

Acoustic Echo Removal (AER)

Software Installation and Verification

**AER version 17.0.0
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Confidential and Proprietary



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1 INTRODUCTION

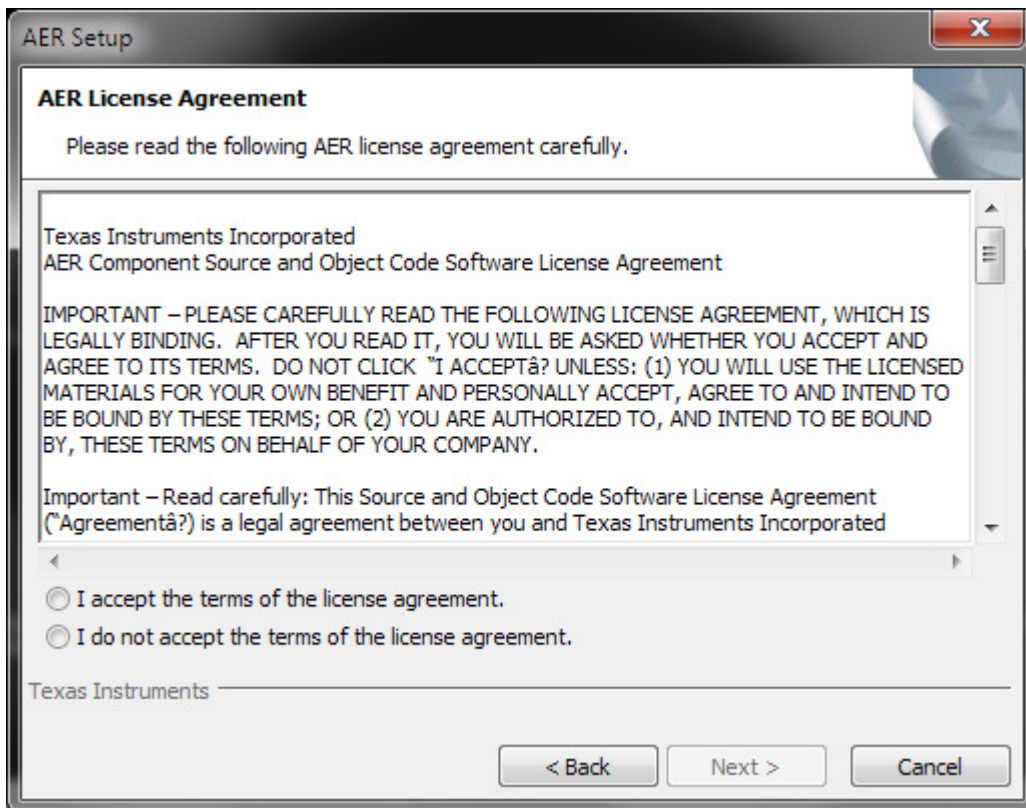
This document explains the installation and verification of the Texas Instruments Acoustic Echo Removal (AER) software.

