

INCH-POUND

A-A-59948

13 Feb 2014

## COMMERCIAL ITEM DESCRIPTION

## TEST SET, SYNCHRO (RESOLVER/STANDARD)

The General Services Administration has authorized the use of this commercial item description for all federal agencies.

## 1.0 SCOPE.

1.1 SCOPE. This Commercial Item Description (CID) Test Set Synchro provides accurate reference values of voltage and phase for the calibration of test measurement and diagnostic equipment used in support and or development, repair and maintenance of navigational aids, radio frequency communications equipment and other measurement equipment. This CID lists the minimum performance, design, functional, environmental, reliability requirements and quality assurance provisions for the electronic test set synchro.

2.0 Classification. The Test Set Synchro/Resolver covered by this purchase description (PD from here after) shall be commercially available equipment that has factory installed options and/or may be modified to the extent necessary to meet the following description. The test set shall be Class 3, in accordance with MIL-PRF-28800.

## 3.0 SALIENT CHARACTERISTICS.

3.1 Item Description. The Test Set Synchro/Resolver Standard shall provide accurate phase reference values for the calibration, development, service & repair of test measurement and diagnostic equipment. The Test Set Synchro/Resolver shall be configurable as a signal source or signal resolver (measurement mode).

3.2 Voltage and Phase Values. The Test Set Synchro/Resolver Standard shall provide and resolve a range of voltages and phase information with a minimum range spanning from 6 volts to 90 volts.

3.3 Angular Range. The Test Set Synchro/Resolver Standard shall have a minimum angular range of  $360^\circ$  or  $2\pi$  radians throughout the operating frequency stated in section 3.4 of this CID.

Beneficial comments, recommendations, additions, deletions, clarifications, etc. and any data that may improve this document should be sent to: WR-ALC 404 SCMS/GUEEA, 235 Byron Street Suite 19A, Robins AFB, GA 31098-1670. Since contact information can change, you may want to verify the currency of this address information using the ASSIST Online database at <https://assist.dla.mil/>.

AMSC N/A

FSC 6625

Distribution Statement A. Approved for public release; distribution is unlimited.

## A-A-59948

3.4 Operating Frequency. The Test Set Synchro/Resolver Standard operating frequency shall have a minimum range spanning from 50 Hz 18 kHz in “Resolver” and/or “Standard” modes.

3.5 Angular Accuracy. The Test Set Synchro/Resolver Standard accuracy shall be  $5 \pm 2$  arc-seconds at 1.2 kHz in “Synchro Mode” from 6 volts to 90 volts. In “Resolver Mode” the accuracy shall be  $3 \pm 1$  arc-seconds up to 1.2 kHz average and  $\leq 75$  arc-seconds up to 18 kHz. Refer to table I for specific frequency response.

TABLE I. Angular Accuracy.

| Frequency vs. Angular Accuracy (Resolver & Synchro Modes) |                                    |                           |                    |
|---|------------------------------------|---------------------------|--------------------|
| Frequency   | Angular Range ( $\pm$ ; Arc-Secs.) |                           |                    |
| (Synchro Mode)  | 6~12 Volts                         | 12~ 48Volts               | 48~90Volts         |
| 47-360 Hz   | ----                               | $\pm 4$ arc-sec           | $\pm 4$ arc-sec    |
| >360-600 Hz   | $\pm 3$ arc-sec(d)                 | $\pm 3$ arc-sec(d)        | $\pm 4$ arc-sec(d) |
| >600-800 Hz   | $\pm 3$ arc-sec(d)                 | $\pm 4$ arc-sec           | $\pm 5$ arc-sec    |
| >800-1200 Hz  | $\pm 3$ arc-sec(d)                 | $\pm 5$ arc-sec           | $\pm 7$ arc-sec    |
| >1200-20,000 Hz   | ----                               | ----                      | ----               |
| (Resolver Mode)   | 6~28 Volts( $\pm 3$ Volts)         | >28 Volts( $\pm 3$ Volts) |                    |
| 47-360 Hz   | ----                               | ----                      |                    |
| >360-600 Hz   | $\pm 3$ arc-sec                    | $\pm 3$ arc-sec           |                    |
| >600-800 Hz   | $\pm 3$ arc-sec                    | $\pm 3$ arc-sec           |                    |
| >800-1200 Hz  | $\pm 3$ arc-sec                    | $\pm 7.5$ arc-sec         |                    |
| >1,200-10,000 Hz  | $\pm 2 \sim \pm 17$ arc-sec        | ----                      |                    |
| >10,000-20,000 Hz   | $\pm 10 \sim \pm 75$ arc-sec       | ----                      |                    |

3.6 Stability Aging Accuracy. The Test Set Synchro/Resolver Standard accuracy variance shall be  $\leq \pm 2\%$  of programmed value within the temperature range of 0°C to 50°C (32°F to 122°F) after tests in MIL-PRF-28800 section 4.5.5.1.1 has been performed for class 3 equipment classification (Per table II on page 41).

