



HEIDENHAIN



HEIDENHAIN DNC RemoTools SDK virtualTNC

Software Interface and
Transfer Components

Information for the
Machine Tool Builder

July 2007

HEIDENHAIN DNC and RemoTools SDK

Tools for Creating PC-Based Applications for the TNC

TNC controls from HEIDENHAIN have long featured data interfaces for communication with external systems. HEIDENHAIN controls are equipped with an Ethernet interface as a standard feature. Together with the software interface **HEIDENHAIN DNC** (Direct Numeric Control) it offers many possibilities for coming to grips with the increasingly complex requirements of the machine's environment.

The development environments on Windows operating systems are particularly well suited as a flexible platform for application development. The flexibility of PC software and the large selection of ready-to-use software components and standard tools in the development environment enable you to develop PC applications in a very short time that can be of great use to your customers, for example:

- Error reporting systems that, for example, send the customer a text message reporting problems on the currently running machining process
- Standard or customer-specific PC software that decidedly increases process security and equipment availability
- Software solutions controlling the processes of manufacturing systems
- Information exchange with job management software

The **HEIDENHAIN DNC** software interface of the TNC is an attractive communication platform for this purpose. It provides all the data and configuration capabilities needed for these processes so that an external PC application can evaluate data from the control and, if required, influence the manufacturing process.

To enable you to use HEIDENHAIN DNC effectively, HEIDENHAIN offers the **RemoTools SDK** development package. It contains the COM components and the ActiveX control for integration in development environments.

Machine simulation is also playing an increasingly important role. The control software **virtualTNC** is a control component for virtual machines available over the HEIDENHAIN DNC interface.

The screenshot displays the 'Operating Time - Drives' window, which provides a comprehensive overview of machine performance and maintenance status. The interface includes a table of current messages, a bar chart showing operating times for different axes, and a list of control functions.

Date	Message
10 03.03.2007 - 10:46	Maintenance Message: "C-Axis: Operating time exceeded!"
11 04.06.2007 - 17:23	Maintenance Message: "Y-Axis: Check gear box oil!"
12 12.07.2007 - 8:30	Error Message: "C-Axis: Lag error"
13	

The bar chart displays operating times for X-Axis, Y-Axis, Z-Axis, A-Axis, and C-Axis, categorized into three ranges: 0 - 200 ms (red), 200 - 700 ms (green), and over 700 ms (blue).

Operator information:

Operator 1	Operator 2
No. 80065	No. 80067
Mark Smith	Kevin Linger

Control panels include: Maintenance, X - AXIS, Y - AXIS, Z - AXIS, A - AXIS, C - AXIS, Tool - Magazine, and Pallet Changer.

The background shows the HEIDENHAIN DNC software interface with various windows open, including 'Program Editor', 'Parameter Editor', and 'Help'.

RemoTools SDK

Development Package

Data transfer technology

HEIDENHAIN controls generally support several communication protocols for data transfer. The LSV-2 protocol serves the control as a complex infrastructure for data transfer between the control and an external system.

If the "HEIDENHAIN DNC" software option is enabled on a HEIDENHAIN control (option 18), a Windows application can then access data in the the TNC and change them as required. The Windows application communicates with the control solely over the **HEIDENHAIN DNC** software interface.

Die additional communication with the control over the LSV-2 communication library (LSV-2 protocol according to DIN 66019) runs in the background.

The connection between the application and the control can be set up over the serial interface or Ethernet (with the TCP/IP protocol).

Another advantage of the **HEIDENHAIN DNC** software interface is the independence of the Windows application from the type of control (whether single- or dual-processor version of the iTNC 530).

Please note:

The architecture of the HEIDENHAIN DNC software interface does not permit communication in real time.

