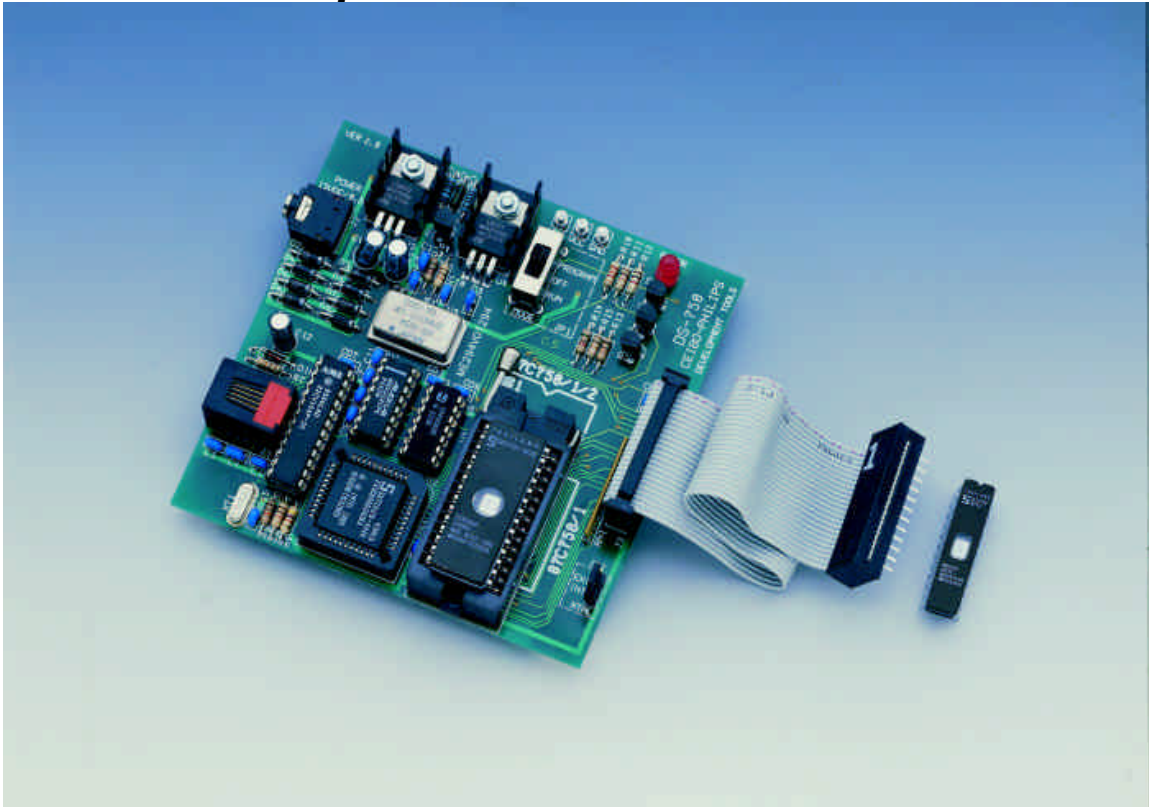


## ***DS-750 Development Tool***



*Development Tool for 87C750 Family of Microcontrollers*

### **FEATURES**

- **Emulates 87C750 Microcontrollers in Real-Time**
- **Programmable Clock up to 40MHz**
- **Built-in Programmer for 87C748/9 and 87C750/1/2 Microcontrollers**
- **Simulator Debug Mode**
- **Source-Level Debugger for C, PLM and Assembler**
- **Runs under DOS and MS-Windows**
- **24-pin DIP Emulation Header**
- **Serially Linked to IBM PC at 115 KBaud**
- **Includes Microcontroller Samples**
- **AC Adapter Supplied**

## **DESCRIPTION**

DS-750 is a development tool that supports Philips 87C750 microcontrollers at any frequency allowed by the devices. It is serially linked to a PC or compatible system and can emulate the microcontroller using either the built-in Clock Oscillator or any other clock source connected to the microcontroller. The Clock Oscillator generates 40MHz, 20MHz, 16MHz, 10MHz and 5MHz. Emulation is carried out by programming an 87C752 microcontroller with the user software and an embedded monitor program. DS-750 provides the on-board programming capabilities and locates the monitor in the upper 1K that is not available for the 87C750. Two working modes are available: Real-time and Simulator Debug Mode. In the Real-Time Mode the user software is executed transparently and without interfering with the microcontroller speed. Breakpoints can be added to stop program execution at a specific address. In the Simulator Debug Mode, an additional microcontroller is used to take control of the 87C750 lines and to simulate its operation but not in real-time. This operating mode allows access to all the microcontroller functions (I/O, timers, interrupts, etc.) and interacts with the hardware according to the user software execution or directly by means of emulator commands sent from the host computer. The combination of the two available working modes allows an easy way to debug hardware and software functions. The software includes C, PLM and Assembler Source-Level Debugger, On-line Assembler and Disassembler, Software Trace, Conditional Breakpoints and many other features. The software is based on DOS pull-down menus and runs also under MS-Windows. The system is supplied with a User's Manual, microcontroller documentation, two samples of the 87C752 and one of the 87C750 (all windowed EPROM microcontrollers) and a power supply.

