

Applications Engineering



RTA-FoUSB-MON

Flash Programmer &
In-Circuit Debugger

User's Manual

Rev. 2. 2

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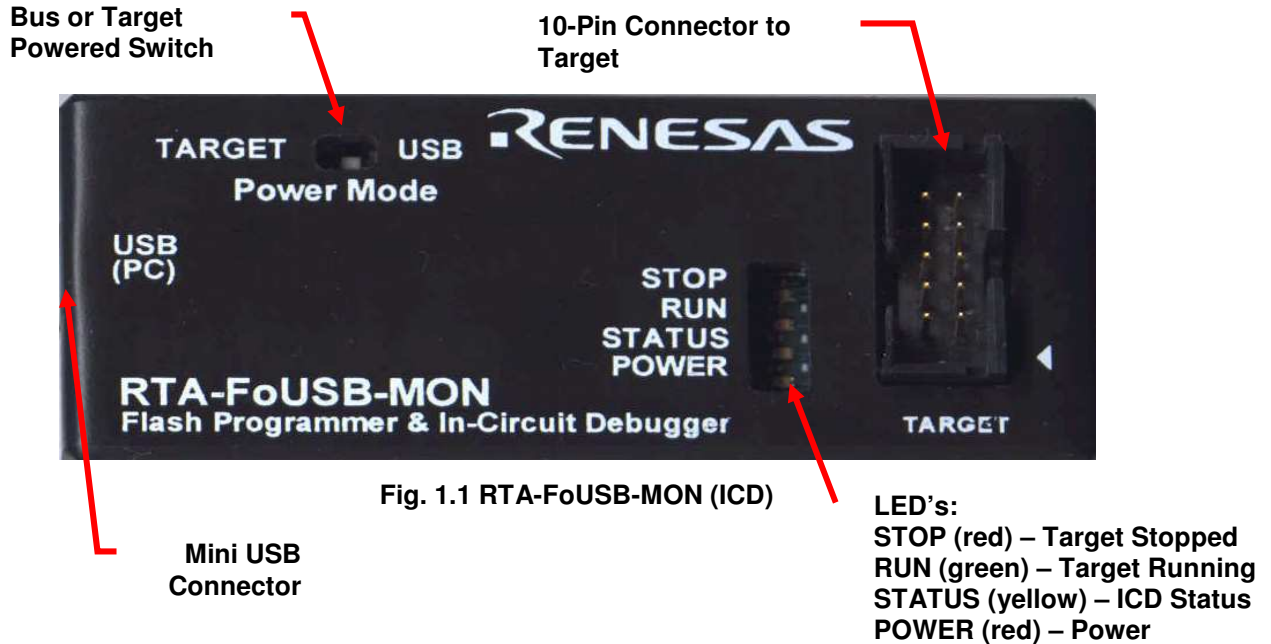


Fig. 1.1 RTA-FoUSB-MON (ICD)

1. Kit Overview

The RTA-FoUSB-MON (ICD) is a low cost compact device that can function as an In-Circuit Debugger (ICD) tool or as an FoUSB (Flash-over-USB™) Programmer for Renesas M16C Flash microcontrollers (MCU). KD30 and KD3083 are the software applications for debugging M16C and M32C firmware and FoUSB Programmer is the software application for programming the Renesas M16C Flash MCU's.

Here are some of the ICD highlights:

- M37641F8HP (8-bit USB Renesas MCU) with 3.9KB RAM and 32KB Flash ROM.
- Bus-powered (powered by USB) or target-powered selectable. No external power supply needed when connecting to Renesas' SKP's (Starter Kits).
- Target connection through a 10-pin header with matching 6 in. cable.
- Mini-USB connector with matching 6ft cable to connect to host PC.
- Semtech USB upstream port filter, EMI, and ESD protection circuitry. All in one device reduces target system part count and complexity while provides internal circuit protection.
- Works on Windows XP, 2000, Windows ME, and Windows 98.

Package Contents:

- 1 – In-Circuit Debugger (ICD)
- 1 – 6ft USB Cable
- 1 – 6 in. 10-pin Flat Cable
- 1 – CD ROM (Documentation, FoUSB Programmer, Debugger)

2. Software Installation

Before using the ICD, we need to install the required software files and applications. Do not plug the ICD into your PC until the install process is finished.

- 2.1 Insert the enclosed "RTA-FoUSB-MON" CD ROM in the PC's CD Rom drive.
- 2.2 The CD should auto start and the Renesas Starter Kit Plus welcome screen is displayed. If the screen does not come up, browse the root folder of the CD using Windows Explorer and double-click on '*SKP_Installer.exe*'.
- 2.3 The installer will create a new directory **C:\MTOOL\RTA-FOUSB-MON** on your PC where it will copy the necessary files for the ICD. During the installation process, dialog boxes will appear allowing you to install the development tools and files. The installer for FoUSB v2.04 (or later) will also automatically load the Windows system with the correct location of the USB drivers for the FoUSB GUI.
- 2.4 After installation, please review the Quick Start Guide, which may contain information about the ICD not yet available when this user's manual was published.
- 2.5 Click on "Finish" to exit install program.

If you experience problems with the install software, please see *C.1 Installing Required Files Manually* in Appendix C. Troubleshooting.

3. Driver Installation

Before using the ICD the device drivers need to be installed.

There are two USB drivers for Flash-Over-USB devices. They are:

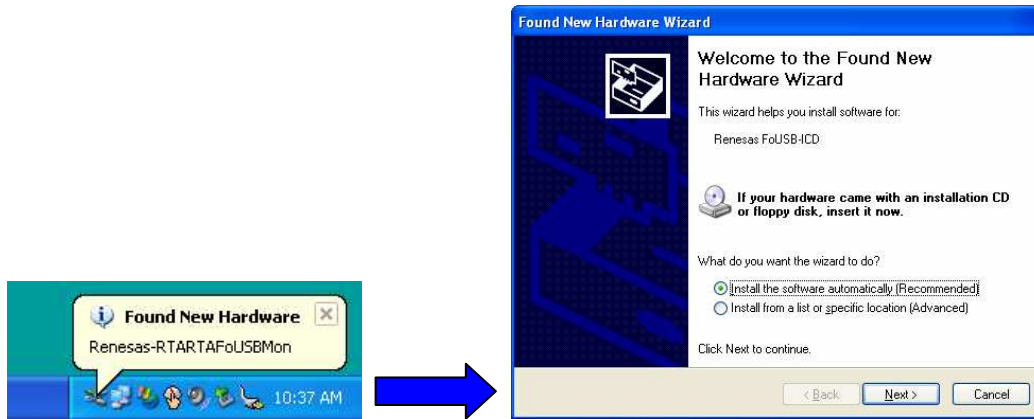
- USBMON.SYS** This is the USB driver that is used for the RTA-FoUSB-MON hardware. Note: In Japan it is called the USB Flash Writer (M3A-0665).
- FOUSB.SYS** This is the USB driver that is used for direct-connected MCU+USB devices operating in boot-mode.

