



SECTION 7 RESET

This section describes the MPC555 / MPC556 reset sources, operation, control, and status.

7.1 Reset Operation

The MPC555 / MPC556 has several inputs to the reset logic which include the following:

- Power on reset
- External hard reset pin ($\overline{\text{HRESET}}$)
- External soft reset pin ($\overline{\text{SRESET}}$)
- Loss of lock
- On-chip clock switch
- Software watchdog reset
- Checkstop reset
- Debug port hard reset
- Debug port soft reset
- JTAG reset

All of these reset sources are fed into the reset controller. The control logic determines the cause of the reset, synchronizes it if necessary, and resets the appropriate logic modules, depending on the source of the reset. The memory controller, system protection logic, interrupt controller, and parallel I/O pins are initialized only on hard reset. External soft reset initializes internal logic while maintaining system configuration.

The reset status register (RSR) reflects the most recent source to cause a reset.

7.1.1 Power On Reset

The power-on reset pin, $\overline{\text{PORESET}}$, is an active low input. In a system with power-down low-power mode, this pin should be activated only as a result of a voltage failure in the KAPWR pin. After detecting the assertion of $\overline{\text{PORESET}}$, the MPC555 / MPC556 enters the power-on reset state. During this state the MODCK[1:3] signals determine the oscillator frequency, PLL multiplication factor, and the PITRCLK and TMBCLK clock sources. In addition, the MPC555 / MPC556 asserts the $\overline{\text{SRESET}}$ and $\overline{\text{HRESET}}$ pins.

The $\overline{\text{PORESET}}$ pin should be asserted for a minimum time of 100,000 cycles of clock oscillator after a valid level has been reached on the KAPWR supply. After detecting the assertion of $\overline{\text{PORESET}}$, the MPC555 / MPC556 remains in the power-on reset state until the last of the following two events occurs:

- The Internal PLL enters the lock state and the system clock is active.
- The $\overline{\text{PORESET}}$ pin is negated.

If the MPC555 / MPC556 is in single-chip mode and limp mode is enabled, the internal PLL is not required to be locked before the chip exits power-on reset.



After exiting the power-on reset state, the MCU continues to drive the $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ pins for 512 system clock cycles. When the timer expires (after 512 cycles), the configuration is sampled from data bus pins, if required (see [7.5.1 Hard Reset Configuration](#)) and the MCU stops driving the $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ pins. In addition, the internal MODCK[1:3] values are sampled.

The $\overline{\text{PORESET}}$ pin has a glitch detector to ensure that low spikes of less than 20 ns are rejected. The internal $\overline{\text{PORESET}}$ signal asserts only if the $\overline{\text{PORESET}}$ pin asserts for more than 100 ns.

7.1.2 Hard Reset

$\overline{\text{HRESET}}$ (hard reset) is an active low, bi-directional I/O pin. The MPC555 / MPC556 can detect an external assertion of $\overline{\text{HRESET}}$ only if it occurs while the MCU is not asserting reset.

When the MPC555 / MPC556 detects assertion of the external $\overline{\text{HRESET}}$ pin or a cause to assert the internal $\overline{\text{HRESET}}$ line, is detected the chip starts to drive the $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ for 512 cycles. When the timer expires (after 512 cycles) the configuration is sampled from data pins (refer to [7.5.1 Hard Reset Configuration](#)) and the chip stops driving the $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ pins. An external pull-up resistor should drive the $\overline{\text{HRESET}}$ and $\overline{\text{SRESET}}$ pins high. After detecting the negation of $\overline{\text{HRESET}}$ or $\overline{\text{SRESET}}$, the MCU waits 16 clock cycles before testing the presence of an external hard or soft reset.

The $\overline{\text{HRESET}}$ pin has a glitch detector to ensure that low spikes of less than 20 ns are rejected. The internal $\overline{\text{HRESET}}$ will be asserted only if $\overline{\text{HRESET}}$ is asserted for more than 100 ns.

The $\overline{\text{HRESET}}$ is an open collector type pin.

7.1.3 Soft Reset

$\overline{\text{SRESET}}$ (soft reset) is an active low, bi-directional I/O pin. The MPC555 / MPC556 can only detect an external assertion of $\overline{\text{SRESET}}$ if it occurs while the MPC555 / MPC556 is not asserting reset.