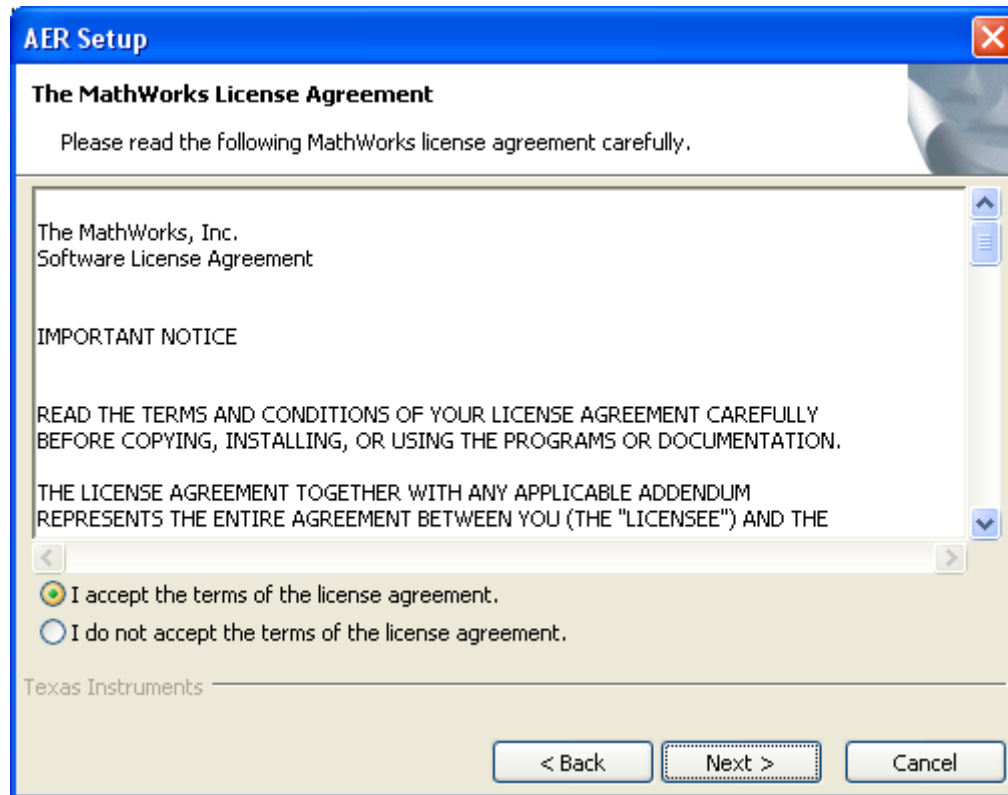
2 INSTALLATION

AER software is packaged and delivered in the format of a self-executable installer for Windows or Linux. The complete software package includes the following:

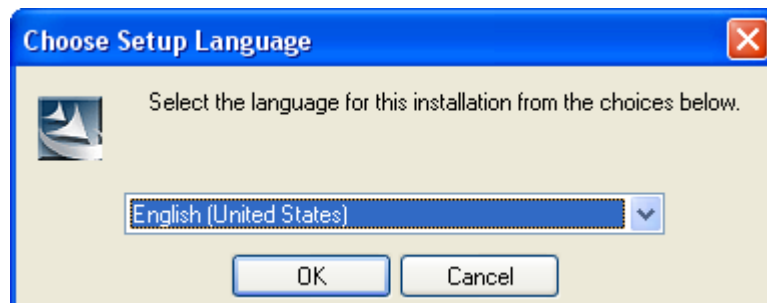
- AER object libraries,
- AER source code for BeamForming (BF) and Multi-Source Selection (MSS) modules,
- AER simulation source code, Code Composer Project files and pre-built test executables,
- Design tools in the format of Matlab application generated by the Matlab Compiler,
- Matlab Compiler Runtime (MCR) installer R2007b for running the design tools,
- Documentations.

The installation has two steps. The first step is to install AER software. The second step, existing in Windows installer only, is to install MCR, which will automatically start after the first step is finished. Users must accept Texas Instruments license agreement and the MathWorks license agreement as shown below to finish the installation.





After AER is installed, the MCR installer will automatically start and the following window will appear.



Click OK to start MCR installation and take proper subsequent actions to finish the installation.

3 AER OBJECT LIBRARIES

After self-installation is completed, the AER package and all dependent packages are installed at `<installation_root>\packages\ti\mas\`. In addition, AER simulation and test package is installed at `<installation_root>\packages\ti\mas\aer\test\`.

The AER object code library for a specific target processor is located at folder: `<installation_root>\packages\ti\mas\aer\lib`. Table 1 lists the library names for each supported target processor. **Note that in each folder, there is an additional library with “_cm” in its**

name. This library is for debugging purpose only, and must NOT be linked into production code.

Table 1 AER object code libraries

Target processor	C55x (Large model) COFF	C64x+/C674x (Little endian) COFF	C64x+ (Big endian) COFF	C64x+/C674x (Little endian) ELF	C64x+ (Big endian) ELF	ARM Cortex-A8 ELF
Libraries	aer_c.a55L aer_a.a55L	aer_c.a64P aer_a.a64P	aer_c.a64Pe aer_a.a64Pe	aer_c.ae64P aer_a.ae64P	aer_c.ae64Pe aer_a.ae64Pe	aer_c.av7A aer_a.av7A

4 VERIFICATION OF PRE-BUILT TEST CODE

A pre-built test code executable is delivered in the AER simulation and test package for a specific target processor. Following sections describe how to run the pre-built executables. All paths referenced in this chapter are relative to <installation_root>\packages\ti\mas\ aer\test\.

