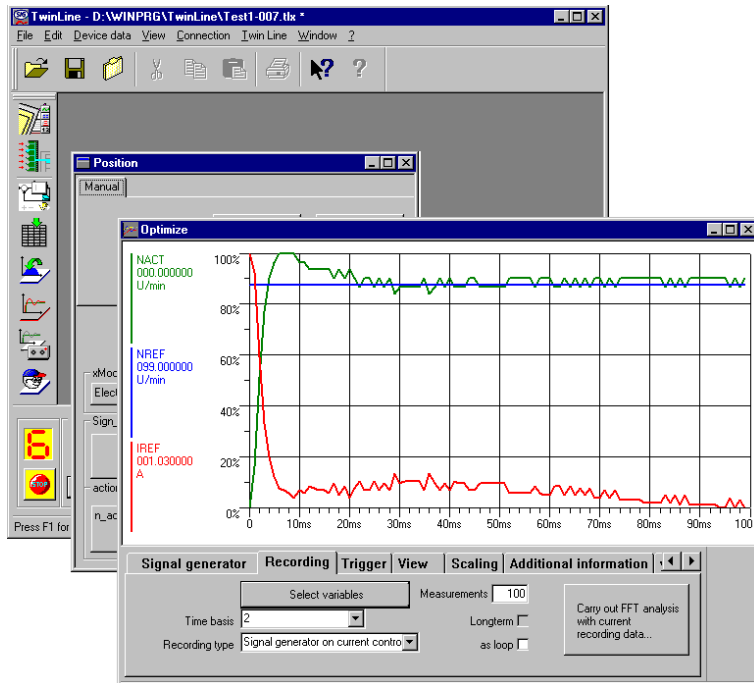


Technical documentation



Operating software for Twin Line units

TL CT

Operating system: 1.0xx

Order no.: 0x9844 1113 096

Edition b121, 05.02

Twin Line

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Reference

Abbreviations

Abbreviation	Meaning
AC	Alternating current
ASCII	American Standard Code for Information Interchange
COS	Controller Operating System
DC	Direct current
E	Encoder; incremental encoder
EMC	Electromagnetic compatibility
HMI	Human machine interface, plug-in hand-held operating unit
Inc	Increments
I/O	Inputs / output
LED	Light-emitting diode
M	Motor
PC	Personal Computer
PELV	Protected Extra Low Voltage
PLC	Programmable logic controller
usr	User units

Product designations

Abbreviation	Product designation	User term
TLDxxx, TLCxxx	Twin Line Drive xxx Twin Line Controller xxx	Controller
TL HMI	Twin Line HMI	Human-Machine Interface HMI
TL CT	Twin Line Control Tool	operating software
TL HBC	Twin Line Holding Brake Controller	Holding brake controller
TL BRC	Twin Line Ballast Resistor Controller	Ballast resistor controller

Technical Terms

<i>Actual position of the drive system</i>	The actual position of the drive system gives the absolute or relative positions of moved components in the system.
<i>Actual position of the motor</i>	The actual position of the motor corresponds to the angular position of the rotor in the motor housing, and refers to one revolution of the motor.
<i>Control dynamicism</i>	Speed at which a controller reacts to a disturbance or to a change in the input signal
<i>DC line</i>	The DC line generates the necessary voltage for operating the motor and provides the amplifier with the necessary energy. The DC line acts as a buffer for energy fed back by the motor.
<i>Default values</i>	Preset values for the parameters of the Twin Line unit before the first commissioning, factory settings
<i>Direction of rotation</i>	Rotation of the motor shaft in a clockwise or anticlockwise direction. A clockwise direction of rotation is given when the motor shaft rotates clockwise as the observer faces the end of the protruding shaft.
<i>Drive solution</i>	The drive solution comprises the drive system with its Twin Line unit and motor as well as the system mechanics forming an integral part of the chain of motion.
<i>Drive system</i>	The drive system consists of the Twin Line unit and the motor.
<i>Electronic gear</i>	An input speed is recalculated by the Twin Line unit using the values of an adjustable gear ratio to produce a new output speed for the motor movement.
<i>Encoder</i>	Sensor for recording the angular position of a rotating element. Mounted on the motor, the encoder signals the angular position of the rotor.
<i>Error class</i>	Reaction of the Twin Line unit to an operational malfunction corresponding to one of five error classes
<i>ESIM1-C, ESIM2-C</i>	Encoder simulation module for the output of motor position data as A/B signal with index pulse to external control or to a second Twin Line Device
<i>ESIM3-C</i>	Encoder simulation module for the output of motor position data as A/B signal with index pulse to external control or to a second Twin Line Device
<i>Forcing</i>	To change signal states irrespective of the hardware switching status in the unit; with the control tool, for example. The hardware signals remain unchanged.
<i>HIFA-C</i>	Module with Hiperface interface for connecting an encoder made by Messrs Stegmann
<i>HMI</i>	Hand-held operating unit which can be plugged into the Twin Line unit. HMI: Human-machine interface.
<i>I²t monitoring</i>	Predictive temperature monitoring. On the basis of the motor current, the expecting heating of unit components is calculated in advance. Should a limit value be exceeded, the Twin Line unit reduces the unit current.
<i>Incremental signals</i>	Angular steps of an encoder in the form of square-wave pulse sequences. The pulses signal changes in position.
<i>Index pulse</i>	Encoder signal for referencing the rotor position in the motor. The encoder sends one index pulse per revolution.

<i>Input device</i>	Input device is the device which can be connected to the RS232 interface for the purpose of commissioning; it is either the HMI hand-held operating unit or a PC with the operating software.
<i>Internal unit</i>	The maximum resolution at which the power amplifier can position the motor, given in increments.
<i>IOM-C</i>	Analog module for providing analog and digital voltage signals and for recording external analog and digital voltage signals
<i>Limit switch</i>	Switches which signal any overrun on the permissible travel.
<i>Module code</i>	Internal electronic code (8 bit) which describes the hardware and the functionality of modules. This code is held in an EEPROM in every module.
<i>Node guarding</i>	Monitoring function at the RS232 interface when the motor is controlled by an operating unit.
<i>Off-line operation</i>	This means working with the program but without a connection to the Twin Line unit. Data can be read, edited and saved on the PC but in off-line mode cannot be transferred to the Twin Line unit.
<i>On-line operation</i>	Between the PC running the Twin Line Control Tool and the Twin Line unit itself there is a data connection which the two devices use to exchange parameter information. In on-line mode the Twin Line unit can be operated from the PC.
<i>Optically isolated</i>	Electrical transmission of signals with electrical isolation
<i>Parameters</i>	Device data and values which can be set by the user
<i>Power controller</i>	This is the unit that controls the motor. The power controller generates currents for controlling the motor in accordance with the positioning signals from the control unit.
<i>PULSE-C</i>	Pulse direction interface for recording external position presets via pulse direction signals for the positioning of the motor
<i>Pulse direction signals</i>	Digital signals with variable pulse frequencies which signal changes in position and rotation direction via separate signal wires.
<i>Quick-stop</i>	Stops the motor with an adjustable braking torque. This function is used in the event of faults, the stop command or in an emergency for rapidly braking an AC synchronous servomotor.
<i>RESO-C</i>	Resolver module, module for connecting a resolver
<i>Resolver</i>	Analog encoder for determining the angular position of the rotor. It is used for returning the actual position of the motor for phase-accurate control of the motor.
<i>RS232 interface</i>	Serial connection for connecting the Twin Line unit to a PC. Three lines suffice for transferring data between the two devices.
<i>RS422 level</i>	The signal status is calculated from the differential voltage of one positive and one inverted negative signal. Two signal wires must therefore be connected for one signal.
<i>RS422-C</i>	RS422 encoder module, module for encoder connection for receiving external encoder signals with RS422 level for motor positioning.
<i>RS485 level</i>	The signal status is calculated from the differential voltage of one positive and one inverted negative signal. Two signal wires must therefore be connected for one signal. RS485 signal transmission is bidirectional.
<i>Shortcut</i>	This is a direct way to starting an action. Program actions which are frequently used can be launched directly via a key combination and without going the long way round via the menu.

- Sincoder* An encoder for registering the position of the rotor of the servomotor as an analog sine-cosine signal and as digital position data via the HIFA-C module. Motor data are held in the Sincoder and are read into the unit once the Twin Line unit is switched on.
- SSI-C* Synchronous serial interface for encoder simulation with serial transmission of absolute position data. The module generates the signals of an SSI encoder.
- User units* A user unit corresponds to the maximum precision at which a distance, speed or acceleration value can be input. User units can be set for all normalizable parameters.
- Watchdog* A device in the unit which detects internal faults. In the event of a fault the Twin Line unit switches off the power amplifier and outputs.
- Zero-clamp* Taking over the current actual position as the new setpoint position. It is used with the quick-stop function when the position controller is switched in at zero speed and set to the current position.

1 Before starting the program

1.1 Twin Line Control Tool operating software

The Twin Line Control Tool operating software works in conjunction with the regulatory and control devices of the Twin Line series. The Twin Line Control Tool is used for rapid start-up and also for troubleshooting. It does not need configuring first before it can be used with any Twin Line unit with an RS232 interface.

The functions of the software adapt automatically to the power range and functions provided by the particular device connected. This means that it can happen that certain functions of the software cannot be accessed despite the fact that they are described in the present on-line manual. These functions are not supported by the device type connected.

The functions of the Software Twin Line Control Tool which can be launched with all device types are:

- Inputting and displaying device parameters
- Archiving and duplicating the device data
- Manual positioning of the motor with the PC
- Recording, evaluating and archiving movement paths
- Off-line and on-line processing of parameters and positioning jobs
- Diagnosis of operating malfunctions
- Commissioning assistant for rapid start-ups with a Twin Line unit

Depending on the device type which is connected there is also a whole series of other functions available:

- Optimizing the control response
- Programming positioning jobs
- Processing movement lists and sets
- Reference runs

Hardware requirements

The minimum hardware requirements for setting up and running the software are

- IBM-compatible PC with an 80486 processor and co-processor, or better a 80586 processor (Pentium)
- 8 MB RAM
- Approx. 5 MB free on the hard disk
- SuperVGA graphics card
- CD-ROM drive
- For data exchange, a free serial port on the PC and an RS232 data cable. The cable is available as an accessory.

System requirements

The Twin Line Control Tool will run on a PC under Windows 95, Windows 98 or Windows NT.

- Connecting up to the device* ▶ If you are using the Twin Line HMI hand-held operating unit or a unit with a hood, before you connect up a PC you will need to unplug the Twin Line HMI or remove the hood cover.

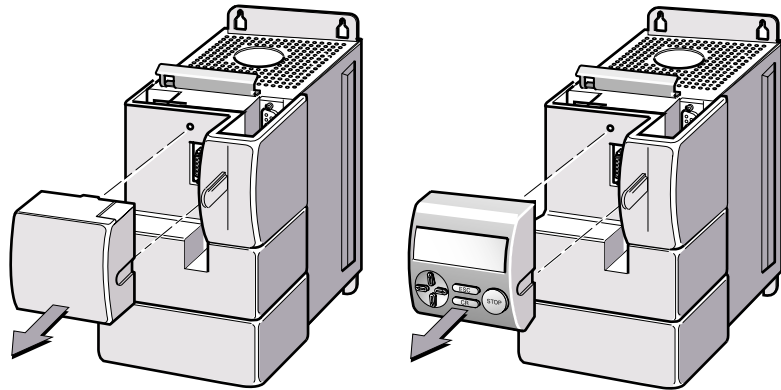


Fig. 1.1 Removing the hood cover or Twin Line HMI

- ▶ Connect the RS232 cable to the serial interface connection COM1 or COM2 of the PCs and to the RS232 connection of the unit. You can plug the connecting cable into the unit even during movement mode.

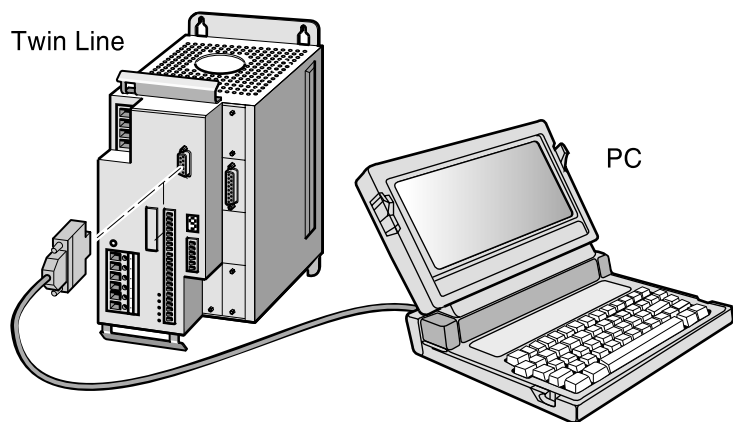


Fig. 1.2 Connecting the PC

1.2 Writing conventions in the on-line manual

The on-line manual contains orientation aids which will help you find your way more easily around the special information the documentation:

Action symbol ► The action symbol ► is used for step-by-step instructions which can be carried out as they are described. If the step leads to a noticeable response from the program or Twin Line unit, a brief description of this will be provided. In this way you will receive direct confirmation that a particular step has been correctly carried out.

Menu paths: → Action steps in the program are described with the complete menu path. For example 'Twin Line → Controller → Optimize', 'Reference variable' tab means:

1. Click on the 'Twin Line' menu on the menu bar, 2. Click on the 'Controller' menu item and then on the 'Optimize' menu item 3. Select the 'Reference variable' tab.

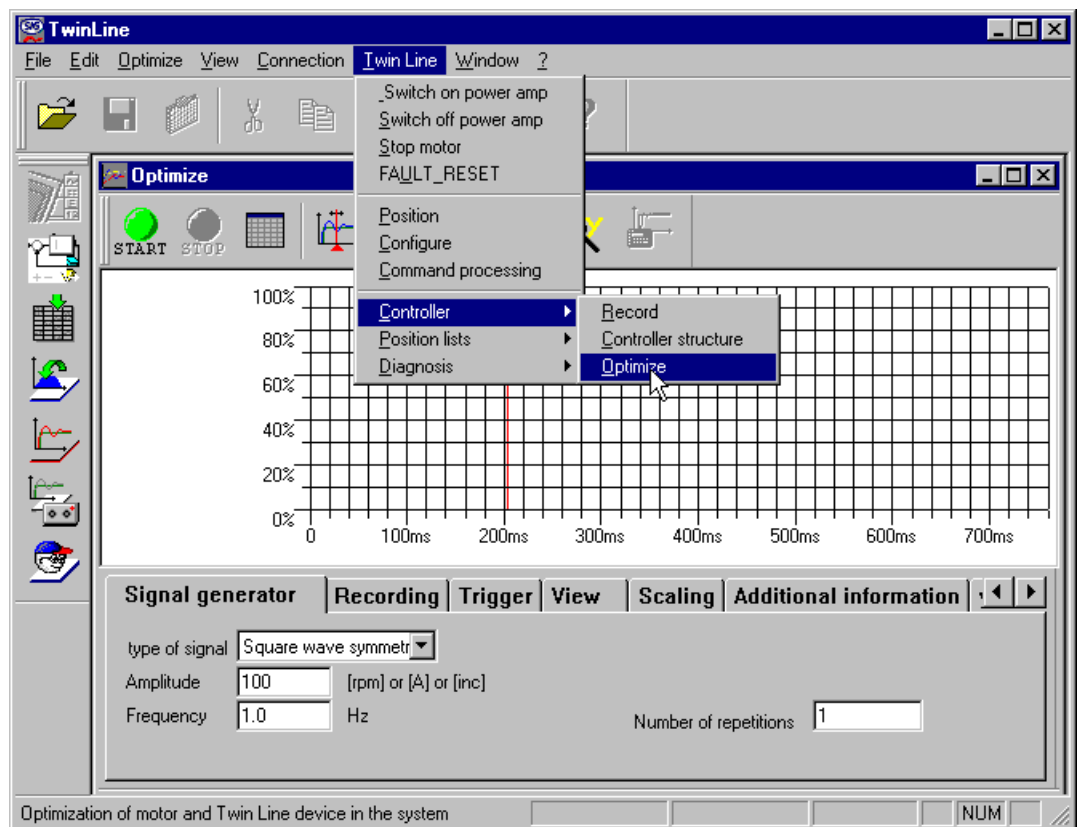


Fig. 1.3 Example of a menu selection: 'Twin Line → Controller → Optimize', 'Reference variable' tab

2 Installation and starting the program

2.1 Scope of supply

The Twin Line Control Tool comes supplied on a CD-ROM and with a printed manual.

In addition to the software package the CD-ROM also contains an on-line version of the manual with a reading utility. This reading utility makes it possible for the manual to be displayed on and printed by the PC.

2.2 Installation

- ▶ Insert the CD-ROM into the CD-ROM drive of your PC.
- ▶ Launch the Windows application Explorer and click on the drive which contains the CD.
- ▶ Select the CD-ROM directory for the language to be used for installing and using the Twin Line Control Tool.
- ▶ Start installation by double-clicking on the program SETUP.EXE.
- ▶ Type in the drive and directory in which the operating software should be installed and start the installation procedure.

Once the Twin Line Control Tool has been installed, it can be started via the start icon on the Windows task bar. The Twin Line entry will be found under 'Start → Programs → Berger Lahr → Twin Line'.

The program for reading the on-line document will be found in the 'Acrobat Reader' subdirectory of the language directory you selected.

- ▶ You will need to install Acrobat Reader from the CD-ROM to be able to read the on-line documentation.

Changing language settings

You can change the language setting for the Twin Line Control Tool by re-installing the software. You do not need to remove the program first. Any saved files and settings of the program will be retained.

Removal

Windows 'registers' the Twin Line Control Tool at the time of installation. If you wish to remove the Twin Line Control Tool, Windows uses this registration to delete all of the installed files.

The Windows program for removing an application can be accessed via the Start icon on the task bar of the Windows interface:

- ▶ Select 'Start → Settings → Control panel'. The 'Control panel' window is displayed.
- ▶ Start the Windows program for removing the Twin Line Control Tool via the 'Software' entry.
- ▶ In the window select the entry for the Twin Line Software and then click on the 'Add/Remove' symbol.

The program files and system settings will now be deleted from the hard disk. Any configuration data and recordings which have been saved will not be removed.

- Starting the program* ▶ Under 'Start' on the Windows task bar select the menu item 'Programs → Berger Lahr → Twin Line'

Before data can be exchanged with a Twin Line unit the 24 V power supply of the Twin Line unit must be switched on and the data cable connected.

The program checks to see whether one or more Twin Line units are connected and displays them in the window for device selection.

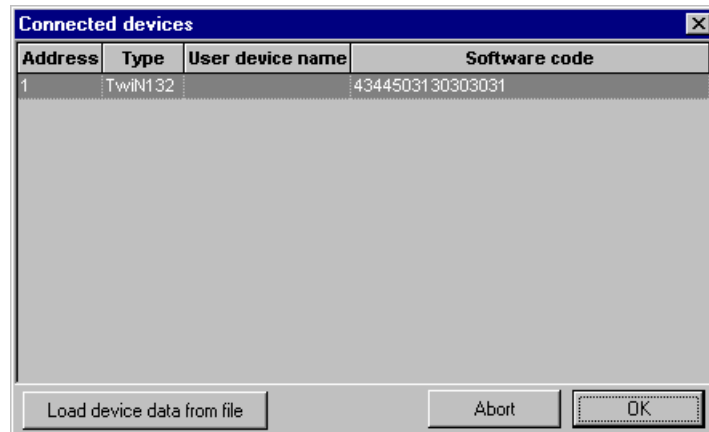


Fig. 2.1 Device selection

- ▶ Select a Twin Line unit and confirm your selection with 'OK' or click on the button 'Load device data from file' to load a saved file.

The program loads the data from the unit or from the file into the PC memory. It then displays the action window.

- Further information*
- Detailed information on loading device data will be found under 'Transferring device data' on page 4-1.

3 Working with the Twin Line Control Tool

3.1 Action window

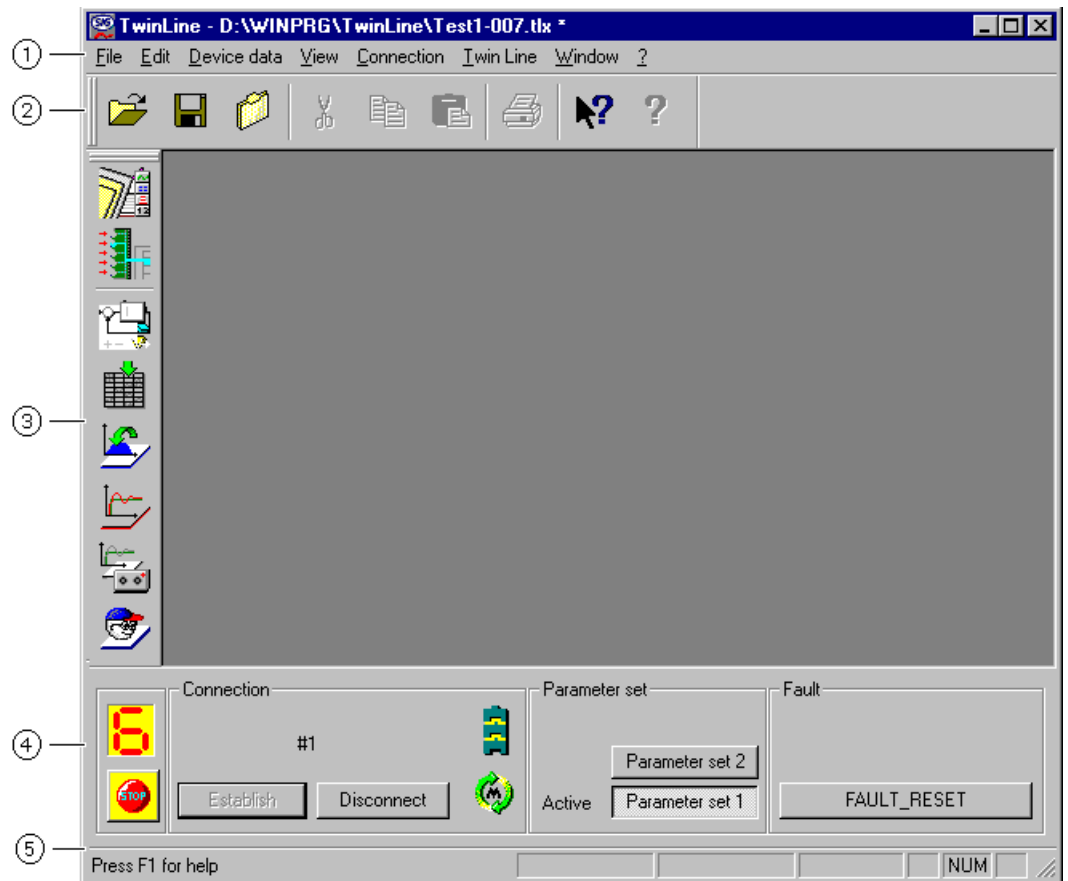


Fig. 3.1 The Twin Line Control Tool action window

- ① Menu bar
- ② Tools bar
- ③ Twin Line bar
- ④ Control bar
- ⑤ Status bar

The commands of the operating software can be activated via the menu bar, via keyboard command or via toolbars.

