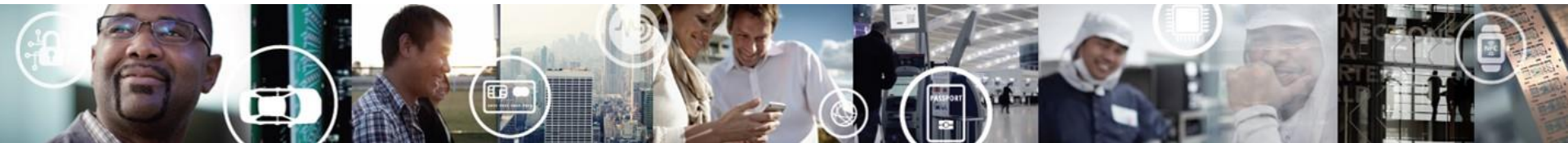


S32K324 DUAL CORES DEBUG WITH P&E MULTILINK



EXTERNAL USE



SECURE CONNECTIONS
FOR A SMARTER WORLD

- Debug S32K324 Project when “CM7_1_ENALBE=1”
- Debug S32K324 Project when “CM7_1_ENALBE=0”

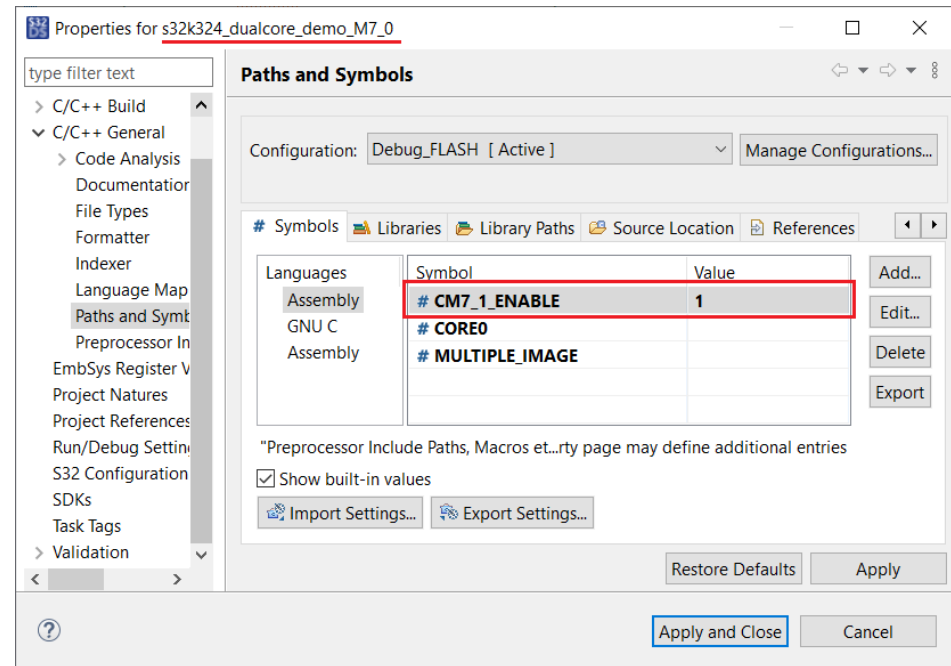
Example application
used in this document



s32k324_dualcore_demo.zip

Debug S32K324 Project when “CM7_1_ENALBE=1”

