



Technical Standard Order

PROPOSED

Subject: AIRCRAFT AUDIO SYSTEMS AND EQUIPMENT

1. **PURPOSE.** This technical standard order (TSO) is for audio systems designers, manufacturers, and installers applying for a TSO authorization or letter of design approval. In it, we (the Federal Aviation Administration, or FAA) tell you what minimum performance standards (MPS) your audio system must meet for approval and identification with the applicable TSO marking. We also combine and update the requirements of TSO-C50c, Audio Selector Panels and Amplifiers; TSO-C57a, Headsets and Speakers; and TSO-C58a, Aircraft Microphones (except carbon).
2. **APPLICABILITY.** This TSO affects new applications submitted after this TSO's effective date.
 - a. The standards of this TSO apply to microphones (except carbon), headsets, handsets, speakers, audio selector panels, and amplifiers used in aircraft audio systems and equipment. We include design and construction features that will improve intelligibility of air-ground communication and audio response.
 - b. We will cancel TSO-C50c, TSO-C57a, and TSO-C58a after publishing this TSO.
3. **REQUIREMENTS.** New models of audio equipment identified and manufactured on or after the effective date of this TSO must meet the MPS in Section 2 of RTCA, Inc. Document (RTCA/DO) No. -214, "Audio Systems Characteristics and Minimum Performance Standards for Aircraft Audio Systems and Equipment," dated March 2, 1993.
 - a. **Functionality.** This TSO's standards apply to equipment intended to support aircraft audio systems' response characteristics. In it, we recommend how users and designers can improve communications equipment. We also recommend minimum standards and test procedures for aircraft microphones (except carbon), headsets, handsets and loudspeakers, and audio systems.
 - b. **Failure Condition Classification.** Failure of the intended function defined in paragraphs 3 and 3a of this TSO is a major failure condition. Develop audio systems and equipment to at least the design assurance level for this failure condition.

c. Environmental Qualification. Test the equipment to the conditions in RTCA/DO-160E, “Environmental Conditions and Test Procedures for Airborne Equipment,” dated December 9, 2004. Find the standards for these test procedures in Appendix A of RTCA/DO-160E.

d. Functional Qualification. Show the required performance under the test conditions in RTCA/DO-214, “Equipment Performance Requirements and Test Procedures,” dated March 2, 1993.

e. Software Qualification. If the article includes a digital computer, develop the software following RTCA/DO-178B, “Software Considerations in Airborne Systems and Equipment Certification,” dated December 1, 1992.

f. Deviations. We have provisions for using alternative or equivalent means of compliance to the criteria in this TSO. If you use these provisions, you must show that your equipment maintains an equivalent level of safety. Apply for a deviation per Title 14, Code of Federal Regulations (14 CFR) § 21.609.

4. MARKING.

a. Mark at least one major component permanently and legibly with all information in 14 CFR § 21.607(d), except the following:

(1) 14 CFR § 21.607(d)(2): use the article’s name, type, and part number. Do not use the optional model number.

(2) 14 CFR § 21.607(d)(3): use the date of manufacture instead of the optional serial number, when the information is critical for maintenance or inspections.

b. Also, mark the following permanently and legibly with at least the manufacturer’s name, subassembly part number, and the TSO number:

(1) Each component that is easily removable (without hand tools),

(2) Each interchangeable element, and

(3) Each sub-assembly of the article that you determined may be interchangeable.

c. If the component includes a digital computer, the part number must include hardware and software identification. Or, use separate part numbers for hardware and software. Either approach must include a means of showing the modification status. Use part numbers to differentiate similar software versions, approved to different software levels.

d. When applicable, identify the equipment as an incomplete system or that it performs functions beyond those described in paragraphs 3 and 3a.

