

MITSUBISHI SINGLE-CHIP MICROCOMPUTER

M16C/62 MiniEmulator

(MSA0652 G01/G02)

USER'S MANUAL

keep safety first in your circuit designs !

- ✦ Mitsubishi Electric Corporation puts the maximum effort into making semiconductor products better and more reliable, but there is always the possibility that trouble may occur with them. Trouble with semiconductors may lead to personal injury, fire or property damage. Remember to give due consideration to safety when making your circuit designs, with appropriate measures such as (i) placement of substitutive, auxiliary circuits, (ii) use of non-flammable material or (iii) prevention against any malfunction or mishap.

Notes regarding these materials

- ✦ These materials are intended as a reference to assist our customers in the selection of the Mitsubishi semiconductor product best suited to the customer's application; they do not convey any license under any intellectual property rights, or any other rights, belonging to Mitsubishi Electric Corporation or a third party.
- ✦ Mitsubishi Electric Corporation assumes no responsibility for any damage, or infringement of any third-party's rights, originating in the use of any product data, diagrams, charts or circuit application examples contained in these materials.
- ✦ All information contained in these materials, including product data, diagrams and charts, represent information on products at the time of publication of these materials, and are subject to change by Mitsubishi Electric Corporation without notice due to product improvements or other reasons. It is therefore recommended that customers contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for the latest product information before purchasing a product listed herein.
- ✦ Mitsubishi Electric Corporation semiconductors are not designed or manufactured for use in a device or system that is used under circumstances in which human life is potentially at stake. Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor when considering the use of a product contained herein for any specific purposes, such as apparatus or systems for transportation, vehicular, medical, aerospace, nuclear, or undersea repeater use.
- ✦ The prior written approval of Mitsubishi Electric Corporation is necessary to reprint or reproduce in whole or in part these materials.
- ✦ If these products or technologies are subject to the Japanese export control restrictions, they must be exported under a license from the Japanese government and cannot be imported into a country other than the approved destination. Any diversion or reexport contrary to the export control laws and regulations of JAPAN and/or the country of destination is prohibited.
- ✦ Please contact Mitsubishi Electric Corporation or an authorized Mitsubishi Semiconductor product distributor for further details on these materials or the products contained therein.

Microsoft, MS, and MS-DOS are registered trademarks of Microsoft Corporation of the U.S.

Windows95 and Windows98 are trademarks of Microsoft Corporation of the U.S.

IBM and PC/AT are registered trademarks of International Business Machines Corporation of the U.S.

Pentium is a trademark of Intel Corporation of the U.S.

Adobe and Acrobat are registered trademarks of Adobe Systems Incorporated.

Preface

Thank you for purchasing Mitsubishi's M16C/62 MiniEmulator.

This manual describes how to use the hardware and software products included with M16C/62 MiniEmulator. To other tools , look other tools's manulas.

Table of Contents

1. Contents of Product Package	1
1.1. M16C/62 MiniEmulator Product List	1
1.2. CD-ROM	2
1.2.1. Software Products	2
1.2.2. Monitor Program and other programs	3
1.2.3. Electronic Manuals	3
1.3. System Requirements	4
2. Gurantee and Support	5
2.1. Gurantee	5
2.2. Support	5
3. System Configuration	6
3.1. Host Computer	7
3.2. MiniEmulator (MSA0652 G01/G02)	7
3.3. Remote Debugger (KD30)	7
3.4. Compiler (KNC30WA)	8
3.5. S/W for programming MCU's Internal The Flash memory (Flash Writer)	8
4. Setting Up Hardware	9
4.1. Connecting Each Unit	9
5. Setting Up Software	11
5.1. Operating Environment	11
5.2. Installing KD30	12
5.2.1. Installation Procedure	12
5.2.2. Starting Up KD30	12
5.3. Installing KNC30WA	14
5.3.1. Installation Procedure	14
5.3.2. Checking Operation of KNC30WA	15
5.2.3. Quitting KD30	14
5.4. Installing FlashWriter	16
5.4.1. Installation Procedure	16
5.4.2 stating Up FlashWriter	16
5.4.3 Quitting FlashWriter	17
5.5. Uninstalling KD30	19
5.6. Uninstalling KNC30WA	19
5.7. Uninstalling FlashWriter	19
5.8. Referencing Electronic Manuals	19

6. Usage Precautions	19
6.1. Limitations on Pin Usage	19
6.2. Limitations on Using M16C/62 Peripheral Functions	19
6.3. Memory Map	20
6.4. Status After Reset	21
6.5. Restrictions on Register Operation	22
6.6. Restrictions on Interrupts	23
6.7. Restrictions on Breakpoints	24
6.8. Restrictions on STOP Modes or WAIT Modes	24
6.9. User Programs Real-time Capability	25
6.10. Exceptional Step Execution	25
6.11. Performing Debug Using Symbols	27
6.12. Corrective Action when Communication Error Occurs at Start up	27
6.13. Corrective Action when Communication Error Occurs During Debug	28
6.14. Corrective Action when Error Occurs During Download	28
7. How to Modify The Monitor Program	29
7.1. How to modify	29
7.2. Modify files	30
7.3. Limit of Frequency	32
8. MSA0652 G01/G02	33
8.1. External Specifications	33
8.2. Power Supply Requirements	34
8.3. Environment Requirements	35
8.4. Block Diagram	35
8.5. Memory Map	36
8.6. Using MSA0652	37
8.6.1. Connect Requirements	37
8.6.2. Jumper Set	38

1. Contents of Product Package

This section shows the contents of the M16C/62 MiniEmulator product package(MSA0652-G01/G02). When unpacking your M16C/62 MiniEmulator, check to see that all products listed below are included.

1.1. M16C/62 MiniEmulator Product List

Table 1-1 lists the products included in the M16C/62 MiniEmulator.

Product Name	Quantity	Remark
M16C/62 MiniEmulator MSA0652-G01 or G02	1 pc.	
Serial cable exclusive to M16C/62 MiniEmulator (Used to connect the host computer)	1 pc.	
LCC socket (IC61-1004-051)	1	For user's target
CD-ROM	1	Compiler KNC30WA Remote debugger KD30 Flash Writer S/W Manuals Sample Program Monitor Program

Table 1-1. M16C/62 MiniEmulator Product List

1.2. CD-ROM

The CD-ROM contains software products necessary for developing programs and electronic manuals as well. Here follow the contents of the CD-ROM.

CD-ROM — English : for English version
 — Japanese : for Japanese version

Other directories under English directory show next part.

1. Contents of Product Package

1.2.1. Software Products

1.MSA0652 directory

Include MSA0652G01/G02's manual.

2.KD30 directory

This directory contains various files available for KD30. The contents of this directory are listed in Table 1-2.

3. KNC30WA directory

This directory contains various commands available for KNC30WA. The contents of this directory are listed in Table 1-3.

4. FlashWriter directory

This directory contains various commands available for Flash Writer. The contents of this directory are listed in Table 1-4.

5. Acrobat directory

This directory contains various commands available for Acrobat Reader. The contents of this directory are listed in Table 1-5.

Directory Name	Content	Outline
\KD30 \Manual	kd30ue.pdf	KD30's manual(English)
\KD30 \setup	setup.exe	Setup-file for KD30(English)
	.	Setup other files

Table 1-2. Contents of KDB30 Directory

Directory Name	Content	Outline
\KNC30WA \Manula	as30ue.pdf	KAS30's manual(English)
	nc30ue.pdf	KNC30's manual(English)
\KNC30WA \setup	setup.exe	Setup file for KNC30WA(English)
	.	Setup other files

Table 1-3. Contents of KNC30WA Directory

Directory Name	Content	Outline
\FlashWR	M16CFlash.exe	Flash Writting S/W for Moniter program
	Manula_e.pdf	Flash Writer S/W's manual(English)

Table 1-4. Contents of FlashWriter Directory

Directory Name	Content	Outline
\Acrobat \Setup	Ar32e301.exe	Setup file for Acrobat Reader3.0(English)
	Readme.txt	Readme(English)

Table 1-5. Contents of Acrobat Directory

1.2.2. Moniter Program and other programs

Moniter program and other programs are listed inTable 1-6.

