

CS+ Code Generator Tool

Integrated Development Environment

User's Manual: RL78 API Reference

Target Device

RL78 Family

Target Tool

CS+ for CC V6.01.00

CS+ for CA, CX V4.01.00

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How to Use This Manual

This manual describes the role of the CS+ integrated development environment for developing applications and systems for RL78 family, and provides an outline of its features.

CS+ is an integrated development environment (IDE) for RL78 family, integrating the necessary tools for the development phase of software (e.g. design, implementation, and debugging) into a single platform.

By providing an integrated environment, it is possible to perform all development using just this product, without the need to use many different tools separately.

Readers	This manual is intended for users who wish to understand the functions of the CS+ and design software and hardware application systems.
Purpose	This manual is intended to give users an understanding of the functions of the CS+ to use for reference in developing the hardware or software of systems using these devices. We aim to help their system development including their hardware and software.
Organization	This manual can be broadly divided into the following units. 1.GENERAL 2.OUTPUT FILES 3.API FUNCTIONS
How to Read This Manual	It is assumed that the readers of this manual have general knowledge of electricity, logic circuits, and microcontrollers.
Conventions	Data significance: Higher digits on the left and lower digits on the right Active low representation: \overline{XXX} (overscore over pin or signal name) Note: Footnote for item marked with Note in the text Caution: Information requiring particular attention Remark: Supplementary information Numeric representation: Decimal ... XXXX Hexadecimal ... 0xXXXX

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1. GENERAL

Code Generator Tool is a software tool that automatically generates device drivers.

This manual explains about .

This manual gives Output files and API functions.

1.1 Overview

Code Generator tool enables you to output the pin assignment of the microcontroller (device pin list and device top view), and the source code (device driver programs, C source files and header files) necessary to control the peripheral functions (clock generator, port functions, etc.) provided by the microcontroller by configuring various information using the GUI.

1.2 Features

Code Generator tool has the following features.

- Code generating function

The Code Generator can output not only device driver programs in accordance with the information configured using the GUI, but also a build environment such as sample programs containing main functions and link directive files.

- Reporting function

You can output configured information using the Pin Configurator/Code Generator as files in various formats for use as design documents.

- Renaming function

The user can change default names assigned to the files output by the Code Generator and the API functions contained in the source code.

- User code protective function

The user can add user's original source code to each API function. When user generated the device driver programs again by the Code Generator, user's source code within this comment is protected.

[Comment for user source code descriptions]

```
/* Start user code. Do not edit comment generated here */
```

```
/* End user code. Do not edit comment generated here */
```

2. OUTPUT FILES

This appendix describes the files output by the Code Generator.

2.1 Description

Below is a list of output file files by the Code Generator.

Table 2.1 Output File List

Peripheral Function	File Name	API Function Name	Output (*1)
Common	r_main.c or r_cg_main.c	main R_MAIN_UserInit	A A
	r_systeminit.c or r_cg_systeminit.c	hdwinit R_Systeminit	A A
	r_cg_macrodriver.h	-	-
	r_cg_userdefine.h	-	-
Clock generator	r_cg_cgc.c	R_CGC_Create R_CGC_Set_ClockMode R_CGC_RAMECC_Start R_CGC_RAMECC_Stop R_CGC_StackPointer_Start R_CGC_StackPointer_Stop R_CGC_ClockMonitor_Start R_CGC_ClockMonitor_Stop	A M A A A A A A
	r_cg_cgc_user.c	R_CGC_Create_UserInit r_cg_ram_ecc_interrupt r_cg_stackpointer_interrupt r_cg_clockmonitor_interrupt R_CGC_Get_ResetSource	M A A A A
	r_cg_cgc.h	-	-
Port functions	r_cg_port.c	R_PORT_Create	A
	r_cg_port_user.c	R_PORT_Create_UserInit	M
	r_cg_port.h	-	-
High-speed on-chip Oscillator clock Fre- quency Correction function	r_cg_hofc.c	R_HOFC_Create R_HOFC_Start R_HOFC_Stop	A A A
	r_cg_hofc_user.c	R_HOFC_Create_UserInit r_hofc_interrupt	M A
	r_cg_hofc.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Timer array unit	r_cg_timer.c or r_cg_tau.c	R_TAUm_Create R_TAUm_Channeln_Start R_TAUm_Channeln_Higher8bits_Start R_TAUm_Channeln_Lower8bits_Start R_TAUm_Channeln_Stop R_TAUm_Channeln_Higher8bits_Stop R_TAUm_Channeln_Lower8bits_Stop R_TAUm_Reset R_TAUm_Set_PowerOff R_TAUm_Channeln_Get_PulseWidth R_TAUm_Channeln_Set_SoftwareTriggerOn	A A A A A A A M A A A
	r_cg_timer_user.c or r_cg_tau_user.c	R_TAUm_Create_UserInit r_taum_channeln_interrupt r_taum_channeln_higher8bits_interrupt	M A A
	r_cg_timer.h or r_cg_tau.h	-	-
Timer RJ	r_cg_timer.c or r_cg_tmrj.c	R_TMR_RJn_Create R_TMR_RJn_Start R_TMR_RJn_Stop R_TMR_RJn_Set_PowerOff R_TMR_RJn_Get_PulseWidth R_TMRJn_Create R_TMRJn_Start R_TMRJn_Stop R_TMRJn_Set_PowerOff R_TMRJn_Get_PulseWidth	A A A A A A A A M M
	r_cg_timer_user.c or r_cg_tmrj_user.c	R_TMR_RJn_Create_UserInit r_tmr_rjn_interrupt R_TMRJn_Create_UserInit r_tmrjn_interrupt	M A M A
	r_cg_timer.h or r_cg_tmrj.h	-	-
Timer RD	r_cg_timer.c or r_cg_tmr.d.c	R_TMR_RDn_Create R_TMR_RDn_Start R_TMR_RDn_Stop R_TMR_RDn_Set_PowerOff R_TMR_RDn_ForcedOutput_Start R_TMR_RDn_ForcedOutput_Stop R_TMR_RDn_Get_PulseWidth R_TMRDn_Create R_TMRDn_Start R_TMRDn_Stop R_TMRDn_Set_PowerOff R_TMRDn_ForcedOutput_Start R_TMRDn_ForcedOutput_Stop R_TMRDn_Get_PulseWidth R_TMRD_Set_PowerOff	A A A M M M A A A A M M M M
	r_cg_timer_user.c or r_cg_tmr.d_user.c	R_TMR_RDn_Create_UserInit r_tmr_rdn_interrupt R_TMRDn_Create_UserInit r_tmr.dn_interrupt	M A M A
	r_cg_timer.h or r_cg_tmr.d.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Timer RG	r_cg_timer.c	R_TMR_RG0_Create R_TMR_RG0_Start R_TMR_RG0_Stop R_TMR_RG0_Set_PowerOff R_TMR_RG0_Get_PulseWidth	A A A M A
	r_cg_timer_user.c	R_TMR_RG0_Create_UserInit r_tmr_rg0_interrupt	M A
	r_cg_timer.h	-	-
Timer RX	r_cg_tmr.c	R_TMRX_Create R_TMRX_Start R_TMRX_Stop R_TMRX_Set_PowerOff R_TMRX_Get_BufferValue	A A A A M
	r_cg_tmr_user.c	R_TMRX_Create_UserInit r_tmr_interrupt	M A
	r_cg_tmr.h	-	-
16-bit timer KB	r_cg_timer.c or r_cg_tmkb.c	R_TMR_KB_Create R_TMR_KBm_Start R_TMR_KBm_Stop R_TMR_KBm_Set_PowerOff R_TMR_KBmn_ForcedOutput_Start R_TMR_KBmn_ForcedOutput_Stop R_TMR_KBm_BatchOverwriteRequestOn R_TMR_KBm_ForcedOutput_mn_Start R_TMR_KBm_ForcedOutput_mn_Stop R_TMR_KBm_Reset	A A A M A A A A A A M
	r_cg_timer_user.c or r_cg_tmkb_user.c	R_TMR_KBm_Create_UserInit r_tmr_kbm_interrupt	M A
	r_cg_timer.h or r_cg_tmkb.h	-	-
16-bit timer KC0	r_cg_timer.c	R_TMR_KC0_Create R_TMR_KC0_Start R_TMR_KC0_Stop R_TMR_KC0_Set_PowerOff	A A A M
	r_cg_timer_user.c	R_TMR_KC0_Create_UserInit r_tmr_kc0_interrupt	M A
	r_cg_timer.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)	
16-bit timer KB2	r_cg_kb2.c	R_KB2m_Create	A	
		R_KB2m_Start	A	
		R_KB2m_Stop	A	
		R_KB2m_Set_PowerOff	M	
		R_KB2m_Simultaneous_Start	A	
		R_KB2m_Simultaneous_Stop	A	
		R_KB2m_Synchronous_Start	A	
		R_KB2m_Synchronous_Stop	A	
		R_KB2m_TKBO0_Forced_Output_Stop_Function1_Start	A	
		R_KB2m_TKBO0_Forced_Output_Stop_Function1_Stop	A	
		R_KB2m_TKBO1_Forced_Output_Stop_Function1_Start	A	
		R_KB2m_TKBO1_Forced_Output_Stop_Function1_Stop	A	
		R_KB2m_TKBO0_DitheringFunction_Start	A	
		R_KB2m_TKBO0_DitheringFunction_Stop	A	
		R_KB2m_TKBO1_DitheringFunction_Start	A	
		R_KB2m_TKBO1_DitheringFunction_Stop	A	
		R_KB2m_TKBO0_SmoothStartFunction_Start	A	
		R_KB2m_TKBO0_SmoothStartFunction_Stop	A	
		R_KB2m_TKBO1_SmoothStartFunction_Start	A	
		R_KB2m_TKBO1_SmoothStartFunction_Stop	A	
	R_KB2m_Set_BatchOverwriteRequestOn	A		
		r_cg_kb2_user.c	R_KB2m_Create_UserInit r_kb2m_interrupt	M A
		r_cg_kb2.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Real-time clock	r_cg_rtc.c	R_RTC_Create	A
		R_RTC_Start	A
		R_RTC_Stop	A
		R_RTC_Set_PowerOff	A
		R_RTC_Set_HourSystem	M
		R_RTC_Set_CounterValue	A
		R_RTC_Set_CalendarCounterValue	A
		R_RTC_Set_BinaryCounterValue	A
		R_RTC_Get_CounterValue	A
		R_RTC_Get_CalendarCounterValue	A
		R_RTC_Get_BinaryCounterValue	A
		R_RTC_Set_ConstPeriodInterruptOn	A
		R_RTC_Set_ConstPeriodInterruptOff	A
		R_RTC_Set_AlarmOn	A
		R_RTC_Set_CalendarAlarmOn	A
		R_RTC_Set_BinaryAlarmOn	A
		R_RTC_Set_AlarmOff	A
		R_RTC_Set_AlarmValue	A
		R_RTC_Set_CalendarAlarmValue	A
		R_RTC_Set_BinaryAlarmValue	A
	R_RTC_Get_AlarmValue	A	
	R_RTC_Get_CalendarAlarmValue	A	
	R_RTC_Get_BinaryAlarmValue	A	
	R_RTC_Set_RTC1HZOn	A	
	R_RTC_Set_RTC1HZOff	A	
	R_RTC_Set_RTCOUTOn	A	
	R_RTC_Set_RTCOUTOff	A	
Real-time clock	r_cg_rtc_user.c	R_RTC_Create_UserInit	M
		r_rtc_interrupt	A
		r_rtc_callback_constperiod	A
		r_rtc_callback_alarm	A
		r_rtc_alarminterrupt	A
		r_rtc_periodicinterrupt	A
r_cg_rtc.h	-	-	
Subsystem clock frequency measurement circuit	r_cg_fmc.c	R_FMC_Create	A
		R_FMC_Start	A
		R_FMC_Stop	A
	r_cg_fmc_user.c	R_FMC_Set_PowerOff	M
		R_FMC_Create_UserInit	M
		r_fmc_interrupt	A
r_cg_fmc.h	-	-	
12-bit interval timer	r_cg_it.c	R_IT_Create	A
		R_IT_Start	A
		R_IT_Stop	A
		R_IT_Reset	M
	r_cg_it_user.c	R_IT_Set_PowerOff	M
		R_IT_Create_UserInit	M
r_cg_it.h	r_it_interrupt	A	
r_cg_it.h	-	-	

Peripheral Function	File Name	API Function Name	Output (*1)
8-bit interval timer	r_cg_it8bit.c	R_IT8bitm_ChannelIn_Create R_IT8bitm_ChannelIn_Start R_IT8bitm_ChannelIn_Stop R_IT8bitm_ChannelIn_Set_PowerOff R_IT8bitm_Set_PowerOff	A A A M M
	r_cg_it8bit_user.c	R_IT8bitm_ChannelIn_Create_UserInit r_it8bitm_channelin_interrupt	M A
	r_cg_it8bit.h	-	-
16-bit wakeup timer	r_cg_timer.c	R_WUTM_Create R_WUTM_Start R_WUTM_Stop R_WUTM_Set_PowerOff	A A A M
	r_cg_timer_user.c	R_WUTM_Create_UserInit r_wutm_interrupt	M A
	r_cg_timer.h	-	-
Clock output/buzzer output controller	r_cg_pclbuz.c	R_PCLBUZn_Create R_PCLBUZn_Start R_PCLBUZn_Stop R_PCLBUZ_Set_PowerOff	A A A M
	r_cg_pclbuz_user.c	R_PCLBUZn_Create_UserInit	M
	r_cg_pclbuz.h	-	-
Watchdog timer	r_cg_wdt.c	R_WDT_Create R_WDT_Restart	A A
	r_cg_wdt_user.c	R_WDT_Create_UserInit r_wdt_interrupt	M A
	r_cg_wdt.h	-	-
24-bit DS A/D converter with programmable gain instrumentation amplifier	r_cg_pga_dsad.c	R_PGA_DSAD_Create R_PGA_DSAD_Start R_PGA_DSAD_Stop R_PGA_DSAD_Set_PowerOff R_PGA_DSAD_Get_AverageResult R_PGA_DSAD_Get_Result R_PGA_DSAD_CAMP_OffsetTrimming	A A A M A A A
	r_cg_pga_dsad_user.c	R_PGA_DSAD_Create_UserInit r_pga_dsad_interrupt_conversion r_pga_dsad_interrupt_scan r_pga_dsad_conversion_interrupt r_pga_dsad_scan_interrupt	M A A A A
	r_cg_pga_dsad.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
A/D converter	r_cg_adc.c	R_ADC_Create R_ADC_Set_OperationOn R_ADC_Set_OperationOff R_ADC_Start R_ADC_Stop R_ADC_Reset R_ADC_Set_PowerOff R_ADC_Set_ADChannel R_ADC_Set_SnoozeOn R_ADC_Set_SnoozeOff R_ADC_Set_TestChannel R_ADC_Get_Result R_ADC_Get_Result_8bit	A A A A A M M M M M M A A
	r_cg_adc_user.c	R_ADC_Create_UserInit r_adc_interrupt	M A
	r_cg_adc.h	-	-
Configurable amplifier	r_cg_camp.c	R_CAMP_Create R_CAMPn_Start R_CAMPn_Stop R_CAMP_Set_PowerOff	A A A M
	r_cg_camp_user.c	R_CAMP_Create_UserInit	M
	r_cg_camp.h	-	-
Temperature sensor	r_cg_tmpps.c	R_TMPS_Create R_TMPS_Start R_TMPS_Stop R_TMPS_Reset R_TMPS_Set_PowerOff	A A A M M
	r_cg_tmpps_user.c	R_TMPS_Create_UserInit	M
	r_cg_tmpps.h	-	-
24-bit DS A/D converter	r_cg_dsadc.c	R_DSADC_Create R_DSADC_Set_OperationOn R_DSADC_Set_OperationOff R_DSADC_Start R_DSADC_Stop R_DSADC_Reset R_DSADC_Set_PowerOff R_DSADC_Channeln_Get_Result R_DSADC_Channeln_Get_Result_16bit	A A A A A M M A A
	r_cg_dsadc_user.c	R_DSADC_Create_UserInit r_dsadc_interrupt r_dsadzcn_interrupt	M A A
	r_cg_dsadc.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
D/A converter	r_cg_dac.c	R_DAC_Create R_DACn_Start R_DACn_Stop R_DAC_Set_PowerOff R_DACn_Set_ConversionValue R_DAC_Change_OutputVoltage_8bit R_DAC_Change_OutputVoltage R_DACn_Create R_DAC_Reset	A A A M A A A A A
	r_cg_dac_user.c	R_DAC_Create_UserInit R_DACn_Create_UserInit	M M
	r_cg_dac.h	-	-
Programmable gain amplifier	r_cg_pga.c	R_PGA_Create R_PGA_Start R_PGA_Stop R_PGA_Reset R_PGA_Set_PowerOff	A A A M M
	r_cg_pga_user.c	R_PGA_Create_UserInit	M
	r_cg_pga.h	-	-
Comparator	r_cg_comp.c	R_COMP_Create R_COMPn_Start R_COMPn_Stop R_COMP_Reset R_COMP_Set_PowerOff	A A A M M
	r_cg_comp_user.c	R_COMP_Create_UserInit r_compn_interrupt	M A
	r_cg_comp.h	-	-
Comparator/ProgrammableGain-Amplifier	r_cg_comppga.c	R_COMPPPGA_Create R_COMPPPGA_Set_PowerOff R_COMPn_Start R_COMPn_Stop R_PGA_Start R_PGA_Stop R_PWMOPT_Start R_PWMOPT_Stop	A M A A A A A A
	r_cg_comppga_user.c	R_COMP_Create_UserInit r_compn_interrupt R_COMPPPGA_Create_UserInit r_compn_interrupt	M A M A
	r_cg_comppga.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Serial array unit	r_cg_serial.c or r_cg_sau.c	R_SAUm_Create R_SAUm_Reset R_SAUm_Set_PowerOff R_SAUm_Set_SnoozeOn R_SAUm_Set_SnoozeOff R_UARTn_Create R_UARTn_Start R_UARTn_Stop R_UARTn_Send R_UARTn_Receive R_CSImn_Create R_CSImn_Start R_CSImn_Stop R_CSImn_Send R_CSImn_Receive R_CSImn_Send_Receive R_IICmn_Create R_IICmn_StartCondition R_IICmn_StopCondition R_IICmn_Stop R_IICmn_Master_Send R_IICmn_Master_Receive	A M M M M A A A A A A A A A A A A A A A A A A
	r_cg_serial_user.c or r_cg_sau_user.c	R_SAUm_Create_UserInit r_uartn_interrupt_send r_uartn_interrupt_receive r_uartn_interrupt_error r_uartn_callback_sendend r_uartn_callback_receiveend r_uartn_callback_error r_uartn_callback_softwareoverrun r_csimn_interrupt r_csimn_callback_sendend r_csimn_callback_receiveend r_csimn_callback_error r_iicmn_interrupt r_iicmn_callback_master_sendend r_iicmn_callback_master_receiveend r_iicmn_callback_master_error	M A A A A A A A A A A A A A A A A
	r_cg_serial.h or r_cg_sau.h	-	-
Serial array unit 4	r_cg_serial.c	R_DALIn_Create R_DALIn_Start R_DALIn_Stop R_DALIn_Send R_DALIn_Receive	A A A A A
	r_cg_serial_user.c	r_dalin_interrupt_send r_dalin_interrupt_receive r_dalin_interrupt_error r_dalin_callback_sendend r_dalin_callback_receiveend r_dalin_callback_error r_dalin_callback_softwareoverrun	A A A A A A A
	r_cg_serial.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Asynchronous serial interface LIN-UART	r_cg_serial.c	R_UARTFm_Create R_UARTFm_Start R_UARTFm_Stop R_UARTFm_Set_PowerOff R_UARTFm_Send R_UARTFm_Receive R_UARTFm_Set_DataComparisonOn R_UARTFm_Set_DataComparisonOff	A A A M A A A A
	r_cg_serial_user.c	R_UARTFm_Create_UserInit r_uartfn_interrupt_send r_uartfn_interrupt_receive r_uartfn_interrupt_error r_uartfn_callback_sendend r_uartfn_callback_receiveend r_uartfn_callback_error r_uartfn_callback_softwareoverrun r_uartfn_callback_expbitdetect r_uartfn_callback_idmatch	M A A A A A A A A A
	r_cg_serial.h	-	-
Serial interface IICA	r_cg_serial.c or r_cg_iica.c	R_IICAn_Create R_IICAn_StopCondition R_IICAn_Stop R_IICAn_Reset R_IICAn_Set_PowerOff R_IICAn_Master_Send R_IICAn_Master_Receive R_IICAn_Slave_Send R_IICAn_Slave_Receive R_IICAn_Set_SnoozeOn R_IICAn_Set_SnoozeOff R_IICAn_Set_WakeupOn R_IICAn_Set_WakeupOff	A M A M M A A A A A A A A A
	r_cg_serial_user.c or r_cg_iica_user.c	R_IICAn_Create_UserInit r_iican_interrupt r_iican_callback_master_sendend r_iican_callback_master_receiveend r_iican_callback_master_error r_iican_callback_slave_sendend r_iican_callback_slave_receiveend r_iican_callback_slave_error r_iican_callback_getstopcondition	M A A A A A A A A M
	r_cg_serial.h or r_cg_iica.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
LCD controller/ driver	r_cg_lcd.c	R_LCD_Create R_LCD_Start R_LCD_Stop R_LCD_Set_VoltageOn R_LCD_Set_VoltageOff R_LCD_Set_PowerOff R_LCD_VoltageOn R_LCD_VoltageOff	A A A A A A A A
	r_cg_lcd_user.c	R_LCD_Create_UserInit r_lcd_interrupt	M A
	r_cg_lcd.h	-	-
Sound generator	r_cg_sg.c	R_SG_Create R_SG_Start R_SG_Stop	A A A
	r_cg_sg_user.c	R_SG_Create_UserInit r_sg_interrupt	M A
	r_cg_sg.h	-	-
DMA controller	r_cg_dmac.c	R_DMACHn_Create R_DMACHn_Start R_DMACHn_Stop R_DMACHn_Set_SoftwareTriggerOn	A A A A A
	r_cg_dmac_user.c	R_DMACHn_Create_UserInit R_DMACHn_Create_UserInit r_dmacn_interrupt	M M A
	r_cg_dmac.h	-	-
Data transfer controller	r_cg_dtc.c	R_DTC_Create R_DTCn_Start R_DTCn_Stop R_DTC_Set_PowerOff R_DTCDn_Start R_DTCDn_Stop	A A A M A A
	r_cg_dtc_user.c	R_DTC_Create_UserInit	M
	r_cg_dtc.h	-	-
Event link controller	r_cg_elc.c	R_ELC_Create R_ELC_Stop	A A
	r_cg_elc_user.c	R_ELC_Create_UserInit	M
	r_cg_elc.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Interrupt functions	r_cg_intc.c	R_INTC_Create R_INTCn_Start R_INTCn_Stop R_INTCLRn_Start R_INTCLRn_Stop R_INTRTCICn_Start R_INTRTCICn_Stop R_INTFO_Start R_INTFO_Stop R_INTFO_ClearFlag	A A A A A A A A A A
	r_cg_intc_user.c	R_INTC_Create_UserInit r_intcn_interrupt r_intclrn_interrupt r_intrtcicn_interrupt r_intfo_interrupt	M A A A A
	r_cg_intc.h	-	-
Key interrupt function	r_cg_intc.c or r_cg_key.c	R_KEY_Create R_KEY_Start R_KEY_Stop	A A A
	r_cg_intc_user.c or r_cg_key_user.c	R_KEY_Create_UserInit r_key_interrupt	M A
	r_cg_intc.h or r_cg_key.h	-	-
Voltage detector	r_cg_lvd.c	R_LVD_Create R_LVD_InterruptMode_Start R_LVD_Start_VDD R_LVD_Start_VBAT R_LVD_Start_VRTC R_LVD_Start_EXLVD R_LVD_Stop_VDD R_LVD_Stop_VBAT R_LVD_Start_VRTC R_LVD_Stop_EXLVD R_LVI_Create R_LVI_InterruptMode_Start	A A A A A A A A A A A A A
	r_cg_lvd_user.c	R_LVD_Create_UserInit r_lvd_interrupt r_lvd_vddinterrupt r_lvd_vbatinterrupt r_lvd_vrtcinterrupt r_lvd_exlvdinterrupt R_LVI_Create_UserInit r_lvi_interrupt	M A A A A A M A
	r_cg_lvd.h	-	-
Battery backup function	r_cg_bup.c	R_BUP_Create R_BUP_Start R_BUP_Stop	A A A
	r_cg_bup_user.c	R_BUP_Create_UserInit r_bup_interrupt	M A
	r_cg_bup.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
Oscillation stop detector	r_cg_osdc.c	R_OSDC_Create R_OSDC_Start R_OSDC_Stop R_OSDC_Set_PowerOff R_OSDC_Reset	A A A M M
	r_cg_osdc_user.c	R_OSDC_Create_UserInit r_osdc_interrupt	M A
	r_cg_osdc.h	-	-
SPI interface	r_cg_saic.c or r_cg_spi.c	R_SAIC_Create R_SAIC_Write R_SAIC_Read R_SPI_Create R_SPI_Write R_SPI_Read	A A M A A A
	r_cg_saic_user.c or r_cg_spi_user.c	R_SAIC_Create_UserInit R_SPI_Create_UserInit	M M
	r_cg_saic.h or r_cg_spi.h	-	-
Operational amplifier	r_cg_opamp.c	R_OPAMP_Create R_OPAMP_Set_ReferenceCircuitOn R_OPAMP_Set_ReferenceCircuitOff R_OPAMPn_Start R_OPAMPn_Stop R_OPAMPn_Set_PrechargeOn R_OPAMPn_Set_PrechargeOff	A A A A A M M
	r_cg_saic_user.c	R_OPAMP_Create_UserInit	M
	r_cg_saic.h	-	-
Data operation circuit	r_cg_doc.c	R_DOC_Create R_DOC_SetMode R_DOC_WriteData R_DOC_GetResult R_DOC_ClearFlag R_DOC_Set_PowerOff R_DOC_Reset	A A A A A M M
	r_cg_doc_user.c	R_DOC_Create_UserInit r_doc_interrupt	M A
	r_cg_doc.h	-	-
32-bit Multiply-accumulator	r_cg_mac32bit.c	R_MAC32Bit_Create R_MAC32Bit_Reset R_MAC32Bit_Set_PowerOff R_MAC32bit_MULUnsigned R_MAC32Bit_MULSigned R_MAC32Bit_MACUnsigned R_MAC32Bit_MACSigned	A M M M M M M
	r_cg_mac32bit_user.c	R_MAC32Bit_Create_UserInit r_mac32bit_interrupt_flow	M A
	r_cg_mac32bit.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
12-bit A/D converter	r_cg_12adc.c	R_12ADC_Create R_12ADC_Start R_12ADC_Stop R_12ADC_Get_ValueResult R_12ADC_Set_ADChannel R_12ADC_TemperatureSensorOutput_On R_12ADC_TemperatureSensorOutput_Off R_12ADC_InternalReferenceVoltage_On R_12ADC_InternalReferenceVoltage_Off R_12ADC_Set_PowerOff	A A A A M M M M M M
	r_cg_12adc_user.c	R_12ADC_Create_UserInit r_12adc_interrupt	M A
	r_cg_12adc.h	-	-
12-bit D/A converter	r_cg_12da.c	R_12DA_Create R_12DAn_Start R_12DAn_Stop R_12DA_Set_PowerOff R_12DAn_Set_ConversionValue	A A A M A
	r_cg_12da_user.c	R_12DA_Create_UserInit	M
	r_cg_12da.h	-	-
Operational amplifier and Analog switch	r_cg_ampansw.c	R_AMPANSW_Create R_OPAMPm_Set_ReferenceCurcuitOn R_OPAMPm_Set_ReferenceCircuitOff R_OPAMPm_Start R_OPAMPm_Stop R_ANSW_ChargePumpm_On R_ANSW_ChargePumpm_Off	A A A A A A A
	r_cg_ampansw_user.c	R_AMPANSW_Create_UserInit	M
	r_cg_ampansw.h	-	-
Voltage reference	r_cg_vr.c	R_VR_Create R_VR_Start R_VR_Stop	A A A
	r_cg_vr_user.c	R_VR_Create_UserInit	M
	r_cg_vr.h	-	-
Sampling output timer detector	r_cg_smotd.c	R_SMOTD_Create R_SMOTD_Start R_SMOTD_Stop R_SMOTD_Set_PowerOff	A A A M
	r_cg_smotd_user.c	R_SMOTD_Create_UserInit r_smotd_counterA_interrupt r_smotd_counterB_interrupt r_smotd_smpn_interrupt	M A A A
	r_cg_smotd.h	-	-

Peripheral Function	File Name	API Function Name	Output (*1)
External signal sampler	r_cg_exsd.c	R_EXSD_Create R_EXSD_Start R_EXSD_Stop R_EXSD_Set_PowerOff	A A A M
	r_cg_exsd_user.c	R_EXSD_Create_UserInit r_exsd_interrupt	M A
	r_cg_exsd.h	-	-
Serial interface UARTMG	r_cg_uartmg.c	R_UARTMGn_Create R_UARTMGn_Start R_UARTMGn_Stop R_UARTMGn_Set_PowerOff R_UARTMGn_Send R_UARTMGn_Receive	A A A M A A
	r_cg_uartmg_user.c	R_UARTMGn_Create_UserInit r_uartmgn_interrupt_send r_uartmgn_interrupt_receive r_uartmgn_interrupt_error r_uartmgn_callback_sendend r_uartn_callback_receiveend r_uartmgn_callback_error r_uartmgn_callback_softwareoverrun	M A A A A A A A
	r_cg_uartmg.h	-	-
Amplifier unit	r_cg_amp.c	R_AMP_Create R_AMP_Set_PowerOn R_AMP_Set_PowerOff R_PGA1_Start R_OPAMPn_Stop R_AMPn_Start R_AMPn_Stop	A A M A A A A
	r_cg_amp_user.c	R_AMP_Create_UserInit	M
	r_cg_amp.h	-	-
Data flash libraries	r_cg_pfdl.c	R_FDL_Create R_FDL_Open R_FDL_Close R_FDL_Write R_FDL_Read R_FDL_Erase	A A A A A A
	r_cg_pfdl.h	-	-

- *1 In case of [API output control] setting are default ([Output all API functions according to the setting]).
A : Output by settings on each peripheral functions panel automatically.
M : Output by the file used setting in API property.

