



# GENTOS

Application Note #008

(AN008-V1.3)

ZZA

## [Total] Frequently Asked Questions

MCU / IP / GENTOS / GENSYS52 /  
Compiler & Assembler / ROM Writer

V1.3

August 2005

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### ◆ How to drive LED (Light Emitting Diode)?

- ✓ Refer to the [Application Note #002 \(AN002\)](#) for detailed information.

### ◆ What is a ADC (Analog-to-Digital Converter) type?

- ✓ It is SAR (Successive Approximation Register) type.

### ◆ What is the effective bit of the ADC result?

- ✓ ENOB (Effective Number of Bit) of ADC is 7 bits. (MiDAS1.0 Family : 9-bit ADC Resolution)

### ◆ How to enhance the EMI (Electro-Magnetic Interference) or noise?

- ✓ User can enhance or noise by reducing the needless swing of ALE signal.  
User sets the ALEOFF flag of PMR (Power Management Register) to disable the ALE signal.
- ✓ Using the best fitted crystal oscillator.  
Refer to the [Application Note #004 \(AN004\)](#) for detailed information.

### ◆ Is there any relationship between the power slope and a POR (Power-On-Reset) action?

- ✓ The POR action is not dependent to the power slope, because the POR pulse is generated by the voltage level.

### ◆ Can I get the information about WDT (Watchdog Timer) and Power Management?

- ✓ Refer to the [Application Note #009 \(AN009\)](#) for "How to Use WDT (Watchdog Timer)".
- ✓ Refer to the [Application Note #010 \(AN010\)](#) for "Power Management (3 Modes)".

## ◆ What is the latency of interrupt service?

- ✓ The latency depends on various situation.
- ✓ So we provides minimum and maximum time.
  - Min. : 5 Machine cycle (20 clocks)
  - Max. : 11 Machine cycle (44 clocks)
- ✓ In more details, refer to the [Full Manual of MiDAS1.0 Family \(FM-GC87C520\)](#).

## ◆ When I used the all external interrupts supported by MCU device, how can I use the other method for external interrupt?

- ✓ User can use the external pin based on event edge of MiDAS family's peripherals.
- ✓ Example 1) UART
  - User can convert the RXD (UART Communication) pin to an additional external interrupt.
  - Refer the [Application Note #001 \(AN001\)](#) for detailed information.
- ✓ Example 2) Timer 0, Timer 1 and Timer 2
  - User can use the external interrupt event. (T0, T1, and T2 pins)
  - Set the TMOD register for Timer 0/1 to 0x60. (Timer 1 → Mode 2, 8-bit Auto-reload; Counter selection of external T1 pin.)
  - TH1 = 0xFF; and TL1 = 0xFF;
  - If the T1 pin is received with external toggle event, Overflow (TF1) is occurred.

### ◆ How to drive LED (Light Emitting Diode)?

- ✓ Refer to the [Application Note #002 \(AN002\)](#) for detailed information.

### ◆ What is a ADC (Analog-to-Digital Converter) type?

- ✓ It is SAR (Successive Approximation Register) type.

### ◆ What is the effective bit of the ADC result?

- ✓ ENOB (Effective Number of Bit) of ADC is 8 bits. (MiDAS1.1 Family : 10-bit ADC Resolution)

### ◆ Is there any relationship between the power slope and a POR (Power-On-Reset) action?

- ✓ The POR action is not dependent to the power slope, because the POR pulse is generated by the voltage level.

### ◆ Can I get the information about WDT (Watchdog Timer) and Power Management?

- ✓ Refer to the [Application Note #009 \(AN009\)](#) for "How to Use WDT (Watchdog Timer)".
- ✓ Refer to the [Application Note #010 \(AN010\)](#) for "Power Management (3 Modes)".

