CONTENTS

Characteristics and dimensions subject to change without notice.
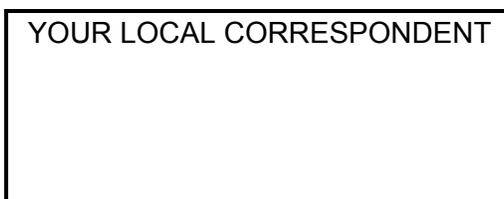
YOUR LOCAL CORRESPONDENT

1. GENERAL

1.1 Software Function

This advanced software runs under Windows and is updated as new options or new motors are developed. It is used for :

- defining motor-drive combinations from an integrated data base;

- reading or changing load loop parameter;

- Uploading and downloading (Save as, Global transfer);

- providing tools for on-line system analysis:
  - ♦ internal variable excitation (stimuli);
  - ♦ observation of variables (oscilloscope function);

- facilitating servo control optimization;

- troubleshooting: potential causes, reporting over time;

- controlling software options or system extensions;

- providing help at start-up.

As a rule, user choices may be either confirmed by clicking on «OK» or cancelled.

1.2 Booting the Software

To launch the installation parameters editor, click on this button of the PARVEX Motion Explorer software.
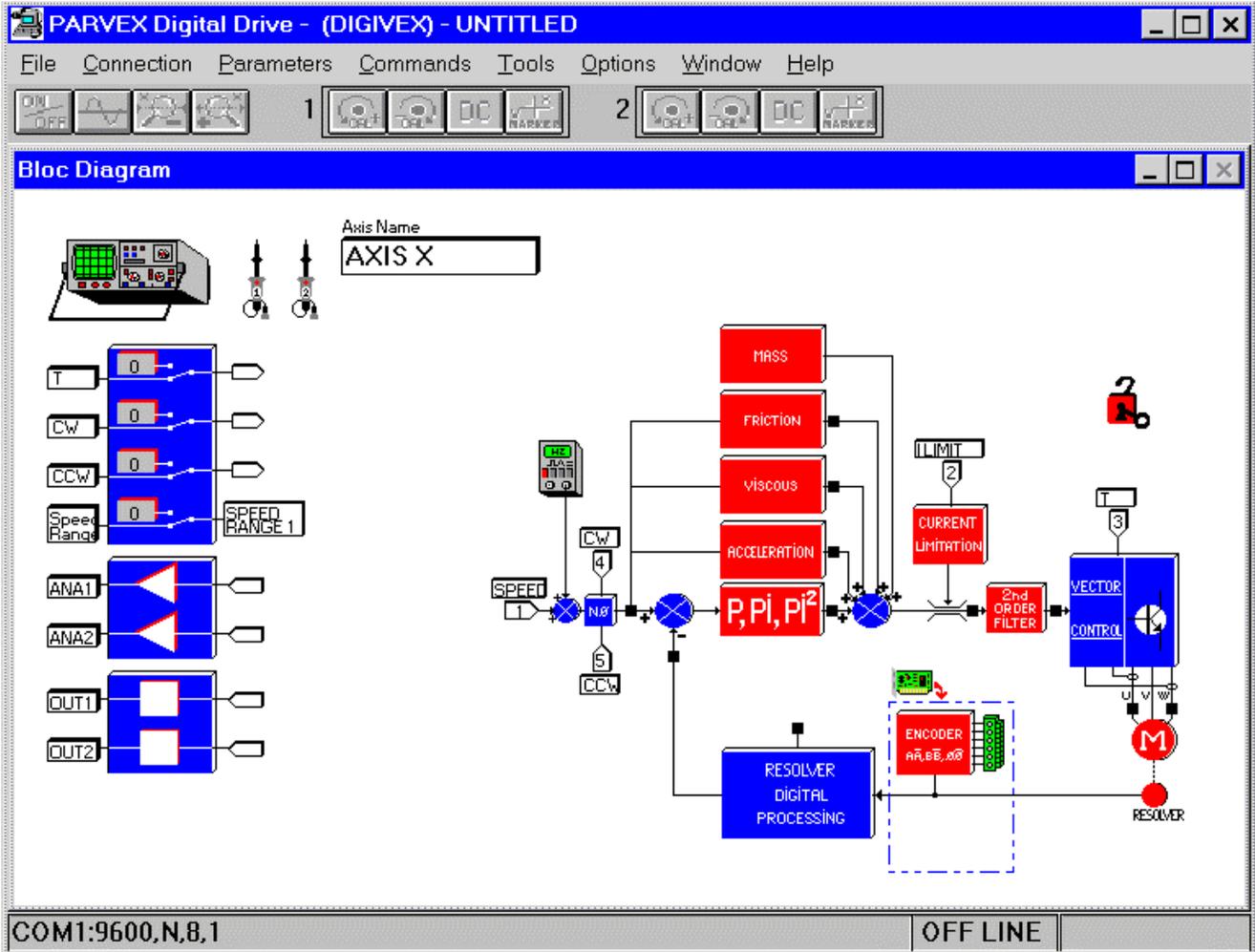
A parameter window may be accessed in two ways:

- either via the menus (FILE, PARAMETERS, etc.);
- or in interactive mode by double clicking on the block to be programmed. Unprogrammed blocks are red: Programmed blocks are blue.

1.3 Software Tree Structure and Description

Tree Structure	Description
	For opening a parameter file saved previously (with its name and extension .PAR).
File Connection Paramete ● Open Ctrl+O Save Ctrl+E Save As... Ctrl+S Print... Ctrl+I Comments Password... File download... Quit	SAVE AS is used for safeguarding, specifying a drive, a directory and a file name (for copying). The file name extension is assigned by default (.PAR) but may be modified by the user. It is advisable to safeguard file during programming.
	For printing the current set of software parameters.
	For entering a short script to be recorded in the parameter file.
	For restricting access to certain level 1 parameters.
	This file is used for transferring a complete parameter file from the PC to the DIGIVEX. **CAUTION:** The global transfer forces the drive to zero torque automatically.
	For leaving the current work session. If changes have been made during the session, the user is asked if he wants to save the parameter changes in a file before quitting (as for SAVE).
Connection	For communicating with the DIGIVEX Drive to which the serial link is connected.
Parameters Commands Tools Options Window Help Motors/Drives ▶ Programmed Motor Resolver ▶ Motors/Drives Base Ctrl+M Speed Torque Loop Ctrl+A Options Ctrl+C	
Motors/drives	Programmed motor: ON LINE, motor characteristics programmed in drive. Motor / drive data base: access to Parvex motor data base.
Sensor	Parameter display: Adjustment: resolver timing aid (on-line).
Speed - torque loop	Provides access to main servo control parameters and predictors.
Options	Sets parameters of available hardware options (encoder emulation, SSI encoder)

Tree Structure	Description
Commands Tools Options Window Help 　Status　　　　　　　　　　▶ Inputs/Outputs Ctrl+F1 　Faults　　　　　　　Ctrl+F3　 Parameters　　Ctrl+F2 　Input assignment　　Ctrl+F4　 Others 　Analog Outputs assignment Ctrl+F5 　Digital Outputs assignment Ctrl+F6	
Status	INPUTS/OUTPUTS: can be used on-line to find out the logic status of the on/off inputs/outputs and the numerical values of the analog inputs/outputs. PARAMETERS: displays numerical values of some of 7 variables available. OTHERS: Serial number and total operating time.
Faults	Last incident detected and corresponding total operating time. Diagnostic help. Record of last 30 incidents.
Input forcing logic	Choice of soft or hard forcing of logic input status.
Input assignment	Assigns each of the two analog outputs to one internal variable from those available.
Output assignment	Assigns the two logic outputs to predefined functions.
Tools Options Window 　Generator 　Oscilloscope... 　Setting procedures... 　Gain computation aid	For defining a general waveform (square, sine, continuous) internally in the DIGIVEX.
	Graphic display tool of predefined variable status.
	Aid for DIGIVEX Drive setting.
	Automatic computation of gain, integration stop frequency and 2nd order filter frequency.
Options Window 　Directories...	Used for changing access paths to parameter files and motor data bases. These paths are defined by default when the software is installed.
Window Help 　Tile 　Cascade ✔ 1　　　Bloc Diagram	Positions the open windows by dividing up the screen. Positions the open windows one on top of the other.
Help 　About...	PARVEX copyright notice.
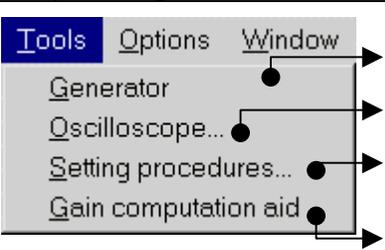
1.4 Sub-D connector X3: RS232

Maximum conductor cross-section: 0.5 mm²
  Serial link configuration:

- ♦ 9600 bauds
- ♦ 8 data bits
- ♦ 1 start bit, 1 stop bit
- ♦ no parity
- ♦ no electrical isolation
- ♦ use an extension cable of 5 m maximum

DIGIVEX INTERNAL LINKS	DIGIVEX 9-PIN SUB-D CONNECTOR	PC	PC 9-PIN SUB-D CONNECTOR
	1	DCD	1
	2 — TD (TXD)	RD (RXD)	2
	3 — RD (RXD)	TD (TXD)	3
	4	DTR	4
	5 — 0V	0V	5
	6	DSR	6
	7	RTS	7
	8	CTS	8
	9 5V / 50mA	For programming console	9 [*]

[*] May be connected without danger to DIGIVEX pin 9.

This input is for linking with a computer (PC) for parameter loading and setting via the DIGIVEX PC software. It is also used with the hand help terminal to change those parameters.

2. USING THE SOFTWARE

2.1 Access Levels

When connected "on-line" there are two levels of access are defined.

Level 1 enables users to:

- read parameters;
- read error diagnostics;
- read internal variables and input/output statuses;
- modify the following parameters within set limits:
  - ♦ gain in a ratio of 0.7 to 1.4 of the set value;
  - ♦ speed for 10 V (±10%);
  - ♦ offset (full scale);
  - ♦ integral stop frequency in a ratio of 0.7 to 1.4;
  - ♦ cut-out frequency in a ratio of 0.7 to 1.4;
  - ♦ use of oscilloscope function;
- effect global transfers if the file is compatible with the password.