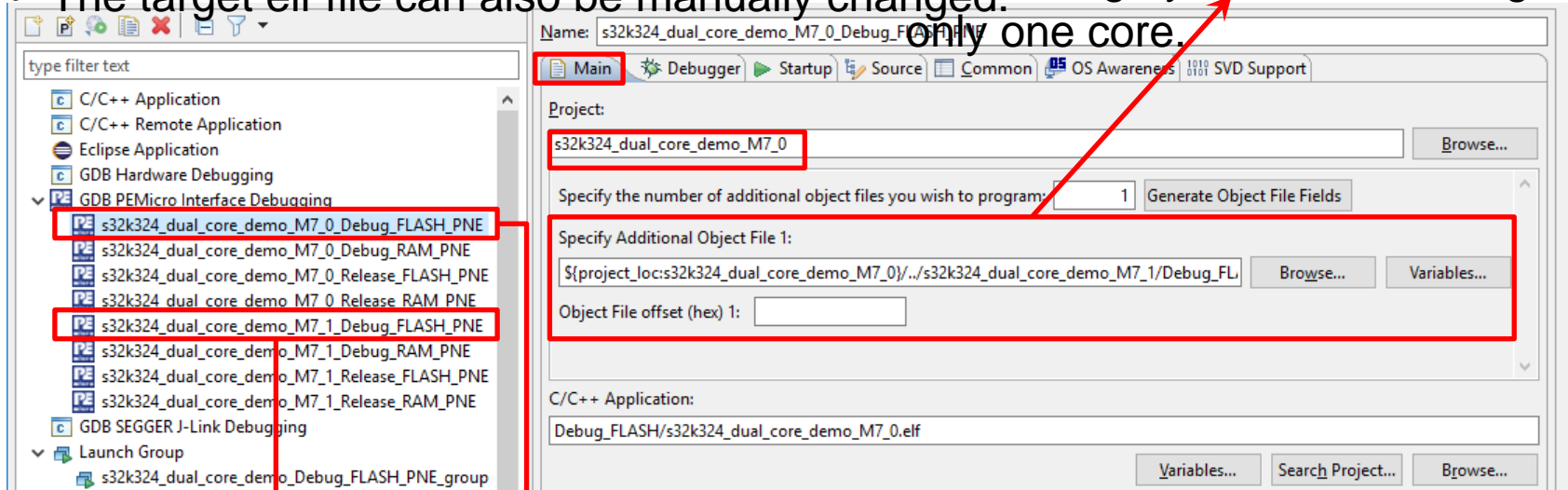
- CM7_1 is enabled during boot. Debugger can connect to it during the debug launch.
- Check CM7_0 and CM7_1 projects debug settings
- Launch Group



Debug S32K324 dual-core projects

- Default settings are OK for debugging s32k324.
- The target elf file can also be manually changed.

It's OK to load both cores' elf even though you want to debug only one core.



You can launch this configuration to debug CM7_0 only

You can launch this configuration to debug CM7_1 after CM7_0 is already connected by the debugger

Debug S32K324 dual-core projects

- Default settings are OK for debugging s32k324. connected to your PC, it can be
- The target device type can be changed in the seen in this drop-down list.

