

USERGUIDE

Programming CN900++ Level II Version 0.6



WARNING - Reliance on this Manual Could Result in Severe Bodily Injury or Death!

This manual is out-of-date and is provided only for its technical information, data and capacities. Portions of this manual detailing procedures or precautions in the operation, inspection, maintenance and repair of the product forming the subject matter of this manual may be inadequate, inaccurate, and/or incomplete and cannot be used, followed, or relied upon. Contact Conair at info@conairgroup.com or 1-800-654-6661 for more current information, warnings, and materials about more recent product manuals containing warnings, information, precautions, and procedures that may be more adequate than those contained in this out-of-date manual.

- CONTENTS -

I – OPERATION COMPLEMENT	1
I – 1. Operating modes	1
I – 1. 1. Stop Mode	1
I – 1. 2. Step-by-Step Mode	1
I – 1. 3. Automatic Mode	2
I – 2. Machine dialogue	3
I – 2. 1. General handling and tooling machine	3
I – 2. 2. Injection machine	3
I – 3. Man / machine dialogue	5
I – 3. 1. injection machine / Robot cycle startup after fault	5
I – 3. 2. Part grip fault	9
I – 4. Status display	10
I – 4. 1. "Test" function	10
I – 4. 2. "Display" monitor	11
I – 4. 3. Displaying the Values Measured on the Monitoring Inputs	12
I – 4. 4. "Extended" monitor	13
I – 5. Production status	14
I – 5. 1. [Time] key	14
I – 5. 2. [Count] key	14
I – 6. Operand modification (Direct Programming)	15
I – 7. "Memory management" procedures	16
I – 7. 1. [Val+0] and [Val+EFT] functions (Recall)	16
I – 7. 2. System procedures [Syst.]	16
I – 7. 3. Reading of options installed	18
I – 7. 4. Accessing User Memory [ReadM]	18
II – SOFTWARE ARCHITECTURE	19
II – 1. Selection mode	19
II – 2. Home return	20
II – 2. 1. Home Return in "Automatic Program change" operation	20
II – 2. 2. Home Return operation	20
II – 2. 3. Total home return in progress	20
II – 2. 4. Home Return and Timer setting	20
II – 3. part program instructions	21
II – 3. 1. Instruction : definition	21
II – 3. 2. Allocation, test and counting instructions	22
II – 3. 3. Customised messages for the robot errors	26
II – 4. Motor-Driven movement codes	28
II – 4. 1. Movement Code	28
II – 4. 2. Operand	29

II – 5. Preparatory "FUN" functions of numerical axes	30
II – 5. 1.Function = Speed [VEL] – axis value in % (Maintained)	30
II – 5. 2.Function = Slow Approach [SLA] (Temporary)	30
II – 5. 3.Specific codes	31
II – 6. Stacking subroutine – SP41 to SP60	32
II – 7. General stacking subroutines – SP 61 to 80 –	39
II – 7. 1.Edition of subroutine SP61 to 80	39
II – 7. 2.Teaching data for general stacking in Adjust mode	40
II – 7. 3.Entering a general stacking	42
II – 7. 4.Description and use of rotation description	43
II – 7. 5.Example 1	44
II – 7. 6.Example 2 – Alternate layers	45
II – 8. Parallel subroutine – SP 81 to 99 –	46

I - OPERATION COMPLEMENT

I - 1. OPERATING MODES

The different operating modes described below are selected using the mode selector:

I - 1. 1. Stop Mode

In this mode:



All axes are braked, even those that are servocontrolled.

The execution of the PLC program, which may be used with the main program (MP), is stopped.

If parameter No. 155 \neq 0 (128, Default value)

All outputs are set to 0 except for:

- the robot status repeat outputs (parameters No. 98 to 101) if parameter No. 9 = 1 and if parameter Nos. 109 to 121 \neq 128.
- outputs allocated to ejector commands for the injection machines (outputs characterized by parameter Nos. 98 and 101).

If parameter No. 155 = 0

All the outputs retain the status they had prior to going into Stop mode **unless** a robot error is present. In this case, the previous procedure applies.

I - 1. 2. Step-by-Step Mode



The speed coefficient applied to all motorized movements is limited to 15%.

The following operations can be carried out:

- A main program step by pressing the *[START]* key until the step is completed. (And the *[Dead Man]* button must also be pressed if the control unit is not in its stationary holder).
- Home Return (SR) or Tool Changing Position (PCO) subroutines. In this case, holding down the *[CYCLE START]* key enables the entire sequence to be run without a break until the word "END" is reached.
- Point teaching during use of the SAP option, using the axis command keys (X+, X-, Y+, etc.). This mode requires a wired axis velocity reduction (Check that the cabinet is fitted with this safety device).

Releasing the *[START]* key while the step is being carried out stops the activation of all outputs except for:

- the output allocated to the machine cycle validation (if the robot parameters are set in PIP),
- the outputs allocated to the status repeat of the robot,
- the outputs allocated to ejector and core puller commands.

if parameter No 155=0, none of the outputs are set to zero.

I - 1. 3. Automatic Mode



This mode is only possible if the control unit is in its stationary holder:

Start key [START] :

Pressing this key triggers, in the following order:

- Servocontrol of the axes (for those declared to be so).
- Execution of the chosen part program (MP).
- Execution of the associated PLC program (if present).
- Machine dialogue management.


Automatic operation:



Once started, automatic operation can be interrupted or temporarily suspended.

- Interrupted by:
 - the end of cycle stop command by pressing the [END OF CYCLE STOP] key. (This command is acknowledged by the AUTO light flashing).
Comment: The actual stopping (AUTO light switched off) is only possible if the ACT-00 or ACT-99 code has been included in the part program and if the executed cycle has finished.
 - the appearance of a fault requiring the operator's intervention.
 - a change of control from the switch (the change from AUTO to STEP BY STEP does not cut the servo-control of the axes when stationary).
- Temporarily suspended by:
 - waiting for certain events such as:

. Waiting for machine to open	[Wait. MO]
. Waiting for part to be made (PIP)	[Wait. PART]
. Waiting for door to close	[Wait. DOOR]
. Suspension of End of cycle (input parameter 122, input = 0 -> cycle suspension)	[SUSPEND]
. Waiting for conditions required to go to the next STEP.	

Overall speed coefficient:

This may be increased by directly using the  key (changes made come into effect after each STEP).

To decrease the speed, the [Point] function must be activated first. This function authorises speed increases through the  key and speed decreases through the  key.

The coefficient is adjustable between 15% and 100% of programmed speed.

I - 2. MACHINE DIALOGUE

The value of machine parameter No. 1 gives the type of machine dialogue to be associated with the robot.

- * **Parameter 1 = 0** : Machine dialogue for an injection machine with total "Man-Machine" dialogue.
- **Parameter 1 = 1** : Dialogue for general handling.
- **Parameter 1 = 2** : Dialogue for tooling machine.
- **Parameter 1 = 3** : Machine dialogue for an injection machine with reduced "Man-Machine" dialogue.
- **Parameter 1 = 10** : Dialogue for injection machine in conformance with US standard SPI with total "Man-Machine" dialogue.
- **Parameter 1 = 13** : Dialogue for injection machine in conformance with US standard SPI with reduced "Man-Machine" dialogue.

I - 2. 1.General handling and tooling machine

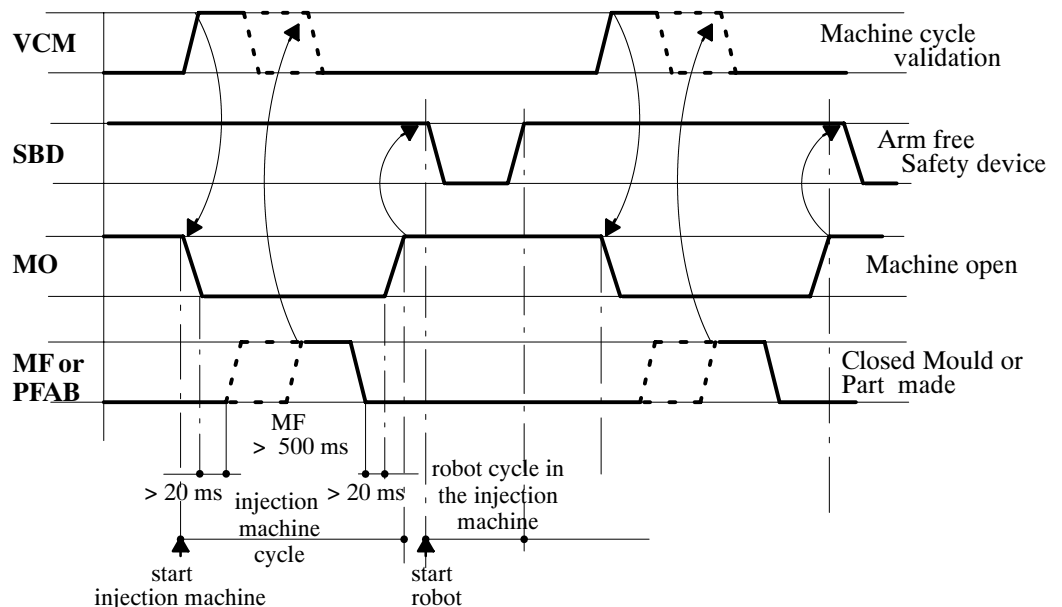
The robot only understands the "MO" (Machine Open) and "PF" (Door Closed) movement safety devices.

I - 2. 2.Injection machine

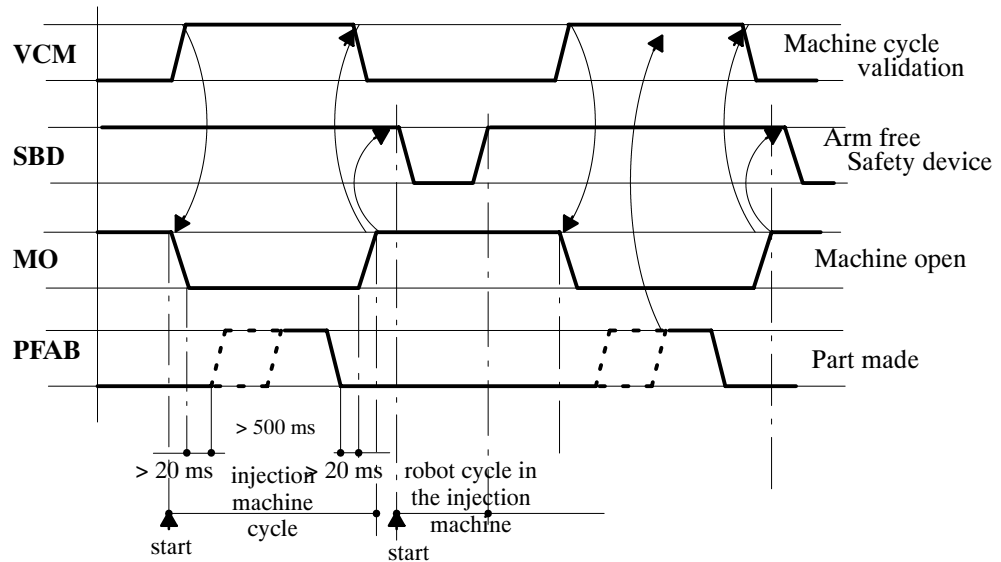
In addition to the "machine open MO" and "door closed PF" signals, the robot also understands the "Part Made PFAB" and "machine in Auto / Semi-Auto MASA" signals as well as checking their coherence. Thus a sequence in which the mould closes and then reopens without the "Part made" signal being displayed indicates the presence of an error No. 30.

Similarly, if the "Part made" signal appears when the mould is open, error No. 31 is indicated.

- Interface wired according to an **EUROMAP 12** or **Sepro** protocol.



- Interface wired according to an **SPI** (American standard) protocol.



Notes:

Part Made "PFAB" information is sometimes replaced by Mould Closed "MF".

Signals transmitted by the injection machine are not acknowledged or monitored UNLESS the injection machine is in "AUTO / SEMI-AUTO" mode with the door closed. This is to avoid the robot interpreting movements of the injection machine in "Manual" mode as incoherent (e.g.: when the operator opens or closes the mould to carry out checks or adjustments).

The appearance of one of these errors does not immediately interrupt the robot, which can continue its placing cycle. The error is only acknowledged and displayed when the Step in which the instruction ACT_00 (or ACT_99 for automatic program change) has been programmed is reached.

Since output parameters can be set, no output is dedicated to controlling the injection machine. It is the output number indicated in parameter No. 60 that is acknowledged (OUT 028 by default).

Press restart can be memorized to avoid programming OUT.28 for each step. Instruction SET.OUT.028 performs this operation. This instruction is only validated in AUTO/SEMI-AUTO mode.

Note: For EUROMAP 12 or Sepro protocol, this instruction is cleared by default when the "Part made" signal appears, without having to use RST.OUT.028.

For the SPI protocol, this instruction is cleared by default when the MO "Mould Open" signal reappears, without having to use RST.OUT.028.

- Reduced Man-Machine dialogue: See Page 7.

I - 3. MAN / MACHINE DIALOGUE

* A combination of 2 parameters will influence the man / machine dialogue. The 2 parameters are: 1: type of robot and 2: type of local commands. See Chapter I - 3. 1.

* No matter what values are assigned to parameters 1 and 2, the cycle is restarted by pressing the *[START]* key, in Automatic or Step-by-Step mode.