5. APPLICATION DATA REQUIREMENTS. Under 14 CFR § 21.605(a)(2), as a manufacturer, you must give the FAA’s aircraft certification office (ACO) manager responsible

for your facilities one copy of the following technical data to support our design and production approval:

a. Operating instructions and equipment limitations, sufficient to describe the equipment's operational ability.

b. Installation procedures and limitations, sufficient to ensure your audio system – when installed following the installation procedures – continues to meet this TSO's requirements. The limitations must identify any unique aspects of the installation, and include a note with the following statement:

The conditions and tests for TSO approval of this article are minimum performance standards. Those installing this article, on or in a specific type or class of aircraft, must determine that the aircraft installation conditions are within the TSO standards. The article may be installed only following 14 CFR part 43 or the applicable airworthiness requirements.

c. When applicable, identify the equipment as an incomplete system or a multi-use system. Describe the intended functions the equipment provides.

d. Schematic drawings of the installation procedures.

e. Wiring diagrams of the installation procedures.

f. List of the components (by part number) that make up the audio system complying with the standards in this TSO. Include vendor part number cross-references, when applicable.

g. Instructions for periodic maintenance, calibration, and repair necessary for continued airworthiness of installed equipment. Instructions should include recommended inspection intervals and service life.

h. Material and process specifications list.

i. The quality control system description required by 14 CFR §§ 21.605(a)(3) and 21.143(a), including functional test specifications used to test each production article.

j. Manufacturer's TSO qualification test report.

k. Nameplate drawing with the information required by paragraph 4 of this TSO.

l. An environmental qualifications form described in RTCA/DO-160D for each component of the system.

m. A list of all drawings and processes necessary to define the article's design. For a minor change, revisions to the list are available only on request.

n. If the article includes a digital computer: a Plan for Software Aspects of Certification (PSAC); Software Configuration Index; and Software Accomplishment Summary. We recommend that you submit the PSAC early in the software development process. Early submittal allows us to quickly resolve issues such as partitioning and determining software levels.

6. MANUFACTURER DATA REQUIREMENTS. Besides the data given directly to the FAA, you as a manufacturer must give the manager of the responsible ACO the following technical data:

- a. The functional test specifications for testing each production article to ensure compliance with this TSO.
- b. Equipment calibration procedures.
- c. Corrective maintenance procedures within 12 months after TSO authorization.
- d. Schematic drawings.
- e. Wiring diagrams.
- f. Manufacturer's TSO qualification test report.
- g. The results of the environmental qualification tests conducted following RTCA/DO-160D.
- h. If the article includes a digital computer, the appropriate documentation defined in RTCA/DO-178B. Include all data supporting the applicable objectives in Annex A of RTCA/DO-178B, Process Objectives and Outputs by Software Level.

7. FURNISHED DATA REQUIREMENTS. With each article manufactured under this TSO, provide one copy of the following:

- a. Technical data and information in paragraphs **5a** through **5g** of this TSO. Add any other data or information necessary for the proper installation, certification, and use, or for continued airworthiness, or both, of the audio equipment.
- b. Data and information in paragraphs **5l** through **5n** of this TSO, if the equipment performs functions beyond those in paragraphs **3** and **3a**. You must send these data to each person receiving one or more aircraft audio systems and equipment.

8. AVAILABILITY OF REFERENCED DOCUMENTS.

a. You can buy copies of RTCA Document Nos. DO-160D, DO-178B, and DO-214 from the RTCA Inc., 1140 Connecticut Avenue, N.W., Suite 1020, Washington D.C. 20036-4001. Telephone (202) 833-9339, fax (202) 833-9434. You can also get copies from the RTCA's Internet website at www.rtca.org.

b. You can buy copies of 14 CFR part 21, subpart O, from the Superintendent of Documents, Government Printing Office, Washington DC 20402-9325. Telephone (202) 512-1800, fax (202) 512-2250. You can also get copies from the Government Printing Office's electronic CFR Internet website at www.access.gpo.gov/ecfr.

c. You can get FAA Advisory Circular (AC) 20-110 (current revision), "Index of Aviation Technical Standard Orders," AC 20-115 (current revision), "Radio Technical Commission for Aeronautic, Inc. Document RTCA/DO-178B," and AC 20-36 (current revision), "Index of Articles Certified Under the Technical Standard Order System," from the U.S. Department of Transportation, Subsequent Distribution Office, Ardmore East Business Center, 3341 Q 75th Avenue, Landover MD 20785. Telephone (301) 322-5377, fax (301) 386-5394. You can also get copies from our Regulatory and Guidance library at www.airweb.faa.gov/rgl. On the RGL webpage, select "Advisory Circulars."

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