The driver files (.sys and .inf) are always located under the FoUSB install directory (For example: C:\MTOOL\FoUSB\USB Drivers\)

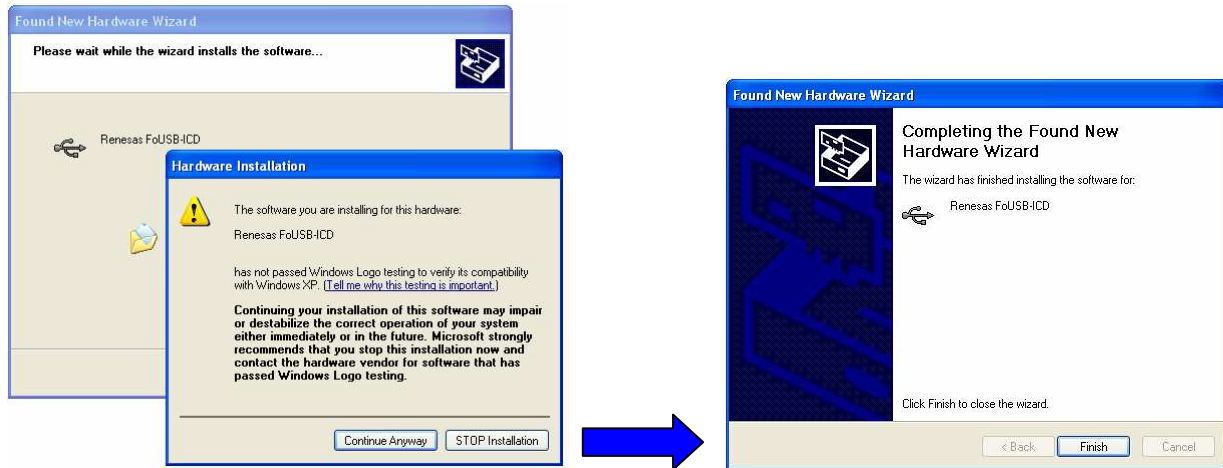
First, verify that the Power Mode switch (S1) on the ICD is in the USB (Bus powered) position. Next connect the ICD to your PC using the supplied USB cable.

If you are running Windows 98, ME or 2000, no intervention by the user is needed. When the ICD is plugged in, Windows automatically attaches the correct driver for your device and it is ready to use.

If you are running Windows XP, the first time an FoUSB device is plugged into a different USB port on the PC, the Windows XP "Found New Hardware Wizard" window will appear. Select the default option "Install the software automatically (Recommended)" as seen below.



Windows will then begin installing the USB driver. Another screen may appear stating that this driver has not been XP certified by Microsoft because we did not participate in Microsoft XP driver certification. Click the "Continue Anyway" button.



Your driver is now installed. Click Finish to close the wizard.

4. Running KD30 Debugger

Before running the debugger, connect the target board to the ICD using the 10-pin flat ribbon cable. Connect the ICD to your PC using the supplied USB cable. If you are using a Renesas SKP starter kit (e.g.: SKP16C62P) the ICD should be set to Bus Powered (S1 set to USB) mode. If using any other target board, select Target Powered mode and supply power through the target board itself.

To run the KD30 debugger, double click on the kd30.exe shortcut on your desktop. An init window, similar to one shown below, will be displayed.

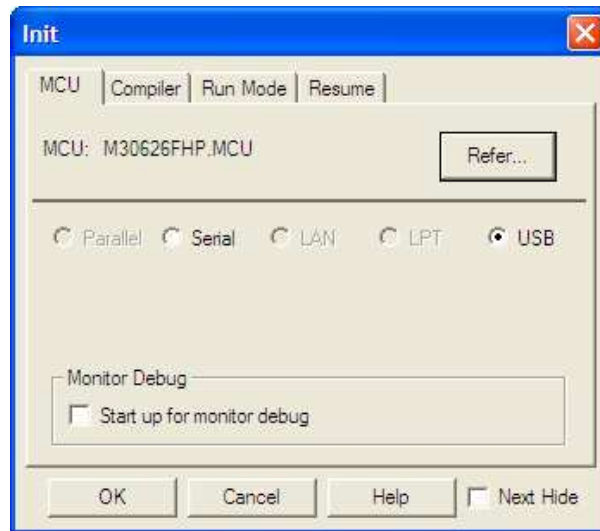


Fig. 4.1 KD30 Debugger Initialization Screen

Select 'USB' option and click on 'OK' button. The KD30 screen should appear. Please see the KD30 Help on how to use the debugger (Start > Programs > Renesas-Tools > KD30 V.3.20 Release 1B >KD30 Help).

KD30 supports at least 2 breakpoint settings on all M16C Family MCU's. Table 4.1 lists the MCU's with additional breakpoint capability as well as those with DBC interrupt support. DBC interrupts are discussed in more detail in Section 8.

Table 4.1 M16C MCU Support Summary

M16C MCU	DBC Support	Breakpoints
M16C/26, M16C/28, M16C/29	Yes	6
M16C/62P, M16C/6N4, M16C/6N5	Yes	8
M32C/83	Yes	4
M32C/85	Yes	8

To close KD30, click on 'File' menu and select 'Exit'; or, click on the close button on the upper right corner of the Window. Do not unplug or detach the ICD from your PC without closing KD30 first. Detaching the ICD while KD30 is still up may cause problems when you try to use KD30 again.

5. Running FoUSB (Flash-over-USB™) Programmer

Renasant Technology America, Inc. has created an easy to use Windows application for programming Renasant's M16C Flash MCU's. This application can be used along with the ICD to program the M16C MCU on a target board. To open the application, click on Start > Programs > Renasant-Tools > Flash-over-USB Ver. 1.x > FoUSB Programmer and a screen similar to Fig. 5.1 will be displayed. **Please ensure that you close KD30 first before running FoUSB Programmer.**