* If the robot is waiting at the step in which the following instructions are programmed

```
Step n      > ACT_00  
            > SET_OUT 028
```

and if the part has not been fabricated or unloaded,

- the robot activates the "VCM" output and lights up the corresponding diode on the control terminal,

- it then displays a short message such as:

- . [Wait PART] -> Waiting for Part to be made

- . [Wait MO] -> Waiting for Machine to Open

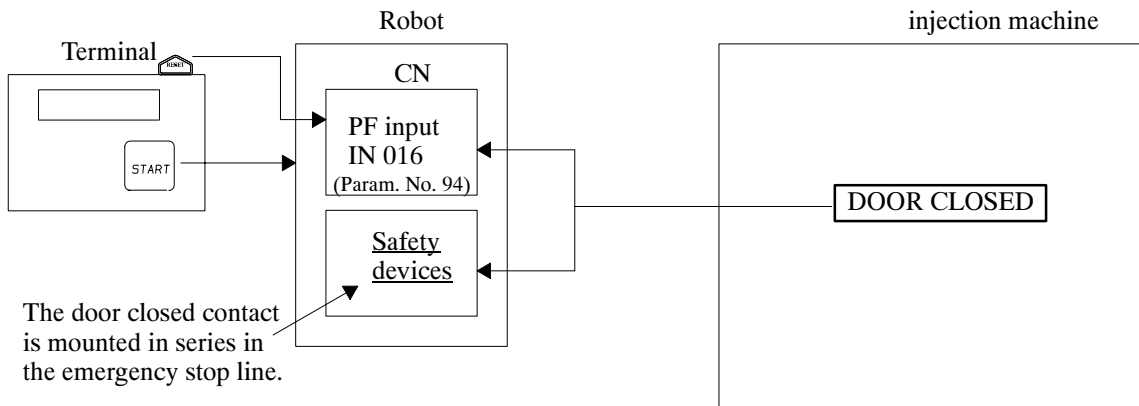
In Automatic mode, the injection machine starts its cycle or waits for a door movement to start the cycle.

I - 3. 1. Injection machine / Robot cycle startup after error

The following tables describe the operation of the robot after the appearance of errors D30 (machine open error), D31 (part made signal error) and D33 (part grip fault).

This operation depends on the value of parameters 1 and 2.

1) Standard operation



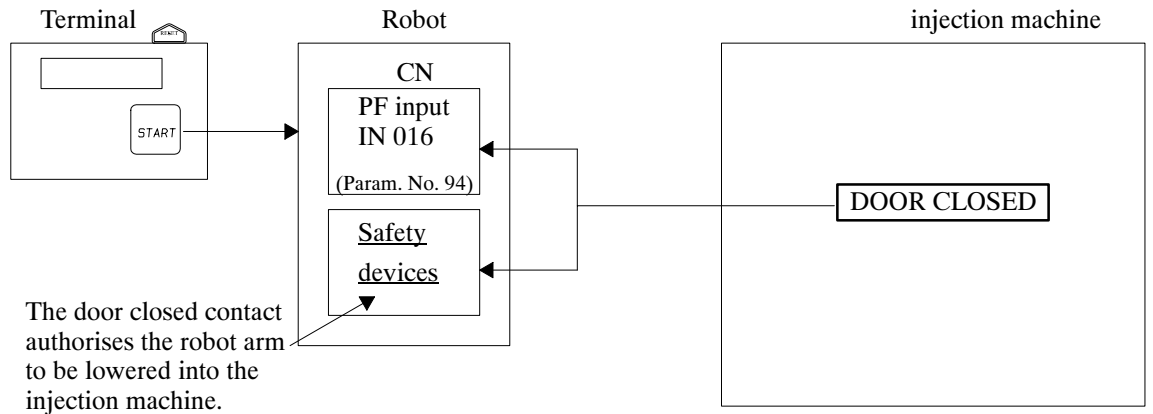
Parameter No 2 = 1

<p>Parameter No. 1 = 0 or = 10</p>	<p>RESET press on the control box ⇒ press START key ⇒ VCM is validated the robot waits for mould to be opened.</p>
	<p>press START key ⇒ The robot executes the unloading cycle.</p>
<p>Parameter No. 1 = 3 or = 13</p>	<p>press START key ⇒ VCM is validated and the robot waits for the mould to be opened.</p>

* The memory part reset button acts on the "Door closed" input. Pressing this button resets the input to zero.

2) **Other Operations**

- with door closed contact not mounted in the emergency stop line



Parameter No. 2 = 0

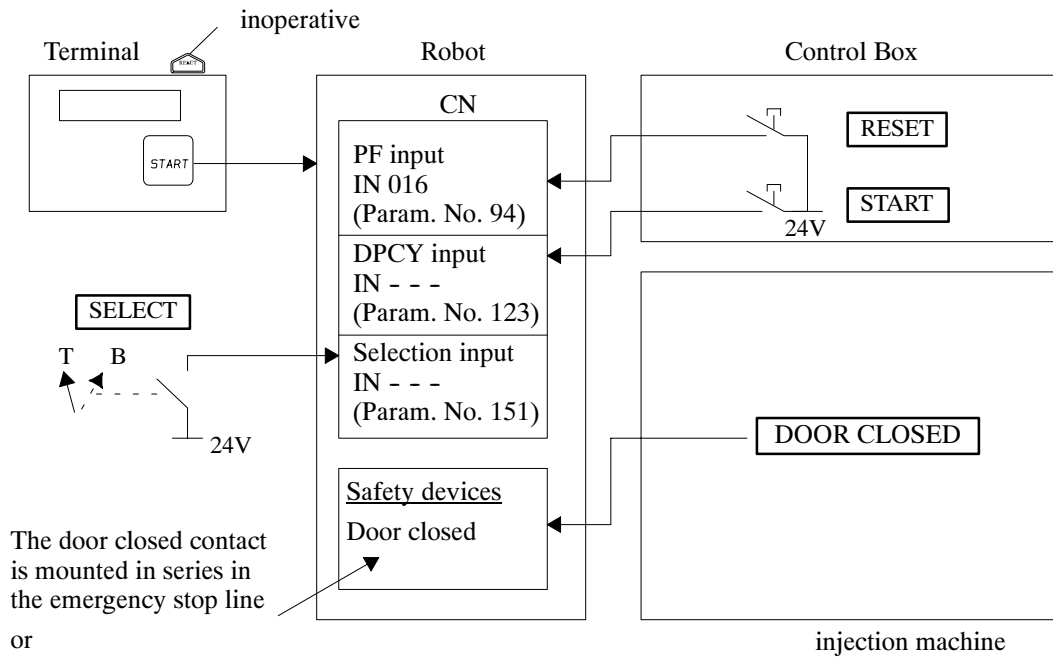
Parameter No. 1 = 0 or = 10	Opening of injection machine door → press START → Remove part from press ? [YES] [NO] [F1] [F2] → START → VCM is validated and the robot waits for the mould to be opened. → START → The robot executes the unloading cycle.
	injection machine door does not open → press START → The robot executes the unloading cycle.
Parameter No. 1 = 3 or = 13	press START → VCM is validated and the robot waits for the mould to be opened. It is ESSENTIAL to remove the part from the mould BEFORE restarting the robot cycle.

Comments:

.It is not possible to switch control or restart the cycle until the operator has replied to the question [Part to be removed from the injection machine ?].

.If parameter No. 1= 0 or = 10, the loss of the "Door Closed" input causes an end of cycle stop to occur when the robot is outside the injection machine.

- with remote control box



The door closed contact is mounted in series in the emergency stop line
or

The door closed contact authorises the robot arm to be lowered into the injection machine.

Parameter No. 2 = 1

Parameter No. 1 = 0 or = 10	press RESET on the control box	⇒	press START	⇒	VCM is validated and the robot waits for mould to be opened.
			press START	⇒	The robot executes the unloading cycle.
Parameter No. 1 = 3 or = 13			press START	⇒	VCM is validated and the robot waits for the mould to be opened.

- * The memory part reset button acts on the "Door closed" input. Pressing this button resets the input to zero.
- * The input number that starts the external signal is contained in parameter 95.
- * The input number which selects the control box is contained in parameter 151; the control box is selected when the input is at 1.

I - 3. 2.Part grip fault

In order to avoid channel cooling problems, the part grip function in the mould is subject to a special "watchdog" period set to 5 seconds by default (value of machine parameter number 8).

If the part has not been gripped by the end of this delay, the robot performs an automatic Home Return to disengage the mould and goes to fault state in order to warn the operator.

This function applies if the fault is detected on movements defined by parameter No. 11.

- **Parameter 11 = 0** The automatic Home Return is triggered by the absence of the check associated with ACT11 (input defined by parameter No. 62) after 5 secs in the mould.
- **Parameter 11 = 1** The automatic Home Return is triggered by the absence of BIT 32 5 secs after ACT11 has been activated in the mould. When ZBD is reached, the value of bit 32 has no importance.
- **Parameter 11 = 2** The automatic Home Return is triggered by the absence of the check associated with ACT 11 or ACT19 (input defined by parameter No. 71) 5 secs after ACT11 or ACT19 has been activated in the mould. These actions can be programmed simultaneously without modifying the functions described above.
- **Parameter 11 = 3** Operation is identical to that obtained when parameter 11 = 1. Checking of BIT 32 is validated by activating ACT11 or ACT19.

I - 4. STATUS DISPLAY

I - 4. 1. "Test" function

When the robot is in "Adjust" mode, "TEST" function allows:

* On the last two lines of the display:

- the display and activation of outputs and the display of forcings, if applicable.

OR

- the display of actions and of the output and two associated inputs, if applicable.

"ACT- nn	->	S-nnn	->	E-nnn	=	n	(E-nnn	=	n)"
↓		↓		↓		↓		↓		↓
action		asociated		control		status		antagonist		status
number		output		input				input		

If the "SAP" module is present, a message describing the action selected is displayed on the 2nd line, e.g.: "ACT-11 Part grip main arm".

* On the first two lines of the display:

- the display of 16 inputs by modulus 4, the status of the numbered input is represented on the left (beside the input number).
- the display of 16 bits by modulus 4 and their forcings, the status of the numbered bit is represented on the left (beside the bit number).

The active lines are shown on the display in upper case letters (line on which the number requested can be modified).

The selection of requested operand number

- [A] : action
- [BIT] : bit
- [E/in] : input
- [S/out] : output

is obtained by:

- pressing numerical keys (0 to 9) followed by [ENT].
- pressing [P+1] incrementation by 16 if possible.
- pressing [P -1] decrementation by 16 if possible.
- pressing [↑] incrementation by 1.
- pressing [↓] decrementation by 1.

Outputs activation:

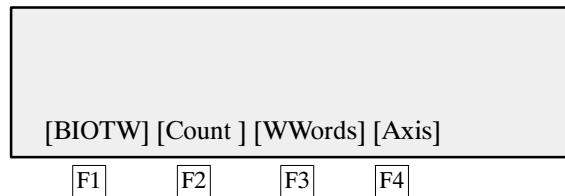
After selection of the number, the outputs are set to 1 by pressing [SET] or to 0 by pressing [RESET].

THE ACTIONS OR OUTPUTS ARE ACTIVATED BY PRESSING THE CYCLE START KEY [START] or immediately after their selection if parameter No. 155 = 0.

I - 4. 2. "Display" monitor

Selectable from "MONIT" menu **[F5]** :

- 1st line displays executed routine context.
- 2nd line displays value of selected data.
- 3rd line displays forcing values for outputs and bits only.
- 4th line displays menus in "Display monitor":



Selection of displays (Bits, Inputs, Outputs, Timer settings, Word) :

- **[F1] key:**
 - . by default (F1 key only) gives display of inputs in the same way as: [F1] then [E/in]
- **[F1] key then [S/out]:**
 - . displays outputs and their forcing.
- **[F1] key then [BIT]:**
 - . displays bits and their forcing.
- **[F1] key then [T]:**
 - . displays time settings and timer bits.
- **[F1] key then [WORD]:**
 - . displays words (from 00 to 63).

Selection of COUNTER display:

- Press the [F2] key.
- Select number; same procedure as above.

Selection of WWORDS display:

- Press [F3] key.
- Select number identical to Bit, Input, Output, Time setting, Counter.

Notes:

Select the Bit, Input, Output, Time setting, Counter or Word numbers (16 to 32 bits) to be displayed by the keys 0 to 9 followed by [ENT].

Pressing [P+1] key increments the number displayed by 16. For the counters, it increments the MP number by 1.

Pressing [P-1] key decrements the number displayed by 16. For the counters, it decrements the MP number by 1.

Pressing [↑] key increments the number displayed by 1. For the counters, it increments the SP number by 1.

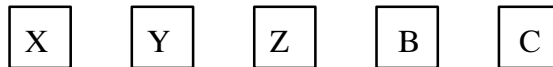
Pressing [↓] key decrements the number displayed by 1. For the counters, it decrements the SP number by 1.

Selection of TRAILING ERROR and SPEED display:

- Press [F4] key.

By default, (press F4 only), the trailing error and speed are displayed for the X axis.

