

DEBUG of Application.

The flexibility of a CNC can also be measured with the rapidity and quality of application on different machines. One of the basic elements to reach this aim is the PLC software system development and mainly its simulation and program check potentialities (debug).

The debug on an application requires the display, even at the same time, both of the sign conditions of the PLC OUTPUT and the information related to it. For example:

- The condition of one (or more) PLC INPUT signals.
- The value of one (or more) variables belonging to the PLC or CNC environment.
- The evolution of the part program both concerning the synchronization commands with the software and the control and use of the variables in the CNC environment.
- The PLC program evolution.

Moreover, what follows can be extremely useful:

- Suddenly modify the variables of both environments
- Make state simulations for PLC INPUT signals
- Force the state of PLC OUTPUTS
- Check the programs evolution in step-by-step mode.

The CNC development system allows all this and as an example, here below is reported the screen of a man-machine interface, where, besides the standard pieces of information (i.e. axes measures, origin and enabled tool, running Part Program, etc.) are reported the windows displaying a dynamic view of what follows:

- Part Program records or steps
- List of the variables recalled within the PLC program
- PLC input signals
- PLC output signals
- Variables into the CNC (named "R").

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The screenshot displays the SIOMAG32 - ver.6.0.1 software interface. The main menu at the top shows 'EXECUTION', 'PROGRAMS', 'RFSIIMF', and 'TRACK'. The date and time are 25 October 2002 14:46:26. The main display area shows 'Height mm' with values for X (211.053), Y (100.080), Z, and A. A 'Track' window is open, showing a list of PLC instructions: N790, N600, N620, N625, N630, and N700. The 'Synonyms display PLC' window shows a table of synonyms: APPS, DIALOG, and NUM. Two 'PLC Variables' windows are also visible, showing input and output signals like MI_1_16, MI_1_32, MO_1_16, and MO_1_32.

Height mm

X	?	211.053
Y	?	100.080
Z	?	
A	?	

Track

```

{ N790 anziche N910 :esci senza fare posizionamenti}
{ test se abil. compensaz.}
N600 IF (GCD) N700
N620 G01 <MVM:<#5>;<INZ>> <MVM:<#6>;<INZ>> { pun
N625 <MVM:<#5>;<FNZ>> <MVM:<#6>;<FNZ>> { bacc
N630 JMP N790
N700 <IFF<POS-1>;N710;N730;N760>
{ pezzo a destra }

```

Synonyms display PLC

Synonym	Area	Format	Value
APPS...	Area B	Byte	0
DIALOG	Area B	Byte	0
NUM ...	Area C	Byte	0

PLC Variables

A Areas	M Areas	PLC inputs	PLC outputs	Axis Input	Axis
MI_1_16		0010.0000.0000.0000			
MI_1_32		0000.0000.0000.0000			
MI_1_48		0000.0000.0000.0000			
MO_1_16		0000.0000.0100.1110			
MO_1_32		0000.0000.0000.0000			