Level 2 can be accessed with a password and in addition to level 1 functions allows users to:

- read and modify all parameters over the full range;
- use the setting assistant;
- alter input/output assignments;
- gain access to stimuli;
- make global transfers without restrictions.

The password allows manufacturers to protect their machines against level two changes. It is not compulsory.

2.2 Password

2.2.1 Entering the password for the first time

When shipped, the password is 0000 0000 (equivalent to no password).

- Clicking on the "red padlock" or calling up FILE + PASSWORD opens the following window:

Key in the password an **8 figure number** and click on OK to validate.
The system asks for the number to be entered a second time for confirmation. Click on OK to validate.

OFF-LINE: this procedure is designed to create locked files.
ON-LINE: the servoamplifier is really locked.

The "level 1" locked state is indicated by the closed "padlock" icon.

2.2.2 Switching from level 1 to level 2

Initial status : padlock closed.
Same procedure as for first time entry, entering the password created earlier.
Level 2 is indicated by the open padlock.

2.2.3 Changing or destroying a password

- Shift from level 1 to level 2 (on-line or off-line), which means you must know the password.
- Click on "modify".
- Key in the new password or 0000 0000 to destroy the existing password. Then validate.
- Enter the new password again and validate it.

2.2.4 Lost password

Contact PARVEX Customer Support stating the serial number of the servoamplifier in question.

2.3 Printing

Access on-line or off-line:

Prints in readable form a parameter file opened beforehand.

SAMPLE PRINT-OUT

DIGIVEX

PARVEX

Motor/Drive Combination
HD630ET-DIGIVEX 8/16

Axis Name

Locking password
No

Comments

Speed/Torque Loop Parameters

Maximum Speed	= 3200.	rpm	Gain	= 94.3	mA/rpm
Speed for 1V (Range 1)	= 320.	rpm	Int. Frequency	= 10.	Hz.
Speed for 1V (Range 2)	= 0.3	rpm	Filter	= 500.	Hz.
Offset	= 0.	rpm	I Restriction	= 16.	A

Corrector	Current protection	External current limitation validated
PI	Stop	No

Prediction

Gravity	OFF	Value	= 0.	A	Dynamic	OFF	Value	= 0.	A
Static	OFF	Value	= 0.	A	Acceleration	OFF	Value	= 1.e-002	ms.
Threshold		Value	= 9.602	rpm					

Logical Inputs Status

T	=	On connector
CW	=	On connector
CCW	=	On connector
Speed Range	=	On connector

Digital Outputs

OUT1	= Speed 1 combinational	Value	= 1065.	rpm
OUT2	= Speed 2 combinational	Value	= 2130.	rpm

Analog Outputs

ANA1	= Speed Reading	Scale:	= 3200.	rpm/10V
ANA2	= Current Set-Point	Scale:	= 16.	A/10V

Motor data

Max. Speed	= 3200.	rpm	Nom. current	= 7.21	A
R Ph-Ph	= 3.71	Ohm	Peak Current	= 16.	A
L Ph-Ph	= 28.9	mH	Motor Polarity	= 5.	pp
Ke Ph-Ph	= 162.	V	Resolver Polarity	= 1.	pp
Motor type	= Without flux	Brake	= Without	Therm. = With

Options

Encoder Emulation	Resolution	= 1000.	Pulse/rp

28/08/1998 16:46:19   DIGIVEX 1.12 - HD630ET.PAR

2.4 Connecting. Disconnecting. Parameter File Transfer – "Extended parameter set" option

2.4.1 Connecting. Disconnecting

2.4.1.1 Function

This asks for the PC to be connected to the digital drive. The user is advised to check the physical connection and the connection set-up.*.*

On-line or off-line status is indicated at the bottom of the main window. Any changes made to parameters while on-line are sent to the drive.

When off-line, users work on a parameter file.

Once connected, select the same menu to disconnect (DISCONNECT).

2.4.1.2 Connection procedure

CONNECT is called up in the menus. Confirm by OK that the drive is connected and that the "auxiliary" supply is switched on.

The connection request transfers all the parameters in the drive to the PC.
Transfer time: 5s to 20s depending on the PC. Communication may be interrupted during transfer time.

The block diagram is then displayed where all the blocks are programmed (therefore blue).

A reminder of ON LINE or OFF LINE status is shown at the bottom right of the screen.

Physically disconnecting the serial link or repeated transmission or reception failure causes the system to disconnect and display OFF LINE.

2.4.1.3 <u>Possible problems</u>

- Auxiliary power supply off.
- Hardware problem with PC or DIGIVEX.
- Selection of wrong serial port (the "ON LINE" indication does not appear) and fault diagnosis. Return to PME control panel to change the serial port selection.
- Cable not connected.

2.4.1.4 <u>Disconnecting</u>

Select DISCONNECT and confirm by OK. OFF-LINE then appears immediately.

DISCONNECT is proposed as a choice instead of CONNECT when the system is ON LINE.

2.4.2 <u>Global transfer of parameter file</u>

Access on-line:

Once a parameter file has been created or modified OFF-LINE it can be downloaded in full to the drive. The procedure is as follows:

- Connect up (CONNECT).
- Select FILE + GLOBAL TRANSFER.
- Select the file to be transferred.

The transfer is then made automatically, all the programmed blocks being shown in blue. For this transfer, the DIGIVEX Drive is automatically forced to zero torque (T= 0) by the software, and is maintained at zero torque. To enable torque, use the INPUT ASSIGNMENT window (see § 2.8).

<u>CAUTION</u>: a global transfer can only be made at level 2 if the password recorded in the file corresponds to that stored in the DIGIVEX which is connected. This means even a locked file can be safeguarded.

There are no restrictions in level 1 or if no password has been entered.

2.4.3 "Extended parameter set" option

2.4.3.1 Description.

This option allows two sets of parameters / motors to be present on one DIGIVEX axis.
The set of parameters is selected at power-up via a logic input reading.

This option entails the installation of a special customization card containing additional EEPROM memory: SZ6608B, U1 to U4 fitted EEPROM memory.
It is automatically detected at power-up (providing the SZ6608B copper J1 band has been soldered), and operates with standard software (AP506V12 and above).

The correct set of parameters can only be loaded when the motion controller auxiliary power source powers-up. The input currently called "speed range" (X2.9, X2.21 input) is used to select the set of parameters. This input is scanned at power-up and gives the set of parameters to be loaded. This input, therefore, loses its primary speed range selection function.

2.4.3.2 Implementation, changing a set of parameters.

The start-up sequence is as follows:
- Set the "speed range" input to the correct position.
- Turn the auxiliary power source on. The processor starts up, recognizes the presence of the "Extended parameter set" option, reads the "speed range" input and loads the correct set of parameters. The "speed range" input is not scanned again after this phase, (it loses its primary speed range selection function).
- Turn the main power supply on.

2.4.3.3 Setting parameters.

The parameters are set using standard PME software. The accessible set of parameters is that selected by the "speed range" input during the auxiliary power source start-up.
To access the second set of parameters, turn both the auxiliary and the mains power off, wait for the auxiliary voltage to cut-out completely (it takes about 10 to 15 seconds for all led lights to go out on the axes power supply section), and follow the sequence as described in 2.4.3.2.

There will be a file for each set of parameters, if a configuration file has to be created on the PC, and PME will consider the two configurations as two different motor/motion controller units. Disconnect the PME when the motion controller cuts out during motor switching, then, reconnect the PME in order to reload the new set of parameters after the switching.

2.4.3.4 Customization card.

The plug-in SZ6608B card contains the set of parameters in EEPROM: additional memory space is required to allow the installation of the two sets of parameters: the U1 to U4 EEPROM must be fitted and the copper J1 band soldered.

This card, therefore, has additional memory and is given a new reference ("Extended parameter set" option to be stated in the instruction).

2.5 Motor/Drive/Resolver Selection

2.5.1 Motor/Drive

Access on-line or off-line :

2.5.1.1 Choosing of standard motor/drive combination

Call up:
- either by clicking on Ⓜ (bottom right of block diagram).
- or by PARAMETERS + MOTORS/DRIVES + STANDARD.

This opens the standard motor/drive window and allows access to the corresponding data base.

List of motor families

List of motors

of drive combined with motor

Characteristics of selected motor
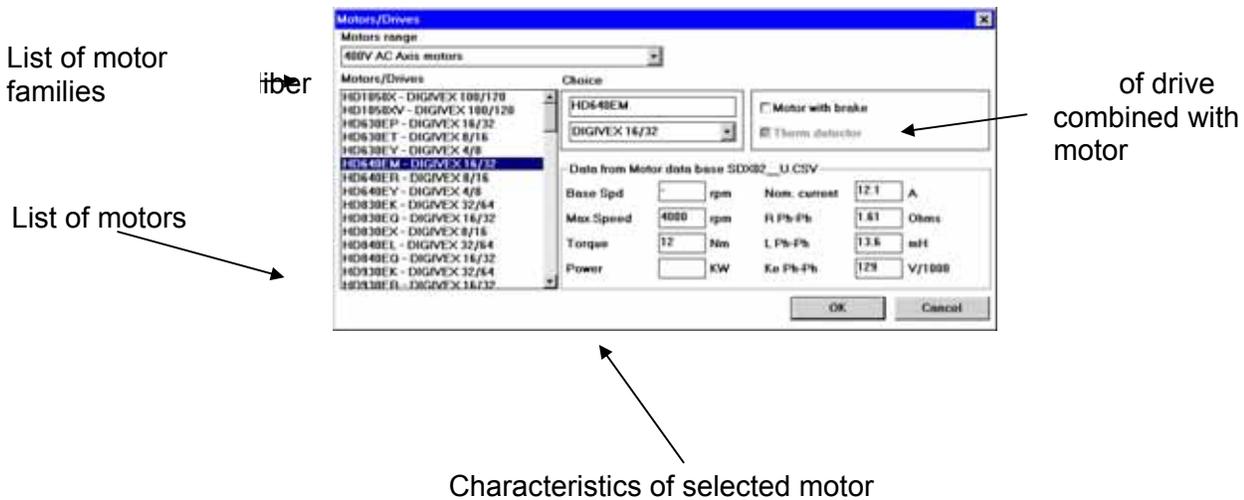
1) Select the motor family.
2) Select a motor from the proposed list (scroll through the list with the up ↑ or down ↓.

