



Chipsmall Limited consists of a professional team with an average of over 10 year of expertise in the distribution of electronic components. Based in Hongkong, we have already established firm and mutual-benefit business relationships with customers from,Europe,America and south Asia,supplying obsolete and hard-to-find components to meet their specific needs.

With the principle of "Quality Parts,Customers Priority,Honest Operation,and Considerate Service",our business mainly focus on the distribution of electronic components. Line cards we deal with include Microchip,ALPS,ROHM,Xilinx,Pulse,ON,Everlight and Freescale. Main products comprise IC,Modules,Potentiometer,IC Socket,Relay,Connector.Our parts cover such applications as commercial,industrial, and automotives areas.

We are looking forward to setting up business relationship with you and hope to provide you with the best service and solution. Let us make a better world for our industry!



Contact us

Tel: +86-755-8981 8866 Fax: +86-755-8427 6832

Email & Skype: info@chipsmall.com Web: www.chipsmall.com

Address: A1208, Overseas Decoration Building, #122 Zhenhua RD., Futian, Shenzhen, China



M68ICS08JLK

In-Circuit Simulator

User's Manual

Important Notice to Users

While every effort has been made to ensure the accuracy of all information in this document, Motorola assumes no liability to any party for any loss or damage caused by errors or omissions or by statements of any kind in this document, its updates, supplements, or special editions, whether such errors are omissions or statements resulting from negligence, accident, or any other cause. Motorola further assumes no liability arising out of the application or use of any information, product, or system described herein; nor any liability for incidental or consequential damages arising from the use of this document. Motorola disclaims all warranties regarding the information contained herein, whether expressed, implied, or statutory, *including implied warranties of merchantability or fitness for a particular purpose*. Motorola makes no representation that the interconnection of products in the manner described herein will not infringe on existing or future patent rights, nor do the descriptions contained herein imply the granting or license to make, use, or sell equipment constructed in accordance with this description.

Trademarks

This document includes these trademarks:

Motorola and the Motorola logo are registered trademarks of Motorola, Inc.

Windows and Windows 95 are registered trademarks of Microsoft Corporation in the U.S. and other countries.

Intel is a registered trademark of Intel Corporation.

Motorola, Inc., is an Equal Opportunity / Affirmative Action Employer.

IBM is a registered trademark of International Business Machines Corporation.

For an electronic copy of this book, visit Motorola's web site at <http://mcu.motsps.com/documentation>

© Motorola, Inc., 2000; All Rights Reserved

List of Sections

| | |
|--|-----------|
| Section 1. Introduction | 13 |
| Section 2. Hardware Installation | 19 |
| Section 3. Support Information | 35 |
| Section 4. Using the MON08 Interface | 43 |
| Appendix A. S-Record Information | 49 |
| Appendix B. Technical Reference and Troubleshooting | 55 |
| Glossary | 83 |
| Index | 89 |

List of Sections

Table of Contents

Section 1. Introduction

| | | |
|-------|--|----|
| 1.1 | Contents | 13 |
| 1.2 | Overview..... | 13 |
| 1.3 | JLJKICS Components..... | 14 |
| 1.3.1 | M68ICS08JLJK Hardware..... | 15 |
| 1.3.2 | ICS Interface Software..... | 16 |
| 1.4 | JLJKICS Features | 16 |
| 1.5 | Hardware and Software Requirements | 17 |
| 1.6 | Specifications | 18 |
| 1.7 | About This Manual..... | 18 |
| 1.8 | Customer Support | 18 |