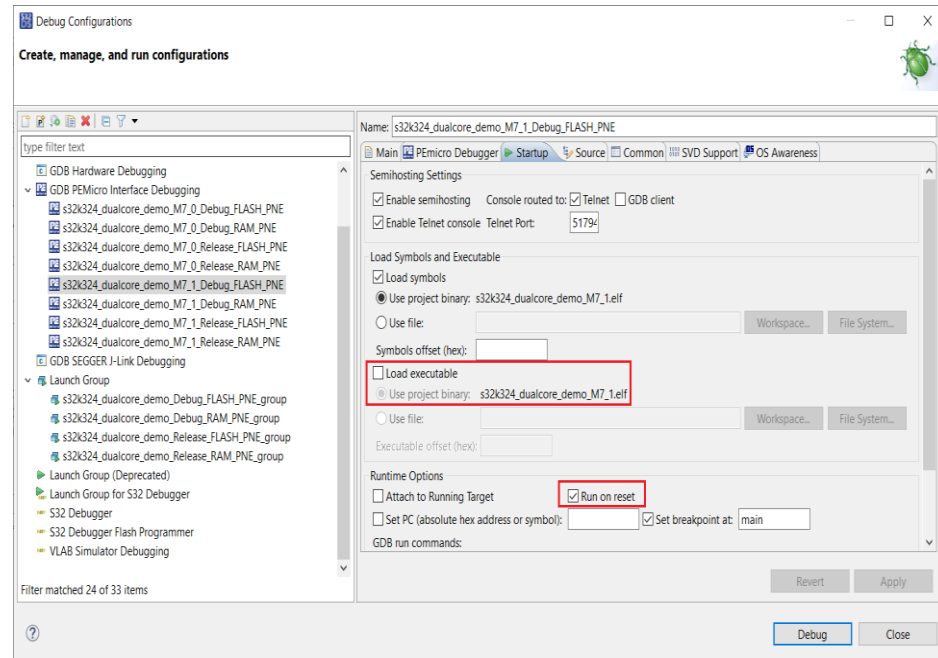
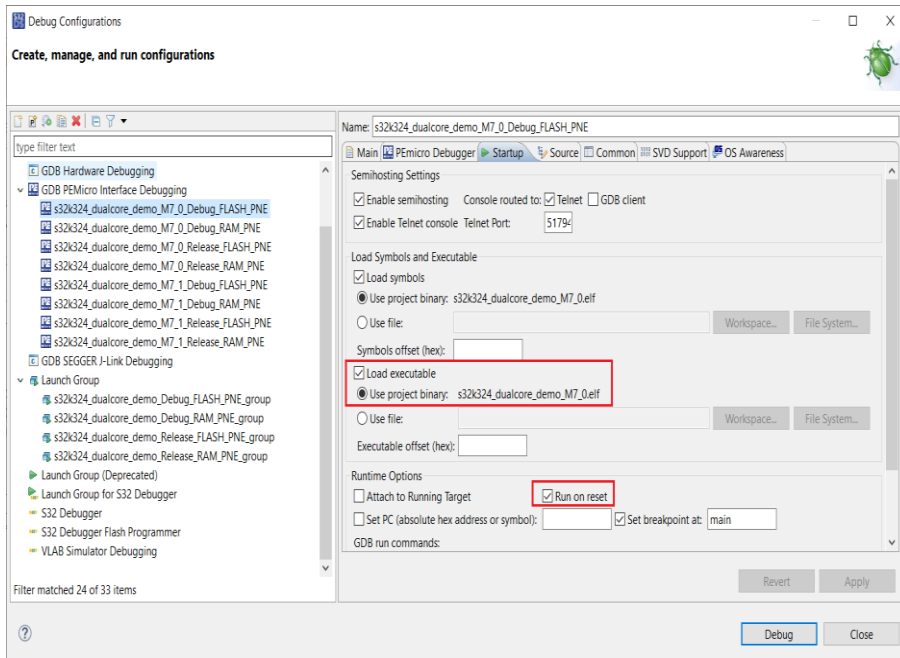
If a P&E multilink debugger or an OpenSDA debugger is

debugger settings page.

The screenshot displays the IDE's debugger settings page for a project named 's32k324_dual_core_demo_M7_0_Debug_FLASH_PNE'. The left pane shows a tree view of project configurations, with 's32k324_dual_core_demo_M7_0_Debug_FLASH_PNE' selected. The right pane shows the 'Debugger' settings for this configuration. Key settings are highlighted with red boxes: the 'Debugger' tab, the 'PEMicro Interface Debugging' category, the selected device 'S32K324', and the 'Core' dropdown set to 'M7_0'. The 'Interface' is set to 'USB Multilink' and the 'Port' is 'USB1 - Multilink Universal Rev D (PEMA536A6)'. A red arrow points from the text box above to the 'Core' dropdown.

Debug S32K324 dual-core projects

- Default settings are OK for debugging s32k324.
- The target device type can be changed in the



Debug S32K324 dual-core projects – launch debug process

Must select a Launch Group to start the dual-core download and debug.

The screenshot shows the Eclipse IDE's Launch Configuration dialog. The left pane shows a tree view of launch configurations, with 's32k324_dual_core_demo_Debug_FLASH_PNE_group' selected. The right pane shows the 'Launches' tab with a table of configurations:

Name	Mode	Action
<input checked="" type="checkbox"/> GDB PEMicro Interface Debugging::s32k324 d... Debug		
<input checked="" type="checkbox"/> GDB PEMicro Interface Debugging::s32k324 d... Debug		

Annotations with red arrows point to:

- The selected launch group in the left pane: "This launch will start debugging both core0 and core1."
- The two entries in the table: "Debug settings for core0" (pointing to the first entry) and "Debug settings for core1" (pointing to the second entry).
- The 'Debug' button at the bottom right.