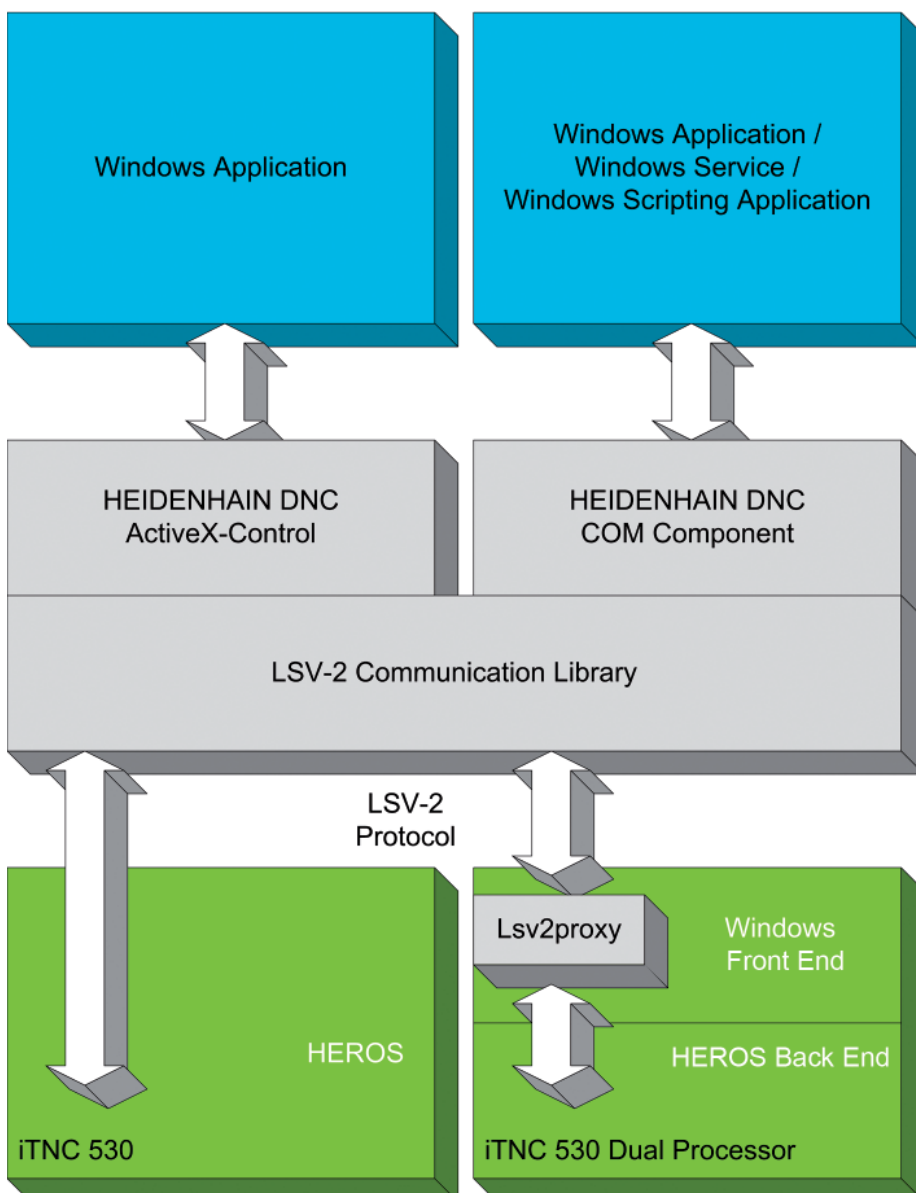
RemoTools SDK development package

To enable you to use the **HEIDENHAIN DNC** software interface, the **RemoTools SDK** development package provides the following software components for development environments on Windows operating systems:

- COM component
- ActiveX control

These components are independent of the programming language, and are based on Microsoft's (D)COM technology. Both software components can be used with any modern development environment for Windows32 (Windows 98/ME/NT 4.0/2000/XP).

