



Figure 1 **TessEm⁸⁰⁰⁰** with 3 displays controlled by the PC keyboard and mouse.

The **TessEm⁸⁰⁰⁰** is a software product that emulates the ABB (originally ASEA) TESSELATOR 8000 family of multi-channel color graphic systems. It runs on a standard PC under the Microsoft Windows XP or Windows 2000 operating systems.

The product uses standard TESSELATOR symbol libraries to achieve the same “look and feel” as the original TESSELATOR 8000 system. All existing TESSELATOR compatible keyboards and trackballs could be used as input devices.

By using a standard PC with the Windows XP or Windows 2000 operating system the software emulator has the ability to take advantage of the myriad of peripheral equipment available on the market from third party vendors. Thus the user is free to select I/O devices such as monitors, keyboards, printers etc, but still keep the unique TESSELATOR functionality.

The basic **TessEm⁸⁰⁰⁰** product emulates all the TESSELATOR 8000 “run-time” functions for presentation of process control information on one display (screen). The following additional options are available:

- **Symbol Handling:** Includes an enhanced symbol editing and conversion capability and functions to store downloaded symbol libraries.
- **Display Edit:** Supports all the TESSELATOR 8000 “offline” display editing functionality using standard TESSELATOR keyboards.
- **PC Keyboard:** The PC keyboard and mouse can be used instead of or as a complement to standard TESSELATOR keyboards and trackballs.
- **Multi-Display:** Adds support for one or two additional displays (screens).
- **X.25:** Adds support for one up to four CCITT X.25/2 LAPB communication channels, each with a maximum communication speed of 8.448 Mb/s.
- **Graphic Objects:** Graphic objects such as points, lines, rectangles, arc, circle segments etc. can be displayed together with the alphanumeric and graphic symbols on the **TessEm⁸⁰⁰⁰** screens.

TessEm⁸⁰⁰⁰ emulates the following TESSELATOR 8000 systems:

- TESSELATOR 8110
- TESSELATOR 8310
- TESSELATOR 8410

The product **TessEm⁸⁰⁰⁰** can directly be used together with host computers such as ABB MasterView 810/830/850, ABB DMS, ABB Superview, ABB SINDAC, ABB MasterView ALSY, ABB MasterView, ABB Transmission HVDC CAS, LinkLaser Process Supervisor, Fisher & Porter DOC or other systems using TESSELATOR 8000 as graphic operator interface.

Technical Data

General

The **TessEm⁸⁰⁰⁰** runs on any PC capable of supporting the Microsoft Windows XP or Windows 2000 operating system. Since this is a software emulator the overall performance will depend on the specifications of the hardware to a large extent. The PC should be a high end PC with an adequate amount of RAM to handle both Windows operating system and any other applications running. The **TessEm⁸⁰⁰⁰** product requires the following:

- **Operating system:**
 - Windows XP Professional or Home Edition, Version 2002, Service Pack 1 or 2.
 - Windows 2000, Version 5.00.2105, Service Pack 2, 3 or 4.
- **PC equipment requirements:** Standard requirements for Windows XP or Windows 2000. The **TessEm⁸⁰⁰⁰** product itself requires around 9 MB RAM when running 3 displays (screens).
- **Screen resolution:** Minimum 1280 x 1024 pixels.
- **Color quality:** At least 8 bits per pixel ("lowest" quality).
- **USB port:** 1.
- **USB License Key**

Input Devices

- **TESSELATOR Keyboard:** All TESSELATOR compatible keyboards can be used, such as DSIH 70/90, QDHI 01 or QSAV 821.
- **TESSELATOR Trackball:** All TESSELATOR compatible trackballs, such as DSIH 71 and QDHI 108 can be used.
- **PC Mouse:** **TessEm⁸⁰⁰⁰** can use a standard PC mouse to positioning the visible cursor, retrieve information and for configuration, display and symbol editing.
- **PC Keyboard:** Standard PC keyboard used for configuration, display and symbol editing. Could be used as a replacement for the standard TESSELATOR keyboard.
(NOTE: Requires the PC Keyboard option)

Output Devices

- **Monitor/Frame rate:** Any display device, with minimum 1280 x 1024 pixels resolution, supported by Windows XP or Windows 2000.
- **Printers:** Any supported by Windows XP or Windows 2000.

Computer Communication

Asynchronous

Point to point, 1 - 4 channels.

- **Interfaces:** RS 232 C (V.24).
- **Data formats:** Selectable, 7 or 8 bits.
- **Speed:** Selectable, 1200 to 128000 bits/s.
- **Parity:** Selectable, odd, even or none.
- **Protocol:** ABB proprietary ADLP-10 (ABB Data Link Protocol).