When the MPC555 / MPC556 detects the assertion of external $\overline{\text{SRESET}}$ or a cause to assert the internal $\overline{\text{SRESET}}$ line, the chip starts to drive the $\overline{\text{SRESET}}$ for 512 cycles. When the timer expires (after 512 cycles) the debug port configuration is sampled from the DSDI and DSCK pins and the chip stops driving the $\overline{\text{SRESET}}$ pin. An external pull-up resistor should drive the $\overline{\text{SRESET}}$ pin high. After the MPC555 / MPC556 detects the negation of $\overline{\text{SRESET}}$, it waits 16 clock cycles before testing the presence of an external soft reset.



7.1.4 Loss of Lock

If the PLL detects a loss of lock, erroneous external bus operation will occur if synchronous external devices use the MPC555 / MPC556 input clock. Erroneous operation could also occur if devices with a PLL use the MPC555 / MPC556 CLKOUT signal. This source of reset can be optionally asserted if the LOLRE bit in the PLL, low-power, and reset control register (PLPRCR) is set. The enabled PLL loss of lock event generates an internal hard reset sequence. Refer to [SECTION 8 CLOCKS AND POWER CONTROL](#) for more information on loss of lock.

7.1.5 On-Chip Clock Switch

If the system clocked is switched to the backup clock or switched from backup clock to another clock source an internal hard reset sequence is generated. Refer to [SECTION 8 CLOCKS AND POWER CONTROL](#).

7.1.6 Software Watchdog Reset

When the MPC555 / MPC556 software watchdog counts to zero, a software watchdog reset is asserted. The enabled software watchdog event generates an internal hard reset sequence.

7.1.7 Checkstop Reset

When the RCPU enters a checkstop state, and the checkstop reset is enabled (the CSR bit in the PLPRCR is set), a checkstop reset is asserted. The enabled checkstop event generates an internal hard reset sequence. Refer to the [RCPU Reference Manual \(RCPURM/AD\)](#) for more information.

7.1.8 Debug Port Hard Reset

When the development port receives a hard reset request from the development tool, an internal hard reset sequence is generated, see [SECTION 8 CLOCKS AND POWER CONTROL](#). In this case the development tool must reconfigure the debug port. Refer to [SECTION 21 DEVELOPMENT SUPPORT](#) for more information.

7.1.9 Debug Port Soft Reset

When the development port receives a soft reset request from the development tool, an internal soft reset sequence is generated, see [SECTION 8 CLOCKS AND POWER CONTROL](#). In this case the development tool must reconfigure the debug port. Refer to [SECTION 21 DEVELOPMENT SUPPORT](#) for more information.

7.1.10 JTAG Reset

When the JTAG logic asserts the JTAG soft reset signal, an internal soft reset sequence is generated, see [SECTION 8 CLOCKS AND POWER CONTROL](#). Refer to [SECTION 22 IEEE 1149.1-COMPLIANT INTERFACE \(JTAG\)](#) for more information.

7.2 Reset Actions Summary

[Table 7-1](#) summarizes the action taken for each reset.

Table 7-1 Reset Action Taken For Each Reset Cause



Reset Source	Reset Logic and PLL States Reset	System Configuration Reset	Clock Module Reset	$\overline{\text{HRESET}}$ Pin Driven	Debug Port Configuration	Other Internal Logic Reset	$\overline{\text{SRESET}}$ Pin Driven
Power On Reset	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hard Reset Sources External Hard Reset Loss of Lock On-Chip Clock Switch Illegal Low-Power Mode Software Watchdog Checkstop Debug Port Hard Reset	No	Yes	Yes	Yes	Yes	Yes	Yes
Soft Reset Sources External Soft Reset Debug Port Soft Reset JTAG Reset	No	No	No	No	Yes	Yes	Yes

7.3 Data Coherency During Reset

The MPC555 / MPC556 supports data coherency and avoids data corruption while reset. If a cycle is to be executed when detecting any $\overline{\text{SRESET}}$ or $\overline{\text{HRESET}}$ source, then the cycle will either complete or will not start before generating the corresponding reset control signal. There are reset sources, however, when the MPC555 / MPC556 generates an internal reset due to special internal situation where this protection is not supported. See [7.4 Reset Status Register](#).

In the case of large operand size (32 or 16 bits) transaction to a smaller port size, the cycle is split into two 16-bit or four 8-bit cycles. In this case, data coherency is assured and data will not be corrupted.

In the case where the core executes an unaligned load/store cycle which is broken down into multiple cycles, data coherency is NOT assured between these cycles (i.e., data could be corrupted).