During installation of RemoTools SDK, the software components are registered in the operating system and are thereby available to the development environments.



for HEIDENHAIN DNC

COM component

The COM component uses the (D)COM model (common object model) from Microsoft, a software module with interfaces defined in the language-neutral "Interface Description Language." Each of the interfaces supports one or more methods that can be called from an application. The COM component is integrated as a reference in the software development environment and stays ready for more complex applications for using these methods and properties. Unlike ActiveX control, the COM component can be used not only for normal Windows applications but also for Windows services and Windows scripting applications.

Communications are over Ethernet (TCP/IP protocol).

ActiveX control

DNC ActiveX control is the simplest way to use DNC functions in Win32 applications. Here all communications are conducted over the ActiveX control. Integrating this control element in the component library of the development environment provides simple methods, properties and events for an application.

Communication is possible over Ethernet (TCP/IP protocol) and the serial interface of the control.

Please note:

*The ActiveX control is still supported to ensure compatibility with older applications. It is preferable to use the **COM component** for new projects because it has more extensive interface functions and is under continuous improvement.*

Requirements for the PC

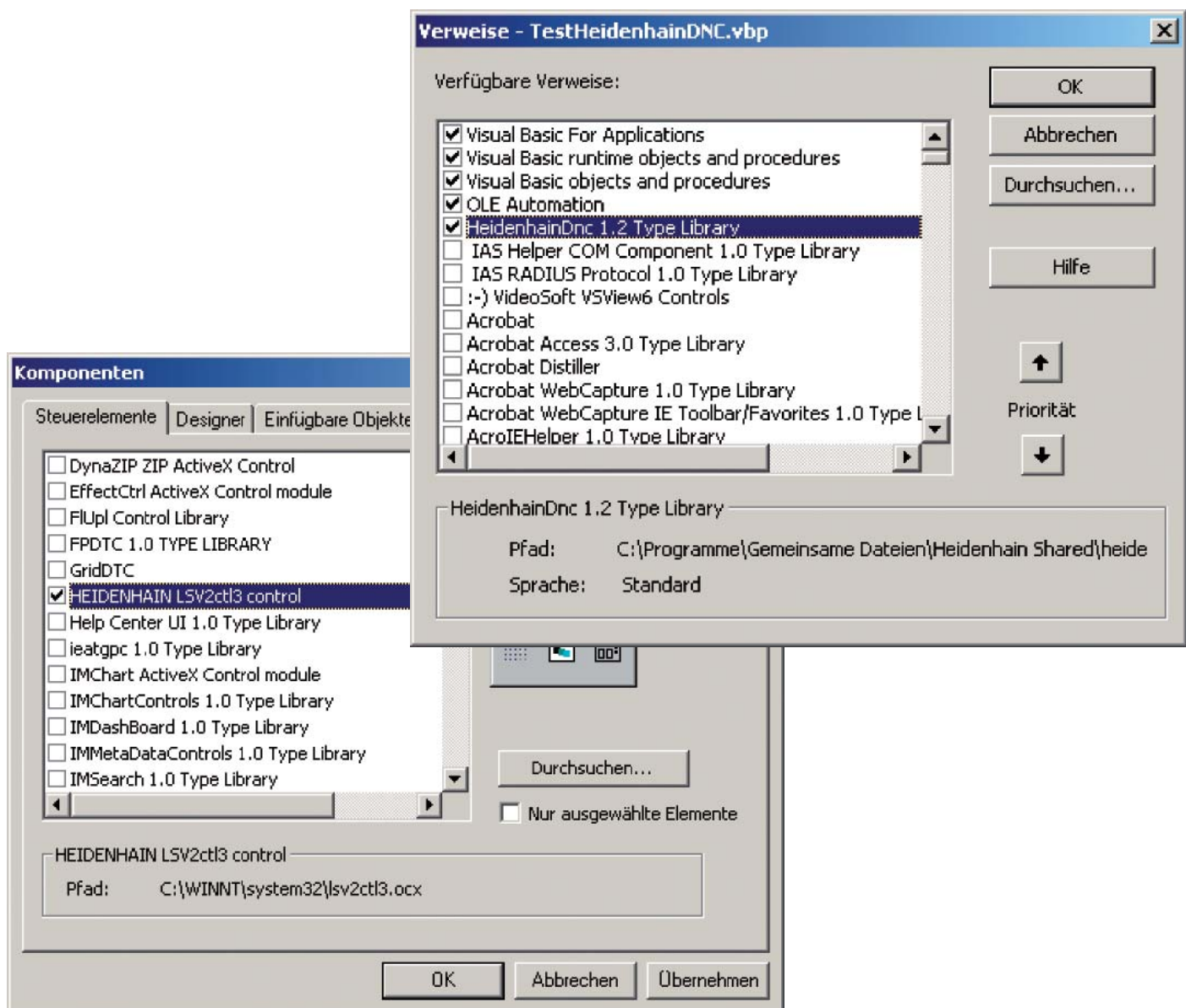
- Windows 95/98, NT 4.0 or 2000/XP operating system
- Windows 2000/XP, Pentium, 128 MB RAM recommended

