MIL-S-20708/67B
30 July 1987

SUPERSEDING
MIL-S-20708/67A(Wep)
1 April 1960

MILITARY SPECIFICATION SHEET

SYNCHRO, TORQUE DIFFERENTIAL RECEIVER, TYPE 31TDR6B

This specification is approved for use by all Departments and Agencies of the Department of Defense. The requirements for acquiring the Synchros described herein shall consist of this specification and the latest issue of MIL-S-20708.

TABLE I. Requirements.

Requirement	Value	Unit	Tolerance
Frequency	60	Hz	±1%
Primary Voltage	90	volts	±1%
Primary Current	748	milliamps	maximum
Primary Power	7.8	watts	maximum
Impedance			
Zp	----	ohms	min.-max.
Zd	----	ohms	min.-max.
Impedance Angle:			
Zp	----	degrees	min.-max.
Zd	----	degrees	min.-max.
Transformation Ratio	1.154	-------	±2%
Phase Shift (Lead)	6.5	degrees	maximum
Electrical Error	10.0	minutes	maximum
Receiver Error	48	minutes	maximum
Synchronizing Time: 30° ±2°	1.0	seconds	maximum
Synchronizing Time: 177° ±2°	2.0	seconds	maximum
Torque Gradient	0.3	ounce-inches per degree	minimum
Radial Play	0.0008	inches	maximum
End Play	0.0050	inches	maximum
Temperature Rise	18	degrees (C)	maximum
Variation of Voltage (+10%) and Freq. (-5%)	----	watts	maximum

TABLE II. Military part number variant characteristics.

Military Part No. 1/	A ±.010	B ±.010	G Maximum	Shaft Style	Terminal End	U +.0000
M20708/67-01B	.700	.730	3.635	Splined	Terminal Board	.2405

1/Military part number M20708/67-01B shall be the NATO standard.

1/The suffix letter following the numerical dash number corresponds to the latest modification letter in the type designation.

TABLE III. Military part number cross-references.

SUPERSEDED MILITARY PART NUMBERS		NEW MILITARY PART NUMBERS
MIL-S-20708/67A	MIL-S-20708/67	
M20708/67A-001	M20708/67-001	M20708/67-01B

NOTE: All line items shown in Table III refer to equivalent and interchangeable synchros of the same type designation modification. Part number changes do not affect form, fit, or function of the synchros listed therein.

Custodians:
Navy-AS

Review Activities:
DLA-ES

User Activities:

Preparing Activity:
Navy-AS

(Project 5990-0334-57)

☆ U. S. GOVERNMENT PRINTING OFFICE: 1987-704-036/74555

MIL-S-20708/67A(Wep)
1 April 1960
SUPERSEDING
MIL-S-20708/67(NOrd)
31 March 1959

MILITARY SPECIFICATION

SYNCHRO, DIFFERENTIAL TRANSMITTER, TYPE 31TDR6b

This specification has been approved by the Bureau of Naval Weapons, Department of the Navy.

1. SCOPE

1.1 This specification covers the detail requirements for differential transmitter synchro, type 31TDR6b, 90 volts, 60 cycles.

2. APPLICABLE DOCUMENTS

2.1 The following documents of the issue in effect on date of invitation for bids form a part of this specification.

SPECIFICATIONS

MILITARY

MIL-I-16557 - Ink, Marking, Quick-drying (For Non-porous Surfaces).
MIL-S-20708 - Synchros, 60 and 400 cycles, General Specifications for.

STANDARDS

MILITARY

MIL-STD-8 - Dimensioning and Tolerancing.
MS 25036 - Lug, Terminal.

DRAWINGS

BUREAU OF NAVAL WEAPONS

1869583 - Clamp, Assembly.
813820 - Washer, Drive.
854949 - Nut.
1074382 - Washer.
LD 255268 - Stock Material for Precision Instrument Components.

FSC 5990

(Copies of specifications, standards, and drawings required by contractors in connection with specific procurement functions should be obtained from the procuring agency or as directed by the contracting officer.)

3. REQUIREMENTS

3.1 Qualification. - Except as specified in par. 3.1.1, synchros covered by this specification shall be a product which has been tested and qualified in accordance with Specification MIL-S-20708.

