This user's guide describes the characteristics, operation, and use of the DAC80501 evaluation module (EVM). This document also discusses the proper setup and configuration of both software and hardware, and reviews various aspects of program operation. Throughout this document, the terms evaluation board, evaluation module, and EVM are synonymous with the DAC80501EVM. A complete circuit description, schematic diagram, and bill of materials are also included in this document.
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Trademarks
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1 Overview

The DAC80501EVM is an easy to use platform for evaluating the functionality and performance of the DAC80501 device. The DAC80501 is a single-channel, buffered, digital-to-analog converter (DAC) in 16-bit resolution with 2.5-V internal reference. This EVM provides output voltage from 0 - 5V. It also provides the SPI programming interface using a PC-based graphical user interface (GUI).

1.1 Kit Contents

Table 1 details the contents of the EVM kit. Contact the TI Product Information Center nearest you if any component is missing. TI highly recommends that the user verify latest versions of the related software at the TI website, www.ti.com.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAC80501EVM evaluation board PCB</td>
<td>1</td>
</tr>
</tbody>
</table>

Table 2. Required Components Not Part of the DAC80501EVM Kit

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>USB2ANY interface adapter</td>
<td>1</td>
</tr>
</tbody>
</table>

1.2 Related Documentation from Texas Instruments

The following document provides information regarding Texas Instruments integrated circuits used in the assembly of the DAC80501EVM. This user’s guide is available from the TI web site under literature number SLAU795. Any letter appended to the literature number corresponds to the document revision that is current at the time of the writing of this document. Newer revisions may be available from the TI web site at http://www.ti.com/, or call the Texas Instruments Literature Response Center at (800) 477-8924 or the Product Information Center at (972) 644-5580. When ordering, identify the document by both title and literature number.

Table 3. Related Documentation

<table>
<thead>
<tr>
<th>Document</th>
<th>Literature Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>DAC80501 product data sheet</td>
<td>SBAS794</td>
</tr>
</tbody>
</table>
2 System Setup

2.1 Hardware Setup

This section provides the overall system setup for the EVM. A PC runs software that provides an interface to the USB2ANY platform. This platform generates the optional 3.3V power and digital signals used to communicate with the EVM board. Connectors are included on the EVM board for external power supplies. Figure 1 displays the system setup for the DAC80501EVM.

![Figure 1. DAC80501EVM Hardware Setup](image)

2.1.1 Connecting the Hardware

Connect the USB cable from the USB2ANY platform to the PC. To connect the USB2ANY to the EVM board, align and firmly connect the keyed ribbon connector to the J8 connector. Verify the connection is snug because loose connections may cause intermittent operation.

2.1.2 Power Configurations

The DAC80501EVM provides electrical connections to the device supply pins. The connectors and optional configurations are shown in the Table 4. Note that the headroom between the reference and the power supply needs to be maintained. Refer to datasheet for details.

<table>
<thead>
<tr>
<th>Connector/Pin</th>
<th>Supply Name</th>
<th>Voltage Range</th>
</tr>
</thead>
<tbody>
<tr>
<td>J2.1</td>
<td>VDD</td>
<td>4.5-V to 5.5-V</td>
</tr>
<tr>
<td>J2.2</td>
<td>GND</td>
<td>0-V</td>
</tr>
<tr>
<td>J1.5 (Option)</td>
<td>VDD (JP1 needs to be closed)</td>
<td>3.3-V</td>
</tr>
</tbody>
</table>

2.1.3 Electrostatic Discharge Warning

Many of the components on the DAC80501EVM are susceptible to damage by electrostatic discharge (ESD). Observe proper ESD handling precautions when unpacking and handling the EVM, including the use of a grounded wrist strap at an approved ESD workstation.

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2.2 Software Setup

This section provides the procedure for EVM software installation.

2.2.1 Operating Systems Requirements

The EVM software is compatible with the Windows™ 7, Windows 8, and Windows 10 operating systems.

2.2.2 Software Installation

The software is available through the EVM product folder on the TI website. After the software is downloaded onto the PC, navigate to the DAC80501EVM folder, and run the Setup_DAC80501_EVM.exe file, as shown in Figure 2. When the software is launched, an installation dialog window opens and prompts the user to select an installation directory. If left unchanged, the software location defaults to C:\Program Files (x86)\Texas Instruments\DAC80501 EVM as shown in Figure 3.