4.1 C55x, C64x+, C674x

- Configure Code Composer Studio (CCS) properly:
 - For C55x, use CCS functional simulator, or C5505/C5510 EVM.
 - For C64x+ little endian, use CCS C6455 functional simulator or DSKTCI6482 configured to little endian.
 - For C64x+ big endian, use CCS C6455 functional simulator, or DSKTCI6482 configured to big endian.
 - For C674x little endian, use CCS functional simulator, or DA830 DSK.
- Load pre-built test code executables included in the delivery:
 - C55x: Inkr\c55l\ aertest_c55l.x55L or .
 - C64x+/C674x little endian COFF: Inkr\c64Ple\ aertest_c64Ple.x64P or ccsProjects\ aertest_c64Ple_C64PLE_LE_COFF\Debug\ aertest_c64Ple_C64PLE_LE_COFF.out.
 - C64x+/C674x little endian ELF: Inkr\ce64Ple\ aertest_ce64Ple.xe64P.
 - C64x+ big endian COFF: Inkr\c64Pbe\ aertest_c64Pbe.x64Pe or ccsProjects\ aertest_c64Pbe_C64PBE_BE_COFF\Debug\ aertest_c64Pbe_C64PBE_BE_COFF.out.
 - C64x+ big endian ELF: Inkr\ce64Pbe\ aertest_ce64Pbe.xe64Pe.
- Run the test and compare the output files against the reference files. The output and reference should match for both receive and transmit processing. The output files are rxOut.pcm and txOut.pcm, located in folder vectors\out. The reference files are listed below for each platform respectively.
 - C55x reference: vectors\refOut\ rxOutRef_c55l.pcm and txOutRef_c55l.pcm.
 - C64x+/C674x little/big endian reference: vectors\refOut\ rxOutRef_c64P.pcm and txOutRef_c64P.pcm.

4.2 Cortex-A8

The pre-built Cortex-A8 test code runs on a Beagle Board or TI813x EVM. Follow procedures below:

- Make a directory path on a Beagle Board or TI813x EVM: `aertest/lnkr/gcarmv7a`.
- Put the pre-built executable `aertest_cortexA8.xv7A` (located at `lnkr/gcarmv7a` of the installed AER test package) to folder `/gcarmv7a` created above.
- Put the AER simulation configuration file `aersimcfg.txt` (located at root of the installed AER test package) to folder `/aertest` created above.
- Make directory paths: `aertest/vectors/inp` and `aertest/vectors/out`.
- Put files listed below (located at `vectors/inp` of the installed AER test package) to folder `/inp` created above:
 - `fe_16k.pcm`
 - `ne_pink_16k.pcm`
- Run `aertest/lnkr/gcarmv7a/aertest_cortexA8.xv7A` and compare outputs `aertest/vectors/out/rxout.pcm` and `txout.pcm` against references: `rxOutRef_CortexA8.pcm` and `txOutRef_CortexA8.pcm` (located at installed package `ti/mas/aer/test/vectors/refOut/`).

5 REBUILDING TEST CODE

AER simulation and test code can be modified and rebuilt. Following sections describe the required tools and how to rebuild the test code.

5.1 Required Tools

Tools that were used to make the various builds are listed in the release notes. These tools should also be used by users to rebuild AER test code and must be installed as described by following sections.

5.2 Installing Tools for Windows

C55x, C64x+, and C674 builds were generated in Windows environment. To use the delivered RTSC scripts or the makefile to rebuild AER test code in Windows environment, the following tools must be installed to the specified locations:

- Install `xdctools_3_20_05_76` at `C:\tools\gen\xdc\xdctools_3_20_05_76`.
- Install `cgen401` for `c5xx` at `C:\tools\c5xx\cgen441\c5500\cgtools` such that the compiler executables are located at **`C:\tools\c5xx\cgen441\c5500\cgtools\bin`**.
- Install `cgen7_4_02` for `c6xx` at `C:\tools\c6xx\cgen7_4_02\c6000\cgtools` such that the compiler executables are located at **`C:\tools\c6xx\cgen7_4_02\c6000\cgtools\bin`**.
- Install XDAIS 5.21 at `C:\tools\Xdais\Xdais_5_21`.
- Install Cygwin 1.18 with Gnu Make 3.79.1 at `C:\cygwin`.

