

Apollo G&N Specification
PS 1003733 Rev. A
Original Issue Date: 3/9/65
Release Authority: TDRR 17259
Class A Release

PROCUREMENT SPECIFICATION

FOR

ROPE MODULES B21 thru 24, B28 and B29

Record of Revisions

This specification consists of pages 1 to 14 inclusive.

APPROVALS	J. W. Hirsch 3/8/65	C. Wall 3/8/65	MJT/IL	B. C. D. Allen 2/9/65 Resigned 2/5/65	600-11000-10000 Feb. 3 1965 QFB Fund RAY 2-4-65
	NASA/MSC				

PUBLICATIONS

NASA -

NPC 200-2 Quality Program Provisions for Space System Contractors

FTM 1003733 Final Test Methods for the Rope Modules B21 thru B24, B28 and B29

2.2 Conflicting Requirements. In the event of conflict between the requirements of the contract, this document, and the documents listed in this section, the requirements of the contract, this document and the documents listed in this section shall govern, in that order.

3. REQUIREMENTS

3-1 DESCRIPTION. The Rope Modules B21 thru B24, B28 and B29, individually consist of 512 cores which are threaded or bypassed by set, reset, inhibit and sense lines in such a manner that the same information wired into the cores is always available when the core is set.

3-2 GENERAL REQUIREMENTS

3-2.1 Qualification Test. A representative sample of the module shall be manufactured using the methods and procedures proposed for the production lot. These shall be submitted to the NASA Inspector for qualification test at an activity designated in the contract or by the procuring activity.

These qualification tests are conducted to determine whether or not the module is being produced in compliance with the requirements of the contract, specifications, and drawings. Failure of the module to meet these requirements may result in disqualification of the contractor as determined by NASA or the procuring activity.

Further production of the item by the contractor prior to approval of the procuring activity or the completion of the preproduction tests shall be at the contractor's risk. Requalification will be required at the discretion of NASA or the procuring activity in the event that: (a) the contractor has modified the item (b) the contractor has instituted a change in the material used or in his processing, or (c) the specification requirements for the item have been amended or revised sufficiently to affect the character of the item.

3-3.1 Functional Requirements. The module shall meet the following requirements under the conditions as specified below.

3-3.1.1 The module shall be exercised by a programmed tape and in conjunction with the following modules; Rope Sense Amplifiers B26 and B27, Rope Driver B32 and B33, Rope Strand Select B30, Strand Gate B31 and the Driver Service Module B7. The programmed tape shall generate inputs and verify that the core ropes are set, reset, inhibited, and sensed in a manner compatible with the programmed instructions.

3-3.1.2 The input signals shall have the following characteristics.
See Figure 1.