START **AUTO** **CON**

NAS
G689

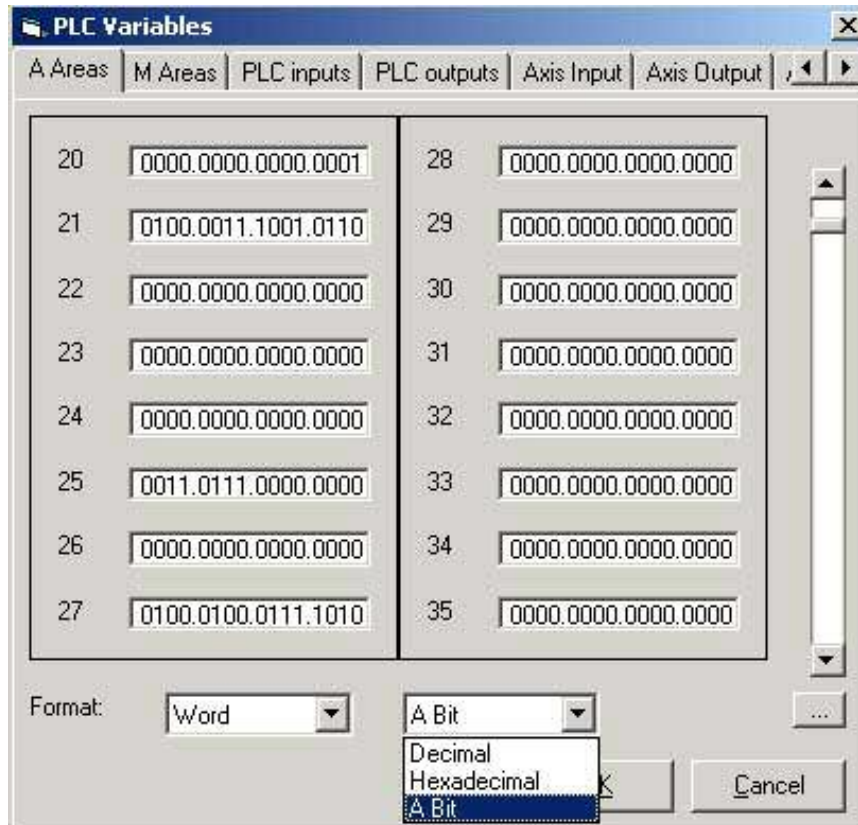
Run Line =18 Select Line =18 In RUN

Height **Stp/Cnt** **Tst/Run** **Profile** **Quot+** **Help**

F1 F2 F3 F4 F5 F6 F7 F8 F9 F10

The windows, besides allowing a dynamic display, also allow both the modification of variables and the forcing of the PLC input and output signals. This can be seen in the detailed display of each window.

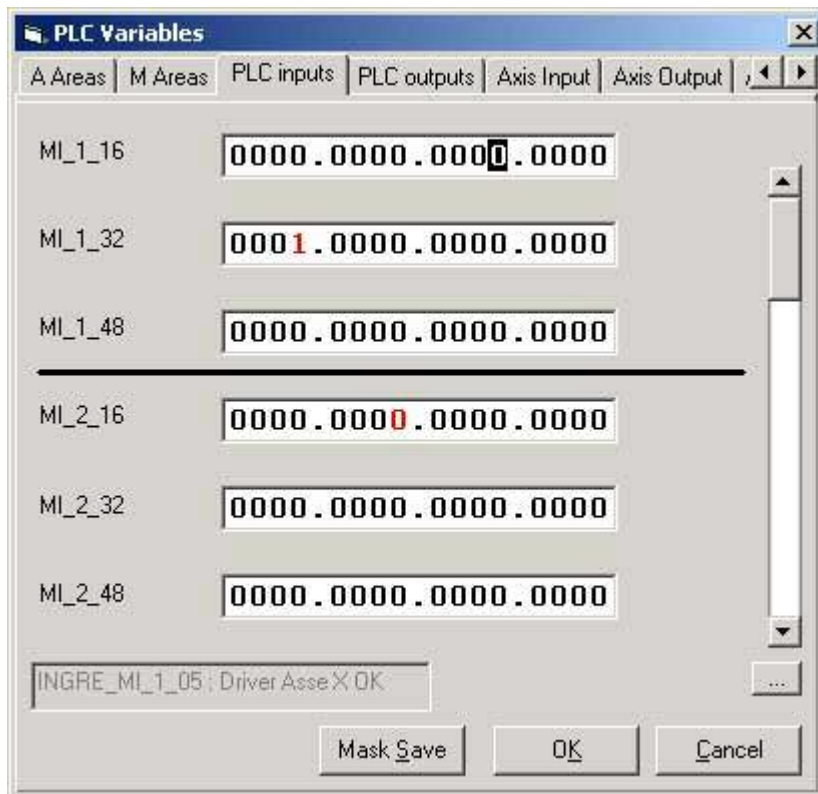
1.1 Sudden variables modification



For an easy reading and modification of the variables, it is possible to define their display format.

1.2 Forcing of PLC inputs and/or output.

The colour red indicates that the signal was forced. For input signals the forcing can also be permanent, except in case of explicit command.