Section 2. Hardware Installation

| | | |
|---------|--|----|
| 2.1 | Contents | 19 |
| 2.2 | Overview..... | 19 |
| 2.3 | Configuring the In-Circuit Simulator Board..... | 20 |
| 2.3.1 | JLJKICS Limitations | 22 |
| 2.3.1.1 | Bus Frequency..... | 22 |
| 2.3.1.2 | Port B0..... | 22 |
| 2.3.2 | JLJKICS Configurable Jumper Headers | 22 |
| 2.3.2.1 | JLJKICS Bus Frequency Selection Header (JP1)..... | 24 |
| 2.3.2.2 | Board Reset Selection Header (JP2)..... | 24 |
| 2.3.2.3 | Clock Source Selection Jumper Headers (JP4 and JP5)..... | 25 |
| 2.3.2.4 | Operating Voltage Selection Header (JP3)..... | 26 |
| 2.3.2.5 | Power Source Selection Jumper Headers (JP6 and JP7)..... | 27 |
| 2.3.3 | 20-Pin DIP Emulation Connector (J1)..... | 28 |

Table of Contents

| | | |
|-------|---|----|
| 2.3.4 | 28-Pin DIP Emulation Connector (J6) | 28 |
| 2.3.5 | MON08 Cable (J3) | 30 |
| 2.3.6 | Blank FLASH Programming Cable (J2) | 30 |
| 2.3.7 | Host Computer to JLJKICS Interconnection (J4) | 31 |
| 2.3.8 | Power Supply | 31 |
| 2.4 | Connecting the Hardware | 32 |
| 2.5 | Installing the Software | 33 |
| 2.6 | Connecting to a Target System | 33 |

Section 3. Support Information

| | | |
|-----|--|----|
| 3.1 | Contents | 35 |
| 3.2 | MCU Subsystem | 35 |
| 3.3 | Level Translation | 36 |
| 3.4 | JLJKICS Connector Signal Definitions | 36 |

Section 4. Using the MON08 Interface

| | | |
|-----|---|----|
| 4.1 | Contents | 43 |
| 4.2 | Overview | 43 |
| 4.3 | Target System Header Placement and Layout | 43 |
| 4.4 | Target Requirements for Using MON08 | 45 |
| 4.5 | Sample Applications | 47 |

Appendix A. S-Record Information

| | | |
|-----|-----------------------------|----|
| A.1 | Contents | 49 |
| A.2 | Overview | 49 |
| A.3 | S-Record Contents | 49 |
| A.4 | S-Record Types | 51 |
| A.5 | S Record Creation | 52 |
| A.6 | S-Record Example | 52 |

| | | |
|-------|-----------------------------|----|
| A.6.1 | S0 Header Record | 52 |
| A.6.2 | First S1 Record | 53 |
| A.6.3 | S9 Termination Record | 54 |
| A.6.4 | ASCII Characters | 54 |

Appendix B. Technical Reference and Troubleshooting

| | | |
|-----|--|----|
| B.1 | Contents | 55 |
| B.2 | Overview | 55 |
| B.3 | JLJKICS Board | 56 |
| B.4 | Troubleshooting the Startup | 57 |
| B.5 | Troubleshooting MON08 Mode | 63 |
| B.6 | Board Layout, Schematic Diagrams, and Parts List | 67 |

Glossary

| | |
|----------------|----|
| Glossary | 83 |
|----------------|----|

Index

| | |
|-------------|----|
| Index | 89 |
|-------------|----|

Table of Contents

List of Figures

| Figure | Title | Page |
|--------|--|------|
| 2-1 | JLJKICS Board Layout. | 20 |
| 2-2 | JLJKICS In-Circuit Simulator Block Diagram. | 21 |
| 2-3 | ICS Functional Diagram. | 21 |
| 2-4 | MCU Bus Frequency Selection Header (JP1) | 24 |
| 2-5 | Board Reset Selection Header (JP2). | 25 |
| 2-6 | Clock Source Selection Jumper Headers (JP4 and JP5). | 25 |
| 2-7 | Jumper Header Voltage Output Options (JP3). | 26 |
| 2-8 | JLJKICS Power Source Selection Headers (JP6 and JP7). | 27 |
| 2-9 | Host Computer to JLJKICS Interconnection (J4). | 31 |
| 4-1 | Recommended Connector Layout. | 46 |
| 4-2 | MON08 Connector Jumpered for Normal Target Operation. | 46 |
| 4-3 | Application Designed with a Circuit for MON08. | 47 |
| 4-4 | Application for Blank FLASH Programming. | 47 |
| A-1 | S-1 Record Example | 54 |
| B-1 | JLJKICS Board Layout. | 67 |

