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M68ICS08KX

In-circuit Simulator Board

User's Manual

MOTOROLA

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Section 1. General Information

1.1 Introduction

This section provides general information about the Motorola M68ICS08KX in-circuit simulator (KXICS).

The KXICS board (Figure 1-1) 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 MC68HC908KX8 microcontroller (MCU).

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

Connection to the target system is accomplished by a ribbon cable, a Motorola M68CLB05A flex cable, or a MONO8 cable. The ribbon cable or flex cable is used when an MCU is resident on the KXICS for emulation or simulation, and the MONO8 cable is used to debug or program a target system's MCU, directly, when the MCU resides on the target hardware.

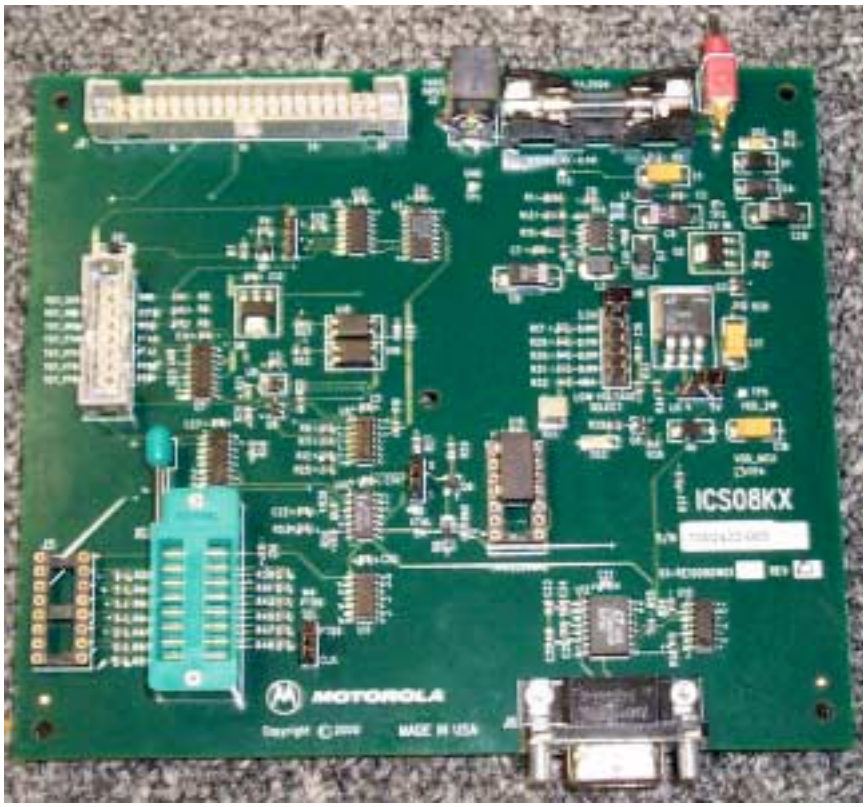


Figure 1-1 Motorola M68ICS08KX (KXICS) Board

The KXICS 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 CASM08W
- Programming FLASH memory with PROG08SZ
- Simulating in-circuit and stand-alone MC68HC908KX8 MCU with ICS08KXW 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 KXICS as a standalone system without a target board
  - Simulation — using the KXICS as an in-circuit simulator/emulator with a target cable
  - Evaluation - using the KXICS for real-time evaluation of the MCU and to debug user developed hardware and software
  - Programming — using the KXICS as a programmer
- With the ICD08SZ debugging software, code can 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 ICS08KXZ 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 ICS08KXZ 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 with a 9.8304 MHz crystal

1.2 KXICS Components

The complete KXICS system includes hardware, software, and documentation. lists the KXICS product components.

Table 1-1. KXICS Product Components

Part Number	Description
ICS08KX	KXICS software development package
ICS08KXZ	KXICS software simulator
ICD08SZ	KXICS software debugger/emulation
MC68HC908KX8CP	MCU (16-pin DIP package)
MC68HC908KX8CDW	MCU (16-pin SOIC Package)
PA16SO-08H-3	SOIC-to-DIP Socket Adapter
M68CLB05A	Flex target cable
KRISTA 22-122	Serial cable
FRIWO 11.8999-P5	Power supply
M68ICS08SOM/D	In-circuit simulator software operator’s manual
M68ICS08KXHOM/D	In-circuit simulator hardware operator’s manual

1.2.1 KXICS Hardware

lists the KXICS hardware components.