The drive rating is combined automatically with the motor.

The rated drive combined with the motor can be changed within the following limits.

- For XD motors: the drive rating is fixed and cannot be changed
- For LV, LW, HV and HW spindle motors
    - ♦ Only the next higher rating is authorized
- For all other motors:
    - ♦ Higher or lower ratings may be used within the following limits:
        - ➢ Lower ratings: 1/5 of rated current
        - ➢ Higher ratings: 5 times rated current

Example:

Drive fixed at 50/80

$\frac{1}{5} x50 = 10A$ Minimum rating 16/32

$5x50 = 250A$ Maximum rating 200/200

2.5.1.2 <u>Motor with brake</u>

If the motor is declared as being "with brake", the drive controls current through the motor. The electrical connection must transit through the drive in this case.
If the brake is controlled independently of the drive, the motor must be declared as being "without brake".
If the 24V "brake" supply fails, drive current limitation is reduced to 90% of rated motor current.

2.5.1.3 <u>Programmed motor and servoamplifier rating display</u>

Access ON-LINE:
- either by double clicking on the motor icon.
- or via PARAMETERS + MOTOR/DRIVE + PROGRAMMED MOTOR, which opens the window below :

2.5.1.4 Changing motor type on line

The drive rating cannot be changed, however the motor type can.

Pressing OK transfers the new motor parameters only if the drive has been set to zero torque beforehand and if the rating corresponds.

2.5.2 Resolver setting

There are two headings under the "Resolver" menu:
  • Parameter display
  • Adjustment, which is accessible on-line only and allows the resolver to be adjusted mechanically.

2.5.2.1 Parameter display

Only resolver timing can be adjusted OFF LINE.
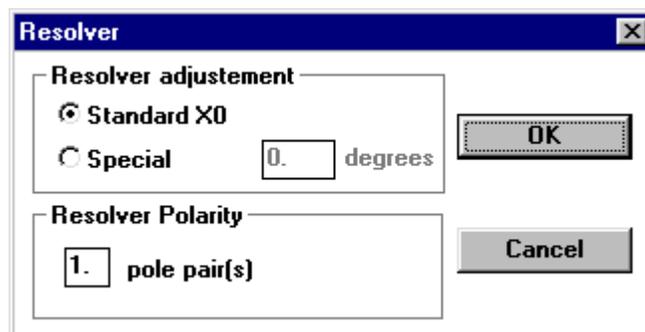
Access :
  • either in interactive mode by clicking on "Resolver" (at the bottom right of the display).
  • or via PARAMETERS + SENSOR and PARAMETER DISPLAY.

Click on "standard" to select X0 timing. Select "special" to enter the angle (in degrees) obtained with the timing function described in 2.5.2.2.

Consult the manufacturer before making any changes to this window.

It is impossible to alter resolver parameters while on-line. Adopt the following procedure:

- Go on-line
- Record a file in the PC
- Go off-line
- Load the resolver parameters
- Re-record the same file
- Go on-line and transfer the file containing the new parameters

2.5.2.2 Adjustment

Access on-line :

ATTENTION: The timing of resolvers fitted to motors is set at the factory. Consequently the procedure described above is to be followed exceptionally for HW and LW motors.

Calling up PARAMETERS + SENSOR + ADJUSTMENT opens the window below:
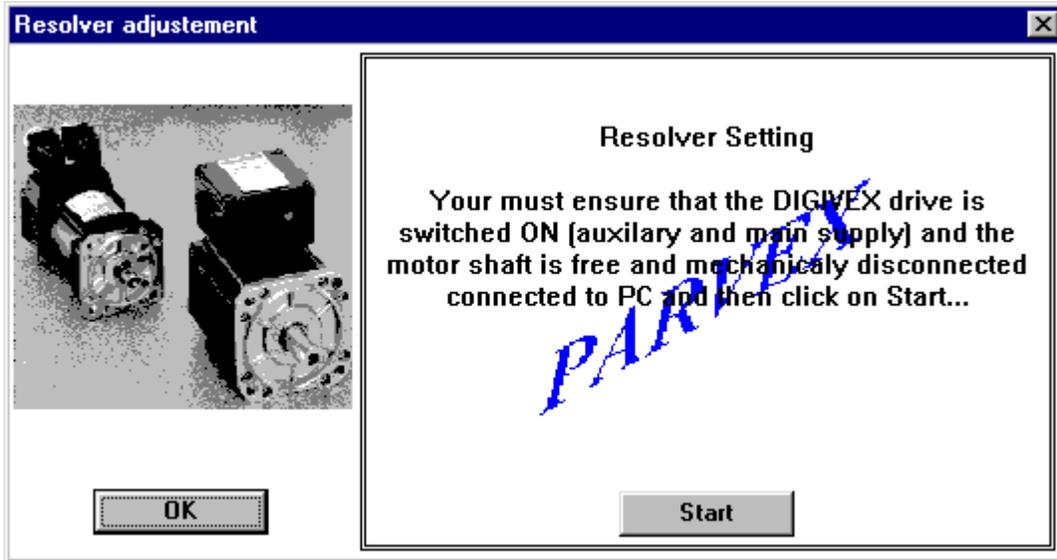
Click on "Start" to display the window below:
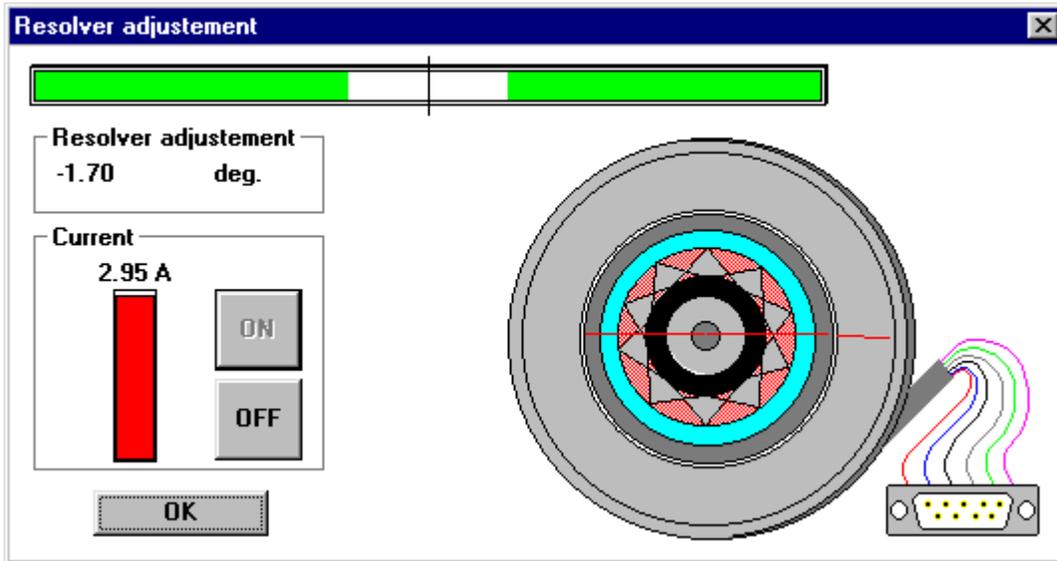
The ON and OFF buttons are used to switch the current on and off.
Click on "ON".

The operator turns the resolver stator manually to make the blank zone between the two green bars as small as possible. The position shown is then close to 0 degrees. The resolver stator must then be locked and the configuration set by clicking on OK.

2.6 Servocontrol Parameters

Access on line or off-line:

Access:

- either in interactive mode by double clicking on blocks P, PI, PI^2 or the predictor blocks (ACCELERATION, VISCOUS, DRY, GRAVITY) or the second order FILTER block or CURRENT LIMITATION BLOCK;
- or via PARAMETERS + SPEED/TORQUE SERVO CONTROL.

The following window appears:
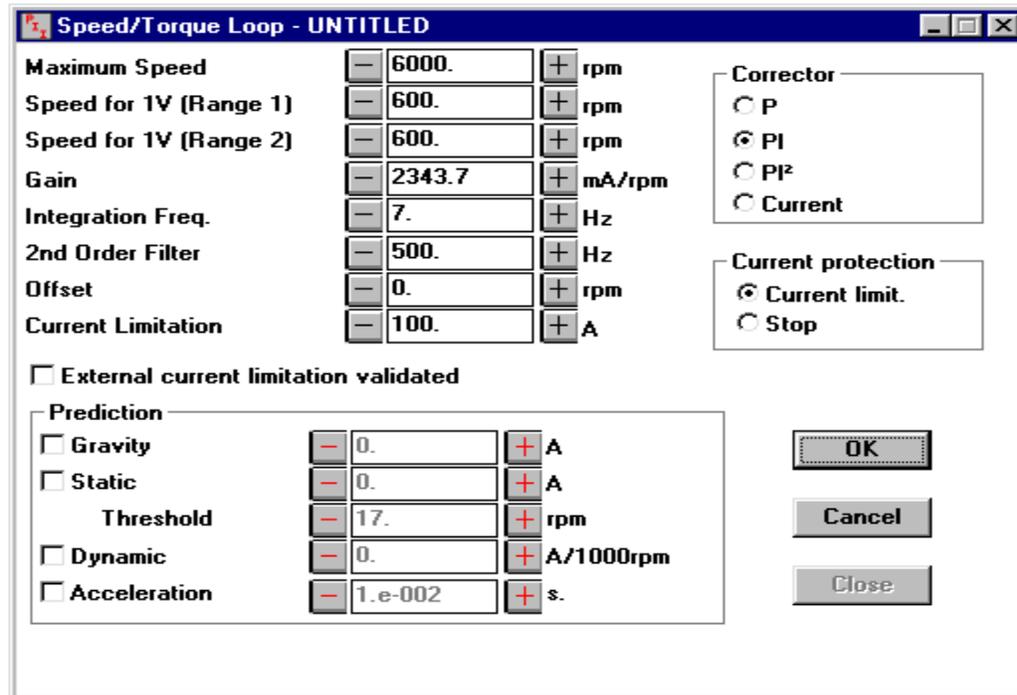
Parameters can be selected depending on the application. Validating by OK turns all the blocks listed above blue.