List of Figures

List of Tables

| Table | Title | Page |
|--------------|---|-------------|
| 1-1 | M68ICS08JLJK Product Components | 15 |
| 1-2 | Hardware Components | 15 |
| 1-3 | Software Components | 16 |
| 1-4 | JLJKICS Board Specifications | 18 |
| 2-1 | JLJKICS Jumper Header Description | 23 |
| 2-2 | MCU Bus Frequency Formula | 24 |
| 2-3 | Logic Table | 25 |
| 2-4 | JLJKICS Power Source Selection Header Settings | 27 |
| 2-5 | J1 20-Pin DIP Emulation Connector | 28 |
| 2-6 | J6 28-Pin DIP Emulation Connector | 29 |
| 2-7 | MON08 J3 Cable Connector | 30 |
| 2-8 | Blank FLASH Programming Cable Connector J2 | 30 |
| 3-1 | Target Connector J1 | 37 |
| 3-2 | Target Connector J6 | 38 |
| 3-3 | MON08 Connector J3 Pin Assignments | 40 |
| 3-4 | DB-9 Communication Connector J4 Pin Assignments | 41 |
| 4-1 | MON08 Target System Connector | 44 |
| A-1 | S-Record Fields | 50 |
| A-2 | S-Record Field Contents | 50 |
| A-3 | S-Record Types | 51 |
| A-4 | S0 Header Record | 52 |
| A-5 | S1 Header Record | 53 |
| A-6 | S9 Header Record | 54 |
| B-1 | Parts List | 68 |

List of Tables

Section 1. Introduction

1.1 Contents

| | | |
|-------|--|----|
| 1.2 | Overview | 13 |
| 1.3 | JLJKICS Components | 14 |
| 1.3.1 | M68ICS08JLJK Hardware | 15 |
| 1.3.2 | ICS Interface Software | 16 |
| 1.4 | JLJKICS Features | 16 |
| 1.5 | Hardware and Software Requirements | 17 |
| 1.6 | Specifications | 18 |
| 1.7 | About This Manual | 18 |
| 1.8 | Customer Support | 18 |

1.2 Overview

This section provides an overview of the Motorola M68ICS08JLJK in-circuit simulator (JLJKICS).

The JLJKICS board, a single 4-inch × 6.5-inch printed circuit board (PCB), is a stand-alone development and debugging aid for designers using MC68HC908JL3, MC68HC908JK3, or MC68HC908JK1 microcontroller unit (MCU) devices. The JLJKICS contains both the hardware and software needed to develop and simulate source code for, and to program, these Motorola microcontrollers.

The JLJKICS and the JLJKICS software form a complete editor, assembler, programmer, simulator, and limited real-time I/O (input/output) emulator for the MC68HC908JL3, MC68HC908JK3, and MC68HC908JK1 MCUs. When the JLJKICS is connected to a host PC (personal computer) and target hardware, the actual inputs and outputs of the target system can be used during simulation of code.

Depending on the software, the uses of the JLJKICS development package are:

- The WINIDE and CASM08Z software may be used as editor and assembler.
- With ICS08JLZ, the JLJKICS is used as a simulator.
- With the PROG08SZ software, the JLJKICS is used to program MCU FLASH memory.
- With the ICD08SZ software, the JLJKICS is used as a limited real-time emulator.

The JLJKICS connects to the target machine via either the provided 20-pin or 28-pin ribbon cable. It connects to the software host via a standard DB-9 serial cable.

Use the JLJKICS with any IBM[®] Windows 95[®]-based computer (or later version) with a serial port.