Directory Name	Content	Outline
\Program \moniter \mot	*.mot	S format file of Moniter program
\Program \moniter \source	*.*	Source files of moniter program
\Program \sample	*.*	Sample programs

Table 1-6. Contents of Moniter program and other programs Directory

1.2.3. Electronic Manuals

- M16C/62 Group Data Sheet (files in PDF)
- M16C/62 Group User's Manual (files in PDF)
- M16C/60 Series Software Manual (files in PDF)
- M16C/60 Series Programming Manual for Assembly Language (files in PDF)
- M16C/60 Series Programming Manual for C Language (files in PDF)
- M16C/60 Series Collection of Sample Programs (files in PDF)

1.3. System Requirements

In addition to the products listed above, you must have the following equipment before you can use the M16C/62 Mini Emulator.

- Personal computer
For details about a personal computer, refer to Section 5.1, "Operating Environment."
- Power supply
For details about power supply requirements, refer to Section 8.2, "Power Supply Requirements."

2. Gurantee and Support

2.1. Gurantee

(HardWare)

In one year , We troubleshoot your problem with no charge provided that you use this product in an environment stated under Section 8 and you use under Section 6. One year later or when you use this product besides a method mentioned above , we repair it by compensation.

Hardware)

- MSA0652G01/G02
- Serial Cable (MF_Ten_Nine cable)

In requesting the repair of this product , contacts your distributor or nearest office of Mitsubishi Electric.

(SoftWare)

In one month, We change it no charge , when it's medium breaks down. There is not a guarantee except this.

Software)

- KNC30WA
- KD30
- FlashWriter

2.2. Support

You can have support of this product and the latest infomation about it referred to from hamepage. Please make use of it.

URL: <http://www.infocom.mesc.co.jp/M16C/mctope.htm>

3. System Configuration

The following lists the hardware and software products required for using the product.

1. Host computer (No Package)
2. M16C/62 MiniEmulator (MSA0652G01 / G02)
3. Serial cable exclusive to the cable debugger
4. Remote debugger KD30
5. Compiler KNC30WA
6. Power supply (No Package)
7. S/W for programing internal Flashmemory

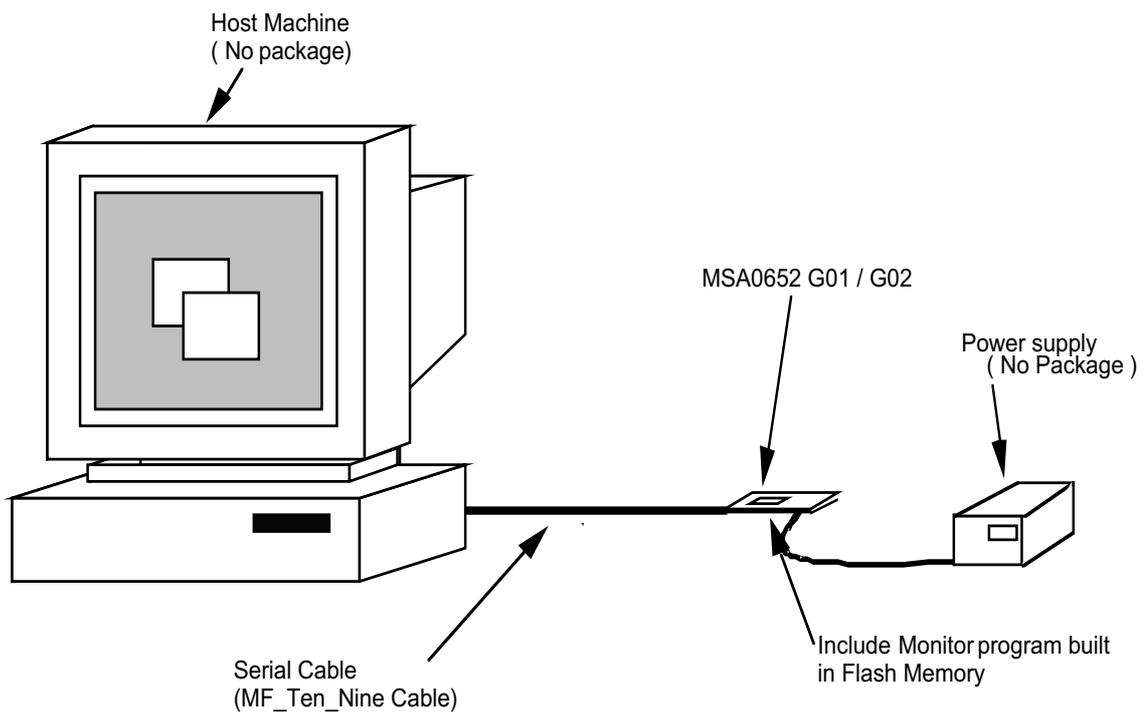


Figure 3-1 shows a system configuration of the product

3.1. Host Computer

KD30 and KNC30WA run on the host computer listed in Table 3-1 below.

Table 3-1. Host Computer

Host Computer Name	OS
IBM PC/AT series or its compatible	Microsoft Windows 95
	Microsoft Windows 98

3.2. M16C/62 MiniEmulator (MSA0652 G01/G02)

The MiniEmulator incorporates the M16C family of Mitsubishi's 16-bit single-chip microcomputer. (MSA0652G01 : M30624FGLFP , MSA0652G02 : M30624FGFP) A debugging monitor program has been written to the microcomputer M16C mounted on the board.

3.3. Remote Debugger (KD30)

KD30 is a remote debugger that runs on the host computer. While communicating with the debug monitor program, this debugger provides a highly efficient evaluation environment. This debugger is compatible with PD30 at operation level. PD30 is the debug software used to control Mitsubishi's M16C emulators.

The following lists the KD30 features)

- 1) Source line debug for assembly language , structured assembly language , C language.
- 2) KD30 have go command with 2 point breakpoint.
- 3) KD30 have RAM monitor function.
RAM monitor function is that dump command practice with any cycle.
- 4) KD30 have window for variable of C language.

3.4. Compiler (KNC30WA)

KNC30WA is the C compiler for the M16C family. KNC30WA generates debug information files from C language and the assembly language source files.

The following lists the KNC30WA features:

- KNC30WA can compile a source file consisting of less than 500 lines.
- Program's ROM size is within 64Kbytes.

KNC30WA is upward compatible with the compiler for the M16C family (NC30WA). All programs developed using KNC30WA can be compiled by NC30WA in the same way.

3.5. S/W for programming MCU's Internal The Flash memory (Flash Writer)

FlashWriter is a windows software. FlashWriter will changed the monitor program.

