted video, enable:

- **fast and economic display** of the work-piece in memory, in **128 resolution** (key F4).
- **precise display** of the part in **256 resolution** (key F6),
- selection of the machining direction (keys F1 to F3, F7 to F9); only machining operations of longest direction shall be shown.

COMMENTS:

The 3D graphic display is also accessible from conversational programming.

Selection of the «D3 VISION» function (F5) runs the following procedure:

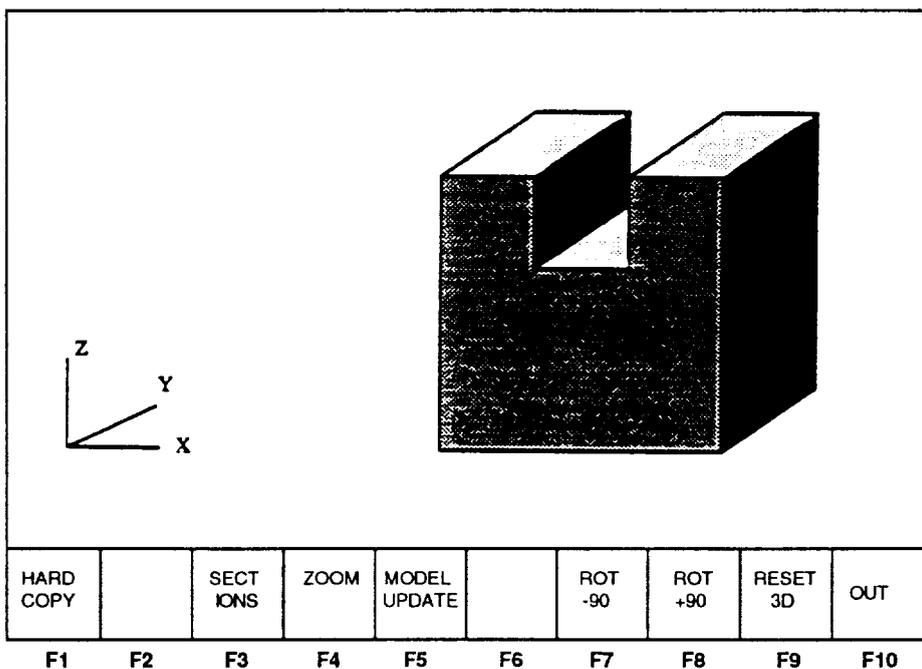
- *reservation of an area of RAM for storage of the geometric model.
The size of this area depends on the resolution selected; **for 256 resolution this will be 192 Kbytes and for 128 resolution, 48 Kbytes,***
- *clearing the screen,*
- *printout of title block representing the next page,*
- *if the part is being traced for the first time:*
 - *display of « Geometric Model Calculation» flashing message,*
 - *drawing of the work-piece in isometric projection,*
- *if the part has already been calculated, immediate drawing of the part in isometric projection.*

COMMENTS:

- Reservation of the 3D memory area is not a systematic operation. This is performed only after:
 - a first call for 3D after Init CN or RAZ 3D (key F9 in figure below),
 - a change in resolution (keys F4 or F6).

This operation can only be performed in the NC RESET status (machine stopped, DNC2 inoperative)

- Calculation of the model may be a long operation; therefore, to save time, this shall be destroyed only on each:
 - modification of program number in the «Graphic Parameters» page,
 - modification of the machining direction,
 - change in model resolution,
- Interaction with the TRACE PLANE 1, TRACE PLANE 2 functions. The «3D VISION» function destroys the red, blue and green planes. Consequently, the images created by the static functions are destroyed for «dynamic tracing».



ROTATION: the method of modelling chosen offers perspective display with rotation in steps of 90 degrees around the machining axis (keys F7 and F8).

The time required for rotation is equal to the normal display time of the work-piece on the screen (approximately 15 s); in fact, the calculation phase no longer has to be performed.

«**Model update**»: signifies geometric model update. Subsequent to main program modifications (Modif Mode), the operator can recreate the geometric model and the 3D image. This function is broken down into two stages:

- calculation of the geometric mode, symbolized by a flashing message on the screen, accompanied by ISO block texts and process comments.
- display of the part in 3D.

«**ZOOM**»: this function provides a zoom of the work-piece. The method for selecting the part of the work-piece to be enlarged is given in paragraph 13.4.3.

«**SECTIONS**»: executes the following functions:

- plane projection of front view,
- sections of lefthand and underside views,
- color display of section perpendicular to the machining axis.

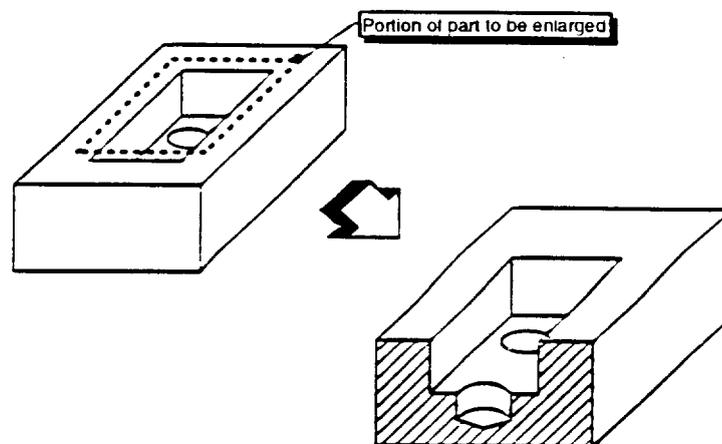
These functions are described in detail in paragraph 13.4.4.

«**RAZ 3D**»: destroys the geometric model and clears the 3D memory area. This function results in a return to the «Graphic Parameters» page.

13.4.3 - Zoom

The zoom is used:

- to enlarge part of the work-piece, in a single operation or recursively,
- to show geometrical details masked by the presence of the foreground material.

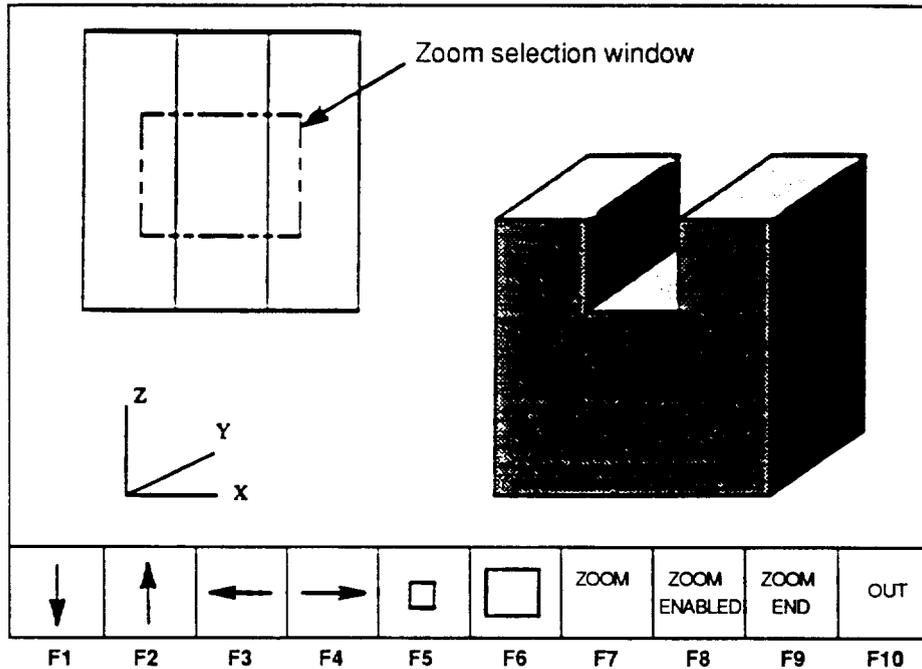


13.4.3.1 - Selection of zoom

Selection of the part of the work-piece to be «zoomed» is made with the zoom selection window shown below. This window is used to choose a part of the work-piece from the top view displayed in the top lefthand part of the screen.

The window can be moved using keys F1 to F4, and reduced or enlarged using keys F5 and F6 respectively.

The ZOOM function zooms the part of the work-piece selected. Further calculation of the model is made so as not to lose precision. The initial mode is not destroyed, and can be rapidly reobtained via «END ZOOM».



13.4.3.2 - Zoom enable

The ZOOM ENABLE key validates the enlarged part of the work-piece. This implies that the initial geometric model is replaced by the enlarged section. The title block of the figure on page 13.17 is proposed to make rotations or sections of a part of the work-piece. It should be noted that **the initial model is lost**.

Keys F9 and F10 respectively enable return to the previous page without taking the zoom and the «Graphic Parameters» page into account.

13.4.3.3 - Zoom limiting

The zoom factor is limited by the minimum dimensions of the selection window (for further information, see paragraph 13.4.5.).

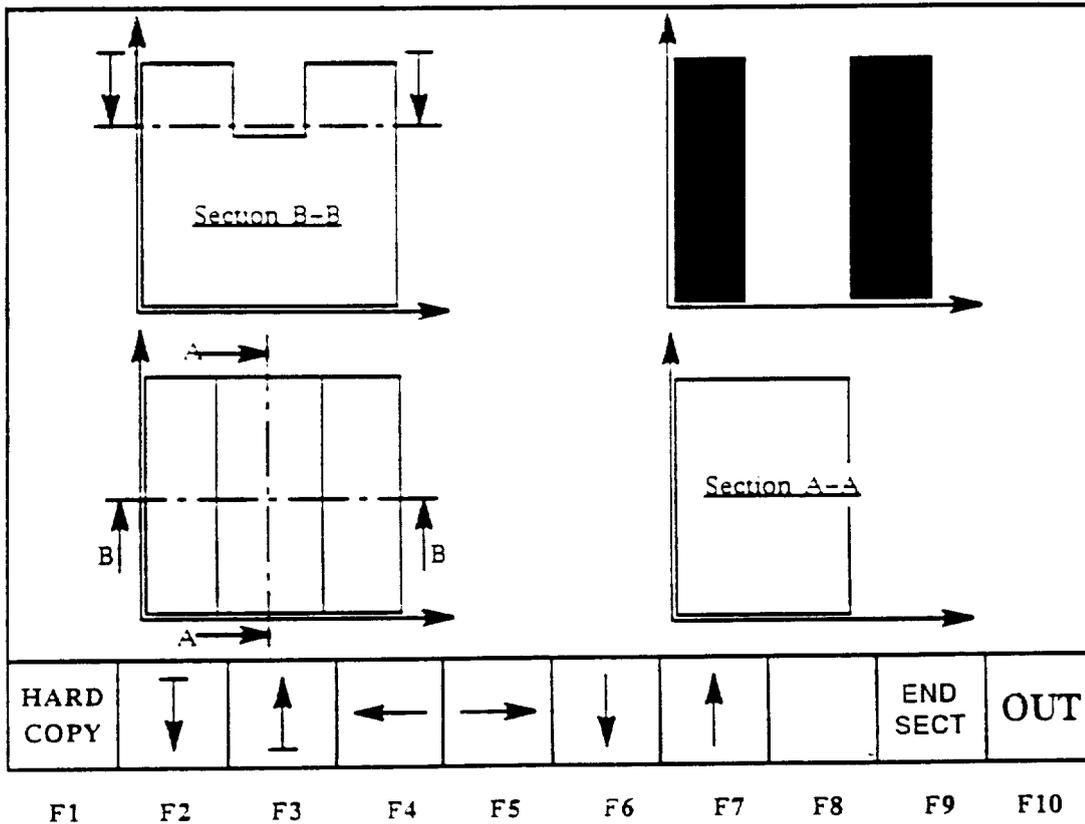
When the maximum zoom has been made, the window movement functions are no longer proposed. The operator can then enable the zoom (key F8) or return to the initial model via key F9.

13.4.4 - Display of sections

It may be of use to extract planes of sections of a part and analyse the contours of the latter. This is proposed by the sectioning functions.

From a top view, at the bottom left of the screen:

- the lefthand and bottom sections respectively, A.A and B.B, are displayed,
- a colored section in a plane perpendicular to the machining axis is selected and displayed in the top righthand corner of the screen. This section is particularly suitable for the display of pockets.



Functions F2 and F3 are used to move the plane of the section perpendicular to the machining axis.

Functions F4 to F7 are used to move the section planes according to the top view of the work-piece.

Keys F9 and F10 respectively enable return to the previous page and the «Graphic Parameters» page.

13.4.5 - Operating limits and error messages

- For performance and display reasons, the image occupies 256 pixels maximum. In this manner, the scale factor which, applied to the tool, internally sets a maximum dimension of 256 pixels, is determined. Consequently:
 - any tool, the radius of which when scaled exceeds 256 pixels, causes «Modellization impossible for tool» error,
 - the maximum zoom factor (the smallest possible selection window) is also limited to be contained within an internal space of 256 pixels.
- The error messages specific through the 3D graphic display are:
 - ERROR 21: bad blank definition (EM) or EM+ functions incorrectly programmed),
 - «RAM memory space unavailable»: the RAM resource is already occupied, for example, by the «DNC load» mode,
 - «Memory space insufficient for 3D»: available RAM memory space insufficient due to resolution used,
 - «No rotation of blank»: the blank definition ISO block in the form EM- and EM+ is missing,
 - «Modellization impossible for tool»: see explanation above.
 - «Machining in course: 3D impossible»: RAM space not available.

COMMENT:

These messages are displayed in clear language on display demand, with the exception of error 21.

NOTES

14 - INCH - METRIC

	PAGE
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14.2 -PROGRAMMING	14-3
14.3 - ENTRY OF OFFSETS AND TOOL DIMENSIONS AT KEYBOARD	14-4
14.4 - DISPLAY	14-4
14.5 - TOOL SET	14-5
14.6 - PROGRAM VARIABLES L AND EXTERNAL PARAMETERS E	14-5
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14.8 - JOG - HANDWHEEL MODE	14-5
14.9 - PROGRAM MODIFICATION - MDI	14-6

NOTES

This option is used to perform machining operations whose dimensions are programmed in the metric system or in Imperial (inch).

14.1 - IMPLEMENTATION

If the option is available, the system takes two items of information into account to operate in inch or metric:

- Machine parameter P7

Bit 3 = 0 The system is initialised on switching on, on a reset, or an M02 in metric (G71).