Otherwise, the desired axis can be selected by pressing one of the keys shown below:



Notes:

* *If movement is in progress:*

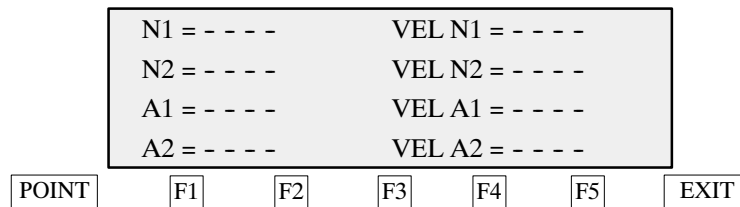
The data displayed are only real time values. The screen refreshment time introduces a time-delay of some ms between the event and its display.

* *Axis stopped:*

This function is used to display position deviation between the position reached and the required position (programmed, calculated or transferred).

I - 4. 3. Displaying the Values Measured on the Monitoring Inputs



Pressing the [POINT] key twice displays the following screen:



This data gives the values of the position and speed of the axes measured.

The "Monitoring an External Axis" manual describes their use.

I - 4. 4."Extended" monitor

The Extended Monitor is accessed via the Display Monitor function by turning the  key once, or via the main execution menu by turning the  key twice.

I - 4. 4.a)[Edit] key

This key is used for dynamic editing of a program for modifying all the operands.

e.g.: Modification of the number of a tested input
> IN 35 ---> > IN 40

Notes:

- The operator needs to know the general structure of the program to access the instruction for which the operand is to be modified. e.g.: Step No. 5 of SP No. 21.
- Distances can be modified by + or - 10 mm max.

I - 4. 4.b)[Forc.] key

This key is used to validate Force mode used by the Monitor procedure to force the bits or outputs (to 0 or 1), and counters, words and long words. It is also possible to force inputs, but only in the PLC programs.

These operations are useful during debugging of the application program.

* **For INPUTS, OUTPUTS or BITS**, this key is used to:

- force the input, the output or the selected bit to 0-> [F to 0],
- force the input, the output or the selected bit to 1-> [F to 1],
- remove the forcing -> [Without],

(The presence of forcing is indicated by an F displayed under the output or bit in question).

* **For the COUNTERS**, this key is used to:

- force the selected counter to a decimal value (maximum 9999).

* **For the WORDS(WRD) or LONG WORDS (WWRD)**, this key is used to:

- write a value in the selected word.
word value -> maxi 9999 or FFFF
long word value -> 09999999 or FFFFFFFF

Press  key to switch from Decimal to Hexadecimal mode.

Note:

Force mode is only active in EXTENDED monitor. Exiting this mode deletes all the forcings set, BUT leaves intact outputs or bits set to 1 and not updated by the part program or the PLC, together with the values entered in the counters or the words.

I - 5. PRODUCTION STATUS

The [Produc] key accesses information about production.

Possible choices:

I - 5. 1.[Time] key F1

This key is used to access the robot cycle time.

- [T1]: Total cycle time of the application including machine waiting time (the time between 2 "MO" machine openings).
- [T2]: Cycle time of the robot alone (the time between 2 readings of the instruction ACT_00 or ACT_99).
- [T3]: Time spent in the injection machine (time elapsed between loss of Arm Up signal and its return; the robot will be on the AM/MO cam - if the robot parameters are set in PIP).

I - 5. 2.[Count] key F2

This key is used to access the part counters.

- [Done] : Displays the contents of WWord No. 76 that can be used to indicate the number of parts handled by the robot. This word is incremented (or decremented) in the parts program as follows:

Step n	SET WWRD 076 + 1_D
--------	--------------------

or if parts are produced in groups of 4 for example

Step n	SET WWRD 076 + 4_D
--------	--------------------

- [ToDo] : Displays the contents of WWord No. 68 that can be used to indicate the number of parts handled by the robot. As above, this word can be set to a value in the parts program.

Step 00	SET WWRD 068 = 9999_D
---------	-----------------------

A comparison of these 2 words can be performed in the parts program in order, for example, to stop the robot when the number of "done" parts is equal to or greater than the number of parts "to do".

Step n	IF WWRD 076 > = WWRD 068 SET WRD 0059 OR 2_H
--------	---

This causes the robot to stop at the end of the cycle.

- [Cnt 0] [Cnt 1] [Cnt 2]: Display the contents of counters 0, 1 and 2 respectively which can be used as required.

IMPORTANT:

- These words and counters can be reset or preset directly to a value by using the [SET] and [RESET] keys of the programming keyboard.

- . Select the word or counter to be modified: e.g.: [ToDo]
- . Press [SET]
- . Enter the password (See "Encoding and addressing of instructions" Manual or contact our After Sales Service).
- . Enter the desired value: e.g.: 9999
- . Confirm by ENR

- These words and counters can also be set by a "Supervisor" system connected to the robot via a JBus dialogue or EUROMAP 17.

I - 6. OPERAND MODIFICATION (DIRECT PROGRAMMING)

Accessing the editing command is described in the Programming CNC900++Level I Manual, chapter III-I "Direct Programming of the Robot".

- Using the [↑] and [↓] keys, place the instruction whose operand is to be modified on the editing line.
- Press F3 [Modif].

If an instruction to several operands is being modified, such as SET WWRD 004 = 00000001_H, the system offers the following choice for each modifiable operand/operator.

Program	Step 000	[Modif]
> SET WWRD 004 = 00000001_H		
[Oper1] [Operat] [Oper2]		

- The operand will flash, prompting you to enter a new value. Type in the value, and enter.

Notes: It is not possible:

- . to modify the instructions with labels such as:

SP xx Lyy ou SP xx N Lyy

- . to replace one operand by another, e.g.:

X.ABS.L.02000.0 by X.ABS.L WW012 or X.ABS.L. Teach mode:
only the numerical value can be modified.

Use the replace function for this.

* If the program to be printed contains SAP "point markers" and if the SAP module is present, the system asks if the operator wishes to print the list of points contained in the selected program. If the response is NO, a normal listing will be printed.

If programs are in EEPROM memory, the number of bytes which are still available will be displayed once they have been edited.

I - 7. "MEMORY MANAGEMENT" PROCEDURES

When the [Memo-M] key is pressed, the following choices are proposed:

- F1 -> [Val+0]** Procedure for reconfiguring of system and user variables.
- F2 -> [Val+EFT]** Procedure for reconfiguring of system and user variables.
- F3 -> [Syst]** Call up procedure for primary modifications to memory.
- F4 -> [Option]** Used to list the options installed.
- F5 -> [MRead]** Used to display and modify user-memory areas (and part of system area).

Note: A password and/or confirmation of continuation may be requested for certain functions modifying the system or critical areas of memory (these are reserved for Sepro technicians, since incorrect use can lead to operating errors).

I - 7. 1.[Val+0] and [Val+EFT] functions (Recall)

Confirmation to continue is required for both functions.

I - 7. 1.a)[Val+0] function

- - clearing and reconfiguring system and user variables concerning the immediate environment for running a program.
- - the RAM or EEPROM memory containing the programs is not affected.

Note: In this procedure the storage counter area is not affected. The program running or to be run will start or restart from the beginning. If the operator does not want to affect the counters, a simple Home Return is performed; otherwise carry out a TOTAL Home Return (recommended Home Return).

I - 7. 1.b)[Val+EFT] function

Same as preceding function, plus:

- - reset of all storage counters,
- - reset of user programs in RAM memory,
- - reset of various basic variables: error stack / bit area / word area / etc...

I - 7. 2.System procedures [Syst.]

Pressing the [Syst] key gives access (with password) to the functions described below:

F1 -> [Config] : Allows access to the following functions:

- **[AUTO]** : To a certain extent, this function allows reconfiguration of the EEPROM (internal or module) after a write error in a program save or alteration of the contents due to an unknown cause.
- **[P by P]** : Idem but error by error with request of continuation after each error.

- **[MANU]** : The memory zone to be deleted is determined by the operator specifying the start address and the end address.

Caution:

These functions go through the memory selected, locate the damaged programs (e.g. absence of "end") and DELETE them !

Notes: These functions can only operate if there is a real write problem in EEPROM (faulty board component).

F2 -> [RzRAM] : Resetting and checking of user RAM.

F3 -> [RzEEP] : Resetting to 0xFF of internal EEPROM (except for parameters).

F4 -> [RzMod] : - Resetting to 0xFF of entire external module.

- In the case of an SAP module, a confirmation message appears:

```
IT'S A LEARNING MODULE (SAP) !!!  
Are you sure ?  
[YES] [NO]
```

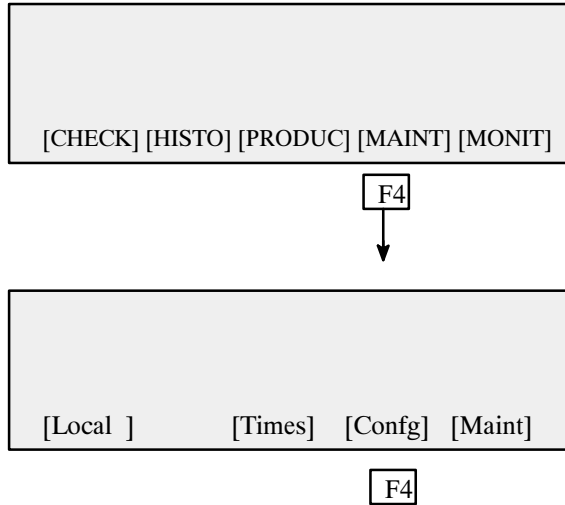
If [YES], the module is deleted and the system prompts confirmation of the module as an SAP module in order to charge the new source programs.

F5 -> [Reset T] : TOTAL reset of system equivalent to first power-up. The user and system RAM is cleared, **the parameters return to the basic parameters.** (EEPROM memory cannot be altered).

If the EEPROM protection system (XICOR 28C64 and 28C256) is active, pressing the F5 [Reset T] key will deactivate the protection system and the data in the EEPROM will be lost.

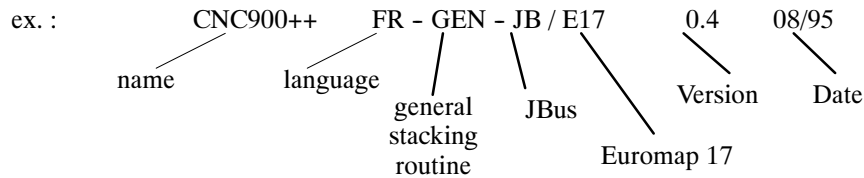
I - 7.3. Reading of options installed

. Access



Holding down the [↑] and [↓] or and keys scrolls the options.

* Sepro software version installed:



* Robot type and serial number.

* EEPROM capacity

* Indicator showing if an external EEPROM module is present or not, displaying:

- . memory capacity,
- . module type: SAP or not.

* Option: Communication with external computer (PC compatible).

* Option: JBUS protocol enabling high-level transfer functions for bits, words, programs.

* Option: PC or JBus selected or not.

* Option: Printer link for printing program listings, error record or error printing as they occur, machine parameters.

- . Printer configuration (See "Using the Printer Connection CN900++" Manual).

I - 7.4. Accessing User Memory [ReadM]

* READ MEMORY function: This function is described in "Encoding and addressing of instructions" Manual).

II - SOFTWARE ARCHITECTURE

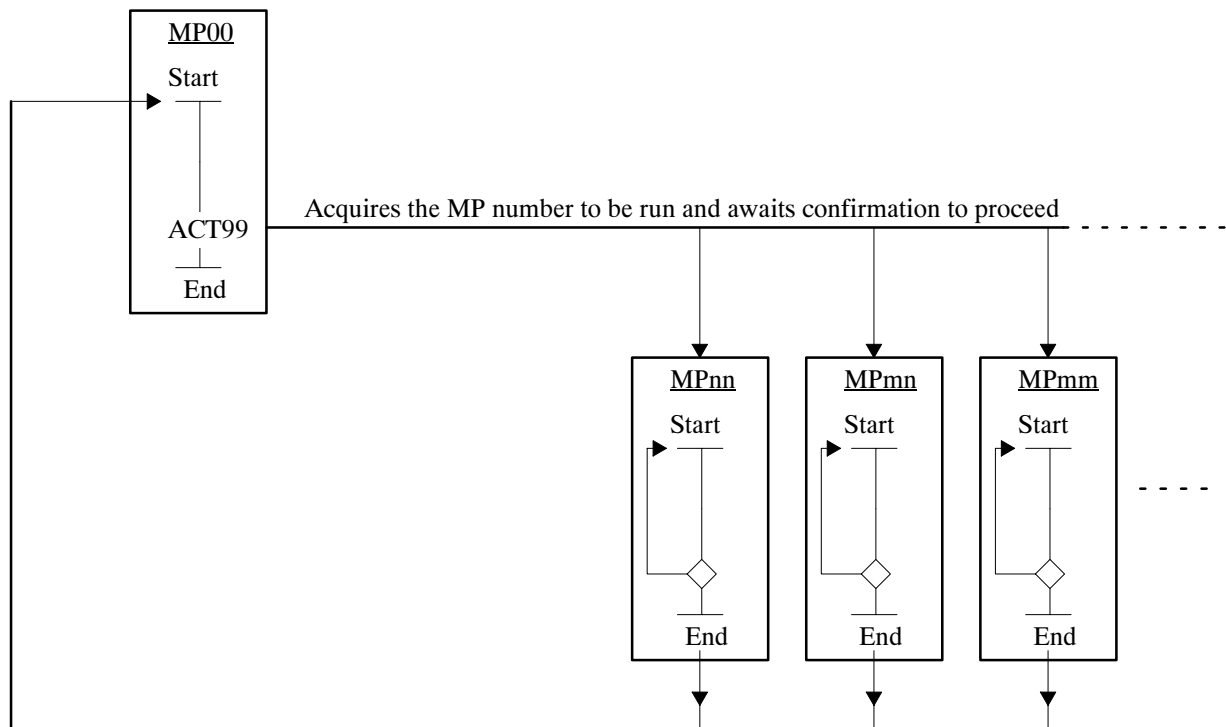
II - 1. SELECTION MODE

The main programs can be selected from the keyboard but also:

- from encoded inputs (limited or extended encoding),
- by dialogue with an external master computer.

