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Renesas Technology Corp.
Customer Support Dept.
April 1, 2003

MITSUBISHI SINGLE-CHIP MICROCOMPUTER

M16C/62 StarterKit2

USER'S MANUAL

Z1-M3A-0654G01
Z1-M3A-0654G02

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Preface

Thank you for purchasing Mitsubishi's M16C/62 StarterKit2.

This manual describes how to use the hardware and software products included with M16C/62 StarterKit2. To other tools , look other tools's manulas.

Table of Content

1. Contents of Product Package

This section shows the contents of the M16C/62 StarterKit2`s product package. When unpacking your M16C/62 StarterKit2, check to see that all products listed below are included.

1.1. M16C/62 StarterKit2 Product List

Table 1-1 lists the products included in the M16C/62 StarterKit2.

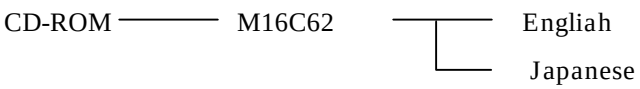
Table 1-1 M16C/62 StarterKit2 Product List

Product List	Quantity	Remark
M3A-0654 G01 / G02	1pc	
Serial cable exclusive to M16C/62 StarterKit2 (used to connect M3A-0654 and the host computer)	1pc	
CD-ROM	1pc	compilor (KNC30WA) remote debugger (KD30) FlashStart S/W Monitor Program Sample program Manual

A power supply isn't attached to this product. Make preparations with the user.

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.



1.2.1. Software Products

Following directory is store in English root directry.

(1) M3A-0654 directory

Include M3A-0654 manual.

(2) KD30 directory

This directory contains various commands available for KD30. The contents of this directory are listed inTable 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) Flashsta directory

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

(5) Program directory

This directory contains various commands available for sample program, monitor program. The contents of this directory are listed in.Table 1-5

(6) Document directory

This directory contains various commands available for Electronic manual. The contents of this directory are listed in.Table 1-6

Table 1-2 KD30 directory

Directory name	File name	OutLine
KD30 - Manual	KD30ue.pdf	KD30's manual
KD30 - setup	setup.exe	Set-up file for KD30

Table 1-3 KNC30WA directory

Directory name	File name	OutLine
KNC30WA - Manual	as30ue.pdf	KAS30's manual
	nc30ue.pdf	KNC30's manual
KNC30WA - setup	setup.exe	Set-up file for KNC30WA
KNC30WA -TM–TM–W95E	Setup.exe	Set-up file for TM
KNC30WA -TM-NC30WA-W95E	Setup.exe	Set-up file for NC30WA

Table 1-4 Flashtsa directory

Directory name	File name	OutLine
Flashsta	Flashsta.exe	Flash writing S/W
	Manual_E.pdf	Flash start manual

Table 1-5 Program directory

Directory name	File name	OutLine
Program - monitor	*.Mot	S format for Monitor Program
	.	Source file for Monitor Program
Program - sample	*.*	Sample program

Table 1-6 Document directory

Directory name	File name	OutLine
Document	*.Pdf	M16C/62 group data sheet
		M16C/62 group user's manual
		M16C/60 Series Software manual
		M16C/60 Series programming manual for Assembly Language,C Language
		M16C/60 Series collection of sample program

1.3. System Requirements

In addition to the products listed above, you must have the following equipment before you can use the M16C/62 StarterKit2.

(1) Personal computer

For details about a personal computer, refer to section 5.1"Operating Environment".

(2) 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.

(1) **M16C/62 StarterKit2(M3A-0654)**

(2) **Serial Cable (M3A-0654CBL: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.

(1) Compiler(**KNC30WA**)

(2) Remote Debugger(**KD30**)

(3) S/W for programing internal Flash memory(**FlashStart**)

(4) **Monitor Program**

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.infomicom.maec.co.jp/M16C/mctopj.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 StarterKit2 (M3A-0654G01 or G02)

(3) Serial cable exclusive to the cable debugger (M3A-0654CBL)

(4) Remote debugger (KD30)

(5) Compiler (KNC30WA)

(6) Power supply (No package)

(7) S/W for programing internal Flashmemory (FlashStart)

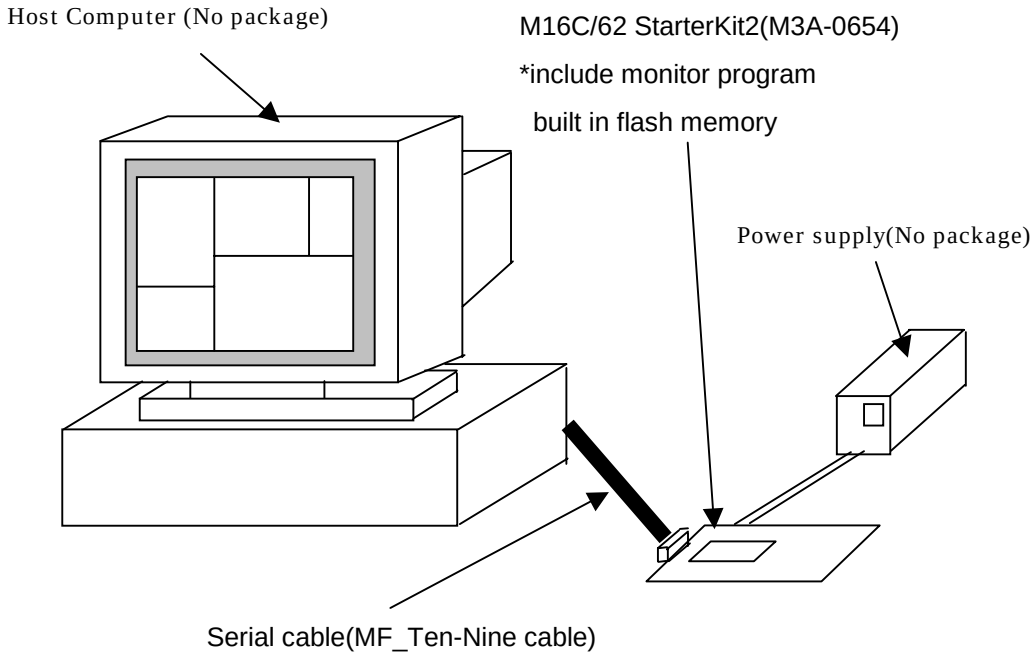


Figure 3-1 System configuration of the product

3.1. Host Computer

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

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 StarterKit2

The M16C/62 StarterKit2 incorporates the M16C family of Mitsubishi's 16-bit single-chip microcomputer.(M3A-0654G01:M30624FGMFP, M3A-0654G02:M30624FGAFP) 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.

features of KD30.

(1) Source line debug for assembly language , structured assembly language, C language.

(2) KD30 have go command with 2 point S/W 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.

(5) Line assembler can't operate it.

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.

features of KNC30WA.

(1) KNC30WA can compile a source file consisting of less than 500 lines.
(2) 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 internal Flash memory of M16C Flash MCU (FlashStart)

FlashStart is the software for Windows that the writing treatment of the built-in flash memory is done toward the M16C flash memory built-in microcomputer. And, an evaluated User's Program can be written in the built-in flash memory by using KD30, too. Monitor Program is erased when a User's Program is written in the built-in flash memory. In that case, you must write Monitor Program by using FlashStart.