Notice that if the system is OFF LINE you can enter the parameter values directly via the keyboard.

If the system is ON LINE, you must use the + and - buttons and the parameters are changed directly in the drive's working memory.

Click on "Cancel" to restore the former values.

Click on « OK » to store the parameters in the drive EEPROM store permanently.

I = f(t) strategy

For controlling mean current and rms current users can choose their strategy:
- I reduc (current reduction).
- Stop (OK relay and fault diagnostic tripped).

External current limitation validated

Allows current limitation analog input to be taken into account.

For a detailed description of the role of each servo-control parameter see the general instructions on the Digivex (DMD PVD3464GB DPD PVD3484GB OR DSD PVD3500GB).

2.7 Options

Access on-line or off-line:
- either by double clicking on « ENCODER EMULATION ».
- or via « PARAMETERS + OPTIONS ».

2.7.1 ON-LINE:

The options installed in the DIGIVEX Drive are detected during connection.
Users then have direct access to the option setting parameters.

2.7.2 OFF-LINE:

The options managed by PC software are listed on the left of the selection window shown below:
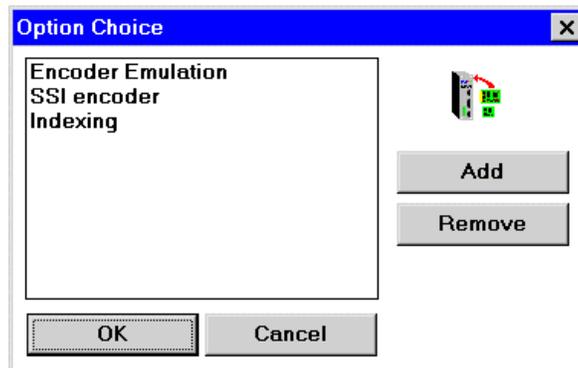
To select an option:
- Select the option
- Click on add
- Then click on OK

2.7.3 <u>Encoder emulation</u>

Access on-line or off-line :

This is valid only if the "ENCODER EMULATION" option is integrated in the DIGIVEX Drive module.
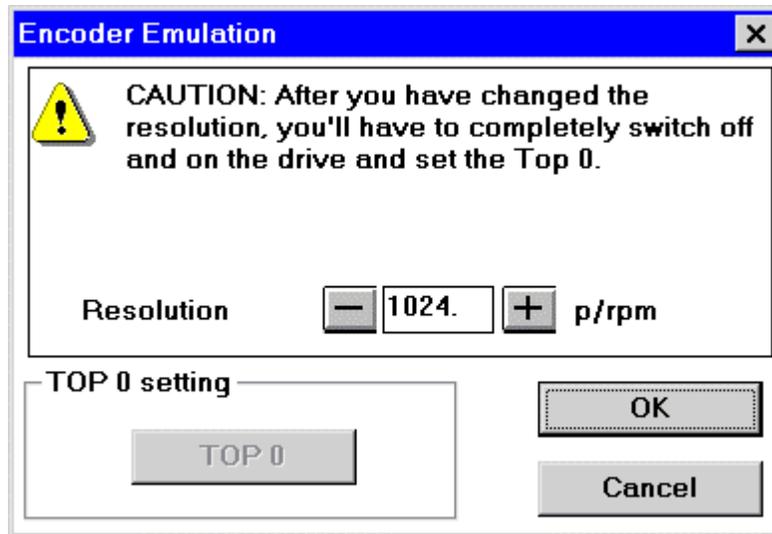
Resolution: adjustable from 1 to 16384
- either by entering the number,
- or by +/-

Zero mark is adjustable in teach mode (ON LINE only). Clicking on "Acknowledge zero mark" calls up a "Zero mark acknowledgement" window showing:
- Position your drive line,
- Validate position on 1 resolver revolution by clicking OK.

<u>CAUTION</u>: Whenever the encoder resolution is modified ON LINE the low level must be removed and then restored to the axis.

2.7.4 <u>Other Options</u>

See the specific documentation for the option in question.

2.8 Input/Output Assignment / Speed Range

2.8.1 Forcing logic inputs / speed range

2.8.1.1 Forcing logic inputs

<u>Caution</u> : When you set torque or speed to 1, make sure the system is able to run and the **safety precautions adhered to**.

Access on-line or off-line:

This part of the software is used for forcing these inputs by software to HIGH or LOW logic states (0 or 1) regardless of their physical status.

- either by double clicking on the "logic inputs" block (on left side of block diagram);
- or by COMMANDS + INPUT ASSIGNMENT.

The following window then opens :
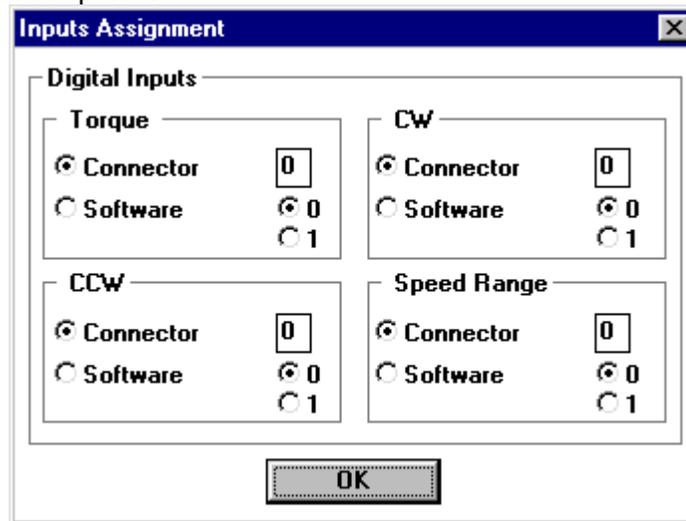
"Connector": the physical input is acknowledged if this is selected.
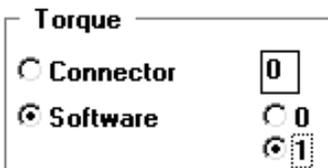
"Software": the 0 or 1 status (status 1 here) is acknowledged if this is selected.
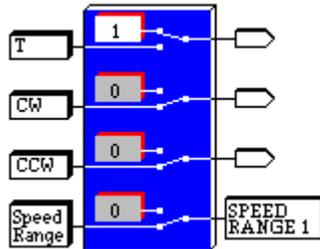
The choice "software" or "hardware" appears with the high and low position of the switch.
The value 1 or 0 of the input status in "software" mode appears in the rectangle (here T = 1, software selection).

Logic state 0 corresponds to :

- zero torque setting (T=0).
- zero speed setting (clockwise or counter clockwise)

This option allows you to set zero torque or zero speed regardless of the physical values.

2.8.1.2 Choosing the speed range (Range 1, Range 2)

The choice of active speed range is determined by the status of logic input no. **4 (Speed Range)**.

Status 0 $\rightarrow$ speed range 1
Status 1 $\rightarrow$ speed range 2

The gradients associated with these two ranges are adjusted in the *Servo-Control* window.

2.8.2 Analog output assignment

Access ON-LINE or OFF-LINE.
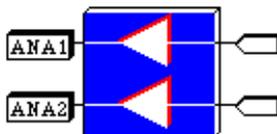
- either by clicking on the "analog output" block at the bottom right of the block diagram,
- or via COMMANDS + OUTPUT ASSIGNMENT.

The following window opens :
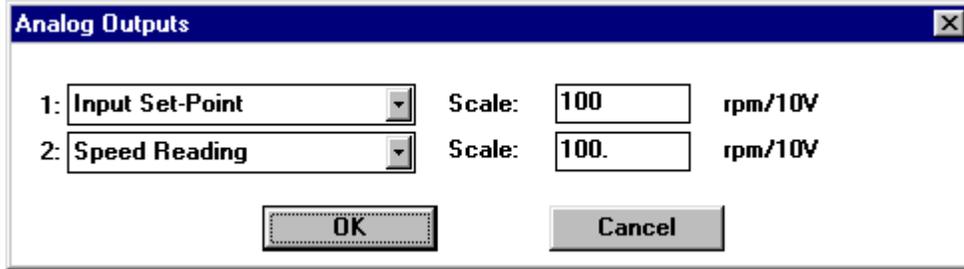
For each of the two analog outputs, users can choose:
- 1 variable from the list of available variables,
- the scale desired for 10 V, the unit is then displayed depending on the variable selected.

The name of the variable appears on the corresponding channel of the block diagram.

The variables are:
- input reference in rpm or Amps;
- speed measurement in rpm;
- current set point in amps (gives an approximate image of torque for drive status;
- rotor position in degrees;
- P, PI or PI^2 block output in Amps;
- « Static » (dry friction) output in Amps;
- « Acceleration »output in Amps;
- « Dynamic » (viscous friction) output in Amps;
- sum in amps (point ahead of 2nd order filter);
- auxiliary input in Volts (second analog input point, assigned to current reduction);
- bus voltage in volts;
- temperature in degrees centigrade;
- LF generator in rpm or Amps (stimuli excitation);
- current Iu in amps;
- current Iw in amps;
- set point I_d in Amps;
- set point I_q in Amps;
- measurement Id in amps;
- measurement Iq in amps;

- voltage Ud in Volts.
- voltage Uq in Volts.

