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Freescale Semiconductor, Inc.

M68ICS08AB

In-Circuit Simulator

User's Manual

MOTOROLA

Freescale Semiconductor, Inc.

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User's Manual — M68ICS08AB In-Circuit Simulator

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Section 1. General Information

1.1 Introduction

This section provides general information about the Motorola M68ICS08AB in-circuit simulator (ABICS)(Figure 1-1).

The ABICS board is a stand-alone development and debugging tool. It contains the hardware and software needed to develop and simulate source code and to program Motorola's MC68HC908AB32 microcontroller (MCU).

The ABICS and it's software form a complete editor, assembler, programmer, simulator, and limited real-time input/output emulator for the MCU. When connection is made between a host PC (personal computer) and target hardware (your prototype product), actual inputs and outputs of the target system may be used during code simulation.

The ABICS can interface with any IBM® Windows 95®-based computer (or later version) through connection of a single RS-232 serial port using a DB-9 serial cable.

 Connection to the target system is accomplished by a ribbon cable, a Motorola M6CLB05C flex cable, or a MON08 cable. The flex cable is used when an MCU is resident on the ABICS for emulation or simulation, and the MON08 cable is used to debug or program a target system's MCU, directly, when the MCU resides on the target hardware.
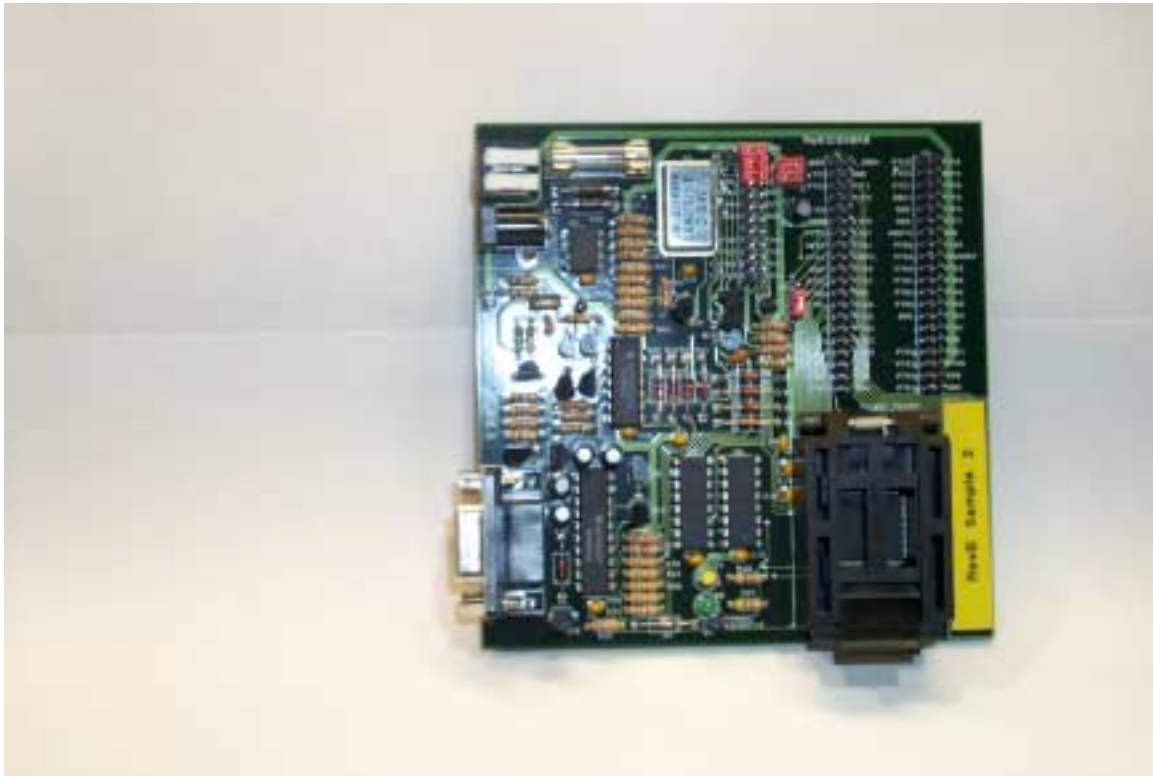
Figure 1-1 M68ICS08AB ABICS In-circuit Simulator Board

The ABICS is a low-cost development system that supports editing, assembling, in-circuit simulation, in-circuit emulation, and FLASH memory programming. Its features include:

- Editing with WINIDE

- Assembling with CASM08Z

- Programming FLASH memory with PROG08SZ

- Simulating in-circuit and stand-alone MC68HC908AB32 MCUs with ICS08ABZ software, providing:

  – Simulation of all instructions, memory, and peripherals

  – Simulation of pin inputs from the target system

  – Installation of conditional breakpoints, script files, and logfiles

- Debugging and emulation (limited real-time) with ICD08SZ, including:

  – Loading code into RAM

– Executing real-time in RAM or FLASH

– Placing one hardware breakpoint in FLASH

– Placing multiple breakpoints in RAM

• On-line help documentation for all software

• Software integrated into the WinIDE environment, allowing function key access to all applications

• MON08 emulation connection to the target system allowing:

– In-circuit emulation

– In-circuit simulation

– In-circuit programming

• Four modes of operation:

– Standalone — using the ABICS as a standalone system without a target board

– Simulation — using the ABICS as an in-circuit simulator/emulator with a target cable

– Evaluation - using the ABICS for real-time evaluation of the MCU and to debug user developed hardware and software

– Programming — using the ABICS as a programmer

• With the ICD08SZ debugging software, code may be run directly out of the MCU's internal FLASH at real-time speeds.

• With the WinIDE, CASM08Z, editor, simulator, and assembler software - the function is as a limited real-time emulator.

• With the PROG08SZ software - the function is to program MCU FLASH memory.

• With the ICS08ABZ simulation software, the MCU provides the required input/output information that lets the host computer simulate code, performing all functions except for maintaining port values. (The internal FLASH memory on the device is downloaded with a program that generates the appropriate port values.) The ICS08ABZ software on the host computer lets the host computer become a simulator.

• With using the ICD08SZ debugging software, code can be run directly out of the MCU's internal FLASH at real-time speeds.

- Timing is accomplished through a 4.9152 MHz crystal

1.2 ABICS Components

The complete ABICS system includes hardware, software, and documentation. **Table 1-1** lists the ABICS product components.

Table 1-1. ABICS Product Components

Part Number	Description
ICS08AB	ABICS software development package
ICS08ABZ	ABICS simulator
ICD08SZ	ABICS debugger/emulator
MC68HC908AB32	MCU
M68CBL05C	Flex target cable
KRISTA 22-122	Serial cable
FRIWO 11.8999-P5	ABICS Power supply
M68ICS08AB	ABICS Hardware board
M68ICS08SOM/D	In-circuit simulator software operator's manual
M68ICS08ABUM/D	In-circuit simulator hardware operator's manual

1.2.1 ABICS Hardware

Table 1-2 lists the ABICS hardware components.

Table 1-2. Hardware Connector Components

Components	Description
XU1	Test socket for the Motorola MC68HC908AB32 MCU: 64-pin QFP (quad flat pack)
J1 &J2	Two 2-row × 20-pin, 0.1-inch spacing connectors to connect the ABICS to a target using the M68CBL05C flex cable
J3	One 2-row × 8-pin, 0.1-inch spacing connector to connect to a remote target via the MON08 debug circuit.
P1	+5 Vdc input voltage (V_{DD})
P2	RS-232 to interface the ABICS to the host serial connector
P3	Power Terminal

1.2.2 ICS Interface Software

Windows-optimized software components are referred to, collectively, as the ABICS software (part number ICS08AB). It is a product of *P&E Microcomputer Systems, Inc.*, and is included in the ABICS kit **(Table 1-3).**

Table 1-3. Software Components

Components	Description
WINIDE.EXE	Integrated development environment (IDE) software interface for editing and performing software or in-circuit simulation
CASM08Z.EXE	CASM08Z command-line cross-assembler
ICS08ABZ.EXE	In-circuit/stand-alone simulator software for the MC68HC908AB32 MCU
PROG08SZ.EXE	FLASH memory programming software
ICD08SZ.EXE	In-circuit debugging software for limited, real-time emulation

1.3 Hardware and Software Requirements

The ABICS software requires this minimum hardware and software configuration:

- Windows 95 or later version operating system

- Approximately 2 Mbytes of available random-access memory (RAM) and 5 Mbytes of free disk space

- An RS232 serial port for communications between the ABICS and the host computer

1.4 Specifications

Table 1-4 summarizes the ABICS hardware specifications.

Table 1-4. ABICS Board Specifications

Characteristic	Specification

Temperature:
    Operating
    Storage
	0° to 40°C
	−40° to +85°C

Relative humidity	0 to 95%, non-condensing
Power requirement	+5 Vdc, from included ac/dc adapter

1.5 About This Manual

The procedural instructions in this manual assume that the user is familiar with the Windows interface and selection procedures.

1.6 Customer Support

To obtain information about technical support or ordering parts, call the Motorola help desk at 800-521-6274.