Table 1-2. Hardware Connector Components

Components	Description
XU1	Test socket for the Motorola MC68HC908KX8 MCU: 16-pin DIP (dual in-line package)
J1	Two 2-row × 20-pin, 0.1-inch spacing connectors to connect the KXICS to a target using the M68CLB05A flex cable
J2	+5 Vdc input voltage (V_{DD})
J3	One 2-row × 8-pin, 0.1-inch spacing connector to connect to a remote target via the MON08 debug circuit.
J4	J4 is the clock output that may be used for synchronizing a target or test equipment to the KXICS clock.
J5	One 2-row × 8-pin, 0.3-inch spacing dual in-line package (DIP) socket to allow the KXICS to be connected to the target using a ribbon cable
J6	RS-232 to interface KXICS to host computer serial connector (DEKL-9SAT-F)

1.2.2 ICS Interface Software

Windows-optimized software components are referred to, collectively, as the KXICS software (part number ICS08KX). It is a product of *P&E Microcomputer Systems, Inc.* and is included in the KXICS kit ().

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
ICS08SZ.EXE	In-circuit/stand-alone simulator software for the MC68HC908KX8 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 KXICS 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
- A serial port for communications between the KXICS and the host computer

1.4 Specifications

Table 1-4 summarizes the KXICS hardware specifications.

Table 1-4. KXICS 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.

General Information

Section 2. Preparation and Installation

2.1 Introduction

This section provides information and instruction for configuring, installing, and readying the M68ICS08KX (KXICS) for use.

2.2 Hardware Preparation

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 KXICS Limitations

These sub-paragraphs describe system limitations of the KXICS.

2.2.1.1 Bus Frequency

The KXICS communicates using the MON08 features which forces the communication rate to $f_{bus}/256$, and the bus frequencies are limited by standard baud rates allowed by the host software.

2.2.1.2 Port A0

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

2.2.1.3 Low Voltage Interrupt (LVI)

The LVI is disabled by default in monitor mode. It is enabled by a dummy write to LVISR.

2.2.1.4 Internal Clock Generator (ICG)

The ICG is bypassed in monitor mode, so it is not available for use.

2.2.2 Configuring the KXICS Jumper Headers

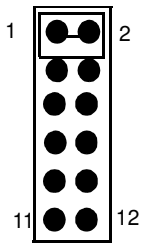
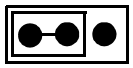
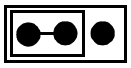
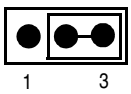
The KXICS supports four configuration options: standalone, simulation, evaluation, and programming.

- Standalone — ICS08KXZ.exe running on the host computer (the KXICS is not connected.) Emulation of the MCU CPU, registers, and I/O ports is done within the host computer environment.
- Simulation — Host computer is connected to the KXICS via the RS-232 cable and ICS08KXZ.exe runs on the host computer, providing access to the M68HC(9)08KX MCU CPU internal registers and I/O ports.
- Evaluation — Host computer is connected to the KXICS, and the KXICS is connected to the target system via the flex cable, providing limited real-time evaluation of the MCU and debugging user developed hardware and software.
- Programming — Host computer is connected to the KXICS, and the KXICS is connected to the target system via the MON08 cable with PROG08SZ.exe used to program the MCU FLASH module. In the programming mode there is limited evaluation (port A0 on the KX8 and port B0 and port B1 on the KX8 are used for communications, so they are unavailable for emulation).

Four jumper headers (Table 2-1) on the KXICS are used to configure the hardware options.