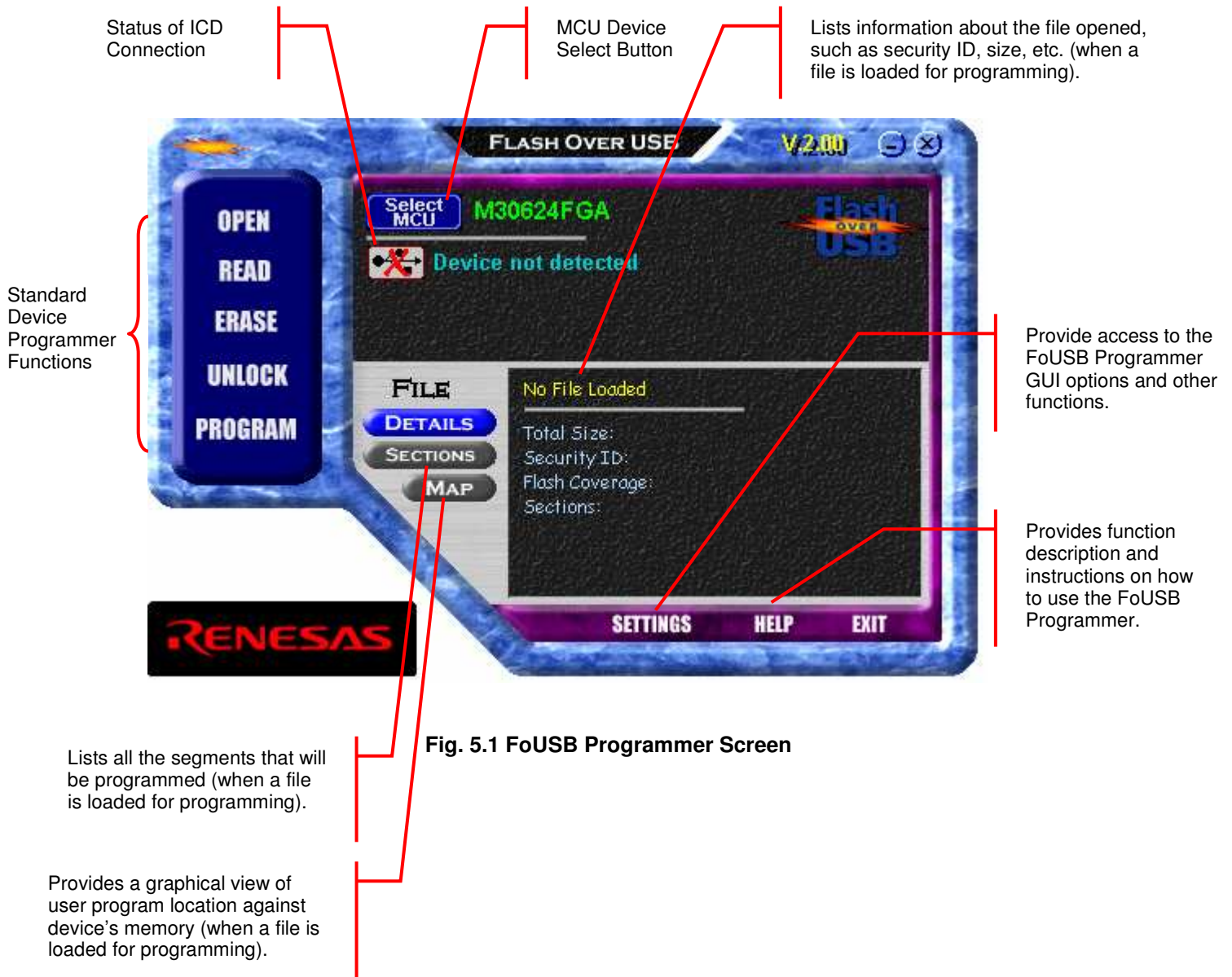


Fig. 5.1 FoUSB Programmer Screen

NOTE:

1. For additional descriptions and operations, please click on Help button of the FoUSB Programmer.
2. Renasant continues to update the application and the version number may be different from what is on this document.

An example of the FoUSB Programmer application with the SKP16C62P board connected is shown below.



Fig. 5.2 Example of FoUSB Programmer Screen with Target Connected

Basic FoUSB Programmer Operations

The **Standard Device Programmer Functions** follow the basic file open, erase, program, ROM memory dump, and RAM memory read/write like other programmers.

- **Open** allows you to select a firmware file you want to program to the target MCU.
- **Read** allows you to dump Flash memory and display it on a screen or write to a text file.
- **Erase** allows you to erase a block or the entire Flash memory.
- **Memory** allows you to read or write internal RAM memory including MCU SFRs.
- **Program** allows you to program or erase, program, and verify the target MCU.

The **Unlock** function used to “unlock” Renesas MCU’s for memory access. Renesas M16C MCU’s are equipped with a security feature, a 7-byte ID, to prevent firmware program disassembly. The user must enter the security ID information to be able to access Flash memory access. In a ‘Locked’ state, the only function you can use is the Unlock function.

An exception of the Unlock function is when the security ID is all zeroes (0x00, 0x00, 0x00, 0x00, 0x00, 0x00, 0x00) or all ones (0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF, 0xFF). For these two ID’s, the application automatically unlocks the device.

The **Command** button is used to send boot commands to the target MCU (when in boot mode). This button is used to debug monitor firmware and by device programmer manufacturers.

The **Select MCU** button allows the user to change FoUSB Programmer configuration to match the target MCU. When you click on this button, a list of currently supported devices will be displayed.

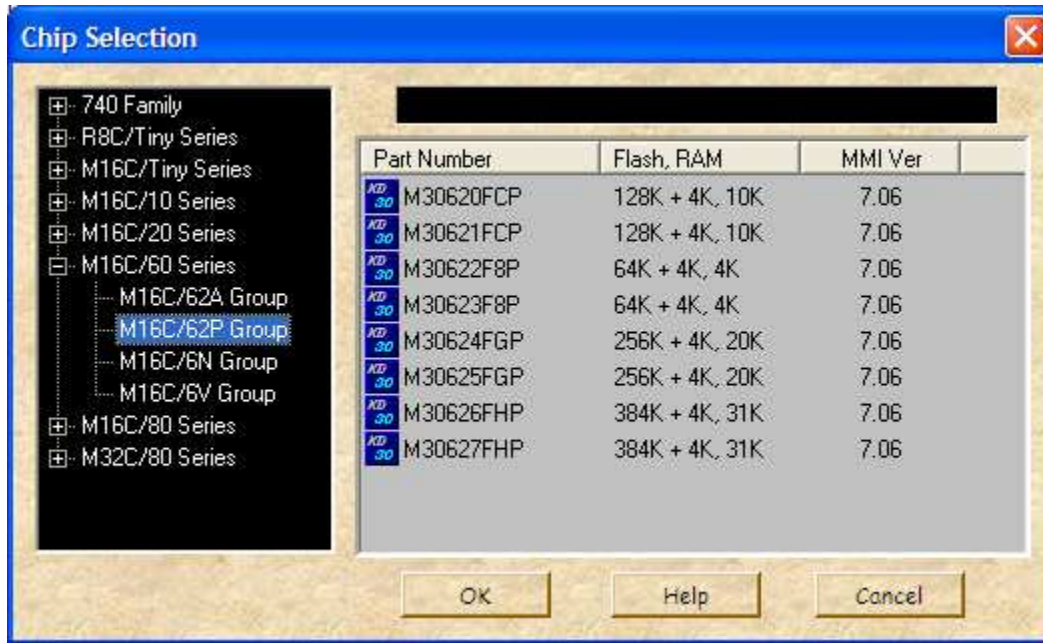


Fig. 5.3 MCU Selection Screen

If the selected MCU is different from the MCU Monitor Image (MMI) file loaded on the ICD, the user will be prompted to re-program the ICD.

The ICD firmware version, MMI file and MCU boot code version are also displayed:

- a. **Monitor Firmware:** Firmware loaded in the ICD.
- b. **MMI Loaded:** MMI (MCU Monitor Image) file loaded with the ICD firmware. This image file contains information on the type of MCU connected to the ICD. Different MCU devices use different image files (similar to the MCU files used by the In-Circuit Emulator).
- c. **Serial Boot Code:** Flash boot code on the target MCU.

The **Settings** button allows the user to configure the FoUSB Programmer for various settings and operational modes including Multi-programming and Automated programming.

6. Target Hardware Connectivity for In-System Programming

This section describes the hardware connections to the ICD for in-system programming purposes. Examples for different M16C MCU's are shown at the end of the section.

The ICD connects to an M16C target board through a polarized, .100" (2.54mm), 10-pin connection using a flat ribbon cable. It communicates with the M16C MCU using the boot UART/SIO in a clocked SIO configuration. The signals used and how these signals are assigned is described below.

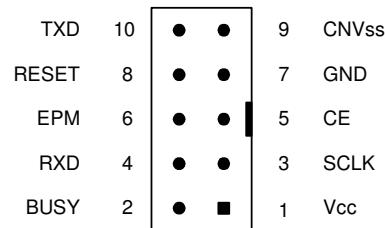


Figure 6.1 Target Board 10-Pin Header/Connector Signal Assignment

NOTE:

All target interface lines are in high impedance state until instructed to do otherwise by the FoUSB Programmer application.

1. Vcc – Power Supply Pin

This provides the common connection point for power between ICD and the target board. This must be connected to the target board's Vcc line/plane.

In Target Power mode, the ICD requires at least 3.3V (5.0V max) and 50mA to operate properly. When programming target boards other than Renesas SKPs, set S1 to Target Powered mode and supply external power.

2. Busy – Target MCU SIO Busy Signal

This line indicates whether the target is busy (and cannot receive data) or not. This must be connected to the target MCU's boot UART/SIO BUSY (CTS/RTS) pin.

This pin may be used for other applications as long as the user ensures that the ICD can drive the pin to valid levels with 5mA current.

3. SCLK – Target MCU Serial Clock Signal

This clock is used for synchronous serial communication between ICD and target board. This must be connected to the target MCU's boot UART/SIO SCLK pin.

This pin may be used for other applications as long as the user ensures that the ICD can drive the pin to valid levels with 5mA current.

4. RXD –Target MCU Receive Data Input Signal (ICD Transmit Data Output Signal)

This is the ICD SIO transmit data output. This must be connected to the target MCU's boot UART/SIO receive data input (RXD) pin.