Synchronous

Point to point, 1 - 4 channels.

(NOTE: Requires the X.25 option)

- **Interfaces:** X.21, RS-442, RS-449.
- **Speed:** Selectable, up to 8.448 Mbits/s.
- **Protocol:** CCITT X.25/2 LAPB.
- **X.25 card:** FarSync X25 T1U, FarSync X25 T2U or FarSync X25 T4U from [Farsite Communications Limited](#).

Peripheral Communication

- **Asynchronous:** Point to point, up to 4 keyboards and up to 2 printers.
- **Interfaces:** RS 232 C (V.24).
- **Data formats:** Selectable, 7 or 8 bits.
- **Speed:** Selectable, 1200 to 128000 bits/s.
- **Parity:** Selectable, odd, even or none.

Display Data

- **Screens:** 1 – 3
(NOTE: Screen 2 and 3 requires the Multi-display option)
- **Tessel resolution:** 240 x 112 (horizontal x vertical)
- **Pixel resolution:** 1200 x 1008 (horizontal x vertical)
- **Tessel size:** 5 x 9 pixels (horizontal x vertical)

Color and Blink (all selectable)

- **Color Palette:** Up to 16 Million (depending on the capabilities of the graphic adapter).
- **Foreground:** 16 + 16 (No blink/Blink).
- **Work Area Background:** 16 area colors.
- **Object Background:** 8 object colors
- **Trend:** 16 colors
- **Blink:** Individual selectable color, frequency and timing
- **General background:** 64 colors, each at one of two brightness levels.

Cursors

- **Computer Cursor:** Non-visible, operates in three modes: Absolute, Logical or Trend Curve mode
- **Visible Cursor:** Selectable cursor shapes, support for custom designed cursor
- **Graphic Cursor**

Symbol and Font Library

- User definable Fonts and Symbols with the extended Symbol Editor. (NOTE: Requires the Symbol Handling option)
- Five symbol fonts, each containing alphanumeric symbols (code 20H - 7EH) and graphic symbols (code 80H – FFH)
- Various language and branch versions available

Display Presentation Functions

The following TESSELATOR 8000 "run-time" display presentation functions are supported:

- Presentation of alphanumeric and graphic symbols
- System, computer and operator fields
- Absolute and logical computer cursor
- Bar graphs
- Trend curves
- Graphic objects

TessEm⁸⁰⁰⁰ Improvements versus TESSELATOR 8000

- **Improved display resolution:** 1200 x 1008 pixels, using a tessel size of 5 x 9 pixels (the original resolution was 720 x 336 with a 3 x 3 pixels tessel), to maintain tessel resolution.
- **Increased communication speed:** Up to 128000 bits/s (max speed was 19,200 bits/s for the TESSELATOR 8000).
- **Five symbol fonts:** Each font containing alphanumeric symbols, code 20H - 7EH, and graphic symbols, code 80H – FFH (the TESSELATOR 8000 had “four” symbol code tables - one of the code tables was “shared” between size one and size five alphanumeric symbols).
- **Extended color handling:**
 - All colors selectable using 8 bits RGB-values, 256 colors (the TESSELATOR 8000 used 2 bits RGB-values).
 - Individual selectable work area background, object background and trend curve colors. Object background colors not related to defined area background colors. Trend colors not related to defined foreground colors.
 - Up to 16 work area background colors.
- **Extended Local Display Storage:** Up to 1000 displays with no memory limitations included as default.
- **Selectable window appearance:** “Resizable Window” on the Microsoft Windows desktop or “Operator”-look (display uses the entire screen) for the emulator window.
- **Selectable cursor shapes for visible cursor:** TESSELATOR 8000 or TESSELATOR 9000 appearance could be used. Support for custom designed cursor shapes.
- **Extended line drawing features:** TESSELATOR horizontal and vertical repeat display code sequences, of line drawing symbols, could be drawn:
 - Using symbols (code E0H – FFH) for compatible mode.
 - Using vectors for optimized display presentation.
- **Hardcopy printouts included as default:**

Printout of emulator window contents to any standard Windows XP or Windows 2000 printer or to a file. Color conversion from window color to printer color, should be defined by the user in a color conversion specification file.
- **Extended symbol-editing functions: (*)**
 - Standalone enhanced Symbol Editor application.
 - TESSELATOR 8000 symbol libraries, downloaded from host computer, could be saved on file, converted and edited.
- **Built-in recording function:** Display command sequences sent from the host computer could be recorded on file for fault-tracing purpose.
- **Built-in system message function:** Illegal command sequences send from the host computer or other errors in the software are reported as system messages, stored in system log file.
- **PC Keyboard features: (**)**

The PC keyboard and mouse could be used instead of or as a complement to standard TESSELATOR keyboards and trackballs. Individual programmable key and mouse sequences.

