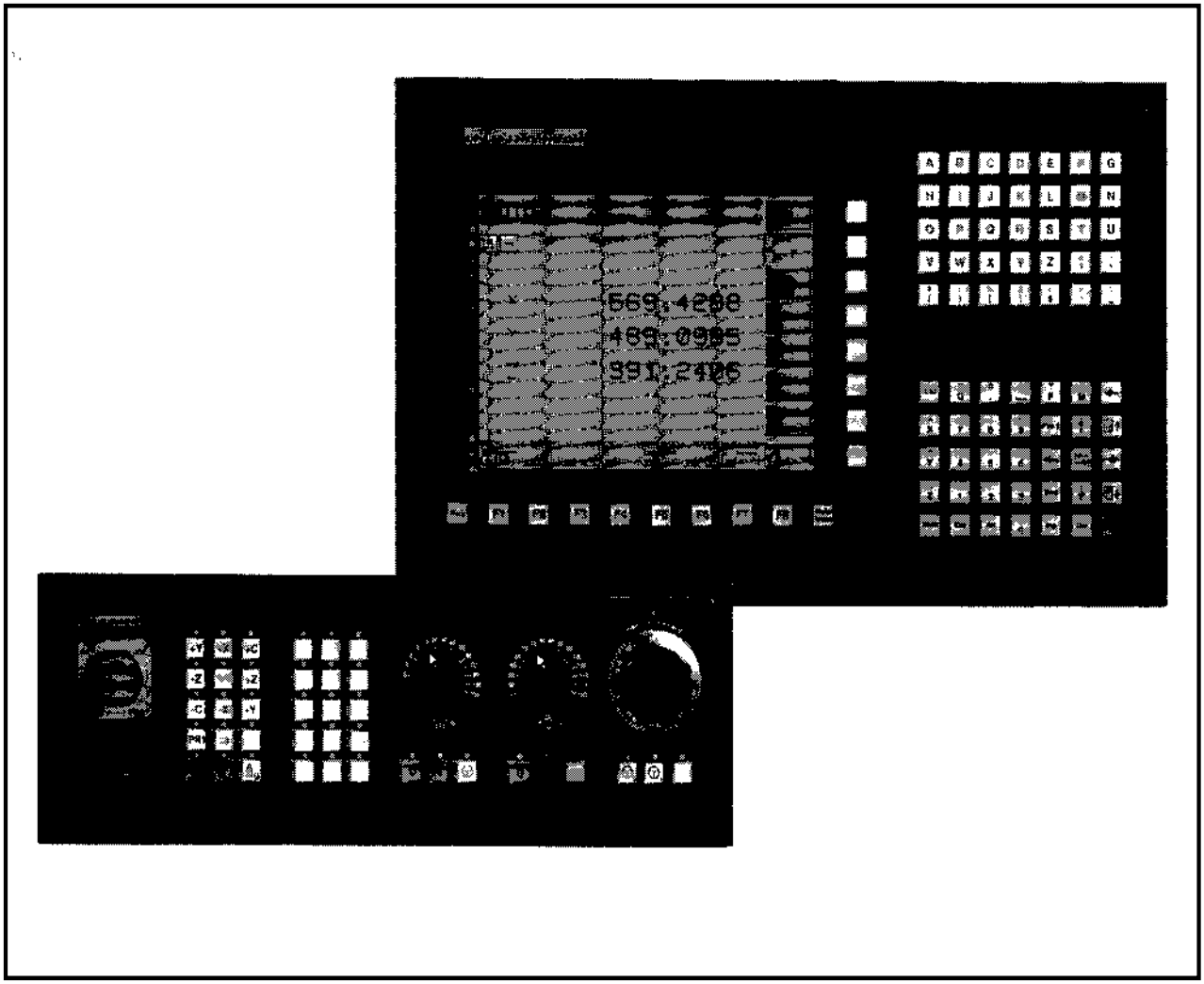
INDRAMAT

MT-CNC
Software Version 16VRS

Installation - New Functions



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Purpose of this document This document describes the installation procedure of the Machine User Interface (MUI) and the Graphical User Interface (GUI) as well as the new functions included in software version 16.

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1 Installing the MUI/GUI

1.1 Introduction

The MUI/GUI - install program decompresses and copies the MUI/GUI program and other MUI/GUI files from the installation diskettes to your hard disk. Before you can use the MUI/GUI, you must execute the install program.

In this chapter you will learn how to install and setup the MUI/GUI on your hard disk. It will be distinguished, whether you install the MUI/GUI the first time or whether you would like to update an already existing installation. At the end it is described, how you can remove the MUI/GUI from the hard disk with the help of the install program.

1.2 Hardware and software requirements

The operator terminal BTV01

The suitable hardware platform to operate the MUI/GUI is the INDRAMAT operator terminal BTV01, an industrial, IBM - compatible PC.

The BTV01.2 is normally equipped with:

- Processor 486DX2/66
- 8 Mbyte RAM
- 256 Kbytes Cache
- at least 500 Mbyte hard disk
- 9,4"-LCD-Color display with VGA - ressolution 640*480 dots
- Serial interface RS232C for connecting the MT-CNC
- Parallel printer interface
- complete NC keyboard with 80 keys
- 8 machine function keys
- Possibility to connect an external PC - keyboard

If required, the following options are available:

- RAM - expansion to a maximum of 64MB
- 10,5"-TFT-Color display
- serial interface RS485 as a bus interface to several MT-CNCs
- second serial interface RS232C or RS485
- ISA-Busadapter with third serial interface RS232C
- installed floppy disk drive 1,44 Mbyte, 3,5" or
- Connection for an external floppy disk drive
- integrated Ethernet - interface
- Profibus-FMS interface

The MUI/GUI can also run on each other „IBM-compatible" PC with the same or better performance as the BTV01. At least the version 5.0 of the operating system MS-DOS is required.

Recommendation for compatible PCs

Different hardware installed in a computer may require special device drivers and/or TSR programs (Terminate and Stay Resident) to be loaded into memory. Some of these programs may interfere with the operation of the MUI/GUI software. If problems appear during the start or the operation of the MUI/GUI, you should deactivate all these programs first (e.g. by disabling them in the files CONFIG.SYS or AUTOEXEC.BAT).

The MUI/GUI software requires at least **590** Kbytes free RAM to operate before it is loaded into memory. Using the command 'MEM' you can identify, how much conventional memory is available on your PC. By removing memory resident drivers or programs you can make more conventional memory available for the MUI/GUI. The program MEMMAKER (which is available since MS-DOS version 6.0) can be used to free more conventional memory by moving drivers into the high memory area.

Note: **Do not execute MEMMAKER, if the MUI/GUI is already installed and automatically started within AUTOEXEC.BAT during the start of the PC!**

The following pages list the system files CONFIG.SYS and AUTOEXEC.BAT, as they are installed on the BTV01 at delivery. In addition examples for system files are indicated for compatible PCs. These examples only contain the essential statements, which are necessary to run the MUI/GUI.

The file *CONFIG.SYS* of the BTV 01

```
REM ************************************************************
REM ***** CONFIG.SYS                                 01.01.1996 *****
REM ***** ------------------------------------------------- *****
REM *****               (C) INDRAMAT GmbH                    *****
REM ************************************************************
DEVICE=C:\DOS\HIMEM.SYS
DEVICE=C:\DOS\EMM386.EXE NOEMS
BUFFERS=10,0
FILES=30
DOS=HIGH,UMB
LASTDRIVE=E
FCBS=4,0
REM DEUTSCH:
COUNTRY=049,850,C:\DOS\COUNTRY.SYS

REM ITALIANO:
REM COUNTRY=049,850,C:\DOS\COUNTRY.SYS

REM ESPANOL
REM COUNTRY=049,850,C:\DOS\COUNTRY.SYS

REM ENGLISH UK
REM COUNTRY=049,850,C:\DOS\COUNTRY.SYS

REM ENGLISH USA
REM COUNTRY=049,850,C:\DOS\COUNTRY.SYS

BREAK=OFF
```

Example of the file *CONFIG.SYS* of compatible PCs

```
DEVICEHIGH=C:\DOS\SETVER.EXE
DEVICE=C:\DOS\HIMEM.SYS
DEVICEHIGH=C:\DOS\EMM386.EXE NOEMS
DEVICEHIGH=C:\DOS\ANSI.SYS /X
DOS=HIGH,UMB
STACKS=0,0
SHELL=COMMAND.COM /E:512 /P
FILES = 30
BUFFERS = 10,0
BREAK = OFF
```

DOS commands are described briefly, refer to your DOS manual for detail information.

The CONFIG.SYS file is used in the PC to load special device drivers and to set up hardware options. The most common commands are the FILES and BUFFERS statements.

The FILES command should be set to 30 or greater. This command specifies the number of files that can be opened simultaneously, the MUI/GUI software uses multiple files in its operation.

The BUFFERS command (together with SMARTDRV) should be set to 10. To reserve more than 10 data buffers together with SMARTDRV in addition to the reserved memory only sometimes generate a higher operating speed, however consumes additional memory area.

Note: **Too large values for FILES and BUFFERS may occupy unnecessarily conventional RAM. If the free working memory is not sufficent for the start of the MUI/GUI anymore, these values must be reduced up to the minimum values.**

In PCs with processors 386 or 486 and expanded memory installed, the expanded memory manager is usually installed via the command DEVICEHIGH, e.g.

```
DEVICEHIGH=C:\DOS\EMM386.EXE NOEMS
```

If WINDOWS is installed on your PC, you may also use the following statements:

```
DEVICE=C:\WINDOWS\HIMEM.SYS
DEVICEHIGH=C:\WINDOWS\EMM386.EXE NOEMS
```

The file *AUTOEXEC.BAT* of the BTV01

```
@ECHO OFF
REM ************************************************
REM *****  AUTOEXEC.BAT                01.01.1996 *****
REM *****-----------------------------------------*****
REM *****            (C) INDRAMAT GmbH            *****
REM ************************************************

PROMPT $p$g
PATH C:\DOS
SET TEMP=C:\DOS
LH DOSKEY
LH C:\DOS\SMARTDRV.EXE 2084 C

rem DEUTSCH:
LH KEYB GR,,C:\DOS\Keyboard.SYS
LH KEYBCODE GR

rem ITALIANO:
rem LH KEYB IT,,C:\DOS\Keyboard.SYS
rem LH KEYBCODE IT

rem ESPANOL:
rem LH KEYB SP,,C:\DOS\Keyboard.SYS
rem LH KEYBCODE SP

rem ENGLISH UK:
rem LH KEYB UK,,C:\DOS\Keyboard.SYS
rem LH KEYBCODE UK

rem ENGLISH USA:
rem LH KEYB US,,C:\DOS\Keyboard.SYS
rem LH KEYBCODE US

MT-RUN
```

An external PC keybourd can be connected to the BTV01. The corresponding country code must be selected by modifying the file AUTOEXEC.BAT. The default setting selects the german keyboard. If a different keyboard is to be connected, the german keyboard driver needs to be disactivated by a REM command while the desired keyboard driver needs to be activated by deleting the REM command in the concerning line. If certain charactars do not appear correctly a wrong setting in the AUTOEXEC.BAT may be the cause.

Example of the file *AUTOEXEC.BAT* for compatible PCs

```
@ECHO OFF
PROMPT $P$G
PATH=C:\DOS;\WINDOWS;C:
SET TEMP=C:\WINDOWS\TEMP
SMARTDRV 2084 1024
LH DOSKEY
MT-RUN
```

By calling the batch MT-RUN at the end of AUTOEXEC.BAT you make sure, that the MUI/GUI is loaded automatically by booting the PC.

MUI/GUI directory tree

The MUI/GUI installation program generates the MUI/GUI directory structure on the PC's hard disk and copies the appropriate files to the correct target.

A directory structure resulting from a MT-CNC installation is shown below. Specifying a second MT-CNC with address 1 will result in an additional tree starting at C:\MT-CNC\ANLAGE01\... etc.

The directories named ..._ARC contain compressed data (archives). A compressed parameter file for example may contain multible files in order to save space on the hard disk. These files are used in case the active file had been destroyed or deleted.

Note: **It's the users responsibillity to archive user data of the single menu items or to make a complete backup of the MUI/GUI user data via the archive function (MUI menu item no. 1).**

```
C:\
├───MT-CNC            Main MUI/GUI directory (*.EXE and *.OVR
files)
│   ├───ANLAGE00      Subdirectory for Master MT-CNC, address 00
│   │   ├───CYCLE     NC-cycle files
│   │   ├───DIAG      Diagnostic text files
│   │   ├───D_CORR    Uploaded D-correction
│   │   ├───EVENTS    Uploaded NC-event status
│   │   ├───GBO       GUI user files
│   │   ├───MACHDATA  Machine data files
│   │   ├───MT_TEMP   Temporary backup files
│   │   ├───NCPRG     NC program packages
│   │   ├───NC_VAR    Uploaded NC-variable data
│   │   ├───OFFSETS   Uploaded offset table data
│   │   ├───OSCIL     Oscilloscoe function files
│   │   ├───PAL       Pallet management data storage
│   │   ├───PARAM     Parameter sets
│   │   ├───PCL       Programmable Controler (SPS) Subdirectory
│   │   │   ├───IB    User start up SPS files
│   │   │   ├───MC    Objekt files of user SPS files
│   │   │   └───SRC   User source SPS files
│   │   ├───PRINT     Print files
│   │   ├───PROJECT   Project related archives
│   │   ├───TOOL      Tool magazine lists
│   │   └───PLC       Not used in version x-16RS
│   ├───CONFIG        Global configuration files
│   ├───CYCLE         Global NC-cycles
│   ├───GBO           GUI files
│   ├───IND_DRV       Global driver files (only MS-WinNT)
│   │   └───PROFI_K   Global Profibus configuration files
│   │                 (only MS-WinNT)
│   ├───MACHDATA      Global machine data files
│   ├───PCL           SPS file deposit subdirectory
│   │   ├───IB        File deposit, user startup SPS files
│   │   ├───MC        Object files of user SPS files
│   │   └───SRC       File deposit, user source SPS files
│   └───SCREEN        User files of the Custom Display menu
│
├───MT_TEXTE          MUI screen text files
│   ├───MTHELP        MUI/GUI help text files
│   └───GBO           GUI text files
│
├───NC_ARC            NC program package archives
├───PAR_ARC           Parameter set archives
├───SPS_ARC           SPS project archives
└───TOOL_ARC          Tool list archives
```

MT-RUN.BAT **File**

The file MT-RUN.BAT is generated during the MUI/GUI installation and resides in the DOS root directory of the specified drive containing the MUI/GUI software installation. In case the MUI/GUI is installed on drive 'C' and the name of the directory is 'MT-CNC' , the file MT-RUN.BAT has the following contents:

```
ECHO OFF
REM INDRAMAT MT-CNC (c) Copyright 1995
REM ---------------------------------
SET DPMIMEM=MAXMEM 4096
    C:
    CD C:\MT-CNC
    TSRPG25I
    MT-CNC /H
    CD\
REM ---------------------------------
```

If required, the following sitches can be added to the line **TSRPG25I** of MT-RUN.BAT. Please contact INDRAMAT Service before using the switches in parenthesis. (the characters are not case sensitive):

/?	: Help display (English)
(/A)	: Displays file processing during MUI booting
/B	: Prevent [Ctrl]+[Alt]+(Del]

/C1 [/C]	: Enables execution under MS-Windows-NT (DOS box)
/C2	: Enables execution under MS-Windows-NT (DOS box) Can only be used in conjunction with the INDRAMAT Function Interface
(/G)	: Generates the file "\GLOBAL.DAT"
(/I=$xx,$yy)	: Programmable interrupt setting $xx = TSR-Interrupt $yy = DPR-Address
(/K)	: TSR-Programm w/o MUI enviroment
/L	: Activation of the MUI error log function
(/O=xxxx)	: Seriel interface (SIO) rate setting: 1:55,5ms 2:27,7ms 4:14ms 8:7ms 16:3,5ms 32:1,7ms 64:868 µs 128:434 µs 256:217 µs 512:108 µs, 1024:54 µs 2048:27 µs 4096:13 µs. The default setting (standard interrupt time) is 1.7ms in case /O is not defined. Different settings can be used in case of communication problems. When using Windows NT (3.5) i.e. switch /O=2 (27.7 ms) must be set.
/P	: TSR program text is taken from hard disk
(/Q)	: IPC1-DPR driver activation
(/R)	: IPC-DPR prototcol with BYTE swapping
(/R0)	: IPC-DPR prototcol w/o BYTE swapping
(/T)	: Disable time synchronisation with hardware time
(/U)	: TSR program debug mode
(/U0)	: Indramat Function Interface test release
(/W)	: Prevents main memory from swapping Reduces the memory area below 640 kByte
(/X)	: DTR/RTS switching for RS-485
(/Y)	: Activation of the TELEBYTE function, which display the seriel communication between the MUI and MT-CNC (Data are stored in ..\TELEGRAM.TXT).
(/Z)	: Data protokol switching (Check sum for TRANSMIT-counter)

If required, the following software options can be appended to the line **MT-CNC** of MT-RUN.BAT. Please contact INDRAMAT Service before using the switches in parenthesis. (the characters are not case sensitive):

/?	: Help display (English)
/B=xx or /b=xx	: The MUI automatically boots the main menu item xx. i.e. /B=09 menu item 9, Custom Display, or /B=10 menu item 10, GUI.

/D=dir	: Allows to define a different work directory i.e. g:\sta1. The drive can be a network drive. All directories and data of the MUI/GUI main directory are user data and must be availlable from the newly defined directory. The contents of the main directory needs not to be copied into the newly defined directory, but can remain on the drive that contains the MUI/GUI installation. Example: 'XCOPY c:\MT-CNC*.* g:\sta1*.* /S /e' and 'delete g:\sta1*.*' can be used to tranfer all user data to a different path i.e. g:\sta1. This also applies to all archive directories of the main installation directory and drive (see also MUI/GUI tree)
(/E or /e)	: Displays the developers name when viewing EXE-versions.
(/F or /f)	: Disables the hard disk memory warning. This warning is generatet if there is less than 1MBbyte availlable memory on the hard disk
/H or /h	: Any EXE-file can be executed using one of the available F-keys. The name of the EXE-file and the related F-key must be determined in the file ..\MT_TEXTE\MAIN_EXE.DAT.
/I or i/	: The original INDRAMAT text for diagnostics will be used. Userdefined text will be suppressed.
(/M or /m)	: Free conventional working memory is not checked when starting the MUI. CAUTION: Unexpected errors may occur during operation which may cause the MUI/GUI to terminat!
(/N or /n)	: New installation of the MUI/GUI software (deletes the file ..:\MT_TEXTE\MT_START)
(/S or /s)	: Boots the MUI/GUI into the Setup mode.
(/V or /v)	: Inserts the version of MT-v into the EXE-header.
/Z or z	: Displays the software licence number

1.3 Before installing the MUI/GUI

Version 16VRS of the MUI/GUI requires at least 590 kByte of convetional work memory on the BTV or PC. Use the DOS command 'MEM' to determine the amount of available conventional work memory and change your computer setup to meet the 590 kByte requirement. Check also the CONFIG.SYS and AUTOEXEC.BAT.

Note: **The software version of the MUI/GUI and the firmware version of the MT-CNC must be the same. Otherwise the system will not work correctly. Before installing or updating the MUI/GUI the compatibillity to the existing firmware of the MT-CNC needs to be checked. The firmware version installed can be read from the barcode label mounted at the top of the rack of the MT-CNC.**

If you would like to install the MUI/GUI for the first time follow the procedure described in 'New Installation'.

If you would like to add German or English help texts or one of these two languages as an additional language to your existing installation, follow the procedure described in 'Installing German or Englisch later'.

If you would like to install a language module (e. g. French, Spanisch, Italian) with your existing installation, follow the procedure described in 'Installing a language module'.

If you would like to update an existing installation follow the procedure described in ‘Updating’.

If you would like to delete an existing installation including user data follow the procedure described in Un-Install.

1.4 New MUI/GUI Installation

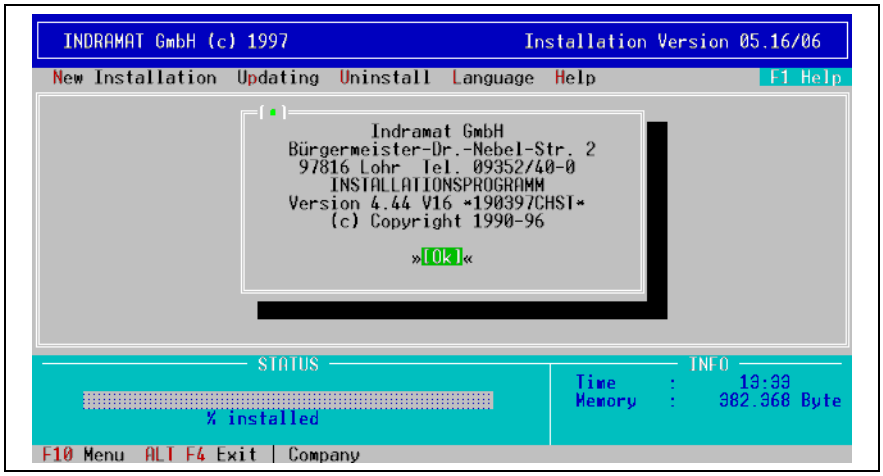
The complete MUI/GUI installation without user programs requires a minimum of 30 MB free hard disk space. Make a ‘DIR’ at the root of the hard disk and make sure that there is enough free memory available before installing the MUI. Read the software licence agreement before installing the MUI/GUI.

To install the MUI, insert disk #1 into drive A or B of your PC (in the further description we are talking about drive A). Return to the root directory of your hard drive (e.g. ‘CD\’) and log on to drive A (e.g. A: [Enter]). To start the automatic MUI install program, type ‘install' and press [Enter].

A Microsoft or compatible mouse can also be used with the install program.

At the language prompt screen use the cursor key to select the desired language (default is German) that should be used during the installation and mark it by pressing the space bar. Then press [Enter] to continue.

The main install screen is displayed after the language for the install program selection. When the screen is first opened, a window will display the version and copyright information about the install program. Press [Enter], to confirm this window or click the button using the mouse.

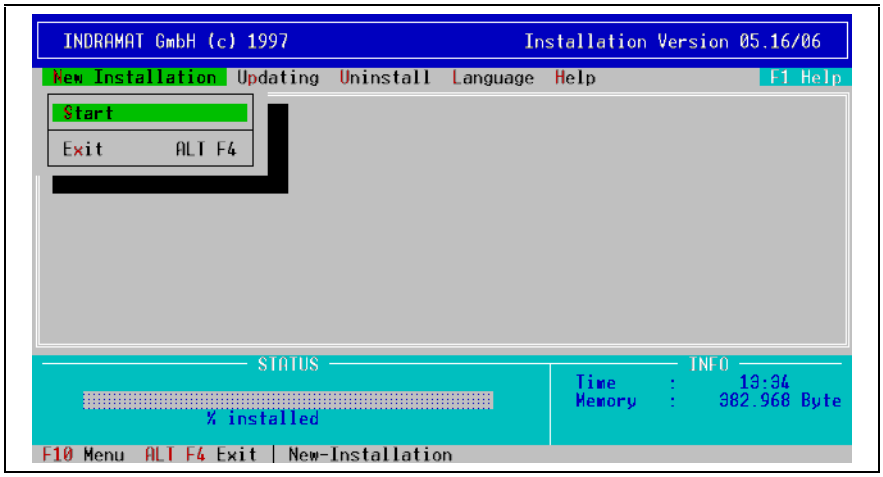


The install program provides help for the different screens and errors.