Bit 3 = 1 The system is initialised, under the same conditions, in inch (G70).

- Programmable controller

Depending on its status (0 or 1), output A.10F governs the display and entry of values in MDI - MODIF and SHIFT . . in the units chosen. (See Manufacturer's Handbook, if the choice is possible, if not the inch operation information can be forced: A.10F = 1).

A.10F = 0 metric

A.10F = 1 inch

NOTE

Internally, in both cases, the NC operates to the nearest micron.

14.2 - PROGRAMMING

The part programming units are selected by function G71, for the metric system, or, G70 for the imperial system.

These functions are modal and contradictory.

The dimension and speed formats are:

	Metric	Inch
X Y Z U V W I J K	+053	+044
P Q R E R		
F in G94	052	043

The format of the other addresses are identical in metric or in inch. The workpiece program is loaded into memory and unloaded without modifying the units; thus, a program loaded in metric will be unloaded in metric even if A.10F = 1, or if bit 3 of P7 = 1.

14.3 - ENTRY OF OFFSETS AND TOOL DIMENSIONS AT KEYBOARD

The format for offsets and tool dimensions is:

- Offsets

	Metric	Inch
DAT 1	053	044
DAT 2	053	044
DAT 3	053	044

- Tool dimensions

L	043	034
@	033	024
R	033	024

- Dynamic corrections (maximum entry on each correction)

DL	0.999	0.0999
DR	0.999	0.0999

NOTE

Depending on the value chosen for the A.10F information, these values can be displayed/entered in inches or mm.

As far as dynamic corrections are concerned, accumulation is made in micron integers.

Example:

Demanded increment in inches	Movement performed in microns	Display in inches	Display in microns
+ 0.0001	3	0.0001	0.003
+ 0.0001	6	0.0002	0.006
+ 0.0001	9	0.0004	0.009
+ 0.0001	12	0.0005	0.012
+ 0.0001	15	0.0006	0.015

14.4 - DISPLAY

- CUR PT page

The current point values with respect to OP and OM, and the distance to go, are displayed in inches if A.10F = 1 and in mm if A.10F = 0.

Tracking errors are always expressed in mm.

- IN PROGRESS page

Modal dimensions X, Y, Z etc. are displayed in the programming units: G70 or G71, independantly of A.10F. This also applies to the tool in progress and programmed offsets.

- PROG, LIST pages

These pages are an image of the workpiece program entered.

- PARAMETERS page

DAT 1, DAT 2 and DAT 3 are displayed in inches if A.10F = 1 and in mm if A.10F = 0.

- TOOL page

Depending on the value of A.10F tool dimensions and dynamic corrections are displayed in inches or millimeters.

	A.10F = 0 mm	A.10F = 1 inches
D1	X = 2.54	X = 1.
D2	X = 7.62	X = 3.
D3	X = 11.684	X = 4.6.

14.5 - TOOL SET

The standard workpiece dimensions are entered and displayed in inches or in mm depending on the value of A.10F.

14.6 - PROGRAM L VARIABLES AND EXTERNAL E PARAMETERS

These are displayed as a function of the programming unit whatever the value of A.10F.

G70	G71
L1 = 10	L1 = 10
XL1 (X = 10 inches)	XL1 (X = 10 mm)
E80000 = 100000	E80000 = 100000
XE 80000 (X = 10 inches)	XE 80000 (X = 100 mm)

- Association of parameters L and E

G70	G71
L10 = E50001/25400	L10 = E50001/1000
L1 = 100 + L10	L1 = L100 + L10
XL1 (X = 100 inches + tool dimension 1 in inches)	XL1 (X = 100 mm + tool dimension 1 in mm)

14.7 - LOADING AND UNLOADING OF TOOL DIMENSIONS

Loading of tool dimensions from their tape reader or over the DNC1 link is made as a function of A.10F.

- A.10F = 0 no conversion of values loaded
- A.10F = 1 values loaded converted into mm (internal to system), but display in inches.

On unloading, the values stored in the system (therefore in mm) are sent as such if A.10F = 0. If A.10F = 1, the values are converted into inches.

14.8 - JOG - HANDWHEEL MODE

Continuous JOG is not affected by the option. Similarly, the handwheel will be adapted to machine parameter P13 coefficients so that microns are sent to the system.

Incremental JOG will be:

1	10	100	1000	10000	microns if A.10F = 0
1	10	100	1000	10000	inch if A.10F = 1

The remainder of the conversions will be accumulated so that there is no drift due to a sequence of increments requested.

14.9 - PROGRAM MODIFICATION - MDI

The format check on entry is a function of A.10F. At analysis level the format check is that of G70 or G71 of the block in progress.

Examples:

Program format check

```
N10 G71  
N20 X10  
.  
.  
N40 X45
```



Modification

A.10F = 1

Entry of +N50 X20.0001. The format will be accepted on entry but refused on analysis.

In program operation

```
N10 G71  
N20 X10  
.  
.  
N40 X45
```



Modification

A.10F = 0
Entry of + N50 X4

Block N50 will be accepted and executed as a movement 4 inches, displayed as 101.6 (since display is demanded in mm).

APPENDIX 1

LIST OF ERRORS

- * E1 : UNKNOWN CHARACTERS
- * AXIS NOT RECOGNIZED BY THE SYSTEM
- * TOO MANY DIGITS AFTER A FUNCTION
- * PRESENCE OF SIGN FOLLOWING A FUNCTION WHICH DOES NOT TOLERATE IT
- * SYMBOLIC VARIABLE OUT OF FORMAT E.G.: F (FEED RATE) WITH (FEED RATE) = 123456

- * E2 : G FUNCTION NOT RECOGNIZED BY THE SYSTEM
- *
- *

- * E3 :
- *
- *

- * E4 : PARAMETERED OR STRUCTURED PROGRAMMING OPTION DISABLED
- *
- *

- * E5 : GEOMETRIC PROGRAMMING OPTION NOT ENABLED
- *
- *

- * E6 :
- *
- *

- * E7 :
- *
- *

- * E8 : TOOL CORRECTOR NO. TOO LARGE
- *
- *

- * E9 : TOO MANY CONSECUTIVE NON EXECUTABLE BLOCKS
- *
- *

* E10 :

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* E11 :

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* E12 :

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* E13 :

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* E14 :

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* E15 :

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* E16 :

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* E17 : END OF BLOCK IN COMMENT

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* E18 :

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*

* E19 :

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*
*

- * E20 : NO M02 AT END OF PROGRAM
 - *
 - *
 - *
- * E21 : GROSS DEFINITION INCOHERENT (IN 3D DISPLAY)
 - *
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 - *
- * E22 :
 - *
 - *
 - *
- * E23 :
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 - *
- * E24 :
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 - *
- * E25 : NON-EXISTENT SUBROUTINE OR SEQUENCE NUMBER
 - *
 - *
 - *
- * E26 : TOO MANY SUBROUTINE NESTINGS
 - *
 - *
 - *
- * E27 : RADIUS COMPENSATION
 - IN MACHINE ORIGIN PROG (G52)
 - IN MOVEMENT WITH STOP ON LIMIT (G10)
 - WITH M00 OR M01 PROG
 - IN DRILLING OR THREAD-CUTTING CYCLE
 - IN OFFSET IN SPACE (G29)
- * E28 : MIXED MACHINE
 - SYNTAX ERROR ON VCC OR IN PLATFORM RADIUS DEFINITION
 - G96 MUST BE FOLLOWED BY S
 - G97 MUST BE FOLLOWED BY S
 - X PROGRAMMED BEFORE G96 IN BLOCK
 - AXIS PROGRAMMED IN G96 OTHER THAN X
 - AFTER G52, X HAS NOT BEEN REPROGRAMMED IN G96
 - G98 MUST BE FOLLOWED BY X
- * E29 : NO PROG. RANGE IN VCC OR NO RANGE COMPATIBLE WITH S IN G97
 - NO RANGE SEARCH OPTION: S NOT BETWEEN MIN AND MAX OF PROGRAMMED RANGE
 - WITH RANGE SEARCH OPTION: S DOES NOT BELONG TO ANY RANGE

- * - - - : MACHINE ERROR (E30 to E32, E36, E40 to E48)
- * E30 : PLOTTER OR DNC LINE FAULT
* READER ABSENT OR READER FAULT
*
*
- * E31 : CONTROL PANEL EXCHANGE FAULT
*
*
*
- * E32 : MOS FAULT (SLIDE ALREADY AGAINST STOP)
*
*
*
- * E33 :
*
*
*
- * E34 : MIXED MACHINE
* MINIMUM RADIUS REACH IN INTERPOLATION (G21)
* MAXIMUM INTERPOLATION SPEED REACHED (G22)
*
- * E.35 : SEQUENCE NO. NOT FOUND IN SNS COMPENSATION
*
*
*
- * E36 : WORKPIECE PROGRAM MEMORY SATURATED
* MEMORY AREA AVAILABLE TOO SMALL FOR OPERATION IN READER
* OR DNC1 PASSING MODE
*
- * E37 : MIXED MACHINE
* MAX VELOCITY EXCEEDED IN THREAD CUTTING
*
*
- * E38 :
*
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*
- * E39 :
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*

* E40 : TRACKING ERROR EXCESSIVE ON AXES 0

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* E41 : TRACKING ERROR EXCESSIVE ON AXES 1

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* E42 : TRACKING ERROR EXCESSIVE ON AXES 2

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* E43 : TRACKING ERROR EXCESSIVE ON AXES 3

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* E44 : TRACKING ERROR EXCESSIVE ON AXES 4

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* E45 : TRACKING ERROR EXCESSIVE ON AXES 5

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* E46 : TRACKING ERROR EXCESSIVE ON AXES 6

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* E47 : TRACKING ERROR EXCESSIVE ON AXES 7

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* E48 : TRACKING ERROR EXCESSIVE ON AXES 8

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* E49 :

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- * - - - : MIXED MACHINE: LIST OF ERRORS IN THREAD CUTTING
- * E50 : PROGRAMMING OF K OBLIGATORY IN 1ST BLOCK IN G38
 * ABSENCE OF AT LEAST 1 MANDATORY DIMENSION: X, Z, P, K IN G33
 *
- * E51 : PRESENCE OF AT LEAST DIMENSION OTHER THAN X, Z, K, P, Q, EA, EB, R, F, S IN
 * G33
 *
- * E52 : ANGLES EA AND EB NOT COMPATIBLE IN G33
 *
- * E53 :
- * E54 : $EB \geq 90$ OR $EB \leq -90$ IN G33
 *
- * E55 : $P \leq 0$ $R < 0$ $Q < 0$ $F \leq 0$ $S \leq 0$ $K \leq 0$ IN G33
 *
- * E56 : $GUARD = 0$ OR $LENGTH\ OF\ CONE \geq LENGTH\ OF\ THREAD\ CUTTING\ PHASE$ IN G33
 *
- * E57 : $Q \geq P$ IN G33
 *
- * E58 : PRECEDING BLOCK INVALID IN G33
 *
- * E59 : $F \geq 100$ $S \geq 100$ $K > 250$ IN G33
 *

- * - - - : G45 POCKET CYCLES
- * E60 : MACHINING AXIS NOT DEFINED IN G45
- *
- *
- *
- * E61 : INTERPOLATION INCORRECTLY DEFINED IN G45
- *
- *
- *
- * E62 : - PROGRAMMING ERROR
- *
- PASSAGE RUN
- *
- SPEED
- *
- DIMENSION (EB, EX, EY, EZ) MISSING
- *
- SPINDLE STOPPED
- * E63 : PARAMETER VALUE ZERO OR NEGATIVE
- *
- DIMENSION
- *
- RUN CUT
- *
- SPEED
- * E64 : PARAMETER INCOMPATIBLE WITH TOOL RADIUS
- *
- *
- *
- * E65 : POCKET DIMENSIONS NOT SITUATED IN INTERPOLATION PLANE
- *
- *
- *
- * E66 : DIMENSIONS NOT COMPATIBLE WITH PROGRAMMED MATERIAL REMOVALS
- *
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- * E67 :
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- * E68 :
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- * E69 :
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- *

- * E70 : MIXED MACHINE: AXES X AND Z NOT YET PROGRAMMED WHEN A THREAD CUTTING OPERATION IS DEMANDED
*
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*
- * E71 : INCREMENTAL PROGRAMMING AFTER AN INCOMPLETE BLOCK
*
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- * E72 :
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- * E73 :
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- * E74 :
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*
- * E75 : MIXED MACHINE
 - PASSAGE FROM STATUS G20 TO G21 OR G22
 - LAST BLOCK IN G20 INCOMPLETE BECAUSE PROGRAMMED IN PGP OR RADIUS C0 OR WITH X <= 0
 - FIRST BLOCK IN G21 WITHOUT X AND Y OR IN G22 WITHOUT Y AND Z
 - PASSAGE FROM STATUS G21 OR G22 TO G20
 - LAST BLOCK IN G21 OR G22 INCOMPLETE OR FIRST BLOCK IN G20 WITH RADIUS C0
 - IN G21: NEGATIVE OR 0 STARTING RADIUS
- * E76 : MIXED MACHINE
IN G21 OR G22: PROGRAMMING OF FIXED TURNING OR MILLING CYCLE
*
*
*
- * E77 : MIXED MACHINE: IN G20, G21 OR G22, PROGRAMS WITHOUT TURNING TOOL OR WITH MILLING TOOL
*
*
*
- * E78 :
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*
- * E79 :
*
*
*

- * - - - : MIXED MACHINE: PROGRAMMING ERRORS IN ROUGH WORKING CYCLE

- * E80 : MIXED MACHINE
 - * - BLOCK PRECEDING CYCLE CALL INCOMPLETE
 - * - CIRCLE PROGRAMMED OR BLOCK INCOMPLETE IN DEFINITION OF ROUGH MACHINING
 - * - GROOVE CYCLE IMPOSSIBLE INCORRECT FORMAT OR NO INTERSECTION POINT

- * E81 : MIXED MACHINE
 - * - ROUGH MACHINING PITCH NOT DEFINED

- * E82 : MIXED MACHINE
 - * THE FIRST OR LAST BLOCK OF THE PROFILE TO BE ROUGH MACHINED HAS NO DIMENSIONS OR IS INCOMPLETE