This pin may be used for other applications as long as the user ensures that the ICD can drive the pin to valid levels with 5mA current.

5. CE Pin

This pin is used to enter boot mode for programming of the target M16C MCU. Not all M16C MCU's have a CE pin. If a CE pin exists on the target MCU, it should be connected to this pin (refer to serial mode flash programming in the target MCU's datasheet). If not, leave pin unconnected.

If the target MCU's CE pin is used as input, isolate the driving circuit from the header connection with a 1Kohm resistor.

If to be left unconnected (if users decides to), care must be taken to ensure that the target MCU's CE pin has a high signal level using a pull-up resistor during any programming operations.

6. EPM Pin (in Target Power Mode)

In Target Power Mode, the pin is used to control target MCU's EPM pin (if it exists on the target MCU). EPM pin is used during programming of the target MCU. If this pin exists on the target MCU, it should be connected to the header (refer to serial mode flash programming of the target MCU's datasheet). If not, leave unconnected.

If the target MCU's EPM pin is used as input, isolate the driving circuit from the header connection with a 1Kohm resistor.

If the EPM pin of the M16C MCU is left unconnected (no external circuit and not connected to 10-pin header), care must be taken to ensure that the target MCU's EPM pin has a low signal level using a pull-down resistor during any programming operations.

7. GND – Ground Pin

This provides the common point where the ICD ground and target board ground planes can be connected. This must be connected to target board's GND line/plane.

8. RESET – Target MCU Reset Signal

This active low signal is used by the ICD to reset the target MCU. This must be connected to the target board's reset circuit or target MCU's reset pin.

The user must ensure that the ICD can drive the pin to a valid low level with 5mA current.

9. CNVss – Target MCU CNVss Pin

This active high signal is used by the ICD to control the target MCU's CNVss pin for programming purposes. This must be connected to the target MCU's CNVss pin. During normal operation, this pin must have a low signal. To accomplish this, connect a 10K (nominal) pull-down resistor. See M16C MCU datasheet on CNVss pin description for details.

10. TXD – Target MCU Transmit Data Output Signal (ICD Receive Data Input Signal)

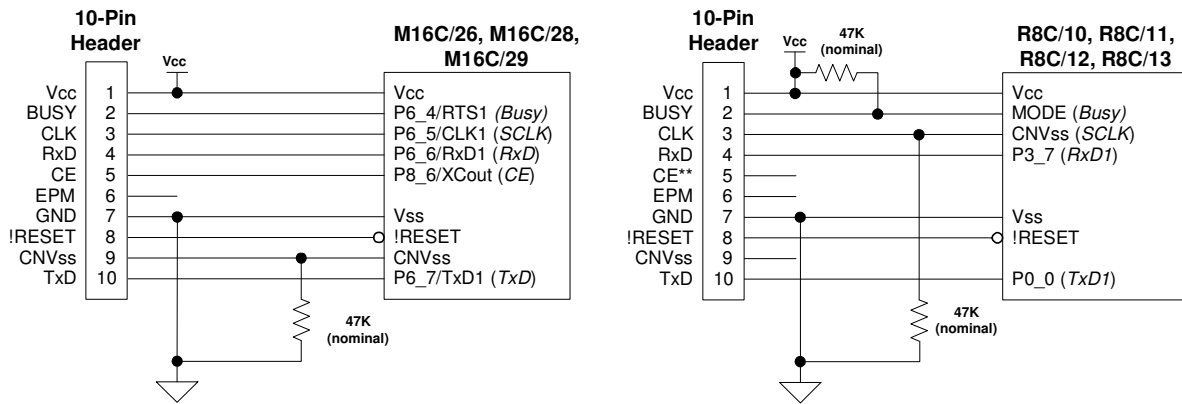
This is the ICD SIO receive data input. This must be connected to the target M16C MCU's boot UART/SIO transmit data output (TXD) pin.

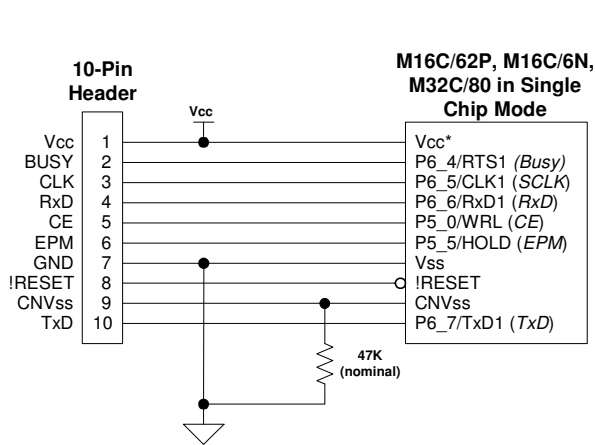
This pin may be used for other applications as long as the user ensures that the ICD can drive the pin to valid levels with 5mA current.

11. Hardware Summary and Precautions

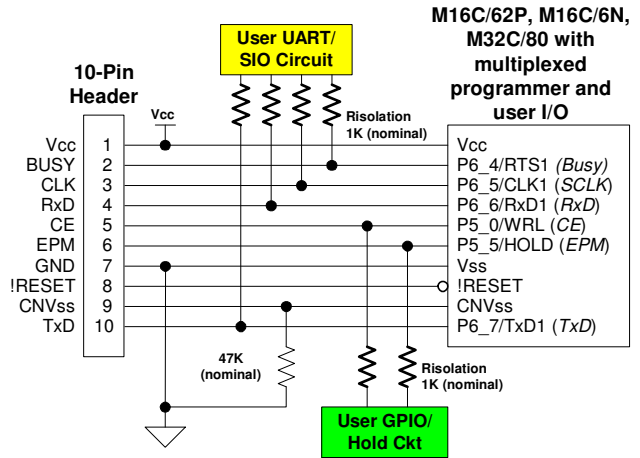
- Connect pull-down resistors to the CNVss line.
- Connect Reset line to the target MCU Reset pin or the target board's reset circuit.
- If EPM or CE lines are used as input pins, isolate the driving circuit from the 10-pin header using a 1Kohm resistor.
- If possible, avoid using the boot SIO/UART pins for other purposes. If not, ensure the lines can be driven in boot mode.
- The FoUSB Programming supports most M16C, M32C and R8C Flash MCU's. See the FoUSB GUI for specific MCUs.

Examples of target board hardware connections to the 10-pin header (ICD), when used for in-system programming only, are shown below. If you cannot find your M16C Flash MCU in the examples shown, please contact Renesas representative for assistance.

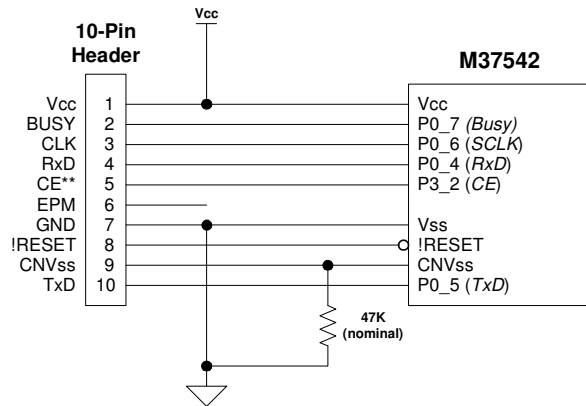
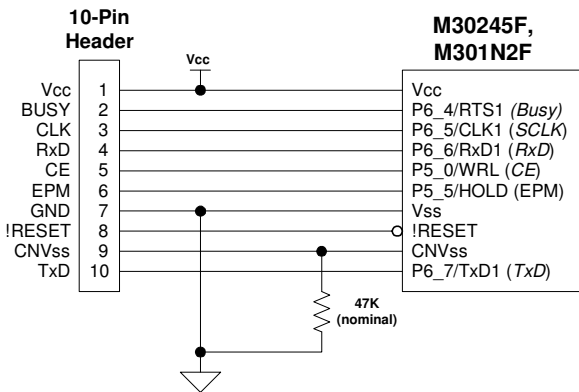




* For M30626F (M16C/62P), connect to Vcc1.