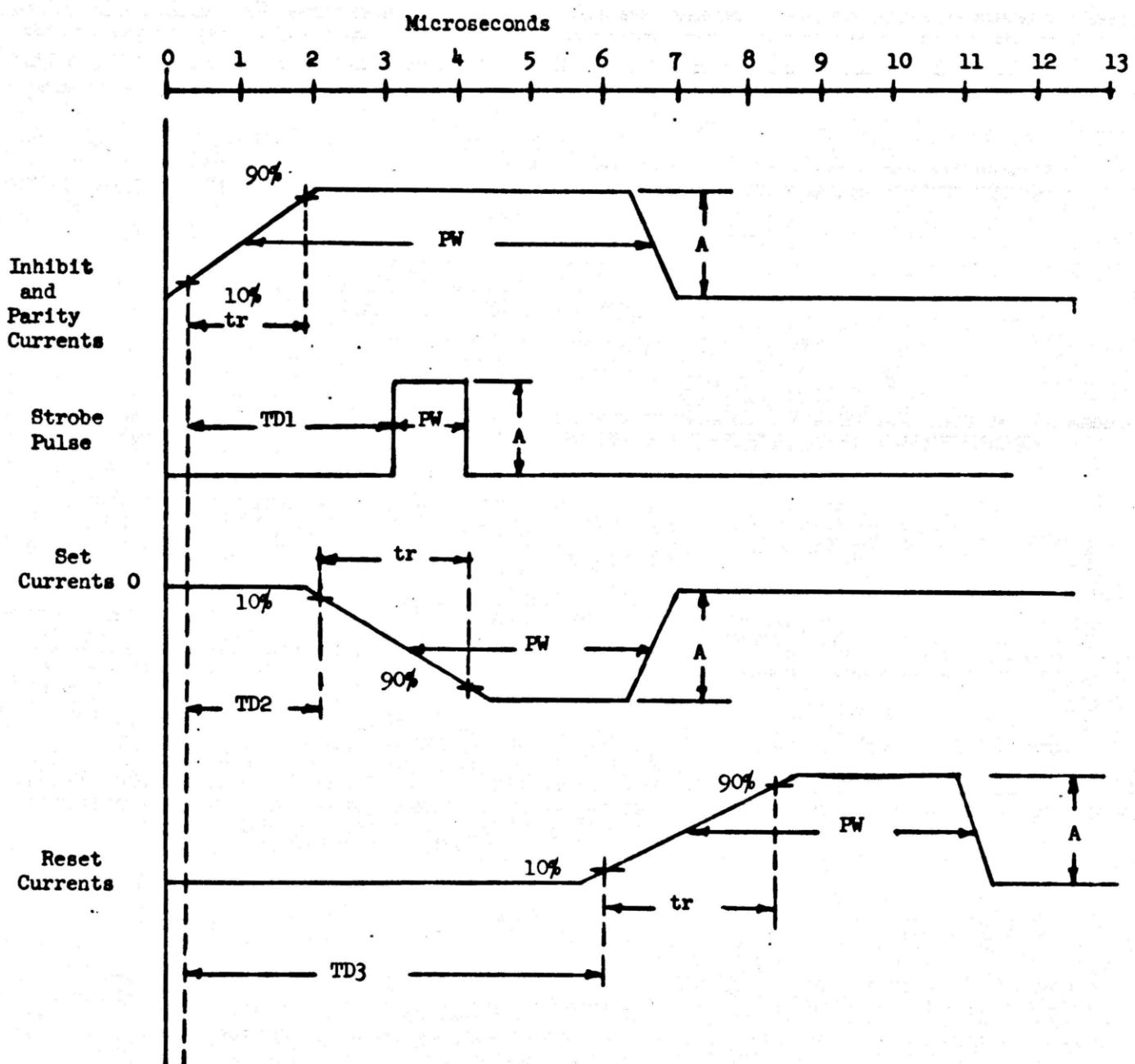
	<u>Parity & Inhibit Input *</u>	<u>Strobe Input</u>
Amplitude (A)	225 ma \pm 10%	NLT 0.5V
Rise Time (tr)	NMT 2.1 usec	-----
Fall Time (tf)	NMT 0.1 usec	-----
Pulse Width (PW)	5.7 usec \pm 10%	1.0 usec \pm 10%
Period (T)	MCT ₁ 16.4 usec \pm 10% MCT ₂ 33.0 usec \pm 10%	-----
TD1	-----	3.2 usec \pm 10%
	<u>Set Input</u>	<u>Reset Input</u>
Amplitude (A)	400 ma \pm 10%	350 ma \pm 10%
Rise Time (tr)	1.6 \pm 0.4 usec	NMT 1.6 usec
Fall Time (tf)	NMT 0.5 usec	0.1 usec \pm 10%
Pulse Width (PW)	4.0 usec \pm 10%	4.0 usec \pm 10%
TD2	2.0 usec \pm 50%	-----
TD3	-----	6.0 usec \pm 10%

* Parity and Inhibit inputs shall start NMT 0.1 usec apart.

3-3.1.3 The output signals shall have the following characteristics on Sense lines Parity thru Sign. See Figure 2.

a)	V1 Max	MMT 130 mv
b)	V1 Min	MLT 40 mv
c)	V0 Max	MMT 10 mv

3-3.2 Environmental Requirements. V0 Max shall be not more than 10 millivolts at $0^{\circ} + 2^{\circ}\text{C}$ and not more than 13 millivolts at $70^{\circ} + 2^{\circ}\text{C}$ when the module is subjected to these temperatures and stabilized at these temperatures for not less than 20 minutes.



Rope Module Input Current Requirements

Figure #1

3-3.1.6 Inhibit Test. Each and every core shall be addressed in succession. The output signal observed on the "test sense line" shall have the following characteristics. Figure 3 defines V_1 Peak and V_1 Min measurement areas.