Some versions of the on-board DIGIVEX Drive software can display additional variables*:*

- filtered position
- filtered speed
- bus current
- filtered bus current
- power (W)
- motor thermal load (%)
- drive thermal load (%)

2.8.3 **Assigning logic outputs**

Access on-line or off-line :

The window for assigning the two logic output available in the DIGIVEX opens:

- either by clicking on the "Logic Outputs" block at the bottom left of the diagram,
- or by **COMMANDS + LOGIC OUTPUT ASSIGNMENT**
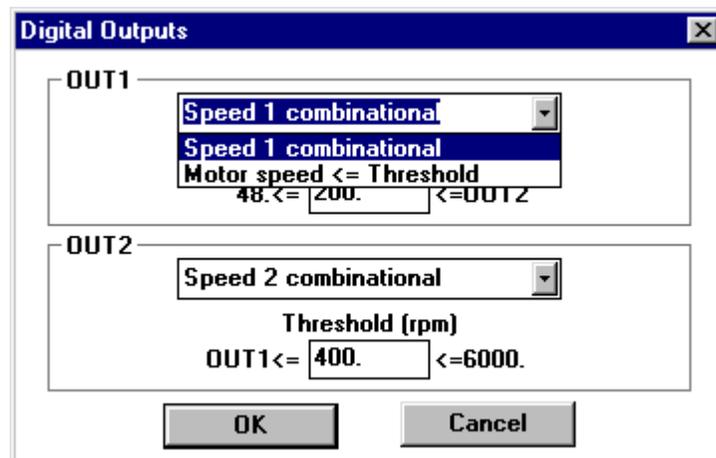
There are two possible functions:

a) speed combination in accordance with thresholds set:

Criterion	OUT1	OUT2
Speed < 48 rpm	1	1
48 rpm ≤ Speed < Limit 1	0	1
Limit 1 ≤ Speed < Limit 2	1	0
Limit 2 ≤ Speed	0	0

N.B. speed limits must comply with the rule: 48 rpm < Limit 1 < Limit 2

b) "speed reached" :

♦ OUT1 status complies with the table below:

Criterion	OUT1
Speed < Limit 3	1
Speed > Limit 3	0

N.B. speed limit 3 must be > 48 rpm

♦ The **OUT2** output changes to **1** when the speed of the motor is within the range given by + or – the value of Threshold 4:

± Limit 4

± Limit 4
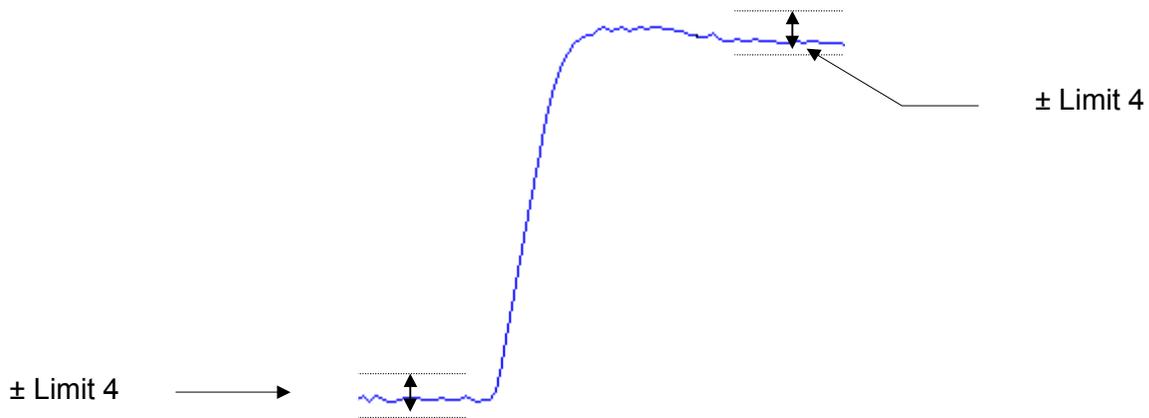
(input instruction – threshold 4 < real speed < input instruction + threshold 4 ⇥ OUT 2 changes to 1)

2.9 Drive Status Readout

Access on-line:

2.9.1 <u>Logic and analog input/output status</u>

Access via COMMANDS + STATUS + INPUTS/OUTPUTS: the following window opens.

Inputs (fixed assignment)

Analog outputs assigned to these two
variables
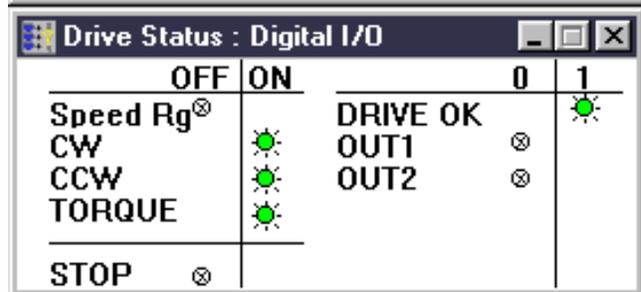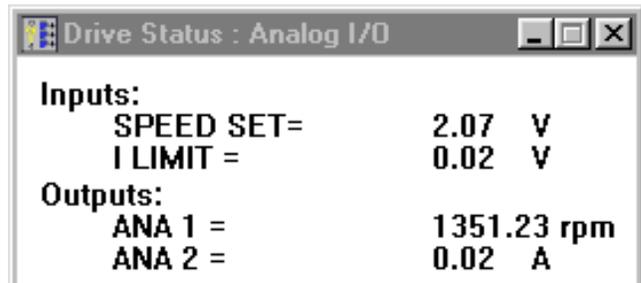
Internal Variables
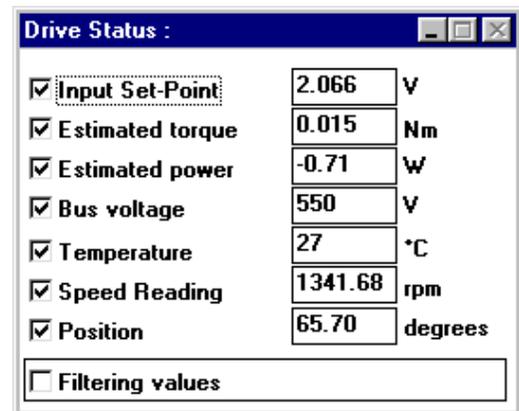
Access via COMMANDS + DRIVE STATUS + VARIABLES: the following window opens showing seven variables.
To obtain the value of a variable, click in the box in front of the variable's name.
This window closes and returns to COMMANDS + DRIVE STATUS + VARIABLES.

2.9.2 <u>System status</u>

Access via COMMANDS + DRIVE STATUS + OTHERS.
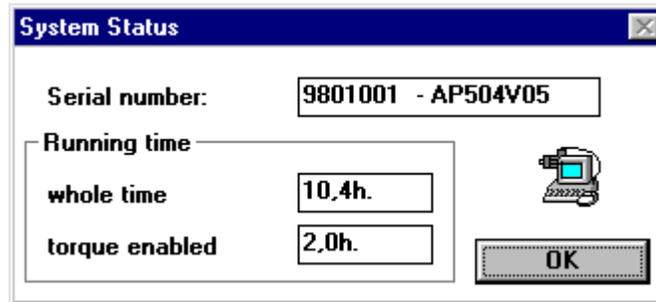
2.9.3 <u>Troubleshooting</u>

Access on-line:

Access on-line via COMMANDS + FAULTS: the following window opens :

The last incident to occur is displayed together with an indication of the total time after which it arose and diagnostic help.

Click on "history" to obtain the list of the previous thirty incidents:
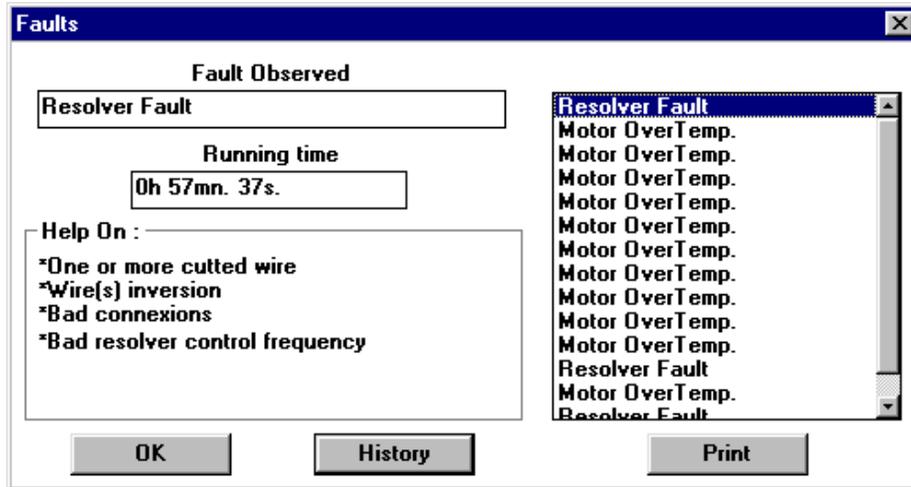
By clicking on one of the incidents in the list, it is shown on the left with an indication of the time after which it occurred.

2.10 Stimulus/Oscilloscope/Setting Procedure Functions

CAUTION: When the stimuli are activated make sure the system is free to run and that the **safety instructions are observed**.

2.10.1 Stimuli

Standard signals are implanted in the drive (square, sine instructions). The stimuli function allows users to select one of these signals, to define its amplitude, its frequency and its offset value.

- Square (single scale response),
- Sine (harmonic analysis).

This is called up via TOOLS + STIMULI or by clicking on the "stimuli" box.
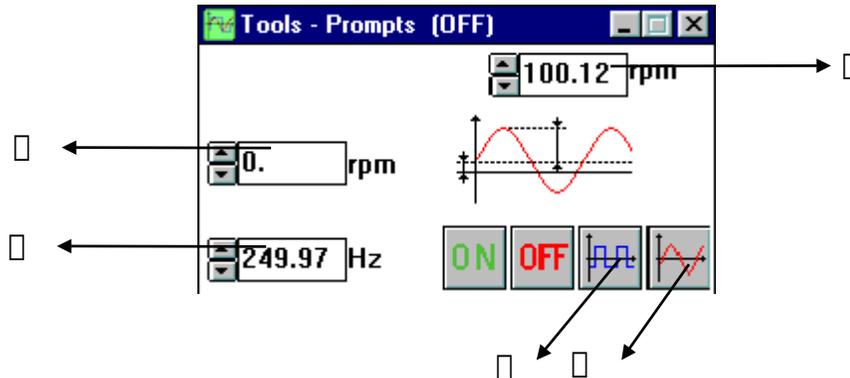
 Select "square" signal for index analysis (single scale response).
 Select "sine" signal for harmonic analysis (transfer function, Bode curves).
 Select mean signal value in rpm.
 Select mean peak value amplitude (and not peak-to-peak) in rpm.
 Select frequency in Hz.