4. Setting UP Hardware

4.1. Connecting Each Unit

M16C/62 StarterKit2 connect to each unit. (Figure 4-1).

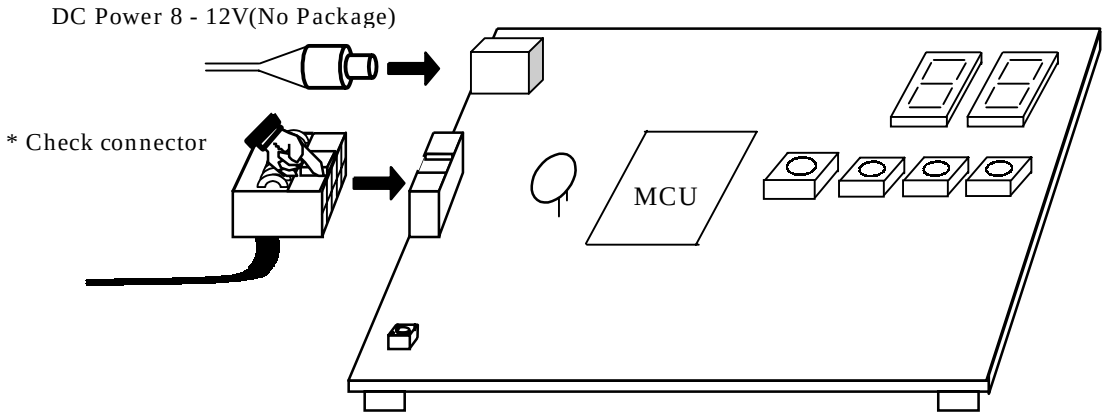


Figure 4-1 Connect to each unit

5. Setting UP Software

5.1. Operating Environment

The software include M16C/62 StarterKit2 run 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 or its compatible
OS	Microsoft Windows 95 ,Microsoft Windows98
CPU	486DX4 -100MHZ or Pentium 75MHZ or newer recommended
Memory	8 Mbyte or more (16 Mbyte recommended)

**** Operation of KNC30WA 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 KD30 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 .

To start up KD30, 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.

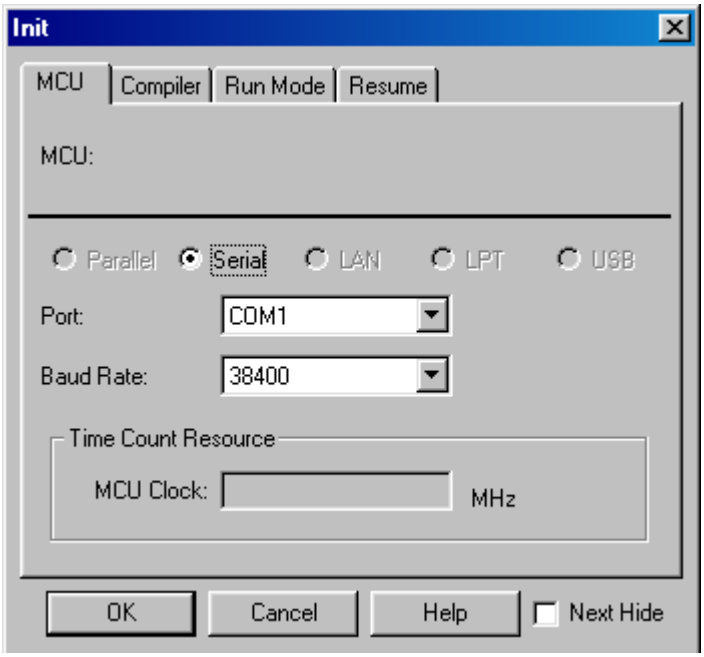


Figure 5-1 Init Window

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 M16C/62 StarterKit2 and personal computer is performed normally, KD30 starts up automatically and a window like the one shown in Figure 5-2 appears.

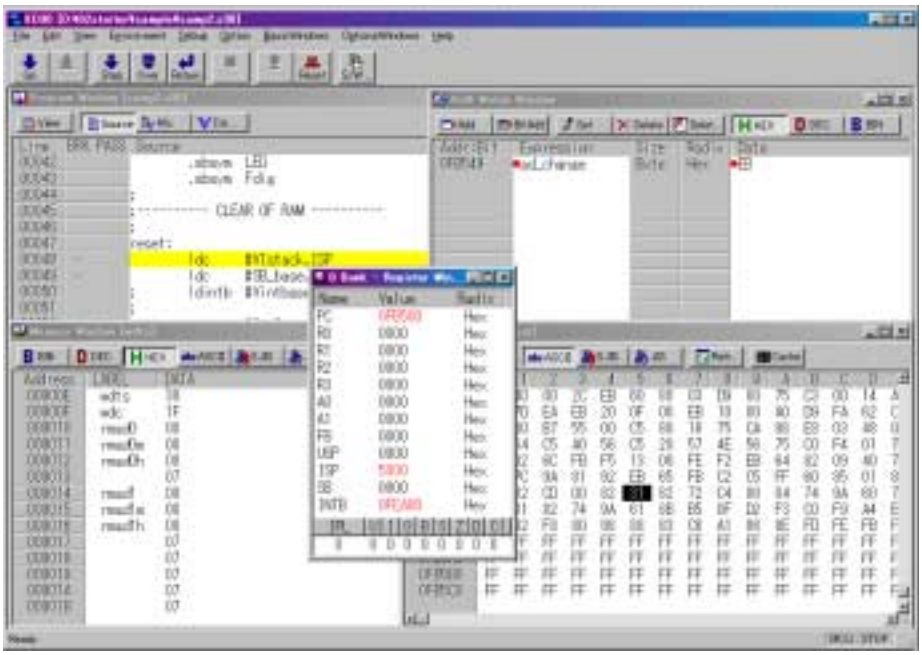


Figure 5-2 KD30 window

If M16C/62 StarterKit2 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

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 6.13”Corrective Action when Communication Error Occurs at Start up” KD30's detail operation read KD30's manual.

5.2.3.Quitting KD30

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

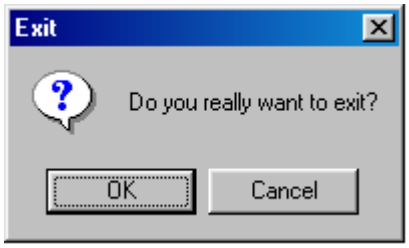


Figure 5-5 Warning dialog box

5.3. Installing KNC30WA

5.3.1.Installation Procedure

(1) Run ' setup.exe ' in KNC30WA 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 NC30WA, the same environment variables are referenced.

5.3.2.Checking Operation of KNC30WA

Input the following command to check that KNC30WA operates normally.

(1) Command input

> KNC30 -v

(2) Result

All program versions are displayed as shown below.

M16C/60 KNC30 COMPILER V.1.00
Copyright 1998 MITSUBISHI ELECTRIC CORPORATION
and MITSUBISHI ELECTRIC SEMICONDUCTOR SYSTEMS CORPORATION
All Rights Reserved.

(3) If KNC30WA does not start up.

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

(b) If " a Windows NT character-mode" appears when executing a command, check thesettings 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.