3.2 Menu bar

The menu bar adapts itself flexibly to the current work situation. It shows only the menus you need for operation. For example, if no device file is open, the 'Edit' and 'Twin Line' menus will not be displayed as without a device file nothing can be set or modified.

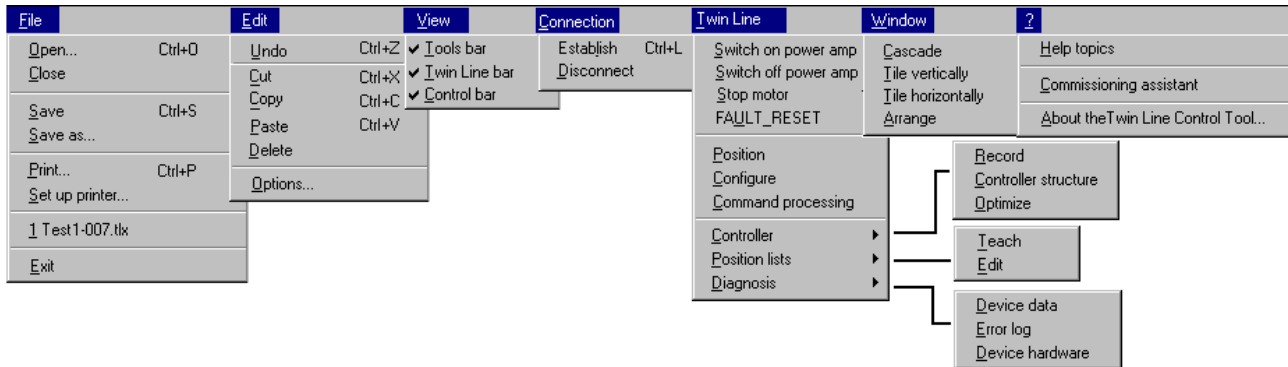


Fig. 3.2 The menu bar and menu structure

The Twin Line Control Tool expands the menu bar by adding specific menu entries for the tool which has just been activated. As soon as the optimization utility, for example, is activated, the Twin Line Control Tool displays the 'Optimize' menu.

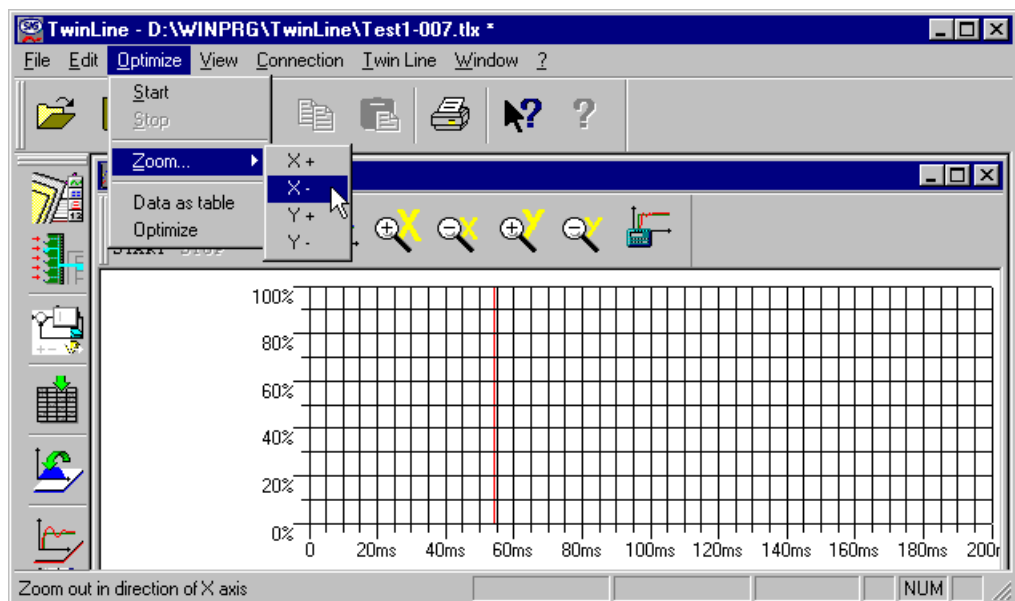


Fig. 3.3 The menu bar with the 'Optimize' menu

Information about all menu entries will be found under 'The Twin Line Control Tool menu' on page 13-1.

Key combinations

If a menu item also provides a key combination, the program action connected with this menu item can also be started via the keyboard. You enter a key combination by holding down one key while briefly pressing the second key. For example, for the key combination 'Ctrl+S' hold down the control key 'Ctrl' and press the 'S' key briefly.

3.3 Tool bars and status bar

For menu commands which are frequently used you only need click on the corresponding symbol on the tool bar to start a program action. The Twin Line Control Tool provides three tool bars in the action window:

- The Twin Line bar with the tools for starting up and running the Twin Line unit.
- A control bar for communication with the Twin Line unit.
- A tools bar for quick-starting important commands from the 'File', 'Edit' and 'Help' menus.

The tool bars can be situated along the edge of the action window or placed anywhere as a moveable window. Double-clicking on the edge of the tool bar is all you need do to change the kind of placing used.

With the 'View' menu you can display or hide each tool bar separately.

The Twin Line bar

The icons on the Twin Line bar can be arranged vertically along the edge of the window in one or more columns.

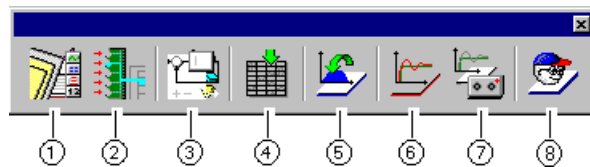


Fig. 3.4 The Twin Line bar

By clicking on the symbols on the Twin Line bar a program action can be started or an already open window for the program action brought into the foreground (on top).

- ① Create and edit **lists**
- ② **Record data**, creating and editing
- ③ Display the **controller structure** of the Twin Line unit as a block diagram
- ④ Display and set the **parameters** of the Twin Line unit
- ⑤ **Position** the motor with the Twin Line Control Tool; program lists and sets
- ⑥ **Optimize** controller functions
- ⑦ **Record** controller and device data
- ⑧ Launch the **commissioning assistant**

Control bar This bar is used for setting up and clearing down a connection and also for monitoring the Twin Line unit.

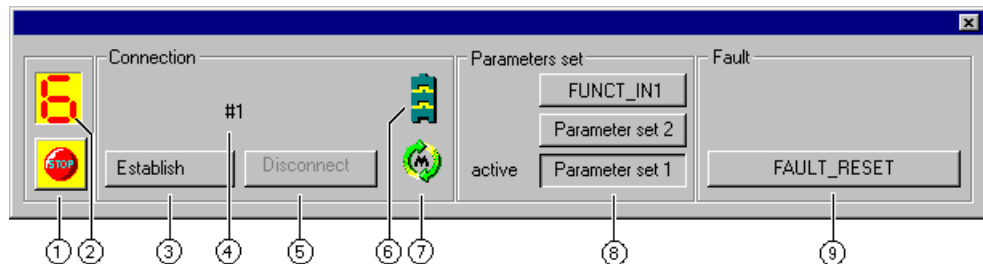


Fig. 3.5 The control bar

- ① **Motor STOP** with quick stop braking ramp. A message is displayed in the Fault field. Before the motor can be enabled the message must be acknowledged with FAULT_RESET. Motor stop can also be activated via the menu item 'Twin Line → Stop motor'.
- ② Current value of the 7-segment status display of the connected Twin Line unit
- ③ **Establish**: Establish a new device connection: the window for selecting a new device is displayed. This action can also be launched via the menu item 'Connection → Establish'.
- ④ **Connection** established: the address number and name of the unit is displayed
- ⑤ **Disconnect**: Disconnect the open device connection to a Twin Line unit. This action can also be launched via the menu item 'Connection → Disconnect'.
- ⑥ Display for **connection status**: Green fields on a grey background: no connection to the device Green fields on a yellow background: connection exists.
- ⑦ Display for **power amplifier status**: Green: power amplifier enabled, motor under control Red: power amplifier disabled, motor without holding torque
- ⑧ Displaying and setting the current control parameters set:
FUNCT_IN1: Selection of the parameter set corresponding to the input signal FUNCT_IN1 at the device interface
Parameter set1: Selection of control parameters set 1
Parameter set2: Selection of control parameters set 2
- ⑨ **FAULT_RESET** for acknowledging an error message once the error is corrected. The current report is displayed above the button. An error message can also be acknowledged via the menu item 'Twin Line → FAULT_RESET'.

Tools bar With the tools bar you can access with a single click frequently used commands in the 'File', 'Edit' and 'Help' menus.

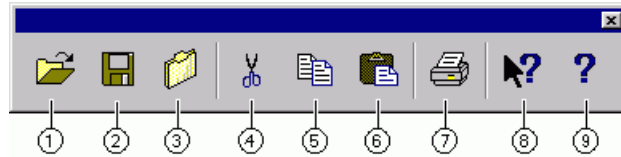


Fig. 3.6 The tools bar

- ① **Open** a device file
- ② **Save** the device data in a file
- ③ **Close** an open device file
- ④ **Cut** and move the selected area to the clipboard
- ⑤ **Copy** the selected area to the clipboard
- ⑥ **Paste** the contents of the clipboard at the cursor position
- ⑦ Open the dialog box for **printing**
- ⑧ Open the **help window**
- ⑨ Display **Information**

Status bar The status bar provides brief information about the buttons and menu items and also reports current status information for the program.



Fig. 3.7 Status bar

- ① Brief help, the information comes after the cursor position. In the graph of a recording, values are displayed here at the cursor position.
- ② Lower limit value of the selected parameter
- ③ Upper limit value of the selected parameter
- ④ Unit of measurement for the selected parameter
- ⑤ 'Caps Lock' key activated
- ⑥ 'Num Lock' key activated
- ⑦ 'Scroll Lock' key activated

Tabs Some dialog boxes of the operating software allow you to access setting windows with special tabs (or index cards). Hidden tabs can be displayed by clicking on the arrow buttons on the right of the tabs.

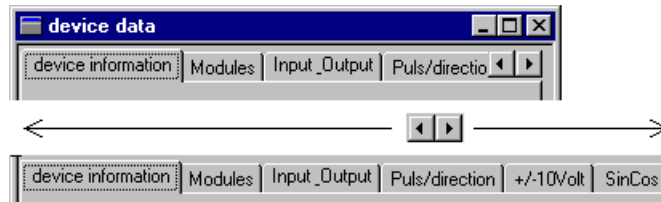


Fig. 3.8 Display tabs

3.4 Setting program options

Connection settings and directory details for accessing the database should be set during installation of the Twin Line Control Tool. They can be modified later in the 'Options' window.

Edit → Options ► Select 'Edit → Options' to open the window.

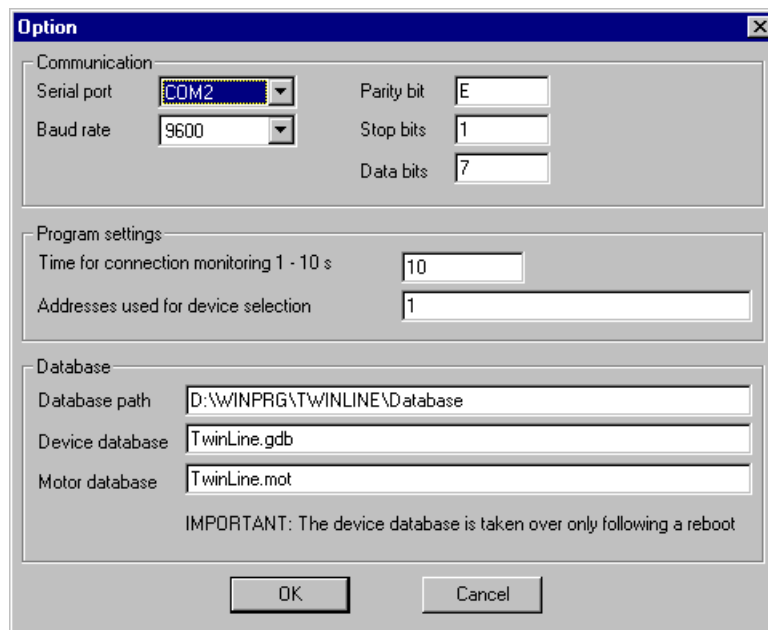


Fig. 3.9 The 'Options' window

► Set the values for your software configuration.

- **Serial port:** the PC connection which is used for the data connection between the PC and the Twin Line unit.
- **Baud rate:** the speed at which data is transmitted between the PC and the Twin Line unit expressed in bits per second. For a fast data connection you should select the highest value possible. If you experience transmission errors you will need to reduce this value.
- **Parity, stop and data:** These are the interface parameters for data exchange with a Twin Line unit. The default setting is (E)ven, 1 stop bit, 7 data bits.
- **Time for connection monitoring:** cycle time in seconds, as set. During movement mode the data connection to the Twin Line unit is continuously monitored via the Twin Line Control Tool. Any interruption to the connection causes the motor to stop immediately.
- **Addresses used for the device selection:** In order to reduce the time required for searching when a connection is being established in field bus operation you can specify a restricted address range here. For example: 1, 2, 5-7: addresses 1, 2 and 5 to 7 will be searched 1-31: all addresses will be searched.
- Under **Databases** you can specify the access path and name for the device database with the parameters of all Twin Line units and the motor database for configuring a motor.

Changes to the settings will not be used until the next time the program is started.

3.5 Data interface and device data

<i>Data interfaces</i>	The connection for exchanging data is set up via the RS232 interface or via a network interface. The RS232 device interface is the default commissioning interface and every Twin Line unit is provided with one. The network interface is available with Twin Line units which have an RS485 connection.
<i>Log-in</i>	Before data can be exchanged with the Twin Line unit a data connection must be established between the PC and the Twin Line unit. The software starts setting up the connection by first logging in. Here it identifies the connected device and reads in the device data.
<i>Compatible Twin Line units</i>	<p>Via device type and device software the Twin Line Control Tool identifies compatible devices. Only compatible Twin Line devices can exchange device data with each other. If the device data in the PC memory are not compatible with a connected Twin Line unit, you will not be able to establish a connection with the device until you have first closed the device file which is open on the PC.</p> <p>The Twin Line Control Tool will tell you if device data are not compatible.</p>
<i>Device data</i>	<p>Device data are all of the parameter values of the Twin Line unit which can be held in the EEPROM memory of the Twin Line unit and which will still be retained in the event of a power outage.</p> <p>When the 24 V power supply is switched on the device data are automatically copied from the internal EEPROM memory and into the RAM memory of the Twin Line unit. The Twin Line unit will now use only the device data in the RAM memory.</p>
<i>Loading and saving the device file</i>	<p>Device data can be loaded into the program from the PC data storage medium or from the Twin Line unit.</p> <p>All of the device data are loaded from a single file on the PC data storage medium: the device file. Should individual parameters be changed and saved, the Twin Line Control Tool will always transfer the complete parameters record to the file. Individual device data cannot be saved or loaded separately.</p> <p>You do not need to establish a data connection to the Twin Line unit to edit and save data to the PC data storage medium.</p>
<i>Exchanging device data with a Twin Line unit</i>	<p>On the other hand you cannot exchange device data with a Twin Line unit unless a data connection has been established. If so, the device data are read into the PC from where they can be transferred complete or in smaller parameter groups back to the Twin Line unit. Saving the data requires two steps:</p> <ul style="list-style-type: none"> • Transfer to the RAM memory • Saving in the EEPROM memory. <p>The Twin Line Control Tool first transfers modified parameters to the RAM memory of the Twin Line unit. Here they will remain but only until the 24 V power supply is switched off.</p> <p>However, to keep the data even after the power supply has been switched off and back on again, you will need to take the further step of transferring them into the EEPROM memory of the Twin Line unit.</p> <p>Details on exchanging parameters will be found under 'Configuring' on page 5-1.</p>

3.6 Off-line and on-line functions

- Off-line functions* You do not need a connection to the Twin Line unit
- to load device data from a file
 - to save device data in a device file
 - to edit parameters
 - to print device data
 - to edit a saved recording, to print it and to save it with the device file

The off-line functions of the software are also available in on-line operation provided the device data of an open file are compatible with those in the Twin Line unit.

- On-line functions* Once a connection with the Twin Line unit has been set up you can also
- load device data from the Twin Line unit
 - write device data to the Twin Line unit
 - position the motor using the software and the PC
 - simulate command processing in field bus mode
 - record movement data
 - observe and set parameters in the controller structure
 - optimize controller settings interactively
 - perform device diagnostics
 - evaluate and reset error messages

4 Transferring device data

4.1 File → Open...

You do not need a data connection to load any device file into the PC memory from the data storage medium and edit it. If a data connection does exist, you will only be able to open a device file when it is compatible with the connected Twin Line unit.

Device files have the file extension '.TLX'.

Opening the device file

- ▶ Select 'File → Open' or click on the 'Load device data from file' button in the 'Device selection' window

A dialog box now opens where you can select a device file.

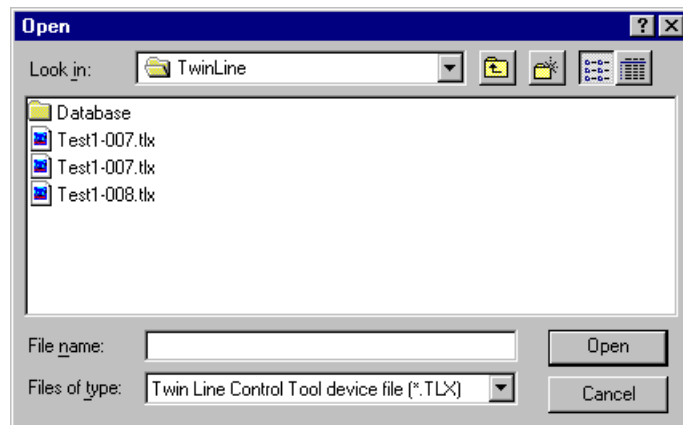


Fig. 4.1 Dialog box for loading a file from the PC

- ▶ Select a device file and confirm this by clicking on the 'Open' button. The file is loaded into the PC memory.

Compatible device file

If a data connection does exist, the program will check to see whether the device types in the file are compatible with that in the Twin Line unit. If this is the case, the new values are read in from the file and the existing parameter values in the PC memory overwritten.

If the device types are not compatible, the program will display an error message and abort the loading process without modifying the current data in the PC memory. Before you repeat the loading process, you should shut down the data connection to the unit.

4.2 File → Save

Device data can be saved in a file on the PC's data storage medium in order to archive them for service or maintenance purposes or, for example, to use the data copy to get other units into operation fast.

After putting your Twin Line unit into operation you should always create a back-up file of the device data. This will allow you to get your Twin Line unit back into operation immediately after repairs.

Backing up the device file

- ▶ Select 'File → Save' or 'File → Save as...'.
 - 'File → Save' updates the contents of an existing file without further acknowledgement.
 - With 'File → Save as...' you can back up device data from the PC memory to a new file. In this case a file dialog box: opens

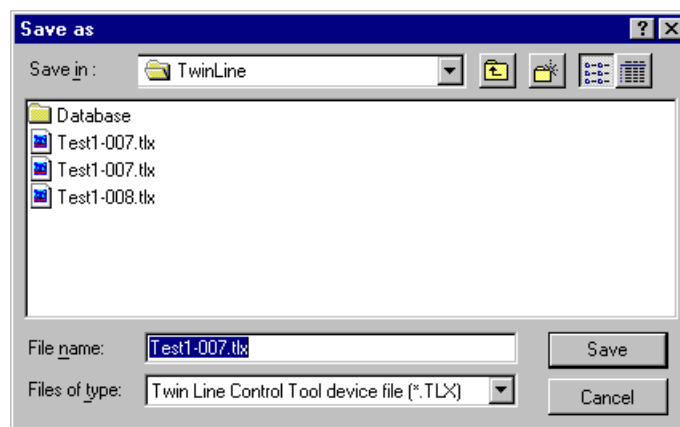


Fig. 4.2 Dialog box for saving data on the PC

- ▶ Type in a name for the new device file and confirm this by clicking on the 'Save' button. The file will now be saved to the data storage medium.

If the data storage medium already holds a file with the same name, a message will tell you that the data in the existing file will be overwritten if you go ahead. You can abort now and save the data under a different name.

Checking the range of values

Before actually saving the data the Twin Line Control Tool checks to see whether the values fall within the valid range of values.

4.3 Connection → Establish

The device data of a connected Twin Line unit are automatically loaded into the PC memory as soon as a data connection is established.

Establishing the data connection

- ▶ Switch on the 24 V power supply to the Twin Line unit. The data cable must be connected to the PC.
- ▶ Select 'Connection → Establish' or click on the 'Establish' button on the control bar.

The 'Device selection' window with a list of the connected devices is displayed.

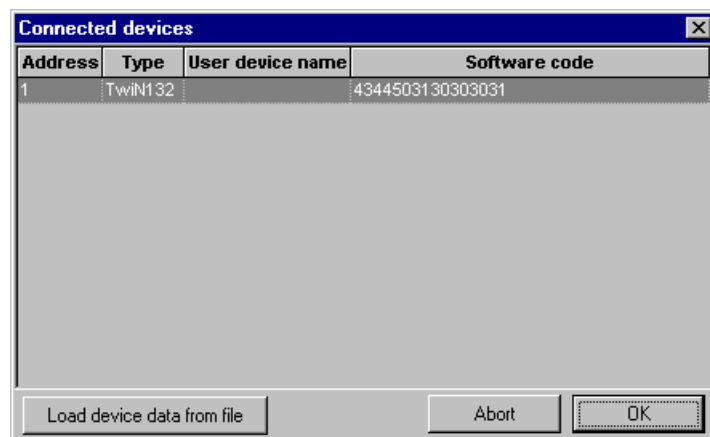


Fig. 4.3 Device selection

- The Twin Line Control Tool uses the **address** to identify the connected units and displays all Twin Line units which return a device code. Via the RS232 interface you can only set up a connection to a single device. Various bus addresses are relevant to field bus operation. The search range for bus addresses can be limited under 'Edit → Options'.
- The device type should be specified under **type**.
- The **user device name** can be used for identifying a device. This name may have no more than eight characters and can be specified with four character in each case in the parameters 'Settings.name1' and 'Settings.name2'.
- **Software code** is specified for service purposes.
- The **Load from file** button opens a file dialog box which allows you to load device data from a file. See page 4-1.

If no devices are displayed, check to see whether there is a data connection to the Twin Line unit and the 24 V power supply to the unit is switched on.

- ▶ Select a Twin Line unit from the list and confirm with 'OK'. The connection to the device will be established and the device data loaded into the PC memory.

Compatible device data If there is already an open file, the program will check to see whether the device data of the open file are compatible with those of the unit. If so, the device data will be read in. If the device data are not compatible, the program will tell you that the current data should be saved before new data are read into the PC memory from the device.

If the values in the PC memory differ from those in the Twin Line unit, the values from the PC memory will be retained but will be colour-coded in the same way as modified parameters.

4.4 Connection → Disconnect

Disconnecting the data connection ► Select 'Connection → Disconnect' or click on the 'Disconnect' button on the control bar.