ON: Sends the selected values and activates the selected stimulus. Clicking "ON" brings up a window "Do you really want to activate the stimuli", "OK" activates them. This activation remains effective even if the stimuli window is closed and even if you disconnect. Stimuli can only be deactivated by selecting OFF.

OFF: deactivates stimuli.
The cursor indicates the ON or OFF status.

Maximum values
Mean values: 0 to (N max - peak value).
Peak value: 0 to N max.

Mean value + peak value are limited to N max entered in the servo parameters window (see §4.3 of DIGIVEX PVD 3464 brochure).
Frequency: 0.06 Hz to 500 Hz.

To obtain a "constant value" stimulus, just select a square or sine stimulus with peak value = 0 and mean value = desired set point.

2.10.2 Oscilloscope function

Access on-line or off-line:

This function can be used in two ways:
- either ON-LINE to display (and save) the reaction of one or two of the twenty internal variables to excitation (stimulus or other);
- or OFF-LINE to study the pre-recorded curves.

Features comprise:
- oscilloscope settings;
- triggering and recording of curves;
- different accessories: labels, markers, colors;
- safeguard or print out curves;

2.10.2.1 Oscilloscope settings

Access:
- either by double clicking on the "oscillo" block at the top left of the block diagram;
- or via TOOLS + OSCILLOSCOPE.

The following window opens:
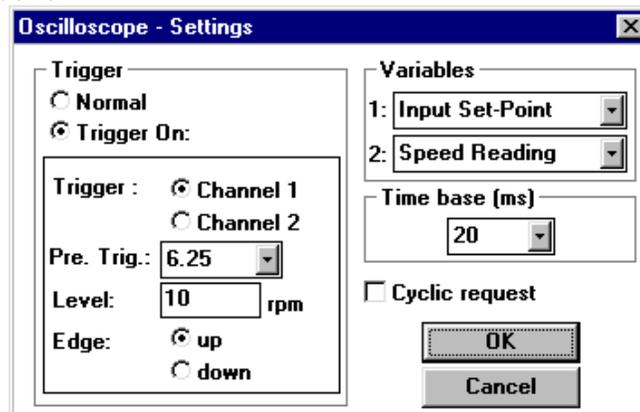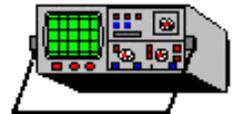
Choice of variables on either of two channels:

this choice is made from the variables described in § 2.8.2
- either by selecting their name from the list proposed;
- or by placing the two "probe tips" on the block diagram over the black squares (with the mouse) for eleven variables only.

The units and amplitudes are controlled automatically.

- Time base: 5 ms - 2 s per division.
- Trigger time:
  - ♦ immediate when OK is clicked;
  - ♦ synchronized on channel 1 or channel 2 with threshold limit of the variable.
- Pre-trigger: 6.25% - 100% for viewing responses before triggering.
- Limit: value (in units) of the trigger limit for the selected parameter.
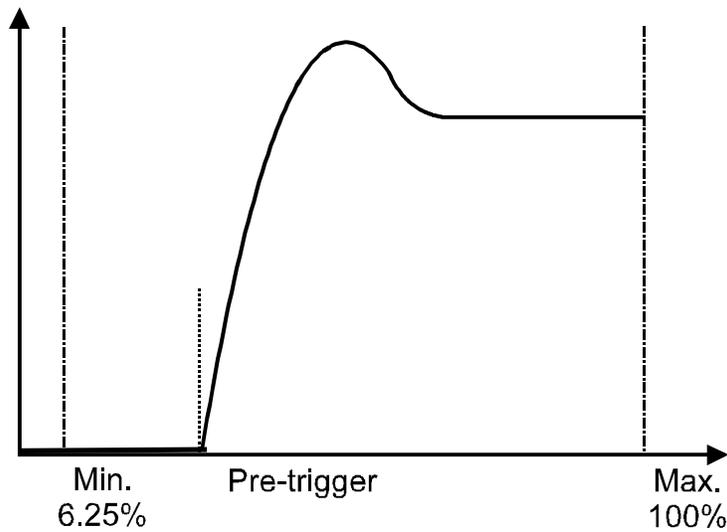
Diplgb45.D/54W

- Cyclic request
  - ♦ If "cyclic request" is not checked, image acquisition occurs each time OK is validated in the definition window or each time the "new request" button in the tool bar is clicked.

  - ♦ If "cyclic request" is checked, at the end of one acquisition routine, another is started automatically in the same conditions (continuous image capture).

2.10.2.2 <u>Curve triggering and acquisition</u>

Validate with OK to trigger the oscilloscope sequence.

Two indicators appear at the top right of the screen showing the acquisition sequence status.
bar graph showing state

Red or green « trigger » light   ⇒   ⇐ Acquisition advance, channel 1
⇐ Acquisition advance, channel 2

Three states can occur :
- trigger red, bar graph empty: waiting to be triggered;
- trigger red, bar graph filling (blue): curve acquisition underway;
- trigger green, bar graph full : acquisition completed. The curve (or two curves) is then displayed on the screen.

<u>Specimen Curve</u>
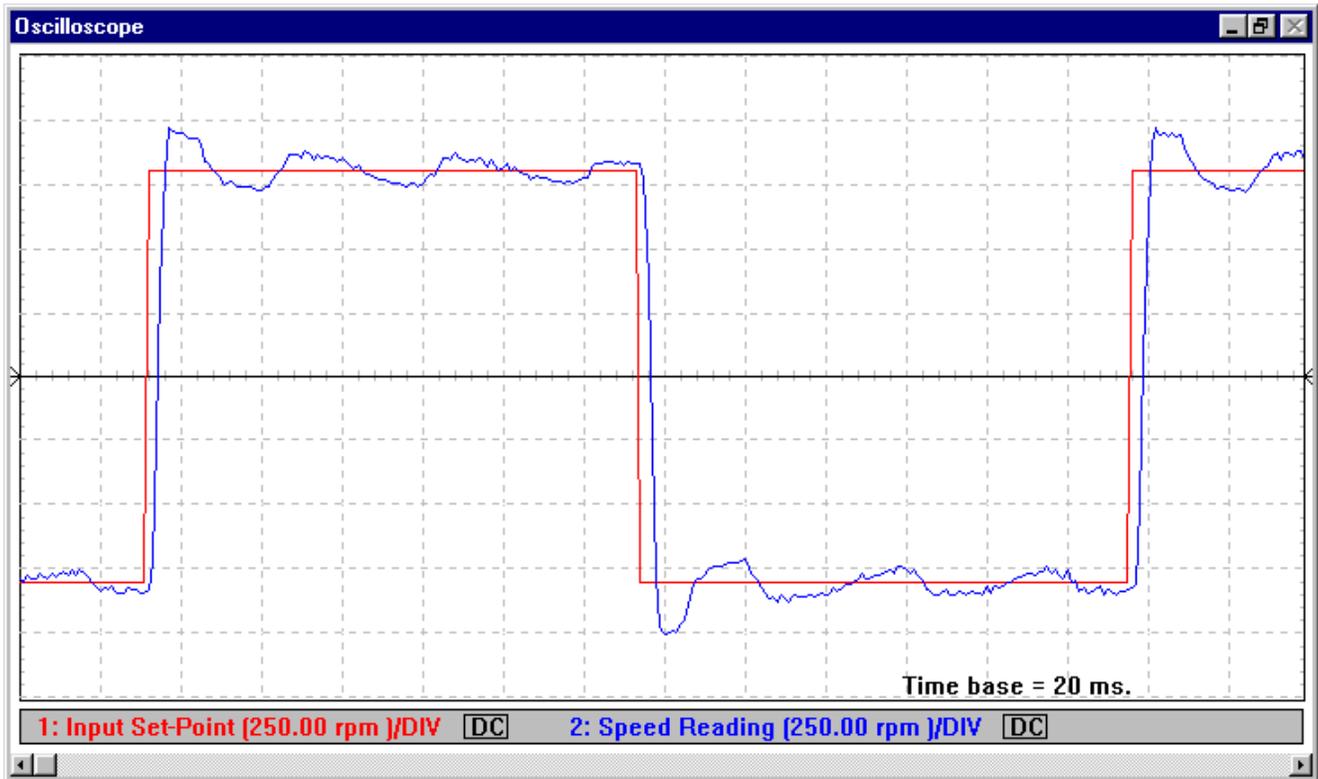
The tool bar for the oscilloscope is located at the top of the screen

OFF = oscilloscope function closed. It may also be closed using the menus.