1.3 JLJKICS Components

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

Table 1-1. M68ICS08JLJK Product Components

| Part Number | Description |
|---------------------------------------|--|
| ICS08JL | JLJKICS software development package |
| ICS08JLZ | ICS simulator |
| ICD08SZ | ICS debugger |
| MC68HC908JL3CP and MC68HRC908JL3CP | Two 28-pin dual in-line package (DIP) MCUs |
| M68ICS08JLJK (JLJKICS) | JLJKICS board |

1.3.1 M68ICS08JLJK Hardware

Table 1-2 lists the JLJKICS hardware components.

Table 1-2. Hardware Components

| Components | Description |
|------------|---|
| U13 | 28-pin DIP socket for the MC68HC908JL3 |
| U14 | 20-pin DIP socket for the MC68HC908JK3 and MC68HC908JK1 MCU devices |
| U16 | 28-pin SOIC socket for the MC68HC908JL3 |
| U17 | 20-pin SOIC socket for the MC68HC908JK3 and MC68HC908JK1 MCU devices |
| J1 | One 2-row × 10-pin, 0.3-inch spacing DIP connector allowing debugging connection to target board through a ribbon cable |
| J2 | 2-pin header allowing programming of MCU with 2-pin cable |
| J3 | One 2-row × 8-pin, 0.1-inch spacing header for connecting to a target board with the MON08 debugging interface |
| J4 | DB-9 serial cable connector |
| J5 | dc power jack |
| J6 | One 2-row × 14-pin, 0.6-inch spacing DIP connector allowing debugging connection to target board through a ribbon cable |
| J7 | 2-pin external oscillator connector |
| D4 | ICS power LED (green) |
| D7 | MCU power LED (yellow) |
| SW1 | Power switch |

1.3.2 ICS Interface Software

Windows[®]-optimized software components are referred collectively to as the JLJKICS software (part number ICS08JL). The ICS08JL software package is a product of P&E Microcomputer Systems, Inc., and is included in the JLJKICS kit. **Table 1-3** lists these software components.

Table 1-3. Software Components

| Components | Description |
|--------------|--|
| WINIDE.EXE | Integrated development environment (IDE) software interface for editing and interfacing with the other items listed here |
| CASM08Z.EXE | CASM08Z command-line cross-assembler |
| ICS08JLZ.EXE | In-circuit/stand-alone simulator software for the MC68HC908JL3, MC68HC908JK3, and MC68HC908JK1 MCU devices |
| PROG08SZ.EXE | FLASH memory programming software |
| ICD08SZ.EXE | In-circuit debugging software for limited, real-time emulation |

1.4 JLJKICS Features

The JLJKICS 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
- FLASH memory programming with PROG08SZ
- In-circuit and stand-alone simulation of MC68HC908JL3, MC68HC908JK3, and MC68HC908JK1 MCUs with ICS08JLZ, including:
 - Simulation of all instructions, memory, and peripherals
 - Optional simulator pin inputs from the target
 - Conditional breakpoints, script files, and logfiles

- Limited real-time emulation and debugging with ICD08SZ, including:
 - Loading code into RAM
 - Executing real-time in RAM or FLASH
 - One hardware breakpoint in FLASH
 - 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 allowing:
 - Limited in-circuit emulation
 - In-circuit simulation
 - In-circuit programming

1.5 Hardware and Software Requirements

The JLJKICS software requires this minimum hardware and software configuration:

- An IBM-compatible host computer running 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 JLJKICS and the host computer

1.6 Specifications

Table 1-4 summarizes the JLJKICS board hardware specifications.