Debug S32K324 Dual-Core project in S32DS with PE Multilink

Run Break(Pause) Terminate(Stop debugging) Disconnect Step into, Step over, Step return, Single instruction step

Restart (can be used as reset and run)

Must select one core to debug. The other core is in running status or in pause status depending on the previous debug operation.

Click to debug core0

Click to debug core1

Both cores are enabled in boot configuration.

The screenshot displays the S32DS IDE interface. The Project Explorer on the left shows a dual-core project structure. Two cores are visible: 's32k324_dualcore_demo_M7_0' and 's32k324_dualcore_demo_M7_1'. Both cores are selected with the 'P' icon, indicating they are in a debug state. The main editor shows the 'main.c' file with the following code:

```
(void)channel;
//Siul2_Dio_Ip_TogglePins(LED2_PORT, (1<<LED2_PIN));
}

/*!
 \brief The main function for the project.
 \details The startup initialization sequence is the following:
 * - startup asm routine
 * - main()
 */
int main(void)
{
 /* initialize the clock with full performance configuration */
 Clock_Ip_Init(&Mcu_aClockConfigPB[0]);

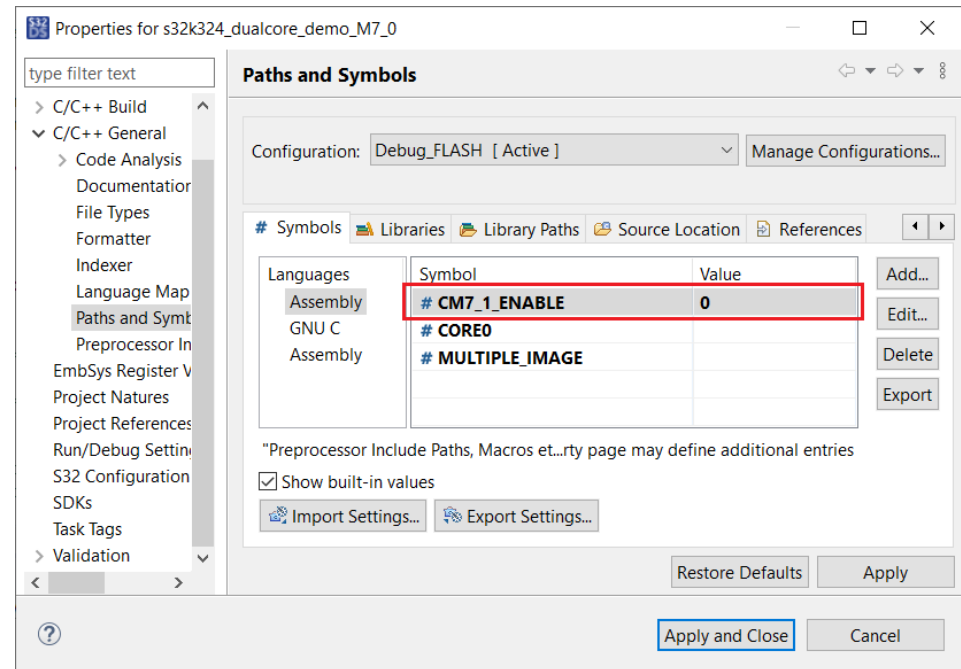
 /* configure SIUL2 pins */
 Siul2_Port_Ip_Init(NUM_OF_CONFIGURED_PINS0, g_pin_mux_InitConfigArr0);

 /* OsIf initialization */
 OsIf_Init(NULL);

 /* PIT timer and interrupt configuration */
 Pit_Ip_Init(PIT0_INST, &PIT_0_InitConfig_PB);
 Pit_Ip_InitChannel(PIT0_INST, &PIT_0_ChannelConfig_PB[0]);
}
```


Debug S32K324 Project when “CM7_1_ENABLE=0”

