



USER GUIDE

# LPDDR5 Test Suite Calibration Scripts

C SERIES



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## Introduction

This document outlines the calibration that must be performed prior to using the LPDDR5 Test Suite.

## Test Bench Setup

Refer to the document “EN-G058E-E-22101 LPDDR5 Test Suite User Guide” for information on setting up the test bench and connecting the SV5C 32 channel bidirectional system.

Figure 1 shows the labelling of each cable assembly, which will be referenced in the section below. The cable types denoted in Figure 1 refer to the endpoints only, there may be additional cables that make up the assembly. For example, cable 1 is labeled as MXP-MXP, but may consist of 2 MXP-SMA cables. Unless specified otherwise, it is important to calibrate with the exact cable assemblies that will be part of the final test bench.

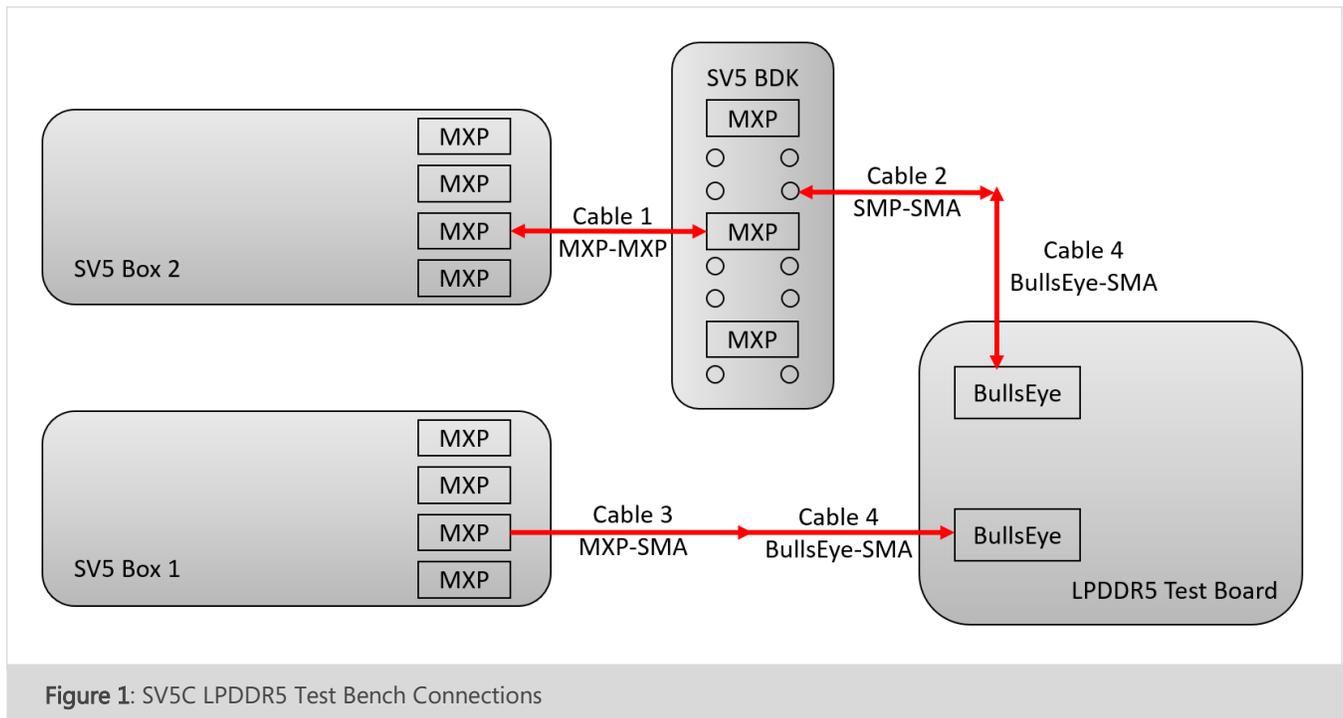
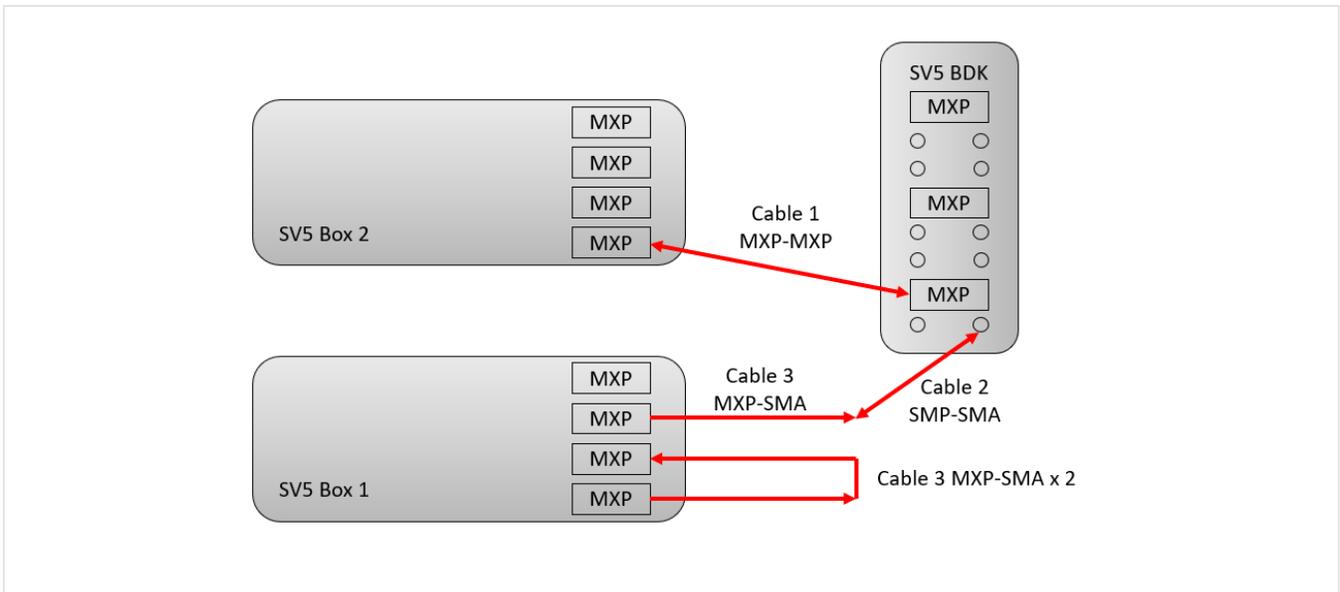