Table 1-4. JLJKICS 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 |

1.7 About This Manual

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

1.8 Customer Support

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

Section 2. Hardware Installation

2.1 Contents

| | | |
|---------|---|----|
| 2.2 | Overview | 19 |
| 2.3 | Configuring the In-Circuit Simulator Board | 20 |
| 2.3.1 | JLJKICS Limitations | 22 |
| 2.3.1.1 | Bus Frequency | 22 |
| 2.3.1.2 | Port B0 | 22 |
| 2.3.2 | JLJKICS Configurable Jumper Headers | 22 |
| 2.3.2.1 | JLJKICS Bus Frequency Selection Header (JP1) | 24 |
| 2.3.2.2 | Board Reset Selection Header (JP2) | 24 |
| 2.3.2.3 | Clock Source Selection Jumper Headers (JP4 and JP5) | 25 |
| 2.3.2.4 | Operating Voltage Selection Header (JP3) | 26 |
| 2.3.2.5 | Power Source Selection Jumper Headers (JP6 and JP7) | 27 |
| 2.3.3 | 20-Pin DIP Emulation Connector (J1) | 28 |
| 2.3.4 | 28-Pin DIP Emulation Connector (J6) | 29 |
| 2.3.5 | MON08 Cable (J3) | 30 |
| 2.3.6 | Blank FLASH Programming Cable (J2) | 30 |
| 2.3.7 | Host Computer to JLJKICS Interconnection (J4) | 31 |
| 2.3.8 | Power Supply | 31 |
| 2.4 | Connecting the Hardware | 32 |
| 2.5 | Installing the Software | 33 |
| 2.6 | Connecting to a Target System | 33 |

2.2 Overview

This section explains how to:

- Configure the M68ICS08JLJK in-circuit simulator board (JLJKICS)
- Install the hardware
- Install the software
- Connect the board to a target system

In interactive mode, the JLJKICS is connected to the serial port of a host PC. The actual inputs and outputs of a target system can be used during simulation of source code.

In software stand-alone mode, the JLJKICS is not connected to the PC. The ICS08JLZ software can be used as a stand-alone simulator running on the PC.

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.*

2.3 Configuring the In-Circuit Simulator Board

The JLJKICS includes a single 4-inch × 6.5-inch printed circuit board (PCB) (M68ICS08JLJK). **Figure 2-1** shows a diagram of the JLJKICS board, **Figure 2-2** shows a block diagram of the JLJKICS board, and **Figure 2-3** is the functional block diagram.