Data transmission is interrupted. The data loaded into the PC are retained.

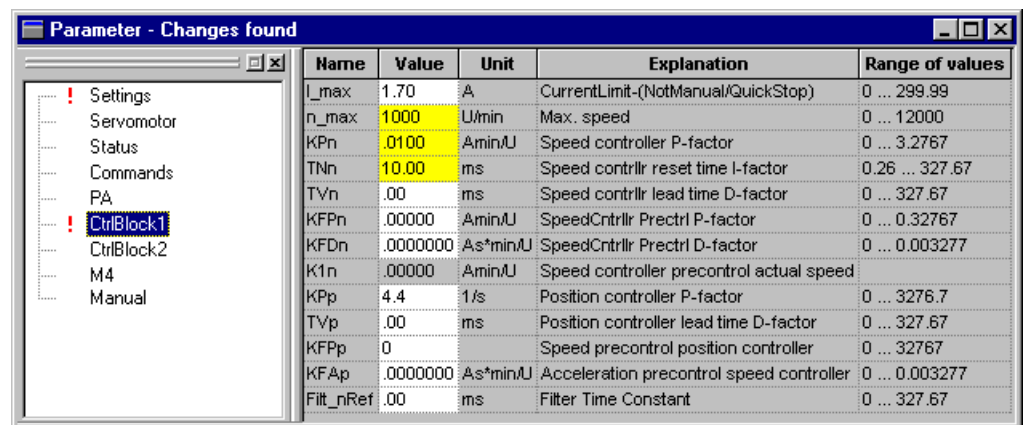
5 Configuring

5.1 Twin Line → Configuring

The device data of a Twin Line unit can be changed within the 'Parameters' window. No data connection to the unit is required for this. The parameter values of a file can be modified in off-line mode and transferred to the unit at a later time.

Opening the parameters window

- ▶ Open the parameters window with 'Twin Line → Configuring' or by clicking on the parameters button on the Twin Line bar.



Name	Value	Unit	Explanation	Range of values
I_max	1.70	A	CurrentLimit-(NotManual/QuickStop)	0 ... 299.99
n_max	1000	U/min	Max. speed	0 ... 12000
KPn	.0100	Amin/U	Speed controller P-factor	0 ... 3.2767
TNn	10.00	ms	Speed contrllr reset time I-factor	0.26 ... 327.67
TVn	.00	ms	Speed contrllr lead time D-factor	0 ... 327.67
KFPn	.000000	Amin/U	SpeedCntrlr Prectrl P-factor	0 ... 0.32767
KFDn	.00000000	As*min/U	SpeedCntrlr Prectrl D-factor	0 ... 0.003277
K1n	.000000	Amin/U	Speed controller precontrol actual speed	
KPP	4.4	1/s	Position controller P-factor	0 ... 3276.7
TVp	.00	ms	Position controller lead time D-factor	0 ... 327.67
KFPp	0		Speed precontrol position controller	0 ... 32767
KFAP	.00000000	As*min/U	Acceleration precontrol speed controller	0 ... 0.003277
FiltnRef	.00	ms	Filter Time Constant	0 ... 327.67

Fig. 5.1 The 'Parameters' window with the parameters of a TLD132 Twin Line unit

The 'Parameters' window shows the device data on the left, subdivided into parameter groups, and on the right the parameters of the selected group.

'Parameters' tools bar

You can use the icons on the tools bar to control data exchange with the device. The same commands can also be activated via the 'Parameters' menu.

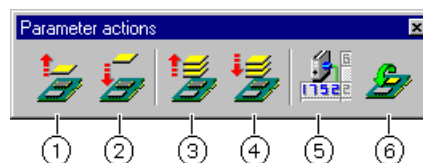


Fig. 5.2 Icons for transmitting and setting the parameter groups

- ① **Uploading parameter groups:** Loads the values of a parameter group into the PC memory from the device RAM
- ② **Downloading parameter groups:** Transfers the values of a parameter group into the device RAM from the PC
- ③ **Uploading all parameters:** Loads all of the device data into the PC.
- ④ **Downloading all parameters:** Transfers all of the device data into the device RAM
- ⑤ **Loading the factory setting:** Resets all parameter values to the factory setting
- ⑥ **Saving to EEPROM:** Copies parameter values from the device RAM into EEPROM.

Parameter groups Which parameter groups are displayed will depend on the device type and module configuration. With all Twin Line units for controlling AC synchronous servomotors these parameter groups are found

- **Settings** for the settings of general device functions
- **PA** for power amplifier: power amplifier parameters
- **Servomotor** with motor-specific settings
- **CtrlBlock1** with settings for control set 1
- **CtrlBlock2** with settings for the control set 2

Depending on the modules configuration and device type, parameter groups for various operating modes and functions are displayed.

- **Manual**, parameter settings for manual operating mode
- **Motion**, parameters for normalization, software limit switch and movement profile curve setting as well as reversal of direction of rotation
- **Gear**, parameter for the 'Electronic gearbox' operating mode
- **Home**, referencing parameters
- **List**, parameters for list processing
- **Record**, setting for record mode
- **Set**, settings for movement data records
- **Oscillator**, parameter for oscillator mode
- **CurrentControl**, parameter for current control.

Depending on the modules fitted to the Twin Line unit, the parameter groups for the modules will also be displayed if the corresponding values can be set:

- **M1**, settings for modules in slot M1
- **M2**, settings for modules in slot M2
- **M3**, settings for the module in slot M3
- **M4**, settings for modules in slot M4

The display boxes for parameter groups can be hidden or positioned as a separate window.

Parameters of a group For the selected parameter group the parameters window shows the values, the identifiers and the meaning of the parameters.

The value of a parameter can be changed in the 'Value' column. Values on a grey background are read-only and cannot be changed.

Values which have been changed but not yet transferred to the device are displayed by the Twin Line Control Tool with a coloured background. At the same time the corresponding parameter group is marked with an explanation mark. As soon as the values have been successfully transferred to the device, these markers are removed.



If there does not appear to be any colour difference between configurable, modified values or read-only values, check your Windows default settings for the colours allocated to the different parts of windows. They must not be set to the same colours.

5.2 Changing parameter values

The Twin Line Control Tool provides entry boxes and list boxes to allow you to change values.



Fig. 5.3 Changing parameter values via entry boxes or list boxes

Entry boxes are used for inputting new parameter values.

- ▶ Click inside the entry box of a parameter and type in the new value. The limit values of the parameter will be displayed on the status line.

List boxes provide you with different ways of setting a value.

- ▶ Click on the list box of a parameter and select the new value or switch a selection field on or off.

A modified value is accepted in the PC memory as soon as the cursor changes the area or the parameter group. Modified parameter settings are retained after the parameters window is closed.

Checking the range of values

Device data are checked before and after transmission. Before data transmission to the Twin Line unit, the Twin Line Control Tool checks to see whether the values fall within the valid range of values.

If device data have been transmitted, the Twin Line unit will also check whether the ranges of values of individual parameters are illegally affecting each other.

In either case the program will inform you and display the parameters in question. A transmission in progress will be aborted. All parameter values which have been transferred up until then will be retained updated in the device RAM.

6 Positioning

With the Twin Line Control Tool you can control the movement of the motor in different operating modes. Depending on the configuration and functional scope of the connected Twin Line unit, various operating modes will be available for positioning.



Automatic operating modes which are implemented via the pulse / direction interface or the ± 10 V analogue output are controlled by the Twin Line Control Tool via index cards under 'Twin Line → Diagnosis → Device hardware'.

Before you can select an operating mode, various conditions must be met. The controller manual for the Twin Line unit provides information on device-specific settings in the section on changing operating modes. The requirement applicable to all devices is:

- There must be a data connection to the Twin Line unit.
- The Twin Line unit is ready. The status display indicates readiness by displaying '4' and '6'.
- You cannot change an operating mode if the Twin Line unit is being controlled via a different input device. Activation of the operating mode via the Twin Line Control Tool is not permitted until movement is completed.

Depending on the device type, the following applies as well:

- The AUTOM input signal at the Twin Line unit must be set to low for a manual run and to high level for the other operating modes. Devices without the AUTOM signal will change between manual movement and automatic operation without additional signals.
- In the case of field bus devices, the local access authorization must not be blocked. If it is, the Twin Line Control Tool will not be able to select an operating mode.
- For absolute positioning in point-to-point mode, a reference point must first be defined.

6.1 Twin Line → Positioning

For each operating mode the Twin Line Control Tool displays a specific index card for operating and inputting values. Each operating mode is implemented via its own index card. The Twin Line Control Tool displays only index cards for the operating modes supported by the connected Twin Line unit.

Device monitoring During motion, the software runs a cycle monitoring the data connection to the device. If the connection cable between device and PC comes loose, the motor stops within the cycle time. The monitoring cycle time can be set under 'Process → Options'.

Starting positioning ▶ Select 'Twin Line → Positioning' or the 'Positioning' icon on the Twin Line bar. The 'Positioning' window appears.

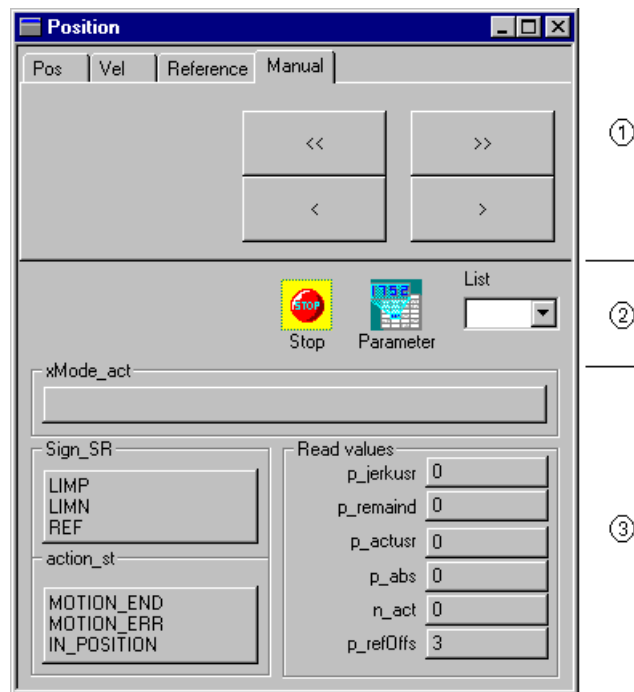


Fig. 6.1 'Positioning' window, here for TLC5xx device data

The window is divided into three parts:

- ① Index cards for selecting an operating mode or function and for the settings of specific movement parameters
- ② Buttons for setting controls and parameters, and for selecting lists or sets in the selected operating mode
- ③ Current operating status

You can change between the index cards in the positioning window without this affecting an operating mode which is currently active.

Index cards Every operating mode is selected by means of its own index card. Index cards and initiating an operating mode are described in the section on index cards from page 6-4.

Buttons for positioning

The buttons are used for starting an operating mode, stopping the motor, calling up the parameter group for the operating mode selected and for activating a list.

Only the buttons relevant for the selected operating mode are displayed. They are always displayed in the middle of the window.

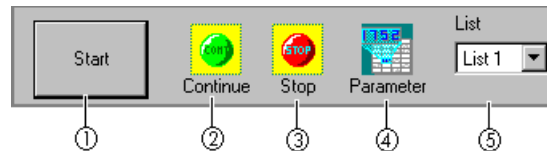


Fig. 6.2 Buttons in the 'Positioning' window

- ① The **Start** button triggers a movement command to the automatic operating mode selected. Values which have been inputted in the index card entry fields are first transmitted to the device.
- ② The **Continue** button is displayed in point-to-point positioning for resuming an interrupted movement.
- ③ The **Stop** button interrupts the current job and stops the motor.
- ④ The **Parameters** button opens the parameter window for the selected operating mode. Operating mode settings can be checked, changed and transmitted to the device on the spot.
- ⑤ The selection box **List** contains all lists actually set in the device. The listing mode is switched off by selecting the inactive mode.

Current operating status

The current operating status of the Twin Line unit is displayed in the bottom section of the window.

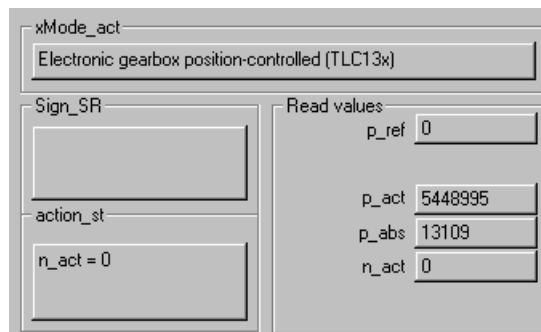


Fig. 6.3 Operating status display

The **xMode_act** field shows the current operating mode.

Sign_SR reports any external monitoring signals which caused a reaction in the device. These include

- LIMP, positive limit switch
- LIMN, negative limit switch
- STOP, stop signal initiated
- REF, reference switch signal activated. The reference switch signal is only found with Twin Line units with referencing capability.

The signal level of these signals can be reversed with the 'Settings.Sign-Level' parameter. With 'Settings.SignEnabl' you can switch out the signals individually.

action_st displays the movement status. Should a device error occur, the error class of the error will be shown here. All displays for this field are listed under 'Status.action_st' in the parameter list of the controller manual.

The **Read values** field contains the current settings for different movement data in the current operating mode.

Parameters display	Explanation
p_ref	Setpoint of the position controller [inc]
p_refJerk	Actual position of the movement profile generators [usr]
p_remaind	Residual value of the position normalization of the position setpoint p_ref [inc]
p_act / p_actusr	Motor position [inc]
p_actusr	Actual position of the motor [usr]
p_abs	Absolute position per motor revolution [inc]
n_act	Actual speed [rpm]
p_refOffs	Actual position of the offset positioning in the electronic gearbox [inc]

More information on the parameters will be found in the 'Status' parameter group in the parameter list in the controller manual.

6.2 Index cards

The index cards and operating modes are explained on the following pages:

- Pos index card under 'Point-to-point operation', page 6-5
- Vel index card under 'Speed mode', page 6-6
- El. Gear index card under 'Electronic gear', page 6-7
- Reference index card under 'Referencing', page 6-8
- Set index card under 'Set operation', page 6-10
- Manual index card under 'Manual movement', page 6-9
- "Oscillator" tab in 'Oscillator mode', Page 6-11
- "Current control" tab in 'Current control', Page 6-12.

6.2.1 Point-to-point operation

In point-to-point operation, a positioning command is used to move the motor from a point A to a point B. The positioning distance is given in absolute terms with reference to the axis zero point, or in relative terms with reference to the current position of the axis.

This operating mode is available with Twin Line devices TLC4xx, TLC5xx and TLC6xx. Details on the operating mode can be found in the manual in the chapter on operating modes.

Before absolute positioning can be carried out, the reference must be defined by a referencing process, see page 6-8.

Selecting the operating mode

- ▶ Click on the 'Pos' tab.



Fig. 6.4 The 'Pos' tab

- You can set the following values on the index card:
- Distance to the **Target Position** in user-defined units
- Selection of **Absolute** or **Relative** positioning
- **Setpoint Speed** in user-defined units.

By selecting the 'ok' button, you transmit a new value during the positioning process. The device uses the new value immediately.

Starting a movement command

- ▶ Switch on automatic mode and enable the amplifier via 'Twin Line → switch on amplifier'.
- ▶ Enter a value for the distance to the target position, and select the Absolute or Relative positioning mode.
- ▶ Enter a value for the setpoint speed, and press 'ok' to send it to the control unit.
- ▶ Start the movement by pressing the 'Start' button.

Continuing point-to-point operation

A positioning process which has been interrupted on its way to the target position can be resumed when the cause of the interruption has been removed.

- ▶ Click on the 'Continue' button to continue and finish the positioning operation.

6.2.2 Speed mode

In speed mode, the motor is given a setpoint speed, and a movement is initiated with no target position. The motor moves at this speed until it receives another setpoint speed or the operating mode is terminated.

This operating mode is available with Twin Line devices TLC4xx, TLC5xx and TLC6xx. Details on the operating mode can be found in the manual in the chapter on the operating modes.

Selecting the operating mode ▶ Click on the 'Vel' tab.



Fig. 6.5 The 'Vel' tab

Set the new setpoint speed in user-defined units in the **Target Speed** field on the index card.

Starting speed mode ▶ Switch on automatic mode and enable the amplifier via 'Twin Line → switch on amplifier'.
▶ Activate the operating mode by pressing the 'Start' button.

Changing speed ▶ Enter a new setpoint speed in user-defined units.
▶ Accept the new speed by pressing the 'Start' button. The motor responds immediately to the new value.

6.2.3 Electronic gear

In the Electronic gear operating mode, the Twin Line device calculates a new position setpoint for the motor movement from a predefined position and an adjustable gear ratio. This operating mode is used when one or more motors are to take their position control from the reference signal from an NC control unit or encoder.

This operating mode is available with Twin Line devices TLC5xx and TLC6xx if a module for feeding position setpoints is inserted in slot M1. Details of the operating mode can be found in the manual in the chapter on operating modes

Selecting the operating mode

- ▶ Click on the 'El. gear' tab.

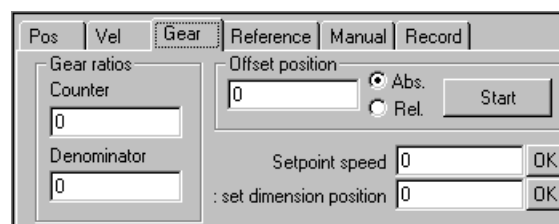


Fig. 6.6 The 'El.Gear' tab

- ▶ You can set the following values on the index card:

- **Gear ratio** with numerator and denominator
- the absolute or relative distance in internal units [Inc] for offset positioning

The **Start** button activates an offset positioning operation. The current positioning operation is not interrupted.

- **Setpoint speed** for offset positioning
- a new absolute position value as a starting point for an offset positioning process using **Offset Dimension Setting Position**.

By pressing the 'ok' button, you transmit the new value which is immediately used by the device even during a positioning operation.

Initiating the Electronic Gear operating mode

- ▶ Switch on automatic mode, and enable the amplifier via 'Twin Line → switch on amplifier'.
- ▶ Activate the operating mode by pressing the 'Start' button, and enter pulses via the module interface

Offset positioning

- ▶ Set offset values for position and speed. Select absolute or relative positioning, and enter an absolute offset position under 'Offset Dimension Setting Position'.
- ▶ Activate the superimposed positioning process by pressing the 'Start' button.

6.2.4 Referencing

In the referencing operating mode, an absolute dimension reference is created between the motor position and the defined axis position. Referencing can be carried out by reference movement or dimension setting.

This operating mode is available with the Twin Line devices TLC4xx, TLC5xx and TLC6xx. Details on the operating mode can be found in the manual in the chapter on operating modes.

Selecting the operating mode ▶ Click on the 'Reference' tab.

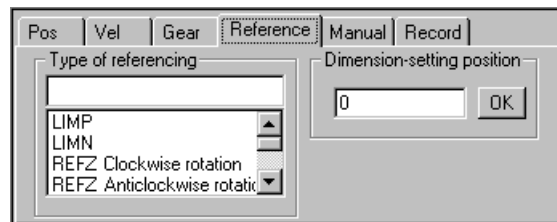


Fig. 6.7 The 'Reference' tab

In the **Type of Referencing** field on the index card, you can choose between four reference movements with or without an additional reference movement to the motors index pulse.

- LIMP: Movement to positive limit switch
- LIMN: Movement to negative limit switch
- Movement to reference switch REF with first movement in a positive direction of rotation
- Movement to reference switch REF with first movement in negative direction of rotation.

In the **Dimension Setting Position** field, an absolute position can be given as a reference point and transmitted to the device by pressing the 'ok' button.

If you select the list value 'Dimension setting the indexer position' in the **Type of Referencing** field, you can give an absolute position as a reference point under **Dimension Setting Position**. This value is transmitted to the device by pressing the 'ok' button.

- Initiating referencing*
- ▶ Switch on automatic mode, and enable the amplifier via 'Twin Line → witch on amplifier'.
 - ▶ Select a type of referencing, and activate the operating mode by pressing the 'Start' button.
- or
- ▶ Enter a value in user-defined units in the 'Dimension Setting Position', and transmit it to the device as a new reference point by pressing 'ok'.

6.2.5 Manual movement

The motor is moved at slower or faster manual speeds with the use of buttons.

Details on the operating mode can be found in the manual in the chapter on operating modes

Selecting the operating mode ► Click on the 'Manual' tab.

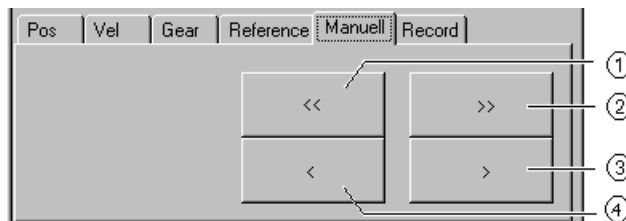


Fig. 6.8 The 'Manual' tab

The control buttons for motor movement are displayed:

- ① Fast manual movement with motor turning clockwise
- ② Fast manual movement with motor turning anticlockwise
- ③ Slow manual movement with motor turning anticlockwise
- ④ Slow manual movement with motor turning clockwise.

Starting manual movement ► Switch off automatic operation and enable the power amplifier by clicking on 'Twin Line → Switch on'.

► Click on one of the buttons, holding the mouse button down to move the motor at the slow or fast manual movement speed.

As soon as the button is no longer being activated, the Twin Line unit brakes the motor to a stop.

6.2.6 Set operation

Selecting the operating mode The motor is moved in point-to-point or speed mode in accordance with a previously programmed set data list.

This operating mode is available with TLC4xx and TLC6xx Twin Line devices. Details on the operating mode can be found in the manual in the chapter on operating modes.

- ▶ Click on the 'Set' tab



Fig. 6.9 The 'Set' tab

The movement set with which set operation is to start, is given under **Set Number**.

The movement sets must be programmed beforehand, see the 'List and set processing' chapter from page 7-1.

- Initiating set processing*
- ▶ Switch on automatic operation, and enable the amplifier via 'Twin Line → witch on amplifier'.
 - ▶ Enter a set number and start set operation by pressing the 'Start' button.

6.2.7 Oscillator mode

You can set a voltage-dependent rpm via the analog input of the motherboard. When the input voltage changes, the drive is accelerated or slowed down to the new setpoint rpm. Acceleration and deceleration values are declared in the parameters "Motion.acc" and "Motion.dec". Various parameters are available for the "Oscillator mode" in the object area "Oscillator" (Index: 51).

Operating modes can be selected via the Twin Line devices TLC5xx and TLC6xx. For detailed information on operating modes refer to the chapter on operating modes in the device user manual.

Selecting the operating mode

- Click on the "Oscillator" tab.

