

Figure 1 *TessEm⁷⁰⁰⁰* used together with *TESSELATOR 7810* in *MasterView 830*.

The *TessEm⁷⁰⁰⁰* is a software product that emulates the ABB (originally ASEA) *TESSELATOR 7000* family of color graphic systems. It runs on a standard PC under the Microsoft Windows Vista, 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 7000* system. All existing *TESSELATOR* compatible keyboards and trackballs can be used as input devices.

By using a standard PC with the Windows Vista, 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 *TessEm⁷⁰⁰⁰* product emulates all the *TESSELATOR 7000* “run-time” functions for presentation of process control information. 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 7000* “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.

- **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 **TessEm⁷⁰⁰⁰** screen.

TessEm⁷⁰⁰⁰ emulates the following TESSELATOR 7000 models:

- DSID 7800 - TESSELATOR 7800 (the basic version with a 16" monitor)
- DSID 7805 - TESSELATOR 7805 (the basic 16" monitor plus additional hard copy capability)
- DSID 7810 - TESSELATOR 7810 (the basic version with a 15" monitor)
- DSID 7815 - TESSELATOR 7815 (the basic 15" monitor plus additional hard copy capability)
- DSID 7850 - TESSELATOR 7850 (the basic version with a 20" monitor)
- DSID 7855 - TESSELATOR 7855 (the basic 20" monitor plus additional hard copy capability)

The product **TessEm⁷⁰⁰⁰** can directly be used together with host computers such as ABB MasterView 810/830, ABB DMS, ABB SuperView, ABB ALSY 200, ABB AccuRay, ABB Transmission HVDC CAS, LinkLaser Process Supervisor or other systems using TESSELATOR 7000 products as graphic operator interface.

NOTE: The product **TessEm⁷⁰⁰⁰** can also replace a TESSELATOR 8000 system using a single display channel (VDU) and asynchronous communication with the host computer.

Technical Data

General

The **TessEm⁷⁰⁰⁰** 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 **TessEm⁷⁰⁰⁰** product requires the following:

- **Operating system:**
 - Windows Vista, Service Pack 1.
 - 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 Vista, Windows XP or Windows 2000.
The **TessEm⁷⁰⁰⁰** product itself requires around 6 MB RAM.
- **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:** *TessEm⁷⁰⁰⁰* 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. Can 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, to one computer.
- **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).

Peripheral Communication

- **Asynchronous:** Point-to-point, to one keyboard and to one printer.
- **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

- **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 versions available.

Display Presentation Functions

The following TESSELATOR 7000 "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.

TessEm⁷⁰⁰⁰ improvements versus TESSELATOR 7000

- **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 7000).
- **Five symbol fonts:** Each font containing alphanumeric symbols, code 20H - 7EH, and graphic symbols, code 80H – FFH (the TESSELATOR 7000 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 7000 used 3 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 7000 or TESSELATOR 9000 appearance can be used. Support for custom designed cursor shapes.
- **Extended line drawing features:** TESSELATOR horizontal and vertical repeat display code sequences, of line drawing symbols, can 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.
- **Alarm printer:** Possible to connect a second printer to a serial port for alarm printouts etc.
- **Extended symbol-editing functions: (*)**
 - Standalone enhanced Symbol Editor application.
 - TESSELATOR 7000 symbol libraries, downloaded from host computer, can be saved on file, converted and edited.
- **Built-in recording function:** Display command sequences sent from the host computer can 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.

- **Programmable keyboard sequences:** Included in TESSELATOR 8000/9000. A key code sent from the keyboard can be translated to a 16 bytes code sequence. The contents of the code sequence are fully programmable.
- **PC Keyboard features: (**)**
The PC keyboard and mouse can 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.
- **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 can be redrawn if necessary. In TESSELATOR 7000 was the pixel information only plotted on the screen.