Note: When only used for programming (i.e. no debugging) and boot UART, CE, and EPM pins are also used as application I/O, connect 1K (nominal) isolation resistors between UART, CE, & EPM circuit and M16C MCU - 10-pin header connection.



NOTE:

If you cannot find your M16C Flash MCU in the examples shown, please contact Renesas representative for assistance.

7. Target Hardware Connectivity for In-Circuit Debugging

This section describes the hardware connections to the ICD for in-circuit debugging operations. Examples for different M16C MCU's are shown at the end of the section. For target MCU resources used during in-circuit debugging, see section 8 for details.

The ICD connects to an M16C target board through a polarized, .100" (2.54mm), 10-pin connection using a flat ribbon cable. It communicates with the M16C MCU using the boot UART/SIO in a clocked SIO configuration. The signals used and how these signals are assigned is described below.

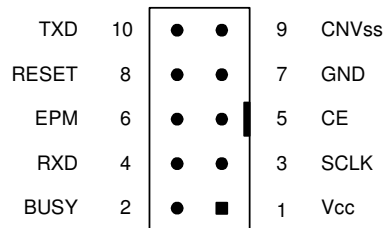


Figure 7.1 Target Board 10-Pin Header/Connector Signal Assignment

NOTE:

All target interface lines are in high impedance state until instructed to do otherwise by the KD30 Debugger application.

1. Vcc – Power Supply Pin

This provides the common connection point for power between ICD and the target board. This must be connected to the target board's Vcc line/plane.

In Target Power mode, the ICD requires at least 3.3V and 50mA to operate properly. The ICD requires 5V when downloading new MCU Monitor Image (MMI).

When debugging target boards other than Renesas SKPs, set S1 to Target Powered mode and supply external power.

2. Busy – Target MCU SIO Busy Signal

This line indicates whether the target is busy (and cannot receive data) or not. This must be connected to the target MCU's boot UART/SIO BUSY (CTS/RTS) pin.

This pin cannot be used while the Kernel program is running (during in-circuit debug operations).

3. SCLK – Target MCU Serial Clock Signal

This clock is used for synchronous serial communication between ICD and target board. This must be connected to the target MCU's boot UART/SIO SCLK pin.

This pin cannot be used while the Kernel program is running (during in-circuit debug operations).

4. RXD –Target MCU Receive Data Input Signal (ICD Transmit Data Output Signal)

This is the ICD SIO transmit data output. This must be connected to the target MCU's boot UART/SIO receive data input (RXD) pin.

This pin cannot be used while the Kernel program is running (during in-circuit debug operations).

5. CE Pin

This pin is used to enter boot mode for programming of the target M16C MCU. Not all M16C MCU's have a CE pin. If a CE pin exists on the target MCU, it should be connected to this pin (refer to serial mode flash programming in the target MCU's datasheet). If not, leave pin unconnected.

This pin is in high impedance when in user mode (during debug operations).

If the target MCU's CE pin is used as input, isolate the driving circuit from the header connection with a 1Kohm resistor.

If to be left unconnected (if users decides to), care must be taken to ensure that the target MCU's CE pin has a high signal level using a pull-up resistor during any programming operations.

6. EPM Pin

The pin is used to control target MCU's EPM pin (if it exists on the target MCU). EPM pin is used during programming of the target MCU. If this pin exists on the target MCU (and in Target Powered mode), it should be connected to the header (refer to serial mode flash programming of the target MCU's datasheet). If not, leave pin unconnected.

If the target MCU's EPM pin is used as input, isolate the driving circuit from the header connection using a 1Kohm resistor.

If the EPM pin of the M16C MCU is left unconnected (no external circuit and not connected to 10-pin header), care must be taken to ensure that the target MCU's EPM pin has a low signal level using a pull-down resistor during any programming operations.

7. GND – Ground Pin

This provides the common point where the ICD ground and target board ground planes can be connected. This must be connected to target board's GND line/plane.

8. RESET – Target MCU Reset Signal

This active low signal is used by the ICD to reset the target MCU. This must be connected to the target board's reset circuit or target MCU's reset pin.

The user must ensure that the ICD can drive the pin to a valid low level with 5mA current.

9. CNVss – Target MCU CNVss Pin

This active high signal is used by the ICD to control the target MCU's CNVss pin for programming purposes. This must be connected to the target MCU's CNVss pin. During normal operation, this pin must have a low signal. To accomplish this, connect a 10K (nominal) pull-down resistor. See M16C MCU datasheet on CNVss pin description for details.

10. TXD – Target MCU Transmit Data Output Signal (ICD Receive Data Input Signal)

This is the ICD SIO receive data input. This must be connected to the target M16C MCU's boot UART/SIO transmit data output (TXD) pin.

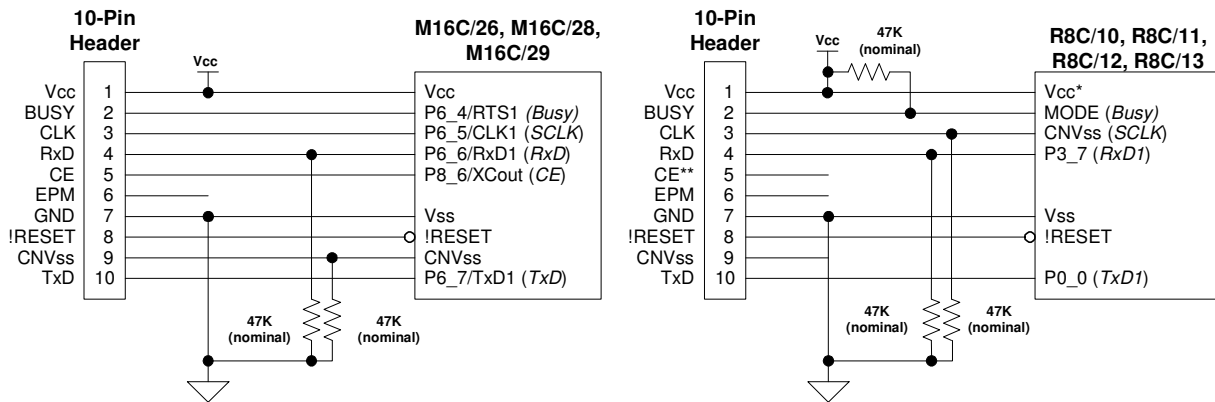
This pin must be pulled down with a resistor connected to GND. The target MCU's Kernel program polls this pin for the presence of the ICD before running the user program. Without the pull-down resistor, the target MCU will only run the Kernel program program.

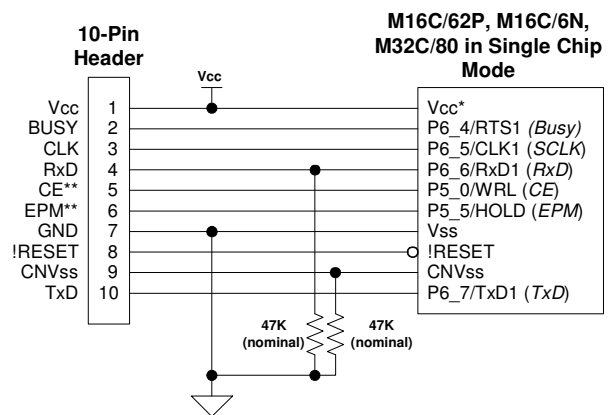
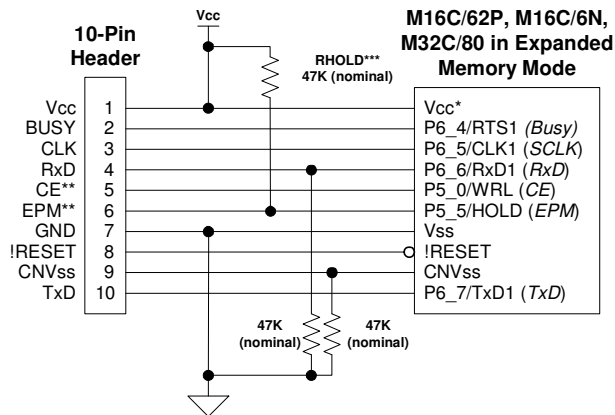
This pin cannot be used while the Kernel program is running (during in-circuit debug operations).