A contention on the data pins may occur while asserting external reset ($\overline{\text{EXT_RESET}}$) if the data coherency mechanism is required, and thus enables a cycle to complete, while external hardware drives the data for the configuration word. See [Table 7-2](#) for a description of the required $\overline{\text{EXT_RESET}}$ line source in a system.

Table 7-2 Reset Configuration Word and Data Corruption/Coherency

Reset Driven	Reset to Use for Data Coherency ($\overline{\text{EXT_RESET}}$)	Comments
$\overline{\text{HRESET}}$	$\overline{\text{SRESET}}$	
$\overline{\text{SRESET}}$	$\overline{\text{HRESET}}$	
$\overline{\text{HRESET}}$ & $\overline{\text{SRESET}}$	$\overline{\text{HRESET}} \parallel \overline{\text{SRESET}}$	Provided only one of them is driven into the MPC555 / MPC556 at a time

7.4 Reset Status Register

All of the reset sources are fed into the reset controller. The 16-bit reset status register (RSR) reflects the most recent source, or sources, of reset. (Simultaneous reset requests can cause more than one bit to be set at the same time.) This register contains one bit for each reset source. A bit set to logic one indicates the type of reset that occurred.

Once set, individual bits in the RSR remain set until software clears them. Can be cleared by writing a one to the bit. A write of zero has no effect on the bit. The register can be read at all times. The reset status register receives its default reset values during power-on reset. The RSR is powered by the KAPWR pin.

RSR — Reset Status Register

0x2F C288

MSB

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EHRs	ESRS	LLRS	SWRS	CSRS	DB-HRS	DB-SRS	JTRS	OCCS	ILBC	GPOR	GH-RST	GSRST	RESERVED		
RESET:															
0	0	0	0	0	0	0	0	0	0	1	1	1	0	0	0

Table 7-3 Reset Status Register Bit Descriptions

Bit(s)	Name	Description
0	EHRs ¹	External hard reset status 0 = No external hard reset has occurred 1 = An external hard reset has occurred
1	ESRS ¹	External soft reset status 0 = No external soft reset has occurred 1 = An external soft reset has occurred
2	LLRS	Loss of lock reset status 0 = No enabled loss-of-lock reset has occurred 1 = An enabled loss-of-lock reset has occurred
3	SWRS	Software watchdog reset status 0 = No software watchdog reset has occurred 1 = A software watchdog reset has occurred
4	CSRS	Checkstop reset status 0 = No enabled checkstop reset has occurred 1 = An enabled checkstop reset has occurred
5	DBHRS	Debug port hard reset status 0 = No debug port hard reset request has occurred 1 = A debug port hard reset request has occurred
6	DBSRS	Debug port soft reset status 0 = No debug port soft reset request has occurred 1 = A debug port soft reset request has occurred
7	JTRS	JTAG reset status 0 = No JTAG reset has occurred 1 = A JTAG reset has occurred
8	OCCS	On-chip clock switch 0 = No on-chip clock switch reset has occurred 1 = An on-chip clock switch reset has occurred

Table 7-3 Reset Status Register Bit Descriptions (Continued)



Bit(s)	Name	Description
9	ILBC	Illegal bit change. This bit is set when the MPC555 / MPC556 changes any of the following bits when they are locked: LPM[0:1], locked by the LPML bit MF[0:1], locked by the MFPDL bit DIVF[0:4], locked by the MFPDL bit
10	GPOR	Glitch detected on $\overline{\text{PORESET}}$ pin. This bit is set when the $\overline{\text{PORESET}}$ pin is asserted for more than TBD ns 0 = No glitch was detected on the $\overline{\text{PORESET}}$ pin 1 = A glitch was detected on the $\overline{\text{PORESET}}$ pin
11	GHRST	Glitch detected on $\overline{\text{HRESET}}$ pin. This bit is set when the $\overline{\text{HRESET}}$ pin is asserted for more than TBD ns 0 = No glitch was detected on the $\overline{\text{HRESET}}$ pin 1 = A glitch was detected on the $\overline{\text{HRESET}}$ pin
12	GSRST	Glitch detected on $\overline{\text{SRESET}}$ pin. If the $\overline{\text{SRESET}}$ pin is asserted for more than TBD ns the GHRST bit will be set. If an internal or external SRESET is generated the $\overline{\text{SRESET}}$ pin is asserted and the GSRST bit will be set. The GSRST bit remains set until software clears it. The GSRST bit can be negated by writing a one to GSRST. A write of zero has no effect on this bit. 0 = No glitch was detected on $\overline{\text{SRESET}}$ pin 1 = A glitch was detected on $\overline{\text{SRESET}}$ pin.
13:15	—	Reserved

NOTES:

1. In the USIU RSR, if both EHRS and ESRS are set, the reset source is internal. The EHRS and ESRS bits in RSR register are set for any internal reset source in addition to external HRESET and external SRESET events. If both internal and external indicator bits are set, then the reset source is internal.