3. API FUNCTIONS

This appendix describes the API functions output by the Code Generator.

3.1 Overview

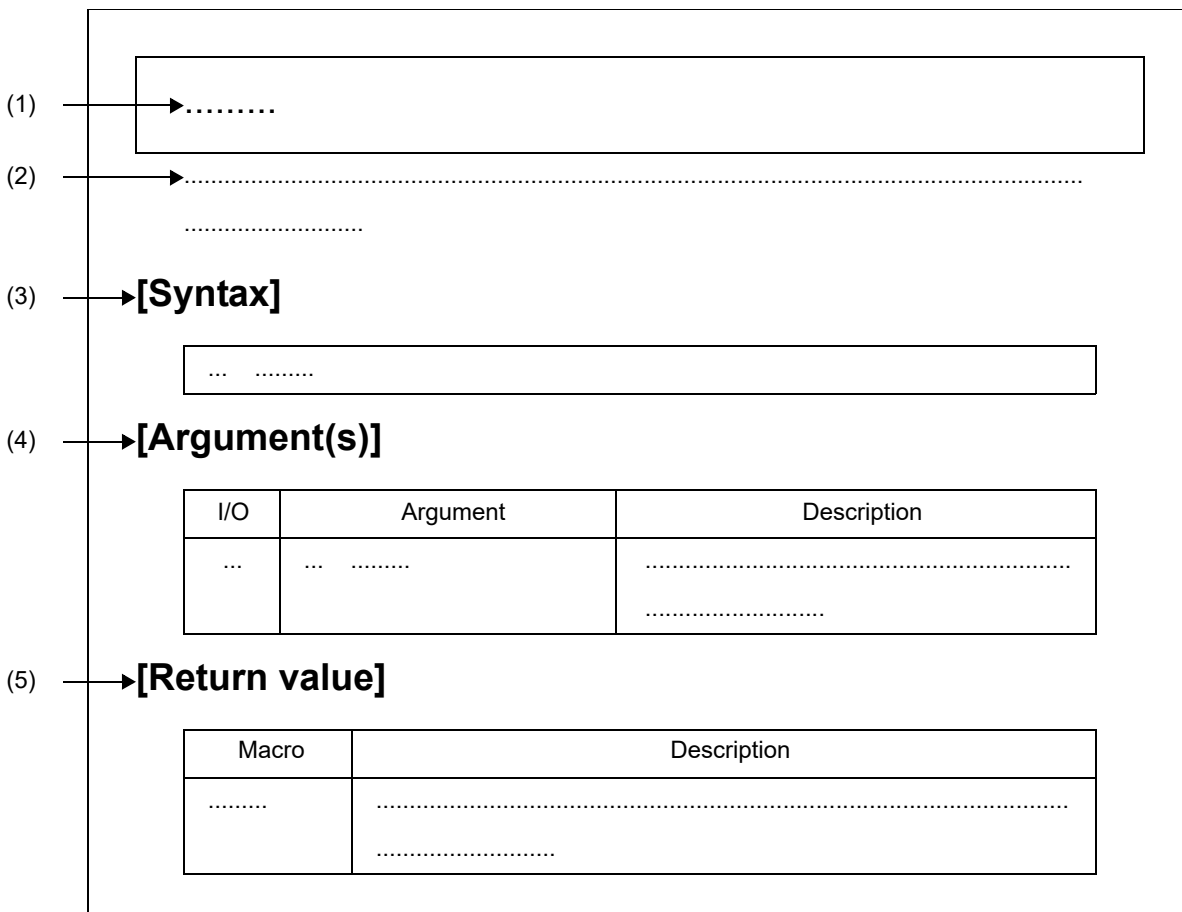
Below are the naming conventions for API functions output by the Code Generator.

- Macro names are in ALL CAPS.
The number in front of the macro name is a hexadecimal value; this is the same value as the macro value.
- Local variable names are in all lower case.
- Global variable names start with a "g" and use Camel Case.
- Names of pointers to global variables start with a "gp" and use Camel Case.
- Names of elements in enum statements are in ALL CAPS.

3.2 Function Reference

This section describes the API functions output by the Code Generator, using the following notation format.

Figure 3.1 Notation Format of API Functions



- (1) Name
Indicates the name of the API function.
- (2) Outline
Outlines the functions of the API function.
- (3) [Syntax]
Indicates the format to be used when describing an API function to be called in C language.

(4) [Argument(s)]

API function arguments are explained in the following format.

I/O	Argument	Description
(a)	(b)	(c)

(a) I/O

Argument classification

I ... Input argument

O ... Output argument

(b) Argument

Argument data type

(c) Description

Description of argument

(5) [Return value]

API function return value is explained in the following format.

Macro	Description
(a)	(b)

(a) Macro

Macro of return value

(b) Description

Description of return value

3.2.1 Common

Below is a list of API functions output by the Code Generator for common use.

Table 3.1 API Functions: [Common]

API Function Name	Function
hdwinit	Performs initialization necessary to control the various hardwares. This API is automatically called from the startup routine of Renesas-made compiler.
R_Systeminit	Performs initialization necessary to control the various peripheral functions.
main	This is a main function.
R_MAIN_UserInit	Performs user-defined initialization.

hdwinit

Performs initialization necessary to control the various hardwares.

Remark Call this API function from the startup routine.

[Syntax]

```
void    hdwinit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_Systeminit

Performs initialization necessary to control the various peripheral functions.

Remark This API function is called as the [hdwinit](#) callback routine.

[Syntax]

```
void    R_Systeminit ( void );
```

[Argument(s)]

None.

[Return value]

None.

main

This is a main function.

Remark Call this API function from the startup routine.

[Syntax]

```
void    main ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_MAIN_UserInit

Performs user-defined initialization.

Remark This API function is called as the [main](#) callback routine.

[Syntax]

```
void    R_MAIN_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.2

3.2.3 Clock generator

Below is a list of API functions output by the Code Generator for clock generator (include reset function, on-chip debug function, etc.) use.

Table 3.2 API Functions: [Clock Generator]

API Function Name	Function
R_CGC_Create	Performs initialization required to control the clock generator (include reset function, on-chip debug function, etc.).
R_CGC_Create_UserInit	Performs user-defined initialization relating to the clock generator (include reset function, on-chip debug function, etc.).
r_cgc_ram_ecc_interrupt	Performs processing in response to the RAM 1-bit correction/2-bit error detection interrupt INTRAM.
r_cgc_stackpointer_interrupt	Performs processing in response to the stackpointer overflow/underflow interrupt INTSPM.
r_cgc_clockmonitor_interrupt	Performs processing in response to the clock monitor interrupt INTCLM.
R_CGC_Get_ResetSource	Performs processing in response to RESET signal.
R_CGC_Set_ClockMode	Changes the CPU clock/peripheral hardware clock.
R_CGC_RAMECC_Start	Starts the RAM-ECC function.
R_CGC_RAMECC_Stop	Ends the RAM-ECC function.
R_CGC_StackPointer_Start	Starts the CPU stack pointer monitor function.
R_CGC_StackPointer_Stop	Ends the CPU stack pointer monitor function.
R_CGC_ClockMonitor_Start	Starts the clock monitor.
R_CGC_ClockMonitor_Stop	Ends the clock monitor.

R_CGC_Create

Performs initialization required to control the clock generator (include reset function, on-chip debug function, etc.).

[Syntax]

```
void R_CGC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_Create_UserInit

Performs user-defined initialization relating to the clock generator (include reset function, on-chip debug function, etc.).

Remark This API function is called as the [R_CGC_Create](#) callback routine.

[Syntax]

```
void    R_CGC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_cgc_ram_ecc_interrupt

Performs processing in response to the RAM 1-bit correction/2-bit error detection interrupt INTRAM.

Remark This API function is called as the interrupt process corresponding to the RAM 1-bit correction/2-bit error detection interrupt INTRAM.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_cgc_ram_ecc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_cgc_ram_ecc_interrupt ( void );
```

Remark *n* is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

r_cgc_stackpointer_interrupt

Performs processing in response to the stack pointer overflow/underflow interrupt INTSPM.

Remark This API function is called as the interrupt process corresponding to the stack pointer overflow/underflow interrupt INTSPM.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_cgc_stackpointer_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_cgc_stackpointer_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_cgc_clockmonitor_interrupt

Performs processing in response to the clock monitor interrupt INTCLM.

Remark This API function is called as the interrupt process corresponding to the clock monitor interrupt INTCLM.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_cgc_clockmonitor_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_cgc_clockmonitor_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_Get_ResetSource

Performs processing in response to RESET signal.

[Syntax]

```
void R_CGC_Get_ResetSource ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_Set_ClockMode

Changes the CPU clock/peripheral hardware clock.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_cgc.h"
MD_STATUS R_CGC_Set_ClockMode ( clock_mode_t mode );
```

[Argument(s)]

I/O	Argument	Description
I	clock_mode_t mode;	Clock generator type HIOCLK: High-speed onchip oscillator SYSX1CLK: X1 clock SYSEXTCLK: External main system clock SUBXT1CLK: XT1 clock SUBEXTCLK: External subsystem clock

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ERROR1	Exit with error (abend)
MD_ERROR2	Exit with error (abend)
MD_ERROR3	Exit with error (abend)
MD_ERROR4	Exit with error (abend)
MD_ARGERROR	Invalid argument specification

R_CGC_RAMECC_Start

Starts the RAM-ECC function.

[Syntax]

```
void R_CGC_RAMECC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_RAMECC_Stop

Ends the RAM-ECC function.

[Syntax]

```
void R_CGC_RAMECC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_StackPointer_Start

Starts the CPU stack pointer function.

[Syntax]

```
void R_CGC_StackPointer_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_StackPointer_Stop

Ends the CPU stack pointer function.

[Syntax]

```
void R_CGC_StackPointer_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_ClockMonitor_Start

Starts the clock monitor.

[Syntax]

```
void R_CGC_ClockMonitor_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CGC_ClockMonitor_Stop

Ends the clock monitor.

[Syntax]

```
void R_CGC_ClockMonitor_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.4 Port functions

Below is a list of API functions output by the Code Generator for port functions use.

Table 3.3 API Functions: [Port Functions]

API Function Name	Function
R_PORT_Create	Performs initialization necessary to control the port functions.
R_PORT_Create_UserInit	Performs user-defined initialization relating to the port functions.

R_PORT_Create

Performs initialization necessary to control the port functions.

[Syntax]

```
void R_PORT_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PORT_Create_UserInit

Performs user-defined initialization relating to the port functions.

Remark This API function is called as the [R_PORT_Create](#) callback routine.

[Syntax]

```
void    R_PORT_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.5 High-speed on-chip Oscillator clock Frequency Correction function

Below is a list of API functions output by the Code Generator for the High-speed on-chip Oscillator clock Frequency Correction function use.

Table 3.4 API Functions: [High-speed on-chip Oscillator clock Frequency Correction function]

API Function Name	Function
R_HOFC_Create	Performs initialization necessary to control the High-speed on-chip Oscillator clock Frequency Correction function.
R_HOFC_Create_UserInit	Performs user-defined initialization relating to the High-speed on-chip Oscillator clock Frequency Correction function.
r_hofc_interrupt	Performs processing in response to the timer interrupt.
R_HOFC_Start	Starts the count for the High-speed on-chip Oscillator clock Frequency Correction function.
R_HOFC_Stop	Ends the count for the High-speed on-chip Oscillator clock Frequency Correction function.

R_HOFC_Create

Performs initialization necessary to control the High-speed on-chip Oscillator clock Frequency Correction function.

[Syntax]

```
void R_HOFC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_HOFC_Create_UserInit

Performs user-defined initialization relating to the High-speed on-chip Oscillator clock Frequency Correction function.

Remark This API function is called as the [R_HOFC_Create](#) callback routine.

[Syntax]

```
void R_HOFC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_hofc_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the High-speed on-chip Oscillator clock Frequency Correction function interrupt INTCR.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_hofc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_hofc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_HOFC_Start

Starts the count for the High-speed on-chip Oscillator clock Frequency Correction function.

[Syntax]

```
void R_HOFC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_HOFC_Stop

Ends the count for the High-speed on-chip Oscillator clock Frequency Correction function.

[Syntax]

```
void R_HOFC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.6 Timer array unit

Below is a list of API functions output by the Code Generator for timer array unit use.

Table 3.5 API Functions: [Timer Array Unit]

API Function Name	Function
R_TAUm_Create	Performs initialization necessary to control the timer array unit.
R_TAUm_Create_UserInit	Performs user-defined initialization relating to the timer array unit.
r_taum_channeln_interrupt	Performs processing in response to the timer interrupt INTTMMn.
r_taum_channeln_higher8bits_interrupt	Performs processing in response to the timer interrupt INTTMMnH.
R_TAUm_Channeln_Start	Starts the count for channel <i>n</i> .
R_TAUm_Channeln_Higher8bits_Start	Starts the count (higher 8-bit) for channel <i>n</i> .
R_TAUm_Channeln_Lower8bits_Start	Starts the count (lower 8-bit) for channel <i>n</i> .
R_TAUm_Channeln_Stop	Ends the count for channel <i>n</i> .
R_TAUm_Channeln_Higher8bits_Stop	Ends the count (higher 8-bit) for channel <i>n</i> .
R_TAUm_Channeln_Lower8bits_Stop	Ends the count (lower 8-bit) for channel <i>n</i> .
R_TAUm_Reset	Reset the timer array unit.
R_TAUm_Set_PowerOff	Halts the clock supplied to the timer array unit.
R_TAUm_Channeln_Get_PulseWidth	Captures the high/low-level width measured between pulses of the signal (pulses) input to the TImn pin.
R_TAUm_Channeln_Set_SoftwareTriggerOn	Generates the trigger (software trigger) for one-shot pulse output.

R_TAUm_Create

Performs initialization necessary to control the timer array unit.

[Syntax]

```
void R_TAUm_Create ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TAU m _Create_UserInit

Performs user-defined initialization relating to the timer array unit.

Remark This API function is called as the [R_TAU \$m\$ _Create](#) callback routine.

[Syntax]

```
void R_TAU $m$ _Create_UserInit ( void );
```

Remark m is the unit number.

[Argument(s)]

None.

[Return value]

None.

r_taum_channel*n*_interrupt

Performs processing in response to the timer interrupt INTT*Mn*.

Remark This API function is called as the interrupt process corresponding to the timer interrupt INTT*Mn*.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_taum_channeln_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_taum_channeln_interrupt ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_taum_channel*n*_higher8bits_interrupt

Performs processing in response to the timer interrupt INTT*Mn*H.

Remark This API function is called as the interrupt process corresponding to the timer interrupt INTT*Mn*H.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_taum_channeln_higher8bits_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_taum_channeln_higher8bits_interrupt ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channeln_Start

Starts the count for channel *n*.

Remark The time from the call to this API function to the start of counting depends on the type of the function in question (e.g. interval timer, square-wave output, or external event counter).

[Syntax]

```
void    R_TAUm_Channeln_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channel*n*_Higher8bits_Start

Starts the count (higher 8-bit) for channel *n*.

Remark This API function can only be called when the timer array unit is used as a 8-bit timer.

[Syntax]

```
void R_TAUm_Channeln_Higher8bits_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channel*n*_Lower8bits_Start

Starts the count (lower 8-bit) for channel *n*.

Remarks 1. This API function can only be called when the timer array unit is used as a 8-bit timer.

Remarks 2. The time from the call to this API function to the start of counting depends on the type of the function in question (e.g. interval timer, external event counter, or delay counter).

[Syntax]

```
void R_TAUm_Channeln_Lower8bits_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channeln_Stop

Ends the count for channel *n*.

[Syntax]

```
void R_TAUm_Channeln_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channel*n*_Higher8bits_Stop

Ends the count (higher 8-bit) for channel *n*.

Remark This API function can only be called when the timer array unit is used as a 8-bit timer.

[Syntax]

```
void R_TAUm_Channeln_Higher8bits_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channel*n*_Lower8bits_Stop

Ends the count (lower 8-bit) for channel *n*.

Remark This API function can only be called when the timer array unit is used as a 8-bit timer.

[Syntax]

```
void R_TAUm_Channeln_Lower8bits_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Reset

Reset the timer array unit.

[Syntax]

```
void R_TAUm_Reset ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Set_PowerOff

Halts the clock supplied to the timer array unit.

Remark Calling this API function changes the timer array unit to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TAUm_Set_PowerOff ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TAUm_Channel*n*_Get_PulseWidth

Captures the high/low-level width measured between pulses of the signal (pulses) input to the T1*m*n pin.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_TAUm_Channeln_Get_PulseWidth ( uint32_t * const width );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const width;	Pointer to an area to store the measurement width (0x0 to 0x1FFFF)

[Return value]

None.

R_TAUm_Channeln_Set_SoftwareTriggerOn

Generates the trigger (software trigger) for one-shot pulse output.

[Syntax]

```
void R_TAUm_Channeln_Set_SoftwareTriggerOn ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.7 Timer RJ

Below is a list of API functions output by the Code Generator for timer RJ use.

Table 3.6 API Functions: [Timer RJ]

API Function Name	Function
R_TMR_RJn_Create	Performs initialization necessary to control the 16-bit timer RJ0.
R_TMR_RJn_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RJ0.
r_tmr_rjn_interrupt	Performs processing in response to the timer interrupt.
R_TMR_RJn_Start	Starts the count for 16-bit timer RJ0.
R_TMR_RJn_Stop	Ends the count for 16-bit timer RJ0.
R_TMR_RJn_Set_PowerOff	Halts the clock supplied to the 16-bit timer RJ0.
R_TMR_RJn_Get_PulseWidth	Reads the pulse width of the 16-bit timer RJ0.
R_TMRJn_Create	Performs initialization necessary to control the 16-bit timer RJ0.
R_TMRJn_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RJ0.
r_tmrjn_interrupt	Performs processing in response to the timer interrupt.
R_TMRJn_Start	Starts the count for 16-bit timer RJ0.
R_TMRJn_Stop	Ends the count for 16-bit timer RJ0.
R_TMRJn_Set_PowerOff	Halts the clock supplied to the 16-bit timer RJ0.
R_TMRJn_Get_PulseWidth	Reads the pulse width of the 16-bit timer RJ0.

R_TMR_RJn_Create

Performs initialization necessary to control the 16-bit timer RJ*n*.

[Syntax]

```
void R_TMR_RJn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RJn_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer RJn.

Remark This API function is called as the [R_TMR_RJn_Create](#) callback routine.

[Syntax]

```
void R_TMR_RJn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_tmr_rjn_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr_rjn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr_rjn_interrupt ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RJn_Start

Starts the count for 16-bit timer RJn.

[Syntax]

```
void R_TMR_RJn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RJn_Stop

Ends the count for 16-bit timer RJn.

[Syntax]

```
void R_TMR_RJn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RJn_Set_PowerOff

Halts the clock supplied to the 16-bit timer RJn.

Remark Calling this API function changes the 16-bit timer RJn to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMR_RJn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RJn_Get_PulseWidth

Reads the pulse width of the 16-bit timer RJn.

Remarks 1. This API function can only be called when the 16-bit timer RJn is being used for pulse width measurement mode / pulse period measurement mode.

Remarks 2. If there is an overflow (2 pulses or more) during pulse-width measurement, then the pulse width will not be read correctly.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_TMR_RJn_Get_PulseWidth ( uint32_t * const active_width );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>active_width</i> ;	Pointer to an area storing the active level width that was read from the TRJnIO pin

[Return value]

None.

R_TMRJn_Create

Performs initialization necessary to control the 16-bit timer R*Jn*.

[Syntax]

```
void R_TMRJn_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRJn_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer R*Jn*.

Remark This API function is called as the [R_TMRJn_Create](#) callback routine.

[Syntax]

```
void R_TMRJn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_tmrjn_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmrjn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmrjn_interrupt ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRJn_Start

Starts the count for 16-bit timer R*Jn*.

[Syntax]

```
void R_TMRJn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRJn_Stop

Ends the count for 16-bit timer RJn.

[Syntax]

```
void R_TMRJn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRJn_Set_PowerOff

Halts the clock supplied to the 16-bit timer RJn.

Remark Calling this API function changes the 16-bit timer RJn to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMRJn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRJn_Get_PulseWidth

Reads the pulse width of the 16-bit timer R*Jn*.

Remarks 1. This API function can only be called when the 16-bit timer R*Jn* is being used for pulse width measurement mode / pulse period measurement mode.

Remarks 2. If there is an overflow (2 pulses or more) during pulse-width measurement, then the pulse width will not be read correctly.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_TMRJn_Get_PulseWidth ( uint32_t * const active_width );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>active_width</i> ;	Pointer to an area storing the active level width that was read from the TR <i>Jn</i> I/O pin

[Return value]

None.

3.2.8 Timer RD

Below is a list of API functions output by the Code Generator for timer RD use.

Table 3.7 API Functions: [Timer RD]

API Function Name	Function
R_TMR_RDn_Create	Performs initialization necessary to control the 16-bit timer RD <i>n</i> .
R_TMR_RDn_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RD <i>n</i> .
r_tmr_rdn_interrupt	Performs processing in response to the timer interrupt.
R_TMR_RDn_Start	Starts the count for 16-bit timer RD <i>n</i> .
R_TMR_RDn_Stop	Ends the count for 16-bit timer RD <i>n</i> .
R_TMR_RDn_Set_PowerOff	Halts the clock supplied to the 16-bit timer RD <i>n</i> .
R_TMR_RDn_ForcedOutput_Start	Starts the pulse output forced cutoff for 16-bit timer RD <i>n</i> ,
R_TMR_RDn_ForcedOutput_Stop	Ends the pulse output forced cutoff for 16-bit timer RD <i>n</i> .
R_TMR_RDn_Get_PulseWidth	Reads the pulse width of the 16-bit timer RD <i>n</i> .
R_TMRDn_Create	Performs initialization necessary to control the 16-bit timer RD <i>n</i> .
R_TMRDn_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RD <i>n</i> .
r_tmrdn_interrupt	Performs processing in response to the timer interrupt.
R_TMRDn_Start	Starts the count for 16-bit timer RD <i>n</i> .
R_TMRDn_Stop	Ends the count for 16-bit timer RD <i>n</i> .
R_TMRDn_Set_PowerOff	Halts the clock supplied to the 16-bit timer RD <i>n</i> .
R_TMRDn_ForcedOutput_Start	Starts the pulse output forced cutoff for 16-bit timer RD <i>n</i> ,
R_TMRDn_ForcedOutput_Stop	Ends the pulse output forced cutoff for 16-bit timer RD <i>n</i> .
R_TMRDn_Get_PulseWidth	Reads the pulse width of the 16-bit timer RD <i>n</i> .
R_TMRD_Set_PowerOff	Halts the clock supplied to the 16-bit timer RD.

R_TMR_RDn_Create

Performs initialization necessary to control the 16-bit timer RDn.

[Syntax]

```
void R_TMR_RDn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RDn_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer RD*n*.

Remark This API function is called as the [R_TMR_RDn_Create](#) callback routine.

[Syntax]

```
void R_TMR_RDn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_tmr_rdn_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr_rdn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr_rdn_interrupt ( void );
```

Remark [n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RD*n*_Start

Starts the count for 16-bit timer RD*n*.

[Syntax]

```
void R_TMR_RDn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RD*n*_Stop

Ends the count for 16-bit timer RD*n*.

[Syntax]

```
void R_TMR_RDn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RDn_Set_PowerOff

Halts the clock supplied to the 16-bit timer RD*n*.

Remark Calling this API function changes the 16-bit timer RD*n* to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMR_RDn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RD*n*_ForcedOutput_Start

Starts the pulse output forced cutoff for 16-bit timer RD*n*.

[Syntax]

```
void R_TMR_RDn_ForcedOutput_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RDn_ForcedOutput_Stop

Ends the pulse output forced cutoff for 16-bit timer RD*n*.

Remark This API function can only be called when the 16-bit timer RD*n* is the count to stopped (the TSTART bit in the timer RD start register (TRDSTR) is 0).

[Syntax]

```
void R_TMR_RDn_ForcedOutput_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_RDn_Get_PulseWidth

Reads the pulse width of the 16-bit timer RDn.

Remarks 1. This API function can only be called when the 16-bit timer RDn is being used for input capture function.

Remarks 2. If there is an overflow (2 pulses or more) during pulse-width measurement, then the pulse width will not be read correctly.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_timer.h"
MD_STATUS R_TMR_RDn_Get_PulseWidth ( uint32_t * const active_width, uint32_t * const
inactive_width, timer_channel_t channel );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>active_width</i> ;	Pointer to an area storing the active level width that was read
O	uint32_t * const <i>inactive_width</i> ;	Pointer to an area storing the inactive level width that was read
I	timer_channel_t <i>channel</i> ;	Pin to read TMCHANNELA: TRDIOAn pin TMCHANNELB: TRDIOBn pin TMCHANNELC: TRDIOCn pin TMCHANNELD: TRDIODn pin

[Return value]

Macro	Description
MD_OK	Normal completion

R_TMRDn_Create

Performs initialization necessary to control the 16-bit timer RD*n*.

[Syntax]

```
void R_TMRDn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer RD*n*.

Remark This API function is called as the [R_TMR_RDn_Create](#) callback routine.

[Syntax]

```
void R_TMRDn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_tmr d_n _interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr $d_n$ _interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr $d_n$ _interrupt ( void );
```

Remark [n is the channel number.]

[Argument(s)]

None.

[Return value]

None.

R_TMRD n _Start

Starts the count for 16-bit timer RD n .

[Syntax]

```
void R_TMRD $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_Stop

Ends the count for 16-bit timer RD*n*.

[Syntax]

```
void R_TMRDn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_Set_PowerOff

Halts the clock supplied to the 16-bit timer RD*n*.

Remark Calling this API function changes the 16-bit timer RD*n* to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMRDn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_ForcedOutput_Start

Starts the pulse output forced cutoff for 16-bit timer RD*n*.

[Syntax]

```
void R_TMRDn_ForcedOutput_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_ForcedOutput_Stop

Ends the pulse output forced cutoff for 16-bit timer RD*n*.

Remark This API function can only be called when the 16-bit timer RD*n* is the count to stopped (the TSTART bit in the timer RD start register (TRDSTR) is 0).