![Figure 2. Launching Software Setup](image)

The software installation automatically copies the required LabVIEW files and drivers to the local machine. Make sure to verify that the USB2ANY is not connected before the software, or the file and driver installation may be affected.

![Figure 3. DAC80501EVM Installation Path](image)
3 Detailed Description

3.1 Hardware Description

The following sections provide detailed information on the EVM hardware and jumper configuration settings. Table 5 displays the default configurations of all jumper connections on the DAC80501EVM. Connect the USB cable from the USB2ANY to the PC.

Table 5. Jumper Settings

<table>
<thead>
<tr>
<th>Jumper</th>
<th>Default Position</th>
<th>Available Option</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>JP1</td>
<td>Open: VDD is supplied externally through J2</td>
<td>Closed: VDD should be supplied by USB2ANY (the reference headroom must be maintained)</td>
<td>VDD Source Selection</td>
</tr>
<tr>
<td>JP2</td>
<td>Closed: SPI Enabled</td>
<td>Open: I2C Enabled (Not supported in the software)</td>
<td>SPI or I2C Interface Selection</td>
</tr>
<tr>
<td>JP3</td>
<td>Open: SYNC/A0 HIGH</td>
<td>Closed: SYNC/A0 LOW</td>
<td>SYNC/A0 Level</td>
</tr>
</tbody>
</table>

3.1.1 Theory of Operation for DAC80501 Hardware

The block diagram of the DAC80501EVM board is displayed in Figure 4. The EVM board connects to external power supply VDD either through USB2ANY (3.3V) or through JP2. Note that the headroom for the reference needs to be maintained as specified in the datasheet. The 10-pin wire-to-board connector J1 provides an interface to the USB2ANY platform. The SPI signals are provided either by using the USB2ANY header or the test points. There is an onboard 5-V reference source selected using JP4. JP4 is open by default making the DAC work with the internal reference.

Figure 4. DAC80501EVM Hardware Block Diagram
3.1.2 Signal Definition of USB2ANY

The DAC80501EVM provides a hardware connector (J1) that connects to the USB2ANY interface board. The USBANY platform supplies VIO power and is responsible for providing the SPI commands sent from the PC GUI software. Optionally, the VDD supply can be provided through an external supply, and all digital communication lines can be accessed through their respective digital test points. Table 6 provides the pin definitions for this connector. Table 7 provides the corresponding test points for the SPI signals.

Table 6. J8 (USB2ANY) Pin Definitions

<table>
<thead>
<tr>
<th>Pin#</th>
<th>Signal</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>GPIO7</td>
<td>General purpose I/O</td>
</tr>
<tr>
<td>2</td>
<td>CS/GPIO6</td>
<td>/CS</td>
</tr>
<tr>
<td>3</td>
<td>RXD/MISO</td>
<td>SPI MISO</td>
</tr>
<tr>
<td>4</td>
<td>TXD/MOSI</td>
<td>SPI MOSI</td>
</tr>
<tr>
<td>5</td>
<td>3.3V</td>
<td>3.3V Supply</td>
</tr>
<tr>
<td>6</td>
<td>GND</td>
<td>Ground</td>
</tr>
<tr>
<td>7</td>
<td>GPIO3</td>
<td>General purpose I/O</td>
</tr>
<tr>
<td>8</td>
<td>SCLK/GPIO2</td>
<td>SPI SCLK</td>
</tr>
<tr>
<td>9</td>
<td>GPIO1</td>
<td>General purpose I/O</td>
</tr>
<tr>
<td>10</td>
<td>GPIO0</td>
<td>General purpose I/O</td>
</tr>
</tbody>
</table>

Table 7. J1 SPI Signal Test Points

<table>
<thead>
<tr>
<th>Test Points</th>
<th>SPI Signal</th>
</tr>
</thead>
<tbody>
<tr>
<td>TP1</td>
<td>SCLK</td>
</tr>
<tr>
<td>TP2, TP3</td>
<td>GND</td>
</tr>
<tr>
<td>TP4</td>
<td>MOSI/SDI</td>
</tr>
<tr>
<td>TP5</td>
<td>SYNC</td>
</tr>
</tbody>
</table>

3.1.3 DAC Signal Pins

The DAC80501EVM provides access to the DAC output through connection J3 as listed in Table 8.