Press [F1] to open the help window for the current menu or error.

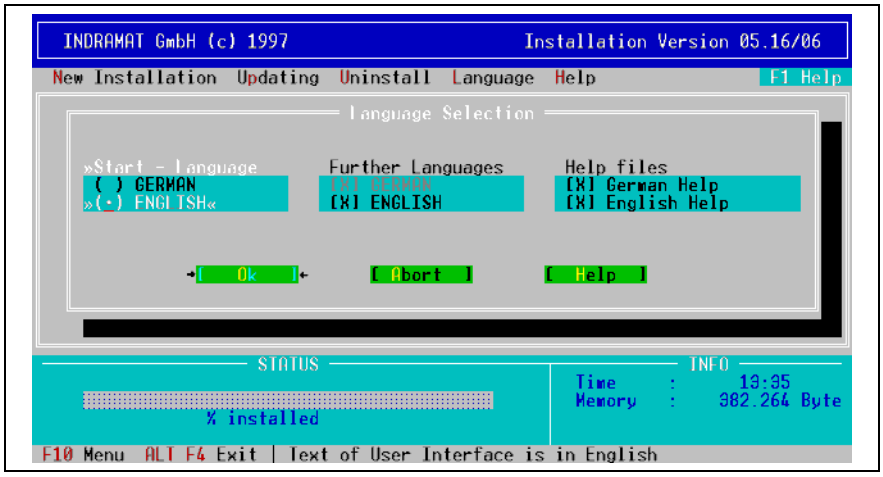
Press [F10] or [Alt]+[N] to select "New Installation". [Alt] + [F4] allows to exit the install program.

To start ‘New Installation’ select ‘Start’ via the cursor and press [Enter] or [S].



The user is then prompted for the MUI/GUI language options. Select all languages that you would like to have available in the MUI/GUI installation. The language German is always installed as a service language. The [Tab] key switches between the columns and the OK button. The ‘Start language’ is used in the MUI/GUI at MUI/GUI boot up. ‘Further languages’ can be tagged via the <space bar> and are available in the installed MUI/GUI. They can be selected through the SETUP. As multiple languages require large disk space, they can be selected seperately.

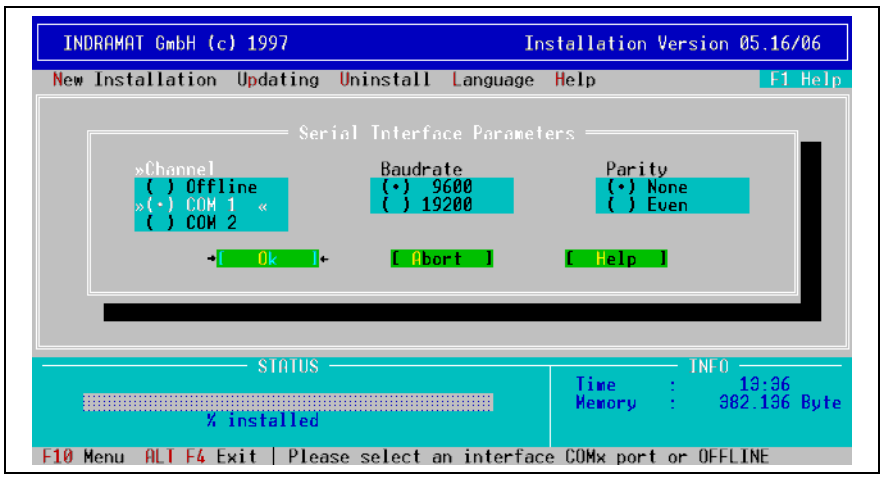
Press [Enter] or click the OK button to complete the language selection.



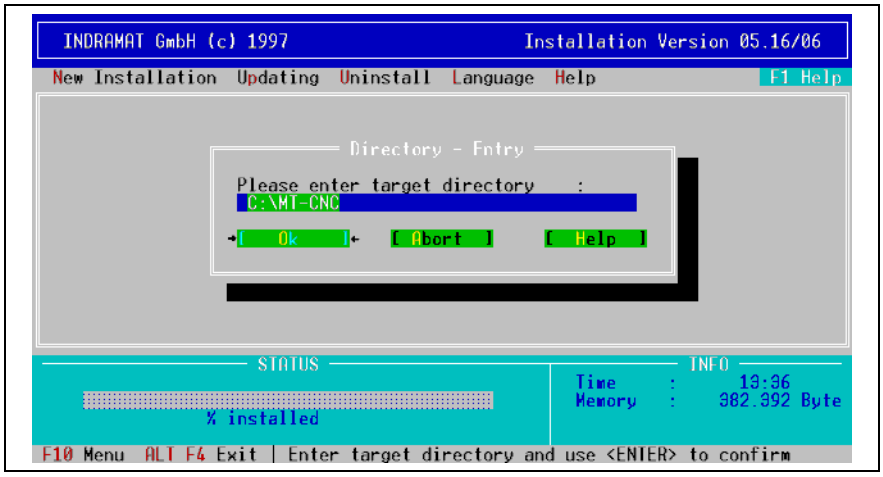
The next screen allows to select the serial interface settings for the time of MUI/GUI boot up.

'Offline' allows to use the MUI/GUI without a connection to the MT-CNC.

Baudrate and parity selection must match the switch settings in the SIOB board or CPUB respectivly (default: 9600, no parity).

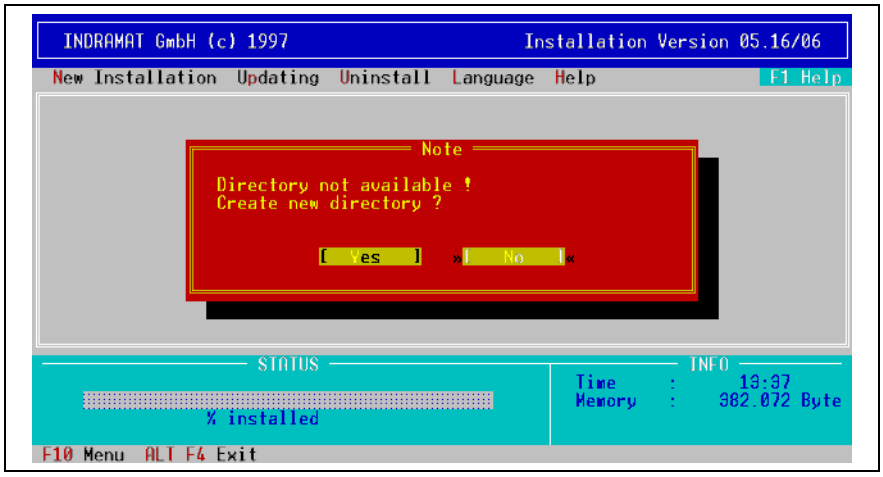


Before the installation begins, the user is prompted for a destination directory on the hard disk. The default prompt is 'C:\MT-CNC'. It is recommended to use the same directory, eventually on a different drive. The destination drive must have a minimum of 25 MByte of free space available for executing the installation successfully. Enter a new path or use the cursor keys first to modify the default path. The [Tab] key allows to move between the selected fields. Click the OK button or press [Enter] after having entered the correct path.



The install program prompts a message indicating the specified directory already exists or that it does not exist. The directory must be generated if it does not exist.

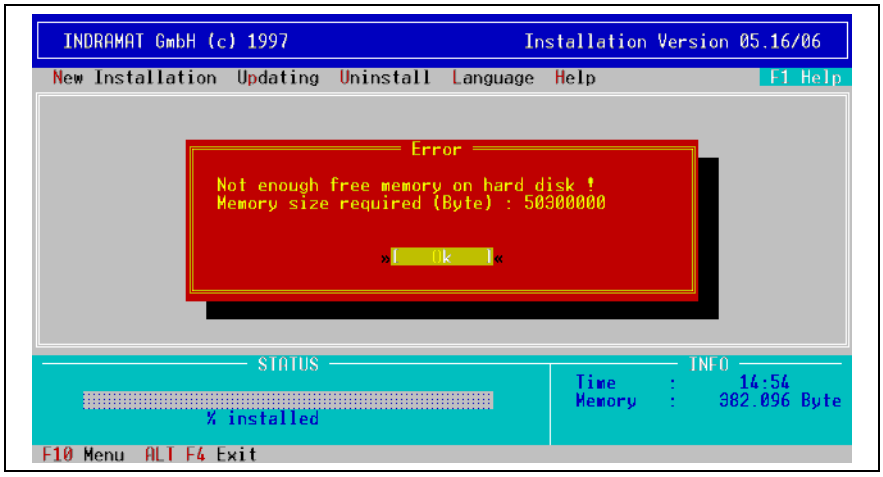
Press [Y] or [Enter] to create the specified directory and the installation is continued.



The install program will now check for the available memory on the specified hard disk.

If the hard disk provides insufficient memory, the following message is displayed.

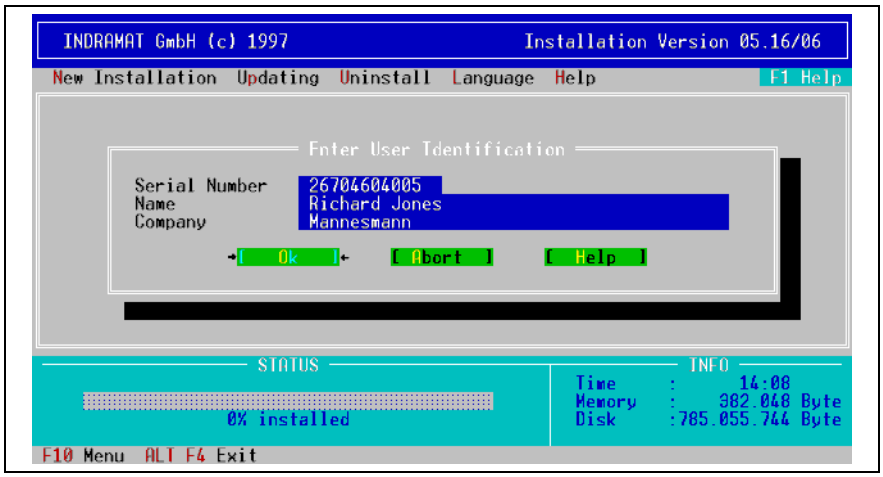
The install program returns to the main menu after pressing [Enter] or clicking the OK button.



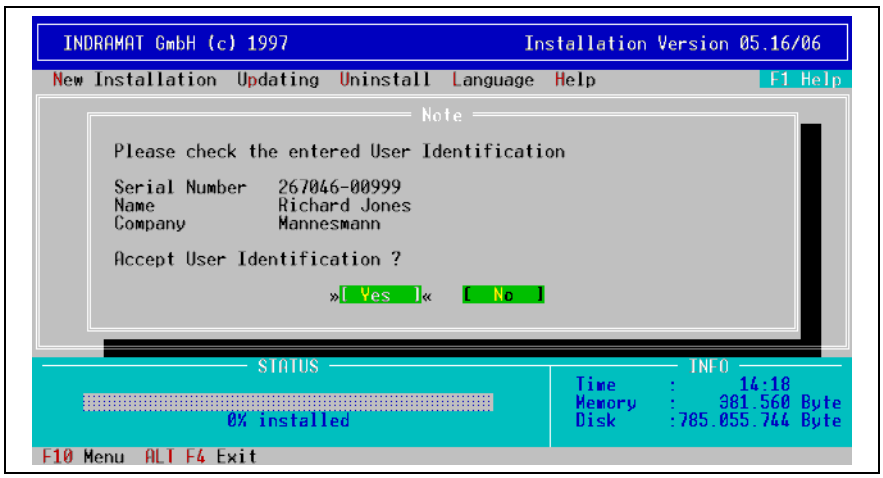
During the first installation the MUI/GUI will be licenced. You are asked to type in the name and company name of the legal software user.

Please consider, that name and company name are displayed everytime when booting the MUI/GUI. Furthermore, name and company name are printed whenever printing user data, e.g. NC programs.

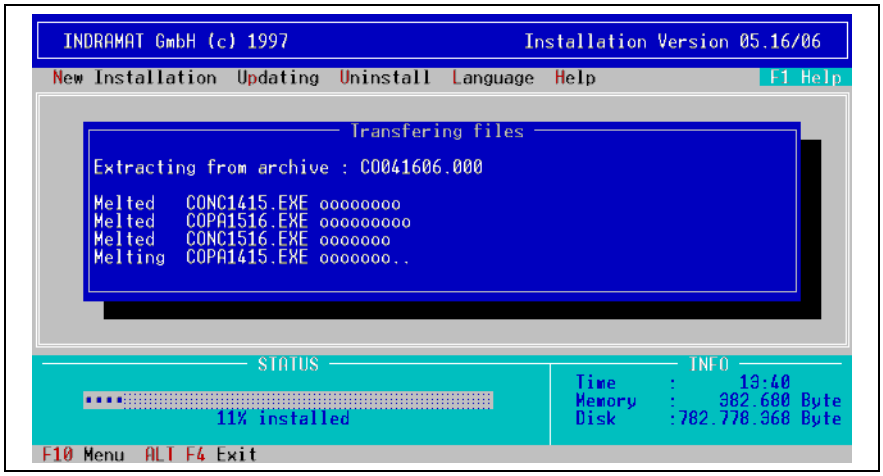
If you have a copy licence, this window appears only with the first installation. Name and company name will then be valid for every additional installation.



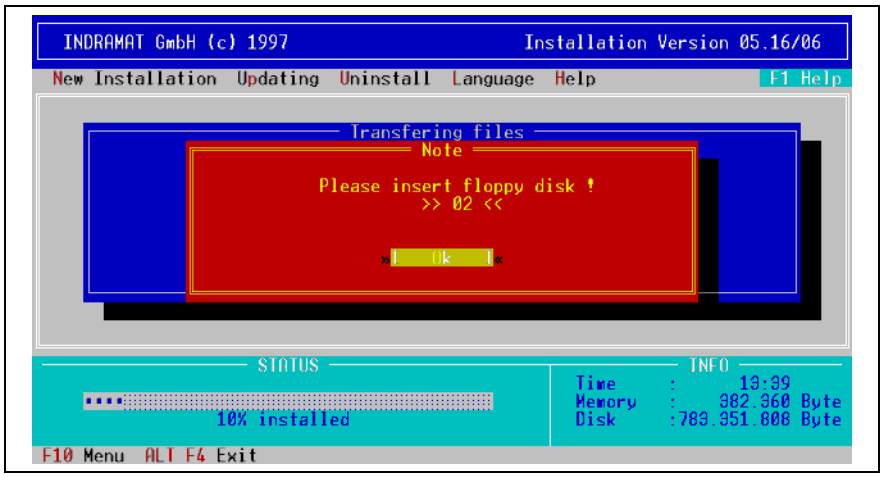
Name and company name will be displayed again to be confirmed. If you would like to correct your input data select ‘NO’ and correct the input. After confirming the input data by selecting ‘YES’ and pressing [Enter], name and company name are stored on floppy disk.



During the installation process, the window on the screen will show status information and the process of decompressing files.

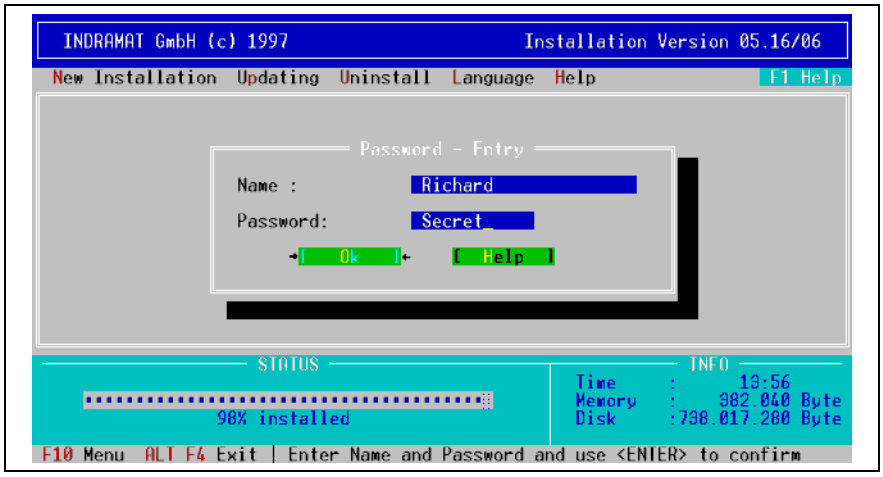


The user will be prompted to insert the required disk.

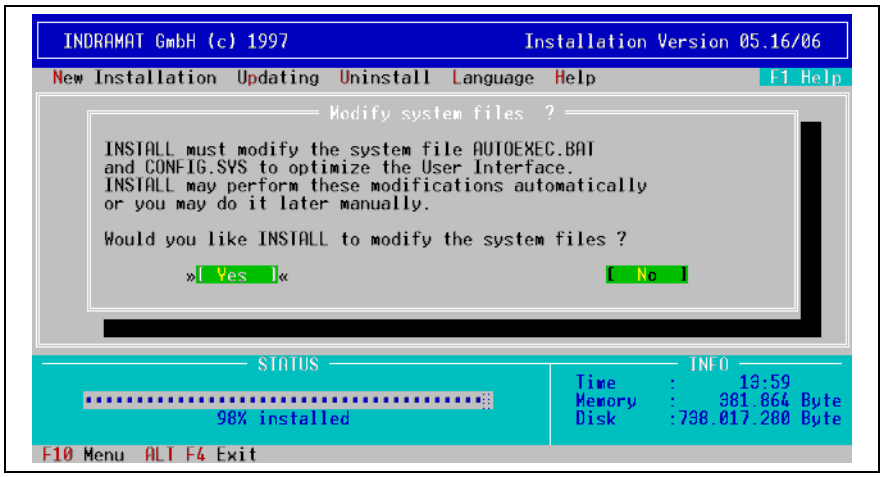


Once the installation procedure is completed, the user is prompted to enter an initial Login Name and PASSWORD. Only this user has the right to introduce new users and the related rights. Please memorize the user name and password. If you are not able to type in the correct user name and password, the MUI/GUI must be reinstalled and the user data will be lost. Indramat service can assist you to find the correct password.

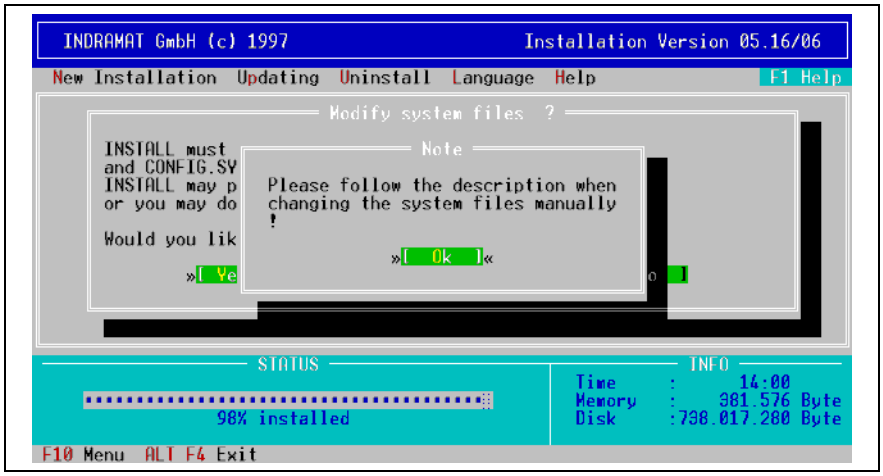
Additional users and their passwords may be added and modified via the MUI setup menu (refer to the MT-CNC User Interface Manual).



The user is asked if the CONFIG.SYS and AUTOEXEC.BAT files should be modified to the MUI settings. The changes are automatically integrated if the OK botton is confirmed by pressing [Enter].



Use [Tab] and press [Enter] or click [NO] if the modification should not be performed. The settings in the CONFIG.SYS and AUTOEXEC.BAT must then be performed manually later.

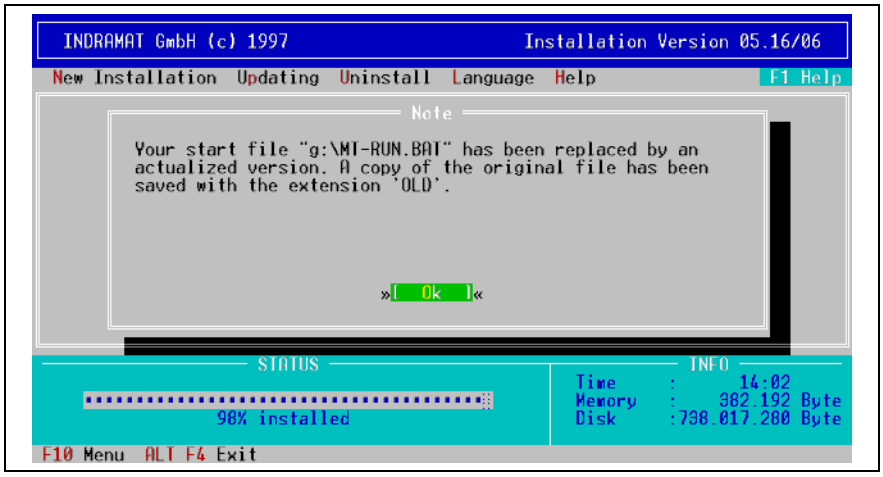


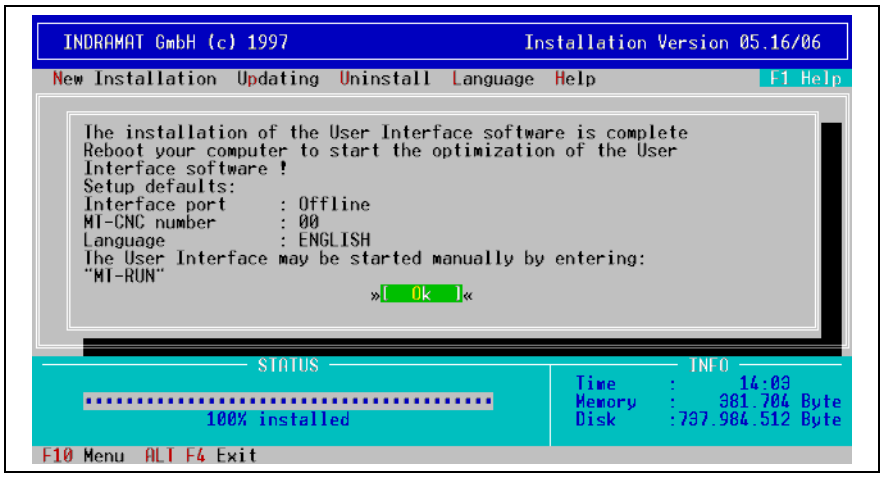
The last screen shows the default settings of the MUI/GUI.

COM1: The MUI/GUI will try to communicate with the MT-CNC via the PC's serial port COM1.

00: Up to 16 MT-CNCs can be administrated via the MUI/GUI. At boot up, MUI/GUI selects the MT-CNC with communication address 00.

ENGLISH: The MUI/GUI will boot up in this language.





The installation is now completed and the DOS prompt is displayed. The root directory of the hard drive contains the MT-RUN.BAT batch file with the standard settings. The possible settings are shown in section ‘The file MT-RUN.BAT’.

To prevent PC lockup during the first MUI/GUI boot up, disconnect devices that are connected to the PC’s serial port COM1. The MUI/GUI will try to communicate with the MT-CNC via this serial port since the default setting is set to COM1 for ONLINE MODE.