### ◆ How to use P1.0/XTAL1 and P1.1/XTAL2 as I/O pins? (When MCU uses the Internal Ring OSC.)

- ✓ Set the IOXEN flag (ALTSEL.7) to select the I/O pins from XTAL1/2 : **ex** ALTSEL |= 0x80 ;  
→ The initial value of IOXEN flag is "0". → P1[1:0] uses as XTAL1/XTAL2.
- ✓ And set the XTOFF flag (PMR.3) to disable the crystal amplifier : **ex** PMR |= 0x08 ;  
→ The initial value of XTOFF flag is "0". → Internal crystal amplifier is ON.

## ◆ How to use P1.2/RESETB as I/O pins? (Default : RESETB)

- ✓ Set the IORSTEN flag (ALTSEL.6) to select the I/O pins from RESETB : **ex)** `ALTSEL |= 0x40;`
- ✓ The P1.2 pin is supported with “high” until P1.2/RESETB to I/O pin selection.
- ✓ The P1.2 pin is Open-drain type. If user use this P1.2 pin to output pin, please check external pull-up resistor.

## ◆ What is a internal Ring oscillator type?

- ✓ Basically, it is consisted of a odd inverter chains, and added RC delay circuits.

## ◆ What is the variation of internal Ring oscillator? (Spec.)

- ✓  $V_{DD} = 5.0V \rightarrow 4.0MHz \pm 15\%$
- ✓  $V_{DD} = 3.3V \rightarrow 3.3MHz \pm 15\%$
- ✓ The value of internal Ring oscillator can be changed by the  $V_{DD}$  or temperature condition.
- ✓ Refer to below values (On average. MCU operating voltage : 2.4V ~ 5.5V)
  - $2.4V = 2.15 MHz$                        $3.0V = 2.98 MHz$                        $3.3V = 3.26 MHz$   
 $5.0V = 3.65 MHz$                        $5.5V = 3.73 MHz$

## ◆ What is the latency of interrupt service?

- ✓ The latency depends on various situation.
- ✓ So we provides minimum and maximum time.
  - ✓ Min. : 5 Machine cycle (20 clocks)
  - ✓ Max. : 11 Machine cycle (44 clocks)
- ✓ In more details, refer to the [Full Manual of MiDAS1.1 Family \(FM-GC87C510\)](#).

◆ When I used the all external interrupts supported by MCU device, how can I use the other method for external interrupt?

- ✓ User can use the external pin based on event edge of MiDAS family's peripherals.
- ✓ Example 1) UART
  - User can convert the RXD (UART Communication) pin to an additional external interrupt.
  - Refer the [Application Note #001 \(AN001\)](#) for detailed information.

◆ How to use the external oscillator?

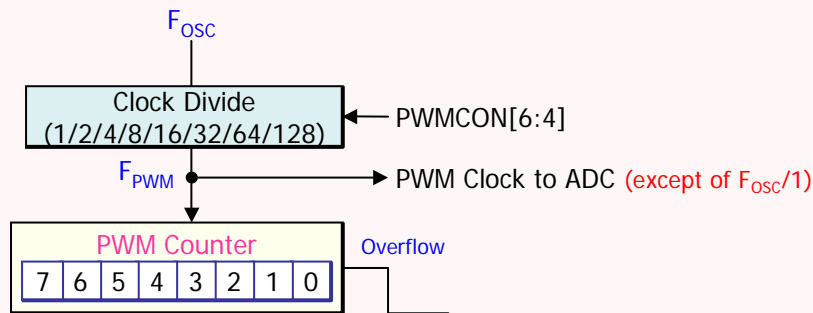
- ✓ The default system clock of MiDAS1.1 family is a internal Ring oscillator.
- ✓ If user want to use the external oscillator (2-pin crystal oscillator or half/full-type oscillator),
- ✓ Check the XTUP flag (STATUS.4) for crystal amplifier ready.
- ✓ After check and XTUP is set, set the XTRG flag (EXIF.3) for external system clock selection.  
Refer to below example code (C and Assembly code)

```
//-----  
// C Code  
//  
while( !(STATUS&0x10) ); // XTUP flag  
  
EXIF |= 0x08; // XTRG flag  
  
// User can use below code.  
// EXIF |= XTRG_;
```

```
;-----  
; Assembly Code  
;  
crystal_osc_amp_ready:  
mov a, STATUS ; XTUP flag (.4)  
jnb acc4, crystal_osc_amp_ready  
  
orl EXIF, #0x08 ; XTRG flag (.3)  
  
; User can use below code.  
; orl EXIF, #XTRG_
```