New acquisition request without changing the current definition

Zoom +/ -

Increase + or decrease - in rating (vertical expansion)

Coupling selection
AC : alternative
DC : direct

Marker request on curve 1

Channel 1   Channel 2
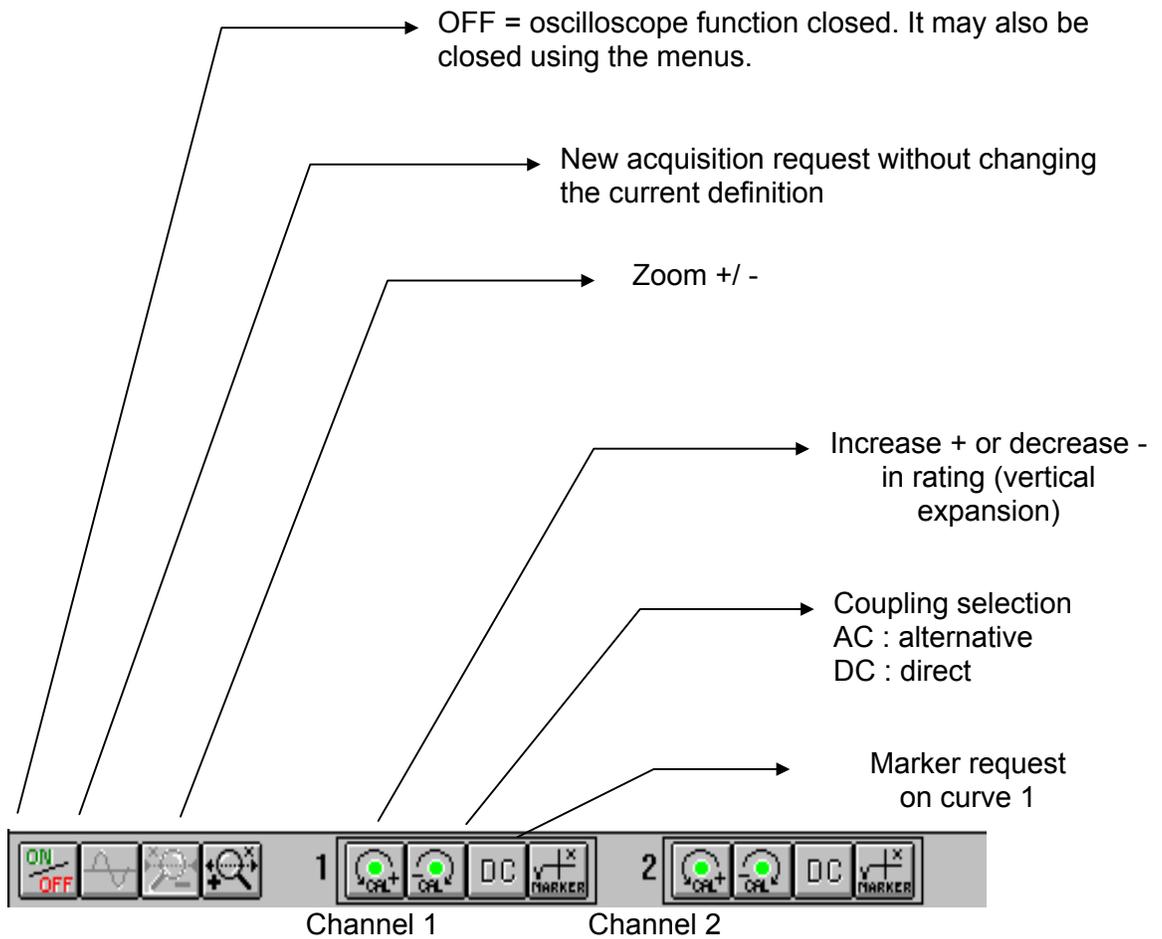
2.10.2.3 <u>Markers and other accessories</u>

Opening the "oscilloscope" screen provides access to an "oscilloscope" menu.

Oscilloscope
- Open...
- Save
- Print...
- To transfer...
- Labels
- Variables Setting
- Markers...
- Colors...
- Comments
- Options
- Close
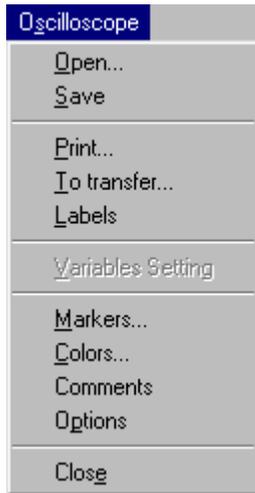
Calling up "markers" opens a window at the bottom right of the screen.

Markers (X in ms.)
Options
x1=6816.   y1=4.77
x2=5120.   y2=9.55
dx=-1696. dy=4.77
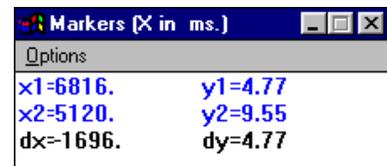
Markers are then selected with the mouse from the tool bar, one per curve or both for the same curve.
They are positioned on the curve again using the mouse. Fine positioning may be done using the arrow keys ← and → on the number pad of the keyboard.

Release the marker by clicking once on the screen area, or by hitting the Enter key. The up ↑ and down ↓ keys are used to assign the marker to the other curve.
Marker 1 is used for x_1 (time) and y_1 (abscissa, variable). Markers 2 is used for x_2 and y_2.

$$dx = x_2 - x_1$$
$$dy = y_2 - y_1$$
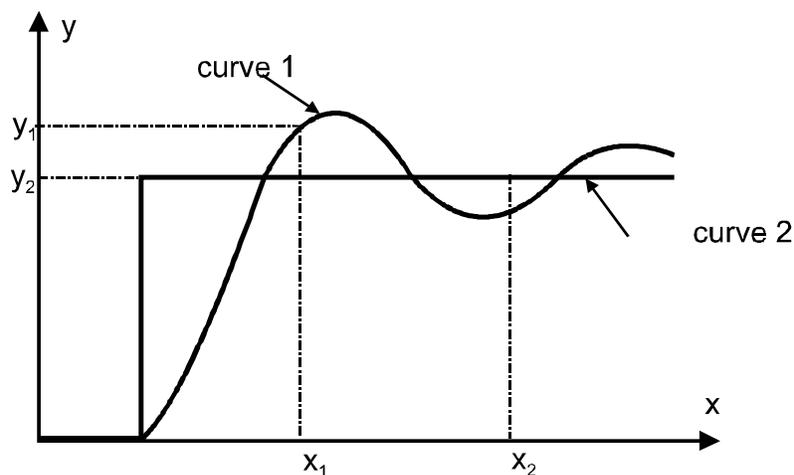
The "options" menu of the "markers" window provides access to the following window:
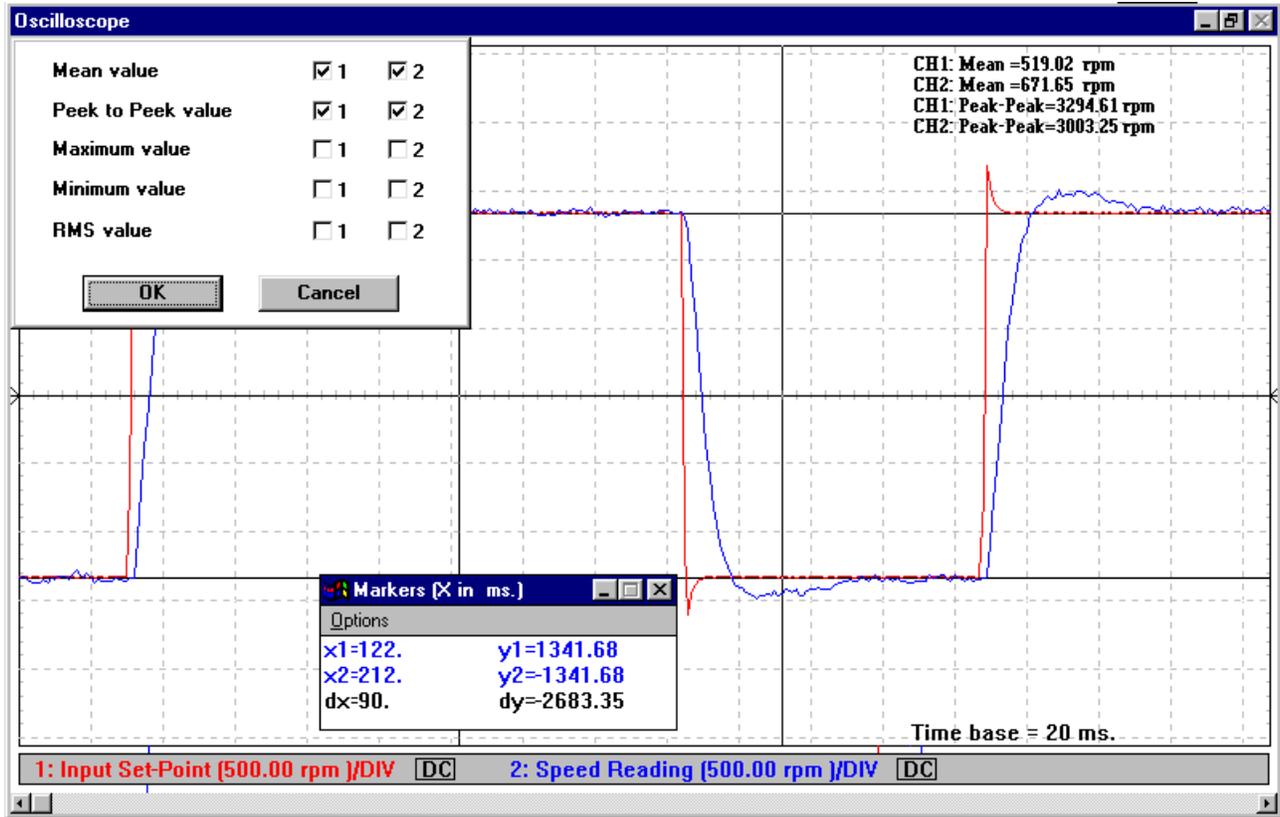
This is used for calculations on the curves of channels 1 and 2, the result being shown at the top right of the screen. These calculations are made over all the points recorded on the chosen curve.
The max and min peak-to-peak values are calculated for all points acquired. The mean and rms values are calculated between the two pre-set markers.

2.10.2.4 Other auxiliary functions

- **Insert comment:** clicking on the right-hand mouse button or selecting "Comments" opens the following window.

```
Enter your comments                                    ☒

 20/12/1998



              OK              Cancel
```
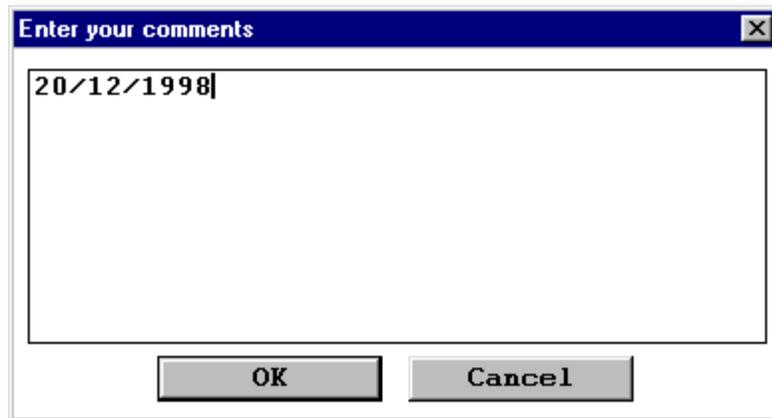
These comments are memorized when saved to the hard disk at the same time as the oscillogram and can be printed.

