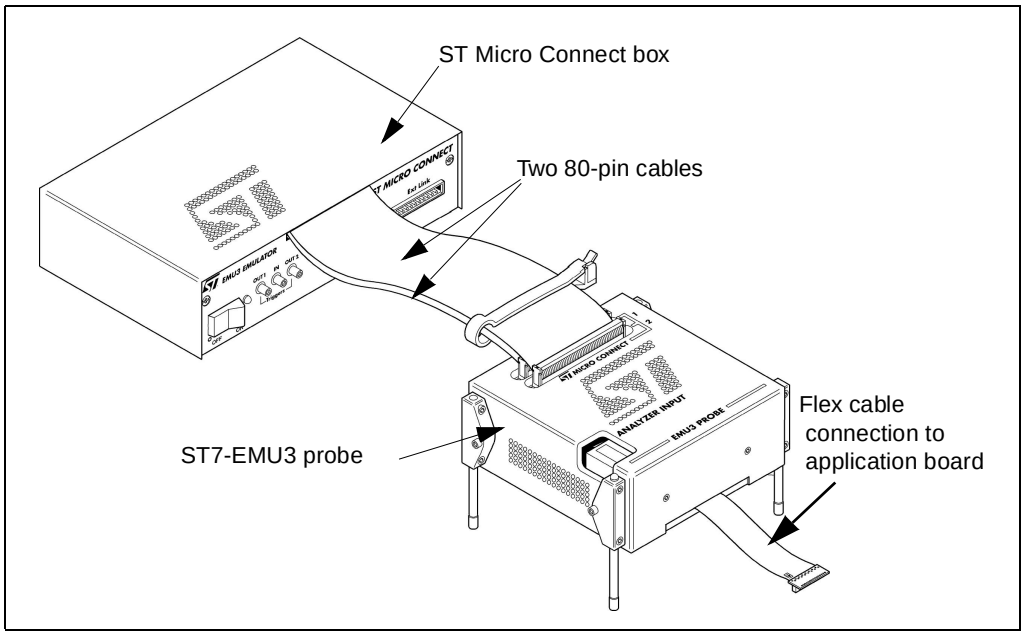
ST7-EMU3

ST7-EMU3 Emulator for ST7 Devices



Main Components

- **ST Micro Connect box—host target interface**
- **ST7 EMU3 probe comprised of a plastic box containing 3 boards:**
  - Common Emulation Board (CEB)
  - ST7 Dedicated Emulation Board (DEB)
  - Target Emulation Board (TEB)
- **STVD7 (ST7 Visual Debug), a Windows®-based Integrated Development Environment**
- **Connection to host PC via parallel port (with a standard parallel cable in standard mode or ECP)**

Description

The ST7-EMU3 emulator is composed of the main components listed above. The ST Micro Connect box is the host target interface, powered by an external power supply and linked to the ST7xxx-EMU3 probe and to a host PC running Windows® 95, 98, 2000 or NT4® and STVD7.

STVD7 is a state-of-the-art, integrated development environment software that allows you to control the emulator, debug, edit and rebuild your application program. Running on the host PC, it takes advantage of the ST7-EMU3 emulator's many hardware features to give you exquisite control over the running of your application program.

The EMU3 probe is made up of 3 boards, two of which (the CEB and the DEB) are generic. The third board, the TEB, is specific to the ST7 target device, or family of devices that you are emulating. You may change TEBs, allowing you to emulate other ST7 devices with the same EMU3 emulator.

The EMU3 probe can be connected to your application board using either rigid device adapters, or via a flex cable, allowing the ST7-EMU3 to run in emulation mode whilst embedded in your application.

1 Hardware Features

- 1.8 to 5.5 V +/- 10% operating voltage range
- Internal clock operation frequency up to 16 MHz
- Clock sources:
  - ➢ Programmable internal (on EMU3 probe) clock up to 16 MHz (62.5 kHz, 125 kHz, 250 kHz, 500 kHz, 1 MHz, 2 MHz, 4 MHz, 8 MHz, 16 MHz)—other frequencies may be available depending on type of TEB installed in EMU3 probe
  - ➢ External application TTL clock source may also be used
- Application power up detection
- Bus Event Machine (BEM) permits non-intrusive querying of memory and signals, thereby allowing the imposition of conditional breakpoints, trace recording and sending of trigger output signals
- 9 external input triggers
  - ➢ 1 input trigger on subclic connector on emulator main box
  - ➢ 8 input triggers on analyzer input connector which are recorded in the trace and accessible by the bus event machine (BEM)
- 2 output triggers on emulator main box (TTL levels)
- Easy upgrade
  - ➢ All programmable hardware components upgradable by software
  - ➢ All emulator firmware downloaded at start-up

2 Debugging Features

2.1 Mapping

- accessible memory in the emulator—RAM/ROM memory zones are emulated with on-emulator memories
- granularity of 1 byte
- illegal access protection mechanism for write protected memory zones or for non-existent memory zones

2.2 Instruction breakpoints

- can place an unlimited number over the entire memory space
- program stop on specified instruction fetch—at C or assembler level
- can be associated with a counter or/and a condition (loss of real time operation)

2.3 Data breakpoints

- available using Advanced Breakpoints
- can place an unlimited number over the entire memory space

- program stop on read or write or read/write address access

2.4 Advanced breakpoints

The Advanced Breakpoints functionality takes advantage of the **Bus Event Machine** and enables the programmer to set simple or multi-level breakpoint conditions, control of trace recording and emulator trigger outputs. A four-level logical sequencer allows you to perform specific actions upon the occurrence of specific event or series of events.