- **Trace Keyboard function: (**)**
In dialogue box displays the codes generated at every key press from a keyboard connected to the Keyboard communication port. The function can be used for configuring of the PC-keyboard Special Key Mapping function.
- **X.25 features: (***)**
Support for one up to four CCITT X.25/2 LAPB communication channels, each with a maximum communication speed of 8.448 Mbits/s.
- **Graphic objects: (****)**
Graphic objects such as points, lines, rectangles, arc, circle segments etc. can be displayed together with the alphanumeric and graphic symbols on the screen. Information about the objects is stored so they could be redrawn if necessary. In TESSELATOR 8000 was the pixel information only plotted on the screen.

(*) **NOTE:** Requires the Symbol Handling option.

(**) **NOTE:** Requires the PC Keyboard option.

(***) **NOTE:** Requires the X.25 option.

(****) **NOTE:** Requires the Graphic Objects option.

TessEm⁸⁰⁰⁰ Differences from TESSELATOR 8000

- Symbol Editor implemented as a standalone application.
- Menu handling functions implemented as a standalone configuration application.
- The TESSELATOR 8000 "offline" display editing functionality, using standard TESSELATOR keyboards, implemented as an option.
- DIM functionality not implemented.
- Tessel size is 5 x 9 pixels, 1200 x 1008 pixels screen resolution.
- Symbol memory format incompatible with the TESSELATOR 8000 format.
- Symbols defined as rectangle pixel map.
- Remote Hardcopy functionality, the command READ HC PACKED (CF 3FH) etc., is not implemented.
- Selection of black and white or color hardcopy printout, through the command HC COLOR (CF 9BH), is not implemented. Translation of window color to printer color should be performed using a color conversion file.
- No loading/reading of symbol memory from/to host computer.
- No loading/reading of parameter memory from/to host computer.
- The GENERAL BACKGROUND COLOR (CF A1H) command is affecting only the background color of a **TessEm⁸⁰⁰⁰** application window.
- No support for TESSELATOR 8410 5,25 inch floppy disc.
- Command interpreter, in TESSELATOR 8410, not implemented.
- Only support for CCITT X.25/2 LAPB communication.
The CCITT X.25/2 LAP protocol not implemented.
- Selected color option affects all displays (screens).

Configuration Application

All configuration of the **TessEm⁸⁰⁰⁰** application, which in the original TESSELATOR 8000 products was done in the Menu handling, is implemented in the stand-alone TessEm Configuration Application (**TessEmCfg**).

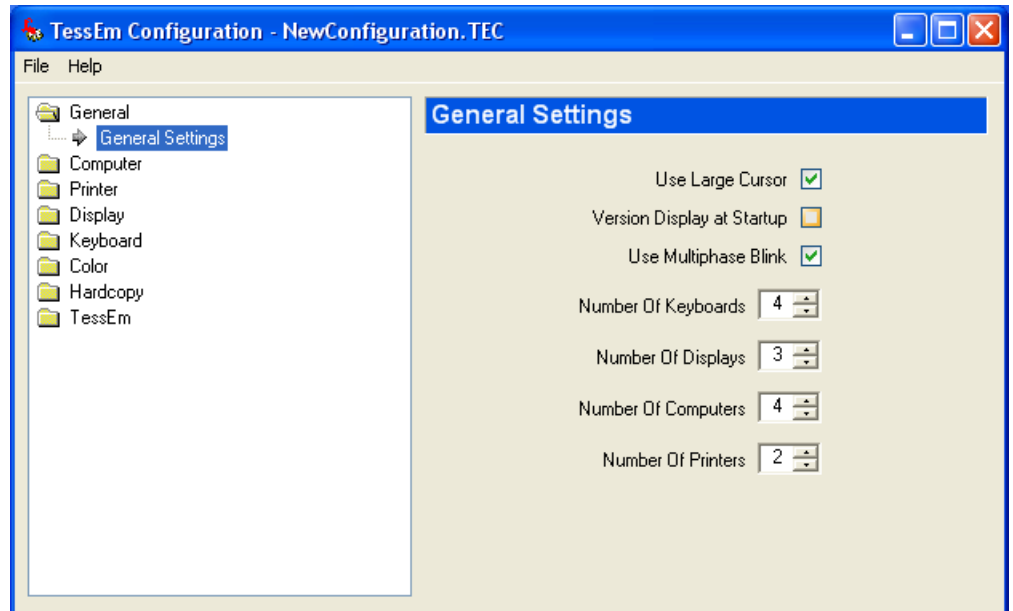


Figure 2 The TessEm Configuration Application (**TessEmCfg**)