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

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

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

TessEm⁷⁰⁰⁰ differences from TESSELATOR 7000

- Symbol Editor implemented as a standalone application.
- Menu handling functions implemented as a standalone configuration application.
- The TESSELATOR 7000 “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 7000 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) is affecting only the background color of a **TessEm⁷⁰⁰⁰** application window.
- The maximum TOP block size that can be defined by using the TOP command Define Block Size (DSB) or used from the host computer is 2048 bytes, including TU and OC bytes.

Configuration Application

All configuration of the *TessEm*⁷⁰⁰⁰ application, which in the original TESSELATOR 7000 products was done in the Menu handling, is implemented in the stand-alone TessEm Configuration Application (*TessEmCfg*).

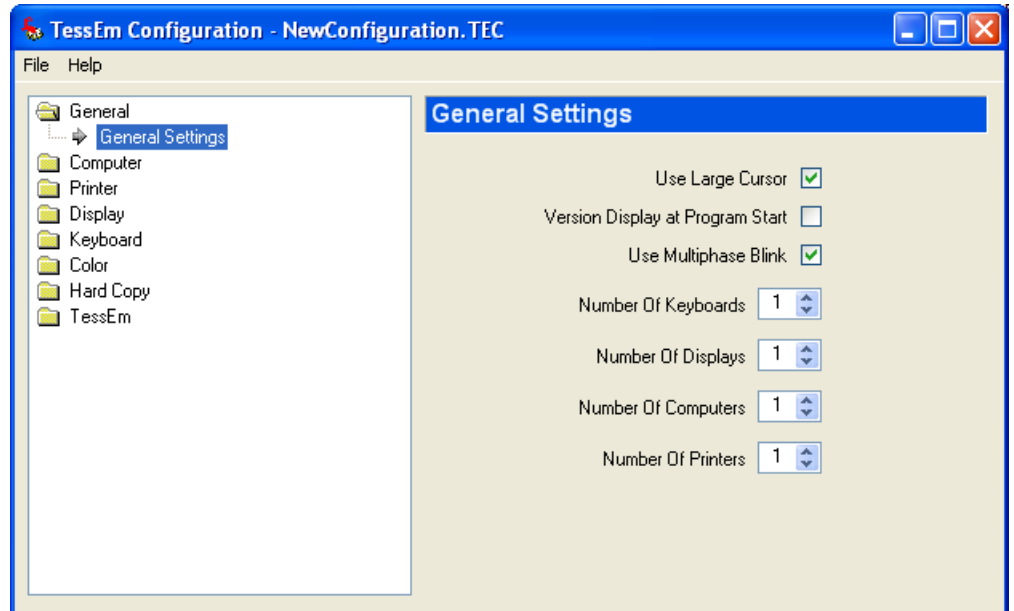


Figure 2 The TessEm Configuration Application

The TessEm Configuration Application contains according to Figure 2, the following functions to configure the *TessEm*⁷⁰⁰⁰ application:

- **File** functions to: Create new, open, save, save as, explore properties of a configuration file and to export configuration to *TessEm*⁷⁰⁰⁰.
- **General Parameters** 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 Communication** functions to select the communication settings for the communication port in the PC connected to the host computer.
- **Printer Communication** functions to select the communication settings for the communication port in the PC connected to the PC to the typewriter for alarm printouts.
- **Keyboard Parameters** functions to select parameters such as: Keyboard Type, Keyboard Communication, First Key Code, Keyboard Codes and PC Keyboard.
- **Color Parameters** 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 Parameters** functions to select parameters such as: Hardcopy Printer Device, Color Conversion File and Hardcopy printout to printer or to file.
- **TessEm Parameters** functions to select parameters such as: Symbol Library, Line Draw Mode, Cursor Style, Window Style, Download Symbol Library capture and activation of System Message and activation of Recording function.
- **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.