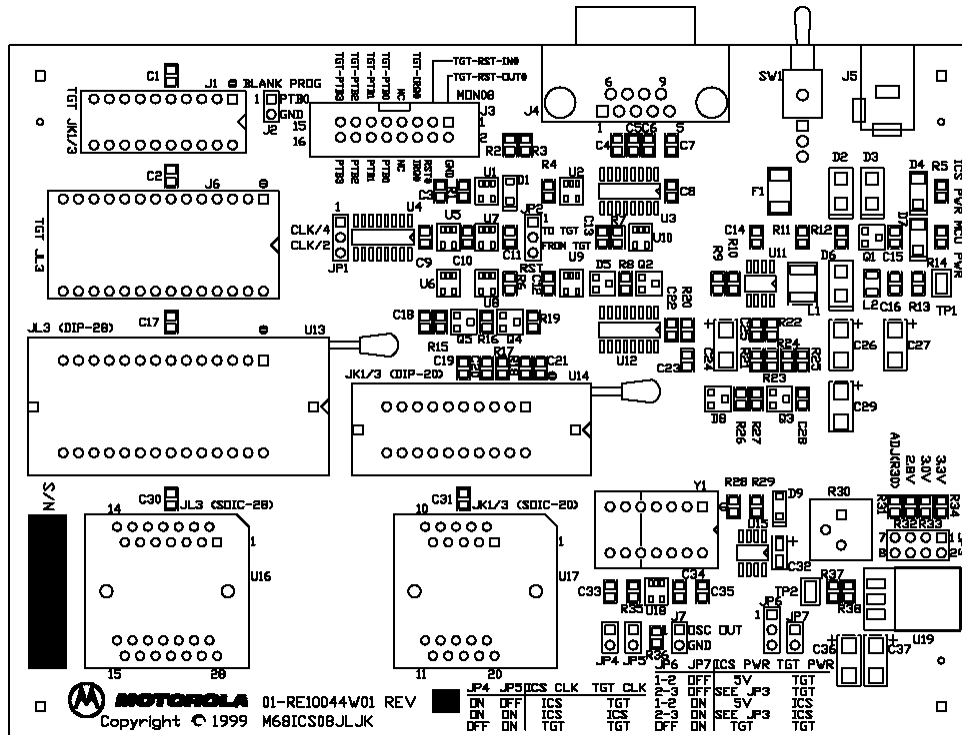


Figure 2-1. JLJKICS Board Layout

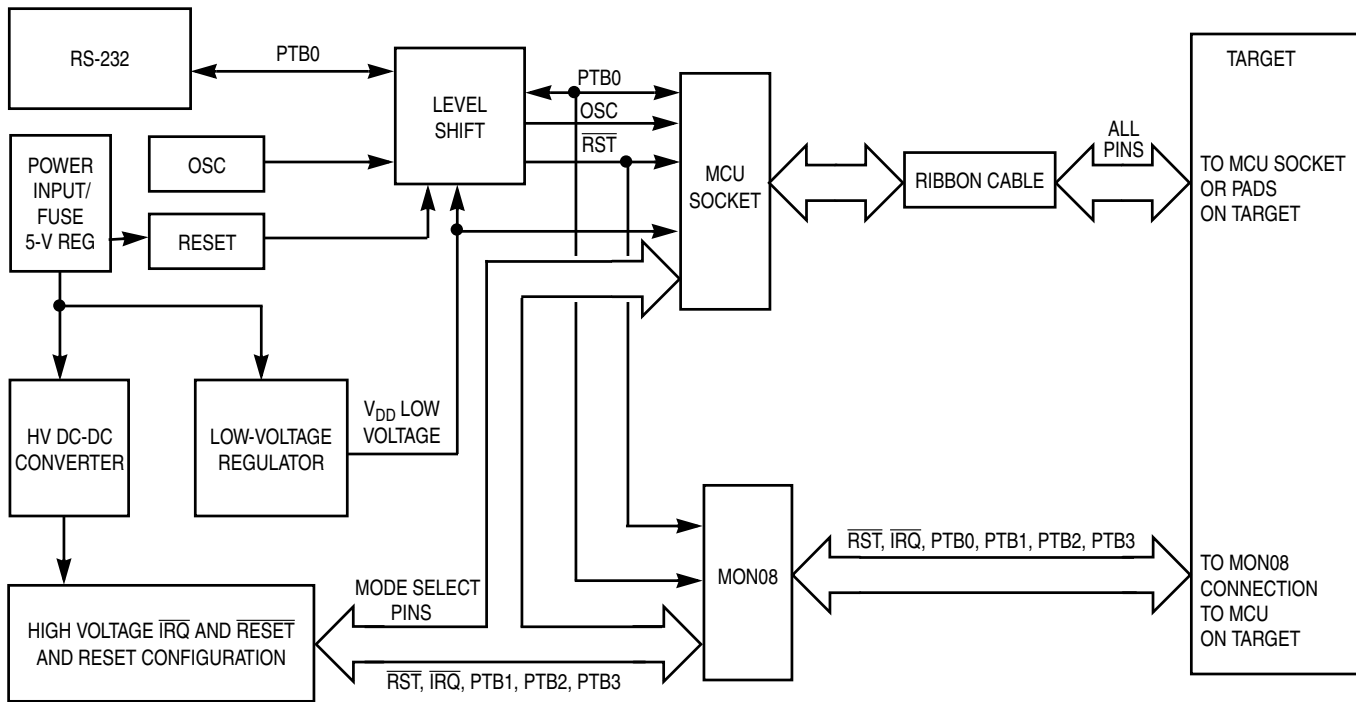


Figure 2-2. JLJKICS In-Circuit Simulator Block Diagram

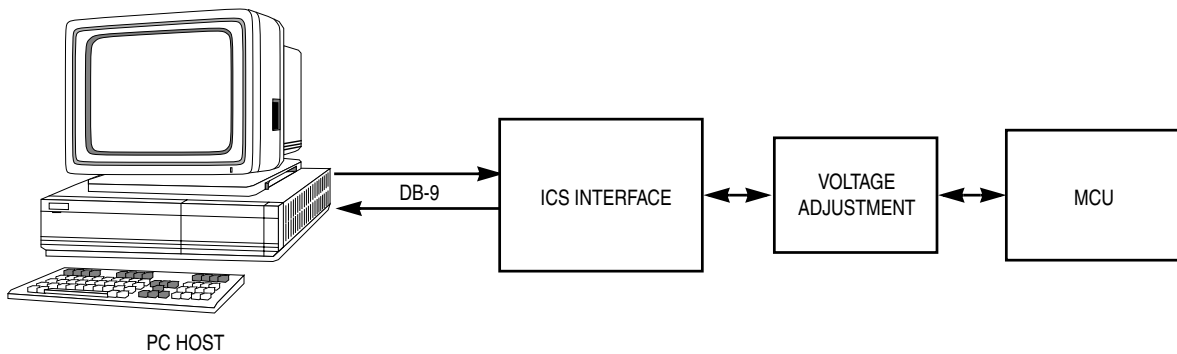


Figure 2-3. ICS Functional Diagram

2.3.1 JLJKICS Limitations

This section describes system limitations of the JLJKICS.

2.3.1.1 Bus Frequency

The RKICS communicates using the MON08 features. This forces the communication rate to $f_{\text{Bus}}/256$. Therefore, the bus frequencies are limited by standard baud rates allowed by the host software. See **2.3.2.1 JLJKICS Bus Frequency Selection Header (JP1)** for available options.

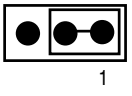
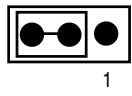
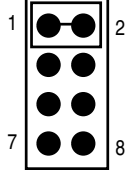


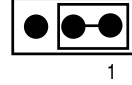

2.3.1.2 Port B0

Port B0 is used for communications, so it is unavailable for emulation.

2.3.2 JLJKICS Configurable Jumper Headers

Seven jumper headers on the JLJKICS are used to reconfigure the hardware options. **Table 2-1** is a quick reference to these optional settings, while subsections **2.3.2.1** through **2.3.2.5** describe jumper header configuration in greater detail.

Table 2-1. JLJKICS Jumper Header Description

| Jumper Header | Type | Description | | |
|--------------------------------------|---|---|------------|--|
