APOLLO G&N Specification
PS 2003981 Rev[illegible] E
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PROCUREMENT SPECIFICATION

PRODUCT CONFIGURATION AND ACCEPTANCE TEST REQUIREMENTS

FIXED MEMORY SENSE AMPLIFIER MODULE B11

DRAWING NO. 2003981

Record of Revisions

	Date	Revision Letter	TDRR No.	Pages Revised	Approvals MIT	Approvals NASA
M	3/1/66	A	29209	1, 4, 7, 12		
M	9/1/66	B	30877	1, 7	FH	FH
M	10/13/66	C	31537	1, 4, 6	FH	FH
	1/6/67	D	32545	1,7,8,13	FH	FH
M	1/5/67	E	32551	1,2,4,6,7	FH	FH

This specification consists of pages 1 to 13 inclusive.

APPROVALS	A. C. METZGER NASA/MSC	MIT/IL	RAY

1. SCOPE

This specification establishes the detail requirements for complete identification and acceptance of the Fixed Memory Sense Amplifier Module B14 Part No. 2003981-011.

2. APPLICABLE DOCUMENTS

The following documents form a part of this specification to the extent specified herein.

2.1 EFFECTIVE ISSUES. Unless otherwise specified herein, Military and Government Standards and specifications shall be the issue in effect on the date of request for proposal or invitation to bid.

SPECIFICATIONS

APOLLO G&N

ND 1002214	General Specification for Preservation, Packaging, Packing and Container Marking of APOLLO Guidance and Navigation Major Assemblies, Assemblies, Subassemblies, Parts and Associated Ground Support Equipment.

DRAWINGS

APOLLO G&N

2003981	Fixed Memory Sense Amplifier Module B14

(Copies of Specifications, Standards, Drawings, Bulletins, and Publications required by suppliers in connection with specific procurement functions should be obtained from the Procuring Activity or as directed by the Contracting Officer).

2.2 CONFLICTING REQUIREMENTS. In event of conflict between the requirements of the contract, this Specification and the documents listed in this section the following order of precedence shall apply and the contractor shall notify MIT Apollo Management of the conflict as soon as it is determined.

a. The contract
b. This Specification
c. Documents listed in this section

3.1.5 Threshold Voltages

3.1.5.1 Outputs. The output of each stage shall be measured as shown in Figure 1 when an input as specified in section 4.1.5.1 is applied.

3.1.5.2 Threshold Voltage (A_k and A_q). Threshold voltage for each stage shall be 35 ± 4.0 mv.

3.1.5.3 Gain Resolution. The gain resolution for each stage shall be not more than 3.5 mv.

3.1.6 Delay Time

3.1.6.1 Strobe Driver Output (STROBE, STROBF). The Strobe Driver output shall be as shown in Figure 2, and shall have the following characteristics when an input as specified in section 4.1.5.2 is applied.

Amplitude (high)	NMT 1.0V below B+
Amplitude (low)	8.0 ± 0.5V below B+
Rise Time (t_r)	NMT 60 nanosec
T_2	70 ± 20 nanosec
T OFF	NMT 0.75 usec

3.1.6.2 Sense Amplifier Outputs. Each of the Sense Amplifier outputs shall be as shown in Figure 2, and shall have the following characteristics when an input as specified in section 4.1.5.2 is applied.

Amplitude (high)	NMT 0.3V below B+
Amplitude (low)	NLT 1.7V below B+
Rise Time (t_r)	NMT 100 nanosec
Fall Time (t_f, t_{f2})	NMT 125 nanosec
T_4	140 ± 40 nanosec
T_5, T_6	NMT 100 nanosec

3.1.6.3 PNP (Q_1) Stage Output. Each PNP Stage Output shall be as shown in Figure 2, and shall have the following characteristics when an input as specified in section 4.1.5.2 is applied.