Figure 1: SV5C LPDDR5 Test Bench Connections

## COMMAND TO DATA SKEW CALIBRATION

The purpose of this calibration is to measure the skew difference between the command address bus path through cable 3, and the data bus path through cable 1, the SV5C bidirectional kit and cable 2. Figure 2 shows the connections required for this calibration. Table 1 provides the channel numbers for these connections.



**Figure 2:** Connections for the Command to Data Skew Calibration

TABLE 1: LPDDR5 CALIBRATION CONNECTIONS

TX CONNECTIONS	RX CONNECTIONS
SV5C TX1P	SV5C RX5P
SV5C TX1N	SV5C RX5N
SV5C TX17P	BDK TX1P
SV5C TX17N	BDK TX1N
BDK RX1P	SV5C RX17P
BDK RX1N	SV5C RX17N
BDK DUT 1	SV5C RX9P
DC block and 50 Ohm term	SV5C RX9N

## Running the Calibration

Open the test procedure folder "DRAMTestSuiteCal" in the Introspect ESP Software GUI with the SV5C\_32C12G\_BIDIR\_DDR form factor and follow the steps below.

1. Setup the test bench for the command to data skew calibration.
2. Click 'run' to start the execution of the calibration.
3. The calibration will generate a file "calOutput.txt" in the Params folder of the test procedure. Rename this file to "commandToDataSkewCal.txt".
4. Open the LPDDR5 Test Suite procedure and enter the value from "commandToDataSkewCal.txt" for *lpDramController.calibratedCommandToDataSkew*. See Figure 3 as an example.

lpDramController properties (class: LpDramController)	
deviceSerialNum	lpdram0
phyParams	phyParams
lpDramParams	lpDramParams
rxChannelLabeling	rxChannelLabeling
txChannelLabeling	ddrLpDramChannelLabeling
bdk1ChannelLabeling	ddrLpBdk1ChannelLabeling
bdk2ChannelLabeling	ddrLpBdk2ChannelLabeling
calibrateZq	True
trainingDataCsPhase	auto
trainingDataCaPhase	auto
trainingDataCaVref	auto
trainingDataWck2CkLeveling	auto
trainingDataWckDutyCycle	auto
trainingDataReadDqCalibration	auto
trainingDataWriteDqPhase	auto
trainingDataWriteDqVref	auto
trainingDataRdqsCalibration	auto
trainingDataParity	auto
trainingDataDFE	skip
csPhaseTrainingStep	32
caPhaseTrainingStep	32
caVrefTrainingStep	1
wckPhaseTrainingStep	128
wckDutyCycleTrainingStep	1
dqReadBdkTrainingStep	25
dqReadPhaseTrainingStep	32
dqWritePhaseTrainingStep	32
dqVrefTrainingStep	1
rdqsBdkTrainingStep	25
rdqsPhaseTrainingStep	32
parityPhaseTrainingStep	32
dfeDqPhaseTrainingStep	32
dfeDqVrefTrainingStep	1
trainingDataFolderPath	
<b>calibratedCommandToDataSkew</b>	<b>1577.91</b>
saveResults	true

Figure 3: Calibration Data Field in the LPDDR5 Test Suite

TABLE 2: REFERENCES

USER GUIDES	
LPDDR5 Test Suite User Guide	EN-G058E-E-22101



Revision Number	History	Date
1.0	Document Release	May 19, 2022

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Published in Canada on May 19, 2022  
EN-G060E-E-22139

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