| JP1 Bus frequency selection |  | <p>Jumper on pins 1 and 2 (default) — MCU bus frequency is set to 2.4576 MHz (OSC ÷ 4) and the I/O baud rate is set to 9600.</p> <p>Jumper on pins 2 and 3 — MCU bus frequency is set to 4.9152 MHz (OSC ÷ 2) and the I/O baud rate is set to 19,200.</p> | | |
| JP2 Board reset |  | <p>Jumper on pins 1 and 2 — The MCU's reset signal initiates resets to the target system.</p> <p>Jumper on pins 2 and 3 (default) — The target board reset signal initiates resets to the JLJKICS on-board MCU.</p> | | |
| JP3 Operating voltage selection |  | <p>Jumper on pins 1 and 2 (default) — 3.3 V</p> <p>Jumper on pins 3 and 4 — 3.0 V</p> <p>Jumper on pins 5 and 6 — 2.8 V</p> <p>Jumper on pins 1 and 2 — ADJ (R30)</p> | | |
| JP4 Crystal to MCU |  | JP4 | JP5 | |
| JP5 Target clock to MCU | | On | On | The JLJKICS MCU and the target board clock signals are supplied by the on-board oscillator Y1 (default). |
| |  | On | Off | The JLJKICS MCU clock signal is supplied by the oscillator Y1 and the target board has its own clock source. |
| | | Off | On | The JLJKICS MCU clock signal is supplied by the target board. |
| | | Off | Off | No clock supplied to JLJKICS MCU |
| JP6 5 V or regulator |  | JP6 | JP7 | |
| JP7 ICS power connected to target | | 1-2 | Off | 5-V supply on JLJKICS, target board power separate |
| | | 2-3 | Off | ICS voltage controlled by JP3 setting, target power separate |
| |  | 1-2 | On | 5 V supplied to both JLJKICS and target board (default) |
| | | 2-3 | On | Voltage controlled by JP3 supplied to both JLJKICS and target |
| | | Off | On | Target supplies power to JLJKICS MCU |