Routine selection can be static or dynamic. Static selection means the routine number can be selected only when the robot is stopped.

Dynamic selection (automatic change of routine number) means the routine to be run can be selected by external dialogue without stopping the machine. In this case routine 00 is set aside as the address for return and routing to the other routines selected.



This type of operation requires a special machine configuration.

GUIDE TO PARAMETERS:

Par. 5 : Defines the operation which enables or disables the automatic change of program.

Par. 92: Contains the input number which validates the automatic change of program (ACT99).

Par. 4 : Defines the type of encoding (4 inputs, 7 inputs or supervisor word).

Par. 131 to Par. 137 : Contain the encoded input numbers.

Par. 138 : Contains the associated parity bit input number.

See the "Parameters" manual.

II - 2. HOME RETURN

II - 2. 1.Home Return in "Automatic Program change" operation

Basic operation is identical to cases described in "Programming CN900++ Level I" manual except that a return to step 00 of main routine 00 can be requested in the return subroutine header (Parameter 5 = 1). In this case, the distinction between "SIMPLE" and "TOTAL" Home Return only affects stacking.

II - 2. 2.Home Return operation

In order to avoid certain operator handling errors, in particular after movements in Adjust mode such as arm lowering and cycle restart, the operator can be forced to perform an RO (standard or total) before restarting execution. To define the type of operation required, please refer to Parameter 154.

II - 2. 3.Total home return in progress

If special operations are to be carried out after a TOTAL home return, it is possible to program them by conditioning the "TOTAL return in progress" bit : BIT 009.

Example : IF BIT 009
 RST OUT 18

II - 2. 4.Home Return and Timer setting

If timer and specific home return instructions are programmed in a step, the specific home return request will only be taken into account at the end of the delay time.

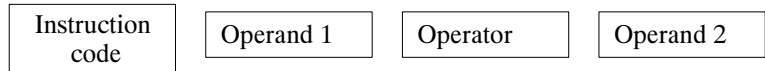
Example : Step n SR 01
 TIME 20
 ...

Important: If a home return is requested in step "n" before the end of the delay time, SR00 and not SR01 will be carried out.

II - 3. PART PROGRAM INSTRUCTIONS

II - 3. 1. Instruction : definition

Syntax :



II - 3. 1.a) Operands

Name	Mnemonic	Size	Number	Functions
Output	OUT	1 bit	000 to 127	Boolean image of an action to be carried out externally (output) (transmitted via the 32S boards).
Input	IN	1 bit	000 to 127	Boolean image of an internal data item (input) received via the 32EO boards.
		16 bits	000 to 127	Modulo of 16 inputs, the number of which indicates the input placed at LSB.
Bit	BIT	1 bit	000 to 127	Internal Boolean variable that is the result of an equation or a setting in the program.
Timer	TIM	1 bit	00 to 15	Internal Boolean variable that is the result of a PLC timer.
Word	WRD	16 bits	000 to 4095	General stored data, maximum 16 bits (odd address).
Long word	WORD	32 bits	000 to 127	General stored data, maximum 32 bits (even address).
Counter	CNT	16 bits	see table II - 3. 2.d)	Structures reserved for increments and decrements

* Status check of a bit:

Proposal: INVERT (otherwise NORMAL).

Syntax: > BIT... (000 to 127) or BIT/...

Status "1" (or "0") of the bit is awaited for passage to next step. Several different bits can be checked at 0 or 1 status in the same step, which is the equivalent of an AND gate between each step.

II - 3. 1.b) Operators

These operators are required to perform allocations, operations or tests in SET and IF type instructions (see following paragraph). They cannot be used alone as instructions in the parts program.

The evaluation result is positioned in operand 1. Operand 2 can be a constant:

. decimal, Operand 2 - **D**

. hexadecimal, Operand 2 - **H**

- Arithmetic operators (only in SET instruction)

[=]	Setting of a value	} <i>- Caution -</i> <i>Capacity overrun in WORD or WWORD is not tested.</i>
[+]	Addition	
[-]	Subtraction	
[*]	Multiplication	
[/]	Whole number division (remainder not used)	

Logic operators

[=]	2 operators are equal	} <i>Comparison</i>
[> =]	Greater than or Equal to	
[< =]	Less than or Equal to	
[AND]	AND logic	} <i>Creating a mask</i>
[OR]	OR logic	

II - 3. 2. Allocation, test and counting instructions

II - 3. 2.a) SET instruction - Allocation -

The following variables can be set:

[BIT] [OUT] [COUNT] [WORD] [WWORD]

Examples:

Addition: . **SET.WRD 000 + 0012 - D**

The contents of WRD 0000 are increased by 12 (decimal)

Division: . **SET.WWRD 005 / 03 - D**

Before: WWRD 005 = 1200 (decimal).

After: WWRD 005 = 400 (decimal).

Multiplication: . **SET.WWRD 120 * A - H**

Before: WWRD 120 = 42 (decimal).

After: WWRD 120 = 420 (decimal).

Exclusive mask: . **SET.WWRD 002 AND WRD 005**

Before: WWRD 002 = 8AB74B7A (Hexadecimal)

WWRD 005 = 0008888 (Hexadecimal)

After: WWRD 002 = 0000088 (Hexadecimal)

Inclusive mask: . **SET.CNT 0010 OR WRD 0000**

Before: CNT 0010 = 0000 0000 0000 1111 = 000F (Hexa)

Word 0000 = 0000 0001 0000 1111 = 010F (Hexa)

After: CNT 0010 = 0000 0001 0000 1111 = 010F (Hexa)

Reset to zero: . **SET.CNT 0141 = 0000 - D**

II - 3. 2.b) RESET instruction

You can allocate the [BIT], [OUT] and [WORD] operands

Examples:

. RST.WRD 0000 -> the contents of Word 0000 equals 0.

. The following can now be written: SET.WRD 0000 = 0000 - D

II - 3. 2.c)IF instruction - Conditions and testing -*** RECALLS:**

Together with an operator, this instruction evaluates the pair of operands it contains. Depending on the result, the next instruction will be executed (instruction IF must never be used alone).

All instructions are valid EXCEPT : LABEL Lnn or Rnn and the MASTER and SLA functions.

You have two choices :

- [**IF**]: if the condition evaluated is *TRUE*, the next instruction is executed.
- [**IF/**]: if the condition evaluated is *FALSE*, the next instruction is executed (or if the condition is true, the next instruction is not executed).

Note that these instructions will condition execution of any subroutine. Complex conditions can be calculated in the PLC and tested in the main program in IF Bit... or IF/Bit... form, followed by the call instruction of the desired subroutine.

The [IN] and [OUT] operands can be checked, as well as :

[BIT] [COUNT] [TIMER] [WORD] [WWORD]

EXAMPLES:

```
. IF CNT 07 ≤ 5
  if CNT 07 = 2
```

so if the condition is true, the following instruction will be executed.

```
. IF CNT 0008 > = 02300 - D
SP 61 L 15
```

If the contents of counter 0008 is greater than or equal to 2300 in decimal then the condition is confirmed and the next SP 61 will be executed.

```
. IF / WWRD 012 = 000B - H
OUT 012
```

If the contents of WWRD 0012 = B - H (11 in decimal)

then the condition is confirmed but the opposite of IF implies that OUT 012 will not be executed.

Notes:

Value tests on stacking counters (when incremented by stacking SPs) should be preceded by an instruction that masks the weight (8000 H) of the counter value. In addition, so that the mask does not modify the counter value, an intermediate WRD instruction should be used.

```
Example : SET WRD 0010 = CNT 0141
          SET WRD 0010 AND 7FFF - H
```

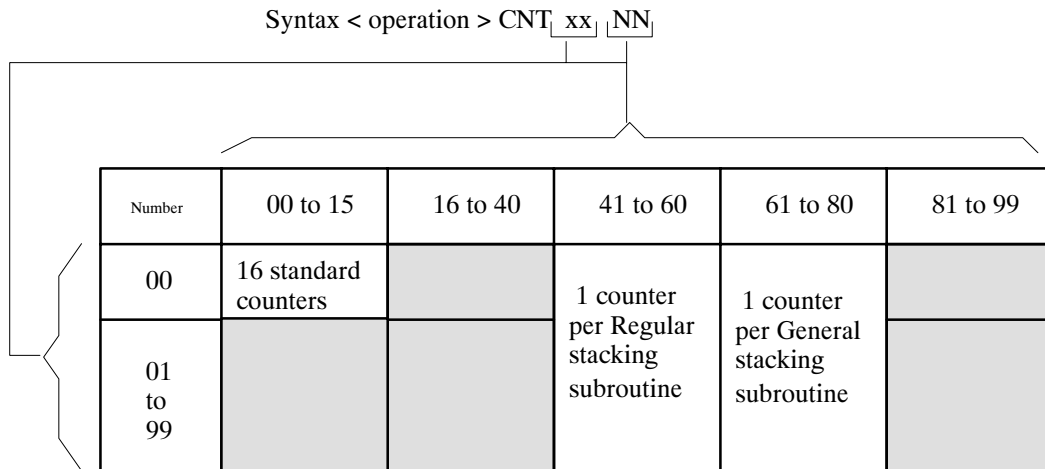
Following these instructions, the value test can be carried out.

```
IF WRD 0010 > = 0030 - D
```

II - 3. 2.d) CNT instruction - Counter handling -

You have at your disposal:

- 16 standard counters,
- 2,000 counters for the regular stacking subroutines (1 per subroutine),
- 2,000 counters for the general stacking subroutines (1 per subroutine).



EXAMPLES:

- DEC CNT 7567 : the counter of subroutine No. 67 of main program 75 is decremented.
- Stacking counters are not implicitly affected. If necessary, it is possible to increase or decrease an interrupted stacking routine by programming the increase or decrease implicitly conditioned by having a value of 1 for the "stacking in progress". (BIT 007)

Example : IF BIT 007
 DEC. FIL

The stacking counters will be reset to zero but not those being used by the PLC.

4 operations can be performed on the counters:

- . SET Setting of an operand. Access using the SET key and then [CNT] in the menu.
- . RESET Counter reset (also possible for SET instruction). Access using the CNT key and then [RESET] in the menu.
- . INC Increment; counter(t) = counter(t-1) + 1. Access using the CNT key and then [INC] in the menu.
- . DEC Decrement; counter(t) = counter(t-1) - 1. Access using the CNT key and then [DEC] in the menu.

Two operations specific to the stacking subroutines are available:

[INC.FIL] Increment current stacking subroutine.

[DEC.FIL] Decrement current stacking subroutine.

These 2 instructions have no operand number. They are only used in Home Return subroutines SR. The incremented or decremented counter is the counter originating the SR request.

II - 3. 2.e) TIME instruction- Timer in part program -

A numerical value from 001 to 999 in 1/10s can be assigned to the timer as well as the following value:

- [WORD] Word No 00 to 15 containing a numerical value from 001 to 999 (in decimal).

Examples

. Numerical value: TIME 0005 - delay of 5 tenths of a second.

. Word : Step n SET WRD 0005 = 0010 - D
 Step k TIME WRD 0005 - delay of 10 tenths of a second.

II - 3. 3. Customised messages for the robot errors

II - 3. 3.a) Using Word 62

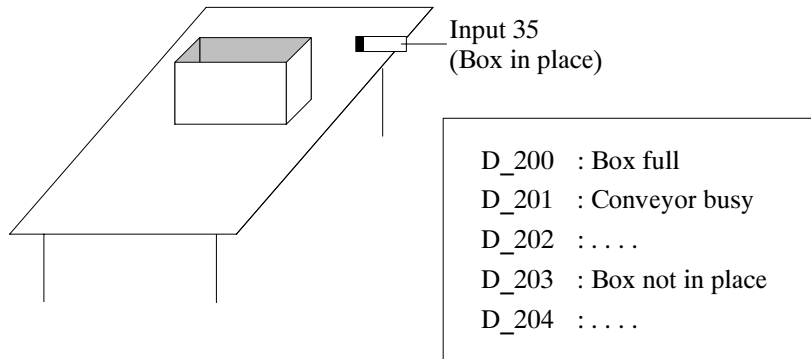
5 programmable errors are available (D200 to D204). A message (that can be changed) can be associated to each of these errors. These errors are available via the function key (Msg) of the edition menu.

Programming the instruction :

```
SET WORD 62 = xxxx - D
```

will put the robot into error mode and the error messages will be displayed when the instruction is carried out.

Example :



MP 15

```

.
.
Step n      IF /IN 35
.            SET WORD 62 = 0203 - D
.