- ◆ How to use PWM clock ( $F_{PWM}$ ) instead of system clock ( $F_{OSC}$ ) as ADC clock ( $F_{ADC}$ )?
  - ✓ User can set the Setting the  $F_{PWM}$  using PS2\_P0, PS1\_P0, and PS0\_P0 flags (PWMCON[6:4]).
  - ✓ Note that  $F_{PWM}$  for  $F_{ADC}$  should not  $F_{OSC}/1$ .
  - ✓ To select  $F_{PWM}$  instead of  $F_{OSC}$  as  $F_{ADC}$ , set the ADIV flag (ADCON.2). Default  $F_{ADC} = F_{OSC}$  (ADIV = 0)

## [ 1. PWM (Pulse Width Modulation) ]



### ■ PWMCON (DCh) : PWM Control Register

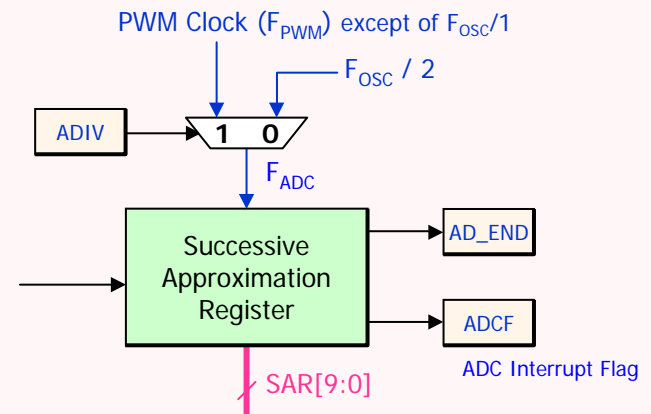
POSEL	PS2_P0	PS1_P0	PS0_P0	-	PWMF	CLR_P0	RUN_P0
R/W(0)	R/W(0)	R/W(0)	R/W(0)		R/W(0)	R/W(0)	R/W(0)

#### ◆ PS2\_P0, PS1\_P0, PS0\_P0 : Pre-scaled Clock Selection.

[0,0,0] =  $F_{OSC}/1$ , [0,0,1] =  $F_{OSC}/2$ , [0,1,0] =  $F_{OSC}/4$ ,  
 [0,1,1] =  $F_{OSC}/8$ , [1,0,0] =  $F_{OSC}/16$ , [1,0,1] =  $F_{OSC}/32$ ,  
 [1,1,0] =  $F_{OSC}/64$ , [1,1,1] =  $F_{OSC}/128$

\* PWM Clock (FPWM) to ADC should not be set to  $F_{osc}/1$ .

## [ 2. ADC (Analog-to-Digital Converter) ]



### ■ ADCON (EFh) : ADC Control & ADC Result Low Register : Value[1:0]

AD_EN	AD_REQ	AD_END	ADCF	AVREF	ADIV	SAR1	SAR0
R/W(0)	R/W(0)	R(1)	R/W(0)	R/W(0)	R/W(0)	R/W(0)	R/W(0)

- ◆ ADIV : ADC input clock select
  - 0 = System clock ( $F_{OSC}$ ) / 2. (Default)
  - 1 = PWM input clock ( $F_{PWM}$ )



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### ◆ What is the effective bit of the ADC result?

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- ✓ In more details, refer to the [Full Manual of MiDAS2.0 Family \(FM-GC80C590\)](#).

### ◆ How to use the IAP (In-Application Programming)?

- ✓ Refer to the [Application Note #012 \(AN012\)](#) for detailed information.