If you have already selected OFFLINE MODE the MUI/GUI will not try to communicate with the MT-CNC and the serial port can be used for other peripheral devices like mouse or printer.

The file MT-RUN.BAT may also be modified to boot into the MUI setup menu which allows to select OFFLINE MODE.

To exit the MUI, press [F10] to return to the main menu and [Ctrl]+[C] to access DOS. The login name and password entry is prompted if no password is active. Unauthorized users cannot return to the operating system level.

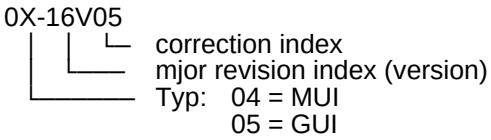
1.5 Updating MUI/GUI Installations

The following must be considered before updating an existing older MUI/GUI version to this new version:

- Restore all user data (backups) that should be converted to this new version into the already existing old MUI/GUI version. Use the archiving utilities of the old and currently installed MUI/GUI version to do so. This is necessary, since backups of earlier MUI/GUI versions cannot be read or converted when retrieving or restoring them with this version.
- When updating a MUI/GUI of a machine, make sure that all MT-CNC control components contain the correct firmware. This information can be obtained by:
  - using [Ctrl]+[F2] in MUI menu item 7 to display the firmware that is installed in the MT-CNC, RECO, BTM,
  - checking the version displayed in the bottom line of the SOT main menu.

The drive that contains the current MUI/GUI installation must provide an additional 15 MByte of free HD memory to perform the update. Make a 'DIR' at the root of the hard disk and assure this free memory before updating the MUI/GUI.

The type code of MUI/GUI software release:



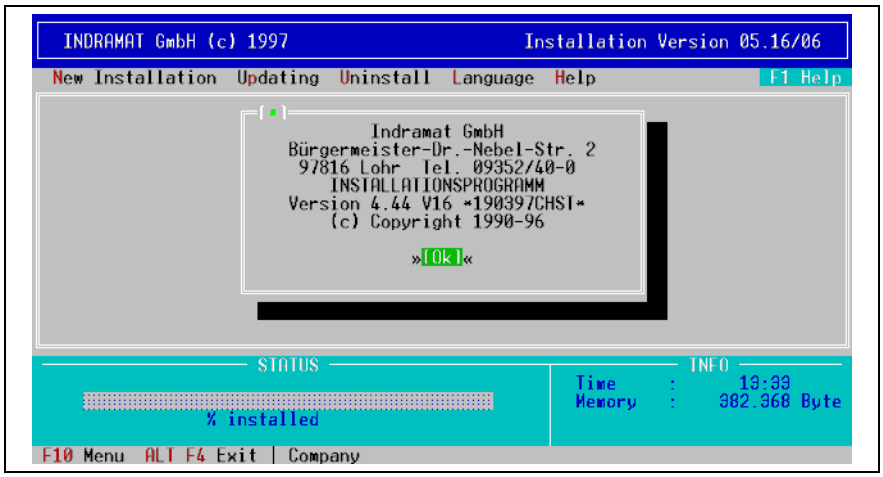
Perform updates in the following sequence up to this version:

03.08/xx ⇒ 04.10/xx ⇒ 04.11/xx ⇒ 04.12/xx ⇒ 04.13/xx ⇒ 04.14/xx ⇒ 04.15/xx ⇒ 04-16Vxx

To update the MUI/GUI, insert disk #1 into drive A or B of your PC (in the following description we are talking about drive A). Return to the root directory of your hard drive (e.g. 'C:\') and log on to drive A (e.g. 'A:[Enter]). To start the automatic MUI/GUI install program, type 'install' and press [Enter]. A Microsoft compatible mouse may also be used with the install program.

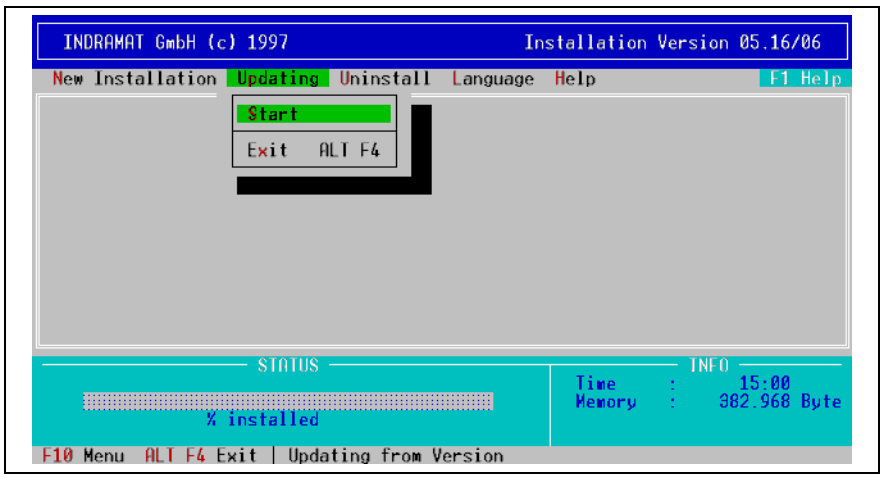
At the language prompt screen use the cursor key to select the desired language (default is German) that should be used during the installation and mark it by pressing the [space] bar. Then press [Enter] to continue.

Then the main install screen is displayed. When the screen is opened, a window will display the version and copyright information about the install program.
Press [Enter] to confirm this window or click the button using the mouse.



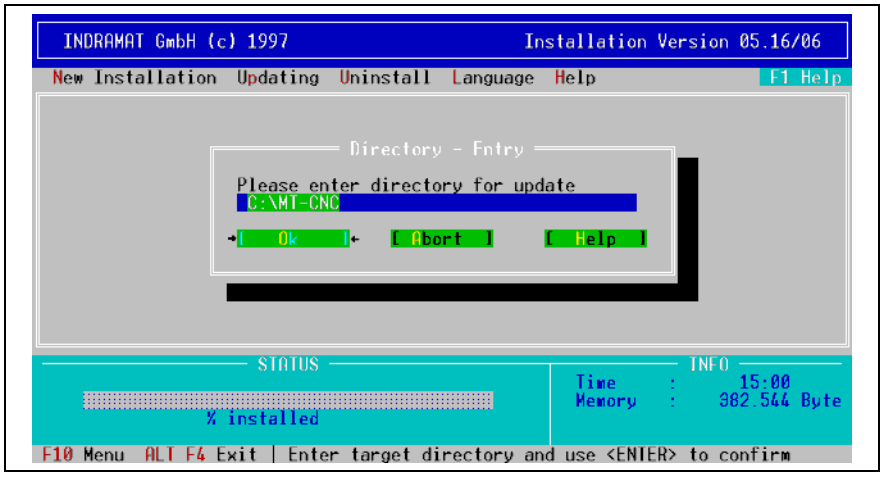
The install program provides help for different screens and errors.
Press [F1] to open the help window for the current menu or error.

Press [F10] or [Alt]+[P] to select ‘Updating’.
[Alt]+[F4] allows to exit the install program.

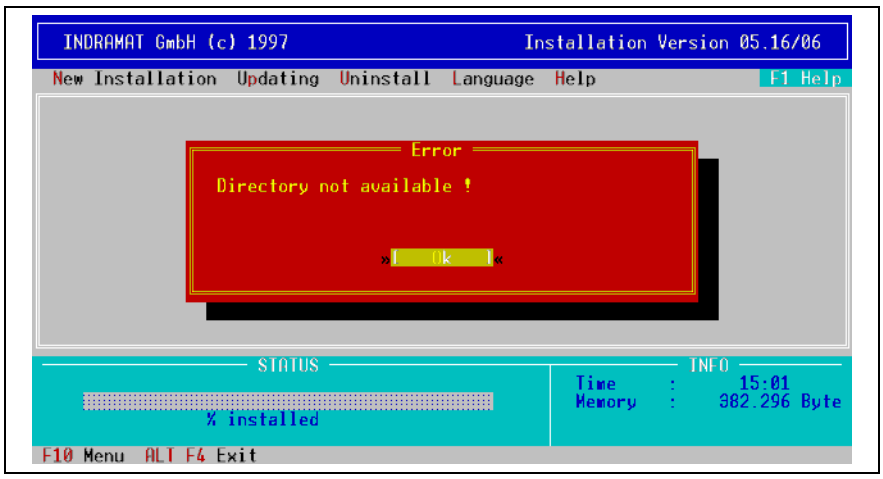


The user is prompted for the directory where the current MUI software is installed. The default is 'C:\MT-CNC'. Confirm this directory or enter the correct drive and directory name.

The [Tab] key allows to move between the selected fields. Click the OK button or press [Enter] after the correct path is entered.



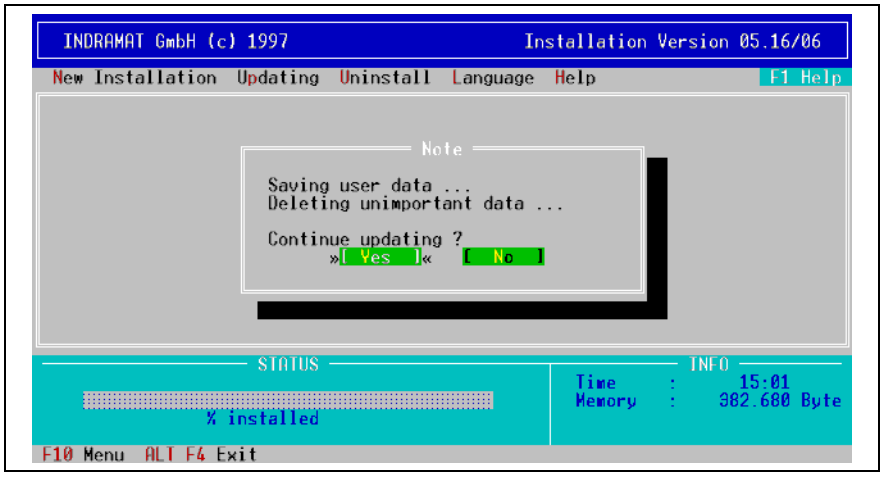
The install program prompts a message if the specified directory does not exist on the specified hard drive or if it is no MUI main directory.



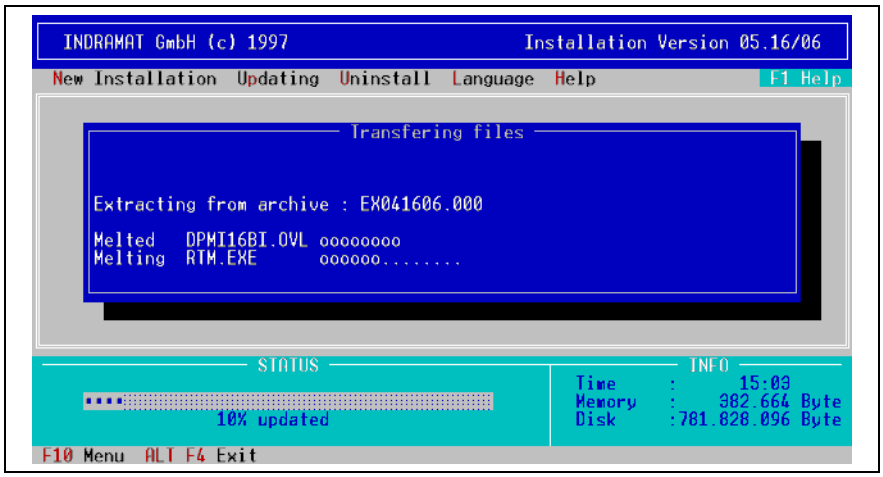
A safety message is prompted, once the specified directory is recognized as a MUI main directory.

Press [N] to abort the update.

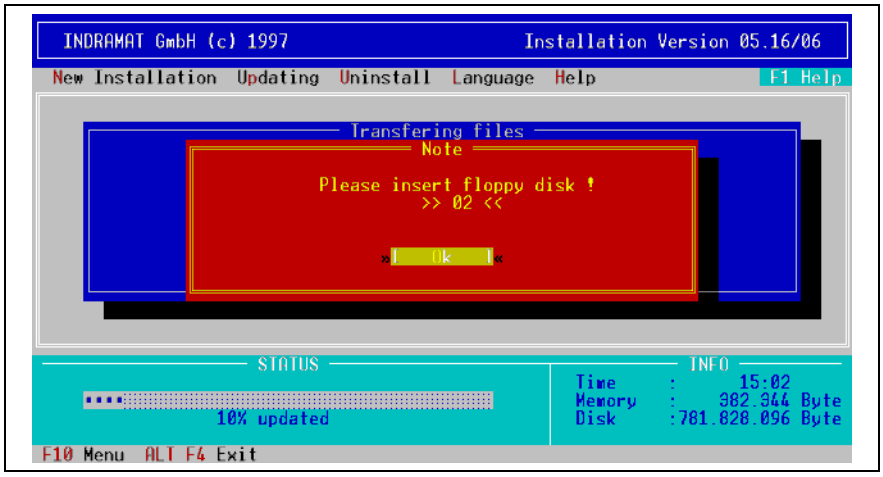
Press [Y] to continue. All MUI/GUI data will be replaced by the one of the new version. User data remains on the hard disk and is converted into the new version.



During the installation process, the window on the screen shows status information and the progress of decompressing.

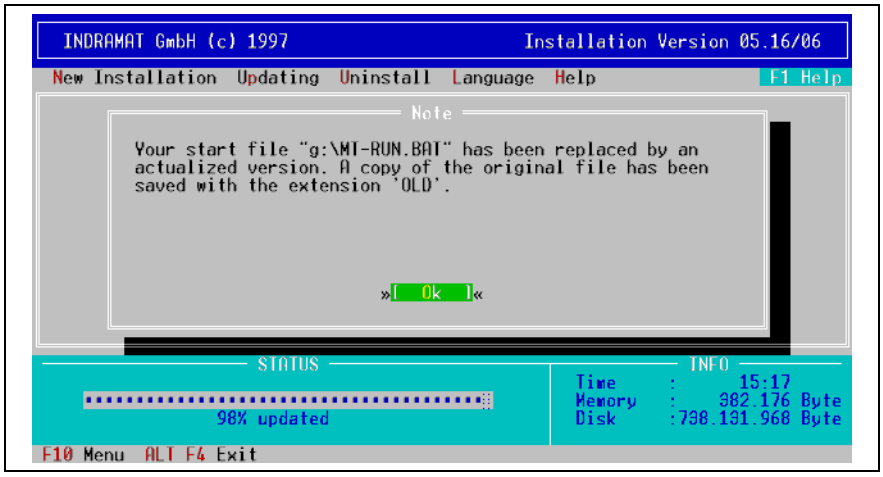


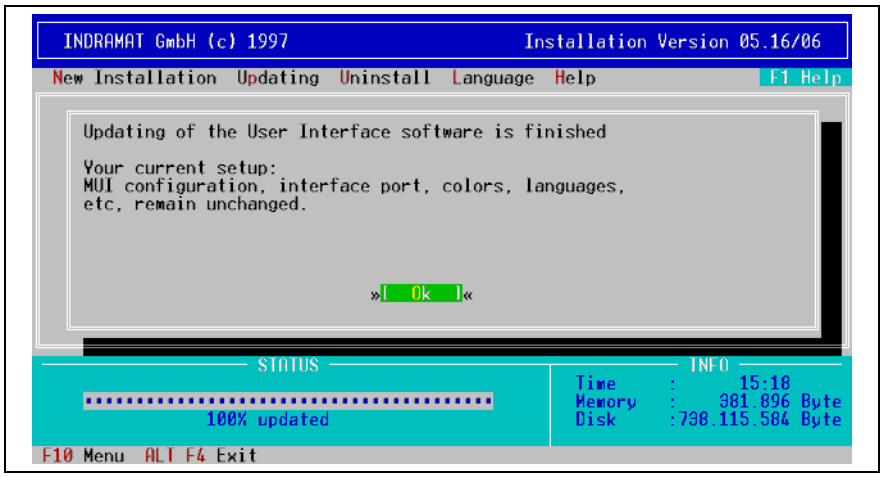
The user will be prompted to insert the required disks.



When the update procedure is complete, the user will be informed that nothing of the previous MUI/GUI setup was changed during the update.

Press [Enter] or click the OK button and the install program will return to the DOS prompt.





The update is now completed and the DOS prompt is displayed. The root directory of the hard drive contains the MT-RUN.BAT batch file with its previous settings. The possible settings are shown in section 'MT-RUN.BAT File'.

To run the MUI/GUI, type 'MT-RUN' at the DOS prompt and press [Enter].

To exit the MUI, press [F10] to return to its main menu and [Ctrl]+[C] to return to DOS. The login name and password entry is prompted if no password is active. Unauthorized users cannot return to the operating system level.

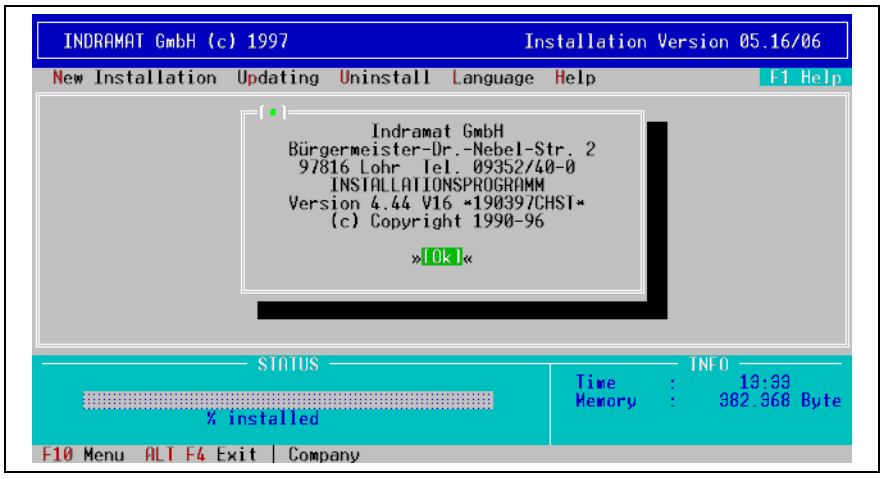
1.6 Installing German or English later

For installing German or English later (you have already installed one of these two languages and would like to add the other one), insert disk #1 into drive A or B of your PC (in the following description we are talking about drive A). Return to the root directory of your hard drive (e. g. 'CD\') and log on to drive A (e. g. 'A:' [Enter]). A Microsoft compatible mouse may also be used with the install program.

At the language prompt screen use the cursor key to select the desired language (default is German) that should be used during the installation and mark it by pressing the [space] bar. Then press [Enter] to continue.

Then the main install screen is displayed. When the screen is opened, a window will display the version and copyright information about the install program.

Press [Enter] to confirm this window or click the button using the mouse.

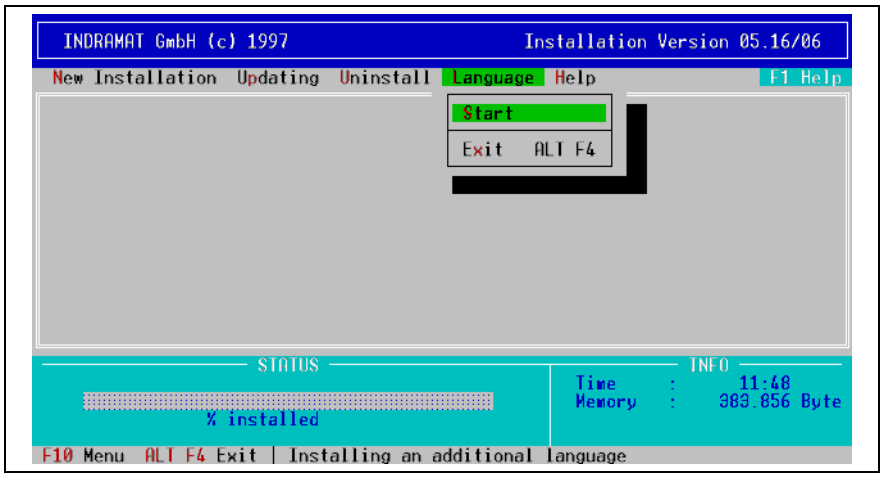


The install program provides help for different screens and errors.

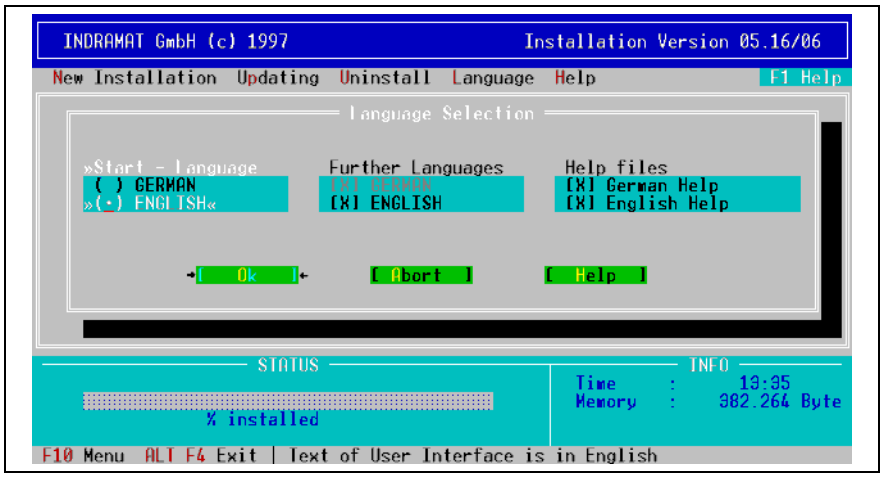
Press [F1] to open the help window for the current menu or error.

Press [Alt]+[L] to select 'Language' or use the mouse to click on 'Language'.

[Alt]+[F4] allows to exit the install program.



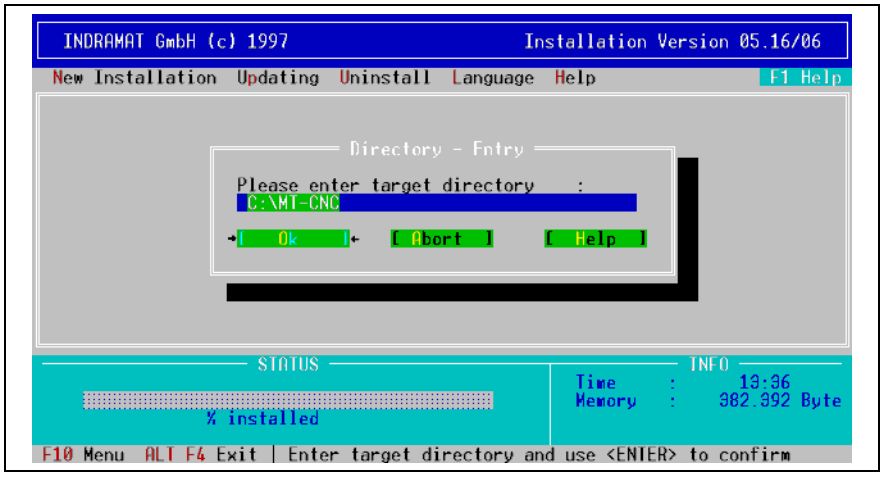
To start 'Language' select 'Start' with the mouse or press [S].



Then you are prompted to determine the possibilities for the languages. Now select the language you would like to add or select the language for which you would like to install the help texts. The [Tab] key allows to move between the selected fields.