[Syntax]

```
void    R_TMRDn_ForcedOutput_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMRDn_Get_PulseWidth

Reads the pulse width of the 16-bit timer RDn.

Remarks 1. This API function can only be called when the 16-bit timer RDn is being used for input capture function.

Remarks 2. If there is an overflow (2 pulses or more) during pulse-width measurement, then the pulse width will not be read correctly.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_timer.h"
MD_STATUS R_TMRDn_Get_PulseWidth ( uint32_t * const active_width, uint32_t * const
inactive_width, timer_channel_t channel );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const active_width;	Pointer to an area storing the active level width that was read
O	uint32_t * const inactive_width;	Pointer to an area storing the inactive level width that was read
I	timer_channel_t channel;	Pin to read TMCHANNELA: TRDIOAn pin TMCHANNELB: TRDIOBn pin TMCHANNELC: TRDIOCn pin TMCHANNELD: TRDIODn pin

[Return value]

Macro	Description
MD_OK	Normal completion

R_TMRD_Set_PowerOff

Halts the clock supplied to the 16-bit timer RD.

Remark Calling this API function changes the 16-bit timer RD n to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMRD_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.9 Timer RG

Below is a list of API functions output by the Code Generator for timer RG use.

Table 3.8 API Functions: [Timer RG]

API Function Name	Function
R_TMR_RG0_Create	Performs initialization necessary to control the 16-bit timer RG0.
R_TMR_RG0_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RG0.
r_tmr_rg0_interrupt	Performs processing in response to the timer interrupt.
R_TMR_RG0_Start	Starts the count for 16-bit timer RG0.
R_TMR_RG0_Stop	Ends the count for 16-bit timer RG0.
R_TMR_RG0_Set_PowerOff	Halts the clock supplied to the 16-bit timer RG0.
R_TMR_RG0_Get_PulseWidth	Reads the pulse width of the 16-bit timer RG0.

R_TMR_RG0_Create

Performs initialization necessary to control the 16-bit timer RG0.

[Syntax]

```
void R_TMR_RG0_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_RG0_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer RG0.

Remark This API function is called as the [R_TMR_RG0_Create](#) callback routine.

[Syntax]

```
void R_TMR_RG0_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_tmr_rg0_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr_rg0_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr_rg0_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_RG0_Start

Starts the count for 16-bit timer RG0.

[Syntax]

```
void R_TMR_RG0_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_RG0_Stop

Ends the count for 16-bit timer RG0.

[Syntax]

```
void R_TMR_RG0_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_RG0_Set_PowerOff

Halts the clock supplied to the 16-bit timer RG0.

Remark Calling this API function changes the 16-bit timer RG0 to reset status.
 For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMR_RG0_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_RG0_Get_PulseWidth

Reads the pulse width of the 16-bit timer RG0.

Remarks 1. This API function can only be called when the 16-bit timer RG0 is being used for input capture function.

Remarks 2. If there is an overflow (2 pulses or more) during pulse-width measurement, then the pulse width will not be read correctly.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_timer.h"
MD_STATUS R_TMR_RG0_Get_PulseWidth ( uint32_t * const active_width, uint32_t * const
inactive_width, timer_channel_t channel );
```

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>active_width</i> ;	Pointer to an area storing the active level width that was read from the TRGIOA pin
O	uint32_t * const <i>inactive_width</i> ;	Pointer to an area storing the inactive level width that was read from the TRGIOA pin
I	timer_channel_t <i>channel</i> ;	Pin to read TMCHANNELA: TRGIOA0 pin TMCHANNELB: TRGIOB0 pin

[Return value]

Macro	Description
MD_OK	Normal completion

3.2.10 Timer RX

Below is a list of API functions output by the Code Generator for timer RX use.

Table 3.9 API Functions: [Timer RX]

API Function Name	Function
R_TMRX_Create	Performs initialization necessary to control the 16-bit timer RX.
R_TMRX_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer RX.
r_tmrx_interrupt	Performs processing in response to the timer interrupt.
R_TMRX_Start	Starts the count for 16-bit timer RX.
R_TMRX_Stop	Ends the count for 16-bit timer RX.
R_TMRX_Set_PowerOff	Halts the clock supplied to the 16-bit timer RX.
R_TMRX_Get_BufferValue	Reads the buffer value of TRX register(16-bit timer RX).

R_TMRX_Create

Performs initialization necessary to control the 16-bit timer RX.

[Syntax]

```
void R_TMRX_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRX_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer RX.

Remark This API function is called as the [R_TMRX_Create](#) callback routine.

[Syntax]

```
void    R_TMRX_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_tmrx_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmrx_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmrx_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRX_Start

Starts the count for 16-bit timer RX.

[Syntax]

```
void R_TMRX_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRX_Stop

Ends the count for 16-bit timer RX.

[Syntax]

```
void R_TMRX_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRX_Set_PowerOff

Halts the clock supplied to the 16-bit timer RX.

Remark Calling this API function changes the 16-bit timer RX to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMRX_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMRX_Get_BufferValue

Reads the buffer value of TRX register (16-bit timer RX).

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_TMRX_Get_BufferValue ( uint32_t * const value );
```

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const value;	Pointer to an area storing the buffer register value of TRX register

[Return value]

なし

3.2.11 16-bit timer KB

Below is a list of API functions output by the Code Generator for 16-bit timer KB use.

Table 3.10 API Functions: [16-bit Timers KB]

API Function Name	Function
R_TMR_KB_Create	Performs initialization necessary to control the 16-bit timer KB.
R_TMR_KBm_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer KB.
r_tmr_kbm_interrupt	Performs processing in response to the timer interrupt.
R_TMR_KBm_Start	Starts the count for 16-bit timer KB.
R_TMR_KBm_Stop	Ends the count for 16-bit timer KB.
R_TMR_KBm_Set_PowerOff	Halts the clock supplied to the 16-bit timer KB.
R_TMR_KBmn_ForcedOutput_Start	Enables input of the trigger signal used for the forced output stop function.
R_TMR_KBmn_ForcedOutput_Stop	Disables input of the trigger signal used for the forced output stop function.
R_TMR_KBm_BatchOverwriteRequestOn	Enables batch overwriting of the compare register.
R_TMR_KBm_ForcedOutput_mn_Start	Enables input of the trigger signal used for the forced output stop function.
R_TMR_KBm_ForcedOutput_mn_Stop	Disables input of the trigger signal used for the forced output stop function.
R_TMR_KBm_Reset	Reset the 16-bit timer KB.

R_TMR_KB_Create

Performs initialization necessary to control the 16-bit timers KB.

[Syntax]

```
void R_TMR_KB_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer KB.

Remark This API function is called as the [R_TMR_KB_Create](#) callback routine.

[Syntax]

```
void R_TMR_KBm_Create_UserInit ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

r_tmr_kbm_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr_kbm_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr_kbm_interrupt ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KB m _Start

Starts the count for 16-bit timer KB.

[Syntax]

```
void R_TMR_KB $m$ _Start ( void );
```

Remark m is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KB*m*_Stop

Ends the count for 16-bit timer KB.

[Syntax]

```
void R_TMR_KBm_Stop ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_Set_PowerOff

Halts the clock supplied to the 16-bit timer KB.

Remark Calling this API function changes the 16-bit timer KB to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMR_KBm_Set_PowerOff ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBmn_ForcedOutput_Start

Enables input of the trigger signal used for the forced output stop function.

[Syntax]

```
void R_TMR_KBmn_ForcedOutput_Start ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBmn_ForcedOutput_Stop

Disables input of the trigger signal used for the forced output stop function.

[Syntax]

```
void R_TMR_KBmn_ForcedOutput_Stop ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_BatchOverwriteRequestOn

Enables batch overwriting of the compare register.

Remark The timing for batch-overwriting the content of the compare register is when a count value and a value set in the compare register are matched or an external trigger is generated after calling this API function.

[Syntax]

```
void    R_TMR_KBm_BatchOverwriteRequestOn ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_ForcedOutput_mn_Start

Enables input of the trigger signal used for the forced output stop function.

[Syntax]

```
void R_TMR_KBm_ForcedOutput_mn_Start ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_ForcedOutput_mn_Stop

Disables input of the trigger signal used for the forced output stop function.

[Syntax]

```
void R_TMR_KBm_ForcedOutput_mn_Stop ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_TMR_KBm_Reset

Reset the 16-bit timers KB.

[Syntax]

```
void R_TMR_KBm_Reset ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

3.2.12 16-bit timer KC0

Below is a list of API functions output by the Code Generator for 16-bit timer KC0 use.

Table 3.11 API Functions: [16-bit Timer KC0]

API Function Name	Function
R_TMR_KC0_Create	Performs initialization necessary to control the 16-bit timer KC0.
R_TMR_KC0_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer KC0.
r_tmr_kc0_interrupt	Performs processing in response to the timer interrupt.
R_TMR_KC0_Start	Starts the count for 16-bit timer KC0.
R_TMR_KC0_Stop	Ends the count for 16-bit timer KC0.
R_TMR_KC0_Set_PowerOff	Halts the clock supplied to the 16-bit timer KC0.

R_TMR_KC0_Create

Performs initialization necessary to control the the 16-bit timer KC0.

[Syntax]

```
void R_TMR_KC0_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_KC0_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer KC0.

Remark This API function is called as the [R_TMR_KC0_Create](#) callback routine.

[Syntax]

```
void R_TMR_KC0_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_tmr_kc0_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_tmr_kc0_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_tmr_kc0_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_KC0_Start

Starts the count for 16-bit timer KC0.

[Syntax]

```
void R_TMR_KC0_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_KC0_Stop

Ends the count for 16-bit timer KC0.

[Syntax]

```
void R_TMR_KC0_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMR_KC0_Set_PowerOff

Halts the clock supplied to the 16-bit timer KC0.

Remark Calling this API function changes the 16-bit timer KC0 to reset status.
 For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMR_KC0_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.13 16-bit timer KB2

Below is a list of API functions output by the Code Generator for 16-bit timer KB2 use.

Table 3.12 API Functions: [16-bit Timer KB2]

API Function Name	Function
R_KB2m_Create	Performs initialization necessary to control the 16-bit timer KB2.
R_KB2m_Create_UserInit	Performs user-defined initialization relating to the 16-bit timer KB2.
r_kb2m_interrupt	Performs processing in response to the timer interrupt INTTKB2m.
R_KB2m_Start	Starts the count for 16-bit timer KB2.
R_KB2m_Stop	Ends the count for 16-bit timer KB2.
R_KB2m_Set_PowerOff	Halts the clock supplied to the 16-bit timer KB2.
R_KB2m_Simultaneous_Start	Starts the simultaneous start/stop mode.
R_KB2m_Simultaneous_Stop	Ends the simultaneous start/stop mode.
R_KB2m_Synchronous_Start	Starts the timer start/clear mode.
R_KB2m_Synchronous_Stop	Ends the timer start/clear mode.
R_KB2m_TKBO_n0_Forced_Output_Stop_Function1_Start	Starts forced output stop function 1 for timer output TKBO _n 0.
R_KB2m_TKBO_n0_Forced_Output_Stop_Function1_Stop	Ends forced output stop function 1 for timer output TKBO _n 0.
R_KB2m_TKBO_n1_Forced_Output_Stop_Function1_Start	Starts forced output stop function 2 for timer output TKBO _n 1.
R_KB2m_TKBO_n1_Forced_Output_Stop_Function1_Stop	Starts forced output stop function 2 for timer output TKBO _n 1.
R_KB2m_TKBO_n0_DitheringFunction_Start	Starts dithering function for timer output TKBO _n 0.
R_KB2m_TKBO_n0_DitheringFunction_Stop	Ends dithering function for timer output TKBO _n 0.
R_KB2m_TKBO_n1_DitheringFunction_Start	Starts dithering function for timer output TKBO _n 1.
R_KB2m_TKBO_n1_DitheringFunction_Stop	Ends dithering function for timer output TKBO _n 1.
R_KB2m_TKBO_n0_SmoothStartFunction_Start	Starts smooth start function for timer output TKBO _n 0.
R_KB2m_TKBO_n0_SmoothStartFunction_Stop	Ends smooth start function for timer output TKBO _n 0.
R_KB2m_TKBO_n1_SmoothStartFunction_Start	Starts smooth start function for timer output TKBO _n 1.
R_KB2m_TKBO_n1_SmoothStartFunction_Stop	Ends smooth start function for timer output TKBO _n 1.
R_KB2m_Set_BatchOverwriteRequestOn	Enables batch overwriting of the compare register.

R_KB2*m*_Create

Performs initialization necessary to control the 16-bit timer KB2.

[Syntax]

```
void R_KB2m_Create ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2m_Create_UserInit

Performs user-defined initialization relating to the 16-bit timer KB2.

Remark This API function is called as the [R_KB2m_Create](#) callback routine.

[Syntax]

```
void R_KB2m_Create_UserInit ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

r_kb2m_interrupt

Performs processing in response to the timer interrupt INTTKB2*m*.

Remark This API function is called as the interrupt process corresponding to the timer interrupt INTTKB2*m*.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_kb2m_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_kb2m_interrupt ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Start

Starts the count for 16-bit timer KB2.

[Syntax]

```
void R_KB2m_Start ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Stop

Ends the count for 16-bit timer KB2.

[Syntax]

```
void R_KB2m_Stop ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Set_PowerOff

Halts the clock supplied to the 16-bit timer KB2.

[Syntax]

```
void R_KB2m_Set_PowerOff ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Simultaneous_Start

Starts the simultaneous start/stop mode.

[Syntax]

```
void R_KB2m_Simultaneous_Start ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Simultaneous_Stop

Ends the simultaneous start/stop mode.

[Syntax]

```
void R_KB2m_Simultaneous_Stop ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Synchronous_Start

Starts the timer start/clear mode.

[Syntax]

```
void R_KB2m_Synchronous_Start ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_Synchronous_Stop

Ends the timer start/clear mode.

[Syntax]

```
void R_KB2m_Synchronous_Stop ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn0_Forced_Output_Stop_Function1_Start

Starts forced output stop function 1 for timer output TKBOn0.

[Syntax]

```
void R_KB2m_TKBOn0_Forced_Output_Stop_Function1_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn0_Forced_Output_Stop_Function1_Stop

Ends forced output stop function 1 for timer output TKBOn0.

[Syntax]

```
void R_KB2m_TKBOn0_Forced_Output_Stop_Function1_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_Forced_Output_Stop_Function1_Start

Starts forced output stop function 2 for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_Forced_Output_Stop_Function1_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_Forced_Output_Stop_Function1_Stop

Ends forced output stop function 2 for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_Forced_Output_Stop_Function1_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn0_DitheringFunction_Start

Starts dithering function for timer output TKBOn0.

[Syntax]

```
void R_KB2m_TKBOn0_DitheringFunction_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2m_TKBO*n*0_DitheringFunction_Stop

Ends dithering function for timer output TKBO*n*0.

[Syntax]

```
void R_KB2m_TKBOn0_DitheringFunction_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_DitheringFunction_Start

Starts dithering function for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_DitheringFunction_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_DitheringFunction_Stop

Ends dithering function for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_DitheringFunction_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn0_SmoothStartFunction_Start

Starts smooth start function for timer output TKBOn0.

[Syntax]

```
void R_KB2m_TKBOn0_SmoothStartFunction_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn0_SmoothStartFunction_Stop

Ends smooth start function for timer output TKBOn0.

[Syntax]

```
void R_KB2m_TKBOn0_SmoothStartFunction_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_SmoothStartFunction_Start

Starts smooth start function for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_SmoothStartFunction_Start ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2*m*_TKBOn1_SmoothStartFunction_Stop

Ends smooth start function for timer output TKBOn1.

[Syntax]

```
void R_KB2m_TKBOn1_SmoothStartFunction_Stop ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_KB2m_Set_BatchOverwriteRequestOn

Enables batch overwriting of the compare register.

Remark The timing for batch-overwriting the content of the compare register is when a count value and a value set in the compare register are matched or an external trigger is generated after calling this API function.

[Syntax]

```
void    R_KB2m_Set_BatchOverwriteRequestOn ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

3.2.14 Real-time clock

Below is a list of API functions output by the Code Generator for real-time clock use.

Table 3.13 API Functions: [Real-time Clock]

API Function Name	Function
R_RTC_Create	Performs initialization necessary to control the real-time clock.
R_RTC_Create_UserInit	Performs user-defined initialization relating to the real-time clock.
r_rtc_interrupt	Performs processing in response to the real-time clock interrupt INTRTC.
R_RTC_Start	Starts the count of the real-time clock (year, month, weekday, day, hour, minute, second).
R_RTC_Stop	Ends the count of the real-time clock (year, month, weekday, day, hour, minute, second).
R_RTC_Set_PowerOff	Halts the clock supplied to the real-time clock.
R_RTC_Set_HourSystem	Sets the clock type (12-hour or 24-hour clock) of the real-time clock.
R_RTC_Set_CounterValue	Sets the counter value of the real-time clock.
R_RTC_Set_CalendarCounterValue	Sets the counter value of the real-time clock.(in the case of the calendar mode setting)
R_RTC_Set_BinaryCounterValue	Sets the counter value of the real-time clock.(in the case of the binary mode setting)
R_RTC_Get_CounterValue	Reads the counter value of the real-time clock.
R_RTC_Get_CalendarCounterValue	Reads the counter value of the real-time clock.(in the case of the calendar mode setting)
R_RTC_Get_BinaryCounterValue	Reads the counter value of the real-time clock.(in the case of the binary mode setting)
R_RTC_Set_ConstPeriodInterruptOn	Sets the cycle of the interrupts INTRTC, then starts the cyclic interrupt function.
R_RTC_Set_ConstPeriodInterruptOff	Ends the cyclic interrupt function.
r_rtc_callback_constperiod	Performs processing in response to the cyclic interrupt INTRTC.
R_RTC_Set_AlarmOn	Starts the alarm interrupt function.
R_RTC_Set_CalendarAlarmOn	Starts the alarm interrupt function.(in the case of the calendar mode setting)
R_RTC_Set_BinaryAlarmOn	Starts the alarm interrupt function.(in the case of the binary mode setting)
R_RTC_Set_AlarmOff	Ends the alarm interrupt function.
R_RTC_Set_AlarmValue	Sets the alarm conditions (weekday, hour, minute).
R_RTC_Set_CalendarAlarmValue	Sets the alarm conditions (year, month, weekday, day, hour, minute, second).(in the case of the calendar mode setting)
R_RTC_Set_BinaryAlarmValue	Sets the alarm conditions.(in the case of the binary mode setting)
R_RTC_Get_AlarmValue	Reads the alarm conditions (weekday, hour, minute).
R_RTC_Get_CalendarAlarmValue	Reads the alarm conditions (year, month, weekday, day, hour, minute, second).(in the case of the calendar mode setting)

API Function Name	Function
R_RTC_Get_BinaryAlarmValue	Reads the alarm conditions.(in the case of the binary mode setting)
r_rtc_callback_alarm	Performs processing in response to the alarm interrupt INTRTC.
R_RTC_Set_RTC1HZOn	Enables output of the correction clock (1 Hz) to the RTC1HZ pin.
R_RTC_Set_RTC1HZOff	Disables output of the correction clock (1 Hz) to the RTC1HZ pin.
R_RTC_Set_RTCOUTOn	Enables output of the RTCOUT.
R_RTC_Set_RTCOUTOff	Disables output of the RTCOUT.
r_rtc_alarminerrupt	Performs processing in response to the alarm interrupt INTRTCALM.
r_rtc_periodicinterrupt	Performs processing in response to the periodic interrupt INTRTCPRD.
r_rtc_callback_periodic	Performs processing in response to the cyclic interrupt INTRTC.

R_RTC_Create

Performs initialization necessary to control the real-time clock.

[Syntax]

```
void R_RTC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Create_UserInit

Performs user-defined initialization relating to the real-time clock.

Remark This API function is called as the [R_RTC_Create](#) callback routine.

[Syntax]

```
void R_RTC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_rtc_interrupt

Performs processing in response to the real-time clock interrupt INTRTC.

Remark This API function is called as the interrupt process corresponding to the real-time clock interrupt INTRTC.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_rtc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_rtc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Start

Starts the count of the real-time clock (year, month, weekday, day, hour, minute, second).

[Syntax]

```
void R_RTC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Stop

Ends the count of the real-time clock (year, month, weekday, day, hour, minute, second).

[Syntax]

```
void R_RTC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_PowerOff

Halts the clock supplied to the real-time clock.

Remarks 1. Calling this API function changes the real-time clock to reset status.

For this reason, writes to the control registers after this API function is called are ignored.

Remarks 2. This API function stops the clock supply to the real-time clock, by operating the RTCEN bit of peripheral enable register *n*.

For this reason, this API function also stops the clock supply to other peripheral devices sharing the RTCEN bit (e.g. interval timer).

[Syntax]

```
void R_RTC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_HourSystem

Sets the clock type (12-hour or 24-hour clock) of the real-time clock.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Set_HourSystem ( rtc_hour_system_t hour_system );
```

[Argument(s)]

I/O	Argument	Description
I	<code>rtc_hour_system_t hour_system;</code>	Clock type HOUR12: 12-hour clock HOUR24: 24-hour clock

[Return value]

Macro	Description
MD_OK	Normal completion
MD_BUSY1	Executing count process (before change to setting)
MD_BUSY2	Stopping count process (after change to setting)
MD_ARGERROR	Invalid argument specification

Remark If MD_BUSY1 or MD_BUSY2 is returned, it may be because the counter-operation is stopped, or the counter operation start wait time is too short, so make the value of the RTC_WAITTIME macro defined in the header file "r_cg_rtc.h" larger.

R_RTC_Set_CounterValue

Sets the counter value (year, month, weekday, day, hour, minute, second) of the real-time clock.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Set_CounterValue ( rtc_counter_value_t counter_write_val );
```

[Argument(s)]

I/O	Argument	Description
I	rtc_counter_value_t counter_write_val;	Counter value

Remark Below is an example of the structure rtc_counter_value_t (counter value) for the real-time clock.

```
typedef struct {
    uint8_t sec; /* Second */
    uint8_t min; /* Minute */
    uint8_t hour; /* Hour */
    uint8_t day; /* Day */
    uint8_t week; /* Weekday (0: Sunday, 6: Saturday) */
    uint8_t month; /* Month */
    uint16_t year; /* Year */
} rtc_counter_value_t;
```

[Return value]

Macro	Description
MD_OK	Normal completion
MD_BUSY1	Executing count process (before change to setting)
MD_BUSY2	Stopping count process (after change to setting)

Remark If MD_BUSY1 or MD_BUSY2 is returned, it may be because the counter-operation is stopped, or the counter operation start wait time is too short, so make the value of the RTC_WAITTIME macro defined in the header file "r_cg_rtc.h" larger.

R_RTC_Set_CalendarCounterValue

Sets the counter value of the real-time clock.(in the case of the calendar mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Set_CalendarCounterValue ( rtc_counter_value_t counter_write_val );
```

[Argument(s)]

I/O	Argument	Description
I	rtc_counter_value_t counter_write_val;	Counter value

Remark See [R_RTC_Set_CounterValue](#) for details about the rtc_counter_value_t counter value.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_BUSY1	Executing count process (before change to setting)

Remark If MD_BUSY1 is returned, it may be because the counter operation start wait time is too short, so make the value of the RTC_WAITTIME macro defined in the header file "r_cg_rtc.h" larger.

R_RTC_Set_BinaryCounterValue

Sets the counter value of the real-time clock.(in the case of the binary mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Set_BinaryCounterValue ( uint32_t counter_write_val );
```

[Argument(s)]

I/O	Argument	Description
I	uint32_t <i>counter_write_val;</i>	Counter value

Remark See [R_RTC_Set_CounterValue](#) for details about the `rtc_counter_value_t` counter value.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_BUSY1	Executing count process (before change to setting)

Remark If MD_BUSY1 is returned, it may be because the counter operation start wait time is too short, so make the value of the RTC_WAITTIME macro defined in the header file "r_cg_rtc.h" larger.

R_RTC_Get_CounterValue

Reads the counter value (year, month, weekday, day, hour, minute, second) of the real-time clock.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Get_CounterValue ( rtc_counter_value_t * const counter_read_val );
```

[Argument(s)]

I/O	Argument	Description
O	<code>rtc_counter_value_t</code> <code>* const counter_read_val;</code>	Pointer to structure in which to store the counter value being read

Remark See [R_RTC_Set_CounterValue](#) for details about the `rtc_counter_value_t` counter value.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_BUSY1	Executing count process (before reading)
MD_BUSY2	Stopping count process (after reading)

Remark If MD_BUSY1 or MD_BUSY2 is returned, it may be because the counter-operation is stopped, or the counter operation start wait time is too short, so make the value of the RTC_WAITTIME macro defined in the header file "r_cg_rtc.h" larger.

R_RTC_Get_CalendarCounterValue

Reads the counter value of the real-time clock.(in the case of the calendar mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Get_CalendarCounterValue ( rtc_counter_value_t * const
counter_read_val );
```

[Argument(s)]

I/O	Argument	Description
O	rtc_counter_value_t * const counter_read_val;	Pointer to structure in which to store the counter value being read

Remark See [R_RTC_Set_CounterValue](#) for details about the rtc_counter_value_t counter value.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ERROR	Read failure

R_RTC_Get_BinaryCounterValue

Reads the counter value of the real-time clock.(in the case of the binary mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Get_BinaryCounterValue ( uint32_t * const counter_read_val );
```

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const counter_read_val;	Pointer to structure in which to store the counter value being read

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ERROR	Read failure

R_RTC_Set_ConstPeriodInterruptOn

Sets the cycle of the interrupts INTRTC, then starts the cyclic interrupt function.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
MD_STATUS R_RTC_Set_ConstPeriodInterruptOn ( rtc_int_period_t period );
```

[Argument(s)]

I/O	Argument	Description
I	<code>rtc_int_period_t period;</code>	Interrupt INTRTC cycle HALFSEC: 0.5 seconds ONESEC: 1 second ONEMIN: 1 minute ONEHOUR: 1 hour ONEDAY: 1 day ONEMONTH: 1 month

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_RTC_Set_ConstPeriodInterruptOff

Ends the cyclic interrupt function.

[Syntax]

```
void R_RTC_Set_ConstPeriodInterruptOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_rtc_callback_constperiod

Performs processing in response to the cyclic interrupt INTRTC.

Remark This API function is called as the callback routine of interrupt process [r_rtc_interrupt](#) corresponding to the cyclic interrupt INTRTC.

[Syntax]

```
static void    r_rtc_callback_constperiod ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_AlarmOn

Starts the alarm interrupt function.

[Syntax]

```
void R_RTC_Set_AlarmOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_CalendarAlarmOn

Starts the alarm interrupt function.(in the case of the calendar mode setting)

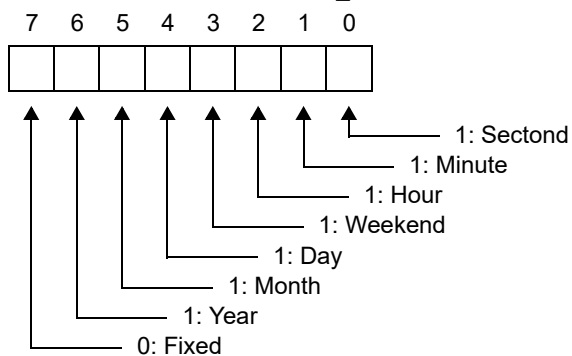
[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Set_CalendarAlarmOn ( uint8_t enb_set );
```

[Argument(s)]

I/O	Argument	Description
I	uint8_t enb_set;	Alarm enable

Remark Below is shown the structure enb_set.



[Return value]

None.

R_RTC_Set_BinaryAlarmOn

Starts the alarm interrupt function.(in the case of the binary mode setting)

[Syntax]

```
void R_RTC_Set_BinaryAlarmOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_AlarmOff

Ends the alarm interrupt function.

[Syntax]

```
void R_RTC_Set_AlarmOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_AlarmValue

Sets the alarm conditions (weekday, hour, minute).

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Set_AlarmValue ( rtc_alarm_value_t alarm_val );
```

[Argument(s)]

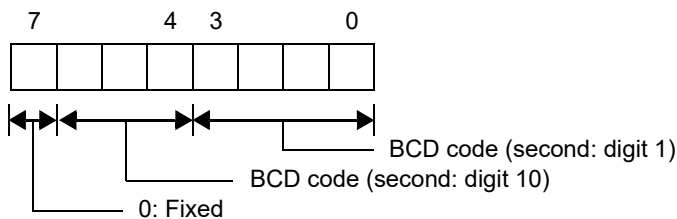
I/O	Argument	Description
I	rtc_alarm_value_t alarm_val;	Alarm conditions (weekday, hour, minute)

Remark Below is shown the structure rtc_alarm_value_t (alarm conditions).(The structure is different according to the device.)