## **SPECIFICATIONS**

### **MONITOR PROGRAM**

The Monitor Program links the microcontroller to the host computer and is used to control the emulation of the application software in real-time. The monitor code is transparent for the 87C750 and does not reduce the 1 KByte of available code for the application.

### **BREAKPOINTS**

Breakpoints allow real-time program execution until an opcode is executed at a specified address. Breakpoints are set when an EPROM device is programmed with a user's code, but can be disabled although disabling a breakpoint implies slowing down the program execution by the Simulator Debug Mode.

## USER SOFTWARE

DS-750 program runs under DOS and MS-Windows. The program is based on pull-down menus with many useful debugging functions.



The screenshot displays the DS-750 Debugger interface. The top menu bar includes File, View, Run, Breakpoints, Data, Options, Window, and Help. The main window is divided into several sections:

- Source Code:** Shows assembly code for 'TESTS.LST'. Line 36 is 'TEST\_MAIN: DO; /\*\*\*\*\* M A I N \*\*\*\*'. Line 37 is 'CALL INIT;'. Lines 38-45 show a loop structure with 'DO WHILE 1; /\* FOR', 'CALL DELAY;', and 'REG\_P1 = PATER'.
- Registers:** Displays the state of registers, including 'REG\_P1 = PATTERN\_CPL;', 'REG\_P1 = PATTERN\_CP', 'REG\_P1 = PATTERN\_ROR;', and 'REG\_P1 = PATTERN\_RO'.
- Memory:** Shows memory addresses and their contents, such as '0194h CODE:INIT 25', '000Fh BYTE:TESTS.ROR\_P1.ROT\_NO 26', '0090h BYTE:TESTS.REG\_P1 FF', and '000Dh BYTE:PATTERN\_ROR 46'.
- Disassembly:** Shows the machine code instructions corresponding to the source code, such as 'TESTS#40 REG\_P1 = PATTERN\_CPL;', 'TESTS#41 CALL CPL\_P1(8);', 'TESTS#42 CALL DELAY;', 'TESTS#43 REG\_P1 = PATTERN\_ROR;', 'TESTS#44 CALL ROR\_P1(?);', 'TESTS#45 CALL DELAY;', 'TESTS#46 REG\_P1 = PATTERN\_ROR;', and 'TESTS#47 CALL ROR\_P1(?);'.

The bottom status bar shows function key shortcuts: F1-Help, F2-Bkpt, F3-Mod, F4-Here, F5-Zoom, F6-Next, F7-Trace, F8-Step, F9-Run, F10-Menu.

Figure 1: DS-750 Debugger

## SYMBOLIC DEBUGGER

DS-750 allows symbolic debugging of assembler or high-level languages. The Symbolic Debugger uses symbols contained in the absolute file generated by the most commonly used Assemblers and high-level language Compilers.

## SOURCE-LEVEL DEBUGGER

The DS-750 software includes a Source-Level Debugger for Assembler and high-level languages (PLM, C and others) with the capability of executing lines of the program while displaying the state of any variable.

## SOFTWARE TRACE

Program execution can be recorded in a 64K buffer. Conditional Breakpoints may be defined to stop program execution. The user can define events and variables to be added to the Software Trace. The Software Trace is not a real-time function and is performed by slowing down the emulation speed.

## FREQUENCY

The system includes a Crystal Oscillator able to supply clock frequencies of 5MHz, 10MHz, 16MHz, 20MHz and 40MHz. Additionally, the user may select any other frequency by connecting an external clock source through the application hardware. Frequency selection is done by means of software selection.

## SIMULATOR DEBUG MODE

The Simulator allows breakpoints to be set at any address and condition even though the user software is actually programmed in the 87C752 EPROM. The

Simulator Debug Mode will be automatically activated in case a breakpoint is enabled and not programmed in the device.

## BUILT-IN PROGRAMMER

The Built-in Programmer may be used to program the following devices: 87C748, 87C749, 87C750, 87C751 and 87C752. All the programming features like security and encryption are fully supported.



Figure 2: DS-750 Programming Capabilities

## EMULATION RESTRICTIONS

The following restrictions are valid for DS-750:

1. The system uses some of the microcontroller resources to emulate it: one Interrupt (either INT0 or INT1 according to software selection) and 5 bytes of the Internal Stack.
2. If you specify a breakpoint not programmed in the device, program execution will be slowed down by the Simulator.
3. Deleting a breakpoint slows down the execution speed by the imulator.

## HOST CHARACTERISTICS

IBM PC or compatible systems with 1 MByte of RAM, one floppy disk drive, one RS-232 Interface card for the PC.

## INPUT POWER

15V to 30VDC (15 VDC/120 VAC wall transformer supplied).

## MECHANICAL DIMENSIONS

10cm x 10cm.

**ITEMS SUPPLIED AS STANDARD**

Development System with Built-in Programmer. 24-pin Emulation Header. User Software including Source Level Debugger, On-line Assembler and Disassembler. User's Manual and Operating Instructions. RS-232 Interface Cable. Power supply.

**WARRANTY**

Two years limited warranty, parts and labor.

**DS-750 - ORDERING INFORMATION**

<b><i>Item</i></b>	<b><i>Description</i></b>
DS-750	Development System, Emulation Header, Software, Power Supply, Cables
FC-24	Spare 24-pin flat cable.
RS-232	Spare Power Supply.
DS-750 Board	Board Replacement.