3.1.1 Preproduction sample. - Pending issuance of a Qualified Products List (Q.P.L.), a sample (see 4.1.1.1) of the synchros to be furnished under this specification shall be subjected to the preproduction tests as specified in Specification MIL-S-20708.

3.2 Requirements. - All requirements shall be in accordance with Specification MIL-S-20708 except as otherwise specified herein.

3.2.1 Salt spray requirements. - Not applicable.

3.2.2 Design and construction. - The synchro shall be of the design, construction, and physical dimensions specified in Figure 1, and shall be complete, including all hardware shown and identified thereon.

3.2.3 Performance requirements. - The values applicable to the synchro shall be as specified in Table I.

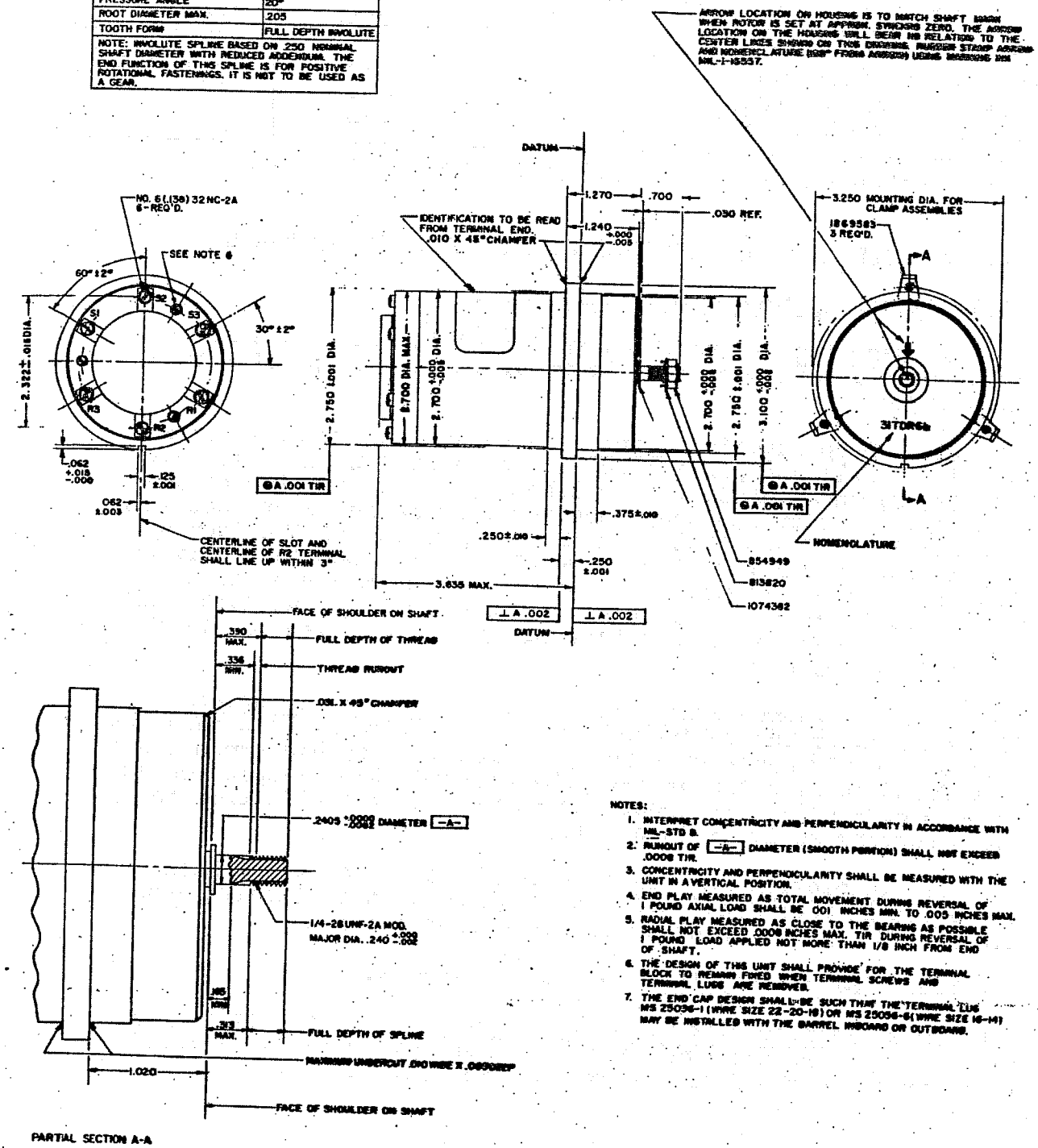
Table I. - Synchro, Differential Transmitter, Type 31TDR6b