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Section 2. Preparation and Installation

2.1 Introduction

This section provides information and instruction for configuring, installing, and readying the M68ICS08AB (ABICS) for use.

2.2 Hardware Preparation

This paragraph explains:

- Limitations of the ABICS

- Configuration of the ABICS

- Installation of the ABICS

- Connection of the ABICS to a target system

ESD CAUTION: *Ordinary amounts of static electricity from clothing or the work environment can damage or degrade electronic devices and equipment. For example, the electronic components installed on the printed circuit board are extremely sensitive to electrostatic discharge (ESD). Wear a grounding wrist strap whenever handling any printed circuit board. This strap provides a conductive path for safely discharging static electricity to ground.*

2.2.1 ABICS Limitations

These sub-paragraphs describe system limitations of the ABICS.

2.2.1.1 Port A0

Port A0 is used for host to MCU communications, so it is unavailable for emulation.

2.2.1.2 DDRA Bit 0 to 1

Setting DDRA bit 0 to 1 will stop communications with the simulation or debugger software and will require a system reset to regain communication with the MCU.

2.2.1.3 Port bits PTC0, PTC1, and PTC3

Port bits PTC0, PTC1, and PTC3 are temporarily disconnected from the target system during reset.

2.2.1.4 RST* signal

RST* signal is limited because the signal is not a bidirectional, open-drain signal. It is emulated as either an input or output when using the target connectors or as two pins (one input and one output) when using the MON08 cable.

2.2.2 Configuring ABICS Jumper Headers

The ABICS supports four configuration options: standalone, simulation, evaluation, and programming.
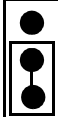
- Standalone — ICS08ABZ.exe running on the host computer (the ABICS is not connected.) Emulation of the MCU CPU, registers, and I/O ports are done within the host computer environment.

- Simulation — Host computer connected to the ABICS via the RS-232 cable and ICS08ABZ.exe running on the host computer. This provides access to the M68HC(9)08AB MCU, internal registers, and I/O ports.

- Evaluation — Host computer connected to the ABICS and the ABICS connected to the target system via the flex cable. This method provides limited real-time evaluation of the MCU and debugging user developed hardware and software.

- Programming — Host computer connected to the ABICS, and the ABICS connected to the target system via the MON08 cable, if the MCU is resident on the target system. Use the PROG08SZ.exe to program the MCU FLASH module. In the programming mode there is limited evaluation.

Eight jumper headers (**Table 2-1**) on the ABICS are used to configure the hardware options.

CAUTION: *The ABICS can be set to operate at a variety of voltages. When configuring the ABICS jumper headers, care must be exercised to ensure that the voltages selected for the board match those of the target device. Failure to do so can result in damage to either or both of the pieces of equipment.*

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Table 2-1 ABICS Jumper Header Description

Jumper Header (No W1 & W2)	Type (Factory Default Shown)	Description
W3 Target Reset Select	[jumper on position 1&2]	Jumper on position 1&2: RST_IN from target resets on-board ripple counters and MCU. Jumper on position 2&3: ICS RST_OUT (from RST*) resets target.
W4 TGT_OSC	[jumper]	No Jumper: Disconnects OSC1 input to OSC input of target adapter Jumper: Connects OSC1 input to OSC input of target adapter.
W5 OSC	[jumper]	No Jumper: Disconnects on-board oscillator to OSC1 input of MCU Jumper: Selects on-board oscillator.
W6 VREFH	[jumper on position 1&2]	Jumper on position 1&2: Selects on-board V_{DD} as ADC reference high signal. Jumper on position 2&3: Selects VREFH signal from target as ADC reference high signal.
W7 VDDAREF	[jumper on position 1&2]	Jumper on position 1&2: Selects on-board V_{DD} as ADC power supply. Jumper on position 2&3: Selects VDDAREF signal from target as ADC power supply.
W8 AVSS	[jumper on position 1&2]	Jumper on position 1&2: Selects on-board GND (Common) as ADC common and reference voltage. Jumper on position 2&3: Selects AVSS/VREFL signal from target as ADC common and reference voltage.
W9 PWR_ON	[no jumper]	No Jumper: DTR turns on regulator. Jumper: Disable DTR control; on-board regulator always on.
W10 EVDD	[no jumper]	(On-board regulator reference input) No Jumper: Pin 1 target power used as reference input. Jumper: Pin 2 is GND (Common).

2.2.3 Target Interface Connection Options

There are two ways to connect the ABICS simulator board to your target system:

- Flex cable — low-noise target interface connection
- MON08 cable — target interface connection with MCU FLASH programming and limited emulation

Table 2-2 is a quick reference for defining the cable/connector setup to use with the ABICS.