- * E83 : MIXED MACHINE
 - * TOO MANY BLOCKS IN PROFILE TO BE ROUGH MACHINED (MAX 50)

- * E84 : MIXED MACHINE
 - * GROOVE CYCLE: INTERSECTION POINT NOT FOUND

- * E85 :

- * E86 : MIXED MACHINE
 - * SYNTAX ERROR IN DEFINITION OF SINKING CYCLE
 - * EF PROGRAM BEFORE EB (+ OR -)

- * E87 : SYNTAX ERROR IN DEFINITION OF CYCLE:
 - * - M3 OR M4 NOT PROGRAMMED
 - * - TIMEOUT NOT COMPATIBLE WITH CYCLE
 - * - P AND/OR Q ZERO OR MISSING IN G83 OR G87 OR NOT COMPATIBLE WITH CYCLE

- * E88 : - INTERPOLATION PLANE DOES NOT CONFORM TO TOOL DIRECTION
 - * - PROGRAM ER BEFORE MACHINING CYCLE
 - * - PLANE AXES NOT PROGRAMMED IN 1ST BLOCK IN G86 OR G31

- * E89 : SYNTAX ERROR IN DEFINITION OF CYCLE G31
 - * - SPINDLE SPEED ZERO
 - * - THREAD CUTTING PITCH NOT PROGRAMMED
 - * - P NOT PROGRAMMED
 - * - INDEXING POSITION - EC - NON-NULL

- * E90 :
*
*
*
- * E91 : PARAMETER NO. NOT RECOGNIZED
*
*
*
- * E92 : - UNSIGNED FUNCTION ASSIGNED NEGATIVE PARAMETER
* - PARAMETER VALUE GREATER THAN THE MAX VALUE OF THE FUNCTION
* WITH WHICH THE PARAMETER IS ASSOCIATED
*
- * E93 : ERROR IN STATEMENT OF PARAMETER OR IN EXPRESSION OF TEST
* - FUNCTION L NOT FOLLOWED BY ONE OF SYMBOLS =, <, >.
* - ASSOCIATION BY STRING CHARACTER -, +, =, / WITH FORBIDDEN FUNCTION
* - PARAMETER NON EXISTENT
- * E94 : OPERATION FORBIDDEN IN PARAMETERISED EXPRESSION
* - SQUARE ROOT OF A NEGATIVE NUMBER
* - DIVISION BY ZERO
*
- * E95 : ATTEMPT TO WRITE IN AN EXTERNAL INPUT PARAMETER
* OR IN READ ONLY PARAMETER
*
*
- * E96 : BLOCK PRECEDING STATEMENT OF AN INCOMPLETE PARAMETER
* PROGRAMMING OF L100 TO L199 OR L900 TO L939
* IN PROFILE DEFINITION OF A G64
*
- * E97 : PARAMETER OUTPUT NOT POSSIBLE IN G76
* - NO "="SYMBOL AFTER PARAMETER NUMBER
* - LESS THAN 10 CHARACTERS RESERVED TO WRITE VALUE
*
- * E98 :
*
*
*
- * E99 :
*
*
*

- * --- LIST OF ERRORS IN THE DEFINITION OF CURVES
- BLOCK IN WHICH THE FINISHING PT IS DETERMINED OR CAN BE CALCULATED USING THE ELEMENTS OF THIS BLOCK
- * E100 :
*
*
*
- * E101 : INSUFFICIENT DATA IN PROGRAMMING OF A CIRCLE
* PROGRAMMING OF CIRCLE ON TWO PARALLEL AXES BY R
*
*
- * E102 : PROGRAMMING OF A STRAIGHT LINE BY ITS ANGLE (A) AND A COORDINATE (X, Y OR Z) WHICH DO NOT ENABLE THE OTHER COORDINATE TO BE KNOWN
*
*
*
- * E103 :
*
*
*
- * E104 :
*
*
*
*
- * E105 :
*
*
*
- * E106 : IN G2 OR G3, PROGRAMING OF THIRD AXIS WITHOUT HELICAL INTERPOLATION OPTION
*
*
*
- * E107 : - PROGRAMMING OF CIRCLE BY ITS RADIUS AND FINISHING POINT, IN WHICH THE FINISHING POINT IS SEPARATED FROM THE STARTING POINT BY A VALUE GREATER THAN 2* RADIUS
*
* - PROGRAMMING OF A CIRCLE BY ITS FINISHING POINT AND THE CENTRE OF THE CIRCLE IN WHICH THE STARTING RADIUS IS = THE FINISHING POINT
*
* - PROGRAMMING OF CIRCLE ON 2 PARALLEL BY I AND J.
*
* - DIMENSION OF 3RD AXIS MISSING IN HELICAL INTERPOLATION.
- * E108 :
*
*
*
- * E109 :
*
*
*

--- TWO BLOCKS WHICH SHOULD ENABLE THEIR TANGENT OR INTERSECTION TO BE CALCULATED

* E110 : SYNTAX ERROR IN THE FIRST OF THE TWO BLOCKS

*
*
*

* E111 : SYNTAX ERROR IN SECOND BLOCK

*
*
*

* E112 : STRAIGHT LINE - STRAIGHT LINE INTERSECTION IN WHICH:
* - STARTING POINT OF 1st BLOCK - ARRIVAL POINT OF 2nd BLOCK
* - FIRST STRAIGHT LINE ANGLE = SECOND STRAIGHT LINE ANGLE
*

* E113 : VALUES PROGRAMMED IN BOTH BLOCKS DO NOT ENABLE TANGENT OR INTERSECTION TO BE DETERMINED

*
*

* E114 : INTERSECTION POINT OR TANGENT NOT DETERMINED BY ET+, ET-, ES+ OR ES-

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*
*

* E115 :

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* E116 :

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* E117 :

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* E118 :

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* E119 :

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*

--- THREE BLOCKS WHICH SHOULD ENABLE THEIR TANGENT OR INTERSECTION
TO BE CALCULATED

* E120 :

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*
*

* E121 : SYNTAX ERROR IN THE FIRST OF THE THREE BLOCKS

*
*
*

* E122 : FIRST TWO BLOCKS ARE NON SECANT STRAIGHT LINES

*
*
*

* E123 : DATA PROG IN THE THREE BLOCKS DO NOT ENABLE TANGENCY POINTS TO BE
DETERMINED

*
*

* E124 : SECOND - THIRD BLOCK TANGENCY POINT NOT SPECIFIED BY ET+ OR ET-

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*
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* E125 :

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* E126 :

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* E127 :

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* E128 :

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* E129 :

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*

- * - - - ERRORS IN THE DEFINITION OF FILLETS OR CHAMFERS

- * E130 : ZERO MOVEMENT IN ONE OF THE TWO BLOCKS CONNECTED BY FILLETS
 * CHAMFERS
 *
 *

- * E131 : - PROGRAMMING OF FILLET OR CHAMFER IN BLOCK COMPRISING M00 OR M02
 * OR M01
 * - INSUFFICIENT PROG IN RUN OF SEQUENCES-ARRIVAL POINT CANNOT BE DETERMINED
 *

- * E132 :
 *
 *
 *

- * E133 :
 *
 *
 *

- * E134 :
 *
 *
 *

- * E135 : A CHAMFER CAN ONLY CONNECT TWO STRAIGHT LINES
 *
 *
 *

- * E136 : MORE THAN TWO BLOCKS NOT COMPRISING A MOVEMENT BETWEEN TWO BLOCKS
 * CONTAINING THEM AND THE INTERSECTION OR TANGENCY PT OF WHICH IS TO BE
 * CALCULATED
 *

- * E137 : CHANGE OF INTERPOLATION PLANE WHEREAS THE BLOCK IS NOT ENABLED
 *
 *
 *

- * E138 : CHANGE OF PLANE OUTSIDE OF G40
 *
 *
 *

- * E139 : PROGRAMMING OF PARALLEL AXES CARRIED OUTSIDE G52 (MEASUREMENT
 * ORIGIN) AND G0
 *
 *
 *

- * E140 : PROGRAMMING ERROR IN RADIUS COMPENSATION
 - TOO MANY UNWANTED BLOCKS BETWEEN 2 CONSECUTIVE TRAJECTORIES
 - PROGRAMMING OF FOLLOWING BLOCKS PROHIBITED:
 - M00, M01, M02, ACCESS TO EXTERNAL PARAMETERS, WRITING OF
 - PARAMETERS E8xxxx OR L = > 100

- * E141 : CARRIED PARALLEL AXES: PROGRAMMING OF CIRCLE THE STARTING POINT OF WHICH WAS PROGRAMMED WITH AN AXIS AND THE ARRIVAL POINT WITH THE ASSOCIATED PARALLEL AXIS

- * E142 :

- * E143 : CANCELLATION OR ENABLING OF THE SCALE FACTOR IN RADIUS COMPENSATION

- * E144 : MOVEMENT ALONG SEGMENTED AXIS OTHER THAN THE CORRECT UNIT

- * E145 : NORMAL VECTOR NOT A UNIT IN D/OFFSET (G29); VAL ABS > 1 mm

- * E146 : IN 3D OFFSET
 - AT LEAST ONE DIMENSION P, Q OR R ABSENT
 - AT LEAST ONE DIMENSION X/U, Y/V OR Z/W ABSENT

- * E147 : SYNTAX ERROR ON G43

- * E148 : MORE THAN TWO AXES PROGRAMMED WITH OPTION 51 CONFIRMED (A1)

- * E149 : TOOL RADIUS TOO BIG WITH RESPECT TO PROGRAMMED PATH

* - - - : MOVEMENT OUTSIDE OF MACHINE LIMITS DEMANDED

* E150 : TRAVEL OVERRUN ON X AXIS

*
*
*

* E151 : TRAVEL OVERRUN ON Y AXIS

*
*
*

* E152 : TRAVEL OVERRUN ON Z AXIS

*
*
*

* E153 : TRAVEL OVERRUN ON U AXIS

*
*
*

* E154 : TRAVEL OVERRUN ON V AXIS

*
*
*

* E155 : TRAVEL OVERRUN ON W AXIS

*
*
*

* E156 : TRAVEL OVERRUN ON A AXIS

*
*
*

* E157 : TRAVEL OVERRUN ON B AXIS

*
*
*

* E158 : TRAVEL OVERRUN ON C AXIS

*
*
*

* E159 : MOVEMENT DEMAND PROGRAMMED ON AXIS FOR WHICH MOS WAS NOT
PERFORMED

*
*

- * - - - : STRUCTURED PROGRAMMING ERRORS
- * E190 : TOO MANY INTERLEAVINGS OR JUMPS OR LOOPS (15 MAX)
- *
 - * E191 : STRUCTURED PROGRAMMING SYNTAX NOT RESPECTED
 - * STRUCTURED PROGRAMMING PROHIBITED IN MDI
 - * LOOP INDEX FOR MUST BE AN L TYPE VARIABLE, A SYMBOLIC VARIABLE
 - * OR AN E80000, E81000 OR E82000 PARAMETER
 - * DO OMITTED AFTER WHILE
 - * SYNTAX NOT RESPECTED IN PUSHES AND PULLS
 - * IF, THEN, ELSE PROGRAMMED IN MDI
- * E192 : KEY WORD NOT RECOGNIZED OR PROHIBITED IN PROGRAM CONTEXT
- *
 - * E193 : STRUCTURE ERROR
- *
 - * E194 :
- * E195 : PROGRAM STACK FULL (SEE MDI MODE: paragraph 11.4)
- *
 - * NUMBER OF CONSTANTS DEFINED GREATER THAN RESERVED
- * E196 : ERROR IN TABLE INDEX DECLARATION
- *
 - * E197 : USE OF NON-DECLARED SYMBOL IN VAR
 - * SET PULLED WASN'T PUSHED
- * E198 : SYNTAX ERROR IN VARIABLE SYMBOL DECLARATION
- *
 - * E199 : VARIABLE DECLARATION SYNTAX INCORRECT

* - - - : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS

* E210 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 0
*
*
*

* E211 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 1
*
*
*

* E212 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 2
*
*
*

* E213 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 3
*
*
*

* E214 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 4
*
*
*

* E215 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 5
*
*
*

* E216 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 6
*
*
*

* E217 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 7
*
*
*

* E218 : ENCODER SIGNAL FAULT - POOR SIGNAL/CHANNEL LOSS FAULT, AXIS 8
*
*
*

* E219 :
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*
*

* - - - SPLINE CURVE PROGRAMMING ERRORS (OPTION)

* E250 : INCORRECT SYNTAX
* ON G48 AND G49 PROGRAMMING OF OTHER PREPARATORY FUNCTIONS OR
* PROHIBITED AUXILIARY FUNCTIONS
*

* E251 : CHARACTER NOT RECOGNIZED
*
*
*

* E252 : INCORRECT FORMAT. DIMENSION FORMAT IS (.3 OR 4.4 DEPENDING ON STATUS OF
* G70 OR G71
*
*

* E253 : INCOHERENT PROGRAMMING
* THE SET OF INTERPOLATED AXES ON THE CURVE MUST BE CONTAINED IN ALL THE
* DEFINITION BLOCKS
*

* E254 : DEFINITION MEMORY AREA SATURATED
*
*
*

* E255 : PROGRAMMING OF TWO CONSECUTIVE IDENTICAL POINTS (NO MOVEMENT
* BETWEEN TWO POINTS)
* SPLINE CURVE DEFINED BY LESS THAN THREE POINTS
*

* E256 : CURVE NOT FOUND IN G06
*
*
*

* E257 :
*
*
*

* E258 :
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*
*

* E259 :
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*
*

* - - - ERRORS IN POCKET CYCLES (E260 to E292) (OPTION)