Requirement	Unit	Value
Frequency	Cycles	60
Primary voltage (nominal)	Volts	90
Primary current (maximum)	Milliamps	748
Primary power (maximum)	Watts	7.8
Transformation ratio ±2%		1.154
Electrical error (maximum)	Minutes	10
Torque gradient (minimum)	Oz-in./deg	0.3
Receiver error (maximum)	Minutes	48
Synchronizing time 30° ±2°	Seconds	1
(maximum) 177° ±2°	Seconds	2

Continued in Page 4

SPLINE DATA	
TEETH	22
PITCH	96
PITCH DIAMETER	.2291 +.0000 -.0020
OUTSIDE DIAMETER	.2405 +.0000 -.0008
PRESSURE ANGLE	20°
ROOT DIAMETER MAX.	.205
TOOTH FORM	FULL DEPTH INVOLUTE

NOTE: INVOLUTE SPLINE BASED ON .250 NOMINAL SHAFT DIAMETER WITH REDUCED ADDENDUM. THE END FUNCTION OF THIS SPLINE IS FOR POSITIVE ROTATIONAL FASTENINGS. IT IS NOT TO BE USED AS A GEAR.



NOTES:

1. INTERPRET CONCENTRICITY AND PERPENDICULARITY IN ACCORDANCE WITH MIL-STD 8.
2. RUNOUT OF -A- DIAMETER (SMOOTH PORTION) SHALL NOT EXCEED .0008 TIR.
3. CONCENTRICITY AND PERPENDICULARITY SHALL BE MEASURED WITH THE UNIT IN A VERTICAL POSITION.
4. END PLAY MEASURED AS TOTAL MOVEMENT DURING REVERSAL OF 1 POUND AXIAL LOAD SHALL BE .001 INCHES MIN. TO .005 INCHES MAX.
5. RADIAL PLAY MEASURED AS CLOSE TO THE BEARING AS POSSIBLE SHALL NOT EXCEED .0008 INCHES MAX. TIR DURING REVERSAL OF 1 POUND LOAD APPLIED NOT MORE THAN 1/8 INCH FROM END OF SHAFT.
6. THE DESIGN OF THIS UNIT SHALL PROVIDE FOR THE TERMINAL BLOCK TO REMAIN FIXED WHEN TERMINAL SCREWS AND TERMINAL LUGS ARE REMOVED.
7. THE END CAP DESIGN SHALL BE SUCH THAT THE TERMINAL LUG MS 25036-1 (WIRE SIZE 22-20-18) OR MS 25036-6 (WIRE SIZE 16-14) MAY BE INSTALLED WITH THE BARREL INBOARD OR OUTBOARD.

FIGURE 1- SYNCHRO, DIFFERENTIAL RECEIVER, TYPE 31TDR6b

UNLESS OTHERWISE SPECIFIED. DIMENSIONS ARE IN INCHES. TOLERANCES ON FRACTIONS ± 1/64 DECIMALS ±.008 ANGLES ± 2°

Table I (Concluded from Page 2)

Requirement	Unit	Value
Phase shift (maximum)	Degrees	6.5 (lead)
Primary impedance (Zp)	Ohms	1/
Secondary impedance (Zd)	Ohms	1/

1/ As specified by the Bureau of Naval Weapons (see 6.1).

4. QUALITY ASSURANCE PROVISIONS AND TEST REQUIREMENTS

4.1 Sampling, inspection, and tests. -

4.1.1 Sampling. - Except as specified in 4.1.1.1, sampling shall be in accordance with the requirements of Specification MIL-S-20708.