Amplitude (high)	1.25 ± 0.15V
Amplitude (low)	NMT 0.20V
Rise Time (t_r)	NMT 125 nanosec
Fall Time (t_f)	NMT 400 nanosec
T7	180 ± 60 nanosec
T8	NMT 1.3 usec

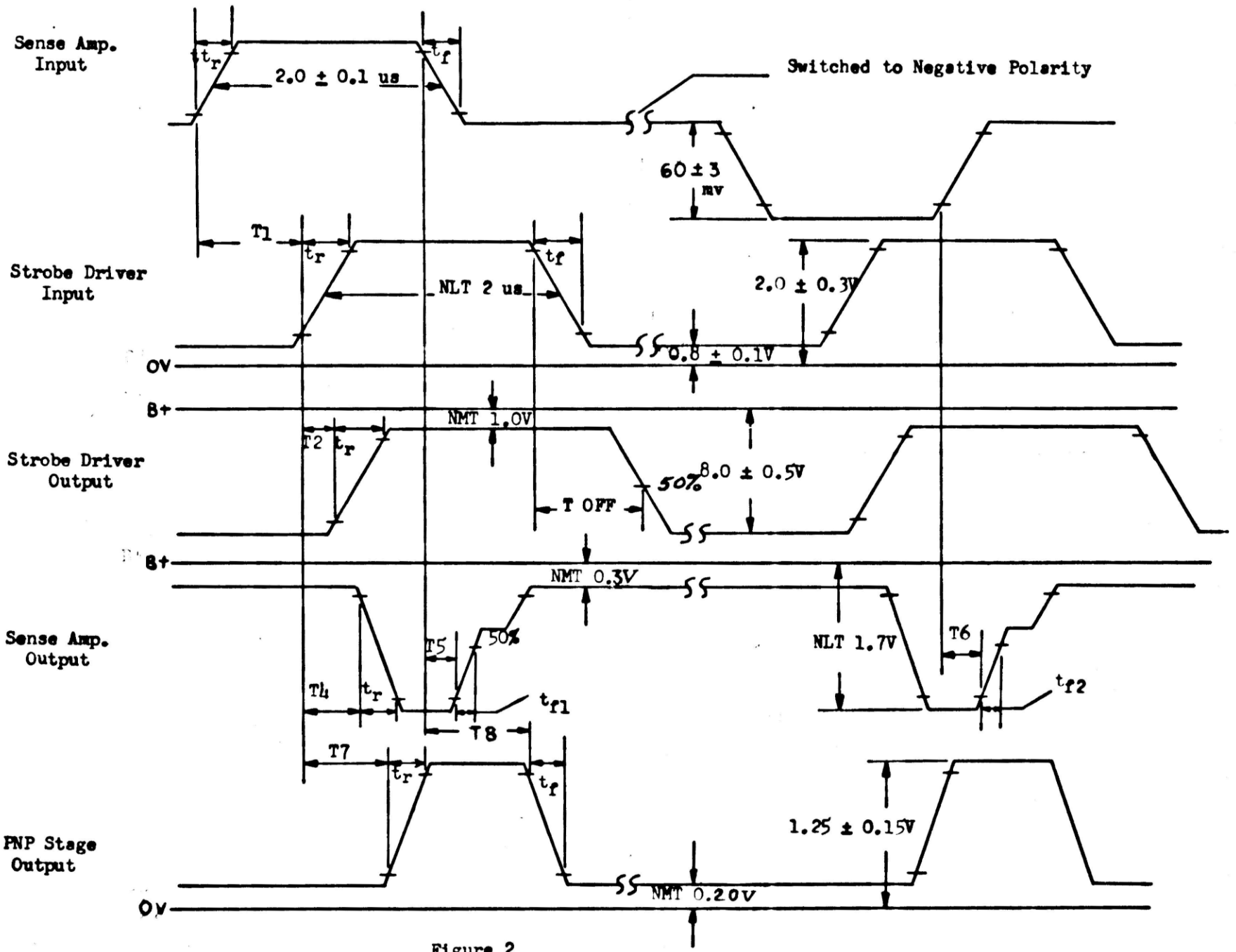
Sense Amp. Input
t_r
t_f
2.0 ± 0.1 us
Switched to Negative Polarity
60 ± 3 mv
Strobe Driver Input
T1
t_r
t_f
NLT 2 us
2.0 ± 0.3V
0.8 ± 0.1V
0V
8+
NMT 1.0V
Strobe Driver Output
T2
t_r
50%
8.0 ± 0.5V
T OFF
8+
NMT 0.3V
Sense Amp. Output
T5
50%
NLT 1.7V
T6
Th
t_r
t_{f1}
t_{f2}
T8
T7
t_r
t_f
PNP Stage Output
1.25 ± 0.15V
NMT 0.20V
0v