2.3.2.1 JLJKICS Bus Frequency Selection Header (JP1)

Use jumper header JP1 to select the MCU bus speed and the I/O baud rate. Install a jumper on jumper header JP1 pins 1 and 2 to set the MCU bus frequency to 2.4576 MHz and the I/O baud rate to 9600. (Refer to **Figure 2-4**.) Install a jumper on jumper header JP1 pins 2 and 3 to set the MCU bus frequency to 4.9152 MHz and the I/O baud rate to 19,200. Refer to **Table 2-2** for the MCU bus frequency formula.

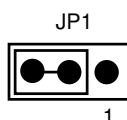


Figure 2-4. MCU Bus Frequency Selection Header (JP1)

Table 2-2. MCU Bus Frequency Formula

| JP1 Setting | Formula |
|-------------|---|
| 1-2 | Crystal oscillator frequency ÷ by 4 = bus frequency Bus frequency ÷ by 256 = baud rate |
| 2-3 | Crystal oscillator frequency ÷ divided by 2 = bus frequency Bus frequency ÷ by 256 = baud rate |

2.3.2.2 Board Reset Selection Header (JP2)

The reset function of the JLJKICS is both an input and an output. The JLJKICS drives its \overline{RST} pin low after encountering several different exception conditions. JP2 selects whether the target system can reset the MCU on the JLJKICS or whether the target system receives a \overline{RST} signal from the JLJKICS (refer to **Figure 2-5**). Install a jumper on jumper header JP2 pins 1 and 2 to use the JLJKICS \overline{RST} signal to reset the JLJKICS MCU and the target system. Install a jumper on jumper header JP2 pins 2 and 3 (factory default) to use the target system reset function to reset the JLJKICS MCU.

\overline{RST} is not a bidirectional, open-drain signal at the target connectors. Removing the jumper leaves the $\overline{RST-IN}$ signal pulled up to MCU operating voltage.

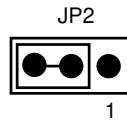


Figure 2-5. Board Reset Selection Header (JP2)

2.3.2.3 Clock Source Selection Jumper Headers (JP4 and JP5)

The JLJKICS contains a 9.8304-MHz crystal oscillator. When the remote target connection is made, the user may opt to feed the output from the JLJKICS crystal (ICS-OCS) to the external clock input (OSC1) of the JLJKICS via jumper headers JP4 and JP5 (refer to **Figure 2-6**). Refer to **Table 2-3** for a description of the clock source options.



Figure 2-6. Clock Source Selection Jumper Headers (JP4 and JP5)

Table 2-3. Logic Table

| JP4 | JP5 | Description |
|-----|-----|---|
| On | On | The JLJKICS MCU and the target board clock signals are supplied by the on-board oscillator Y1 (default). |
| On | Off | The JLJKICS MCU clock signal is supplied by the oscillator Y1 and the target system has its own clock source. |
| Off | On | The JLJKICS MCU clock signal is supplied by the target system. |
| Off | Off | JLJKICS MCU has no clock source. |