CAUTION: *The KXICS can be set to operate at a variety of voltages. When configuring the KXICS 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.*

Table 2-1 KXICS Jumper Header Description

Jumper Header	Type (Factory Default Shown	Description
W1 Low Voltage Select		Used to set power for the MCU to match various target voltages.(No default) Jumper on position 1 & 2: 3.3 V Jumper on position 3 & 4: 3.0 V Jumper on position 5 & 6: 2.7 V Jumper on position 7 & 8 2.2 V Jumper on position 9 & 10 2.0 V Jumper on position 11 & 12: ADJ
W2 MCU Voltage Select		Selects voltage powering MCU and related circuitry. Jumper on position 1&2: Regulator Lo V as set by W1, is supplied by MCU. Labeled LO V. Jumper on position 3&2: Power supply, 5V Switched, is supplied by board to MCU. Labeled 5V.
W3 Target Clock Select		Jumper on position 1&2: supplies KXICS,9.8304 MHz, clock, to MCU and target via W4. Jumper on position 3&2: disables Xtal clock output, which will affect the power-up reset. Labeled 1.
W4 PTB6 Select		Jumper on position 1&2: MCU's internal clock is supplied to target cable via PTB6. Jumper on position 3&2: KXICS Xtal clock is supplied to MCU.

2.2.3 Installing an MCU on the KXICS

Either of two types of MCUs may be installed on the KXICS board, a DIP-type or a SOIC-type.

2.2.3.1 DIP-type MCU

1. Place the pin tension arm of the KXICS DIP socket XU1 in the up position.
2. Install the DIP type MCU into the DIP socket XU1. Be sure that the pin 1 orientation of the silkscreened dot on the MCU aligns with the pin 1 location on the DIP socket (upper left pin of the socket).

3. Place the pin tension arm of the KXICS DIP socket XU1 in the down position to secure the pins of the MCU to the socket.

NOTE: *The top (label side) of the MCU package must be visible when looking at the component side of the board.*

2.2.3.2 SOIC-type MCU

NOTE: *Installation of a SOIC type MCU requires the use of the SOIC-to-DIP adapter identified in Table 1-1 of this manual.*

1. Place the pin tension arm of the KXICS DIP socket XU1 (Figure 2-1) in the up position.
2. Install the SOIC-to-DIP adapter into the DIP socket XU1 (Figure 2-1). Be sure that the pin 1 orientation of the adapter aligns with the pin 1 location on the DIP socket (upper left pin of the DIP socket).

CAUTION: *The SOIC-to-DIP adapter may be confusing to install. It must be placed into the DIP socket, XU1, with the hinged side of the SOIC shell aligned to the bottom of the KXICS board. This positioning will place the SOIC-type MCU socket pin 1 in the upper left corner of the SOIC socket.*

3. Place the pin tension arm of the KXICS DIP socket XU1 in the down position to secure the pins of the adapter to the socket.
4. Open the hinged access door on the SOIC shell.
5. Install the SOIC-type MCU into the SOIC socket of the adapter. Be sure that the pin 1 orientation of the silkscreened dot on the MCU aligns with the pin 1 location on the SOIC socket (upper left pin of the socket).
6. Close and secure the hinged access door on the SOIC shell.