- **Labels:** can be used to position tags on the curves (□ and O) to distinguish them other than by color. Cancel labels by clicking on "labels" again.

- **Options (of the oscilloscope menu)**: Allows measurements to be filtered.

- **Axis movement :** If the cursor moved by the mouse reaches the edge of the graph on one axis it turns into a "hand". The two axes can then be moved by clicking and holding down the mouse button.

- **Close the oscilloscope function:**
  - ♦ either by the OFF button on the tool bar;
  - ♦ or by "Close" in the oscilloscope window.

2.10.2.5 Saving and recalling records

- **Saving a curve**
  - ♦ Use "Save" in the "oscilloscope" sub menu. This creates a curve file that is saved on the hard disk in a file with extensions (.OSC).

- **Recalling a curve**
  - ♦ Open the oscilloscope. The oscilloscope sub menu then appears.
  - ♦ Select "OPEN" and then the program name (extensions .OSC). The curve(s) saved appear on the oscilloscope.

- **Printing a curve**
  - ♦ Select "Print" in the sub menu.

- **Export a curve to another .csv file that can be read by Excel.**

2.10.3 <u>Setting procedure</u>

This procedure is designed to make it easier to set servo parameters — gain, integral frequency, $P/PI/PI^2$, filter frequency — by using the single scale response (index analysis).

The procedure is called up via TOOLS + SETTING PROCEDURE, which opens the window below

```
┌─────────────────────────────────────────────┐
│ Assistant Setting                         [X] │
├─────────────────────────────────────────────┤
│                                               │
│           The assistant is going to start     │
│         the tools necessary for the observation│
│          and the setting of the DIGIVEX drive.│
│                                               │
│                 Click on Start...             │
│                                               │
│                                               │
│      [ Previous ]  [  Start  ]  [ Cancel ]    │
└─────────────────────────────────────────────┘
```
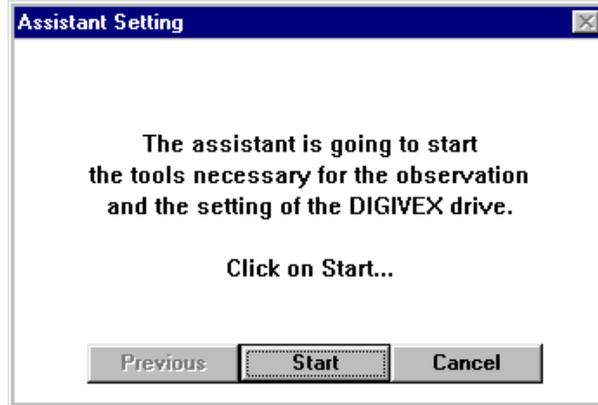
When "start" is clicked:
- the system comes "on line" if it was "off line";
- the oscilloscope function is opened with:
  - ♦ Channel 1: input set point
  - ♦ Channel 2: speed measurement
  - ♦ Time: 10 ms/division
  - ♦ Synchronization on channel 1 with pre-trigger = 6.25%, limit = 10 rpm, rising edge.
  - ♦ Scales set at 2% N max.

- the stimuli function is opened with:
  - ♦ Square signal
  - ♦ Frequency 1 Hz
  - ♦ Offset = 0 rpm
  - ♦ Peak amplitude = 2% maximum speed

- the servo parameters window is opened.

The different conditions (oscilloscope or stimuli) can be changed at any time by calling up the corresponding window.

The setting procedure stages are as follows:

- First window: Proportional gain.

Optimal gain and second order filter adjustment: P regulation, second order filter at 800 Hz. Change by +/- on gain and filter.
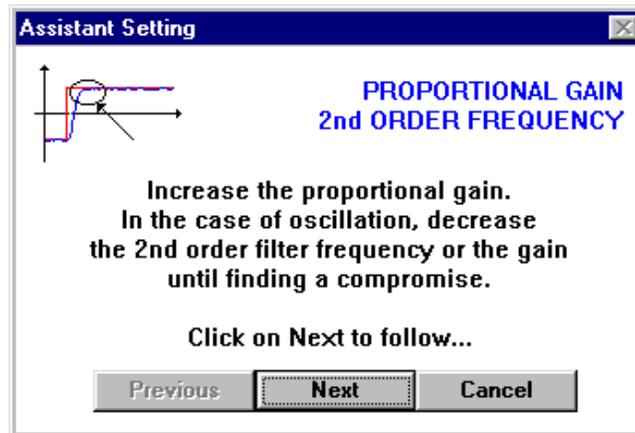
To optimize these parameters see the DIGIVEX DMD PVD3464GB, DPD PVD3484GB, DSD PVD3500GB instructions. When single scale response is judged correct (no oscillation, minimum speed rise time), click on "Next".

- Second window : PI / PI^2 adjustment. Enter this window via PI. PI or PI^2 can then be selected. Adjust the integration frequency by +/- (without adjusting the previous settings).
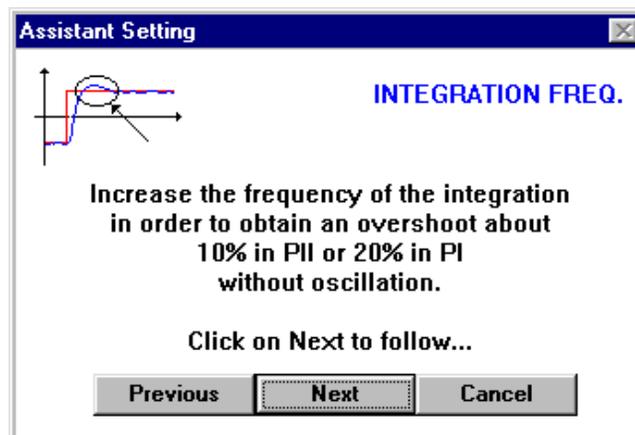
When the response is judged satisfactory (overshoot correct), click on "Next" to validate the settings.
- End of procedure.
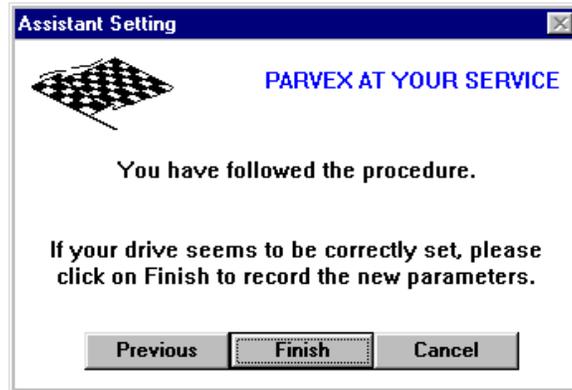
You can validate by clicking "Finish". In this case the parameters are transferred to the drive EEPROM. Then the initial status is resumed (oscilloscope, stimuli, etc. closed).
It is also possible to cancel and repeat the procedure from the start or select "Previous" to change the parameters.

2.10.4 Gain computation

ON LINE or OFF LINE access
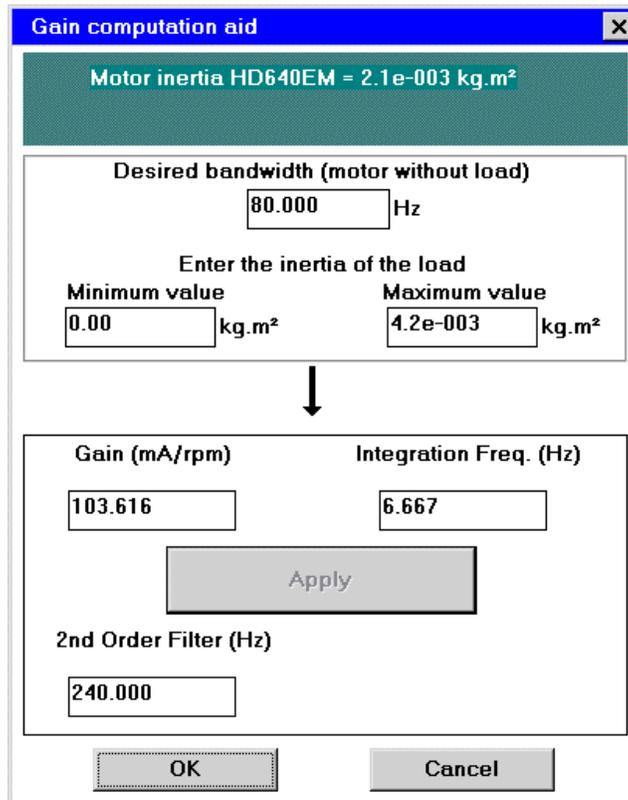
This function is for calculating gain, integration stop frequency and 2nd order filter frequency for a desired bandwidth: (motor off-load).

- Select a motor from the motor/drive window.
- Open the gain computation window from the tools menu.
- Enter the bandwidth
- Enter the minimum load inertia value.
- Enter the maximum load inertia value.
- Apply the settings.
- Close the window by clicking on OK to validate the settings applied or on Cancel to restore the previous settings.

2.11 Emergency Stop "POWER OFF"

In on-line mode only. Clicking on the red POWER OFF "mushroom" button on the screen (ON LINE) causes the software to trip the OK relay of the DIGIVEX POWER SUPPLY and therefore to open the power switch.

To restart, press RESET (hardware)
- For the DMD by the "RESET" push-button on the front panel of the "POWER SUPPLY".
- For the DPD and DSD on the axis front panel.

This is not stored in the fault log.

2.12 Application Name

Access on line or off-line:

An application name can be stored in the DIGIVEX (up to 8 characters). Enter the name (on-line or in an off-line file) in the space provided in the block diagram.