TessEmCfg contains according to Figure 2, the following functions to configure the **TessEm⁸⁰⁰⁰** product:

- **File** functions to: Create new, open, save, save as, explore properties of a configuration file and to export configuration to **TessEm⁸⁰⁰⁰**.
- **General Settings** functions to select parameters such as: Use Large Cursor, Version Display at Start-up and Use Multiphase Blink and number of different connected units.
- **Computer** functions to select the communication type and the communication settings for each of the host computers connected to the PC.
- **Printer** functions to select the communication settings for the communication ports in the PC connected to a typewriter for alarm printouts.
- **Display** functions for activation of Recording function on displays.
- **Keyboard** functions to select parameters such as: Keyboard Communication settings, Keyboard Type settings and PC Keyboard.
- **Color** functions to select parameters such as: Color Options, Blink Type and Color Values in RGB (Red, Green, Blue) representation for foreground colors, area background colors, object background colors, trend colors, blink colors and multiphase blink colors.
- **Hardcopy** functions to select parameters such as: Hardcopy Printer Device, Color Conversion File and Hardcopy printout to printer or to file.

- **TessEm Settings** functions to select parameters such as: Symbol Library, Line Draw Mode, Cursor Style, Window Style, Download Symbol Library capture and activation of System Message.
- **Help** functions for searching and displaying information about the functions in ***TessEmCfg***.

Symbol Handling option

The **Symbol Handling** option includes a stand-alone enhanced editing and conversion capability (**TessSymb**) and functions to store downloaded symbol libraries.

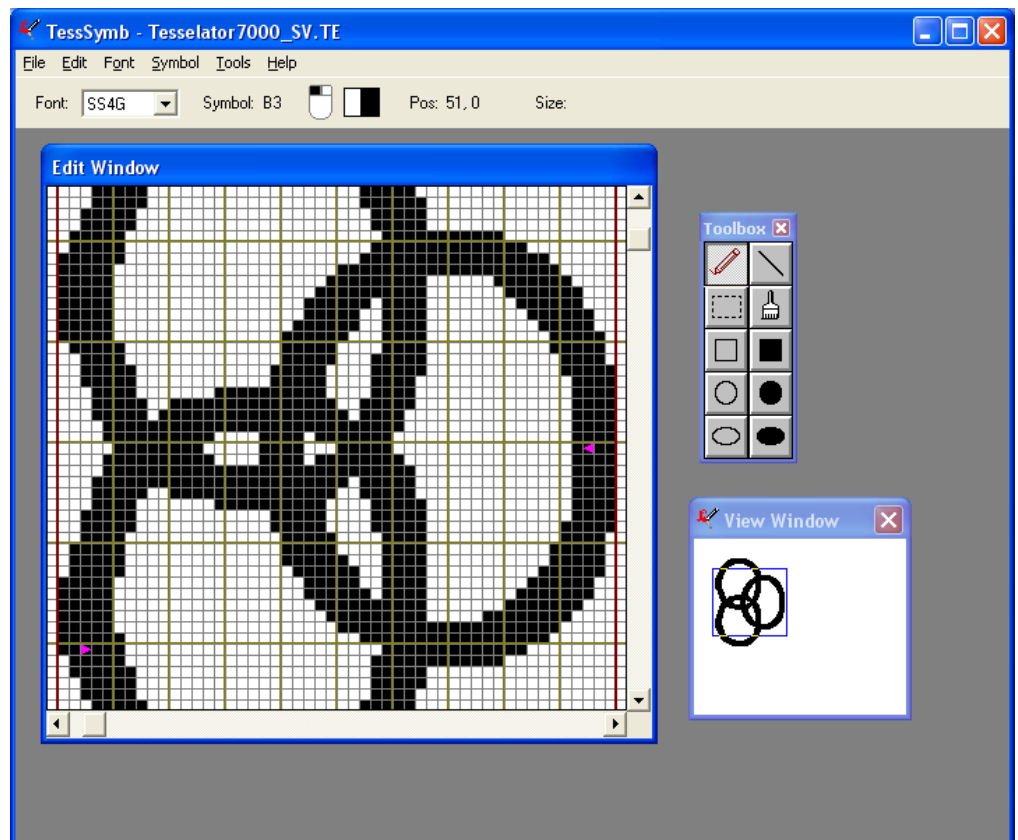


Figure 3 The Enhanced Symbol Editor (**TessSymb**)

The enhanced symbol editor **TessSymb** uses according to Figure 3, three different windows, the **Edit** window, the **View** window and the **Toolbox** window, in the client area of the application window. These three windows can be positioned inside the client area of the application window and the Edit and View windows can also be resized. By using functions in the **Tools** menu the View and Toolbox windows can be hide or displayed.