(4) 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 TM

5.4.1.Installing

The directory in which NC30WA will be installed

1)You can not specify a name that contains a blank for the directory.

2)There is Setup.exe of NC30WA of CD-ROM.

(M16C62 – ENGLISH - KNC30WA – TM - NC30WA - W95E)

5.4.2.About this product

The Entry Version is **not to be supported and warranted**. Accordingly, for the directions for use of Entry Version or the like, you cannot apply to our company. However, if you inform us of any idea that may flash upon your mind and your comments, if any, we are ready to take up your suggestions and hints for future improvements. However, please take note that we may not give our reply to you as to your idea.

entry@tool.maec.co.jp

5.4.3.About the specification of Entry version

Please be careful that Entry version has the following specification.

Refer to the manual which is stuck in detail and which is stored in less than a M16C62 – ENGLISH - KNC30WA - TM directory, a release notebook, Readme, and so on.

1)About –fansi option

This compiler always compile with “-fansi” option. So If you specify this option, this compiler disregards this option.

2)About describing of a program

If you describe the following words, append “underscore(_)” before the word, please.

inline		**_inline**
near	→	**_near**
far		**_far**
asm()		**_asm()**

3)About NC30&AS30 option

You can not use the following options.

C compiler(NC30)	
Debug Option	-genter,-gno_reg
Optimization Option	-O[1-5],-OR,-OS,-Oconst(-OC),-Ono_bit(-ONB),-Ono_break_source_debug(-ONBSD),-Ono_float_const_fold(-ONFCF),-Ono_stdlib(-ONS),-Osp_adjust(-OSA),-Ostack_frame_align(-OSFA),-Oloop_unroll(-OLU),-Ono_asmopt(-ONA),-Ono_logical_or_combine(-ONLOC), -Ocompare_byte_to_word(-OCBTW)
Code generated Option	-finfo,-fuse_DIV(-fUD),-fansi,-fnear_ROM(-fNROM),-fsmall_array(-fSA), -fno_align(-fNA)
Assemble & Link Option	-as30,-ln30
Assembler(AS30)	
Option	-finfo, -P, -M

4)About software tools and an utility

You can not use the following software tools and an utility.

Software Tools	StkViewer,MapViewer,assemble optimizer(aopt30), Librarian(lb30), Structured description assembler(pre30), Standard Library source file
Utility	Utl30(The SBDATA declaration & SPECIAL page Function declaration Utility)

5)About TM (Tool Manager)

a)You can not use the inspector function of TM(Tool Manager).

b)You can not create a library project.

5.5. Installing FlashStart

5.5.1.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 Flashsta held in the CD-ROM to the directory created in step 1.

5.5.2.Stating Up FlashStart

Before you can start up FlashStart, You must first connect the serial cable (M3A-0654CBL) to M16C/62 StarterKit2.

It clicks on"Flashsta.exe" in the copie file double for the start. when Flah Start, the window of the Figure 5-6 opens. "Select Program" is to choose "Internal flash memory". Setup RS232C to use more than PullDownList.

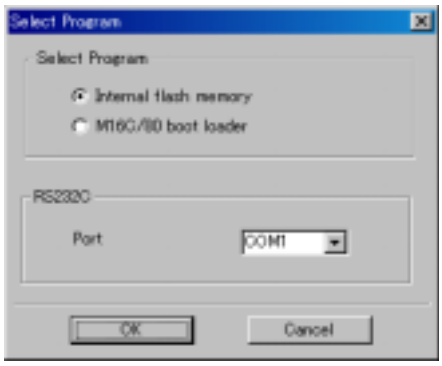


Figure 5-6 Select Program Window

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

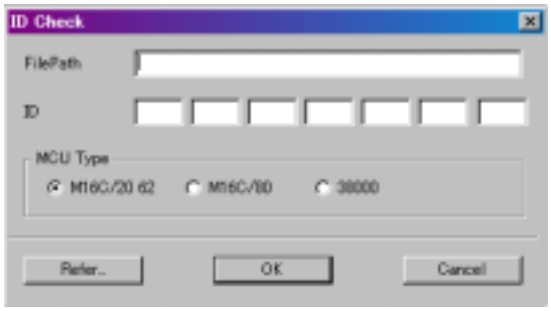


Figure 5-7 ID check Window

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

When Figure 5-8 appears , please check to connection between MF_Ten_Nine cable and M16C/62 StarterKit2 or power on M16C/62 StarterKit2.

Figure 5-8 Connection error Window

5.5.3.Quitting FlashStart

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

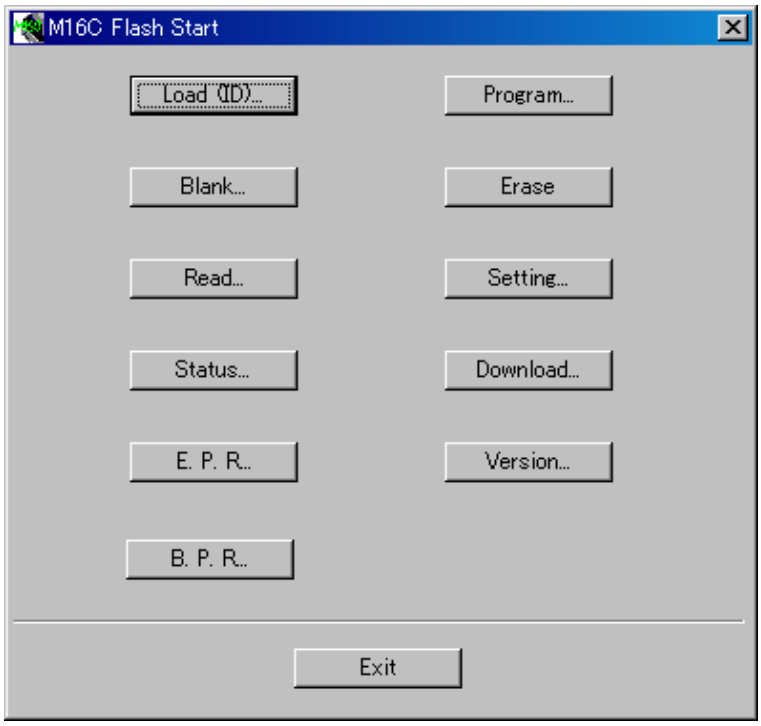


Figure 5-9 Main Window

5.6. Uninstalling KD30

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

5.7. Uninstalling KNC30WA

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

5.8. Uninstalling FlashStart

To uninstall FlashStart. delete a FlashStart's directory.

5.9. 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

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 M16C/62 StarterKit2. Always be sure to read this section before you use M16C/62 StarterKit2.

Table 6-1 List of Usage Precautions

Item	Sections to See
Precautions on creating program	6.4 "Memory Map" 6.5."A limitation item about register operation" 6.6."Restrictions on Interrupts" 6.7."A limitation item about the C language"
Precautions on debugging program	6.8."Restrictions on Breakpoints" 6.9."Restrictions on STOP Modes or WAIT Modes" 6.10."User's Program Real-time Capability" 6.11."Exceptional Step Execution" 6.12. "Performing Debug Using Symbols" 6.13. "Corrective Action when Communication Error Occurs at Start up" 6.14. "Corrective Action when Communication Error Occurs During Debug" 6.15. "Corrective Action when Error Occurs During Download" 6.16. "The coping when the error of "A source file isn't found." occurred"

6.1. Limitations on Pin Usage

(1) TxD1 and RxD1 (UART1) pins

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

(2) NMI (P85) pin

NMI pin needs pull up.