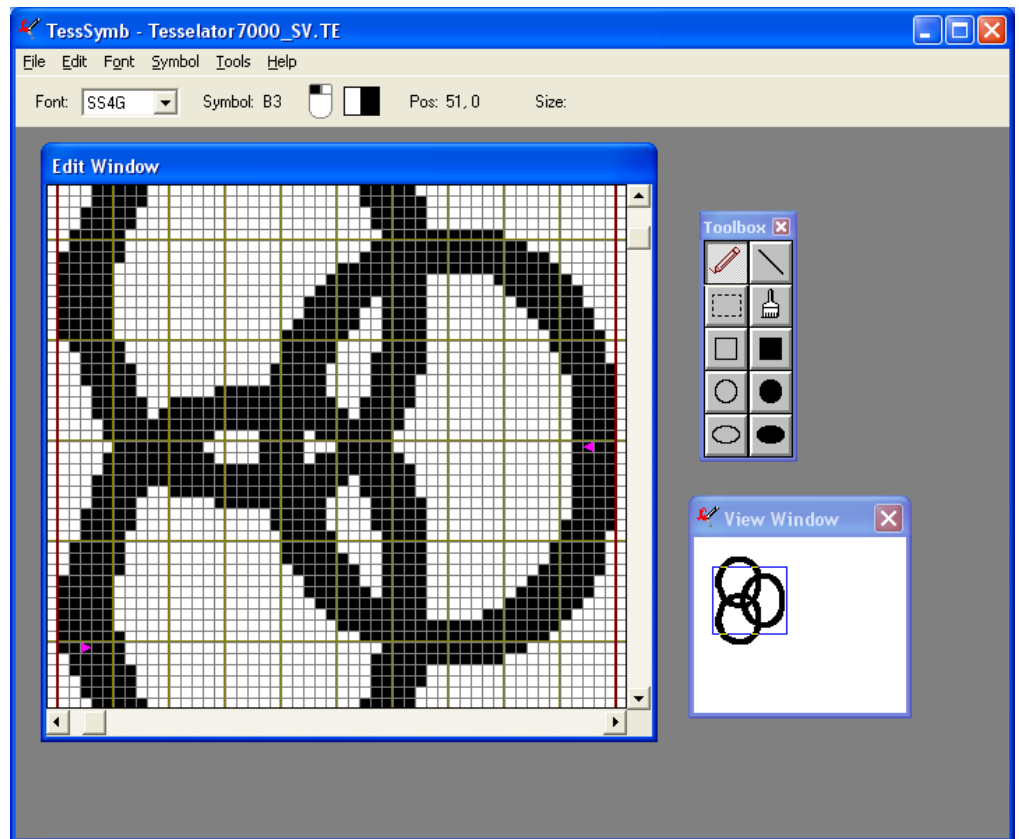


Figure 3 The Enhanced Symbol Editor (**TessSymb**)

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 can handle symbol libraries on TESSELATOR 9000 and **TessEm** format. Symbol libraries on TESSELATOR 7000 or TESSELATOR 8000 formats can be converted.

- **Edit functions** to: Copy, cut, paste, and 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 **TessEm⁷⁰⁰⁰** application to capture and store downloaded symbol libraries on TESSELATOR 7000 or 8000 format. The stored information can be converted to **TessEm⁷⁰⁰⁰** 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.

Display Edit option

The **Display Edit** option supports all the TESSELATOR 7000 “offline” display editing functionality using standard TESSELATOR keyboards.

The TESSELATOR 7000 editing support functionality such as the Compass, the Display Frame, Visible Mark etc is included.