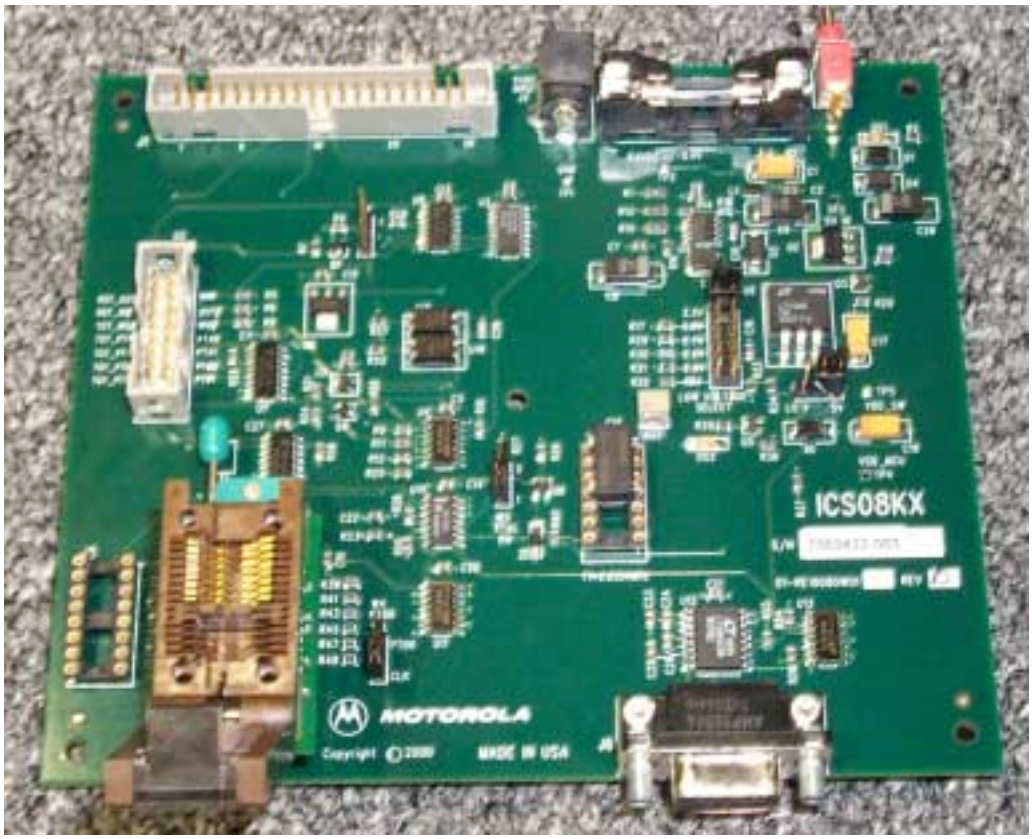


Figure 2-1 KXICS with SOIC-to-DIP Adapter

2.2.4 Connecting the KXICS to the host PC.

Locate the 9-pin connector labeled J6 on the board. Using the cable provided, connect it to a serial COM port on the host PC.

2.2.5 Applying power to the KXICS.

CAUTION: *Although applying power is described here, do not apply power until all other configuring, installing, and cable connections are completed. Equipment damage can result.*

Connect the 5-volt power supply to the round connector on the board, J2. Plug the power supply into an ac power outlet, using one of the country-specific adapters provided. (The KXICS green power LED on the board lights when switch SW1 is in the ON position.)

2.2.6 Target Cable Interface Connection Options

There are three ways to connect the KXICS simulator board to your target system:

- Flex cable — low-noise target interface connection (may be ordered separately)
- Ribbon cable — low-cost target interface connection
- MON08 cable — target interface connection with MCU FLASH programming and limited emulation

Below (Table 2-2) is a quick reference for defining the cable/connector selection to use with the MC68HC908KX8. Select the option that meets your requirements and connect accordingly.

Table 2-2. Cable/Connector Options for MCUs

MCU	Flex Cable	Ribbon Cable	MON08 Cable
MC68HC908KX8	J1	J5	J3

2.3 Target Cable Interface Connectors

NOTE: *Refer to Section 3, Support Information for more detail.*

2.3.0.1 Target Flex Cable Interface Connector J1

The flex cable is a low-noise alternative connection that may be used to connect to the target. Table 2-3 shows the pin assignments for flex cable connector J1.

Table 2-3 J1 Pin Assignments

		J1			
N/C	1	•	•	2	N/C
N/C	3	•	•	4	PTB7
N/C	5	•	•	6	PTB6
N/C	7	•	•	8	PTB5
N/C	9	•	•	10	PTB4
N/C	11	•	•	12	N/C
N/C	13	•	•	14	PTB3
TGT_PTA0	15	•	•	16	PTB2
TGT_PTA1	17	•	•	18	TGT_PTB1
TGT_PTA2	19	•	•	20	TGT_PTB0
TGT_PTA3	21	•	•	22	N/C
TGT_PTA4	23	•	•	24	N/C
N/C	25	•	•	26	IRQ*
N/C	27	•	•	28	N/C
Common	29	•	•	30	Common
Common	31	•	•	32	Common
Common	33	•	•	34	Common
Common	35	•	•	36	Common
Common	37	•	•	38	Common
Common	39	•	•	40	Common