7.5 Reset Configuration

7.5.1 Hard Reset Configuration

When a hard reset event occurs, the MPC555 / MPC556 reconfigures its hardware system as well as the development port configuration. The logical value of the bits that determine its initial mode of operation, are sampled from the following:

- The external data bus pins DATA[0:31]
- An internal default constant (0x0000 0000)
- An internal NVM register value (CMFCFIG)

If at the sampling time (at $\overline{\text{HRESET}}$ negation) $\overline{\text{RSTCONF}}$ is asserted, then the configuration is sampled from the data bus. If $\overline{\text{RSTCONF}}$ is negated and a valid NVM value exists (CMFCFIG bit $\overline{\text{HC}}=0$), then the configuration is sampled from the NVM register in the CMF module. If $\overline{\text{RSTCONF}}$ is negated and no valid NVM value exists (CMFCFIG bit $\overline{\text{HC}}=1$), then the configuration word is sampled from the internal default. HC will be “1” if the internal flash is erased. [Table 7-4](#) summarizes the reset configuration options.

NOTE

If the CMFCFIG reset config word is being used, then the flash is automatically enabled.

Table 7-4 Reset Configuration Options

$\overline{\text{RSTCONF}}$	Has Configuration (HC)	Internal Configuration Word
0	x	DATA[0:31] pins
1	0	NVM flash EEPROM register (CMFCFIG)
1	1	Internal data word default (0x0000 0000)

If the PRDS control bit in the PDMCR register is set and $\overline{\text{HRESET}}$ and $\overline{\text{RSTCONF}}$ are asserted, the MPC555 / MPC556 pulls the data bus low with a weak resistor. The user can overwrite this default by driving the appropriate bit high. See [Figure 7-1](#) for the basic reset configuration scheme.