## ◆ How to drive MiDAS2.0 family at 5V supply voltage?

- ✓ User cannot support the 5V to MiDAS2.0 family (Only 3.3V operation)
- ✓ But, MiDAS2.0 family supports the 5V tolerant I/O pins.
- ✓ G-type : 44-PLCC/TQFP, 64-TQFP, 80-TQFP, and 100-TQFP
  - P0, P1, P2, and P3
- ✓ A-type : 44-PLCC/TQFP
  - P0, P2, and P3
- ✓ Refer to [the Brief Manual of MiDAS2.0 Family \(BM-GC80C590\)](#).

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- ✓ Example 2) Timer 0, Timer 1 and Timer 2
  - User can use the external interrupt event. (T0, T1, and T2 pins)
  - Set the TMOD register for Timer 0/1 to 0x60. (Timer 1 → Mode 2, 8-bit Auto-reload; Counter selection of external T1 pin.)
  - TH1 = 0xFF; and TL1 = 0xFF;
  - If the T1 pin is received with external toggle event, Overflow (TF1) is occurred.



- ◆ I cannot set the clock over 30MHz. GENTOS outputs some error message which is “out of range” when I try to set the clock of GENSYS52 MDS equipment.
  - ✓ GENTOS program and GENSYS52 MDS equipment generate the emulator clock ( $F_{osc}$ ) up to 30MHz Max.
  - ✓ If the user's setting clock is over than 30MHz, GENTOS program will warn about it.
  
- ◆ What kinds of OS (Operating System) are supported for GENTOS program?
  - ✓ GENTOS program works in MS Windows 98 / ME / 2000 / XP.
  - ✓ We recommend that user uses GENTOS program at MS Windows XP.
  
- ◆ I cannot watch a local variable.
  - ✓ GENTOS program cannot support to watch a local variable yet.
  - ✓ This problem will be solved in December, 2004.  
(Current released version is GENTOS V2.1. And Next Version will support this.)
  
- ◆ Can I install the GENTOS program at the other disk driver?
  - ✓ User must install at C driver. (We recommend at “c:\gentos” directory.)

## 4. GENSYS52 / GENICE52 MDS Equipment (1 of 1)

- ◆ I want to use a oscillator (Full/Half type) or crystal oscillator as the target clock (External clock).
  - ✓ GENSYS52 can only use the oscillator (Full/Half type).
  - ✓ Crystal oscillator cannot be used because of no amplifier.
  
- ◆ How to use the target power source ( $V_{DD}$ )?
  - ✓ User selects "MCU\_VCC" to "EXT" using jumper switch on the top of GENSYS52 POD board.
  - ✓ Refer to the [Brief Manual of GENTOS \(BM-GENTOS\)](#) in details information.

- ◆ How to support In-line assembly programming in `gcc`?
  - ✓ Refer to the [Application Note #007 \(AN007\)](#) for detailed information.
- ◆ Can I get the guideline for assembly programming?
  - ✓ Refer to the [Application Note #011 \(AN011\)](#) for detailed information.
- ◆ How to reduce the code size in `gcc`?
  - ✓ Refer to the [Application Note #006 \(AN06\)](#) for detailed information.
- ◆ What does mean “**Unreachable Code**” warning when compiling?
  - ✓ The control flow of the program can be changed by dummy or redundant codes.
  - ✓ These codes don't be executed after compiling.
  - ✓ But, this warning has no effect on the correct execution.
- ◆ If the ISRs (Interrupt Service Routines) are not included in the main routine file, is any program?
  - ✓ The ISRs and main routines should be existed in the same file.
  - ✓ If not, the ISRs don't be called and don't work correctly.
- ◆ How to create a new library file?
  - ✓ Refer to the [Application Note #003 \(AN003\)](#) for detailed information.