```

When the step is executed and if the box is not in place, the robot will go into error mode and the following message will be displayed :

MP 15 []

D-203 : Box not in place

[Help] [Histo]

Pressing  once restarts the robot.

Note : There is no [Help] message available for errors 200 and 204.



II - 3. 3.b) Using SP 100

The subroutine SP 100 is a structure that activates customised messages that have already been defined using the program editor on the PC.

The message displayed when there is an error will then be the message written in the SP100. If there is no SP 100 or customised message, the system message will be displayed.

To create an SP 100, refer to the Instructions Manual for editing a program on PC.

II - 3. 3.c) Summary of instructions

Instructions	Suffix = Operand 1									Operator					Operand 2											
	Stacking	BIT	OUT	IN	TIM	CNT	WRD	Wword	D		+	-	*	/		Y	^	AND	OR	D	H	CNT	IN	WRD	Wword	
SET		032 ↓ 127	000 ↓ 127																							
						00 ↓ 15 0041 ↓ 9980	000 ↓ 4095				•	•	•	•	•				•	•	0000 ↓ 9999	0000 ↓ FFFF	•	•	•	
								000 ↓ 127			•	•	•	•	•				•	•	00000000 ↓ 99999999	00000000 ↓ FFFFFFFF	00 ↓ 15 0041 ↓ 9980	000 ↓ 112	0000 ↓ 4095	000 ↓ 127
RST		032 ↓ 127	000 ↓ 127			00 ↓ 15 0041 ↓ 9980	00 ↓ 15																			
IF		032 ↓ 127	000 ↓ 127	000 ↓ 127	00 ↓ 15																					
						00 ↓ 15 0041 ↓ 9980	000 ↓ 4095								•	•	•	•		0000 ↓ 9999	0000 ↓ FFFF	•	•	•		
								000 ↓ 127			•	•	•	•					•	•	00000000 ↓ 99999999	00000000 ↓ FFFFFFFF	00 ↓ 15 0041 ↓ 9980	000 ↓ 112	0000 ↓ 4095	000 ↓ 127
INC	•				00 ↓ 15 0041 ↓ 9980																					
DEC	•				00 ↓ 15 0041 ↓ 9980																					
TIME							00 ↓ 15		00 ↓ 999																	

Key:

□ Operand/operator not accepted

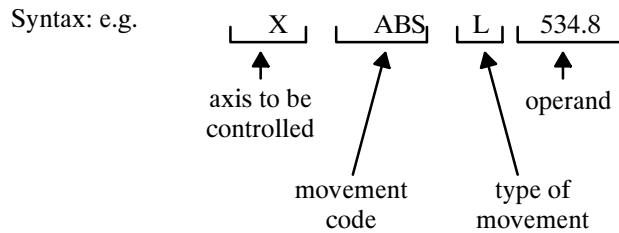
• the type of operand/operator is valid

00
↓
15

indicates the operand number (e.g. CNT00 to CNT15) or the numerical value (e.g. TIME 001)

II - 4. MOTOR-DRIVEN MOVEMENT CODES

These instruction codes are used to control a movement on a given axis.



II - 4. 1. Movement Code

Having selected the axis to be controlled (if it is motorized) the following movements are proposed:

[FIL] [REL] [CTL] [FREE] [. / . .]

the list is continued by pressing

[ABS] [POS A] [POS N] [VEL A] [VEL N]

- * ABS = absolute
- REL = relative
- CTL = control
- FREE = release

Details of these movement codes are given in the "Programming CN900++ Level I" manual.

* FIL : Stacking movement

The use of the stacking movement is described in Chapter II - 6. page 32.

* POSA / POSN / VELA / VELN : Servo-controlled movements

The use of these instructions is described in the "Monitoring an External Axis" Manual.

II - 4. 2.Operand

After selecting the movement code, the operand can be given a numerical value (in 1/10 mm or in 1/10 degrees). One of the following functions can be used:

[Wword] [Learn] [Offset] [FilVal]

* **Learn** : Learning

* **Offset** : Present position of axis

* **wword** : 32-bit word

=> These operands are described in the "Programming CNC900++Level I" manual.

* **LINEAR movement**

Syntax: > X.ABS L WW 00 (to 65)

Syntax: > X.FIL L WW 00 (to 65)

Syntax: > X.REL L WW 00 (to 65)

Syntax: > X.CTL L WW 00 (to 65)

* **ROTATING movement**

Syntax: > B.ABS R WW 00 (to 65)

Syntax: > B.REL R WW 00 (to 65)

Syntax: > B.CTL R WW 00 (to 65)

* **Actuating movements of axes B and C for stacking**

Syntax: > B.FIL

Syntax: > C.FIL

(Codes only validated in general stacking subroutines SP 61 to 80).

* **Examples of movement programs**

X.ABS L WW 06	Absolute movement of X in relation to long word No 6.
Y.FIL L WW 02	Storage movement in relation to long word No 2.

II - 5. PREPARATORY "FUN" FUNCTIONS OF NUMERICAL AXES

Preparatory functions are movement parameters relating to numerical movements. There are basically two types:

- . Temporary-effect functions (only valid for the current step),
- . Maintained-effect functions until the appearance of a new function.

Program	Step 000	[Append]
[Vel.]	[Acc.]	[Sla.] [Imp.] [. . / . .]

. The function list continues by pressing F5

[Append]
[Master] [Line]

II - 5. 1.Function = Speed [VEL] - axis value in % (Maintained)

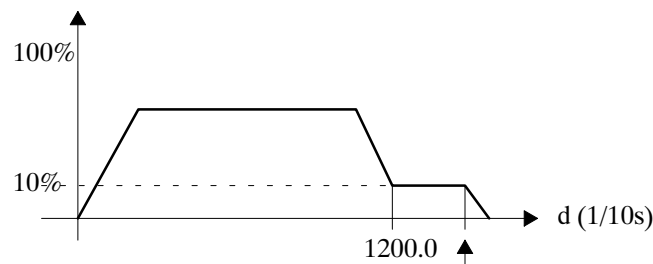
Apart from the assignment of a numerical value between 1 and 100%, the percentage speed can be changed using the following value :

- . [WWORD] 32 bit word (Nos. 00 to 63, 66, 67) containing 1 to 100 (decimal)

II - 5. 2.Function = Slow Approach [SLA] (Temporary)

REMINDER:

Example : APL Y 10%
 Y ABS_L 1200.0
 ACT 11
 ACT 19



GUIDE TO PARAMETERS:

- . Loss of FAL: Parameter 85
- . Loss of Slow Speed End: Parameter 199 for X, 349 for Y, 499 for Z, 649 for B, 799 for C.
- . Part Presence : Parameter 62
- . Part Presence : Parameter 71

In addition the so-called "slow" input, which causes a controlled reduction in speed when it disappears, is contained in the following parameters:

PAR 198 for X, PAR 348 for Y, PAR 498 for Z, PAR 648 for B et PAR 798 for C.

II - 5. 3. Specific codes

SP code as instruction

Number 61 to 80: General stacking subroutines.

Syntax: > SP nn L00 to 99 N(ormal) operation

or

Syntax: > SP nn I L00 to 99 I(nverse) operation

Number 81 to 99: Subroutines executed in parallel.

Syntax: > SP nn L00

Notes:

* For the parallel SP, the Label is always forced to 0.

* ACT 99: Awaits validation of the number of MP to be executed (automatic change of program number: see Chapter II - 1. page 19).

* ACT 90: cancels the "Watchdog between steps" function. This function can only be cancelled for the step where ACT 90 is programmed.

II - 6. STACKING SUBROUTINE - SP41 TO SP60

These subroutines are used to simplify the organization of pallets or an existing stack/column arrangement..

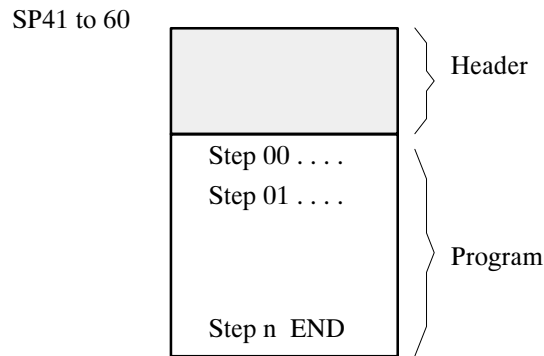
They can be named (maximum 30 characters) in order to denote the palletization carried out.

Example: "SP42 cover on Pallet 2"

STRUCTURE:

The stacking subroutines comprise two parts:

- A header : Stating the pallet organization.
- A program : Cycle describing the picking-up or setting-down of the first part on the pallet.



STACKING COUNTER

A usable counter with a computer address that can be displayed is allocated to each stacking program.

CNT xxnn xx : No. of the main program
 nn : No. of the subroutine concerned

The stacking counter is set to 0 when a TOTAL home return is made. A simple home return has no effect on the stacking unless otherwise programmed.

The stacking counter is increased at each decoding of the stacking subroutine header. When it is equal to the number of parts to be stacked, the counter is set to 1 at the following decoding.

HEADER:

The header is completed using a dialogue box. This takes the form of a set of questions which vary according to whether the stacking is carried out with or without staggering.

Header:

Staggering No (0) or Yes (1)
 By layer (0) or stack (1)
 Stacking (0) or Unstacking (1)
 Order XY (0) or YX (1)
 Number of parts in X, row 1
 * Number of parts in X, row 2
 Distance X between parts, row 1
 * Distance X between parts, row 2
 * Distance X between parts, column 1 and 2
 Number of parts in Y, column 1
 * Number of parts in Y, column 2
 Distance Y between parts, column 1
 * Distance Y between parts, column 2
 * Distance Y between rows 1 and 2.
 Number of layers
 Distance between layers
 Command at the end of layer or stack
 Command at the end of pallet

** These questions are only asked if the stacking includes staggering.*

Definitions:

- Row : Alignment of parts parallel to X-axis
- Column : Alignment of parts parallel to Y-axis
- Layer : Stacking of parts along Z-axis
- Part no. 1 is located in stack 1, column 1, layer 1.

END OF LAYER, STACK, PALLET COMMAND:

The possible commands are: OUT ___ (from 0 to 127)
 BIT ___ (from 34 to 127)

The command is activated by the system if the following conditions are satisfied:

- The stacking counter has as a value the number of parts in a layer or stack (end of layer or stack) or the number of parts on the pallet (end of pallet).
- The system decodes the relevant stacking subroutine header.

The command activated by the system is set at 1. The following commands are then available:

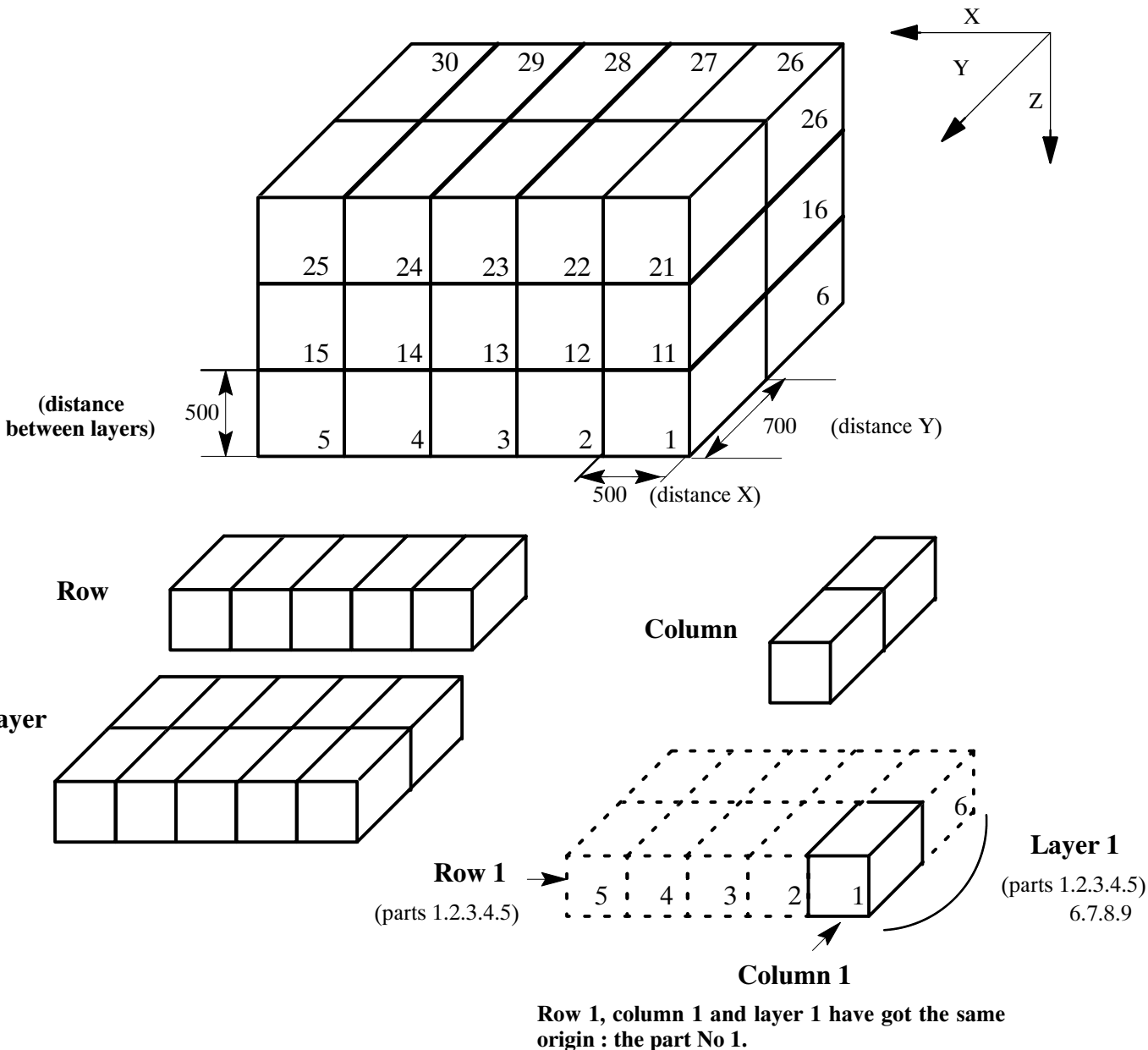
 SET OUT ___
 or SET BIT ___

Do not forget, therefore, to program RST OUT ___ or RST BIT ___ in the program sequence.