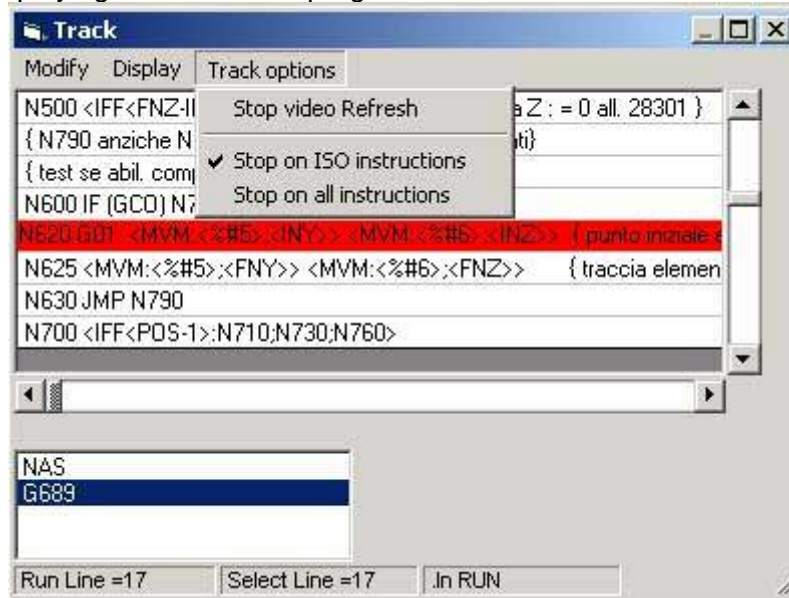


Each signal, besides being identified with the terminal or terminal board to which it is connected, it is also provided with a displayed comment, written by the application, and by which the name /wire number is identified. This comment provides for the wiring diagram, which is temporarily missing.

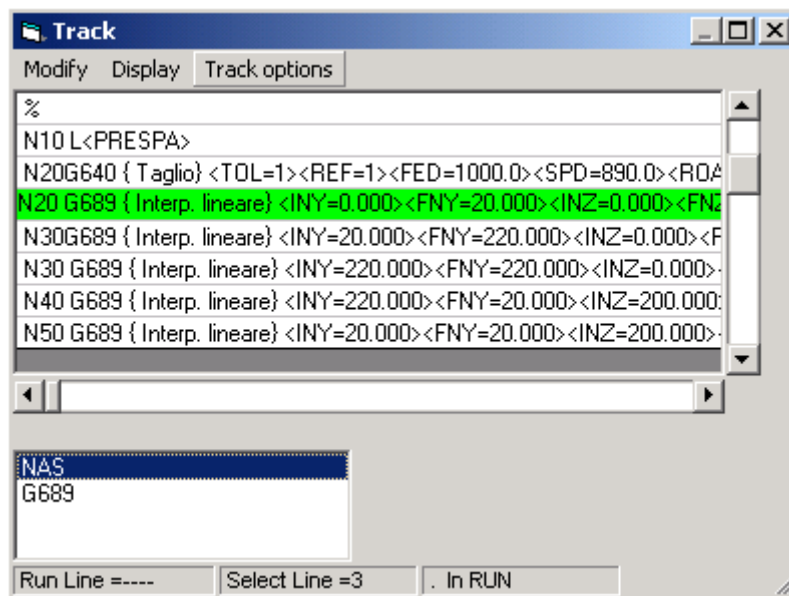
1.3 STEP BY STEP Analysis of the Part Program.

To accomplish the Part Program evolution at its best, it is possible either to run it throughout or to cancel all the axes displacements. The running can be either of continuous or step-by-step type. In the latter mode it is possible to accomplish, predict, and control the running result of each program record. A stop is allowed only on the movement instructions or on the output of auxiliary functions or any instruction.

During the running of the main program it is possible to control the calls to the sub-programs with the possibility of displaying or not the sub-programs records.



In order to check the results of the part program the measures display is available. Such a display is updated no matter if the movement was executed or not. Another control device is the window for the variables and the PLC input and output signals .



1.4 PLC Program Analysis

In order to control the PLC program it is possible to display the source file related to the dynamic view either of the state or the value of the variables belonging to the selected record in the text.

“Window 1”
Source file selected

“Window 2”
PLC synonyms

“Window 3”
State of the synonyms that are on the selected line in window 1.