3.7 Voltage/Frequency Sensitivity. The Test Set Synchro/Resolver Standard sensitivity values are shown in table 2.

TABLE II. Sensitivity.

| Reference Input Voltages | Synchro <sub>Mode</sub>   | Resolver <sub>Mode</sub>     |
|--------------------------|---------------------------|------------------------------|
| Operating Frequency      | 50 Hz~1.2 kHz             | 360 Hz~18 kHz                |
| 50~1.2 kHz               | 6~90 Volts <sub>RMS</sub> |                              |
| $\geq 1.2$ kHz~18 kHz    | ----                      | 6~ 28 Volts ( $\pm 3$ Volts) |
| $Z_{Input}$              | $\geq 200$ k $\Omega$     |                              |

## A-A-59948

3.8 Output Impedance. The Test Set Synchro/Resolver Standard output impedance shall be  $\leq 5 \Omega$  average from 50 Hz to 18 kHz. See table 3 for details.

TABLE III. Output Values.

| Reference Output Voltages                  | Synchro <sub>Mode</sub>  | Resolver <sub>Mode</sub>              |
|--|--|---------------------------------------|
| Operating Frequency                        | 50 Hz~1.2 kHz  | 360 Hz~18 kHz                         |
| 50~1.2 kHz                                 | $V_{\text{Out Ref}} \leq 6, V_{\text{Out Ref}} \geq 90 \text{ Volts}_{\text{RMS}}$ |                                       |
| $\geq 1.2 \text{ kHz} \sim 18 \text{ kHz}$ | ----   | 6~ 28 Volts ( $\pm 3 \text{ Volts}$ ) |
| $Z_{\text{Input}}$                         | $\leq 7 \pm 45^\circ (5 \pm j5) \Omega_{\text{Avg}}$                               |                                       |

3.9 Output Reference Current. The Test Set Synchro/Resolver Standard shall have reference output current values listed in table 4 for details.

TABLE IV. Output Current.

| Output Voltage ( $V_{\text{Ref Out}}$ )              | Output Current (Milli-Amps, mA) |
|--|---------------------------------|
| $V_{\text{Out}} \cong 6 \sim 28 \text{ Volts}$       | $\cong 100 \text{ mA}$          |
| $V_{\text{Out}} \cong 28 \sim \geq 90 \text{ Volts}$ | $\cong 25 \text{ mA}$           |

3.10 Output Current Resolver Mode. The Test Set Synchro/Resolver Standard shall have resolver mode output current levels listed in table 5 for details.

TABLE V. Output Current in Resolve Mode.

| Output Voltage ( $V_{\text{Out}}$ )             | Output Current (Milli-Amps, mA) |
|---|---------------------------------|
| $V_{\text{Out}} \cong 6 \sim 12 \text{ Volts}$  | 250 mA                          |
| $V_{\text{Out}} \cong 12 \sim 28 \text{ Volts}$ | 125 mA                          |
| $V_{\text{Out}} \cong 28 \sim 90 \text{ Volts}$ | 30 mA                           |

3.11 Temperature Coefficient. The Test Set Synchro/Resolver Standard shall have a temperature coefficient (TC) within the temperature range of 15 °C to 35 °C, the magnitude of TC is bounded by 10 Volts with a TC  $\leq 0.04 \text{ ppm}/^\circ\text{C}$  and 1.018 Volts with a TC  $\leq 0.1 \text{ ppm}/^\circ\text{C}$ .

3.12 Design and Construction. The Test Set Synchro/Resolver Standard shall be used in both bench top and rack mounted environments. The Voltage Reference and DC Standard is a commercial off the shelf item subject to commercial products regulatory standards. The Voltage Reference and DC Standard shall comply with all applicable MIL-PRF-28800 sections. The Test Set Synchro shall be designed and constructed in accordance with all applicable International Standards Organization, European Union (EU), International Electro-Technical Commission requirements in order to have the “ISO, CE & IEC” marking affixed and or be issued a Certificate of Conformance.

## A-A-59948

3.13 Display Indicators. The Test Set Synchro/Resolver Standard shall have a method of indicating system status or conditions for power, calibration and charge or length of operation status.