4. Setting Up Hardware

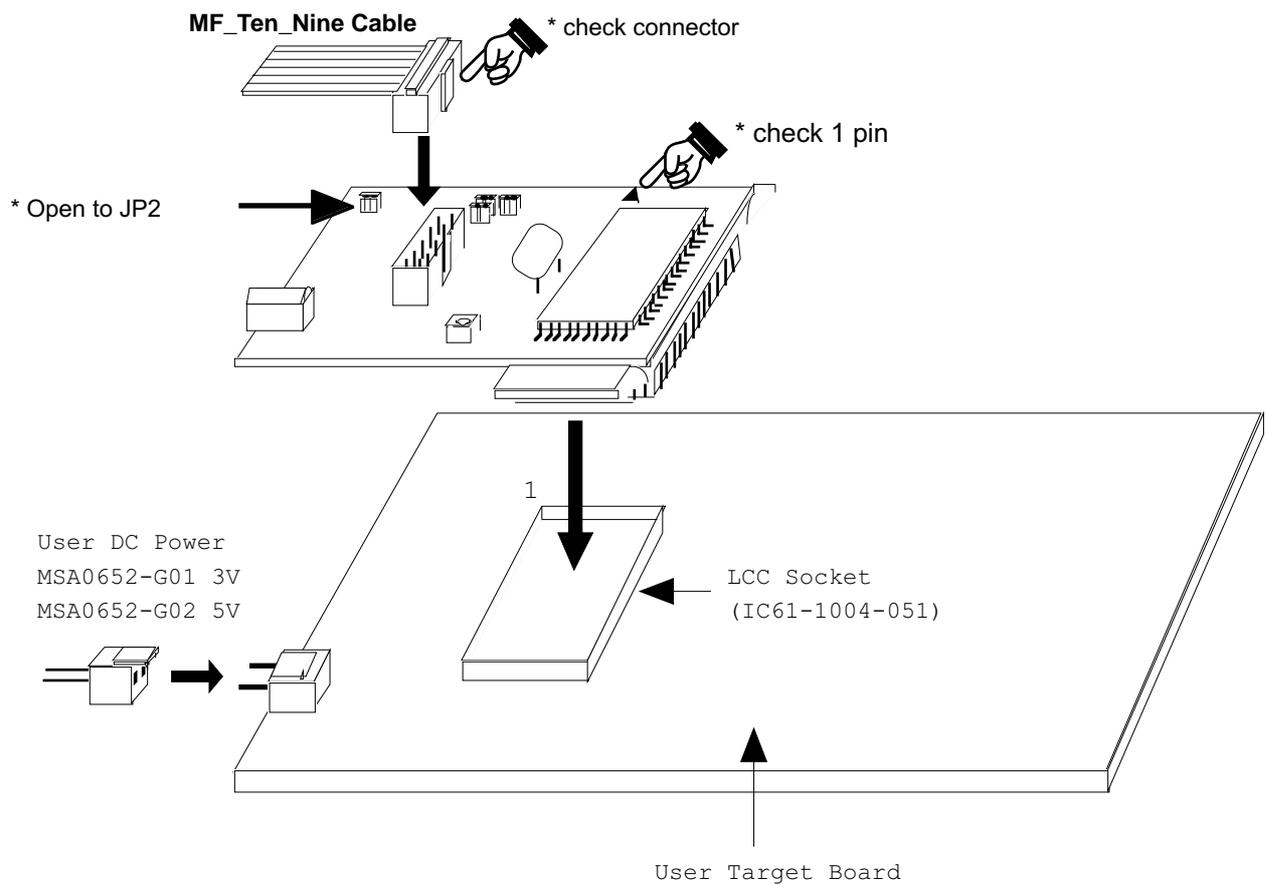
4.1. Connecting Each Unit

MSA0652 G01/G02 have 3 movement modes. These modes are different connect to each unit.

- 1) Connect the user target board
- 2) Stand-alone
- 3) Connect the option's target board (MSA0654-G10)

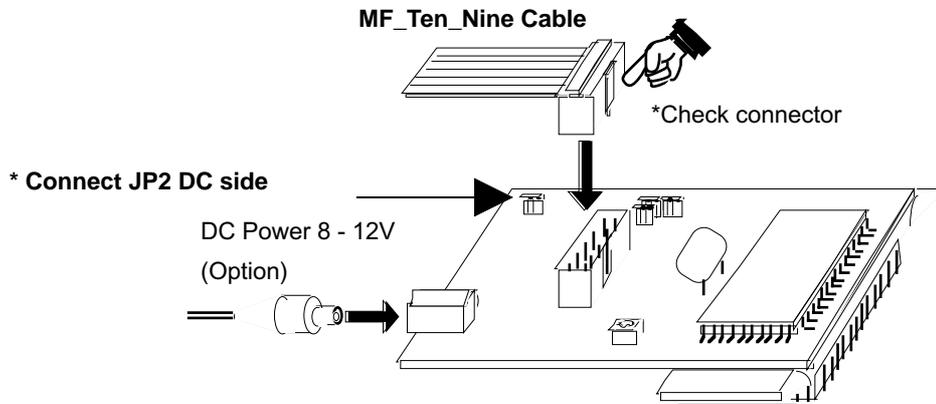
- 1) Connect the user target board

Need open to JP2

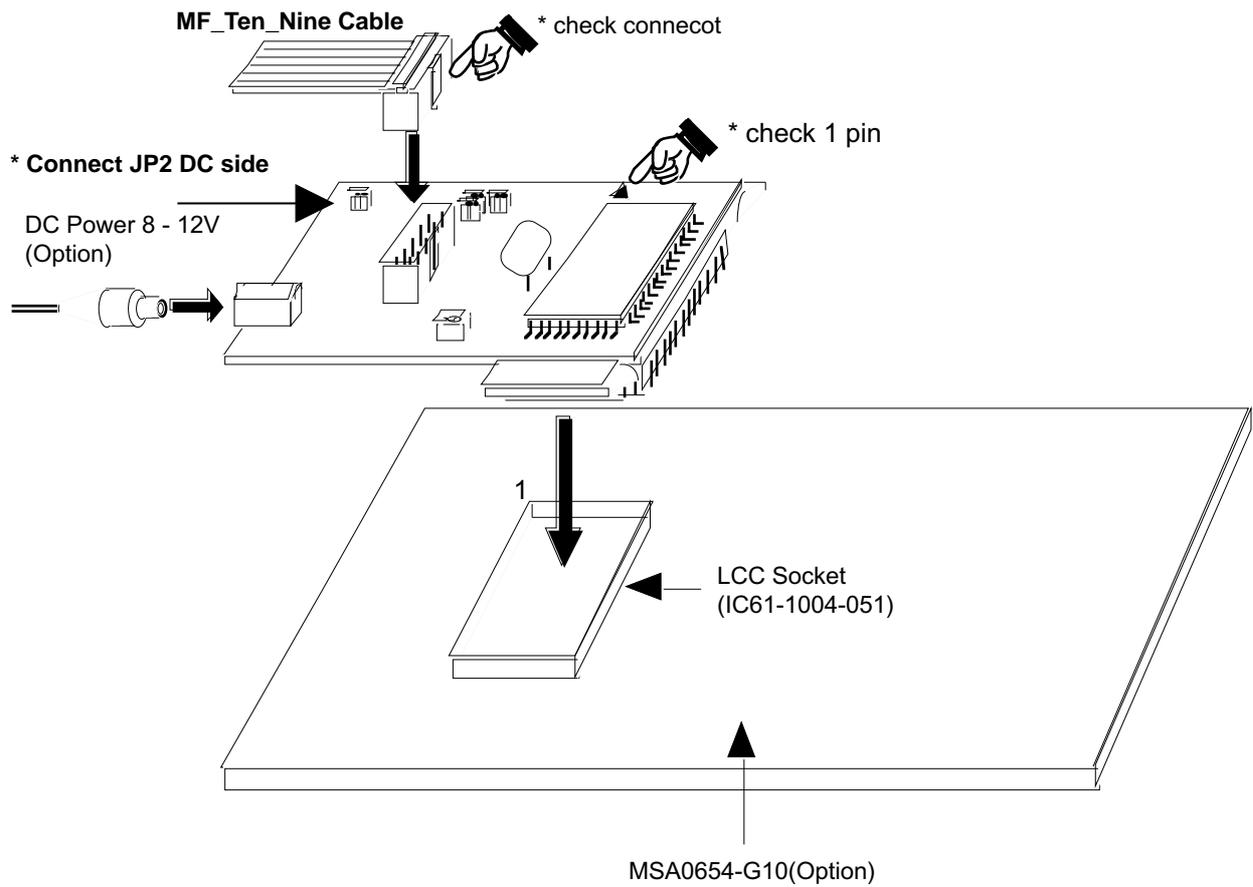


4. Setting Up Hardware

2) Stand-alone



3) Connect the option's target board (MSA0654-G10)



5. Setting Up Software

5.1. Operating Environment

The software include MSA0652G01/G02 on the host computer under the OS version that are listed respectively in Table 5-1.

Table 5-1. Operating Environment

Host Computer	IBM PC/AT series and its compatible
OS	Microsoft Windows 95 , Microsoft Windows 98
CPU	486DX4-100 MHz or Pentium 75 MHz or newer recommended
Memory	8 Mbytes or more (16 Mbytes recommended)

** Operation of KNC30WA30 on Windows 95 or Windows 98**

KNC30WA operates from the DOS prompt of Microsoft Windows 95 or Windows 98.

** Operation of KNC30WA and KD30 on Windows 95 or Windows 98**

No special character (include space code) can be included in the file name. Nor can a network drive name be used for KNC30WA and KD30. When using a network drive name, be sure to assign it to the drive

5.2 Installing KD30

5.2.1 Installation Procedure

Follow the procedure described below to install KD30.