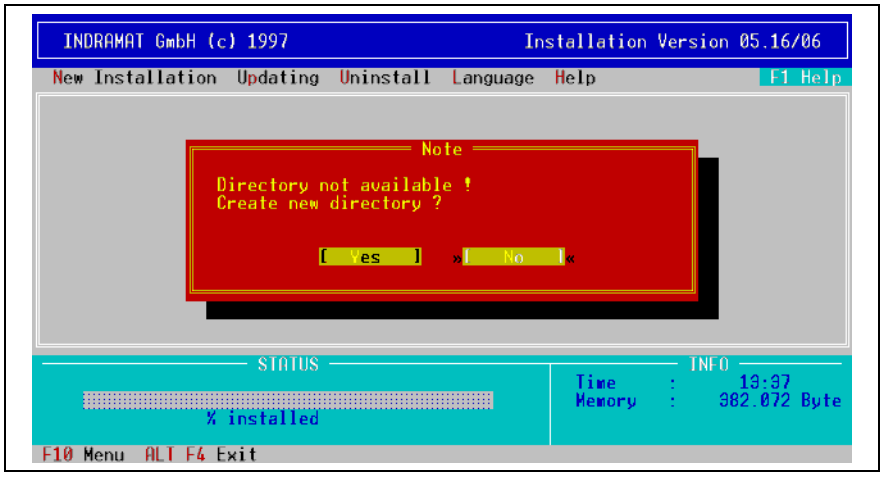
When the MUI/GUI is started the first time the language selected with 'Start' is used. 'Further languages' can be marked by the space bar and are then available in the Setup Menu of the MUI/GUI.

To complete the selection of the languages press [Enter] or click the OK button with the mouse.

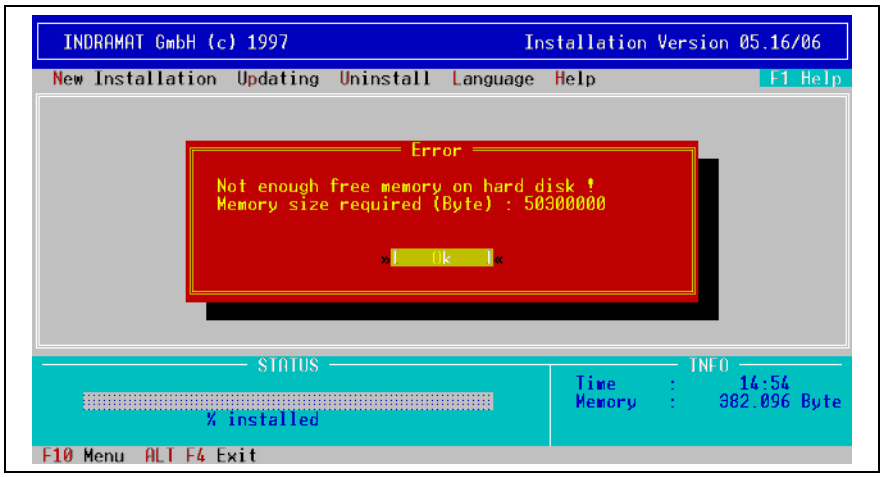


The user is prompted for the directory where the current MUI software is installed. The default is 'C:\MT-CNC'. Confirm this directory or enter the correct drive and directory name.

The [Tab] key allows to move between the selected fields. Click the OK button or press [Enter] after having entered the correct path.



The install program prompts a message if the specified directory does not exist on the specified hard drive or if it is no MUI main directory.

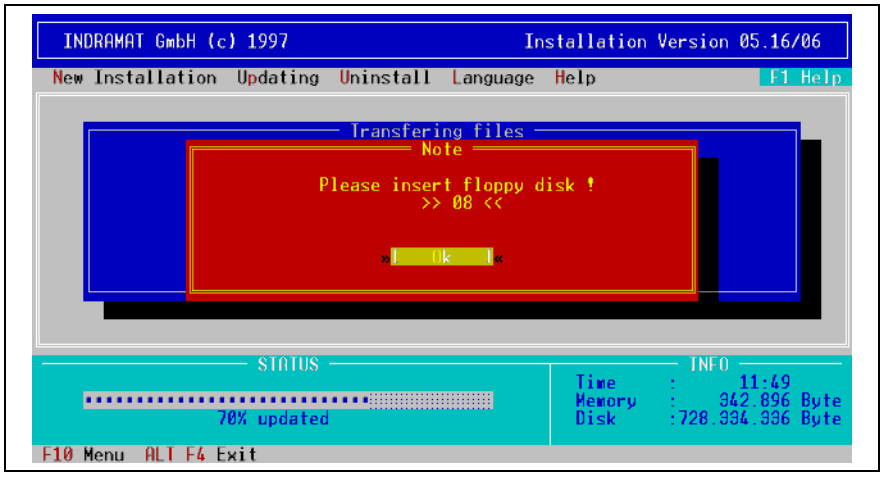


Now the install program checks if there is enough free memory capacity on the selected hard drive.

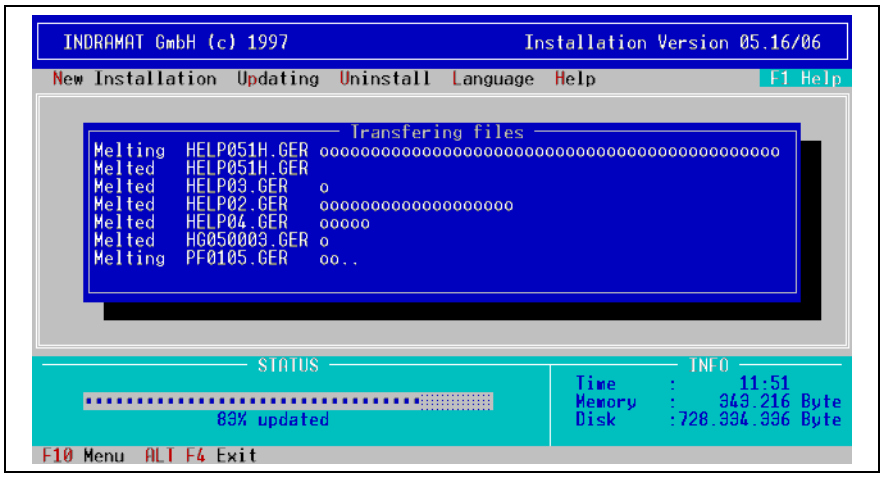
If this is not the case you will receive the message shown above.

After pressing [Enter] or clicking the OK button with the mouse, the install program returns to the main menu.

For installing another language or help texts not all disks are necessary. The number of the concerning disks are shown on the screen in correct order and you will be asked to insert the concerning disks.

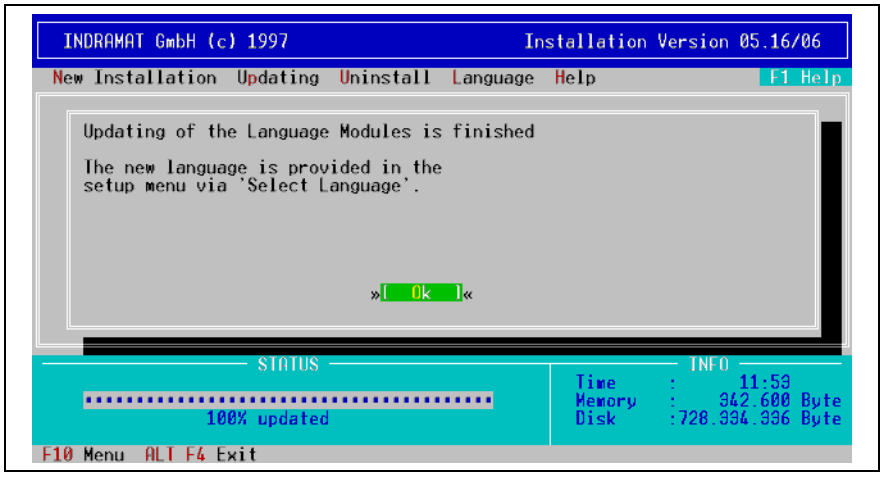


During the installation process, the window on the screen shows status information and the progress of decompressing.



When the installing procedure is complete, the user is informed that the new language is now available in the Setup Menu (language selection).

Press [Enter] or click the OK button with the mouse to return to the DOS prompt.



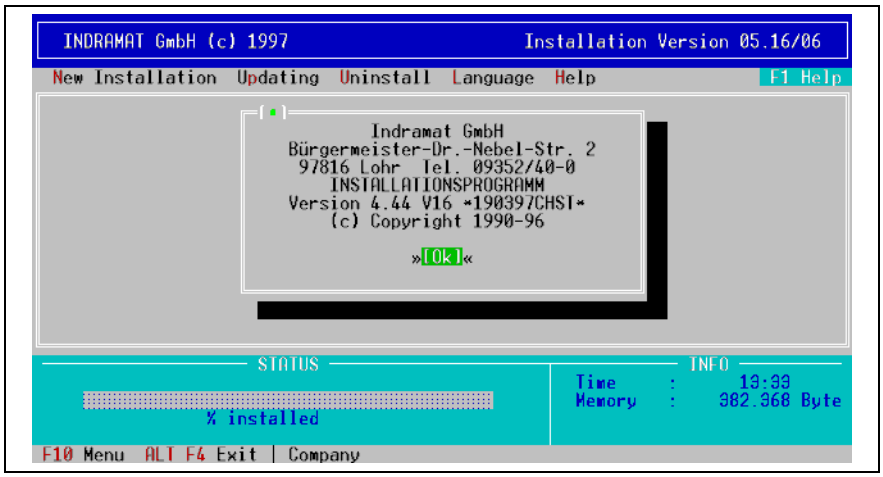
1.7 Un-Installing the MUI/GUI

This feature can be used to remove all MUI/GUI files, MT-CNC user files and their directories from the specified hard disk.

To un-install the MUI/GUI, insert disk #1 into drive A or B (in the further description we are talking about drive A). Return to the root directory of your hard drive (e.g. 'CD\') and log on to drive a (e.g. 'A:[Enter]). To start the automatic MUI/GUI install program, type 'install' and press [Enter]. A Microsoft compatible mouse may be used also with the install program.

At the language prompt screen use the cursor key to select the desired language (default is German) that should be used during the installation and mark it by pressing the <space bar>. Then press [Enter] to continue.

The main install screen is displayed after the language selection. When the screen is first opened, a window will display the version and copyright information about the install program. Press [Enter] to confirm this window or click the OK button using the mouse.

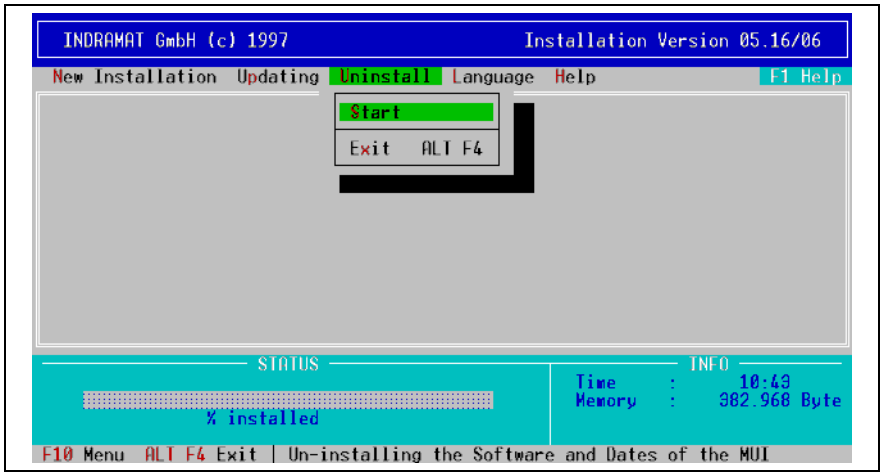


The install program provides help for the different screens and errors.

Press [F1] to open the help window for the current menu or error.

Press [F10] or [Alt]+[U] to select ‘Un-Install’.

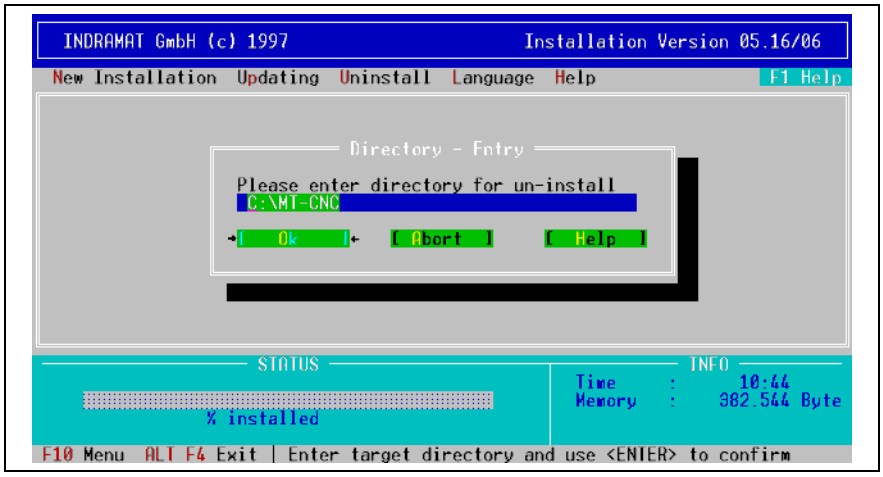
[Alt]+[F4] allows to exit the install program.



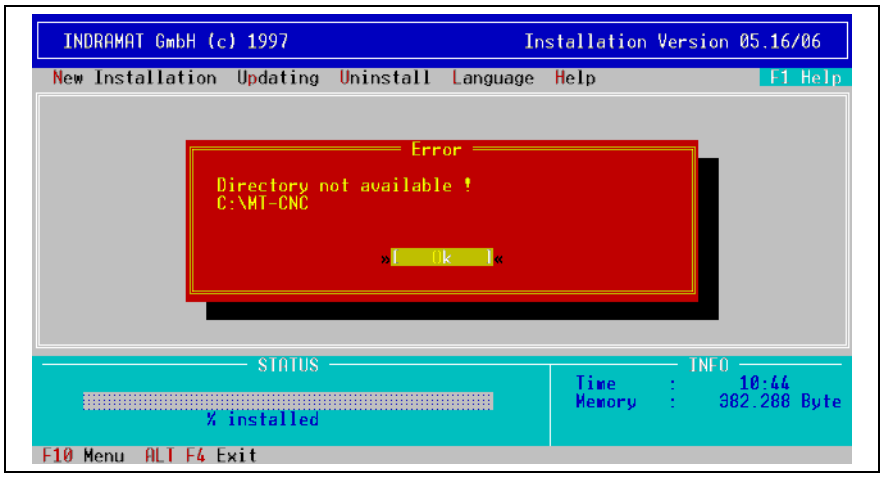
The user is prompted for the directory where the current MUI/GUI software is installed. The default is 'C:\MT-CNC'. Confirm this entry or enter the correct drive and directory name.

The [Tab] key allows to move between the selected fields.

Click the OK button or press [Enter] after the correct path is entered.



The install program prompts a message if the specified directory does not exist on the specified hard drive or is no MUI/GUI main directory.

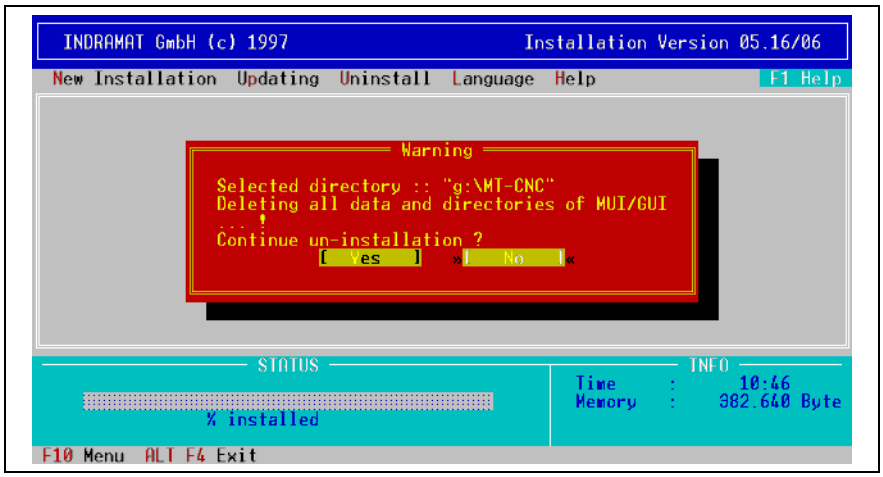


A safety message is prompted, once the specified directory is recognized as an MUI/GUI main directory.

Press [N] to abort the un-install.

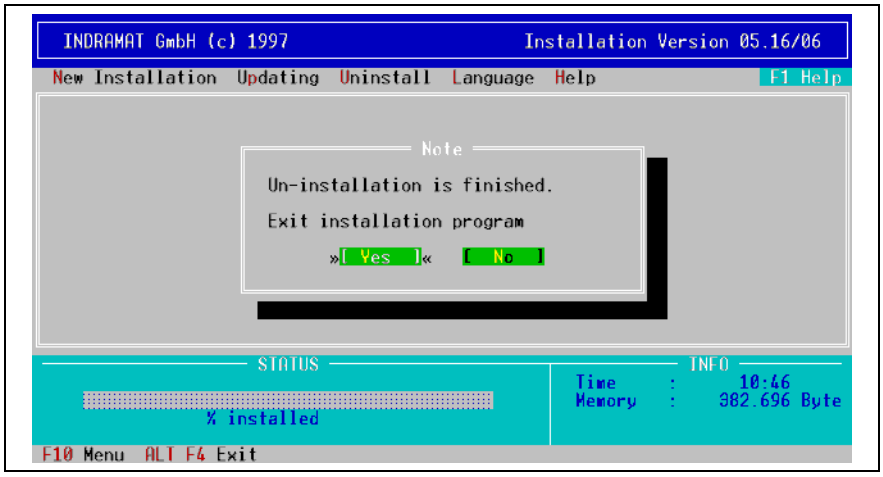
Press [Y] to continue.

All MUI/GUI and user program data on the specified hard disk will be erased !



When the install program is completed, all MUI/GUI related files including user data are erased from the hard disk.

Press [Enter] or click the OK button and the install program will return to the DOS prompt.



The MUI/GUI and all related data are now erased from the hard disk. If the MUI/GUI program call has been initiated from the AUTOEXEC.BAT, the concernig comand line should be removed now.

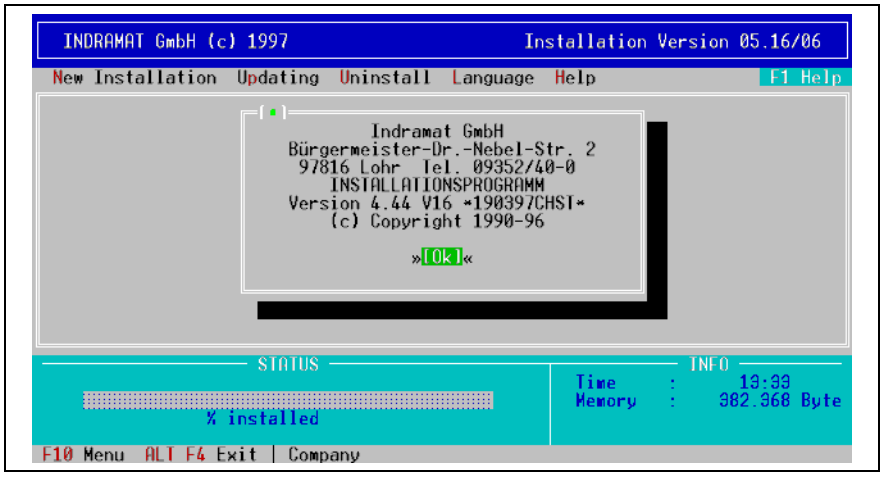
1.8 Installing a language module

For installing a language module, insert the correspondent disk into drive A or B of your PC (in the following description we are talking about drive A). Return to the root directory of your hard drive (e. g. 'CD\') and log on to drive A (e. g. A:[Enter]). To start the automatic MUI/GUI install program, type 'INSTALL' and press [Enter]. A Microsoft compatible mouse may also be used with the install program.

At the language prompt screen use the cursor key to select the desired language (default is German) that should be used during the installation and mark it by pressing the [Space] bar. Then press [Enter] to continue.

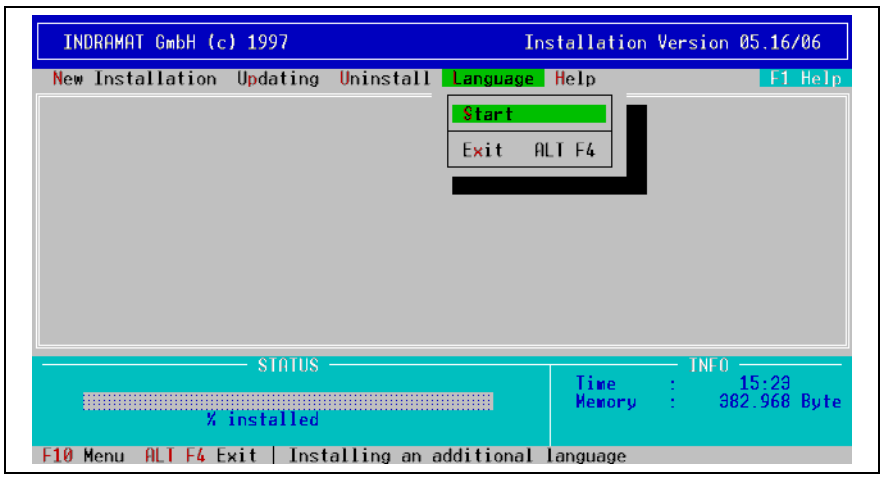
Then the main install screen is displayed. When the screen is opened, a window will display the version and copyright information about the install program.

Press [Enter] to confirm this window or click the button using the mouse.



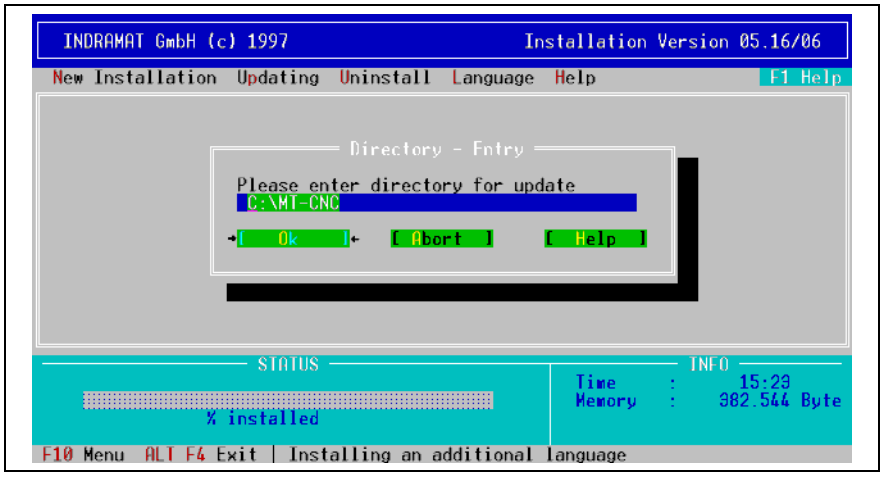
The install program provides help for different screens and errors.
Press [F1] to open the help window for the current menu or error

Press [Alt]+[L] to select 'Languages' or use the mouse button.
Now select 'Start' by pressing [S] or using the mouse button.
[Alt]+[F4] allows to exit the install program.