* E260 : WORKING MEMORY FULL

*
*
*

* E261 : PROGRAM NUMBER TOO HIGH

*
*
*

* E262 : NU NUMBER NOT INCLUDED IN THOSE AUTHORIZED

*
*
*

* E263 : EXECUTION IMPOSSIBLE, TEST OR GRAPHIC MODE MANDATORY
AFTER INITIAL LOADING OR AFTER MODIFICATION

*
*

* E264 : NO DIMENSION PROGRAMMED IN CONTOURING PLANE, OR DIMENSION OUT OF PLANE

*
*
*

* E265 : FIRST POSITIONING BLOCK MISSING, DEFINITION OF CONTOUR SHOULD BEGIN
WITH G0 OR G1

*
*

* E266 : INSUFFICIENT MEMORY AREA

*
*
*

* E267 : CHARACTER NOT AUTHORIZED IN POCKET SYNTAX

*
*
*

* E268 : POCKET PROGRAMMING BLOCK INCOMPLETE
POCKET PROGRAMMING BLOCK CONTAINING NON-AUTHORIZED DATA

*
*

* E269 : CONTOUR BLOCK INCOMPLETE
POSITIONING BLOCK MISSING BEFORE POCKET DEFINITION

*
*

- * E270 : POCKET DEFINITION PARTIALLY OR COMPLETELY MISSING
*
*
*
- * E271 : TOOL DIRECTION NOT PERPENDICULAR TO CONTOURING PLANE
*
*
*
- * E272 : REAL TOOL NOT COMPATIBLE WITH POCKET TECHNOLOGICAL DATA
*
*
*
- * E273 : CHANGE IN CONTOURING PLANE BETWEEN POCKET DEFINITION AND MACHINING
*
*
*
- * E274 : TWO NESTED POCKET DEFINITIONS
*
*
*
- * E275 : NU ZERO PROGRAMMED WITH G59
*
*
*
- * E276 : POCKET DEPTH NULL
* PROGRAMING ERROR IN DIMENSION «ER»
*
*
- * E277 : IN POCKET DEFINITION, THE COORDINATES OF THE BEGINNING OR END POINT
* ARE INCOMPLETE
*
*
- * E278 : SPINDLE ROTATION DIRECTION INCOMPATIBLE WITH THAT DEMANDED
* IN POCKET DEFINITION
*
*
- * E279 : G FUNCTION NOT AUTHORIZED IN A POCKET PROGRAMMING BLOCK
*
*
*

* E280 : FIRST CONTOUR BLOCK INCOMPLETE

*
*
*

* E281 : DISCONTINUITY IN ONE OF THE PROFILES DESCRIBED

*
*
*

* E282 : POCKET DEFINITION PARAMETER(S) INCORRECT

*
*
*

* E283 : EXTERNAL PROFILE MUST BE UNIQUE AND MUST EXIST

*
*
*

* E284 : FAULT IN PROFILE DEFINITION

*
*
*

* E285 : TOO MANY CONTOURS

*
*
*

* E286 : MATERIAL REMOVAL EXCESSIVE WITH RESPECT TO TOOL DIAMETER

*
*
*

* E287 : MATERIAL REMOVAL TOO LOW WITH RESPECT TO DIMENSIONS

*
*
*

* E288 : FINISHING ENGAGED IN INSIDE CORNER
FINISHING ENGAGED IN NON-ROUGHED AREA (CHANGE ENGAGEMENT POINT)

*
*

* E289 : TOOL NUMBER TOO HIGH

*
*
*

* E290 : INTERNAL ERROR (SOFTWARE)

*
*
*

* E291 : FINISHING ENGAGED OUTSIDE OF PROFILE

*
*
*

* E292 : DOUBLE POSITIONING AT BEGINNING OF PROFILE

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*
*

* E293 : PROGRAMMING OF A ROUGHING STARTING OR END POINT FOR SURFACE FINISHING

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* E294 :

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* E295 :

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* E296 :

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* E297 :

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* E298 :

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* E299 :

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NOTES

APPENDIX 2

FINAL SITE UTILITIES (UT9 and UT11)

This utility, which is supplied with each machine is used to modify some of the machine parameters, and for loading and unloading of numerical control and programmable controller EEPROM stored software packages.

These software packages must only be loaded in the event of incidents on the machine: processor PCB or programmable controller memory extension defective and requiring replacement, or if the numerical control processor individualisation PCB is defective.

- Utility 9, which concerns machine parameters and enables modification of parameters P16 (position of stop in machine dimensions ORMOS), P17 (axes travels FDCX), P18 (inversion clearances), P37, P38 and P39 (DNC - Level 1 link), P48 (spindle origin offset) and P59 (Graphic parameter).
- Utility 11 enabling punching of storage tapes for the contents of the numerical control EEPROM (Machine parameters, screw corrections, fixed macros) and the contents of the programmable controller EEPROM, and reloading of these tapes.

COMMENT

Loading or unloading of the contents of the NC EEPROM or programmable controller EEPROM can be made from IBM PC or compatible floppy disks using the NUM.PC software; see NUM Manual PC number 938764.

A2.1 - UTILITY 9: MACHINE PARAMETERS

By typing 9 (LF) in the resident utility menu, obtained by pressing SERVICE, the following menu is displayed:

```
MACHINE PARAMETERS
0  DISPLAY
1  MODIFICATION
```

A2.1.1 - Display

When the menu is called the pointer automatically sets to 0. Press CONTINUED to obtain the question PARAMETER? on the communication line.

Select the parameter to be displayed at the alphanumerical keyboard, e.g. P10 LF.

```
(DISPLAY)  PARA : 10 TYPE : 0 NO. OF WORDS : 2
> N0 00
  N1 00
```

appears on the display.

To display all the parameters, press the CONTINUED key to the question PARAMETER?, this displays P0, press CONTINUED again to display P1, and so on.

Return to the menu is obtained by pressing the «service» key.

Page displayed for a parameter

Having demanded display or modification of a parameter, the following appears on the display page:

```
(MODIF)   PARA: TYPE: NO. OF WORDS:
      or
(DISPLAY)
          > N0
            N1
            N2
            N3
            .
            .
```

- the number of the parameter requested is displayed after PARA.
- either 0, 1, 2 or 3 are written after TYPE.
 - 0 corresponds to a word written in hexadecimal from 00 to FF.
 - 1 corresponds to a word written in decimal from - 32767 to + 32767.
 - 2 corresponds to a decimal word from - 99999999 to + 99999999
 - 3 signifies that the corresponding has one character, e.g. X
- NO. WORDS indicates the number of words in the parameter.
- N0 - N1 - N2 gives the word number. A maximum of 5 words are displayed, the subsequent words are obtained by pressing key «↓».

A2.12 - MODIFICATION

Only parameters P16, P17, P18, P37, P38, P39, P48 and P59 can be modified.

It is impossible to modify other parameters.

In the MACHINE PARAMETER menu, press 1 LF to set the cursor to the MODIFICATION line with the question PARAMETER ? on the communication line.

At the keyboard, enter the parameter to be modified, followed by LF.
For example, P17 LF. The display then reads:

```
(MODIF)   PARA : 17  TYPE : 2  NO. WORDS : 24
          > N0 - 10000
            N1 + 150000
            N2 - 20000
            N3 - 100000
            N4 - 5000
```

Using «↓» align the pointer with the parameter to be modified, the use # «New value» LF to modify the word.

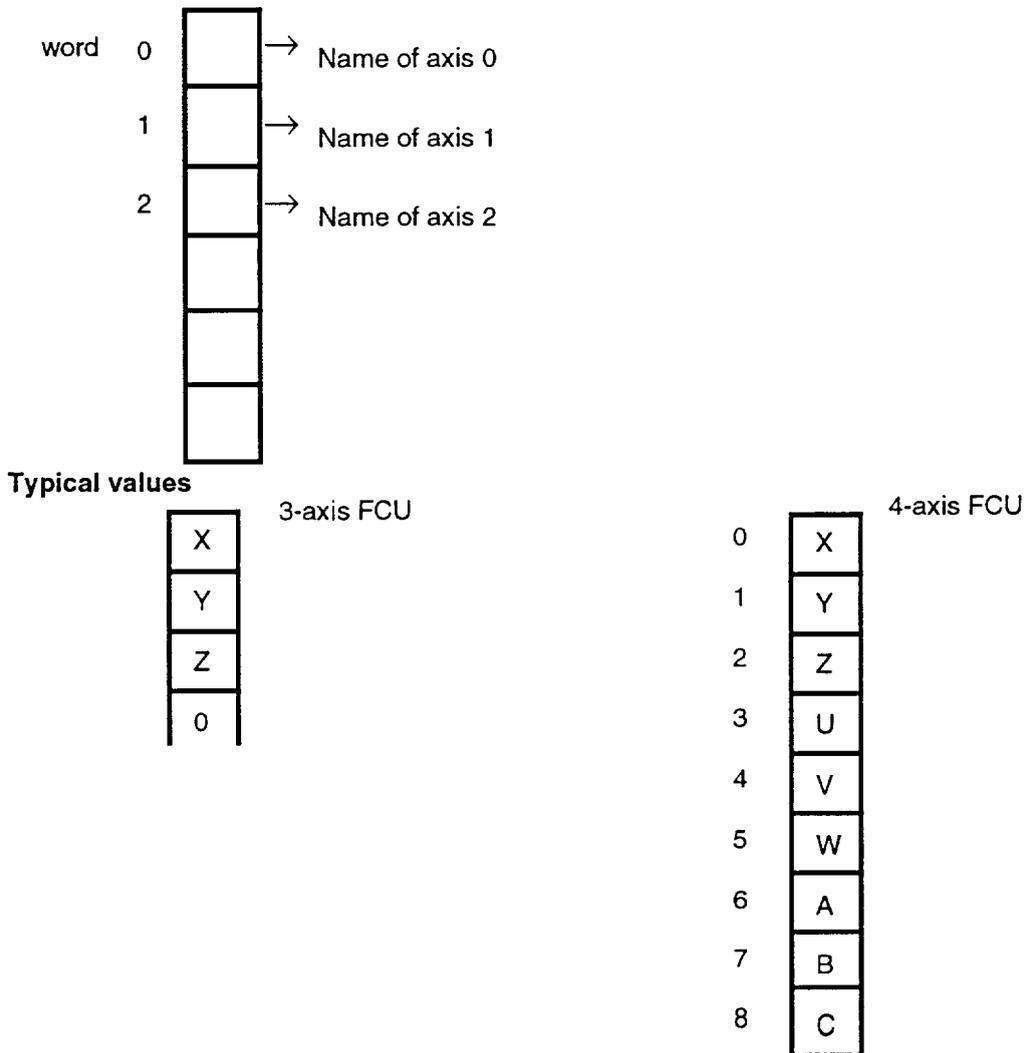
If there is only one character to be modified on the line, press # LF to bring the pointed line onto the communication line, and modify by means of the cursor, correction and then LF.

Operate the «service» key to return to the menu.

Having made the modifications, do not forget to produce an EEPROM-NC tape or floppy disk using utility 11.

NUM 750	PARAMETER P0	FUNCTION		
	LISTE OF PROGRAMMABLE AXIS NAMES	AXES DECLARATION		
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS	16	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)			
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX	F	
	<input checked="" type="checkbox"/> 3 Character			

Declaration of axis names. This enables the system to recognize the names of the axes.



Absent axes are named "0".

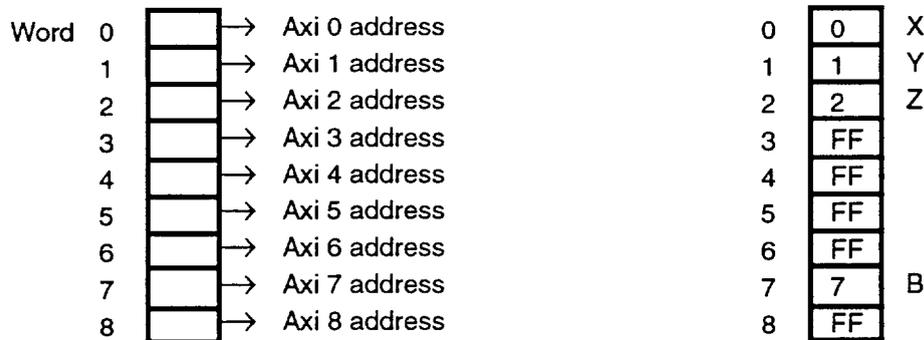
				NOMAXE
2.84	B			
25.7.83	A			P0
9.3.83	Creation			1/1

NUM 750	PARAMETER	P9			FUNCTION
	MACHINES AXES ADDRESSES			AXES DECLARATION	
WORD TYPE	<input checked="" type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS			9
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)	INDEX			F
<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)					
<input type="checkbox"/> 3 Character					
VALIDITY INDEX	760 F: from software 200324/B				

This parameter provides the addresses of the programmable axes. The address corresponds to the wiring of the axis PCB connector for the axis considered.

The addresses possible range from 0 to 11. Absence of an axis is declared by address FF. These need not be in increasing order.

Example: FCU axes XYZ and B



				ADRAX
9.85	B			
4.85	A			P9
2.84	Creation			1/1

NUM 750	PARAMETER	P16			FUNCTION
		HOME POSITION IN MACHINE DIMENSIONS			MEASUREMENTS TRAVELS
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)			12	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input checked="" type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)				
	<input type="checkbox"/> 3 Character				F

Word *i* of this parameter corresponds to axis *i* (axis number according to wiring of axis PCB connector, defined by P9).

Each word contains the position of the stop on the corresponding axis in machine dimensions, the sign is determined by the direction machine origin towards the stop.

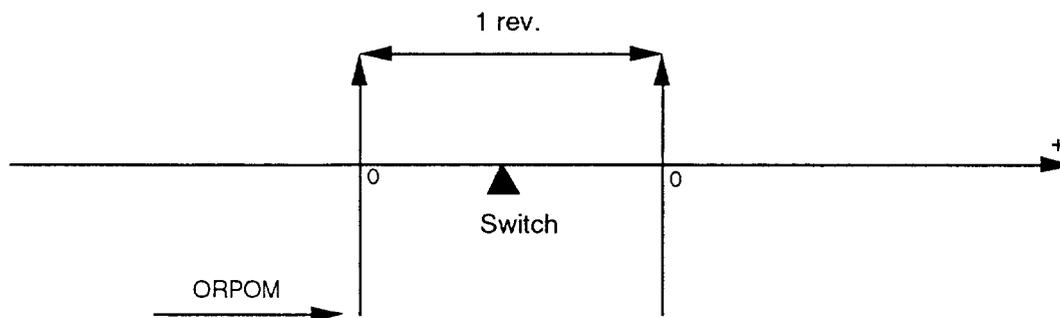
In fact, this is the position, in machine dimensions, of the point corresponding to the 0 of the 2mm coupler thread (corresponding to one revolution) to which their stop has been set.