```
typedef struct {
    uint8_t sec; /* Second */
    uint8_t min; /* Minute */
    uint8_t hour; /* Hour */
    uint8_t week; /* Weekday (0: Sunday, 6: Saturday) */
    uint8_t day; /* Day */
    uint8_t month; /* Month */
    uint16_t year; /* Year */
} rtc_alarm_value_t;
```

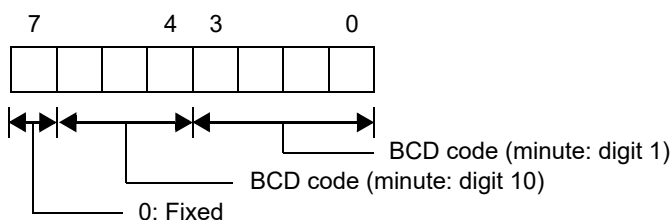
- alarmws (Second)

Below are shown the meanings of each bit of the structure member alarmws.



- alarmwm (Minute)

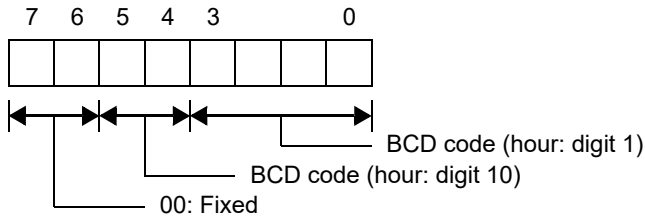
Below are shown the meanings of each bit of the structure member alarmwm.



- alarmwh (Hour)

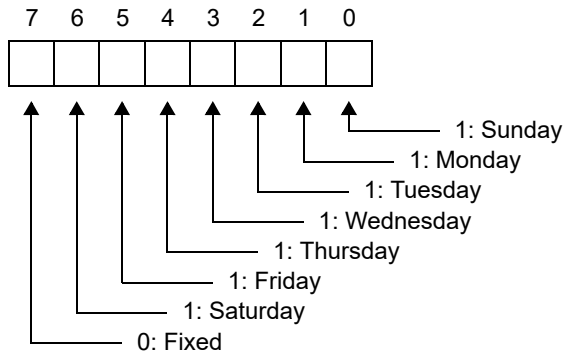
Below are shown the meanings of each bit of the structure member alarmwh.
 If the real-time clock is set to the 12-hour clock, then bit 5 has the following meaning.

- 0: AM
- 1: PM



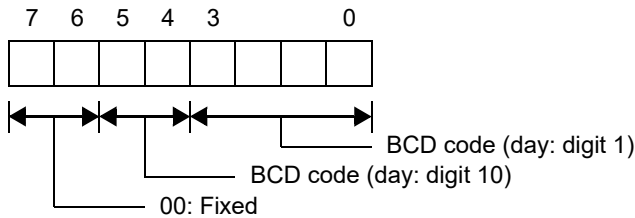
- alarmww (Weekday)

Below are shown the meanings of each bit of the structure member alarmww.



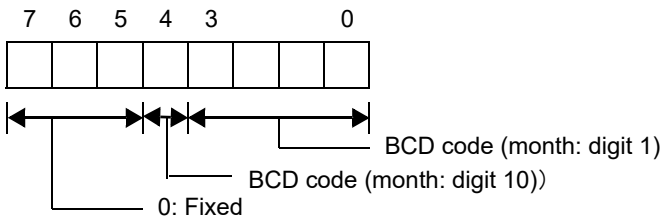
- alarmwd (Day)

Below are shown the meanings of each bit of the structure member alarmwd.



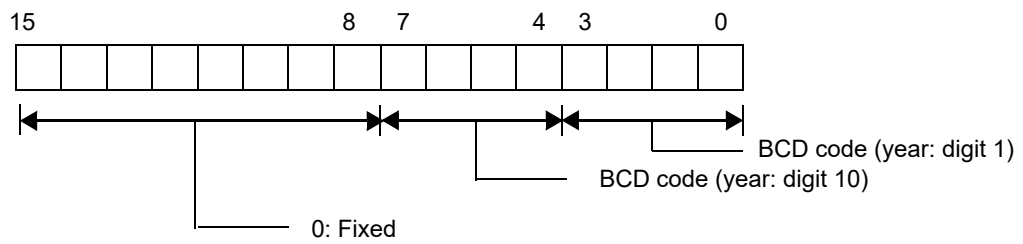
- alarmwmn (Month)

Below are shown the meanings of each bit of the structure member alarmwmn.



- alarmwy (Year)

Below are shown the meanings of each bit of the structure member alarmwmmn.



[Return value]

None.

R_RTC_Set_CalendarAlarmValue

Sets the alarm conditions (year, month, weekday, day, hour, minute, second).(in the case of the calendar mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Set_CalendarAlarmValue ( rtc_alarm_value_t alarm_val );
```

Remark See [R_RTC_Set_AlarmValue](#) for details about `rtc_alarm_value_t` (alarm conditions).

[Argument(s)]

I/O	Argument	Description
I	<code>rtc_alarm_value_t alarm_val;</code>	Alarm conditions (second, minute, hour, weekday, day, month, year)

[Return value]

None.

R_RTC_Set_BinaryAlarmValue

Sets the alarm conditions.(in the case of the binary mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Set_BinaryAlarmValue ( uint32_t alarm_enable, uint32_t alarm_val );
```

[Argument(s)]

I/O	Argument	Description
I	<code>uint32_t alarm_enable;</code>	Alarm enable (Set the value to the Binary Counter Alarm Enable Register)
	<code>uint32_t alarm_val</code>	Alarm conditions (count value) (Set the value to the Binary Counter Alarm Register)

[Return value]

None.

R_RTC_Get_AlarmValue

Reads the alarm conditions (weekday, hour, minute).

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Get_AlarmValue ( rtc_alarm_value_t * const alarm_val );
```

Remark See [R_RTC_Set_AlarmValue](#) for details about `rtc_alarm_value_t` (alarm conditions).

[Argument(s)]

I/O	Argument	Description
O	<code>rtc_alarm_value_t</code> <code>* const alarm_val;</code>	Pointer to structure in which to store the conditions being read

[Return value]

None.

R_RTC_Get_CalendarAlarmValue

Reads the alarm conditions (year, month, weekday, day, hour, minute, second).(in the case of the calendar mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Get_CalendarAlarmValue ( rtc_alarm_value_t * const alarm_val );
```

Remark See [R_RTC_Set_AlarmValue](#) for details about `rtc_alarm_value_t` (alarm conditions).

[Argument(s)]

I/O	Argument	Description
O	<code>rtc_alarm_value_t</code> <code>* const alarm_val;</code>	Pointer to structure in which to store the conditions being read

[Return value]

None.

R_RTC_Get_BinaryAlarmValue

Reads the alarm conditions (weekday, hour, minute).(in the case of the binary mode setting)

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_rtc.h"
void R_RTC_Get_BinaryAlarmValue ( uint32_t * const alarm_enable, uint32_t * const
alarm_val );
```

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>alarm_enable</i>	Pointer to structure in which to store the alarm enable value being read
O	uint32_t * const <i>alarm_val</i>	Pointer to structure in which to store the conditions being read

[Return value]

None.

r_rtc_callback_alarm

Performs processing in response to the alarm interrupt INTRTC.

Remark This API function is called as the callback routine of interrupt process [r_rtc_interrupt](#) corresponding to the alarm interrupt INTRTC.

[Syntax]

```
static void r_rtc_callback_alarm ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_RTC1HZOn

Enables output of the correction clock (1 Hz) to the RTC1HZ pin.

[Syntax]

```
void R_RTC_Set_RTC1HZOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_RTC1HZOff

Disables output of the correction clock (1 Hz) to the RTC1HZ pin.

[Syntax]

```
void R_RTC_Set_RTC1HZOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_RTCOUTOn

Enables output of the RTCOUT.

[Syntax]

```
void R_RTC_Set_RTCOUTOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_RTC_Set_RTCOUTOff

Disables output of the RTCOUT.

[Syntax]

```
void R_RTC_Set_RTCOUTOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_rtc_alarminerrupt

Performs processing in response to the alarm interrupt INTRTCALM.

Remark This API function is called as the interrupt process corresponding to the alarm interrupt INTRTCALM.

[Syntax]

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```
__interrupt static void r_rtc_alarminerrupt ( void );
```

CC-RL Compiler

```
static void __near r_rtc_alarminerrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_rtc_periodicinterrupt

Performs processing in response to the periodic interrupt INTRTCPRD.

Remark This API function is called as the interrupt process corresponding to the periodic interrupt INTRTCPRD.

[Syntax]

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```
__interrupt static void r_rtc_periodicinterrupt ( void );
```

CC-RL Compiler

```
static void __near r_rtc_periodicinterrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_rtc_callback_periodic

Performs processing in response to the cyclic interrupt INTRTC.

Remark This API function is called as the callback routine of interrupt process [r_rtc_interrupt](#) corresponding to the cyclic interrupt INTRTC.

[Syntax]

```
static void r_rtc_callback_periodic ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.15 Subsystem clock frequency measurement circuit

Below is a list of API functions output by the Code Generator for subsystem clock frequency measurement circuit use.

Table 3.14 API Functions: [Subsystem Clock Frequency Measurement Circuit]

API Function Name	Function
R_FMC_Create	Performs initialization necessary to control the subsystem clock frequency measurement circuit.
R_FMC_Create_UserInit	Performs user-defined initialization relating to the subsystem clock frequency measurement circuit.
r_fmc_interrupt	Performs processing in response to the end of frequency measurement interrupt INTFM.
R_FMC_Start	Starts measurement of the frequency that uses the subsystem clock frequency measurement circuit.
R_FMC_Stop	Ends measurement of the frequency that uses the subsystem clock frequency measurement circuit.
R_FMC_Set_PowerOff	Halts the clock supplied to the subsystem clock frequency measurement circuit.

R_FMC_Create

Performs initialization necessary to control the subsystem clock frequency measurement circuit.

[Syntax]

```
void R_FMC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FMC_Create_UserInit

Performs user-defined initialization relating to the subsystem clock frequency measurement circuit.

Remark This API function is called as the [R_FMC_Create](#) callback routine.

[Syntax]

```
void    R_FMC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_fmc_interrupt

Performs processing in response to the end of frequency measurement interrupt INTFM.

Remark This API function is called as the interrupt process corresponding to the end of frequency measurement interrupt INTFM.

[Syntax]

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```
__interrupt static void r_fmc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_fmc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FMC_Start

Starts measurement of the frequency that uses the subsystem clock frequency measurement circuit.

[Syntax]

```
void R_FMC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FMC_Stop

Ends measurement of the frequency that uses the subsystem clock frequency measurement circuit.

[Syntax]

```
void R_FMC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FMC_Set_PowerOff

Halts the clock supplied to the subsystem clock frequency measurement circuit.

Remark Calling this API function changes the subsystem clock frequency measurement circuit to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_FMC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.16 12-bit interval timer

Below is a list of API functions output by the Code Generator for 12-bit interval timer use.

Table 3.15 API Functions: [12-Bit Interval Timer]

API Function Name	Function
R_IT_Create	Performs initialization necessary to control the 12-bit interval timer.
R_IT_Create_UserInit	Performs user-defined initialization relating to the 12-bit interval timer.
r_it_interrupt	Performs processing in response to the 12-bit interval timer interrupt INTIT.
R_IT_Start	Starts the count of the 12-bit interval timer.
R_IT_Stop	Ends the count of the 12-bit interval timer.
R_IT_Reset	Reset the 12-bit interval timer.
R_IT_Set_PowerOff	Halts the clock supplied to the 12-bit interval timer.

R_IT_Create

Performs initialization necessary to control the 12-bit interval timer.

[Syntax]

```
void R_IT_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT_Create_UserInit

Performs user-defined initialization relating to the 12-bit interval timer.

Remark This API function is called as the [R_IT_Create](#) callback routine.

[Syntax]

```
void    R_IT_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_it_interrupt

Performs processing in response to the 12-bit interval timer interrupt INTIT.

Remark This API function is called as the interrupt process corresponding to the 12-bit interval timer interrupt INTIT.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_it_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_it_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT_Start

Starts the count of the 12-bit interval timer.

[Syntax]

```
void R_IT_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT_Stop

Ends the count of the 12-bit interval timer.

[Syntax]

```
void R_IT_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT_Reset

Reset the 12-bit interval timer.

[Syntax]

```
void R_IT_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT_Set_PowerOff

Halts the clock supplied to the 12-bit interval timer.

Remarks 1. Calling this API function changes the 12-bit interval timer to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

Remarks 2. This API function stops the clock supply to the 12-bit interval timer, by operating the RTCEN bit of peripheral enable register *n*.
For this reason, this API function also stops the clock supply to other peripheral devices sharing the RTCEN bit (e.g. real-timer clock).

[Syntax]

```
void R_IT_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.17 8-bit interval timer

Below is a list of API functions output by the Code Generator for 8-bit interval timer use.

Table 3.16 API Functions: [8-Bit Interval Timer]

API Function Name	Function
R_IT8bitm_Channeln_Create	Performs initialization necessary to control the 8-bit interval timer.
R_IT8bitm_Channeln_Create_UserInit	Performs user-defined initialization relating to the 8-bit interval timer.
r_it8bitm_channeln_interrupt	Performs processing in response to the 8-bit interval timer interrupt INTIT <i>n</i> 0 or INTIT <i>n</i> 1.
R_IT8bitm_Channeln_Start	Starts the count of the 8-bit interval timer.
R_IT8bitm_Channeln_Stop	Ends the count of the 8-bit interval timer.
R_IT8bitm_Channeln_Set_PowerOff	Halts the clock supplied to the 8-bit interval timer.
R_IT8bitm_Set_PowerOff	Halts the clock supplied to the 8-bit interval timer.

R_IT8bit m _Channel n _Create

Performs initialization necessary to control the 8-bit interval timer.

[Syntax]

```
void R_IT8bit $m$ _Channel $n$ _Create ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IT8bit m _Channel n _Create_UserInit

Performs user-defined initialization relating to the 8-bit interval timer.

Remark This API function is called as the [R_IT8bit \$m\$ _Channel \$n\$ _Create](#) callback routine.

[Syntax]

```
void R_IT8bit $m$ _Channel $n$ _Create_UserInit ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_it8bitm_channeln_interrupt

Performs processing in response to the 8-bit interval timer interrupt INTITn0 or INTITn1.

Remark This API function is called as the interrupt process corresponding to the 8-bit interval timer interrupt INTITn0 or INTITn1.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_it8bitm_channeln_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_it8bitm_channeln_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IT8bit m _Channel n _Start

Starts the count of the 8-bit interval timer.

[Syntax]

```
void R_IT8bit $m$ _Channel $n$ _Start ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IT8bit m _Channel n _Stop

Ends the count of the 8-bit interval timer.

[Syntax]

```
void R_IT8bit $m$ _Channel $n$ _Stop ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IT8bit m _Channel n _Set_PowerOff

Halts the clock supplied to the 8-bit interval timer.

Remark Calling this API function changes the 8-bit interval timer to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_IT8bit $m$ _Channel $n$ _Set_PowerOff ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IT8bit m _Set_PowerOff

Halts the clock supplied to the 8-bit interval timer.

Remark Calling this API function changes the 8-bit interval timer to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_IT8bit $m$ _Set_PowerOff ( void );
```

Remark m is the unit number.

[Argument(s)]

None.

[Return value]

None.

3.2.18 16-bit wakeup timer

Below is a list of API functions output by the Code Generator for 16-bit wakeup timer (WUTM) use.

Table 3.17 API Functions: [16-bit Wakeup Timer]

API Function Name	Function
R_WUTM_Create	Performs initialization necessary to control the 16-bit wakeup timer.
R_WUTM_Create_UserInit	Performs user-defined initialization relating to the 16-bit wakeup timer.
r_wuttm_interrupt	Performs processing in response to the timer interrupt.
R_WUTM_Start	Starts the count for 16-bit wakeup timer.
R_WUTM_Stop	Ends the count for 16-bit wakeup timer.
R_WUTM_Set_PowerOff	Halts the clock supplied to the 16-bit wakeup timer.

R_WUTM_Create

Performs initialization necessary to control the 16-bit wakeup timer.

[Syntax]

```
void R_WUTM_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WUTM_Create_UserInit

Performs user-defined initialization relating to the 16-bit wakeup timer.

Remark This API function is called as the [R_WUTM_Create](#) callback routine.

[Syntax]

```
void R_WUTM_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_wutm_interrupt

Performs processing in response to the timer interrupt.

Remark This API function is called as the interrupt process corresponding to the timer interrupt.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_wutm_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_wutm_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WUTM_Start

Starts the count for 16-bit wakeup timer.

[Syntax]

```
void R_WUTM_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WUTM_Stop

Ends the count for 16-bit wakeup timer.

[Syntax]

```
void R_WUTM_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WUTM_Set_PowerOff

Halts the clock supplied to the 16-bit wakeup timer.

Remark Calling this API function changes the 16-bit wakeup timer to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_WUTM_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.19 Clock output/buzzer output controller

Below is a list of API functions output by the Code Generator for clock output/buzzer output controller use.

Table 3.18 API Functions: [Clock Output/Buzzer Output Controller]

API Function Name	Function
R_PCLBUZn_Create	Performs initialization necessary to control the clock/buzzer output controller.
R_PCLBUZn_Create_UserInit	Performs user-defined initialization relating to the clock/buzzer output controller.
R_PCLBUZn_Start	Starts clock/buzzer output.
R_PCLBUZn_Stop	Ends clock/buzzer output.
R_PCLBUZ_Set_PowerOff	Halts the clock supplied to the clock/buzzer output controller.

R_PCLBUZn_Create

Performs initialization necessary to control the clock/buzzer output controller.

[Syntax]

```
void R_PCLBUZn_Create ( void );
```

Remark *n* is the output pin.

[Argument(s)]

None.

[Return value]

None.

R_PCLBUZn_Create_UserInit

Performs user-defined initialization relating to the clock/buzzer output controller.

Remark This API function is called as the [R_PCLBUZn_Create](#) callback routine.

[Syntax]

```
void R_PCLBUZn_Create_UserInit ( void );
```

Remark *n* is the output pin.

[Argument(s)]

None.

[Return value]

None.

R_PCLBUZn_Start

Starts clock/buzzer output.

[Syntax]

```
void R_PCLBUZn_Start ( void );
```

Remark *n* is the output pin.

[Argument(s)]

None.

[Return value]

None.

R_PCLBUZn_Stop

Ends clock/buzzer output.

[Syntax]

```
void R_PCLBUZn_Stop ( void );
```

Remark *n* is the output pin.

[Argument(s)]

None.

[Return value]

None.

R_PCLBUZ_Set_PowerOff

Halts the clock supplied to the clock/buzzer output controller.

Remarks 1. Calling this API function changes the clock/buzzer output controller to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

Remarks 2. This API function stops the clock supply to the clock/buzzer output controller, by operating the RTCEN bit of peripheral enable register *n*.
For this reason, this API function also stops the clock supply to other peripheral devices sharing the RTCEN bit (e.g. real-time clock).

[Syntax]

```
void R_PCLBUZ_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.20 Watchdog timer

Below is a list of API functions output by the Code Generator for watchdog timer use.

Table 3.19 API Functions: [Watchdog Timer]

API Function Name	Function
R_WDT_Create	Performs initialization necessary to control the watchdog timer.
R_WDT_Create_UserInit	Performs user-defined initialization relating to the watchdog timer.
r_wdt_interrupt	Performs processing in response to the interval interrupt INTWDTI.
R_WDT_Restart	Clears the watchdog timer counter and resumes counting.

R_WDT_Create

Performs initialization necessary to control the watchdog timer.

[Syntax]

```
void R_WDT_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WDT_Create_UserInit

Performs user-defined initialization relating to the watchdog timer.

Remark This API function is called as the [R_WDT_Create](#) callback routine.

[Syntax]

```
void R_WDT_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_wdt_interrupt

Performs processing in response to the interval interrupt INTWDTI.

Remark This API function is called as the interrupt process corresponding to the interval interrupt INTWDTI.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_wdt_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_wdt_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_WDT_Restart

Clears the watchdog timer counter and resumes counting.

[Syntax]

```
void R_WDT_Restart ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.21 24-bit DS A/D converter with programmable gain instrumentation amplifier

Below is a list of API functions output by the Code Generator for 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier use.

Table 3.20 API Functions: [24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier]

API Function Name	Function
R_PGA_DSAD_Create	Performs initialization necessary to control the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.
R_PGA_DSAD_Create_UserInit	Performs user-defined initialization relating to the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.
r_pga_dsad_interrupt_conversion	Performs processing in response to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.
r_pga_dsad_interrupt_scan	Performs processing in response to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.
R_PGA_DSAD_Start	Starts A/D conversion.
R_PGA_DSAD_Stop	Ends A/D conversion.
R_PGA_DSAD_Set_PowerOff	Halts the clock supplied to the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.
R_PGA_DSAD_Get_AverageResult	Reads the results of A/D conversion.(mean value)
R_PGA_DSAD_Get_Result	Reads the results of A/D conversion.
R_PGA_DSAD_CAMP_OffsetTrimming	Connects the configurable amplifier to the 24-bit $\Delta\Sigma$ A/D converter and trims the offset.
r_pga_dsad_conversion_interrupt	Performs processing in response to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.
r_pga_dsad_scan_interrupt	Performs processing in response to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.

R_PGA_DSAD_Create

Performs initialization necessary to control the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.

[Syntax]

```
void R_PGA_DSAD_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_DSAD_Create_UserInit

Performs user-defined initialization relating to the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.

Remark This API function is called as the [R_PGA_DSAD_Create](#) callback routine.

[Syntax]

```
void    R_PGA_DSAD_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_pga_dsad_interrupt_conversion

Performs processing in response to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

Remark This API function is called as the interrupt process corresponding to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_pga_dsad_interrupt_conversion ( void );
```

CC-RL Compiler

```
static void __near r_pga_dsad_interrupt_conversion ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_pga_dsad_interrupt_scan

Performs processing in response to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.

Remark This API function is called as the interrupt process corresponding to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_pga_dsad_interrupt_scan ( void );
```

CC-RL Compiler

```
static void __near r_pga_dsad_interrupt_scan ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_DSAD_Start

Starts A/D conversion.

[Syntax]

```
void R_PGA_DSAD_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_DSAD_Stop

Ends A/D conversion.

[Syntax]

```
void R_PGA_DSAD_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_DSAD_Set_PowerOff

Halts the clock supplied to the 24-bit $\Delta\Sigma$ A/D converter with programmable gain instrumentation amplifier.

[Syntax]

```
void R_PGA_DSAD_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_DSAD_Get_AverageResult

Reads the average results of A/D conversion.(mean value)

[Syntax]

```
#include    "r_cg_macrodriver.h"
void      R_PGA_DSAD_Get_AverageResult ( uint16_t * const bufferH, uint16_t * const
bufferL );
```

[Argument(s)]

I/O	Argument	Description
O	uint16_t * const <i>bufferH</i> ;	Pointer to area in which to store read results of A/D conversion (DSADMVM resister and DSADMVH resister)
O	uint16_t * const <i>bufferL</i> ;	Pointer to area in which to store read results of A/D conversion (DSADMVC resister and DSADMVL resister)

[Return value]

None.

R_PGA_DSAD_Get_Result

Reads the results of A/D conversion.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_PGA_DSAD_Get_Result ( uint16_t * const bufferH, uint16_t * const bufferL );
```

[Argument(s)]

I/O	Argument	Description
O	<code>uint16_t * const <i>bufferH</i>;</code>	Pointer to area in which to store the results of A/D conversion (DSADCRM resister and DSADCRH resister)
O	<code>uint16_t * const <i>bufferL</i>;</code>	Pointer to area in which to store the results of A/D conversion (DSADCRC resister and DSADCRL resister)

[Return value]

None.

R_PGA_DSAD_CAMP_OffsetTrimming

Connects the configurable amplifier to the 24-bit $\Delta\Sigma$ A/D converter and trims the offset.

[Syntax]

```
void R_PGA_DSAD_CAMP_OffsetTrimming ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_pga_dsad_conversion_interrupt

Performs processing in response to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

Remark This API function is called as the interrupt process corresponding to the 24-bit $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_pga_dsad_conversion_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_pga_dsad_conversion_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_pga_dsad_scan_interrupt

Performs processing in response to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.

Remark This API function is called as the interrupt process corresponding to the 24-bit $\Delta\Sigma$ A/D scan end interrupt INTDSADS.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_pga_dsad_scan_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_pga_dsad_scan_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.22 A/D converter

Below is a list of API functions output by the Code Generator for A/D converter use.

Table 3.21 API Functions: [A/D Converter]

API Function Name	Function
R_ADC_Create	Performs initialization necessary to control the A/D converter.
R_ADC_Create_UserInit	Performs user-defined initialization relating to the A/D converter.
r_adc_interrupt	Performs processing in response to the A/D conversion end interrupt INTAD.
R_ADC_Set_OperationOn	Enables operation of voltage converter.
R_ADC_Set_OperationOff	Disables operation of voltage converter.
R_ADC_Start	Starts A/D conversion.
R_ADC_Stop	Ends A/D conversion.
R_ADC_Reset	Reset A/D conversion.
R_ADC_Set_PowerOff	Halts the clock supplied to the A/D converter.
R_ADC_Set_ADChannel	Configures the analog voltage input pin for A/D conversion.
R_ADC_Set_SnoozeOn	Enables the switch from STOP mode to SNOOZE mode.
R_ADC_Set_SnoozeOff	Disables the switch from STOP mode to SNOOZE mode.
R_ADC_Set_TestChannel	Sets the operation mode of A/D converter.
R_ADC_Get_Result	Reads the results of A/D conversion (10 bits).
R_ADC_Get_Result_8bit	Reads the results of A/D conversion (8 bits; most significant 8 bits of 10-bit resolution).

R_ADC_Create

Performs initialization necessary to control the A/D converter.

[Syntax]

```
void R_ADC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Create_UserInit

Performs user-defined initialization relating to the A/D converter.

Remark This API function is called as the [R_ADC_Create](#) callback routine.

[Syntax]

```
void R_ADC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_adc_interrupt

Performs processing in response to the A/D conversion end interrupt INTAD.

Remark This API function is called as the interrupt process corresponding to the A/D conversion end interrupt INTAD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_adc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_adc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_OperationOn

Enables operation of voltage converter.

- Remarks 1. About 1 microsecond of stabilization time is required when changing the voltage converter from operation stopped to operation enabled status. Consequently, about 1 micro second must be left free between the call to this API function and the call to [R_ADC_Start](#).
- Remarks 2. On the [A/D Converter], in the [Comparator operation setting] area, if "Operation" is selected, then the voltage converter will be switched to "always on". There is thus no need to call this API function in this case.

[Syntax]

```
void R_ADC_Set_OperationOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_OperationOff

Disables operation of voltage converter.

[Syntax]

```
void R_ADC_Set_OperationOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Start

Starts A/D conversion.

Remark About 1 micro second of stabilization time is required when changing the voltage converter from operation stopped to operation enabled status.
Consequently, about 1 micro second must be left free between the call to [R_ADC_Set_OperationOn](#) and the call to this API function.

[Syntax]

```
void    R_ADC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Stop

Ends A/D conversion.

Remark The voltage converter continues to operate after the process of this API function completes. Consequently, to stop the operation of the voltage converter, you must call [R_ADC_Set_OperationOff](#) after the process of this API function completes.

[Syntax]

```
void R_ADC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Reset

Reset A/D conversion.

[Syntax]

```
void R_ADC_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_PowerOff

Halts the clock supplied to the A/D converter.

Remark Calling this API function changes the A/D converter to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_ADC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_ADChannel

Configures the analog voltage input pin for A/D conversion.

Remark The value specified in argument *channel* is set to analog input channel specification register (ADS).

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_adc.h"
MD_STATUS R_ADC_Set_ADChannel ( ad_channel_t channel );
```

[Argument(s)]

I/O	Argument	Description
I	ad_channel_t <i>channel</i> ;	Analog voltage input pin ADCHANNEL <i>n</i> : Input pin

Remark See the header file `r_cg_adc.h` for details about the analog voltage input pin ADCHANNEL*n*.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_ADC_Set_SnoozeOn

Enables the switch from STOP mode to SNOOZE mode.

[Syntax]

```
void R_ADC_Set_SnoozeOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_SnoozeOff

Disables the switch from STOP mode to SNOOZE mode.

[Syntax]

```
void R_ADC_Set_SnoozeOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ADC_Set_TestChannel

Sets the operation mode of A/D converter.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_adc.h"
MD_STATUS R_ADC_Set_TestChannel ( test_channel_t channel );
```

[Argument(s)]

I/O	Argument	Description
I	test_channel_t channel;	Operation mode of A/D converter ADNORMALINPUT: Normal mode (Normal A/D conversion) ADAVREFM: Test mode (AVREFM input) ADAVREFP: Test mode (AVREFP input)

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_ADC_Get_Result

Reads the results of A/D conversion (10 bits).

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_ADC_Get_Result ( uint16_t * const buffer );
```

[Argument(s)]

I/O	Argument	Description
O	<code>uint16_t * const <i>buffer</i>;</code>	Pointer to area in which to store read results of A/D conversion

[Return value]

None.

R_ADC_Get_Result_8bit

Reads the results of A/D conversion (8 bits; most significant 8 bits of 10-bit resolution).

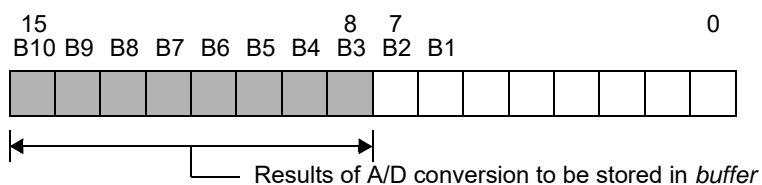
[Syntax]

```
#include "r_cg_macrodriver.h"
void R_ADC_Get_Result_8bit ( uint8_t * const buffer );
```

[Argument(s)]

I/O	Argument	Description
O	<code>uint8_t * const <i>buffer</i>;</code>	Pointer to area in which to store the results of A/D conversion

Remark Below is an example of the results of A/D conversion to be stored in *buffer*.