EXAMPLES OF HEADER STATEMENTS

See following pages.

Example of stacking without staggering

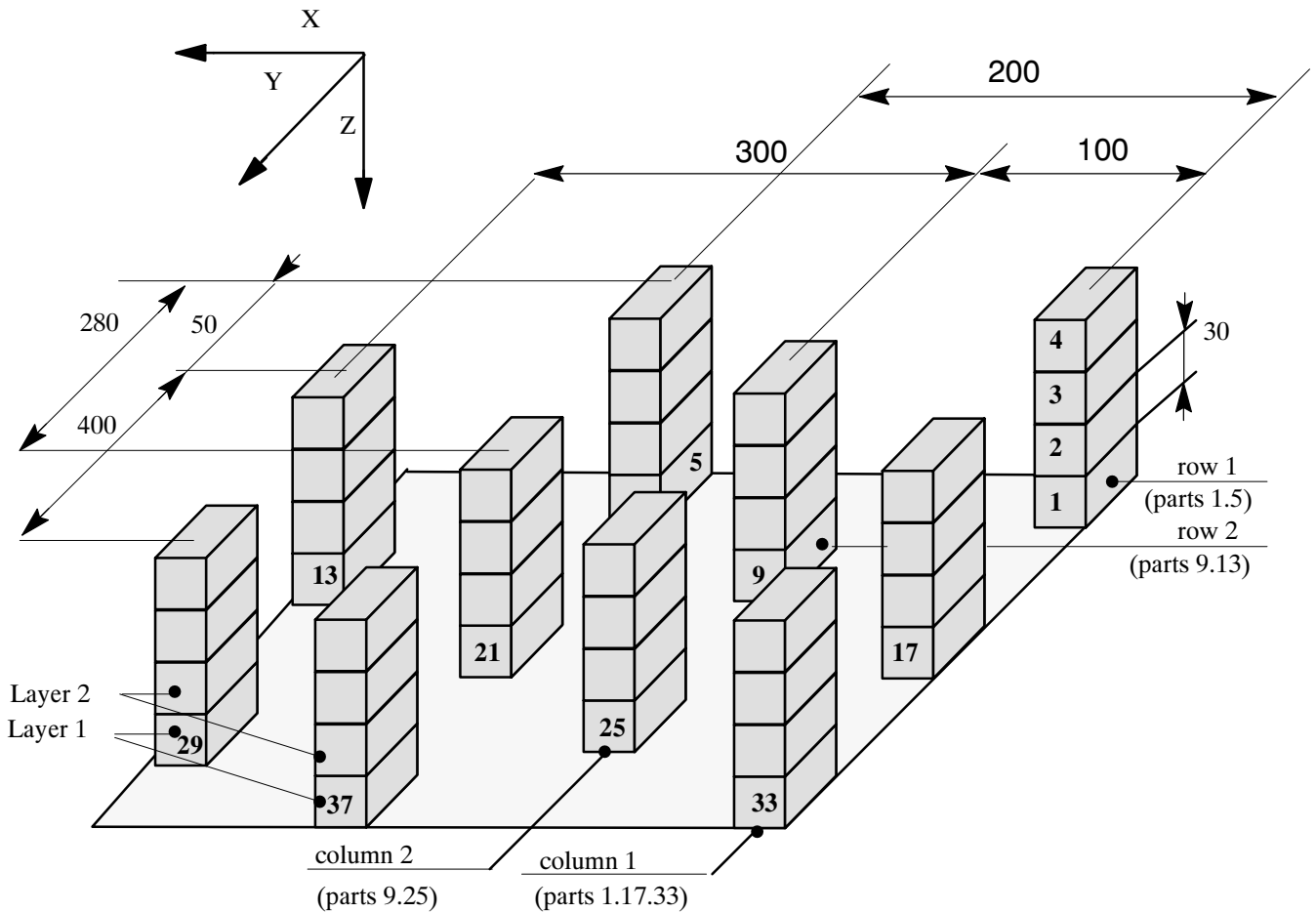


Limit Values

Staggering No (0) or Yes (1) 0
 By layer (0) or column (1)..... 0
 Stacking (0) or unstacking (1) 0
 Order XY (0) or YX (1) 0
 Number of parts in X, row 1 5
 Distance X between parts, row 1.....+500.0
 Number of parts in Y, column 1 2
 Distance Y between parts, column 1.....-700.0
 Number of layers..... 3
 Distance between layers.....500.0
 Command at the end of layer or column ...Bit100
 Command at the end of palletBit 100

1 to 99
 -9999.9 to 9999.9
 1 to 99
 -9999.9 to 9999.9
 1 to 99
 0 to 9999.9
 OUT ... / BIT ...
 OUT ... / BIT ...

Example of staggered stacking



Limit values

Staggering No (0) or Yes (1)	1	
By layer (0) or stack (1)	1	
Stacking (0) or unstacking (1)	0	
Order XY (0) or YX (1)	0	
Number of parts in X, row 1	2	1 to 99
Number of parts in X, row 2	2	1 to 99
Distance X between parts, row 1	200.0	-9999.9 to 9999.9
Distance X between parts, row 2	300.0	-9999.9 to 9999.9
Distance X between columns 1 and 2.....	100.0	-9999.9 to 9999.9
Number of parts in Y, column 1	3	0 to 99
Number of parts in Y, column 2	2	0 to 99
Distance Y between parts, column 1	280.0	-9999.9 to 0999.9
Distance Y between parts, column 2	400.0	-9999.9 to 9999.9
Distance Y between rows 1 and 2	50.0	-9999.9 to 9999.9
Number of layers.....	4	0 to 99
Distance between layers	30	0 to 9999.9
Command at the end of layer or column	BIT 50	OUT. ... / BIT ...
Command at the end of pallet	BIT 51	OUT. ... / BIT ...

PROGRAM:

Calling a stacking subroutine:

The structure for calling a stacking subroutine is identical to those of standard subroutines. The only difference is the execution choice the system proposes:

- Normal
- Inverse

The "Inverse" selection allows the execution of the program in the opposite way to that initially stated. In "normal" execution mode, the stacking counter is increased before the distances are calculated. In "inverse" execution mode, the distances are calculated before the counter is decreased.

The "end of layer", "end of pallet" bits are also positioned in a coherent fashion. This function is mainly of interest in the management of stock reserves.

Programming of a stacking subroutine:

The displacements for stacking calculations are programmed using the following codes

X FIL _____
Y FIL _____
Z FIL _____

When the program is running, the processor calculates position adjustments to be made in relation to the first pick-up/set-down programmed.

System bits :

For the programmer use, the system sets the bits for choosing placement orientation, depending on whether the parts belong to odd or even lines.

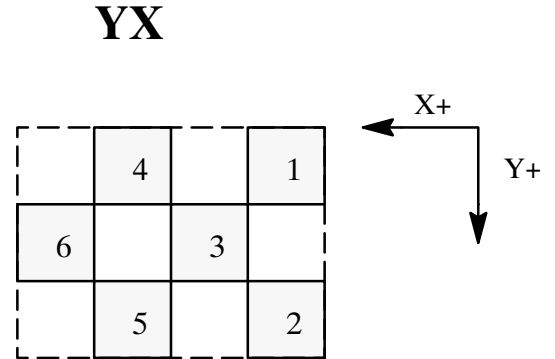
- **Bit 0** : Inverse stacking operation bit.
- **Bit 1** : End of layer or stack bit.
- **Bit 2** : End of pallet bit.
- **Bit 3** : Odd row in progress bit.
- **Bit 4** : Odd column in progress bit.
- **Bit 5** : Odd layer in progress bit.
- **Bit 6** : Odd counter bit.
- **Bit 7** : Stacking in progress bit.

Bit 7 is set if the conditions are required from the moment the header of the routine is decoded until the word END is run or until a sequence returning to a label other than 00 is called.

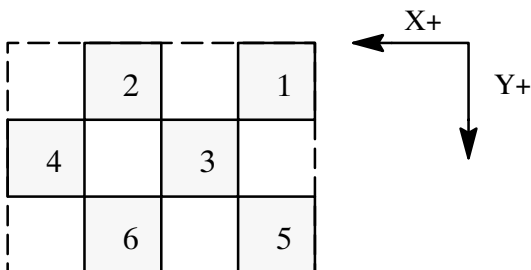
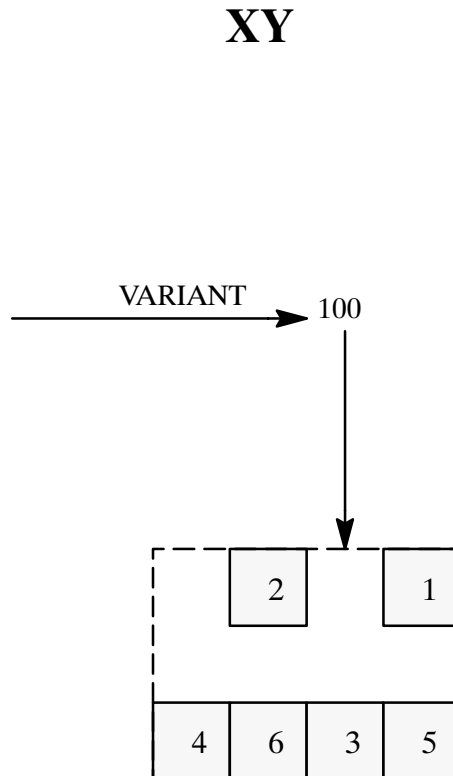
The programmed bits or outputs must be reset by the programmer after use. At the end of the layer or pallet, bits B00 to B05 are set to decoding of the header, and a total home return resets them to 0.

Example of special cases: Stacking No 1

Staggering No (0) or Yes (1) 1
 By layer (0) or Column (1) 0
 Stacking (0) or unstacking (1) 0
 Order XY (0) or YX (1) 1
 Number of parts in X, row 1 2
 Number of parts in X, row 2 2
 Distance X between parts, row 1100.0
 Distance X between parts, row 2100.0
 Distance X between column 1 and 2 ...50.0
 Number of parts in Y, column 1 2
 Number of parts in Y, column 2 1
 Distance Y between parts, column 1100.0
 Distance Y between parts, column 2100.0
 Distance Y between rows 1 and 250.0
 Number of layers 1
 Distance between layers 0
 Command at the end of layer or column..
 Command at the end of pallet

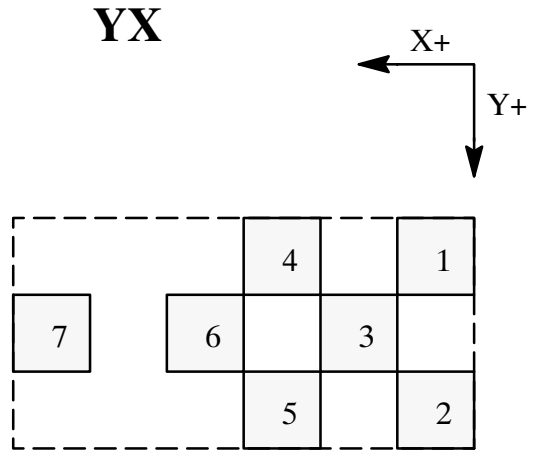


Staggering No (0) or Yes (1) 1
 By layer (0) or Column (1) 0
 Stacking (0) or unstacking (1) 0
 Order XY (0) or YX (1) 0
 Number of parts in X, row 1 2
 Number of parts in X, row 2 2
 Distance X between parts, row 1100.0
 Distance X between parts, row 2100.0
 Distance X between column 1 and 2 ...50.0
 Number of parts in Y, column 1 2
 Number of parts in Y, column 2 1
 Distance Y between parts, column 1100.0
 Distance Y between parts, column 2 0
 Distance Y between rows 1 and 250.0
 Number of layers 1
 Distance between layers 0
 Command at the end of layer or column..
 Command at the end of pallet