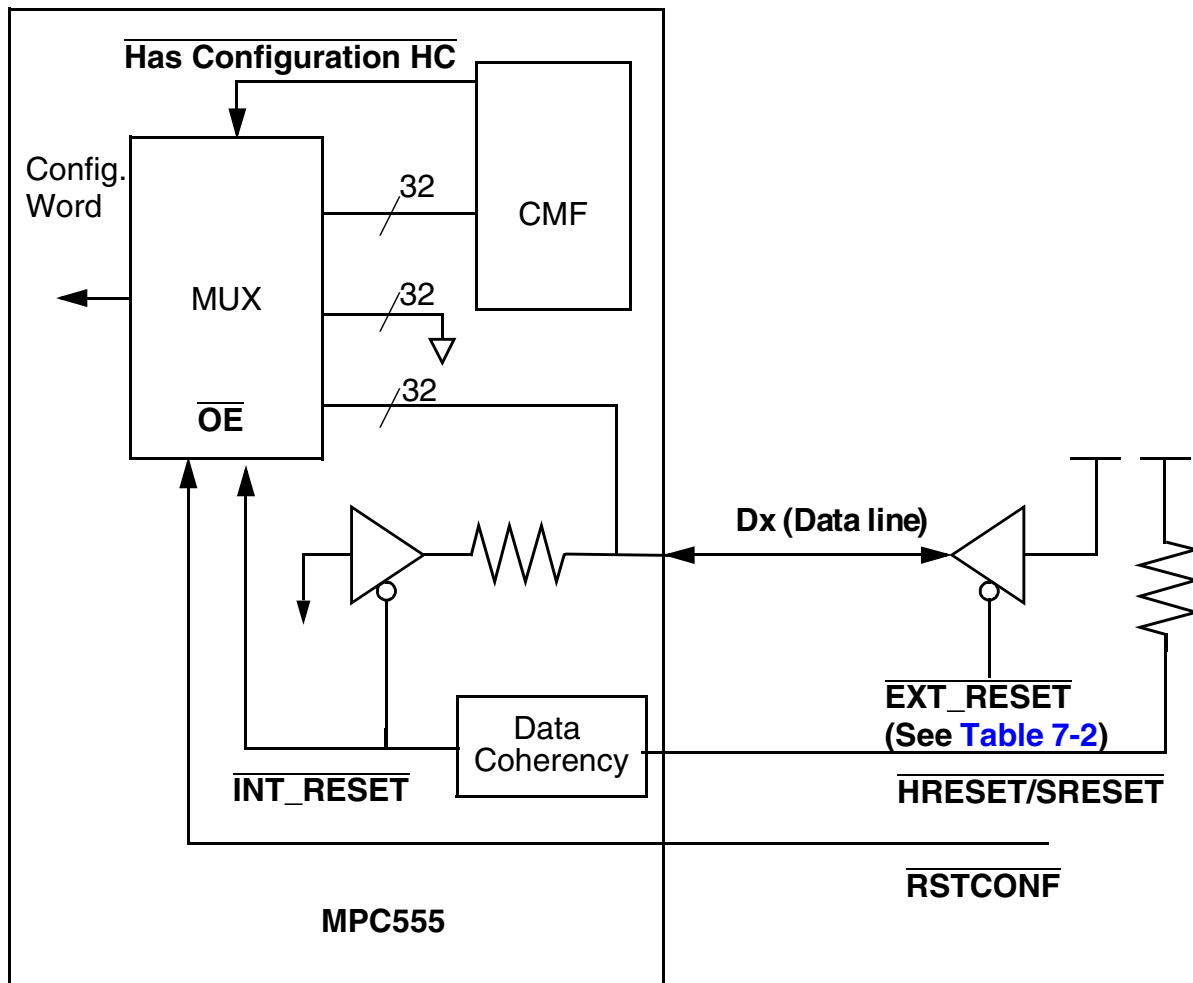


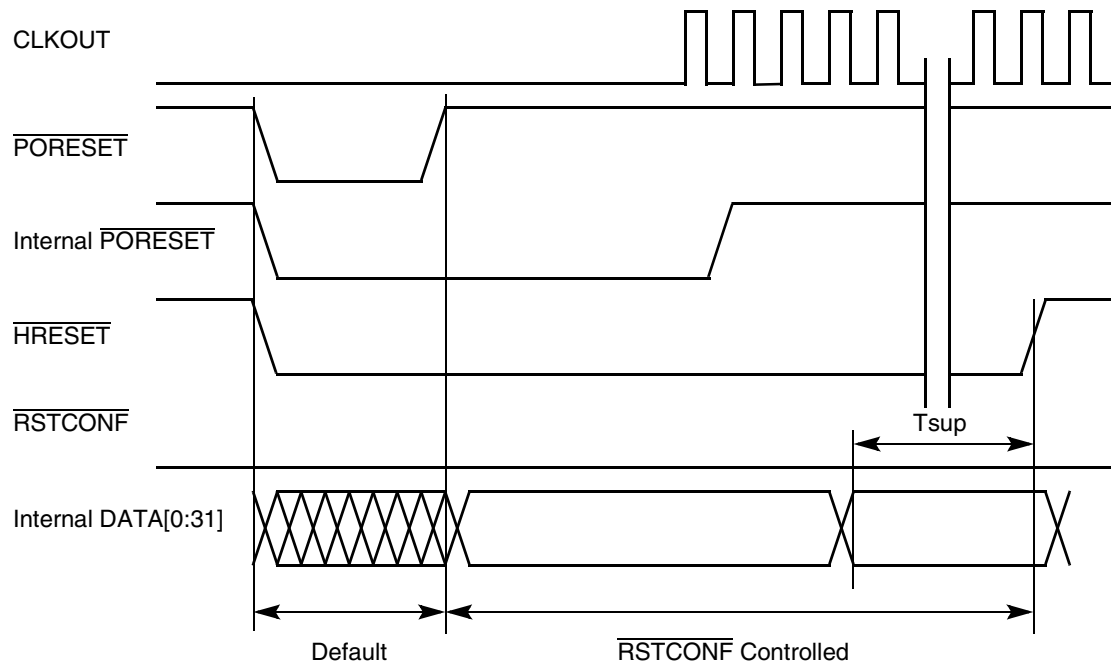
Figure 7-1 Reset Configuration Basic Scheme

During the assertion of the $\overline{\text{PORESET}}$ input signal, the chip assumes the default reset configuration. This assumed configuration changes if the input signal $\overline{\text{RSTCONF}}$ is asserted when the $\overline{\text{PORESET}}$ is negated or the CLKOUT starts to oscillate. To ensure

that stable data is sampled, the hardware configuration is sampled every eight clock cycles on the rising edge of CLKOUT with a double buffer. The setup time required for the data bus is approximately 15 cycles, and the maximum rise time of $\overline{\text{HRESET}}$ should be less than 6 clock cycles. In systems where an external reset configuration word and the TEXP output function are both required, $\overline{\text{RSTCONF}}$ should be asserted until $\overline{\text{SRESET}}$ is negated.