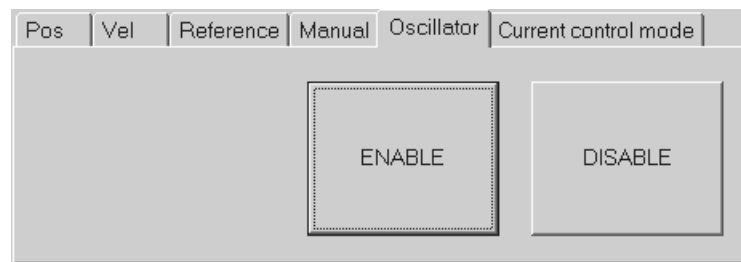


Fig. 6.10 The "Oscillator" tab

Starting and terminating oscillator mode

In the tab, activate or deactivate the operating mode by clicking on the **Enable** or **Disable** button.

6.2.8 Current control

The "Current control" mode can be used to influence torque mode. When you start this operating mode, you can select whether to determine the setpoint via the analog input (+/- 10 Volt) or via parameter. If you select the analog input to determine the setpoint, the drive reacts in current control mode, same as with the Twin Line devices TLD13x. Various parameters are available for "Current control" mode in the object area "CurrentControl" (Index: 50).

You can select operating modes via the Twin Line devices TLC53x and TLC63x. For detailed information on operating modes refer to the chapter on operating modes in the device user manual..

Selecting the operating mode

- ▶ Click on the "Current control" tab.

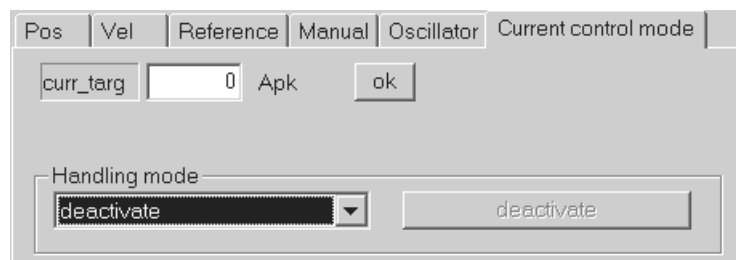


Fig. 6.11 The "Current control" tab

- ▶ In this tab, you can enter the following values:

- In the **Edit Mode** selection box, you can determine whether to disable the operating mode or to determine the setpoint via analog input or parameters. Click on the **disable** button if you want to switch off the current control.
- If the setpoint is to be determined by parameters, you must declare the parameter value in **curr_targ** "CurrentControl.curr_targ". Confirm your entry with **OK**.

Starting current control

- ▶ Select the edit mode. Either enter the parameter value and confirm your entry with OK or make provisions to ensure that the analog input receives the correct signal.
- ▶ click on the "Start" button to start the current control.

7 List and set processing

Depending on the device type, you can process two different lists with list and set processing:

List 1 and List 2 for list-driven operation with TLC5xx Twin Line units.

Set data list for set operation with TLC4xx and TLC6xx Twin Line units.



The menu items for list and set processing are only active when the open device data file supports list-driven operation or set operation. This applies, for example, to device data for TLC4xx, TLC5xx and TLC6xx Twin Line units.

- ▶ Start list and set processing with the Line Control Tool in the Twin Line menu via:
 - 'Twin Line → Position lists → Process': Create and process list entries manually.
 - 'Twin Line → Position lists → Teach In': Enter position data interactively by positioning the motor, and complete missing list data manually.

7.1 Twin Line → Position lists → Process

- Start list processing*
- ▶ Select 'Twin Line → Position lists → Teach In' or 'Twin Line → Position lists → Process'. In both cases the 'List processing' window is opened.

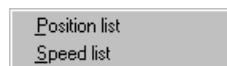


Fig. 7.1 'List processing' window

If you have selected the teach-in function via 'Twin Line → Position lists → Teach In', the positioning window for interactive capture of position values also opens.

'List data processing' toolbar

The functions for list and set processing can be activated via the List data processing menu or via the List data processing toolbar. You will find a description of the menu items in the 'The Twin Line Control Tool menu' chapter from page 13-1.

The toolbar can be turned on and off via the menu item 'View → List processing toolbar' toolbar.



Fig. 7.2 List data processing buttons

- ① **Upload:** load list data from Twin Line unit into PC
- ② **Download:** transfer list data from PC to the Twin Line units RAM
- ③ **Take over:** Take over value of a position which has been approached via teach-in
- ④ Activate **List 1**
- ⑤ Activate **List 2**
- ⑥ Set position / **signal list**
- ⑦ Set position / **speed list**
- ⑧ Save list data permanently in **units EEPROM**
- ⑨ **Parameter:** Display and edit parameter values for the Twin Line device

'Data set data processing' toolbar

The functions for list and set processing can be activated via the Data set data processing menu or via the Data set data processing toolbar. You will find a description of the menu items in the 'The Twin Line Control Tool menu' chapter from page 13-1.

The toolbar can be turned on and off via the menu item 'View → List processing toolbar' toolbar.

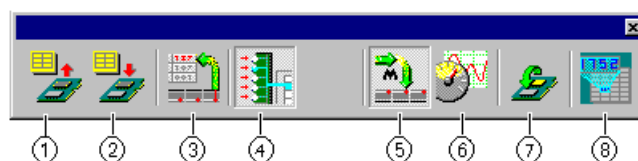


Fig. 7.3 List data processing buttons

- ① **Upload:** load list data from Twin Line unit into PC
- ② **Download:** transfer list data from PC to the Twin Line units RAM
- ③ **Take over:** Take over value of a position which has been approached via teach-in
- ④ Activate **set data list**
- ⑤ Set **position list**
- ⑥ **Set speed list**
- ⑦ Save list data permanently in **units EEPROM**
- ⑧ **Parameter:** Display and edit parameter values for the Twin Line device

List display The list and set processing values are entered in the list fields and accepted. The function of the list columns varies according to the type of list selected. Only the last column, 'Comments', is shown in all list displays. Use this column to enter brief information on each position value.

7.1.1 Processing list 1 and list 2

- ▶ Click on the 'List 1' or 'List 2' button

Two lists can be programmed for list-driven operation. For each list, the list type must be specified:

- Position / signal list: The signal interfaces output signal TRIGGER is switched low or high according to the list entry, when the motor has reached the programmed list position.
- Position / speed list: The speed is changed in accordance with the list entry when the motor has reached the programmed list position.

Selecting the position / signal list

- ▶ Click on the 'Signal List' button to switch the current list to the position / signal list.

	Position	Signal	Commentary
1	0	0	
2	1000	1	
3	34000	0	
4	34100	1	
5	50450	0	
6	50460	1	
7	0	0	
8	0	0	

Fig. 7.4 Position / Signal list, here for list 2

Select a list position and enter the signal status and position value in user-defined units.

Selecting position / speed list

- ▶ Click on the 'Speed list' button to switch the current list to position / speed list.

	Position	Speed	Commentary
1	0	0	
2	200	1000	
3	140500	120	
4	200000	1500	
5	380000	500	
6	400000	1500	
7	620000	120	
8	620200	10	
9	620500	0	
10	0	0	

Fig. 7.5 Position / Speed list, here for list 1

- ▶ Select a list position and enter position and speed value in user-defined units.

7.1.2 Processing set data

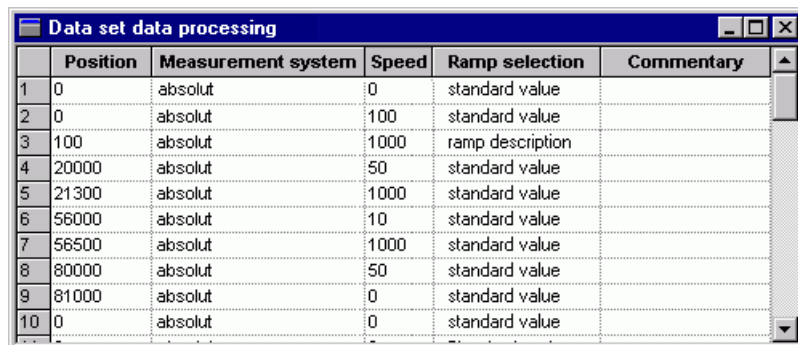
- ▶ Click on the 'set data' button

A set data list can be programmed for set operation. The set data list type must be set before values are entered:

- Position list: The programmed movement command is processed in point-to-point operation.
- Speed list: The programmed movement command is carried out in speed operation.

Selecting the position list

- ▶ Click on the 'Position list' button to enter the movement data for the point-to-point operation.



	Position	Measurement system	Speed	Ramp selection	Commentary
1	0	absolut	0	standard value	
2	0	absolut	100	standard value	
3	100	absolut	1000	ramp description	
4	20000	absolut	50	standard value	
5	21300	absolut	1000	standard value	
6	56000	absolut	10	standard value	
7	56500	absolut	1000	standard value	
8	80000	absolut	50	standard value	
9	81000	absolut	0	standard value	
10	0	absolut	0	standard value	

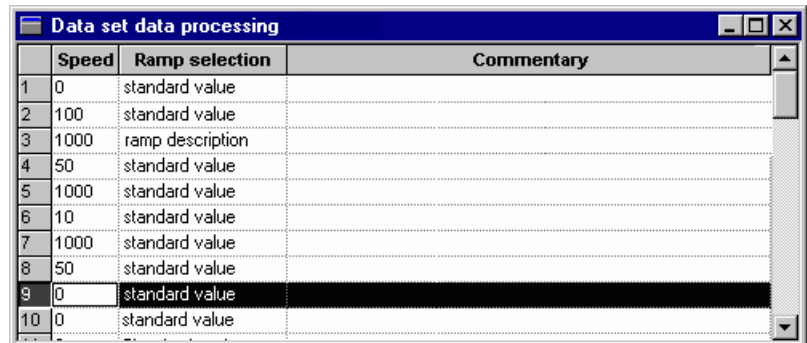
Fig. 7.6 Position list for set data

- ▶ Select a list position and enter position value and setpoint speed in user-defined units. Specify the dimension system for absolute or relative positioning.

You can also select one of three acceleration or deceleration ramps.

If a list position shows the speed value '0', the Twin Line unit switches over to the setpoint speed 'motion.v_target0' (29:23).

- Selecting the speed list* ▶ Click on the 'Speed list' button to enter the movement data for speed operation.



	Speed	Ramp selection	Commentary
1	0	standard value	
2	100	standard value	
3	1000	ramp description	
4	50	standard value	
5	1000	standard value	
6	10	standard value	
7	1000	standard value	
8	50	standard value	
9	0	standard value	
10	0	standard value	

Fig. 7.7 Speed list for set data

- ▶ Select a list position and enter the position value and setpoint speed.

You can also select one of three acceleration or deceleration ramps.

7.2 Twin Line → Position lists → Teach In

In the teach-in function, position values can be directly approached and transferred to the current list field.

Buttons, menu entries and the various list types all work in the same way as for list processing described in the last section.

- Starting teach-in* ▶ Select 'Twin Line → Position lists → Teach In'. The 'List processing and Positioning' windows are displayed.

For the teach-in function, the Twin Line unit must be switched to manual operation, and the motor moved via the 'Positioning' window or via the signal interfaces manual movement signals.

- ▶ Select a list position in the open list.
- ▶ Switch to the 'Manual' index card in the 'Positioning' window, and move the motor to the new target position.
- ▶ Click on the 'Take over' button as soon as the motor has stopped. The current motor position is transferred to the list.

You can enter the other data on the list position directly or after completing the teach-in process, and transfer them to the unit.

8 Command processing

With command processing the Twin Line Control Tool allows you to exchange transmitted and received data with a Twin Line unit as in field bus operation.

Information on command processing via the field bus will be found in the field bus documentation on the Twin Line units. Processing commands with the Twin Line Control Tool will relieve you of a large part of the work needed for data preparation.

8.1 Twin Line → Command processing

Opening the 'Command processing' window

- ▶ Select 'Twin Line → Command processing'. The 'Command processing' window now opens.



Fig. 8.1 'Command processing' window

This window is subdivided into four sections:

- ① Command input
- ② **Preview:** Preview of the encoded command
- ③ **Request / response:** Transmitted and received data
- ④ Received data in decoded form

Inputting commands

A command is eight bytes long. For a command you must input the three following data:

- Byte 1: READ initiates a read access, WRITE a write access of the Twin Line unit
- Bytes 2 and 3: A parameter in the field of the commands is selected which will be sent as a command to the device. The subindex and index for the selected command are displayed above the field.
- Bytes 4 to 8: Values which are passed on with the command. These could be positioning information or bit codings for an output word.

The length of the value is specified as 32, 16 or 8 bits which means that the input value can be matched to the length of the field bus command.

- Send your command to the Twin Line unit with the 'Send' button.

The unit responds by sending an answer back to the PC. The received data are shown in decoded form in the lower section of the window.

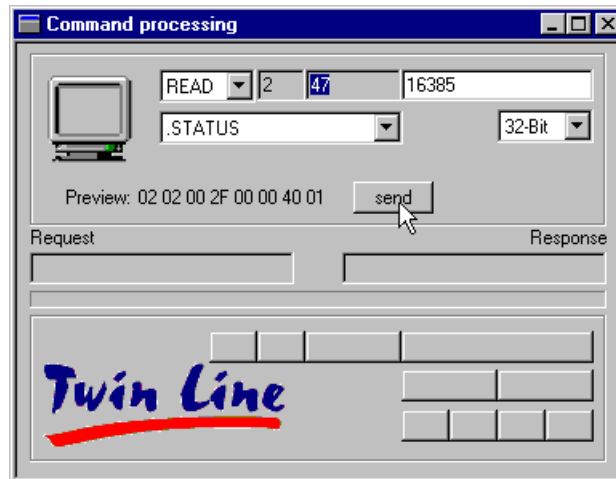


Fig. 8.2 Transmitted and received data

- Byte 1 (here 106): Reception acknowledgement and error information
- Byte 2 (here 2): Information on axis operating mode, referencing and on motor status
- Bytes 3 and 4 (here 47): Status information of the unit
- Bytes 5 up to 8 (here 0): Controller information such as position or speed data or, in the event of a fault, the error number as reply.

Detailed information on the bit-coding of the individual bytes will be found in the field bus manual of the Twin Line units in the section on communication on the field bus.

9 Recording

To allow visualization of device-internal data during movement mode the Twin Line Control Tool provides the 'Recording' function. The Twin Line unit reads movement data into the device-internal recording memory for a defined recording period, transferring the data to the PC once this time period has lapsed. The data are processed in the PC for graphic display and can be displayed as a graph or table.

A recording can be saved as a file and archived for documentation purposes or loaded and printed out.

Recording data can also be acquired in a long-term measurement procedure. Here the Twin Line unit transfers data straightaway to the PC every measurement cycle.

The topics dealt with in this section are:

- 'Twin Line → Recording', page 9-1
- 'Index cards of the 'Recording' window', page 9-2
- 'Preparing for and starting recording', page 9-7
- 'Evaluating recordings', page 9-9
- 'Documenting and exporting recordings', page 9-11

9.1 Twin Line → Recording

Opening the 'Recording' window ▶ Select 'Twin Line → Controller → Recording'. The 'Recording' window opens.

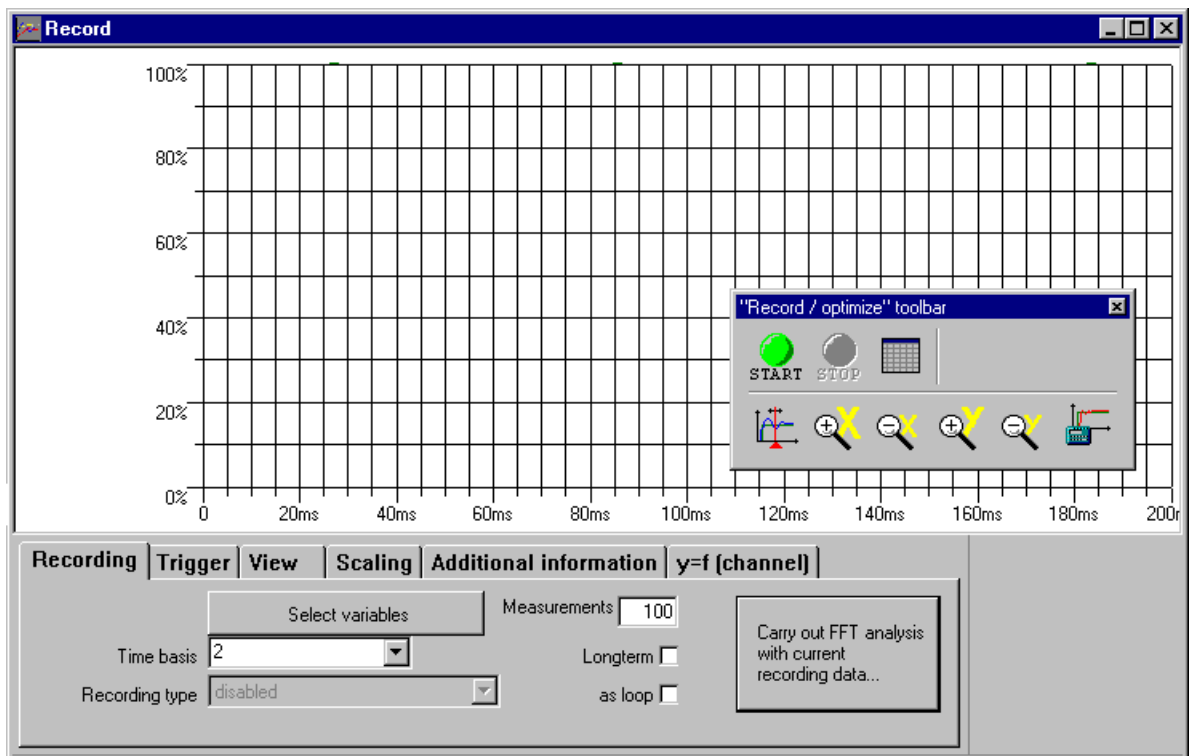


Fig. 9.1 The 'Recording' window

The top part of the window shows the graph with the recording data while the bottom part shows the index cards for setting all recording parameters. The index cards can also be opened via the 'Recording' menu.

Recording data can be displayed as a graph or table. More detailed information will be found under 'Evaluating recordings' on page 9-9.

The 'Recording' tools bar

The recording functions are activated directly via the tools bar in the 'Recording' window. The tools bar can be placed at the edge of the window or anywhere on the screen and displayed or hidden via the menu item 'View → Tools bar'.

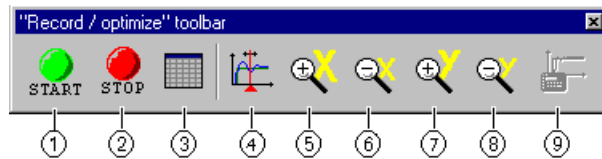


Fig. 9.2 The recording buttons

- ① Start recording
- ② Abort recording
- ③ Display recording data as a table
- ④ Place the reference point on the graph
- ⑤ Zoom in on the x-axis
- ⑥ Zoom out on the x-axis
- ⑦ Zoom in on the y-axis
- ⑧ Zoom out on the y-axis
- ⑨ Start the algorithm for controller optimization

9.2 Index cards of the 'Recording' window

The 'Recording' index card

The Twin Line Control Tool provides various recording values for simpler configuring of a recording. These are input into the 'Recording' index card together with a number of basic settings for a recording.

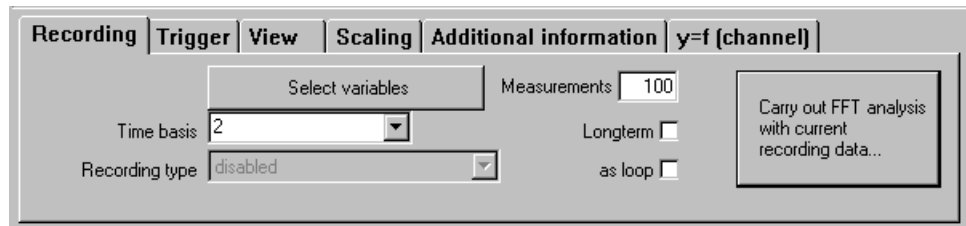


Fig. 9.3 The 'Recording' index card

- Click on the **Select recording values** button to open a window for selecting the recording values. Depending on the device type, between four and ten recording values can be selected simultaneously.

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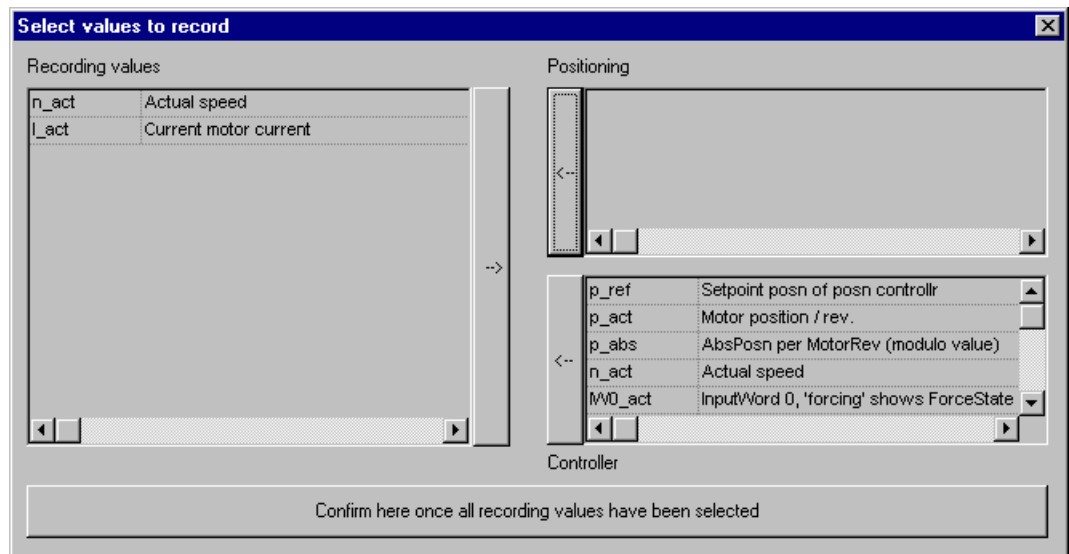


Fig. 9.4 The window for selecting the recording values

The left-hand half of the window contains the values which are to be used for the ensuing recording. The recording values which are available for selection, which depend on the Twin Line device type, are displayed in the two right-hand windows. The top window **Position values** displays values which can be recorded in the unit using a time base greater than or equal to 1 ms. The bottom window **Controller values** shows all of the values which can be recorded even faster than at 1 ms.

You can mark a value in the left-hand or right-hand window and then move it using the arrow buttons to the opposite window. If you attempt to activate more recording values than is permitted, the Twin Line Control Tool will tell you.

Information on the position and significance of the recording values in the controller structure will be found under 'Controller structure and block diagrams' on page 10-1.

- The **time base** expresses the time interval between two measurements. The minimum interval time is specified by the Twin Line unit. The smallest value for the time base is 0.25 ms.

You can select the interval time from the list box or type in a time greater or equal to 1 ms. Values without a unit are given in milliseconds.

- Settings under **Recording type** are only relevant for optimizing the Twin Line unit. The field is not used for recording movement data.
- The maximum value for the number of **measurements** depends on the size of the recording memory in the Twin Line unit and is preset by the unit. With a smaller value you can reduce the recording duration. Recording duration = time base * number of measurements.
- If **extended measurement** is switched on, the Twin Line unit will carry out recording on a continuous basis. The values are transferred directly to the PC after every interval step. The smallest time interval between two recording cycles is limited by the transmission time for sending the data to the PC. Under extended measurement the Twin Line Control Tool changes automatically to the long-term window view with a variable time axis. It is not possible to save an extended recording on the data storage medium.