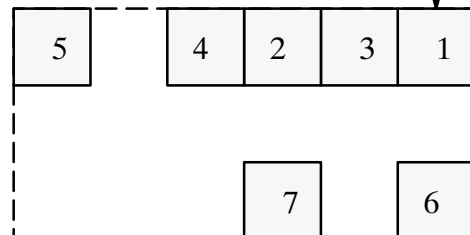
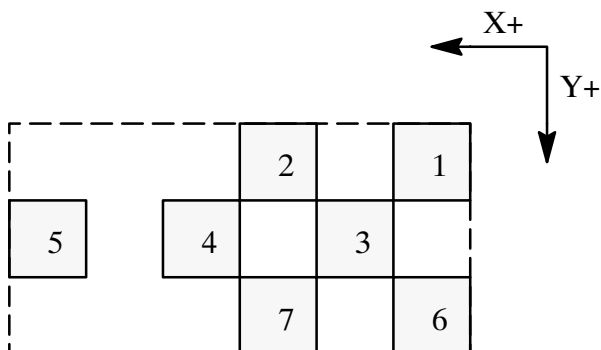
Example of special cases: Stacking No 2

Staggering No (0) or Yes (1) 1
 Stacking (0) or unstacking (1) 0
 Order XY (0) or YX (1) 1
 Number of parts in X, row 1 2
 Number of parts in X, row 2 3
 Distance X between parts, row 1100
 Distance X between parts, row 2100
 Distance X between column 1 and 2 ... 50
 Number of parts in Y, column 1 2
 Number of parts in Y, column 2 1
 Distance Y between parts, column 1100
 Distance Y between parts, column 2 0
 Distance Y between rows 1 and 2 50
 Number of layers 1
 Distance between layers 0
 Command at the end of layer or column..
 Command at the end of pallet



Staggering No (0) or Yes (1) 1
 By layer (0) or Column (1) 0
 Stacking (0) or unstacking (1) 0
 Order XY (0) or YX (1) 0
 Number of parts in X, row 1 2
 Number of parts in X, row 2 3
 Distance X between parts, row 1100
 Distance X between parts, row 2100
 Distance X between column 1 and 2 ... 50
 Number of parts in Y, column 1 2
 Number of parts in Y, column 2 1
 Distance Y between parts, column 1100
 Distance Y between parts, column 2 0
 Distance Y between rows 1 and 2 50
 Number of layers 1
 Distance between layers 0
 Command at the end of layer or column..
 Command at the end of pallet

VARIANT → 0



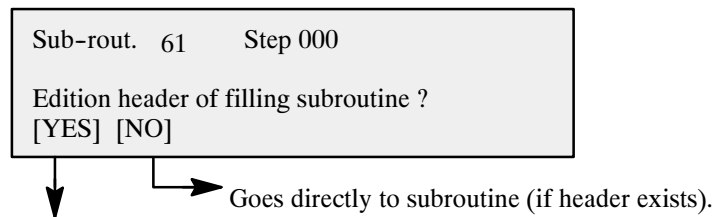
II - 7. GENERAL STACKING SUBROUTINES - SP 61 to 80 -

These subroutines are designed to describe stacking of parts that are not regular but that are repeated over several layers or several times in a cycle.

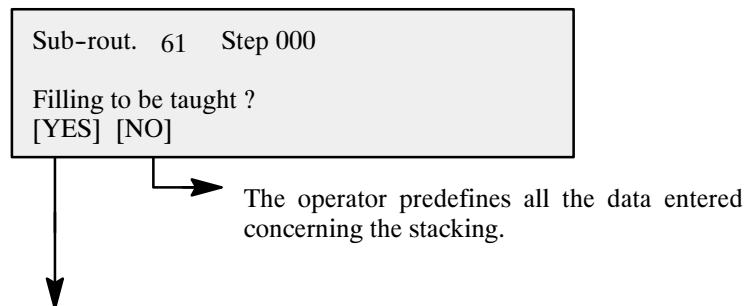
Each layer is described as follows:

- The first part is used as the absolute reference.
- The positions of subsequent parts are treated as relative (in relation to the first part)
-> Distances.
- A data item is allocated to each position, describing the position of the rotations (MOTROT = Rotation Word).

II - 7. 1. Edition of subroutine SP61 to 80



Allows creation or modification of general stacking parameters.



The part positions are not known.

The positions are taught by the operator by moving the robot manually.

-> Teaching the positions.

In RAM memory:

The header can be fully modified, including the **extended monitor system**. Modifications are taken into account only after quitting the routine header by pressing [P+1] or [Layer+]”F5”.

In EEPROM memory:

Only those parameters which do not change the format of the routine can be altered:

- . Stacking or Unstacking
- . Number of layers
- . Height of parts to be stacked
- . or Distance between layers of the same type
- . Command at the end of layer
- . Command at the end of pallet

and all X, Y, and Z distances, B and C values, as well as the value of "MotRot".

Changes are taken into account immediately after pressing [ENR].

II - 7. 2. Teaching data for general stacking in Adjust mode

Sub-rout. 61 Step 000

Filling to be taught ?

[YES] [NO]

↓ header must be filled out before entering dimensions.

*** Parameter writing:**

- Alternate layers No (0) or Yes (1) 1
- Stacking (0) or Unstacking (1) 0
- Number of layers 2
- Distance between layers of same type150.0
- Number of parts, layer 1 3
- Number of parts, layer 2 5
- Command at the end of layerBIT 61
- Command at the end of palletOUT12

*** Teaching of distances:**

If your are not in Adjust mode, select Adjust mode and turn PROG key in order to return to Programming mode. The display then reads:

SP 61 FIL GEN Step 000

B = C = MotRot = 07 H

[ROT 1] [ROT 2] [ROT 3] ENR if OK

Motorised axes can be moved to bring the robot to the desired location. For part 1 layer 1, the X, Y, and Z distances do not appear but will be stored in order to calculate the distances of subsequent parts relative to the position of part 1 layer 1.

Choice of rotations :

Pressing [ROT 1] [F1] then START has two possible effects:

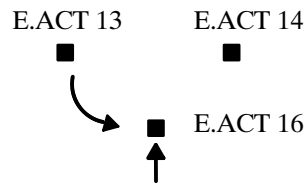
- . if in ACT.10, ACT.09 is run,
- . if in ACT.09, ACT.10 is run.

Pressing [ROT 2] [F2] then START has two possible effects:

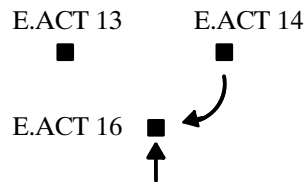
- . if in ACT.13, ACT.14 is run,
- . if in ACT.14, ACT.13 is run.

Pressing [ROT 3] ”F3” then START has two possible effects:

- . if the input corresponding to ACT.13 is active, it runs ACT.14 by activating the intermediate stop.

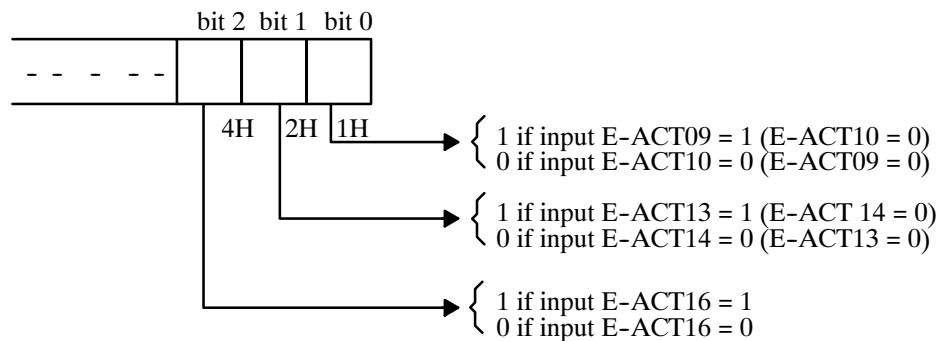


- . if the sensor corresponding to ACT.14 is active, it runs ACT.13 by activating the intermediate stop (equivalent to ACT 16).



Note : ACT.13 or ACT.14 **activates withdrawal of the intermediate stop.**

Depending on the rotation inputs present, and if parameter No 10 = 0, MotRot (rotation description) is prepared (modification of bits weighted 1, 2, 4 by rotation).



Pressing the [ENR] key stores the distances of the declared axes and the rotation description (RotDes), if parameter No 10 = 0, and goes on to the next part, the next layer, or routine.

Keys [P+1] and [P+1] increase or decrease the part number.

*** Creation of the routine**

After acquiring data on the last part of the last layer, the routine itself is edited.

If the axes are declared, X, Y, Z, B, and C locations will have been stored. They are restored by keying in codes **X.FIL.L** 1000.0 (value flashes). If the dimension is suitable, press [ENR].

II - 7.3.Entering a general stacking

If all the positions and data of stackings are known, teaching can be refused.

```

Sub-rout.      Step 000

Filling to be taught ?
[YES] [NO]

```



These two headers correspond to the examples on the following pages:

Example 1 : (See Chapter II - 7. 5.)

```

Alternate layers No (0) or Yes (1) ..... 0
stacking (0) or Unstacking (1) ..... 0
Number of layers ..... 1
Distance between 2 layers .....2500
Number of parts, layer 1 ..... 5
Command at the end of layer .....OUT 10
Command at the end of pallet .....BIT 107

```

Example 2 : (See Chapter II - 7. 5.)

```

Alternate layers No (0) or Yes (1) ..... 1
Stacking (0) or Unstacking (1) ..... 0
Number of layers ..... 2
Distance between layers of same type .....500.0
Number of parts, layer 1 ..... 3
Command at the end of layer .....OUT 10
Command at the end of pallet .....BIT 107

```

*** To write and modify the 1st part of the header, use:**

- numerical keys for numerical values,
- keys or to select the end of layer or pallet variable,
- keys or to change the line,
- key to confirm.

*** For the distances and the rotation words, press .**

```

SP 61  FIL GEN Step 000 Part 02 Layer 2
Ex = 0025.0   Ey = -0250.0   Ez = 0000.0
B =           C =           MotRot = 01 H
                        [Layer -] [Layer +]

```

The value being processed flashes on the display (if the corresponding axis exists).

Keys: [P-1] and [P+1] increase or decrease the part number.

Keys: [layer -] and [layer +] increase or decrease the layer number.

Keys: [>] and [>] move the axis involved or MotRot backwards or forwards.

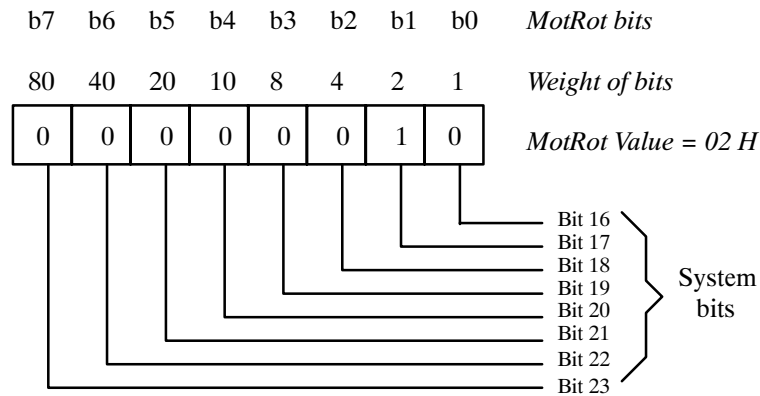
Note : After entering a value and pressing [ENR], the next value appears (next part, next layer).

```

SP 61 FIL GEN Step 000 Part 01 Layer 1
Ex = 0000.0   Ey = -0000.0   Ez = 0000.0
B =           C =           MotRot = 02 H
                    [Layer -] [Layer +]
```

The other bits do not change (see use of bits under Programming).

II - 7. 4. Description and use of rotation description



The following should therefore be programmed in the stacking sequence concerned:

- IF BIT 016
ACT.09
- IF/BIT 016
ACT.10
- IF BIT 017
ACT.13
- IF/BIT 017
ACT.14



Example for a robot equipped for 2 standard pneumatic rotations.