**[Return value]**

None.

3.2.23 Configurable amplifier

Below is a list of API functions output by the Code Generator for configurable amplifier use.

Table 3.22 API Functions: [Configurable amplifier]

API Function Name	Function
R_CAMP_Create	Performs initialization necessary to control the configurable amplifier.
R_CAMP_Create_UserInit	Performs user-defined initialization relating to the configurable amplifier.
R_CAMPn_Start	Turns on the power of the configurable amplifier(AMPn).
R_CAMPn_Stop	Turns off the power of the configurable amplifier(AMPn).
R_CAMP_Set_PowerOff	Halts the clock supplied to the configurable amplifier.

R_CAMP_Create

Performs initialization necessary to control the configurable amplifier.

[Syntax]

```
void R_CAMP_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CAMP_Create_UserInit

Performs user-defined initialization relating to the configurable amplifier.

Remark This API function is called as the [R_CAMP_Create](#) callback routine.

[Syntax]

```
void R_CAMP_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_CAMP n _Start

Turns on the power of the configurable amplifier(AMP n).

[Syntax]

```
void R_CAMP $n$ _Start ( void );
```

Remark n is the channel number.ye

[Argument(s)]

None.

[Return value]

None.

R_CAMP n _Stop

Turns off the power of the configurable amplifier(AMP n).

[Syntax]

```
void R_CAMP $n$ _Stop ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_CAMP_Set_PowerOff

Halts the clock supplied to the configurable amplifier.

[Syntax]

```
void R_CAMP_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.24 Temperature sensor

Below is a list of API functions output by the Code Generator for temperature sensor use.

Table 3.23 API Functions: [Temperature Sensor]

API Function Name	Function
R_TMPS_Create	Performs initialization necessary to control the temperature sensor.
R_TMPS_Create_UserInit	Performs user-defined initialization relating to the temperature sensor.
R_TMPS_Start	Starts measurement of the temperature that uses the temperature sensor.
R_TMPS_Stop	Ends measurement of the temperature that uses the temperature sensor.
R_TMPS_Reset	Reset the temperature sensor.
R_TMPS_Set_PowerOff	Halts the clock supplied to the temperature sensor.

R_TMPS_Create

Performs initialization necessary to control the temperature sensor.

[Syntax]

```
void R_TMPS_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMPS_Create_UserInit

Performs user-defined initialization relating to the temperature sensor.

Remark This API function is called as the [R_TMPS_Create](#) callback routine.

[Syntax]

```
void    R_TMPS_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMPS_Start

Starts measurement of the temperature that uses the temperature sensor.

[Syntax]

```
void R_TMPS_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMPS_Stop

Ends measurement of the temperature that uses the temperature sensor.

[Syntax]

```
void R_TMPS_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMPS_Reset

Reset the temperature sensor.

[Syntax]

```
void R_TMPS_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_TMPS_Set_PowerOff

Halts the clock supplied to the temperature sensor.

Remark Calling this API function changes the temperature sensor to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_TMPS_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.25 24-bit DS A/D converter

Below is a list of API functions output by the Code Generator for 24-bit $\Delta\Sigma$ A/D converter use.

Table 3.24 API Functions: [24-bit $\Delta\Sigma$ A/D Converter]

API Function Name	Function
R_DSADC_Create	Performs initialization necessary to control the 24-bit $\Delta\Sigma$ A/D converter.
R_DSADC_Create_UserInit	Performs user-defined initialization relating to the 24-bit $\Delta\Sigma$ A/D converter.
r_dsadc_interrupt	Performs processing in response to the $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.
r_dsadzcn_interrupt	Performs processing in response to the zero-cross detection interrupt INTDSADZCn.
R_DSADC_Set_OperationOn	Enables operation of 24-bit $\Delta\Sigma$ A/D converter.
R_DSADC_Set_OperationOff	Disables operation of 24-bit $\Delta\Sigma$ A/D converter.
R_DSADC_Start	Starts A/D conversion.
R_DSADC_Stop	Ends A/D conversion.
R_DSADC_Reset	Reset the 24-bit $\Delta\Sigma$ A/D converter.
R_DSADC_Set_PowerOff	Performs electric charge reset for the 24-bit $\Delta\Sigma$ A/D converter.
R_DSADC_Channeln_Get_Result	Reads the results of A/D conversion (24 bits).
R_DSADC_Channeln_Get_Result_16bit	Reads the results of A/D conversion (16 bits; most significant 16 bits of 24-bit resolution).

R_DSADC_Create

Performs initialization necessary to control the 24-bit $\Delta\Sigma$ A/D converter.

[Syntax]

```
void R_DSADC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Create_UserInit

Performs user-defined initialization relating to the 24-bit $\Delta\Sigma$ A/D converter.

Remark This API function is called as the [R_DSADC_Create](#) callback routine.

[Syntax]

```
void R_DSADC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_dsadc_interrupt

Performs processing in response to the $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

Remark This API function is called as the interrupt process corresponding to the $\Delta\Sigma$ A/D conversion end interrupt INTDSAD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dsadc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_dsadc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_dsadzcn_interrupt

Performs processing in response to the zero-cross detection interrupt INTDSADZCn.

Remark This API function is called as the interrupt process corresponding to the zero-cross detection interrupt INTDSADZCn.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dsadzcn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_dsadzcn_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Set_OperationOn

Enables operation of 24-bit $\Delta\Sigma$ A/D converter.

[Syntax]

```
void R_DSADC_Set_OperationOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Set_OperationOff

Disables operation of 24-bit $\Delta\Sigma$ A/D converter.

[Syntax]

```
void R_DSADC_Set_OperationOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Start

Starts A/D conversion.

[Syntax]

```
void R_DSADC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Stop

Ends A/D conversion.

[Syntax]

```
void R_DSADC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Reset

Reset the 24-bit $\Delta\Sigma$ A/D converter.

[Syntax]

```
void R_DSADC_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Set_PowerOff

Performs electric charge reset for the 24-bit $\Delta\Sigma$ A/D converter.

Remark About 1.4 microseconds of stabilization time is required when electric charge reset is performed for the 24-bit $\Delta\Sigma$ A/D converter.

[Syntax]

```
void    R_DSADC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DSADC_Channel*n*_Get_Result

Reads the results of A/D conversion (24 bits).

Remark The result of A/D conversion (24 bits) by this API function must be read within the maximum pending time of the $\Delta\Sigma$ A/D conversion result register *n* after $\Delta\Sigma$ A/D conversion end interrupt INTDSAD is generated.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DSADC_Channeln_Get_Result ( uint32_t * const buffer );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint32_t * const <i>buffer</i> ;	Pointer to area in which to store read results of A/D conversion

[Return value]

None.

R_DSADC_Channel*n*_Get_Result_16bit

Reads the results of A/D conversion (16 bits; most significant 16 bits of 24-bit resolution).

Remark The result of A/D conversion by this API function must be read within the maximum pending time of the $\Delta\Sigma$ A/D conversion result register *n* after $\Delta\Sigma$ A/D conversion end interrupt INTDSAD is generated.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DSADC_Channeln_Get_Result_16bit ( uint16_t * const buffer );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint16_t * const <i>buffer</i> ;	Pointer to area in which to store the results of A/D conversion

[Return value]

None.

3.2.26 D/A converter

Below is a list of API functions output by the Code Generator for D/A converter use.

Table 3.25 API Functions: [D/A Converter]

API Function Name	Function
R_DAC_Create	Performs initialization necessary to control the D/A converter.
R_DAC_Create_UserInit	Performs user-defined initialization relating to the D/A converter.
R_DACn_Start	Starts D/A conversion.
R_DACn_Stop	Ends D/A conversion.
R_DAC_Set_PowerOff	Halts the clock supplied to the D/A converter.
R_DACn_Set_ConversionValue	Sets the analog voltage output to the ANOn pin.
R_DAC_Change_OutputVoltage_8bit	Changes the output voltage of D/A converter.(8bit mode)
R_DAC_Change_OutputVoltage	Changes the output voltage of D/A converter.(12bit mode)
R_DACn_Create	Performs initialization necessary to control the D/A converter.
R_DAC_Reset	Reset the D/A converter.
R_DACn_Create_UserInit	Performs user-defined initialization relating to the D/A converter.

R_DAC_Create

Performs initialization necessary to control the D/A converter.

[Syntax]

```
void R_DAC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DAC_Create_UserInit

Performs user-defined initialization relating to the D/A converter.

Remark This API function is called as the [R_DAC_Create](#) callback routine.

[Syntax]

```
void R_DAC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DACn_Start

Starts D/A conversion.

[Syntax]

```
void R_DACn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DACn_Stop

Ends D/A conversion.

[Syntax]

```
void R_DACn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DAC_Set_PowerOff

Halts the clock supplied to the D/A converter.

Remark Calling this API function changes the D/A converter to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_DAC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DACn_Set_ConversionValue

Sets the analog voltage output to the ANOn pin.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DACn_Set_ConversionValue ( uint8_t reg_value );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>reg_value</i> ;	D/A conversion value (0x0 to 0xFF)

[Return value]

None.

R_DAC_Change_OutputVoltage_8bit

Changes the output voltage of D/A converter.(8bit mode)

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DAC_Change_OutputVoltage_8bit ( uint8_t outputVoltage );
```

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>outputVoltage</i> ;	output Voltage (Low 8bit)

[Return value]

None.

R_DAC_Change_OutputVoltage

Changes the output voltage of D/A converter.(12bit mode)

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DAC_Change_OutputVoltage ( uint16_t outputVoltage );
```

[Argument(s)]

I/O	Argument	Description
I	<code>uint16_t outputVoltage;</code>	output Voltage (Low 12bit)

[Return value]

None.

R_DACn_Create

Performs initialization necessary to control the D/A converter.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DACn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DAC_Reset

Reset the D/A converter.

[Syntax]

```
void R_DAC_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DACn_Create_UserInit

Performs user-defined initialization relating to the D/A converter.

Remark This API function is called as the [R_DACn_Create](#) callback routine.

[Syntax]

```
void R_DACn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.27 Programmable gain amplifier

Below is a list of API functions output by the Code Generator for programmable gain amplifier use.

Table 3.26 API Functions: [Programmable Gain Amplifier]

API Function Name	Function
R_PGA_Create	Performs initialization necessary to control the programmable gain amplifier.
R_PGA_Create_UserInit	Performs user-defined initialization relating to the programmable gain amplifier.
R_PGA_Start	Starts the operation of programmable gain amplifier.
R_PGA_Stop	Ends the operation of programmable gain amplifier.
R_PGA_Reset	Reset the programmable gain amplifier.
R_PGA_Set_PowerOff	Halts the clock supplied to the programmable gain amplifier.

R_PGA_Create

Performs initialization necessary to control the programmable gain amplifier.

[Syntax]

```
void R_PGA_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Create_UserInit

Performs user-defined initialization relating to the programmable gain amplifier.

Remark This API function is called as the [R_PGA_Create](#) callback routine.

[Syntax]

```
void    R_PGA_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Start

Starts the operation of programmable gain amplifier.

[Syntax]

```
void R_PGA_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Stop

Ends the operation of programmable gain amplifier.

[Syntax]

```
void R_PGA_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Reset

Reset the operation of programmable gain amplifier.

[Syntax]

```
void R_PGA_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Set_PowerOff

Halts the clock supplied to the programmable gain amplifier.

Remark Calling this API function changes the comparator to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_PGA_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.28 Comparator

Below is a list of API functions output by the Code Generator for comparator use.

Table 3.27 API Functions: [Comparator]

API Function Name	Function
R_COMP_Create	Performs initialization necessary to control the comparator.
R_COMP_Create_UserInit	Performs user-defined initialization relating to the comparator.
r_compn_interrupt	Performs processing in response to the comparator interrupt <i>INTCMP_n</i> .
R_COMP_n_Start	Begins comparison of reference input voltage and analog input voltage.
R_COMP_n_Stop	Stops comparison of reference input voltage and analog input voltage.
R_COMP_Reset	Reset the comparator.
R_COMP_Set_PowerOff	Halts the clock supplied to the comparator.

R_COMP_Create

Performs initialization necessary to control the comparator.

[Syntax]

```
void R_COMP_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_COMP_Create_UserInit

Performs user-defined initialization relating to the comparator.

Remark This API function is called as the [R_COMP_Create](#) callback routine.

[Syntax]

```
void R_COMP_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_comp n _interrupt

Performs processing in response to the comparator interrupt INTCMP n .

Remark This API function is called as the interrupt process corresponding to the comparator interrupt INTCMP n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_comp $n$ _interrupt ( void );
```

CC-RL Compiler

```
static void __near r_comp $n$ _interrupt ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_COMP n _Start

Begins comparison of reference input voltage and analog input voltage.

[Syntax]

```
void R_COMP $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_COMP n _Stop

Stops comparison of reference input voltage and analog input voltage.

[Syntax]

```
void R_COMP $n$ _Stop ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_COMP_Reset

Reset the comparator.

[Syntax]

```
void R_COMP_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_COMP_Set_PowerOff

Halts the clock supplied to the comparator.

Remark Calling this API function changes the comparator to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_COMP_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.29 Comparator/ProgrammableGainAmplifier

Below is a list of API functions output by the Code Generator for comparator/programmable gain amplifier use.

Table 3.28 API Functions: [Comparator/ProgrammableGainAmplifier]

API Function Name	Function
R_COMPPGA_Create	Performs initialization necessary to control the comparator/programmable gain amplifier.
R_COMPPGA_Set_PowerOff	Halts the clock supplied to the comparator/programmable gain amplifier.
R_COMPPGA_Create_UserInit	Performs user-defined initialization relating to the comparator/programmable gain amplifier.
r_compn_interrupt	Performs processing in response to the comparator interrupt <i>INTCMP_n</i> .
R_COMPn_Start	Begins comparison of reference input voltage and analog input voltage.
R_COMPn_Stop	Stops comparison of reference input voltage and analog input voltage.
R_PGA_Start	Starts the operation of programmable gain amplifier.
R_PGA_Stop	Ends the operation of programmable gain amplifier.
R_PWMOPT_Start	Supplies the clock to the 6-phase PWM option. In addition, sets the operation mode of the 6-phase PWM option.
R_PWMOPT_Stop	Halts the clock supplied to the 6-phase PWM option.

R_COMPPGA_Create

Performs initialization necessary to control the comparator/programmable gain amplifier.

[Syntax]

```
void R_COMPPGA_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_COMPPGA_Set_PowerOff

Halts the clock supplied to the comparator/programmable gain amplifier.

Remark Calling this API function changes the comparator/programmable gain amplifier to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_COMPPGA_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_COMPPGA_Create_UserInit

Performs user-defined initialization relating to the comparator/programmable gain amplifier.

Remark This API function is called as the [R_COMPPGA_Create](#) callback routine.

[Syntax]

```
void R_COMPPGA_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_comp n _interrupt

Performs processing in response to the comparator interrupt INTCMP n .

Remark This API function is called as the interrupt process corresponding to the comparator interrupt INTCMP n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_comp $n$ _interrupt ( void );
```

CC-RL Compiler

```
static void __near r_comp $n$ _interrupt ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_COMP n _Start

Begins comparison of reference input voltage and analog input voltage.

[Syntax]

```
void R_COMP $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_COMP n _Stop

Stops comparison of reference input voltage and analog input voltage.

[Syntax]

```
void R_COMP $n$ _Stop ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_PGA_Start

Starts the operation of programmable gain amplifier.

[Syntax]

```
void R_PGA_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA_Stop

Ends the operation of programmable gain amplifier.

[Syntax]

```
void R_PGA_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PWMOPT_Start

Supplies the clock to the 6-phase PWM option.
In addition, sets the operation mode of the 6-phase PWM option.

[Syntax]

```
void R_PWMOPT_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PWMOPT_Stop

Halts the clock supplied to the 6-phase PWM option.

[Syntax]

```
void R_PWMOPT_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.30 Serial array unit

Below is a list of API functions output by the Code Generator for serial array unit use.

Table 3.29 API Functions: [Serial Array Unit]

API Function Name	Function
R_SAUm_Create	Performs initialization necessary to control the serial array unit.
R_SAUm_Create_UserInit	Performs user-defined initialization related to the serial array unit.
R_SAUm_Reset	Reset the serial array unit.
R_SAUm_Set_PowerOff	Halts the clock supplied to the serial array unit.
R_SAUm_Set_SnoozeOn	Enables the switch from STOP mode to SNOOZE mode.
R_SAUm_Set_SnoozeOff	Disables the switch from STOP mode to SNOOZE mode.
R_UARTn_Create	Performs initialization necessary to perform the UART communication.
r_uartn_interrupt_send	Performs processing in response to the UART transmission end interrupt INTST n .
r_uartn_interrupt_receive	Performs processing in response to the UART reception end interrupt INTSR n .
r_uartn_interrupt_error	Performs processing in response to the reception error interrupt INTSRE n .
R_UARTn_Start	Sets UART communication to standby mode.
R_UARTn_Stop	Ends UART communication.
R_UARTn_Send	Starts UART data transmission.
R_UARTn_Receive	Starts UART data reception.
r_uartn_callback_sendend	Performs processing in response to the UART transmission end interrupt INTST n .
r_uartn_callback_receiveend	Performs processing in response to the UART reception end interrupt INTSR n .
r_uartn_callback_error	Performs processing in response to the UART reception error interrupt INTSRE n .
r_uartn_callback_softwareoverrun	Performs processing in response to detection of overrun error.
R_CSImn_Create	Performs initialization necessary to perform the 3-wire serial I/O communication.
r_csimn_interrupt	Performs processing in response to the CSI communication end interrupt INTCSIm n .
R_CSImn_Start	Sets 3-wire serial I/O communication to standby mode.
R_CSImn_Stop	Ends 3-wire serial I/O communication.
R_CSImn_Send	Starts CSI data transmission.
R_CSImn_Receive	Starts CSI data reception.
R_CSImn_Send_Receive	Starts CSI data transmission/reception.
r_csimn_callback_sendend	Performs processing in response to the CSI transmission end interrupt INTCSIm n .

API Function Name	Function
r_csimm_callback_receiveend	Performs processing in response to the CSI reception end interrupt INTCSImm.
r_csimm_callback_error	Performs processing in response to the CSI reception error interrupt INTSREn.
R_IICmn_Create	Performs initialization necessary to perform the simplified IIC communication.
r_iicmn_interrupt	Performs processing in response to the simple IIC communication end interrupt INTIICmn.
R_IICmn_StartCondition	Generates start conditions.
R_IICmn_StopCondition	Generates stop conditions.
R_IICmn_Stop	Ends simplified IIC communication.
R_IICmn_Master_Send	Starts simple IIC master transmission.
R_IICmn_Master_Receive	Starts simple IIC master reception.
r_iicmn_callback_master_sendend	Performs processing in response to the simple IICmn master transmission end interrupt INTIICmn.
r_iicmn_callback_master_receiveend	Performs processing in response to the simple IICmn master reception end interrupt INTIICmn.
r_iicmn_callback_master_error	Performs processing in response to detection of parity error (ACK error).

R_SAUm_Create

Performs initialization necessary to control the serial array unit.

[Syntax]

```
void R_SAUm_Create ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_SAUm_Create_UserInit

Performs user-defined initialization related to the serial array unit.

Remark This API function is called as the [R_SAUm_Create](#) callback routine.

[Syntax]

```
void    R_SAUm_Create_UserInit ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_SAUm_Reset

Reset the serial array unit.

[Syntax]

```
void R_SAUm_Reset ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_SAUm_Set_PowerOff

Halts the clock supplied to the serial array unit.

Remark Calling this API function changes the serial array unit to reset status.
For this reason, writes to the control registers (e.g. serial clock select register n : SPS n) after this API function is called are ignored.

[Syntax]

```
void    R_SAUm_Set_PowerOff ( void );
```

Remark m is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_SAUm_Set_SnoozeOn

Enables the switch from STOP mode to SNOOZE mode.

[Syntax]

```
void R_SAUm_Set_SnoozeOn ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_SAUm_Set_SnoozeOff

Disables the switch from STOP mode to SNOOZE mode.

[Syntax]

```
void R_SAUm_Set_SnoozeOff ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_UART*n*_Create

Performs initialization necessary to perform the UART communication.

Remark This API function is used as an internal function of [R_SAUm_Create](#).
For this reason, there is normally no need to call it from a user program.

[Syntax]

```
void    R_UARTn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartn_interrupt_send

Performs processing in response to the UART transmission end interrupt INTST n .

Remark This API function is called as the interrupt process corresponding to the UART transmission end interrupt INTST n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartn_interrupt_send ( void );
```

CC-RL Compiler

```
static void __near r_uartn_interrupt_send ( void );
```

Remark [n is the channel number.]

[Argument(s)]

None.

[Return value]

None.

r_uartn_interrupt_receive

Performs processing in response to the UART reception end interrupt INTSR n .

Remark This API function is called as the interrupt process corresponding to the UART reception end interrupt INTSR n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartn_interrupt_receive ( void );
```

CC-RL Compiler

```
static void __near r_uartn_interrupt_receive ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartn_interrupt_error

Performs processing in response to the reception error interrupt INTSRE n .

Remark This API function is called as the interrupt process corresponding to the reception error interrupt INTSRE n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartn_interrupt_error ( void );
```

CC-RL Compiler

```
static void __near r_uartn_interrupt_error ( void );
```

Remark [n is the channel number.]

[Argument(s)]

None.

[Return value]

None.

R_UART*n*_Start

Sets UART communication to standby mode.

[Syntax]

```
void R_UARTn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UART*n*_Stop

Ends UART communication.

[Syntax]

```
void R_UARTn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTn_Send

Starts UART data transmission.

Remarks 1. This API function repeats the byte-level UART transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

Remarks 2. When performing a UART transmission, [R_UARTn_Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_UARTn_Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_UARTn_Receive

Starts UART data reception.

Remarks 1. This API function performs byte-level UART reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

Remarks 2. Actual UART reception starts after this API function is called, and [R_UARTn_Start](#) is then called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_UARTn_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

r_uartn_callback_sendend

Performs processing in response to the UART transmission end interrupt INTST n .

Remark This API function is called as the callback routine of interrupt process [r_uartn_interrupt_send](#) corresponding to the UART transmission end interrupt INTST n (performed when number of transmission data specified by [R_UARTn_Send](#) argument tx_num has been completed).

[Syntax]

```
static void r_uartn_callback_sendend ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartn_callback_receiveend

Performs processing in response to the UART reception end interrupt INTSR n .

Remark This API function is called as the callback routine of interrupt process [r_uartn_interrupt_receive](#) corresponding to the UART reception end interrupt INTSR n (performed when number of received data specified by [R_UARTn_Receive](#) argument *rx_num* has been completed).

[Syntax]

```
static void r_uartn_callback_receiveend ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartn_callback_error

Performs processing in response to the UART reception error interrupt INTSRE n .

Remark This API function is called as the callback routine of interrupt process [r_uartn_interrupt_error](#) corresponding to the UART reception error interrupt INTSRE n .

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_uartn_callback_error ( uint8_t err_type );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t <i>err_type</i> ;	Trigger for UART reception error interrupt 00000xx1B: Overrun error 00000x1xB: Parity error 000001xxB: Framing error

[Return value]

None.

r_uartn_callback_softwareoverrun

Performs processing in response to detection of overrun error.

Remark This API function is called as the callback routine of interrupt process [r_uartn_interrupt_receive](#) corresponding to the UART reception end interrupt INTSR n (process performed when the amount of data received is greater than the argument rx_num specified for [R_UARTn_Receive](#)).

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_uartn_callback_softwareoverrun ( uint16_t rx_data );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint16_t rx_data ;	Receive data (greater than the argument rx_num specified for R_UARTn_Receive)

[Return value]

None.

R_CSImn_Create

Performs initialization necessary to perform the 3-wire serial I/O communication.

Remark This API function is used as an internal function of [R_SAUm_Create](#).
For this reason, there is normally no need to call it from a user program.

[Syntax]

```
void    R_CSImn_Create ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_csimn_interrupt

Performs processing in response to the CSI communication end interrupt INTCSImn.

Remark This API function is called as the interrupt process corresponding to the CSI communication end interrupt INTCSImn.

[Syntax]

```
__interrupt static void r_csimn_interrupt ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_CSImn_Start

Sets 3-wire serial I/O communication to standby mode.

[Syntax]

```
void R_CSImn_Start ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_CSImn_Stop

Ends 3-wire serial I/O communication.

[Syntax]

```
void R_CSImn_Stop ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_CSImn_Send

Starts CSI data transmission.

Remarks 1. This API function repeats the byte-level CSI transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

Remarks 2. When performing a CSI transmission, [R_CSImn_Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_CSImn_Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_CSImn_Receive

Starts CSI data reception.

Remarks 1. This API function performs byte-level CSI reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

Remarks 2. When performing a CSI reception, [R_CSImn_Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_CSImn_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_CSImn_Send_Receive

Starts CSI data transmission/reception.

Remarks 1. This API function repeats the byte-level CSI transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

Remarks 2. This API function performs byte-level CSI reception the number of times specified by the argument *tx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

Remarks 3. When performing a CSI reception, [R_CSImn_Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_CSImn_Send_Receive ( uint8_t * const tx_buf, uint16_t tx_num, uint8_t *
const rx_buf );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send/receive
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

r_csimn_callback_sendend

Performs processing in response to the CSI transmission end interrupt INTCSImn.

Remark This API function is called as the callback routine of interrupt process [r_csimn_interrupt](#) corresponding to the CSI transmission end interrupt INTCSImn (performed when number of transmission data specified by [R_CSImn_Send](#) or [R_CSImn_Send_Receive](#) argument *tx_num* has been completed).

[Syntax]

```
static void r_csimn_callback_sendend ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_csimn_callback_receiveend

Performs processing in response to the CSI reception end interrupt INTCSImn.

Remark This API function is called as the callback routine of interrupt process [r_csimn_interrupt](#) corresponding to the CSI reception end interrupt INTCSImn (performed when number of received data specified by [R_CSImn_Receive](#) or [R_CSImn_Send_Receive](#) argument *rx_num* has been completed).

[Syntax]

```
static void r_csimn_callback_receiveend ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_csimn_callback_error

Performs processing in response to the CSI reception error interrupt INTSRE n .

Remark This API function is called as the callback routine of interrupt process [r_uartn_interrupt_error](#) corresponding to the CSI reception error interrupt INTSRE n .

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_csimn_callback_error ( uint8_t err_type );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t <i>err_type</i> ;	Trigger for CSI reception error interrupt 0000xx1B: Overrun error

[Return value]

None.

R_IICmn_Create

Performs initialization necessary to perform the simplified IIC communication.

Remark This API function is used as an internal function of [R_SAUm_Create](#).
For this reason, there is normally no need to call it from a user program.

[Syntax]

```
void    R_IICmn_Create ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iicmn_interrupt

Performs processing in response to the simple IIC communication end interrupt INTIIC*m**n*.

Remark This API function is called as the interrupt process corresponding to the simple IIC communication end interrupt INTIIC*m**n*.

[Syntax]

```
__interrupt static void r_iicmn_interrupt ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICmn_StartCondition

Generates start conditions.

Remark This API function is used as an internal function of [R_IICmn_Master_Send](#) and [R_IICmn_Master_Receive](#).
For this reason, there is normally no need to call it from a user program.

[Syntax]

```
void    R_IICmn_StartCondition ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICmn_StopCondition

Generates stop conditions.

[Syntax]

```
void R_IICmn_StopCondition ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICmn_Stop

Ends simple IIC communication.

[Syntax]

```
void R_IICmn_Stop ( void );
```

Remark m is the unit number, and n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICmn_Master_Send

Starts simple IIC master transmission.

Remark This API function repeats the byte-level simple IIC master transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

[Syntax]

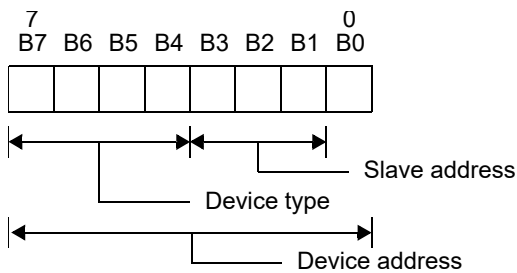
```
#include "r_cg_macrodriver.h"
void R_IICmn_Master_Send ( uint8_t adr, uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>adr</i> ;	Device address
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

Remark Below is shown the format for specifying device address *adr*.



[Return value]

None.

R_IICmn_Master_Receive

Starts simple IIC master reception.