The screenshot shows the 'PLC state display' window with the following content:

```

case 44:
FATM = 0;
if( I_GAM4 && !I_GAM2 && !I_GAM1 )
{
FATM = 1;
}
if( 1 ) /* DEBUG: Come sopra */
{
FATM = 1;
I_GAM4 = 1;
I_GAM2 = 0;
I_GAM1 = 0;
}
break;
}

/*-----GESTIONE CAMBIO UTENSILE MANUALE-----*/
if( PSET && D_EXE )
{
switch( D_GN )
{
case 0:
/* richiesto cambio utensile : [CUM] */
messagg( AT_HOME);
break;

case 6:
/* richiesto cambio utensile : [CUM] */
messagg( MS_M06STA );
/* prova messaggio con stringa componibile vedi capitolo 1

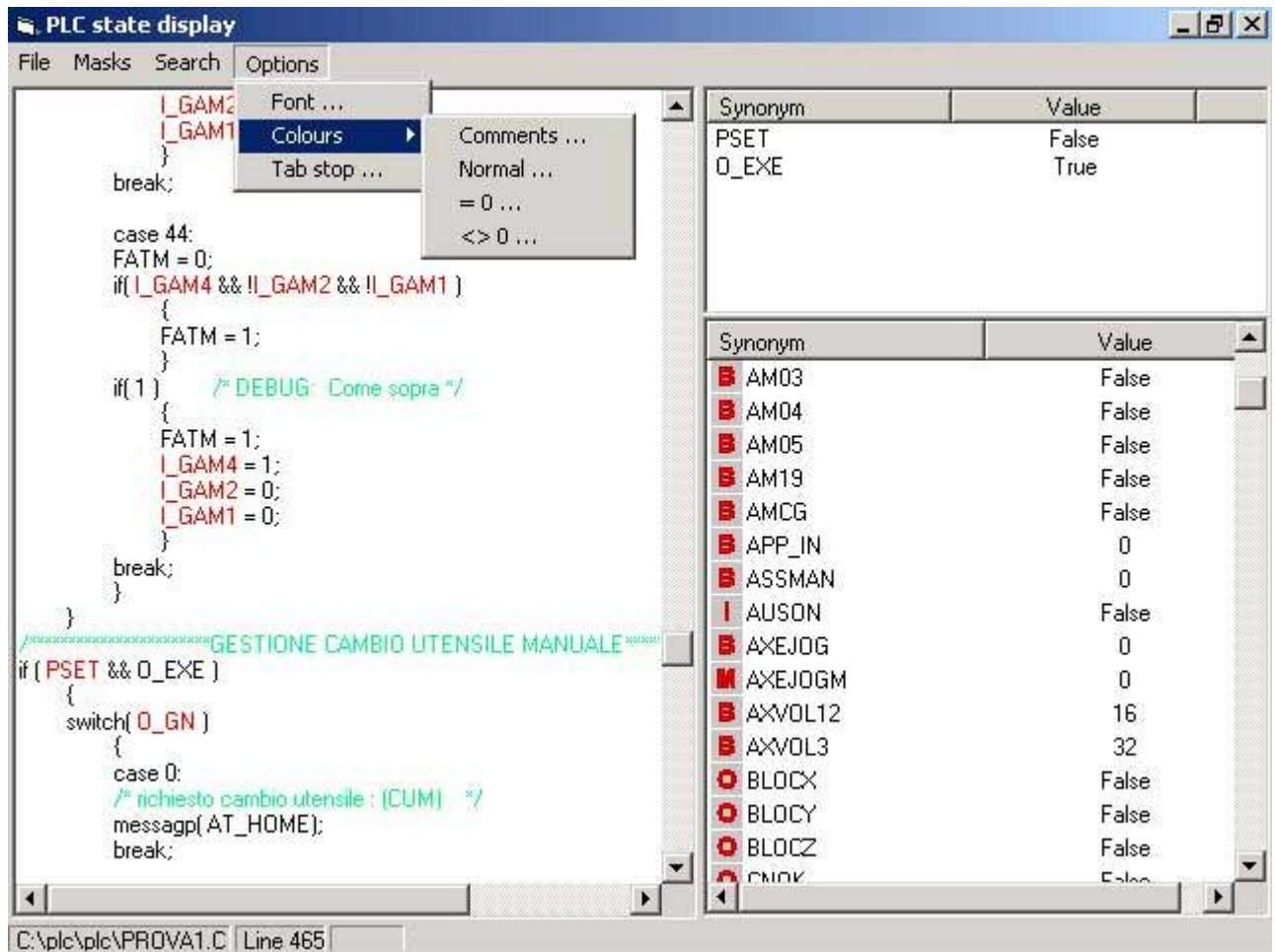
```

The right side of the window displays two tables of PLC synonyms and their values:

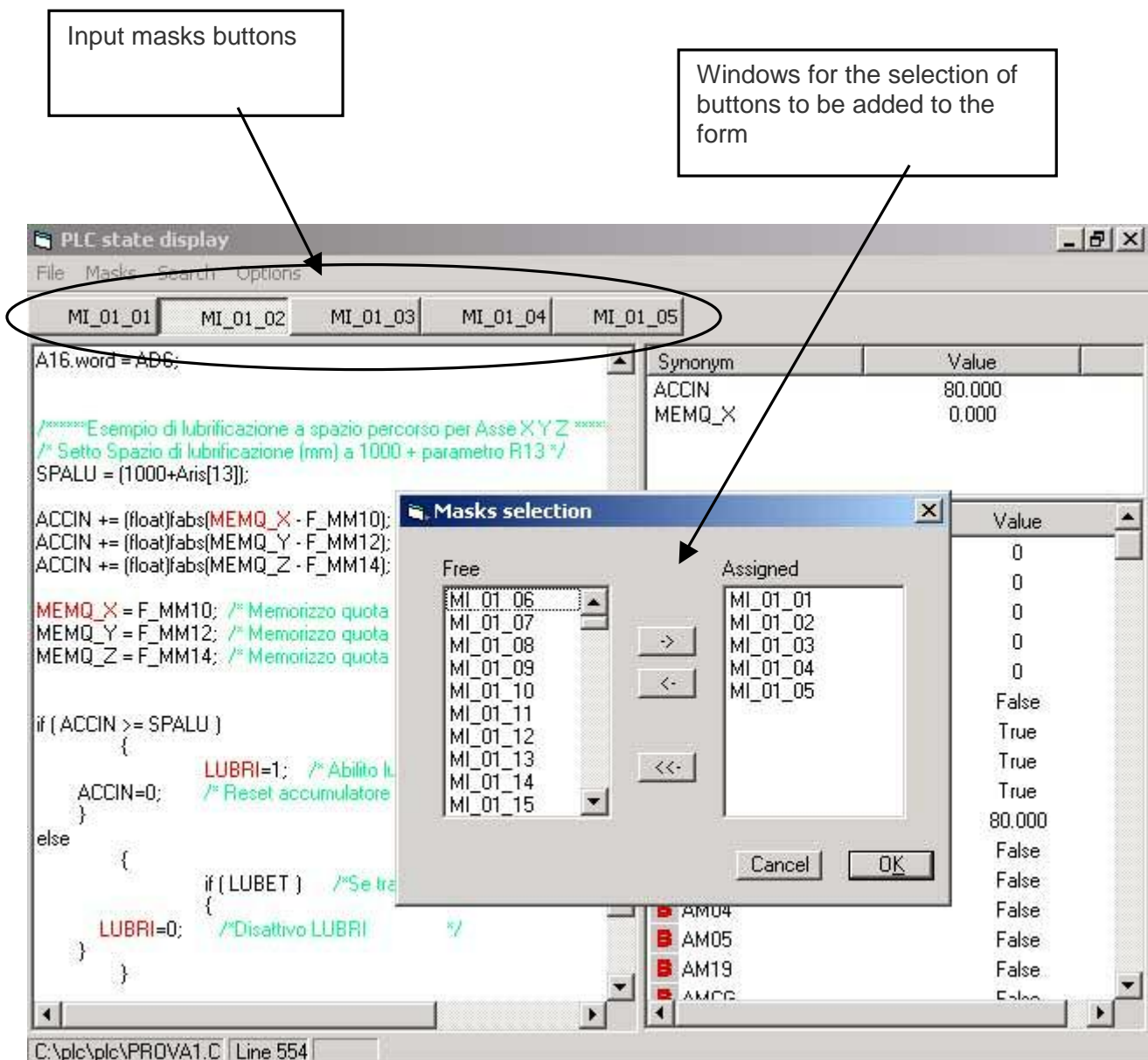
Synonym	Value
I_GAM4	False
I_GAM2	False
I_GAM1	False

Synonym	Value
B_APPSTAT	0
B_DIALOG	0
C_NUM_AX	0
C_TST_AX	0
B_ABIASS	0
O_ABILIC	False
O_ABILX	True
O_ABILY	True
O_ABILZ	True
A_ACCIN	80.255
C_ACKCONS	False
B_AM03	False
B_AM04	False
B_AM05	False
B_AM19	False
B_AMCC	False

The status bar at the bottom indicates the file path: C:\plc\plc\PROVA1.C and the current line number: Line 450.



For an easy program analysis, different parts of the test can be highlighted with different colours such as comments, instructions, synonyms, with a previously defined value.



In order to simulate the program functioning, events can be simulated thanks to the availability of software buttons (keys) made according to the user's need.