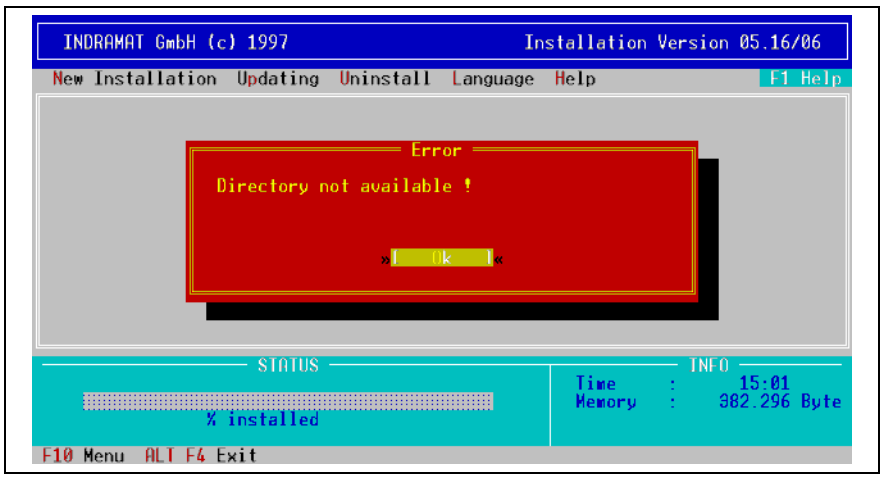


The user is prompted for the directory where the current MUI software is installed. The default is 'C:\MT-CNC'. Confirm this directory or enter the correct drive and directory name.

The [Tab] key allows to move between the selected fields. Click the OK button or press [Enter] after having entered the correct path.



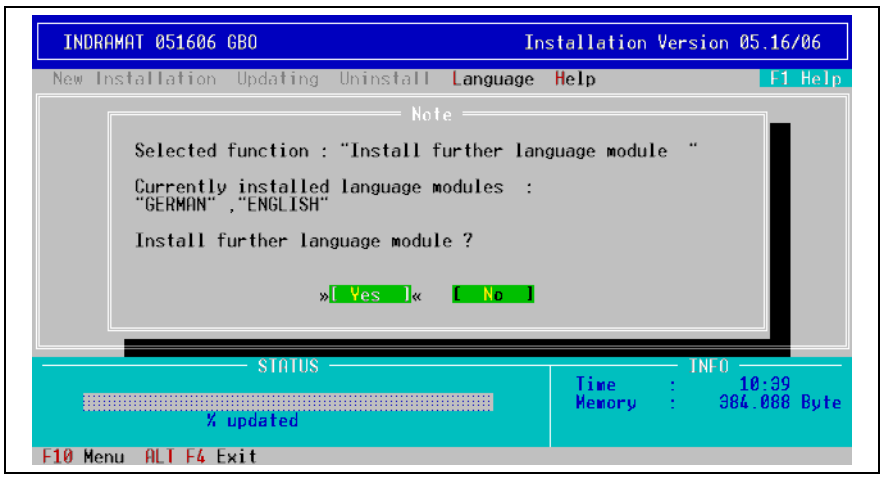
The install program prompts a message if the specified directory does not exist on the specified hard drive or if it is no MUI main directory.



A safety message is prompted, once the specified directory is recognized as a MUI main directory.

Press [N] to abort the update.

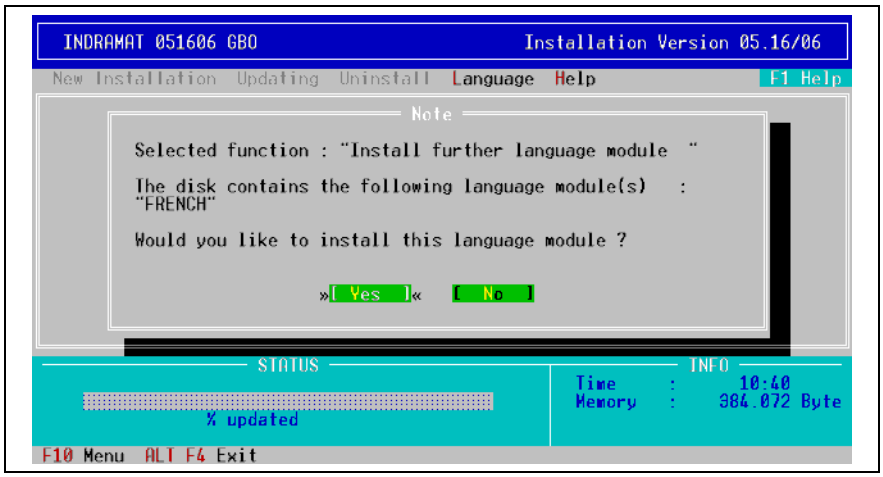
Press [Y] to install the new language module.



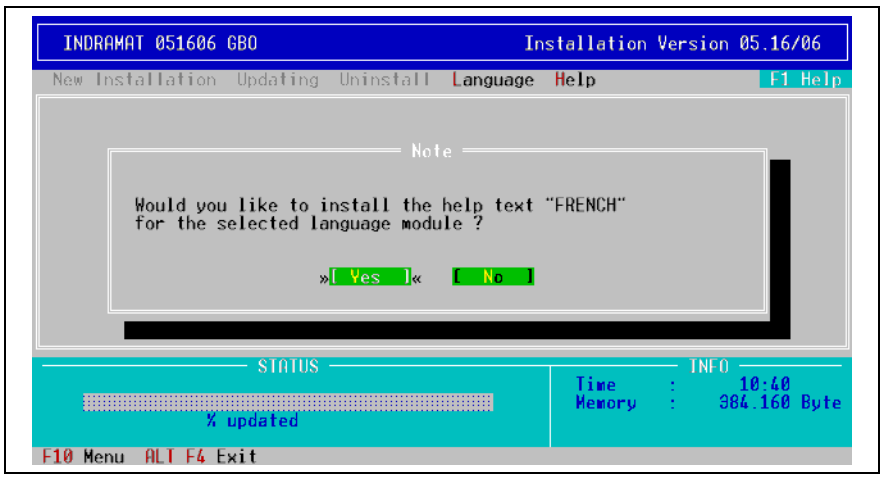
It is shown which language module is on the disk inserted.

You still have the possibility to terminate the installation by pressing [N].

Confirm by pressing [Y] if you would like to install the language module shown.

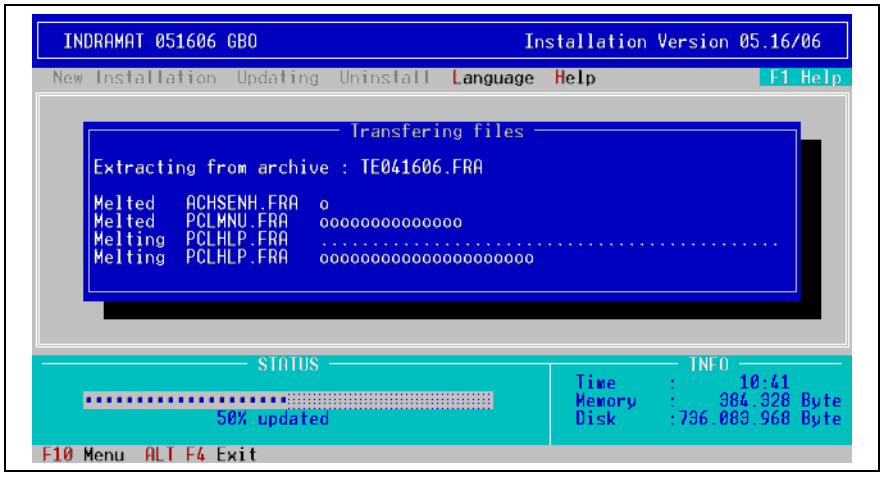


The next windows asks the user whether the help texts for the correspondent language module should also be installed. Please select the desired fonction.



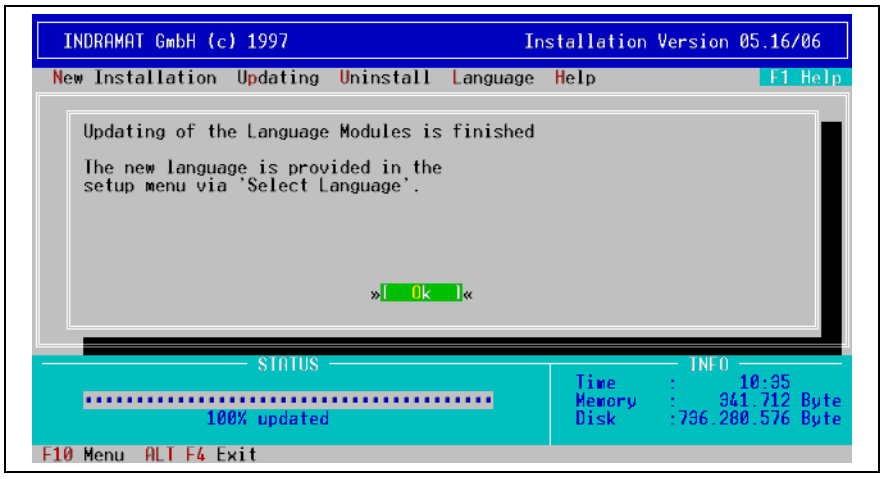
The installation will be started then.

During the installation process, the window on the screen shows status information and the progress of decompressing.



When the installation procedure is complete, the user will be informed that the new language will now be available in the Setup Menu (language selection).

Press [Enter] or click on the OK button to return to the DOS prompt.



2 New Functions

2.1 Introduction

As any new release, this release contains advanced features and some risk that user programs may need modifications when updating an older version. Even though the firmware and software is extensively tested before the release, it may be necessary to correct undiscovered errors in further bug fix releases.

We therefore recommend to install this new version only in applications where the provided functionality is required. For all other applications the previous version 00X-15VRS should be used.

The User Interface (GUI/MUI) can be operated as a DOS application under the Windows NT3.51 operating system for the first time. This feature is required if other PC tasks must run simultaneously to the User Interface on the PC. Especially the Profibus-FMS and DDE feature require the Windows NT™ operating system.

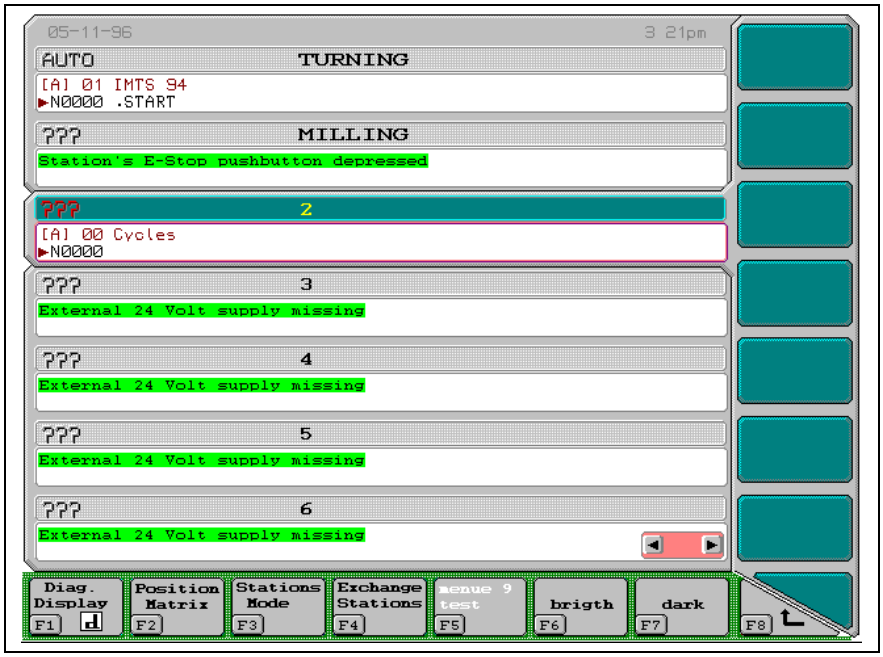
Important for distribution and sales:

If the MUI/GUI is the only task operated on the PC (e. g., BTV), installing the Windows™ NT operating system does not provide any advantages. On the contrary, Windows NT™ requires more operating (>= 16 MByte) and storage memory (60 - 90 MByte). Consequently the overall PC performance decreases requiring faster processors and cost increase.

Please consult application engineering for approval if an application requires the use of Windows NT™.

2.2 Changes in the User Interface

Multi-station display (GUI)



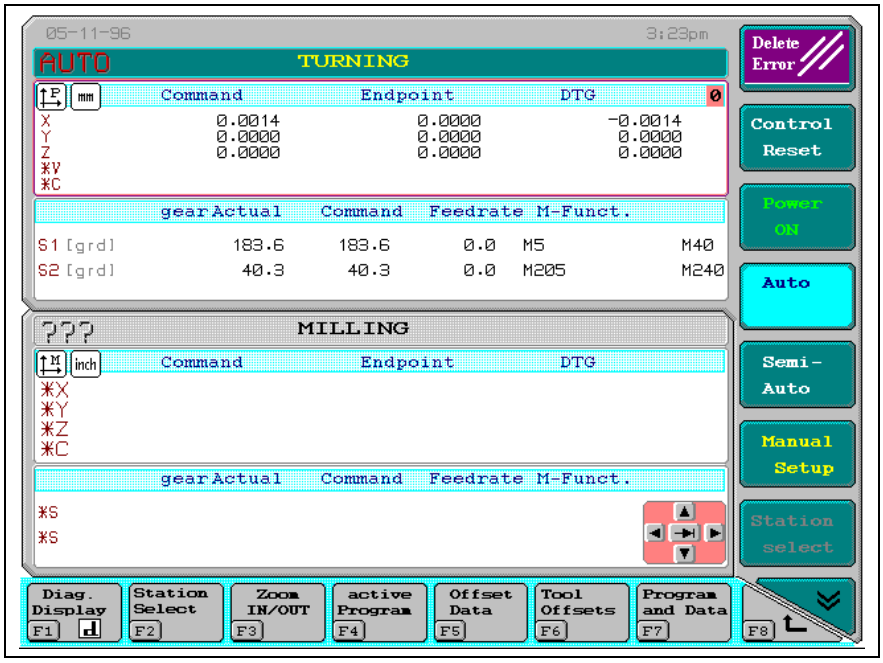
The multi-station display shows the operating mode with a data window for each station (process). Station specific global identifiers and station specific Machine Keys are associated to the active station.

The active station is identified via the colored header and connection frame to the Machine Keys.

Stations can be switched either via [Ctrl]+[PgUp]/[PgDn] or via the station selection function.

Either the diagnostic or NC-block display with the active program name similar to the single station display can be selected and is automatically stored depending on the corresponding basic screen via [Shift]+[F8].

Dual station display in GUI

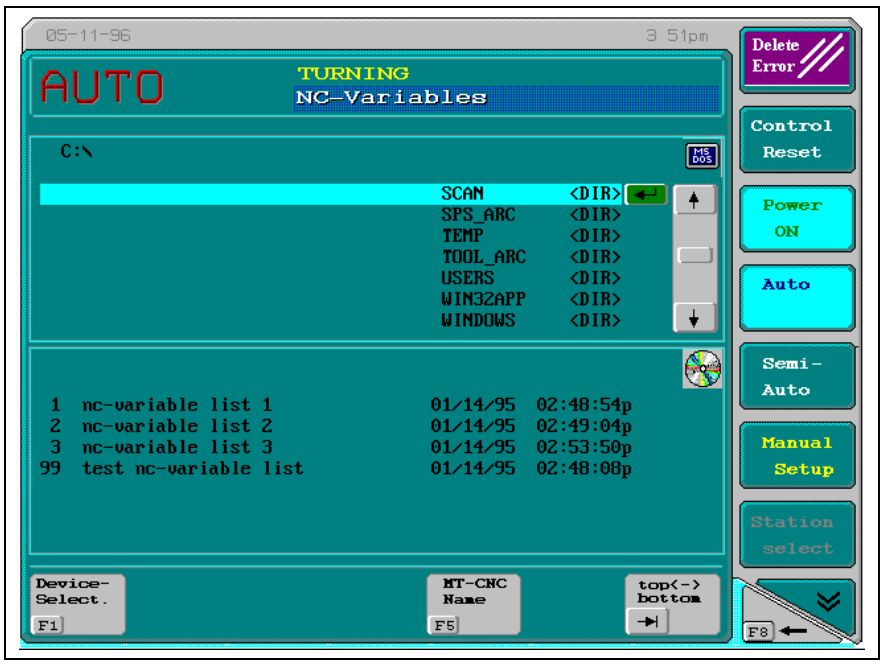


The header, operating mode and two data windows (including position display) are displayed in the dual station display; otherwise it is similar to the multi-station display.

More basic screen (GUI)

The number of basic screens available in the Screen Catalog was increased from 4 to 28 for more flexible configurations. Associated settings for the maximum of 10 windows (single, dual and multi-station display, Zoom In/Out), selected by the user via [Shift]+[F8], are stored and reinstated for each basic screen.

External Data Handling (GUI)

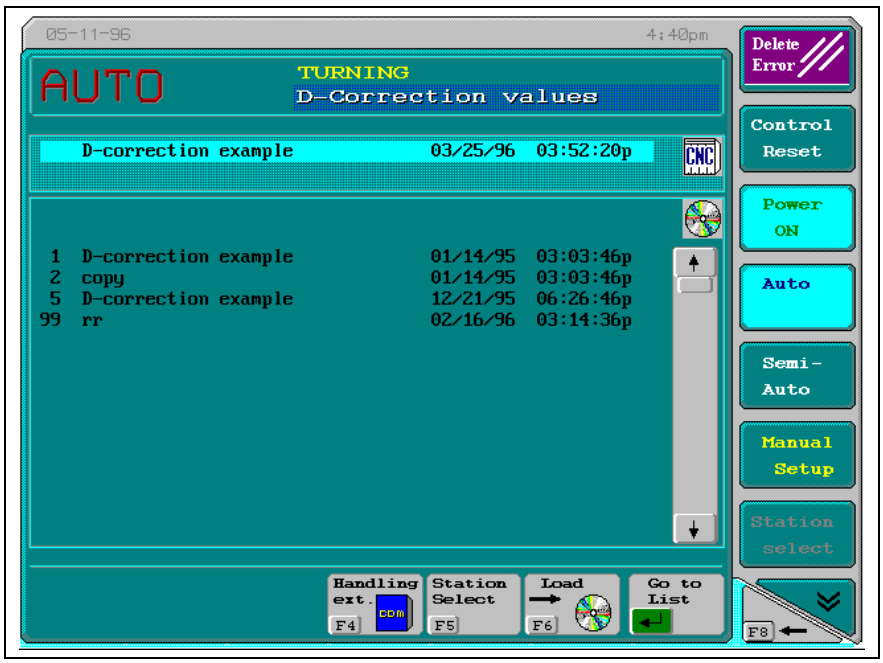


The menus

- ‘Zero Offsets’,
- ‘NC-variables’,
- ‘NC-events’ and
- ‘D-corrections’

offer now an archive function that allows to store and retrieve the generated lists on to and from the hard or floppy disk. To accomplish this, the function key ‘External Data Handling’ and ‘Device Selection’ are offered in the List Index menu. Now different paths can be defined for floppy and hard disk drives.

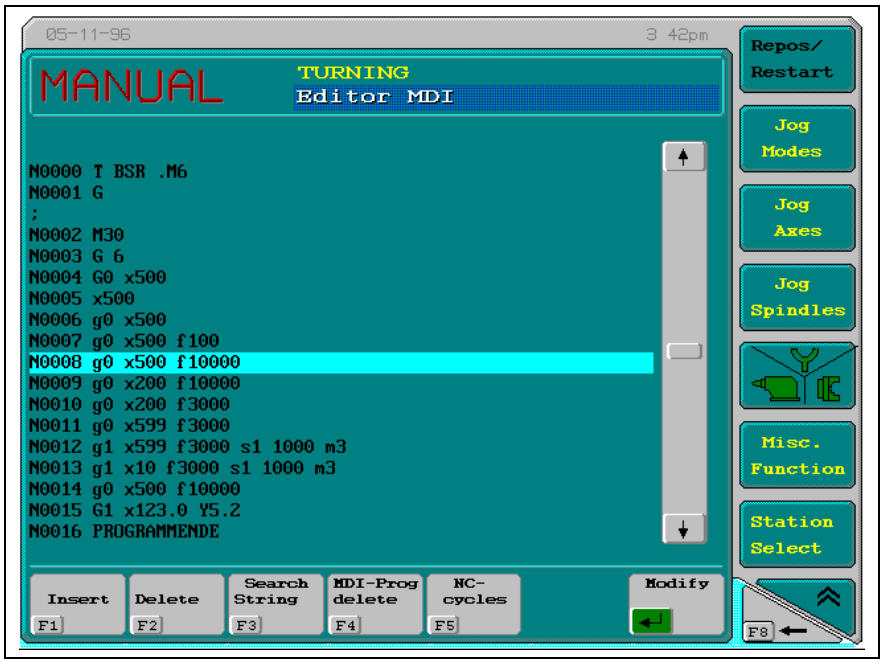
NC-variable, NC-event and D-correction Lists (GUI)



The number of elements of the ‘NC-variable’, ‘NC-event’ and ‘D-correction’ list is the maximum possible number (NC-variables: 7 * 256, NC-events: 7 * 32 and D-corrections: 99).

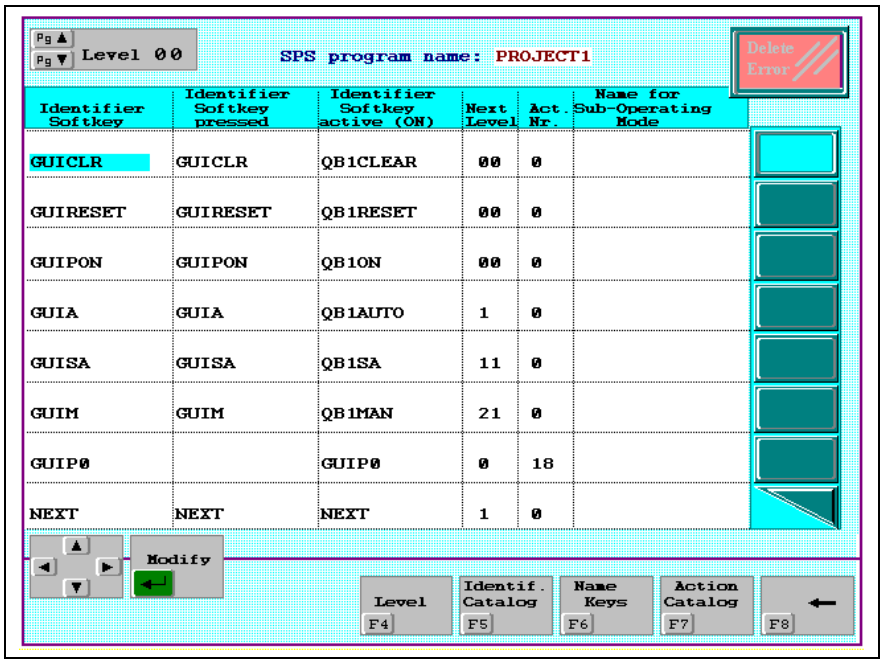
In these menus a default list that contains all NC-variables, NC-events and D-corrections can be generated via softkeys. The GUI does not initialize the NC-variables and NC-events in these lists. Only the D-corrections are defaulted by the GUI with the value ‘0’.