Remark This API function performs byte-level simple IIC master reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

[Syntax]

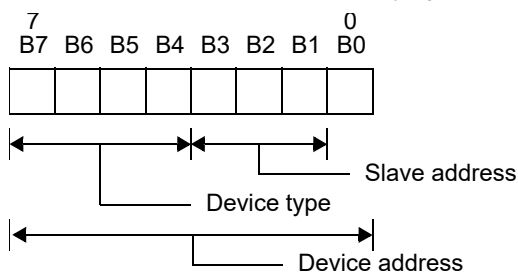
```
#include "r_cg_macrodriver.h"
void R_IICmn_Master_Receive ( uint8_t adr, uint8_t * const rx_buf, uint16_t rx_num
);
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>adr</i> ;	Device address
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

Remark Below is shown the format for specifying device address *adr*.



[Return value]

None.

r_iicmn_callback_master_sendend

Performs processing in response to the simple IICmn master transmission end interrupt INTIICmn.

Remark This API function is called as the callback routine of interrupt process [r_iicmn_interrupt](#) corresponding to the simple IICmn master transmission end interrupt INTIICmn (performed when number of transmission data specified by [R_IICmn_Master_Send](#) argument *tx_num* has been completed).

[Syntax]

```
static void r_iicmn_callback_master_sendend ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iicmn_callback_master_receiveend

Performs processing in response to the simple IICmn master reception end interrupt INTIICmn.

Remark This API function is called as the callback routine of interrupt process [r_iicmn_interrupt](#) corresponding to the simple IICmn master reception end interrupt INTIICmn (performed when number of received data specified by [R_IICmn_Master_Receive](#) argument *rx_num* has been completed).

[Syntax]

```
static void r_iicmn_callback_master_receiveend ( void );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iicmn_callback_master_error

Performs processing in response to detection of parity error (ACK error).

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_iicmn_callback_master_error ( MD_STATUS flag );
```

Remark *m* is the unit number, and *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	MD_STATUS <i>flag</i> ;	Cause of communication error MD_NACK: Acknowledge not detected

[Return value]

None.

3.2.31 Serial array unit 4

Below is a list of API functions output by the Code Generator for serial array unit 4 (DALI/UART4) use.

Table 3.30 API Functions: [Serial Array Unit 4]

API Function Name	Function
R_DALIn_Create	Performs initialization necessary to control the serial array unit 4 (DALI/UART4).
r_dalin_interrupt_send	Performs processing in response to the DALI transmission end interrupt INTSTDL <i>n</i> .
r_dalin_interrupt_receive	Performs processing in response to the DALI reception end interrupt INTSRDL <i>n</i> .
r_dalin_interrupt_error	Performs processing in response to the DALI reception error interrupt INTSREDL <i>n</i> .
R_DALIn_Start	Sets DALI communication to standby mode.
R_DALIn_Stop	Ends DALI communication.
R_DALIn_Send	Starts DALI data transmission.
R_DALIn_Receive	Starts DALI data reception.
r_dalin_callback_sendend	Performs processing in response to the DALI transmission end interrupt INTSTDL <i>n</i> .
r_dalin_callback_receiveend	Performs processing in response to the DALI reception end interrupt INTSRDL <i>n</i> .
r_dalin_callback_error	Performs processing in response to the DALI reception error interrupt INTSREDL <i>n</i> .
r_dalin_callback_softwareoverrun	Performs processing in response to detection of overrun error.

R_DALIn_Create

Performs initialization necessary to control the serial array unit 4 (DALI/UART4).

[Syntax]

```
void R_DALIn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_dalin_interrupt_send

Performs processing in response to the DALI transmission end interrupt INTSTDL n .

Remark This API function is called as the interrupt process corresponding to the DALI transmission end interrupt INTSTDL n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dalin_interrupt_send ( void );
```

CC-RL Compiler

```
static void __near r_dalin_interrupt_send ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_dalin_interrupt_receive

Performs processing in response to the DALI reception end interrupt INTSRDL n .

Remark This API function is called as the interrupt process corresponding to the DALI reception end interrupt INTSRDL n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dalin_interrupt_receive ( void );
```

CC-RL Compiler

```
static void __near r_dalin_interrupt_receive ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_dalin_interrupt_error

Performs processing in response to the DALI reception error interrupt INTSREDL n .

Remark This API function is called as the interrupt process corresponding to the DALI reception error interrupt INTSREDL n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dalin_interrupt_error ( void );
```

CC-RL Compiler

```
static void __near r_dalin_interrupt_error ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DALIn_Start

Sets DALI communication to standby mode.

[Syntax]

```
void R_DALIn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DALIn_Stop

Ends DALI communication.

[Syntax]

```
void R_DALIn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DALIn_Send

Starts DALI data transmission.

Remarks 1. This API function repeats the byte-level DALI transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

Remarks 2. When performing a DALI transmission, [R_DALIn_Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_DALIn_Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_DALIn_Receive

Starts DALI data reception.

Remarks 1. This API function performs byte-level DALI reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

Remarks 2. Actual DALI reception starts after this API function is called, and [R_DALIn_Start](#) is then called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_DALIn_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

r_dalin_callback_sendend

Performs processing in response to the DALI transmission end interrupt INTSTDL*n*.

Remark This API function is called as the callback routine of interrupt process [r_dalin_interrupt_send](#) corresponding to the DALI transmission end interrupt INTSTDL*n* (performed when number of transmission data specified by [R_DALIn_Send](#) argument *tx_num* has been completed).

[Syntax]

```
static void r_dalin_callback_sendend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_dalin_callback_receiveend

Performs processing in response to the DALI reception end interrupt INTSRDL n .

Remark This API function is called as the callback routine of interrupt process [r_dalin_interrupt_receive](#) corresponding to the DALI reception end interrupt INTSRDL n (performed when number of received data specified by [R_DALIn_Receive](#) argument rx_num has been completed).

[Syntax]

```
static void r_dalin_callback_receiveend ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_dalin_callback_error

Performs processing in response to the DALI reception error interrupt INTSREDL n .

Remark This API function is called as the callback routine of interrupt process [r_dalin_interrupt_error](#) corresponding to the DALI reception error interrupt INTSREDL n .

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_dalin_callback_error ( uint8_t err_type );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t <i>err_type</i> ;	Trigger for DALI reception error interrupt 0000xx1B: Overrun error 0000x1xB: Parity error 00001xxB: Framing error

[Return value]

None.

r_dalin_callback_softwareoverrun

Performs processing in response to detection of overrun error.

Remark This API function is called as the callback routine of interrupt process [r_dalin_interrupt_receive](#) corresponding to the DALI reception end interrupt INTSRDLn (process performed when the amount of data received is greater than the argument *rx_num* specified for [R_DALIn_Receive](#)).

[Syntax]

```
#include    "r_cg_macrodriver.h"
static void  r_dalin_callback_softwareoverrun ( uint16_t rx_data );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	<code>uint16_t rx_data;</code>	Receive data (greater than the argument <i>rx_num</i> specified for R_DALIn_Receive)

[Return value]

None.

3.2.32 Asynchronous serial interface LIN-UART

Below is a list of API functions output by the Code Generator for asynchronous serial interface LIN-UART (UARTF) use.

Table 3.31 API Functions: [Asynchronous Serial Interface LIN-UART]

API Function Name	Function
R_UARTFn_Create	Performs initialization necessary to control the asynchronous serial interface LIN-UART (UARTF).
R_UARTFn_Create_UserInit	Performs user-defined initialization related to the asynchronous serial interface LIN-UART (UARTF).
r_uartfn_interrupt_send	Performs processing in response to the LIN-UART transmission end interrupt INTLT.
r_uartfn_interrupt_receive	Performs processing in response to the LIN-UART reception end interrupt INTLR.
r_uartfn_interrupt_error	Performs processing in response to the LIN-UART reception status interrupt INTLS.
R_UARTFn_Start	Sets LIN communication to standby mode.
R_UARTFn_Stop	Ends LIN communication.
R_UARTFn_Set_PowerOff	Halts the clock supplied to the asynchronous serial interface LIN-UART (UARTF).
R_UARTFn_Send	Starts UARTF data transmission.
R_UARTFn_Receive	Starts UARTF data reception.
R_UARTFn_Set_DataComparisonOn	Starts the data comparison.
R_UARTFn_Set_DataComparisonOff	Ends the data comparison.
r_uartfn_callback_sendend	Performs processing in response to the LIN-UART transmission end interrupt INTLT.
r_uartfn_callback_receiveend	Performs processing in response to the LIN-UART reception end interrupt INTLR.
r_uartfn_callback_error	Performs processing in response to the LIN-UART reception status interrupt INTLS.
r_uartfn_callback_softwareoverrun	Performs processing in response to detection of overrun error.
r_uartfn_callback_expbitdetect	Performs processing in response to detection of expansion bit.
r_uartfn_callback_idmatch	Performs processing in response to match of ID parity.

R_UARTFn_Create

Performs initialization necessary to control the asynchronous serial interface LIN-UART (UARTF).

[Syntax]

```
void R_UARTFn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTFn_Create_UserInit

Performs user-defined initialization related to the asynchronous serial interface LIN-UART (UARTF).

Remark This API function is called as the [R_UARTFn_Create](#) callback routine.

[Syntax]

```
void R_UARTFn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_interrupt_send

Performs processing in response to the LIN-UART transmission end interrupt INTLT.

Remark This API function is called as the interrupt process corresponding to the LIN-UART transmission end interrupt INTLT.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartfn_interrupt_send ( void );
```

CC-RL Compiler

```
static void __near r_uartfn_interrupt_send ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_interrupt_receive

Performs processing in response to the LIN-UART reception end interrupt INTLR.

Remark This API function is called as the interrupt process corresponding to the LIN-UART reception end interrupt INTLR.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartfn_interrupt_receive ( void );
```

CC-RL Compiler

```
static void __near r_uartfn_interrupt_receive ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_interrupt_error

Performs processing in response to the LIN-UART reception status interrupt INTLS.

Remark This API function is called as the interrupt process corresponding to the LIN-UART reception status interrupt INTLS.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartfn_interrupt_error ( void );
```

CC-RL Compiler

```
static void __near r_uartfn_interrupt_error ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTF n _Start

Sets LIN communication to standby mode.

[Syntax]

```
void R_UARTF $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTFn_Stop

Ends LIN communication.

[Syntax]

```
void R_UARTFn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTFn_Set_PowerOff

Halts the clock supplied to the asynchronous serial interface LIN-UART (UARTF).

Remark Calling this API function changes the asynchronous serial interface LIN-UART (UARTF) to reset status. For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_UARTFn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTFn_Send

Starts UARTF data transmission.

- Remarks 1. This API function repeats the byte-level UARTF transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.
- Remarks 2. When performing a UARTF transmission, [R_UARTFn_Start](#) must be called before this API function is called.
- Remarks 3. If the asynchronous serial interface LIN-UART (UARTF) is used in expansion bit mode, then store the data to send in the buffer specified by argument *tx_buf*, in the following format.
"8-bit data", "Expansion bit", "8-bit data", "Expansion bit", ...

[Syntax]

```
MD_STATUS R_UARTFn_Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification
MD_DATAEXISTS	Executing transmission process

R_UARTF n _Receive

Starts UARTF data reception.

- Remarks 1. This API function performs byte-level UARTF reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.
- Remarks 2. Actual UARTF reception starts after this API function is called, and [R_UARTFn_Start](#) is then called.
- Remarks 3. If the asynchronous serial interface LIN-UART (UARTF) is used in expansion bit mode, then the received data is stored in the buffer specified by argument *rx_buf*, in the following format.
"8-bit data", "Expansion bit", "8-bit data", "Expansion bit", ...

[Syntax]

```
MD_STATUS R_UARTFn_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_UARTF n _Set_DataComparisonOn

Starts the data comparison.

Remark Calling this API function switches the asynchronous serial interface LIN-UART (UARTF) to expansion bit mode (with data comparison).

[Syntax]

```
void    R_UARTF $n$ _Set_DataComparisonOn ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTFn_Set_DataComparisonOff

Ends the data comparison.

Remark Calling this API function switches the asynchronous serial interface LIN-UART (UARTF) to expansion bit mode (with no data comparison).

[Syntax]

```
void    R_UARTFn_Set_DataComparisonOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_callback_sendend

Performs processing in response to the LIN-UART transmission end interrupt INTLT.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_send](#) corresponding to the LIN-UART transmission end interrupt INTLT (performed when number of transmission data specified by [R_UARTFn_Send](#) argument *tx_num* has been completed).

[Syntax]

```
static void r_uartfn_callback_sendend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_callback_receiveend

Performs processing in response to the LIN-UART reception end interrupt INTLR.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_receive](#) corresponding to the LIN-UART reception end interrupt INTLR (performed when number of received data specified by [R_UARTFn_Receive](#) argument *rx_num* has been completed).

[Syntax]

```
static void r_uartfn_callback_receiveend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_callback_error

Performs processing in response to the LIN-UART reception status interrupt INTLS.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_error](#) corresponding to the LIN-UART reception status interrupt INTLS.

[Syntax]

```
static void r_uartfn_callback_error ( uint8_t err_type );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t <i>err_type</i> ;	Trigger for LIN-UART reception status interrupt 00000xx1B: Overrun error 00000x1xB: Parity error 000001xxB: Framing error

[Return value]

None.

r_uartfn_callback_softwareoverrun

Performs processing in response to detection of overrun error.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_receive](#) corresponding to the LIN-UART reception end interrupt INTLR (performed when number of received data specified by [R_UARTFn_Receive](#) argument *rx_num* has been completed).

[Syntax]

```
static void r_uartfn_callback_softwareoverrun ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_callback_expbitdetect

Performs processing in response to detection of expansion bit.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_error](#) corresponding to the LIN-UART reception status interrupt INTLS (performed when expansion bit has been detected).

[Syntax]

```
static void r_uartfn_callback_expbitdetect ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartfn_callback_idmatch

Performs processing in response to match ID parity.

Remark This API function is called as the callback routine of interrupt process [r_uartfn_interrupt_error](#) corresponding to the LIN-UART reception status interrupt INTLS (performed when ID parity has been matched).

[Syntax]

```
static void r_uartfn_callback_idmatch ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.33 Serial interface IICA

Below is a list of API functions output by the Code Generator for serial interface IICA use.

Table 3.32 API Functions: [Serial Interface IICA]

API Function Name	Function
R_IICAn_Create	Performs initialization necessary to control the serial interface IICA.
R_IICAn_Create_UserInit	Performs user-defined initialization related to the serial interface IICA.
r_iican_interrupt	Performs processing in response to the IICA communication end interrupt INTIICAn.
R_IICAn_StopCondition	Generates stop conditions.
R_IICAn_Stop	Ends IICA communication.
R_IICAn_Reset	Reset the serial interface IICA.
R_IICAn_Set_PowerOff	Halts the clock supplied to the serial interface IICA.
R_IICAn_Master_Send	Starts IICA master transmission.
R_IICAn_Master_Receive	Starts IICA master reception.
r_iican_callback_master_sendend	Performs processing in response to the IICA master transmission end interrupt INTIICAn.
r_iican_callback_master_receiveend	Performs processing in response to the IICA master reception end interrupt INTIICAn.
r_iican_callback_master_error	Performs processing in response to detection of IICA master communication error.
R_IICAn_Slave_Send	Starts IICA slave transmission.
R_IICAn_Slave_Receive	Starts IICA slave reception.
r_iican_callback_slave_sendend	Performs processing in response to the IICA slave transmission end interrupt INTIICAn.
r_iican_callback_slave_receiveend	Performs processing in response to the IICA slave reception end interrupt INTIICAn.
r_iican_callback_slave_error	Performs processing in response to detection of IICA slave communication error.
r_iican_callback_getstopcondition	Performs processing in response to detection of stop condition.
R_IICAn_Set_SnoozeOn	Enables operation of the address match wakeup function in STOP mode.
R_IICAn_Set_SnoozeOff	Disables operation of the address match wakeup function in STOP mode.
R_IICAn_Set_WakeupOn	Enables operation of the address match wakeup function in STOP mode.
R_IICAn_Set_WakeupOff	Disables operation of the address match wakeup function in STOP mode.

R_IICAn_Create

Performs initialization necessary to control the serial interface IICA.

[Syntax]

```
void R_IICAn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Create_UserInit

Performs user-defined initialization related to the serial interface IICA.

Remark This API function is called as the [R_IICAn_Create](#) callback routine.

[Syntax]

```
void R_IICAn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iican_interrupt

Performs processing in response to the IICA communication end interrupt INTIICAn.

Remark This API function is called as the interrupt process corresponding to the IICA communication end interrupt INTIICAn.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_iican_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_iican_interrupt ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_StopCondition

Generates stop conditions.

Remark After calling this API function, please confirm a detection of stop condition by SPD0 bit before stopping IICA.

[Syntax]

```
void    R_IICAn_StopCondition ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Stop

Ends IICA communication.

[Syntax]

```
void R_IICAn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Reset

Reset the serial interface IICA.

[Syntax]

```
void R_IICAn_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Set_PowerOff

Halts the clock supplied to the serial interface IICA.

Remark Calling this API function changes the serial interface IICA to reset status.
For this reason, writes to the control registers (e.g. IICA control register n : IICCTL n) after this API function is called are ignored.

[Syntax]

```
void    R_IICAn_Set_PowerOff ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Master_Send

Starts IICA master transmission.

Remark This API function repeats the byte-level IICA master transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_IICAn_Master_Send ( uint8_t adr, uint8_t * const tx_buf, uint16_t tx_num,
uint8_t wait );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>adr</i> ;	Slave address
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send
I	uint8_t <i>wait</i> ;	Setup time of start conditions

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ERROR1	Bus communication status
MD_ERROR2	Bus not released status

R_IICAn_Master_Receive

Starts IICA master reception.

Remark This API function performs byte-level IICA master reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_IICAn_Master_Receive ( uint8_t adr, uint8_t * const rx_buf, uint16_t
rx_num, uint8_t wait );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t <i>adr</i> ;	Slave address
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive
I	uint8_t <i>wait</i> ;	Setup time of start conditions

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ERROR1	Bus communication status
MD_ERROR2	Bus not released status

r_iican_callback_master_sendend

Performs processing in response to the IICA master transmission end interrupt INTIICAn.

Remark This API function is called as the callback routine of interrupt process [r_iican_interrupt](#) corresponding to the IICA master transmission end interrupt INTIICAn.

[Syntax]

```
static void r_iican_callback_master_sendend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iican_callback_master_receiveend

Performs processing in response to the IICA master reception end interrupt INTIICAn.

Remark This API function is called as the callback routine of interrupt process [r_iican_interrupt](#) corresponding to the IICA master reception end interrupt INTIICAn.

[Syntax]

```
static void r_iican_callback_master_receiveend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iican_callback_master_error

Performs processing in response to detection of IICA master communication error.

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_iican_callback_master_error ( MD_STATUS flag );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	MD_STATUS <i>flag</i> ;	Cause of communication error MD_SPT: Stop condition detected MD_NACK: Acknowledge not detected (No slave that matches the address/A slave can receive no more data or does not require the next data)

[Return value]

None.

R_IICAn_Slave_Send

Starts IICA slave transmission.

Remark This API function repeats the byte-level IICA slave transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_IICAn_Slave_Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

None.

R_IICAn_Slave_Receive

Starts IICA slave reception.

Remark This API function performs byte-level IICA slave reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_IICAn_Slave_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

None.

r_iican_callback_slave_sendend

Performs processing in response to the IICA slave transmission end interrupt INTIICAn.

Remark This API function is called as the callback routine of interrupt process [r_iican_interrupt](#) corresponding to the IICA slave transmission end interrupt INTIICAn.

[Syntax]

```
static void r_iican_callback_slave_sendend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iican_callback_slave_receiveend

Performs processing in response to the IICA slave reception end interrupt INTIICAn.

Remark This API function is called as the callback routine of interrupt process [r_iican_interrupt](#) corresponding to the IICA slave reception end interrupt INTIICAn.

[Syntax]

```
static void r_iican_callback_slave_receiveend ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_iican_callback_slave_error

Performs processing in response to detection of IICA slave communication error.

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_iican_callback_slave_error ( MD_STATUS flag );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	MD_STATUS <i>flag</i> ;	Cause of communication error MD_ERROR: Address mismatch detected MD_NACK: Acknowledge not detected (Master receiving end)

[Return value]

None.

r_iican_callback_getstopcondition

Performs processing in response to detection of stop condition.

[Syntax]

```
static void r_iican_callback_getstopcondition ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Set_SnoozeOn

Enables operation of the address match wakeup function in STOP mode.

[Syntax]

```
void R_IICAn_Set_SnoozeOn ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Set_SnoozeOff

Disables operation of the address match wakeup function in STOP mode.

[Syntax]

```
void R_IICAn_Set_SnoozeOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Set_WakeupOn

Enables operation of the address match wakeup function in STOP mode.

[Syntax]

```
void R_IICAn_Set_WakeupOn ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_IICAn_Set_WakeupOff

Disables operation of the address match wakeup function in STOP mode.

[Syntax]

```
void R_IICAn_Set_WakeupOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.34 LCD controller/driver

Below is a list of API functions output by the Code Generator for LCD controller/driver use.

Table 3.33 API Functions: [LCD Controller/Driver]

API Function Name	Function
R_LCD_Create	Performs initialization necessary to control the LCD controller/driver.
R_LCD_Create_UserInit	Performs user-defined initialization relating to the LCD controller/driver.
r_lcd_interrupt	Performs processing in response to the LCD frame interrupt INTLCD.
R_LCD_Start	Sets the LCD controller/driver to display on status.
R_LCD_Stop	Sets the LCD controller/driver to display off status.
R_LCD_Set_VoltageOn	Enables operation of internal voltage boost circuit and capacitor split circuit.
R_LCD_Set_VoltageOff	Disables operation of internal voltage boost circuit and capacitor split circuit.
R_LCD_Set_PowerOff	Halts the clock supplied to the LCD controller/driver.
R_LCD_VoltageOn	Enables operation of internal voltage boost circuit and capacitor split circuit.
R_LCD_VoltageOff	Disables operation of internal voltage boost circuit and capacitor split circuit.

R_LCD_Create

Performs initialization necessary to control the LCD controller/driver.

[Syntax]

```
void R_LCD_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Create_UserInit

Performs user-defined initialization relating to the LCD controller/driver.

Remark This API function is called as the [R_LCD_Create](#) callback routine.

[Syntax]

```
void    R_LCD_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lcd_interrupt

Performs processing in response to the LCD frame interrupt INTLCD.

Remark This API function is called as the interrupt process corresponding to the LCD frame interrupt INTLCD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lcd_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_lcd_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Start

Sets the LCD controller/driver to display on status.

[Syntax]

```
void R_LCD_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Stop

Sets the LCD controller/driver to display off status.

[Syntax]

```
void R_LCD_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Set_VoltageOn

Enables operation of internal voltage boost circuit and capacitor split circuit.

[Syntax]

```
void R_LCD_Set_VoltageOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Set_VoltageOff

Disables operation of internal voltage boost circuit and capacitor split circuit.

[Syntax]

```
void R_LCD_Set_VoltageOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_Set_PowerOff

Halts the clock supplied to the LCD controller/driver.

Remarks 1. Calling this API function changes the LCD controller/driver to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

Remarks 2. This API function stops the clock supply to the LCD controller/driver, by operating the RTCEN bit of peripheral enable register *n*.
For this reason, this API function also stops the clock supply to other peripheral devices sharing the RTCEN bit (e.g. real-time clock).

[Syntax]

```
void R_LCD_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_VoltageOn

Enables operation of internal voltage boost circuit and capacitor split circuit.

[Syntax]

```
void R_LCD_VoltageOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LCD_VoltageOff

Disables operation of internal voltage boost circuit and capacitor split circuit.

[Syntax]

```
void R_LCD_VoltageOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.35 Sound generator

Below is a list of API functions output by the Code Generator for sound generator use.

Table 3.34 API Functions: [Sound Generator]

API Function Name	Function
R_SG_Create	Performs initialization necessary to control the sound generator.
R_SG_Create_UserInit	Performs user-defined initialization relating to the sound generator.
r_sg_interrupt	Performs processing in response to the threshold value detection of the logarithmic decrement interrupt INTSG.
R_SG_Start	Enables operation of sound generator.
R_SG_Stop	Disables operation of sound generator.

R_SG_Create

Performs initialization necessary to control the sound generator.

[Syntax]

```
void R_SG_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SG_Create_UserInit

Performs user-defined initialization relating to the sound generator.

Remark This API function is called as the [R_SG_Create](#) callback routine.

[Syntax]

```
void R_SG_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_sg_interrupt

Performs processing in response to the threshold value detection of the logarithmic decrement interrupt INTSG.

Remark This API function is called as the interrupt process corresponding to the threshold value detection of the logarithmic decrement interrupt INTSG.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_sg_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_sg_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SG_Start

Enables operation of sound generator.

[Syntax]

```
void R_SG_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SG_Stop

Disables operation of sound generator.

[Syntax]

```
void R_SG_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.36 DMA controller

Below is a list of API functions output by the Code Generator for DMA controller use.

Table 3.35 API Functions: [DMA Controller]

API Function Name	Function
R_DMACn_Create	Performs initialization necessary to control the DMA controller.
R_DMACn_Create_UserInit	Performs user-defined initialization relating to the DMA controller.
R_DMAC_Create	Performs initialization necessary to control the DMA controller.
R_DMAC_Create_UserInit	Performs user-defined initialization relating to the DMA controller.
r_dmacn_interrupt	Performs processing in response to the DMA transfer end interrupt INTDMA n .
R_DMACn_Start	Enables operation of channel n .
R_DMACn_Stop	Disables operation of channel n .
R_DMACn_Set_SoftwareTriggerOn	Starts DMA transfer.

R_DMAn_Create

Performs initialization necessary to control the DMA controller.

[Syntax]

```
void R_DMAn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DMAn_Create_UserInit

Performs user-defined initialization relating to the DMA controller.

Remark This API function is called as the [R_DMAn_Create](#) callback routine.

[Syntax]

```
void R_DMAn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DMAC_Create

Performs initialization necessary to control the DMA controller.

[Syntax]

```
void R_DMAC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DMAC_Create_UserInit

Performs user-defined initialization relating to the DMA controller.

Remark This API function is called as the [R_DMAC_Create](#) callback routine.

[Syntax]

```
void R_DMAC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_dmacn_interrupt

Performs processing in response to the DMA transfer end interrupt INTDMA n .

Remark This API function is called as the interrupt process corresponding to the DMA transfer end interrupt INTDMA n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_dmacn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_dmacn_interrupt ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DMACHn_Start

Enables operation of channel *n*.

[Syntax]

```
void R_DMACHn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DMAn_Stop

Disables operation of channel *n*.

Remarks 1. This API function does not forcibly terminate DMA transfer.

Remarks 2. Before using this API function, you must confirm that transmission has ended.

[Syntax]

```
void R_DMAn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DMAn_Set_SoftwareTriggerOn

Starts DMA transfer.

[Syntax]

```
void R_DMAn_Set_SoftwareTriggerOn ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.37 Data transfer controller

Below is a list of API functions output by the Code Generator for Data transfer controller use.

Table 3.36 API Functions: [Data transfer controller]

API Function Name	Function
R_DTC_Create	Performs initialization necessary to control the Data transfer controller.
R_DTC_Create_UserInit	Performs user-defined initialization relating to the Data transfer controller.
R_DTCn_Start	Enables operation of the Data transfer controller.
R_DTCn_Stop	Disables operation of the Data transfer controller.
R_DTC_Set_PowerOff	Halts the clock supplied to the Data transfer controller.
R_DTCDn_Start	Enables operation of the Data transfer controller.
R_DTCDn_Stop	Disables operation of the Data transfer controller.

R_DTC_Create

Performs initialization necessary to control the DTC.

[Syntax]

```
void R_DTC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DTC_Create_UserInit

Performs user-defined initialization relating to the DTC.

Remark This API function is called as the [R_DTC_Create](#) callback routine.

[Syntax]

```
void R_DTC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DTCn_Start

Enables operation of the DTC.

[Syntax]

```
void R_DTCn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DTCn_Stop

Disables operation of the DTC.

[Syntax]

```
void R_DTCn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DTC_Set_PowerOff

Halts the clock supplied to the DTC.

Remark Calling this API function changes the DTC to reset status.
 For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_DTC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DTCDn_Start

Enables operation of the DTC.

[Syntax]

```
void R_DTCDn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_DTCDn_Stop

Disables operation of the DTC.

[Syntax]

```
void R_DTCDn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.38 Event link controller

Below is a list of API functions output by the Code Generator for event link controller (ELC) use.

Table 3.37 API Functions: [Event Link Controller]

API Function Name	Function
R_ELC_Create	Performs initialization necessary to control the event link controller (ELC).
R_ELC_Create_UserInit	Performs user-defined initialization relating to the event link controller (ELC).
R_ELC_Stop	Disables operation of the event link controller (ELC).

R_ELC_Create

Performs initialization necessary to control the event link controller (ELC).

[Syntax]

```
void R_ELC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ELC_Create_UserInit

Performs user-defined initialization relating to the event link controller (ELC).