The View window shows the graphic information in natural size. A rectangular part of the View window, the Zoom Area, is displayed in enlarged form in the Edit window to simplify graphic editing. The Toolbox window contains push buttons for the available drawing tools.

TessSymb contains the following functions to handle symbol libraries:

File functions to: Create, open, save and convert symbol libraries. The editor could handle symbol libraries on TESSELATOR 9000 and **TessEm⁸⁰⁰⁰** format. Symbol libraries on TESSELATOR 8000 or TESSELATOR 7000 formats could be converted.

- **Edit** functions to: Copy, cut, paste, move and import graphic information.
- **Font** functions to: Save the font information, append symbols to the font, delete symbols and define font parameters.

- **Symbol** functions to: Create new symbols, retrieve defined symbols, save symbols and define symbol parameters.
- **Tool** functions to affect some elements in the **TessSymb** application window such as: Enable/disable the Tessel Grid in the Edit window, defining the size of the Brush and Pen, enable/disable of showing the cursor position, enable/disable of showing the drawing object size, hide/display View window and hide/display Toolbox window.
- **Help** functions for searching and displaying information about the functions in **TessSymb**.

The **Symbol Handling** option also includes functions in **TessEm⁸⁰⁰⁰** application to capture and store downloaded symbol libraries on TESSELATOR 8000 format. The stored information could be converted to **TessEm** symbol library format by using the functions in the **TessSymb** application. The function to capture and store downloaded symbol libraries is activated by using functions in the TessEm Configuration Application (**TessEmCfg**).

Display Edit option

The **Display Edit** option supports all the TESSELATOR 8000 “offline” display editing functionality using standard TESSELATOR keyboards.

TESSELATOR 8000 editing support functionality such as the Compass, the Display Frame, Visible Mark etc is included.

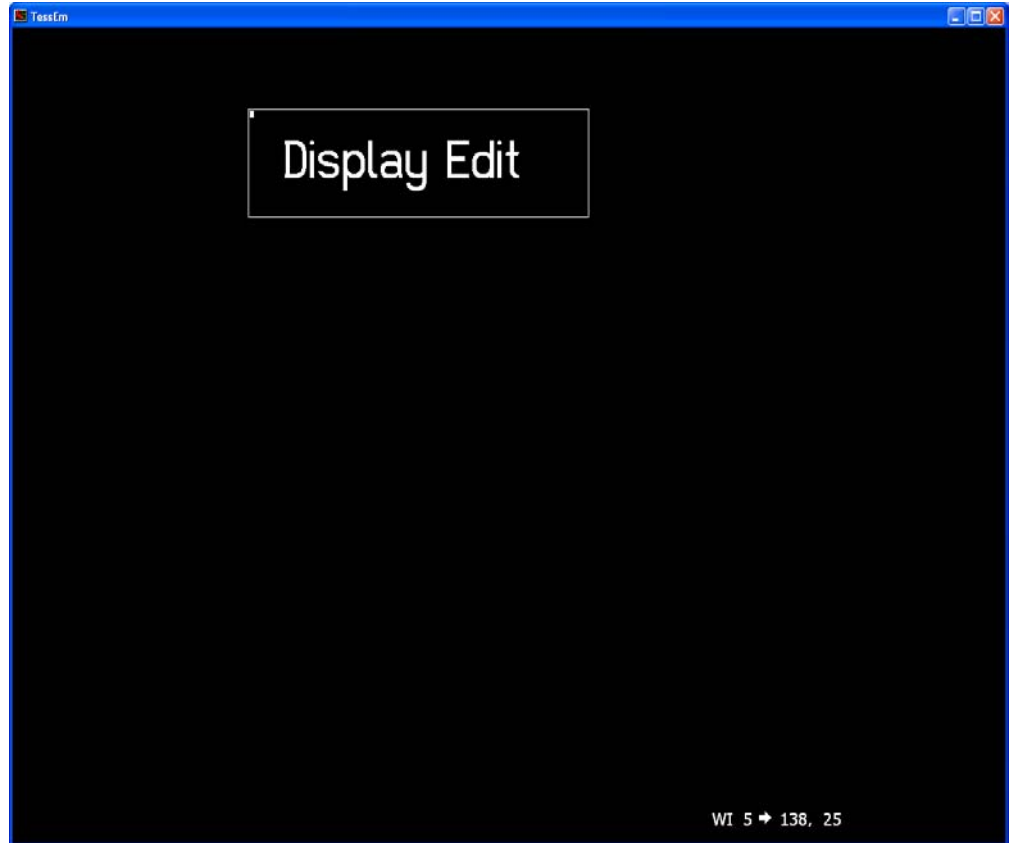


Figure 4 The Display Frame and Compass

The following display editing command, for the visible cursor, is included in the option:

- **Clear Store** (CF 2BH)
- **Move Right** (CF 49H)
- **Move Down** (CF 4AH)
- **Save Work Area** (CF 4BH)
- **Set Background Color** (CF 4EH)
- **Move Left** (CF 59H)
- **Move Up** (CF 5AH)
- **Restore** (CF 5BH)
- **Display On** (CF 5CH)
- **Change Foreground Color** (CF 5EH)
- **Catch Color** (CF B0H)
- **Enable Compass** (CF BAH)

PC Keyboard option

With the **PC Keyboard** option the PC standard keyboard and mouse could be used instead of or as a complement to standard TESSELATOR keyboards and trackballs.

The PC standard keyboard is integrated into the *TessEm⁸⁰⁰⁰* software product according to Figure 5.



Figure 5 PC standard keyboard layout

The **PC Keyboard** option could work together with a standard TESSELATOR keyboard connected to a COM-port or be used as the only input device for *TessEm⁸⁰⁰⁰*.

The keyboard mapping and each key sequence is defined using the TessEm Configuration Application (*TessEmCfg*). The keyboard mapping could be activated individual for two groups of keys: the **Special Keys** and the **Standard Keys**.

The **Special Keys**, marked with yellow in the Figure 5, could be programmed, mapped, to generate standard TESSELATOR keyboard codes sequences. For every key could the non-shifted and shifted value of the key generate an up to sixteen (16) bytes sequence. The left mouse button could also be programmed, mapped, to generate keyboard codes sequences in the same way as the other Special Keys.

The **Standard Keys**, marked with green in the Figure 5, is automatically mapped to the corresponding TESSELATOR keyboard codes if the mapping for the group is activated.

The **PC Keyboard** option contains also a **Trace Keyboard** function, which in a dialogue box displays every key press from a keyboard, connected to the Keyboard communication port. The function can be used for configuring of the PC-keyboard Special Key Mapping function.

Multi-Display option

With the **Multi-Display** option can one or two additional displays (screens) be added to the **TessEm⁸⁰⁰⁰** product, which can handle maximum three displays (screens). Each display is handled in the same way as a display channel in TESSELATOR 8000.

Each display (screen) is handled as a separate window by the **TessEm⁸⁰⁰⁰** product. The windows use one of the following three different window types:

- **Resizable Window:** An overlapped window on the Windows desktop with changeable size.

NOTE: A screen resolution of 1280 x 1024 pixels is not enough to hold the whole 1200 x 1008 pixels **TessEm⁸⁰⁰⁰** window because the caption bar takes some space (approx. 27 pixels).

- **Operator Window:** A window placed on top of all other windows on the Windows desktop, covering the entire screen.

NOTE: Requires a dedicated graphics chip driving each display (screen). If more than one display is defined in **TessEm⁸⁰⁰⁰**, more than one graphic card or a multi-monitor graphic card must be installed in the PC.

- **Fix Size Window:** An overlapped window on the Windows desktop with fixed size, 1200 x 1008 pixels.

X.25 option

With the **X.25** option can synchronous communication be used for transferring information between the **TessEm⁸⁰⁰⁰** product and host computer. The synchronous communication is based on the **HDLC** (High-Level Data Link Control procedure), as specified by the CCITT X.25 layer 2 **LAPB** (Link Access Procedure-Balanced protocol) recommendations.

The **X.25** option adds up to four individual synchronous channels, each with maximum communication speed of 8.448 Mbits/s, to the **TessEm⁸⁰⁰⁰** product. The X.21, RS-442 or RS-449 communication interface can be used.

The **TessEm⁸⁰⁰⁰** product uses the FarSync X25 T1U (1 port), FarSync X25 T2U (2 ports) or FarSync X25 T4U (ports) cards from [Farsite Communications Limited](#) for synchronous communication. Maximum one of these cards can be used together with the **TessEm⁸⁰⁰⁰** in a PC.