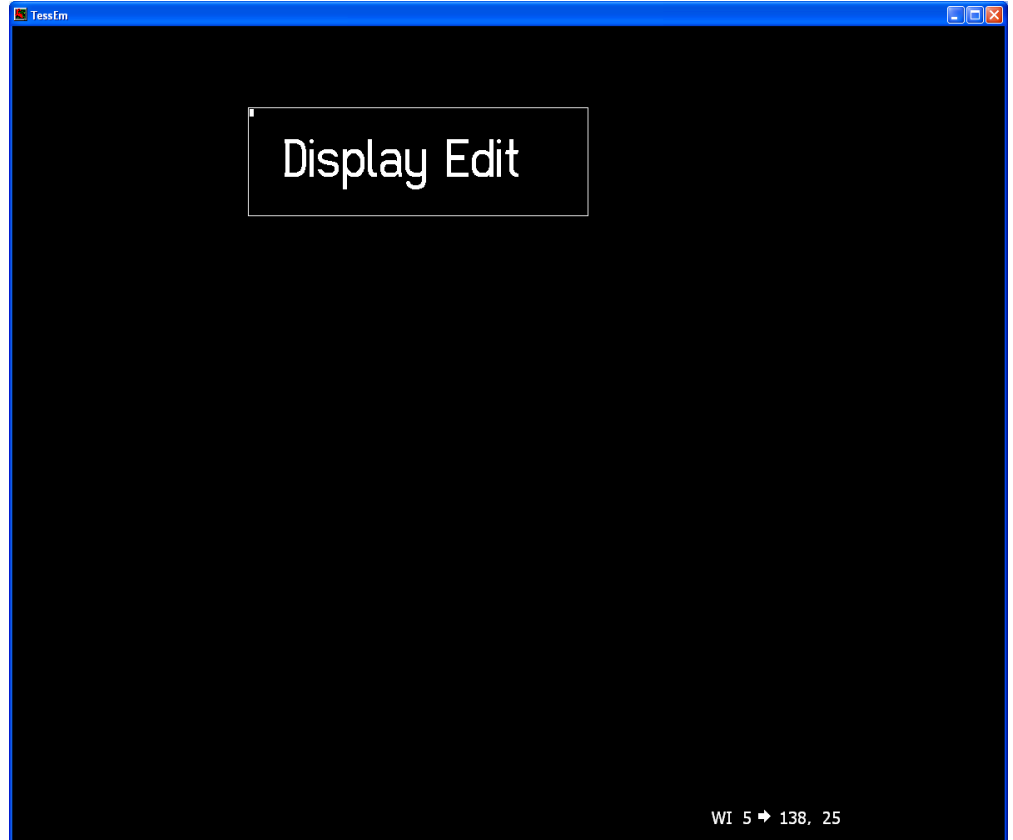


Figure 4 Display Frame and Compass

The following Controller Functions (1BH) commands for display editing, defined for the visible cursor, are 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 can be used instead of or as a complement to standard TESSELATOR keyboards and trackballs.

The PC standard keyboard is integrated into the **TessEm⁷⁰⁰⁰** software product according to Figure 5.



Figure 5 PC standard keyboard layouts

The **PC Keyboard** option can work together with a standard TESSELATOR keyboard connected to a COM-port or be used as the only input device for **TessEm⁷⁰⁰⁰**.

The keyboard mapping and each key sequence are defined using the TessEm Configuration Application (**TessEmCfg**). The keyboard mapping can 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, can be programmed, mapped, to generate standard TESSELATOR keyboard codes sequences. For every key can the non-shifted and shifted value of the key generate an up to sixteen (16) bytes sequence. The left mouse button can 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.

Graphic Objects option

The **Graphic Objects** option supports all the TESSELATOR 7000 graphic objects such as points, lines, rectangles, arcs, circle segments, fill etc. The graphic objects can be displayed together with the alphanumeric and graphic symbols on the **TessEm⁷⁰⁰⁰** screen.