Remark This API function is called as the [R_ELC_Create](#) callback routine.

[Syntax]

```
void R_ELC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_ELC_Stop

Disables operation of the event link controller (ELC).

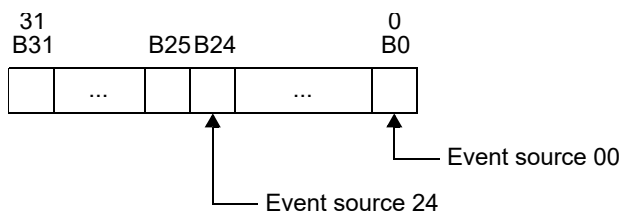
[Syntax]

```
void R_ELC_Stop ( uint32_t event );
```

[Argument(s)]

I/O	Argument	Description
I	uint32_t event;	Disabled event source

Remark Below is shown the format for specifying disabled event source *event*.
 In case of setting the *event* to 0x01010101, the event link operations of event source 00, 08, 16, 24 are prohibited.



[Return value]

None.

3.2.39 Interrupt functions

Below is a list of API functions output by the Code Generator for interrupt functions use.

Table 3.38 API Functions: [Interrupt Functions]

API Function Name	Function
R_INTC_Create	Performs initialization necessary to control the interrupt functions.
R_INTC_Create_UserInit	Performs user-defined initialization relating to the interrupt functions.
r_intcn_interrupt	Performs processing in response to the external maskable interrupt <i>INTP_n</i> .
R_INTCn_Start	Enables the acceptance of the external maskable interrupts <i>INTP_n</i> .
R_INTCn_Stop	Disables the acceptance of the external maskable interrupts <i>INTP_n</i> .
r_intclm_interrupt	Performs processing in response to the external maskable interrupt <i>INTPLR_n</i> .
R_INTCLRn_Start	Enables the acceptance of the external maskable interrupts <i>INTPLR_n</i> .
R_INTCLRn_Stop	Disables the acceptance of the external maskable interrupts <i>INTPLR_n</i> .
r_intrtcicn_interrupt	Performs processing in response to the external maskable interrupt <i>INTRTCIC_n</i> .
R_INTRTCICn_Start	Enables the acceptance of the external maskable interrupts <i>INTRTCIC_n</i> .
R_INTRTCICn_Stop	Disables the acceptance of the external maskable interrupts <i>INTRTCIC_n</i> .
R_INTFO_Start	Enables the acceptance of the external maskable interrupts <i>INTFO</i> .
R_INTFO_Stop	Disables the acceptance of the external maskable interrupts <i>INTFO</i> .
R_INTFO_ClearFlag	Clears <i>INTFCLR</i> flag of Interrupt flag output control register 1 (<i>INTFOCTL1</i>).
r_intfo_interrupt	Performs processing in response to the external maskable interrupt <i>INTFO</i> .

R_INTC_Create

Performs initialization necessary to control the interrupt functions.

[Syntax]

```
void R_INTC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_INTC_Create_UserInit

Performs user-defined initialization relating to the interrupt functions.

Remark This API function is called as the [R_INTC_Create](#) callback routine.

[Syntax]

```
void R_INTC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_intcn_interrupt

Performs processing in response to the external maskable interrupt INTP n .

Remark This API function is called as the interrupt process corresponding to the external maskable interrupt INTP n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_intcn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_intcn_interrupt ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTC n _Start

Enables the acceptance of the external maskable interrupts INTP n .

[Syntax]

```
void R_INTC $n$ _Start ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTC n _Stop

Disables the acceptance of the external maskable interrupts INTP n .

[Syntax]

```
void R_INTC $n$ _Stop ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

r_intclrn_interrupt

Performs processing in response to the external maskable interrupt INTPLR n .

Remark This API function is called as the interrupt process corresponding to the external maskable interrupt INTPLR n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_intclrn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_intclrn_interrupt ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTCLR n _Start

Enables the acceptance of the external maskable interrupts INTPLR n .

[Syntax]

```
void R_INTCLR $n$ _Start ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTCLR n _Stop

Disables the acceptance of the external maskable interrupts INTPLR n .

[Syntax]

```
void R_INTCLR $n$ _Stop ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

r_intrtcicn_interrupt

Performs processing in response to the external maskable interrupt INTRTCIC n .

Remark This API function is called as the interrupt process corresponding to the external maskable interrupt INTRTCIC n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_intrtcicn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_intrtcicn_interrupt ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTRTCIC n _Start

Enables the acceptance of the external maskable interrupts INTRTCIC n .

[Syntax]

```
void R_INTRTCIC $n$ _Start ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTRTCIC n _Stop

Disables the acceptance of the external maskable interrupts INTRTCIC n .

[Syntax]

```
void R_INTRTCIC $n$ _Stop ( void );
```

Remark n is the interrupt factor number.

[Argument(s)]

None.

[Return value]

None.

R_INTFO_Start

Enables the acceptance of the external maskable interrupts INTFO.

[Syntax]

```
void R_INTFO_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_INTFO_Stop

Disables the acceptance of the external maskable interrupts INTFO.

[Syntax]

```
void R_INTFO_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_INTFO_ClearFlag

Clears INTFCLR flag of Interrupt flag output control register 1 (INTFOCTL1).

[Syntax]

```
void R_INTFO_ClearFlag ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_intfo_interrupt

Performs processing in response to the external maskable interrupt INTFO.

Remark This API function is called as the interrupt process corresponding to the external maskable interrupt INTFO.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_intfo_interrupt ( void );
```

CC-RL Compiler

[Argument(s)]

```
static void __near r_intfo_interrupt ( void );
```

None.

[Return value]

None.

3.2.40 Key interrupt function

Below is a list of API functions output by the Code Generator for key interrupt function use.

Table 3.39 API Functions: [Key Interrupt Function]

API Function Name	Function
R_KEY_Create	Performs initialization necessary to control the key interrupt function.
R_KEY_Create_UserInit	Performs user-defined initialization relating to the key interrupt function.
r_key_interrupt	Performs processing in response to the key interrupt INTKR.
R_KEY_Start	Enables the acceptance of the key interrupt INTKR.
R_KEY_Stop	Disables the acceptance of the key interrupt INTKR.

R_KEY_Create

Performs initialization necessary to control the key interrupt function.

[Syntax]

```
void R_KEY_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_KEY_Create_UserInit

Performs user-defined initialization relating to the key interrupt function.

Remark This API function is called as the [R_KEY_Create](#) callback routine.

[Syntax]

```
void R_KEY_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_key_interrupt

Performs processing in response to the key interrupt INTKR.

Remark This API function is called as the interrupt process corresponding to the key interrupt INTKR.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_key_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_key_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_KEY_Start

Enables the acceptance of the key interrupt INTKR.

[Syntax]

```
void R_KEY_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_KEY_Stop

Disables the acceptance of the key interrupt INTKR.

[Syntax]

```
void R_KEY_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.41 Voltage detector

Below is a list of API functions output by the Code Generator for voltage detector use.

Table 3.40 API Functions: [Voltage Detector]

API Function Name	Function
R_LVD_Create	Performs initialization necessary to control the voltage detector.
R_LVD_Create_UserInit	Performs user-defined initialization relating to the voltage detector.
r_lvd_interrupt	Performs processing in response to the voltage detection interrupt INTLVI.
r_lvd_vddinterrupt	Performs processing in response to the voltage detection of VDD pin interrupt INTLVDVDD.
r_lvd_vbatinterrupt	Performs processing in response to the voltage detection of VBAT pin interrupt INTLVDVBAT.
r_lvd_vrtcinterrupt	Performs processing in response to the voltage detection of VRTC pin interrupt INTLVDVRTC.
r_lvd_exlvdinterrupt	Performs processing in response to the voltage detection of EXLVD pin interrupt INTLVDEXLVD.
R_LVD_InterruptMode_Start	Starts voltage detection (when in interrupt mode, and interrupt & reset mode).
R_LVD_Start_VDD	Enables operation of VDD pin voltage detection.
R_LVD_Start_VBAT	Enables operation of VBAT pin voltage detection.
R_LVD_Start_VRTC	Enables operation of VRTC pin voltage detection.
R_LVD_Start_EXLVD	Enables operation of EXLVD pin voltage detection.
R_LVD_Stop_VDD	Disables operation of VDD pin voltage detection.
R_LVD_Stop_VBAT	Disables operation of VBAT pin voltage detection.
R_LVD_Stop_VRTC	Disables operation of VRTC pin voltage detection.
R_LVD_Stop_EXLVD	Disables operation of EXLVD pin voltage detection.
R_LVI_Create	Performs initialization necessary to control the voltage detector.
R_LVI_Create_UserInit	Performs user-defined initialization relating to the voltage detector.
r_lvi_interrupt	Performs processing in response to the voltage detection interrupt INTLVI.
R_LVI_InterruptMode_Start	Starts voltage detection (when in interrupt mode, and interrupt & reset mode).

R_LVD_Create

Performs initialization necessary to control the voltage detector.

[Syntax]

```
void R_LVD_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Create_UserInit

Performs user-defined initialization relating to the voltage detector.

Remark This API function is called as the [R_LVD_Create](#) callback routine.

[Syntax]

```
void    R_LVD_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvd_interrupt

Performs processing in response to the voltage detection interrupt INTLVI.

Remark This API function is called as the interrupt process corresponding to the voltage detection interrupt INTLVI.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvd_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvd_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvd_vddinterrupt

Performs processing in response to the voltage detection of VDD pin interrupt INTLVDVDD.

Remark This API function is called as the interrupt process corresponding to the voltage detection of VDD pin interrupt INTLVDVDD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvd_vddinterrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvd_vddinterrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvd_vbatinterrupt

Performs processing in response to the voltage detection of VBAT pin interrupt INTLVDVBAT.

Remark This API function is called as the interrupt process corresponding to the voltage detection of VBAT pin interrupt INTLVDVBAT.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvd_vbatinterrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvd_vbatinterrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvd_vrtcinterrupt

Performs processing in response to the voltage detection of VRTC pin interrupt INTLVDVRTC.

Remark This API function is called as the interrupt process corresponding to the voltage detection of VRTC pin interrupt INTLVDVRTC.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvd_vrtcinterrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvd_vrtcinterrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvd_exlvdinterrupt

Performs processing in response to the voltage detection of EXLVD pin interrupt INTLVDEXLVD.

Remark This API function is called as the interrupt process corresponding to the voltage detection of EXLVD pin interrupt INTLVDEXLVD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvd_exlvdinterrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvd_exlvdinterrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_InterruptMode_Start

Starts voltage detection (when in interrupt mode, and interrupt & reset mode).

[Syntax]

```
void R_LVD_InterruptMode_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Start_VDD

Enables operation of VDD pin voltage detection.

[Syntax]

```
void R_LVD_Start_VDD ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Start_VBAT

Enables operation of VBAT pin voltage detection.

[Syntax]

```
void R_LVD_Start_VBAT ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Start_VRTC

Enables operation of VRTC pin voltage detection.

[Syntax]

```
void R_LVD_Start_VRTC ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Start_EXLVD

Enables operation of EXLVD pin voltage detection.

[Syntax]

```
void R_LVD_Start_EXLVD ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Stop_VDD

Disables operation of VDD pin voltage detection.

[Syntax]

```
void R_LVD_Stop_VDD ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Stop_VBAT

Disables operation of VBAT pin voltage detection.

[Syntax]

```
void R_LVD_Stop_VBAT ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Stop_VRTC

Disables operation of VRTC pin voltage detection.

[Syntax]

```
void R_LVD_Stop_VRTC ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVD_Stop_EXLVD

Disables operation of EXLVD pin voltage detection.

[Syntax]

```
void R_LVD_Stop_EXLVD ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVI_Create

Performs initialization necessary to control the voltage detector.

[Syntax]

```
void R_LVI_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVI_Create_UserInit

Performs user-defined initialization relating to the voltage detector.

Remark This API function is called as the [R_LVI_Create](#) callback routine.

[Syntax]

```
void R_LVI_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_lvi_interrupt

Performs processing in response to the voltage detection interrupt INTLVI.

Remark This API function is called as the interrupt process corresponding to the voltage detection interrupt INTLVI.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_lvi_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_lvi_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_LVI_InterruptMode_Start

Starts voltage detection (when in interrupt mode, and interrupt & reset mode).

[Syntax]

```
void R_LVI_InterruptMode_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.42 Battery backup function

Below is a list of API functions output by the Code Generator for battery backup function use.

Table 3.41 API Functions: [Battery Backup Function]

API Function Name	Function
R_BUP_Create	Performs initialization necessary to control the battery backup function.
R_BUP_Create_UserInit	Performs user-defined initialization relating to the battery backup function.
r_bup_interrupt	Performs processing in response to the power switching detection interrupt INTVBAT.
R_BUP_Start	Enables operation of battery backup function.
R_BUP_Stop	Disables operation of battery backup function.

R_BUP_Create

Performs initialization necessary to control the battery backup function.

[Syntax]

```
void R_BUP_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_BUP_Create_UserInit

Performs user-defined initialization relating to the battery backup function.

Remark This API function is called as the [R_BUP_Create](#) callback routine.

[Syntax]

```
void R_BUP_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_bup_interrupt

Performs processing in response to the power switching detection interrupt INTVBAT.

Remark This API function is called as the interrupt process corresponding to the power switching detection interrupt INTVBAT.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_bup_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_bup_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_BUP_Start

Enables operation of battery backup function.

[Syntax]

```
void R_BUP_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_BUP_Stop

Disables operation of battery backup function.

[Syntax]

```
void R_BUP_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.43 Oscillation stop detector

Below is a list of API functions output by the Code Generator for oscillation stop detector use.

Table 3.42 API Functions: [Oscillation Stop Detector]

API Function Name	Function
R_OSDC_Create	Performs initialization necessary to control the oscillation stop detector.
R_OSDC_Create_UserInit	Performs user-defined initialization relating to the oscillation stop detector.
r_osdc_interrupt	Performs processing in response to the oscillation stop detection interrupt INTOSDC.
R_OSDC_Start	Enables operation of oscillation stop detector.
R_OSDC_Stop	Disables operation of oscillation stop detector.
R_OSDC_Set_PowerOff	Halts the clock supplied to the oscillation stop detector.
R_OSDC_Reset	Reset the oscillation stop detector.

R_OSDC_Create

Performs initialization necessary to control the oscillation stop detector.

[Syntax]

```
void R_OSDC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OSDC_Create_UserInit

Performs user-defined initialization relating to the oscillation stop detector.

Remark This API function is called as the [R_OSDC_Create](#) callback routine.

[Syntax]

```
void    R_OSDC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_osdc_interrupt

Performs processing in response to the oscillation stop detection interrupt INTOSDC.

Remark This API function is called as the interrupt process corresponding to the oscillation stop detection interrupt INTOSDC.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_osdc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_osdc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OSDC_Start

Enables operation of oscillation stop detector.

[Syntax]

```
void R_OSDC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OSDC_Stop

Disables operation of oscillation stop detector.

[Syntax]

```
void R_OSDC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OSDC_Set_PowerOff

Halts the clock supplied to the oscillation stop detector.

Remark Calling this API function changes the oscillation stop detector to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_OSDC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OSDC_Reset

Reset the oscillation stop detector.

[Syntax]

```
void R_OSDC_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.44 SPI interface

Below is a list of API functions output by the Code Generator for SPI interface use.

Table 3.43 API Functions: [SPI Interface]

API Function Name	Function
R_SAIC_Create	Performs initialization necessary to control the SPI interface.
R_SAIC_Create_UserInit	Performs user-defined initialization relating to the SPI interface.
R_SAIC_Write	Starts SPI data transmission.
R_SAIC_Read	Starts SPI data reception.
R_SPI_Create	Performs initialization necessary to control the SPI interface.
R_SPI_Create_UserInit	Performs user-defined initialization relating to the SPI interface.
R_SPI_Write	Starts SPI data transmission.
R_SPI_Read	Starts SPI data reception.

R_SAIC_Create

Performs initialization necessary to control the SPI interface.

[Syntax]

```
void R_SAIC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SAIC_Create_UserInit

Performs user-defined initialization relating to the SPI interface.

Remark This API function is called as the [R_SAIC_Create](#) callback routine.

[Syntax]

```
void R_SAIC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SAIC_Write

Starts SPI data transmission.

[Syntax]

```
void R_SAIC_Write ( const smartanalog_t * p_saic_data );
```

[Argument(s)]

I/O	Argument	Description
I	const smartanalog_t * p_saic_data;	Pointer to area storing the transmission data

[Return value]

None.

R_SAIC_Read

Starts SPI data reception.

[Syntax]

```
void R_SAIC_Read ( const smartanalog_t * p_saic_data, smartanalog_t *  
p_saic_read_buf );
```

[Argument(s)]

I/O	Argument	Description
O	const smartanalog_t * p_saic_data;	Pointer to area to store the received data
O	smartanalog_t * p_saic_read_buf;	Pointer to a buffer to store the received data

[Return value]

None.

R_SPI_Create

Performs initialization necessary to control the SPI interface.

[Syntax]

```
void R_SPI_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SPI_Create_UserInit

Performs user-defined initialization relating to the SPI interface.

Remark This API function is called as the [R_SPI_Create](#) callback routine.

[Syntax]

```
void R_SPI_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SPI_Write

Starts SPI data transmission.

[Syntax]

```
void R_SPI_Write ( const smartanalog_t * p_saic_data );
```

[Argument(s)]

I/O	Argument	Description
I	const smartanalog_t * p_saic_data;	Pointer to area storing the transmission data

[Return value]

None.

R_SPI_Read

Starts SPI data reception.

[Syntax]

```
void R_SPI_Read ( const smartanalog_t * p_saic_data, smartanalog_t * p_saic_read_buf );
```

[Argument(s)]

I/O	Argument	Description
O	const smartanalog_t * p_saic_data;	Pointer to area to store the received data
O	smartanalog_t * p_saic_read_buf;	Pointer to a buffer to store the received data

[Return value]

None.

3.2.45 Operational amplifier

Below is a list of API functions output by the Code Generator for Operational Amplifier use.

Table 3.44 API Functions: [Operational amplifier]

API Function Name	Function
R_OPAMP_Create	Performs initialization necessary to control the operational amplifier.
R_OPAMP_Create_UserInit	Performs user-defined initialization related to the operational amplifier.
R_OPAMP_Set_ReferenceCircuitOn	Enables operational amplifier reference current circuit.
R_OPAMP_Set_ReferenceCircuitOff	Disables operational amplifier reference current circuit.
R_OPAMPn_Start	Starts operational amplifier of unit <i>n</i> .
R_OPAMPn_Stop	Stops operational amplifier of unit <i>n</i> .
R_OPAMPn_Set_PrechargeOn	Starts precharging of the external capacitor of the operational amplifier <i>n</i> .
R_OPAMPn_Set_PrechargeOff	Performs user-defined initialization related to the operational amplifier.

R_OPAMP_Create

Performs initialization necessary to control the operational amplifier.

[Syntax]

```
void R_OPAMP_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMP_Create_UserInit

Performs user-defined initialization relating to the operational amplifier.

Remark This API function is called as the [R_OPAMP_Create](#) callback routine.

[Syntax]

```
void R_OPAMP_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMP_Set_ReferenceCircuitOn

Enables operational amplifier reference current circuit.

[Syntax]

```
void R_OPAMP_Set_ReferenceCircuitOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMP_Set_ReferenceCircuitOff

Disables operational amplifier reference current circuit.

[Syntax]

```
void R_OPAMP_Set_ReferenceCircuitOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMP n _Start

Starts operational amplifier of unit n .

[Syntax]

```
void R_OPAMP $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMP n _Stop

Stops operational amplifier of unit n .

[Syntax]

```
void R_OPAMP $n$ _Stop ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMP n _Set_PrechargeOn

Starts precharging of the external capacitor of the operational amplifier n .

[Syntax]

```
void R_OPAMP $n$ _Set_PrechargeOn ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMP n _Set_PrechargeOff

Stops precharging of the external capacitor of the operational amplifier n .

[Syntax]

```
void R_OPAMP $n$ _Set_PrechargeOff ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

3.2.46 Data operation circuit

Below is a list of API functions output by the Code Generator for comparator use.

Table 3.45 API Functions: [Data operation circuit]

API Function Name	Function
R_DOC_Create	Performs initialization necessary to control the data operation circuit.
R_DOC_Create_UserInit	Performs user-defined initialization related to the data operation circuit.
r_doc_interrupt	Performs processing in response to the DOC operation result detection interrupt INTDOC.
R_DOC_SetMode	Configures the operation mode of data operation circuit.
R_DOC_WriteData	Writes new data to compare, add or subtract.
R_DOC_GetResult	Gets result of addition or subtraction.
R_DOC_ClearFlag	Clears DOPCF flag of DOC control register (DOCR).
R_DOC_Set_PowerOff	Stops the clock supplied for data operation circuit.
R_DOC_Reset	Resets Data operation circuit module.

R_DOC_Create

Performs initialization necessary to control the data operation circuit.

[Syntax]

```
void R_DOC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DOC_Create_UserInit

Performs user-defined initialization relating to the data operation circuit.

Remark This API function is called as the [R_DOC_Create](#) callback routine.

[Syntax]

```
void R_DOC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_doc_interrupt

Performs processing in response to the data operation circuit interrupt INTDOC.

Remark This API function is called as the interrupt process corresponding to the data operation circuit interrupt INTDOC.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_doc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_doc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DOC_SetMode

Configures the operation mode of data operation circuit.

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_doc.h"
MD_STATUS R_DOC_SetMode ( doc_mode_t mode, uint16_t value);
```

[Argument(s)]

I/O	Argument	Description
I	doc_mode_t mode;	Operation mode of data operation circuit ADDITION: Data addition mode SUBTRACTION: Data subtraction mode COMPARE_MATCH: Data comparison mode (Detection Condition: Data match is detected) COMPARE_MISMATCH: Data subtraction mode (Detection Condition: Data mismatch is detected)
I	uint16_t value;	Data addition and data subtraction : Results of operations Data comparison : 16-bit data for use as a reference

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_DOC_WriteData

Writes new data to compare, add or subtract.

Remark Write data to DODIR register.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_DOC_WriteData ( uint16_t data );
```

[Argument(s)]

I/O	Argument	Description
O	uint16_t <i>data</i> ;	data to compare, add or subtract

[Return value]

None.

R_DOC_GetResult

Gets result of addition or subtraction.

[Syntax]

```
#include    "r_cg_macrodriver.h"  
void      R_DOC_GetResult ( uint16_t *const data );
```

[Argument(s)]

I/O	Argument	Description
O	uint16_t *const data	pointer to where result will be stored

[Return value]

None.

R_DOC_ClearFlag

Clears DOPCF flag of DOC control register (DOCR).

[Syntax]

```
void R_DOC_ClearFlag ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DOC_Set_PowerOff

Stops the clock supplied for data operation circuit.

[Syntax]

```
void R_DOC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_DOC_Reset

Resets Data operation circuit module.

[Syntax]

```
void R_DOC_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.47 32-bit Multiply-accumulator

Below is a list of API functions output by the Code Generator for 32-bit Multiply-accumulator use.

Table 3.46 API Functions: [32-bit Multiply-accumulator]

API Function Name	Function
R_MAC32Bit_Create	Performs initialization necessary to control the data operation circuit.
R_MAC32Bit_Create_UserInit	Performs user-defined initialization related to the data operation circuit.
r_mac32bit_interrupt_flow	Performs processing in response to the DOC operation result detection interrupt INTDOC.
R_MAC32Bit_Reset	Gets result of addition or subtraction.
R_MAC32Bit_Set_PowerOff	Clears DOPCF flag of DOC control register (DOCR).
R_MAC32bit_MULUnsigned	Operates the unsigned multiply.
R_MAC32Bit_MULSigned	Operates the signed multiply.
R_MAC32Bit_MACUnsigned	Operates the unsigned multiply-accumulate.
R_MAC32Bit_MACSigned	Operates the signed multiply-accumulate.

R_MAC32Bit_Create

Performs initialization necessary to control the 32-bit Multiply-accumulator.

[Syntax]

```
void R_MAC32Bit_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_MAC32Bit_Create_UserInit

Performs user-defined initialization relating to the 32-bit Multiply-accumulator.

Remark This API function is called as the [R_MAC32Bit_Create](#) callback routine.

[Syntax]

```
void    R_MAC32Bit_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_mac32bit_interrupt_flow

Performs processing in response to the 32-bit Multiply-accumulator interrupt INTMACLOF.

Remark This API function is called as the interrupt process corresponding to the 32-bit Multiply-accumulator interrupt INTMACLOF.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_mac32bit_interrupt_flow ( void );
```

CC-RL Compiler

```
static void __near r_mac32bit_interrupt_flow ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_MAC32Bit_Reset

Resets the 32-bit Multiply-accumulator.

[Syntax]

```
void R_MAC32Bit_Reset ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_MAC32Bit_Set_PowerOff

Stops the clock supplied for the 32-bit Multiply-accumulator.

[Syntax]

```
void R_MAC32Bit_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_MAC32bit_MULUnsigned

Operates the unsigned multiply.

[Syntax]

```
#include    "r_cg_macrodriver.h"
#include    "r_cg_mac32bit.h"
void      R_MAC32Bit_MULUnsigned(uint32_t data_a, uint32_t data_b, mac32bit_uint64_t *
buffer_64bit);
```

[Argument(s)]

I/O	Argument	Description
I	uint32_t data_a	Multiplicand
I	uint32_t data_b	Multiplier
O	mac32bit_uint64_t * buffer_64bit	Multiplier result

Remark Below is an example of the structure mac32bit_uint64_t for the multiplier result.

```
typedef struct
{
    uint16_t low_low;
    uint16_t low_high;
    uint16_t high_low;
    uint16_t high_high;
} mac32bit_uint64_t;
```

[Return value]

None.

R_MAC32Bit_MULSigned

Operates the signed multiply.

[Syntax]

```
#include    "r_cg_macrodriver.h"
#include    "r_cg_mac32bit.h"
void      R_MAC32Bit_MULSigned(int32_t data_a, int32_t data_b, mac32bit_int64_t *
buffer_64bit);
```

[Argument(s)]

I/O	Argument	Description
I	int32_t data_a	Multiplicand
I	int32_t data_b	Multiplier
O	mac32bit_int64_t * buffer_64bit	Multiplier result

Remark

Below is an example of the structure mac32bit_int64_t for the multiplier result.

```
typedef struct
{
    int16_t low_low;
    int16_t low_high;
    int16_t high_low;
    int16_t high_high;
} mac32bit_int64_t;
```

[Return value]

None.

R_MAC32Bit_MACUnsigned

Operates the unsigned multiply-accumulate.

[Syntax]

```
#include    "r_cg_macrodriver.h"
#include    "r_cg_mac32bit.h"
void      R_MAC32Bit_MACUnsigned(uint32_t data_a, uint32_t data_b, mac32bit_uint64_t *
buffer_64bit);
```

[Argument(s)]

I/O	Argument	Description
I	uint32_t data_a	Multiplicand
I	uint32_t data_b	Multiplier
O	mac32bit_uint64_t * buffer_64bit	Accumulation initial value / Multiplier result

Remark See [R_MAC32bit_MULUnsigned](#) for details about the mac32bit_uint64_t.

[Return value]

None.

R_MAC32Bit_MACSigned

Operates the signed multiply-accumulate.

[Syntax]

```
#include    "r_cg_macrodriver.h"
#include    "r_cg_mac32bit.h"
void      R_MAC32Bit_MACSigned(int32_t data_a, int32_t data_b, mac32bit_int64_t *
buffer_64bit);
```

[Argument(s)]

I/O	Argument	Description
I	int32_t data_a	Multiplicand
I	int32_t data_b	Multiplier
O	mac32bit_int64_t * buffer_64bit	Accumulation initial value / Multiplier result

Remark See [R_MAC32Bit_MULSigned](#) for details about the mac32bit_int64_t.

[Return value]

None.

3.2.48 12-bit A/D converter

Below is a list of API functions output by the Code Generator for 12-bit A/D converter use.