The FarSync TxU card type and PCI specification:

- 50MHz AMD Am186-CH (FS6140, FS6240)
- 50MHz AMD Am186-CC (FS6440)
- 1 Mbyte zero wait state SRAM
- Intelligent Universal bus mastering PCI card
- Short card (height 107mm, length 167mm)
- PCI-X compatible
- PCI v2.2 compliant
- Supports 3.3 & 5 volt signaling
- Suitable for 32 and 64 bit PCI bus slots



Figure 6 FarSync X25 T2U card

Graphic Objects option

The **Graphic Objects** option supports all the TESSELATOR 8000 graphic objects such as points, lines, rectangles, arcs, circle segments, fill etc. The graphic objects could be displayed together with the alphanumeric and graphic symbols on the **TessEm⁸⁰⁰⁰** screen.

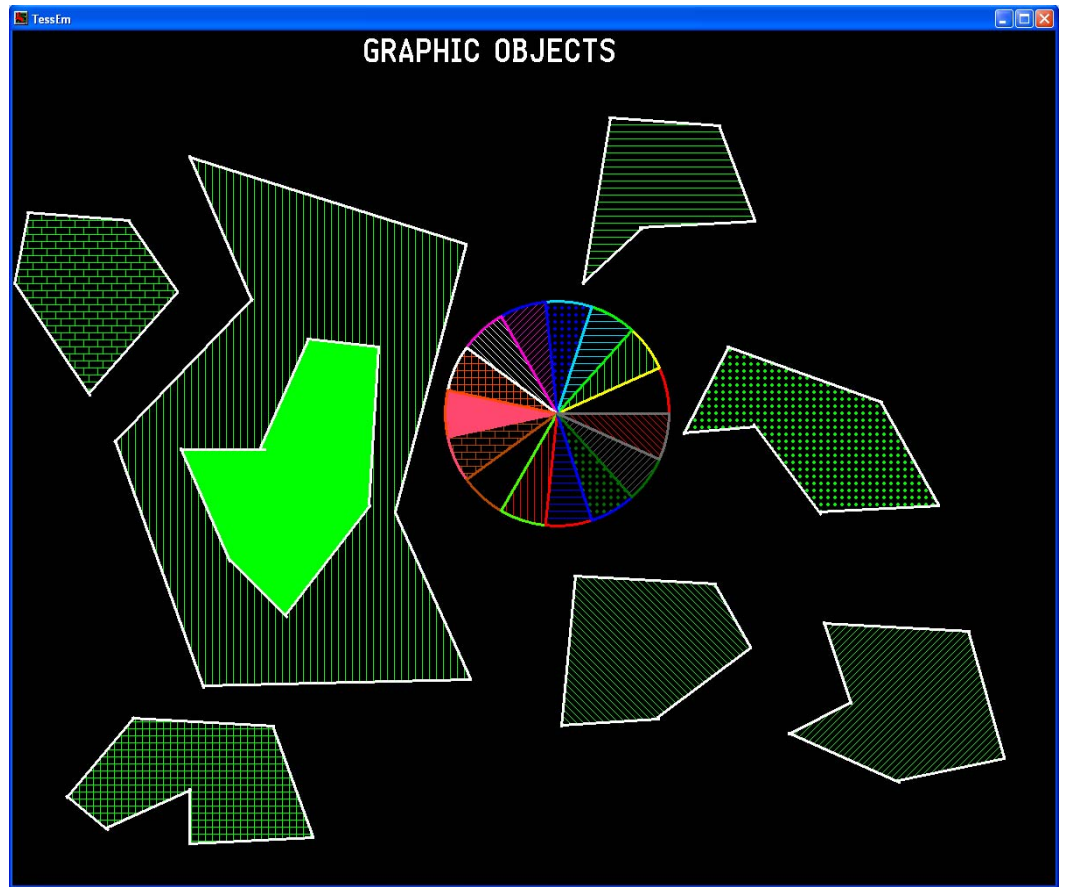


Figure 7 Example of TessEm graphic objects

Performance Comparison

A typical power distribution control display, according to Figure 8, containing 2132 screen objects and 8 background color rectangles was used to compare the performance of the *TessEm*⁸⁰⁰⁰ emulator with an original TESSELATOR 8000.