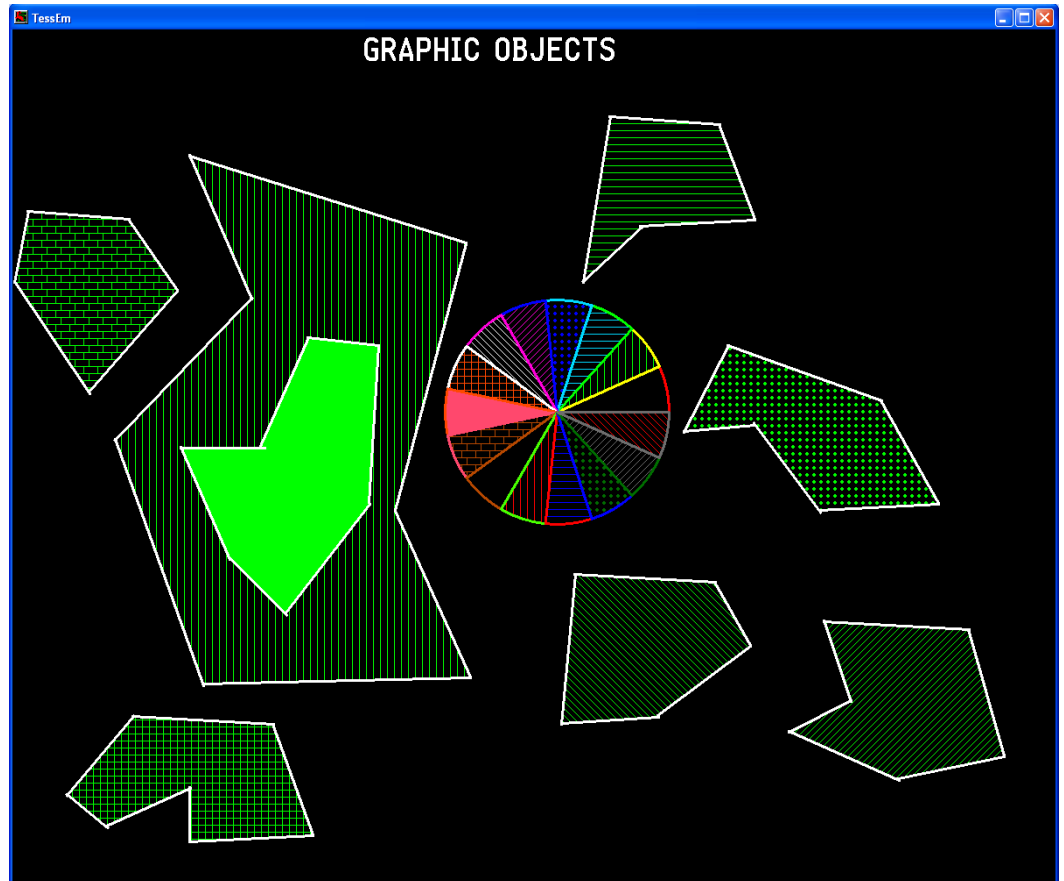


Figure 6 Example of graphic objects

The following Controller Functions (1BH) commands for graphic objects are included in the option:

- **Copy To Cursor** (CF C0H)
- **Draw Point** (CF C1H)
- **Draw Line** (CF C2H)
- **Draw Rectangle** (CF C3H)
- **Draw Arc** (CF C4H)
- **Arc Continue** (CF C5H)
- **Circle Segment** (CF C6H)
- **Circle Segment Continue** (CF C7H)
- **Fill** (CF C8H)

- **Copy To Graphic Pointer** (CF C9H)
- **Graphic Pointer Absolute** (CF D0H)
- **Delete Point** (CF D1H)
- **Delete Line** (CF D2H)
- **Delete Rectangle** (CF D3H)
- **Delete Arc** (CF D4H)
- **Delete Arc Continue** (CF D5H)
- **Delete Circle Segment** (CF D6H)
- **Delete Circle Segment Continue** (CF D7H)
- **Delete Fill** (CF D8H)
- **Graphic Pointer Relative** (CF D9H)

Performance Comparison

A typical power distribution control display, according to Figure 7, containing 2132 screen objects and 8 background color rectangles was used to compare the performance of the **TessEm⁷⁰⁰⁰** emulator with an original TESSELATOR 7000.