Table 3.47 API Functions: [12-bit A/D Converter]

API Function Name	Function
R_12ADC_Create	Performs initialization necessary to control the 12-bit A/D converter.
R_12ADC_Create_UserInit	Performs user-defined initialization relating to the 12-bit A/D converter.
r_12adc_interrupt	Performs processing in response to the A/D conversion end interrupt INTAD.
R_12ADC_Start	Starts A/D conversion.
R_12ADC_Stop	Ends A/D conversion.
R_12ADC_Get_ValueResult	Reads the results of A/D conversion (12 bits).
R_12ADC_Set_ADChannel	Configures the analog voltage input pin for A/D conversion.
R_12ADC_TemperatureSensorOutput_On	Enables 12-bit A/D converter temperature sensor output circuit.
R_12ADC_TemperatureSensorOutput_Off	Disables 12-bit A/D converter temperature sensor output circuit.
R_12ADC_InternalReferenceVoltage_On	Enables 12-bit A/D converter reference voltage circuit.
R_12ADC_InternalReferenceVoltage_Off	Disables 12-bit A/D converter reference voltage circuit.
R_12ADC_Set_PowerOff	Halts the clock supplied to the 12-bit A/D converter.

R_12ADC_Create

Performs initialization necessary to control the 12-bit A/D converter.

[Syntax]

```
void R_12ADC_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_Create_UserInit

Performs user-defined initialization relating to the 12-bit A/D converter.

Remark This API function is called as the [R_12ADC_Create](#) callback routine.

[Syntax]

```
void R_12ADC_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_12adc_interrupt

Performs processing in response to the A/D conversion end interrupt INTAD.

Remark This API function is called as the interrupt process corresponding to the A/D conversion end interrupt INTAD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_12adc_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_12adc_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_Start

Starts A/D conversion.

Remark About 1 micro second of stabilization time is required when changing the voltage converter from operation stopped to operation enabled status.
Consequently, about 1 micro second must be left free between the call to [R_12ADC_Create](#) and the call to this API function.

[Syntax]

```
void    R_12ADC_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_Stop

Ends A/D conversion.

Remark The voltage converter continues to operate after the process of this API function completes. Consequently, to stop the operation of the voltage converter, you must call [R_12ADC_Set_PowerOff](#) after the process of this API function completes.

[Syntax]

```
void    R_12ADC_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_Get_ValueResult

Reads the results of A/D conversion (12 bits).

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_12ADC_Get_ValueResult ( ad_channel_t channel, uint16_t * const buffer );
```

[Argument(s)]

I/O	Argument	Description
I	ad_channel_t <i>channel</i>	Analog voltage input pin
O	uint16_t * const <i>buffer</i> ;	Pointer to area in which to store read results of A/D conversion

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_12ADC_Set_ADChannel

Configures the analog voltage input pin for A/D conversion.

Remark The value specified in argument channel is set to A/D channel select register A0 (ADANSA0) or A/D conversion extended input control register (ADEXICR).

[Syntax]

```
#include "r_cg_macrodriver.h"
#include "r_cg_12adc.h"
MD_STATUS R_12ADC_Set_ADChannel ( ad_sel_register_t register, uint16_t data );
```

[Argument(s)]

I/O	Argument	Description
I	ad_sel_register_t register;	Set to selected register SEL_ADANSA0: A/D channel select register A0 (ADANSA0) SEL_ADEXICR: A/D conversion extended input control register (ADEXICR)
I	uint16_t data;	Set to selected register value

Remark See the header file r_cg_12adc.h for details about the analog voltage input pin ADCHANNELn.

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_12ADC_TemperatureSensorOutput_On

Enables 12-bit A/D converter temperature sensor output circuit.

[Syntax]

```
void R_12ADC_TemperatureSensorOutput_On ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_TemperatureSensorOutput_Off

Disables 12-bit A/D converter temperature sensor output circuit.

[Syntax]

```
void R_12ADC_TemperatureSensorOutput_Off ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_InternalReferenceVoltage_On

Enables 12-bit A/D converter reference voltage circuit.

[Syntax]

```
void R_12ADC_InternalReferenceVoltage_On ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_InternalReferenceVoltage_Off

Disables 12-bit A/D converter reference voltage circuit.

[Syntax]

```
void R_12ADC_InternalReferenceVoltage_Off ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12ADC_Set_PowerOff

Halts the clock supplied to the 12-bit A/D converter.

Remark Calling this API function changes the A/D converter to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_12ADC_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.49 12-bit D/A converter

Below is a list of API functions output by the Code Generator for 12-bit D/A converter use.

Table 3.48 API Functions: [12-bit D/A Converter]

API Function Name	Function
R_12DA_Create	Performs initialization necessary to control the 12-bit D/A converter.
R_12DA_Create_UserInit	Performs user-defined initialization relating to the 12-bit D/A converter.
R_12DAn_Start	Starts D/A conversion.
R_12DAn_Stop	Ends D/A conversion.
R_12DA_Set_PowerOff	Halts the clock supplied to the 12-bit D/A converter.
R_12DAn_Set_ConversionValue	Sets the analog voltage output to the ANOn pin.

R_12DA_Create

Performs initialization necessary to control the 12-bit D/A converter.

[Syntax]

```
void R_12DA_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12DA_Create_UserInit

Performs user-defined initialization relating to the 12-bit D/A converter.

Remark This API function is called as the [R_12DA_Create](#) callback routine.

[Syntax]

```
void R_12DA_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12DAn_Start

Starts D/A conversion.

[Syntax]

```
void R_12DAn_Start ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_12DAn_Stop

Ends D/A conversion.

[Syntax]

```
void R_12DAn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_12DA_Set_PowerOff

Halts the clock supplied to the 12-bit D/A converter.

Remark Calling this API function changes the 12-bit D/A converter to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_12DA_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_12DAn_Set_ConversionValue

Sets the analog voltage output to the ANOn pin.

[Syntax]

```
#include "r_cg_macrodriver.h"
void R_12DAn_Set_ConversionValue ( uint16_t reg_value );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint16_t <i>reg_value</i> ;	D/A conversion value.

[Return value]

None.

3.2.50 Operational amplifier and Analog switch

Below is a list of API functions output by the Code Generator for Operational Amplifier and Analog switch use.

Table 3.49 API Functions: [Operational amplifier and Analog switch]

API Function Name	Function
R_AMPANSW_Create	Performs initialization necessary to control the Operational amplifier and Analog switch.
R_AMPANSW_Create_UserInit	Performs user-defined initialization relating to the Operational amplifier and Analog switch.
R_OPAMPm_Set_ReferenceCircuitOn	Enables operational amplifier reference current circuit.
R_OPAMPm_Set_ReferenceCircuitOff	Disables operational amplifier reference current circuit.
R_OPAMPm_Start	Starts operational amplifier of unit <i>m</i> .
R_OPAMPm_Stop	Stops operational amplifier of unit <i>m</i> .
R_ANSW_ChargePumpm_On	Enables analog switch of unit <i>m</i> .
R_ANSW_ChargePumpm_Off	Disables analog switch of unit <i>m</i> .

R_AMPANSW_Create

Performs initialization necessary to control the Operational amplifier and Analog switch.

[Syntax]

```
void R_AMPANSW_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_AMPANSW_Create_UserInit

Performs user-defined initialization relating to the Operational amplifier and Analog switch.

Remark This API function is called as the [R_AMPANSW_Create](#) callback routine.

[Syntax]

```
void R_AMPANSW_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMPm_Set_ReferenceCircuitOn

Enables operational amplifier reference current circuit.

[Syntax]

```
void R_OPAMPm_Set_ReferenceCircuitOn ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMPm_Set_ReferenceCircuitOff

Disables operational amplifier reference current circuit.

[Syntax]

```
void R_OPAMPm_Set_ReferenceCircuitOff ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMPm_Start

Starts operational amplifier of unit *m*.

[Syntax]

```
void R_OPAMPm_Start ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_OPAMPm_Stop

Stops operational amplifier of unit *m*.

[Syntax]

```
void R_OPAMPm_Stop ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_ANSW_ChargePumpm_On

Enables analog switch of unit *m*.

[Syntax]

```
void R_ANSW_ChargePumpm_On ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_ANSW_ChargePumpm_Off

Disables analog switch of unit *m*.

[Syntax]

```
void R_ANSW_ChargePumpm_Off ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

3.2.51 Voltage reference

Below is a list of API functions output by the Code Generator for voltage Reference use.

Table 3.50 API Functions: [Voltage Reference]

API Function Name	Function
R_VR_Create	Performs initialization necessary to control the Voltage reference.
R_VR_Create_UserInit	Performs user-defined initialization relating to the Voltage reference.
R_VR_Start	Enables operation of Voltage reference.
R_VR_Stop	Disables operation of Voltage reference.

R_VR_Create

Performs initialization necessary to control the Voltage reference.

[Syntax]

```
void R_VR_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_VR_Create_UserInit

Performs user-defined initialization relating to the Voltage referdetector.

Remark This API function is called as the [R_VR_Create](#) callback routine.

[Syntax]

```
void    R_VR_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_VR_Start

Enables operation of Voltage reference.

[Syntax]

```
void R_VR_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_VR_Stop

Disables operation of Voltage reference.

[Syntax]

```
void R_VR_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.52 Sampling output timer detector

Below is a list of API functions output by the Code Generator for Sampling output timer detector use.

Table 3.51 API Functions: [Sampling output timer detector]

API Function Name	Function
R_SMOTD_Create	Performs initialization necessary to control the Sampling output timer detector.
R_SMOTD_Create_UserInit	Performs user-defined initialization relating to the Sampling output timer detector.
r_smotd_counterA_interrupt	Performs processing in response to the Sampling output timer interval interrupt INTSMOTA.
r_smotd_counterB_interrupt	performs processing in response to the Sampling output timer compare match interrupt INTSMOTB.
r_smotd_smpn_interrupt	Performs processing int response to the Sampling detector detection interrupt INTSMPn.
R_SMOTD_Start	Starts Sampling output timer detector.
R_SMOTD_Stop	Ends Sampling output timer detector.
R_SMOTD_Set_PowerOff	Halts the clock supplied to the Sampling output timer detector.

R_SMOTD_Create

Performs initialization necessary to control the Sampling output timer detector.

[Syntax]

```
void R_SMOTD_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SMOTD_Create_UserInit

Performs user-defined initialization relating to the Sampling output timer detector.

Remark This API function is called as the [R_SMOTD_Create](#) callback routine.

[Syntax]

```
void R_SMOTD_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_smotd_counterA_interrupt

Performs processing in response to the Sampling output timer interval interrupt INTSMOTA.

Remark This API function is called as the interrupt process corresponding to the Sampling output timer interval interrupt INTSMOTA.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_smotd_counterA_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_smotd_counterA_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_smotd_counterB_interrupt

Performs processing in response to the Sampling output timer compare match interrupt INTSMOTB.

Remark This API function is called as the interrupt process corresponding to the Sampling output timer compare match INTSMOTB.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_smotd_counterB_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_smotd_counterB_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_smotd_smpn_interrupt

Performs processing in response to the Sampling detector detection interrupt INTSMP n .

Remark This API function is called as the interrupt process corresponding to the Sampling detector detection interrupt INTSMP n .

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_smotd_smpn_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_smotd_smpn_interrupt ( void );
```

Remark n is the sampling input number.

[Argument(s)]

None.

[Return value]

None.

R_SMOTD_Start

Starts Sampling output timer detector.

[Syntax]

```
void R_SMOTD_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SMOTD_Stop

Ends Sampling output timer detector.

[Syntax]

```
void R_SMOTD_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_SMOTD_Set_PowerOff

Halts the clock supplied to the Sampling output timer detector.

[Syntax]

```
void R_SMOTD_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.53 External signal sampler

Below is a list of API functions output by the Code Generator for External signal sampler use.

Table 3.52 API Functions: [External signal sampler]

API Function Name	Function
R_EXSD_Create	Performs initialization necessary to control the External signal sampler.
R_EXSD_Create_UserInit	Performs user-defined initialization relating to the External signal sampler.
r_exsd_interrupt	Performs processing in response to the External signal sampler edge detection interrupt INTEXSD.
R_EXSD_Start	Starts External signal sampling.
R_EXSD_Stop	Ends External signal sampling.
R_EXSD_Set_PowerOff	Halts the clock supplied to the External signal sampler.

R_EXSD_Create

Performs initialization necessary to control the External signal sampler.

[Syntax]

```
void R_EXSD_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_EXSD_Create_UserInit

Performs user-defined initialization relating to the External signal sampler.

Remark This API function is called as the [R_EXSD_Create](#) callback routine.

[Syntax]

```
void R_EXSD_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

r_exsd_interrupt

Performs processing in response to the External signal sampler edge detection interrupt INTEXSD.

Remark This API function is called as the interrupt process corresponding to the External signal sampler edge detection interrupt INTEXSD.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_exsd_interrupt ( void );
```

CC-RL Compiler

```
static void __near r_exsd_interrupt ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_EXSD_Start

Starts A/D External signal sanpling.

[Syntax]

```
void R_EXSD_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_EXSD_Stop

Ends External signal sampling.

[Syntax]

```
void R_EXSD_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_EXSD_Set_PowerOff

Halts the clock supplied to the External signal sampler.

Remark Calling this API function changes the External signal sampler to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_EXSD_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

3.2.54 Serial interface UARTMG

Below is a list of API functions output by the Code Generator for serial interface UARTMG use.

Table 3.53 API Functions: [Serial interface UARTMG]

API Function Name	Function
R_UARTMGn_Create	Performs initialization necessary to control the serial interface UARTMG.
R_UARTMGn_Create_UserInit	Performs user-defined initialization related to the serial interface UARTMG.
r_uartmgn_interrupt_send	Performs processing in response to the UARTMG transmission completion interrupt INTSTMGn.
r_uartmgn_interrupt_receive	Performs processing in response to the UARTMG reception completion interrupt INTSRMGn.
r_uartmgn_interrupt_error	Performs processing in response to the UARTMG reception error interrupt INTSREMGn.
R_UARTMGn_Start	Sets UARTMG communication to standby mode..
R_UARTMGn_Stop	Ends UARTMG communication.
R_UARTMGn_Set_PowerOff	Halts the clock supplied to the serial interface UARTMG.
R_UARTMGn_Send	Starts UARTMG data transmission.
R_UARTMGn_Receive	Starts UARTMG data reception.
r_uartmgn_callback_sendend	Performs processing in response to the UARTMG transmission completion interrupt INTSTMGn.
r_uartn_callback_receiveend	Performs processing in response to the UARTMG reception completion interrupt INTSRMGn.
r_uartmgn_callback_error	Performs processing in response to the UARTMG reception error interrupt INTSREMGn.
r_uartmgn_callback_softwareoverrun	Performs processing in response to detection of overrun error.

R_UARTMGn_Create

Performs initialization necessary to control the serial interface UARTMG.

[Syntax]

```
void R_UARTMGn_Create ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTMGn_Create_UserInit

Performs user-defined initialization related to the serial interface UARTMG.

Remark This API function is called as the [R_UARTMGn_Create](#) callback routine.

[Syntax]

```
void R_UARTMGn_Create_UserInit ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartmgn_interrupt_send

Performs processing in response to the UARTMG transmission completion interrupt INTSTMGn.

Remark This API function is called as the interrupt process corresponding to the UARTMG transmission completion interrupt INTSTMGn.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartmgn_interrupt_send ( void );
```

CC-RL Compiler

```
static void __near r_uartmgn_interrupt_send ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartmgn_interrupt_receive

Performs processing in response to the UARTMG reception completion interrupt INTSRMGn.

Remark This API function is called as the interrupt process corresponding to the UARMG reception completion interrupt INTSRMGn.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartmgn_interrupt_receive ( void );
```

CC-RL Compiler

```
static void __near r_uartmgn_interrupt_receive ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartmgn_interrupt_error

Performs processing in response to the UARTMG reception error interrupt INTSREMGn.

Remark This API function is called as the interrupt process corresponding to the UARTMG reception error interrupt INTSREMGn.

[Syntax]

CA78K0R Compiler

```
__interrupt static void r_uartmgn_interrupt_error ( void );
```

CC-RL Compiler

```
static void __near r_uartmgn_interrupt_error ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTMG n _Start

Sets UARTMG communication to standby mode.

[Syntax]

```
void R_UARTMG $n$ _Start ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTMGn_Stop

Ends UARTMG communication.

[Syntax]

```
void R_UARTMGn_Stop ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTMGn_Set_PowerOff

Halts the clock supplied to the serial interface UARTMG.

Remark Calling this API function changes the serial interface UARTMG to reset status.
For this reason, writes to the control registers after this API function is called are ignored.

[Syntax]

```
void    R_UARTMGn_Set_PowerOff ( void );
```

Remark *n* is the channel number.

[Argument(s)]

None.

[Return value]

None.

R_UARTMG n _Send

Starts UARTMG data transmission.

Remarks 1. This API function repeats the byte-level UART transmission from the buffer specified in argument *tx_buf* the number of times specified in argument *tx_num*.

Remarks 2. When performing a UART transmission, [R_UARTMG \$n\$ _Start](#) must be called before this API function is called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_UARTMG $n$ _Send ( uint8_t * const tx_buf, uint16_t tx_num );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
I	uint8_t * const <i>tx_buf</i> ;	Pointer to a buffer storing the transmission data
I	uint16_t <i>tx_num</i> ;	Total amount of data to send

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

R_UARTMGn_Receive

Starts UARTMG data reception.

Remarks 1. This API function performs byte-level UART reception the number of times specified by the argument *rx_num*, and stores the data in the buffer specified by the argument *rx_buf*.

Remarks 2. Actual UART reception starts after this API function is called, and [R_UARTMGn_Start](#) is then called.

[Syntax]

```
#include "r_cg_macrodriver.h"
MD_STATUS R_UARTMGn_Receive ( uint8_t * const rx_buf, uint16_t rx_num );
```

Remark *n* is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t * const <i>rx_buf</i> ;	Pointer to a buffer to store the received data
I	uint16_t <i>rx_num</i> ;	Total amount of data to receive

[Return value]

Macro	Description
MD_OK	Normal completion
MD_ARGERROR	Invalid argument specification

r_uartmgn_callback_sendend

Performs processing in response to the UARTMG transmission completion interrupt INTSTMG n .

Remark This API function is called as the callback routine of interrupt process [r_uartmgn_interrupt_send](#) corresponding to the UARTMG transmission completion interrupt INTSTMG n (performed when number of transmission data specified by [R_UARTMGn_Send](#) argument tx_num has been completed).

[Syntax]

```
static void r_uartmgn_callback_sendend ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartn_callback_receiveend

Performs processing in response to the UARTMG reception completion interrupt INTSRMG n .

Remark This API function is called as the callback routine of interrupt process [r_uartmgn_interrupt_receive](#) corresponding to the UARTMG reception completion interrupt INTSRMG n (performed when number of received data specified by [R_UARTMGn_Receive](#) argument rx_num has been completed).

[Syntax]

```
static void r_uartmgn_callback_receiveend ( void );
```

Remark n is the channel number.

[Argument(s)]

None.

[Return value]

None.

r_uartmgn_callback_error

Performs processing in response to the UARTMG reception error interrupt INTSREMG n .

Remark This API function is called as the callback routine of interrupt process [r_uartmgn_interrupt_error](#) corresponding to the UARTMG reception error interrupt INTSREMG n .

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_uartn_callback_error ( uint8_t err_type );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint8_t <i>err_type</i> ;	Trigger for UART reception error interrupt 0000xx1B: Overrun error 0000x1xB: Parity error 00001xxB: Framing error

[Return value]

None.

r_uartmgn_callback_softwareoverrun

Performs processing in response to detection of overrun error.

Remark This API function is called as the callback routine of interrupt process [r_uartmgn_interrupt_receive](#) corresponding to the UARTMG reception end interrupt INTSRMG n (process performed when the amount of data received is greater than the argument rx_num specified for [R_UARTMGn_Receive](#)).

[Syntax]

```
#include "r_cg_macrodriver.h"
static void r_uartmgn_callback_softwareoverrun ( uint16_t rx_data );
```

Remark n is the channel number.

[Argument(s)]

I/O	Argument	Description
O	uint16_t rx_data ;	Receive data (greater than the argument rx_num specified for R_UARTMGn_Receive)

[Return value]

None.

3.2.55 Amplifier unit

Below is a list of API functions output by the Code Generator for Amplifier unit use.

Table 3.54 API Functions: [Amplifier unit]

API Function Name	Function
R_AMP_Create	Performs initialization necessary to control the amplifier unit.
R_AMP_Create_UserInit	Performs user-defined initialization related to the amplifier unit.
R_AMP_Set_PowerOn	Enables amplifier unit power supply.
R_AMP_Set_PowerOff	Disables amplifier unit power supply.
R_PGA1_Start	Starts instrumentation amplifier 1.
R_OPAMPn_Stop	Stops instrumentation amplifier 1.
R_AMPn_Start	Starts operational amplifier <i>n</i> .
R_AMPn_Stop	Stops operational amplifier <i>n</i> .

R_AMP_Create

Performs initialization necessary to control the amplifier unit.

[Syntax]

```
void R_AMP_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_AMP_Create_UserInit

Performs user-defined initialization relating to the amplifier unit.

Remark This API function is called as the [R_AMP_Create](#) callback routine.

[Syntax]

```
void R_AMP_Create_UserInit ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_AMP_Set_PowerOn

Enables amplifier unit power supply.

[Syntax]

```
void R_AMP_Set_PowerOn ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_AMP_Set_PowerOff

Disables amplifier unit power supply.

[Syntax]

```
void R_AMP_Set_PowerOff ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_PGA1_Start

Starts instrumentation amplifier 1.

[Syntax]

```
void R_PGA1_Start ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_OPAMP n _Stop

Stops instrumentation amplifier 1.

[Syntax]

```
void R_PGAl_Stop ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_AMP n _Start

Starts operational amplifier n .

[Syntax]

```
void R_AMP $n$ _Start ( void );
```

Remark n is the operational amplifier unit number.

[Argument(s)]

None.

[Return value]

None.

R_AMP n _Stop

Stops operational amplifier n .

[Syntax]

```
void R_AMP $n$ _Stop ( void );
```

Remark n is the operational amplifier unit number.

[Argument(s)]

None.

[Return value]

None.

3.2.56 Data flash libraries

Below is a list of API functions output by the Code Generator for data flash libraries use.

Table 3.55 API Functions: [Data Flash Libraries]

API Function Name	Function
R_FDL_Create	Performs initialization necessary to control the Data Flash Libraries.
R_FDL_Open	Starts the Data Flash Libraries.
R_FDL_Close	Stop the Data Flash Libraries.
R_FDL_Write	Writes the data to Data Flash Memories.
R_FDL_Read	Reads the data from Data Flash Memories.
R_FDL_Erase	Erases data for Data Flash Memories.

R_FDL_Create

Performs initialization necessary to control the Data Flash Libraries.

[Syntax]

```
void R_FDL_Create ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FDL_Open

Starts the Data Flash Libraries.

[Syntax]

```
void R_FDL_Open ( void );
```

[Argument(s)]

None.

[Return value]

None.

R_FDL_Close

Stops the Data Flash Libraries.

[Syntax]

```
void R_SAUm_Reset ( void );
```

Remark *m* is the unit number.

[Argument(s)]

None.

[Return value]

None.

R_FDL_Write

Writes the data to Data Flash Memories.

[Syntax]

```
pfdl_status_t R_FDL_Write ( pfdl_u16 index, __near pfdl_u08 * buffer, pfdl_u16 bytecounter);
```

Remark *m* is the unit number.

[Argument(s)]

I/O	Argument	Description
I	pfdl_u16 index;	Writing start address of Data Flash Memories
I	pfdl_u08 * buffer;	Pointer to a buffer to store the write data
I	pfdl_u16 bytecounter;	Total amount of data to write

[Return value]

Macro	Description
PFDL_OK	Normal completion
PFDL_BUSY	During execution of the other commands.
PFDL_ERR_WRITE	Error of the writing
PFDL_ERR_PARAMETER	Error of the parameters

R_FDL_Read

Reads the data from Data Flash Memories.

[Syntax]

```
pfdl_status_t R_FDL_Read ( pfdl_u16 index, __near pfdl_u08 * buffer, pfdl_u16 bytecounter );
```

[Argument(s)]

I/O	Argument	Description
I	<i>pfdl_u16 index;</i>	Reading start address of the Data Flash Memories
O	<i>pfdl_u08 * buffer;</i>	Pointer to a buffer to store the read data
I	<i>uint16_t tx_num;</i>	Total amount of data to read

[Return value]

Macro	Description
PFDL_OK	Normal completion
PFDL_BUSY	During execution of the other commands.
PFDL_ERR_PARAMETER	Error of the parameters

R_FDL_Erase

Erases the block of Data Flash Memories.

[Syntax]

```
void R_FDL_Erase ( pfdl_u16 blockno );
```

[Argument(s)]

I/O	Argument	Description
I	pfdl_u16 blockno;	Erase no block for Data Flash Memories

[Return value]

Macro	Description
PFDL_OK	Normal completion
PFDL_ERR_ERASE	Error of the erasing
PFDL_ERR_PARAMETER	Error of the parameters

Revision Record

Rev.	Date	Description	
		Page	Summary
1.00	Aug 01, 2015		First Edition issued
1.01	Dec 01, 2014		2. OUTPUT FILES TimerRJ, TimerRD API addition
			2. OUTPUT FILES Comparator/Programmable gain amplifier API addition
			3.2.5 Timer RJ API addition
			3.2.6 Timer RD API addition
			3.2.24 Comparator/Programmable gain amplifier chapter addition
1.02	Aug 01, 2015		2. OUTPUT FILES API addition <ul style="list-style-type: none"> • Timer RX • PGA+DS A/D converter • Configurable Amp • D/A converter • Voltage detector
		98 - 105	3.2.8 Timer RX chapter addition
		208 - 218	3.2.19 PGA+DS A/D converter chapter addition
		235 - 240	3.2.21 Configurable Amp chapter addition
		265 - 266	3.2.24 D/A converter API addition
		439 - 442	3.2.39 Voltage detector API addition
1.03	Mar 01, 2016	7,11, 13,16, 17,18, 19	2. OUTPUT FILES API addition <ul style="list-style-type: none"> • High-speed on-chip Oscillator clock Frequency Correction function • Real-time clock • Temperature sensor • 24-bit DS A/D converter • Serial interface IICA • Interrupt functions • Voltage detector • Oscillation stop detector • 32-bit Multiply-accumulator
		44 – 49	3.2.4 High-speed on-chip Oscillator clock Frequency Correction function chapter addition
		166 – 190	3.2.13 Real-time clock API addition
		271	3.2.23 Temperature sensor API addition

Rev.	Date	Description	
		Page	Summary
		282	3.2.24 24-bit DS A/D converter API addition
		323	3.2.32 Serial interface IICA API addition
		457 – 459	3.2.38 Interrupt functions API addition
		470 – 482	3.2.40 Voltage detector API addition
		500	3.2.42 Oscillation stop detector API addition
		525 – 534	3.2.46 32-bit Multiply-accumulator chapter addition
1.04	2016.10.01	8, 9, 11, 13, 14, 16, 17	2. OUTPUT FILES API addition <ul style="list-style-type: none"> • Timer array unit(R_TAUmReset) • 16-bit timer KB(R_TMR_KBm_ForcedOutput_mn_Start, R_TMR_KBm_ForcedOutput_mn_Stop, R_TMR_KBm_Reset) • A/D converter(R_ADC_Reset) • D/A converter(R_DACn_Create, R_DAC_Reset) • Programmable gain amplifier(R_PGA_Reset) • LCD controller/driver(R_LCD_VoltageOn, R_LCD_VoltageOff) • Interrupt functions(R_INTFO_Start, R_INTFO_Stop, R_INTFO_ClearFlag, r_intfo_interrupt)
		9, 17	2. OUTPUT FILES File addition <ul style="list-style-type: none"> • 16-bit timer KB(r_cg_tmkb.c, r_cg_tmb_user.c, r_cg_tmkb.h) • Key interrupt function(r_cg_key.c, r_cg_key_user.c, r_cg_key.h)
		19, 20	2. OUTPUT FILES Function additional <ul style="list-style-type: none"> • 12-bit A/D converter • 12-bit D/A converter • Operational amplifier and Analog switch • Voltage reference
		22	Table 3.1.) API Functions: [Common] Note update <ul style="list-style-type: none"> • hdwinit
		23, 24	3.2.1. Common Note update <ul style="list-style-type: none"> • hdwinit • R_Systeminit
		115, 125- 127	3.2.10.16-bit timer KB API addition <ul style="list-style-type: none"> • R_TMR_KBm_ForcedOutput_mn_Start • R_TMR_KBm_ForcedOutput_mn_Stop • R_TMR_KBm_Reset
		286, 295- 296	3.2.25.D/A converter API addition <ul style="list-style-type: none"> • R_DACn_Create • R_DAC_Reset

Rev.	Date	Description	
		Page	Summary
		295, 300	3.2.26.Programmable gain amplifier API addition • R_PGA_Reset
		414, 423- 424	3.2.33.LCD controller/driver API addition • R_LCD_VoltageOn • R_LCD_VoltageOff
		448, 460- 463	3.2.38.Interrupt functions API addition • R_INTFO_Start • R_INTFO_Stop • R_INTFO_ClearFlag • r_intfo_interrupt
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