Depending on the case involved, this 0 can be on either side of the stop. The possible cases are shown below.

COMMENT

If bit 7 of P4 is at 0 the dimensions for the linear axes are given in microns, and in tenths of a micron if bit 7 of P4 is at 1. For the rotary axes these are expressed in 1/1000°.

Resolver case



ORMOS defines the position of the resolver null immediately prior to the switch, allowing for the direction of the axis and independantly of the direction of the MOS.

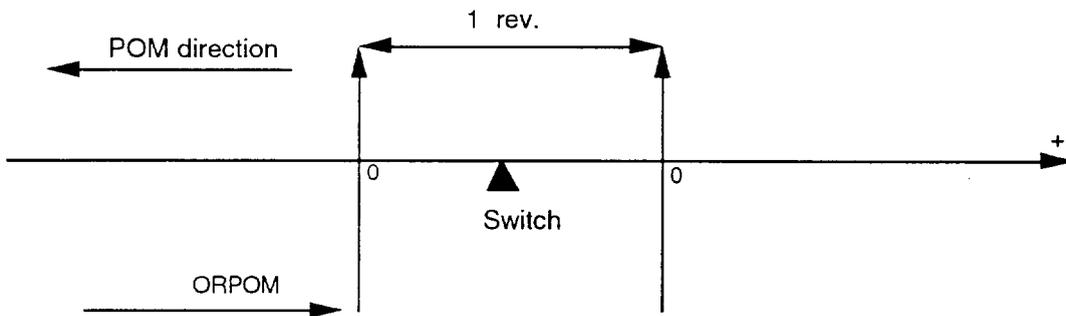
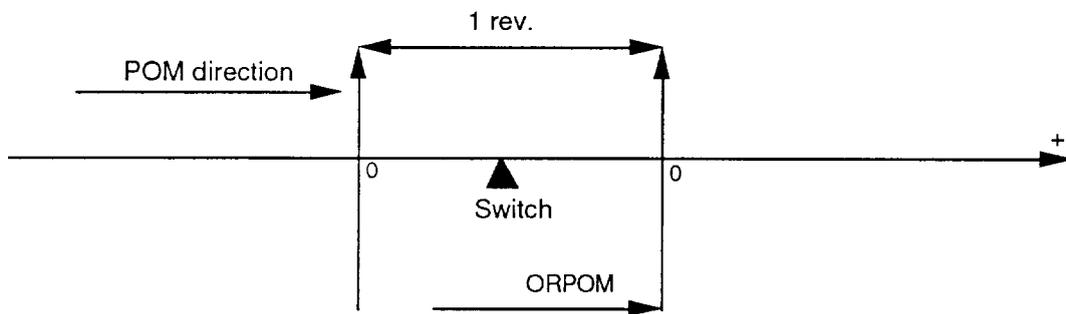
NOTE

See P9 for definition of row *i*.

				ORMOS	
2.84	B			P16	1/2
25.7.83	A				
9.3.83	Creation				

NUM 750	PARAMETER	P16	FUNCTION
	HOME POSITION IN MACHINE DIMENSIONS		MEASUREMENTS TRAVELS

Encoder case



ORMOS defines the encoder null position encountered after the HOME switch.

2.84	B			ORMOS	
25.7.83	A				
9.3.83	Creation			P16	2/2

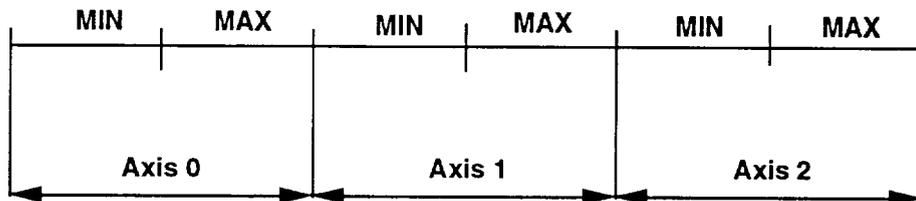
NUM 750	PARAMETER	P17			FUNCTION
	AXIS TRAVELS			MEASUREMENTS TRAVELS	
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		24	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input checked="" type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				

Each pair of words corresponds to a machine axis (odd word - even word)

The even word gives the travel lower limit: MIN (in machine dimensions) for the corresponding axis.

The odd word gives the travel upper limit: MAX (in machine dimensions) for the corresponding axis.

If bit 7 of P4 is at 0 the dimensions for the linear axes are given in microns, and in tenths of a micron if bit 7 of P4 is at 1. For the rotary axes these are expressed in 1/1000°.



COMMENT:

For the modulo rotary axes, it is recommended to program maximum values.

				FDCXS	
2.84	B			P17	1/1
25.7.83	A				
9.3.83	Creation				

NUM 750	PARAMETER	P18			FUNCTION
	REVERSAL ERROR COMPENSATION			MEASUREMENTS TRAVELS	
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		12	
	<input checked="" type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				

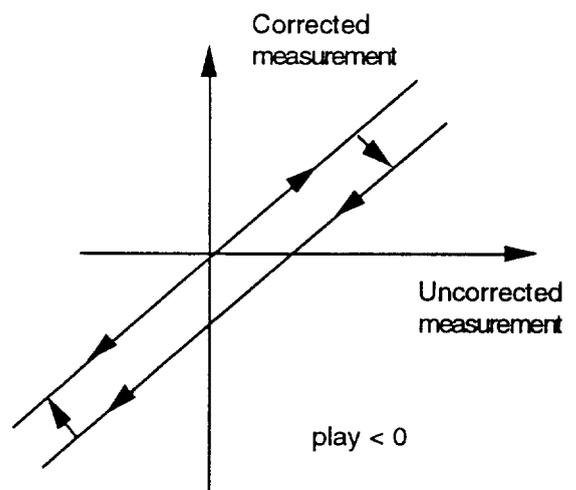
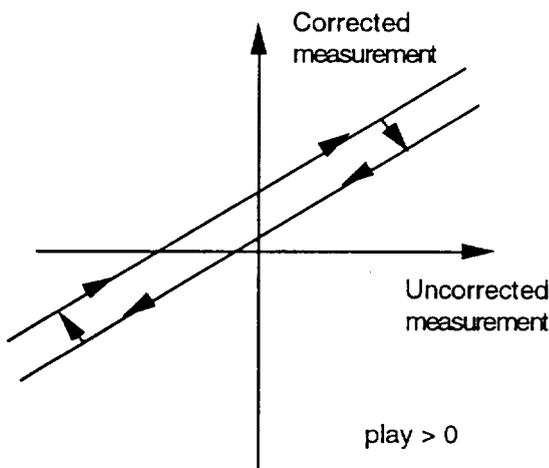
Each word corresponds to an axis and contains a signed value.

The absolute value of the content of a word gives the reversal error compensation on the corresponding axis.

The sign gives the direction of movement for which the reversal error compensation applies, as well as the sign of the correction.

Value > 0 : Positive correction, applied when the axis moves in the positive direction

Value < 0 : Negative correction, applied when the axis moves in the negative direction



If bit 7 of P4 is at 0 the corrections for the linear axes are given in microns, and in tenths of a micron if bit 7 of P4 is at 1.

For the rotary axes these are expressed in 1/1000° in all cases.

2.84	B			PLAYS (JEU)	
25.7.83	A			P18	1/1
9.3.83	Creation				

NUM 750	PARAMETER	P37			FUNCTION
	Formatting of characters Service character codes			DNC Level 1	
WORD TYPE	<input checked="" type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		9	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				
VALIDITY INDEX	750 F : from software 200324/C				

1 - Word of row 0 : Character formatting

This word defines the serialization mode for the line characters.

The values permitted for this mode are as follows:

- 02 : 7 bits + parity bit + 2 stop bits
- 06 : 7 bits + imparity bit + 2 Stop bits
- 0A : 7 bits + parity bit + 1 stop bit
- 0E : 7 bits + imparity bit + 1 stop bit
- 12 : 8 bits + 2 stop bits
- 16 : 8 bits + 1 stop bit
- 1A : 8 bits + parity bit + 1 stop bit
- 1E : 8 bits + imparity bit + 1 stop bit

NOTE

This parameter is used only with the DNC1 link procedure.

If absent, its content is indifferent.

9.88	B : IBM-PC			FORMAT	
12.85	A : Character code			P37	1/2
9.3.83	Creation				

NUM 750	PARAMETER	P37	FUNCTION
	Formatting of characters Service character codes		DNC Level 1

2 - Words of rows 1 to 8: Service character codes

- Word 1 : STX (Beginning of text) = \$ 02
- 2 : ETX (End of text) = \$ 03 (with IBM-PC : BEL = \$ 07)
- 3 : SYN (Initialization) = \$ 16
- 4 : ACK (Positive acknowledgement) = \$ 06 (with IBM-PC : SOH = \$ 01)
- 5 : NAK (Negative acknowledgement) = \$ 15
- 6 : EOT (End of transmission) = \$ 04
- 7 : ENQ (Repetition request) = \$ 05
- 8 : GS (Block separator) = \$ ID

			FORMAT
11-87	B : IBM-PC		P37 2/2
12-85	A : Character code		
1-85	Creation		

NUM 750	PARAMETER	P38			FUNCTION
	Translation of special characters in operator/computer dialogue			DNC Level 1	
WORD TYPE	<input checked="" type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS	16	INDEX	F
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)				
	<input type="checkbox"/> 3 Character				

This table is used to translate codes which can be used to monitor the dialogue between the NC operator and the computer.

These codes generally correspond to a cursor return, line cancellation, etc.

This parameter is a table of 16 words broken down into two parts.

1 - **Words 0 to 7** : (Translation of character sent from keyboard to computer).

- **Even words**: test character codes sent by NC keyboard.
- **Odd word** : translation of code contained in word of previous row.
It is this translation that is sent to the computer

2 - **Words 8 to 15** :

- **Even words**: test character code sent by computer
- **Odd words** : translation of code contained in preceding row word, which will be sent to the NC display

				CARSPE
				P38
7.84	Creation			1/2

NUM 750	PARAMETER	P38	FUNCTION
	Translation of special characters in operator/computer dialogue		DNC Level 1

Example: Use of "backward arrow" keyboard character (hexa:09) as a test character for the "cursor back" function.

The function code "cursor back" is hexa 09 on the display and hexa 08 on the computer considered.

0	09	1	08	2	00	3	00
4	00	5	00	6	00	7	00
8	08	9	09	10	00	11	00
12	00	13	00	14	00	15	00

NOTE

This parameter is used only with the DNC1 link procedure.

If this is absent, its content is indifferent.

				CARSPE	
				P38	2/2
7.84	Creation				

NUM 750	PARAMETER	P39			FUNCTION
	Timeouts used in DNC1 protocol			DNC Level 1	
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		3	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input checked="" type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				

WORD 0	
WORD 1	
WORD 2	

Word 0 defines the minimum time which the NC must respect between reception of a message or an acknowledgement and sending of the return acknowledgement or message.

This period enables the computer to set to reception. This is expressed in milliseconds.

Word 1 defines the minimum time allotted to the computer to reply after sending of a message or acknowledgement by the NC. This is expressed in milliseconds.

Word 2 defines the timeout used for spacing of characters sent to the computer by the NC.

This timeout is not necessary if signals CTS and RTS are used to synchronize both partners. In this case, the content of word 2 must be null.

If the test signals are not used, word 2 must contain the spacing value of the characters expressed in microseconds.

The maximum permissible value for this timeout is 81900 microseconds.

NOTE

This parameter is used only with the DNC1 link procedure. In the absence of this, the parameter content is indifferent.

			DELAI	
7.84	Creation		P39	1/1

NUM 750	PARAMETER	P48			FUNCTION
	Spindle origin offset			Spindle	
WORD TYPE	<input type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		2	
	<input checked="" type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				

(See chapter: SPINDLE INDEXING)

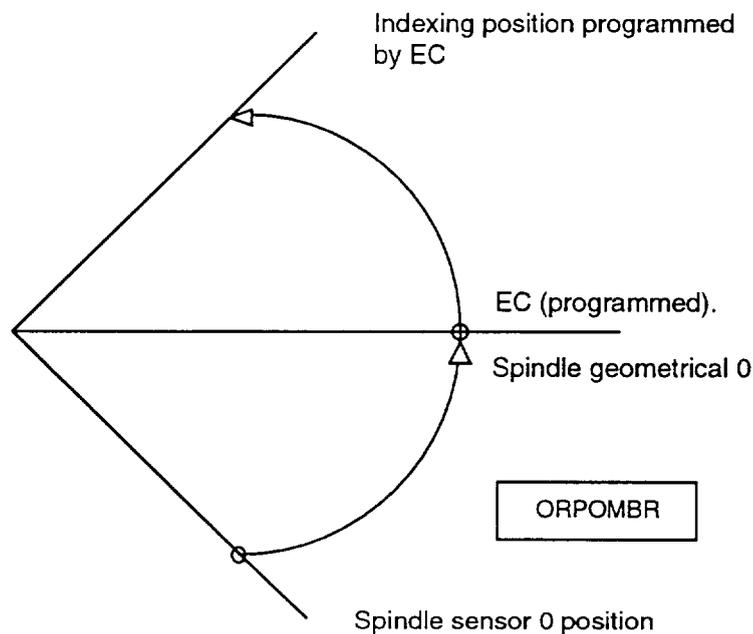
This parameter (ORPOMBR) is used to set the 0 position of the spindle, and consequently the indexing position.

1st word : spindle 1

2nd word : spindle 2

This is expressed in 1/4096 rev.

$$\text{ORPOMBR} = \text{offset (degrees)} \frac{4096}{360}$$



Significant with "spindle indexing" option only.