- When the 'As loop' field is switched on, the Twin Line unit starts another recording as soon as the previous recording has been transmitted to the PC. To stop continuous recording click on the 'Stop recording' button. As soon as a recording has finished, the PC will load and update the graph data.

The 'Trigger' index card The trigger signal starts a recording and is defined on the 'Trigger' index card. The index card is not displayed when an extended measurement has been activated.

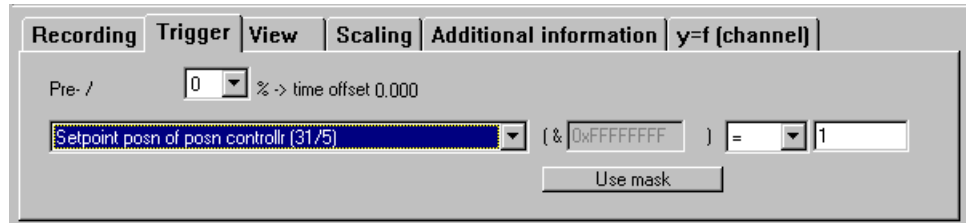


Fig. 9.5 The 'Trigger' index card

The trigger signal is defined as a trigger condition with or without a mask. Recording begins as soon as the specified trigger condition is satisfied. Possible

conditions include:

- **immediately**: Record immediately the start signal is given.
- **= value**: Record as soon as the trigger value changes to the specified numerical value - in the diagram above, this is '1'.
- **< value**: Recording begins when the trigger value is less than the specified numerical value.
- **> value**: Recording begins when the trigger value is greater than the specified numerical value.
- **/= value**: Recording begins when the trigger value and specified numerical value are not equal.

A trigger condition can be expressed as a Boolean operation on the trigger signal and a constant. Let us provide two examples:

- Trigger signal: setpoint speed nref Mask: none or value 0xFFFFFFFF Condition: '> 100'
Recording starts when the setpoint speed 'nref' exceeds the value of 100 rpm.
- Trigger signal: Input word 0: IW0_act Mask: 0x0000000F Condition: '= 0x00000008'
Recording starts when the inputs of the device interface to which bits 0, 1 and 2 are assigned are inactive and the input for bit 3 is active.

Assignment of the inputs in the parameter 'I/O.IW0_act' varies depending on the device type. You will find the assignment for your Twin Line unit given in the controller manual.

Trigger conditions can be set for simple or repeated recordings. The trigger condition is permanently set in the case of extended recording: an 'immediate' start once recording starts.

- With **pre / post-trigger** you can shift the starting point for recording before or after the trigger signal. A negative value starts recording before the trigger signal, a positive one after the signal. Pre-trigger settings are not possible with device types TLD1xx and TLD2xx.
- The starting time is expressed as a percentage of the recording duration. Under **time offset** the value is shown converted into milliseconds.

Example: Time base: 15 ms, Number of measurements: 120, Pre-trigger: -5% Time offset = 15 ms x 120 x -0.05 = -90 ms Recording starts 90 milliseconds before the trigger signal.

The 'View index card Each recording value transmitted by the Twin Line unit to the PC occupies one transmission channel. The diagrammatic presentation of the values can be configured with the 'View' index card.

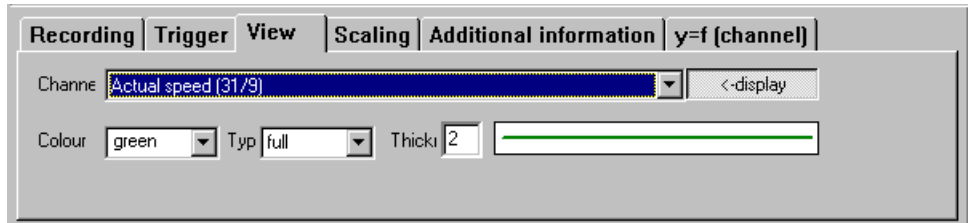


Fig. 9.6 The 'View' index card

- In the **Channel** list box you can select the appropriate recording value. You can only specify recording values which have previously been selected for a recording.
- The **Display** button enables presentation as a graph when it is activated.
- With **Colour, Type and Thickness** you can define how the value is to appear in the diagram. Different kinds of dotted line are only displayed with line thickness '1'.

The 'Scaling' index card You can use the 'Scaling' index card to adjust how recording values are to be presented should they extend beyond the top or bottom of the diagram or be shown too small. .

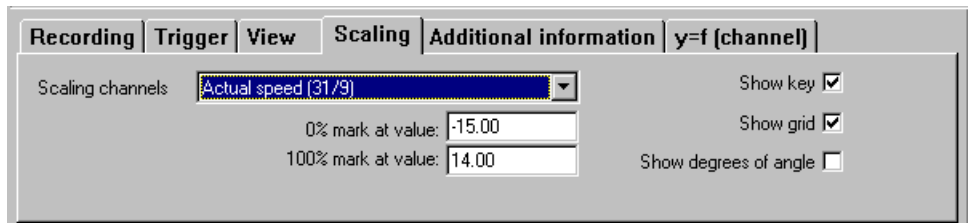


Fig. 9.7 The 'Scaling' index card

- In the **Scaling channels** field you can select the value to whose amplitude the diagram is to be scaled.

The graph shows measured value between the **0% mark** and the **100% mark**. The measured value can be scaled to any value between these two limit values.

Example: The graph shows a speed value with the 0% value '0' and starting at 0 rpm; if the 0% value is '500', this means the graph starts at 500 rpm.

- The graph shows measured values on the X axis in milliseconds. As regards the **Degrees of angle** setting, the diagram shows the data for the time duration of a complete sine cycle in the form of degrees from 0° to 360°.

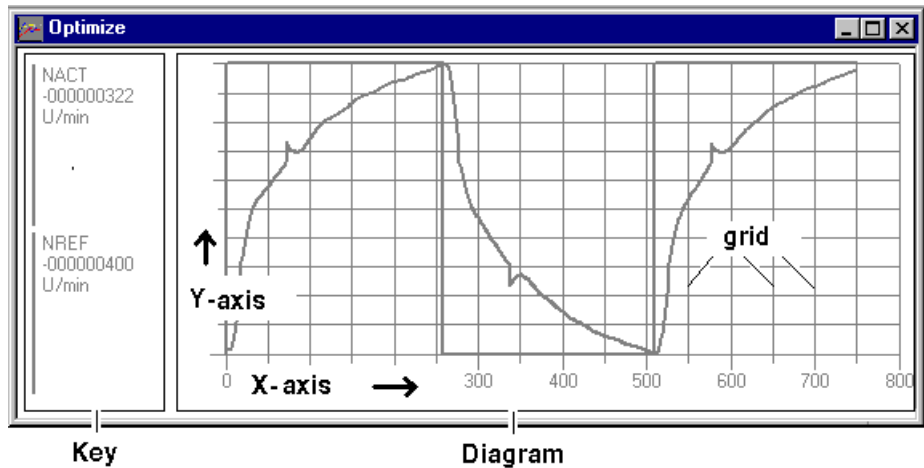


Fig. 9.8 Axes and elements of diagrammatic presentation

- **Grid lines** subdivide the graph with additional vertical lines. This allows you to read off the measured values very precisely.
- The **key** can be displayed on the left of the graph. For every value in the recording it shows
 - the abbreviated name
 - the current value at the position of the cursor in the diagram
 - the unit of the value.

The 'Additional information' index card Information about the documentation of the recording is entered on the 'Additional information' index card.

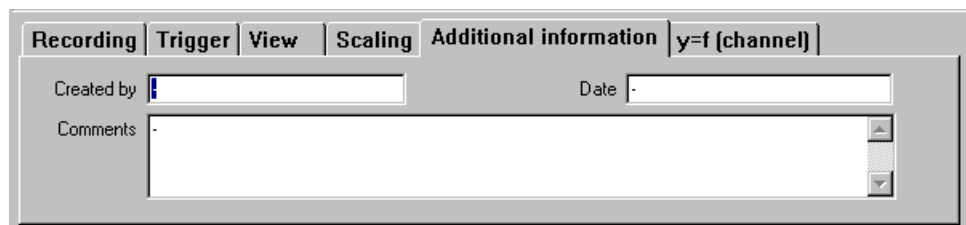


Fig. 9.9 The 'Additional information' index card

The entries appear in the print-out of the recording and are saved in the device file.

The 'y=f (channel)' index card The default setting for the horizontal axis is for time to be shown in milliseconds. The functional dependence of several recording values can be specified on the 'y=f (channel)' index card.

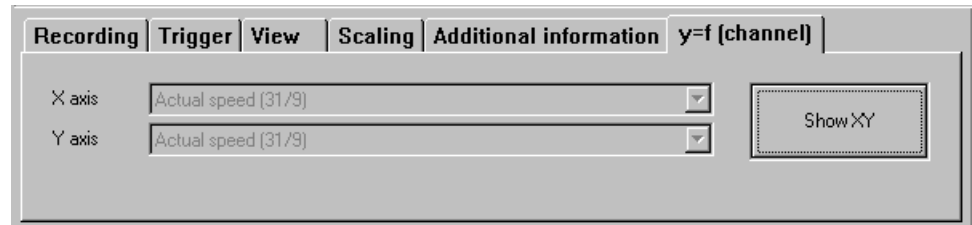


Fig. 9.10 'Y=f (channel)' index card

- If the **Show XY** field is switched on, a value **Y** can be selected and displayed on the vertical axis as a function of the recording value **X** on the horizontal axis.
- Click on the **Show XY** button to switch round the view.

9.3 Preparing for and starting recording

- ▶ Establish a data connection to the Twin Line unit.
- ▶ Open the window for recording via 'Twin Line → Controller → Recording'.

Preparing for recording

- ▶ On the **Recording** index card select the recording values and under 'Time base' specify an interval time for the recording.
- ▶ Set the mode you want for the recording:
 - Record once: Specify the number of measurements for one run-through and switch off the 'Extended measurement' and 'Loop' fields.
 - Continuous measurement: Switch on the 'Extended measurement' field.
 - Repeated recording: Switch on the 'Loop' field and specify the number of measurements for one run-through.
- ▶ Specify the trigger condition on the **Trigger** index card. One simple setting is the condition 'Immediately'. Recording starts as soon as the Twin Line unit receives the request to record.
- ▶ On the **View** index card make sure that every transmission channel is switched on so that the measured value can be acquired and displayed. The colour, line type and thickness of the displayed measured values are preset and do not need to be changed.
- ▶ Fill in the fields on the **Key** index card if you want to save and archive the recording file.

Starting recording ▶ Click on 'Start' to start the recording.

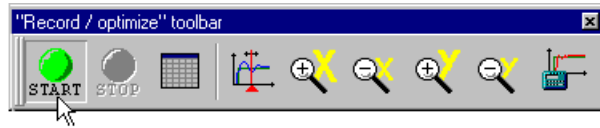


Fig. 9.11 Starting a recording

The presets for the Twin Line unit are transferred at the start of a recording.

Recording in progress While a recording is in progress the 'Start' button is greyed out and the 'Stop' button highlighted. If a trigger condition has been specified the unit will hold recording until this condition has been met.

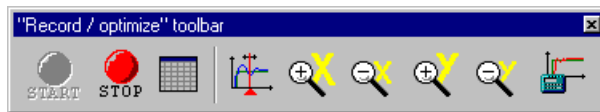


Fig. 9.12 Recording in progress

Recording finished, loading data As soon as the recording is finished both buttons ('Start' and 'Stop') will be greyed out for the duration of data transmission.

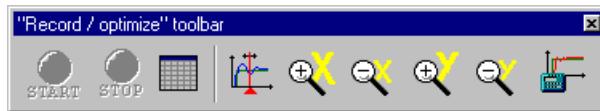


Fig. 9.13 Recording finished, data being loaded

Once the data have been loaded the recording is displayed in the diagram and the 'Start' button changes back to green again. You can now make another recording.

Use the 'Stop' button to stop extended recordings.

Stopping recording ▶ Click on the 'Stop' button to stop a recording which is in progress.

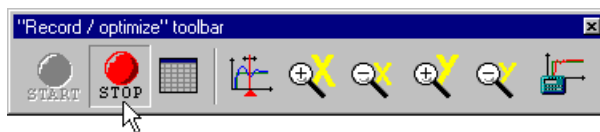


Fig. 9.14 Stopping a recording

Should an error occur during the recording - for example, a dropped connection - the Twin Line unit will abort recording. The Twin Line Control Tool displays an error message with a description of the reason for the error. Once you have corrected the error, start the recording again.

9.4 Evaluating recordings

To allow you to evaluate a recording the Twin Line Control Tool provides you with various processing tools in the graph view:

- Zoom in and out on parts of the graph by axis
- Display or hide the key and the measurement curves
- Measure time intervals in the graph
- Show recordings as a table.

Zooming in or out on the graph

You can stretch or compress the X and Y axes as you like and independently of each other.

- ▶ Use the zoom buttons on the tools bar to activate the zoom functions.

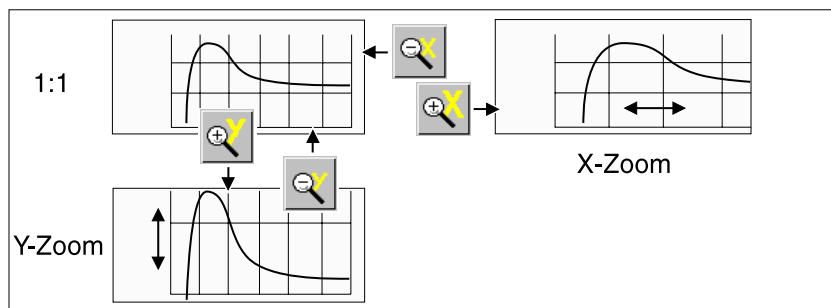


Fig. 9.15 Zoom functions

Displaying and hiding the key and measurement curves

The key on the left of the graph can be displayed or hidden. Measurement curves can be hidden separately and each can also be given its own colour, line thickness and line design.

- ▶ Select 'Twin Line → Controller → Recording', 'View' tab to carry out these actions.

Measuring time intervals

On the status bar the Twin Line Control Tool displays time intervals above a freely definable reference position.

To measure a time interval

- ▶ In the graph click on a starting position for time measurement. The current position is indicated by a vertical red line.
- ▶ Click on the 'Reference cursor' button on the tools bar to select the current position as the reference position for time measurement.

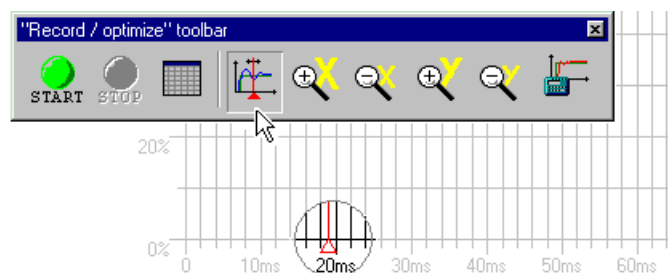


Fig. 9.16 The 'Reference cursor' button and the selected position

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- ▶ Drag the red line onto a second position. The position of the reference cursor is shown by a mark on the X axis. The time intervals are displayed on the status bar.

REF: Time interval from '0' to the starting position

DIFF: Time interval between the starting position and the current cursor position

ABS: Time interval from '0' to the cursor position

The recording as a table A recording can be shown and edited as a table.

- ▶ Click on the table icon

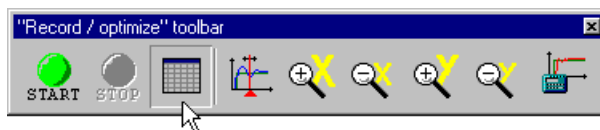


Fig. 9.17 The 'Table' button

A window opens with the recording data displayed as a table.

No.	Time [ms]	NACT	IACT [A]
1	0.000000	3	6
2	2.000000	10	-3
3	4.000000	14	-9
4	6.000000	10	-7
5	8.000000	0	2
6	10.000000	-8	6
7	12.000000	-12	15
8	14.000000	-12	19
9	16.000000	-8	19
10	18.000000	0	12
11	20.000000	7	6
12	22.000000	14	0
13	24.000000	14	-7
14	26.000000	10	-7
15	28.000000	3	0
16	30.000000	-8	6

Fig. 9.18 Tabular display of the recording data

Each line contains the values for one recording interval. These values can be selected and then copied via the clipboard to another Windows application.

If you do not want to transfer all of the values, set up the table accordingly first. You can move rows and columns in the table, and display or hide them.

To shift a row or column:

- ▶ Select the row or column. This is done by clicking in the grey field at the head of the row or column.
- ▶ If you want to select several fields, click on the first field, keep the Shift key pressed down and then click on the last field. The area between will now appear as selected.
- ▶ Move the selected area to its new position by clicking again in the grey field, holding down the mouse button and moving the cursor to the new position. The new insertion point is indicated by a red line as you drag your selection. The rows are then immediately renumbered.

To display or hide rows or columns and to change their height or width:

- ▶ Click between two grey row or column fields and move the cursor in one direction. You can reveal hidden rows or columns by double-clicking between the two fields.
- ▶ You can hide or enlarge several rows or columns simultaneously by selecting them and then carrying out the previous action beneath the selected area.

When you close the table window, the rows and columns will be reset to the default settings.

9.5 Documenting and exporting recordings

Recordings can be saved, loaded, printed out and exported for the purpose of documenting movement curves and device settings, analysing movement data or restoring the settings of a recording .

In none of these cases do you need a data connection to the Twin Line unit.

- Saving*
- ▶ Select 'File → Save as...'. The file dialog box for saving files is now displayed.
 - ▶ Under file name you should input a name for the recording and click on the 'Save' button.

All of the data of the recording are saved to a new device file together with the device data. At the same time the following settings are saved with the recording:

- All entries on the 'Recording' and 'Additional information' index cards
- Scaling factors from the 'Scaling' index card.

- Loading* Recordings can be reloaded with the saved default settings.
- ▶ Select 'File → Open...'. The file dialog box for opening a file will be displayed.
 - ▶ Select the device file with the recording and click on the 'Open' button.

The data are loaded into the PC and can then be processed further. You can also use the loaded recording to carry out new recordings with the same presets.

- Exporting* The recording data can be exported in ASCII CSV format to allow the recorded values to be further processed and analysed in a spreadsheet program. Tables in ASCII CSV format can be imported by most programs of this type.

The ASCII CSV format separates each column of a table row with the semicolon character ';'. Rows of the table are marked by a line break.

To export in ASCII CSV format:

- ▶ Select 'File → Export'. The file dialog box for saving a file is displayed. The setting under 'File type' will be the table format '.csv'.
- ▶ Under 'File name' type in a name for the recording and click on the 'Export' button.

The recording data are saved in the corresponding data format.

To export via the clipboard:

- ▶ In table view select the rows and columns which you would like to export and select 'Edit → Copy'.

The selected data are copied to the clipboard and can be imported with the 'Paste' function of your spreadsheet application.

- Printing*
- ▶ Configure the printer under 'File → Printer set-up...'.
▶ Select 'File → Print...'. A selection window for defining printing data is opened.

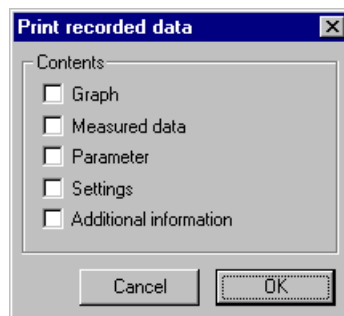


Fig. 9.19 Specifying items for the print-out

- ▶ Select the items which you would like to print out:
 - Graph:** Outputs the recording as a graph
 - Measured data:** Outputs the recording as a table
 - Parameters:** Prints all device data
 - Settings:** Print details of the settings for a 'Recording'
 - Additional information:** Print details of the author, date and comments as entered on the 'Additional information' index card of the 'Record' window.
- ▶ Click on 'OK' to open the Windows printing dialogdialog. Start printing from this window by clicking on 'OK'.

10 Optimizing

The motor and Twin Line unit must be adjusted to each other in the system in preparation for movement mode. A whole series of factors - such as the inertia of moving system components or the rigidity of the components within the flow of force - affects the operating and movement characteristics of the Twin Line unit and the motor when they are in operational use.

The Twin Line Control Tool provides functions for optimizing the Twin Line unit:

- Display the open- and closed-loop control circuits under 'Controller structure and block diagrams', page 10-1
- 'Inputting parameters in the block diagram', page 10-3
- 'Twin Line → Controller → Optimize' page 10-4.

10.1 Controller structure and block diagrams

Opening window ► Select 'Twin Line → Controller → Controller structure' or click on the 'Controller' icon on the Twin Line bar. The 'Controller structure' window opens.

The block diagram shows the signal structure and the parameters of the connected Twin Line unit for the current operating mode.

10.1.1 Controller structure of a Twin Line unit

The controller structure of a Twin Line unit for AC servomotors is the same as the classic cascaded control of a closed positioning loop with current controller, speed and position controller.

The additional closed-loop control blocks shown in following figure are incorporated for precontrolling.

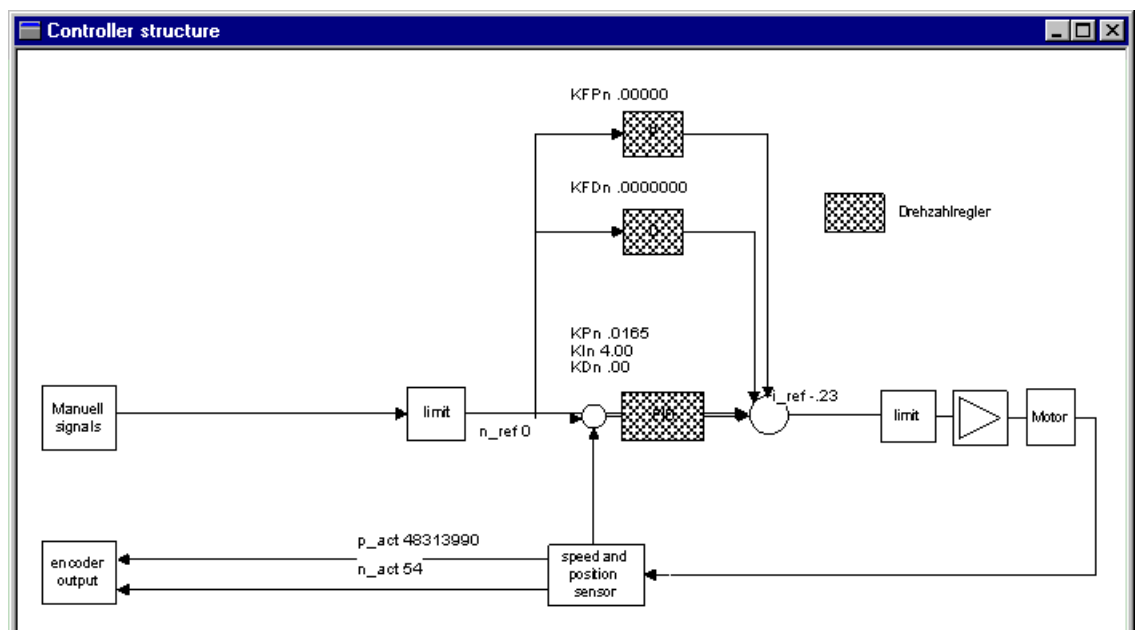


Fig. 10.1 Block diagram of a Twin Line unit for AC servomotors

0x9844 1113 096, b121, 05.02

<i>Current controller</i>	The current controller is used for regulating the drive torque of the motor. The current controller has been preoptimized with the saved motor data.
<i>Speed controller</i>	The speed controller has a decisive influence on the speed at which the drive reacts. The dynamics of the speed controller depend on <ul style="list-style-type: none">• the moments of inertia of the drive• the torque of the motor• the rigidity and elasticity of the elements in the flow of force• the play in the mechanical drive elements• friction.
<i>Position controller</i>	The position controller reduces the following error to zero. The closed positioning loop is switched on in the operational function 'Electronic gearbox' and for the holding control of the quick stop function. A precondition of good gain in the position controller is an optimized speed control circuit.
<i>Precontrol</i>	The precontroller runs parallel to the speed controller. It compensates for the acceleration- and speed-dependent torque.
<i>Reference smoothing</i>	With the filter time constants of the reference variable filter you can improve the transient response with optimized speed control.