3.14 System Safety. The Test Set Synchro/Resolver Standard system shall comply with all applicable sections of the Underwriters Laboratories (UL), IEC/ISO standard for electrical safety

3.15 Sound Levels. The Test Set Synchro/Resolver Standard acoustic noise shall conform to sound level requirements ISO 7779 and ISO 8253-2.

3.16 Electrostatic Discharge (ESD). The design of the Test Set Synchro/Resolver Standard shall preclude equipment damage due to ESD (internal/external electrical arcing), protect personnel from electrical shock due to static charging, and prevent ignition of explosive atmospheres due to sparking in accordance with MIL-STD-1686 sections 5.2 and 5.7.2 and MIL-HDBK-263 for guidance.

3.17 Electro Magnetic Interference and Compatibility (EMI/EMC). The Test Set Synchro/Resolver Standard EMI and EMC emissions shall comply and be in accordance with the following radiated emission and susceptibility requirements of MIL-PRF-28800 section 4.5.6.5, MIL-STD-461: RE102 and RS103 & the applicable sections IEC-61000-4. Emitted radiation absorption and radiation limits FCC Part 15.109 & 15.209.

3.18 Port Damage. The Test Set Synchro/Resolver Standard ports shall withstand shorted outputs indefinitely without damage to the instrument. The 10V output shall withstand voltages  $\leq$  220V, up to 25 mA continuous current for periods of time  $\leq$  15 seconds.

3.19 Connectors. The Test Set Synchro/Resolver Standard system shall have a "Banana" type connector set for two voltages with common ground and a chassis/ground terminal. If equipped with a GPIB, it shall be compliant with the IEC-60488-1 and IEC-60488-2 for communications and control protocols.

3.20 Operating Temperature Range. The Test Set Synchro/Resolver Standard shall meet the specifications listed herein with full capabilities within the temperature range of 0°C to 50°C (32° to 122°F) after performing tests in MIL-PRF-28800 section 4.5.5.1.1 table 11 for class 3 equipment.

3.21 Storage Temperature Range. The Test Set Synchro/Resolver Standard shall meet and/or exceed manufacturer's specifications for stored equipment -40° C to 71° C (-40° F to 159°F) storage after tests of MIL-PRF-28800 section 4.5.5.1.1 table 11 for temperature range and relative humidity storage for class 3 equipment classification.

3.22 Altitude Requirements. The Test Set Synchro/Resolver Standard shall meet its operating performance and accuracy while operating at an altitude equal or greater than 6,000 ft. (1,828 meters). The equipment shall meet performance and accuracy requirements, for non-operating storage up to 10,000 (3,050 meters).

## A-A-59948

3.23 Calibration & Maintenance Adjustments. No special tools or software shall be required for alignment or adjustment except those furnished with the Test Set Synchro/Resolver Standard. A software license shall be issued for each physical instrument when the system is designed for computer based calibration. Any special equipment, fixtures, tools, standards, etc., required for calibration and not common to a secondary calibration laboratory shall be supplied with the Test Set Synchro/Resolver Standard. Any unique accessories including software required for calibration of this item shall be furnished by the manufacturer. A list of peripheral support TMDE equipment required to accomplish the calibration/alignment/adjustments of the unit shall be provided with the Test Set Synchro/Resolver Standard. Any unique accessories including software required for calibration of this item shall be furnished by the manufacturer. All firmware or software provided under this purchase description shall be the same version, revision and revision date.

3.24 Calibration Period. The design of the Test Set Synchro/Resolver Standard shall provide readily accessible calibration and maintenance adjustments. The calibration adjustments shall be accessible without removal of the instrument internal modules. The calibration interval shall be based on a period of one calendar year or an operating time of 8,766 hours or whichever occurs first.

3.25 Reliability. The design of the Test Set Synchro/Resolver Standard shall be such that under normal use and operation the mean time between failures (MTBF) exceeds the minimum of 2,080 hours of operation accordance with MIL-PRF-28800. The manufacturer shall provide a summary of maintenance or warranty records to establish the validity of the statistical assertion in accordance with MIL-PRF-28800 section. The manufacturer shall be able to reasonably establish the claim that the offered equipment is capable of the required level of reliability by meeting and/or exceeding MIL-PRF-28800 sections and section.

3.26 Maintainability. The Test Set Synchro/Resolver Standard shall meet the maintainability criterion in accordance with MIL-STD-1472 paragraphs 5.9 through 5.9.18 and 5.9.21 and MIL-PRF-28800 sections 3.14.1 through 3.14.4 and sections 6.6.2.4 and 6.6.24.1.