Requirements for the NC software

- The RemoTools SDK help system provides current NC software for the iTNC 530 and a compatibility overview for older NC software versions.

RemoTools SDK 1.2

Software development package for HEIDENHAIN DNC
ID 340442-11 (German)
ID 340442-12 (English)



Overview of Functions

Interface Objects of HEIDENHAIN DNC

Overview of COM component functions

General machine functions

- Display of configured connections
- Establishing and terminating connection to the control
- Information about the connection status
- Provides connection to other objects

Version information

- Information about control model and NC software
- Information on the active PLC program
- Software identification key (SIK) interrogation
- Information about version of the COM interface

Process information

- Operating time of the control
- Operating time of the machine and spindle/axes
- Time elapsed in NC program run
- Other programmable operating times

Configuration information

- Information on number of axes
- Information on type and designation of axes

Machining control

- Setting an override on the control
- Selecting and starting an NC program
- Interrupting program run at a predetermined line
- Interrogation of the current tool position
- Name and current line number of the running NC program
- Setting and reading the operating mode
- Interrogating the status of the active NC program
- Resetting the control and reselecting the program
- Interrogation of override potentiometer values
- Editing the override potentiometer values
- Status change report of the running NC program (e.g. terminated or stopped)

Table access

- Reading the structure information of a table
- Reading lines
- Deleting lines
- Table transfer, table merge

File operations

- Making, renaming or changing directories
- Reading directory contents (with/without filter)
- Reading the current working directory on the NC control
- Deleting empty directories on the NC control
- Transferring files to the NC control
- Transferring files from the NC control
- Renaming files on the NC control
- Setting the change time and date of a file on the NC control
- Interrupting the file transfer
- Deleting files on the NC control
- Reading and setting file attributes on the NC control
- Definition of files to be monitored for event triggering
- Reading the complete memory and free memory of partitions
- Access also to password-protected areas on the NC control
- Notification of change in a monitored file
- Notification when file transfer ends
- Indication of progress during data transfer

Error message handling

- Readout of pending error information
- Acknowledgment of all pending errors
- Reading the error description
- Generating custom error messages on the NC control
- Notification of an error event upon occurrence
- Notification and acknowledgment of an error

Simple PLC data transfer

- File transfer to and from the PLC of the NC control
- Notification of PLC data sent by the NC control

Direct access to PLC memory

- Read and write access to the PLC memory:
Markers, inputs, outputs, counters, timers, bytes, words,
double words, strings
Input of bytes/words/double words
Output of bytes/words/double words

Transfer of axis positions (only for virtualTNC)

- Reading the current axis positions
- Defining the axes to be read
- Defining the request cycle
- Recording the axis positions in a log file

virtualTNC

PC Software for Control of Virtual Machines

Simulation of NC programs on the control has been a feature of HEIDENHAIN contouring controls for some time now. The PC software virtualTNC now makes it possible to use the iTNC 530 as control component for machine-simulation applications (virtual machines) on external computer systems.