4.1.1.1 Preproduction samples. - Unless otherwise specified (see 4.1.1.1.1) and pending the issuance of a Q.P.L. (see 3.1.1), four (4) synchros shall be furnished by the contractor to the procuring activity for preproduction testing in accordance with Specification MIL-S-20708. Further production of the item by the contractor prior to the approval of the procuring activity shall be at the contractor's risk. Accepted preproduction samples will become the property of the procuring activity and will be included in the quantity of synchros called for in the contract or order.

4.1.1.1.1 Preproduction sample for a subsequent contract. - If a contractor has delivered synchros previously in accordance with the requirements of this specification and his product has been found to be satisfactory, the preproduction sample for any subsequent contract or order may be waived at the discretion of the procuring activity (see 6.1).

4.1.2 Inspection and tests. - Inspection and tests shall be conducted in accordance with the requirements of Specification MIL-S-20708 except as otherwise specified herein.

4.1.2.1 Salt spray test. - Not applicable.

4.1.2.2 Preproduction rejection criteria. - Failure of any preproduction sample synchro in any test or requirement shall be cause for withholding approval (see 4.1.1.1).

5. PREPARATION FOR DELIVERY

5.1 Preparation for delivery shall be in accordance with the requirements of Specification MIL-S-20708 except as otherwise specified herein.

5.2 Hardware. - All loose hardware (see 3.2.2) shall be packaged in a ventilated envelope made of material having a PH value of 6-8 that is compatible with the weight of the contents. The packaged hardware shall be placed in the unit synchro package.

6. NOTES

6.1 All notes specified in Specification MIL-S-20708 are applicable to this specification and in addition, under ordering data, should specify the following:

a. If preproduction samples are not required (see 4.1.1.1).
b. Impedance (see Table I).

6.2 Stock material. - Miscellaneous stock materials not shown on Figure 1 which may be required for use with synchros, should be selected from LD 255268.

Notice. - When Government drawings, specifications, or other data are used for any purpose other than in connection with a definitely related Government procurement operation, the United States Government thereby incurs no responsibility nor any obligation whatsoever; and the fact that the Government may have formulated, furnished, or in any way supplied the said drawings, specifications, or other data is not to be regarded by implication or otherwise as in any manner licensing the holder or any other person or corporation, or conveying any rights or permission to manufacture, use, or sell any patented invention that may in any way be related thereto.

SPECIFICATION ANALYSIS SHEET

Form Approved
Budget Bureau No. 119-R004

INSTRUCTIONS

This sheet is to be filled out by personnel either Government or contractor, involved in the use of the specification in procurement of products for ultimate use by the Department of Defense. This sheet is provided for obtaining information on the use of this specification which will insure that suitable products can be procured with a minimum amount of delay and at the least cost. Comments and the return of this form will be appreciated. Fold on lines on reverse side, staple in corner, and send to preparing activity *(as indicated on reverse hereof)*.

SPECIFICATION

ORGANIZATION *(Of submitter)* | CITY AND STATE

CONTRACT NO. | QUANTITY OF ITEMS PROCURED | DOLLAR AMOUNT $

MATERIAL PROCURED UNDER A

☐ DIRECT GOVERNMENT CONTRACT ☐ SUBCONTRACT

1. HAS ANY PART OF THE SPECIFICATION CREATED PROBLEMS OR REQUIRED INTERPRETATION IN PROCUREMENT USE?

A. GIVE PARAGRAPH NUMBER AND WORDING.

B. RECOMMENDATIONS FOR CORRECTING THE DEFICIENCIES.

2. COMMENTS ON ANY SPECIFICATION REQUIREMENT CONSIDERED TOO RIGID

3. IS THE SPECIFICATION RESTRICTIVE?

☐ YES ☐ NO IF "YES", IN WHAT WAY?

4. REMARKS *(Attach any pertinent data which may be of use in improving this specification. If there are additional papers, attach to form and place both in an envelope addressed to preparing activity)*

SUBMITTED BY *(Printed or typed name and activity)* | DATE

DD FORM 1 APR 63 1426 REPLACES NAVSHIPS FORM 4863, WHICH IS OBSOLETE PLATE NO. 15419