Figure 7-2 to **Figure 7-5** provide sample reset configuration timings.



**Figure 7-2 Reset Configuration Sampling Scheme
For “Short” $\overline{\text{PORESET}}$ Assertion, Limp Mode Disabled**

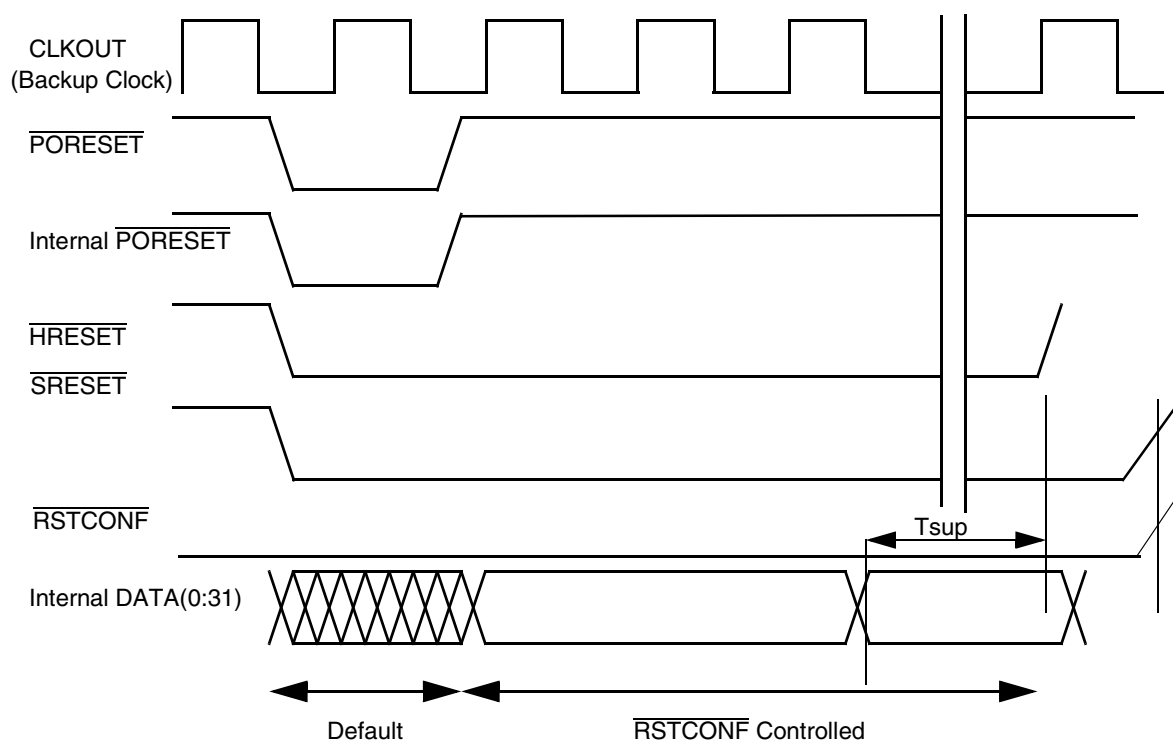


Figure 7-3 Reset Configuration Timing for “Short” $\overline{\text{PORESET}}$ Assertion, Limp Mode Enabled