1. Run ' setup.exe ' in English\KD30\setup on CD-ROM.
2. Display the install's window , and install under the window.

5.2.2 Starting Up KD30

Before you can start up KD30, you must first set up hardware. For this setup, refer to Section 4, Setting Up Hardware.”

To start up KDB30, click [start] - [program] - [MITSUBISHI-TOOL] - [KD30] for Windows 95. When you call up KD30, an Init dialog box (Figure 5.1) appears. Use this dialog box to set the operating environment required for start-up of KD30.

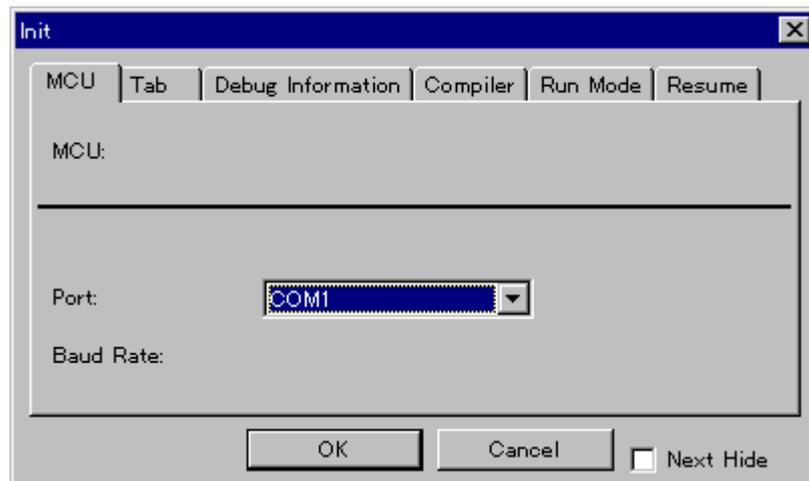


Figure 5-1. Init Window

The Init dialog box is detailed in KD30's manual. Here, set the following item to ensure that KD30 starts up normally.

When you have finished setting the above, click on the <OK> button in the Init dialog box. If communication between MSA0652G01/G02 and personal computer is performed normally, KD30 starts up automatically and a window like the one shown in Figure 5-2 appears.



Figure 5-2. KD30 window

If MSA0652 G01/G02 fails to communicate with the personal computer, an error dialog box like the one shown in Figure 5-3 or Figure 5-4 appears.



Figure 5-3. Example of error dialog box1 at start-up



Figure 5-4. Example of error dialog box2 at start-up

5. Setting Up Software

When you click on the <OK> button in this error dialog box, the Init dialog box pops up again. If this error dialog box is displayed, refer to Section 6.12, "Corrective Action when Communication Error Occurs at Start up".

KD30 detail operation read KD30 manual.

5.2.3. Quitting KD30

To quitting KD30, select the menus [File] -> [Exit]. When you select the Exit menu, the warning dialog box shown in Figure 5-5 appears, so click on the <OK> button. If you click on the <Cancel> button, KD30 is not terminated.

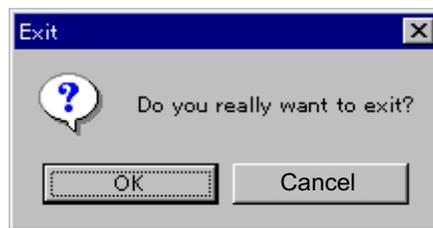


Figure 5-5. Exit Window

5.3. Installing KNC30WA

5.3.1. Installation Procedure

1. Run ' setup.exe ' in English\KNC30\setup on CD-ROM.
2. Display the install's window , and install under the window.
3. When install , display message of change 'Autoexec.bat' file.When not change 'Autoexec.bat' file, change 'Autoexec.bat' file yourself under part.

Add the following lines to AUTOEXE.BAT:

```
SET BIN30=(Install directory)\BIN30
SET LIB30=(Install directory)\LIB30
SET INC30=(Install directory)\INC30
SET TMP30=(Install directory)\TMP
PATH=%PATH%;%BIN30%
```

4. computer restart after install.

< Caution >

KNC30WA uses the same environment variables as used by NC30WA. Note that if you are using NC30WA in combination with KNC30WA, the same environment variables are referenced.

5.3.2. Checking Operation of KNC30WA

Input the following command to check that KNC30WA operates normally.

- Command input

>KNC30 -v

- Result

All program versions are displayed as shown below:

```
M16C/60 KNC30 COMPILER V.1.00
Copyright 1988 MITSUBISHI ELECTRIC CORPORATION
and MITSUBISHI ELECTRIC SEMICONDUCTOR SYSTEMS CORPORATION
All Rights Reserved.
```

- If KNC30WA does not start up...

(1)Check to see if the command path PATH is set correctly.

(2)If " a Windows NT character-mode" appears when executing a command, check the settings of the DOS window given below.

1)Choose the property of the DOS window.

2)Choose the button for "Advanced Program Settings" of program tag.

3)Remove the check in the check box of:

Prevent MS-DOS -based programs from detecting Windows.

4)Close the DOS window, then execute the command again.

- If version numbers are not displayed...

Check to see if each command (listed in Section 1.2, Software Product List) is expanded correctly in the directory you have specified for BIN30.

5.4. Installing FlashWriter

5.4.1. Installation Procedure

1. Create a directory on the personal computer's hard disk where you want the software to be installed.
2. Copy all the contents of the directory English\KDB30 held in the CD-ROM to the directory created in step 1.

5.4.2. Stating Up FlashWriter

Before you can start up KD30, you must first connect the serial cable (MF_Ten_Nine cable) to MSA0652.

To start up KDB30, click 'M16Cflash.exe in a created directory.

When you call up FlashWriter, a windows appears.(Figure 5-6) Select a baud rate in purudown list.

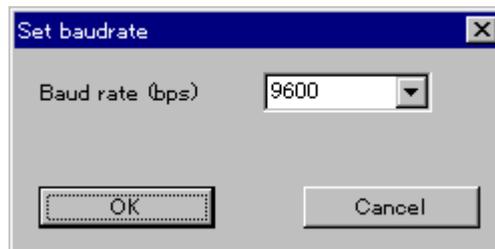


Figure 5-6. Set baud rate Window

When click <OK> button , a windows appears.(Figure 5-7)

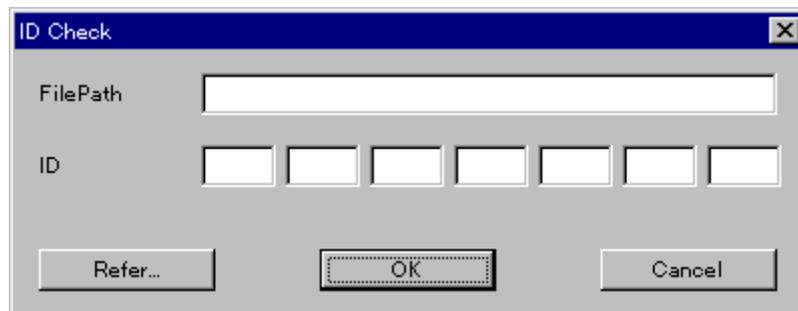


Figure 5-7. ID check Window

Detail operation of ID check Window and FlashWriter check FlashWriter's manual.

When Figure 5-8 appears , please check to connection between MF_Ten_Nine cable and MSA0652G01/G02 or power on MSA0652G01/G02.



Figure 5-8. Connection error Window

5.4.3. Quitting FlashWriter

When FlashWriter quit. click <Exit> on Figure 5-9.