Principle of function of a virtual machine with virtualTNC

Machine simulation applications (virtual machines) are capable of the complete simulation of production units to optimize production processes in the field beforehand.

virtualTNC can control the axes of a virtual machine as if it were a real system. Users program and operate the control in the same way as they do an actual HEIDENHAIN iTNC 530.

virtualTNC is the programming station software of the iTNC 530 with a special interface that enables the machine simulation software to identify the current axis positions of the running "virtual" control.

Interfacing of virtualTNC over HEIDENHAIN DNC

Software manufacturers who would like to simulate a production system can connect their virtual machine to virtualTNC over HEIDENHAIN DNC. The **COM component** (Object Axis Streaming) required for programming and configuring the interface to virtualTNC and its interface description are included in the **Remo-Tools SDK 1.2** software development package and its help system.

Requirements for a PC with virtualTNC

- Windows2000/XP operating system
- Pentium 400 MHz or better
- Min. 128 MB RAM
- Min. 350 MB free hard-disk space
- DVD drive (for program installation)
- USB port for software enable module
- Internet-Explorer 5.5 or later
- Acrobat Reader 4.05 (6.0 is on DVD)

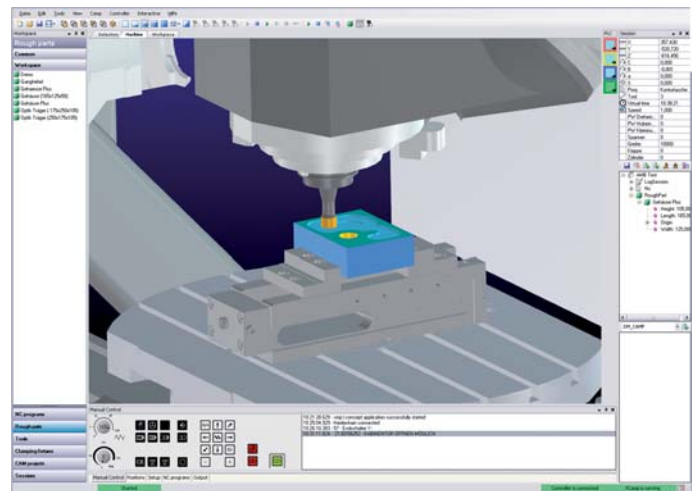
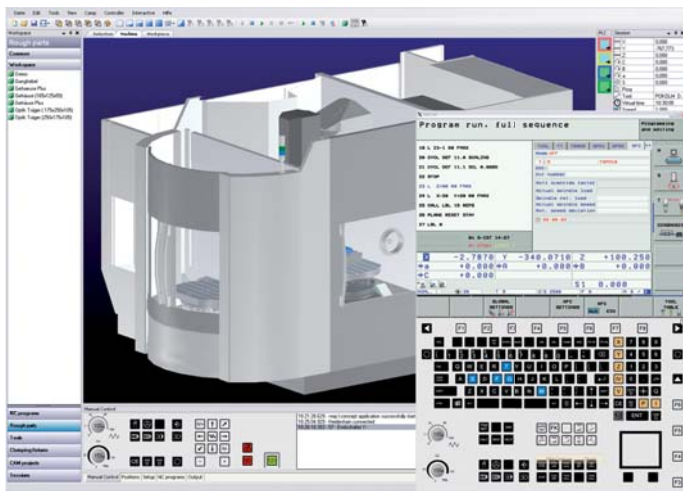
Supported NC software

- NC software 340494-03 or better

virtualTNC

Control software for virtual machines

- ID 584421-01
- With programming station software on DVD and software enable module (USB dongle)



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For more information

- iTNC 530 brochure