Table 8. J3 Pin Definitions

<table>
<thead>
<tr>
<th>Connector/Pin</th>
<th>Signal Name</th>
</tr>
</thead>
<tbody>
<tr>
<td>J3-1</td>
<td>VOUTA</td>
</tr>
<tr>
<td>J3-2</td>
<td>GND</td>
</tr>
</tbody>
</table>
3.2 Software Description

This section describes the features of the DAC80501 EVM software, and discusses how to use these features. The software provides basic control of all the registers and functions to the DAC80501 device.

3.2.1 Starting the Software

After the DAC80501EVM software is installed, a restart may be required by Windows. To launch the software, locate the Texas Instruments folder in the All Programs menu, and select the DAC80501 EVM icon.

![Figure 5. DAC80501EVM GUI Location](image)

Figure 5 shows that if the USB2ANY is correctly connected, the status bar at the bottom of the screen displays HARDWARE CONNECTED. If the USB2ANY is not properly connected or not connected at all, the status bar displays DEMO. If the GUI is not displaying the HARDWARE CONNECTED status while the USB2ANY is connected, unplug and reconnect the USB2ANY and relaunch the GUI software.

![Figure 6. DAC80501EVM GUI Connection Detection](image)
3.2.2 Software Features

The DAC80501 EVM incorporates interactive functions that help configure the DAC80501 device. These functions are built into several GUI pages, as shown in Figure 7. The Page Selection menu allows the user to switch between the pages, with each page representing a feature of the software.

![Figure 7. DAC80501EVM Software Page Selection](image)

3.2.2.1 Low Level Configuration Page

The DAC80501 EVM Register Map page, shown in Figure 8, allows the user to access low level communication directly with the DAC80501 registers. Selecting a register on the Register Map list shows a description of the values in that register, as well as information on the register address, default value, size, and current value. Values can be read and written to the registers by writing to the Value or bit field of the GUI.

![Figure 8. Low Level Configuration Page](image)
The values of the register map can also be saved by pressing the *Save Configuration* button under the *File* menu option. Additionally, the configuration files can be accessed through the *Load Configuration* button. Other options selectable by the user are the Update Mode, Write Selected, Read Selected, Write Modified, and Read All buttons. All buttons are displayed in Figure 9.

Figure 9. Low Level Configuration Page Options

If *Immediate* is selected under Update Mode, all changes to register values update immediately. The *Deferred* option allows the user to modify the value of a register without taking effect until the Write Selected, or Write Modified button is pressed. The Read Selected button allows individual register reads, whereas the Read All button reads the status of all registers located in the register map.

3.2.2.2 High Level Configuration Page

The High Level Configuration page provides an easy interface to program the output code for the DAC80501 device. This page is displayed in Figure 10.

Figure 10. High Level Configuration Page
4 Schematic, PCB Layout, and Bill of Materials

This section contains the complete bill of materials and schematic diagram for the DAC80501EVM.

4.1 Board Schematic

Figure 11. DAC80501EVM Board Schematic
4.2 PCB Components Layout

Figure 12 through Figure 14 show the layout of the components for the DAC80501EVM board.