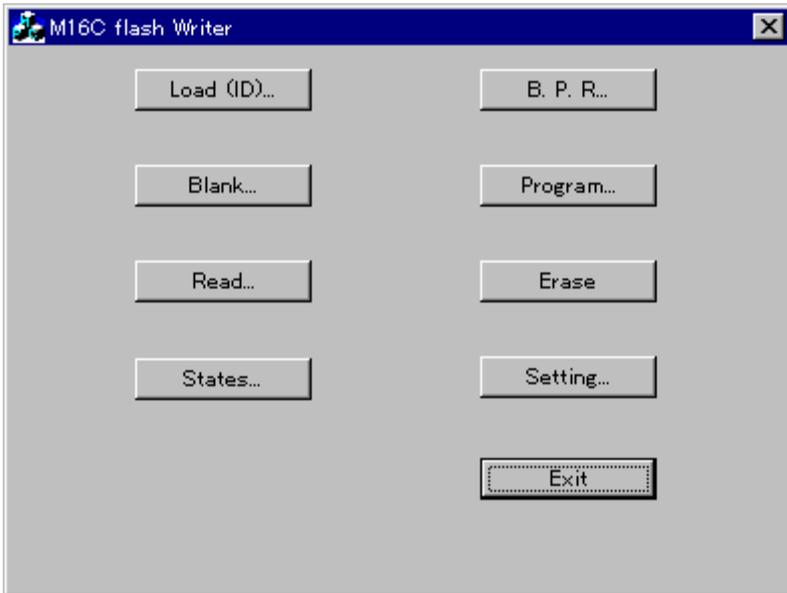


Figure 5-9. Main Window

5.5. Uninstalling KD30

To uninstall KD30. appears [start] - [setting] - [control panel] and click <add and move>. Select a <KD30 Ver2.00> in any list , click <add and move>. Appears uninstalling window , uninstall KD30.

5.6. Uninstalling KNC30WA

To uninstall KNC30WA. appears [start] - [setting] - [control panel] and click <add and move>. Select a <KNC30WA Ver1.00> in any list , click <add and move>. Appears uninstalling window , uninstall KNC30WA.

5.7. Uninstalling FlashWriter

To uninstall FlashWriter. Delete a FlashWriter's directory.

5.8. Referencing Electronic Manuals

Electronic Manuals of the Product are in the form of files in PDF (portable document format). To reference them, the user needs Adobe Acrobat Reader, which is held in the CD-ROM attached, so install it when necessary.

- Start up the installer on the CD-ROM holding the product.
- Install Adobe Acrobat Reader according to what are contained in the Readme file.

The user can download Adobe Acrobat Reader from the home page of Adobe Systems Incorporated. For latest information as to Adobe Acrobat Reader, go to the following URLs.

<http://www.adobe.co.jp>

<http://www.adobe.com>

6. Usage Precautions

This section describes the precautions to be observed when using MSA0652G01/G02. Always be sure to read this section before you use MSA0652G01/G02.

Table 6-1. List of Usage Precautions

Item	Sections To See
Precautions on creating programs	6.3, "Memory Map" 6.5, "Restrictions on Register Operation" 6.6, "Restrictions on Interrupts"
Precautions on debugging programs	6.7, "Restrictions on Breakpoints" 6.8, "Restrictions on STOP Modes or WAIT Modes" 6.9, "User Program's Realtime Capability" 6.10, "Exceptional Step Execution"

6.1. Limitations on Pin Usage

(1) CNVss pin

Apply a low signal to the CNVSS pin.

(2) TxD1 and RxD1 (UART1) pins

These pins are used to communicate with the host computer. Do not connect these pins to any other pins.

(3) NMI pin

Apply a high voltage to NMI pin. And inhibit NMI Interrupt.

6.2. Limitations on Using M16C/62 Peripheral Functions

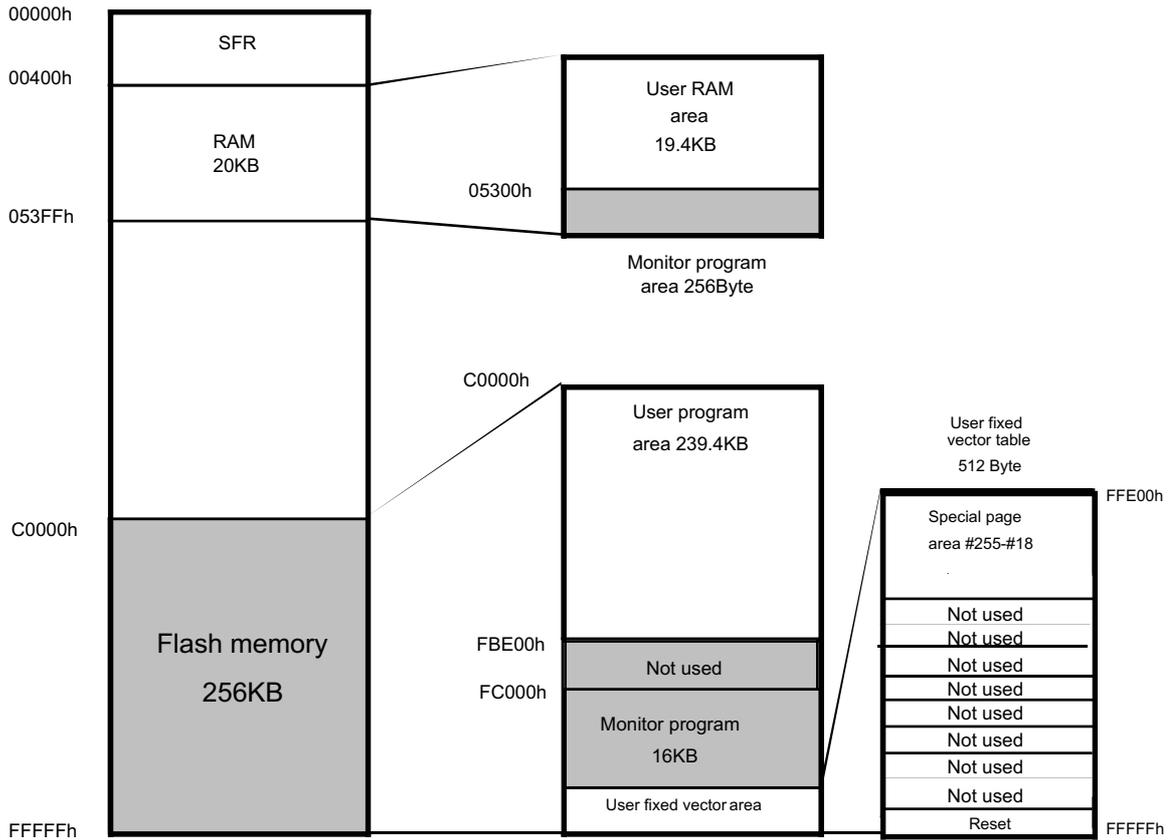
The UART1 transmit and receive interrupts are used for communication between the monitor program and the host computer.

UART1 cannot be used in the user program.

6.3. Memory Map

Figure 6-1 shows the MSA0652G01/G02's memory map.

The area the user can use is as much as [internal RAM area - 19.4Kbyte , internal FlashROM area - 239.4Kbyte].



For use internal RAM 20Kbyte , internal ROM 256Kbyte, The monitor program write '1' to bit of Processor Mode Register 1's internally reserved area extension.

Figure 6-1. MSA0652G01/G02's memory map

6.4. Status After Reset

Table 6-2 lists the registers that are initialized by the monitor program when MSA0652G01/G02 is reset. The status of all other registers depends on the microcomputers internal operation performed after a reset.

Table 6-2. Initial Register Values after Reset

Register Name	Initial Value
Processor mode register 0	Initialized to 00_{16} . Processor mode: Single-chip mode
Processor mode register 1	Initialized to 08_{16} . Internally reserved area extension
System clock control register 0	Initialized to 08_{16} .
System clock control register 1	Initialized to 20_{16} . Selected main clock divide ratio: Not divide
ISP (interrupt stack pointer)	Initialized to $044FF_{16}$.
UART1 Transmit/Receive Mode Register	Initialized to 05_{16} .
UART1 Transfer Speed Register	Initialized to $1A_{16}$.
UART1 Transmit/Receive Control Register 0	Initialized to 10_{16} .
UART1 Transmit/Receive Control Register 1	Initialized to 05_{16} .
UART1 Interrupt Control Register 0	Initialized to 07_{16} .
UART transmit/receive control register 2	Initialized to 03_{16} .

6.5. Restrictions on Register Operation

Table 6-3 lists the restrictions on register operation. If you modify the content of a register which is inhibited against modification, the operation of the monitor program cannot be guaranteed.