V_1 Peak	NMT 230 mv
V_1 Min	NLT 75 mv

3-3.1.7 Dynamic Test. The contents of the Rope Module shall be compared to a programmed tape. The programmed tape shall address each core with the required input signal as defined in sections 3-3.1.2 and 3-3.1.5 and shall verify that each core contains the correct information.

3-3.1.7.1 The output signals shall have the following characteristics on Sense Lines Parity through Sign. See Figure 3.

V_1 Peak	NMT 160 mv
V_1 Min	NLT 50 mv
V_0	NMT 13 mv

3-3.2 Environmental Requirements. The module shall be operated in accordance with the requirements specified in sections 3-3.1.7 and 3-3.1.7.1 when the ambient temperatures are $0^{\circ}\text{C} \pm 2^{\circ}\text{C}$ and $70^{\circ}\text{C} \pm 2^{\circ}\text{C}$.

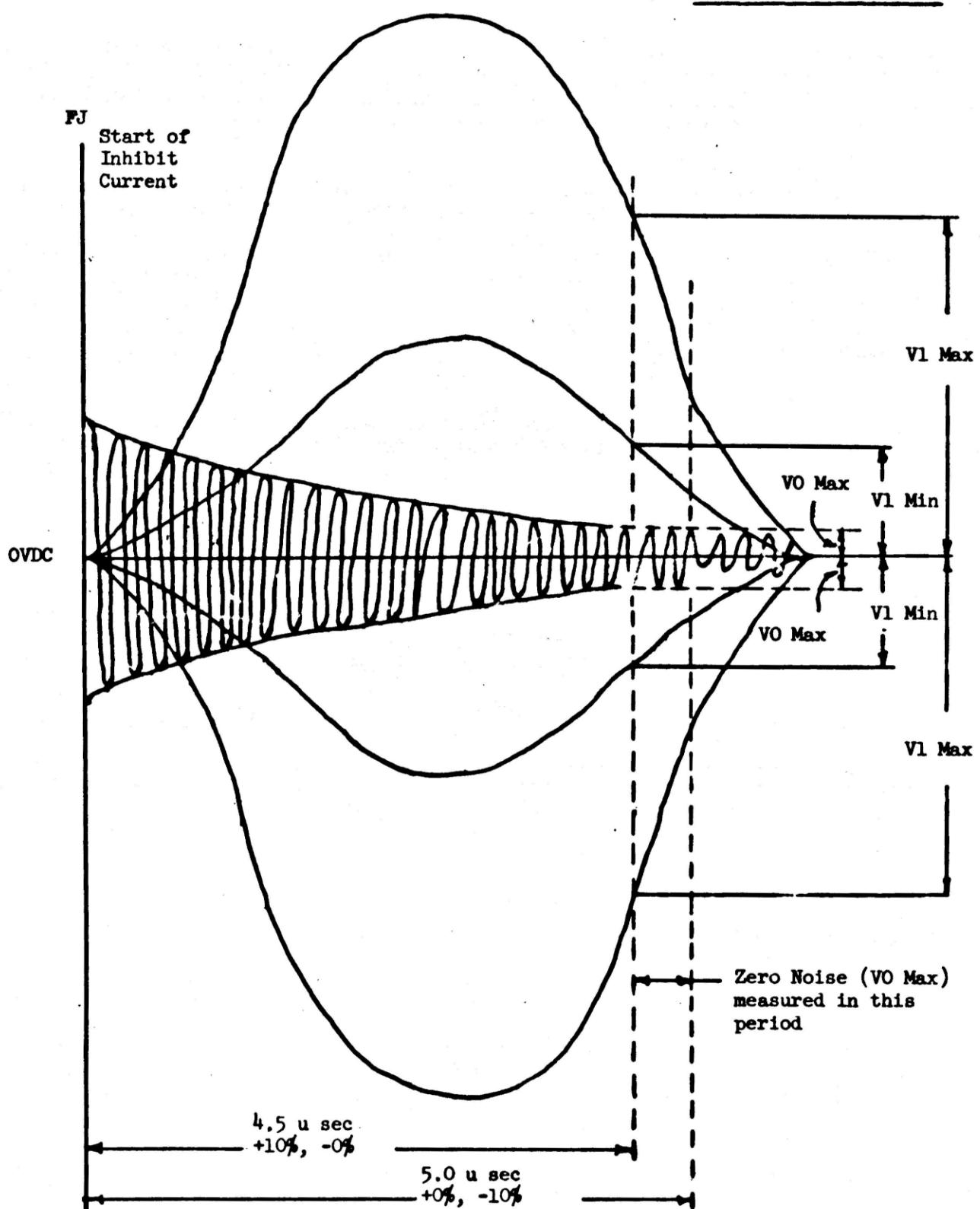


FIGURE #2 ROPE OUTPUT WAVEFORM CHARACTERISTICS

3-3.3 Service Life. The module design is intended to meet the following requirements.