MDI Memory (GUI)



NC-blocks entered via MDI (Manual Data Input) are stored in lists similarly to NC-programs. They can be called from their sequentially via [PgUp] and [PgDn] or specifically selected via [Tab]. This list can be freely edited.

’Identifier Catalog’ for Machine Keys (GUI)



All declared SPS identifiers are now offered for direct selection via [F5] 'Identifier Catalog' when configuring the ‘Global Identifiers’, ‘Machine Keys’ and ‘Interactive Identifiers’.

The menu provides the logic structure and available identifiers of each Program Organization Unit (POU).

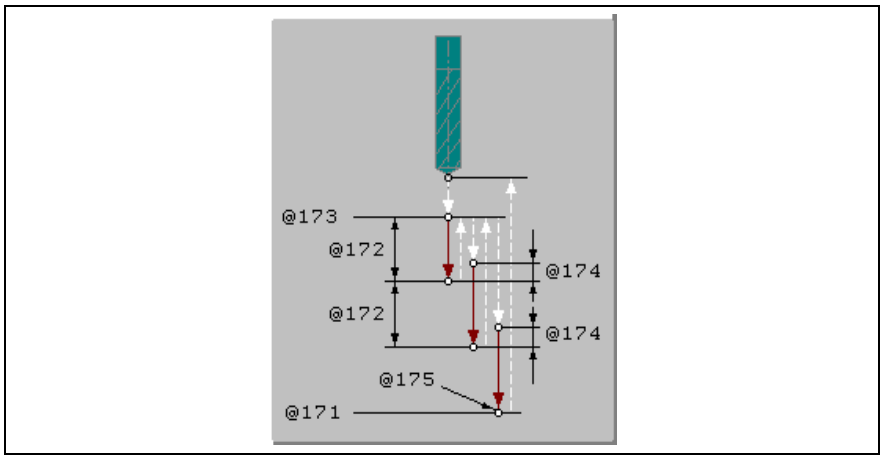
Station Selection via Diagnostic Overview Menu (GUI)

The station can be selected via the cursor keys in the Diagnostic Overview. After pressing [Enter], the selected station's basic screen of the single station display is available.

[Alt]+[H]	Display available Hot-key functions
[Alt]+[V]	Version display
[Alt]+[P]	Print screen into a file with BMP format (does not check for free disk space)

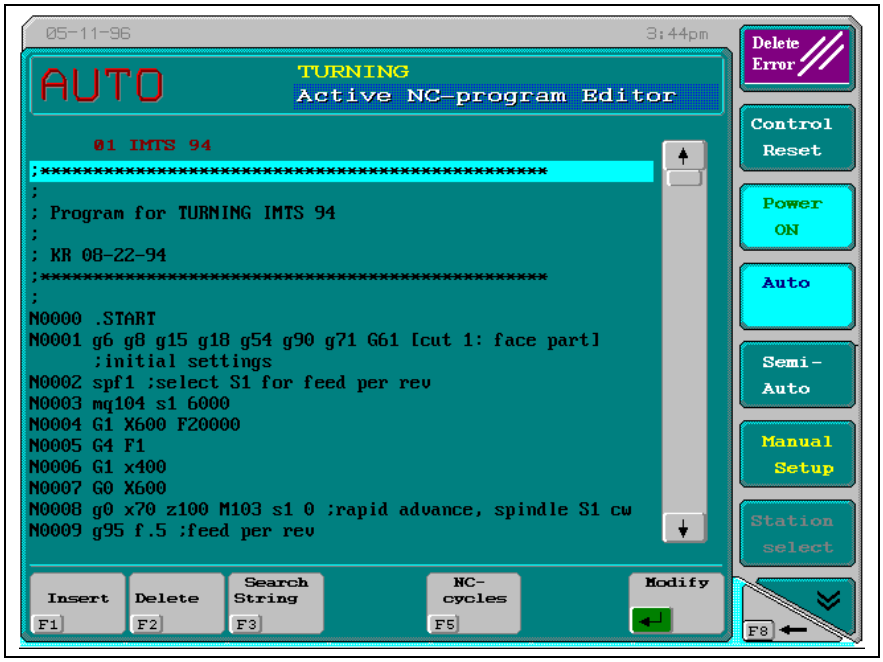
NC-cycle Programing (MUI)

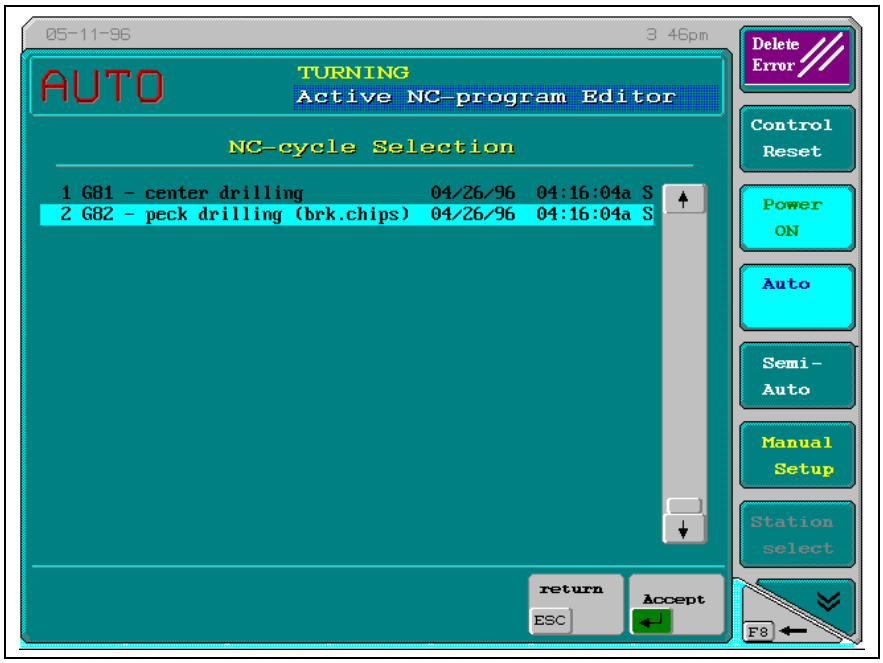
The full screen editor (command [Ctrl]+[K][C]) and the single line editor allows now to call Indramat standard and user NC-cycles via function keys. After NC-cycle selection, the MUI displays the entry dialog defined in the NC-cycle header.



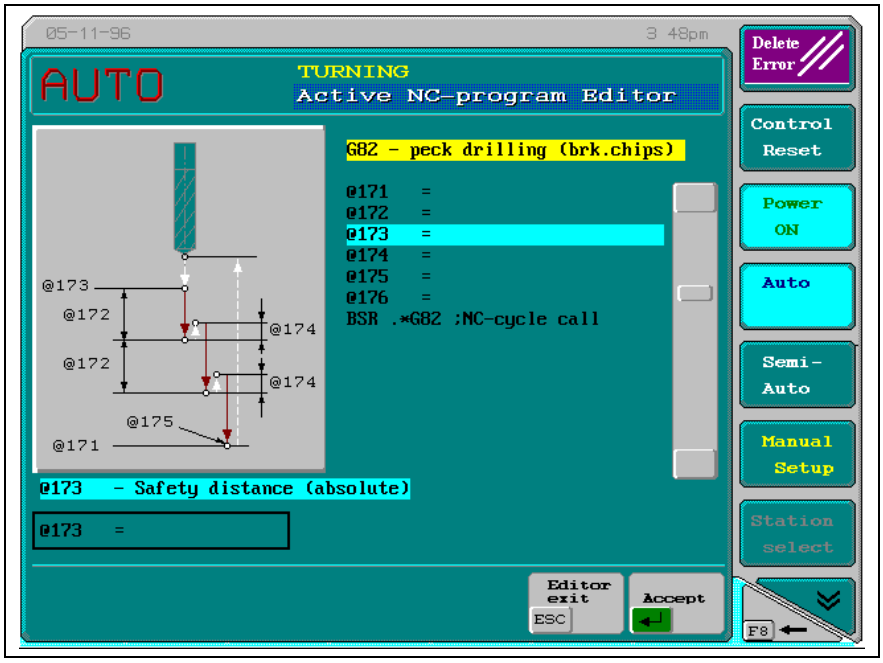
The dialog window is closed and he NC-cycle with the associated NC-variable data is added to the NC-program after all required data is entered by the user. A graphical representation (custom PCX picture) whose call is embedded into the NC-cycle header can be displayed via [F9] or [Help] to clearly identify the NC-variables for the NC-cycle. OEM and end user specific NC-cycles can also contain custom graphical representations to improve entry dialog.

NC-cycle Call in Active NC-program Editor (GUI)





The user can interactively implement NC-cycles that are available in the NC-cycle library .



The user can also write his own NC-cycles and pictorial representation and add them to the user library.

Upload of NC-program Package (MUI)

The function ‘MT-CNC -> NC-prg.Pkg’ in the ‘NC-program Administration’ menu allows to upload the NC-program package in the MT-CNC to the PC. Note that eventually available comments and Tool Setup Lists are NOT loaded to the PC. Comments are stored on the PC and NOT in the MT-CNC.

Extended NC-cycle Handling (MUI)

The following features are now available:

- The NC-cycle Handling is now contained in the menu item ‘NC-program Administration’, MUI menu item #2.

- NC-cycle Packages can be loaded into the MT-CNC and uploaded from the MT-CNC (without comments) to the PC independent of other data.
- A max. of 99 NC-cycle Packages is now available.
- A max. of 255 NC-cycles per process can be configured in a single NC-cycle Package.
- A NC-cycle library that can be accessed from each NC-cycle Index is now available.
- INDRAMAT standard NC-cycles (for drilling) are installed in a library on the hard disk.
- User specific NC-cycles can be generated in the library and read into the corresponding Indexes.
- Copy, import, export and archiving functions further enhance the NC-cycle Handling.

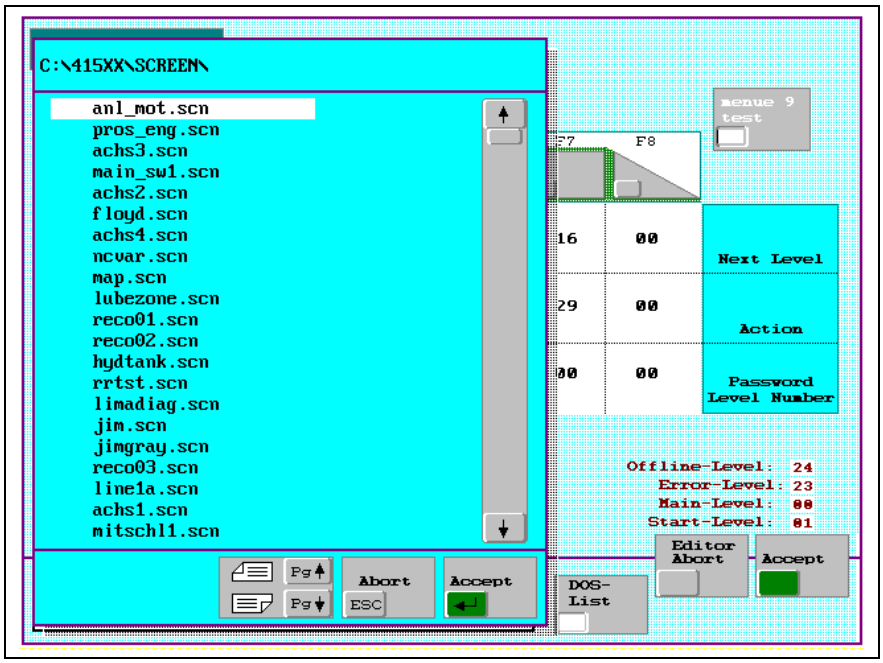
Copy Tool Data Set (MUI)

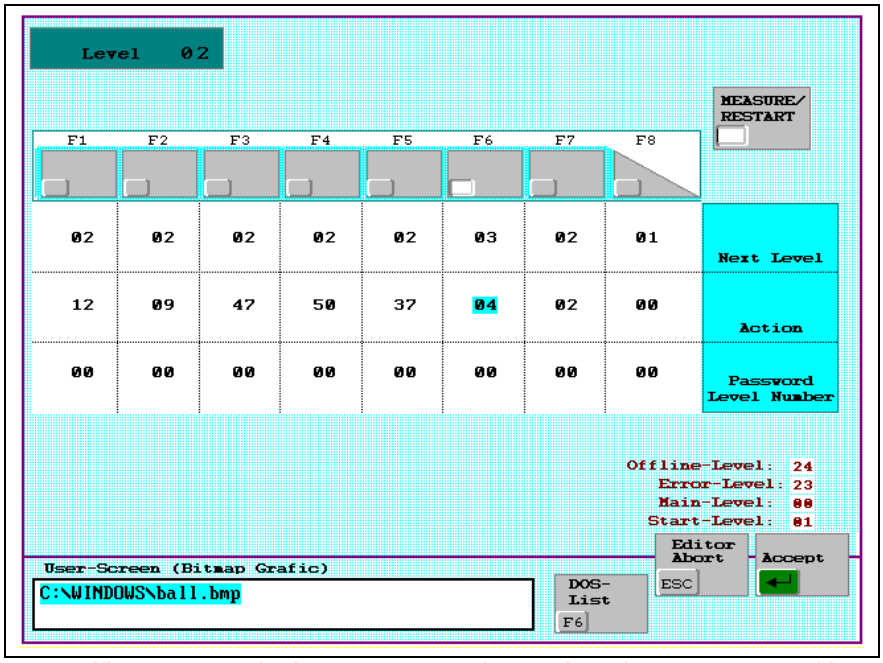
Tool Data sets can be copied within a Tool List and between Tool Lists (including Active Tool List). This allows to generate tool libraries from which tool data sets are repeatedly copied.

Import-/Export Function (MUI)

Import and export of NC-programs can be performed optional with or without NC-block number.

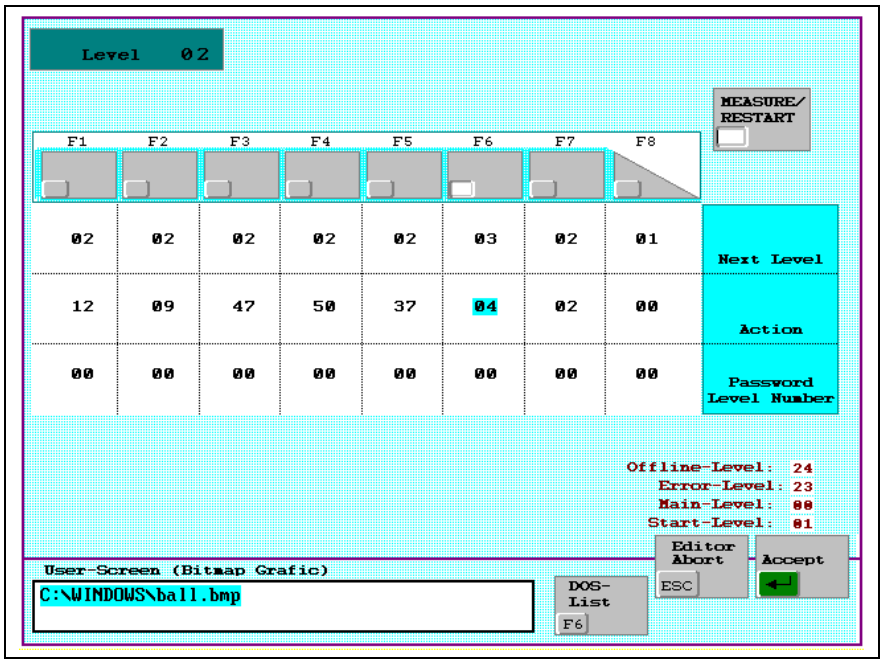
Custom Display Screens via Softkeys (GUI)





A specific Custom Display screen can be assigned to any GUI softkey. This allows the user to mix GUI and Custom Display screens.

BMP and Indramat Graphics Files via Softkeys (GUI)



Bitmap files (16 colors) can be assigned to any GUI softkey.

The softkey [F6] ‘DOS-List’ allows to select the disk drive and path were the file is located.

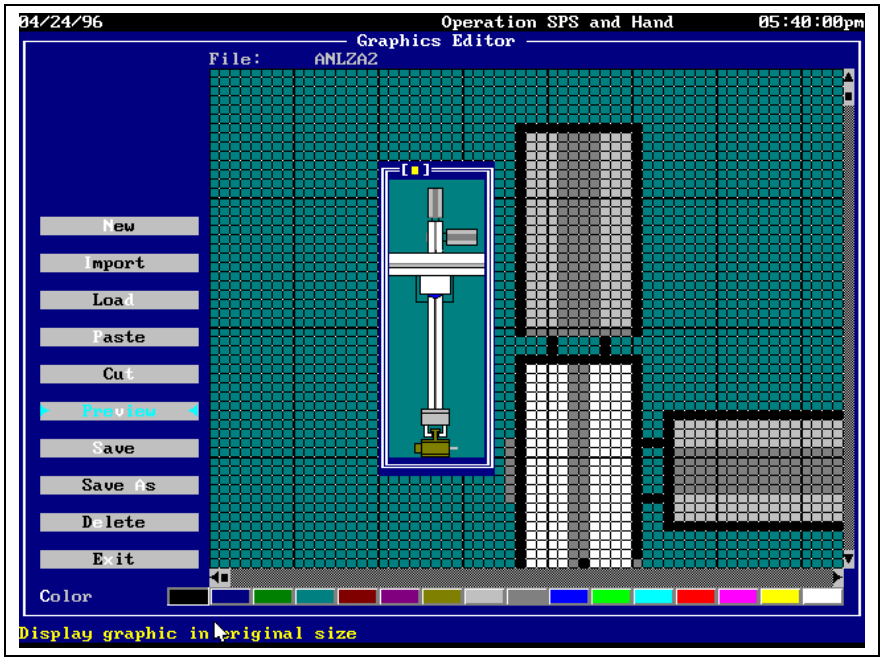
This also applies to graphics files that were converted to Indramat’s graphics format.

Graphical Custom Display (MUI/GUI)

The Custom Display menu (#9) is now offering graphics resolution and mode. This increased the number of possible text lines from 25 to 34. The lines and columns (characters) are used as the basic snap grid for the imported PCX graphics. Screens of previous versions are automatically converted, however, it may be required to generate a new global setup file after the upgrade from a lower version.

The graphics mode allows now to implement PCX graphics:

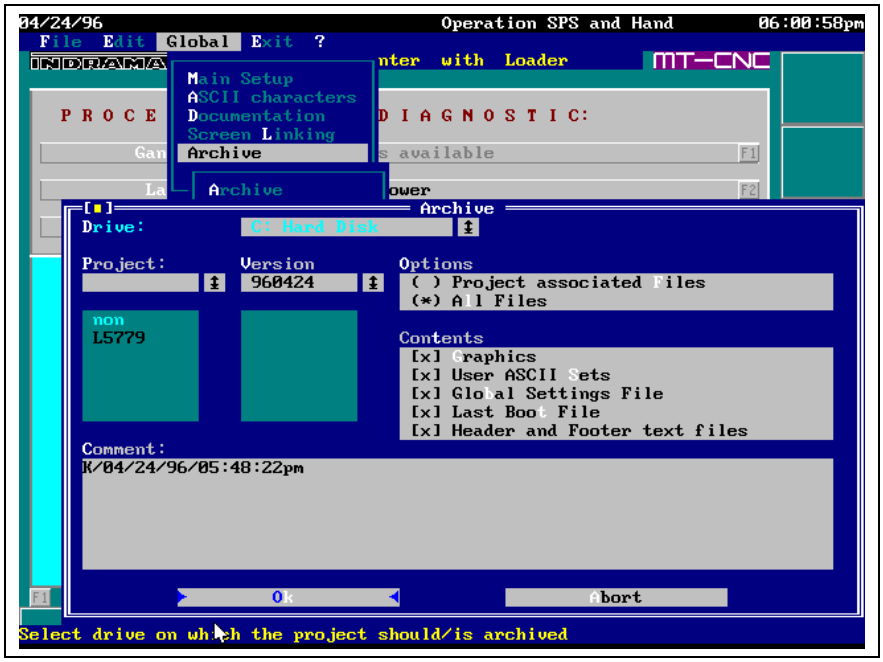
- up to 16 graphical images as background for each screen mask,
- up to 16 graphical images in the global masks,
- up to 64 graphical image pairs for ON/OFF states (2 graphics) and dynamic output, and
- graphics to describe softkeys and Machine Keys.



The built in editor provides a pixel graphics import filter for PCX (and later BMP) format. The filter converts the imported standard graphics into an internal format with line / column snap grid. Imported graphics can be edited with the built in pixel editor using copy and insert functions.

External EXE files wiht their path can be called with the corresponding parameters using the procedure 'CallProgram'.

The editor is adapted to the SAA strategy and supports an activate pointing device. User friendly selection choices replace entry for the most part, improving the support for function parametrization.



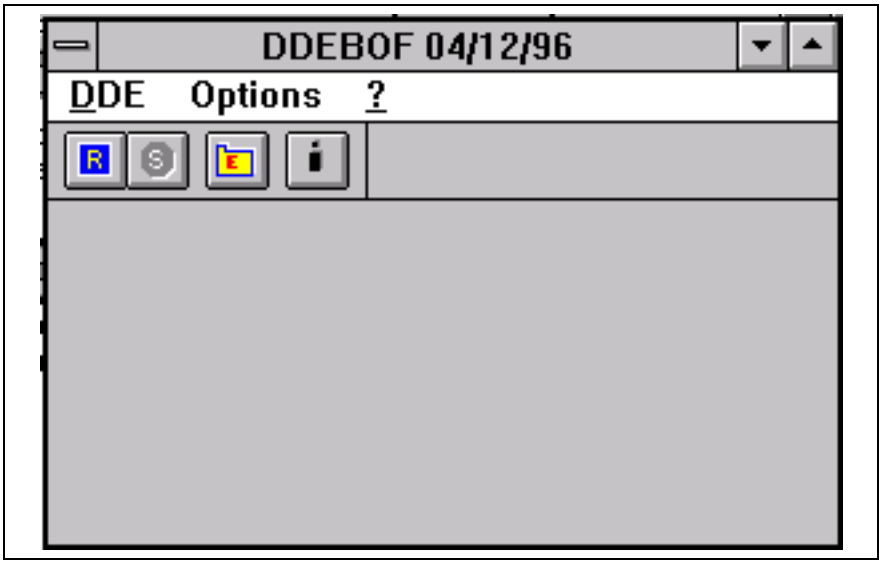
Improved screen and project archiving and documentation features as well as faster processing of embedded NC-variables further enhance the Custom Display menu.

User Interface Operation under Windows NT™ (Option)

The User Interface (MUI/GUI) can be operated under Windows™ NT3.51, starting with the version 00X-16VRS. The following was implemented for this:

- The MUI directory structure was expanded by the directory '..:\MT-CNC\IND_DRV' for the Function Interface programs and '..:\MT-CNC\IND_DRV\PROFI_K' for the Profibus-FMS configuration files.
- A Windows™ NT interface driver and expanded TSR program allow the call and operation of the User Interface under Windows™ NT.

Function Interface and DDE Server (Option)



The optional Function Interface driver (**SWA-PC*WNT-DRV-02VRS-NN-C1,44**) with its call library (**SWA-PC*WNT-FLB-02VRS-EN-C1,44)** is available under Windows NT™ to develope third party application software. Currently, reading and writing of SPS and actual NC status information data in ASCII and binary format is supported.