11. Hardware Summary and Precautions

- Connect pull-down resistors to RXD and CNVss lines.
- Connect Reset line to the target MCU Reset pin or the target board's reset circuit.
- If EPM or CE lines are used as input pins, isolate the driving circuit from the 10-pin header using a 1Kohm resistor.
- If possible, avoid using the boot SIO/UART pins for other purposes.

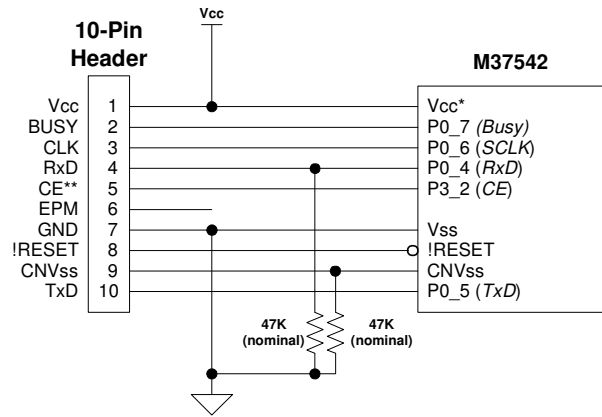
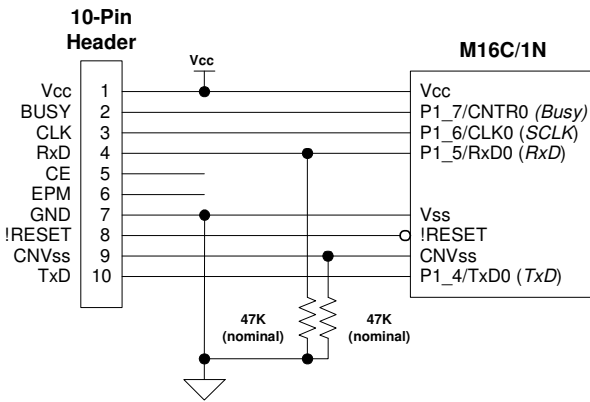
Examples of target hardware connection to the 10-pin header (ICD) when used for debugging purposes. If you cannot find your M16C Flash MCU in the examples shown, please contact Renesas representative for assistance.





* For M30626F (M16C/62P), connect to Vcc1.
 ** CE and EPM pin are high impedance in user mode (during debug operations).
 *** HOLD/EPM pin must be pulled high in memory expansion mode.

* For M30626F (M16C/62P), connect to Vcc1.
 ** CE and EPM pins are high impedance in user mode (during debug operations).



NOTE:

If you cannot find your M16C Flash MCU in the examples shown, please contact Renesas representative for assistance.

8. Target MCU Resources Used by ICD for Debugging

This section describes the MCU resources used by the ICD for in-circuit debugging (with the KD30 Debugger). These resources are NOT used when the ICD is used for programming (with the FoUSB Programmer). See previous sections for details on how to connect the hardware for in-circuit debugging or in-system programming support.

When used as a debug interface, the ICD downloads a small program, called a kernel program (or ROM Monitor), to the target MCU to establish communications used for program debugging operations. This kernel program is downloaded to the target MCU when the KD30 application is started.

It is important to note that the operation of the ICD is transparent to the user. There is no special software processing required to be able to use it as long as the user understands the exceptions and follows the rules described below.

NOTE:

These resources are ONLY used when the ICD is used for in-circuit debugging. Only the MCU pin resources are used when the ICD is used for in-system programming.

a. ROM

The kernel program code is located in the M16C memory space starts at address 0FF900H to 0FFE80H. KD30 will display a message on any attempt to overwrite specified ROM location. Rules on ROM usage are described below.

- User memory allocated to the Kernel program should not be used. Any attempt to use this area by the user code will be ignored.
- The special page vector table is mapped from 0FFE00H to 0FFFDBH. It is suggested that, if special page jumps are used, the special page numbers start with the minimum value of 20 and increases to a maximum of 127 to accommodate future monitor size increases.

b. RAM

The kernel program utilizes 128 bytes of RAM memory located at the top of MCU RAM area. For example, on an M30624 MCU, there is 20Kbytes of RAM located from 00400H to 053FFH. In this case, the monitor will be using the addresses from 05380H to 053FFH. In addition, the monitor also uses 4 bytes (max) of RAM on the interrupt stack.

In the R8C, there is special debug RAM that is utilized, so no user RAM is required.

c. Interrupts

Many M16C family MCU's support a special debug interrupt called DBC. For all MCU's that do NOT support DBC interrupt, the kernel program requires that the receive interrupt vector for the monitor/boot UART **MUST** point to the communications entry point of the monitor, which is 0FF900H. In addition, the monitor reserves the following hardware interrupt vectors for its own use:

- BREAK vector (0FFFE4H)
- ADDRESS MATCH vector (0FFFE8H)
- SINGLE STEP vector (0FFFECH)
- DBC vector (0FFFF4H)

The user code download process will properly load values into these locations. User code that globally disables interrupts for long periods of time (>1s), may interfere with the proper operation of the monitor.

NOTE:

For MCU's that do NOT have DBC interrupts, always ensure that the global interrupt is enabled in the startup files. Communications between ICD and the kernel program will fail when the global

interrupt is not set or disabled for long periods (>1s). This is the primary cause of communication errors while using the KD30 Debugger.

The following list includes MCUs with DBC support:

- M16C/26, M16C/28, M16C/29
- M16C/62P, M16C/6N4, M16C/6N5
- M32C/83, M32C/85

d. Peripherals

The kernel program uses the serial port associated with the boot mode of the MCU for communication with the ICD. Connect the SCLK, TxD, RxD signals from the 10-pin header to this serial port. For example, in the case of M30624 MCU, the monitor uses UART1 as the boot UART.

For MCU's that do NOT support DBC, ensure that the interrupt vector for the boot UART is set to FF900h.

Avoid byte-writes to the (boot UART/SIO) port, including direction register, associated with the SIO when the other half of the port is used as General Purpose I/O (GPIO) pins. Byte-writes to the port and direction register may prevent the monitor program from functioning properly. Use read-modify-write instructions instead.

If possible, avoid using this serial port for other applications in the firmware when the ICD will be used for development.

e. Real-Time Capability

Please be aware that while the kernel program is in its "STOP"ed state, the hardware peripherals will continue to run. Therefore, interrupts may not be serviced properly. Also, the watchdog timer will not be serviced and will likely timeout if active.