3.27 Preventive Maintenance. Preventive maintenance shall not require more than 15 minutes per 30-day period. Preventive maintenance shall not require breaking of the equipment seams where calibration seals would normally be placed in accordance with MIL-PRF-28800 sections 3.14.2 & 3.14.3.

3.28 Corrective Maintenance. The Test Set Synchro/Resolver Standard shall be designed to meet reparability criterion in accordance with section 3.14.3 sub sections (a) through (d) of MIL-PRF-28800.

3.29 Electrical Power Sources & Connections. The Test Set Synchro/Resolver Standard shall operate from nominal commercial, military, aircraft and power sources with a nominal voltage of 120 VRMS Single Phase AC ( $\pm 10\%$ ) at line frequencies of 50 Hz & 60 Hz ( $\pm 5\%$ ), in accordance with MIL-PRF-28800 paragraph 3.1.5.2 and 3.1.5.2a. Transient state conditions shall meet MIL-PRF-28800 requirements for the classification specified herein. AC input power shall be used to power the Test Set Synchro/Resolver Standard and recharge batteries for nonvolatile memory if equipped with them.

## A-A-59948

3.30 Dimensions. The Test Set Synchro/Resolver Standard shall comply with width and depth of EIA/ECA-310 standard equipment rack configuration. The width shall be the 19" when configured with rack adapter/mount hardware and include a rack-mount conversion kit if required at organizational level. The height shall be compatible with standard EIA height units. One unit or "U" is defined by EIA/ECA-310 to be 1.75 inches or 44.45 mm.

3.31 Weight. The Test Set Synchro/Resolver Standard system shall comply with MIL-STD-1472 section 5.9.11.3.3 for weight & size restrictions for single person lift & handling. The total weight of the electronic test set synchro, excluding accessories and manuals, shall not exceed a two-person lift of 40 pounds, (18.2 kilograms).

#### 4.0 PRODUCT CONFORMANCE PROVISIONS

4.1 Product Conformance. The products provided shall meet the salient characteristics of this Commercial Item Description, conform to the producer's own drawings, specifications, standards, and quality assurance practices, and be the same product offered for sale in the commercial marketplace. The government reserves the right to require proof of such conformance.

4.2 Verification. Verification of the delivered electronic test set synchro will be performed at the delivery point by the end user.

#### 5.0 PACKAGING.

5.1 Preservation, packing and marking shall be as specified in the contract or order.

#### 6.0 NOTES.

6.1 National Stock Number(s) (NSNs). The following list of NSNs assigned that correspond to this CID. The list may not be indicative of all possible NSNs associated with the CID.

|     |                  |
|-----|------------------|
| NSN | 6625-01-482-9783 |
|-----|------------------|

6.2 Acquisition requirements. Acquisition documents must specify the following:

- a. Title, number and date of the CID.
- b. Packaging requirements (see 5.0)

6.3 Source of documents.

6.3.1 Department of Defense and Federal documents may be obtained at <https://assist.dla.mil> or from the Document Automation and Production Service, Bldg 4D (DPM-DODSSP), 700 Robbins Avenue, Philadelphia PA 19111-5094.

6.3.2 ISO documents can be obtained online at <http://www.iso.org> or from the International Organization for Standardization, ISO Central Secretariat, 1, ch de la Voie-Creuse, CP 56-CH-1211 Geneva 20, Switzerland.

A-A-59948

6.3.3 ANSI/EIA standards may be obtained at <http://www.ansi.org> or <http://www.eia.org> or available from the Electronics Industry Association, Engineering Department, 2001 Pennsylvania Ave., N.W., Washington, D.C., 20006. Phone: 1-800-854-7179 (USA and Canada).

6.3.4 IEC documents may be obtained at <http://www.eciaonline.org/default.aspx> or from Electronic Components Industry Association, 111 Alderman Drive, Suite 400, Alpharetta, GA 30005.

6.3.5 Underwriters Laboratories (UL) copies may be obtained online at <http://ulstandardsinfonet.ul.com> or from: COMM 2000, 1414 Brook Drive, Downers Grove, IL 60515-5000.

#### 6.4 Key Words.

Angular Range  
Calibration  
Phase  
Voltage

Custodian:  
Air Force - 84

Preparing activity:  
Air Force - 84

Reviewer:  
Air Force - 99

Agent:  
Air Force – 99

Project 6625-2014-015

NOTE: The activities listed above were interested in this document as of the date of this document. Since organizations and responsibilities can change, you should verify the currency of the information above using the ASSIST Online database at <https://assist.dla.mil/> .