Figure 2

3.1.7 Marginal Voltages and Temperature Extremes.

3.1.7.1 With the input voltage adjusted to 12.2 ± 0.1 VDC, and an ambient temperature of -10°C $^{+0C^{\circ}}_{-2.8C^{\circ}}$, the module shall operate as specified in sections 3.1.5 and 3.1.6, except threshold voltage shall be 35 $^{+7}_{-4}$ mv, and PNP and STROBE output amplitudes may decrease by 20%. The only times measured shall be:

T_2	70 $^{+40}_{-20}$ ns
T_4	140 $^{+80}_{-40}$ ns
T_7	180 $^{+140}_{-60}$ ns
T_5, T_6	NMT 125 ns
T_8	NMT 1.125 µs
T OFF	NMT 0.45 µs

3.1.7.2 With the input voltage adjusted to 16.5 ± 0.1 VDC, and an ambient temperature of -10°C $^{+0C^{\circ}}_{-2.8C^{\circ}}$, the module shall operate as specified in sections 3.1.5 and 3.1.6, except threshold voltage shall be 35 $^{+7}_{-4}$ mv, and PNP and STROBE output amplitudes may increase by 20%. The only times measured shall be:

T_2	70 $^{+40}_{-20}$ ns
T_4	140 $^{+80}_{-40}$ ns
T_7	180 $^{+140}_{-60}$ ns
T_5, T_6	NMT 125 ns
T_8	NMT 1.125 µs

T OFF NMT 0.45 µs

3.1.7.3 With the input voltage adjusted to 16.5 ± 0.1 VDC, and an ambient temperature of 70° $^{+2.8C^{\circ}}_{-0C^{\circ}}$, the module shall operate as specified in sections 3.1.5 and 3.1.6, except threshold voltage shall be 35 $^{+4}_{-7}$ mv, and PNP and STROBE output amplitudes may increase by 20%. The only times measured shall be:

T_2	70 $^{+40}_{-20}$ ns
T_4	140 $^{+80}_{-40}$ ns
T_7	180 $^{+140}_{-60}$ ns
T_5,T_6	NMT 125 ns
T_8	NMT 1.125 µs

T OFF NMT 0.45 µs

3.1.8 Vibration. The module shall perform as specified in paragraphs 3.1.5.1 through 3.1.6.3 when installed in an operating computer which is being subjected to the vibration requirements specified in the applicable specifications for the computer subsystem. Acceptance criteria for the module shall be the compliance of the computer subsystem with its applicable specifications.

3.2 PRODUCT CONFIGURATION

3.2.1 DRAWING. The configuration of the assembly shall be in accordance with APOLLO G&N Drawing 2003981 and all drawings and engineering data referenced thereon.

3.2.2 Weight of the module shall be recorded.

4. QUALITY ASSURANCE PROVISIONS

4.1 GENERAL. The contractor responsible for the manufacture of the assembly shall be responsible for the accomplishment of each test required herein. See Table I, Product Performance and Configuration Requirement/Quality Verification Cross Reference Index.

TABLE I

Requirements	Verification
3.1.1	4.2.2
3.1.2.1	4.2.3.1
3.1.2.2	4.2.3.2
3.1.2.3	4.2.3.3
3.1.3.1	4.2.4.1
3.1.3.2	4.2.4.2
3.1.3.3	4.2.4.3
3.1.3.4	4.2.4.4
3.1.5.1	4.2.5.1, 4.2.5.2
3.1.5.3	4.2.6
3.1.6.1	4.2.5.5
3.1.6.2	4.2.5.3, 4.2.5.4
3.1.6.3	4.2.5.6
3.1.7.1	4.3.1.1
3.1.7.2	4.3.1.2
3.1.8	4.3.2
3.2.1	4.2.1
3.2.2	4.2.7

4.1.1 Test Conditions

4.1.1.1 Environmental. Unless otherwise specified, the assemblies shall be tested under the following ambient conditions:

a. Temperature 25°C ± 10°C

b. Relative Humidity 90% max.

c. Barometric Pressure 28 to 32 inches of Hg

4.2.3.3 Measure the resistance between pin 269 (chassis ground) and the chassis, and verify that it is as specified in paragraph 3.1.2.3.