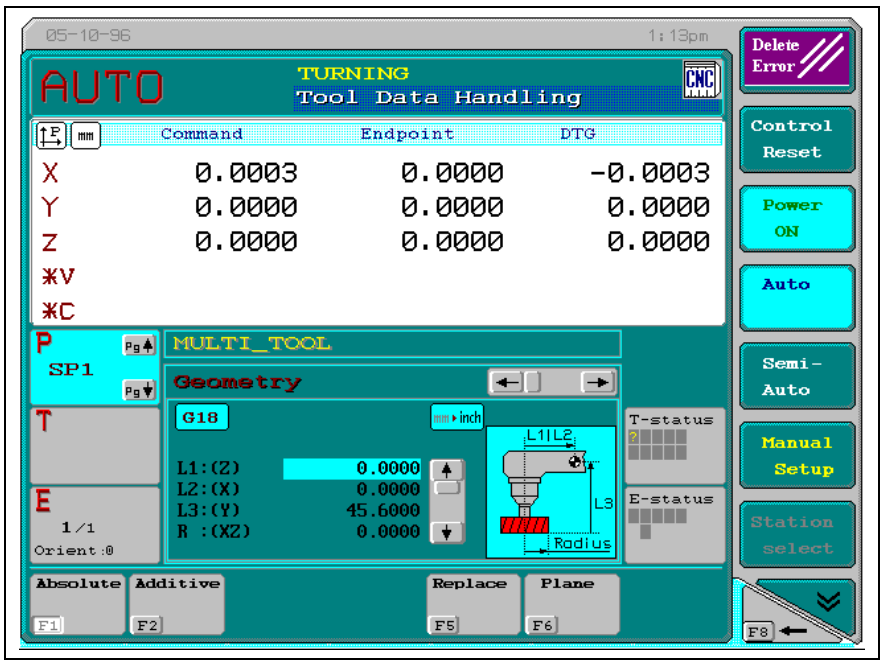
The Function Interface also provides an optional MT-CNC DDE server (**SWA-PC*WNT-DDE-01VRS-EN-C1,44**). All declared SPS identifiers and some NC-status information can be accessed via predefined call codes with optional parameters or identifiers.

The currently available Function Interface allows simultaneous communication of 8 different applications to a single MT-CNC via the serial port or Dual Port RAM.

Profibus-FMS Interface (Option)

A Profibus-FMS PC card can be operated with the Indramat front end PC BTV 01.2 under Windows NT3.51. The Profibus-FMS driver (**SWA-PC*WNT-PFM-02VRS-EN-C1,44**) and call library (**SWA-PC*WNT-PLB-01VRS-EN-C1,44**) currently available supports up to 5 applications (Virtual Field Devices, VFDs) via the Profibus-FMS card. Reading and writing of SPS data as well as initializing and monitoring of the connections is currently supported by the driver. The SPS can initiate Profibus-FMS write functions.

Tool Data Handling (GUI)



The first development step for the GUI tool data handling (GUI function #42) is introduced as the dialogue window shown above.

The tool handling supports the technologies turning and milling (tool correction type 1 .. 4). Since this function replaces only part of the MUI tool data handling, it may not be available in the standard softkey setup. The user may implement the function on a desired softkey.

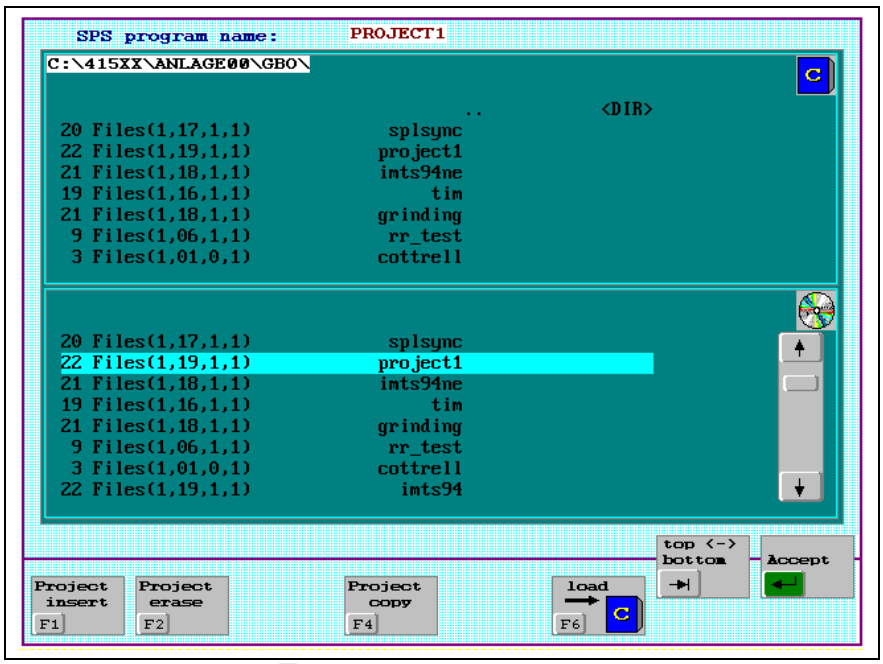
The GUI data handling comprises the display and editing of geometry, offset, tool wear, tool life and tool and tool edge status bits of individual tools in the Active Tool List of the MT-CNC.

Adjust Tool function (GUI)

The function #88 ‘Adjust Tool’ is available in the Function Catalog for Machine Key implementation. The function writes data into the Identifiers mTL_STORE, mTL_PLACE, and TL_STAT (must be declared with the TYPE UINT) when called.

The location, storage and active station number of the tool currently selected in the Tool Data Handling screen (GUI function #42) is written into the above identifiers. In any other screen the location and storage are set to zero. The function is meant to realize sequences in the SPS user program that refer to the tool currently displayed in the GUI Tool Data Handling screen (e. g., sequence to bring tool into machining position).

Project Handling for Machine (SPS) Keys (GUI)



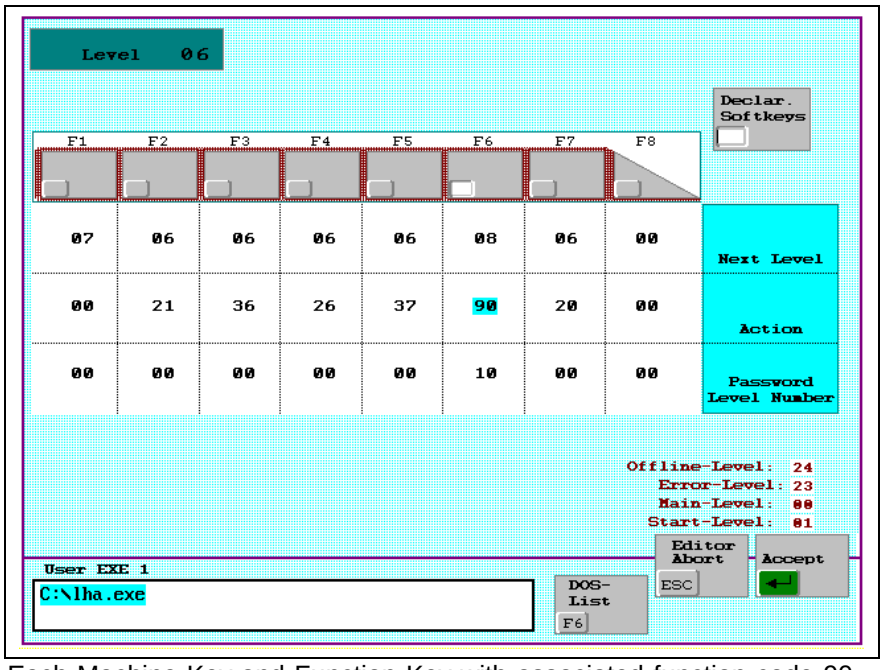
The function Archive F6 was improved for the Machine Key definition menu.

The function allows to archive, copy, delete or create all data and picture files associated with a project (SPS PROGRAM name).

The number of associated files (global Identifiers, Machine Key Identifiers, and screen connection Identifiers, e. g., **22 Files (1,19,1,1) project1**) are displayed to the project name.

The function is similarly to the ‘External Data Handling’ for NC-data in the GUI.

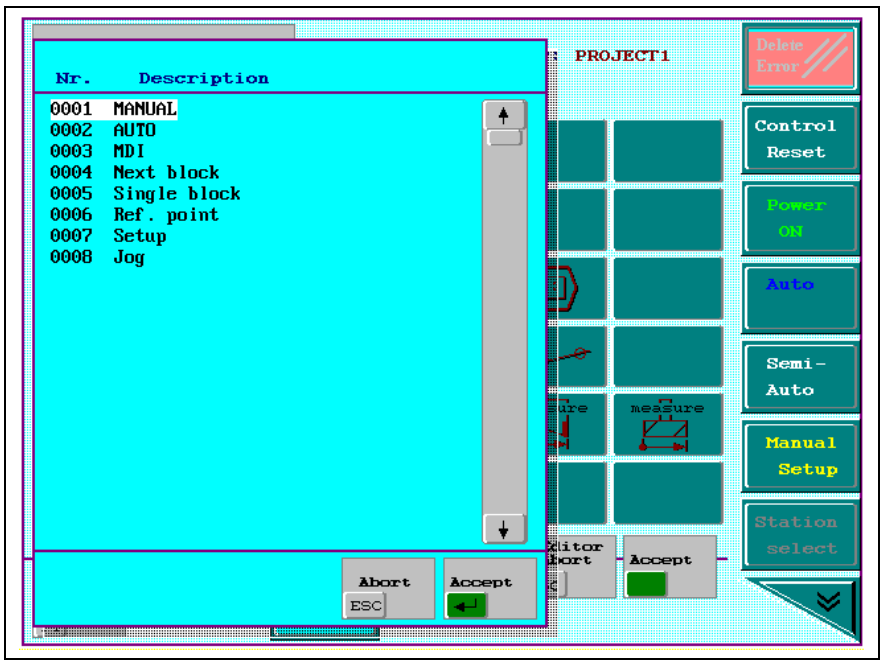
Calls of User EXE files (GUI)



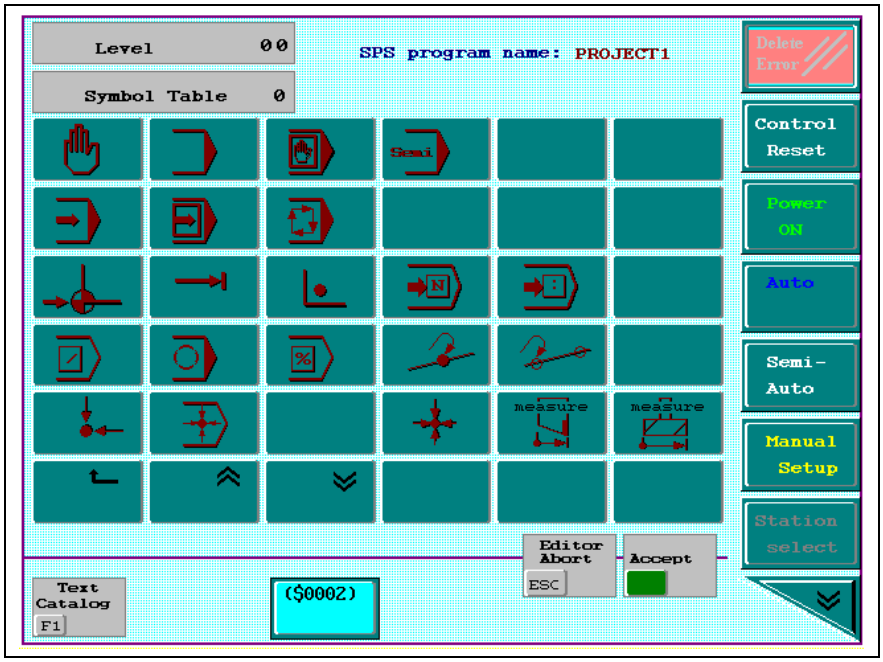
Each Machine Key and Function Key with associated function code 90 .. 94 ‘user-exe’ can directly contain in the second line the name of the EXE file with associated path.

This eliminates the need of the file USER_EXE.DAT for new implementations. The file is still supported for existing applications.

Multi-lingual Machine Key, Softkey and Mode User Text (GUI)



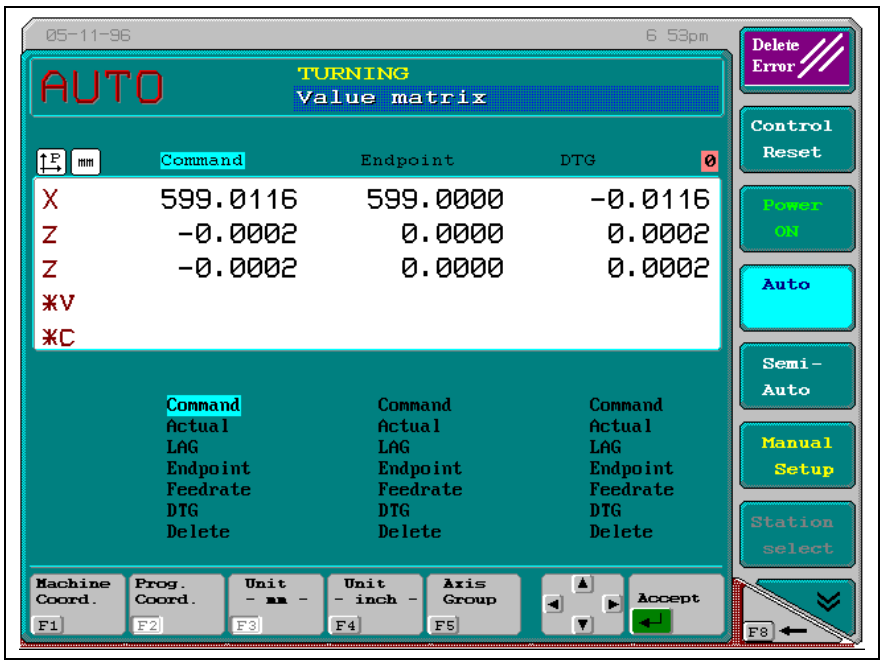
The text used to identify Softkey and Machine Key labels can be multilingual, depending on the selected language in the MUI/GUI software. The required text must be entered into the corresponding language file (..:\mt-nc\anlagexx\gbo\user.ger \ ..usa \ ..fra \ ..ita, etc.) according to the provided sample file.



A 'Text Catalog' displaying the contents of USER.* is offered under [F1] in the menu where softkey text is entered. The text should be limited to 8 characters for a line in the Softkey and Machine Key labels. A text code is displayed after text selection. After the label entry is completed, the text for the currently selected MUI/GUI language is displayed.

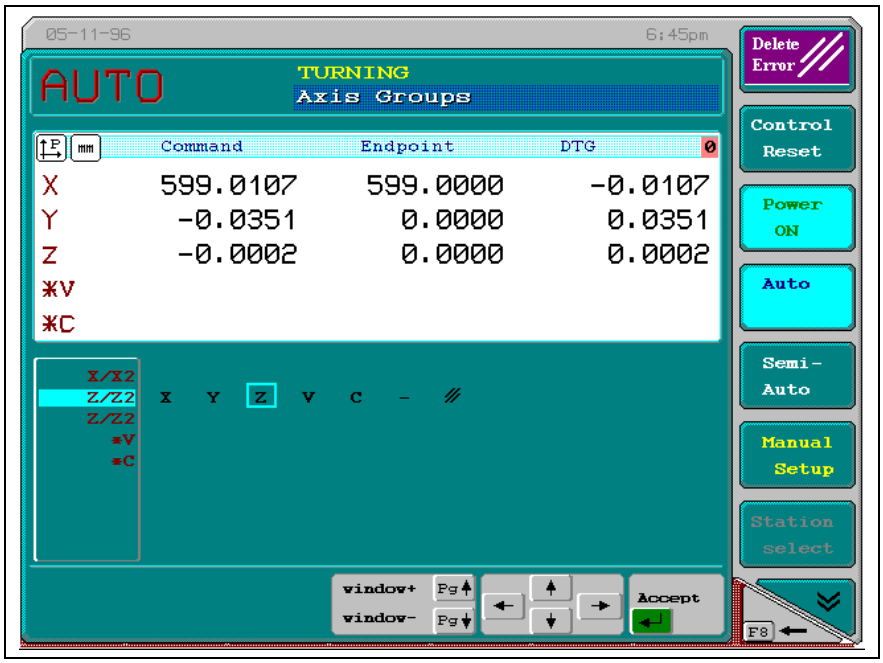
The length for primary and secondary operating mode text can be up to 13 characters long.

Axis Group Setup (GUI)



In the menu 'Value Matrix' a new function for axis group definition is offered. The user can use this feature to define up to 8 different axis groups as windows.

These windows are displayed in window 1 of the basic screen and window 1 and 3 of the dual station display, selected via [Shift]+[F8]. Hereby, a selection of the parameterized axes, their sequence and location can be determined. The selected window number is bound to the mostly operating mode depending basic screen.



The function key NC-cycles is offered in the 'Active NC-program Editor'. The menu NC-cycles offers the possibility to select from the loaded NC-cycles, to define values for the parametrization NC-variables with graphically supported dialog, and to insert the NC-cycle into the active NC-program.

2.3 Modifications of the CNC

The following hardware is no longer supported:
The CPU-2 hardware (MPK circuit board) used in CPUB0x-01 (x = 1, 2, 3) is no longer supported starting with CPU firmware level 03-16V00 and later !

Free Plane Selection

The preparatory functions G17, G18 and G19 select the plane and perpendicular axis of an existing Cartesian coordinates system, consisting of the axis with the meaning X, Y and Z.

In addition to this the free plane selection (G20) allows to select the axes that build the coordinate system. The user must sequentially specify the axes that will have the axis meaning X, Y and Z. The first and second axis define the active plane and the third axis defines the axis perpendicular to the plane. This allows rotary axis and secondary axis to be considered in circular interpolation, tool path compensation, speed calculation, constant surface speed (CSS) and diameter programming.

Cylinder Surface Interpolation

The NC generates on a cylinder surface straight lines and circles as defined in the NC-program when using Cylinder Interpolation (G32).

The contour that should be generated on the cylinder surface can be programmed in the plane of the rolled out cylinder surface. The associated rotary axis receives the functionality of a linear main axis providing the user with all functions of a linear main axis during the cylinder interpolation.

Expanded Auxiliary Function Output / Acknowledgment

Starting with version 00X-16VRS, the MT-CNC provides

- three digit M-functions (M0 .. M999),
- four digit Q-functions (Q0 .. Q9999),
- S-functions with up to five leading and two trailing digits (S0.00 .. S99999.99),
- seven digit T-functions (T0 .. T9999999) and
- single digit E-functions (E0 .. E9)

The user can program up to six auxiliary functions per NC-block, whereby per NC-block a maximum of six M-, one Q-, one S1-, one S2-, one S3-, one T- and one E-function is allowed. The OEM can define for auxiliary M- and Q-functions the output behavior to the SPS as

- at the end of motion (NC-block), at the begin of the motion (NC-block), no output, and the acknowledge behavior as
- at the end of motion (NC-block), at the begin of motion (NC-block), at a later time (quick auxiliary functions)

in the System and Process parameters.

Auxiliary M- and Q-functions can be programmed with an optional appended ‘Q” (for quick, e. g., MQ806) as quick auxiliary functions if defined in the system and process parameters as acknowledged ‘at a later time’. Quick auxiliary functions can be checked later in the NC-program for acknowledgment by appending the letter ‘W’ (for wait, e. g., MW806). The NC-stops NC-program execution until the ‘quick’ auxiliary function is acknowledged and continues if already acknowledged.

When upgrading older versions, the auxiliary function system and process parameters are defaulted for output behavior ‘at the end’ and acknowledge ‘at the end’, maintaining existing functionality.

Asynchronous Spindle Movements

Spindles can be asynchronously accelerated / decelerated while continuing NC-block execution if the OEM defined acknowledgment of the spindle control M-functions (Mj03, Mj04 and Mj05; j ε {´´, ´1´, ´2´, ´3´}) as ‘at a later time’ and the end user programs them with an appended ‘Q’ ´Q´ (MQj03, MQj04, MQj05).

Setup Registers for Spindles and Feed axes

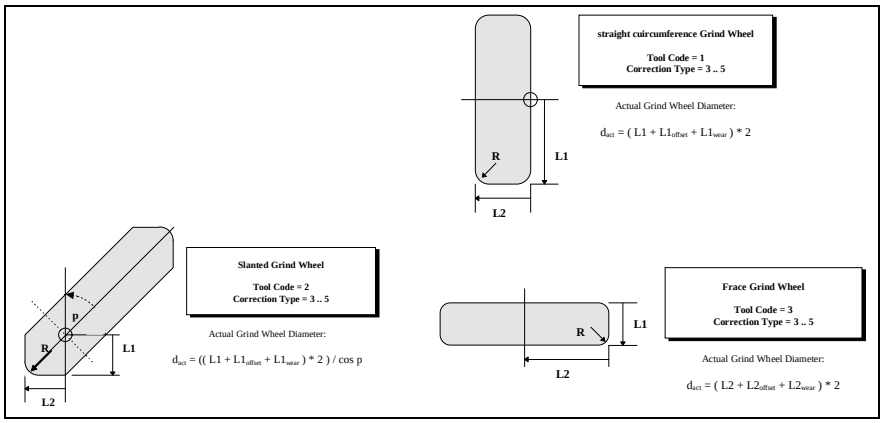
The setup registers for spindles and feed axes further improve the operators manual mode to clamp / unclamp and check of workpieces and fixtures. The setup registers can be influenced by the user via the Machine Data menu #3 or the SPS program.
This new features allow the user and the SPS program to define in **PAGE 1** for spindles

- Jog speed (element 1)
- Jog speed rapid (element 2)
- Spindle position M19 (element 3)

and in **PAGE 10** for feed axes

- Jog velocity (element 1)
- Jog velocity rapid (element 2)
- Jog distance (element 3)

Extended Tool Data



The tool data sets were expanded by element **E0.D18** 'Tool Code':

0 ;standard tool data set
1 ;Circumference Grind Wheel
2 ;Slanted Grind Wheel
3 ;Face Grind Wheel
4 ;spare
5 ;spare
6 ;spare
7 ;spare
8 ;Dresser
9 ;Dresser with monitor values of last active Grind Wheel

and elment **E0.D19** 'Display Code' for the technology 'Grinding'.

Note: When selecting the tool technology 'Grinding' with System Parameter A00.091 'Tool technology [Turn./ Mill.; Grinding] the first four tool edge user data elements

A00.070	Description of user tool edge data 1	S-min
A00.071	Description of user tool edge data 2	S-max
A00.072	Description of user tool edge data 3	WSS-max
A00.073	Description of user tool edge data 4	Slant angle

will be reserved for grind wheel specific data (S-min, S-max, CWS-max, slant angle).

Constant Wheel Surface Speed

The grinding specific function 'Constant Wheel Surface Speed' (G66) programming allows to keep the wheel's surface speed (programmed in [m/s] or [feet/sec]) constant even though the wheel diameter defined in the tool data changes.

The spindle speed driving the wheel is immediately adjusted when the user modifies the data that specifies the wheel diameter in the Active Tool data set via MUI or SPS program.

Correction Type 5 (Tool Gripper)

A tool with correction type 5 (tool gripper) can perform length corrections in all directions of the main axes (X, Y, Z) via the length correction (L1, L2, L3). Length L3 works always perpendicular to the active plane, while length L1 and L2 always work in the active plane. The correction type 5 corresponds to correction type 4 with the difference that it has no radius R correction.