10.1.2 Inputting parameters in the block diagram

- ▶ *Checking and modifying parameters* In the block diagram click on a parameter. The 'Control parameter' window showing the parameters of the block is now displayed.

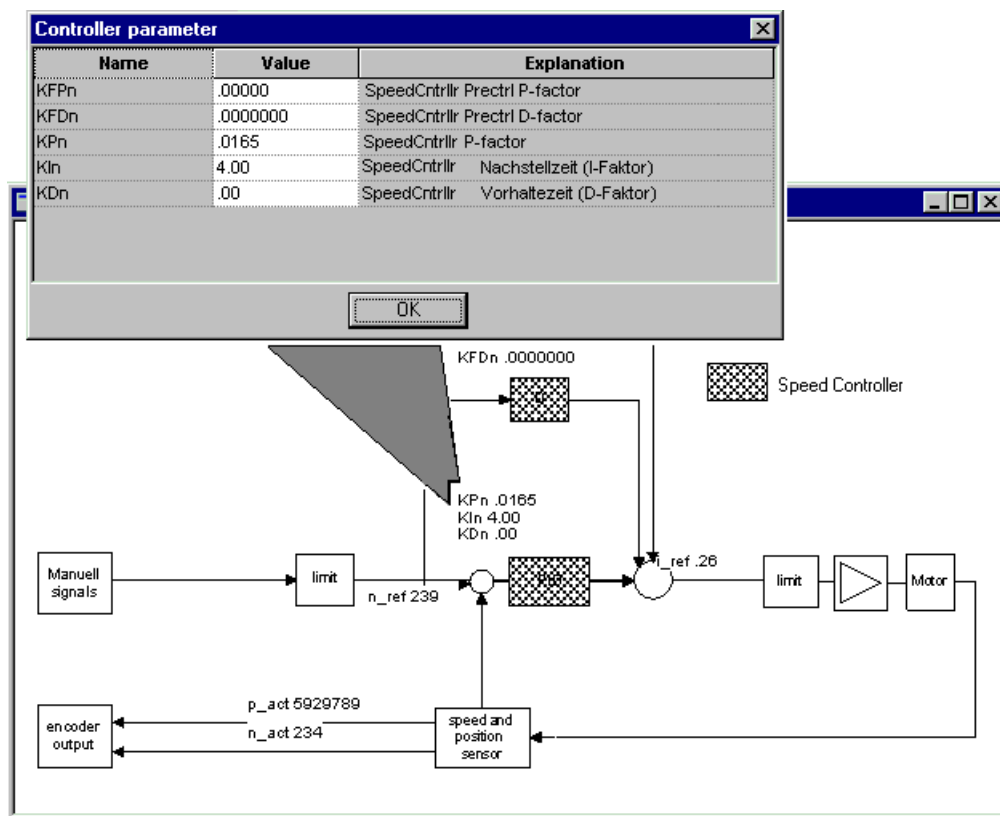


Fig. 10.2 The 'Parameters' window opened by double-clicking on the parameter

- ▶ Check the settings or change them. Fields with a grey background are read-only and cannot be changed - as in the 'Parameters' window. When you close the window by clicking on 'OK', the modified parameters are transferred directly to the unit.

10.2 Twin Line → Controller → Optimize

10.2.1 The 'Optimize' window

Opening window ► Select 'Twin Line → Controller → Optimize' or click on the 'Optimize' icon on the Twin Line bar. The 'Optimize' window opens.

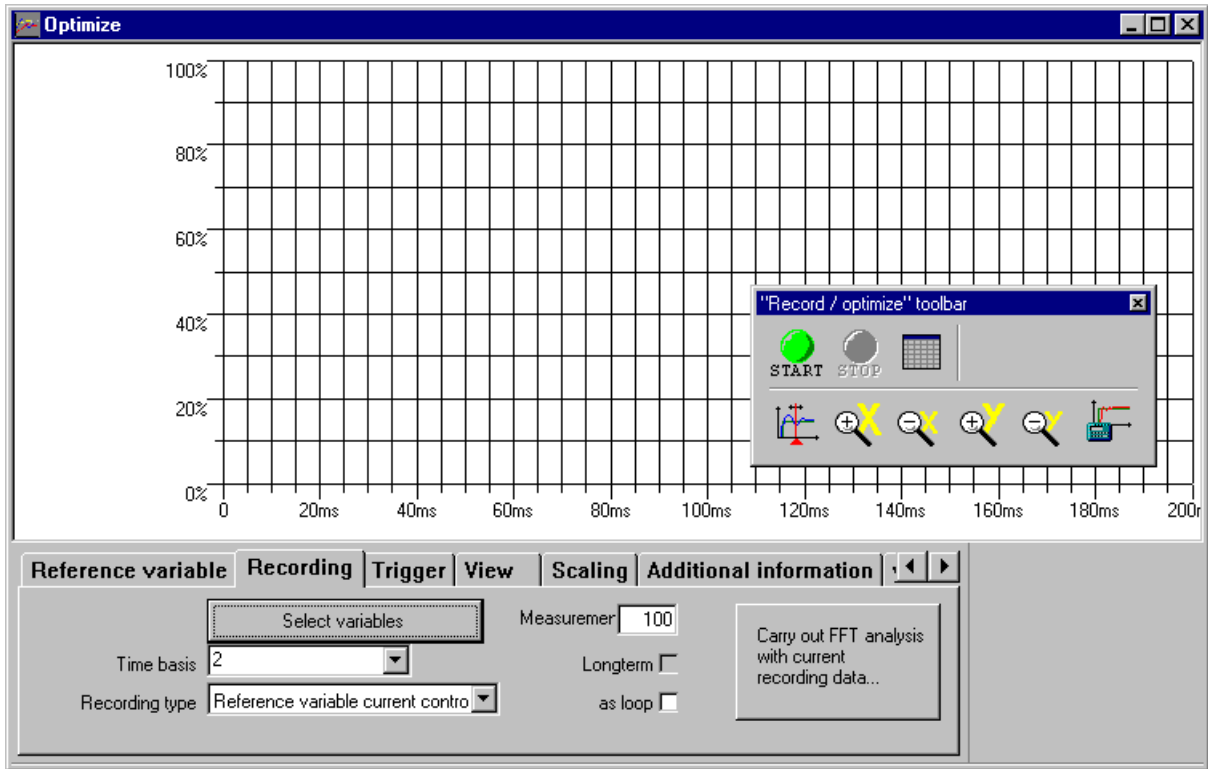


Fig. 10.3 The 'Optimize' window

The 'Optimize' tools bar

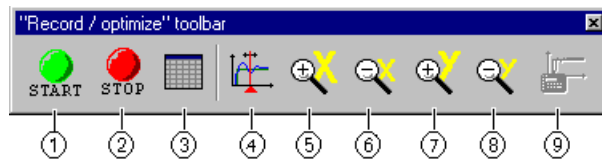


Fig. 10.4 The 'Optimize' tools bar

- ① Initiates a reference signal and starts recording
- ② Aborts recording
- ③ Displays the values of the recording
- ④ Places the reference point on the graph
- ⑤ Zooms in on the x-axis
- ⑥ Zooms out on the x-axis
- ⑦ Zooms in on the y-axis
- ⑧ Zooms out on the y-axis
- ⑨ Starts the algorithm for controller optimization

Recording and optimizing The index card settings and the functions for displaying, evaluating and documenting measured values closely correspond to those for recording, as described under 'Recording' on page 9-1.

Any optimization settings which differ from these are dealt with below.

10.2.2 Index cards of the 'Optimize' window

The 'Reference variable' index card The reference signal of the signal generator is set on the 'Reference variable' index card. The signal generator is a component of the Twin Line unit and supports optimization of the Twin Line unit by injecting defined, 'clean' input signals into the selected control loop.

Fig. 10.5 The 'Reference variable' index card

- The type of reference signal is specified under **Curve shape**. Three curve shapes are available:
 - Jump: positive or negative
 - Square wave: symmetrical, positive or negative
 - Sine: symmetrical, positive or negative.

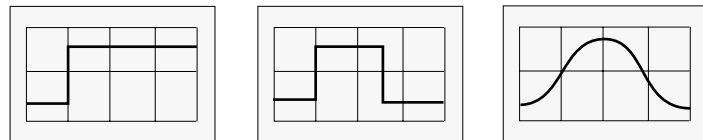


Fig. 10.6 Jump, square wave and sine signal shapes

With a positive or negative signal the motor follows the reference signal only in the specified direction of rotation. With a symmetrical signal the reference signal moves the motor alternately in the positive and negative directions of rotation (clockwise and anticlockwise).

- The **amplitude** defines the height of the reference signal. The value is given in the unit displayed:
 - Current controller
 - amps [A]
 - Speed controller
 - revolutions per minute [rpm]
 - Position controller - increments [inc].
- Frequency** specifies the period of oscillation of the reference signal in cycles per second [Hz].
- The number of periods is entered under **Number of repetitions**. The default value '65535' means an unlimited setting.

- The 'Recording' index card* The control loop which is to be optimized is specified on the 'Recording' index card under **recording type**:
- Current controller: reference variable to current controller
 - Speed controller: reference variable to speed controller
 - Position controller: reference variable to position controller.
- Extended measurement is not possible for controller optimization.
- The 'Trigger' index card* The 'Trigger' index card does not include any trigger conditions which can be set for controller optimization. Recording starts with the reference signal of the signal generator which is produced when recording starts.

10.2.3 Configuring optimization

The default values for controller optimization will depend on the device type. These values will be found in the optimization section of the controller manual for the Twin Line unit.

- Setting reference signals* ▶ On the 'Reference variable' index card you can set the reference signal of the signal generator: signal shape, amplitude, frequency and number of repetitions.
- As **curve shape** select either 'Jump' or 'Square wave'. Only with these two signal shapes is the entire dynamic behaviour of a control loop recognizable.

- Setting recording signals* ▶ On the 'Recording' index card select - the **values** which are to be recorded - the **time base** for the interval between two measurements - under **recording type** the control loop for optimization
- ▶ On the 'Recording' index card switch on the recording channels whose values you wish to view.
- ▶ The other values on the 'View', 'Scaling', 'Additional information' and 'y=f (channel)' index cards need not be set for optimization.

Entering controller values You can input the values for the control parameters either in the parameters window or in the 'Block diagram' window.

To input values in the parameters window:

- ▶ Open the 'Parameters' window and select the active parameter group: 'CtrlBlock1' or 'CtrlBlock2'. The group which is active is shown on the control bar in the 'Parameter set' field.
- ▶ Enter the control parameters as specified in the controller manual of the Twin Line unit.

To input values in the 'Block diagram' window:

- ▶ Open the 'Controller structure' window and click on the 'Controller structure' icon on the Twin Line bar.
- ▶ Click on one of the parameters for which the control loop is set. The 'Control parameter' window opens.
- ▶ Input the new value in the parameters window in accordance with the details in the controller manual of the Twin Line unit.

10.2.4 Starting recording

Controller optimization can only be started in manual mode.

- ▶ Switch automatic operation off and with 'Twin Line → Switch on power amplifier' enable the power amplifier.
- ▶ Click on 'Start' to have the signal generator produce a reference signal.

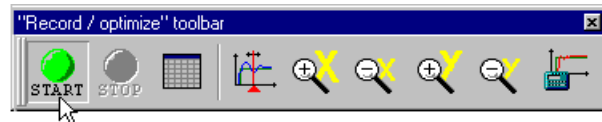


Fig. 10.7 Starting the signal generator and a recording

The Twin Line unit performs a motor movement corresponding to the specified reference variable and at the same time records the values in the unit. The recording is transferred to the PC as soon as the test run is finished or aborted.

Aborting recording

- ▶ Click on 'Stop' to abort a recording in progress. The Twin Line Control Tool loads the measured values into the PC and displays them in the diagram.

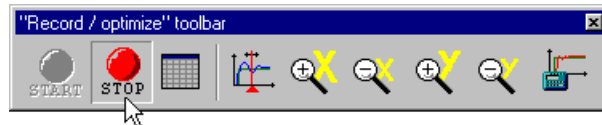


Fig. 10.8 Stopping a recording

Pressing 'Stop' only stops the recording. The signal generator in the Twin Line unit continues to carry out optimization but this can be stopped by switching off the power amplifier.

Should an error occur during the recording, the Twin Line unit will abort recording. The application reports an error and gives a description of the cause. Start the test run again once you have corrected the cause of the error.

Evaluating the recording

To evaluate a recording you can use the functions available in the graph view, as described under 'Evaluating recordings' page 9-9.

As an aid to evaluating the recording and further optimization you can refer to the graphs in the controller manual for the Twin Line unit. These will be found in the section on optimization.

10.3 Algorithm for optimising controllers

10.3.1 Characteristics and conditions

The Twin Line Control Tool uses an algorithm to automatically optimise the controller. When the user calls up the algorithm, it determines the optimum parameter set for the combination of motor and controller connected.

Optimisation is carried out by approximation using the aperiodic limiting case method. Theoretical controller settings are calculated based on an estimated value for the total moment of inertia.



The total moment of inertia J_g calculated by the algorithm must satisfy the following condition:

$0.8 \cdot J_M < J_g < 20 \cdot J_M$, whereby J_g is the entire moment of inertia of the system and J_M the moment of inertia of the motor.

If this condition is not met, the system cannot be optimised with the algorithm.

Please contact your local service department.

Before you can start the optimisation algorithm, you must carry out a manual movement in order to determine the current which the system needs to overcome frictional effects. This is necessary as the algorithm does not automatically determine the amount of friction, but it has to be known in order to be able to estimate the moment of inertia of the system.

The controller cannot be optimised by the algorithm in all mechanical systems. If the inertia conditions are not right, you will have to optimise the controller manually as described in the documentation and in the chapter entitled 'Twin Line → Controller → Optimize' on page 10-4.

10.3.2 Carrying out optimisation using the algorithm

- ▶ Use a manual movement at a constant speed of approx. 50 to 100 r.p.m. to determine the current required by the system to overcome friction. Record the values for Nact and Iact, and determine the Iact value at which Nact is more or less constant. This Iact value must later be entered in the dialog box for the optimisation algorithm under Friction.

In the following example, you can read off a Iact value of 0.23 A at a constant speed of 100 r.p.m.

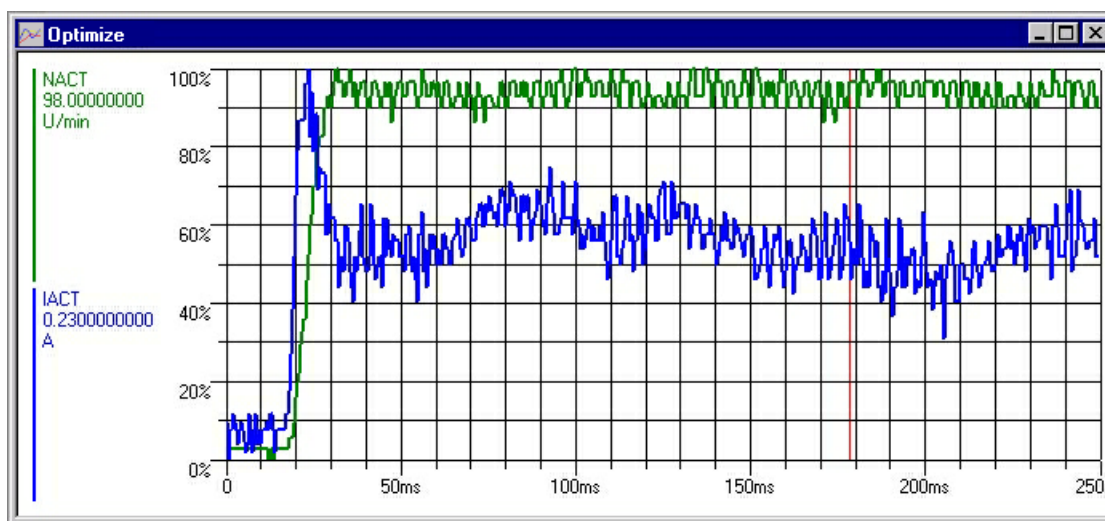


Fig. 10.9 Determination of Iact value to be entered under Friction

- ▶ Select "Twin Line → Controller → Optimize", or click on the Optimise symbol on the Twin Line toolbar. The Optimize window will open.
- ▶ Click on the controller optimisation algorithm button on the optimisation window toolbar.

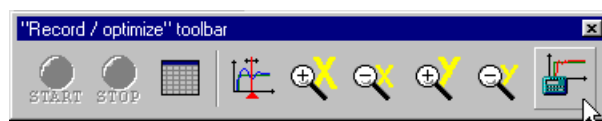


Fig. 10.10 Open the controller optimisation algorithm window

A dialog box will open which will help you to carry out automatic optimisation.

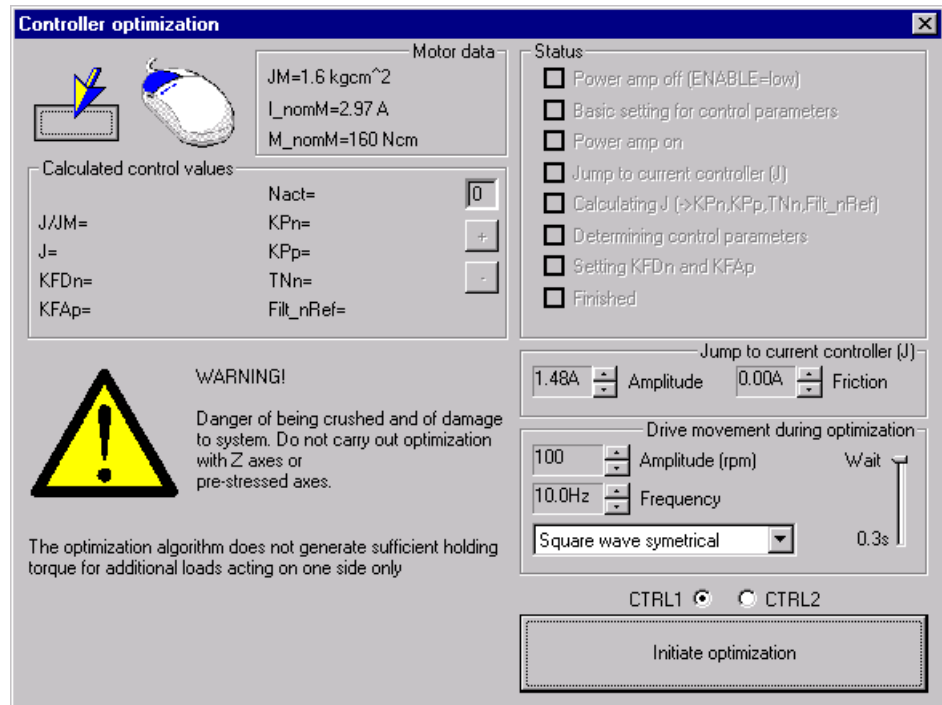


Fig. 10.11 "Controller optimisation dialog box

The dialog box is designed to prevent you from carrying out any further actions with the Twin Line Control Tool while the optimisation algorithm window is active.



WARNING!

*Danger of being crushed and of damage to the system!
Do not carry out optimisation with Z axes or pre-stressed axes, as the optimisation algorithm does not create sufficient holding torque for additional, one-sided loads.*



ATTENTION!

*Damage to system parts!
Do not interrupt the algorithm while automatic optimisation is running, as otherwise the system may be run with insufficiently optimised parameter sets.*

- ▶ Enter the value which you have determined during manual movement under Friction.
- ▶ Set the amplitude for the jump to the current controller, if necessary.
- ▶ Select parameter sets CTRL1 or CTRL2 the values for which you wish to optimise.
- ▶ Select symmetrical movements, positive movements or negative movements from the pull-down menu for optimisation.
- ▶ Set the amplitude of the speed controller for the drive movement, if necessary.
- ▶ Set the frequency of the speed controller for the drive movement, if necessary.

- ▶ Set the delay for stabilisation of the system after the drive movement, if necessary.

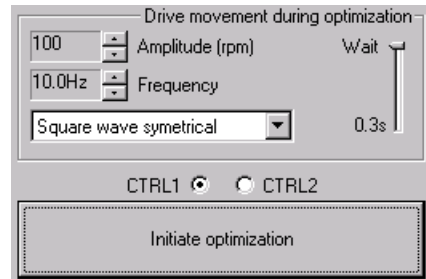


Fig. 10.12 Settings in the controller optimisation window before optimisation



Before starting optimisation with the algorithm, set the "AUTOM" and "ENABLE" inputs to "low", in order to produce a defined output status for automatic optimisation. When optimisation starts, a basic parameter setting is sent to the device in order to create uniform conditions. This is only possible if the "AUTOM" and "ENABLE" inputs are not carrying a signal.

- ▶ Start optimisation by clicking on the Start optimisation button.

The following individual steps are then carried out; you will have to confirm the first steps by clicking on the relevant button:

- Switch off power amplifier
- Load basic setting for controller parameter sets
- Switch power amplifier on again
- Start optimisation

The algorithm calculates the required values and optimises the filters for current, speed, position controller and reference values. The values determined and calculated are shown in the dialog box under Calculated controller values.

- Setting parameters KFDn and KFAP

The effect of KFDn and KFAP on input control is identical. Both parameters compensate the dynamic component which depends on the acceleration of the reference value, thereby improving the dynamics of the system.

KFDn uses the set speed signal as its input signal; the acceleration signal is determined by means of digital differentiation. KFAP uses the set acceleration signal directly as its input signal, if it is available.

If possible, KFAP should be used, as digital differentiation causes a marked increase in the level of noise in the system. The system may even become unstable at standstill.



ATTENTION!

*Damage to system parts!
Only one of the two parameters, KFDn or KFAP, may be used, and the one not being used must be set to 0.
Controlling the acceleration with one of the two parameters, KFDn or KFAP, increases the jerk in mechanical systems. Normally these values do not have to be changed by the user: only if the dynamic demands on the system are very high, should the values for one of the parameters be set manually in the Parameter setting window.*

- Complete optimisation. The dialog box will display the values which have been measured or calculated; the status information is all ticked off.