Figure 12. DAC80501EVM PCB Components Layout

Figure 13. Top Layer
Figure 14. Bottom Layer
## 4.3 Bill of Materials

### Table 9. DAC80501 EVM Bill of Materials

<table>
<thead>
<tr>
<th>Designator</th>
<th>Quantity</th>
<th>Value</th>
<th>Description</th>
<th>Package Reference</th>
<th>Part Number</th>
<th>Manufacturer</th>
</tr>
</thead>
<tbody>
<tr>
<td>!PCB</td>
<td>1</td>
<td></td>
<td>Printed Circuit Board</td>
<td>DC024</td>
<td>Any</td>
<td></td>
</tr>
<tr>
<td>C1, C3, C6, C7</td>
<td>4</td>
<td>1uF</td>
<td>CAP, CERM, 1 uF, 25 V, +/- 10%, X7R, 0603</td>
<td>0603</td>
<td>C1608X7R1E105K080AB</td>
<td>TDK</td>
</tr>
<tr>
<td>C2</td>
<td>1</td>
<td>10uF</td>
<td>CAP, TA, 10 uF, 16 V, +/- 20%, 2 ohm, SMD</td>
<td>3528-21</td>
<td>293D106X0016B2TE3</td>
<td>Vishay-Sprague</td>
</tr>
<tr>
<td>C4</td>
<td>1</td>
<td>0.1uF</td>
<td>CAP, CERM, 0.1 uF, 25 V, +/- 10%, X7R, 0603</td>
<td>0603</td>
<td>0603C104KAT2A</td>
<td>AVX</td>
</tr>
<tr>
<td>C5</td>
<td>1</td>
<td>10uF</td>
<td>CAP, TA, 10 uF, 16 V, +/- 10%, 0.8 ohm, SMD</td>
<td>3528-21</td>
<td>TPSB106K016R0800</td>
<td>AVX</td>
</tr>
<tr>
<td>H1, H2, H3, H4</td>
<td>4</td>
<td></td>
<td>Bumpon, Hemisphere, 0.44 X 0.20, Clear</td>
<td>Transparent Bumpon</td>
<td>SJ-5303 (CLEAR)</td>
<td>3M</td>
</tr>
<tr>
<td>J1</td>
<td>1</td>
<td></td>
<td>Header (shrouded), 100mil, 5x2, Gold, SMT</td>
<td>SMT Header</td>
<td>52601-S10-BLF</td>
<td>FCI</td>
</tr>
<tr>
<td>J2, J3</td>
<td>2</td>
<td></td>
<td>Terminal Block, 3.5mm Pitch, 2x1, TH</td>
<td>7.0x8.2x6.5mm</td>
<td>ED555/2DS</td>
<td>On-Shore Technology</td>
</tr>
<tr>
<td>JP1, JP2, JP3, JP4</td>
<td>4</td>
<td></td>
<td>Header, 2.54mm, 2x1, Tin, SMT</td>
<td>Header, 2.54mm, 2x1, SMT</td>
<td>M20-8770246</td>
<td>Harwin</td>
</tr>
<tr>
<td>LBL1</td>
<td>1</td>
<td></td>
<td>Thermal Transfer Printable Labels, 0.650&quot; W x 0.200&quot; H - 10,000 per roll</td>
<td>PCB Label 0.650 x 0.200 inch</td>
<td>THT-14-423-10</td>
<td>Brady</td>
</tr>
<tr>
<td>R1, R2, R3, R4</td>
<td>4</td>
<td>10k</td>
<td>RES, 10 k, 5%, 0.1 W, AEC-Q200 Grade 0, 0603</td>
<td>0603</td>
<td>CRCW060310K0JNEA</td>
<td>Vishay-Dale</td>
</tr>
<tr>
<td>SH-JP1, SH-JP2</td>
<td>2</td>
<td>1x2</td>
<td>Shunt, 100mil, Gold plated, Black</td>
<td>Shunt</td>
<td>SNT-100-BK-G</td>
<td>Samtec</td>
</tr>
<tr>
<td>TP1, TP2, TP3, TP4, TP5, TP6, TP7, TP8</td>
<td>8</td>
<td>Test Point, Miniature, SMT</td>
<td>Test Point, Miniature, SMT</td>
<td>5019</td>
<td>Keystone</td>
<td></td>
</tr>
<tr>
<td>U1</td>
<td>1</td>
<td></td>
<td>16-Bit, 1-LSB INL, Voltage-Output Digital-to-Analog Converters with Precision Internal Reference, DQF0008A (WSON-8)</td>
<td>DQF0008A</td>
<td>DAC80501DQF</td>
<td>Texas Instruments</td>
</tr>
<tr>
<td>U2</td>
<td>1</td>
<td></td>
<td>Low Noise, Very Low Drift, Precision Voltage Reference, -40 to 125 degC, 8-pin SOIC (D), Green (RoHS &amp; no Sb/Br)</td>
<td>D0008A</td>
<td>REF5050AID</td>
<td>Texas Instruments</td>
</tr>
</tbody>
</table>
STANDARD TERMS FOR EVALUATION MODULES

1. Delivery: TI delivers TI evaluation boards, kits, or modules, including any accompanying demonstration software, components, and/or documentation which may be provided together or separately (collectively, an “EVM” or “EVMs”) to the User (“User”) in accordance with the terms set forth herein. User's acceptance of the EVM is expressly subject to the following terms.