2.84	B			ORPOMBR	
25.7.83	A			P48	1/1
9.3.83	Creation				

NUM 750	PARAMETER	P59			FUNCTION
	Graphic parameter			Miscellaneous	
WORD TYPE	<input checked="" type="checkbox"/> 0 Hexadecimal (00 to FF)	NUMBER OF WORDS		4	
	<input type="checkbox"/> 1 Decimal (-32767 to +32767)				
	<input type="checkbox"/> 2 Decimal (-99.999.999 to +99.999.999)	INDEX		F	
	<input type="checkbox"/> 3 Character				
VALIDITY INDEX	750F: from software 200324/E				

- The first word of this parameter is used to define whether the hard copy from the graphic display is made on an EPSON EX 800 or EX 1000 (9 needle), BROTHER M1818 (80-column) printer, with BROTHER 1918 color kit (132 columns), with BROTHER M2518 color kit with serial interface option, or on EPSON LX or RX80, BROTHER 1818 or BROTHER 1918 black and white printer.

\$ 01: EPSON or BROTHER black and white printer
 \$ 02: SEIKOSHA color printer
 \$ 03: EPSON or BROTHER color printer

- The second word of the parameter defines the type of NC screen.

\$ 00 : Monochrome screen
 \$ 01 : Color screen

The second byte is tested by the conversational. If the screen is declared monochrome, all the displays made by the conversational are made in the "Grey" plane, which is overbright so as to obtain maximum brilliance.

- The third word of the parameter concerns the graphics:

\$ 00 = Dynamic drawing from reference
 \$ 01 = Dynamic drawing from measurement.

- The fourth word is not used.

9.88	C : SEIKOSHA printer			GRAPHI
7.87	B : Type of printer			
12.85	A : Type of screen			P59
4.85	Creation			

A2.2 - UTILITY 11: EEPROM ARCHIVING

This enables saving of digital data (data and software) stored in EEPROM.

The unload operation is mandatory at end of machine integration, or after each modification of parameters. Unloaded tapes must remain on the machine.

The loading operation is performed if a PCB is replaced: or the NC software is customized or changed.

On all tapes, the affair number is given so as to check compliance on loading.

The data are classified according to three types:

- Data applicable to NC
 - Software number, option grid and key,
 - Parameter type and table,
 - Measurement corrections,
 - Resident sub-routines.
- Data concerning the programmable controller:
 - Programmable controller binary.

A2.2.1 - Implementation

After selection of 11 (LF) in the utility menu, the following menu is displayed.

```
          EEPROM DATA TREATMENT
>  0 CN DATA LOAD
   1 PC DATA LOAD
   3 CN DATA UNLOAD
   4 PC DATA UNLOAD
   6 CN PAPER TAPE VERIFICATION
   7 PC PAPER TAPE VERIFICATION
```

Choice of a menu item is made by typing the corresponding number, followed by LF. Lines 0, 3 and 6 have a sub-menu if the EEPROMs are extended by 128 or 256 kbytes.

To quit a menu item, press «SERVICE»; this gives a return to the utility menu.

To quit the utility menu, press X OFF; the following message is then displayed:

```
NON-DETECTED MAINS FAILURE
ACKNOWLEDGE (Y/N)?
```

Reply Y (LF) provides return to the «Current Point» page, after automatic reinitialization of the NC.

IMPORTANT NOTE:

Below, implementation is described together with the use of the paper tape reader and punch. This is identical to using an IBM or compatible PC: see NUM PC manual No. 938 764.

A2.2.2 - Loading of NC data

When in the «EEPROM archiving» menu page, 0 (LF) results in the following menu being displayed:

```
      CN DATA LOAD
> 0 LOAD DATA IN BASIC EEPROM
  1 LOAD SEGMENT 1 DATA
  2 LOAD SEGMENT 2 DATA
```

If there is no EEPROM extension, the system automatically changes to the next item; if not, select 0, 1 or 2 (LF), followed by display of:

OPTION KEY

```
> 0 CONSERVATION OF STORED OPTIONS
  1 RESTORATION OF OPTIONS ON TAPE
```

Conservation of stored options is to be used when an individualization PCB featuring new options (addition) is installed.

Restoration of tape options is to be used after replacing of a defective EEPROM by a standardized EEPROM.

Restoration is possible (line 0 or 1) only under the following conditions:

- the affair number, unloaded onto the tape, is identical to the affair number contained in the EEPROM,
- or the machine affair number is equal to «00000000» (standard EEPROM reloaded). In this case, the tape affair number is stored in the EEPROM and replaces «00000000».

If none of the above conditions is fulfilled, the message «AFFAIR No. INCORRECT» is displayed.

The number of axes authorized per group is accepted under the same terms as the software options in the restoration mode selected.

- Machine parameters

Where the machine parameter table type is different than that of the archived tape, the following message appears:

```
TAPE PARAMETER TABLE TYPE
OTHER THAN EEPROM TYPE
LOAD TAPE PARAMETERS ?
(Y/N)?
```

By replying N (LF), no machine parameters are loaded (the tape fast forwards to the area concerning the machine parameters).

By replying Y (LF), the machine parameters on tape are loaded normally. Data concerning a parameter not existing in the table or a non-existing word of a parameter are unused.

- Corrected points

If the number of corrected points on the archived tape is greater than the space available in the correction table, the following message is displayed:

```
TOO MANY CORRECTED POINTS ON TAPE
MEASUREMENT CORRECTIONS NOT LOADED,
CONTINUE? (TAPE READING REQUIRED)
(Y/N) ?
```

To continue retrieval of macros, reply Y (LF). Excess points are not retrieved. The corrections already present and loaded are conserved.

- Macros

If the total size of the archiving tape macros is greater than the space available in the macro-resident area, the following message appears:

```
MACRO SPACE FULL
SUBSEQUENT MACROS NOT LOADED
CONTINUE? (TAPE READING REQUIRED)
(Y/N)?
```

To continue retrieving NC data, reply Y (LF). In this case, the excess macros are not loaded; the macros of the archive tape already loaded are conserved. The tape fast forwards up to the end.

The storage times without tape feed are indicated to the operator by the flashing message «WAIT».

A2.2.3 - Loading LPC data

The data saved concern the PLC program. Restoration is complete and automatic.

From the menu, type 1 (LF). The display reads «READY?».

With the paper tape on the reader and the latter on «READ», reply Y (LF) causes reading and storage of the PLC program.

At end of reading, return to menu.

When processing PLC data, three faults may be displayed:

- «INCORRECT AFFAIR No.»: the tape read does not correspond to the affair to be loaded.
- «INSUFFICIENT MEMORY AREA»: the data on the tape cannot all be stored in the available space in EEPROM.
- «PROGRAMMABLE CONTROLLER LOADING FAULT»: at least one character has been misread. Repeat the operation. If the fault persists, this may be due to the reader, to the NC-reader link or the punched tape, which was not checked on unloading.

A2.2.4 - Unloading of NC data

In the «EEPROM archiving» menu page, 3 (LF) displays:

```
          CN DATA UNLOAD
>  0 UNLOAD DATA TO BASIC EEPROM
  1 UNLOAD SEGMENT 1 DATA
  2 UNLOAD SEGMENT 2 DATA
```

If there is no EEPROM extension, the system automatically changes to the question «READY»; if not, select 0, 1 or 2 (LF), then reply to question «READY».

With the tape punch ready, unloading takes place as soon as the operator types Y (LF).

No other command is required. At end of punching, the utility menu is returned to.

A meter of tape and sprocket is created automatically before and after punching of the tape.

After unloading, the tape must be checked from the «NC DATA CHECK» line.

A2.2.5 - NC tape check

Having unloaded the NC program, compliance of the punched tape with the EEPROM content must be checked before archiving.

From the «EEPROM DATA TREATMENT» menu, type 6 (LF) which displays:

```
          NC DATA VERIFICATION
    >  0 BASIC EEPROM DATA VERIFICATION
      1 SEGMENT 1 DATA VERIFICATION
      2 SEGMENT 2 DATA VERIFICATION
```

If there is no EEPROM extension, the system automatically changes to «READY»?; if not, select the segment which was unloaded (0, 1 or 2) (LF); the question «READY»? appears.

Place the tape on the reader, select «READ».

Reply Y (LF) to question «READY»?

Reading of tape and «VERIFICATION IN COURSE» displayed.

- If the tape is correct, the menu is returned to at end of reading.
- If a fault is detected, the «TAPE DEFECTIVE» message is displayed.

Repeat the operation from the beginning, since the fault may be due to dust on the tape.

If the fault persists, check the tape; if OK, unload again and perform a check.

A2.2.6 - Unloading of programmable controller data

In the «EEPROM DATA TREATMENT» menu, typing 4 (LF) gives the question «READY?»

With the tape punch ready, unloading is made as soon as the operator presses Y (LF).

No other command is required; at end of punching, return to the utility menu. The punched tape must be monitored under the «TAPE CHECK» line.

A2.2.7 - Programmable controller data verification

The programmable controller data having been unloaded, it is necessary to verify compliance of the punched tape with the content of the memories.

In the «EEPROM DATA TREATMENT» menu, type 7 (LF); the question «READY»? appears.

With the tape punch ready, reply Y (LF) results in checking: identical to «NC TAPE CHECK».

NOTES

APPENDIX 3

CONNECTIONS OF PAPER TAPE READERS OR PUNCHERS AND PRINTER

The peripherals mentioned above can be connected to the NC to the Cannon READER/PUNCHER connector on the CN V2 processor board (200433) in the electronics rack (board located to the right of rack near its power supply) or to an external connector installed by the constructor of the machine and connected to the READER/PUNCHER connector.

Adjustment of the sending rate is made as a function of the peripheral via switches on the front panel of the processor board CN V2:

- READER switch: setting of reception rate for tape reader (300 to 9600 bauds)
- READER switch: adjustment of sending speed to a paper tape punch or a printer (300 to 9600 bauds)

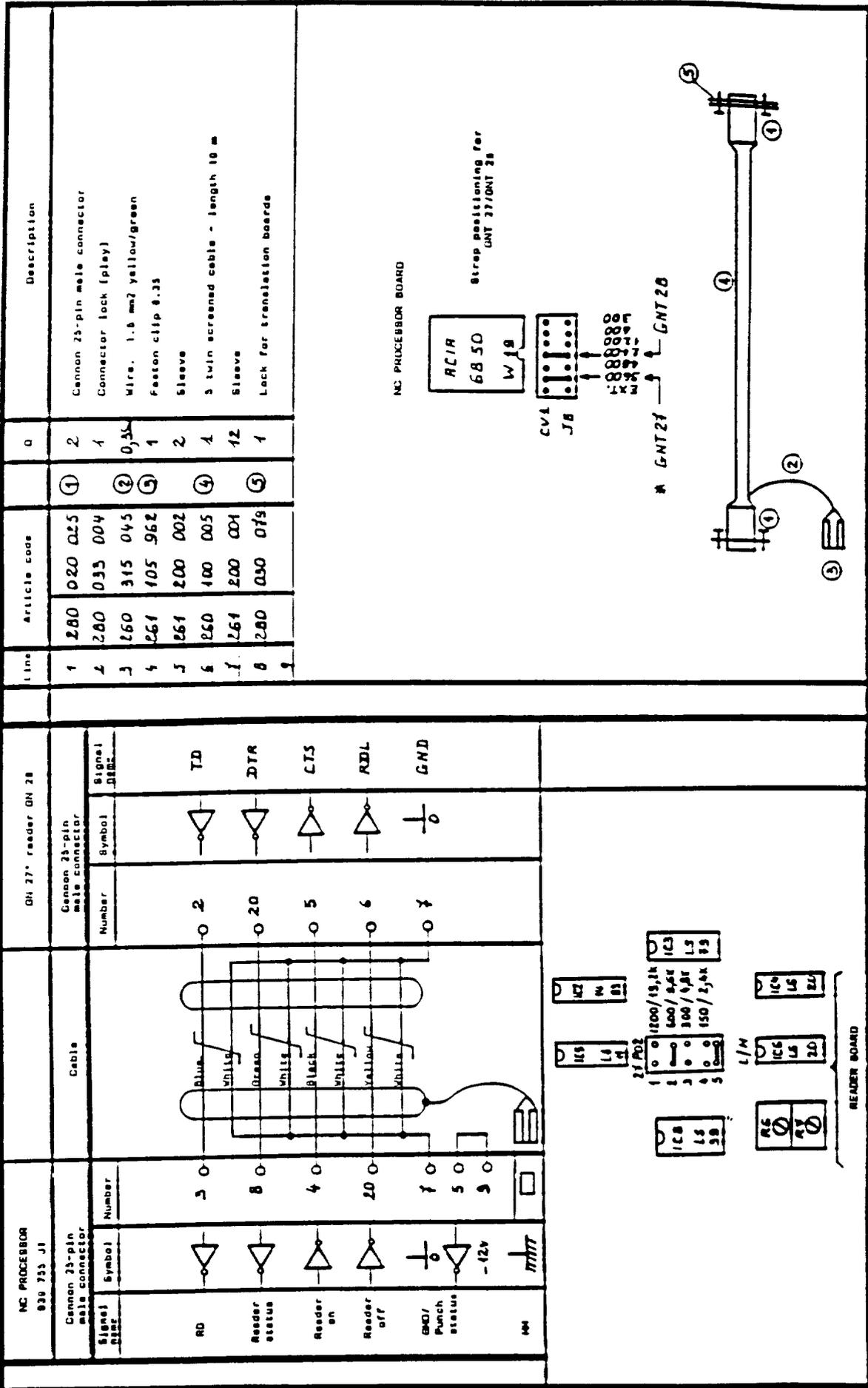
Comment

*For systems equipped with the CN V1 processor board (939755), the settings are obtained by jumpers on the board (see page A3.9); the system **must be switched off** to perform these adjustments.*