4.2.4 Insulation Resistance Tests. Using a resistance bridge or equivalent with a test potential of 50 VDC limited to a short circuit current of 50 microamperes, perform the following:

4.2.4.1 Measure the resistance between any one pin B and all other pin B's, and any one pin E and all other pin E's, and verify that they are specified in paragraph 3.1.3.1.

4.2.4.2 Measure the resistance between each pin B and all pins G, H, I, J, and pins 126, 128, 103, 229, 234, and 268. Verify that they are as specified in paragraph 3.1.3.2.

4.2.4.3 Measure the resistance between each pin E and all pins G, H, I, J, and pins 126, 128, 103, 229, 234, and 268. Verify that they are as specified in paragraph 3.1.3.3.

4.2.4.4 Measure the resistance between pin 269 and all other pins on the module, and verify that they are as specified in paragraph 3.1.3.4.

4.2.5 Functional Tests

4.2.5.1 With the input signal of paragraph 4.1.5.1 applied to pins A & C of each stage, and the output (pin G) loaded with the circuit shown in paragraph 4.1.4, measure the output at pin G and verify that it is in accordance with paragraphs 3.1.5.1 and 3.1.5.2.

4.2.5.2 With the input signal of paragraph 4.1.5.1 applied to Pins D & F of each stage, measure the output at pin J and verify that it is in accordance with paragraphs 3.1.5.1 and 3.1.5.2.

4.2.5.3 With the input signal of paragraph 4.1.5.2.1 applied to pins A & C of each stage, and the output (pin G) loaded with the circuit shown in paragraph 4.1.4, measure the output at pin G and verify that it is in accordance with paragraph 3.1.6.2.

4.2.5.4 With the input signal of paragraph 4.1.5.2.1 applied to pins D & F of each stage, measure the output at pin J and verify that it is in accordance with paragraph 3.1.6.2.

4.2.5.5 With the input signal of paragraph 4.1.5.2.2 applied to pin 268, measure the output at pin 126 and verify that it is in accordance with paragraph 3.1.6.1

4.2.5.6 With the input signal of paragraph 4.1.5.2.1 applied to pins A & C and D & F of each stage, and pin I loaded with a 1000 ohm ± 5% resistor, measure the output at pin I and verify that it is in accordance with paragraph 3.1.6.3.

4.2.6 Gain Resolution. Using the following formula, calculate the gain resolution for each stage, and verify that they are in accordance with paragraph 3.1.5.3.

NOTE: See paragraph 4.1.5.1 for definitions of symbols

$$\text{GAIN RESOLUTION} = AK - A_k$$

$$= AQ - A_q$$

4.2.7 Weight. Weigh the module to the nearest .01 pound. Verify that the weight does not exceed the maximum allowable weight specified in paragraph 3.2.2.

4.3 WORKMANSHIP. The following tests shall be pweformed under the conditions specified as a verification of good workmanship.

4.3.1 Marginal Voltage and Temperature Extremes.

4.3.1.1 With the input voltage and ambient temperature as specified in paragraph 3.1.7.1, repeat tests 4.2.5.1 through 4.2.6. Verify that the module performs as specified in paragraph 3.1.7.1.

NOTE: The module shall be maintained at the specified temperature for not less than 30 minutes prior to start of tests.

4.3.1.2 With the input voltage and ambient temperature as specified in paragraph 3.1.7.2, repeat tests 4.2.5.1 through 4.2.6. Verify that the module performs as specified in paragraph 3.1.7.2.

NOTE: The module shall be maintained at the specified temperature for not less than 30 minutes prior to start of tests.

4.3.1.3 With the input voltage and ambient temperature as specified in paragraph 3.1.7.3, repeat tests 4.2.5.1 through 4.2.6. Verify that the module performs as specified in paragraph 3.1.7.3.

NOTE: The module shall be maintained at the specified temperature for not less than 30 minutes prior to start of tests.

4.3.2 Vibration. Install the module in an applicable computer. Subject the computer subsystem to the vibration tests specified in the applicable JDC. Verify that the computer subsystem meets the requirements of the applicable specification.

5. PREPARATION FOR DELIVERY

5.1 GENERAL. Preparation for delivery shall be in accordance with Specification ND 1002214.

6. NOTES: None.