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's Program.

6.3. Coution when use the memory expansion mode

To enable the memory expansion mode, pull up the HOLD pin and RDY pin of the MCU on the M16C/62 StarterKit2. Set the processor mode bits to "01b" in your User's Program. There is no need to modify the Monitor Program. Please note that accessing external memory in the memory expansion mode from either KD30 can only be done with [Memory Read/Write]. Program controls, such as downloading a program to the external memory (assigning a program in the external memory usingFile - Download - Load Module) or placing a break in the external memory, cannot be performed. In addition, after switching to memory expansion mode from single-chip mode, make sure you reference the external memory in the DUMP window to confirm operations.

6.4. Memory Map

Figure 6-1 shows the M16C/62 StarterKit2 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 internally reserved area extension.

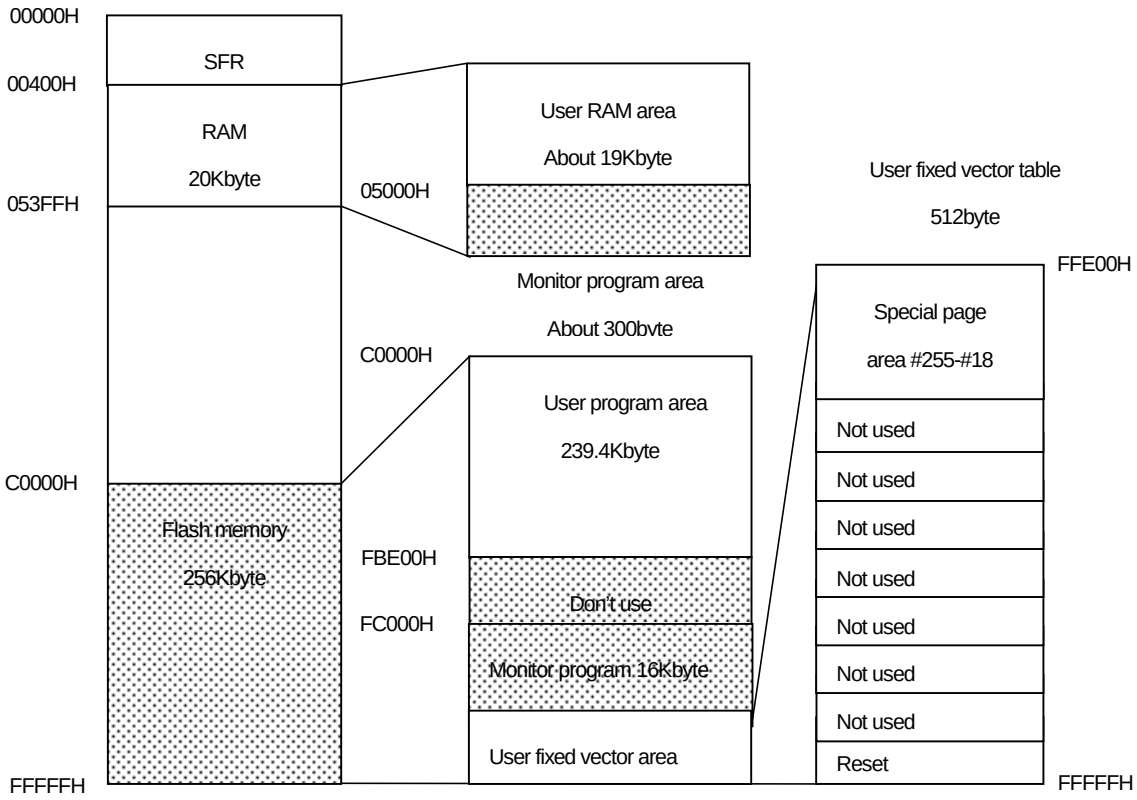


Figure 6-1 M16C/62 StarterKit2 memory map

6.5. A limitation item about register operation

The limitation item related to register operation in the Table 6-2. And, the movement of Monitor Program can't be assured when register that a change is prohibited is changed.

Table 6-2 A limitation item about register operation

Register Name	Initial value	Restriction	Operation by the User Program
Processor Mode register 0	00h(Processor mode: Single-chip mode)	Change this register by the user program when you use the memory expansion mode.. Never change it by monitor program.	△
Processor Mode register 1	I08h(Internally reserved area extension)	When changing this register in the User's Program, always be sure to set bit 3 to 1.	○
System clock control register 0	08h		○
System clock control register 1	20h(Selected main clock divide ratio: Not divide)		○
ISP (interrupt stack pointer)	05000h	Set a value below 05000h Values 05000h - 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 SIO3,4 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: 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)	△
UART1 Transmit/Receive Mode Register	05h	Do not modify this register.	×
UART1 Transfer Speed Register	80h		
UART1 Transmit/Receive Control Register 0	10h		
UART1 Transmit/Receive Control Register 1	05h		
UART1 Interrupt Control Register 0	07h		
UART transmit/receive control register 2	02h	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.	×
Interrupt table register	0FEA00h	Do not modify this register.	×

○ : change OK × : change NG △ : change OK (There is a limitation)

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's 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 6-3 fixed vector table address

Interrupt Cause	Specification for CPU	Specification for Monitor
Undefined instruction	$FFFDC_{16}$-$FFFDF_{16}$	Do not use*
Overflow	$FFFE0_{16}$-$FFFE3_{16}$	Do not use*
BRK instruction	$FFFE4_{16}$-$FFFE7_{16}$	Do not use
Address match	$FFFE8_{16}$-$FFFEB_{16}$	Do not use
Single step	$FFFEC_{16}$-$FFFEF_{16}$	Do not use
Watchdog timer	$FFFF0_{16}$-$FFFF3_{16}$	Do not use
DBC	$FFFF4_{16}$-$FFFF7_{16}$	Do not use
NMI	$FFFF8_{16}$-$FFFFB_{16}$	Do not use
Reset	$FFFFC_{16}$-$FFFFF_{16}$	$FFFFC_{16}$-$FFFFF_{16}$

*) Interrupt of Undefined, Overflow run at UND, INTO instruction. UND, INTO instruction not use in the User's Program.

2) Interrupts located in the variable vector table

Monitor Program uses interrupt of UART1. Therefore, don't use it with User's Program. Interrupt of variable vector table except for UART1 can be used with User's Program.

(1) When using INTB to set up the variable vector table, set **$0FF900_{16}$** 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.

(4) Setup "interrupt permission" in the case of multiplex interrupt treatment in that case "step interrupt" stops that it may be made in the beginning of each interrupt.

*) 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 Capter 6.11)

6.7. A limitation item about the C language

It is described about attached KNC30WA here. When KNC30WA is installed, a STARTUP folder is prepared. You must change ncrt0.a30 in that and sect30.inc. The contents to change in the following are specified. Modify the treatment which is applicable when other compilers are used.