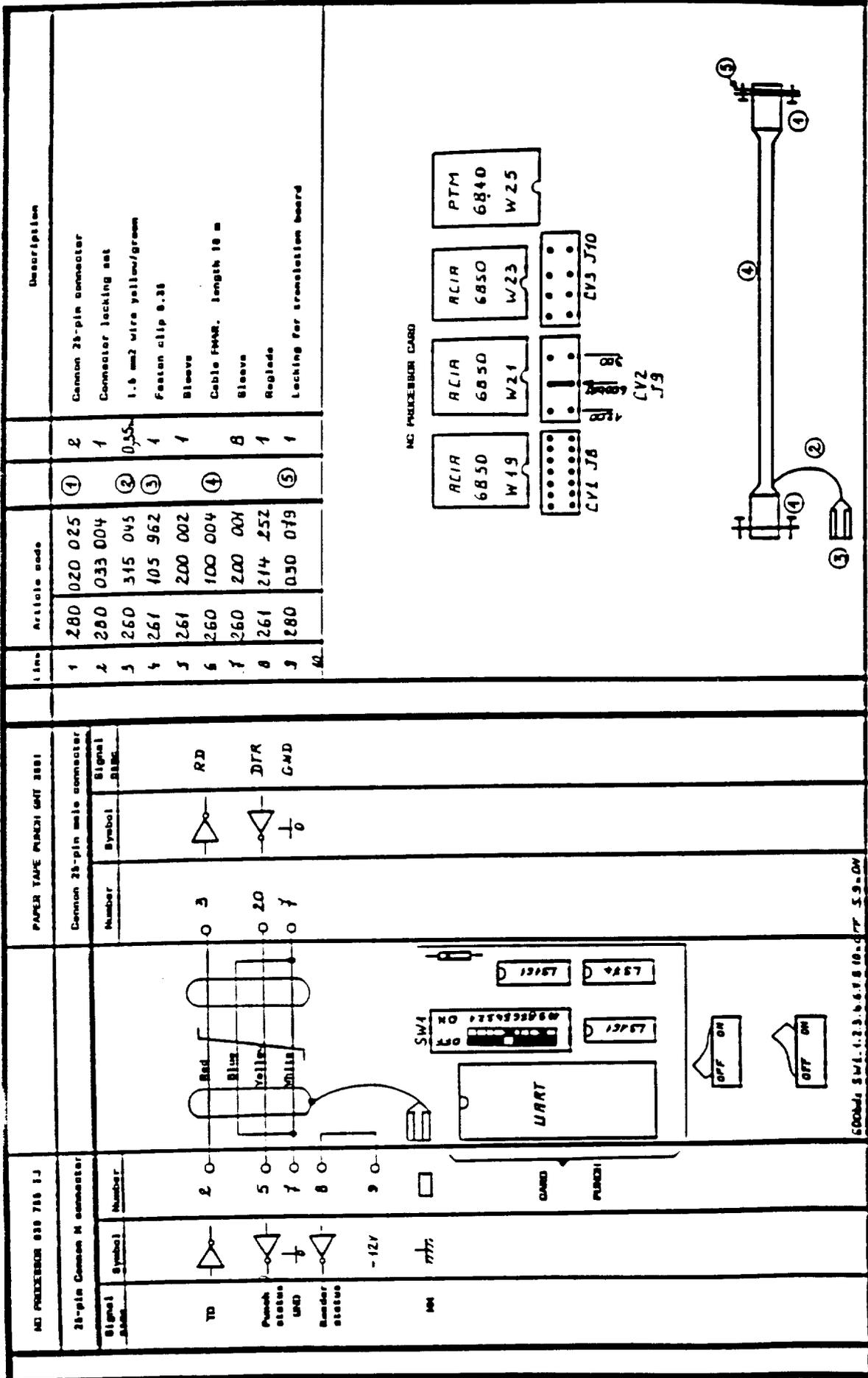
NOTE

In some drawings on the following pages, the adjustments of the NC processor board have been indicated for a V1 board; if the system is equipped with a V2 board, the adjustment is to be made on the board front panel.

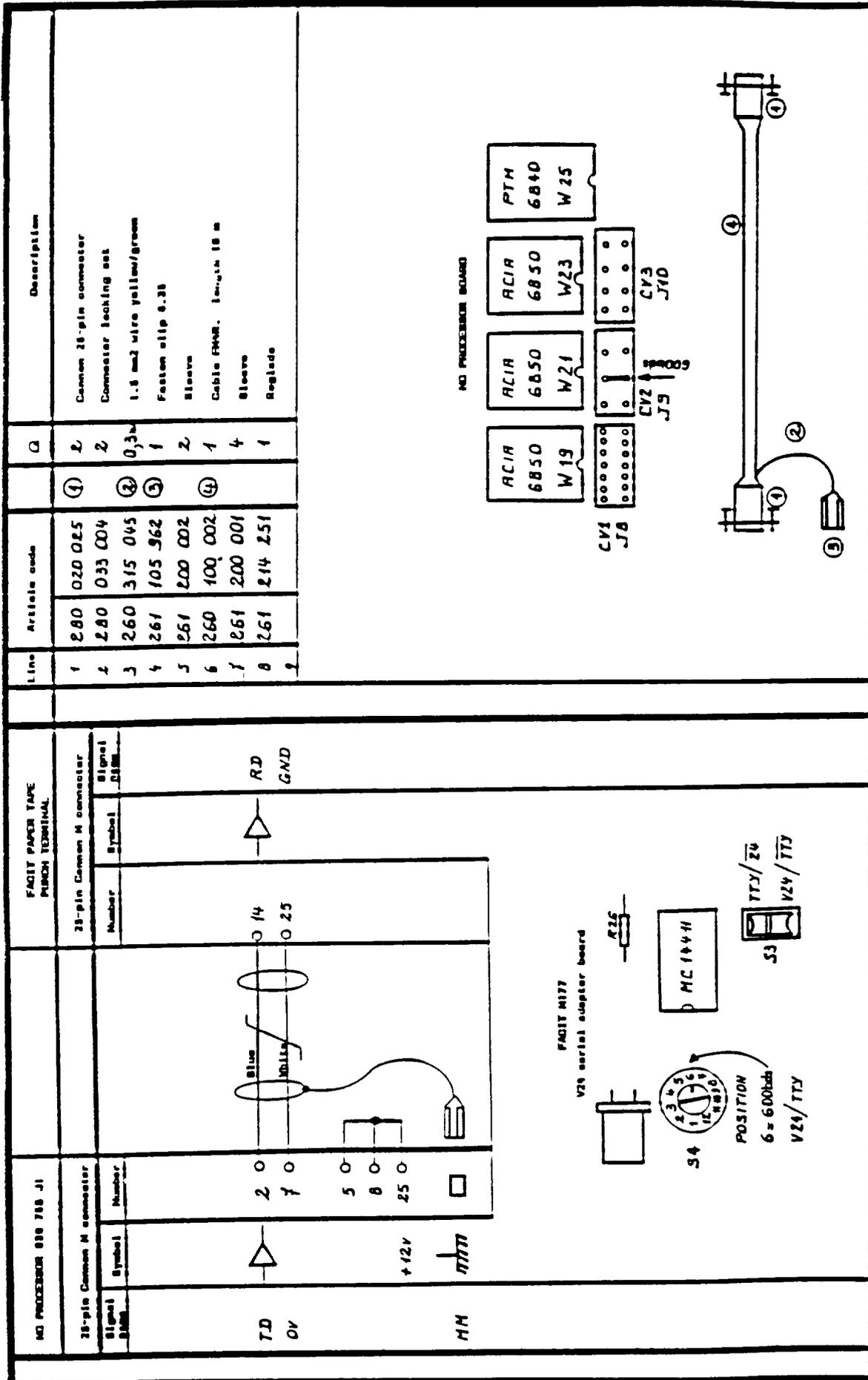
GNT READER (200 169 B)



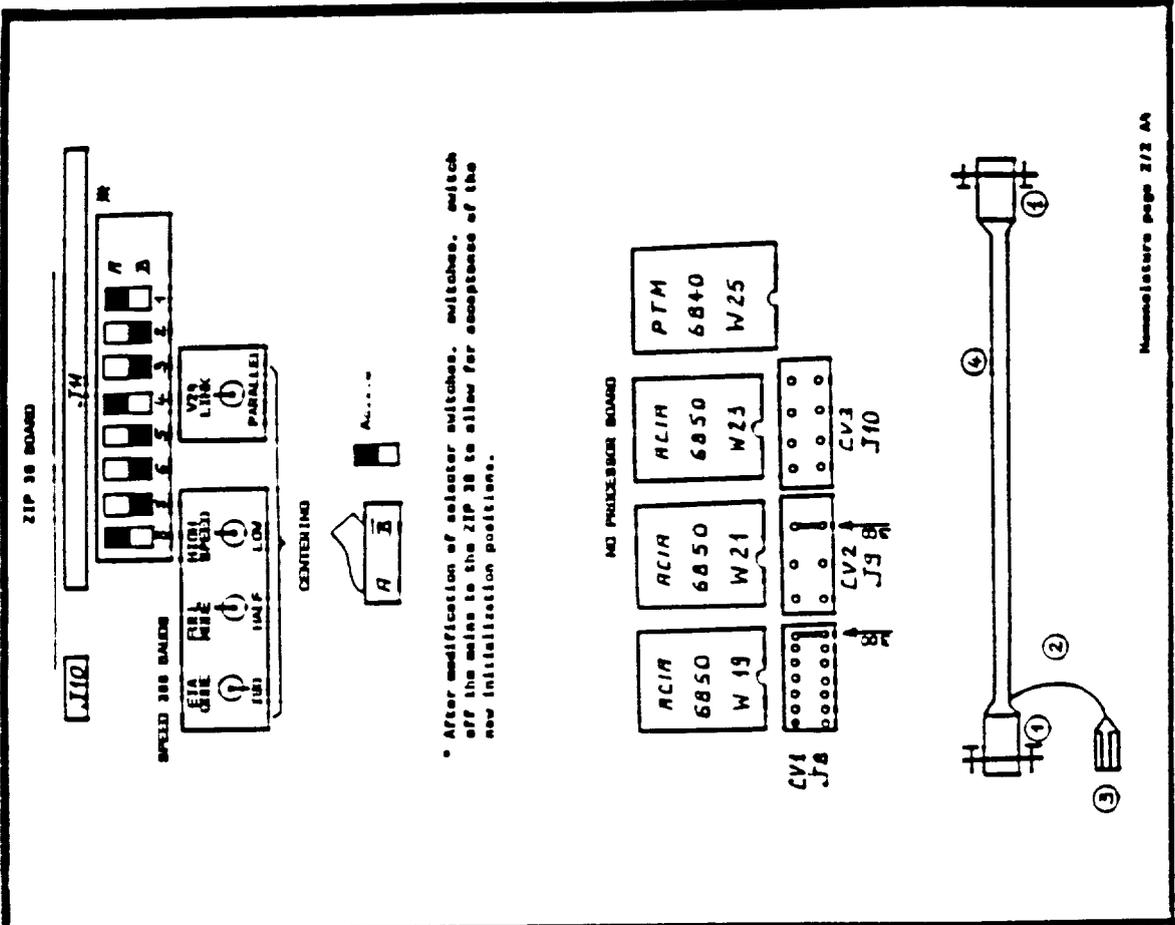
PAPER TAPE PUNCH - GNT 3601 (200 173 B)



FACIT PAPER TAPE PUNCH (200 175 B)



ZIP 30 (200 171 B)



MD PROCESSOR 030 710 J1		TERMINAL ZIP 30	
Signal name	Symbol	Number	Symbol
RD		0 2	
Reader status		0 20	
Reader em		0 5	
TD		0 3	
RD		0 6	
RD		0 7	
RD		0 8	
RD		0 9	
RD		0 10	
RD		0 11	
RD		0 12	
RD		0 13	
RD		0 14	
RD		0 15	
RD		0 16	
RD		0 17	
RD		0 18	
RD		0 19	
RD		0 20	
RD		0 21	
RD		0 22	
RD		0 23	
RD		0 24	
RD		0 25	
RD		0 26	
RD		0 27	
RD		0 28	
RD		0 29	
RD		0 30	
RD		0 31	
RD		0 32	
RD		0 33	
RD		0 34	
RD		0 35	
RD		0 36	
RD		0 37	
RD		0 38	
RD		0 39	
RD		0 40	
RD		0 41	
RD		0 42	
RD		0 43	
RD		0 44	
RD		0 45	
RD		0 46	
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RD		0 79	
RD		0 80	
RD		0 81	
RD		0 82	
RD		0 83	
RD		0 84	
RD		0 85	
RD		0 86	
RD		0 87	
RD		0 88	
RD		0 89	
RD		0 90	
RD		0 91	
RD		0 92	
RD		0 93	
RD		0 94	
RD		0 95	
RD		0 96	
RD		0 97	
RD		0 98	
RD		0 99	
RD		0 100	

EPSON L OR R X 80 PRINTERS

SEIKOSHA (GP 700 A + GP 700 10) BROTHER M1818 or 1918 or 2518 (200 104 C)

Line	Article code	Q	Description
1	280 020 025	①	Cannon 25-pin M connector
2	280 033 004	②	Connector locking nut
3	260 315 045	③	Wire 1.5 mm2 yellow/green
4	261 105 962	③	Faston clip 0.2h
5	261 200 002	④	Sleeve
6			Screened insulated cable containing 2 stranded wires
7			Max. length 15 m
8	261 214 251	1	Reglade
9	261 200 001	6	Sleeve
10		1	Strap

Signal Code	Symbol	Number	Signal Code
TD		3	R/D
Punch status GND		20	DTR
Header status		7	GND
-12V			
MS			

NO PROCESSOR BOARD

- ACIA 6850 W18
- ACIA 6850 W24
- ACIA 6850 W23
- PTM 6840 W25
- CV1 J8
- CV2 J9
- CV3 J10

EPSON EX 800 PRINTER (200 820 B)

Line	Article code	Q	Description
1	280 021 025	1	Cannon 28-pin M connector
2	280 035 004	2	Connector locking set
3	280 030 006	1	8-pin, 80° M DIN connector
4	260 345 045	0,35	Wire 1.6 mm yellow/green
5	251 405 963	1	Faston terminal 8.28
6	260 100 003	1	Cable PMS max length - 18 M
7	261 244 252	6	Reglade
8	251 200 001	6	Sleeve
9	261 200 002	1	Sleeve

EPSON EX 800 PRINTER		DIN 8-pin M connector	
Number	Symbol	Number	Signal name
3		3	DTR IN
2		2	DTR
5		5	GND

RS 232 INTERFACE BOARD FOR 300/280 and 910 PRINTERS (NO PROCESSOR J1)		Cannon 28-pin M connector	
Signal Name	Symbol	Number	Symbol
TD		2	
CTS		5	
OV		7	