### ◆ I want to use other compiler such as KEIL in GENTOS or CoreRiver MCU.

- ✓ The hexa file generated by other compiler can be executed in GENTOS (Emulation) or CoreRiver MCU.
- ✓ But, because the other compiler cannot support the debug information which is recognized in GENTOS, the debugger doesn't work.
- ✓ GENTOS supports just run and stop operation (Emulation) in this case.
- ✓ We recommend `gencc` because it can only support fully the functions of all analog part of CoreRiver MCU such as ADC.

### ◆ How is the quality of `gencc` if compared with KEIL compiler?

- ✓ The code size of `gencc` is larger than that of KEIL compiler. ( $\pm 10 \sim 30\%$  on average)
- ✓ Refer to the [Application Note #006 \(AN06\)](#) to reduce the code size with `gencc`.

### ◆ Why the code size is increased in an ISR (Interrupt Service Routine) after the ISR calls a function?

- ✓ The ISR with no function call and using non-zero bank registers doesn't save that bank.
- ✓ But, if the ISR with function call which uses some other bank, that bank is saved entirely.

### ◆ Is there any guideline to convert C source file of KEIL compiler to that of `gencc`?

- ✓ We are preparing the guideline to convert C source file.
- ✓ We will release it as soon as possible.

### ◆ Does `gencc` support floating-point?

- ✓ Yes, `gencc` supports only IEEE single precision (4 bytes) floating-point numbers, not double precision.
- ✓ The floating-point routines are derived from "`float.h`" header file. (`c:\gentos\include`)



## ◆ How can I see the assembly code created by `gcc`?

- ✓ User can see the assembly code file from "`source_file_name.asm`" or "`source_file_name.lst`" in the current workspace directory.

## ◆ If the source file is larger than 62KB code size in MiDAS2.0 Family, can `gcc` compile it?

- ✓ The `gcc` can compile the source file with larger than 62KB code size.
- ✓ But, it cannot work in real MCU chip (MiDAS2.0 Family).
- ✓ You have to optimize you program (code).

## ◆ How to use the bit addressable memory at C programming?

- ✓ When a variable is declared as a "`bit`", it is allocated into the bit addressable memory.  
ex) `bit test_bit;`
- ✓ **At this case, register bank 1, 2, and 3 is not used. (variables not allocated)**
- ✓ To use the register bank 1, 2, and 3, user may use for ISR with register bank or assigning the variables to absolute address (0x08 ~ 0x1F). Refer to Next Slide.

## ◆ Is there any limitation of ROM size when compiling?

- ✓ The limitation in compiling is the same as that of respective device.
- ✓ MiDAS1.0 Family : 8KB
- ✓ MiDAS1.1 Family : 4KB
- ✓ MiDAS2.0 Family : 62KB

## ◆ How to write a time-critical ISR (interrupt service routine) in C programming?

- ✓ To reduce backup process between function call, user may use the keyword “`_naked`” and the attribute “`using`”.
- ✓ The keyword “`_naked`” prevents the compiler from generating prologue and epilogue code for that function.
- ✓ With the attribute “`using`” user can assign the dedicated register bank for each interrupt priority level. Refer to below example.

```
//-----  
// Timer 0 Interrupt Function (with Register Bank 1)  
void timer0_int(void) interrupt TFO_VECTOR using 1 {  
  
    :  
    :  
  
    TFO = 0;  
}
```

## ◆ How to assign the variables to an absolute address in C programming?

- ✓ User may use the key word “`at RAM_address`” to assign.  
ex) `unsigned char at 0x20 test_byte;`

### ◆ Which ROM writer (or programmer) does support CoreRiver MCU?

- ✓ Hi-Lo Systems : ALL-100, ALL-11P3 , GANG-08 → MiDAS1.0/1.1 Family
- ✓ ADVANTECH : LABTOOL-48XP → MiDAS1.0/1.1 Family
- ✓ TOPMAX : EETools → MiDAS1.0 Family
- ✓ CoreRiver : GenWriter 0.2 → MiDAS1.0 Family (28 pins), and MiDAS1.1 Family  
(Refer to [Brief Manual of GenWriter \(BM-GENWRITER\\_V02\)](#).)  
GenWriter 2.0 → MiDAS1.1 Family
- ✓ Other ROM writers (or programmers) are registering the CoreRiver MCU now.
- ✓ User can download the recent program at each company's download center.