3-3.3.1 Operating Life. The module is intended to meet performance specifications for at least 2000 hours operation, excluding the contractor's test time of the complete unit.

3-3.3.2 Shelf Life. The module is intended to have a shelf life of at least 3 years, without operation, at ambient room temperature after final acceptance at the contractor's plant when packaged in accordance with ND 1002214.

3-3.4 Design Characteristics

3-3.4.1 Interchangeability. Unless otherwise specified, the module shall be physically and functionally interchangeable without selection or fitting.

3-3.4.2 Reliability. The module shall be capable of meeting a maximum failure rate of 4.53 failures per million hours at a 90 percent confidence level.

4. QUALITY ASSURANCE PROVISIONS

4-1 GENERAL. Unless otherwise specified herein, the contractor is responsible for the performance of all inspection requirements prior to submission for NASA inspection and acceptance. Except as otherwise specified, the contractor may utilize his own facilities or any commercial laboratory acceptable to NASA. Inspection records of the examinations and tests shall be kept complete and available to NASA as specified in the contract or order.

4-1.1 Acceptance Tests. These tests shall be accomplished on each module being submitted for acceptance under the contract. Acceptance test data on each unit accepted must accompany shipment to the procuring activity. Acceptance tests shall be witnessed by the cognizant government inspector, a representative of the procuring activity, or as the procuring activity may direct in the procurement order. These tests are detailed in paragraph 4-2. Failure of the module to comply with these requirements shall result in rejection of the item or lot of items.

b-1.1.1 NASA Acceptance Inspection. The NASA acceptance inspection will be in accordance with FIM 1003133 for the Rope Modules B21 thru B24, B28 and B29.

b-1.2 Qualification and Requalification Tests. Qualification and Requalification tests shall be at a NASA-designated activity in accordance with NASA Document NPC 200-2, Quality Program Provisions for Space System Contractors, and such other documents as may be provided. These tests, as outlined in paragraph 4-3, shall be conducted after the award of the contract to determine that the product will meet all specified requirements.

Failure of the Module to comply with these requirements shall result in the rejection of the lot or the cessation of production, as determined by the procuring activity.

b-2 ACCEPTANCE TESTS.

b-2.1 Test Conditions. Unless otherwise specified herein, the module shall be subjected to tests under the following ambient conditions:

Temperature	25 \pm 10°C
Relative Humidity	Not more than 90%
Barometric Pressure	28 to 32 in Hg

b-2.2 TESTS. The module shall be tested for the requirements as described in sections 3-3.1 and 3-3.2.

b-2.3 Visual and Mechanical Inspection. A comprehensive inspection shall be made of the module to determine the extent of compliance with the requirements of this specification and the applicable NASA drawing #1003733 and shall at least include determination of the following:

1. Size, dimension, weight, appearance, and markings
2. Finish, coatings, construction, markings, as applicable
3. Welding, soldering, and terminals, as applicable
4. Workmanship and cleanup

b-3 QUALIFICATION AND REQUALIFICATION TEST. Qualification and Requalification tests may be performed individually or when the module is assembled as part of the APOLLO Guidance Computer Subsystem. The tests shall be in accordance with the applicable paragraphs of specification ND-1002037 as directed by the procuring activity.

APOLLO G & N Specification

PS 1003733

Date _____

5. PREPARATION FOR DELIVERY

5-1 GENERAL. Unless otherwise specified by the procuring activity or the applicable detail specification, the assemblies shall be preserved, packaged, packed and marked in accordance with Specification ND-1002214.

6. NOTES

6-1 INTENDED USE. The Rope Modules B21 thru B24, B28 and B29 are intended for use in the APOLLO Guidance Computer.

NOTICE: When NASA drawings, specifications, or other data are used for any purpose other than in connection with a definitely related NASA procurement operation, the National Aeronautics and Space Administration thereby incurs no responsibility nor any obligation whatsoever; and the fact that NASA 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.