Each level is defined by:

IF <NOT> (N1 * Event1)logic_operator1 <NOT> (Event2)THEN action_list1

ELSE IF <NOT> (N2 * Event3)logic_operator2 <NOT> (Event4)THEN action_list2

(logic_operator1 or logic_operator2 are one of AND, NAND, OR, NOR, XOR, XNOR)

Note that:

- only one level is active at any one time
- two 16-bit counters available per level (one for IF, one for ELSE IF condition)

Events can be defined using any of the following parameters:

- a specific address or range of addresses
- a specific data value with bit mask
- a read, write or read/write access
- an opcode fetch
- external event(s) monitored using one or all of the 9 input triggers
- trace full information
- a DMA memory access
- an interruption on an input channel
- a stack operation access
- any combination of the above

Actions that may be performed upon the occurrence of the defined event or sequence of events are:

- a break in the execution of the program (i.e. a breakpoint)
- the outputting of a waveform to one or both of the two output triggers
- the enabling, or disabling of trace recording
- the recording of a snapshot in the trace
- continuing to another level of conditions, defined by another event or series of events.
- a set of the above actions.

When the conditions programmed by the user are met, the sequencer carries out the preset actions. Up to four levels of conditional terms may be linked to construct logical functions capable of precisely defining the event to be tracked and the action to be carried out, within even the most convoluted of program sequences. It is this adaptability which makes the sequencer such a valuable tool.

The heart of the Advanced Breakpoints sequencer is the **Bus Event Machine (BEM).** This hardware system is transparent to the user, and equipped with its own memory and bus connections. The BEM functions in parallel with (i.e. at the same time as) the emulation hardware system controlling the program under test. In this way, the EMU3 emulator is able to carry out **non-intrusive** debugging actions.

2.5 Trace

- trace contents are disassembled at source level, optionally interleaved with machine instruction and bus activity data
- trace can be recorded to a text file if desired
- trace buffer can hold 256k-word trace records composed of:
  - ➢ address, data and control bus activity
  - ➢ 8-bit analyzer input
  - ➢ 1 trigger input
  - ➢ 30-bit timestamp extendable by overflow counting (where timestamp clock is device clock source or fixed 20 MHz reference)
  - ➢ advanced breakpoint sequencer information
- selective trace defined by events in the sequencer
  - ➢ trace on,
  - ➢ trace off,
  - ➢ snapshot

2.6 Performance analysis

- measures real time spent executing a portion of code defined by specifying a range between 2 specified instructions
- 48-bit wide count based on timestamp clock
- up to 128k executions recorded for the defined portion of code
- time analysis gives average time, minimum time, maximum time and standard deviation
- results can be displayed graphically

2.7 Configurable peripheral options

- MCU configuration options permit you to configure the emulated device's peripheral options
- Allows user to freeze selected peripherals when program execution is stopped
- Note that Watchdog is always stopped when program is stopped

2.8 Read/Write on the Fly

- allows a non-intrusive read or write of a variable during emulation (i.e. while program running)
- variable can be 8, 16 or 32-bit
- the full emulation space (up to 64 kbytes) is accessible (except for internal ST7 registers emulated by the CPU)
- Read/Write on the Fly available in both the Memory window and Watch window of STVD7

2.9 Code debug

- full C source level and/or assembly level debugging capabilities
- display of source code in concurrent windows

- disassembling capability, optionally with interleaved source lines and ST7 instructions, with symbolic and/or hexadecimal instruction operands
- log file feature, allowing storage and subsequent redisplay or re-use of all displayed information
- command files capability, which may be executed at user's request or automatically interpreted at start-up
- Integrated Development Environment (IDE)

2.10 Display and modification capabilities

- of all variables, taking into account the exact structure declared in the source code
- of C-like expressions (display only)
- for the entire ST7 memory structure
- symbolic display of peripheral registers both for name and value
- of the ST7 system registers, stacks, Accumulator A and Index X and CCR flags
- of stack showing current function calls for each stack level and their parameter values (display only)
- of current, minimum and maximum stack address

2.11 Run features

- execution starting from reset entry point, or from the current position in the user program
- single stepping capabilities
  - ➢ at source code level,
  - ➢ at ST7 machine instruction level,
  - ➢ can step into interrupts, or step over them
- function call or a macro reference may optionally be considered as a single instruction depending on the level of detail required
- display of current CPU state (RESET, HALT, WFI or RUN)
- when the program execution is stopped, peripherals are frozen:
  - ➢ you can individually select enable/disable freeze function for timers
  - ➢ the Watchdog is always stopped when program is stopped

2.12 Debugger customization

- last working environment restored automatically for a given application
- number of windows opened,
- windows position,
- breakpoint lists
- working environment storage in personalized files capability

2.13 Online help

- full on-line help following Windows standard help facilities,

- context-sensitive access from any window,
- keyword search facility

3 Mechanical Data

Component	Dimensions
ST Micro Connect box	190 x 130 x 50 mm (metal housing)
EMU3 Probe	120 x 90 x 50 mm (plastic housing)

Component Connections	Description
ST Micro Connect box to EMU3 probe connection	Two 50 cm long, flat cables, 80 wires each, pitch 0.635