(1) The change point of ncrt0.a30

Have comment out by the I/O initialization treatment (Initialize standard I/O) not to call I/O initialization treatment because there is a setup which UART1 is used for. Interrupt permission flag is cleared by the reset treatment (after reset, this program will start) right after the LDINB order. Because of that, it can't talk to Monitor Program. Establish intrrupt permission right after the LDINB order. Change it to "0EFD00" by interrupt vector address treatment(INTERRUPT VECTOR ADDRESS definition)because piles up with Monitor Program when it is initialized interrupt vector address.

(2) The cange point of sect30.inc

Set it up by variable vector table address because the setup of UART1 to use by KD30 and Monitor Program isn't being done.Program execution cannot be stopped by a break in the INT instruction. Once a break.

6.8. 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
INT #3     ← BREAK     Go from the interrupt source can't be used
NOP
NOP
```

6.9. Restrictions on STOP Modes or WAIT Modes

The Monitor Program can't be run in STOP modes and WAIT modes. Can't be changed STOP modes or WAIT modes in User's Program.

6.10.User's Program Real-time Capability

KD30 has two User's Program execution modes: Sampling Mode and Free-run Mode. In Sampling Mode, the Monitor Program periodically monitors the User's Program execution status to detect stoppage of the User's Program caused by a break, etc. For this reason, the Monitor Program requests an interrupt during User's Program execution. Consequently, the User's Program real-time capability is lost. In Free-run Mode, the User's Program execution is not monitored, so its real-time capacity is guaranteed.

(1) Sampling Mode

In this mode, the User's Program execution status is periodically monitored when executing Go or Come. Therefore, this mode allows you to detect stoppage of the User's Program caused by a break, etc. Choose this mode when you perform regular debug.

(2) Free-run Mode

In this mode, the User's Program execution status is not monitored when executing Go or Come. Although for this reason the User's Program real-time capability is guaranteed, you can't detect stoppage of the User's Program caused by a break, etc. Therefore, even when the User's Program has stopped, KD30 does not stop the operation executed by Go or Come. If you want to stop KD30, press the STOP button. Choose this mode when you want to run User's Program in real time.

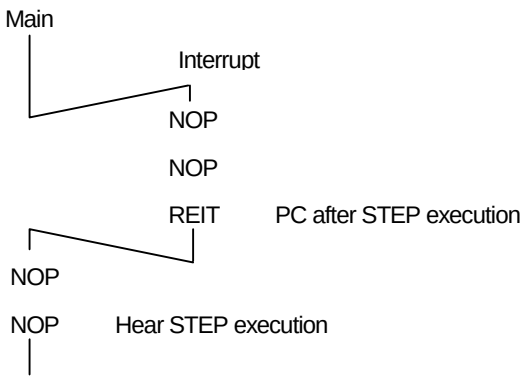
6.11.Exceptional Step Execution

If the following two instructions are STEP, they operate differently than they are executed normally.

(1) REIT instruction, JMPS instruction, JSRS instruction

When above instruction is STEP, the program stops after executing one instruction after returning from the interrupt.

<Exsample>



(2) INT instructions

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

<Exsample1>

```
                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.

<Exsample2>

```
                NOP
                INT   #3        Execution by GO command
                NOP
                JMP   MAIN
INT_3:
                NOP   <- BREAK
                NOP
                REIT
```

(3) 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.

<Exsample2>

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

1 STEP command go to enable interrupt

6.12.Performing Debug Using Symbols

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

6.13.Corrective Action when Communication Error Occurs at Start up

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

(1) Whether the M16C/62 StarterKit2 hardware is correctly set up

(2) Whether cable is firmly connected and whether the power is turned on.

(3) Whether the serial port set in the Init dialog box matches the actual serial port where the M16C/62 StarterKit2 is connected.

6.14.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's 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) Reset the hardware by working the reset jumper on the CPU board (or turn off the power and turn it back on again) to reset the hardware.

(4) Press KD30 reset button.

When the above is done, you can restart debugging. However, because the data in the User's 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.

6.15.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.

6.16.The coping when the error of "A source file isn't found." occurred

Confirm the following contens wen the error of "A source file isn't found." occurs.

1)Does it exist in the directory(or,folder) that an executive file is the same as the source file?

2)Give it to me if a source file isn't being opened with editor except for KD30.

7. How to repair Monitor Program

7.1. How to repair

Monitor Program has already been written in the microcomputer since it is purchased first. Monitor Program is erased when flash memory writing S/W was used for the built-in flash memory and User's Program was written. When debugging of User's Program is done by using KD30 again, you must write Monitor Program in the built-in flash memory again. Monitor Program The writing process of Program is specified in the following.

(1) Make the terminal that CNVss and silk are being printed on the circuit board of M16C/62 StarterKit2 a "H" level. (Like a Figure 7-1, Short)

(2) Start attached flash memory writing S/W (FlashStart). At this time, a communication error occurs if the setup of (1) isn't being done.

(3) It is thrown, and a Reset button is pushed to M16C/62 StarterKit2(the power supply).

(4) Monitor Program is written by using FlashStart.1)
Monitor Program Input all the ID codes of with '00H'.

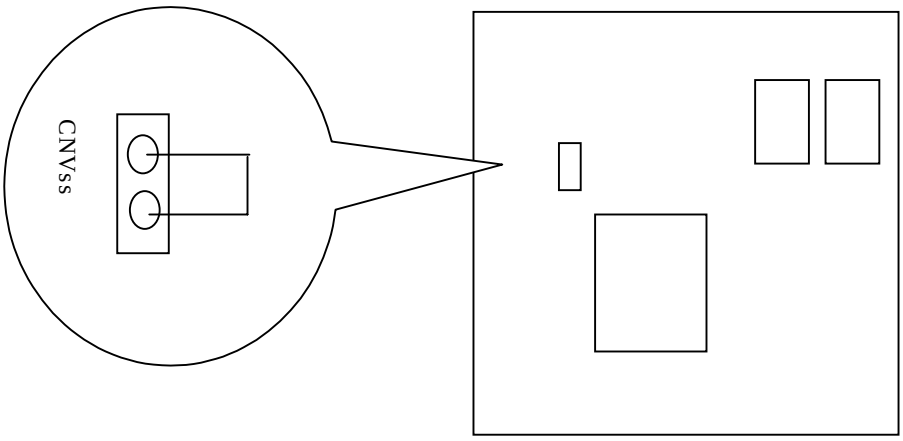
(5) Push an E.P.R button (Erase, Program, Read are done.)

(6) Push a button, and finish flash memory writing S/W (FlashStart) because OK button is indicated if writing is completed.

(7) Make the CNVss terminal being made a "H" level in (1) a "L" level. (It is made OPEN.)

(8) Writing of Monitor Program is completion in the above.

1) Refer to an attached manual for the way of operating FlashStart.



M16C/62 StarterKit2

Figure 7-1 Setting M16C/62 StarterKit2

7.2. Limit of Frequency

The monitor program is running in the following frequency range of M16C/62 StarterKit2 clock. With the clock frequencies outside of this range, device operation cannot be guaranteed, so use the clock frequencies of this range.

Communicable Baud Rate at Each Frequency in the Table 7-1.