1.1 EVMs are intended solely for product or software developers for use in a research and development setting to facilitate feasibility evaluation, experimentation, or scientific analysis of TI semiconductors products. EVMs have no direct function and are not finished products. EVMs shall not be directly or indirectly assembled as a part or subassembly in any finished product. For clarification, any software or software tools provided with the EVM (“Software”) shall not be subject to the terms and conditions set forth herein but rather shall be subject to the applicable terms that accompany such Software.

1.2 EVMs are not intended for consumer or household use. EVMs may not be sold, sublicensed, leased, rented, loaned, assigned, or otherwise distributed for commercial purposes by Users, in whole or in part, or used in any finished product or production system.

2 Limited Warranty and Related Remedies/Disclaimers:

2.1 These terms do not apply to Software. The warranty, if any, for Software is covered in the applicable Software License Agreement.

2.2 TI warrants that the TI EVM will conform to TI's published specifications for ninety (90) days after the date TI delivers such EVM to User. Notwithstanding the foregoing, TI shall not be liable for a nonconforming EVM if (a) the nonconformity was caused by neglect, misuse or mistreatment by an entity other than TI, including improper installation or testing, or for any EVMs that have been altered or modified in any way by an entity other than TI, (b) the nonconformity resulted from User's design, specifications or instructions for such EVMs or improper system design, or (c) User has not paid on time. Testing and other quality control techniques are used to the extent TI deems necessary. TI does not test all parameters of each EVM. User's claims against TI under this Section 2 are void if User fails to notify TI of any apparent defects in the EVMs within ten (10) business days after delivery, or of any hidden defects with ten (10) business days after the defect has been detected.

2.3 TI's sole liability shall be at its option to repair or replace EVMs that fail to conform to the warranty set forth above, or credit User's account for such EVM. TI's liability under this warranty shall be limited to EVMs that are returned during the warranty period to the address designated by TI and that are determined by TI not to conform to such warranty. If TI elects to repair or replace such EVM, TI shall have a reasonable time to repair such EVM or provide replacements. Repaired EVMs shall be warranted for the remainder of the original warranty period. Replaced EVMs shall be warranted for a new full ninety (90) day warranty period.

3 Regulatory Notices:

3.1 United States

3.1.1 Notice applicable to EVMs not FCC-Approved:

FCC NOTICE: This kit is designed to allow product developers to evaluate electronic components, circuitry, or software associated with the kit to determine whether to incorporate such items in a finished product and software developers to write software applications for use with the end product. This kit is not a finished product and when assembled may not be resold or otherwise marketed unless all required FCC equipment authorizations are first obtained. Operation is subject to the condition that this product not cause harmful interference to licensed radio stations and that this product accept harmful interference. Unless the assembled kit is designed to operate under part 15, part 18 or part 95 of this chapter, the operator of the kit must operate under the authority of an FCC license holder or must secure an experimental authorization under part 5 of this chapter.

3.1.2 For EVMs annotated as FCC – FEDERAL COMMUNICATIONS COMMISSION Part 15 Compliant:

CAUTION
This device complies with part 15 of the FCC Rules. Operation is subject to the following two conditions: (1) This device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation. Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

FCC Interference Statement for Class A EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.
FCC Interference Statement for Class B EVM devices

NOTE: This equipment has been tested and found to comply with the limits for a Class B digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference in a residential installation. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the instructions, may cause harmful interference to radio communications. However, there is no guarantee that interference will not occur in a particular installation. If this equipment does cause harmful interference to radio or television reception, which can be determined by turning the equipment off and on, the user is encouraged to try to correct the interference by one or more of the following measures:

- Reorient or relocate the receiving antenna.
- Increase the separation between the equipment and receiver.
- Connect the equipment into an outlet on a circuit different from that to which the receiver is connected.
- Consult the dealer or an experienced radio/TV technician for help.