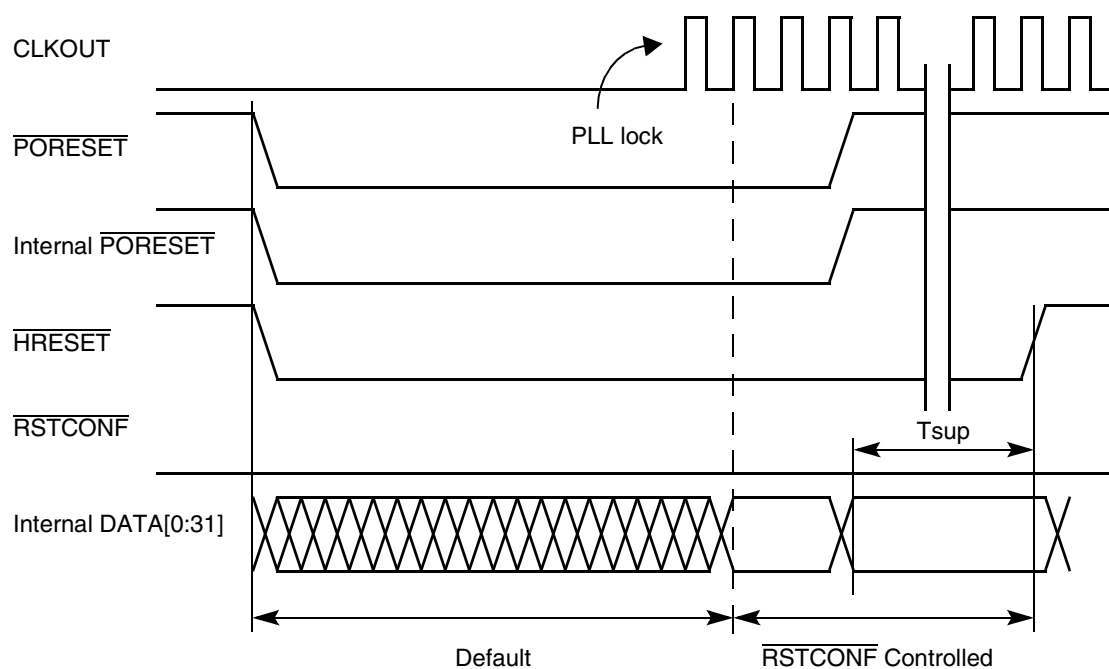


Figure 7-4 Reset Configuration Timing for

“Long” $\overline{\text{PORESET}}$ Assertion, Limp Mode Disabled



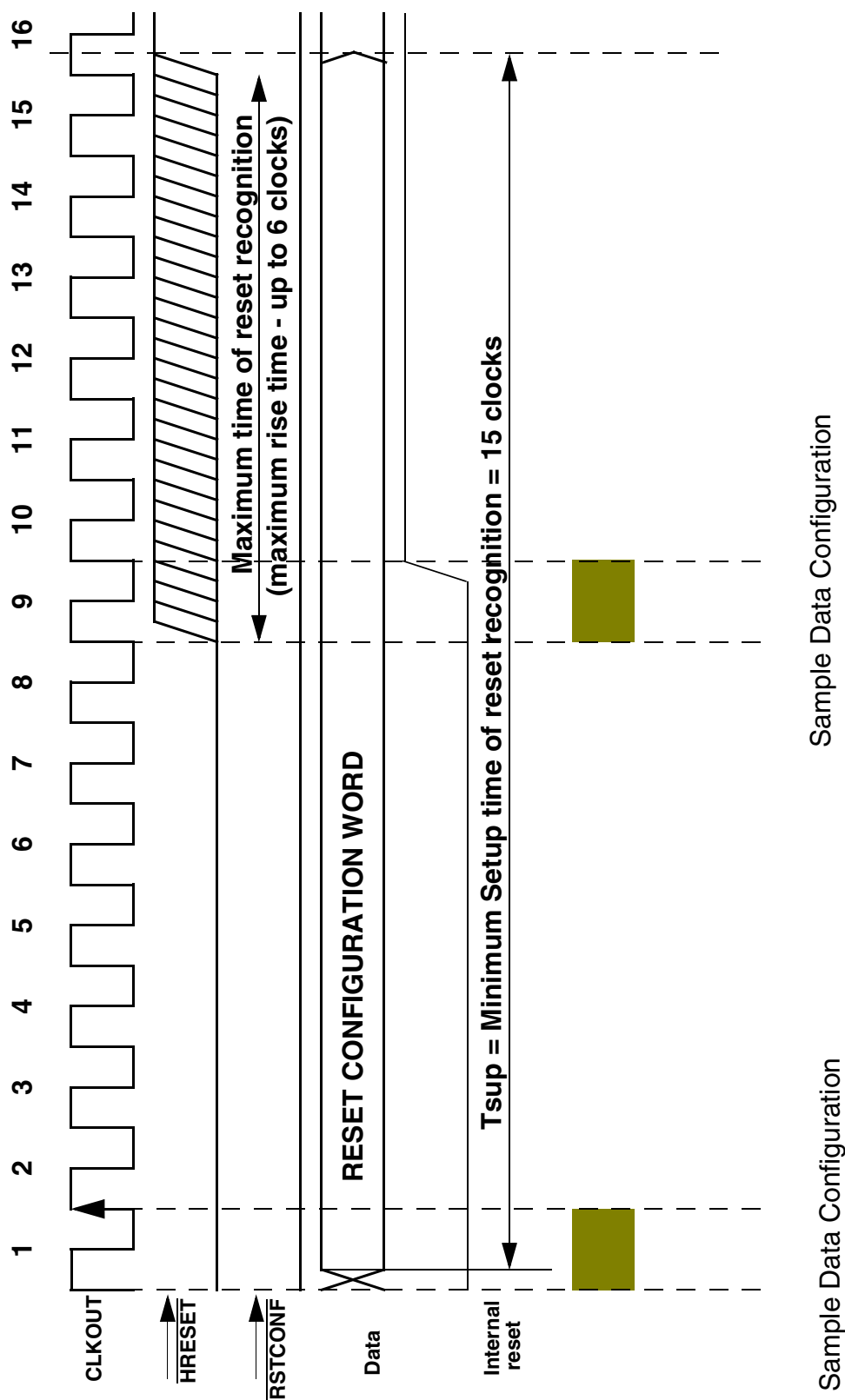


Figure 7-5 Reset Configuration Sampling Timing Requirements

7.5.2 Hard Reset Configuration Word

The hard reset configuration word, which is sampled from the internal data bus on the negation of HRESET, is shown below. The reset configuration word is not a register in the memory map. Most of the bits in the configuration are located in registers in the USIU. The user should refer to the appropriate register definition for a detailed description of each control bit.



Hard Reset Configuration Word

MSB															
0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
EARB	IP	BDRV	BDIS	BPS		Reserved			DBGC		DBPC	ATWC	EBDF		Re-served
DEFAULT:															
0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Table 7-5 Hard Reset Configuration Word Bit Descriptions (Continued)



Bit(s)	Name	Description
11	DBPC	Debug port pins configuration. See 6.13.1.1 SIU Module Configuration Register for this field definition. The default value is for these pins to function as development support pins.
12	ATWC	Address type write-enable configuration. Refer to 6.13.1.1 SIU Module Configuration Register for this field definition. The default value is for these pins to function as write-enable pins.
13:14	EBDF	External bus division factor. This field defines the initial value of the external bus frequency. Refer to 8.12.1 System Clock Control Register (SCCR) for details. The default value is that CLKOUT frequency is equal to that of the internal clock (divide by one).
15	—	Reserved
16	PRPM	Peripheral mode enable. This bit determines whether the chip is in peripheral mode. Refer to 6.13.1.3 External Master Control Register (EMCR) for details. The default value is that peripheral mode is not enabled.