Table 6-3. Restrictions on Register Operation(1/2)

Register Name	Restriction
Processor mode register 0	Do not modify this register.
Processor mode register 1	When changing this register in the user program, always be sure to set bit 3 to 1.
ISP	Set a value below 05300H. Values 05300H through 053FFH are used by the monitor program.
Protect register	If the monitor program starts immediately after Protect Register bit 2 (Port P9 Direction Register and SI/O3,4 Control Register write enable bit) is set to 1 (enabled), a write to some address by the monitor program occurs, so that the P9 Direction Register write enable bit is reset to 0 (disabled). Consequently, the P9 Direction Register cannot be written to in the following cases: <ol style="list-style-type: none"> 1) When a break to at the instruction that sets the write enable bit to 1 occurs 2) When Go, Step, Over, or Return to the instruction that sets the write enable bit to 1 is executed 3) When the P9 Direction Register is operated on from the dump window, etc.
Flag register	Write to the D flag and I flag is ignored. (Always D flag is 0 , I flag is 1.)

Table 6-3. Restrictions on Register Operation(2/2)

Register Name	Restriction
UART1 transmit/receive mode register	Don't make changes.
UART1 bitt rate generator	
UART1 transmit/receive control register 0	
UART1 transmit/receive control register 1	
UART1 interrupt control register 0	
UART transmit/receive control register 2	Don't change bits 0, 2, 4, 5, and 6
UART1 transmit buffer register	Don't write any data to this register.
UART1 receive buffer register	Don't read this register.

6.6. Restrictions on Interrupts

1) Interrupt vector tables that reside in the fixed vector table

Interrupt vector tables that reside in the fixed vector table are not use the user program except reset. When used Interrupt vector tables that reside in the fixed vector table, will be change that they not run. The monitor program sets dummy function (REIT function) on Interrupt vector tables that reside in the fixed vector table.

Table 6-4. Interrupt Vector Table Addresses

Interrupt Cause	Specification for CPU	Specification for Kit
Undefined	FFFDC ₁₆ ~FFFDF ₁₆	Use inhibited *
Overflow	FFFE0 ₁₆ ~FFFE3 ₁₆	Use inhibited *
BRK instruction	FFFE4 ₁₆ ~FFFE7 ₁₆	Use inhibited
Address match	FFFE8 ₁₆ ~FFFEB ₁₆	Use inhibited
Single-step	FFFE _{C16} ~FFFE _{F16}	Use inhibited
Watchdog timer	FFFF0 ₁₆ ~FFFF3 ₁₆	Use inhibited
DBC	FFFF4 ₁₆ ~FFFF7 ₁₆	Use inhibited
NMI	FFFF8 ₁₆ ~FFFFB ₁₆	Use inhibited
Reset	FFFF _{C16} ~FFFF _{F16}	FFFF _{C16} ~FFFF _{F16}

*) Interrupt of Undefined , Overflow run at UND , INTO instruction. UND , INTO instruction not use in the user program.

2) Interrupts located in the variable vector table

The UART1 transmit/receive interrupts are used by the monitor program and cannot be used by a user program. All other interrupts can be used by a user program.

(1) When using INTB to set up the variable vector table, set **0FCB6BH** at the addresses (software interrupt numbers 19, 20) that correspond to the UART1 transmit/receive interrupts.

(2) Do not disable interrupts (by clearing the I flag).

A monitor program use interrupt of UART1. If in interrupt program have disable interrupt time over 260us, will occur communication error. When this time, set I flag = 1 at top of a interrupt program.

(3) When using interrupts in your program, do not set the Interrupt Priority Level (IPL) to 7.

*) When change a interrupt control register, need to be disable interrupt. When be disable interrupt (I flag = 0), can't be STEP command function while disable interrupt. (check to Chapter 6.10)

6.7. Restrictions on Breakpoints

(1) Do not set a breakpoint in an instruction immediately after the LDC instruction. No break occurs even when you set a breakpoint in an instruction immediately after the LDC instruction.

(2) Program execution cannot be stopped by a break in the INT instruction. Once a break occurs, the GO command cannot be used thereafter.

< Exsample >

```
NOP
NOP
NOP
INT #3 <- BREAK GO from the interrupt source cannot be used
NOP
NOP
```

6.8. Restrictions on STOP Modes or WAIT Modes

The monitor program cannot be run in STOP modes and WAIT modes. Can't be changed STOP modes or WAIT modes in user program.

- INT instructions
From the INT instruction, you cannot successively step through the internal processing of the INT instruction.

Figure 6-3. Example of operation when INT instruction is STEP

```
      NOP
      NOP
INT #3 <- STEP  Skipped over when STEP is executed.
NOP
      JMP  MAIN

INT_3:
NOP <- Address at which program execution ought to stop.
      NOP
      NOP
      REIT
```

When using the INT instruction to debug your program, follow the procedure shown below.

< Exsample >

Set a software break for the internal processing of the INT instruction and use it in combination with the Go command.

Figure 3. Example for debugging a program using INT instruction

```
      NOP
      NOP
INT #3
      NOP
      JMP  MAIN

INT_3:
NOP <- BREAK
      NOP
      NOP
      REIT
```

Execution by GO command



- operation of while disable interrupt

When to be disable interrupt , can't use STEP command while disable interrupt. 1 STEP command

go at enable interrupt.

< Exsample >

```

FCLR I           ; Disable interrupt
AND #00H , 0055H ; Change Timer Interrupt
NOP
NOP
FSET I           ; Enable Interrupt

```

1 STEP command
go to enable
interrupt



6.11. Performing Debug Using Symbols

To debug your program using symbols in KD30, add the debug option (-g) in KNC30WA before compile the programs.

6.12. Corrective Action when Communication Error Occurs at Start up

If a communication error occurs during start up, check the following:

- Whether MSA0652 G01/G02 hardware is correctly set up
- Whether cable is firmly connected and whether the power is turned on.
- Whether the serial port set in the Init dialog box matches the actual serial port where the MSA0652G01/G02 is connected.

6.13. Corrective Action when Communication Error Occurs During Debug

If a communication error occurs during debug, one probable cause is that the monitor program is made to go wild by the user program (ex, user programs runaway or access to monitor area). In such a case, follow the procedure below to initialize the system:

1. Press the [OK] button in the error dialog box to close it.
2. When an Exit dialog box appears, press the [Cancel] button to close it.
3. Press KD30 reset button.

When the above is done, you can restart debugging. However, because the data in the user program area may have been damaged, recommends downloading your program again before you start debugging.

If many communication error happen , check this.

-> * your program have interrupt program. And don't set I flag in interrupt program.

When this interrupt program spend a time over 260us, please set I flag = 1 in the beginning of interrupt program.

6.14. Corrective Action when Error Occurs During Download

When a wrong occurs during download or reload (Ex. Stop download), may be a problem that a part of program will be running. When run download or reload , will have to push a reset button on KD30 before running download or reload. After , will be download or reload.

7. How to Modify The Monitor Program

7.1. How to modify

When change a MSA0652G01/G02's clock , must to modify the monitor program. This chapter is how to modify the monitor program.

Follow the procedure described below to correct the monitor program.

* To modify the monitor program, you must have the MSA0654-G10, a product separately available from the distributor.

- (1) Short the CNVSS pin (shown below) on the MSA0654-G10. (Figure 7-1)
- (2) Connect the MSA0652G01 or G02 and MSA0654-G10.
- (3) Set connect oscillator of 10MHz (MSA0652-G01) , 16MHz (MSA0652-G02).
- (4) Turn on the power to the MSA0652 G01 or G02.
- (5) Start FlashWriterS/W include with the MSA0652.
- (6) Write the corrected the monitor program to the MSA0652G01 or G02 with FlashWriter. 1)
 - ID-code is all 00H when first write the monitor program.**
- (7) Turn off the power to the MSA0652G01 or G02.
- (8) Remove the MSA0652 from the MSA0654-G10. 2)
 - 1) FlashWriter's detail operation read a FlashWriter's manual.
 - 2) When use a expand I/O board for MSA0654-G10 , open the CNVss pin at Figure 7-1.