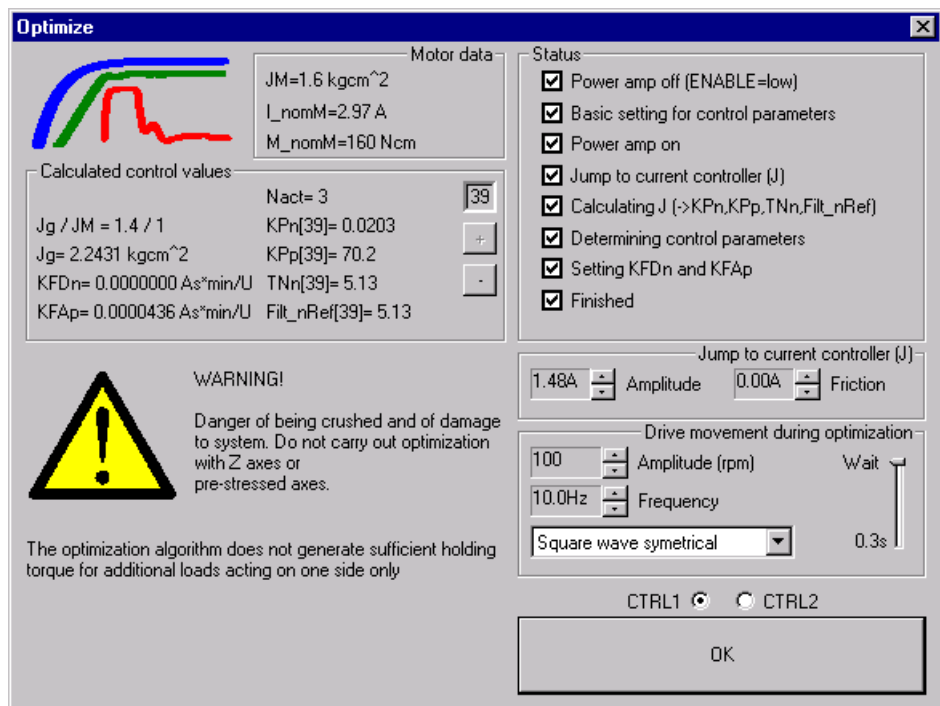


Fig. 10.13 Controller optimisation dialog box after optimisation has been completed

After optimisation, the Optimise and Parameters windows are open and show the optimised graphs and values. This completes the optimisation process.

11 Diagnosis and error rectification

Overview The Twin Line Control Tool provides diagnostic functions and information on troubleshooting in separate windows:

- Diagnostic functions for the unit under 'Twin Line → Diagnosis → Device hardware' page 11-4
- On-line monitoring of parameters under 'Twin Line → Diagnosis → Device data', page 11-2
- Error information under 'Twin Line → Diagnosis → Error log', page 11-3.

Error display The cause of an operating malfunction is displayed or indicated:

- in the Twin Line unit by a flashing number in the seven-segment display
- by the error response of the Twin Line unit.
- in the Twin Line Control Tool as an error message on the control bar and as the last error message in the 'Twin Line → Diagnosis → Error log'. In addition the seven-segment display on the control bar shows the error status of the Twin Line unit.

Warning messages are only displayed in the error display of the Twin Line Control Tool but not in the Twin Line unit.

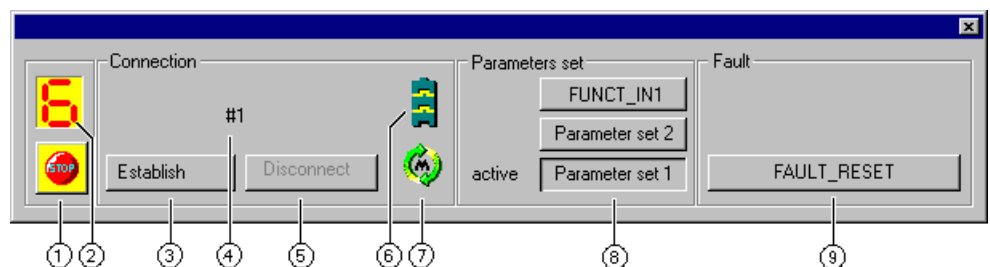


Fig. 11.1 The control bar with error display and fault reset button at 9

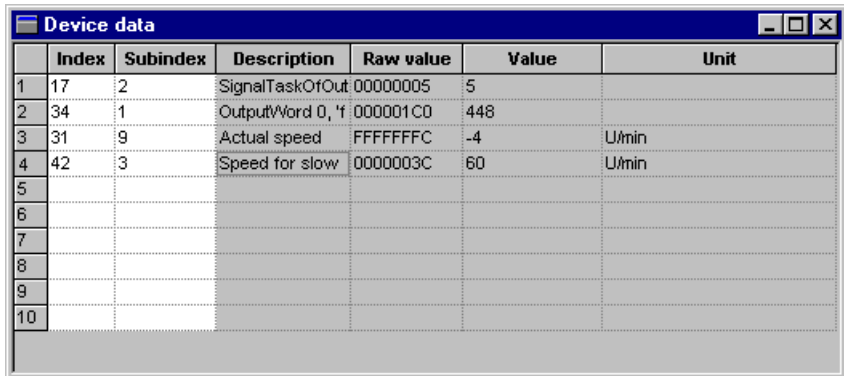
Resetting fault messages Once the fault has been corrected, the message can be reset:

- by setting the input signal `FAULT_RESET` at the signal interface of the Twin Line unit
- with the Twin Line Control Tool via the 'FAULT_RESET' button or via the 'Twin Line → FAULT_RESET' menu item
- by switching off the 24 V power supply to the Twin Line unit.

11.1 Twin Line → Diagnosis → Device data

All of the parameters and status values of a Twin Line unit are managed within the unit on the basis of index and subindex. You can access all of the values of the device via the index and subindex in the 'Device data' window. Up to ten parameter values can be monitored continuously.

Starting monitoring ▶ Select 'Twin Line → Diagnosis → Device data'. The 'Device data' dialog box is displayed.



	Index	Subindex	Description	Raw value	Value	Unit
1	17	2	SignalTaskOfOut	00000005	5	
2	34	1	OutputWord 0, 'f	000001C0	448	
3	31	9	Actual speed	FFFFFFFC	-4	U/min
4	42	3	Speed for slow	0000003C	60	U/min
5						
6						
7						
8						
9						
10						

Fig. 11.2 The 'Device data' window

- **Index** indicates the group under which the value is administered internally. This group assignment does not correspond to the parameter groups.
- **Subindex** designates the number of the value in an index group.
- The meaning of the value is shown under **Description**.
- **Raw value, value and unit** show the current value of the parameter or of the status variable together with the unit of measurement.

The values in the window are read continuously from the unit and the screen updated. The refresh rate can be configured:

▶ Select 'Device data → Time interval'. The 'Time interval' window is displayed.

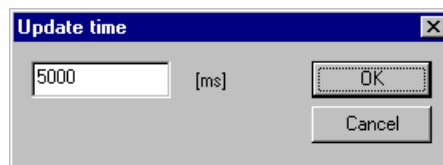


Fig. 11.3 The 'Time interval' window

▶ Type in a time interval in milliseconds. The smallest time value depends on the speed at which data are transmitted from the device to the PC.

11.2 Twin Line → Diagnosis → Error log

Accessing the error display ► Select 'Twin Line → Diagnosis → Error log'. The 'Error log' dialog box is displayed.

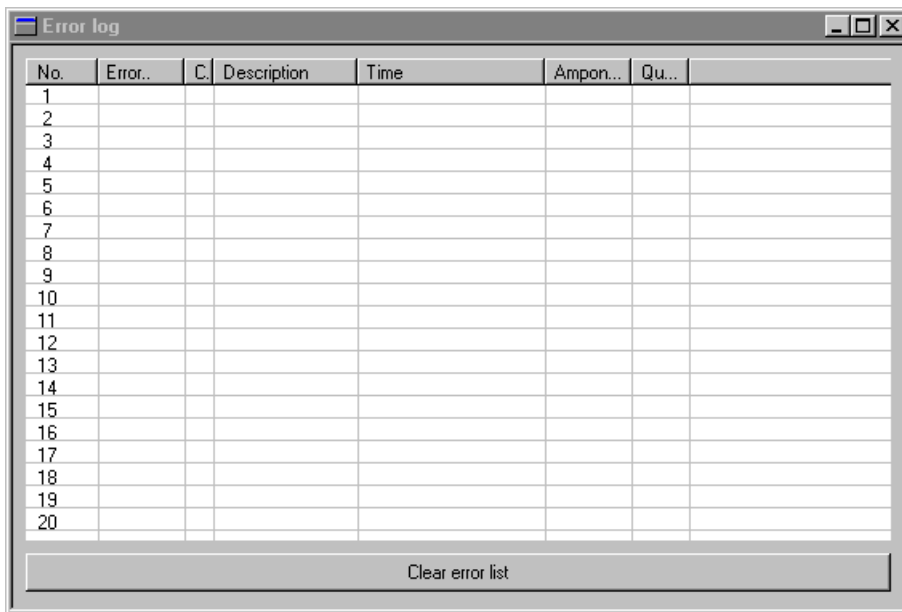


Fig. 11.4 The 'Error log' window

Error messages are displayed with internal **Error numbers**, with **Error class**, **Description** and **Time** of occurrence.

Error messages are listed in chronological order. Error 1 is the earliest of the error messages displayed.

You can delete all error entries by clicking on the **Clear error list** button.

The Twin Line unit gives an error response when there is an error. Depending on the severity of the error the Twin Line unit will react in accordance with an error class.

An overview of Twin Line unit error messages and error rectification measures will be found in the section in the controller manual dealing with diagnosis and error rectification.

11.3 Twin Line → Diagnosis → Device hardware

In the 'Device data' window the Twin Line Control Tool provides diagnostic functions for the device and interfaces.

- Starting diagnosis* ▶ Select 'Twin Line → Diagnosis → Device hardware'. The 'Device data' dialog box is displayed.

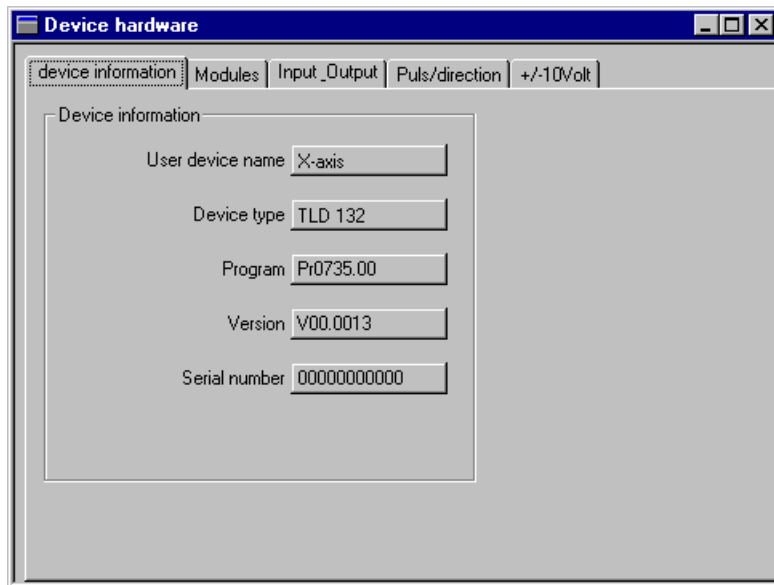


Fig. 11.5 The 'Device data' dialog box

Depending on the configuration and functional scope of the Twin Line unit you can select various diagnostic functions via the following index cards:

- Device information
- Configured modules
- Inputs / outputs
- Pulse / direction
- +/-10 volt

If the Twin Line unit in question does not support one of the diagnostic functions, the corresponding index card will not be displayed.

The 'Device information' index card

The 'Device information' index card shows the system date of the connected Twin Line unit.

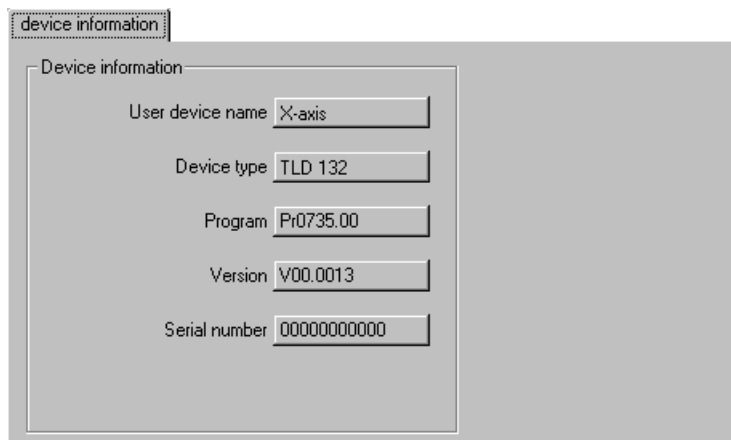


Fig. 11.6 The 'Device information' index card

You can access the device information here for service purposes.

The 'Configured module' index card

The 'Configured module' index card displays system data about the device configuration and the modules fitted.

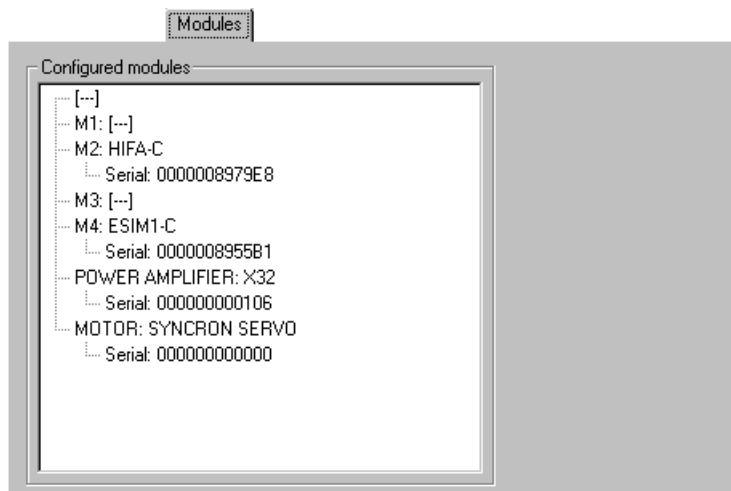


Fig. 11.7 The 'Device hardware' index card'

For each entry you can access further detailed information by double-clicking on the entry.

The 'Inputs / outputs' index card The switching states of all inputs and outputs of the signal interface can be observed and modified via the 'Inputs / outputs' index card.

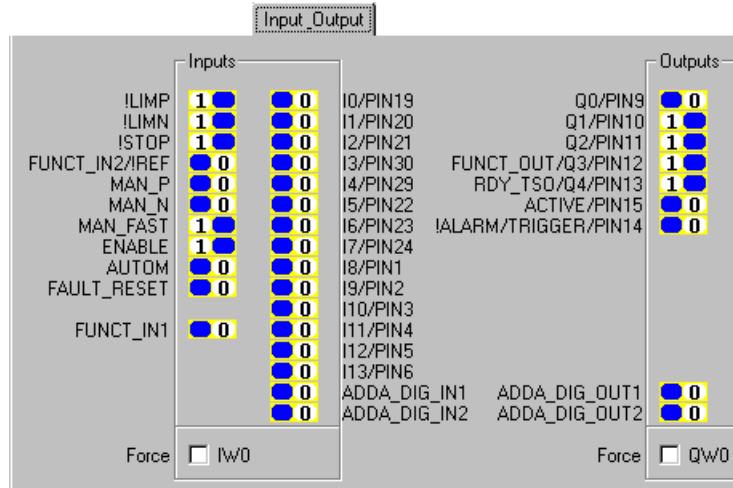


Fig. 11.8 The 'Inputs / outputs' index card- in this case for a TLD13x Twin Line unit



If you have expanded your Twin Line device with an analog module on slot M1 The module I/O is displayed additionally in the tab.

The values '0' and '1' indicate what signal voltage is present at the input or output.

- Value '0': voltage 0 V or signal level low
- Value '1': voltage 24 V or signal level low



Which interface signals are assigned in the Twin Line unit to the inputs and outputs shown on the index card will vary depending on the device type. For the assignments applicable to your particular unit, you should refer to the controller manual under the section dealing with commissioning and testing the inputs and outputs.

'Forcing' inputs and outputs

If the **Force** box is checked, you can change the switching states for inputs and outputs in the device by means of the software. The hardware signals of the signal interface will then be ignored.



WARNING!

Danger of injury and damage to system parts! Activating and deactivating inputs and outputs can result in unexpected switching states and motor movements. Do not change the settings unless the motor can be run without danger.

- ▶ Click on the 'Force' box to switch signal states for inputs or outputs using the Twin Line Control Tool.

The Twin Line Control Tool highlights in colour all switches which can be set.

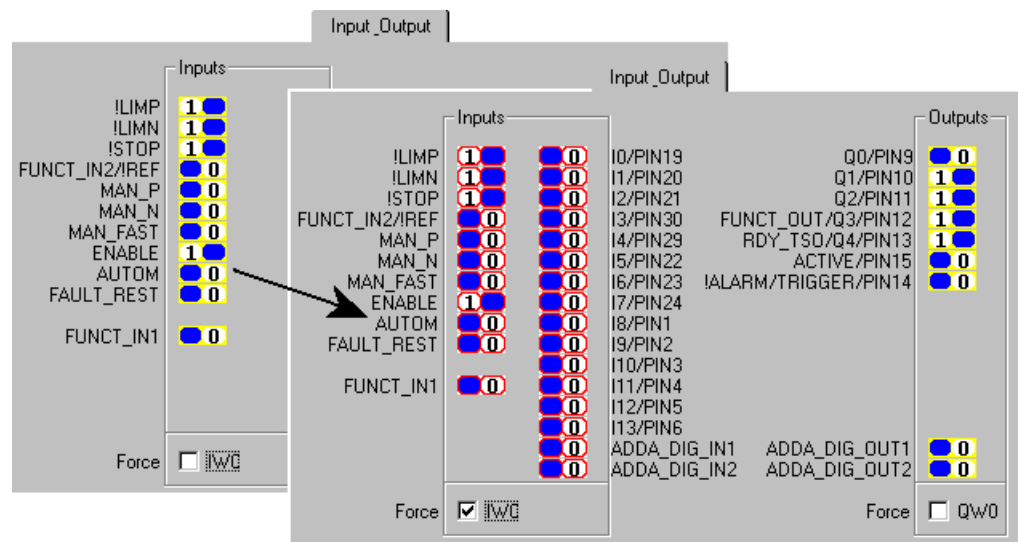


Fig. 11.9 Inputs with activated 'Force' box

- ▶ To change the signal state, click on one of the switches which can be set.

The Twin Line Control Tool sends the command to the device. As soon as the Twin Line unit switches the signal over, the software displays the signal change on the screen.

- ▶ Start a manual run, for example, by setting the AUTOM signal to '0' and the input signal MAN_N or MAN_P for manual mode to '1'.
- ▶ Finish making your entries by unchecking the 'Force' box or closing the 'Device data' window. The hardware signal states are then re-activated.

If you change from the 'Inputs / outputs' index card to another index card or window and do not uncheck the 'Force' box, the 'Force' switching state will be retained. Not until the connection is disconnected or dropped will all values be reset to the hardware signal states.

The 'Pulse / direction' index card

The reference signals of the pulse / direction interface can be observed and modified via the 'Pulse / direction' index card.



The Twin Line unit must be working in the automatic operating mode 'Electronic gearbox'. In the controller manual for the Twin Line unit you will find descriptions of the operating modes and of the conditions for switching over to 'Electronic gearbox' mode: see the section dealing with the operating modes.



Fig. 11.10 The 'Pulse / direction' index card

The frequency of the pulse / direction signal is shown in the **v_refGear** field, first by the position of the slide bar and beneath this as a value with its unit [kHz]. The plus or minus prefix shows whether the motor is moving clockwise or anticlockwise.

The **p_refGear** field shows the setpoint in increments at the gearbox input. The position is given as an absolute value which is derived from the resolution of the position sensor and the starting position:

- Resolution for AC servomotors with Sincoder: 16384 inc/rev
- Resolution for AC servomotors with resolver: 4096 inc/rev
- Resolution for stepping motors 1000 inc/rev

'Forcing' pulse / direction signals

If the **Force** box is checked, you can specify the pulse frequency for the setpoint via the Twin Line Control Tool.



WARNING!

Danger of injury and damage to system parts! Changing settings may result in unforeseen motor movements. Do not change the settings unless the motor can be run without danger.

- ▶ Click in the 'Force' box.

The current actual value for the pulse frequency is read from the device and used as initial value.

- ▶ To change the pulse frequency, move the slide bar pointer with the mouse pointer. The frequency which is set will be displayed simultaneously as a number in the entry box.

Alternatively you can type a frequency into the entry box and then click on the **OK** button to transfer it to the unit. The slide bar moves automatically to this value.

With the **zero** button you can reset the pulse frequency to zero.

- ▶ Finish making your entries by unchecking the 'Force' box. The pulse frequency of the interface will now be re-activated.

The **Force** box is automatically unchecked when you close the 'Device data' window or switch to another window or index card.

The '+/-10 Volt' index card

The reference signals of the analogue interface can be observed and modified via the the '+/-10 Volt' index card. This index card is only displayed with Twin Line units which are equipped with an analogue interface for setpoint input . Automatic mode must be switched on.

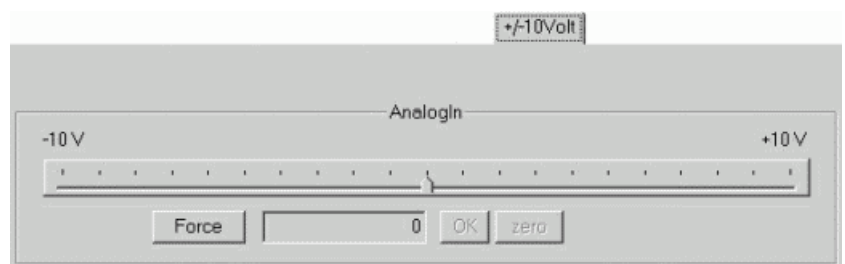


Fig. 11.11 The '+/-10 Volt' index card'



If you have expanded your Twin Line device with an analog module on slot M1 The module I/O is displayed additionally in the tab.