- Assumption:
 - CM7_1 is NOT enabled during boot. Debugger cannot work before it is launched. CM7_1 is started in CM7_0 application code.
- Use the same Debug Configuration as debugging “CM7_1_ENABLE=1”.
- Procedure:
 - Download CM7_0 elf and CM7_1 elf into the flash with Group Launch



Debug S32K324 Dual-Core project when CM7_1_ENALBE=0

workspaceS32DS.3.4 - s32k324_dualcore_demo_M7_0/src/main.c - S32 Design Studio for S32 Platform

File Edit Source Refactor Navigate Search Project ConfigTools Run PEMicro FreeRTOS Window Help

Debug Project Explorer S32K344_COM... RegLockMacros.h main.c main.c Siul2_Dio_Ip.c

s32k324_dualcore_demo_Debug_FLASH_PNE_group [Laur
C:\NXP\S32DS.3.4\eclipse\plugins\com.pemicro.debug
arm-none-eabi-gdb
Semihosting Console
arm-none-eabi-gdb
Semihosting Console

s32k324_dualcore_demo_M7_0_Debug_FLASH_PNE [GDB
s32k324_dualcore_demo_M7_0.elf
Thread #1 (Suspended: Breakpoint)
main() at main.c:160 0x4015f0
C:\NXP\S32DS.3.4\eclipse\plugins\com.pemicro.debug
arm-none-eabi-gdb
Semihosting Console

s32k324_dualcore_demo_M7_1_Debug_FLASH_PNE [GDB
s32k324_dualcore_demo_M7_1.elf
Thread #1 (Running: User Request)
arm-none-eabi-gdb
Semihosting Console

```
157 */
158 int main(void)
159 {
160     OsIf_Init(NULL);
161     Clock_Ip_Init(&Mcu_aClockConfigPB[0]);
162     Siul2_Port_Ip_Init(NUM_OF_CONFIGURED_PINS0, g_pin_mux_InitConfigArr0);
163
164     /* If previous reset is caused by FCCU fault state, the LPUART GPIO mi
165     /* LPUART initialization */
166     Console_SerialPort_Init();
167     printf("***** \r\n");
168     printf("***** MCU reset occurred ***** \r\n");
169
170     /* XRDC initialization */
171     Xrdc_Ip_Init(&Xrdc_Config_BOARD_INITPERIPHERALS);
172     /* XBIC initialization */
173     Xbic_Ip_Init(&Xbic_Config_BOARD_INITPERIPHERALS);
174     /* Semaphore initialization */
175     Sema42_Ip_Init(0);
176
177     /* After IntCtrl is enabled, the FCCU Alarm ISR is allowed to run */
178     IntCtrl_Ip_ConfigIrqRouting(&IntRouteConfig);
```

Core1 is not started at this moment, you can't debug Core1.



Debug S32K324 Dual-Core project when CM7_1_ENALBE=0

Debug Core0 step by step, after calling Mcme_Start_Core1 to start Core1, you will find the start address of Core1 could be showed at left side, then you could debug Core1 now.

```
workspaceS32DS.3.4 - s32k324_dualcore_demo_M7_0/src/main.c - S32 Design Studio for S32 Platform
File Edit Source Refactor Navigate Search Project ConfigTools Run PEMicro FreeRTOS Window Help

S32K344_COM... RegLockMacros.h main.c main.c Siul2_Dio_Ip.c
184 Pit_Ip_InitChannel(PIT_0_IP_INSTANCE_NUMBER, &PIT_0_ChannelConfig_PB[0]);
185 /* Start PIT0 channel0 */
186 Pit_Ip_StartChannel(PIT_0_IP_INSTANCE_NUMBER, 0, 4000000);
187 /* Enable PIT0 channel0 interrupt */
188 Pit_Ip_EnableChannelInterrupt(PIT_0_IP_INSTANCE_NUMBER, 0);
189
190 #if ENABLE_DUAL_CORE_DEMO
191 /* Initialize STM0 instance. It is used in sema42 demo for random tin
192 Stm_Ip_Init(0, &STM_0_InitConfig_PB);
193 Stm_Ip_StartTimer(0, 0x00000000);
194
195 /* Core0 use SEMA42 Gate0 to notify Core1 init ready */
196 Sema42_Ip_LockGate(SEMA42_INSTANCE, SEMA42_GATE0, CORE_DOMAIN_ID);
197
198 /* Core0 use shared variable to notify Core1 that Core0 is ready */
199 core0Status = CORE_STATUS_INIT_DONE;
200
201 /* start core1 */
202 Mcme_Start_Core1(CORE1_START_ADDR);
203
204 /* Core0 wait for Core1 initialization done. */
205 while(core1Status != CORE_STATUS_INIT_DONE){}
206
```