NOTE:

While the kernel program is in its "RUN"ning state, there is no overhead on the application code, UNLESS a RAM monitor window is open in KD30. This window requires periodic communication with the target MCU, which suspends normal application operation while servicing the request (approximately 2000 BCLK cycles for each 16 bytes of data displayed in the window are used per window update). The user must determine whether or not, this behavior is acceptable.

f. Software Summary and Precautions

- Ensure that global interrupt is set in the startup file and not disabled for long periods (>1s).
- Do NOT use the RAM or ROM memory as specified in sections 8.a and 8.b.
- Avoid byte-writes to the port and direction register to avoid interfering with monitor operation associated with the boot SIO/UART. Use bit manipulations.
- Do NOT change boot UART configuration.
- Ensure that the boot SIO/UART vector is properly set-up to point to FF900H for those M16C MCU's that do NOT support/have DBC interrupt.
- Do NOT attempt to debug watchdog, WAIT mode, or STOP mode.
- Do NOT execute a 'STEP' operation after a write to PRC2 SFR.

Appendix A. ICD Board Specifications

The following table lists the specifications for the ICD Board.

Table A.1 ICD Specification

Item	Description
USB MCU	Renesas M37641F8HP (8-bit USB Flash MCU)
Interface	PC host and target connectivity.
a. USB (J1)	Full speed USB connection and USB 2.0 compliant. Primary connection to debug PC.
b. UART Interface (J2)	4-pin header for RS-232C PC connection (TTL Level -RS-232C transceiver/circuit is mounted externally).
c. Target Interface (J3)	10-pin connection with starter kit board or target board. Please read 'Target Board Connectivity' on how to design the target hardware to connect the ICD.
LED	4 LED's: 2 red, 1 green, 1 yellow
a. Red (D1)	Power LED.
b. Red (D2)	Lights up when target MCU is stopped.
c. Green (D3)	Lights up when target MCU is running.
d. Yellow (D4)	ICD ready status – blinking
Switch, Jumpers	Provide additional debug pins, microprocessor mode and power supply selection.
a. Bus Power (S1)	Power selection: Bus powered or target powered.
b. MCU Mode (JP1)	CNVss pin for boot mode (shunted) or user mode (open).
c. Debug (JP3)	Provide debug pins for external interrupts (INT0, INT1), monitor status, counters 0 & 1 output pins.
Power Configuration	The ICD will operate either at 5V or 3.3V and may be bus powered (from USB) or target powered. 5V/3.3V selection using pin 6 of J3 connection to target.
Current Requirements	The maximum current draw by the ICD is 50mA.
Board Size	2.75" x 1.15" (70mm x 29 mm)

Appendix B. Technical Notes & Limitations**A. MSV1632-SKP Board**

When using the ICD with the MSV1632-SKP board, connect a 10KOhm pull-down resistor on JP9's (UART1) RXD line to be able to run user code. The monitor program polls the RXD line for the presence of the ICD before running the user program. Without the pull-down resistor, the M16C/62 MCU will only run the monitor program.

Appendix C. Troubleshooting

This section discusses possible problems you may encounter while installing the software (and drivers) and while running the KD30 or FoUSB Programmer applications. This section also discusses the countermeasures and solutions to resolve these problems.

If, for any reason, you cannot resolve the problem, please contact your Renesas representative for assistance.

C.1 Manual Installation

Before connecting the ICD to your PC, the driver files (inf and sys) files and executables must be copied to the C:\MTOOL\FOUSB directory.

To do this, run FoUSB_Vx.xx.exe under \Tools\FoUSB directory on the SKP CD. After the FoUSB Programmer install, if the default directory was used during install, a C:\MTOOL\FoUSB subfolder should have been created. The Windows USB drivers can be found under the USB Drivers folder, i.e. fousb.inf, fousb.sys (driver files to run FoUSB.exe), usbmon.inf, and usbmon.sys (driver files to run KD30).

The C:\MTOOL\RTA-FOUSB-MON folder contains all latest documentation about the ICD from Quick Start Guide to schematics. The development tools can be found under *tools* folder from the CD root. The *\tools\kd30* folder contains the KD30 installer executable.

NOTE: If you are using Windows 2000 or XP, you will need Administrator privileges to be able to install the drivers.

- (1) Windows 2000
 - (a). Install FoUSB Programmer by double-clicking on fousb.exe from the \Tools\FOUSB folder of the CD.
 - (b). Copy the fousb.inf and usbmon.inf files from C:\MTOOL\FOUSB\USB Drivers folder to \WINNT\INF folder.
 - (c). Copy the fousb.sys and usbmon.sys files from C:\MTOOL\FOUSB\USB Drivers folder to \WINNT\SYSTEM32\drivers folder.
 - (d). Install KD30 by double-clicking on KD30V3R1_e.exe in \tools\kd30 folder, which can be found on the CD root. It will create \Mtool\KD30 directory on your PC.
 - (e). Copy communi.dll and kd30dll.def from \Tools\ICD\KD30V3R1 folder of the CD to the C:\Mtool\KD30 directory.
 - (f). Right-click on kd30.exe file on C:\Mtool\KD30 directory and select 'Send to Desktop (create a desktop shortcut).

- (2) Windows 98
 - (a). Install FoUSB programmer by double-clicking on fousb.exe from the \Tools\FOUSB folder of the CD.
 - (b). Copy the fousb.inf and usbmon.inf files from C:\MTOOL\FOUSB\USB Drivers folder to \WINDOWS\INF folder.
 - (c). Copy the fousb.sys and usbmon.sys files from C:\MTOOL\FOUSB\USB Drivers folder to \WINDOWS\SYSTEM32\drivers folder.
 - (d). Install KD30 by double-clicking on KD30V3R1_e.exe in \tools\kd30 folder, which can be found on the CD root. It will create C:\Mtool\KD30 directory on your PC.
 - (e). Copy communi.dll and kd30dll.def from \Tools\ICD\KD30V3R1 folder of the CD to the C:\Mtool\KD30 directory.
 - (f). Right-click on kd30.exe file on \Mtool\KD30 directory and select 'Send to Desktop (create a desktop shortcut).

C.2 Driver Problems

This part discusses the usual problems with the driver installation and how to fix it. The most common problem encountered is, Windows did not properly install the driver and so the ICD is not recognized. This may also cause the device status to indicate that the device is not working properly. An indication of this problem is the ICD's Status LED (yellow), it should be blinking at about 2-3 times a second. When the driver is installed properly, the Status LED only blinks every second.

Before trying the following steps, try re-starting your PC to see if this resolves the problem. You can check the status using the Device Manager. If the ICD appears under the Universal Serial Bus Controllers with NO red X or yellow exclamation point, the driver was installed properly.

For cases where the 'Device Status' states the device is not working properly, please try the following:

1. Double-click on 'Renesas USB ICD' and a Renesas USB ICD Properties dialog box appears.
2. Click on 'Driver' tab and click on 'Update Driver' button.
3. Select 'Display a list...' and click on 'Have Disk' button.
4. Locate the C:\MTOOL\FOUSB\USB Drivers folder and install 'usbmon.sys' driver.
5. If this process does not work, please follow instructions below.

For cases where in the driver was not installed properly by Windows (Windows 98, Windows 2000) or not listed in the Device Manager > Universal Serial Bus Controllers, please try the following:

1. Unplug the USB Cable so Windows removes driver from memory.
2. Delete the driver 'usbmon.sys' from '\WINNT\SYSTEM32\DRIVERS\' folder in Windows 2000 or \WINDOWS\SYSTEM32\DRIVERS folder in Windows 98.
3. Plug in ICD + target and try installing the driver as written above and use the driver from the C:\MTOOL\FOUSB\USB Drivers.

C.3 KD30 Problems

The common problems encountered with KD30 are: USB cannot be selected on the initialization screen, cannot connect to target, and KD30 already exist. This part discusses the cause of the problem and the countermeasures to resolve it.

When USB cannot be selected, you have an old version of KD30. Un-install the current version and delete the KD30 folder under C:\MTOOL. Run the latest KD30 install from the SKP CD or download the file from the Renesas Tools website.

When the message 'Can't connect with the target' is displayed, there are several reasons that may cause this message to appear. We'll discuss each cause and the corresponding countermeasure.