3.2 Canada

3.2.1 For EVMs issued with an Industry Canada Certificate of Conformance to RSS-210 or RSS-247

Concerning EVMs Including Radio Transmitters:

This device complies with Industry Canada license-exempt RSSs. Operation is subject to the following two conditions:

(1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Concernant les EVMs avec appareils radio:

Le présent appareil est conforme aux CNR d'Industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes: (1) l'appareil ne doit pas produire de brouillage, et (2) l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

Concerning EVMs Including Detachable Antennas:

Under Industry Canada regulations, this radio transmitter may only operate using an antenna of a type and maximum (or lesser) gain approved for the transmitter by Industry Canada. To reduce potential radio interference to other users, the antenna type and its gain should be so chosen that the equivalent isotropically radiated power (e.i.r.p.) is not more than that necessary for successful communication. This radio transmitter has been approved by Industry Canada to operate with the antenna types listed in the user guide with the maximum permissible gain and required antenna impedance for each antenna type indicated. Antenna types not included in this list, having a gain greater than the maximum gain indicated for that type, are strictly prohibited for use with this device.

Concernant les EVMs avec antennes détachables

Conformément à la réglementation d'Industrie Canada, le présent émetteur radio peut fonctionner avec une antenne d'un type et d'un gain maximal (ou inférieur) approuvé pour l'émetteur par Industrie Canada. Dans le but de réduire les risques de brouillage radioélectrique à l'intention des autres utilisateurs, il faut choisir le type d'antenne et son gain de sorte que la puissance isotrope rayonnée équivalente (p.i.r.e.) ne dépasse pas l'intensité nécessaire à l'établissement d'une communication satisfaisante. Le présent émetteur radio a été approuvé par Industrie Canada pour fonctionner avec les types d'antenne énumérés dans le manuel d'usage et ayant un gain admissible maximal et l'impédance requise pour chaque type d'antenne. Les types d'antenne non inclus dans cette liste, ou dont le gain est supérieur au gain maximal indiqué, sont strictement interdits pour l'exploitation de l'émetteur.

3.3 Japan

3.3.1 Notice for EVMs delivered in Japan: Please see http://www.tij.co.jp/lds/ja/general/eStore/notice_01.page 日本国内に輸入される評価用キット、ボードについては、次のところをご覧ください。
http://www.tij.co.jp/lds/ja/general/eStore/notice_01.page

3.3.2 Notice for Users of EVMs Considered “Radio Frequency Products” in Japan: EVMs entering Japan may not be certified by TI as conforming to Technical Regulations of Radio Law of Japan.

If User uses EVMs in Japan, not certified to Technical Regulations of Radio Law of Japan, User is required to follow the instructions set forth by Radio Law of Japan, which includes, but is not limited to, the instructions below with respect to EVMs (which for the avoidance of doubt are stated strictly for convenience and should be verified by User):

1. Use EVMs in a shielded room or any other test facility as defined in the notification #173 issued by Ministry of Internal Affairs and Communications on March 28, 2006, based on Sub-section 1.1 of Article 6 of the Ministry’s Rule for Enforcement of Radio Law of Japan.
2. Use EVMs only after User obtains the license of Test Radio Station as provided in Radio Law of Japan with respect to EVMs.
3. Use of EVMs only after User obtains the Technical Regulations Conformity Certification as provided in Radio Law of Japan with respect to EVMs. Also, do not transfer EVMs, unless User gives the same notice above to the transferee. Please note that if User does not follow the instructions above, User will be subject to penalties of Radio Law of Japan.
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1. 電波法施行規則第6条第1項第1号に基づく平成18年3月28日総務省告示第173号で定められた電波暗室等の試験設備でご使用いただく。
2. 実験局の免許を取得後ご使用いただく。
3. 技術基準適合証明を取得後ご使用いただく。

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西新宿三井ビル

3.3.3 Notice for EVMs for Power Line Communication: Please see [http://www.tij.co.jp/lmds/ti_ja/general/eStore/notice_02.page](http://www.tij.co.jp/lmds/ti_ja/general/eStore/notice_02.page)

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4.4 User assumes all responsibility and liability to determine whether the EVM is subject to any applicable international, federal, state, or local laws and regulations related to User's handling and use of the EVM and, if applicable, User assumes all responsibility and liability for compliance in all respects with such laws and regulations. User assumes all responsibility and liability for proper disposal and recycling of the EVM consistent with all applicable international, federal, state, and local requirements.