Debug S32K324 Dual-Core project when CM7_1_ENALBE=0

If the start address is still 0 after started Core1 in Core0 project, please check if there is similar log in Console window.

Open this folder, delete / rename the file 'S32K324.mac' to another name. Then debug again the dual-core project. Issue should be disappeared. There is no side effect to delete / rename this file 'S32K324.mac'.

The screenshot shows the S32 Design Studio IDE interface. The main editor displays a C source file with the following code:

```
187 /* Enable PIT0 channel0 interrupt */
188 Pit_Ip_EnableChannelInterrupt(PIT_0_IP_INSTANCE_NUMBER, 0);
189
190 #if ENABLE_DUAL_CORE_DEMO
191 /* Initialize STM0 instance. It is used in sema42 demo for random tim
192 Stm_Ip_Init(0, &STM0_InitConfig_PB);
193 Stm_Ip_StartTimer(0, 0x00000000);
194
195 /* Core0 use SEMA42 Gate0 to notify Core1 init ready */
196 Sema42_Ip_LockGate(SEMA42_INSTANCE, SEMA42_GATE0, CORE_DOMAIN_ID);
197
198 /* Core0 use shared variable to notify Core1 that Core0 is ready */
199 core0Status = CORE_STATUS_INIT_DONE;
200
201 /* start core1 */
202 Mcme_Start_Core1(CORE1_START_ADDR);
203
204 /* Core0 wait for Core1 initialization done. */
205 while(core1Status != CORE_STATUS_INIT_DONE){}
206
207 /* run the dual-core demo: sell tickets */
208 Sema42_Demo();
209 for(volatile uint32_t i=0; i<1000000; i++){
210 do {
211 Sema42_Ip_LockGate(SEMA42_INSTANCE, SEMA42_GATE1, CORE_DOMAIN_ID);
212 } while(CORE_DOMAIN_ID != Sema42_Ip_GetGateLocker(SEMA42_INSTANCE, SEM
213 printf("Tickets selling demo finished.\r\n");
214 Sema42_Ip_UnlockGate(SEMA42_INSTANCE, SEMA42_GATE1);
```

The console window at the bottom shows the following log entries:

```
s32k324_dualcore_demo_M7_0_Debug_FLASH_PNE [GDB PEMicro Interface Debugging] C:\NXP\S32DS.3.4\ eclipse\plugins\com.pemicro.debug.gdbjtag.pne_5.1.7.202112141853\win32\pegdserver_console
Done.
Delaying for 20mS ...
Done.
Reset script (C:\NXP\S32DS.3.4\ eclipse\plugins\com.pemicro.debug.gdbjtag.pne_5.1.7.202112141853\win32\gdi\PE\supportFiles_ARM\NXP\S32K3xx\S32K324.mac) completed.
Connection from "127.0.0.1" via 127.0.0.1. Connection from port "53216" to 7226
Interrupt command received. Halting execution.
UsageFault: An instruction executed with an invalid EPSR.T or EPSR.IT field.
```

A red arrow points from the text above to the console log entry: "Reset script (C:\NXP\S32DS.3.4\ eclipse\plugins\com.pemicro.debug.gdbjtag.pne_5.1.7.202112141853\win32\gdi\PE\supportFiles_ARM\NXP\S32K3xx\S32K324.mac) completed."





SECURE CONNECTIONS
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