1MHz (MIN) to 10 MHz (MAX) (M16C/62 StarterKit2:M3A-0654G01)

1MHz (MIN) to 16 MHz (MAX) (M16C/62 StarterKit2:M3A-0654G02)

* However, the device can't operate with the following clocks:

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

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

3) The subclock (Xcin) used as BCLK

Table 7-1 Communicable Baud Rate at Each Frequency

Xin(Hz)	Baud Rate(BPS)					
	1200	2400	4800	9600	19200	38400
16M	-	-	√	√	√	√
14M	-	-	√	√	√	√
12M	-	-	√	√	√	√
10M	-	√	√	√	√	√
8M	-	√	√	√	√	√
6M	-	√	√	√	√	√
4M	√	√	√	√	√	-
2M	√	√	√	√	-	-
1M	√	√	√	-	-	-

- :Not communicable

√ : communicable

7.3. The movement of the circumference I/O in break

A circumference I/O keeps working though interrupt isn't accepted in break. For example, timer interrupt isn't accepted (timer and so on) though it keeps counting timer when User's Program is made to stop at break and so on after it is made to work.

8. M16C/62 StarterKit2

8.1. External Specifications

Table 8-1 and Table 8-2 list external specifications of M16C/62 StarterKit2.

Table 8-1 External Specifications of M16C/62 StarterKit2

Item	Content
MCU	M3A-0654G01 MCU : M30624FGMFP Operation mode : single chip-mode Clock frequency : main clock 10MHz M3A-0654G02 MCU : M30624FGAFP Operation mode : single chip-mode Clock frequency : main clock 16MHz
Memory	Internal memory RAM : 20KB(19KB open to user) Flash ROM:256KB(239.4KB to user)

Table 8-2 External Specifications of M16C/62 StarterKit2

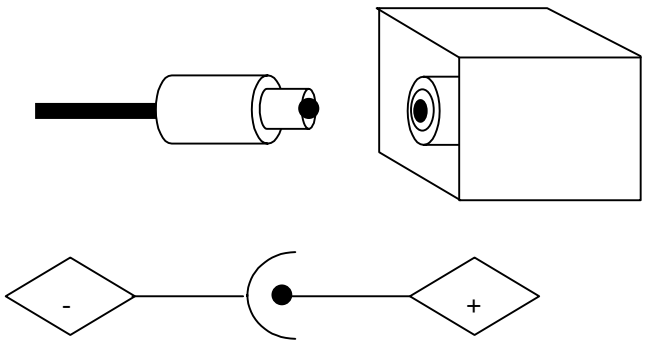
Item	Content
connector	[CN1] : Serial interface connrctor(M3A-0654CBL) [CN2] : power supply connector [CN3] : Throuh hall contact for DC power supply M3A-0654G01 : 3V M3A-0654G02 : 5V [CN4] : Throuh hall for ezpansion contact Recommendation connector : PCN10A-96S-2.54DS or PCN10B-96S-2.54DS
switch	[SW1] : push button (connect INT0) [SW2] : push button (connect INT1) [SW3] : push button (connect ADTRG) [SW4] : push button (connect RESET)
LED	[LED1] : user I/O (connector P0_0-P0_7) [LED2] : user I/O (connector P0_0-P0_7)

8.2. Power Supply Requirements

Table 8-3 lists and Figure 8-1 connector Pin assign power requirements of M16C/62 StarterKit2.

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)	-



note) It plug correspond to old “EIAJ” standard.

Figure 8-1 connector Pin assign

8.3. Environment Requirements

Table 8-4 lists environment requirements for using and storing M16C/62 StarterKit2. When storing M16C/62 StarterKit2, 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 condetion	Ambient temperature	Ambient humidity
When using	Opoerating ambient temperature:0 - 55[C] (No corrosive gas allowed)	30 - 80[%] (no dewdrops allowed)
When using	Storage ambient temperature: -30 - 75[C] (No corrosive gas allowed)	30 - 80[%] (no dewdrops allowed)

8.4. Block Diagram

Figure 8-2 a block diagram of M16C/62 StarterKit2.

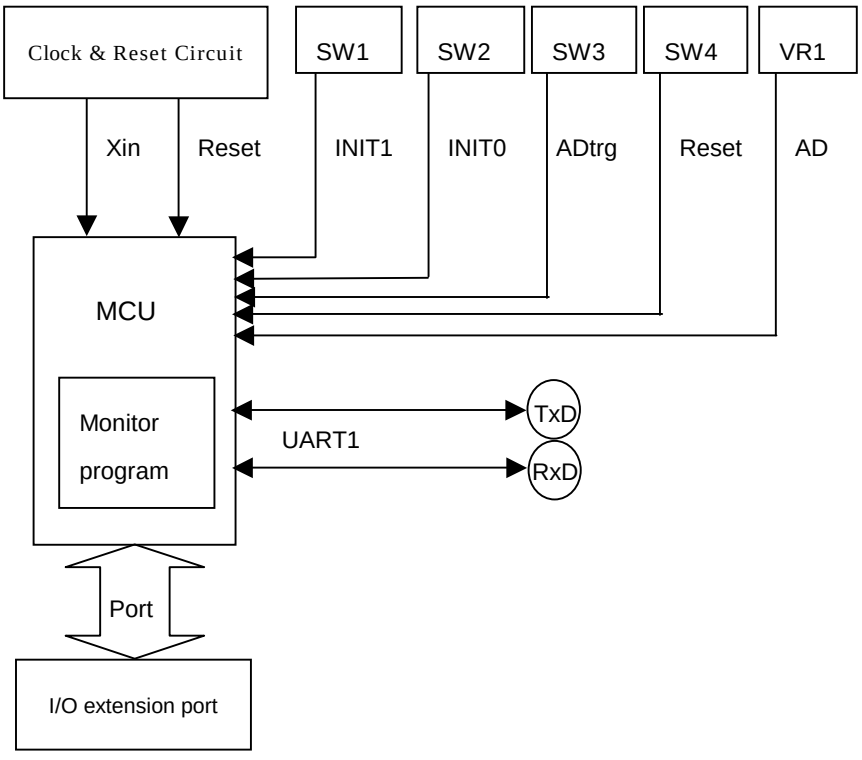


Figure 8-2 Block diagram of M16C/62 StarterKit2

8.5. Memory Map

Figure 8-3 a memory map of M16C/62 StarterKit2. Use of a user area (RAM 19KB,FlashROM 239.4KB).