- (1) The ICD is not connected to the PC. Please connect the ICD to your PC.

NOTE:

Regardless of whether the ICD is bus or target powered, please connect target board to ICD first before plugging the USB cable to your PC.

- (2) The ICD to target cable is not connected. Please connect the ICD to the target board using the 10-pin flat ribbon cable.
- (3) There is insufficient bus power to run the ICD and target board. Bus power can supply up to 100mA to both ICD and SKP boards. Renesas SKP boards were designed so that the combination of ICD and SKP board will be under 100mA limit. If your target board is a non-Renesas SKP board, change the S1 Power Mode switch to TARGET and connect an external power supply to your target board.
- (4) The target MCU programmed on the ICD during KD30 initialization does not match the actual target MCU. Close the error message by clicking on 'OK' button and then click on 'Cancel' button of the KD30 Init window to close KD30. Select the correct MCU from the Refer button of the KD30 Init screen.
- (5) The hardware connection on the target board does not follow the specification for connection between the ICD and target board. Please review the connection and check your circuit. Refer to section 7 in this manual, 'Target Hardware Connectivity for In-Circuit Debugging'.
- (6) The target MCU maybe damaged. Try a different target board and MCU.

When a message 'KD30 already exists' is displayed, the usual reason for this problem is that the KD30 application was not properly closed. Please check if KD30 is already running by looking at your task bar. If KD30 cannot be found there, bring up Task Manager (for Windows 2000, right-click on Task Bar and select 'Task Manager'; for Windows 98, ME or XP, press CTRL-ALT-DEL and select 'Task Manager'). Select KD30.exe on the 'Processes' list and click on 'End Process' to terminate KD30.

C.4 FoUSB Programmer Problems

This section describes common problems, causes, and countermeasures when working with the FoUSB Programmer. The common problems with FoUSB Programmer are: FoUSB Programmer does not come up, device is not detected, or target is not connected.

When FoUSB Programmer does not come up properly, the main reason is that the MCU text file list folder does not exist on the folder where the FoUSB Programmer executable is. The MCU text file is a list of all MCU's that the FoUSB Programmer supports. Please read 'Installing Required Files Manually' on running fousb.exe to fix the problem.

If you encounter a 'device is not detected', the possible causes and countermeasures are listed below.

- (1) The ICD and target board is not connected to the PC. Please plug one end of the USB cable to the ICD and the other end to the PC. Make sure you connect the ICD to the target board first before plugging the USB cable to the PC.
- (2) The FoUSB Programmer driver (fousb.inf and fousb.sys) was not installed properly. Please refer to section C.1, 'Installing Required Files Manually'.
- (3) The ICD has no user ROM firmware. Please refer to section C.5, 'Using the ICD's Boot Mode' to program the user ROM firmware.

If you encounter a 'target is not connected', the possible causes and countermeasures are listed below.

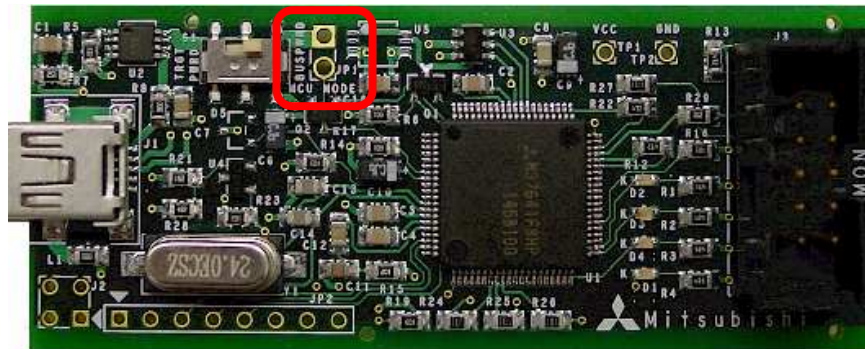
- (1) The target board is not connected to the ICD. Please unplug the USB cable first and then connect the target board to the ICD with the 10-pin flat ribbon cable before plugging back the USB cable to your PC.
- (2) The target MCU is not a flash version. The ICD can only communicate with M16C flash MCU's through it's boot program. Please verify if the target MCU is a flash part.
- (3) The hardware connection on the target board does not follow the specification for connection between the ICD and target board. Please review the connection and check your circuit. Refer to section 6 in this manual, 'Target Hardware Connectivity for In-System Programming'.
- (4) The target MCU maybe damaged. Try a different target board and MCU.

C.5 Re-programming the ICD

This section discusses how to re-program the ICD if for some reason the user ROM firmware was erased or damaged. A good indication that the ICD needs to be re-programmed is when there is no yellow LED flashing, yet the red power LED is on.

The ICD has a boot mode that can be used to program the user ROM area. When the ICD was shipped, the user ROM firmware was pre-programmed with firmware that can communicate with the FoUSB Programmer and KD30 Debugger. However, in the event that this firmware got erased or damaged, you can use this boot mode to re-program the ROM firmware.

- First unplug the USB Monitor board from both its target and from the USB cable.
- Remove the black plastic case.
- Shunt JP1 with a 2.54mm (.100 mil) jumper or using a bent paper clip, short the 2 hole jumper labeled MCU Mode. This will configure the ICD to run in boot mode when it is powered up.



- Plug the USB cable back in. The ICD will now be in boot mode and will communicate as a USB device to the PC. The ICD uses a different USB Driver than the USB Monitor application, so we will need to load another USB Driver. The driver is located in C:\MTOOL\FOUSB\USB Driver\.
- Once the driver is loaded, open Flash-Over-USB again. Note that the MCU device name displayed in green on the front screen will automatically change to **M37641F8** without having to select that device.



- Also, a **Load MMI** button will appear on the right. Click on the **Load MMI** button and select your target MCU device and let FoUSB re-program the ICD.
- Remove the paper clip, unplug the USB Cable and enclose the board back into its case. Now re-attach the ribbon cable to your target board and re-connect the ICD to your PC with the USB cable.
- If you plug the ICD into the PC, the FoUSB Programmer should show the target MCU device name you selected earlier. If for some reason, it still does not come up, your ICD may have been damaged. Please contact your Renesas representative to get a replacement.

Appendix D. Reference Manuals

Item	Title	Description
1.	RTA-FOUSB-MON Quick Start Guide	Document that will help you get started on using the ICD.
2.	RTA-FOUSB-MON User's Manual	This document.
3.	ICD Board Schematic	Schematic diagram for the ICD board.
4.	ICD Board BOM	Bill of materials for the ICD board.
5.	M16C/20/60 Series C-Language Programming Manual	ANSI C-language programming guide for the M16C/20/60 series MCU.
6.	M16C/20/60 Series Assembler Language Programming Manual	Assembly language programming guide for the M16C/20/60 series MCUs.
7.	HEW User's Manual	This document describes installation and operation of this Integrated Development Environment for Renesas' Tools.
8.	KD30 User's Manual	The HELP file that runs with KD30 provides all user manual information.
9.	AS30 User's Manual	Guide for AS30 assembler.
10.	NC30 User's Manual	Guide for NC30WA compiler.
11.	Target Setup for In-Circuit Debugger	Application note for ICD
12.	Target Setup for FoUSB Programmer	Application note for FoUSB
13.	Firmware Requirements for In-Circuit Debugger Support	Application note for ICD

NOTE:

The RTA-FOUSB-MON installer will copy all these manuals during installation. They can be accessed using the Document Descriptions file by clicking on the Start > Programs > Renesas-Tools > RTA-FOUSB-MON > Document Descriptions.

Appendix E. Board Schematic & BOM

The circuit board schematic and BOM are available as separate documents,

RTA-FoUSB-MON_Schematic_RevX.pdf and
RTA-FoUSB-MON_Board_BOM_RevX.pdf respectively.