5. Accuracy of Information: To the extent TI provides information on the availability and function of EVMs, TI attempts to be as accurate as possible. However, TI does not warrant the accuracy of EVM descriptions, EVM availability or other information on its websites as accurate, complete, reliable, current, or error-free.
6. **Disclaimers:**

6.1 **EXCEPT AS SET FORTH ABOVE, EVMS AND ANY MATERIALS PROVIDED WITH THE EVM (INCLUDING, BUT NOT LIMITED TO, REFERENCE DESIGNS AND THE DESIGN OF THE EVM ITSELF) ARE PROVIDED “AS IS” AND “WITH ALL FAULTS.” TI DISCLAIMS ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, REGARDING SUCH ITEMS, INCLUDING BUT NOT LIMITED TO ANY EPIDEMIC FAILURE WARRANTY OR IMPLIED WARRANTIES OF MERCHANTABILITY OR FITNESS FOR A PARTICULAR PURPOSE OR NON-INFRINGEMENT OF ANY THIRD PARTY PATENTS, COPYRIGHTS, TRADE SECRETS OR OTHER INTELLECTUAL PROPERTY RIGHTS.

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7. **USER’S INDEMNITY OBLIGATIONS AND REPRESENTATIONS.** USER WILL DEFEND, INDEMNIFY AND HOLD TI, ITS LICENSORS AND THEIR REPRESENTATIVES HARMLESS FROM AND AGAINST ANY AND ALL CLAIMS, DAMAGES, LOSSES, EXPENSES, COSTS AND LIABILITIES (COLLECTIVELY, “CLAIMS”) ARISING OUT OF OR IN CONNECTION WITH ANY HANDLING OR USE OF THE EVM THAT IS NOT IN ACCORDANCE WITH THESE TERMS. THIS OBLIGATION SHALL APPLY WHETHER CLAIMS ARISE UNDER STATUTE, REGULATION, OR THE LAW OF TORT, CONTRACT OR ANY OTHER LEGAL THEORY, AND EVEN IF THE EVM FAILS TO PERFORM AS DESCRIBED OR EXPECTED.

8. **Limitations on Damages and Liability:**

8.1 **General Limitations.** IN NO EVENT SHALL TI BE LIABLE FOR ANY SPECIAL, COLLATERAL, INDIRECT, PUNITIVE, INCIDENTAL, CONSEQUENTIAL, OR EXEMPLARY DAMAGES IN CONNECTION WITH OR ARISING OUT OF THESE TERMS OR THE USE OF THE EVMS, REGARDLESS OF WHETHER TI HAS BEEN ADVISED OF THE POSSIBILITY OF SUCH DAMAGES. EXCLUDED DAMAGES INCLUDE, BUT ARE NOT LIMITED TO, COST OF REMOVAL OR REINSTALLATION, ANCILLARY COSTS TO THE PROCUREMENT OF SUBSTITUTE GOODS OR SERVICES, RETESTING, OUTSIDE COMPUTER TIME, LABOR COSTS, LOSS OF GOODWILL, LOSS OF PROFITS, LOSS OF SAVINGS, LOSS OF USE, LOSS OF DATA, OR BUSINESS INTERRUPTION. NO CLAIM, SUIT OR ACTION SHALL BE BROUGHT AGAINST TI MORE THAN TWELVE (12) MONTHS AFTER THE EVENT THAT GAVE RISE TO THE CAUSE OF ACTION HAS OCCURRED.

8.2 **Specific Limitations.** IN NO EVENT SHALL TI’S AGGREGATE LIABILITY FROM ANY USE OF AN EVM PROVIDED HEREUNDER, INCLUDING FROM ANY WARRANTY, INDEMNITY OR OTHER OBLIGATION ARISING OUT OF OR IN CONNECTION WITH THESE TERMS, EXCEED THE TOTAL AMOUNT PAID TO TI BY USER FOR THE PARTICULAR EVM(S) AT ISSUE DURING THE PRIOR TWELVE (12) MONTHS WITH RESPECT TO WHICH LOSSES OR DAMAGES ARE CLAIMED. THE EXISTENCE OF MORE THAN ONE CLAIM SHALL NOT ENLARGE OR EXTEND THIS LIMIT.

9. **Return Policy:** Except as otherwise provided, TI does not offer any refunds, returns, or exchanges. Furthermore, no return of EVM(s) will be accepted if the package has been opened and no return of the EVM(s) will be accepted if they are damaged or otherwise not in a resalable condition. If User feels it has been incorrectly charged for the EVM(s) it ordered or that delivery violates the applicable order, User should contact TI. All refunds will be made in full within thirty (30) working days from the return of the components(s), excluding any postage or packaging costs.

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