Refer to Section 3, Support Information for pin assignments and signal definition.

Table 2-2. Cable/Connector Options for MCUs

MCU	Flex Cable	MON08 Cable
MC68HC908AB32	J1 and J2	J3

2.2.4 Host Computer - ABICS Interconnection (P2)

The host computer to ABICS interface is via the single system connector P2, which is a 9-pin, D-type connector (Amp part number AMP-9726-A) (**Figure 2-1**), mounted on the top side of the board.

Connection requires the cable assembly supplied with your ABICS kit, a DB9-male-to-female, 6-ft. (3 m) long serial cable.
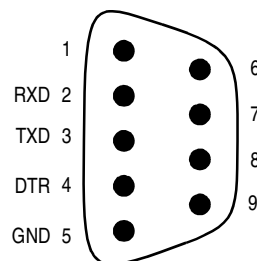

Figure 2-1 P2 Host Computer to ABICS Interconnection

2.2.5 Power Connector (P1)

Connect +5-Vdc power directly to the ABICS via connector J3 (**Figure 2-2**) using the provided power supply.
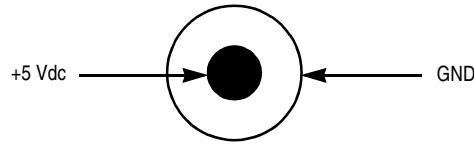
+5 Vdc ⟶ ● ⟵ GND

Figure 2-2 P1 Power Connector

2.3 Connecting the ABICS

The following steps provide instructions for connecting the ABICS to the host PC and power connection.

ESD CAUTION: *Ordinary amounts of static electricity from clothing or the work environment can damage or degrade electronic devices and equipment. For example, the electronic components installed on the printed circuit board are extremely sensitive to electrostatic discharge (ESD). Wear a grounding wrist strap whenever handling any printed circuit board. This strap provides a conductive path for safely discharging static electricity to ground.*

a. Configure the jumpers W-3 through W-10 (Table 2-1) on the ABICS for your application.

b.Install an MCU into the appropriate socket, for your application, onto the ABICS board.

Note: Observe the pin 1 orientation with the silkscreened dot. The top (label side) of the MCU package must be visible when looking at the component side of the board.

c. Plug the serial cable into P2 on the ABICS.

d. Plug the serial cable into the COM port on the host PC.

NOTE: *Steps e. through g. should not be completed until all connections to the target are completed (**Paragraph 2.4**).*

e. Connect the power cable to P1 on the ABICS board.

f. Plug the power cable into an ac power outlet, using one of the country-specific adapters.

g. The ABICS green power LED lights.

2.4 Connecting the ABICS to the Target System

Connect the ABICS to the target system using one of these methods:

- Emulating using a flex cable for low-noise

  When emulating, connect the 80-pin M68CLB05C flex cable to the connectors labeled J1and J2 on the simulator board. Attach the other end of the cable to the appropriate connector on the target system. Target head adapters are available.

- Using a MON08 cable to debug the target system.

NOTE: *An MCU must be installed in the target system. No MCU should on the ABICS.*

Connect the MON08 debug interface cable to the appropriate MON08 debug interface connector, J3, for communication with the target system's MCU. Attach the other end of the cable to the appropriate connector on the target system.

NOTE: *For more detailed information on the MON08, refer to Section 4 of this manual.*

2.5 Installing the Software

For instructions for installing the ICS08 software, refer to *P&E Microcomputer Systems, Inc.*, *M68ICS08HC08 In-Circuit Simulator Operator's Manual,* Motorola document order number M68ICS08SOM/D, and you may refer to http://www.pemicro.com/ics08/index.html#docs.

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Section 3. Support Information

3.1 Introduction

This section includes data and information that may be useful in the design, installation, and operation of your application.

3.2 MCU Subsystem

The MCU subsystem consists of the MC68HC908AB32 microcontroller, clock generation and selection, monitor mode control logic that places and holds the ABICS in monitor mode, the bus voltage level translation buffers, and processor operating voltage variable regulator.

The on-board MCU (the test MCU) simulates and debugs the MCU's interface to its peripherals and to other devices on the target board through a variety of connections.

Depending on the connection, the MCU is used in one of FOUR operating modes:

- In the ABICS socket simple simulation

- In the ABICS socket for programming

- In the ABICS socket connected to the target for emulation

- In the target for MON08 debug operation

3.3 ABICS Functional Description

NOTE: *For the following discussion on the theory of operation of the ABICS, refer to the schematic diagrams in Paragraph 3.6, Figures 3-5 to 3-11 of this section.*