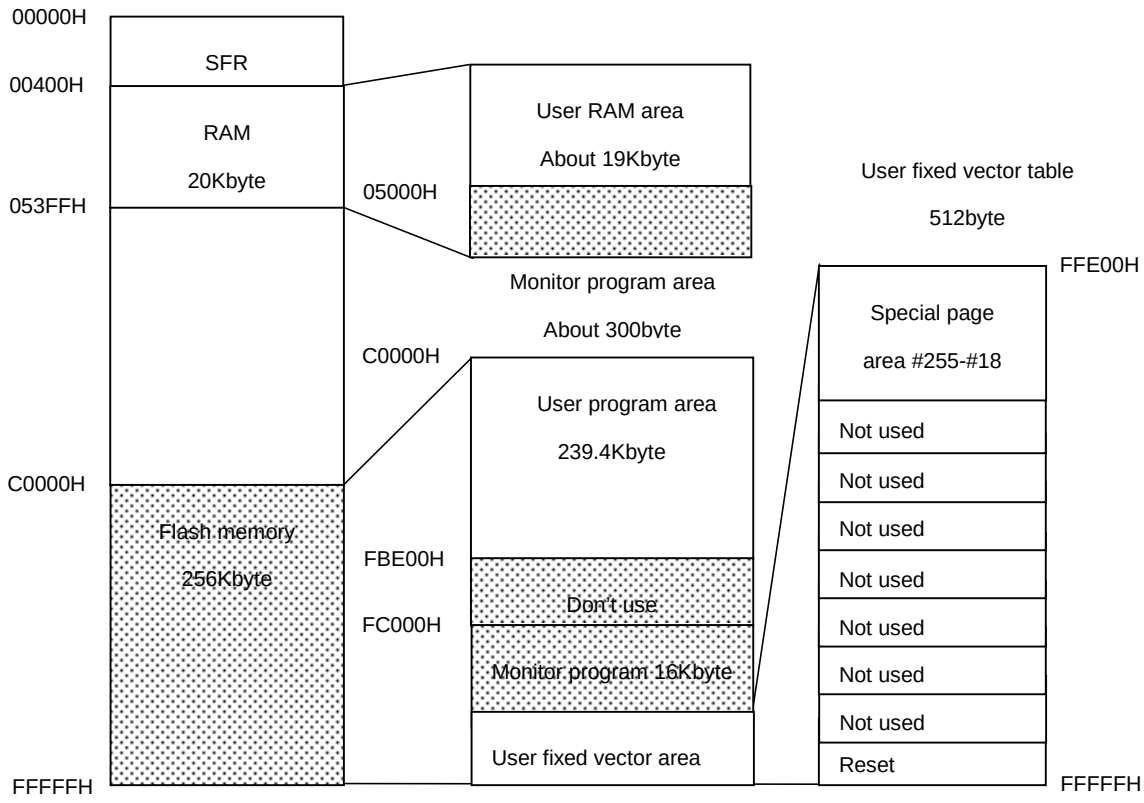


Figure 8-3 M16C/62 StarterKit2 memory map

8.6. Using

8.6.1.Part arrangement figure

M16C/62 StarterKit2 has 12jumper (JP1 to JP5 and 2-3 pin of JP8 dose short as Default. If change, cut line), 2LEDs and 4 switch and 1 variable resistance are prepared. Refer to the next page for the pin arrangement of CN4. Figure 8-4 shows the location of each part of M16C/62 StarterKit2.

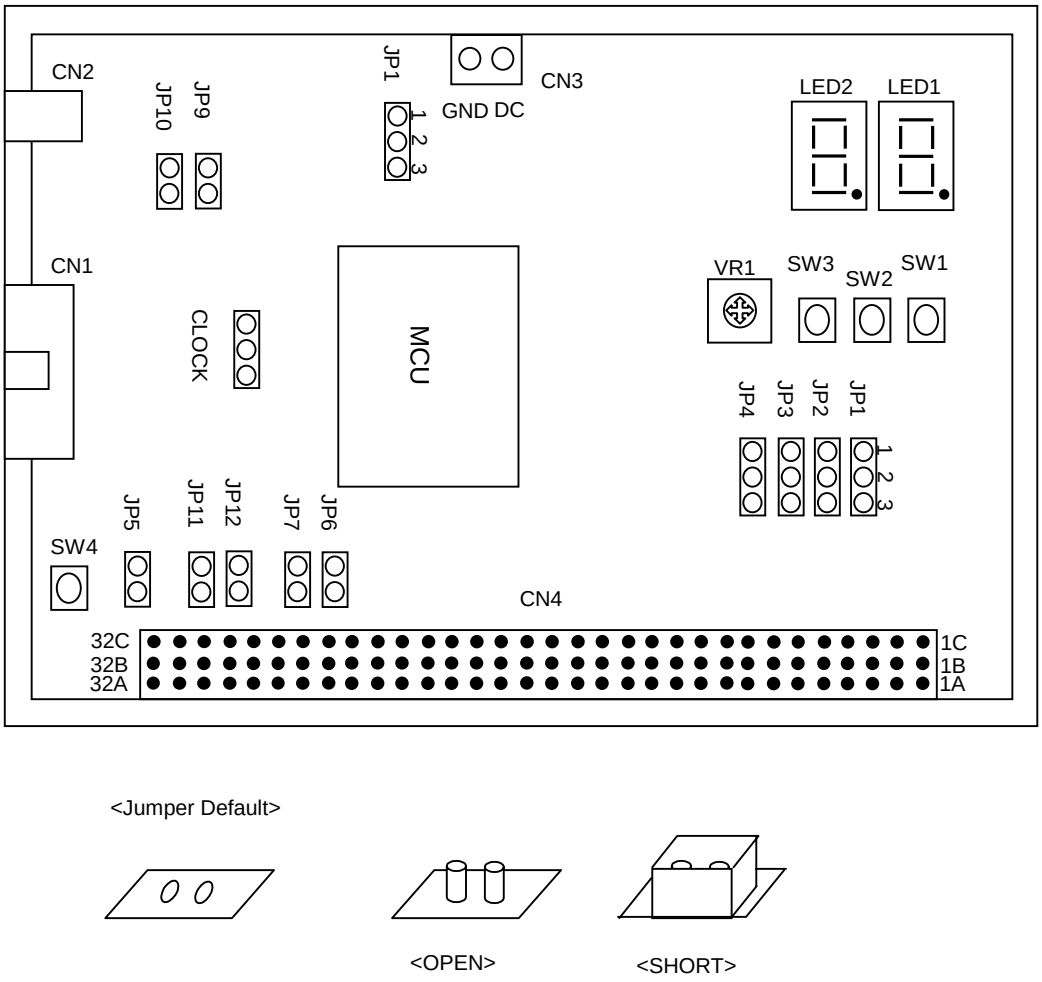


Figure 8-4 location of each part of M16C/62 StarterKit2

8.6.2.Connect Requirements

Table 8-5 connector requirements and

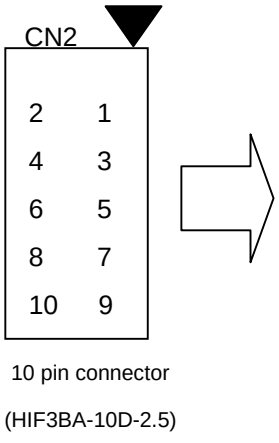
Table 8-6 CN2 connector Pin assign and Table 8-7 CN4 connector Pin assign of M16C/62 StarterKit2.

note) Connect nothing with 31,32pin. When it is't KD30 normal connected.