### ◆ What file is used to program ROM of MCU?

- ✓ The file format is Intel hexa file (\*.hex).
- ✓ User uses the " **Workspace\_Name.hex** " in the current workspace directory.
- ✓ If user uses the [EETools programmer equipment of TOPMAX](#), must check the extension "\* .hex".

### ◆ Is there any method for ISP (In-System Programming) in MiDAS1.1 Family?

- ✓ Refer to the [Application Note #013 \(AN-013\)](#) for MiDAS1.1 Family.

### ◆ How to protect the user program (code)?

- ✓ Check the "Lock" option in programming.

## ◆ The List of the Application Notes

- ✓ AN001\_VXX : [MiDAS1.0/1.1] Using UART RXD pin as External Interrupt
  - ✓ AN002\_VXX : [MiDAS1.0/1.1] Driving LEDs (Light Emitting Diodes) in MiDAS
  - ✓ AN003\_VXX : [GENTOS] Creating Library Archives in GENTOS
  - ✓ AN004\_VXX : [MiDAS1.0] Guideline for Oscillator Configuration & Crystal Usage
  - ✓ AN005\_VXX : [MiDAS] Technical Terms about CoreRiver MCU
  - ✓ AN006-VXX : [GENTOS] How to Reduce the Code Size using CoreRiver Compiler (gcc)
  - ✓ AN007-VXX : [GENTOS] In-line Assembly Programming using CoreRiver Compiler (gcc)
  - ✓ AN008-VXX : [Total] FAQs (Frequently Asked Questions)
  - ✓ AN009-VXX : [MiDAS1.0/1.1/2.0] How to Use WDT (Watchdog Timer)
  - ✓ AN010-VXX : [MiDAS1.0/1.1/2.0] Power Management : 3 Modes
  - ✓ AN011-VXX : [GENTOS] Guideline for Assembly Programming
  - ✓ AN012-VXX : [MiDAS2.0] How to Use IAP (In-Application Programming)
  - ✓ AN013-VXX : [MiDAS1.1] How to Use ISP Configuration for User System
  - ✓ AN014-VXX : [MiDAS1.0] Training Guide for Lab. With GENTOS (GENSYS52)
  - ✓ AN015-VXX : [MiDAS2.0] How to Use ISP with GenICE52
- ✓ User can get these documents (.pdf) from download center of CoreRiver homepage ([www.coreriver.com](http://www.coreriver.com)).
- ✓ We support the more Application Note as soon as possible.

### ◆ The List of the Brief Manuals

- ✓ BM-GC80C520-VXX : Brief Manual of MiDAS1.0 Family
- ✓ BM-GC80C510-VXX : Brief Manual of MiDAS1.1 Family
- ✓ BM-GC80C590-VXX : Brief Manual of MiDAS2.0 Family
  
- ✓ BM-GENTOS-VXX : Brief Manual of GENTOS (GENTOS Program & GENSYS52 MDS Equipment)
- ✓ BM-GENWRITER\_V02-VXX : Brief Manual of GenWriter (GenWriter V0.2 Board & GenWriter I/II Program)
  
- ✓ BM-HERA-VXX : Brief Manual of HERA K2.1 Application Board (for MiDAS1.0 Family)
- ✓ BM-HERA\_JR\_V1-VXX : Brief Manual of HERA Jr. V1.0 Application Board (for MiDAS1.1 Family)

### ◆ The List of the Full Manuals

- ✓ FM-GC80C520-VXX : Full Manual of MiDAS1.0 Family
- ✓ FM-GC80C510-VXX : Full Manual of MiDAS1.1 Family
- ✓ FM-GC80C590-VXX : Full Manual of MiDAS2.0 Family
  
- ✓ FM-GENTOS-VXX : Full Manual of GENTOS (GENTOS Program & GENSYS52 MDS Equipment)