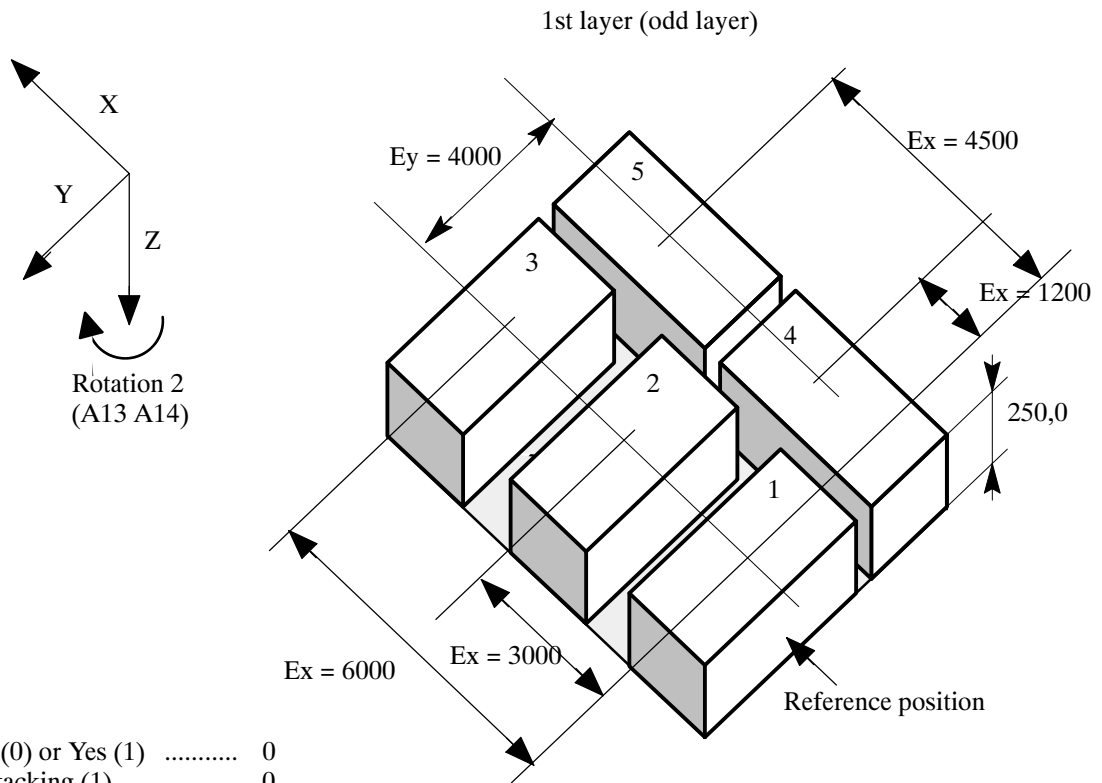
When the stacking subroutine header is run, the following bits are set:

- Bit 0 : Inverse stacking operation bit
- Bit 1 : End of layer bit
- Bit 2 : End of pallet bit
- Bit 3 : } Not significant (used in Regular Stacking)
- Bit 4 : } Not significant (used in General Stacking)
- Bit 5 : Odd layer in progress bit
- Bit 6 : Odd counter bit
- Bit 7 : Stacking in progress bit

If parameter No 10 (type of stacking rotation) is set to 1, it is possible to enter rotations in teach mode, so that :

- BIT 16 at 1 indicates an ACT. 09 rotation is to be performed
- BIT 16 at 0 indicates an ACT.10 rotation is to be performed
- BIT 17 at 1 indicates an ACT.13 rotation is to be performed
- BIT 17 at 0 indicates an ACT.14 rotation is to be performed
- BIT 18 at 1 indicates an ACT.16 rotation without intermediate stop
- BIT 18 at 0 indicates an ACT.16 rotation with intermediate stop

II - 7.5.Example 1



Alternate layers No (0) or Yes (1) 0
 Stacking (0) or Unstacking (1) 0
 Distance between 2 layers.....1
 Height of parts to be stacked250,0
 Number of parts, layer 2 5
 Command at the end of layer or column .. OUT 10
 Command at the end of palletBIT 107

DISTANCES :

Part 1 Layer 1

Ex = 0 Ey = 0 Ez = 0
 B = 0 C = 0 MotRot = 2

Part 2 Layer 1

Ex = 300,0 Ey = 0 Ez = 0
 B = 0 C = 0 MotRot = 2

Part 3 Layer 1

Ex = 600,0 Ey = 0 Ez = 0
 B = 0 C = 0 MotRot = 2

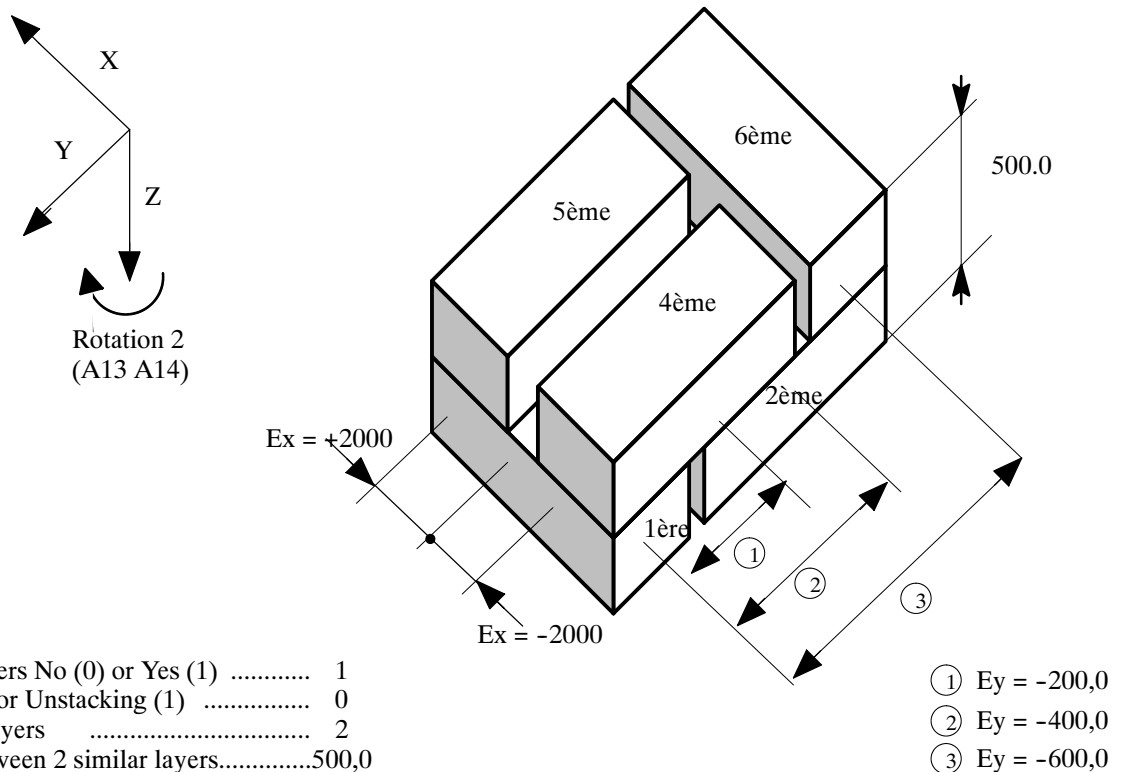
Part 4 Layer 1

Ex = 120,0 Ey = 400,0 Ez = 0
 B = 0 C = 0 MotRot = 0

Part 5 Layer 1

Ex = 450,0 Ey = 400,0 Ez = 0
 B = 0 C = 0 MotRot = 0

II - 7. 6.Example 2 - Alternate layers



Alternate layers No (0) or Yes (1) 1
 Stacking (0) or Unstacking (1) 0
 Number of layers 2
 Distance between 2 similar layers.....500,0
 Number of parts, layer 1 3
 Number of parts, layer 2 3
 Command at the end of layer or column... OUT 10
 Command at the end of palletBIT 107

① Ey = -200,0
 ② Ey = -400,0
 ③ Ey = -600,0

DISTANCES :

Part 1 Layer 1 (1st Part)

Ex = 0 Ey = 0 Ez = 0
 B = 0 C = 0 MotRot = 0

Part 2 Layer 1 (2nd Part)

Ex = -200,0 Ey = -400,0 Ez = 0
 B = 0 C = 0 MotRot = 1

Part 3 Layer 1 (3rd Part)

Ex = 200,0 Ey = -400,0 Ez = 0
 B = 0 C = 0 MotRot = 1

Part 1 Layer 2 (4th Part in diagram)

Ex = -200,0 Ey = -200,0 Ez = 250,0
 B = 0 C = 0 MotRot = 1

Part 2 Layer 2 (5th Part in diagram)

Ex = 200,0 Ey = -200,0 Ez = 250,0
 B = 0 C = 0 MotRot = 1

Part 3 Layer 2 (6th Part in diagram)

Ex = 0 Ey = -600,0 Ez = 250,0
 B = 0 C = 0 MotRot = 0

II - 8. PARALLEL SUBROUTINE - SP 81 to 99 -

The structure and use of this SPP (Parallel subroutine) are similar to those of an ordinary SP. It is triggered by an MP or an SP, and is executed independently, in parallel with execution of the program that triggered it.

* All part program instructions may be used within this SP, except for:

- The MASTER preparation function, and consequently all triggered movements and CTL controls.
- Special instructions ACT-00 and ACT-99.
- Calling of other SPs or SRs.

Moreover, for robots using PIP parameters, the following instructions are taken into account during machine dialogue in the part program only. They are ignored in the SPP.

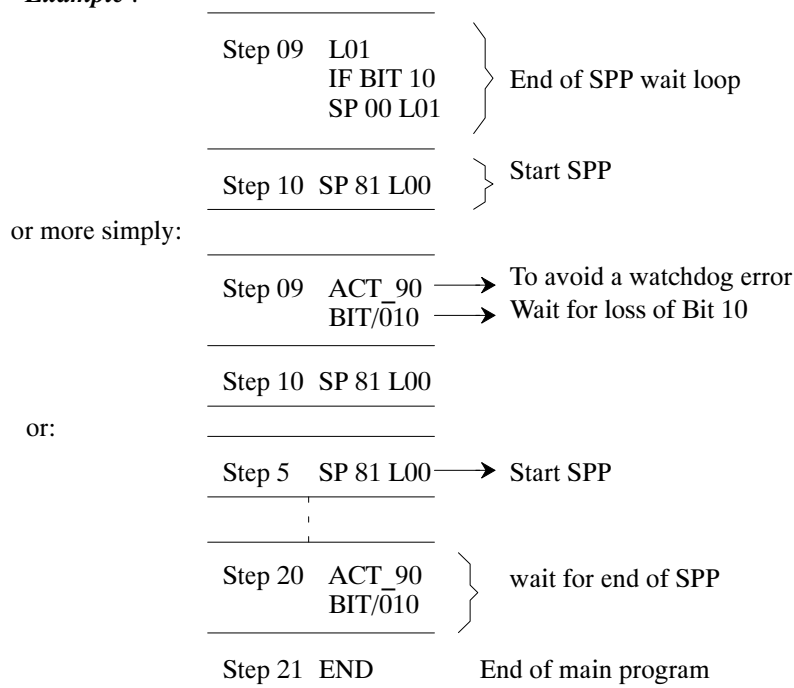
- "Machine cycle validation" given by: OUT nn or SET_OUT nn.
- "Grip part in machine" given by: ACT_11, ACT_19.

* Only one SPP can be running at any given moment. Triggering a second, or the same one before the end of the first, will give rise to error number 24.

To avoid this, it is best to "synchronize" execution of the main program with execution of the SPP.

System bit number 10 may be used. It is set to 1 when the SPP is started and is automatically reset to 0 by the system upon completion.

Example :



* As in ordinary programs, SPPs can be dependent on certain conditions:

Example :

```

Step 8  IF BIT 100
        SP 81 L00
        IF /BIT 100
        SP82 L00
    
```

IMPORTANT: SIMPLE or TOTAL home return requests or tool change position (PCO) requests CANCEL the SPP being executed and reset system bit 10 to 0.

Conair has made the largest investment in customer support in the plastics industry. Our service experts are available to help with any problem you might have installing and operating your equipment. Your Conair sales representative also can help analyze the nature of your problem, assuring that it did not result from misapplication or improper use.

WE'RE HERE TO HELP

To contact Customer Service personnel, call:



HOW TO CONTACT CUSTOMER SERVICE

From outside the United States, call: 814-437-6861

You can commission Conair service personnel to provide on-site service by contacting the Customer Service Department. Standard rates include an on-site hourly rate, with a one-day minimum plus expenses.

If you do have a problem, please complete the following checklist before calling Conair:

- Make sure you have all model, serial and parts list numbers for your particular equipment. Service personnel will need this information to assist you.
- Make sure power is supplied to the equipment.
- Make sure that all connectors and wires within and between loading control and related components have been installed correctly.
- Check the troubleshooting guide of this manual for a solution.
- Thoroughly examine the instruction manual(s) for associated equipment, especially controls. Each manual may have its own troubleshooting guide to help you.
- Check that the equipment has been operated as described in this manual.
- Check accompanying schematic drawings for information on special considerations.

BEFORE YOU CALL ...

Additional manuals and prints for your Conair equipment may be ordered through the Customer Service or Parts Departments for a nominal fee.

EQUIPMENT GUARANTEE

Conair guarantees the machinery and equipment on this order, for a period as defined in the quotation from date of shipment, against defects in material and workmanship under the normal use and service for which it was recommended (except for parts that are typically replaced after normal usage, such as filters, liner plates, etc.). Conair's guarantee is limited to replacing, at our option, the part or parts determined by us to be defective after examination. The customer assumes the cost of transportation of the part or parts to and from the factory.

PERFORMANCE WARRANTY

Conair warrants that this equipment will perform at or above the ratings stated in specific quotations covering the equipment or as detailed in engineering specifications, provided the equipment is applied, installed, operated and maintained in the recommended manner as outlined in our quotation or specifications.

Should performance not meet warranted levels, Conair at its discretion will exercise one of the following options:

- Inspect the equipment and perform alterations or adjustments to satisfy performance claims. (Charges for such inspections and corrections will be waived unless failure to meet warranty is due to misapplication, improper installation, poor maintenance practices or improper operation.)
- Replace the original equipment with other Conair equipment that will meet original performance claims at no extra cost to the customer.
- Refund the invoiced cost to the customer. Credit is subject to prior notice by the customer at which time a Return Goods Authorization Number (RGA) will be issued by Conair's Service Department. Returned equipment must be well crated and in proper operating condition, including all parts. Returns must be prepaid.

Purchaser must notify Conair in writing of any claim and provide a customer receipt and other evidence that a claim is being made.

WARRANTY LIMITATIONS

Except for the Equipment Guarantee and Performance Warranty stated above, Conair disclaims all other warranties with respect to the equipment, express or implied, arising by operation of law, course of dealing, usage of trade or otherwise, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.