5.3 Installing Tools for Linux

Cortex-A8 build was generated in Linux environment. To use the delivered RTSC scripts or the makefile to rebuild AER test code in Linux environment, the following tools must be installed:

- XDC tools 3.20.05.76.
- Codesourcery tools Arm 2009 Q1 for soft floating point.
- Linaro ARM Linux 2013.03 for hard floating point.
- XDAIS 5.21.

5.4 Rebuilding AER Test for C55x, C64x+, C674x in Windows

5.4.1 Using XDC Tools

- Open a DOS command prompt window, and go to folder:
<installation_root>\packages\ti\mas\swtools.
- Set up build environment using command:
<installation_root>\packages\ti\mas\swtools>cygwinxdc.bat bypass
- Change folder to <installation_root>\packages\ti\mas\aer\test, and build the test code using xdc command for the desired target:
 - C55x CPU 2.x large model: **xdc XDCARGS="c55l"**
 - C55x CPU 3.3 large model: **xdc XDCARGS="c55l cpu=3.3"**
 - C64x+/C674x little endian COFF: **xdc XDCARGS="c64Ple"**
 - C64x+/C674x little endian ELF: **xdc XDCARGS="c64Ple_elf"**
 - C64x+ big endian COFF: **xdc XDCARGS="c64Pbe"**
 - C64x+ big endian ELF: **xdc XDCARGS="c64Pbe_elf"**
- The newly built executables (refer to section 4.1 for executable names for various targets) will replace the pre-built executables.

5.4.2 Using Makefile

- Open a DOS window, and issues two commands to set environment variables:
 - **set MAS_INSTALL_DIR=<installation_root>/packages.**
Note that “/” must be used instead of “\” in the path. If there are spaces in any folder name, it must be converted to DOS path name. For example, if installation_root is C:\Program Files\Texas Instruments\ aer_c64Px_obj_17_0_0_0, the command must be: **set MAS_INSTALL_DIR=C:/PROGRA~1/TEXASI~1/aer_c64Px_obj_17_0_0_0/packages**
 - **set PATH=C:\WINDOWS;C:\WINDOWS\system32;c:\cygwin\bin**
- Go to <installation_root>\packages\ti\mas\aer\test, and build the test code using command: **make all.**
- The newly built executables (refer to section 4.1 for executable names for various targets) will replace the pre-built executables.

5.5 Rebuilding AER Test for Cortex-A8 in Linux

5.5.1 Using XDC Tools

- Modify following environment variables in build script `<installation_root>/packages/ti/mas/swtools/xdcpaths.mk`:
 - `export XDC_INSTALL_DIR := <xdc_tools_path>/xdctools_3_20_05_76`
 - `export XDAIS_INSTALL_DIR := <xdais_tools_path>/xdais_5_21`
 - `export GCARMV7ACGTOOL := <codesourcery_tools_path> or <Linaro_tools_path>`
 - `export XDCBUILDCFG := <installation_root>/packages/ti/mas/swtools/config.bld`
 - `export MAS_INSTALL_DIR := <installation_root>/packages`
- Go to directory `<installation_root>/packages/ti/mas/swtools/`, and issue command:
make XDCARGS="gcarmv7a" COMPONENT=ti.mas.aer.test
- The newly built executable `aertest_cortexA8.xv7A` at `<installation_root>/packages/ti/mas/aer/test/lnkr/gcarmv7a/` will replace the pre-built file.

5.5.2 Using Makefile

- Set Linux environment variables from the command line (make sure there is no space before and after “=”):
 - `export GNU_ARM_CORTEXA8_GEN_INSTALL_DIR= <codesourcery_tools_path> or <Linaro_tools_path>`
 - `export MAS_INSTALL_DIR=<installation_root>/packages`
- Go to directory `<installation_root>/packages/ti/mas/aer/test/` and issue command:
make all
- The newly built executable `aertest_cortexA8.xv7A` at `<installation_root>/packages/ti/mas/aer/test/lnkr/gcarmv7a/` will replace the pre-built file.