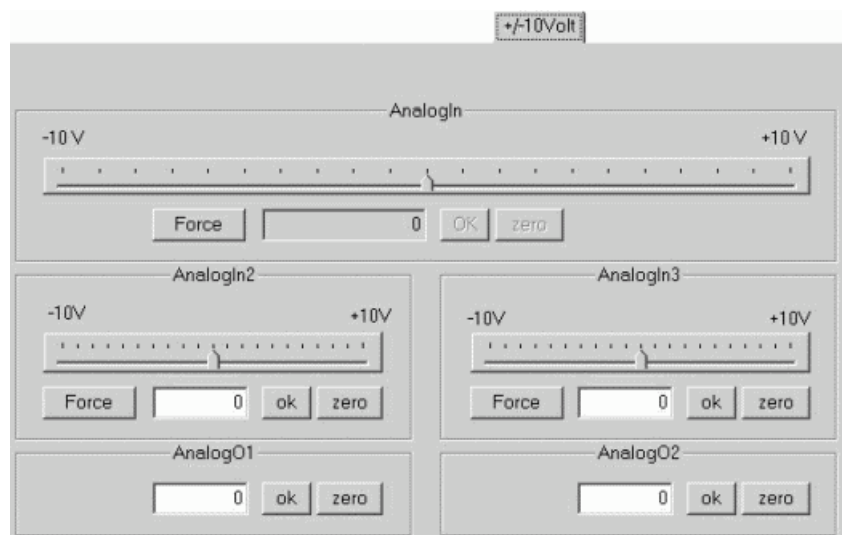


Fig. 11.12 The '+/-10 Volt' index card' with the analog module

The voltage of the analogue signal is shown in the **AnalogIn** field, first by the position of the slide bar and beneath this as a value with its unit [volts]. The plus or minus prefix shows whether the motor is moving clockwise or anticlockwise.

'Forcing' analogue signals If the **Force** box is checked, you can specify the analogue voltage for the setpoint via the Twin Line Control Tool.



WARNING!

*Danger of injury and damage to system parts!
Changing settings may result in unforeseen motor movements. Do not change the settings unless the motor can be run without danger.*

- ▶ Click in the 'Force' box.

The actual value of the analog voltage for the respective input is fetched from the device and applied as start value.

- ▶ To change the voltage, move the slide bar pointer with the mouse pointer. The voltage which is set will be displayed simultaneously as a number in the entry box.

You can also enter a voltage in the input field and transfer it to the device by confirming the entry with a click on **OK**. The slider controls of the analog inputs are automatically adjusted to this value. The value entered is output to the analog outputs.

With the **zero** button you can reset the voltage to zero.

- ▶ Finish making your entries by unchecking the 'Force' box. The analogue voltage of the interface will now be re-activated.

The **Force** box is automatically unchecked when you close the 'Device data' window or switch to another window or index card.

Register SinCos

If you have connected a motor with a multiturn transducer to the HIFA interface, the Twin Line device reads the absolute position of the motor from the multiturn transducer and uses this value to set the actual position value of and the position setpoint in the Twin Line device. You can correct the absolute position of the motor in the "SinCos" tab by transferring a new absolute position as values of the parameter "M2.SetEncPos" to the multiturn transducer.



After you have input the value, it is checked whether it lies within the permitted value range:

- For single-turn transducers: 0 .. 16383
- For multiturn transducers: 0 .. [(4096 x 16384) - 1].



Fig. 11.13 The "SinCos" tab

**WARNING!**

*Risk of injury and damage to plant components!
Take the following notes into consideration when you transfer a new absolute position:*

- The position change is not validated until after a restart of the Twin Line device.
- After you have entered the absolute position you must wait 5 seconds before you switch off the device. Otherwise, the input value is not applied correctly.
- After the restart of the Twin Line device, check the motor position before you switch on the end amplifier.

12 Commissioning assistant

12.1 Starting the assistant

The commissioning assistant will guide you step by step through the commissioning process.

- ▶ Select '? → Commissioning assistant' or the 'Assistant' icon on the Twin Line bar. The 'Commissioning assistant' dialog box is displayed.

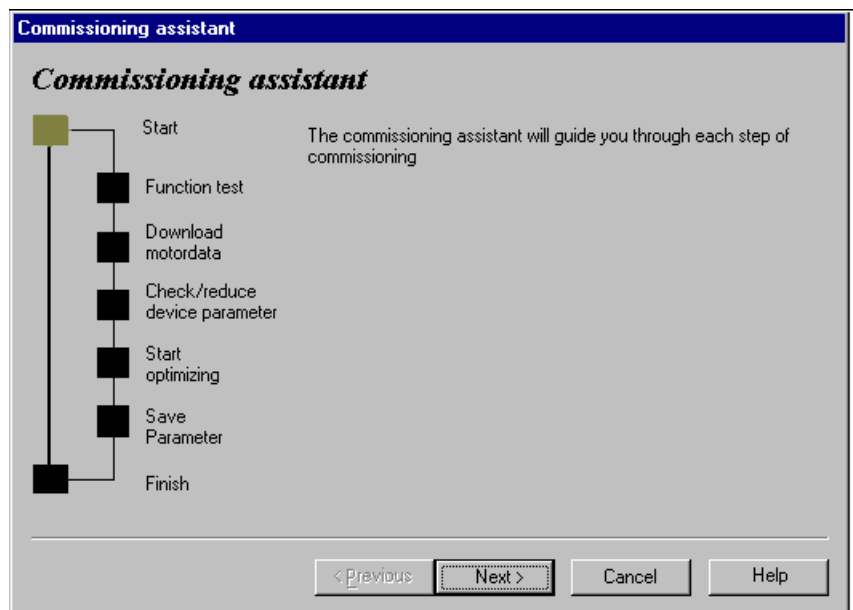


Fig. 12.1 The starting window of the Commissioning assistant

Checking the wiring

Carry out the following steps when the function in question is relevant to your particular system layout and the signal connections have been wired up. Check

- the connections and functioning of the limit switches
- the connections and functioning of the holding brake.

The wiring assignments of the signal interface will vary depending on the device type. For the input and output assignments applicable to your particular unit, you should refer to the controller manual.

Selecting the motor data record

This step only applies to Twin Line units for AC servomotors with resolvers and not to Twin Line units for stepping motors or Twin Line units for AC servomotors with a Hiperface connection. Motors with a Hiperface connection will give the unit the correct motor data as soon as the Twin Line unit is switched on.

- ▶ In the 'Parameters' window select the 'Servomotor' parameter group.
- ▶ In the 'Motor type' field type in the data set for the resolver motor which is connected. Information about inputting parameters will be found under 'Twin Line → Configuring' page 5-1.

All motor data sets for motors approved by the manufacturer for controller operation are installed at the time when the software is installed. If no

motor data set appears to be available for your motor, contact your local service department.

Configuring the Twin Line unit

- ▶ Set the parameter values for the device as specified in the controller manual. The values in question will be found in the section dealing with inputting control parameters.
- ▶ Perform a function check on the Twin Line unit when you have finished configuring it and before installing the motor in the system. Do so by means of a run under manual operation. You can carry out this manual test run via the inputs of the signal interface - as described in the controller manual - or use the Twin Line Control Tool - as described under 'Manual movement' on page 6-9.

Starting optimization

Optimization of the controller setting is described under 'Twin Line → Controller → Optimize' on page 10-4. The values set will vary depending on the device type. They will be found in the controller manual for your Twin Line unit.

- ▶ When you have finished optimization save all of the device data to the EEPROM of the Twin Line unit. Document the settings by making a print-out and back up a copy of the device file on the PC.

13 The Twin Line Control Tool menu

The 'File' menu



Fig. 13.1 The 'File' menu

File → Open: Device data are loaded from file into the PC. Device files have the file extension '.TLX'.

This command can also be given via the key combination Ctrl+O.

File → Close: This closes an open device file.

If parameter entries have been modified or new parameter or recording data created and not yet saved, the program will display a warning. You can then abort and save your changes before going on to close the window.

File → Save: An open device file is saved to the data storage medium together with its parameter and recording data. The program does not ask for confirmation.

If a file has not as yet been created on the data storage medium, a file dialog will open which allows you to type in a name for the new file.

This command can also be given via the key combination Ctrl+S.

File → Save as...: An open device file can be saved to the data storage medium under a new name. A file dialog will open which allows you to type in a new name for the file. Device files have the file extension '.TLX'.

If the name is already being used for a saved file, the program will display the corresponding message. You can now save the file under a different name.

File → Export...: The recording data can be exported in ASCII CSV format to allow the recorded values to be further processed and analysed in a spreadsheet program. Tables in ASCII CSV format can be imported by most programs of this type.

This menu item only appears when the 'Record' or 'Optimize' window is activated.

File → Print...: The Twin Line Control Tool prints the data from an open device file. If a recording has been made, a selection window will open which allows you to specify printing data before printing:

Diagram: Outputs the recording as a graph

Measured data: Outputs the recording as a table

Parameters: Prints all device data

Settings: Print details of the settings for a 'Recording'

Additional information: Print details of the author, date and comments as entered on the 'Additional information' index card of the 'Record' window.

This command can also be given via the key combination Ctrl+P.

File → Printer set-up...: The printer is set up for printing from a Windows application. The printer and the paper are set up by size and format. Depending on which printers you have installed, you can set special printer functions here, such as colour or grey scale values.

File → Last file: If device files have already been edited, the file name of the files last opened will appear here. They can be opened by clicking on the corresponding menu item.

File → Exit: All program windows are closed, the connection is disconnected and the program shut down. If the Twin Line Control Tool detects parameter values or settings which have been changed but not yet saved it will warn you about this. You can save your modifications to a file or simply discard them.

The 'Edit' menu

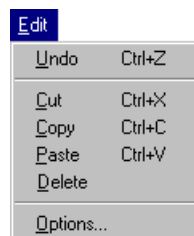


Fig. 13.2 The 'Edit' menu

Edit → Undo: The last modification to an input can be undone.

This command can also be given via the key combination Ctrl+Z.

Edit → Cut: The selected area is cut at the current location and moved to the clipboard.

This command can also be given via the key combination Ctrl+X.

Edit → Copy: The selected area is copied and this copy moved to the clipboard.

This command can also be given via the key combination Ctrl+C.

Edit → Paste: The contents of the clipboard are pasted at the cursor position

This command can also be given via the key combination Ctrl+V.

Edit → Delete: The selected area is deleted.

Edit → Options: The 'Options' window is used for inputting the settings for a connection set-up as well as the directory and file name for database access.

The 'Device data' menu This menu is only displayed when the 'Device data' window has been activated via 'Twin Line → Diagnosis → Device data'.

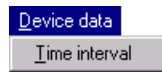


Fig. 13.3 The 'Device data' menu - only appears when the 'Device data' window is active

Device data → Interval: For setting the interval period for the continuous updating of the data in the 'Device data' file.

List data processing menu The menu is only displayed if list data processing has been activated via 'Twin Line → Position Lists → Teach In' or 'Twin Line → Position Lists → Process'.

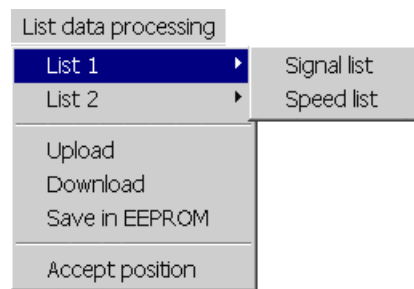


Fig. 13.4 List data processing menu, only visible when 'List data processing' window is active

List data processing → List 1: Setting List 1 to Position / Signal List or Position / Speed List.

List data processing → List 2: Setting List 2 to Position / Signal List or Position / Speed List.

List data processing → Upload: Load the list values from the Twin Line unit into the PC.

List data processing → Download: Transfer the list values to the Twin Line unit and save them in RAM.

List data processing → Save in EEPROM: Transfer the list values permanently to the Twin Line units EEPROM.

List data processing → Accept position: Transmit the currently selected list position value to the Twin Line unit as the new target position.

The commands can also be given via the 'List data processing' toolbar buttons.

Menü List data processing → List1 and ... → List2 Menu

The sub-menu is only displayed if list data processing has been activated via 'Twin Line → Position Lists → Teach In' or 'Twin Line → Position Lists → Process'.

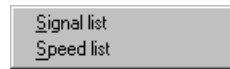


Fig. 13.5 List processing menu, only visible when 'List data processing' window is active

List data processing → List 1 → Signal list: Setting List 1 to Position / Signal List.

List data processing → List 1 → Speed list: Setting List 1 to Position / Speed List.

The same menu entries apply for List 2.

The commands can also be given via the 'List data processing' toolbar buttons.

Data set data processing menu

The menu is only displayed if data set data processing has been activated via 'Twin Line → Position Lists → Teach In' or 'Twin Line → Position Lists → Process'.

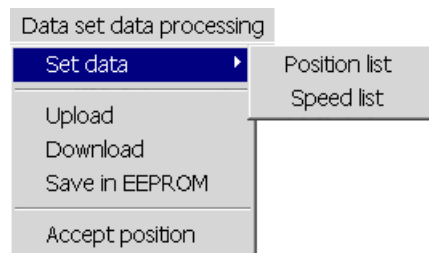


Fig. 13.6 Data set data processing menu, only visible when 'Data set data processing' window is active

Data set data processing → Set Data: Setting the list for set data to Position or Speed list.

Data set data processing → Upload: Load the list values from the Twin Line unit into the PC.

Data set data processing → Download: Transfer the list values to the Twin Line unit and save them in RAM.

Data set data processing → Save in EEPROM: Transfer the list values permanently to the Twin Line units EEPROM.

Data set data processing → Accept position: Transmit the currently selected list position value to the Twin Line unit as the new target position.

The commands can also be given via the 'Data set data processing' toolbar buttons.

Data set data processing → *Set Data*

The sub-menu is only displayed if Data set data processing has been activated via 'Twin Line → Position Lists → Teach In' or 'Twin Line → Position Lists → Process'.

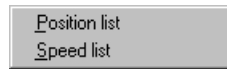


Fig. 13.7 Data set data processing menu, only visible if 'Data set data processing' window is active

Data set data processing → Set Data → Position List: Setting set processing to position list.

Data set data processing → Set Data → Speed List: Setting set processing to speed list.

The commands can also be given via the 'Data set data processing' toolbar buttons.

The 'Optimize' menu

This menu is only displayed when the 'Optimize' window has been activated via 'Twin Line → Controller → Optimize'.

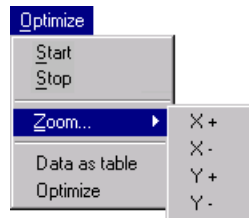


Fig. 13.8 The 'Optimize' menu - only appears when the 'Optimize' window is active

Optimize → Start: This causes the signal generator produce a reference signal and starts a recording.

The command can also be activated via the 'Start' button on the 'Optimize' toolbar.

Optimize → Stop: This aborts the recording.

The command can also be activated via the 'Stop' button on the 'Optimize' toolbar.

Optimize → Zoom: This opens a submenu allowing you to change the diagram resolution gradually, increasing it with X+ and Y+, decreasing it with X- and Y-.

Optimize → Data as table: This opens the table window with the data for a recording.

Optimize → Optimize: This starts the algorithm for optimizing the controller.

The 'Record' menu This menu is only displayed when the 'Record' window has been activated via 'Twin Line → Controller → Record'.

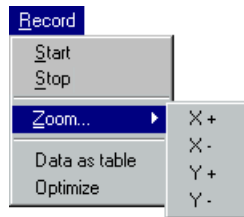


Fig. 13.9 The 'Record' menu - only appears when the 'Record' window is active

Record → Start: This transmits the trigger condition – if one is specified – and starts a recording with the set parameters.

The command can also be activated via the 'Start' button on the 'Record' toolbar.

Record → Stop: This aborts the recording.

The command can also be activated via the 'Stop' button on the 'Record' toolbar.

Record → Zoom: This opens a submenu allowing you to change the diagram resolution gradually, increasing it with X+ and Y+, decreasing it with X- and Y-.

Record → Data as table: This opens the table window with the data for a recording.

Record → Optimize: This starts the algorithm for optimizing the controller.

The 'Parameters' menu This menu is only displayed when the 'Parameters' window has been activated via 'Twin Line → Controller → Configure'.

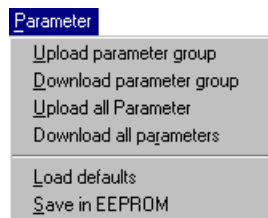


Fig. 13.10 The 'Parameters' menu

Parameters → Upload parameter group: This loads the values of a parameter group into the PC memory from the device RAM

Parameters → Download parameter group: This transfers the values of a parameter group into the device RAM from the PC

Parameters → Upload all parameters: This loads all of the device data into the PC.

Parameters → Download all parameters: This transfers all of the device data from the PC into the device RAM

Parameters → Load defaults: This resets all parameter values to the factory setting

Parameters → Save in EEPROM: This copies parameter values from the device RAM into EEPROM.

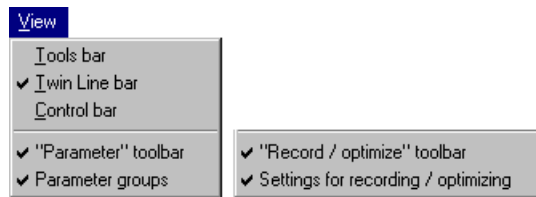
The 'View' menu

Fig. 13.11 The 'View' menu

View → Tools bar: The tools bar of the main window is displayed or hidden.

View → Twin Line bar: The Twin Line bar is displayed or hidden.

View → Control bar: The control bar is displayed or hidden.

View → 'Parameters': When the 'Parameters' window is activated, the tools bar of the window is displayed or hidden.

View → Parameter groups: When the 'Parameters' window is activated, the window for selecting a parameter group is displayed or hidden.

View → 'Record / optimize' tools bar: When the 'Record' or 'Optimize' window is activated, you can use this to display or hide the tools bar of the window.

View → Settings for recording / optimizing: The window with the index cards is displayed or hidden.

The 'Connection' menu

Fig. 13.12 The 'Connection' menu

Connection → Establish: Via the 'Device selection' window this makes a connection to the connected Twin Line unit. The device configuration is read into the PC.

This command can also be activated via the control bar or via the key combination Ctrl+L.

Connection → Disconnect: On-line operation with a Twin Line unit is terminated immediately.

This command can also be activated via the control bar.

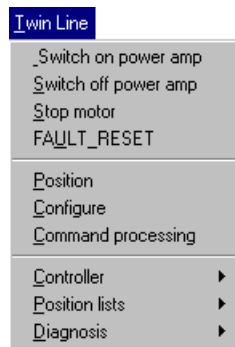
The 'Twin Line' menu

Fig. 13.13 The 'Twin Line' menu

Twin Line → Switch on power amp: The power amplifier is switched on. The switching status of the ENABLE input signal at the signal interface is ignored until the connection to the device is released.

The green motor icon on the control bar shows that the power amplifier is switched on.

Twin Line → Switch off power amp: The power amplifier is switched off. The switching status of the ENABLE input signal at the device interface is ignored until the connection to the device is released.

The red motor icon on the control bar shows that the power amplifier is switched off.

Twin Line → Stop motor: The motor is stopped but the power amplifier is not yet switched off so as to give the motor holding torque.

Twin Line → Reset errors: An error message from the Twin Line unit must be reset before starting movement mode. If there is a data connection to the unit, the signal can be reset via this menu item.

The command can also be activated via the 'FAULT_RESET' button on the control bar.

Twin Line → Positioning: This opens the 'Positioning' window for controlling a Twin Line unit with the Twin Line Control Tool. Which operating modes can be selected depends on the connected device type.

The command can also be activated via the 'Positioning' button on the Twin Line bar.

Twin Line → Configuring: This opens the 'Parameters' window for viewing and for modifying active parameters.

The command can also be activated via the 'Parameters' button on the Twin Line bar.

Twin Line → Command processing: This opens the 'Command processing' window for simulating a field bus interface. Here you can send control commands to a Twin Line unit and observe response data from the Twin Line unit.

The 'Twin Line → Controller' submenu

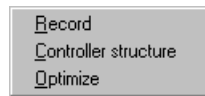


Fig. 13.14 The 'Twin Line → Controller' submenu

Twin Line → Controller → Record: This opens the 'Record' window. In on-line mode, movement parameters and setting values of the Twin Line unit can be recorded. Recording data can be displayed as a graph or table. They can be saved, printed out, exported and reloaded for later evaluation.

The command can also be activated via the 'Record' button on the Twin Line bar.

Twin Line → Controller → Controller structure: This opens the 'Controller structure' window. In on-line mode, the controller structure of the connected Twin Line unit can be displayed. Parameter values for the control loops displayed can be set in the window.

The command can also be activated via the 'Controller structure' button on the Twin Line bar.

Twin Line → Controller → Optimize: This opens the 'Optimize' window. The device settings are optimized for the safe and efficient operation of Twin Line units in a system.

To facilitate evaluation of the setting values the program allows you – in a similar manner to the 'Record' menu item – to display and evaluate the settings of the Twin Line unit as a graph or table.

The command can also be activated via the 'Optimize' button on the Twin Line bar.

The 'Twin Line → Position lists' submenu

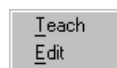


Fig. 13.15 The 'Twin Line → Position lists' submenu

Twin Line → Position lists → Teach: This opens the 'Teach' window for programming list or set data.

Twin Line → Position lists → Edit: Opens the window "Edit list data" or "Edit data record" for editing the list/data records which are stored in the memory.

You can also enable this command via "Edit list data" and "Edit data record" in the Twin Line taskbar.

The 'Twin Line → Diagnosis' submenu

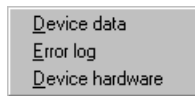


Fig. 13.16 The 'Twin Line → Diagnosis' submenu

Twin Line → Diagnosis → Device data: Ten status and parameter values from the connected Twin Line unit can be displayed in the 'Monitor' window. The values are given with index and subindex angegeben. The index and subindex make up the code under which all of the device data of the Twin Line unit are administered.

Twin Line → Diagnosis → Error log: This displays in the 'Error log' window the last 20 error and warning messages.

Twin Line → Diagnosis → Device hardware: This opens the 'Diagnosis' window for displaying and setting the device data. Several index cards are provided for identifying device hardware and installed modules, for switching interface signals and for setting reference signals for motor operation mode.

The 'Window' menu

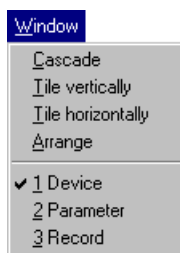


Fig. 13.17 The 'Window' menu

Window → Cascading: The program arranges the open windows in shingled form. The size of the windows is adapted to match the size of the program window.

Window → Tile horizontally: The program arranges the open windows alongside each other. The size of the windows is adapted to match the size of the program window.

Window → Tile vertically: The program arranges the open windows one above the other. The size of the windows is adapted to match the size of the program window.

Window → Arrange: Minimized windows appear as buttons at the lower edge of the action window and above the tool bar.

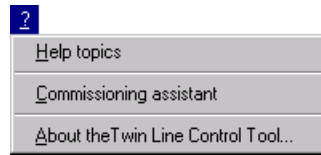
The '?' menu

Fig. 13.18 The Help menu

? → **Help topics**: This opens the Twin Line Control Tool help files and opens the help window.

This command can also be given via the key combination Shift+F1.

? → **Commissioning assistant**: This opens the 'Commissioning assistant' window. Commissioning a Twin Line unit can be carried out here step by step.

Information on installing the the Twin Line unit will be found in the device manual.

The command can also be activated via the Twin Line bar.

? → **Information about the Twin Line Control Tool**: This opens a window which shows the version number of the program. If you can access the internet from your PC, you can use this to contact web site of the manufacturer directly.

14 Service

14.1 Service address

Contact your local dealer with any questions or problems. Your dealer will be happy to give you the name of a customer service outlet in your area.

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