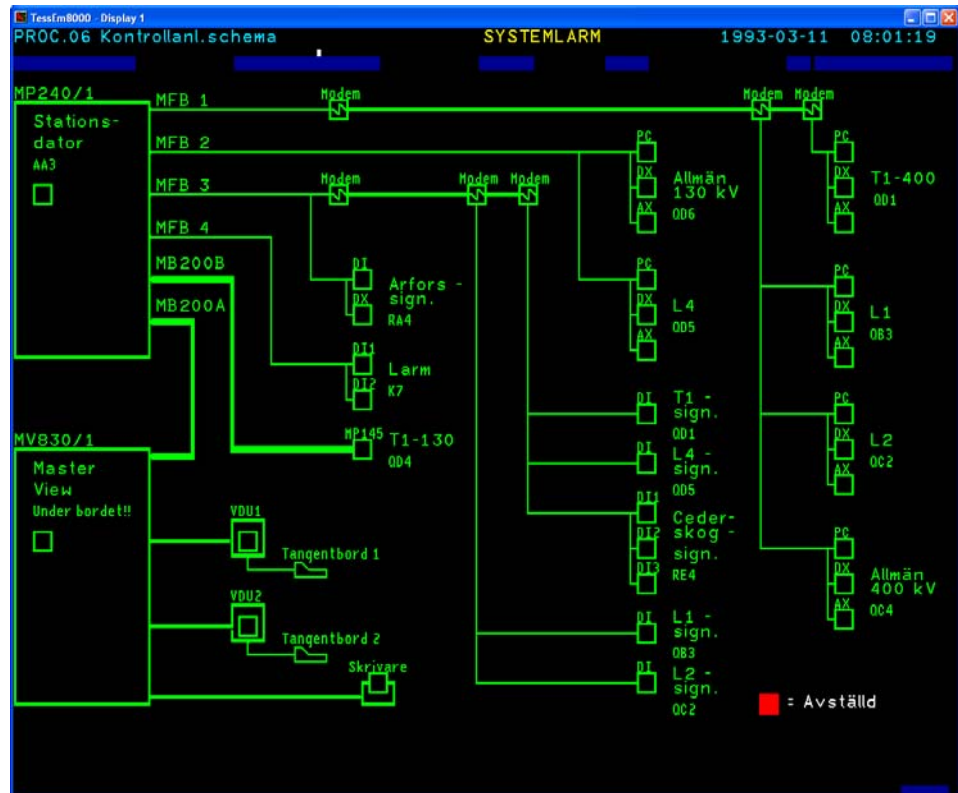


Figure 8 Typical power distribution control display

The display information was stored in the Local Display Storage. Sending the following commands from a host computer to each display, using asynchronous communication, performed the test: CLEAR WORK AREA SCREEN (CF 48H) followed by LOCAL STORAGE LOAD (CF FBH). The command sequence was repeated 100 times sent in one communication message (ADLP10- and TOP-message).

Average display presentation time:

- The *TessEm*⁸⁰⁰⁰ emulator: 55 ms (*), 30 ms (**)
- TESSELATOR 8300: 280 ms (*)

(*) Lines drawn using symbols

(**) Lines drawn using vectors

The *TessEm*⁸⁰⁰⁰ emulator, version 1.0.0, was running on standard PC with the following data:

- **Operating system:** Windows XP Professional version 2002, Service Pack 1
- **PC equipment:** Intel Pentium 4, 2.4 GHz, 512 MB RAM.
- **Screen resolution:** 1280 x 1024 pixels
- **Color quality:** 32 bits per pixel ("Highest")
- **Display adapter:** Matrox G450 DualHead DVI PCI 32 MB RAM

New Features

The following new features are under development for the **TessEm⁸⁰⁰⁰** emulator:

- **LAN communication option:** Using TCP/IP, sockets for communication between host computer and the **TessEm⁸⁰⁰⁰** emulator.
- **Event Logging option:** Replacement of event and alarm printers. Can handle data from various kinds of text based data sources. Data is stored for subsequent analysis.
- **Virtual On-Screen keyboard option:** Custom designed virtual keyboards can be used on the **TessEm⁸⁰⁰⁰** screen as a replacement to or work together with a standard TESSELATOR keyboards.

New Products

Check out the product **TessEm⁷⁰⁰⁰**, which emulate the graphic system TESSELATOR 7000! Also under development is the product **TessEm⁹⁰⁰⁰**, which will emulate the multi-channel high-end graphic system TESSELATOR 9800.

Newcon Data AB has extensive expertise in man-machine communication interfaces (MMI), real-time programming and embedded computer systems and provides advanced technical services for development of embedded computer systems and new MMI systems.

The employees at the company have extensive knowledge, 25 years of experience, of the TESSELATOR product family (8000, 8000 and 9000) since they have been part of the development teams for all the models. The company has also undertaken additional projects related to the TESSELATOR products, as the windowing functions in the TESSELATOR 9000 system.

Newcon Data AB has been handling the maintenance, administration, technical support and new software development on the TESSELATOR product family for ABB Automation Technologies AB since 1991.

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