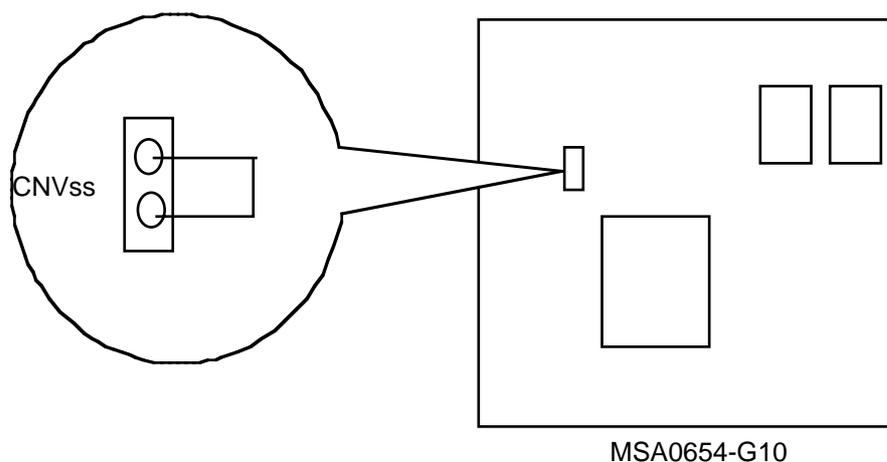


Figure 7-1 Setting MSA0654-G10

7.2. Modify files

If changed MSA0652G01/G02's clock frequency, need to change baud rate settings of the monitor program and set up the wait cycles for write to the flash memory and the divide-by value. Show modify files at table 7-1.

Table 7-1. List of modify files

Change files	Description of files
Mon_cnt.a30	Initializes the monitor. Others include the main routine.
F_ram8.a30	Program to download into flash memory.

```

<How to repair>
FILE : mon_cnt.a30
Lines  Program
126 ;-----*****
127 ;    Setting Baudrate generater
128 ;-----*****
129 ;    If you changed the resonator, refer to the comment
130 ;    below as you set the baud rate for the new resonator.
131 ;    Note that the f_ram8.a30 file must also be modified.
132 ;
133 ;-----****
134
135 MOV.B    #25,U1BRG ; Sending speed 38400 BPS(16M)
136 ; MOV.B    #19,U1BRG ; Sending speed 38400 BPS(12M)
137 ; MOV.B    #15,U1BRG ; Sending speed 38400 BPS(10M)
138 ; MOV.B    #12,U1BRG ; Sending speed 38400 BPS(8M)
139 ; MOV.B    #9,U1BRG  ; Sending speed 38400 BPS(6M)
140 ;
141 ;
142 ;-----****
    
```

Baud rates are set here. Refer to the values shown table 7-2 as you change baud rate settings as necessary.

Table 7-2. Comparison of clock and baud-rate

Clock (MHz)	6	8	10	12	16
Baudrate	9	12	15	19	25

FILE : F_ram8.a30

```

line program
35 ;-----****
36 ;   Setting up wait cycles for write to flash memory
37 ;-----****
38 ;   If you changed the resonator, you need to change the
39 ;   operation frequency for write to flash memory.
40 ;   12.5 MHz or less when internal wait cycles are inserted
41 ;   6.25 MHz or less when no internal wait cycles are inserted
43 ;   Note:
44 ;   There is an entry on the 152nd line of this file that requires the
45 ;   same modification.
46 ;-----****
46 BSET 0,0AH           ; enable register of protect
48 MOV.B #01000000B,CM1 ; 1/2
49 ; MOV.B #00000000B,CM1 ; 1/1
50 BCLR 6,CM0
51 BCLR 0,0AH          ; disable egistor of protect
52
53 BSET 1,0aH          ; enable register of protect

55 BSET 7,PM1          ; 1 WAIT
56 ; BCLR 7,PM1        ; 0 WAIT
57 BCLR 1,0AH          ; disable register of protect
58 ;-----****
    
```

Set up the divide-by value and wait cycles by referring to the notes written above.

Table 7-3. Example for setting up the divide-by value and wait cycles relative to the clock

Clock (MHz)	6	8	10	12	16
Divide-value	1	1	1/2	1/2	1/2
Wait	0	0	0	1	1

7. How to modify The Monitor Program

```
FILE : f_ram8.a30
line program
153 ;-----****
154 ;   Setting up wait cycles for write to flash memory
155 ;-----****
156 ;   If you changed the resonator, you need to change the
157 ;   operation frequency for write to flash memory.
158 ;   12.5 MHz or less when internal wait cycles are inserted
159 ;   6.25 MHz or less when no internal wait cycles are inserted
160 ;-----****
161 BSET    0,0AH      ; enable register of protect
162 MOV.B   #01000000B,CM1 ; 1/2
163 ; MOV.B  #00000000B,CM1 ; 1/1
164 BCLR    6,CM0
165 BCLR    0,0AH      ; disable register of protect
166
167 BSET    1,0AH      ; enable register of protect
168 MOV.B   #10001000B,PM1 ; 0 wait
169 ; MOV.B  #00001000B,PM1 ; 1 wait
170 BCLR    1,0AH      ; disable register of protect
171 ;-----****
```

Set up the divide-by value and wait cycles by referring to the notes written above.

7.3. Limit of Frequency

The monitor program is running in the following frequency range of MSA0652G01/G02's clock. With the clock frequencies outside of this range, device operation cannot be guaranteed, so use the clock frequencies of this range.

6 MHz (MIN) to 10 MHz (MAX) (MSA0652-G01)

6 MHz (MIN) to 16 MHz (MAX) (MSA0652-G02)

* However, the device cannot operate with the following clocks:

* When the main clock = 6 MHz, divide-by-8 and divide-by-16 clocks

* When the main clock = 10 MHz, divide-by-16 clock

* The subclock (Xcin) used as BCLK

8. MSA0652 G01/G02

8.1. External Specifications

Tables 8-1 and 8-2 list external specifications of MSA0652G01/G02.

Table 8-1. External Specifications of MSA0652G01/G02

Item	Content
MCU	MSA0652G01 MCU:M30624FGLFP Operation mode: Single chip mode Clock frequency: Main clock 10 MHz MSA0652G02 MCU:M30624FGFP Operation mode: Single chip mode Clock frequency: Main clock 16 MHz
Memory	Internal memory RAM: 20KB(19.4KB open to the user) FLASH ROM: 256KB(239.4KB open to the user)

Table 8-2. External Specifications of MSA0652

Item	Content
Connector	[CN2]: Serial interface connector (Conect to MF_Ten_Nine Cable) [CN3]: Throught hall for Power supply MSA0652-G01 : for 3V power MSA0652-G02 : for 5V power [CN4]: 8V-12V Power supply connector
Switch	[SW]: push button(connected to RESET)

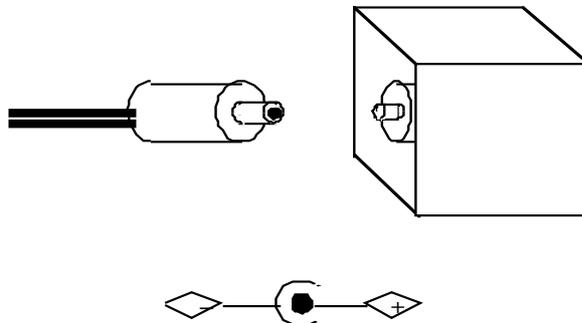
8.2. Power Supply Requirements

Table 8-3 lists and Figure 8-1 connector Pin assign power requirements of MSA0652 G01/G02.

Table 8-3. Power Requirements

	Power Supply Voltage	Power Supply Current
Vcc	DC 8[V] to 12[V]	500 [mA] (max.)
GND	0 [V] (reference voltage)	—

Figure 8-1 connector Pin assign



note) It plug correspond to old "EIAJ" standard

8.3. Environment Requirements

Table 8-4 lists environment requirements for using and storing MSA0652 G01/G02. When storing MSA0652 G01/G02, place it in a conductive bag and then in a packing box. The packing box in which your product was shipped from the factory is desirable.

Table 8-4. Environment Requirements

Environment Condition	Ambient Temperature	Ambient Humidity
When using	Operating ambient temperature: 0 to 55°C (No corrosive gas allowed)	30 to 80% (No dewdrops allowed)
When stored	Storage ambient temperature: -30 to 75°C (No corrosive gas allowed)	30 to 80% (No dewdrops allowed)

8.4. Block Diagram

Figure 8-2 shows a block diagram of MSA0652 G01/G02.