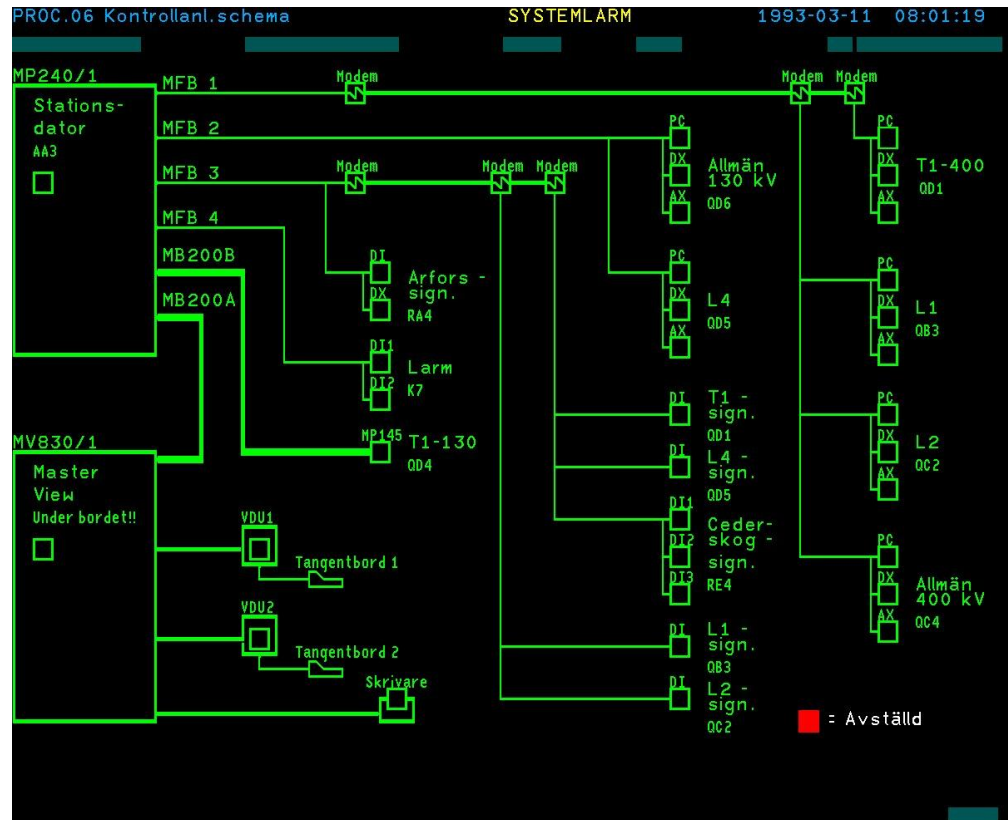


Figure 7 Typical power distribution control display

The display information was stored in Local Display Storage. Sending the following commands from a host computer to the display channel 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 in ms:

- The **TessEm⁷⁰⁰⁰** emulator: 31 (*), 14 (**)
- TESSELATOR 7810: 275 (*)

(*) Lines drawn using symbols

(**) Lines drawn using vectors

The **TessEm⁷⁰⁰⁰** emulator, version 1.0.2, 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:** 2560 x 1024 pixels
- **Color quality:** 32 bits per pixel ("Highest")
- **Display adapter:** Matrox Parhelia, 128 MB RAM

New features

The following new features are under development for the **TessEm⁷⁰⁰⁰** 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.
- **LAN Communication option:** Using TCP/IP, sockets for communication between host computer and the **TessEm⁷⁰⁰⁰** emulator.
- **Virtual On-Screen Keyboard option:** Custom designed virtual keyboards can be used on the **TessEm⁷⁰⁰⁰** screen as a replacement to or work together with a standard TESSELATOR keyboards.

New products

Check out the products **TessEm⁸⁰⁰⁰**, emulating the multi-channel graphic system TESSELATOR 8000, and the product **TessEm⁹⁰⁰⁰**, emulating the high-end multi-channel graphic system TESSELATOR 9800.

Check out the new product **DDR** (Disk Drive Replacement). The **DDR** unit replaces the old 5.25" floppy disk drives, DSMD 113 and DSMD 110, in ABB Master Automation systems. The product is fully compatible with the ABB MasterView product family 810/830/850 and also MasterPiece 200, MasterAid 214/215/220 and TESSELATOR 8400/9800.

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, 29 years of experience, of the TESSELATOR product family (7000, 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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