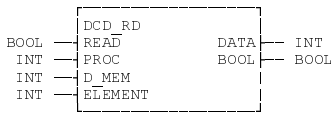
Activation of Tool Corrections

Beside the existing possibilities on activating tool corrections (process parameter B00.043 'Activate Tool Correction': 'imm.after stop' or 'next activation') the new option 'next possible NC-block' is introduced. When this new option is selected the NC considers modifications of tool geometry data as soon as the NC-blocks in the look ahead memory are processed.

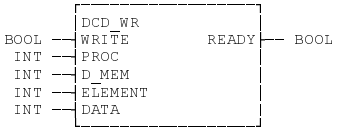
Access to D-corrections

D-corrections can be read and written from the NC-program, SPS program as well as the GUI D-correction menu (lists). The Dxx (xx = 0 .. 99) command is available in the NC and the FUNCTION_BLOCKs DCD_RD and DCD_WR are available in the SPS program to access D-correction data.

- **Read D-correction Data**



- **Write D-correction Data:**



Rotary Axis Direction Mode

With the version 00x-16VRS, the following preparatory functions are available to select other direction modes beside 'shortest distance' for modulo (endless rotating) rotary axis:

- G36, Shortest distance, with modulo calculation
- G37, Positive direction, with modulo calculation
- G38, Negative direction, with modulo calculation

The selected rotary mode is valid for all rotary axes in a process. Independent of the selected mode the NC considers rotary axes as always like wound up linear axes when 'Incremental Programming, G91' is active. The process default rotary mode G-code can be defined in process parameter B00.056 'Rotary Axes Mode Default'.

Extended Tool Turret Functions

- Activate tool correction for turret
  The process parameter B00.057 'Activate tool correction for turret' can be used by the OEM to define whether the tool corrections are activated 'at the end' or 'at the begin' of the turret movement.
- Asynchronous Turret Movement

When setting process parameter B00.044 'Asynchronous Turret Movement' to 'yes', the OEM can synchronize the turret movement with the NC-block execution by activating the standard FUNCTION **REV_SYNC**.

Longest rotation distance for turret:

The direction option of the NC-command MTP and MMP was expanded as follows:
0: shortest distance (any direction)
1: positive direction,
2: negative direction and
3: longest distance (any direction).

Chip removal can be performed via direction option ‘3’ when using NC-command MTP and MMP. When these two NC-commands are used without an activated T-number, the turret performs a 360° rotation !

Increased Number of NC-blocks per NC-program

With version 00X-16VRS a NC-program can contain up to 10.000 NC-blocks.

Processing of NC-command BST

Starting with version 00X-16VRS the execution of the NC-command BST does no longer use the currently selected NC-program number (watch out for SPS program) as the active NC-program and keeps the current NC-program number. This allows to remain within a called NC-subroutine even if the NC-subroutine is contained in another NC-program.

The NC-command RET continues to use the currently selected NC-program number and branches with stop to the NC-block N0000 of that NC-program.

Number of SOTs operated with a MT-CNC

The maximum number of SOTs that can be operated by a single MT-CNC was expanded to 9. Up to 7 SOTs can be operated via the SPS program and 2 SOTs can be daisy chained to the corresponding serial port of the CPUB card.

2.4 Modifications of the SPS

Spindle Jogging via SPS

The new axis control Gateway signal AxxC.RAPID allows to move spindles with rapid traverse independent of the feed axis (PxxC.RAPID) when in manual operating mode.

Note:

Starting with version 00X-16VRS, the process control Gateway signal **P**xxC.RAPID no longer influences main spindles. The Gateway control signal **A**xxC.RAPID must be used for main spindles instead.

Tool Data Manipulation in the SPS

Starting with version 00X-16VRS, FUNCTION_BLOCKs and data structures for a SPS tool data control are introduced.

Standard data type for Basic Tool Data, **TLBD**

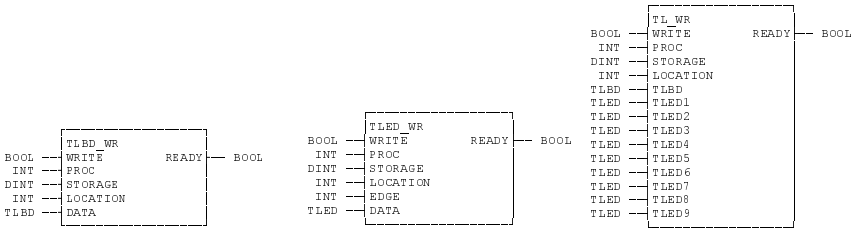
```
STRUCT TLBD                                          (*Basic tool data*)
      TOOL_NAME:     CHAR28;     (*E0.D02: Tool Name (ID)*)
      T_NR:          DINT;       (*E0.D05: T-number*)
      INDEX_NR:      INT;        (*E0.D06: Index number*)
      CORR_TYP:      USINT;      (*E0.D07: Correction Type*)
      EDGES:         USINT;      (*E0.D08: Amout of Edges*)
      STATUS:        DWORD;      (*E0.D09: Tool Status*)
      HALF_POCK:     USINT;      (*E0.D10: half pocket overlap*)
      F1:            USINT;      (*not used*)
      OLD_PLACE:     INT;        (*E0.D11: old pocket*)
      TIME_UNIT:     USINT;      (*E0.D16: time unit*)
      LEN_UNIT:      USINT;      (*E0.D17: length unit*)
      CODE:          USINT;      (*E0.D18: Function / feature
      F2:            USINT;      (*not used*)
      DISPLTYP:      INT;        (*E0.D19: Display type, tool
      USERDAT1:      REAL;       (*E0.D20: User tool data 1*)
      USERDAT2:      REAL;       (*E0.D21: User tool data 2*)
      USERDAT3:      REAL;       (*E0.D22: User tool data 3*)
      USERDAT4:      REAL;       (*E0.D23: User tool data 4*)
      USERDAT5:      REAL;       (*E0.D24: User tool data 5*)
      USERDAT6:      REAL;       (*E0.D25: User tool data 6*)
      USERDAT7:      REAL;       (*E0.D26: User tool data 7*)
      USERDAT8:      REAL;       (*E0.D27: User tool data 8*)
      USERDAT9:      REAL;       (*E0.D28: User tool data 9*)
END_STRUCT
```

and Tool Edge Data, **TLED**

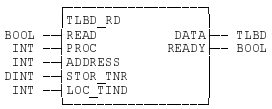
```
STRUCT TLED                                          (*Edge tool data*)
      ORIENT:        USINT;      (*En.D01: Edge Orientation*)
      STATUS:        WORD;       (*En.D02: Edge Status*)
      F1:            USINT;      (*not used*)
      REM_LIFE:      REAL;       (*En.D04: Remain. Tool Life*)
      WARN_LIM:      REAL;       (*En.D04: Warning Limit*)
      MAX_LIFE:      REAL;       (*En.D05: Max. Tool Life*)
      LENGTH_L1:     DINT;       (*En.D07: Lenght L1*)
      LENGTH_L2:     DINT;       (*En.D08: Lenght L2*)
      LENGTH_L3:     DINT;       (*En.D09: Lenght L3*)
      RADIUS_R:      DINT;       (*En.D10: Radius R*)
      WEAR_L1:       DINT;       (*En.D11: Wear L1*)
      WEAR_L2:       DINT;       (*En.D12: Wear L2*)
      WEAR_L3:       DINT;       (*En.D13: Wear L3*)
      WEAR_R:        DINT;       (*En.D14: Wear R*)
      OFFSET_L1:     DINT;       (*En.D15: Offset L1*)
      OFFSET_L2:     DINT;       (*En.D16: Offset L2*)
      OFFSET_L3:     DINT;       (*En.D17: Offset L3*)
      OFFSET_R:      DINT;       (*En.D18: Offset R*)
      WEARFCTL1:     DINT;       (*En.D27: Wear Factor L1*))
      WEARFCTL2:     DINT;       (*En.D28: Wear Factor L2*))
      WEARFCTL3:     DINT;       (*En.D29: Wear Factor L3*))
      WEARFCTR:      DINT;       (*En.D30: Wear Factor R*)
      USERDAT1:      REAL;       (*En.D31: User Edge Data 1*)
      USERDAT2:      REAL;       (*En.D32: User Edge Data 2*)
      USERDAT3:      REAL;       (*En.D33: User Edge Data 3*)
      USERDAT4:      REAL;       (*En.D34: User Edge Data 4*)
      USERDAT5:      REAL;       (*En.D35: User Edge Data 5*)
      USERDAT6:      DINT;       (*En.D36: User Edge Data 6*)
      USERDAT7:      DINT;       (*En.D37: User Edge Data 7*)
      USERDAT8:      DINT;       (*En.D38: User Edge Data 8*)
      USERDAT9:      DINT;       (*En.D39: User Edge Data 9*)
      USERDAT10:     DINT;       (*En.D40: User Edge Data 10*)
END_STRUCT
```

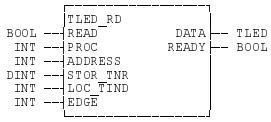
provide access to the individual tool data elements and a simple way to access all tool information. FUNCTION_BLOCKs using the above data types allow to

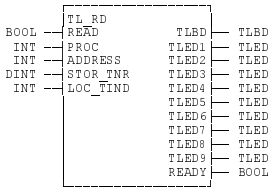
- insert (write) a
  Basic Tool Data set, Tool Edge Data set, complete Tool Data set



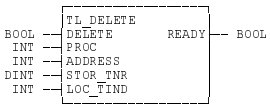
- read a
  Basic Tool Data set, Tool Edge Data set, complete Tool Data set



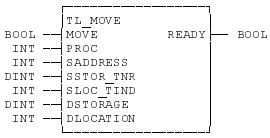




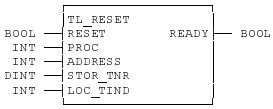
- delete a tool,



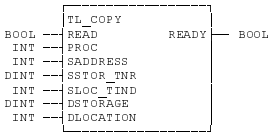
- logically move a tool to a different tool location



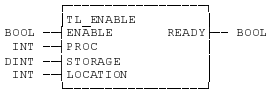
- reset tool data



- copy a tool, and



- enable a tool data set



are available beside the current FUNCTION_BLOCK TLD_RD and TLD_WR that allows tool data modifications. Process overlapping tool transfers are now possible using the FB to insert and erase a tool.

Extended Online Modifications

Single networks can be inserted and deleted in the programming language LD, IL and FBD. The identifiers used in the network that is inserted must already be declared.

Modifications to the Import, IO and Declaration List require a complete compile of the Program Organization Unit that also can be performed ONLINE.

Save and Restore Identifier Status

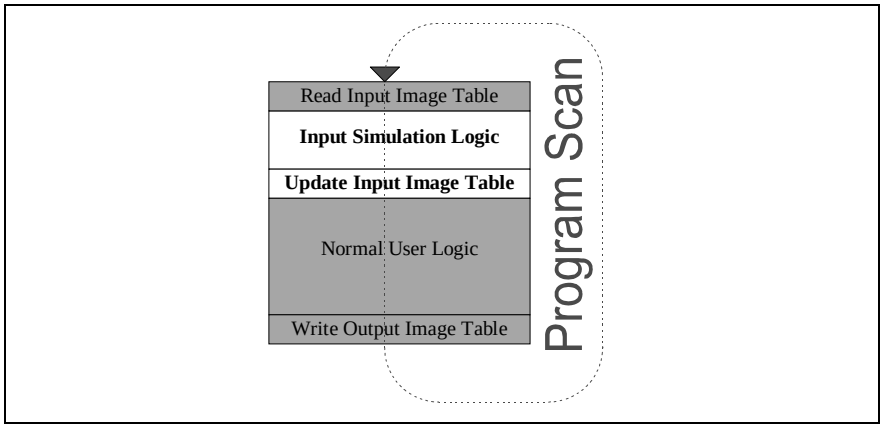
The Declaration Editor in version 00X-16VRS allows to store the current status of marked Identifiers via a block into an ASCII file. The user can use such and ASCII file to assign data to the identifiers. The list can then be written back into the SPS (single scan force of each identifier in the list) via the block commands. This method is especially useful to preload data structures and arrays.

Export and Import User Comments

The user comments in the SPS program and all included Program Organization Units can be extracted and exported into ASCII files, using the current language selected in the software, e. g., English.

The OEM can translate the language into the language used at the end user installation, e. g., French. Translated files can then be imported back into the currently selected language in the software, e. g., French. This method allows to document the SPS program in different languages that are selected when selecting the corresponding language of the User Interface Software.

Simulation of Inputs



The menu item ‘Simulation’ under ‘Edit’ allows to write status to inputs using interlocks with available functions. This allows to simulate non present machine input devices via logic. A warning message ‘Simulation’ is displayed while simulation logic is processed.

The PLC processes the Simulation Logic after reading the input image table and then updates the input image table again before processing the normal PROGRAM logic. After scanning the PROGRAM, the output image table is written which completes a single PROGRAM scan.

Auxiliary Functions

SPS FUNCTIONs to process auxiliary M- and S-functions were expanded by the ‘GROUP’ and ‘SPINDLE’ input respectively. SPS UNCTIONs to process Auxiliary T- and E-functions are now available as well.

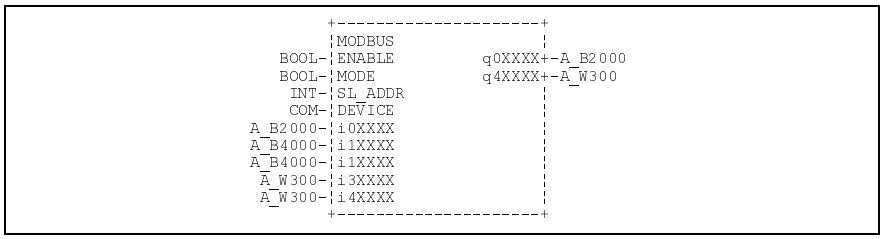
Note: Starting with version 00X-16VRS the auxiliary function check must not be programmed when calling an auxiliary function acknowledgment.

General FBs

The following standard FBs are available in SPS with version 00X-16VRS:

- Read and write NC-variables (without limitation via process data channel),
- Conversion of the TYPEs BYTE, WORD, DWORD to BOOL and vice versa,
- Read and write STRINGs from and to serial SPS interfaces, and
- Conversion between TIME - INTEGER.

- MODBUS emulation via standard (optional) FUNCTION_BLOCK **MODBUS:**



This FUNCTION_BLOCK works with an open SPS serial port (COM and OPEN_COM) and provides MODBUS communication. RTU and ASCII transfer to and from the MODBUS slave are supported at different baudrates when using Indramat IO devices such as PLCB, RECO and BTM 03/04.

INDRAMAT SPS Fiber Optic Loop(s)

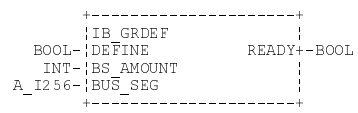
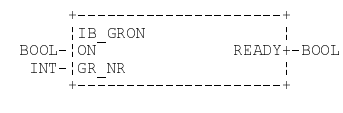
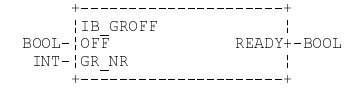
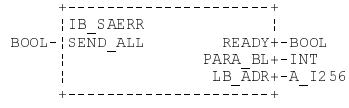
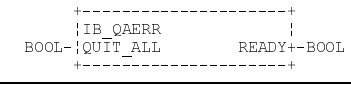
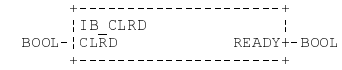
- Both INDRAMAT SPS fiber optic loops can now operate up to 16 devices (RECOs, BTMs and 'slave MT-CNCs') each.
- IO capacity of each Loop was expanded to a maximum of 2048 (256 Bytes) inputs and 2048 (256 Bytes) outputs each.
- To address the maximum number of 32 fiber optic IO devices (16 per loop), the logical addressing also used with InterBus-S is used with INDRAMATs fiber optic IO loops.
- Up to 7 serial SPS ports can be operated via the SPS program per SPS fiber optic loop, a total of 14 per MT-CNC on two fiber optic loops.

InterBus-S

The following changes were implemented with version 00X-16VRS:

- New FBs to process the InterBus-S system are introduced. FBs to determine erroneous local bus segments, FBs to acknowledge module errors and Alarm-Stop of the InterBus-S loop.
- Access to the diagnostic register and diagnostic parameter register is introduced.
- Activation and deactivation of local bus segments previously defined in a group is now allowed during SPS operation.
- The Ident-Code is now displayed for the programmed and actually connected node. The IO editor can automatically match and offer connected nodes for IO list entry.
- This version supports now the Interbus-S firmware version 3.72.
- The command *Bit-Copy* and *Word-Copy* with Bit mask was added to the Process Data Interlock feature. This allows now to use multiple bit manipulation registers.

- Provided FUNCTION_BLOCKs:

IB_GRDEF ;Define Group InterBus-S 	IB_GRON Actiate group InterBus-S 
IB_GROFF **;De-activate group InterBus-S** 	**IB_SAERR** **;Send All module Error request** 
IB_QAERR **;Quit module Error All Services** 	**IB_ALSTP** **;Alarm Stop -> Bus Reset** 
IB_CLRD **;Clear Display** 	

Import Editor

Imported FUNCTON_BLOCKs, FUNCTIONs and TYPEs can be replace with interface compatible FUNCTON_BLOCKs, FUNCTIONs and TYPEs in the Import Editor.

A standard Program Organization Unit (POU) can be redefined into a user POU by entering the standard FUNCTON_BLOCK, FUNCTION and TYPE into the Import List.

Declaration List

To further improve productivity, the following features were added:

- Complete Declaration Lists may now be written to a file. When reading the file back into the Declaration List, the identifiers of the different sections are automatically inserted at the end of the corresponding section. The same applies for any overlapping Block read/write operations.
- A single command can be used to remove declared but non implemented identifiers from the marked Declaration List area (will also remove comments if highlighted).

IL, LD, FBD

Further improvements in the Instruction List (IL), Ladder Diagram (LD) and Function Block Diagram (FBD) editor:

- A new editor strategy is introduced to improve network inserting, allowing to insert blank networks.
- When reading blocks, non declared identifiers in the block are identified and functions are offered to correct or declare them.

Sequential Function Chart (SFC)

The graphical SFC representation was completed by merge lines preceding branches.

Action Blocks

Further improvements in the Action Block editor:

- Introducing the search and replace command.
- Action Block comments can be copied and moved.

General Improvements

- Via an option, the state of the SPS programming software is stored on exit and reinstated when entering SPS again, e. g., loading of the work file loaded at exit.
- Introduced the menu ‘File’ / ‘New’.
- Introduced a file selection menu under ‘File’ and ‘Load’ that offers all available files.
- Introduced the search, replace and cross-reference list functions in the pull down menu under ‘Edit’ and ‘Search’.
- The ‘Options’ menu structures is now optimized.
- Standard Program Organization Units (POUs) and standard data TYPEs are displayed in a different color than user POUs and user data TYPEs.
- The search and replace functions are now also working with comments in the Declaration, LD, IL, and FBD editor.

Cross-reference List

Introduced the searching for the next and previous entry and the printing of blocks.

SPS Fiber Optic Repeater / Switcher

It is especially required in flexible machining cell system that single stations are switched off for maintenance and repair work while all other stations continue working without being interrupted. To maintain SPS fiber optic communication from a station MT-CNC to a cell master MT-CNC, the fiber optic repeater / switcher (LWR01.1) is now available and supported with version 00X-16VRS.

The LWR is connected into Loop 2 of the station (slave) MT-CNC, has the same power source as the master MT-CNC and decouples the station SPS fiber optic loop from the master MT-CNC’s fiber optic loop. Received data is passed along to the connected slave MT-CNC and the next device of the master loop. Received slave MT-CNC data is also passed on to the master MT-CNC.

When the slave MT-CNC is powered off, received master MT-CNC information is passed on to the next device without interrupting communication of the SPS master loop. The LWR automatically establishes communication between a working slave MT-CNC’s SPS and the master MT-CNC’s SPS.

Note: The LWR must be used only in conjunction with slave MT-CNC (loop 2) connections to a master MT-CNC loop and must NOT be used with any other Indramat SPS fiber optic IO device or SERCOS drive/IO.

2.5 Improvements in SFP (Option)

Expanded the Menus ´Options / Machine´

Further menus are available under ‘Options’ and ‘Machine’:

- Technology Data; Many technology related settings, e. g., safety distance, max. cutting depth, feed recommendation, tool change variations, etc., can be defined by the user.
- Machine Data; The adaptation was expanded by NC-block sequences, NC axis traverse ranges, selection of standard NC-cycles as subroutine call or as single blocks, possibility of modifying standard NC-cycles and to include further non standard NC-cycles.
- Post processor user macros; The user (OEM) can define self generated sequences that directly belong to the post processor function.
- Import and use data of the MT-CNC Parameter Set; The post processor setup for the MT-CNC was simplified with version 00X-16VRS. SFP related data can be extracted from the active MT-CNC Parameter Set and imported into the SFP machine data set.

System macros

The user can define self generated sequences that are available for the complete processing system.

Password Administration

With version 00X-16VRS, SFP was adapted to the MT-CNCs password administration.

User Registration Display

The SFP registration name is displayed during the SFP start.

Conversion of Circles to Straight

Straight lines are generated depending on the allowed contour deviation when the maximum possible interpolation radius (see machine data) is exceeded.

MM - INCH

Part programming in SFP can be performed in ‘mm’ or ‘inch’ starting with version 00X-16VRS.

Hot-Key Functions

[Alt]+[H]	Display available Hot-Key functions
[Alt]+[P]	Print current screen into a PCX file

Part Program Contour

Part program correction was expanded by the possibility of ‘dialog entry’, offering the same menus as when generating new part programs. In the part program correction blocks can be marked via [Shift]+[CursorUp]/[CorsorDn]. Marked blocks can be moved via [Shift]+[Insert]. The block is placed right before the selected instruction. These functions allow to reorganize and exchange technological sequences.

Turning

The following improvements are available in version 00X-16VRS:

- Two new variations to process the flanges and form plunges are available.
- Sequential thread cutting is possible via axis parallel or flange infeed.
- Tools to define surcumferential drill patterns were increased.
- The workpiece clamping via the chuck can now be performed via symbolic or fixed jaws.

Drilling / Milling

Expanded the surface milling by the feature to surface circular surfaces.

Post Processors

The connection of any machine or control to the SFP system is possible any time considering the SFP limits. An adaptation to the specific conditions is not included in the selling price when sold in the North American market.

2.6 Tips and Tricks

Administrating external Tools in the Tool List

The tool management allows to administer tools outside the tool storage device beside the tools located in the tool storage device. To accomplish this, the number of locations in the tool storage can be expanded via process parameter Bxx.008 'Number of Locations in Tool Storage':

Bxx.008 := Tools in Tool Storage + external tools

Programming of external tools must be prevented in the user NC and SPS program for both NC and SPS controlled tool storage devices. The SPS program must monitor the commanded pocket number (PxxS.MGCP) for numbers that exceed the maximum number of locations defined in Bxx.008 and prevent NC-program execution when exceeded.

Call of Help Programs

Help programs, required by the SPS in setup mode to move for example NC axes, should be handled as NC-cycles. In addition a branch sequence that allows to call desired help programs should be implemented at the begin of the NC-cycle memory. The SPS program can then call desired help programs during operation as follows:

- select NC-program ´0´ (NC-cycle memory),
- select number of help program (transfer number to branch sequence via NC-variable) and start process

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