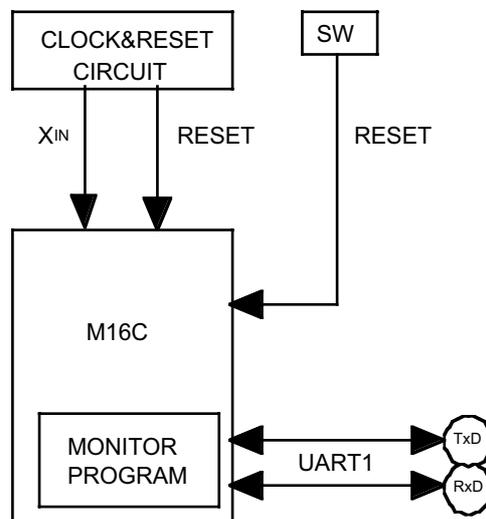


Figure 8-2. Block diagram of MSA0652

8.5. Memory Map

Figure 8-3 shows a memory map of MSA0652 G01/G02.
 Use of a user area (RAM 19.4KB,FlashROM 239.4KB).

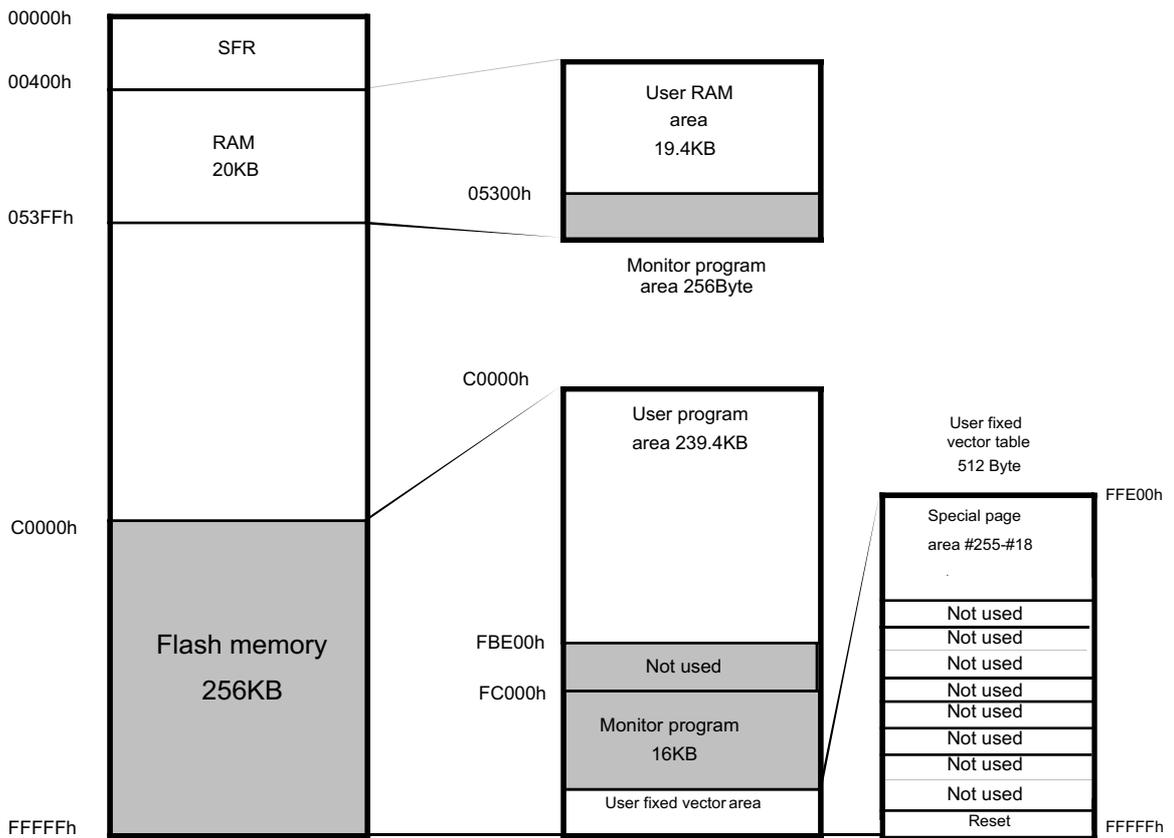


Figure 8-3. MSA0562 G01/G02 memory map

8.6. Using MSA0652

MSA0652 G01/G02 has one switch and five jumper.(default open).
Figure 8-4 shows the location of each part of MSA0652 G01/G02.

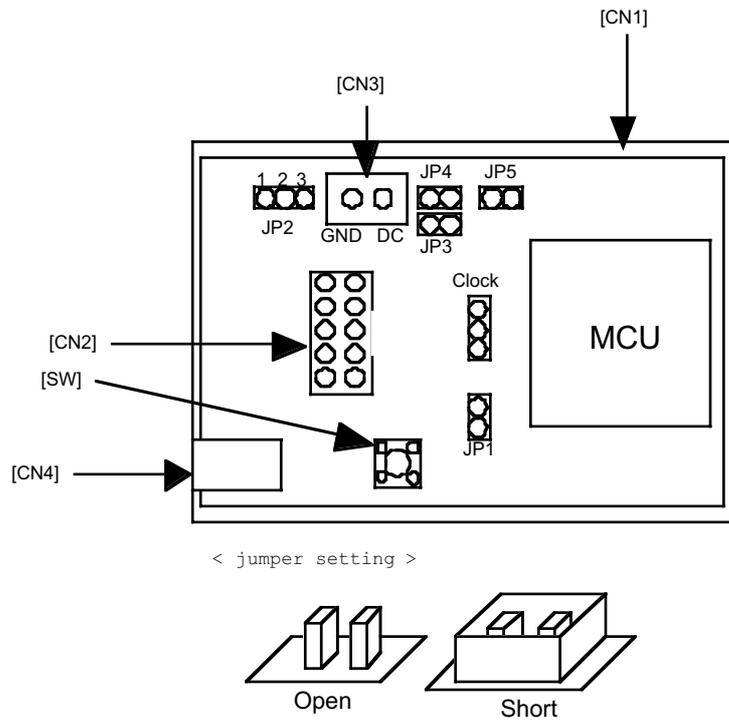


Figure 8-4. Location of each part of MSA0652

8.6.1. Connect Requirements

Table 8-3 connector requirements and Table 8-4 CN2 connector Pin assign of MSA0652 G01/G02.

Table 8-3 connector requirements

CN1	MCU connector
CN2	Serial connector
CN3	Hole for power supply
CN4	Power supply connector [8 V to 12 V]
SW	RESET switch

Table 8-4 CN2 connector Pin assign

CN2(Pin No)	PORT	SIGNAL
1		Vcc-mon
2		
3		
4	P6_6	RxD
5		
6		
7		GND
8		
9		
10	P6_7	TxD

Receive connector ← { Straight Type:HIF3FC-10PA-2.54DSA
Angle Type:HIF3FC-10PA-2.54DS

8.6.2. Jumper Set

Table 8-5 jumper setting MSA0652 G01/G02.

Table 8-5 jumper setting

JUMPER No	Default mode	FUNCTION
JP1	Short	on board divce reset Short : Reset for SW Open : reset for user's target
JP2	2-3 Short	power supply control *) 1-2 : for use CN3 2-3 : for use CN4 Open : for use target board's power
JP3	Short	A-D analogue input terminal (AVcc pin) Short : connect MCU's Vcc Open : set user's target
JP4	Short	A-D transfer basis input (Vref pin) Short : connect MCU's Vcc Open : set user's target
JP5	Short	A-D analogue input terminal (AVss pin) Short : connect MCU's GND Open : set user's target

*) Short is to do 1-2 (Figure 8-4) when supplying a power supply from the CN3.

**Caution : When use the CN3 , MSA0652-G01 have power supply of 3V ,
MSA0652-G02 have power supply of 5V.**

Short is to do 2-3 (Figure 8-4) when supplying a power supply from the CN4.

M16C/62 MiniEmulatorG01/G02 USER'S MANUAL.Rev.B

Mar. 1999 (1st version)

Jul. 1999 (2nd version)

Edited by

Mitsubishi Electric Semiconductor Systems Corporation

Published by

Mitsubishi Electric Semiconductor Systems Corporation

This book, or parts thereof, may not be reproduced in any form without permission of Mitsubishi Electric Corporation.

©1999 MITSUBISHI ELECTRIC SEMICONDUCTOR SYSTEMS CORPORATION