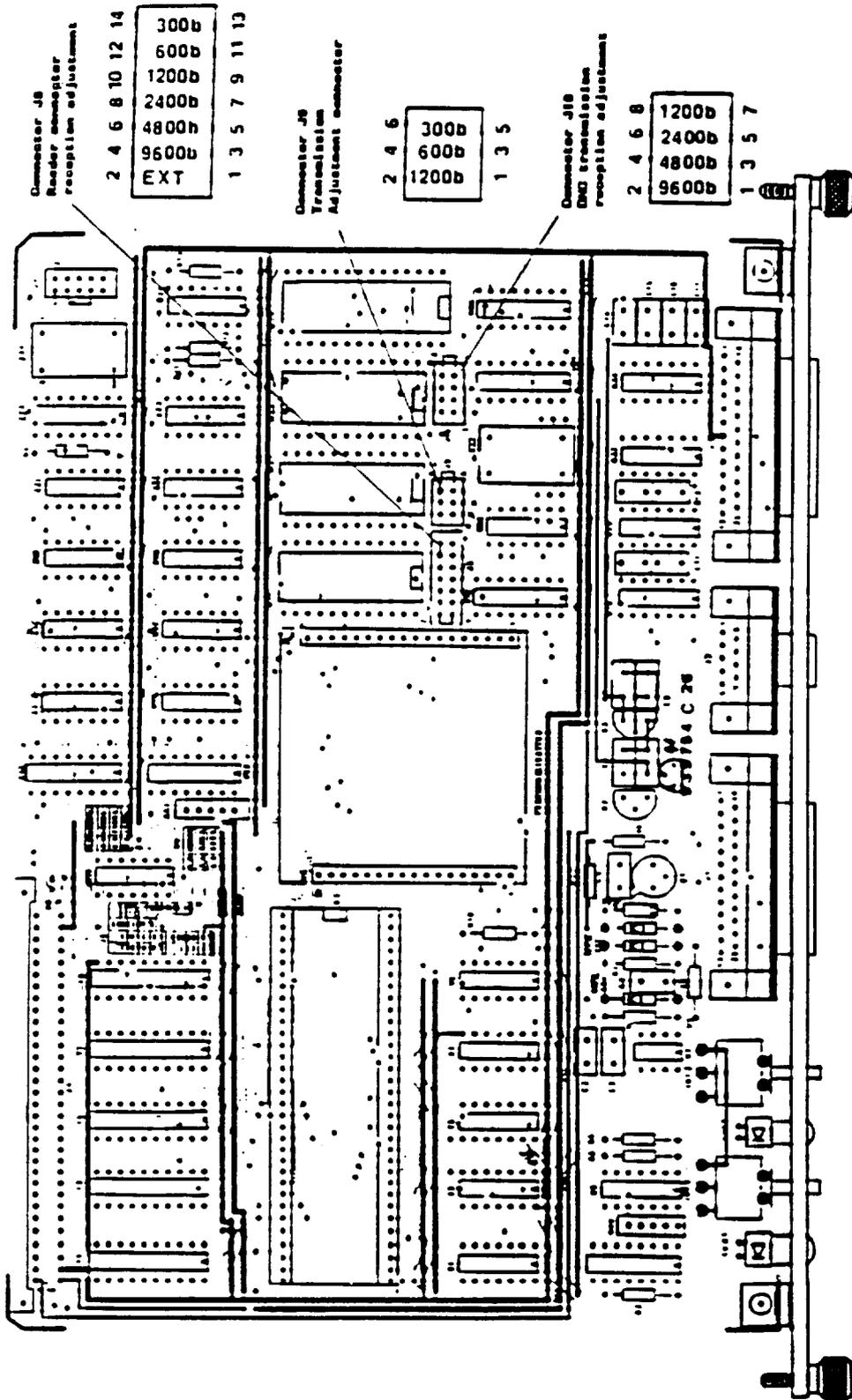
PRINTER

RS 232 INTERFACE BOARD

Example showing setting to 4800 Bauds

RS 232 Interface mod

TRANSMISSION AND RECEPTION SPEED ADJUSTMENTS CN V1 PROCESSOR (939755)



NOTES

APPENDIX 4

A4.1 - GENERAL FORMAT OF DATA AND ADDRESS DEFINITION (ISO/DIS 6983/1 Appendix C)

Programming of dimensions is expressed with an explicit decimal point symbolized by DS:

X+36 is equivalent to X = 36 mm

X- .3 is equivalent to - 0.3 mm.

% 04	Program number
N05	Sequence number (0)
G02	Preparatory functions
H04	Number of machining subroutine in call sequence containing G77
X+053	Movement along X, diameter or radius programmed
Y+053	Movement along Y
Z+053	Movement along Z
I+053 J+053 K+053	{ On G2 or G3, absolute or relative coordinates of center of circle In helical interpolation, no helix In grain threading, no thread
I053	On G45, no axial material removal on finishing
J053	On G45, lateral material removal on finishing.
K053	On G84, no tap in rigid tapping
U+053	Movement along U (secondary axis parallel to X)
V+053	Movement along V (secondary axis parallel to Y)
W+053	Movement along W (secondary axis parallel to Z)
A+033	Angular coordinate on A (rotary axis around X)
B+033	Angular coordinate on B (rotary axis around Y)
C+033	Angular coordinate on C (rotary axis around Z)
EA+033	On G1, angle in degrees of straight line with respect to axis: X in G17 Z in G18 Y in G19
EB+053	EB + on G1, G2 or G3, fillet between any two elements EB - in G1, chamfer between two straight sections EB033 in G33 expressed absolute penetration angle
EC+033	Value of spindle indexation angle
ED+033	Angular offset
EF+022 EF 053	Timeout on cycle G82, 87, 89 or G31. Specific feed rate on fillet or chamfer
EG 03	Programmed acceleration modulation (1 to 100%)
EI 053	In G45, axial finishing speed

EJ 053	On G45, lateral finishing speed
EK 053	Ascent/descent spindle rate ratio in rigid tapping, G84
EM ±	Maximum dimensions of rectangle for 3D display
EP 053	In G45, axial roughing rate
EQ 053	In G45, lateral roughing rate
ER+053	Dimension of return plane in cycles
EX 053	In G45, dimension of pocket in relative terms along X or U
EY 053	In G45, dimension of pocket in relative terms along Y or V
EZ 053	In G45, dimension of pocket in relative terms along Z or W
P+053	In G83 or G87, value of first penetration In G16 (P+ or P-), direction of tool rotation along X or U In G29 (P043) component along X of normal vector In G45 P043) axial material removal, in roughing In G31, withdrawal of tool at bottom of hole
Q+053	In G83 or G87, value of last penetration In G16 (Q+ or Q-), tool direction along X or V axis In G29 (Q+043), component along normal vector In G45 (Q043) lateral material removal in roughing
R+053	In circular or helical interpolation, radius of circle In G1 or G0 (R+ or R-), positioning at a distance equal to the tool radius from the specified point in the block In G16 (R+ or R-), tool direction along Z or W In G29 (R+043), component Z of normal vector In G84, rigid tapping, spindle speed ratio, ascent/descent In G92R, programming of tangential feed rate
F052	In G93, F042, programmed feed rate along V/L In G94, feed rate expressed in mm/min: maximum 15 m/min. In G04, F022 value of timeout in seconds: maximum 99.9 s In G31, F1 number of threads
M03	Auxiliary functions 27 decoded, 229 encoded
S05 or S022	In G97, spindle rotation speed in rpm (S5 or S2.2) In G77, S04 number of repeats and subroutine
T05	Tool Number 0 to 65535
D03	Corrector number from 0 to 255
L03	Program variable 0 to 19, from 100 to 199 and from 900 to 939
E113	External parameters
NC05	Number of spline curves. NC0: end of definition of spline curve.

OMMENTS:

If the system is designed for programming to one-tenth of a micron (linear axes), the dimensions or sides are expressed with 4 digits after the decimal point.

The maximum travels are 9.9999 meters; e.g. X is expressed by X + 044.

Programming in tenths of micron excludes inch programming.

A4.2 - ADDRESSES AND SPECIAL DATA FOR MACHINING OF POCKETS AND SURFACE FINISHING WITH ANY CONTOUR

ED 053	Diameter of rough milling cutter
EH+053	Material plane dimension
EI+052	Down-feed in finishing
EJ+052	Lateral feed in finishing
EP+052	Down-feed
EQ+052	Lateral machining feed
EX } EY } + 053 EZ }	Coordinates in pocket plane, of end point for roughing
J 053	Finishing machining allowance
LX } LY } + 053 LZ }	Coordinates of plane of pocket, from roughing starting point to finishing
NP 05	Pocket number, or surface finishing
NR	Type of work: NR+: swallowing, NR-: opposition
NU 02	Type of blocks. Is always preceded by function G46
P 053	First penetration in G83 or G87
Q 053	Last penetration in G83 or G87
R01	Tool rotation direction (3 or 4)

A4.3 - G FUNCTIONS

CODE	NAME	DESCRIPTION
G00	G01-G02-G03	Linear interpolation in fast feedrate
G01*	G00-G02-G03	Linear interpolation at programmed feedrate
G02	G00-G01-G03	Circular interpolation at programmed tangential feedrate, counter-clockwise
G03	G00-G01-G02	Circular interpolation at programmed tangential feedrate, clockwise
G04	End of block	Programmable delay with address F
G06	End of block	
G09	End of block	Precise stop at end of block before stringing to next block
G10	End of block	Machining stop on acquisition of «End of block stop» signal or on detection of measured threshold and jump to other block or stringing to next block
G12	End of block	Overspeed from handwheel
G16*	End of block	Definition of tool axis using addresses PR
G17*	G18-G19	Choice of XY plane for circular interpolation and radius correction
G18	G17-G19	Choice of ZX plane for circular interpolation and radius correction
G19	G17-G18	Choice of YZ plane for circular interpolation and radius correction
G29	G40	Correction of tool in space, contradicts G41 and G42
G31	G80 to G89	Grain threading
G40*	G29-G41-G42	Cancellation of tool correction along radius
G41	G40-G42	Correction of tool radius to left of profile
G42	G40-G41	Correction of tool radius to right of profile
G45	End of block	Pocket cycle
G46	End of block	Definition of special pocket cycle block and surface finishing with any contour
G48	End of curve definition	Beginning of definition of spline curve
G49	End of block	Release of spline curve memories
G51	End of block	Validation or invalidation of mirror function using axis addresses
G52	End of block	Absolute programming of dimensions with respect to measurement origin
G53	G54	Invalidation of offsets DAT1 and DAT2
G54*	G53	Validation of offsets DAT1 and DAT2

G59	End of block	Programmed origin offset. Adds to offset enabled by G54
G70	G71	Data input in inches
G71*	G70	Data input in metric
G73*	G74	Cancellation of scale factor
G74	G73	Validation of scale factor
G75	End of block	Validation of emergency backoff subroutine
G76	End of block	Transfer of current values of parameters into work-piece program
G77	End of block	Unconditional call to subroutine or group of sequences with return
G79	End of block	Conditional or unconditional jump to a sequence without return
G80*	G81 to G89	Cancellation of machining cycle
G81	G80 G82 to G89	Centering drilling cycle
G82	G80 G81 G83 to G89	Chambering drilling cycle
G83	G80 to G82 G84 to G89	Chip clearance cycle
G84	G80 to G83 G85 to G89	Tapping cycle or rigid tapping cycle if followed by K053
G85	G80 to G84 G86 to G89	Reaming cycle
G86	G80 to G85 G87 to G89	Reaming cycle with indexed spindle stop at bottom of hole
G87	G80 to G86 G88 to G89	Drilling cycle with chip breaking
G88	G80 to G87 G89	Boring cycle and surface straightening
G89	G80 to G88	Reaming cycle with timed stop at bottom of hole
G90*	G91	Absolute programming with respect to program origin
G91*	G90	Relative programming with respect to block starting point
G92	End of block	Preselection of program origin
G93	G94	Feed rate expressed as inverse of time (V/L)
G94*	G93	Feed rate expressed in mm/min

* Indicates functions initialized on power-on, or subsequent to a reset.

A4.4 - DECODED M FUNCTIONS

CODE	FUNCTION		CANCEL	DESCRIPTION
	BEFORE	AFTER		
M00		X	Operate DCY	Programmed stop
M01		X	Operate DCY	Optional stop
M02		X	% or EOR	End of part program
M03	X		M4-M5-M0-M19	Spindle rotation clockwise
M04	X		M3-M5-M0-M19	Spindle rotation anti-clockwise
M05*		X	M3-M4	Spindle stop
M06		X	Report	Tool change
M07	X		M9-M2	Flushing No. 2
M08	X		M9-M2	Flushing No. 1
M09*		X	M7-M8	Flushing off
M10		X	M11	Axis blocking
M11	X		M10	Axis release
M12		X	FEED STOP end	Forcing of INTERV mode, axis manipulator or handwheel available. No change in execution of program
M19		X	M3-M4-M5	Spindle indexing
M40 to M45	X			6 spindle ranges
M48*		X	M49	Validation of spindle and feed potentiometers

M49	X		M48	Disabling of spindle and feed potentiometers
M64*	X		M65	Spindle 1 control
M65	X		M64-M2	Spindle 2 control
M66*	X		M67	Spindle 1 measurement use
M67	X		M66-M2	Spindle 2 measurement use
M997	X		M998-M999 M2	Forcing of block stringing
M998*	X			M999-M997 MODIF, MDI mode and subroutine call by PLC enabled
M999	X		M997-M998-M2	Masking by programming of MODIF, MDI modes and subroutine call from PLC.

* Functions initialized on power-on or subsequent to a reset.

N.B.:

- Only function M6 is modal; this is reset to zero on detection of a report from M (CRM) by the CNC.
- Several decoded M functions (e.g. M3, M8, M41) can be programmed in a block.
- The other encoded M functions defined by the manufacturer are «after» functions. Only one of these functions is authorized in a block.

NOTES

NUM in the Great Britain and in the United States

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	Address	Telephone Telex (Tx)	Fax Minitel
Great Britain	<input type="checkbox"/> NUM SERVOMAC Ltd - Coventry <input checked="" type="checkbox"/>	(203) 69.25.25 Tx : 317 208	(203) 69.22.59
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NUM in the world

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