17:18	SC	Single chip select. Refer to 6.13.1.1 SIU Module Configuration Register for details. 00 = Extended chip, 32 bits data 01 = Extended chip, 16 bits data 10 = Single chip and show cycles (address) 11 = Single chip
19	ETRE	Exception table relocation enable. This field defines whether the exception table relocation feature in the BBC is enabled or disabled. The default state is disabled. Refer to SECTION 4 BURST BUFFER for details.
20	FLEN	Flash Enable — This field determines whether the on-chip flash memory is enabled or disabled out of reset. The default state is disabled, which means that by default, the boot is from external memory. 0 = Flash disabled — boot is from external memory 1 = Flash enabled
21	EN_COMP ¹	Enable Compression — This bit enables the operation of the MPC555 / MPC556 with compressed code. The default state is disabled. See Table 4-8 .
22	EXC_COMP ¹	Exception Compression — This bit determines the operation of the MPC555 with exceptions. If this bit is set, then the MPC555 assumes that ALL the exception routines are in compressed code. The default indicates the exceptions are all non-compressed. See Table 4-8 .
23	—	This bit should not be high in the reset configuration word.
24:27	—	Reserved
28:30	ISB	Initial internal space base select. This field defines the initial value of the ISB field in the IMMR register. Refer to 6.13.1.2 Internal Memory Map Register for details. The default state is that the internal memory map is mapped to start at address 0x0000 0000.
31	DME	Dual mapping enable. This bit determines whether dual mapping of the flash EEPROM module is enabled. Refer to 10.8.5 Dual Mapping Base Register (DMBR) for details. The default value is for dual mapping to be disabled. 0 = Dual mapping disabled 1 = Dual mapping enabled

NOTES:

1. This bit is available only on the MPC555 / MPC556.

7.5.3 Soft Reset Configuration

When a soft reset event occurs, the MPC555 / MPC556 reconfigures the development port. Refer to [SECTION 21 DEVELOPMENT SUPPORT](#) for details.