Table 8-5 Connect Requirements

Connector No	Content	Connector No	Content
CN1	Serial interface connector	SW3	switch
CN2	Power supply connector	SW4	switch
CN3	Throuh hall contact for DC power supply	VR1	Variable resistance
CN4	Throuh hall for ezpansion contact	LED1	User I/O
SW1	Switch	LED2	User I/O
SW2	Switch		

Table 8-6 CN2 Connect PIN assing

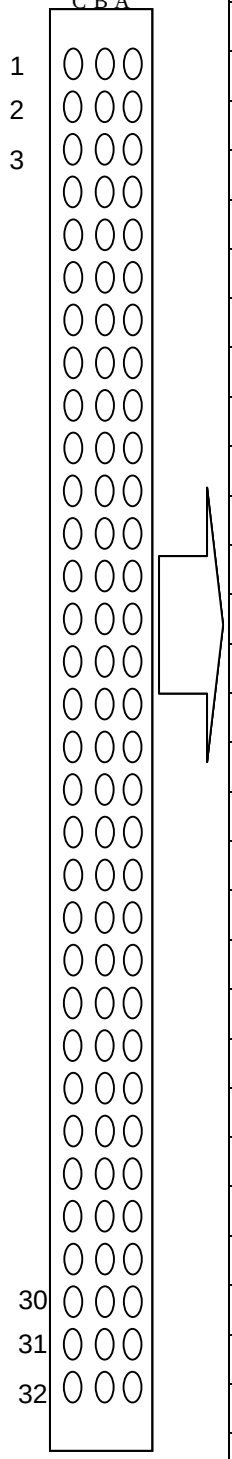


CN2(Pin No)	port	signal
1		Vcc
2		
3		
4	P6_6	RxD
5		
6		
7		GND
8		
9		
10	P6_7	TxD

note)

Receve connector
- Straight type : HIF3FC-10PA-2.54DSA
- Angle type : HIF3FC-10PA-2.54DS

Table 8-7 CN4 Connect PIN assing



CN4C	PINNo	signal	CN4B	PINNo	signal	CN4A	PINNo	signal
1C	VCC		1B	VCC		1A	100	ADTRG
2C	99	AVCC	2B	98	VREF	2A	97	AN0
3C	96	AVSS	3B	95	P10_1	3A	94	P10_2
4C	93	P10_3	4B	92	P10_4	4A	91	P10_5
5C	90	P10_6	5B	89	P10_7	5A	88	LED1,2
6C	87	LED1,2	6B	86	LED1,2	6A	85	LED1,2
7C	84	LED1,2	7B	83	LED1,2	7A	82	LED1,2
8C	81	LED1,2	8B	80	P1_0	8A	79	P1_1
9C	78	P1_2	9B	77	P1_3	9A	76	P1_4
10C	75	P1_5	10B	74	P1_6	10A	73	P1_7
11C	72	P2_0	11B	71	P2_1	11A	70	P2_2
12C	69	P2_3	12B	68	P2_4	12A	67	P2_5
13C	66	P2_6	13B	65	P2_7	13A	63	P3_0
14C	61	P3_1	14B	60	P3_2	14A	59	P3_3
15C	58	P3_4	15B	57	P3_5	15A	56	P3_6
16C	55	P3_7	16B	54	P4_0	16A	53	P4_1
17C	52	P4_2	17B	51	P4_3	17A	50	P4_4
18C	49	P4_5	18B	48	P4_6	18A	47	P4_7
19C	46	CE	19B	45	P5_1	19A	44	P5_2
20C	43	P5_3	20B	42	P5_4	20A	41	EPM
21C	40	P5_6	21B	39	P5_7	21A	38	P6_0
22C	37	P6_1	22B	36	P6_2	22A	35	P6_3
23C	34	P6_4	23B	33	P6_5	23A	32	RXD1
24C	31	TXD1	24B	30	P7_0	24A	29	P7_1
25C	28	P7_2	25B	27	P7_3	25A	26	P7_4
26C	25	P7_5	26B	24	P7_6	26A	23	P7_7
27C	22	P8_0	27B	21	P8_1	27A	20	INIT0
28C	19	INIT1	28B	18	P8_4	28A	17	P8_5
29C	12	RESET	29B	11	XCOUT	29A	10	XCIN
30C	7	P9_0	30B	6	P9_1	30A	2	P9_2
31C	4	P9_3	31B	3	P9_4	31A	2	P9_5
32C	GND	NC	32B	GND	NC	32A	1	P9_6

8.6.3.Jumper setting

Table 8-8 Jumper setting M16C/62 StarterKit2.

Table 8-8 Jumper setting

JUMPER No	Marking name	Default mode	Function
JP1	AN0	1-2 Short 1)	A-D0 input 1-2pin short : connect variable resistance 2-3pin short : connect extend connector
JP2	Avcc	1-2 Short 1)	A-D analogue input terminal 1-2pin Short : connect MCU Vcc 2-3pin Short : connect extend connector
JP3	Vref	1-2 Short 1)	A-D analogue based terminal 1-2pin Short : connect MCU Vcc 2-3pin Short : connect extend connector
JP4	Avss	1-2 Short 1)	A-D analogue input terminal 1-2pin Short : connect MCU GND 2-3pin Short : connect extend connector
JP5	RESET	Short 1)	On baud divce reset Short : connect for SW4 Open : connect extend connector
JP6	RxD	Open	UART1 input 2) Short : connect extend connector Open : connect CN1
JP7	TxD	Open	UART1 input 2) Short : connect extend connector Open : connect CN1
JP8	POWER	2-3 Short 1)	Power supply control 1-2pin Short : for use CN3 2-3pin Short : for use CN1 Open : for use target board's power 3)
JP9	BYTE	Open	BYTE pin input Short : 8bit access external BUS (External memory mode only) Open : 16bit access external BUS (External memory mode only)
JP10	CNVss	Open	MCU mode input Short : use for change monitor program 4) Open : single chip-mode
JP11	P8_7	Open	Xcin input Short : connect extend connector Open : used on board sub-clock (hall only)
JP12	P8_6	Open	Xcout input Short : connect extend connector Open : used on board sub-clock (hall only)

1) This pin is short on back side. If modify, cut line on back side.

2) Can't changed. If chang, can't connect KD30.

3) OPEN is to do jumper from to prevent reverse electric currento the connector CN2 due to what is done so, and supply a power supply on the board. It can be used for the function that a user is optional.

4) When modify a monitor program, it is short. When modify a monitor program, show it section 7.

8.6.4.LED

Table 8-9 show LED and port connection about the connection with each LED and port in following.

Table 8-9 LED and port connection

(SEGMENT)

LED1,2	PORT	PIN No	ACTIVE
a	P0_0	88	L
b	P0_1	87	L
c	P0_2	86	L
d	P0_3	85	L
e	P0_4	84	L
f	P0_5	83	L
g	P0_6	82	L
h	P0_7	81	L

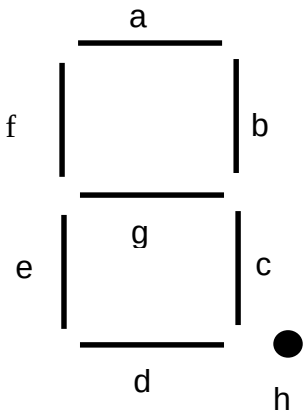


Figure 8-5 segment

(DIGIT)

LED	PORT	PIN No	ACTIVE
LED1	P1_0	80	L
KED2	P1_1	79	L

8.6.5.SWITCH

Table 8-10 switch, INT0, INT1 of MCU, get crowded, and SW1, SW2 are the witches connected with the input terminal. ADTRG, RESET of MCU profit get crowded, and SW3,SW4 are the switches connected with the input terminal. It can be used for the function that a user is optional. Show the connection of each switch and the input terminal in the following.

Table 8-10 switch

SW	Input	Note
SW1	INT0	
SW2	INT1	
SW3	ADTRG	
SW4	RESET	

M16C/62 StarterKit2 USER'S MANUAL.RevE

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